S-Series

SGA Fast, Low Noise Signal Generator

AEROFLEX
A passion for performance.

Compact, easy to use, high performance signal generator for R&D, manufacturing and the field

Features

- Wide band cover:
  - SGA-3 - 100 kHz to 3 GHz
  - SGA-6 - 100 kHz to 6 GHz
- +13 dBm output (+20 dBm option)
- Low SSB phase noise: –135 dBc/Hz at 1 GHz, at 20 kHz offset
- Fast frequency settling time: 100 µs
- Wide bandwidth AM, FM, ØM with comprehensive and fully flexible modulation modes (option)
- Four internal 10 MHz modulation oscillators
- Internal pulse modulator/generator (option)
- Comprehensive frequency and amplitude sweep capabilities
- Avionics ILS/VOR and DME options
- Half-rack width, 4U high with 8.5 inch touch-screen user-interface
- Synchronization and interaction with S-Series modules and instruments
- Aerolock™ interlocking mechanism for multiple instrument applications
- LAN and GPIB remote control
- Low cost of ownership through modular design
- Carrier phase control

The SGA employs a large touch-screen user-interface to provide a signal generator with unparalleled ease of use. With such a small form-factor, the SGA is equally at home in the field as it is in the laboratory or a production line. The use of Aeroflex's Fast Low Noise Synthesis (FLNS) technology, added to the experience gained through decades of developing leading-edge signal source products, ensures that signal purity and integrity have not been sacrificed in the quest for speed; the SGA excels in all respects. With a comprehensive range of features and options, the SGA meets the needs for a general-purpose signal generator while offering the high performance required of demanding, critical receiver measurements or rapid manufacturing.

Display and User-Interface

A large 8.5 inch touch-screen LCD enables all relevant set-up information to be displayed on one screen, and without the need to select configurations from lower level menu structures. It is quick to learn, easy to use, clear, with large characters and a wide viewing angle. Touch targets are sufficiently large to ensure usability even when wearing gloves. A pop-up keyboard is complemented with a touch-vernier control with adjustable sensitivity and a step control, both of which can be assigned to any variable parameter.

A mouse and keyboard may also be connected to allow ease of use when using Windows™ features.

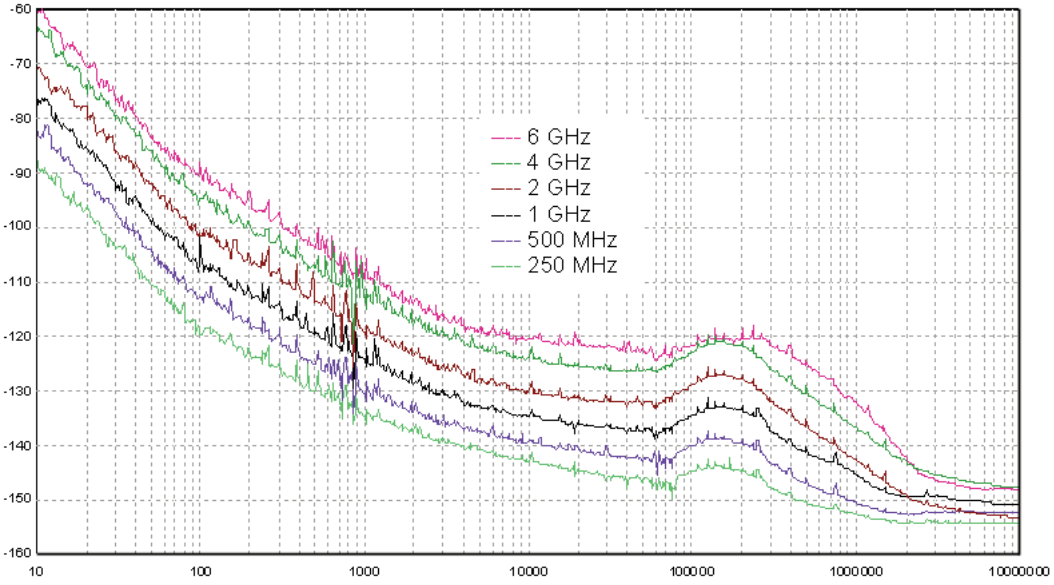
No knobs or keyboard, just a simple touch-screen user interface

