

## Agilent 35670A Dynamic Signal Analyzer

### Product Overview



**Versatile two- or four-channel high-performance  
FFT-based spectrum/network analyzer**

**122  $\mu$ Hz to 102.4 kHz 16-bit ADC**



**The Agilent 35670A  
shown with four  
channels (option AY6)**

#### Key Specifications

<b>Frequency Range:</b>	102.4 kHz 1 channel 51.2 kHz 2 channel 25.6 kHz 4 channel
<b>Dynamic Range:</b>	90 dB typical
<b>Accuracy:</b>	$\pm 0.15$ dB
<b>Channel Match:</b>	$\pm 0.04$ dB and $\pm 0.5$ degrees
<b>Real-time Bandwidth:</b>	25.6 kHz/1 channel
<b>Resolution:</b>	100, 200, 400 & 800 lines
<b>Time Capture:</b>	0.8 to 5 Msamples (option UFC)
<b>Source Types:</b>	Random, Burst random, Periodic chirp, Burst chirp, Pink noise, Sine, Swept-Sine (option 1D2), Arbitrary (option 1D4)

The Agilent 35670A is a portable two- or four-channel dynamic signal analyzer with the versatility to be several instruments at once. Rugged and portable, it's ideal for field work. Yet it has the performance and functionality required for demanding R&D applications. Optional features optimize the instrument for troubleshooting mechanical vibration and noise problems, characterizing control systems, or general spectrum and network analysis.

#### Take the Agilent 35670A where it's needed!

Whether you're moving an instrument around the world or around the lab, portability is a real benefit. Small enough to fit under an airplane seat, the 35670A goes where it's needed. But there's more to portability than size. Like a nominal 12- to 28-volt dc

power input and self-contained features that do not require external hardware, such as built-in piezoelectric integrated circuit power supply, analog trigger and tachometer inputs, and optional computed order tracking.

#### Versatile enough to be your only instrument for low frequency analysis

With the 35670A, you carry several instruments into the field in one package. Frequency, time, and amplitude domain analysis are all available in the standard instrument. Build on that capability with options that either add new measurement capability or enhance all measurement modes.

AY6	Add Two Channels (Four Total)
1D0	Computed Order Tracking
1D1	Real-Time Octave Measurements
UK4	Microphone Adapter and Power Supply
1D2	Swept-Sine Measurements
1D3	Curve Fit and Synthesis
1D4	Arbitrary Waveform Source
1C2	Agilent Instrument BASIC
UFF	Add 1 Mbyte NVRAM
AN2	Add 4 Mbyte RAM (8 Mbytes Total)
UFC	Add 8 Mbyte RAM (12 Mbytes Total)
100	1D0 - 1D4/UFC bundle



**Agilent Technologies**

Innovating the HP Way

# Agilent 35670A Dynamic Signal Analyzer

## Versatile Measurement Modes

Standard and optional measurement modes include:

- FFT Analysis
  - Real-Time Octave Analysis (option 1D1)
  - Order Analysis (option 1D0)
  - Swept-Sine (option 1D2)
  - Correlation Analysis
  - Histogram Analysis
  - Time Capture
- All measurement options may be retrofitted.

## Powerful Markers

Extract information from measurement data with trace and special markers:

- Individual Trace
- Coupled Trace
- Absolute or Relative
- Peak Search
- Harmonic
- Band
- Sideband Power
- Waterfall
- Time Parameter
- Frequency and Damping

## Built-In 3.5 inch Flexible Disk Drive

Store instrument states, programs, time captured data, waterfall data, trace data, limits, math functions, data tables, and curve fit/synthesis tables. Supported disk formats are HP-LIF and MS-DOS. Internal RAM may also be formatted as storage disk.

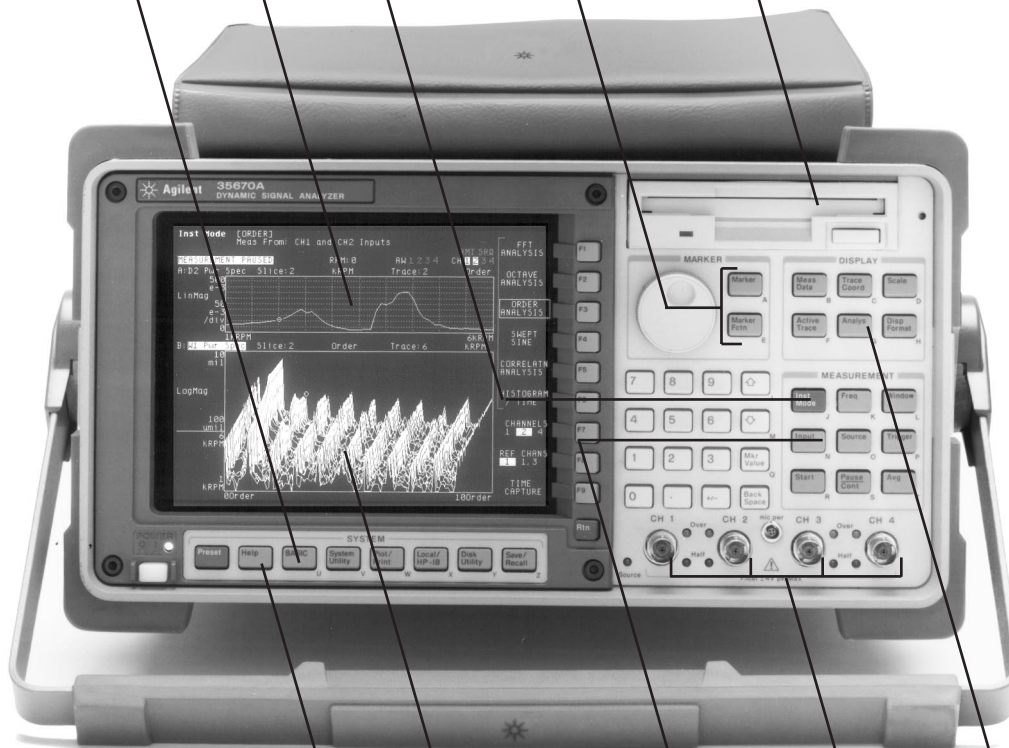
## Agilent Instrument BASIC (Option 1C2)

Develop a custom user-interface, integrate several instruments and peripherals into a system using the 35670A as the system controller, or simply automate measurements.

## RPM Display

Read RPM in any measurement mode

Shown with  
option AY6 -  
Add Two  
Channels



## Online Help

Applications oriented help is just a few keystrokes away.

## Large 6.9 inch (17.5 cm) display

Display area is not compromised by portability

## Input Channels

- Analog A-weighted filters (switchable)
- Transducer sensitivity input
- Engineering units: g, m/s<sup>2</sup>, m/s, m, in/s<sup>2</sup>, in/s, in, mil, kg, dyn, lb, N, and pascals
- Built-in 4 mA constant current power supply

## Precision Measurements

- 16-bit ADC
- $\pm 0.15$  dB spectrum amplitude accuracy
- $\pm 0.04$  dB,  $\pm 0.5$  degrees channel match (full scale)
- 90 dB dynamic range (typical)
- 130 dB dynamic range with swept-sine (option 1D2)
- Up/Down autorange
- Up only autorange

## Math Functions

Powerful math and data editing functions to quickly modify measurement results. (Curve fit and frequency response synthesis available with option 1D3.)

### Source Types

- Random Noise
- Burst Random Noise
- Periodic Chirp
- Burst Chirp
- Pink Noise
- Fixed Sine
- Arbitrary Waveform Source (Option 1D4)
- Swept-Sine Source (Option 1D2)

Note: The source is located on the front panel of a standard two-channel 35670A.

