

Agilent Upgrade Guide for the 8510 Vector Network Analyzer

Product Note



85107B, 45 MHz to 50 GHz in coax



**85106D with option 001,
45 MHz to 50 GHz in coax,
above 50 GHz in waveguide**



**8510XF
on-wafer configuration**



Agilent Technologies

Table of Contents

3	Vector network analyzer (VNA) overview
5	Agilent 8510 family of products
5	Agilent 8510 network analyzer
6	Agilent 8510 firmware upgrade kits
7	Test sets
8	Sources
9	Upgrade considerations
9	Upgrading individual components
9	Upgrading the 8510
10	Upgrading the 8510 to 8530
11	Test set upgrades
11	Expanding measurement capabilities
11	Adding pulse capabilities
11	Adding time domain capabilities
12	Upgrading systems
13	System upgrades
15	Examples of upgrade paths
15	Measurement accessories
16	Calibration kits
17	Verification kits
17	Test port cables and adapters
19	Related literature

Vector network analyzer (VNA) overview

Vector network analyzer (VNA) measurement systems are used to fully characterize the linear behavior of two port devices or networks. Device characteristics include the magnitude and phase data of the transmission or reflection parameters that are required to determine complex impedance, both resistive and reactive components, shown in Figure 1. A network's behavior is linear when (1) a linear change in the input results in a linear change in the output, and (2) the output, resulting from multiple input signals, is the same as the sum of the outputs resulting from independent input signals. Some examples of linear networks are filters, amplifiers, cables and isolators.

A network analyzer measurement system can be divided into four major parts shown in Figure 2:

1. A signal source providing the incident signal
2. Signal separation devices to separate the incident, reflected and transmitted signals, and then down converts the microwave signals to a lower intermediate (IF) signal
3. A receiver to attain the IF signal and down convert it to DC
4. A signal processor and display section that processes the data and displays information on a CRT

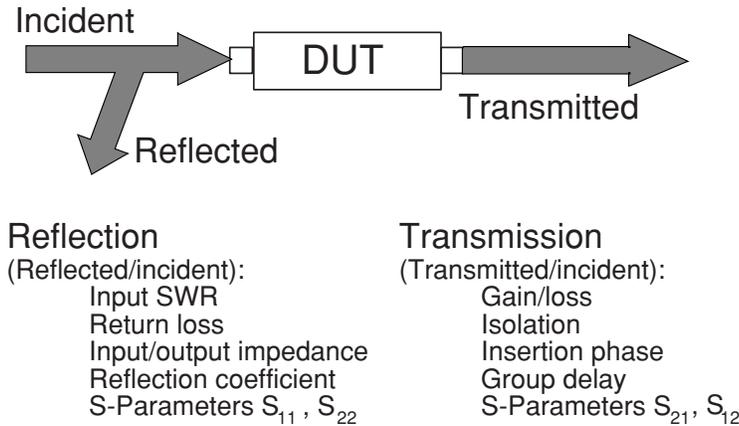


Figure 1. Device characterization

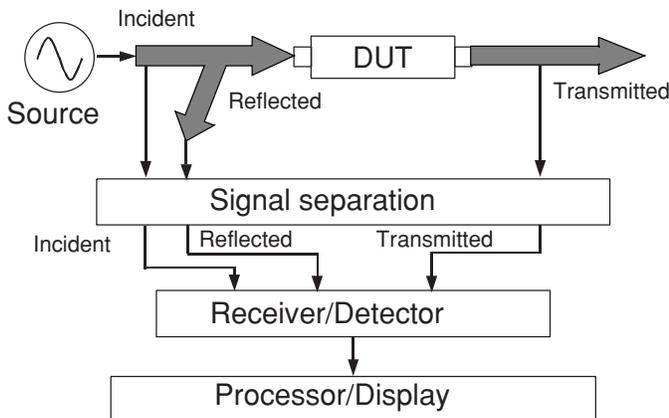


Figure 2. Network analyzer configuration

The Agilent Technologies 8510 network analyzer consists of a family of compatible products where each part is a separate system component. Each complete system includes the 8510 network analyzer, a test set, and compatible sources (measurement accessories are also needed to complete the measurement setup), shown in Figure 3. The frequency range of the measurement system is determined by the test set or the compatible source's lesser frequency. Example: if a 50 GHz test set is used with a 20 GHz source, the maximum frequency measured is 20 GHz.

