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Newport Laser Control System

User's Manual

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Newport Laser Control System

User's Manual Addendum

NOTE

This User's Manual applies to Newport Laser Control System Software up through Version 2.74C for Newport Rack Systems that support GPIB communication. Portions of this manual may NOT be suitable for use with digital (high-density) rack systems.

Contact your Newport Corporation representative for additional information regarding digital Newport rack systems.

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CHAPTER 1

1. General Information

1.1 Introduction

This manual describes the features of the Newport Laser Control System software and also briefly describes how to set up and run a typical device test using the Newport Laser Diode Test System hardware and software.

1.2 Newport Laser Diode Test System Features

Newport's Laser Diode Test and Characterization System allows complete testing and characterization of virtually any kind of laser diode in any package style.

Chip-on-Carrier (COC) and Coaxial Device Burn-in and Lifetest Racks

The COC/Coaxial Burn-in and Lifetest Racks offer high-density precision control and monitoring of COC devices. Powerful control software allows flexible test procedures for LI and burn-in processes, as well as extensive pass/fail crite

ria. A powerful reporting engine is used to generate user-defined reports throughout a test process. Precision electronics, both in high-resolution 16-bit and low-cost 12-bit versions, allow complete control and monitoring of devices under test. High power temperature controllers are used to control and monitor the temperature of each fixture in the system.

Butterfly Module Burn-in and Lifetest Racks

The Butterfly Module Burn-in and Lifetest Racks use the same control system as the COC and Coaxial Device Burn-in and Lifetest Racks, which allows the same precision electronics and powerful test and reporting engine to be used by both systems. The primary difference is the addition of internal peltier cooler controllers for each device in the system, for complete control of the butterfly module. The system supports testing of butterfly modules with and without internal TECs, without changing hardware or software.

Newport Laser Control System Software

The Newport Laser Control System Software offers the user full control over the characterization and burn-in testing of laser diode devices through an intuitive Windows-based user interface. Device tests can be set up, started, and stopped for a single device or for an entire loaded high-density rack system. The software allows the user to view and store the test data in a database or view the results in a graphical form.

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1.3 Safety Terms and Symbols

1.3.1 Terms

The following safety terms are used in this manual:

The **WARNING** heading in this manual explains dangers that could result in personal injury or death.

The **CAUTION** heading in this manual explains hazards that could damage the instrument.

The **NOTES** heading provides information to the user that may be beneficial when using this instrument.

1.3.2 Symbols

The following symbols may be used in this manual, component manuals, and on the instruments:



Caution (refer to the documentation)



Fuse



Protective earth ground connection



Caution – Laser Radiation

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1.4 General Warnings and Cautions

The following general warnings and cautions are applicable to this instrument:

CAUTION

Do not exceed the input power of the UPS.

Refer to the APC Smart-UPS system documentation for additional information.

WARNING

Any use of the Newport Laser Diode Test System not specified by Newport Corporation, or failure to comply with precautions or specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of this equipment. Violation of safety standards and misuse of equipment may cause damage or injury.

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CHAPTER 2

2. Newport Laser Control System Software Installation and Start-up

2.1 Introduction

The Newport Laser Diode Test and Measurement System is setup and controlled through the Newport Laser Control System (NLCS) software. The user interface of the Newport Laser Control System software is simple and easy to use. It allows the user to set all of the test parameters and then run the device tests with just a few button clicks.

NOTE
Refer to each component's User's Manual for additional information about the component.

2.2 Newport Rack System Power Up

The rear panel area of the rack system components requires a minimum of two (2) to four (4) inches of clearance for adequate air circulation. Ensure that the fan area in the back of the units is unobstructed to allow for proper airflow through the unit.

2.2.1 AC Power Connection

The instruments contained in a typical Newport Rack System all plug into the UPS (uninterruptible power supply) that supplies clean, uninterrupted AC power for each rack system component. The UPS unit is connected to a 120 VAC 3-prong AC power outlet (unless otherwise specified). Ensure that all of the component power connections are secure, and ensure that the proper fuses are installed in the components before connecting AC power to the system.

CAUTION
Do not exceed the input power of the UPS.

Refer to the UPS system documentation for additional information.

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2.2.2 Power Up Sequence

With the UPS power supply connected to an AC power source with the correct voltage and each component connected to the UPS, turn each Newport Laser Diode Test System component switch to its ON (I) position according to the sequence below:

1. UPS system
2. Each laser diode modular controller
3. TEC instrument
4. Laptop computer in rack-mounted drawer

Once the power is turned on, each component will begin its power-up sequence.

If starting the rack system for the first time on a new computer or with new software installed, procced to **Section 2.3 Software Installation and Set Up** to properly configure the NLCS software.

2.2.3 Software Quick-Start

Use the following procedure to start the NLCS software. This procedure assumes that the software has been installed and properly set up. If the software needs to be installed and/or configured, skip to **Section 2.3 Software Installation and Setup**.

1. Double-click on the **NLCS** icon.

   OR

   Select the **Start** button, then **Programs | Newport Laser Control System | Laser Control System**.

2. At the Login dialog box, select the proper name/title from the **Operator Name** drop-down list box.

3. Enter the appropriate **Password** for the chosen operator name.

4. Select the desired Work Mode:

   - Select the **Online** button to connect with and control the Newport rack system components. Continue with Step 5 below.

   - Select the **Offline** button to work with the databases without connecting to the Newport rack system. Skip to Step 6 below.

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5. With the Online work mode selected, the following message will appear while the system initializes and makes contact with the system components:



Figure 1 – Establishing Communications with Rack Dialog Box

NOTE
The process of establishing communications may take several minutes to complete, especially if a data acquisition unit is connected to the system.

6. Proceed to use the system.

2.3 Software Installation and Set Up

2.3.1 Software Installation

The Newport Laser Control System Software (NLCS) is installed and set up at the factory. However, in the event that the system needs to be reconfigured (typically when installing a software upgrade), use the following procedure:

1. With the laptop computer turned on, insert the **NLCS CD** in the CD drive.
2. Browse to find the "install.exe" file on the CD.
3. Double-click on the "install.exe" file and follow the on-screen instructions.
4. Once the install is complete, select the **Finish** button.
5. Browse to the newly created Newport folder to ensure that the proper files were installed. Refer to **Section 2.4.1 NLCS Folder Contents** and **Section 2.4.2 Other Significant NLCS Files** for an explanation of the major files that are installed as a part of the NLCS software.
6. Follow the procedure found in **Section 2.3.2 Software Setup** to properly configure the NLCS software.

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2.3.2 Software Setup

Once the Newport Laser Control System Software (NLCS) is installed on the rack system computer, the NLCS software must be configured. Typically the computer is set up at the factory before the system is shipped. However, in the event that the system needs to be reconfigured, use the following procedure to set up the minimum parameters that will allow the system to operate properly.

NOTE

Only trained system technicians should attempt the following procedure. If any procedure step is questionable, contact Newport Corp. Customer Support before attempting.

1. Start the (new) Newport Laser Control System software executable (NLCS.exe) file in Offline Mode.

2. Change or enter the Rack Layout settings for the rack system:

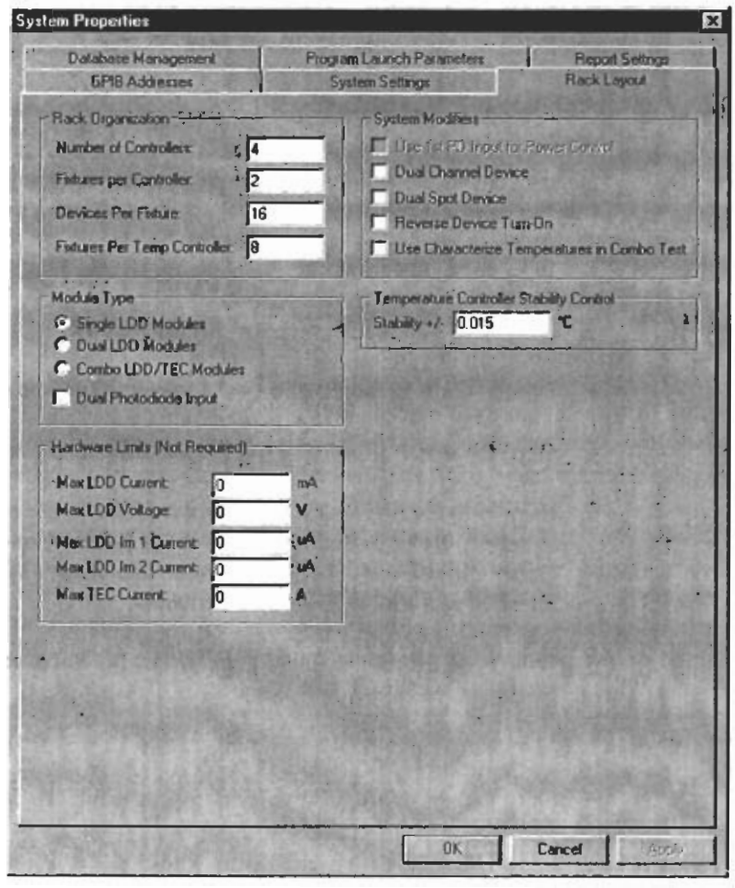


Figure 2 – System Properties, Rack Layout Tab

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a) Select **Rack | System | Properties...** to display the System Properties dialog box, and then select the **Rack Layout** tab.

b) Enter the following parameters:

NOTE

The following parameters are saved in the NLCS.ini file and are used to identify the rack system layout. It is very important that the following parameters are entered correctly.

- **Number of Controllers** in the rack system
- Number of **Slots per Controller** in the rack system
- Number of **Devices per Fixture** in the rack system
- Number of **Fixtures per Temperature Controller** in the rack system
- Select the **Module Type** to be used in the system

c) Verify that the Rack Configuration settings and the selected Module Type are correct.

3. Shutdown the NLCS software, delete the NLCS.ser file, and then restart the software:

NOTE

The software must be shutdown before the NLCS.ser file is deleted. The NLCS.ser file must be deleted before restarting the NLCS software in order to properly complete the software setup process. Once the software has been restarted after the NLCS.ser file is deleted, do NOT change the Rack Configuration or Module Type again without repeating Steps 2 and 3.

a) Select **File | Exit** to exit the NLCS software.

b) At the Exit Application dialog box, select the **Exit Application** button.

c) Delete the NLCS.ser file from its typical installation location (C:\Program Files\Newport\Newport Laser Control System).

d) Restart the NLCS software in Offline mode.

4. Select **Rack | System | Properties...**, and then select **Rack Layout** to confirm that the Rack Configuration settings and the Module Type are correct. Proceed to Step 4a below.

   If the settings are not correct, repeat Steps 2 and 3.

   a) Check whether or not the system will be using Dual Photodiode Inputs.

   b) Enter or check any of the other parameters on the Rack Layout tab that apply to the rack system.

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5. Select **Rack | System | Properties...**, and then select **GPIB Addresses** to configure the rack system communication parameters:

   Refer to **Section 3.5.1.1.1 GPIB Addresses** for additional information.

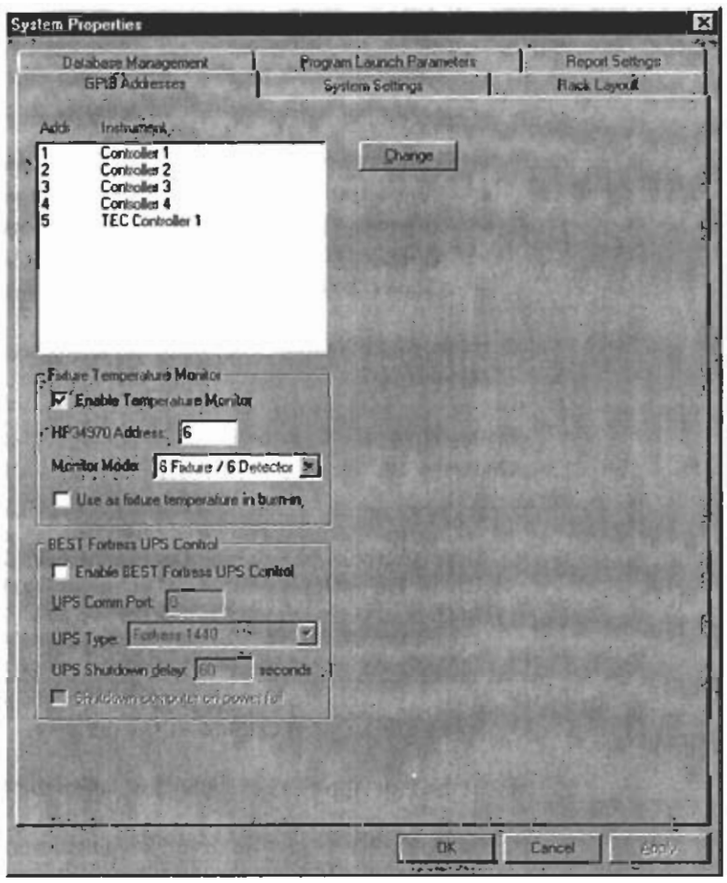


Figure 3 – System Properties, GPIB Addresses Tab

a) Set the **GPIB addresses** for the controllers and other components installed in the rack system according to the local instrument's address setting.

b) If installed, enable the **Fixture Temperature Monitor** and configure appropriately.

c) If installed, enable the **BEST Fortress UPS Control** and configure appropriately.

d) Select the **OK** button to accept the address changes.

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6. If the system does not have database support, copy the NLCS.mdb file to a known directory. Proceed to Step 7.

   If the system does have database support, ensure that the database has a compatible format with the current or upgraded software. In Microsoft Access, load the new database provided separately with the upgrade and verify that all of the fields match. Add any missing fields into the existing database. Proceed to Step 7.

7. Set up the **Database Support**:

   a) Select **Rack | System | Properties...** to display the System Properties dialog box, and then select the **Database Management** tab.

   b) Check the **Enable Database Support** check box.

   c) At the **Database Name** entry box, browse to select the NLCS.mdb file by selecting the Browse button (...).

   d) At the **Workspace Name** entry box, browse to select the desired workspace (.mdw) file by selecting the Browse button (...). The file that is typically used and its location are: C:\Windows\System\System.mdw

8. Set up the calibration file to be used for testing purposes:

   a) Select **Rack | System | Properties...** to display the System Properties dialog box, and then select the **System Settings** tab.

   b) Check the **Use PD Calibrate Values** check box to utilize the calibration file listed in the PD Response File Name.

   c) Select the Browse button (...) to locate and specify the appropriate calibration file (*.cal). This file is necessary to obtain the correct power readings.

9. Shutdown the NLCS software.

10. Restart the NLCS software.

11. Proceed to setup device templates and tests according to the information in this manual.

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2.4 NLCS Software Components

2.4.1 NLCS Folder Contents

The files and folders contained in the Newport Laser Control System folder are needed in order for NLCS to operate properly. Descriptions of each folder and file typically installed with NLCS are provided below.



Figure 4 – Newport Laser Control System Folder Contents

DAQ 3.5 – File folder that contains database information.

ODBC 3.0 – File folder that contains database information.

Burnin_ACC_APC.rpt – A Seagate Crystal Report file used during the burn-in testing of a laser diode device. Can be used for ACC (constant current) or APC (constant power) by device.

BurninDetail.rpt – A detailed tabular format Seagate Crystal Report file used during the burn-in testing of a laser diode device.

Characterize.rpt – A graphical format (by device) Seagate Crystal Report file used during the characterization test of a laser diode device.

CharacterizeDetail.rpt – A detailed tabular format Seagate Crystal Report file used during the characterization test of a laser diode device.

COC Fixtures 980928.cal – An example of a typical laser diode test system calibration file as created using the PD Calibrate software.

Newport.ico – The icon file for the Newport logo.

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NLCS.exe – The application executable file for the Newport Laser Control System software that is used to control the Newport rack system.

NLCS.mdb – The Microsoft Access database file that contains saved test information.

NLCS.ser – A file that contains the system properties, test defaults, and other NLCS application specific information. Note that this file is created after the NLCS application is started and configured the first time, and this file requires special attention when initially setting up the software (refer to **Section 2.3.2 Software Setup** for details).

NLCS.trc – A trace file that contains tracing information for the software.

NLCSExtension.dll – A Dynamic Link Library file that contains NLCS information needed to run the application.

PDCalibrate.exe – The application executable file for the Newport PD Calibrate software that is used to calibrate the user devices to Newport's modular laser and temperature controllers. The software allows the user to setup and save calibration configurations for each device fixture in the rack system.

Uninst.isu – A file that is used during the uninstall process when removing the NLCS software from the laptop computer. The file keeps track of changes to the laptop once the program is installed.

2.4.2 Other Significant NLCS Files

Some files and folders needed to properly utilize the NLCS software are not contained in the Newport Laser Control System folder. A description of each folder and file that is found outside of the NLCS folder typically installed with NLCS is provided below.

NLCS.ini – A file that contains the Rack Layout information (Rack Organization settings and Module Type) necessary to properly identify the configuration of the rack system. The contents of this file may be viewed using Microsoft Notepad for troubleshooting purposes. NEVER attempt to change any settings in this file.

The Rack Organization information includes the number of controllers, number of fixtures per controller, the number of devices per fixture, and the number of fixtures per temperature controller. The NLCS.ini file also indicates the Module Type that will be used in the rack system.

NLCS.lgc – A log file for the NLCS program on the C: drive that is used by the Windows operating system (Task Mon application) to track applications used on the computer. This file is typically located in the C:\WINDOWS\APPLOG folder. Note that this file is NOT installed with NLCS and is NOT used directly by the NLCS software and thus does not affect program performance or operation.

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CHAPTER 3

3. Software Overview

3.1 Introduction

The Newport Laser Control System (NLCS) software allows the operator to control the testing of the devices using a PC interface. The NLCS software is used to do the following:

- Enter and manage the testing configuration information.
- Run customized characterization and/or burn-in tests for a wide variety of devices.
- View customizable graph displays of test data.

The NLCS software user interface features a Windows based layout designed for ease of use and manipulation of the testing parameters. The software provides simple menus, list boxes, and push button selections for control of the Newport rack system. Options are given in a simple and straightforward manner that allows for easy system manipulation. All of the software features and their associated functions are detailed in the sections below.

NOTE

A range is provided for each parameter that may be entered numerically by the user. This range is a software range for possible entries and may NOT always be a valid entry range for the hardware. Entries should be within the actual limits of the instruments and/or devices. Consult with the instrument User's Manual or your Newport representative for support if the actual allowable range is not known.

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3.2 Menu Tree

The Newport Laser Control System software menus are intuitive and laid out in a logical manner. Refer to the menu tree diagrams below for menu locations and associations.

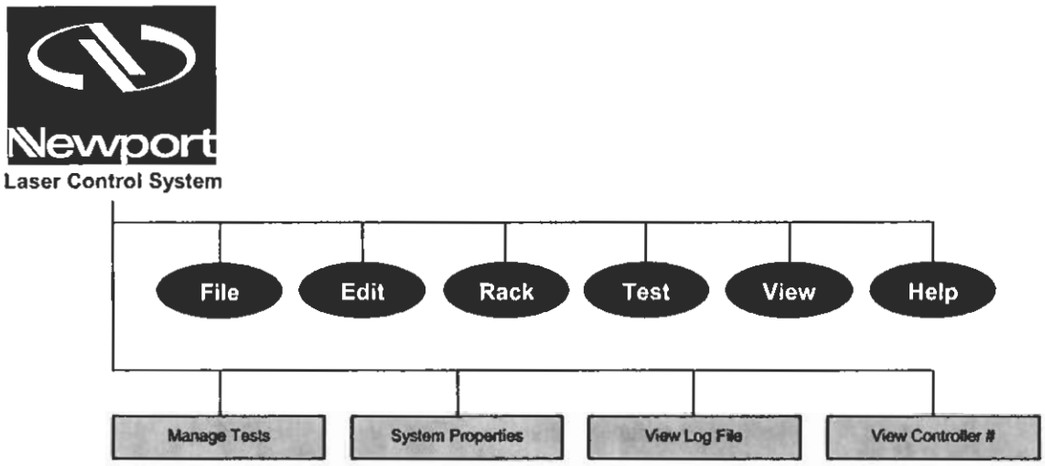


Figure 5 – Newport Laser Control System Software Menu Tree

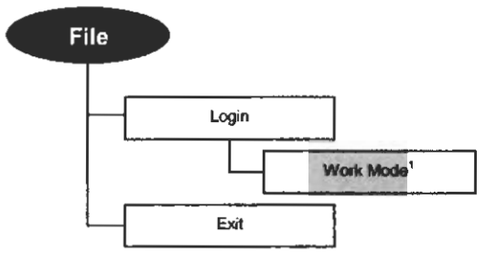


Figure 6 – File Menu Tree Diagram

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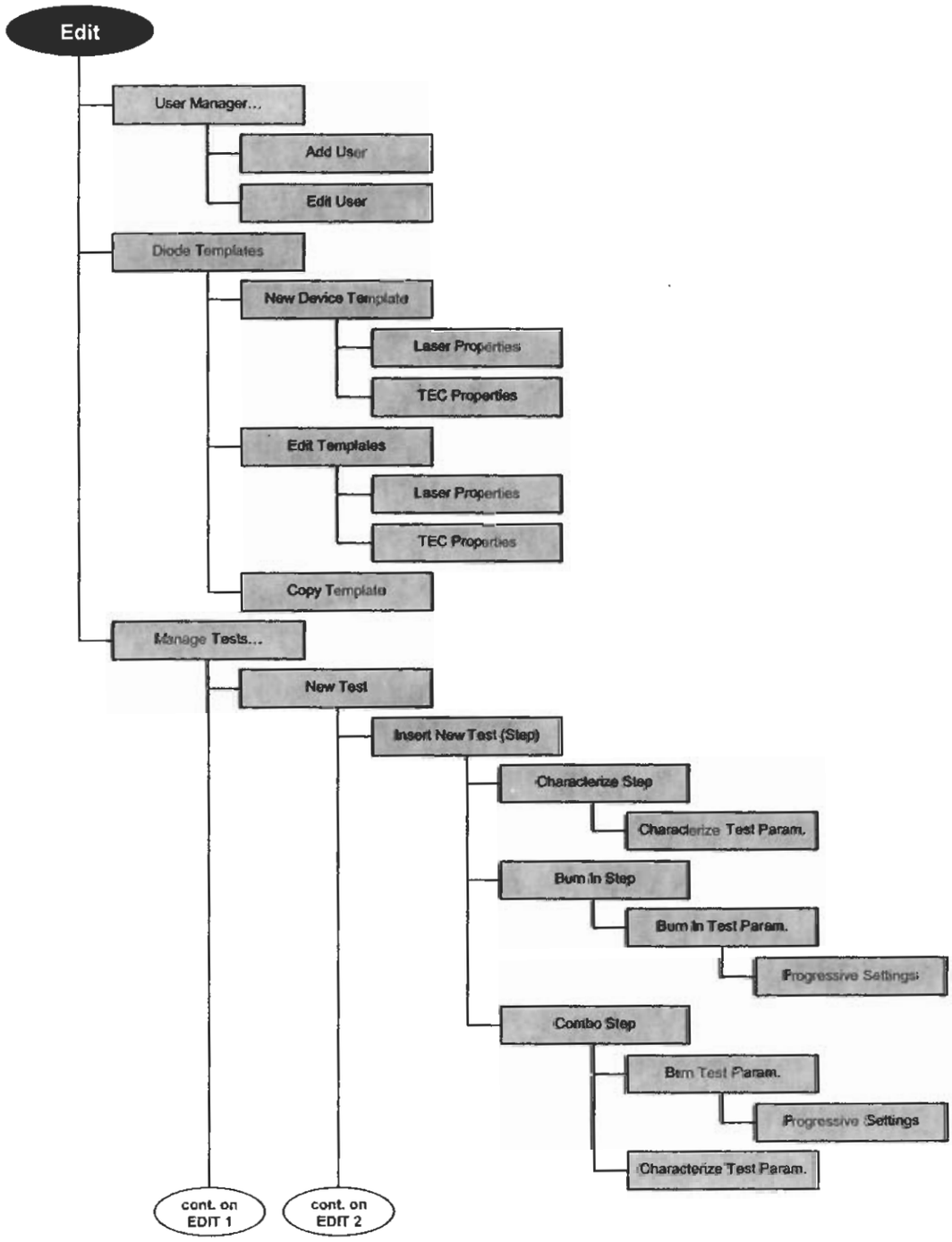


Figure 7 – Edit Menu Tree Diagram (1 of 3)

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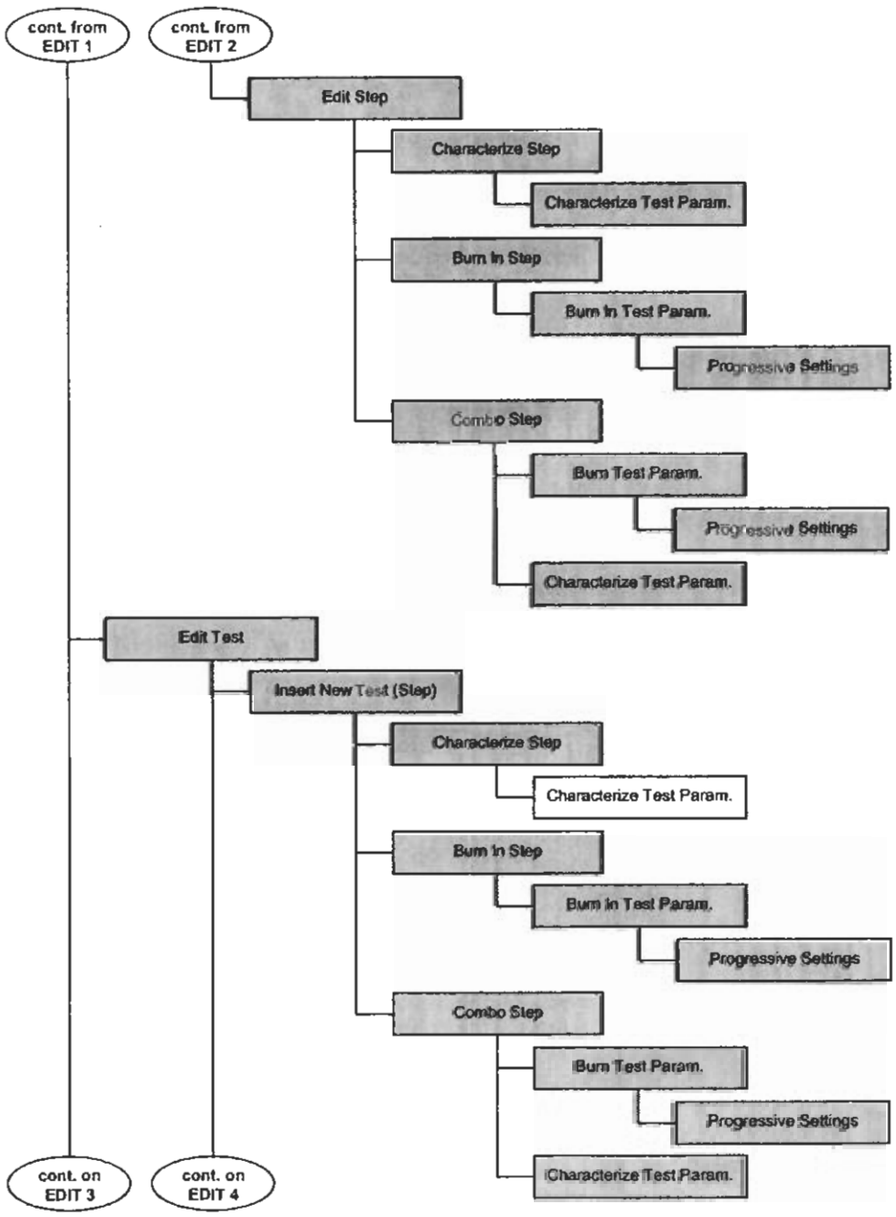


Figure 8 – Edit Menu Tree Diagram (2 of 3)

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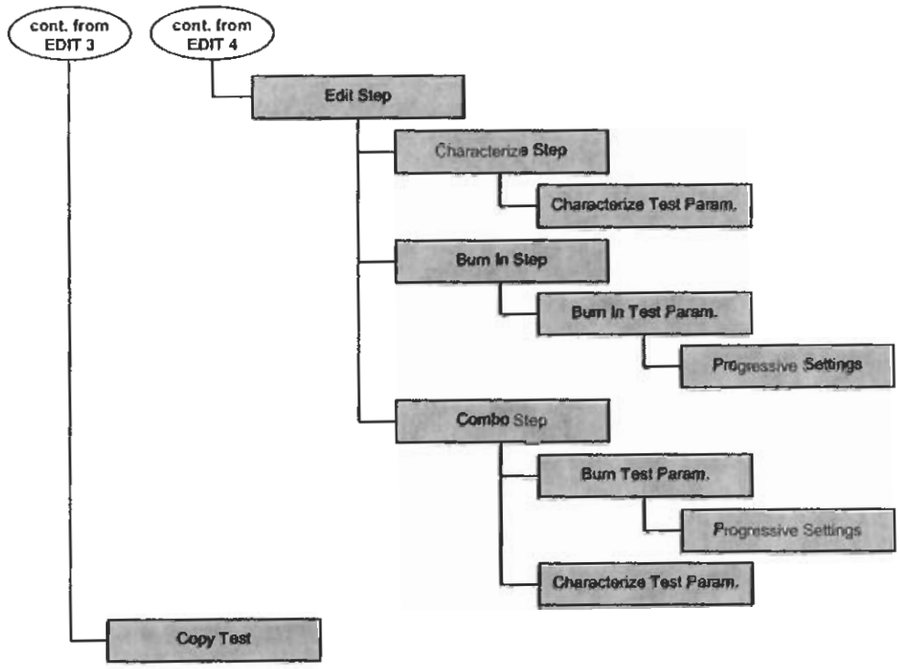


Figure 9 – Edit Menu Tree Diagram (3 of 3)

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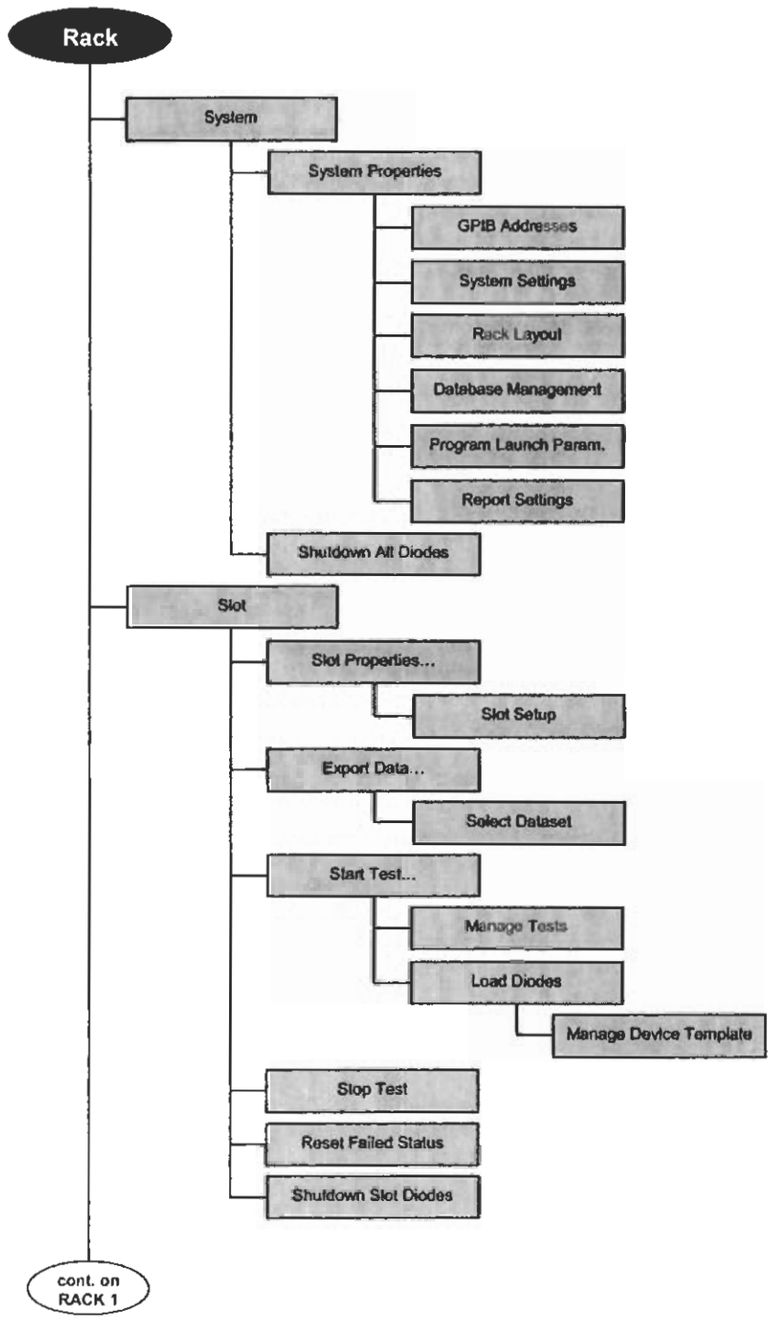


Figure 10 – Rack Menu Tree Diagram (1 of 2)

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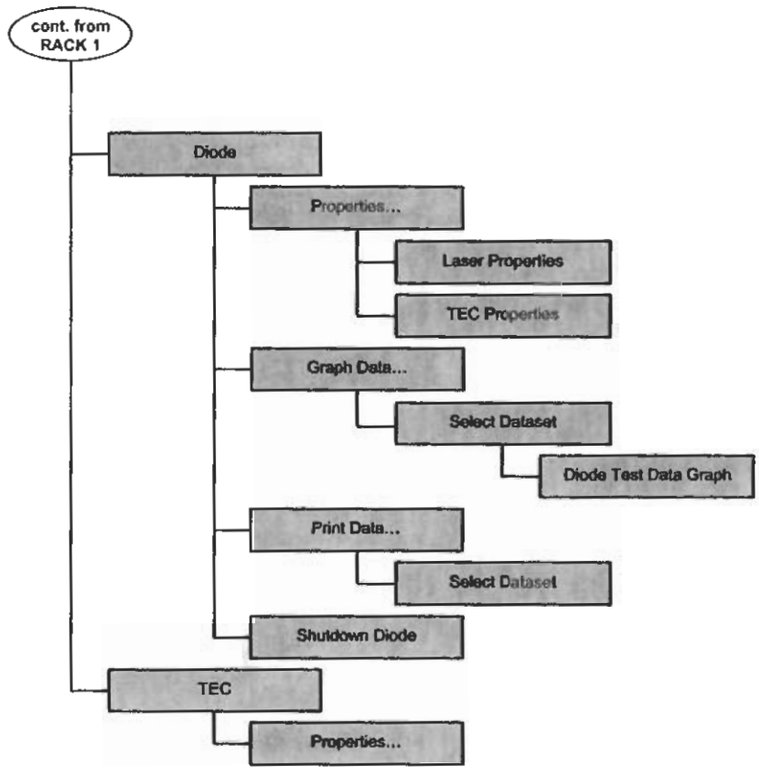


Figure 11 – Rack Menu Tree Diagram (2 of 2)

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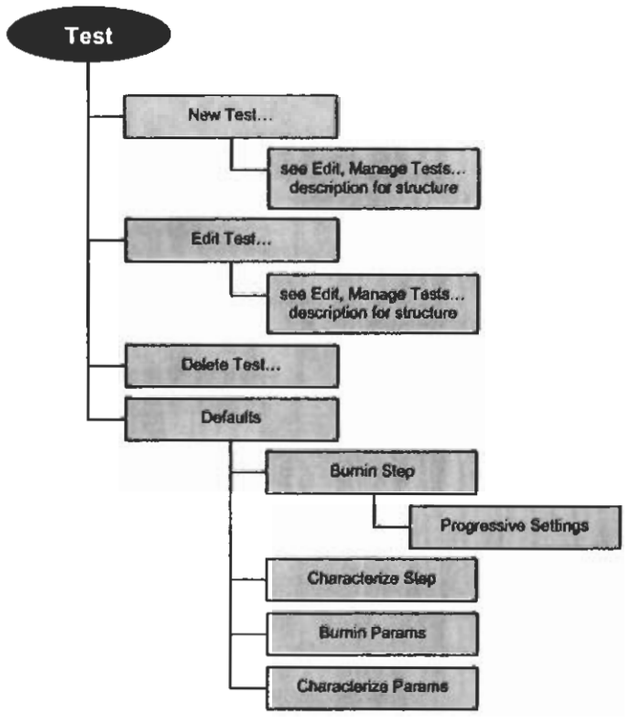


Figure 12 – Test Menu Tree Diagram

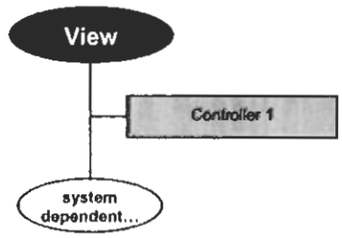


Figure 13 – View Menu Tree Diagram

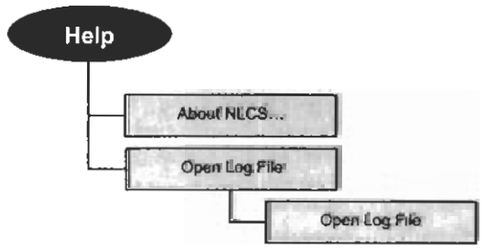


Figure 14 – Help Menu Tree Diagram

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3.3 File Menu Features

The File menu provides options for logging in to the software and exiting the software.

3.3.1 Login Dialog Box

The Login dialog box appears during the software start-up sequence to allow the user to select an operator name (with its associated access level) and enter a password. Operator Names, Passwords, and their associated access levels are entered and configured in the User Manager dialog box. Refer to **Section 3.4.1 User Manager** for additional User Manager information.

Users may also login under a different operator name while in the NLCS software. Once the login is changed, the user profile will change to the newly entered operator name's access level.

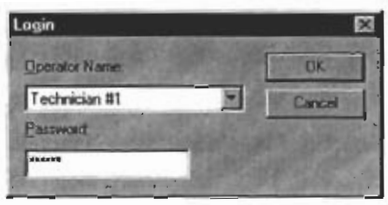


Figure 15 – Login Dialog Box

Operator Name – This drop-down list box allows the users to select their operator name from the available choices.

Password – Enter the proper password associated with the Operator Name selected.

NOTE
To ensure password protection, characters appear as asterisks when typed in the Password entry box.

OK – Select the **OK** button to accept the selected login information and login.

Cancel – Select the **Cancel** button to cancel the login process.

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3.3.1.1 Work Mode

The Work Mode allows the user to connect the computer to the rack system components for rack control or work offline to manipulate data only without communicating with the rack system components. Note that this dialog box only appears during the start-up sequence after the user has logged in.

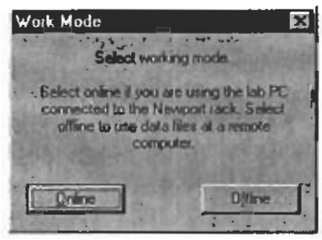


Figure 16 – Work Mode Dialog Box

Online – Select the Online button to connect the computer to the rack system components to establish communications and control the rack system.

NOTE
The process of establishing communications may take several minutes to complete, especially if a data acquisition unit is connected to the system.

Offline – Select the Offline button to start the NLCS software without establishing communications with the rack system components. This allows the user to access and then copy database files from one rack controller PC to another system to work with the data. Offline mode is also used when upgrading the software.

3.3.1.2 Establishing Communications... Message Box

The Communications message box appears after the Online Work Mode button is selected. This message is displayed as the computer is establishing communications with the rack system components. Note that this message may appear for several minutes in some cases.



Figure 17 – Establishing Communications Message Box

Cancel – Select the Cancel button to abort the connection process for the rack system.

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If the Cancel button is pressed during the connection process, a warning message will appear as shown in **Figure 18 – Cancel Communications Warning Message Box** below. Select the **Yes** button to abort the connection process, or select the **No** button to resume the connection process.

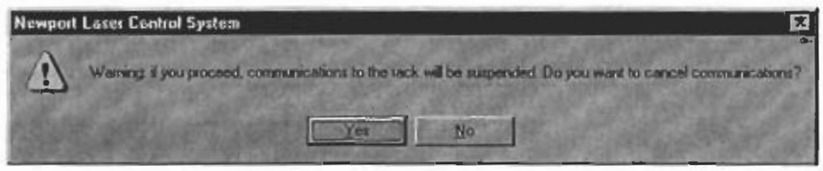


Figure 18 – Cancel Communications Warning Message Box

If the Yes button is selected, another warning message will appear as seen in **Figure 19 – Check Addresses Warning Message Box** below alerting the user to check the component addresses in the system properties. Select the **OK** button. The software will default to the offline work mode.



Figure 19 – Check Addresses Warning Message Box

3.4 Edit Menu Features

The Newport Laser Control System Edit menu contains options to access the User Manager, Diode Templates, and Test Manager. The User Manager allows a user with the appropriate privileges to add, edit, or delete system operators. The Diode Templates choice allows a user with the appropriate privileges to add, edit, copy, or delete diode templates used for device testing. The Tests... option allows a user with the appropriate privileges to add, edit, delete, and copy tests.

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3.4.1 User Manager

The User Manager allows the system administrator to add, edit, or delete system operators.

NOTE
This dialog box is available only for users logged in with administrator privileges.

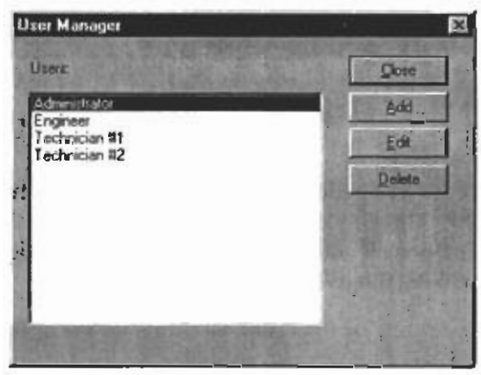


Figure 20 – Work Mode Dialog Box

Close – Select the **Close** button to accept any user changes and close the User Manager dialog box.

Add – Select the **Add** button to add a new user.

Edit – With an existing user selected (highlighted) from the list, select the **Edit** button to edit the name and/or profile for that user.

Delete – With an existing user selected (highlighted) from the list, select the **Delete** button to delete that user from the users list.

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3.4.1.1 Add User

The Add User dialog box appears when the Add button in the User Manager dialog box is selected and allows the user to add users and assign a corresponding password and privilege.

NOTE
This dialog box is available only for users logged in with administrator privileges.



Figure 21 – Add User Dialog Box

Name – Enter the name or title of the new user to be entered. User names are limited to 32 characters.

Password – Enter the desired password for the user name entered. Passwords are limited to 32 characters. Note that characters appear as asterisks (*) when typed to ensure password protection.

Privilege – Select the proper access level for the user name entered. Access rights for each level are provided in the table below.

Privilege	Access Rights
Administrator	All software screens, menus, and functions
Engineer	Set up tests, change slot properties, change device properties, and start/stop slot and device tests
Technician	Start/stop slot and device tests

Table 1 – User Privileges

OK – Select the **OK** button to accept the newly entered user information.

Cancel – Select the **Cancel** button to close the Add User dialog box without adding the new user.

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3.4.1.2 Edit User

The Edit User dialog box appears when the Edit button in the User Manager dialog box is selected and allows the user to edit the name, password, and/or privilege of an existing user.

NOTE

This dialog box is available only for users logged in with administrator privileges.

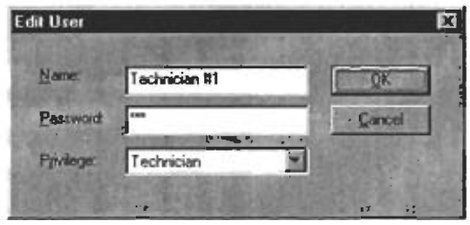


Figure 22 – Edit User Dialog Box

Name – Enter the new name or title of the user. User names are limited to 32 characters.

Password – Enter the desired password for the user name entered. Passwords are limited to 32 characters. Note that characters appear as asterisks (*) when typed to ensure password protection.

Privilege – Select the proper access level for the user name entered. See Table 1 – User Privileges for each level's access rights.

OK – Select the **OK** button to accept the changed user information.

Cancel – Select the **Cancel** button to close the Edit User dialog box without accepting the changed user information.

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3.4.2 Diode Templates

The Manage Device Templates dialog box allows the user to add, edit, copy, and delete laser diode testing templates.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

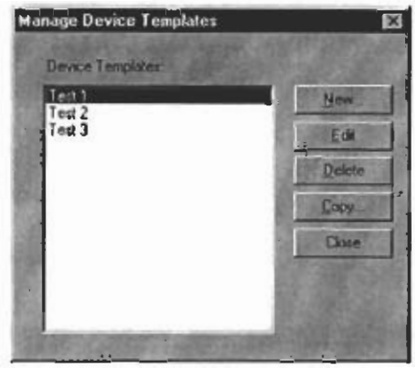


Figure 23 – Manage Device Templates Dialog Box

New... – Select the **New...** button to add a new laser diode test template.

Edit – With an existing diode test template selected (highlighted) from the list, select the **Edit** button to edit the device settings for the selected template.

Delete – With an existing diode test template selected (highlighted) from the list, select the **Delete** button to delete that template from the template list.

Copy... – With an existing test template selected (highlighted) from the list, select the **Copy...** button to copy the device settings of the highlighted test to the copy.

Enter the name for the test template copy and select the **OK** button, or select the **Cancel** button to cancel the template copy process.

Close – Select the **Close** button to accept any diode test template changes and close the Manage Device Templates dialog box.

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3.4.2.1 New Device Template

The New Device Template dialog box appears when the New… button in the User Manager dialog box is selected and allows the user to name and set parameters for a new device template.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

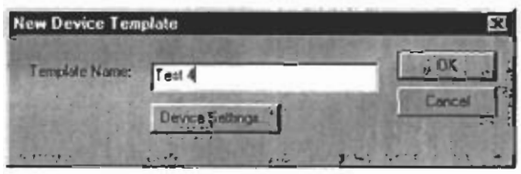


Figure 24 – New Device Template Dialog Box

Template Name – Enter the new device template name or title.

Device Settings… – Select the **Device Settings…** button to display and set the tabbed Diode Properties dialog box. This tabbed dialog box allows the user to set the Laser and TEC properties. Refer to **Section 3.4.2.1.1 Laser Properties and Section 3.4.2.1.2 TEC Properties** for additional device settings information.

NOTE
The TEC tab is only available on Combo LDD/TEC Modules systems.

OK – Select the **OK** button to accept the new device template device settings and name.

Cancel – Select the **Cancel** button to close the New Device Template dialog box without accepting the new template information.

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3.4.2.1.1 Laser Properties

The Laser Properties dialog box appears when the Device Settings... button in the New Device Manager (or Edit Templates) dialog box is selected and allows the user to turn on the laser and set the operating properties for the laser diodes.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

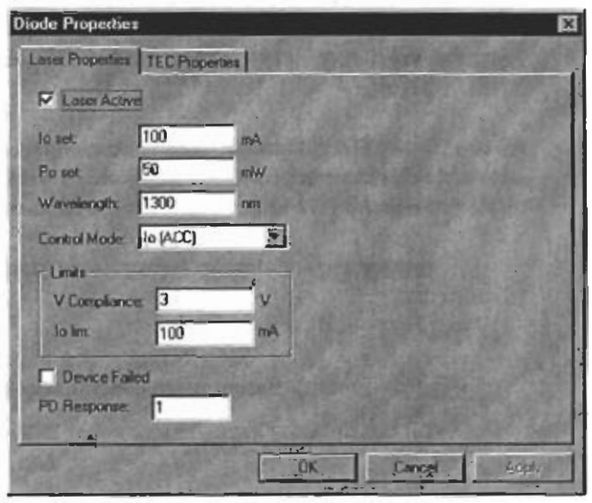


Figure 25 – Laser Properties Dialog Box

Laser Active – Select (check) the Laser Active check box to manually turn the laser ON and OFF.

Avoid exposure: Class 3B laser radiation emitted.

Io set: – Enter the desired current set point for the laser diode to be used while the laser is manually activated. The laser diode current set point used during a test will actually be taken from the test parameters and will override this value.
Range: 0 – 10000 milliamps

Po set: – Enter the desired power set point for the laser diode to be used while the laser is manually activated. The power set point used during a test will actually be taken from the test parameters and will override this value.
Range: 0 – 10000 milliwatts

Wavelength: – Enter the wavelength for the diode currently in use. Note that the wavelength is tied to the calibration data to accurately measure the power output of the diode.
Range: 200 -- 1800 nanometers

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Control Mode: – Select the desired laser test signal modulation control mode for either constant current (ACC) or constant power (APC) modulation mode to precisely control the laser output.
Options: Io (ACC), Po (APC)

Limits Group Box – Enter the limits of the diode to prevent accidental testing with voltage or current greater than the device can handle.

The voltage compliance setting controls the shutdown of the laser module output when the forward voltage of the laser exceeds the compliance setting. The V Compliance should be set to approximately 10% over the diode's maximum operating voltage or less to prevent accidental damage to the laser diode from too much voltage.

As one of the safety features of the laser modules, the Io Lim sets a maximum allowable drive current for the laser diode. The Io Lim should be set at or below the diode's maximum forward current to prevent damage from too much current.

V Compliance: – Enter the appropriate compliance voltage for the diode being tested.
Range: 0 – 150 volts

Io Lim: – Enter the appropriate laser diode drive current limit for the diode being tested.
Range: 0 – 99999 milliamps

Device Failed – Select (check) the Device Failed check box to enable the failed device notification feature.

PD Response: – Enter the appropriate PD response value for the diode according to the photodiode's calibration data. The N/A value entered for the slot properties will be multiplied by the PD Response value to be used in all calculations and displays.
Range: [any integer]

OK – Select the **OK** button to accept the laser property settings and name.

Cancel – Select the **Cancel** button to close the Diode Properties dialog box without accepting the laser property information.

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3.4.2.1.2 TEC Properties

The TEC Properties dialog box appears when the TEC Properties tab is selected at the Diode Properties dialog box and allows the user to turn on the TEC and set the operating properties for the TEC controller.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

NOTE
The TEC tab is only available on Combo LDD/TEC Modules systems.

