

APPH6000-IS400 Specification V1.1

A Modular High-Performance Cross-Correlation
Signal Source Analyzer with internal reference sources for
5 MHz to 400 MHz



Introduction

The APPH6000 is a single-instrument solution that offers an indispensable set of measurement functions for evaluating RF signal sources such as crystal oscillators, PLL synthesizers, clocks, phase-locked VCOs, DROs, and many others.

The instrument provides a complete set of measurement such as phase noise measurement, AM noise measurement, residual noise characterization or direct access to the FFT analyzer for baseband signal and (LF) noise analysis.

Using proven cross-correlation measurement procedures and self-calibration routines, reproducible, and accurate measurements are obtained even under changing environmental conditions. Fully automated frequency acquisition and self-calibration greatly simplify use and applicability of the instrument, resulting in much faster measurement throughput and greater ease-of-use in actual operation.

It is a compact and powerful instrument available with LAN (VXI-11), USBTMC, or with GPIB (optionally) interfaces. Platform independent intuitive graphical user interface (GUI), API library, and powerful SCPI command language set is available.

Measurement supported:

- Additive or residual phase noise measurement
- Use of INTERNAL or EXTERNAL references
- Amplitude noise measurements
- FFT analyzer mode

Specifications

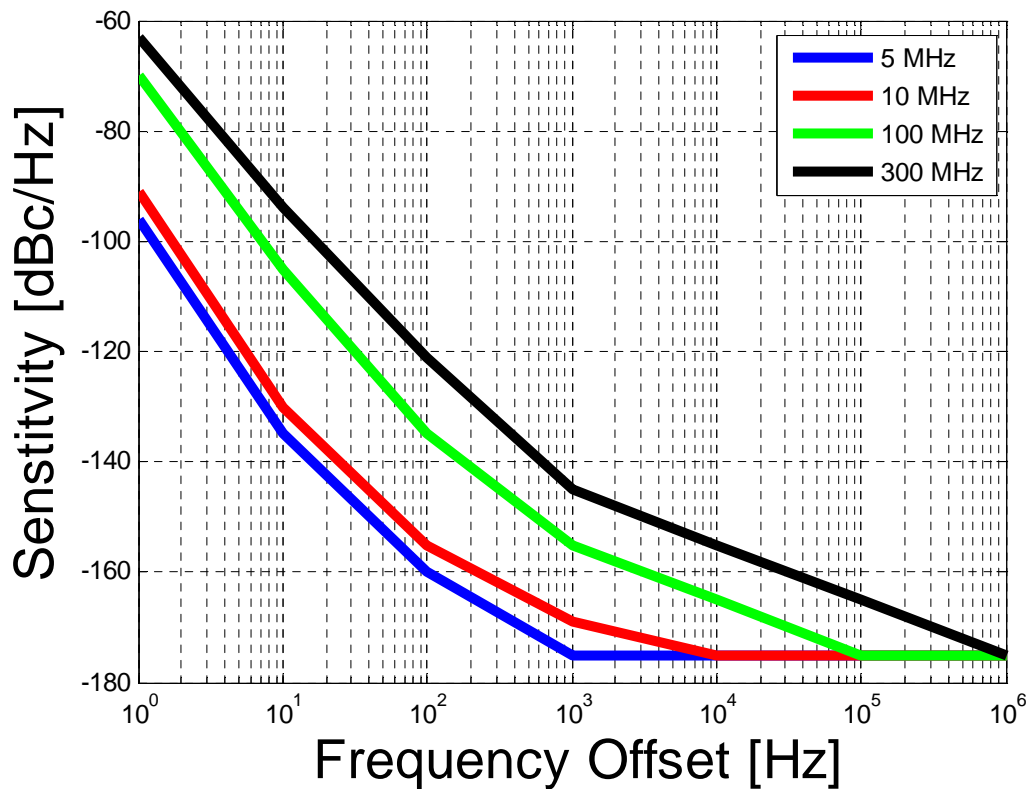
The specifications in the following pages describe the warranted performance of the signal generator for $25 \pm 10^\circ\text{C}$ after a 30 minute warm-up period. Typical specifications describe expected, but not warranted performance. Min and Max specifications are warranted.

