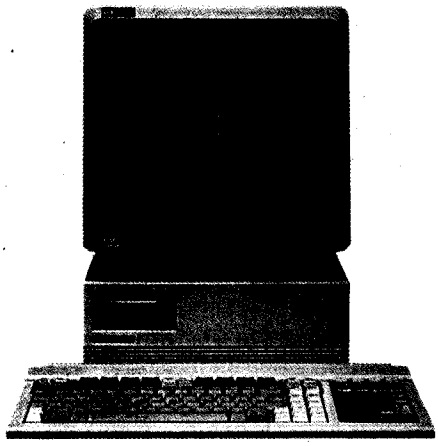
SIGNAL GENERATORS

Frequency Agile/Complex Signal Simulation

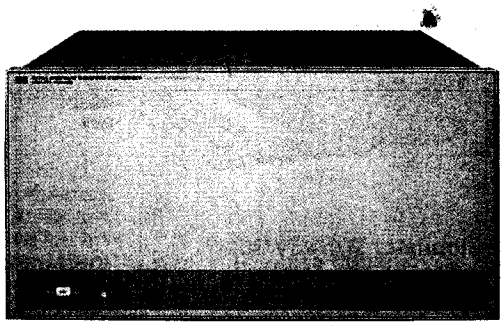
HP 8770S, 8770A, 11776A

- Unmatched spectral purity
- Source of "real-life" signals to 50 MHz
- A software reconfigurable modulation source
- Simulate very complex baseband and IF signals
- Outstanding reliability (> 100,000 hrs MTBF)
- 125-MHz sample rate
- 12-bit resolution, 512K word memory



HP 11776A

DESIGNED FOR HP-IB SYSTEMS



HP 8770A

HP 8770S Signal Simulator System, dc–50 MHz

Simulate Signals for Radar, EW, Communications, Magnetic Disk, and Other Applications

Today's sophisticated electronic systems require "real-life" functional testing to ensure that they will perform properly under their intended operating conditions. The HP 8770S helps you answer critical questions: "Will this radar accurately detect and decode multiple targets? Will my EW receiver correctly identify advanced threats? Will this digital communications receiver properly reconstruct transmitted signals in the presence of fading or jamming? Will this magnetic disk read circuit respond properly to a missing bit?"

Description

The HP 8770S Signal Simulator System consists of the:

- HP 8770A Arbitrary Waveform Synthesizer
- HP 9000 Series 300 Technical Computer
- HP 11776A Waveform Generation Software

You design waveforms with the software, then generate the waveforms with the HP 8770A. Use this advanced simulation system to generate complex baseband and IF signals from dc to 50 MHz. Add precise amounts of distortion and noise to test the operating margins of your system early in the development cycle. All signal parameters are under complete software control, allowing quick changes to meet new test demands. The HP 8770A has a complete HP-IB command set for full automatic control and easy downloading of waveform data previously defined by the HP 11776A, or by other means. Regardless of your application, the use of precise, complex test signals improves the evaluation of your circuits and systems.

The HP 8770A Arbitrary Waveform Synthesizer (AWS) forms the heart of the HP 8770S. Advanced digital synthesis techniques ensure precise waveform generation.

Features	Benefits
• 8-ns sample update rate	• Rapid signal parameter changes
• 12-bit words	• High-amplitude resolution
• 125-MHz internal clock (phase-locks to crystal osc.)	• Time base with synthesizer accuracy
• Special "deglitching" circuits	• Low harmonic and spurious distortion levels
• 110-dB RF attenuator	• 12-bit resolution even at low signal levels
• 512-K memory	• Highly complex waveforms, longer waveform sequences

The HP 11776A Waveform Generation Software operates on the HP 9000 Series 300 technical computers. It consists of the Waveform Generation Language (WGL), an HP BASIC 5.13 operating system, and application disks for powerful waveform development. Use over 100 easy commands and math functions to create and manipulate waveforms as desired. Add noise or spurs to generate real-life test signals. Add waveforms together to create harmonically-distorted waves, or multiply waves to create complex modulated signals. Create waves in either the frequency or time domain and quickly convert from one to the other. Capture data from other instruments such as spectrum analyzers and oscilloscopes. Once waveforms have been developed, you can download them into the HP 8770A for immediate generation, or store them on a disk for later use in multiple stations. Thus, WGL makes "what if" testing to determine a device's performance easy and affordable.

