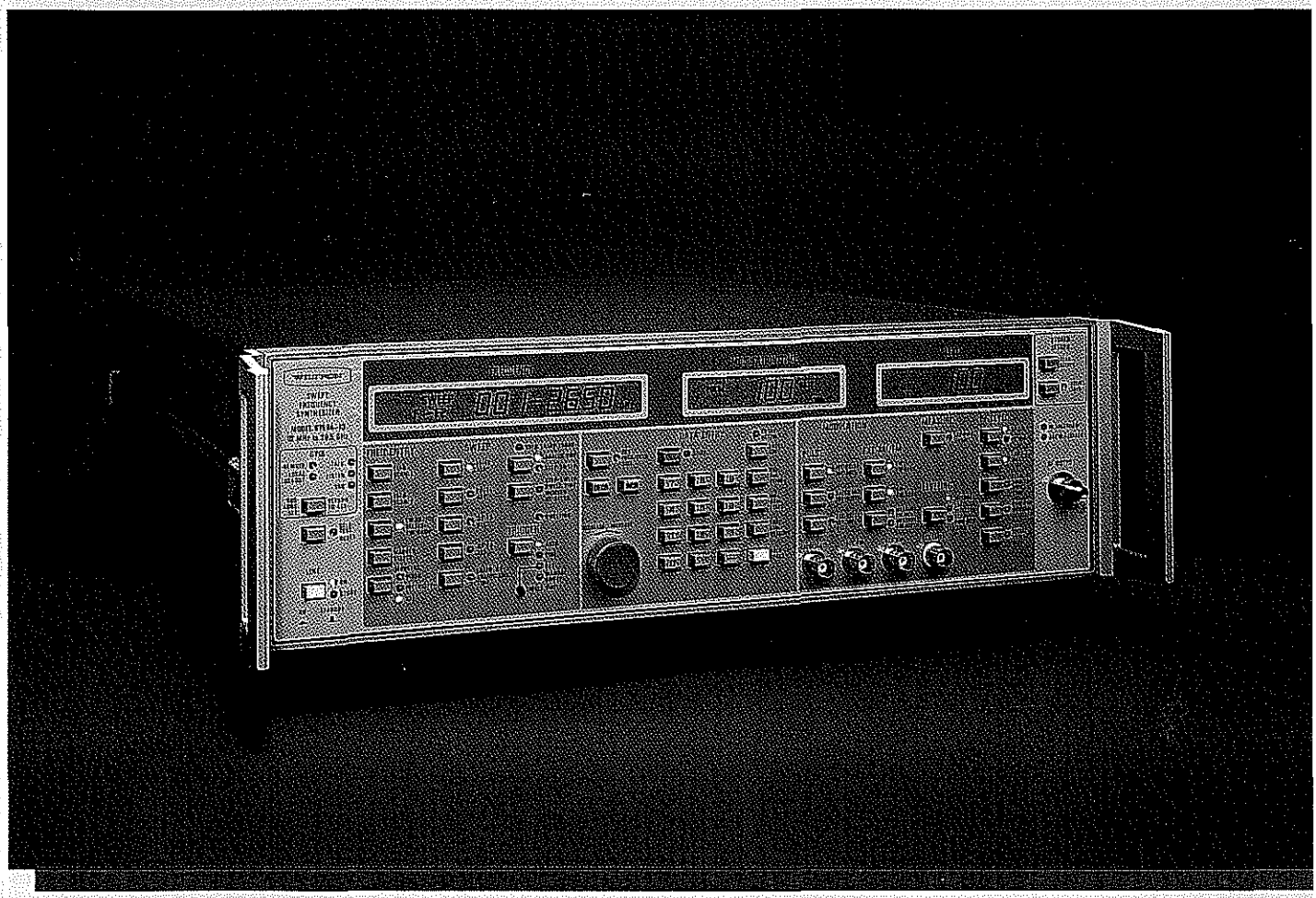
WILTRON

6700A Series
Swept Frequency Synthesizers
10 MHz to 40 GHz



Precision Performance and Versatility
at a Surprisingly Low Price

TESTECH INC.
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Quality Signal Synthesis That Will Improve Your Measurement Accuracy

iltron brings performance, rsatility, and cost savings gether in a new synthesizer.

With 27 years of dedication to crowave instrumentation, it is not surising that Wiltron should be the mpany to close the gap between nthesizer performance and price. Now gineers who need improved performnce and versatility can get them *and* joy substantial cost savings.

The Wiltron 6700A Series Swept equency Synthesizers cover the MHz to 40 GHz range with 26 models, e of which spans the full range (figure The series offers many features: ms frequency switching speeds over y step size, up to 20 mW output to GHz (2 mW to 40 GHz), 1 kHz solution up to 26.5 GHz, wideband FM, - and dc-coupled AM, and pulse odulation with an internal high-rformance pulse generator. In every pect of synthesizer performance—curacy, stability, signal purity, close-in ase noise, EMI, modulation—this ries is exceptional. To add further its value, the 6700A includes a ntinuous analog sweep capability, as ll as a phase-locked step sweep.

ean signals improve easurement accuracy.

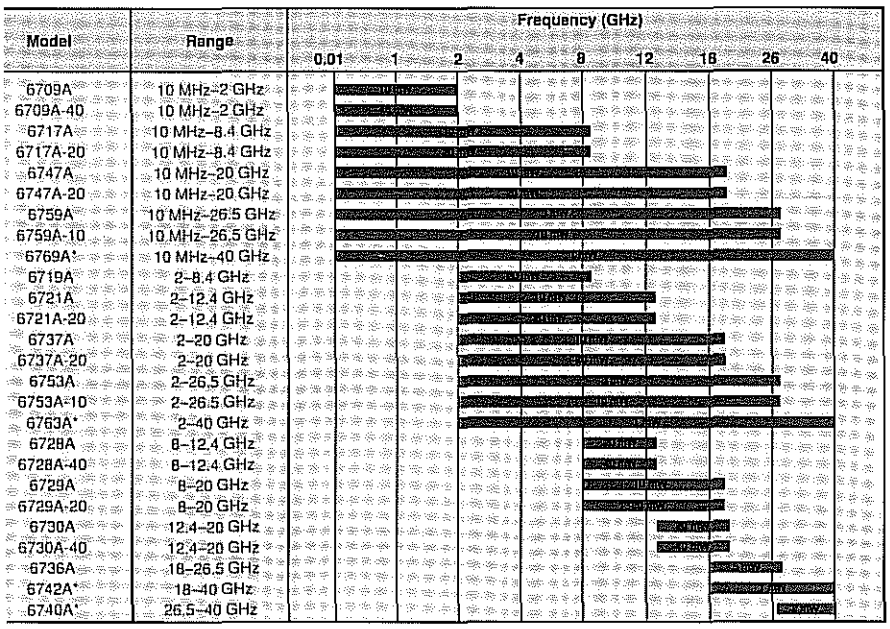
The 6700A uses fundamental YIG-ned oscillators from 2 to 26.5 GHz cause they produce the cleanest signals. Completely free of the error-producing subharmonics of frequency multipliers, these signals can be applied to your test device with confidence that the test data will be accurate. Harmonics and spurious are less than −60 dBc from 2 to 26.5 GHz. Figure 2 shows the quality of spectral purity you can expect from your instrument.

