User's Guide

HP 85869PC EMI Measurement Software

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Introduction

Thank you for purchasing the HP 85869PC EMI measurement software. The HP 85869PC software runs under Microsoft Windows 3.1 or Windows 95 on a personal computer.

Additional benefits of the HP 85869PC software include:

- Increased measurement speed
- Simplification of complex measurement tasks
- Increased measurement integrity
- Ease of use

This chapter contains the following information:

- What You Received with Your HP 85869PC Software
- Personal Computer Requirements
  - Minimum PC Requirements
  - Recommended PC Configuration
  - Software Requirements
- Program Features
  - Design Your Own Tests
  - Select From Prestored Tests
  - Make a Commercial (CISPR-Based) Test
  - Library Sections
    - Store Your Measurement Data
    - Make Changes to the Libraries
  - Measurement Capability
    - Each Test Can Have Up to 20 Frequency Ranges
    - Control Other System Devices
    - Quick-Look Capability
  - Hard Copy Output of Results
  - Entering Test Setups
  - Utilities/Convenience Features

Hardware Key A hardware key is included with the HP 85869PC EMI measurement software. This hardware key *must* be installed on the first parallel port (LPT1) of the computer and is required for the software to run. It should be noted that this hardware key is *in addition* to the hardware key required for HP BASIC for Windows. Refer to "Installing HP BASIC for Windows" in Chapter 3 for more information.

The hardware key is not specific to any individual computer, therefore, it can be moved to another computer at any time. For example, if the original computer must be repaired, the software and hardware key may be loaded onto another computer.

What You Received with Your HP 85869PC Software

If you are missing any of the following items, notify your local Hewlett-Packard sales office or representative.

Standard Product

- One disk containing the HP 85869PC software
  - 3-1/2 inch high-density disks, 1.44 MByte
- Hardware Key
- HP 85869PC User's Guide

Option 488

- National Instruments AT-GPIB/TNT or AT-GPIB Interface board

Personal Computer Requirements

The following describes the minimum and recommended requirements of personal computer configurations. If the minimum requirements are not met, the HP 85869PC software will not operate correctly.

Note The HP 85869PC software supports *only* 256 colors. If the driver for the computer video card uses more than 256 colors in its color palette or if it uses a nonstandard color palette, graphics problems will occur when using this program. Avoid these graphics problems by using the 256 standard color palette.

Minimum PC Requirements

CPU	Intel 486/DX2 running at 66 MHz
RAM	16 MBytes (32 MBytes for Windows NT 4.0)
Parallel Port	Software requires hardware keys be installed on LPT1
Graphics	VGA 15-inch monitor with any Windows-supported video board
Hard Disk	Software installation requires 5 MByte free disk space Free work environment: 15 MByte
Floppy Disk	3.5 inch high-density, 1.44 MByte
GPIB	National Instruments Corporation's AT-GPIB/TNT, AT-GPIB/TNT(PNP), or PCMCIA Interface card, or Hewlett-Packard's HP-IB card (HP 82341C/D)
Printer and Plotter	GPIB printer/plotter; printers supported by MS-Windows
Pointing Device	Any Windows 3.1 compatible mouse or trackball

Recommended PC Configuration

CPU	Pentium (586) running at 133 MHz or faster
RAM	16 MBytes (64 MBytes for Windows NT 4.0)
Parallel Port	Software requires hardware keys be installed on LPT1
Graphics	SVGA 17-inch monitor with a graphics accelerator
Hard Disk	Software installation requires 5 MByte free disk space Free work environment: 15 MByte
Floppy Disk	3.5 inch high-density, 1.44 MByte
GPIB	National Instruments Corporation's AT-GPIB/TNT, AT-GPIB/TNT(PNP), or PCMCIA Interface card, or Hewlett-Packard's HP-IB card (HP 82341C/D)
Printer and Plotter	GPIB printer/plotter; printers supported by MS-Windows
Pointing Device	Any Windows 3.1 compatible mouse or trackball

Software Requirements

Before the HP 85869PC software can run on your PC, the following software must be installed and running:

- Windows 3.1x
  - Microsoft Windows 3.1x
  - National Instruments Corporation's AT-GPIB/TNT, AT-GPIB/TNT(PNP), or PCMCIA card or Hewlett Packard's HP 82341C HP-IB card
  - HP BASIC for Windows, version 6.30 only
- Windows 95/98
  - National Instruments Corporation's AT-GPIB/TNT, AT-GPIB/TNT(PNP), PCMCIA card or Hewlett Packard's HP 82341C/D HP-IB card
  - HP BASIC for Windows, version 6.30, 6.31, 6.32, or 6.33

- Windows NT 4.0
- National Instruments Corporation's AT-GPIB/TNT, AT-GPIB/TNT(PNP)
- HP BASIC for Windows, version 6.32 or 6.33

Program Features

The HP 85869PC EMI measurement software is a general purpose program for making automatic commercial and military emissions measurements. The program uses the HP 8566B, HP 8567A, or HP 8568B spectrum analyzer to make these measurements. The HP 85869PC EMI measurement software is written in HP BASIC for Windows to run as a native application on a personal computer. The HP 85869PC software requires HP BASIC for Windows and either the National Instrument's AT-GPIB/TNT, AT-GPIB/PNP, PCMCIA card or Hewlett-Packard's HP-IB card to be properly installed and running before it can be started. The friendly menu structure of the program leads you through an EMI measurement from initial setup to a final hard-copy plot of the test results. No programming knowledge is needed and only minimum knowledge of spectrum analyzer operation is required.

Design Your Own Tests

Program flexibility allows you to enter test equipment parameters directly into a test setup table. Transducer factors, preamplifier gain, cable loss, and test limits can be loaded from their respective libraries or entered directly from the computer keyboard. When your test is designed, you can store it in the test library. You can later recall, modify, and restore this test as your measurement needs change.

Select From Pre-Stored Tests

It is easy to select a pre-stored EMI test from one of the test libraries supplied with this program (refer to Figure 1-1). The pre-stored tests in the test libraries include common commercial and MIL-STD measurements. After a test is loaded, you simply press a few keys on the computer keyboard and the measurement is made automatically.

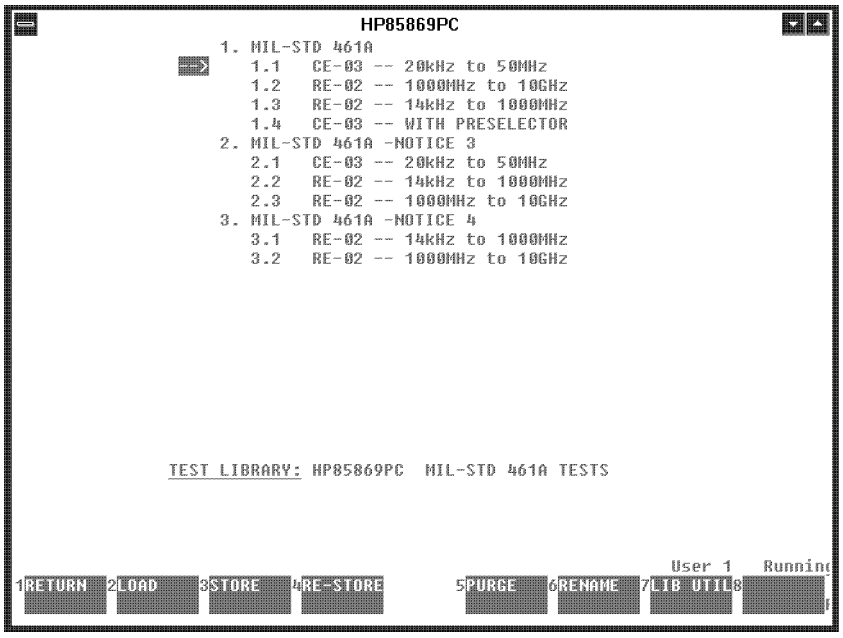

Figure 1-1. Example of a Pre-Stored Test Library Index

Make a Commercial (CISPR-Based) Test

Adding an HP 85650A quasi-peak adapter and an HP 85685A RF preselector to the system ensures compliance of the measurement system with the specifications of an EMI receiver called out in CISPR 16, Part 1. CISPR is an acronym for *Comite International Special Des Perturbations Radioelectriques*.

A speaker, which is built into the HP 85650A quasi-peak adapter, allows you to tune-in and listen to any signal of interest. With this speaker, you can acoustically discriminate between signals, that is, emissions from the equipment under test (EUT) or ambient signals.

Library Sections

The HP 85869PC EMI measurement software supports seven types of software libraries: test, data, transducer, gain/loss, limit, report, and receiver corrections (for the HP 8571A/8572A receiver systems). Supplied with the program are libraries with files containing common EMI test setups. Also included in these libraries are test limits and examples of typical transducer calibration factors for some commercially available antennas and current probes. It is recommended that you modify these libraries according to your specific hardware configurations.

Store Your Measurement Data

You can store measurement data in data libraries for easy record keeping. Whether viewing, analyzing, or copying the test results onto paper, the data is available for retrieval any time you need it.

Make Changes to the Libraries

Test setups, test limits, transducer factors, gain/loss factors, and report formats are quickly entered, stored, modified, or deleted allowing for easy expansion of your libraries as your test needs grow. The library system organizes your measurement history for quick and easy retrieval of test information.

Measurement Capability

Measurements can be made using peak, quasi-peak, average, or log average detection for a variety of EMI test applications. The HP 8566B and HP 8568B spectrum analyzers offer a selection of resolution bandwidths from 10 Hz to 3 MHz in a 1, 3, 10 sequence and the HP 8567A spectrum analyzer offers a selection of resolution bandwidths from 1 kHz to 3 MHz in a 1, 3, 10 sequence. This bandwidth selection provides great flexibility for making narrowband and broadband tests used in military measurements.

Each Test Can Have Up to 20 Frequency Ranges

You can pause a test at the end of each range for antenna or equipment changes (such as switching preamplifiers). You can also repeat a range several times in order to rotate equipment, raise and lower an antenna, or rearrange the test configuration to maximize measured emissions.

Control Other System Devices

You can enter your own subroutines to control automatic turntables, antenna masts, or other user-specified devices connected to the system. This feature helps to reduce measurement time.

Quick-Look Capability

For a more detailed analysis of specific emissions, the spectrum analyzer can be returned to local operator control. The spectrum analyzer, with its swept frequency capability and display screen is ideally suited to quickly look at a signal of interest (refer to Figure 1-2). When this analysis is complete, a single key press recalls any previously displayed measurement data and re-stores program control.

Hard Copy Output of Results

You can send the data displayed on the spectrum analyzer to the plotter connected to the GPIB port of your PC for a permanent record of your test. It takes only a few key presses to plot what you see on the spectrum analyzer's display. Three plot formats are available for your convenience in this case: one, two, or four plots on a single letter-size sheet of paper. This means that up to four separate measurements can be plotted on one sheet, as shown in Figure 1-2, for convenient test comparison. The program can report the peak value and frequency of measured emissions that exceed your preset amplitude limit and send this information to the printer connected either to the GPIB port, or the serial or parallel port of your PC for a permanent record. You can also mark a signal of interest for identification or mark a signal for reference by using the Mark Trace analysis option. Text or plot information can be saved to files for later use. These files can then be imported into other PC applications like word processors for reporting purposes or spreadsheets for further analysis.

For more information on printer and plotter configurations, refer to Chapter 8.

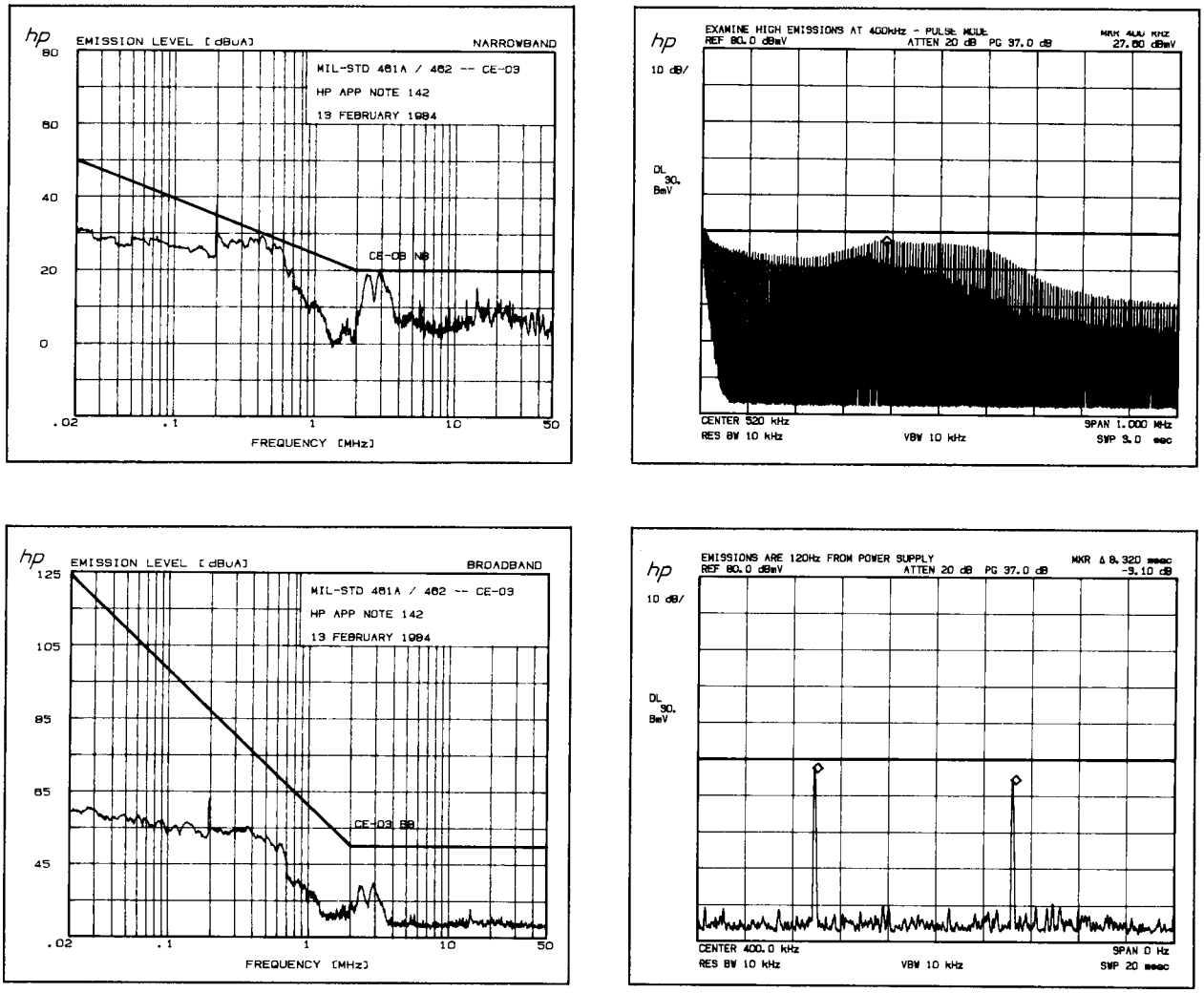

Figure 1-2. Example of Four Display Plots Created on a GPIB Plotter

Entering Test Setups

You can enter test equipment parameters directly from the computer keyboard or load pre-stored tests from the test library for commercial or MIL-STD testing. After loading the test parameters, you can modify the test setup tables at any time (refer to Figure 1-3). Changes can be as simple as specifying a new start frequency or as detailed as designing an entirely new test. You can access the limit tables and enter the limits for your current test needs. You can change the calibration factors in the transducer table to those of the transducer you are using. You can access the gain/loss tables and enter your preamplifier gain and cable loss for each frequency range. After making changes, you can store the modified test in the test library under a new test name and add new limits, transducer calibration factors, and gain/loss factors to their respective libraries as well.

Utilities/Convenience Features

Utility functions include setting the system clock, creating report formats, performing system calibration, measuring the system impulse bandwidths, and establishing the facility name.

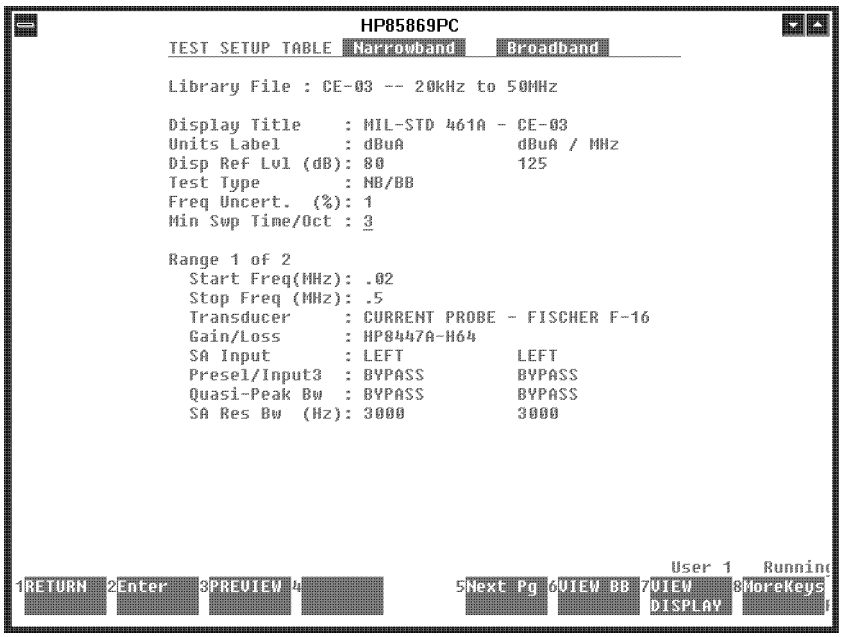

Figure 1-3. Example Test Setup Table Showing MIL-STD CE-03 Test, Page 1 of 2

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Configuration

This chapter contains the following information:

- Equipment Requirements and Options
  - Equipment Tables
  - PC Requirements
- Rear Panel Cables and GPIB Address Switches

This chapter explains how to configure your test equipment and prepare it for use with the HP 85869PC EMI measurement software. In this chapter, you will find the following:

- an example of a typical system configuration
- a form that will help aid you in the selection of test equipment
- tables that list recommended test equipment used with this software
- an example showing how cables are connected and what to set the GPIB addresses switches to on each piece of test equipment in a typical system configuration

Equipment Requirements and Options

The HP 85869PC EMI measurement software was designed to run on a PC using the HP BASIC for Windows programming environment. Furthermore, a GPIB card and driver need to be installed on your PC to use a variety of Hewlett-Packard equipment. Figure 2-1 gives an example of a typical system configuration used with the HP 85869PC EMI measurement software.

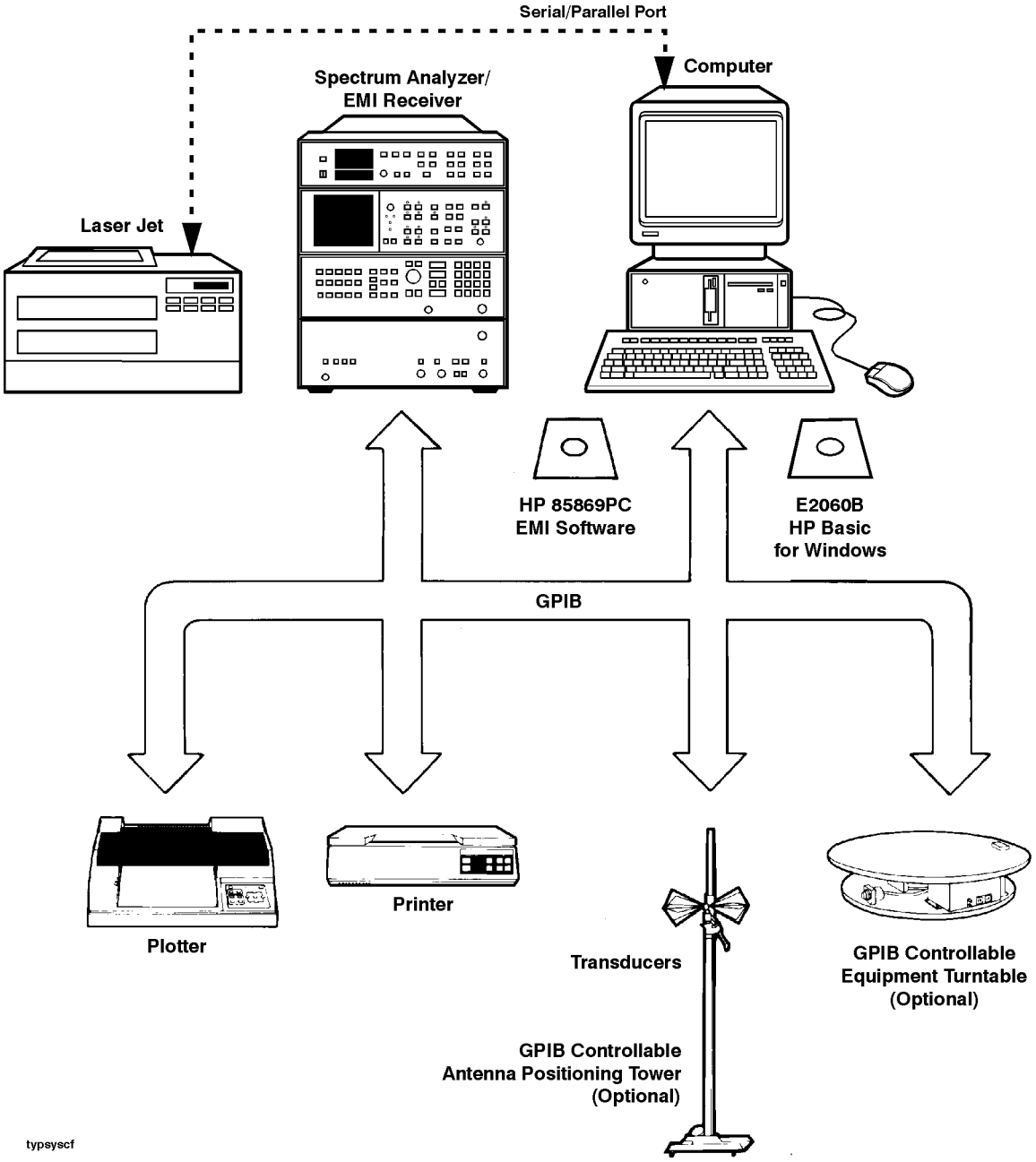

Figure 2-1. Typical System Configuration

Table 2-1 gives an example of the equipment used in a typical system configuration.

Table 2-1. Typical System Configuration Equipment

General Description	Recommended Equipment
EMI receiver which consists of the following equipment:	HP 8574B
Spectrum analyzer	HP 8568B
Quasi-peak adapter	HP 85650A
Preselector[1]	HP 85685A
Printer	HP LaserJet
Plotter[1]	HP 7550A

1 This device is recommended but is not needed in all applications.

Table 2-2. Supported EMI Receiver Configurations

HP 8571A MIL-STD EMI receiver 20 Hz—22 GHz
which consists of the following equipment:

HP 8566B spectrum analyzer (firmware date code 12.4.91 or later)

HP 11713A switch driver

HP 8449B preamplifier (Option H02)

HP 85685A RF preselector (firmware date code 27 Jan 92 or later)
(required for overload protection)

HP 8572A CISPR EMI receiver 20 Hz—22 GHz
which consists of the following equipment:

HP 8566B spectrum analyzer (firmware date code 12.4.91 or later)

HP 85650A quasi-peak adapter

(Required for CISPR-based testing and the tune and listen capability.)

HP 11713A switch driver

HP 8449B preamplifier (Option H02)

HP 85685A RF preselector (firmware date code 27 Jan 92 or later)

(Required for CISPR-based testing and overload protection)

HP 8573B CISPR EMI receiver 9 kHz—1.5 GHz
which consists of the following equipment:

HP 8567A[1] spectrum analyzer (firmware date code 7.4.87 or later)

HP 85650A quasi-peak adapter

(Required for CISPR-based testing and the tune and listen capability.)

HP 85685A RF preselector (firmware date code 1 Dec 88 or later.)

(Required for CISPR-based testing and overload protection.)

HP 8574B CISPR EMI receiver 9 kHz—1.5 GHz
which consists of the following equipment:

HP 8568B[1] spectrum analyzer (firmware date code 7.4.87 or later)

HP 85650A quasi-peak adapter

(Required for CISPR-based testing and the tune and listen capability.)

HP 85685A RF preselector (firmware date code 1 Dec 88 or later.)

(Required for CISPR-based testing and overload protection.)

1 The spectrum analyzer can be substituted with an HP 8566B
100 Hz—22 GHz (firmware date code 29.9.86 or later).

Table 2-3. Transducers

Antennas
HP 11966A Options K12 - K38
HP 11966B-J
HP 11966N, P
LISNs (line impedance stabilization network)
HP 11967C/D/E
Current probes
HP 11967A, B

Table 2-4. Printers

HP LaserJet Series printers
HP DeskJet Series printers
HP 2225A ThinkJet printer
HP 2227B QuietJet Plus printer

Table 2-5. Preamplifiers

HP 8447F[1] Option H64 .009—1300 MHz
HP 8447D[1] 0.1—1300 MHz
HP 8449A[1] 1—26.5 GHz
HP 11909A[1] 9 kHz—1 GHz
HP part number 08640-60506[1] 20 Hz—10 MHz (Used in CE-06 Tests)

1 Using an HP 85685A RF preselector in your configuration eliminates the need of a preamplifier below 2 GHz for most applications.

Table 2-6. Plotters

HP 7440A 8-pen graphics plotter
HP 7470A 2-pen graphics plotter
HP 7475A 6-pen graphics plotter (A firmware upgrade for the HP 8566B is required if the spectrum analyzer's firmware date code is **16.7.85** or earlier.)
HP 7550A[1] 8-pen graphics plotter
HP 7550 Plus 8-pen graphics plotter

1 This is the recommended model for use with the HP 85869PC EMI measurement software.

Table 2-7. Accessories

HP 11713A[1] attenuator/switch driver
HP 11947A[1] transient limiter
HP 11968B/C/E positioning accessories

1 This is the recommended model for use with the HP 85869PC EMI measurement software.

Rear Panel Cables and GPIB Address Switches

To properly connect the rear-panel cables and set the GPIB address switches on each component of the test system configuration, perform the following steps:

- Interconnect all equipment on the GPIB.

  If the HP 85685A RF preselector is used, the GPIB interconnect cables must be connected as shown in Figure 2-2.

- Connect power cords to each piece of equipment.
- Set LISTEN ONLY to 0 on all address switches.

  All equipment in a typical system configuration must have its GPIB address set and each component must be set to a different GPIB address.

  Table 2-8 lists the factory preset addresses of all EMI system components. Addresses other than those listed may be used, but such changes must be entered in the program. Refer to the manuals provided with each piece of equipment for instructions on changing or determining its GPIB address.

Table 2-8. Factory Preset Primary GPIB Addresses

EMI Component	Primary Address
Spectrum analyzer	18
Preselector[1]	19
Quasi-peak adapter	17
Attenuator/switch driver	28
System plotter	05
System printer	MS-Windows (Black/White)
Antenna tower	08
Turntable	09

1 The GPIB address switch of the HP 85685A RF preselector is factory preset to 18. The preselector's GPIB software address must be set to 19, that is, one above whatever the spectrum analyzer's GPIB address switch is set to. Refer to the HP 85685A RF preselector manual for further information.

Figure 2-2 depicts the high sweep cable to the HP 85685A RF preselector for preselector serial numbers greater than 3010A01160. For serial numbers 3010A01160 and earlier, refer to "How to Connect the High Sweep Cable" in the *Installation Manual* of the HP 85685A RF preselector.

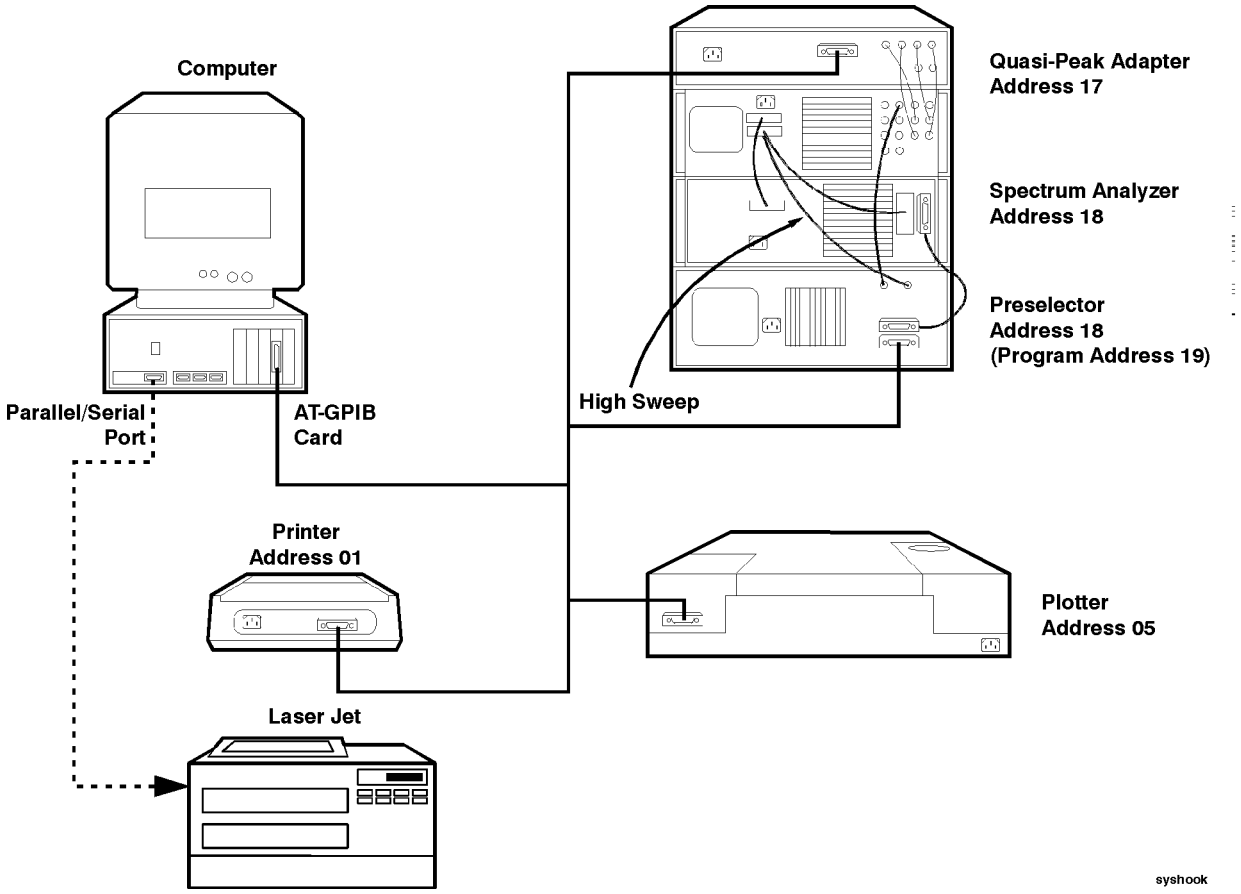

Figure 2-2. Typical System Configuration, Rear-Panel Connections

Note The GPIB address switch of the HP 85685A RF preselector is factory preset to 18. The preselector's GPIB address must be set to 19, that is, one above whatever the spectrum analyzer's GPIB address switch is set to. Refer to the HP 85685A RF preselector manual for further information.

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Installation

This chapter contains the following information:

- Installing your GPIB interface Card
- Installing HP BASIC for Windows
- Installing the HP 85869PC EMI Measurement Software
- Using the EMI Configuration Program
  - Colors
  - Print/Plot Files
  - GPIB Configuration
  - Printer/Plotter

Installing the GPIB Interface Card

Before installing HP BASIC for Windows or the HP 85869PC EMI measurement software, you will need to install the GPIB card into your personal computer.

Install the GPIB card and drivers following the manufacturer's instructions. During installation you may need to set the DMA, Base I/O Address, and the Interrupt Level (IRQ) of the card.

Refer to the following table when installing your GPIB card. Record the configuration information while you are installing the card. You will used these settings later to configure the HP 85869PC software.

Table 3-1. Configuration Information to Record

Card Type	Operating System	HP BASIC for Windows Version	Record this configuration information
NI AT-GPIB/TNT or NI AT-GPIB/TNT (PNP)	Windows 3.1x	6.30 only	Base I/O Address Interrupt Level (IRQ)
	Windows 95/98	6.30, 6.31	Base I/O Address Interrupt Level (IRQ)
	Windows 95/98	6.32, 6.33	None Required
	Windows NT 4.0	6.32, 6.33	None Required
NI AT-GPIB	Windows 3.1x	6.30 only	Base I/O Address Interrupt Level (IRQ)
NI PCMCIA	Windows 95/98	6.30, 6.31	Base I/O Address Interrupt Level (IRQ)
	Windows 95/98	6.32, 6.33	None Required
HP 82341C	Windows 3.1x	6.30 only	Interrupt Level (IRQ)
	Windows 95/98	6.30, 6.31, 6.32, 6.33	Interrupt Level (IRQ)
HP 82341D	Windows 95/98	6.30, 6.31, 6.32, 6.33	Interrupt Level (IRQ)

Verify that the GPIB is Working Properly

It is important to test that your GPIB hardware is functioning properly and that the configuration of your board does not conflict with any other resources in your PC. Refer to the documentation that was supplied with your GPIB hardware for instructions regarding how to test and verify the hardware and software driver installation.

Note The GPIB card must be installed and configured correctly, and pass the verification test or the HP 85869PC software will not function properly.

Installing HP BASIC for Windows

Refer to the Installing HP BASIC for Windows chapter in the *HP BASIC for Windows Installing and Using Guide* for complete instructions.

Installing the HP 85869PC EMI measurement software

Hardware Key

A hardware key is included with the HP 85869PC EMI measurement software. This hardware key *must* be installed on the first parallel port (LPT1) of the computer and is required for the software to run. It should be noted that this hardware key is *in addition* to the hardware key is required for some versions of HP BASIC for Windows. Refer to "Installing HP BASIC for Windows" for more information.

The hardware key is not specific to any individual computer, therefore, it can be moved to another computer at any time. For example, if the original computer must be repaired, the software and hardware key may be loaded onto another computer.

1. Attach the HP 85869PC hardware key onto the HP BASIC hardware key, located on the parallel printer port of your PC. (Up to five hardware keys can be stacked on the parallel printer port.)
2. Insert the HP 85869PC software disk into drive A (or appropriate 3.5 inch floppy drive) and close the drive door, if necessary.
3. Click on the **File** menu in the Program Manager then **Run** . . . .
4. Type `A:\setup` then press <**Enter**>.

   If your floppy drive is not drive A, type the correct letter instead of the letter "A". For example, if it is drive B, type B:\setup.
5. Follow the instructions displayed on the computer screen.
6. When the setup is complete, click the **OK** button.

   After the installation of the HP 85869PC software, the windows group HP 85869PC will be created.

Initial Configuration

The first time the application is run, you will need to change settings in the HP 85869PC configuration program to match the hardware you are using. Use the following procedure to access the configuration program.

1. From the **Windows Start** menu, select **Programs**, **HP 85869PC**, then **HP 85869PC**.
2. In the EMI Start menu, press `EMI CONFIG` (F4), then `GP-IB CONFIG` (F3).
3. Select the appropriate GP-IB interface selection for the GPIB card that you have installed. For some cards you will need to set the Base I/O address and the Interrupt Level (IRQ) for the settings that you recorded when you installed and configured your GPIB card.
4. Press `RETURN` to return to the EMI Configuration menu, then select `PRINTER PLOTTER` (F4). Use the appropriate printer and plotter softkeys to match your printer or plotter with the selection.
5. Press `RETURN` to return to the EMI Configuration menu.
6. Press `STORE & END` (F8) to save the changes and return to the EMI Start menu.

7. From the EMI Start menu, you can press `Start EMI PROG` (F1) to run the EMI measurement application.

EMI Configuration Program

The EMI configuration program of the HP 85869PC software allows you to configure the software to meet your specific needs. To access the EMI Configuration screen, select `EMI CONFIG` from the EMI Start Menu.

To access the EMI Configuration program, first start the HP 85869PC software by double-clicking on the HP 85869PC icon from the HP 85869PC group in MS-Windows 3.1 or selecting the HP 85869PC application from the Programs category under the Start button in Windows 95, Windows 98, or Windows NT 4.0 (usually found in the HP 85869PC group). When the EMI Start Menu screen is displayed, select the `EMI CONFIG` softkey and the display should look similar to the one shown in Figure 3-1.

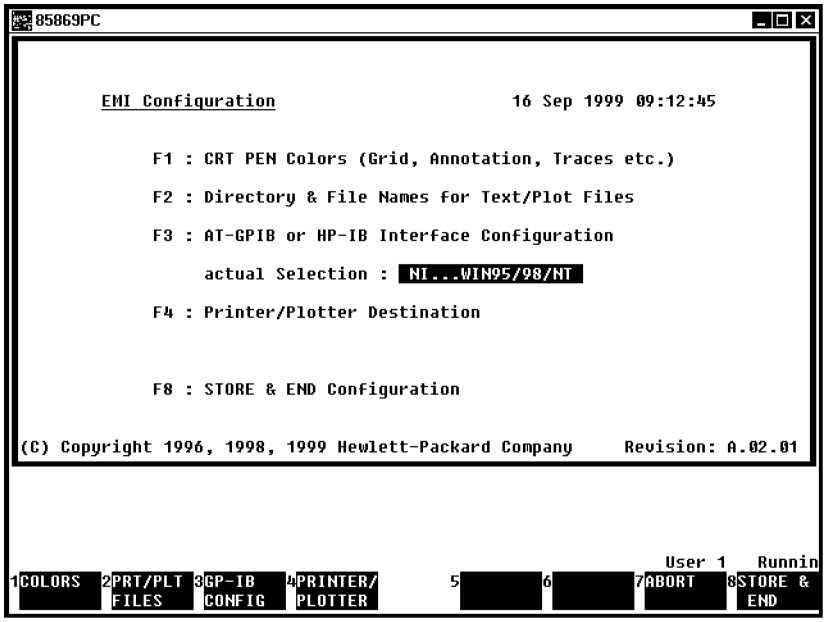

Figure 3-1. EMI Configuration Screen

`COLORS` defines the display colors for the different parts of the measurement screens.

`PRT/PLT FILES` specifies directory and file names for saving print and plot files.

`GP-IB CONFIG` allows you to enter the settings of the base I/O address and the interrupt level for the National AT-GPIB card or Hewlett-Packard's HP-IB card.

`PRINTER/ PLOTTER` specifies the interface type and GPIB address (if applicable) of the printer and the GPIB address of the plotter used to generate a hard copy of the graphics and text outputs.

After changes have been made to any of the four EMI configuration settings (Color, Print/Plot Files, GPIB, or Printer/Plotter), use one of the following softkeys to exit this area the EMI Configuration screen.

`ABORT`	returns to the EMI Start Menu without making any changes to the EMI Configuration settings.
`STORE & END`	saves all of the EMI configuration settings in the "/85869PC/emi_conf.dat" file and returns to the EMI Start Menu.

Colors

The `COLORS` softkey accesses the screen to change the display colors for the different parts of the measurement screens. Changes can be made to the grid, peak trace, quasi-peak trace, average trace, limit lines, and screen annotation. Choose the appropriate softkey to make changes to the specific parts of the graph. There are 15 colors to choose from; however, colors 8 through 15 may not be visible depending on the video driver and the resolution of your monitor. The graph shown in Figure 3-2 displays the current selection of colors.

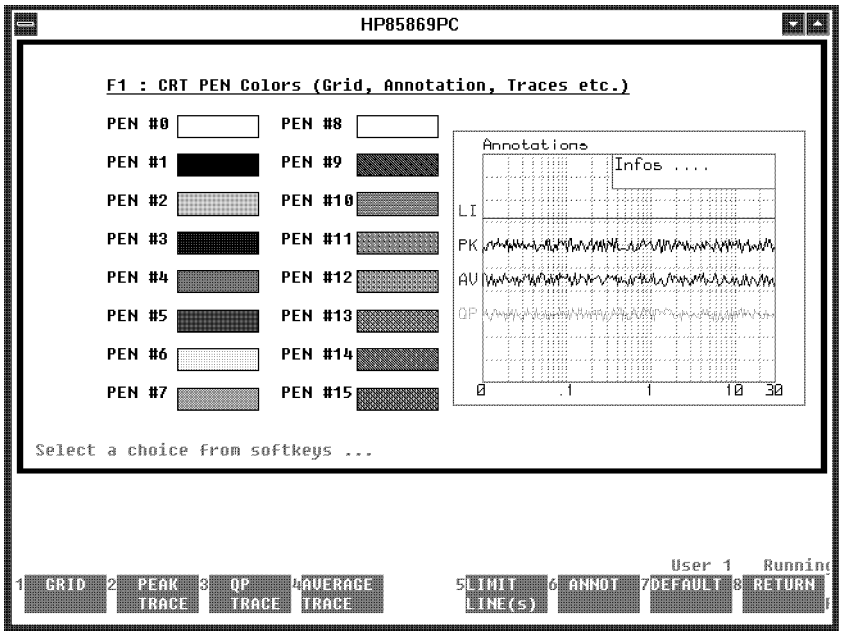

Figure 3-2. `COLORS` Screen

Note The colors set in `EMI Config`, `COLORS` are for display purposes only. To set the colors for a plot refer to Chapter 8 for more information.

GRID	activates the grid portion for color editing. The default color is PEN #4.
PEAK TRACE	activates the peak trace portion for color editing. The default color is PEN #1.
QP TRACE	activates the quasi-peak trace portion for color editing. The default color is PEN #2.
AVERAGE TRACE	activates the average trace portion for color editing. The default color is PEN #3.
LIMIT LINES(s)	activates the limit line portion for color editing. The default color is PEN #6.
ANNOT	activates the text annotation for color editing. The default color is PEN #3.
DEFAULT	returns the graph attributes to their default values as described above.
RETURN	returns the program to the EMI Configuration screen.

When any of the above graph attribute softkeys have been selected, the following softkeys are used to define the new color selections.

NEXT	increases the current color to the next numerical value. For example, if the current color is PEN #3, then selecting NEXT sets the color to PEN #4.
PREV	decreases the current color to the previous numerical value. For example, if the current color is PEN #3, then selecting PREV sets the color to PEN #2.
DEFAULT PEN	returns the selected graph attribute back to its default value. For example, if GRID is selected, then selecting DEFAULT PEN would reset the color to PEN #4.
ACTIVATE COLOR	displays and activates the updated color selections. To save the new color selections, press ACTIVATE COLOR before exiting this screen.
CHG GRID MODE	(available only for the GRID attribute) toggles between the dotted and dashed line mode. Depending on the video adapter used, grid lines may not be displayed. In this case, a grid may be displayed by changing to a dashed line.
RETURN	returns the program to the Color screen.

Print/Plot Files

The PRT/PLT FILES softkey accesses the screen to specify directory and file names for saving print and plot files.

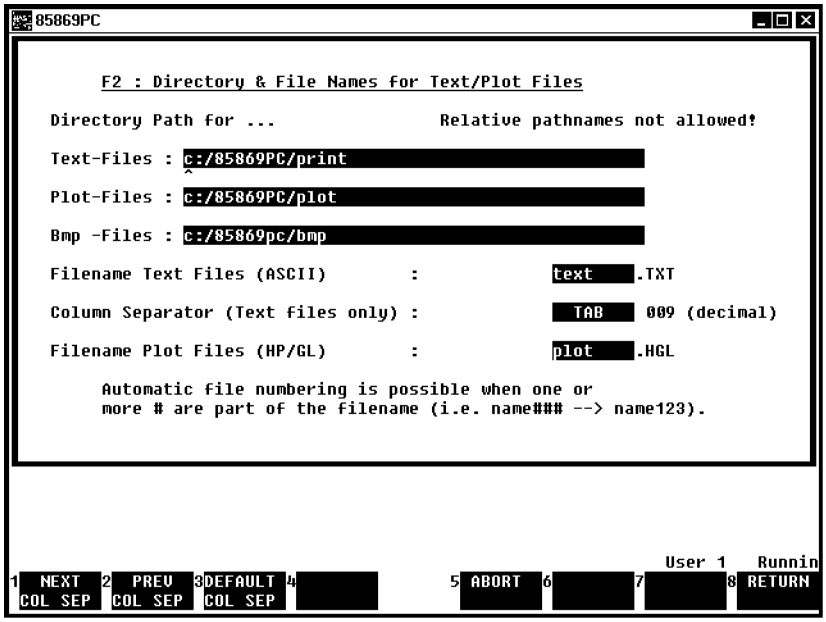

Figure 3-3. PRT/PLT FILES Screen

- Directory Path for Text Files: field is used to specify the directory path in which the text files are to be stored. The complete path name must be specified starting at the root directory as relative path names are not allowed, for example, C:\85869PC\PRINT.
- Directory Path for Plot Files: field is used to specify the directory path in which the plot files are to be stored. The complete path name must be specified starting at the root directory as relative path names are not allowed, for example, C:\85869PC\PLOT.
- Filename Text Files (ASCII): field is used to specify a filename for text files. You can assign automatic numbering for the text files by adding a pound sign "#" to the file name. For example, the file name EUT## will save the first text file as EUT00, the next text file as EUT01, and so on, in the specified directory. The pound signs can be located anywhere within the file name. The file name can be up to eight characters long with up to eight pound signs incorporated within the file name. Text files are saved in ASCII format using the specified field separator as described below.
- Column Separator (Text files only): field is used to specify the column separator type in conjunction with the type of spreadsheet used. Use one of the following softkeys to access the desired column separator.

NEXT COL SEP	increases the column separator to the next type.
PREV COL SEP	decreases the column separator to the previous type.
DEFAULT COL SEP	returns the column separator to the default type. The default column separator type is TAB.

- `Filename Plot Files (HP/GL)`: field is used to specify a filename for plot files. You can assign automatic numbering for the text files by adding a pound sign "#" to the file name. For example, the file name EUT## will save the first text file as EUT00, the next text file as EUT01, and so on, in the specified directory. The pound marks can be located anywhere within the file name. The file name can be up to eight characters long with up to eight pound marks incorporated within the file name. Plot files are saved in HPGL format.

`ABORT` returns to the EMI Configuration screen without saving any changes to the `PRT/PLT FILES` screen.

`RETURN` saves the changes and returns the program to the EMI Configuration screen.

GPIB Configuration

The `GPIB CONFIG` interface softkey accesses the screen to specify your GPIB interface card.

`HP-IB` accesses the screen to enter the settings of the base I/O address and the interrupt level for the Hewlett-Packard HP-IB card.

`AT-GPIB/ TNT` accesses the screen to enter the settings of the base I/O address and the interrupt level for the National Instrument AT-GPIB/TNT and AT-GPIB/TNT(PNP) card.

`AT-GPIB` accesses the screen to enter the settings of the base I/O address and the interrupt level for the National Instrument AT-GPIB card.

`PCMCIA` accesses the screen to enter the settings of the base I/O address and the interrupt level for the National Instrument PCMCIA card.

`NI...WIN 95/98/NT` for Windows 95, 98, and NT 4.0 with HP BASIC revisions 6.32 or 6.33, this softkey automatically sets the base I/O and interrupt level to available settings in the computer when using a National Instruments AT-GPIB/TNT, AT-GPIB/TNT(PNP), or PCMCIA interface card.

`NONE` specifies that no GPIB interface is installed in your computer. This allows you to access the software, with a computer that does not have a GPIB interface installed, using the Demo Mode. See "DEMO ON/OFF" in Chapter 4.

`ABORT` returns to the EMI Configuration screen without saving any changes to the `GPIB CONFIG` screen.

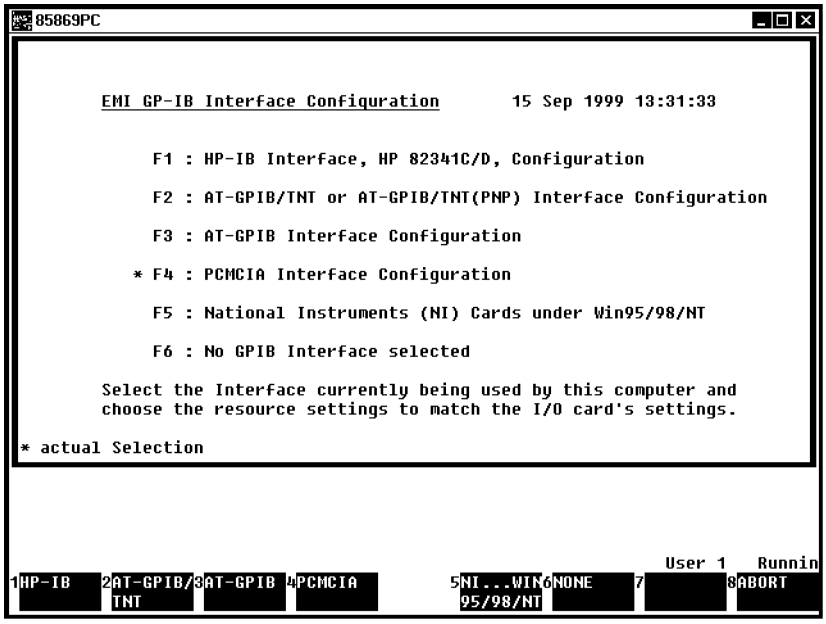

Figure 3-4. GPIB Interface Screen

Printer/Plotter

The PRINTER/PLOTTER softkey accesses the screen to specify the interface type and GPIB address (if applicable) of the printer and the GPIB address of the plotter used to generate a hard copy of the graphics and text files.

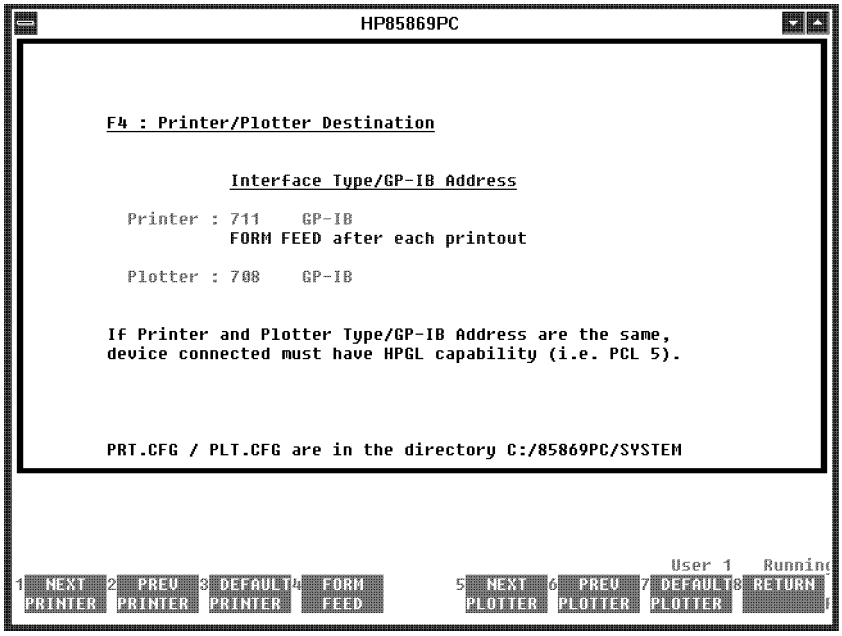

Figure 3-5. PRINTER/PLOTTER Screen

Printer Types

There are four printer interface types to choose from.

- MS-Windows printer (color)
- MS-Windows printer (black/white)
- GPIB printer
- GPIB printer configured through the PRT.CFG file

MS-Windows Printer

The Windows Print Manager controls and administers the printing process for the MS-Windows printer. MS-Windows printers are connected to the parallel or serial port of the personal computer. Refer to the "Microsoft Windows User's Guide" for more information on installing and configuring an MS-Windows printer and controlling the printing of your files. When printing to an MS-Windows black and white printer, the colors of the graphics are inverted prior to the printing process.

GPIB Printer

The GPIB printer is controlled directly through the HP 85869PC software. GPIB printers are connected to the GPIB interface port of the personal computer. A GPIB address from 00 to 30 must be specified for your printer.

When GPIB (configured through PRT.CFG file) is selected, you can specify a printer configuration in the PRT.CFG file. The content of this file, which are escape sequences, is sent to the printer before the actual printing process is started. This file is located in the `\85869PC\SYSTEM` directory. To edit this file, use either Write Pad in MS-Windows 95 or Note Pad in MS-Windows 3.1. For more information on the available escape sequences to set up a printer using the PRT.CFG file, refer to the printer manual.

`NEXT PRINTER` increases to the next printer selection.

`PREV PRINTER` decreases to the previous printer selection.

`DEFAULT PRINTER` resets to the default printer which is the MS-Windows printer (black/white).

`FORM FEED` executes a form feed after each printout is completed unless the `FORM FEED` softkey is toggled off. This softkey is only available when one of the GPIB printers is selected. A form feed is automatically executed for an MS-Windows printer via the Windows Print Manager.

Example of a prt.cfg file

```
!! ------------------------------------------------------------------------
!! example prt.cfg file (must be located in the \85869pc\system directory)
!!
!! the printer must be configured (EMI_CONF program) to allow use of this file
!!
!! the contents of this file (not the comments) are sent to the printer to
!! configure the printer individually
!!
!! escape code must be entered as  [esc]
!!
!! all text after 2 quotes (!!) is interpreted as a comment and are not sent
!! to the device
!!
!! Hewlett-Packard  05/96
!! ------------------------------------------------------------------------

[esc]%E  !! reset 1200C
[esc]%0A !! set 1200C to print mode
```

Plotters

There are two plotter interface types to choose from.

- GPIB plotter
- GPIB plotter configured through the PLT.CFG file

Note

- A plot using HPGL format is *not* possible in the case that a printer is connected via the serial or parallel port, even when the printer has HPGL capability.
- A serial or parallel plotter *cannot* be used with the MS-Windows Print Manager. However, if the printer has HPGL capability, then the use of a parallel to GPIB converter is possible.
- If the printer and plotter are specified with the same GPIB address, the device connected must have HPGL capability.

GPIB Plotter

The GPIB plotter is controlled directly through the HP 85869PC software. GPIB plotters are connected to the GPIB interface port of the personal computer. A GPIB address from 00 to 30 must be specified for your plotter.

When GPIB (configured through PLT.CFG file) is selected, you can specify a plotter configuration in the PLT.CFG file. The content of this file, escape sequences, is sent to the plotter before the actual plotting process is started. This file is located in the `\85869PC\SYSTEM` directory. To edit this file, use either the Write Pad in MS-Windows 95 or Note Pad in MS-Windows 3.1. For more information on the available escape sequences to set up a plotter using the PLT.CFG file, refer to the plotter manual.

`NEXT PLOTTER`	increases to the next plotter selection.
`PREV PLOTTER`	decreases to the previous plotter selection.
`DEFAULT PLOTTER`	resets to the default plotter which is the GPIB plotter with the address set to 705.
`RETURN`	saves the current settings and returns to the EMI Configuration screen.

Example of a plt.cfg file

```
!! ------------------------------------------------------------------------
!! example plt.cfg file (must be located in the \85869pc\system directory)
!!
!! the plotter must be configured (EMI_CONF program) to allow use of this file
!!
!! the contents of this file (not the comments) are sent to the plotter to
!! configure the printer/plotter individually
!!
!! escape code must be entered as  [esc]
!!
!! all text after 2 quotes (!!) is interpreted as a comment and are not sent
!! to the device
!!
!! Hewlett-Packard  05/96
!! ------------------------------------------------------------------------

[esc]%-1B  !! reset 1200C
IP150,150,9820,7560 !! set IP individual
```

4

Getting Started

This chapter contains the following information:

- EMI Process Overview
- EMI Start Menu
  - Start EMI Program
  - EMI Configuration
  - Import
  - Library Copy Utility
- Verifying Your System Configuration
  - Verifying Your HP 8571A or HP 8572A System Configuration
- Importing Receiver Correction Tables
  - How to Import the Receiver Correction Tables
- Designating a Library MSI
- Program Top Level
  - Top Level Softkeys
    - Setup
    - Test Library
    - Data Library
    - Measure
    - Plot
    - Instrument Address
    - Utility
    - View Broadband and View Narrowband
    - View Spectrum Analyzer
- Tutorial
  - Typical Sequence of Steps
  - Ending the Program
  - Choosing How to Perform a Measurement
  - Running a Predefined Test
  - Running a Customized Test
    Customizing a Test Setup Table
  - Example of Analyzing Measurement Data

This chapter explains how to get started using the HP 85869PC EMI measurement software. Once the software is running, a section on verifying your system configuration is presented. While verifying your system configuration, you are given the option of designating a library MSI. After completing the section on verifying your system configuration, each portion of the program is introduced with a short explanation. When all of the portions of the program have been introduced, a short tutorial on using this software is presented.

EMI Process Overview

This section describes the overall process of using the HP 85869PC EMI measurement software for making an EMI measurement. It is highly recommended that you review this section and any section that is referenced here to better understand how to optimize the use of the HP 85869PC software in as little time as possible.

1. Double-click on the HP 85869PC icon from the HP 85869PC group in MS-Windows 3.1 or select the HP 85869PC application from the Programs category under the Start button of Windows 95 (usually found in the HP 85869PC group).

   The EMI Start Menu screen will be displayed. See Figure 4-1.

2. If it is necessary to change your display colors, printer/plotter file names, GPIB information, or printer/plotter address, press the `EMI CONFIG` function key. For more information on making changes to these items, refer to Chapter 2.

Note Verifying your printer/plotter selection at this time will prevent you from having to return to the EMI Configuration program.

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3. Review the `IMPORT` and `LIB COPY UTILITY` function keys and determine if it is necessary to transfer HP 85869A user libraries and files to the PC or copy library files from one directory to another. Refer to Appendix D and Chapter 11 for more information on these functions.
4. Press `START EMI PROG` to initiate the HP 85869PC EMI measurement software.
5. Review the EMI components "currently connected to system" to determine if they are correct. (See Figure 4-2.) If they are, press `CONTINUE`. Otherwise, use the `RECONFIG` softkey to access the menu for reconfiguring the instrument addresses of your EMI components. For more information, refer to "Verifying Your System Configuration" later in this chapter and "Reconfiguration" in Chapter 9 in Chapter 9.
6. From the EMI Program Top Level screen, choose one of the following six functions:

   a. Select `TEST LIB` to choose an existing test and load it. Refer to Chapter 6 for more information on libraries.

Note The test libraries that are provided here have been created using standard specifications and are intended to be used as a template and *not* to be used as is. You will most likely want to customize the templates for your environment by specifying your own transducers, gain/loss tables, correct receiver inputs, and so on.

---

   b. Select `SETUP` to modify a test, transducers, gain/loss, or limits. Refer to Chapter 5 for more information on test setup parameters.

   c. Select `MEASURE` to calibrate the system, preview the range specified by the test, make an actual measurement, or analyze the measurement data. Refer to Chapter 7 for more information on measurement related tasks.

   d. Select `PLOT` to send graphics to a plotter, printer, or file for use in other PC applications such as MS-Word. Refer to Chapter 8 for more information on plotting and printing.

   e. Select `DATA LIB` to save measurement data along with settings. Refer to Chapter 6 for more information on data libraries.

   f. Select `UTILITY` to create a report. Refer to Chapter 10 for more information on creating reports.

EMI Start Menu

After starting the HP 85869PC EMI measurement software, the following display will appear on the screen. The EMI Start Menu allows you to set up the EMI Configuration, import data files from the HP 85869A software, copy library files from one directory to another, and start the measurement portion of the software.

To start the HP 85869PC software, double-click on the HP 85869PC icon from the HP 85869PC group in MS-Windows 3.1 or select the HP 85869PC application from the Programs category under the Start button in Windows 95 (usually found in the HP 85869PC group).

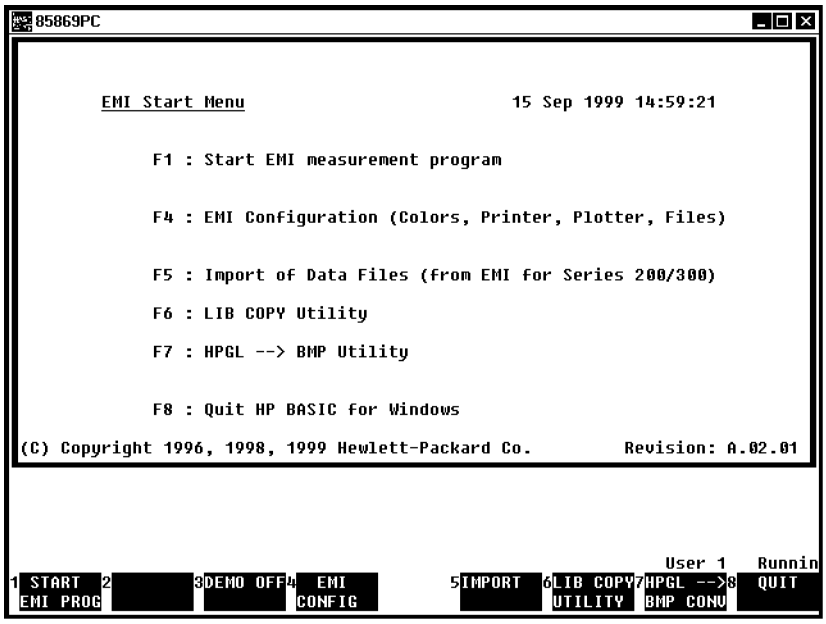

Figure 4-1. EMI Start Menu

Start EMI Program

The `START EMI PROG` softkey is used to access the measurement portion of the HP 85869PC software.

DEMO ON/OFF

The `DEMO ON OFF` softkey allows you to enter the program without having a security key. When DEMO is ON, control of GPIB devices is disabled (with the exception of the printer or plotter) and no measurements can be made.

Tip You can use the DEMO mode to print graphical or tabular test data from a PC that does not have an HP 85869PC security key.

EMI Configuration

The `EMI CONFIG` softkey accesses the EMI Configuration screen where you can configure the software to meet your specific needs in the following areas:

`COLORS`	defines the display colors for the different parts of the measurement screens.
`PRT/PLT FILES`	specifies directory and file names for saving print and plot files. For additional information, refer to Chapter 8.
`GP-IB`	allows you to enter the settings of the base I/O address and the interrupt level for the National AT-GPIB card.
`PRINTER/ PLOTTER`	specifies the interface type and GP-IB address (if applicable) of the printer and the GP-IB address of the plotter used to generate a hard copy of the graphics and text outputs.

Import

The `IMPORT` softkey accesses the functionality to transfer BASIC files like the HP 85869A user libraries/files, subprograms, and HP 8571A/8572A calibration data into a specific directory of the personal computer from a LIF format floppy disk.

Library Copy Utility

The `LIB COPY UTILITY` softkey accesses a program to copy all or selected library files from one directory to another.

Use the Library Copy Utility to incorporate portions of defined test libraries to create a new test. Once you have leveraged all of the applicable portions of the existing test libraries, you can use the Setup portion of the program to create the undefined portions of the test library.

HPGL Bitmap Conversion

The `HPGL → BMP CONV` softkey is used to convert HPGL data plot files (*.hgl) to bitmap (*.bmp) files. For additional information, refer to Chapter 8.

Verifying Your System Configuration

After starting the HP 85869PC EMI measurement software, a display similar to the following appears on the PC screen.