Parameter	Min.	Typ.	Max.	Note
RF Input Section				
RF Frequency Range	5 MHz 5 MHz		6 GHz 400 MHz	External Refs Internal Refs (work down to 2 MHz)
Input Power Range	-5 dBm -3 dBm	+5 dBm	+ 18 dBm + 18 dBm	
Input impedance VSWR		50 Ω	2	
Offset Analysis Range	0.1 Hz 0.01 Hz		1 MHz 40 MHz	See APPH6o4o/APPH2oG
Phase Noise Measurement				
Measurement Accuracy		± 4 dB ± 3 dB ± 2 dB		< 10 Hz offset < 1 kHz offset > 1 kHz
Residual Phase Noise Floor				
1 Hz 10 Hz 100 Hz 1 kHz 10 kHz 1 MHz		-140 dBc/Hz -150 dBc/Hz -160 dBc/Hz -165 dBc/Hz -172 dBc/Hz -172 dBc/Hz		Absolute system noise floor (cross-correlation applied, external references)
Measurement time				See Table "Measurement Time"
Internal References				
Frequency Range	2 MHz		400 MHz	
Spurious level		-75 dBc		
Phase Noise Sensitivity				See Table & Plot "Sensitivity"
Tracking Range (adaptive)		± 100 ppm		of center frequency, carrier and offset frequency dependent
External References				
Frequency Range	5 MHz		6.5 GHz	
Reference Level Range	+8 dBm	+13 dBm	+ 18 dBm	
Tuning Voltage Range	0 V		+15 V	
Output current			10 mA	

Baseband Input Range Input Impedance Voltage noise density	-12 V	1 k Ω 1.2 nV/ $\sqrt{\text{Hz}}$	+ 12 V	DC Input shorted, f > 1 kHz
Supply Voltage Range (Supply 1 & 2)	0 V		+5 V	
Resolution		10 mV		
Output current			140 mA	
Noise Density		<10 nV/ $\sqrt{\text{Hz}}$		f > 100 Hz
AM Noise Measurement				
RF input range	5 MHz		7 GHz	
Offset range	10 Hz		2 MHz	
1 kHz 10 kHz noise floor		-145 dBc/Hz -170 dBc/Hz -170 dBc/Hz		Absolute system noise floor (cross-correlation applied, external references)
FFT Analyzer				
Offset range	10 Hz		1 MHz	
Input Noise Density		< 2 nV/ $\sqrt{\text{Hz}}$		F > 100 Hz

Phase Noise Sensitivity (dBc /Hz)

Measurement time ~25 seconds, after first cross-correlation; further correlations will improve sensitivity by 5 dB by for 10, 10 dB for 100, and 15 dB for 1000 respective correlations performed down to system noise floor.