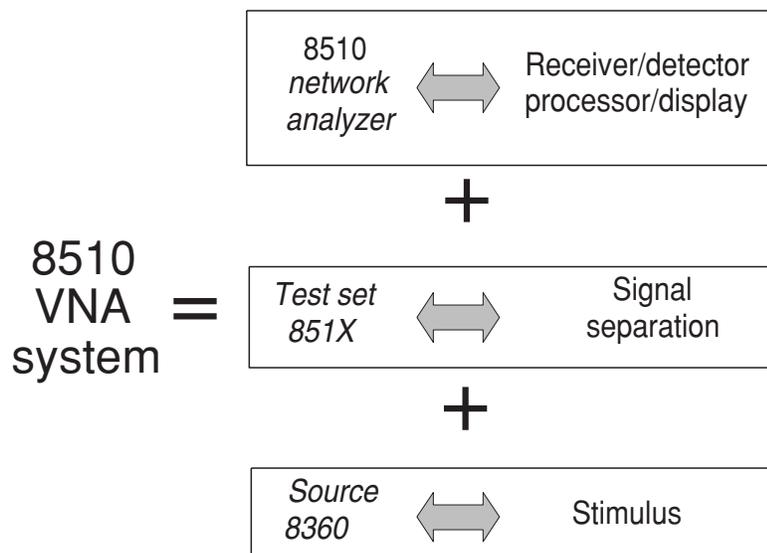
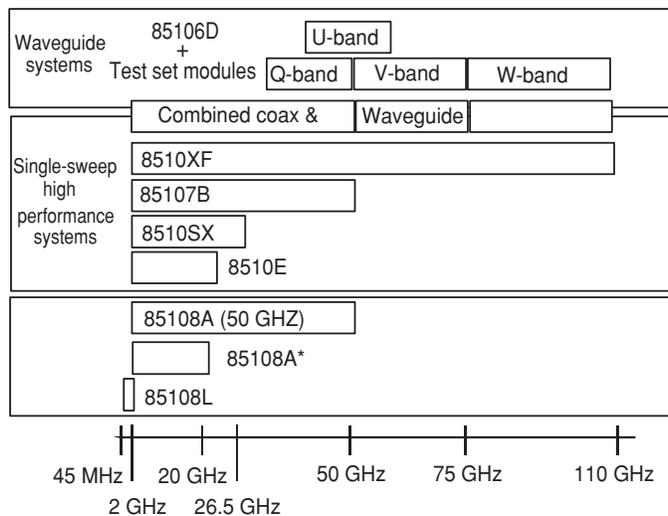


Figure 3. 8510 measurement systems are made up of modular components, the 8510 network analyzer, a test set and a compatible source.

Agilent 8510 family of products



* 85108A also available in frequency range of 45 MHz to 20 GHz

Figure 4. 8510 family of system solutions

Agilent 8510 network analyzer

Tables 1 and 2 show the different features of the 8510A, B, and C, hardware and firmware, respectively.

Table 1. Hardware revision and measurement capability

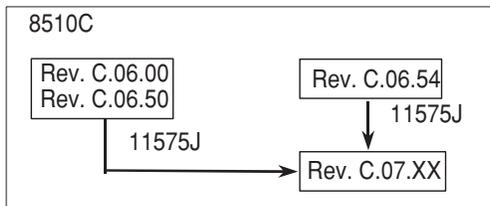
Product	Firmware revisions	Hardware features
8510A	A.02.00	• Tape drive
8510B	B.03.00 to B.06.54	• Tape drive
8510C	C.06.00 to present	• Large color display • Internal disk drive (LIF or DOS file formats) • 4 S-parameter display

Table 2. Firmware revision and measurement capability

Revision	Time domain ¹	Pulse ²	Power domain limit lines	Other added key features
A.02.00	✓			
B.03.00	✓			• Adapter removal calibration • Direct control of two sources
B.03.11	✓			• Direct control of up to 4 test sets
B.04.00	✓			• 40 GHz test set capability • Frequency subset calibration
B.05.00	✓	✓		
B.05.11	✓	✓		• Lightwave data format
B.06.30	✓	✓		• 50 GHz source/test set compatibility
B.06.54	✓	✓		
C.06.00	✓	✓		• Color display • Support for hardcopy printer plots
C.06.54	✓	✓		• Color printer capability
C.07.00	✓	✓	✓	• Connector compensation
C.07.01	✓	✓	✓	
C.07.14	✓	✓	✓	• Y2K compliance
C.07.16	✓	✓	✓	• CRT
C.08.10	✓	✓	✓	• LCD

Agilent 8510 Firmware upgrade kits

Figure 5 diagrams which product to order (numbers shown above arrows) to upgrade the existing firmware. For example, to upgrade Rev. C.06.54 to Rev. C.07.XX, order 11575J.



Note: Upgrade kit 11575J has Option 010 (time domain) available.
If you currently have time domain, you must order Option 010.

Figure 5. 8510 firmware upgrade kits

1. Time domain capabilities require Option 010 on the 8510. Time domain option can be upgraded by ordering 85012C for 8510C.
2. Pulse capabilities require Option 008 on the 8510 working with either 85110L or 85110A pulsed-RF S-parameter test set. Pulse option on the 8510 can be upgraded by ordering 85111B for 8510C. Pulse capability is not available with 8510A or 8510B.

Test Sets

The test set in a VNA measurement system is used to separate the incident, the reflected, and the transmitted signals. It is also used to convert the RF signal to IF (intermediate frequency) signal and to pass the IF to the receiver.

Once signals are separated, their individual magnitude and phase differences can be measured. Test sets are classified into two groups: (1) one-path transmission or reflection and (2) two-path S-parameter allowing forward and reverse measurements of a two port device with a single connection. S-parameter test sets can be divided into two types: (1) sampler-based and (2) mixer-based, shown in Table 3. Sampler-based test sets require one external source to provide the RF stimulus. The mixer-based test sets require two external sources; one to provide the RF stimulus and the other to provide the LO signal.

