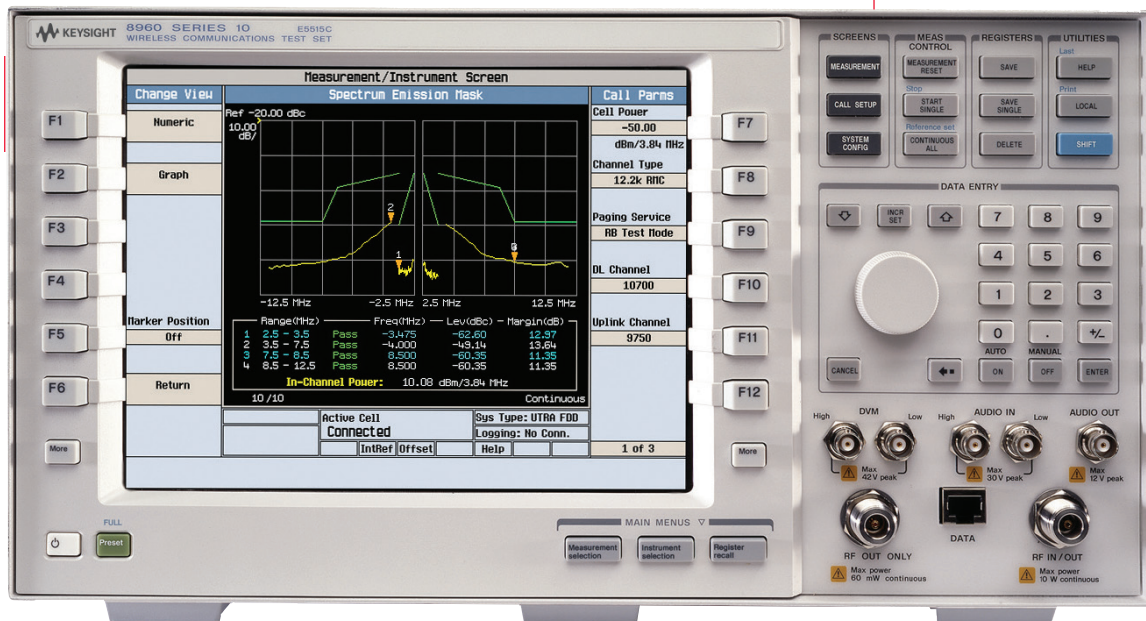


Keysight 8960

Wireless Communications Test Set

Configuration Guide



8960 Series 10 Wireless Communications Test Set – Mainframe, Applications, and Software

To accelerate the testing of wireless devices throughout design and manufacturing, use the Keysight Technologies 8960 Series 10 wireless communications test set.

The building blocks of the 8960 are an E5515 test set mainframe and mobile test applications (TAs) or lab applications (LAs). Test applications provide RF parametric measurements and base station emulation capabilities for all major 2G/3G/3.5G cellular technologies. Lab applications add a wide range of IP data test capabilities and support real-world testing of today’s hot applications such as data throughput, SMS/MMS, AGPS, simultaneous services, and more.

Wireless Test Manager is a family of easy-to-use software which automates parametric measurements and basic call processing tests on the 8960. Wireless Test Manager runs on a Windows PC.

Interactive functional test software automates real-world data application test on the 8960. Interactive functional test software runs on a Windows PC.

This configuration guide describes how to configure a new 8960 test set for single or multiple wireless formats and lists the upgrades available for existing 8960 test sets.

Configuring a New 8960 for Your Application

Tables 1 and 2 show the recommended or required options to purchase with a new 8960 for testing various wireless formats. Table 1 outlines the various test application configuration options. Table 2 outlines the lab application configurations available. Table 3 lists LA annual contracts. An annual contract provides early LA releases and LA upgrades for the term of the contract.

If adding a TA or LA to an existing E5515C/E mainframe, refer to the section entitled, *Adding wireless technology formats to your 8960 test set*.

Table 1. Configuring a new 8960 with a test application

Wireless technology format	TA model (option)	Mainframe model	Mainframe options (For E5515C only, model no. - option)		Wireless Test Manager
	Required	Required ¹	Required	Recommended	
cdma2000®/IS-95/AMPS	E1962B	E5515C, E5515E	003	002	E6567E/F
Release A: New control channels	E1962B-401	E5515C, E5515E	003	002	
Advanced AMPS	E1962B-402	E5515C, E5515E	003	002	
Authentication	E1962B-403	E5515C, E5515E	003	002	
Digital bus (fading)	E1962B-405	E5515C, E5515E	003	002	
Multi-unit synchronization	E1962B-406	E5515C, E5515E	003	002	
Protocol logging	E1962B-407	E5515C, E5515E	003	002	
cdma2000 SMS	E1962B-409	E5515C, E5515E	003	002	
cdma2000 1x Advanced	E1962B-410	E5515C, E5515E	003	002	
W-CDMA	E1963A	E5515C, E5515E	003	002	E6568E/F
W-CDMA end-to-end video	E1963A-401	E5515C, E5515E	003	002	
W-CDMA video loopback	E1963A-402	E5515C, E5515E	003	002	
HSDPA test modes	E1963A-403	E5515C, E5515E	003	002	
HSDPA 14.4 Mbps test mode ²	E1963A-405	E5515C, E5515E	003	002	
W-CDMA enhanced audio	E1963A-408	E5515C, E5515E	003	002	
W-CDMA advanced SMS	E1963A-409	E5515C, E5515E	003	002	
HSUPA test modes ³	E1963A-413	E5515C, E5515E	003	002	
HSPA+ test modes ⁴	E1963A-423	E5515C, E5515E	003	002	
DC-HSDPA test modes ⁵	E1963A-433	E5515E			
HSDPA MIMO test modes	E1963A-435	E5515E			
1xEV-DO	E1966A	E5515C, E5515E	003	002	E6567E/F
1xEV-DO Release A and B	E1966A-102	E5515C, E5515E	003	002	
1xEV-DO multi-carrier ⁶	E1966A-103	E5515C, E5515E	003	002	
1xEV-DO Rel B Optional DRC ⁷	E1966A-104	E5515C, E5515E	003	002	
Digital bus (fading)	E1966A-405	E5515C, E5515E	003	002	
Multi-unit synchronization	E1966A-406	E5515C, E5515E	003	002	
Protocol logging	E1966A-407	E5515C, E5515E	003	002	
1xEV-DO factory test mode	E1976A	E5515C, E5515E	003	002	
1xEV-DO FTM Rel A and B	E1976A-102	E5515C, E5515E	003	002	
GSM/GPRS⁸	E1968A	E5515C, E5515E	002	003	E6568E/F
GSM	E1968A-101	E5515C, E5515E	002	003	
GPRS	E1968A-102	E5515C, E5515E	002	003	
EGPRS	E1968A-103	E5515C, E5515E	002	003	
Evolved EDGE9	E1968A-104	E5515C, E5515E	002	003	
GSM and GPRS	E1968A-201	E5515C, E5515E	002	003	
GSM, GPRS, and EGPRS	E1968A-202	E5515C, E5515E	002	003	
GSM/GPRS VAMOS	E1968A-406	E5515C, E5515E	002, 003		
GSM/GPRS enhanced audio	E1968A-408	E5515C, E5515E	002	003	
GSM/GPRS advanced SMS	E1968A-409	E5515C, E5515E	002	003	
PAvT	E1968A-410	E5515C, E5515E	002	003	
I/Q capture capability	E1968A-411	E5515C, E5515E	002	003	
Mobile calculated BER	E1968A-419	E5515C, E5515E	002	003	
Class 34	E1968A-430	E5515C, E5515E	002	003	
Class 45	E1968A-431	E5515C, E5515E	002	003	