The phase-locked stability and low phase noise of the 6700A make it an ideal signal source for simulation and test of narrowband devices and communications systems. The noise characteristics shown in figure 3 compare very favorably with those of much more expensive, less versatile instruments.

Built-in pulse modulation with internal pulse generator is standard.

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 below 20 GHz, 70 dB above, and a rise time that is less than 10 ns (figure 4). The internal pulse generator provides repetition rates from 10 Hz to 1 MHz and pulse widths from 25 ns to 99 ms, both parameters being crystal derived.

For additional pulse modulation capability, you can apply externally generated pulses to the 6700A. 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 6700A's programmable frequency hopping, saves time and simplifies tests in complex radar simulation applications.



Model	Range
6709A	10 MHz–2 GHz
6709A-40	10 MHz–2 GHz
6717A	10 MHz–8.4 GHz
6717A-20	10 MHz–8.4 GHz
6747A	10 MHz–20 GHz
6747A-20	10 MHz–20 GHz
6759A	10 MHz–26.5 GHz
6759A-10	10 MHz–26.5 GHz
6769A*	10 MHz–40 GHz
6719A	2–8.4 GHz
6721A	2–12.4 GHz
6721A-20	2–12.4 GHz
6737A	2–20 GHz
6737A-20	2–20 GHz
6753A	2–26.5 GHz
6753A-10	2–26.5 GHz
6763A*	2–40 GHz
6728A	8–12.4 GHz
6728A-40	8–12.4 GHz
6729A	8–20 GHz
6729A-20	8–20 GHz
6730A	12.4–20 GHz
6730A-40	12.4–20 GHz
6736A	18–26.5 GHz
6742A*	18–40 GHz
6740A*	26.5–40 GHz

heduled for later introduction

ure 1. Twenty-six broadband and narrowband models offer the exact frequency coverage need.

The 6700A Brings You a New Level of Versatility at a Price You Can Afford.

Alternate sweep mode *makes two "simultaneous" measurements over narrow or wide frequency ranges.*

Step sweep *moves with an adjustable dwell time of 1 ms to 99 s per step through 1000 phase-locked frequencies spaced as close as 1 kHz—synthesizer accuracy in a sweep mode.*

True analog sweep *provides fast, continuous measurement over the full frequency range or any portion thereof—the benefits of a sweeper in a synthesizer package.*

You make test parameter entries with the greatest ease either on the ***keypad, control knob, or Increase/Decrease step control.***

Built-in pulse modulation *includes an internal pulse generator to create high-fidelity radar signals without the expense and inconvenience of additional instruments.*

You determine modulation status with a glance at the large LCD display of ***FM rate and deviation, %AM, pulse width and PRF.***

One instrument provides ***simultaneous FM, AM, and pulse modulation*** *to simulate complex radar, EW, and ECM signals.*

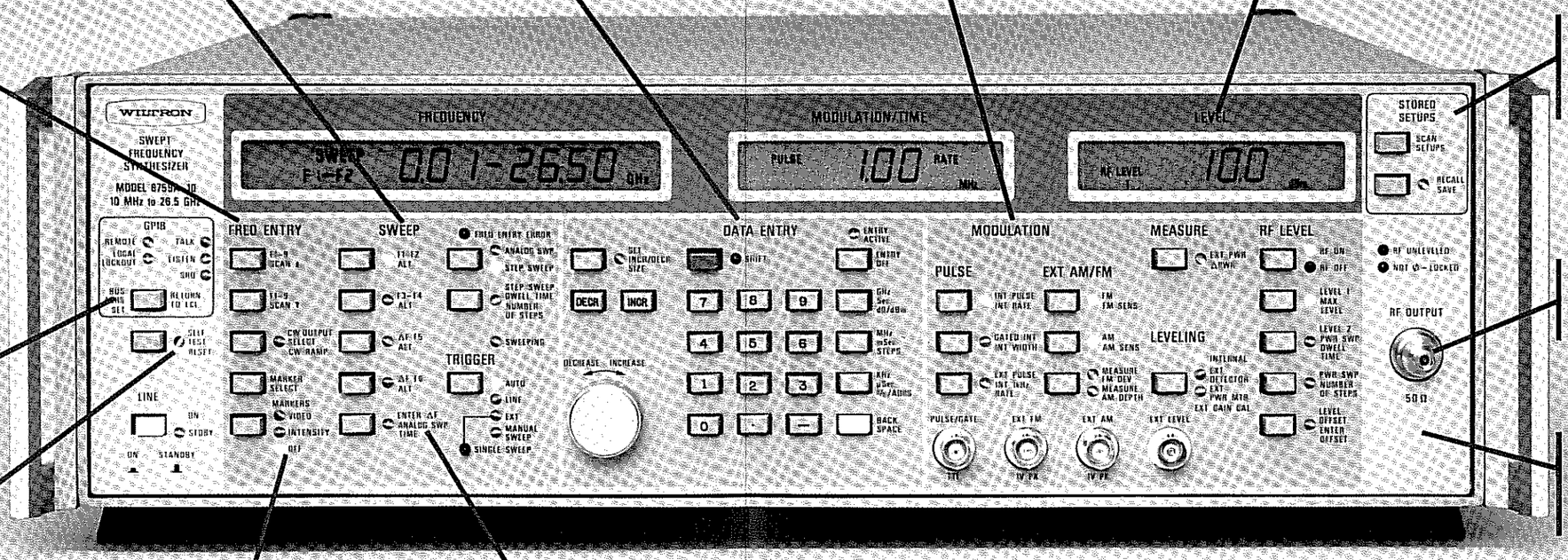
Output power can be swept *with variable steps and dwell time over the full dynamic range—perfect for gain compression measurements.*

