User's Guide

Passive Component Test Application

(For the Agilent 86140-series Optical Spectrum Analyzer)

Agilent Technologies

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Key type for keys or text located on the keyboard or instrument.

Softkey type for key names that are displayed on the instrument's screen.

`Display type` for words or characters displayed on the computer's screen or instrument's display.

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Using the Application

About the Application

The passive component test application simplifies the complex characterization and testing of passive components. The application includes guided setups to prompt you through the measurement procedure. When the setup is complete the application performs an automatic pass/fail check against your custom specifications.

The application can easily be customized for your particular devices by modifying the specification files using either a text editor or a Microsoft®[1] Excel spreadsheet template wizard. The template wizard can be downloaded from the web. For more information, refer to "Excel Template Wizard for the PCT Application" on page 2-3.

To perform a measurement, you must run a specification file. Specification files configure the settings of the instrument, describe measurements, and direct the printing or saving of the measurement results. Specification files can be stored and loaded from the internal memory of the optical spectrum analyzer, or imported from a disk.

Because specification sets are stored in the internal memory of the optical spectrum analyzer, you can easily switch between tests. Refer to Chapter 2, "Designing Specification Sets" to learn how to design your own specification files.

It is easy to learn how to design and write specification files. Anyone with a basic understanding of how to operate the optical spectrum analyzer can learn how to design specification sets in approximately one hour. This is a small investment considering the time you'll save testing your devices.

Figure 1-1 and Figure 1-2 on page 1-3 show the measurement screen and the table of results displayed after a measurement has been taken.

1. Microsoft® is a U.S. registered trademark of Microsoft Corp.

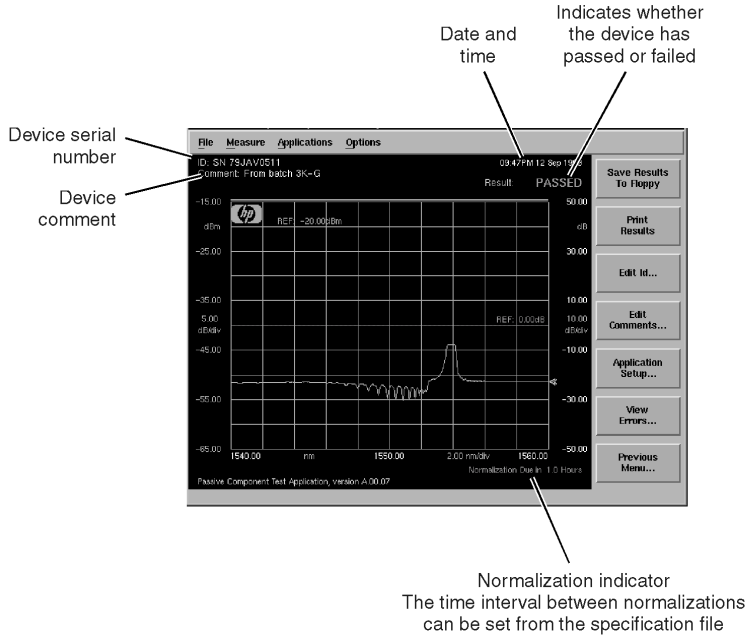


Figure 1-1. The Measurement screen.

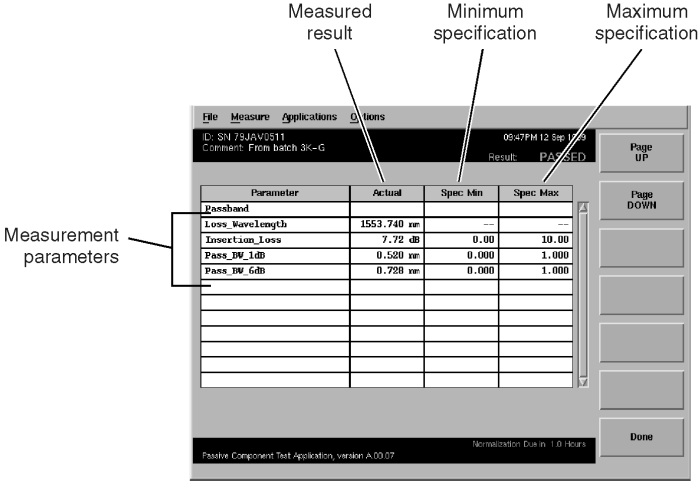
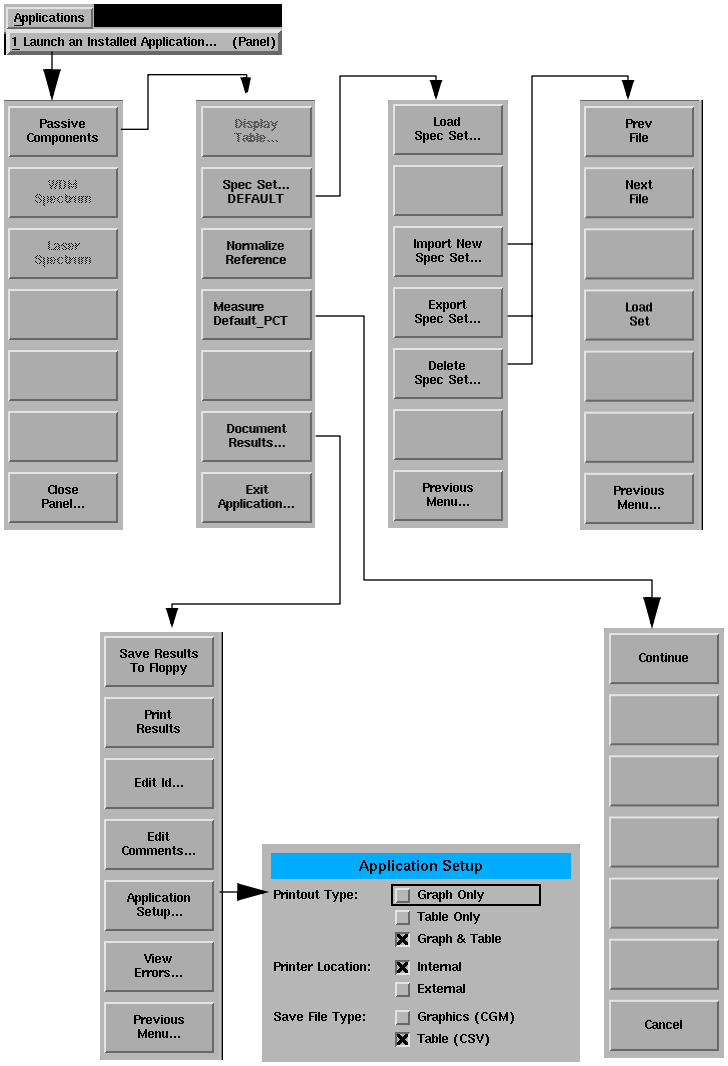


Figure 1-2. A table of results.

The Passive Component Test Menus



The application softkeys are accessed using the front-panel Appl's key or the Applications menu, Launch an Installed Application selection on the menu bar.

Function	**See....**
Passive Components Test application	"To start the Passive Components Test application" on page 1-7
Display Table....	"To display a table of the results" on page 1-14
Spec Set.... <*spec set*>	"To select a specification set" on page 1-8
Load Spec Set....	"To load an existing specification set" on page 1-9
Import Spec Set....	"To import a specification set" on page 1-8
Export Spec Set....	"To export a specification set" on page 1-11
Delete Spec Set....	"To delete a specification set" on page 1-11
Normalize Reference	"To run the source normalization routines" on page 1-12
Measure <*path_name*>	"To measure the device-under-test" on page 1-13
Document Results....	
Save Results to Floppy	"To save the results to floppy" on page 1-14
Print Results	"To print the results" on page 1-14
Edit Id....	"To edit the id of the device-under-test" on page 1-15
Edit Comments....	"To edit the comments for the device-under-test" on page 1-16
Application Setup....	"To change the default application settings" on page 1-17

Performing Measurements

This chapter explains how to load and use the Passive Components Test application.

Measurements are performed using either the instrument's internal broadband EELED or white-light source, or an external broadband source. You can test passive devices having any number of light paths, such as filters and couplers and WDM multiplexers.

To use the Passive Components Test application you must:

1. Start the application, see "To start the Passive Components Test application" on page 1-7.
2. Load a specification set from internal memory, see "To load an existing specification set" on page 1-9, or import a specification set from a floppy disk, see "To import a specification set" on page 1-8.
3. Perform a normalization if required, see "To run the source normalization routines" on page 1-12. The application automatically detects whether normalization is required.
4. Measure the device-under-test, see "To measure the device-under-test" on page 1-13.

You can then:

- Save the results, see "To save the results to floppy" on page 1-14.
- Print the results, see "To print the results" on page 1-14.
- View the results in a table, see "To display a table of the results" on page 1-14.

To start the Passive Components Test application

1. Press the front-panel Appl's key or the Applications menu Launch an Installed Application selection.
2. The following screen is displayed.

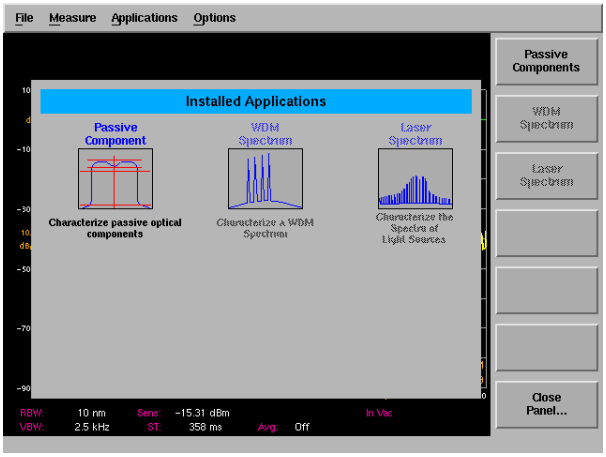


Figure 1-3. Applications Panel and Menu

The panel and the menu change whenever an application is installed or uninstalled. Each installed application has an icon on the panel and a corresponding softkey.

3. Press the *Passive Components* softkey. The loading of the application is indicated by the on-screen message, "`Loading Passive Component Application, Please Wait...`". When the application is loaded, the name of the selected set appears on the *Spec Set...* softkey. The application is now ready for use.

   The following functions assume the application is loaded.

To select a specification set

1 Press the *Spec Set...* *<spec set>* softkey.

You can now load an existing specification set, import a new specification set from a floppy disk, or delete an existing specification set from the internal memory of the OSA. If no specification sets are available, the default specification set is loaded.

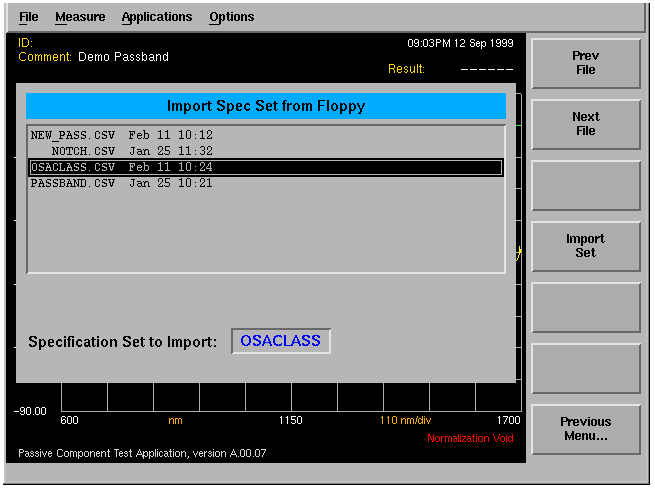
To import a specification set

1 Insert the floppy disk containing the specification set into the internal floppy disk drive of the OSA.

> **Note**
>
> Specification set file names must conform to the MS-DOS 8.3 file name convention, a maximum of 8 characters.

2 Press the *Spec Set...* *<spec set>* softkey.

3 Press the *Import Spec Set...* softkey.



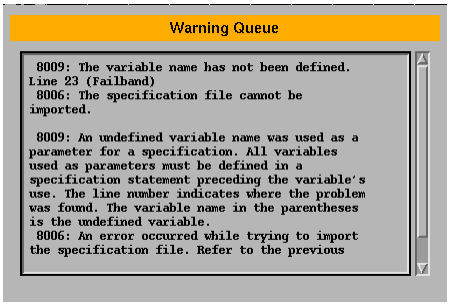
A list of the externally stored specification sets is displayed.

4 Use the navigation keys to select the desired specification set.

5 Press the *Import Set* softkey.

The selected specification set is imported into the internal memory of the OSA. When a specification set is imported it is checked for errors and "compiled" before being copied into internal storage.

If errors are detected in the specification set being imported, the *Show Warnings....* softkey appears. Press the *Show Warnings....* softkey, then the *Prev* and *Next* softkeys to display a detailed description of the error.

