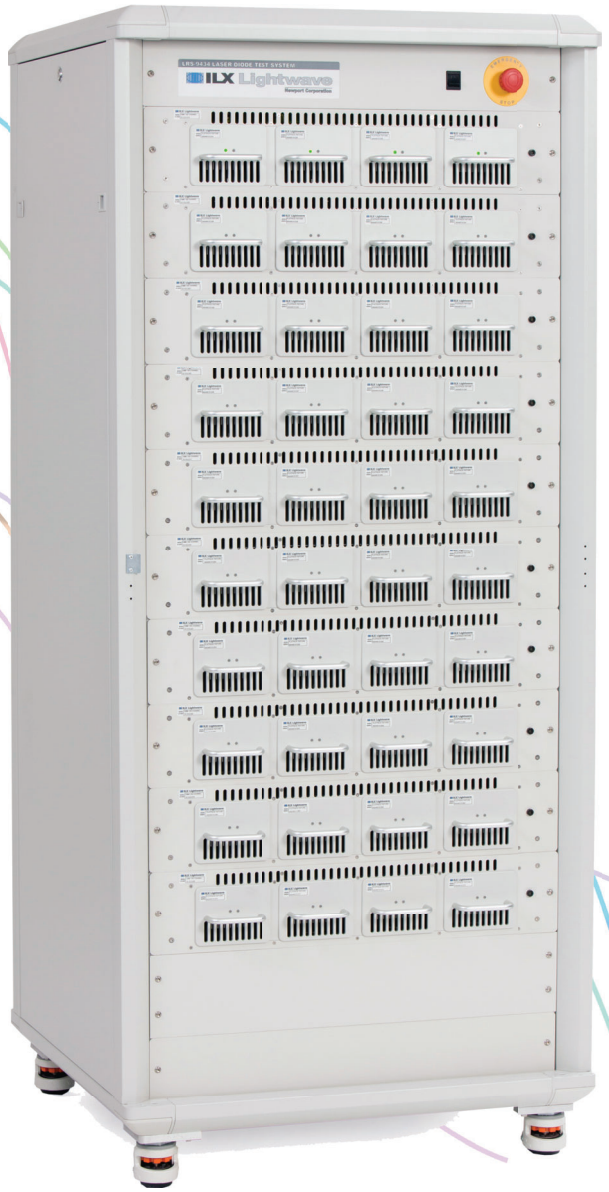
User's Guide

Laser Reliability and Burn-In Test System
LRS-9434 and LRS-9434SS



Newport®

Newport Corporation
31950 Frontage Road Bozeman, MT, USA
www.newport.com
PHONE: 1-800-459-9459 1-406-556-2481 FAX: 1-406-586-9405 EMAIL: sales@ilxlightwave.com
Complete listings for all global office locations are available online at www.newport.com/contact

700481 May 2020

Table of Contents

Chapter 1 : Introduction

This chapter is an introduction to the LRS-9434 Laser Reliability and Burn-In Test System. This chapter also includes:

- ✓ Unpacking information
- ✓ Instructions on how to install and apply power
- ✓ Maintenance information

Product Overview

The LRS-9434 is a high-density laser burn-in and life-test system capable of testing a maximum of 1408 devices simultaneously. The system can be configured to test up to eleven shelves with up to four fixtures per shelf capable of holding up to 32 devices per fixture. The temperature of each fixture is independently controllable and capable of operation from 40°C to 120°C. Burn-ins and life-tests can be run in either ACC (constant current) or APC (constant power) mode. A built-in routine for performing in situ L-I-V tests may be run between burn-in / life-test steps with either the device's internal photodiode or an optional external photodiode array.

A computer is connected to the system via an Ethernet port to allow test control and data storage and analysis. The system's ReliaTest software comes pre-configured to operate the computer and chamber as a standalone system.

NOTE: This manual describes the standard configuration of the LRS-9434. This system can be configured with custom features. All non-standard, custom features are described in Appendix C: Custom Features.

Initial Inspection

When you receive the LRS-9434 system, verify that the following items were shipped:

One or two pallets containing the following:

- LRS-9434 Laser Reliability Test Chamber
- Boxes containing:
  - Any control measure modules that were ordered with the system
  - Any test fixtures that were ordered with the system
  - Any detector arrays that were ordered with the system
  - LRS-9434 system notebook
- System control laptop computer

Tour of the LRS-9434 System

The LRS-9434 is a high-density, high-reliability laser life-test and burn-in test system. A variety of laser packages can be tested, and different test scenarios (profiles) can be run simultaneously in the chamber. A comprehensive and easy-to-use software package, called ReliaTest, gives you full control over all aspects of the system. ReliaTest allows you to easily configure and manage tests and has graphical data display features so you can easily monitor devices throughout the test process.

Figure 1.1 shows the LRS-9434. The rack holds up to eleven independent control measure modules (CMMs). Each CMM accepts up to four laser diode fixtures. AC power and Ethernet to each CMM are routed at the rear of the rack. The top panel houses the emergency stop button. The start switch will power on the system as long as the emergency stop is not depressed and the circuit breaker on the top rear panel is on.

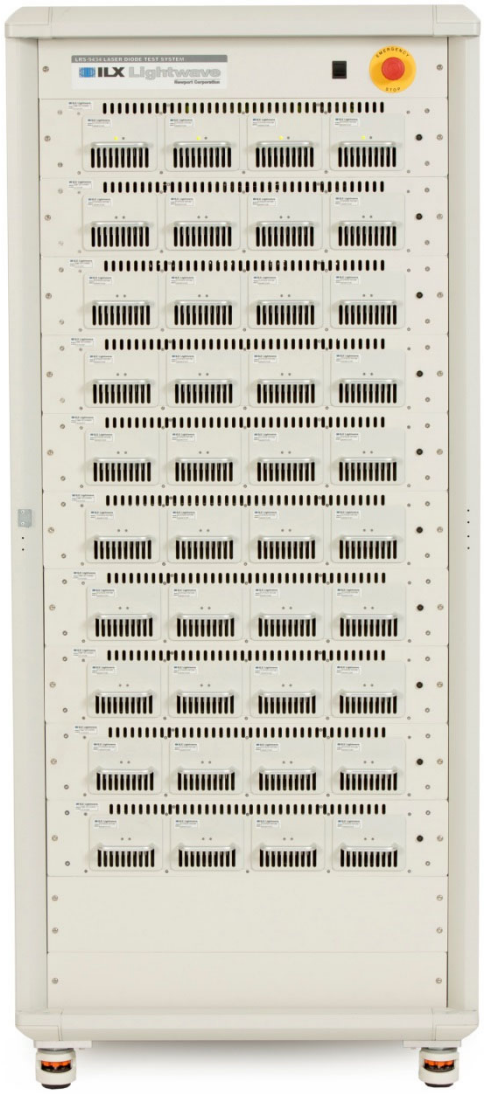


Figure 1.1 – LRS-9434

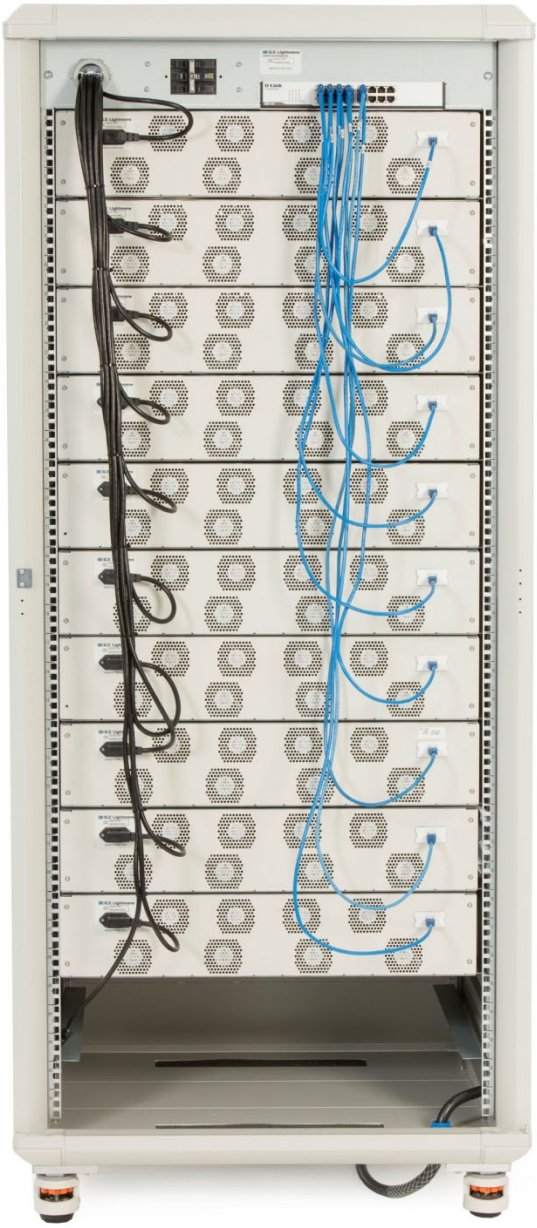


Figure 1.2 – Rear View of the LRS-9434

Figure 1.2 shows the rear of the system. All power and communications cables are routed at the rear of the system. As shown, there is a main power switch/breaker that must be engaged to allow the system to operate. The power cord is delivered unterminated to allow direct connection to the facility's main power. The system can be connected to the facility network by connecting an Ethernet cable to one of the open ports on the Ethernet router.

Figure 1.3 – Front View of the Sentry LRS-9434SS

Figure 1.3 shows the Sentry LRS-9434SS. This is a bench top model of the LRS-9434. This system has a maximum of 4 fixtures. The system can be expanded into a full rack as needed.

Features

The LRS-9434 features have been designed to be easy to use and with intelligent and efficient test capabilities. Several features of note are the following:

- Test up to 1408 devices simultaneously
- Up to 500 mA of laser drive current per device; higher currents are possible with current paralleling fixtures
- Different tests may be simultaneously run on different device fixtures
- Test temperatures from 40°C to 120°C; 25ºC available via custom configuration at the time of ordering
- Different device types can be tested simultaneously (separate fixtures required)
- Device fixtures support measurements using internal and/or external photodiodes
- Absolute power measurement via external photodiodes
- Fixtures support multiple pin configurations and are configurable through the ReliaTest software
- Real-time viewing of currently running test data with simultaneous viewing of completed tests
- Intuitive graphical interface for viewing system and test status
- Graceful handling of power blackouts and brownouts
- Optional ReliaCal calibration fixture and software available

Safety Considerations

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Throughout this manual, important symbols are used to indicate potential hazards that may be experienced while operating the LRS-9434. These systems are defined below.

Important operating and service/maintenance information

Risk of exposure to visible and/or invisible laser radiation

Caution: Risk of electric shock

Frame or chassis terminal

Chapter 2 : Installation

This chapter describes the steps that must be followed before you can begin using your system for normal operations. Normally, an ILX Lightwave representative should be present to manage the installation, system validation, and training at your site.

Rack Installation Requirements

The LRS-9434 requires 200V-240V, 50/60Hz, 50A three phase electrical service with true earth ground. For CE Marked systems, the AC service is permanent. The service connector should be located within 1 meter (3') of the center of the LRS-9434, and between 15cm and 55cm above the floor (6" - 22"). The power cord exits the bottom of the rack. The rack dimensions are 190 cm high by 80 cm wide by 80 cm deep.

The following physical clearances are required for the LRS-9434 system rack:

- Minimum Side Clearance: 2.5 cm (1”) on each side
- Minimum Back Clearance: 30 cm (12”)
- Minimum Front Clearance: 100 cm (39”)
- Minimum Top Clearance: 2.5 cm (1”)

The specified back clearance is for the operation of the LRS-9434. If maintenance or upgrades need to be performed on the instrument, a minimum of 100 cm (39”) is required to access the electronics bay.

Sentry Installation Requirements

The Sentry LRS-9434SS requires 110-240V, 50/60Hz, 10A, single phase electrical service with true earth ground.

The following physical clearances are required for the Sentry LRS-9434SS:

- Minimum Side Clearance: 10 cm (4”) on each side
- Minimum Back Clearance: 10 cm (4”)
- Minimum Front Clearance: 100 cm (39”)

Installation Procedure

Unpacking and Inspection

Carefully remove the packing from around the LRS-9434 and inspect the rack for any signs of physical damage or impact.

Open the boxes containing the control-measure modules (CMMs) and the laser fixtures, but DO NOT remove these components yet from the ESD-protective packaging. Inspect the components and packaging for any signs of breakage or damage. Finally, open all boxes containing the system control computer. Inspect all boxes and components for damage.

If any damaged containers or system components are found, notify the shipping courier and ILX Lightwave immediately.

Rack Installation

The LRS-9434 should be placed near its final location at this point. Make sure the main breaker, located at the top rear of the rack, is in the OFF position, then connect the unterminated system power cord to the facility power. This power cord should be a direct connection to facility power for safety reasons. Move the LRS-9434 chamber into its proper location, making sure to maintain the required clearances for ventilation and access.

Computer Installation

Assemble the computer by first locating the components in their installation locations, and then connect the computer components together per the instructions included with the computer. Connect an Ethernet cable from the LRS-9434 to the computer; use the right most Ethernet port, as viewed from the rear of the chamber, to connect to the computer's integrated network jack. It is recommended that internet access be provided by connecting a network cable from the facility's network to the computer's additional Ethernet port. Network access will allow the user to permit ILX to remotely operate the system for troubleshooting.

Only the computer that is supplied with the LRS-9434 system can be used to control the system. It has been configured at the factory with the proper control software and operating system configurations. If any other computer is used to control the chamber, the results may be unpredictable and the software may not function correctly.

Powering ON the System

The Control Measure modules must be installed prior to powering on the system. The control measure modules are normally installed by a representative from ILX Lightwave or in special cases with instructions from ILX.

System Validation

Once the ReliaTest software is running you will be able to begin system validation. The exact validation process will vary and is based on your test system design and functional requirements.

A typical validation procedure will verify that laser control and measurement functions are operating properly and within specification and all temperature control circuits work properly.

Chapter 3 : ReliaTest Software

This chapter describes the screens and functions that are accessed when configuring tests, fixtures, and devices for tests using the ReliaTest system control software. The process that must be followed to configure a test is described in Chapter 4, Configuring and Running Tests.

Software Terms and Fundamentals

The software is easy to use once the basics are well understood. A few terms that are helpful to know are listed below.

Device	Laser, TOSA or other device-under-test (DUT)
Device Type	A set of configuration instructions that define a particular device type; includes current limits, temperature limits, and laser safety-off criteria
Test Step	A single step of a test scenario, such as LIV or burn-in
Test Scenario	A sequence of test steps which, when combined, create an entire test sequence
Events	Any occurrence that causes the software to generate an alarm or alert message
Control Measure Module	The electronic current source board used to drive a full shelf in the chamber; a single control measure module (CMM) can drive up to 128 DUTs on four fixtures, and includes temperature controllers and TCP/IP communications circuitry

Starting the Computer and Software

The computer is configured to automatically power on when AC power is applied. It will automatically log onto your facility's network, start the ReliaTest control software, and connect to the LRS-9434. Refer to Appendix A for instructions on changing the log on passwords.

Before the computer is switched on, make sure the Ethernet cable is connected between the computer and LRS-9434. Refer to the manufacturer's instructions provided with the control computer for details on properly setting up and powering the computer.

Once the computer has booted, the ReliaTest control software will automatically start and will search for all available control-measure modules (CMMs). The software may be manually restarted by double-clicking on the ReliaTest icon located on the computer desktop. The startup process is logged in the Initialization Log, and can be viewed by clicking **Events -> View Initialization Log** in the menu at the top of the main window.

NOTE: Do not install additional software as this may negatively impact performance.

Navigating the Software

The software is primarily navigated using a Graphical User Interface (GUI) consisting of views and windows, on-screen buttons, and dialogue boxes.

There are three main sections, or views, to the software screen shown in Figure 3.1; the **Control View**, the **System View**, and the **Test View**. Generally, these sections each focus on the functions for which they are named.