Table 3. Family of test sets

Products	Frequency range (GHz) type	Test set (application) needed	Recommend RF source ¹ needed	Recommend LO source ¹ (GHz)	Test port connector ² (GHz)
8511A ³	0.045 to 26.5	Frequency Converter	N/A	N/A	3.5 mm (M)
8511B ³	0.045 to 50	Frequency Converter	N/A	N/A	2.4 mm (F)
8512A	0.400 to 18	Transmission/Reflection		Obsolete	
8513A	0.045 to 26.5	Transmission/Reflection		Obsolete	
8514A	0.500 to 18	S-parameter		Obsolete	
8514B	0.045 to 20	S-parameter Sampler-based	83621B	-----	3.5 mm (M) (0.045 to 20)
8515A	0.045 to 26.5	S-parameter Sampler-based	83631B (0.045 to 26.5)	-----	3.5 mm (M)
8516A	0.045 to 40	S-parameter	Obsolete --- replaced with 8517A		
8517A	0.045 to 50	S-parameter	Obsolete --- replaced with 8517B		
8517B	0.045 to 50	S-parameter Sampler-based	83651B (0.045 to 50)	-----	2.4 mm (M)
85110L	0.045 to 2	Pulsed-RF S-parameter Mixer-based	83620B #001, 004, 008, H80	83620B #004, 008, H80	7 mm
85110A	2 to 20	Pulsed-RF S-parameter Mixer-based	83622B #001, 004, 008 [Option H50: 83650B (0.045 to 50) #001, 004, 008]	83623L #004, 008	3.5 mm (M)
85105A ⁴ MM-wave Controller	33 to 110 (waveguide bands)	S-parameter Mixer-based (waveguide bands)	83621B (0.045 to 20) [Option 050: 83651B (0.045 to 50)]	83621B (0.045 to 20)	WR-22 (33 to 50) WR-19 (40 to 60) WR-15 (50 to 75) WR-10 (75 to 110)
8510XF MM-wave Subsystem	0.045 to 110 (coaxial)	S-parameter Mixer-based (ultra-broadband)	83651B (0.045 to 50)	83621B (0.045 to 20)	1 mm (M)

1. Although general purpose 8360 series synthesized sweepers (836x0B) can be used in place of the 8510-dedicated 8360 series synthesized sweepers (836x1B), the following options are typically recommended: Option 004 (rear panel connectors) and Option 008 (1-Hz frequency resolution). These options are standard in the 8510-dedicated 8360 series synthesized sweepers.

Mixed sources: While mixing synthesized series is acceptable in multiple-source applications, the following areas must be considered:

- RF source = 8340, LO source = 8340, system performance will be degraded substantially.
- RF source = 8340, LO source = 8360, better system performance
- RF source = 8360, LO source = 8360, faster step frequency measurements. Using the 8340 as either the RF source or the LO source will more than double the measurement time.

2. All coaxial test port connectors are ruggedized connectors.

3. These test sets provide access to four samplers directly.

4. The following test set modules are available. Two test set modules must be ordered for complete waveguide S-parameter test set operation for each waveguide band:

- Q85104A test set module (33 GHz to 50 GHz)
- U85104A test set module (40 GHz to 60 GHz)
- V85104A test set module (50 GHz to 75 GHz)
- W85104A test set module (75 GHz to 110 GHz)

Sources

The RF or microwave signal source in a VNA measurement system provides the incident signal used to stimulate the device-under-test (DUT). The DUT responds by reflecting part of the incident and transmitting the remaining part. By sweeping the frequency of the source, the frequency response of the DUT can be determined.

There are two types of sources available; the General Purpose (GP) 8360 series synthesized sweepers (836x0B) and the 8510-dedicated 8360 series synthesized sweepers (836x1B). Note: All 8360A synthesizers have been replaced by 8360B synthesizers.

Dedicated sources, such as the 836x1B shown in Table 4, are optimized for use in the 8510 network analyzer systems. They are configured without modulation capabilities or front panel keyboards. These sources include a 1 Hz frequency resolution and rear-panel output connectors.

Table 4. 8510-dedicated sources

Product ¹	Frequency range
83621B	45 MHz to 20 GHz
83631B	45 MHz to 26.5 GHz
83651B	45 MHz to 50 GHz

For applications that require modulation capabilities, such as pulsed-RF measurements, the required source is a general purpose 836x0B synthesized sweeper, shown in Table 5. Order Option 004 to obtain rear panel connectors, and Option 008 for 1 Hz frequency resolution.

Table 5. 8360 general purpose synthesizers

Product ¹	Frequency range
83620B	10 MHz to 20 GHz
83622B	2 GHz to 20 GHz
83623B	10 MHz to 20 GHz (high power)
83624B	2 GHz to 20 GHz (high power)
83630B	10 MHz to 26.5 GHz
83640B	10 MHz to 40 GHz
83650B	10 MHz to 50 GHz

1. Although general purpose 8360 series synthesized sweepers (836x0B) can be used in place of the 8510-dedicated 8360 series synthesized sweepers (836x1B), the following options are typically recommended: Option 004 (rear panel connectors) and Option 008 (1-Hz frequency resolution). These options are standard in the 8510-dedicated 8360 series synthesized sweepers.

