# Agilent
# 8645A Agile Signal Generator
## 252 kHz to 2060 MHz

**Data Sheet**


## Combining frequency agility with high performance

**Performance signal generator series — a commitment to cost-effective solutions**

Agilent Technologies

# The 8645A agile signal generator brings all the pieces together

*The 8645A agile signal generator is a 252 kHz to 2060 MHz synthesized generator that combines high performance with frequency agility. With this combination, test both stringent RF performance and fast hopping capability of frequency agile radios and surveillance receivers. In addition, the 8645A can simulate a complex environment to test for susceptibility to interference or provide a fast-switching stimulus for decreasing production test time.*

*In the past, testing secure communications receivers required two separate pieces of equipment. Measurements such as sensitivity and distortion were done one frequency at a time with a generator of high spectral purity and modulation capability. Another generator that switched frequency quickly, or another radio was used to functionally test the dynamic or agile portion of the radio. Now the 8645A offers both high performance and fast hopping so you can test both static and agile operations of the receiver with just one calibrated signal generator.*

## Quality measurements begin with a quality source

Signal generator performance must be better than receiver design, or you end up measuring the source rather than the receiver. The 8645A offers high performance for in-channel and adjacent channel measurements, both in static and agile operation. For example, an adjacent channel signal must have low phase noise and spurs at the channel offset or the receiver's signal will be masked. The 8645A specifies <–127 dBc phase noise and <–100 dBc spurious amplitudes at a 20 kHz offset from the carrier. Typical performance is even better.

As an in-channel signal generator, low FM distortion and residual FM become essential. The 8645A specifies less than 1 to 6% of FM distortion for deviations up to 20 MHz, and less than 1 to 4 Hz residual FM for carrier frequencies from 0.25 to 2060 MHz.

For traditional receiver measurements the 8645A offers the performance you need for even the most stringent receiver specifications. Add frequency agility without sacrificing high performance specifications and you have one generator for testing both static and agile operation.

## Modulation while hopping

For receiver measurements, the 8645A offers simultaneous FM, AM and pulse modulation. Whether in fast hop mode or doing static receiver measurements, the carrier can be either internally or externally modulated. The 8645A has a digitally generated 0.1 Hz to 400 kHz audio source. Or you can use external FM with up to 20 MHz deviation and 10 MHz rates. In fast hop mode, maximum deviation is 3.5 MHz with rates up to 10 MHz. AM is available with up to 100 kHz rates and 99% depth. Pulse modulation allows a 35 dB on/off ratio with 100 nsec rise/fall times.

Courtesy of ITT Aerospace/Optical Division

## Testing frequency agile radios

Testing frequency agile radios in design and manufacturing requires two sets of capabilities. High performance is needed for traditional measurements such as sensitivity and distortion. Frequency agility is needed for testing hopping characteristics. The 8645A provides both of these in one generator. Because spectral purity and accurate modulation is available under both static and dynamic operation, you can make fundamental tests such as sensitivity while hopping the radio. Selectable FM deviations from 1 Hz to 20 MHz with rates up to 10 MHz lets you test either voice quality or high-speed data reception. Built-in control capabilities allow the 8645A to synchronize with a transmitter, or directly to the receiver. Key parameters such as hop rate, dwell time, amplitude and frequency can be modified precisely either in real time, from the front panel, or over GPIB.

## Specified agile performance

In the past, to get agility in a generator, you had to give up performance such as phase noise, spurious levels and amplitude range. With the 8645A you can maintain signal performance while switching frequencies as fast as 15 µsec from 128 to 2060 MHz. Typical frequency accuracy is 1 Hz per MHz and amplitude accuracy is better than ±1 dB. Extending the range down to 8 MHz increases switching speed to 85 µsec. Below 8 MHz it is 500 µsec. For a full test of the receiver, you can enter 2400 unique frequencies and specify unique sequences of up to 4000 frequency settings. Key performance parameters such as phase noise, spurious, amplitude accuracy, and modulation remain high quality and are completely specified.

## Complete control of frequency hopping

The 8645A offers flexible control of frequency switching. You can input parameters from the front panel, with GPIB or using TTL connectors from the rear panel.

Extensive hopped frequency simulations can be entered into the nonvolatile memory from the front panel. Your system is up and running quickly without needing a special interface. To activate a hopped sequence, you just push a button. Or you can enter in the data with a computer using HPSL (Hewlett-Packard Systems Language) and start the sequence with a single command. Either way, you can precisely control hop rate, dwell time, frequency, amplitude and modulation. For real-time control, the rear panel accepts TTL inputs for triggering, dwell time and frequency selection. With this choice of control, you can customize use of the 8645A for any test application.

