Agilent 85161B

Measurement Automation Software for the 8510 Network Analyzer

Product Note

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This product note provides useful information about the 85161B measurement automation software, including hardware and software requirements, and information that may be useful for specialized uses and advanced applications.

The software itself is designed to be self-contained and self-explanatory, and the best way to learn how to use the software is to use it. Try out its features, test its capabilities. Except for specialized applications, a manual is not necessary, and creative experimentation is the best—and fastest—way to learn.

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The manual supplied with the 85161B measurement automation software has eight chapters, three appendices, and a complete alphabetical index. A brief summary of the manual contents follows below.

Chapter 1 – Product Features describes the main features of the 85161B measurement automation software and explains briefly some of the ways it can be used to make measurements with the 8510 network analyzer.

Chapter 2 – Hardware and Software Requirements describes the hardware and software required to use the 85161B measurement automation software.

The 85161B software is designed to be used with HP 9000 Series 200 or Series 300 computers, or a PC with Windows that runs HP Basic for Windows. It can be used with 8510 network analyzers, with any 8510-system S-parameter test set, and with either the 8360 synthesized sweeper, the 8340A/B or 8341B synthesized sweeper, or the 8350B sweep oscillator. It can also be used with the 85106 millimeter-wave network analyzer system.

The software is written in BASIC, and BASIC 3.0 (or higher) and a number of binary fields must be installed in order to use it. Memory and operating system requirements are explained in Chapter 2. Binary files are listed in Chapter 3.

Chapter 3 – Setting Up a System tells how to set up a device measurement system using the 85161B software and the recommended hardware.

Chapter 4 – Installing the 85161B Software tells how to install and run the software on an HP 9000 Series 200 or Series 300 computer. It tells how to install the BASIC operating system and binary files required by the 85161B program and how to install the 85161B software itself into flexible-desk, shared resource management (SRM), and hard disk drive systems.

Chapter 4 also tells how to make a working copy of the software and how to run the program when it has been stored in an SRM system or onto a hard disk drive. It also explains screen display and keyboard differences between Series 200 and Series 300 computers when the program is run.

Chapter 5 – Configuring Measurements is the first of four chapters that tells how to use the 85161B measurement automation software. Although these chapters are designed mainly as a reference, they also offer (through examples) a tutorial that explains all of the main features of the software.

Chapter 5 begins with an overall view of how measurements are made using the 85161B software. Individual sections in this chapter then explain in detail how to set start and stop frequencies, how to choose the number of points in each measurement sweep, and how to set up other details of the measurement. This chapter also tells how to store and recall measurement configurations.

Chapter 6 – Calibrating the System tells how to use the 85161B software in measurement calibration of the 8510 network analyzer. Measurement calibration is done to produce fully error-corrected measurements and the software guides the user step-by-step through this process. Chapter 6 also covers storing and recalling measurement calibrations.

Chapter 7 – Measuring Devices tells how to measure devices using the 85161B software, including how to add electrical delay to measurements. This chapter also explains how to use the measurement loops available in the 85161B software to make the same or similar measurements more than once without having to configure the measurement each time.

Chapter 8 – Plotting, Printing, and Storing Data tells how to plot, print, store, and recall measurement data using the 85161B software.

Chapter 8 also tells how to use measurement data in computer-aided engineering applications—with the MDS (CITIFile), as well as the Touchstone, and Super Compact linear circuit simulation programs—and how to convert device files from one format to another.

Appendix A – Principal Screens and User-Definable Functions summarizes information presented in detail elsewhere in the manual. It offers a program flowchart, illustrations of the principal screen displays, and a list of user-defined numerical values and major functions.

Appendix B – Error Messages lists the error messages that may appear when the program is run and recommends responses to these messages.

Appendix C – Modifying the Program tells how to customize the software by modifying the program. The 85161B measurement automation software is written in BASIC and is not secured, so it is easy to use as a starting-point for custom-designed automated measurement programs.

The Index gives immediate, direct access to detailed information on topics that may come up while the software is actually being used.

85161B Guided measurements

The 85161B Measurement Automation Software offers a simple, menu-driven way of making general-purpose measurements over the entire frequency range of the 8510 network analyzer. Depending on the test set, this range is between 45 MHz and 50 GHz (coaxial), or between 8.2 GHz and 110 GHz (waveguide).

The software takes complete control of the network analyzer and leads the user step-by-step through the measurement. In this way, repeatable, high-quality magnitude, phase, and group delay measurements can be made with a minimum of training or previous experience, and with no need to learn the network analyzer front panel.

