STANFORD RESEARCH SYSTEMS

SR760 and SR770 FFT SPECTRUM ANALYZERS

FFT SPECTRUM ANALYZERS

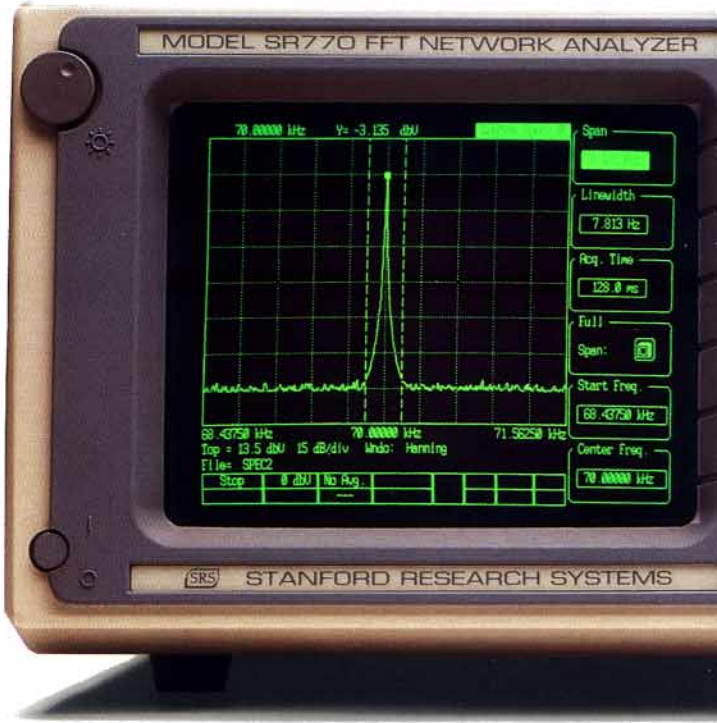
SR760
SR770

- **476 μHz to 100 kHz frequency range**
- **90 dB dynamic range (16 bit A/D)**
- **100 kHz real-time bandwidth**
- **Synthesized source (SR770) - sine, two-tone, white and pink noise, chirp**
- **Frequency response measurements to 100 kHz (SR770)**
- **THD, 1/3 octave, band and sideband analysis**
- **Direct plotting and printing**
- **3.5 inch MS-DOS compatible disk drive**
- **IEEE-488, RS-232, and printer interfaces**

The SR760 and SR770 FFT spectrum analyzers from Stanford Research Systems offer outstanding performance, easy operation and exceptional value. These analyzers are ideal for applications in audio and acoustic research, vibration analysis, control systems, sonar, electronic design, and general noise analysis. Both instruments are well suited for complex frequency domain measurements. The SR770 has a built-in synthesized source for measuring transfer functions of electronic and mechanical systems.

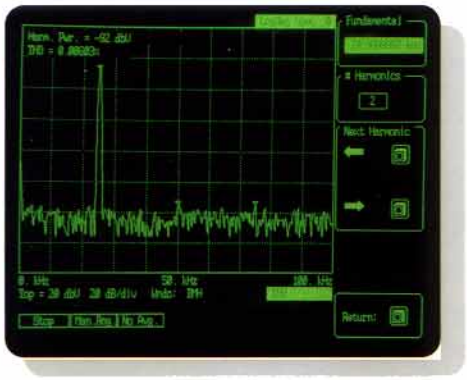
Outstanding performance

With a frequency range of 476 μHz to 100 kHz, and a dynamic range of 90 dB, these analyzers provide performance and versatility in the most demanding situations. The fast 100 kHz real-time bandwidth allows continuous processing of the input signal with no dead time between measurements, regardless of the frequency span. Measurements are taken up to 40 times faster than other analyzers, which typically have a real-time bandwidth of a few kilohertz, and cost up to three times as much.



Spectrum measurements

The spectrum and power spectral density (PSD) functions are used to measure the magnitude, phase, real or imaginary parts of complex signals. Data is displayed in single or dual screen format in units of Volts, Vrms, dBV, dBVrms or user defined engineering units. A choice of window functions including Hanning, Flattop, Uniform and Blackman-Harris optimize measurements for amplitude accuracy and frequency selectivity.



