E7346A and E7356A Performance Upgrade Kits for 85106C/D Network Analyzers

Installation Manual

Applicable systems:

85106C
85106C with Option 002
85106D

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Read Me First!

Using this document and an E7346A or E7356A upgrade package, an Agilent service engineer can upgrade an 85106C, 85106C with Option 002, or 85106D network analyzer to full 8510XF capability, in either 85 GHz or 110 GHz.

Option 002 on the 85106C replaced 8350B/83540A with 83621A/B.

Agilent Technologies does not recommend customer installation of the upgrade packages.

Scheduling Installation

The E7346A or E7356A performance upgrade packages come with prepaid installation. Please call your local Agilent office to arrange for a service engineer to install the upgrade kit (see "Contacting Agilent" on page vi)

Warranty

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

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For assistance, call your local Agilent Technologies office (refer to "Contacting Agilent" on page vi).

Contacting Agilent

Online assistance: www.agilent.com/find/assist

United States	Latin America	Canada	Europe
(tel) 1 800 452 4844	*(tel)* (305) 269 7500 *(fax)* (305) 269 7599	*(tel)* 1 877 894 4414 *(fax)* (905) 282-6495	*(tel)* (+31) 20 547 2323 *(fax)* (+31) 20 547 2390
New Zealand *(tel)* 0 800 738 378 *(fax)* (+64) 4 495 8950	**Japan** *(tel)* (+81) 426 56 7832 *(fax)* (+81) 426 56 7840	**Australia** *(tel)* 1 800 629 485 *(fax)* (+61) 3 9210 5947	**Singapore** *(tel)* 1 800 375 8100 *(fax)* (65) 836 0252
Malaysia *(tel)* 1 800 828 848 *(fax)* 1 800 801 664	**Philippines** *(tel)* (632) 8426802 *(tel) (PLDT subscriber only):* 1 800 16510170 *(fax)* (632) 8426809 *(fax) (PLDT subscriber only):* 1 800 16510288	**Thailand** *(tel) outside Bangkok:* (088) 226 008 *(tel) within Bangkok:* (662) 661 3999 *(fax)* (66) 1 661 3714	**Hong Kong** *(tel)* 800 930 871 *(fax)* (852) 2506 9233
Taiwan *(tel)* 0800-047-866 *(fax)* (886) 2 25456723	**People's Republic of China** *(tel) (preferred):* 800-810-0189 *(tel) (alternate):* 10800-650-0021 *(fax)* 10800-650-0121	**India** *(tel)* 1-600-11-2929 *(fax)* 000-800-650-1101	

Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

WARNING   **The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.**

CAUTION   The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

Instrument Markings

⚠️ !	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
⚡	This symbol indicates hazardous voltages.
☀	The laser radiation symbol is marked on products that have a laser output.
∼	This symbol indicates that the instrument requires alternating current (ac) input.
CE	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
N10149	The C-Tick mark is a registered trademark of the Australian Spectrum Agency.
CSA	The CSA mark is a registered trademark of the Canadian Standards Association.

1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
❘	This symbol indicates that the power line switch is ON.
⏻	This symbol indicates that the power line switch is OFF or in STANDBY position.

Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Typeface Conventions

Italics
- Used to emphasize important information:
  Use this software *only* with the xxxxxX system.

- Used for the title of a publication:
  Refer to the *xxxxxX System-Level User's Guide*.

- Used to indicate a variable:
  Type LOAD BIN *filename*.

Instrument Display
- Used to show on-screen prompts and messages that you will see on the display of an instrument:
  The xxxxxX will display the message **CAL1 SAVED**.

[Keycap]
- Used for labeled keys on the front panel of an instrument or on a computer keyboard:
  Press **[Return]**.

{Softkey}
- Used for simulated keys that appear on an instrument display:
  Press *{Prior Menu}*.

User Entry
- Used to indicate text that you will enter using the computer keyboard; text shown in this typeface must be typed *exactly* as printed:
  Type LOAD PARMFILE

- Used for examples of programming code:
  #endif // ifndef NO_CLASS

Path Name
- Used for a subdirectory name or file path:
  Edit the file *usr/local/bin/sample.txt*

Computer Display
- Used to show messages, prompts, and window labels that appear on a computer monitor:
  The **Edit Parameters** window will appear on the screen.

- Used for menus, lists, dialog boxes, and button boxes on a computer monitor from which you make selections using the mouse or keyboard:
  Double-click **EXIT** to quit the program.

Introduction

Contents:

NOTE

The 8510C works with all 8360 synthesized sweeper models. To take advantage of two 8510C system features (quick step and test port power flatness correction), however, some 8360 instruments must be upgraded.

NOTE

This chapter covers both the CRT and LCD displays. Some display-related adjustments apply only to instruments with a CRT display.

Scheduling Installation

The E7346A and E7356A performance upgrade packages come with prepaid installation. Please call your local Agilent Technologies office to arrange for a service engineer to install the upgrade kit (see "Contacting Agilent" on page vi).

