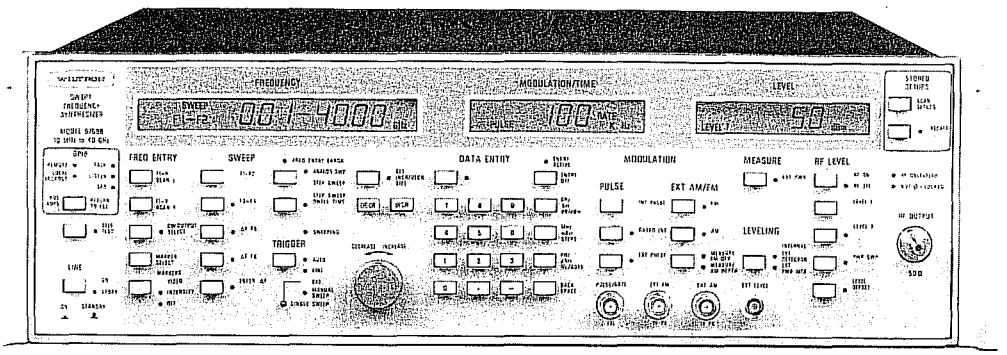
Swept Frequency Synthesizers

6700B Series, 10 MHz to 60 GHz



6700B Swept Frequency Synthesizer Highlights

- 25 ms Switching Speed Over Any Frequency Step Size
- 40 mW Output Power Up to 20 GHz
- 1 kHz Resolution up to 26.5 GHz
- Built-In Power Measuring Capability
- Simultaneous FM, AM, and Pulse Modulation, Including a Built-In Pulse Generator
- Continuous Analog Sweep and Phase-Locked Step Sweep Capability

Performance and Versatility

The Wiltron 6700B Series covers the 10 MHz to 60 GHz range with 31 models. The series offers many features: 25 ms frequency switching speeds over any step size, up to 20 mW output to 20 GHz (10 mW to 40 GHz; 1 mW to 60 GHz), 1 kHz resolution up to 26.5 GHz, wideband FM, ac- and dc-coupled AM, and pulse modulation with an internal high-performance pulse generator. In every aspect of synthesizer performance—accuracy, stability, signal purity, close-in phase noise, EMI, modulation—this series is exceptional. To add further to its value, the 6700B includes a continuous analog sweep capability, as well as a phase-locked step sweep.

Clean Signals

The 6700B uses fundamental YIG-tuned oscillators from 2 to 26.5 GHz because they produce the cleanest signals. Completely free of the error-producing subharmonics of frequency multipliers, these signals can be applied to your test device with confidence that the test data will be accurate. Harmonic and spurious are less than –60 dBc from 2 to 26.5 GHz. The phase-locked stability and low phase noise of the 6700B make it an ideal signal source for simulation and test of narrow-band devices and communications systems. Noise characteristics compare very favorably with those of much more expensive, less versatile instruments.

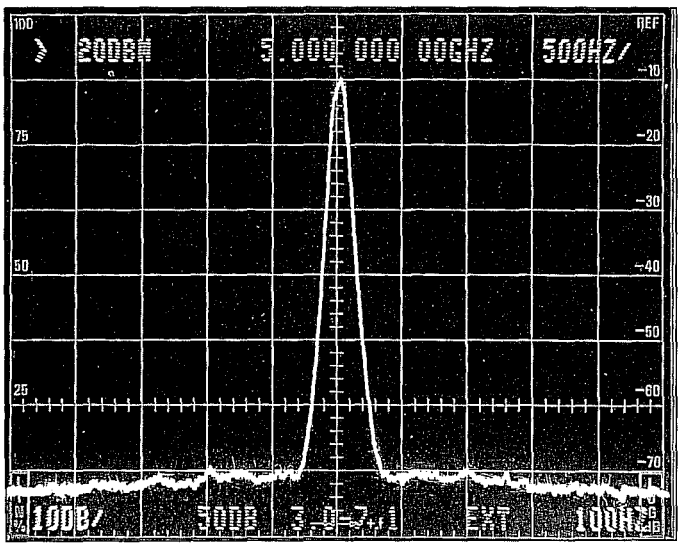
Broadest Selection

Model	Range	Output Power[1] (Minimum)
6709B	10 MHz to 2 GHz	10 mW
6709B-40	10 MHz to 2 GHz	40 mW
6717B	10 MHz to 8.4 GHz	10 mW
6717B-20	10 MHz to 8.4 GHz	20 mW
6722B	10 MHz to 12.4 GHz	10 mW
6722B-20	10 MHz to 12.4 GHz	20 mW
6745B	10 MHz to 18 GHz	10 mW
6747B	10 MHz to 20 GHz	10 mW
6747B-20	10 MHz to 20 GHz	20 mW
6759B	10 MHz to 26.5 GHz	3 mW
6759B-10	10 MHz to 26.5 GHz	10 mW
6769B	10 MHz to 40 GHz	3 mW
6719B	2 to 8.4 GHz	20 mW
6721B	2 to 12.4 GHz	10 mW
6721B-20	2 to 12.4 GHz	20 mW
6737B	2 to 20 GHz	10 mW
6737B-20	2 to 20 GHz	20 mW
6753B	2 to 26.5 GHz	3 mW
6753B-10	2 to 26.5 GHz	10 mW
6763B	2 to 40 GHz	3 mW
6728B	8 to 12.4 GHz	20 mW
6728B-40	8 to 12.4 GHz	40 mW
6729B	8 to 20 GHz	10 mW
6729B-20	8 to 20 GHz	20 mW
6730B	12.4 to 20 GHz	20 mW
6730B-40	12.4 to 20 GHz	40 mW
6760B	12.4 to 40 GHz	3 mW
6736B	18 to 26.5 GHz	5 mW
6736B-10	18 to 26.5 GHz	10 mW
6740B	26.5 to 40 GHz	10 mW
6772B[2]	40 to 60 GHz	1 mW