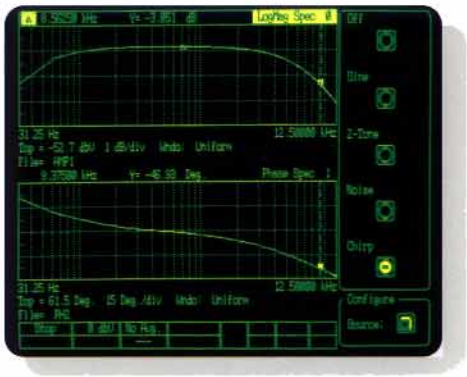
Harmonics of a 25 kHz sine wave are detected more than 90 dB below the fundamental.

Synthesized source

The SR770 includes a very low distortion (-80 dB), synthesized source used primarily for frequency response measurements. It generates single frequency sine waves, two-tone signals for intermodulation distortion (IMD) testing, pink and white noise for audio and electronic applications, and frequency chirps for transfer function analysis. This direct digital synthesis (DDS) source provides an output level from 100 µV to 1 V, and delivers up to 50 mA of current.

Frequency response measurements

The SR770 performs accurate frequency response measurements and is ideal for characterizing electronic and mechanical systems. The synthesized source is synchronized with the input sampling of the instrument allowing transfer functions to be measured with 0.05 dB precision. The SR770 measures the magnitude and phase response of control systems, amplifiers, filters and electro-mechanical systems and displays the resulting Bode plot.



The above transfer function shows the gain and phase characteristics of a bandpass filter.

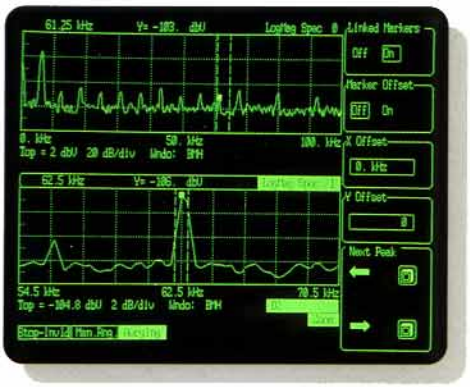
Octave analysis

Octave analysis computes the spectral power within 1/3 octave bands, and is often used in acoustical research and environmental noise measurements. Both 15 band and 30 band, 1/3 octave analysis is supported from band -2 (630 mHz) through band 49 (80 kHz). A-weighting compensation is also available.

1/3 octave analysis is useful for characterizing the audio response of rooms.

Marker functions

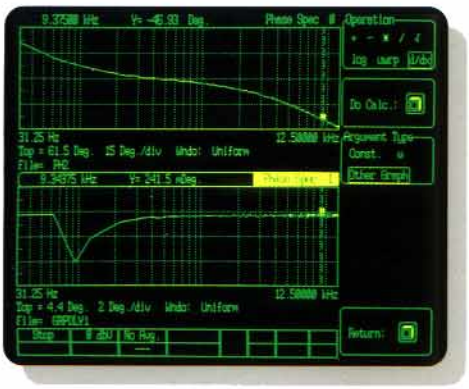
A fast, responsive marker reads the minimum, maximum or mean value of the variable width cursor. In delta-mode, changes in frequency and amplitude from a defined reference are measured. Max-find, peak-find, harmonic and sideband markers quickly locate components in the display.



Markers are used to identify spectral components of interest. Upper and lower displays have linked or independent markers.

On-screen analysis

Real-time analysis features add power and flexibility to signal measurements. Both harmonic power and total harmonic distortion (THD) are computed on harmonics up to 100 kHz. Sideband analysis quickly measures the power in a specified sideband relative to the carrier power, while band analysis integrates the power over a selected frequency range. Perform background subtraction, normalize data or measure group delay using the post acquisition math functions.



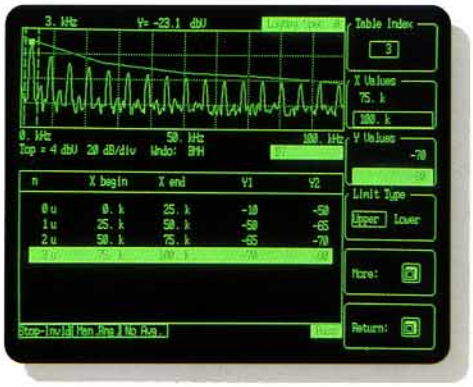
Group delay is calculated by differentiating the phase transfer function with respect to frequency.

Limit and data tables

Data tables display up to 200 selected frequencies in tabular format. Harmonics, sidebands or any frequencies of interest can be monitored. Limit tables provide convenient Go/No Go testing on up to 100 user defined upper and lower limits. When a limit is exceeded, an audio alarm, screen message and GPIB service request are generated.

