

XL 3000-series

Microwave Frequency Counters

Ultimate frequency counting

- Simultaneous Frequency and Power measurements
- Wide frequency range from 10 Hz to 60 GHz
- Compact, portable, rugged and battery operated
- High stability Oven-controlled Crystal timebases and ultra-stable Rubidium option
- Short acquisition time (<60ms)
- 5 year warranty
- Outstanding performance/price ratio



Perfect solution in the field...

The 3000-series of microwave counters provides simultaneous measurement of both frequency and power and are well suited for field, lab-bench, and test-rack environments.

For **field applications** like installation, maintenance and calibration of microwave links, radar CW, microwave transmitters, DAB or DTV links, satellite ground stations or radio base stations, the models in the 3000-series give you ultra-high accuracy in a portable compact, lightweight and rugged design. A weather-resistant instrument back-pack is included with the battery power option.

Atomic clock accuracy in a true portable format: You can bring cal lab accuracy out into the field thanks to an integrated rubidium or high-stability OCXO oscillator. Since both frequency and power verification are standard measurements in field installation and maintenance, you can have both instruments in one box, meaning less to carry around. The same input connector is used for both measurements, which simplifies operation. An optional battery pack is used in environments where no AC power is available, or to keep an OCXO continuously heated during transport for optimum performance. The battery typically provides over 3 hours of continuous operation and automatically charges whenever the counter is connected to the AC mains.

Very Easy to Use: To eliminate operator mistakes, the instruments are very easy to use and require no costly training. The front panel controls are self-explanatory and the read-out of result is unambiguous due to the bright LED display which ensures full visibility, whether in full sunlight or in low light.

Lower operating costs than any competitive solution: In addition to the very affordable purchase price, the instruments are very durable and reliable, and will give you trouble-free operation year after year. A 5 year warranty comes with each instrument.

...or on the bench

For **bench and test systems applications** like R&D, Service, incoming inspection, quality control and manufacturing test of RF components, systems or subassemblies, microwave transmitters/receivers, radar equipment etc, the models in the 3000-series gives you ultra-high performance and remote GPIB connectivity.

Three instruments in one: Measurements are accurate and fast, with less than 60 ms acquisition time. With the Rubidium oscillator option, you will not only get a high-accuracy microwave counter, but also a 10 MHz reference output frequency for the local lab or for the ATE-rack, where you can supply other instruments with an atomic frequency standard.

In Test Systems you save valuable space by integrating three instruments in one package; a mm frequency counter, a power meter and a frequency reference.

Oscillator Options

A wide choice of internal time base oscillators are available; the standard TCXO oscillator, two high stability OCXO oscillators, and a Rubidium Frequency Standard. Please see table below for specs.

Telecommunication professionals often have a requirement to measure and verify base station reference oscillators at remote sites. These base station oscillators must be calibrated very accurately. The optional internal Rubidium Frequency Standard, along with the standard 0.01 Hz resolution in Band 1 meets this requirement.

The Rubidium option counters require four minutes of warmup time and provide measurements only when fully stable - accuracy and reliability you can count on!

Oscillator Options Available	Standard TCXO (Note 1)	Option 112 OCXO	Option 120 OCXO	Option 125 Rubidium (Note 2)
Short term stability:	5.1x10 ⁻⁹ (τ=1s, Allan Dev.)	5x10 ⁻¹⁰ (τ=1s, Allan Dev.)	5x10 ⁻¹² (τ=1s, Allan Dev.)	1.4x10 ⁻¹¹ (τ=1s, Allan Dev.)
Aging/day:	n.s.	3x10 ⁻⁹	4x10 ⁻¹⁰	n.s.
Aging/month:	n.s.	n.s.	n.s.	5x10 ⁻¹¹
Aging/year:	7.6x10 ⁻⁷ (after 45 days)	5x10 ⁻⁷	1x10 ⁻⁷ (after 30 days)	2x10 ⁻¹⁰
Warm-up (time): @ 25°C	4x10 ⁻⁷ in 5 min.	1x10 ⁻⁸ in 20 min.	5x10 ⁻⁸ in 5 min.	5.1x10 ⁻¹⁰ after 4 min. 1x10 ⁻¹⁰ after 10 min. 2x10 ⁻¹¹ after 60 min.
Temperature: (0°C to 50°C)	1x10 ⁻⁶	1x10 ⁻⁸	7x10 ⁻⁹	3x10 ⁻¹¹
MAINS change: (±10%)	5x10 ⁻⁹	1x10 ⁻⁹	2x10 ⁻⁹	N/A

Note 1: The standard TCXO oscillator is installed in the basic unit unless an optional oscillator is selected.