Integral power meter *saves the cost of a second instrument by measuring externally applied power over a +16dBm to –35 dBm range.*

Level Offset feature ***calibrates power meter readings*** *to include losses between the instrument and a remote location.*

You can save valuable test time by storing for immediate recall any combination of ***nine CW and marker frequencies.***

Nine test setups *can be stored in memory, scanned sequentially, and recalled instantly to make substantial improvement in costly set-up time.*



Complete programmability *via GPIB (IEEE-488) ensures compatibility with all computers and network analyzers in ATE applications.*

Self-test *function checks the analog and digital circuits every time power is applied and displays diagnostic codes to aid troubleshooting.*

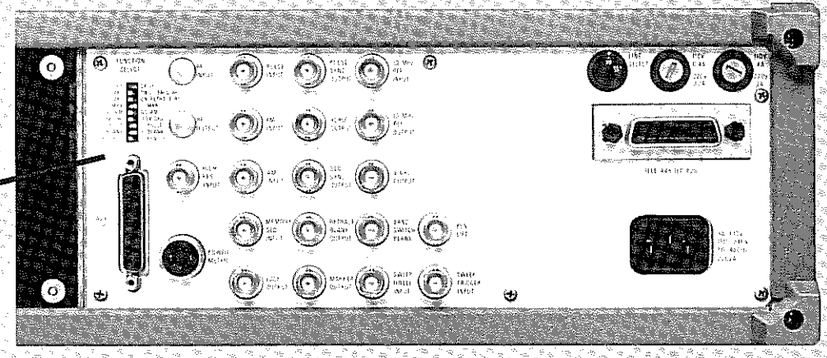
Harmonics of less than –60 dBc *and a source match of better than 1.6 SWR help make high-accuracy measurements an everyday reality.*

Panel height of 133 mm *(5-1/4 in.) saves valuable rack space in ATE systems. Weight is 25 kg (55 lb), making the instrument readily portable.*

Nine video or intensity markers *make fast, accurate identification of swept frequencies.*

Start/Stop frequencies of analog sweep are ***phase-lock-corrected during each sweep.***

Rear panel connectors expand applicability so ***one instrument covers almost every kind of microwave test.***



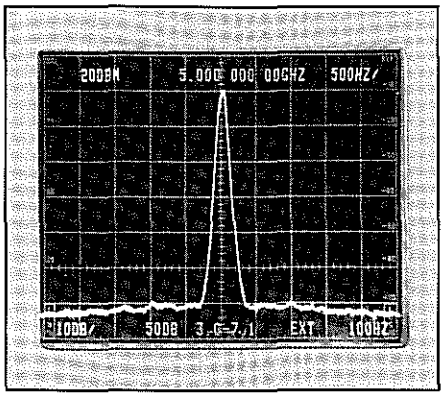


Figure 2. Clean 5 GHz signal has low SSB phase noise and an absence of spurious signals.

Wide dynamic range extends test capability.

With a greater than 100 dB dynamic range, the 6700A 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.

LCDs display parameters for AM, FM, and pulse modulation.

The 6700A 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 50 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 6700A allows you to use this single instrument in almost all applications.

Step Sweep and Analog Sweep ensure accurate characterizations.

The 6700A has two sweep modes. The first is the step sweep which consists of up to 1000 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 ten-fold better than that of a conventional sweep generator. Because the start/stop and band-switching frequencies are phase-lock-corrected during each sweep, the analog sweep is drift-free and repeatable.

Frequency parameters for four different sweep ranges (F1–2, 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.

Innovative engineering gives you the best of synthesizer and sweep generator technology. Measurements go faster. Accuracy is improved.

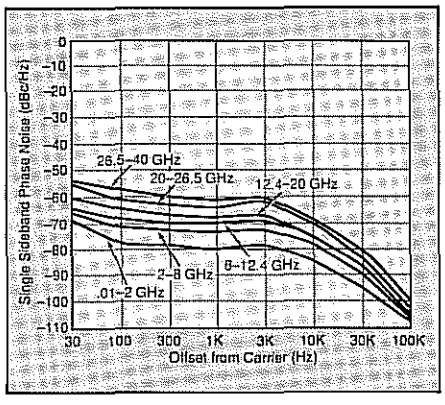


Figure 3. Measurement accuracy of close-in signals and narrowband devices is enhanced by low single-sideband phase noise.

Alternate Sweep boosts productivity

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 mode makes gain compression tests simple.

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 (figure 5) which greatly simplify gain compression measurements.

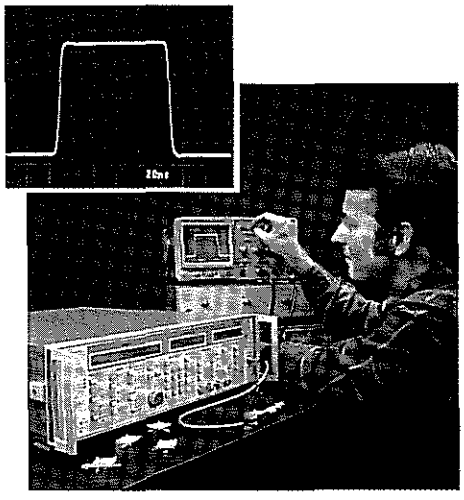


Figure 4. Built-in pulse generator typically has less than 5 ns rise time over a 25 ns to 99 ms pulse width range.

Nine markers make precise frequency identification.

In both the step and analog sweep modes, you have 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.

Better performance and productivity make your products more competitive.

The 6700A benefits do not end with superior performance. Equally important are the short- and long-term cost savings. Short-term benefits become clear when you compare prices. Typically, you save 15% to 25% in the most basic synthesizer applications—even more when the 6700A replaces several other instruments.