Averaging

Up to 64,000 spectra can be averaged to improve the signal to noise ratio. RMS averaging reduces fluctuations of the input signal, while vector averaging reduces the random noise floor. In many cases, signals as small as 114 dB below full scale can be resolved. Linear, exponential and peak hold averaging are supported.



Defined upper and lower limits provide accurate GO/NO GO testing. Automated entry makes table setup a snap.

Triggering

Precise triggering is needed to capture transient events and preserve spectral phase information. The SR760 and SR770 can be triggered either internally or externally with adjustable pre- trigger and post-trigger delays.

Easy operation

Unlike most other analyzers, the SR760 and SR770 are simple to use. All functions are menu driven and supported with on-screen help. Softkeys select options within a menu, and the spin knob and alphanumeric keypad make parameter entry fast and easy.

Transient events are easily captured with either internal or external triggering.

Communication

All instrument functions can be controlled and read through the standard RS-232 and IEEE-488 computer interfaces. Traces, data tables, limit tables and instrument configurations can be stored and recalled using the 3.5 inch MS-DOS disk drive. Data is saved in either binary or ASCII format. Direct hardcopy outputs are available with dot matrix and LaserJet printers, as well as HP-GL compatible plotters.

Exceptional value

SR760 and SR770 FFT Spectrum Analyzers offer unmatched performance, versatility and value. For additional technical information please see the specifications on the following page or call SRS at (408)744-9040.

FREQUENCY

Measurement range	476 μHz to 100 kHz, baseband and zoomed.
Spans	191 mHz to 100 kHz
Resolution	Span/400
Center frequency	Anywhere within the measurement range subject to span and range limits.
Accuracy	25 ppm
Window functions	Hanning, Flattop, Uniform, Blackman-Harris.
Real-time bandwidth	100 kHz

AMPLITUDE

Input range	-60 dBV (1.0 mV pk) to +34 dBV (50 V pk) in 2 dB steps.
Dynamic range	90 dB
Harmonic distortion	No greater than -90 dB from DC to 50 kHz. No greater than -80 dB to 100 kHz.
Input sampling	16 bit A/D at 256 kHz
Accuracy	± 0.2 dB ± 0.003% of full scale
Averaging	RMS and vector modes. Linear and exponential averaging up to 64k scans.

SOURCE

(SR770 only)

Amplitude range	0.1 mV pk to 1.000 V pk
Amplitude resolution	1 mV pk (output > 100 mV pk) 0.1 mV pk (output ≤ 100 mV pk)
DC offset	< 10.0 mV (typical)
Output impedance	< 5 Ω, 50 mA peak output current.

Sine

Frequency range	DC to 100 kHz
Resolution	15.26 mHz
Amplitude accuracy	± 1% (0.09 dB) of setting
Spectral purity	-80 dBc, f <10 kHz -70 dBc, f ≥10 kHz (harmonics and sub-harmonics) < -100 dB full scale (spurious signals)

Two-tone

Frequency range	DC to 100 kHz
Resolution	15.26 mHz
Amplitude accuracy	± 1% (0.09 dB) of setting
Spectral purity	-80 dBc, f <10 kHz -70 dBc, f ≥10 kHz (harmonics and sub-harmonics) < -100 dB full scale (spurious signals)

White noise

Frequency range	DC to 100 kHz (all spans)
Flatness	< 1.0 dB pk-pk (rms averaged spectra)

Pink noise

Frequency range	DC to 100 kHz (all spans)
Flatness	< 4.0 dB pk-pk (using 1/3 octave analysis)

Chirp

	Output is equal amplitude sine waves at each frequency bin of the measurement span.
Flatness	< 0.05 dB pk-pk (typical) < 0.2 dB pk-pk (max)
Phase	Auto-phase function calibrates to current phase spectrum.

SIGNAL INPUT

Number of channels	1
Input	Single-ended or true differential
Input impedance	1 MΩ, 15 pf
Coupling	AC or DC
CMRR	90 dB at 1 kHz
Noise	5 nVrms/√Hz at 1 kHz typical (-166 dBVrms/√Hz)

TRIGGER INPUT

Modes	Continuous, internal or external.
Internal	Level: adjustable to ±100% of input scale. (Positive or negative slope)
External	Level: ± 5V in 40 mV steps. (Positive or negative slope) Impedance: 10 kΩ
Post-trigger	Measurement record is delayed by 1 to 64,000 samples (1/512 to 128 time records) after the trigger. Delay resolution is 1 sample (1/512 of a record).
Pre-trigger	Measurement record starts up to 52 ms prior to the trigger. Delay resolution is 4 μs.