### GPIB Connector

Integrate the 35670A with other instruments and peripherals for system operation or printing/plotting. System controller for GPIB (IEEE-488.1 and 488.2) compatible instrumentation via Agilent Instrument BASIC (option 1C2). Provides direct control of GPIB printers, plotters, and HP SS80 disk drives.

### Serial Port

Plot to HP-GL plotters or print to HP-GL and raster printers.

### Parallel Port

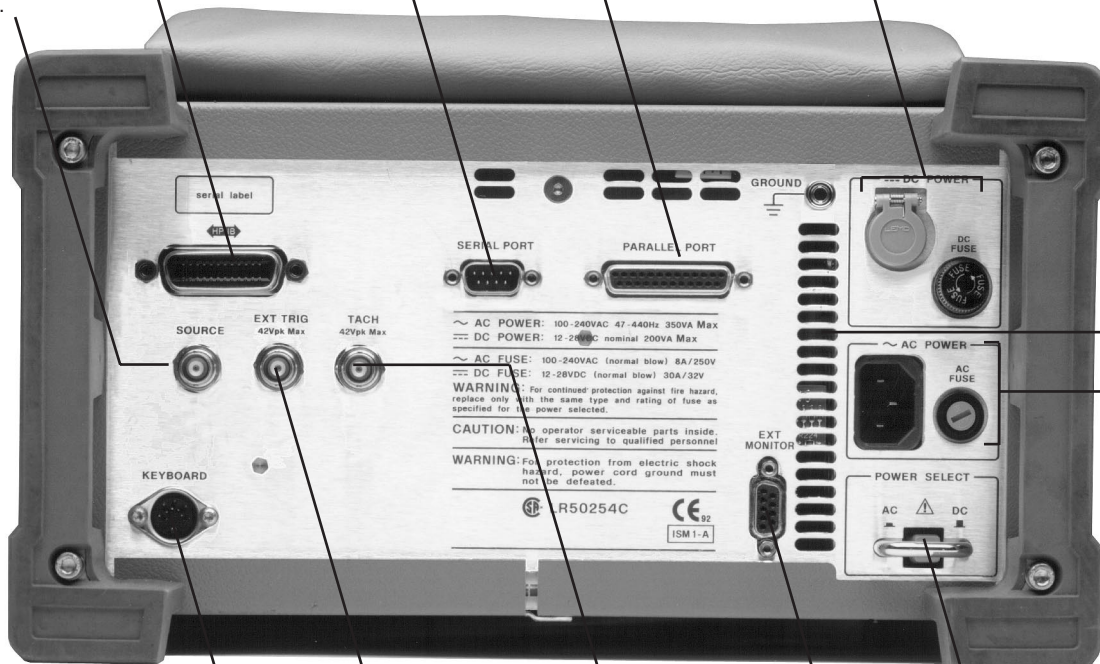
Plot to HP-GL plotters or print to HP-GL and raster printers.

### DC Power

Accepts 12 to 28 volts dc (nominal). Use the 35250A power cable for DC power source connection, or the 35251A power cable with cigarette-lighter adapter.

### Low Noise Fan

Fan may be turned off for acoustic applications. Running speed depends on ambient temperature.



### External Trigger

(42 Volt Peak Max)  
No external signal conditioning hardware required. Triggers on selected level between  $\pm 10$  volts.

### Tachometer

(42 Volt Peak Max)  
No external signal conditioning hardware required. Reads frequency (RPM) on selected levels between  $\pm 20$  volts.

### Keyboard

Use a standard PC keyboard to title data, edit Agilent Instrument BASIC programs, or to operate the instrument.

### Power Select

Switch between ac and dc power sources without interrupting instrument operation.

### External Monitor

Drive a multisync monitor for remote viewing by large groups.

**AC Power**  
Universal power supply will operate with any combination of voltage between 100 and 240 VAC and line frequency between 47 and 440 Hz. The maximum power requirement is 350 VA.

# Spectrum Analysis

## Laboratory-quality measurements in the field

Obtain all of the performance of your bench-top analyzer in a portable instrument.

## Ease-of-use

Portability, versatility, and performance are valued attributes, but to be really valuable an instrument must also be easy to use. The 35670A has a friendly front panel, plus online help that's always available to answer your questions. An interactive measurement state lets you configure the instrument setup from a single display.

FT-based spectrum analyzers, such as the 35670A, are ideal for measuring the spectra of low-frequency signals like speech or mechanical vibration. Transient components, usually missed with swept-frequency analyzers, are easily measured and displayed at speeds fast enough to follow trends. The 35670A has both the performance and features required to take full advantage of this technology.

## 16-Bits for High Performance

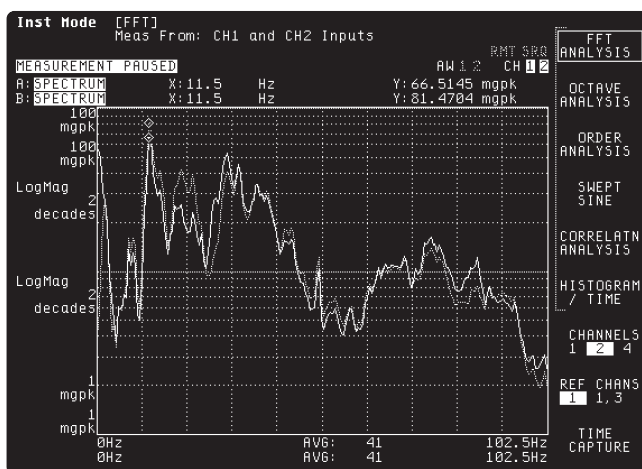
With a 16-bit ADC (90 dB typical dynamic range) and a real-time bandwidth of 25.6 kHz, you can be sure nothing will be missed. Resolve signals using 100 to 1600 lines resolution, or for really close-in analysis, use frequency zoom to resolve signals with up to 61  $\mu$ Hz resolution. Use time or RPM arming to develop waterfalls of sequential vibration spectra for trend analysis or for an overview of device vibration.

## Power and Linear Spectrums

Match your spectrum measurement mode to the signal being tested. Use linear spectrum analysis to measure both the amplitude and phase of periodic signals such as the spectra of rotating machinery. Power spectrum analysis is provided for averaging nonrepetitive signals.

## Averaging

Various averaging modes let you further refine spectrum analysis measurements. Time averaging extracts repetitive signals out of the noise while rms averaging reduces the noise to its mean value. Exponential averaging, available for both time and rms averaging, is useful for reducing the noise while following changing signals—tracking the resonance shifts in a fatiguing structure for example.



Two spectrums of road induced vibration measured at different speeds are compared using the front/back mode of the Agilent 35670A.

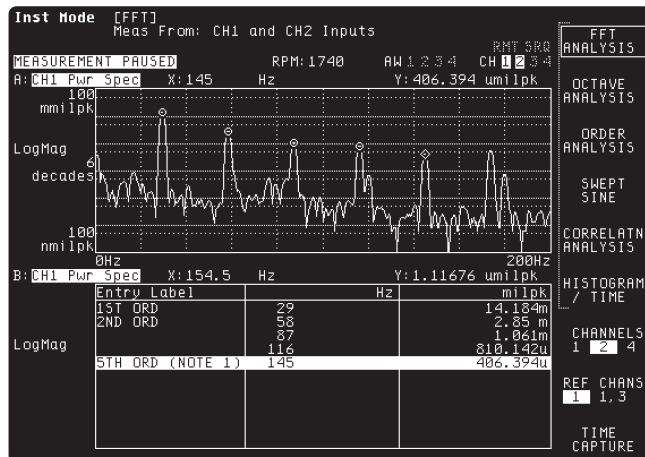


## Time Domain

Use your spectrum analyzer as a low-frequency oscilloscope or view signals in the time and frequency domains simultaneously. (Note: anti-alias filters can be switched off.) Special markers for time-domain data facilitate extraction of key control system performance parameters: overshoot, rise time, setting time, and delay time.