1. New E5515s may not work with old revisions or discontinued applications. Please contact your Keysight sales representative to determine application compatibility.
2. HSDPA 14.4 Mbps test mode (E1963A-405) requires HSDPA test modes (E1963A-403).
3. HSUPA test modes (E1963A-413) require HSDPA test modes (E1963A-403). Please contact your Keysight sales representative to determine application compatibility.
4. HSPA+ test modes (E1963A-423) require HSDPA test modes (E1963A-403), HSUPA test modes (E1963A-413), and HSDPA 14.4 Mbps test modes (E1963A-405).
5. DC-HSDPA test modes (E1963A-433) require HSDPA test modes (E1963A-403), HSUPA test modes (E1963A-413), HSDPA 14.4 Mbps test modes (E1963A-405), and HSPA+ test modes (E1963A-423). This feature requires E5515E HW, or E5515C with E5515CU-80E, or equivalent HW upgrade. Please contact your Keysight Sales Representative for more information.
6. E1966A-103 requires both E1966A-102 and E1966A-406.
7. E1966A-104 requires E1966A-102.
8. Must order at least one format option (-101, -102, -103, -201, or -202) with E1968A GSM/GPRS TA.
9. E1968A-104 requires E1968A-103 or E1968A-202 licenses.

Table 1. Configuring a new 8960 with a test application continued

Wireless technology format	TA model (option)	Mainframe model	Mainframe options (For E5515C only, model no. - option)		Wireless Test Manager
	Required	Required ¹	Required	Recommended	
TD-SCDMA_GSM fast switch Test application²	E1969A	E5515C, E5515E	002, 003		
TD-SCDMA non-signaling test mode	E1969A-101	E5515C, E5515E	003	002	
TD-SCDMA signaling mode	E1969A-201	E5515C, E5515E	003	002	
TD-SCDMA FDT ¹¹	E1969A-301	E5515C, E5515E	003	002	
TD-HSDPA	E1969A-403 ¹⁰	E5515C, E5515E	003	002	
TD-SCDMA protocol logging	E1969A-407 ^{13, 25}	E5515C, E5515E	003	002	
TD-SCDMA RTVocoder	E1969A-408 ¹³	E5515C, E5515E	003	002	
TD-HSUPA test mode	E1969A-413 ^{14, 16}	E5515C, E5515E	003	002	
Packet data service	E1969A-502 ^{15, 16}	E5515C, E5515E	003	002	
Inter-RAT with TD-LTE ²⁵	E1969A-501	E5515C, E5515E	003	002	
Simultaneous service	E1969A-503 ¹⁷	E5515C, E5515E	003	002	
E5515 application features³	E1999A	E5515C, E5515E		002, 003	
Fast device tune enhanced	E1999A-202	E5515C, E5515E		002, 003	
GPS single channel source	E1999A-206	E5515C, E5515E	003	002	
PESQ measurement ⁴	E1999A-301	E5515C, E5515E		002, 003	
2-box voice handover ¹²	E1999A-501	E5515C, E5515E		002, 003	
Test application fast switching⁵	E1987A	E5515C, E5515E	002, 003		
UMTS test application suite⁶	E1993A	E5515C, E5515E	002, 003		E6568E/F
cdma2000/1xEV-DO TA suite⁷	E1996A	E5515C, E5515E	003	002	E6567E/F
Test application suite⁸	E1991B	E5515C, E5515E	002, 003		
Revision to current⁹	E5515C-R2C	E5515C, E5515E		002, 003	

