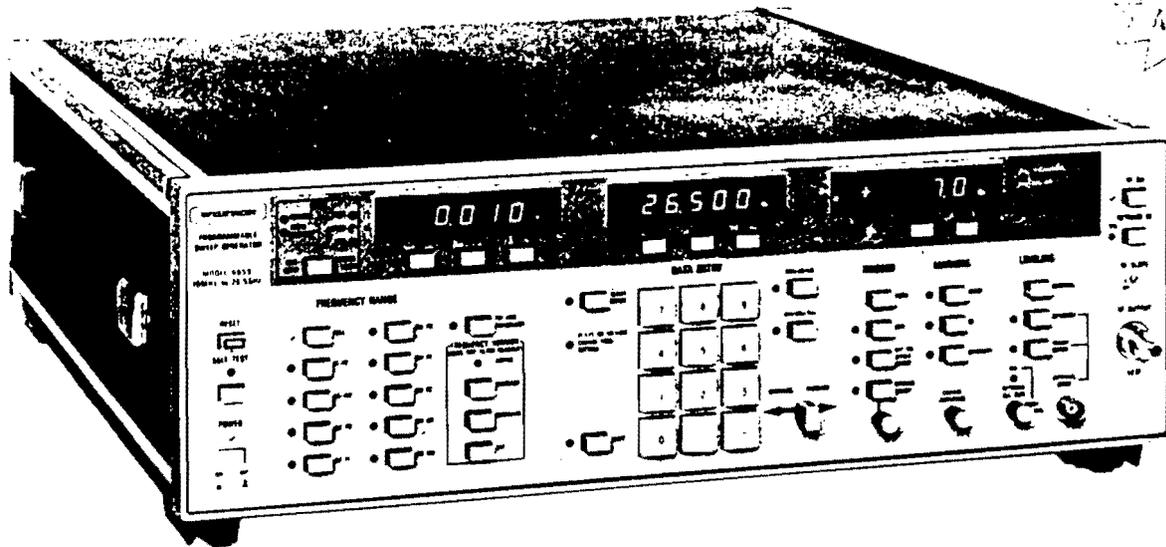


## Programmable Sweep Generators 10 MHz - 40 GHz

## MODEL 6600A SERIES



### A FRESH APPROACH TO SWEEP GENERATORS

The WILTRON 6600A Series Sweep Generators is an all-new generation of solid state sweepers, combining new RF technology with microprocessor control. This is truly an easy-to-use instrument which is equally well suited to operation from the front panel or as a computer-controlled signal source in an automatic test system. In either application, the improvement in accuracy with which microwave measurements can be made is impressive. Fundamental oscillators generate clean signals with harmonics that are less than  $-40$  dBc from 2 to 26.5 GHz, avoiding the errors of harmonic-burdened signal sources. Whether you need a broadband signal source for ATE or for a traditional reflection and transmission loss or gain test setup, the 6600A is your best choice.

### BROADBAND AND NARROW-BAND FREQUENCY RANGES

The 6600A family consists of 29 models (Figure 1) from which you can select a unit that is exactly suited to your application. For broadband use, the 6659A spans the 10 MHz to 26.5 GHz range. For narrow-band tests you can select the coverage you need, avoiding the expense of unneeded capability. All models offer the accuracy, stability, residual FM, and lower price of the 6600A's hard-wired circuitry. And YIG-tuned oscillators are covered by a two-year warranty.

### IMPROVED MEASUREMENT ACCURACY

Whether in one of the five sweep modes or in CW at  $F_0$ ,  $F_1$ ,  $F_2$ ,  $M_1$ , or  $M_2$ , you will appreciate the exceptional spectral purity, accuracy and stability. Several innovative ideas make this new level of performance possible:

- The signal source is a frequency module which is mounted inside the instrument. Compared to a plug-in sweeper, performance is considerably improved because circuits are hard-wired, eliminating the routing of signals (and pick-up) in and out of the plug-in. Control voltages and currents are cleaner, resulting in improved quality of the output signal.