## Frequency sweeping

To find the amplitude response of frequency-sensitive devices, the 8645A can sweep even wide frequency ranges without surrendering to long sweep times and slow display updates. To stimulate IF passband circuits or filters, spans up to 40 MHz can be swept with a phase continuous output in only 10 msec. Much wider spans of more than 1 GHz can be covered in less than 100 msec with a stepped output of up to 1000 points. In either sweep mode, up to three markers can be set to highlight points on the response.


Courtesy of Rockwell International

## Testing surveillance receivers

Surveillance receivers are designed to detect and identify a wide variety of transmissions. The 8645A can benefit designers of surveillance hardware with a calibrated nonclassified source that can simulate many fixed and agile transmitters. The 8645A signal generator can operate from 252 kHz to 2060 MHz with FM, AM, and pulse modulation.

Hop rates as fast as 50,000 changes per second and dwell times as short as 6.4 (sec per frequency allow receiver testing for transmitters now and into the future.

# Performance signal generator series— a commitment to cost effective solutions

*The 8645A agile signal generator is the first member of the performance signal generator series. Using innovative design and manufacturing, this series offers benefits such as selectable performance, greater reliability, modular support strategy, and an easier programming language.*


## Optimize your purchase and your measurements

The performance signal generator series offers cost-effective choices when you buy it and when you use it. Purchase as many options as you need to meet your most stringent requirements. An internally modular design means the particular configuration you need doesn't come with extra hardware that adds to the price. On your bench, you can optimize the particular capability that is most important to the test.

You select the performance you need at the front panel by pressing a mode key. For example, phase noise and spurious products can be decreased by allowing a slower switching speed. Also, very wide FM deviations can be selected by giving up some spectral purity. With the performance signal generator series, you buy only what you need and optimize for each application.

Courtesy of AEL Industries, Inc.

## Analyzing receiver vulnerability

Using the 8645A, you can exercise your receiver's susceptibility to various RF signal environments. Complete control of frequency, amplitude, modulation and hop parameters lets you fully characterize performance. Adjust the amplitude at the input to the receiver to determine its performance in the presence of jamming. Combine frequency and amplitude modulation to evaluate propagation losses or transmitter velocity shifts. Use the white Gaussian noise output of the internal modulation oscillator to create a static or agile jamming signal to evaluate minimum signal detection. Or vary the hop frequency, hop rate, dwell time power or FM deviation to test the receiver's susceptibility to loss of synchronization. With the 8645A, you can start with a nominal signal and stretch every parameter to test the receiver's limits.

## Building in greater reliability

The performance signal generator series offers you a more reliable signal generator. Each instrument consists of modules with specified performance. Every module is tested as if it were a complete instrument on the production lines. When the modules are brought together in an instrument, the overall performance of the module combination is tested again. Using this proven concept of building high-performance instruments from modules results in greater reliability.

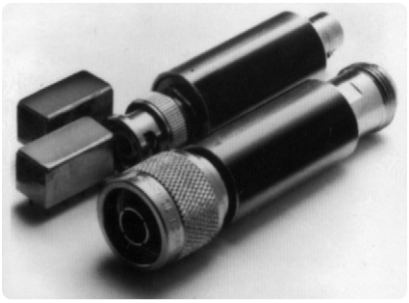
## Designed to be self-supporting

The design of the 8645A offers innovative advances in support strategies. Each module contains built-in sensors. By activating the built-in calibration routine, the instrument will measure internal signal levels and adjust control voltages to ensure the output meets specifications. This self-calibration eliminates the need for external test equipment. Digital control makes all adjustments automatic without removing the instrument cover.

If a circuit fails, the 8645A will use the same built-in sensors to locate the failure and instruct the user on which module to replace. With a new or repaired module in place, the 8645A calibrates itself and is ready to go-all in less than 20 minutes. This internal fault location and self-calibration capability means fewer visits to the calibration lab, giving you more up time.

## Easier programming

Building and maintaining a program to control the 8645A is easier with HPSL. Full word mnemonics are used to decrease the documentation investment required. A “command package” message structure allows many commands to be grouped together for simultaneous execution. These packages avoid operating limitations and errors due to the order of commands given. These fundamental changes result in easier programming and reduced software development time.



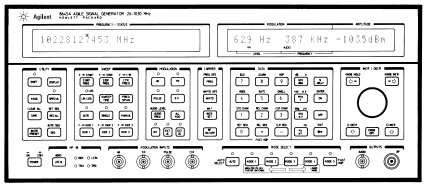
Courtesy of Mini-Circuit

## Fast stimulus testing

Operating in either static or agile mode, the 8645A can stimulate a device with a calibrated input to find its exact operating response. Either output a single frequency while varying amplitude or modulation, or do the same while hopping frequencies. Or select frequency sweep for a repetitive picture of a frequency response.