## Data Table

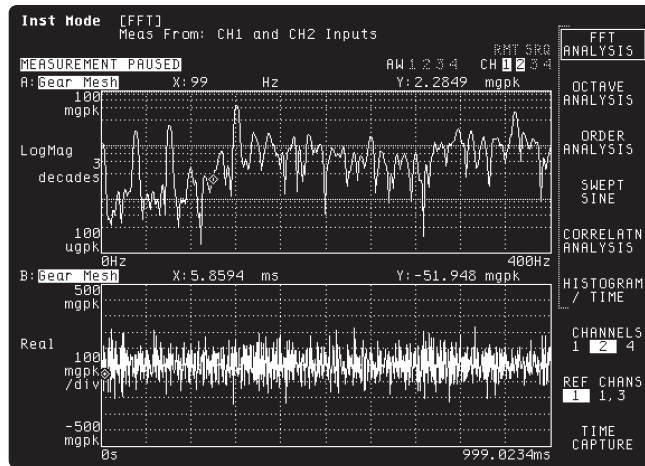
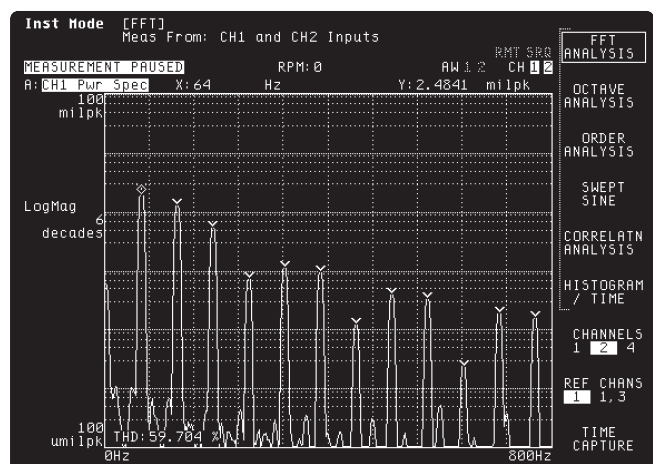
Use a tabular format to keep track of key frequencies in the spectra of rotating machinery. The amplitude and frequency of the signal and a 16-character entry label field are listed for each selected point.



## Automatic Units Conversion

Display vibration data in the units of your choice. Select  $g$ ,  $m/sec^2$ ,  $in/sec^2$ ,  $m/s$ ,  $in/s$ ,  $m$ ,  $mil$ ,  $inch$ ,  $Kg$ ,  $lb$ ,  $N$ ,  $dym$ , or  $pascals$  as appropriate for your application. The instrument automatically converts frequency-domain data from specified input transducer units to the units you select for display. For example, accelerometer data is automatically converted and displayed as mils when mils are selected. Of course,  $dB$ ,  $dBV$ ,  $dBm$  and  $vols$  are available for electrical applications.

Harmonic markers are used to calculate the THD of a signal without including the effects of noise.



Simultaneous display of frequency and time domain data facilitates analysis of gear mesh vibration.

## Markers

Markers streamline analysis by helping you select and display specific data. Marker functions include marker to peak, next right peak, and coupled markers for selecting points in multiple data displays. Markers readouts are absolute or relative to your selected reference.

## Special Markers

Three special marker functions facilitate analysis of your spectral data. Sideband markers aid analysis of modulation signals. Use this function to quickly locate sidebands in the complicated spectra of rotating machines. A band-power marker reads the total power in a selected band of frequencies and a total harmonic distortion marker lets you calculate total harmonic distortion without including the effects of noise.

# Frequency Response Measurements

The 35670A has the flexibility to make measurements of both electrical networks and mechanical devices. FFT-based network analysis is fast enough to allow real-time adjustments of circuit parameters while the swept-sine option provides exacting measurements over more than six frequency decades, and a 130 dB dynamic range.

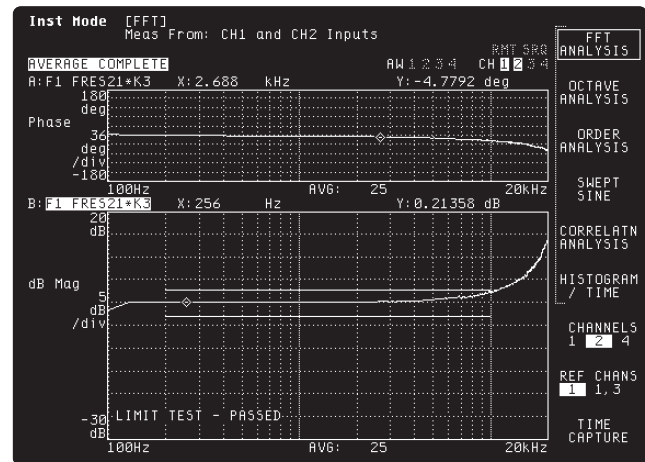
## Source

Select the optimum stimulus for each application—random noise, periodic chirp, pink noise, fixed sine, burst random, and burst chirp. For zoomed network analysis measurements, the source is band-translated to match the zoom span at frequencies up to 51.2 kHz. An optional arbitrary source lets you test your product using real-world signals. A  $\pm 10$  volt dc source offset facilitates tests of control systems.

## Impact Testing

Force and exponential windows allow impact testing for modal and structural analysis. Quality measurements are ensured using preview and accept/reject during averaging. A 4 mA constant current transducer power supply is built-in for true portability.

Limits are used for go/no go testing in production. The response of an accelerometer is being checked in this example.

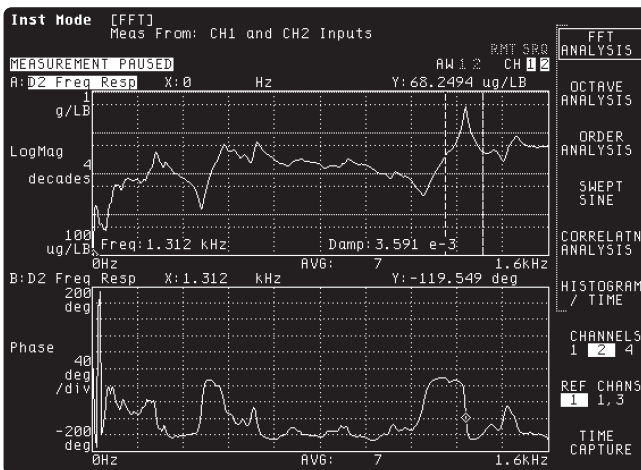


## Limits

Test network measurements against preset limits. Up to 800 separate line segments are available for setting upper and lower limits. Limits are also used for testing spectrum measurements.

## Four Channels (option AY6)

Test up to three devices simultaneously with a four-channel 35670A. Channel one is the common reference channel and two, three, and four are the response channels. Alternatively, select channels one and three as reference channels for two totally independent network measurements. See option AY6 description for more information.



Characteristics of a selected resonance are automatically calculated from an impact measurement using the frequency and damping marker.

# Time Capture

## Markers

A frequency and damping marker provides the resonant frequency and the damping ratio of single-degree-of-freedom frequency response measurements.

