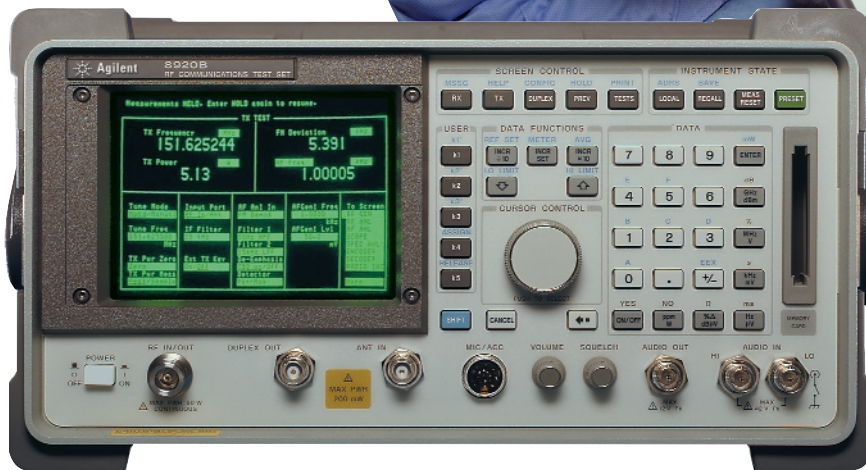# Agilent 8920B RF Communications Test Set, Agilent 8920B Option 800 and 801 for TIA/EIA-136 and PCS Test, and Agilent 83206A Cellular Adapter

Improve throughput and quality!

Agilent Technologies

Innovating the HP Way

*T*he Agilent Technologies *8920B* is a full function RF test set with accuracy, speed, and flexibility for testing land mobile radios, cellular telephones, and other communications systems while improving throughput and quality in manufacturing.

The 8920B RF communications test set— optimized for manufacturing test

AM, FM, ΦM,
EDACS, LTR, CORDLESS,
AMPS/NAMPS/TACS/ETACS

+DAMPS(IS-54B),
+DCCH (IS-136) 800 MHz

Accuracy as Good as Stand-Alone Instruments

When the test equipment is not accurate and repeatable, the number of devices that must be reworked or retested grows, consuming precious time and space. The 8920B greatly reduces the uncertainty in a "Pass" or "Fail" result, with accurate and very repeatable test measurements. As a result, test margins can be minimized without passing bad devices or failing good ones.
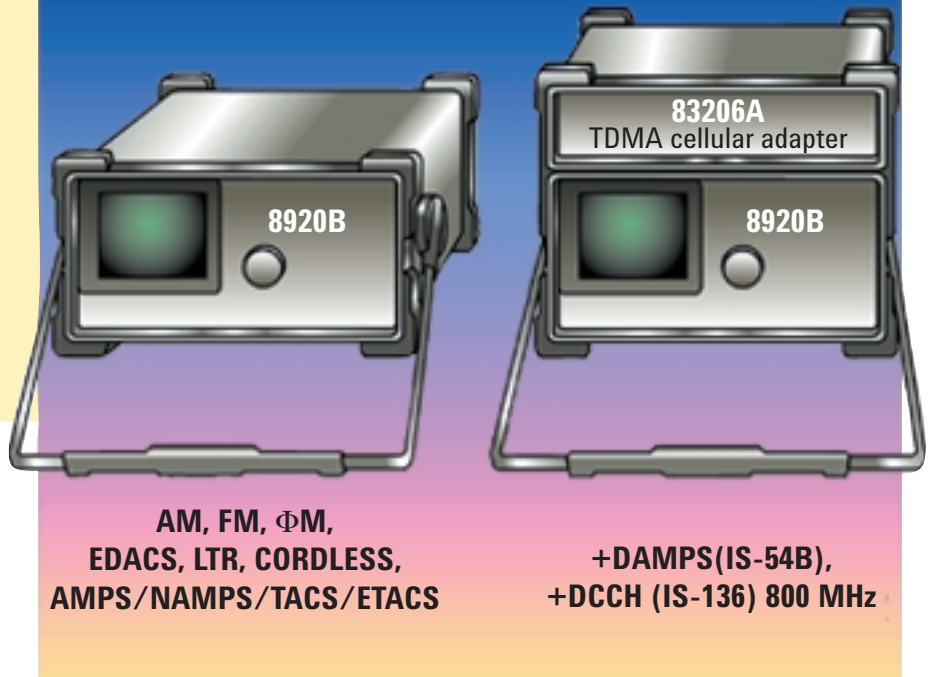
When using the 8920B you can be sure of passing more good radios in production tests and of consistently finding those that are out of specification.