Model	Range	Frequency (GHz)							
		2	4	6	12	18	26	40	
6609A	10 MHz - 2 GHz								
6617A	10 MHz - 8 GHz								
6647A	10 MHz - 18.6 GHz								
6648A	10 MHz - 20 GHz								
6659A	10 MHz - 26.5 GHz								
6619A	2 - 8 GHz								
6619A-40	2 - 8 GHz								
6621A	2 - 12.4 GHz								
6621A-40	2 - 12.4 GHz								
6637A	2 - 18.6 GHz								
6637A-40	2 - 18.6 GHz								
6638A	2 - 20 GHz								
6653A	2 - 26.5 GHz								
6610A	1 - 2 GHz								
6616A	1.7 - 4.3 GHz								
6620A	3.6 - 6.5 GHz								
6624A	4 - 8 GHz								
6627A	5.9 - 9 GHz								
6628A	8 - 12.4 GHz								
6628A-50	8 - 12.4 GHz								
6629A	8 - 18.6 GHz								
6629A-40	8 - 18.6 GHz								
6631A	10 - 15.5 GHz								
6630A	12.4 - 18.6 GHz								
6630A-50	12.4 - 18.6 GHz								
6632A	17 - 22 GHz								
6636A	18 - 26.5 GHz								
6642A	18 - 40 GHz								
6640A	26.5 - 40 GHz								

Figure 1. The 6600A Programmable Sweep Generator family covers the 10 MHz to 40 GHz range.

- Frequency accuracy and stability also are vastly improved. This is accomplished by compensating for the nonlinear frequency characteristics of the YIG-tuned oscillators. A frequency correction is stored in memory and added to the oscillator control voltage. CW accuracy is held to less than  $\pm 10$  MHz up to 18.6 GHz and  $\pm 20$  MHz up to 26.5 GHz, without the adjustment of tracking filters that is required by other sweepers. Even greater accuracy is available by phase locking the unit to an external source-locking frequency counter.
- Fundamental oscillators are used from 2 GHz to 26.5 GHz. These oscillators are free of the substantial harmonically-related spurious signals found in the multiplier-type oscillators used in other well-known sweepers. For the first time, harmonics are held well below  $-40$  dBc from 2 to 26.5 GHz. This is important because the high spurious content of the multiplier-type oscillators can cause large errors in the measurement of reflection and transmission characteristics. Figure 2 illustrates one example.

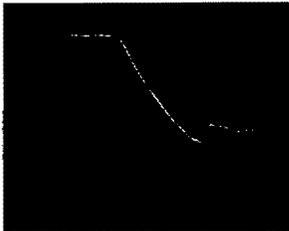


Figure 2A. Data taken on network analyzer using multiplier-type oscillators. By-products of multiplied frequencies give erroneous indication of response outside filter passband. 10 dB/div.

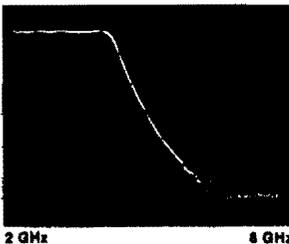


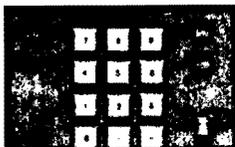
Figure 2B. Data taken with WILTRON Network Analyzer. Clean signals from fundamental oscillators show that response outside passband is actually 20 dB less than shown in 2A. 10 dB/div.

### FAMILIAR CONTROL TERMINOLOGY

The selection of parameters and modes of operation is logical and straightforward (Figure 3). In contrast to other units, this sweeper does not change modes while new parameters are entered; it changes only when you are ready to operate in the new mode. There is no uncontrolled switching through unwanted test conditions.



1) Select the parameter to be used: frequency, sweep time or power level.



2) Enter the desired values for frequency, sweep time, or power level.

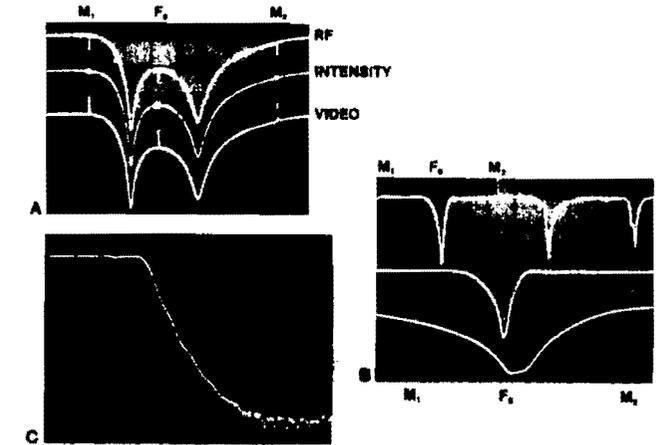


Figure 4. (A)  $F_0$ ,  $M_1$ ,  $M_2$  markers are displayed as RF, intensity, or video pips. (B) In  $F_1$ - $F_2$  sweep (top),  $M_1$  and  $M_2$  markers can be used to select limits of  $M_1$ - $M_2$  sweep (center). The  $F_0/\Delta F$  sweep (bottom) with  $M_1$ ,  $M_2$  markers sweeps symmetrically about  $F_0$  from 0 to 100% of full band. (C) When used with the 560A Network Analyzer, the 6600A markers can be tilted for optimum display on vertical traces.