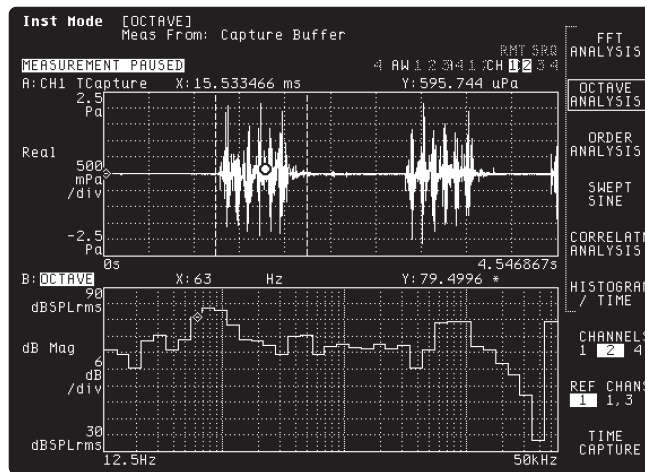
Gain and phase margin markers extract key frequency-domain stability data from frequency response measurements of control systems.

## Signal Injection for Control Loops

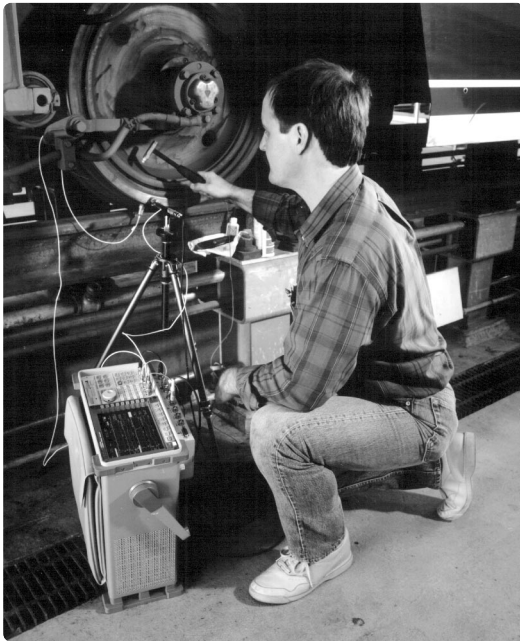
Use one of three Agilent signal injection devices for testing control loops. The 35280A summing junction provides convenient dc to 1 MHz signal injection for most control loops. Use the 35281A clip-on transformer when it is not possible to temporarily open the loop, or use the 35282A signal injection transformer when secondary voltages are up to 600 Vpk.

Capture transient events or time histories for complete analysis in any measurement mode (except swept-sine). Use either the entire time-capture record or a selected region of interest for repetitive analysis in the FFT, octave, order track, correlation or histogram instrument modes.

Add an additional 4 Mbytes (option AN2) or 8 Mbytes (option UFC) of memory for really deep time-capture capability.



An interval of time-capture data has been selected for analysis in the octave mode.



## Using Measurement Results

Taking the measurement is only half the job. Raw measurement data must be stored, recalled, printed, plotted, integrated with other data for analysis, and reported. The 35670A has a variety of tools to help you finish the job.

### Enhanced Data Transfer Utilities for PCs

Standard Data Format (SDF) Utilities, provided with the 35670A, allow you to easily move data from the instrument to wherever it's needed:

- For general digital signal processing and filtering, translate data files to formats compatible with MATLAB and MATRIXx, Data Set 58, or ASCII for use in popular spreadsheets.
- For specific applications, use application software that reads SDF files directly, such as STARModal and STARAcoustics from SMS and CADA-PC from LMS.
- Transfer data to and from the 35665A, 3566A, 3567A, 3562A, 3563A.
- Use the viewdata feature to display data on your PC or to convert to the HP-GL format for transfer to Microsoft's Word for Windows or Lotus' AMI PRO word processing software.
- Convert between HP-LIF and MS-DOS® formats.
- Read data files into a program.

### Documented Results

The 35670A supports a variety of GPIB, serial and parallel printers and plotters for direct hardcopy output. The internal 3.5 inch flexible disk drive stores data, instrument states, HP-GL plots and Agilent Instrument BASIC programs in HP-LIF or MS-DOS formats for future recall or use on HP workstations or a personal computer.

Entire display screens can be imported directly into your word processing program by plotting HP-GL files to your named DOS file. HP-GL files are interpreted and displayed directly by Microsoft's Word for Windows and AMI PRO from Lotus Development Corp.

## Computed Order Tracking (Option 1D0)

**Self-contained—no ratio synthesizer or tracking filter required**

### Order Maps

#### Order Tracking

#### RPM or Time Trigger

#### Display RPM Profile

#### Track Up to Five Orders/Channel

#### Up to 200 Orders

#### Composite Power

#### RPM Measurements

Order tracking facilitates evaluation of spectra from rotating machines by displaying vibration data as a function of orders (or harmonics) rather than frequency. All measurement spectra is normalized to the shaft RPM.

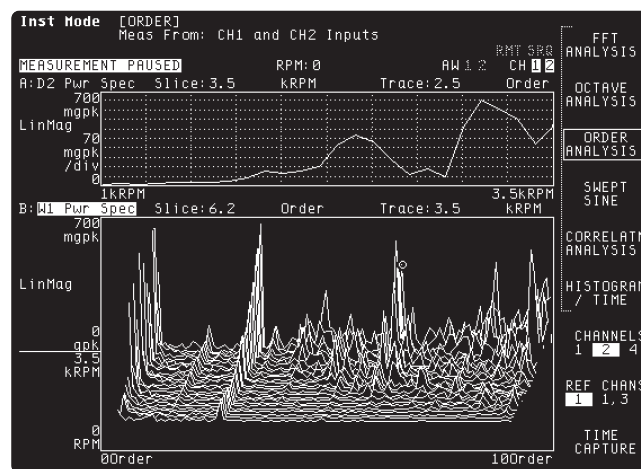
Now you can have order tracking without compromising portability. Traditional analog order tracking techniques require external tracking filters and ratio synthesizers. With Agilent's computed order tracking algorithm, external hardware is gone.

Because order tracking is implemented in the software, data is more precise and your job is easier. Compared to traditional analog order tracking techniques, computed order tracking offers:

- Improved dynamic range at high orders
- More accurate tracking of rapidly changing shaft speeds
- Accurate RPM labeled spectra with exact RPM trigger arm
- Wide 64:1 ratio of start to stop RPMs

### Order Map

Use order maps for an overview of vibration data versus RPM or time. Display the amplitude profile of individual orders and suborders using the slice marker function. Alternatively, use trace markers to select individual traces for display.



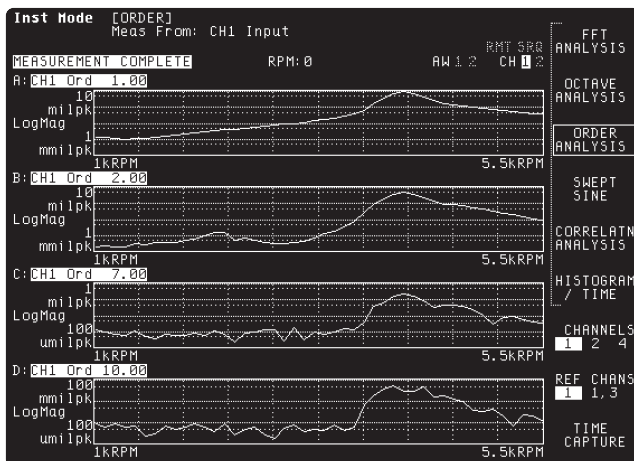
**The slice marker feature is used to select and display an order or suborder from an order map.**

MS-DOS and Microsoft are U.S. registered trademarks of Microsoft Corp.