1. New E5515s may not work with old revisions or discontinued applications. Please contact your Keysight sales representative to determine application compatibility.
2. Must order at least one option (-101 or -201) with E1969A TD-SCDMA_GSM fast switch test application. E1969A allows fast switching across TD-SCDMA and GSM/GPRS/EGPRS test applications that have a valid license.
3. E5515 application features require one or more TA formats (models E1962B, E1963A, E1966A, and E1968A). See Table 1 for required mainframe options for each TA.
4. E1999A-301 is required to enable PESQ measurement in the E1962B, E1963A, and E1968A TAs and the E6701I, E6702E, and E6703H LAs.
5. E1987A allows fast switching across all TA technology formats that have a valid license except for TD-SCDMA. E1987A is free and does not require and E1987A license.
6. E1993A includes TAs for W-CDMA, GSM, GPRS, EGPRS, and fast switching (models E1963A, E1968A-202, and E1987A). Suite does not include feature options. Feature options can be ordered as additional options to E1993A (see Table 1 for E1963A-xxx and E1968A-xxx options).
7. E1996A includes TAs for cdma2000, 1xEV-DO, and fast switching (models E1962B, E1966A, and E1987A). Suite does not include feature options. Feature options can be ordered as additional options to E1996A (see Table 1 for E1962B-xxx and E1966A-xxx options).
8. E1991B includes TAs for cdma2000, 1xEV-DO, W-CDMA, GSM, GPRS, EGPRS, AMPS, and fast switching (models E1961A, E1962B, E1963A, E1966A, E1968A-202, and E1987A). Suite does not include feature options. Feature options can be ordered as additional options to E1991B (see Table 1 for E1962B-xxx, E1963A-xxx, E1966A-xxx, and E1968A-xxx options).
9. One time upgrade that enables revision to current license protected features on test applications. R2C applies to all the TAs installed on a single E5515C or E5515E test set. See Table 1 for required mainframe options for each TA.
10. E1969A-403 requires E1969A-201.
11. E1969A-301 requires E1969A-201 or E1969A-101.
12. E1999A-501 is required to enable 2-box voice handover in the E1963A and E1968A.
13. E1969A-407 and -408 requires E1969A-201.
14. E1969A-413 requires E1969A-201 and E1969A-403.
15. E1969A-502 requires E1969A-201 and E1969A-403.
16. This feature requires E5515E, or the latest E5515C, or E5515C with the CU-80C, CU-80E or CU-787 upgrade. Please contact your Keysight Sales Representative for more information. E1969A-501 requires E1969A-201.
17. E1969A-503 requires E1969A-502 license.

Table 2. Configuring a new 8960 with a lab application

Wireless technology format	LA model (option)	Mainframe model	Mainframe options (For E5515C only, model no. - option)	
	Required	Required ¹	Required	Recommended
GSM/GPRS	E6701K	E5515C, E5515E	002	003
GSM/GPRS/EGPRS fading ²	E6701K	E5515C, E5515E	002, 003, 004 ¹¹	003
GSM/GPRS/EGPRS encryption ³	E6705A	E5515C, E5515E	002	
EGPRS⁴	E6704A	E5515C, E5515E	002	003
Enhanced GAN license⁵	E6708A			
cdma2000	E6702G	E5515C, E5515E	003	002
cdma2000 fading ²	E6702G	E5515C, E5515E	003, 004 ¹¹	002
W-CDMA/HSPA	E6703J	E5515C, E5515E	002, 003	002
W-CDMA fading ²	E6703J	E5515C, E5515E	003, 004 ¹¹	002
W-CDMA/HSPA ciphering ⁶	E6715A	E5515C, E5515E	003	002
1xEV-DO with Release A & B	E6706G	E5515C, E5515E	003	002
1xEV-DO fading ²	E6706G	E5515C, E5515E	003, 004 ¹¹	002
cdma2000/1xEV-DO LA Suite⁷	E6716G	E5515C, E5515E	003	002
UMTS lab application suite⁸	E6717H	E5515C, E5515E	002, 003	
Lab application suite⁹	E6719J	E5515C, E5515E	002, 003	
Lab application fast switching¹⁰	E6785J	E5515C, E5515E	002, 003	

1. New E5515s will not work with most older revisions or discontinued applications. The E6701K, E6702G, E6703J, E6706G, and related LA suites require the latest E5515C or E5515E. Old E5515Cs need to be upgraded with E5515CU-80C or -80E to run these new LAs. Please contact your Keysight Sales Representative to determine application compatibility.
2. For more information on fading visit www.keysight.com/find/8960-fading or visit www.keysight.com/find/E5515releasenotes.
3. E6705A requires E6701F or newer. E6705A may optionally be used with E6708A for UMA/GAN ciphering.
4. E6701 LA required for E6704A LA.
5. E6708A for 2G/3G requires E6701G and/or E6703F or newer and optionally E6705A and/or E6715A for UMA/GAN ciphering. E6708A license installs on 8960 and enables the E6962B GANC (generic access network controller) software (downloaded free from the Web and installed on a standalone PC) to connect to the 8960 to facilitate GAN data connectivity. User supplies third-party security gateway (SEGW) SW for the PC.
6. E6715A requires E6703F or newer. E6715A may optionally be used with E6708A for UMA/GAN ciphering.
7. E6716G includes LAs for cdma2000 and 1xEV-DO (models E6702F, E6706F, and E6785I).
8. E6717H includes LAs for W-CDMA/HSPA, GSM, GPRS, EGPRS, and fast switching (models E6701J, E6703I, E6704A, and E6785I).
9. E6719J includes LAs for cdma2000, 1xEV-DO, W-CDMA/HSPA, GSM, GPRS, EGPRS, and fast switching (models E6701J, E6702F, E6703I, E6704A, E6706G, and E6785I).
10. E6785J fast switches between GSM/GPRS, W-CDMA, cdma2000, and 1xEV-DO. Requires one or more of the following: E6701K, E6702G, E6703J, and E6706G LAs. Order E6704A LA to add EGPRS to fast switching.
11. E5515E-004 is needed for E5515E to enable fading functionality.

Test Set Mainframe

E5515C/E 8960 Series 10 mainframes. Require at least one of the Keysight Technologies test or lab applications. Older revision and discontinued applications are not compatible with new E5515s. Please contact your Keysight sales representative to determine application compatibility.

Test set mainframe options

E5515C-002 Second RF source. Required for all GSM, GPRS, and EGPRS applications.

E5515C-003 Flexible CDMA base station emulator. Required for all cdma2000/IS-95/AMPS, W-CDMA/HSPA, 1xEV-DO, and TD-SCDMA applications.

E5515C/E-004 Digital bus. Enables fading in cdma2000, 1xEV-DO, GSM/GPRS/EGPRS, and W-CDMA/HSPA LAs. (Note: E5515C-004 requires E5515C-003.)

E5515C/E-ABA Documentation for applications purchased with a mainframe. Consists of a CD-ROM that includes all of the test and lab application documentation.