Build Waveform Libraries for Complete Tests

Any HP-IB computer can control the HP 8770A and download previously defined waveform data. Generate a library of test waveforms with the HP 11776A software or your own BASIC program. Then download them to the HP 8770A from the computer in your ATE system for use in your applications.

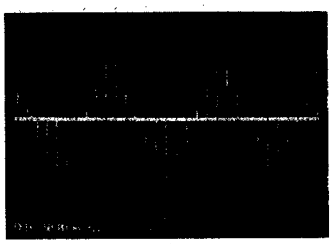
Stretch Memory with Sequencing

Certain parts of waveforms often repeat themselves and quickly fill up even the largest memory. This leaves less memory to define the rest of the desired test signal. The HP 8770A avoids this problem by allowing sections of memory (packets) to be repeated any number of times and in any order. This sequencing capability and the large 512-K word memory free large amounts of memory for greater flexibility when defining complex waves. Many test signals can also be stored simultaneously in the memory and accessed at any time with the sequencer. In a production ATE environment, this substantially decreases download time, reducing costs.

Applications Overview

Radar

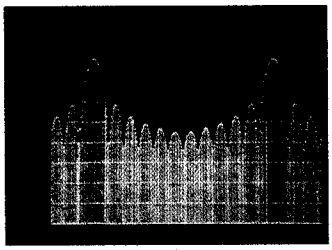
The HP 8770S simulates multiple targets for more effective radar testing. Simulate complex radar video and IF signals. Add noise, pulse jitter, and clutter. Shape radar chirps to exact specifications. Stagger multiple radar pulses. Vary the PRF as a function of time. Control radar pulse parameters with extremely precise resolution. Finally, manipulate Doppler shift and range or superimpose multiple targets together, resulting in complex, demanding test signals.



Doppler-shifted return of moving target

Electronic Warfare

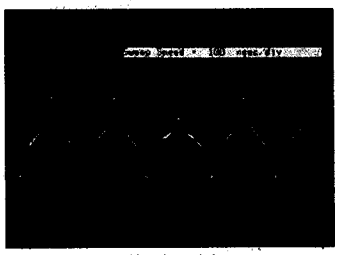
Simulate MOP, exotic threats, and other complex modulated signals to test next-generation EW receivers and signal processors. Vary pulse amplitudes, rise and fall times, pulse width, PRI, and stagger of individual radars.



Antenna scan pattern

Communications

The HP 8770S is an excellent signal simulator for conventional analog communication systems, digital microwave radios, and satellite communications systems. Design and generate amplitude-, frequency-, and phase-modulated communications signals with digital precision. Exploit memory sequencing to hop from one frequency to the next with fast frequency switching speed and phase continuity. Simulate Nyquist filter responses in software to eliminate time-consuming and costly hardware filters.



Missing bit

Magnetic Disk

The signal simulation system continues to be extremely successful in magnetic disk applications. Replace the head disk assembly to test read/servo channel boards for design integrity, calibrate disk media certifiers, or verify board operation in production test. Test bit shift susceptibility to less than 50-ps shift resolution. The Programmer's Starter Kit (P/N 08770-60064) interactively creates seven common disk-test waveforms.