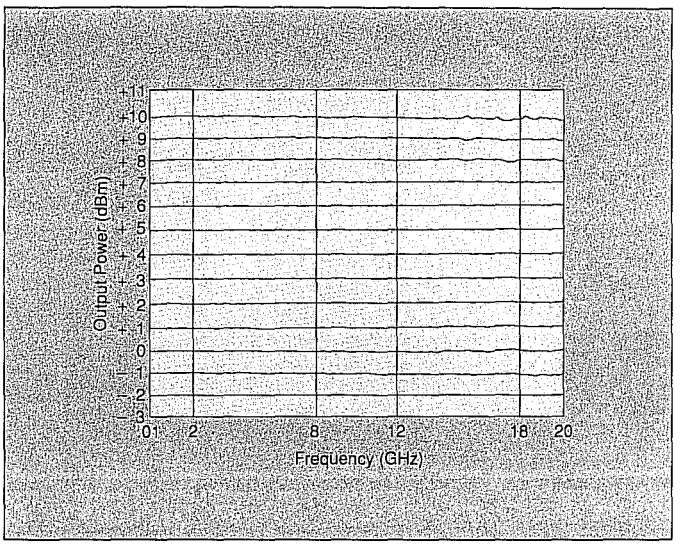
[1]Without optional attenuator. [2]External leveling only.

Built-In Pulse Generator

Because pulse performance is often critical in synthesizer applications, every model includes as standard equipment an internal pulse generator and modulator. Specifications include an on/off ratio of 80 dB and a rise time of less than 10 ns (typically <5 ns). The internal pulse generator provides repetition rates from 10 Hz to 1 MHz and pulse widths of 25 ns to 99 ms, both parameters being crystal derived.



Typical 5 GHz signal shows low SSB noise and absence of spurious signals.



In the Power Sweep mode, the 6700B can sweep frequency at each power level, simplifying gain compression measurements.

For additional pulse modulation capability, you can apply externally generated pulses to the 6700B. The pulse width range then becomes 10 ns to CW at repetition rates from 10 Hz to 10 MHz. Furthermore, an applied TTL signal can be used to gate the internal generator to produce pulse bursts. This pulse burst capability, combined with the 6700B's programmable frequency hopping, saves time and simplifies tests in complex radar simulation applications.

Wide Dynamic Range From Built-in Attenuator Option

With a greater than 120 dB dynamic range, the 6700B eliminates the need for external attenuators when testing filters, attenuators, tuners, isolators, mixers, and receivers. For your convenience, power levels can be selected on the keypad, control knob, Increase/Decrease key, or GPIB—all with 0.01 dB resolution. Wiltron's optional built-in attenuators work to 60 GHz, compared to only 26.5 GHz for competing units.

AM, FM, and Pulse Modulation

The 6700B produces simultaneous AM, FM, and pulse modulation. Sensitivity levels for FM and AM input signals are adjustable and calibrated so that modulation values may be read directly from an LCD display. For AM, the modulation range is 0 to 90% at rates of dc to 100 kHz. For FM, the deviation range is up to 20 times the modulation rate from 100 Hz to 250 kHz. In addition, an "unlocked FM" mode can be enabled from the front panel for deviation up to ±25 MHz and modulation rates down to dc. The modulation versatility of the 6700B allows you to use this single instrument in almost all applications.

Step Sweep and Analog Sweep

The 6700B has two sweep modes. The first is the Step Sweep Mode which consists of up to 1800 synthesized steps, spaced by as little as 1 kHz. The dwell time per step can be adjusted to allow an adequate settling time for the test device or other instruments.

The second sweep mode is a true analog sweep with frequency accuracy that is at least tenfold better than that of a conventional sweep generator. Because the start/stop and bandswitching frequencies are phase-lock-corrected during each sweep, the analog sweep is drift-free and repeatable.

Frequency parameters for four sweep ranges (F1–F2, F3–F4, ΔF F5, ΔF F6) in the step or analog sweep can be stored and recalled as needed to save set-up time and simplify measurements.

Alternate Sweep

In the Alternate Sweep mode, you sweep alternately between any two of the F1–F2, F3–F4, ΔF F5, and ΔF F6 ranges. You improve productivity by measuring filter rejection outside the passband while simultaneously viewing response within the passband.

Power Sweep

The Power Sweep might be considered a third sweep mode. In this mode, the output power can be automatically stepped over your selected range. In addition a frequency sweep can be made at each power level, thereby generating a family of curves which greatly simplify gain compression measurements.

Nine Markers

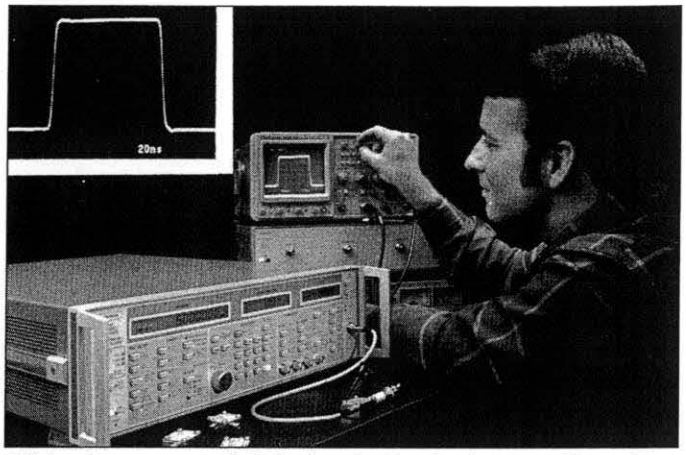
In both the step and analog sweep modes, you have up to nine markers for precise frequency identification. These can be saved with other sweep parameters for recall, reducing set-up time when changing from one test device to another.