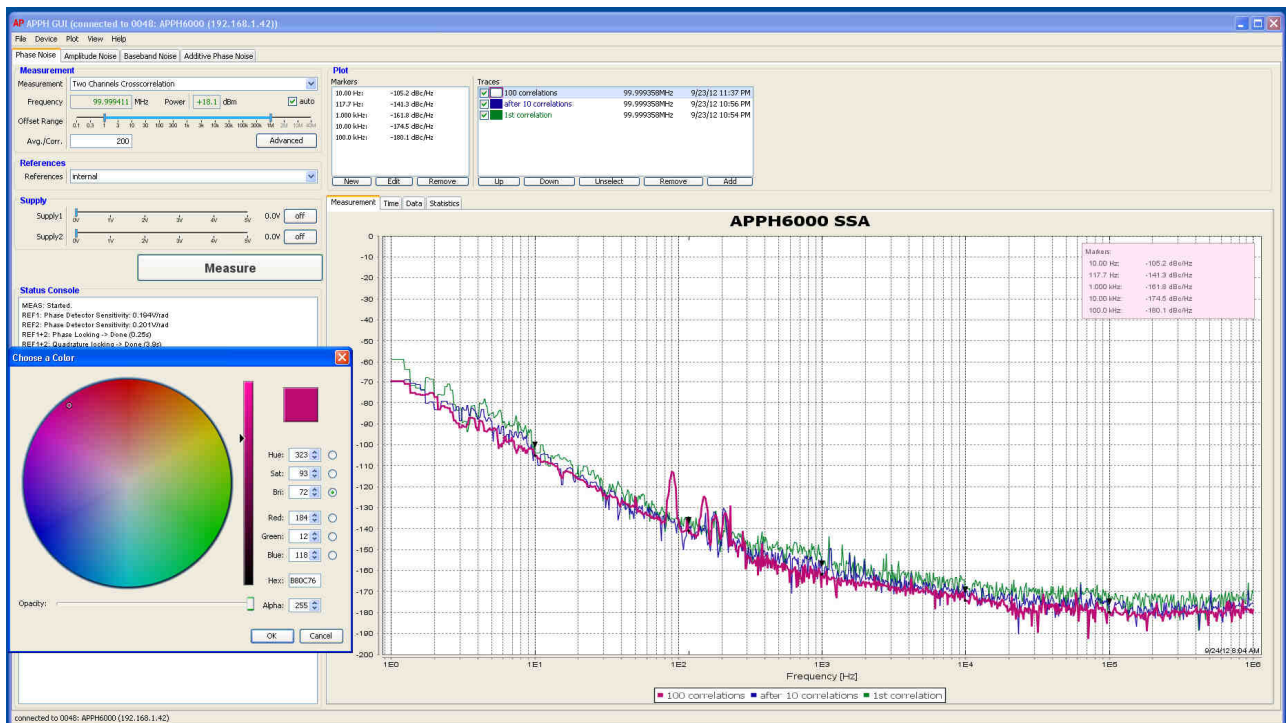


Measurement Time

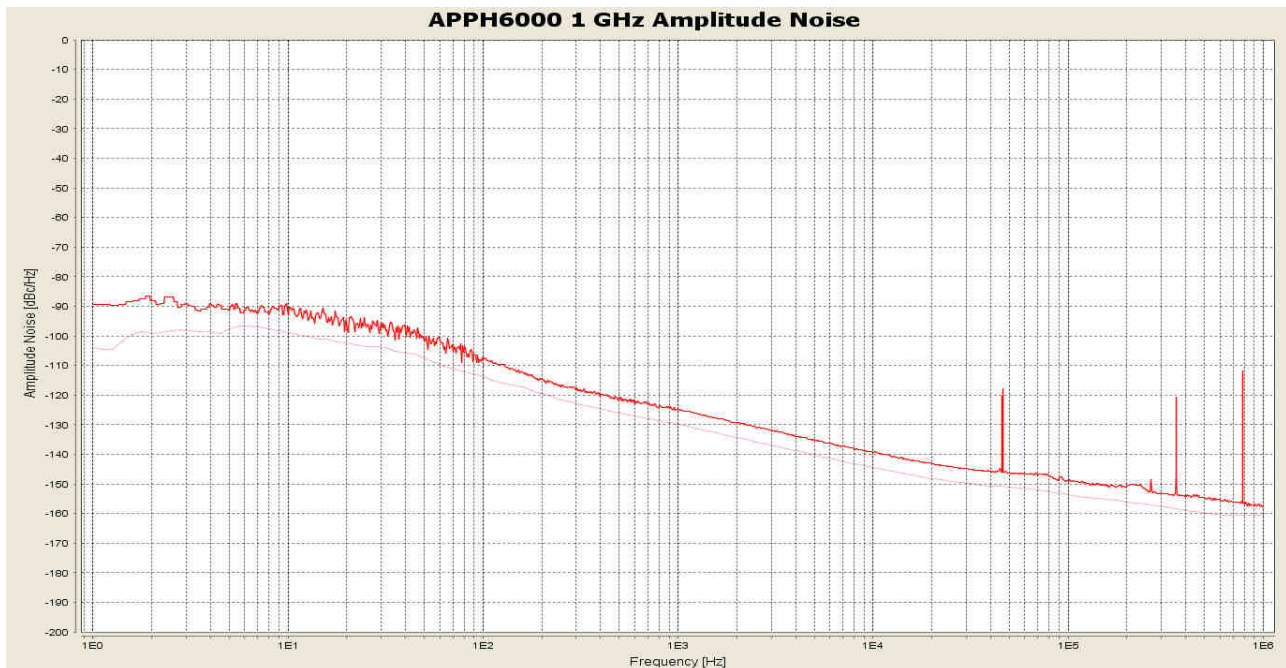
Total measurement time consists of setup time plus the number of performed correlations times the time per correlation (Pentium Dual Core, 3 GHz)