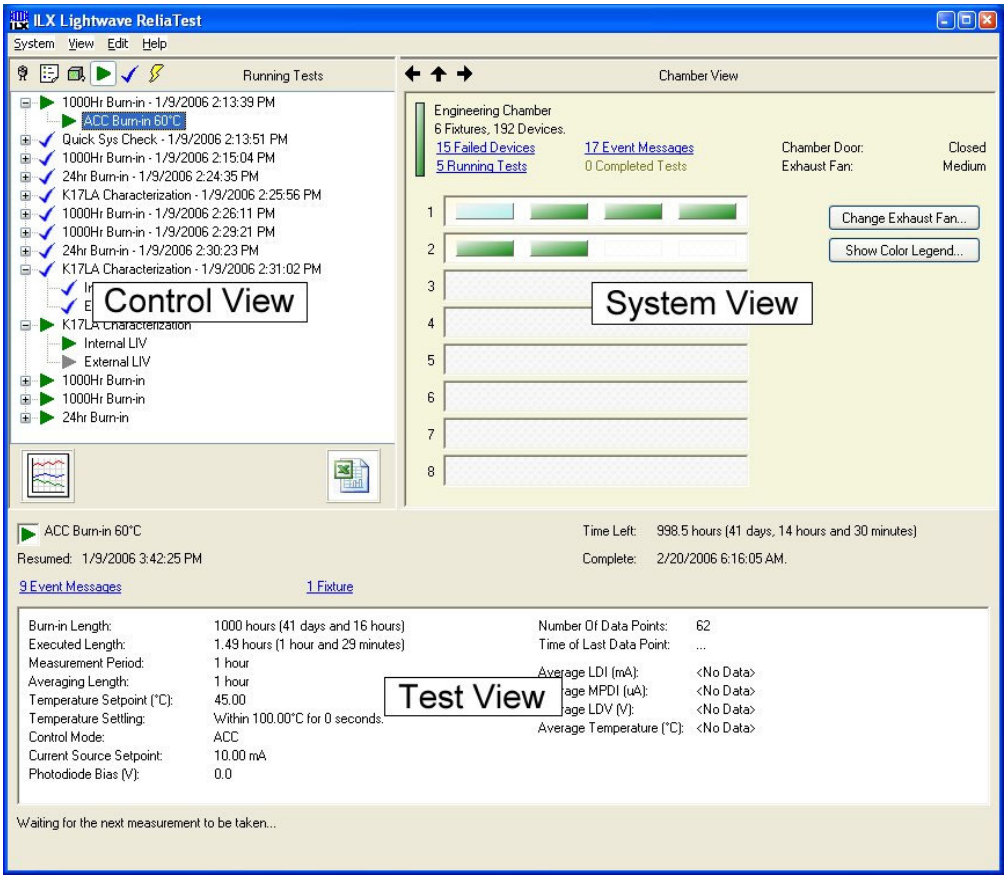


Figure 3.1 – Software Main Screen

Control View

The Control View in the upper left side of the main screen displays information relative to controlling the system. The six buttons in the top-left corner of the Control View are used to access the different functions described below.

- Device Type Configuration
- Test Configuration
- Instrument Information
- Running Tests
- Historical Test Data
- Events and Alarms

System View
The System View presents specific information on the entire chamber, each shelf, each fixture, and each device. Instruments can be viewed in detail by double-clicking them, or the three arrow buttons at the top of the System View can be used to step through devices and fixtures.

Test View
The Test View, at the bottom of the screen, presents information on the test scenario or step that is highlighted in the Control View. Information can be viewed for test configurations that are not running (Configured Tests), current running test scenarios (Running Tests), and test scenarios that have stopped running (Historical Tests).

Using the System View
You can view specific details on each shelf, fixture, or device by "diving down" through the hierarchy in the System View area. Simply double-click on the subcomponent - shelf, fixture, or device - you wish to examine in detail.

The System View hierarchy is shown in Figure 3.2. As the system view changes, the Control View also updates to display the location in the hierarchy "tree" that you are examining.
When an Event occurs, the affected instrument will flash red to get your attention. You can navigate in the System View to the affected instrument to find the event message. More information on events is in Chapter 6.

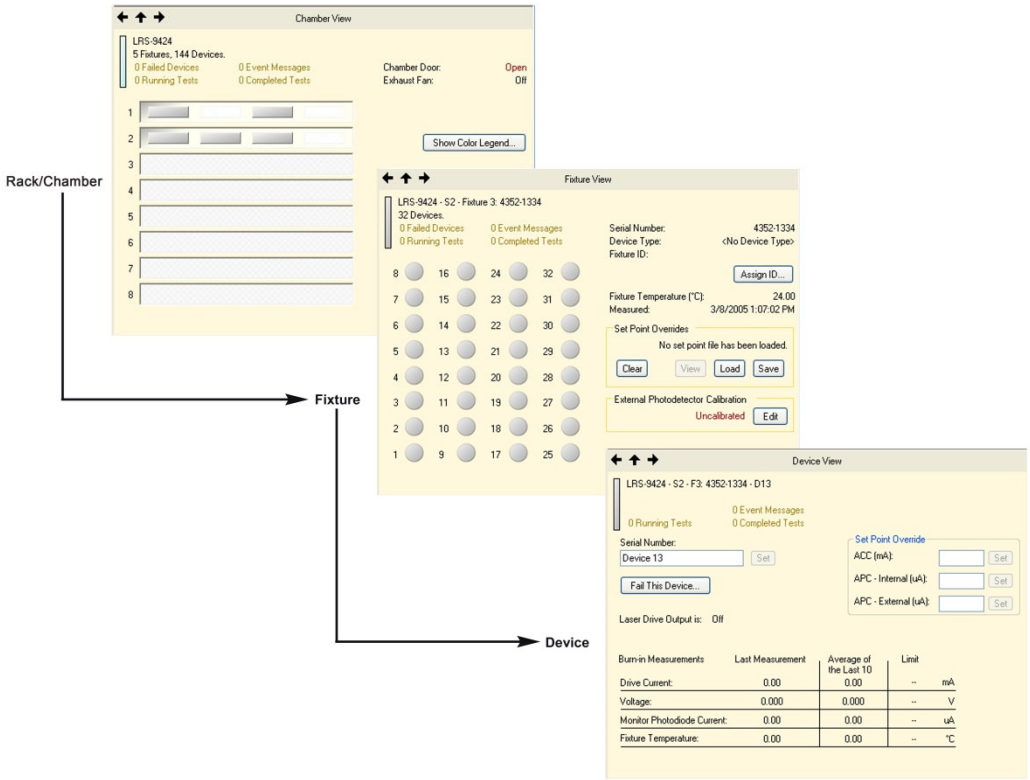


Figure 3.2 – System View Hierarchy

Chamber View

From the Chamber View, one can see all the fixtures and control measure modules (CMMs) that are installed within a single chamber. As shown in Figure 3.3, any shelf that is not populated with a CMM is lightly hatched. In this figure, shelves 1 and 2 are the only ones with CMMs installed. Any shelf with an installed CMM but with no fixtures will be visible with white boxes indicating open positions within the shelf.

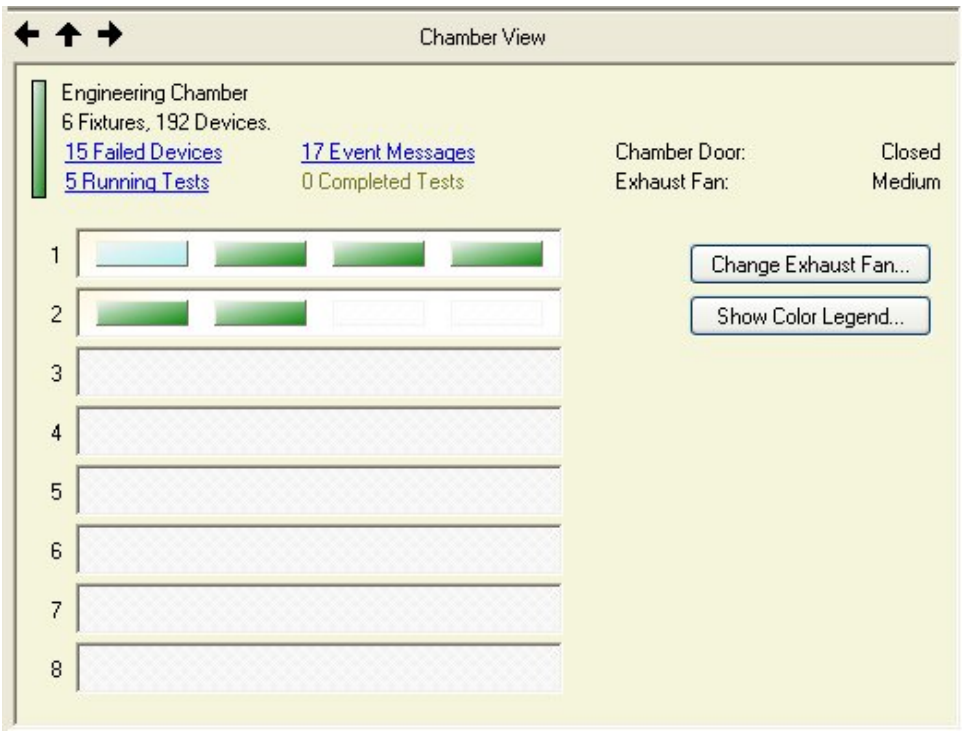
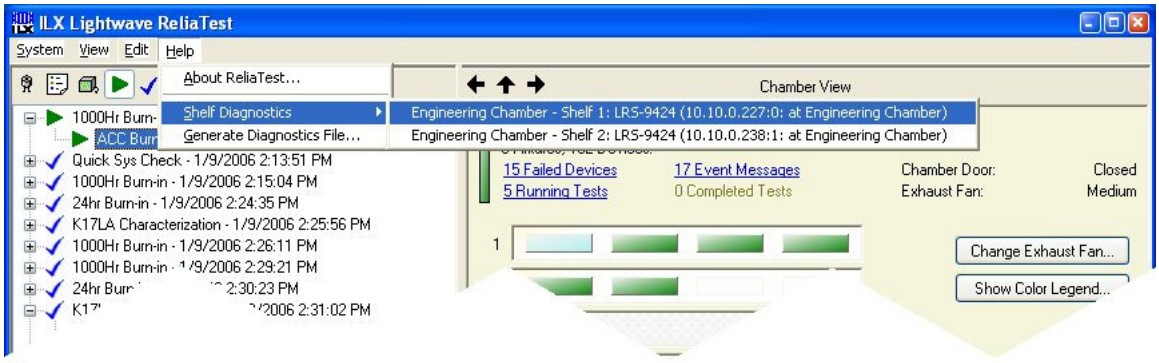


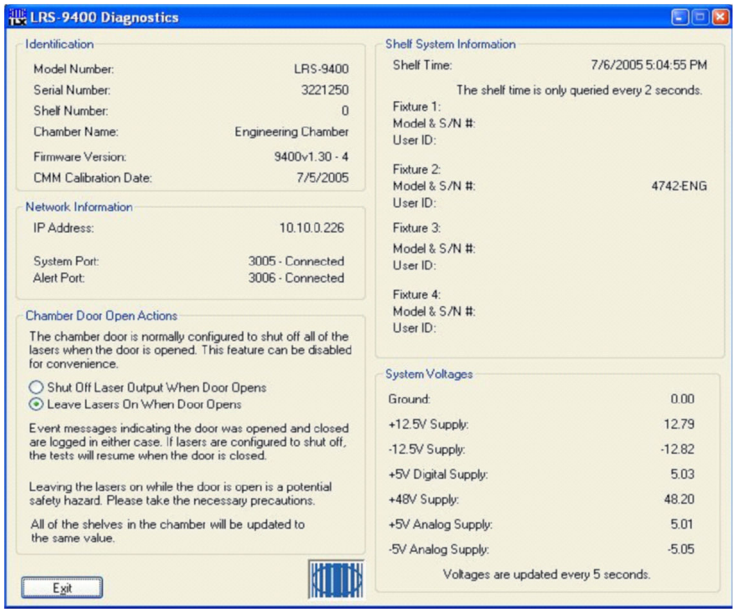
Figure 3.3 – Chamber View

Shelf Diagnostics

The Shelf Diagnostics provide detailed information about the status of a specific CMM. The Shelf Diagnostics may be accessed by selecting Help -> Shelf Diagnostics as shown below.



The diagnostics window provides important information used to verify system identification and operational integrity. The majority of the information displayed in the diagnostics window is intended for use by an ILX representative. The CMM serial number and the CMM calibration date are significant details in the diagnostics window.



Fixture View

Double clicking on a fixture from the Chamber View, or clicking on a fixture within the connected instruments tree from the Control View will bring up a view similar to that shown in Figure 3.4. The ReliaTest software identifies fixtures through the use of a serial number and fixture ID stored within the EEPROM located on the fixture circuit board. The fixture ID can be a name as descriptive as required and can be changed by clicking on the Assign ID button. The fixture ID can only be changed when the fixture is NOT being used in a currently running test. If the fixture is in use, the Assign ID button will be grayed out and unavailable.

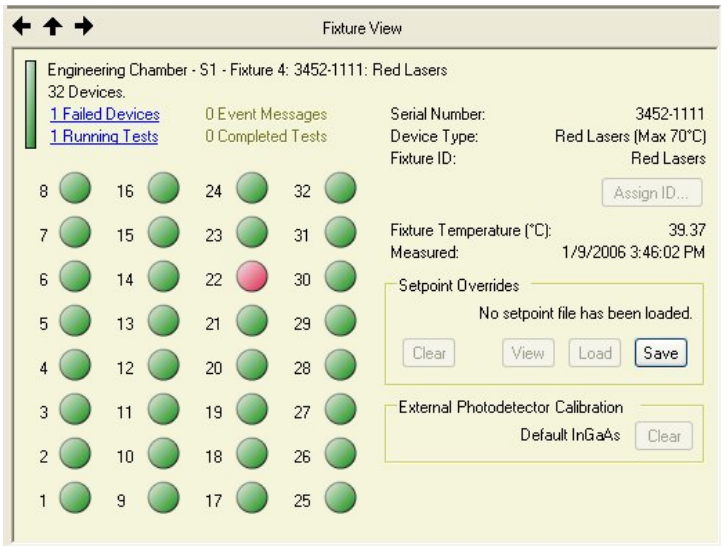


Figure 3.4 - Fixture View

The Fixture View also displays the fixture temperature while in standby mode and when a test is running. A timestamp shows how current the measurement is.

Setpoint Overrides

Below the fixture temperature display is a section allowing the manipulation of setpoint override files. Setpoint overrides will be discussed in more detail in the section entitled Device View. From the Fixture View, a file containing setpoint overrides may be assigned to a fixture, removed from a fixture, or viewed. Setpoint overrides assigned from the Device View may be saved to a file from this section of the Fixture View.

External Photodetector Calibration

External photodiode arrays have been calibrated to measure absolute optical power. A calibration file is associated with the array. This file is identified by the array serial number and should be located in the C:\Program Files (x86)\ILX Lightwave Corporation\ReliaTest\XPD Calibration Files directory on the control computer.

If the calibration was performed after initial system shipment, the calibration files will be provided with the arrays. The provided files should be copied into the ReliaTest calibration directory.

Clicking on the Edit button brings up a dialog box allowing the calibration file to be located and associated with the fixture currently being viewed. After association has occurred, the button text changes from Edit to Clear to allow future fixture and array disassociation. This button is only active if the fixture is not presently being used in a test. This association remains in force even if the array has been physically removed from the fixture. Once an external photodiode array and fixture have been associated, measurements from the array will be shown in units of milliwatts.

To correctly measure absolute optical power, the Laser External Power Calibration Information in the Device Configuration screen shown in Figure 3.1 must be appropriately set for the type of device being tested. If the external photodiode array is to be used on a different fixture, it must first be disassociated from the original fixture and then associated with the new fixture. Click on the Clear button to disassociate the fixture and array.

Device View

Double-clicking on any device shown in a Fixture View, or clicking on a device within the connected instruments tree from the Control View will bring up a Device View similar to that shown in Figure 3.5. From this view, current status and limit information for a specific device may be viewed. The left and right arrows allow the view to cycle between all the device positions within a fixture. When the device/fixture is NOT currently being used in a test, one may enter a serial number or other descriptive information pertaining to the specific device by entering the information in the Serial Number: field and then clicking on the Set button next to the field.