Note 2: Selection of Rubidium Oscillator Option 125 extends the counter chassis depth from 333 mm (13.1 in.) to 368 mm (14.5 in.). Rubidium Oscillator Option 125 is not available with Battery Option 150 counters.

Technical Specifications

Measuring modes

Frequency, Band 1

Range: 10 Hz to 120 MHz (model 3120, 3200, 3260);
10 Hz to 100 MHz (model 3400A, 3460, 3600; 1 M Ω);
50 MHz to 250 MHz (model 3400A, 3460, 3600; 50 Ω)

Resolution: 0.01 Hz to 1 MHz in decade steps

Accuracy: ± 1 count, \pm time base accuracy

Frequency, Band 2

Range: 120 MHz to 12.4/20/26.5 GHz (model 3120, 3200, 3260);
200 MHz to 40/46/60 GHz (model 3400A, 3460A, 3600)

Resolution: 1 Hz to 1 MHz in decade steps

Accuracy: ± 1 count, \pm time base accuracy

Power, Band 2

Frequency range: Full frequency range (band 2)

Power range: -35 to +10 dBm

Resolution: 0.1 dBm

Accuracy: ± 1 dBm to 26.5 GHz, typical
 ± 2 dBm to 26.5-40 GHz, typical
 ± 3 dBm at 60 GHz, typical

Measurement time: Freq. meas. time +15 ms

Band 1 Specifications

Band 1 Input/1 M Ω :

Frequency range: 10 Hz to 120 MHz (model 3120, 3200, 3260)
10 Hz to 100 MHz (model 3400A, 3460A, 3600)

Sensitivity: 25 mVrms

Dynamic range: 25 mV to 1 Vrms

Coupling: AC

Impedance: 1 M Ω /25 pF

Damage level: 250 VAC+DC to 400 Hz, decreasing to 5V at 1 MHz; 5V from 1 MHz to 120 MHz

Connector: BNC female

Band 1 Input/50 Ω :

(Models 40 GHz and above: 3400A, 3460A & 3600)

Frequency range: 50 Hz to 250 MHz

Sensitivity: -25 dBm

Dynamic range: -25 dBm to +10 dBm

Coupling: AC

Impedance: 50 Ω nom.

Damage level: +25 dBm

Connector: BNC female

Band 2 Specifications

Common Specs

(Models 3120, 3200, 3260, 3400A, 3460A, 3600)

Dynamic range: Min. sens. to +10 dBm

Coupling: AC

Impedance: 50 Ω nom.

Automatic Amplitude Discrimination:
10 dB separation between 2 signals within 30 MHz, 20 dB otherwise

Integrated Kickback noise: -50 dBm typical

AM tolerance: Any modulation index, provided the minimum signal is not less than the sensitivity spec.

FM tolerance: 20 MHz P-P

Signal acquisition time: <60 ms

Damage level: +25 dBm (for mod 3600 +23 dBm)

VSWR: 2:1 typical (mod 3120/3200/3260)
3:1 typical (mod 3400A/3460A/3600)

Overload indicator:
On at +10 dBm nom. to 26.5 GHz,
increasing to +15 dBm at 46 GHz,
to +20 dBm at 60 GHz

Model 3120 Band 2 (to 12.4 GHz)

Frequency range: 120 MHz to 12.4 GHz

Sensitivity: -30 dBm

Connector: N female (Band 2)

Model 3200 Band 2 (to 20 GHz)

Frequency range: 120 MHz to 20 GHz

Sensitivity: -25 dBm

Connector: N female (Band 2)

Model 3260 Band 2 (to 26.5 GHz)

Frequency range: 120 MHz to 26.5 GHz

Sensitivity: -25 dBm

Connector: SMA female sparkplug (Band 2)

Model 3400A Band 2 (to 40 GHz)

Frequency range: 200 MHz to 40 GHz

Sensitivity: -30 dBm to 26.5 GHz
-25 dBm to 40 GHz

Connector: 2.92 mm female sparkplug (Band 2)

Model 3460A Band 2 (to 46 GHz)

Frequency range: 200 MHz to 46 GHz

Sensitivity: -30 dBm to 26.5 GHz
-20 dBm to 46 GHz

Connector: 2.92 mm female sparkplug (Band 2)

Model 3600 Band 2 (to 60 GHz)

Frequency range: 200 MHz to 60 GHz

Sensitivity: -25 dBm to 40 GHz
-15 dBm at 60 GHz
(-20 dBm at 60 GHz typ)

Connector: 1.85 mm female sparkplug (Band 2)

Additional Technical Data

General

Gate time: 1s, 0.1s, 0.01s & 1.0 ms

Display time: 0.3 s, 3.0 s, Infinite, & Min

Self-test: All digits segments, all LED's, 10 MHz clock, & GPIB address

Display: 11 digits/0.5" high LED, Overload, decimal point & sign. Simultaneous displays Frequency (with 0.1 MHz resolution) and Power.