	Typical setup time (sec)	Time per average (sec)	Nr. of points
0.1 Hz to 1 MHz	3	115	~ 1400
1 Hz to 1 MHz	3	12	~ 1200
10 Hz to 1 MHz	3	1.7	~ 1000
100 Hz to 1 MHz	3	0.5	~ 800
1 kHz to 1 MHz	<2	0.2	~ 600
10 kHz to 1 MHz	<2	<0.1	~ 400

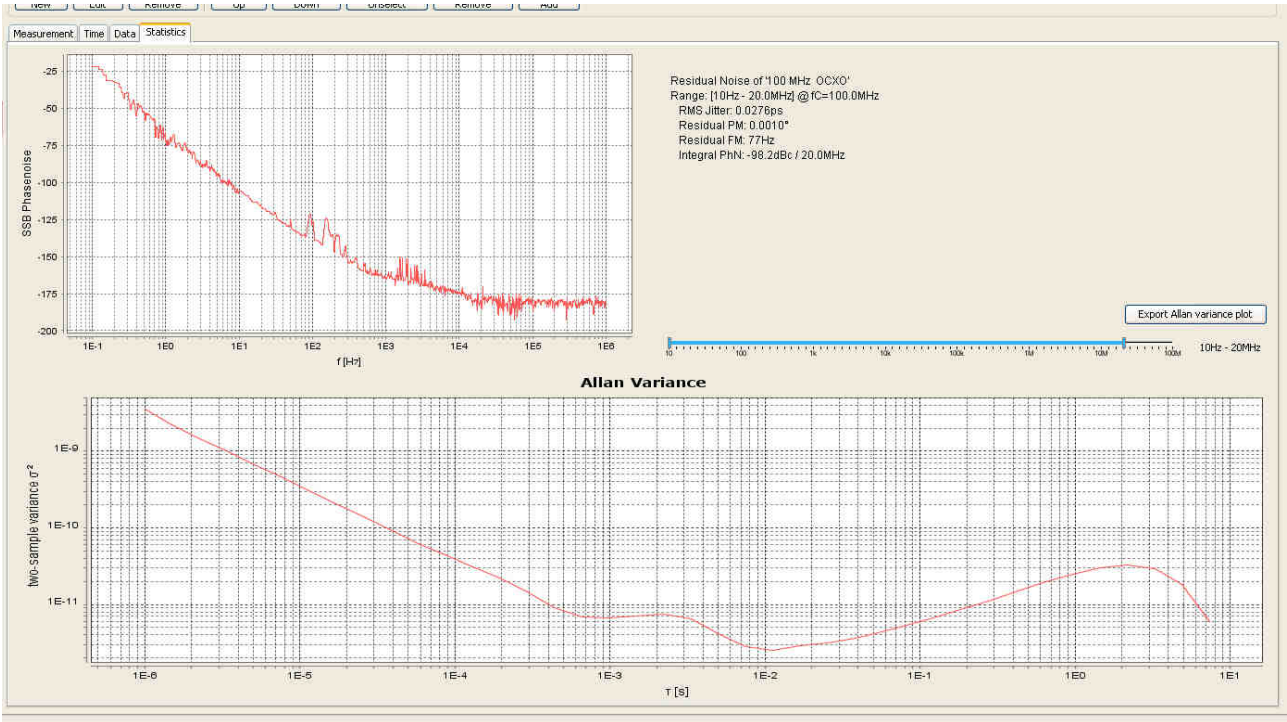
GUI Interface (internal sources measuring OCXO at 100 MHz)