In all cases, phase noise and spurs are low and do not interfere with test results. Having one signal generator as a static, agile and swept frequency stimulus reduces maintenance and training costs, and improves ATE programming productivity.

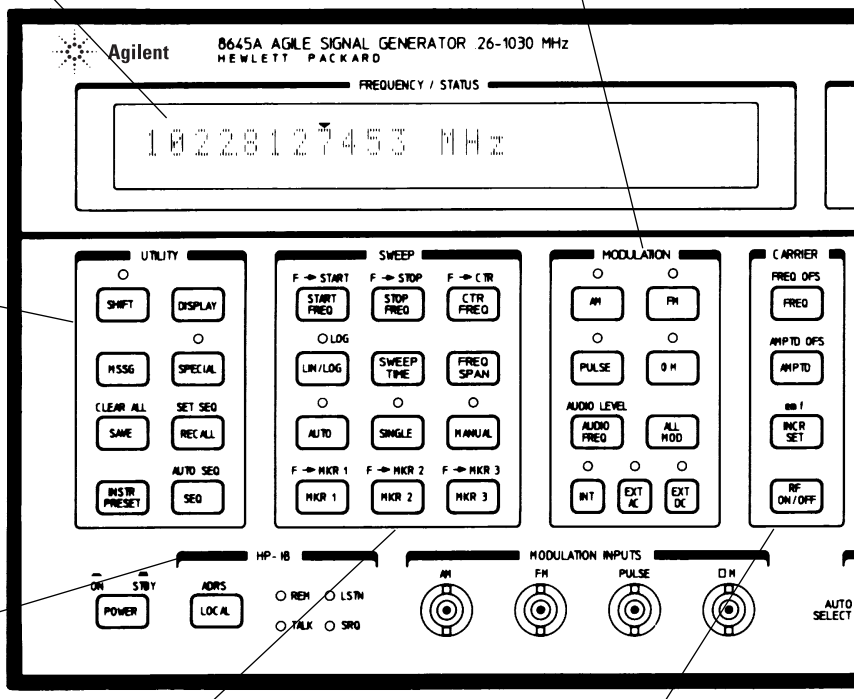
# Front panel features



Bright vacuum-florescent **displays** clearly show the status of the signal being generated under any ambient light conditions. The output signal's frequency, amplitude, modulation and hopping status as well as any special functions or diagnostic messages appear in this area.

Control of **modulation** includes type, deviation and depth as well as whether the modulating signal is the internal 400 kHz oscillator or an external input. Selectable coupling of the external inputs allows dc or only ac components to appear on the carrier.

The **utility** area contains a number of functions that can reset or report the instrument state. While instrument preset and the 50 save/recall registers set controls to a known status, the sequence key can trigger the sequential recall of up to 10 stored instrument states for faster production line operation. Pressing special allows a review of all special functions with a spin of the knob and selection with the on key. Operating conditions can be checked using message. The display key offers helpful information on such things as which special functions are currently active.

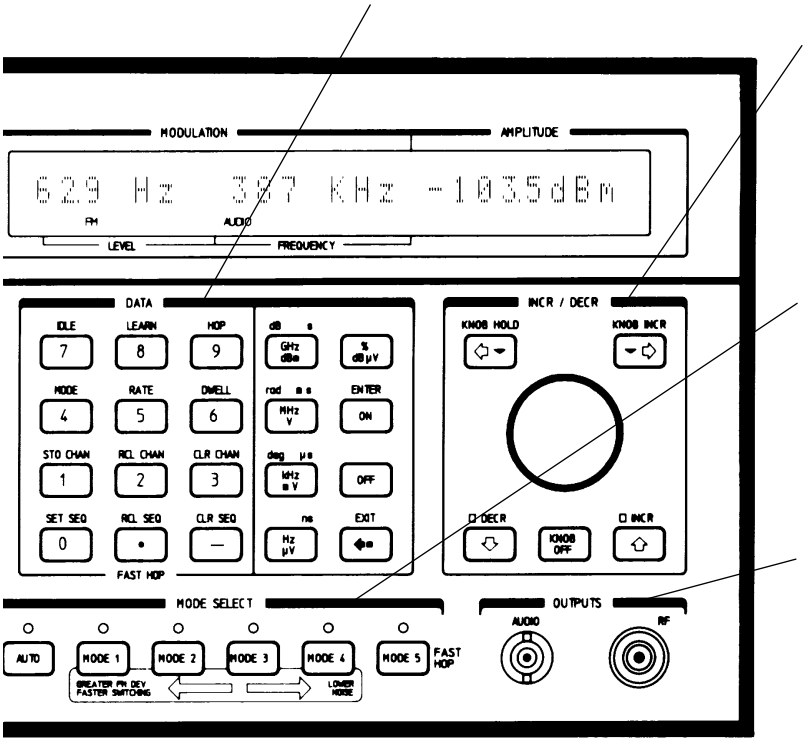



**GPIB** status and control is provided with several indicator lights and a key to return the instrument to local control. Displaying or setting the GPIB address is a shifted function of the local key.