Integral Power Meter

The built-in power meter eliminates the expense and inconvenience of an external power meter. By connecting one of the Wiltron detectors listed on page 66, you measure over the +16 dBm to −35 dBm range from 10 MHz to 40 GHz. For remote power measurements, extension cables up to 61 m (200 ft) long can be used with negligible effect on accuracy.

Swept Frequency Synthesizers (Cont.)

6700B Series



Built-in pulse generator typically has less than 5 ns rise time over a 25 ns to 99 ms pulse width range.

High Fidelity Radar Simulation

The 6700B generates pulsed signals in three ways:

- By controlling the built-in pulse modulator with the internal pulse generator, you avoid the inconvenience and expense of an external pulse generator.
- By externally "gating" the internal pulse generator, you can easily create complex pulse bursts.
- By externally controlling the internal pulse generator/ modulator, you obtain high pulse fidelity with no droop, minimal overshoot, video feedthrough of less than ±5 mVpk, and constant peak power with changing pulse widths.

Accurate rotating antenna simulation is achieved with 0 to 90% modulation depths, ac- or dc-coupled AM, fast frequency agility, and amplitude-modulated pulse envelopes.

Doppler simulation is enhanced with phase-locked and unlocked, dc-coupled FM.

Receiver Measurement Capability

The growing demand for greater sensitivity and selectivity in EW/ECM, navigation, and communication receivers can be fulfilled only with performance like that of the 6700B. Exceptional EMI and RFI shielding takes the guesswork out of low signal level tests. The broad frequency range of this one instrument permits measurements at all receiver frequencies—from baseband to microwave. Virtually every receiver characteristic can be measured with ease: sensitivity, selectivity, discriminator alignment, audio noise and distortion, AM reflection, intermodulation, distortion, SINAD, audio hum, and AGC response.

Wiltron Quality Components

When you consider overall measurement accuracy, the 6700B is superb. Wiltron fundamental oscillators avoid the errors introduced by the subharmonics of multiplier-type oscillators. Wiltron-designed PIN switches hold harmonic levels to better than −60 dBc above 2 GHz, while spurious are typically less than −70 dBc.

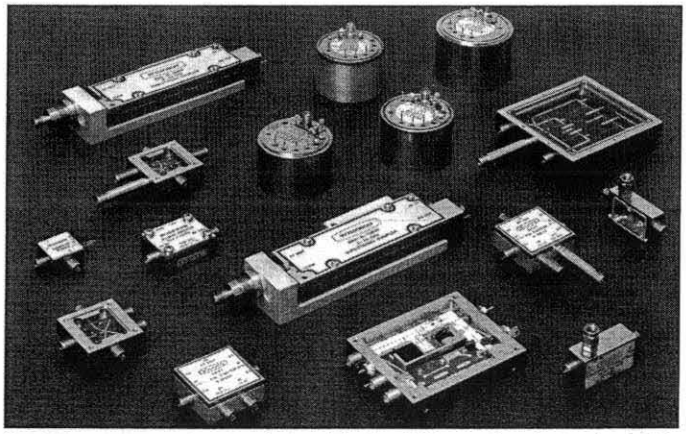
Source match is better than 13 dB return loss (1.6 SWR), a result of the excellent directivity of the Wiltron-designed leveling loop coupler. The addition of external components to improve match is unnecessary.

Also contributing to accuracy is the diode detector in the leveling loop. This component, also Wiltron designed, is digitally calibrated to compensate for variations in the temperature response and linearity. The result is a more accurate RF level.

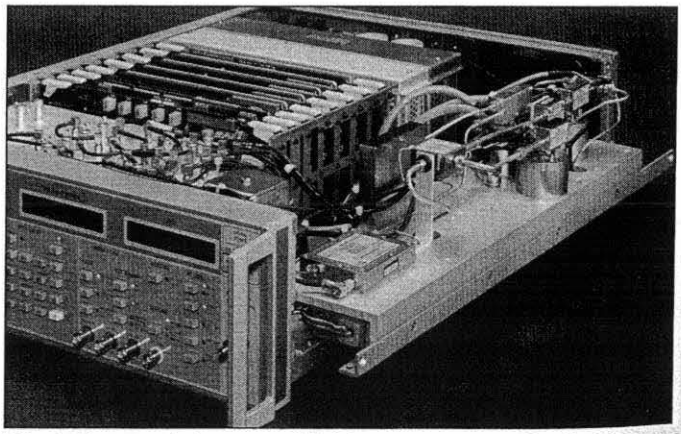
Serviceability

An inside view of the 6700B provides convincing evidence of the care given to making it serviceable. For instance, a major competitor has 109 potentiometer adjustments in its 26.5 GHz synthesizer. The 6700B has 7! Precision voltage regulators and microprocessor-controlled, digital-to-analog converters are used throughout to eliminate manual adjustments, to improve stability and reliability, and to reduce calibration time. Major functions can be tested and recalibrated from the front panel without an external controller. Internal firmware makes it easy.

To enhance serviceability further, circuitry is divided into readily accessible modules, including one each for the entire front and rear panels. A tilt-out RF deck exposes all microwave components for easy inspection or replacement. Access to the components while the instrument is in operation contributes to efficient troubleshooting.