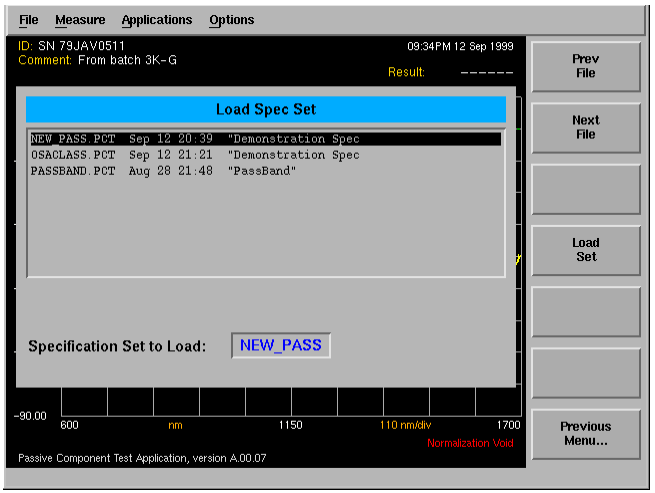


If no errors are detected, the file is automatically copied to internal memory, loaded, and the application returns to the previous menu.

To load an existing specification set

1 Press the *Spec Set....* <*spec set*> softkey.

2 Press the *Load Spec Set....* softkey.



A list of the internally stored specification sets is displayed. A specification set must be imported from a floppy disk into the internal memory of the OSA before it can be loaded. For information on importing specification sets, see "To import a specification set" on page 1-8.

If no specification sets have been previously imported, the Load Spec Set list will contain the Default specification set.

3 Use the navigation keys to select the desired specification set.

4 Press the *Load Set* softkey.

The currently selected specification set is loaded and you are returned to the previous softkey menu. While the specification set is being loaded, the message "`Loading Spec Set <spec set name>, Please Wait...`" is displayed.

To export a specification set

1. Press the *Spec Set....* *<spec set>* softkey.
2. Press the *Export Spec Set....* softkey. A list of the internally stored specification sets is displayed.
3. Use the navigation keys to select the desired specification set and then press the *Export Set* softkey. The CSV specification set file from internal memory is output to the floppy disk.

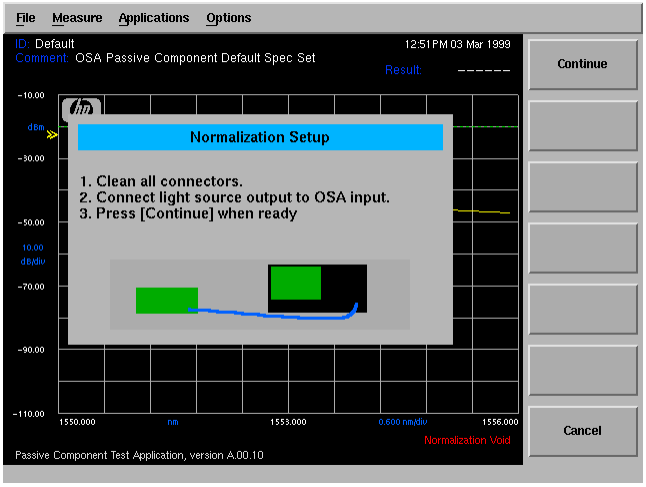
To delete a specification set

1. Press the *Spec Set....* *<spec set>* softkey.
2. Press the *Delete Spec Set....* softkey. A list of the internally stored specification sets is displayed.
3. Use the navigation keys to select the specification set to be deleted and then press the *Delete Spec Set* softkey. The currently selected specification set is deleted from internal memory. The message, "`Deleting Spec Set <spec set name>, Please Wait...`" is displayed while the set is deleted. After the file is deleted, the application returns to the previous menu.

To run the source normalization routines

> **Note**
>
> The application will automatically detect if a normalization is required and will run the routine before the next measurement is made. The time interval between normalizations is specified in the specification set.

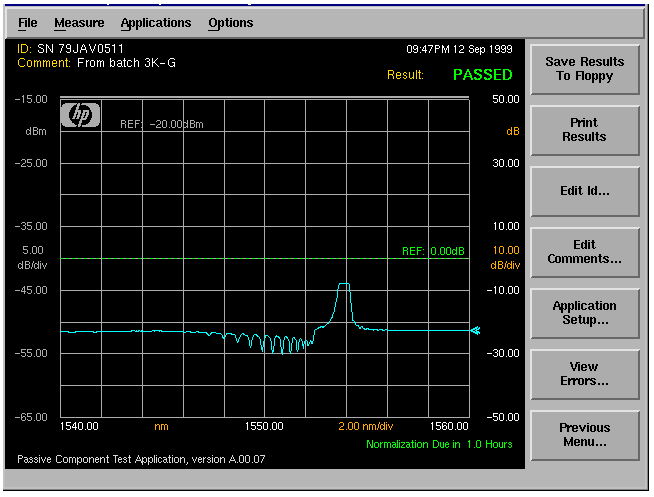
1. Load the desired specification set. See "To select a specification set" on page 1-8.
2. Press the *Normalize Reference* softkey.



3. Follow the on-screen instructions to perform the source normalization. After the source normalization is successfully completed you are returned to the previous menu and the device-under-test can be measured. See "To measure the device-under-test" on page 1-13.

To measure the device-under-test

1. Load the desired specification set. See "To select a specification set" on page 1-8.
2. Press the *Measure <spec set>* softkey. The application will detect and automatically run the normalization routine if required. See "To run the source normalization routines" on page 1-12.
3. The measurement will automatically continue when the normalization routine is completed.



The results can now be viewed as a waveform, as shown in the figure, or in a table, see "To display a table of the results" on page 1-14. The data can also be saved, see "To save the results to floppy" on page 1-14, and printed, see "To print the results" on page 1-14.

To save the results to floppy

The results can be saved automatically by using the STORE, AUTO keyword in the specification set, see “STORE, AUTO” on page 3-15.

To save the results manually after completing a measurement, press the *Document Results* softkey. Then press the *Save Results to Floppy* softkey. The results of the test are saved to the floppy disk. The data can be saved as either graphical data in CGM format or as tabular data in CSV. For information on selecting the type of data to be saved, see “To change the default application settings” on page 1-17.

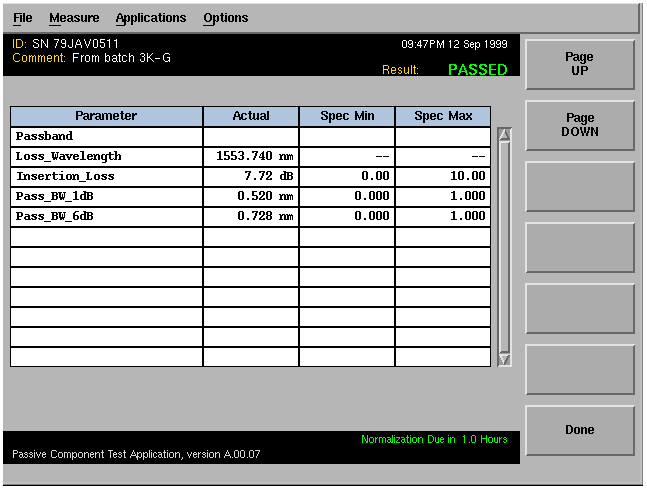
To print the results

The results can be printed automatically by using the PRINT keyword in the specification set, see “PRINT” on page 3-12.

To print the results manually after completing a measurement, press the *Document Results* softkey. Then press the *Print Results* softkey. The results can be printed out as a graph, a table, or as both on either the internal printer or on an external printer. See “To change the default application settings” on page 1-17 for information on making these selections.

To display a table of the results

After a measurement has been completed, press the *Display Table....* softkey.



Parameter	Actual	Spec Min	Spec Max
Passband			
Loss_Wavelength	1553.740 nm	--	--
Insertion_Loss	7.72 dB	0.00	10.00
Pass_BW_1dB	0.520 nm	0.000	1.000
Pass_BW_6dB	0.728 nm	0.000	1.000

To edit the id of the device-under-test

> **Note**
>
> Based on the specification set selected, you are usually prompted for the Device ID and Comments at the beginning of the measurement. However, if you were not prompted, or you wish to edit the Device ID or Comment fields, the following procedure can be used.

1. After completing a measurement, press the *Document Results....* softkey.
2. Press the *Edit Id....* softkey.

To enter the id using the arrow keys

1. Use the front-panel step keys (⇑ and ⇓) and the arrow softkeys (→ and ←) to highlight each letter of the id string.
2. When the desired letter or function is selected, press the *Select* softkey.
3. Select the *BackSpace* softkey to delete individual letters.
4. When you finish entering the string, press the *Continue* softkey.

To enter the id using a trackball or mouse

1. Use the pointing device to place the cursor on a letter of the filename. Click on the character to select it.
2. Click the *BackSpace* softkey to delete individual letters.
3. When you finish entering the string, click the *Continue* softkey. The new device id is displayed on-screen in the ID field.

> **Note**
>
> The new Device ID is saved *only for the current session.* Each time a new device is measured, the comment and ID strings are reset to the values specified in the specification set.

To edit the comments for the device-under-test

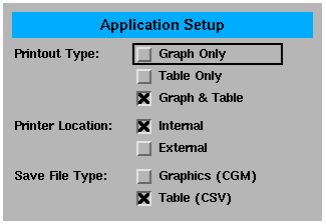
> **Note**
>
> Based on the specification set selected, you are usually prompted for the Device ID and Comments at the beginning of the measurement. However, if you were not prompted, or you wish to edit the Device ID or Comment fields, the following procedure can be used.

1. After completing a measurement, press the *Document Results....* softkey.
2. Press the *Edit Comments....* softkey.
3. Use the navigation keys to enter your comments. See "To enter the id using the arrow keys" on page 1-15 and "To enter the id using a trackball or mouse" on page 1-15 for information on entering the comment string.
4. When you finish entering the string, click the *Continue* softkey. The new comment is displayed on-screen in the Comment field.

> **Note**
>
> The new comment is saved *only for the current session.* Each time a new device is measured, the comment and ID strings are reset to the values specified in the specification set.

To change the default application settings

1. After completing a measurement, press the *Document Results....* softkey.
2. Press the *Application Setup....* softkey.
3. Refer to "To Fill In a Setup Panel" on page 1-19 for information on changing and selecting items in the setup panel.



Setup panel selections

Printout Type

The results can be printed out as a graph, a table, or as both.

Printer Location

Selects either the internal printer or an external printer as the print destination.

Save File Type

The data can be saved as either graphical data in CGM format or as tabular data in CSV.

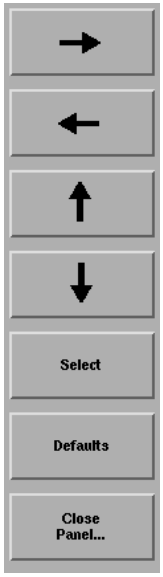
Setup Panels

Any of the instrument settings can be changed by using either the front-panel keys or the menu bar selections. Many of the menu selections and front-panel keys display a softkey panel. Settings in softkey panels are changed using the softkeys, data-entry keys, mouse, and trackball.

To Fill In a Setup Panel

Setup panels allow you to adjust setup conditions which are not frequently changed.

Using the softkeys



The arrow softkeys

Allows the user to navigate from field to field in the dialog box. The highlighted parameter can be changed.

The Select softkey

Selects or deselects the highlighted parameter.

The Defaults softkey

Resets the parameters to their default condition.

Close Panel.... softkey

Saves the current setup and returns the user to the previous menu.

The front-panel number keys, step keys, and knob

Allows the user to enter a numeric value in the highlighted field.

To use the navigation softkeys

1. Use the arrow softkeys to highlight the settings on the setup panel.
2. Use the *Select* softkey to toggle the selection boxes on and off.
3. Enter values in the numeric fields using the front-panel knob or numeric entry pad.
4. To return the setup values to the instrument's preset settings, press the *Defaults* softkey.
5. When you are satisfied with your selections, press the *Close Panel*.... softkey to enter your selections and close the setup panel.

2

Designing Specification Sets

Designing Specification Sets

What is a specification set?

Specification sets are files that program the passive component test application to perform a measurement. Each specification set defines one test. Specification sets are comma-separated-value (CSV) ASCII files that you can write using any text editor or spreadsheet program. The file name must comply with the MS-DOS 8.3 file name convention, a maximum of 8 characters, and the file name extension must be *.csv*.

How can I write specification sets?

You can use any ASCII editor to create your specification sets. See "Using an ASCII Editor" on page 2-20 for more information.

You can also simplify the writing of specification sets by using an Excel template. See "Excel Template Wizard for the PCT Application" on page 2-3 for more information.

If you use a spreadsheet program to develop your specification sets, configure the spreadsheet to automatically insert the commas for you when you save your file.

To learn the details about each specification set keyword, refer to Chapter 3, "Keyword Reference".

Excel Template Wizard for the PCT Application

Using an Excel Template

Writing specification sets can be simplified by using the Microsoft® Excel template. The Excel template wizard can be downloaded from the web at http://www.tmo.hp.com/tmo/software/English/osa_pct_wizard.html. The template features a pull-down menu and setup wizard to automate the generation of specification sets.

Installing the PCT Wizard

The Microsoft® Excel spreadsheet wizard, *pct_wizard.xlt,* contains a powerful macro that prompts you for measurement statements and builds a valid specification set file for your measurement.

Before using the template for the first time, make a backup copy and store it in a safe place. When working with the template in Excel, use the *Save CSV* button to prevent writing over the original, unmodified template. To prevent modifying the original template, on the File menu do *not* select Save.