### FIVE SWEEP MODES AND THREE MARKERS

In the broadband FULL and  $F_1$ - $F_2$  sweep modes, three markers are available at  $F_0$ ,  $M_1$  and  $M_2$ . These may be used for precise identification of single frequency points, marker sweep limits, or for the center frequency of the  $F_0/\Delta F$  narrow-band sweep (Figure 4).

### CALIBRATED OUTPUT POWER

A keypad and digital readout calibrated in dBm take the guesswork out of selecting an exact value of output power. With the addition of the 70 dB attenuator (Option 2), the instrument provides an 82 dB power control range in 0.1 dB steps up to 26.5 GHz. The capability of making tests at a specified power level eliminates one more variable that can contribute to measurement inaccuracies.

### EXCEPTIONAL SOURCE MATCH

A poor source-impedance match can introduce significant errors in test results. Energy reflected from the mismatch becomes an error vector in return loss and transmission measurements. This error is minimized by the exceptionally good source match of the 6600A Series. In the 6647A, for example, source SWR is less than 1.4 from 8 to 18.6 GHz. This



3) Select the appropriate unit (GHz, msec, dBm, etc.)



4) Select the desired sweep or CW mode.

Figure 3. Innovative human engineering makes operation of the 6600A series virtually self-explanatory.

compares to the 1.9 above 2 GHz specified for other sweepers, a difference of greater than 5 dB return loss.

### MICROPROCESSOR AND DIGITAL CIRCUITRY

The powerful combination of microprocessors and digital circuits is beautifully demonstrated in the 6600A Series. Circuits are tested automatically each time the instrument is turned on. All major controls are electronic—no mechanical knobs—and positioned logically in functional groups. All displays are digital and include the appropriate unit. LEDs alert the operator when an erroneous entry is made. Data is entered on the convenient and exact keypad. All of these add up to improved accuracy, ease of operation, greater reliability and lower cost.

### HIGH RESOLUTION FREQUENCY VERNIER

The FREQUENCY VERNIER controls are used to calibrate frequency accuracy in the CW and  $\Delta F$  modes. While monitoring the output with a counter, you simply press the INCREASE and DECREASE buttons until the desired frequency is obtained. Future requests for the same frequency will produce the same frequency, including the correction. Here is one more way the 6600A Series improves measurement accuracy and meets the needs of applications which formerly required a signal generator or synthesizer.

### 82 dB POWER SWEEP RANGE

Characteristics of power sensitive devices, such as amplifiers and mixers, can be tested conveniently with the power sweep feature. Power output is programmable over the GPIB or selectable from the front panel with 0.1 dB resolution.

### TIME-SAVING SELF TEST

The Series 6600A modular design and self-test features allow you to diagnose problems and return the unit to service with a minimum of down-time. When a self test is initiated by a controller over the bus, the sweep generator supplies a pass or fail indication to the bus. When a self test is initiated from the front panel, up to 25 error codes are displayed on the front panel numeric LED readouts. The error codes direct the repair technician to the module or modules that need to be serviced.

### NON-VOLATILE MEMORY

The Series 6600A Sweep Generators retain a complete set of front panel settings in non-volatile memory. The settings remembered are the ones last commanded. If power is lost and then restored, the sweep generator is immediately available for testing. Data stored in memory is valid for a minimum of 20 days without application of line power.

### COMPLETE PROGRAMMABILITY

Every measurement parameter can be controlled over GPIB (IEEE-488/IEC 625) by descriptive commands which make the 6600A compatible with virtually any computer or controller. The sweep generator recognizes bus messages that assure smooth operation of an interactive, real-time ATE system. Parallel poll, serial poll, service request (SRQ), and group execute trigger provide programming flexibility to achieve optimum test sequencing, timing and control. A Local Lockout command protects the system against errors that might be inadvertently introduced by operating the front-panel controls. The sweep generator uses distributed microprocessors to reduce bus loading and to minimize measurement times. Processing and control functions are divided between two microprocessors and two programmable LSI interfaces.