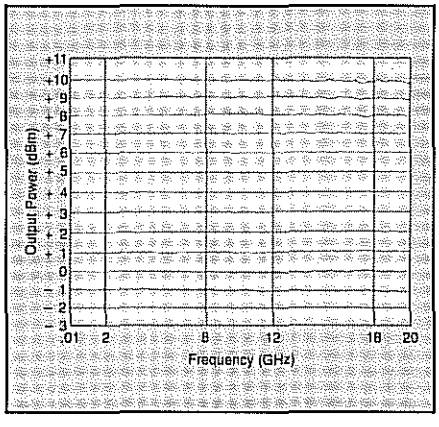
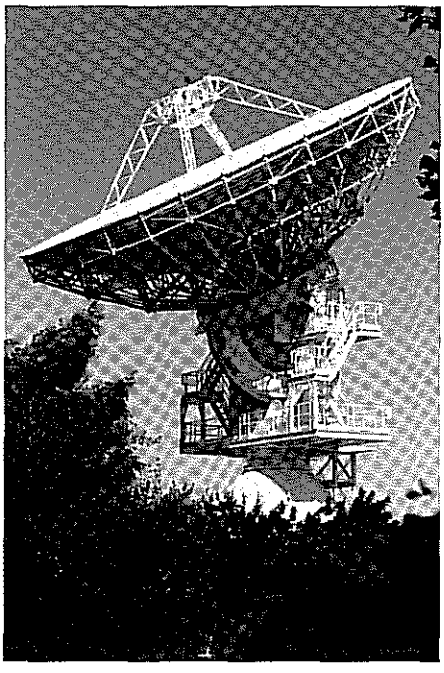


Figure 5. In the Power Sweep mode, the instrument can automatically sweep frequency at each power level.

Use the 6700A with Confidence and Pleasure in Production, Laboratory, or Field



Versatility and precision—a winning combination.

The 6700A is the one instrument that generates any type of test signal, simply and accurately—from a fixed-frequency LO to radar with simultaneous, AM, and pulse modulation.

High fidelity radar simulation at your finger tips.

The 6700A generates pulsed signals in three ways:
1) By controlling the built-in pulse modulator with the internal pulse generator, you avoid the inconvenience and expense of an external pulse generator.
2) By externally "gating" the internal pulse generator, you can easily create complex pulse bursts.
3) 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 (figure 6).

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

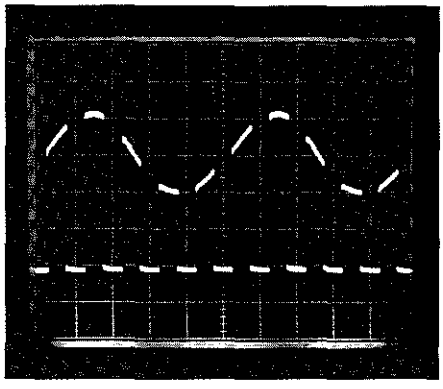


Figure 6. Simultaneous AM, FM, and pulse modulation add to 6700A versatility.

Network analyzer measurements at a new level of convenience.

The quality of the signal used to make measurements on scalar or vector network analyzers has a significant impact on measurement accuracy. With the 6700A synthesized signal, you can test narrowband communication filters and sharply tuned receivers with confidence. You know that the frequency identification is precise and repeatable.

In the analog sweep mode, you get continuous frequency coverage and reduced sweep time as well. Since the analog sweep start and stop frequencies are corrected through phase locking, accuracy is considerably better than that of conventional sweepers.

Quality performance from Wiltron quality components.

When you consider overall measurement accuracy, the 6700A is superb. Wiltron fundamental oscillators (figure 7) avoid the errors introduced by the subharmonics of multiplied 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 temperature response and linearity. The result is a more accurate RF level.

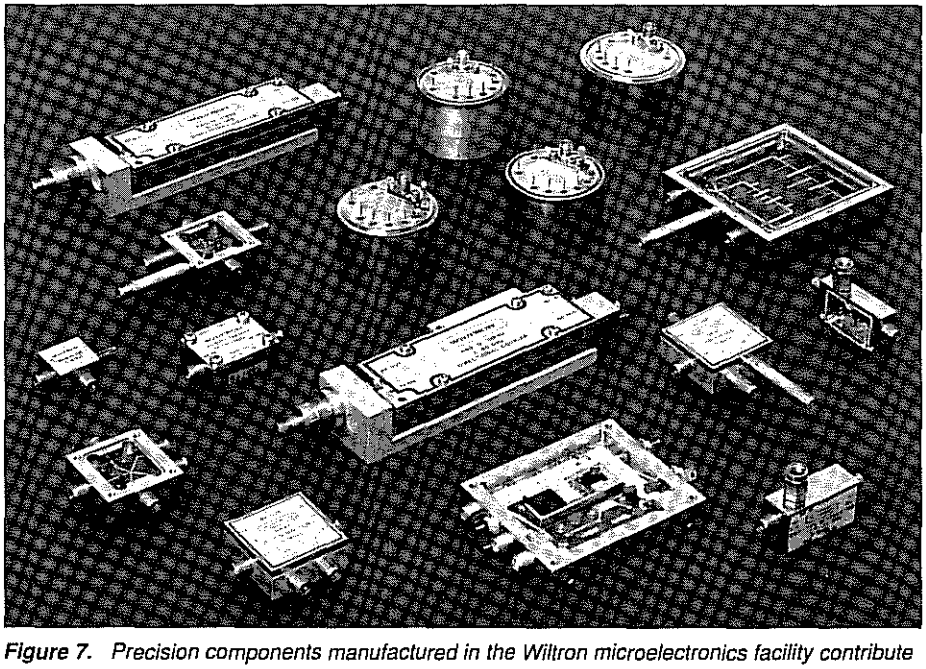


Figure 7. *Precision components manufactured in the Wiltron microelectronics facility contribute greatly to the exceptional performance of the 6700A.*

Built-in power meter for remote or local measurements.

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 14, 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.

Enviable receiver measurement capability.

The growing demand for greater sensitivity and selectivity in EW/ECM, navigation, and communication receivers (figure 8) can be fulfilled only with performance like that of the 6700A. 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.

Savings in ATE rack space, software, and memory.

Automatic test systems (figure 9) place a high premium on rack space, computer-memory capacity, and controller software. That's why the 6700A is the ideal signal source for ATE applications. In some systems, this single 133 mm (5-1/4 in.) high instrument replaces a sweep generator, a frequency counter or synchronizer, a power meter, MATE translators, switches, and modulators.

Many complex routines—such as power sweep, step sweep, random frequency patterns, and power correction—are standard functions in the 6700A, further reducing software overhead. For ATE, the 6700A wins two ways: performance and cost savings.