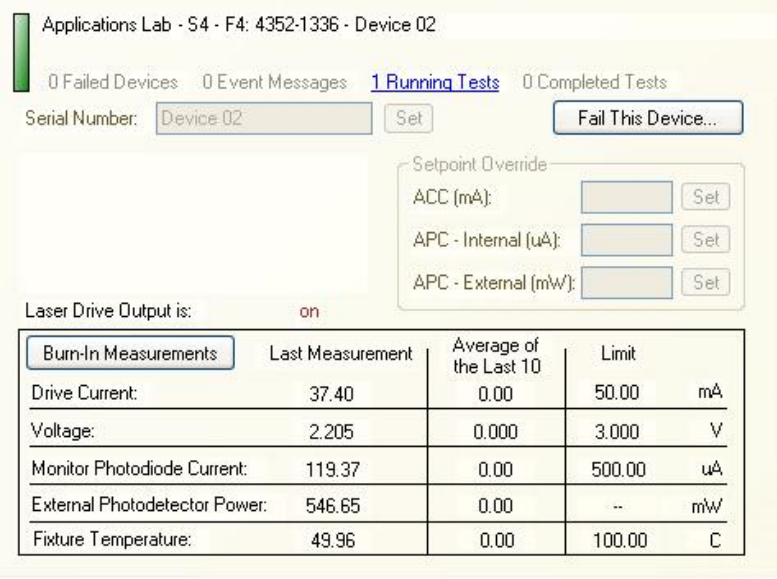


Figure 3.5 - Device View

During a test, a device may fail due to an open or short circuit, or due to exceeding one or more of the limits set for the device. This information will be displayed in the Device View. A device may be manually failed as well by clicking on the Fail This Device button. If this is done, a dialog box will appear so an explanation for the failure may be given. This information is recorded in the test event log.

The Device View also displays recently gathered test data for the displayed device. The Burn-in Measurements button allows the user to query new data on demand.

Setpoint Overrides

Modifications to test setpoints may be made on a device-by-device basis through the Setpoint Override section of the Device View. As its name suggests, any value entered in any of the fields shown in the Setpoint Override section will be used for a given type of test for that specific device. Setpoint overrides may be assigned to a fixture/device or to a test. This section describes how to assign the fixture or device.

To set a setpoint override in the Device View, click on the appropriate override parameter box to place the cursor there. Enter the appropriate value, and click on the Set button. The Set button must be clicked in order to store the value. Use the left and right arrow buttons to move from DUT to DUT to set their specific override values. Setpoint overrides do not function in L-I-V tests.

The setpoint overrides must be entered prior to starting a test. If the fixture is presently being used in a running test, this option will be grayed out and unavailable. Once an override has been entered for a specific device, it will remain active for as long as the fixture remains installed in the chamber. This means that after one test scenario has finished with overrides active, any additional test scenarios run on this fixture will be run using the same override values. In order to manually remove the overrides, highlight the override value, delete it from the parameter box, and click on the Set button. Entering zero for the override simply enters the value of zero as the setpoint override.

After a set of overrides has been manually entered, they may be saved for future use. This option is available from the Fixture View, Figure 3.4, in the section Setpoint Overrides as well. Clicking on the Save button will open a dialog box to specify the location where a text file containing the overrides should be saved. A sample override file is shown in Figure 3.6.

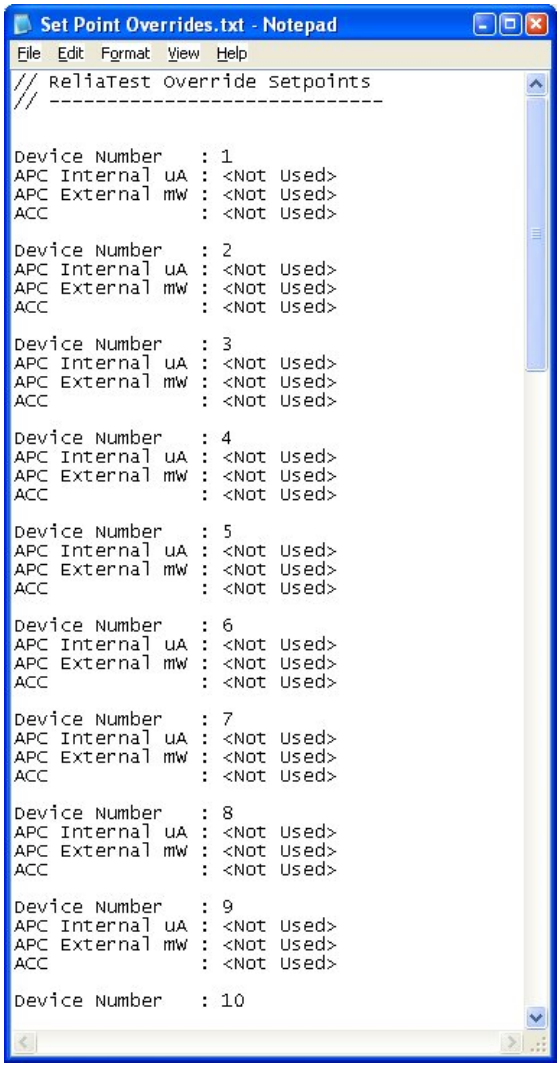


Figure 3.6 – Setpoint Override File

The different button functions as shown in Figure 3.4 are described below:

- Clear – Removes any setpoint overrides that have been entered and any setpoint file from memory
- View – Opens the default viewer for text documents (typically Notepad) to allow the setpoint override file to be edited
- Load – Opens file browser to allow previously saved override files to be loaded
- Save – Saves any existing setpoint overrides into a configuration file for future use; the file format is text file; if no overrides have been manually entered, this button will save a blank temperate to be edited later

Using the Control View

The system hierarchy is shown in a "tree" fashion in the Control View when the View Connected Instruments display is active. Figure 3.7 shows an example of the tree.

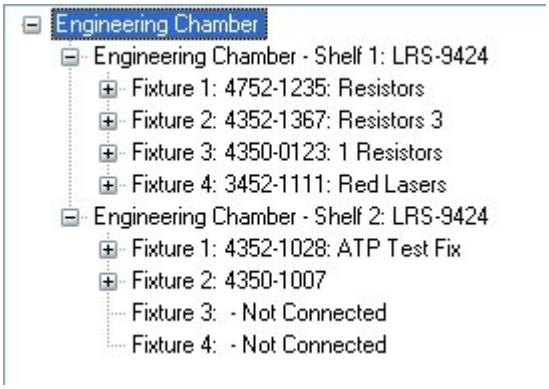


Figure 3.7 - System Hierarchy in the Control View

To navigate through the tree, simply click on the instrument you wish to view. This method also allows you to select individual fixtures and DUTs, and the Test View updates accordingly. The System View on the right side of the screen also updates as you click down through the tree.

Using the Test View

The Test View is at the bottom of the main screen and displays information about the test that is currently highlighted in the Control View. Tests can be selected from the View Configured Tests, View Running Tests, and View Historical Data sections of the Control View.

When a Scenario name is highlighted, the Test View shows which instruments are assigned to that test. Only a single fixture can be assigned to a test scenario.

Status Color Codes

As you navigate through the instrument hierarchy, shelves, fixtures, and DUTs change color to indicate their status. A color code list is viewable from the Chamber View by clicking on the Show Color Legend button. The color codes are explained in Figure 3.8.

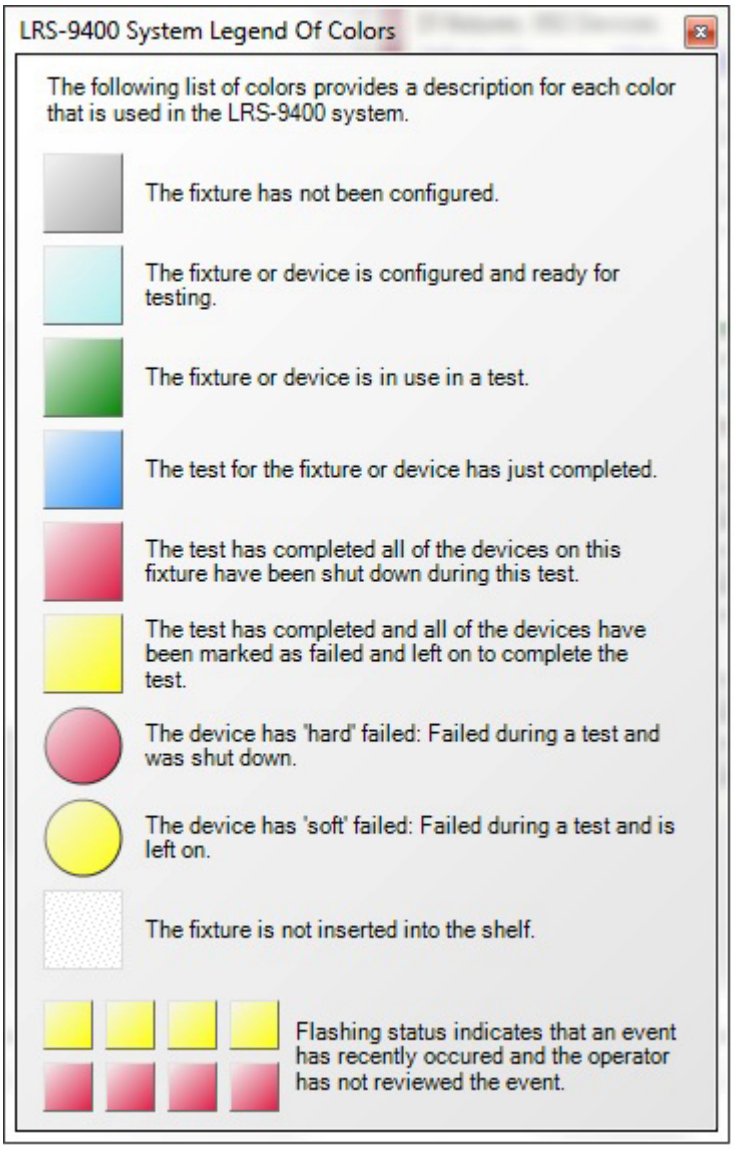


Figure 3.8 - Status Color Codes

Operations Interface

The Operations Interface provides a simple, clean interface for repeatable, every-day use of the software. Where the Engineering Interface allows full access to the Device Configuration and the Test Configuration windows, the Operations Interface is designed purely for starting and stopping tests that have already been configured. The Operations Interface is very similar to the Engineering Interface with a few minor differences.

Access between the Operations Interface and the Engineering Interface is provided through the pad-lock icon on the main screen.

Running Tests List Differences

In the Operations Interface, the Running Test list contains only the tests that are actively running in the system. Tests which have been recently paused or aborted stay in the Running Test list for one hour. In the Engineering Interface, the tests in the Running Test list are listed in the order that they are started. The tests in the Operations Interface Running Test list are listed in the order of the shelves that they are running on.

Test View Differences

In the Operations Interface, the Test View may be hidden or displayed by the user. If the Test View is displayed, it will only contain the test scenario status. The status information for the test steps is not displayed. This is intended to keep the interface simple and easy to understand. If the user clicks on the test step, only the test scenario status is displayed in the Test View.

Restricted Areas

The Operations Interface may be configured to restrict the user's access only to the areas of the software that are required for operating the system. Areas of the software that are used to configure the system may be inaccessible.

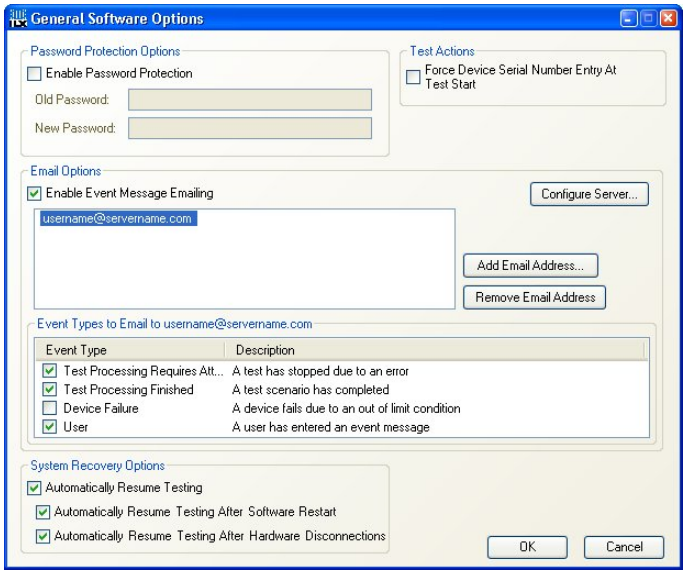


Figure 3.9 - General Software Options

From the Engineering Interface, choose System->Options to access the General Software Options. By checking Enable Password Protection, the Operations Interface is restricted to "operation-only" screens and information. To access the restricted areas, the user must enter the Engineering Interface. If password protection is enabled, the user will be prompted for the password to enter the Engineering Interface. If the incorrect password is entered, ReliaTest will log an event message to signify that an attempt to gain access was blocked.

The following areas or options are inaccessible from the Operations Interface:

- The Database Configurations Dialog
- The General Software Options Dialog
- The Test Configuration Dialog
- The Device Type Configuration Dialog
- The Device Types Control View
- The Existing Tests Control View
- The Connected Instruments Control View
- The Default Running Tests Control View
- The Historic Tests Control View
- The System Events Control View
- Deletion of Historical Tests (Singular and Multiples)
- Restarting a Test From the Beginning

Chapter 4 :
Configuring and Running Tests

This chapter describes the steps required to configure and start a test. This chapter refers frequently to Chapter 5, which describes each of the screens and functions in detail. Refer to Chapter 5 for instructions on viewing the test data once the test has started.

How to Configure a Test

The basic process flow for configuring and starting a test is as follows:

1) Configure device type
2) Define test scenario
3) Assign device type to a fixture
4) Assign a fixture to a test scenario
5) Start test

Device Type Configuration

The Device Type Configuration screen is used to set the attributes for DUTs. Click the View Device Types button in the top left corner of the Control View to activate the Devices control view.

To create a new device type, right-click in the Control View area and select New Device to bring up the window shown in Figure 4.1. Fill in the device type attributes to configure the device. Click OK when the page is complete.

To edit an existing device type, right-click on the device you want to modify and select Edit Device Type. Modify the attributes described below, and then click OK.

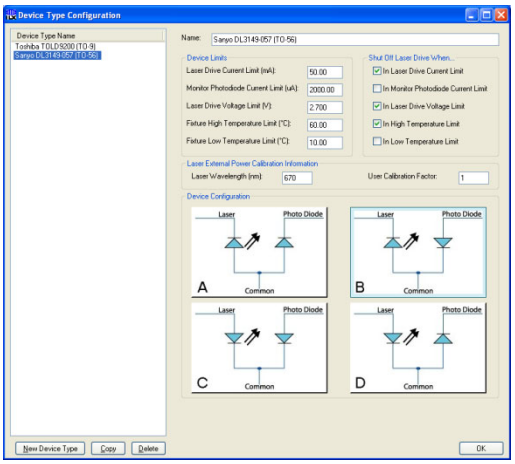


Figure 4.1 – Device Type Configuration

Devices attributes that must be configured are:

- Device type name; typically the device model number
- Device current, voltage, and temperature limits
    - Typically determined by the DUT product characteristics
    - The LRS-9434 software and firmware control system will prevent these limits from being exceeded during operation.
- Laser safety shut-off criteria
    - If any of these conditions occur, the laser will be switched off and an event message generated.
- Device pin-out assignment
    - The four device configurations accommodated by the standard fixture and CMM circuitry.
    - These options may be different for custom device fixtures
- Laser wavelength
    - Used in conjunction with the external photodiode array calibration file specified. If a calibration file has been specified, an output wavelength must be set in the Laser Wavelength box.
- User calibration factor
    - To achieve rated optical power measurement accuracy, the User Calibration Factor must be correctly set. This value compensates for varying output beam geometries from different laser devices. If device samples were provided at the time of factory calibration, a User Calibration Factor will be provided as part of the calibration documentation. This will be a nominal value for each device type and can be calculated from the ratio of actual measured power over ReliaTest measured power.