Mixed sources: While mixing synthesized series is acceptable in multiple-source applications, the following areas must be considered:

- RF source = 8340, LO source = 8340, system performance will be degraded substantially.
- RF source = 8340, LO source = 8360, better system performance
- RF source = 8360, LO source = 8360, faster step frequency measurements. Using the 8340 as either the RF source or the LO source will more than double the measurement time.

Upgrade considerations

There are numerous reasons for upgrading the Agilent 8510 system. The 8510 network analyzer maintains excellent performance while adapting to different measurement requirements such as basic component testing, on-wafer probing, pulsed device characterization, antenna and RCS (Radar Cross Section) measurements. Depending on the application, the 8510 network analyzer system can be reconfigured to meet other system measurement needs.

Upgrading individual components

Upgrading the 8510

Figure 6 below illustrates how the 8510A or 8510B can be upgraded to an 8510C.

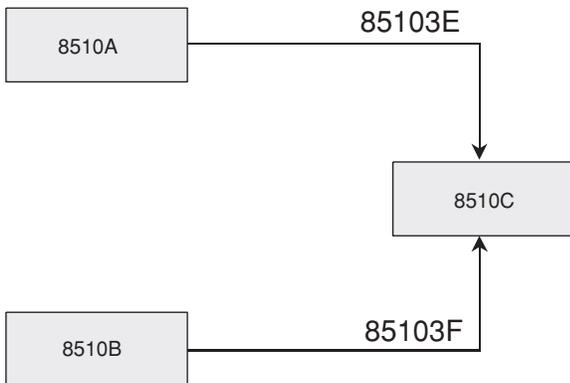


Figure 6. 8510 upgrade paths

Agilent 85103E Upgrades the 8510A to an 8510C by replacing the top unit and modifying the bottom unit of the 8510A. It includes on-site installation by an Agilent Customer Engineer (where available).

Option 001 adds a rack modification kit for mounting in an 85043A system rack

Option 002 adds an 8360 series source compatibility kit for 8517A/B test sets¹

Option 003 adds an 8360 series source compatibility kit for 8514/15 and 85110A test sets¹

Option 004 adds an 85110L source compatibility kit

Option 010 adds time domain to an 8510A with time domain previously installed

Agilent 85103F Upgrades the 8510B to an 8510C by replacing the top unit on the 8510B. It includes on-site installation by Customer Engineer (where available).

Option 001 adds a rack modification kit for mounting in an 85043A system rack

Option 002 adds an 8360 series source compatibility kit for 8517A/B test sets¹

Option 003 adds an 8360 series source compatibility kit for 8514/15 and 85110A test sets¹

Option 004 adds an 85110L source compatibility kit

Option 010 adds time domain to an 8510B with time domain previously installed

1. Please review order instructions for serial number break.

Upgrading the 8510 to the 8530 microwave receiver for antenna measurements

Figure 7 below illustrates how the 8510C can be upgraded to either an 8530A or 8530A and 8510C. For example, to upgrade an 8510C to an 8530A, order 85395C with Option 111.

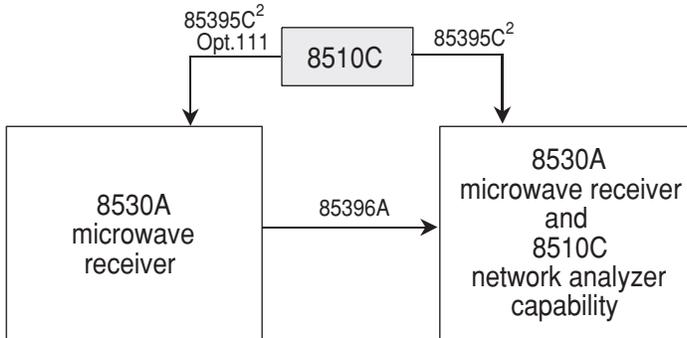


Figure 7. 8510 to 8530 upgrade paths

Agilent 85395C² Upgrades any 8510C to an 8530A. Retains network analyzer capability. Includes on-site installation by Customer Engineer (where available). Other requirements may apply (such as 8530 firmware).¹

The following options are available:

- Option 010** adds time domain capability
- Option 111** deletes network analyzer capability

Agilent 85396A Adds 8510C Network Analyzer capability to any 8530A (equivalent to 8530A Option 011).

- Option 010** adds time domain capability

1. For additional information, please refer to the Agilent 85395A/B/C and 85396A Upgrade Kits, literature number 5091-0948E.

2. Requires an 8510C with serial prefix 3936A or lower

Test set upgrades

A single 8510 network analyzer can be configured to control up to four test sets. The operator can switch between test sets, without reconnections, using front panel controls. This arrangement is often referred to as the *multiple test set* configuration. Each test set must be equipped with Option 001 for IF switching. Other requirements may apply for RF/LO switching.

For more details, please refer to product note 8510-14, *Using Multiple Test Sets with the Agilent 8510C* (literature number 5967-5886E).

Agilent 8511A K01 or 08511-60008 Retrofits IF switching (Option 001) to any 8510 test set for multiple test set operations.