8920B Performance Accuracy

- Power measurement: ±5%
- SINAD: ±1 dB
- Signal generator level: ±1 dB
- Residual FM: <7 Hz
- EVM measurement: <1%

See specifications for additional information

Test Speed that Lowers Your Cost Per Test

The 8920B takes you another step forward in manufacturing productivity. Processing speed improvements reduce the automated test time of cellular radios by approximately 15% when compared to rack and stack systems and more than double the computing speed over the 8920A for initial transceiver measurements and GPIB commands.

This means lower cost per test and more throughput from your production line.

Flexibility to Meet More of Your Testing Needs

The 8920B meets your test needs on multiple radio test lines; testing land mobile, trunked, cordless, and cellular phones while also meeting your need for fast parametric tests, troubleshooting, QA, and call processing test.

Hardware and firmware upgrades keep your 8920B's capabilities current, giving you flexibility to meet new radio testing needs.

8920B flexibility allows you to standardize on a single platform, reducing training and support needs.

83206A
TDMA cellular adapter

8920B

83236A/B
PCS interface
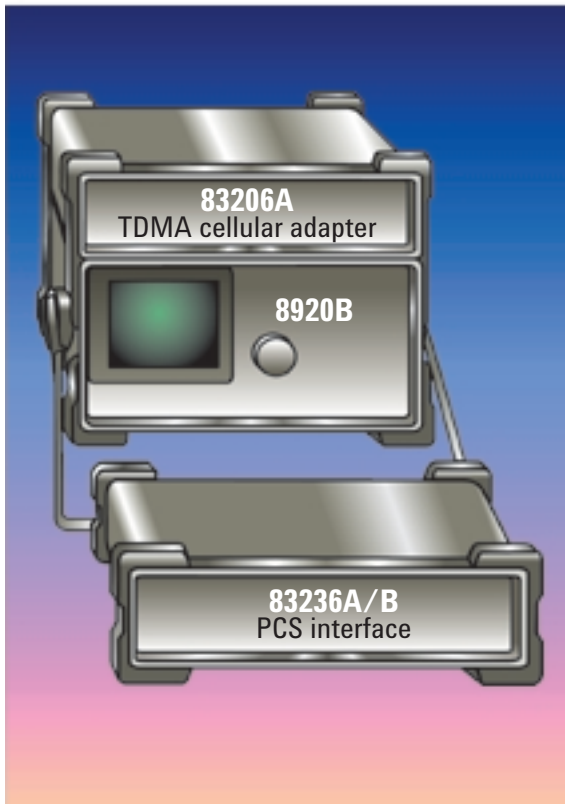
Front-Panel Upgrades for Firmware Enhancements

Firmware features are easily upgraded via the front panel with a PCMCIA Flash Memory Card, eliminating the need to open the instrument to change memory chips. Just insert the firmware upgrade card and turn the test set on. In minutes the upgrade is complete! Downtime is minimized. This quick upgrade also helps maintain process control (all test equipment is standardized at the same firmware version).

Modularity and Built-In Test to Simplify Upgrades and Maintenance

The 8920B uses modular design for reliability and easy repair. Agilent Technologies provides built-in-test, diagnostics, and an assembly level repair manual to find problems quickly. Should a failure occur, replacement modules are available worldwide and can be installed on site in minutes.

Test Features

IS-136 Test
- EVM, 10-burst EVM measurements
- Mobile reported parameters for MAHO
- Unique programming of FACCH and SACCH
- BER loop-back mode
- Front-panel firmware upgrade for features such as DCCH authentication, SMS, Caller ID, and Message Waiting as they become available

New Call Processing Subsystem
- Intuitive, call processing test screens with on-call parametric test capability
- AMPS authentication test screens with SSD Update, Unique Challenge, and A-key generation
- Supported hand-off modes:
  - DCCH to DTC or AVC
  - ACC to DTC or AVC
  - DTC to DTC or AVC
  - AVC to DTC or AVC