Extensive **sweep** capabilities include phase continuous outputs for smooth frequency stimulus, synthesized frequency stepped signals for highly accurate outputs, and a fast hop function for very wide sweeping with fast updates. Besides linear or log frequency spacing of the steps, up to three markers can be set anywhere in the sweep range.

Centrally located **carrier** controls select frequency and amplitude level and offer a simple way to turn the output on or off. Offset capability includes add/subtract/multiply/divide functions to provide a display of the signal frequency or level at the output of a device under test. Even emf can be selected to display the open-circuit output voltage.

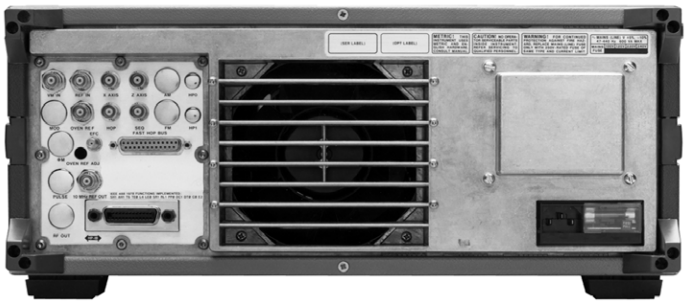
The **data** block not only allows numeric or on/off entries for many instrument functions, it also contains the shifted control keys for the fast hop functions. Signal parameters are entered into the channel and sequence tables here along with the hopping rate and length of the RF dwell at each frequency. Control of the hop trigger and dwell time are selectable with the mode key. Pressing learn prepares for frequency hopping, hop begins the hopped output, and idle stops the hopped signal.




The **increment/decrement** area contains the knob and step keys which allow numeric changes of any signal parameter with the resolution set using the left/right arrow keys or the increment set of the carrier controls. Phase increment/ decrement of the carrier output relative to the timebase signal is also provided here with 1˚ resolution.

The **mode select** keys 1 through 4 represent internal signal paths that minimize phase noise and spurs on the RF output as a function of how much FM deviation is selected. The automatic capability chooses the signal path with the best possible spectral purity for any control setting. Pressing the mode 5 fast hop key prepares the internal hardware for a frequency agile output.

Individual **output** ports for both the RF carrier and the internal modulation oscillator provide two synthesized signals from one instrument. The RF port yields a 50Ω output of signals from 252 kHz to 2060 MHz with selectable frequency, amplitude and modulation characteristics. The audio output is the internal modulating signal or, when internal modulation is not active, can provide a calibrated signal in the range of 0.1 Hz to 400 kHz with a maximum 1-volt level into 600Ω.



# Rear panel features

Rear panel ports allow a variety of signals to be available for use as needed. Reference signals from the internal frequency standard or the Option 001 high-stability timebase are provided. The user can tune the Option 001 timebase through an electronic frequency control, or lock the generator to an independent 10 MHz reference signal input at the reference in port.

# 8645A specifications

**Specifications** describe the instrument's warranted performance and apply 24 hours after the unit has been connected to the ac power line and 10 minutes after tum-on (except fast hop: 2 hours warm-up). The specifications assume the instrument is operating in the auto mode (except fast hop operation) which automatically optimizes the internal hardware configuration for maximum performance.

***Supplemental characteristics*** are intended to provide information useful in applying the instrument by giving typical, but not warranted performance. These characteristics are shown in *italics* or labeled as "typical", "approximate", or "nominal".

## Frequency

**Range:** 251.46485 kHz to 1030 MHz. 251.46485 kHz to 2060 MHz with Option 002 or with an 11845A 2 GHz retrofit kit installed.

**Frequency bands:** Exact endpoints and their approximations for each frequency band of the instrument are shown below.

| Approximate frequency band endpoints (MHz) | Specified frequency band endpoints (MHz) |
|---|---|
| 1030 to 2060 | 1030 to 2060 |
| 515 to 1030 | 515 to 1029.99999999 |
| 257 to 515 | 257.5 to 514.99999999 |
| 128 to 257 | 128.75 to 257.49999999 |
| 64 to 128 | 64.375 to 128.74999999 |
| 32 to 64 | 32.1875 to 64.37499999 |
| 16 to 32 | 16.09375 to 32.18749999 |
| 8 to 16 | 8.046875 to 16.09374999 |
| 4 to 8 | 4.0234375 to 8.04687499 |
| 2 to 4 | 2.01171875 to 4.02343749 |
| 1 to 2 | 1.00585938 to 2.01171874 |
| 0.5 to 1 | 0.50292969 to 1.00585937 |
| 0.25 to 0.5 | 0.25146485 to 0.50292968 |