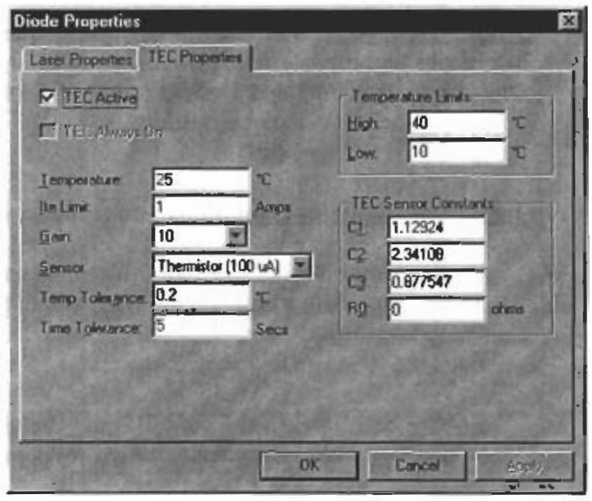


Figure 26 – TEC Properties Dialog Box

TEC Active – Select (check) the TEC Active check box to turn the TEC ON to reach the value entered in the Temperature check box.

TEC Always On – Select (check) the TEC Active check box to configure the TEC so that it remains ON at all times.

NOTE
The system must be online with the TEC installed in order for this check box to be available.

Temperature: – Enter the desired TEC temperature for the test. The test will run with the temperature dwelling within the Temp Tolerance entered.
Range: -90 – 200 degrees Celsius

Ite Limit: – Enter the desired TEC input current to be used for the test.
Range: 0.1 – 30 Amps

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Gain: – Select the gain to be used by the TEC for the test.
Options: 1, 3, 5, 10, 30, 50, 100, and 300

Sensor – Select the proper sensor installed in the TEC.
Options: Thermistor (100μA), Thermistor (10μA)

Temp Tolerance: – Enter the appropriate temperature tolerance for the test. This determines the amount of allowable variation in temperature as output by the TEC during the test. For instance, if the Temperature Tolerance is set to 1 °C and the Temperature is set to 25 °C, the test will run with an allowed temperature range of 24 – 26 °C.
Range: 0.01 – 5 degrees Celsius

Time Tolerance: – Enter the desired time tolerance for the test. This parameter determines the amount of time that the temperature must be within the temperature tolerance and within the temperature controller stability setting to be considered 'stable' to proceed with device testing.
Range: 0.1 – 120 seconds

Temperature Limits Group Box – Enter the desired TEC temperature for the test.

High: – Enter the desired high TEC temperature limit for the test. If the high temperature limit is reached, the TEC will change the power output to decrease the temperature.
Range: -90 – 240 degrees Celsius

Low: – Enter the desired low TEC temperature limit for the test. If the low temperature limit is reached, the TEC will change the power output to increase the temperature.
Range: -90 – 240 degrees Celsius

TEC Temperature Constants – Enter the appropriate TEC temperature constant values to achieve the desired resistance and cooling effect. The constants are part of the Steinhart-Hart equation used to derive temperature from the non-linear resistance of an NTC (Negative Temperature Coefficient) thermistor.

C1: – Enter the appropriate C1 constant value to achieve the desired resistance.
Range: -9.99999 – 9.99999

C2: – Enter the appropriate C2 constant value to achieve the desired resistance.
Range: -9.99999 – 9.99999

C3: – Enter the appropriate C3 constant value to achieve the desired resistance.
Range: -10 – 10

R0: – Enter the appropriate R0 constant value to achieve the desired resistance.
Range: 0 – 105 ohms

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3.4.2.2 Edit Device Template

The Edit Templates dialog box appears when the Edit button in the User Manager dialog box is seleeted and allows the user to name and set parameters for a new device template.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.



Figure 27 – Edit Templates Dialog Box

Template Name – Enter the new device template name or title.

Device Settings... – Select the Device Settings button to display and set the Diode Properties dialog box. This tabbed dialog box allows the user to set the Laser and TEC properties. Refer to **Section 3.4.2.1.1 Laser Properties and Section 3.4.2.1.2 TEC Properties** for additional device settings information.

NOTE
The TEC tab is only available on Combo LDD/TEC Modules systems.

OK – Select the **OK** button to accept the new deviee template device settings and name.

Cancel – Select the **Cancel** button to close the Edit Templates dialog box without accepting the new template information.

3.4.2.2.1 Laser Properties

The Laser Properties dialog box appears when the Device Settings... button in the New Device Manager (or Edit Templates) dialog box is selected and allows the user to turn on the laser and set the operating properties for the laser diodes.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.2.1.1 Laser Properties – New Device Template** for information about laser properties settings and features.

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3.4.2.2.2 TEC Properties

The TEC Properties dialog box appears when the TEC Properties tab is selected at the Diode Properties dialog box. This dialog box allows a user with the administrator or engineer privileges to turn on the TEC and set the operating properties for the TEC controller.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.2.1.2 TEC Properties** for information about TEC properties settings and features.

3.4.2.3 Copy Device Template

The Copy Template dialog box appears when the Copy… button in the User Manager dialog box is selected and allows the user to copy the template of an existing diode template to another template. Once the copy is created, the template can be edited if necessary.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

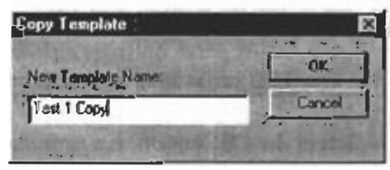


Figure 28 – Copy Template Dialog Box

New Template Name: – Enter the copied device template name or title.

OK – Select the **OK** button to accept the copy of the device template name.

Cancel – Select the **Cancel** button to close the Copy Template dialog box without accepting the template copy information.

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3.4.3 Manage Tests

The Manage Tests dialog box appears when Tests... is selected from the Edit menu and allows the system administrator or engineer to add, edit, or delete diode tests. The available test types are characterization tests, burn-in tests, and combo tests (characterization and burn-in). Default test settings are set in the Test | Defaults... dialog box.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.



Figure 29 – Manage Tests Dialog Box

New... – Select the **New...** button to add a new laser diode test.

Edit – With an existing diode test selected (highlighted) from the list, select the **Edit** button to edit the device settings for the selected test.

Delete – With an existing diode test selected (highlighted) from the list, select the **Delete** button to delete that test from the test list.

Copy... – With an existing test selected (highlighted) from the list, select the **Copy...** button to copy the device settings of the highlighted test to the copy.

Enter the name for the test copy, and select the **OK** button OR select the **Cancel** button to cancel the test copy process.

Close – Select the **Close** button to accept any diode test template changes and close the Manage Tests dialog box.

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3.4.3.1 New Test

The New Test dialog box appears when the New… button in the Manage Tests dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

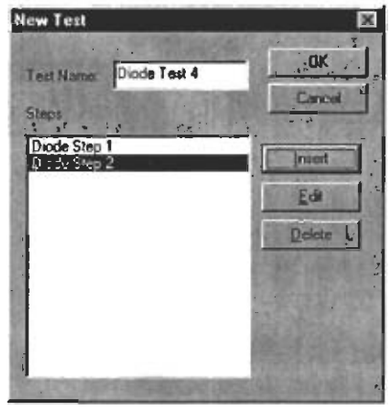


Figure 30 – New Test Dialog Box

OK – Select the **OK** button to accept the new test name and steps.

NOTE
If a test name is entered that is the same as an existing test, an error message will be displayed to alert the user. Enter a new name for the test.

Cancel – Select the **Cancel** button to close the New Test dialog box without accepting the test name and step information.

Insert – Select the **Insert** button to create and set up a new test step.

Edit – With a test step selected (highlighted), select the **Edit** button to edit the test step order, type, and/or reporting parameters.

Delete – With a test step selected (highlighted), select the **Delete** button to remove the test step from the list.

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3.4.3.1.1 Insert New Test (Step) – New Test

The Insert New Test dialog box allows the user to set the new test order, type, and reporting information.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

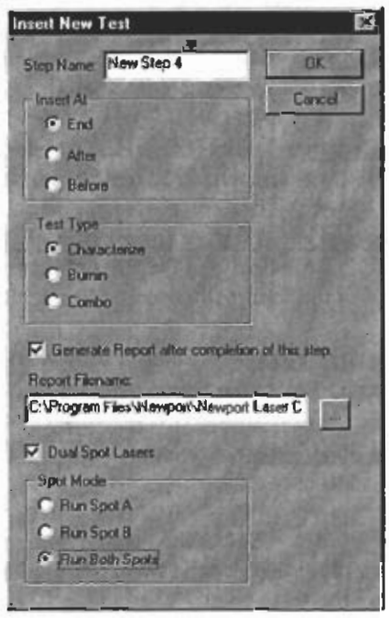


Figure 31 – Insert New Test Dialog Box

Step Name: – Enter the desired name for the new test step.

Insert At – Select the desired placement order for the new test to be inserted. For instance, if a new step should be inserted before an existing step, select the existing step, and then select the Before button to insert the new step before the selected step.

End – Select (fill-in) the End radio button to place the new test at the end of the test list.

After – Select (fill-in) the After radio button to place the new test after the currently selected (highlighted) test in the Steps list box.

Before – Select (fill-in) the Before radio button to place the new test before the currently selected (highlighted) test in the Steps list box.

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Test Type – Select the desired test type from the Test Type group box. Characterization tests can be used to measure the front facet laser diode power, determine spectral and spatial device characterization, and to develop L/V/I curves. Burn-in testing of the devices are controlled and monitored using high power temperature controllers. Combo testing involves both characterization testing and burn-in testing.

Characterize – Select (fill-in) the Characterize radio button to test the device(s) according to the characterization test parameters.

Burnin – Select (fill-in) the Burnin radio button to test the device(s) according to the burn-in test parameters.

Combo – Select (fill-in) the Combo radio button to test the device(s) according to the characterization and burn-in test parameters.

Generate report after completion of this step. – Select (check) the Generate report after... check box to allow the software to generate a complete test data report to be saved to the report file specified in the Report Filename box.

Report Filename: – Enter or browse to the desired test step report name and location. Select the Browse button (...) to select the proper report location.

Dual Spot Lasers – Select (check) the Dual Spot Lasers check box to enable the dual spot laser options.

Spot Mode[1] – Select the desired dual spot device run mode. The spot mode determines which of the two laser diodes (spot A or spot B) or if both will be used during the test.

Run Spot A[1] – Select (fill-in) the Run Spot A radio button to test the device(s) by running laser diode (spot) A.

Run Spot B[1] – Select (fill-in) the Run Spot B radio button to test the device(s) by running laser diode (spot) B.

Run Both Spots[1] – Select (fill-in) the Run Both Spots radio button to test the device by running both laser diodes (spots) A and B.

OK – Select the **OK** button to accept the new test setup information.

Cancel – Select the **Cancel** button to close the Insert New Test dialog box without accepting the test setup information.

[1] - These parameters appear only when Dual Spot Device is selected (checked) in the System Properties, Rack Layout dialog box.

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3.4.3.1.1.1 *Characterize Step – New Test*

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.

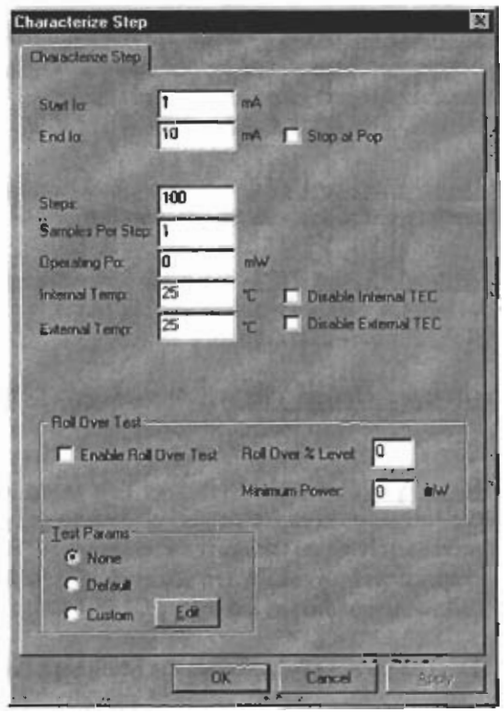


Figure 32 – Characterize Step Dialog Box

Start Io (mA) – Enter the desired starting laser diode drive current of the characterization process for the diode being tested.
Range: 0 – 6000 milliamps

End Io (mA) – Enter the desired ending laser diode drive current of the characterization process for the diode being tested.
Range: 0 – 6000 milliamps

Stop at Pop – Select (check) the Stop at Pop check box to turn the stop the device test once the power reaches the operating power.

Steps – Enter the desired number of testing points (steps) that are stored and saved in the database for the characterization.
Range: 2 – 1000 steps

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Samples Per Step – Enter the desired number of samples to be taken at each Step during the test. The software will take the number of samples entered at each step to determine an average value to display and/or plot.
Range: 1 – 5 samples per step

Operating Po (mW) – Enter the desired operating laser diode drive power for the characterization process for the diode being tested.
Range: 0 – 10000000 milliwatts

Internal Temp (°C) – Enter the desired temperature for the device to stabilize at before the characterization test can begin. This is only visible if the module has an internal temperature controller installed.
Range: -90 – 200 degrees Celsius

Disable Internal TEC – Select (check) the Disable Internal TEC check box to turn the internal thermoelectric cooler OFF.

External Temp (°C) – Enter the desired temperature for the module to stabilize at before the characterization test can begin.
Range: -90 – 200 degrees Celsius

Disable External TEC – Select (check) the Disable External TEC check box to turn the external thermoelectric cooler OFF.

Roll Over Test – The Roll Over Test group box allows the user to set up and have the software check for power roll over to determine if the test should be stopped prematurely when the device's power starts "rolling" over (with reference to a graphed test curve). When selected, the test will be checked for roll over when the following conditions are met:

1) The power (Po) exceeds the Minimum Power setting.

2) If the power (Po) drops below the Roll Over % Level (of Maximum Power).

Once these two conditions are met, the test will stop for the device.

Enable Roll Over Test – Select (check) the Enable Roll Over Test check box to have the test monitored for roll over to stop the test when the roll over test conditions are met. If the check box is not checked, the test will NOT be monitored for roll over.

Roll Over % Level – Enter the desired ending laser diode drive current of the characterization process for the diode being tested.
Range: [any value] percent

Minimum Power (mW) – Enter the desired ending laser diode drive current of the characterization process for the diode being tested.
Range: [any value] milliwatts

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Test Params – The Test Parameters group box allows the user to select what, if any, testing parameters are used during testing. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. See **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for additional information.

None – Select (fill-in) the None radio button to test the device(s) without reference to any characterization test parameters.

Default – Select (fill-in) the Default radio button to use the default Characterize Test Parameters during the device testing.

Custom – Select (fill-in) the Custom radio button to use the entered Characterize Test Parameters during the device testing.

Edit – Select the **Edit** button to display the Characterize Test Parameters dialog box. Note that "Custom" Test Parameters must be selected in order for the Characterize Test Parameters to be used during the device testing.

OK – Select the **OK** button to accept the new test name and steps.

Cancel – Select the **Cancel** button to close the New Test dialog box without accepting the test and step information.

Apply – Select the **Apply** button to apply the settings made at the Characterize Step dialog box.

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3.4.3.1.1.1.1 Characterize Test Parameters – New Test

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected for the Test Params in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.

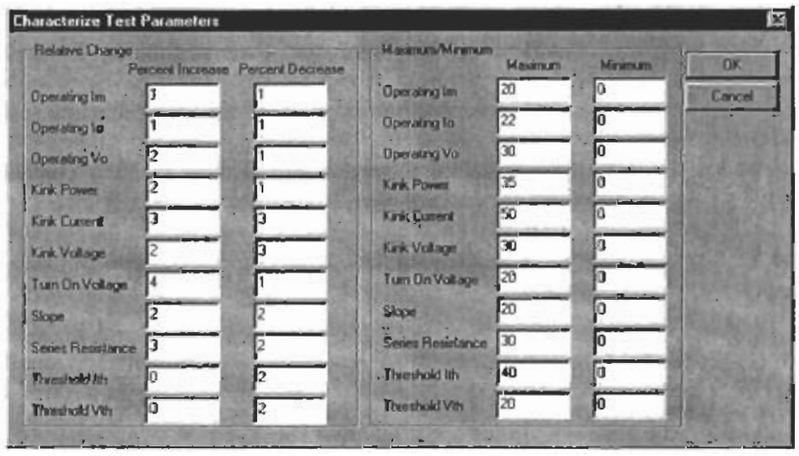


Figure 33 – Characterize Test Parameters Dialog Box

Relative Change – Enter the proper Relative Change increase percentage and/or decrease percentage for each of the parameters used to determine if the device passes or fails. The pass/fail calculations compare the current characterization step to the previous characterization step. If the parameter changes more than the Percent Increase value or less than the Percent Decrease value, then the device fails.

Operating Im – Enter the desired Relative Change increase percentage and/or decrease percentage for the photodiode current.
Range: [any value] percent

Operating Io – Enter the desired Relative Change increase percentage and/or decrease percentage for the laser diode drive current.
Range: [any value] percent

Operating Vo – Enter the desired Relative Change increase percentage and/or decrease percentage for the laser diode drive voltage.
Range: [any value] percent

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Kink Power – Enter the desired Relative Change increase percentage and/or decrease percentage for the power at which the kink in the characterization curve occurs.
Range: [any value] percent

Kink Current – Enter the desired Relative Change increase percentage and/or decrease percentage for the current at which the kink in the characterization curve occurs.
Range: [any value] percent

Kink Voltage – Enter the desired Relative Change increase percentage and/or decrease percentage for the voltage at which the kink in the characterization curve occurs.
Range: [any value] percent

Turn On Voltage – Enter the desired Relative Change increase percentage and/or decrease percentage for the turn on voltage when the laser begins to lase.
Range: [any value] percent

Slope – Enter the desired Relative Change increase percentage and/or decrease percentage for the slope of the characterization curve.
Range: [any value] percent

Series Resistance – Enter the desired Relative Change increase percentage and/or decrease percentage for the series resistance of the device.
Range: [any value] percent

Threshold Ith – Enter the desired Relative Change increase percentage and/or decrease percentage for the threshold current for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] percent

Threshold Vth – Enter the desired Relative Change increase percentage and/or decrease percentage for the threshold voltage for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] percent

Maximum/Minimum – Enter the proper Maximum parameter value or Minimum parameter value for each of the factors used to determine if the device passes or fails. If the parameter reaches more than the Maximum value or less than the Minimum value, then the device fails.

Operating Im – Enter the desired Maximum and/or Minimum passable value(s) for the photodiode current.
Range: [any value] milliamps

Operating Io – Enter the desired Maximum and/or Minimum passable value(s) for the laser diode drive current.
Range: [any value] milliamps

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Operating Vo – Enter the desired Maximum and/or Minimum passable value(s) for the laser diode drive voltage.
Range: [any value] volts

Kink Power – Enter the desired Maximum and/or Minimum passable value(s) for the power at which the kink in the characterization curve occurs.
Range: [any value] milliwatts

Kink Current – Enter the desired Maximum and/or Minimum passable value(s) for the current at which the kink in the characterization curve occurs.
Range: [any value] milliamps

Kink Voltage – Enter the desired Maximum and/or Minimum passable value(s) for the voltage at which the kink in the characterization curve occurs.
Range: [any value] volts

Turn On Voltage – Enter the desired Maximum and/or Minimum passable value(s) for the turn on voltage when the laser begins to lase.
Range: [any value] volts

Slope – Enter the desired Maximum and/or Minimum passable value(s) for the slope of the characterization curve.
Range: [any value] milliwatts/milliamps

Series Resistance – Enter the desired Maximum and/or Minimum passable value(s) for the series resistance of the device.
Range: [any value] ohms

Threshold Ith – Enter the desired Maximum and/or Minimum passable value(s) for the threshold current for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] milliamps

Threshold Vth – Enter the desired Maximum and/or Minimum passable value(s) for the threshold voltage for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] volts

OK – Select the **OK** button to accept the new test name and steps.

Cancel – Select the **Cancel** button to close the New Test dialog box without accepting the test and step information.

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3.4.3.1.1.2 *Burn-in Step – New Test*

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.

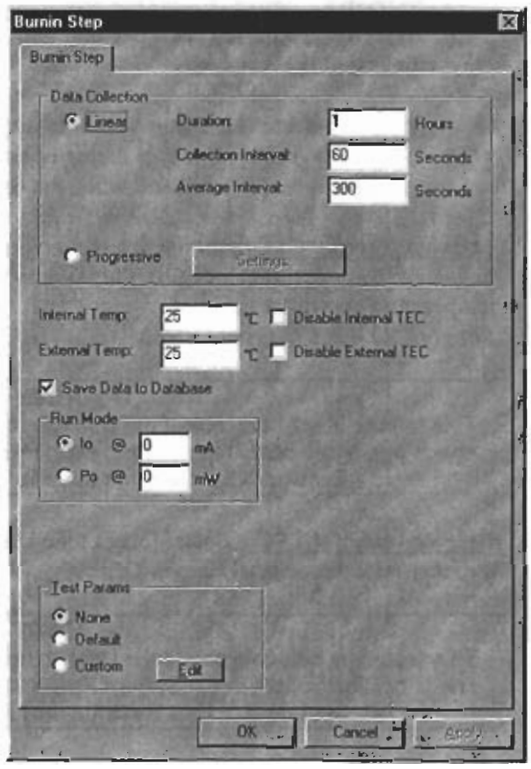


Figure 34 – Burnin Step Dialog Box

Data Collection – Data from burn-in tests can be collected in two ways: linearly or progressively. Linear mode is used when there is one set length for the test and data will be collected at regular intervals during that one test length. Progressive mode allows data to be collected and averaged at different rates and intervals during different phases of the test.

Linear – Select (fill-in) the Linear radio button to select the linear data collection mode that uses the Duration, Collection Interval, and Average Interval settings.

Duration (hours) – Enter the total amount of time that the burn-in test will run.
Range: 0 – 10,000,000 hours

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Collection Interval (seconds) – Enter how often points will be collected (collect points every ___ seconds).
Range: 15 – 6,000,000 seconds

Average Interval (seconds) – Enter how often the points collected are averaged and saved to the database (average points every ___ seconds).
Range: 15 – 6,000,000 seconds

Progressive – Select (fill-in) the Progressive radio button to select the progressive data collection mode that uses the settings made in the Progressive Settings dialog box table.

Settings – Select the Settings button to display the Progressive Settings dialog box. The Progressive Settings dialog box allows the user to set when and how long data will be collected and when the data will be averaged.

Internal Temp (°C) – Enter the desired temperature for the device to stabilize at before the burn-in test can begin. This is only visible if the module has an internal temperature controller installed.
Range: -90 – 200 degrees Celsius

NOTE
This feature is only available if the Use Characterize Temperatures in Combo Test check box is checked in the System Properties | Rack Layout dialog box. Refer to **Section 3.5.1.1.3 Rack Layout** for additional information.

Disable Internal TEC – Select (check) the Disable Internal TEC check box to turn the internal thermoelectric cooler OFF.

NOTE
This feature is only available if the Use Characterize Temperatures in Combo Test check box is checked in the System Properties | Rack Layout dialog box. Refer to **Section 3.5.1.1.3 Rack Layout** for additional information.

External Temp (°C) – Enter the desired temperature for the slot to stabilize at before the burn-in test can begin.
Range: -90 – 200 degrees Celsius

NOTE
This feature is only available if the Use Characterize Temperatures in Combo Test check box is checked in the System Properties | Rack Layout dialog box. Refer to **Section 3.5.1.1.3 Rack Layout** for additional information.

Disable External TEC – Select (check) the Disable External TEC check box to turn the external thermoelectric cooler OFF.

NOTE
This feature is only available if the Use Characterize Temperatures in Combo Test check box is checked in the System Properties | Rack Layout dialog box. Refer to **Section 3.5.1.1.3 Rack Layout** for additional information.

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Save Data to Database – Select (check) the Save Data to Database check box to save the data to the database specified on the System Properties Database Management tab.

Run Mode – The Run Mode group box allows the user to set up the system to run at a constant current or power.

Io @ ____ mA – Select (check) the Io check box and enter the desired laser diode driver operating current to be used for the device test.
Range: 0 – 6000 milliamps

Po @ ____ mW – Select (check) the Po check box and enter the desired laser diode driver operating power to be used for the device test.
Range: 0 – 1,milliwatts

Test Params – The Test Parameters group box allows the user to select what, if any, testing parameters are used during testing. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. See **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for additional information.

None – Select (fill-in) the None radio button to test the device(s) without reference to any characterization test parameters.

Default – Select (fill-in) the Default radio button to use the default Characterize Test Parameters during the device testing.

Custom – Select (fill-in) the Custom radio button to use the entered Characterize Test Parameters during the device testing.

Edit – Select the Edit button to display the Characterize Test Parameters dialog box. Note that "Custom" Test Parameters must be selected in order for the Characterize Test Parameters to be used during the device testing.

OK – Select the **OK** button to accept the new test name and steps.

Cancel – Select the **Cancel** button to close the New Test dialog box without accepting the test and step information.

Apply – Select the **Apply** button to apply the settings made at the Burnin Step dialog box.

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3.4.3.1.1.2.1 Burn Test Parameters – New Test

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

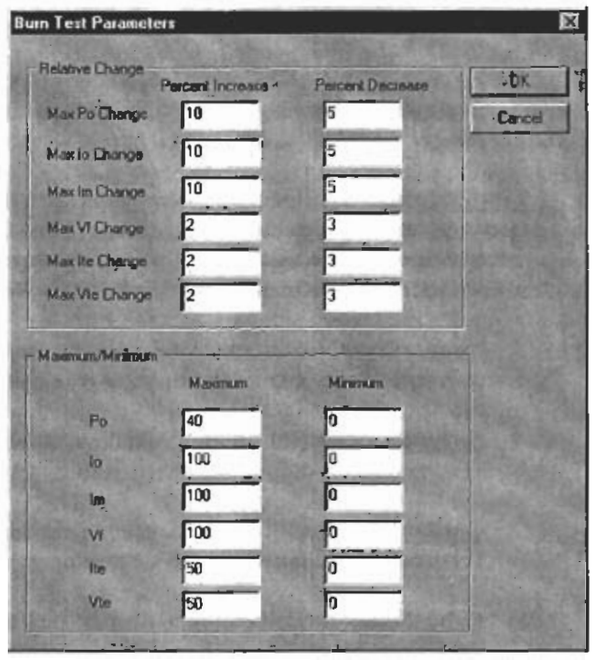


Figure 35 – Burn Test Parameters Dialog Box

Relative Change – Enter the proper Relative Change increase percentage and/or decrease percentage for each of the parameters used to determine if the device passes or fails. The pass/fail calculations compare the present data reading to the first data reading of the present Burn-In test. If the parameter increases more than the Percent Increase value or decreases less than the Percent Decrease value, then the device fails.

Max Po Change – Enter the desired Relative Change increase percentage and/or decrease percentage for the laser diode driver output power.
Range: [any value] percent

Max Io Change – Enter the desired Relative Change increase percentage and/or decrease percentage for the laser diode driver output current.
Range: [any value] percent

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Max Im Change – Enter the desired Relative Change increase percentage and/or decrease percentage for the photodiode current.
Range: [any value] percent

Max Vf Change – Enter the desired Relative Change increase percentage and/or decrease percentage for the forward voltage across the device.
Range: [any value] percent

Max Ite Change – Enter the desired Relative Change increase percentage and/or decrease percentage for the current injected into the TEC controller.
Range: [any value] percent

Max Vte Change – Enter the desired Relative Change increase percentage and/or decrease percentage for the voltage at the TEC controller.
Range: [any value] percent

Maximum/Minimum – Enter the proper Maximum parameter value or Minimum parameter value for each of the factors used to determine if the device passes or fails during the burn-in test. If the parameter reaches more than the Maximum value or less than the Minimum value, then the device fails.

Po – Enter the desired Maximum and/or Minimum passable value(s) for the operating power.
Range: [any value] milliwatts

Io – Enter the desired Maximum and/or Minimum passable value(s) for the laser diode driver output current.
Range: [any value] milliamps

Im – Enter the desired Maximum and/or Minimum passable value(s) for the photodiode current.
Range: [any value] milliamps

Vf – Enter the desired Maximum and/or Minimum passable value(s) for the forward voltage across the device.
Range: [any value] volts

Ite – Enter the desired Maximum and/or Minimum passable value(s) for the current injected into the TEC controller.
Range: [any value] milliamps

Vte – Enter the desired Maximum and/or Minimum passable value(s) for the voltage at the TEC controller.
Range: [any value] volts

OK – Select the **OK** button to accept the Burn Test Parameters.

Cancel – Select the **Cancel** button to close the Burn Test Parameters dialog box without accepting the relative change and maximum/minimum settings.

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3.4.3.1.1.2.2 Progressive Settings – New Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

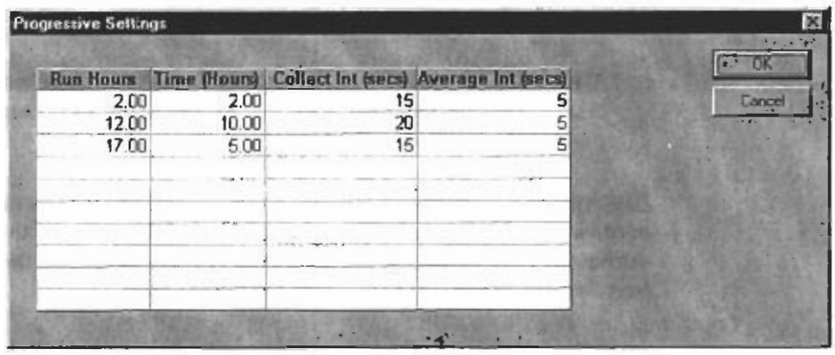


Figure 36 – Burn-In Data Collection Progressive Settings Dialog Box

Run Hours – Displays the total run time through that test step.

Time (Hours) – Enter the total test time for the step.
Range: [any value] hours

Collect Int (secs) – Enter how often (interval) points will be collected (collect points every ___ seconds).
Range: [any value ≥ 15] seconds

Average Int (secs) – Enter how often (interval) the points collected are averaged and saved to the database (average points every ___ seconds).
Range: [any value ≥ 15] seconds

OK – Select the **OK** button to accept the progressive data collection settings.

Cancel – Select the **Cancel** button to close the Progressive Settings dialog box without accepting the data collection information.

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3.4.3.1.1.3 *Combination Test – New Test*

The Combination Test dialog box appears when a Combo test is selected at the New Test dialog box. This dialog box allows a user to set the parameters for a combination Burn-In and Characterization test.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.

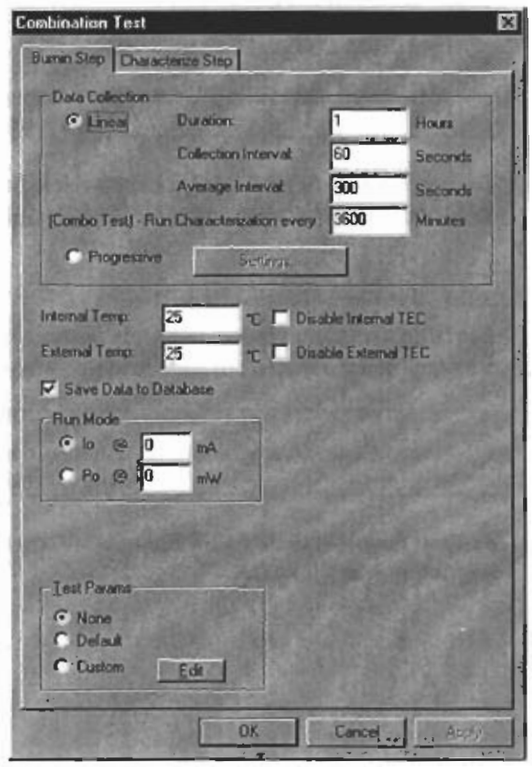


Figure 37 – Combination Test Step (Burnin Step) Dialog Box

The Burnin Step settings and features for the Combination Test are similar to the Burn Test settings for Burn-In tests with the exception of the features listed below. Refer to **Section 3.4.3.1.1.2 Burnin Step – New Test** for information about the Burn-In Step settings and features.

(Combo Test) Run Characterization every: – Enter how often the characterization test will be run during the combination test (run characterization test every ___ minutes).
Range: 2 – 9999 minutes

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3.4.3.1.1.3.1 Characterize Test Parameters – New Combo Test

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterize step settings and features.

3.4.3.1.1.3.2 Burn Test Parameters – New Test

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test – New Test** for information about burn-in step settings and features.

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3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

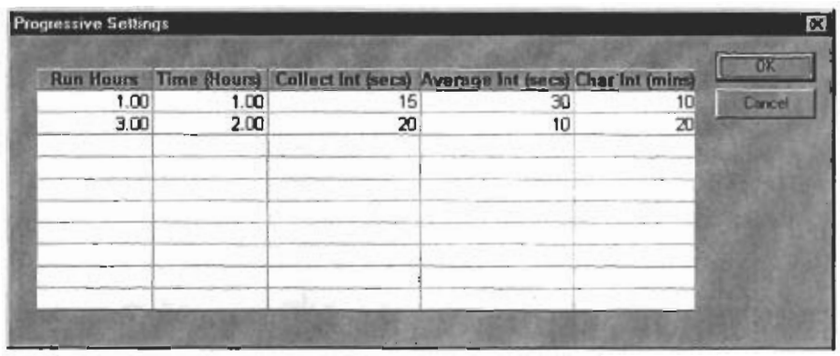


Figure 38 – Combo Test Data Collection Progressive Settings Dialog Box

Run Hours – Displays the total run time through that test step.

Time (Hours) – Enter the total test time for the step.
Range: [any value] hours

Collect Int (secs) – Enter how often (interval) points will be collected (collect points every ___ seconds).
Range: [any value ≥ 15] seconds

Average Int (secs) – Enter how often (interval) the points collected are averaged and saved to the database (average points every ___ seconds).
Range: [any value ≥ 15] seconds

Char Int (mins) – Enter how often the characterization test will be run during the combination test (run characterization test every ___ minutes).
Range: 2 – 9999 minutes

OK – Select the **OK** button to accept the progressive data collection settings.

Cancel – Select the **Cancel** button to close the Progressive Settings dialog box without accepting the data collection information.

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3.4.3.1.2 Edit Step

The Edit Step dialog box appears when the Edit button is selected at the Edit Test dialog box and allows the user to change the name and/or reporting status for the selected step.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.



Figure 39 – Edit Step Dialog Box

Step Name: – Enter the desired name for the test step.

Generate report after completion of this step. – Select (check) the Generate report after… check box to allow the software to generate a complete test data report to be saved to the report file specified in the Report Filename box.

Report Filename: – Enter or browse to the desired test step report name and location. Select the Browse button (…) to select the proper report location.

Dual Spot Lasers – Select (check) the Dual Spot Lasers check box to enable the dual spot laser options.

Spot Mode[1] – Select the desired dual spot device run mode. The spot mode determines which of the two laser diodes (spot A or spot B) or if both will be used during the test.

Run Spot A[1] – Select (fill-in) the Run Spot A radio button to test the device(s) by running laser diode (spot) A.

[1] - These parameters appear only when Dual Spot Device is selected (checked) in the System Properties, Rack Layout dialog box.

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Run Spot B[1] – Select (fill-in) the Run Spot B radio button to test the device(s) by running laser diode (spot) B.

Run Both Spots[1] – Select (fill-in) the Run Both Spots radio button to test the device by running both laser diodes (spots) A and B.

OK – Select the **OK** button to accept the test setup information.

Cancel – Select the **Cancel** button to close the Edit Test dialog box without accepting the changed test setup information.

3.4.3.1.2.1 Characterize Step – Edit Test

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterize step settings and features.

3.4.3.1.2.1.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterize test parameter settings and features.

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3.4.3.1.2.2 Burn-in Step – Edit Test

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-In Step – New Test** for information about burn-in step settings and features.

3.4.3.1.2.2.1 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test – New Test** for information about burn-in step settings and features.

3.4.3.1.2.2.2 Progressive Settings – Edit Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings – New Test** for information about burn-in step progressive settings and features.

3.4.3.1.2.3 Combination Test – Edit Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination test step settings and features.

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3.4.3.1.2.3.1 Characterize Test Parameters – Edit Step

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterize step settings and features.

3.4.3.1.2.3.2 Burn Test Parameters – Edit Step

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about combination burn test settings and features.

3.4.3.1.2.3.3 Progressive Settings (Combination Test) – Edit Step

The Progressive Settings dialog box appears when the Settings... button in the Burnin Step dialog box is selected and allows the user to set the data collection time and frequency.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test** for information about combination test progressive settings and features.

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3.4.3.2 Edit Test

The Edit Test dialog box appears when the Edit… button in the Manage Tests dialog box is selected and allows the user to edit an existing test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.



Figure 40 – Edit Test Dialog Box

OK – Select the **OK** button to accept the edited test name and/or steps.

NOTE
If a test name is entered that is the same as an existing test, an error message will be displayed to alert the user. Enter a new name for the test.

Cancel – Select the **Cancel** button to close the Edit Test dialog box without accepting the test and step information.

Insert – Select the **Insert** button to edit and set up a new test step.

Edit – With a test step selected (highlighted), select the **Edit** button to edit the test step order, type, and/or reporting parameters.

Delete – With a test step selected (highlighted), select the **Delete** button to remove the test step from the list.

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3.4.3.2.1 Insert New Test (Step) – Edit Test

The Insert New Test (Step) dialog box appears when the New button is selected at the Edit Test dialog box and allows the user to change the name and/or reporting status for the selected step.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.



Figure 41 – Edit Step Dialog Box

Step Name: – Enter the desired name for the test step.

Generate report after completion of this step. – Select (check) the Generate report after… check box to allow the software to generate a complete test data report to be saved to the report file specified in the Report Filename box.

Report Filename: – Enter or browse to the desired test step report name and location. Select the Browse button (…) to select the proper report location.

OK – Select the **OK** button to accept the test setup information.

Cancel – Select the **Cancel** button to close the Edit Test dialog box without accepting the changed test setup information.

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3.4.3.2.1.1 Characterize Step – Edit Test

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterize step settings and features.

3.4.3.2.1.1.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Step – New Test** for information about characterize step settings and features.

3.4.3.2.1.2 Burn-in Step – Edit Test

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-In Step – New Test** for information about burn-in step settings and features.

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3.4.3.2.1.2.1 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test – New Test** for information about burn-in step settings and features.

3.4.3.2.1.2.2 Progressive Settings – Edit Test

The Progressive Settings dialog box appears when the Settings... button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings – New Test** for information about burn-in step progressive settings and features.

3.4.3.2.1.3 Combination Test – Edit Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination test step settings and features.

3.4.3.2.1.3.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

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NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterize step settings and features.

3.4.3.2.1.3.2 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about combination test burn-in test parameter settings and features.

3.4.3.2.1.3.3 Progressive Settings (Combination Test) – Edit Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to set the data collection time and frequency.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.2.3.3 Progressive Settings (Combination Test) – New Test** for information about combination test progressive settings and features.

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3.4.3.2.2 Edit Step

The Edit Step dialog box appears when the Edit button is selected at the Edit Test dialog box and allows the user to change the name and/or reporting status for the selected step.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.



Figure 42 – Edit Step Dialog Box

Step Name: – Enter the desired name for the test step.

Generate report after completion of this step. – Select (check) the Generate report after… check box to allow the software to generate a complete test data report to be saved to the report file specified in the Report Filename box.

Report Filename: – Enter or browse to the desired test step report name and location. Select the Browse button (…) to select the proper report location.

OK – Select the **OK** button to accept the test setup information.

Cancel – Select the **Cancel** button to close the Edit Step dialog box without accepting the changed test setup information.

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3.4.3.2.2.1 Characterize Step – Edit Test

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterize step settings and features.

3.4.3.2.2.1.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterize step settings and features.

3.4.3.2.2.2 Burn-in Step – Edit Test

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-In Step – New Test** for information about burn-in step settings and features.

3.4.3.2.2.2.1 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

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Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn-in step settings and features.

3.4.3.2.2.2 Progressive Settings – Edit Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings Parameters – New Test** for information about burn-in test progressive settings and features.

3.4.3.2.2.3 Combination Test – Edit Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination characterization and burn-in test settings and features.

3.4.3.2.2.3.1 Characterize Test Parameters (Combination Test) – Edit Step

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about combo test characterization step settings and features.

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3.4.3.2.2.3.2 Burn Test Parameters (Combination Test) – Edit Step

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn test step settings and features.

3.4.3.2.2.3.3 Progressive Settings (Combination Test) – Edit Step

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test** for information about burn-in test progressive step settings and features.

3.4.3.3 Copy Test

The Copy Test dialog box appears when the Copy… button in the Manage Tests dialog box is selected and allows the user to copy the steps and parameters of an existing test to another test. Once the copy is created, the test can be edited if needed.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

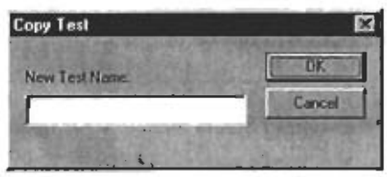


Figure 43 – Copy Test Dialog Box

New Test Name: – Enter the new name for the copied device test name or title.

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OK – Select the **OK** button to accept the test copy name.

NOTE
If a test name is entered that is the same as an existing test, an error message will be displayed to alert the user. Enter a new name for the test.

Cancel – Select the **Cancel** button to close the Copy Test dialog box without accepting the test copy information.

3.5 Rack Menu Features

The Rack menu allows access to the menus and functions for the rack system, slot, diode, and TEC controller settings.

NOTE
Some options may not be available, depending on the access level of the logged in user.

3.5.1 System

The System menu offers features and options that control and set up the operating characteristics for the entire rack system.

NOTE
This dialog box is available only for users logged in with administrator privileges.

Properties – With System selected (highlighted) in the system view, select Properties to display the System Properties dialog box.

Shutdown All Diodes – With a test running, select Shutdown All Diodes to stop all currently running diode tests.

3.5.1.1 System Properties

The System Properties dialog box appears when Properties is selected from the System drop-down menu OR when the user double-clicks on System in the system view and allows the user to set the system operating properties for the overall rack system.

NOTE
This dialog box is available for users logged in with administrator privileges.

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3.5.1.1.1 GPIB Addresses

The GPIB Addresses dialog box tab appears when System Properties is selected from the System drop-down menu and allows the user to configure the rack system GPIB communication addresses and additional instrument properties. However, these settings are typically made at the factory and should only be changed by a Newport Corp. Field Service Technician if necessary.

NOTE

This dialog box is available for users logged in with administrator privileges.

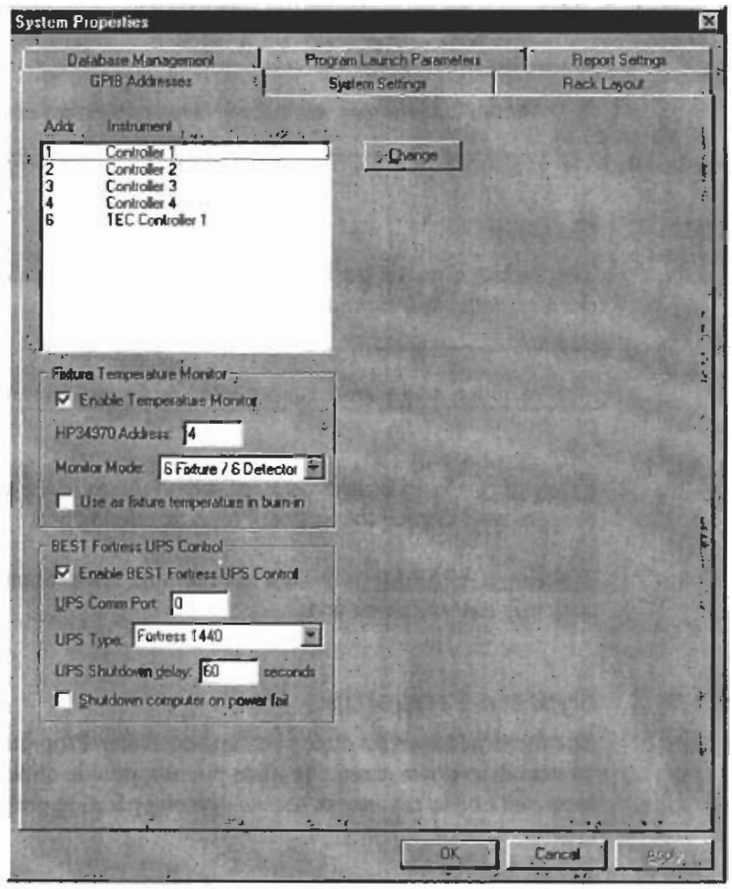


Figure 44 – System Properties, GPIB Addresses Dialog Box

Instrument Address List Box – Displays the rack system instrument and its assigned GPIB address. Each component must have its own GPIB address from 1 to 31.

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Change – With an instrument selected in the Instrument Address List Box, select the **Change** button to assign a different GPIB address for the instrument.
Range: 1 – 31



Figure 45 – GPIB Address Change Dialog Box

Fixture Temperature Monitor – Enter the operating characteristics for the HP34970 (Agilent) Data Acquisition System (if installed). Using a fixture temperature monitor offers better resolution and accuracy when monitoring temperatures for each device within a fixture by providing measurements at up to eight different locations on the fixture. Refer to the data acquisition system User's Manual for additional information regarding the set up and use of the system.

Enable Temperature Monitor – Select (check) the Enable Temperature Monitor check box to turn on the temperature monitoring function of the data acquisition system.

HP34970 Address – If installed, enter an appropriate GPIB address for the HP34970 Data Acquisition System.
Range: 1 – 31

Monitor Mode – Select the data acquisition system-monitoring mode from the drop-down list box. Refer to the data acquisition system User's Manual for additional information regarding monitor mode settings.
Options: 6 Fixture/6 Detector, 8 per fixture, 4 per fixture

Use as fixture temperature in burn-in – Select (check) the Use as fixture temperature in burn-in check box to utilize the HP34970 instrument as the temperature source for the devices during a burn-in test.

BEST Fortress UPS Control – Enter the operating characteristics for the BEST Fortress UPS Control System (if installed). Refer to the BEST Fortress UPS User's Manual for additional information regarding the set up and use of the system.

Enable BEST Fortress UPS Control – Select (check) the Enable BEST Fortress UPS Control check box to turn on the BEST Fortress UPS system for rack system power management and safeguarding.

UPS COM Port – If installed, enter the appropriate COM port address for the BEST UPS system.
Options: [system dependent]

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UPS Type – Select the type of BEST Fortress UPS that is installed from the drop-down list box. Refer to the UPS system User's Manual for additional information regarding UPS specifications.
Options: Fortress 1425, Fortress 1440

UPS Shutdown delay: – If installed, enter the desired amount of time that the UPS system should keep the rack system computer powered up in order to facilitate proper shutdown.
Range: 0 – 3600 seconds

Shutdown computer on power fail – Select (check) the Shutdown computer on power fail check box to enable the safeguarding feature for the computer system. In the event of a power failure, the UPS system will supply power for the amount of time specified in the UPS shutdown delay entry box to allow enough time to safely shutdown the computer system.

The computer system should always be shutdown properly to avoid system and file damage.

NOTE
Use this check box ONLY if a BEST UPS system is installed in the Newport Rack System! If an APC Smart-UPS system is installed, use the PowerChute UPS management software to set up the UPS operating characteristics.

OK – Select the **OK** button to accept the System Properties information.

Cancel – Select the **Cancel** button to close the System Properties dialog box without accepting the changed system information.

Apply – Select the **Apply** button to utilize the current System Properties changes immediately.

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3.5.1.1.2 System Settings

The System Settings dialog box appears when the tab is selected from the System Properties dialog box and allows the user to configure the rack system data collecting and processing parameters. However, these settings are typically made at the factory and should only be changed by a Newport Corp. Field Service Technician if necessary.

NOTE

This dialog box is available for users logged in with administrator privileges.

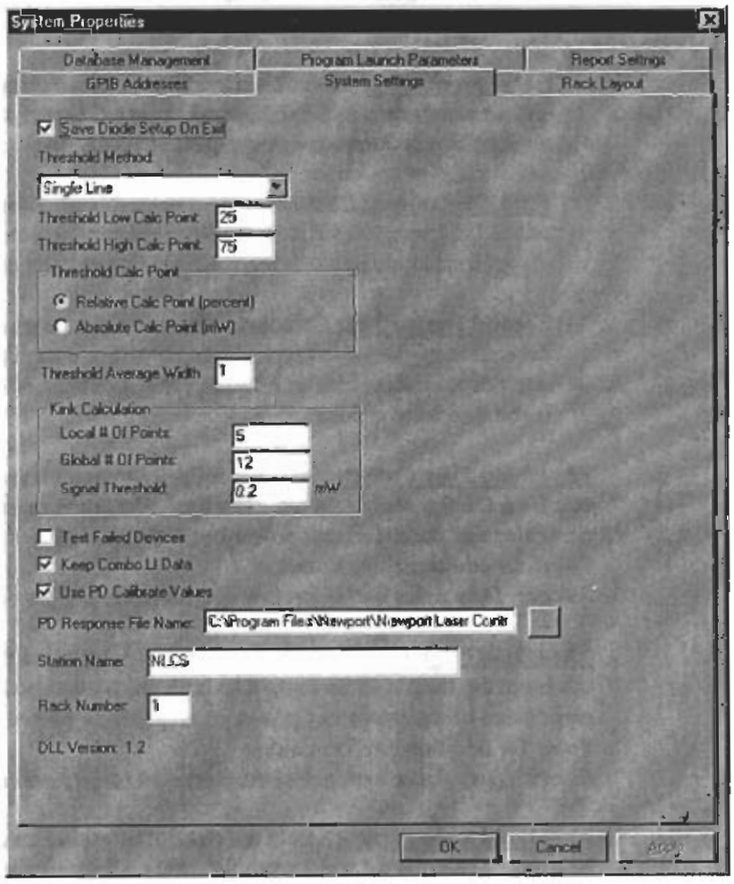


Figure 46 – System Properties, System Settings Dialog Box

Save Diode Setup on Exit – Select (check) the Save Diode Setup on Exit check box to keep the diode load state and diode data stored on disk when the application is shutdown. If this check box is not selected, "No Load" will appear for each diode when the software is started.