Precision components manufactured in the Wiltron microelectronics facility contribute greatly to the exceptional performance of the 6700B



Tilt-out microwave deck exposes all high-frequency components and cabling.

Specifications

FREQUENCY

Model	Frequency Range	Output Power[1]
6772B[2]	40 to 60 GHz	0 dBm (1 mW)
6769B	10 MHz to 40 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz
6763B	2 to 40 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz
6740B	26.5 to 40 GHz	+10 dBm (10 mW)
6759B	10 MHz to 26.5 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz
6759B-10	10 MHz to 26.5 GHz	+10 dBm (10 mW)
6753B	2 to 26.5 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz
6753B-10	2 to 26.5 GHz	+10 dBm (10 mW)
6736B	18 to 26.5 GHz	+7 dBm (5 mW)
6736B-10	18 to 26.5 GHz	+10 dBm (10 mW)
6747B	10 MHz to 20 GHz	+10 dBm (10 mW)
6747B-20	10 MHz to 20 GHz	+13 dBm (20 mW)
6737B	2 to 20 GHz	+10 dBm (10 mW)
6737B-20	2 to 20 GHz	+13 dBm (20 mW)
6729B	8 to 20 GHz	+10 dBm (10 mW)
6729B-20	8 to 20 GHz	+13 dBm (20 mW)
6730B	12.4 to 20 GHz	+13 dBm (20 mW)
6730B-40	12.4 to 20 GHz	+16 dBm (40 mW)
6745B	10 MHz to 18 GHz	+10 dBm (10 mW)
6722B	10 MHz to 12.4 GHz	+10 dBm (10 mW)
6722B-20	10 MHz to 12.4 GHz	+13 dBm (20 mW)
6721B	2 to 12.4 GHz	+10 dBm (10 mW)
6721B-20	2 to 12.4 GHz	+13 dBm (20 mW)
6728B	8 to 12.4 GHz	+13 dBm (20 mW)
6728B-40	8 to 12.4 GHz	+16 dBm (40 mW)
6717B	10 MHz to 8.4 GHz	+10 dBm (10 mW)
6717B-20	10 MHz to 8.4 GHz	+13 dBm (20 mW)
6719B	2 to 8.4 GHz	+13 dBm (20 mW)
6709B	10 MHz to 2 GHz	+10 dBm (10 mW)
6709B-40	10 MHz to 2 GHz	+16 dBm (40 mW)

[1]Without optional attenuator. [2]External leveling only.

CW MODE

Output: Nine independent, presettable CW frequencies.

Accuracy: Same as internal or external time base.

Internal 10 MHz Time Base Stability:
With Aging: $<5 \times 10^{-10}$/day
With Temperature: $<\pm 5 \times 10^{-9}$ over 0° to +55°C range

Resolution: 1 kHz at ≤26.5 GHz
2 kHz at >26.5 to 40 GHz
3 kHz at >40 to 60 GHz

10 MHz Reference Output: 2 Vp–p typical into 50Ω. AC coupled. BNC, rear panel, 50Ω impedance.

External 10 MHz Reference Input: Accepts external 10 MHz ±100 Hz, 0 to +10 dBm time base signal. Automatically disconnects internal time base. BNC, rear panel, 50Ω impedance.

High Resolution Input: Accepts 20–32.1 MHz external synthesizer signal to improve resolution to equal that of external instrument. BNC, rear panel, 50Ω impedance, 0 dBm.

Switching Time (for any step size): <15 ms typical, 25 ms max. to within 1 kHz.

Lock Output: Provides TTL-high signal when frequency is phase locked.

SWEEP MODES

Analog Sweep

F1–F2, F3–F4, ΔF F5, and ΔF F6 Sweep Width: Independently selected, 1 MHz to full range continuous sweep. For >50 MHz sweep width, start/stop and bandswitching frequencies are phase-lock-corrected during every sweep. For ≤50 MHz width, the center frequency is phase-lock-corrected.
Accuracy: The lesser of ±30 MHz or ±(2 MHz + 0.25% of sweep width) for sweep speeds of ≤50 GHz/s
Resolution: 1 MHz
Sweep Time Range: 30 ms to 99 s

Phase-Locked Step Sweep

F1–F2, F3–F4, ΔF F5, and ΔF F6 Sweep Width: Independently selected, 1 kHz to full range. Every frequency step in sweep range is phase locked.
Accuracy: Same as internal or external time base.
Resolution: Minimum step size is 1 kHz at ≤26.5 GHz
2 kHz at >26.5 to 40 GHz
3 kHz at >40 to 60 GHz
Number of Steps: Variable from 1 to 1800
Dwell Time Per Step: Variable from 1 ms to 99s
Switching Time (for any step size): <15 ms typical, 25 ms max. to within 1 kHz

Alternate Sweep:
Sweeps alternately in analog or step sweep between any two of the sweep ranges: F1–F2, F3–F4, ΔF F5, and ΔF F6

Manual Sweep:
Provides stepped, phase-locked adjustment of frequencies between sweep limits.

Programmable Frequency Agility:
Under GPIB control, up to 512 nonsequential frequencies can be stored and then addressed as a phase-locked step sweep.
Switching Time (for any step size): <15 ms typical, 25 ms max. to within 1 kHz.