**Resolution:** 0.01 Hz.

**Stability:** Same as reference oscillator. See fast hop for exception.[1]

***Frequency switching time:*** *<85 msec, to within 100 Hz of final frequency. See fast hop for exception.*

***Phase offset:*** *Adjustable in 1˚ increments.*

## Internal reference oscillator

**Stability, Option 001:** $<5 \times 10^{-10}$/day aging after 10 day warm-up.

| | *Standard* | *Option 001* |
|---|---|---|
| ***Aging:*** | *±2 ppm/year after 1 year* | *$\pm 3 \times 10^{-10}$/day after 10 days* |
| ***Temperature:*** | *±4 ppm, 0 to +55˚C* | *$\pm 6 \times 10^{-9}$, 0 to +55˚C* |
| ***Line voltage:*** | *±0.1 ppm, ±10%* | *$\pm 1 \times 10^{-10} \pm 10\%$* |

***Electronic frequency control, Option 001:*** ±0.01 ppm for ±1 V at rear panel connector. Voltage range is ±10 V. Input impedance is 10 kΩ.

***Output:*** 10 MHz, >1 $V_{rms}$ level into 50Ω, output impedance of 50Ω.

***External reference oscillator input:*** Accepts 10 MHz ±1 kHz and a level range of 0.5 to 2 $V_{rms}$. Input impedance is 50Ω.

1. Agilent does not support the fast hop, buffer off mode of operation.
2. Typically ±2 ppm of carrier frequency multiplied by the temperature change in ˚C must be added if ambient temperature changes occur between the learn operation and the conclusion of frequency hopping. FM off or at minimum deviation.

## Fast hop operation

**Frequency switching time:**
128.75 to 2060 MHz: <15 µsec.
8 to 2060 MHz: <85 µsec.
0.25 to 2060 MHz: <500 µsec.
Add 5 µsec for closed-loop ALC operation.

**Frequency hop range:** 0.25 to 2060 MHz. With FM on, limited to any three consecutive carrier frequency bands.

**Frequency accuracy**[2]**:** ±2 ppm of carrier frequency. Typically ±1 ppm.

**Amplitude accuracy:** ±1 dB, >–127 dBm output.

**Channel and sequence tables:** In fast hop, each specific frequency and amplitude to be output is entered into a channel table. The order for the channels to be output is entered in a sequence table.

**Maximum number of channels:** 2400.

**Maximum number of channels in sequence table:** 4000.

**Hop rate range:** Fixed rates from 8 Hz to 50 kHz using the internal timer. An external trigger input allows extended range and variable rates.

**Dwell time range:** Fixed times of 6.4 µsec to 99 msec using the internal timer. An external trigger input allows longer and variable dwell times.

**Learn cycle time:** Typically 10 sec to 2 minutes depending on sequence table length.

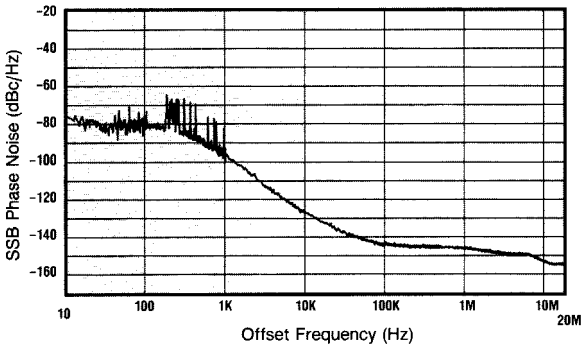
**Fast hop bus:** Allows real-time selection of any channel for output while fast hopping. Typically, frequency switching time increases by 5 µsec.

**Modulation allowed:** Internal or external AM, FM, or simultaneous AM and FM.

***Output level:*** *Maximum allowed variation of all amplitudes entered in channel table is 20 dB. Frequency switching time and absolute accuracy degrade with increasing amplitude variation. Output level is reduced by >60 dB while switching between channels. External dc AM can be used to shape the output level while fast hopping.*[1]

## Spectral purity

***Typical SSB phase noise and spurs at 1 GHz.***



**SSB phase noise (CW, AM, or FM[3] operation):**

| | Standard operation offset frequency | | Fast hop operation |
|---|---|---|---|
| **Carrier frequency (MHz)** | **20 kHz (dBc/Hz)** | **100 kHz (dBc/Hz)** | **20 kHz offset (dBc/Hz)** |
| 1030 to 2060 | –120 | –127 | –117 |
| 515 to 1030 | –127 | –134 | –124 |
| 257 to 515 | –132 | –137 | –130 |
| 128 to 257 | –136 | –140 | –133 |
| 64 to 128 | –139 | –141 | –137 |
| 32 to 64 | –141 | –141 | –139 |
| 16 to 32 | –142 | –142 | –141 |
| 8 to 16 | –143 | –143 | –142 |
| 4 to 8 | –144 | –144 | –143 |
| 2 to 4 | –144 | –144 | –144 |
| 1 to 2 | –144 | –144 | –144 |
| 0.5 to 1 | –144 | –144 | –144 |
| 0.25 to 0.5 | –144 | –144 | –144 |