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Threshold Method: – Select the threshold calculation method from the drop-down list box.
Options: Single Line, Two Line, Least Square Fit, First Derivative, Second Derivative

Single Line Method: Uses a straight line fit through the linear portion of the L/I curve to determine the threshold current. The point at which the line intercepts the X-axis is the threshold current.

Two Line: Uses two straight lines fit through the segments of the L/I data above and below threshold to determine the threshold current. The point at which the two lines intersect is the threshold current.

Least Square Fit: Calculates the threshold using the sum of the squares of the differences between the actual and expected curve, with each squared difference divided by the corresponding expected curve.

First Derivative: Calculates the threshold current by taking the first derivative of the L/I curve (i.e. dL/dI). The current at which the derivative reaches half of its peak value along the steep leading edge of the curve is the threshold current.

Second Derivative: Calculates the threshold current by taking the second derivative of the L/I curve (i.e. dL^2/dI^2). The current at which the second derivative reaches half of its peak value along the steep leading edge of the curve is the threshold current.

Threshold Low Calc Point: – Enter the low point on the curve to be used to calculate the threshold current. The low calculation point will either be a relative percentage of the maximum power or an absolute power value. See **Threshold Calc Point** for additional information.
Range: [any value within proper operation range] percent OR milliwatts

Threshold High Calc Point: – Enter the high point on the curve to be used to calculate the threshold current. The high calculation point will either be a relative percentage of the maximum power or an absolute power value. See **Threshold Calc Point** for additional information.
Range: [any value within proper operation range] percent OR milliwatts

Threshold Calc Point – Select the desired threshold calculation parameter type to be used. The units for the Threshold Low Calc Point and Threshold High Calc Point are determined by the selection in this group box.

Relative Calc Point (percent) – Select (fill-in) the Relative Calc Point radio button to utilize the values entered for the Threshold Low and High Calc Points to calculate the threshold current for the device. The values entered will be relative to (a percentage of) the maximum power measured during the device test.

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Absolute Calc Point (mW) – Select (fill-in) the Absolute Calc Point radio button to utilize the values entered for the Threshold Low and High Calc Points to calculate the threshold current for the device. The values entered will be absolute power values (in milliwatts) from the power curve.

Threshold Average Width – Enter the number of points to use when calculating the threshold current. The software will average the observed points to determine the average current readings.
Range: 0 – 1000000 points

Kink Calculation – Enter the parameters to be used to calculate the kink in the L/I curve.

Local # of Points: – Enter the number of local graph points near the kink to be used for the kink calculation.
Range: 0 – 2,147,483,647 points

Global # of Points: – Enter the number of global graph points, throughout the curve, to be used for the kink calculation.
Range: 0 – 2,147,483,647 points

Signal Threshold: – Enter the desired signal threshold for the kink calculation. The kink calculation points are weighted and averaged. The kink is determined when the absolute value of the difference between the Local # of Points and the Global # of Points is greater than the signal threshold.
Range: [any value] milliwatts

Test Failed Devices – Select (check) the Test Failed Devices check box to continue to test and log data for devices that failed during the testing process. If the check box is not checked, the test will stop running on the failed device.

Keep Combo LI Data – Select (check) the Keep Combo LI Data check box to save the combo LI data from the tests to the database as specified at the Database Management tab in the System Properties.

NOTE
Deselecting this feature when the excess data is not relevant helps keep memory use at manageable levels.

Use PD Calibrate Values – Select (check) the Use PD Calibrate Values check box to utilize the PD Calibrate values as determined and specified in the file selected in the PD Response File Name entry box.

NOTE
If this check box is checked, the PD Response value cannot be changed in the Slot Properties dialog box. Deselect the Use PD Calibrate Values check box to enter a custom PD Response value for the Slot Properties.

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PD Response File Name: – Enter OR select the Browse button (...) to find the appropriate PD Calibrate fixture calibration filename. The PD Response file contains all of the detector calibration data and is used to convert detector feedback into power.

Station Name – Enter the desired name for the rack system.

Rack Number – Enter the number of the rack system that use the present System Settings.
Range: 1 – 32,000

OK – Select the **OK** button to accept the System Properties information.

Cancel – Select the **Cancel** button to close the System Properties dialog box without accepting the changed system information.

Apply – Select the **Apply** button to utilize the current System Properties changes immediately.

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3.5.1.1.3 Rack Layout

The Rack Layout dialog box appears when the tab is selected from the System Properties dialog box and allows the user to set up the rack organization, set the module type, enter hardware limits, and enable/disable system alterations. However, these settings are typically made at the factory and should only be changed by a Newport Corp. Field Service Technician if necessary.

NOTE

This dialog box is available for users logged in with administrator privileges.

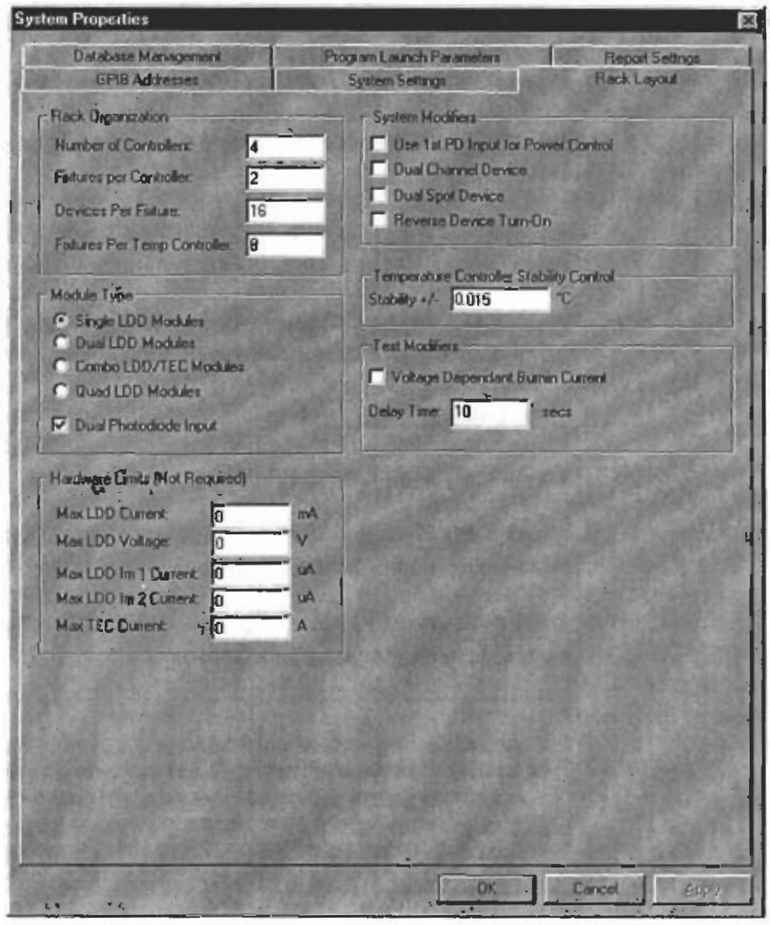


Figure 47 – System Properties, Rack Layout Dialog Box

Rack Organization – Enter the rack system device testing hardware characteristics. The characteristics depend on the actual design and configuration of the rack system.

NOTE

Once the software has been configured according to the **Section 2.3.2 Software Setup** procedure, do NOT change the Rack Configuration or Module Type again without repeating Steps 2 and 3 of **Section 2.3.2 Software Setup**.

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Number of Controllers: – Enter the number of modular controllers installed in the rack system.
Range: 1 – 64 controllers [rack system configuration dependent]

Fixtures per Controller: – Enter the number of device test fixtures installed in the rack system that are controlled by each modular controller.
Range: 1 – 16 fixtures [rack system configuration dependent]

Devices per Fixture: – Enter the number of devices per device test fixture.
Range: 1 – 16 devices [fixture design dependent]

Fixtures per Temp Controller: – Enter the number of device test fixtures that are controlled by each temperature controller.
Range: 1 – 8 fixtures [rack configuration dependent]

Module Type – Select the module type that is installed in the rack system modular controller.

Single LDD Modules – Select (fill-in) the Single LDD Modules radio button when using a single laser diode driver module in the modular controller.

Dual LDD Modules – Select (fill-in) the Dual LDD Modules radio button when using a dual laser diode driver module in the modular controller.

Combo LDD/TEC Modules – Select (fill-in) the Combo LDD/TEC Modules radio button when using a combination laser diode driver and TEC control module in the modular controller.

Quad LDD Modules – Select (fill-in) the Quad LDD Modules radio button when using a four-element laser diode driver module in the modular controller.

Dual Photodiode Input – Select (check) the Dual Photodiode Input check box to enable testing of two photodiode inputs.

NOTE

If uncertain, check the photodiode current setting on the laser controller unit to determine if the laser controller is set up for two photodiode inputs. If the laser controller offers settings for Im_1 AND Im_2, then the unit is set up for two photodiode inputs (where Im_1 is the internal photodiode and Im_2 is the external photodiode). If the laser controller only offers a setting for Im, then the unit is set up for a single photodiode input only.

Hardware Limits (Not Required) – If desired, enter operating limits for the laser diode driver and TEC controller hardware to help determine the accuracy and precision of the readings. Refer to the instrument's User's Manual for unit operating specifications.

Max LDD Current: – Enter the maximum laser diode driver current (Io) for device testing.
Range: [hardware dependent] milliamps

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Max LDD Voltage: – Enter the maximum laser diode driver voltage (Vo) for device testing.
Range: [hardware dependent] volts

Max LDD Im 1 Current: – Enter the maximum laser diode driver photodiode current (Im) [for channel 1 of a dual LDD module or single channel module] for device testing.
Range: [hardware dependent] microamps

Max LDD Im 2 Current: – Enter the maximum laser diode driver photodiode current (Im) [for channel 2 of a dual LDD module] for device testing.
Range: [hardware dependent] microamps

Max TEC Current: – Enter the maximum TEC current (Ite) for device testing.
Range: [hardware dependent] amps

System Modifiers – Select the desired system modifiers to alter the test hardware operation.

Use 1st PD Input for Power Control – Select (check) the Use 1st PD Input for Power Control check box to utilize the input power for the first photodiode (Im_1 on the laser controller) as the input power for the rest of the devices in the system.

Dual Channel Device – Select (check) the Dual Channel Device check box if each device being tested requires two channels.

Dual Spot Device – Select (check) the Dual Spot Device check box if testing dual spot devices.

Reverse Device Turn-On – Select (check) the Reverse Device Turn-On check box if the last device in the device test fixture is located where the first device is typically located.

Use Characterize Temperatures in Combo Test – Select (check) the Use Characterize Temperatures in Combo Test check box to use the Internal and/or External Temp settings in the Combination Test, Characterize Step dialog box for the characterization test portion of the combination test. If this check box is not selected, the Burn-In Step temperature settings will be used for the Characterization Step of the Combo Test. Note that this selection may not be available in all software versions.

Temperature Controller Stability Control – Enter the temperature stability tolerance for the temperature controller. The Stability setting determines when the temperature is stable and ready to start testing. The temperature's stability, temperature tolerance, and time tolerance are checked whenever the temperature changes to a new set point.

Stability +/- – Enter the stability determining plus and minus temperature tolerance.
Range: 0 – 1,000,000 degrees Celsius

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Test Modifiers – Set up the software to control the burn in test current according to the settings made in the Test Modifiers group box. Running with this modifier selected, if the voltage reaches a predetermined maximum level while running at a particular current, then the system will switch to a different current to keep the device below the predetermined maximum voltage.

Voltage Dependent Burnin Current – Select (check) the Voltage Dependent Burnin Current check box to enable the voltage dependent current control for burn in tests as described above.

Delay Time: – Enter the desired delay time for the software to be used to allow the voltage reading to stabilize before the current is changed.
Range: 0 – 21,474,836,847 seconds

OK – Select the **OK** button to accept the System Properties information.

Cancel – Select the **Cancel** button to close the System Properties dialog box without accepting the changed system information.

Apply – Select the **Apply** button to utilize the current System Properties changes immediately.

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3.5.1.1.4 Database Management

The Database Management dialog box appears when the tab is selected from the System Properties dialog box and allows the user to set up the parameters for database file names and locations. However, these settings are typically made at the factory or on-site and should only be changed by a Newport Corp. Field Service Technician if necessary.

NOTE

This dialog box is available for users logged in with administrator privileges.

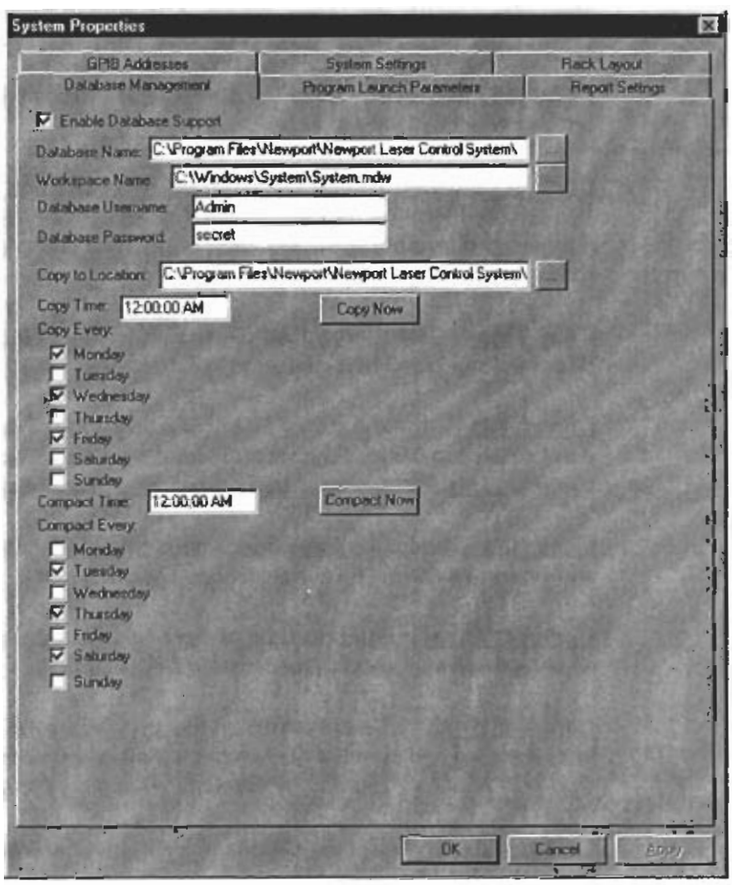


Figure 48 – System Properties, Database Management Dialog Box

Enable Database Support – Select (check) the Enable Database Support check box to facilitate database support for the test data according to the settings in this dialog box.

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Database Name: – Enter OR select the Browse button (...) to find the appropriate database filename and location. Typical Microsoft Access database name is:

C:\Program Files\Newport\Newport Laser Control System\NLCS.mdb

Workspace Name: – Enter OR select the Browse button (...) to find the appropriate workspace filename and location. Typical workspace name is:

C:\Windows\System\System.mdw

Database Username: – Enter the user's name to be used for access to the database files.

Database Password: – Enter the password to be used with the Database Password for access to the database files.

Copy to Location: – Enter OR select the Browse button (...) to find the appropriate filename and location for the database file copies. This copies the database files to the specified location at the specified Copy Time on the day(s) selected under Copy Every.

Copy Time: – Enter the time of day to save a copy of the database file. The file will be copied and saved to the location specified in the Copy to Location entry box.

Copy Every: – Enter the time of day to save a copy of the database file. The file will be saved to the location specified in the Copy to Location entry box.
Options: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday

Copy Now – Select the **Copy Now** button to copy the database file now. The file will be copied and saved to the location specified in the Copy to Location entry box.

Compact Time: – Enter the time of day to compact the database file. The file will be compacted and saved in the location specified in the Copy to Location entry box.

Compact Every: – Enter the time of day to compact the database file. The file will be compacted and saved in the location specified in the Copy to Location entry box.
Options: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday

Compact Now – Select the **Compact Now** button to compact the database file. Compacting the file cleans up and decreases the overall size of the database by removing extraneous or false data. The file will be compacted in the location specified in the Copy to Location entry box.

OK – Select the **OK** button to accept the System Properties information.

Cancel – Select the **Cancel** button to close the System Properties dialog box without accepting the changed system information.

Apply – Select the **Apply** button to utilize the current System Properties changes immediately.

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3.5.1.1.5 Program Launch Parameters

The Program Launch dialog box appears when the tab is selected from the System Properties dialog box and allows the user to select a program and associated files to be opened automatically after a test has completed.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

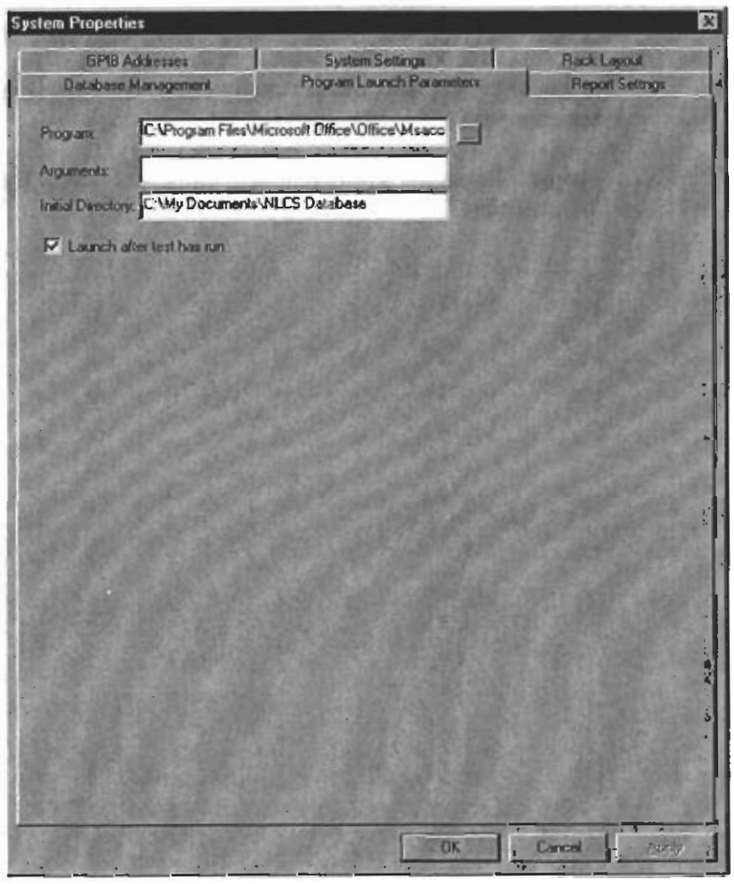


Figure 49 – System Properties, Program Launch Parameters Dialog Box

Program: – Enter OR select the Browse button (...) to find the appropriate executable file (*.exe) and location. Programs selected in the Program entry box will be started after the testing has stopped.

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Arguments: – Enter any supported arguments (commands or otherwise) for the program to be launched. Typical commands might include specifying files to be opened or controlling specific program switches.

Initial Directory: – Enter the initial directory that the specified program will work from when the program is started.

Launch after test has run – Select (check) the 'Launch after test has run' check box to start the program specified in the Program entry box after the device test has completed. Note that if this feature is not checked, the program will not be launched.

OK – Select the **OK** button to accept the System Properties information.

Cancel – Select the **Cancel** button to close the System Properties dialog box without accepting the changed system information.

Apply – Select the **Apply** button to utilize the current System Properties changes immediately.

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3.5.1.1.6 Report Settings

The Report Settings dialog box appears when the tab is selected from the System Properties dialog box and allows the user to select the filename and location for the device test reports to be viewed in the Crystal Reports software.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.

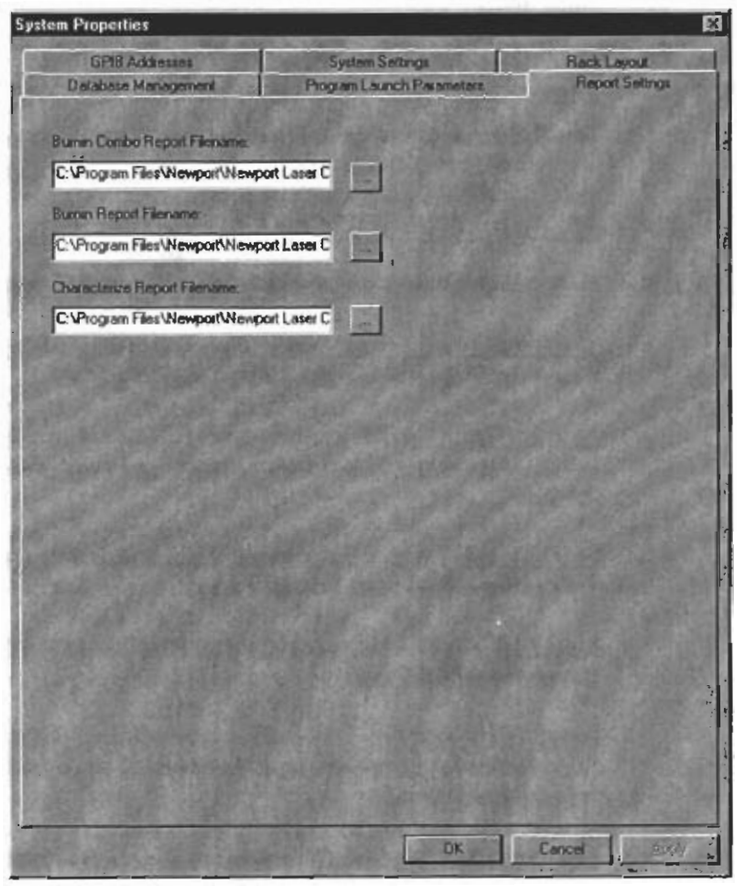


Figure 50 – System Properties, Report Settings Dialog Box

Burnin Combo Report Filename: – Enter OR select the Browse button ( ) to find the appropriate burn-in combination test report filename and location.

Burnin Report Filename: – Enter OR select the Browse button ( ) to find the appropriate burn-in test report filename and location.

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Characterize Report Filename: – Enter OR select the Browse button (...) to find the appropriate characterization test report filename and location.

OK – Select the **OK** button to accept the System Properties information.

Cancel – Select the **Cancel** button to close the System Properties dialog box without accepting the changed system information.

Apply – Select the **Apply** button to utilize the current System Properties changes immediately.

3.5.2 Slot

The Slot menu offers features and options that control and set up the operating characteristics for the device slot. Note that the slot may sometimes be referred to as the 'fixture' when loaded with devices.

NOTE
This dialog box is available only for users logged in with administrator privileges.

Slot Properties... – With a slot selected (highlighted) in the system view, select Properties to display the Slot Properties dialog box.

Export Data... – After a test has run and with a slot selected (highlighted) in the system view, select Export Data to export and save the current slot test data to the database.

Start Test... – With a slot selected (highlighted) in the system view, select Start Test to display the Start Test dialog box.

Stop Test – With a test running, select Stop Test to stop the currently running diode test on the selected slot.

Reset Failed Status – With a slot selected (highlighted) in the system view, select Reset Failed Status to reset the failed status of diodes to make the device(s) available for additional testing.

Shutdown Slot Diodes – With a test running, select Shutdown Slot Diodes to stop all currently running diode tests in the selected slot.

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3.5.2.1 Slot Properties

The Slot Properties dialog box appears when Slot Properties… is selected from the Slot drop-down menu OR when the user double-clicks on a slot in the system view. This dialog box allows the user to set the selected slot operating properties.

NOTE
This dialog box is available for users logged in with administrator privileges.

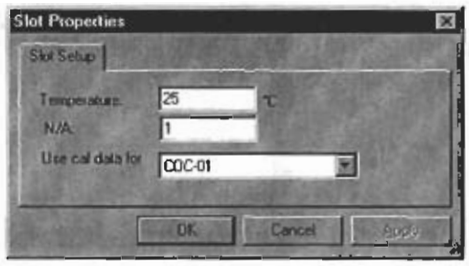


Figure 51 – Slot Properties Dialog Box

Temperature: – Enter the desired temperature for the slot.
Range: -90 – 200 degrees Celsius

N/A: – Enter the numerical aperture for the devices being tested in the slot, which defines the maximum cone angle of light accepted or emitted by an optical system.
Range: [any value]

Use cal data for – Select the desired calibration data file for the slot from the drop-down menu.
Options: COC-01, COC-2, COC-3, …, COC-33, Uncalibrated

OK – Select the **OK** button to accept the Slot Properties information.

Cancel – Select the **Cancel** button to close the Slot Properties dialog box without accepting the changed slot information.

Apply – Select the **Apply** button to utilize the current Slot Properties changes immediately.

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3.5.2.2 Export Data

The Export Data Select Dataset dialog box appears when Export Data... is selected from the Slot drop-down menu and allows the user to export the current slot test data to a database file.

NOTE

This dialog box is available for users logged in with administrator privileges.

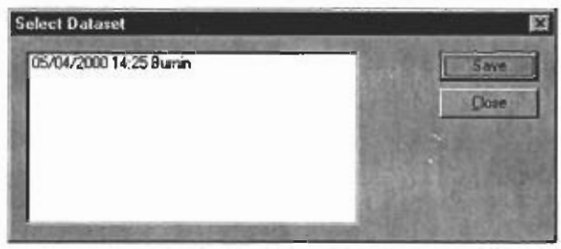


Figure 52 – Slot Properties Dialog Box

Data List Box – Select the desired test data to be saved to the database.

Save – With test data selected from the data list box, select the **Save** button to save the test data to be saved to the database.

Close – Select the **Close** button to close the Select Dataset dialog box without saving any test data to the database.

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3.5.2.3 Start Test

The Start Test dialog box appears when Start Test… is selected from the Slot drop-down menu and allows the user to set the selected slot operating properties.

NOTE

This dialog box is available for users logged in with administrator privileges.

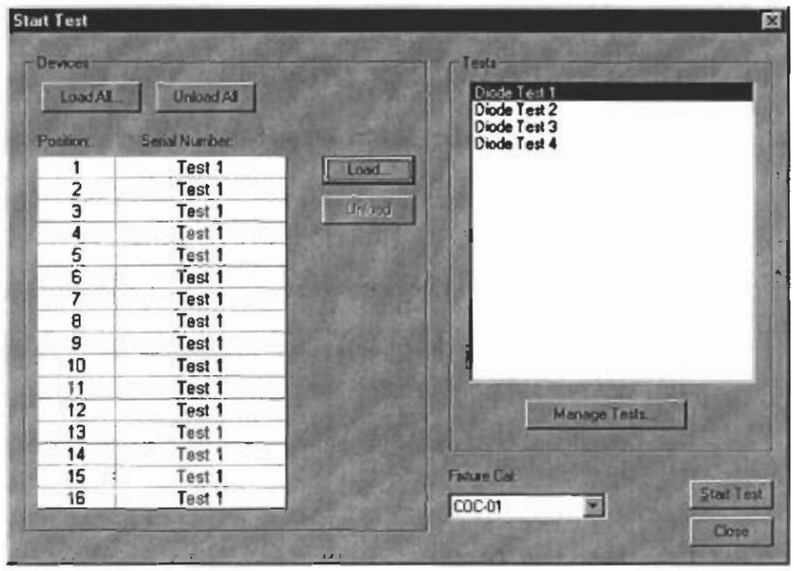


Figure 53 – Start Test Dialog Box

Devices Group Box – Load the proper test for all or each of the devices in the system.

Load All… – Select the **Load All…** button to select and load a test for all devices in the slot fixture.

Unload All – Select the **Unload All** button to 'remove' all diodes from the test fixture. 'Empty' will appear in the Serial Number column for all removed diodes. Testing will not occur on a device with an 'empty' indication.

Load… – With a device highlighted from the list, select the **Load…** button to select and load a test for the selected device.

Unload – With a device highlighted from the list, select the **Unload** button to 'remove' the diode from the test fixture. 'Empty' will appear in the Serial Number column for the removed diode. Testing will not occur on a device with an 'empty' indication.

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Tests – The Tests group box displays the available tests in the Manage Tests list box.

Manage Tests... – Select the **Manage Tests...** button to display the Manage Tests dialog box that will allow the user to add, edit, copy, and delete device tests. See **Section 3.4.3 Manage Tests** for additional information about managing device tests.

Fixture Cal: – Select the desired calibration data file for the slot from the drop-down menu.
Options: COC-01, COC-2, COC-3, ..., COC-33, Uncalibrated

Start Test – Select the **Start Test** button to start the selected tests for the devices.

Close – Select the **Close** button to close the Start Test dialog box without starting a test.

OK – Select the **OK** button to accept the slot test information.

Cancel – Select the **Cancel** button to close the Start Test dialog box without accepting the changed slot test information.

Apply – Select the **Apply** button to utilize the current slot testing changes immediately.

3.5.2.3.1 Manage Tests

The Manage Tests dialog box appears when Manage Tests... is selected from the Start Test dialog box and allows the user with administrator privileges to add, edit, delete, and copy device tests. Refer to **Section 3.4.3 Manage Tests** for additional information.

NOTE
This dialog box is available for users logged in with administrator privileges.

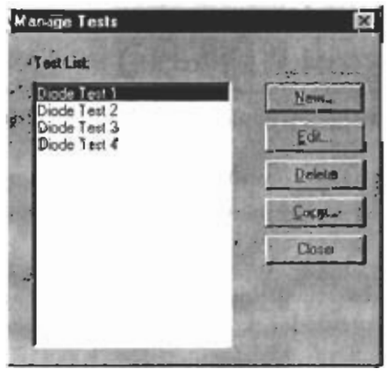


Figure 54 – Manage Tests Dialog Box

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3.5.2.3.2 Load Diodes

The Load Diodes dialog box appears when Load All... or Load... is selected from the Start Test dialog box and allows the user to set the selected slot operating properties.

NOTE
This dialog box is available for users logged in with administrator privileges.



Figure 55 – Load Diodes Dialog Box

Diode Templates: – Displays all of the diode templates currently saved.

OK – Select the **OK** button to accept the diode templates.

Manage... – Select the **Manage...** button to display the Manage Device Templates dialog box.

Cancel – Select the **Cancel** button to close the Load Diodes dialog box without accepting the changed diode template information.

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3.5.2.3.2.1 *Manage Device Templates*

The Manage Device Templates dialog box appears when Manage… is selected from the Load Diodes dialog box and allows the user to add, edit, delete, and copy diode-testing templates. Refer to **Section 3.4.2 Diode Templates** for additional information about managing device templates.

NOTE

This dialog box is available for users logged in with administrator privileges.

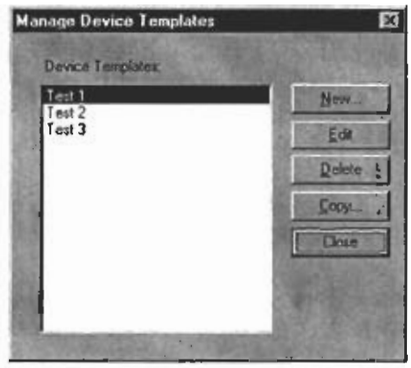


Figure 56 – Manage Device Templates Dialog Box

3.5.2.4 Stop Test

Stop Test is selected from the Slot drop-down menu. Selecting Stop Test allows the user to stop the currently running test.

3.5.2.5 Reset Failed Status

Reset Failed Status is selected from the Slot drop-down menu. Selecting Reset Failed Status allows the user to remove the failed status from devices that failed during past tests.

3.5.2.6 Shutdown Slot Diodes

Shutdown Slot Diodes is selected from the Slot drop-down menu. Selecting Shutdown Slot Diodes allows the user to stop the currently running diode tests in the chosen slot.

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3.5.3 Diode

The Diode menu offers features and options that control and set up the operating characteristics for testing the individual diode device. Note that the diode may sometimes be referred to as a 'device'.

NOTE
This dialog box is available only for users logged in with administrator privileges.

Properties... – With a slot selected (highlighted) in the system view, select Properties to display the Diode Properties dialog box.

Graph Data... – After a test has run and with a diode selected (highlighted) in the system view, select Graph Data to export and create a graph of the current diode test data.

Print Data... – With a diode selected (highlighted) in the system view, select Print Data to print the diode test data for the current diode.

Shutdown Diode – With a test running, select Shutdown Diode to stop the currently running diode test in the selected slot.

3.5.3.1 (Diode) Properties

The Diode Properties dialog box appears when Properties... is selected from the Diode drop-down menu OR when the user double-clicks on a diode in the system view and allows the user to set the selected slot operating properties.

NOTE
This dialog box is available for users logged in with administrator privileges.

Laser Properties – Select the Laser Properties tab to display and set the diode laser properties.

TEC Properties – Select the TEC Properties tab to display and set the diode thermoelectric cooler properties.

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3.5.3.1.1 Diode Laser Properties

The Diode Laser Properties dialog box appears when the Laser Properties tab is selected from the Diode Properties dialog box and allows the user to select and enter parameters for the diode laser properties.

Refer to **Section 3.4.2.1.1 Laser Properties** for information about laser properties settings and features.

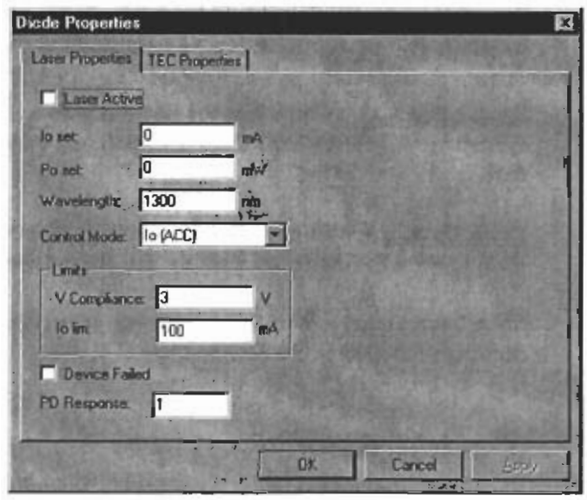


Figure 57 – Diode Laser Properties Dialog Box

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3.5.3.1.2 Diode TEC Properties

The Diode TEC Properties dialog box appears when the TEC Properties tab is selected from the Diode Properties dialog box and allows the user to select and enter parameters for the diode TEC properties.

Refer to **Section 3.4.2.1.2 TEC Properties** for information about TEC properties settings and features.

NOTE
The TEC tab is only available if Combo LDD/TEC Modules is selected in the System Properties | Rack Layout dialog box.

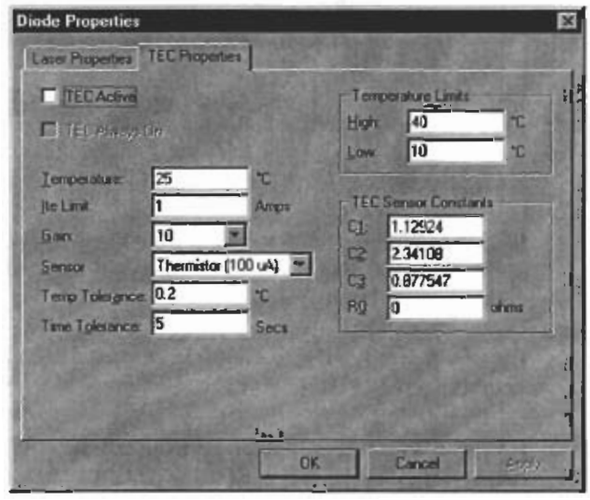


Figure 58 – Diode TEC Properties Dialog Box

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3.5.3.2 (Diode) Graph Data

The Diode Graph Data Select Dataset dialog box appears when Graph Data… is selected from the Diode drop-down menu and allows all users to view a graph for the selected diode test data.



Figure 59 – Diode Graph Data Dialog Box

Data List Box – Select the desired calibration data to be saved to the database.

Graph – With test data selected from the data list box, select the **Graph** button to graph the test data. The graphed test data will be displayed on the Diode Test Data dialog box that will appear.

Close – Select the **Close** button to close the Select Dataset dialog box without graphing any test data.

Delete – With test data selected from the data list box, select the **Delete** button to delete (remove) the test data.

3.5.3.2.1 Diode Test Data Graph

The Diode Test Data dialog box appears when the Graph button is selected from the Graph Data Select Dataset dialog box and allows all users to view a graph for the selected diode test data.

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3.5.3.3 (Diode) Print Data

The Diode Print Data Select Dataset dialog box appears when Print Data... is selected from the Diode drop-down menu and allows all users to view a graph for the selected diode test data.

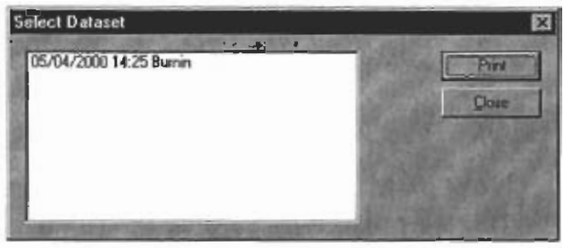


Figure 60 – Diode Print Data Dialog Box

Data List Box – Select the desired test data to be saved to the database.

Print – With test data selected from the data list box, select the **Print** button to display the standard Windows Print dialog box. Set up the printing instructions as desired.

Close – Select the **Close** button to close the Select Dataset dialog box without printing any test data.

3.5.3.4 Shutdown Diode

Shutdown Diode is selected from the Diode drop-down menu. Selecting Shutdown Diode allows users to stop the currently running diode tests for the chosen device.

3.5.4 TEC

The TEC menu offers features and options that control and set up the operating characteristics for testing the individual diode device. Note that the diode may sometimes be referred to as a 'device'.

NOTE
This dialog box is available only for users logged in with administrator privileges.

Properties... – With a TEC controller selected (highlighted) in the system view, select Properties to display the TEC Properties dialog box.

Refer to **Section 3.4.2.1.2 TEC Properties** for information about TEC properties settings and features.

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3.6 Test Menu Features

The Test menu allows access to the menus and functions for the rack system tests. Tests can be added, edited, and deleted using the test menu selections. Test default settings are also established with these test menus.

NOTE
Some options may not be available, depending on the access level of the logged in user.

3.6.1.1 New Test

The New Test dialog box appears when the New… button in the Manage Tests dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1 New Test** for information about setting up a new test.

3.6.1.1.1 Insert New Test (Step) – New Test

The Insert New Test dialog box allows the user to set the new test order, type, and reporting information.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1 Insert New Test – New Test** for information about inserting a new test step.

3.6.1.1.1.1 Characterize Step – New Test

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterization step settings and features.

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3.6.1.1.1.1.1 Characterize Test Parameters – New Test

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization test parameters settings and features.

3.6.1.1.1.2 Burn-in Step – New Test

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-in Step – New Test** for information about burn-in step settings and features.

3.6.1.1.1.2.1 Burn Test Parameters – New Test

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn-in test settings and features.

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3.6.1.1.1.2.2 Progressive Settings – New Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings – New Test** for information about burn test progressive settings and features.

3.6.1.1.1.3 Combination Test – New Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination test settings and features.

3.6.1.1.1.3.1 Characterize Test Parameters – New Combo Test

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization step settings and features.

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3.6.1.1.1.3.2 Burn Test Parameters – New Test

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn-in step parameter settings and features.

3.6.1.1.1.3.3 Progressive Settings (Combination Test) – New Test

The Progressive Settings dialog box appears when the Settings... button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test** for information about combination test progressive settings and features.

3.6.1.1.2 Edit Step

The Edit Step dialog box appears when the Edit button is selected at the Edit Test dialog box and allows the user to change the name and/or reporting status for the selected step.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

3.6.1.1.2.1 Characterize Step – Edit Test

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterization step settings and features.

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3.6.1.1.2.1.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization step settings and features.

3.6.1.1.2.2 Burn-in Step – Edit Test

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-In Step – New Test** for information about burn-in step settings and features.

3.6.1.1.2.2.1 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test – New Test** for information about burn-in step settings and features.

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3.6.1.1.2.2.2 Progressive Settings – Edit Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to set the parameters for data collection.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings – New Test** for information about burn-in step progressive settings and features.

3.6.1.1.2.3 Combination Test – Edit Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination test step settings and features.

3.6.1.1.2.3.1 Characterize Test Parameters – Edit Step

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization step settings and features.

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3.6.1.1.2.3.2 Burn Test Parameters – Edit Step

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about combination test burn-in test settings and features.

3.6.1.1.2.3.3 Progressive Settings (Combination Test) – Edit Step

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to set the data collection time and frequency.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test** for information about combination test progressive settings and features.

3.6.1.2 Edit Test

The Edit Test dialog box appears when the Edit… button in the Manage Tests dialog box is selected and allows the user to edit an existing test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

3.6.1.2.1 Insert New Test (Step) – Edit Test

The Insert New Test (Step) dialog box appears when the New button is selected at the Edit Test dialog box and allows the user to change the name and/or reporting status for the selected step.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1 Insert New Test (Step) – New Test** for information about characterization step settings and features.

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3.6.1.2.1.1 *Characterize Step – Edit Test*

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterization step settings and features.

3.6.1.2.1.1.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization step settings and features.

3.6.1.2.1.2 *Burn-in Step – Edit Test*

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-In Step – New Test** for information about burn-in step settings and features.

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3.6.1.2.1.2.1 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn-in step settings and features.

3.6.1.2.1.2.2 Progressive Settings – Edit Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user to set the parameters for data collection.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings – New Test** for information about burn-in step progressive settings and features.

3.6.1.2.1.3 Combination Test – Edit Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination test step settings and features.

3.6.1.2.1.3.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit… button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

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NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization step settings and features.

3.6.1.2.1.3.2 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit… button in the Burnin Step dialog box is selected and allows the user to set the burn-in test parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about combination test burn-in test settings and features.

3.6.1.2.1.3.3 Progressive Settings (Combination Test) – Edit Test

The Progressive Settings dialog box appears when the Settings… button in the Burnin Step dialog box is selected and allows the user with administrator or engineer privileges to set the data collection time and frequency.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test** for information about combination test progressive settings and features.

3.6.1.2.2 Edit Step

The Edit Step dialog box appears when the Edit button is selected at the Edit Test dialog box and allows the user to change the name and/or reporting status for the selected step.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

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3.6.1.2.2.1 Characterize Step – Edit Test

The Characterize Step dialog box allows the user to set the test parameters for the characterization tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1 Characterize Step – New Test** for information about characterization step settings and features.

3.6.1.2.2.1.1 Characterize Test Parameters – Edit Test

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about characterization step settings and features.

3.6.1.2.2.2 Burn-in Step – Edit Test

The Burn-in Step dialog box allows the user to set the test parameters for the burn-in tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2 Burn-In Step – New Test** for information about burn-in step settings and features.

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3.6.1.2.2.2.1 Burn Test Parameters – Edit Test

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn-in step settings and features.

3.6.1.2.2.2.2 Progressive Settings – Edit Test

The Progressive Settings dialog box appears when the Settings... button in the Burnin Step dialog box is selected and allows the user to set the parameters for data collection.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.2 Progressive Settings Parameters – New Test** for information about burn-in test progressive settings and features.

3.6.1.2.2.3 Combination Test – Edit Test

The Combination Test dialog box appears when a Combo test is selected at the New Test or Edit test dialog box and allows the user to set the parameters for a combination Burn-In and Characterization test.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3 Combination Test – New Test** for information about combination characterization and burn-in test settings and features.

3.6.1.2.2.3.1 Characterize Test Parameters (Combination Test) – Edit Step

The Characterize Test Parameters dialog box appears when the Edit... button in the Characterize Step dialog box is selected. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. The determining parameters are high and low percentages of the test settings and maximum and minimum values. If a device exceeds one of these judging criteria, the device is failed. Because of this, the test parameters are also known as Pass/Fail Criteria. Note that if "None" is selected in the Characterize Step dialog box, the test parameters will not be utilized.

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NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.1.1 Characterize Test Parameters – New Test** for information about combo test characterization step settings and features.

3.6.1.2.2.3.2 Burn Test Parameters (Combination Test) – Edit Step

The Burn Test Parameters dialog box appears when the Edit... button in the Burnin Step dialog box is selected and allows the user to create a new test and add, edit, and delete test steps.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for information about burn-in test parameter settings and features.

3.6.1.2.2.3.3 Progressive Settings (Combination Test) – Edit Step

The Progressive Settings dialog box appears when the Settings... button in the Burnin Step dialog box is selected and allows the user to set the parameters for data collection.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

Refer to **Section 3.4.3.1.1.3.3 Progressive Settings (Combination Test) – New Test** for information about burn-in test progressive step settings and features.

3.6.2 Defaults

The Test Defaults dialog box appears when selected from the Test drop-down menu. This dialog box contains options to set test parameter defaults to be used when specific parameters are not set up for a particular test. The Defaults dialog box has tabs for the Burn-In Step default settings, Characterization Step default settings, Burn-In Parameters default settings, and Characterization Parameters default settings.

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3.6.2.1 Burn-In Step

The Burn-In Step dialog box appears when the Burnin Step tab is selected from the Defaults dialog box and allows the user to set the default burn-in step parameters.

NOTE

This dialog box is available for users logged in with administrator or engineer privileges.

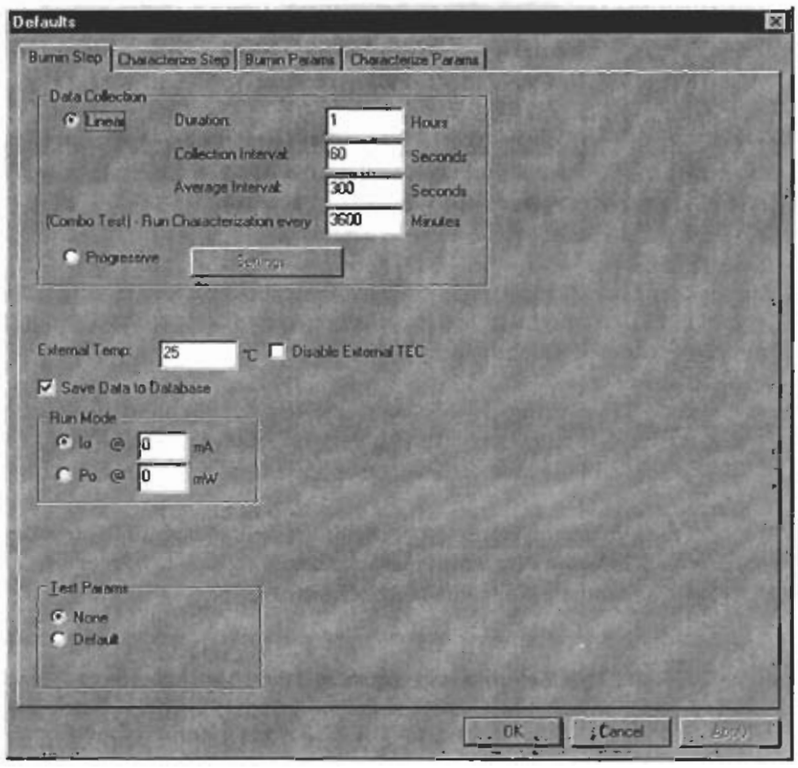


Figure 61 – Defaults Burn-In Step Dialog Box Tab

Data Collection – Data from burn-in tests can be collected in two ways: linearly or progressively. Linear mode is used when there is one set length for the test and data will be collected at regular intervals during that one test length. Progressive mode allows data to be collected and averaged at different rates and intervals during different phases of the test.

Linear – Select (fill-in) the Linear radio button to select the linear data collection mode that uses the Duration, Collection Interval, and Average Interval settings.

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Duration (hours) – Enter the default total amount of time that the burn-in test will run.
Range: 0 – 10,000,000 hours

Collection Interval (seconds) – Enter the default amount for how often points will be collected (collect points every ___ seconds).
Range: 15 – 6,000,000 seconds

Average Interval (seconds) – Enter the default amount for how often the points collected are averaged and saved to the database (average points every ___ seconds).
Range: 15 – 6,000,000 seconds

(Combo Test) – Run Characterization every (minutes) – Enter the default amount for how often the points collected are averaged and saved to the database (average points every ___ seconds).
Range: 15 – 99,999 minutes

Progressive – Select (fill-in) the Progressive radio button to select the default progressive data collection mode that uses the settings made in the Progressive Settings dialog box table.

Settings… – Select the **Settings…** button to display the Progressive Settings dialog box. The Progressive Settings dialog box allows the user to set when and how long data will be collected and when the data will be averaged.

External Temp (°C) – Enter the desired default temperature for the slot to stabilize at before the burn-in test can begin.
Range: -90 – 200 degrees Celsius

NOTE
This feature is only available if the Use Characterize Temperatures in Combo Test check box is checked in the System Properties | Rack Layout dialog box. Refer to **Section 3.5.1.1.3 Rack Layout** for additional information.

Disable External TEC – Select (check) the Disable External TEC check box to turn the external thermoelectric cooler OFF.

NOTE
This feature is only available if the Use Characterize Temperatures in Combo Test check box is checked in the System Properties | Rack Layout dialog box. Refer to **Section 3.5.1.1.3 Rack Layout** for additional information.

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Save Data to Database – Select (check) the Save Data to Database check box to default to save the test data to the database file specified in the System Properties, System Settings dialog box.

Run Mode – The Run Mode group box allows the user to set up and have the software check for power.

Enable Roll Over Test – Select (check) the Enable Roll Over Test check box to have the test monitored for roll over to stop the test when the roll over test conditions are met. If the check box is not checked, the test will NOT be monitored for roll over.

Roll Over % Level – Enter the desired ending laser diode drive current of the characterization process for the diode being tested.
Range: [any value] percent

Minimum Power (mW) – Enter the desired ending laser diode drive current of the characterization process for the diode being tested.
Range: [any value] milliwatts

Test Params – The Test Parameters group box allows the user to select what, if any, testing parameters are used during testing. The Burnin Step Test Params (if selected) are used to determine when a device has failed the test. See **Section 3.4.3.1.1.2.1 Burn Test Parameters – New Test** for additional information.

None – Select (fill-in) the None radio button to test the device(s) without reference to any burn test parameters.

Default – Select (fill-in) the Default radio button to use the default Burn Test Parameters during the device testing.

OK – Select the **OK** button to accept the Defaults Burn-In Step dialog box.

Cancel – Select the **Cancel** button to close the Defaults Burn-In Step dialog box without accepting the test and step information.

Apply – Select the **Apply** button to apply the settings made at the Defaults Burnin Step dialog box.