GUI Interface AM Noise Measurement

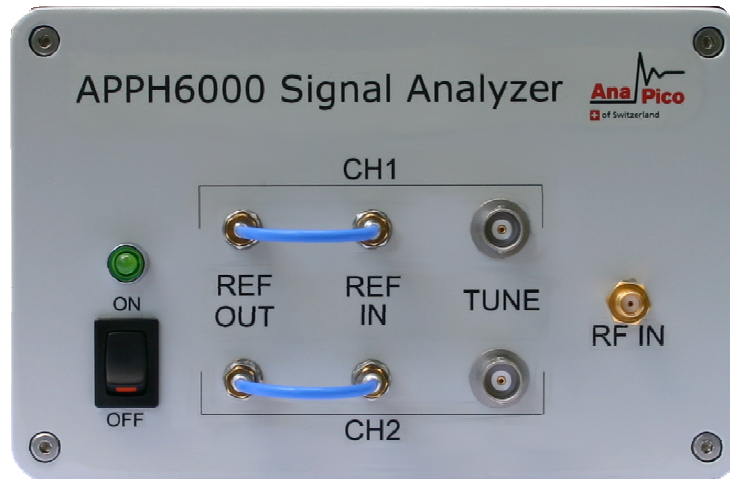


GUI Interface Statistic Data Display (Jitter, Allan Variance)



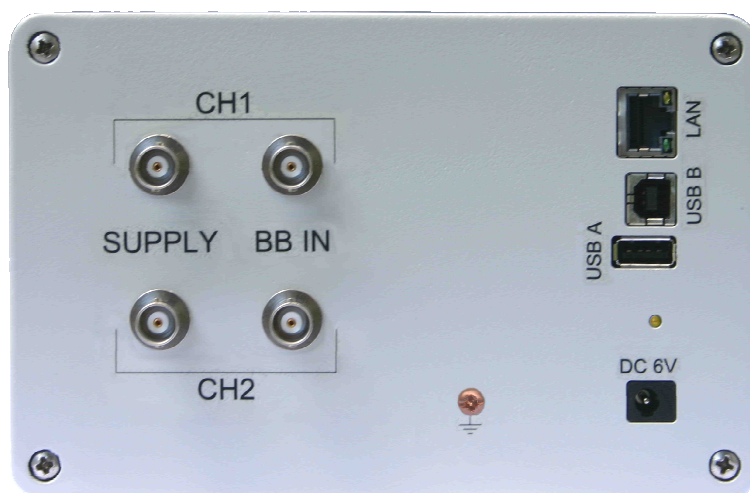
Connectors

1. RF inputs: , RF IN, REFIN1, REFIN2, REFOUT1, REFOUT2 : SMA female
2. Tuning outputs: Tune1, Tune2 : BNC female
3. DC power switch



Connectors (Rear)

1. Supply outputs: Supply1, Supply2 : BNC female
2. Baseband inputs: BBIN1, BBIN2) BNC female
3. LAN connection: RJ-45
4. USB 2.0 host and device
5. DC Power plug (6V, 2.5A)



General Characteristics

Remote programming interfaces
Ethernet 100BaseT LAN interface,
USB 2.0 host & device
GPIB (IEEE-488.2,1987) with listen and talk (optional)
Control language SCPI Version 1999.0

Power requirements 6 VDC; 20 W maximum
Mains adapter supplied: 100-240 VAC in/ 6V 2.5A DC out
Operating temperature range 0 to 45 °C
Storage temperature range -40 to 70 °C
Operating and storage altitude up to 15,000 feet

CE notice
Safety/EMC complies with applicable Safety and EMC regulations and directives.

Weight ≤ 3 kg (6 lbs) net
Dimensions

Document History

Version/Status	Date	Author	Notes
V10	2012-05-10	jk	first release
V10	2012-09-10	jk	Added sensitivity plots, reworked sensitivity specs for 