## Order Tracking

Measure only the data you need. Order tracking lets you measure the amplitude profile of up to five orders plus composite power simultaneously on each channel. Up to four orders or three orders and composite power can be displayed simultaneously.



Order tracking is used to simultaneously display up to four orders or a combination of orders, composite power and RPM profile.

## RPM Profile

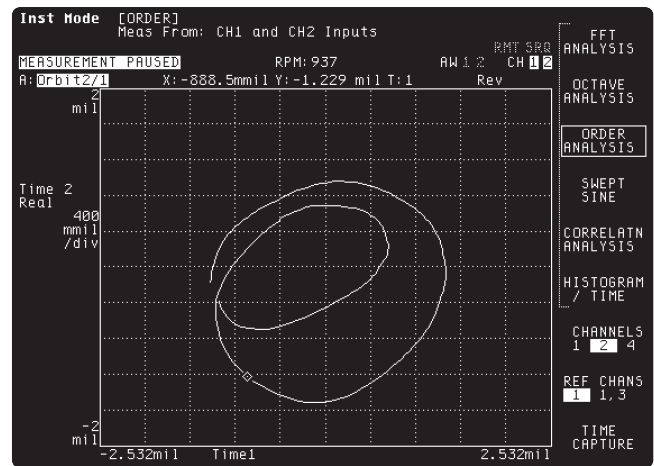
Use RPM profile to monitor the variation of RPM with time during order tracking measurements.

## Composite Power

Composite power provides the total signal power in a selected channel as a function of RPM.

## Run-Up and Run-Down Measurements

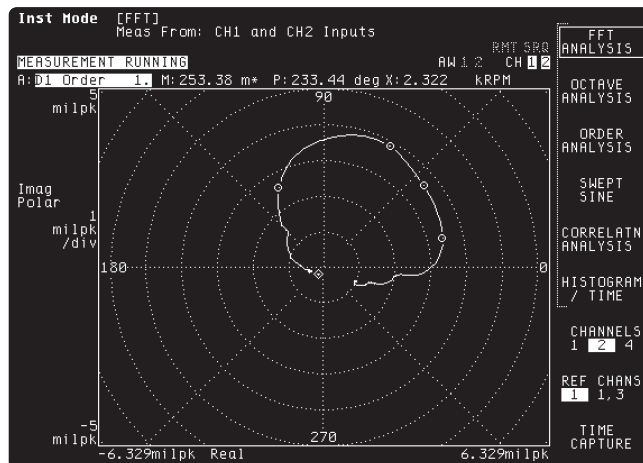
Run-up and run-down measurements of any order are made using external trigger as the phase reference. Display the results as bode or polar plots; both are available. Markers allow convenient notation of important shaft speeds.



Oscilloscope-quality orbit diagrams mean you carry only one instrument onto the shop floor.

## Orbits

Obtain oscilloscope-quality orbit measurements with your 35670A. Unlike traditional FFT analyzers, the 35670A equipped with computed order tracking displays a selected number of loops (usually one) as the shaft RPM is varied.



Markers are used to annotate shaft speeds at selected points in a run-up measurement.



# Real-Time Octave Measurements (Option 1D1) Microphone Adapter and Power Supply (Option UK4)

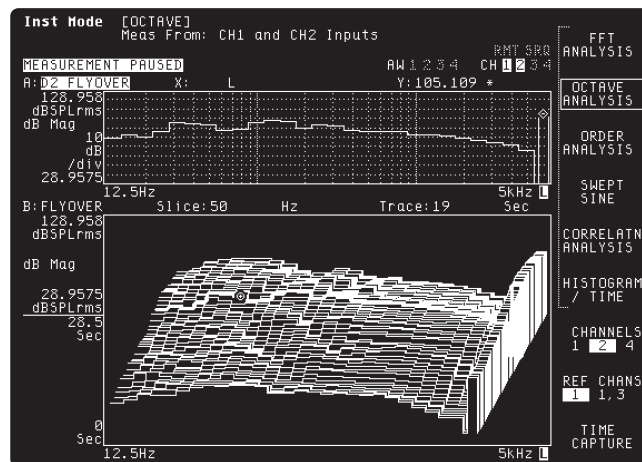
**Real-Time Third Octave to 40 kHz  
ANSI S1.11-1986 Filter Shapes  
Microphone Inputs and Power  
A-Weighted Overall SPL  
RPM or Time-Triggered Waterfalls**

Eliminate the expense and inconvenience of multiple instruments in the field. With optional real-time octave analysis, and the optional microphone adapter and power supply, you have a complete real-time octave analyzer added to your 35670A at a fraction of the cost of a second instrument. Now you can carry both your FFT and real-time octave analyzers to the job site in the same hand.

## Real-Time 1/3-Octave to 40 kHz on One Channel

With two input channels of 1/3-octave real-time measurements at frequencies up to 20 kHz, you get all of the information you'll ever need to understand the noise performance of your product. No misinterpreted measurements because transient components were missed. When the frequency range requirement is 10 kHz or less, use four channels to characterize spatial variations. For those exceptional circumstances, use 1/3-octave resolution at frequencies up to 40 kHz on a single channel. Resolutions of 1/1- and 1/12-octave are also available.

This waterfall display of a flyover test can be analyzed trace-by-trace or by selecting time slices along the z-axis.



Overall sound pressure level and A-weighted sound pressure level can be displayed with the octave bands individually, together, or not at all.

A fan-off mode lets you use the instrument in the sound field being measured.

## ANSI S1.11-1986

All octave filters comply with filter shape standards ANSI S1.11-1986 (Order 3, type 1-D), DIN 45651, and IEC 225-1966. An 80 dB dynamic range for the audio spectrum provides the performance required by acousticians. Switchable analog A-weighting filters in the input channels comply fully with both ANSI S1.4-1983 and IEC 651-1979 Type 0.

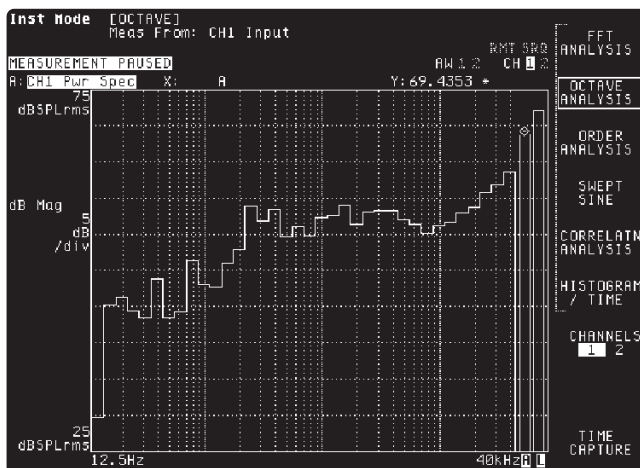
## Advanced Analysis

Use waterfall displays of octave data for an overview of device noise versus time or RPM. Display individual frequency bands as a function of RPM or time using the slice marker function. Alternatively, use trace markers to select individual traces for display.

A pink noise source is available for testing electro-acoustic devices.

## Sound Level Meter Measurements

Peak hold, impulse, fast, slow, and  $L_{eq}$  are all provided with optional Real-time Octave Measurements. All measurements conform to IEC 651-1979 Type 0 - Impulse.



Real-time 1/3-octave measurements at frequencies up to 40 kHz.



Agilent 35670A with option UK4 microphone adapter and power supply.