A complete set of 6600A programmable functions provide the flexibility needed by the ATE system designer. Descriptive commands provide a clear correlation between hardware and software, reducing program learning times. Easy-to-learn programming simplifies the selection of optimum test sequences, timing, control, data storage, and data retrieval.

### COMPATIBLE WITH PHASE-MAGNITUDE NETWORK ANALYZER

Rear panel blanking, frequency reference, and sweep dwell connections on the 6600A Series Sweep Generators make them compatible with the HP 8410B Network Analyzer or the HP 8409B Automated Network Analyzer.

## There is a software command for every sweep generator front panel pushbutton (except line power).

Program sweep ranges independently. Commanding one mode does not change the limits of a previously programmed mode.

Program sweep to dwell at a marker while a counter counts frequency.

Use SRQ at end of sweep for control of sweep functions and test sequences.

Program Reset and Self-Test independently. Self-Test does not destroy test setup. A pass or fail indication is provided to the bus.

Turn off displays under program control for secure operation in special environments.

Program frequencies independently. Select sweep limits, CW frequencies, marker frequencies (F0, M1, M2), or center frequencies for  $\Delta F$  operation.

Program frequency span ( $\Delta F$ ).

Program frequencies with standard resolution of 1 MHz.

Program FM or phaselock capability. Lock to an external counter or synchronizer for improved frequency resolution and accuracy.

Correct output frequency under program control with 100 kHz resolution over +12.7 MHz to -12.8 MHz range.

Correlate data with frequency, power (both dB and dBm), and time terminators.

Under program control, modify frequency,  $\Delta F$ , sweep time, and power in programmable steps.

Use SAV and RCL commands to save and recall complete front-panel status. Store and retrieve conditions at your convenience.

Program sweep time over a 10 msec to 99 sec range.

Program power level over 12 dB range (standard) with 0.1 dB resolution or over 82 dB range with optional attenuator.

Program RF on or off, and RF on or off during retrace.

Select leveling mode under program control.

Select marker type, including patented dwell-type intensity markers, under program control.

Use group execute trigger commands to optimize system performance.

Select trigger mode under program control.

Trigger and reset sweep under program control.

Program high-resolution, high-speed step sweep and step size. Divide 10 GHz or 1 MHz into 4096 points.

# 6600A Series Specifications

## FREQUENCY

**Frequency Range:** 10 MHz to 40 GHz in 29 models. See pages 26-27.

### Frequency Control:

**FULL:** Sweeps upward across the complete frequency range.

**F<sub>1</sub>-F<sub>2</sub>:** Sweeps from F<sub>1</sub> to F<sub>2</sub> which are entered independently on keypad. F<sub>2</sub> must be greater than F<sub>1</sub>.

**M<sub>1</sub>-M<sub>2</sub>:** Sweeps from M<sub>1</sub> to M<sub>2</sub> markers which are entered independently on keypad. M<sub>2</sub> must be greater than M<sub>1</sub>.

**ΔF:** Sweeps upward symmetrically about F<sub>0</sub> or F<sub>1</sub>. Sweep width is adjustable on keypad in MHz or GHz.

**CW:** Single frequency at F<sub>0</sub>, F<sub>1</sub>, F<sub>2</sub>, M<sub>1</sub> and M<sub>2</sub> which are independently entered on keypad.

**ALTERNATING SWEEP:** Alternately sweeps any two of the Full, F<sub>1</sub>-F<sub>2</sub>, M<sub>1</sub>-M<sub>2</sub>, ΔF F<sub>0</sub>, and ΔF F<sub>1</sub> sweep modes.

**FREQUENCY VERNIER:** Fine adjustment of F<sub>0</sub>, F<sub>1</sub>, F<sub>2</sub>, M<sub>1</sub>, and M<sub>2</sub> in CW modes and F<sub>0</sub> and F<sub>1</sub> in ΔF modes up to ± 12.7 MHz for models with specified frequency accuracies of ≤ ± 10 MHz and up to ± 25 MHz for accuracies of > ± 10 MHz. A different correction can be selected for each frequency with the INCREASE and DECREASE pushbuttons. Correction applies until released with OFF button or the frequency is changed. ACTIVE light is on whenever a vernier adjustment has been made.

**MANUAL:** Continuous manual adjustment of frequency between sweep limits in every sweep mode. May be used to set recorder sweep limits.