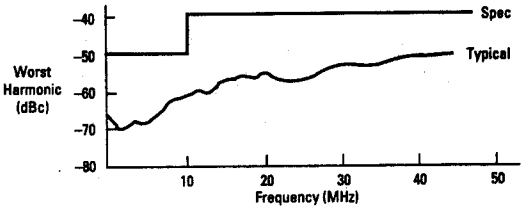
Other Applications

- Video and Imaging
- Component Test

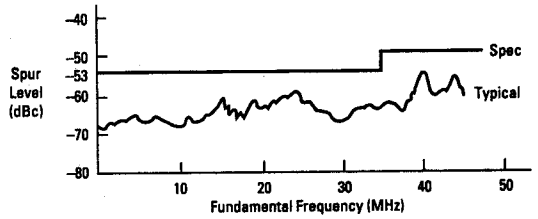
HP 8770A Performance Characteristics

Frequency
Range: dc to 50 MHz
Frequency Switching Speed: 8 ns, phase continuous
RF output
Power range: +10 dBm to −110 dBm
Attenuator: 110 dB in 10 dB steps
Max Output Voltage: 2 V peak-to-peak into 50 or 75 ohms
Number of DAC bits: 12 true bits, monotonic
Amplitude Resolution: .024% of full scale
Amplitude Flatness: < ±0.65 dB (<0.1 dB w/predistortion)
Phase Linearity (dc - 50 MHz): ±5° (< ±1° w/predistortion)
Output Impedance: 50 Ω (75 Ω for Option 002)
Output SWR: <1.2:1
Connector: Type N (female)

Spectral Purity
Harmonic Distortion (output level = +10 dBm):



Inband Spurious and Nonharmonic Distortion:



Two-Tone Intermodulation Distortion: < −65dBc for a 10.000 MHz and 10.124 MHz signal at +4 dBm each
SSB Phase Noise @ 10MHz: < −120 dBc/Hz @ 10 kHz offset.
Modulation Capabilities
AM, FM, ΦM, Chirp, Pulse, Digital (BPSK, QPSK, BPSK, QAM), Antenna Scan, I/Q
External System Triggering: Repetitive, Single-Shot, Gated
Outputs: Scan Start, Packet Start, Sequence Start, Equal Address, Packet Advance Ready
Inputs: Packet Advance Trigger, System Start Trigger, System Stop Trigger
Clock
Sampling Clock Rate: 125 MHz (externally variable)
Reference Oscillator: 10 MHz quartz crystal. Aging rate $<5\times10^{-10}$/day after a 24-hour warm-up and an oscillator time-off of less than 24 hours.
Remote Operation
HP-IB and 16-bit GPIO parallel port
General
Operating Temperature: 15° to 40° C
Power: 445 VA
Weight: Net, 23.6 kg (52 lb); shipping, 29.5 kg (65 lb).
Size: 235 mm H × 425.5 mm W × 622 mm D (9.25 in × 16.75 in × 24.5 in)

Ordering Information	Price
HP 8770S Signal Simulator System	$0
To ensure coordination of shipments and compatibility of instruments, computers, and software, use the system model number when ordering individual components. Obtain the HP 8770A and HP 11776A Data Sheet and an HP 8770S Ordering Guide from your local sales office.	
HP 8770A Arbitrary Waveform Synthesizer	$26,000
Opt 907 Front-Panel Handles (5062-3991)	$75
Opt 908 Rack Mount Flange Kit (5062-3979)	$40
Opt 909 Rack Flange Kit with Front Handles (5062-3985)	$105
Opt 915 Add Service Manual (08770-90019)	$40
Opt 916 Extra Operating Manual (08770-90036)	$25
Opt 002: 75 ohm Output Impedance	$0
Opt H12: Digital Data Output	$500
Opt W30 Extended Repair Service. See page 671.	$595
Opt W32 Calibration Service.	$285
HP 11776A Waveform Generation Software (5¼-in Diskettes Standard)	$7,000
Opt 630: 3½-in Diskettes Only	$0
HP P/N 08770-60064 Programmer Starter Kit	$75
Other software to control HP 8770A	Contact HP