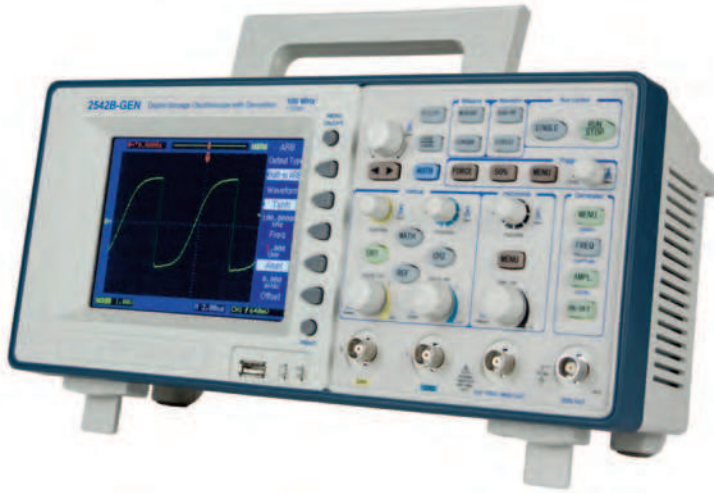


Data Sheet

Digital Storage Oscilloscopes Models 2540B, 2542B, 2540B-GEN, 2542B-GEN



The 2540B, 2542B, 2540B-GEN, and 2542B-GEN dual channel 60 MHz and 100 MHz digital storage oscilloscopes deliver performance and value, all in one portable solution. Maximize productivity using extensive features such as digital filtering, waveform recorder, pass/fail limit testing, and automatic measurements. These oscilloscopes offer powerful tools in a small affordable package with deep waveform memory up to 2.4 Mpts plus LAN and USB PC interface. The 2540B-GEN and 2542B-GEN models add a built-in function/arbitrary waveform generator (AWG).

Easily capture, save, and analyze measurement results with Comsoft PC software. All scope parameters can be controlled via a PC without the need for programming or communicate with the DSO via the built-in LAN interface using a web browser.

Additionally, these oscilloscopes can be integrated with AWGs using B&K Precision's waveform editing software, WaveXpress. WaveXpress allows users to easily modify waveforms downloaded from the scope and can also be used for analysis of deep memory acquisitions.

Educators will appreciate the ability to disable the Auto Set button that would automatically setup the scope to display a signal, circumventing the need to know how to set up scope parameters. This is key for teaching waveform measurement fundamentals as if it was an analog oscilloscope.

These oscilloscopes are ideal for applications in design and debugging, service and repair, and education.

Features and Benefits

- 60 MHz (2540B/2540B-GEN) and 100 MHz (2542B/2542B-GEN) bandwidth
- 1 GSa/s sample rate
- Deep waveform memory up to 2.4 Mpts¹
- 28 automatic measurements
- Four different math functions – Add, Subtract, Multiply, and FFT
- Pulse width, video, slope and alternate triggering
- Advanced tools include digital filter with adjustable limits, pass/fail testing, and waveform recorder mode
- Four shortcut keys for quick access of frequently used functions (models 2540B and 2542B only)
- Built-in Function/Arbitrary Waveform Generator (models 2540B-GEN and 2542B-GEN only)
- 11 different language user interfaces
- Built-in context sensitive help system
- For educators - ability to disable the Auto Set button
- LAN and USB connectivity for remote PC control through Comsoft PC software² or custom software using SCPI commands
- USB host port for convenient storing and recalling of waveform data, setups, and screenshots on a USB flash drive
- LAN interface for capturing screenshots via a web browser plus full front panel emulation

| Models | 2540B | 2542B | 2540B-GEN | 2542B-GEN |
|--------------|--------|---------|-------------|-------------|
| Bandwidth | 60 MHz | 100 MHz | 60 MHz | 100 MHz |
| Built-In AWG | No | No | Yes, 20 MHz | Yes, 40 MHz |



For more information, visit www.bkprecision.com/WaveXpress

¹-Based on sample rate and accessible via remote interface

²-Available for download at the B&K Precision website

Front panel

Menu On/Off button

Configure the menu parameters and hide the menu with the push of a button to view your signal in full screen.