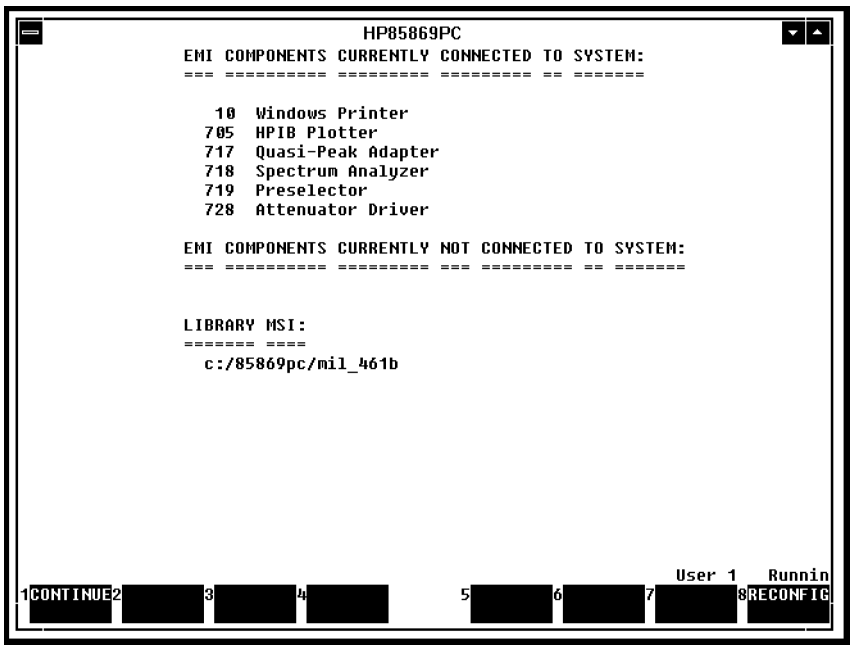

Figure 4-2. Configuration Display

Verify that all HP 85869PC EMI measurement software system instruments connected are displayed in the "CURRENTLY CONNECTED" list. If an instrument is connected, but not powered-up or if its GPIB address does not match one of the addresses shown, it will be displayed in the CURRENTLY NOT CONNECTED list.

For proper printer operation, the printer type needs to be properly selected. To change any of the GPIB addresses, refer to Chapter 9 for detailed information on reconfiguring your system.

The LIBRARY MSI listing in Figure 4-2 may be blank depending on the way that your system is configured. If you must designate a directory to be used for library operations, perform the procedure "Designating a Library MSI" later in this chapter.

If your system is either an HP 8571A or HP 8572A, proceed to "Verifying Your HP 8571A or HP 8572A System Configuration" below.

Verifying Your HP 8571A or HP 8572A System Configuration

If your system has an HP 8566B spectrum analyzer and an HP 11713A attenuator/switch driver found active on the GPIB, then after pressing `CONTINUE`, the software will ask you to verify if your system is an HP 8571A or HP 8572A EMI receiver system. A display similar to the following may then appear on the computer screen.

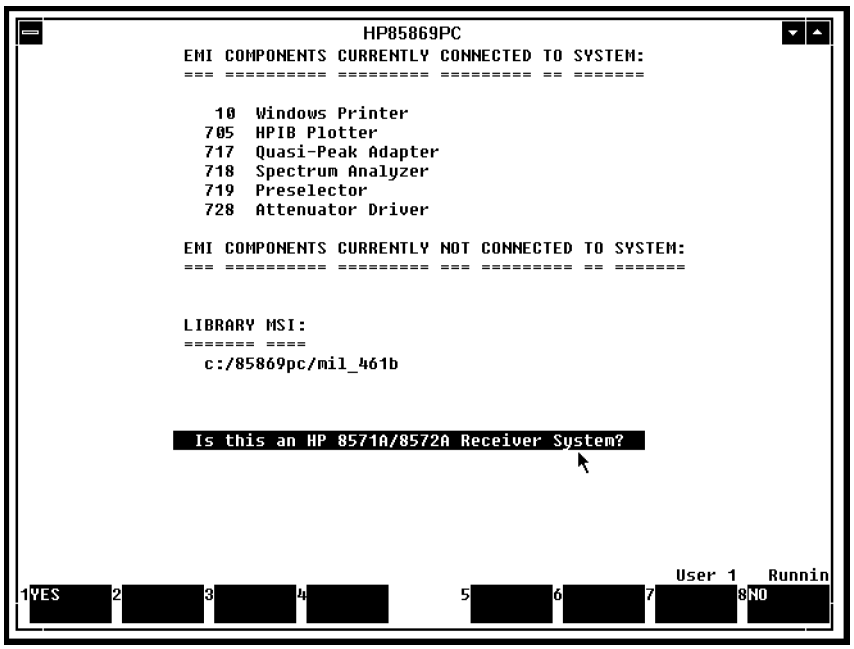

Figure 4-3. HP 8571A or HP 8572A Configuration Display

Press either `YES` or `NO` to load correction factors for Input 3.

`YES` answers 'yes' to the question "Is this an HP 8571A/8572A Receiver System?" and exits the instrument address portion of the program and accesses the second level Receiver Correction Tables library list. Refer to "Importing Receiver Correction Tables" for more information.

`NO` answers 'no' to the question "Is this an HP 8571A/8572A Receiver System?" and is used to exit the instrument address portion of the program (the HP 8571A/8572A receiver system's calibration factors for input 3 will not be active) and return to the program top level.

Importing Receiver Correction Tables

A calibration data disk is generated during factory or HP Customer Service Center calibration of an HP 8571A or HP 8572A EMI receiver system. This calibration data is shipped with each EMI system and is specific to that system. The disk contains all of the calibration factors necessary when Input 3 (1 to 22 GHz) is used on the HP 8571A/8572A EMI receiver. The calibration data disk contains the following files:

TEST_DATA	BDAT
CITIFILE	HP-UX

When attempting to import calibration data into the HP 85869PC software (for the first time in a specific library directory), the following error will occur: "NO LIBRARY FOUND ON MSI". This error occurs because the EMI software is searching for a library that contains the calibration data. There are no HP 85869PC libraries on the calibration data disk, only the raw calibration data information generated during calibration which will need to be imported into the PC.

Note The calibration data file TEST_DATA needs to be imported into the PC and the receiver correction library created. The EMI software will not be able to find the correction data until the receiver library is created. The following procedure describes the process that will allow the HP 85869PC software to import the calibration data.

How to Import the Receiver Correction Tables

1. Obtain the HP 8571A/8572A Calibration Data disk specific to the EMI receiver in use and insert this disk into the 3.5 inch floppy drive.
2. Double-click on the HP85869PC icon in the HP 85869PC group to start the HP 85869PC EMI measurement software.
3. From the EMI Start Menu screen, select `IMPORT` (F5).
4. Specify the following;
   a. Source Drive of Library Disk
   b. DOS Destination Drive
   c. DOS Destination Directory Path
5. Press `IMPORT Data` (F6).

   This will copy the TEST_DATA and CITIFILE files to the specified destination. The file names copied to the specified destination will be `test.dat` and `cit`. (These file name changes were necessary to provide compatability with MS-DOS file naming conventions.)
6. Press `END IMPORT` (F8) to exit the import screen and return to the EMI Start Menu screen.

   Once the files have been imported and the destination directory is *not* the desired HP 85869PC library directory, then use File Manager (or Windows Explorer) to move the file test.dat to the current directory. (The application does not use the "cit" and can therefore be deleted from the directory.)
7. From the EMI Start Menu screen, press `START EMI PROG` (F1). If all EMI components are connected, press `CONTINUE` (F1), then press `YES` to the question "`Is this an HP 8571A/8572A Receiver System?`"

8. When the message "NO LIBRARY FOUND ON MSI" appears, select NEW LIB (F7).

9. After the notice "If Library mass storage device has been formatted, press CONTINUE" appears, press CONTINUE (F1) and enter the receiver library and name. For example, type in Receiver Correction Data then press ENTER (F1).

10. When the message "NO FILES CURRENTLY DEFINED IN LIBRARY" appears, press IMPORT (F8) to load the receiver correction data from the test.dat file into the application.

11. If desired, to print or view the correction data file information, press PRINT TO FILE (F3), PRINT (F4), or VIEW (F5). Press RETURN (F1) when finished.

12. To save the imported data as a library item, press STORE (F3).

    It is necessary to enter the name of the indicated header, for example, HP 8572A SN: 3412A01452, and press ENTER. It is now necessary to enter the name of the indicated file, for example, Calibration Data 24 March 1996.

13. After the data has been saved as a library item, press RETURN (F1) to access the EMI Program Top Level screen.

Designating a Library MSI

In order to access the test, data, transducer, receiver correction factors gain/loss, limit, or report libraries, the disk drive and directory path containing these files needs to be specified. The LIBRARY MSI listing that is shown during verification of your system configuration contains this specification. See Figure 4-2.

If the LIBRARY MSI listing is properly set for your needs, press CONTINUE; but, if the LIBRARY MSI listing is set differently than you wish or not set at all, perform the following procedure to designate a default directory.

1. Press RECONFIG.

2. Press Lib MSI.

3. Type the directory path of the disk drive to be used for library operations (for example, C:/HP85869PC/comm_con) and press ENTER.

4. Press RETURN.

5. If you wish to save the configuration, press YES after the prompt, otherwise press NO.

   By saving the configuration, you are saving all of the information that is shown in the configuration display. If this is done, the configuration will come up with the same values the next time that you run this software.

   If no further changes in the configuration are necessary, press CONTINUE to return to the EMI Program Top Level.

After performing these steps, the HP 85869PC EMI measurement software is ready for use. For more detailed information on reconfiguring your system, refer to Chapter 9.

Program Top Level

After performing the procedure "Verifying Your System Configuration", a display similar to the following is displayed on your computer screen.

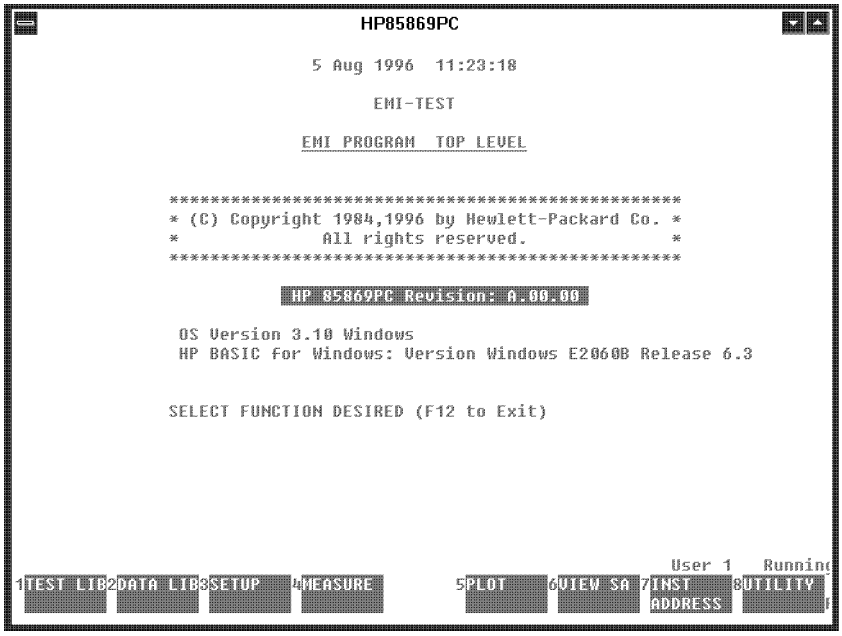

Figure 4-4. Top Level Softkey Menu

The HP 85869PC EMI measurement software is made up of sections that perform unique tasks. You can access these sections by pressing the softkeys that form the program top level.

`TEST LIB`	Test Library
`DATA LIB`	Data Library
`SETUP`	Setup
`MEASURE`	Measure
`PLOT`	Plot
`VIEW SA`	View Spectrum Analyzer display
`INST ADDRESS`	Instrument Address
`UTILITY`	Utility
`F12`	Exit the HP 85869PC and returns to the EMI Start Menu

Conditional Top Level Softkeys —

Depending on the setup, one of the following program top level softkeys may replace the `VIEW SA` softkey.

`VIEW BB`	View Broadband
`VIEW NB`	View Narrowband

The following sections present a brief overview of the function that each of these top level softkeys perform.

Test Library

The test library (`TEST LIB`) is used to transfer information to and from the test setup table. The test setup table holds the parameters that describe each test.

With the test library, you can store, purge, or rename the contents of a test setup table. You can also load a file into the test setup table. Loading a test into the test setup table automatically configures the measurement system for an EMI test.

The test library also contains a utility section. This utility section allows the user to print a library index or examine a library in another directory. To use the softkeys in the test library section, refer to "Library Softkeys" in Chapter 6.

There are six test libraries supplied with this program that contain EMI tests. These test libraries are:

- Conducted Commercial Tests
- Radiated Commercial Tests
- MIL-STD 461A Tests
- MIL-STD 461B Tests
- MIL-STD 461C Tests
- MIL-STD 461D Tests

Index listings that show the test setup tables available with this program are supplied in the "Test Library" in Chapter 6.

Data Library

The data library (`DATA LIB`) is used to store the test results (collected data) after loading and running a test from the test library.

Loading a data file, from the data library, into the measurement system, simultaneously recalls its corresponding test file (test setup table) from the test library. When a data library file is loaded, it replaces measurement results shown on the spectrum analyzer or PC screen and erases the previous contents of the test setup table. In order to preserve the contents of a data file, its information must be stored in the data library or test library prior to loading another file.

The data library also contains a utility section. This utility section allows the user to print a library contents or examine a library in another directory. To use the softkeys in the data library section, refer to "Library Softkeys" in Chapter 6.

Setup

The setup (`SETUP`) portion of the program can be used to create a new EMI test or modify one that is already predefined. An EMI test is defined by a set of parameters that are listed in the test setup table. The "Test Library" in Chapter 6 describes a number of standard EMI tests that come with the HP 85869PC EMI measurement software. These tests can be used as they are after verification of applicability to the current test environment or they can be customized and extended as necessary. Refer to Chapter 5 for information on specifying test setup table parameters.

Note The test libraries that are provided have been created using standard specifications and are intended to be used as a template and *not* to be used as is. You will most likely want to customize the templates for your environment by specifying your own transducers, gain/loss tables, correct receiver inputs, and so on.

Setup also contains the tables for transducer, gain/loss, and limit libraries. Transducer, gain/loss, limit tables are used to characterize transducers, preamplifier gain, cable loss, and test limits; you can access and customize these sections to complete or store portions of a test setup table.

Measure

The measure (`MEASURE`) portion of the program uses test limits and test parameters, from a test setup table, to perform the measurement and testing process used by the HP 85869PC EMI measurement software.

When using the measure portion of the program:

- all measurement and test results produced by this software are presented in logarithmic scale on the spectrum analyzer display.
- measurement results can be duplicated and viewed on the computer display, plotted on a GPIB plotter, printed on a serial/parallel printer, controlled through Print Manager, or stored, recalled, and re-analyzed using the data library portion of the program.
- test limits are simultaneously displayed with measurement results so test failures can be easily viewed.
- both quasi-peak and average measurements can be made over one or multiple portions of the measured frequency span.

Plot

The plot (`PLOT`) portion of the program is used to document measurement results with a GPIB plotter.

When using the plot portion of the program:

- the spectrum analyzer display can be reproduced whether it is an EMI screen or a local screen.
- a choice of up to eight pens are available (GPIB only).
- pen selection can be varied for annotation, graticules, traces, and so on (GPIB only).
- recreate the spectrum analyzer display in three different formats that contain from one to four plot positions, refer to Figure 4-5. (Available only for output devices connected to the GPIB interface.)

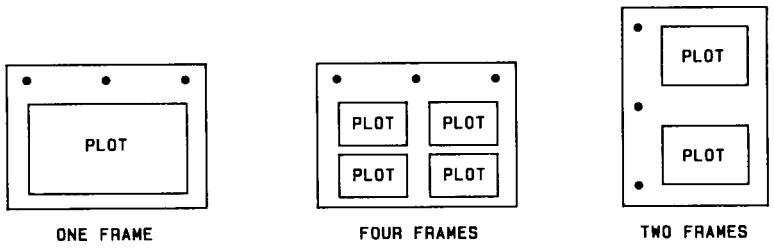

Figure 4-5. Plot Formats

- the size, aspect ratio, and position of the plotting area can be controlled manually by changing P1 and P2 on the plotter. Refer to the plotter's operating manual for further information on changing P1 and P2.
- a plotter/printer setup file can also be used to define values for P1 and P2 automatically.

View Spectrum Analyzer/Broadband/Narrowband

`VIEW SA` (spectrum analyzer) offers you choices that can be used for changing the traces that are visible on the display of the spectrum analyzer and PC such as peak, quasi-peak (QP), or average (Avg). The `VIEW SA` softkey is only available when the test type (in the test setup table) is specified as either Peak or Peak/Log Average.

`VIEW BB` (broadband) and `VIEW NB` (narrowband) bring either the broadband or the narrowband displayed trace to the spectrum analyzer and PC displays for inspection. The `VIEW BB` and `VIEW NB` softkeys are only available when the test type (in the test setup table) is specified as either NB/BB or BB AUTO.

For more information on these softkeys, refer to Chapter 5.

Instrument Address

The instrument addresses (`INST ADDRESS`) function resets the GPIB bus and lists the equipment connected to the system. In addition, the "Instrument Address" portion of the program provides the means to change the GPIB device bus addresses, and library directory used in the program.

Utility

Utility (`UTILITY`) functions include setting the system clock, creating report templates, performing system calibration, measuring the system impulse bandwidths, and establishing the facility name.

Ending the Program

To end the program at any time, press the `F12` softkey at the program top level. You can also exit the program by pressing (Shift) (Reset).

Tutorial

The HP 85869PC EMI measurement software controls a spectrum analyzer based receiver system and compares received signals to selected test limits. Test limits and responses are displayed on the spectrum analyzer and PC display.

Typical Sequence of Steps

To use this software, you would perform a procedure similar to the following.

1. Load a test from the test library or define your own customized test; the setup portion of the program is used to define a customized test.

   A test is defined by the parameters in a test setup table. The parameters listed in the test setup table are used to characterize the measurement system and its display for specific EMI tests. It is used to control the settings of all instruments in the measurement system such as bandwidth, frequency span, and attenuation settings. In addition, the test setup table is used to specify the test limits, gain/loss factors, and transducer characteristics.

2. After a test setup table has been loaded from the test library, you use the measure portion of the program to conduct the actual EMI measurement, analyze measurement results, or remeasure with quasi-peak or average detection.

3. When all measurements are complete, you store the test setups in the test library, analyze the test results (collected data), and store them in the data library.

4. Finally, you produce a hard copy of your measurement results, or you can save them in files for further processing.

   The program can produce a hard copy of test limits, gain/loss factors, and measurement results on a plotter, and list transducer factors, test limits, and test setup parameters on a printer.

   Measurement data can be saved in tabular form as an ASCII file using the previously defined separator or in graphical format in an HPGL file. These resultant files can be processed further for data analysis using a commercially available spreadsheet application, or for documentation purposes using a word processor.

Choosing How to Perform a Measurement

This software can be used in two ways. You can load and run one of the predefined tests that comes with the HP 85869PC EMI measurement software or you can customize and run your own tests.

The parameters used to define an EMI test are organized in a test setup table. The "Test Library" in Chapter 6 shows an index of a number of standard EMI tests which come with the HP 85869PC EMI measurement software. These tests can be used as they are or they can be customized and extended as necessary. The setup portion of the program can be used to customize one of these tests, modify one that is already predefined, or create a new EMI test.

Before going any further, you must decide whether you would like to run a predefined test setup from the test library or run a test setup that have customized.

Use Table 4-1 to decide which procedure to perform next.

Table 4-1. Running a Test

If you would like to ...	Then go to the section ...
Use a predefined test setup table	"Running a Predefined Test"
Use a customized test setup table	"Running a Customized Test"

Running a Predefined Test

You can run a predefined test by selecting a test setup from the test library.

The LIBRARY MSI listing that is shown in your configuration display is where the program will be loading tests from.

CAUTION The original libraries are contained on the installation disk used to set up the HP 85869PC EMI measurement software. It is recommended that the libraries installed on the PC be treated as working masters. Generally, a new directory is created (using either File Manager in Windows 3.1 or Windows Explorer in Windows 95) for a new project or EUT. The desired test, transducer, limit line, gain/loss and report libraries are copied from the working master directories to this new directory using the Library Copy Utility. After the libraries are copied to the working directory, they can be modified under the Setup function for changes specific to the new project or EUT.

Use the following procedure to load and run a predefined test.

1. Press `TEST LIB` at the program top level. If an error occurs when trying to load a test library, refer to "If you have problems loading a library" in Appendix A.
2. Using the up and down arrow keys on the keyboard, align the arrow indicator to a desired test and press `LOAD`.

   After a test is loaded, the program returns to the top level.
3. At the program top level, press `MEASURE` to enter the measure portion of the program.

   When the measurement display appears, you can select to measure the whole frequency range or only a portion of the frequency range.
4. To measure only a portion of the frequency range, press the `RANGES` softkey.

5. Align the indicator, using the up and down arrow keys on the keyboard, to the range that you want to measure and press SELECT.

6. Press RETURN after the desired ranges are selected.

7. To start the measurement, press MEASURE a second time and follow the prompts on the computer's display.

   If you specified only a certain frequency range with the RANGES softkey, only that frequency range will be measured.

   When measurements are complete, press CONTINUE to display data analysis options. For further details, refer to "Data Analysis Options" in Chapter 7.

These steps include a selection of test from the test library, execution of the loaded test, and data collection during the measurements.

To see an example of how you could analyze the collected data, refer to "Example of Analyzing Measurement Data" later in this chapter or refer to "Data Analysis Options" in Chapter 7.

Running a Customized Test

You can run a customized test by selecting a test setup from the test library and modifying the test setup table parameters, or you can define a new test setup including your own parameters.

The LIBRARY MSI listing that is shown in your configuration display is where the program will be loading tests from.

Customizing a Test Setup Table

To help get you familiar with a test setup table, we are going to change some of the parameters in an existing test setup. We will load a test setup from one of our library directories, modify some of the parameters, and run the test.

CAUTION The original libraries are contained on the installation disk used to set up the HP 85869PC EMI measurement software. It is recommended that the libraries installed on the PC be treated as working masters. Generally, a new directory is created (using either File Manager in Windows 3.1 or Windows Explorer in Windows 95) for a new project or EUT. The desired test, transducer, limit line, gain/loss and report libraries are copied from the working master directories to this new directory using the Library Copy Utility. After the libraries are copied to the working directory, they can be modified under the Setup function for changes specific to the new project or EUT.

Use the following procedure to load a test.

1. Press TEST LIB at the program top level. If an error occurs when trying to load a test library, refer to "If you have problems loading a library" in Appendix A.

2. Using the up and down arrow keys on the keyboard, align the arrow indicator to a desired test and press LOAD.

   For this example, we will use one of the following tests (that is, library MSI /85869PC/comm_con).

Table 4-2. Which Test to Select

If your system is ...	Then select this test ...
with a preselector	1.1 FCC Part 15 Class A&B
without a preselector	2.1 FCC Part 15 Class A&B

After the test is loaded, the program returns to the top level.

3. To view and customize the newly loaded test setup table, press the `SETUP` softkey.

Use the following procedure to modify some of the parameters.

As examples of how to customize the parameters in a test setup table, we will change the Display Title, the SA Input, and a message prompt. A message prompt is controlled by the Msg, Sub, Cont parameter. Refer to Figure 4-6 when performing the following steps.

The Display Title parameter is used to enter a title on the display of your system's spectrum analyzer. The title can be up to 31 characters long and appears in the upper-right corner of the spectrum analyzer display.

Note If unfamiliar with the use of the editing functions of your computer, refer to your computer user's manual and HP BASIC for Windows User's Manual.

When editing a test setup table that contains parameters for both narrowband and broadband tests or peak and log average tests, use the (Tab) key on the computer keyboard to move the cursor between the two columns.

To change (edit) the Display Title parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor indicator (_) under the table entry next to the Display Title parameter and type `TUTORIAL SETUP`.

   Type the text in the selected line. The computer beeps when the line is filled.

2. Press `Enter` to accept the table entry.

   If you look at the spectrum analyzer display, you will see the new title that you typed.

To change (edit) SA Input parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor indicator (_) under the table entry next to the SA Input parameter.

2. Press the `Modify` softkey and press `RIGHT`.

3. Press `Enter` to accept the table entry.

   When you run the test, the right input of the spectrum analyzer will be used as the input.

To change a message prompt, use the Msg, Sub, Cont parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor indicator (_) under the table entry next to the Msg, Sub, Cont parameter and press the `Modify` softkey then `MESSAGE` (F1).
2. On Line #1, type `A TUTORIAL TEST SETUP TABLE WAS`, and then on Line #2 type `USED FOR THIS SETUP.`

   Type the text in the selected line. The computer beeps when the line is filled.

   When you run this test, these message lines will show as the prompt.

After modifying some of the Test Setup Table parameters, use the following procedure to run the customized test.

1. Press `RETURN` to return to the EMI Program Top Level screen.
2. At the program top level, press `MEASURE` to enter the measure portion of the program.

   When the measurement display appears, you can select to measure the whole frequency range or only a portion of the frequency range.
3. To measure only a portion of the frequency range, press the `RANGES` softkey.
4. Use the up and down arrow keys on the keyboard to the range that you want to measure and press `SELECT`.
5. Press `RETURN` after the desired ranges are selected.
6. To start the measurement, press `MEASURE` a second time and follow the prompts on the computer's display.

   If you specified only a certain frequency range with the `RANGES` softkey, only that frequency range will be measured.
7. When measurements are complete, press `CONTINUE` to display data analysis options. For further details, refer to "Data Analysis Options" in Chapter 7.

These steps include the selection of a test from the test library, modification of parameters, execution of the customized test setup, and collection of data during the test.

To see an example of how you could analyze the data that was collected from these measurements, refer to "Example of Analyzing Measurement Data" later in this chapter or refer to "Data Analysis Options" in Chapter 7.

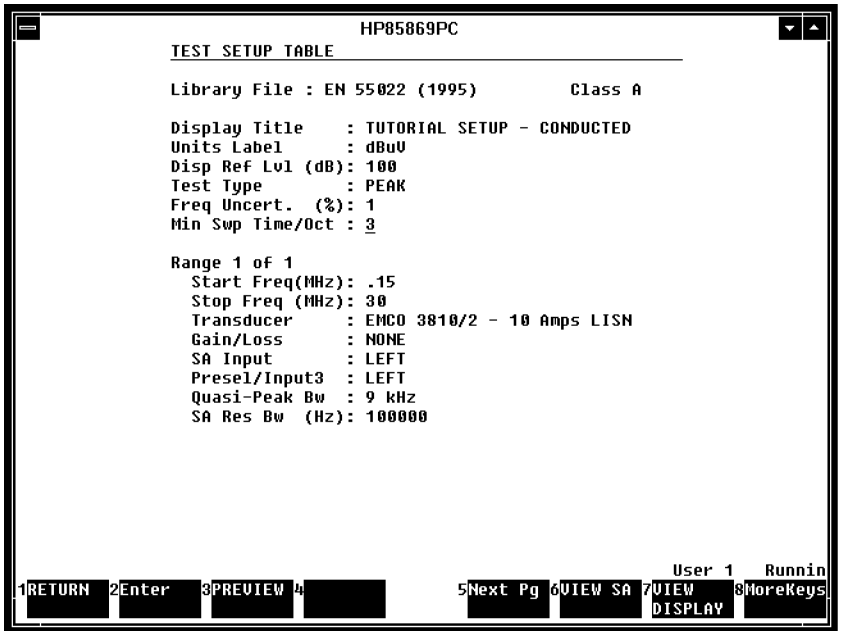

Figure 4-6. Customized Test Setup Table based on EN55022 Conducted, First Part

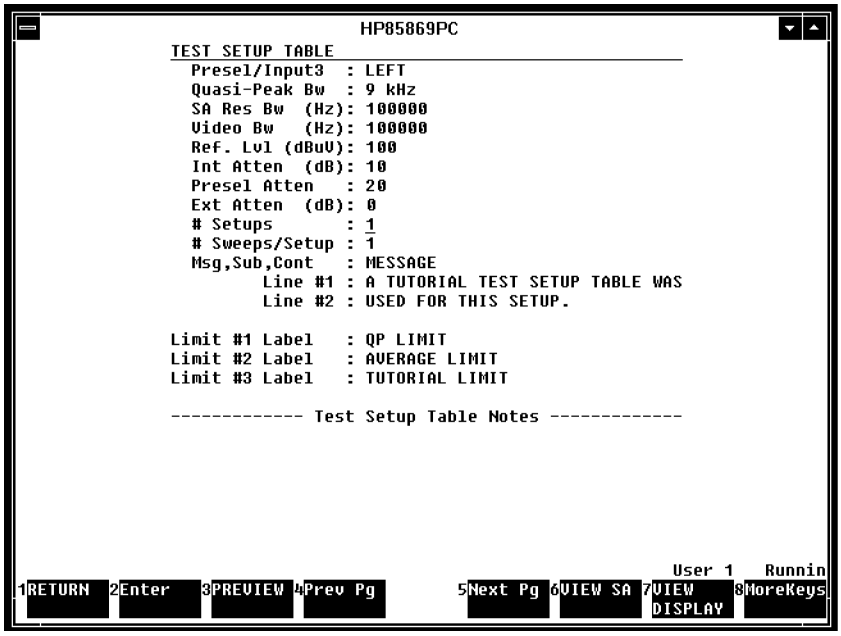

Figure 4-7. Customized Test Setup Table based on EN55022 Conducted, Second Part

Example of Analyzing Measurement Data

The HP 85869PC EMI measurement software offers a variety of ways to analyze the data that is created during a measurement.

As an example, the Zoom Local option, in the measure portion of the program, takes a closer look at signals of interest by narrowing the spectrum analyzer's frequency span and zooming in on a frequency range that is determined by the placement of two markers on the screen of the spectrum analyzer. In this way, the Zoom Local option can be used to pinpoint EMI sources in equipment under test (EUT). The user can then monitor EMI levels on a spectrum analyzer display while changing the test setup or modifying the EUT.

Use the following procedure to use the Zoom Local option which is accessed via `MEASURE` then `ANALYSIS`.

1. When measurements are complete and you have pressed `CONTINUE`, align the arrow, using the up and down arrow keys on the keyboard, to the Zoom Local option and press `SELECT`.
2. After reading the prompt on the computer screen, use the DATA knob on the spectrum analyzer to place a marker somewhere on the display and press `CONTINUE` on the computer keyboard.

   A marker is already enabled on the spectrum analyzer, so, all you need to do is move the marker to some point on the display with the spectrum analyzer's DATA knob.
3. After setting the first marker on the spectrum analyzer display, a second prompt on the computer screen signals you to set another marker. Again, use the spectrum analyzer's DATA knob to place a marker somewhere on the display, in the same frequency range, and press `CONTINUE` on the computer keyboard.

   The frequency span of the spectrum analyzer display is then zoomed in between the two points that the markers were set to. If a warning message appears when trying to set the markers, refer to "If markers are not set in the same range" in Appendix A.

   At this point, the spectrum analyzer is in local control and all spectrum analyzer functions are available to perform further analysis.

For further details, refer to "Zoom Local" in Chapter 7.

5

Setup

This chapter contains the following information:

- Test Setup Table Parameters
- Library File
- Display Title
- Units Label
- Display Reference Level (dB)
- Test Type
- Freq Uncertainty (%)
- Minimum Sweep Time/Octive or Minimum Measurement Time/MHz
  - Min Swp Time/Oct
  - Min Meas Time/MHz
  - Changing Min Swp Time/Oct to Min Meas Time/MHz
    - Changing Min Meas Time/MHz (MMM) for the Current Application Session
- Start Frequency (MHz)
- Stop Frequency (MHz)
- Transducer
- Gain/Loss
- Spectrum Analyzer Input
- Preselector/Input 3
- Quasi-Peak Bandwidth
- Spectrum Analyzer Resolution Bandwidth (Hz)
- Video Bandwidth (Hz)
- Reference Level (dBμV)
- Internal Attenuation (dB)
- Preselector Attenuation
- External Attenuation (dB)
- Number of Setups
- Number of Sweeps/Setup
- Messages, Subprograms, Continue
- Limit #1 Label
- Test Setup Table Notes
- Using Setup Softkeys
  - MoreKeys A
    Error Checking
  - MoreKeys B
- Transducer, Gain/Loss, and Limit Table Softkeys

The setup portion of the program can be used to create a new EMI test or modify one that is already predefined. An EMI test is defined by a set of parameters that are listed in a "test setup table". The "Test Library" in Chapter 6 describes a number of standard EMI tests templates that come with the HP 85869PC EMI measurement software. These tests can be used as they are or they can be customized and extended as necessary. If library templates are used as they are, measurement accuracy will not match your configuration.

Setup also contains the tables for transducer, gain/loss, and limit libraries. Transducer, gain/loss, limit tables are used to characterize transducers, preamplifier gain, cable loss, and test limits. Refer to Chapter 6 for information on accessing the test, data, transducer, gain/loss, limit, and report libraries.

When using the setup portion of the program:

- you can access and customize test setup table parameters
- you can access and customize transducer, gain/loss, and limit tables
- characterize transducers, preamplifier gain, cable loss, and limit lines
- store portions of a test setup table

Note When entering the Test Setup Table, notice that the cursor (_) defaults to the test setup parameter field "`Min Swp Time/Oct`". Use the up and down arrow keys to move the cursor to the desired test setup parameter for editing.

Test Setup Table Parameters

The test setup table, used to describe each individual EMI test, is divided into four areas (refer to Figure 5-1 for an example).

Initial Setup Area

The first area of the test setup table is called the "initial setup area". The initial setup area defines:

- units of measurement
- reference level
- type of testing (PEAK, NB/BB, BB AUTO, or PEAK LOG AVG)
- frequency uncertainty
- minimum sweep time per frequency octave

Range Area

The second area of the test setup table is called the "range area". The range area defines the:

- frequency ranges to test over
- spectrum analyzer to be used
- transducers to be used
- preselector to be used
- preamplifier gain and cable loss factors
- number of setups
- messages
- spectrum analyzer's and quasi-peak adapter's resolution bandwidth and video bandwidth
- spectrum analyzer's internal attenuation and reference level during the EMI test
- the preselector's attenuation

Limit Area

The third area of the test setup table is called the "limit area". The limit area is used to define the number and kind of test limits that will be used with the test setup. This area is also used to access and modify the limit tables.

Notes Area

The final area of the test setup table is called the "notes area". The notes area is used for measurement instructions or comments. In this area, you can type up to 48 lines of text.

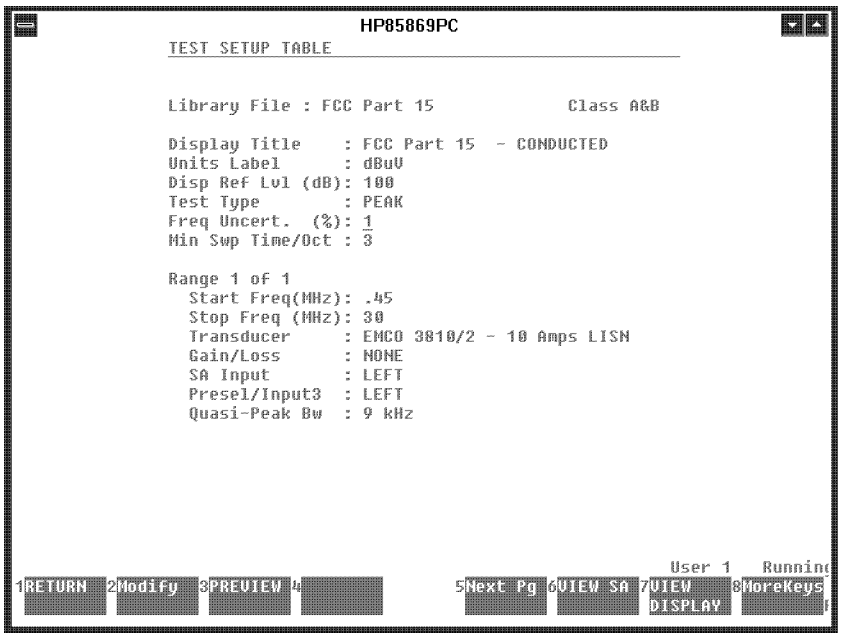

Figure 5-1. Test Setup Table Example, Initial Setup Area & Top of Range Area

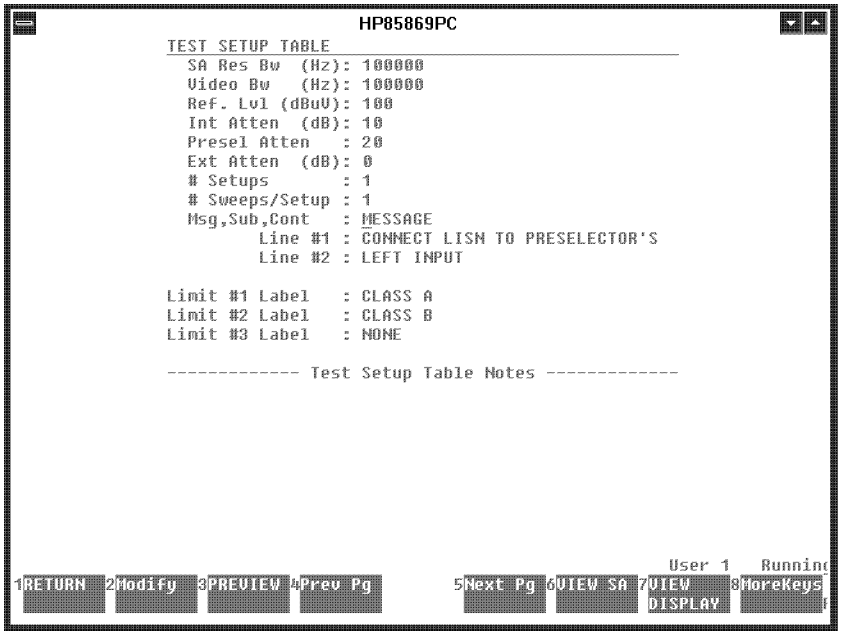

Figure 5-2.
Test Setup Table Example, Bottom Half of Range Area, Limit Line & Notes Area

Library File

Library File : filename

The Library File parameter specifies the name of the test library file currently loaded in the test setup table. If a test library file is not loaded from the test library or a change is made to the current test setup table, the displayed window will read "SETUP NOT STORED".

filename Specifies the name of the test library file that contains a test setup table. A list of predefined test setup tables is shown in "Test Library" in Chapter 6.

Example To change (load) a Library File parameter:

1. Press TEST LIB at the program top level. If an error occurs when trying to load a test library, refer to "If you have problems loading a library" in Appendix A.
2. Using the up and down arrow keys on the keyboard, align the arrow indicator to a desired test and press LOAD.
3. Press Setup to view the test setup table parameters for the test that you loaded.

See Also "Test Library" in Chapter 6

"Running a Predefined Test" in Chapter 4

Display Title

Display Title : title

The Display Title parameter is used to place a title on the system's spectrum analyzer display.

title The title can be up to 31 characters long and appears in the upper-right corner of the spectrum analyzer display.

Example To change (edit) the Display Title parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Display Title parameter and type the new title that you want displayed on your spectrum analyzer.
2. Press Enter to accept the table entry.

   If you look at the spectrum analyzer's display, you will see the new title that you entered.

See Also "Customizing a Test Setup Table" in Chapter 4

Units Label

Units Label : label

The Units Label parameter specifies the amplitude units used on the spectrum analyzer display when viewing measurement results.

label Specifies a label to be displayed on the spectrum analyzer that specifies the amplitude units. The label can be any ASCII characters. This is a display title only, it does not change any of the parameters in the test setup table. The correct transducer or conversion factors must be entered in the transducer table. You may display measurement results in any units, but they should be consistent with the type of transducer used, such as dBμV/m, when measuring electric field strength, or dBμA/m, when measuring magnetic field strength.

Example To change (edit) the Units Label parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Units Label parameter and type the new label that you want displayed on your spectrum analyzer.
2. Press `Enter` to accept the table entry.

Display Reference Level (dB)

Disp Ref Lvl (dB) : reference level

The Disp Ref Lvl (dB) parameter specifies the reference level for the measurement result presentation on the spectrum analyzer display.

reference level Specifies the reference level to be displayed on the spectrum analyzer display. The reference level is specified at the top graticule line of the spectrum analyzer display in the units previously defined under the Units Label parameter. Each horizontal graticule line is equal to 10 dB. To ensure that all signals are displayed properly, the display reference level should be set to a value greater than the largest signal present in the measurement range plus any applicable correction factors.

Example To change (edit) the Disp Ref Lvl (dB) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Disp Ref Lvl (dB) parameter and type the new reference level that you want displayed on your spectrum analyzer.
2. Press `Enter` to accept the table entry.

   At the top-left corner of the spectrum analyzer's screen, the new reference level is displayed.

Test Type

Test Type : type of test

The Test Type parameter specifies the type of EMI measurement to be performed.

type of test	**PEAK**	Specifying PEAK as the test type sets up the EMI system to perform a measurement once with peak detection. Use peak detection with narrowband units (dBμV/m, dBμA/m, and so on).
	NB/BB	Specifying NB/BB as the test type sets up the EMI system to perform a measurement twice with peak detection. It measures once for narrowband responses and another time for broadband responses.
	BB AUTO	Specifying BB AUTO as the test type sets up the EMI system to perform a measurement twice with peak detection. It measures once for narrowband responses and another time for broadband responses. The Freq Uncert. parameter does not apply to this broadband measurement.
	PEAK LOG AVG	Specifying PEAK LOG AVG as the test type sets up the EMI system to perform a measurement twice with peak detection. It measures once for peak responses and another time for log average responses. The peak parameters are in the left column and the log average parameters are in the right column.

Note When editing a test setup table that contains parameters for both narrowband and broadband tests or peak and log average tests, the Tab key on the computer keyboard is used to move the cursor between the two columns.

Example To change (edit) the Test Type parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Test Type parameter and press `Modify`.
2. Select one of the following softkeys.

`PEAK`	`NB/BB`	`BB AUTO`	`PEAK LOG AVG`

PEAK Pressing the `PEAK` softkey measures once with peak detection.

NB/BB Pressing the `NB/BB` softkey measures twice with peak detection. It measures once for narrowband responses and another time for broadband responses. The "Test Library" in Chapter 6 shows examples of parameters for narrowband/broadband tests. The narrowband parameters are in the left column while the broadband parameters are in the right column.

- It is important to remember that the amplitude of broadband measurement results are normalized to a 1 MHz bandwidth unless overridden in the function FNM_get_ref_bw. This means that regardless of the spectrum analyzer bandwidth setting, a correction factor is added to broadband measurement results so that a broadband response is always displayed at the same signal level on the spectrum analyzer screen.

- The HP 85869PC EMI measurement software contains a routine that determines the correction factors by measuring the spectrum analyzer impulse bandwidths. An impulse bandwidth and correction factor is computed for each of the spectrum analyzer resolution bandwidth settings. This routine is accessed in the utility portion of the program with the `BWi` softkey. For most accurate results, run the routine for your specific spectrum analyzer before making broadband measurements.
- A sample of correction factors produced by the impulse bandwidth and correction factor routine is shown in Figure 5-3.

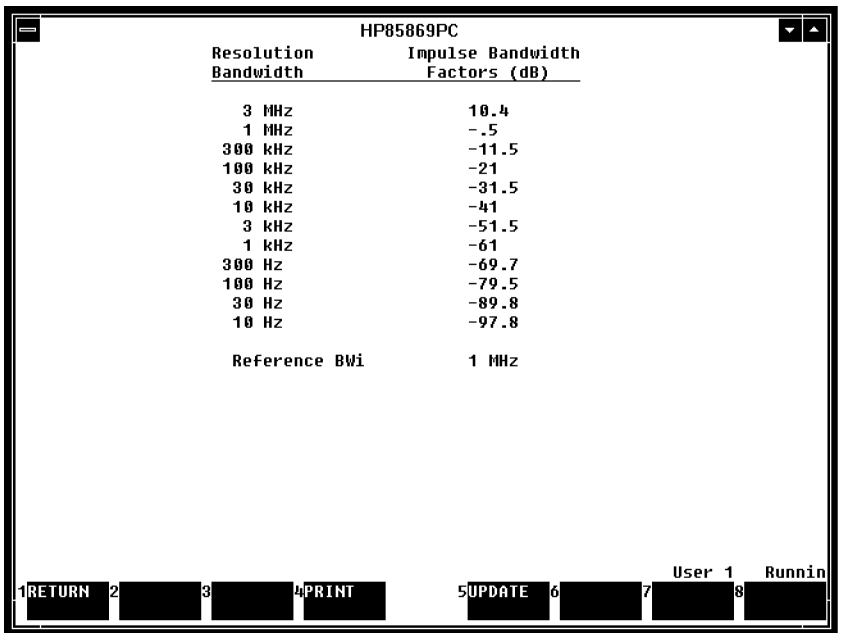

Figure 5-3. Sample Impulse Bandwidth Correction Factors

- Use `BWi` in the Utility section to produce a chart for your spectrum analyzer to ascertain the true signal level of a broadband response displayed on the spectrum analyzer screen.

  For example, if the spectrum analyzer bandwidth is set to 3 kHz, a correction factor, as shown in Figure 5-3, of $-51.5\ dB$ is subtracted from the signal level.

$$42\ dB\mu V - (-51.5\ dB) = 93.5\ dB\mu V/MHz$$

or

received signal level − correction factor = displayed signal level

Figure 5-4. Calculation of Displayed Signal Level

- The NB/BB program selection does not distinguish between narrowband and broadband signals, but adds the correction factors to all measured emissions when performing broadband measurements. As a result, the displayed signal level of narrowband signals (continuous wave) is too high. If measured emissions exceed either the narrowband or broadband test limits, determine which type of signal is present using the Zoom Local measurement option in Chapter 7 or selecting BB AUTO as the test type in the test setup table.

BB AUTO

Pressing the `BB AUTO` softkey measures twice with peak detection. It measures once for narrowband responses and another time for broadband responses. When measuring for broadband responses, the software identifies and removes narrowband signals that are contained in the spectrum analyzer's trace data. A signal is considered a narrowband signal if the trace closely matches the shape of the spectrum analyzer's resolution bandwidth filter; The Freq Uncert. parameter does not apply to this broadband measurement. Results are normalized to a 1 MHz bandwidth as discussed in the `NB/BB` softkey description.

It is recommended that the start frequency of the first range for NB/BB with auto discrimination (BB AUTO) be set to 9 kHz or higher. For proper operation of the auto discrimination algorithm, it is recommended that the minimum span of any band be 10 times greater than the resolution bandwidth.

PEAK LOG AVG

Pressing the `PEAK LOG AVG` softkey measures twice with peak detection. It measures once for peak responses and another time for log average responses. The "Test Library" in Chapter 6 shows examples of parameters for peak and log average tests. The peak parameters are in the left column and the log average parameters are in the right column.

See Also

"Limit "#1 Label"

"Limit Library" in Chapter 6

Frequency Uncertainty (%)

Freq Uncert. (%) : frequency uncertainty

The Freq Uncert. (%) parameter specifies the percentage of frequency uncertainty in the measurement results. Frequency uncertainty can be set between 0.1% and 2.0% or it can be set to coupled mode. There is a tradeoff involved in the selection of frequency uncertainty; higher frequency accuracy increases the measurement time. Measurement time is increased because the spectrum analyzer must take several overlapping sweeps to cover the frequency range in order to maintain the desired frequency accuracy. For the purpose of this program, a frequency range is defined as being a region of the frequency band under test in which the hardware used to make the test remains unchanged.

frequency uncertainty 0.1, 0.2, 0.5, 1, 2, COUPLED

COUPLED The COUPLED mode requires the spectrum analyzer to take just one sweep per range. This mode allows the fastest measurement possible, but with the least amount of frequency accuracy.

Example To change (edit) the Freq Uncert. (%):

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Freq Uncert. (%) parameter and select `Modify`.
2. Press one of the following softkeys:

`0.1` `0.2` `0.5` `1` `2` `COUPLED`

Note Lowering the frequency uncertainty increases the test time. A larger frequency uncertainty leads to greater overlap of the individual sweeps. A 2% uncertainty may lead to double reporting of signals.

Minimum Sweep Time/Octive or Minimum Measurement Time/MHz

To change Min Swp Time/Oct to Min Meas Time/MHz, refer to "Changing Min Swp Time/Oct to Min Meas Time/MHz".

Min Swp Time/Oct

Min Swp Time/Oct : system sweep time (units=seconds)

The minimum sweeptime per octive (Min Swp Time/Oct) parameter determines sweep time per frequency octave. This parameter is independent of the spectrum analyzer sweep time. The Min Swp Time/Oct parameter allows you to slow down the sweep rate of the measurement system. This is useful for measuring certain types of signals with varying duty cycles.

system sweep time The sweep rate of the measurement system is determined by the resolution bandwidth, start frequency, stop frequency, and the frequency uncertainty.

If the sweeptime selected is too fast, it will automatically be changed to the fastest allowable sweep time during the measurement process.

Example To change (edit) the Min Swp Time/Oct parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Min Swp Time/Oct parameter and type the new system sweep time.

   Type the text within the displayed window which outlines the allowable entry length. The computer beeps when the window is filled.

2. Press `Enter` to accept the table entry.

Changing Min Swp Time/Oct to Min Meas Time/MHz

The following steps outline the procedure for changing the User_sub code from Min Swp time/Oct to Min Meas Time/MHz.

1. To access the subprogram User_sub:
   a. Return to the EMI Program Top Level of the HP 85869PC EMI measurement software.
   b. Press the (Pause) key to pause the program.
   c. Type `EDIT` (leave a space) then type `CHG_SWP` and press (Return) to access the Swp_oct0_mhz1=0 section of the the User_sub subprogram.
   d. Scroll to the `Swp_oct0_mhz1=0` program line.
   e. Change `Swp_oct0_mhz1=0` to `Swp_oct0_mhz1=1` to change Min Swp Time/Oct to Min Meas Time/MHz, then press the Enter key on the keyboard.
   f. To run the program, press RUN. To permanently save the modified User_sub program, continue to step 2.

CAUTION Using the STORE command in step 2 will permanently change the file EMI_BW to include changes made in User_sub. If you do not want to make the changes permanent, do not use STORE to save the program.

2. To permanently save the modified User_sub program:

   a. Type "RENAME "EMI_BW" TO "EMI_BW.BAK".

   b. Type STORE "EMI_BW".

   This will secure the original EMI_BW file.

The modified program is now permanently saved and will be loaded each time the HP 85869PC EMI measurement software is loaded. It may be changed at any time using this procedure.

Min Meas Time/MHz

The Minimum Measurement Time per Megahertz (Min Meas Time/MHz) parameter determines the sweep time per span normalized to MHz. This parameter is independent of the spectrum analyzer sweep time. The Min Meas Time/MHz parameter allows you to slow down the sweep rate of the measurement system. This is useful for measuring certain types of signals with varying duty cycles and for complying to the regulations that require this function.

system sweep time The sweep rate of the measurement system is determined by the resolution bandwidth, start frequency, stop frequency, and the frequency uncertainty.

If the sweeptime selected is too fast, it will automatically be changed to the fastest allowable sweep time during the measurement process.

Example To change (edit) the Min Meas Time/MHz parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Min Meas Time/MHz parameter and type the new system sweep time.
2. Press Enter to accept the table entry.

Changing Min Meas Time/MHz for the Current Application Session

---

CAUTION Changing MMM (Min Meas Time/MHz) in the message section of the test setup table makes the change permanent until the PAUSE and RUN keys are pressed from the application's main menu.

To change MMM (Min Meas Time/MHz) in the message section of the test setup table, enter MMM plus a number. The program will change Min Swp Time/Oct to Min Meas Time/MHz and use that number as the value for Min Meas Time/MHz. This allows separate minimum measurement times for different frequency ranges.

Start Frequency (MHz)

Start Freq (MHz) : start frequency

The Start Freq (MHz) parameter marks the start frequency of a measurement range. Since the ranges are contiguous, each range begins where the previous range ends.

Note

- When measuring very narrow frequency ranges, signal responses close to the start or stop frequency, but outside the specified measurement range, may be displayed at the edge of the spectrum analyzer graticule. Refer to "Display Format for Narrow-Span Measurements" in Appendix B.
- If your start frequency, plus frequency uncertainty, is less than 2 GHz and you are using input 3, there will be no preselection available in the receiver system from 2 to 2.5 GHz. If your start frequency minus the frequency uncertainty is 2 GHz or greater, then preselection in the frequency range from 2 to 2.5 GHz is used.
- If your start frequency, plus frequency uncertainty, is less than 2 GHz and you are using input 3, you will be unpreselected from 2 to 2.5 GHz. If your start frequency, minus the frequency uncertainty, is 2 GHz or greater than you will be preselected from 2 to 2.5 GHz.

start frequency

The Start Freq (MHz) parameter marks the start frequency of a measurement range.

Example

To change (edit) the Start Freq (MHz) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Start Freq (MHz) parameter and type the new start frequency.
2. Press `Enter` to accept the table entry.

   At the bottom-left corner of the spectrum analyzer screen, the new start frequency is displayed.

Stop Frequency (MHz)

Stop Freq (MHz) : stop frequency

The Stop Freq (MHz) parameter marks the stop frequency of a measurement range. Since the ranges are contiguous, each range begins where the previous range ends.

stop frequency The Stop Freq (MHz) parameter marks the stop frequency of a measurement range.

Example To change (edit) Stop Freq (MHz) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Stop Freq (MHz) parameter and type the new stop frequency.
2. Press `Enter` to accept the table entry.

   At the bottom-right corner of the spectrum analyzer screen, the new stop frequency is displayed.

Transducer

Transducer : transducer file

The Transducer parameter allows you to enter a transducer file into the test setup table.

transducer file Transducer files describe the transducer characteristics for particular antennas, current probes, or LISNs. Transducer files are grouped in transducer libraries. Sample transducer libraries are supplied with each test library.

For detailed information on loading a transducer library refer to “Transducer Library” in Chapter 6.

Gain/Loss

Gain/Loss : gain/cable loss file

The Gain/Loss parameter allows you to enter the gain of a preamplifier, cable loss, or a combination of both. The program corrects measurement results mathematically by the amount of gain and cable loss entered in the gain/loss table.

gain file A preamplifier would be used at the input of a spectrum analyzer to improve measurement sensitivity.

cable loss file Cable loss would be used to correct for attenuation of the cables used in the measurement.

For detailed information on loading and using a gain/loss file, refer to "Gain/Loss Library" in Chapter 6.

Spectrum Analyzer Input

SA Input : input port

The SA Input parameter applies only to the HP 8568B spectrum analyzer which has two input ports. An SA Input parameter must be specified as the left or right input port for each range in the test setup table.

input port

LEFT Use the left port for input signals less than 100 kHz.

RIGHT Use the right port which has better sensitivity, flatness, and SWR for input signals greater than or equal to 100 kHz. If you are using an HP 8566B or HP 8567A spectrum analyzer, this parameter is ignored because the HP 8566B only has one input.

Example To change (edit) the SA Input:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the SA Input parameter and select `Modify`.
2. Press one of the following softkeys:

`LEFT` `RIGHT`

Preselector/Input 3

Presel/Input3 : input port

The Presel/Input 3 parameters—left, right, and bypass—apply only to the HP 85685A RF preselector which has two input ports. Input 3 parameter applies only to the HP 8449B Option H02 preamplifier input port.

input port

LEFT Use the left port for input signals less than 50 MHz.

RIGHT Use the right port for input signals between 20 MHz—2 GHz.

BYPASS The bypass function activates an alternate signal path that bypasses the preselector and routes the signal directly into the spectrum analyzer. It also deactivates the preselector tracking capability and releases preselector control of the spectrum analyzer sweep. Bypass allows you to input signals into the spectrum analyzer, through the preselector, without having to manually make or break connections. Only signals connected to input 2 (right port) can bypass the preselector. To activate the function, press the ENABLE key, then the BYPASS key. The LED in the bypass key and the LED above input 2 (right port) light up, indicating the function is active. To deactivate bypass, press the NORMAL key or an input select key. This returns the preselector to normal operation.

INPUT 3 This input is only valid for the HP 8571A/8572A EMI receiver systems.

The HP 8449B's 1-22 GHz input (receiver input 3) routes the incoming signal to a low-noise microwave preamplifier to improve sensitivity. When using Input 3, it is necessary to ensure that receiver correction data has been loaded.

Example To change (edit) the Presel Input parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Presel Input parameter and select `Modify`.
2. Press one of the following softkeys:

LEFT	BYPASS INPUT3	RIGHT	INPUT3

Note If you are using the HP 8568B spectrum analyzer to measure signals less than 100 kHz, select the `LEFT` softkey and connect the HP 85685A RF preselector output to the left input port on the spectrum analyzer.

Quasi-Peak Bandwidth (Hz)

Quasi-Peak Bw : bandwidth

The Quasi-Peak Bw parameter specifies the quasi-peak adapter bandwidth. When an HP 85650A quasi-peak adapter is in the system, measurements can be made with the three 6 dB resolution bandwidths specified by *CISPR Publication 16 Part 1*: 200 Hz, 9 kHz, and 120 kHz. To obtain these bandwidths, the spectrum analyzer bandwidths must be set accordingly. Refer to Table 5-1 for spectrum analyzer bandwidth settings.

bandwidth

200 Hz This selects 200 Hz quasi-peak adapter bandwidth. This is used in 10—150 kHz frequency range which corresponds to CISPR Band A. The SA Res Bw and Video Bw parameter are both automatically set to 3 kHz.

9 kHz This selects 9 kHz quasi-peak adapter bandwidth, usually used in 150 kHz—30 MHz frequency range which corresponds to CISPR Band B. The SA Res Bw and Video Bw parameter are both automatically set to 100 kHz.

120 kHz This selects 120 kHz quasi-peak adapter bandwidth, usually used in 30 MHz—1 GHz frequency range for EMI testing. The SA Res Bw and Video Bw parameter are both automatically set to 1 MHz.

BYPASS Bypasses the HP 85650 quasi-peak adapter. If you desire peak detection without CISPR bandwidths or do not have a quasi-peak adapter in the spectrum analyzer system, select `BYPASS`.

Example To change (edit) the Quasi-Peak Bw:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Quasi-Peak Bw parameter and select `Modify`.
2. Press one of the following softkeys:

`200 Hz` `9 kHz` `120 kHz` `BYPASS`

If the quasi-peak adapter bandwidth is specified before the resolution or video bandwidths are specified, the program automatically sets the resolution and video bandwidths of the spectrum analyzer to the bandwidths shown in Table 5-1. These bandwidths are also listed on the front panel of the HP 85650A quasi-peak adapter.

Table 5-1. Spectrum Analyzer Bandwidths

Desired	Required	Required
CISPR 6 dB BW (Quasi-Peak BW)	Spectrum Analyzer Resolution BW	Spectrum Analyzer Video BW
200 Hz	3 kHz	3 kHz
9 kHz	100 kHz	100 kHz
120 kHz	1 MHz	1 MHz

Spectrum Analyzer Resolution Bandwidth (Hz)

SA Res Bw (Hz) : resolution bandwidth

The SA Res Bw (Hz) parameter specifies the spectrum analyzer's resolution bandwidth in the final IF stage.

resolution bandwidth

The resolution bandwidth of the spectrum analyzer depends on the spectrum analyzer being used in your system. The resolution bandwidths are as follows:

HP 8566B	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 1 MHz, 3 MHz
HP 8567A	1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 1 MHz, 3 MHz
HP 8568B	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 1 MHz, 3 MHz

Example

To change (edit) the SA Res Bw (Hz) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the SA Res Bw (Hz) parameter and type the new resolution bandwidth you want to set the spectrum analyzer to.
2. Press `Enter` to accept the table entry.

If using a quasi-peak adapter, then refer to Table 5-1 for the correct settings. If no quasi-peak measurements are to be made, then the SA Res Bw (Hz) parameter can be manually altered.

See Also

Quasi-Peak Bandwidth

Video Bandwidth (Hz)

Video Bw (Hz) : video bandwidth

The Video Bw (Hz) parameter specifies the spectrum analyzer post-detection, video filter bandwidth which averages the detected signals before they are displayed.

video bandwidth

The video bandwidth of the spectrum analyzer depends on the spectrum analyzer being used in your system. The video bandwidths are as follows:

HP 8566B	1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 1 MHz, 3 MHz
HP 8567A	1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 1 MHz, 3 MHz
HP 8568B	1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz, 30 kHz, 100 kHz, 1 MHz, 3 MHz

Example

To change (edit) the Video Bw (Hz) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to Video Bw (Hz) and type the new video bandwidth you want to set the spectrum analyzer to.
2. Press `Enter` to accept the table entry.

Initially, most EMI measurements are made with peak detection. The video bandwidth is usually set much wider than the resolution bandwidth (preferably ten times as wide). This prevents averaging of broadband signals. On the other hand, if average detection is desired, the video filter should be reduced to a value less than the pulse repetition frequency (PRF) of the signal being observed. A video filter of 1 Hz gives maximum averaging.

See Also

Quasi-Peak Bandwidth

Reference Level (dBμV)

Ref. Lvl (dBuV) : reference level

The Ref. Lvl (dBuV) parameter specifies, in dBμV, the absolute amplitude of the spectrum analyzer top graticule line to be used during the measurement.

reference level Specifies the reference level to be displayed on the spectrum analyzer display. The reference level is specified at the top graticule line of the spectrum analyzer display in the units previously defined under the Units Label parameter. Each horizontal graticule line is equal to 10 dB. To ensure that all signals are displayed properly, the display reference level should be set to a value greater than the largest signal present in the measurement range plus any applicable correction factors.

Example To change (edit) the Ref. Lvl (dBuV) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Ref. Lvl (dBuV) parameter and type the new reference level.
2. Press `Enter` to accept the table entry.

See Also "Units Label"

"Display Reference Level (dB)"

Internal Attenuation (dB)

Int Atten (dB) : internal attenuation

The Int Atten (dB) parameter specifies the spectrum analyzer's internal attenuation which reduces the input signal level at the first mixer.

internal attenuation The internal attenuation is in 10 dB steps and can range from 0 dB to 50 dB.

Whenever the internal attenuation is changed, the spectrum analyzer readjusts its display accordingly so that correct signal value is always displayed.

Example To change (edit) the Int Atten (dB) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Int Atten (dB) parameter and type the new input attenuation.
2. Press `Enter` to accept the table entry.

Preselector Attenuation

Presel Atten : preselector attenuation

The Presel Atten parameter specifies the internal preselector attenuation. Whenever the internal attenuation of the preselector is changed, the spectrum analyzer readjusts its display so that the correct signal level is always displayed.

preselector attenuation The preselector attenuation can be set to 0, 3, 10, 13, 20, 23, 30, 33, 40, 43, 50, or 53 dB.

Example To change (edit) the Presel Atten parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Presel Atten parameter and type the new preselector attenuation.
2. Press `Enter` to accept the table entry.

External Attenuation (dB)

Ext Atten (dB) : external attenuation

The Ext Atten parameter specifies RF attenuation in front of the receiver system. As long as the spectrum analyzer is under program control, it readjusts the display as external attenuation varies, so correct signal value is always displayed. However, when the instrument is under local control, it simply displays the signal level as seen at the input which can be attenuated.

external attenuation The external attenuation specifies the RF attenuation outside the spectrum analyzer and RF preselector.

If the HP 11713A attenuator/switch driver is used, its attenuation is set automatically by the program.

Example To change (edit) the Ext Atten (dB) parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Ext Atten (dB) parameter and type the new external attenuation.
2. Press `Enter` to accept the table entry.