Markers: Up to nine independent, presettable markers.
Video: TTL high during marker. BNC, rear panel.
Intensity (analog sweep only): Intensified dot on trace. Obtained by momentary dwell in sweep.
Accuracy: Same as sweep frequency accuracy.
Resolution (Step Sweep): 1 kHz at ≤26.5 GHz
2 kHz at >26.5 to 40GHz
3 kHz at >40 to 60 GHz
Resolution (Analog Sweep): 1 MHz or sweep width divided by 4096, whichever is greater.

Sweep Triggering:
Auto: Triggers sweep automatically.
Line: Triggers sweep from power line frequency.
External: Accepts TTL-high signal of >1 μs width to trigger, abort, or reset analog sweep. BNC, rear panel.
Single: Triggers, aborts, and resets a single sweep. Front-panel pushbutton.

Sweep Dwell Input: Accepts TTL-low signal to stop sweep. Sweep continues when signal is removed. BNC, rear panel.

Horizontal Sweep Output: Provides 0V at beginning to 10V at end of sweep for all sweep modes, regardless of sweep width. In CW mode, voltage is proportional to frequency between 0V at low end and 10V at high end of range. In CW mode, CW RAMP provides a repetitive, 30 ms, 0V to 10V ramp. BNC, rear panel.
V/GHz Output: 0.5 V/GHz or 1 V/GHz up to 20V maximum. BNC, rear panel.
Bandswitch Blanking Output: +5V or –5V signal coincident with bandswitching points. BNC, rear panel.
Retrace Blanking Output: +5V or –5V output signal coincident with sweep retrace. AUX I/O Cannon 25 pin D style, rear panel.
Pen Lift Output: Normally open or normally closed internal relay contacts during sweep retrace. BNC, rear panel.
Sequential Sync Output: Provides TTL-high signal during retrace and at bandswitching points for interface to network analyzers, –5V during marker and –10V during selected marker. BNC, rear panel.

6700B Series

SPECTRAL PURITY

All specifications apply to the phase-locked CW and Step Sweep Modes.

Spurious Signals:
Subharmonics: ≤26.5 GHz: None
26.5 to 40 GHz: –20 dBc
Harmonics: ≤2 GHz: –40 dBc
(–30 dBc for 6709A–40, 6717A–40, and 6747A–20)
>2 to ≤26.5 GHz: –60 dBc
>26.5 to 60 GHz: –20 dBc
Nonharmonics: –60 dBc, typically –70 dBc

Single-Sideband Phase Noise (dBc, CW mode, max.):

Range (GHz)	Offset From Carrier				
	30 Hz	100 Hz	1 kHz	10 kHz	100 kHz
0.01 to 8	–67	–72	–76	–80	–98
8 to 12.4	–64	–69	–73	–77	–100
12.4 to 20	–60	–65	–69	–73	–100
20 to 26.5	–58	–63	–67	–71	–97
26.5 to 40	–54	–59	–63	–67	–95
40 to 60	–50	–55	–59	–63	–90

Power Line and Fan Rotation Spurious (dBc, CW mode, max.):

Range (GHz)	Offset From Carrier		
	<300 Hz	300 Hz to 1 kHz	1 kHz
0.01 to 8	–50	–60	–65
8 to 12.4	–46	–53	–58
12.4 to 20	–41	–48	–53
20 to 26.5	–40	–47	–52
26.5 to 40	–35	–42	–47
40 to 60	–40	–47	–52

Residual FM (CW Mode, 50 Hz – 15 kHz BW, typical):

Frequency Range (GHz)	Residual FM (Hz RMS)
0.01 to 2	80
2 to 8	90
8 to 12.4	190
12.4 to 20	240
20 to 26.5	280
26.5 to 40	480
40 to 60	720

Residual FM (Analog Sweep, 50 Hz – 15 kHz BW)

Frequency Range (GHz)	Residual FM (kHz RMS)
0.01 to 8	5
8 to 12.4	7
12.4 to 20	10
20 to 26.5	15
26.5 to 40	30
40 to 60	30

RF OUTPUT

Power level specifications apply at 25°C ±10°. Please see page 51 for power ratings.

Leveled Output Power Range:
Without Attenuator: 12 dB
With Option 2A, 2B, or 2C: 122 dB
Attenuator Insertion Loss: Reduces rated power by 3 dB max.

Output Power Entry Resolution: 0.01 dB
Output Power Display Resolution: 0.1 dB

Power Level Stability with Temperature: Typically 0.02 dB/°C
Power Level Switching Time (to within specified accuracy):
Without Change in Step Attenuator (pulse off): <50 µs
With Change in Step Attenuator (pulse off): <20 ms

Output Power Accuracy and Flatness:
Step Sweep and CW Modes:

Attenuation Below Maximum Power	Frequency			
	0.01 to 20 GHz	20 to 26.5 GHz	26.5 to 40 GHz	40 to 60 GHz③
Accuracy①				
0 to 12 dB	±0.6 dB	±0.6 dB	±0.8 dB	N/A
0 to 30 dB②	±1.4 dB	±2.0 dB	±3.0 dB	N/A
30 to 60 dB②	±2.6 dB	±2.6 dB	±4.6 dB	N/A
60 dB②	±3.1 dB	±4.0 dB	±5.0 dB	N/A
Flatness				
0 to 12 dB	±0.4 dB	±0.4 dB	±0.6 dB	N/A
0 to 30 dB②	±0.8 dB	±1.0 dB	±2.0 dB	N/A
30 to 60 dB②	±2.0 dB	±2.0 dB	±3.0 dB	N/A
60 dB②	±2.5 dB	±3.0 dB	±4.0 dB	N/A

①Includes flatness variations. ②For models with attenuator. ③External leveling.