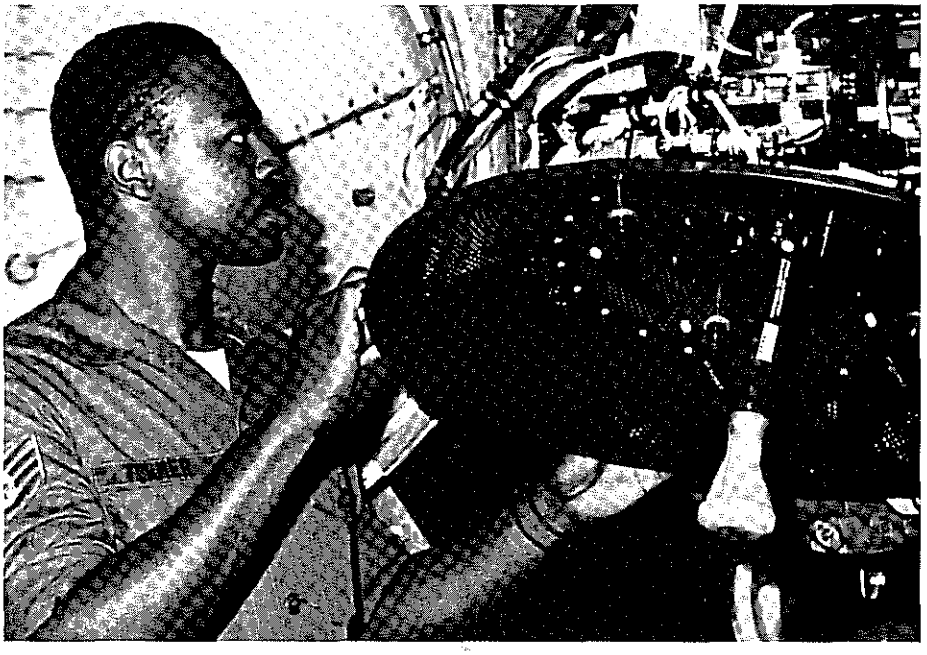


Figure 8. *The modulation dynamic range, accuracy, signal purity and complete programmability of the 6700A make it the right choice for ECM/EW, communication, navigation, and radar measurements.*

Courtesy of Watkins Johnson

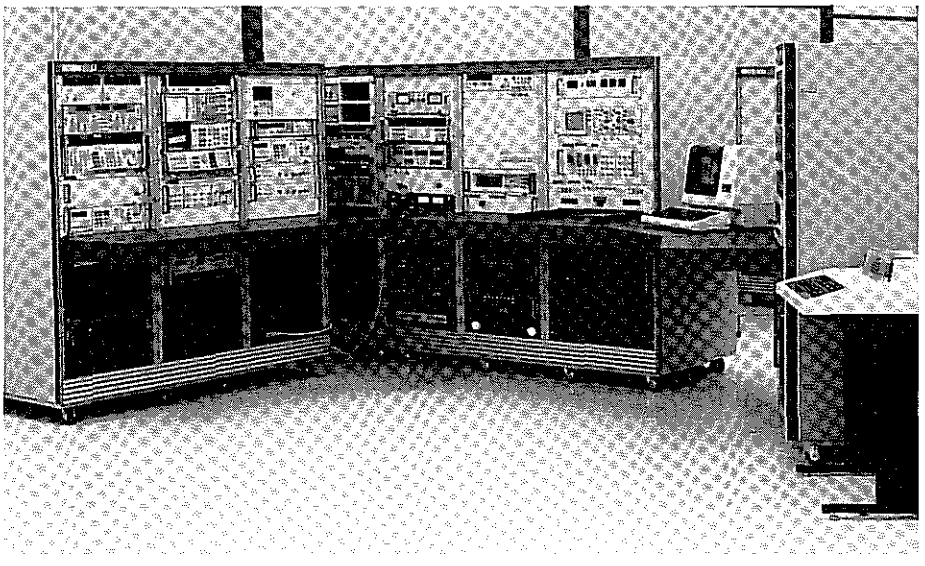


Figure 9. *In some ATE applications, the 6700A replaces a power meter, counter, sweep generator, synchronizer, and pulse generator.*

Put the 6700A to Your Test and See Advanced Technology Go to Work.

Figure 10. *The open, component-accessible design of the 6700A simplifies troubleshooting and repair.*

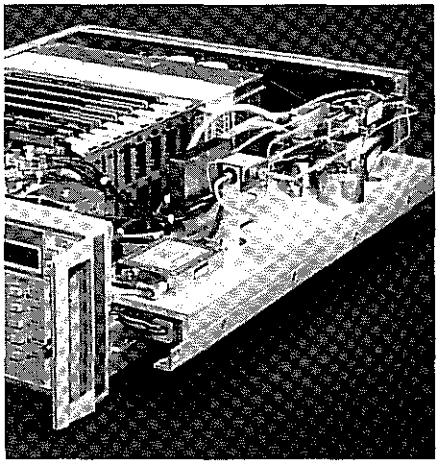


Figure 11. *Tilt-out microwave deck exposes all high-frequency components and cabling.*

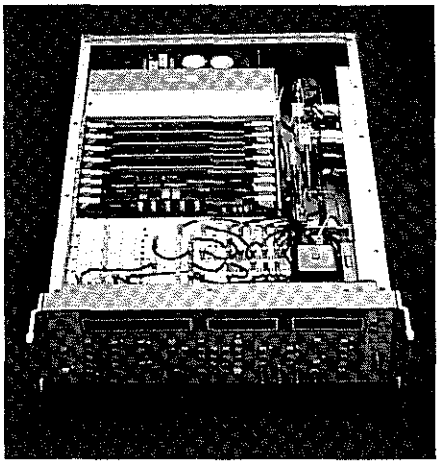


Figure 12. *Ingenious layout contributes to reliability by keeping components cool.*

Serviceability that will earn your gratitude.

An inside view of the 6700A provides convincing evidence of the care given to making it serviceable (figures 10, 11, 12). For instance, a major competitor has 109 manual adjustments in its 26.5 GHz synthesizer. The 6700A has 101

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.

When you need help, Wiltron service information is as near as your telephone. Sales and service offices staffed by factory-trained personnel are located in many parts of the world (figure 13). Should you need replacement parts, you receive fast, single-day response from courteous, technically competent service engineers.

With your instrument you receive a two-volume Operation and Service manual meeting the requirements of MIL–M–7298C. Because of the unusual ease with which you can find material in the manual, you will value this important maintenance tool.