Waveform analysis with math and FFT

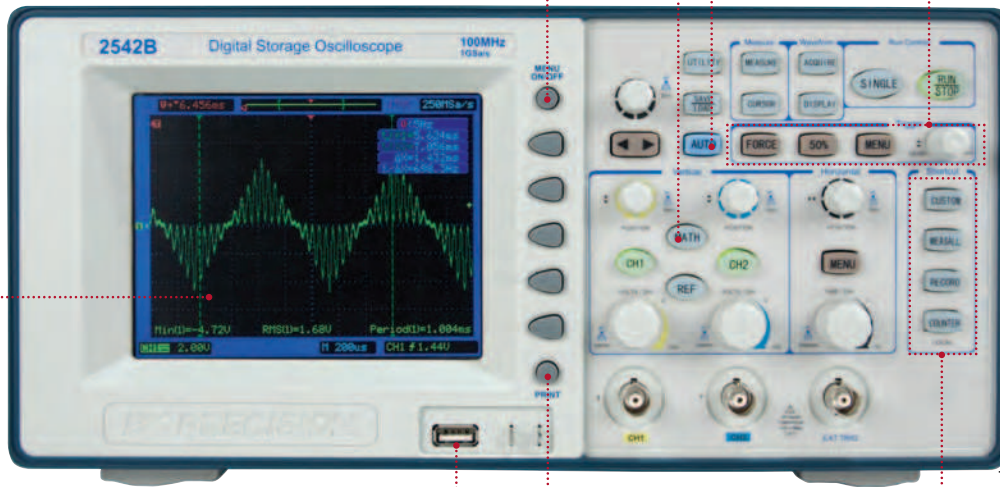
Analyze your signals with add, subtract, and multiply functions. View the signal's frequency spectrum and perform harmonic distortion analysis.

Auto Set button

Vertical, horizontal, and trigger controls are automatically adjusted for fast signal display.

Advanced triggering

Isolate the signal with advanced triggering including pulse width and selectable video trigger.



Display
5.7" color display.

USB host port

Connect your USB flash drive to conveniently update firmware and store/recall waveform data, setups, and screenshots.

Print button

Simply press the Print button to save a screenshot in bitmap format to a USB flash drive.

Shortcut buttons (models 2540B and 2542B only)

Use these buttons to quickly access your most frequently used functions or menus. The Custom button allows you to assign your own shortcut.

Built-in arbitrary waveform generator (models 2540B-GEN and 2542B-GEN only)



Optimize your workspace and increase productivity with the unique combination of a DSO and a built-in AWG.

Rear panel



Security loop

Use the built-in security loop to secure your instrument to your location.

AC Input Socket

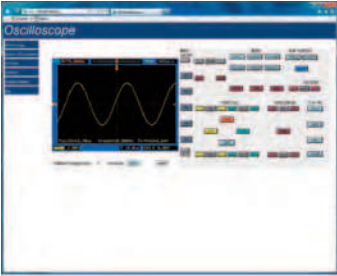
Input socket for the AC power cord.

Communication

LAN, RS232, and USB ports enable remote PC control.

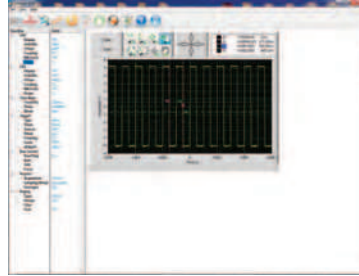
The tools you need

Web-Enabled



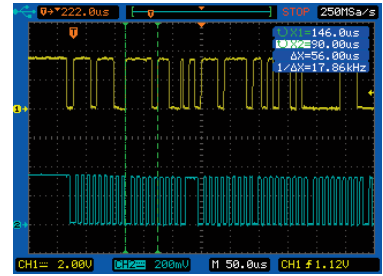
The built-in LAN interface allows you to easily capture screenshots at a user-configurable refresh rate with a web browser. A GUI simulating the front panel provides full DSO control. This feature can be useful in an education setting.

PC Connectivity



Comsoft software provides seamless integration between the oscilloscope and PC. Capture and transfer waveforms, screen images, setups, and measurement results to a Windows PC via the LAN and USB device port on the back of the instrument. A USB host port on the front allows for quick and easy screen saving to a USB flash drive.

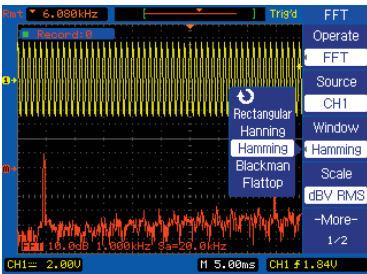
Deep Memory



Beneficial for applications such as I²C serial data streams, deep memory lets you capture waveforms in high resolution while maintaining a high sample rate over a longer period of time. Up to 2.4 Mpts of memory can be captured in as fast as 5 seconds* using binary transfer through the LAN or USB interface.