Test Scenario Definition

Click the View Configured Test button in the top left corner of the Control View to activate the Configured Tests List. To create a new test scenario, right-click in the Control View area and select New Test to bring up the Test Configuration window shown in Figure 4.2.

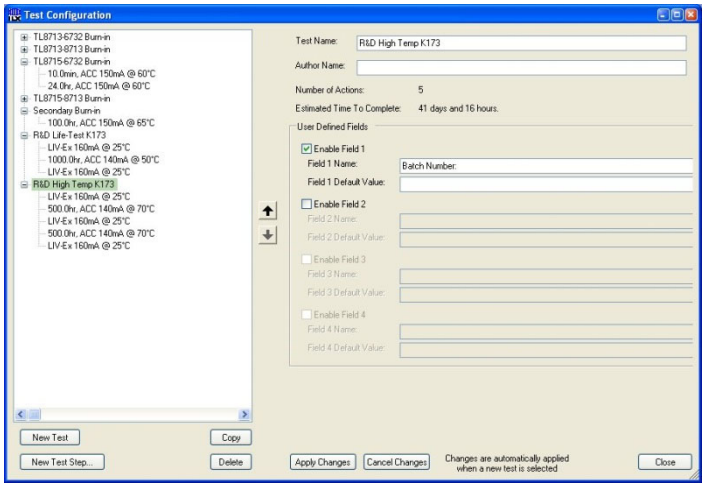


Figure 4.2 - Test Configuration Window

- New Test - Creates a new test scenario.
- New Test Step - Creates a new test step in an existing test scenario. Possible test steps include monitored burn-in tests and LIV tests.
- Copy - Copies the highlighted test scenario or test step. The copy is placed adjacent to the highlighted item.
- Delete - Deletes the highlighted test scenario (and any associated test steps) or the highlighted test step.
- Up and Down Arrow Buttons - Allows test steps to be reordered within a test scenario or test steps may be moved from one test scenario to another.

Click the New Test button in the bottom left corner to create a new test scenario. A new test scenario item will be inserted at the top of the list of test. Click on this new test scenario to display the related configuration information in the left side of the screen.

- Test Name - The user-defined name of this test scenario. This name must be unique among all of the predefined test scenarios. This field is limited to 30 characters.
- Author Name - The optional name of the author of this test scenario. This field is limited to 256 characters.
- Default Device Type - The optional default device type to utilize when this test runs. A device type must be assigned in order for this test to be started from the Operations Interface.
- Test Description - The optional description of this test. This information is displayed in the Operations Interface in the Select a Test dialog when the operator is starting a test on a shelf. This field is limited to 512 characters.
- Number of Actions - The number of test steps that are contained by this test scenario.
- Estimated Time To Complete - The estimated time that this test scenario requires to finish.
- User Defined Fields - Customizable fields that will be displayed to the operator when this test starts. The operator is required to enter a value into each active field before the test will start. Typical use of these fields maybe to prompt for the operator's name, the batch number of the devices in test, or perhaps the sales order number for the devices under test. This information is always available after the test has started in the Custom User Information tab within the Test View. This information is exported to the test scenario CSV file.

Editing Test Scenarios

To edit an existing test scenario from the Control View, right-click the test scenario you want to modify, and then select Edit Test.

Test scenarios can also be edited by clicking on the test name in the Test Configuration window. The right side of the Test Configuration window will show the information relevant to the selected test.

Creating New Test Steps

To add a test step to a scenario, first click on the test scenario name. Then click the New Test Step button in the bottom left corner of the Test Configuration window; the Adding a New Test Step Type window will appear (Figure 4.3). Click to select the type of test you want to execute in that test step:

- Execute Command Line
- Monitored Burn-In
- LIV Test
- Sampled Burn-In Test

Click on the type of test you want to create and then click OK. The right side of the Test Configuration window will change according to the type of test you select, and each is described below.

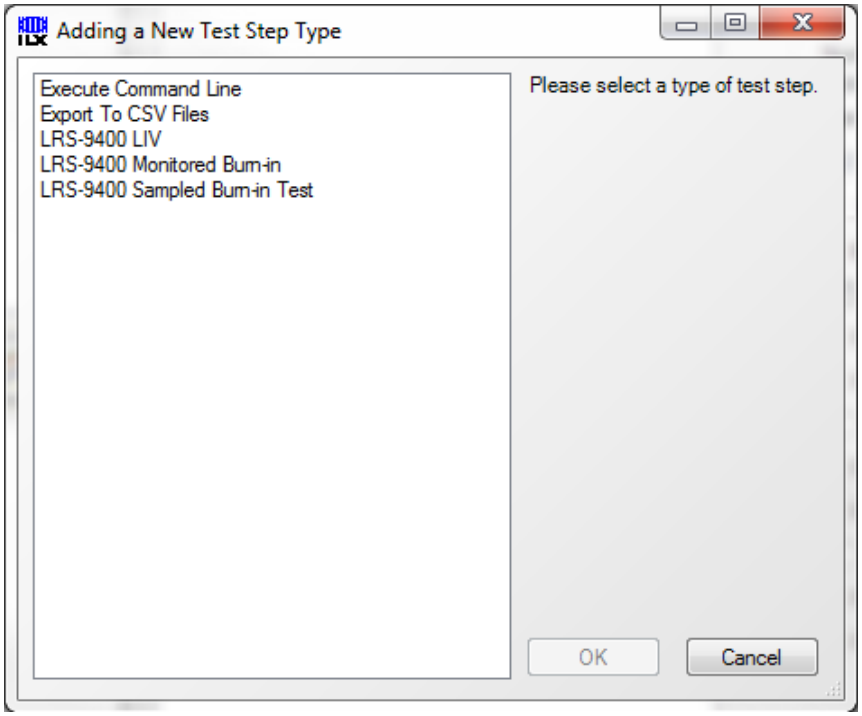


Figure 4.3 - Adding a New Test Step Type

Execute Command Line

The Execute Command Line configuration screen is shown in Figure 4.4. This feature is used to open or run any file, including external application programs. You can choose to wait until the other program has been closed before moving on to the next step, or the next step can begin immediately after the external application program is called. This function can be used to run an external program to analyze test data, print a data file or report, or perform other analysis or system control functions.

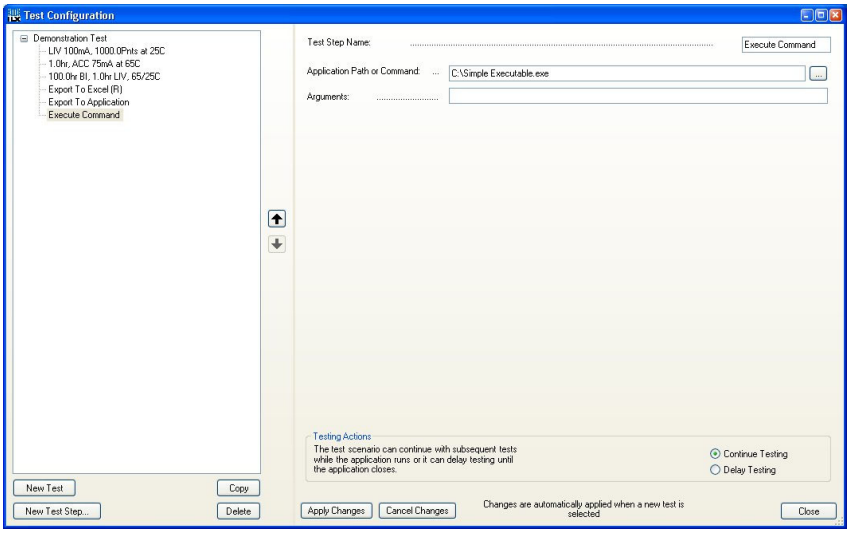


Figure 4.4 - Execute Command Line Configuration

LIV

An LIV test is a method of characterizing laser diodes. It is a test where laser forward current (I) is ramped from zero to (typically) the maximum of the laser's operating range. While the current is being ramped, the laser's forward voltage (V) and optical light (L) outputs are recorded. The data is plotted with I as the independent variable and L and V as dependent variables to produce an LIV graph.

The operational parameters of lasing threshold and slope efficiency are calculated from the resultant data. Several different methods may be used to determine threshold and slope efficiency. Each method is available from within the LIV configuration screen shown in Figure 4.5.

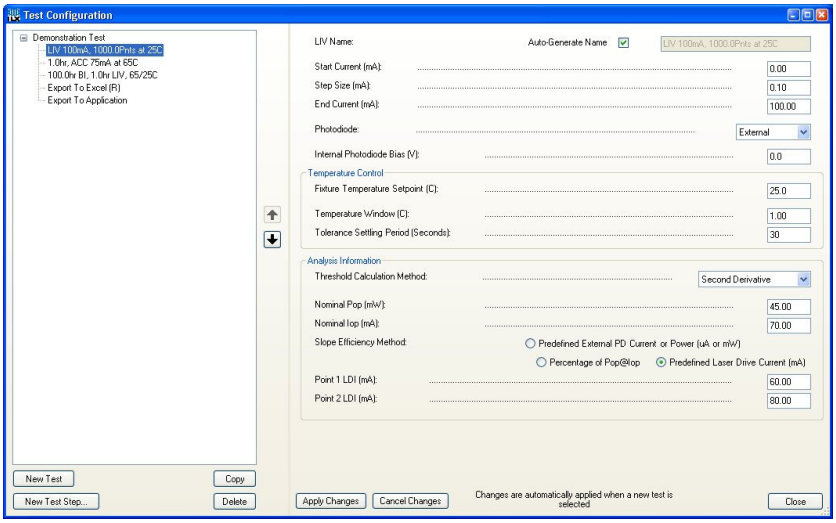


Figure 4.5 - LIV Configuration

Fill in each of the data fields on the screen to complete the LIV test configuration.

- LIV Name - The user-defined name of this test step. This name does not need to be unique. This field is limited to 30 characters.
- Auto-Generate Name - When selected, this option will automatically generate a consistent name based on the parameters entered into this test step.
- LIV Ramp Settings - The Start Current, Step Size, and End Current that define the current ramp of the LIV. The values entered here cannot create a ramp that has more than 1000 steps.
- Fixture Temperature Set Point - The temperature set point of the fixture.
- Temperature Window and Tolerance Period - The temperature settling size and timing that define the when the test will begin. The temperature must be stabilized within the Temperature Window for the entire duration of the Tolerance Period before the lasers will turn on.
- Threshold Current Calculation Method - The method used by the software to calculate the threshold current of the laser. The first three are based on Telcordia GR-468-CORE and GR-3013-CORE.
    - Second Derivative - This method uses the peak of the second derivative for the threshold point.
    - First Derivative - This method uses the point where the first derivative reaches 1/2 of its peak value as the threshold point.
    - Two-Segment Line-Fit - This method extrapolates the two linear portions of the L/I curve and uses the point where these lines intersect as the threshold point.
    - Single Line-Fit - This method extrapolates the linear portion of the L/I curve above the knee to the zero optical power point, which is considered to be the point of threshold. This method is not recognized by Telcordia.
- Nominal Pop - The optional field denoting the expected power at the typical operating current. The Iop of the laser will be calculated based on this value.
- Nominal Iop - The optional field denoting the typical operating current of the device. The Pop of the laser will be calculated based on this value.
- Slope Efficiency Method, Point 1, and Point 2 - The optional information used to determine the slope efficiency of the laser. The points entered define the line with the slope of the laser's Light versus Current data.
- Predefined External Power - Points are entered in terms of optical power (Watts).
- Percentage of Pop@Iop - Points are entered as a percentage of the calculated Pop@Iop.
- Predefined Laser Drive Current - Points are entered in terms of the drive current.

Monitored Burn-in

A monitored burn-in test may be several minutes to several thousand hours in length. It is a test where the system attempts to hold one operation parameter constant throughout the entire test while recording the remaining parameters. These parameters may be laser drive current, internal (backfacet) monitor photodiode current, or output power. Control via output power is only possible through the use of an external photodiode array that has been calibrated for absolute power measurement.

The Monitored Burn-in configuration screen is shown in Figure 4.6

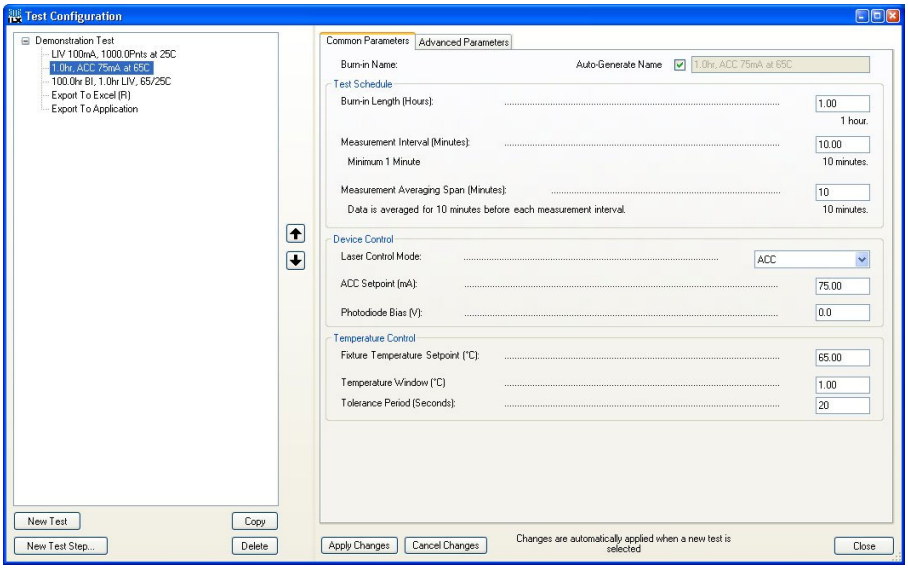


Figure 4.6 - Burn-in Configuration

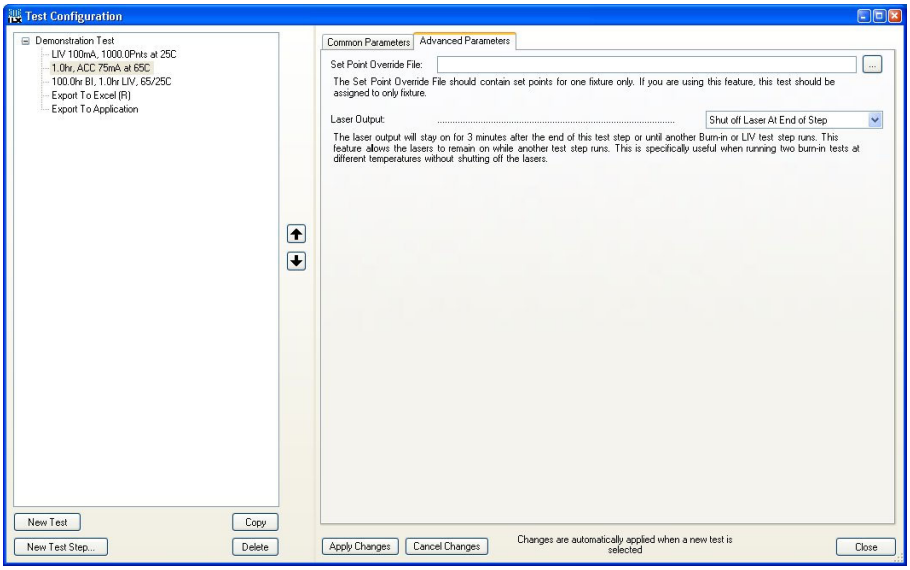


Figure 4.7 - Burn-in Configuration (Advanced)

- Burn-In Name - The user-defined name of this test step. This name does not need to be unique. This field is limited to 30 characters.
- Auto-Generate Name - When selected, this option will automatically generate a consistent name based on the parameters entered into this test step.
- Burn-in Length - The time, in hours, that the devices in test will be at the laser drive set point; time is displayed in “days, hours, minutes, seconds” below.
- Measurement Interval - The interval, in minutes, at which the measured parameters are reported; minimum of ten minutes.
- Measurement Averaging Span - The time span, in minutes, over which data is averaged. The averaged data is reported at each measurement interval.
- Laser Control Mode - The method to drive the devices. ACC for automatic current control; APC for automatic power control. APC may be selected for the internal diodes or the external power detectors.
- Laser Drive Set Point - The drive current that the devices under test are supplied.
- Fixture Temperature Set Point - The temperature set point of the fixture.
- Temperature Window and Tolerance Period - The temperature settling size and timing that define the when the test will begin. The temperature must be stabilized within the Temperature Window for the entire duration of the Tolerance Period before the lasers will turn on.
- Advanced Parameters Tab - These advanced settings are optional and do not need to be configured.
- Laser Output - Configures the lasers to shut off or remain on after the end of the test. The lasers maybe configured to remain on up to 3 minutes after the burn-in test length has expired. This option may be useful when running multiple burn-in tests in succession. With this option set to Leave Lasers On After End Of Step, the lasers will remain on as the next test step commences. This option allows a string of test data to be recorded at different measurement intervals or temperatures without shutting the lasers down between tests.
- Setpoint Override File - The setpoint override file which will be assigned to the fixture during this test.