Simplified Programming
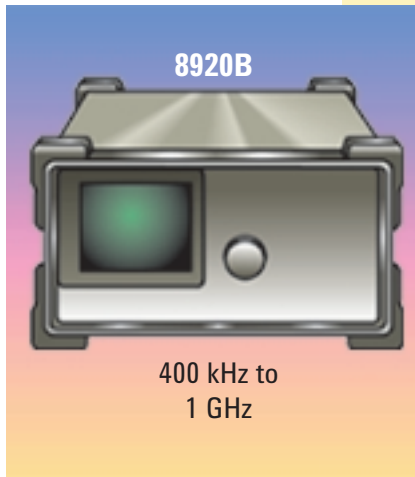- High-level GPIB commands to simplify call processing programmability
- Agilent VEE support with new 8920B drivers

PCS Upgrade Path
- PCS phone test upgrade path with the new 83236A/B PCS interface for dual-band, dual-mode systems

*M*any instruments in a small package

8920B

400 kHz to
1 GHz

- RF/AF signal generators
- AM/FM modulation analyzer
- RF/AF power meter
- Spectrum analyzer
- Tracking generator
- Adjacent channel power meter
- Oscilloscope
- IBASIC controller
- Signaling encoder/decoder
- Function generator
- AC/DC voltmeter
- SINAD/SNR meters
- DC current meter
- High stability reference
- IEEE 488.2/RS-232 interface
- Centronics port

In the past, adding a new test to measure distortion or to verify adjacent channel power may have required adding another instrument to a test system. However, with the multifunction capability of the Agilent 8920B, verifying new performance parameters is as simple as pressing a front-panel key or adding a command to the test program. The 8920B contains the functions of many instruments in a small, space-saving package. The 8920B is very flexible, which means it can grow to meet new requirements.

Single key transmitter, receiver, and duplex radio testing with autotuning

Autoprint of all measurements when an external printer is added to the 8920B

Save/recall registers save entire instrument setups
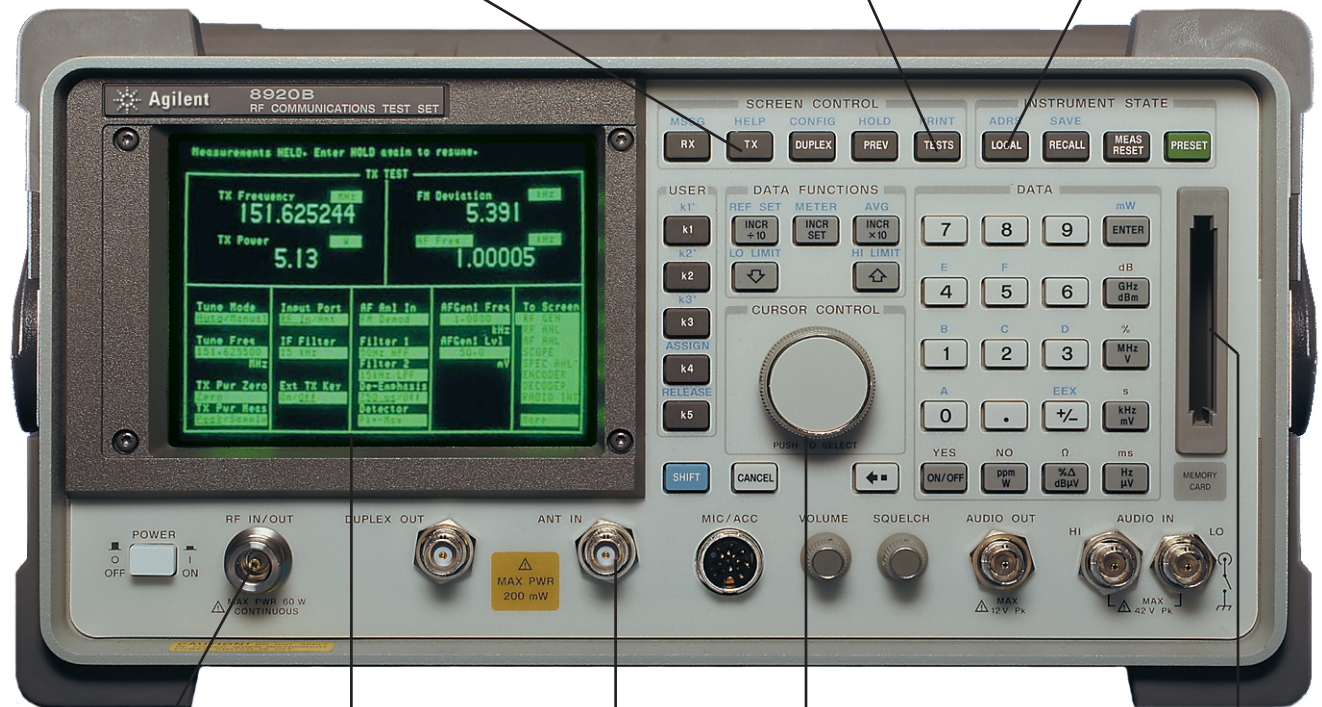
High-power input for transmitter testing