Standard warranty

R-51B-001-3C 1-year return-to-Keysight warranty extended to 3 years

Optional warranty

R-51B-001-5C 1-year return-to-Keysight warranty extended to 5 years

Optional calibration

R-50C-011-3 Keysight Calibration Upfront Support Plan 3 year coverage

R-50C-011-5 Keysight Calibration Upfront Support Plan 5 year coverage

R-50C-021-3 Z540 Calibration Upfront Support Plan 3 year coverage

R-50C-021-5 Z540 Calibration Upfront Support Plan 5 year coverage

Accessories

Programmed test SIM cards

E5515-10009 Universal SIM Card. Included with E6703

External adapters

E5520A FM adapter. Connects to the RF Out Only port on the E5515C to enable testing of FM receivers

Test Applications and Feature Options

Note: If adding a test application to an existing mainframe, see *Adding wireless technology formats to your 8960 test set*.

- E1962B** cdma2000/IS-95/AMPS mobile test application.
(Requires E5515E or E5515C with E5515C-003.)
- E1962B-401** cdma2000 Rel A control channels.
(Requires E5515E or E5515C with E5515C-003.)
 - E1962B-402** Advanced AMPS. (Requires E5515E or E5515C with E5515C-003.)
 - E1962B-403** cdma2000 authentication.
(Requires E5515E or E5515C with E5515C-003.)
 - E1962B-405** cdma2000 digital bus (fading).
(Requires E5515E with E5515E-004 or E5515C with E5515C-003 and E5515C-004.)
 - E1962B-406** cdma2000 multi-unit synchronization.
(Requires two E5515Es or E5515Cs with E5515C-003.)
 - E1962B-407** cdma2000 protocol logging.
(Requires E5515E or E5515C with E5515C-003 and E6584A-002.)
 - E1962B-409** cdma2000 SMS. (Requires E5515E or E5515C with E5515C-003.)
 - E1962B-410** cdma2000 1x Advanced.
(Requires E5515E or E5515C with E5515C-003.)
- E1963A** W-CDMA mobile test application.
(Requires E5515E or E5515C with E5515C-003.)
- E1963A-401** W-CDMA end-to-end video.
(Requires E5515E or E5515C with E5515C-003.)
 - E1963A-402** W-CDMA video loopback.
(Requires E5515E or E5515C with E5515C-003.)
 - E1963A-403** HSDPA test modes.
(Requires E5515E or E5515C with E5515C-003.)
 - E1963A-405** HSDPA 14.4 Mbps test mode.
(Requires E5515E or E5515C with E5515C-003 and E1963A-403.)
 - E1963A-408** W-CDMA enhanced audio.
(Requires E5515E or E5515C with E5515C-003.)
 - E1963A-409** W-CDMA advanced SMS.
(Requires E5515E or E5515C with E5515C-003.)
 - E1963A-413** HSUPA test modes.
(Requires E5515E or E5515C with E5515C-003 and E1963A-403.)
 - E1963A-423** HSPA+ test modes.
(Requires E5515E or E5515C with E5515C-003, E1963A-403, E1963A-405, and E1963A-413.)
 - E1963A-433** DC-HSDPA test mode.
(Requires E5515E, E1963A-403, E1963A-405, E1963A-413, and E1963A-423.)
 - E1963A-435** HSDPA MIMO test modes.
(Requires E5515E, E1963A-403, E1963A-405, E1963A-413 and E1963A-423.)
 - E1966A-406** 1xEV-DO multi-unit synchronization.
(Requires two or more E5515Es, or E5515Cs with E5515C-003.)
 - E1966A-407** 1xEV-DO protocol logging.
(Requires E5515E or E5515C with E5515C-003 and E6584A-006.)

Test Applications and Feature Options continued

Note: If adding a test application to an existing mainframe, see *Adding wireless technology formats to your 8960 test set*.

- E1968A** E1968A GSM/GPRS mobile test application. GSM, GPRS, EGPRS formats available. Must specify an option for a specific format or combination of formats.
- E1968A-101** GSM functionality. (Requires E5515E or E5515C with E5515C-002.)
 - E1968A-102** GPRS functionality. (Requires E5515E or E5515C with E5515C-002.)
 - E1968A-103** EGPRS functionality. (Requires E5515E or E5515C with E5515C-002.)
 - E1968A-104¹** Evolved EDGE functionality.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-201** GSM/GPRS functionality.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-202** GSM/GPRS/EGPRS functionality.
(Requires E5515C and E5515C-002.)
 - E1968A-406** GSM/GPRS VAMOS.
(Requires E5515E or E5515C with E5515C-002 and E5515C-003.)
 - E1968A-408** GSM/GPRS Enhanced Audio.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-409** GSM/GPRS advanced SMS.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-410** EGPRS phase and amplitude versus time.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-411** I/Q capture capability.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-419** GSM/GPRS mobile calculated BER.
(Requires E5515E or E5515C with E5515C-002.)
 - E1968A-430** Class 34. (Requires E5515E or E5515C with E5515C-002.)
 - E1968A-431** Class 45. (Requires E5515E or E5515C with E5515C-002.)
- E1969A** TD-SCDMA_GSM fast switch test application. Must specify an option for TD-SCDMA. Fast switches across TD-SCDMA and GSM/GPRS/EGPRS TA formats. (Requires E5515E or E5515C with E5515C-002 and E5515C-003.)
- E1969A-101** TD-SCDMA non-signaling test mode.
(Requires E5515E or E5515C with E5515C-003.)
 - E1969A-201** TD-SCDMA signaling mode. (Requires E5515E or E5515C with E5515C-003.)
 - E1969A-301** TD-SCDMA fast device tune. (Requires E5515E or E5515C with E5515C-003.)
 - E1969A-403** TD-HSDPA (Requires E5515E or E5515C with E5515C-003.)
 - E1969A-407** Protocol logging. (Requires E5515E or E5515C/E5515C-003, and E1969A-201.)
 - E1969A-408** Real-time vocoder. (Requires E5515E or E5515C/E5515C-003 and E1969A-201)
 - E1969A-413** TD-HSUPA. (Requires E5515E or E5515C/E5515C-003, E1969A-201, and E1969A-403.)
 - E1969A-502** Packet data service. (Requires E5515E or E5515C/E5515C-003, E1969A-201, and E1969A-403.)
 - E1969A-503** Simultaneous service. (Requires E5515E or E5515C/E5515C-003, E1969A-201, -403 and -502.)
- E1976A** 1xEV-DO factory test mode test application. (Requires E5515E or E5515C with E5515C-003.)
- E1976A-102** 1xEV-DO Release A and Release B factory test mode. (Requires E5515E or E5515C with E5515C-003.)