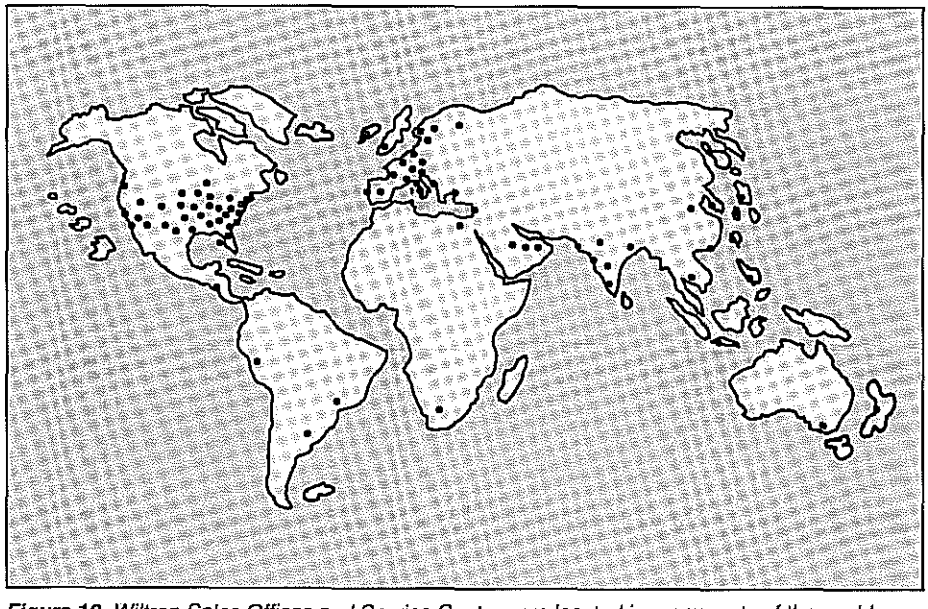


Figure 13. *Wiltron Sales Offices and Service Centers are located in many parts of the world, staffed by friendly, competent people, who are factory-trained to serve you well.*

Figure 14. Built for rough work in the field, the 6700A withstands severe shock and vibration.

Figure 15. Every instrument is subjected to 72 hours of 50°C temperature cycling before shipment.

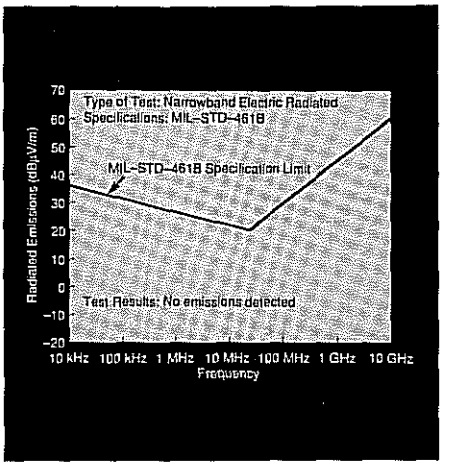


Figure 16. MIL-STD-461B test results demonstrate the exceptional EMI and RFI performance of the 6700A.

Programmability that minimizes software development time.

With its dedicated GPIB (IEEE-488) processor, the 6700A is fully programmable. High-level, three-letter mnemonics are easy to learn and minimize software development time. Also, via the Service Request facility, you can monitor instrument status. Should an error occur, bus-accessible, self-check routines test the analog and digital modules and identify the unit(s) that needs attention. You cut long-term costs by reducing troubleshooting time, mean-time-to-repair, and the level of skill required of your maintenance personnel.

Status bytes provide information on internal operations, such as phase-lock acquisition and leveling. They can also be used as a timing aid to speed measurements or as a malfunction indicator. You improve controller efficiency and avoid continued operation when an error occurs.

Should you already have programs for Wiltron 6600 Programmable Sweep Generators, you will also reduce software-development costs by being able to use all but eleven of the one-hundred 600 commands to control the 6700A.

Reliability that deserves your trust.

Reliability was a major 6700A design objective. Features that reflect this objective include a very conservative thermal design and use of an 80 CFM fan to keep the internal components remarkably cool. High quality interconnections and very few manual adjustments minimize the effects of time and vibration. Automatic monitoring and calibrating of critical circuits maintain high-quality performance despite shock, temperature extremes, and aging. Additionally, every instrument is tested under computer control for 72 hours minimum at 50°C (122°F). Also, the conservative design and thorough testing provided Wiltron components make it possible to warrant the YIG oscillators for two years and all other parts for one.

The 6700A withstands severe environments, both electrical and mechanical (figure 14, 15). Production units have been subjected to 90% humidity, full temperature cycling, vibration up to 55 Hz with 0.015 inch peak-to-peak displacement, and shocks of a 50-lb hammer dropping from five feet in all planes. However severe your applications, you can choose the 6700A with confidence.

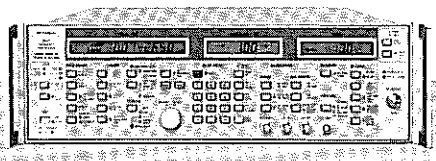
EMI protection that invites confidence.

As you view the inside of the 6700A, you will be impressed by the precautions taken to ensure electromagnetic compatibility:

- Extensive grounding and shielding of internal assemblies stops EMI at the source. RF circuits communicate through double-shielded coax and filtered connections. Even the microprocessor bus is shielded.
- The one-piece front and rear castings are RF-tight—no large apertures or ungrounded I/O shields to act as unwanted antennas. (Aluminum honeycomb shields the fan inlet.)
- The one-piece, seam-welded instrument case is fully gasketed at the front and rear castings. Fewer seams mean better EMI protection.
- A custom-designed, line-power-entry module and extensive filtering help keep power distribution lines free of spurious signals. In system applications, maintaining a clean power distribution system is an important consideration.

The instrument meets the requirements of MIL-STD-461B, Part 4, Class A3 equipment, for conducted (CE03) and radiated (RE02) emissions (figure 16).

Specifications



FREQUENCY

Range	Model	Output Power*
10 MHz to 40 GHz	6769A**	+10 dBm, ≤20 GHz +5 dBm, ≤26.5 GHz 0 dBm, ≤40 GHz
2 to 40 GHz	6763A**	+10 dBm, ≤20 GHz +5 dBm, ≤26.5 GHz 0 dBm, ≤40 GHz
18 to 40 GHz	6742A**	+5 dBm, ≤26.5 GHz 0 dBm, ≤40 GHz
26.5 to 40 GHz	6740A**	+3 dBm
10 MHz to 26.5 GHz	6759A	+10 dBm, ≤20 GHz +5 dBm, >20 GHz
10 MHz to 26.5 GHz	6759A–10	+10 dBm
2 to 26.5 GHz	6753A	+10 dBm, ≤20 GHz +5 dBm, >20 GHz
2 to 26.5 GHz	6753A–10	+10 dBm
18 to 26.5 GHz	6736A	+7 dBm
10 MHz to 20 GHz	6747A	+10 dBm
10 MHz to 20 GHz	6747A–20	+13 dBm
2 to 20 GHz	6737A	+10 dBm
2 to 20 GHz	6737A–20	+13 dBm
8 to 20 GHz	6729A	+10 dBm
8 to 20 GHz	6729A–20	+13 dBm
12.4 to 20 GHz	6730A	+13 dBm
12.4 to 20 GHz	6730A–40	+16 dBm
2 to 12.4 GHz	6721A	+10 dBm
2 to 12.4 GHz	6721A–20	+13 dBm
8 to 12.4 GHz	6728A	+13 dBm
8 to 12.4 GHz	6728A–40	+16 dBm
10 MHz to 8.4 GHz	6717A	+10 dBm
10 MHz to 8.4 GHz	6717A–20	+13 dBm
2 to 8.4 GHz	6719A	+13 dBm
10 MHz to 2 GHz	6709A	+10 dBm
10 MHz–2 GHz	6709A–40	+16 dBm

* Optional attenuator reduces rated power by 3 dB. ** Scheduled for later introduction.