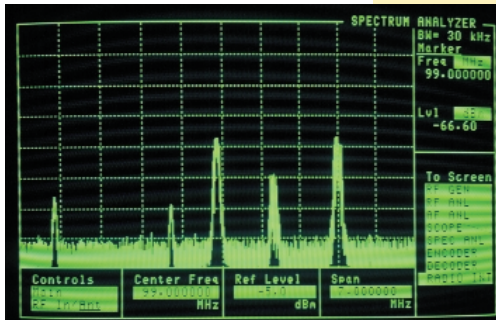All measurements and settings displayed on CRT

2 µV sensitivity for over-the-air signal monitoring

Quick and simple instrument control with knob/cursor

PCMCIA memory card slot for loading IBASIC programs, upgrading firmware, and saving data

*F*lexible spectrum analyzer and oscilloscope capabilities

Spectrum Analyzer–Option 102

The optional spectrum analyzer measures signals from 10 MHz to 1 GHz with variable spans from 5 kHz to 1 GHz (full span). Display resolution is selectable between 1, 2, and 10 dB per division. The tunable marker provides automatic readout of frequency and amplitude, or relative frequency and amplitude from a reference. Other marker functions, usually available only in stand-alone spectrum analyzers, include peak hold, marker-to-peak, marker-to-next peak, marker-to-center-frequency, and marker-to-reference; all of which speed up and simplify signal searching and measurement.

Tracking Generator
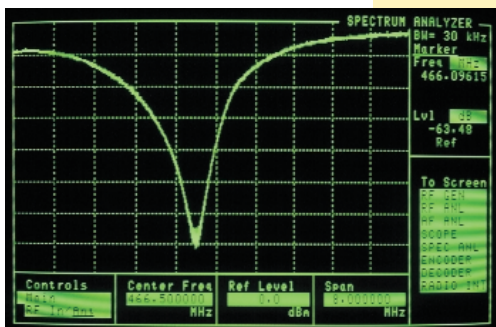
The tracking generator, included with the spectrum analyzer option, allows for quick and accurate characterization of filters, duplexers, combiners, and RF to IF conversions. Broadband RF devices can be characterized with single sweeps up to 1 GHz. The tracking generator also includes fully settable amplitude and frequency offset, and a tunable marker that provides automatic readout of frequency and amplitude of any response point.

Adjacent Channel Power Tests
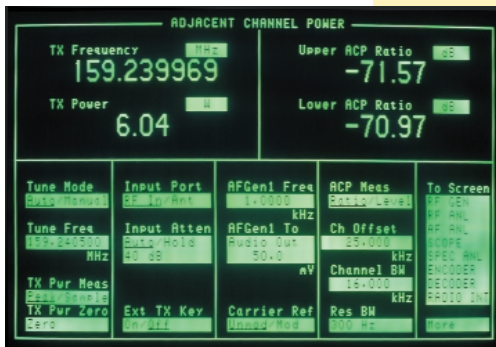
Included in the Option 102 is the capability to make adjacent channel power (ACP) tests on transmitters. This test measures undesirable signals that spill into and interfere with neighboring channels. ACP tests can be made by varying three parameters: channel offset, channel bandwidth, and resolution (measurement bandwidth). The dynamic range for ACP is typically -65 dBc to -70 dBc, adequate for most radio standards.

