

3120A

High-Performance Phase Noise Test Probe



Key Features

- Independent input and reference frequencies from 0.5 MHz to 30 MHz
- Cross-correlated measurements of PM noise at offsets from 1 Hz to 100 kHz
- Allan deviation (ADEV) typically less than $1E-13$ at $t=1s$
- SFDR specified at -100 dBc, typically below -120 dBc
- Frequency and phase difference graphs depict oscillator drift with 1 million+ point records
- Includes digital I/O expansion port and independent access to input ADCs
- Easy-to-use measurement software, fully multithreaded for high performance
- Straightforward ASCII file format with flexible data import/export options

Optional Features (Available as a Software Upgrade)

- AM Noise License
- Signal Statistics License for MDEV, HDEV, TDEV, and jitter measurements
- Frequency Counter License
- Mask Test License
- User-definable limit lines for all supported measurements take the guesswork out of pass/fail testing

Key Benefits

- Measurement results displayed within seconds
- Supports measurements with input and reference at different frequencies
- Cost effective solution
- No measurement calibration required: saves time
- Easy to use software with an intuitive graphical user interface
- Small form factor

Accurate, Cost Effective Measurements in Seconds

The Microsemi®-developed direct digital phase noise measurement technique has been extended to a test probe. Making accurate phase noise and Allan deviation measurements has never been more cost effective. The programmable high-performance Microsemi 3120A Phase Noise Test Probe measures the amplitude, phase and frequency stability of RF sources and two-port devices at frequencies from 0.5 MHz to 30 MHz.

Measurements made by the 3120A include the following:

- Real-time 'strip charts' of phase and frequency differences with sub-picosecond (ps) precision.
- Absolute frequency counts at 13+ digits per second, 17 digits maximum (upgrade option)
- Allan deviation (ADEV) typically less than $1E-13$ at $t=1s$
- Modified Allan deviation (MDEV), Hadamard deviation (HDEV), and time deviation (TDEV) (upgrade option)

- RMS-integrated Phase Noise and Phase noise at offsets from 1Hz to 100 kHz and levels below -170 dBc/Hz (upgrade option)
- AM noise at offsets from 1 Hz to 100 kHz and levels below -170 dBc/Hz (upgrade option)
- RMS-integrated time jitter with less than 100 fs residual jitter from 1 Hz to 100 kHz (upgrade option)

All measurements made with the 3120A require a host PC and an external reference oscillator to be supplied by the user.

Virtually all aspects of measurement performance—accuracy, repeatability, noise floor, and spurious responses—depend on the ability to provide the best reference signal possible, such as a standalone low-noise OCXO for phase noise and AM noise measurements.

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Figure 1 shows a screen capture view of the 3120A Phase Noise Test Software that is shipped along with the product. 3120A Phase Noise Test Software runs on Intel® or AMD® x86-based PCs equipped with Microsoft Windows® XP SP2, Windows 7, or Windows 8. Minimum system requirements are 100 MB of disk space, 1 GB RAM and a CPU with SSE2 support. A dual- or quad-core processor is strongly recommended.

Traditional analog measurement instruments require an external phase-lock loop, turning these types of measurements into a complicated and costly endeavor. Compare this to the 3120A, which makes fast yet accurate single sideband (SSB) carrier/noise ratio and ADEV measurements at the click of the button, all at a fraction of the cost of alternative solutions.

Microsemi's 3120A continues the easy to use paradigm that Microsemi established with its earlier test sets. By simply connecting the device under test (DUT) and an external reference signal to the probe, which is connected to a Windows PC via a USB interface, the user can start taking measurements.

The 3120A leverages the extensive knowledge and experience obtained by Microsemi during the development of the industry standard for phase noise and ADEV measurements.