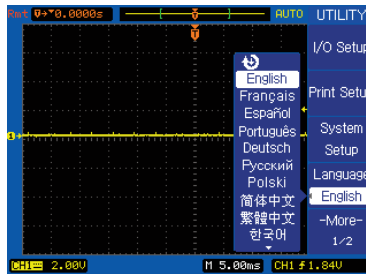
*Typical time based on LAN speed testing.

Powerful Measurement Functions



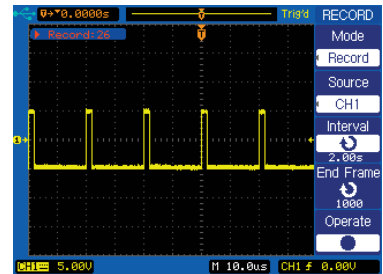
Display and measure the input signal's frequency spectrum. Select one of the 5 FFT windows: Rectangular, Hanning, Hamming, Blackman, and Flattop. Use cursors to measure the spectral component's magnitude and frequency.

Multi-Language Interface



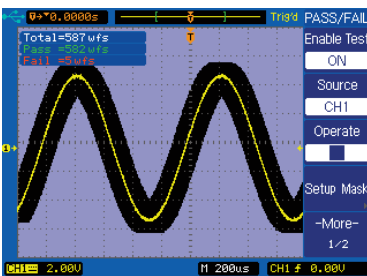
Operate the oscilloscope in a language you understand best with the built-in multi-language interface. Choose from English, Simplified Chinese, Traditional Chinese, Korean, Japanese, French, German, Russian, Spanish, Portuguese, and Polish.

Waveform Recorder



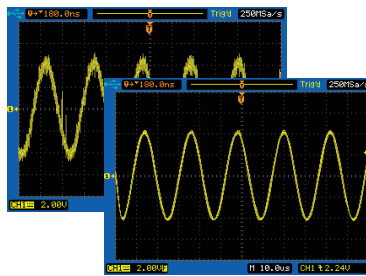
Monitor and analyze long-term signal behavior by recording data continuously over an extensive period of time and playing it back for post acquisition analysis. Data is recorded in a sequence of up to 1000 frames.

Pass/Fail Testing



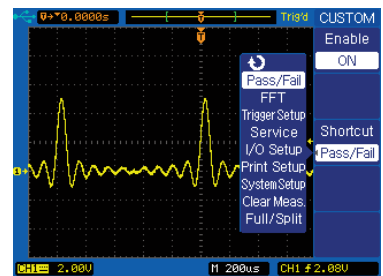
Generate user-defined pass/fail limits to quickly identify go/no go test results.

Digital Filtering



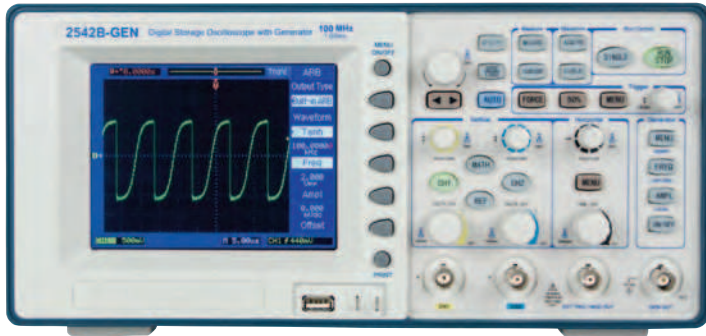
Filter out unwanted signal components such as various types of noise with built-in digital filters. Choose from Low-Pass, High-Pass, Band-Pass, and Band-Stop filters.

Custom Shortcut Key (Models 2540B and 2542B only)



Generate your own shortcut key from the shortcut menu to quickly access your most frequently used function.

Arbitrary Waveform Generator Features for Models 2540B-GEN and 2542B-GEN



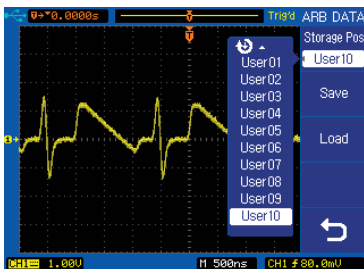
Great for education labs, research, and manufacturing environments, the 2540B-GEN and 2542B-GEN help save bench space and cost by combining 2 instruments in 1. These models provide users a high performance DSO with a full-featured Function/Arbitrary Waveform Generator in a compact and affordable package.