Digital Oscilloscope
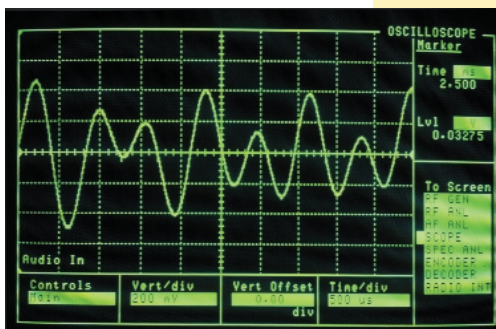
The standard built-in 50 kHz digital oscilloscope provides multiple triggering formats (internal, external, and encoder); single-shot and pre-trigger view for signaling analysis; and full marker capability with automatic level and time readout. Time/division, volts/division, and vertical offset are displayed and easily changed using the front-panel knob. The trigger delay feature allows you to choose the delay from 20 μsec to 3.2 seconds.

*C*onfigure the 8920B to meet your radio test needs by selecting options tailoring it for your radio and test application. For a more turnkey, automatic test solution, select one of the Agilent Technologies 11807E software packages designed to run on the 8920B's internal controller.

*C*ellular phone test capabilities enhance the 8920B's fast and accurate parametric measurements.

Call processing display showing DCCH phone data
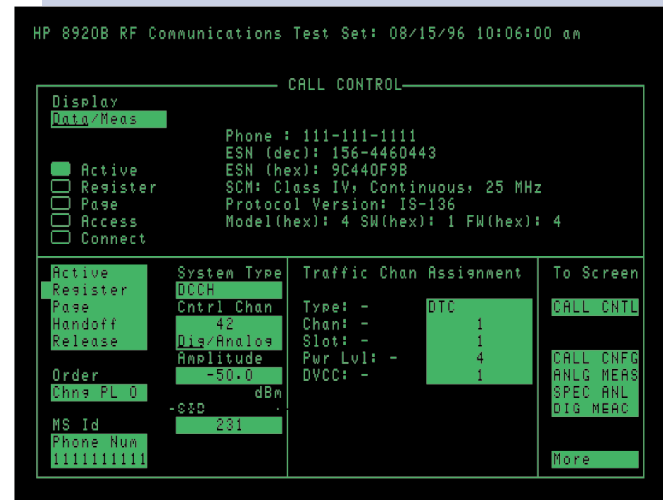
AM, FM, ΦM, and SSB Radios

The optional signaling encoder and decoder support common land mobile radio formats including tone sequential, digital paging, and DTMF signaling. Common standards are included, and are easily modified for different user formats. For thorough and fast testing to international standards, 11807E software packages are available for AM, FM, and ΦM radios.

Test high-power transmitters with Option H08 for frequency and power measurements up to 100 W continuous (125 W intermittently with 10 seconds per minute duty cycle). With this option, AM and FM measurements can be made on inputs from -16 to +50 dBm.

Trunked Radios

The signaling option also provides protocol for testing both LTR and EDACS radios. Use the manual mode to perform quick functional checks and to verify system programming. For full characterization, run a suite of tests on multiple channels with 11807E LTR or EDACS software test packages.

Cordless Phones, Data Terminals, Short-Range Transceivers

Test cordless phones, data terminals, and short-range transceivers by adding Option 007, which shifts the input range for RF power measurements to a level ideal for characterization of low-power transmitters. RF power with fully specified accuracy can be measured on signals as low as 40 μW. Option 007 reduces the maximum continuous input power of the 8920B to 2.4 W.

Call Processing

Cellular phone testing with the 8920B has a whole new look and feel with the new call processing subsystem. New front panel screens simplify manual testing as well as GPIB programmability. In call processing mode, the 8920B emulates a cellular base station, allowing you to automatically establish and maintain a cellular link between the test set and cellular phone. Use the front-panel knob to register the phone, originate a call, page the phone, hand off to other channels, change power, and release calls; as well as make fast parametric measurements while the phone is on a voice or traffic channel. Messages received from the mobile, such as phone number, ESN, SCM, protocol version, model, and order acknowledgment are displayed on an interactive screen where you can monitor the phone's status. The new call processing features are available for AMPS, DAMPS, NAMPS, TACS, NTACS, JTACS, and DCCH radio test.

Authentication for Control Channel and Voice Channel

Use the intuitive call processing screens to test your phone's ability to register, originate, and receive page messages with or without authentication enabled. Your phone's response to orders such as SSD Update and Unique Challenge with authentication enabled is displayed in an easy-to-read "pass/fail" format.