NOTE

Agilent Technologies does not recommend customer installation of these upgrade packages. Customer installation of these upgrade packages will void the warranty.

System Configurations

The system may be configured either for coaxial measurement or on-wafer measurement.

Coaxial Configuration

When the 8510XF is configured for measurement through coaxial connections, the network analyzer, millimeter wave controller, and RF and LO sources are all installed in the system rack as shown in Figure 1. The test heads are placed on a work surface which is mounted below the millimeter wave controller.
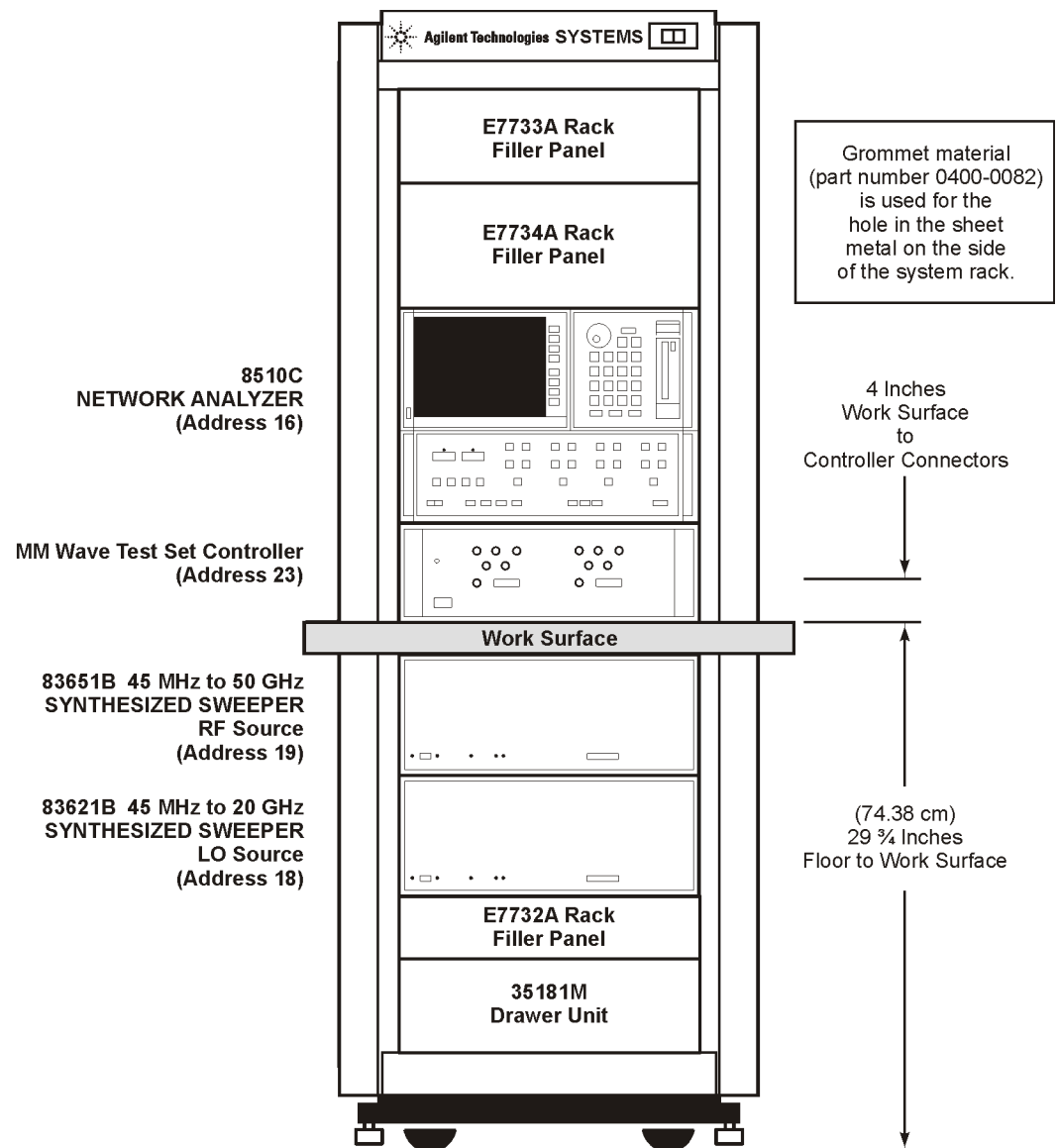
rr54c