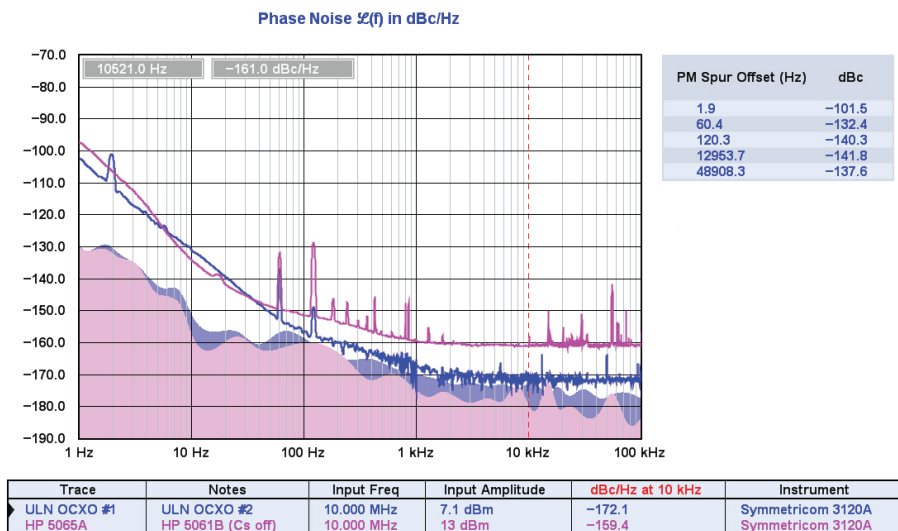


Figure 1: Screen view of the 3120A Test Probe Software

Recent advances in high speed, low noise analog to digital converters, have allowed the combination of multiple measurement tools to be integrated into a one probe chassis that connects to a PC. This enables the 3120A to make accurate measurements while remaining cost effective.

The 3120A follows the paradigm shift begun by the Microsemi 5120A to the way phase noise and ADEV measurements are made. With the 3120A, these measurements are now more cost effective in both R&D and production environments.

Benefits of an All-Digital Test Set

The 3120A combines sophisticated timing technologies into a single, advanced measurements instruments. As shown in figure 2, upon entry to the unit, the DUT and reference signals are immediately converted to their digital representations. This allows the 3120A to make accurate measurements without the need for an external phaselock loop, enabling calibration-free measurements.

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3120A Software Licensing Options

The base model of the 3120A allows customers to measure phase noise and ADEV. Upgradeable software options for customers to measure AM noise, HDEV, MDEV, TDEV, and jitter, along with the ability to set test mask limits or to use the probe as a frequency counter are available.

Upon purchase customers will be provided a software license key based on their specific option choices. Once a license key has been used with the test probe for the first time, it is not necessary to re-enter the license key information, even if the probe is used with a different computer.

AM Noise Measurement Floor

This option allows the 3120A to measure the AM noise spectrum of the input signal. Results are displayed in dBc/Hz at offsets from 1 Hz to 100 kHz, with typical instrument noise below -165 dBc/Hz at 10 kHz (-160 dBc/Hz specified performance). Applications include evaluation of high-performance HF oscillators, signal generators, and frequency standards, as well as residual AM measurement of distribution amplifiers and other two-port devices.

Signal Statistics – HDEV, TDEV, MDEV Measurement and Jitter

The Signal Statistics option provides additional statistics for advanced stability monitoring and characterization. These include modified Allan deviation (MDEV), Hadamard deviation (HDEV), and time deviation (TDEV) for frequency stability measurements, as well as jitter, residual FM, and SSB carrier/noise levels between user-specified integration limits in phase noise measurements. As with all of the 3120A's standard measurement views, results are displayed and updated in real-time.

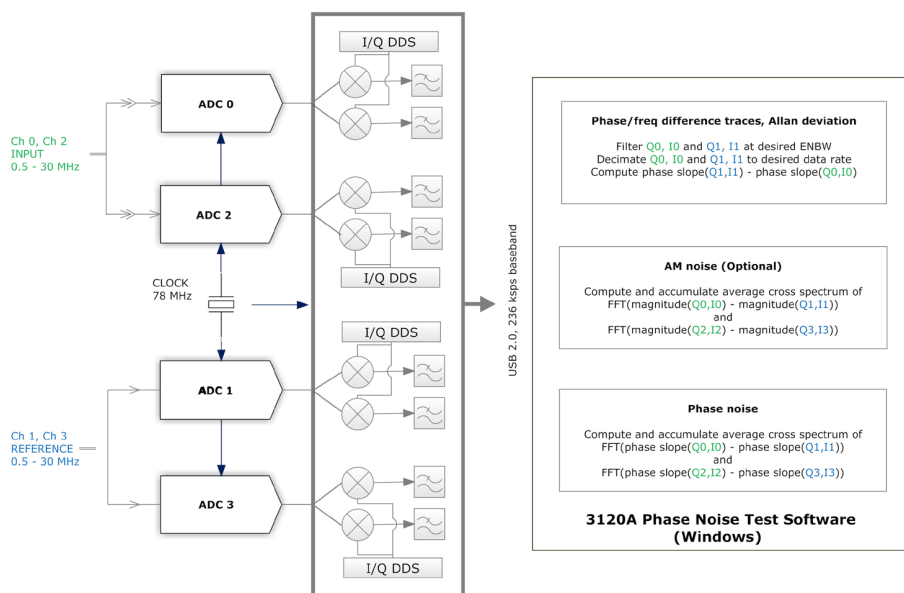


Figure 2: 3120A Block Diagram

Frequency Counter

This option adds a real-time chart of absolute frequency measurements to the Frequency Difference graph. The chart is continuously updated at averaging times from less than one second to over 1000 seconds. Accuracy is determined solely by the external reference, with usable precision typically greater than 13 digits per second. The Frequency Counter option turns the 3120A into a dramatically superior alternative to traditional counters in high-performance HF measurements, including calibration of atomic frequency standards and ultra-high performance HF oscillators.