- 1 μ Hz to 20 MHz Sine Output (2540B-GEN)
- 1 μ Hz to 40 MHz Sine Output (2542B-GEN)
- 1 μ Hz to 20 MHz Square Output
- 1 MHz to 10 MHz Pulse Output
- Frequency Sweep and Burst Mode
- Output protected against short circuit

Capture and Storage Function

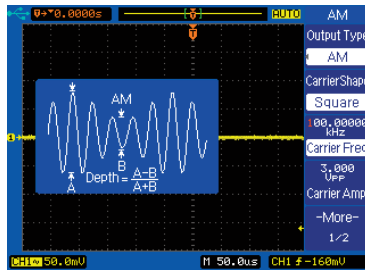


Quick and easy single-button capture function lets you acquire and store your signal directly from the oscilloscope's channels to the generator's internal memory. Not only can CH1 and CH2 signals be captured, but math functions applied to the channels can also be captured and stored.



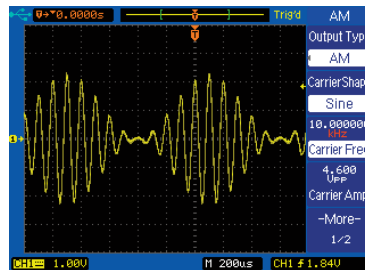
Store user arbitrary waveforms internally (up to 10 waveforms) or externally as an ARB or CSV file to a USB flash drive.

Graphical Help Feature



Display a graphical illustration explaining the parameters of the built-in arbitrary waveforms and modulation schemes. This is a convenient tool for students and new users.

Wide Array of Modulation Schemes

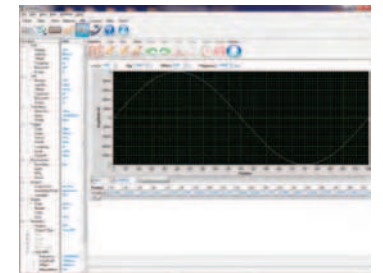


The built-in arbitrary waveform generator is capable of many different types of modulation for various applications. Modulate your waveforms with AM, FM, FSK, PSK, and PWM modulation schemes and use any of the 30 built-in waveforms as the modulating waveform.

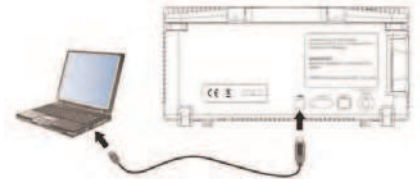
Multiple Ways to Interface



Save and load arbitrary waveform data in CSV format from a USB flash drive.

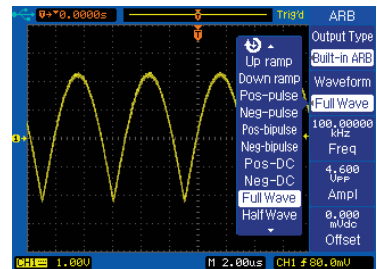


Generate, edit, and upload arbitrary waveforms to the scope using the intuitive Comsoft PC software.



Remotely connect to the scope and download waveform data from custom software using SCPI commands.

30 Built-In Arbitrary Waveforms



Take advantage of the generator's already built-in waveforms that fit your application.