Figure 1   ***Network analyzer mounted in system rack***

Wafer Probe Configuration

When the 8510XF is configured for measurement through on-wafer probe connections, the millimeter wave controller, and the RF and LO sources are installed in the rack. However, the network analyzer and the wafer probe station are placed side-by-side on a work surface in front of the test system, as shown in Figure 2.
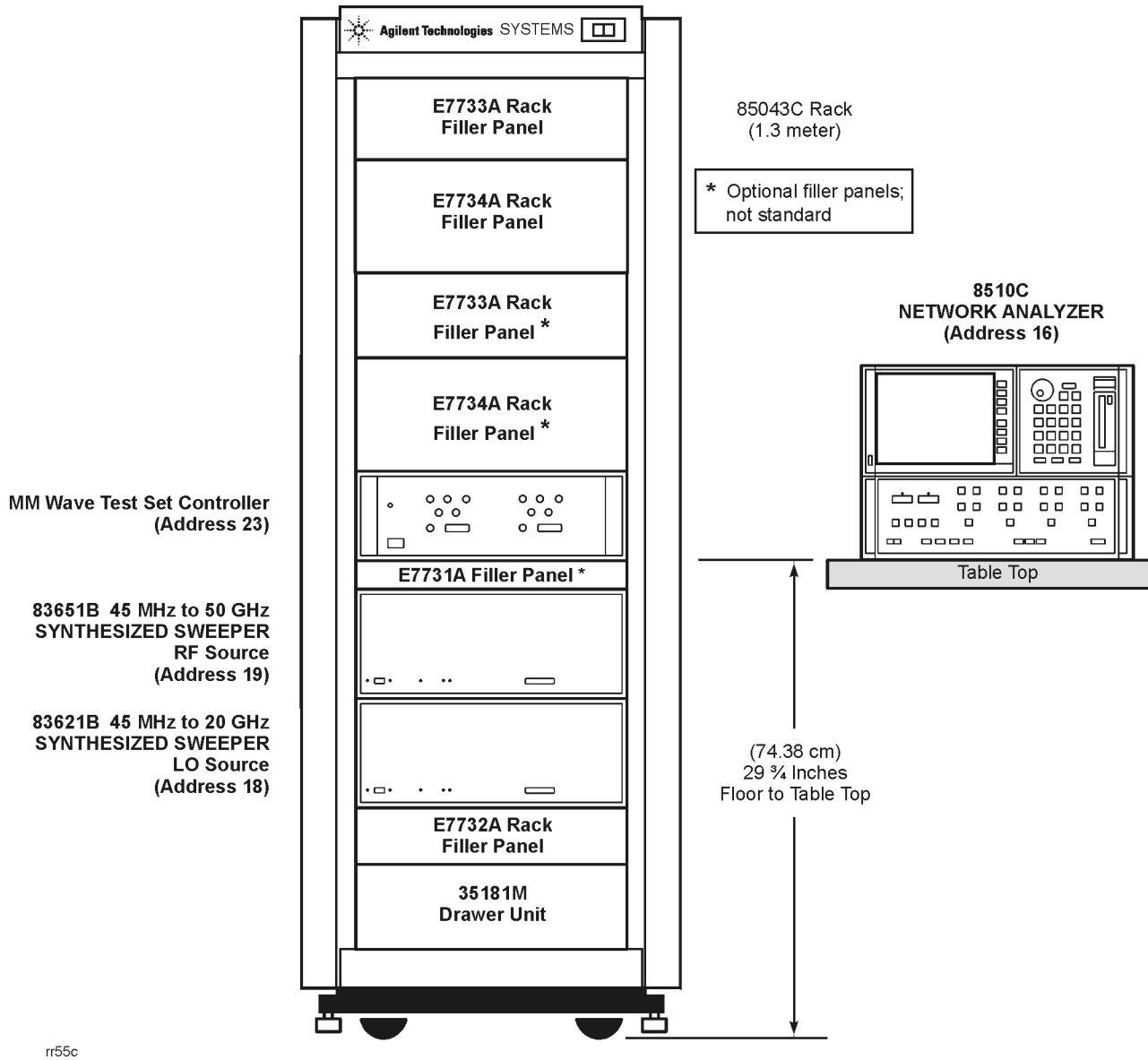

Figure 2   Network analyzer located on work surface

Overview of the Upgrade Packages

The E7346A or E7356A upgrade packages will upgrade an existing 85106C/D network analyzer system to the 8510XF system with 85 GHz or 110 GHz capability, respectively.

8510XF (85 GHz)   Use the E7346A package to upgrade an 85106C/D to an 8510XF with 85 GHz capability. With this package, you will do the following:

- Check the operation of 85106C/D.
- Check the memory in 8510C vector network analyzer.
- Upgrade the memory in the 8510C vector network analyzer.
- Disconnect unwanted elements from the existing system.
- Install an E7341A millimeter wave controller.
- Install an 83651B RF source.
- Install millimeter wave test set.
- Reconnect the system.
- Load the 8510XF operating system.
- Use the 8510C performance verification software to verify performance of 8510XF in coax.

8510XF (110 GHz)   Use the E7356A package to upgrade an 85106C/D to an 8510XF with 110 GHz capability. With this package, you will do the following:

- Check the operation of 85106C/D.
- Check the memory in 8510C vector network analyzer.
- Upgrade the memory in the 8510C vector network analyzer.
- Disconnect unwanted elements from the existing system.
- Install an E7341A millimeter wave controller.
- Install an 83651B RF source.
- Install millimeter wave test set.
- Reconnect the system.
- Load the 8510XF operating system.
- Use the 8510C performance verification software to verify performance of 8510XF in coax.