Authentication Procedures	Control Channel	Voice Channel
Shared secret data (SSD) update	•	•
Unique challenge response	•	•
MS originating call setup	•	
MS terminating call setup	•	
MS registration	•	

Additional Capabilities
- A-key generation via GPIB
- Random data entry via front panel and GPIB

Analog Cellular Phone Test
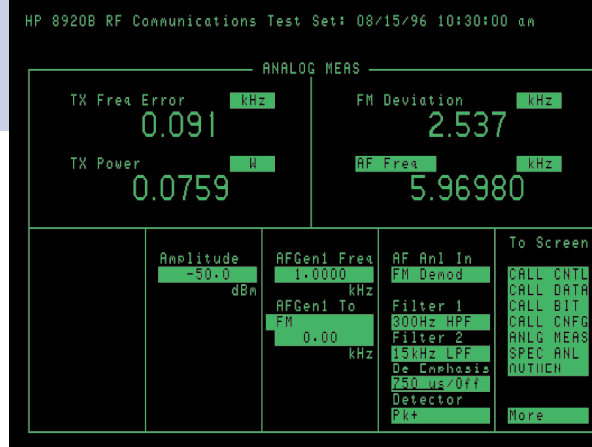
Call processing display showing RF and audio measurements
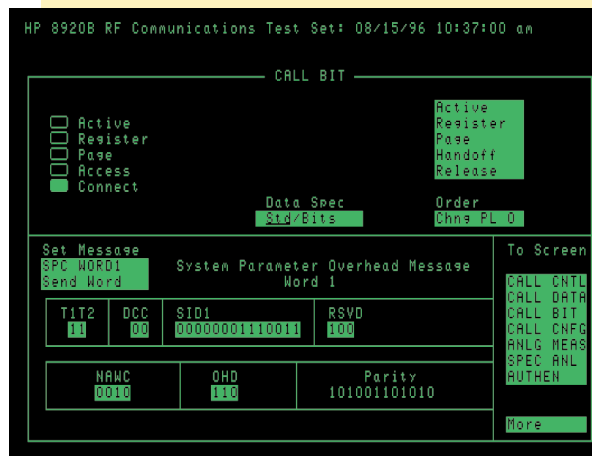
Call processing display showing data message information

The Agilent 8920B delivers performance cellular manufacturers need, with the intuitive feel users want. The protocol for testing AMPS, EAMPS, NAMPS, TACS, ETACS, JTACS, and NTACS phones is included with the signaling option (Option 004) to the 8920B.

Measurements of TX frequency error, TX power, FM deviation, and AF frequency are made on a mobile station's RF carrier while on a voice channel. Additional audio measurements, such as RF sensitivity, and FM hum and noise, can be made from call processing screens using audio break-outs to connect audio to the test set's audio in and audio out connectors.

Forward and reverse data message information at the bit level is displayed in an easy-to-read format to simplify message analysis for troubleshooting.

Easier Programming

The new call processing subsystem also creates a more user-friendly programming interface for automated cellular phone test. High-level GPIB commands such as "page" and "register" simplify code generation for phone test.

Cellular Phone Test

8920B with Agilent 83206A TDMA Cellular Adapter

TDMA Cellular Adapter

The 83206A TDMA cellular adapter (8920B Option 800) provides a complete π/4 DQPSK signal generator, π/4 DQPSK modulation analyzer, data source, and BER analyzer for TDMA measurements on DAMPS (IS-54B) and DCCH (TIA/EIA-136) phones. The 83206A replaces the 83201B TDMA cellular adapter (previously 8920B Option 500) for making measurements on TDMA dual-mode DAMPS phones, adding digital control channel test features to fully characterize DCCH phones. Refer to the 8920B configuration guide, literature number 5968-5919E for configuration requirements.

Faster Software

The new Agilent Technologies 11807E Option 014 AMPS/NAMPS/DAMPS/DCCH phone test package automates DCCH tests such as call processing from a DCCH, RF power versus channel, receiver sensitivity versus channel, and battery life.

Option 014 takes advantage of new 8920B Option 800 call processing features—enhancing test speed by as much as 25% and adding a more robust control channel link making your phone less likely to tune to an off-the-air control channel during test. Refer to the 8920B configuration guide for a complete list of tests.

True-Average Power Measurements

For the most accurate power measurements on TDMA signals, include the new 10 W to 50 μW power measurement range option (8920B Option 006). This option increases power measurement accuracy by extending the 8920B's ±5% power measurement performance down to 50 μW and enabling true-average power measurements with the 83206A TDMA cellular adapter. True-average power measurements are performed directly with a new average power detector.