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3.6.2.1.1 Progressive Settings

The Progressive Settings dialog box appears when the Progressive button is selected at the Burnin Step dialog box and allows the user to set the default settings for the Burn-In Step Progressive Settings.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

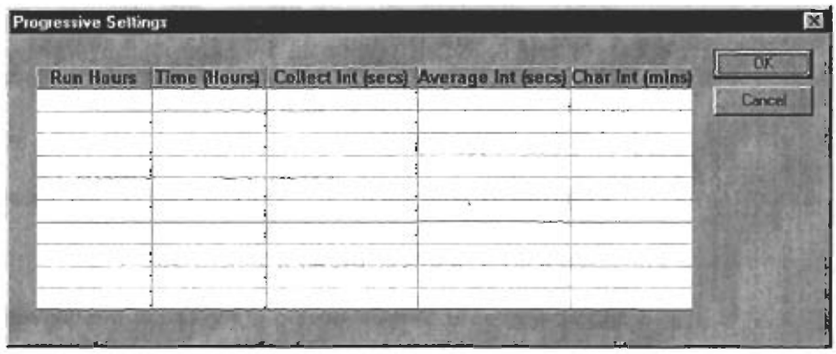


Figure 62 – Defaults Burn-In Step Progressive Settings Dialog Box

Run Hours – Displays the default total run time through that test step.

Time (Hours) – Enter the default total test time for the step.
Range: [any value] hours

Collect Int (secs) – Enter the default amount for how often (interval) points will be collected (collect points every ___ seconds).
Range: [any value ≥ 15] seconds

Average Int (secs) – Enter the default amount for how often (interval) the points collected are averaged and saved to the database (average points every ___ seconds).
Range: [any value ≥ 15] seconds

Char Int (mins) – Enter the default amount for how often the characterization test will be run during the combination test (run characterization test every ___ minutes).
Range: 0 – 99999 minutes

OK – Select the **OK** button to accept the Progressive Settings collection settings.

Cancel – Select the **Cancel** button to close the Progressive Settings dialog box without accepting the data collection information.

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3.6.2.2 Characterize Step

The Characterize Step dialog box appears when the Characterize Step tab is selected from the Defaults dialog box and allows the user to set the default characterization step parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

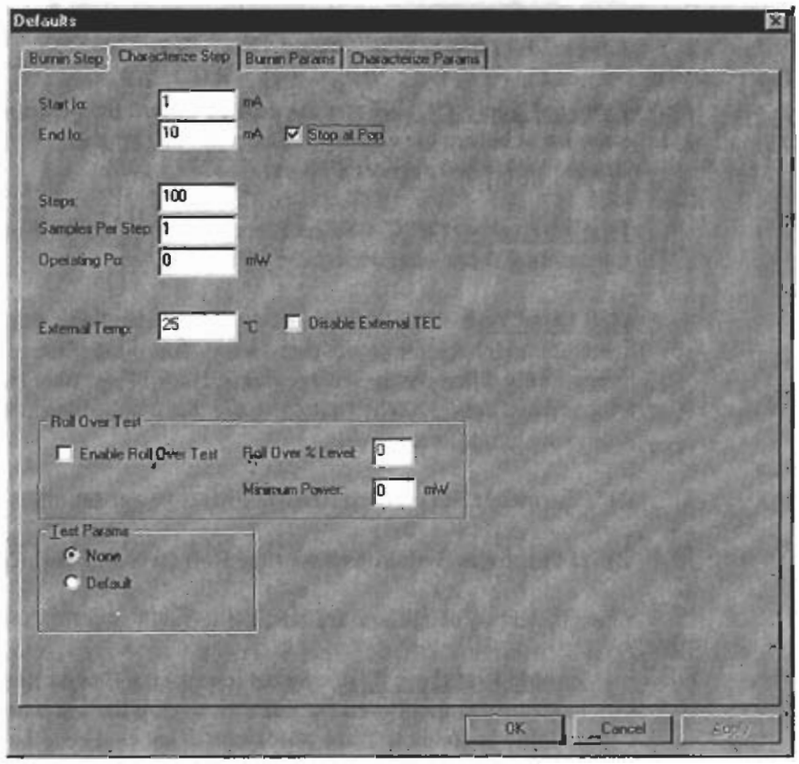


Figure 63 – Defaults Characterize Step Dialog Box Tab

Start Io (mA) – Enter the desired default starting laser diode drive current of the characterization process for the diode being tested.
Range: 0 – 6000 milliamps

End Io (mA) – Enter the desired default ending laser diode drive current of the characterization process for the diode being tested.
Range: 0 – 6000 milliamps

Stop at Pop – Select (check) the Stop at Pop check box to stop the device test once the power reaches the operating power.

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Steps – Enter the desired default number of testing points (steps) that are stored and saved in the database for the characterization.
Range: 2 – 1000 steps

Samples Per Step – Enter the desired default number of samples to be taken at each Step during the test. The software will take the number of samples entered at each step to determine an average value to display and/or plot.
Range: 1 – 6 samples per step

Operating Po (mW) – Enter the desired default ending laser diode drive power of the characterization process for the diode being tested.
Range: 0 – 10000000 milliwatts

External Temp (°C) – Enter the desired default temperature for the module to stabilize at before the characterization test can begin.
Range: -90 – 200 degrees Celsius

Disable External TEC – Select (check) the Disable External TEC check box to turn the external thermoelectric cooler OFF.

Roll Over Test – The Roll Over Test group box allows the user to set up and have the software check for power roll over to determine if the test should be stopped prematurely when the device's power starts "rolling" over (with reference to a graphed test curve). When selected, the test will be checked for roll over when the following conditions are met:

1) The power (Po) exceeds the Maximum Power setting.

2) If the power (Po) drops below the Roll Over % Level (of Minimum Power).

Once these two conditions are met, the test will stop for the device.

Enable Roll Over Test – Select (check) the Enable Roll Over Test check box to have the test monitored for roll over to stop the test when the roll over test conditions are met. If the check box is not checked, the test will NOT be monitored for roll over.

Roll Over % Level – Enter the desired roll over power percentage to be used during the roll over test.
Range: [any value] percent

Minimum Power (mW) – Enter the desired minimum power setting to be used during the roll over test.
Range: [any value] milliwatts

Test Params – The Test Parameters group box allows the user to select what, if any, testing parameters are used during testing. The Characterize Test Parameters (if selected) are used to determine when a device has failed the test. See **Section 3.4.3.1.1.1.1 Characterize Test Parameters** for additional information.

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None – Select (fill-in) the None radio button to test the device(s) without reference to any characterization test parameters.

Default – Select (fill-in) the Default radio button to use the default Characterize Test Parameters during the device testing.

OK – Select the **OK** button to accept the Defaults Characterize Step settings.

Cancel – Select the **Cancel** button to close the Defaults Characterize Step dialog box without accepting the test and step information.

Apply – Select the **Apply** button to apply the settings made at the Characterize Step dialog box.

3.6.2.3 Burn-In Parameters

The Burn-In Parameters dialog box appears when the Burnin Params tab is selected from the Defaults dialog box and allows the user to set the default burn-in parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

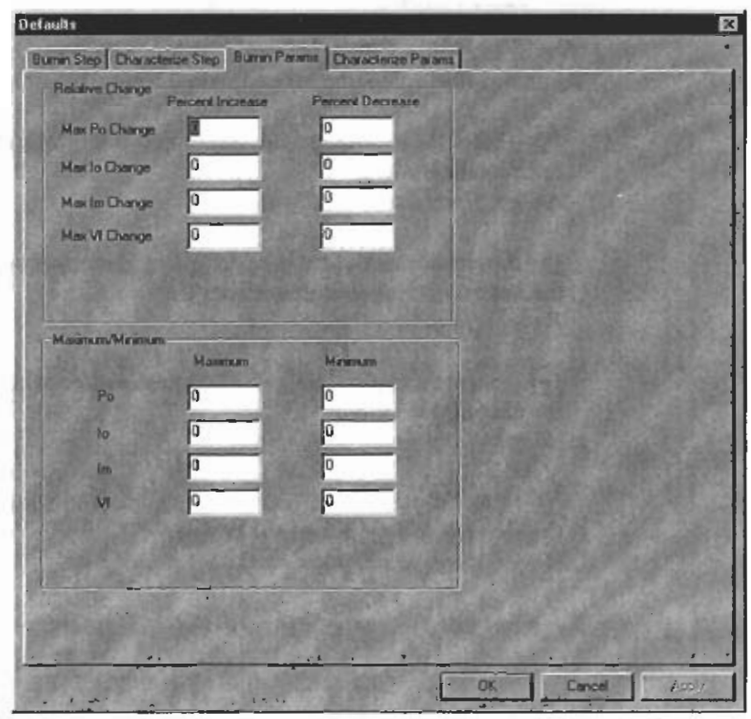


Figure 64 – Default Burn-In Parameters Dialog Box Tab

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Relative Change – Enter the proper default Relative Change increase percentage and/or decrease percentage for each of the parameters used to determine if the device passes or fails. The pass/fail calculations compare the present data reading to the first data reading of the present Burn-In test. If the parameter increases more than the Percent Increase value or decreases less than the Percent Decrease value, then the device fails.

Max Po Change – Enter the desired default Relative Change increase percentage and/or decrease percentage for the photodiode current.
Range: [any value] percent

Max Io Change – Enter the desired default Relative Change increase percentage and/or decrease percentage for the laser diode driver output current.
Range: [any value] percent

Max Im Change – Enter the desired default Relative Change increase percentage and/or decrease percentage for the photodiode current.
Range: [any value] percent

Max Vf Change – Enter the desired default Relative Change increase percentage and/or decrease percentage for the forward voltage across the device.
Range: [any value] percent

Maximum/Minimum – Enter the proper default Maximum parameter value or Minimum parameter value for each of the factors used to determine if the device passes or fails during the burn-in test. If the parameter reaches more than the Maximum value or less than the Minimum value, then the device fails.

Po – Enter the desired default Maximum and/or Minimum passable value(s) for the operating power.
Range: [any value] milliwatts

Io – Enter the desired default Maximum and/or Minimum passable value(s) for the laser diode driver output current.
Range: [any value] milliamps

Im – Enter the desired default Maximum and/or Minimum passable value(s) for the photodiode current.
Range: [any value] milliamps

Vf – Enter the desired default Maximum and/or Minimum passable value(s) for the forward voltage across the device.
Range: [any value] volts

OK – Select the **OK** button to accept the Defaults Burn-in Parameters.

Cancel – Select the **Cancel** button to close the Defaults Burn-in Parameters dialog box without accepting the relative change and maximum/minimum settings.

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3.6.2.4 Characterize Parameters

The Characterize Parameters dialog box appears when the Characterize Params tab is selected from the Defaults dialog box and allows the user to set the default characterization parameters.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

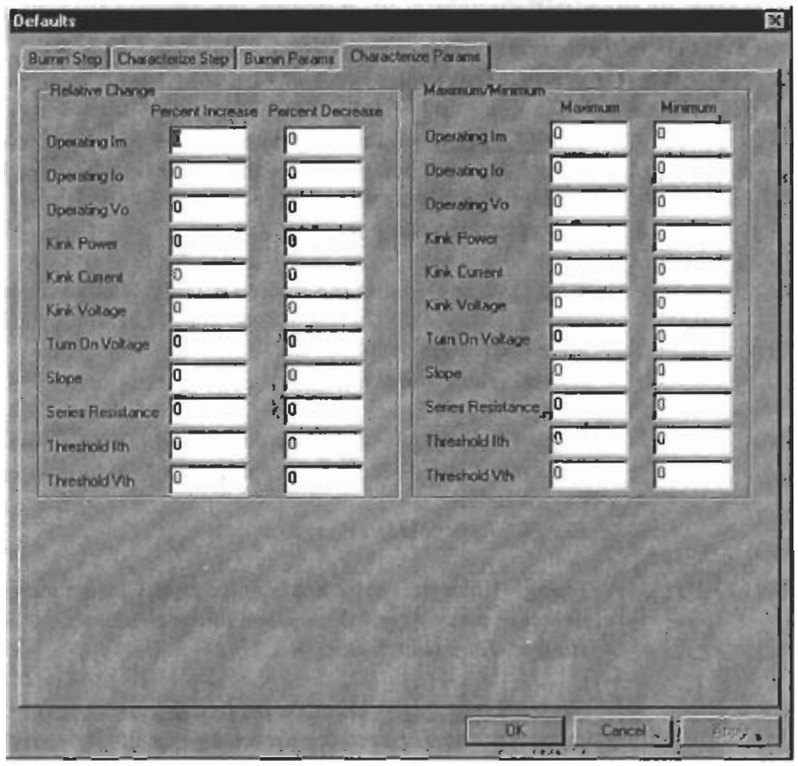


Figure 65 – Default Characterize Parameters Dialog Box Tab

Relative Change – Enter the proper Relative Change increase percentage and/or decrease percentage for each of the parameters used to determine if the device passes or fails. The pass/fail calculations compare the current characterization step to the previous characterization step. If the parameter changes more than the Percent Increase value or less than the Percent Decrease value, then the device fails.

Operating Im – Enter the desired default Relative Change increase percentage and/or decrease percentage for the photodiode current.
Range: [any value] percent

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Operating Io – Enter the desired default Relative Change increase percentage and/or decrease percentage for the laser diode drive current.
Range: [any value] percent

Operating Vo – Enter the desired default Relative Change increase percentage and/or decrease percentage for the laser diode drive voltage.
Range: [any value] percent

Kink Power – Enter the desired default Relative Change increase percentage and/or decrease percentage for the power at which the kink in the characterization curve occurs.
Range: [any value] percent

Kink Current – Enter the desired default Relative Change increase percentage and/or decrease percentage for the current at which the kink in the characterization curve occurs.
Range: [any value] percent

Kink Voltage – Enter the desired default Relative Change increase percentage and/or decrease percentage for the voltage at which the kink in the characterization curve occurs.
Range: [any value] percent

Turn On Voltage – Enter the desired default Relative Change increase percentage and/or decrease percentage for the turn on voltage when the laser begins to lase.
Range: [any value] percent

Slope – Enter the desired default Relative Change increase percentage and/or decrease percentage for the slope of the characterization curve.
Range: [any value] percent

Series Resistance – Enter the desired default Relative Change increase percentage and/or decrease percentage for the series resistance of the device.
Range: [any value] percent

Threshold Ith – Enter the desired default Relative Change increase percentage and/or decrease percentage for the threshold current for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] percent

Threshold Vth – Enter the desired default Relative Change increase percentage and/or decrease percentage for the threshold voltage for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] percent

Maximum/Minimum – Enter the proper Maximum parameter value or Minimum parameter value for each of the factors used to determine if the device passes or fails. If the parameter reaches more than the Maximum value or less than the Minimum value, then the device fails.

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Operating Im – Enter the desired default Maximum and/or Minimum passable value(s) for the photodiode current.
Range: [any value] milliamps

Operating Io – Enter the desired default Maximum and/or Minimum passable value(s) for the laser diode drive current.
Range: [any value] milliamps

Operating Vo – Enter the desired default Maximum and/or Minimum passable value(s) for the laser diode drive voltage.
Range: [any value] volts

Kink Power – Enter the desired default Maximum and/or Minimum passable value(s) for the power at which the kink in the characterization curve occurs.
Range: [any value] milliwatts

Kink Current – Enter the desired default Maximum and/or Minimum passable value(s) for the current at which the kink in the characterization curve occurs.
Range: [any value] milliamps

Kink Voltage – Enter the desired default Maximum and/or Minimum passable value(s) for the voltage at whieh the kink in the characterization curve occurs.
Range: [any value] volts

Turn On Voltage – Enter the desired default Maximum and/or Minimum passable value(s) for the turn on voltage when the laser begins to lase.
Range: [any value] volts

Slope – Enter the desired default Maximum and/or Minimum passable value(s) for the slope of the characterization curve.
Range: [any value] milliwatts/milliamps

Series Resistance – Enter the desired default Maximum and/or Minimum passable value(s) for the series resistance of the device.
Range: [any value] ohms

Threshold Ith – Enter the desired default Maximum and/or Minimum passable value(s) for the threshold current for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] milliamps

Threshold Vth – Enter the desired default Maximum and/or Minimum passable value(s) for the threshold voltage for the characterization curve (the point on the LI curve where the power curves sharply upward).
Range: [any value] volts

OK – Select the **OK** button to accept the Defaults Characterize Parameters.

Cancel – Select the **Cancel** button to close the Defaults Characterize Parameters dialog box without accepting the test and step information.

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3.7 View Menu Features

The View drop down menu allows the user to view the desired controller in the table view section of the screen. The table view section displays the data and status of each slot and each device before, during, and after tests.

NOTE
This dialog box is available for users logged in with administrator or engineer privileges.

3.7.1 Controller 1 (Controller 2, Controller 3, etc.)

Select the desired controller from the View drop down menu to switch to that controller view. The number of controllers available on the View drop down menu depends on the number of controllers installed in the test system.

3.8 Help Menu Features

The Help drop down menu allows the user to view information about the software. Selecting About NLCS displays the version of the NLCS software currently running. The Help menu also allows the user to view the program log file that records the events encountered while the software is operating.

3.8.1 About NLCS

Select About NLCS to view the version and copyright information for the Newport Laser Control System software that is currently running.

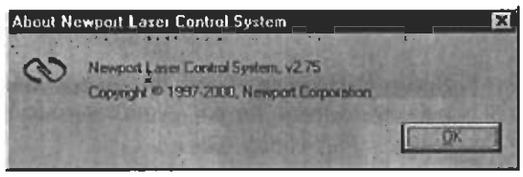


Figure 66 – About Newport Laser Control System Software Dialog Box

OK – Select the **OK** button to close the About NLCS dialog box.

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3.8.2 Open Log File

Select Open Log File to view the log file for the program. The Newport Laser Control System software records the time, date, and event details for all of the major events that occur while the software is running such as when the program is started and shutdown, when tests are started and stopped, and when an error or alarm condition occurs. The information is stored in the Newport.log file and can be viewed, edited, and printed using the Microsoft Notepad program that is automatically launched when Open Log File is selected from the Help menu *OR* when the Open Log File button () is selected.



Figure 67 – Newport.log File Viewed in Notepad

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CHAPTER 4

4. Software Operation

4.1 Introduction

The Newport Laser Control System (NLCS) software allows the operator to control the testing of the devices using a PC interface. The NLCS software is used to do the following:

- Maintain user profiles for security and integrity
- Set up and customize system properties for the rack system
- Set up, start, and monitor device testing
- View, graph, and save device test data

The following table offers a quick summary of the typical order of operations for using the NLCS software:

General Software Operation Summary	User's Manual Topic Location
1. Install and set up software (if necessary)	Section 2.3
2. Start and Login to software	Section 2.2.3
3. Enter/check System Properties	Section 2.3.2
4. Set Test Defaults	Section 3.6.2 and 4.7.2
5. Create Device Template(s)	Section 4.6.1
6. Create device test(s)	Section 4.7.2
7. "Load" Devices (in software)	Section 3.5.2.3.2
8. Select test	Section 3.5.2.3 and 4.7.5
9. Start and run test	Section 4.7.5
10. Graph and/or save test data	Section 3.5.2.2, 3.5.3.2, and 4.5.2

Table 2 – General Software Operations

Some of the basic procedures and operations utilized in NLCS are provided in the sections that follow. For details on software screen features and functions, refer to **Chapter 3 – Software Overview**.

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4.2 Logging On

4.2.1 Change User Login Name

Use the following procedure to change the logged in user while using the software:

1. Select **File | Login** to display the Login dialog box.

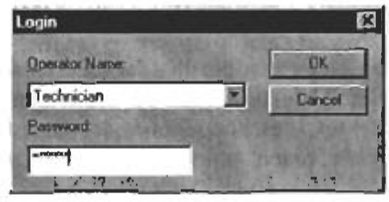


Figure 68 – Login Dialog Box

2. Select the desired name from the **Operator Name** drop-down list box.
3. Enter the proper **password** for the seleeted Operator Name.
4. Select the **OK** button to accept the new login name and password. The software will take on the privileges assigned to the operator selected.

4.3 User Management

4.3.1 Add a User

Use the following procedure to add a new user profile:

1. Select **Edit | User** Manager... to display the User Manager dialog box.

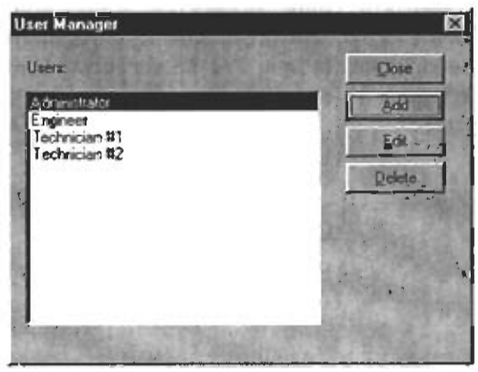


Figure 69 – User Manager Dialog Box – Add Button Highlighted

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2. Select the **Add** button.

3. At the Add User dialog box, enter the name (up to 32 characters) for the new user in the **Name** entry box.

4. Enter the desired **password** (up to 32 characters) for the new user. Note that each character entered will appear as an "*" to maintain the integrity of the password.

5. Select the appropriate user access level from the **Privilege** drop-down list box.

Privilege	Access Rights
Administrator	All software screens, menus, and functions
Engineer	Set up tests, change slot properties, change device properties, and start/stop slot and device tests
Technician	Start/stop slot and device tests

Table 3 – User Privileges

6. Select the **OK** button to accept the new user. The new user will now appear in the Users list box.

4.3.2 Edit a User Profile

Use the following procedure to edit an existing user profile:

1. Select **Edit | User Manager...** to display the User Manager dialog box.



Figure 70 – User Manager Dialog Box – Edit Button Highlighted

2. Select (highlight) the existing **user profile** to be changed from the Users list box.

3. Select the **Edit** button.

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4. Make the desired change(s) to the **User Name** (up to 32 characters), **Password** (up to 32 characters), and/or **Privilege**.

Privilege	Access Rights
Administrator	All software screens, menus, and functions
Engineer	Set up tests, change slot properties, change device properties, and start/stop slot and device tests
Technician	Start/stop slot and device tests

Table 4 – User Privileges

5. Select the **OK** button to accept the change(s) to the user profile.

4.3.3 Delete a User

Use the following procedure to delete an existing user profile:

1. Select **Edit | User Manager...** to display the User Manager dialog box.



Figure 71 – User Manager Dialog Box – Delete Button Highlighted

2. Select (highlight) the existing **user profile** to be deleted from the Users list box.

3. Select the **Delete** button. The user profile will be deleted immediately from the Users list box.

4.4 System Properties Setup

Typically the computer is set up at the factory before the system is shipped. However, in the event that the system needs to be reconfigured (typically when installing a software upgrade), refer to **Section 2.3.2 Software Setup** to set up the parameters that will allow the system to operate properly.

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4.5 Slot Properties Setup

The following group of procedures presents instructions for common slot property operations. Typical slot operations include setting the slot properties, resetting the failed devices, and exporting the slot test data. Refer to **Section 3.5.2 Slot** for additional slot screen information.

4.5.1 Set Slot Properties

Use the following procedure to set the slot properties:

1. Expand the System tree in the system view at the main screen to display the slots within (below) the system by selecting the "+" sign to the left.

2. Right-click on the desired **slot** to display the slot drop-down menu.

3. Select **Properties...** from the Slot drop-down list to display the Slot Properties dialog box.

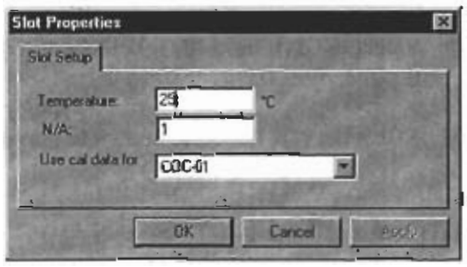


Figure 72 – Slot Properties Dialog Box

4. At the Temperature entry box, enter the desired **temperature** for the slot.

5. Enter the desired **numerical aperture (N/A)** for the slot.

6. Select the desired **calibration data file** for the slot from the drop-down menu.

7. When complete, select the **OK** button to accept and utilize the new slot properties.

4.5.2 Export Slot Data

Use the following procedure to export (save) test data to a database file:

1. Expand the System tree in the system view at the main screen to display the slots within (below) the system by selecting the "+" sign to the left.

2. Right-click on the desired **slot** to display the slot drop-down menu.

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3. Select **Export Data...** to export test data to a specific location/database file.

4. At the **Select Dataset** dialog box, select (highlight) the dataset to be saved.



Figure 73 – Export Data Selection Dialog Box

5. Select the **Export** button to save the selected test data to a database file.

6. Select the **Save** button.

7. Select the **database file** where the test data will be saved. Enter a new name if desired.

8. Select the **OK** button to complete the data export.

4.5.3 Reset Failed Status

Use the following procedure to reset the failed status for the slot devices:

1. Expand the System tree in the system view at the main screen to display the slots within (below) the system by selecting the "+" sign to the left.

2. Right-click on the desired **slot** to display the slot drop-down menu.

3. Select **Reset Failed Status...** to reset the failed status of any devices in the slot so that they can be tested.

4.6 Device Template Operations

The following group of procedures presents instructions for adding, copying, editing, and deleting device templates. The device template can also be referred to as the serial number for the device type. This allows the device template to be easily associated with the devices themselves when 'loading' the devices for testing. Refer to **Section 3.4.2 Diode Templates** for additional Device Template screen information.

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4.6.1 Add a New Device Template

Use the following procedure to add a new device (diode) template:

1. Select **Edit | Diode Templates...** to display the Manage Deviee Templates dialog box.

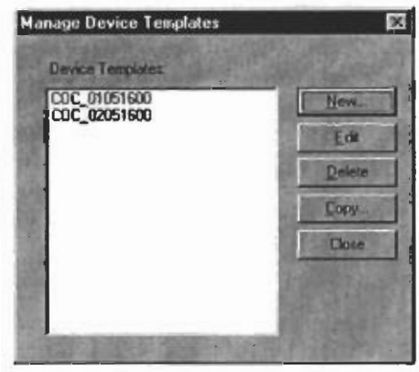


Figure 74 – Manage Device Templates Dialog Box – New Button Highlighted

2. Select the **New...** button.

3. At the New Device Template dialog box, enter the desired name in the **Template Name** entry box.

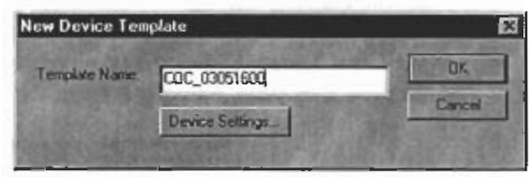


Figure 75 – New Device Template Dialog Box

4. Select the **Device Settings** button to display the Diode Properties dialog box.

5. Enter or select the desired **laser** and/or **TEC properties**. Note that the TEC Properties tab will be available only if the Combo LDD/TEC module type is selected.

6. Select the **OK** button to accept the Diode Properties.

7. Verify that the **Template Name** is correct.

8. Select the **OK** button to accept the new device template. The new template will appear in the Device Templates list box.

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4.6.2 Copy a Device Template

Use the following procedure to create a new device template by copying the information from an existing device template:

1. Select **Edit | Diode Templates...** to display the Manage Device Templates dialog box.



Figure 76 – Manage Device Templates Dialog Box – Copy Button Highlighted

2. Select (highlight) the **Device Template** to be copied from the Device Templates list box.

3. Select the **Copy...** button.

4. At the Copy Template dialog box, enter the name of the copied device template in the **New Template Name** entry box.

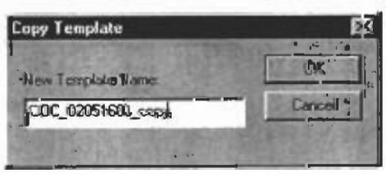


Figure 77 – Manage Device Templates Dialog Box – Copy Button Highlighted

5. Select the **OK** button to accept the new device template copy. The new device template copy will appear in the Device Templates list box. Refer to **Section 4.6.3 Edit a Device Template** to change the template name or any settings.

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4.6.3 Edit a Device Template

Use the following procedure to edit the name or other parameters for a device template:

1. Select **Edit | Diode Templates...** to display the Manage Device Templates dialog box.



Figure 78 – Manage Device Templates Dialog Box – Edit Button Highlighted

2. Select (highlight) the **test** to be edited from the Device Templates list box.

3. Select the **Edit** button to display the Edit Templates dialog box.

4. At the Edit Templates dialog box, enter a revised **Template Name** and/or select the **Device Settings...** button to change the diode properties.



Figure 79 – Edit Templates Dialog Box

5. With all of the changes made, select the **OK** button to accept the revised device template. The revised device template will appear in the Device Templates list box.

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4.6.4 Delete a Device Template

Use the following procedure to delete an existing device template:

1. Select **Edit | Diode Templates...** to display the Manage Device Templates dialog box.

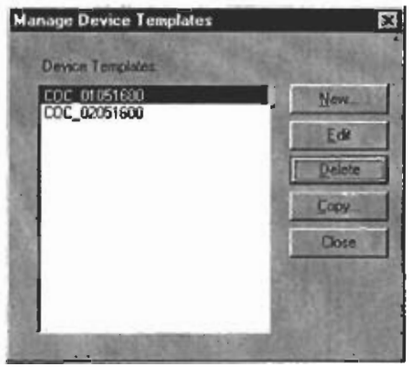


Figure 80 – Manage Device Templates Dialog Box -- Delete Button Highlighted

2. Select (highlight) the **test** to be deleted from the Device Templates list box.
3. Select the **Delete** button to remove the selected template from the list.
4. Select the **Yes** button to confirm the deletion of the template. The template will be removed from the Device Templates list box.

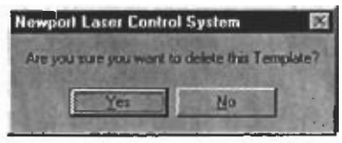


Figure 81 – Delete Device Template Confirmation Dialog Box

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4.7 Test Operations

The following group of procedures presents instructions for common test operations. Typical test operations include adding a new test, copying a test, and deleting a test. Refer to **Section 3.6.2 Defaults** for additional Test screen information.

4.7.1 Set Test Defaults

Use the following procedure to set the default test parameters that initially appear when setting up a test:

1. Select **Test | Defaults...** to display the Defaults dialog box.

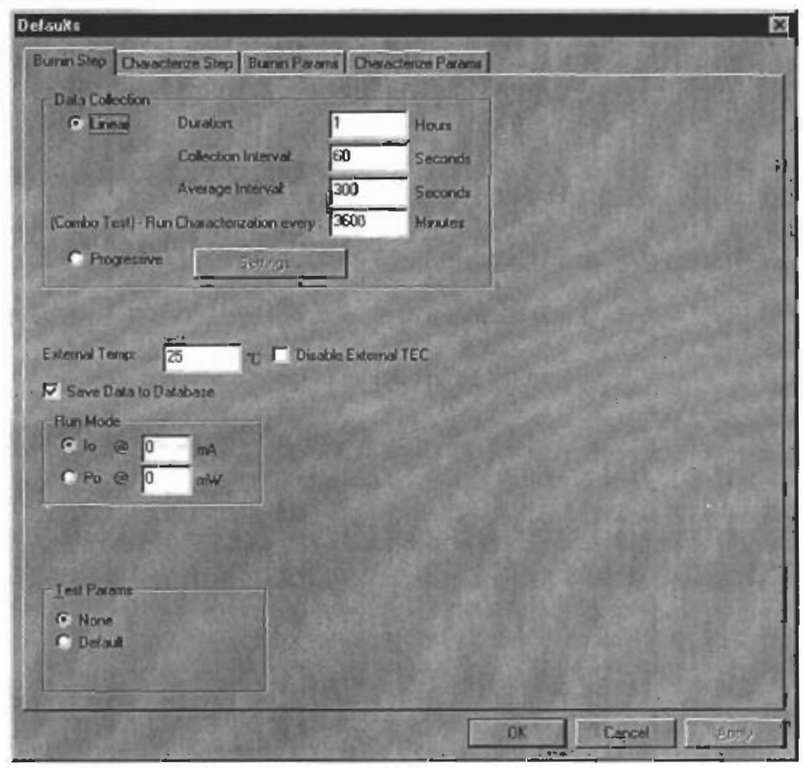


Figure 82 – Test Defaults Dialog Box

2. Select the **Burnin Step, Characterize Step, Burnin Params**, or **Characterize Params** tab to set the defaults.

3. Set the **default parameters**.

4. With all of the default parameters set, select the **OK** button to accept the default test parameters.

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4.7.2 Insert (Add) a New Test

Use the following procedure to add a new test:

1. Select **Test | New Test...** to display the New Test dialog box.



Figure 83 – New Test Dialog Box

2. Enter the **name** of the new test in the Test Name entry box.

3. Select the **Insert** button to insert a new test step.

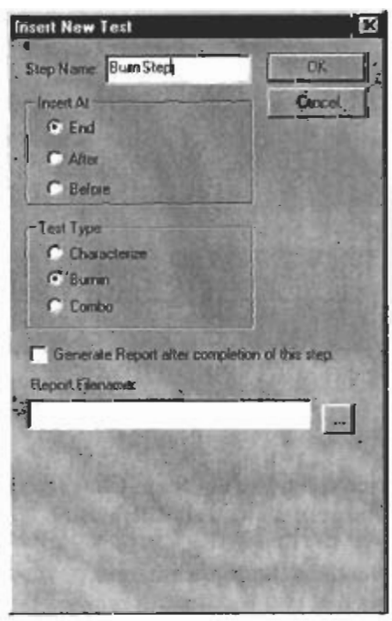


Figure 84 – Insert New Test Step Dialog Box

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4. Enter a new name in the **Step Name** entry box.

5. Select the insertion point for the test step from the **Insert At** group box. The insertion point is relative to the other existing test steps.

6. Select the **Test Type** for the new test step.

7. If desired, select (check) the **Generate Report** after completion of this step check box.

8. If generating a report after the step, browse to find or enter the report file name to be used.

9. Select the **OK** button.

10. Enter the proper **parameters** for the new test step.

11. If desired or necessary, select the Test Params **Edit** button to enter or change the test step parameters.

12. Select the **OK** button to accept the step parameters. The new test step will then appear in the Steps list box.

13. Repeat Steps 3 through 12 for each new test added.

14. With all of the tests and test steps entered, select the **OK** button to accept the new test information.

4.7.3 Edit a Test

Use the following procedure to edit an exiting device test:

1. Select **Test | Edit Test...** to display the Edit Test dialog box.



Figure 85 – Edit Test Dialog Box

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2. Select (highlight) the **test** to be edited from the list.
3. Select the **Edit** button to display the Edit Test dialog box.
4. Rename the test if desired.
5. **Insert**, **Edit**, or **Delete** test steps by selecting the appropriate button.
6. Once the changes have been made, select the **OK** button to accept the changes.

4.7.4 Delete a Test

Use the following procedure to delete an existing device test:

1. Select **Test | Delete Test...** to display the Delete Test dialog box.



Figure 86 – Delete Test Dialog Box

2. Select (highlight) the **test** to be deleted.
3. Select the **Delete** button to delete the selected test.
4. Select the **Yes** button to confirm the deletion of the test. The test will then be deleted from the list.

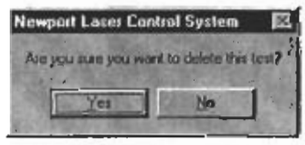


Figure 87 – Delete Test Confirmation Dialog Box

5. Select the **Close** button to close the Delete Test dialog box.

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4.7.5 Start a Test

Use the following procedure to set up and start a device test for a particular slot:

1. Expand the System tree in the system view at the main screen to display the slots within (below) the system by selecting the "+" sign to the left.

2. Right-click on the desired slot and select **Start Test...** from the drop-down menu.

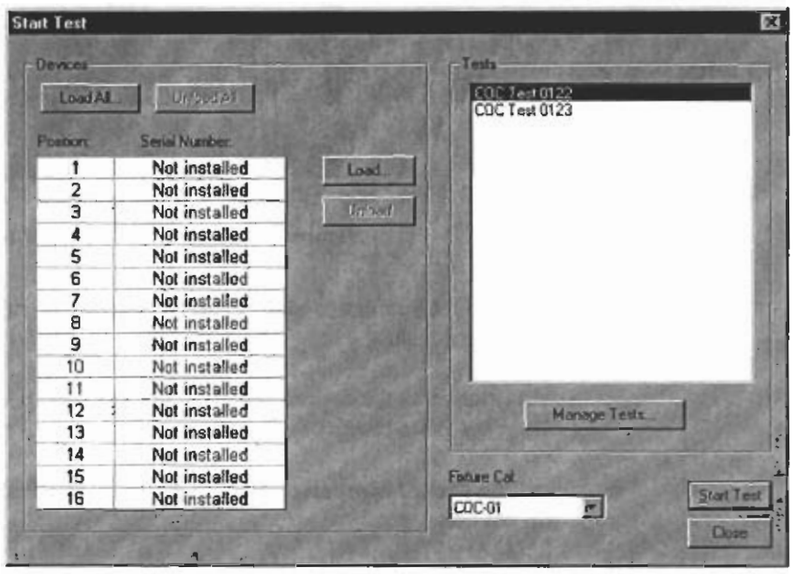


Figure 88 – Start Test Dialog Box

3. **Load** a device template, which appears in the "serial number" column, for each device position using one of the two methods below:

   Select the **Load All...** button to load the same device template for all of the devices in the slot.

   OR

   Select one position or a group of positions, and then select the **Load...** button.

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4. At the Load Diodes dialog box, select (highlight) the desired **template** from the Diode Templates list box *OR* select the **Manage...** button to set up and/or edit a device template.



Figure 89 – Load Diodes Dialog Box

5. Select the **OK** button to assign (load) the selected device template to the appropriate devices.

6. Select (highlight) the desired **test** from the Tests list box *OR* select the **Manage Tests...** button to set up or edit a device test.

7. Select the desired appropriate **fixture calibration file** from the Fixture Cal drop-down list box.

8. Verify that all of the information entered/selected is correct.

9. Select the **Start Test** button to start the device test. The test status will be displayed at the top of the slot table in the Table (Controller) View.

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4.8 Open File Log

Use the following procedure to open and view the Newport Laser Control System log file:

1. At the main screen, select the **Open Log File** button ( ) to open the Microsoft Notepad application to view the Newport.log file.

2. View, search, save, and/or print the log file.

3. Select **File | Exit** when finished.

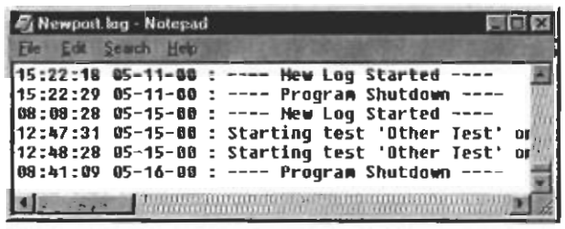


Figure 90 – Log File

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CHAPTER 5

5. Database Management

5.1 Introduction

Test data can be saved in a database for easy storage and manipulation. The database allows the test engineer to easily sort and manage the large amounts of test data using a database application, Microsoft Access.

5.2 Database Layout

Figure 91 – Database Layout Diagram shows the layout of the database file created from the Newport Laser Control System software.

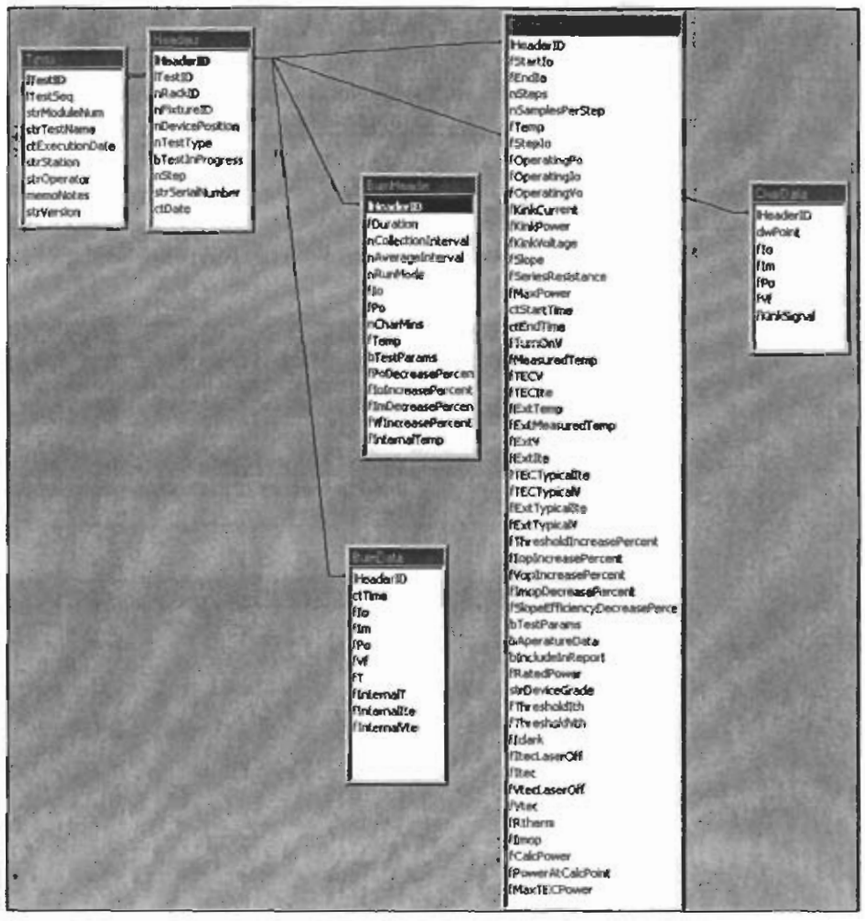


Figure 91 – Database Layout Diagram

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5.3 Database Parameter Descriptions

Each test has one unique test record. Each device and test step type (Characterize, Burn-In, Combo Characterize, and Combo Burn-in) has one header record that contains common header information for the test performed on the device. However, Characterization tests and Combo Characterization tests have a corresponding CharHeader record for each device in the test that provides more specific information on the test step for the device. Burn-In tests and Combo Burn-In tests have a BurnHeader record for each device in the test that provides more specific information on the test step for the device.

The data points for the tests are stored in the BurnData or CharData records. The Header ID ties the data to a device, test ID, and test type. When a test is complete, the Test In Progress field in the header record is set to 0. There are also calculated values that are stored in the CharHeader or BurnHeader records when the test completes.

NOTE
Fields listed as "Fields Not Used" are fields that are used by other Newport applications that use this database.

5.3.1 Tests Table

There is one test record per test with the following fields:

Fields Used

lTestID	**Unique test ID that is automatically assigned by the database when a test record gets created.**
strTestName	Test name specified in the test procedure.
ctExecutionDate	Time the test was started.
strStation	Preset to "NLCS".
strOperator	Name of the user logged in to the system.
strVersion	Version number of the software release that wrote this record to the database.

Fields Not Used

lTestSeq, strModuleNum, memoNotes

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5.3.2 Headers Table

There is one header record per test step with the following fields:

Fields Used	
lHeaderID	Unique Header ID that is automatically assigned by the database when a Header record gets created.
lTestID	lTestID that was assigned to the test record.
nRackID	This is the user assigned Rack Number set in System Properties.
nFixtureID	Slot number for this record.
nDevicePosition	Device's position in the Slot.
nTestType	0 = Burn-in Step, 1 = Characterize Step, 2 = Characterize Combo, 3=Burnin Combo.
bTestInProgress	1 = Test Step is in Progress, 0 = Test Step is complete
nStep	Step number of this test step.
strSerialNumber	Serial number assigned to this diode.
ctDate	For a Burn-in test: time the test step started. For a Characterization test: time the test step finished.

5.3.3 BurnHeader Table

There is one BurnHeader record per test step with the following fields:

Fields Used	
lHeaderID	lHeaderID assigned to the Header record that is linked to this BurnHeader record.
fDuration	Duration of the Burnin set in the test procedure.
nCollectionInterval	Collection interval set in the test procedure.
nAverageInterval	Average Interval in minutes, set in the test procedure.
nRunMode	Run Mode set in the test procedure 0 = Constant Current, 1 = Constant Power.
flo	Io value set in the test procedure, used when running in constant current.
fPo	Po value set in the test procedure, used when running in constant power.
nCharMins	Interval value (in minutes) to run the Characterize, while in a Combo Test Step, this is set in the test procedure of combo test steps.
fTemp	External (Slot) Temperature set in the test procedure.
bTestParams	Set to 1 if the user has specified to use Test Parameters in the test procedure, otherwise it is 0.
fPoDecreasePercent	Po Decrease Percent specified in the Test Parameters for the Test Procedure.
floIncreasePercent	Io Increase Percent specified in the Test Parameters for the Test Procedure.
flmDecreasePercent	Im Decrease Percent specified in the Test Parameters for the Test Procedure.
fVfIncreasePercent	Vf Increase Percent specified in the Test Parameters for the Test Procedure.
fIteIncreasePercent	Ite Increase Percent specified in the Test Parameters for the Test Procedure.
fVteIncreasePercent	Vte Increase Percent specified in the Test Parameters for the Test Procedure.
fInternalTemp	Internal (Module) Temperature set in the test procedure.
nAverageIntervalSeconds	Average Interval in seconds, set in the test procedure.

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5.3.4 BurnData Table

There is one BurnData table contains all the data points for the Burnin Test Step. There is one Burn Data record for each averaged point. The fields used in this table are:

Fields Used	
lHeaderID	lHeaderID assigned to the Header record that is linked to this BurnData record.
ctTime	Time this point was added to the database.
flo	Io value at this time.
flm	Im value at this time.
fPo	Po value at this time.
fVf	Vf value at this time.
fT	External Temperature value at this time.
FInternalT	Internal Temperature value at this time (if there is an Internal TEC).
FInternalIte	Internal Ite value at this point (if there is an Internal TEC).
FInternalIVte	Internal Vte value at this point (if there is an Internal TEC).

5.3.5 CharHeader Table

There is one CharHeader record per Characterize test step with the following fields:

Fields Used	
lHeaderID	lHeaderID assigned to the Header record that is linked to this CharHeader record.
fStartIo	Start Io of the Characterize, set in the test procedure.
fEndIo	End Io of the Characterize set, in the test procedure.
nSteps	Number of steps in the Characterize, set in the test procedure.
nSamplesPerStep	Number of samples per step in the Characterize, set in the test procedure.
fTemp	Internal temperature for the module, set in the test procedure (if there is an Internal TEC).
fStepIo	Io Increment for each step of the Characterize.
fOperatingPo	Operating Power, calculated at the end of the Characterize.
fOperatingIo	Operating Current, calculated at the end of the Characterize.
fOperatingVo	Operating Voltage, calculated at the end of the Characterize.
fKinkCurrent	Kink Current, calculated at the end of the Characterize.
fKinkPower	Kink Power, calculated at the end of the Characterize.
fKinkVoltage	Kink Voltage, calculated at the end of the Characterize.
fSlope	Slope, calculated at the end of the Characterize.
fSeriesResistance	Series Resistance, calculated at the end of the Characterize.
fMaxPower	Max Power, calculated at the end of the Characterize.
ctStartTime	Start Time for this Characterize.
ctEndTime	End Time for this Characterize.
fTurnOnV	Turn OnVoltage, calculated at the end of the Characterize.
fExtTemp	External Temperature, set in the test procedure.

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Fields Not Used

fMeasuredTemp,fTECV,fTECIte,fExtMeasuredTemp,fExtV,fExtIte, fTECTypicalIte, fTECTypicalV, fExtTypicalIte, fExtTypicalV, bAperatureData, bIncludeInReport, fRatedPower, strDeviceGrade, fIDark, fTecLaserOff, fItec, fVtecLaserOff, fVtec, fRtherm, fCalcPower, fPowerAtCalcPoint, fMaxTECPower

5.3.6 CharData Table

The Char Data Table contains all the data points for the Characterize Tests. There is one CharData record per each step with the following fields:

Fields Used

lHeaderID	lHeaderID assigned to the Header record that is linked to this CharData record.
dwPoint	The point number.
fIo	Io value at dwPoint.
fIm	Im value at dwPoint.
fPo	Po value at dwPoint.
fVf	Vf value at dwPoint.

Fields Not Used

fKinkSignal

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CHAPTER 6

6. Technical Support

6.1 Introduction

This section contains information regarding obtaining factory service for the Newport Laser Control System (NLCS) software.

6.2 Trouble-Avoidance Tips

The Newport Laser Control System software was written for easy and reliable use. However, some possible operating problems can be prevented by using the following tips and information:

1. Do not use the front panel of an instrument while a test is running.

   Navigating through instrument menus while a test is running can cause the instrument to reset itself and interrupt the test. Restart the test or continue with the test if possible. If the test will not run correctly, contact the Newport Customer Support Team via the phone number or website address given in **Section 6.4 – Getting Technical Support – Software**.

2. Do not change the settings in **System | Properties | GPIB Addresses** or **System | Properties | Rack Layout**.

   These settings are made during the installation of the system and should not be changed without proper direction and/or support from Newport's Field Service or Customer Support. If the settings have been changed, contact the Newport Customer Support Team via the phone number or website address given in **Section 6.4 – Getting Technical Support – Software**.

6.3 Getting Technical Support – Hardware

To obtain information concerning factory service, contact Newport Corporation or your nearest Newport representative. For hardware, please have the following information available:

- Instrument model number (on front panel)
- Instrument serial number (on rear panel)
- Description of the problem

If the instrument is to be returned to Newport Corporation, you will be given a Return Materials Authorization (RMA) number, which you should reference in your shipping documents as well as clearly marked on the outside of the shipping container.

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Please fill out the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

6.4 Getting Technical Support – Software

Since software can change drastically from one version to the next, refer to the software Release Notes for the latest tips and information. Information provided in the Release Notes takes precedence over information provided in this or any other previous manual version.

Contact the Newport Technical Support for assistance if a problem or question regarding the operation of the Newport Laser Control System software should arise. You can contact the Technical Support Team by calling (800)549-4089 or via the following website: http://slo.newport.com/service.

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Service Form

Newport	Telephone (in the United States): 800-222-6440	FAX: 949-253-1680
	Telephone: 949-863-3144	Internet: www.newport.com

Name _____ RMA Number _____

Company _____ (NOTE: Please obtain Return Materials

Address _____ Authorization (RMA) number prior to return of item.)