Measurement configuration

Measurements are configured using the 85161B configuration screen. This screen makes available the main measurement capabilities of the 8510 network analyzer. Choices can be made before each measurement, or they can be made once and recalled together as a stored configuration.

Choices on the 85161B configuration screen make it easy to set or modify all of the following details of the measurement directly, without using or referring to the front panel of the 8510 network analyzer:

- Start and stop frequencies from 45 MHz to 110 GHz, depending on the test set.
- If desired, the advanced configuration screen can be used instead to specify frequencies in terms of the center frequency and frequency span or in up to 30 separate (non-continuous) frequency segments or single frequency points.
- Number of points per data trace: five different choices are available directly, from 51 to 801 points; other choices are available by listing frequency segments.
- RF source power level, sweep time, and if the source is an 8360 series, 8340A/B or 8341B synthesized sweeper-ramp or step sweep mode.
- Port 1 and Port 2 attenuators can be set to increase dynamic range (except for test sets with Option 002 which has no attenuators).

Noise reduction through trace averaging can be specified also, using the advanced configuration screen.

Calibration for error correction

When the desired measurement configuration has been set up, a guided step-by-step measurement calibration sequence begins.

The calibration type is chosen in response to the user's answers to questions about the type of calibration that will be done and the kind of device that will be measured:

- 1-port reflection calibration for one-port devices.
- One path 2-port calibration for two port devices measured on a reflection/transmission only test set.
- Full 2-port OSLT (open-short-load-through) or TRL (through-reflect-line) calibration for two-port devices measured on an S-parameter test set.

If non-insertable two-port devices will be measured, guided full 2-port calibration is available using either the adapter removal or equal-length-adapter technique. This is also true of transitional devices, in which the input and output ports have different connector types.

When the calibration has been chosen, the software guides the user step-by-step through the calibration—even if the calibration requires connecting and disconnecting adapters or using a different calibration kit for each test port.

If desired, the network analyzer can be calibrated manually using the front panel.

The calibration sequence can also be omitted to make measurements immediately, or a calibration that has been done and stored earlier can be recalled and used again.

Different calibration (and measurement) interfaces can be specified according to connector type: 7 mm, 3.5 mm, 2.4 mm, 1.85 mm, type-N, or X/P/K/R/Q/U/V/W-bands.

Measurement calibration is performed at the actual measurement reference plane, and in the connector type of the device-under-test, regardless of the connector type of the test set. When the device-under-test has SMA connectors, measurement calibration is performed in 3.5mm.

When the calibration type and measurement interface have been specified, the software guides the user step-by-step through the calibration process. Screen prompts tell which calibration device to use, and when to connect and disconnect each one.

When the calibration sequence has been completed, the calibration data can be stored in a calibration file and used either immediately or later. It can also be used immediately without storing it, for one-of-a-kind measurements.

Storing configurations and calibrations

Measurement configurations and calibrations can be saved in disk files and recalled whenever needed. These can then be recalled and done in exactly the same way every time, no matter how long or complicated the instructions would be if the tests were performed manually.

Plotting and printing data

Display and plot options

Test data can be displayed (and plotted) in linear or log magnitude, SWR, phase, polar, or Smith Chart formats. Start and stop frequencies different from those in the measured data can be specified to magnify a particular area of interest for closer examination. Both axes are labeled for easy interpretation, and both axes can be scaled manually for optimum data resolution.

Print options

Measurement data in numerical form can be displayed on the computer or printed on any GPIB compatible printer.

Up to nine columns of data can be printed to represent frequency and test data in linear or log magnitude, phase, SWR, or group delay for all four S-parameters. H, Y, or Z parameter conversion is also available.

Data storage and CAE applications

Device measurement data can be stored on flexible disks in binary format or in formats compatible with the 85161B Measurement Automation Software, as well as the Touchstone, or Super Compact linear circuit simulation programs used in computer-aided engineering (CAE).

Data that has been stored in binary format can be recalled later for further examination or statistical analysis. Compatibility with well-known circuit simulation programs makes it possible to use actual device data in CAE applications. In addition, files can be converted from one storage format to another, allowing previously measured device data to be moved between CAE programs.