Test application suites and application features

E1987A	Fast switching test application. Fast switches across all TA formats except for TD-SCDMA. (Requires at least two TAs, E5515C/E and E5515 options for the wireless formats to be switched.)								
E1991B	8960 test application suite. Includes TAs for GSM, GPRS, EGPRS, AMPS, cdma2000, 1xEV-DO, W-CDMA, and fast switching. Contains E1968A-202, E1962B, E1963A, E1966A, and E1987A TAs. (Requires E5515E or E5515C with E5515C-002 and E5515C-003. E1991B is for installation on a single 8960 test set. TA feature options are not included and must be ordered separately as options to E1991B.)								
E1993A	8960 UMTS test application suite. Includes TAs for GSM, GPRS, EGPRS, W-CDMA, and fast switching. Contains E1968A-202, E1963A, and E1987A TAs. (Requires E5515E or E5515C with E5515C-002 and E5515C-003. E1993A is for installation on a single 8960 test set. TA feature options are not included and must be ordered separately as options to E1993A.)								
E1996A	8960 cdma2000/1xEV-DO test application suite. Includes TAs for cdma2000, 1xEV-DO, AMPS, and fast switching. Contains E1962B, E1966A, and E1987A TAs. (Requires E5515E or E5515C with E5515C-003. E1996A is for installation on a single 8960 test set. TA feature options are not included and must be ordered separately as options to E1996A.)								
E1999A	E5515 application features <table> <tr> <td>E1999A-202</td><td>Fast device tune enhanced measurement. Enables fast device tune measurement in E1962B, E1963A, E1966A, E1968A, and E1987A TAs. (Requires E1962B, E1963A, E1966A, or E1968A TA.)</td></tr> <tr> <td>E1999A-206</td><td>Single channel GPS source. Simulates GPS signal with default navigation messages. (Requires E5515E or E5515C with E5515C-003 and a TA.)</td></tr> <tr> <td>E1999A-301</td><td>PESQ measurement. Provides an objective method to predict vocoder speech quality using the industry standard PESQ algorithm. (Requires one of the E1962B, E1963A, E1968A, E6701J, E6702F, and E6703I applications.)</td></tr> <tr> <td>E1999A-501</td><td>2-box voice handover. Enables 2-box voice handovers between E1963A and E1968A. (Requires E1963A and E1968A TA.)</td></tr> </table>	E1999A-202	Fast device tune enhanced measurement. Enables fast device tune measurement in E1962B, E1963A, E1966A, E1968A, and E1987A TAs. (Requires E1962B, E1963A, E1966A, or E1968A TA.)	E1999A-206	Single channel GPS source. Simulates GPS signal with default navigation messages. (Requires E5515E or E5515C with E5515C-003 and a TA.)	E1999A-301	PESQ measurement. Provides an objective method to predict vocoder speech quality using the industry standard PESQ algorithm. (Requires one of the E1962B, E1963A, E1968A, E6701J, E6702F, and E6703I applications.)	E1999A-501	2-box voice handover. Enables 2-box voice handovers between E1963A and E1968A. (Requires E1963A and E1968A TA.)
E1999A-202	Fast device tune enhanced measurement. Enables fast device tune measurement in E1962B, E1963A, E1966A, E1968A, and E1987A TAs. (Requires E1962B, E1963A, E1966A, or E1968A TA.)								
E1999A-206	Single channel GPS source. Simulates GPS signal with default navigation messages. (Requires E5515E or E5515C with E5515C-003 and a TA.)								
E1999A-301	PESQ measurement. Provides an objective method to predict vocoder speech quality using the industry standard PESQ algorithm. (Requires one of the E1962B, E1963A, E1968A, E6701J, E6702F, and E6703I applications.)								
E1999A-501	2-box voice handover. Enables 2-box voice handovers between E1963A and E1968A. (Requires E1963A and E1968A TA.)								

Test application includes

- Test application license
- 8960 documentation set. (Includes documentation for all 8960 TAs and LAs. Must specify language localization option. When ordered with an E5515 mainframe use E5515 application documentation options.)

Lab Applications and Feature Options

Note: If adding a lab application to an existing mainframe, see the section entitled, *Adding wireless technology formats to your 8960 test*.