Expanding measurement capabilities

Adding pulse capabilities (Option 008)

To perform pulse measurements, the 8510 network analyzer must be retrofitted with Option 008. The measurement system must include either the 85110L (0.045 to 2 GHz) or 85110A (2 to 20 GHz) pulsed-RF S-parameter test set and two synthesizers (high power synthesizers may apply).

- The 85110L requires an 83620B synthesizer with Options 001/004/008/H80 (for RF) and an 83620B with Options 004/008/H80 (for LO)
- The 85110A requires an 83622B synthesizer with Options 001/004/008 (for RF) and an 83623L with Options 004/008 (for LO)

Agilent 85111B Adds pulsed-RF measurement capability (Option 008) to the 8510C by adding new circuitry and includes on-site installation by an Customer Engineer (where available). To perform pulsed-RF measurements, the 8510 with Option 008 must be used with either the 85110L or 85110A Pulsed-RF S-parameter test set. Other requirements may apply.

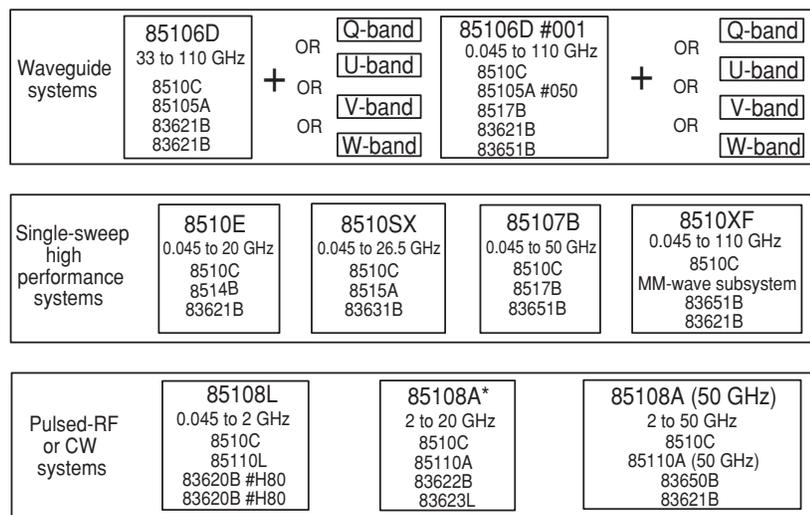
Adding time domain capabilities

With the time domain option, data from transmission or reflection measurements are converted from the frequency domain to the time domain via the inverse Fourier transform. The time domain data are presented on the CRT display showing the measured parameter value versus time.

Agilent 85012C Adds time domain (Option 010) to an 8510C (customer installed).

Upgrading systems

Figure 8 shows the different 8510 systems and their components. This figure is an excellent guide when upgrading systems.



* 85108A also available in frequency range of 45 MHz to 20 GHz

Figure 8. 8510 family of system solutions

To upgrade from one system to another, simply order the pieces that are needed in the new system that are currently not in the existing system, an example is shown in Figure 9. Complete waveguide S-parameter systems require two test set modules for each band.¹ Necessary accessories such as calibration kits, verification kits, test port cables or adapters² must be ordered. See pages 17 through 19 for more information.

- The following test set modules are available. Two test set modules must be ordered for complete waveguide S-parameter test set operation for each waveguide band:
 - Q85104A test set module (33 GHz to 50 GHz)
 - U85104A test set module (40 GHz to 60 GHz)
 - V85104A test set module (50 GHz to 75 GHz)
 - W85104A test set module (75 GHz to 110 GHz)
- Please refer to the RF & Microwave Test Accessories Catalog (literature number 5964-9527E) on detailed information on available adapters.

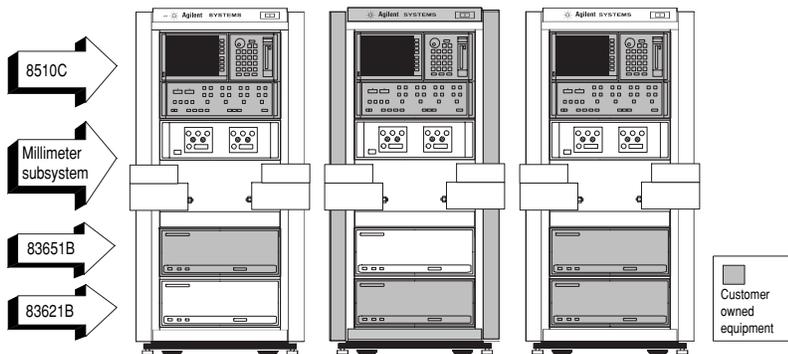
Here is a checklist of items to consider when upgrading systems:

1. **Which 8510 do I have?** The 8510C is recommended for the latest available measurement capabilities.
 - To upgrade an 8510A to an 8510C, order 85103E.
 - To upgrade an 8510B to an 8510C, order 85103F.
 - Make sure the appropriate options are ordered. For instance, order Option 010 if the 8510 has previously installed time domain.
 - Do I need pulse capabilities? If yes, order 85111B for 8510C.
2. **What test set do I need?**
 - Refer to Table 3 for test set selection. Frequency range and application type are critical when selecting the appropriate test set.
3. **What source do I need?**
 - Refer to Table 3 for the source(s) that's required for the test set of choice.
4. **What measurement accessories do I need?**
 - The appropriate measurement accessories will be determined mainly by the connector type of the device-under-test (DUT). These accessories include calibration (mechanical or electronic), verification kits, test port cables and/or adapters as appropriate. Refer to pages 17 through 19 for available products.