DISPLAY FUNCTIONS

Display	Real, imaginary, magnitude or phase.
Measurements	Spectrum, power spectral density, time record and 1/3 octave, Bode plots (SR770 only).
Analysis	Band, sideband, total harmonic distortion.
Math functions	+, -, x, / with a constant, 2πf, or another trace. Log, √, d/dx and phase unwrap functions.
Graphic zooming	Display zooms up to 50x about any point in the display.

MARKER FUNCTIONS

Harmonic marker	Displays up to 400 harmonics of the fundamental.
Delta marker	Reads amplitude and frequency relative to defined reference.
Next-peak/harmonic	Locates nearest peak or harmonic to the left or right.
Data tables	Lists Y values for up to 200 user defined X points.
Limit tables	Automatically detects data exceeding user defined upper and lower limit traces.

GENERAL

Monitor	Monochrome CRT. 640H by 480V resolution. Adjustable brightness and screen position.
Interfaces	IEEE-488, RS-232 and Centronics printer interfaces standard. All instrument functions can be controlled through the IEEE-488 and RS-232 interfaces. A PC keyboard input is provided for additional flexibility.
Hardcopy	Screen dumps to dot matrix or LaserJet printers. Plots to HP-GL compatible plotters (RS-232 or GPIB).
Disk drive	3.5 inch MS-DOS compatible format, 1.4 mbyte capacity (720 kbyte for SR760). Storage of data and instrument setups (binary or ASCII). Screens can be saved to disk as PCX files.
Power	100/120/220/240 VAC, 50/60 Hz, 60 Watts.
Dimensions	17"W x 6.25"H x 16.5"L
Weight	36 lbs.
Warranty	One year parts and labor on materials and workmanship.

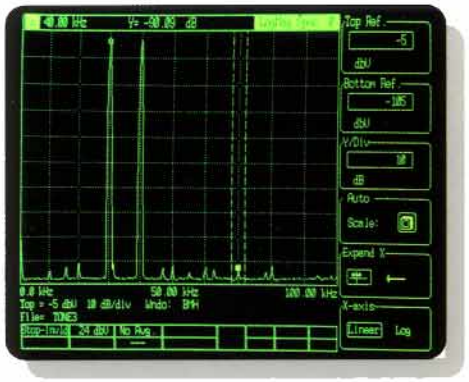
What to look for in an FFT spectrum analyzer

• A ***dynamic range*** of 90 dB means that an analyzer's spurious response is at least 30,000 times (90 dB) below full scale. When analyzing high performance electronic or mechanical systems it is often necessary to measure components that are 80 dB or even 90 dB below carrier. These small components disappear in the noise floor of an analyzer with only 70 dB dynamic range.

• ***Real-time bandwidth*** is equivalent to the highest frequency that can be continuously measured. At this frequency, the instrument's FFT calculation time is equal to the signal acquisition time. When measuring frequencies above the real-time rate, an analyzer will miss data due to 'processor overhead'. An analyzer with a 10 kHz real-time bandwidth, measuring a 100 kHz signal, misses 90 percent of the data. An analyzer with 100 kHz real-time bandwidth captures 100 percent of the data.

• ***Data analysis*** functions bring power and versatility to an analyzer. When you need to measure transfer functions, monitor total harmonic distortion, analyze power in a sideband, or normalize to a data file, your analyzer better be up to the task. If computer integration is necessary, standard interfaces like RS-232 and GPIB are a must.

The above trace shows a clean 2.5 kHz signal in a 390 Hz span with no averaging. Any nearby signal, such as 60 or 120 Hz sidebands, would be easily detected at a level of -110 dB below the carrier.



When a pure two-tone signal is analyzed, virtually no distortion is introduced by the instrument. The intermodulation distortion component at 70 kHz is -90 dBc. The trace also shows a noise floor more than 90 dB below full scale on full span.

• ***A precision source*** is required for accurate frequency response measurements, octave analysis, intermodulation distortion testing and many other measurements. The source should generate clean, precise functions like single and two-tone sine waves, white and pink noise, and chirps. Remember, what you put in determines the quality of what you get out. A source with -60 dB harmonic distortion may not be good enough.

Ordering Information

SR760
FFT Spectrum Analyzer
SR770
FFT Network Analyzer

Options
-0760RM Rack Mount Kit
-0760H Handle Kit

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