**Residual FM[4] (CW, AM, FM[5] operation):**

| | Post detection bandwidth | |
|---|---|---|
| **Carrier frequency (MHz)** | **0.3 to 3 kHz (Hz rms)** | **0.05 to 15 kHz (Hz rms)** |
| 0.25 to 257 | <1 | <1.2 |
| 257 to 515 | <1.2 | <2 |
| 515 to 1030 | <2 | <4 |
| 1030 to 2060 | <4 | <8 |

**Residual AM:** <0.01% AM rms, 0.3 to 3 kHz post detection bandwidth.

***SSB AM noise floor, offsets >100 kHz:***
*<–157 dBc/Hz at +10 dBm output, 0.25 to 1030 MHz.*
*<–150 dBc/Hz at +13 dBm output, 1030 to 2060 MHz.*

**Spurious signals**
Harmonics: <–30 dBc, output ≤+10 dBm.
Harmonics, Option 002:
<–30 dBc, 0.25 to 1030 MHz, output ≤+8 dBm.
<–25 dBc, 1030 to 2060 MHz, output ≤+8 dBm.
Subharmonics: None, 0.25 to 515 MHz.
<–70 dBc, 515 to 1030 MHz.
<–40 dBc, 1030 to 2060 MHz.
Nonharmonics[6]:
<–100 dBc, >20 kHz offset, 0.25 to 1030 MHz.
<–94 dBc, >20 kHz offset, 1030 to 2060 MHz.

3. FM at minimum deviation.
4. Specified for 48 to 63 Hz power line. Typical for 400 Hz power line and for fast hop operation.
5. Deviation ≤0.1% of maximum available.
6. Typically nonharmonic spurs at all offsets are <30 dB above the instrument's phase noise level as measured in a 1 Hz bandwidth.
7. Lower 3 dB bandwidth limit is typically 20 Hz for ac coupling.

## Output

**Maximum level:** +16 dBm, 0.25 to 1030 MHz.
Option 002: +14 dBm, 0.25 to 1030 MHz.
+13 dBm, 1030 to 2060 MHz.

**Minimum level:** –137 dBm.

**Display resolution:** 0.1 dB.

**Absolute accuracy:** ±1 dB, output ≥–127 dBm.
Typically ±3 dB, output <–127 dBm.

**Reverse power protection:** 50 watts from a 50Ω source, 25 Vdc.

***Third order intermodulation:*** *<–50 dBc, with two signals at +8 dBm and 25 kHz apart passing through a resistive combiner (exception: fast hop operation). Decreases 10 dB for every 5 dB of combined level decrease.*

***Output level overrange:*** *Typically 2 dB more than maximum level.*

***Output level switching time:*** *<50 msec. See exception in fast hop.*

***SWR and output impedance:*** *<1.7: 1, output <–2 dBm <2 : 1, output ≥–2 dBm; 50Ω output impedance.*

## Modulation

**External modulation input:** *Coupling is ac or dc for AM, FM and phase modulation. Pulse modulation input is dc coupled. Displayed deviation or depth corresponds to ± 1 V external input.*

***Simultaneous modulation:*** *AM/FM, AM/Phase, AM/Pulse, FM/Pulse, Phase/Pulse, AM/FM/Pulse, AM/Phase/Pulse.*

***Simultaneous internal/external modulation:*** *FM and Phase.*

## Amplitude modulation

**AM depth:** 0 to 99.9%, for output ≤+7 dBm.

**AM resolution:** 0.1%.

**AM indicator accuracy:** ±(6% of setting +1% AM), up to 90% depth and 1 kHz rate.

**AM distortion, at 400 Hz and 1 kHz rates:**

| | Carrier frequency | |
|---|---|---|
| **Depth (%)** | **0.25 to 1030 MHz** | **1030 to 2060 MHz** |
| 257 to 30 | <2% | <2% |
| 515 to 70 | <3% | <4% |
| 1030 to 90 | <4% | <6% |