System upgrades

Upgrades available for existing 8510 systems to 8510XF single-sweep systems

Upgrades from ...	85107B 85109C	85106C 85106C w/ Opt.002 85106D	85106C w/ Opt.001 & 002 85106D w/ Opt.001 85109C w/ Opt.002
... to 85 GHz	E7345A	E7346A	E7347A
... to 110 GHz	E7355A	E7356A	E7357A



Upgrades for 85107B, 85109C

Upgrade consists of two test heads, a millimeter test set controller, an 83621B for LO source, and rack. It does not include calibration kits or test port cables.

- E7345A** upgrade to an 8510XF 85 GHz system
- E7355A** upgrade to an 8510XF 110 GHz system

The following options are available for both upgrades:

- Option 005** add 45 MHz to 2 GHz low frequency extension
- Option 006** add RF pass thru (provides coupled output of 50 GHz source for additional test sets. Additional test set(s) must have Option 001 installed.)

Upgrades for 85106C, 85106C with Option 002 (replaced 8350B/83540A with 83621A/B), 85106D

Upgrade consists of two test heads, a millimeter test set controller and an 83651B for RF source. It does not include calibration kits, test port cables or rack.

- E7346A** upgrade to an 8510XF 85 GHz system
- E7356A** upgrade to an 8510XF 110 GHz system

The following options are available for both upgrades:

- Option 005** add 45 MHz to 2 GHz low frequency extension
- Option 006** add RF pass thru (provides coupled output of 50 GHz source for additional test sets. Additional test set(s) must have Option 001 installed.)

Upgrades for 85106C with Options 001 and 002 (added 8517B, replaced 83621A/B with 83651A/B, and replaced 8350B/83540A with 83621A/B), **85106D with Option 001** (added 8517B and replaced 83621B with 83651B), **85109C with Option 002** (replaced 8350B/83540A with 83621A/B)

Upgrade consists of two test heads and a millimeter test set. It does not include calibration kits, test port cables or rack.

- E7347A** upgrade to an 8510XF 85 GHz system
- E7357A** upgrade to an 8510XF 110 GHz system

The following options are available for both upgrades:

- Option 005** add 45 MHz to 2 GHz low frequency extension
- Option 006** add RF pass thru (provides coupled output of 50 GHz source for additional test sets. Additional test set(s) must have Option 001 installed.)

Examples of upgrade paths

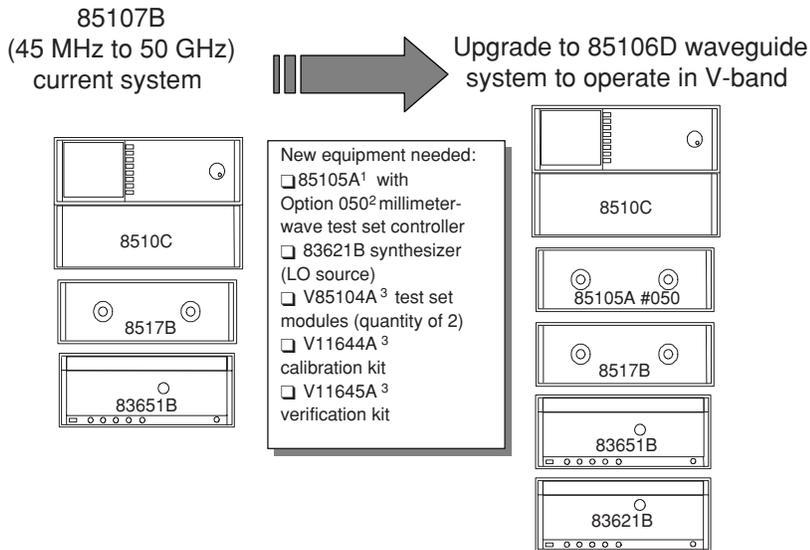


Figure 10. Upgrading an 85107B 50 GHz system to an 85106D waveguide system to operate in V-band (or W-band)

Measurement accessories

There are measurement accessories for seven device connector types: 7 mm, 3.5 mm, 2.92 mm, 2.4 mm, 1.85 mm, 1 mm and Type-N. Calibration kits include standards that are required for vector error correction. Verification kits include standards used to verify system performance specifications. Test port return cables extend the ports of the test set and connect to the device under test. Agilent 85130X adapter sets convert test set ports to the same connector type (acting as a test port saver) or to a different connector type.

1. Standard 85105A already includes IF switching (Option 001)

2. Option 050 provides a 50 GHz RF source switch. This is necessary in order to operate with the existing 83651B 50 GHz source and 8517B 50 GHz test set.