To download and install the wizard

The PCT Wizard download is for Microsoft Windows systems only. To download the PCT Wizard:

1. Create a folder *c:\osa\pct* on your local PC.
2. On the web, go to http://www.agilent-tech.com – then click on Products, Test & Measurement, Fiber Optic Test Equipment, Optical Spectrum Analyzers, Agilent 86140A Optical Spectrum Analyzers, Agilent 86140A Technical Support, and then Agilent 86140A Series OSA Passive Component Test Application (under Software Patches & Drivers).
3. Download and save the *pct_wizard.exe* to the *c:\osa\pct* directory. This is a self extracting archive.

4 To extract the files, from Windows Explorer, double-click on *pct_wizard.exe*.

Four files are extracted:

readme.txt	A text file of the instructions shown on this web page.
pct_wizard.xlt	The Excel Wizard used to write specification sets.
pct_wizard.dll	The driver file required to run the PCT Wizard.
pct_help.pdf	Instructions for using the PCT Wizard and a brief tutorial. This file can be viewed and printed using Adobe Acrobat. If you do not have Adobe Acrobat Reader necessary for viewing PDF documentation, download your free Acrobat Reader now. (Button)

5 Move the *pct_wizard.dll* to the *c:\windows\system* directory.

6 Make a backup copy of *pct_wizard.xlt* and store it in a safe place.

To view the help file

Note

You must have Adobe Acrobat reader installed.

To view the help file and tutorial, from Windows Explorer, double click on *pct_help.pdf*.

To start the PCT Wizard

Note

You must have Microsoft Excel installed.

To open Excel and start the Wizard, from Windows Explorer, double-click on *pct_wizard.xlt*.

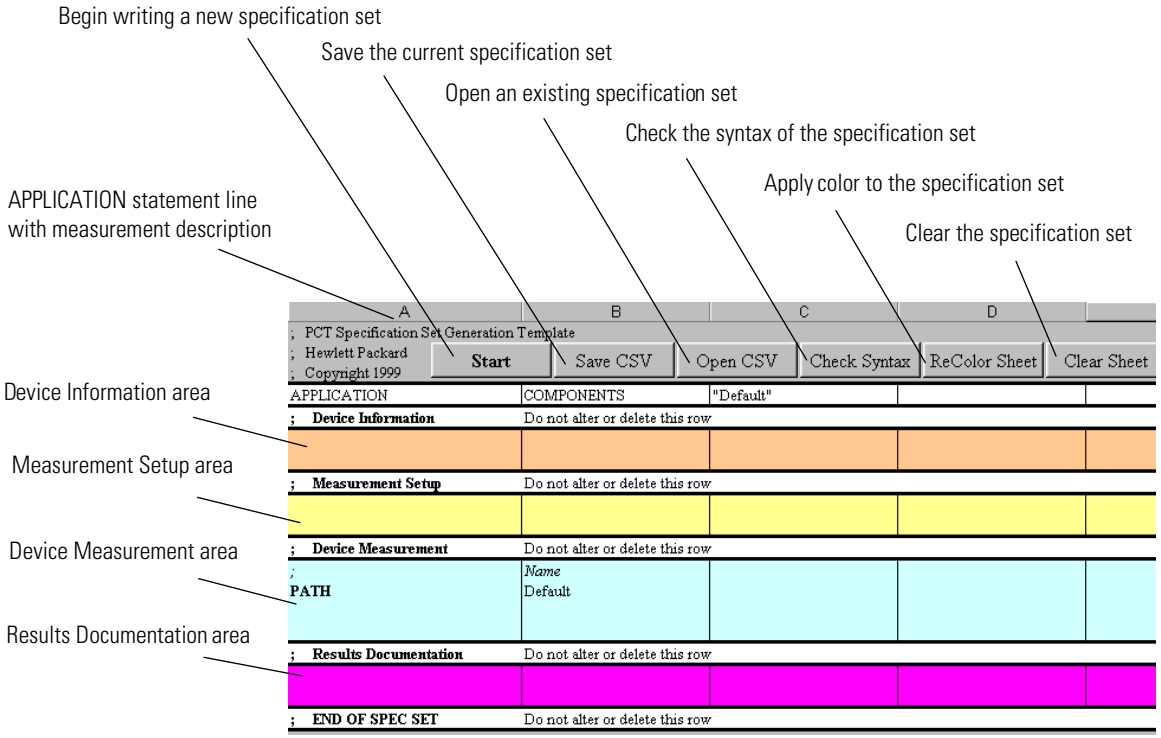
CAUTION

Never save your work from the file menu. This creates a modified template file which generates an improper specification set (CSV) file that will not run in the Passive Component Test application. **Always click the *Save CSV* button to save your specification set.**

To remove the PCT Wizard from your PC

1. To remove all files and the PCT Wizard from your PC, delete the folder *c:\osa\pct* and all its contents.
2. Delete the file *pct_wizard.dll* from the *c:\windows\system* directory.

The PCT Wizard at a Glance



The spreadsheet template

Device Information area

This section is used to enter information about the device, such as the identification and comments. The ID and COMMENT statements allow you to specify the device you are testing and to label the test. Both of these values will be shown on the instrument screen. Each time a device is tested, the user can be prompted to enter the device's serial number.

Measurement Setup area

This section is used to enter measurement setup information, such as the resolution, span, center wavelength and sensitivity. This area will contain the required NORMALIZE and SETUP keywords and the optional STIMULUS keyword to set up the optical spectrum analyzer for measurement.

The SETUP statement configures the settings of the optical spectrum analyzer. Only one SETUP statement should be used. The NORMALIZE keyword performs a trace normalization. The STIMULUS statement is used to specify the internal or external broadband light source of the instrument.

Device Measurement area

This section us used to enter the test sequence and specification limits, such as, center wavelength and insertion loss. This area of the spreadsheet will contain the required PATH keyword, and the keywords and parameters for the chosen measurements.

For a full list of keywords and parameters, refer to Chapter 3, "Keyword Reference".

Results Documentation area

Use this area to specify where and how the measurement results are stored and printed.

Use PRINT_SETUP to determine whether the summary is printed to the internal or external printer, and whether to print the results table or both the table and the graphics.

STORE_SETUP is used to determine what results information is saved to the floppy disk.

To begin the specification set

Every specification set begins with a required APPLICATION statement which identifies the specification set with the passive component test application. It also provides an identification string which is displayed when the file is cataloged. You must edit this string manually in cell C4.

CAUTION

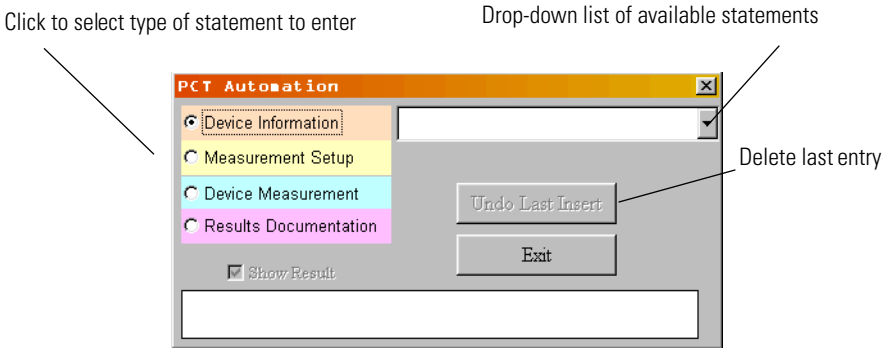
Do not modify or delete title rows, such as the "Device Information" row. If these rows are deleted, the PCT Wizard will not run properly.

After entering the identification string, you can create the specification set using the PCT Automation wizard.

All specification sets also require entries for SETUP, NORMALIZE, and PATH keywords. A default path is created whenever the *Clear Sheet* button is pressed. These will be entered using the wizard. Other keywords are optional. For a full list of keywords and parameters, refer to Chapter 3, “Keyword Reference”.

Using the PCT Wizard

1 Click the *Start* button to display the PCT Automation dialog box.

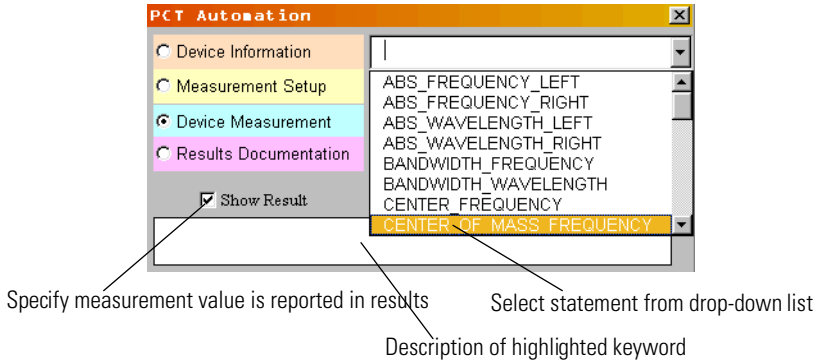


PCT Automation dialog box

2 There are four types of specification set statements: Device Information, Measurement Setup, Device Measurement, and Results Documentation. For a complete description of these statements refer to “Filling in the Device Information area” on page 2-10, “Filling in the Measurement Setup area” on page 2-12, “Filling in the Device Measurement area” on page 2-14, “Filling in the Results Documentation area” on page 2-16, and Chapter 3, “Keyword Reference”.

For each type of specification set statement, click the radio button next to the statement in the dialog box, then use the menu at the right to select a keyword. Enter the required information, then click OK to go on to the next item or to return to the first dialog box.

The *Undo Last Insert* button allows you to delete the last entry made. If you need to modify any other entry, close the wizard and then edit the spreadsheet cell directly.



3 When finished, click the *Exit* button to close the PCT Automation dialog box. Any modifications necessary to the spreadsheet entries may be made directly to the spreadsheet cells after the dialog box is closed.

4 To save the specification set, click the *Save CVS* button. On the File menu, do *not* select the Save command. If you do the specification set will *not* be saved properly.

Name of specification set listed in the "Load Spec Set" file listing of the passive component test application

Required statement identifying application to run specification set

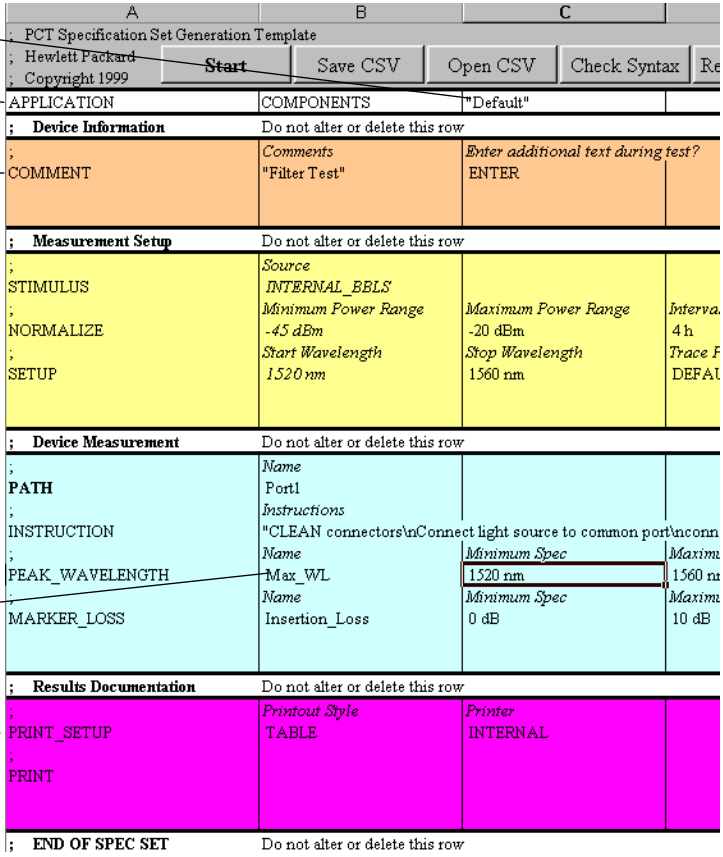
One of two optional statements for identifying the device being tested

Required NORMALIZE and SETUP statements

Instructions for performing measurements

Variable name for measured value listed in the measurement results

Measurement results sent to the internal printer



	A	B	C	
	; PCT Specification Set Generation Template			
	; Hewlett Packard	Start	Save CSV	Open CSV	Check Syntax	Re
	; Copyright 1999			
	APPLICATION	COMPONENTS	"Default"	
	; **Device Information**	Do not alter or delete this row		
	;	*Comments*	*Enter additional text during test?*	
	COMMENT	"Filter Test"	ENTER	
	; **Measurement Setup**	Do not alter or delete this row		
	;	*Source*		
	STIMULUS	*INTERNAL_BBLS*		
	;	*Minimum Power Range*	*Maximum Power Range*	*Interva*
	NORMALIZE	*-45 dBm*	-20 dBm	4 h
	;	*Start Wavelength*	*Stop Wavelength*	*Trace F*
	SETUP	*1520 nm*	1560 nm	DEFAU
	; **Device Measurement**	Do not alter or delete this row		
	;	*Name*		
	PATH	Port1		
	;	*Instructions*		
	INSTRUCTION	"CLEAN connectors\nConnect light source to common port\nconn		
	;	*Name*	*Minimum Spec*	*Maxim*
	PEAK_WAVELENGTH	Max_WL	1520 nm	1560 n
	;	*Name*	*Minimum Spec*	*Maxim*
	MARKER_LOSS	Insertion_Loss	0 dB	10 dB
	; **Results Documentation**	Do not alter or delete this row		
	;	*Printout Style*	*Printer*	
	PRINT_SETUP	TABLE	INTERNAL	
	;			
	PRINT			
	; **END OF SPEC SET**	Do not alter or delete this row		

Example of a specification set

Tutorial

In this tutorial you will create a specification set for measuring the peak wavelength of a WDM filter. The passband of the filter is from 1540 nm to 1560 nm.