Display legend: Hz, kHz, MHz, GHz & dBm

Status indicators: BAND 1, (or BAND 1/1 M Ω , BAND 1/50 Ω), BAND 2, EXT REF, DISPLAY TIME, REMOTE, GATE, ΔF , OVERLOAD (band 2 only), POWER METER (band 2 only), & STANDBY

ΔF : Difference between stored and measured frequency

GPIB (IEEE 488 Std-1978)

Programmable: BAND 1, (or BAND 1/1 M Ω , BAND 1/50 Ω), BAND 2, RESET, TEST, ΔF , ΔF RESOLUTION, DISPLAY TIME, POWER METER, STANDBY & RESOLUTION

Environmental

Operating temp: 0°C to 50°C (std CW)
-0°C to 40°C (battery operation)

Storage temp: -40°C to 71°C (std CW)
-10°C to 40°C (battery operation)

Relative humidity: 95% \pm 5%, 10°C to 30°C; 75% \pm 5%, to 40°C; 45% \pm 5%, >40°C

Vibration limits: 2g

Burn-In: Failure-free burn-in of no less than 100 hours at 40°C

Pollution degree: 1 (no pollution) (EN 61010-1)

Transient overvoltage: Install. Cat II (EN 61010-1)

Cooling: These microwave counters do not contain nor require a cooling fan

Mechanical

Power DC: 11-28 VDC; 20 VA (Std. CW); 12-28 VDC (Opt. 150); 18-28 VDC (Opt. 125)

Power AC MAINS: 90-130 VAC or 180-265 VAC, 45 Hz-440 Hz; 25 VA

Weight Net: 3.6 kg (8 lbs.) / Battery Option 5 kg. (11 lbs)

Weight Shipping: 5.5 kg (12 lbs.) / Battery Option 6.8 kg. (15 lbs)

Internal/External Reference Oscillator

10 MHz ref osc out: 10 MHz, 1 Vrms into 50 Ω

Ext ref osc in: 2, 5 or 10 MHz >0.2 Vrms/1 k Ω

Connectors (IN/OUT): BNC female (rear panel)

Reliability

MTBF: >32,000 hours (MIL-HDBK-217E)

MTTR: 30.92 minutes (MIL-HDBK-472)

Standards Compliance

EC (European Union):
EMC Emissions: Certified to EN 55022:1987 Class B
EMC Immunity: Certified to EN 50082-1:1992
Safety (LVD): Complies with EN 61010-1

ISO 9001:
The Quality System for design and manufacture is registered and certified by RWTUV to ISO 9001:2000

Montreal Protocol: Nil return

Ordering Information

Basic models

3120 Frequency counter 10 Hz to 12.4 GHz

3200 Frequency counter 10 Hz to 20 GHz

3260 Frequency counter 10 Hz to 26.5 GHz

3400A Frequency counter 10 Hz to 40 GHz

3460A Frequency counter 10 Hz to 46 GHz

3600 Frequency counter 10 Hz to 60 GHz

Accessories Included

- One (1) Operating/Maintenance manual
- One (1) AC power cord, 2 meters

Options/Accessories

150 Battery Option, rechargeable sealed lead/acid battery (3h op time)

170 Rack Ears, RETMA (HxW) 88.9 mm x 482.6 mm (3.5" x 19")

213 Factory Calibration of microwave counters with TCXO oscillators

214 Factory Calibration of microwave counters with OCXO oscillators

302 Hard shell Case

326 Watertight Case, for severe environmental conditions

336 Weather-Resistant Instrument Back-Pack

320 Spare Battery, 12V/2.3 Ah Rechargeable

305 Spare Operating and Maintenance Manual

315 Adapter: V (m) to K (f) (model 3600 only)

316 Adapter: V (f) to WR15 (model 3600 only)

317 Adapter: V (f) to WR19 (model 3600 only)

318 Coax cable, 0.5 m V (m) to V (m) (<60 GHz)

319 Coax cable, 1.0 m V (m) to V (m) (<60 GHz)

Specifications subject to change without notice

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Pendulum Instruments

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- Experts in time & frequency calibration, measurement and analysis