### Frequency Resolution:

**NORMAL:** 1 MHz

**FREQUENCY VERNIER:** 100 kHz on ± 12.7 MHz range, 200 kHz on ± 25 MHz range.

**STEP SWEEP:** 4096 Programmable points.

**Frequency Accuracy:** See pages 26-27.

### Frequency Markers:

**MARKER SELECTION:** Three markers at F<sub>0</sub>, M<sub>1</sub> and M<sub>2</sub> frequencies which are independently entered on keypad in MHz or GHz. Displayed in the following modes:

SWEEP MODE	AVAILABLE MARKERS
Full	F <sub>0</sub> , M <sub>1</sub> , M <sub>2</sub>
F <sub>1</sub> -F <sub>2</sub>	F <sub>0</sub> , M <sub>1</sub> , M <sub>2</sub>
F <sub>1</sub> /ΔF	F <sub>0</sub> , M <sub>1</sub> , M <sub>2</sub>
F <sub>2</sub> /ΔF	M <sub>1</sub> , M <sub>2</sub>
M <sub>1</sub> -M <sub>2</sub>	F <sub>0</sub>

**ACCURACY:** Same as frequency accuracy. See pages 26-27.

**RESOLUTION:** 0.4% of sweep width.

**DISPLAY:** Front panel pushbuttons select three alternate marker displays:

*Video:* Positive video pulse of up to 5 volts amplitude, adjustable with MARKER AMPLITUDE control.

*RF:* Attenuated RF pulse of up to 5 dB amplitude, adjustable with MARKER AMPLITUDE control.

*Intensity:* Intensified dot on trace, obtained by momentary dwell in sweep.

**MARKER OUTPUT:** 0 to +5 volt TTL-compatible pulse, coincident with video markers, 1k ohm impedance. Rear panel BNC connector. Adjustable with MARKER AMPLITUDE control.

## SWEEP AND TRIGGERING MODES

### Sweep Triggering:

**AUTO:** Triggers sweep automatically.

**LINE:** Triggers sweep from power line frequency.

**EXTERNAL:** Triggers sweep from externally applied 4 to 25 Vpk or TTL-compatible pulse with > 1 μsec width and > 5 μsec fall time. Rear panel BNC connector.

**SINGLE:** EXT OR SINGLE SWEEP selects mode, triggers, aborts and resets single sweep.

**Sweep Time:** Adjustable from approximately 0.01 to 99 sec. Entered on keypad in msec or sec.

**Retrace RF:** Front panel pushbutton blanks RF power during sweep retrace.

**Horizontal Output:** 0 to 10 volt ramp coincident with sweep in all sweep modes. In CW mode, output voltage varies in proportion to frequency, 0 volts at 0 GHz and 10 volts at 26.5 GHz. Rear panel BNC connector.

**Sequential Sync Output:** +5 volt TTL-compatible pulse occurring at oscillator bandswitching points and during sweep retrace. Rear panel BNC connector.

**Retrace Blanking (-) Output:** -5 volt pulse occurring during sweep retrace. Rear panel BNC connector. < 100 ohm impedance

**Retrace Blanking (+) Output:** +5 volt TTL-compatible pulse occurring during sweep retrace. Rear panel BNC connector.

**Bandswitch Blanking Output:** ±5 volt pulse occurring during oscillator bandswitching points. Polarity selected on rear panel switch. Rear panel BNC connector. < 100 ohm impedance.

**V/GHz Output:** Reference voltage of 1 volt per GHz, varying in proportion to output frequency. On 6636A, 6640A, 6642A, 6653A and 6659A, output is 0.5 volt per GHz. Rear panel BNC connector. < 100 ohm impedance.

**Penlift Output:** Normally-open relay contacts for lifting recorder pen during sweep retrace. Internal jumper can be installed to provide normally-closed contacts. Rear panel BNC connector.

**Sweep Dwell Input:** Low true TTL-compatible pulse causes frequency sweep to stop. May be used to count marker frequencies with an external counter and Frequency Counter Interface output, Option 13.

**External Sweep Input:** Externally applied 0 to 10 volt ramp sweeps frequency between selected sweep limits. Rear panel BNC connector. 10k ohm impedance. Front panel control.