Program flowchart (1 of 3) – configuring measurements

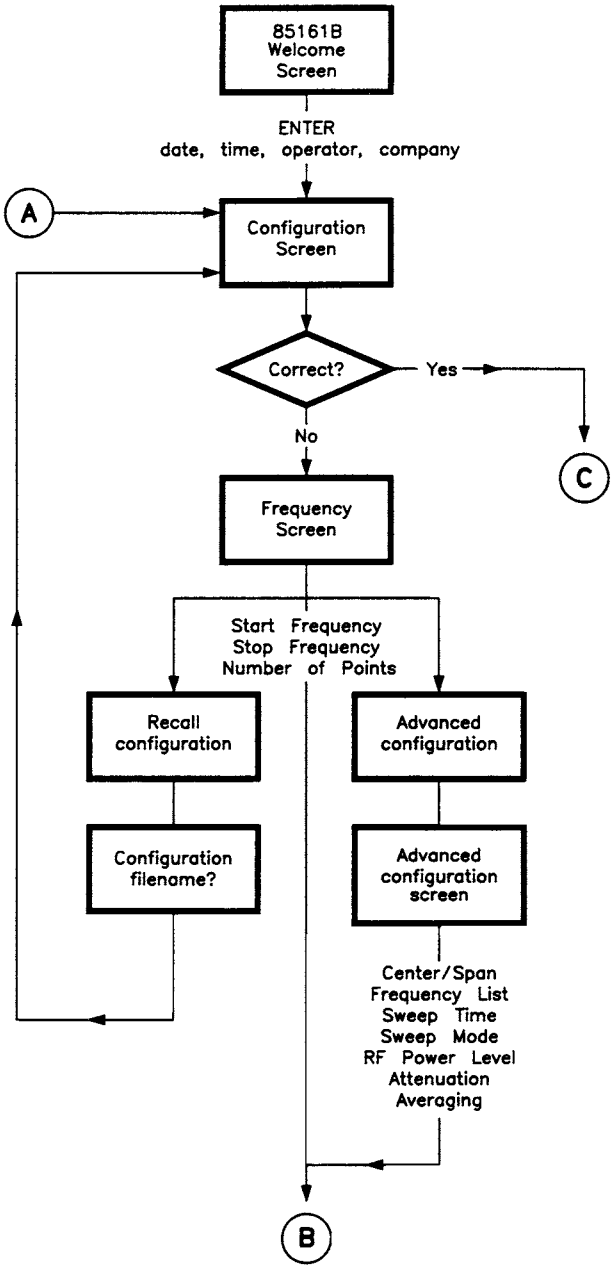

Figure 1.