To start the PCT Wizard

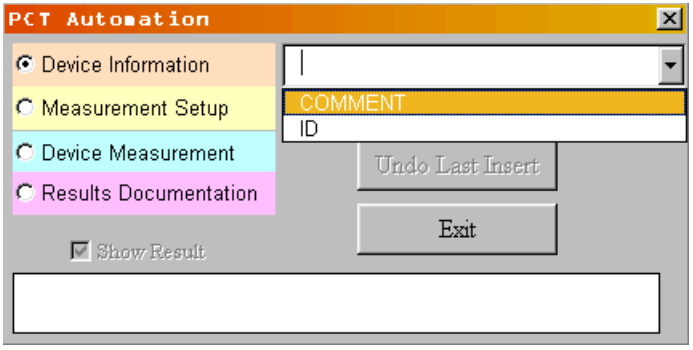
1 To open Excel and start the Wizard, from Windows Explorer, double-click on *pct_wizard.xlt*.

2 Click the *Start* button.

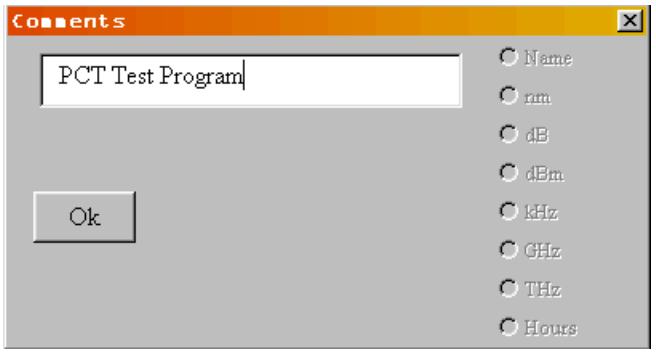
Filling in the Device Information area

To enter comments

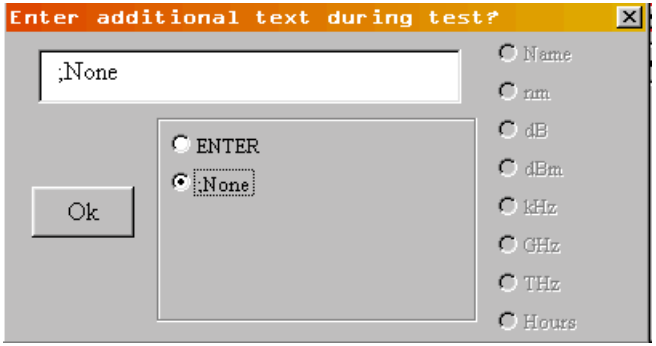
1 In the PCT Automation dialog box, click on the drop-down list and select COMMENT.



2 In the Comments dialog box text box, type `PCT Test Program` and then click *Ok*.



3 In the Enter Additional Text During Test dialog box select the None option button and then click *Ok*.

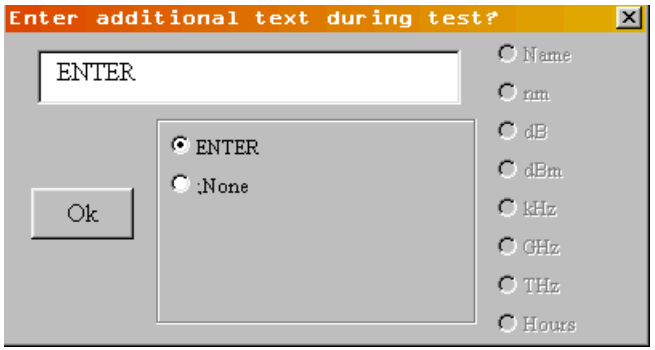


To enter the device id

4 In the PCT Automation dialog box on the drop-down list select ID.

5 In the Serial Number dialog box text box type, `HB001` and click *Ok*.

6 In the Enter Additional Text During Test? dialog box, click *Ok* to select the default text.



Note

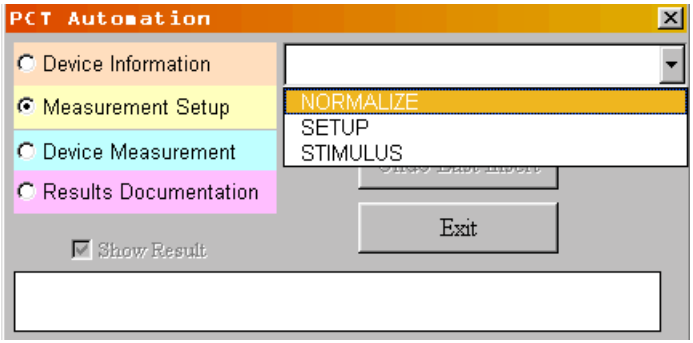
The default text of "ENTER" will cause the Optical Spectrum Analyzer to prompt the user to input a device ID number

Filling in the Measurement Setup area

To enter the normalize information

1 In the PCT Automation dialog box, select the Measurement Setup option button.

2 In the PCT Automation dialog box select NORMALIZE on the drop-down list.



3 In the Minimum Power Range dialog box enter `-40` in the text box. Click *Ok*.

4 In the Maximum Power Range dialog box enter `0` in the text box. Click *Ok*.

5 To set the time between normalizations to two hours, in the Interval between normalizations dialog box enter `2`. Click *Ok*.

To enter the setup information

1 In the PCT Automation dialog box, select SETUP on the drop-down list.

2 In the Start Wavelength dialog box, type `1540.` Click *Ok*.

3 In the Stop Wavelength dialog box, type `1560.` Click *Ok*.

4 In the Trace Points dialog box, type `1001.` Click *Ok*.

5 In the Averages dialog box, type `1.` Click *Ok*.

6 In the Resolution Bandwidth dialog box select the 0.1 nm option button. Click *Ok*.

7 In the Reference Level dialog box, type `0`. Click *Ok*.

8 In the Scale (dB per division - optional) dialog box, type `10`. Click *Ok*.

9 In the Sensitivity dialog box type, `-85`. Click *Ok*.

10 In the Video Bandwidth (3kHz max…) dialog box click *Ok* to keep the DEFAULT text.

11 In the PCT Automation dialog box select STIMULUS on the drop-down list.

12 In the Stimulus dialog box click *Ok* to keep the INTERNAL_BBLS text.

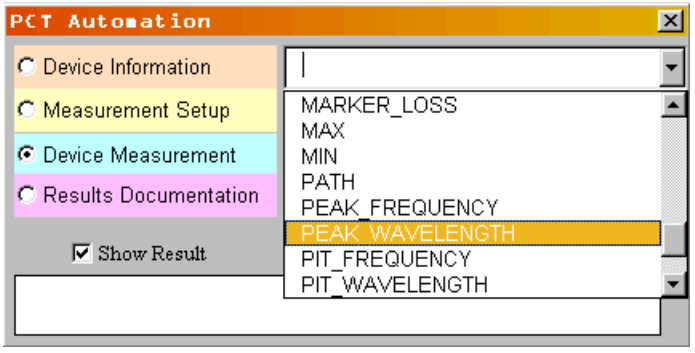
Filling in the Device Measurement area

1 In the PCT Automation dialog box select the Device Measurement option button.

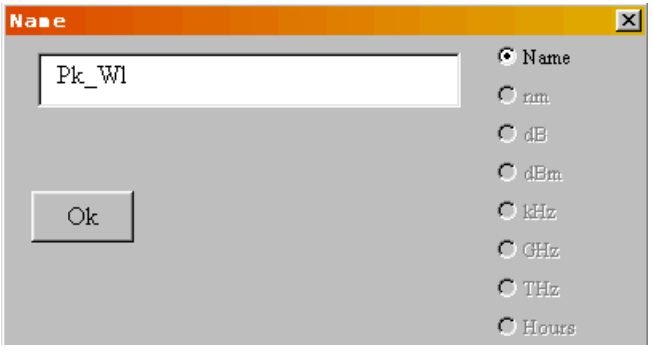
2 In the PCT Automation dialog box select PEAK_WAVELENGTH from the drop-down list.

Note

Use the front-panel up and down arrow keys to cycle through the list of keywords and display a description of the highlighted keyword.



3 In the Name dialog box type `Pk_Wl.` Click *Ok*.



Note

The name you just entered, Pk_Wl, is now a variable name you can reference later.

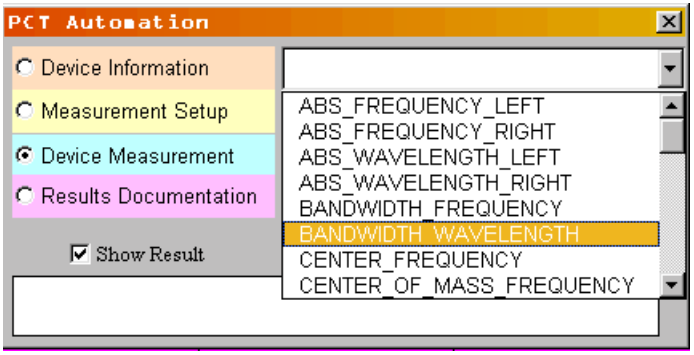
4 In the Minimum Spec dialog box, type `1545.` Make sure the nm option button is selected. Click *Ok*.

5 In the Maximum Spec dialog box, type `1555`. Click *Ok*.

6 In the Search From dialog box, type `1540`. Click *Ok*.

7 In the Search To dialog box, type `1560.`Click *Ok*.

8 In the PCT Automation dialog box select BANDWIDTH_WAVELENGTH on the drop-down list.



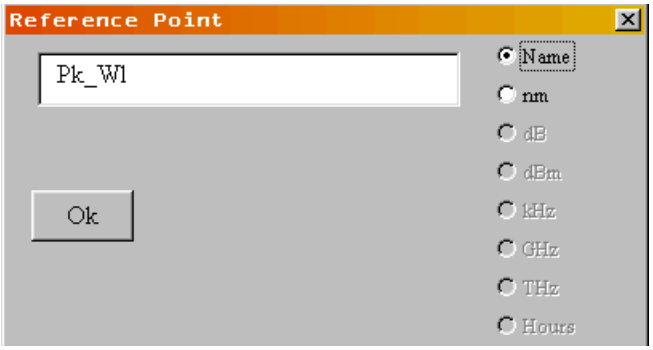
9 In the Name dialog box type `BW_3dB`. Click *Ok*.

> **Note**
>
> The name you just entered, `BW_3dB`, is now a variable name you can reference later.

10 In the Minimum Spec dialog box type `0.1`. Click *Ok*.

11 In the Maximum Spec dialog box type `2`. Click *Ok*.

12 In the Reference Point dialog box type, `Pk_Wl`. Select the Name option button. Click *Ok*.



Note

This command uses the variable Pk_Wl you defined in Step 3 as its reference point. For this reason it is necessary to click on the Name bullet and not the nm option button. If an actual known wavelength value is entered, leave the nm option button selected.

13 In the Excursion dialog box, type `-3`. Click *Ok*.

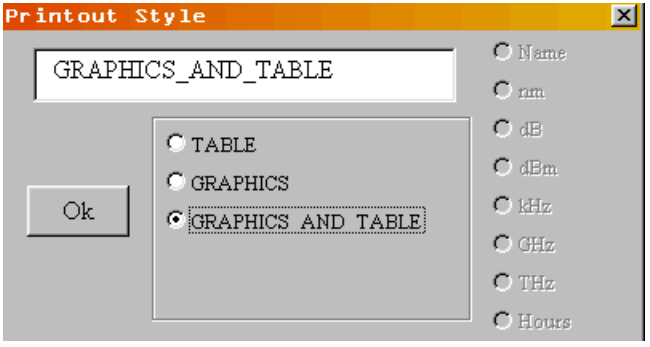
Filling in the Results Documentation area

To select the information to be printed

1 In the PCT Automation dialog box select the Results Documentation option button.

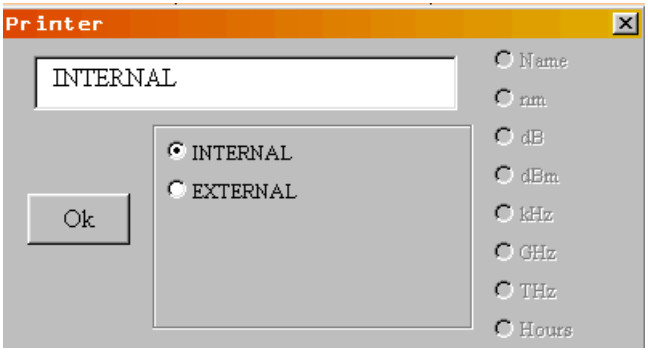
2 In the PCT Automation dialog box select PRINT_SETUP from the drop-down list.