Number of Setups

Setups : number of setups

The # Setups parameter specifies the number of times the test range is repeated using different setups such as different antenna heights or instrument positions.

number of setups There can be from 1 to 999 test range setups.

Example To change (edit) the # Setups parameter:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the # Setups parameter and type the new number of setups. (Type any number between 1 and 999.)
2. Press `Enter` to accept the table entry.

See Also Appendix B presents a general discussion of the Measure_sub subroutine which uses setup numbers.

Number of Sweeps/Setup

Sweeps/Setup : sweeps per setup

The # Sweeps/Setup parameter repeats each sweep for any given setup the number of times requested and takes the maximum data.

sweeps per setup The number of sweeps per setup can be from 1 to 100.

Example To change (edit) the # Sweeps/Setup parameter:

1. Using the up and down arrow keys on the computer keyboard, position the cursor under the table entry next to the # Sweeps/Setup parameter and type the number of sweeps per setup. (Type any number between 1 and 100.)
2. Press `Enter` to accept the table entry.

Messages, Subprograms, Continue

Msg, Sub, Cont : [Message, Subprogram, Continue]

The Msg, Sub, Cont parameters allow you to display messages, perform functions using your own subprogram, or continue without a message or subprogram.

MESSAGE Specifying the MESSAGE function displays a message on your computer screen before the program measures a range. You can use the MESSAGE function to display two lines of instructions with up to 31 characters in each line.

Example To change (edit) the MESSAGE:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Msg, Sub, Cont parameter and select `Modify`.
2. Press the `MESSAGE` softkey.
3. On the first line, type the first line of your message and press `Enter` to accept the table entry.
4. Then, on the second line, type the second line of your message or press the `Enter` softkey to leave it blank.

SUBPROG Specifying SUBPROG loads and runs a subprogram that you have written.

Example To load (specify) a SUBPROG:

1. Using the up and down arrow keys on the keyboard, position the window over the table entry next to the Msg, Sub, Cont parameter and select `Modify`.
2. Press the `SUBPROG` softkey.
3. Enter a subprogram name and press the `Enter` softkey.

Use of this function requires a knowledge of HP BASIC for Windows and an understanding of your PC's operation and knowledge of programming the AT-GPIB card. Refer to "Measuring With Your Own Subprograms" in Appendix B for detailed information on how to write, store, and use your own subprograms.

CONTINUE You would specify the CONTINUE parameter when you don't want to display any messages or run any subprograms in the test setup table.

Example To specify CONTINUE:

1. Using the up and down arrow keys on the keyboard, position the cursor under the table entry next to the Msg, Sub, Cont parameter and select `Modify`.
2. Press the `CONTINUE` softkey.

See Also "Customizing a Test Setup Table" in Chapter 4.

Appendix B presents a general discussion of the Measure_sub subroutine which uses setup numbers.

For MIL-STD 461D only.

CAUTION Changing MMM in the message section of the test setup table makes the change permanent until `PAUSE` and `RUN` are pressed from the application's main menu.

To change MMM in the message section of the test setup table, enter MMM (Min Meas Time/MHz) plus a number. The program will change Min Swp Time/Oct to Min Meas Time/MHz and use that number as the value for Min Meas Time/MHz. This allows separate minimum measurement times for different frequency ranges.

Limit #1 Label

Limit #1 Label : limit line

The Limit #1 Label parameter allows you to enter a limit line file into the test setup table. Limit #2 Label and Limit #3 Label parameters are used in the same manner as the Limit #1 Label parameter. The limit line files are located in the limit library. The limit library is a portion of the program that contains a selection of predefined files, specifically selected, for the six different classes of EMI tests that this software can perform. The limit library is used to set up test limits. The test limits are controlled by limit parameters that are loaded into the test setup table.

There is one predefined limit library supplied with each test library.

limit line The limit line that is used in a test setup table also depends on the Test Type parameter that is specified in the initial setup area.

- **PEAK** If PEAK is the test type specified, up to three limit lines can be defined.
- **NB/BB** If NB/BB is selected as the test type, up to six limit lines can be defined; three for narrowband and three for broadband responses.
- **BB AUTO** If BB AUTO is selected as the test type, up to six limit lines can be defined; three for narrowband and three for broadband responses.
- **PK LGAVG** If PK LGAVG is selected as the test type, up to six limit lines can be defined; three for peak and three for log average responses.

See Also For detailed information on loading and using a limit library file, refer to "Limit Library" in Chapter 6.

Test Setup Table Notes

Test Setup Table Notes : notes

The area under Test Setup Table Notes is the final area of the test setup table. It is used for measurement instructions or comments.

notes You may leave this area blank if you want to. It does not perform any function in the test setup table other than allowing the user to enter notes in the table for the next time that the test setup table is used. In this area, you can type up to 48 lines of text.

Example To change (edit) the Test Setup Table Notes area:

1. Using the up and down arrow keys on the keyboard, position the cursor at the first line following the Test Setup Table Notes title and type your message.
2. Type the text pressing `Enter` after each line.

Using Setup Softkeys

Enter the setup portion of the program by pressing the SETUP softkey at the program top level.

Top Level Softkeys[1]

TEST LIB	DATA LIB	SETUP	MEASURE	PLOT	VIEW SA	INST ADDRESS	UTILITY	VIEW* BB	VIEW* NB	VIEW* SA

1 Keys labeled with asterisks are not always present.

Pressing the SETUP softkey at the program top level brings up a set of first level softkeys. These softkeys manipulate the test setup table contents.

First Level Softkeys[1]

RETURN	Enter	Modify*									MoreKeys
			Next Pg*	Prev Pg*	Next Rng*	Prev Rng*	VIEW NB*	VIEW BB*	VIEW SA*		
			Get Trns*	Get Lmt*	No Trns*	No Limit*	VIEW DISPLAY	PREVIEW	Get G/L*	No G/L*	

1 Keys labeled with asterisks are not always present.

The softkeys marked with an asterisk appear and disappear depending on the cursor position on the test setup table. Vary the cursor position using the up and down arrow keys on the computer keyboard.

RETURN returns to the program top level after performing an automatic error check.

Enter is used to enter user-defined table entries.

Modify is used to change table entries where only specific entries are allowed. The allowable entries appear in a softkey menu.

Next Pg (next page) moves the cursor forward a page.

Prev Pg (previous page) moves the cursor backwards a page.

Next Rng (next range) appears when there is at least one range that follows. If, for example, the cursor is positioned at the Presel Input parameter when the Next Rng key is pressed, the cursor jumps to the Presel Input parameter of the following range. This allows you to quickly change a specific parameter in every range area without using the up and down arrow keys on the computer keyboard.

Prev Rng (previous range) appears when there is at least one preceding range. If, for example, the cursor is positioned at the Presel Input parameter when the Prev Rng key is pressed, the cursor jumps to the Presel Input parameter of the preceding range. This allows you to quickly change a specific parameter in every range area without using the up and down arrow keys on the computer keyboard.

VIEW BB and VIEW NB bring either the broadband or narrowband test results to the spectrum analyzer display for inspection.

These softkeys are available only when the test type, in the test setup table, is NB/BB or BB AUTO. Otherwise, this softkey does not appear.

`VIEW SA` offers you options on changing the traces that are visible on the spectrum analyzer's display.

This softkey is available only when the test type, in the test setup table, is Peak or Peak/Log Average. Otherwise, this softkey does not appear.

`Get Trns` retrieves the transducer tables.

`Get G/L` retrieves the gain/loss tables.

`Get Lmt` retrieves the limit tables.

`No Trns` is used to scratch the transducer shown within the displayed window.

`No G/L` is used to scratch the gain/loss shown within the displayed window.

`No Limit` is used to scratch the limit shown within the displayed window.

`VIEW DISPLAY` reproduces the spectrum analyzer display on the computer display. If the measurement results have been loaded from the data library, the spectrum analyzer display along with measurement results are reproduced even if the spectrum analyzer is not connected to the system.

`PREVIEW` checks for errors in the test setup table and invokes the Preview function if no errors exist. Refer to Chapter 7 for a description of the Preview function.

`MoreKeys` accesses the setup softkey set.

MoreKeys A

Pressing the `MoreKeys` softkey at the first level softkeys brings up a set of additional softkeys. The new menu would show the following softkeys.

RETURN	Enter	Print	Scratch	ErrCheck	Summary

Move* Lbl	MoreKeys	Modify*	Get* Trns	Get* G/L	Get* Lmt [1]

1 Keys labeled with asterisks are not always present.

The new softkeys that are available when the `MoreKeys` softkey is pressed are as follows.

`RETURN` returns to the program top level after performing an automatic error check.

`Enter` is used to enter a user-definable table entry.

`Print` prints the test setup table on the selected system printer.

`Scratch` Pressing the `Scratch` softkey clears most of the test setup table leaving some default values. Use `Modify`, `Get Trns`, `Get G/L`, `Get Lmt`, and `Enter` to fill in the table.

`ErrCheck` checks for any errors in the test setup table. If no errors exist, the following message appears at the bottom of the computer screen:

```
There are no errors in Setup Table.
```

If errors do exist, proceed to “Error Checking”.

`Summary` presents a table on the screen that lists the start frequency, stop frequency, and transducer of the existing ranges (refer to Figure 5-5).

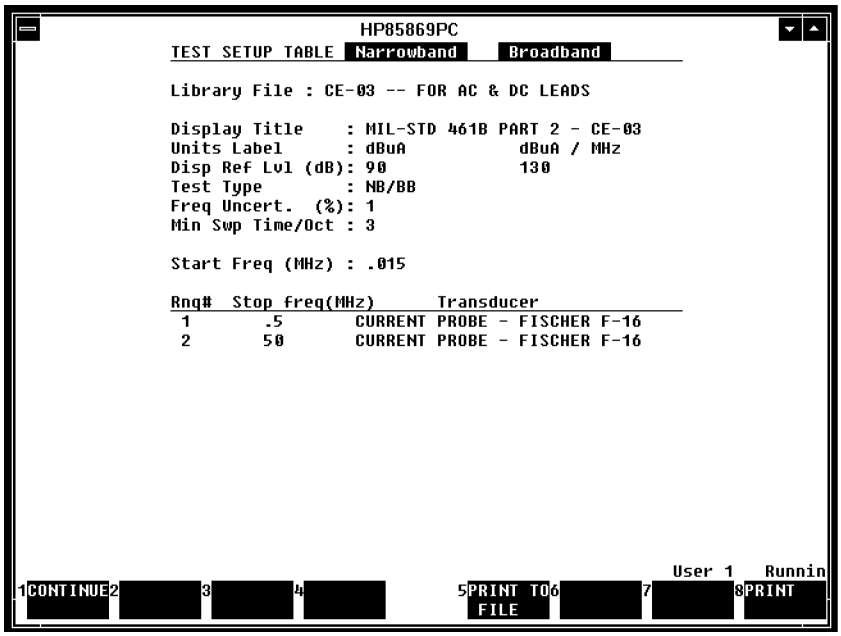

Figure 5-5. Example Summary Table

`Move Lbl` is used to move the limit label associated with the limit line on the spectrum analyzer display.

`MoreKeys` accesses the previous or next set of softkeys available.

`Modify` is used to change table entries where only specific entries are allowed. The allowable entries appear in a softkey menu.

`Get Trns` retrieves the transducer tables.

`Get G/L` retrieves the gain/loss tables.

`Get Lmt` retrieves the limit tables.

Error Checking

After entering the test setup table, you must use the `RETURN` softkey to exit the setup portion of the program. When the `RETURN` softkey is pressed, the program performs an automatic error check on the test setup table.

- If no errors exist or if nothing has been changed in the test setup table, the program returns to the program top level.
- If errors exist in the test setup table, the program displays a message, as shown in Figure 5-6, on the computer screen:

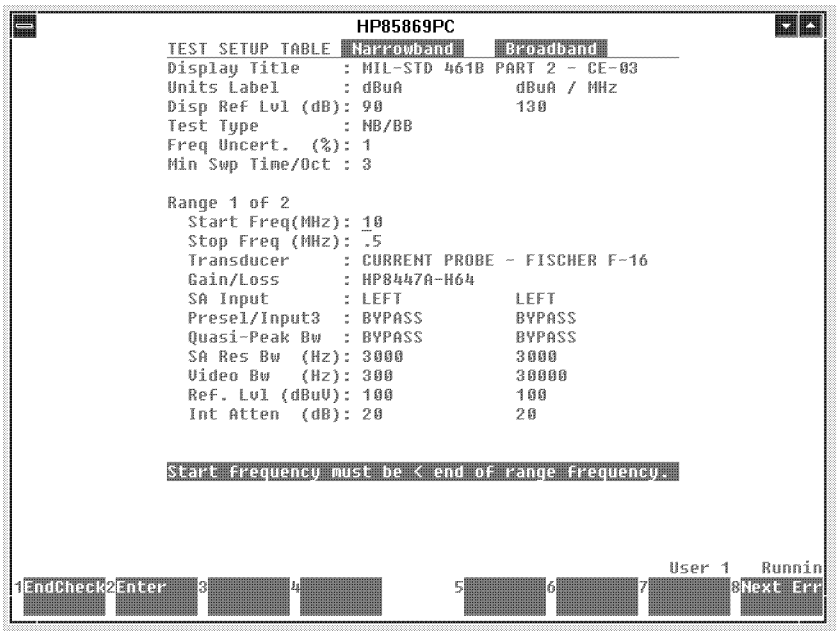

Figure 5-6. Errors Occurred Prompt

`EndCheck` restores the previous key set.

`Enter` is used to enter a user-definable table entry.

`Next Err` positions the cursor under the next error in the test setup table.

Example To eliminate errors in the test setup table:

1. Press the `Fix Err` softkey.

   When you press the `ErrCheck` key and errors exist, the cursor positions itself at the first error. A message appears at the bottom of the computer screen indicating the value that must be entered for that specific parameter.

2. Enter the correct value, then press `Enter`.

   The cursor is automatically positioned at the next error if another error exists.

3. Press `Next Err` to position the cursor at the next error.

4. When all errors are corrected, a message as shown in Figure 5-7 appears at the bottom of the computer screen.

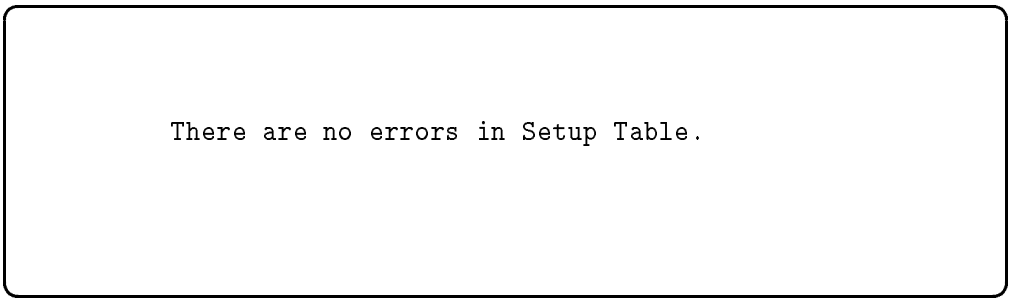

Figure 5-7. No Errors in the Test Setup Table

MoreKeys B

Pressing the MoreKeys softkey at the first level softkeys brings up a set of additional softkeys. The new menu would show the following softkeys.

RETURN	Add Rng	Ins Rng	Del Rng	MoreKeys	Get* Trns	Get* G/L

Get* Lmt	Modify*	Next Pg	Prev Pg	Next* Rng	Prev* Rng [1]

1 Keys labeled with asterisks are not always present.

The new softkeys that are available when the MoreKeys softkey is pressed allow you to add, delete, and insert ranges.

RETURN — returns to the program top level after performing an automatic error check.

Add Rng — (add range) allows you to add an additional range. It appears while in a range area when less than twenty ranges exist. The new range is added after the existing ranges.

Ins Rng — (insert range) inserts a new range before the current range. It appears while in a range area when less than twenty ranges exist. If pressed, for example, while in the range 1 area, the previous range 1 start frequency becomes the stop frequency of the inserted range 1 and a new start frequency must be entered. If pressed while in a range greater than range 1, a stop frequency must be specified for the inserted range. All range numbers following the inserted range are incremented by one.

Del Rng — (delete range) allows you to delete a range. It appears while in a range area. If two ranges exist, for example, and range 1 is deleted, then range 2 is moved up to the range 1 area. The range number is automatically changed from 2 to 1 and the stop frequency of the deleted range becomes the start frequency. If range 1 is deleted and only one range exists, then default values are inserted. The message, as shown in Figure 5-8 appears on the computer screen before a range is deleted to allow the opportunity to discontinue the deletion process.

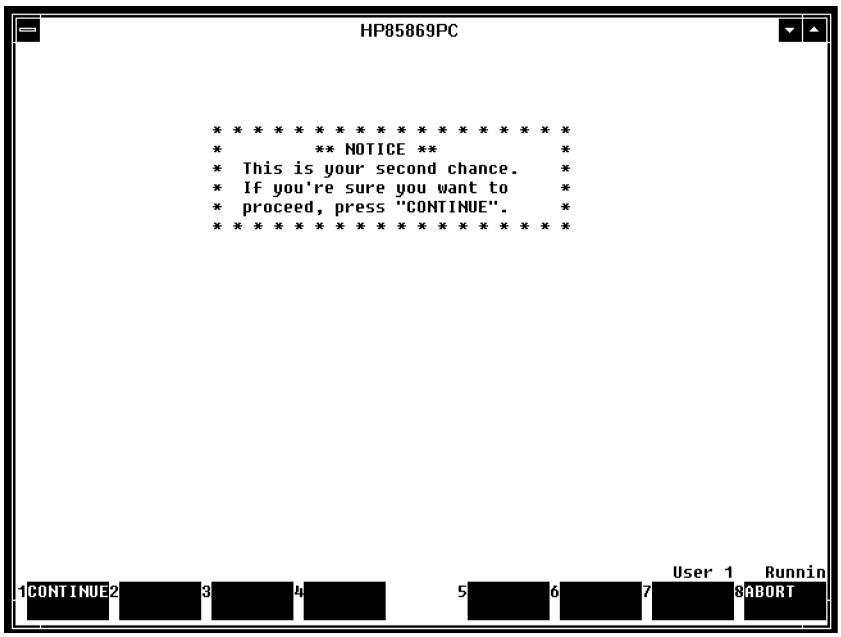

Figure 5-8. Second Chance Before Deleting a Range

`MoreKeys` accesses the previous or next set of softkeys available.

`Get Trns` retrieves the transducer tables.

`Get G/L` retrieves the gain/loss tables.

`Get Lmt` retrieves the limit tables.

`Modify` is used to change table entries where only specific entries are allowed. The allowable entries appear in a softkey menu.

`Next Pg` (next page) moves the cursor forward a page.

`Prev Pg` (previous page) moves the cursor backwards a page.

`Next Rng` (next range) appears when there is at least one range that follows. If, for example, the cursor is positioned at the Presel Input parameter when the `Next Rng` key is pressed, the cursor jumps to the Presel Input parameter of the following range. This allows you to quickly change a specific parameter in every range area without using the up and down arrow keys on the computer keyboard.

`Prev Rng` (previous range) appears when there is at least one preceding range. If, for example, the cursor is positioned at the Presel Input parameter when the `Prev Rng` key is pressed, the cursor jumps to the Presel Input parameter of the preceding range. This allows you to quickly change a specific parameter in every range area without using the up and down arrow keys on the keyboard.

Transducer, Gain/Loss, and Limit Table Softkeys

Second Level Softkeys[1]

RETURN	Enter	Library	Activate*	Modify*	Print	Scratch

1 Keys labeled with asterisks are not always present.

`RETURN` returns the program to the test setup table.

The frequencies listed in a transducer, gain/loss, or limit table are automatically sorted in ascending order when the `RETURN` softkey is pressed.

`Enter` Allows you to enter values into the limit, transducer, or gain/loss table.

`Library` Pressing this softkey brings up the library softkey functions. Refer to "Library Softkeys" in Chapter 6 for information on using library softkeys.

`Activate` Is used to activate a limit, transducer, or gain/loss table that was loaded for viewing from the limit, transducer, or gain/loss library. Once you have activated this table, it becomes the currently active limit, transducer, or gain/loss table. If *not* pressed, the previously loaded correction factors will be used.

`Modify` is used to change table entries where only specific entries are allowed. The allowable entries appear in a softkey menu.

`Print` prints the transducer, gain/loss, or limit table on the selected system printer.

`Scratch` clears the transducer, gain/loss, or limit table contents leaving default values. The message, as shown in Figure 5-9, appears on the computer screen when the `Scratch` softkey is pressed:

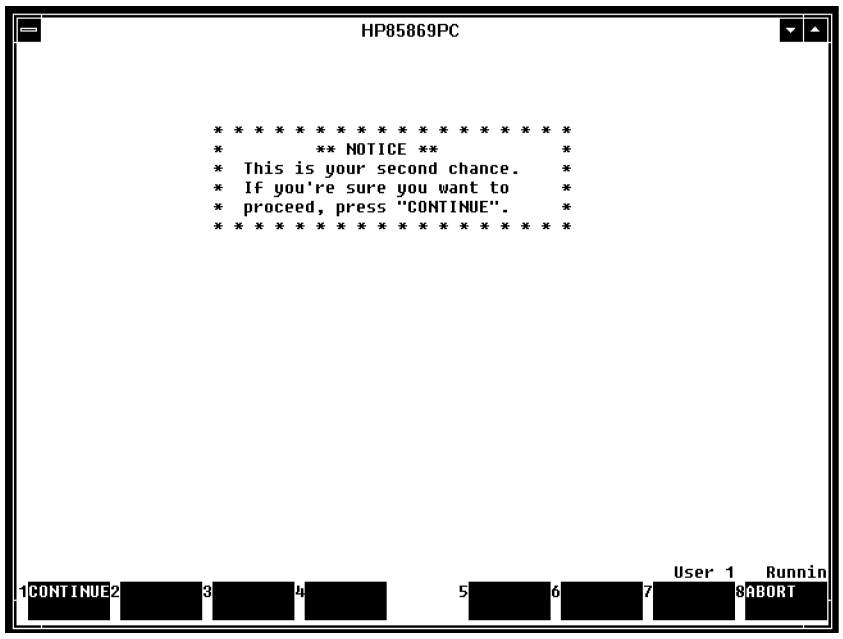

Figure 5-9. Message for Clearing a Transducer, Gain/Loss, or Limit Table

- Press CONTINUE to clear a transducer, gain/loss, or limit table.
- Press ABORT to discontinue the scratch process and keep the original entries.

If a transducer, gain/loss, or limit table is incomplete or does not cover the specified frequency range, an error message appears on the computer screen.

All tables contain the most recently loaded entries. If none have been entered, the tables contain default values.

6

Libraries

This chapter contains the following information:

- Test Library
- Data Library
- Transducer Library
  - Transducer Title
  - Sign of Transducer
  - Frequency Interpolation
  - Number of Points
- Gain/Loss Library
  - Gain/Loss Title
  - Number of Points
- Limit Library
  - Limit Title
  - Number of Points
- Report Library
- Receiver Correction Tables Library
- Library Softkeys
  - Loading Files
  - Storing Files
  - Purging Files
  - Combining Two or More Data Files
  - Renaming Files, Headers, and Libraries
- Library Utilities
  - Printing a Library File
  - Creating a New Library
  - Changing to a Different Library

This chapter explains the different libraries that come with the HP 85869PC EMI measurement software. Following the explanation of these libraries on the next page, is a library softkey section that describes the softkeys that are common among these libraries.

The seven different types of libraries included with this software are:

Test Library The test library is a portion of the program that is used to transfer information to and from the "test setup table". The test setup table is used to hold the parameters that describe each test.

Data Library The data library is a portion of the program that is used to store the test results (collected data) after loading and running a test from the test library.

Transducer Library The transducer library is a portion of the program containing files that describe the transducer characteristics, for example, antennas, current probes, and LISNs.

Gain/Loss Library The gain/loss library is a portion of the program containing files that describe the gain/loss characteristics for EMI tests.

Predefined gain/loss libraries have been included with this program but do not contain files. However, the files can be created, stored, and loaded in the same manner as transducer libraries.

Limit Library The limit library is a portion of the program containing test limits. The test limits are controlled by limit parameters that are loaded into the test setup table.

Report Library The report library is a portion of the program used to generate a report from data that is collected while performing an EMI test.

Receiver Correction Tables Library When created, the receiver correction tables library will contain a selection of predefined correction tables for particular EMI systems.

The receiver correction data is provided with the receiver. When the system is recalibrated, new correction data is provided and this library needs to be updated accordingly.

Test Library

The test library contains files with information defining a test. This information is transferred to the test setup table when a test is loaded from the library and saved to a file when a test setup table is stored in this library.

With the test library, you can store, purge, or rename the contents of a test setup table. You can also load a file into the test setup table. Loading a test into the test setup table automatically configures the measurement system for an EMI test.

The test library also contains a library utility section. This utility section allows the user to print a library index or examine a library in other directories. To use the softkeys in the test library section, refer to "Library Softkeys".

There are six different test libraries supplied with this program that contain EMI tests. For accessing these libraries, refer to "Changing to a Different Library" later in this chapter.

These test libraries are:

- Commercial Conducted Tests shown in Figure 6-1 and Figure 6-2
- Commercial Radiated Tests shown in Figure 6-3 and Figure 6-4
- MIL-STD 461A Tests shown in Figure 6-5
- MIL-STD 461B Tests shown in Figure 6-6 and Figure 6-7
- MIL-STD 461C Tests shown in Figure 6-8
- MIL-STD 461D Tests shown in Figure 6-9 and Figure 6-10
- MIL-STD 461E Tests shown in Figure 6-11 and Figure 6-12

All library files are grouped under headers in a library index. A selection arrow is used to point to test files in each library index. If a test file is currently loaded, an asterisk (*) appears to the left of its name as a reminder.

Note

- Only one library of each library type (for example, test, data, or transducer library) can exist in a directory at a time.
- The transducer and gain/loss factors provided with the HP 85869PC EMI measurement software are typical values only. Before performing any measurements, it is very important that these values be replaced with the actual factors for the particular transducers, preamplifier, and cables being used. Failure to take these steps could result in measurement inaccuracies of several dB.

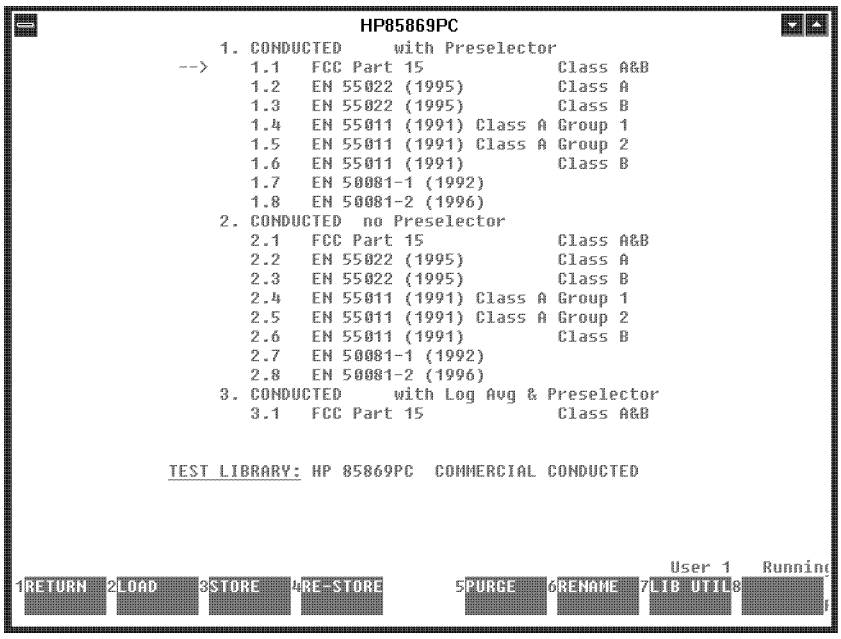

Figure 6-1. Commercial Conducted Tests, First Part

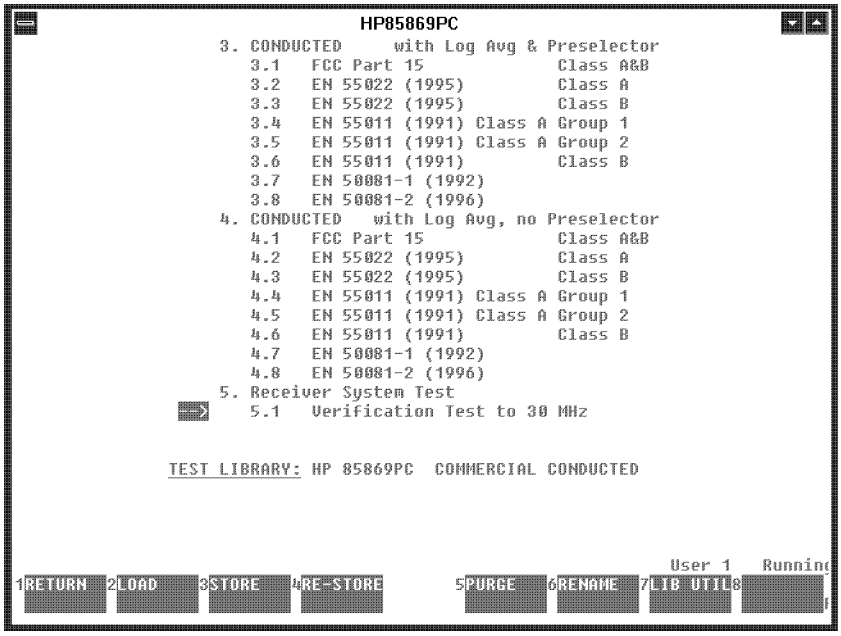

Figure 6-2. Commercial Conducted Tests, Second Part

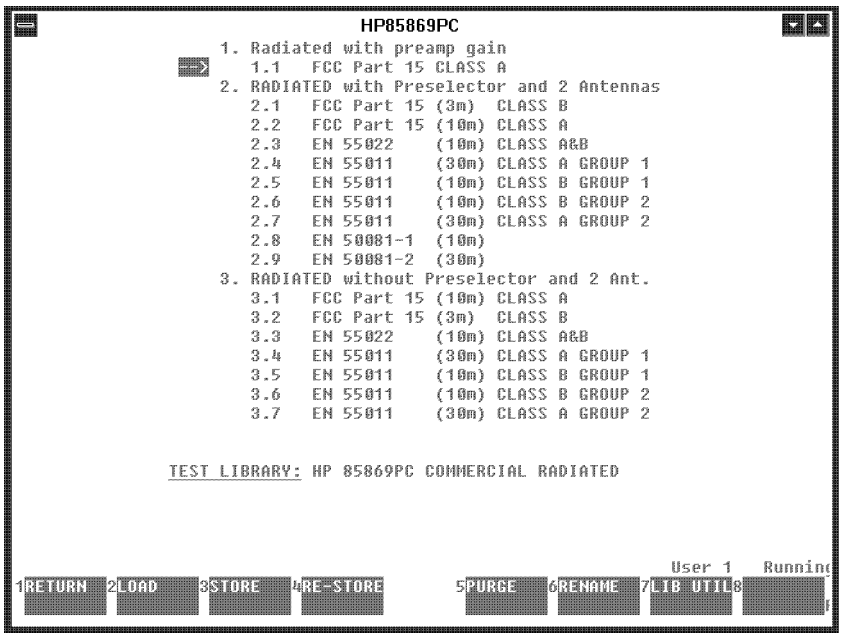

Figure 6-3. Commercial Radiated Tests, First Part

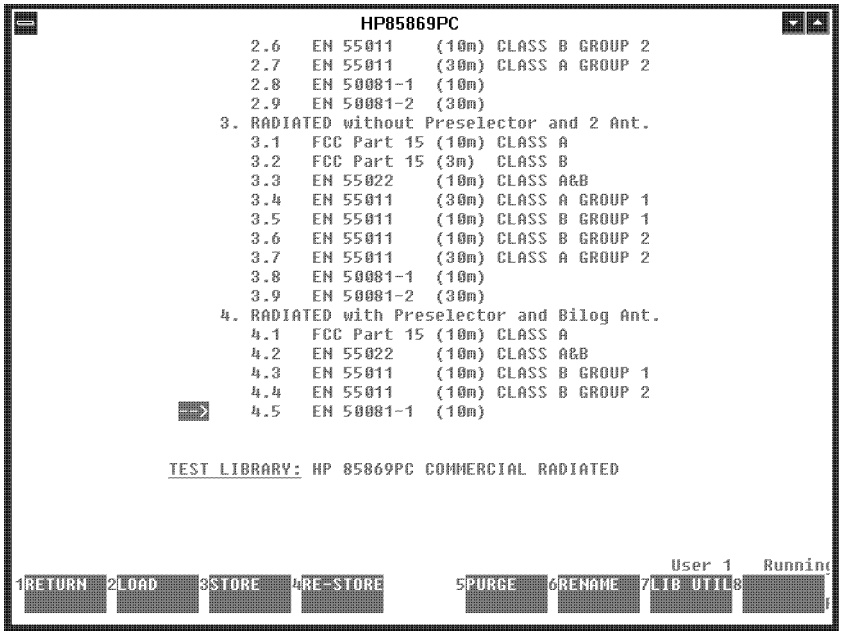

Figure 6-4. Commercial Radiated Tests, Second Part

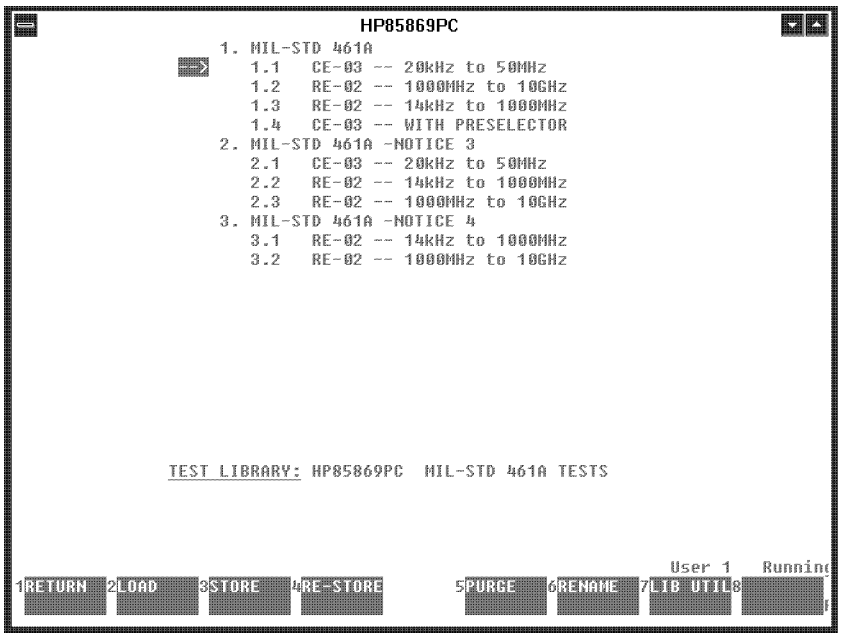

Figure 6-5. MIL-STD 461A Tests

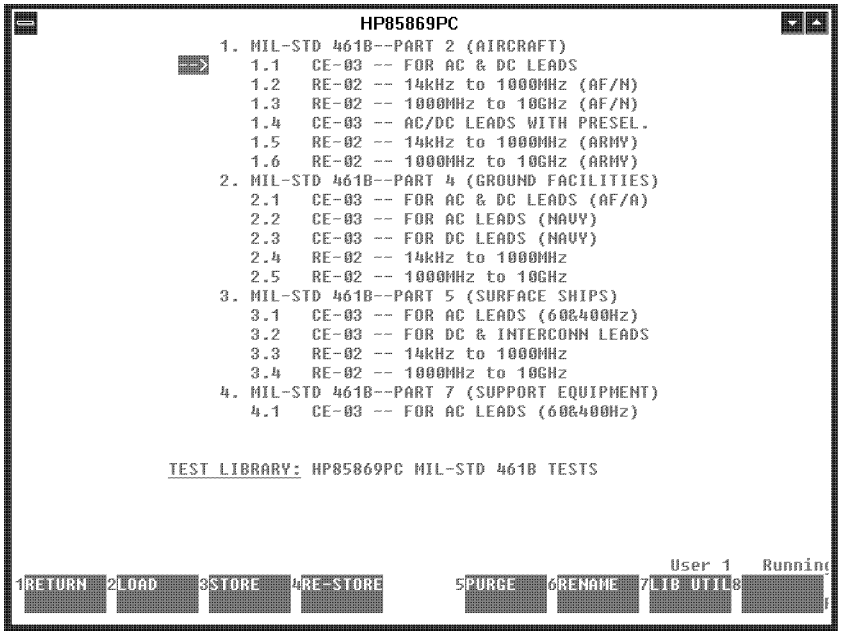

Figure 6-6. MIL-STD 461B Tests, First Part

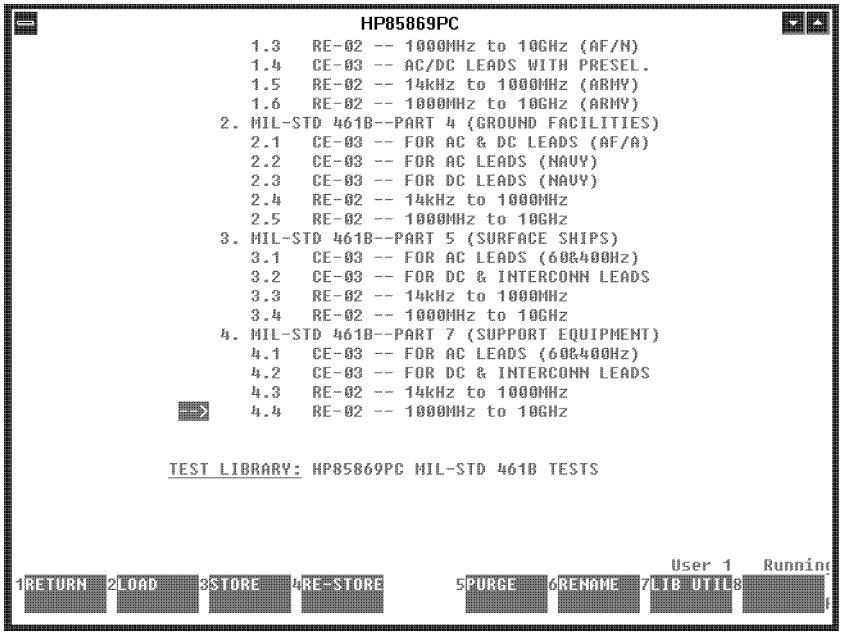

Figure 6-7. MIL-STD 461B Tests, Second Part

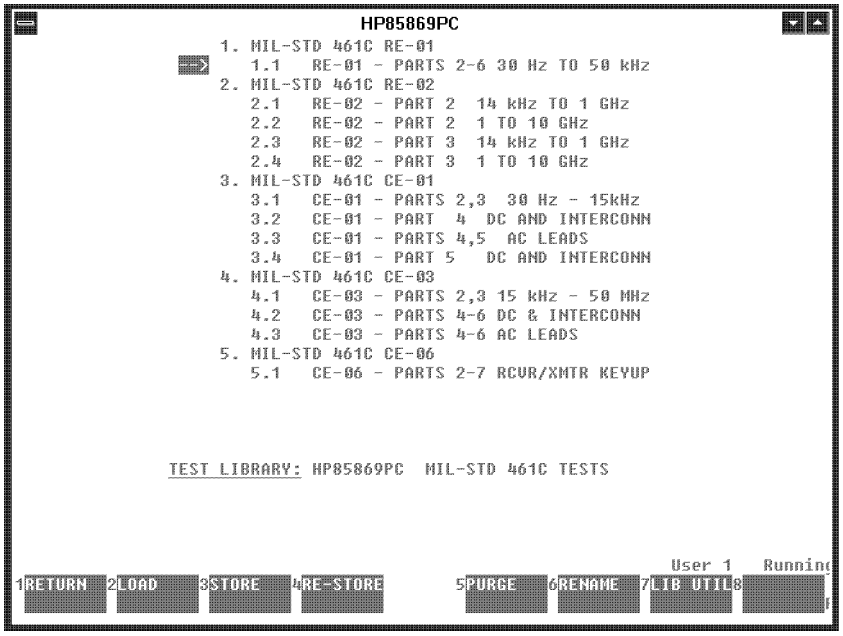

Figure 6-8. MIL-STD 461C Tests

Book MIL-STD 462D (January 1993), section 4.11.1, and MIL-STD 461E (August 1999), section 4.3.11.1, call out a measurement to verify the complete test system, including measurement receiver, cables, and transducers before the actual test is performed. This system verification is done by injecting a known signal, as stated in the individual test method, while monitoring the system output for the proper indication.

The verification test procedures for the different emissions tests can be found in the following sections of the standards:

Table 6-1. Emission Tests for MIL-STD 462D and 462E

Test	MIL-STD 462D	MIL_STD 462E
CD 101	4.b	5.4.3.4.b
CE 102	4.a	5.5.3.4.a
CE 106	4.1.b 4.2.b	5.6.3.4.1.b 5.6.3.4.2.b
RE101	4.b	5.15.3.4.b
RE102	4.c 4.d	5.16.3.4.c 5.16.3.4.d
RE103	4.c	5.17.3.4.c

These verification test require additional test equipment and transducers. Therefore, no dedicated verification test setups can be provided to automate these measurements and document their results. However, the provided test files for the actual EUT measurements can be modified to incorporate the specifics for the verification test setup. The results of the test system certification have to be documented and included in the test report.

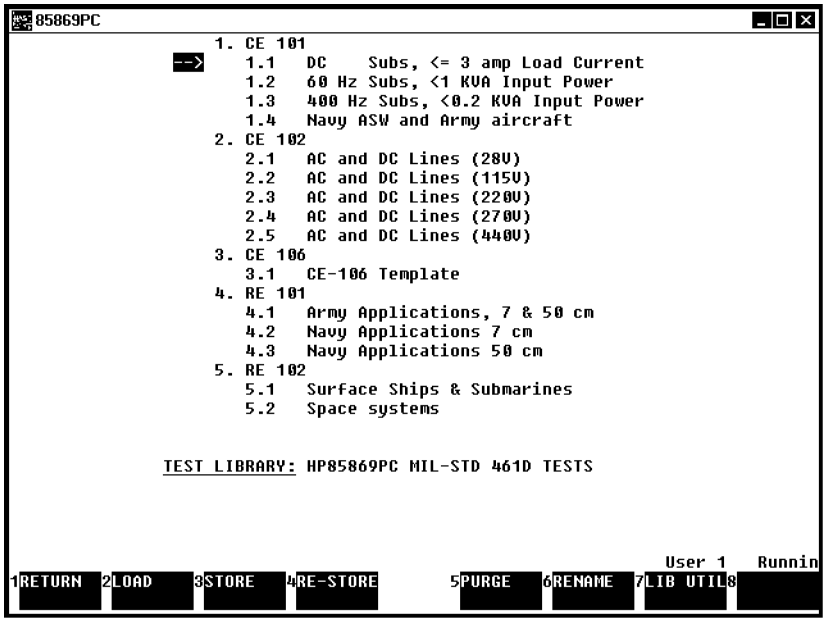

Figure 6-9. MIL-STD 461D Tests Part 1

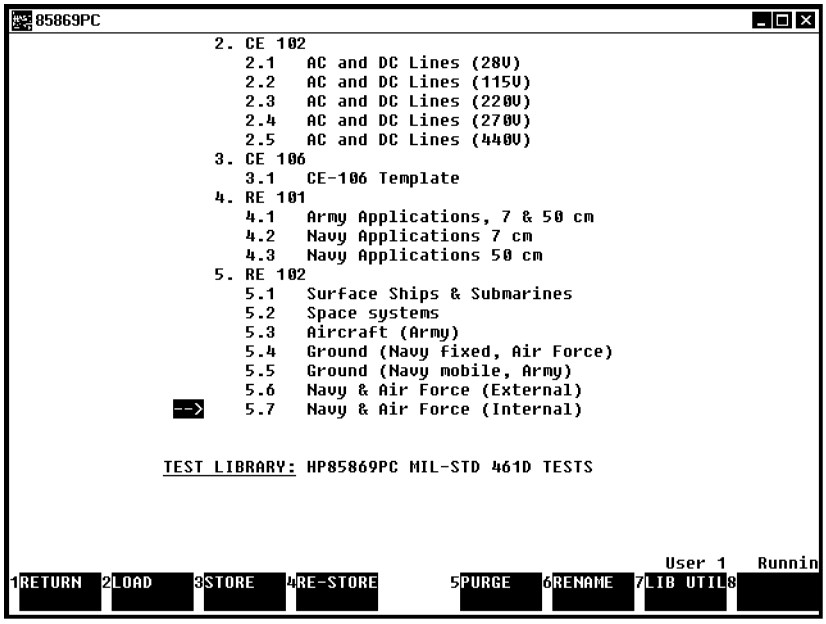

Figure 6-10. MIL-STD 461D Tests Part 2

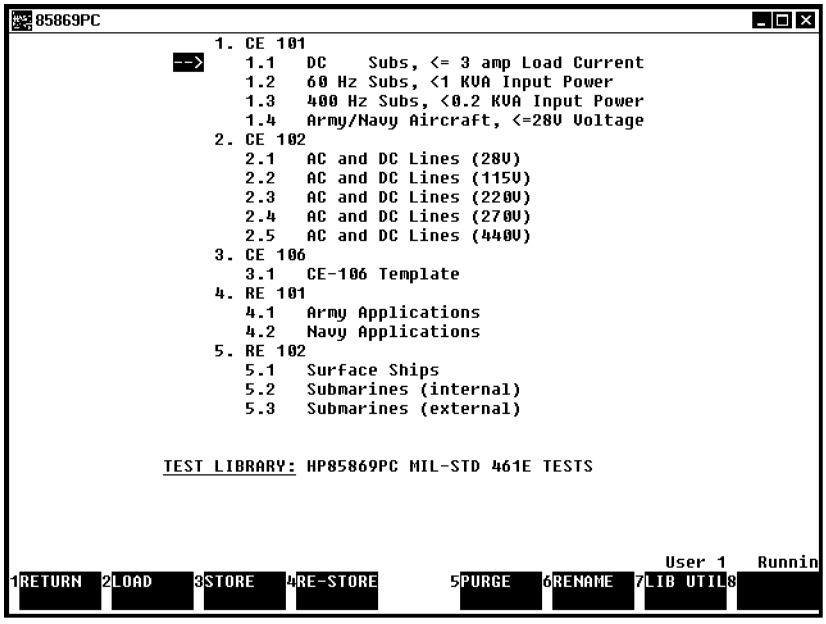

Figure 6-11. MIL-STD 461E Tests Part 1

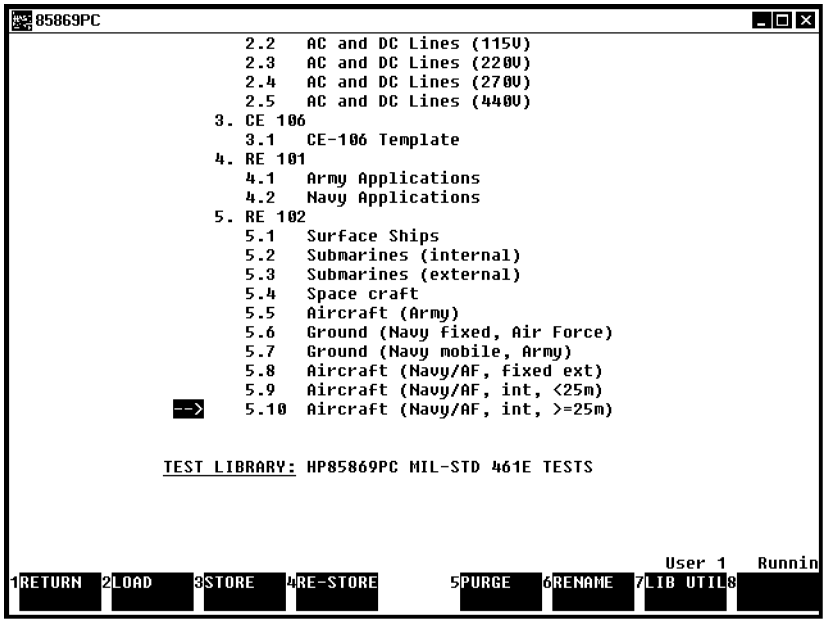

Figure 6-12. MIL-STD 461E Tests Part 2

Data Library

The data library is used to store the test results (collected data) after loading and running a test from the test library.

Loading a data file, from the data library, into the measurement system, simultaneously recalls its corresponding test file (test setup table) from the test library. When a data library file is loaded, it replaces measurement results shown on the spectrum analyzer or computer screen and erases the previous contents of the test setup table. In order to preserve the contents of a data file, its information must be stored in the data library or test library prior to loading another file.

The data library also contains a utility section. This utility section allows the user to print a library index or examine a library in another directory. To use the softkeys in the data library section, refer to "Library Softkeys".

The two data libraries supplied with the program that contain sample data that corresponds to the MIL-STD 461A and MIL-STD 461B test libraries are:

- MIL-STD 461A Measurement Data shown in Figure 6-13
- MIL-STD 461B Measurement Data shown in Figure 6-14

All library files are grouped under headers in a library index. A selection arrow is used to point to data files in each library index. If a data file is currently loaded, an asterisk (*) appears to the left of its name as a reminder.

Note Only one library of each library type (for example, test, data, or transducer library) can exist in a directory at a time.

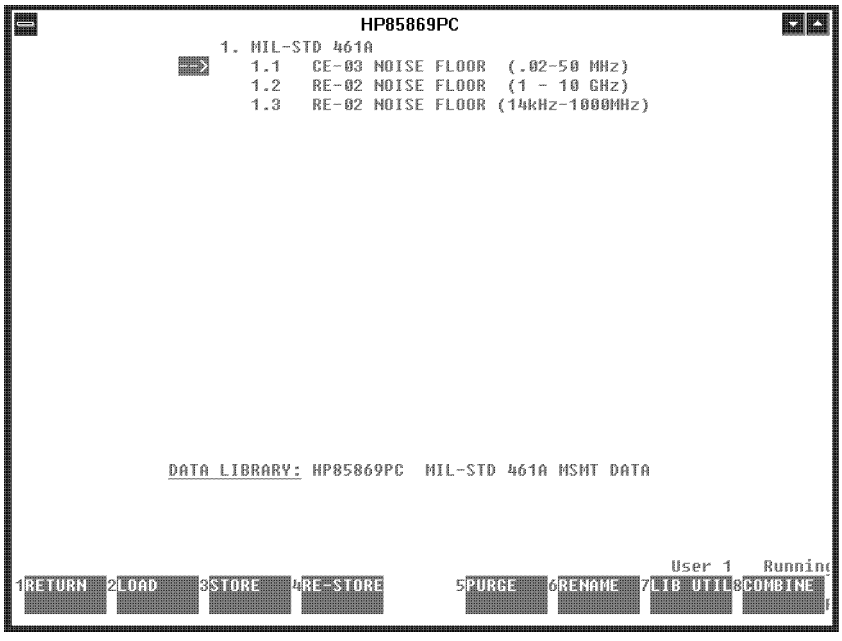

Figure 6-13. Sample Data Library for MIL-STD 461A

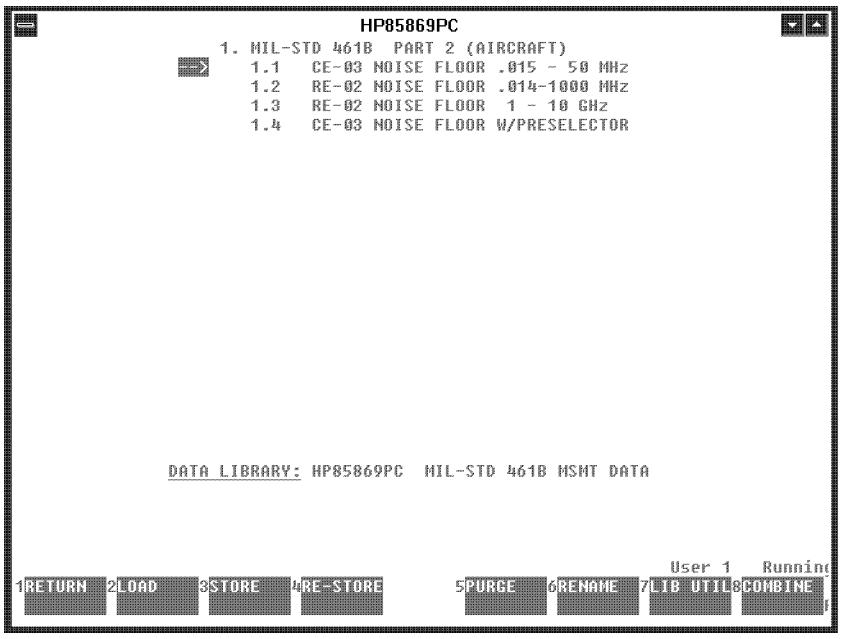

Figure 6-14. Sample Data Library for MIL-STD 461B

See Also

- "Noise Floors" in Appendix B

Transducer Library

The transducer library contains files describing the transducer characteristics which are tailored to the six different classes of EMI tests that this software can perform. The transducer libraries include factors for antennas, current probes, LISNs, and so on.

There are six predefined transducer libraries supplied with this software; one for each test category. One example of a transducer library is shown in Figure 6-15.

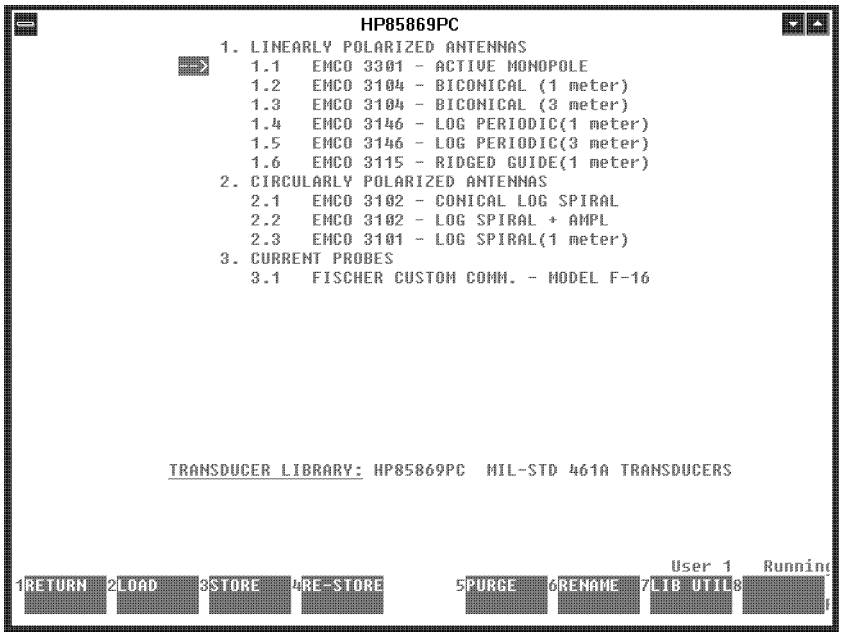

Figure 6-15. Predefined Transducer Library

When the Transducer parameter in the test setup table is selected to be modified, a transducer table similar to Figure 6-16 appears on your PC.

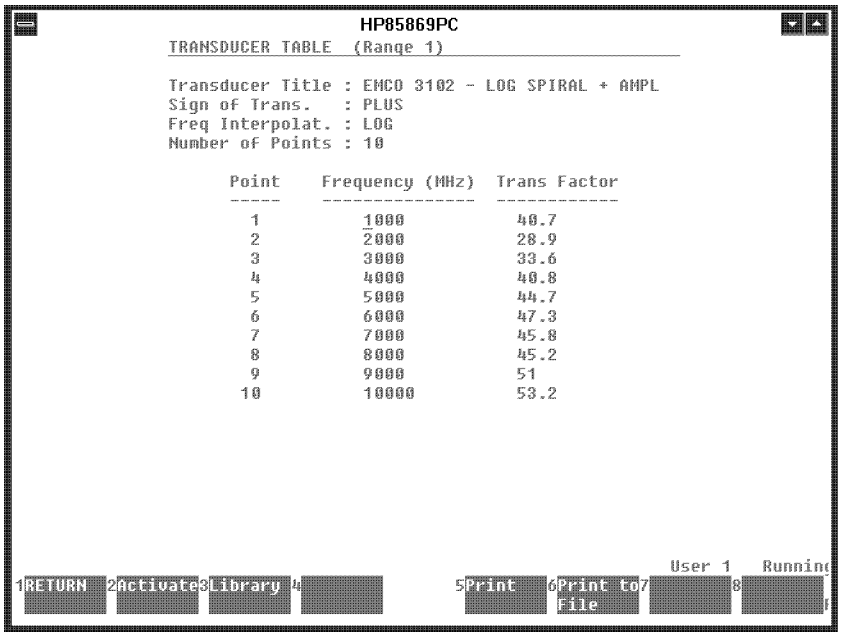

Figure 6-16. Example Transducer Table

The following sections explain each of the parameters in a transducer table.

Transducer Title

Transducer Title : title

title Specifies the name of the file that contains a transducer table.

Example To change (load) a Transducer Table:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Transducer parameter and press `Get Trns`.

   The `Get Trns` softkey is activated only when the cursor is under the Transducer parameter on the test setup table.

   A transducer table similar to Figure 6-16 should appear on your computer screen.

2. Press `Library` to access the transducer library table. A predefined transducer library table is shown in Figure 6-15.

3. Use the up and down arrow keys on the keyboard to position the arrow next to a transducer file and press `LOAD`.

4. Press `Activate` to load the transducer file into the test setup table.

   If the `Activate` softkey is not pressed, transducer table contents are lost when the `RETURN` softkey is pressed and the original contents are restored.

5. Press `RETURN` to return to the test setup table.

After a transducer library file is loaded into the test setup table, the parameters in the transducer table can be changed.

See Also "Transducer" in Chapter 5

Sign of Transducer

Sign of Trans. : polarity

The Sign of Trans. parameter specifies the polarity of the transducer being used in the test setup table.

polarity

PLUS Specify PLUS as the polarity for antennas. In this case, the factors are added to the voltage values measured by the receiver.

MINUS Specify MINUS as the polarity for current probes. In this case, the transducer factors are subtracted from the voltage values measured by the receiver.

Example To change (edit) the Sign of Trans. parameter:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Transducer parameter and press `Get Trns`.

   The `Get Trns` softkey is activated only when the cursor is under the Transducer parameter on the test setup table.

   A transducer table similar to Figure 6-16 should appear on your computer screen.

2. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Sign of Trans. parameter and press `Modify`.

3. Select one of the following softkeys.

   `PLUS` `MINUS`

The type of transducer used determines whether the transducer factor is added or subtracted from the measured voltage.

- $E = V + K$
- $I = V - Z$
- K = antenna factor (dB/m)
- Z = current probe transfer impedance (dBΩ)
- E = electric field (dBμV/m)
- I = current (dBμA)
- V = voltage signal level (dBμV)

Frequency Interpolation

Freq Interpolat. : interpolation mode

The Freq Interpolat. parameter specifies the mode that an interpolation is performed in.

Interpolation occurs when the transducer factors are applied to the data trace or when a limit line is adjusted for transducer factors during the Preview and Zoom Local function. Refer to Chapter 7 for further details.

interpolation mode Is the mode used to estimate values (of a function) between two known values.

LOG	Specify log for logarithmic frequency interpolation. If no changes are made, the default frequency interpolation is logarithmic.
LINEAR	Specify linear for linear frequency interpolation.

Example To change (edit) the Freq Interpolat. parameter:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Transducer parameter, then press `Get Trns`.

   The `Get Trns` softkey is activated only when the cursor is under the Transducer parameter on the test setup table.

   A transducer table similar to Figure 6-16 should appear on your computer screen.

2. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Freq Interpolat. parameter, then press `Modify`.

3. Select one of the softkeys.

   `LOG` `LINEAR`

See Also "Zoom Local" in Chapter 7

"Pre-Measurement Options" in Chapter 7

Number of Points

Number of Points : transducer factors

The Number of Points parameter specifies the number of transducer factors to be used by the selected transducer. If the measurement results are displayed in units other than dBμV, that is, if the Units Label parameter in the initial setup area of the test setup table is not dBμV, the appropriate transducer factor must be entered to convert dBμV to the displayed units.

transducer factors The transducer factors are points where you have correction data for the transducer being used. Up to 47 transducer factors can be listed for each transducer.

The transducer factor may represent an antenna factor, a transfer impedance of a current probe, or the insertion loss of a LISN.

Example To change (load) the Number of Points parameter:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Transducer parameter, then press `Get Trns`.

   The `Get Trns` softkey is activated only when the cursor is under the Transducer parameter on the test setup table.

   A transducer table similar to Figure 6-16 should appear on your computer screen.

2. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Number of Points parameter, then type the new number of transducer factors.

3. Press `Enter` to accept the table entry.

Table 6-2 shows the amplitude offsets that convert dBμV to other units.

Table 6-2. Conversion Factors for 50 Ohm Impedance

To/From	dBm	dBV	dBmV	dBuV
dBm	0	−13	+47	+107
dBV	+13	0	+60	+120
dBmV	−47	−60	0	+60
dBuV	−107	−120	−60	0

For example, assume measurement results will be displayed in dBmV and you are measuring without a transducer. A transducer parameter must still be entered in the test setup table, to offset the measurement results 60 dB, in order to produce measurement results in dBmV. Figure 6-17 shows the transducer table containing the −60 dB offset. The transducer factor here is actually being used as a conversion factor.

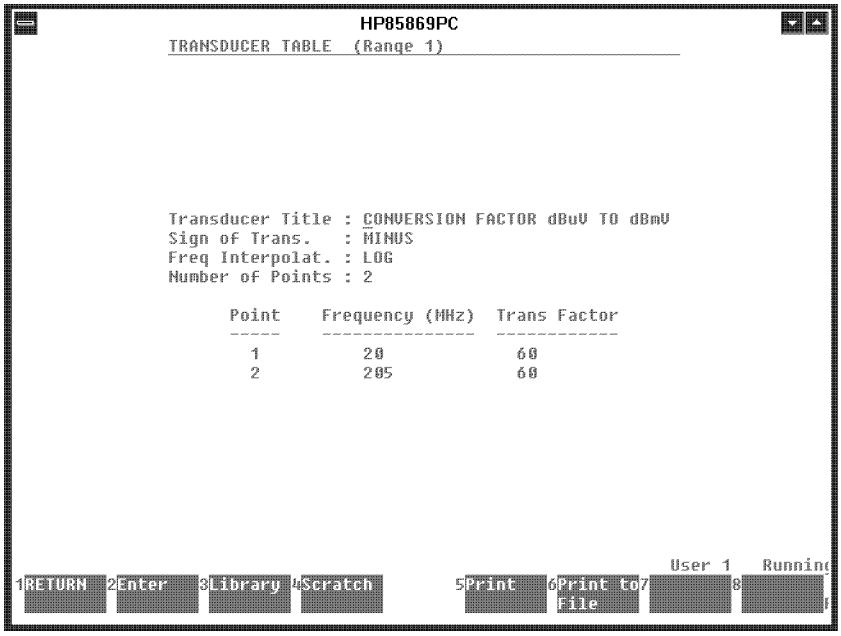

Figure 6-17. Transducer Table to Convert dBuV to dBmV

Gain/Loss Library

The gain/loss library contains files that describe the gain/loss characteristics for EMI tests.