Sampled Burn-in Test

The sampled burn-in test is a long burn-in with periodic LIVs occurring during the test. The sampled burn-in allows for different temperatures between the burn-in test and the interspersed LIV. The data reported in the ReliaTest graph and CSV files are based on the analysis of the periodic LIV tests: threshold, Iop @ Pop, Pop @ Iop, Vop @ Iop, slope efficiency, the temperature of the LIV, and the time of the LIV. The sampled burn-in test contains configuration screens for the both the burn-in test and the periodic LIV tests.

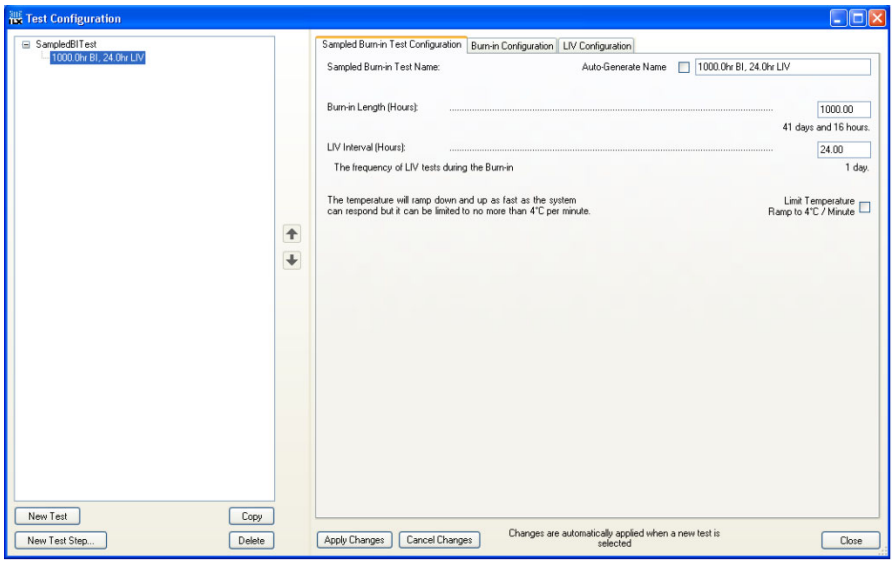


Figure 4.8 - Sampled Burn-in Configuration (Main)

- Sampled Burn-in Test Name - The user-defined name of this test step. This name does not need to be unique. This field is limited to 30 characters.
- Burn-in Length - The time, in hours, that the devices in test will be at the burn-in drive current and temperature set points. This represents the total burn-in time of the devices for this test.
- LIV Interval - The frequency within the burn-in test that the LIV tests should occur. An LIV test will always occur at the very beginning and end of the test.
- Limit Temperature Ramp to 4°C / Minute - Ensures that when temperature cycling between the LIV and burn-in tests temperatures, the fixture temperature will not increase/decrease by more than 4° per minute.

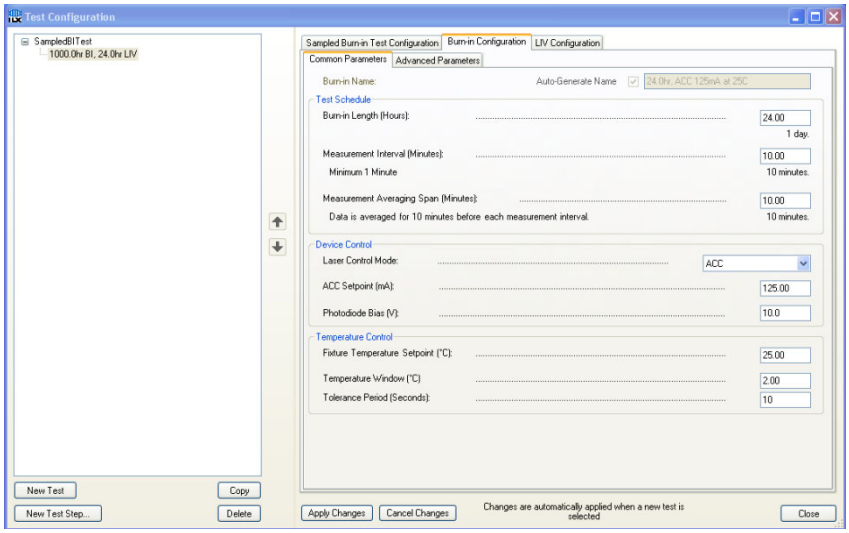


Figure 4.9 - Sampled Burn-in Configuration (Burn-in)

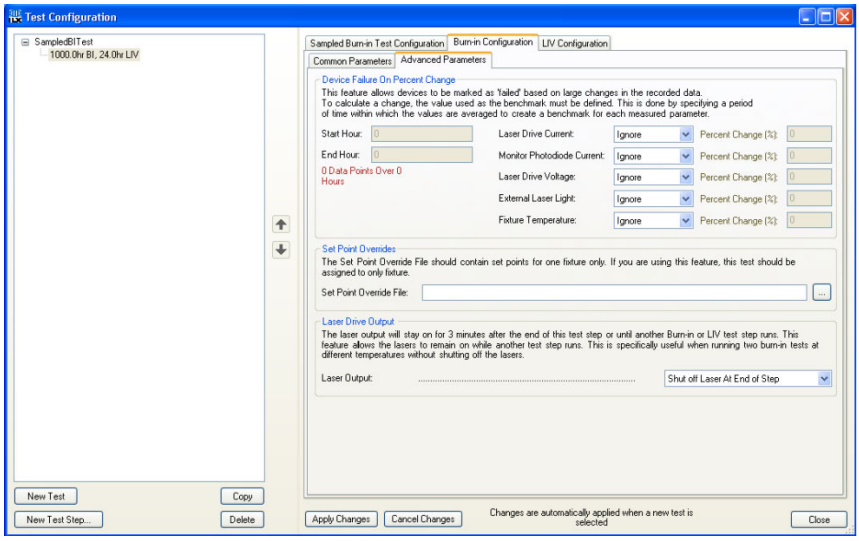


Figure 4.10 - Sampled Burn-in Configuration (Advanced)

Advanced parameters allow users to fail devices based on changes in benchmark data. In addition, a set point override file can be used for the burn-in test.

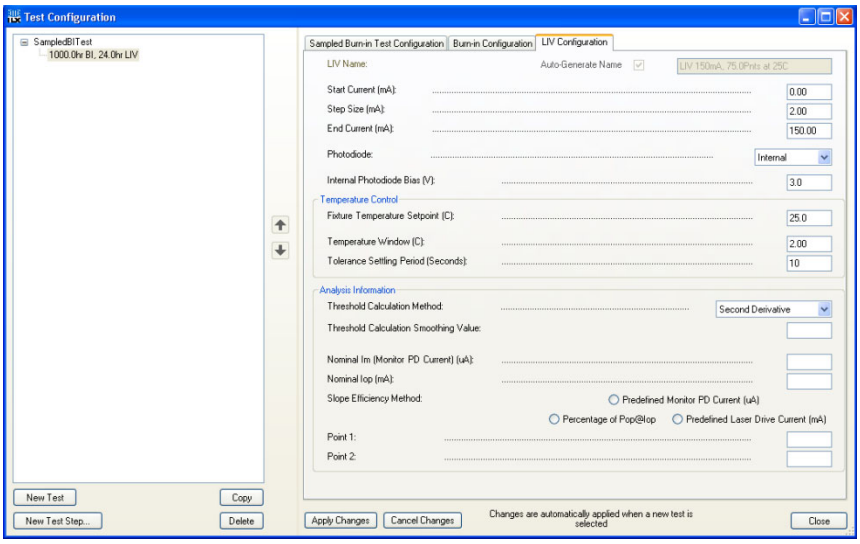


Figure 4.11 - Sampled Burn-in Configuration (LIV)

For information about the burn-in or LIV configuration screens, please refer to the sections in this manual which describe those test steps.

Assign Device Types to Fixtures

The fixture must be installed in the chamber in order to assign a device type to it. The Ready LED on the fixture will begin blinking to indicate that the fixture is properly installed. The fixture color in the System View will change from white to dark gray once the system recognizes that a fixture has been installed.

Change the Control View to show the list of device types and change the System View to display the Chamber View. The screen should appear similar to Figure 4.12. Click and drag the device type to the fixture you are configuring. Each fixture can test only a single device type, but the same device type can be assigned to many fixtures. After a device has been assigned to a fixture, the fixture will change to light blue in color.

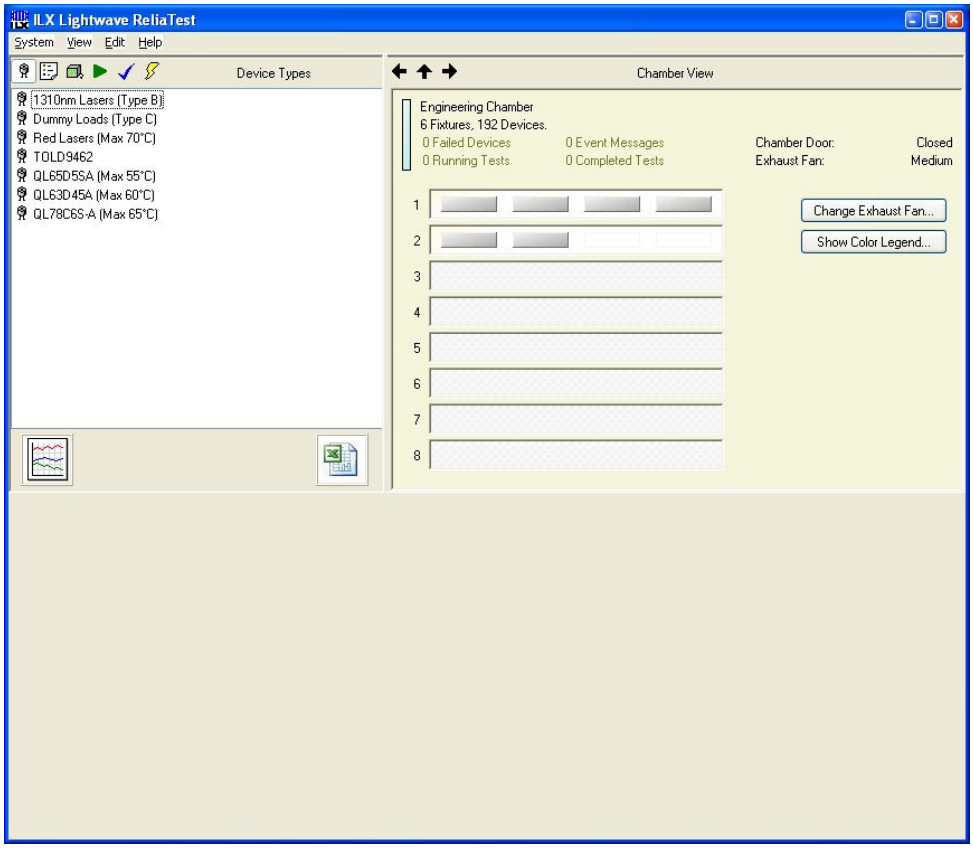


Figure 4.12 - Device List and Chamber View

Starting a Test Scenario on a Fixture

Once the devices under test have been inserted into a fixture, the system is ready to start testing these devices. The fixture maybe assigned to the desired test scenario and the test scenario may be started on that fixture.

Prior to starting a test scenario, if the test scenario does not have a default device type configured in the test scenario settings, the device type must be assigned to the fixture.

The first method to start a test is to right-click on the fixture and choose the menu item Start Test. This method opens a list of tests that may be started. Select the desired test and enter any optional user information presented. Click the Start Test button to start the test. The user may then be prompted with the device serial numbers if ReliaTest is configured to require them.

The second method is to select the Existing Tests lists in the Control View and click on the desired test scenario. With the test scenario selected, highlight test desired fixture with the mouse and click the Add Selected Fixtures button. Click the Start Test button to start the test. If the test scenario requires any optional user information, a screen is presented for the user to enter the information. The user may then be prompted with the device serial numbers if ReliaTest is configured to require them.

As an available software package purchase, a compatible plug and play barcode reader can be utilized as a third method of test scenario assignment to a test zone. Start by right-clicking on

the fixture, and choose the menu item Start Test. You can now select the option to use the barcode reader method and scan the appropriate barcode that matches your desired test set-up. The user may then be prompted with the device serial numbers if ReliaTest is configured to require them, which the barcode reader can also be utilized instead of the keyboard interface. Contact your local ILX sales representative for more information on the barcode test scenario creation software package.

Only one test scenario can be run on any given fixture at a time, but the same test scenario configuration can be run simultaneously on as many fixtures as needed. A completely configured test scenario is shown in Figure 4.13.

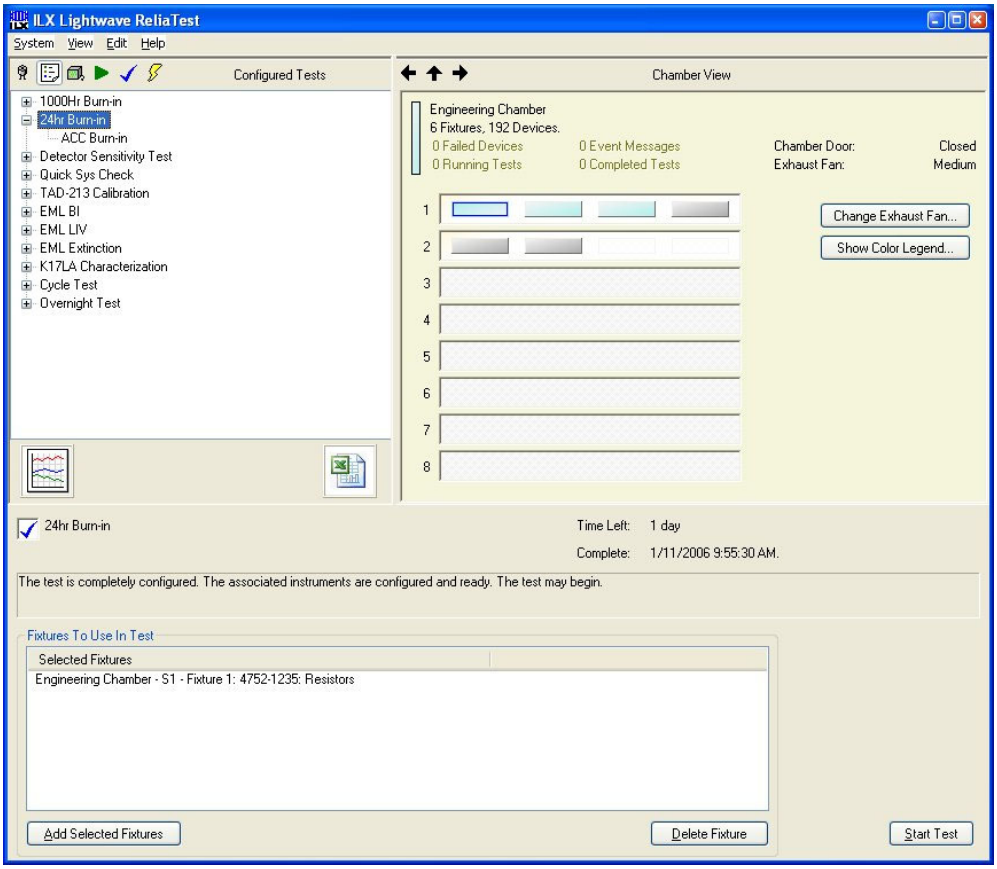


Figure 4.13 – Completely Configured Test Scenario

Removing Fixtures from a Test

To remove a fixture from a test:

1) Click on the View Existing Tests button in the Control View and select the test scenario.
2) In the Test View, click on the fixture that you want to remove from the test, then click the Delete Fixture button.