RF measurements include:

- Analog and digital tests for IS-19B, IS-54B, and TIA/EIA-136.
- Error vector magnitude (EVM)
- 10-burst error vector magnitude
- Magnitude error
- Phase error
- Burst amplitude droop
- I/Q origin offset
- Carrier frequency error
- Adjacent channel power
- True-average power (with Opt. 006 and 83206A)
- Bit error rate (BER) loop-back mode
- TX power levels 0 through 10

Call processing display showing DCCH phone on-call parametric measurements

Additional DCCH Test Features Available Include:

Mobile Reported Parameters for MAHO—Given a list of up to six neighbor channels, the test set directs the mobile to report back the RSSI detected for each neighbor cell. The test set displays the mobile reported RSSI for neighbor channels and RSSI and BER of the current channel.

Power Control—Once on a digital traffic channel, the user can command the mobile to adjust power.

Unique Programming of FACCH and SACCH—Allows the user, via software, to send custom FACCH and SACCH messages to the mobile.

BER Calculation—Transmits a PRBS sequence and calculates loopback BER.

DCCH Test Features—Such as DCCH authentication, SMS, Caller ID, and Message Waiting, can be easily added with front-panel firmware updates to the 83206A as they become available.

Quick-test, Base Station Emulation Mode—Provides a base station emulation mode that bypasses call processing procedures to quickly get to a traffic channel. This feature is important for manufacturing test where avoiding overhead time associated with call processing can greatly reduce parametric test times.
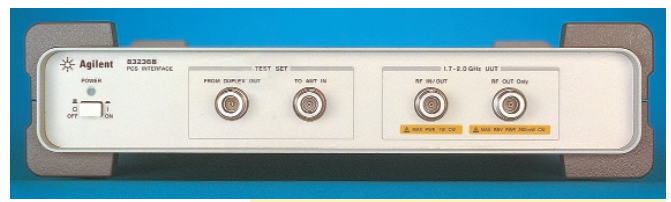
PCS *Upgrade Path*

Agilent Technologies 83236B PCS Interface

Extend DCCH test capabilities for future PCS phone test by adding the 83236B PCS interface to translate DCCH measurement capability to the PCS band. Power measurement accuracy and speed are maintained at PCS band frequencies with an internal power meter for measurements on CW and TDMA ($\pi/4$ pulsed or continuous) signals.

For more information, refer to the 83236B configuration guide, literature number 5965-5625E.

***P**rogram the 8920B* from an external controller or use the built-in controller for a self-contained automated test solution.

External Controller

Use any controller or PC that supports the IEEE 488.2 interface to write test programs for the 8920B. Examples include an IBM compatible PC with the Agilent Technologies 82335B GPIB interface card, Agilent Series 200/300, or Series 700 workstation with the E2070B GPIB interface card.

Agilent VEE Supports the 8920B!

Agilent Visual Engineering Environment (Agilent VEE) is a graphical programming language optimized for instrument control. Use VEE with new 8920B drivers to reduce test development time compared to conventional programming techniques. For more information on VEE refer to "VEE the Productivity Language" brochure, literature number 5980-0841E.

## *Built-In Automation Capability*

Built-In Controller

The 8920B has a built-in Instrument BASIC (IBASIC) controller that provides powerful automation capability. The controller operates using the IBASIC programming language. IBASIC is a subset of HP BASIC, Rocky Mountain Basic (RMB) used in the Agilent Series 200/300 controllers, and BASIC for Windows.

Control External Instruments

The built-in controller can be used to control all instrument functions making the 8920B a self-contained automated test station.

The 8920B can also control external instruments. The IBASIC programming language has the capability to output commands over GPIB or serial bus to other instruments and query them for measured results. This gives you the capability to add a power supply or a second signal generator to your test system and use the 8920B as the system controller. This eliminates the additional space and expense of a separate system controller.