### CW Filter Enable/Disable:

**ENABLED:** Filter inserted for CW mode and sweep widths ≤ 50 MHz.

**DISABLED:** Filter removed for all modes of operation.

## LEVELING AND MODULATION

### Leveling:

**INTERNAL:** Levels output power at front panel connector. See pages 26-27 for power variation specifications. Not available on 6640A or 6642A above 26.5 GHz.

**EXTERNAL DETECTOR:** Levels output power at remote test position where directional detector samples RF power and provides a positive or negative polarity detected signal of 5 mV to 500 mV to front panel

# 6600A Series Specifications (cont.)

BNC connector. Front panel ALC gain control adjusts input signal level to optimum value.

**POWER METER:** Levels output power at remote test position where a power meter samples RF power and provides a  $\pm 1.0V$  full scale video signal to a front panel BNC connector. Front panel ALC gain control adjusts input signal level to optimum value.

**Unleveled Indicator:** Lights when output power is insufficient to maintain leveling across the selected sweep range.

**Attenuator:** Option 2 adds a 10 dB step attenuator with a 70 dB range. See pages 26-27 for accuracy specifications.

**RF Slope Control:** Adjusts slope of leveled output power by increasing power at the higher frequencies to compensate for frequency-dependent cable losses in test setup.

**External Square Wave Input:** Externally applied TTL-compatible square wave modulates output at dc to 50 kHz rate. Will accommodate  $\pm 6V$  square wave. On/Off ratio, typically 40 dB. Maximum input,  $\pm 20$  volts. Rear panel BNC connector. Not available on 6640A and 6642A. Order Option 11 for 6610A, 6616A, 6619A, 6619A-40, 6620A, 6624A, 6627A, 6628A, 6628A-50, 6630A, 6630A-50, 6631A, 6632A, and 6636A. Standard on all others.

**External AM Input:** Rear panel BNC connector. 10k ohm impedance.

**SENSITIVITY:** 1 dB/V

**FREQUENCY RESPONSE (TYPICAL):** DC-50 kHz

**INPUT IMPEDANCE:** 10 k $\Omega$

**AMPLITUDE CONTROL RANGE:** > 13 dB

**MAXIMUM INPUT:** 20V

**External FM and Phase Lock Input:** Rear panel BNC connector. 10k ohm impedance

**SENSITIVITY:** -6 MHz/V

**MAXIMUM DEVIATION FOR MODULATION FREQUENCY OF:**

DC-100 kHz:  $\pm 25$  MHz

100-250 kHz:  $\pm 5$  MHz

## INSTRUMENT STATUS

**GPIB Indicators:** When General Purpose Interface Bus (GPIB), Option 3 is added to the instrument, LED lights indicate the following conditions:

**REMOTE:** Operating on GPIB

**TALK:** Talking on GPIB.

**LISTEN:** Listening on GPIB.

**SRQ:** Sending a service request.

**LOCAL LOCKOUT:** Disabling the RETURN TO LOCAL pushbutton. The instrument can be placed in local mode only via GPIB.

**Non-Volatile Memory:** Retains front panel control settings in memory for more than 20 days. Whenever instrument is turned on, control settings come on at the same functions and values existing when power was removed.

**Reset Control:** Returns controls to following conditions:

**FREQUENCY RANGE:** Full

**TRIGGER:** Auto

**MARKERS:** Off

**RF:** On

**LEVEL:** Specified power level

**LEVELING:** Internal. Not available on 6640A and 6642A  $\geq 26.5$  GHz.

**SWEEP TIME:** 50 msec

**F<sub>0</sub>, F<sub>1</sub>, F<sub>2</sub>, M<sub>1</sub>, M<sub>2</sub>,  $\Delta F$ :** Frequency varies with model number.

**Self-Test:** Performs self-test every time power is applied or when SELF TEST pushbutton is pressed. If an error is detected, a diagnostic code appears, identifying the cause and location of the error.