Installation Procedure Outline

Follow this outline to install either the E7346A or E7356A performance upgrade. Detailed procedures are provided in the subsequent sections.

Step 1   **Secure a Static Safe Work Station**

Check for the following:

- the static mat sits on a clean, flat, sturdy surface.
- the static mat has a connection to an earth ground.
- the static mat has a wrist strap connected to it.

Step 2   **Verify the Upgrade Package Contents**

Using the packing list for your upgrade kit, check the completeness of the package. If the kit does not have all the items listed, contact your local Agilent Technologies office (see table inside the front of this manual).

Step 3   **Secure Items Not Included in Upgrade Package**

Using the table provided in this section, obtain the items required but not supplied in the package.

Step 4   **Check the 85106C/D System Operation and Memory**

Using the instructions in this section, check that the system you plan to upgrade functions.

Step 5   **Install Non-Volatile Memory Upgrade (if needed)**

Using the instructions in this section, install additional memory in the 8510C.

Step 6   **Disconnect Unneeded Equipment**

Using the instructions in this section, disconnect the equipment not needed for the upgraded system and remove them from the system rack.

Step 7   **Install the Millimeter Wave Controller**

Using the instructions in this section, install the E7341A millimeter wave controller.

Step 8   **Install the 83651B RF Source**

Using the instructions in this section, install the 83651B RF source.

Step 9   **Reconnect the System**

Using the instructions in this section, reconnect the system.

Step 10   **Install the Millimeter Wave Test Set**

Using the instructions in this section, install the millimeter wave test set.

Step 11   **Load the 8510XF Operating System (Firmware)**

Using the instructions in this section, load the 8510XF operating system.

Step 12   **Performance Check the Upgraded 8510XF System**

Using the instructions in this section, performance check the upgraded network analyzer system.

Step 1. Secure Static Safe Work Station

Static electricity builds up on the body and on tools, including calibration components and devices under test. When static electricity is accidentally discharged, sensitive circuit elements can be damaged.

It is important that appropriate measures are taken to adequately discharge static electricity which may otherwise damage test equipment circuitry.

Circuit elements within a device can be damaged from static electricity, such as through accidental contact with the center conductor of a connector. Even a discharge that is too small to be felt can cause circuit damage.

Protection against electrostatic discharge (ESD) is essential while connecting, cleaning, or inspecting connectors attached to static-sensitive circuits, such as those found in test sets. Protective measures appropriate to the 8510 series systems are described below.

- Always use a grounded anti-static mat in front of your test equipment, and wear a grounded wrist strap attached to it.

- Ground yourself before you clean, inspect, or make a connection to a static-sensitive device or test port. You can, for example, grasp the grounded outer shell of the test port briefly to discharge static from your body.

- Discharge static electricity from a device before connecting it, such as by touching the device briefly through a resistor of at least 1 MΩ to either the outer shell of the test port or to another exposed ground.

ESD Accessories The following accessories for preventing electrostatic discharge can be ordered from Agilent Technologies:

Item	Part Number
Grounding wrist strap	9300-1367
Grounding cord for wrist strap (5 ft)	9300-0980
Conductive table mat (2 x 4 ft) with ground wire (15 ft)	9300-0797
ESD heel strap (for conductive floors)	9300-1126

Step 2. Verify Upgrade Package Contents

Following are the contents of the E7346A and E7356A performance upgrade packages. Compare this list against the packing list and against the actual package contents. If the kit does not have all of the items listed, contact your nearest Agilent Technologies office (refer to page vi).

Table 1   Performance Upgrade Package Contents

Item	Part Number	E7346A Quantity	E7356A Quantity
Software Data Disk	08510-10033	1	1
Cable, IF Interconnect	08510-60107	1	1
Cable, IF Interconnect	08510-60126	2	2
IC EEPROM, 32K X 8 (Memory Chips)	1818-7167	8	8
Adapter, 3.5mm (f-f)	5061-5311	1	1
Power Cable, 03C 03f-03m	8120-1348	2	2
Power Cable, 03C 03F-03M	8120-1405	1	1
Cable Assembly, BNC	8120-1838	1	1
Cable Assembly, BNC	8120-1839	1	1
Cable, GPIB	8120-3447	1	1
Cable Assembly, BNC	8120-5370	2	2
Synthesized Sweeper	83651B	1	1
Rack Flange Kit	83651B number 913	1	1
Adapter, 2.4mm (f-f)	85056-60006	1	1
8510XF Operating System	E7340-10001	1	1
Semirigid Cable	E7340-20075	1	1
Semirigid Cable	E7340-20076	1	1
Cable, DC Bias	E7340-60009	2	2
Service Quick Reference Guide	E7340-90013	1	1
Millimeter Controller	E7341A	1	1
Head Assembly, Left	E7342L	1	0
Head Assembly, Right	E7342R	1	0
LO Cable, 3.5mm-3.5mm	E7342-60004	2	2
RF Cable, 2.4mm	E7342-60005	4	4

Table 1   Performance Upgrade Package Contents (Continued)

Item	Part Number	E7346A Quantity	E7356A Quantity
Head Assembly, Left	E7352L	0	1
Head Assembly, Right	E7352R	0	1
System Manual	E7350-90001	1	1
Upgrade Installation Manual	E7350-90004	1	1

NOTE

The table top is not included with the E7346A or the E7356A upgrade kits. It may be ordered from Agilent Technologies using part number 85106-60038 (refer to "Contacting Agilent" on page vi).