10

Optional radio interface card allows you to control modules or transceivers with remote control
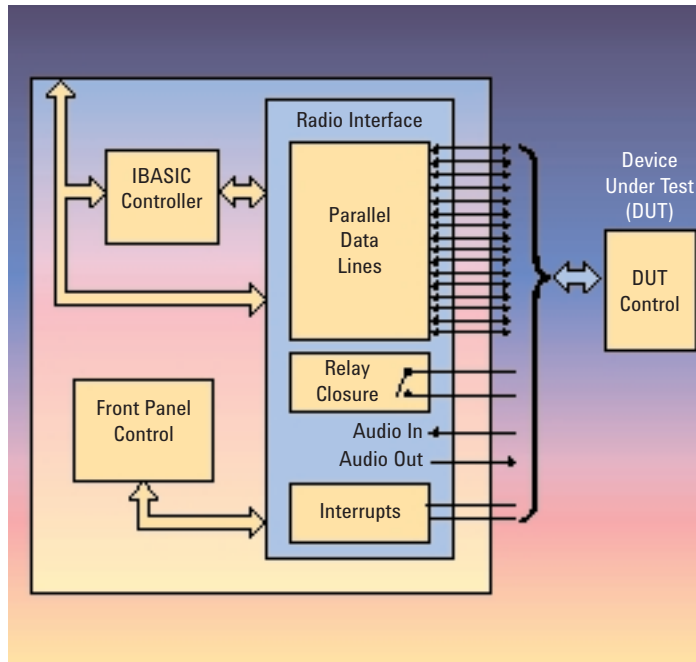
Radio Interface Card–Option 020

The 8920B has an optional built-in radio interface card for automating module and radio testing. This eliminates the need for a system operator to key the transmitter or manually control operation of the module or radio.

The radio interface card has sixteen parallel data lines, two interrupts, and brings the audio in/out lines and a relay closure out from the MIC/ACC connector located on the front panel. All are controlled by either the 8920B IBASIC control language, an external GPIB controller or manually. All data lines provide TTL level outputs and require TTL level inputs.

Develop Custom IBASIC Programs

IBASIC programs can be developed in several different ways:

1) Programs can be created using IBASIC mnemonics on a controller or a PC and then downloaded into the 8920B over the optional GPIB bus, or run from the controller or PC.

2) An ASCII terminal can be connected to the RS-232 bus and programs developed on the 8920B using the ASCII terminal keyboard as the input device.

3) Programs can be created on a PC using IBASIC mnemonics and saved as an ASCII file. This ASCII file can then be loaded into the 8920B via the RS-232 bus or PCMCIA card.

The Agilent 83224A IBASIC development tool kit is available to aid you in writing your own IBASIC programs. Once written, programs can be stored on memory cards. These PCMCIA memory cards are available in 64 KB (83230A) and 1 MB SRAM (83231A) sizes for storing all of your programs.

Agilent Technologies 11807E IBASIC Radio Test Software
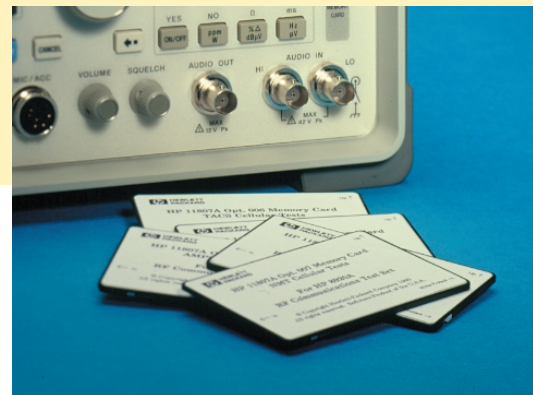
IBASIC radio test software cards

Agilent Technologies 11807E software provides a solution for automatically testing your radios without having to invest in software development time. The software is written in IBASIC for the 8920B internal controller. It fully controls the 8920B, testing radios against recognized international standards. This automation gives you the capability to produce higher quality radios at a lower cost per test by requiring less user training, testing radios consistently, and increasing your throughput at a given test station. For more information see the 11807A/E radio test software product overview, literature number 5968-1379E.

For more information, visit our website at:
www.agilent.com/find/8920support/

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for at least five years beyond the produc-
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underlie Agilent's overall support policy:
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When you are choosing new equipment,
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tion, including realistic performance spec-
ifications and practical recommendations
from experienced test engineers. When
you use Agilent equipment, we can verify
that it works properly, help with product
operation, and provide basic measurement
assistance for the use of specified capabil-
ities, at no extra cost upon request. Many
self-help tools are available.

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"Your Advantage" means that Agilent
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can purchase according to your unique
technical and business needs. Solve prob-
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