3. To operate in W-band, replace all V-band components with W-band.

Calibration kits

Error correction requires that the systematic errors in the measurement system be characterized by measuring known devices (standards) over the frequency range of interest with the process of calibration. All calibration kits contain standards used for this purpose. The standards in the 3.5 mm, 2.4 mm and Type-N calibration kits use the precision slotless connector (PSC-3.5, PSC-2.4 and PSC-N). Unless otherwise noted all coaxial calibration kits include connector gauges and a torque wrench.

Mechanical calibration kit	Connector type	Frequency range (GHz)	Description
85050B	7 mm	0.045 - 18	Contains open and short circuits, fixed and sliding terminations.
85050C	7 mm	0.045 - 18	Precision kit. Contains standards for TRL calibration, including precision airline. Also contains open and short circuits and fixed termination.
85050D	7 mm	0.045 - 18	Economy kit. Contains open and short circuits and precision fixed termination. Gauges not included.
85052B	3.5 mm	0.045 - 26.5	Contains open and short circuits, fixed and sliding terminations and in-series adapters.
85052C	3.5 mm	0.045 - 26.5	Precision kit. Contains standards for TRL calibration, including precision airlines. Also contains open and short circuits, fixed terminations and in-series adapters. Gauges not included.
85052D	3.5 mm	0.045 - 26.5	Economy kit. Contains open and short circuits, precision fixed termination, and in-series adapters. Gauges not included.
85054B	Type-N	0.045 - 18	Contains open and short circuits, fixed and sliding terminations, in-series adapters and 7 mm-to-Type-N adapters.
85054D	Type-N	0.045 - 18	Economy kit. Contains open and short circuits, fixed terminations, in-series adapters and 7 mm-to-Type-N adapters. Gauges not included.
85056A	2.4 mm	0.045 - 50	Contains open and short circuits, fixed and sliding terminations and in-series adapters.
85056D	2.4 mm	0.045 - 50	Economy kit. Contains open and short circuits, fixed terminations and in-series adapters. Gauges not included.
85056K	2.92/2.4 mm	0.045 - 50	Contains 2.4 mm open and short circuits, fixed loads and 2.92 mm adapters.
85059A	1 mm	0.045 - 110	Broadband coaxial precision calibration kit consists of 1 mm shorts, opens, fixed loads and in-series adapters. It also includes offset-shorts covering 50 to 110 GHz. Gauges not included.
11904S	2.92 mm	0.045 - 40	Must be used with Agilent 85056A/D 2.4 mm calibration kit. Includes four 2.92 mm-to-2.4 mm adapters. Gauges not included.
X11644A	WR-90	8.2 - 12.4	Contains standards for TRL calibration. Includes precision waveguide section, short circuit and fixed or sliding terminations. Gauges not included.
P11644A	WR-62	12.4 - 18	
K11644A	WR-42	18 - 26.5	
R11644A	WR-28	26.5 - 40	
Q11644A	WR-22	33 - 50	
U11644A	WR-19	40 - 60	
V11644A	WR-15	50 - 75	
W11644A	WR-10	75 - 110	

Verification kits

Verification kits are used to verify the performance specifications of an 8510 system. All kits include a precision Z_0 airline, mismatched airline and fixed attenuators. Measured data and uncertainties traceable to the U.S. National Institute of Standards and Technology (NIST) are included with each kit. Compliance with MIL-STD 45662A is available for an extra charge

Choose a verification kit for each connector type required.

Verification kit	Connector type	Frequency range (GHz)	Verification kit	Connector type	Frequency range (GHz)
85051B	7 mm	0.045 - 18	R11645A	WR-28	26.5 - 40
85053B	3.5 mm	0.045 - 26.5	Q11645A	WR-22	33 - 50
85055A	Type-N	0.045 - 18	U11645A	WR-19	40 - 60
85057B	2.4 mm	0.045 - 50	V11645A	WR-15	50 - 75
			W11645A	WR-10	75 - 110

Test port cables and adapters

Test port cables and adapter sets are available for various connector types. Special test port adapter sets convert the rugged ports of the network analyzer test set to the desired connector interface. Each kit contains two adapters, one male and one female. Both the cables and the test port adapters have one special female connector which is designed to connect directly to the 3.5 mm test port (2.4 mm for 8517B). This side of the cable or adapter can only be connected to the test set port and cannot be mated to a standard 3.5 mm (or 2.4 mm) male connector. Choose one of the configurations shown.

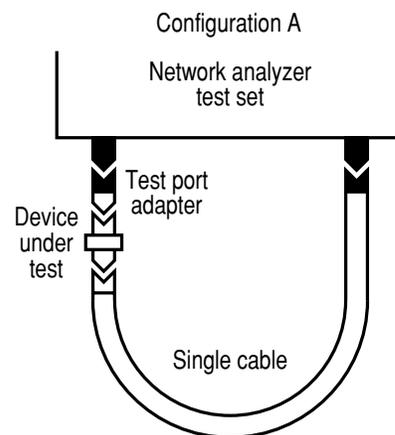
Configuration A. This cable arrangement is for applications where the device under test is connected directly to the test set port. This setup offers the best mechanical rigidity for device connection. To adapt the test set port (port 1) to the device under test, choose the appropriate special adapter set. In addition to converting the test port to the desired interface, these adapters also function as “test port savers” which protect the test set from damage and wear due to heavy use.