Digital Storage Oscilloscope Specifications

| Model | 2540B/2540B-GEN | 2542B/2542B-GEN |
|--|--|-----------------|
| Performance Characteristics | | |
| Bandwidth | 60 MHz | 100 MHz |
| Real Time Sampling Rate | Single Channel: 1 GSa/s Dual Channel: 500 MSa/s | |
| Channels | 2 | |
| Rise time | <5.83 ns | <3.50 ns |
| Max Memory Depth (based on sample rate) | 1 GSa/s: 16 kpts 500 MSa/s: 8 kpts (dual channel) 500 MSa/s: 2.4 Mpts* (single channel) ≤ 250 MSa/s: 1.2 Mpts* (single and dual channel) *Maximum number of points can only be extracted via remote control using the USB, RS232C, or LAN interface. | |
| Vertical Resolution | 8 bits | |
| Vertical Sensitivity | 2 mV/div -10 V/div (1-2-5 order) | |
| DC Gain Accuracy | 10 mV/div to 10 V/div: ±3.0% 2 mV/div, 5 mV/div: ±4.0% | |
| Maximum input voltage | 400 V (DC+AC PK-PK, 1 MΩ input impedance, X10), CAT I | |
| Position Range | ±8 divisions away from the center of the screen | |
| Bandwidth Limit | 20 MHz selectable | |
| Horizontal Scan Range | 2 ns/div to 50 s/div | |
| Timebase Accuracy | ±0.01 % | |
| Input Coupling | AC, DC, GND | |
| Input Impedance | 1 MΩ 18 pF | |
| Vertical and Horizontal Zoom | Vertically or horizontally expand or compress a live or stopped waveform | |
| I/O Interface | | |
| USB | USB host port for flash drives, USB device port for remote control via PC and Comsoft software | |
| RS232 | Remote control via PC and Comsoft software | |
| LAN | Remote control via web browser or PC and Comsoft software | |
| Pass/Fail | Pass/Fail output | |
| Acquisition Modes | | |
| Normal | Display sample data only | |
| Peak Detect | Capture the maximum and minimum values of a signal | |
| Average | Waveform averaged, selectable from 2, 4, 8, 16, 32, 64, 128, 256 | |
| Trigger System | | |
| Trigger Types | Edge, Pulse Width, Video* *Support signal Formats: PAL/SECAM, NTSC Trigger condition : odd field, even field, all lines, or line number | |
| Trigger Modes | Auto, Normal, Single | |
| Trigger Coupling | AC, DC, LF reject, HF reject | |
| Trigger Source | CH1, CH2, EXT, EXT/5, AC Line, Alternating | |
| Pulse Width Trigger | Trigger Modes: Positive Pulse (>, <, =), Negative Pulse (>, <, =) | |
| Slope Trigger | Time: 20 ns-10 s | |
| Alternative Trigger | CH1 trigger type: Edge, Pulse, Video, Slope CH2 trigger type: Edge, Pulse, Video, Slope | |

| | |
|--|---|
| Hardware Frequency Counter | |
| Reading resolution | 5 digits |
| Range | up to oscilloscope's maximum bandwidth |
| Waveform Math and Automatic Measurements | |
| Math operation | Add, Subtract, Multiply, FFT |
| FFT | Window mode: Rectangular, Hanning, Hamming, Blackman, Flattop Sampling points: 1024 |
| Measurements | Max, Min, VPP, High, Low, Amplitude, Average, RMS, Overshoot, Preshoot, Cycle average, Cycle RMS, Frequency, Period, Rise time, Fall time, +Width, -Width, +Duty, -Duty, Delay, Phase, X at MAX, X at MIN |
| Cursors | |
| Types | Voltage, Time |
| Measurements | ΔV, ΔT, 1/ΔT (frequency) |
| Auto Set | |
| Function | Single button automatic setup of both channels for vertical, horizontal and trigger system. Can be disabled for training purposes |
| Requirements | Minimum voltage > 10 mVpp, 0.5% duty cycle and minimum frequency > 50 Hz |
| Display System | |
| Display | 5.7 in. Color TFT, 320 x 234 resolution, 24-bit true color |
| Wave display range | 8 x 12 div |
| Wave display mode | Dots, Vector |
| Persistence | Off, Infinite |
| Waveform interpolation | Sin(x)/x, Linear |
| Color mode | Normal, Inverted |
| Environmental and Safety | |
| Temperature | Operating: 32° F to 104° F (0° C to +40° C) Non-operating: -4° F to 131° F (-20° C to +55° C) |
| Humidity | Maximum 80% R.H. for temperatures up to 87.8° F (31° C), decreasing linearly to 50% R.H. at 104° F (40° C) |
| Altitude | Operating: 9,842.5 ft (3,000 m) Non-operating: 49,212.6 ft (15,000 m) |
| Electromagnetic Compatibility | Meets EMC Directive 2004/108/EC, meets EN61326 Class A |
| Safety | EN61010-1:2001, EU Low Voltage Directive 2006/95/EC |
| General | |
| Power Requirements | 100-240 VAC, CAT II, 50 VA max, 47 Hz to 440 Hz |
| Dimensions (WxHxD) | 12.6" x 6.16" x 4.84" (320 x 156.5 x 123 mm) |
| Weight | 6.2 lbs. (2.81 kg) |
| Three-Year Warranty | |
| Supplied Accessories: User manual, two 150 MHz 10:1 passive probes (model PR37A), power cord, USB interface cable, and certificate of calibration. One BNC-to-BNC cable (for models 2540B-GEN and 2542B-GEN only) | |