CW Mode

Output: Nine independent, presettable CW frequencies.
Accuracy: Same as internal or external time base.
Internal 10 MHz Time Base Stability:
With Aging: $<1 \times 10^{-9}$/day
With Temperature: $\leq \pm 5 \times 10^{-9}$ over 0° to 55°C range
Resolution: 1 kHz at ≤26.5 GHz
2 kHz at >26.5 to 40 GHz
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
Number of Steps: Variable from 1 to 1000
Dwell Time Per Step: Variable from 1 ms to 99 s
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 40 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: Rear panel switch selects 0.5 V/GHz or 1 V/GHz up to 20V maximum. BNC, rear panel.
Bandswitch Blanking Output: Rear panel switch selects +5V or –5V signal coincident with bandswitching points. BNC, rear panel.

Retrace Blanking Output: Rear panel switch selects +5V or −5V output signal coincident with sweep retrace. AUX I/O Cannon 25 pin D style, rear panel.
Pen Lift Output: Rear panel switch selects 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.

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: −30 dBc (−20 dBc for 6709A–40, 6717A–40, and 6747A–20)
>2 to ≤26.5 GHz: −60 dBc
>26.5 to 40 GHz: −20 dBc
Nonharmonics: ≤2 GHz: −40 dBc
>2 GHz: −60 dBc, typically −70 dBc

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

Range (GHz)	Offset from Carrier				
	30 Hz	100 Hz	1 kHz	10 kHz	100 kHz
0.01 to 2	−69	−78	−80	−84	−107
>2 to 8	−66	−71	−73	−76	−100
>8 to 12.4	−64	−68	−70	−73	−107
>12.4 to 20	−60	−63	−67	−74	−105
>20 to 26.5	−55	−61	−64	−69	−102
>26.5 to 40	−54	−57	−61	−68	−99

Power Line and Fan Rotation Spurious (dBc, CW, typical):

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 26.6	−40	−47	−52
>26.5 to 40	−35	−42	−47

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

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

RF OUTPUT

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

Leveled Output Power Range:
Without Attenuator: 12 dB
With Option 2A, 110 dB Attenuator for Models with Maximum Frequency of ≤12.4 GHz: 122 dB
With Option 2B, 90 dB Attenuator for Models with Maximum Frequency of >12.4 GHz and ≤ 26.5GHz: 102 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
Output Power Accuracy and Flatness
Step Sweep and CW Modes:

Attenuation Below Maximum Power	0.01–20 GHz	>20–26.5 GHz	>26.5–40 GHz
Accuracy*			
0–12 dB	±0.6 dB	±0.6 dB	±0.8 dB
0–30 dB**	±1.4 dB	±1.6 dB	N/A
>30–60 dB**	±2.6 dB	±2.6 dB	N/A
>60 dB**	±3.1 dB	±5.0 dB	N/A
Flatness			
0–12 dB	±0.4 dB	±0.4 dB	±0.6 dB
0–30 dB**	±0.8 dB	±1.0 dB	N/A
>30–60 dB**	±2.0 dB	±2.0 dB	N/A
>60 dB**	±2.5 dB	±3.0 dB	N/A

* Includes flatness variations.
** For models with attenuator.

Analog Sweep Modes (typical):

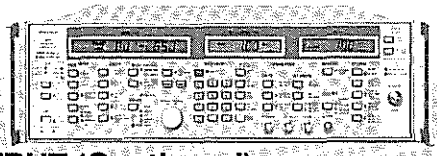
Attenuation Below Maximum Power	0.01–20 GHz	>20–26.5 GHz	>26.5–40 GHz
Accuracy*			
0–12 dB	±1.0 dB	±1.5 dB	±2.0 dB
0–30 dB**	±3.5 dB	±3.6 dB	N/A
>30–60 dB**	±4.0 dB	±4.2 dB	N/A
>60 dB**	±5.0 dB	±5.2 dB	N/A
Flatness			
0–12 dB	±1.0 dB	±1.5 dB	±2.0 dB
0–30 dB**	±3.0 dB	±3.1 dB	N/A
>30–60 dB**	±3.5 dB	±3.6 dB	N/A
>60 dB**	±4.0 dB	±4.2 dB	N/A

* Includes flatness variations.
** For models with attenuator.

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

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

Specifications (Cont.)



RF OUTPUT (Continued)

Level Offset: Offsets displayed power level to establish a new reference level.
RF On/Off Between Frequency Steps: Rear panel switch selects 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

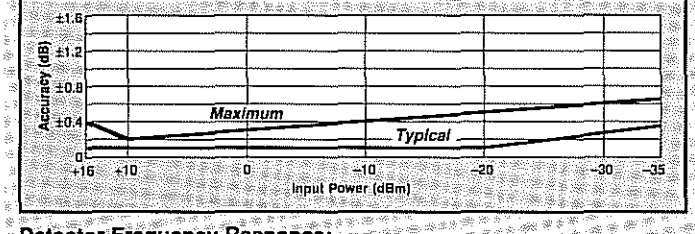
Range: Sweeps between any two power levels.
Resolution: 0.01 dB/step
Accuracy: Same as output accuracy.
Number of Steps: Variable from 1 to 1000
Dwell Time per Step: Variable from 50 ms to 10 s

Power Meter

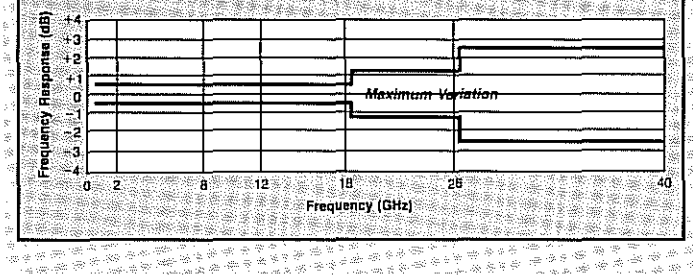
Built-In Power Meter Range: +16 dBm to –35 dBm. Compatible with Wiltron 560–7 or 6400–71 Series Detectors. Rear panel input.
Built-In Power Meter Accuracy:
Meter Accuracy (25°C):
Detector Frequency Response

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 at ≤20 GHz
>70 dB at >20 to 40 GHz
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	*	*
100 ns to <200 ns	*	±1.5 dB
200 ns to <500 ns	*	±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

* RF power is controllable, but not automatically leveled for very narrow pulses.