**AM 3 dB bandwidth[7]:**
>5 kHz, 0.25 to 8 MHz.
>50 kHz, 8 to 128 MHz.
>100 kHz, 128 to 2060 MHz.

**Incidental phase modulation:** <0.2 radians peak, at 30% depth and 1 kHz rate.

***External AM input impedance:*** *600Ω.*

## Frequency modulation

**FM deviation and rate:**

| | Maximum peak deviation | | Maximum rate |
|---|---|---|---|
| **Carrier frequency (MHz)** | **Standard (kHz)** | **Fast hop[8] (kHz)** | **(3 dB BW)[7] (kHz)** |
| 1030 to 2060 | 20000 | 3520 | 10000 |
| 515 to 1030 | 10000 | 1760 | 10000 |
| 257 to 515 | 5000 | 880 | 5000 |
| 128 to 257 | 2500 | 440 | 2500 |
| 64 to 128 | 1250 | 220 | 1250 |
| 32 to 64 | 625 | 110 | 625 |
| 16 to 32 | 313 | 55 | 313 |
| 8 to 16 | 156 | 27.5 | 156 |
| 4 to 8 | 78 | 13.7 | 78 |
| 2 to 4 | 39 | 6.8 | 39 |
| 1 to 2 | 19.5 | 3.4 | 19.5 |
| 0.5 to 1 | 9.7 | 1.7 | 9.7 |
| 0.25 to 0.5 | 4.8 | 0.8 | 4.8 |

**FM resolution:** 2.5% of setting.

**FM indicator accuracy:**

| Standard operation | | Fast hop operation | |
|---|---|---|---|
| **Deviation (% of maximum)** | **Maximum rate** | **Deviation (% of maximum)** | **Maximum rate** |
| *Specified accuracy ±10%:* | | | |
| 0 to 10 | 50 kHz | 0 to 50 | 50 kHz |
| *Specified accuracy ±18%:* | | | |
| 0 to 17 | 3.75 MHz | 0 to 100 | 3.75 MHz |

**FM distortion, rates 20 Hz to 100 kHz:**

| Deviation (% of maximum) | Standard operation | Fast hop operation |
|---|---|---|
| 0 to 2 | <1% | <1% |
| 2 to 10 | <3% | <1% |
| 10 to 50 | <3% | <3% |
| 50 to 100 | <6% | <6% |

**Carrier frequency accuracy in FM:** ±0.4% of deviation setting, ac or dc coupled. Typically add 1% of deviation to frequency accuracy in fast hop operation.

**Incidental AM:** <0.5%, deviation ≤6% of maximum or 20 kHz, whichever is less.

***External FM group delay:*** *30 μsec for rates 20 Hz to 20 kHz, decreases to <1 μsec at rates above 200 kHz. Fast Hop: <1 μsec.*

***External FM input impedance:*** *50Ω or 600Ω.*

8. Deviation is limited to the maximum available at the lowest carrier frequency output in the fast hop sequence.

## Phase modulation

***Maximum phase deviation:*** *400 radians, 1030 to 2060 MHz, decreases by half for each frequency band below this band.*

***Phase modulation indicator accuracy:*** *±10%.*

***Phase modulation distortion:*** *<1%.*

***Phase modulation 3 dB bandwidth[7]: >150 Hz.***

***External input impedance:*** *600Ω.*

## Pulse modulation

**On/off ratio:** >35 dB.

**Rise/fall time:** <100 nsec, 10% to 90% response points.

**Maximum pulse repetition frequency:** 1 MHz.

**Minimum pulse width:** 0.5 μsec.

***Video feedthrough and overshoot:*** *<10%, 10 to 2060 MHz.*

***Output level accuracy:*** *±2 dB.*

***External input levels:*** *On: >3.0 V peak. Off: <0.8 V peak. Damage Level: ≥±10 V peak.*

***External input impedance:*** *600Ω.*

## Internal modulation source

**Waveforms:** Sine, square, sawtooth and white Gaussian noise.

**Frequency range:** Sine, white Gaussian noise: 0.1 Hz to 400 kHz. Square, sawtooth: 0.1 Hz to 50 kHz.

**Frequency switching time:** Typically <30 msec.

**Frequency resolution:** 0.1 Hz.

**Frequency accuracy:** Same as internal reference oscillator.

**Maximum output level:** Nominal 1V peak into 600Ω. Typical accuracy: ±20 mV, output ≤100 kHz.

**Output level resolution:** 2 mV. Typical output impedance: 600Ω.

**Distortion:** <0.1%, output at 1 V peak and ≤15 kHz.

## Frequency sweep

**Phase continuous sweep:**

Sweep type: Linear, phase continuous.

Sweep time: 10 msec to 10 sec, not dependent on sweep span selected.

