Spectrum Analyzer

1. Display & Function Keys

The Display Shows the Soft Keys for the Current Function, Frequency, Amplitude and Marker Information.
Function Keys Directly Correspond to the Soft Keys on the Operation of Display.

2. Operation Keys

The Operation Keys Usually Include Main Function Keys, Control Keys, State Keys, System Keys and Marker Keys.

3. Arrow/Numeric Pad/Scroll Wheel

The Numeric Keypad is Used to Enter Values and Parameters.
It is Often Used in Conjunction with the Arrow Keys and Scroll Wheel.

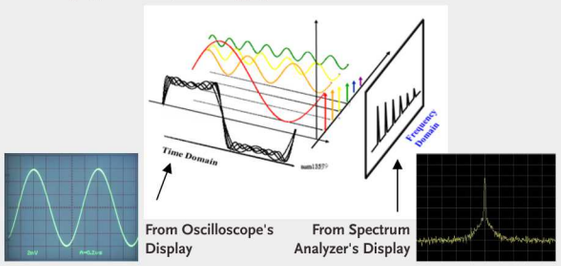
4. RF Input Terminal

RF Input Port. Accepts RF Inputs Through Antenna, RF Cable or Another Components.

A An Introduction to Spectrum Analyzer

1. Why to Proceed in Spectrum Analysis?

In the typical time-domain analysis, one can easily inspect the event of signal waveform along the time axis as long as using oscilloscope to measure electronic signal event with any time function in terms of instantaneous physical variable. To fully analyze and clarify characteristics of desired signal, except using an oscilloscope to inspect signal from time-domain, one needs to analyze the desired signal from frequency-domain. Usually one can use an oscilloscope to capture a signal without integrity; one can only find the aggregated waveform.



From Oscilloscope's Display

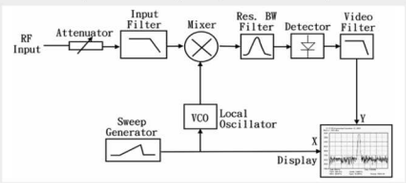
From Spectrum Analyzer's Display

2. The Primary Settings for Spectrum Analyzer

Frequency Resolution Sweep Time

* Frequency range: To display the frequency range can be implemented by setting the starting frequency and cutoff frequency (frequency maximum and minimum).
* Level display range: Setting this range can facilitate to illuminate the depiction and interval of maximum level.
* Frequency resolution: When manipulating spectrum analyzer in the way of heterodyne principle, the frequency resolution can be set through IF Filter bandwidth or RBW.
* Sweep Time: This item is primarily set in heterodyne type of spectrum analyzer, which means to record the time to cover the entire frequency range, and it is called Sweep Time.

3. The Structure of Super-heterodyne Spectrum Analyzer



* **Input Attenuator :** The first part of our analyzer is the RF input attenuator. Its purpose is to ensure the signal enters the mixer at the optimum level to prevent overload, gain compression, and distortion.
* **Mixer :** Mixers are 3 Port active or passive devices. They are designed to yield both, a sum and a difference frequency at a single output port when two distinct input frequencies are inserted into the other two ports.
* **Local Oscillator :** A local oscillator is an electronic device used to generate a signal normally for the purpose of converting a signal of interest to a different frequency using a mixer.
* **Resolution Bandwidth :** Resolution bandwidth (RBW) filters are band-pass filters located in the spectrum analyzer's final IF stages. They determined how well closely spaced signals can be separated.
* **Detector :** The simplest form of envelope detector is the diode detector that consists of a diode connected between the input and output of the circuit, with a resistor and capacitor in parallel from the output of the circuit to the ground. In a spectrum analyzer, the input to the envelope detector comes from the final IF, and the output is a video signal.
* **Video Bandwidth :** The cutoff frequency (3 dB point) of an adjustable low pass filter in the video circuit. When the video bandwidth is equal to or less than the resolution bandwidth, the video circuit cannot fully respond to more rapid fluctuations of the output of the envelope detector.

B The Key Specifications of Spectrum Analyzers

1. Frequency Range :

Selecting a spectrum analyzer for a measurement requires designate frequency range, like 1GHz, 2.4GHz, and so on. Therefore, the frequency range is the first consideration for most applications.

2. Noise Floor :

Noise floor is the bottom noise level when no signal is detected by the spectrum analyzer. It represents the lowest signal level that the spectrum analyzer can measure.

3. Spurious Noise :

Circuit noise or interference that looks like a signal occurs even without an input signal due to spurious noise of the spectrum analyzer.

4. Phase Noise :

Phase noise is the frequency domain representation of rapid, short-term, random fluctuations in the phase of a waveform, caused by time domain instabilities.

5. Inter-Modulation :

Third order inter-modulation occurs with a two-tone input signal, a signal with two frequencies or two signals with different frequencies that are fed into a spectrum analyzer at the same time.

* When the input signal frequencies are f1 and f2, the harmonics are as follows.

Input	output	
f1,f2	fundamentals	f1,f2
2nd	order harmonics	2f1,2f2,f1±f2,
3rd	order harmonics	3f1,3f2,2f1±f2,2f2±f1
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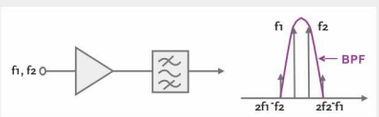
* Third Order Harmonics of 2f1-f2 and 2f2-f1.

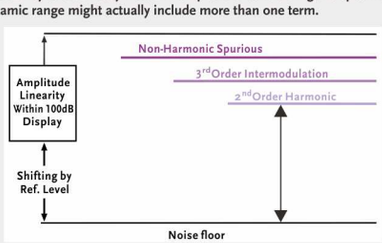


* An example is provided as below:

	Harmonics	1	2	3
Input Frequency	100, 110	**100, 110**	···	300, 330, 310, 320, 90, 120
	100, 101	**100, 101**	···	300, 303, 301, 302, 99, 102
	100, 100.1	100, 100.1	···	300, 300.3, 300.1, 300.2, 99.9, 100.2

6. Dynamic Range :

Different companies use different definitions for dynamic range, but actually they all point to the same thing; the ability to accurately measure amplitude. Considering the specifications introduced above, the dynamic range might actually include more than one term.



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