After a test has been started, the fixtures that had been assigned to the test are automatically removed from that test.

A fixture may be assigned to several tests simultaneously, but only one of those tests can be running at any time. This feature is useful if the same fixture is used for several different tests that are not run simultaneously, perhaps for different device types. Note that any additional tests assigned to a fixture will not automatically start after the previous test has finished.

Pausing and Restarting Tests

Pausing a Test

To pause a currently-running test, first click the View Running Tests button. Right-click on the test you want to pause, and select Pause Test. Once the test is paused, the icon will change as is shown on the left.

Restarting a Paused Test

A paused test can be restarted from the same point it was paused. Right-click on the test name and select Restart From Pause. While the test is resuming, the restart icon (shown on the left) will appear next to the test name. Once the test is successfully restarted, the icon will change to running again.

Completing a Test

When a test has completed, the Running icon changes to the Test Complete icon shown on the left. The completed test scenario remains listed in the Running Tests view for 24 hours after the test has completed. When this time has elapsed, the test is removed from the Running Tests view and moved to the Historical Tests view. Tests that have been moved may be viewed by clicking on the View Historical Test button. Any test that has been manually paused or stopped due to an error will not be moved from the Running Tests View.

View Running Tests

Click the View Running Tests button in the Control View to display a list of all tests that are presently running under the control of ReliaTest. The status for each test can be viewed by clicking on the test scenario or step name; the information will appear in the Test View at the bottom of the main screen.

Viewing Historical Tests

Click the View Historical Tests button in the Control View to display a list of all tests that have been moved to the historical test list. Any completed test scenario will be moved to the historical test list 24 hours after it has been completed. Any test that has been aborted either manually or due to an error will not be automatically moved.

Any completed, paused or aborted test scenario in the Running Tests view may be manually moved to the historical test list. This is possible by right-clicking on the test scenario and selecting the Move To Historic Test List menu option.

Loading a Fixture Incompletely

The ReliaTest software assumes that each fixture is fully loaded with devices at the beginning of a test scenario. Once the test begins, the empty “devices” will fail as open circuits and the software will no longer record data on those positions. The “failed devices” will flash red and an error event will be logged. Clearing the logged events or marking them as read will cease the flashing indicators; refer to Chapter 6 for more information on clearing logged events.

Chapter 5 :
Viewing Data and Data Management

This ReliaTest software offers a variety of methods for viewing and reporting the data generated during LIV or burn-in tests. ReliaTest normally records test data to a database and includes a graphing feature for tracking device performance while tests are running, but also allows you to export the data to a CSV-format file. Once the data is stored in the database, other programs can be used to access the data or run reports.

Graphing Test Data

The graphing button is on the left side of the main window, between the Control View and the Test View sections. The graphing functions are accessed by clicking the graph button in the lower-left corner of the Control View.

Selecting Test Scenarios or Test Steps to Graph

You can use the graphing feature to examine data in currently running tests and historical data on tests that have terminated. The procedure for generating the graphs is the same, but the location of the raw data is different. For data on a currently running test, select tests from the Running Tests screen in the Control View. To view historical data, select tests from the Historical Tests screen in the Control View.

To select data to graph, right-click on the test that you wish to graph, then select Add To Graph. Tests may be added to the graph by clicking and dragging them to the graph icon. The number in the graph button on the Control View will increment to indicate the number of tests that have data loaded into the graphing routine. Both individual test steps and whole scenarios may be graphed.

Click the graph button to open the Graph window as shown in Figure 5.1.

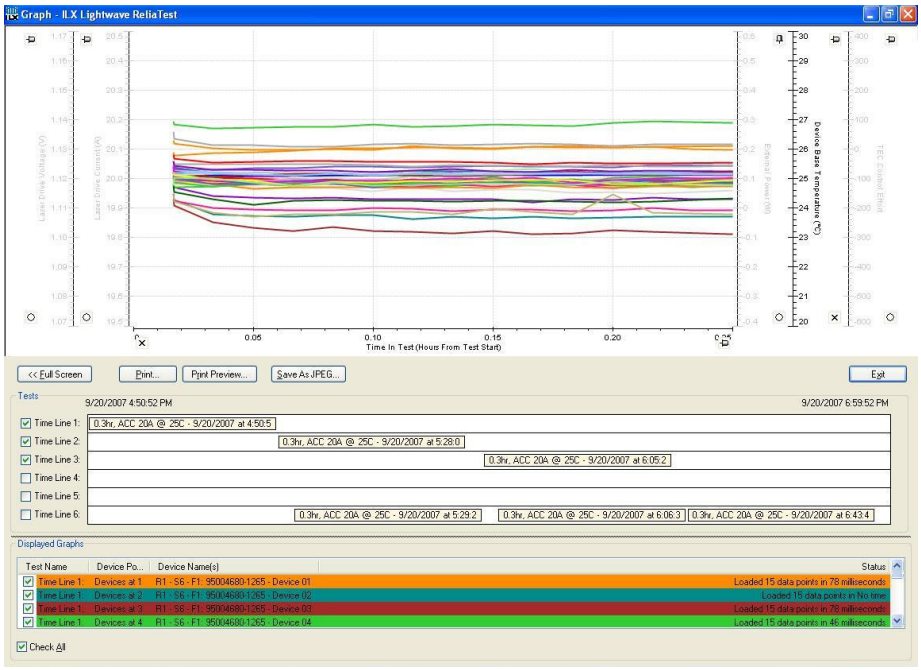


Figure 5.1 – Graph Window

Tests and Timelines

Tests that have been added to the graph are represented graphically in the Test Timeline section. The Test Timeline section contains a timeline for each test that was added to the graph.

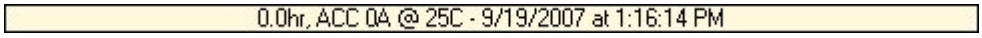


Figure 5.2 - Test Graphical Objects - Burn-In and LIV

The light blue and light beige bars in the Test Timeline section represent the tests which have been added to the graph. These bars may be moved between timelines. Tests that share a timeline are graphed consecutively. Tests that do not share timelines are overlaid on top of each other. For burn-in tests, the graphical data is plotted with Time In Tests as the X-axis. For tests that share the same timeline, the start of the second test coincides with the end of the first test.

Graphing two or more tests on the same timeline is only useful for appending data for the same set of lasers from multiple different tests. The Test Timeline section organizes the tests horizontally based on the date and time that they started and finished. A test that started at the time as another test appears in the same horizontal location as the other test. In this way, tests that were executing at the same time as another test may not share the same timeline. Tests that were executing at different times may share the same timeline.

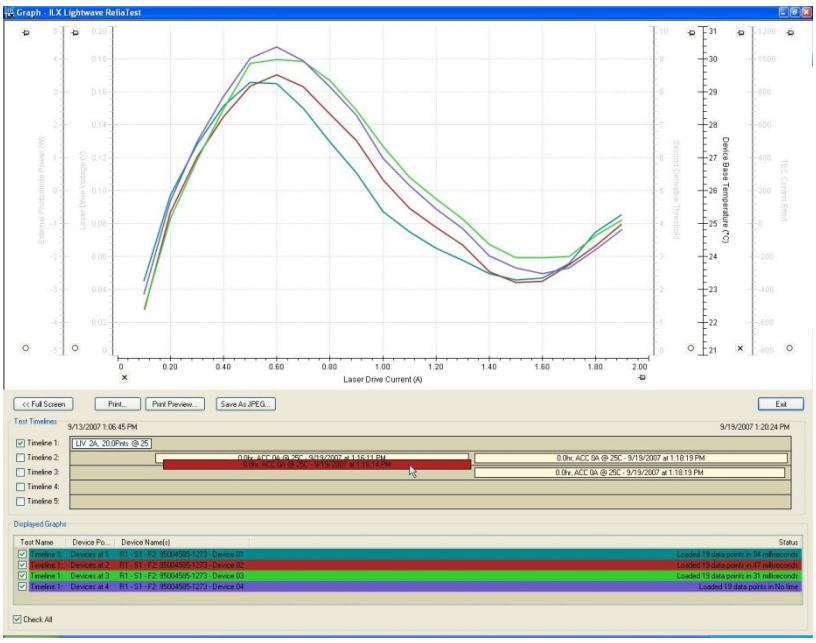


Figure 5.3 - Test Colors

In Figure 5.3, the red test bar indicates that the test may not be placed on that timeline. The light beige bar indicates a burn-in test. The light blue bar indicates an LIV test. LIV and burn-in tests may not share the same timeline.

A Note on Appending Data

When appending data from two tests in the same timeline, ReliaTest must relate the data from the first test to the data in the second. In Figure 5.4, there are two fixtures that were used in the same two consecutive burn-in tests. ReliaTest uses the fixture's identity number to match the data from fixture SN 1320 in the first test to fixture SN 1320 in the second test. ReliaTest also matches fixture SN 1307 between the first and second tests.

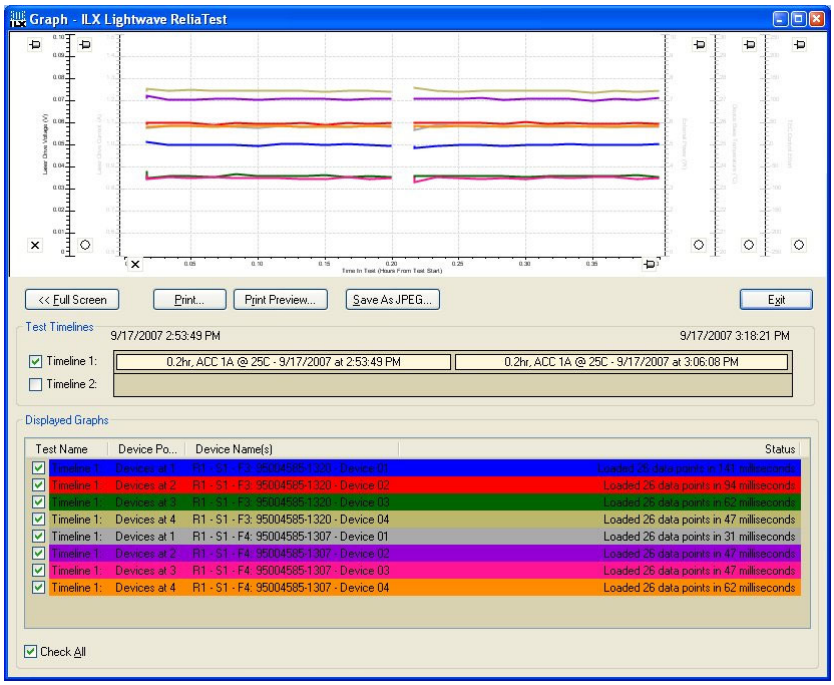


Figure 5.4 - One Timeline, Two Fixtures

A more complex situation occurs where SN 1320, for some reason, cannot be used in the second test. In this example, assume the lasers were removed from SN 1320 and placed into SN 1321. These lasers were tested in the first test in fixture SN 1320 but tested in fixture SN 1321 in the second test. ReliaTest first automatically matches SN 1307 between the two tests. ReliaTest then assumes that the fixtures SN 1320 and SN 1321 should be matched together.

The fixture identity number is, by default, the fixture's model and serial number. The user may apply a user identity number which would then be used by the graph to match the fixtures. If ReliaTest cannot match the fixtures using the fixture ID, it matches fixtures based on location in the shelf. If two fixtures share the same physical location (positions 1 through 4), ReliaTest matches the fixtures and append the data. ReliaTest also matches data between tests that were run on different shelves, following the same rules as notes above.

Displayed Graphs

The check box preceding each timeline allows the timeline to be graphed. The test data from the tests in the timeline are organized into the Displayed Graphs section. Each item in the Displayed Graphs section represents a set of graph data for one device.

The check box on each graph item line enables the graph data for that device. Enabled graphs are provided a color to help identify them in the graph screen. Disabling and re-enabling a graph applies a new color for that graph. The mouse cursor may be moved over any graph to display on the data for that graph. This allows for rapid searching through all of the graphs that are enabled in the Displayed Graph section.

The mouse cursor may be moved over any of the graph axes to display the data for that axis. In the burn-in data, there are multiple sets of data per devices that are plotted against Time in Test; voltage, current, and temperature, for example. When the mouse is positioned over the voltage axis, only the

voltage versus time in test data is displayed. Each axis may be completely turned off and on by right-clicking on the axis or by changing the status of the check box by the axis.

Printing and Saving Graphs

The Print and Print Preview buttons print the currently displayed graphs to the printer. The computer must already be configured to use a printer in order for this option to function. A list of the displayed graphs is included with the printed graph to help identify the data. The Save As JPEG button saves the graph to a JPEG image on the computer. The JPEG image also contains a list of the displayed graphs to help identify the data.

Exporting Tests to CSV Files

Test data may be exported from the database to a CSV (comma-separated variable) file. A CSV file is created for each fixture and for each test step. A CSV file is created for the test scenario which contains a list of the events that occurred during the test. To export the test data, right-click on the test scenario or test step and select Export to CSV from the drop-down menu. Choose a destination folder for the CSV data and ReliaTest exports the data. Using this method, the data for the entire test scenario or only the data from the single test step may be exported.

CSV File Format

The CSV file format is a comma-separated file. The file is specifically formatted to assist with automated file parsing. The format of the file (such as positions of labels and values) will be maintained as strictly as possible as ReliaTest is upgraded in the future. This is done to prevent such changes from affecting any customer-configured file parsers. An example of a CSV formatted file is shown in Figure 5.5.

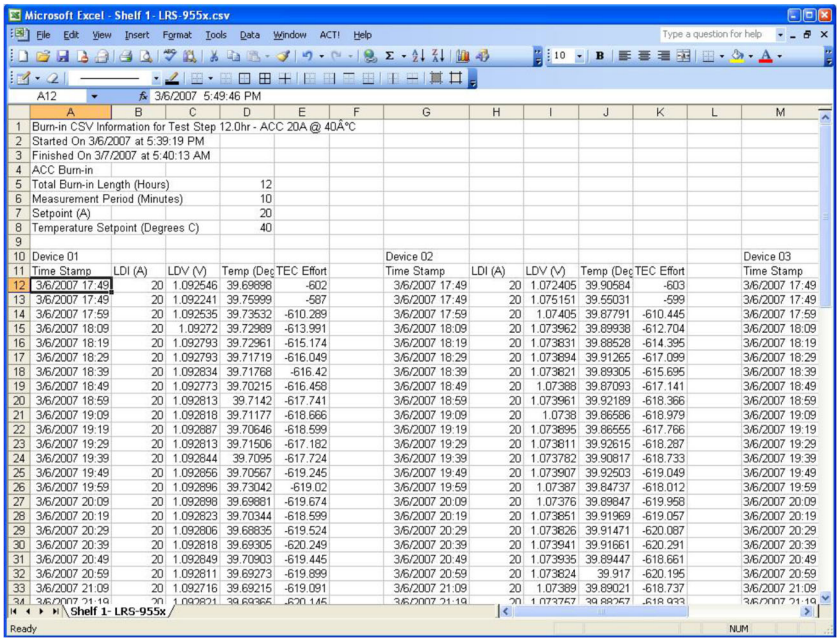


Figure 5.5 – CSV Formatted Data File

The CSV-formatted files are automatically recognized by Microsoft ® Excel. If Microsoft ® Excel is installed; double-clicking the file will open Microsoft ® Excel. Each label or value is parsed into individual cells in the worksheet.

Database Management

ReliaTest is compatible with MSDE (Microsoft Database Engine) and SQL Server. The control computer is configured at ILX Lightwave with a SQL Express database installed on the computer. This database is the “primary” database that is used by the software to store all of the configuration and test data. This database also stores the device and test configurations as well as the data from completed tests (historical data). The database configuration window is shown in Figure 5.6 and is accessed by selecting the System -> Database Configurations...menu item and clicking on the Advanced>> button.