3 In the Printout Style dialog box select the GRAPHICS AND TABLE option button. Click Ok.



To select the printer

1 In the Printer dialog box click *Ok* to select the default text, INTERNAL.



2 In the PCT Automation dialog box select PRINT on the drop-down list.

3 In the PCT Automation dialog box, click on the Exit button

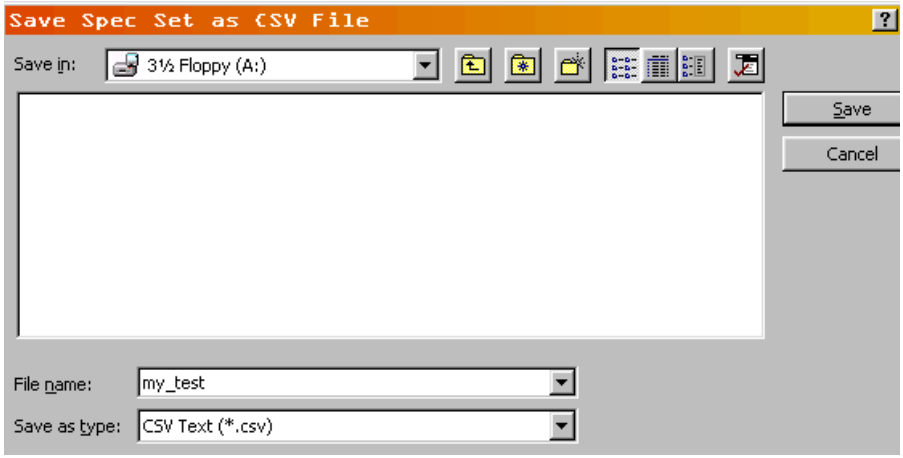
Saving your specification set

1 Use the slide bar to go to the top of the template. Click on the *Save CSV* button.

CAUTION

Always click the *Save CSV* button to save your specification set. If you save your work from the File menu an Excel spreadsheet file (**.xls*) will be saved. Although you can modify or change this spreadsheet file in the furure.an Excel spreadsheet file will *not* run in the Passive Component Test application. To create a file that *will* run in the Passive Component Test application click on the *Save CSV* button.

2 Enter the file name and directory of your choice. Note that to port the specification set to the OSA it must be saved on a floppy disk in the root directory.



CAUTION

When you close the PCT template, Excel will ask you "Do you want to save the changes you made to 'PCT Template, v1.11'?" **Always answer "NO" to this question.** If you answer "YES" the original PCT Template will be changed. If you want to save your work as an Excel spreadsheet template enter a new filename, such as *my_test.xls*.

A picture of the completed specification sheet is shown on the following page.

; PCT Specification Set Generation Template
; Hewlett Packard
; Copyright 1999

Start | Save CSV | Open CSV | Check Syntax | ReColor Sheet | Clear Sheet

APPLICATION	COMPONENTS	"Default"							
; Device Information	Do not alter or delete this row								
;	*Comments*	*Enter additional text during test?*							
COMMENT	"PCT Test Program"	;None							
;	*Serial Number*	*Enter additional text during test?*							
ID	"HB001"	ENTER							
; Measurement Setup	Do not alter or delete this row								
;	*Minimum Power Range*	*Maximum Power Range*	*Interval between normalizations*						
NORMALIZE	-40 dBm	0 dBm	2 h						
;	*Start Wavelength*	*Stop Wavelength*	*Trace Points*	*Averages*	*Resolution Bandwidth*	*Reference Level*	*Scale (dB per Div*	*Sensitivity*	*Vide*
SETUP	1540 nm	1560 nm	1001	1	0.1 nm	0 dBm	10 dB	-85 dBm	DEF
;	*Source*								
STIMULUS	INTERNAL_BBLS								
; Device Measurement	Do not alter or delete this row								
;	*Name*								
PATH	Default								
;	*Name*	*Minimum Spec*	*Maximum Spec*	*Search From*	*Search To*				
PEAK_WAVELENGTH	Pk_W1	1545 nm	1555 nm	1540 nm	1560 nm				
;	*Name*	*Minimum Spec*	*Maximum Spec*	*Reference Point*	*Excursion*				
BANDWIDTH_WAVELENGTH	BW_3dB	0.1 nm	2 nm	Pk_W1	-3 dB				
; Results Documentation	Do not alter or delete this row								
;	*Printout Style*	*Printer*							
PRINT_SETUP	GRAPHICS_AND_TABLE	INTERNAL							
;									
PRINT									
; END OF SPEC SET	Do not alter or delete this row								

Using an ASCII Editor

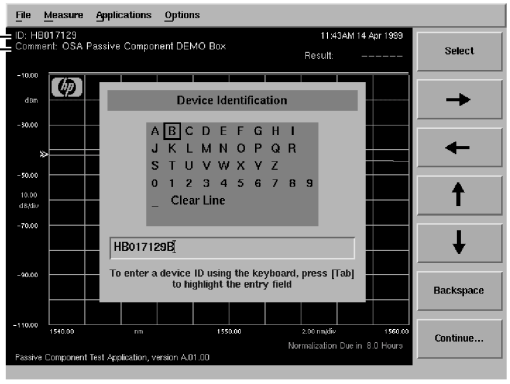
There are four types of specification set keywords: System Commands, Measurement Setup, Device Measurement, and Results Documentation. All specification sets require the APPLICATION, SETUP, NORMALIZE, and PATH keywords.

Every specification set begins with the APPLICATION keyword which identifies the specification set with the passive component test application. It also provides a label that will be displayed when the specifications set is cataloged by the passive component test application. Try to make the label descriptive of the test or device that you are measuring.

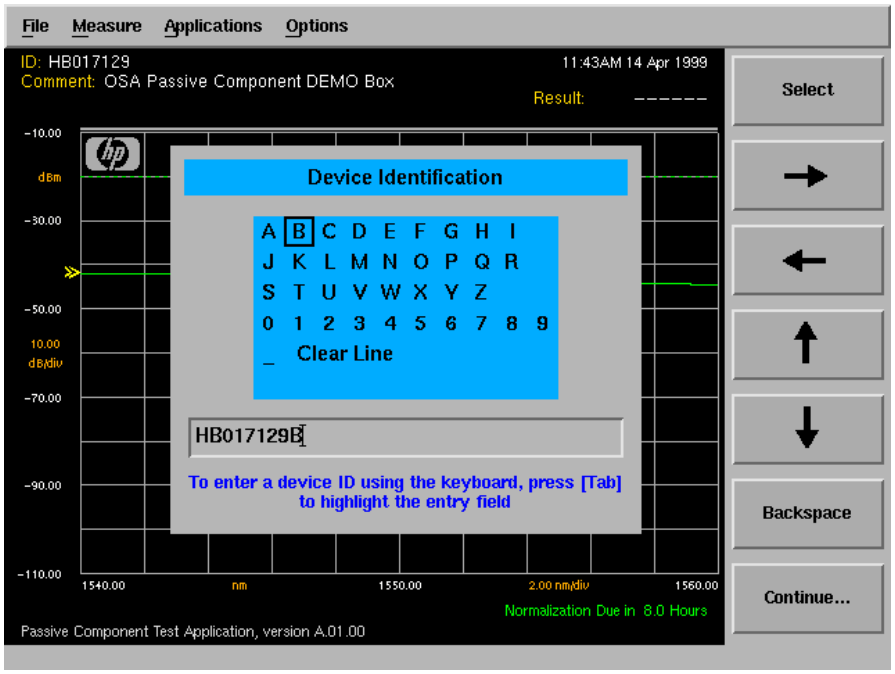
After the APPLICATION keyword, use the optional ID and COMMENT keywords to label the test and device being tested. The entered strings appear on the instrument's display as shown in Example 2-1. Add the STIMULUS keyword to select the broadband light source. Next, use the SETUP and NORMALIZE keywords to configure the instrument's settings and perform a trace normalization, see Example 2-3 on page 2-26.

Follow the PATH keyword with any keywords that are required for your measurement, followed by keywords to print or store the measurement results. Only one SETUP keyword should be used. If additional SETUP keywords are included, only the last keyword is used. Use the SWEEP and ZOOM commands to sweep a subset of the wavelength range and zoom to the screen.

```
PCT Specification Set Generation Template
;  Hewlett Packard
;  Copyright 1999
APPLICATION              COMPONENTS          "Demonstration Spec Set"
;    Device Information  Do not alter or delete this row
;,                       Comments
COMMENT,                 "OSA Passive Component DEMO Box"
;                        Serial Number       Additional text during test?
ID                       "HB017129"          ENTER
```



Example 2-1.



Keywords, such as PEAK_WAVELENGTH for example, must use all uppercase letters. Comments are preceded by a semicolon (;) character. Everything after a semicolon on a line is ignored. You can also insert blank lines to make your files easier to read. Keywords can be separated by either spaces or a comma (,) character. Notice that no flow control keywords, such as branching or looping, are provided.

Measurement paths require a PATH keyword

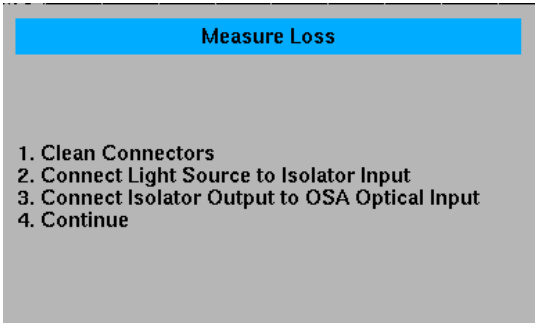
Include the PATH keyword before any group of measurement keywords listed for a specific measurement path. Devices with multiple paths, such as WDM multiplexers, require one PATH keyword for each path. Example 2-3 on page 2-26 has one PATH keyword. Example 2-2 on page 2-23 has two PATH keywords, one for device loss and one for device isolation. All measurement keywords between two PATH keywords apply to the first PATH keyword. Each PATH is measured in the order listed in the specification file. The *name* specified for each PATH appears in the final result table and on the *Measure* softkey.

```
;    Device Measurement     Do not alter or delete this row
;                           Name
PATH                        Loss
;                           Instructions
INSTRUCTION                 1. Clean Connectors\n2. Connect Light Source to Isolator Input\n3. Connect Isolator Output to OSA Optical Input\n4. Continue
;                           Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS                  Insertion_Loss_1525     DEFAULT                 4 dB                    1525 nm
;                           Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS                  Insertion_Loss_1550     DEFAULT                 4 dB                    1550 nm
;                           Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS                  Insertion_Loss_1620     DEFAULT                 5 dB                    1620 nm
;                           Start Wavelength (nm)   Stop Wavelength (nm)    Reference Level         Scale (dB per Div - optional)
ZOOM                         1525 nm                 1620 nm                 0 dB                    2 dB

;                           Name
PATH                         Isolation
;                           Instructions
INSTRUCTION                 1. Clean Connectors\n2. Connect Light Source to Isolator Output\n3. Connect Isolator Input to OSA Optical Input\n4. Continue
;                           Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS                  Isolation_1525          20 dB                   DEFAULT                 1525 nm
;                           Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS                  Isolation_1550          35 dB                   DEFAULT                 1550 nm
;                           Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS                  Isolation_1620          25 dB                   DEFAULT                 1620 nm
;                           Name
;                           Start Wavelength (nm)   Stop Wavelength (nm)    Reference Level         Scale (dB per Div - optional)
ZOOM                         1525 nm                 1620 nm                 -20 dB                  10 dB
```

Example 2-2.

Notice the use of the INSTRUCTION keyword to convey instructions to the user. Each PATH can have one or more INSTRUCTION keywords. The dialog boxes are displayed in the order of the INSTRUCTION keywords. If no INSTRUCTION keyword is given for a particular PATH, a default instruction prompt is displayed. The measurement pauses until the *Continue* softkey is clicked. In the displayed string, use the escape sequence \n to enter a newline character and force a line break.

Pressing the *Measure DUT* softkey brings up an instruction panel.



When the measurement is complete, the results can be viewed both graphically and in table form, as shown in Figure 2-1 and Figure 2-2.

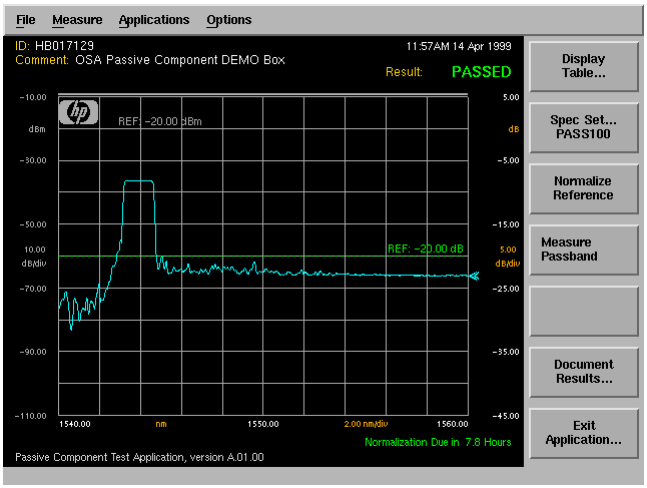


Figure 2-1. Measurement results displayed graphically.