Maximum sweep span:

| Frequencyrange (MHz) | Maximum span (MHz) |
|---|---|
| 1030 to 2060 | 40 |
| 515 to 1030 | 20 |
| 257 to 515 | 10 |
| 128 to 257 | 5 |
| 64 to 128 | 2.5 |
| 32 to 64 | 1.25 |
| 16 to 32 | 0.625 |
| 8 to 16 | 0.312 |
| 4 to 8 | 0.156 |
| 2 to 4 | 0.078 |
| 1 to 2 | 0.039 |
| 0.5 to 1 | 0.019 |
| 0.25 to 0.5 | 0.009 |

**Fast hop sweep:**
Sweep type: Linear or log, frequency stepped.
Sweep time range: 10 msec to 1000 sec, number of frequency steps varies with sweep time selected. Typical time per step is 30 µsec for outputs within 128 to 2060 MHz, 170 µsec for 8 to 2060 MHz, and 650 µsec for 0.25 to 2060 MHz.

**Digitally stepped sweep:**
Sweep type: Linear or log, frequency stepped.
Sweep time range: 500 msec to 1000 sec, number of frequency steps varies with sweep time selected. Typical time per step is 90 msec.

**X-axis output:** Nominal 0 to +10 V.

**Z-axis output:** Nominal +5 V during retrace.

**Markers available:** 3.

## Remote programming

**Interface:** GPIB

**GPIB select code range:** 00 to 30. Interface function is listener and talker.

**Control language:** HPSL (Hewlett-Packard Systems Language).

**Functions controlled:** All front panel functions except power switch and knob.

**IEEE-488 functions:** SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C0, E2.

**Fast hop bus interface:** DB-25 connector accepting TTL levels.

## General

**Power requirements:** ±10% of 100 V, 120 V, 220 V, or 240 V; 48 to 440 Hz; 500 VA maximum.

**Operating temperature range:** 0 to +55˚C.

**Storage temperature range:** –55 to +75˚C.

**Leakage:** Conducted and radiated interference meets MIL STD 461B RE02 and FTZ 1046. RF leakage is typically <0.5 µV induced in a two-turn loop antenna 2.5 cm in diameter held 2.5 cm away from the front panel for output levels <0 dBm.

**Acoustic noise:** Typically <5.5 bels.

**Internal calibration:** The operator can initiate an internal calibration and diagnostic function that will ensure all specifications are being met with a confidence level exceeding the accepted standard of 95%.

**Internal diagnostics:** The instrument monitors its operation and will alert the user to most internal malfunctions. Built-in test capability locates circuit malfunctions to allow repair through module or cable replacement.

**Calibration interval:** 3 years (MTBC).

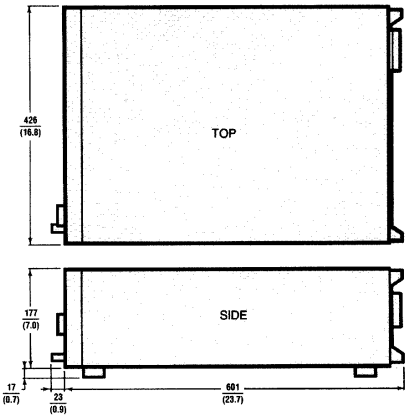
**Retrofit kit, 11845A:** Installation of a single module and several cables extends the frequency range of the standard instrument to 2060 MHz.

**Storage registers:** 10 full function and 40 frequency/amplitude registers.

**Memory erasure:** All memory contents except generic calibration data can be erased according to Mil Std 380-380.

**Weight:** Approximately 29 to 31 kg (63 to 69 lbs) net and 40 to 42 kg (88 to 94 lbs) shipping depending on the options ordered.

**Dimensions:** Approximately 177H x 426W x 624D mm (7 x 16.8 x 24.6 in.).




## Ordering information

To add options to a Model, use the following ordering scheme:

| | Example |
|---|---|
| Model # | 8645A |
| Model #-option# | 8645A-001 |

**8645A agile signal generator options:**

8645A-001: High stability time base

8645A-002: 2 GHz output

8645A-003: Rear panel inputs/outputs (deletes front panel inputs/outputs)

8645A-907: Front handle kit (5061-9690)

8645A-908: Rack flange kit (5061-9678)

8645A-909: Combined front handle/rack flange kit (5061-9684)

8645A-910: Extra manual set (includes service manual)

8645A-915: Add service manual

Transit case (9211-2662)

Transit case wheels (1490-0913)

Non-tilting rack slide kit (1494-0059)

Tilting rack slide kit (1494-0063)

**Warranty plans**

Standard warranty is 36 months.

For warranty and service of 5 years, please order 60 months of R-51B (quantity = 60).

R-51B: Return-to-Agilent warranty and service plan

**Calibration plan[9]**

For 3 years, order 36 months of the appropriate calbration plan shown below. For 5 years, specify 60 months.

R-50C-001: Standard calibration

9. Options not available in all countries.

**Agilent Technologies' Test and Measurement Support, Services, and Assistance**

Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

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**Product specifications and descriptions in this document subject to change without notice.**



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