Function/Arbitrary Waveform Generator Specifications

These specifications apply to models 2540B-GEN and 2542B-GEN only.

| Models 2540B-GEN & 2542B-GEN | |
|--------------------------------------|---|
| Frequency Characteristics | |
| Sine | 1 μ Hz to 20 MHz (2540B-GEN) 1 μ Hz to 40 MHz (2542B-GEN) |
| Square | 1 μ Hz to 20 MHz |
| Pulse | 1 mHz to 10 MHz |
| Built-in AWG | 1 mHz to 1 MHz |
| User AWG | 1 mHz to 1 MHz |
| Frequency resolution | Sine, Square: 1 μ Hz Pulse, Built-in ARB, User ARB: 1 mHz |
| Frequency accuracy | $\leq \pm 5 \times 10^{-4}$ |
| Frequency stability | $\pm 5 \times 10^{-5}$ |
| Waveform Characteristics | |
| Harmonic distortion (sine) | < 5 MHz: -50 dBc ≤ 10 MHz: -45 dBc > 10 MHz: -40 dBc |
| Rise / Fall time (square, pulse) | < 20 ns |
| Duty cycle (pulse) | 10% to 90% (at 10 MHz) 0.01% to 99.99% (below 10 kHz) |
| Pulse width | 10 ns to 999.99 s |
| Arbitrary | |
| Waveform length | 8000 points |
| Vertical resolution | 8 bits |
| Sampling rate | 40 MSa/s |
| Non-volatile memory | 10 waveforms storage capability |
| Built-in arbitrary waveforms | Sine, Square, Triangle, Up ramp, Down ramp, Positive pulse, Negative pulse, Positive double pulse, Negative double pulse, Positive DC, Negative DC, Full Wave, Half Wave, Clipped Sine, Gate Sine, SQRT, Exponential, Log, Semicircle, Tanh, Sinc, Noise, Duty 10%, Duty 90%, Up Step, Down Step, Tri-pulse, Trapezoidal, Cosine, and SCR |
| Amplitude Characteristics | |
| Generator Output (GEN OUT) | |
| Amplitude range | freq. ≤ 20 MHz: 2 mVpp to 20 Vpp (open circuit), 1 mVpp to 10 Vpp (50 Ω) freq. > 20 MHz: 2 mVpp to 6 Vpp (open circuit), 1 mVpp to 3 Vpp (50 Ω) |
| Resolution | 1 μ Vpp (max.) |
| Accuracy | $\leq \pm 5\% \pm 1$ mV @ 1 kHz sine waveform |
| Flatness | freq. ≤ 5 MHz: $\pm 5\%$ freq. > 5 MHz: $\pm 10\%$ |
| Flatness (built-in AWG, user AWG) | freq. ≤ 50 kHz: $\pm 5\%$ freq. > 50 kHz: $\pm 20\%$ |
| Output impedance | 50 Ω |
| Modulating Waveform Output (MOD OUT) | |
| Waveforms | All 30 built-in arbitrary waveforms |
| Output amplitude | 5 Vpp $\pm 20\%$ |
| Output impedance | 600 Ω |

| AM, FM, PWM, and DCOM Modulation Characteristics | |
|--|--|
| Carrier waveforms | Sine, Square (AM, FM, DCOM) |
| | Pulse (PWM) |
| Modulating waveforms | All 30 built-in arbitrary waveforms |
| Modulation frequency | 1 mHz to 1 MHz |
| AM modulation depth | 0% to 120% |
| FM Frequency deviation | 0.1% to 99.9% |
| PWM Width deviation | 1% to 99% |
| FSK Modulation Characteristics | |
| Carrier waveform | Sine |
| Hop frequency | 1 μ Hz to 40 MHz |
| Interval time | 1 ms to 40 s |
| PSK Modulation Characteristics | |
| Carrier waveform | Sine |
| Hop phase | 0° to 360° |
| Interval time | 1 ms to 40 s |
| Frequency Sweep Characteristics | |
| Waveforms | Sine, Square |
| Frequency range | 1 μ Hz to 20 MHz (2540B-GEN) 1 μ Hz to 40 MHz (2542B-GEN) |
| Sweep mode | Linear Up, Down, Up-Down |
| Sweep time | 1 ms to 500 s |
| Burst Characteristics | |
| Waveforms | All 30 built-in arbitrary waveforms |
| Counts | 1 to 60000 cycles |
| Burst rate | 1 mHz to 1 MHz |