Program flowchart *(continued)*

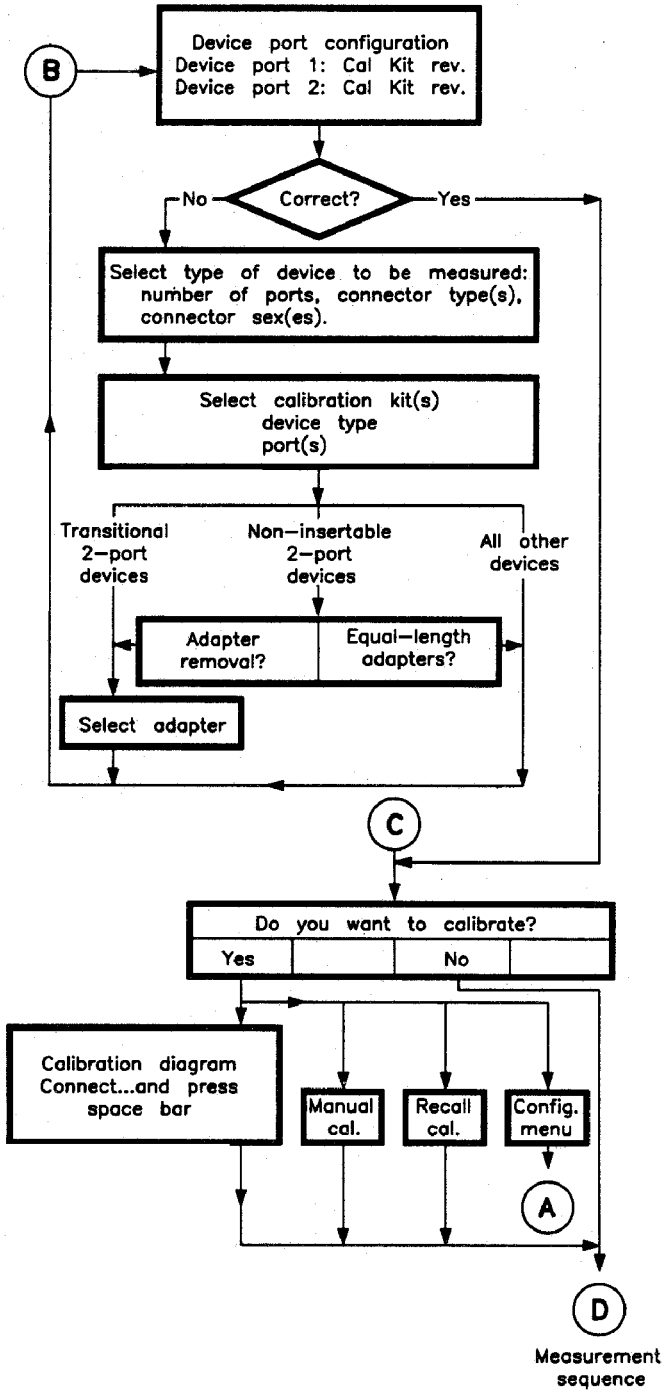

Figure 2.

Program flowchart *(continued)*

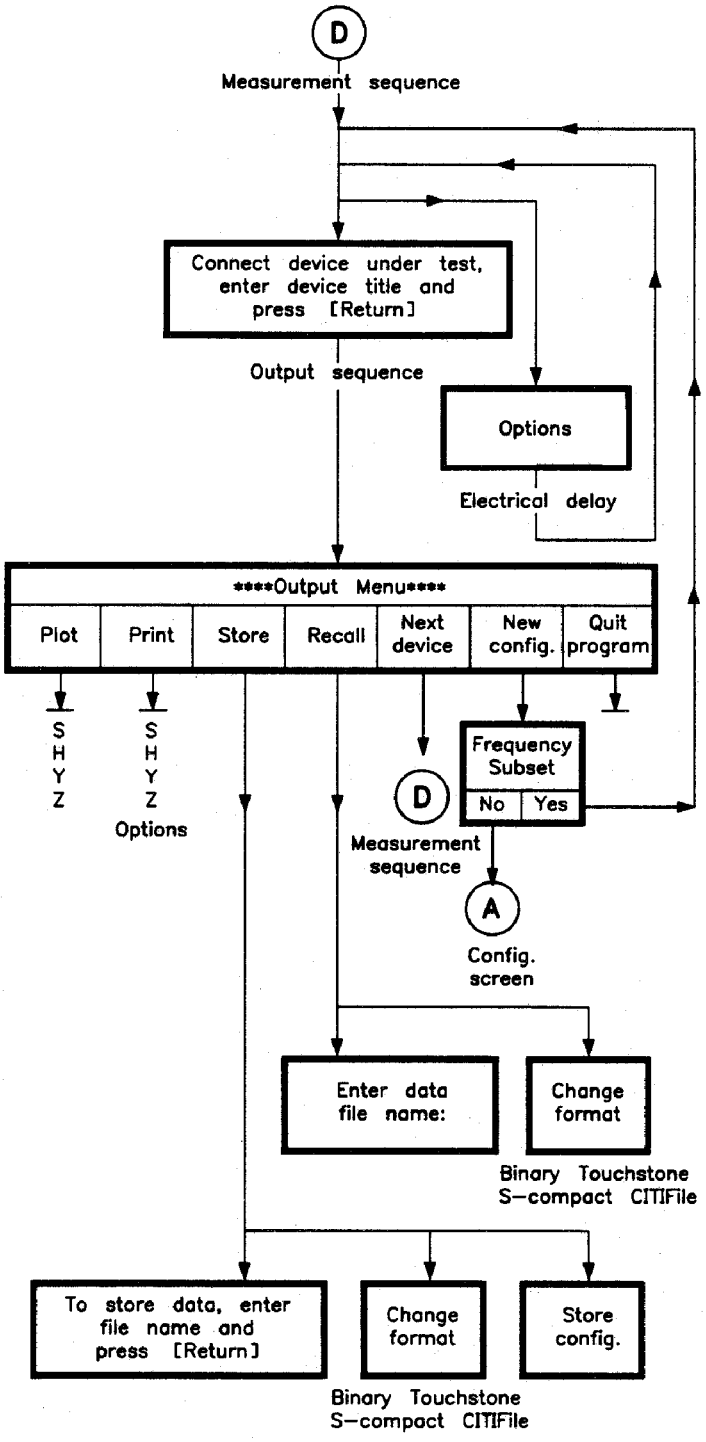

Figure 3.

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