Step 3. Secure Additional Installation Equipment

Equipment Required But Not Supplied

The following additional equipment will aid in the installation of the upgrade package, but are *not* included in the upgrade kit.

Make sure that these items are available and at hand before proceeding with the upgrade.

Table 2 *Equipment Required But Not Supplied*

Item	Part Number
Network Analyzer	8510C
Source	83620B or 83621B
Calibration/Verification kit	85059A
GPIB cables	10833A
BNC to BNC cable	10503A
Small Pozi-drive (#1)	8710-0899
Medium Pozi-drive (#2)	8710-0900
Flat blade screwdriver	not supplied
Static control table mat	9300-0797
Wrist strap	9300-1367
Wrist-strap-to-mat cord (5 ft)	9300-0980
PC with BASIC for Windows (Rev. 6.3 or higher)	not supplied

Step 4. Check the 85106C/D System Operation and Memory

The following information applies to both the E7346A and E7356A upgrade kits. Use this procedure to ensure that the existing 85106C/D system works properly before installing the upgrade package.

Procedure

1. Turn on the instruments in the following order:

    a. the 83621B or 8350B source (be sure to turn the switch to power on, not standby)

    b. the 85105A test set

    c. the 8510C network analyzer

2. On the 85102, press the green preset key.

3. Does the system pass self-test (85101 self tests, 85102 running error messages, and test set unratio of power tests) and display a `LOG MAG S`$_{11}$ trace? If not, do *not* perform the upgrade until the system has been serviced.

4. Initialize a blank disk, as follows:

    a. load a blank diskette (with write-protect off),

    b. on the 85102, press `DISK`,

    c. on the 85101, select `INITIALIZE DISK: YES`.

5. Does the system initialize the disk and display `DISK INITIALIZED`? If not, tag the 85101, indicating that it has a defective disk drive. The disk drive must be working to load the 8510XF firmware.

NOTE

Steps 6 and 7 below apply only to a CRT based display.

6. Turn the CRT to its highest intensity. Does the image remain focused? If not, return the CRT to its normal intensity and tag the 85101, indicating that it has a defective CRT.

7. Return the CRT to its normal intensity. As long as the CRT functions properly, continue with this procedure.

8. If the system displays a self-test,[*] running error message, or unratio power test failure, check the equipment setup. Do not perform the upgrade until either you correct the setup problem, or you have the system serviced.

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[*] You may have to rely on the red LEDs rather than the display.

Step 5. Install Non-Volatile Memory Upgrade (if needed)

The 8510XF firmware requires at least 832 Kbytes of non-volatile memory.

To determine how much memory is installed in the system

1. With the 85106C/D system on, press [SYSTEM] {More} {Service Functions} {Test Menu}.

2. Select 22: run service program.

3. Select 1: 85101 Display/processor service program.

4. Select 4: non-volatile memory board.

5. A password is required, which is "8515".

Incorrect useage of the password can erase the non-volatile memory.

6. Select 8. If the *Number of Pages* reading is equal to or greater than 30BB, there is enough memory for running the 8510XF firmware. Skip the balance of this procedure and go to "Step 6. Disconnect Unneeded Equipment" on page 27.

To increase the non-volatile memory

1. Place the 8510C on an ESD safe work surface and insure there is no AC power connected to the rear panel.

2. Remove the two plastic feet on the rear upper portion of the 8510C, and then remove the top cover. The PC boards are located beneath the metal cover that runs the length of the right side of the chassis.

3. Remove the 21 screws that secure the cover and remove the cover to access the PC boards. The board that contains the non-volatile memory is the A6 board, and is easily identified by its orange card extractor.

4. Remove the plastic card spacers that position the A6 board.

5. Gently grab the card extractor tabs on the ends of the board, and pull away and up to remove the board.

6. Place the board on an ESD safe work surface. There are 16 banks on the board, and 8510XF requires at least 13 banks. There are 8 IC chips supplied with this kit. Fill the empty slots until at least 13 banks are filled. The ICs to be loaded in these sockets are a CMOS version of the original replacement IC (part number 1818-4653).

7. Carefully bend the leads of the IC chips so that the leads are perpendicular to the body and insert them into the empty sockets. Be sure to match up the notch on the top of the chips with the notch on the sockets. Gently press them into place making sure that all leads go into the socket.