Excellent Spectral Purity

The excellent noise characteristics and the low level of spurious signals of the SGA enable the instruments to be used with confidence for a wide range of critical measurements for the most demanding measurements on modern receivers, RF systems and A-D converters.

Low SSB Phase Noise

With a specified SSB phase noise performance of typically -135 dBc/Hz at 20 kHz offset from a carrier of 1 GHz, the SGA is easily able to measure receiver selectivity beyond 80 dB. The low residual FM noise figure of less than 1 Hz RMS at 1 GHz gives the SGA the capability of measuring receiver signal-to-noise ratios as high as 80 dB.



Graph of typical phase noise performance

Fast Frequency and Level Settling Times

These are critical parameters to ensure maximum throughput in production applications. With frequency and level settling times of 1 ms in conventional frequency selection mode, or 100 μs in list mode, the SGA is ideally suited for frequency hopping and semiconductor production test applications.

RF Output

RF output up to +13 dBm can be set to a resolution of 0.01 dB. A high power option is available to extend the maximum calibrated RF level to +20 dBm.

In the tradition of Aeroflex's excellence in RF signal generation, the ultimate attention has been given to ensure the quality of the RF performance extends beyond the specification. Such attributes are:

- that no positive RF level transients generated as a result of changing between any frequency or level
- class-leading source VSWR specification helps to ensure that the specified RF level accuracy is more likely to be met when the load match is not ideal
- excellent linearity and monotonicity even over fine RF level steps
- repeatability ensures the same RF level is produced every time

The fastest level switching speed with a long life is achieved by the use of an electronic attenuator ensuring suitability for use in the most demanding production test applications.

Carrier Phase Control

This controls the phase of the carrier with respect to reference frequency standard and allows multiple SGA to be locked in frequency with controlled phase.

Flexible Modulation Capabilities (Option)

With four internal 10 MHz oscillators and two external modulation inputs, a wide selection of modulation modes is catered for. With four modulation channels it is possible to have single AM, FM or PM (phase modulation) and dual AM and FM (or PM) using any combination of internal and external sources.

Typical multiple modulation set-up

Wide AM and FM bandwidths support the testing of broadcast systems by allowing video signals to modulate the carrier with minimal distortion. Wideband FM also supports testing of equipment using frequency shift keying for high speed digital transmission and telemetry.

Sweep

The comprehensive sweep mode provides a digital sweep of carrier frequency and RF level in discrete steps. It is possible to set the start, stop, number of steps (or step size) and step time, up to a maximum of 65536 steps.

A sweep can be externally triggered via a rear panel BNC connector for Start, Start/Stop and Step, while up to six markers can be used to identify specific events within the sweep.

Typical frequency sweep set-up

List Mode Sweep

With a minimum dwell time of 100 us, list mode provides the ultimate in frequency switching speed. A table of up to 1000 carrier frequency and RF level values may be created. Start address, stop address and dwell time can be controlled and can be externally triggered from a rear panel BNC connector.

Creating a list in List Mode

List Mode control screen showing a List sweep in action

Pulse Modulation (Option)

An optional pulse modulator with internal pulse generator allows the generation of fast rise time RF signals with on/off ratios that meet the most demanding tests on radar RF and IF stages and EMC/ECCM test applications.

Avionics Options

Following on from the industry standard 2030 Series, the SGA with option 006, retains the performance and essential features for testing ILS, VOR and aircraft communications systems, including the highest performance navigational receivers such as those used for airfield alarm monitors. Its inherent low phase noise performance enables a receiver's selectivity to be tested against the most stringent requirements in this safety critical industry. Digitally generated modulating waveforms ensure excellent accuracy and stable performance under all operating conditions.