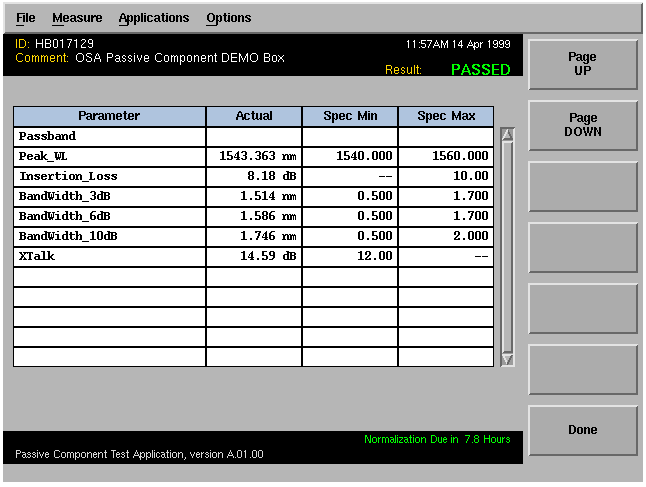


Figure 2-2. Measurement results displayed in tabular format.

Use variables to identify measured values

The first parameter for most measurement keywords is a variable name. Variables are automatically initialized and allocated the first time that they are assigned a value by the application. Variables "hold" the measured value for the keyword. Variable values and names are displayed in the measurement results table. To prevent a variable from being displayed in the measurement results table, begin the corresponding keyword line with a pound sign (#) character.

The following PEAK_WAVELENGTH keyword defines the variable Peak_wavelength. Notice that the MARKER_LEVEL keyword uses Peak_wavelength, which is measured in the previous step, to define the wavelength for placing the marker.

```
PEAK_WAVELENGTH,Peak_wavelength,1545 nm,1555 nm,DEFAULT,DEFAULT
MARKER_LEVEL,Peak_power,-3 dB,3 dB,Peak_wavelength
```

Variable names can include both upper and lowercase letters but cannot include spaces; use the underscore character (_) instead. The first character of a variable must be a letter. Only the first 32 characters of the variable *name* are significant. For names to be considered different, the first 32 characters must not be identical.

Results documentation area

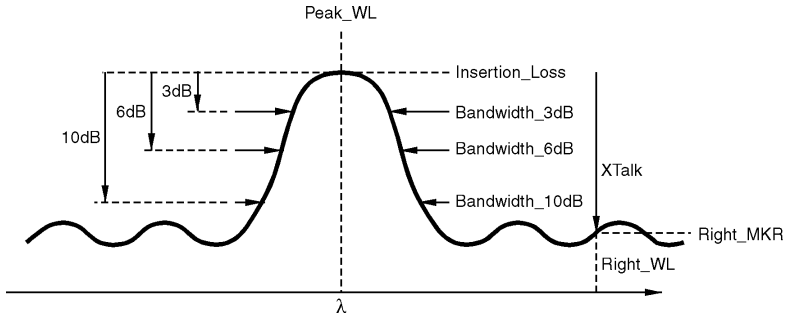
Use this area to specify where and how the measurement results are stored and printed.

Use PRINT_SETUP to determine whether the summary is printed to the internal or external printer and whether to print the results table or both the table and graphics.

STORE_SETUP is used in a similar way to determine what results information is saved to the floppy disk.

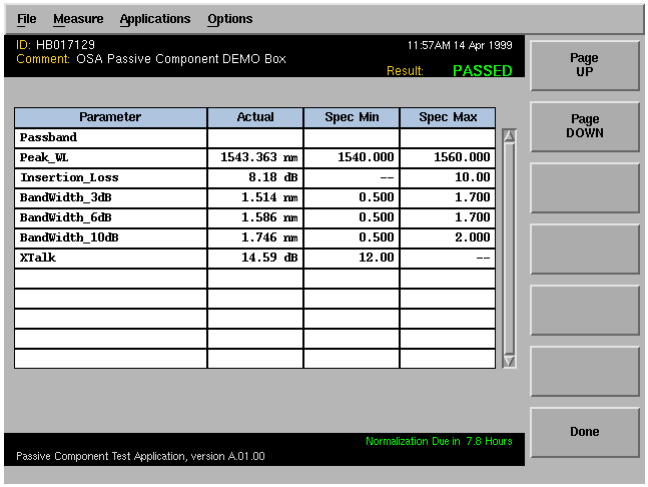
```
;   PCT Specification Set Generation Template
;   Hewlett Packard
;   Copyright 1999
APPLICATION              COMPONENTS                  Demonstration Spec Set
;    Device Information  Do not alter or delete this row
;                        Comments
COMMENT                  OSA Passive Component DEMO Box
;                        Serial Number               Additional text during test?
ID                       HB017129                     ENTER


;    Measurement Setup   Do not alter or delete this row.   SETUP  and CALIBRATE are mandatory keywords.
;                        Minimum Power Range         Maximum Power Range      Interval between calibrations
NORMALIZE                -43 dBm                      -33 dBm                 8 h
;                        Start Wavelength            Stop Wavelength          Trace Points (optional)     Averages (optional)   Resolution Bandwidth (optional)
SETUP                    1540 nm                     1560 nm                                      1000                        1 0.1 nm
;                        Source
STIMULUS                 INTERNAL_BBLS


;    Device Measurement  Do not alter or delete this row
;                        Name
PATH                     Passband
;                        Instructions
INSTRUCTION              1. Clean Connectors\n2. Connect Light Source to Device Input\n3. Connect Passband to OSA Optical Input\n4. Continue
;                        Start Wavelength (nm)       Stop Wavelength (nm)     Reference Level (optional)  Scale (dB per Div - optional)
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     From (Optional)     To (Optional)
PEAK_WAVELENGTH          Peak_WL                     1540 nm                  1560 nm                     DEFAULT             DEFAULT
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     At (interpolate if location is not point)
MARKER_LOSS              Insertion_Loss              DEFAULT                  10.0 dB                     Peak_WL
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     Reference Point     Excursion (Optional)
BANDWIDTH_WAVELENGTH     BandWidth_3dB               .5 nm                    1.7 nm                      Peak_WL             -3 dB
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     Reference Point     Excursion (Optional)
BANDWIDTH_WAVELENGTH     BandWidth_6dB               .5 nm                    1.7 nm                      Peak_WL             -6 dB
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     Reference Point     Excursion (Optional)
BANDWIDTH_WAVELENGTH     BandWidth_10dB              .5 nm                    2.0 nm                      Peak_WL             -10 dB
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     At (interpolate if location is not point)
#MARKER_LEVEL            Center_MKR                  DEFAULT                  DEFAULT                     Peak_WL
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     First Value         Second Value
#LIN_ADD                 Right_WL                    DEFAULT                  DEFAULT                     Peak_WL             2 nm
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     At (interpolate if location is not point)
#MARKER_LEVEL            Right_MKR                   DEFAULT                  DEFAULT                     Right_WL
;                        Name                        Minimum Spec (Optional)  Maximum Spec (Optional)     First Value         Second Value
LOG_SUB                  XTalk                       12 dB                    DEFAULT                     Center_MKR          Right_MKR
;                        Start Wavelength (nm)       Stop Wavelength (nm)     Reference Level (optional)  Scale (dB per Div - optional)
ZOOM                     1540 nm                     1560 nm                   -20 dB                     5 dB
```

Example 2-3. Specification set for characterizing a WDM filter.



Example 2-3 on page 2-26 shows a specification set written to characterize a WDM filter. The specification set measures the insertion loss, the 3, 6, and 10 dB bandwidths, the peak wavelength and the crosstalk.

Figure 2-3 shows the results summary table for a device measured using the specification set shown in Example 2-3. The device passes the specifications in this example.



Parameter	Actual	Spec Min	Spec Max
Passband			
Peak_WL	1543.363 nm	1540.000	1560.000
Insertion_Loss	8.18 dB	--	10.00
BandWidth_3dB	1.514 nm	0.500	1.700
BandWidth_6dB	1.586 nm	0.500	1.700
BandWidth_10dB	1.746 nm	0.500	2.000
XTalk	14.59 dB	12.00	--

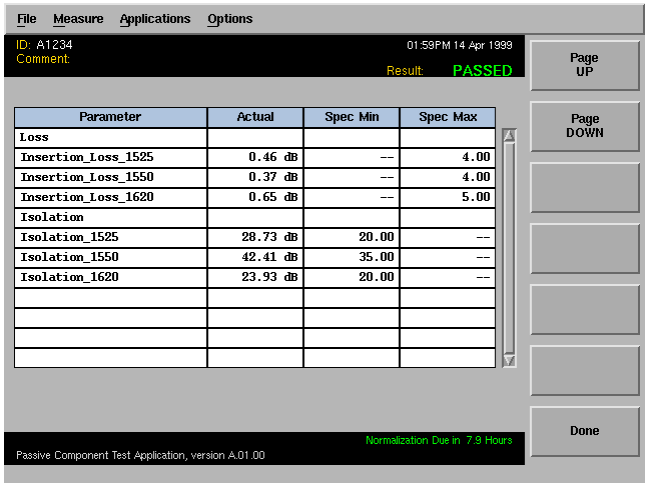
Figure 2-3. Results summary table for a WDM filter.

Example 2-4 on page 2-28 shows a specification set for characterizing an optical isolator. Note that it uses two paths, one for the insertion loss and one for the isolation.

```
;  PCT Specification Set Generation Template
;  Hewlett Packard
;  Copyright 1999
APPLICATION              COMPONENTS              Default
;   Device Information   Do not alter or delete this row
;                        Serial Number           Additional text during test?
ID                       A1234                   ENTER

;   Measurement Setup    Do not alter or delete this row
;                        Source
STIMULUS                 INTERNAL_BBLS
;                        Start Wavelength        Stop Wavelength         Trace Points                 Averages      Resolution Bandwidth    Reference Level
SETUP                    1525 nm                 1620 nm                                        2001              1  2 nm                   -30 dBm
;                        Minimum Power Range     Maximum Power Range     Interval between normalizations
NORMALIZE                -45 dBm                 10 dBm                  8 h

;   Device Measurement   Do not alter or delete this row
;                        Name
PATH                     Loss
;                        Instructions
INSTRUCTION              1. Clean Connectors\n2. Connect Light Source to Isolator Input\n3. Connect Isolator Output to OSA Optical Input\n4. Continue
;                        Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS              Insertion_Loss_1525     DEFAULT                 4 dB                    1525 nm
;                        Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS              Insertion_Loss_1550     DEFAULT                 4 dB                    1550 nm
;                        Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS              Insertion_Loss_1620     DEFAULT                 5 dB                    1620 nm
;                        Start Wavelength (nm)   Stop Wavelength (nm)    Reference Level         Scale (dB per Div - optional)
ZOOM                     1525 nm                 1620 nm                 0 dB                    2 dB

;                        Name
PATH                     Isolation
;                        Instructions
INSTRUCTION              1. Clean Connectors\n2. Connect Light Source to Isolator Output\n3. Connect Isolator Input to OSA Optical Input\n4. Continue
;                        Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS              Isolation_1525          20 dB                   DEFAULT                 1525 nm
;                        Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS              Isolation_1550          35 dB                   DEFAULT                 1550 nm
;                        Name                    Minimum Spec            Maximum Spec            Wavelength or frequency to measure power at
MARKER_LOSS              Isolation_1620          25 dB                   DEFAULT                 1620 nm
;                        Name
;                        Start Wavelength (nm)   Stop Wavelength (nm)    Reference Level         Scale (dB per Div - optional)
ZOOM                     1525 nm                 1620 nm                 -20 dB                  10 dB

;   Results Documentation  Do not alter or delete this row
;                        Printout Style          Printer
PRINT_SETUP              GRAPHICS_AND_TABLE      INTERNAL
;                        Store Type
STORE_SETUP              TABLE
;                        Store Name
STORE                    AUTO

;   END OF SPEC SET      Do not alter or delete this row
```

Example 2-4. Specification set for characterizing an optical isolator.

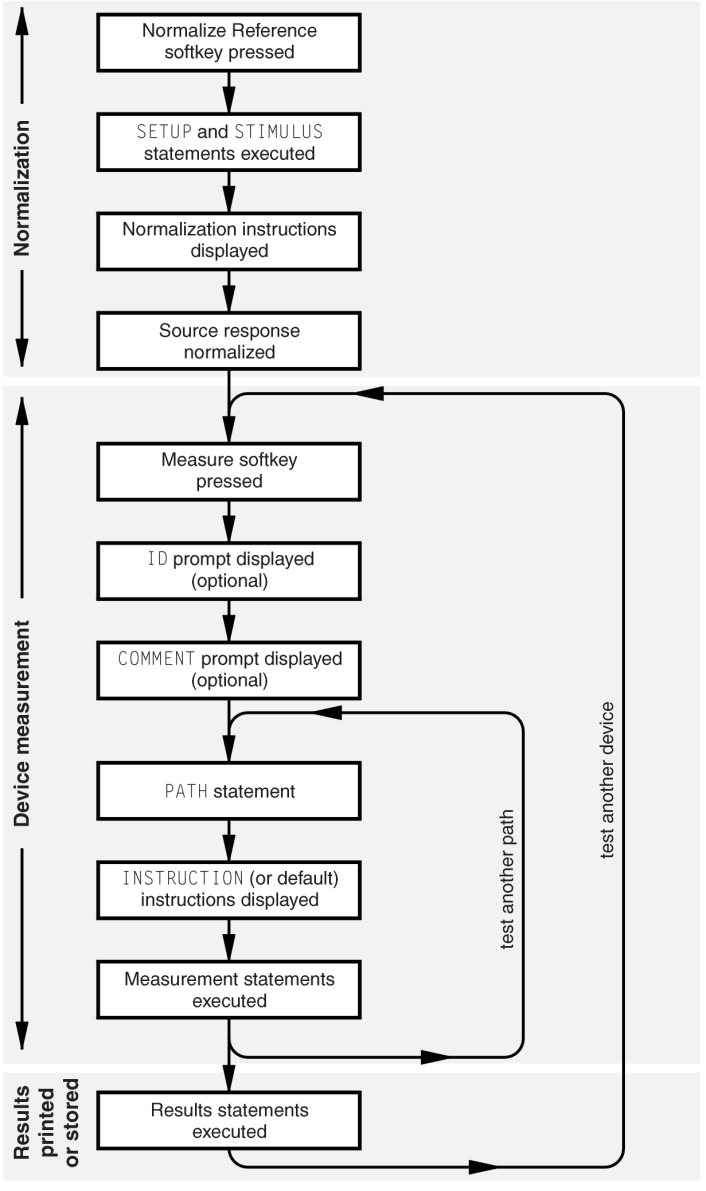
Figure 2-5 shows an example of the results summary table for an optical isolator characterized using the specification set shown in Example 2-4.