## GENERAL

**Power Variation With Temperature:**  $\pm 0.05$  dB/ $^{\circ}C$ . Not applicable to 6632A, 6640A, and 6642A.

**Residual AM (50 kHz Bandwidth):** > 50 dBc. Not applicable to 6640A and 6642A.

## Source Match:

MODEL	SOURCE SWR (500)	SOURCE SWR WITH OPTION 2, ATTENUATOR
6609A	1.3	1.5
6610A	1.3	1.5
6616A, 6620A	1.4	1.5
6617A	1.4 ( $\leq 2$ GHz) 1.2 ( $> 2$ GHz)	1.5
6621A, 6621A-40	1.3 ( $\leq 8$ GHz) 1.5 ( $> 8$ GHz)	2.0
6619A, 6619A-40, 6624A, 6627A, 6628A, 6628A-50, 6629A, 6629A-40	1.5	2.0
6630A, 6630A-50, 6631A	1.8	2.0
6632A	2.0	2.0
6636A	2.0	2.0
6637A, 6637A-40, 6638A	1.2 ( $\leq 8$ GHz) 1.4 ( $> 8$ GHz)	2.0
6640A	N/A	N/A
6642A	2.0 (18-26.5 GHz) N/A (26.5-40 GHz)	N/A
6647A, 6648A	1.4 ( $< 2$ GHz) 1.2 (2-8 GHz) 1.4 ( $> 8$ GHz)	2.0
6653A, 6659A	1.5 ( $\leq 18$ GHz) 1.7 ( $> 18$ GHz)	2.0

**Output Connector:** Type N Female all models except:

**MODEL 6632A:** WSMA Female

**MODELS 6653A, 6659A and 6636:** Ruggedized WSMA Female

**MODEL 6640A:** UG-599/U

**MODEL 6642A:** Ruggedized WSMA Female (18-26.5 GHz) UG-599/U (26.5-40 GHz)

**Decrease/Increase Control:** Electronically increases and decreases value of frequency, sweep time, and power. Rate of change is greatest when lever is in extreme position, decreasing as it is moved toward the center. A "tap" moves the parameter by one increment.

**Data Entry:** Frequency, sweep time, and power level are entered on keypad with up to 5 digit resolution. Entry is terminated by pressing appropriate unit (MHz, dB, mS or GHz, dBm, Sec) pushbutton. Entry errors are cleared by pressing CLEAR ENTRY.

**Shift Key:** Activates dual function controls—ALT (alternating sweep), CW FILTER (CW filter enable/disable), CW RAMP (horizontal output ramp), and EXTERNAL SWEEP (external sweep input).