Country _____ Date _____

P.O. Number _____ Phone Number _____

Item(s) Being Returned:

Model Number _____ Serial Number _____

Description _____

Reason for return of goods (please list any specific problems) _____

_____

List all control settings and describe problem _____

_____

_____

_____ (Attach additional sheets as necessary)

System Diagram:

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Describe signal source. If source is laser, describe output mode, peak power, pulse width, and repetition rate.

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Where is measurement being performed?
(factory, controlled laboratory, out-of-doors, etc.) _____

What input power line voltage is used? _____ Variation? _____

Input Power Frequency? _____ Ambient Temperature? _____

Any Additional Information: (i.e. If any special modifications were made by the user, please describe below.)

_____

_____

_____

Newport Laser Control System – PD Calibrate Software

User's Manual Addendum

NOTE

This User's Manual applies to Newport Laser Control System Software up through Version 2.74C for Newport Rack Systems that support GPIB communication and require the PD Calibrate software for device calibration. Portions of this manual may NOT be suitable for use with digital (high-density) rack systems.

Contact your Newport Corporation representative for additional information regarding digital Newport rack systems.

Certificate No.: FM 27207

Newport Corporation, Irvine, California, has been certified compliant with ISO 9002 by the British Standards Institution.

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CHAPTER 1

1. Newport Laser Control System – PD Calibrate Software

1.1 Introduction

The Newport Laser Control System (NLCS) is a comprehensive characterization and burn-in system that consists of a rack of control equipment and a software application for controlling the equipment. PD Calibrate is included in the NLCS software package, and is used to calibrate the user devices to Newport's modular laser and temperature controllers. The software allows the user to setup and save calibration configurations for each device fixture in the rack system.

1.2 Software Overview

PD Calibrate is installed as part of the NLCS software package that is included with the Newport rack system controllers. The software is a Windows 95, Windows 98, or NT-based application that calibrates the user's devices to Newport's equipment for data logging and data display of the laser drivers and TECs. The typical installation location for the PD Calibrate executable file is:

c:\Program Files\Newport\Newport Laser Control System\PD Calibrate.exe

1.3 Safety Precautions

Laser diodes are extremely sensitive to electrostatic discharge and current spikes (transients). Damage can result in reduced output power, shift in threshold current, changes in beam divergence, and ultimately failure to lase (LED-like output only). Newport Corporation precision current sources and controllers offer the most advanced laser protection features available, including power line filters, clamping current limits, and slow-start-up circuits.

However, no instrument can protect against all conditions.
Please observe these additional precautions to further protect your laser diode:

- ESD is the primary cause of premature laser failure. As a minimum, use anti-static wrist straps (grounded with 1 MΩ resistor), anti-static floor coverings, grounded soldering irons, and grounded work areas. Ionized air blowers are also recommended.
- Laser diode leads should be shorted whenever the laser is transported or stored.
- Select a drive instrument with maximum current levels commensurate with the laser's operating current.
- If industrial loads are switched in or near your laboratory, use isolation transformers and/or surge suppresser power strips with your laser current source.
- Isolate your laser current driver with a surge suppresser when using a common line with laboratory power supplies, soldering irons, or other electronic instruments. Avoid using such devices on the same surge suppresser as your laser source.

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- Make sure the all cables to the laser diode are securely fastened. Avoid "bundling" current source cables with other cables in your laboratory.
- Set current limit to appropriate levels, following the laser manufacturer's recommendations (or to just above the expected operating current).
- Avoid ground loops.

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CHAPTER 2

2. Control Software

2.1 Software Operation Overview

2.1.1 Starting the Program

Select PD Calibrate from the Microsoft Start/Programs menu. Once the program is loaded, use the program to calibrate the equipment according to the sections below.

NOTE: The NLCS software and PD Calibrate programs cannot run at the same time. Always close one program before starting the other program to prevent communication errors.

2.1.2 Calibration Setup

Following the procedure below, prepare the rack system for the components that need to be calibrated. **All fixtures are calibrated in Slot 1 of the rack system and thus must be changed in and out of Slot 1 during the calibration process.** Consult with the controller User's Manual for additional information.

It is recommended that a calibrated device be placed in each location in the fixture (for example, sixteen known and calibrated devices in a sixteen device fixture), rather than move one known device from one device location to the next device location in the fixture. Filling the fixture with known devices will reduce the amount of time and potential for device damage associated with using one device only.

1) Using accepted methods for that fixture and device combination, load the rack system fixture(s) with devices that need to be tested. Refer to the component User's Manual for details.

2) Obtain the data sheets/speeifications for each of the deviees that are loaded in the fixture(s). Data should include the calibrated wavelength, temperature, current output, and power output.

3) If necessary, start the **PD Calibrate** program.

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2.1.3 Starting a Calibration Configuration File

A fixture contains information for each device in a particular fixture. Calibration configuration files include current output values and power output values for all fixtures in a rack system. Once the information is entered and the devices are calibrated, the calibration data should be saved to a calibration file so that the NLCS software can then reference it later. Use the following steps to start a calibration configuration file:

1) Referring to **Figure 1 – PD Calibrate Window, New File Creation**, at the PD Calibrate window, select the **Add Fixture** button.

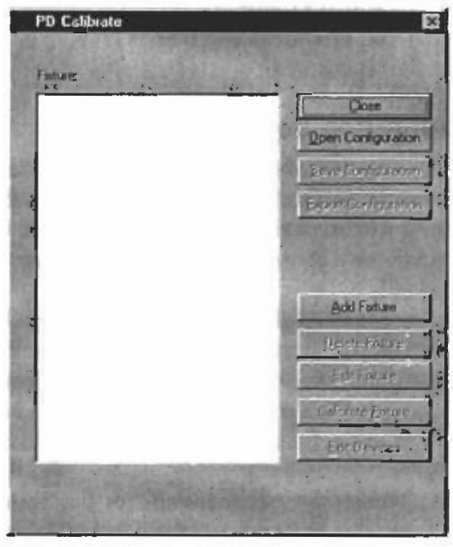


Figure 1 – PD Calibrate Window, New File Creation

2) Referring to **Figure 2 – Add Fixture Dialog Box**, enter the fixture identification information:

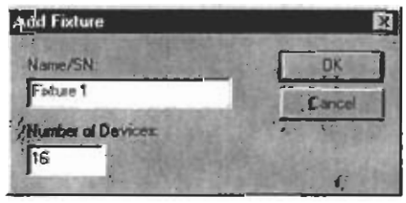


Figure 2 – Add Fixture Dialog Box

a. In the **Name/SN** entry box, enter the desired name for the fixture.

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b. In the **Number of Devices** entry box, enter the number of devices found in that fixture.

c. Select the **OK** button to continue.

3) Repeat Steps 1 and 2 for each fixture that needs to be added to the calibration configuration file.

NOTE: For advanced users, the fixture can be calibrated immediately after the fixture is added. See the **Calibrating a Device Using PD Calibrate** section for details.

4) Once all of the fixtures are added, select the **Save Configuration** button to save the file:

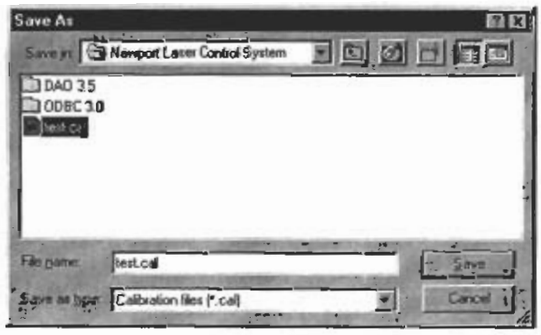


Figure 3 – Save As Dialog Box for Calibration File

a. Using proper Windows file naming conventions, enter the desired name for the calibration configuration file in the **File name** entry box with a ".cal" file extension.

For example, enter "test.cal" as shown in **Figure 3 – Save As Dialog Box for Calibration File**.

NOTE: The ".cal" extension must be typed in at the end of the file name in the entry box. The ".cal" extension will not be entered automatically.

b. Ensure that the **Save as type** is set to "Calibration files (*.cal)".

c. Select the **Save** button to save the file.

5. Calibrate the fixture according to the **Calibrating a Device Using PD Calibrate** section below.

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2.1.4 Calibrating a Device Using PD Calibrate

The PD Calibrate software is used to calibrate the devices in the fixture. Calibration configurations store the calibration information for each fixture and each device in the fixture. If the user is starting the program for the first time, add and save the fixture and device parameters according to the **Starting a Calibration Configuration File** section in this manual. Existing calibration configuration files have a ".cal" file extension and are typically saved in the NLCS folder (c:\Program Files\Newport\Newport Laser Control System).

Calibrate the fixture according to the procedure below:

1) Select the **Open Configuration** button to open an existing calibration configuration file. The saved fixtures for that file should appear in the Fixture window.

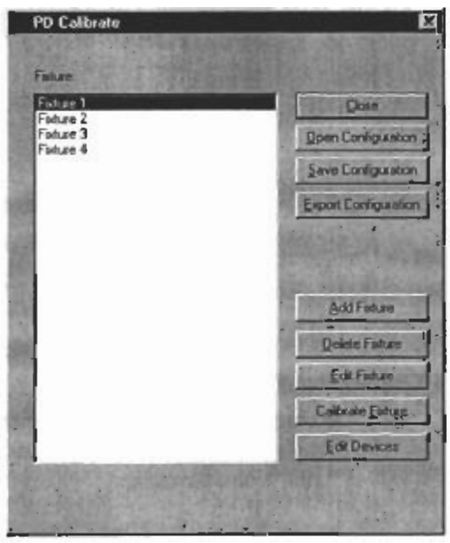


Figure 4 – PD Calibrate Window, Opened Configuration

2) Highlight the fixture to be calibrated by clicking on it in the Fixture window once with the left mouse button.

3) Move the selected fixture to be calibrated to **Slot 1** on the rack system.

4) Select the **Calibrate Fixture** button to calibrate the selected fixture.

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5) Referring to **Figure 5 – Calibrate Fixture Window Example**, enter the appropriate parameters for the devices being calibrated:

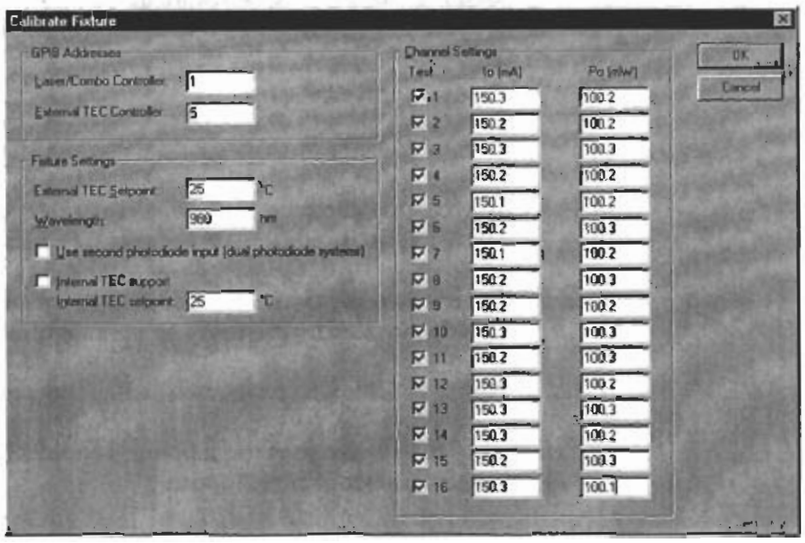


Figure 5 – Calibrate Fixture Window Example

a. In the GPIB Addresses group box, ensure that the **Laser/Combo Controller** entry box has the same GPIB address as the first LDD controller, which is typically "1".

NOTE: Since all fixtures must be calibrated in Slot 1, this GPIB address should remain the same throughout the calibration process.

b. In the GPIB Addresses group box, ensure that the **External TEC Controller** entry box has the GPIB address of the TEC controller.

c. In the Fixture Settings group box, enter the **External TEC Setpoint** temperature (software default temperature is 25 degrees Celsius). This should be the temperature at which the devices in the fixture were calibrated.

d. In the Fixture Settings group box, enter the **Wavelength** (software default wavelength is 980 nanometers). This should be the calibrated wavelength for the devices in the fixture.

e. If applicable, in the Fixture Settings group box, select (check - ✓) the **Use second photodiode input (dual photodiode systems)** check box.

This function should normally be checked unless the hardware only supports a single PD input.

f. If testing butterfly devices and using combo LDD/TEC controllers, in the Fixture Settings group box, select (check) the **Internal TEC support** check box.

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g. If applicable, in the Fixture Settings group box, enter the **Internal TEC Setpoint** temperature (software default temperature is 25 degrees Celsius). This should be the calibrated temperature for the devices in the fixture.

h. Select (check) all of the devices in the **Test** check column that should be calibrated. A check mark indicates that the device will be calibrated.

i. Referring to the device data sheets, enter the proper current specifications in the **Io (mA)** column for each device.

j. Referring to the device data sheets, enter the proper current specifications in the **Po (mW)** column for each device.

k. Verify that all of the calibration settings are correct.

6) Select the **OK** button to start the calibration process for the fixture. Calibration will start for the devices in the fixture.

7) Select the **Save Configuration** button to save the calibration information.

8) If necessary, remove the calibrated fixture from Slot 1.

9) Place the calibrated fixture in its intended Slot in the rack system.

10) Repeat steps 2 through 9 for each fixture that needs to be calibrated.

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2.1.5 Exporting a Calibration Configuration File

Calibration configuration files can be exported to a text file that can be viewed and/or printed using a word processing program. Use the following method to edit the calibration parameters for a fixture's configuration file:

1) Export the text (.txt) file to the desired location:

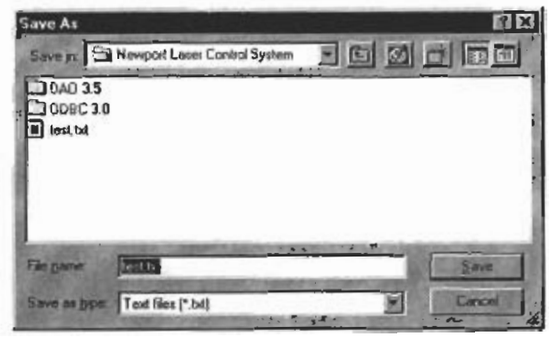


Figure 6 – Save As Dialog Box, Configuration Export

a. Using proper Windows file naming conventions, enter the desired name for the calibration configuration file in the **File name** entry box with a ".txt" file extension.

   For example, enter "test.txt" as shown in **Figure 6 – Save As Dialog Box, Configuration Export**.

b. Ensure that the **Save as type** is set to "Text files (*.txt)".

c. Select the **Save** button to save the file.

2) Open a word processing program, Microsoft NotePad, or Microsoft WordPad.

3) Open the saved text export file.

2.1.6 Deleting a Fixture from a Configuration File

Fixtures can be deleted easily from a configuration file at the PD Calibrate window. Use the following method to edit the calibration parameters for a fixture's configuration file:

1) At the Fixture list box, select a fixture from the list by clicking once on the desired fixture.

2) Verify that the correct fixture is selected.

3) Select the **Delete Fixture** button. The fixture will be deleted immediately, without warning.

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2.1.7 Editing a Fixture Setup

The calibration parameters for the fixtures can be edited and then saved for future use. Use the following method to edit the calibration parameters for a fixture's configuration file:

1) At the Fixture list box, select a fixture from the list by clicking once on the desired fixture.

2) Select the **Edit Fixture** button.

3) Referring to **Figure 7 – Edit Fixture Dialog Box**, enter the new fixture information:



Figure 7 – Edit Fixture Dialog Box

   a. In the **Name/SN** entry box, enter the new desired name for the fixture.

   b. In the **Number of Devices** entry box, enter the new number of devices found in that fixture.

   c. Select the **OK** button to continue.

4) Verify that the fixture has the new information in the Fixture list box.

2.1.8 Editing Calibration Information

Laser diodes can be calibrated at different wavelengths. The responsivity (calibration factor), output per unit input, is automatically generated for each device that is calibrated using PD Calibrate. The calibration factor is measured in Amps per Watt (A/W) and is used to divide the wavelength to achieve the desired results for the device.

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The NLCS software refers to the calibration factor for each wavelength that is stored in the PD Calibrate (PD Calibrate.ser) file. NLCS checks the calibration factor for the wavelength that is entered in the Diode Template information (see **Figure 8 – NLCS Diode Properties, Laser Properties Dialog Box** for details). Refer to the NLCS Software User's Manual for additional Diode Template information.

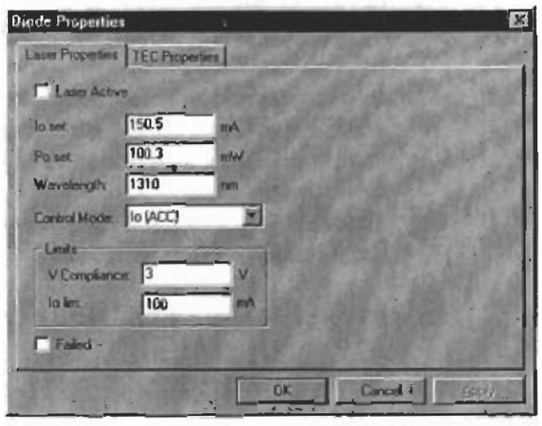


Figure 8 – NLCS Diode Properties, Laser Properties Dialog Box

Wavelengths and calibration factors for each device in each fixture can be inserted, deleted, and/or edited. Use the following method to edit the calibration parameters for each device:

1) At the Fixture list box, select a fixture from the list by clicking once on the desired fixture.

2) Select the **Edit Devices** button.

3) Referring to **Figure 9 – Device Edit Window**, perform the necessary changes to the devices using the buttons described below:

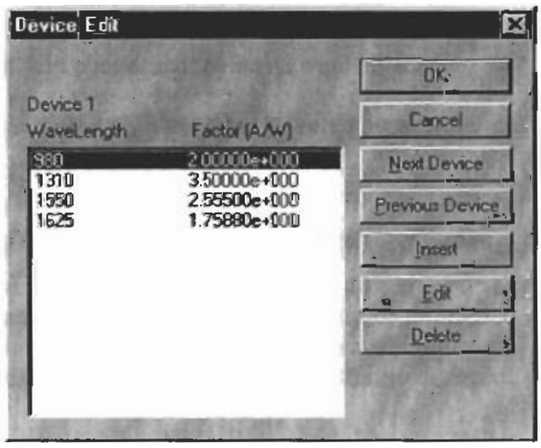


Figure 9 – Device Edit Window

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- **OK** – Select the OK button to accept all of the device parameters.
- **Cancel** – Select the Cancel button to quit the device editing without applying the changes.
- **Next Device** – Select the Next Device button to advance to the next device for editing.
- **Previous Device** – Select the Previous Device button to recede to the prior device for editing.
- **Insert** – Select the Insert button to insert a new wavelength and wavelength factor for the current device.
- **Edit** – Select the Edit button to edit the currently selected (highlighted) device parameters.
- **Delete** – Select the Delete button to delete the currently selected (highlighted) device parameters.

An example action for the Edit Devices box is:

a. Select the **Insert** box.

b. Referring to **Figure 10 – Add Device Entry, Device Edit**, enter the new desired **Wavelength** for the device.

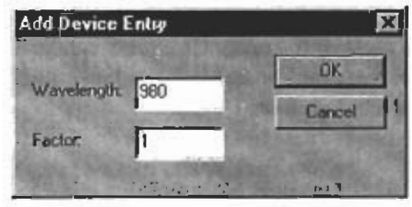


Figure 10 – Add Device Entry, Device Edit

c. Enter the device factor in the **Factor** entry box.

d. Select the **OK** button to continue.

4) Once the devices are edited, select the **OK** button to complete the editing.

5) Select the **Save Configuration** button to save the changes to the file.

2.1.9 Setting the PD Response File Name in NLCS

The Newport Laser Control System software uses factor parameters saved in the calibration configuration file for the rack system. Once all of the fixtures and devices are calibrated and saved, the file must be located for the NLCS software. Set the PD Response File Name to the location of the calibration configuration file.

Use the following method to set the calibration configuration file location in the NLCS software:

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1) Select the **Close** button to exit the PD Calibrate software.

2) Select the **Yes** button to confirm exiting the program.

3) Start the **Laser Control System** software from the Windows Start/Programs menu.

4) Select (highlight) the **System** icon in the upper left corner of the screen.

5) Select **Rack, System, and Properties** to display the System Properties window.

6) Select the **System Settings** tab.

7) Referring to **Figure 11 – NLCS System Properties, System Settings Window**, enter the following location in the **PD Response File Name** entry box OR Browse to find the file location:

c:\Program Files\Newport\Newport Laser Control System\test.cal

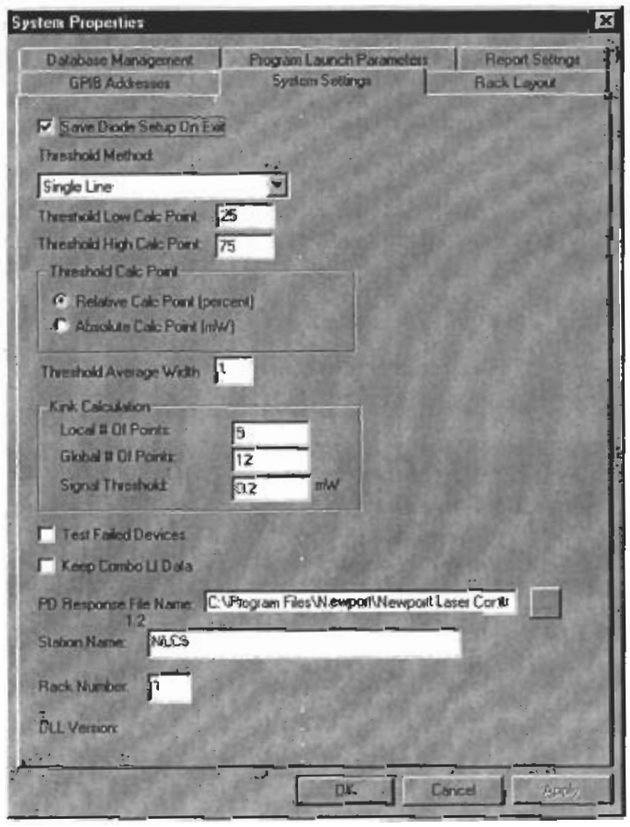


Figure 11 – NLCS System Properties, System Settings Window

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4) Once the file location is entered, select the **OK** button to complete the change.

   Refer to the NLCS User's Manual for additional information on setting up NLCS.

5) Select **File**, **Exit**, and **Exit Application** to exit the NLCS software and apply the changes.

6) Start the **Laser Control System** software from the Windows Start/Programs menu.

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Newport Custom Rack System

128 Channel Chip on Submount
Laser Diode Burn-In Rack System
Documentation

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Limited Warranty

Newport warrants that this product will be free from defects in materials and workmanship for a period of one year from the date of shipment. If any such product proves defective during the applicable warranty period, Newport, at its option, either will repair the defective product with charge for parts and labor or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, the customer must notify Newport of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. In all cases the customer will be responsible for packaging and shipping the defective product back to the service center specified by Newport, with shipping charges prepaid. Newport shall pay for the return of the product to the customer if the shipment is within the continental United States, otherwise the customer shall be responsible for all shipping charges, insurance, duties and taxes, if the product is returned to any other location.

This warranty shall not apply to any defect, failure or damage caused by improper use or failure to observe proper operating procedures per the product specification or operators manual or improper or inadequate maintenance and care. Newport shall not be obligated to furnish service under this warranty 1) to repair damage resulting from attempts by personnel other than Newport's representatives to repair or service the product; 2) to repair damage resulting from improper use or connection to incompatible equipment; 3) to repair damage resulting from operation outside of the operating or environmental specifications of the product.

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EC Declaration of Conformity

We declare that the accompanying product, identified with the "CE" mark, meets all relevant requirements of Directive 89/336/EEC and Low Voltage Directive 73/23/EEC.

Compliance was demonstrated to the following specifications:

EN50081-1 EMISSIONS:

Radiated and conducted emissions per EN55011, Group 1, Class A

EN50082-1 IMMUNITY:

Electrostatic Discharge per IEC 1000-4-2, severity level 3
Rated Emission Immunity per IEC 1000-4-3, severity level 2
Fast Burst Transients per IEC 1000-4-4, severity level 3
Surge Immunity per IEC 1000-4-5, severity level 3

IEC SAFETY:

Safety requirements for electrical equipment specified in IEC 1010-1.

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CHAPTER 1

1. General Information

1.1 Introduction

This manual describes the features and specifications of the Newport Custom 128-Channel Chip on Submount Laser Diode Burn-In System. This manual contains documentation that will allow you to safely and efficiently operate your Newport custom rack system. The Newport Laser Diode Test and Measurement Custom Rack System Rack System Documentation contains specific information for your rack system. This may include system certification and layout information. The Model 8016/9008/9016 Modular Controller User's Manual contains information regarding the care and use of the laser diode controller. The Newport Laser Control System Software User's Manual and NLCS PD Calibrate User's Manual contain information regarding use of the rack system control software for laser diode test and measurement and calibration.

1.2 EC Declaration of Conformity Description

The EC Declaration of Conformity document states that the rack system meets all relevant requirements and is compliant with Directive 89/336/EEC and Low Voltage Directive 73/23/EEC. This compliance is identified with the "CE" mark symbol. The relevant compliant specifications are listed on the included document.

1.3 Newport Custom Laser Diode Burn-In Rack System Description

Newport's Chip On Submount Laser Diode Burn-In system houses 128 channels in one 38U rack. The rack contains control and measurement electronics, test fixtures, and uninterruptable power supply (UPS).

Dual Output Laser Diode Driver (LDD) modules provide 128-Channels @ 1,500 mA of current and a compliance voltage of 3.5 volts. Both Constant Power (APC) and Constant Current (ACC) modes are available. Constant power mode operation uses a front facet silicon photodiode, which is part of the test fixture. Forward current, forward voltage, and front facet power are all measured at a resolution of 16-bits.

Removable fixtures are designed to hold Pirelli's 980nm chip on submount laser diode for the purposes of burn-in. Spring loaded "pogo pins" secure each chip-on-submount device to a temperature-controlled plate and provide electrical connection with the anode and cathode contact pads. Sixteen (16) laser diodes are loaded into a fixture. Two (2) peltier coolers control the fixture plate temperature. A large area silicon photodiode collects the front facet beam of each laser diode. Each photodiode is angled 8 degrees to prevent back reflections to the laser diode.

The temperature between each set of diode is independently measured and recorded for increased temperature accuracy at the COC device. This is achieved using an external data acquisition unit.

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An uninterruptible power supply is supplied to act as a continuous voltage regulator and transient suppresser. Backup batteries provide emergency power in the event of complete AC power failure. In the event of power failure, the UPS switches to battery backup power and notifies the computer. The computer will continue to operate for a preprogrammed amount of time to allow any data completion underway to be completed. Once the data collection is finished, the outputs to the laser diodes and then the entire system are shut down.

A Pentium™ laptop computer is included with the system and is located in one of the rack drawers for easy access. Communication with the system is handled over an IEEE-488 interface. A comprehensive software package allows complete control, measurement, and analysis including laser diode burn-in life-testing. Data collection of all 128 channels is completed in less than 30 minutes in Newport's Burn-In system.

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1.4 Newport Custom Laser Diode Burn-In Rack Layout and Footprint

The Newport Custom Laser Diode Burn-In Rack is laid out for optimum efficiency and ergonomics. The controllers are in positions that are intuitive and easy to read. The device fixture drawers are in easy to reach locations for easy loading and unloading (*The approximate height measurements for the device fixture drawers are provided in* ***Figure 1*** *below.*).

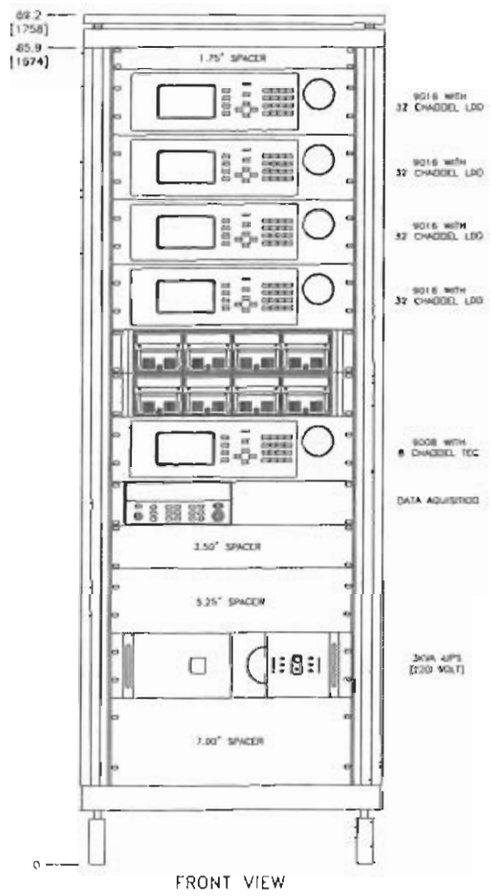


Figure 1 – Rack Test System Layout and Front View Drawing

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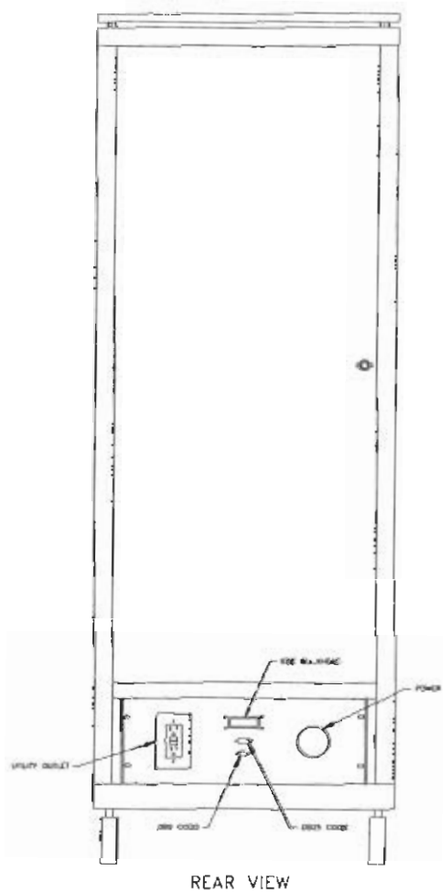


Figure 2 – Rack Test System Back View Drawing

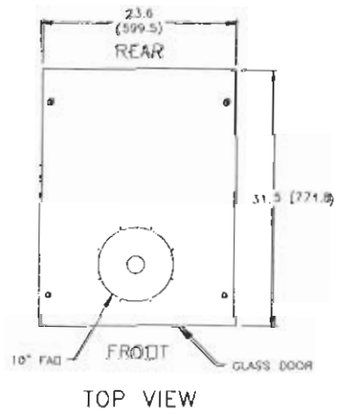


Figure 3 – Rack Test System Top View (Footprint) Drawing

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1.5 General Newport Custom Laser Diode Burn-In Rack System Specifications

System Size

Rack Size	38U (height) [19-in. Schroff Rack]
Number of Racks	1
Total Device Capability	128
Fixture Drawers	8
Device Type	Chip on Submount (per Pirelli drawings)
Filter Location	Rack Bottom

Table 1 – System Size

Device Temperature Control

Temperature Range	+25°C to +85°C
Temperature Stability	± 0.05°C
Temperature Resolution	± 0.01°C

Table 2 – Device Temperature Control

Operating Modes

Automatic Power Control (APC)	YES (via front facet photodiode)
Automatic Current Control (ACC)	YES

Table 3 – Operating Modes

Photodiode (front facet)

Detector Type	Silicon Photodiode
Wavelength Range	0.4 to 1.1µm
Input Power	1,500mW

Table 4 – Photodiode, Front Facet

Characterization Capabilities

L-I (Current-Light)	YES
V-I (Current-Voltage)	YES
If versus Time (APC mode)	YES
L versus Time (ACC mode)	YES

Table 5 – Characterization Capabilities

Model 9016 Modular Controller

Display	Backlit LCD graphics display, 128 (H) X 240 (W) pixels
Computer Interface	IEEE-488
Local/Remote Operation	YES (Local operation allows individual manual status display and output control of each channel from rack)

Table 6 – Model 9016 Modular Controller

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Universal Power Supply

Input Power, Frequency	220 VAC, 50 Hz/60 Hz
Input Power Conditioning	YES
Battery Backup	YES, uninterrupted power during AC power failure, system goes into Standby mode and LD turns off safely. System remains off until operator turns it back on - the computer will then display any error messages including time of power failure.

Table 7 – Universal Power Supply

System Certification

Certification	CE marked

Table 8 – System Certification

NOTE

In accordance with ongoing efforts to continuously improve our products, Newport Corporation reserves the right to modify product specifications without notice and without liability for such changes.

1.6 Dual Output Laser Diode Driver Specifications

Laser Output (per output)

Output Current Range	0 to 1,500 mA
Output Current Resolution (16-bit)	0.03 mA
Compliance Voltage	3.5 Volts
Temperature Coefficient (Full Scale)	< 50 ppm/ °C

Table 9 – Laser Output (per output)

Current Limit (set in software)

Range	0 to 1,500 mA
Resolution (8-bit)	6 mA
Accuracy	± 10 mA

Table 10 – Current Limit

Forward Current (I_f) Measurement

Range	0 to 1,500 mA
Resolution (16-bit)	0.03 mA
Accuracy	0.03% + 15 µA

Table 11 – Forward Current Measurement (I_f)

Front Facet Power (L) Measurement

Power Measurement Range	0 to 1,500 mW
Power Resolution	0.1 mW
Power Accuracy	± 7% (at given calibrated wavelengths)

Table 12 – Front Facet Power Measurement (L)

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Forward Voltage (V_f) Measurement

Forward Voltage Range	0.00 to 3.50 V
Forward Voltage Resolution	1 mV
Forward Voltage Accuracy	0.5% + 10 mV

Table 13 – Forward Voltage (V_f) Measurement

NOTE

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CHAPTER 2

2. Safety

2.1 Introduction

The Newport Custom Burn-In Rack System is designed for safe and efficient operation. Very few safety issues exist when using the test system under normal circumstances. However, special care and consideration must be taken when moving and/or servicing the rack system. The following chapter contains safety information that should be adhered to at all times. Additional safety information for each controller and other rack system component can be found in the instrument's user's manual.

2.2 Safety Terms

The following safety terms are used in this manual:

- The **WARNING** heading in this manual explains dangers that could result in personal injury or death.
- The **CAUTION** heading in this manual explains hazards that could damage the instrument.
- The **NOTES** heading provides information to the user that may be beneficial when using this instrument.

2.3 Safety Symbols and Messages

The following safety symbols and messages may appear in this manual and/or on the rack system instruments.

2.3.1 Symbols

The following symbols are used in this manual and on the instrument:

-  Refer to the documentation for proper operating instructions.
-  Protective earth ground connection.
-  Fuse symbol with voltage and amperage information.
-  Caution, risk of electrical shock.
-  This product is "CE" certified.

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2.3.2 General Warnings and Cautions

The following general warnings and cautions are applicable to this instrument:

CAUTION
Although ESD protection is designed into the rack system, operation in a static-free work area is required.

CAUTION
Do NOT plug-in or unplug a laser diode fixture while the laser is energized.

CAUTION
There are no serviceable parts inside the Laser Diode Controller. Work performed by persons not authorized by Newport Corporation may void the warranty. For instructions on obtaining warranty repair or service please refer to Chapter 5 of this manual.

WARNING
Any use of the Custom Rack System not specified by Newport Corporation, or failure to comply with precautions or specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of this equipment. Violation of safety standards and misuse of equipment may cause damage or injury.

WARNING
HEAVY! Use extreme caution when moving (rolling) rack system, especially on inclines. Use two (2) people when moving rack cabinet.

WARNING
Always lock the front caster wheels when the rack is not moving.

WARNING
Disconnect AC power from the controller before cleaning.

WARNING
Live voltage is present after disconnection from supply until UPS is turned OFF.

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CHAPTER 3

3. Burn-In Rack System Use

3.1 Introduction

The Newport Custom Burn-In Rack System is designed for the complete burn-in testing of Chip On Submount (COS) style laser diode packages. The rack system can be installed and used as an independent, stand-alone system or it can be connected to a network with other systems. The following chapter provides information for safely and effectively setting up and using the Burn-In Rack System.

NOTE

Refer to the controller or other component's User's Manual for additional information.

3.2 Installation

The Newport Custom Burn-In Rack System is assembled in a complete self-contained cabinet that can be placed and used in many locations. However, read the following sections and all CAUTION and WARNING statements below before installing and powering up the rack system.

3.2.1 Rack Placement

The Newport Rack System can be installed and used as a stand-alone system or grouped with other rack systems. Ensure that the following points are taken into consideration when determining the location and actually performing the installation:

- Static-Free Work Area
- Rack Dimensions
- Rack System Cabinet Service Access Footprint
- Rack Weight
- Moving the Rack System
- Environment Ventilation
- Utilities Proximity

3.2.1.1 Static-Free Work Area

Ensure that the desired location is appropriately static-free. Proper building and finishing materials coupled with proper worker electrostatic-discharge (ESD) dissipation training and work habits should be utilized and maintained for the desired installation location.

CAUTION

Although ESD protection is designed into the rack system, operation in a static-free work area is required.

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3.2.1.2 Rack Dimensions

Listed below are the dimensions for the custom rack system cabinet, rounded up to the nearest tenth of an inch.

Height	Width	Depth
76.0 in.	23.6 in.	31.5 in.
(193.4 cm)	(59.9 cm)	(80.0 cm)

3.2.1.3 Rack System Cabinet Service Access Footprint

Ensure that the area in the back of the unit is unobstructed to allow access to the rear of the unit. Allow a minimum of 61 cm (24-in.) for full access to the front and rear of the rack system. Allow a minimum of 31 cm (12-in.) of clearance on top of the rack system for proper air fan exhaust.

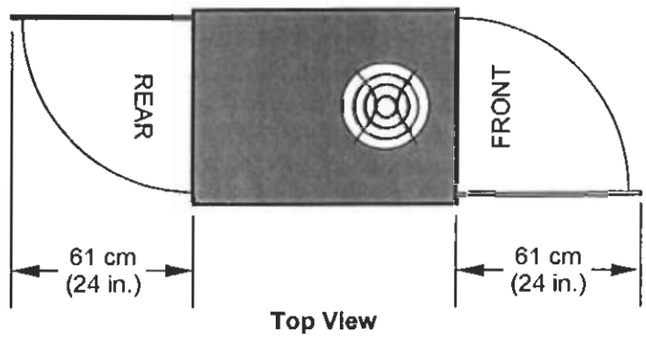


Figure 4 – Rack System Cabinet Footprint

3.2.1.4 Rack Weight

Ensure that the intended placement location and all paths leading to the location can support the full weight of the rack system. The system weighs approximately **650 pounds** (295 kilograms) with all components installed in the rack. The rack system has a large amount of weight on the upper half of the cabinet. Use extreme caution when moving and setting up the rack.

WARNING

HEAVY! Use extreme caution when moving (rolling) rack system, especially on inclines. Use two (2) people when moving rack cabinet.

WARNING

Always lock the front caster wheels when the rack is not moving.

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3.2.1.5 Moving the Rack System

The cabinet is fitted with heavy-duty casters that allow for easy movement of the cabinet and can fully support the weight of the rack system. Always use **two (2)** people to move the rack system. Always pay attention to the surroundings and ensure that each mover has a means to escape the path of the cabinet in the event that the cabinet should tip over or become uncontrollable on an incline.

WARNING

HEAVY! Use extreme caution when moving (rolling) rack system, especially on inclines. Use two (2) people when moving rack cabinet.

WARNING

Always lock the front caster wheels when the rack is not moving.

One person should guide the cabinet from the front and the other person should push from the rear of the cabinet. The cabinet should be supported (pushed and guided) on the upper half of the cabinet.

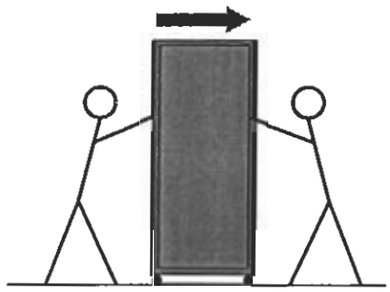


Figure 5 – Proper Rack System Cabinet Moving Techniques – Flat

However, when moving the cabinet down an incline, both people should move to the front of the cabinet, holding the upper half of the cabinet, to control the speed and direction of the cabinet.

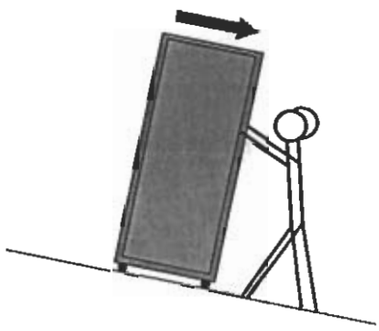


Figure 6 – Proper Rack System Cabinet Moving Techniques – Incline

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3.2.1.6 Ventilation

Ensure that the proposed location has adequate environment ventilation. The test system can generate large amounts of heat, which may affect system and worker performance if the heat is not properly expelled.

3.2.1.7 Utilities Proximity

Ensure that the required utilities can reach the rack system cabinet. Verify that the supplied power cord will reach the proper power source without the use of extension devices (cords, power strips, etc.). The single power cord that supplies power to the entire rack system exits the cabinet through an access hole in the bottom rear panel of the cabinet. Verify that data cables can reach the terminals on the bottom rear panel of the cabinet. Ensure that any other necessary utilities (such as air, water, etc. if installed) can be routed efficiently to the rack system cabinet.

3.2.2 Power Up Sequence

Ensure that the proper voltage is selected and setup on the uninterruptible power supply. The rack system is setup at the factory to operate on 220 VAC @ 50/60 Hz. If necessary, contact your Newport representative for additional setup information and options.

1. Connect the rack system power cord to an acceptable power source.

2. Switch the UPS master power switch is in the ON position and then press the power on/off button on the APC Smart-UPS to the ON position to supply power to the rack system.

   Please refer to the APC Smart-UPS User's Manual for additional setup and power up information.

3. Turn the laptop power button ON.

4. Ensure that all controller electronic displays are active.

3.3 Custom Rack System Familiarization

Described below are the components found in the rack system.

1. **16-Channel Chip on Submount Fixture** – Laser diode device fixture that holds a total of sixteen (16) devices secured to a temperature controlled mounting plate.

2. **Model 9008** – The Model 9008 Modular Controller houses and manages the thermoelectric cooling and heating (TEC) modules for the rack system.

3. **Model 9016** – The Model 9016 Modular Controller houses and manages the dual output laser diode driver modules for the rack system.

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4. **Agilent Technologies 34970A Data Acquisition/Switch Unit** – The Agilent 34970A Data Acquisition and Switch Unit is used log and acquire data from the test equipment.

5. **APC Smart-UPS 3000** – Provides clean, uninterrupted power for all devices connected to the UPS. The UPS guards against power spikes and drops that may damage equipment. Also provides battery backup for a limited amount of time in the event of a power failure, giving the user enough time to properly and safely turn the system power off.



3.3.1 COS Fixture Front Panel Familiarization

Described below is a 16-channel COS laser diode fixture front panel as shown in the figure below.

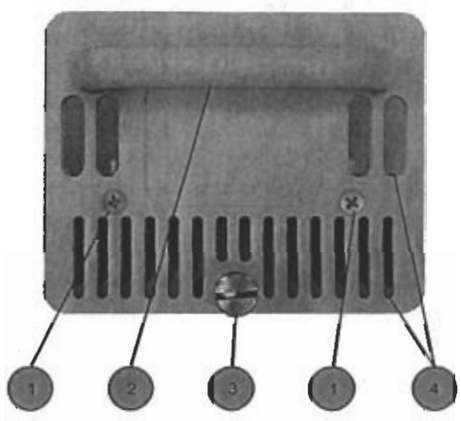


Figure 7 – Fixture Front Panel

1. **Fixture Assembly Screws** – Flathead screws used to affix the fixture drawer front to the fixture chassis. Do NOT remove these screws during normal operation!

2. **Fixture Drawer Handle** – Handle for the fixture drawer that is used to install and remove the fixture drawer from the fixture bays.

3. **Fixture Lock Screw** – Spring-loaded thumb screw used to lock the fixture in the fixture bay. The screw is also used to activate/deactivate the interlock for device testing. Testing cannot proceed if the screw is not properly engaged and tightened for the fixture.

4. **Ventilation Slots** – Allow air to move through the device fixture drawer.

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3.4 Laser Diode Protection Requirements

Laser diodes are extremely sensitive to electrostatic discharge and current spikes (transients). Damage can result in reduced output power, shift in threshold current, changes in beam divergence, and ultimately failure to lase (LED-like output only).

Newport precision current sources and controllers offer the most advanced laser protection features available, including power line filters, clamping current limits, and slow-start-up circuits.

However, no instrument can protect against all conditions, especially ESD at the laser. In order to optimize immunity from radiated or conducted electromagnetic energy, e.g. static discharge, the following guidelines for the laser diode must be adhered to:

- ESD is the primary cause of premature laser failure. As a minimum, use anti-static wrist straps (grounded with 1 MΩ resistor), anti-static floor coverings, grounded soldering irons, and grounded work areas. Ionized air blowers are also recommended.
- Laser diode leads should be shorted whenever the laser is transported or stored.
- Select a driver module with the lowest possible current rating that still exceeds the laser's maximum operating current.
- If industrial loads are switched in or near your laboratory, use isolation transformers and/or surge suppresser power strip with your laser current source.
- Isolate your laser current driver with a surge suppresser when using a common line with laboratory power supplies, soldering irons, or other electronic instruments. Avoid using such devices on the same surge suppresser as your laser source.
- Make sure the all cables to the laser diode are securely fastened. Avoid "bundling" current source cables with other cables in your laboratory,
- Set current and voltage limits to appropriate levels, following the laser manufacturer's recommendations (or to just above the expected operating current). Suggestions include setting the compliance voltage no more than 10% above V_f, and setting the current limit at or below the maximum operating current of the laser diode.
- Avoid ground loops. Do not ground the LDD cable shield to the laser diode body.

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3.5 Device Fixture Loading and Unloading

The Newport Burn-In Rack System is used to completely test Chip on Submount (COS) laser devices. The devices are loaded in the Newport test fixture drawers. The fixture safely holds the devices and incorporates the testing leads and detectors used during testing. Once the fixture is loaded with devices, the fixture can be installed in the fixture bay in the rack system. Refer to the following procedures for device fixture loading and unloading details:

- Device Fixture Loading and Unloading
- Fixture Installation and Removal

3.5.1 Device Fixture Loading and Unloading

The laser diode devices can be fragile and care should be taken when loading them in the fixture mounting plate and when removing the devices from the fixture mounting plate. Use proper laser diode insertion and removal methods according to procedures approved by the company and device manufacturer to load devices in the fixture mounting plate.

NOTE
Observe the rules for ESD compliance to prevent damage to the laser diode devices.

3.5.2 Fixture Installation and Removal

Use the following laser diode fixture installation and removal procedures to ensure that the laser diode fixtures are loaded and unloaded properly in the fixture bay.

NOTE
Observe the rules for ESD compliance to prevent damage to the laser diode devices.

3.5.2.1 Installing Fixture in Fixture Bay

Use the following procedures to install a laser diode fixture in the fixture bay.

1. Ensure that the laser diode driver controller is not running a test or that the controller is turned OFF.
2. Verify that all devices are properly loaded in the device carrier.
3. Holding the fixture drawer by the handle, align the fixture drawer with the fixture guides in the chassis.

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4. Slide the fixture straight in until it is fully seated in the fixture bay by pushing firmly with even pressure on the center of the fixture drawer.

NOTE
Seating the connectors should not require too much force. Ensure that the fixture is aligned with the connector before exerting excessive force on the fixture.

5. Tighten the spring-loaded drawer retaining screw by pushing in while rotating the screw *clockwise* manually or with a large flathead screwdriver. Note that this screw must be tightened to ensure that the interlock is engaged for the fixture.

6. Verify that the fixture is seated securely in the chassis. The devices in the chassis are now ready for testing.

3.5.2.2 Fixture Removal

Use the following procedure to remove the laser diode fixture drawer from the chassis.

1. Ensure that all tests are complete on the fixture to be removed.

NOTE
Other fixtures may be inserted and/or removed from other fixture bays while a test is running on one fixture within the chassis. Do not attempt to remove a fixture while a test is running on that particular fixture.

2. Turn the laser controller for the fixture OFF.

3. Using a large flathead screwdriver or by hand, loosen the spring-loaded drawer retaining screw by rotating the screw *counterclockwise*.

4. Using the handle on the front of the fixture drawer, carefully pull the fixture drawer straight out of the fixture bay.

5. Place the fixture drawer on a flat solid surface to remove the device carriers according to the above procedures.

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CHAPTER 4

4. Maintenance

4.1 Introduction

The Newport Rack System is designed for easy reliable usage. Do not attempt to remove the cover of a device fixture chassis or other rack component! Refer to the controller or other device's user's manual for additional maintenance and calibration information.

4.2 General Maintenance Schedule

Performing regular maintenance will help ensure long trouble-free operation. Use the following table to schedule regular preventive maintenanee and selected repair procedures. The intervals provided are recommendations and may be need to be adjusted to fit the needs of the users. Contact your Newport representative for assistance in scheduling maintenance and repairs.

Service	Recommended Interval
Wipe down all cabinet surfaces inside and outside	Every two weeks or as soon as necessary
Wipe down instrument front panels	Every two weeks or as soon as necessary
Clean device fixture surfaces	Every two weeks or as necessary
Vacuum inside of cabinet	Every three months or as necessary
Brush/vacuum exhaust fans (instrument and cabinet fans)	Every three months or as necessary
Clean fixture bays (drawer surfaces)	Every three months or as necessary

4.3 General Cleaning

Regular cleaning of the instrument and connectors will help to maintain the appearance and trouble-free operation of the rack system. Where applicable, always adhere to clean room cleaning policies and protocols when cleaning rack system components.

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4.3.1 Cleaning Cabinet Surfaces

Use a mild soap solution on a damp but not wet lint-free cloth to wipe off dirty surfaces on the outside of the rack cabinet or front panel.

WARNING
Disconnect AC power before cleaning.