Parameter	Actual	Spec Min	Spec Max
Loss			
Insertion_Loss_1525	0.46 dB	--	4.00
Insertion_Loss_1550	0.37 dB	--	4.00
Insertion_Loss_1620	0.65 dB	--	5.00
Isolation			
Isolation_1525	28.73 dB	20.00	--
Isolation_1550	42.41 dB	35.00	--
Isolation_1620	23.93 dB	20.00	--

Figure 2-5. Measurement summary table for an isolator

Specification Set Flowchart



3

Keyword Reference

Quick List of Keywords

Table 3-1. List of Keywords (1 of 2)

Command	Description
SYSTEM COMMANDS	
APPLICATION, COMPONENTS	Designates the specification set for use with the passive component test application. Also identifies test in catalog.
COMMENT	Prints comment in comment section of the instrument's display.
ID	Prints an identification string in ID section of the instrument's display.
MEASUREMENT SETUP COMMANDS	
NORMALIZE	Specifies the minimum and maximum peak power range (in dBm) for the reference signal for a valid normalization.
SETUP	Configures the optical spectrum analyzer settings.
STIMULUS	Specifies the source that is used to take a reference trace as well as the actual measurement.
MEASUREMENT COMMANDS	
ABS_FREQUENCY_LEFT	Measures the absolute frequency of a trace point.
ABS_FREQUENCY_RIGHT	Measures the absolute frequency of a trace point.
ABS_WAVELENGTH_LEFT	Measures the absolute wavelength of a trace point.
ABS_WAVELENGTH_RIGHT	Measures the absolute wavelength of a trace point.
BANDWIDTH_FREQUENCY	Calculates the bandwidth (in THz).
BANDWIDTH_WAVELENGTH	Calculates the bandwidth (in nm).
CENTER_FREQUENCY	Locates the center frequency (THz).
CENTER_OF_MASS_FREQUENCY	Calculates the mean frequency (THz) representing the center of mass.
CENTER_OF_MASS_WAVELENGTH	Calculates the mean wavelength (nm) representing the center of mass.
CENTER_WAVELENGTH	Locates the center wavelength (nm).
DELTA_FREQUENCY_LEFT	Determines the frequency separation between a measurement point and reference point.
DELTA_FREQUENCY_RIGHT	Determines the frequency separation between a measurement point and reference point.
DELTA_WAVELENGTH_LEFT	Determines the wavelength separation between a measurement point and reference point.

Table 3-1. List of Keywords (2 of 2)

Command	Description
DELTA_WAVELENGTH_RIGHT	Determines the wavelength separation between a measurement point and reference point.
INSTRUCTION	Displays a prompt for the user for a measurement path.
LIN_ADD	Calculates the sum of two, or more, linear power, wavelength, frequency, or constant values.
LIN_AVG	Calculates the average of two or more values.
LIN_DIV	Calculates the ratio of two, or more, linear power, wavelength, frequency, or constant values.
LIN_MUL	Calculates the product of two, or more, linear power, wavelength, frequency, or constant values.
LIN_SUB	Calculates the difference between two, or more, linear power, wavelength, frequency, or constant values.
LOG_ADD	Calculates the sum of two, or more, logarithmic power, wavelength, frequency, or constant values.
LOG_SUB	Calculates the difference between two, or more, logarithmic power, wavelength, frequency, or constant values.
MARKER_LEVEL	Measures the power at the location specified.
MARKER_LOSS	Measures the power loss at the location specified referenced to the normalized response.
MAX	Calculates the maximum of two or more values.
MIN	Calculates the minimum of two or more values.
PATH	Specifies which set of measurement keywords should be grouped together and performed on the same trace measurement.
PEAK_FREQUENCY	Measures the frequency (THz) of the maximum power trace point in a wavelength range.
PEAK_WAVELENGTH	Measures the wavelength (nm) of the maximum power trace point in a wavelength range.
PIT_FREQUENCY	Measures the frequency (THz) of the minimum power trace point in a wavelength range.
PIT_WAVELENGTH	Measures the wavelength (nm) of the minimum power trace point in a wavelength range.
SWEEP	Specifies that the following data should be taken from a partial sweep.
ZOOM	Display the trace over the specified wavelength range on the screen.
RESULTS COMMANDS	
PRINT	Prints the measurement results with the settings defined in the PRINT_SETUP keyword.
PRINT_SETUP	Configures the hardcopy output of the measurement results.
PRINT_SUMMARY	Prints the final summary of the results.
STORE, AUTO	Saves the measurement results as defined by the STORE_SETUP keyword.
STORE_SETUP	Configures the output of the measurement results that is stored on a disk in the front-panel disk drive.

Specification Set Keywords

Convention	Description
< >	Angle brackets indicate text strings entered by the developer.
[ ]	Square brackets indicate that the keyword DEFAULT can be used instead of a value or a variable for that parameter. Refer to the actual command description for the behavior when the DEFAULT keyword is used for a parameter.
|	Indicates a choice of one element from a list.
{ }	Braces indicate a group of constants to select from. Each constant is separated by the | character.
name	Indicates the variable for which you provide a descriptive name. Any letter (Aa-Zz) followed by letters, digits (0-9) and underscore (_). Only the first 32 characters are significant.
spec_min	–infinity. The parameter *spec_min* cannot be a variable, only a constant or DEFAULT.
spec_max	+infinity. The parameter *spec_max* cannot be a variable, only a constant or DEFAULT.
from	Start wavelength or frequency of trace in nm (default) or THz.
to	Stop wavelength or frequency of trace in nm (default) or THz.
excursion	+excursion: means excursion dBs up (for example, from a pit). -excursion: means excursion dBs down (for example, from a peak).
ref_pt	The reference point to be used for a measurement keyword.

`ABS_FREQUENCY_LEFT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Measures the absolute frequency of a trace point and loads the value into the *name* variable. The value returned by this function is in THz. The point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on frequencies higher than the reference. Arguments are *spec_min* and *spec_max*, which are absolute frequency values, or DEFAULT. The *ref_pt* can be a constant or a variable. To return the relative frequency, refer to the DELTA keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the left endpoint (highest frequency) of the trace is returned.

`ABS_FREQUENCY_RIGHT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Measures the absolute frequency of a trace point and loads the value into the *name* variable. The value returned by this function is in THz. The point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on frequencies lower than the reference. Arguments *spec_min* and *spec_max* are absolute frequency values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the relative frequency, refer to the DELTA keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the right endpoint (lowest frequency) of the trace is returned.

`ABS_WAVELENGTH_LEFT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Measures the absolute wavelength of a trace point and loads the value into the *name* variable. The value returned by this function is in nm. The point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on wavelengths shorter than the reference. Arguments *spec_min* and *spec_max* are absolute wavelength values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the relative wavelength, refer to the DELTA keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the left endpoint (shortest wavelength) of the trace is returned.

`ABS_WAVELENGTH_RIGHT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Measures the absolute wavelength of a trace point and loads the value into the *name* variable. The value returned by this function is in nm. The point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on wavelengths longer than the reference. Arguments *spec_min* and *spec_max* are absolute wavelength values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the relative wavelength, refer to the DELTA keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the right endpoint (longest wavelength) of the trace is returned.

`APPLICATION, COMPONENTS, "label string"`

Designates the specification set for use with the passive component test application. This keyword *must* be the first keyword in the specification set. The label string is used as a description when cataloging the imported specification sets in the instrument.

`BANDWIDTH_FREQUENCY, name, [spec_min], [spec_max], ref_pt, [excursion]`

Calculates the bandwidth (in THz) and loads the value into the *name* variable. The value returned by this function is in THz. The bandwidth is determined *excursion* dB to the left and to the right of the reference point. Negative excursion values specify a lower amplitude from the reference point, and positive excursion values specify a higher amplitude. If either the left or right trace point fails to meet the excursion criterion, the keyword is considered to have failed. If the left trace point fails, the left endpoint is used for the bandwidth calculation. If the right trace point fails, the right endpoint is used for the bandwidth calculation.

`BANDWIDTH_WAVELENGTH, name, [spec_min], [spec_max], ref_pt, [excursion]`

Calculates the bandwidth (in nm) and loads the value into the *name* variable. The value returned by this function is in nm. The bandwidth is determined *excursion* dB to the left and to the right of the reference point. Negative excursion values specify a lower amplitude from the reference point, and positive excursion values specify a higher amplitude. If either the left or right trace point fails to meet the excursion criterion, the keyword is considered to have failed. If the left trace point fails, the left endpoint is used for the bandwidth calculation. If the right trace point fails, the right endpoint is used for the bandwidth calculation.

`CENTER_FREQUENCY, name, [spec_min], [spec_max], ref, [excursion]`

Locates the center frequency (THz) and loads the value into the *name* variable. The value returned by this function is in THz. It represents the mean value of the two frequencies found *excursion* dB down (for negative excursion value) or up (for positive excursion value) to the left and right of the reference point. The reference parameter can be a variable or a constant. If either the left or right trace point fails to meet the excursion criterion, the keyword is considered to have failed. If the left trace point fails, the left endpoint is used for the bandwidth calculation. If the right trace point fails, the right endpoint is used for the bandwidth calculation.

`CENTER_OF_MASS_FREQUENCY, name, [spec_min], [spec_max], [from], [to]`

Calculates the mean frequency (THz) and loads the value into the *name* variable. The value returned by this function is in THz. The mean value represents the center of mass of the trace over the range *from-to*.

`CENTER_OF_MASS_WAVELENGTH, name, [spec_min], [spec_max], [from], [to]`

Calculates the mean wavelength (nm) and loads the value into the *name* variable. The value returned by this function is in nm. The mean value represents the center of mass of the trace over the range *from-to*.

`CENTER_WAVELENGTH, name, [spec_min], [spec_max], ref, [excursion]`

Locates the center wavelength (nm) and loads the value into the *name* variable. The value returned by this function is in nm. It represents the mean value of the two wavelengths found *excursion* dB down (for negative excursion value) or up (for positive excursion value) to the left and right of the reference point. The reference parameter can be a variable or a constant. If either the left or right trace point fails to meet the excursion criterion, the keyword is considered to have failed. If the left trace point fails, the left endpoint is used for the bandwidth calculation. If the right trace point fails, the right endpoint is used for the bandwidth calculation.

`COMMENT, “<any text>”, ENTER`

Allows the application user to enter a comment for the device being tested. The optional ENTER parameter causes a dialog box to appear before the measurement of the first path, prompting the operator to enter a comment. The maximum number of characters that can be displayed on the screen is 56.

`DELTA_FREQUENCY_LEFT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Determines the frequency separation between a measurement point and reference point and loads the value into the *name* variable. The value returned by this function is in THz. The measurement point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on frequencies higher than the reference. The value of the frequency returned is positive. Arguments *spec_min* and *spec_max* are absolute frequency values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the absolute frequency, refer to the ABS keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the separation between the left endpoint of the trace and the reference point is returned.

`DELTA_FREQUENCY_RIGHT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Determines the frequency separation between a measurement point and reference point and loads the value into the *name* variable. The value returned by this function is in THz. The measurement point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on frequencies lower than the reference. The value of the frequency returned is negative. Arguments *spec_min* and *spec_max* are absolute frequency values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the absolute frequency, refer to the ABS keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the right endpoint of the trace is returned.

`DELTA_WAVELENGTH_LEFT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Determines the wavelength separation between a measurement point and reference point and loads the value into the *name* variable. The value returned by this function is in nm. The measurement point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on wavelengths shorter than the reference. The value of the wavelength returned is negative. Arguments *spec_min* and *spec_max* are absolute wavelength values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the absolute wavelength, refer to the ABS keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the left endpoint of the trace is returned.

`DELTA_WAVELENGTH_RIGHT, name, [spec_min], [spec_max], ref_pt, [excursion]`

Determines the wavelength separation between a measurement point and reference point and loads the value into the *name* variable. The value returned by this function is in nm. The measurement point is located *excursion* dB away from the amplitude of the reference point (*ref_pt*). The search is made on wavelengths longer than the reference. The value of the wavelength returned is positive. Arguments *spec_min* and *spec_max* are absolute wavelength values or DEFAULT. The *ref_pt* can be a constant or a variable. To return the absolute wavelength, refer to the ABS keywords. If no point on the trace meets the excursion criterion, the keyword is considered to have failed, and the left endpoint of the trace is returned.