# Swept-Sine Measurements (Option 1D2)

## 130 dB Dynamic Range

### Logarithmic or Linear Sweeps

#### “Auto” Frequency Resolution

While FFT-based network analysis is fast and accurate, swept-sine measurements are a better choice when the device under test has a wide dynamic range or covers several decades of frequency range. Use swept-sine measurements to extend the network measurement capabilities of the 35670A.

## Network Analysis Over a 130 dB Range

With traditional swept-sine, the 35670A is optimally configured to measure each individual point in the frequency response. The result is a 130 dB dynamic range. With FFT-based network analysis, all frequency points are stimulated simultaneously and the instrument configures itself to measure the highest amplitude response—thereby limiting the dynamic range.

## Characterize Nonlinear Networks

Use the auto-level feature to hold the input or output amplitude constant during a sweep. This provides the device response for a specific signal amplitude. With FFT-based network analysis using random noise, the random amplitudes of the stimulus tend to “average out” the non-linearities and therefore does not capture the dependency of the response on the stimulus amplitude.

## Logarithmic Sweep

Test devices over more than six decades of frequency range using logarithmic sweep. In this mode, the frequency is automatically adjusted to provide the same resolution over each decade of frequency range. With FFT-network analysis, resolution is constant—not a problem when measuring over narrow frequency ranges.

## Flexible

Make the measurement your way. Independently select logarithmic or linear sweep, sweep up or down, automatic or manual sweep, and autoresolution.

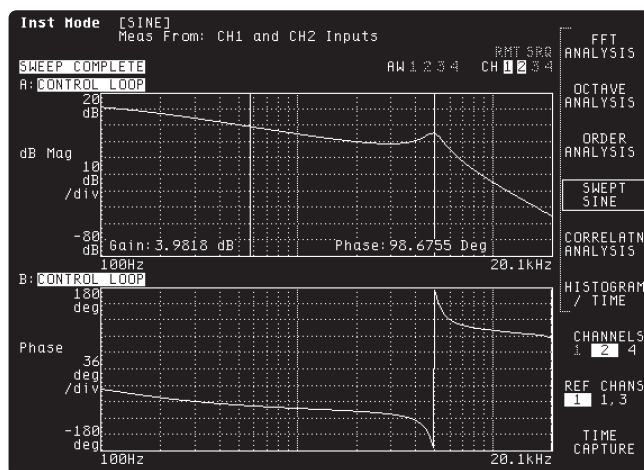
## Automatic Frequency Resolution

Use autoresolution to obtain the fastest sweep possible without sacrificing accuracy. With autoresolution, the 35670A automatically adjusts the frequency step according to the device response. High rates of amplitude and phase change are matched with small frequency steps. Low rate-of-change regions are quickly measured with larger frequency steps.

## Test Multiple Devices Simultaneously

Increase throughput in production. Swept-sine measurements up to 25.6 kHz can be made on three devices simultaneously using swept-sine on a four-channel 35670A. Channel one is the common reference channel for these measurements.

Alternatively, channels one and three can be designated as independent reference channels for two totally independent swept-sine measurements.



The stability of a control loop is quickly characterized using the gain and phase margin marker function.

# Agilent Instrument BASIC (Option 1C2)

Realize the advantages of using your instrument with a computer without sacrificing portability. Agilent Instrument BASIC provides the power of a computer inside your 35670A.

- Create custom interfaces for simplified operation.
- Use the 35670A as a system controller to integrate it with other instruments and peripherals.
- Enhance functionality by creating custom measurements.
- Increase productivity with automated operation.

Agilent Instrument BASIC is a compatible subset of the Agilent BASIC used in HP 9000 series 200, 300, 400 and 700 computers.

## Easy Programming

The Agilent Instrument BASIC program editor supports:

- Line-by-line syntax checking
- Pre-run program verification
- Single step and debug
- Automatic line numbering

An optional PC-style 101-key keyboard facilitates program development and editing. Simple programs can be entered or edited using the front-panel keys. Large programs can be developed or edited in HP 9000 Series 200, 300, and 400 computers, or on a HP Vectra with Instrument BASIC for Windows, E2200A, and then transferred to the 35670A.

Agilent Instrument BASIC can be used to display measurement results in a new format or to create a new operator interface.

## Over 200 Agilent Instrument BASIC Commands

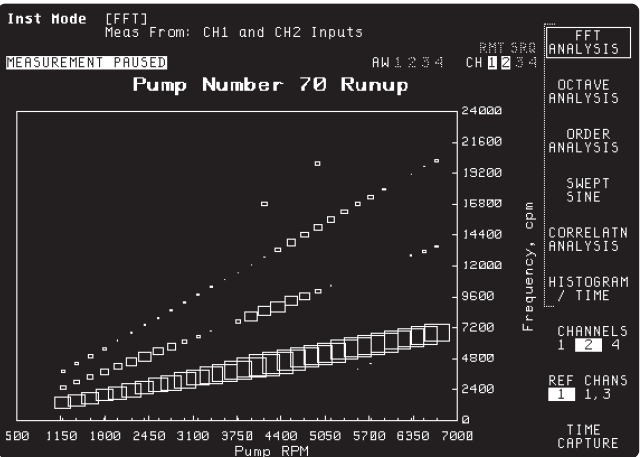
Program entry and editing	Binary functions
Program debugging	Trigonometric operations
Memory allocation	String operations
Relation operators	Logical operators
General math	GPIO control
Graphics control	Mass storage
Graphics plotting	Event initiated branching
Graphics axes and labeling	Clock and calendar
Program control	General device I/O
	Array operations

## Keystroke Recording

Most program development begins with keystroke recording. Each keystroke is automatically saved as a program instruction as you set up your measurement using the front panel. The recorded sequence can be used as the core of a sophisticated program or run as an automatic sequence.

Keystroke recording quickly creates the core of your Agilent Instrument BASIC program.

```
1 ASSIGN @Hp35670a TO 800 ENTER
2 OUTPUT @Hp35670a: "SYST: PRES"
3 OUTPUT @Hp35670a: "INST: ORD" INSERT SPACE
4 OUTPUT @Hp35670a: "VOLT1: RANG: UNIT: USER: SFAC 0.2 V/E"
5 OUTPUT @Hp35670a: "VOLT1: RANG: UNIT: XDCR: LAB INCH" INSERT LINE
6 OUTPUT @Hp35670a: "CALC1: UNIT: AMPL PEAK: *WAI"
7 OUTPUT @Hp35670a: "CALC1: UNIT: VOLT 'V': *WAI" INSERT LINE
8 OUTPUT @Hp35670a: "ARM: SOUR RPM"
9 OUTPUT @Hp35670a: "ARM: RPM: INCR 100 rpm"
10 OUTPUT @Hp35670a: "TRIG: TACH: RANG HIGH" DELETE LINE
11 OUTPUT @Hp35670a: "TRIG: TACH: LEV -10.0393700787 V"
12 OUTPUT @Hp35670a: "TRIG: TACH: SLOP NEG"
13 END RECALL LINE
DELETE CHARACTER
TYPING UTILITIES
GOTO LINE
END EDIT
```





## Add Two Channels (Option AY6)

### 51.2 kHz Frequency Range On One and Two Channels

### 25.6 kHz Frequency Range On Four Channels

### One or Two Reference Channels

Enhance your productivity by adding two additional input channels to your portable analyzer. Having four channels often means the difference between solving a problem in the field and having to schedule time in a test bay.

Monitor four signals simultaneously or use channel one as the reference channel for up to three simultaneous cross-channel measurements. Two totally independent cross-channel measurements are made by selecting channels one and three as independent reference channels. All channels are sampled simultaneously.