Mask Test

The Mask Test option takes the visual guesswork out of performance optimization and production testing. With this option, measurements made by the 3120A are automatically evaluated against user-definable limit lines for phase noise, AM noise, Allan deviation, and other graph types. Pass/fail results and margins are continuously updated in the graph legend table as the measurement progresses.

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Specifications

PERFORMANCE

| | |
|---|--|
| • Input frequency range | 0.5 - 30 MHz (sine wave) |
| • Input frequency and level | 0.5 MHz - 30 MHz, -5 dBm to +20 dBm, 50 ohm TNC-F |
| • Reference frequency and level | 0.5 MHz - 30 MHz, -5 dBm to +20 dBm, 50 ohm TNC-F |
| • Input/reference | VSWR (0.5-25 MHz) 1.5:1 or better |
| • Input/reference port isolation (10 MHz) | 130 dB or better |
| • Maximum allowed DC at any RF input | +/- 5V |
| • Allan deviation (5 MHz-25 MHz, t=1s) | 1E-13 minimum, 5E-14 typical (50 Hz ENBW) |
| • Allan deviation (5 MHz-25 MHz, t=1000s) | 5E-15 minimum, 1E-15 typical |
| • Phase stability (5 MHz) | Less than 10 ps/hour after 2 hour warmup. Typically below 3 ps/hour |
| • Residual phase noise floor (5 MHz, 1 Hz) | -140 dBc/Hz minimum, <-145 dBc/Hz typical |
| • Residual phase noise floor (25 MHz, 1 Hz) | -130 dBc/Hz minimum, <-135 dBc/Hz typical |
| • Residual phase noise floor (5 MHz, 10 Hz) | -170 dBc/Hz minimum, <-175 dBc/Hz typical |
| • Residual phase noise floor (25 MHz, 10 Hz) | -165 dBc/Hz minimum, <-170 dBc/Hz typical |
| • Residual phase noise floor (5 MHz, 10 Hz) | -160 dBc/Hz minimum, <-165 dBc/Hz typical |
| • Spurious responses (SFDR) | Less than -100 dBc (5 MHz, 1Hz-100 kHz) (phase noise) or -90 dBc (AM noise) Typically below -120 dBc |

ELECTRICAL SPECIFICATIONS

| | |
|-----------------------|-----------------------------|
| • Input signal level: | 5 dBm to 15 dBm recommended |
| • Input impedance: | 50Ω |

MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

| | |
|--------------------------|--|
| • Size: | 28 cm x 12 cm x 7.5 cm (11" x 5" x 3") |
| • Power: | 90-264 VAC 47-63 Hz, <25W, 3-pole AC inlet IEC 320-C14 |
| • Operating temperature: | 15° C to 35° C (60° F to 95° F) |
| • Storage temperature: | -20° C to 50° C (0° F to 125° F) |
| • Unit weight alone: | 1 kg (2 lbs) |

UPGRADE OPTIONS

The following options are available for purchase individually:

- AM noise measurement
- Frequency counter
- Signal Statistics - HDEV, TDEV, MDEV and Jitter measurements
- Mask tests for automatic pass/fail evaluation

PRODUCT INCLUDES

3120A Test Probe, (2) TNC-M/BNC-F coaxial adapters, (1) USB 2.0 cable
A male/B Male, (1) Power supply, (2) 1" (2.54 mm) SMA-M/SMA-M coaxial
jumpers (pre-installed)

PRODUCT SERVICE

- One year warranty (HW only)
- Platform Maintenance (needs to be ordered separately)
- Extended Hardware warranty (needs to be ordered separately)

FRONT PANEL

- (4) SMA (Ch 0 OUT, Ch2 OUT, Ch 0 IN, Ch2 IN), (1) TNC (INPUT)

REAR PANEL

- TNC-F input for external reference signal (REF IN)
- USB (1x): Series B for PC connectivity (USB)
- 5 pin DIN jack for power supply (POWER)
- 8-pin Mini DIN jack for future accessory expansion (ACC)
- STATUS indicator

CERTIFICATIONS

- 3120A Phase Noise Test Probe has passed EMC Testing for FCC, CE, KCC
and VCCI Certification

RoHS COMPLIANCE

- 3120A Phase Noise Test Probe is RoHS Compliant



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Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense & security, aerospace and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; security technologies and scalable anti-tamper products; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, Calif., and has approximately 3,400 employees globally. Learn more at www.microsemi.com.

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