**Dimensions:** 133 mm H  $\times$  432 mm W  $\times$  476 mm D (5.25" H  $\times$  17" W  $\times$  18.75" D)

**Weight:** 15 kg (33.5 lb) maximum.

**Input Power:** 100V/120V/220V/240V + 5%, - 10% selectable on rear panel. 50-60 Hz, 250 VA maximum.

**Operating Temperature Range:** 0 to +55 $^{\circ}C$ .

# 6600A Series Specifications (cont.)

MODEL	FREQUENCY RANGE (GHz)	OUTPUT POWER (25°C ±5°)		POWER LEVEL ACCURACY			LEVELED POWER VARIATION		HARMONICS (dBc)	
		INTERNALLY LEVELED MAXIMUM (mW)	WITH OPT. 2, 70 dB ATTENUATOR (mW)	LEVELED (dB)	WITH OPT. 2, 70 dB ATTENUATOR ADD: (dB)	ATTENUATOR ACCURACY PER STEP (dB)	WITH FREQUENCY (dB)	WITH FREQUENCY OPT. 2, 70 dB ATTENUATOR (dB)		
<b>Multiband</b>										
6659A	.01-26.5	> 10 (≤ 18 GHz) > 4 (> 18 GHz)	> 5 (≤ 18 GHz) > 1.6 (> 18 GHz)	±1	±2	±0.7	±1.0	±1.5	> 30 (< 2 GHz) > 40 (> 2 GHz)	
6648A	.01-20	> 10 (≤ 18 GHz) > 5 (> 18 GHz)	> 6.6 (≤ 18 GHz) > 3.3 (> 18 GHz)	±1	±1.5	±0.7	±0.6	±1.5	> 30 (< 2 GHz) > 40 (> 2 GHz)	
6647A	.01-18.6	> 10	> 6.6	±1	±1.5	±0.4	±0.5	±1.5	> 30 (< 2 GHz) > 40 (> 2 GHz)	
6653A	2-26.5	> 10 (≤ 18 GHz) > 4 (> 18 GHz)	> 5 (≤ 18 GHz) > 1.6 (> 18 GHz)	±1	±2	±0.7	±1.0	±1.5	> 40	
6638A	2-20	> 10 (≤ 18 GHz) > 5 (> 18 GHz)	> 6.6 (≤ 18 GHz) > 3.3 (> 18 GHz)	±1	±1.5	±0.7	±0.5	±1.5	> 40	
6637A	2-18.6	> 10	> 6.6	±1	±1.5	±0.4	±0.5	±1.5	> 40	
6637A-40	2-18.6	> 40	> 26.3	±1	±1.5	±0.4	±0.5	±1.5	> 25	
6621A	2-12.4	> 10	> 7.4	±1	±1.5	±0.4	±0.5	±1.4	> 40	
6621A-40	2-12.4	> 40	> 29.5	±1	±1.5	±0.4	±0.5	±1.4	> 25	
6617A	.01-8	> 10	> 7.9	±0.9	±1	±0.4	±0.5	±1	> 30 (< 2 GHz) > 40 (> 2 GHz)	
6619A	2-8	> 10	> 7.9	±1	±1.5	±0.4	±0.4	±0.9	> 40	
6619A-40	2-8	> 40	> 31.6	±1	±1.5	±0.4	±0.4	±0.9	> 25	
6629A	8-18.6	> 10	> 6.6	±1	±1.5	±0.4	±0.5	±1.5	> 40	
6629A-40	8-18.6	> 40	> 26.3	±1	±1.5	±0.4	±0.5	±1.5	> 40	
6642A	18-40	> 3.1 (18-26.5 GHz) > 1 (26.5-40 GHz) ①	N/A	±2 (< 26.5 GHz) N/A (> 26.5 GHz)	N/A	N/A	±1 (< 26.5 GHz) N/A (> 26.5 GHz)	N/A	> 30 (< 26.5 GHz) > 20 (> 26.5 GHz)	
<b>Single Band</b>										
6609A	.01-2	> 20	> 17.8	±0.6	±0.8	±0.3	±0.3	±0.8	> 30	
6610A	1-2	> 20	> 17.8	±1	±1.5	±0.4	±0.3	±0.5	> 30 ②	
6616A	1.7-4.3	> 10	> 7.8	±1	±1.5	±0.4	±0.4	±0.7	> 20 ① 7-2 26 GHz) > 30 ② 26-4.3 GHz)	
6620A	3.6-6.5	> 20	> 15.6	±1	±1.5	±0.4	±0.3 05 (±0.03 dB/30 MHz)	±0.8	> 30	
6624A	4-8	> 10	> 7.8	±1	±1.5	±0.4	±0.4	±0.9	> 30 ③	
6627A	5.9-9.0	> 10	> 7.8	±1	±1.5	±0.4	±0.3	±0.8	> 30	
6628A	8-12.4	> 10	> 7.4	±1	±1.5	±0.4	±0.4	±0.9	> 30	
6628A-50	8-12.4	> 50	> 37.2	±1	±1.5	±0.4	±0.4	±0.9	> 30	
6630A	12.4-18.6	> 10	> 6.6	±1	±1.5	±0.4	±0.5	±1	> 30	
6630A-50	12.4-18.6	> 50	> 33.9	±1	±1.5	±0.4	±0.5	±1	> 30	
6631A	10-15.5	> 10	> 7	±1	±1.5	±0.4	±0.4	±0.9	> 30	
6632A	17-22	> 5	> 3.2	±1	±3	±0.7	±0.8	±2.3	> 30	
6636A	18-26.5	> 3.1	> 1.2	±2	±3	±0.7	±1	±2.5	> 30	
6640A	26.5-40	> 1 ①	N/A	N/A	N/A	N/A	N/A	N/A	> 20	

① External leveling only.

② Excluding 5% band edges where specification is > 20 dBc.

③ Measured in 30 Hz-15 kHz bandwidth.

④ After 30 minutes warmup at selected CW frequency.

## OPTIONS

**Rack Mounting, Option 1:** Unit supplied with mounting ears and chassis track slides (90° tilt) installed.

**Attenuator, Option 2:** Adds 10 dB step attenuator with 70 dB range. Output power is selected on keypad directly in dBm over an 82 dB range. Not available on 6640A or 6642A above 26.5 GHz.

For models with highest frequency ≤ 18.6 GHz:

For models with highest frequency > 18.6 GHz:

**GPIB Interface, Option 3:** Adds General Purpose Interface Bus (IEEE-488/IEC 625). All pushbutton controls except line power on/off are bus controlled. Field installable.

**Rear Panel RF Output, Option 9:** Option 9S adds SMA female and Option 9N adds Type N female rear panel RF output connector and deletes front panel RF connector, degrading output power (typically 1 dB at 18.6 GHz), source SWR (typically to 2 @ > 8 GHz), and power variation. Not available on 6640A and 6642.