Internal Pulse Generator:
Pulse Width Range: ≤25 ns to ≥99 ms
Pulse Width Control Resolution: 25 ns at up to 100 µs width
1 µs at >100 µs to 1 ms width
10 µs at >1 to 10 ms width
100 µs at >10 to 99 ms width
Note: Specified resolution may exceed the 3-digit display resolution.

Pulse Width Accuracy: ±10 ns typical
Pulse Repetition Rate: 10 Hz to 1 MHz
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
Delay Time: 50 ns typical

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% typical with RF level at 6 dB below maximum rated output.
AM Depth Metering Accuracy: Same as Sensitivity Accuracy.
AM Bandwidth (3 dB, pulse off): DC to 50 kHz or 50 Hz to 50 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 at ≤300 kHz/V sensitivity.
1–250 kHz at >300 kHz/V sensitivity.
Unlocked Mode: DC to 250 kHz rate.
Flatness(relative to 40 kHz rate):
Phase-Locked Mode:
±1 dB from 200 Hz to 200 kHz at ≤300 kHz/V sensitivity.
±1 dB from 3 kHz to 200 kHz 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 and self-test diagnostics.
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.
From AC Power Application: 72 hours to achieve 1 x 10^{-9} per day frequency stability.
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.

Ordering Information

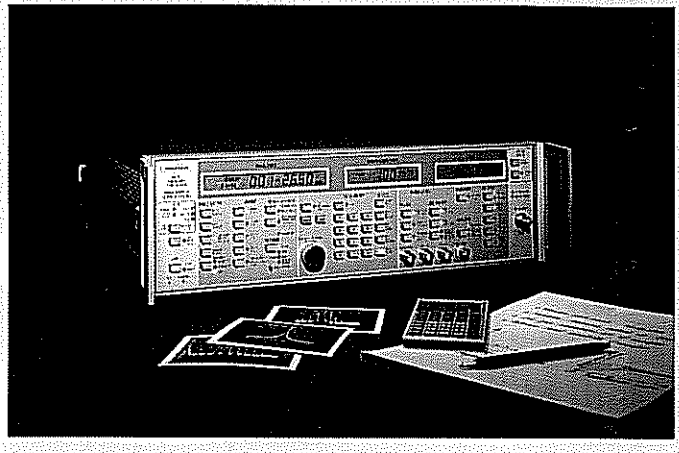
Swept Frequency Synthesizers

Mode	Frequency Range	Output Power* (Minimum)	Price
6709A	10 MHz to 2 GHz	+10 dBm	$24,750
6709A–40	10 MHz to 2 GHz	+16 dBm	$25,500
6717A	10 MHz to 8.4 GHz	+10 dBm	$29,500
6717A–20	10 MHz to 8.4 GHz	+13 dBm	$30,500
6719A	2 to 8.4 GHz	+13 dBm	$26,000
6721A	2 to 12.4 GHz	+10 dBm	$31,000
6721A–20	2 to 12.4 GHz	+13 dBm	$32,500
6728A	8 to 12.4 GHz	+13 dBm	$24,500
6728A–40	8 to 12.4 GHz	+16 dBm	$26,000
6729A	8 to 20 GHz	+10 dBm	$30,500
6729A–20	8 to 20 GHz	+13 dBm	$32,000
6730A	12.4 to 20 GHz	+13 dBm	$25,000
6730A–40	12.4 to 20 GHz	+16 dBm	$26,500
6736A	18 to 26.5 GHz	+7 dBm	$26,500
6737A	2 to 20 GHz	+10 dBm	$34,000
6737A–20	2 to 20 GHz	+13 dBm	$35,500
6740A**	26.5 to 40 GHz	+3 dBm	N/A
6742A**	18 to 40 GHz	+5 dBm, ≤26.5 GHz 0 dBm, ≤40 GHz	N/A
6747A	10 MHz to 20 GHz	+10 dBm	$36,000
6747A–20	10 MHz to 20 GHz	+13 dBm	$37,000
6753A	2 to 26.5 GHz	+10 dBm, ≤20 GHz +5 dBm, ≤26.5 GHz	$39,000
6753A–10	2 to 26.5 GHz	+10 dBm	$41,000
6759A	10 MHz to 26.5 GHz	+10 dBm, ≤20 GHz +5 dBm, ≤26.5 GHz	$42,000
6759A–10	10 MHz to 26.5 GHz	+10 dBm	$44,000
6763A**	2 to 40 GHz	+10 dBm, ≤20 GHz +5 dBm, ≤26.5 GHz 0 dBm, ≤40 GHz	N/A
6769A**	10 MHz to 40 GHz	+10 dBm, ≤20 GHHz +5 dBm, ≤26.5 GHz 0 dBm, ≤40 GHz	N/A

** Optional attenuator reduces rated power by 3 dB.
* Scheduled for later introduction.

Power Meter Detectors

Detector Model	Frequency Range	Input Connector	Price
6400–71N50	10 MHz to 2 GHz	N Male	$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 Opt. 2	10 MHz to 26.5 GHz	WSMA Male	$600
560–7K50	10 MHz to 40 GHz	K Male	$675



Power Meter Extender Cables

Cable Model	Description	Price
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

Options

Option	Description	Price
1	Rack mount kit with slides. Weight: 2.3 kg (5 lb).	$300
2A	110 dB attenuator only for 6709A (–40), 6717A (–20), 6719A, 6721A (–20), and 6728A (–40). Reduces rated power by 3 dB.	$2,000
2B	90 dB attenuator for all models with an upper frequency limit of >18GHz.. Reduces rated power by 3 dB.	$2,700
9K	Adds rear panel K Connector RF output. Deletes front panel connector. Degrades output power, flatness, and SWR.	$500

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