Pre-defined gain/loss libraries have been included with this program, but contain no data files. However, they can be created, stored, and loaded in the same manner as transducer libraries.

When the Gain/Loss parameter in the test setup table is selected to be modified, a gain/loss table similar to Figure 6-18 appears on your computer.

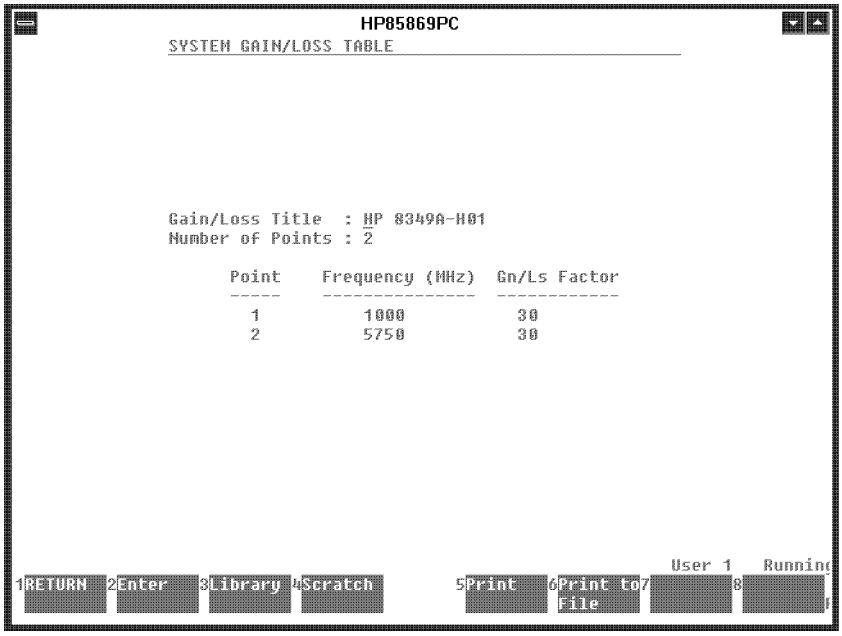

Figure 6-18. Example Gain/Loss Table

The following sections explain each of the parameters in a gain/loss table.

Gain/Loss Title

Gain/Loss Title : title

title Specifies the name of the file that contains a transducer library.

Example To create a Gain/Loss table:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Gain/Loss parameter, then press `Get G/L`.
2. Enter a title, the number of frequency points, the frequencies, and the amplitudes.
3. Press the `Library` softkey to create a new library or access an existing library.

Example To change (load) a Gain/Loss table:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Gain/Loss parameter, then press `Get G/L` to load a gain/loss table.

   The `Get G/L` softkey is activated only when the cursor is under the Gain/Loss parameter on the test setup table.

   A gain/loss table similar to Figure 6-16 should appear on your computer screen.

2. Press `Library` to access the gain/loss library files. If no gain/loss libraries exist, you will have to create them. Refer to "Library Utilities" to create a new library.

3. Use the up and down arrow keys on the keyboard to position the arrow next to a gain/loss file and press `LOAD`.

4. Press `Activate` to load the gain/loss file into the test setup table.

   If the `Activate` softkey is not pressed, gain/loss table contents are lost when the `RETURN` softkey is pressed and the original contents are restored.

5. Press `RETURN` to return to the test setup table.

See Also "Gain/Loss" in Chapter 5

Number of Points

Number of Points : gain/loss factors

The Number of Points parameter specifies the gain/loss factors that are used. Gain/Loss factors are used to correct the measurement trace along with the transducer factors. The same correction factors are also used to correct the limit line when using the Preview and Zoom Local options (for example, linear mode). Any interpolation between the gain/loss factors assumes linear mode.

gain/loss factors Up to 47 gain/loss factors can be listed for each gain/loss table.

Example To change (load) the Number of Points parameter:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Number of Points parameter, then type gain/loss factors.

2. Press `Enter` to accept the table entry.

See Also "Zoom Local" in Chapter 7

"Pre-Measurement Options" in Chapter 7

Limit Library

The limit libraries contain a selection of predefined limit lines which are different for the six different classes of EMI tests that this software can perform.

The limit library is used to specify test limits. The test limits are defined by limit parameters that are loaded into the test setup table.

An example of a predefined limit library is shown in Figure 6-15.

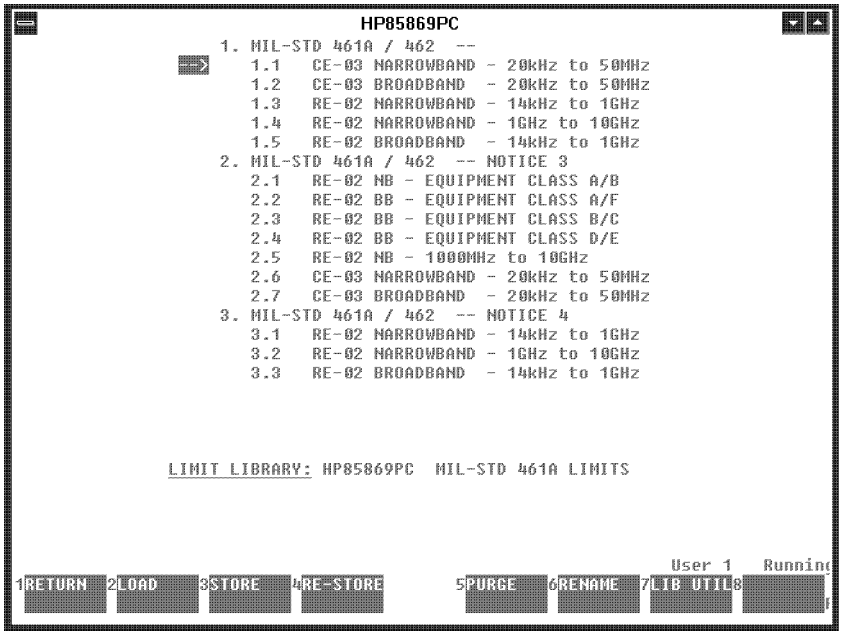

Figure 6-19. Limit Library for MIL-STD 461A Tests

When the Limit # Label parameter in the test setup table is selected to be modified, a limit table similar to Figure 6-20 appears on your computer.

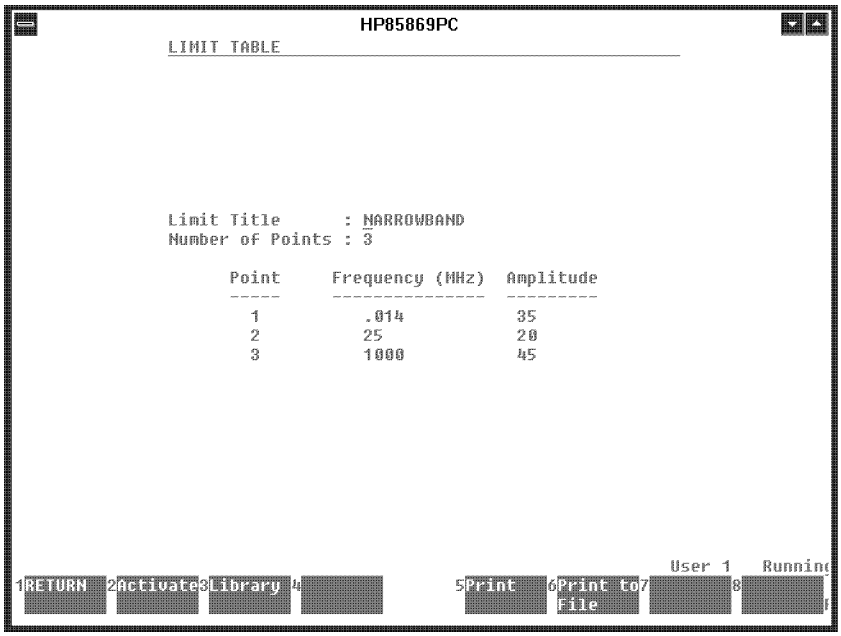

Figure 6-20. Example Limit Table

Test limits are listed as a series of frequencies and corresponding amplitude limits in the limits table. Depending on the test type that is specified in the test setup table, up to six limit lines can be defined.

PEAK If PEAK is the test type specified, up to **three** limit lines can be defined.

NB/BB If NB/BB is selected as the test type, up to **six** limit lines can be defined; three for narrowband and three for broadband responses.

BB AUTO If BB AUTO is selected as the test type, up to **six** limit lines can be defined; three for narrowband and three for broadband responses.

PEAK LOG AVG If PEAK LOG AVG is selected as the test type, up to **six** limit lines can be defined; three for peak and three for log average responses.

The following two sections explain each of the parameters in a limit table.

Limit Title

Limit Title : title

The Limit Title parameter is the limit library file name if a limit file has been loaded. It is also the label that appears on the spectrum analyzer screen.

title Specifies the name of the file that contains a limit library.

Example To change (load) a Limit Library file:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Limit # Label parameter, then press the `Get Lmt` softkey.
2. Press `Library` to access the limit library files.
3. Scroll the pointer to a limit file and press `LOAD`.
4. Press `Activate` to load the limit file into the test setup table.

   If the `Activate` softkey is not pressed, limit table contents are lost when the `RETURN` softkey is pressed and the original limit table contents are restored.
5. Press `RETURN` to return to the test setup table.

See Also "Limit "#1 Label" in Chapter 5

Number of Points

Number of Points : data points

The Number of Points parameter specifies the number of data points in a table.

data points Each test limit has up to 99 data points. Each data point represents an amplitude value at a particular frequency.

Example To change (load) Number of Points:

1. Use the up and down arrow keys on the keyboard to position the cursor under the table entry next to the Number of Points parameter, then type the new number of points.
2. Press `Enter` to accept the table entry.

Report Library

The report library is used to generate a report from data that is collected while performing an EMI test.

Report files can be stored, loaded, and purged just like any of the other six library types. It should be noted that a default report has been provided, but it has not been saved as a report library item.

The Report Form Generator's features include:

- integrated text and graphics
- screen editor
- up to 200 fields of text and data
- insertion of graphics anywhere on the form by pressing a single key
- insertion of the peak amplitude list anywhere on the form by pressing a single key
- insertion of form feeds anywhere on the form
- full use of the computer's editing keys
- storage of forms in the report library for future use
- two modes of operation

There are two modes of operation available when using the Report Form Generator:

Update Mode The update mode is used to design a new report template or edit an existing one. Two different "fields" are utilized in the update mode of operation to design a form:

text field The text fields make up the basic form (for example, DATE, TIME, EUT DESCRIPTION, and so on).

data field The data fields are used to enter data associated with a specific test.

Having separate text and data fields enables the user to erase only the data associated with a specific test and not the entire form.

Data Entry Mode After the design or editing is complete, the Data Entry Mode is used to enter data pertinent to a specific EUT and test.

Figure 6-21 shows an example report template provided with the HP 85869PC EMI measurement software. Refer to Chapter 10 for further information on producing reports.

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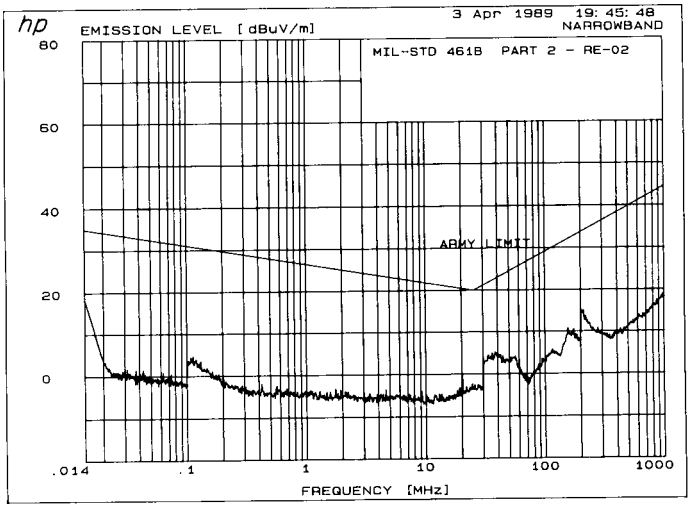
EMI MEASUREMENT SOFTWARE

This is a sample report form. There are two basic modes of operation: the Data Entry mode and the Update mode. The Data Entry mode is used to fill in data fields that have been defined, such as the date and time fields on this sample report form. The Update mode is used to add new data fields or text such as this paragraph. With this capability, the report form can be easily modified to meet individual requirements.

DATE: TIME:
EUT DESCRIPTION:
TYPE TEST:
FREQUENCY RANGE:
SYSTEM DESCRIPTION:

TEST PERFORMED BY:
TEST RESULTS:



Peaks above -30 dB of Limit Line #1

PEAK#	FREQ (MHz)	(dBpT)	DELTA
1	4.8E-5	103.2	-28.5
2	.00011	90.5	-26.5
3	.000169	94.9	-14.4

Figure 6-21. Example Report Template

Receiver Correction Tables Library

The receiver correction tables library is the portion of the program that will contain your selection of predefined correction tables after you have created them. Figure 6-22 is an example of what would be displayed if receiver correction tables have been previously created.

Note For detailed information about importing receiver correction tables, refer to "Importing Receiver Correction Tables" in Chapter 4.

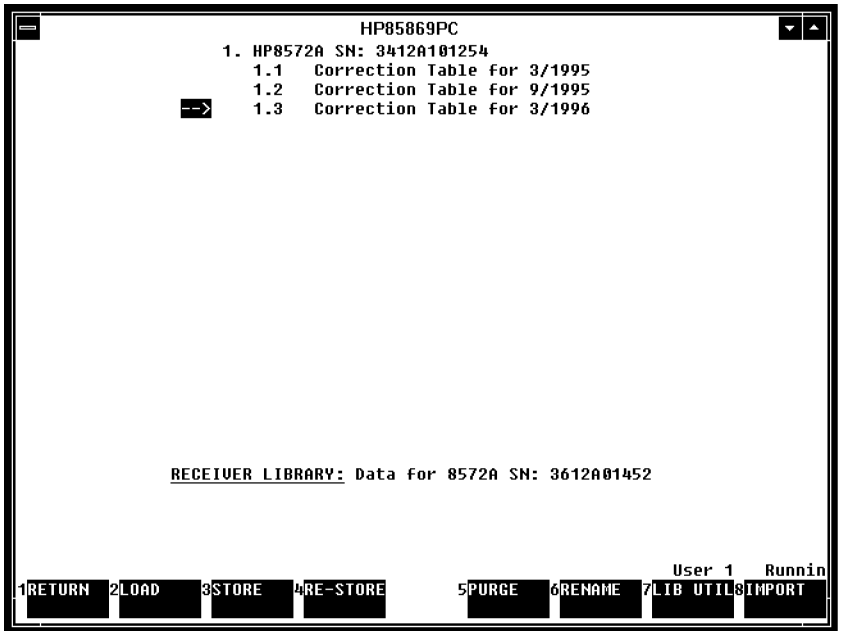


Figure 6-22. Receiver Correction Tables Library Example

RETURN	returns to the program to the next highest level.
LOAD	loads the receiver correction table into an internal correction array.
STORE	stores the receiver correction table contents in a new file.
RE-STORE	stores the receiver correction table contents in an existing file. The original file contents of the existing file are erased, but the receiver correction table is not cleared.
PURGE	erases a single library file or all library files under a selected header. If a single file is selected and it is the only file under the header, then the header is erased as well. If a receiver correction library is purged and corresponding data exists, in the data library, a message is displayed which allows the user to abort the purge operation or continue. If the user selects to continue, the receiver correction library the measurement data is lost.
RENAME	changes the name of a file without changing its contents. It can also change the name of a header or library.
LIB UTIL	(library-utility) leads to a library utility menu.
IMPORT	imports the correction data shipped with the receiver or data generated during periodic recalibration.

Library Softkeys

The HP 85869PC EMI measurement software supports seven types of software libraries: test, data, transducer, gain/loss, limit, report and receiver correction tables. Supplied with the program are libraries with prestored files for common EMI test setups. Also included are libraries for different test limits and examples of typical transducer factors for commercially available antennas, current probes, and LISNs.

CAUTION The original libraries are contained on the installation disk used to set up the HP 85869PC EMI measurement software. It is recommended that the libraries installed on the PC be treated as working masters. Generally, a new directory is created (using either File Manager or Windows Explorer) for a new project or EUT. The desired test, transducer, limit line, gain/loss and report libraries are copied from the working master directories to this new directory using the Library Copy Utility. After the libraries are copied to the working directory, they can be modified under the Setup function for changes specific to the new project or EUT.

The seven libraries supplied with this software can be accessed from different levels in the program by pressing a corresponding softkey:

- Test Library - Press `TEST LIB` at the program top level.
- Data Library - Press `DATA LIB` at the program top level or while in the measure portion of the program.
- Transducer Library - Press `Get Trns` while in the setup portion of the program.
- Gain/Loss Library - Press `Get G/L` while in the setup portion of the program.
- Limit Library - Press `Get Lmt` while in the setup portion of the program.
- Report Library - Press `Rpt Lib` while in the utility portion of the program.
- Receiver Correction Tables Library - Press `YES` to the question "`Is this an HP 8571A/8572A Receiver System?`" while in the instrument address level. This library is HP 8571A/8572A receiver system specific.

After pressing one of the corresponding softkeys, the following library softkeys are available.

RETURN	LOAD	STORE	RE-STORE	PURGE	RENAME	LIB UTIL	COMBINE* [1]

1 Softkeys labeled with asterisks are only available with in the data library.

`RETURN` returns the program to the next highest level.

`LOAD` loads the contents of the selected file into the test setup table or the report generator area.

`STORE` stores the test setup table contents, data or report in a new file.

`RE-STORE` stores the test setup table contents, data or report, in an existing file. The original file contents of the existing file is erased, but the original file name is retained.

`PURGE` erases a single library file or all library files under a selected header. If a single file is selected and it is the only file under the header, then the header is erased as well.

If a test setup library is purged and corresponding data exists, in the data library, a message is displayed which allows the user to abort the purge operation or continue. If the user selects to continue, the test setup library as well as the corresponding data library is purged.

`RENAME` changes the name of a file without changing its contents. It can also change the name of a header or library.

`LIB UTIL` (library-utility) leads to a library utility menu.

`COMBINE` combines two or more data files containing measurement results into one data file. Each of the data files to be combined must be associated with the same test setup. Data files are combined using the higher of the two amplitudes when there is a frequency overlap.

Practical uses of this function include:

- Testing and storing measurement results for individual ranges of a multiple range test, independent of the other ranges, then combining the data for all ranges.

  This allows you to control the order in which individual ranges of a multiple range test are performed so that accessory and hookup changes are minimized. This can be especially useful when performing the same test on more than one instrument under test.

- Testing for radiated emissions at each of the surfaces of an instrument under test to determine maximum emissions present at each surface, then combining the data for an overall profile.

Loading Files

To load the contents of a file into the test setup table or retrieve data:

1. Press the `TEST LIB` or the `DATA LIB` softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the `TEST LIB` or the `DATA LIB` softkey brings up the test library's first level softkeys along with a list of tests on the computer screen.

2. Use the up and down arrow keys on the keyboard to align the arrow indicator to a desired test and press `LOAD`.

   After a test is loaded, the program returns to the program top level.

Storing Files

To store test setup table contents in the test library or test data in the data library:

1. Press the TEST LIB or the DATA LIB softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the TEST LIB or the DATA LIB softkey brings up the test library's first level softkeys along with a list of tests on the computer screen.

2. Press the STORE softkey and a second level softkey menu appears.

3. Use the up and down arrow keys on the keyboard to select a header with the SELECT softkey, create a new header with the ADD HDR softkey, or insert a new header with the INSERT softkey.

4. After a header has been selected, created, or inserted, complete the storing process by entering the file name.

   Type the name of the new header (up to 32 characters) inside the window then press ENTER.

The following second level softkeys are used for selecting, creating, or inserting files.

Second Level Softkeys

SELECT	ADD HDR	INSERT	ABORT

SELECT is used to add an additional test under an existing header. Up to 99 tests can be stored under each header.

Up to 500 entries (test files and headers combined) can be stored in each test library.

Example To add an additional test:

1. Use the up and down arrow keys on the keyboard to align the arrow at a header and press SELECT.
2. Type the name of the test (up to 32 characters) inside the window then press ENTER.

ADD HDR (add header) creates a new header at the end of the library index.

Up to 500 entries (test files and headers combined) can be stored in each test library.

Example To create a new header:

1. Press the `TEST LIB` or the `DATA LIB` softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the `TEST LIB` or the `DATA LIB` softkey brings up the test library's first level softkeys along with a list of tests on the computer screen.

2. Press the `STORE` softkey and a second level softkey menu appears.

3. Press `ADD HDR` and type the name of the new header (32 characters maximum) and press `ENTER`.

`INSERT` inserts a new header immediately above the arrow.

Example To insert a new header:

1. Press the `TEST LIB` or the `DATA LIB` softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the `TEST LIB` or the `DATA LIB` softkey brings up the test library's first level softkeys along with a list of tests on the computer screen.

2. Press the `STORE` softkey and a second level softkey menu appears.

3. Use the up and down arrow keys on the keyboard to align the arrow at a header and press `INSERT`.

4. Type the new header (32 characters maximum) and press `ENTER`.

5. Once the header has been selected or created, complete the storing process by naming the file.

   Type up to 32 characters inside the window and press `ENTER`.

6. Selecting `ABORT`, after the header is established, aborts the file naming process and returns the program to the previous level.

`ABORT` discontinues the storing process and returns the program to the previous level.

Purging Files

To purge (erase) a library file under a header:

1. Press the TEST LIB or the DATA LIB softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the TEST LIB or the DATA LIB softkey brings up the test library's first level softkeys along with a list of tests on the computer screen.

2. Press PURGE.

3. Use the up and down arrow keys on the keyboard to align the arrow at a file or header and press SELECT.

   If a header is selected, a precaution message is displayed giving the user a second chance.

   After a file or header is purged, the program returns to the program top level.

Combining Two or More Data Files

To combine two or more data files:

1. Press the DATA LIB softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the DATA LIB softkey brings up the data library's first level softkeys along with a list of tests on the computer screen.

2. Press COMBINE.

3. Align arrow at primary file to be combined.

Note The primary file is handled differently by the COMBINE function than are secondary files. The primary file is loaded with its general measurement information such as time and date as well as the information in the spectrum analyzer titles fields. (Refer to "Data Analysis Options" in Chapter 7 for more information.) This information becomes part of the combined file. This general measurement information is not loaded with secondary files.

---

1. Press SELECT.

2. Align the indicator at a secondary file to be combined.

3. Press SELECT.

4. Align arrow at additional secondary file to be combined then press SELECT or press RETURN if no additional files are to be combined. Use STORE to save the combined file.

Renaming Files, Headers, and Libraries

To rename a file, header, or library:

1. Press the TEST LIB or the DATA LIB softkey at the program top level. If an error occurs when trying to load a library, refer to "If you have problems loading a library" in Appendix A.

   Pressing the TEST LIB or the DATA LIB softkey brings up the test library's first level softkeys along with a list of tests or data files on the computer screen.

2. Use the up and down arrow keys on the computer keyboard to select a file, header, or library then press ENTER.

3. Press the RENAME softkey and a second level softkey menu appears.

Example To change the name of a file, header, or library name:

1. Use the up and down arrow keys on the computer keyboard to align the indicator at a file, header, or library name and press RENAME.
2. Press FILE, HEADER, or LIB NAME.
3. Type up to 32 characters for a file or header and up to 36 characters for a library and press ENTER.

Second Level Softkeys

RETURN	FILE	HEADER	LIB NAME

RETURN	returns the program to the next highest level.
FILE	allows you to change the name of a file (up to 32 characters).
HEADER	allows you to change the name of a header (up to 32 characters).
LIB NAME	allows you to change the name of a library (up to 36 characters).

Library Utilities

Press `LIB UTIL` at the first level softkeys to access these second level softkeys:

Second Level Softkeys[1]

`RETURN` `PRT LIB` `LIB MSI` `NEW LIB`

1 Keys labeled with asterisks are not always present.

`RETURN` returns the program to the next highest level.

`PRT LIB` prints the library content on the defined system printer.

`Lib MSI` (Library Mass Storage Is) is used to change the library directory.

`NEW LIB` creates a new library in the currently active directory specified in the `Lib MSI` field.

Printing a Library File

Any of the libraries supplied with the HP 85869PC EMI measurement software can be printed on the system printer.

Example To print a test setup table from a library:

1. Press `TEST LIB` at the program top level.
2. Press `LIB UTIL` then `PRT LIB`.

   If a library is not present in the current directory, press `LIB UTIL` at the first level softkeys.

Creating a New Library

Example To create a new library in the currently active directory:

1. Press `NEW LIB`.
2. If the Lib MSI designates a floppy disk drive, insert an initialized flexible disk into the disk drive. If you have no initialized disks, refer to your computer user's manual for instructions on how to initialize new disks.
3. Press `CONTINUE`.
4. Type the desired name of the new library and press `ENTER`.

   The program does not accept the library name if the disk is not initialized or if the disk already has a library name, but instead displays the message in Figure 6-23. To solve this problem, refer to "If you have problems loading a library" in Appendix A.

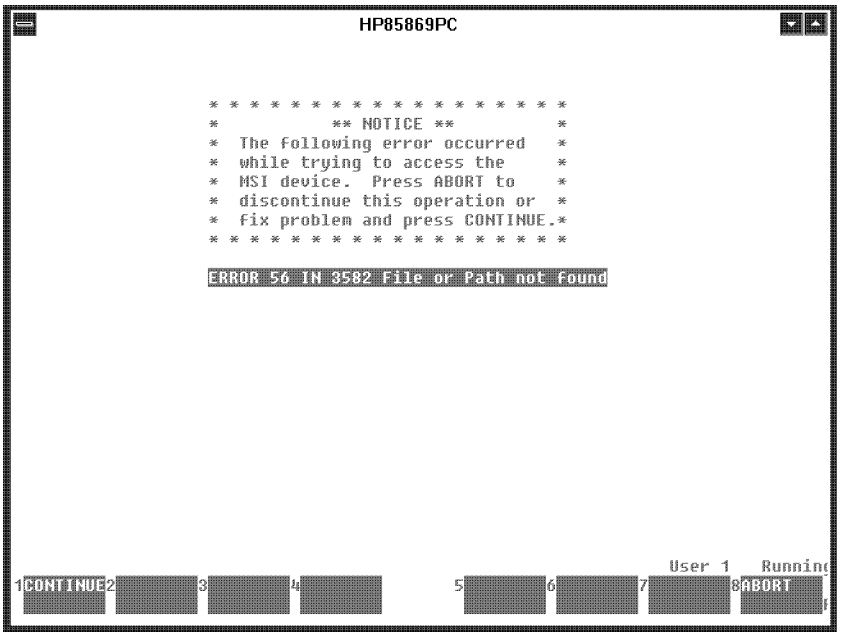


Figure 6-23. Error Occurred Trying to Access MSI

Changing to a Different Library

Example To change to a different library directory:

1. Press `Lib MSI`.
2. Replace the existing entry by typing the directory path for the library, starting at the root directory, then press `ENTER`.

7

Measure

This chapter contains the following information:

- Making Measurements
  - Summary of Measurement Steps
  - Measurement Options
  - Amplitude Accuracy Considerations
- Pre-Measurement Options
  - System Calibration
  - Preview
  - Measure
  - View Broadband and View Narrowband
  - View Spectrum Analyzer
  - View Display
  - Ranges
- Data Analysis Options
  - Zoom Local
  - Print Peaks
  - Tune and Listen
  - ReMeasure - At Peak
  - ReMeasure - Over Span
  - Quasi-Peak Measurement - At Peak
  - Quasi-Peak Measurement - Over Span
  - Explanation of Peak/Quasi-Peak Measurement Example
  - Average Measurement - At Peak
  - Average Measurement - Over Span
  - Explanation of Peak/Average Measurement Example
  - Mark Trace
  - Notes
  - User Written Subroutine
  - Spectrum Analyzer Titles

The measure portion of the program uses test limits and test parameters to perform the measurement process. The test limits and test parameters are stored in a test setup table.

The setup portion specifies the limits and parameters which define a test. The "Test Library" in Chapter 6 shows a variety of standard EMI tests (that is, predefined test setup tables) which are included with the HP 85869PC EMI measurement software. These standard EMI tests can be used after verification of the applicability to the individual test environment or they can be customized and extended as necessary. Refer to Chapter 5 for information on specifying test setup table parameters.

Making Measurements

When using the measure portion of the program:

- All measurement and test results produced by this software are presented on a logarithmic frequency and amplitude scale on the spectrum analyzer display.
- Measurement results can be duplicated and viewed on the computer display, plotted on a GPIB plotter, printed on a systems printer, or stored, recalled, and reanalyzed using the data library.
- Test limits are simultaneously displayed with measurement results so test failures can be easily viewed.
- Both quasi-peak and average measurements can be made over one or multiple portions of the measured frequency span.

Summary of Measurement Steps

In Chapter 4, a typical sequence of steps is provided along with a short tutorial on using this software. The same sequence of steps is presented here, but this chapter focuses on the options available in step 2. To make a measurement, you would perform a procedure similar to the following.

1. Load a test from the test library or define your own customized test; the setup portion of the program is used to define a customized test.

   A test is defined by the parameters in a test setup table. The parameters listed in there are used to characterize the measurement system and its display for specific EMI tests. It is used to control the settings of all instruments in the measurement system such as bandwidth, frequency span, and attenuation settings. In addition, the test setup table is used to specify the test limits, gain/loss factors, and transducer characteristics.

2. After a test has been loaded from the test library, use the measure portion of the program to conduct the actual EMI measurement, analyze measurement results, or remeasure with quasi-peak or average detection.

3. When all measurements are complete, store the test setups in the test library, analyze the test results (collected data), and store them in the data library.

4. Finally, you produce a hard copy of your measurement results.

   The program can produce a hard copy of test limits, gain/loss factors, and measurement results on a plotter, and list transducer factors, test limits, and test setup parameters on a printer.

Measurement Options

By following the "Summary of Measurement Steps", you will access the measure portion of the program in step 2. When you access the measure portion of the program, you are given a choice of both "pre-measurement options" and "data analysis options".

pre-measurement	options allow you to perform various functions before performing the actual testing process. Before you start a measurement, you may want to use the pre-measurement options, for example, system calibration or preview. Performing a system calibration improves the accuracy of the measurement, and performing a preview assures that the chosen parameters in the test setup table are suitable. It is good measurement practice to perform these pre-measurement functions before the execution of the actual test.
data analysis	options allow you to analyze measurement data. You can also use these analysis options to analyze previously stored measurement data.

Amplitude Accuracy Considerations

For measurements above 2 GHz, a function called Preselector Peaking needs to be performed in order to insure accurate amplitude measurements. The Preselector Peaking routine will align the HP 8566B spectrum analyzer's preselector filters for proper operation. The internal analyzer routine adjusts the analyzer's preselector filters for maximum amplitude at the current active marker position. Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information.

In order to minimize the amplitude error possibilities, when applicable, the spectrum analyzer is preselector peaked at each "at peak" marker reading. The preselector filter is reset to its nominal setting after each "at peak" measurement. The filter is also set to its nominal setting after every "over span" measurement, as well as when invoking `MEASURE`. The analyzer's preselector filter's nominal value is factory selected by determining the best filter settings for each internal frequency band above 2 GHz. Be aware of amplitude inaccuracies when measuring noisy, intermittent, or modulated signals and performing the Preselector Peak function.

The remainder of this chapter describes each of the pre-measurement and data analysis options available with this software.

Pre-Measurement Options

When entering the measure portion of the program by pressing the MEASURE softkey at the program top level, a set of softkeys as shown in Figure 7-1 appears on your computer display.

After pressing the MEASURE softkey, from the program top level, a display similar to Figure 7-1 appears on your computer.

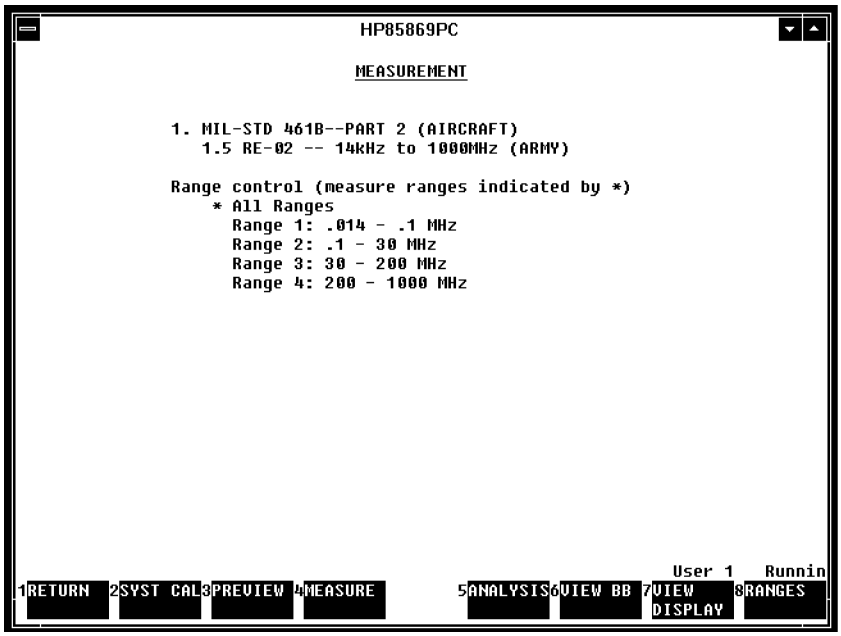


Figure 7-1. Pre-measurement Options Menu

RETURN — is used to discontinue the measure portion of the program and return the program to the previous level.

SYST CAL — performs a two-step system calibration on the spectrum analyzer and preselector connected to the equipment configuration.

PREVIEW — places the spectrum analyzer in local control and allows verification of the currently used test setup parameters. This function views a single measurement range at a time or all ranges along with the test limits. It is also useful for viewing the relative difference between a signal and a test limit.

MEASURE — initiates the measurement process.

ANALYSIS — brings up a set of analysis options used to analyze measurement data. You can also use this analysis option to analyze previously stored measurement data.

`VIEW BB` and

`VIEW NB` softkeys bring either the broadband or the narrowband test results to the spectrum analyzer display for inspection.

These softkeys are available only when the test type, in the test setup table, is NB/BB or BB AUTO. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

`VIEW SA` offers options that can be used for changing the traces that are visible on the spectrum analyzer's display.

This softkey is available only when the test type, in the test setup table, is Peak or Peak/Log Average. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

`VIEW DISPLAY` reproduces the spectrum analyzer display on the computer display. If the measurement results have been loaded from the data library, graphical representation of the resultant trace along with the measurement results are reproduced even if the spectrum analyzer is not connected to the system.

`RANGES` specifies the measurement ranges that will be measured during a selected test. Measurement ranges are designated by the setup table for each test. Each setup table can have from 1 to 20 ranges. This program measures all ranges by default unless this default is modified before a measurement.

The remainder of this chapter presents detailed information and examples of how to use each of the pre-measurement and data analysis options. Pre-measurement options are presented first which are then followed by data analysis options.

System Calibration

The SYST CAL softkey performs a two-step system calibration on the spectrum analyzer and preselector connected to the equipment configuration.

Example To use the system calibration function:

1. Press MEASURE at the program top level.
2. Press SYST CAL at the first level softkeys.

   Follow the prompts on the computer display to continue or use the ABORT softkey to terminate the SYST CAL function.

A system calibration is performed in two steps.

First, a spectrum analyzer calibration is performed using the built-in settings of registers 8 and 9. Refer to the spectrum analyzer manual for more detailed information.

Next, if an HP 85685A RF preselector is in the system and not in bypass, a preselector calibration is performed. All ranges and portions of ranges above 200 kHz are calibrated using the preselector's comb generator output. Connections are made manually, following the directions on the computer's display. Calibration data is stored by this program and applied at measurement time. For maximum measurement accuracy, it is recommended that system calibration be performed frequently.

See Also

- "System Calibration" in Chapter 10

Preview

The PREVIEW softkey places the spectrum analyzer in local control and allows for verification of the currently used test setup parameters. This function views all ranges or a single measurement range at a time along with the test limits. It is also useful for viewing the relative difference between a signal and a test limit.

After selecting the PREVIEW softkey, from the pre-measurement options menu, a display similar to Figure 7-2 appears on your computer.

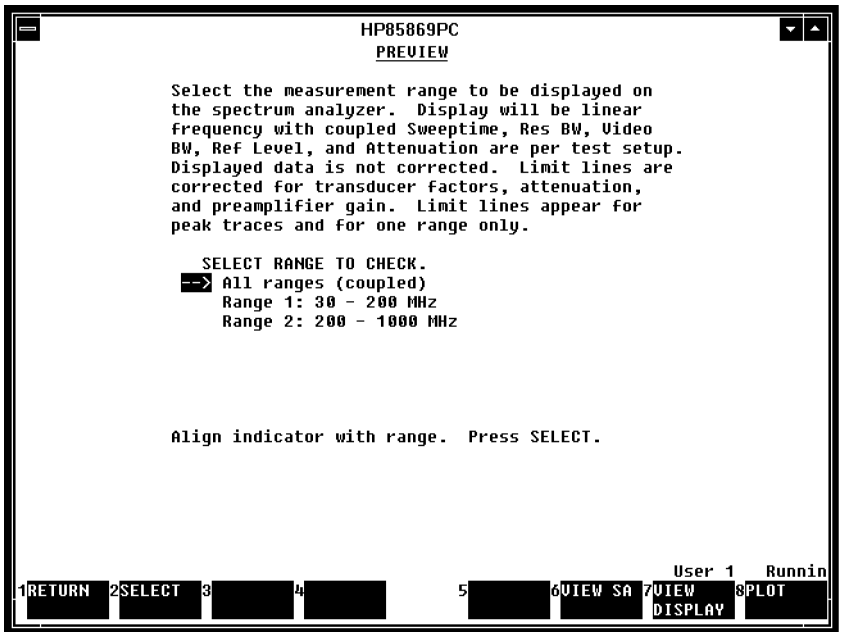


Figure 7-2. Preview Options Menu

RETURN — is used to discontinue the Preview function and return the program to the previous level.

SELECT — sets the spectrum analyzer to remote, selects a frequency range to be previewed, and displays a test limit line on the spectrum analyzer.

LOCAL — returns the spectrum analyzer to local mode and removes the test limit line from the spectrum analyzer display.

VIEW BB and VIEW NB — softkeys bring either the broadband or the narrowband test results to the spectrum analyzer display for inspection.

These softkeys are available only when the test type, in the test setup table, is NB/BB or BB AUTO. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

`VIEW SA` offers options that can be used for changing the traces that are visible on the spectrum analyzer's display.

This softkey is available only when the test type, in the test setup table, is Peak or Peak/Log Average. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

`VIEW DISPLAY` reproduces the spectrum analyzer display on the computer display. If the measurement results have been loaded from the data library, graphical representation of the resultant trace along with the measurement results are reproduced even if the spectrum analyzer is not connected to the system.

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` and then press `PLOT`.

Example To use the preview function:

1. Press `MEASURE` at the program top level.
2. Press `PREVIEW` at the first level softkeys.

   After pressing the `PREVIEW` softkey, a display similar to Figure 7-2 appears on your computer.
3. Align the indicator at the desired range or leave the indicator positioned next to All Ranges.

   You can choose to display the whole frequency range or only a portion of the measurement frequency range.
4. Press `SELECT` and a modified test limit line appears on the spectrum analyzer.

Note

- Previewing All Ranges: If all ranges are selected from the preview menu, then the resolution bandwidth, video bandwidth, and attenuation are automatically coupled. When the spectrum analyzer is in this state, check for possible measurement problems such as gain compression, harmonic distortion, improper reference level, or incorrect frequency range. You could also, for example, adjust the antenna height for maximum signal amplitude to ensure that your measurement setup is adjusted so that "worst-case" measurements can be made.

  If all ranges are selected, a test limit line cannot be viewed.

  If all ranges are being previewed or no limits exist, the spectrum analyzer is set to local control. Otherwise, the limits, as defined by the setup table, will be displayed on the spectrum analyzer display and a `LOCAL` softkey is made available on the computer keyboard in order to regain local control.
- Previewing a Single Range: If a single range is selected, `PREVIEW` sets the spectrum analyzer's frequency range, resolution bandwidth, video bandwidth, and attenuation to the values specified in the test setup table for that range. The test limit lines are also adjusted according to the transducer and gain/loss factors.

See Also

- Chapter 8

Measure

CAUTION Noisy, intermittent, or modulated signals can cause repeatability problems. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations" found earlier in this chapter

The MEASURE softkey initiates the measurement process. If measured results exceed the spectrum analyzer reference level, signals will be plotted above the graticule of the output; this indicates invalid measurement results.

A measurement cannot be made unless the test setup table is complete. The test setup table can be completed quickly by loading a file from the test library. Otherwise, it can be completed in the setup portion of the program (refer to the "Test Library" in Chapter 6 for further information).

After selecting the MEASURE softkey, from the Pre-measurement Options menu, a display similar to Figure 7-3 appears on your computer.

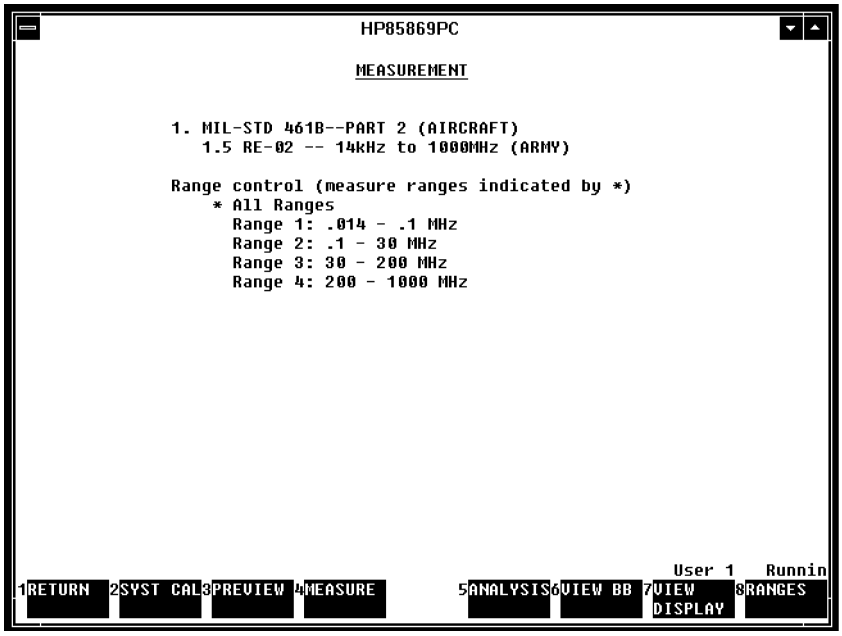


Figure 7-3. Measure Options Menu

Refer to "Pre-Measurement Options" for a description of the softkeys available on this menu.

Example To measure All Ranges:

1. Press MEASURE at the program top level.

   After pressing the MEASURE softkey, a display similar to Figure 7-3 appears on your computer.

2. To start the measurement, press the MEASURE softkey again and follow the prompts on the computer's display.

3. When measurements are complete, press CONTINUE to display data analysis options.

Example To measure selected ranges:

1. Press `MEASURE` at the program top level.

   After pressing the `MEASURE` softkey, a display similar to Figure 7-3 appears on your computer. When the measurement display appears, you can select to measure the whole frequency range or only a portion of the frequency range.

2. To measure only a portion of the frequency range, press the `RANGES` softkey.

3. Use the up and down arrow keys on the computer keyboard to align the indicator to the range that you want to measure then press `SELECT`.

   An asterisk appears next to enabled ranges. Any combination of ranges can be enabled at one time. Pressing the same key again disables that range.

4. Press `RETURN` after desired ranges are selected.

5. To start the measurement, press the `MEASURE` softkey a second time and follow the prompts on the computer's display.

   If you specified only a certain frequency range with the `RANGES` softkey, only that frequency range will be measured.

6. When measurements are complete, press `CONTINUE` to display data analysis options.

Note During normal operation while this program is controlling a measurement, the message `SRQ 104` may appear on the spectrum analyzer display. SRQ 104 is a service-request message that appears when the spectrum analyzer has completed a sweep and has measurement data to send to the computer. The `SRQ 104` message disappears when the computer accepts the data.

See Also

- "Data Analysis Options"
- "Ranges"
- "Running a Predefined Test" in Chapter 4

View Broadband and View Narrowband

The VIEW BB and VIEW NB softkeys bring either the broadband or the narrowband test results to the spectrum analyzer display for inspection.

These softkeys are available only when the test type, in the test setup table, is NB/BB or BB AUTO. Otherwise, these softkeys do not appear.

Example To use the view broadband and view narrowband functions:

1. Press MEASURE at the program top level.
2. Press VIEW BB or VIEW NB at the first level softkeys.

   When either of these softkeys are selected, the appropriate limit lines corresponding to broadband or narrowband are displayed on the spectrum analyzer's display.

See Also

- Chapter 5

View Spectrum Analyzer

The VIEW SA softkey offers options for changing the visible traces on the spectrum analyzer display.

This softkey is available only when the test type, in the test setup table, is Peak or Peak/Log Average. Otherwise, this softkey does not appear.

After selecting the VIEW SA softkey, from the pre-measurement options menu, a display similar to Figure 7-4 appears on your computer.

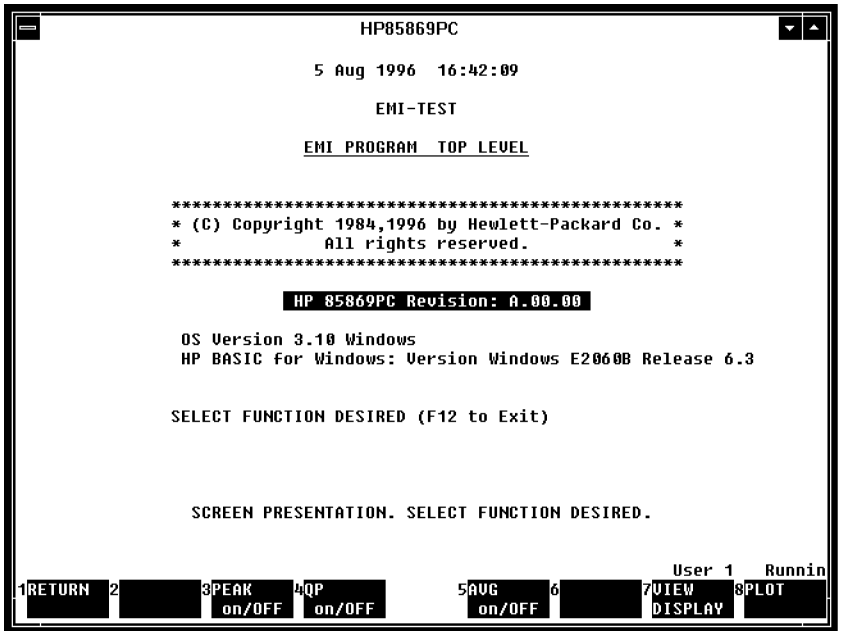


Figure 7-4. VIEW SA Softkeys

RETURN — is used to discontinue the VIEW SA function and return the program to the previous level.

PEAK on/OFF — turns the peak trace data on the spectrum analyzer's display on or off.

QP on/OFF — turns the quasi-peak trace data on the spectrum analyzer's display on or off.

AVG on/OFF — turns the averaged trace data on the spectrum analyzer's display on or off.

LAVG on/OFF — turns the log averaged trace data on the spectrum analyzer's display on or off. *This softkey is only displayed when the* PEAK LOG AVG *softkey is selected as the test type in the Test Setup Table.*

`VIEW DISPLAY` reproduces the spectrum analyzer display on the computer screen. If the measurement results have been loaded from the data library, the graphical representation of the resultant trace along with the measurement results are reproduced even if the spectrum analyzer is not connected to the system.

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` and then press `PLOT`.

Example To use the view spectrum analyzer function:

1. Press `MEASURE` at the program top level.
2. Press `VIEW SA` at the first level softkeys.

   After pressing the `VIEW SA` softkey, a set of softkeys, as shown in Figure 7-4, are available on your computer.

See Also

- Chapter 5
- Chapter 8

View Display

The VIEW DISPLAY softkey reproduces the spectrum analyzer display on the computer screen. If the measurement results have been loaded from the data library, the graphical representation of the resultant trace along with the measurement results are reproduced even if the spectrum analyzer is not connected to the system.

After selecting the VIEW DISPLAY softkey, from the pre-measurement options menu, a display similar to Figure 7-5 appears on your computer.

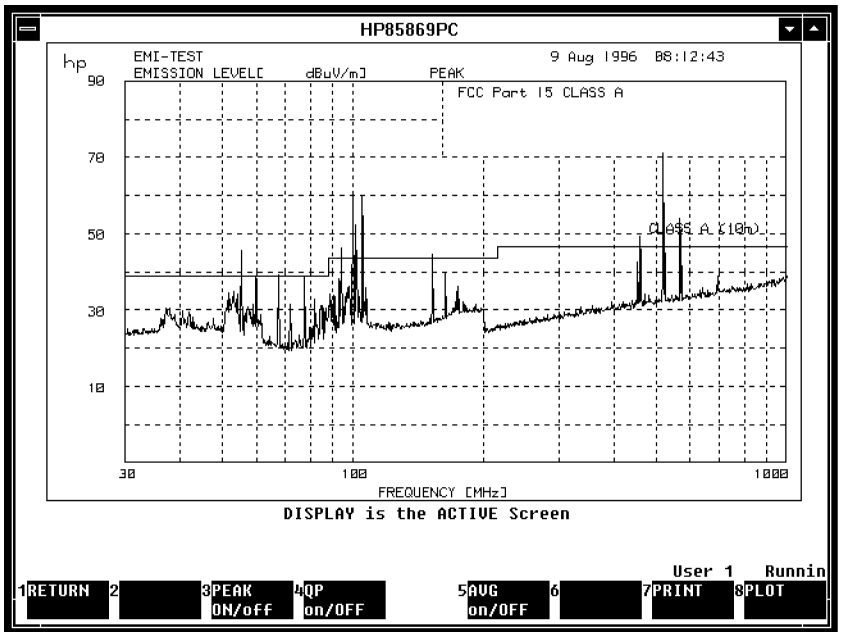


Figure 7-5. VIEW DISPLAY Softkeys

RETURN	is used to discontinue the VIEW SA function and return the program to the previous level.
PEAK on/OFF	turns the peak trace data on the spectrum analyzer's display on or off.
QP on/OFF	turns the quasi-peak trace data on the spectrum analyzer's display on or off.
AVG on/OFF	turns the averaged trace data on the spectrum analyzer's display on or off.
LAVG on/OFF	turns the log averaged trace data on the spectrum analyzer's display on or off. *This softkey is only displayed when the* PEAK LOG AVG *softkey is selected as the test type in the Test Setup Table.*

`PRINT` prints the current display on the system printer. If you are using a high-resolution monitor with this software, refer to Chapter 9 for information on configuring your system printer so that the entire display, of your high-resolution monitor, can be printed.

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` and then press `PLOT`.

Example To use the view display function:

1. Press `MEASURE` at the program top level.
2. Press `VIEW DISPLAY` at the first level softkeys.

   The spectrum analyzer is then reproduced on the computer display. Use the `PRINT` or `PLOT` softkeys to produce a hard copy.

See Also

- Chapter 8

Ranges

The RANGES softkey specifies measurement ranges that will be measured during a selected test. Measurement ranges are designated by the setup table for each test. Each setup table can have from 1 to 20 ranges. This program measures all ranges by default unless this default is modified before a measurement.

After selecting the RANGES softkey, from the pre-measurement options menu, a display similar to Figure 7-6 appears on your computer.

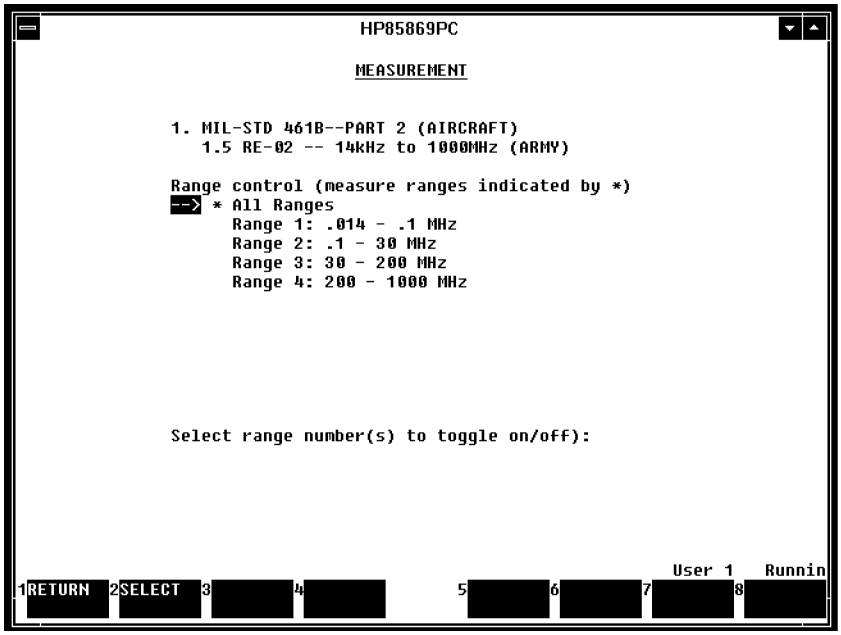


Figure 7-6. Ranges Option Menu

RETURN discontinues the ranges function and returns the program to the previous level.

SELECT selects a frequency range to be measured.

Example To use the ranges function:

1. Press MEASURE at the program top level.
2. Press RANGES at the first level softkeys.

   After pressing the RANGES softkey, a display similar to Figure 7-6 appears on your computer.
3. Use the up and down arrow keys on the computer keyboard to align the indicator at the desired range or leave the indicator positioned next to All Ranges then press SELECT.

   When a single range or ranges are selected, an asterisk appears next to enabled ranges. Any combination of ranges can be enabled at one time. Selecting the same range again disables that range. Selecting All Ranges also disables independently selected ranges and enables All Ranges.

See Also

- "Measure"

Data Analysis Options

The ANALYSIS softkey brings up a set of options used to analyze measurement data. You can also use these analysis options to analyze previously stored measurement data.

Some of the data analysis options operate on a segment of the original measurement range. In this case, the program asks you to define an analysis area with one or two markers. Markers appear on the spectrum analyzer display as small bright dots. The intensity of these bright dots can be adjusted with the intensity control on the spectrum analyzer's display.

After selecting the ANALYSIS softkey, from the pre-measurement options menu, a display similar to Figure 7-7 appears on your computer.

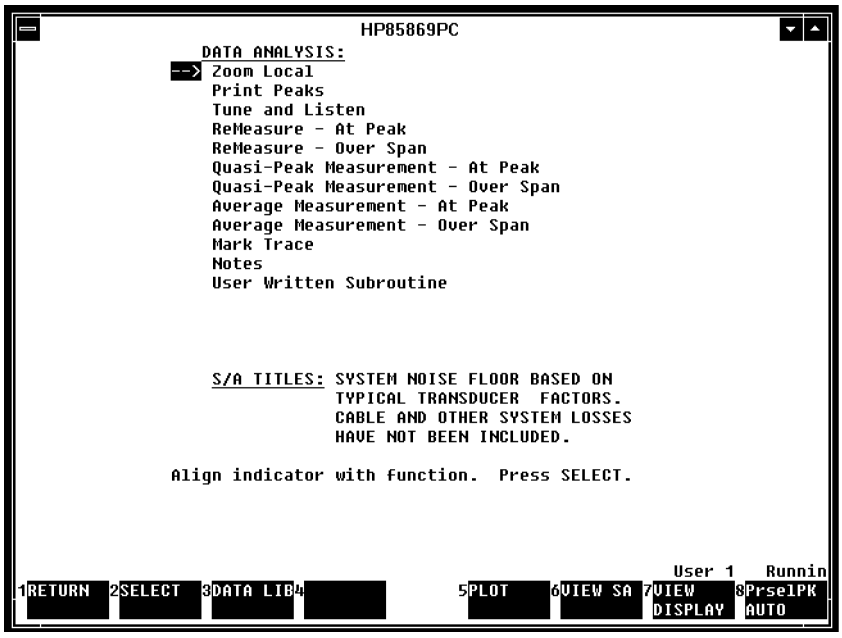


Figure 7-7. Data Analysis Options Menu

RETURN — is used to discontinue the ANALYSIS function and return the program to the previous level.

SELECT — enables any of the analysis or display options listed on the computer display at the second level. To enable an option, align the indicator, using the up and down arrow keys on the computer keyboard, with the desired option, then press SELECT.

DATA LIB — accesses the first level of the data library where data files containing measurement results are loaded and stored. When a data file is loaded, the test setup associated with the stored measurement results are loaded into the test setup table and the test results are displayed on the spectrum analyzer display. Unless previous test results are stored in the data library, they are lost when a new data file is loaded (refer to Chapter 6 for further information).

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` then press `PLOT`.

`VIEW BB` and

`VIEW NB` softkeys bring either the broadband or the narrowband test results to the spectrum analyzer display for inspection.

These softkeys are available only when the test type, in the test setup table, is NB/BB or BB AUTO. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

`VIEW SA` offers options that change the visible traces on the spectrum analyzer's display.

This softkey is available only when the test type, in the test setup table, is Peak or Peak/Log Average. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

`VIEW DISPLAY` reproduces the spectrum analyzer display on the computer display. If the measurement results have been loaded from the data library, the graphical representation of the resultant trace along with the measurement results are reproduced even if the spectrum analyzer is not connected to the system.

`PrselPK AUTO` toggles between preselector peaking AUTO, MANUAL, or OFF. Use `PrselPK AUTO` to automatically detect the highest signal and preselector peak on that signal. `PrselPK MAN` stops the program and prompts the user to use the spectrum analyzer's front-panel knob to achieve maximum trace display. `PrselPK OFF` turns preselector peaking off. When a `MEASURE` is performed, the program defaults to `PrselPK AUTO`.

This softkey is available only with the HP 8566B spectrum analyzer or HP 8571/8572 EMI receivers.

Note The application's preselector peaking routine aligns the HP 8566B spectrum analyzer's preselector filters for proper operation. The internal analyzer routine adjusts the analyzer's preselector filters for maximum amplitude at the current active marker position.

Example To use the data analysis function:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.

   After pressing the `ANALYSIS` softkey, a display similar to Figure 7-7 appears on your computer.
3. Align the indicator with a data analysis option and press the `SELECT` softkey to enable it. Refer to the following sections for information on how to use these data analysis options.

See Also

- "Example of Analyzing Measurement Data" in Chapter 4

Zoom Local

The Zoom Local analysis option takes a closer look at signals of interest by narrowing the spectrum analyzer's frequency span and zooming in on a frequency range that is determined by the placement of two markers. In this way, the Zoom Local analysis option can be used to pinpoint EMI sources in equipment under test (EUT). The user can then monitor EMI levels on a spectrum analyzer display while changing the test setup or modifying the EUT.

The Zoom Local analysis option also places the spectrum analyzer in local control so that front-panel controls may be altered to aid in analysis.

Note Instruments can be put in local control at most locations by calling the User_sub subroutine with the LOCAL parameter. Details on the User_sub subroutine can be found in Appendix B.

After selecting the Zoom Local option, from the data analysis options menu, a display similar to Figure 7-8 appears on your computer.

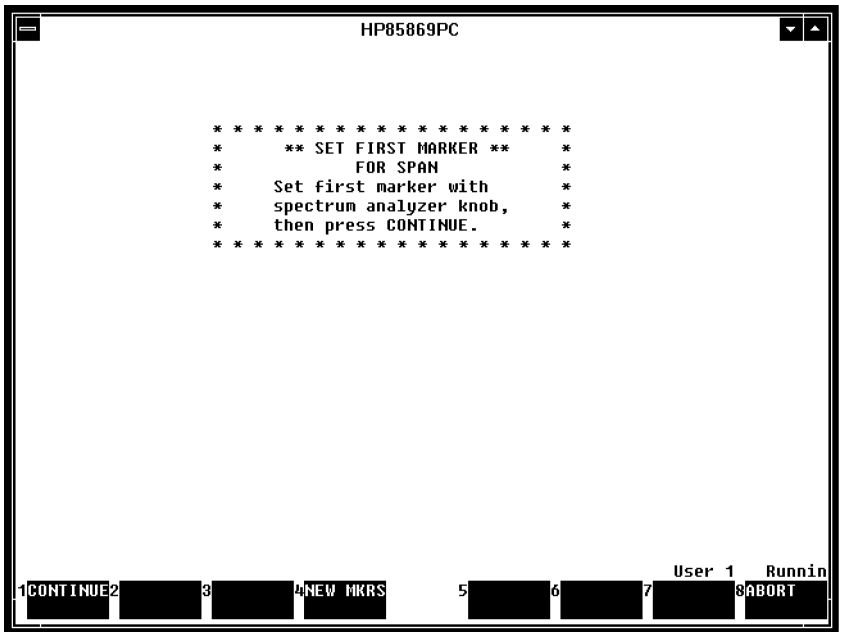


Figure 7-8. Setting First Zoom Local Marker

`CONTINUE` sets the marker then continues to the next setting.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving the function.

`ABORT` aborts the Zoom Local analysis option and returns to the data analysis menu.

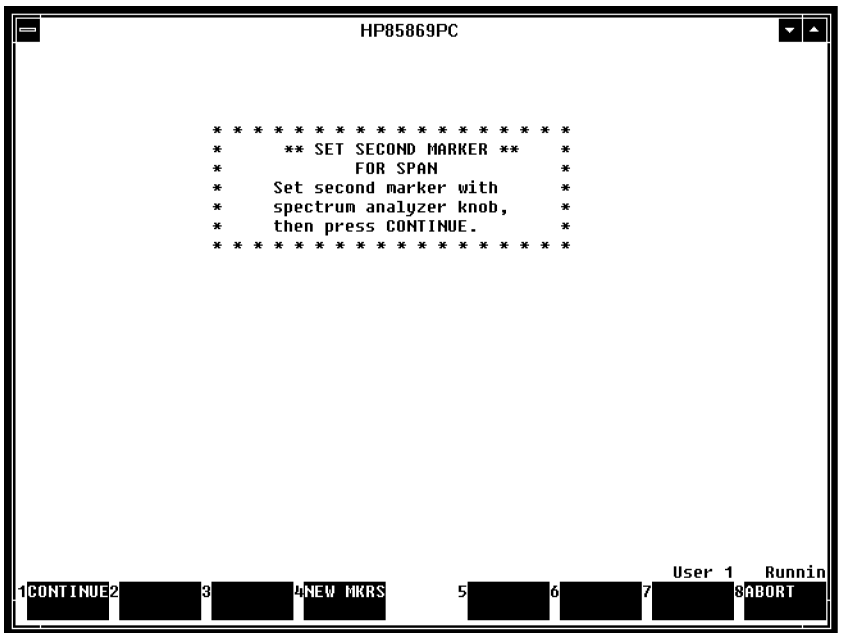


Figure 7-9. Setting Second Zoom Local Marker

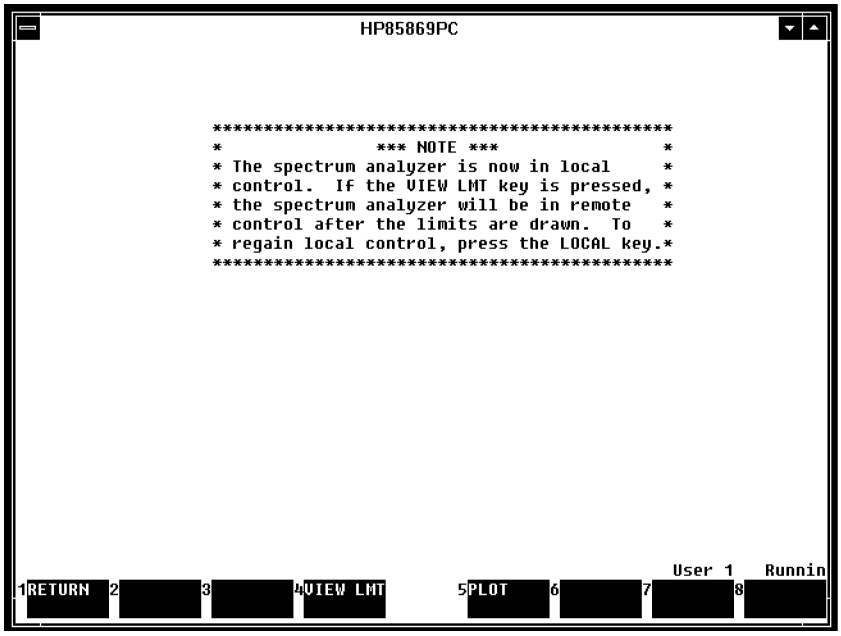


Figure 7-10. Zoom Local Options Menu

`RETURN` discontinues the Zoom Local analysis option and return the program to the previous level.