E6701K	GSM/GPRS lab application. (Requires E5515E or E5515C (with S/N MY52101001 and above) with E5515C-002. Order E5515E-004 or E5515C-003 with E5515C-004 to enable fading.)
E6702G	cdma2000 lab application. (Requires E5515E or E5515C (with S/N MY52101001 and above) with E5515C-003. Order E5515E-004 or E5515C-004 to enable fading.)
E6703J	W-CDMA/HSPA lab application. (Requires E5515E or E5515C (with S/N MY52101001 and above) with E5515C-003. Order E5515E-004 or E5515C-004 to enable fading.) Includes UMTS (W-CDMA) USIM card.
E6704A	EGPRS lab application. (Requires E6701 and E5515E or E5515C with E5515C-002.)
E6705A	GSM/GPRS encryption. E6705A requires E6701F or newer. E6705A may optionally be used with E6708A for UMA/GAN ciphering.
E6706G	1xEV-DO lab application with Release A & B. (Requires E5515E or E5515C (with S/N MY52101001 and above) with E5515C-003. Order E5515E-004 or E5515C-004 to enable fading.)
E6708A	Enhanced GAN license for 2G/3G. License installed on 8960, enables the E6962B GANC software (download for free from Web and install on standalone PC) to connect 8960 and test advanced UMA/GAN capability. Requires E6701G and/or E6703F or newer. User also supplies third party security gateway (SEGW) software for the PC.
E6785J	Fast switching lab application for GSM/GPRS/EGPRS, W-CDMA, cdma2000, and 1xEV-DO. Requires one or more LAs (E6701K, E6702G, E6703J, E6706G), E5515E or E5515C (with S/N MY52101001 and above) with E5515C-002 and E5515C-003. For EGPRS capability, add E6704A. Order E5515E-004 or E5515C-004 to enable fading.
E6715A	W-CDMA/HSPA ciphering. E6715A requires E6703G or newer. E6715A may optionally be used with E6708A for UMA/GAN ciphering.
E6716G	cdma2000/1xEV-DO lab application suite. Includes LAs for cdma2000 and 1xEV-DO with Release A & B. Contains E6702G, E6706G, E6785J LAs. (Requires E5515E or E5515C (with S/N MY52101001 and above) with E5515C-003. Order E5515E-004 or E5515C-004 to enable fading. E6716G is for installation on a single 8960 test set.)
E6717H	8960 lab application UMTS suite. Includes LAs for GSM, GPRS, EGPRS, and W-CDMA/HSPA. Contains E6701K, E6703J, E6704A, and E6785J fast switching LA. (Requires E5515E or E5515C with E5515C-002 and E5515C-003. Order E5515E-004 or E5515C-004 to enable fading. E6717H is for installation on a single 8960 test set.)
E6719J	Lab application suite. Includes LAs for GSM, GPRS, EGPRS, cdma2000, W-CDMA/HSPA, 1xEV-DO with Release A & B, and fast switching. Contains E6701K, E6702G, E6703J, E6704A, and E6706G. LAs plus E6785J fast switching LA. (Requires E5515E or E5515C (with S/N MY52101001 and above) with E5515C-002 and E5515C-003. Order E5515E-004 or E5515C-004 to enable fading. E6719I is for installation on a single 8960 test set.)

Lab application includes

- Lab application license
- Wireless protocol advisor (WPA) software for specified format. WPA is PC software that works with 8960 lab applications to capture and analyze wireless protocols.
- 8960 application documentation. (Must specify localization option. When ordered with E5515 mainframe use E5515 application documentation options.)

E6584A PC software that works with 8960 lab applications to capture and analyze wireless protocols. (CD-ROM included with LA. Download application for free at www.keysight.com/find/8960downloads.) To order a CD-ROM without an LA, order E6584A.

Wireless Test Manager Software

Wireless Test Manager software runs on a standalone PC to automate the 8960 and requires a specific model and revision of TA and LA. See the data sheet or overview to determine compatible TAs and LAs at www.keysight.com/find/wtm. Wireless Test Manager software runs Visual Basic.NET .

Formats	WTM model
TA and LA Wireless Test Manager software	
cdma2000/IS-95/AMPS	E6567F
1xEV-DO	E6567F
GSM/GPRS/EGPRS	E6568F
W-CDMA/GSM/GPRS/EGPRS	E6568F
cdma2000/IS-95/1xEV-DO	E6567F
Run-time license for all formats	E6571F

Interactive Functional Test Software

Interactive functional test software runs on a standalone PC to automate real-world functional test (with the N5972A) and operator-specific test plans (with the N5973A and N5974A). See the IFT technical overviews available at www.keysight.com/find/ift.

Location Server Emulator Software

E6965A The E6965A location server emulator software is a standalone Windows PC-based software application that emulates a network-based location server. The E6965A facilitates testing of location services related hardware and firmware/software in SUPL-enabled terminal (SET) devices that utilize assisted GPS (A-GPS) positioning. Secure user plane location (SUPL) is a technology which utilizes existing cellular infrastructure and standards to transfer location services (LCS) data over a user plane bearer, such as internet protocol (IP). The E6965A with options 1FP and 2FP facilitates A-GPS/location service testing via the user plane by emulating a SUPL location platform. Used in combination with the Keysight 8960 wireless communications test set and an appropriate lab application, the E6965A makes it possible to test a SUPL-enabled terminal on your benchtop. For more information see www.keysight.com/find/E6965A.

E6965A-1FP SUPL server emulator
E6965A-2FP LCS positioning server emulator

Upgrading an Existing 8960 Test Set

The 8960 is a flexible test set that can be upgraded to meet your changing wireless test needs. There are four types of 8960 upgrades:

1. Updating an existing test/lab application
2. Upgrading an application to a new model number
3. Upgrading a test application to a lab application
4. Adding a wireless technology format

When upgrading applications, an 8960 HW upgrade may need to enable the main-frame to run the new applications or enable the new features. For example, adding the DC-HSDPA application may require that the E5515C HW be updated with E5515CU-80E, E5515CU-58C, -80C, or -80E. Other individual E5515C HW upgrade kits may be required to support specific features or applications for other wireless technologies. Please contact your Keysight Sales Representative for more information.

1. Updating a TA or LA revision to get new features

TAs and LAs are periodically revised to add new features, improve performance, or resolve known issues. New features typically require a TA option upgrade, TA revision to current upgrade, LA model upgrade, LA option upgrade, or an E5515 mainframe hardware upgrade. Refer to Table 4 to determine the appropriate TA upgrade. The latest features available for the 8960 are described in the TA release notes at www.keysight.com/find/8960manuals. To determine if a hardware upgrade may be required to enable a feature, contact your Keysight Sales Representative.

TA and LA downloads are available at www.keysight.com/find/8960downloads. A valid license is required. Contact your Keysight Sales Representative for application upgrade information.

NOTE: Application suites (E1991, E1993, E1996, E6716, E6717, and E6719) can be updated by upgrading the individual constituent applications. For example, to upgrade the E6701G GSM/GPRS lab application and the E6703F W-CDMA lab application purchased in the E6717D UMTS LA suite, the individual upgrades E6701HU-001 and E6703GU-002 should be purchased. There are no upgrade products for the suites as a whole. Typically using newer 8960 HW requires the latest application revisions, but there are some exceptions. For more information visit www.keysight.com/find/E5515releasenotes.