The avionics option supports the following systems:

- Instrument Landing Systems (ILS)
- VHF Omni Range (VOR) beacons
- Marker Beacons
- Automatic Direction Finder (ADF)
- COM/ID

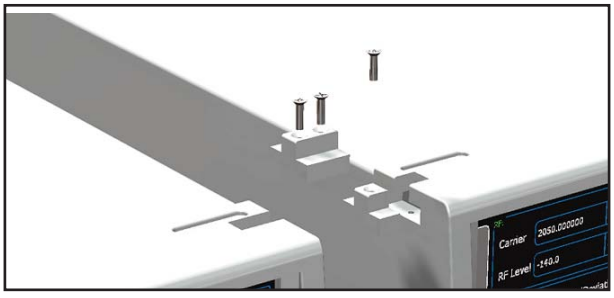
Avionics parameters are presented in the same form as described in the International Civil Aviation Organization (ICAO) standards.

DME (Distance Measuring Equipment) provides aircraft with accurate and continuous information of their slant range distance from a ground reference point. Option 010 produces the necessary Gaussian shaped double pulses required to test DME transponders, with 90% of the transmitted energy within a bandwidth of 0.5 MHz in accordance with EUROCAE ED57. Variable control of pulse width, rise and fall times, pulse pair spacing and pulse repetition rate give complete flexibility when defining the pulse profile. Rear panel connectors provide External Trigger input and Synchronization and Video outputs.

Modular Instrument Concept Employing Aeroflex's Aerolock™ Interlocking Mechanism

The SGA is designed to work with another SGA and a selection of S-Series modules which mount underneath.

Aerolock™ is an ingenious, simple and strong interlocking mechanism allowing SGA instruments and a full-rack width module, or two half-rack width modules, to be joined as one, creating a bespoke test solution. Weighing-in at less than 8 kg each, two SGAs joined together may be easily carried within the laboratory, the factory or the field without necessitating a 2-person lift.



Aerolock™ interlocking mechanism

Two SGAs joined together as one

When a module is connected to the SGA via a USB plug and play interface, its presence will be automatically recognized and the features and applications relevant to that module will be available on the SGA.

Many applications will be supported including tests for power amplifiers, receiver selectivity, intermodulation, adjacent channel power and mixer testing, with many more to come in the future. It will be possible to couple the settings of one SGA with another, allowing quick and simple control across any frequency or level range where two sources with a defined relationship are required.

Remote Operation

LAN and GPIB interfaces are all supported using SCPI format commands where possible. Remote desktop and VNC are also supported allowing off-site remote control.

The 2030 Series GPIB emulation mode enables the SGA to seamlessly replace a 2030 or NAV-750C in automated test systems.

Non-Volatile Memory

Hundreds of full instrument setting stores may be configured. Each store may be independently named allowing quick search of required memory.

Removable Hard Disk (Option)

For use in secure areas, the optional removable hard disk allows easy removal of all sensitive instrument settings stores in the event the instrument has to leave the secure area. No settings data is stored in any other memory location within the instrument.

Low Cost of Ownership

The SGA comes with a standard 2-year warranty and recommended 2-year calibration periodicity. Options to extend the warranty to five years are available.

The instrument's software may be installed simply from a USB port so that upgrades can be performed with the minimum down-time and maximum convenience. The latest software version will always be available on Aeroflex's web site.

SPECIFICATIONS

All specifications apply after a warm-up period of 20 minutes.