`LOCAL` returns the spectrum analyzer to local control and erases the test limit lines.

`VIEW LMT` draws composite test limit lines on the spectrum analyzer display and sets the spectrum analyzer to remote mode. The test limit lines are adjusted according to the transducer factors, gain/loss factors, external attenuation, and broadband correction factors if applicable.

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` then press `PLOT`.

Unlike the measurement data which is corrected for transducer factor, preamplifier gain, cable loss, and external attenuation, the Zoom/Local analysis mode display is uncorrected and the amplitude scale is dBμV. However, the relative difference between a signal and a composite test limit line can be easily viewed by pressing the `VIEW LMT` softkey. To return the spectrum analyzer to local control, after viewing the limit line, press the `LOCAL` softkey; this also erases the test limit line on the spectrum analyzer display.

Example Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Zoom Local analysis option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Zoom Local analysis option and press `SELECT`. After pressing the `SELECT` softkey, a display similar to Figure 7-8 appears on your computer.
4. After reading the prompt on the computer display, use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on the display and press the `CONTINUE` softkey. This marker sets the first end of the range that you are analyzing.

   A marker is already enabled on the spectrum analyzer, so, all you need to do is move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.
5. After setting the first marker on the spectrum analyzer display, a second prompt on the computer display signals you to set another marker. Again, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, in the same frequency range, and press `CONTINUE` on the computer keyboard. This marker sets the second end of the range that you are analyzing.

   The frequency span of the spectrum analyzer display is then zoomed in between the two points that the markers were set to.

   If a warning message appears when trying to set the markers, refer to "If markers are not set in the same range" in Appendix A.

   At this point, the spectrum analyzer is in local control and all spectrum analyzer functions are available to perform further analysis.

See Also

- "Example of Analyzing Measurement Data" in Chapter 4
- "Tune and Listen"

Print Peaks

The Print Peaks analysis option generates a table of data that is determined by the parameters specified in the Print Peaks menu. The data in the table is a list of signals that are above a specified (user-defined) threshold or offset to a limit line. These signal amplitudes can be sorted by amplitude, frequency, or delta-to-limit and output to a printer, the computer display, or an ASCII file.

Peak criteria is the amount the amplitude rises and falls in order to be considered a peak. Peak criteria can be changed from its default of 6 dB. Depending on available traces, either peak, quasi-peak, average, or log average, amplitudes and frequencies can be listed using the print peaks menu. All of these options are available by setting up a table as shown in Figure 7-11.

After selecting the Print Peaks option, from the data analysis options menu, a display similar to Figure 7-11 appears on your computer.

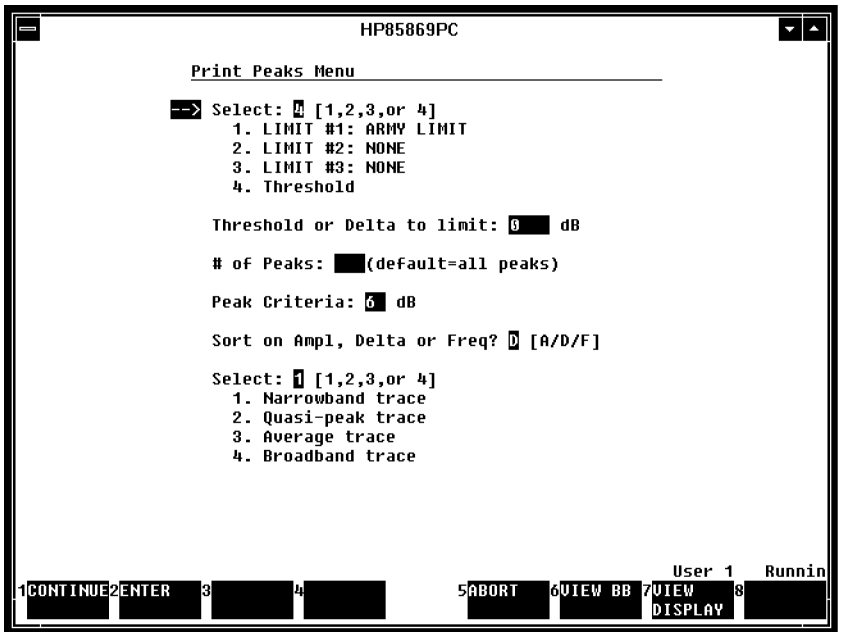


Figure 7-11. Print Peaks Options Menu

`CONTINUE` executes the sort routine selected on the Print Peaks menu.

`ENTER` press this softkey after entering information in the highlighted data entry field.

`ABORT` aborts the Print Peaks analysis option before displaying the peaks.

`VIEW BB` and

`VIEW NB` softkeys bring either the broadband or the narrowband test results to the spectrum analyzer display for inspection.

These softkeys are available only when the test type, in the test setup table, is NB/BB or BB AUTO. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

VIEW SA

offers options that can be used for changing the traces that are visible on the spectrum analyzer's display.

This softkey is available only when the test type, in the test setup table, is Peak or Peak/Log Average. Otherwise, this softkey does not appear (refer to Chapter 5 for further information).

VIEW DISPLAY

reproduces the spectrum analyzer display on the computer display. If the measurement results have been loaded from the data library, the graphical representation of the resultant trace along with the measurement results are reproduced even if the spectrum analyzer is not connected to the system.

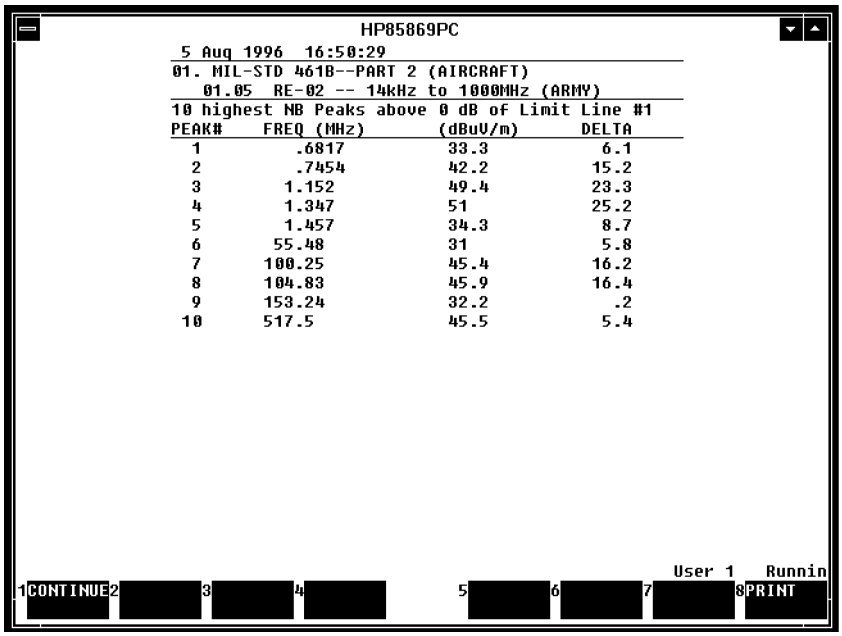


Figure 7-12. Example of Print Peaks Data

CONTINUE

returns to the data analysis menu.

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the default settings of the Print Peaks analysis option:

1. Press MEASURE at the program top level.
2. Press ANALYSIS at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Print Peaks analysis option then press SELECT.

   After pressing the SELECT softkey, a display similar to Figure 7-11 appears on your computer.
4. Press the CONTINUE softkey to initiate the Print Peaks analysis option (refer to Figure 7-12 for an example of the displayed result).

Example To modify or use the Print Peaks analysis option, perform the following procedure:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Print Peaks analysis option then press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-11 appears on your computer.
4. Use the up and down arrow keys on the computer keyboard to skip to different lines and press the `ENTER` softkey after each entry.
5. If a limit line is selected (for example, 1, 2, or 3), enter an offset to the limit on the Threshold or Delta-to-limit line.

   For example, if all peaks greater than 10 dB below the limit line are to be displayed, type `-10`, then press the the `ENTER` softkey.
6. If a threshold is selected, option 4 as shown in Figure 7-11, enter the amplitude value. The units value of the Threshold or Delta-to-limit is assumed to be the same as the current spectrum analyzer amplitude scale.
7. The maximum number of peaks printed can be altered. For instance, if many peaks fit the selected criteria, but only the 10 highest are desired, enter 10 for the # of peaks entry. If less than 10 peaks fit the criteria, the list will reflect only those that are found.
8. Once the parameters have been specified, press the `CONTINUE` softkey to initiate the Print Peaks analysis option (refer to Figure 7-12 for an example of the displayed result).

Tune and Listen

Use the Tune and Listen analysis option to distinguish ambient transmissions, such as radio stations, from signals generated by the equipment under test (EUT). This data analysis option sets up the spectrum analyzer as a fixed-tuned receiver so that EMI transmissions in the audio frequency range can be heard on the quasi-peak adapter's speaker.

After selecting the Tune and Listen option, from the data analysis options menu, a display similar to Figure 7-13 appears on your computer.

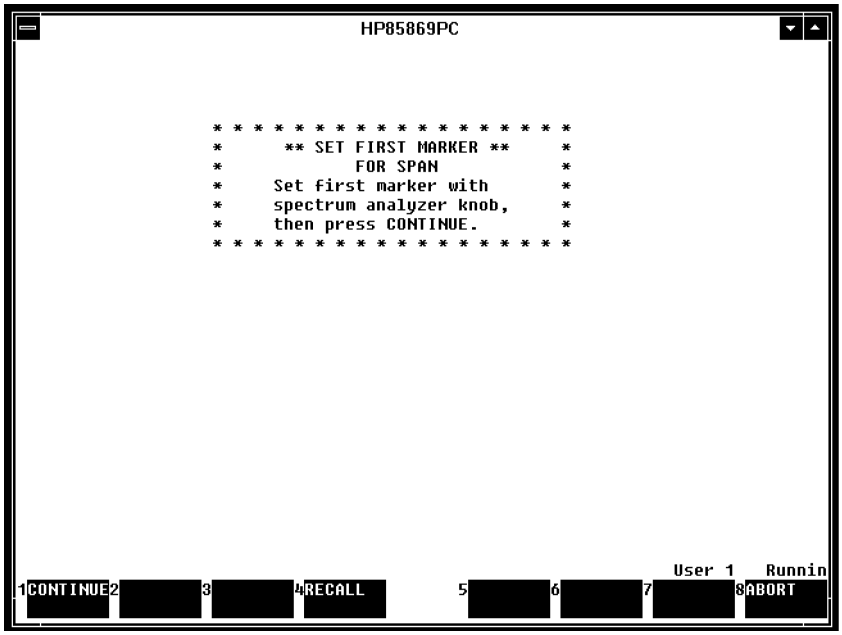


Figure 7-13. Setting First Tune and Listen Marker

`CONTINUE` sets the first markers then continues to the next screen.

`RECALL` recalls the positions of the markers that were set in the previous Tune and Listen analysis.

`ABORT` aborts the Tune and Listen analysis option and returns to the data analysis menu.

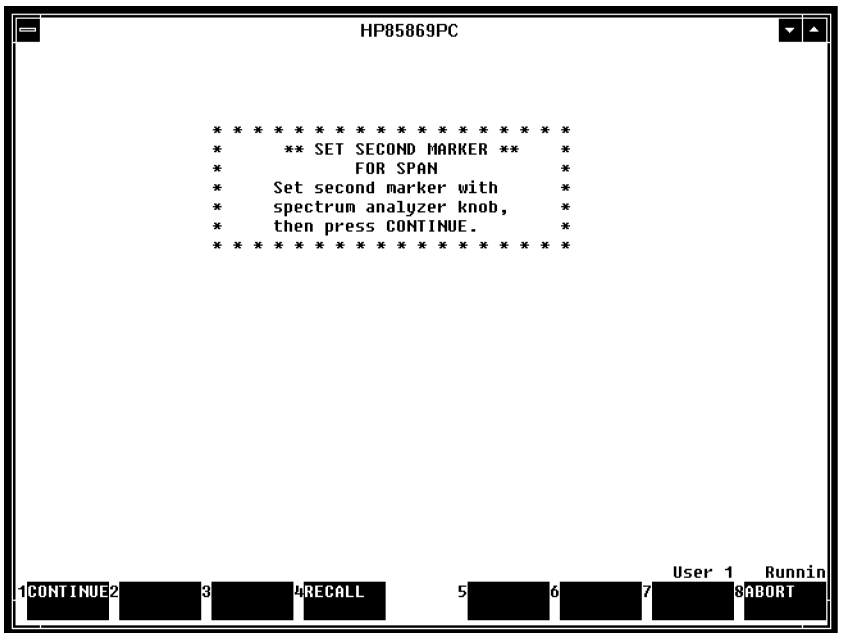


Figure 7-14. Setting Second Tune and Listen Marker

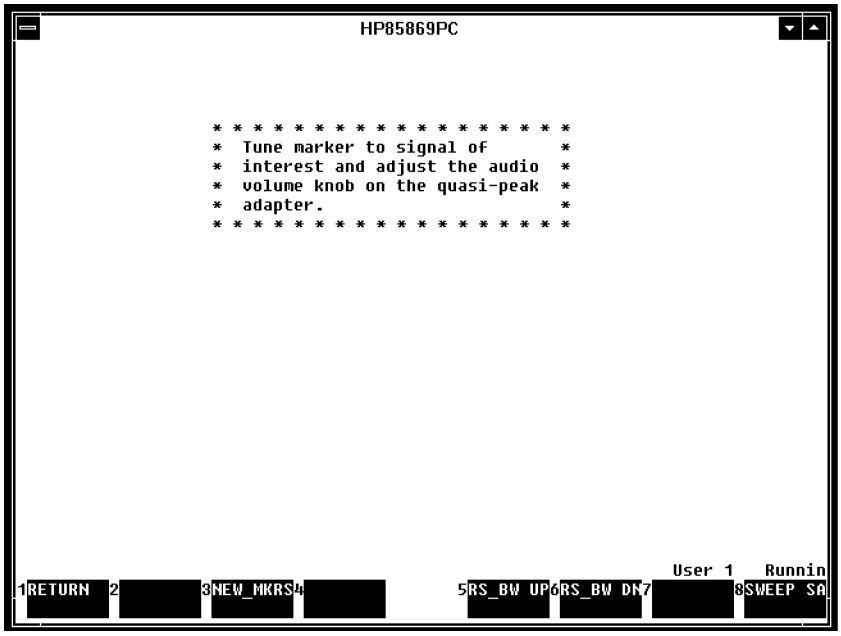


Figure 7-15. Tune and Listen Options Menu

`RETURN` discontinues the Tune and Listen analysis option and returns the program to the previous level.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving this function.

`RS_BW UP` widens the spectrum analyzer resolution bandwidth.

`RS_BW DN` narrows the spectrum analyzer resolution bandwidth.

`SWEEP SA` performs a single sweep on the spectrum analyzer.

Example Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Tune and Listen analysis option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Tune and Listen analysis option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-13 appears on your computer.
4. After reading the prompt on the computer display, use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on the display and press the `CONTINUE` softkey. This marker sets the first end of the range that you are analyzing.
5. After setting the first marker on the spectrum analyzer display, a second prompt on the computer display signals you to set another marker. Again, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, in the same frequency range, and press the `CONTINUE` softkey. This marker sets the second end of the range that you are analyzing.

   If a warning message appears when trying to set the markers, refer to "If markers are not set in the same range" in Appendix A.
6. After the frequency span of the spectrum analyzer is narrowed (spans down) to the range of interest, retune a marker to any signal on the spectrum analyzer display and adjust the audio volume knob on the quasi-peak adapter to listen to the signal.

ReMeasure - At Peak

CAUTION Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations" found earlier in this chapter.

The ReMeasure - At Peak analysis option is used to remeasure a signal using the peak detector at a selected frequency determined by the placement of a marker.

There are two modes that the ReMeasure - At Peak analysis option can be used in: auto-mode and manual-mode.

In auto-mode, the user can set a marker to a point on the spectrum analyzer display within the start and stop frequencies specified in the test setup table. The spectrum analyzer zooms to a narrower span (reduced span) and determines the highest signal in the frequency span by performing a max-hold then a marker-to-peak. Then, a re-measure is performed at the frequency that was determined to be the highest peak.

In manual-mode, the user can set a marker to a point on the spectrum analyzer display within the start and stop frequencies specified in the test setup table. The spectrum analyzer zooms to a narrower span (reduced span) and determines the highest signal in the frequency span by performing a max-hold then a marker-to-peak. Then, before a remeasure is performed at the marker frequency, the user can adjust the marker to a different frequency within the reduced span. After adjusting the marker to a new frequency and pressing the `CONTINUE` softkey, a remeasure is performed at the new marker frequency.

After selecting the ReMeasure - At Peak option, from the data analysis options menu, a display similar to Figure 7-16 appears on your computer.

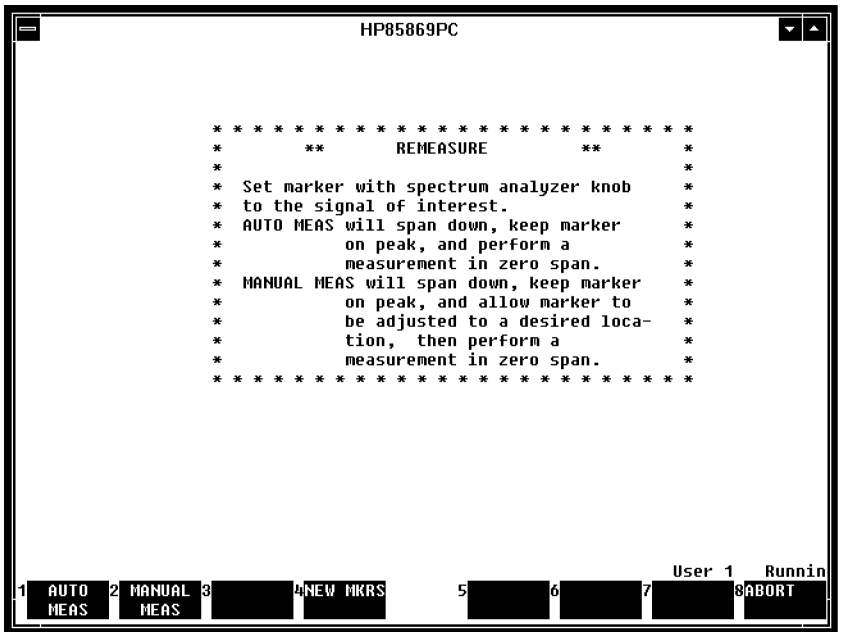


Figure 7-16. ReMeasure - At Peak Option Menu

AUTO MEAS — performs an automatic ReMeasure. This mode narrows the frequency span of the spectrum analyzer (spans down) while keeping a marker set on the highest peak found then performs a remeasure in zero span at the marker frequency.

MANUAL MEAS — performs a manual ReMeasure. This mode narrows the frequency span of the spectrum analyzer (spans down) while keeping a marker set on the highest peak found. Before performing a ReMeasure in zero span at the marker frequency, the user can adjust the marker frequency within the displayed frequency range.

NEW MKRS — allows you to reset the markers on the spectrum analyzer screen without leaving the function.

ABORT — aborts the ReMeasure - At Peak analysis option and returns to the data analysis menu.

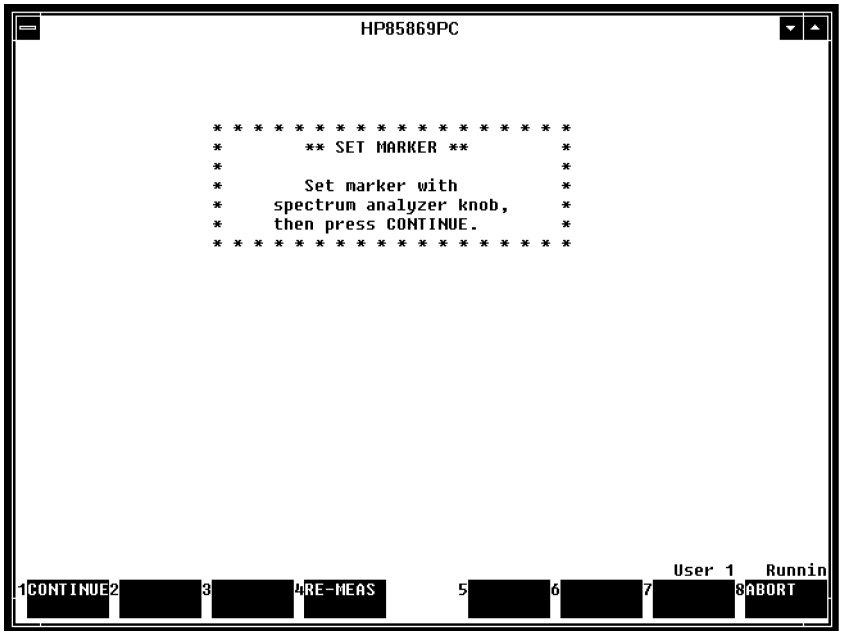


Figure 7-17. Manual Mode using the ReMeasure - At Peak Option

CONTINUE — proceeds with a manual ReMeasure after manually adjusting a marker to a new signal of interest.

RE-MEAS — repeats a ReMeasure before the test has completed. This function uses the previous marker that was defined.

ABORT — aborts the ReMeasure - At Peak analysis option and returns to the data analysis menu.

Example Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the ReMeasure - At Peak analysis option in auto-mode:

1. Press MEASURE at the program top level.
2. Press ANALYSIS at the first level softkeys.

3. Use the up and down arrow keys on the computer keyboard to align the indicator with the ReMeasure - At Peak analysis option then press SELECT.

   After pressing the SELECT softkey, a display similar to Figure 7-16 appears on your computer.

4. After reading the prompt on the computer display, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, then press the AUTO MEAS softkey.

   A marker is already enabled on the spectrum analyzer, so, all you need to do is move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.

   After the remeasurement is performed, your computer's display is updated and the VIEW SA function is activated.

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the ReMeasure - At Peak analysis option in manual-mode:

1. Press MEASURE at the program top level.
2. Press ANALYSIS at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the ReMeasure - At Peak analysis option then press SELECT.

   After pressing the SELECT softkey, a display similar to Figure 7-16 appears on your computer.

4. After reading the prompt on the computer display, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, then press the MANUAL MEAS softkey.

   A marker is already enabled on the spectrum analyzer, so, all you need to do is move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.

5. Tune the marker to some point on the spectrum analyzer and press the MANUAL MEAS softkey.
6. After reading the screen prompt on the computer display, adjust the marker to place it on a new signal of interest and press the CONTINUE softkey to perform a re-measurement at the new marker frequency.

   After the re-measurement is performed, your computer display is updated and the VIEW SA function is activated.

See Also

- "View Spectrum Analyzer"

ReMeasure - Over Span

CAUTION Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations".

The ReMeasure - Over Span analysis option is used remeasure a frequency span that is delimited by two markers using the peak detector.

All or part of the original frequency range can be retested, but the re-measurement is usually performed only in areas of the original peak measurement that are close to or exceed the test limit.

After selecting the ReMeasure - Over Span option, from the data analysis options menu, a display similar to Figure 7-18 appears on your computer.

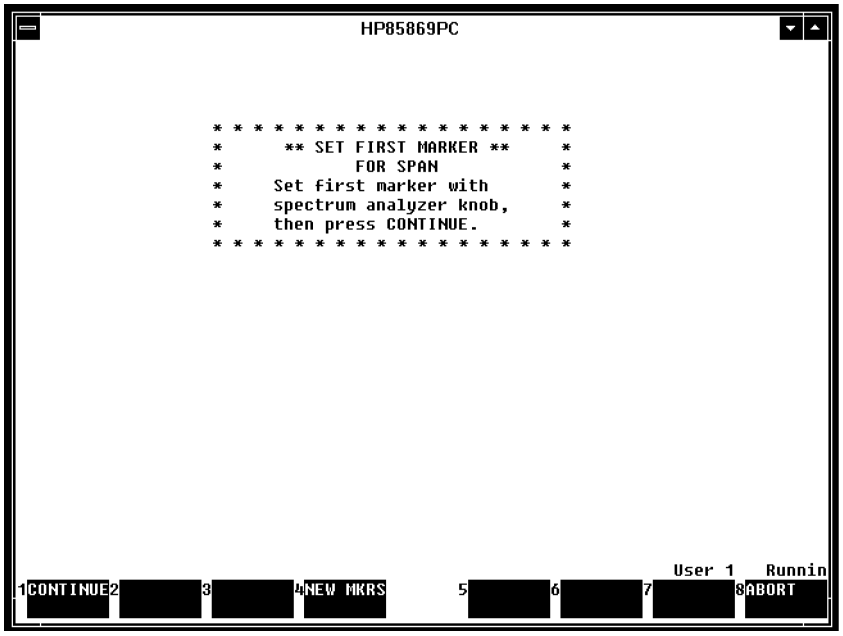


Figure 7-18. Setting First Marker for ReMeasure - Over Span

`CONTINUE` returns to the data analysis menu.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving the function.

`ABORT` aborts the ReMeasure - Over Span analysis option and returns to the data analysis menu.

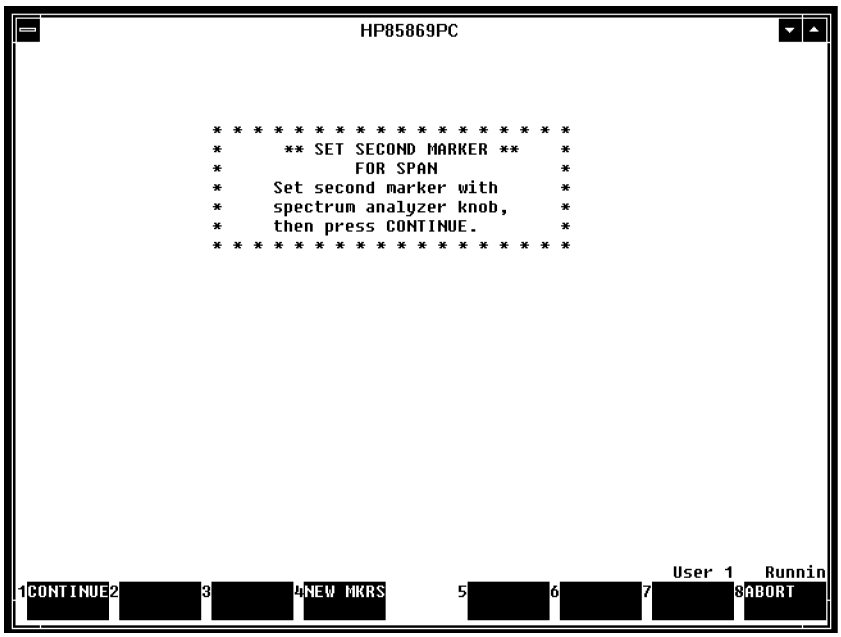


Figure 7-19. Setting Second Marker for ReMeasure - Over Span

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the ReMeasure - Over Span analysis option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Using the up and down arrow keys on the computer keyboard, align the indicator with the ReMeasure - Over Span analysis option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-18 appears on your computer.

4. After reading the prompt on the computer display, use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on the display and press the `CONTINUE` softkey. This marker sets the first end of the range that you are analyzing.

   A marker is already enabled on the spectrum analyzer, so, all you need to do is move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.

5. After setting the first marker on the spectrum analyzer display, a second prompt (similar to Figure 7-19) on the computer display asks you to set another marker. Again, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, in the same frequency range, and press `CONTINUE` on the computer keyboard. This marker sets the second end of the range that you are analyzing. For faster results, indicate the smallest range possible.

   If a warning message appears when trying to set the markers, refer to "If markers are not set in the same range" in Appendix A.

   After the re-measurement is performed, your computer display is updated and the `VIEW SA` function is activated.

See Also

- "View Spectrum Analyzer"

Quasi-Peak Measurement - At Peak

CAUTION Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations".

The Quasi-Peak Measurement - At Peak analysis option is used to perform a quasi- peak measurement at a selected frequency that is determined by the placement of a marker.

There are two modes that the Quasi-Peak Measurement - At Peak analysis option can be used in: auto-mode and manual-mode.

In auto-mode, the user can set a marker to a point on the spectrum analyzer display within the start and stop frequencies specified in the test setup table. The spectrum analyzer zooms to a narrower span (reduced span) and determines the highest signal in the frequency span by performing a max-hold then a marker-to-peak. Then, a quasi-peak measurement is performed at the frequency that was determined to be the highest peak.

In manual-mode, the user can set a marker to a point on the spectrum analyzer display within the start and stop frequencies specified in the test setup table. The spectrum analyzer zooms to a narrower span (reduced span) and determines the highest signal in the frequency span by performing a max-hold then a marker-to-peak. Then, before a quasi-peak measurement is performed at the marker frequency, the user can adjust the marker to a different frequency within the reduced span. After adjusting the marker to a new frequency and pressing the `CONTINUE` softkey, a quasi-peak measurement is performed at the new marker frequency.

Note If BYPASS is specified for the Quasi-Peak Bw parameter in the test setup table, a quasi-peak measurement cannot be performed.

After selecting the Quasi-Peak Measurement - At Peak option, from the data analysis options menu, a display similar to Figure 7-20 appears on your computer.

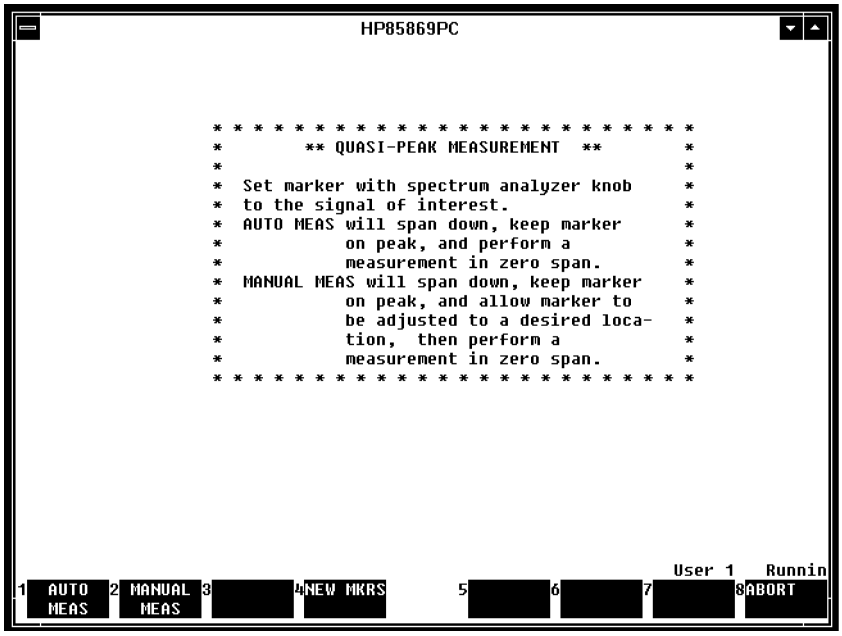


Figure 7-20. Quasi-Peak Measurement - At Peak Option Menu

`AUTO MEAS` performs an automatic quasi-peak measurement. This mode narrows the frequency span of the spectrum analyzer (spans down) while keeping a marker set on the highest peak found then performs a quasi-peak measurement in zero span at the marker frequency.

`MANUAL MEAS` performs a manual quasi-peak measurement. This mode narrows the frequency span of the spectrum analyzer (spans down) while keeping a marker set on the highest peak found. Before performing a quasi-peak measurement in a zero span at the marker frequency, the user can adust the marker frequency within the displayed frequency range.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving the function.

`ABORT` aborts the Quasi-Peak Measurement - At Peak analysis option and returns to the data analysis menu.

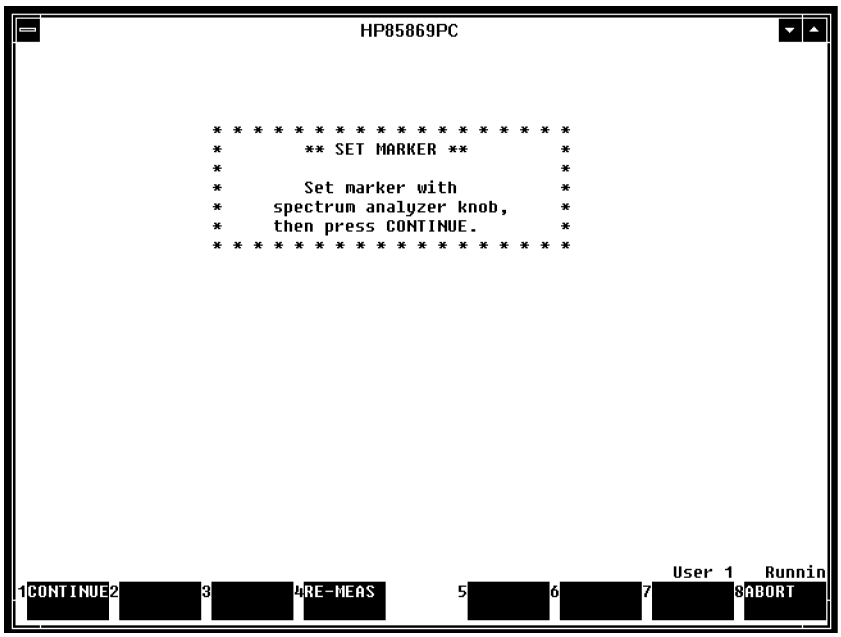


Figure 7-21. Manual Mode using the Quasi-Peak Measurement - At Peak Option

`CONTINUE` proceeds with a manual quasi-peak measurement after manually adjusting a marker to a new signal of interest.

`RE-MEAS` repeats a quasi-peak measurement before the test has completed. This function uses the previous marker that was defined.

`ABORT` aborts the Quasi-Peak Measurement - At Peak analysis option and returns to the data analysis menu.

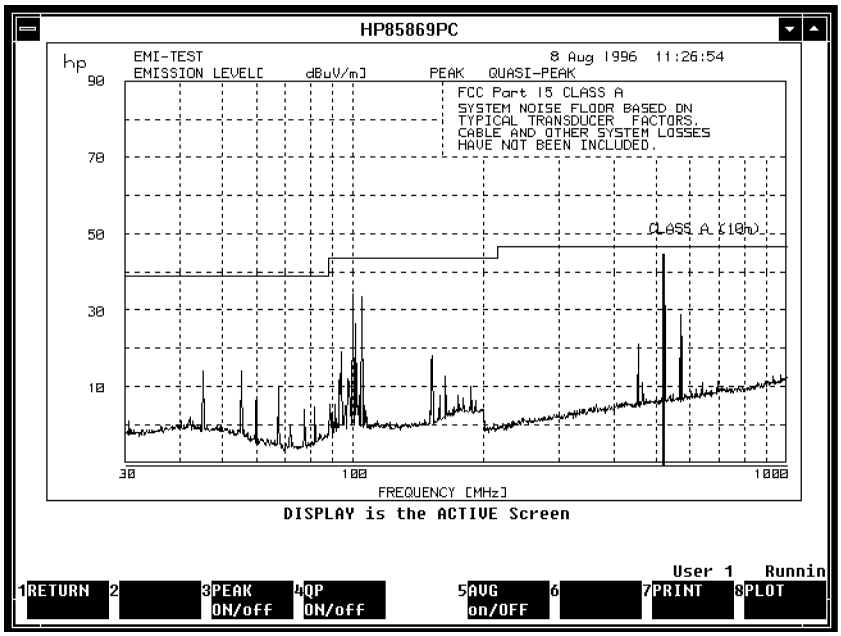


Figure 7-22. Quasi-Peak Display at Marker

`RETURN` is used to discontinue the VIEW SA function and return the program to the previous level.

`PEAK on/OFF` turns the peak trace data on the spectrum analyzer's display on or off.

`QP on/OFF` turns the quasi-peak trace data on the spectrum analyzer's display on or off.

`AVG on/OFF` turns the averaged trace data on the spectrum analyzer's display on or off.

`LAVG on/OFF` turns the log averaged trace data on the spectrum analyzer's display on or off. *This softkey is only displayed when the* `PEAK LOG AVG` *softkey is selected as the test type in the Test Setup Table.*

`PRINT` prints the current display on the system printer.

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` and then press `PLOT`.

Example Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Quasi-Peak Measurement - At Peak analysis option in auto-mode:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Quasi-Peak Measurement - At Peak analysis option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-20 appears on your computer.
4. After reading the prompt on the computer display, press the `AUTO MEAS` softkey and use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on its display.

   Since a marker is already enabled on the spectrum analyzer, just move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.

   After the quasi-peak measurement is performed, your computer's display is updated and the `VIEW SA` function is activated.

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Quasi-Peak Measurement - At Peak analysis option in manual-mode:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Quasi-Peak Measurement - At Peak analysis option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-20 appears on your computer.
4. After reading the prompt on the computer display, press the `MANUAL MEAS` softkey and use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on its display.

   Since a marker is already enabled on the spectrum analyzer, just move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.
5. After tuning the marker to some point on the spectrum analyzer and pressing the `MANUAL MEAS` softkey, a display similar to Figure 7-21 appears on your computer display.
6. After reading the prompt on the computer display, adjust the marker to place it on a new signal of interest and press the `CONTINUE` softkey to perform a quasi-peak measurement at the new marker frequency.

   After the quasi-peak measurement is performed, your computer display is updated and the `VIEW SA` function is activated.

See Also

- "View Spectrum Analyzer"

Quasi-Peak Measurement - Over Span

CAUTION Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations".

The Quasi-Peak Measurement - Over Span analysis option is used to perform a quasi-peak measurement over a frequency span that is delimited by two markers.

The Quasi-Peak Measurement - Over Span analysis option uses quasi-peak detection to perform the measurement. All or part of the original measurement can be retested, but since quasi-peak detection requires more time than peak detection and since any peak-detected responses have greater amplitude than quasi-peak detected responses, the quasi-peak measurement is usually performed only in areas of the original peak measurement that are close to or exceed the test limit.

Note If BYPASS is specified for the Quasi-Peak Bw parameter in the test setup table, a quasi-peak measurement cannot be performed.

After selecting the Quasi-Peak Measurement - Over Span option, from the data analysis options menu, a display similar to Figure 7-23 appears on your computer.

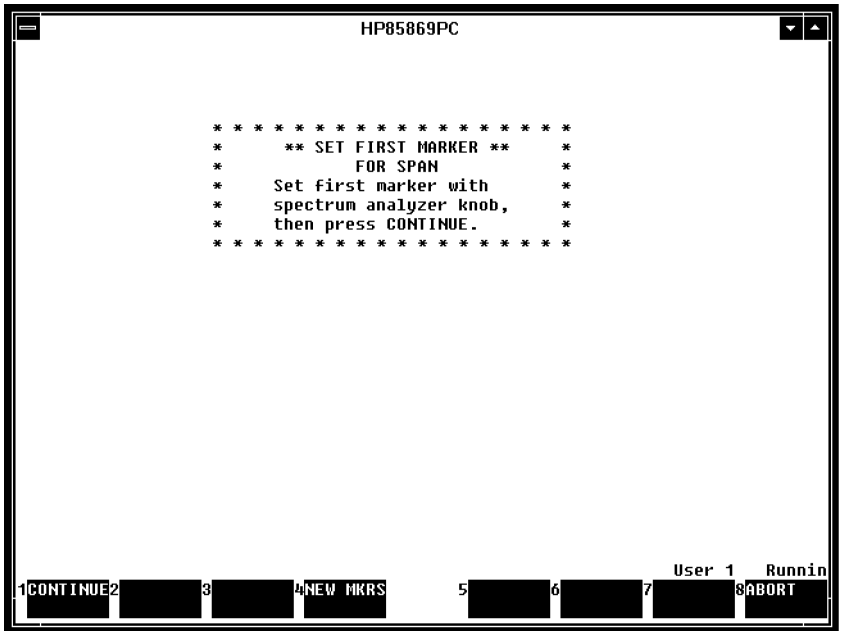


Figure 7-23. Setting First Marker for Quasi-Peak Measurement - Over Span

`CONTINUE` sets the first marker then proceeds to the next screen.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving the function.

`ABORT` aborts the Quasi-Peak Measurement - Over Span analysis option and returns to the data analysis menu.

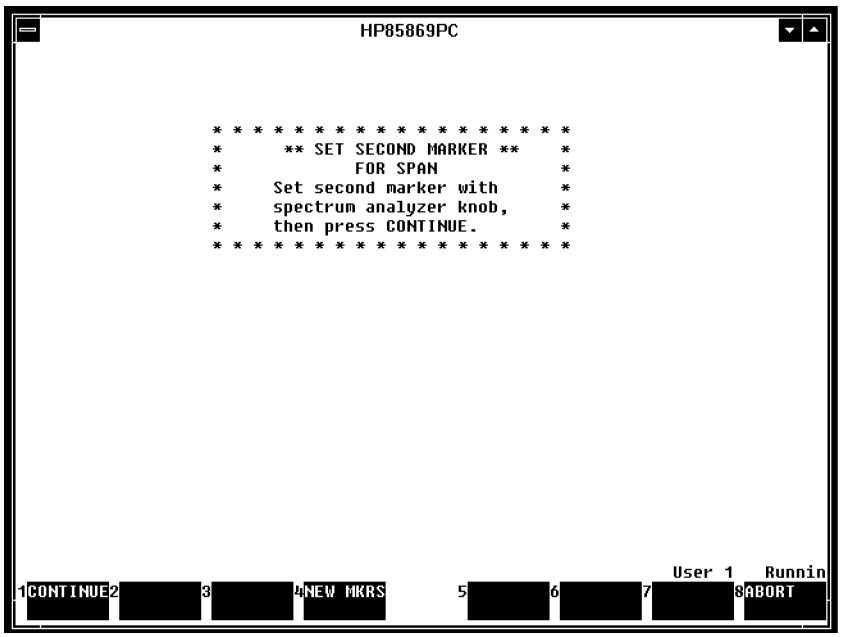


Figure 7-24. Setting Second Marker for Quasi-Peak Measurement - Over Span

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Quasi-Peak Measurement - Over Span analysis option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Quasi-Peak Measurement - Over Span analysis option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-23 appears on your computer.
4. After reading the prompt on the computer display, use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on the display and press the `CONTINUE` softkey. This marker sets the first end of the range that you are analyzing.

   Since a marker is already enabled on the spectrum analyzer, just move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.
5. After setting the first marker on the spectrum analyzer display, a second prompt (similar to Figure 7-24) on the computer display asks you to set another marker. Again, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, in the same frequency range, and press the `CONTINUE` softkey. This marker sets the second end of the range that you are analyzing. For faster results, indicate the smallest range possible.

If a warning message appears when trying to set the markers, refer to "If markers are not set in the same range" in Appendix A.

After the quasi-peak measurement is performed, your computer display is updated and the `VIEW SA` function is activated.

See Also ■ "View Spectrum Analyzer"

Explanation of Peak/Quasi-Peak Measurement Example

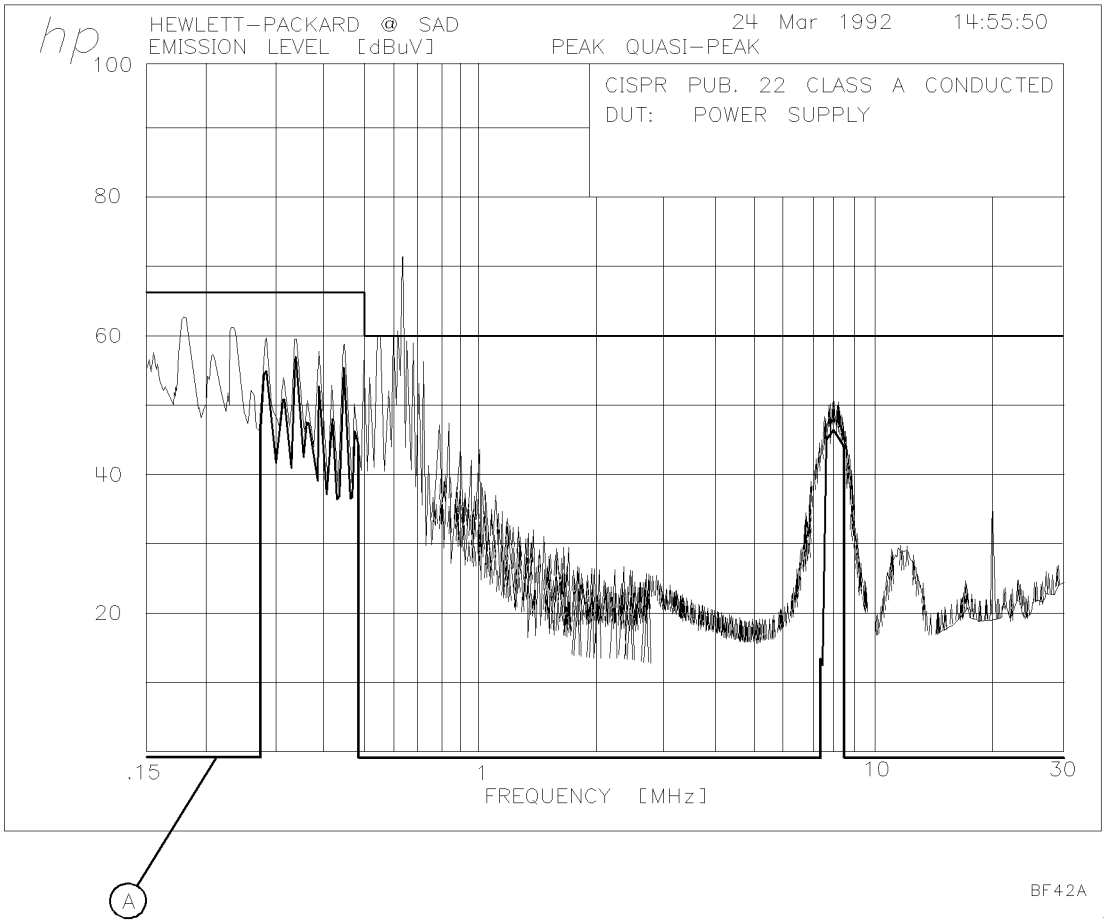


Figure 7-25. Peak/Quasi-peak Measurement Example

Ⓐ For quasi-peak measurements, this line is an indication that no data has been taken. This is indicated by the pedestal residing below the bottom graticule. For quasi-peak measurements, the data shown in the bottom graticule may be lower than the value indicated by the amplitude scale. Whenever an amplitude measurement is taken in the bottom half of the lowest graticule division, it is plotted on the baseline (bottom of the graticule) due to being an uncalibrated measurement.

Average Measurement - At Peak

CAUTION Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations".

The Average Measurement - At Peak analysis option is used to perform an average measurement at a selected frequency that is determined by the placement of a marker.

There are two modes that the Average Measurement - At Peak analysis option can be used in: auto-mode and manual-mode.

In auto-mode, the user can set a marker to a point on the spectrum analyzer display within the start and stop frequencies specified in the test setup table. The spectrum analyzer zooms to a narrower span (reduced span) and determines the highest signal in the frequency span by performing a max-hold then a marker-to-peak. Then, an average measurement is performed at the frequency that was determined to be the highest peak.

In manual-mode, the user can set a marker to a point on the spectrum analyzer display within the start and stop frequencies specified in the test setup table. The spectrum analyzer zooms to a narrower span (reduced span) and determines the highest signal in the frequency span by performing a max-hold then a marker-to-peak. Then, before an average measurement is performed at the marker frequency, the user can adjust the marker to a different frequency within the reduced span. After adjusting the marker to a new frequency and pressing the `CONTINUE` softkey, an average measurement is performed at the new marker frequency.

After selecting the Average Measurement - At Peak option, from the data analysis options menu, a display similar to Figure 7-26 appears on your computer.

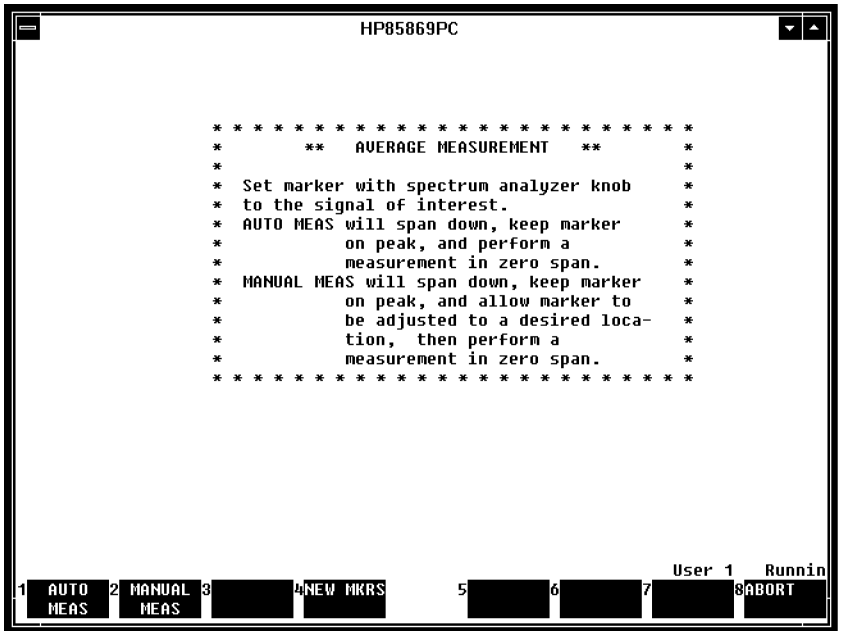


Figure 7-26. Average Measurement - At Peak Option Menu

`AUTO MEAS` performs an automatic average measurement. This mode narrows the frequency span of the spectrum analyzer (spans down) while keeping a marker

set on the highest peak found then performs an average measurement in zero span at the marker frequency.

`MANUAL MEAS` performs a manual average measurement. This mode narrows the frequency span of the spectrum analyzer (spans down) while keeping a marker set on the highest peak found. Before performing an average measurement in a zero span at the marker frequency, the user can adjust the marker frequency within the displayed frequency range.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving the function.

`ABORT` aborts the Average Measurement - At Peak analysis option and returns to the data analysis menu.

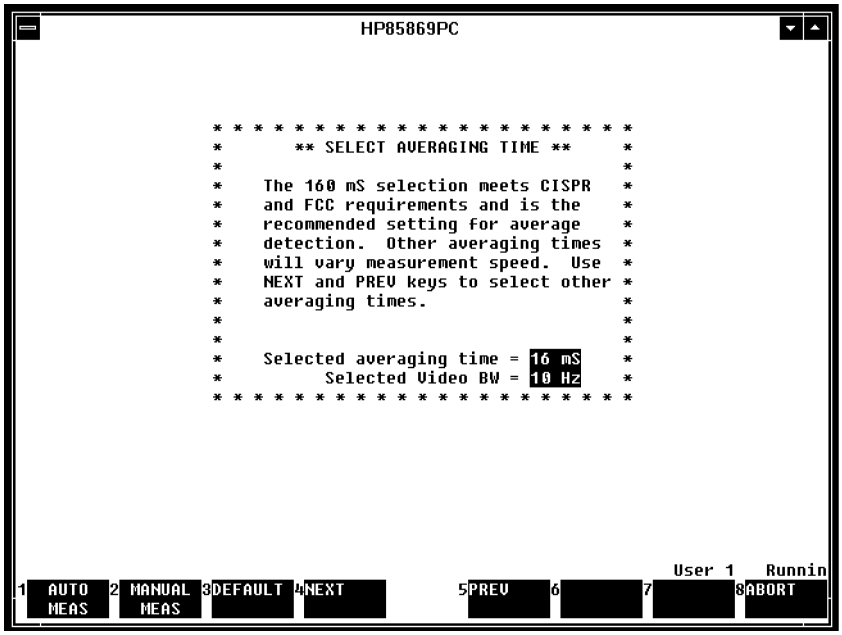


Figure 7-27. Selecting an Average Measurement Time

Before the actual average measurement is being executed, the averaging time needs to be selected. Therefore, the screen shown in Figure 7-27 is presented. Use the softkeys `DEFAULT`, `NEXT`, and `PREV` to select the averaging time. After selecting the averaging time, use either the `AUTO MEAS` or `MANUAL MEAS` softkeys to start the actual averaging measurement.

`DEFAULT` resets the averaging time to 160 mS, a value called out in CISPR 16, Part 1.

`NEXT` selects the next available averaging time (refer to Table 7-1 for available averaging times).

`PREV` selects the previous available averaging time (refer to Table 7-1 for available averaging times).

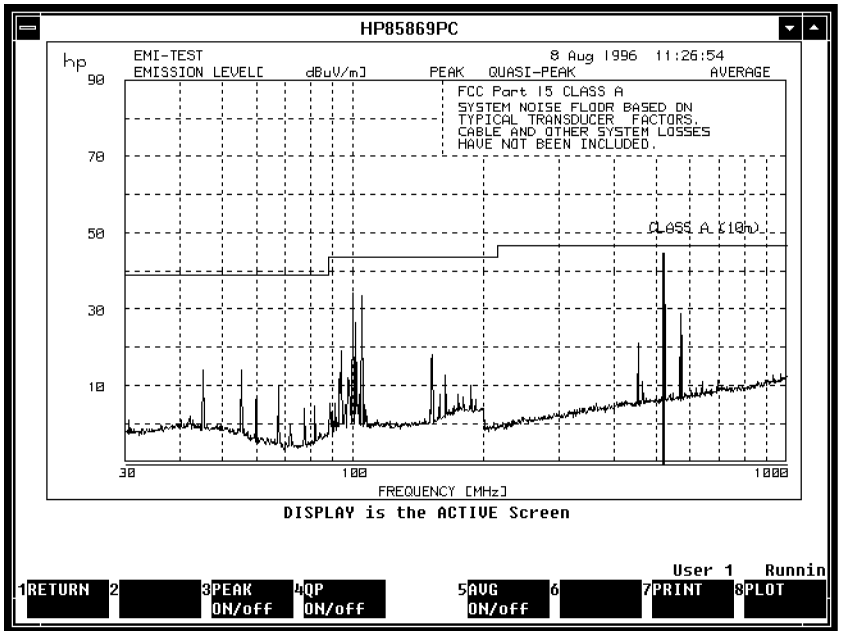


Figure 7-28. Manual Mode using the Average Measurement - At Peak Option

`RETURN` is used to discontinue the VIEW SA function and return the program to the previous level.

`PEAK on/OFF` turns the peak trace data on the spectrum analyzer's display on or off.

`QP on/OFF` turns the quasi-peak trace data on the spectrum analyzer's display on or off.

`AVG on/OFF` turns the averaged trace data on the spectrum analyzer's display on or off.

`LAVG on/OFF` turns the log averaged trace data on the spectrum analyzer's display on or off. *This softkey is only displayed when the* `PEAK LOG AVG` *softkey is selected as the test type in the Test Setup Table.*

`PRINT` prints the current display on the system printer.

`PLOT` transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press `VIEW DISPLAY` and then press `PLOT`.

Example Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Average Measurement - At Peak analysis option in auto-mode:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.

3. Using the up and down arrow keys on the computer keyboard, align the indicator with the Average Measurement - At Peak analysis option and press SELECT.

   After pressing the SELECT softkey, a display similar to Figure 7-26 appears on your computer.

4. After reading the prompt on the computer display, press the AUTO MEAS softkey and use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on its display.

   Since marker is already enabled on the spectrum analyzer, just move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.

   After pressing the AUTO MEAS softkey, a display similar to Figure 7-27 appears on your computer.

5. Select a new averaging time (using DEFAULT, NEXT, or PREV) or press the AUTO MEAS softkey to perform the measurement with the averaging time that is displayed on your computer's display. The averaging time that is displayed on your computer is retained by this software until it is changed with either DEFAULT, NEXT, or PREV softkeys.

   After an average measurement is performed, your computer's display is updated and the VIEW SA function is activated.

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Average Measurement - At Peak analysis option in manual-mode:

1. Press MEASURE at the program top level.

2. Press ANALYSIS at the first level softkeys.

3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Average Measurement - At Peak analysis option and press SELECT.

   After pressing the SELECT softkey, a display similar to Figure 7-26 appears on your computer.

4. After reading the prompt on the computer display, press the MANUAL MEAS softkey and use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on its display.

   Since marker is already enabled on the spectrum analyzer, just move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.

   After pressing the MANUAL MEAS softkey, a display similar to Figure 7-27 appears on your computer.

5. Select a new averaging time (using DEFAULT, NEXT, or PREV) or press the MANUAL MEAS softkey to perform the measurement with the averaging time that is displayed on your computer's display. The averaging time that is

displayed on your computer is retained by this software until it is changed with either DEFAULT, NEXT, or PREV softkeys.

6. After pressing the MANUAL MEAS softkey, a display similar to Figure 7-28 appears on your computer display.
7. After reading the prompt on the computer display, adjust the marker to place it on a new signal of interest and press the CONTINUE softkey to perform an average measurement at the new marker frequency.

   After an average measurement is performed, your computer display is updated and the VIEW SA function is activated.

The average measurement time for a particular video bandwidth (Video Bw) can be calculated with the formula:

$$Average\ Measurement\ Time = \frac{1}{2 \times \pi \times Video\ Bw}$$

When the averaging time is changed, the average measurement time (intergration time) constant of the average detector in the system's spectrum analyzer is changed. Video Bw (average measurement time) cannot be any greater than $\frac{1}{10}$ the value of the spectrum analyzer's resolution bandwidth (Res Bw) for the range specified in the test setup table (refer to Table 7-1 for available average measurement times).

Table 7-1. Average Measurement Times Available

Average Measurement Time (mS)	Video Bw (Hz)
160	1
53	3
16	10
6.2	30
2.4	100
1.4	300
1.0	1000
0.95	3000
0.91	10000
0.90	30000
0.90	100000
0.90	300000

See Also ■ "View Spectrum Analyzer"

Average Measurement - Over Span

CAUTION Noisy, intermittent, or modulated signals can cause a problem. In this case, proper peaking may not occur, thereby giving erroneous amplitude information. For more information refer to "Amplitude Accuracy Considerations".

The Average Measurement - Over Span analysis option is used to perform an average measurement over a frequency span that is delimited by two markers.

The Average Measurement - Over Span analysis option uses average detection to perform the measurement. All or part of the original measurement can be retested, but since average detection requires more time than peak detection and since any peak-detected responses have greater amplitude than average detected responses, the average measurement is usually performed only in areas of the original peak measurement that are close to or exceed the test limit.

After selecting the Average Measurement - Over Span option, from the data analysis options menu, a display similar to Figure 7-29 appears on your computer.

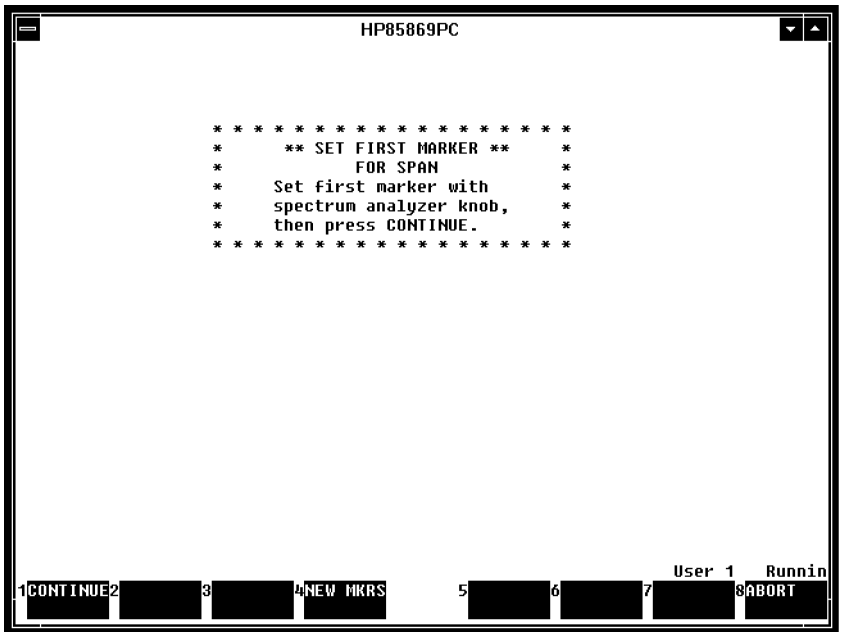


Figure 7-29. Setting First Marker for Average Measurement - Over Span

`CONTINUE` sets the first markers then proceeds to the next screen.

`NEW MKRS` allows you to reset the markers on the spectrum analyzer screen without leaving the function.

`ABORT` aborts the Average Measurement - Over Span analysis option and returns to the data analysis menu.

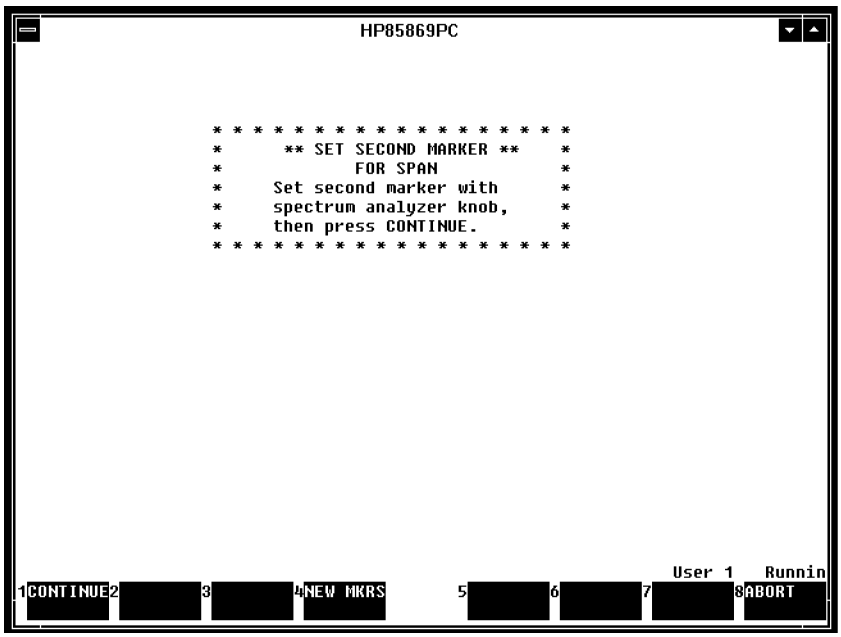


Figure 7-30. Setting Second Marker for Average Measurement - Over Span

`CONTINUE` performs the average measurement over the span that is delimited by the two markers.