4.3.2 Cleaning Exhaust Fans and Inside the Rack Cabinet

Over time, dust may accumulate in and on the rack cabinet. If the system is located in a clean room environment vacuuming will not be needed as often. However, if the system is not in a clean room environment, vacuuming may be required every 3 to 6 months.

To keep your custom rack system free from dust build up, regularly vacuum the exhaust fans. Vacuum the top of the cabinet and the top cabinet fan guard. Open the back door and gently vacuum the fans on the sides of each modular controller and the bottom cabinet fan guard.

WARNING
Disconnect AC power before cleaning.

4.3.3 Cleaning Fixture Chassis Surfaces

Using a cotton swab soaked with isopropyl alcohol, wipe the alignment tabs and slot area to remove any accumulations of dust or other debris. Avoid contact with the fixture connector located in the back of the fixture chassis. If necessary, use clean, dry compressed air to carefully blow any dust or debris away from the connector pins.

WARNING
Disconnect AC power before cleaning.

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CHAPTER 5

5. Factory Service

5.1 Introduction

This section contains information regarding calibration and obtaining factory service for the Laser Diode Test Controller and other custom rack system components.

5.2 Obtaining Service

To obtain information concerning factory service, contact Newport Corporation at 800-222-6440 (within the U.S.) or your Newport representative. Please have the following information available:

1. Instrument model number (on front panel)

2. Instrument serial number (on rear panel)

3. Description of the problem

If the instrument is to be returned to Newport Corporation, you will be given a Return Materials Authorization (RMA) number, which you should reference in your shipping documents as well as clearly marked on the outside of the shipping container.

Please fill out the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

Additional service information may be obtained from the Newport Corporation website:

http://www.newport.com

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Service Form

Newport	*Telephone (in the United States):* 800-222-6440	*FAX:* 949-253-1680
	Telephone: 949-863-3144	*Internet:* www.newport.com

Name _____ RMA Number _____

Company _____ (NOTE: Please obtain Return Materials

Address _____ Authorization (RMA) number prior to return of item.)

Country _____ Date _____

P.O. Number _____ Phone Number _____

Item(s) Being Returned:

Model Number _____ Serial Number _____

Description _____

Reason for return of goods (please list any specific problems) _____

_____

List all control settings and describe problem _____

_____

_____

_____ (Attach additional sheets as necessary)

System Diagram:

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Describe signal source. If source is laser, describe output mode, peak power, pulse width, and repetition rate.

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Where is measurement being performed?
(factory, controlled laboratory, out-of-doors, etc.) _____

What input power line voltage is used? _____ Variation? _____

Input Power Frequency? _____ Ambient Temperature? _____

Any Additional Information: (i.e. If any special modifications were made by the user, please describe below.)

_____

_____

_____

Model 8016 / 9008 / 9016
Modular Controller
User's Manual

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Certificate No.: FM 27207

Newport Corporation, Irvine, California, has been certified compliant with ISO 9002 by the British Standards Institution.

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EC DECLARATION OF CONFORMITY

Model 9008/Model 9016 Modular Controllers

We declare that the accompanying product, identified with the "CE" mark, meets all relevant requirements of Directive 89/336/EEC and Low Voltage Directive 73/23/EEC.

Compliance was demonstrated to the following specifications:

EN50081-1 EMISSIONS:
Radiated and conducted emissions per EN55011, Group 1, Class A

EN50082-1 IMMUNITY:
Electrostatic Discharge per IEC 1000-4-2, severity level 3
Rated Emission Immunity per IEC 1000-4-3, severity level 2
Fast Burst Transients per IEC 1000-4-4, severity level 3
Surge Immunity per IEC 1000-4-5, severity level 3

IEC SAFETY:
Safety requirements for electrical equipment specified in IEC 1010-1.

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45340 Beaune-la-Rolande, France

Jeff Cannon

General Manager-Precision Systems
1791 Deere Avenue
Irvine, Ca. USA

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CHAPTER 1

1. General Information

1.1 Introduction

This chapter describes the features, options, accessories, and specifications of the Model 8016 / 9008 / 9016 Modular Controller.

This manual will use "Model 9016" to refer to the Model 8016, Model 9008, and Model 9016 controllers, unless individual differences need to be specified. The Model 8016 can be ordered as an 8, 12, or 16 channel controller. The Model 9008 is an 8-channel controller using the same chassis as the Model 9016 (a 16-channel controller), with the same command and functional properties.

1.2 Product Overview

1.2.1 Product Features

- 8 or 16 module slots
- GPIB/IEEE 488.2 and RS-232C interface
- Link feature allows inter-module programming control not found in any other products

The Model 9016 Modular Controller is a result of Newport's continuing commitment to provide advanced laser diode instrumentation at affordable prices. Advanced designs guarantee that the Model 9016 will accommodate future modules making this controller the most complete instrument for laser diode control, characterization, and testing far into the future.

1.2.2 High Power Temperature Controller Fulfills All Your Thermoelectric (TE) Cooling Needs

The 40 Watt Model 8350 Temperature Controller module is offered to meet your most demanding TE cooling needs. It may be operated in one of three modes:

- Constant Temperature
- Constant Resistance
- Constant TE Current

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Short-term stability is better than 0.004°C while long-term stability is better than 0.01°C. Four sensor types are compatible with this TEC module:

- Thermistors
- AD590 series
- LM335 series
- 100Ω Platinum RTDs

With the sensor's calibration constants, the actual laser diode temperature can be displayed in °C on the front panel.

1.2.3 Full Feature LDD Modules Offer Complete Test and Characterization Capabilities

The flexible design of the laser diode driver modules offers the users many options to complete their desired testing. Advanced circuit designs and careful layout of laser diode driver modules provide users with an extremely low noise, highly stable output current. Current outputs can range from 25 milliamps to 10 Amps. An external analog modulation input allows precision control of the laser output for a variety of applications including power level control and wavelength tuning (on some models). A monitor photodiode may be zero biased for CW low noise applications or reversed biased up to 5 volts for high frequency modulation (on some models). All laser diode parameters are accessible with 16-bit resolution including the laser diode's forward voltage for full characterization using any of the 8500 series modules. Dual modules have all the same features except for external modulation and offer two independent channels in one module (on some models).

1.2.4 Combination LDD/TEC Modules Offer Full Laser Control In A Single Package

When temperature stabilization is required, the Combination LDD/TEC module gives you full control of your laser diodes. The TEC section temperature-stabilizes your laser diode. On the LDD section, an internal function generator provides modulation.

1.2.5 Comprehensive Safety Features Protect Your Laser Diode

Time-tested laser diode protection safety features are incorporated into every Laser Diode Driver offered. Input power module filters provide first stage protection against transients. Additional filtering and power regulation stages coupled with high-speed transient detection circuits let you operate your laser diode worry-free from transients. A slow turn-on sequence, multiple output shorting circuits, and an independent current limiting feature provide the superior protection you demand from all your laser diode instrumentation.

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1.2.6 Intuitive Controls and Large Graphics Display Simplify Control and Test Procedures

Improved data presentation and system control are achieved using an LCD graphics display. A MASTER display shows the entire system configuration as well as each module's status. "Soft Keys" guide you through initial system setup routines and the operation of each module. Real-time control of an output is accomplished either by entering the set point on the keypad or via the control knob. MENU and FUNC keys access saved system configurations and repetitive procedures. All controls are clearly marked and instructions easily understood for simple operation.

1.2.7 GPIB/IEEE-488.2 and RS-232 Interfaces Gives Power to Remotely Control and Collect Data

For ultimate control a GPIB/IEEE-488.2 interface is available. All control and measurement functions are accessible via the GPIB interface. In addition, standard serial RS-232C input and output ports allow several of the mainframes to be connected together to build large test and characterization stations. As your instrumentation needs change the Model 9016 Modular Controller will adapt to all your new laser diode applications giving you the ultimate in flexible laboratory equipment.

1.3 Safety Terms and Symbols

1.3.1 Terms

The following safety terms are used in this manual:

The **WARNING** heading in this manual explains dangers that could result in personal injury or death.

The **CAUTION** heading in this manual explains hazards that could damage the instrument.

The **NOTE** heading gives information to the user that may be beneficial in the use of this instrument.

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1.3.2 Symbols

The following symbols are used in this manual and on the instrument:

-  Refer to the documentation for proper operating instructions.
-  Protective earth ground connection.

1.4 General Warnings and Cautions

The following general warning and cautions are applicable to this instrument:

WARNING

This instrument is intended for use by qualified personnel who recognize shock hazards or laser hazards and are familiar with safety precautions required to avoid possible injury. Read the instruction manual thoroughly before using, to become familiar with the instrument's operations and capabilities.

WARNING

The American National Standards Institute (ANSI) states that a shock hazard exists when probes or sensors are exposed to voltage levels greater then 42 VDC or 42V peak AC. Do not exceed 42V between any portion of the Model 9016 (or any attached detector or probe) and earth ground or a shock hazard will result.

WARNING

To avoid electrical shock hazard, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury or death.

CAUTION

Do not exceed 240 VAC on the line input.
Do not operate with a line voltage that is not within the specified line setting. Too low of an input voltage may cause excessive ripple on the DC supplies. Too high of an input voltage will cause excessive heating.

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CAUTION
Although ESD protection is designed into the Model 9016, operation in a static-free work area is recommended.

CAUTION
Do not plug-in or unplug a module with the AC power on.

CAUTION
There are no serviceable parts inside the Model 9016. Work performed by persons not authorized by Newport Corporation may void the warranty. For instructions on obtaining warranty repair or service please refer to Chapter 7 of this manual.

CAUTION
Operating above +40°C can cause excessive heating and possible component failures.

CAUTION
Do not connect or disconnect a signal to the modulation input with the laser on.

CAUTION
Do not disconnect the photodiode with the laser on.

CAUTION
Before connecting the laser diode to the module, be sure that the LASER ENABLE is in the OFF position. Before turning on the laser output, be sure that the current limit and voltage compliance limit have been correctly set.

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CHAPTER 2

2. System Operation

2.1 Introduction

This chapter describes how to operate the Model 9016 mainframe. Module specific details can be found in the appropriate module section in this User's Manual.

2.2 Installation

CAUTION
Although ESD protection is designed into the Model 9016, operation in a static-free work area is recommended.

CAUTION
Do not plug-in or unplug a module with the AC power on.

2.2.1 AC Power Considerations

The Model 9016 has an auto-sensing power supply that operates from 86V to 240V.

CAUTION
Do not exceed 240 VAC on the line input.
Do not operate with a line voltage that is not within the specified line setting. Too low of an input voltage may cause excessive ripple on the DC supplies. Too high of an input voltage will cause excessive heating.

WARNING
To avoid electrical shock hazard, connect the instrument to properly earth-grounded, 3-prong receptacles only. Failure to observe this precaution can result in severe injury or death.

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2.2.2 Rack Mounting

The Model 8016, Model 9008, and Model 9016 are typically mounted in a rack system cabinet unless otherwise specified. Rack mounting tabs are integrated into the instrument's front panel for a seamless and sturdy instrument chassis mount.

2.2.3 Ventilation Requirements

The rear and side panel areas require two (2) to four (4) inches of clearance for adequate air circulation. Ensure that the fan area on the side of the unit and the air ventilation holes on the rear of the unit are unobstructed to allow for proper airflow through the unit.

2.2.4 Power-Up Sequence

With the Model 9016 connected to an AC power source, set the power switch to "|" or ON to supply power to the instrument and start the power-up sequence.

During the power-up sequence, the following takes place:
An initialization screen is displayed for between 15 to 20 seconds. The software version is displayed in the lower left corner of the screen. During this time a self-test is performed to ensure that the Model 9016 hardware and software are communicating. If the Model 9016 cannot successfully complete this test, an error message will be displayed.

After this test, the Model 9016 is configured to the state it was in when the power was last shut off and displays the master display.

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2.3 Introduction to the Model 9016 Front Panel

2.3.1 Front Panel Familiarization

Described below are the functions of each feature on the front panel (Model 8016 shown). Actual front panel layout and labeling for each of the different controllers (Model 8016/9008/9016) may vary slightly.

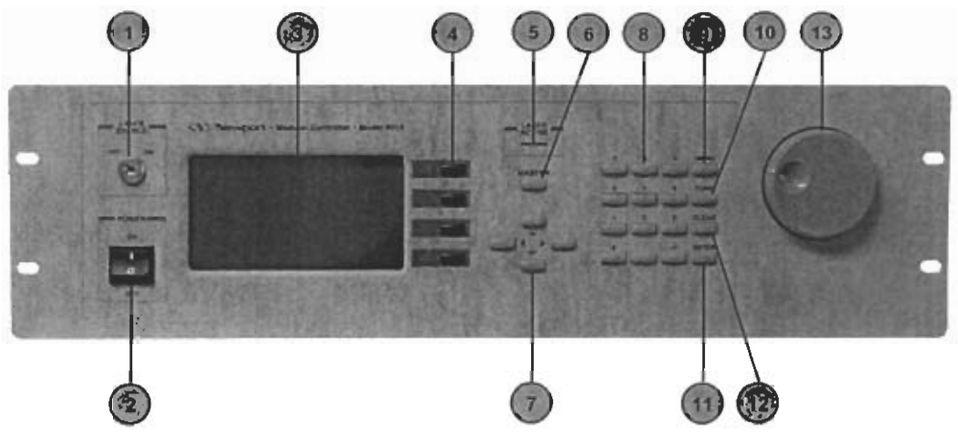


Figure 1 – Model 8016 Front Panel

1. **Laser Enable Key Lock** – Safety key lock to enable and disable the laser. Not available on all controllers.

2. **Power Switch** – ON/OFF rocker switch turns the unit power on or off.

3. **LCD Display** – LCD graphics display 128 (H) x 240 (W) pixels that displays the settings and readings.

4. **Display Soft Keys** – These are the four dark keys located to the right of the display. The function of these four keys varies depending on what menu is displayed. See **Section 2.4.1.4** for a complete description of soft keys.

5. **Laser Active LED** – Indicates one or more laser outputs are on.

6. **MASTER Key** – Switches to the master display from any screen in the system (see **Section 2.4.2**).

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7. **Numerical Keys** – Used to set parameter values of numerical entry fields in various screens.

8. **Cursor Control Keys** – Moves cursor up or down between editable data fields. The left arrow functions as a backspace in numerical entry fields, or as a previous choice in a multi-choice entry field. The right arrow functions as a next choice in multi-choice entry fields. See **Section 2.4.1.3** for a description of data fields.

9. **MENU Key** – Switches to the main menu from any screen in the system (see **Section 2.4.2**).

10. **FUNCTION Key** – Used to execute user macros and special functions (see **Section 2.4.2**).

11. **ENTER Key** – Used to enter parameter values set with the numerical or left/right arrow keys.

12. **CLEAR Key** – Clears numeric data typed, but not yet entered, in an edit field.

13. **Knob** – Used to continuously vary certain parameters. The knob has an acceleration factor that causes the rate of change to increase as the knob is turned faster. Turning slowly allows for a fine adjustment at the smallest displayed decimal place.

2.4 General Operation

2.4.1 Display Elements

The Model 9016 uses a graphical display to depict information about the current state of the system. The display can be broken down into four basic elements: static fields, non-editable data fields, editable data fields, and soft key labels.

2.4.1.1 Static Fields

Static fields are elements on the display that do not change from moment to moment. These can include help text, screen titles, and error messages.

2.4.1.2 Non-Editable Data Fields

Non-editable data fields are used mainly to display read back information, such as temperature, laser current, etc. These fields can have a prefix or suffix label, such as "**Io=**" or "**mA**", and are periodically updated by the system.

2.4.1.3 Editable Data Fields

Editable data fields are used for module and system settings such as current set point, temperature set point, display contrast, etc. An editable field has four distinct display states: focused, focused and editing, non-focused, and read-only.

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The focused state indicates that the field has the input "focus." When the a field has the focus, it is shown in reverse color (white text on black background if the display is not inverted). Any keyboard entry or knob adjustment will be applied to the field, and only one field at a time on the display can have focus. Move between fields using the up and down arrow keys.

When the user starts to make changes to the data field using the numeric or left/right arrows, the field enters the focused and editing state. In this state, a box is drawn around the data field to indicate changes are being made to the value. See **Section 2.4.1.3.1** below for a description of how the keyboard operates while in this state. The box will remain around the field until **Enter** or **Clear** is pressed, or the user moves focus to another field using the up or down arrows.

The non-focused state indicates that the field is editable, but does not currently have the focus. These fields are drawn with a solid underline. Using the up and down arrows, focus can be moved to these fields.

When the editable data field is in the read-only state, it looks and acts exactly like a non-editable data field. Like the non-editable data field, it cannot have focus, and the up or down arrow keys will skip over the field. This state is used primarily to lockout specific data elements from front panel change when the Model 9016 is in remote mode. Any IEEE-488 or RS-232 communication will place the unit in remote mode, and editable fields that are protected during remote operations change to the read only state.

2.4.1.3.1 Changing Data Fields

A data field can only be changed from the front panel when the field has the focus. Some fields are numeric-based, such as current set point or temperature limits. Other fields are multi-choice fields, such as Yes/No fields. Both types are changed with the left and right arrows or the knob. Below is a description of each of the keys used for front panel input.

NOTE

If functions are not setup/supported for a particular key, the Model 9016 will beep.

Perhaps the most important key is the **Enter** key. Any changes to a data field made with the numeric pad or left/right arrows are not put into effect *until the enter key is pressed.* It is a common mistake to type in a number and press the up or down arrow to move to the next field or change to another screen without first pressing **Enter** to store the new value. If focus is removed from the field before the **Enter** key is pressed, it reverts to its previous value, discarding the user's input. The **Clear** button is used to revert a value being changed back to the previous value before **Enter** is pressed.

When changing values with the knob, if the focused field is *not* currently being edited, **changes made with the knob take effect *immediately.*** There is no need to press **Enter** after making changes with the knob. If a field *is* being edited, then the knob acts as a simple up/down adjustment to the edited value, and these changes do not take affect until the **Enter** key is pressed.

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There are a few other keys the operator can use during input. The +/- button is used to change the sign of a numerical input, such as 45.0 to -45.0, but does not otherwise affect the value. If the field is a numeric field, the left arrow functions as a backspace key, allowing correction of a mistyped digit. If the field is a multi-choice field, such as a Yes/No field, the left and right arrows function as previous and next choice, respectively.

2.4.1.4 Soft Key Labels

Soft key labels are labels for the buttons located to the immediate right of the display. Each label either indicates the action that is performed when the corresponding key is pressed (such as changing screens), or the state of a data element in the system (such as laser output OFF/ON). In the first case, pressing the corresponding soft key will cause the action to happen, such as changing to the setup screen when the **Setup** soft key is pressed from a module's main screen. In the second case, pressing the soft key will change the associated state, such as turning a laser output ON. Like the editable data fields above, certain soft keys are programmed to enter a read-only mode when the unit enters remote mode. Read only soft keys are displayed as an outline rather than a solid block.

NOTE

If functions are not setup/supported for a particular key, the Model 9016 will beep.

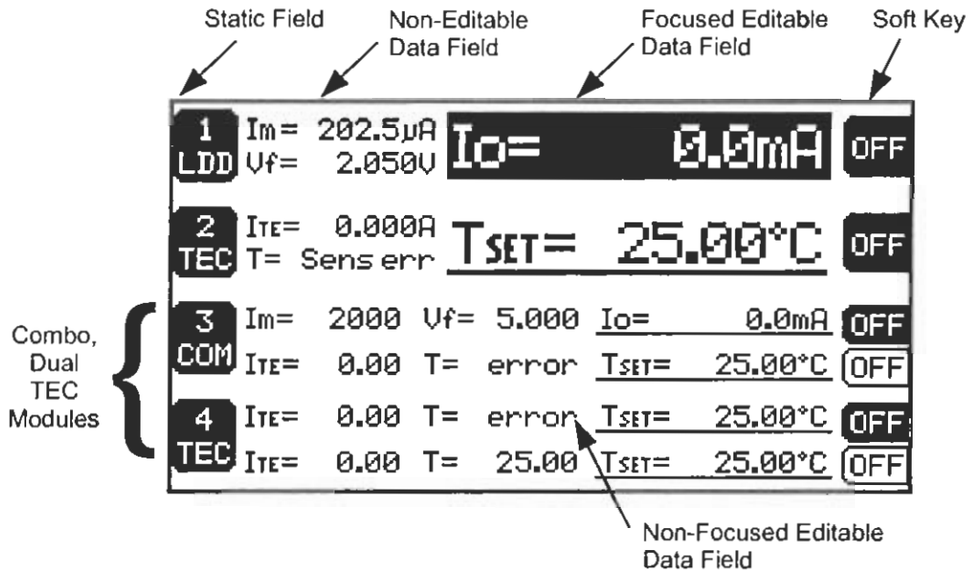


Figure 2 – Various Data Fields Found on the Master Screen

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2.4.2 Menu Structure

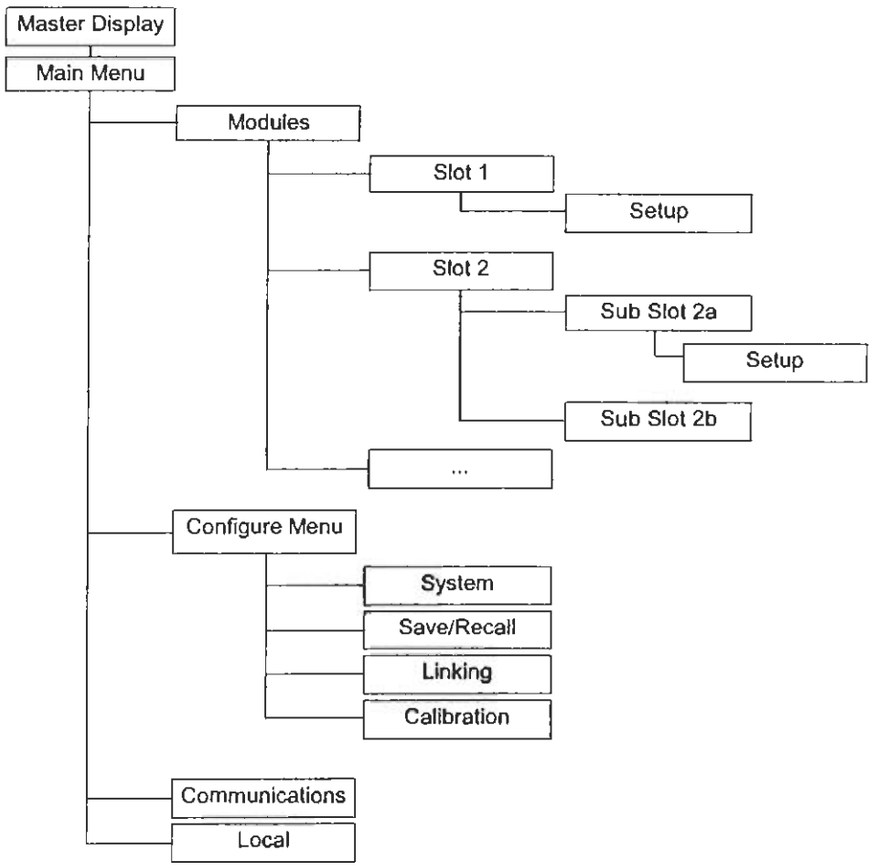


Figure 3 – Model 8016/9008/9016 Menu Structure

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2.4.3 Master Display

The Master Display is shown in **Figure 4** and **Figure 5**. This is the highest-level display and indicates the general status of up to four modules or sub modules in the system at a time.

The master display has two modes of operation, **Expanded** and **Condensed**. **Figure 4** shows the master display as it would be viewed in **Expanded** mode. Each channel is displayed in one fourth of the display. When the system has modules with multiple sub modules, such as the dual TEC or Combo module, each sub module is displayed separately, and the module ID box on the left shows the slot number with an 'a', 'b', etc. after the module number to indicate the sub module. When the total number of modules and sub modules exceeds four, pressing the **MASTER** key repeatedly pages down though the list of modules.

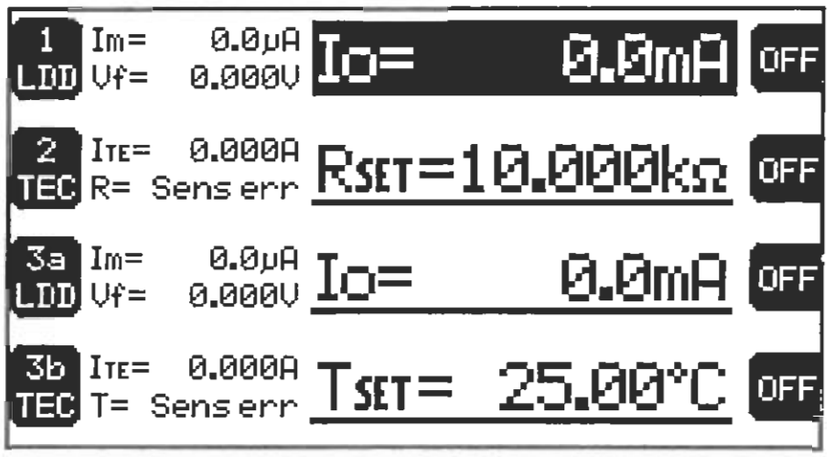


Figure 4 – Master Display, Expanded Display

Figure 5 shows the master display in **Condensed** mode. Instead of displaying a combo or dual module as two separate elements on the master display, they are combined into a single element. Notice that each combo and dual element has two ON/OFF soft keys, one active and the other disabled. In this mode, the **MASTER** button toggles the active ON/OFF button for the combo/dual modules.

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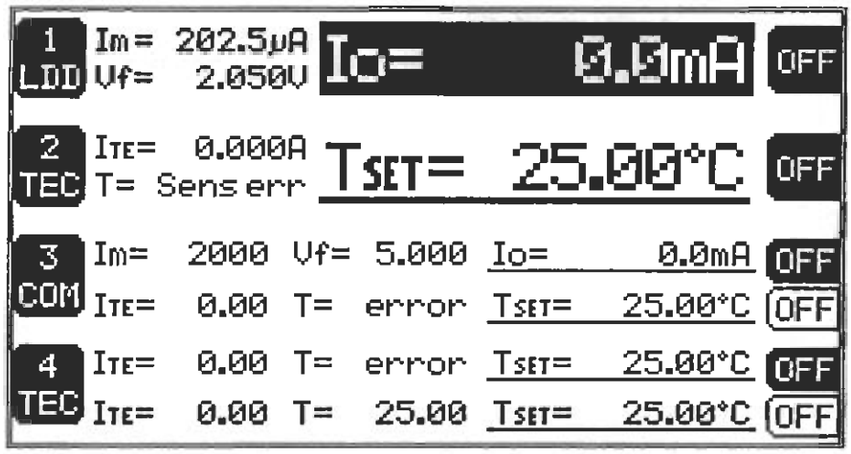


Figure 5 – Master Display, Condensed Mode

The Master Display can be accessed from any screen in the system by pressing **MASTER**. For slots not containing a module, the text "Not installed" is displayed next to the slot number.

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2.4.4 Main Menu

The Main Menu is shown in **Figure 6**. This is the second highest menu and is used to access four general system functions:

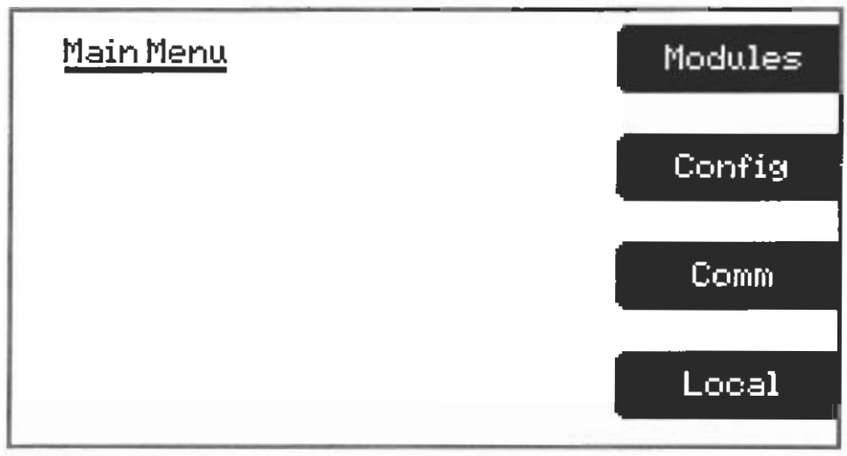


Figure 6 – Main Menu

1. **Modules** – Pressing the adjacent soft key gives access to each of the four "slot" positions for setup and control of each module.

2. **Config** – Pressing the adjacent soft key gives access to the general configuration menu, with soft keys to access system configure, save/recall, and linking screens.

3. **Comm** – Pressing the adjacent soft key gives access to the GPIB and RS-232 parameters.

4. **Local** – When the unit is in remote mode, either through GPIB or RS-232C communications, the **Local** soft key will be available. Pressing it returns the Model 9016 to a local state. When in local mode, this key does *not* appear on the display. The Model 9016 is placed in remote mode through GPIB or RS-232 communication, or during the execution of a macro or special function.

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2.4.5 Configure Menu

The configure menu provides access to the system configuration, save/recall, linking, and calibration screens.

2.4.6 System Configure Screen

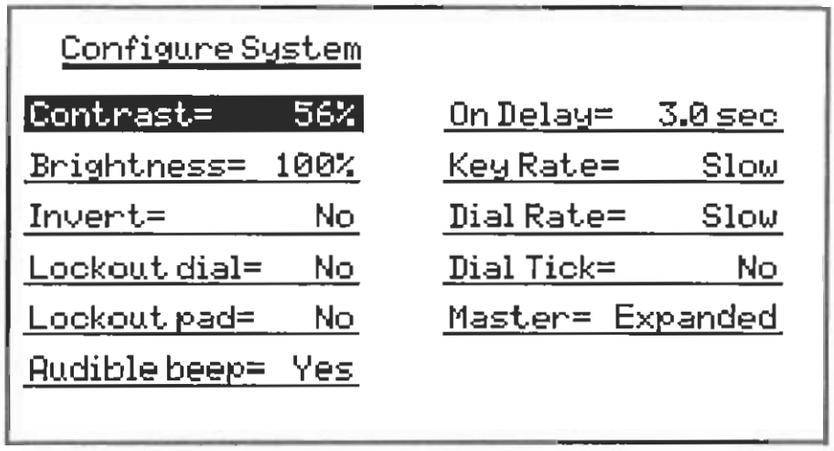


Figure 7 – Configure System Screen

The System Configure screen controls basic operation of the Model 9016 system.

1. **Contrast** – Adjust the contrast to optimize the viewing angle on the LCD display.

2. **Brightness** – Adjust the brightness to adjust the backlighting intensity on the LCD display.

3. **Invert** – Selecting "Yes" inverts the screen to be white text on a black background rather than black text on a white background (No).

4. **Lockout dial** – Selecting "Yes" disables the dial to avoid accidental changes in active data fields when the dial is bumped.

5. **Lockout pad** – Selecting "Yes" locks out the data entry portion on the keypad. Navigation keys, such as up and down, **MENU**, and **MASTER** continue to work.

   Note that both the Lockout dial and Lockout pad settings are temporarily suspended while in the Configure System Screen, allowing the dial and keypad lockout settings to be changed while in this screen.

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6. **Audible Beep** – Controls the system's audible beeper. The beeper indicates errors, invalid data entry, and other situations where the Model 9016 needs to alert the user.

7. **On Delay** – Controls the delay time from the moment a Laser Diode Driver is turned on by the user to the actual time the output is energized. The delay time is programmable from 0 seconds to 30 seconds. The default setting is three (3) seconds.

8. **Key Rate** – Controls the speed at which, when a key is held down, it repeats. Settings are Slow, Medium, and Fast.

9. **Dial Rate** (similar to the **Key Rate** setting) – Controls the acceleration of the dial as it is turned. Settings are Slow, Medium, and Fast.

   When set to Yes, **Dial Tick** will produce a tick sound for each increment or decrement of the dial.

10. **Master** – Controls the format of dual and combo modules on the master display (see **Section 2.4.3**). Settings are Expanded and Condensed.

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2.4.7 Save/Recall Screen

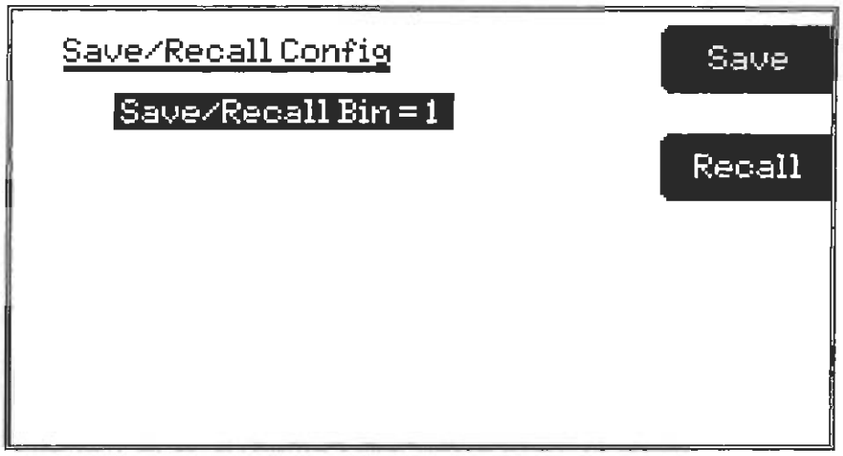


Figure 8 – Save/Recall Screen

The Save and Recall functions are used to store and retrieve Model 9016 setup configurations for future use. For example, a specific test setup may be saved for later use, and then another setup may be used presently. Then, when the user desires to perform the specific test, its setup is simply recalled.

Non-volatile memory is used for saving the instrument parameters. When a save operation is performed, all of the parameters that are currently in effect on the Model 9016 are stored. The user selects a "bin" number for saving the parameters. Then, when that "bin" number is recalled, the Model 9016 is restarted and the parameters are reconfigured to the previously stored values.

A special "bin 0" is reserved for the reset state. Recalling bin 0 will reset all modules in the system to factory defaults.

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2.4.8 Linking Screen

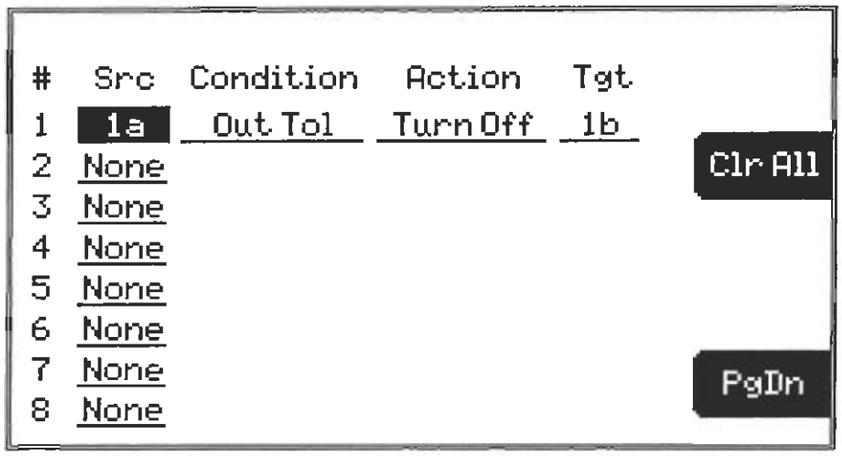


Figure 9 – Link Screen

The linking screen allows the condition of one module to affect one or more other modules in the system. The **Clr All** soft key allows clearing of all defined links. To clear a single link, simply change the **Src** field to **None**. The system supports up to 32 links.

As an example of linking, consider a system containing a laser and TEC module in slots 1 and 2, respectively. The TEC module cannot operate when the laser is off because condensation will form on the laser and may damage it. However, the TEC must be turned on whenever the laser is on to protect it from overheating. First, program the TEC high and low temperature limits to the operating range of the laser. The following three links will then ensure that these conditions are met:

Link #	SRC	Condition	Action	Tgt
1	1	On	Turn On	2
2	1	Off	Turn Off2	-
3	2	T Lim	Turn Off1	-

Link function explanations:

- Link #1 turns ON the TEC whenever the laser is ON.
- Link #2 turns OFF the TEC whenever the laser is OFF.
- Link #3 turns OFF the laser if the TEC exceeds its temperature limits.
- There is no need to define a fourth link to turn off the TEC on a T Lim condition because if Link #3 turns off the laser, Link #2 will automatically turn off the TEC.

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As shown in the example above, it is possible to setup a level of control that would normally only be possible with a computer-based monitoring system.

When the unit enters remote mode, the linking screen is not accessible.

2.4.9 Calibration Screen

See the calibration chapter for detailed information.

2.4.10 Configure Communications Screen

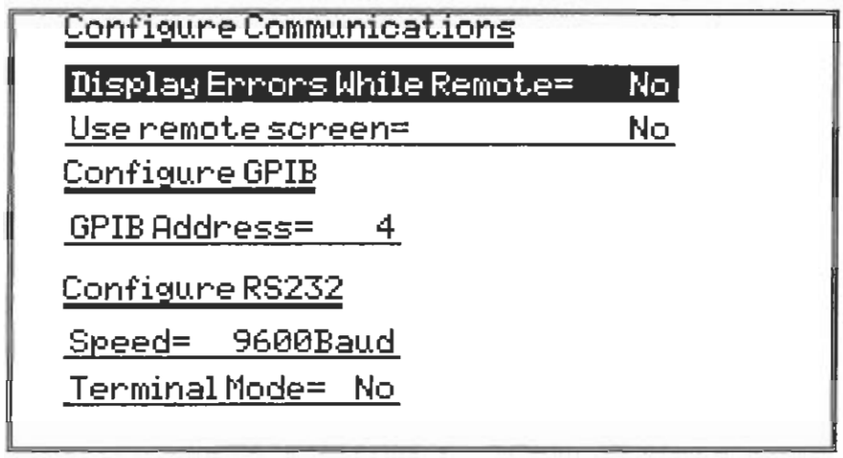


Figure 10 – Configure Communications Screen

1. **Display Errors While Remote** – Controls the announcement of errors on the Model 9016's screen. When this setting is set to **Yes**, then all errors will pop up on the Model 9016 screen, even in remote mode. When the setting is **No**, errors are not displayed on the Model 9016 screen while in remote mode (but will be displayed in local mode). This *does not* affect the error list which is queried via the GPIB **ERR?** query. It is intended to keep the Model 9016 screen free of error messages while operating in remote mode.

2. **Use remote screen** – Used to improve throughput on fully loaded Model 9016 systems. Although throughput improvement is not significant, it may slightly reduce the latency time between the sending of a GPIB command and the actual time the command is processed. When this setting is **Yes**, the Model 9016 will switch to a "remote" screen when entering remote mode, although the **MENU** and **MASTER** buttons can be used to switch out of this screen. When leaving remote mode, the Model 9016 will switch to the master display, unless the user has left the remote screen.

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3. **GPIB Address** – Sets the IEEE-488 device address assigned to the Model 9016. Valid addresses are 1 to 31.

4. **Speed** – Sets the baud rate of the RS-232 serial port.

5. **Terminal Mode** – Enhances the interface with the Model 9016 when communicating via the RS-232 in a ANSI/VT100 compatible serial terminal.

See the ***Newport Computer Interfacing Manual*** for additional information on **Terminal Mode** and **Speed**.

2.4.10.1 Error Message Control

Error messages may appear on the display when error conditions occur which force the output off or reflect hardware errors in the Model 9016. Chapter 8 contains an explanation of the error message which may be reported by the Model 9016.

NOTE

Setting **Display Errors While Remote** to **No** may disable display of error messages on the Model 9016 screen while in remote mode. Errors will continue to accumulate in the error queue, but will not be displayed on-screen.

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2.5 Rear Panel Familiarization

2.5.1 GPIB Connector

The GPIB connector, located on the back of the microprocessor module, allows full remote control as described in the ***Newport Computer Interfacing Manual***. The connector accepts a standard IEEE-488 cable for remote control, and uses Metric lock screws.

2.5.2 RS-232 Connector

The Model 9016 has one RS-232 connector located on the back of the microprocessor module for remote control via the serial port. See the ***Newport Computer Interfacing Manual*** for a more complete description of the RS-232 interface.

2.5.3 Input Power Connector

Accepts a standard line cord for AC input.

CAUTION

Do not exceed 240 VAC on the line input.
Do not operate with a line voltage that is not within the specified line range. Too low of an input voltage may cause excessive ripple on the DC supplies. Too high of an input voltage will cause excessive heating.

2.6 Warm Up and Environmental Consideration

Operate the Model 9016 at an ambient temperature in the range of 0 to +40°C. Storage temperatures should be in the range of -20 to +60°C. To achieve rated accuracy, let the Model 9016 warm up for 1 hour. For greatest accuracy, recalibrate when ambient temperature changes more than a few degrees.

CAUTION

Operating above +40°C can cause excessive heating and possible component failures.

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CHAPTER 3

3. Laser Diode Driver Module Operation

3.1 Laser Diode Driver Module

3.1.1 Introduction

The 8500 and 8600 Series laser modules are precision current source modules for use in the Model 9016 Modular Controller. It may be installed in any of the bays at the rear of the Model 9016 and may be interchanged with any other module.

Features of the 8500 and 8600 series include:

- Service-free modularity (calibration information is stored on the module)
- Closed-case calibration
- High-stability, low noise design
- Flexible setup with Model 9016 save/recall front panel functions
- Photodiode feedback control mode
- Modulation input (on some models)
- Fault detection
- Current and voltage limiting

3.1.2 Installation

This section describes the procedures for installing and removing a module from the Model 9016.

NOTE

The save/recall bin information will be lost upon detecting any change in the module configuration (such as installing a new module).

CAUTION

Although ESD (electrostatic discharge) protection is designed into the module, operation in a static-free work area is recommended.

CAUTION

Do not plug-in or unplug a module with the AC power on.

To install the module into the Model 9016, follow these steps:

1. **Turn the Model 9016 power OFF.** Installing a module with the power ON can damage the module and the Model 9016.

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2. Place the module into an open bay on the back of the Model 9016 and slide the module into place. There are tracks at the top and bottom of the bay that guide the module into place. Screw the module locking screws into the back panel to secure the module.

To remove the module from the Model 9016, follow these steps:

1. **Turn the Model 9016 power OFF.** Removing a module with the power ON can damage the module and the Model 9016.

2. Unfasten the module locking screws that secure the module to the Model 9016 back panel.

3. Grasp the module by the handle that extends from the bottom of the back panel. Gently, but firmly, pull the module out.

3.1.3 Laser Diode Protection Requirements

Laser diodes are extremely sensitive to electrostatic discharge and current spikes (transients). Damage can result in reduced output power, shift in threshold current, changes in beam divergence, and ultimately failure to lase (LED-like output only).

Newport precision current sources and controllers offer the most advanced laser protection features available, including power line filters, clamping current limits, and slow-start-up circuits.

However, no instrument can protect against all conditions, especially ESD at the laser. In order to optimize immunity from radiated or conducted electromagnetic energy, e.g. static discharge, the following guidelines for the laser diode must be adhered to:

- ESD is the primary cause of premature laser failure. As a minimum, use anti-static wrist straps (grounded with 1 MΩ resistor), anti-static floor coverings, grounded soldering irons, and grounded work areas. Ionized air blowers are also recommended.
- Laser diode leads should be shorted whenever the laser is transported or stored.
- Select a driver module with the lowest possible current rating that still exceeds the laser's maximum operating current. For example, the Model 6505 500mA laser driver module should drive a laser with a maximum operating current of 150 mA.
- Recess the laser diode inside a metal shielded enclosure, such as a Model 700C laser diode mount, recessed at least 0.25-in. with the minimum aperture necessary to allow beam exit (less than 0.125-in.).
- If industrial loads are switched in or near your laboratory, use isolation transformers and/or surge suppresser power strip with your laser current source.
- Isolate your laser current driver with a surge suppresser when using a common line with laboratory power supplies, soldering irons, or other electronic instruments. Avoid using such devices on the same surge suppresser as your laser source.

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- Make sure the all cables to the laser diode are securely fastened. Avoid "bundling" current source cables with other cables in your laboratory,
- Set current and voltage limits to appropriate levels, following the laser manufacturer's recommendations (or to just above the expected operating current). Suggestions include setting the compliance voltage no more than 10% above V_f, and setting the current limit at or below the maximum operating current of the laser diode.
- Avoid ground loops. Do not ground the LDD cable shield to the laser diode body.

Added protection from electrostatic discharge (ESD) can be obtained by inserting ferrite beads and capacitors near the laser diode as shown below.

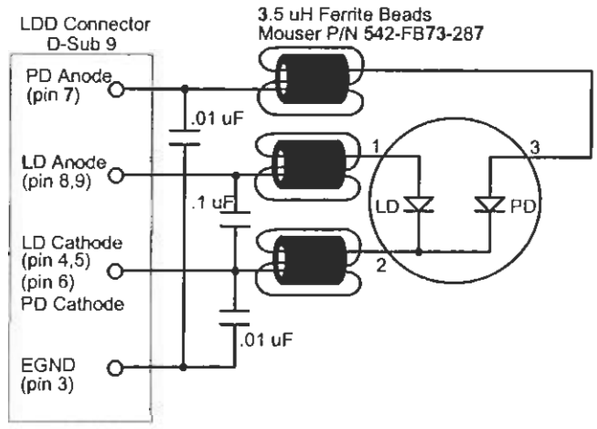


Figure 11 – Laser Diode Protection Circuit

NOTES:

1. When applying high-speed modulation to the laser diode, this circuit may reduce the maximum modulation frequency.
2. The temperature controlled mount is earth grounded through pins 5 and 6 of the TEC D-sub connector.
3. On all 700 series mounts, the temperature control cable must be connected for maximum protection.
4. For maximum laser diode protection, the diode should be recessed, as in the 700-C mount.

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3.2 Laser Safety Features

3.2.1 Conditions That Can Automatically Shut Off the Laser Output.

- Laser Open Circuit[1]
- Laser Compliance Voltage Limit[1]
- Laser Hard Current Limit[1]
- Laser Interlock State Changed[1]
- Laser Photodiode High Current Limit
- Laser Photodiode High Power Limit
- Laser Intermittent Contact (if enabled, default disabled)
- A Linked Function

With the exception of the linked functions, some of these conditions can be disabled by clearing the appropriate bits in the **LASer:ENABle:OUTOFF** register. See the ***Newport Computer Interfacing Manual*** for additional information.

3.2.2 Key Switch Interlock

The LASER ENABLE key switch on the front panel will shutoff, or not allow to be turned on, any laser outputs while in the OFF position, per CDRH requirements.

3.2.3 Turn On Delay

The Model 9016 is CDRH Compliant with a user programmable turn on delay. The default turn on delay is three seconds, but is user programmable from 0 to 30 seconds. The delay setting is in the system configure screen, which can be reached by pressing the **MENU** button, followed by the **Config** soft key, then the **System** soft key. The field is labeled **On Delay**.

[1] This condition will always shutdown the laser output, and cannot be disabled.

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3.3 The Laser Connectors

On standard LDD connectors, a 9-pin female D-connector is used for input and output connections, as shown by the pin-out diagram below. A 15-pin female D-connector is used on single connector combo LDD/TEC modules.

Pin	Description
1,2	Interlock
3	Chassis Ground
4,5	Laser Cathode
6	Photodiode Cathode (+)
7	Photodiode Anode (-)
8,9	Laser Anode

Table 1 – Laser Connector Pinouts

For single connector combo LDD/TEC modules, a 15-pin male D-connector is used, as shown below.

DB15 Connector

Pin	Description
1	TE+
2	TE-
3	SENSOR+
4	SENSOR-
5	PD Anode
6	PD Cathode
7	LD Anode
8	LD Cathode
9	TEC V Sense+
10	TEC V Sense-
11	Interlock
12	Interlock (GND)
13	No Connect
14	LDD V Sense+
15	LDD V Sense-

Table 2 – Combo Single DB15 Connector Pinouts

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For single connector dual LDD modules, a high density 26-pin male D-connector is used, as shown below.

HD26 Connector

Pin	Description	Pin	Description
1	Analog Ground	14	Analog Ground
2	B BOT	15	A LD Cathode
3	B TOP	16	A LD Anode
4	Vpow	17	Vpow
5	Analog Ground	18	Digital Ground
6	A BOT	19	B PD 2 Cathode
7	A TOP	20	B PD 2 Anode
8	Vpow	21	B PD 1 Cathode
9	Interlock	22	B PD 1 Anode
10	Analog Ground	23	A PD 2 Cathode
11	B LD Cathode	24	A PD 2 Anode
12	B LD Anode	25	A PD 1 Cathode
13	Vpow	26	A PD 1 Anode

Table 3 – Dual LDD Single HD26 Connector Pinouts

3.3.1 Modulation

CAUTION
Do not connect or disconnect a signal to the modulation input with the laser on.

A BNC connector is provided on some modules for an external modulation signal. See **Section 3.5.3.2** for a description of modulation bandwidth.

Each 100 mV change in the modulation input is equal to 1% of the maximum drive current of the module. For example, 100 mV input on a 6560 module (6 A driver) would equate to 60 mA of drive current. However, regardless of the input voltage, the current cannot exceed the current limit.

3.3.2 Photodiode Bias Control

An adjustment is provided for 0V to 5V reverse bias adjust on single channel modules. Dual and Combo modules do not have a photodiode bias control and have fixed bias at either 0V or 5V.

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3.3.3 Photodiode

A BNC connector is provided for photodiode connections. It is the same input as the PD Anode/PD Cathode pins in the D-connector with the anode on the shell. Combo and dual modules do not have this BNC connector.

CAUTION
Do not disconnect the photodiode with the laser on.

3.3.4 Interlock

The laser can be interlocked using one of the options listed below with the proper setup:

Normal – The interlock connector is the typical method for interlocking the laser involves connecting the interlock pins together to complete the circuit and allow the laser operation. Two pins (typically 1 and 2) are shorted out on the LDD connector to enable the activation of the LDD.

On/Off – Shorting and not-shorting the enable pins will turn the LDD ON or OFF.

Fixture – The laser diode drivers are grouped. The first LDD's interlock pin in the group interlocks the remaining laser diode drivers. The fixture size (number of modules) is set by the FIXTURESIZE command or through the UI at the configure system menu.