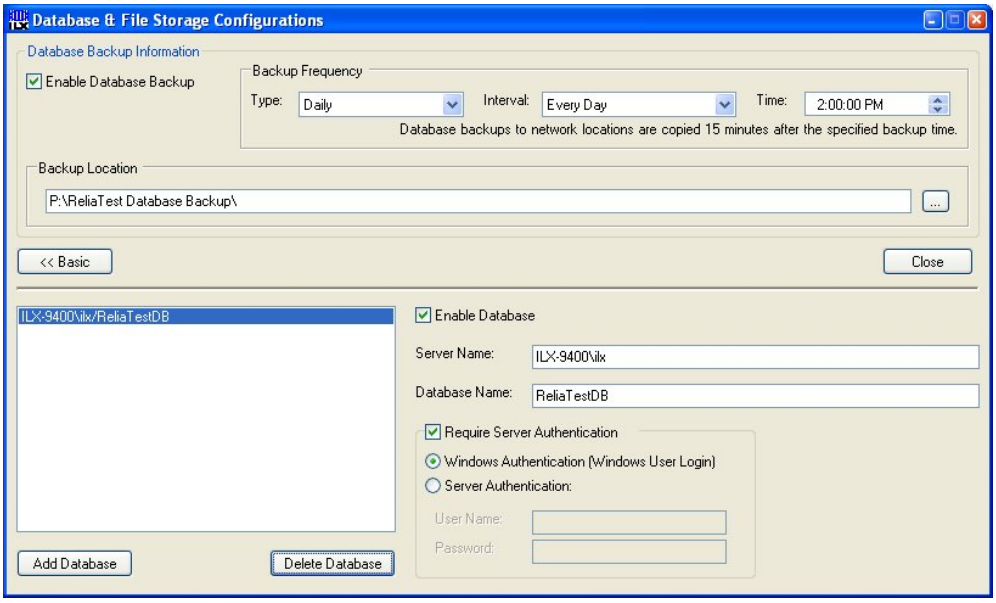


Figure 5.6 - Database Configuration Window

User Authentication and Licensing

The database server requires user authentication in order to be accessed. Authentication may be either SQL Server-based or Windows login-based. If SQL Server is used, you must have proper licensing arrangements in order for ReliaTest to access the database. Enter the User Name and Password in the areas provided in this window.

To enable multiple users to utilize ReliaTest, configure the server to use a User Name and Password. This can be configured using the SQL Management Studio that is provided with the system computer.

If the secondary database is Windows-based, the user name and password that are used to log into the computer will be sent to the server and used for authentication. By default, the Windows Authentication method should be selected.

Creating a New Database

ReliaTest is designed to operate with a single database. The database must be located on the computer on which ReliaTest is installed.

It is highly recommended that the default database is not altered in any way, as abnormal results may occur. Contact your local ILX service representative before any changes are made to the existing default database, or when creating a new database, to ensure proper operation in ReliaTest.

If data is to be stored in a database other than the default, a new database must be created. From the Database Configuration window, disable the existing database by unchecking the Enable Database option. Click on the Add Database button, select the SQL Server or MSDE Database option and click OK. Enter the server name in the box provided. The Default Server Name is the computer's name followed by "\SQLExpress". Next, enter a new database name in the box provided. The database name may be anything descriptive. Figure 5.6 shows how the server and database names are divided. Next, make sure Enable Database and Require Server Authentication are checked. Close the window and then close and restart ReliaTest. Once ReliaTest is running, the new database should be enabled.

Deleting a Database

Databases may be deleted at any time by selecting the database name from the list shown and clicking Delete Database. This function will only delete the ReliaTest reference to the database. The data files still reside on the computer - the data is never deleted by using the Delete Database function. Data will no longer be stored to database references that have been deleted.

You cannot remove the primary database. If the primary database becomes unavailable, either because it is deleted, is full, or for some other reason, then the software will not be able to run tests until the primary database is restored.

Reviewing Historical Data

Historical data is accessible by clicking the View Historical Test Data button at the top of the Control View section of the main screen. All tests for which data is available will be displayed. You can graph the data or export it to a CSV file.

Database Maintenance

To prevent the system computer from slowing down or lagging, routine database maintenance should be performed. This involves removing old tests from the running and historic test lists. If the data is critical, it is recommended that the test is exported to CSV for future analysis. Proper maintenance of the database will help improve the speed of ReliaTest and will increase the overall system performance.

Chapter 6 :
Software Events and Alarms

ReliaTest records and reports information on events that may impact the test data or test performance. The events can be divided into two major groups, system events and test events. The system event log can be viewed by clicking the View Events button in the upper left portion of the screen. The test event log is viewed by first selecting a test scenario from either the currently running test list or the historical test list and then selecting the Events tab. Each test event is time-stamped for reference. Test events are not visible if an individual test step is highlighted. ReliaTest can also be configured to send email alerts when specific types of events occur. Examples of system events and test events are shown in Figure 6.1.

Software Events and Alarms

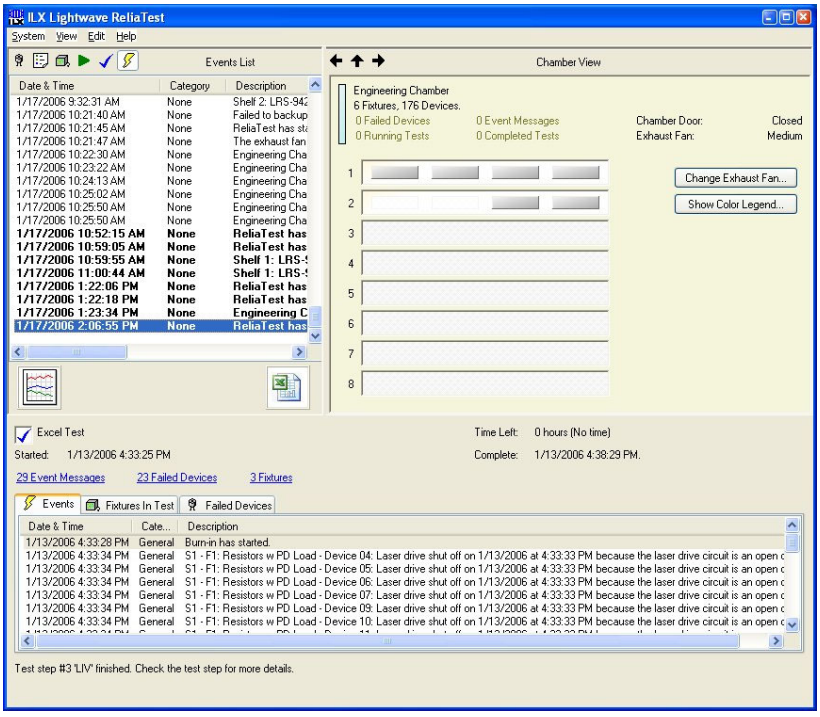


Figure 6.1 – Event List

System Events

The system event log is accessible by clicking the View Events button in the Control View. Events may be recorded at any time, regardless of whether a test is running. New events are made known to the user through the vertical bar directly under the left arrow that is visible in either the Chamber, Fixture or Device View; see Figure 6.1. When a new system event occurs, this bar will flash red. The lightning bolt in the View Events button will also flash yellow. When the system event log is accessed, any new event will be in bold type. To clear the new event

status, any new event must be marked as read or deleted through the use of the right-click menu. Right clicking on any event will allow the options of marking all or a single event as read (or unread, as appropriate) as well as deleting a single event or all events. Once all new events have been read or deleted, the vertical bar will turn green or gray depending on if a test is running or not.

System events fall under these categories:

- Power Failures - event messages generated when the computer or chamber power fails
- Software Events - caused by starting or stopping ReliaTest or general program errors
- Control-Measure Module Events - caused when the electronic hardware experiences a problem such as a processor error
- Communications Events - caused when the control computer is no longer able to communicate with the CMMs

Power Failures

The LRS-9434 system is designed to handle power failures without loss of data and no damage to the devices being tested.

Computer Power Failure

To prevent database corruption due power failure, the computer is capable of running off of battery power for several minutes. Monitoring software runs in the background watching for power failures. If a power failure occurs, the monitor software will gracefully shut the computer down after one to two minutes. If the computer fails while tests are running, the data for each test is retained in the CMM on-board volatile RAM. With 10-minute data collection intervals, a CMM has enough capacity for a minimum of three days of data storage. The CMMs will continue running the burn-in test even if the ReliaTest software is not running. The CMM will shut the lasers off at the end of the burn-in test step without software intervention.

If an LIV test step was running when the computer power failed, ReliaTest will resume testing the same device when the power is restored.

When a computer failure or power loss of the computer is observed, it is highly recommended that the end user restarts and reconnects the computer within eight (8) hours of the original failure / power outage. While the default configuration of the computer is to automatically restart ReliaTest and recover the logged test information, it is up to the end user to verify this setting is correct and if not, must manually restart ReliaTest if changed from the system default configuration.

The reason to have the end user restart and reconnect the computer within eight (8) hours of the original failure / power outage is due to the CMM on-board volatile RAM memory limitations. If set to the minimum 1-minute data collection interval, the on-board memory will be at full capacity after this eight-hour time frame. Failure to reconnect the computer with ReliaTest running could cause the CMM test scenario to remain incomplete, if the remaining data to collect exceeds this maximum capacity value. Once reconnected to ReliaTest, the CMM will transfer this retained data, and normal testing will resume. Without transferring this data, the CMM will stop recording new measurements, resulting in missing data. The test will stop at the designated duration set by the test scenario.

When the computer is restarted, the ReliaTest software will resume automatically and then check the database to determine if there are any tests currently running in the chamber. It will then annotate the database with information about the power failure, download data from the CMMs to the database, and resume any running tests. While ReliaTest is resuming tests, the icon next to the test scenario will change to the Auto Restarting icon.

CAUTION: Do not close ReliaTest while it is restoring tests. If the software is closed while it is downloading stored data from the CMMs then the data will be lost and cannot be recovered. Refer to Appendix A for information on setting network and computer user names and passwords so that the auto-restart feature functions properly on your network.

Rack / Electronics Power Failure

The CMMs have built-in power failure detection circuitry and will ramp down and short the laser current sources within 20 ms after detecting a power failure. The system will also pause the test scenarios if a power brownout is detected.

There are two points in the system (per CMM) where a loss of power can occur for the end-user to note: at each individual shelf rear panel AC power cord socket and at the main breaker / socket for the entire LRS-9434 rack. Ensure all physical connections are checked and corrected when a power failure is observed.

If power to the system is lost, then the computer will log the event and generate an event message in the test event log of any tests that are being run. The software will pause execution of any running tests that are affected by the power failure.

When the system power is restored, the CMM processors are re-enabled and resume communications with the control computer.

The software then automatically resumes the tests that were interrupted by the power failure.

Database Events

ReliaTest will post event messages if the database communications are lost or disrupted. If communication with the primary database is lost, all running tests will be paused and a system event message generated.

CMM Processor Failure

In the event the processor on the CMM fails, independent sensing circuitry will shut off the current sources within 50 ms. This feature ensures that the current sources are controlled at all times and the lasers are not unintentionally driven beyond the limits configured in the device setup.

Communications Events

A communication failure is treated the same way as a power failure; if communication with the system is lost, the software logs the event. Once the software is able to communicate with the system, it determines the status of any tests that had been running and, if necessary, resumes them. If the system was running and storing data during the communications failure, the software will download the data and store it in the database.

Test Events

Test events cause the test to halt when it is running or when the software has just started the test. The ReliaTest software will usually state the cause of the error. Some examples of test events include:

- Mismatched device parameters - If the drive current set point is greater than the current limit in ACC mode, the software will halt the test prior to starting.
- Fixture is removed while a test is running - The software will generate an event message and abort the test that is running on that fixture.
- A fixture assigned to a test is already running in another test - ReliaTest will not allow the new test to start, and will generate an error message stating that one of the fixtures is already under the control of a different test.
- Failed devices - Whenever a device under test fails due to open or short circuit, or due to being shut off for reaching a limit value, an event message is logged indicating this. If all devices fail in a fixture, the test will stop with an error saying it cannot proceed.

In any case, the software will generate an event message and record the event in the database log for that test. Also, the fixture image on the monitor will flash red to alert you to a problem on that fixture. The error can be investigated by double-clicking on the fixture, then the individual device, which will also be flashing red.

Any device may be manually "failed" by the user. Click on the Fail This Device button in the Device View shown in Figure 6.2 and enter the reason to fail the device to manually fail the device. The user-specified device failure is handled in the exact same manner as a failure detected by the software. If all devices fail, the test scenario will fail and be stopped.

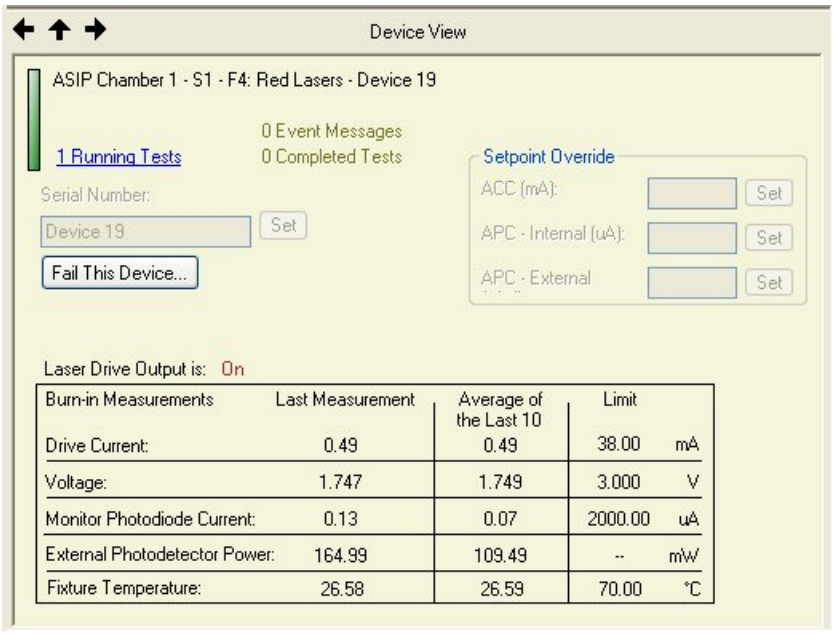


Figure 6.2 - Device View

Events Email Configuration

ReliaTest can be configured to send email messages when specific types of events occur. This configuration is found in the General Software Options screen in the System -> Options menu.

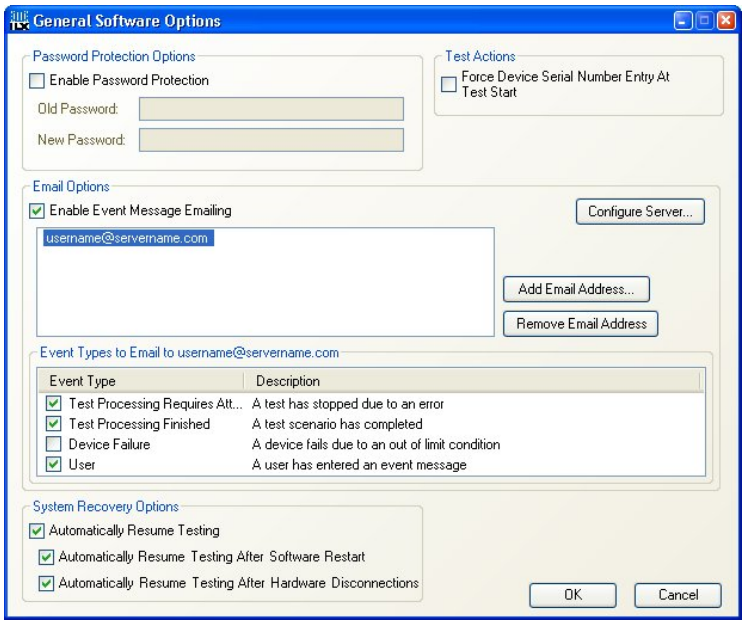


Figure 6.3 - General Software Options

In the Email Options section, check Enable Event Message Emailing. ReliaTest allows multiple email addresses to be added to list of recipients. Use the Add Email Address… and Remove Email Address buttons to manage the list of recipients.