Use triaxial measurements to simultaneously characterize the motion of mechanical devices in three axes.

For control systems, simultaneously measure several points in a single loop.

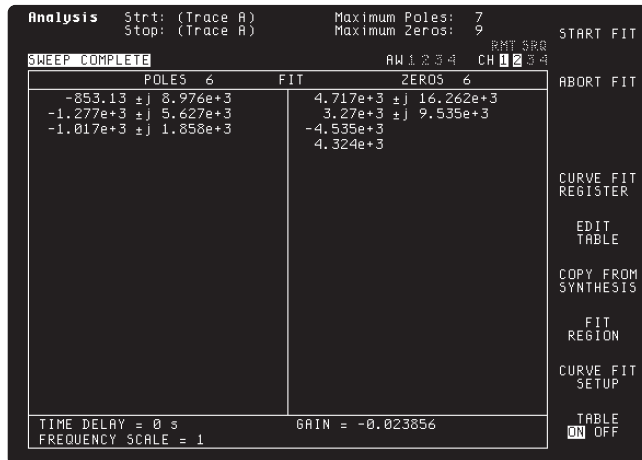
## Curve Fit and Synthesis (Option 1D3)

### 20 Poles/20 Zeros Curve Fitter

### Frequency Response Synthesis

### Pole/Zero, Pole/Residue and Polynomial Format

Use curve fit and synthesis in the 35670A to take the guesswork out of your design process. The 20-pole and 20-zero multiple-degree-of-freedom curve fitter calculates a mathematical model of your system or circuit from measured frequency response data. The model can be expressed in pole/zero, pole/residue, or polynomial format.



**Curve fit provides an exact mathematical model of your circuit or device.**

Transfer the circuit model to the synthesis function to experiment with design modifications. Add and delete poles and zeros, change gain factors, time delays, or frequency scaling, then synthesize the frequency response from the modified model. Design modifications are tested without ever touching a soldering iron.

## Arbitrary Waveform Source (Option 1D4)

Expand the data storage and time-capture capacity of your 35670A.

### Frequency or Time Domain Entry

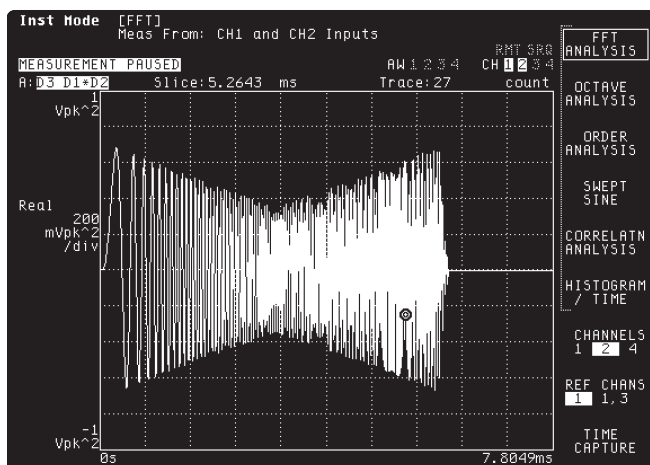
#### Data Edit

#### Store Up to Eight Arbitrary Waveforms

Test your products using real-world signals. Measure a signal in either the time or frequency domain, then output it via the arbitrary waveform source. Use math functions and data edit to obtain precisely the output waveform you need. An arbitrary waveform may be output once or repeatedly.

Standard source types can be optimized for specific applications. For example, random noise can be shaped to improve the effective dynamic range of your measurement. Alternatively, you can use data edit and math functions to create an arbitrary waveform.

Use time capture as a digital tape recorder, then playback captured signals through the arbitrary waveform source.



Math functions are used to optimize a burst chirp signal for a frequency response measurement.

## Add 8 Mbytes RAM (Option UFC) Add 4 Mbytes RAM (Option AN2)

Expand the data storage and time-capture capacity of your 35670A.

### Number of Spectra Stored Per Channel

	Standard	Add 4 Mbyte	Add 8 Mbyte
FFT - 1 Channel <sup>1</sup>	130	600	1000
FFT- 2 Channels <sup>2</sup>	50	250	400
FFT - 4 Channels <sup>3</sup>	20	100	200
1/3-Octave Spectra <sup>4</sup>	4000	18800	32000
Time Capture <sup>1</sup>	550 KSamples	2.6 MSamples	4.7 MSamples

<sup>1</sup> Conditions: Preset with instrument mode switched to 1 channel.

<sup>2</sup> Conditions: Preset

<sup>3</sup> Conditions: Preset with instrument mode switched to 4 channels.

<sup>4</sup> Conditions: Preset with instrument mode switched to octave.

## Add 1 Mbyte Nonvolatile RAM (Option UFF)

Use the 1 Mbyte nonvolatile RAM in environments too harsh for the 3.5 inch flexible disk drive. The memory functions as a high-speed disk for storage of the following information.

- Instrument Setup States
- Trace Data
- User Math Definitions
- Limit Data
- Time Capture Buffers
- Agilent Instrument BASIC Programs
- Waterfall Display Data
- Curve Fit/Synthesis Tables
- Data Tables

Information stored in nonvolatile RAM is retained when the power is off.

# Agilent 35670A Ordering Information

## Agilent 35670A Dynamic Signal Analyzer Standard Configuration:

- 1.4 Mbyte, 3.5-in. flexible disk drive
- 1.5 Mbytes user RAM
- Impact Cover
- Standard Data Format Utilities
- AC Power Cord
- Operating manual set including:  
Operator's Guide  
Quick Start Guide  
Installation and Verification Guide  
GPIB Programming with the 35670A  
GPIB Commands: Quick Reference  
GPIB Programmer's Guide
- Standard one-year warranty

## Options for the 35670A

### Opt. Description

- AY6 Add Two Channels (four total)  
1D0 Computed Order Tracking  
1D1 Real-Time Octave Measurements  
UK4 Microphone Adapter and Power Supply  
1D2 Swept-Sine Measurements  
1D3 Curve Fit and Synthesis  
1D4 Arbitrary Waveform Source  
1C2 Agilent Instrument BASIC  
AN2 Add 4 Mbytes Memory  
UFC Add 8 Mbytes Memory  
Note: Only one of option AN2 or UFC may be installed  
UFF Add 1 Mbyte Nonvolatile RAM  
1F0 PC-style Keyboard  
1F1 German Keyboard  
1F2 Spanish Keyboard  
1F3 French Keyboard  
1F4 UK Keyboards  
1F5 Italian Keyboard  
1F6 Swedish Keyboard  
AX4 Rack Mount Without Handles  
100 Software Bundle 1D0-1D4, UFC  
UK5 Carrying Case (for shipping)  
OB1 Additional Manual Set  
OBU Additional Agilent Instrument BASIC Manual Set  
OB3 Add Service Manual  
1BP Military Calibration (meets MIL 45662A)  
W30 Two Year Extended Service Contract

## To Upgrade Your 35670A

To add an option to your 35670A, order 35670U followed by the option number. Options AY6, AN2, UFC and UFF must be installed by Agilent Technologies. Option UE2 is available to upgrade instrument firmware to latest version, as appropriate.

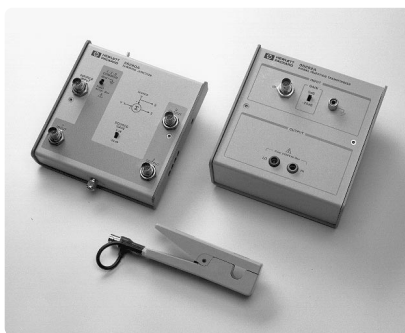
## Accessories

### DC Power Cables

The 35250A is a three meter cable terminated with lugs for connecting to most dc power sources. The 35251A is a three meter cable terminated with an adaptor that plugs into a cigarette lighter.