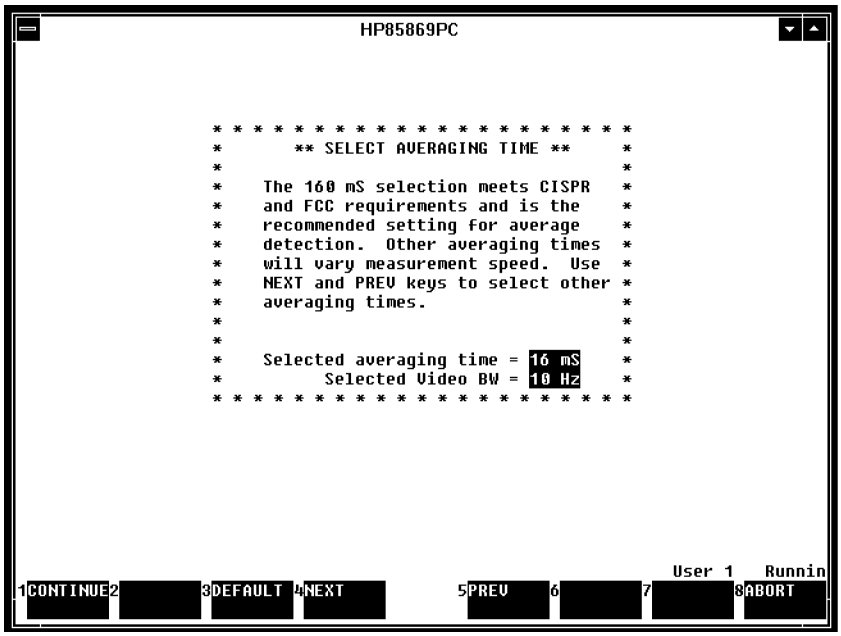


Figure 7-31. Selecting an Average Measurement Time

`DEFAULT` resets the averaging time to 160 mS, a value called out in CISPR 16, Part 1.

`NEXT` selects the next available averaging time (refer to Table 7-2 for available averaging times).

PREV

selects the previous available averaging time (refer to Table 7-2 for available averaging times).

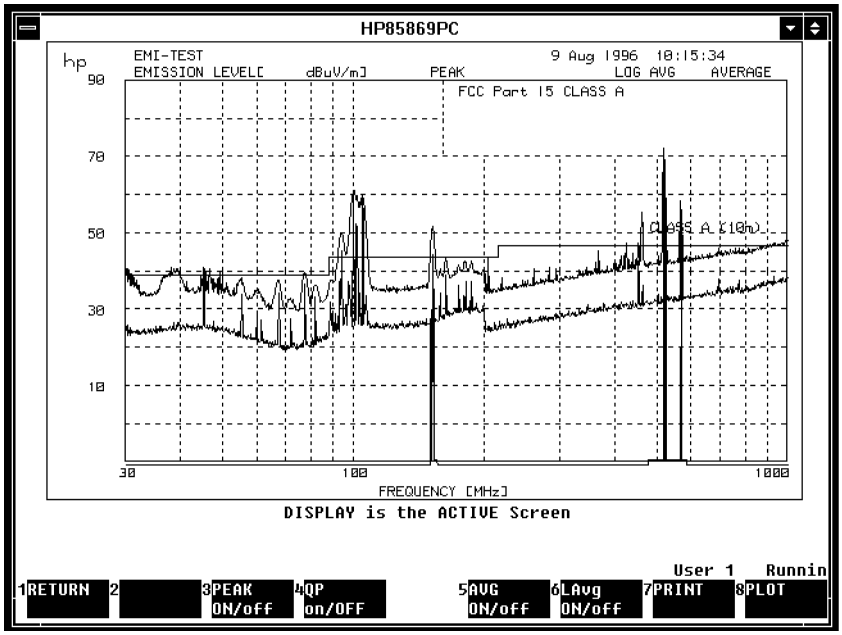


Figure 7-32. Average Measurement - Over Span

RETURN

is used to discontinue the VIEW SA function and return the program to the previous level.

PEAK on/OFF

turns the peak trace data on the spectrum analyzer's display on or off.

QP on/OFF

turns the quasi-peak trace data on the spectrum analyzer's display on or off.

AVG on/OFF

turns the averaged trace data on the spectrum analyzer's display on or off.

LAVG on/OFF

turns the log averaged trace data on the spectrum analyzer's display on or off. *This softkey is only displayed when the* PEAK LOG AVG *softkey is selected as the test type in the Test Setup Table.*

PRINT

prints the current display on the system printer.

PLOT

transfers control to the plot portion of the program. The plot portion of the program is used to document measurement results with a GPIB plotter.

To plot stored test results recalled from the data library when the spectrum analyzer is not in the system, press VIEW DISPLAY and then press PLOT.

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To use the Average Measurement - Over Span analysis option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Average Measurement - Over Span analysis option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-29 appears on your computer.
4. After reading the prompt on the computer display, use the DATA RPG knob on the spectrum analyzer to place a marker somewhere on the display then press the `CONTINUE` softkey. This marker sets the first end of the range that you are analyzing.

   Since a marker is already enabled on the spectrum analyzer, just move the marker to some point on the display with the spectrum analyzer's DATA RPG knob.
5. After setting the first marker on the spectrum analyzer display, a second prompt (similar to Figure 7-30) on the computer display asks you to set another marker. Again, use the spectrum analyzer's DATA RPG knob to place a marker somewhere on the display, in the same frequency range, then press the `CONTINUE` softkey. This marker sets the second end of the range that you are analyzing. For faster results, indicate the smallest range possible.

   If a warning message appears when trying to set the markers, refer to "If markers are not set in the same range" in Appendix A.

   After pressing the `CONTINUE` softkey, a display similar to Figure 7-31 appears on your computer.
6. Select a new averaging time (using `DEFAULT`, `NEXT`, or `PREV`) or press the `CONTINUE` softkey to perform the measurement with the averaging time that is displayed on your computer's display. The averaging time that is displayed on your computer is retained by this software until it is changed with either `DEFAULT`, `NEXT`, or `PREV` softkeys.

   After an average measurement is performed, your computer display is updated and the `VIEW SA` function is activated.

The average measurement time for a particular video bandwidth (Video Bw) can be calculated with the formula:

$$Average\ Measurement\ Time = \frac{1}{2 \times \pi \times Video\ Bw}$$

When the averaging time is changed, the average measurement time (intergration time) constant of the average detector in the system's spectrum analyzer is changed. Video Bw (average measurement time) cannot be any greater than $\frac{1}{10}$ the value of the spectrum analyzer's resolution bandwidth

(Res Bw) for the range specified in the test setup table (refer to Table 7-2 for available averaging times).

Table 7-2. Average Measurement Times Available

Average Measurement Time (mS)	Video Bw (Hz)
160	1
53	3
16	10
6.2	30
2.4	100
1.4	300
1.0	1000
0.95	3000
0.91	10000
0.90	30000
0.90	100000
0.90	300000

See Also

- "View Spectrum Analyzer"

Explanation of Peak/Average Measurement Example

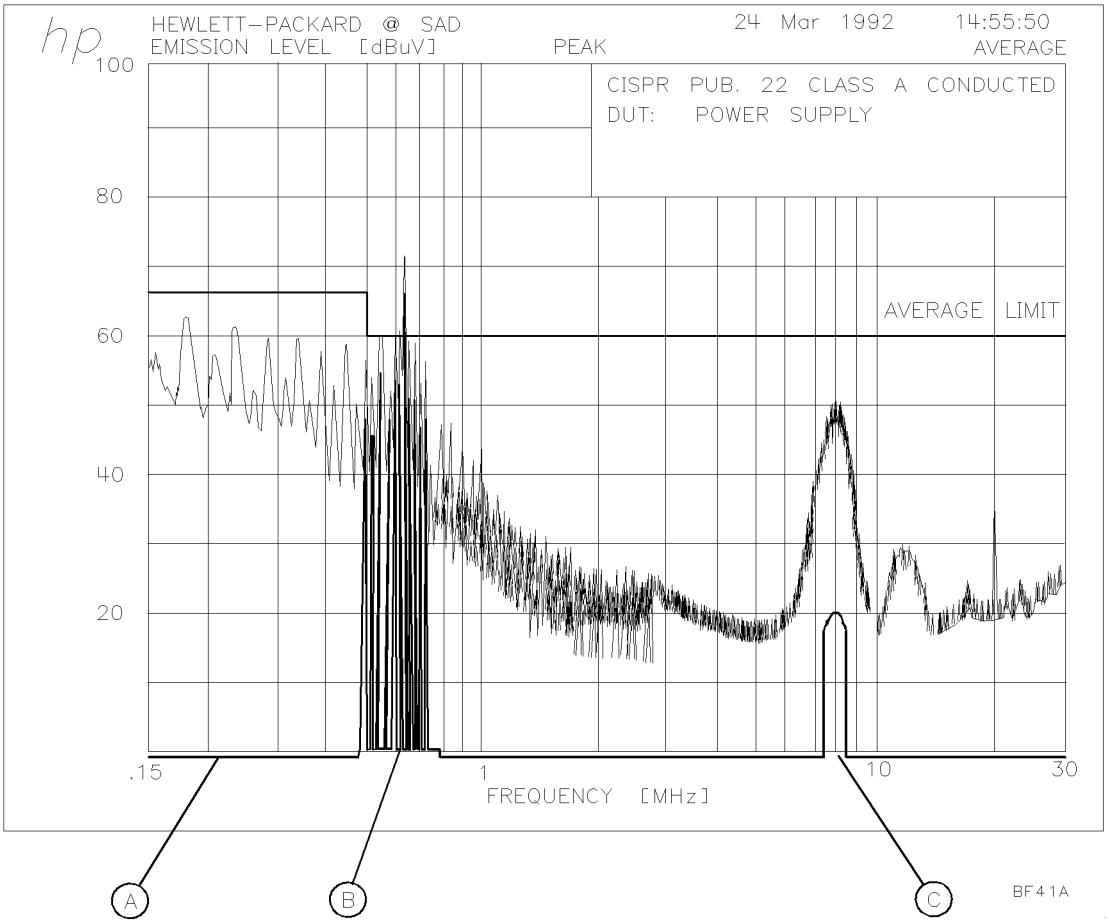


Figure 7-33. Peak/Average Measurement Example

Ⓐ For average measurements, this line is an indication of no data taken. This is indicated by the pedestal residing below the bottom graticule.

Ⓑ For average measurements, the data shown in the bottom graticule may be lower than the value indicated by the amplitude scale. Whenever an amplitude is measured in the bottom half of the lowest graticule division, it is plotted on the baseline (bottom of graticule) due to being an uncalibrated measurement.

Ⓒ If there are no signals detected above the bottom graticule division when taking a linear average measurement, a logarithmic average measurement is taken and the resulting data is displayed.

Mark Trace

The Mark Trace analysis option places the labels 1, 2, 3, 4, 5 anywhere along the trace displayed on the spectrum analyzer. Use this analysis option to label signals of interest in order to view them using the `VIEW DISPLAY` softkey.

After selecting the Mark Trace option, from the data analysis options menu, a display similar to Figure 7-34 appears on your computer.

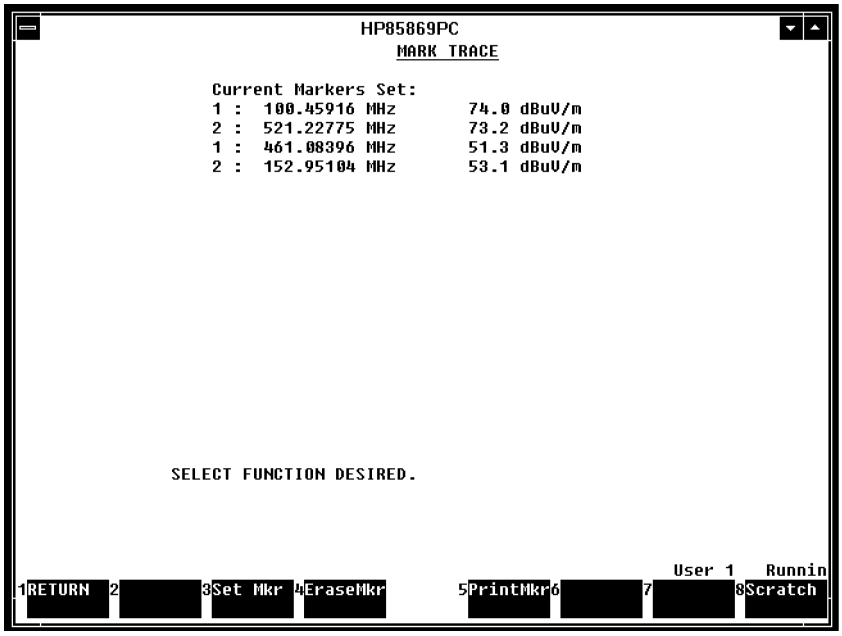


Figure 7-34. Mark Trace Option with Markers Set

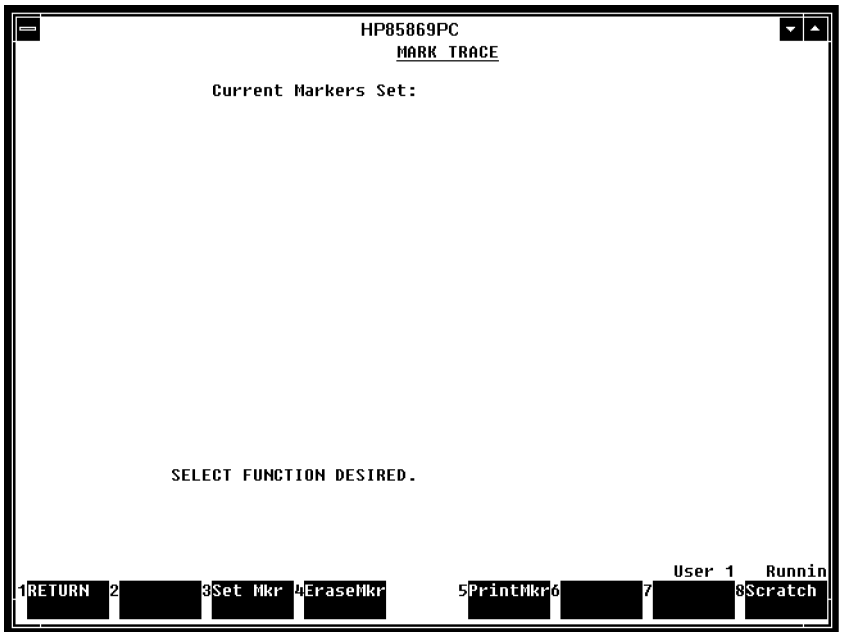


Figure 7-35. Mark Trace Option with No Markers Set

`RETURN` discontinues the Mark Trace analysis option and returns the program to the previous level.

`Set Mkr` creates labels on the spectrum analyzer and computer display.

`EraseMkr` erases a marker label on the spectrum analyzer and computer display.

`PrintMkr` prints the list of marker labels on the system printer.

`Scratch` erases all marker labels on the spectrum analyzer and computer display.

Example Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To set a marker label:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Mark Trace analysis option and press `SELECT`.
4. After pressing the `SELECT` softkey, a display similar to Figure 7-35 appears on your computer.
5. Press `Set Mkr`.

   The message "`Choose symbol`" appears prompting you to specify a marker number using the function keys F1 through F5.
6. Press `1`, `2`, `3`, `4`, or `5`.

   Up to 15 locations can be marked using the numbers 1 through 5 as labels. Any combination of these labels can be used.
7. Position a marker on the spectrum analyzer trace with the spectrum analyzer DATA RPG knob.
8. Press `SET` to place the label that you selected at the marker position.

   Both the spectrum analyzer display and the list of current markers set, on the computer display, are updated with the new label.

Example

Measurement data must exist from a previous measurement in order to use this data analysis option. Refer to "Measure" for information on making a measurement.

To erase a marker label:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Mark Trace analysis option then press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-34 appears on your computer.
4. Press `EraseMkr`.
5. Use the up and down arrows on the computer keyboard to align the indicator with the marker you wish to erase.
6. Press the `SELECT` softkey and the marker is erased.

   Both the spectrum analyzer display and the list of current markers set, on the computer display, are updated with the new label.

Figure 7-36 illustrates how the Mark Trace analysis option labels appear on your spectrum analyzer display.

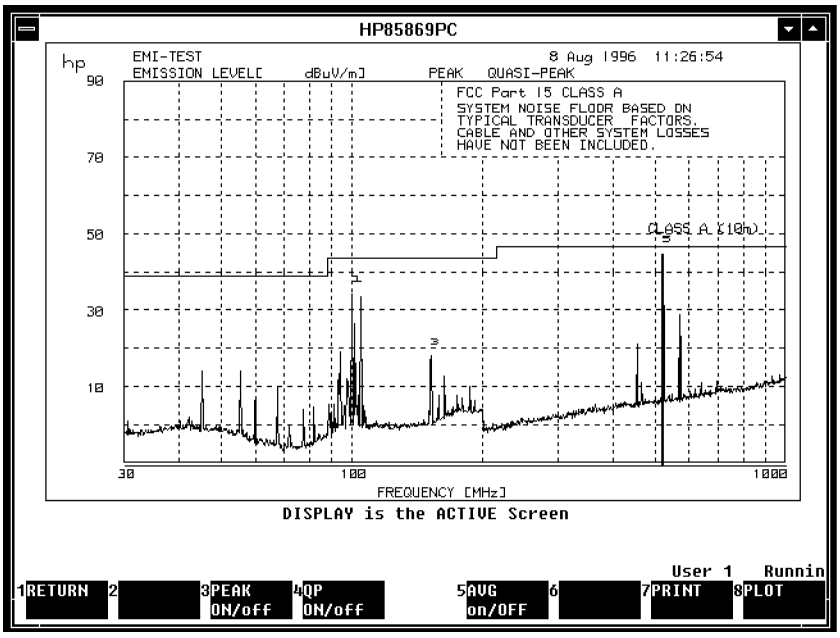


Figure 7-36. Example Display Using Mark Trace Labels

Notes

Use the Notes option to create up to 48 lines of text. Text is entered one line at a time and can be changed at any time.

If measurement results are stored in the data library, these notes are also stored. Notes cannot be stored separately. If you wish to save the notes that you enter, be sure to store the measurement results in the data library.

After selecting the Notes option, from the data analysis options menu, a display similar to Figure 7-37 appears on your computer.

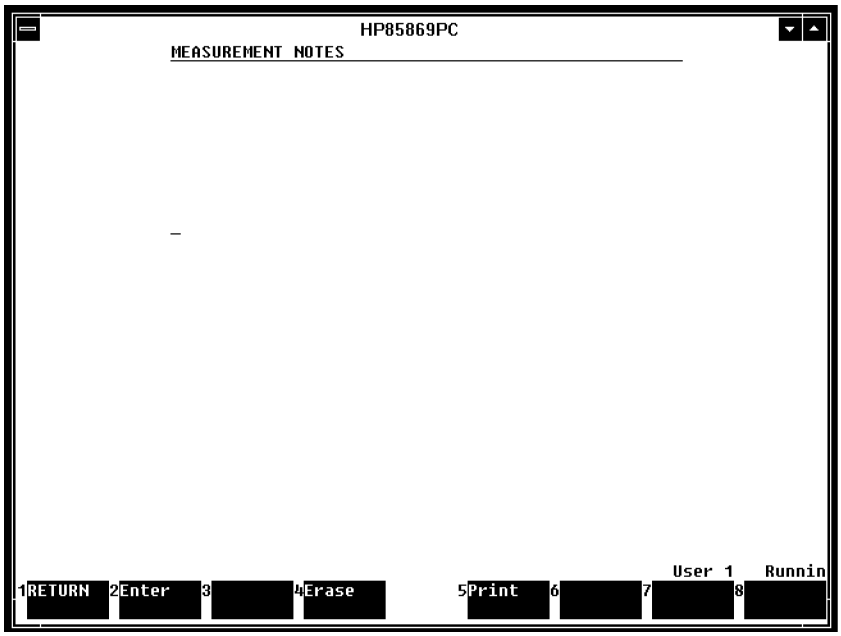


Figure 7-37. Measurement Notes Area

`RETURN` discontinues the Notes option and returns the program to previous level.

`Enter` press this softkey after typing a line of text within the window.

`Erase` erases all lines of notes.

`Print` prints notes on the system printer.

Example To use the Notes option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the Notes option and press `SELECT`.

   After pressing the `SELECT` softkey, a display similar to Figure 7-37 appears on your computer screen.
4. Type text at the cursor. Press (Enter) to continue typing on the next line.
5. Press `Enter` when the desired amount of text for a line has been typed or there is not enough room within the window for the next word. When input exceeds one line, the computer sounds a beep to signal the user to press the `Enter` softkey. After pressing the `Enter` softkey, the window moves down one line and text input can continue.

See Also

- "Data Library" in Chapter 6

User Written Subroutine

The User Written Subroutine analysis option allows you to perform analysis of measurement data using your own subprogram.

Example To execute a subprogram:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the User Written Subroutine analysis option then press `SELECT`.

   If the message "`no sub here, please add your code ...` " appears, then refer to "User-Written Subprograms" in Appendix B. Otherwise, your analysis subprogram is executed and, upon completion, the program returns to the "Data Analysis Options" menu.

See Also

- "Data Analysis Using Your Own Subprograms" in Appendix B
- "User-Written Subprograms" in Appendix B
- "Display Format for Narrow-Span Measurements" in Appendix B

Spectrum Analyzer Titles

The S/A Titles analysis option is used to enter pertinent information about a test in the upper-right corner of the spectrum analyzer display. Up to 4 lines of text can be entered with up to 31 characters in each line.

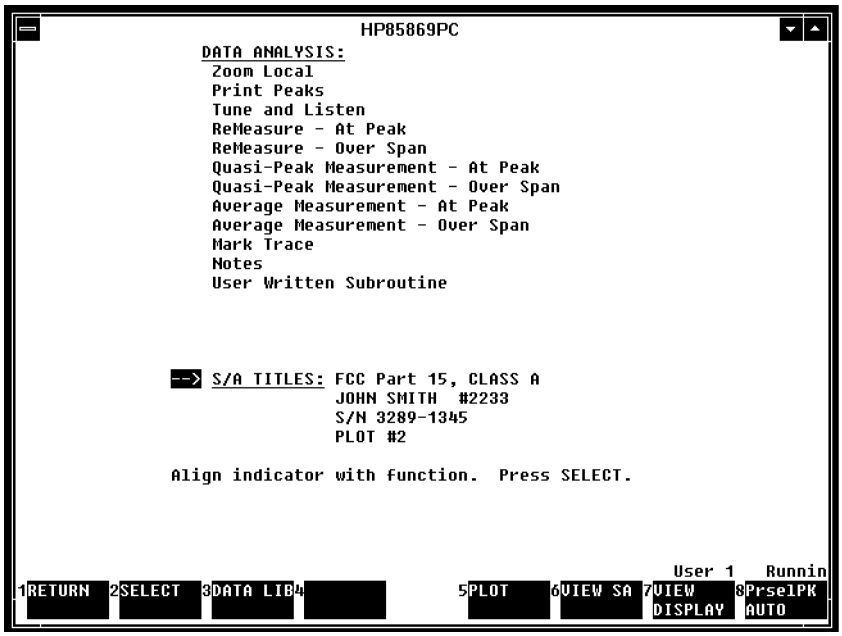


Figure 7-38. Spectrum Analyzer Titles Option

Example To use the spectrum analyzer titles analysis option:

1. Press `MEASURE` at the program top level.
2. Press `ANALYSIS` at the first level softkeys.
3. Use the up and down arrow keys on the computer keyboard to align the indicator with the S/A Titles analysis option then press `SELECT`.
4. After pressing the `SELECT` softkey, type text at the cursor in the highlighted field.
5. Press `ENTER` when the desired amount of text for a line has been typed or if there is not enough room within the window for the next word. When the input exceeds one line, the computer sounds a beep to signal the user to press the `Enter` softkey. After pressing the `Enter` softkey, the window moves down one line and text input can continue.
6. Repeat the process of pressing `SELECT`, typing text, and pressing `ENTER` for each line (up to 4 lines of text can be entered with up to 31 characters in each line).

Figure 7-39 illustrates how the S/A Titles analysis option appears on your spectrum analyzer display in the upper-right corner.

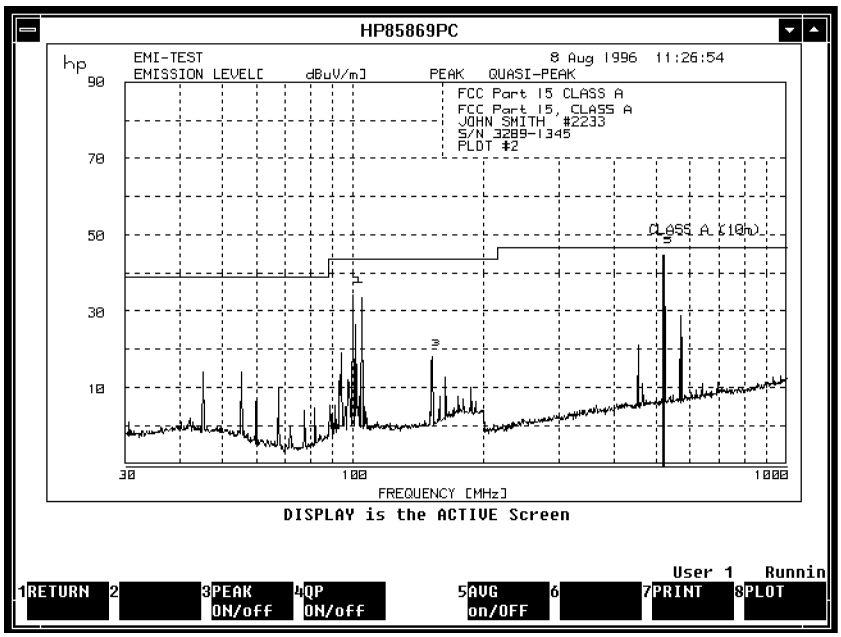


Figure 7-39. Example Display Using the S/A Titles Option

See Also ■ "Notes"

8

Plot and Print

This chapter contains the following information:

- Multiple Plots Per Page
- Using Plot Softkeys
- Changing the Pen Control Table

In this chapter, the use of printers and plotters are described and a brief description of data storage to files is included.

The available functionality to produce a hard copy of graphical or tabular test data is related to the interface being used to connect the printer or plotter to the measurement system.

The measurement data can be output to either a peripheral device or saved in files for further processing. The default directory for these print and plot files are specified in the EMI Configuration program using the `PRT/PLT FILES` functionality. However, the directory can also be changed directly before the data is stored. The data storage functionality is contained in the Plot and Print menus of the HP 85869PC EMI measurement software. Graphic data, for example, spectrum analyzer screen content or measurement result plots that are displayed on the PC screen, can be saved as a file in HPGL format. Many commercially available word processors provide import filters to import these files into a document, for example, a test report. Tabular test data, for example, results from a Mark Trace or Print Peaks operation, can be saved in ASCII format as a text file. The column separator, inserted between the actual data, is specified in the `PRT/PLT FILES` section of the EMI Configuration program. These files can be included in documents residing in a commercially available word processor using an appropriate import filter. Furthermore, these print files can be processed further, for example, statistical data evaluation, in a commercially available spreadsheet program.

Note

- Every attempt has been made to ensure compatibility of file formats being used (for example, HPGL and ASCII) with import filters of commercially available programs. In case of difficulties, please contact the manufacturer of the application being used for help on file importing.
- Another possibility to transfer an image from the HP 85869PC software to a word processor is via the MS-Windows clipboard. In this case, the image is stored as a bitmap. The content of the HP 85869PC window can be copied to the clipboard by pressing <Alt> <Print Screen> on your keyboard.
- For further processing, a bitmap image can be copied to the Paintbrush program (Windows 3.1) or Paint program (Windows 95). These additions to the image can be made before placing them in a document residing in a word processor.
- Commercially available screen capture programs can also be used to copy parts of images or the whole image to the clipboard.
- Due to the bitmap format resizing of an image in another application, for example, the word processor, there may be a loss in its resolution.

Printers and plotters are used to document measurement results and generate a hardcopy of tabular data or complete reports. These peripherals are connected to the PC in one of the following ways:

Table 8-1. Printer and Plotter Connections

GPIB	Plotter/printer has a GPIB interface built in.
GPIB to Parallel Converter	Printer/plotter has a parallel interface but needs to be connected to the PC's GPIB interface.
Direct Serial/Parallel Connection	The printer/plotter has a direct serial/parallel connection between the printer's built-in serial/parallel port and the PC's port.[1]

1 The MS-Windows Print Manager administers and controls the print process. In this mode, no plotting to a plotter (through the MS-Windows Print Manager) is possible.

The following table summarizes the available capabilities depending on the connections outlined above.

Table 8-2. Available Print/Plot Capabilities

Function	Interface		
	GPIB and GPIB to Parallel Converter	Serial/Parallel Port	File
Print	Yes	Yes	Yes
Graphics Output[1]	No	Yes	No
Plot (HPGL)	Yes[2]	No	Yes

1 The HP BASIC for Windows programming environment supports a graphics output function which copies the contents of the display to a printing device. However, this functionality is only available when the printer is connected to the PC through the serial or parallel port. The display contents *cannot* be stored in a file using this function.

2 When using a GPIB to parallel converter, only one plot per page can be output. Multiple plots on the same page are only possible when the plotter is connected to the PC via GPIB directly.

Due to the implementation of the MS-Windows Print Manager functionality, plotting capability (using HPGL format) is *not* available when the plotter is connected to the PC through a serial or parallel connection. If a printer is being used as a plot device, it must have PCL5 capability to process HPGL data correctly.

When the plot device is connected to the PC via GPIB, the following functions are available:

- Multiple plots per page
- Use of plot softkeys
- Change of the pen control table

When using the plot portion of the HP 85869PC EMI measurement software, you can:

- reproduce the spectrum analyzer display whether it is an EMI screen or a local screen.
- choose from up to eight pens that are available.
- vary pen selection for annotation, graticules, traces, and so on.
- recreate the spectrum analyzer display in three different formats that contain from one to four plot positions (refer to Figure 8-1).

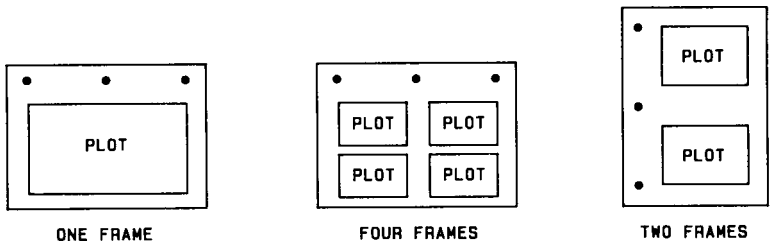


Figure 8-1. Plot Formats

- manually control the size, aspect ratio, and position of the plotting area by changing P1 and P2 on the plotter. Refer to the plotter's operating manual for further information on changing P1 and P2. The PLT.CFG file can also be used to automatically use additional plotter functions, for example, initialization. See "Printer/Plotter" in Chapter 3 for more information.

Multiple Plots Per Page

The following procedure describes how to generate multiple plots per page using HP 7550B plotters.

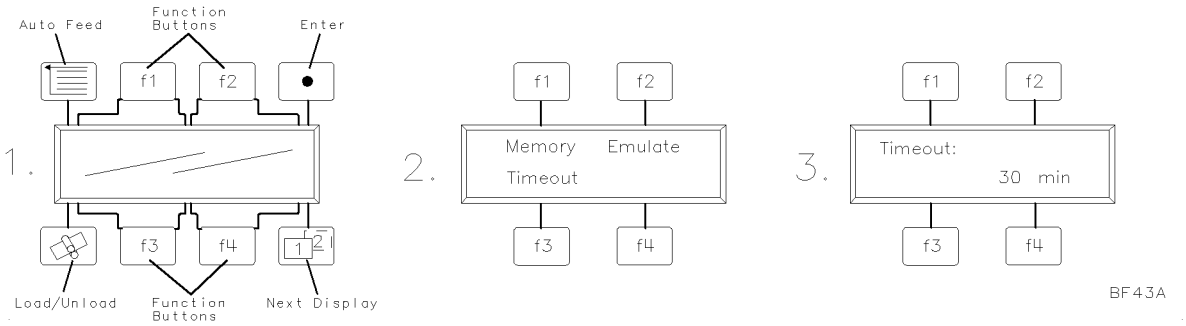


Figure 8-2. HP 7550B Plotter Display

1. Press (Next Display) until `Timeout` appears. (Figure 8-2, step 1)
2. Press `Timeout`. (Figure 8-2, step 2)
3. Press `f4` to view the `Timeout` then press `f3` to see the previous option. (Figure 8-2, step 3)
4. Select `Timeout` option `OFF`.
5. Press (Enter) to store your setting in continuous memory. (The setting remains in memory until you change it, even if you turn the plotter off.)
6. To exit without changing the setting, press (Next Display). `Timeout` affects all plots drawn until plotter is reset.

Using Plot Softkeys

Enter the plot portion of the program by pressing the PLOT softkey at the EMI Program Top Level screen which is accessed by pressing the START EMI PROG function key.

In addition to the program top level, the PLOT softkey is also available from other levels of the program that require plotting.

Top Level Softkeys[1]

TEST LIB	DATA LIB	SETUP	MEASURE	PLOT	VIEW SA	INST ADDRESS	UTILITY	END*	VIEW* BB	VIEW* NB

1 Keys labeled with asterisks are not always present.

Example To plot a spectrum analyzer display:

1. Press MEASURE at the program top level.
2. Press VIEW SA at the Measurement screen.
3. Press PLOT at the first level softkeys.

   After pressing the PLOT softkey, a display similar to Figure 8-3 appears on your computer.
4. To start the plot, press the PLOT softkey again and follow the prompts on the display screen.

Example To plot stored results without a spectrum analyzer present:

1. Press DATA LIB at the program top level.
2. Load a data library file, pressing the LOAD softkey in the data library portion of the program.
3. Press MEASURE at the first level softkeys.
4. Press VIEW DISPLAY at the first level softkeys.

   This allows you to view the test results on the computer screen.
5. Press PLOT at the first level softkeys.

   After pressing the PLOT softkey, a display similar to Figure 8-3 appears on your computer.
6. To start the plot, press the PLOT softkey again and follow the prompts on the display screen.

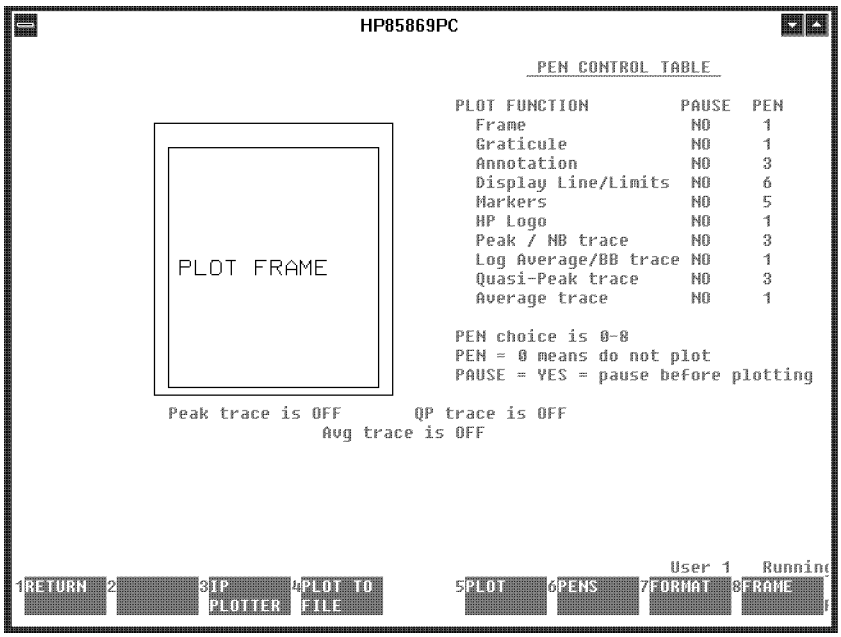


Figure 8-3. Pen Control Table

`RETURN` returns the program to the previous level.

`IP PLOTTER` resets the plotter so that P1 and P2 are at their default values.

`PLOT TO FILE` stores the graphic data in a specified file in HPGL format. No plotter needs to be connected to perform this function.

`PLOT` duplicates the spectrum analyzer display, if a GPIB plotter is present in the system.

Stored measurement results may be plotted even when the spectrum analyzer is not in the system.

`PENS` enables the pen control table.

`FORMAT` changes the plot format. Plot one, two, or four spectrum analyzer displays on a single page.

`FRAME` changes the position of the plot on the paper for two of the three formats (refer to Figure 8-1).

This `FRAME` softkey has no effect on the one frame format because it has only one position.

Figure 8-4 shows the correspondence between the pen control table, shown in Figure 8-3 and the system's spectrum analyzer display.

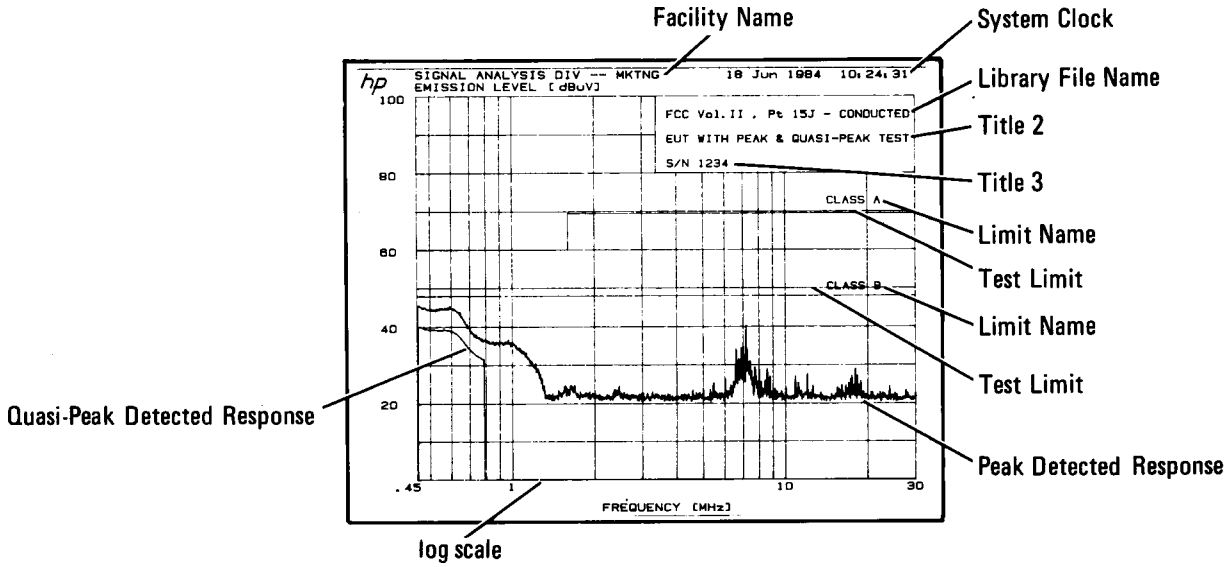


Figure 8-4. Plot of Measurement Results

Changing the Pen Control Table

Pressing the PENS softkey brings up a set of softkeys that allow you to change the pen control table.

Second Level Softkeys

RETURN	PAUSE	PEN

RETURN gives you the option of storing the plotter configuration in the bwi_fact file:

- Press YES if you wish to store the plotter configuration in the bwi_fact file for future use.
- Press NO if you intend to use the plotter configuration only until the program is terminated.

Note If the program cannot find the Bwi_fact file, an error message appears on the computer screen. Press NEW MSI and enter the current location of the bwi_fact file then press CONTINUE. Press ABORT to terminate the storage process.

PAUSE suspends plotting of the indicated function.

- Use the up and down arrow keys to move the indicator to the desired plot function.
- Press PAUSE repeatedly to select yes or no.
- Select yes to pause during plotting. This allows time to change the plotter pen. Press CONTINUE to resume plotting after pausing.

PEN activates different pens. The program controls up to eight different pens if an 8-pen plotter is connected to the system. Pens are numbered 0 through 8. If 0 (zero) is designated as the pen number, the pen position is up and no plotting occurs, regardless of plotter type.

To specify pen numbers:

- Align the arrow to the desired plot function.
- Press the PEN softkey repeatedly to change the pen number:
  - □ select 0, 1, or 2 when using the HP 7470A 2-pen graphics plotter
  - □ select 0, 1, 2, 3, 4, 5, or 6 when using the HP 7475A 6-pen graphics plotter
  - □ select 0, 1, 2, 3, 4, 5, 6, 7, or 8 when using the HP 7440A or HP 7550A 8-pen graphics plotter.

  Press the (SHIFT) and PEN softkeys concurrently to decrease the pen selection.

  The pen number selected defines the color of the pen used if the Plot to File function is used. Therefore, the pen number controls the pen color of HPGL (*.hpg) files that are converted to bitmap (*.bmp) files.

Using the HPGL to Bitmap Conversion Utility

The HPGL to Bitmap conversion utility can be used to convert HP 85869PC software generated HP Graphics Language (HPGL, *.hpg) files to bitmap (*.bmp) files, which can be imported into applications supporting the (*.bmp) file format. You can access the conversion utility from either the HP 85869PC software or outside of the HP 85869PC application.

To convert HPGL files to bitmap files using the HP 85869PC software

1. From the HP 85869PC application's EMI Start menu, select `EMI CONFIG` (F4) then `PRT/PLT FILES` (F2).
2. In the Directory and File Names for Text/Plot Files window, type in the directory path name for the location of both the plot and bitmap files.
3. To save the changes made, select `RETURN` then `STORE & END`.
4. From the EMI Start Menu, select `HPGL → BMP Utility` to convert the HPGL plot files into bitmap files.

   A prompt will appear that states `Delete HPGL - Source - File(s) after conversion?` Select Yes or No. If Yes is selected, all HPGL files in the specified plot files directory will be deleted after the conversion to bitmap format is complete.

To convert HPGL files to bitmap files using the convert.exe utility

When running the convert.exe utility standalone, there are several switch options that you can utilize.

-s	Source Directory: Syntax: Drive:\Path of directory containing HPGL (*.hpg) files Example: c:\85869pc\plot
-d	Destination Directory: Syntax: Drive:\Path of directory where bitmap (*.bmp) files will be stored Example: c:\85869pc\bmp
-e	File extension of the HPGL files (for example, .hpg, .hgl)
-c	If present, the bitmap colors that correspond to the plotter PEN definition set in the HP 85869PC software will be used. If not present, the bitmap colors are black and white.
-ds	If present, the HPGL source files will be deleted after successful conversion to bitmap. If not present, the HPGL source files will not be deleted.

The following example converts HPGL files with an .hgl extension in the c:\85869pc\plot directory to bitmap files and places them in the c:\85869pc\bmp directory. The -c extension sets the bitmap colors to correspond to the plotter PEN definition.

1. From the Windows **Start** menu select **Run**.
2. In the Open drop-down list box type, `c:\85869pc\convert.exe -e hgl -s c:\85869pc\plot -d c:\85869pc\bmp -c`. Click **OK**.

9

Instrument Address

This chapter contains the following information:

- Polling Your System Configuration
  - Polling for the HP 8571A/8572A Receiver Configuration
- Reconfiguration
  - Defaults
  - Printer/Plotter
  - Preselector
  - Quasi-Peak Adapter (QPA)
  - Spectrum Analyzer (SA)
  - Driver
  - Library Mass Storage Is (MSI)
- Adding Peripheral Devices
- Peripheral Not Responding

The instrument address portion of the program allows you to reconfigure the HP 85869PC EMI measurement software.

When using the instrument address portion of the program, you can perform the following:

- change the GPIB address of system components
- change the library directory

Polling Your System Configuration

When you enter the instrument address portion of the program by pressing the `INST ADDRESS` softkey, a polling process of all instruments connected to the GPIB is initiated. The result of this polling process is a list of all HP 85869PC EMI measurement software system components currently connected with power on. This list is displayed on the computer screen as shown in Figure 9-1.

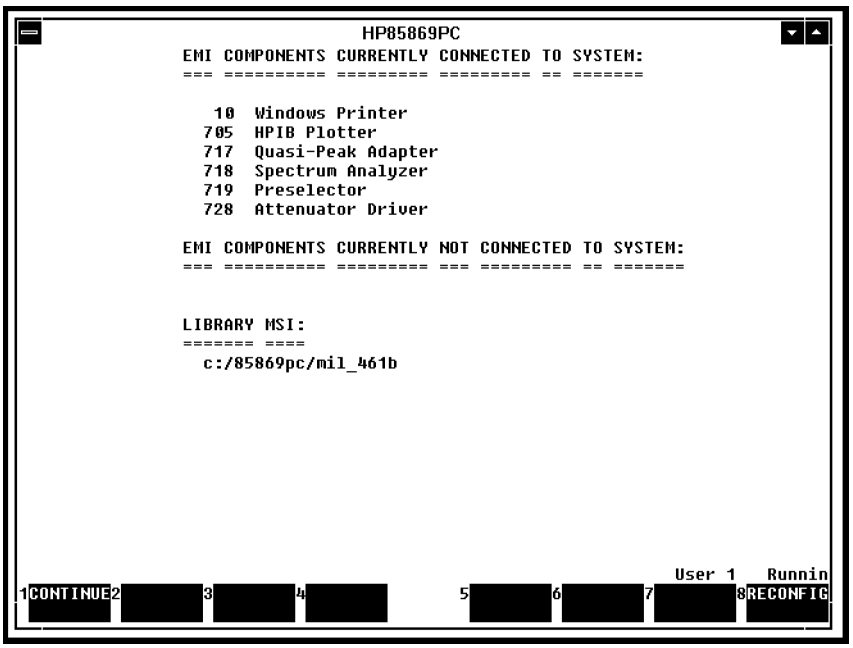


Figure 9-1. Configuration Display

`CONTINUE` exits the instrument address portion of the program and returns to the program top level if the spectrum analyzer is an HP 8566B and the spectrum analyzer, preselector, and attenuator drivers are currently connected to the GPIB, then the message "`Is this an HP 8571A/8572A Receiver System?`" is displayed.

`RECONFIG` accesses the second level reconfiguration menu.

Polling for the HP 8571A/8572A Receiver Configuration

The result of this polling process is a list of all HP 8571A/8572A EMI receiver system components currently connected and with power on. This screen will only appear when all the components that make up a receiver system are on the bus. This list and the library MSI listing are displayed on the computer screen as shown in Figure 9-2.

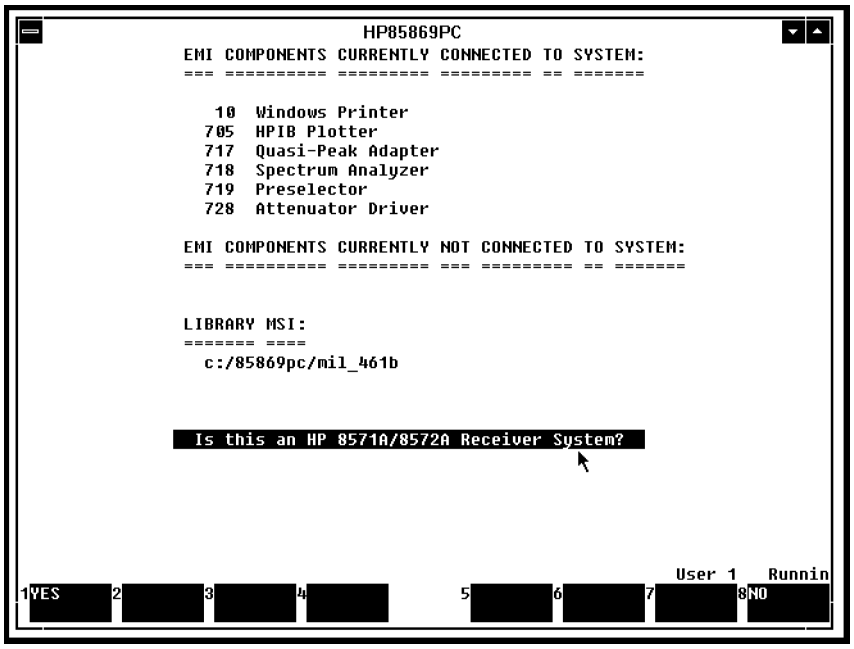


Figure 9-2. Configuration Display

The message "`Is this an HP 8571A/8572A Receiver System?`" is only displayed if the spectrum analyzer is an HP 8566B and the spectrum analyzer, preselector, and attenuator drivers are currently connected to the GPIB.

`YES` answers 'YES' to the question "`Is this an HP 8571A/8572A Receiver System?`" and exits the instrument address portion of the program and accesses the second level Receiver Correction Tables library list.

`NO` answers 'NO' to the question "`Is this an HP 8571A/8572A Receiver System?`" and is used to exit the instrument address portion of the program and return to the program top level.

Reconfiguration

When you enter the reconfiguration portion of the program by pressing the RECONFIG softkey, the following softkey menu is enabled on your computer.

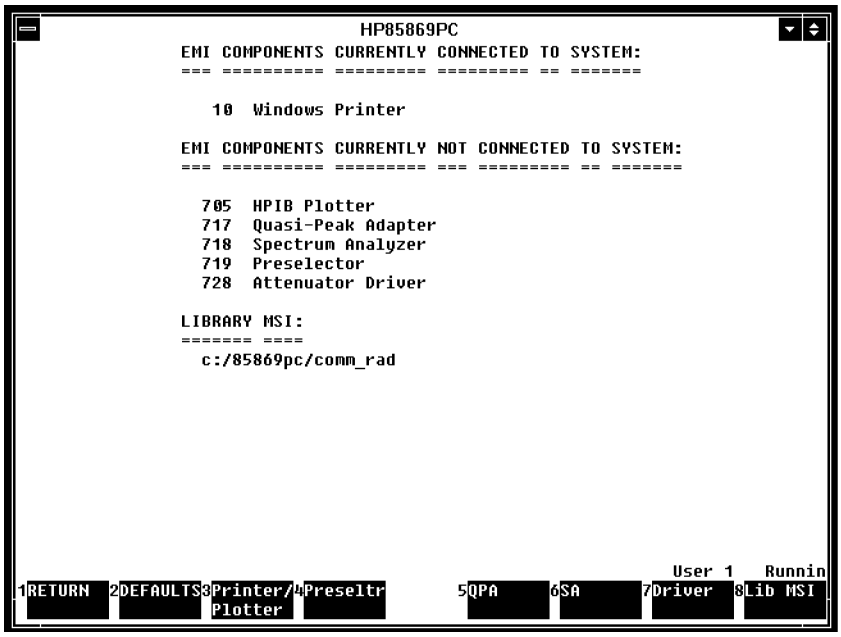


Figure 9-3. RECONFIG Softkey Menu

RETURN returns the program to the next highest level. If changes have been made, you are given the option of saving the configuration on the default configuration file (Bwi_fact).

DEFAULTS sets the default (factory preset) and primary GPIB addresses for each system component used with this software. It also sets the default library mass storage device.

Printer/ Plotter accesses the printer/plotter section of the EMI Configuration program. A choice of GPIB or MS-Windows printers and plotters is available. For more information, refer to the section "EMI Configuration Program" in Chapter 3.

Preseltr is used to change the primary GPIB address of the preselector used with this software. The HP 85685A RF preselector's GPIB address must be set to one above the value of its GPIB address switch setting (refer to the HP 85685A RF preselector manual for further information).

QPA is used to change the primary GPIB address of the quasi-peak adapter used with this software.

SA is used to change the primary GPIB address of the spectrum analyzer used with this software.

Driver is used to change the primary GPIB address of the attenuator/switch driver used with this software.

Lib MSI (Library Mass Storage Is) is used to change the library directory that is used with this software.

Defaults

The DEFAULTS softkey is used to set the default (factory preset) and primary GPIB addresses for each system component used with this software. It also sets the default library mass storage device to /85869PC/comm_rad.

Example To set all system components to their default (factory preset) values:

1. Press INST ADDRESS at the program top level.
2. Press RECONFIG at the first level softkeys.

   After pressing the RECONFIG softkey, a set of softkeys are enabled that correspond to each piece of equipment that can be used with this software.
3. Press DEFAULTS.

   The default primary GPIB addresses for each component used with the HP 85869PC EMI measurement software are shown in Table 9-1.

Table 9-1. Factory Preset Primary GPIB Addresses

EMI Component	Primary Address
Spectrum Analyzer	18
Preselector[1]	19
Quasi-Peak Adapter	17
Attenuator/Switch Driver	28
System Plotter	05
System Printer	MS-Windows (Black/White)
Antenna Tower	08
Turntable	09

1 The GPIB address switch of the HP 85685A RF preselector is factory preset to 18. The preselector's GPIB software address must be set to 19, that is, one above whatever the spectrum analyzer's GPIB address switch is set to. Refer to the HP 85685A RF preselector manual for further information.

Printer/Plotter

The `Printer/Plotter` softkey accesses the Printer/Plotter section of the EMI Configuration program for specification of the peripherals. For more information, refer to Chapter 2.

Preselector

The `Preseltr` softkey is used to change the primary GPIB address of the preselector used with this software. The HP 85685A RF preselector's GPIB address must be set to one above the value of its GPIB address switch setting (refer to the HP 85685A RF preselector manual for further information).

Example To change the primary GPIB address of the preselector:

1. Press `INST ADDRESS` at the program top level.
2. Press `RECONFIG` at the first level softkeys.

   After pressing the `RECONFIG` softkey, a set of softkeys are enabled that correspond to each piece of equipment that can be used with this software.
3. Press `Preseltr`.
4. Type the new primary GPIB address of the preselector and press `ENTER`. To keep the previous selection, press the `ABORT` softkey.

   The default primary GPIB address for a preselector used with the HP 85869PC EMI measurement software is 19.
5. Press `YES` to save the new configuration in the default configuration file (bwi_fact), or press `NO` to cancel changes.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

Quasi-Peak Adapter (QPA)

The QPA softkey is used to change the primary GPIB address of the HP 85650A quasi-peak adapter used with this software.

Example To change the primary GPIB address of the quasi-peak adapter:

1. Press INST ADDRESS at the program top level.
2. Press RECONFIG at the first level softkeys.

   After pressing the RECONFIG softkey, a set of softkeys are enabled that correspond to each piece of equipment that can be used with this software.
3. Press QPA.
4. Type the new primary GPIB address of the quasi-peak adapter and press ENTER. To keep the previous selection, press the ABORT softkey.

   The default primary GPIB address for a quasi-peak adapter used with the HP 85869PC EMI measurement software is 17.
5. Press YES to save the new configuration on the default configuration file (bwi_fact), or press NO to cancel changes.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

Spectrum Analyzer (SA)

The SA softkey is used to change the primary GPIB address of the spectrum analyzer used with this software.

Example To change the primary GPIB address of the spectrum analyzer:

1. Press INST ADDRESS at the program top level.
2. Press RECONFIG at the first level softkeys.

   After pressing the RECONFIG softkey, a set of softkeys are enabled that correspond to each piece of equipment that can be used with this software.
3. Press SA.
4. Type the new primary GPIB address of the spectrum analyzer and press ENTER. To keep the previous selection, press the ABORT softkey.

   The default primary GPIB address for a spectrum analyzer used with the HP 85869PC EMI measurement software is 18.
5. Press YES to save the new configuration on the default configuration file (bwi_fact), or press NO to cancel changes.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

Driver

The `Driver` softkey is used to change the primary GPIB address of the attenuator/switch driver used with this software.

Example To change the primary GPIB address of the attenuator/switch driver:

1. Press `INST ADDRESS` at the program top level.
2. Press `RECONFIG` at the first level softkeys.

   After pressing the `RECONFIG` softkey, a set of softkeys are enabled that correspond to each piece of equipment that can be used with this software.
3. Press `Driver`.
4. Type the new primary GPIB address of the attenuator/switch driver and press `ENTER`. To keep the previous selection, press the `ABORT` softkey.

   The default primary GPIB address for an attenuator/switch driver used with the HP 85869PC EMI measurement software is 28.
5. Press `YES` to save the new configuration on the default configuration file (bwi_fact), or press `NO` to cancel changes.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

Library Mass Storage Is (MSI)

The `Lib MSI` softkey is used to change the library directory that is used with this software.

Example To change the library MSI default mass storage device and directory path:

1. Press `INST ADDRESS` at the program top level.
2. Press `RECONFIG` at the first level softkeys. After pressing the `RECONFIG` softkey, a set of softkeys are enabled that correspond to each piece of equipment that can be used with this software.
3. Press `Lib MSI`.
4. Type the library directory, starting from the root directory, replacing the existing entry, and press `ENTER`. To keep the previous selection, press the `ABORT` softkey.
5. Press `YES` to save the new library msus in the default configuration file (bwi_fact) or press `NO` if you do not wish it to be saved.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

See Also

- "Library Utilities" in Chapter 6

Adding Peripheral Devices

Polling of the GPIB is performed each time the HP 85869PC EMI measurement software is run, so all system components connected (with power on) are automatically configured into the system at that time.

Example To add peripheral devices while the program is running:

1. Connect the peripheral to the GPIB and turn the peripheral power on.
2. Press `INST ADDRESS` at the program top level.
3. Press `CONTINUE` at the first level softkeys.

   The new model spectrum analyzer should be configured into the system. It should show as CURRENTLY CONNECTED in the configuration display.

See Also

- An example of the configuration display is shown in Figure 9-1.

Peripheral Not Responding

If a peripheral connected through GPIB does not appear to be responding, perform the following.

1. Press `INST ADDRESS` at the program top level.
2. Verify that the peripheral is listed as CURRENTLY CONNECTED in the configuration display. An example of the configuration display is shown in Figure 9-1.
3. Press `CONTINUE` at the first level softkeys.

If the peripheral is still not responding, perform the following.

4. Verify that all devices connected to the GPIB are powered on.
5. Verify that no two devices are set to the same GPIB address.
6. Verify that the GPIB address switch is set properly (refer to Chapter 2).
7. Verify that all devices are connected to the same GPIB interface select code. The default select code is 7 (refer to `Select Code` in this chapter).
8. Verify that the GPIB cable between the peripheral and the computer is connected properly (refer to Chapter 2).

10

Utility

This chapter contains the following information:

- First Level Functions—System Utility
  - System Calibration
  - Report

    Designing New Forms
    Editing Existing Forms
    Entering Data into a Report
    Printing a Report Form
    Storing a Report Form in a Library
    Creating a Default Report
  - Time and Date
  - Resolution and Impulse Bandwidths (BWi)
  - Name

The utility portion of the program performs miscellaneous utility functions. When using the utility portion of the program you can:

- measure impulse bandwidth correction factors for broadband measurements.
- write a facility name at the top of a spectrum analyzer display containing measurement results.
- update and print customized reports using the Report Form Generator.
- perform spectrum analyzer and preselector calibrations.
- set the system clock.

The facility name, impulse bandwidth, and report functions of the utility portion of the program require the use of the bwi_fact and EMI_RPT files stored in the "/85869PC" directory.

First Level Functions—System Utility

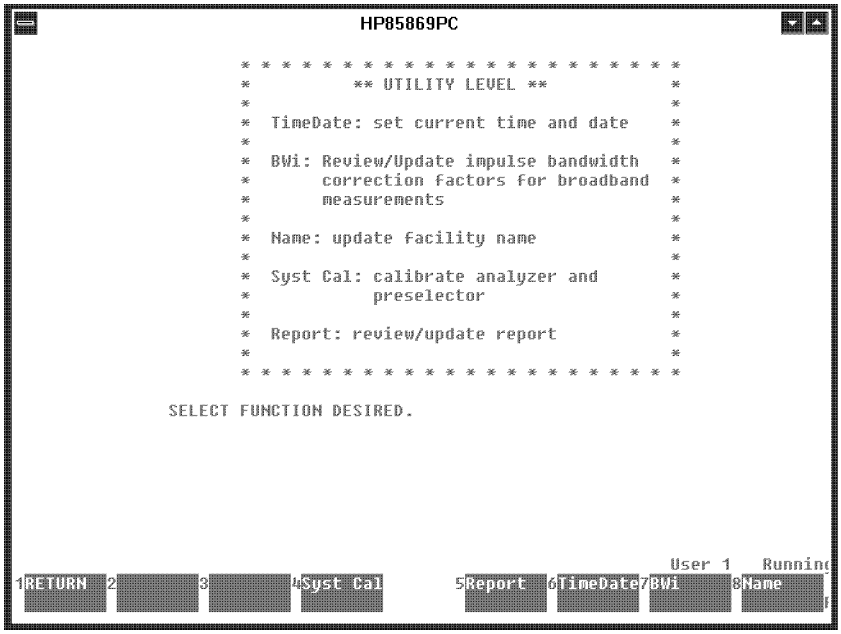


Figure 10-1. First Level Utility Screen

`RETURN` returns the program to the top level.

`Syst Cal` performs a system calibration on the spectrum analyzer and preselector connected to the equipment configuration.

`Report` activates the Report Form Generator. The Report Form Generator is a tool used to generate a report.

`TimeDate` sets the system clock to the current time.

`BWi` displays the spectrum analyzer resolution bandwidth and the last-calculated impulse bandwidth along with the correction factor for each.

`Name` displays the facility name at the top of the spectrum analyzer display containing measurement results.

System Calibration

The `Syst Cal` softkey performs a two-step system calibration on the spectrum analyzer and preselector connected to the equipment configuration.

Example To use the Syst Cal function:

1. Press `UTILITY` at the program top level.
2. Press `Syst Cal` at the first level softkeys.

   Follow the prompts on the computer display to continue or use the `ABORT` softkey to terminate the Syst Cal function.

A system calibration is performed in two steps.

First, a spectrum analyzer calibration is performed using the built-in settings of recall registers 8 and 9.

Next, if an HP 85685A RF preselector is in the system and not in bypass, a preselector calibration is performed. All ranges and portions of ranges above 200 kHz are calibrated using the preselector's comb generator output. Connections are made manually, following the directions on the screen. Calibration data is stored by this program and applied at measurement time. For maximum measurement accuracy, it is recommended that system calibration be performed frequently.

The `Syst Cal` softkey can also be accessed through `MEASURE` at the program top level. Refer to "System Calibration" in Chapter 7 for more information.

Report

The `Report` softkey activates the Report Form Generator. The Report Form Generator is a tool used to generate a report with data collected from an EMI measurement.

Although no report libraries have been supplied with the program, they can be stored, loaded, and purged just like any of the other six library types.

The Report Form Generator's features include:

- integrated text and graphics
- screen editor
- up to 200 fields of text and data
- insertion of graphics anywhere on the form by pressing a single key
- insertion of the peak amplitude list anywhere on the form by pressing a single key
- insertion of form feeds anywhere on the form
- full use of the computer's editing keys
- storage of forms in the report library for future use

There are two modes of operation available when using the Report Form Generator:

Update Mode The update mode is used to design a new form or edit an existing one. Two different "fields" are utilized in the update mode of operation to design a form:

text field The text fields make up the basic form (for example, DATE, TIME, EUT DESCRIPTION, and so on).

data field The data fields are used to enter data associated with a specific test.

Having separate text and data fields enables you to erase only the data associated with a specific test and not the entire form. To erase the entire form, text and data fields, press the `Scratch` softkey. The `ErasData` softkey erases only the data fields.

Data Entry Mode After the design or editing is completed, the Data Entry Mode is used to enter data pertinent to a specific EUT.

