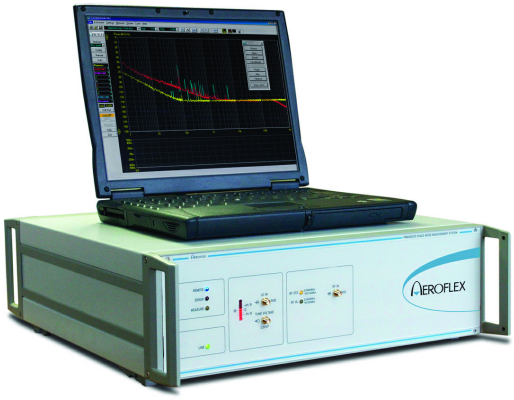
Phase Noise

PN8000



LOW COST automated crystal oscillator / PLL synthesizer phase noise test system

The PN8000 is a low cost compact phase noise test set, designed for simple measurement of crystal oscillator and synthesizer source phase noise measurements.

The PN8000 is a system similar to the PN9000, designed for customers who do not need the additional performance of the PN9000 or PN9500 options.

The PN8000 uses the Reference Phase Locking Method exclusively, to detect DUT phase noise.

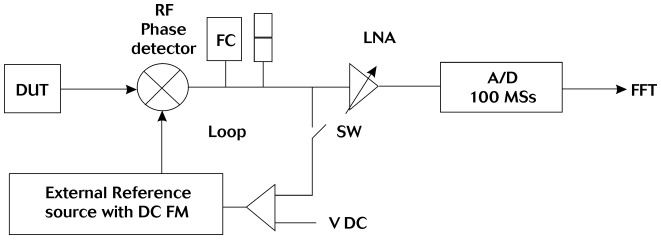
The instrument measurement requires only an additional reference source, which could be either a crystal oscillator or a synthesizer, controlled by the instruments DC-FM tune port.

The PN8000 comes with similar software to the WPN9000, used on the PN9000 test set.

PN8000 Base System

The PN8000 measures sources from 2 MHz up to 1.8 GHz (18 GHz optional). All necessary hardware is included for real time offset span analysis from 0.1 Hz up to 1 MHz (20 MHz optional).

Base System Operating Diagram



Using the built-in frequency counter, the LO reference source is tuned to the DUT frequency, while the switch 'SW' is in the open position. Then the beat signal between DUT and reference is used to calibrate the phase detector transfer function. Built-in automated functions measure the DUT frequency and tune the LO reference source to the same frequency.

Loop Bandwidth and LO Reference FM Deviation can be measured and adjusted, depending on the expected noise and stability of the DUT. For most PLL synthesizers, a few hundred Hz is a convenient average value, but large loop bandwidths of a few kilo-Hertz are also possible. Then, by closing the loop (i.e. switch 'SW' ON), the LO reference source will be phase locked to the DUT; the RF/LO phase detector inputs will be automatically set in phase quadrature, which provides phase demodulation of the combined noise of the DUT and the LO reference source. An LED indicator graph will then show a single stable segment, indicating the locked condition.

The LNA, with auto-gain, will amplify the noise to the right amplitude to be digitized by the A/D converter, then an FFT calculation is processed and the phase noise spectrum is displayed on the monitor. The measurement loop bandwidth is fully compensated automatically to display the proper measurement response, as close as 0.1 Hz offset from the carrier. The LO reference source will not impact the measurement if it is more than 10 dB better than the DUT's and

adds about 1 dB uncertainty if it is about 6 dB better. In the typical setup, the system residual noise (i.e. measurement noise floor) will be limited by the LO reference source performance.

ATE / Remote control compatible through GPIB, TCP/IP or RS232 (optional).

Residual system noise, not including the reference source, is -178 dBc/ Hz with the high level RF phase detector.

SPECIFICATIONS

Frequency Range

2 MHz to 1.8 GHz (18 GHz optional)

Offset Analysis

0.1 Hz to 1 MHz (20 MHz optional)

Measurement Accuracy

±2 dB up to 20 MHz

Reference Tuning Voltage

±20 Volt with 5 mV resolution

Phase Lock Loop Gain

Proportional and Integral (DUT drift compensation)

Loop Compensation

Automatic (can be disabled)

Phase Noise

Typical values for nominal RF & LO input levels

Parameters	***Standard RF***	***Option: High Level RF***
Frequency range, GHz	*0.002 to 1.8*	*0.002 to 1.6*
RF Input min. dBm	*-20*	*+10*
RF input max. dBm	*+10*	*+20*
LO input min. dBm	*0*	*+10*
LO input max. dBm	*+10*	*+20*
RF input Gain, dB	*-10, 0, 10, 20*	*0, 10*
LO input Gain, dB	*0, 10*	*0, 10*
Noise floor, in dBc/Hz at 1 Hz offset	*-130*	*-140*
10 Hz	*-140*	*-150*
100 Hz	*-150*	*-160*
1 kHz	*-160*	*-170*
10 kHz	*-168*	*-178*
100 kHz & 20 MHz	*-168*	*-178*
Nominal RF input level, dBm	*+6*	*+16*
Nominal LO input level dBm	*+7*	*+17*

For specified values add +3 dB . For RF levels <nominal value, the noise floor will increase by the number of dB below the nominal value. For example, for 0 dBm RF input, instead of +6, the typical system residual noise is,at 10 kHz offset : -168 dBc/Hz + 6 dB = -162 dBc/Hz

Spurious level

- 110 dBc, above 2 kHz offset

Built-in Counter, DUT, Reference LO

2 MHz to 1.8 GHz

IF/Beat

0.3 Hz to 400 kHz

TEMPERATURE & HUMIDITY

Operating

0 to +50°C

Storage

-40 to +75°C. Up to 95 % non-condensing

Software and manual on CDROM (Computer is not included, but available as an option)

Minimum computer requirements

Pentium III

Windows XP Pro

256 MB RAM minimum

CD ROM drive

100 MB free disk space

Parallel port (printer should use USB)

RS-232 port

PN8000 Options

PN9348-10	*18 GHz Microwave Phase Detector*
PN9490-10	*1 to 20 MHz span extension*
PN9630-00	*Desktop controller*
PN9635-02	*Notebook controller*
PN3100-10	*Frequency stability measurements*
PN9692-80	*ATE remote control*

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