`ID, "<serial number>", ENTER`

Allows the application user to enter an identification number for the device being tested. The optional ENTER parameter causes a dialog box to appear before the measurement of the first path, prompting the operator to enter the identification number. The ID keyword is not required in a specification set.

`INSTRUCTION, "<prompt string>"`

Displays a prompt for the user in a dialog box. Each PATH can have one or more INSTRUCTION keywords. The dialog boxes are displayed in the order of the INSTRUCTION keywords. If no INSTRUCTION keyword is given for a particular PATH, a default instruction prompt is displayed. The measurement pauses until the *Continue* softkey is clicked.

Use the escape sequence \n to enter a newline character and force a line break. Use the escape sequence \" to enter a double quote character.

`LIN_ADD, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the sum of two or more linear power, wavelength, frequency, or constant values. The value returned by this function is in nm, THz, or dB, depending on the inputs. The sum is loaded into the *name* variable.

`LIN_AVG, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the average of two or more values and loads the value into the *name* variable. The values are converted to linear and the linear average is calculated.

`LIN_DIV, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the ratio of two or more linear power, wavelength, frequency, or constant values. The value returned by this function is in nm, THz, dB, or unitless, depending on the inputs. The ratio is loaded into the *name* variable.

`LIN_MUL name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the product of two or more linear power, wavelength, frequency, or constant values. The value returned by this function is in nm, GHz, or dB. The product is loaded into the *name* variable.

`LIN_SUB, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the difference between two or more linear power, wavelength, frequency, or constant values. The value returned by this function is in nm, GHz, or dB. The difference is loaded into the *name* variable.

`LOG_ADD, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the sum of two or more logarithmic power, wavelength, frequency, or constant values. The value returned by this function is in dB. The sum is loaded into the *name* variable.

`LOG_SUB, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the difference between two or more logarithmic power, wavelength, frequency, or constant values. The value returned by this function is in dB. The difference is loaded into the *name* variable.

`MARKER_LEVEL, name, [spec_min], [spec_max], ref_pt`

Measures the power at the reference point specified and loads the value into the *name* variable. The value returned by this function is in dB. The power (dBm) or loss (dB) is dependent on the trace at a given wavelength. The *ref_pt* parameter can be a wavelength, frequency, or a previously defined *name*. Log interpolation of the power level is used if *ref_pt* doesn't fall exactly on a trace point.

`MARKER_LOSS, name, [spec_min], [spec_max], ref_pt`

Measures the power loss at the reference point specified, and loads the value into the *name* variable. Although the marker measures a negative decibel value, the returned value is positive to represent loss. The *ref_pt* parameter can be a wavelength, frequency, or a previously defined *name*. Log interpolation of the power level is used if *ref_pt* doesn't fall exactly on a trace point.

This keyword is provided as a convenience when measuring values, like insertion loss, which are typically specified with positive dB values but measured as negative dB values by the OSA.

`MAX, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the maximum of two or more values and loads the value into the *name* variable. All the values must have the same units. The *spec_min* and *spec_max* parameters must be either DEFAULT or constants with the same units as the values.

`MIN, name, [spec_min], [spec_max], value1, value2, ... , valueN`

Calculates the minimum of two or more values and loads the value into the *name* variable. All the values must have the same units. The *spec_min* and *spec_max* parameters must be either DEFAULT or constants with the same units as the values.

`NORMALIZE, [spec_min], [spec_max], [interval]`

Specifies the minimum and maximum peak power range (in dBm) for the reference signal for a valid normalization. Failures cause the message "`Normalization failed, clean connector and try again`" to be displayed. All buttons except *Normalize Reference* are disabled. Pushing *Normalize Reference* starts the sequence again. Interval specifies the time interval between calibrations in hours. For example, 0.5h corresponds to 30 minutes. The maximum and DEFAULT value for the interval is 24 hours.

`PATH, name`

Specifies which set of measurement keywords should be grouped together and performed on the same trace measurement. The *name* specified for each PATH appears in the final result table and on the *Measure* softkey. For example, a coupler would require two PATH keywords, one for each arm of the coupler. Each PATH uses its own trace. All measurement keywords between two PATH keywords apply to the first PATH keyword. Each PATH is measured in the order listed in the specification file.

`PEAK_FREQUENCY, name, [spec_min], [spec_max], [from], [to]`

Measures the frequency (THz) of the maximum power trace point in a wavelength range. The units returned by this function are in THz. The measured value is placed in the *name* variable.

`PEAK_WAVELENGTH, name, [spec_min], [spec_max], [from], [to]`

Measures the wavelength (nm) of the maximum power trace point in a wavelength range. The units returned by this function are in nm. The measured value is placed in the *name* variable.

`PIT_FREQUENCY, name, [spec_min], [spec_max], [from], [to]`

Measures the frequency (THz) of the minimum power trace point in a wavelength range. The units returned by this function are in THz. The measured value is placed in the *name* variable.

`PIT_WAVELENGTH, name, [spec_min], [spec_max], [from], [to]`

Measures the wavelength (nm) of the minimum power trace point in a wavelength range. The units returned by this function are in nm. The measured value is placed in the *name* variable.

`PRINT`

Prints the results with the settings defined in the PRINT_SETUP keyword.

`PRINT_SETUP, {TABLE | GRAPHICS | GRAPHICS_AND_TABLE}, {INTERNAL | EXTERNAL}`

Configures the hardcopy output of the measurement results. Either the instrument's internal printer or an external printer can be selected. As shown in the following table, the type of data printed is also selectable. Although application users can temporarily override these selections for the current measurement, when a new device is measured the print setup resets to the values defined by the PRINT_SETUP keyword.

Constant	Description
TABLE	Prints the measurement data in a table.
GRAPHICS	Prints the instrument's display.
GRAPHICS_AND_TABLE	Prints the measurement data in a table along with the instrument's display.
INTERNAL	Selects the instrument's internal printer.
EXTERNAL	Selects an external printer.

`PRINT_SUMMARY`

Prints the final summary of the results.

`SETUP, start_wvl, stop_wvl, [pts], [avgs], [rbw], [ref_lvl], [scale], [sens], [vbw]`

This required keyword configures the following optical spectrum analyzer settings:

start wavelength (nm)
stop wavelength (nm)
number of trace points
number of trace averages
resolution bandwidth (nm)
reference level (dBm)
amplitude scale (dB)
sensitivity (dBm)
video bandwidth (Hz)

The following line shows an example of this keyword:

```
SETUP 1500.00,nm,1600.00,nm,4001,1,0.10,nm,+10.00,dBm,10,dB,-90.0,dBm,100,Hz
```

These settings are always used when performing a normalization. PATH measurements also use these settings unless changed by the SWEEP keyword. If a parameter other than *avgs* is set to DEFAULT, the optical spectrum analyzer keeps its current setting. For the *avgs* parameter the DEFAULT keyword will set the value to 1. Otherwise, the SETUP keyword changes the setting to whatever is specified for a parameter. This behavior has the potential consequence of allowing the SWEEP keyword to change the sensitivity from the first normalization for subsequent normalizations.

For example, suppose that the instrument is currently at –70 dBm sensitivity and the SETUP keyword has DEFAULT for the sensitivity parameter. There is a SWEEP keyword with –80 dBm for sensitivity. This results in the first normalization being performed at –70 dBm sensitivity. After a path is measured which sets the instrument to –80 dBm sensitivity, subsequent normalizations will be made at –80 dBm.

There should be only one SETUP command in a specification set. Multiple SETUP commands generate a warning when the specification set is imported, but the specification set can still be imported. The settings of the last SETUP command will be the ones used by the specification set.

The start and stop wavelength values can only be constants. DEFAULT is not allowed for these values. All other parameter values must be either constants with units or the keyword DEFAULT. Variables are *not* allowed as parameters for this keyword.

```
STIMULUS, {INTERNAL_BBLS | EXTERNAL_BBLS}
```

Specifies the source that is used to take a reference trace, as well as the actual measurement.

Constant	Description
INTERNAL_BBLS	Selects the instrument's internal white-light or EELED broadband light source.
EXTERNAL_BBLS	Selects an external unmodulated broadband light source.

`STORE, AUTO`

Saves the measurement results as defined by the STORE_SETUP keyword. A filename is automatically generated from the last 8 characters of the identification string entered using the ID keyword. The only legal characters for the filename are letters, numbers, and the underscore (_) character. If the ID string contains any other characters, those characters will be replaced with the underscore character. If a file already exists on the disk with the same filename, the file will be overwritten. There is no prompt for overwrite.

`STORE_SETUP, {TABLE | GRAPHICS}`

Configures the output of the measurement results that is stored on a disk in the front-panel disk drive. Although application users can temporarily override these selections for the current measurement, when a new device is measured, the storage setup resets to the values defined by the STORE_SETUP keyword. Use the STORE, AUTO keyword to actually store the data.

Constant	Description
TABLE	Stores the measurement data in a table, as well as all of the traces used for the measurements, in comma-separated-value (CSV) format.
GRAPHICS	Stores the measurement data in a CGM graphic file.

`SWEEP, start_wvl, stop_wvl, [avgs], [sens]`

Specifies that the following data should be taken from a partial sweep. Normalization traces are always made using the conditions specified by SETUP. You can use this keyword to decrease measurement time by setting the instrument to sweep over a smaller wavelength range or with different trace averaging or sensitivity. The wavelength range specified here must fall within the one given in SETUP. In order to maintain integrity with the reference trace, the SWEEP function does *not* change the absolute wavelength position of trace points nor does it change the hardware reference level.

The start and stop wavelength values can only be constants. DEFAULT is not allowed for these values. All other parameter values must be either constants with units or the keyword DEFAULT for the optional parameters. Variables are not allowed as parameters for this keyword.

`ZOOM, start_wvl, stop_wvl, [ref_lvl], [scale]`

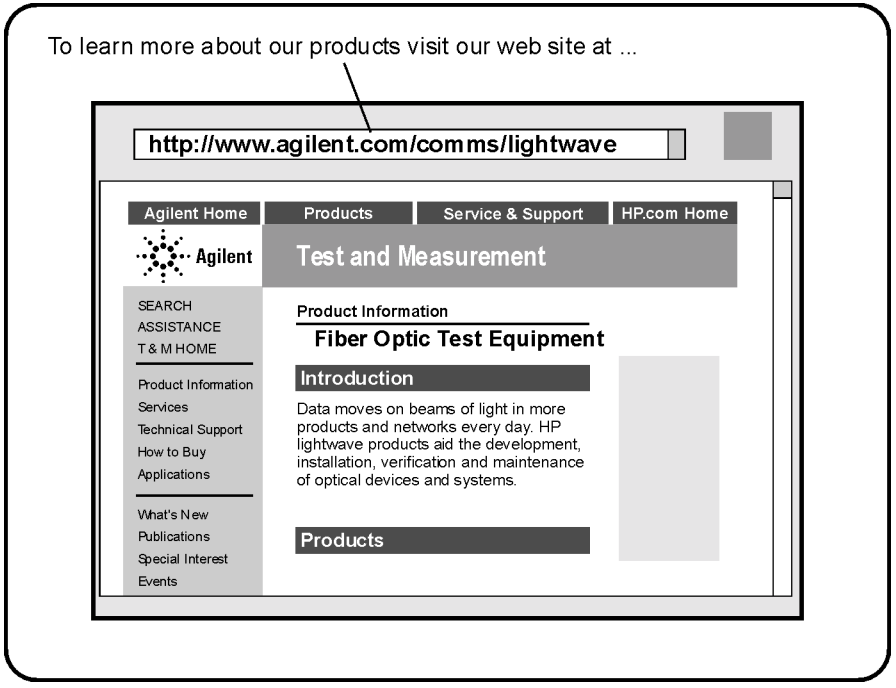
Displays the trace over the specified wavelength range on the screen. The zoom is performed after the path measurement is completed. If multiple ZOOM keywords are used for a PATH, only the last ZOOM keyword is used. Variables are not allowed as parameters for this keyword. The start and stop wavelength values can only be constants. DEFAULT is not allowed for these values. Reference level and scale values must be either constants with units or the keyword DEFAULT. DEFAULT reference level or the scale parameters specify that those settings will not change when zooming in the display.

4

Contacting Agilent

Contacting Agilent

To learn more about your optical spectrum analyzer and other lightwave optical communication test solutions, visit our Internet web site. Before returning an instrument for service, call the Agilent Technologies Instrument Support Center at (800) 403-0801, visit the Test and Measurement Web Sites by Country page at http://www.tm.agilent.com/tmo/country/English/index.html, or call one of the numbers listed below. See "Agilent Technologies Service Offices" on page 4-4 for a list of sales and service centers.



To learn more about this or any Agilent Technologies product, visit our web site at http://www.agilent.com.

To learn more about Fiber Optic Test Equipment, go to the Agilent Technologies home page listed above, and follow this path:

1. Click Products.
2. Click Test and Measurement.
3. Under Products, click Fiber Optic Test Equipment.

This path will take you to the Fiber Optic Test Equipment page. Alternately, you can enter the URL for this page directly:

http://www.tm.agilent.com/tmo/Products/English/FiberOpticTestEquipment.html

Agilent Technologies Service Offices

Before returning an instrument for service, call the Agilent Technologies Instrument Support Center at (800) 403-0801, visit the Test and Measurement Web Sites by Country page at http://www.tm.agilent.com/tmo/country/English/index.html, or call one of the numbers listed below.

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Korea	82/2-3770-0419
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