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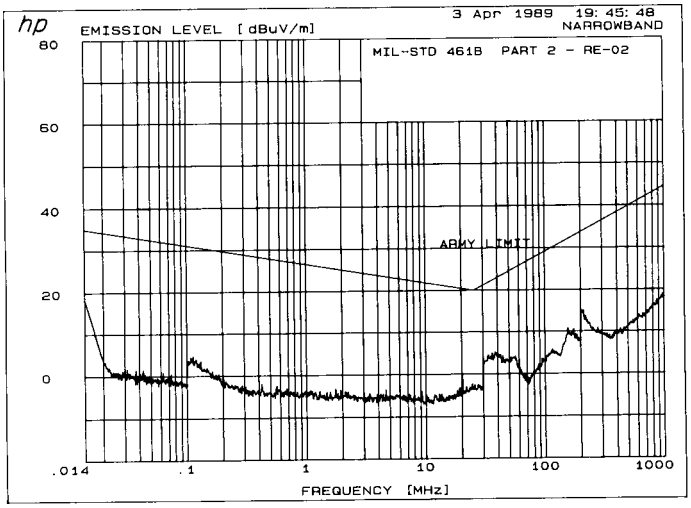
HP 85869PC
EMI MEASUREMENT SOFTWARE

This is a sample report form. There are two basic modes of operation: the Data Entry mode and the Update mode. The Data Entry mode is used to fill in data fields that have been defined, such as the date and time fields on this sample report form. The Update mode is used to add new data fields or text such as this paragraph. With this capability, the report form can be easily modified to meet individual requirements.

DATE: TIME:
EUT DESCRIPTION:
TYPE TEST:
FREQUENCY RANGE:
SYSTEM DESCRIPTION:

TEST PERFORMED BY:
TEST RESULTS:



Peaks above -30 dB of Limit Line #1

PEAK#	FREQ (MHz)	(dBpT)	DELTA
1	4.8E-5	103.2	-28.5
2	.00011	90.5	-26.5
3	.000169	94.9	-14.4

Figure 10-2. Example Report Form

After selecting the Report softkey, from the utility menu, a display similar to Figure 10-3 appears on your computer.

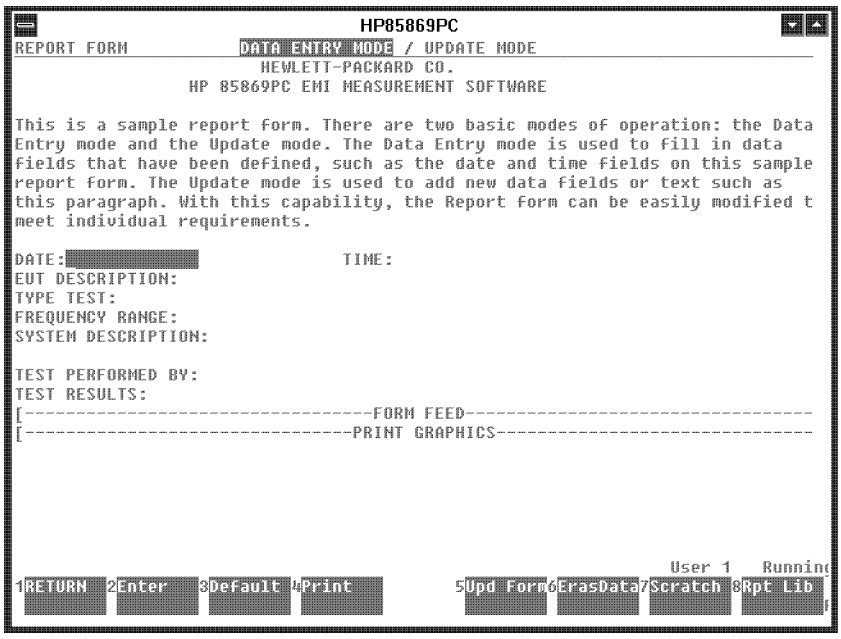


Figure 10-3. Report Softkeys

RETURN	leaves the report section and returns the program to the previous level.
Enter	accepts any modifications made to the form.
Default	specifies the currently displayed report as the default report file (EMI_RPT) that is automatically loaded at run-time. To override the existing default report, make the changes necessary, then press Default and following the prompts on the display.
Print	prints the report form currently shown on the computer screen to the printer. Graphics data (InsGraph) can only be output when the system printer is connected through either the serial or parallel interface. A printer which is connected to the measurement system will only output the text portion and tabular data (InsPeaks).
Upd Form	accesses an additional softkey menu that is used to update report forms.
ErasData	erases data fields.
Scratch	erases an entire report form, including both text and data fields.
Rpt Lib	accesses the report library. Refer to "Library Utilities" in Chapter 6 for information on using library softkeys.

After selecting the `Upd Form` softkey, from the report softkeys menu, a display similar to Figure 10-4 appears on your computer.

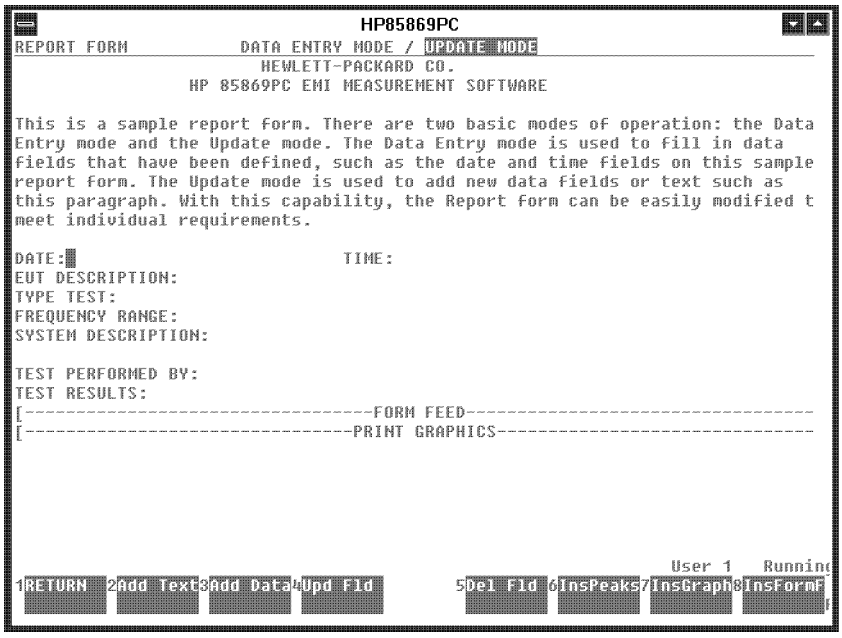


Figure 10-4. Update Form Softkeys

`RETURN` discontinues the Report function and returns the program to the previous level.

`Add Text` adds a block of text into a report form.

`Add Data` adds a block of data into a report form.

`Upd Fld` updates a field in a report form.

`Del Fld` deletes a field in a report form.

`InsPeaks` inserts print peaks data into a report form.

`InsGraph` inserts the current active graph into a report form (printout is only possible on serial/parallel printers).

`InsFormF` inserts a formfeed into a report form.

Designing New Forms

The following section is a step-by-step procedure that explains how to create the form shown in Figure 10-2.

1. From the Utility portion of the program, press `Report`.

   The default form should be displayed on the computer screen.

2. Press `Scratch` followed by `YES` to erase the displayed form.

   The Report Form Generator is in the now in the Update Mode.

3. Press `Add Text`.

   A highlighted field is displayed at the top of the screen.

4. Use the space bar to move the cursor to the center of the screen and type `Hewlett-Packard Co.`, then press `ENTER`.

   Be sure to leave enough blank spaces before the text for future editing purposes. Use the spacebar to align the text as desired.

5. Use the computer's ▼ key, to position the cursor at the next line.

6. Repeat steps 3 through 5 for the next two lines of text.

7. Use ▼ to position the cursor three lines below `EMI MEASUREMENT SOFTWARE`.

8. Press `Add Text`.

9. Type the first line of the paragraph, then press `ENTER`.

10. Use ▼ to position the cursor to the next line. Repeat steps 8 through 10 for the remaining lines of the paragraph.

11. Position the cursor two lines below the last line of the paragraph.

12. Press the `Add Text` softkey.

13. Type `DATE:`, then press the `ENTER` softkey.

14. Position the cursor one space to the right of the DATE: text field.

    If attempting to add a field where a field already exists, the error message "`Cannot add a field while within a field range.`" appears on the computer screen. If an error message is displayed, press the `Upd Fld` key to see the width of the existing field. Press `ABORT`, and position the cursor one space to the right of the existing text field.

15. Press `Add Data`.

16. Use the → key to add 14 spaces to create a blank data entry field for `TIME`, then press `ENTER`.

17. Position the cursor approximately 20 spaces to the right of the data field that was just added.

18. Press `Add Text`.

19. Type TIME:, then press `ENTER`.

20. Position the cursor one space to the right of the TIME: text field.

21. Press `Add Data`.
22. Use the (→) key to add 10 spaces to create a blank data entry field for DATE, then press `Enter`.
23. Move the cursor to the next line and over to the extreme left of the form.
24. In the same way, create the remaining text fields shown in Figure 10-2, then create data fields to the desired width.

Example To insert a listing of the peaks at the current cursor position:

- Position the cursor where the list is to be inserted, then press `InsPeaks`.

Example To insert a logarithmic plot of trace data at the current cursor position:

- Position the cursor where the graphics is to be inserted, then press `InsGraph`.

Example To insert a form feed at the current cursor position:

- Place the cursor where a form feed is to be inserted and press `InsFormF`.
- Press `RETURN` to return to the data entry mode.

Editing Existing Forms

In the following procedure, the form shown in Figure 10-2 is edited. In this example, the TYPE TEST text field is changed to read TYPE OF TESTING.

Use the following procedure to change the TYPE TEST text field:

1. From the Utility portion of the program, press `Report`.

   The report form should appear on the computer screen.
2. Press `Upd Form`.
3. Using the arrow keys on the computer keyboard, position the cursor at the TYPE TEST text field.
4. Press `Upd Fld`.

   Note that the active window appears over the TYPE TEST text field showing the width of this text field. If the active window appears to the right of TYPE TEST:, the cursor was not within the TYPE TEST text field when the `Upd Fld` softkey was pressed. Instead, the cursor was in the data field that is to the right of the TYPE TEST: text field. If this is the case, press the `ABORT` softkey, position the cursor over any letter in TYPE TEST:, then press the `Upd Fld` softkey.

   The text field is not large enough to allow the words TYPE OF TESTING:. This text field must be deleted as well as the data field to the right.
5. Press `ABORT`.
6. Press `Del Fld`.
7. Position the cursor within the data field.
8. Press `Del Fld`.

Both the text and the data fields are deleted. Note the cursor position—it is positioned on the preceding data field.

9. Position the cursor down one line and move the cursor to the extreme left of the form.
10. Press `Add Text`.

    The active window is the full width of the form.

11. Input `TYPE OF TESTING:`, then press `ENTER`.

    A text field has been created. The next step is to create a data field to the right of this text field.

12. Position the cursor one space to the right of the TYPE OF TESTING: text field.
13. Press the `Add Data` softkey.
14. Press the (→) key or space bar until the cursor is positioned at the desired width, then press `ENTER`.

Entering Data into a Report

Once a form has been created data can be added as shown in the following procedure.

1. From the Utility portion of the program, press `Report`.

   The active window outlines the first data field.

2. Type the appropriate data then press `ENTER`.
3. Press the (▼) or the (Tab) key to position the active window to any of the data entry fields.
4. In the same way, enter all data specific to the EUT.

Printing a Report Form

To print a report form that is currently shown on the computer screen to the printer, press the `Print` softkey at the second level.

Note If graphics are inserted in the report, a graphics printer must be used. This printer *must* be connected through the serial or parallel port.

If the test type is NB/BB or BB AUTO, then the trace that is printed is the currently active trace. Press the `VIEW BB` or `VIEW NB` at the program top level to toggle the active trace.

Storing a Report Form in a Library

Once the report has been created, press the `Rpt Lib` softkey to access the report library.

Although no report libraries have been supplied with the program, they can be stored, loaded, and purged just like any of the other six library types. Refer to "Library Utilities" in Chapter 6 for information on using library softkeys.

Creating a Default Report

The default report file (EMI_RPT) is automatically loaded at run-time. To override the existing default report, simply make the changes necessary, then press `Default` and the following message will appear on the report form:

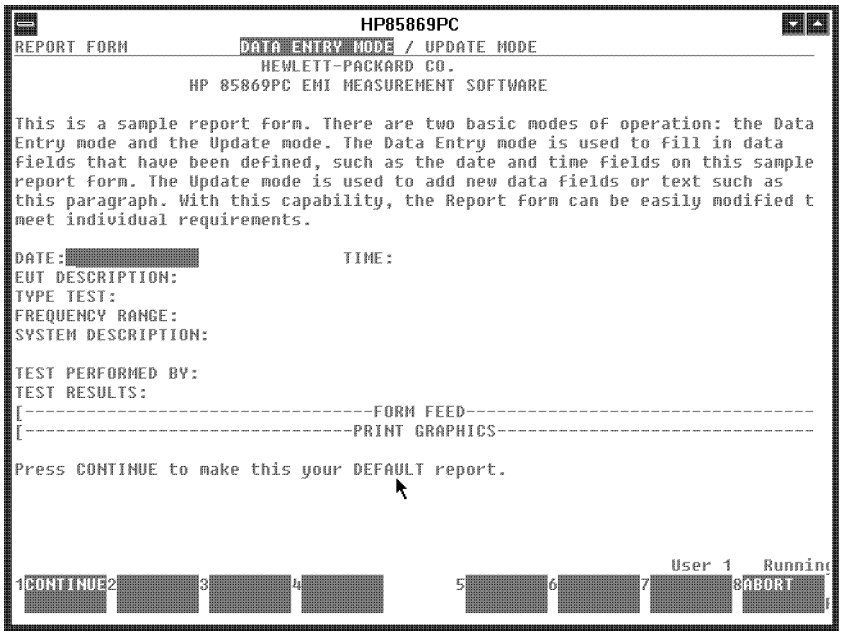


Figure 10-5. Default Report Message

Press `CONTINUE` to proceed or `ABORT` to discontinue the operation.

Time and Date

The TimeDate softkey sets the system clock to the current time. The time is displayed in the upper-right corner of the spectrum analyzer display.

Note Changing the time or date in this application will modify your PC's system time and date setting used by other applications.

Example To change the date and time of the system clock:

1. Press the TimeDate softkey on the system utility menu. A display similar to Figure 10-6 is displayed on your computer screen.

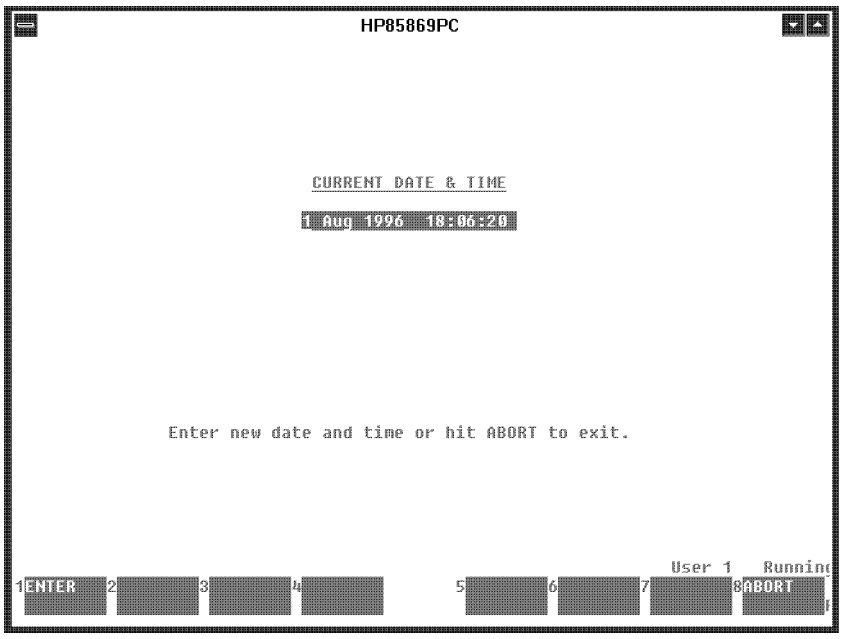


Figure 10-6. System Clock Prompt Screen

2. Type the new date and the time in the highlighted field.
3. Press ENTER.

   The ABORT softkey interrupts the process and returns the program to the utility menu.

Resolution and Impulse Bandwidths

The BWi softkey displays the spectrum analyzer resolution bandwidth and the last-calculated impulse bandwidth along with the correction factor for each.

Example To view the last-calculated impulse bandwidth correction factors:

1. Press the BWi softkey on the system utility menu. A display similar to Figure 10-6 is displayed on your computer screen.

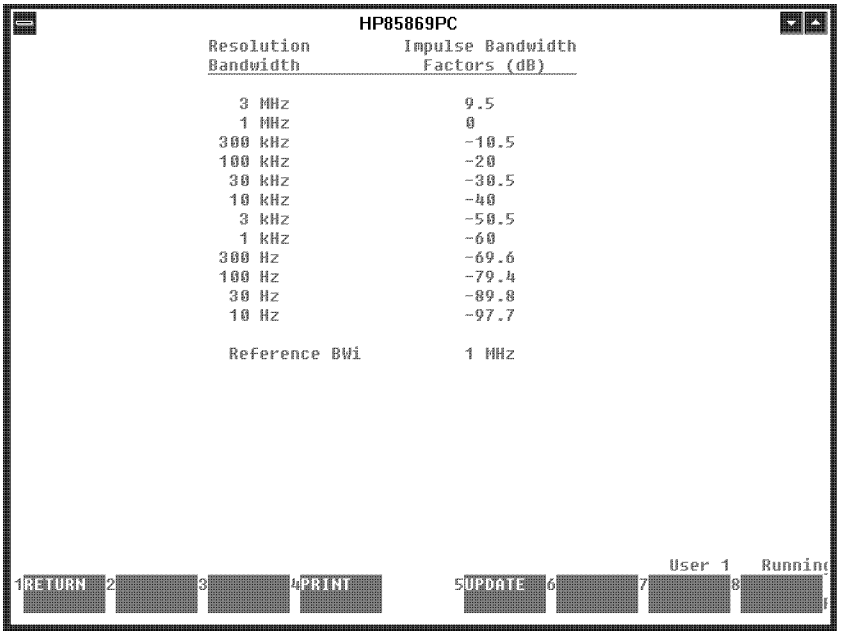


Figure 10-7. Last-Calculated Impulse Bandwidth Correction Factors

RETURN returns program to previous level.

PRINT prints the last-calculated impulse bandwidth correction factors on the printer.

UPDATE updates the last-calculated impulse bandwidth correction factors.

Note

To determine the receiver bandwidth type, inspect the front panel of the spectrum analyzer's IF display section. The receiver bandwidth type is printed on the front panel (OPT 462 only) and appears as one of the following:

OPT 462 Impulse Bandwidth Spectrum Analyzer

or

OPT 462 6 dB Resolution Bandwidth Spectrum Analyzer Display

Example

To remeasure bandwidths and recalculate correction factors:

1. Press `UPDATE`.
2. Select receiver bandwidth type `6dB BW` or `IMPULSE BW`.
3. Connect the spectrum analyzer calibration output to the preselector's right input.
4. Press `CONTINUE` and follow the prompts on the computer display to begin the measurement (it takes about two minutes).
5. When the measurement is complete, the newly-calculated impulse bandwidth correction factors are displayed on the computer screen.
6. Press `YES` to save the new configuration on the default configuration file (bwi_fact), or press `NO` to cancel changes.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

Name

The Name softkey displays the facility name at the top of the spectrum analyzer display containing measurement results.

Example To change the facility name:

1. Press the Name softkey on the system utility menu. A display similar to Figure 10-8 is displayed on your computer screen.

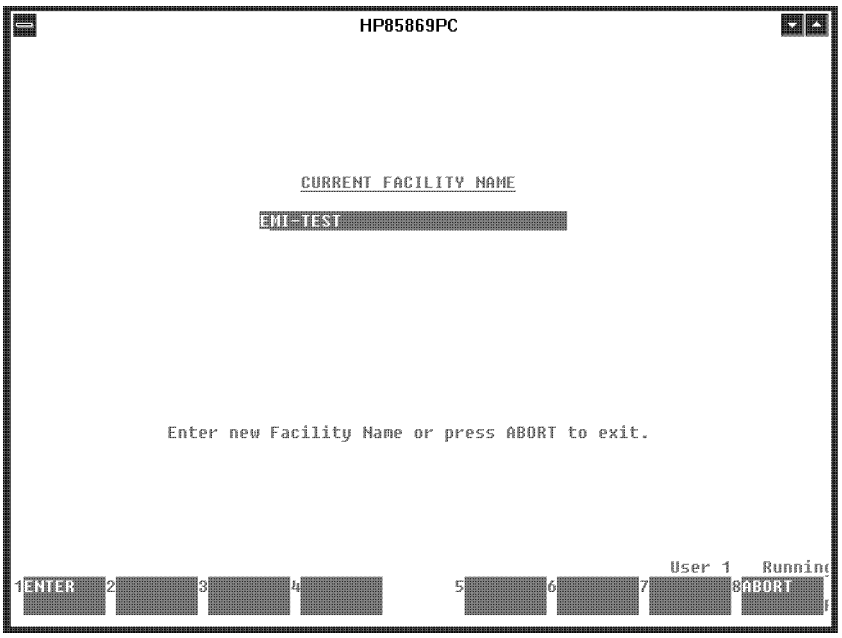


Figure 10-8. Facility Name Prompt Screen

2. Type the facility name (up to 29 letters).
3. Press ENTER.
4. Press YES if you wish to store the facility name for future use or press NO if you intend to use the facility name only until the program is terminated.

   If you have problems accessing the file bwi_fact, refer to "If you have problems accessing the bwi fact file" in Appendix A.

11

Library Copy Utility

This chapter contains the following information:

- Mass Storage Specification Screen
  - Source Function Keys
  - Destination Function Keys

The `LIB COPY UTILITY` softkey is used to copy all or selected library files from one directory to another. To access the Library Copy Utility screen, select `LIB COPY UTILITY` from the EMI Start Menu.

Use the Library Copy Utility to incorporate portions of defined test libraries to create a new test. Once you have leveraged all of the applicable portions of the existing test libraries, you can use the Setup portion of the program to create only the undefined portions of the test library.

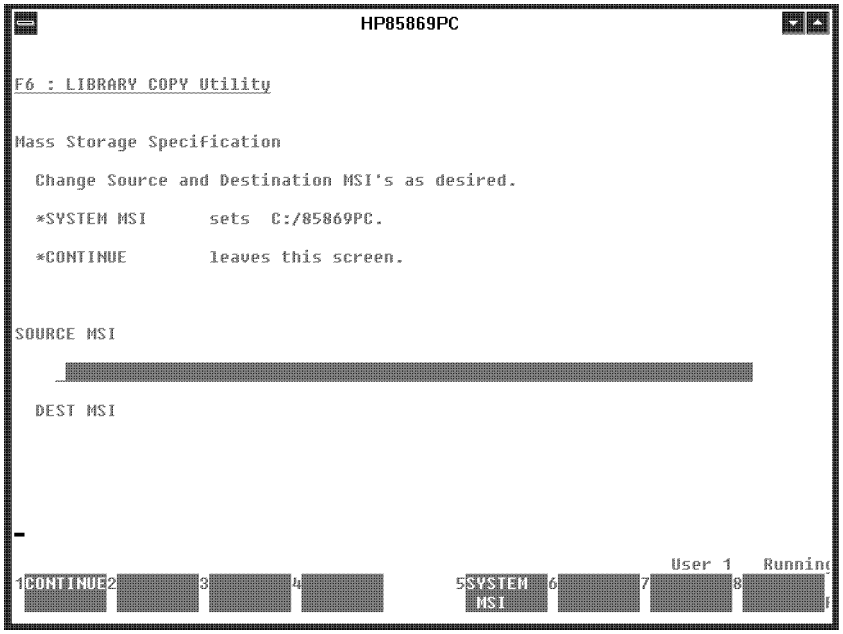


Figure 11-1. `LIB COPY UTILITY` **Screen**

Note The program handles different libraries, different disk types (LIF or HFS), the presence or absence of libraries on the destination drive, duplicate file names, and full disks. A destination directory *must* already exist in the MS-DOS environment.

Mass Storage Specification Screen

`SOURCE MSI` field specifies the source directory of the files to be copied from.

Note In order to switch between the source and destination MSI fields, either press the (Enter) key or use the up and down arrow keys.

`DEST MSI` field specifies the destination directory where the files are to be copied to.

`CONTINUE` accesses the next screen to specify library files to copy.

`SYSTEM MSI` enters the directory location of the HP 85869PC software into either the `SOURCE MSI` field or the `DEST MSI` field. When accessing files located under the HP 85869PC directory, simply type in the remaining directory path. This function key has been added for your convenience.

After the `SOURCE MSI` and `DEST MSI` fields have been specified and `CONTINUE` has been pressed, a menu of all available library copying utilities are displayed. See Figure 11-2.

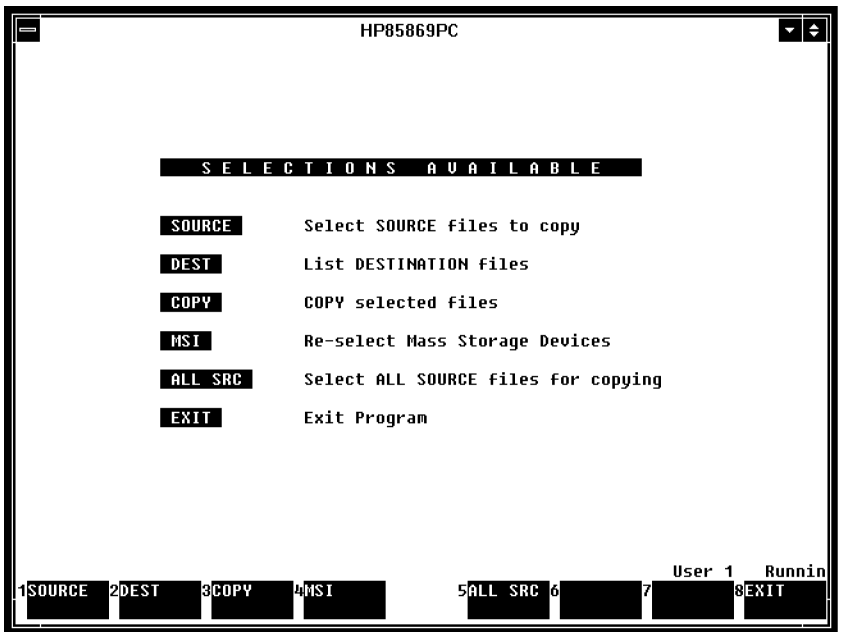


Figure 11-2. Available Library Copy Utilities

`SOURCE` accesses a menu of softkeys to select individual libraries for copying from the specified source directory—Test, Data, Correction Data, Limits, Transducers, Gain/Loss, and Reports.

`DEST` lists the library contents of the individual libraries specified in the destination MSI. For example, use `DEST` to verify that selected files were copied to the specified library destination. Use the following softkeys to view the contents of each library.

`COPY` copies the selected files in the source directory to the destination directory.

`MSI` returns to the Mass Storage Specification screen.

`ALL SRC` selects the entire contents of the source directory for copying.

EXIT exits the program and returns to the EMI Start Menu.

Source Function Keys

SOURCE displays a set of function keys which allows access to individual libraries. Pressing a library function key specifies it as the type of library for copying from. Selecting a specific library type by its function key allows you to view the source library items in that library; SELECT, UNSELECT, SELECT ALL, and UNSELECT ALL can be used for copying. You can access one or more library types before returning to the Selections Available screen.

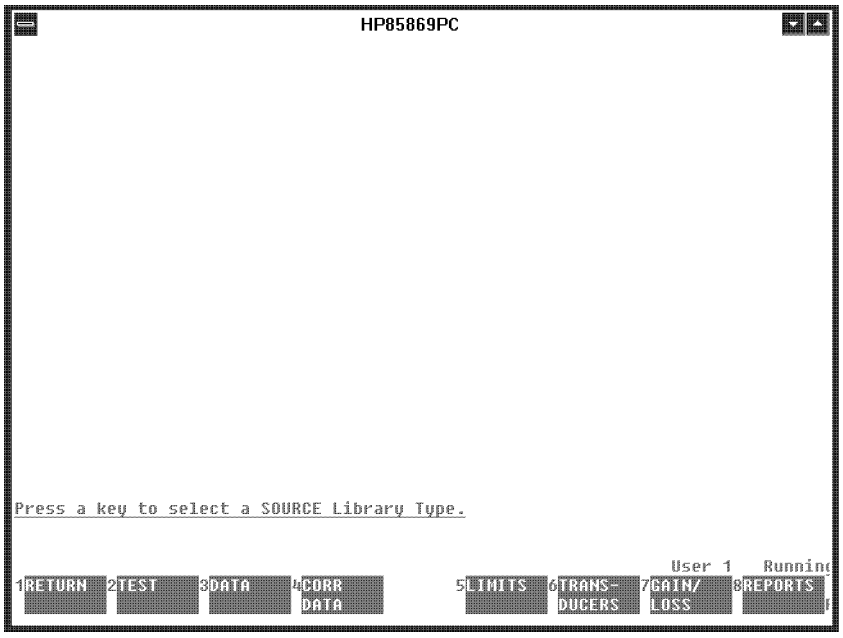


Figure 11-3. SOURCE Function Keys

RETURN returns to the previous screen.

TEST displays the test library stored in the source library, for example, Commercial Radiated, Commercial Conducted, MIL-STD 461A, MIL-STD 461B, MIL-STD 461C, or MIL-STD 461D. Use the softkeys, as described below, to select all or portions of the test to be copied.

DATA displays the currently stored measurement data in the source library. There are two sample data libraries supplied with the program that correspond to MIL-STD 461A and MIL-STD 461B.

CORR DATA displays the stored receiver correction data.

LIMITS displays the test limit files contained in the stored limit-line library. There is one predefined limit library supplied in each of the six test libraries.

TRANS- DUCERS displays the transducers associated with the selected test library. There is one predefined transducer library supplied in each of the six test libraries.

GAIN/ LOSS — displays the gain/loss characteristics associated with the selected test library. There is one predefined gain/loss library supplied in each of the six test libraries, but may not contain any files.

REPORTS — displays any report files currently contained in the report library.

Source Library Function Keys

Use the source library function keys to select and unselect the library files in the specified library for copying purposes.

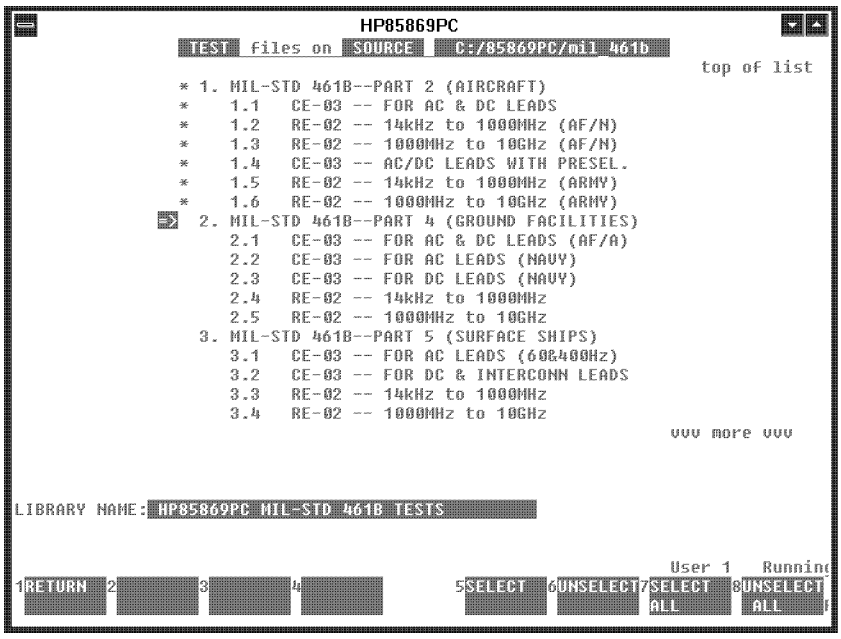


Figure 11-4. Source Library Function Keys

RETURN — returns to the previous screen.

SELECT — selects the library file located to the right of the cursor. The complete group is selected, when the cursor is pointing to a test parameter group heading, for example, MIL-STD 461B—PART 2 (AIRCRAFT).

UNSELECT — unselects the library file located to the right of the cursor. The complete group is unselected, when the cursor is pointing to a test parameter group heading, for example, MIL-STD 461B—PART 2 (AIRCRAFT).

SELECT ALL — selects all of the library files.

UNSELECT ALL — unselects all of the selected library files.

Destination Function Keys

DEST displays a set of function keys which allows access to individual libraries. Pressing a library function key will list its contents as specified in the destination MSI.

RETURN	returns to the previous screen.
TEST	lists the files in the selected test library.
DATA	lists the files in the selected data library.
CORR DATA	displays the receiver calibration data files in the correction data library.
LIMITS	lists the files in the selected limits library.
TRANS-DUCERS	lists the files in the selected transducer library.
GAIN/ LOSS	lists the files in the selected gain/loss library.
REPORTS	lists the files in the selected report library.

A

Troubleshooting

This appendix contains information in regard to the following problems:

- If you exceed spectrum analyzer display capacity
- If markers are not set in the same range
- If you have problems loading a library
- If you have problems accessing the BWi factor file
- If you need to determine the msus of a disk drive for the work station

This appendix contains additional material that may only apply to certain instances and may contain in-depth information. The majority of the information is related to screen prompts that may appear while running this software. In each instance, the screen prompt is indicating a problem. In this appendix, each of these problems are describes and a sequence of steps to solve the problem is presented.

If you exceed spectrum analyzer display capacity

It is possible to set up a measurement that will exceed the display capacity of the system's spectrum analyzer. This may happen under a variety of conditions. Such conditions include using a very complex test setup table (for example, using all three 20-point limit lines) or adding markers to a complex measurement.

Symptoms When the screen capacity is exceeded, a message appears on the screen informing you that certain functions will be eliminated from view. It is important to note that although the functions do not appear on the screen, they still exist. For example, if the trace markers do not appear on the screen, you could go to the marker screen and see the values of the marker coordinates. The number of functions to be eliminated depends on how complex the screen is. Functions can be eliminated one at a time until the problem is solved. Use the following list as a guide when selecting the order in which to eliminate functions.

To solve this problem:

1. Eliminate the HP logo.
2. Eliminate markers.
3. Eliminate limit lines and limit titles.
4. Eliminate annotation.
5. Eliminate the graticule.

If markers are not set in the same range

When setting the markers with the data analysis measurement options, described in Chapter 7, the markers must be within the same frequency range.

Symptoms If you set the markers in different frequency ranges, a message as shown in Figure A-1 appears.

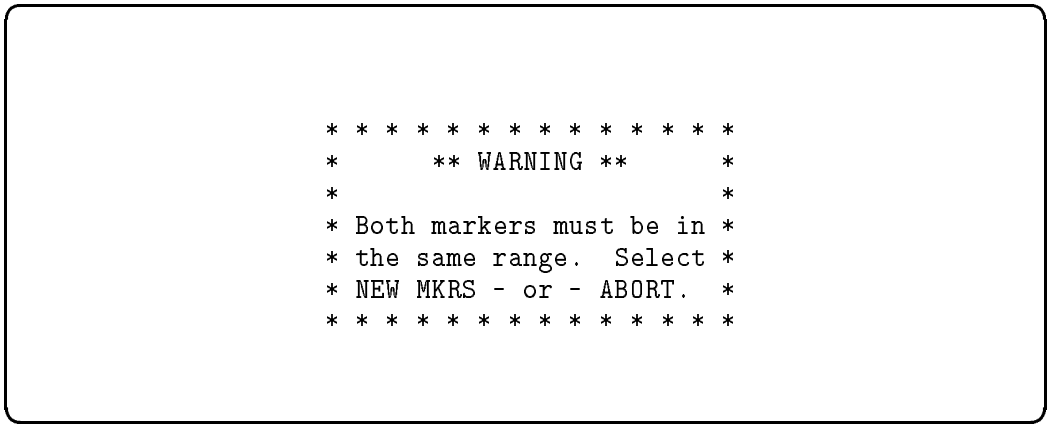


Figure A-1. Markers Not Set in One Range

When this message appears, it is warning you that the markers that you set are in different ranges. Each range is specified by the start frequency and stop frequency parameters defined in the test setup table.

When you placed your first marker in one range and the second marker in a different range, the measurement could not be performed because each range has its own set of parameters which most likely differ from each other.

To solve this problem:

1. Press NEW MKRS.

   This allows you to repeat the process of selecting the placement of the markers.

2. Re-enter the markers according to the prompts on the computer screen and proceed.

   If you are unsure of the end-points of a range, refer to the start and stop frequency parameters of the test setup table that is being used.

If you have problems loading a library

The personal computer uses the LIBRARY MSI setting that was designated in "Designating a Library MSI" in Chapter 4.

Symptoms If the computer is having a problem accessing the LIBRARY MSI setting that was designated, you get an error as shown in Figure A-2.

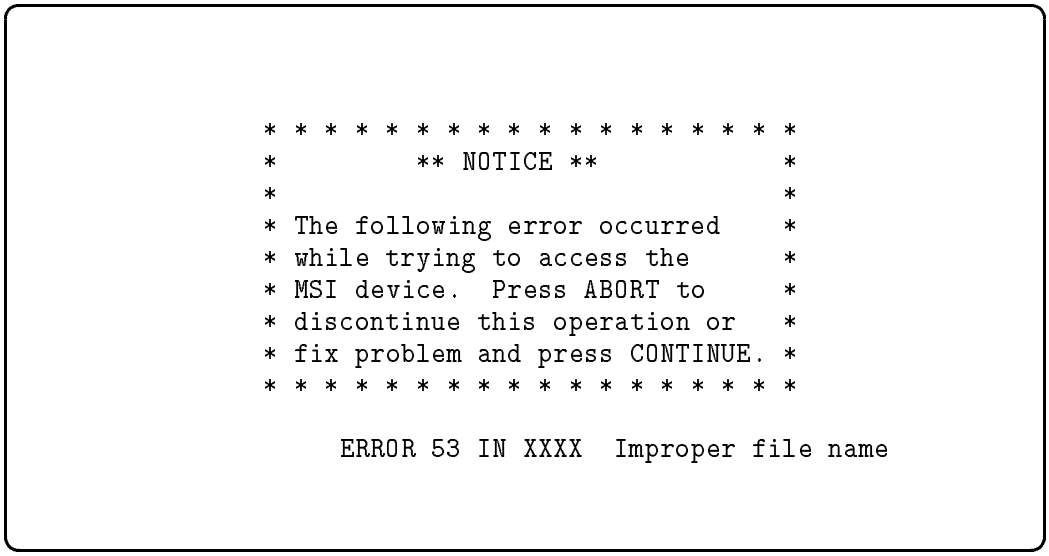


Figure A-2. Error Occurred Trying to Access MSI

To solve this problem:

- Press `ABORT`.
- Press `INST ADDRESS`.
- Press `RECONFIG`.
- Press `Lib MSI`.
- Type the directory path to be used for library operations (for example, c:/85869PC/MIL_461B), and press `ENTER`.
- Press `RETURN`.
- Press `YES` to save the new configuration to the default configuration file (bwi_fact), or press `NO` if you do not wish the current changes to be saved.

  If you have problems accessing the file bwi_fact, refer to the following section "If you have problems accessing the bwi fact file".
- If no further changes in the configuration are necessary, press `CONTINUE`.

If you have problems accessing the bwi fact file

The following functions require the use of the default configuration file bwi_fact:

- Instrument address (`INST ADDRESS`) of the reconfiguration program
- Library MSI (`Lib MSI`) of the reconfiguration program
- Facility name (`Name`) of the utility program
- Impulse bandwidth(`BWi`) of the utility program

The program searches for the bwi_fact file at the currently specified directory of the HP 85869PC application, for example, "/85869PC".

Symptoms If the default configuration file (bwi_fact) is not found at the expected location, the message, as shown in Figure A-3, appears on the computer screen.

```
* * * * * * * * * * * * * * * * * * *
*            ** NOTICE **            *
*   Any access to the impulse        *
*   bandwidth factors, instrument    *
*   configuration, facility name,    *
*   or plotter parameters requires   *
*   the use of bwi_fact file.        *
*   Make sure the file is in the     *
*   same directory as the EMI        *
*   Program and press "CONTINUE" or  *
*   press "NEW MSI" to specify a     *
*   new MSI.                         *
* * * * * * * * * * * * * * * * * * *
```

Figure A-3. Prompt Showing the Default Configuration File is Not Found

To solve this problem:

1. Press `NEW MSI` and enter the directory of the default configuration file (bwi_fact) or use File Manager or Windows Explorer to copy the bwi_fact file to this directory, then press `CONTINUE`.

   Press `ABORT` to terminate the storage process.

Note The HP 85869PC EMI measurement software has been designed to have the bwi_fact file located under the root directory "/85869PC".

Determining the msus of a Disk Drive and Directory for the PC

In order for your personal computer to access a disk drive that is connected to your system, it must know the volume of the disk drive.

The HP 85869PC EMI measurement software has been designed to work on any disk drive destination, for example, C:, D:, N:, and so on. The program must find the root level directory "/85869PC" and its associated files on the designated disk drive. This is the default volume of the application and *cannot* change.

The library directories can be specified by the user by setting a different value for the library MSI. These drives and directory paths specify where the HP 85869PC library files exist, for example, D:/PROJECTS/1996/EUT_1.

The HP 85869PC software provides the test, data, transducer, gain/loss, and limit libraries in the following directories (which are default MSI libraries from the factory):

- /85869PC/comm_con
- /85869PC/comm_rad
- /85869PC/mil_461a
- /85869PC/mil_461b
- /85869PC/mil_461c
- /85869PC/mil_461d

volume Every disk drive connected to your personal computer has its own logical location (for example, C:). The installation procedure allows selection of the volume of the disk drive and the directory where the software is going to be installed.

MSI is an abbreviation for "mass storage is". MSI refers to the setting that was set during the installation process and is used to designate a directory as the system default directory. Once it is selected, all system mass storage operations automatically refer to the default directory .

Example To determine the current volume of a disk drive and directory path with the HP 85869PC software loaded, perform the following procedure:

1. Return to the program top level of the HP 85869PC EMI measurement software.
2. Press the Pause key to pause the program.
3. Type `SYSTEM$("MSI")` and press Return.

   This displays the current volume on your display.

   You also could have typed `SYSTEM$("MASS STORAGE IS")` to perform the same function.

B

Application Notes

This appendix contains the following information:

- Measuring With Your Own Subprograms
- How to Use the Subprogram Measure_sub
  - Modifying the Subprogram Measure_sub
- How to Use the Subprogram M_modify_data
  - Modifying the Subprogram M_modify_data
- How to Use the Subprogram M_post_msmt
  - Modifying the Subprogram M_post_msmt
- Data Analysis Using Your Own Subprograms
- How to Use the Subprogram Analysis_sub
  - Modifying the Subprogram Analysis_sub
- User-Written Subprograms
- Display Format for Narrow-Span Measurements
- Noise Floors

There are five subprograms which are available for user modification. These subprograms can perform customized measurements, customized analysis, and arbitary functions. For customized measurements, there are the Measure_sub, M_modify_data, and M_post_msmt subprograms. For customized analysis, there is an Analysis_sub subprogram. For arbitrary functions, there are User_sub subprograms. The next three sections cover these subprograms in detail.

Measuring With Your Own Subprograms

The automated measurement capability of the HP 85869PC EMI measurement software can be expanded through the use of user-written subprograms. For example, subprograms to control motor-driven antenna towers and turntables can be written to further automate your EMI measurements.

The three measurement subprograms that can be customized are Measure_sub, M_modify_data, and M_post_msmt. Figure B-1 shows when they are called during the measurement process.

```
FOR Range = 1 TO N
  FOR Setup = 1 TO Num_setups(Range)
    CALL + M_msg_sub_cnt  ! This can call SUB + Measure_sub
    FOR Sweep = 1 TO Swps_per_setup(Range)
      FOR Nb1_bb2 = 1 TO 2
        Set instrument states
        REPEAT
          Calculate Start and Stop freq for each SA sweep
          Take sweep over this span
          Read SA data into computer
          CALL + M_modify_data
          Convert linear frequency data to log format
          Correct data for Transducer and Gain/Loss points
        UNTIL Stop freq >= Range stop frequency
      NEXT Nb1_bb2
    NEXT Sweep
  NEXT Setup
NEXT Range
CALL + M_post_msmt
```

Figure B-1. HP 85869PC Measurement Hierarchy

How to Use the Subprogram Measure_sub

The subprogram Measure_sub is called during the measurement just prior to the start of any setup which specifies the use of the subprogram. Use of the subprogram is specified by selecting `Subprog` in the test setup table (refer to Chapter 5 for details).

To assist you in developing your subprograms, a subprogram "skeleton" named Measure_sub is provided as part of the EMI program; this subprogram is shown in Figure B-2 and Figure B-3.

Modifying the Subprogram Measure_sub

The following steps outline the procedure for modifying the Measure_sub subprogram for use in your measurements.

1. Access the subprogram Measure_sub:
   a. Return to the program top level of the HP 85869PC EMI measurement software.
   b. Press the (Pause) key to pause the program.
   c. Type `RE-STORE "EMI_BW.BAK"` and then press the (RETURN) key. This will create a backup copy of the HP 85869PC EMI measurement software.
   d. Type `EDIT`, then type `Measure_sub` and press (Return).

      The subprogram Measure_sub appears on the computer screen.
2. Edit Measure_sub:
   a. Use the computer arrow keys to scroll through the program lines.
   b. Enter your Subname (up to 15 characters) as a CASE under SELECT Subname$ in SUB Measure_sub.
   c. Enter your Subname code under CASE, or, if multiple setups are to be used (such as for different antenna or turntable positions), then:
   d. Enter a CASE for each Setup number under SELECT Setup. (CASE = X, where X is the Setup number.)
   e. Enter code for task to be performed for each setup under CASE statement for that Setup number.
3. Press (f3) (run) to continue the program.
4. Modify your test setup table:
   a. Using the setup portion of the program, go to test setup table where the subprogram is to be used.
   b. Enter your Subname in the test setup table for the first setup (and all other setups if the same Subname is to be used for all).
   c. This Subname is passed to SUB Measure_sub as the string Subname$.

5. Test the modified Measure_sub:

   Perform your measurement using the modified subprogram to verify that it operates as intended. The subprogram has not yet been permanently stored. You can go back to step 1 at any time and make additional changes until you are satisfied that the subprogram is performing properly.

6. Permanently save the modified Measure_sub by typing `RE-STORE "EMI_BW"`.

The modified subprogram is now permanently saved and will be loaded each time the HP 85869PC EMI measurement software is loaded. It may be changed or added to at any time using this procedure.

```
 SUB Measure_sub(INTEGER Range,Setup,Sa_called_1_0,Subname$)
Measure_sub:REM
    REM
    REM USEFUL COMMON VARIABLES:
    COM /Hpib_1/S,R,@Sa,@Sa_bin,L$
    COM /Hpib_3/@Printer,@Plotter,@Qpa,@Driver,@Pr
    COM /User_sub/User_sub$        ! Input parameter to User sub
    COM /Setup_states_3/ INTEGER Rng_num
    COM /Test_6/St_oct             ! Sweep time/octave
    COM /User_swp/Swp_oct0_mhz1    ! Rev A.03.00
    REM
    REM ****************************************************************
    REM * This subprogram "skeleton" is provided to allow customizing the  *
    REM * HP 85869PC EMI Measurement software to suit the individual needs  *
    REM * of the user. This subprogram can be called from the measurement  *
    REM * setup portion of the program just prior to the start of each     *
    REM * setup.                                                           *
    REM *                                                                  *
    REM * Two parameters are passed to this subprogram and one is returned.*
    REM *                                                                  *
    REM * The first parameter passed is the Setup number for the particular*
    REM * range being measured. The number of setups per range is set in   *
    REM * the measurement setup portion of the program.                    *
    REM *                                                                  *
    REM * The second parameter passed is the Subname$ string. This string  *
    REM * is also set in the measurement setup portion to allow further    *
    REM * branching in this user subprogram.                               *
    REM *                                                                  *
    REM * The one parameter that must be returned to the main program is   *
    REM * the integer variable Sa_called_1_0. It has two possible values:  *
    REM * 0 and 1. A "0" "tells" the main program that the user sub did not*
    REM * alter the current state of the spectrum analyzer. If the current *
    REM * state of the spectrum analyzer is altered by the user sub, then  *
    REM * Sa_called_1_0 must be set to "1". This is extremely important.   *
    REM * Failure to set this variable properly could result in measurement*
    REM * errors due to the spectrum analyzer being in an incorrect state. *
    REM *                                                                  *
    REM * These remarks may be deleted to minimize the amount of code in   *
    REM * this subprogram.                                                 *
    REM *                                                                  *
    REM * An example-code for antenna/table control with EMCO controllers  *
    REM * is part of this skeleton.                                        *

    REM ****************************************************************
```

Figure B-2. Subprogram "Skeleton" Measure_sub Page 1 of 2

```
    REM
    Sa_called_1_0=0
    SELECT UPC$(Subname$)
    CASE "LOCAL"
       LOCAL 7
    CASE "Subname entered in Setup table"
       REM          .
       REM     Code for task here
       REM          .
    CASE "Another subname from Setup table"
       SELECT Setup
       CASE =1
  REM       .
  REM   Code for task here
  REM       .
       CASE =2
  REM       .
  REM   Code for additional task here
  REM       .
       CASE =3
  REM       .
  REM   Code for additional task here
  REM       .
       END SELECT
    CASE ELSE
       REM No subname found. Possible error.
    END SELECT
    REM
SUBEND
```

Figure B-3. Subprogram "Skeleton" Measure_sub Page 2 of 2

How to Use the Subprogram M_modify_data

The M_modify_data subprogram allows users to access data prior to any correction in order to complete any special processing that is not normally done by the HP 85869PC EMI measurement software. For example, if narrowband signals are discovered during a broadband test, those portions of the data containing narrowband signals could be deleted, leaving only broadband signal information in the data.

During a test, the main measurement loop of the HP 85869PC EMI measurement software calls subprogram M_modify_data after each sweep of the spectrum analyzer. There are five integer parameters passed into the routine. The following is a listing of these parameters.

Range This parameter indicates the current range in which the spectrum analyzer is measuring. This parameter can equal 1 through 20.

Nb1_bb2 This parameter indicates whether the measurement is in the narrowband or broadband phase of the test. During a peak, quasi-peak, or narrowband measurement, this parameter will have a value of 1 and during a broadband measurement will have a value of 2.

Setup This parameter contains the current setup number for the spectrum analyzer data in Y(*). This parameter can be any integer value between 1 and 99.

Sweep This parameter contains the current sweep number for the spectrum analyzer data in Y(*). This parameter can be any integer value between 1 and 99.

Y(1:1001) This array contains the raw spectrum analyzer trace data. Each of its 1001 elements can be any integer value between 0 and 1000. This corresponds to data expressed in "display units" or O2 format. In this format, 0 represents the bottom graticule line and 1000 represents the reference level. Thus there are 100 display units per vertical division of the CRT grid, or 0.1 dB per display unit. The data in this array has not yet been corrected for antenna factors or gain/loss factors nor has it been converted from a linear frequency format to a log frequency format. Thus it is considered "raw" data.

Modifying the Subprogram M_modify_data

The following steps outline the procedure for modifying the subprogram M_modify_data for use in your measurements.

1. Access the subprogram M_modify_data:
   a. Return to the program top level of the HP 85869PC EMI measurement software.
   b. Press the (Pause) key to pause the program.
   c. Type `RE-STORE "EMI_BW.BAK"` and then press the (RETURN) key. This will create a backup copy of the HP 85869PC EMI measurement software.
   d. Type `EDIT` (leave a space) then type `M_modify_data` and press (Return).

      The subprogram M_modify_data appears on the computer screen.
2. Edit M_modify_data:
   a. Use the up and down arrow keys on the computer keyboard to scroll through the program lines.
   b. Enter your code for the task to be performed.
   c. Press (3) (run) to continue the program.
3. Test the modified M_modify_data:

   Perform your measurement to verify that the subprogram operates as intended. The subprogram has not yet been permanently stored. You can go back to step 1 at any time and make additional changes until you are satisfied that the subprogram is performing properly.
4. Permanently save the modified M_modify_data by typing `RE-STORE "EMI_BW"`.

The modified subprogram is now permanently saved and will be loaded each time the HP 85869PC EMI measurement software is loaded. It may be changed or added to at any time using this procedure.

How to Use the Subprogram M_post_msmt

The third measurement subprogram is M_post_msmt which is called at the end of every measurement. M_post_msmt has one input parameter called Abort$. Abort$ signifies the outcome of a measurement. If the user presses the ABORT key during the measurement process, Abort$ will contain ABORT; otherwise, it is an empty string. This enables you to test the outcome of the measurement before any action is taken.

Modifying the Subprogram M_post_msmt

The following steps outline the procedure for modifying the subprogram M_post_msmt for use in your measurements.

1. Access the subprogram M_post_msmt:
   a. Return to the program top level of the HP 85869PC EMI measurement software.
   b. Press the (Pause) key to pause the program.
   c. Type `RE-STORE "EMI_BW.BAK"` and then press the (RETURN) key. This will create a backup copy of the HP 85869PC EMI measurement software.
   d. Type `EDIT` (leave a space) then type `M_post_msmt` and press (Return).

      The subprogram M_post_msmt appears on the computer screen.
2. Edit M_post_msmt:
   a. Use the up and down arrow keys on the computer keyboard to scroll through the program lines.
   b. Enter your code for the task to be performed.
   c. Press (3) (run) to continue the program.
3. Test the modified M_post_msmt:

   Perform your measurement to verify that the subprogram operates as intended. The subprogram has not yet been permanently stored. You can go back to step 1 at any time and make additional changes until you are satisfied that the subprogram is performing properly.
4. Permanently save the modified M_post_msmtby typing `RESTORE "EMI_BW"`.

The modified subprogram is now permanently saved and will be loaded each time the HP 85869PC EMI measurement software is loaded. It may be changed or added to at any time using this procedure.

Data Analysis Using Your Own Subprograms

The analysis of your measurement results can be enhanced through the use of user-written subprograms.

To assist you in developing your subprograms, a subprogram skeleton named Analysis_sub is provided as part of the HP 85869PC EMI measurement software. This subprogram is shown in Figure B-4. The line numbers shown in Figure B-4 may not correspond to the line numbers of your subprogram.

```
 SUB Analysis_sub
Analysis_sub:REM
    !
    ! USEFUL COMMON VARIABLES:
    !
    ! Do not change the value of the following variables. It would have
    ! very detrimental effects on the operation of the program.
    COM /Test_2/ Display_unit$(*)
    COM /Test_3/ Dsp_ref_level(*)
    COM /Test_7/ INTEGER N
    COM /Test_8/ Stop_freq(*)
    !
    ! The values in these variables may be altered if desired.
    COM /Data_date/ Timedate$,Time_set_y_n$
    COM /Data_titles/ Title2$(*),Title3$(*)
    COM /Data_3/ INTEGER Pk_nb_trace(*)
    COM /Data_4/ INTEGER Bb_trace(*)
    COM /Data_5/ INTEGER Qp_trace(*)
    COM /User_sub/User_sub$
    !
    !  Place code here.
    User_sub$="ANALYSIS SUB"
    CALL User_sub
    !
 SUBEND
    !
```

Figure B-4. Subprogram "Skeleton" Analysis_sub

How to use the Subprogram Analysis_sub

The subprogram Analysis_sub is called from the measure portion of the program. Use of the subprogram is specified by selecting User_written subroutine in the data analysis options list (refer to Chapter 7 for details).

The following text describes each of the variables included in the subprogram.

CAUTION Do not change the values of the following variables in your subprogram. Any change in the value of these variables will result in improper or degraded performance of the HP 85869PC EMI measurement software.

Variable N contains the number of ranges defined in the measurement. It has an integer value between 1 and 20.

Stop_freq(*) is a six-element array with subscripts between 0 and 20.

Stop_freq(0) is the start frequency of the first range.

Stop_freq(1) through Stop_freq(20) are the stop frequencies of each range. The frequency units are in MHz.

Dsp_ref_level(*) and

Display_unit$(*) are each two-element arrays containing the display reference levels and their respective units used in the measurement.

Dsp_ref_level(1) reference level for peak, narrowband, quasi-peak, average, and log average measurements.

Display_unit$(1) amplitude units for peak, narrowband, quasi-peak, average, and log average measurements.

Dsp_ref_level(2) reference level for broadband measurements.

Display_unit$(2) amplitude units for broadband measurements.

The values of the following variables may be changed within your subprogram if desired.

Timedate$ is the time of the measurement as recorded from the system clock.

Title2$ and

Title3$ are each two 31-character strings containing the measurement titles entered from the measure portion of the program.

The following three trace arrays are integer arrays containing the measured data. The value of each element of the array has a range of 1 to 1001. Each element of the array has a range of 0 to 1000. This data format corresponds to the format used in the display memory of the spectrum analyzer.

Pk_nb_trace(*) peak measurement data. If a narrowband/broadband measurement was specified, narrowband data is stored here.

Bb_trace(*) broadband measurement data. (NB/BB and BB AUTO test only.)

Qp_trace(*) quasi-peak measurement data.

Avg_trace(*) average measurement data. If a peak or peak log average measurement was specified, peak data is stored here.

Since the data is stored in a log-frequency format, the frequency of a marker placed on a trace cannot be read directly from the spectrum analyzer. To compute its frequency in Hz, read the marker's X-position and apply the following equation.

$$Freq = Stop\_freq(0) * 1.E + 6 * \left(\frac{Stop\_freq(N)}{Stop\_freq(0)} \right)^{\frac{Mkr\ X\ -1}{1000}}$$

where $Stop\_freq(0)$ is the start frequency of the first range and $Stop\_freq(N)$ is the stop frequency of the last range.

Similarly, the marker's amplitude can be computed by reading its Y-position and applying the following equation.

$$Ampl = Dsp\_ref\_level(*) - 100 + \frac{Mkr\ Y\ position}{10}$$

Modifying the Subprogram Analysis_sub

The following steps outline the procedure for modifying the subprogram Analysis_sub for use in analysis of your measurement results.

1. Access the subprogram Analysis_sub:
   a. Return to the program top level of the HP 85869PC EMI measurement software.
   b. Press the (Pause) key to pause the program.
   c. Type `RE-STORE "EMI_BW.BAK"` and then press the (RETURN) key. This will create a backup copy of the HP 85869PC EMI measurement software.
   d. Type `EDIT` (leave a space) then type `Analysis_sub` and press (Return).

      The subprogram Analysis_sub appears on the computer screen.
2. Edit Analysis_sub:
   a. Use the up and down arrow keys on the computer keyboard to scroll through the program lines.
   b. Enter your code in the subprogram skeleton where the label Place code here. appears.
3. Press (3) (run) to continue the program.
4. Test the modified Analysis_sub:

   Perform your measurement analysis using the modified subprogram to verify that it operates as intended. The subprogram has not yet been permanently stored. You can go back to step 1 at any time and make additional changes until you are satisfied that the subprogram is performing properly.

The modified subprogram is now permanently saved and will be loaded each time the HP 85869PC EMI measurement software is loaded. It may be changed or added to at any time using this procedure.

User-Written Subprograms

One of the features of the HP 85869PC EMI measurement software is its ability to execute user-supplied code at any time (except while the GPIB configuration screen is displayed). Three subprograms have been provided for your use.

Note The following supplied subprograms should not be deleted or modified.

- BEEP ON BEEP OFF can be used to turn the beeper on your computer on or off.
- DWELL TIME allows you to specify a reference level ranging of greater than 10 seconds to capture low repetition rates signals during measurments made from the Analysis menu.
- STORE PEAK TRACE converts the composite trace into 1001 amplitude and frequency pairs and saves the data into a tab separated text file named `85869pc/print/trace.txt`. If this user subprogram is executed more than once, the trace.txt file must be deleted from the `85869pc/print` folder between each execution.

The method for accessing your own code or one of the three subprograms provided involves calling the User_sub subprogram which is located at the end of the HP 85869PC EMI measurement software. To call the User_sub subprogram, press (CTRL) and (ENTER) simultaneously, enter an input parameter, and press (ENTER).

The User_sub subprogram is called with an input parameter. The User_sub subprogram skeleton contains useful global variable descriptions as well as some CASE functions. The LOAD DATA CASE loads data previously stored on an ASCII file by using the STORE DATA CASE. The same test setup file must be currently loaded in order to load a data file. The CASE, LOCAL, allows you to put all instruments in local control.

To add code, an appropriate CASE label must be added to this subprogram followed by the actual code to be executed. The CASE label must match the input parameter. For example, if you want to send additional commands to an external device, you would add CASE ALTER DEVICE followed by the commands you want executed. Then, whenever you want to execute those commands, you would supply ALTER DEVICE as the User_sub input parameter.

The following steps outline the procedure for adding code to the subprogram User_sub for use in your measurements.

1. Access the subprogram User_sub:
   a. Return to the program top level of the HP 85869PC EMI measurement software.
   b. Press the (Pause) key to pause the program.
   c. Type `RE-STORE "EMI_BW.BAK"` and then press the (RETURN) key. This will create a backup copy of the HP 85869PC EMI measurement software.
   d. Type `EDIT` (leave a space) then type `User_sub` and press (Return).

      The subprogram User_sub appears on the computer screen.
2. Edit User_sub:
   a. Use the up and down arrow keys on the computer keyboard to scroll through the program lines.
   b. Enter your code in the form of a CASE statement immediately following the SELECT Subname$ line.
   c. Press (3) (run) to continue the program.

3. Test the User_sub subprogram:

   Perform your measurement using the subprogram to verify that it operates as intended. The subprogram has not yet been permanently stored. You can go back to step 1 at any time and make additional changes until you are satisfied that the subprogram is performing properly.

4. Permanently save the modified User_sub by typing `RE-STORE "EMI_BW"`.

The modified subprogram is now permanently saved and will be loaded each time the HP 85869PC EMI measurement software is loaded. It may be changed or added to at any time using this procedure.

Display Format for Narrow-Span Measurements

When making measurements of a signal in a very narrow frequency range, it is helpful to understand the steps that the program takes when setting the start and stop frequencies of the spectrum analyzer to ensure that all signals within the desired frequency range will be captured.

Whenever the program instructs the spectrum analyzer to take a sweep over a frequency range, it sets the start frequency to a slightly lower value and the stop frequency to a slightly higher value than those specified in the test setup table (refer to Figure B-5).