8. After the ICs have been installed, gently insert the A6 board back into its connector.

Verify the memory upgrade with chassis open

9. Plug the power cord into the 85101C, turn on the power, and allow the instrument to complete its initialization.

10. With the 85101C box on, press [=marker] to enter the Test menu.

11. Select 22: run service program.

12. Select 1: 85101 Display/processor service program.

13. Select 4: non-volatile memory board.

14. A password is required, which is "8515".

CAUTION

Incorrect useage of the password can erase the non-volatile memory.

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15. Select 1:Initialize Memory.

16. On the front panel of the 8510C, select Prior Menu, then Show Non-Volatile Memory Parameters. The 8510C should be displaying the memory board parameters. If the EEPROM in the highest memory page was read successfully, then the # of pages should read at least 30BB. Ignore the present position information. The number-of-pages information is only useful for indicating whether the last bank of upgraded memory is good or not.

Memory Write/Read Test

17. To determine if all of the added memory banks are functioning, select Prior Menu, then Complete Memory Board Unformatted Write/Read Test (2).

18. Press [=Marker] [x1]. This test takes a few minutes to run. If all the memory banks are working, the display will read that the first useable memory bank location is 10 hex. If any other hex location is listed, refer to the following chart to determine which EEPROM chip is at fault.

First Unuseable Memory Location Read	Possible Fault Location
0C Hex	U13 or U29
0D Hex	U14 or U30
0E Hex	U15 or U31
0F Hex	U16 or U32

Try replacing one or the other or both of the EEPROM(s) listed if you do not get 10 Hex as the first useable memory location. Continue repeating the above test until the bad EEPROM(s) are identified.

19. When the EEPROMs are found to be working properly, turn off the 8510C and remove the power cord from the rear panel.

20. Reinstall the plastic spacers on the A6 board.

21. Place the cover over the PC board cage and secure the original 21 screws.

22. Install the top cover on the 8510C and finish integrating the 8510C into the system depending on the configuration.

Step 6. Disconnect Unneeded Equipment

Remove all of the instruments that are not required for in the 8510XF system.

Step 7. Install the Millimeter Wave Controller

Install the 7341A millimeter wave controller into the system rack as shown in Figure 1 on page 13 (in-rack configuration) or Figure 2 on page 14 (table-top configuration).

# Step 8. Install the 83651B RF Source

Install the second source into the system rack as shown in Figure 1 (in-rack configuration) or Figure 2 (table-top configuration).

Step 9. Install the Millimeter Wave Test Set

Using the following procedure, install the millimeter wave test set:

1. Place the test heads on the table top or work surface in front of the millimeter wave controller.

2. Connect the cables as shown in Figure 3. Installation of these cables may require a long, 5/16-inch open-ended wrench.
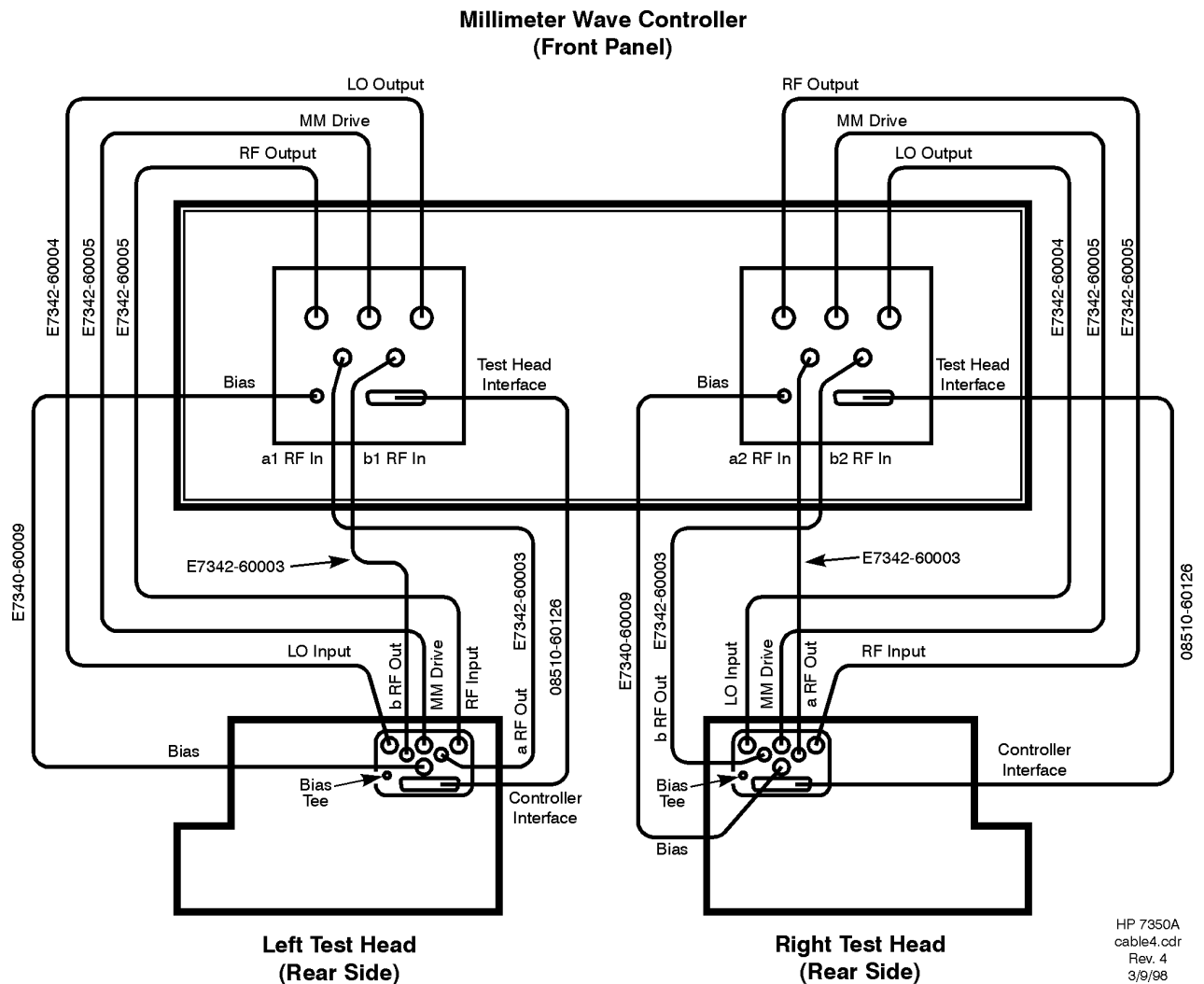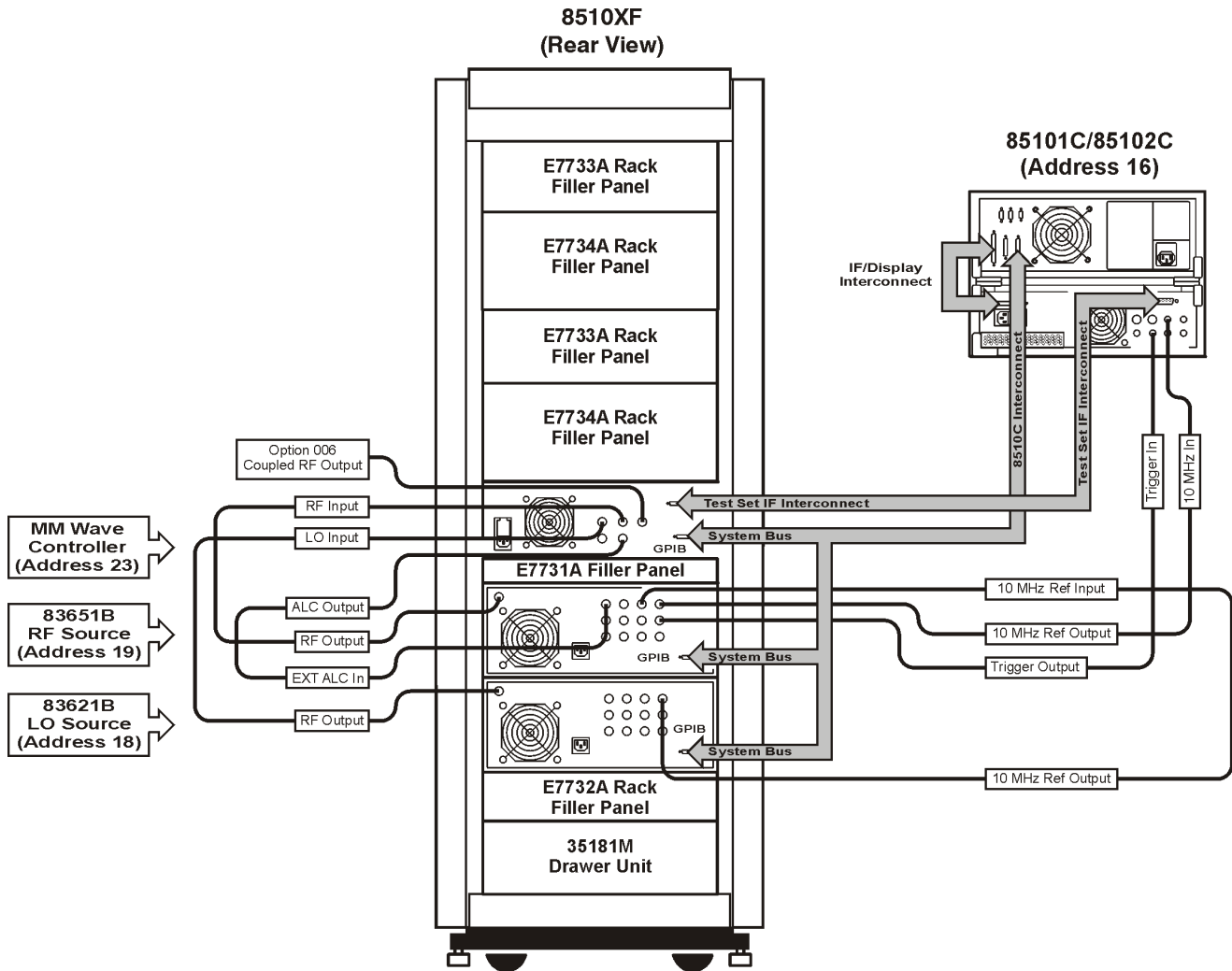