Analog Sweep Modes (typical):

Attenuation Below Maximum Power	Frequency			
	0.01 to 20 GHz	20 to 26.5 GHz	26.5 to 40 GHz	40 to 60 GHz③
Accuracy①				
0 to 12 dB	±1.0 dB	±1.5 dB	±2.0 dB	N/A
0 to 30 dB②	±3.5 dB	±3.6 dB	±4.6 dB	N/A
30 to 60 dB②	±4.0 dB	±4.2 dB	±5.2 dB	N/A
60 dB②	±5.0 dB	±5.2 dB	±6.2 dB	N/A
Flatness				
0 to 12 dB	±1.0 dB	±1.5 dB	±2.0 dB	N/A
0 to 30 dB②	±3.0 dB	±3.1 dB	±4.1 dB	N/A
30 to 60 dB②	±3.5 dB	±3.6 dB	±4.6 dB	N/A
60 dB②	±4.0 dB	±4.2 dB	±5.2 dB	N/A

①Includes flatness variations. ②For models with attenuator. ③External leveling.

Source Impedance: 50Ω

Source SWR (internal leveling):
Without Attenuator: <1.7 at <2 GHz
<1.6 at 2 to 20 GHz
<2.0 at >20 GHz
With Attenuator: <2 typical

Level Offset: Offsets displayed power level to establish a new reference level.

RF On/Off Between Frequency Steps: RF On or Off during frequency switching in CW or step sweep mode.

Retrace RF On/Off: Rear panel switch selects RF On or Off during retrace.

RF Off: With RF control in Off position, oscillators are turned fully off.

Internal Leveling: Power is leveled at output connector in all modes.

External Leveling:
External Detector: Levels power at remote detector location. Front panel BNC connector, positive or negative 0.5 mV to 500 mV. EXT GAIN CAL adjusts input gain to optimum value.
External Power Meter: Levels output power at remote power sensor location. Front panel BNC connector, ±1V full scale EXT GAIN CAL adjusts input gain to optimum value.

External Leveling Bandwidth (pulse off): 30 kHz typical in Detector mode, >0.7 Hz typical in Power Meter mode.

Unleveled Indicator: Lights when output power is unleveled.

POWER SWEEP

Range: Sweeps between any two power levels.
Resolution: 0.01 dB/step
Accuracy: Same as output accuracy.
Number of Steps: Variable from 1 to 1000.
Dwell Time per Step: Variable from 50 ms to 10s.

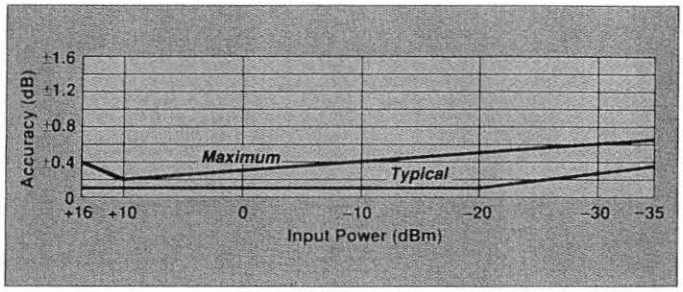
POWER METER

Built-In Power Meter Range: +16 dBm to −35 dBm. Compatible with Wiltron 560-7 or 6400-71 Series Detectors. Rear panel input.

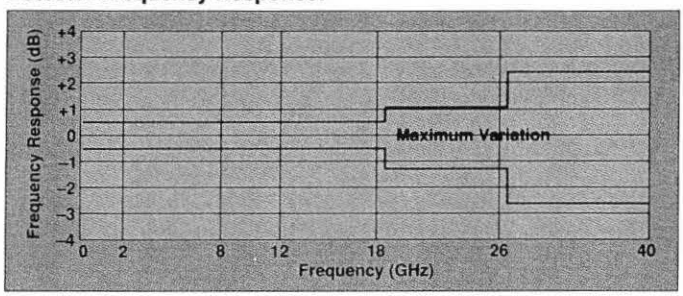
Built-In Power Meter Accuracy:

Power Measurement Accuracy = Meter Accuracy + Detector Frequency Response

Meter Accuracy (25°C):



Detector Frequency Response:



MODULATION

AM, FM, and pulse modulation can be applied simultaneously.

PULSE MODULATION

On/Off Ratio: 80 dB
Pulse Rise and Fall Time: <5 ns typical, 10 ns max.
Pulse Overshoot and Ringing: <10% typical
Pulse Width Compression: ±5 ns max.
Video Feedthrough: <±2 mVpk typical, ±5 mVpk max.

Accuracy of Peak Pulse Power (relative to CW level, 100 Hz ≤PRF ≤1 MHz):

Pulse Width	<2 GHz	≥2 GHz
<100 ns	①	①
100 ns to 200 ns	①	±1.5 dB
200 ns to 500 ns	①	±1.5 dB
500 ns to <1 µs	±1.2 dB	±0.8 dB
1 µs to <2 µs	±0.9 dB	±0.5 dB
2 µs to <5 µs	±0.6 dB	±0.3 dB
≥5 µs	±0.3 dB	±0.3 dB

①RF Power is controllable, but not automatically leveled for very narrow pulses.

Internal Pulse Generator:
Pulse Period: 1 µs to 100 ms
Pulse Period Resolution: 0.1 µs (1 µs to 99.9 µs pulse period)
1 µs (100 µs to 999 µs pulse period)
10 µs (1 ms to 9.99 ms pulse period)
100 µs (10 ms to 100 ms pulse period)
Pulse Period Accuracy: ±10 ns, typical
Gate Width Range: 100 ns to infinity
Pulse Input: Rear panel switch selects TTL-high or -low signal for triggering or gating internal pulse generator. BNC, rear panel.
Pulse Sync Output: TTL-high signal, 100 ns minimum pulse width, preceding RF pulse by 100 ns. BNC, rear panel.