### For Testing Control Systems

The 35280A summing junction provides convenient dc to 1 MHz signal injection for most control loops. Use the 35281A clip-on transformer when it is not possible to temporarily open the loop, or use the 35282A signal injection transformer when secondary voltages are up to 600 Vpk.



# Summary of Features on Standard Instrument

## Instrument Modes

FFT Analysis Histogram/Time  
Correlation Analysis Time Capture

## Measurement

Frequency Domain  
Frequency Response Power Spectrum  
Linear Spectrum Coherence  
Cross Spectrum Power Spectral Density

Time Domain (oscilloscope mode)

Time Waveform Autocorrelation  
Cross-Correlation Orbit Diagram  
Amplitude Domain  
Histogram, PDF, CDF

## Trace Coordinates

Linear Magnitude Unwrapped Phase  
Log Magnitude Real Part  
dB Magnitude Imaginary Part  
Group Delay Nyquist Diagram  
Phase Polar

## Trace Units

Y-axis Amplitude: combinations of units, unit value, calculated value, and unit format describe y-axis amplitude

Units: volts, g, meters/sec<sup>2</sup>, inches/sec<sup>2</sup>, meters/sec, inches/sec, meters, mils, inches, pascals, Kg, N, dyn, lb, user-defined EUs

Unit Value: rms, peak, peak-to-peak

Calculated Value: V, V<sup>2</sup>, V<sup>2</sup>/Hz, V/√Hz, V<sup>2</sup>s/Hz (ESD)

Unit Format: linear, dB's with user selectable dB reference, dBm with user selectable impedance.

Y-Axis Phase: degrees, radians

X-Axis: hz, cpm, order, seconds, user-defined

## Display Formats

Single  
Quad  
Dual Upper/Lower Traces  
Small Upper and Large Lower  
Front/Back Overlay Traces  
Measurement State  
Bode Diagram  
Waterfall Display with Skew, -45 to 45 Degrees  
Trace Grids On/Off  
Display Blanking  
Screen Saver

## Display Scaling

Autoscale Selectable Reference  
Manual Scale Linear or Log X-Axis  
Input Range Tracking Y-Axis Log  
X & Y Scale Markers with Expand and Scroll

## Marker Functions

Individual Trace Markers  
Coupled Multi-Trace Markers  
Absolute or Relative Marker  
Peak Search  
Harmonic Markers  
Band Marker  
Sideband Power Markers  
Waterfall Markers  
Time Parameter Markers  
Frequency Response Markers

### Signal Averaging (FFT Mode)

Average Types (1 to 9,999,999 averages)  
*RMS* *Time Exponential*  
*RMS Exponential* *Peak Hold*  
*Time*

Averaging Controls  
*Overload Reject*  
*Fast Averaging On/Off*  
*Update Rate Select*  
*Select Overlap Process Percentage*  
*Preview Time Record*

### Measurement Control

Start Measurement  
Pause/Continue Measurement

### Triggering

Continuous (Freerun)  
External (Analog or TTL Level)  
Internal Trigger from any Channel  
Source Synchronized Trigger  
GPIO Trigger  
Armed Triggers  
*Automatic/Manual*  
*RPM Step*  
*Time Step*  
Pre- and Post-Trigger Measurement Delay

### Tachometer Input:

$\pm 4V$  or  $\pm 20V$  range  
40 mV or 200 mV resolution  
Up to 2048 pulses/rev  
Tach hold-off control

### Source Outputs

Random	Burst Random
Periodic Chirp	Burst Chirp
Pink Noise	Fixed Sine

Note: Some source types are not available for use in optional modes. See option description for details.

### Input Channels

Manual Range	Anti-alias Filters On/Off
Up-Only Auto Range	AC or DC Coupling
Up/Down Auto Range	LED Half Range and Overload Indicators
Floating or Grounded Transducer Power Supplies (4 ma constant current)	A-Weight Filters On/Off

### Frequency

20 Spans from 195 mHz to 102.4 kHz (1 channel mode)  
20 Spans from 98 mHz to 51.2 kHz (2 channel mode)  
Digital zoom with 244 mHz resolution throughout the 102.4 kHz frequency bands.

### Resolution

100, 200, 400, 800 and 1600 lines

### Windows

Hann	Uniform
Flat Top	Force/Exponential

### Math

$+$ , $-$ , $*$ , $/$	Conjugate
Magnitude	Real and Imaginary
Square Root	FFT, FFT <sup>-1</sup>
LN	EXP
$*j\omega$ or $/j\omega$	PSD
Differentiation	A, B, and C weighting
Integration	Constants K1 thru K5
	Functions F1 thru F5

### Analysis

Limit Test with Pass/Fail  
Data Table with Tabular Readout  
Data Editing

### Time Capture Functions

Capture transient events for repeated analysis in FFT, octave, order, histogram, or correlation modes (except swept-sine). Time-captured data may be saved to internal or external disk, or transferred over GPIB. Zoom on captured data for detailed narrowband analysis. Up to 750K samples of data can be saved in the standard unit.

### Data Storage Functions

Built-in 3.5 in., 1.44 Mbyte flexible disk also supports 720 KByte disks, and 128 Kbyte NVRAM disk. Both MS-DOS and HP-LIF formats are available. Data can be formatted as either ASCII or Binary (SDF). The 35670A provides storage and recall from the internal disk, internal RAM disk, internal NVRAM disk, or external GPIB disk for any of the following information:

Instrument Setup States	Trace Data
User-Math	Limit Data
Time Capture Buffers	Agilent Instrument BASIC Programs
Waterfall Display Data	Curve Fit/Synthesis Tables
Data Tables	

### Interfaces

GPIB (IEEE-488.1 and 488.2)  
Parallel  
RS-232C Serial

### Hard-Copy Output

To Serial or Parallel HP-GL Plotters  
To Raster Printers  
To Serial or Parallel HP-GL Printers  
To Disk File (Supports Raster Printer, HP-GL Plotter, and HP-GL Printer)  
Time Stamp

### GPIB Capabilities

Listener/Talker (Direct control of plotters, printers, disk drives)  
Conforms to IEEE 488.1/488.2  
Conforms to SCPI 1992  
Controller with Agilent Instrument Basic option

### Standard Data Format (SDF) Utilities

Exchange data between virtually all Agilent Dynamic Signal Analyzers  
Easy data transfer to spreadsheets  
Data transfer to MATRIX<sub>x</sub> and Matlab

SDF utilities run in an external PC

### Calibration & Memory

Single or Automatic Calibration  
Built-In Diagnostics & Service Tests  
Nonvolatile Clock with Time/Date  
Time/Date Stamp on Plots and Saved Data Files

### Online Help

Access to Topics via Keyboard or Index

### Fan

On/Off

### Agilent Technologies' Test and Measurement Support, Services, and Assistance

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

### Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications 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 capabilities, at no extra cost upon request. Many self-help tools are available.

### Your Advantage

Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and on-site education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

### For More Assistance with Your Test & Measurement Needs go to

[www.agilent.com/find/assist](http://www.agilent.com/find/assist)

Or contact the test and measurement experts at Agilent Technologies  
(During normal business hours)

**United States:**  
(tel) 1 800 452 4844

**Latin America:**  
(tel) (305) 267 4245  
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Innovating the HP Way