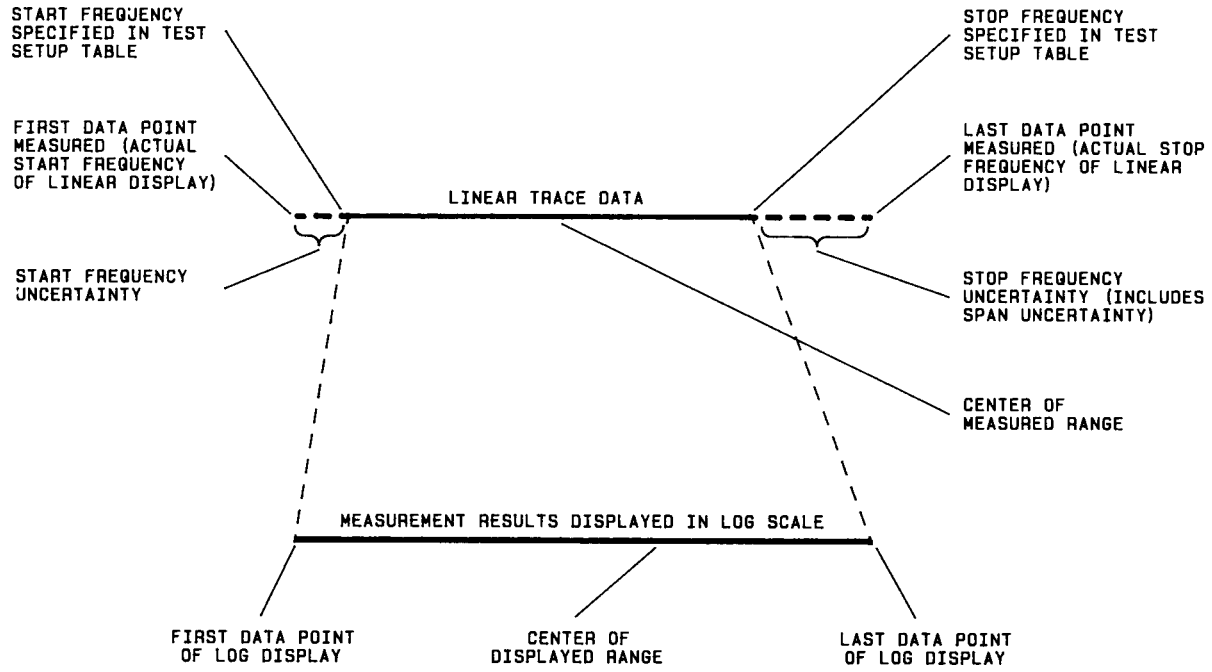


Figure B-5.
Spectrum Analyzer Over-Sweeps to Detect Signals Near Start and Stop Frequencies

The amount of under-sweeping and over-sweeping is a function of the specified frequency uncertainty (.1 to 2%) and the spectrum analyzer's span error and drift error specifications. This ensures that the uncertainty involved in setting the start and stop frequencies on the spectrum analyzer will not result in missing a signal that occurs near the edge of the sweep. The program takes the maximum value of any signals encountered between the actual start frequency and the user-defined start frequency and displays it in the first data point of the final logarithmic data array. Similarly, the maximum signal occurring between the user-specified stop frequency and the actual stop frequency are displayed in the last data point of the log data array.

As an example, consider the measurement of a 97 dBuV, 20 MHz CW signal in a narrow span using 0.1% frequency accuracy. In the first case, a start frequency of 19.999 MHz and a stop frequency of 20.001 MHz are chosen in the test setup table. The actual frequencies sent to the spectrum analyzer are 19.9970 MHz and 20.0210 MHz respectively.

The results are shown in Figure B-6. Note that because of the linear to logarithmic data transformation, the signal appears to be stepped. This is because the first 500 points of linear trace data must fill approximately 700 logarithmic data points, while the next 500 linear data points map into the last 300 logarithmic data points. Therefore, many of the first 500 linear data points must fill more than one point of the log display, resulting in the staircase appearance of the trace. A marker set on the signal (labeled with a 1) indicates a frequency of 20.00007 MHz and an amplitude of 96.8 dBμV.

Figure B-7 shows a measurement of the same signal in a slightly wider span, 40 kHz. The actual start and stop frequencies sent to the analyzer are 19.9762 MHz and 20.0400 MHz respectively. A marker set on the signal (labeled with a 2) indicates a frequency of 20.00014 MHz and an amplitude of 96.7 dBμV.

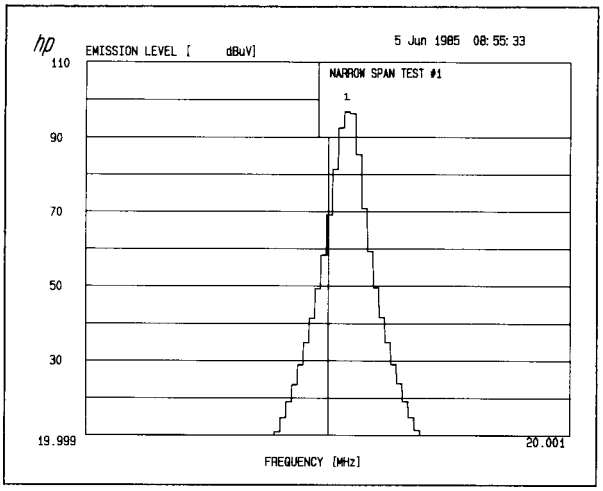


Figure B-6. Measurement Results Containing Response Near Stop Frequency

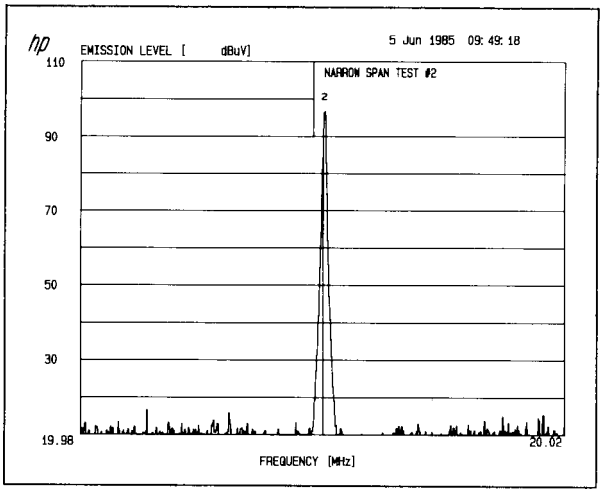
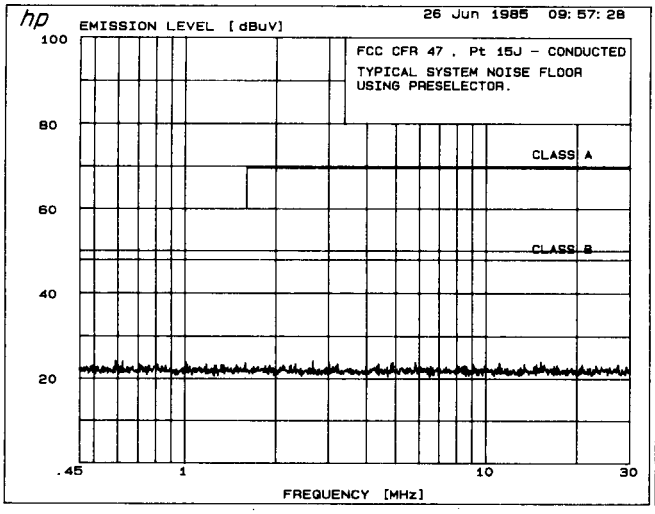


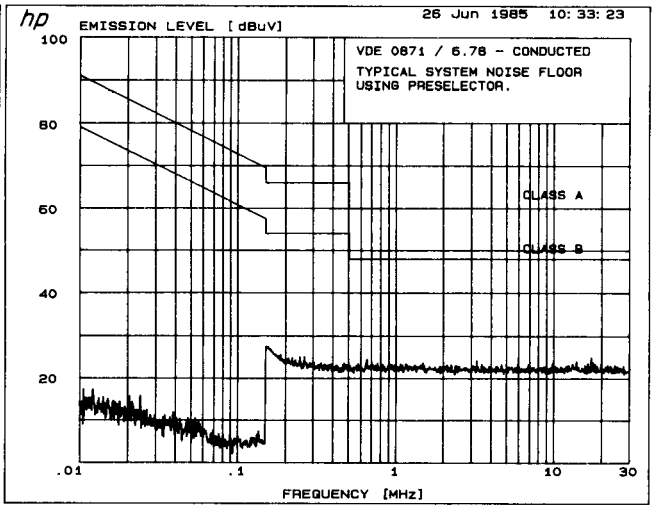
Figure B-7. Measurement Results After Being Re-Measured With Wider Span

Noise Floors

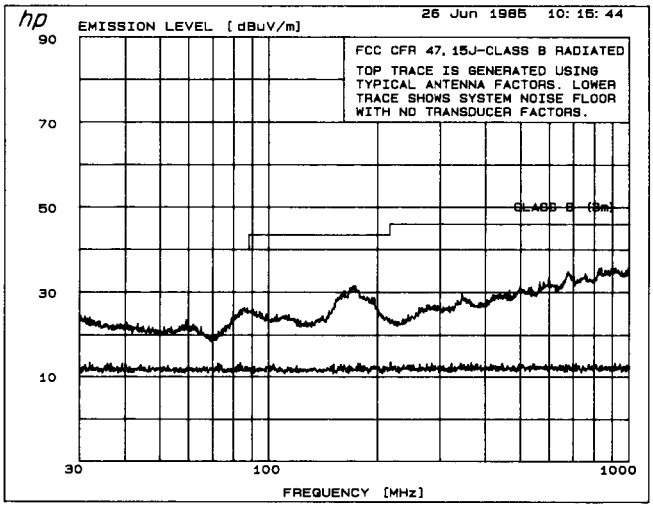
Typical system noise floors are shown in the eight display plots of Figure B-8 and Figure B-9. The top traces were generated using typical transducer factors. The bottom traces were generated without transducer factors. You can determine the typical system noise floor for your system by adding the factors for the actual transducers being used to the bottom traces.



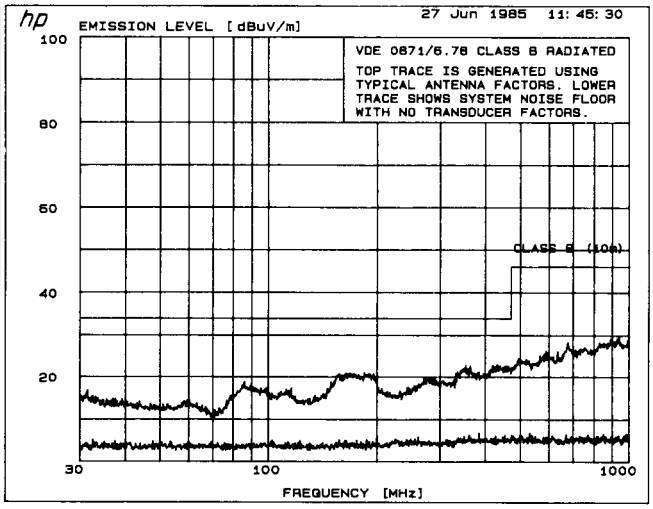
FCC Part 15-Conducted
Noise Floor Using Preselector



VDE 0871/6.78-Conducted
Similar to EN 55011/1991-Conducted
Noise Floor Using Preselector

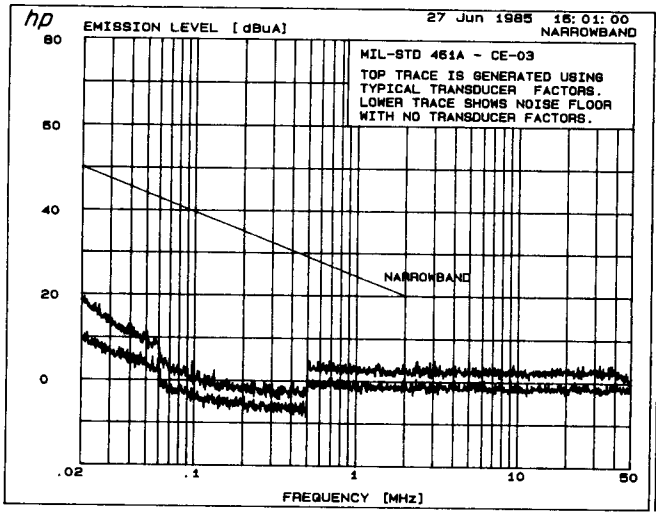


FCC Part 15, Class B (3m)-Radiated
Typical Noise Floors

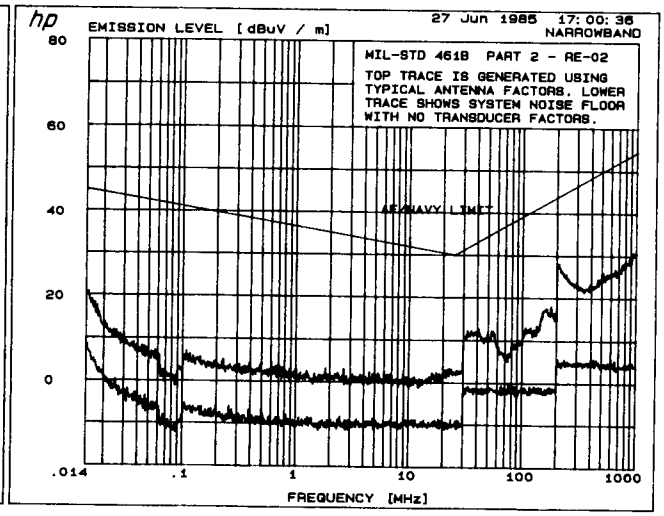


VDE 0871/6.78-Radiated
Similar to EN 55011/1991, Class B (10m)-Radiated
Typical Noise Floors

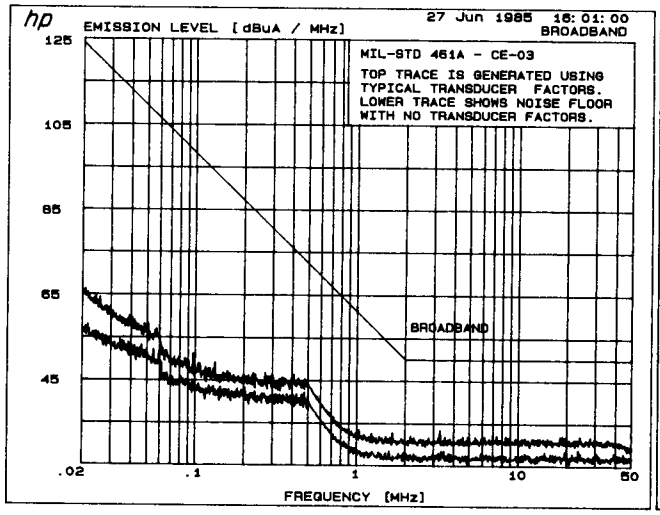
Figure B-8. Example FCC Noise Floors



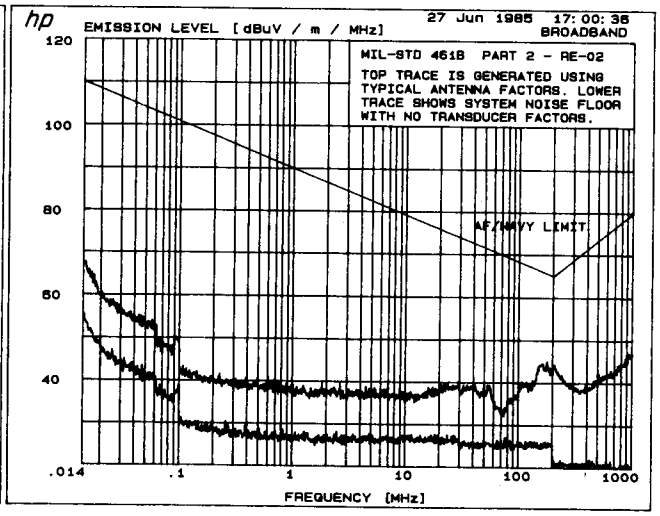
MIL-STD 461A - CE-03
Typical Noise Floors (Narrowband)



MIL-STD 461B Part 2 - RE-02
Typical Noise Floors (Narrowband)



MIL-STD 461A - CE-03
Typical Noise Floors (Broadband)



MIL-STD 461B Part 2 - RE-02
Typical Noise Floors (Broadband)

Figure B-9. Example MIL-STD Noise Floors

C

MIL-STD 461D/462D/461E

Implications on Measurement Techniques, Receivers, and Software

The following is an examination of the key changes in MIL-STD 461D/462D/461E from its predecessors and how these changes affect measurement technique, the HP 8571A/8572A MIL EMI receivers, and HP 85869PC EMI measurement software.

Hewlett-Packard was a member of the industry committee that suggested changes to the MIL STD 461/462 working group. We have tracked these changes and are still in contact with members of the working group to help ensure proper interpretation and implementation of the new standard. HP has modified the HP 8571A/8572A MIL EMI receivers and HP 85869PC EMI measurement software to address the needs of the new standard. We feel, with proper measurement technique, the HP measurement solutions meet the test needs of MIL-STD 461D/462D/461E.

The following is a highlight of the key areas as we understand them at this time. This is not an exhaustive analysis of the MIL-STD and should not replace a detailed analysis of the standard itself. It is intended to be the starting point for communication of the changes and their impact and will be enhanced as more detailed clarifications become available.

- **narrowband** and **broadband** measurements are **no longer** allowed. The narrowband and broadband limits have been replaced by single limits to remove measurement ambiguities.
- All measurements are done in **peak detection mode** and the video bandwidth must always be greater than the resolution (or IF) bandwidth of the receiver.
- The **resolution bandwidth** is specified for the different frequency ranges. This means that a narrower bandwidth cannot be used for signal-to-noise improvement and that a narrower video bandwidth cannot be used to smooth the data.
- The **resolution bandwidths** are specified at the –6 dB points for the 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, and 1 MHz bandwidths. These bandwidths are stated to be consistent with "ANSI C63.2, paragraph 7.7.2" on page 12 of the ANSI document.

  The HP 8571A/8572A receivers have been modified to incorporate this change. The previous spectrum analyzer option 462 provided impulse bandwidths which are slightly narrower than the 6 dB bandwidth. On a purely impulsive type of signal, this would give a reading that is $\leq$ 1 dB too low. On noise-like or CW signals the error is less, <.5 dB for noisy signals, and 0 dB for CW signals. The option 462 has been updated to provide the 6 dB bandwidths for the HP 8571A/8572A MIL EMI receivers. It should be noted that a wider receiver bandwidth is allowed. A wider bandwidth will result in a higher measured level for a signal with broadband content, but will not result in an increased level for CW or coherent signals in which the frequency instability is smaller than the receiver bandwidth. This will most likely be the case for the narrower bandwidths of 10 Hz and 100 Hz which are intended to resolve narrowband signals.
- The **antennas** for radiated emissions are specified as follows:
  - Active Rod (1 m), 10 kHz to 30 MHz
  - Bicon, 30 MHz to 200 MHz

- Ridged waveguide horns, > 200 MHz

The antenna factors for these types of antennas are essentially fixed by design and in some frequency areas are quite large. The bicon has large antenna factors over some of its range as well as ridged waveguide horns above 12 GHz. Standard gain horns could be used from 12 to 18 GHz to improve signal-to-noise ratio. At this time, this is apparently an acceptable alternative.

A particular area of difficulty is in the RE102 limit. Depending on system signal characteristics, a preamplifier inserted close to the transducer may be needed.

- All **data** must be taken in an "automatic" fashion. Manual measurements and data recording are not allowed except as verification.
- Data must be presented on **continuous frequency plots** with specified minimum frequency and amplitude resolution. The frequency ranges used in the HP 85869PC software are to be set to provide this coverage.
- The **test system must be verified** by the tester to show that the entire system as a whole can measure a signal 6 dB below the test limit within 3 dB error. This may be difficult in areas of large antenna factors and high cable loss. Discussions with a member of the 461/462 committee have indicated that it was not the intent of the committee to require additional preamplification to meet the 6 dB test margin and that capability to measure signals at the limit may be acceptable as verification of system measurement integrity. To accomplish this test, a signal from a signal generator must be fed into the cable at the transducer end with a level equal to the limit minus the transducer factor. The test must be performed at the high end of each frequency band.
- A requirement for minimum frequency scan time was included to provide for minimum probability to capture the highest level of the signal of interest.

The HP 85869PC EMI measurement software has been modified to support the changes of MIL-STD 461D/462D/461E. These changes include:

1. New MIL-STD limit library
2. Proper receiver bandwidths and detection mode control
3. Automated measurements and data logging with display and output meeting the appropriate frequency resolution requirements
4. Minimum frequency scan time setting

D

Importing HP 85869A Files

This appendix contains the following information:

- Transferring User Libraries from the HP 85869A to the HP 85869PC
  - Part 1: Using a Series 200/300 Computer
  - Part 2: Using an HP 82324A/B Co-Processor
  - Part 3: Using HP BASIC for Windows and the HP 85869PC
- Transferring Subprograms from the HP 85869A to the HP 85869PC
  - Part 1: Using a Series 200/300 Computer
  - Part 2: Using HP BASIC for Windows and the HP 85869PC
- HP 8571A/8572A Calibration Data Transfer
  - Using HP BASIC for Windows and the HP 85869PC

The `IMPORT` softkey accesses the functionality to transfer the HP 85869A user libraries and files, subprograms, and HP 8571A/8572A calibration data (in LIF format) into the MS-DOS Windows environment on your personal computer. To access the Import of Library/Data Files screen, select `IMPORT` from the EMI Start Menu. For detailed information on performing these functions, refer to the following sections later in this chapter:

- "Transferring User Libraries from the HP 85869A to the HP 85869PC"
- "Transferring Subprograms from the HP 85869A to the HP 85869PC"
- "HP 8571A/8572A Calibration Data Transfer"

Note The directory \85869PC\tmp *must* exist in order for the LIF EMI catalog and `IMPORT Data` keys to work. Otherwise, anomalies on your PC may occur.

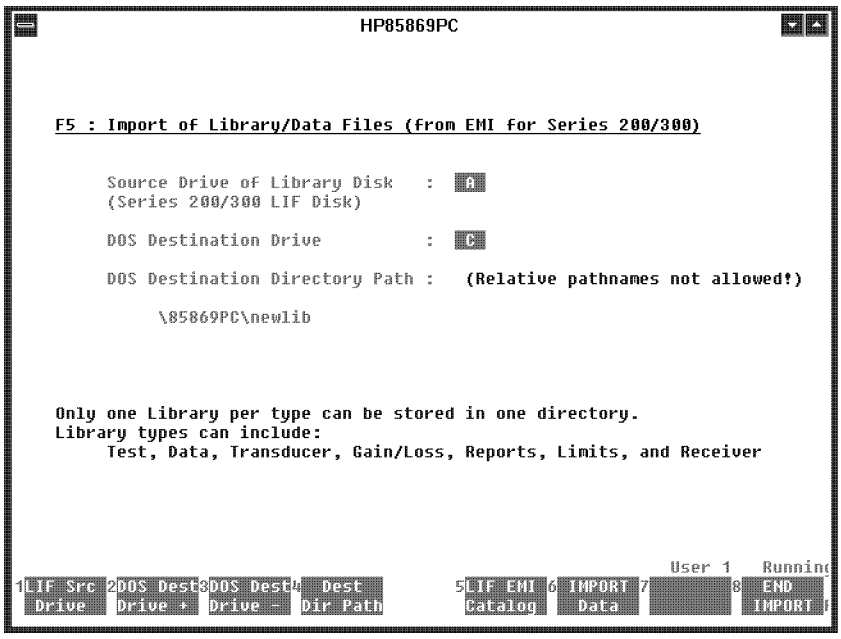


Figure D-1. `IMPORT` **Screen**

`LIF Src Drive` toggles between `A` and `B` floppy disk drives to set the source drive where the Series 200/300 LIF library disk resides.

`DOS Dest Drive +` increases the DOS destination drive letter by one letter at a time. Drives A through Z are available for selection.

`DOS Dest Drive -` decreases the DOS destination drive letter by one letter at a time. Drives A through Z are available for selection.

`Dest Dir Path` activates the `DOS Destination Directory Path` field. Enter the directory path in which the libraries or files are to be stored. The complete path name must be specified starting at the root directory as relative path names are not allowed. For example, C:\85869PC\LIB_LMTS1.

`LIF EMI Catalog` displays the contents (that is, libraries and data files) of the HP 85869A LIF disk. Notice that while the catalog function is in progess, Windows "shuts down" and MS-DOS is used. This is an MS-DOS utility.

`IMPORT Data` executes a LIF EMI Catalog then converts the LIF formatted libraries and files to MS-DOS file format. The entire contents of the LIF disk is converted. You *cannot* select individual files or libraries on the LIF disk for conversion.

Note Only one library type can be stored in one destination directory. Library types include Test, Data, Transducer, Limit Lines, Gain/Loss, Reports, and Receiver Correction Data.

`END IMPORT` exits the Import screen and returns to the EMI Start Menu.

Transferring User Libraries from the HP 85869A to the HP 85869PC

The HP 85869PC EMI measurement software utilizes the same internal library structure as the HP 85869A program running on HP workstations. Therefore, the HP 85869PC application is able to directly use all libraries including Test, Data, Transducer, Gain/Loss, Report, Limit, and Receiver Correction libraries.

The transfer of these libraries is a two-part process. Part 1 uses the HP 85869A LIB_COPY utility found on disk 10 of the HP 85869A application to transfer libraries and files from the hard drive to a floppy disk. Part 2 uses a different program to transfer files from the PC using an HP 82324A/B co-processor to run the HP 85869A program. Part 3 uses the HP 85869PC Import and Library Copy Utility programs to import libraries and files into the MS-Windows environment on the PC.

Note

- The HP 85869A utility LIB_COPY will *not* work on systems using the HP 82324A/B co-processor. You must follow steps outlined in Part 2.
- If libraries are already saved on a floppy disk in LIF format, then Part 1 or Part 2 can be skipped.

Part 1: Using a Series 200/300 Computer

1. Determine which libraries will be transferred to the HP 85869PC application.

   The HP 85869A LIB_COPY utility can be used to list the various test and data files in each of the libraries (except Receiver Correction). Refer to Appendix A, "Additional Utilities," in the *HP 85869A EMI Measurement Software Operation Manual* for a more complete description on using the LIB_COPY utility. Depending on the organization of libraries in your existing system, you may have to search several different library MSI paths to locate all libraries and data files.

2. Set the "Mass Storage Is" specifier (MSI) to your normal operating environment where the libraries are found (for example, MSI ":,700,0").

3. Select the LIB_COPY utility to copy all selected libraries and files to a LIF formatted BASIC disk.

Note If you are not using either an HP 8571A or HP 8572A Receiver Correction library in the HP 85869A application, skip the following step.

4. The LIB_COPY utility of the HP 85869A application does not copy the Receiver Correction library files. To copy the Receiver Correction library files, perform the following steps:

   a. Locate the MSI or directory where the Receiver Correction library files reside.

   b. Type `WILDCARDS UX; ESCAPE "\"` then press RETURN.

   c. Type `COPY "LIB_RECV*" TO ":,700,1"` then press RETURN.

   d. Type `COPY "RECV1*" TO "*:,700,1"` then press RETURN.

   This will transfer *all* Receiver Correction library files from the hard drive to the floppy drive for transfer to the personal computer.

Part 2: Using an HP 82324A/B Co-Processor

The HP 85869A utility LIB_COPY never worked with the HP 82324A/B co-processor. The HP 85869PC software provides an additional utility for HP 85869A users to successfully transfer *all* from the co-processor disk drive to a LIF-formatted floppy disk.

Note It is important to copy *all* library files within a LIBRARY MSI. If not all library items are needed for transfer to the HP 85869PC software, then use the `PURGE` function in the HP 85869A EMI program as outlined in the "Library Softkeys" section, Chapter 6, of the *HP 85869A Operation Manual*.

---

1. Using the co-processor, format a LIF floppy disk. This will be the disk used to transfer the utility copy file from the HP 85869PC software to be used on the co-processor.
2. Insert the formatted disk from step 1 into the PC where the HP 85869PC software is installed.
3. On the PC where the HP 85869PC software is installed, open an MS-DOS window and execute the following commands:

   ```
   cd \85869PC\UTILS
   lifcopy c:copyfile 0:copyfile
   ```

   Note c: and 0: are drive specific and may be different for your PC.

   This will copy the ASCII file "copyfile" from the HP 85869PC software to the floppy disk.
4. Remove the LIF disk from the PC and insert it into the floppy drive of the co-processor with BASIC running. Type in `GET "copyfile"` from the command line and press (RETURN). (Note: it is assumed that the MSI is set to the default floppy msus.)
5. Press `RUN` and follow the screen prompts.
   a. When the prompt "What is the source msus specifier?" is displayed, enter in the msus for the source disk drive, for example, :,700,0.
   b. When the prompt "What is the source directory path, if any?" is displayed, enter in the directory path for the source library; leave blank if none is used.
   c. When the prompt "What is the destination msus specifier?" is displayed, enter in the msus for the destination.
   d. The program will then indicate how many LIF disks it will need to copy over all library files. The program will initialize these disks, if necessary. Answer yes or no to the question regarding initializing disks.
   e. Insert a blank disk into the floppy drive and press CONTINUE. If files are found on the disk, you will have the opportunity to change disks or have the program remove the files.
   f. Repeat step e for the number of disks needed.
6. After all libraries have been copied to floppy disks, proceed to Part 3. It is *very* important to import all disks before trying to use the Library Copy Utility program of the HP 85869PC EMI measurement software.

Part 3: Using HP BASIC for Windows and the HP 85869PC

1. With the HP 85869PC application running at the EMI Start Menu, select the `IMPORT` utility and insert the floppy disk (LIF format) used in steps 3 and 4 of Part 1, or step 5e of Part 2, into the floppy drive of the personal computer.
2. Set the Source Drive, DOS Destination Drive, and DOS Destination Directory Path for your environment, using the appropriate softkeys to make your selections.

   Select `LIF EMI Catalog` to confirm that the settings are correct.
3. Select `IMPORT Data` to import the libraries and files to the location defined in the above step.
4. After the libraries and files have been imported into the personal computer, press `END IMPORT` to return you to the EMI Start Menu.

   At this point, the libraries have been imported into the destination directory on the personal computer. To move the libraries to a directory that is different from the one defined in step 2, proceed with one of the following steps.

   - Use the MS-Windows File Manager (for Windows 3.1) or Windows Explorer (for Windows 95) to rename the directory name as defined in step 2 to another more logical directory name. For example, change from “newlib” to “proj_xyz”.
   - Use the HP 85869PC `LIB COPY UTILITY` found in the EMI Start Menu to move libraries and files to existing directories or new directories.

   This completes the process to transfer user libraries from the HP 85869A (LIF format) to the HP 85869PC (DOS format).

Transferring Subprograms from the HP 85869A to the HP 85869PC

There are five subprograms which were available for user modification in the HP 85869A EMI measurement software. These subprograms perform customized measurements, customized analysis, and user-defined functions. Refer to Appendix C, "Application Notes," in the *HP 85869A EMI Measurement Software Operation Manual* for more information. The five main subprograms contained in the HP 85869A application are:

- Measure_sub
- M_modify_data
- M_post_msmt
- Analysis_sub
- User_sub

Any or all of the five subprograms, as well as any additional subprograms associated with the main subprograms, may be included in the HP 85869PC application by performing the procedure described below.

Part 1: Using a Series 200/300 Computer

1. Determine which subprograms will be transferred to the HP 85869PC application.

   If any of the five subprograms have been customized for your HP 85869A application, you will probably want to transfer these to the HP 85869PC application. If you are unsure whether a subprogram has been modified, a comparison can be made between the HP 85869A and HP 85869PC versions using the EDIT mode for both. Be sure to include any additional subprograms that may be associated with the five main subprograms.

2. Type `SCRATCH` and press (RETURN).

3. Set the "Mass Storage Is" (MSI) specifier to your normal operating environment where the "EMI" application is found. For example, `MSI ":,700,0"`.

4. Determine where your subprograms reside in order to access them by using one of the following:

   - If you are working from a floppy environment, insert disk 9 (Program Disk 5) into the floppy drive. It is most likely all customized subprograms reside in the file labeled "EMI_DISK9".
   - If you are working from a hard disk drive environment, all customized subprograms are probably included in the file labeled "EMI."

5. Based on the subprograms determined in step 1, load in each of the subprograms using the command line for your environment as follows and then press the (RETURN) key:

   - For floppy disks: `LOADSUB Subprogram FROM "EMI_DISK9"` (or equivalent file name)
   - For hard drives: `LOADSUB Subprogram FROM "EMI"` (or equivalent file name)
     where `Subprogram` represents one or more of the actual subprogram names listed above.

Note The modifications required for the User_sub subprogram described below apply *only* to version A.03.00 and later for the HP 85869A application.

6. In order to use the HP 85869A User_sub subprogram in the HP 85869PC application, editing of the code is required. Perform the modifications described below to account for common variable (COM) declaration differences in the two programs.

   a. Type `FIND "/Menu_1"` and then press the RETURN key. Change the program line as follows:

   ```
   from: XXXXX   COM /Menu_1/Menu_key$(0:9)[12]
     to: XXXXX   COM /Menu_1/Menu_key$(0:9)[16]
   ```

   b. Type `FIND "/States_2"`, press the RETURN key, and delete the following program line:

   ```
   XXXXX   COM /States_2/ Sys_id$[16]
   ```

   c. Press the CONTINUE softkey to find the following program line to delete:

   ```
   XXXXX   COM /States_2/ Lib_msi_2$[80]
   ```

   d. Type `FIND "/States_10"`, press the RETURN key, then use the CONTINUE softkey to find the following program line to delete:

   ```
   XXXXX   COM /States_10/ Bwi_msi_2$[80]
   ```

   e. Type `FIND "/Trace_color"`, press the RETURN key, and add the following three variables to the program line: Annot_color, Lim_color, and Grid_mode. The program line should read as follows:

   ```
   COM /Trace_color/ INTEGER Pk_nb_color,Lavg_bb_color,Qp_color,Avg_color,Grid_color,Annot_color,Lim_color,Grid_mode
   ```

   f. Type `FIND "S_what_keyboard"`, press the RETURN key, and delete the program line found here.

7. Set the "Mass Storage Is" specifier ("MSI") to the floppy drive, type `SAVE "CUST_SUB"`, and then press the RETURN key. This will save all of your user subprograms as an ASCII file in order to successfully import these into the HP 85869PC application.

Part 2: Using HP BASIC for Windows and the HP 85869PC

1. With the HP 85869PC application running at the EMI Start Menu, insert the disk used in step 7 into the floppy drive, and select the `IMPORT` softkey.
2. Set the Source Drive, DOS Destination Drive, and DOS Destination Directory for your environment by using the appropriate softkeys. Use the `LIF EMI Catalog` softkey to confirm the settings are correct.
3. Select the `IMPORT Data` softkey to initiate importing the CUST_SUB file to the location defined in step 2 above.
4. When the importing process is complete, press the `END IMPORT` softkey to return to the EMI Start Menu.
5. Select the `START EMI PROG` softkey to start running the HP 85869PC software. Follow the screen prompts to access the EMI PROGRAM TOP LEVEL menu then press the (PAUSE) key.
6. Type `RE-STORE "EMI_BW.BAK"` and then press the (RETURN) key. This will create a backup copy of the HP 85869PC EMI measurement software.
7. If the subprograms loaded in the "CUST_SUB" file are modifications of the five main subprograms described in Appendix C of the HP 85869A application, then use the DELSUB command to eliminate any default user_sub subprograms provided with the HP 85869PC application.

   For example, "`DELSUB User_sub`" will delete the subprogram User_sub from the HP 85869PC application. This will enable your customized version of User_sub (that is included in the CUST_SUB file) to be used instead of the version provided with the HP 85869PC application.
8. Repeat the step above as necessary in order to eliminate all subprograms that may be duplicate in your CUST_SUB file.
9. To load the customized subprograms in the CUST_SUB file, type `GET "newlib/cust_sub",40000` and then press the (RETURN) key. (Use the appropriate directory names as necessary.)
10. Press F12 to access the system keys then press the `RUN` softkey. This will determine if there are any COM declaration conflicts or pre-run errors. If errors exist, they should be understood and fixed before proceeding. If no errors occur and the program gets to the TOP LEVEL menu, press the (PAUSE) key.
11. Type in the following three commands as follows:

    `REN 1,1` and press (RETURN)
    `INDENT 6,3` and press (RETURN)
    `RE-STORE "EMI_BW"` and press (RETURN)

    This completes the process of transferring user-written subprograms from the HP 85869A application to the HP 85869PC application.

HP 8571A/8572A Calibration Data Transfer

This chapter describes the process for transferring the calibration data of either an HP 8571A or HP 8572A receiver system to the HP 85869PC application. The disks are created upon system calibration for these receiver systems for use with the Series 200/300 computers. Therefore, it is necessary to "import" these files into your personal computer environment using HP BASIC for Windows and the HP 85869PC application.

Using HP BASIC for Windows and the HP 85869PC

1. With the HP 85869PC application running at the EMI Start Menu, select the `IMPORT` utility and insert the HP 8571A/8572A Calibration Data disk into the floppy drive of your personal computer.
2. Set the Source Drive, DOS Destination Drive, and DOS Destination Directory for your environment using the appropriate softkeys to make your selections. Use the `LIF EMI Catalog` function to confirm that the settings are correct.
3. Select the `IMPORT Data` utility to import the two files found on the HP 8571A/8572A Calibration Data disk to the location defined in step 2.

   The file "TEST_DATA" contains the calibration data to be used by the HP 85869PC application and will be imported as "test.dat." The file "CITIFILE" is not used by this application, but will be imported as the file "cit".
4. After the calibration data files have been imported into the personal computer, press `END IMPORT` on the utility to return to the EMI Start Menu.
5. Using File Manager (MS-Windows 3.1) or Windows Explorer (MS-Windows 95), move the file "test.dat" from the directory defined in step 2 to the desired library directory.
6. From the EMI Start Menu, select `START EMI PROG`, press `CONTINUE` through the hardware configuration screen until the message "`Is this an HP 8571A/8572A Receiver System?`" is displayed, and then press the `YES` softkey.
7. Select the `IMPORT` softkey. After the receiver calibration data is imported into the application, you can use the `PRINT`, `PRINT TO FILE`, or `VIEW` softkeys to examine the calibration data. Press (RETURN). At this point, if this is a valid calibration data file, press `STORE` to save this data file as an HP 85869PC library file. Refer to "Importing Receiver Correction Tables" in Chapter 4 for a more complete description on importing and saving correction data.

   This completes the process to transfer files from the HP 8571A/8572A Calibration Data disk to the HP 85869PC application.

Glossary

AMPLITUDE ACCURACY

Amplitude accuracy is the uncertainty of the amplitude calibration of the spectrum analyzer. This uncertainty consists of several components: flatness, the switching input attenuator, switching between bandwidths, IF gain of the log amplifier, amplitude display, and the built-in calibrator. Measuring with IF substitution improves amplitude accuracy: measurement error equals the sum of the frequency response variations plus the error of the IF gain circuitry (log reference level control).

AMPLITUDE DISPLAY ACCURACY

Amplitude display accuracy is the accuracy of relative amplitude measurements made from display scale.

ANECHOIC CHAMBER

An anechoic chamber is an enclosure for making electromagnetic measurements. The interior surfaces of the enclosure absorb electromagnetic radiation which reduces reflection and room resonance.

ANTENNA FACTOR

Antenna factor is a ratio describing the gain or loss of an antenna. The ratio is the magnitude of an electric field impinging on an antenna divided by the magnitude of the voltage across the antenna output terminals (which are properly terminated).

Antenna factor is commonly expressed in decibels per meter (logarithmic terms):

$$K = |E| - V$$

K is antenna factor (dB/m)

$|E|$ is magnitude of an electric field $(dB\mu V/m)$

V is magnitude of received voltage $(dB\mu V)$

ATTENUATION

See INTERNAL ATTENUATION and EXTERNAL ATTENUATION.

BB AUTO

BB AUTO is an algorithm for identifying and removing narrowband signals from a trace which contains both narrowband and broadband responses.

AVERAGE DETECTION

Average detection is a data analysis option in the measure portion of the HP 85869PC EMI measurement software. Average detection is a weighted form of peak detection. It is used for measurement of narrowband signals to overcome problems associated with either modulation content or the presence of broadband noise. Many commercial standard measurements, particularly CISPR measurements, require average detection.

AVERAGE MEASUREMENT TIME

The average measurement time for a particular video bandwidth (Video Bw) can be calculated with the formula:

$$Average\ Measurement\ Time = \frac{1}{2 \times \pi \times Video\ Bw}$$

When the averaging time is changed, the average measurement time (intergration time) constant of the average detector in the system's spectrum analyzer is changed. Video Bw (average measurement time) cannot be any greater than $\frac{1}{10}$ the value of the spectrum analyzer's resolution bandwidth (Res Bw) for the range specified in the test setup table.

Average Measurement Times Available

Average Measurement Time (mS)	Video Bw (Hz)
160	1
53	3
16	10
6.2	30
2.4	100
1.4	300
1.0	1000
0.95	3000
0.91	10000
0.90	30000
0.90	100000
0.90	300000

BASIC LANGUAGE SYSTEM

The BASIC language system is an EXTENDED BASIC that forms the computer operating system that runs the HP 85869PC EMI measurement software.

BANDWIDTH

See IMPULSE BANDWIDTH, RESOLUTION BANDWIDTH, and VIDEO BANDWIDTH.

BANDWIDTH SHAPE FACTOR

Bandwidth shape factor is the ratio of the 60 dB bandwidth divided by the 3 dB bandwidth:

$$\frac{Bandwidth\ 60\ dB\ down\ (in\ Hz)}{Bandwidth\ at\ 3\ dB\ (in\ Hz)}$$

The smaller this ratio, the sharper and more selective is the filter.

This bandwidth shape factor is a measure of how wide the spectrum analyzer IF filter is below the 3 dB points. Bandwidth shape factor describes the spectrum analyzer capability to resolve closely spaced signals of unequal amplitudes.

BLANK DISK

A blank disk is a new disk that is not initialized. See INITIALIZE.

BROADBAND RESPONSE

Broadband response is displayed on the spectrum analyzer when its bandwidth is wider than the discrete frequency components of the received impulsive signal. In this mode, each displayed response represents more than one frequency component. This occurs, for example, when the spectrum analyzer bandwidth is wider than the repetition frequency (PRF) of a pulsed transmission.

To check for broadband response, vary the spectrum analyzer bandwidth, sweep time, or span width. Broadband response has three characteristics. First, amplitude varies directly with the spectrum analyzer bandwidth; doubling the bandwidth increases the displayed amplitude 6 dB. Second, line spacing depends on sweep time; increasing the sweep time decreases the line spacing. Third, span width does not affect line spacing. See NARROWBAND RESPONSE.

When measuring both narrowband and broadband responses, select NB/BB or BB AUTO as the test type in the test setup table.

CONDUCTED EMISSIONS

Conducted emissions is the amount of electromagnetic energy measured on the power or signal lines connected to the equipment under test, propagated along a conducting member of the equipment under test.

CURRENT PROBE

A current probe is the transducer used for most military-conducted emissions tests. It measures the magnetic field produced by current in wire when clamped around the wire. Output voltage of a current probe is proportional to the current level, frequency, and probe characteristics. Transfer impedance of a probe must be known to calculate the current level in a wire:

$$I(dB\mu A) = V(dB\mu V) - Z(dBohm)$$

DATA LIBRARY

The data library is a portion of the HP 85869PC EMI measurement software that contains measurement results and notes pertaining to measurements.

DISPLAY RANGE (spurious free)

The display range is the difference (in dB) between the top line of the display (reference level) and the lowest calibrated line (second from bottom) on the spectrum analyzer display. This display range is limited by the screen scale and noise level.

DYNAMIC RANGE

Dynamic range is the maximum power ratio of two signals simultaneously present at the input that may be measured within the limits of specified accuracy, sensitivity, and distortion: >70 dB.

ELECTRIC FIELD STRENGTH

Electric field strength is the magnitude of an electric field. It is commonly expressed in volts per meter or $dB\mu V/m$ and notated as $|E|$.

EXTENDED BASIC

See BASIC LANGUAGE SYSTEM.

EXTERNAL ATTENUATION

External attenuation is an attenuator that is located outside of a spectrum analyzer, before the spectrum analyzer's input.

FAR FIELD EMISSION

A far field emission is an electromagnetic field propagated by the equipment under test (EUT) measured far away from the equipment under test, where $|E|$ and H are inversely proportional to r. (See NEAR FIELD.) The distance from the source is defined as r:

$$r \geq \frac{1}{2\pi} D \ll \lambda$$

$$r \geq \frac{D^2}{2\pi} D \geq \lambda$$

where

r is distance from source

D is maximum linear dimension of source

λ is wavelength

FLATNESS

Flatness describes the amplitude variations according to frequency of the spectrum analyzer. Amplitude (± 1 dB flatness) means the maximum and minimum values of the frequency response of the spectrum analyzer are 2 dB apart.

FREQUENCY RANGE

In the HP 85869PC EMI measurement software, frequency range refers to the measurement range where the equipment configuration, such as the antenna type or spectrum analyzer bandwidth, does not change during the measurement. Up to twenty ranges can be defined for any one measurement step; refer to the Chapter 5.

FREQUENCY RESOLUTION

Frequency resolution is the ability of the spectrum analyzer to resolve two signals present at its input. Closely spaced signals are more difficult to resolve than widely spaced signals. Several factors affect resolution. The most important of these is the final IF bandwidth and its shape factor.

FREQUENCY STABILITY

Frequency stability refers to the stability of the spectrum analyzer. Two measures of frequency stability are used: short-term and long-term. Residual FM and noise sidebands are used to define short-term stability; drift is used to define long-term stability.

GAIN COMPRESSION

Gain compression is a condition where change in spectrum analyzer response is not directly proportional to change of input signal level. Gain compression occurs when spectrum analyzer response is lower than actual input signal level by 1 dB or more. This usually occurs when the input signal level exceeds –5 dBm.

GAIN/LOSS LIBRARY

The gain/loss library is a selection of gain/loss correction factors which can be loaded into a test setup table. Gain/loss values are stored here for future use.

GAIN/LOSS TABLE

A gain/loss table describes any gain/loss correction factors which are added to the measured data to produce corrected results.

GPIB

General Purpose Interface Bus is a general name for the communications interface system defined in the ANSI/IEEE Standard 488.1-1987 and ANSI/IEEE Standard 488.2-1987. See HP-IB.

HARMONIC DISTORTION

Harmonic distortion occurs when the input signal is of sufficient amplitude to drive the mixer into non-linear operation. When this occurs, harmonics of the input signals may be generated in the mixer. These harmonics are called harmonic distortion.

HARMONIC MIXING

Harmonic mixing is a technique that extends the frequency range of the spectrum analyzer. A response is displayed when the input signal satisfies the following equation:

$$F_{in} = nF_{LO} \pm F_{IF}$$

where

F_{in} is frequency of input signal,

F_{LO} is frequency of the spectrum analyzer local oscillator,

F_{IF} is first IF frequency of the spectrum analyzer,

n is the harmonic number of the spectrum analyzer local oscillator.

Thus, mixing with the harmonics of the local oscillator extends the spectrum analyzer frequency range to higher and higher frequencies.

HEADER

All library files are stored under a heading which is called a header.

HP-IB

HP-IB is an acronym for the Hewlett-Packard Interface Bus (Hewlett-Packard's implementation of GPIB). It supports IEEE-488 and IEC-645, which are worldwide standards for instrument interfaces. The HP-IB is accessed at the rear panel of the computer and all HP-IB controlled peripherals (printer, plotter, spectrum analyzer, and so on). See GPIB.

IF FEEDTHROUGH
Since the spectrum analyzer is a heterodyne receiver, a signal equal in frequency to the first IF lifts the entire display baseline, regardless of the frequency control settings. This phenomenon is known as IF feedthrough. Lifting the baseline obscures the display and may completely submerge other signals present. Thus, to eliminate any gap in the spectrum analyzer frequency coverage, an alternate IF must be available and the two IFs must not be harmonically related. A preselector also eliminates IF feedthrough.

IMAGE RESPONSES
An image responses is a false response which appears at $2 * F_{IF}$ above or below the applied signal. This can occur for any IF within the spectrum analyzer. See TRACKING FILTER and FILTER.

IMPEDANCE
Impedance is the nominal input impedance of the spectrum analyzer. 50Ω and 75Ω are most widely used.

IMPULSE BANDWIDTH (BWi)
The impulse bandwidth (BWi) of a filter is the bandwidth of a rectangular filter having the same peak-voltage pulse response as the filter in question. Impulse bandwidth (BWi) = 1.6 times resolution bandwidth (BW_{3dB}).

INITIALIZE
All new disks must be initialized before use. (The initializing process erases all files on a disk; data stored on such a disk is lost.)

INTERMODULATION (IM) DISTORTION
Intermodulation (IM) distortion occurs when two strong and closely-spaced signals are fed into the spectrum analyzer input mixer. The two signals drive the mixer into non-linear operation. This causes the two signals to interact and produce several mixing products. For example, if two signals, f_1 and f_2, are fed into the input mixer, then $2f_1 \pm f_2$, $2f_2 \pm f_1$, $2(f_1 \pm f_2)$ and $3(f_1 \pm f_2)$, and so on, are some of the intermodulation distortion products that may be seen on the display. $2f_1 - f_2$ and $2f_2 - f_1$ are called third order IM products and are the most critical distortion products. They are the most critical because they are located close to f_1 and f_2; the rest of the IM products are farther from the spectrum of interest.

INTERNAL ATTENUATION
Internal attenuation is the attenuator inside a spectrum analyzer. See EXTERNAL ATTENUATION.

LEVEL
Group of softkey functions that can be accessed at one time, and are displayed simultaneously at the bottom of the computer screen.

LIBRARY DISK
A library disk is a disk dedicated to test, data, transducer, limit, or gain/loss library files.

LIBRARY INDEX
A library index lists all available library files.

LIMIT LIBRARY
A limit library is a selection of test limits which can be loaded into a test setup table.

LIMIT TABLE

A limit table describes any test limit. A test limit is the highest acceptable EMI level for any given frequency.

LINEAR INPUT LEVEL

Linear input level is the maximum input signal level where gain compression does not occur. See GAIN COMPRESSION.

LISN

LISN is the acronym used for a line impedance stabilization network. A LISN is also called an artificial mains network. A LISN is used for conducted emissions tests. They present a defined impedance at high frequencies to equipment under test. That also isolate the equipment under test from emissions coming from the power line.

LO EMISSIONS

LO emissions are produced by the first local oscillator energy that passes through the input mixer to the spectrum analyzer input connector. In the absence of any input filters, the energy comes out the input connector and goes into anything connected to the spectrum analyzer.

LO FEEDTHROUGH

LO feedthrough is the response that occurs when the frequency of the first local oscillator is equal to the IF frequency.

LOG AVERAGE DETECTION

Log average detection is a measurement option in the measure portion of the HP 85869PC EMI measurement software. Log average detection is a weighted form of peak detection. It is used for measurement of narrowband signals to overcome problems associated with either modulation content or the presence of broadband noise. Review the setup portion of the HP 85869PC EMI measurement software for use of this capability.

MAGNETIC FIELD STRENGTH

Magnetic field strength is the magnitude of the magnetic field, commonly expressed in amperes per meter and notated as $|H|$. Under far-field conditions, electric and magnetic field strengths of linearly-polarized waves are related by the impedance of free space as:

$$|H| = \frac{|E|}{120\pi}$$

where

$120\pi\Omega$ = free-space wave impedance (ohms)

See FAR FIELD EMISSION.

MARKER

A marker is a small bright dot on spectrum analyzer trace. Some of the data analysis options, in the measure portion of the program, operate on a segment of the original measurement range. In this case, the program asks you to define an analysis area with one or two markers. Markers appear on the spectrum analyzer display as small bright dots. The intensity of these bright dots can be adjusted with the intensity control on the spectrum analyzer's display.

MAXIMUM INPUT LEVEL

The maximum input level is the maximum safe operating level of the spectrum analyzer front end.

MENU

See SOFTKEY FUNCTIONS.

NARROWBAND RESPONSE

Narrowband response is displayed on spectrum analyzer when the spectrum analyzer bandwidth is narrow enough to resolve the discrete frequency components of the received signal. For example, since the individual spectral components of a pulsed RF transmission are spaced at the pulse repetition frequency (PRF), the spectrum analyzer displays a narrowband response when its bandwidth is narrower than the PRF. (To be sure that all components are resolved, regardless of their relative amplitudes, spectrum analyzer bandwidth should be less than 0.3 times the PRF.)

To check for narrowband response, vary the spectrum analyzer bandwidth, span width, or sweep time. The amplitude of a narrowband response should not change as the bandwidth is varied. Widening the span width decreases spacing between spectral lines; sweep time changes do not affect spectral line spacing.

When measuring narrowband signals (with narrowband units like $dB\mu V/m$ or $dB\mu A$, select PEAK for the test type in the test setup table. See BROADBAND RESPONSE.

NEAR FIELD

Near field an electromagnetic field located close to and propagated by the equipment under test. The amplitudes of the electric and magnetic fields in the near field vary with the distance from the source and cannot be related by the equation given in MAGNETIC FIELD STRENGTH. See FAR FIELD and MAGNETIC FIELD STRENGTH.

NOISE SIDEBANDS

Noise sidebands are a measure of the spectrum analyzer spectral purity. For example, how spectrally clean the spectrum analyzer local oscillators are is a measure of noise sidebands. This specification is significant because, for spectral purity measurements, the spectrum analyzer must be more spectrally pure than the signals it measures, and noise sidebands can limit resolution. Noise sidebands are specified in dB relative to the carrier (dBc), in a specific bandwidth. For example, in the HP 8568B, a spectrum analyzer with a 100 Hz to 1500 MHz range, noise sidebands are more than 90 dB down from the carrier when 300 Hz away from the carrier and normalized to a 1 Hz bandwidth.

OPTIMUM INPUT LEVEL

Optimum input level refers to the signal level into the input mixer which ensures that the spectrum analyzer generated distortion products are below a certain level. For example, a −40 dBm optimum level into the mixer guarantees distortion products to be below |nobreak|−110 dBm.| For example, 70 dB down. The 70 dB range is the dynamic range defined above. Different mixers have different optimum levels. However, most Hewlett-Packard spectrum analyzers specify −40 dBm as the optimum input level.

OPTIMUM RESOLUTION BANDWIDTH

Optimum resolution bandwidth is the bandwidth which provides the most convenient display commensurate with scan width and fastest sweep time.

PEAK DETECTION

The spectrum analyzer detects the peak level of the input signal. Military standard measurements (MIL-STD) usually require peak detection (envelope detection with the video bandwidth set three times wider than the resolution bandwidth). See QUASI-PEAK DETECTION and AVERAGE DETECTION.

PRESELECTOR

A preselector is a bandpass filter that passes the desired signal to the spectrum analyzer input. Conducted measurements and radiated measurements that are performed in semi-anechoic chambers, generally do not require preselection. However, preselection is usually required at open sites, especially those near metropolitan areas, to avoid distortion or gain compression. (See GAIN COMPRESSION.) The HP 8566B has tracking preselection from 2 to 22 GHz. Use fixed-tuned filters or tunable bandpass filters as non-tracking preselectors. See TRACKING PRESELECTOR.

PROGRAM LEVEL

See LEVEL.

QUASI-PEAK DETECTION

Quasi-peak detection is a weighted form of peak detection. During quasi-peak detection, the display response drops as the repetition rate of the measured signal decreases. Many commercial standard measurements, particularly CISPR measurements, require quasi-peak detection.

A quasi-peak adapter must be included in the measurement system if quasi-peak detection is desired. The quasi-peak detector introduces special bandwidths and slower time constants into the measurement system to produce lower level test results. In the HP 85869PC EMI measurement software, quasi-peak detection is a data analysis option in the measure portion of the program. The program does not conduct a quasi-peak detected measurement correctly unless a quasi-peak adapter bandwidth is specified in the test setup table. If BYPASS is specified as the quasi-peak bandwidth, quasi-peak detection does not occur.

QUASI-PEAK ADAPTER BANDWIDTH

Three quasi-peak adapter bandwidths correspond to three quasi-peak adapter frequency bands:

Frequency Band 1 (FR1):	200 Hz Quasi-Peak Adapter Bandwidth (Corresponds to CISPR Band A, 10 kHz to 150 kHz)
Frequency Band 2 (FR2):	9 kHz Quasi-Peak Adapter Bandwidth (Corresponds to CISPR Band B, 150 kHz to 30 MHz)
Frequency Band 3 (FR3):	120 kHz Quasi-Peak Adapter Bandwidth (Corresponds to CISPR Band C/D, 30 MHz to 1 GHz)

RADIATED EMISSION

A radiated emission is electromagnetic energy propagated into space.

REPORT LIBRARY

The report library is a selection of EMI reports which can be loaded into computer memory, modified to include measurement results, and then printed.

RESIDUAL FM

Residual FM is a short-term measure of the spectrum analyzer jitter or aberrations. It is usually measured in a specific bandwidth and is specified as so many Hz in one second (RMS, peak, peak-to-peak, or average). The spectrum analyzer's narrowest bandwidth and scan width are limited by the residual FM.

RESIDUAL RESPONSES

Residual responses are responses which appear on the display with no input signal connected to the spectrum analyzer. These ever-present responses are distortion products which result when a local oscillator fundamental or higher harmonics mix with a response of another internal oscillator to produce signals at one of the IF frequencies of the spectrum analyzer.

RESOLUTION BANDWIDTH

Resolution bandwidth is the 3 dB bandwidth of the spectrum analyzer IF stage. It is called the resolution bandwidth because two closely-spaced, equal amplitude signals are just resolved if they are separated by an amount equal to the spectrum analyzer 3 dB bandwidth. For example, a final IF bandwidth of 100 Hz just resolves two equal amplitude signals 100 Hz apart. However, if the two signals are less than 100 Hz apart, they are within the IF bandwidth at the same time and, therefore, appear as one signal.

SCAN (FREQUENCY SPAN) LINEARITY

Scan linearity is the accuracy of the horizontal axis of the display. It is the frequency error between two points on the display.

SCAN TIME

Scan time is the total time of one full sweep.

SCROLL KEYS

Scroll keys are keys on computer keyboard which change the position of the arrow, cursor, or window outlined on some of the computer screens during program operation.

SCROLL KNOB

Scroll knob is the dial or rotary pulse generator (RPG) on the computer keyboard that changes the position of the arrow, cursor, or window outlined on some of the computer screens during program operation.

SEMI-ANECHOIC CHAMBER

A semi-anechoic chamber is an enclosure for making EMI measurements. The interior surfaces of the enclosure, except the floor, absorb electromagnetic radiation, reducing reflections of radiated electromagnetic fields.

SENSITIVITY

Sensitivity is a measure of the spectrum analyzer's capability to detect small signals. Like most receivers, the spectrum analyzer's maximum sensitivity (minimum discernible signal) is limited by the inherent average noise. Thus, an unknown signal can be detected when the signal power equals inherent average noise power. When viewed on the display, this signal appears about 3 dB above the inherent average noise level.

Referenced to the spectrum analyzer input, the inherent average noise level has two components: thermal noise and noise resulting from the active elements:

$$P_{in} = 10 log KTB + N_o$$

where

P_{in} is inherent average noise, in dBm

K is Boltzmann's constant, in joules

T is absolute temperature, in ^oK

B is equivalent IF bandwidth, in Hz

N_o is the spectrum analyzer noise figure

(the contribution of the active elements), in dB

From this definition, we can see that the inherent average noise is bandwidth-dependent. Because of the power relationship above, a decade decrease in bandwidth results in 10 dB lower noise level and, consequently, 10 dB better sensitivity. When measuring inherent average noise level, a video filter with a bandwidth much less than the IF bandwidth

should be used and the spectrum analyzer input should be terminated with its characteristic impedance.

SOFTKEY FUNCTIONS

Softkey functions are listed at the bottom of computer screen during program operation and are activated with computer keys f1 through f8. The softkey functions displayed on the computer screen form a menu.

SPAN

Span refers to the frequency calibration of the horizontal axis of the spectrum analyzer. The horizontal axis has 10 divisions.

SPECTRUM ANALYZER

A spectrum analyzer graphically presents the energy distribution of a signal as a function of frequency. Typically, the display is a cathode ray tube (CRT) screen which shows amplitude versus frequency. There are two types of spectrum analyzers: real-time and non-real-time:

REAL-TIME SPECTRUM ANALYZER

A real-time spectrum analyzer is a spectrum analyzer which is tuned to the entire spectrum at once. Thus, it responds to changes in signals as they occur.

NON-REAL-TIME (SCANNING) SPECTRUM ANALYZER

A non-real-time (scanning) spectrum analyzer is only tuned to a single frequency at a given instant in time; so, to analyze several signals, it sequentially scans through them one at a time. Because it must wait to tune to a particular frequency, it is not a real-time spectrum analyzer. The phenomenon under test must be repetitive; otherwise, it may not be detected. Scanning spectrum analyzers are usually the superheterodyne receiver type in which the first local oscillators (LO) or some *IF* is swept. Hewlett-Packard spectrum analyzers are generally superheterodyne, with a swept first LO.

SPURIOUS RESPONSES

Spurious responses are undesired responses that are generated in the spectrum analyzer and displayed on the screen. There are two types: harmonic and non-harmonic. Harmonic spurious responses are second, third, fourth, and so on, harmonics of the input signal. Non-harmonic spurious responses are intermodulation and residual responses.

TEST LIMIT

A test limit is the highest acceptable EMI level for any given frequency. The test limit is configured in the limit table and can be stored in the limit library.

TEST SETUP

A test setup describes all parameters for a measurement setup and is listed in the test setup table in Chapter 5.

PROGRAM TOP LEVEL

The program top level is the highest group of softkey functions in the program. All sections of the program are accessed with the softkeys at the program top level. The program top level can always be reached by repeatedly pressing `RETURN` or `ABORT`.

TRACKING PRESELECTOR

A tracking preselector is a voltage-tuned bandpass filter (typically 20-50 MHz bandwidth and 2-22 GHz range) which tracks the spectrum analyzer tuning. It is used with the harmonic-mixing spectrum analyzer (like an HP 8566 or HP 8568) to eliminate image, multiple, and spurious responses.

TRANSDUCER LIBRARY

The transducer library contains a selection of transducer correction factors which can be loaded into the transducer table and then transferred to the test setup table.

TRANSDUCER TABLE

A transducer table lists gain (or loss) characteristics of any transducer according to frequency. The loss of cables and external attenuators, or the frequency response of preamplifiers, can also be accounted for in the measurement system by listing their characteristics in the transducer table. Table contents are stored in the transducer library or transferred to the test setup table.

TRANSFER IMPEDANCE

Transfer impedance is the magnitude of the current sensed by a current probe divided by the voltage across the output terminals of the probe (when properly terminated). Commonly expressed in decibels referenced to one ohm ($dBohm$):

$$Z_t = V - I$$

where

Z_t is transfer impedance ($dBohm$)

V is magnitude of voltage across probe ($dB\mu V$)

I is magnitude of current measured ($dB\mu A$)

VIDEO BANDWIDTH

The video bandwidth determines the amount of video filtering. See VIDEO FILTER.

VIDEO FILTER

A video filter is a post-detection averaging device which averages the noise present in the spectrum analyzer. A noise averaging filter is a low-pass filter whose bandwidth should be much narrower than the resolution bandwidth of the spectrum analyzer. However, since the video filter is located after the IF bandwidth, it does not affect frequency resolution.

In some measurements, like AM, FM, and pulsed RF demodulation, the video filter bandwidth should be equal to or greater than the IF bandwidth to pass the demodulated waveform without distortion.

VIDEO TRIGGER

Video trigger is a triggering mode where the spectrum analyzer sweep is synchronized to the envelope of the RF input signal. This mode recovers modulation in the zero span mode.

WINDOW

A window outlines the active area of the computer display where text may be entered or changed.

ZERO SPAN

Zero span is a mode where the horizontal axis is calibrated in real time at a single frequency. The spectrum analyzer is tuned in this mode to a continuous wave (CW). Thus, time variations of the signal amplitude are displayed on the screen and the spectrum analyzer becomes a tunable, variable-bandwidth receiver.

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