For Agilent 8514B/8515A/85110A test sets (3.5 mm rugged test port connectors)

	Cables/adapter	Connector type (on device side of cable/adapter)
For 3.5 mm devices	85131C semi-rigid cable or 85131E flexible cable 85130D adapter set	3.5 mm (f) 3.5 mm (f) 3.5 mm (m and f)
For 7 mm devices	85132C semi-rigid cable or 85132E flexible cable 85130B adapter set	7 mm 7 mm 7 mm
For Type-N devices	Use 7 mm cables and the 7 mm-to-Type-N adapters included in the 85054B/D Type-N calibration kit	

For Agilent 8517B test sets (2.4-mm rugged test port connectors)

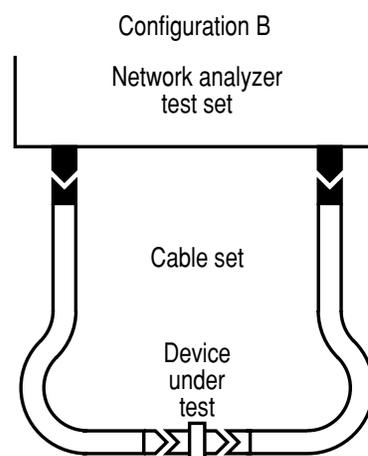
	Cables/adapter	Connector type (on device side of cable/adapter)
For 2.4 mm devices	85133C semi-rigid cable or 85133E flexible cable 85130G adapter set	2.4 mm (f) 2.4 mm (f) 2.4 mm (m and f)
For 3.5 mm devices	85134C semi-rigid cable or 85134E flexible cable 85130F adapter set	3.5 mm (f) 3.5 mm (f) 3.5 mm (m and f)
For 7 mm devices	85135C semi-rigid cable or 85135E flexible cable 85130E adapter set	7 mm 7 mm 7 mm



Configuration B. This cable arrangement is for applications where the device under test is connected between cable ends. This setup offers more flexibility when connecting to the device under test.

For 8514B/8515A/85110A test sets (3.5 mm rugged test port connectors)

	Cables/adapter	Connector type (on device side of cable/adapter)
For 3.5 mm devices	85131D semi-rigid cable set or 85131F flexible cable set	3.5 mm (m and f) 3.5 mm (m and f)
For 7 mm devices	85132D semi-rigid cable set or 85132F flexible cable set	7 mm 7 mm
For Type-N devices	Use 7 mm cables and the 7 mm-to-Type-N adapters included in the 85054B/D Type-N calibration kit	



For 85110L Test sets (7 mm rugged test port connectors)

	Cables/adapter	Connector type (on device side of cable/adapter)
For 7 mm devices	11857D Cable pair	7 mm

For 8517B Test sets (2.4 mm rugged test port connectors)

	Cables/adapters	Connector type (on device side of cable/adapter)
For 2.4 mm devices	85133D semi-rigid cable set or 85133F flexible cable set	2.4 mm (m and f) 2.4 mm (m and f)
For 3.5 mm devices	85134D semi-rigid cable set or 85134F flexible cable set	3.5 mm (m and f) 3.5 mm (m and f)
For 7 mm devices	85135D semi-rigid cable set or 85135F flexible cable set	7 mm 7 mm

For 8510XF systems (1 mm test port connectors)

	Cables/adapters	Connector type
For 1 mm devices	11500I (8.8 cm) test port cable	1 mm (f and f)
	11500J (16 cm) test port cable	1 mm (m and f)
	11500K (20 cm) test port cable	1 mm (m and f)
	11500L (24 cm) test port cable	1 mm (m and f)
For V-band waveguide devices	V281C adapter	1 mm (f) to V-band waveguide devices
	V281D adapter	1 mm (m) to V-band waveguide devices
For W-band waveguide devices	W281C adapter	1 mm (f) to W-band waveguide devices
	W281D adapter	1 mm (m) to W-band waveguide devices

Related literature

	Pub. number
<i>Agilent 8510 Network Analyzer</i> , Color Brochure	5091-8970E
<i>Agilent 8510 System Solutions</i>	5965-8837E
<i>Agilent 8510 Family Network Analyzer</i> , Configuration Guide	5091-8967E
<i>Agilent 8510 Family Network Analyzer</i> , Data Sheet	5091-8484E
<i>Agilent 85103C/D Upgrade Packages to the 8510C</i>	5091-8969E
<i>Agilent 85395A/B/C and 85396A Upgrade Kits</i> , (8510 to 8530 upgrades)	5091-0948E
<i>Agilent 8360B Series Synthesized Swept Signal Generators</i> , Data Sheet	5964-6162E
Product overviews	
<i>Agilent 85106D Millimeter-wave Network Analyzer System</i>	5964-4229E
<i>Agilent 85108A/L CW/Pulsed Network Analyzer Systems</i>	5091-8965E
<i>Agilent 8510XF 110 GHz Single-Sweep Systems</i>	5965-9888E
<i>Agilent 85060 Series and 85090 Series Electronic Calibration Modules and PC Interface</i>	5963-3743E
Product notes	
<i>Agilent PN 8510-14, Using Multiple Test Sets with the 8510C</i>	5967-5886E

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