Table 4. TA Upgrades

TA format	Feature	Application	Feature option upgrade ¹
cdma2000	cdma2000 Rel A new control channels	E1962B	E1962BU-401
	Advanced AMPS	E1962B	E1962BU-402
	Authentication	E1962B	E1962BU-403
	Digital bus (fading)	E1962B	E1962BU-405
	Multi-unit synchronization	E1962B	E1962BU-406
	Protocol logging	E1962B	E1962BU-407
	cdma2000 SMS	E1962B	E1962BU-409
	cdma2000 1x Advanced	E1962B	E1962BU-410
W-CDMA	W-CDMA end-to-end video	E1963A	E1963AU-401
	W-CDMA video loopback	E1963A	E1963AU-402
	HSDPA test modes	E1963A	E1963AU-403
	HSDPA 14.4 Mbps test mode ²	E1963A	E1963AU-405
	W-CDMA enhanced audio	E1963A	E1963AU-408
	W-CDMA advanced SMS	E1963A	E1963AU-409
	HSUPA test modes ³	E1963A	E1963AU-413
	HSPA+ test modes ⁴	E1963A	E1963AU-423
	DC-HSDPA test modes ⁵	E1963A	E1963AU-433
1xEV-DO	HSDPA MIMO test modes ¹⁸	E1963A	E1963AU-435
	1xEV-DO Rel A and B	E1966A	E1966AU-102
	1xEV-DO Rel B multi-carrier ⁶	E1966A	E1966AU-103
	1xEV-DO Rel B optional DRC ⁷	E1966A	E1966AU-104
	Digital bus (fading)	E1966A	E1966AU-405
	Multi-unit synchronization	E1966A	E1966AU-406
	Protocol logging	E1966A	E1966AU-407
GSM/GPRS/EGPRS	Evolved EDGE	E1968A	E1968A-104 ¹¹
	GSM/GPRS VAMOS	E1968A ¹⁰	E1968A-406
	GSM/GPRS enhanced audio	E1968A	E1968A-408
	GSM/GPRS advanced SMS	E1968A	E1968A-409
	PAvT	E1968A	E1968A-410
	I/Q capture	E1968A	E1968A-411
	Mobile-calculated BER	E1968A	E1968A-419
	Class 34	E1968A	E1968A-430
	Class 45	E1968A	E1968A-431
TD-SCDMA	TD-HSDPA	E1969A	E1969AU-403 ¹²
	FDT	E1969A	E1969AU-301 ¹³
	Protocol logging	E1969A	E1969AU-407 ¹⁴
	TD-SCDMA RTVocoder	E1969A	E1969AU-408 ¹²
	TD-HSUPA	E1969A	E1969AU-413 ¹⁵
	Packet data services	E1969A	E1969AU-502 ¹⁶
	Inter-RAT with TD-LTE	E1969A	E1969AU-501 ¹⁷
	Simultaneous service	E1969A	E1969AU-503
Multiple	Fast device tune enhanced	Multiple ⁸	E1999AU-202, E1999A-202
	Single channel GPS source	Multiple	E1999A-206
	PESQ measurement	Multiple	E1999A-301
	2-box voice handover	Multiple	E1999A-501
Revision to current	Revision to current, one-time upgrade	Multiple ⁹	E5515CU-R2C

- Some TA features are enabled by a feature option. Required feature options are listed.
- HSDPA 14.4 Mbps test mode (E1963AU-405) requires HSDPA test modes (E1963A/AU-403).
- HSUPA test modes (E1963AU-413) requires HSDPA test modes (E1963A/AU-403).
- HSPA+ test modes (E1963AU-423) requires HSDPA test modes (E1963A/AU-403), HSDPA 14.4 Mbps test mode (E1963A/AU-405), and HSUPA test modes (E1963A/AU-413).
- DC-HSDPA test modes (E1963AU-433) require HSDPA test modes (E1963A/AU-403), HSDPA 14.4 Mbps test modes (E1963A/AU-405), HSUPA test modes (E1963A/AU-413), and HSPA+ test modes (E1963A/AU-423). DC-HSDPA requires E5515E or E5515C with E5515CU-80E upgrade.
- E1966A-103 requires both E1966A-102 and E1966A-406.
- E1966A-104 requires E1966A-102; or optionally, E1966A-103 and E1966A-406.
- To upgrade an existing E1999A-201 Fast Device Tune feature option to E1999A-202 Fast Device Tune Enhanced, order E1999AU-202. Otherwise, use E1999A-202 to order a new Fast Device Tune Enhanced feature option.
- One license enables all revision to current license protected features in all licensed TAs (E1962B, E1963A, E1966A, E1968A, E1987A.) Refer to the TA Release Notes at www.keysight.com/find/8960manuals for Revision to Current license protected TA feature information.
- E1968A-406 requires E1968A-101 license.
- E1968A-104 requires E1968A-103 or E1968A-202 license.
- E1969AU-403, -408 requires E1969A-201 license.
- E1969AU-301 requires E1969A-101 or E1969A-201 license.
- E1969AU-407 requires E1969A-201 license. Requires E5515E, or E5515C (with S/N MY52101001 and above), or an old E5515C with E5515CU-80C or -80E, or any other equivalent hardware upgrade. Contact your Keysight Sales Representatives for more information.
- E1969AU-413 requires E1969A-201 and E1969A-403 license. Requires E5515E, or E5515C (with S/N MY52101001 and above), or an old E5515C with E5515CU-80C or -80E, or any other equivalent hardware upgrade. Contact your Keysight Sales Representatives for more information.
- E1969AU-502 requires E1969A-201 and E1969A-403 license. Requires E5515E, or E5515C (with S/N MY52101001 and above), or an old E5515C with E5515CU-80C or -80E, or any other equivalent hardware upgrade. Contact your Keysight Sales Representatives for more information.
- E1969AU-501 requires E1969A-201 and E5515E or E5515C (with S/N MY52101001 and above), or an old E5515C with E5515CU-80C or -80E, or any other equivalent hardware upgrade. Contact your Keysight Sales Representatives for more information.
- HSDPA MIMO test modes E1963A-435 requires E1963A/AU-403, -405, -413, and -423, and E5515E or E5515C with the E5515CU-80E upgrade.