Fix(ture)/Ser(ial) – Two connector pins (RXD and TXD) of the RS-232 port are used to interlock fixture 1 and 2 respectively. Using this interlock requires a modification to the hardware.

Fix(ture)&LED – This has the same functionality as the Fixture interlock (described above) with an additional LED indicator feature. The RS-232 port has modified hardware that controls two LEDs that reflect the LDD ON state.

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3.4 Connecting to Your Laser

When connecting laser diodes and other sensitive devices to the module, we recommend that the Model 9016 be powered-up and the laser output be off. In this condition, a low impedance shunt is active across the output terminals. When disconnecting devices, it is only necessary to turn the laser output OFF.

On connectors with multiple pins assigned to the same function, these pins are tied together to provide greater contact area for the output connection.

NOTE

Whenever external connections are made to multi-pin outputs, these connector leads should be tied together to ensure the greatest laser diode safety.

We also recommend the use of a D-connector for your interface rather than binding posts, or loose wires. This will insure the best connection.

3.4.1 Laser Diode Connections and Shielding

CAUTION

Before connecting the laser diode to the module, be sure that the LASER ENABLE is in the OFF position. Before turning on the laser output, be sure that the current limit and voltage compliance limit have been correctly set.

NOTE

The cable connections to the laser must be secure to avoid an open circuit, should they be jostled or bumped. Should an open circuit occur during laser operations, the laser output will normally be turned off automatically.

Special circuits in the laser module are present for detecting intermittent contacts and connections. These circuits detect the abrupt change in current that occurs when the output circuit is opened.

Experience indicates that should an open circuit occur during laser operation, the laser may be damaged. Therefore, secure cabling is important.

NOTE

Although the Intermittent Contact circuitry works well in helping to protect the laser diode, there is still a danger in having poor connections, as no circuit can protect completely.

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NOTE

It is possible with some modes of modulation, especially square-wave, to trigger the intermittent contact circuit and cause a shutdown. If this is the case for you, the intermittent contact feature may be disabled in the laser set up menu, with reduced laser protection in the case of poor connections.

It is recommended that the connections to the module output be made using twisted wire pairs with an earth-grounded shield. The output terminals of the module are left floating relative to earth ground to suppress AC power-on/power-off transients that may occur through an earth-ground path. If the output circuit is earth-grounded at some point (such as through the laser package and mount), the user must be careful to avoid multiple earth grounds in the circuit. Multiple earth grounds may provide circuit paths that short the driver and may damage the laser.

3.4.2 Photodiode Feedback Connections

The photodiode signal is input on the D-connector and/or the photodiode BNC (if available).

Many laser diode modules contain an internal photodiode that monitors the back-facet emission of the laser. Usually, one side of the photodiode is internally connected to either the laser anode or cathode. **Figure 12** through **Figure 15** show the recommended connections and shielding for the various configurations of laser diode modules and photodiode feedback schemes. The photodiode circuit is isolated from ground and the laser circuit.

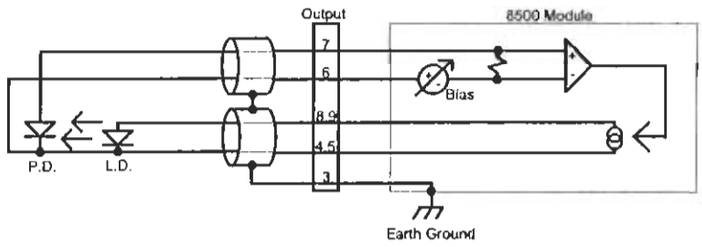


Figure 12 – Common Laser Cathode / Photodiode Cathode

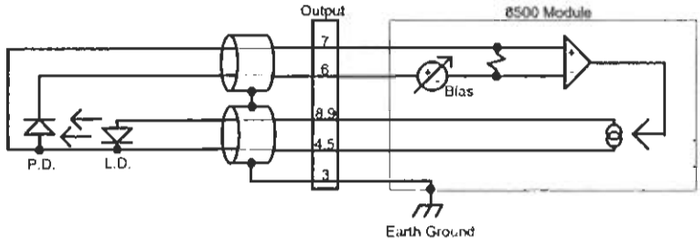


Figure 13 – Common Laser Cathode / Photodiode Anode

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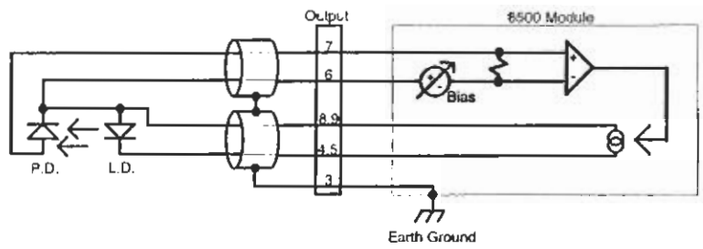


Figure 14 – Common Laser Anode / Photodiode Cathode

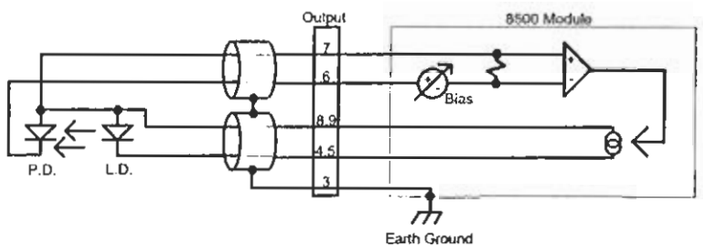


Figure 15 – Common Laser Anode / Photodiode Anode

3.4.3 Sync Out Option

The Sync Out connector on the back of the 8600 series is a custom option. Normally the connector will not be loaded.

3.4.4 Grounding Consideration

Some laser outputs may be floating, but most are either common anode or common cathode. On floating laser outputs, neither side may be grounded. On common type outputs, only the common side may be earth grounded.

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3.5 Laser Module Operation

3.5.1 Quick Start

After the power-on sequence is complete, the Model 9016 goes to the Master display.

To set up a laser module:

1. Press the **MENU** button, then the **Modules** soft key.
2. Select the slot that the module resides in.
3. Select the **Setup** soft key. At this point, the display shows all laser parameters.
4. Using the cursor keys, numerical keypad, knob, and ENTER, select the desired functions and set the parameter values.
5. When finished, return to the laser display by selecting the **Prev** (previous) soft key.
6. Using the numerical key pad and ENTER, or using the knob, enter the desired set point value.
7. Press the **OFF** soft key to operate the laser (the **OFF** changes to **ON**).
8. Press the **ON** soft key to turn the laser OFF.

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3.5.2 Laser Main Screen

The laser main screen in shown in **Figure 16** and described in detail below. Certain features are not available on some modules.

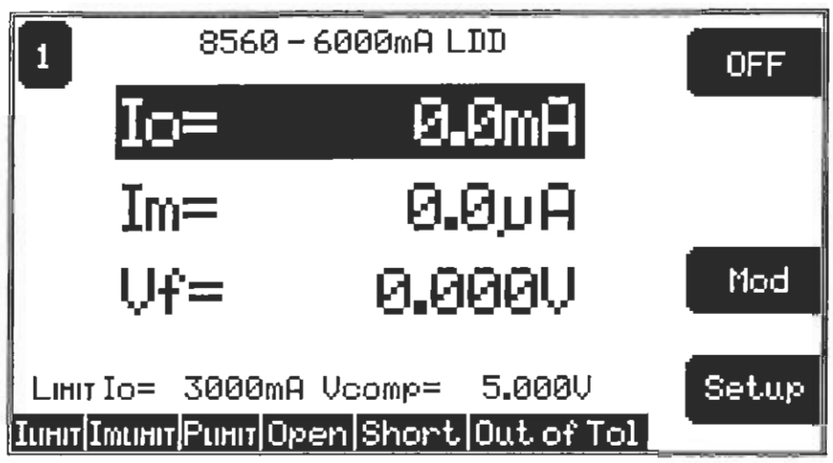


Figure 16 – Laser Main Screen

Io=, Im=, or Po= – When these fields are editable, such as the **Io=** field in the figure above, they indicate the corresponding set point. Non-editable fields, such as the **Im=** and **V_f=** fields above, indicate measured values, such as laser current or voltage, photodiode current, or photodiode power.

OFF/ON – Indicates the state of the laser's output. Pushing the adjacent soft key toggles the state.

Mod – This button will be available only on certain combo modules while in Io mode. Pushing the adjacent soft key activates the modulation setup screen.

Setup – Pushing the adjacent soft key activates the setup screen.

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The bottom line on the display has six "LED" enunciators, each indicating a particular state of the laser. They are defined as:

ILIMIT	When illuminated, indicates the unit is current limiting.
IMLIMIT	When illuminated, indicates the unit has exceeded the monitor photodiode current limit.
PLIMIT	When illuminated, indicates the unit has exceeded the monitor photodiode power limit.
Open	When illuminated, indicates the system has detected an open circuit. Only detected when the unit is on.
Short	When illuminated, indicates the system has detected a short circuit. Only detected when the unit is on.
Out of Tol	When illuminated, indicates the unit is out of tolerance as defined by the **Tol Time** and **Tol Iop** settings in the Laser Setup Screen.

3.5.3 Laser Setup Screen

The laser setup screen is shown in **Figure 17** and described in detail below. Certain features are not available on some modules.

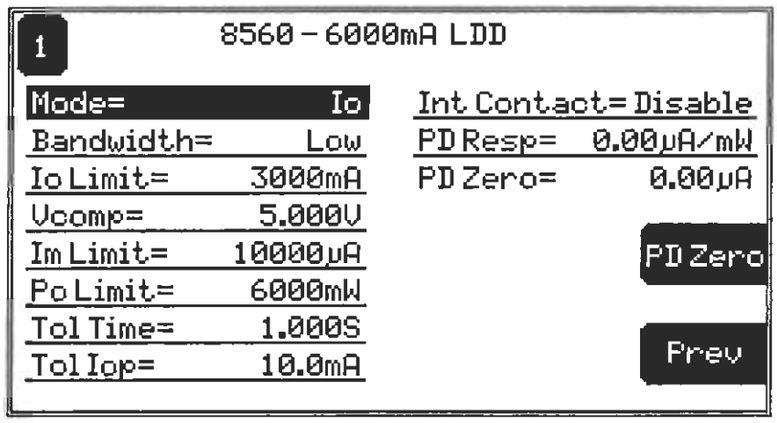


Figure 17 – Laser Setup Screen

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3.5.3.1 Mode

The **Mode** setting controls how the laser driver current is controlled. There are three modes: **Io**, **Im**, and **Po**.

In the **Io** mode, the active set point is the actual drive current. A set point of 1000 mA will cause the module to drive 1000 mA through the laser diode, assuming the **Io Lim** is set at or above 1000 mA.

In **Im** mode, the set point is the desired amount of photodiode current, in µA. Unlike the **Io** mode, **Im** mode will drive whatever current is necessary though the laser diode, up to the limit, to achieve the set point photodiode current.

Po mode is simply an extension on the **Im** mode, allowing the user to operate the system in milliwatts of power. The photodiode power set point, in mW, is converted to photodiode current using the **PD Resp** value from the setup screen.

3.5.3.2 Bandwidth

This setting is used to control noise and laser current modulation rates on certain modules. Allowable settings are **Low**, **Low CW**, and **High**. **Low CW** allows a maximum modulation rate of 30 Hz, and operates with the least noise. **Low** allows up to 10 kHz modulation, while **High** allows full bandwidth modulation. Modulation is disabled in **Im** and **Po** modes.

3.5.3.3 Io Lim

As one of the safety features of the Laser modules, the **Io Lim** sets a maximum allowable current drive for the laser diode. The system will also limit current set points to this value when operating in the **Io** mode. Two conditions can be generated when the driver reaches this limit: the soft current limit and a hard current limit.

The less critical of the two is the soft current limit. The soft limit, indicated by **ILIMIT** on the status line of the Laser Main Screen, indicates that the laser module is limiting the current drive to the laser diode, but otherwise operating as normal.

The second condition is a hard limit, which indicates that the current drive attempted to exceed the current limit faster than the circuitry could limit it. This condition causes the laser module's output to be shutdown. Both of these conditions are monitored in circuitry on the module itself, and in the case of the hard limit, shutdown is within microseconds of the condition being detected.

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3.5.3.4 Vcomp

The voltage compliance setting controls the shutdown of the laser module output when the forward voltage of the laser exceeds the compliance setting. Like the current limit described above, the voltage compliance is monitored in circuitry on the module itself, allowing for shutdown within microseconds of the condition.

3.5.3.5 Im Lim

The photodiode current limit is a software-monitored limit on the current delivered from the photodiode. Because this limit is a software-monitored limit, shutdown can occur up to a second after the condition is true.

3.5.3.6 Po Lim

Like the **Im Lim**, the photodiode power limit is a software-monitored limit on the power delivered from the photodiode. For this limit to function, the user must set a **PD Resp** value other than zero. Because this limit is a software-monitored limit, shutdown can occur up to a second after the condition is true.

3.5.3.7 Tol Time and Tol Iop

The **Tol Time** and **Tol Iop** elements are used for determining when the laser is "in tolerance." The **Tol Time** value is expressed in seconds, and can range from 0.001 seconds to 50 seconds. The **Tol Iop** value is displayed in mA, and can range from 0.1 mA to 100 mA. When operating in **Im** or **Po** modes, the **Tol Iop** setting is ignored, and fixed values of 50 µA and 50 mW, respectively, are used. The laser is considered in tolerance after it has been within the tolerance setting for the set number of seconds. If at any time it goes outside the tolerance range, the time restarts at zero.

As an example, if the **Tol Time** is set to 5 seconds, the **Tol Iop** is set to 2 mA, and the current set point was 1000 mA, the laser module would have to stay within 998 mA and 1002 mA to be within tolerance. Out of tolerance is indicated by an **Out Of Tol** status field on the bottom of the Laser Main Screen.

3.5.3.8 Intermittent Contact (Int Contact)

The **Int Contact** setting controls the detection of intermittent contacts caused by faults cables or connectors. If enabled, an intermittent contact will shutdown the laser with an "open" error. The system allows the user to disable the circuit when working in an electrically noisy environment that might cause a false detection. The circuit is automatically disabled in the High Bandwidth Mode.

3.5.3.9 PD Resp

The **PD Resp** element is the conversion factor between photodiode current and photodiode power, and is expressed in µA per mW. If this value is zero, the system will not operate in **Po** mode.

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3.5.3.10 PD Zero

The **PD Zero** element is the photodiode offset that is removed from the photodiode read back before any values are displayed, and conversely, is added to any photodiode set point. The photodiode offset is a combination of any dark current or stray light picked up while the laser is off. Pressing the **PD Zero** soft key sets this element to the photodiode current that is present on the photodiode input. To clear it, simply press the **PD Zero** soft key a second time.

3.5.3.11 Prev Soft Key

Pushing the **Prev** soft key returns to the previous screen.

3.5.4 Laser Modulation Setup Screen

Newer modules have onboard modulation circuits. The modulation setup screen has six variables, **Mod Enable, Mod Frequency, Mod Amplitude, Mod Type, Io min,** and **Io max**. **Mod Amplitude, Io min,** and **Io max** are interrelated, see below.

3.5.4.1 Mod Enable

Mod Enable turns the modulation circuit on or off.

3.5.4.2 Mod Frequency

The modulation circuit is capable of a frequency between 200 Hz to 300 kHz. Below 2 kHz, the frequency is displayed in Hz, while above 2 kHz, the frequency is displayed in kHz.

3.5.4.3 Mod Amplitude

Modulation amplitude is entered in milliamps. The amplitude is the positive and negative amplitude of the sine or square wave around the Io set point. The actual **Mod Amplitude** set point has a resolution of 1% of the full-scale output. When changing **Mod** Amplitude, **Io min** and **Io max** are recalculated using the Io set point and the new modulation amplitude to derive **Io min** and **Io max**.

For example, if the set point was 50 mA and the amplitude was 15 mA, **Io min** would be recalculated at 35 and **Io max** would be recalculated at 65. Changing **Io min** or **Io max** has a similar effect on **Mod Amplitude** and the Io set point, but in reverse. See **Section 3.5.4.5** below.

3.5.4.4 Mod Type

Mod Type selects the type of waveform generated by the modulation circuit: square wave, sine wave, or (on some modules) triangle wave.

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3.5.4.5 Io Min and Io Max

Io min and **Io max** can be used in place of the Io set point and **Mod Amplitude** to set the top and bottom Io levels for the modulation output. Because these values are calculated based on the Io set point and **Mod Amplitude** and not stored, they are displayed as a "Modulation Calculator". Changing either of these values will change the set point and amplitude settings accordingly.

3.5.5 Link Conditions

The Laser module supports the following link conditions:

Condition	Description
On	Laser output is on
Off	Laser output is off
Out Tol	Laser is out of tolerance
In Tol	Laser is in tolerance
Io Lim	Laser is current limiting
V_f Lim	Laser has reached its voltage limit
I_m Lim	Laser has exceeded photodiode current limit
Po Lim	Laser has exceeded photodiode power limit
Interlock	Laser interlock is not closed
Open	Laser module is open circuit
Short	Laser module is shorted

Table 4 – Laser Link Conditions

See the **Section 2.4.8** for a complete description of the linking process.

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3.6 Laser Module Theory of Operation

Figure 18 shows the functionality of the Laser Module. The following sections detail the theory of operation for each of the blocks in **Figure 18**.

The circuit block diagrams for each laser mode of operation are shown in **Figure 19, Figure 20**, and **Figure 21**. The theory of operation for each mode of operation is discussed in **Sections 3.6.9 - 3.6.11**. Note that some modules may not contain all features shown.

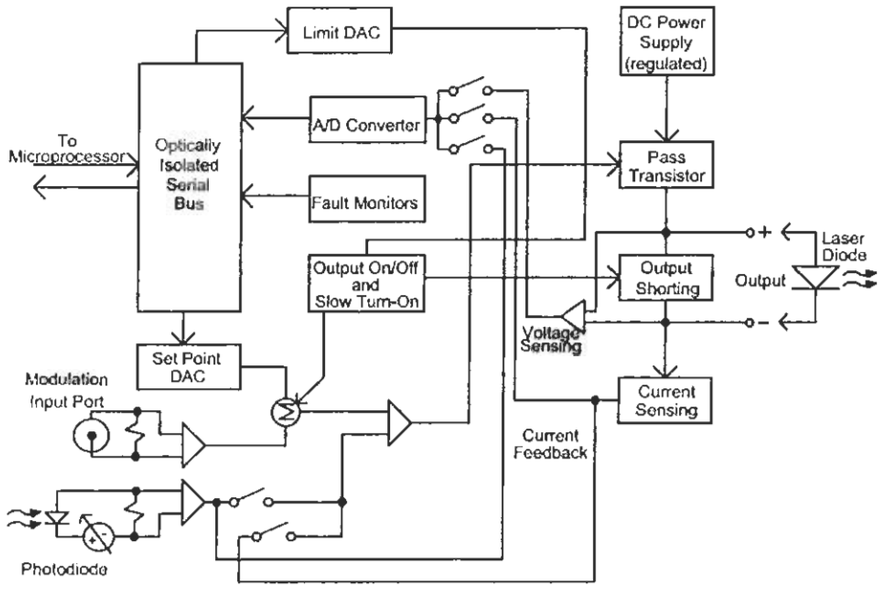


Figure 18 – Laser Module Block Diagram

3.6.1 Laser Interface

The laser interface provides optically isolated serial communications between the laser board and the microprocessor. Control signals are passed to the laser board to set the laser board status, current limit, current set points, and photodiode feedback functions. Instructions and data are sent over the serial interface to the optical barrier. Status and data are serially passed back to the microprocessor.

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3.6.2 Limit DAC

The microprocessor loads the current limit value into the DAC. The Limit DAC converts a digital limit signal from the microprocessor to a voltage that becomes the Limit Set Point voltage for the Output Stage. The current limit value is updated at power-up, at a "bin" recall, and whenever a LIM I value is changed.

3.6.3 Set Point DAC

The microprocessor loads the current set point value into the DAC. The Set Point DAC converts a set point value from the microprocessor to a voltage that becomes the current or I_{PD} set point input to the laser output stage. The laser current set point value is updated at power-up, at a "bin" recall, and whenever a laser set point value is changed.

3.6.4 A/D Converter

The A/D converter measures the limit current, actual current, and photodiode current.

3.6.5 Current Source Voltage

A regulated DC power supply forms the current source voltage.

3.6.6 Output Shorting

A relay shorts the LD ANODE and LD CATHODE terminals whenever the laser output is turned off. At the same time an FET is switched on to shunt any current that may appear at the output. When the laser output is turned on, the shunt circuit and short are removed in two stages. This ensures transient protection of the laser output.

3.6.7 Modulation/Voltage Control Input Port

The rear panel MOD input connector drives a precision wide-band instrumentation amplifier allowing the differential control signal applied to this port to use a different ground than the laser output terminals. However, due to the input common-mode voltage restrictions the MOD input should be within ±10 volts of the laser output terminals.

Each 100 mV change in the modulation input is equal to 1% of the maximum drive current of the module. For example, 100 mV input on a 6560 module (6 A driver) would equate to 60 mA of drive current. However, regardless of the input voltage, the current cannot exceed the current limit.

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3.6.8 Photodiode Feedback Amplifier

Photodiode feedback is amplified by a precision instrumentation amplifier or a transimpedance amplifier. When constant Power mode is selected, the photodiode feedback signal is used to control the laser output.

3.6.9 Constant Current, High Bandwidth Mode

This mode of laser operation is shown in **Figure 19**. In this mode, current feedback is used to control the laser output. The bandwidth is between 50 kHz and 500 kHz, depending on the model.

3.6.10 Constant Current, Low Bandwidth Mode

This mode of laser operation is shown in **Figure 20**. In this mode, current feedback is used to control the laser output.

In this mode, capacitors are switched into the circuit. These capacitors act as a filter and therefore prevent the laser output from changing too rapidly. This gives added laser diode protection. This also limits the laser output bandwidth to about 10 kHz. In the Low Bandwidth - CW mode, the bandwidth is further limited to 30 Hz.

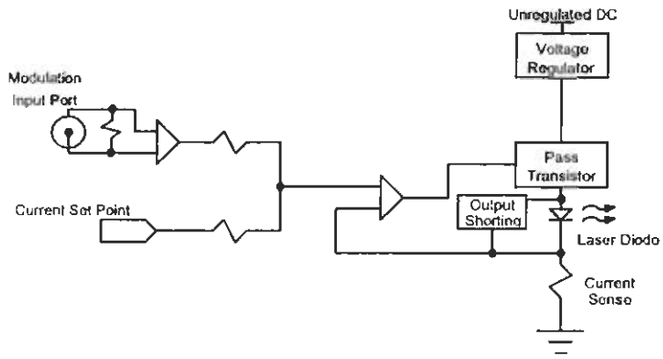


Figure 19 – Constant Current - High Bandwidth Mode

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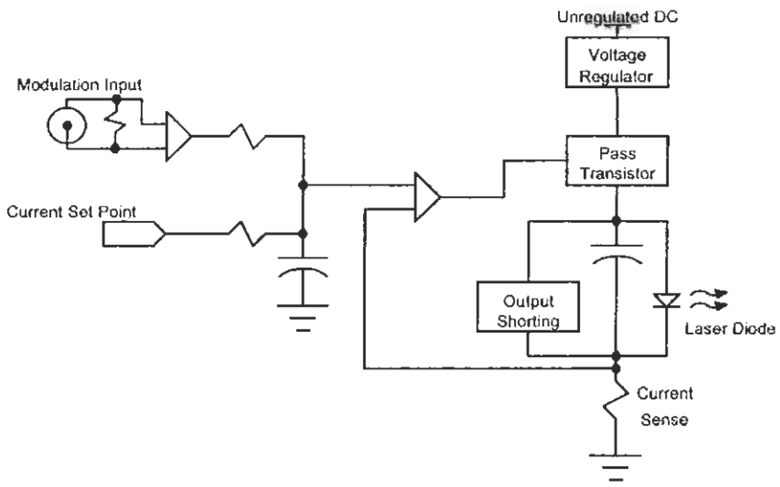


Figure 20 – Constant Current - Low Bandwidth Mode

3.6.11 Constant Power Mode

In constant P mode the laser circuit is configured as shown in **Figure 21**. Photodiode feedback is used to control the laser output and the bandwidth is held low.

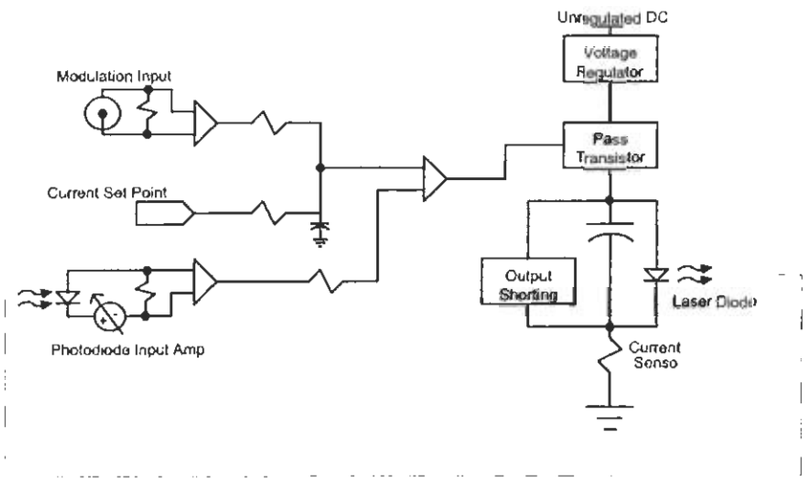


Figure 21 – Constant Power Mode

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3.6.12 Laser Interlock Operation

The back panel laser input/output connector has interlock connections that must be connected before the laser output will be enabled.

If there is not a connection between these pins, the laser output will not be enabled. When this path is broken, the laser Interlock Error condition/event will be reported in the laser Condition Status Register and the Laser Event Status Register.

This interlock is a safety feature for laser protection. It requires that the connecting cable be secure before the laser output is enabled. A secure connection significantly reduces the possibility of an intermittent open circuit to the laser drive current.

NOTE

There may be two interlocks used on a Model 8016/9008/9016 laser module. One interlock may be on the laser connector. Another interlock may be found on the rear panel of the Model 8016/9008/9016.

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CHAPTER 4

4. Temperature Controller Module Operation

4.1 Temperature Controller (TEC) Module

4.1.1 Introduction

The Temperature Control Modules are precision thermoelectric cooler control modules for use in the Model 9016 Modular Controller. It may be installed in any of the channel slots on the rear of the Model 9016, and may be interchanged with any other.

Features of the modules include:

- Service-free modularity (calibration information is stored on the module)
- Close-case calibration
- Operational with most thermistors, AD590, LM335, and RTD temperature sensors
- Flexible setup with Model 9016 save/recall front panel functions
- High temperature stability
- Current limit

4.1.2 Installation

This section describes the procedures for installing and removing a module from the Model 9016.

CAUTION
Although ESD protection is designed into the module, operation in a static-free work area is recommended.

CAUTION
Do not plug-in or unplug a module with the AC power on.

NOTE
The save/recall bin information will be lost upon detecting any change in the module configuration (such as installing a new module).

To install the module into the Model 9016, follow these steps:

1. **Turn the Model 9016 power OFF.** Installing a module with the power ON can damage the module and the Model 9016.

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2. Place the module into an open bay on the back of the Model 9016 and slide the module into place. There are tracks at the top and bottom of the bay that guide the module into place. Screw the Module Locking Screws into the back panel to secure the module.

To remove the module from the Model 9016, follow these steps:

1. **Turn the Model 9016 power OFF**. Removing a module with the power ON can damage the module and the Model 9016.

2. Unscrew the Module Locking Screws that secure the module to the Model 9016 back panel.

3. Grasp the module by handle that extends from the bottom of the back panel. Gently, but firmly, pull the module out of the Model 9016.

4.2 TEC Safety Features

4.2.1 Conditions That Will Automatically Shut Off the TEC Output

- High Temperature Limit
- Low Temperature Limit
- R Limit
- Sensor Open
- TEC Module Open
- Sensor Select changed
- Sensor Shorted
- Any Linked Functions

With the exception of the linked functions, clearing the appropriate bits in the TEC OUTOFF register can disable each of these conditions. See the ***Newport Computer Interfacing Manual*** for additional information.

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4.3 The TEC Connectors

On the TEC Module, a 15-pin D-connector is used for input and output connections, as shown by the pin-out diagram below.

DB15 Connector	
Pin	Description
1,2	TE+
3,4	TE-
5,6	Ground
7	Sensor+
8	Sensor-

Table 5 – TEC Connector Pinouts

For single connector combo LDD/TEC modules, a 15-pin male D-connector is used, as shown below.

DB15 Connector	
Pin	Description
1	TE+
2	TE-
3	SENSOR+
4	SENSOR-
5	PD Anode
6	PD Cathode
7	LD Anode
8	LD Cathode
9	TEC V Sense+
10	TEC V Sense-
11	Interlock
12	Interlock (GND)
13	No Connect
14	LDD V Sense+
15	LDD V Sense-

Table 6 – Combo Single DB15 Connector Pinouts

4.3.1 TEC Grounding Consideration

The TEC should remain isolated from any ground or laser connection. Do not ground either side of the TEC output.

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4.4 TEC Module Operation

4.4.1 Quick Start

Use the following Quick Start procedure to set up a TEC module for the Model 9016:

1. Once the Model 9016 LCD display goes to the Master Screen after the power-on sequence is complete, press the **MENU** button.
2. Press the **Modules** soft key.
3. Select the slot in which the module resides.
4. Select the **Setup** soft key. At this point, the display shows all TEC parameters.
5. Using the cursor keys, the numerical keypad, knob and ENTER, select the desired functions and set the parameter values.
6. When finished, return to TEC display by selecting the **Prev** (previous) soft key.
7. Using the knob or the numerical keypad and ENTER button, enter the desired set point value.
8. Press the **OFF** soft key to operate the TEC. The OFF soft key changes to ON.
9. Press the **ON** soft key to turn the TEC OFF.

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4.4.2 TEC Main Screen

The TEC main screen is shown **Figure 22** and described below.

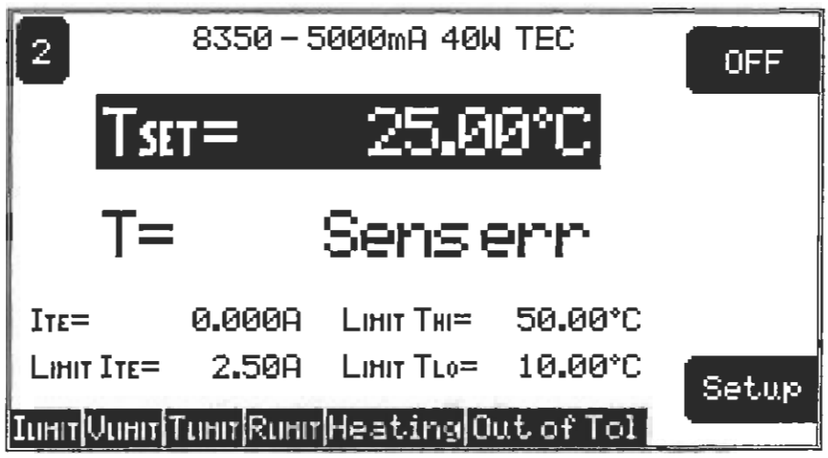


Figure 22 – TEC Main Screen

ISET=, TSET=, RSET=, iSET=, and vSET= – Indicates the set point value of current, temperature resistance, AD590 sensor current, or LM335 sensor voltage. In the screen shown above, the **TSET** is shown. **ISET, RSET, iSET=,** and **vSET=** appear when operating in those respective modes. The set point can be changed using the numeric keys or the knob.

I=, T=, R=, i=, and v= – Indicates the measured value of current, temperature, or resistance. A **Sens err** indicates a sensor error, usually caused by the sensor not hooked up or the wrong sensor selected. In the screen shown above, the **T** is shown. **I, R, i,** and **v** would be seen when operating in those modes.

OFF/ON – Indicates the state of the TEC output. Pushing the adjacent soft key toggles the state.

Setup – Pushing the adjacent soft key activates the setup screen.

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The bottom line on the display has six "LED" enunciators, each indicating a particular state of the laser. They are defined as:

ILIMIT	When illuminated, indicates the TEC module is in current limit.
VLIMIT	When illuminated, indicates the TEC module has reached its voltage limit.
TLIMIT	When illuminated, indicates the TEC module is outside the temperature limits defined by THI and TLO in the setup screen.
RLIMIT	When illuminated, indicates the TEC module is outside the reference limits defined by RHI/VHI/IHI and RLO/VLO/ILO in the setup screen.
Heating/Cooling	When illuminated, indicates that the TEC is heating or cooling.
Out of Tol	When illuminated, indicates that the TEC is out of tolerance as defined by **Tol Time** and **Tol Temp** in the setup screen.

4.4.3 TEC Setup Screen

The TEC Setup screen is shown in **Figure 23**. Each section is described below in detail.

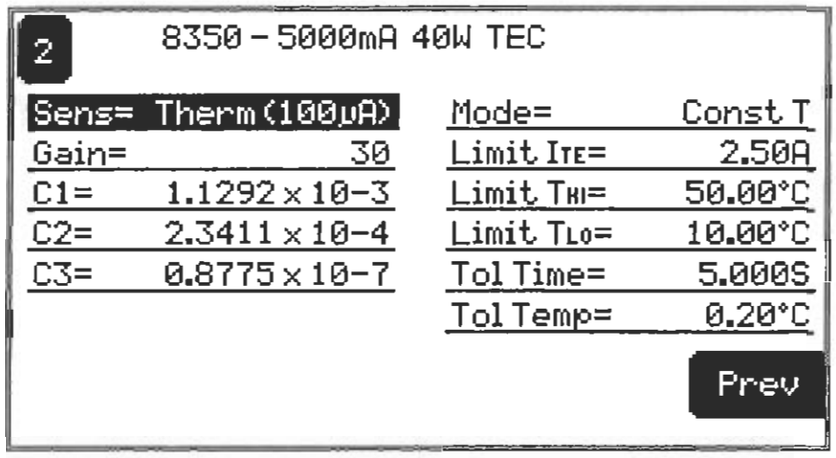


Figure 23 – TEC Setup Screen

4.4.3.1 Sensor

Selects the temperature sensor type used in your TEC mount. If the **None** type (not available in some modules) is selected, only the ITE mode is allowed. This type is intended for applications running without a temperature sensor. After selecting desired sensor. See the following sections for discussions of the various sensor types. All TEC modules support the thermistor sensors (10µA and 100µA range). Some TEC modules add support for the AD590, LM335, and RTD sensors.

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4.4.3.2 Gain

The Gain function controls two parameters of the hybrid PI control loop: **proportional gain** and **integration time**.

When the actual temperature and the set point are different, an error voltage is generated. This error voltage is directly related to the difference in the actual and set point temperatures. The error voltage is then amplified by the proportional gain and used to control the amount of current driven through the TEC. The higher the gain, the more current will be driven for any given temperature difference, with the maximum current being determined by the current limit.

The error voltage also drives an integrator. The integrator's output also controls the amount of current being driven through the TEC. The integrator is an amplifier whose gain is proportional to time. The longer a given error voltage is present, the more current will be driven through the TEC, with the maximum current being determined by the current limit. The speed at which the integrator's output increases is the integration time, which can be "Slow" or "Fast". Some TEC modules do not support the Slow setting, and therefore omit the Fast designator in the range of settings.

The available Gain values are: 0.2 Slow, 0.6 Slow, 1 Slow, 1 Fast, 2 Slow, 3 Fast, 5 Fast, 6 Slow, 10 Slow, 10 Fast, 20 Slow, 30 Fast, 50 Fast, 60 Slow, 100 Fast or 300 Fast. The number actually defines the proportional loop gain. The slow/fast suffix indicates the speed at which the integrator's output increases. The slow setting allows for larger masses or greater distance between the sensor and the thermo-electric cooler by slowing the speed of the integrator.

Both the proportional gain and the integration time must be matched to the thermal characteristics of the TE cooler and sensor. If the settings are incorrect, the temperature set point will take an excessive amount of time to settle, or it will oscillate around the set point and never settle.

The Gain setting depends on the thermal time constants in your setup, but we can suggest guidelines for selecting the proper gain. Set the gain to 1 fast and increase it until the actual temperature oscillates around the set temperature. Then reduce the gain to the next lower value.

To read the Gain setting, go to the setup. The display will show the value of the Gain setting. In Constant I_{TE} mode the Gain setting has no effect.

4.4.3.3 C1, C2, C3, and Ro

See the section of each of the sensors for a description of how C1, C2, C3, and Ro are used.

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4.4.3.4 Mode

4.4.3.4.1 Constant Temperature Mode (Const T)

This mode holds the TEC at a constant temperature based on feedback from the sensor in the TEC mount, using "TSET=" and "T=" variables. In this mode, the Model 9016 uses a control loop comparing the sensor input to the temperature set point, driving the ITE current positive or negative to reach and maintain that set point. The sensor's input is converted to temperature for display of actual TEC temperature. The ITE current is also displayed in this mode.

4.4.3.4.2 Constant Resistance/Reference Mode (Const R/Const v/Const i)

This mode operates identically to the Const T mode, but the sensor input is not converted to temperature, but is displayed in unconverted form. Likewise, the set point is used directly, not converted from temperature. Thermistor and RTD sensors use resistance (Const R mode, "RSET=" and "R=" variables), LM335 sensors use millivolts (Const v mode, "vSET=" and "v=" variables), and AD590 sensors use microamps (Const i mode, "iSET=" and "i=" variables)). Const R, Const v, and Const i are primarily intended for users who know a sensor set point in "sensor" units, not in °C. ITE current is also displayed in these modes. Const v and Const i modes are not supported on dual or combination TECs, as the sensors required for these modes are not supported.

4.4.3.4.3 Constant Current Mode (Const ITE)

Unlike the modes above, the Const ITE mode allows the operator to explicitly set the amount and direction of current flow through the TEC, using "ISET=" and "ITE=" variables. If a sensor has been selected, the TEC temperature will be displayed. Although temperature is not a factor in the amount or direction or current flow, the high and low temperature limits are observed, and will shutdown the output if exceeded, in Const ITE mode if a sensor is selected. For no temperature limits, set the sensor type to "None." Const ITE mode is not supported on dual or combination TECs.

NOTE

Use caution when limits are not active, as the temperature may exceed your TEC or laser's thermal limits.

4.4.3.4.4 Effects of Calibration on TEC Modes

On startup, the TEC module performs an auto-calibration to eliminate most of the error in ADC and DAC values. After this auto-calibration, each sensor type supported by the module has an offset calibration, while the ITE set point and read back has a two-point calibration. These calibration constants are then used to calibration a set point or read back value. This includes "cross-mode" values, such as displaying actual current while in constant temperature mode. While the current *set point* calibration has no effect in Const T mode, the *read back* calibration is used to more accurately display the actual current.

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4.4.3.5 Limits

4.4.3.5.1 TE Current Limit (Limit ITE)

This sets the maximum drive current the module will allow. This maximum applies to all modes (constant ITE/R/T).

4.4.3.5.2 Temperature Limits (Limit THI and Limit TLO)

The TEC module supports both a low and high temperature limit, and can be programmed to turn the TEC output off in the event those limits are exceeded (default state). The temperature limits are monitored regardless of the mode of the module. This has the added safety feature of shutting down the module in Const ITE or Const R mode when the temperature limit is exceeded (if the output off bits are enabled for this condition).

NOTE

These limits do not apply if the sensor type is set to "None."

4.4.3.5.3 Resistance/Reference Limits (Limit RHI/VHI/IHI and Limit RLO/VLO/ILO)

Like the temperature limits, the 8300/8600 also supports both a low and high resistance/reference limit, and can be programmed to turn the TEC output off in the event those limits are exceeded; although this is disabled by default. These limits are monitored only while in Const R/v/i mode.

4.4.3.6 Tolerances (Tol Time and Tol Temp)

The **Tol Time** and **Tol Temp** elements are used for determining when the 8300 is "in tolerance," where the actual temperature has stayed within **Tol Temp** of the set point for at least **Tol Time** seconds. The **Tol Time** value is expressed in seconds, and can range from 0.001 seconds to 50 seconds. The **Tol Temp** value is displayed in °C (the most common usage), and can range from 0.01 to 10.00. If at any time it goes outside the tolerance range, the time restarts at zero.

As an example, if the **Tol Time** is set to 5 seconds, the **Tol Temp** is set to 0.2°C, and the temperature set point was 25.0°C, the TEC module would have to stay within 24.8°C and 25.2°C to be within tolerance. Out of tolerance is indicated by an **Out Of Tol** status field on the bottom of the TEC Main Screen.

The out of tolerance condition is most often used to shutdown laser outputs when a TEC is not operating within tolerance. This can be done in one of two ways. The first, and simplest, would be to define a link condition with the TEC module as the source, **Out of Tol** as the condition, **Turn Off** as the action, and the laser module as the target.

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The second method can be used if the system was being operated over IEEE-488 or RS-232. Once the TEC was within tolerance, its OUTOFF register could be set to turn the TEC off when out of tolerance and then enable the TEC OFF bit in the laser's OUTOFF register. This will cause the TEC to shutdown when it goes out of tolerance and then cause the laser to shutdown because the TEC is OFF. The disadvantage of this second method is that the laser would shutdown if *any* TEC were off, which might not be the desired operation. Also, you would have to disable the Out of Tolerance bit in the TEC's OUTOFF register before you could turn the TEC back on.

4.4.3.7 Prev Soft Key

Pushing the **Prev** soft key returns to the previous screen.

4.4.4 Link Conditions

The Laser module supports the following link conditions:

Condition	Description
On	TEC output is on
Off	TEC output is off
Out Tol	TEC is out of tolerance
In Tol	TEC is in tolerance
I Lim	TEC is current limiting
V Lim	TEC has reached its voltage limit
T Lim	TEC has exceeded temperature limit (low or high)
Th Lim	TEC has exceeded high temperature limit
Tl Lim	TEC has exceeded low temperature limit
R Lim	TEC has exceeded R limits (high or low)
Open	TEC module is open

Table 7 – TEC Link Conditions

See the section in the main Model 9016 manual of linking for a complete description of the linking process.

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4.5 Sensors

4.5.1 Thermistor and Thermistor Current Selection

4.5.1.1 Introduction

Choosing the right sensing current depends on the temperature range you want to measure and the resolution required at the highest measured temperature. To correctly set the thermistor current, you must understand how the thermistor and the Model 9016 interact and how temperature range and resolution values are inherent in the nature of thermistors.

4.5.1.2 Thermistor Range

Thermistors can span a wide temperature range, but their practical range is limited by their non-linear resistance properties. As the sensed temperature increases, the resistance of the thermistor decreases significantly and the thermistor resistance changes less for an equivalent temperature change. Consider the temperature and sensitivity figures in the table below.

Temperature	Sensitivity
-20°C	5600 ohms/°C
25°C	439 ohms/°C
50°C	137 ohms/°C

Table 8 – Temperature and Corresponding Sensitivity

The practical upper temperature limit in the Model 9016 is the temperature at which the thermistor becomes insensitive to temperature changes. The lower end of the temperature range is limited by the maximum A/D input voltage of the Model 9016. Thermistor resistance and voltage are related through Ohm's Law (V = I x R). The Model 9016 supplies current to the thermistor, either 10 µA or 100 µA , and as the resistance changes a changing voltage signal is available to the thermistor inputs of the Model 9016. The Model 9016 will over-range when the input voltage exceeds about 5 Volts. **Figure 24** graphically shows the lower temperature and upper voltage limits for a typical 10 K Ohm thermistor. The practical temperature ranges for a typical 10 K thermistor (a 10 K thermistor bas a resistance of 10 K Ohms at 25°C) are given in the table below.

Sensing Current	Temperature Range
10 µA	-51 to 40°C
100 µA	-10 to 100°C

Table 9 – Practical Temperature Ranges for a Typical 10 K Thermistor

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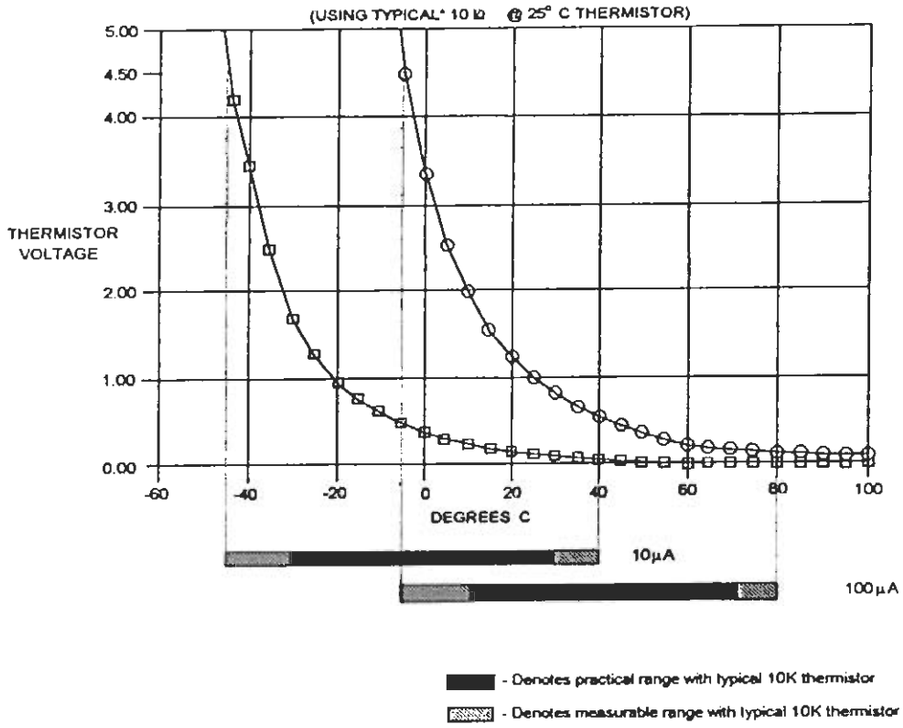


Figure 24 – Thermistor Temperature Range

4.5.1.3 Temperature Resolution

You must also consider measurement resolution since the resolution decreases as the thermistor temperature increases. The Model 9016 uses an A/D converter that has a maximum resolution of about 76 µV. The microprocessor converts this digital number to resistance, stores the resistance, then converts the resistance to a temperature using the Steinhart-Hart equation, and stores this temperature. A temperature change of one degree centigrade will be represented by a greater resistance increase (and therefore more A/D counts) at a lower temperature than at a higher temperature because of the non-linear resistance of the thermistor.

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Resolution figures for a typical 10 k Ohm thermistor are given in the table below.

Temperature	Voltage at 10 µA	Resolution
-20 °C	56.0 mV/°C	0.018 °C/mV
25 °C	4.4 mV/°C	0.230 °C/mV
50 °C	1.4 mV/°C	0.700 °C/mV

Table 10 – Resolution Figures for a Typical 10 K Thermistor

For this thermistor, a temperature change from -20°C to -19°C will be represented by 737 A/D counts (if supplied with 10µA). The same thermistor will only change about 18 A/D counts from 49°C to 50°C.

4.5.1.4 Selecting Thermistor Current

To select the current setting for a typical 10 K thermistor, determine the lowest temperature you will need to sample and select the current according to the range limits given above. If the temperature you want to sample is below -10°C you should use the 10µA setting.

With the current set to 10µA, the best resolution you will see will be a 1.0°C temperature change. For example, if the lower limit is 0°C, you can choose either setting, but there is a tradeoff in terms of resolution. If you need better than 0.1°C measurement resolution you will have to change to 100µA.

If you need high resolution over a narrow range, for a very accurate measurement, you can set the current setting for the maximum resolution. For example, at a high temperature of 15°C, you require a measurement resolution of at least 0.05°C. This resolution is within the range of either setting, but at the 10µA setting the resolution is only 0.2°C while at the 100 µA setting the resolution is better than 0.05 °C.

Generally, it is best to use the 100µA setting for all measurements of -10°C or greater with a 10 K thermistor.

4.5.1.5 Selecting Thermistors

The type of thermistor you choose will depend primarily on the operating temperature range. These guidelines for selecting the range and resolution will apply to any thermistor. 10 K thermistors are generally a good choice for most laser diode applications where high stability is required near room temperatures. Similarly, 10 K thermistors are often a good choice for cooling applications where you want to operate at temperatures from -40°C to room temperature.

If you require a different temperature range or the accuracy you need can't be achieved with either current setting, select another thermistor. Thermistor temperature curves, supplied by the manufacturer, show the resistance verses temperature range for many other thermistors. Newport will also offer help for your specific application.

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4.5.1.6 The Steinhart-Hart Equation

The Steinhart-Hart equation is used to derive temperature from the non-linear resistance of an NTC (Negative Temperature Coefficient) thermistor.

The following section contains an explanation of the Steinhart-Hart equation and the values of these constants for some common thermistors.

Two terminal thermistors have a non-linear relationship between temperature and resistance. The resistance verses temperature characteristics for a family of similar thermistors is shown in **Figure 25**. It has been found empirically that the resistance verses temperature relationship for most common negative temperature coefficient (NTC) thermistors can be accurately modeled by a polynomial expansion relating the logarithm of resistance to inverse temperature. The Steinhart-Hart equation is one such expression and is given as follows:

$$1/T = C1 + C2\,(\text{Ln } R) + C3\,(\text{Ln } R)^3$$

Where T is in KELVIN. To convert T to °C, subtract 273.15.

Equation 1 – Steinhart-Hart Equation

Once the three constants C1, C2, and C3 are accurately determined, only small errors in the calculation of temperature over wide temperature ranges exist. **Table 11** shows the results of using the equation to fit the resistance verses temperature characteristic of a common 10 K Ohm (at room temperature) thermistor. The equation will produce temperature calculation errors of less than 0.01°C over the range -20°C to 50°C.

