SR 770 Spectrum/Network Analyzer

A Spectrum Analyzer, or Network Analyzer, displays frequency on the X axis and Amplitude on the Y axis. By using a signal generator to sweep a frequency spectrum into a unit under test an analyzer can produce a curve of the units amplitude vs frequency.

The Stanford Research Systems SR770 FFT (Fast Fourier Transform) Spectrum Analyzer takes a time varying input signal, like you would see on an oscilloscope trace, and computes its frequency spectrum. Fourier's basic theorem states that any waveform in the time domain can be represented by the weighted sum of pure sine waves of all frequencies. What the spectrum analyzer does is represent the time domain signal by its component frequencies. In a FFT Analyzer the input signal is digitized at a high sampling rate, similar to a digitizing oscilloscope. The resulting digital time record is then mathematically transformed into a frequency spectrum using an algorithm known as the Fast Fourier Transform or FFT. The FFT is a clever set of operations which implements Fourier's basic theorem and results in a good approximation of the frequency spectrum and the resulting spectrum shows the frequency components of the input signal.

Using the SR 770

For obtaining the gain curve of the Johnson Noise Amplifier/Filter.

Note: Turning the analyzer on, while pressing the backspace key, will return it to the default settings.

The SR 770, like many analyzers, has a built in signal generator, typically called a tracking generator, that can be used to provide an input signal to a device under test. This generator will be used as the input to the Johnson Noise Amplifier/Filter to sweep through its frequency range and determine its gain curve, or transfer function.

The Johnson Noise JN-C Amplifier/Notch Filter produces a voltage gain of around 10,000 and it will start to distort with more than about 0.4mV at its input.

Open the Source menu and select Chirp output, then set the chirp level to 0.3 mV. The chirp output is a time varying sine wave meant for the FFT system and will not be very intelligible as an oscilloscope waveform. During its sweep the Chirp source provides an equal amplitude sinewave at each bin of the displayed spectrum.

Connect the source output to the amplifier’s input using the adapter box to change from the special BNC Twinax connector to a standard BNC. Connect the amplifier’s output to the SR770 Input A. Set the amplifier’s external power supply to +/- 7VDC and connect the amplifier power.

Open the Measure menu and select the Window menu, then select Uniform window.

Open the Input menu and select the Trigger menu. Select Source Trigger which is a special trigger mode that will work only with the SR 770's own source. Press <Return> to Go back to the main Input menu and then Press <Auto Offset> to select Off.

Open the Input menu. Set Auto Offset to off, Coupling to AC and Input Range to 8 dBV.

Open the Display menu and set Grid to 10 divisions.

Open the Measure menu and set Units to RMS or Peak then return.

go to Measure and set to PSD, then return

go to Display and select Linear Magnitude.

Open the Scale menu, set Top Ref to 20 mV and Y/div to 2 mV/Hz.

Open the Average menu, select Average Type as Vector, averages to 20 and Averaging On.

This will write a file in internal memory tabulating the relative (uncalibrated) gain vs frequency. To save data to the SR 770's floppy drive open the Store/Recall menu

In the Entry keypad press the ALT key to allow creating a file name using the alternate key symbols at the lower right corners of some of the keys. (this is messy) and press enter. Now press Save Data.