Each email address can be configured to receive up to four different types of event messages. When an email address is selected, the four types are displayed in the Event Types to Email to list box. The following list describes each event category in detail and when it might occur in ReliaTest:

- Test Processing Requires Attention - This event category contains events which unexpectedly halt a running test. This would occur during power failures, hardware communication issues, and ReliaTest shutdown events. This event is only expected during abnormal or system error conditions.
- Test Processing Finish - This event category contains events which occur when a test has finished. This event is expected under normal operation. This message will indicate to the email recipient that the test is complete and a new test maybe started in that test fixture location.
- Device Failure - This event category contains events which occur when a device has been marked as 'failed' by the system or a user. Some devices may reach an out-of-limit condition during normal operation, depending on the device type configuration.
- User - This event category contains events which are entered by the user. This only contains event messages which the user specifically enters.

Email Server Configuration

Currently, ReliaTest supports a non-authenticated SMTP connection. ReliaTest does not support SSL connections.

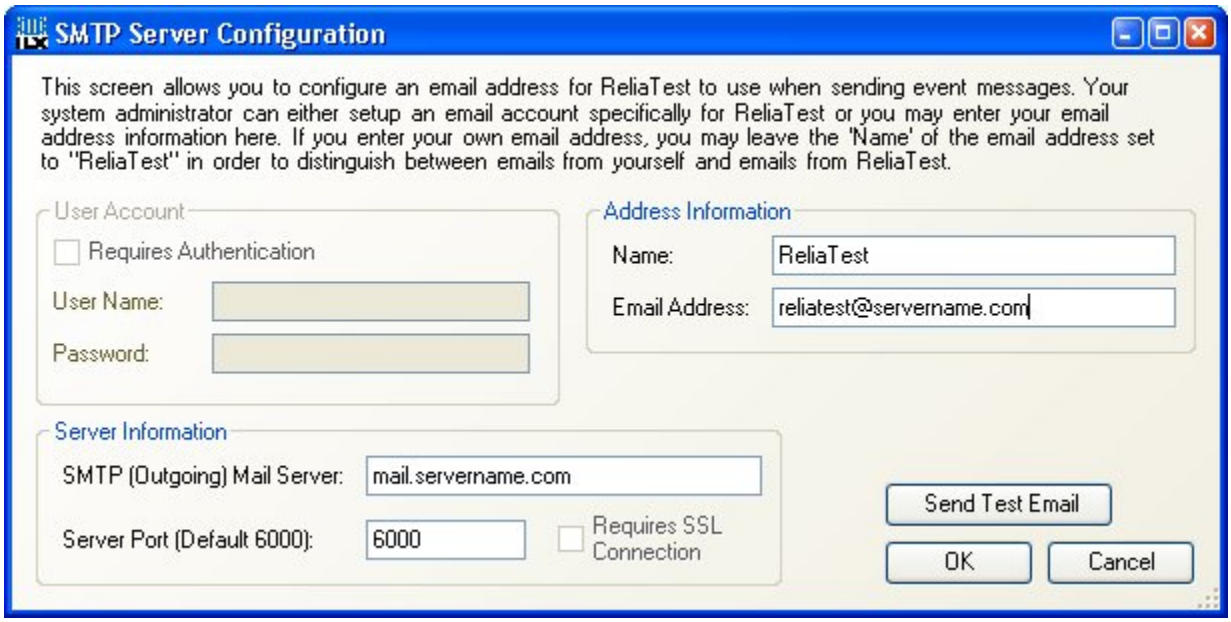


Figure 6.4 - SMTP Server Configuration

The settings in the SMTP Server Configuration screen will be very similar to the settings found in most email software clients (such as Microsoft ® Outlook). Use the Address Information fields to configure the 'From' information in future ReliaTest emails. Here, the email address can be any email address, even a fake or nonexistent address, in a valid format however, it is recommended to change the 'servername' section of the Email Address field to the SMTP email server name from which the emails will be sent. It is further recommended to leave 'ReliaTest' in the Name field so that emails from ReliaTest are listed as such from within any standard email client.

Chapter 7 :
System Maintenance and Upgrades

Routine System Maintenance

The following routine maintenance schedule is recommended by ILX Lightwave.

Maintenance Task	Frequency	Performed By	Notes
Calibrate CMMs and Fixtures	Annual	ILX Lightwave	Send CMMs to ILX
Remove old tests from the running or historic lists	As needed	Customer	Ensures that ReliaTest operates efficiently

Available on select LRS-9434 and LRS-9434SS systems, a separate calibration fixture and software package, ReliaCal, can be purchased for on-site calibration of the CMM shelves. This calibration package is a one-time purchase to perform on-demand calibration by the end-user team, usable on multiple LRS-9434 systems of the same design type. Contact your ILX Lightwave representative for more information and ordering details.

Chapter 8 : Troubleshooting

System Diagnostics Screen

The System Diagnostics screen is used to view the status of the system power supplies, shelf loading, and chamber statistics. A Diagnostics screen is available for each CMM and may be accessed from the Help menu. Each connected CMM will be listed by name and IP address. The window shown in Figure 8.1 will appear when a CMM is selected.

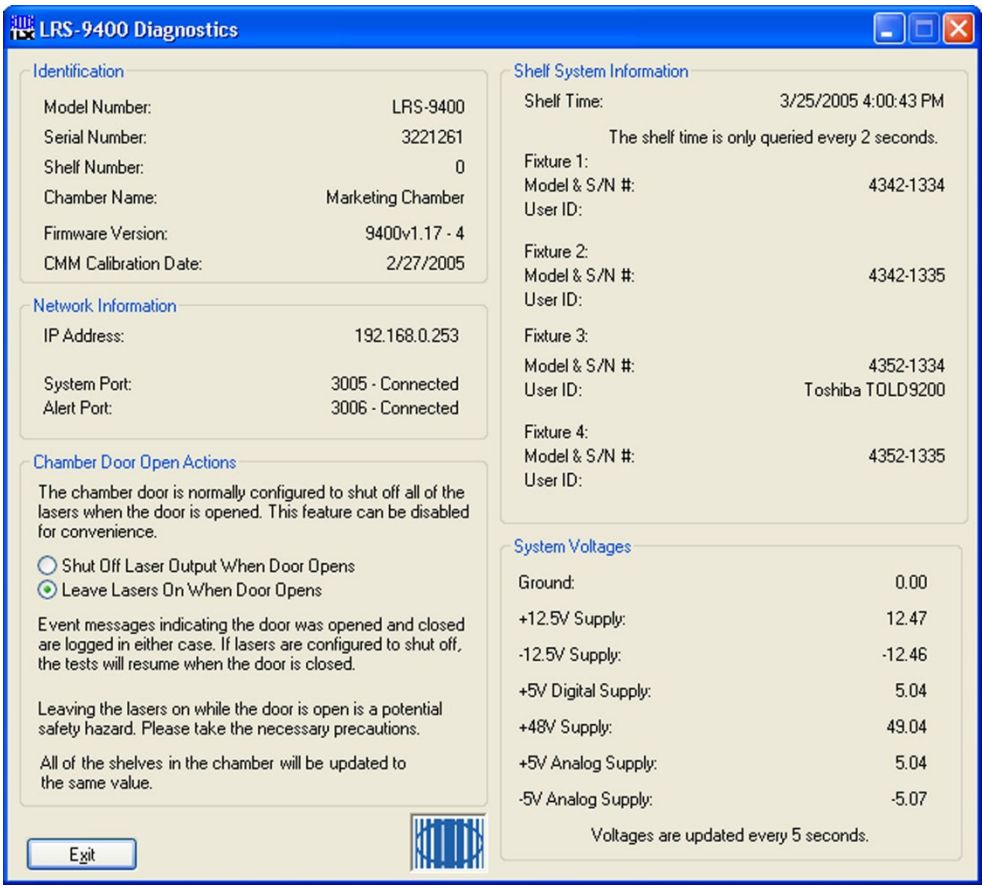


Figure 8.1 - System Diagnostics Screen

Troubleshooting Procedures

Most of the errors that occur with the LRS-9434 system will be logged by the software. The error messages give an indication of the nature of the error, and may provide clues to help resolve the problem.

Problem / Symptom	Possible Causes	Action
Newly loaded fixture no recognized by software	Improper fixture insertion	Remove and re-insert fixture, making sure that the fixture is properly seated in the connector.
	CMM firmware is locked up	Software will not be able to communicate with the CMM; any fixture that is inserted into the shelf will be inoperable. The system power must be recycled in order to reset the CMM firmware.
Fixture READY light doesn't blink when fixture is installed	Fixture EEPROM is corrupt	Move fixture to a different CMM slot; if problem still occurs then the fixture EEPROM is corrupt. Return the fixture to ILX for repair. An error message should appear in the ReliaTest event log.
	Improper fixture insertion	Remove and re-insert fixture making sure that the fixture is properly seated in the connector.
Software fails to detect device open or short circuit failures	Drive current too low	Laser drive current must be >10 mA in order for the system to recognize open or short circuit failures.
All lasers fail	Device type setup is incorrect	Check the pin out type in the Device Type configuration. (Chapter 4)
	Devices have reached user-set limits	Check the device operating limits in the Device Type configuration.

Lasers switch off when limit is reached	Device type configuration	Check the device configuration (Chapter 4) and make sure devices are not configured to switch off when limits are reached.
No front facet power measurement	Front facet array cable not installed	Check that the ribbon cable to the front facet array is correctly installed
	Improper test configuration	Check that the test has been configured to monitor or control the front facet array. Check that the correct fixture type is being used and that the front facet array is attached to the fixture. Check for any other error messages generated by the software.
Computer power failure	Power cord pulled out of wall	Replace power cord. Refer to Chapter 6 for information on automatic computer restarts.
	Facility power failure	Wait for power to be restored. The computer will automatically restart once the facility power is restored. Refer to Chapter 6.
System power failure	Facility power failure	Refer to Chapter 6 for information on restoring power to the system after a power failure.
Erratic or unstable temperature control	AD590 temperature sensor is failing	Sensor may need replacement. Contact ILX for information on obtaining a calibrated AD590 and software to update the fixture EEPROM.
Fixture will not maintain temperature set point at low temperature	DUTs are generating too much heat	Lasers in the fixture are generating too much heat and cause the fixture to “self-heat”. Contact ILX for in-depth applications help.

ReliaTest stops communicating with the LRS-9434	Ethernet cable is disconnected	Reconnect Ethernet cable between computer and chamber. Refer to Chapter 2 for information on which Ethernet ports are used. Refer to Chapter 6 for information on how ReliaTest recovers from a loss of communication event. Go to the DOS prompt using the Start>Run button in the menu bar at the bottom of the screen. At the DOS prompt, type “ping<IP address>” using the IP address of the CMM. If the response indicates a ping return, then the cable is connected and the loss of communication is caused by a different problem. Contact ILX Lightwave for in-depth troubleshooting instructions.
ReliaTest stops communicating with the control measure module	CMM firmware is locked up Processor module has failed	System power must be cycled in order to reset the CMM firmware. If communications are not restored after cycling the system power, or if the CMM does not respond to the PING command from the DOS prompt, the processor module may have failed. Contact ILX for in-depth troubleshooting help.
Chamber continually resets itself	True earth ground does not exist on input AC cable	Rewire AC service to disconnect AC-Neutral wire and replace it with earth ground.

Returning Components for Repair

If troubleshooting has failed to remedy the problem, return of one or more components of the system for repair may be required. Before returning parts or equipment, a Return Material Authorization (RMA) number must be obtained from ILX Lightwave. The equipment must be shipped in the original packing carton or one that will provide equivalent protection with freight and insurance prepaid by the customer. The equipment should be sent to the factory at the address below, referencing the Return Material Authorization number.

ILX Lightwave
ATTN: RA# _____
31950 East Frontage Road
Bozeman, MT 59715 USA

Repairs are warranted for the remainder of the original warranty or for 90 days, whichever is greater.

Appendix A:
Changing the Computer Passwords

The system control computer is configured at ILX Lightwave to automatically reboot after a power failure. This section contains information on changing the log on passwords so that the computer can automatically log into your local networks on startup and so that you can change the password to match your convention.

Configuring Computer to Automatically Boot Into Windows

The LRS-9434 control computer is configured to automatically resume all of the running tests after a power failure. This feature happens in four separate steps:

1) The computer automatically boots when the power is available and the master switch on the back of the computer is ON
2) The computer automatically logs into Windows and your local network
3) The computer automatically starts the ReliaTest software application
4) ReliaTest automatically resumes each test that was running prior to the power outage

Automatically Booting Computer

The computer is configured at ILX Lightwave to automatically boot when the power is available. This feature is enabled in the computer BIOS. If the computer is manually shut down, it must be manually restarted.

Automatically Logging Into Computer and Network (Windows 7)

The computer must use a user name and password that can authenticate to the network and the computer. Follow the steps below to configure the computer to use an existing account.

1) Click Start, click Run, type regedit, and then click OK to start Registry Editor.
2) Locate the following registry key:
   HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\WindowsNT\CurrentVersion\Winlogon
3) Using your account name and password, double-click the DefaultUserName entry, type your user name, and then click OK.
4) Double-click the DefaultPassword entry, type your password under the value data box, and then click OK.

If there is no DefaultPassword value, follow these steps to create the value:

a) On the Registry Editor menu, click Edit, click New, and then click String Value.
b) Type DefaultPassword as the value name, and then press ENTER.
c) Double-click the newly created key, and then type your password in the Value Data box.

If no DefaultPassword string is specified, Windows automatically changes the value of the AutoAdminLogon key from 1 (true) to 0 (false) to disable the AutoAdminLogon feature.

5) Double-click the AutoAdminLogon entry, type 1 in the Value Data box, and then click OK.

If there is no AutoAdminLogon entry, follow these steps to create the entry:

d) On the Registry Editor menu, click Edit, click New, and then click String Value.
e) Type AutoAdminLogon as the value name, and then press ENTER.
f) Double-click the newly created key, and then type 1 in the Value Data box.

6) Double-click the DefaultDomainName entry, type the network domain that the computer will use the user account to authenticate on.
7) To enforce this setting for all future logoffs, set the following registry key:
   KEY_LOCAL_MACHINE\SOFTWARE\Microsoft\WindowsNT\CurrentVersion\Winlogon
   Value:ForceAutoLogon
   Type: REG_SZ
   Data: 1
8) Quit Registry Editor.
9) You must restart the computer in order for the changes to take effect.
10) After your computer restarts and Windows starts, the computer will log on automatically.

Automatically Logging Into Computer and Network (Windows 10)

The computer must use a user name and password that can authenticate to the network and the computer. Follow the steps below to configure the computer to use an existing account.

1) Go to the directory location: C: -> Program Files (X86) -> ILX Lightwave Corporation -> ReliaTest -> Tools.
2) Locate the Autologin.exe application, and double click it to start the program.
3) Using the supplied fields in the program, enter your username, domain name, and password for your network.
4) When all fields are populated and accurate, click the Enable button to save the registration.
5) To remove a registered account, repeat step 3, and click the Disable button to remove those credentials.
6) Close the Autologin.exe application and restart the computer for the changes to take effect.
7) After your computer restarts and Windows starts, the computer will log on automatically.

Automatically Starting ReliaTest

The computer is configured at ILX Lightwave to automatically start ReliaTest when the system has finished its boot cycle. If ReliaTest does not automatically start, this feature can be re-enabled by placing a shortcut to the ReliaTest Launcher application in the appropriate location. For Windows 7, this can be found in the following directory: Start Menu -> Programs -> Startup menu of the user account. For Windows 10, this can be found in the following directory: Microsoft -> Windows -> Start Menu -> Programs -> Startup user drive location.

Automatically Resuming Tests in ReliaTest

When the ReliaTest software application starts, all tests that were previously running will be restarted. ReliaTest waits for thirty seconds before resuming the tests to allow the user a chance to cancel the automatic resume feature. After each test resumes, any data that was stored on the instrument will be read by the software and stored with the test in the database. The test resumes and finishes the rest of the test procedure.