External Pulse Input:
Pulse Width Range: 10 ns to CW
Repetition Rate: 10 Hz to 10 MHz
External Trigger: TTL
Delay Time: 50 ns typical
Delay Range: 200 ns to 100 ms
Delay Resolution: 100 ns to 99.9 µs: 100 ns
100 µs to 999 µs: 1 µs
1 ms to 9.9 ms: 10 µs
10 ms to 100 ms: 100 µs

AMPLITUDE MODULATION

Specifications are measured at 1 kHz rate, 30% AM depth, with internally leveled RF at 4 dB below maximum rated output, unless otherwise noted.
AM Input: Rear panel switch selects ac or dc coupling. BNC, front and rear panel, 600Ω impedance.
Sensitivity: 1%/V to 100%/V, selectable
Sensitivity Accuracy: ±10% of displayed value ±1% AM plus AM flatness
Depth: 0–90% at ≤26.5 GHz, typical; 0-80% at >26.5 GHz, typical; with RF level at 6 dB below maximum rated output
AM Depth Metering Accuracy: Same as Sensitivity Accuracy
Bandwidth (3 dB, pulse off): DC to 100 kHz or 50 Hz to 100 kHz, selectable
AM Bandwidth with Pulse Modulation (typical):
10 kHz for pulse widths of ≥16 µs
10 kHz times the duty factor for pulse widths of <16 µs
Flatness (relative to 1 kHz rate, pulse off): ±0.3 dB from dc to 10 kHz
Distortion: <5% typical
Incidental Phase Modulation (100 Hz–10 kHz modulation rates): <0.4 radians, typical
Incidental FM: Incidental phase modulation times modulation frequency.

FREQUENCY MODULATION

FM Input: ±1 Vpk provides full range frequency deviation. BNC, front and rear panel, 600Ω impedance.
Sensitivity:
Phase-Locked Mode: 10 kHz/V to 5 MHz/V, selectable to 3 digits
Unlocked Mode: 10 kHz/V to 25 MHz/V, selectable to 3 digits
Accuracy: ±5% at 40 kHz modulation rate
Maximum Deviation:
Phase-Locked Mode: ±20 times the modulation rate
Unlocked Mode: ±25 MHz
Deviation Meter Accuracy: ±5% of full range plus FM flatness
Modulation Rates (3 dB BW):
Phase-Locked Mode:
100 Hz–250 kHz (500 kHz typical) at ≤300 kHz/V sensitivity
1–250 kHz (500 kHz typical) at >300 kHz/V sensitivity
Unlocked Mode: DC to 250 kHz (500 kHz typical) rate
Flatness (relative to 40 kHz rate):
Phase-Locked Mode:
±1 dB from 200 Hz to 200 kHz (500 kHz typical) at ≤300 kHz/V sensitivity
±1 dB from 3 kHz to 200 kHz (500 kHz typical) at 300 kHz/V sensitivity
Unlocked Mode: ±1 dB from dc to 200 kHz
Distortion at 1 kHz: <10%
Incidental AM: ±0.2% per MHz deviation

INSTRUMENT STATUS (IEEE-488)

GPIB Indicators: LED lights indicate the following conditions:
Remote: Operating on GPIB
Talk: Talking on GPIB
Listen: Listening on GPIB
SRG: Sending a service request
Local Lockout: Disables the RETURN TO LOCAL pushbutton. Instrument can be placed in local mode only via GPIB.
Remote Operation: All front-panel functions except line power and GPIB address are programmable via GPIB (IEEE–488). Additional programmable commands include: front-panel settings, stored setups, error/malfunction messages, operational status, self-test diagnostics.

Swept Frequency Synthesizers (Cont.)

6700B Series

INSTRUMENT STATUS (Cont.)

GPIB Speed: 15K bytes/s
GPIB Address: Selectable from front panel
IEEE–488 Interface Functions:
Source: SH1
Acceptor Handshake: AH1
Talker: T6
Listener: L4
Service Request: SR1
Remote Local: RL1
Parallel Poll: PP1
Device Clear: DC1
Device Trigger: DT1

GENERAL

Stored Setups: Saves front-panel settings and nine additional stored setups for approximately ten years. Setups can be recovered directly by using the RECALL function or sequentially by using the SCAN function. Whenever the instrument is turned on, control settings come on at the same functions and values existing when power was removed.
Memory Sequencing Input: Accepts TTL-low signal to sequence through nine stored setups. BNC, rear panel.
Self-Test: Self-test is performed when power is applied or SELF TEST key is pressed. If an error is detected, a diagnostic code appears, identifying the cause and location of the error.
Secure Mode: Front-panel readouts are blanked to protect confidential test parameters.
Parameter Entry: Instrument-controlled parameters may be entered in 3 ways: keypad, control knob, or step DECR/INCR keys. Controlled parameters are frequency, power level, sweep speed, dwell time, pulse width, pulse repetition rate, AM % depth, AM sensitivity, and FM sensitivity. Entry is terminated by pressing appropriate unit key, i.e., GHz, MHz, dBm, ms, %, etc. Values of each are displayed on LCD readout.
Reset Control: Returns test parameters to preset default values
Warm-Up Time From Standby: 30 minutes
Warm-Up Time From Power Application: 72 hours to achieve 1×10^{-9} per day frequency stability
Output Connectors:
Models with Output Frequency ≤20 GHz: Type N female
Models with Output Frequency >20 GHz and ≤40 GHz: K female
Model 6772B: WR19 Waveguide (UG–383/U Flange)
Weight: 25 kg (55 lb.) maximum
Dimensions: 133 H x 429 W x 584 D mm
(5-1/4 H x 16-7/8 W x 23 D in.)
Power: 90–130V or 120–240V, 50–400 Hz, 220 VA (30 VA in Standby)
Standby: With ac line power connected, unit is placed in standby when power switch is released from On position.