2. Upgrading an existing application to a new model number

Upgrading a TA or LA to a new model number (e.g. E1985B to E1987A, or E6701F to E6701G) offers important new features and functionality. LA upgrades to newer model numbers are offered as an upgrade product. TA upgrades may be free down-loads or upgrade products. TA and LA upgrades are customer-installable. Refer to Table 5 for available TA model upgrades and Table 6 for available LA upgrades. Some TA and LA model upgrades may require an E5515 hardware upgrade to run or enable specific features. Contact your Keysight Sales Representative for specific application upgrade information.

Table 5. TA model number upgrades³

TA format	Application		Upgrade to order
	From	To	
GSM TA	E1960A	E1968A-101	Free upgrade ¹
GPRS TA	E1964A	E1968A-102	Free upgrade ¹
Fast switch TA	E1985A, B, C, D, or E	E1987A	Free upgrade ^{1,2}

1. Download free upgrades at www.keysight.com/find/8960downloads.
2. E5515C with serial number < GB45070001 or any US serial number may require a hardware upgrade. Please contact an Keysight Sales Representative for more information.
3. To upgrade to any of the latest TA revisions (shipped after March 12, 2012) requires at least the E5515CU-787 upgrade. Please contact your Keysight Sales Representative for more information.

Table 6. LA model number upgrades

LA format	Application		Upgrade to order
	From	To	
GSM/GPRS LA	E6701F and prior versions	E6701K	E6701KU-002 ¹
GSM/GPRS LA	E6701G	E6701K	E6701KU-003 ¹
GSM/GPRS LA	E6701H	E6701K	E6701KU-004 ¹
GSM/GPRS LA	E6701I	E6701K	E6701KU-005
GSM/GPRS LA	E6701J	E6701K	E6701KU-006 ¹
cdma2000 LA	E6702B and prior versions	E6702G	E6702GU-002 ¹
cdma2000 LA	E6702C	E6702G	E6702GU-003 ¹
cdma2000 LA	E6702D	E6702G	E6702FU-004 ¹
cdma2000 LA	E6702E	E6702G	E6702GU-005
cdma2000 LA	E6702F	E6702G	E6702GU-006 ¹
W-CDMA/HSPA LA	E6703E and prior versions	E6703J	E6703JU-002 ¹
W-CDMA/HSPA LA	E6703F	E6703J	E6703JU-003 ¹
W-CDMA/HSPA LA	E6703G	E6703J	E6703JU-004 ¹
W-CDMA/HSPA LA	E6703H	E6703J	E6703JU-005
W-CDMA/HSPA LA	E6703I	E6703J	E6703JU-006 ¹
1xEV-DO LA	E6706B and prior versions	E6706G	E6706GU-002 ¹
1xEV-DO LA	E6706C	E6706G	E6706GU-003 ¹
1xEV-DO LA	E6706D	E6706G	E6706GU-004 ¹
1xEV-DO LA	E6706E	E6706G	E6706GU-005
1xEV-DO LA	E6706F	E6706G	E6706GU-006 ¹
Fast switching	E6785A, B, C, D, E, F, G, H, or I	E6785J	Free upgrade ^{1,2}

1. To upgrade to any of the latest LA revisions requires E5515E, the latest E5515C (with S/N MY52101001 and above), or E5515C with at least E5515CU-787 or E5515CU-80C. Please contact your Keysight Sales Representative for more information.
2. Download free upgrades at www.keysight.com/find/8960downloads.

3. Upgrading a test application to a lab application

Upgrading a TA to an LA (e.g. E1962B to E6702F) is customer-installed. Some TA to LA upgrades may require an E5515 mainframe hardware upgrade. TA to LA upgrades must be customer installed, they cannot be ordered pre-installed on new instruments. Contact your Keysight Sales Representative for compatibility information.

Table 7. TA to LA upgrades

TA format	Application		Upgrade to order
	From	To	
GSM/GPRS TA to LA	E1968A	E6701K	E6701KU-001 ¹
cdma2000 TA to LA	E1962B	E6702G	E6702GU-001 ¹
W-CDMA TA to LA	E1963A	E6703J	E6703JU-001 ¹
1xEV-DO TA to LA	E1966A	E6706G	E6706GU-001 ¹
Fast switching	E1987A	E6785J	Free upgrade ^{1,2}

1. The latest LA revisions require E5515E, the latest E5515C (with S/N MY52101001 and above), or E5515C with at least E5515CU-787 or E5515CU-80C. Please contact your Keysight Sales Representative for more information.

2. Download free upgrades at www.keysight.com/find/8960downloads.

4. Adding wireless technology formats to your 8960 test set

You can add any TA or LA to an existing E5515E or E5515C. Being able to purchase another wireless format for your existing E5515 may save considerable expense when compared to purchasing a new test set. Adding a new TA or LA to an existing E5515E or E5515C may require a hardware upgrade. Contact your Keysight Sales Representative for details and delivery information.

Important: Existing TA and LAs installed on an E5515E or E5515C may have to be updated to a newer revision or new model after a hardware upgrade. Older LA models may not work on an upgraded E5515. Before ordering an E5515 hardware upgrade, check with your Keysight Sales Representative to make sure you have ordered the necessary LA upgrades to run on the upgraded E5515 hardware.

5. Three main hardware upgrade kits for the E5515C

Upgradin There are three primary E5515C upgrade kits: E5515CU-80E, -80C, and -58C. Each of these kits include a batch of HW modules. Other kits are available for E5515C-specific HW upgrades. Some HW upgrade kits are used to enable the E5515C to operate new 8960 TAs and LAs.

- | | |
|--------------------|---|
| E5515CU-80E | This HW upgrade kit updates most, but not all, key E5515C modules to be the same as the E5515E in order to support DC-HSDPA. Contact your Keysight Sales Representative for more information or visit; www.keysight.com/find/E5515CU-80E . |
| E5515CU-80C | This HW upgrade kit updates most, but not all, E5515C modules to be the same as the E5515C hardware shipped from March 12, 2012. Contact your Keysight Sales Representative for more information or visit; www.keysight.com/find/E5515CU-80C . |
| E5515CU-58C | This kit is used to upgrade very old E5515C units to a HW version that is equivalent to the HW release of September 2008. However, not all modules are included. Contact your Keysight Sales Representative for more information or visit; www.keysight.com/find/E5515CU-58C . |

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