Figure 3 *Controller to Test Heads Cabling*

Step 10. Reconnect the System

Reconnect the test system according to the desired configuration. Figure 4 shows the system wiring for the coaxial configuration. Figure 5 on page 32 shows the system wiring for the on-wafer configuration.
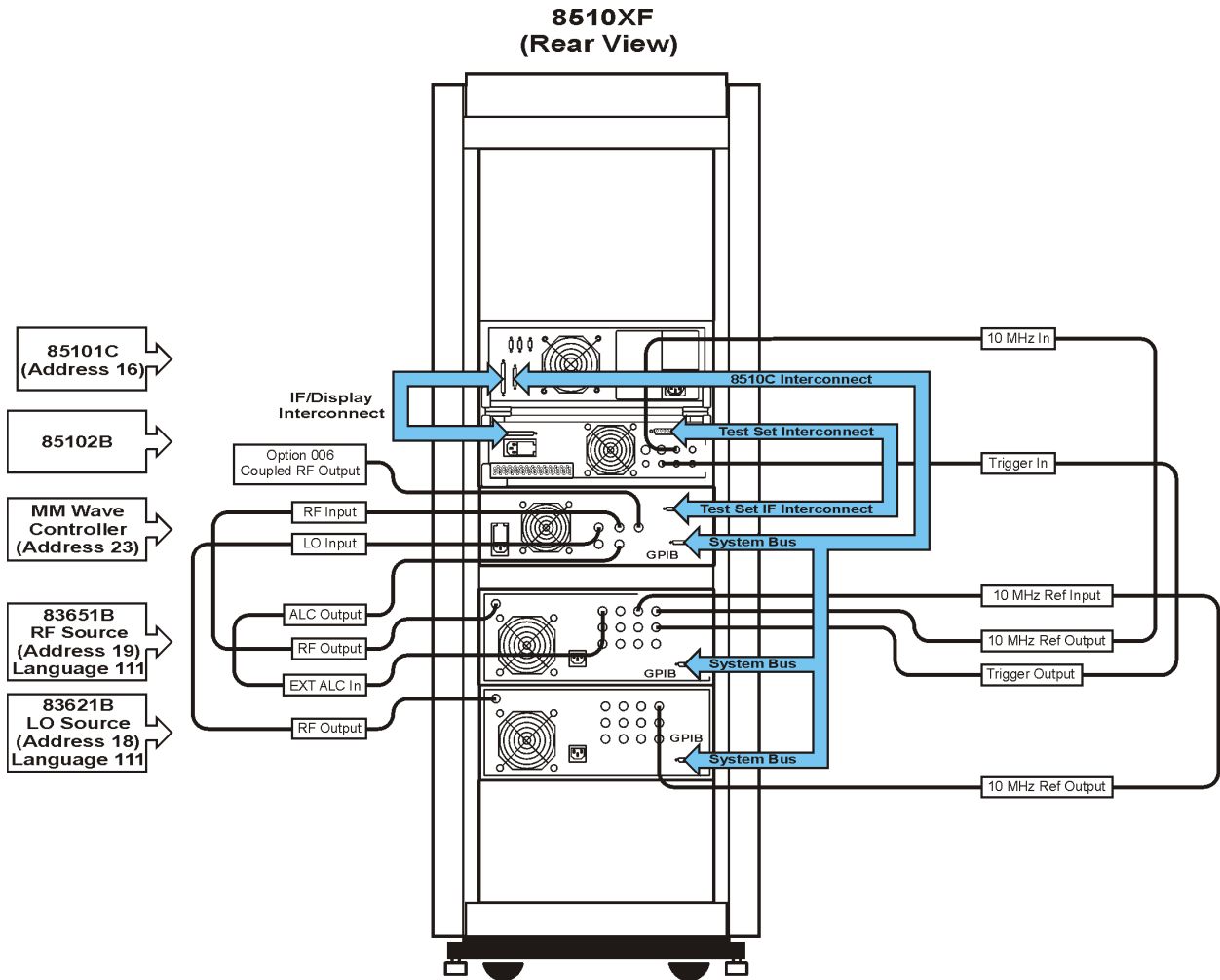
rr514c

Figure 4   Coaxial configuration system cabling diagram

Figure 5   On-wafer configuration system cabling diagram

Step 11. Load 8510XF Operating System (Firmware)

Perform the following procedure to load the 8510XF software.

1. Insert the operating system disk into the 85101 disk drive.

2. On the 8510C, press **[SYSTEM]** *{More}*, and then select *{Service Function}*.

3. Select *{Test Menu}*, and then **19**. It takes about 3 minutes to load the software and reinitialize the system.

Step 12. Perform the 8510XF Performance Verification

Refer to the 8510XF System Manual for the procedures to perform a Performance Verification on the upgraded system.