ENVIRONMENTAL

Operating Temperature Range: 0°C to 55°C
Relative Humidity: 95%
EMI: Meets the conducted and radiated emission requirements of MIL–STD–461B, CE03, RE02, Part 4, Class A3 and VDE 0871/1978, Level B. Tested for conducted and radiated susceptibility per MIL–STD–462, CS02, CS06, and RS03 with no functional failures.

ACCESSORIES

Power Meter Extender Cables:
800–109 Extender Cable, 7.6 m (25 ft.) $50
800–110 Extender Cable, 15.2 m (50 ft.) $75
800–111 Extender Cable, 30.5 m (100 ft.) $100
800–112 Extender Cable, 61.0 m (200 ft.) $180
GPIB Cables:
2100–1 GPIB Cable, 1 m (3.3 ft.) long $60
2100–2 GPIB Cable, 2 m (6.6 ft.) long $75
2100–4 GPIB Cable, 4 m (13.2 ft.) $95
2100–5 GPIB Cable, 0.5 m (1.65 ft.) $55
Transit Case 760–81 for 6700B $655

Ordering Information

Model	Frequency Range	Output Power① (Minimum)	Price
6709B	10 MHz to 2 GHz	+10 dBm (10 mW)	$26,900
6709B-40	10 MHz to 20 GHz	+16 dBm (40 mW)	$27,900
6717B	10 MHz to 8.4 GHz	+10 dBm (10 mW)	$32,000
6717B-20	10 MHz to 8.4 GHz	+13 dBm (20 mW)	$33,000
6719B	2 to 8.4 GHz	+13 dBm (20 mW)	$28,300
6721B	2 to 12.4 GHz	+10 dBm (10 mW)	$33,600
6721B-20	2 to 12.4 GHz	+13 dBm (20 mW)	$35,100
6722B	10 MHz to 12.4 GHz	+10 dBm (10 mW)	$37,200
6722B-20	10 MHz to 12.4 GHz	+13 dBm (20 mW)	$38,500
6728B	8 to 12.4 GHz	+13 dBm (20 mW)	$26,500
6728B-40	8 to 12.4 GHz	+16 dBm (40 mW)	$28,100
6729B	8 to 20 GHz	+10 dBm (10 mW)	$33,000
6729B-20	8 to 20 GHz	+13 dBm (20 mW)	$34,600
6730B	12.4 to 20 GHz	+13 dBm (20 mW)	$26,900
6730B-40	12.4 to 20 GHz	+16 dBm (40 mW)	$28,800
6736B	18 to 26.5 GHz	+7 dBm (5 mW)	$28,500
6736B-10	18 to 26.5 GHz	+10 dBm (10 mW)	$30,000
6737B	2 to 20 GHz	+10 dBm (10 mW)	$35,700
6737B-20	2 to 20 GHz	+13 dBm (20 mW)	$37,300
6740B	26.5 to 40 GHz	+10 dBm (10 mW)	$33,500
6745B	10 MHz to 18 GHz	+10 dBm (10 mW)	$37,300
6747B	10 MHz to 20 GHz	+10 dBm (10 mW)	$37,800
6747B-20	10 MHz to 20 GHz	+13 dBm (20 mW)	$38,800
6753B	2 to 26.5 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz	$43,000
6753B-10	2 to 26.5 GHz	+10 dBm (10 mW)	$45,000
6759B	10 MHz to 26.5 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz	$46,000
6759B-10	10 MHz to 26.5 GHz	+10 dBm (10 mW)	$48,000
6763B	2 to 40 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz	$53,000
6769B	10 MHz to 40 GHz	+10 dBm (10 mW), ≤20 GHz +5 dBm (3 mW), >20 GHz	$57,500
6772B②	40 to 60 GHz	+10 dBm (10 mW)	$39,500

①Without optional attenuator. ②External leveling only.

Options:
Rack Mounting, Option 1: Rack mount kit with chassis track slides and mounting ears. Weight is 2.3 kg (5 lb). $350
Attenuator, Option 2: Adds 10 dB step attenuator to increase the RF output range. Reduces rated power by 3 dB (4 dB for Option 2C).

For Models With Upper Frequency Limit	Maximum Attenuation	Order	Price
≤20 GHz	110 dB	Option 2A	$1,600
26.5 GHz	110 dB	Option 2B	$2,100
40 GHz	110 dB	Option 2C	$3,800

Rear Panel RF Output, Option 9K: Adds rear panel K Connector RF output. Deletes front panel connector. Degrades output power, flatness, and SWR. $500

Power Meter Detectors:

Detector Model	Frequency Range	Input Connector	Price
6400-71N50	10 MHz to 2 GHz	N Male, 50Ω	$375
6400-71N75-1	10 MHz to 2 GHz	N Male, 75Ω	$475
560-7A50	10 MHz to 18 GHz	GPC–7	$550
560-7S50	10 MHz to 18.5 GHz	WSMA Male	$525
560-7N50	10 MHz to 18.5 GHz	N Male	$525
560-7S50-2	10 MHz to 26.5 GHz	WSMA Male	$600
560-7K50	10 MHz to 40 GHz	K Male	$675