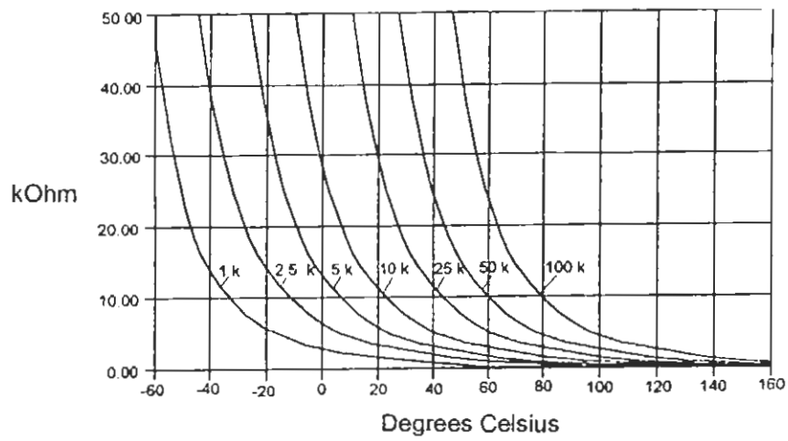


Figure 25 – Thermistor Resistance Versus Temperature

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R[1]	T Actual	Third Order Fit. Eq. 1[2]
97072	-20.00	-0.32
55326	-10.00	-0.06
32650	0.00	0.09
19899	10.00	0.15
12492	20.00	0.13
10000	25.00	0.08
8057	30.00	0.01
5326	40.00	-0.20
3602	50.00	-0.50

Table 11 – Comparison of Curve Fitting Equations

The constants C1, C2, and C3 may all be expressed in the form n.nnn, thus simplifying entry into the Model 9016.

4.5.1.7 Table of Constants

We have listed some common thermistors and included the appropriate calibration constants for the temperature range -20°C to 50°C in **Table 12**. The Model 9016, by default, uses the BetaTHERM 10K3 thermistor values.

Manufacturer	C1	C2	C3
BetaTHERM 10K3	1.129241	2.341077	0.877547
BetaTHERM 0.1K1	1.942952	2.989769	3.504383
BetaTHERM 0.3K1	1.627660	2.933316	2.870016
BetaTHERM 1K2	1.373419	2.771785	1.999768
BetaTHERM 1K7	1.446659	2.682454	1.649916
BetaTHERM 2K3	1.498872	2.379047	1.066953
BetaTHERM 2.2K3	1.471388	2.376138	1.051058
BetaTHERM 3K3	1.405027	2.369386	1.012660
BetaTHERM 5K3	1.287450	2.357894	0.950520
BetaTHERM 10K3	1.129241	2.341077	0.877547
BetaTHERM 10K4	1.028444	2.392435	1.562216
BetaTHERM 30K5	0.933175	2.213978	1.263817
BetaTHERM 30K6	1.068981	2.120700	0.901954
BetaTHERM 50K6	0.965715	2.106840	0.858548
BetaTHERM 100K6	0.827111	2.088020	0.805620
BetaTHERM 1M9	0.740239	1.760865	0.686600

Table 12 – Thermistor Constants

[1] Resistance of a 10K, Fenwal UUA41J1 thermistor.

[2] Constants $C1 = 1.125 * 10^{-3}$
$C2 = 2.347 * 10^{-4}$
$C3 = 0.855 * 10^{-7}$

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4.5.2 AD590 and LM335

AD590 and LM335 sensors are not supported on dual or combination TECs.

4.5.2.1 General

The Model 9016 uses two constants (C1 and C2) for calibrating the two linear thermal sensing devices, the AD590 and the LM335. C1 is used as the zero offset value, and C2 is used as the slope or gain adjustment. Therefore, C1 has a nominal value of 0, and C2 has a nominal value of 1 when using the AD590 or LM335. In order to calibrate a linear sensor device, the sensor must be operated at an accurately known, stable temperature.

For example, the sensor may be calibrated at 0°C if the sensor is placed in ice water until its temperature is stable. A highly accurate temperature probe, thermometer, environmental chamber, etc., may also be to determine the known temperature for calibration.

4.5.2.2 AD590 Sensor

The AD590 is a linear thermal sensor that acts as a current source. It produces a current, i, which is directly proportional to absolute temperature, over its useful range (-50°C to + 150°C). This nominal value can be expressed as:

$$i = 1\ \mu A / K$$

Where i is the nominal current produced by the AD590, and K is in Kelvin.

Equation 2 – Linear Thermal Sensor Current Equation

The Model 9016 uses i to determine the nominal temperature, T_n, by the formula:

$$T_n = (i/(1\ \mu A / K)) - 273.15$$

Where T_n is in °C.

Equation 3 – Nominal Instrument Temperature (T_n) Equation – AD590 Sensor

The displayed temperature, $T_d = C1 + (C2 * T_n)$, is then computed, where C1 and C2 are the constants stored in the Model 9016 for the AD590. The AD590 grades of tolerance vary, but typically without adjusting C1 and C2, the temperature accuracy is ±1°C over its rated operating range. However, the AD590 is not perfectly linear, and even with C1 accurately known there is a non-linear absolute temperature error associated with the device. This non-linearity is shown in **Figure 26**, reprinted from Analog Devices specifications, where the error associated with C1 is assumed to be zero.

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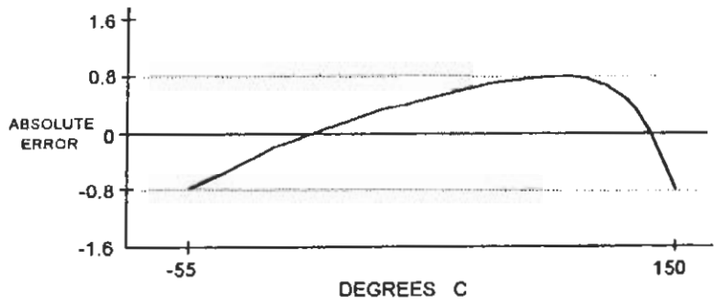


Figure 26 – AD590 Nonlinearity

If a maximum absolute error of 0.8°C is tolerable, the one point calibration of C1 should be used. If a greater accuracy is desired, the two point method of determining C1 and C2 should be used. However, note that the absolute error curve is non-linear. Therefore the constant C2 will vary for different measurement points.

4.5.2.3 LM335 Sensor

The LM335 is a linear thermal sensor that acts as a voltage source. It produces a voltage (v), which is directly proportional to absolute temperature over its useful range (-40°C to + 100°C). This nominal value can be expressed as:

$$v = 10mV / K$$

Where v is the voltage produced by the LM335 and K is Kelvin.

Equation 4 – Linear Thermal Sensor Voltage Equation

The Model 9016 uses v to determine the nominal temperature, T_n, by the formula:

$$T_n = (v / (10mV / K)) - 273.15$$

Where T_n is in °C.

Equation 5 – Nominal Instrument Temperature (T_n) Equation – LM3335 Sensor

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The temperature, T_d, which is displayed by the Model 9016 is calculated as follows:

$$T_d = C1 + (C2 * T_n)$$

Where C1 and C2 are the constants stored in the Model 9016 for the LM335.

Equation 6 – Display Temperature (T_d) Equation – LM335 Sensor

When the LM335 is calibrated to 25°C, C1 = 0 and C2 = 1, and the temperature accuracy is typically ±0.5°C over the rated operating range. However, the LM335 is not perfectly linear, and even with C1 accurately known, there is a non-linear absolute temperature error associated with the device. This non-linearity caused error is typically ±0.3°C, with the error associated with C1 assumed to be zero.

If a maximum absolute error of ±0.3°C can be tolerated, the one point calibration of C1 should be used. If a greater accuracy is desired, the two point method of determining C1 and C2 should be used. However, note that the absolute error associated with the constant C2 may vary over different temperature ranges.

4.5.2.4 Determining C1 and C2 for the AD590 and LM335

The nominal values of C1 and C2 are 0 and 1, respectively, for both types of devices. These values should be used initially for determining C1 and C2 in the methods described below.

The One Point method is easiest, but it ignores the non-linearity of the device. It is most useful when a high degree of temperature accuracy is not required.

The Two Point method can achieve a high degree of accuracy over a narrower operating temperature range, but requires two accurate temperature measurements.

4.5.2.4.1 One Point Calibration Method

The calibration described in this section is independent of the calibration procedure described in **Section 6.3.4** and **Section 6.3.6**. These sections deal with the internal calibration of the 8300 module, while the following calibration procedure should be used to calibrate the external AD590 or LM335 sensor. For the most accurate possible results, both calibration procedures should be performed.

The accuracy of this procedure depends on the accuracy of the externally measured temperature. It is used to determine the zero offset of the device, and it assumes that the gain (slope) is known.

1. Allow the Model 9016 to warm up for at least one hour.
2. Select the desired sensor type in the setup menu.
3. Set the C1 parameter to zero.

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4. Set the C2 parameter to 1.

5. Place the sensor at an accurately known and stable temperature, T_a.

6. Connect the sensor to the Model 9016 for normal Constant temperature operation. Allow the Model 9016 to stabilize at the known temperature, T_a and read the displayed temperature, T_d.

7. Determine the new value of C1 from the formula:

$$C1 = T_a - T_d$$

Equation 7 – C1 Constant Equation

8. Enter the new C1 value.

4.5.2.4.2 Two Point Calibration Method

The calibration described in this section is independent of the calibration procedure described in **Section 6.3.4** and **Section 6.3.6**. Those sections deal with the internal calibration of the 8300 module, while the following calibration procedure is for calibrating the external AD590 or LM335 sensor. For the most accurate possible results, both calibration procedures should be performed.

The accuracy of this procedure depends on the accuracy of the externally measured temperature. It is used to determine the zero offset of the device and the gain (slope).

1. Allow the Model 9016 to warm up for at least one hour.

2. Select the desired sensor type in the setup menu.

3. Set the C1 parameter to zero.

4. Set the C2 parameter to 1.

5. Place the sensor at an accurately known and stable temperature, T_{a1}.

6. Connect the sensor to the Model 9016 for normal Constant temperature operation. Allow the Model 9016 to stabilize at the known temperature, T_{a1} and read the displayed temperature, T_{d1}.

7. Record these values.

8. Repeat Steps 5 and 6 for another known temperature, T_{a2}, and the corresponding displayed temperature, T_{d2}. The two known temperatures should be at the bounds of the intended operating range. For best results, make the range between T_{a1} and T_{a2} as narrow as possible.

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9. Determine the new value of C1 and C2 from the following calculations.

   First determine the intermediate values U and V, where

$$C2 = (T_{a1} - T_{a2}) / (T_{d1} - T_{d2}), \text{ and}$$

$$C1 = T_{a1} - (T_{d1} * C2)$$

Equation 8 – Constant C1 and Constant C2 Equations

10. Enter the new C1 and C2 values.

4.5.3 RTD Sensors

RTD sensors are not supported on dual or combination TECs.

The following equation is used in temperature to resistance conversions:

$$R_t = R_0 [1 + (C1 \times t) + (C2 \times t^2) + C3 (t-100) t^3] \text{ for } t < 0°C$$
$$R_t = R_0 [1 + (C1 \times t) + (C2 \times t^2)] \text{ for } t >= 0°C$$

Where R_t is the resistance in Ω at temperature t and
t is the temperature in °C.

Equation 9 – Resistance at Temperature t Equation

4.5.3.1 RTD Constants

The constants entered for an RTD depend on the type of curve it has. **Table 13** shows three standard types.

Curve	TCR (Ω/Ω/°C)	C1	C2	C3	Ro
Laboratory	0.003926	3.9848×10^{-3}	-0.58700×10^{-6}	-4.0000×10^{-12}	100.00
US	0.003910	3.9692×10^{-3}	-0.58495×10^{-6}	-4.2325×10^{-12}	100.00
European	0.003850	3.9080×10^{-3}	-0.58019×10^{-6}	-4.2735×10^{-12}	100.00

Table 13 – RTD Constant Curves

The Ro constant also applies for RTD sensors. It is the RTD's value at 0°C and is nominally 100.00 Ω, but can be varied from 95.00 Ω to 105.00 Ω.

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4.6 TEC Module Theory of Operation

Figure 27 shows the functionality of the TEC module. The following sections detail the theory of operation for each of the blocks in **Figure 27**.

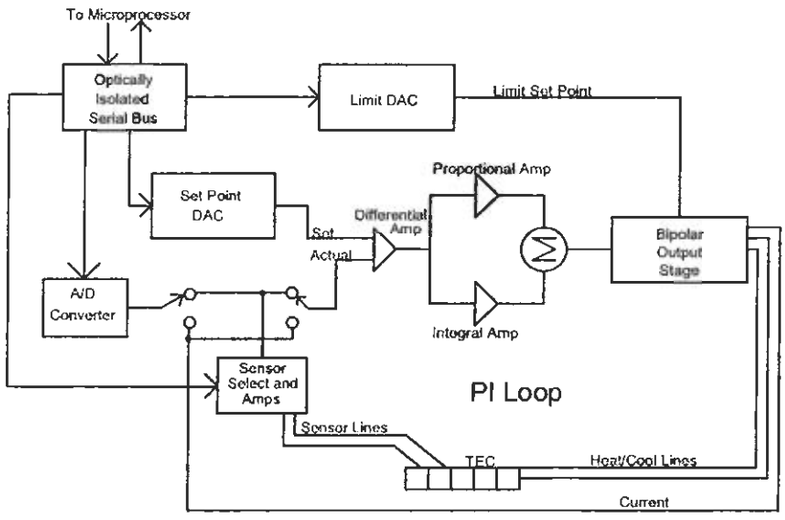


Figure 27 – TEC Board Module Diagram

4.6.1 TEC Interface

The TEC interface provides optically isolated serial communications between the TEC board and the microprocessor. Control signals are passed to the TEC board to set the TEC board status, current limit, and temperature set points. Instructions and data are sent over the serial interface to the optical barrier. Status and data are serially passed back to the microprocessor.

4.6.2 Limit DAC

The microprocessor loads the digitally stored current limit value into the current limit 12-bit DAC. The Limit DAC converts the digital limit signal from the microprocessor to a voltage that becomes the limit voltage for the Bipolar Output Stage. The current limit value is updated at power-up, at a "bin" recall, and whenever the LIM ITE value is changed.

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4.6.3 Set Point DAC

The microprocessor loads the digitally stored current set point value into the set point 16-bit DAC. The Set Point DAC converts a digital set point signal from the microprocessor to a voltage that becomes the set temperature input to the PI control loop. The TEC current set point value is updated at power-up, at a "bin" recall, and whenever a TEC set point value is changed.

4.6.4 A/D Converter

The 16-bit A/D converter measures the sensor voltage and the current of the bipolar output stage. The sensor measurement is used by the microprocessor in the calculation of temperature or thermistor resistance. The current measurement is used for the ITE value.

4.6.5 Sensor Select

Sensor selection is accomplished in the Sensor Select block of the TEC board. Precision 100µA and 10µA current sources may be selected for thermistor control. RTD, LM335, and AD590 IC temperature sensors may also be selected. The AD590 has a +5 VDC bias voltage, the LM335 has a 1 mA bias current, and the RTD has a precision 1 mA current source.

The output of the Sensor Select block of the TEC board is a voltage that is proportional to the actual temperature. This voltage is fed to the A/D converter that provides a digital measurement to the microprocessor, and to the PI control loop to close the feedback loop when temperature is being controlled.

4.6.6 Difference Amplifier

Differential amp provides a proportional difference signal to the PI control. This signal is the difference between set temperature and actual temperature voltage.

4.6.7 Proportional Amplifier and Integrator

The proportional amplifier is part of a digitally controlled gain stage consisting of the analog switches and their associated resistors. The analog switches vary the ratio of resistance in the feedback circuit to change the gain.

The signal from the difference amplifier is sent to an integrator that reduces the difference between the set point temperature and the actual temperature to zero, regardless of the gain setting. An analog switch discharges the integrating capacitor whenever integration is not required to prevent unnecessary difference signal integration.

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4.6.8 Bipolar Output Stage

The Bipolar Output Stage consists of circuits that limit the TEC output, sense the TEC output polarity, sense voltage, and current limit conditions, as well as supply the bipolar TEC output. The following sections discuss these functions of the Bipolar Output Stage.

4.6.8.1 Current Limiting

The output of the proportional amplifier and integrator together form the control signal. Output current limiting is effected by bounding the control signal so that it is always less than the limit current. The limit current is set with the front panel controls or through the GPIB. The bipolar current limit levels are established by the output of the current Limit DAC.

4.6.8.2 Current Limit Condition Sensing

Comparators sense the output to determine when output current limiting is occurring. When this condition occurs, the I Limit signal is sent to the microprocessor.

4.6.8.3 Voltage Controlled Current Source

The bounded output control signal is applied to an amplifier. This amplifier and the current sensing amplifier form the output voltage controlled current source. The output of this stage directly drives the externally connected TE cooler module.

4.6.8.4 Voltage Limit Condition Sensing

Comparators sense the output to determine when the TEC output compliance voltage limiting is occurring. This condition occurs whenever the TEC output is open or connected to a high resistance. If this condition occurs, the V Limit error signal is passed to the microprocessor.

4.6.9 TEC Control Modes

The Model 9016 provides three control modes for operation, constant T (temperature), constant R (resistance, voltage, or current), and constant ITE (current) modes. Each of these modes is discussed in the following sections.

4.6.9.1 T Mode

In constant T mode the TEC is driven to the set point temperature. This temperature is monitored by the sensor in the TEC. In the case of a thermistor sensor, the thermistor's resistance is used to determine TEC's temperature by using the Steinhart-Hart conversion equation. The resistance is determined by measuring the voltage across the thermistor (with a known current of 10µA or 100µA). The ITE current is also measured and saved. The TEC's output current is sensed across a resistor and the voltage is converted to an ITE current value.

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When an LM335 sensor is used, a two-point conversion equation is used to determine the temperature. Its voltage is measured as well as the ITE current.

When an AD590 sensor is used, another two-point conversion equation is used to determine the temperature. Its reference current is sensed across a resistor, and this voltage is measured. The ITE current is also measured.

4.6.9.2 R Mode

In constant R mode, the TEC is driven to the set point resistance, voltage, or current. This resistance, voltage, or current is measured and converted to a temperature. The ITE current is also measured.

4.6.9.3 ITE Mode

In constant ITE mode, the TEC is driven with a constant current, at the ITE set point value. The ITE current is sensed across a resistor and the voltage is converted to ITE current.

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CHAPTER 5

5. Maintenance

5.1 Introduction

Module specific calibration can be found in the module's manual. No calibration is necessary on the main frame. Do not attempt to remove the cover.

5.2 Fuse Replacement

The fuses are accessible on the back panel of the Model 9016. Before replacing a fuse, turn power off and disconnect the line cord. Use only the fuse indicated below.

Line Voltage	Fuse Replacement
100-240 VAC	5.00 Amp (T), 5x20mm, 250V

5.3 Cleaning

Disconnect AC power before cleaning. Use mild soap solution on a damp but not wet cloth to wipe down the exterior of the instrument. Do NOT remove the instrument's top cover.

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CHAPTER 6

6. Calibration

6.1 Calibration Overview

The Model 9016 performs an automatic DAC calibration on power-up. This removes the majority of calibration error. However, if it is desired to completely calibrate the system, the following procedures will do so.

All calibrations are done with the case closed. The instrument is calibrated by changing the internally stored digital calibration constants.

All calibrations may be performed locally or remotely. However, depending on the sensor configuration, some procedures may not apply to all instruments.

6.1.1 Environmental Conditions

Calibrate this instrument under laboratory conditions. We recommend calibration at 25°C ± 1.0°C. When necessary, however, the Model 9016 may be calibrated at its intended use temperature if this is within the specified operating temperature range of 0°C to 40°C.

6.1.2 Warm-Up

The Model 9016 should be allowed to warm up for at least one (1) hour before calibration.

6.2 Laser Module Calibration

6.2.1 Recommended Equipment

Recommended test equipment for calibrating the module is listed in **Table 14 – Recommended Test Equipment**. Equipment other than that shown in the table may be used if the specifications meet or exceed those listed.

Description	Mfg./Model	Specification
DMM	HP 34401A	DC Amps @ 1.0 A): ±1% Resistance (@ 10 ohms): 0.02%
Resistor	High Power, Low Temperature Coefficient	1 Ω, 50 W; 2 Ω, 25 W; 5 Ω, 10 W; 10 Ω, 5 W; 30 Ω, 2 W
Optical Isolator	NEC PS2501-1	or equivalent, 6-pin
Connector	D-sub	9-pin male

Table 14 – Recommended Test Equipment

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6.2.2 Drive Current Load Resistor Selection

Maximum Module Current	Resistor
200 mA	30 Ω, 2 W
500 mA	10 Ω, 5 W
1,000 mA	5 Ω, 10 W
3,000 mA	2 Ω, 25 W
6,000 mA	1 Ω, 50 W

Table 15 – Drive Current Load Resistor Selection

6.2.3 Local Operation Current Source (Io) Calibration

Use the following procedure to calibrate the current source for the unit locally:

a. With the output off, connect a load resistor, as selected from **Table 15 – Drive Current Load Resistor Selection**, and a calibrated ammeter in series across the laser output terminals.

   If an ammeter with the appropriate current ratings is unavailable, connect a calibrated DMM across the laser output terminals to measure the voltage across the resistor.

b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

   where V is the measured voltage across the resistor, and R is the measured load resistance.

c. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the soft key(s) that correspond to the module to be calibrated.

d. Press the **Setup** soft key and set the laser current limit (**Io Lim**) to one-half scale plus 100 mA and output bandwidth as desired. Press the **Prev** soft key to return to the single display.

e. Press the **OFF** soft key to turn the laser output ON, if it is not on already.

f. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

g. Press the **Io** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point before completing the calibration.

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6.2.4 Remote Operation Current Source (I_O) Calibration

Use the following procedure to calibrate the current source for the unit remotely:

a. With the output off, connect a load resistor, as selected from **Table 15 – Drive Current Load Resistor Selection**, and a calibrated ammeter in series across the laser output terminals.

   If an ammeter with the appropriate current ratings is unavailable, connect a calibrated DMM across the laser output terminals to measure the voltage across the resistor.

b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

   where V is the measured voltage across the resistor, and R is the measured load resistance.

c. Select the channel [,subchannel] via the **LAS:CHAN** command. Set the current limit to one-half scale plus 100 mA via the **LAS:LIM:LDI** command, output bandwidth as desired via the **LAS:MODE:I**, **LAS:MODE:ICW**, or **LAS:MODE:ILBW** command, and current set point to one-half scale via the **LAS:LDI** command.

d. Enter the **LAS:OUTPUT ON** command to turn the laser output on.

e. Enter the laser LDI calibration mode by issuing the **LAS:CAL:LDI** command.

f. Input the actual (measured) laser output current (as an <nrf value>) via the **LAS:LDI <nrf value>** command.

   The Model 9016 will be ready to receive the current value when, after a **LAS:CAL:LDI?** query is sent, the response from the Model 9016 is "1".

g. Once the actual current value is entered via the **LAS:LDI** command, the Model 9016 will apply a new current equal to approximately one-fourth (¼) the previous set point.

   The Model 9016 will be ready to receive the second current value when, after a **LAS:CAL:LDI?** query is sent, the response from the Model 9016 is "1".

h. Input the second actual (measured) laser output current as in Step f.

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i. Once the actual current value is entered via the second **LAS:LDI** command, the Model 9016 leaves the current calibration mode.

If, at any time prior to the second **LAS:LDI**, a command other than **LAS:LDI** or **LAS:CAL:LDI?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

The ***OPC?** query may be used to determine when the calibration is completed.

The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

6.2.5 Local Operation I_{PD} Current Calibration

This procedure calibrates the feedback circuits locally for constant I_{PD} and constant P_{PD} modes. The user enters the actual value of the current, as measured by an external DMM. The Model 9016 then automatically calibrates the laser feedback circuits.

The I_{PD} calibration circuit is diagrammed below. Use **Table 15 – Drive Current Load Resistor Selection** above to select a value for the R2 resistor that matches the maximum drive current of the laser diode module.

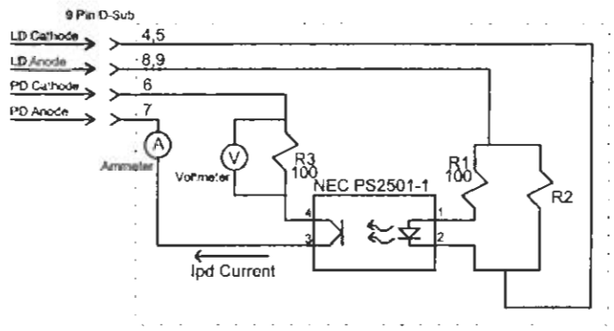


Figure 28 – I_{PD} Calibration Circuit

a. With the laser output off, connect a calibrated ammeter to the PD Anode output of the module and connect the circuit of **Figure 28** to the laser and PD outputs.

If a calibrated ammeter (with 0.1 µA resolution) is not available, place a calibrated DMM (with 0.1 mV resolution) to measure the voltage across the resistor, R3, as shown in **Figure 28**.

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b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

where V is the measured voltage across the resistor, and R is the measured load resistance.

c. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the soft key(s) that corresponds to the module to be calibrated.

d. Press the **Setup** soft key, change the **Mode** to **Im** (Photodiode constant current mode), and set the laser current limit (**Io Lim**) to maximum. Press the **Prev** soft key to return to the single display.

e. Press the **OFF** soft key to turn the laser output ON. If a laser on delay has been set, wait that amount of time to allow the laser output to engage.

f. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

g. Press the **Im** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

6.2.6 Remote Operation I_{PD} Current Calibration

Use the following procedure to calibrate the feedback circuits remotely for constant I_{PD} and constant P_{PD} modes:

a. With the laser output off, connect a calibrated ammeter to the photodiode anode output of the module and connect the circuit of **Figure 28** to the laser and photodiode outputs.

If a calibrated ammeter (with 0.1 µA resolution) is not available, place a calibrated DMM (with 0.1 mV resolution) to measure the voltage across the resistor, R3, as shown in **Figure 28**.

b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

where V is the measured voltage across the resistor, and R is the measured load resistance.

c. Select the channel [,subchannel] via the **LAS:CHAN** command. Set the laser current limit to full scale via the **LAS:LIM:LDI** command. Set the photodiode current set point to half of full scale via the **LAS:MDI** command. Place the unit into constant photodiode current mode via the **LAS:MODE:MDI** command.

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d. Enter the **LAS:OUTPUT ON** command to turn the laser output on.

e. Enter the **LAS:CAL:MDI** command to place the Model 9016 in its laser photodiode current calibration mode.

f. After a few seconds, the Model 9016 will be ready for the actual photodiode current to be entered via the **LAS:MDI** command. The measured value of the current should not be entered until the Model 9016 is ready to receive it.

The Model 9016 will be ready to receive the current value when, after a **LAS:CAL:MDI?** query is sent, the response from the Model 9016 is "1".

g. Once the actual photodiode current value is entered via the **LAS:MDI** command, the Model 9016 will apply a new photodiode current equal to approximately one-fourth (¼) the previous set point.

The Model 9016 will be ready to receive the second current value when, after a **LAS:CAL:MDI?** query is sent, the response from the Model 9016 is "1".

h. Input the second actual (measured) photodiode current as in Step f.

i. Once the actual photodiode current value is entered via the second **LAS:MDI** command, the Model 9016 leaves the current calibration mode.

If, at any time prior to the second **LAS:MDI,** a command other than **LAS:MDI** or **LAS:CAL:MDI?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

The ***OPC?** query may be used to determine when the calibration is completed.

The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

6.2.7 Local Operation Laser Voltage Measurement Calibration

Use the following procedure to calibrate the laser voltage measurement locally:

a. With the output off, connect a calibrated voltmeter, in parallel with a load resistor, as selected **Table 15 – Drive Current Load Resistor Selection**, to the laser output terminals.

b. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

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c. Press the **Setup** soft key and set the laser current limit (**Io Lim**) to 80% of the maximum current plus 100 mA and the laser voltage compliance limit (**Vcomp**) to maximum. Press the **Prev** soft key to return to the single display.

d. Press the **OFF** soft key to turn the laser output on, if it is not on already.

e. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

f. Press the $\mathbf{V_f}$ soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

6.2.8 Remote Operation Laser Voltage Measurement Calibration

Use the following procedure to calibrate the laser voltage measurement remotely:

a. With the output off, connect a calibrated voltmeter in parallel a load resistor, as selected, to the laser output terminals.

b. Select the channel [,subchannel] via the **LAS:CHAN** command. Set the voltage limit to full scale via the **LAS:LIM:LDV** command, and the current set point necessary to read approximately 80% of full-scale voltage. For example, with an 8560 module, with a resistance of 1 Ω, set the current to 4,800 mA. Place the unit into constant current mode via the **LAS:MODE:LDI** command.

c. Enter the **LAS:OUTPUT ON** command to turn the laser output on.

d. Enter the laser voltage calibration mode by issuing the **LAS:CAL:LDV** command.

e. Input the actual (measured) laser voltage (as an <nrf value>) via the **LAS:LDV <nrf value>** command.

   The Model 9016 will be ready to receive the value when, after a **LAS:CAL:LDV?** query is sent, the response from the Model 9016 is "1".

f. Once the actual voltage value is entered via the **LAS:LDV** command, the Model 9016 will apply a new current equal to approximately one-fourth (¼) the previous set point.

   The Model 9016 will be ready to receive the second voltage value when, after a **LAS:CAL:LDV?** query is sent, the response from the Model 9016 is "1".

g. Input the second actual (measured) voltage as in Step e.

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h. Once the actual voltage value is entered via the **LAS:LDV** command, the Model 9016 leaves the current calibration mode.

If, at any time prior to the second **LAS:LDV**, a command other than **LAS:LDV** or **LAS:CAL:LDV?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s). The ***OPC?** query may be used to determine when the calibration is completed.

The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

6.3 TEC Calibration

6.3.1 Recommended Equipment

Recommended test equipment for calibrating the module is listed in **Table 16 – Recommended Test Equipment**. Equipment other than that shown in the table may be used if the specifications meet or exceed those listed.

Description	Mfg./Model	Specification
DMM	HP34401A	DC Amps @ 1.0 A): ±1% Resistance (@ 10 ohms): 0.02%
Resistors	Metal Film	10 kΩ for ITE calibration (dual/combo only) 1 kΩ for 100µA calibration 100 kΩ for 10µA calibration 3 kΩ for LM335 sensor calibration 16 kΩ for AD590 sensor calibration 100 Ω for RTD sensor calibration
Resistor	High Power	1 Ω, 50 W, for current calibration
Connector	D-sub	15-pin male

Table 16 – Recommended Test Equipment

6.3.2 Local Operation Thermistor Calibration

Use the following procedure to calibrate the thermistor locally:

a. Measure and record the exact resistance of your metal film resistor. Use nominal values of 1 kΩ for the 100µA setting, and 100 kΩ for the 10µA setting. With the TEC output off, connect the metal film resistor to the sensor input of the TEC Module.

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b. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

c. Press the **Setup** soft key and select the appropriate thermistor (10µA or 100µA) as the Sensor Type. Press the **Prev** soft key to return to the single display.

d. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

e. Enter the TEC sensor calibration mode by pressing the **Sensor** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

6.3.3 Remote Operation Thermistor Calibration

Use the following procedure to calibrate the thermistor sensor for remote operation:

a. Measure and record the exact resistance of your metal film resistor. Use nominal values of 1 kΩ for the 100µA setting, and 100 kΩ for the 10µA setting. With the TEC output off, connect the metal film resistor to the sensor input of the TEC Module.

b. Enter the **TEC:CHAN** command to select the channel [,subchannel] to be calibrated. Send **TEC:SENS 1** 100µA thermistor, or **TEC:SENS 2** for the 10µA thermistor, followed by the **TEC:CAL:SEN** to enter sensor calibration mode.

   The Model 9016 will be ready to receive the resistance when, after a **TEC:CAL:SEN?** query is sent, a "1" is returned.

c. Input the actual resistance of the metal film resistor, in kΩ, (as an <nrf value>) via the **TEC:R <nrf value>** command.

   If, at any time prior to **TEC:R,** a command other than **TEC:R** or **TEC:R?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

   Once the **TEC:R** value is sent, the **OPC?** query may be used to determine when the calibration is completed. The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

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6.3.4 Local Operation AD590 Sensor Calibration

Use the following procedure to calibrate the AD590 sensor remotely:

a. With the TEC output off, connect a precision 16 kΩ metal film resistor and a precision ammeter in series at the sensor input of the TEC Module.

b. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

c. Press the **Setup** soft key and select the AD590 as the Sensor Type. Press the **Prev** soft key to return to the single display.

d. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

e. Enter the TEC sensor calibration mode by pressing the **Sensor** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

6.3.5 Remote Operation AD590 Sensor Calibration

Use the following procedure to calibrate the AD590 sensor remotely:

a. With the TEC output off, connect a precision 16 kΩ metal film resistor and a precision ammeter in series at the sensor input of the TEC Module.

b. Enter the **TEC:CHAN** command to select the channel [,subchannel] to be calibrated. Enter the **TEC:SEN 4** and **TEC:CAL:SEN** to select the AD590 sensor and enter sensor calibration mode.

   The Model 9016 will be ready to receive the current value when, after a **TEC:CAL:SEN?** query is sent, the response from the Model 9016 is "1".

c. Input the actual current measured, in µA, by the external ammeter (as an <nrf value>) via the **TEC:R <nrf value>** command.

   If, at any time prior to **TEC:R,** a command other than **TEC:R** or **TEC:R?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

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Once the **TEC:R** value is sent, the **OPC?** query may be used to determine when the calibration is completed. The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

6.3.6 Local Operation LM335 Sensor Calibration

Use the following procedure to calibrate the LM335 sensor locally:

a. With the TEC output off, connect a 3 kΩ metal film resistor and a precision voltmeter in parallel at the sensor input of the TEC module.

b. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

c. Press the **Setup** soft key and select the LM335 as the Sensor Type. Press the **Prev** soft key to return to the single display.

d. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

e. Enter the TEC sensor calibration mode by pressing the **Sensor** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

6.3.7 Remote Operation LM335 Sensor Calibration

Use the following procedure to calibrate the LM335 sensor remotely:

a. With the TEC output off, connect a 3 kΩ metal film resistor and a precision voltmeter in parallel at the sensor input of the TEC module.

b. Enter the **TEC:CHAN** command to select the channel [,subchannel] to be calibrated. Enter the **TEC:SEN 3** and **TEC:CAL:SEN** to select the LM335 sensor and enter sensor calibration mode.

The Model 9016 will be ready to receive the voltage value when, after a **TEC:CAL:SEN?** query is sent, the response from the Model 9016 is "1".

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c. Input the actual voltage, in mV, measured by the external voltmeter (as an <nrf value>) via the **TEC:R <nrf value>** command.

If, at any time prior to **TEC:R,** a command other than **TEC:R** or **TEC:R?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

Once the **TEC:R** value is sent, the **OPC?** query may be used to determine when the calibration is completed. The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

6.3.8 Local Operation RTD Calibration

Use the following procedure to calibrate the RTD sensor locally:

a. Measure and record the exact resistance of your 100 Ω metal film resistor. With the TEC output OFF, connect the metal film resistor to the sensor input of the TEC Module.

b. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

c. Press the **Setup** soft key and select the RTD as the Sensor Type. Press the **Prev** soft key to return to the single display.

d. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

e. Enter the TEC sensor calibration mode by pressing the **Sensor** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

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6.3.9 Remote Operation RTD Calibration

Use the following procedure to calibrate the RTD sensor remotely:

a. Measure and record the exact resistance of your 100 Ω metal film resistor. With the TEC output OFF, connect the metal film resistor to the sensor input of the TEC Module.

b. Enter the **TEC:CHAN** command to select the channel [,subchannel] to be calibrated. Send **TEC:SENS 5** to select the RTD sensor, followed by the **TEC:CAL:SEN** to enter sensor calibration mode.

   The Model 9016 will be ready to receive the resistance when, after a **TEC:CAL:SEN?** query is sent, a "1" is returned.

c. Input the actual resistance, in ohms, of the metal film resistor (as an <nrf value>) via the **TEC:R <nrf value>** command.

   If, at any time prior to **TEC:R,** a command other than **TEC:R** or **TEC:R?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

   Once the **TEC:R** value is sent, the **OPC?** query may be used to determine when the calibration is completed. The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

6.3.10 RTD Lead Resistance Calibration (Offset Null)

Because the RTD sensor reflects changes in temperature with small changes in resistance, even a small lead resistance (resistance caused by the wire running between the TEC module and the RTD sensor) can cause significant temperature offset. The lead resistance may be taken out of the RTD reading as follows:

a. With the TEC output OFF, short the sensor wires as close to the RTD sensor as possible.

b. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

c. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

d. Enter the TEC sensor calibration mode by pushing pressing the **RTD Null** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

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6.3.11 Local Operation ITE Current Calibration

The following procedure is for calibrating the ITE constant current source locally for both polarities of current:

a. With the output off, connect a 1 Ω, 50 W resistor and a calibrated ammeter in series across the laser output terminals.

   If an ammeter with the appropriate current ratings is unavailable, connect a 1 Ω, 50 W resistor across the laser output terminals and use a calibrated DMM to measure the voltage across the resistor.

b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

   where V is the measured voltage across the resistor, and R is the measured load resistance. For dual and combination modules, also connect a 10 kΩ resistor across the sensor input.

c. Go to the single module display by first pressing the **MENU** button, then the **Modules** soft key, then the slot soft key that corresponds to the module to be calibrated.

d. Go to the Calibration Screen. This is done by pressing the **Menu** button, **Config** soft key, **Calibrate** soft key; then the soft key(s) that correspond to the module to be calibrated.

e. Enter the TEC ITE calibration mode by pushing the **ITE** soft key. Follow the on-screen instructions to complete the calibration. The calibration can be canceled without affecting the stored constants if the **Cancel** soft key is pressed at any point prior to completing the calibration.

6.3.12 Remote Operation ITE Current Calibration, Single Channel TEC Modules

Use the following procedure to calibrate the ITE current for single channel TEC modules remotely:

a. With the output off, connect a 1 Ω, 50 W resistor and a calibrated ammeter in series across the laser output terminals.

   If an ammeter with the appropriate current ratings is unavailable, connect a 1 Ω, 50 W resistor across the laser output terminals and use a calibrated DMM to measure the voltage across the resistor.

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b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

where V is the measured voltage across the resistor, and R is the measured load resistance.

c. Enter the **TEC:CHAN** command to select the channel [,subchannel] to be calibrated. Send **TEC:CAL:ITE** to enter ITE calibration mode.

The module will be placed in ITE mode, limit set to 50% of full scale plus 100 mA, and the ITE set point set to 50% of full scale.

The Model 9016 will be ready to receive the first measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

d. Input the actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command. The Model 9016 will then drive the current to 25% of the initial set point.

The Model 9016 will be ready to receive the second measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

e. Input the second actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command. The Model 9016 will then drive the current to the negative current value of the initial set point.

The Model 9016 will be ready to receive the third measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

f. Input the third actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command. The Model 9016 will then drive the current to 25% of the negative current value of the initial set point.

The Model 9016 will be ready to receive the fourth measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

g. Input the fourth actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command.

If, at any time prior to the last **TEC:ITE,** a command other than **TEC:ITE** or **TEC:ITE?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s).

Once the **TEC:ITE** value is sent, the **OPC?** query may be used to determine when the calibration is completed. The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

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6.3.13 Remote Operation ITE Current Readback Calibration, Dual and Combo TEC Modules

Because the dual and combo modules only support constant temperature mode, calibration of the ITE read back is done using the limit circuit. By loading a 10 kΩ resistor across the sensor input and selecting the Thermistor sensor, the system will read the temperature as a constant 25°C. Setting a temperature of 20°C and 30°C with the output on will force it to go to the positive and negative limit, respectively, allowing the limit set point to simulate an ITE current set point.

a. Connect a 10 kΩ resistor across the sensor input. With the output off, connect a 1 Ω, 50 W resistor and a calibrated ammeter in series across the output terminals.

   If an ammeter with the appropriate current ratings is unavailable, connect a 1 Ω, 50 W resistor across the output terminals and use a calibrated DMM to measure the voltage across the resistor.

b. Calculate the current in the following steps by using Ohm's Law:

$$I = V / R$$

   where V is the measured voltage across the resistor, and R is the measured load resistance.

c. Enter the **TEC:CHAN** command to select the channel [,subchannel] to be calibrated. Send **TEC:CAL:ITE** to enter ITE calibration mode.

   The Model 9016 will select the Thermistor sensor and place the system in constant temperature mode. The ITE current limit is set to 50% of full scale, and the output turned on.

   The Model 9016 will be ready to receive the first measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

d. Input the actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command. The Model 9016 will then drive the current to 25% of the initial set point. The Model 9016 will be ready to receive the second measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

e. Input the second actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command. The Model 9016 will then drive the current to the negative current value of the initial set point. The Model 9016 will be ready to receive the third measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

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f. Input the third actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command. The Model 9016 will then drive the current to 25% of the negative current value of the initial set point. The Model 9016 will be ready to receive the fourth measured current value when, after a **TEC:CAL:ITE?** query is sent, a "1" is returned.

g. Input the fourth actual current (as an <nrf value>) via the **TEC:ITE <nrf value>** command.

If, at any time prior to the last **TEC:ITE,** a command other than **TEC:ITE** or **TEC:ITE?** is sent to the Model 9016, the Model 9016 will cancel the calibration mode and then process the command(s). Once the **TEC:ITE** value is sent, the **OPC?** query may be used to determine when the calibration is completed. The operation complete flag (bit 0 of the Standard Event Status Register) may be used to trigger an interrupt. This type of interrupt is enabled by setting bit 0 of the Service Request Enable register and using the ***OPC** command.

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CHAPTER 7

7. Factory Service

7.1 Introduction

This section contains information regarding obtaining factory service for the Model 9016. The user should not attempt any maintenance or service of this instrument and/or accessories beyond the procedures given in Chapters 5 and 6. Any problems that cannot be resolved using the guidelines listed in Chapters 5 and 6 should be referred to Newport Corporation factory service personnel. Contact Newport Corporation or your Newport representative for assistance.

7.2 Obtaining Service

To obtain information concerning factory service, contact Newport Corporation at 800-222-6440 (within the U.S.) or your Newport representative. Please have the following information available:

1. Instrument model number (on front panel)

2. Instrument serial number (on rear panel)

3. Description of the problem

If the instrument is to be returned to Newport Corporation, you will be given a Return Materials Authorization (RMA) number, which you should reference in your shipping documents as well as clearly marked on the outside of the shipping container.

Please fill out the service form, located on the following page, and have the information ready when contacting Newport Corporation. Return the completed service form with the instrument.

Additional service information may be obtained from the Newport Corporation website:

http://www.newport.com

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CHAPTER 8

8. Error Messages

8.1 Introduction

Error messages may appear on the display when error conditions occur in the respective functions of the Model 9016.

In remote operation, the current error list can be read by issuing the "ERR?" query. When this is done, a string will be returned containing all of the error messages that are currently in the error message queue.

8.2 Error Codes

The errors codes are numerically divided into areas of operation as shown below.

Error Code Range	Area of Operation
E-001 to E-099	Internal Program Errors
E-100 to E-199	Parser Errors
E-200 to E-299	Execution Control Errors
E-300 to E-399	GPIB/RS-232 Errors
E-400 to E-499	TEC Control Errors
E-500 to E-599	Laser Control Errors
E-900 to E-999	System Errors
E-1000 to E-9999	Miscellaneous Errors
E-10000 to E-19999	Internal Program Errors

Table 17 contains all of the error messages that may be generated by the Model 9016. Not all of these messages may be displayed. Some refer to GPIB activities only, for example.

Table 17 – Error Codes

Error Code	Explanation
E-001	Memory allocation failure.
E-002	Floating point error; element in error set to default value.
E-104	<NON-DECIMAL NUMERIC PROGRAM DATA> type not defined.
E-106	<DECIMAL PROGRAM DATA> digit expected
E-107	<DECIMAL PROGRAM DATA> digit not expected.
E-115	<PLACEHOLDER PROGRAM DATA> identifier not valid.
E-116	Parser syntax error, character was not expected.
E-126	Too few or too many program data elements.

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Error Code	Explanation
E-201	<PROGRAM DATA> value out of range.
E-214	<PROGRAM DATA> length exceeds maximum.
E-217	Attempted to recall a bin from a unsaved position.
E-218	Link table full
E-301	A <RESPONSE MESSAGE> was ready, but controller failed to read it. (Query error).
E-302	Instrument is talking, but controller didn't read entire message.
E-303	Input buffer overflow
E-304	Output buffer overflow
E-305	Parser buffer overflow
E-306	Parser IEEE received
E-402	Sensor open disabled output.
E-403	TEC module open disabled output.
E-404	TEC Current limit disabled output.
E-405	TEC Voltage limit disabled output.
E-406	TEC resistance/reference limit disabled output
E-407	TEC high temperature limit disabled output.
E-409	TEC sensor type changed, TEC output shutdown.
E-410	TEC out of tolerance disabled output.
E-415	TEC sensor short, TEC output shutdown.
E-416	Incorrect TEC configuration to enter Calibration mode.
E-417	TEC output must be on to begin calibration.
E-418	TEC C1, C2, or C3 constants are bad, all set to default values.
E-419	TEC mode change disabled output
E-420	TEC interlock disabled output
E-431	TEC link condition forced output on
E-432	TEC link condition forced output off
E-433	Attempt to select non-TEC channel for TEC mode.
E-501	Laser interlock disabled output.
E-502	Laser hard current limit disabled output
E-503	Laser open circuit disabled output.
E-504	Laser current limit disabled output.
E-505	Laser voltage limit disabled output.
E-506	Laser photodiode current limit disabled output
E-507	Laser photodiode power limit disabled output.
E-508	Condition from linked module laser output shutdown.
E-509	Laser short circuit disabled output
E-510	Laser out of tolerance disabled output.
E-514	Laser mode change disabled output
E-515	Laser bandwidth change disabled output
E-516	Incorrect Configuration for Calibration Sequence to start.
E-517	Calibration for Laser Diode current must have the output on to start.

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Error Code	Explanation
E-518	Calibration for the Monitor Diode must have the output on and the sensitivity set to zero to start.
E-519	Setting a measurement is only valid during the calibration phase for that measurement. User has tried to calibrate a measurement without first entering the required calibration mode.
E-520	User cannot change the Laser Current set point while operating in a calibration mode for another measurement.
E-521	Cannot change photodiode input while output is on.
E-522	Critical failure, current flow while output is off. Power supply shutdown.
E-523	Critical failure, laser power supply indicating Vlas is not good.
E-524	Critical failure, internal laser heat sink temperature too high. Output shutdown.
E-525	Module initialization error typically caused by open laser circuit
E-526	Laser PD response value changed while on. Cannot change PD response value while output is on.
E-527	Io setpoint below modulation level. Cannot energize output.
E-528	Laser setpoint below modulation level. Laser limit was adjusted.
E-529	Laser modulation must be enabled to adjust this value.
E-530	Laser pulse change, shutdown laser output.
E-531	Laser link condition forced output on
E-532	Laser link condition forced output off
E-533	Attempted to select non-laser channel for laser operation.
E-534	Modulation not viable with thermopile.
E-900	Calculation Error shutdown output
E-901	System over temperature shutdown all outputs
E-902	Front laser enable panel key lock in off position, shutdown all laser outputs
E-903	Loading of a saved bin shutdown module output
E-904	Module communications/hardware error.
E-905	Recoverable EEPROM error, module values set to factory defaults.
E-906	System over-temperature, all outputs shutdown.
E-907	System interlock open, all outputs shutdown.
E-908	ADC ready line failed.
E-910	Power supply failed, supply shutdown.
E-911	Excessive internal power dissipation, output shutdown.
E-912	Inadequate power supplied.
E-913	Device over-temperature, output shutdown.
E-914	Fixture interlock/key switch open, all fixture outputs shutdown.
E-915	Auxiliary temperature exceeds limit, output shutdown.
E-916	Module init bit reset.
E-9999	Error condition remains from last user.
E-10000	No parameter.

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Error Code	Explanation
E-10001	Parameter blank.
E-10002	Delay in effect.
E-10003	Remote command too long, exceeded command depth.

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CHAPTER 9

9. Specifications

9.1 Mainframe and General Specifications

Model 8016/9008/9016 Modular Controller Specifications

Display	
Type	LCD graphics display, 240 (W) x 128 (H) pixels
Back Lighting	Green LED
Controls	Brightness and Contrast (contrast optimizes viewing angle)
Channel Active	Green LASER ACTIVE LED indicates that at least one Laser Diode output is on and the LCD graphics shows details of active channels.
Output Connectors	
Chassis Ground	4 mm Banana Jack
GPIB Connector	24 pin IEEE-488
RS-232 Connector	One 9-pin male D-sub
Power Requirements	100 to 240 volts, 5 Amp Max; 50 to 60 Hz
Size (H x W x D)	5.25-in. x 19.00-in. x 17.40-in. (13.3mm x 48.26cm x 44.20cm)
Mainframe Weight	40 lbs. (18 kg)
Modules Weight	2.5 lbs. (1.1 kg), typical weight each
Operating Temperature	0 to 40°C, < 70% relative humidity non-condensing
Storage Temperature	-20°C to 60°C, < 90% relative humidity non-condensing
Operating Altitude	<2000 meters (6562 feet)
Instrument Use	The Model 8016/9008/9016 is intended for indoor use only.
Laser Safety Features	Interlock, Output Delay (meets CDRH US21 CFR 1040.10)

In accordance with ongoing efforts to continuously improve our products, Newport Corporation reserves the right to modify product specifications without notice and without liability for such changes.

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Service Form

Newport	Telephone (in the United States):	FAX:
	800-222-6440	949-253-1680
	Telephone:	Internet:
	949-863-3144	www.newport.com

Name _____ RMA Number _____

Company _____ (NOTE: Please obtain Return Materials

Address _____ Authorization (RMA) number prior to return of item.)

Country _____ Date _____

P.O. Number _____ Phone Number _____

Item(s) Being Returned:

Model Number _____ Serial Number _____

Description _____

Reason for return of goods (please list any specific problems) _____

_____

List all control settings and describe problem _____

_____

_____

_____ (Attach additional sheets as necessary)

System Diagram:

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Describe signal source. If source is laser, describe output mode, peak power, pulse width, and repetition rate.

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Where is measurement being performed?
(factory, controlled laboratory, out-of-doors, etc.) _____

What input power line voltage is used? _____ Variation? _____

Input Power Frequency? _____ Ambient Temperature? _____

Any Additional Information: (i.e. If any special modifications were made by the user, please describe below.)

_____

_____

_____

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