FREQUENCY

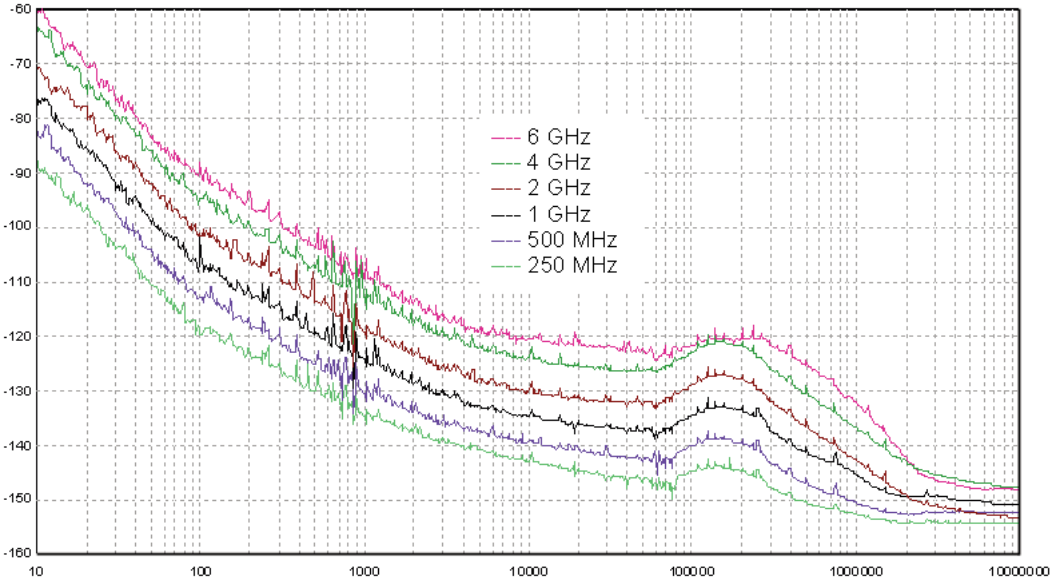
Range	*100 kHz to 3 GHz (SGA-3)* *100 kHz to 6 GHz (SGA-6)*
Resolution	*0.01 Hz*
Accuracy	*As frequency reference*
Settling Time *(CW Mode)*	*Typical settling time to within 0.1 ppm of final frequency after receipt of remote interface delimiter:* *5 ms*
Settling Time *(List Mode)*	*Typical settling time to within 0.1 ppm of final frequency after trigger pulse in List Mode.:* *<100 µs* *for frequency changes exceeding 1.6 GHz within the frequency range above 3.2 GHz:* *>101 µs*
Carrier Phase	*0 – 359.99 degrees in 0.01 degree steps* *Carrier phase controls the phase of the carrier with respect to the reference frequency standard, be it internal or external.*

RF LEVEL

Range	*-130 to +13 dBm* *-130 to +10 dBm below 3 MHz* *When AM is selected, the maximum RF output level is linearly reduced by up to 6 dB depending on the requested AM depth.* *Step attenuator: 0 to 132.5 dB in 0.25 dB steps* *Note: Performance is not guaranteed below -120 dBm*		
Range (option 003)	*-130 to +20 dBm* *-130 to +16 dBm below 50 MHz* *-130 to +10 dBm below 3 MHz* *-130 dBm to +19 dBm above 5.8 GHz* *Note: Performance is not guaranteed below -120 dBm*		
Resolution	*+0.01 dB*		
Accuracy at 23°C ±5°C	*100 kHz - 50 MHz*	*<±0.7 dB*	
		<±1.0 dB	*below -110 dBm*
	>50 MHz - 3 GHz	*<±0.5 dB*	*+9.5 to -50 dBm*
		<±0.7 dB	*below -50 dBm*
		<±1.0 dB	*below -110 dBm*
		<±1.0 dB	*above +9.5 dBm*
	>3 GHz - 6 GHz	*<±0.6 dB*	*+8.5 to -50 dBm*
		<±1.0 dB	*below -50 dBm*
		<±1.0 dB	*above +8.5 dBm*
	Add 0.2 dB when AM enabled *Temperature stability +0.01 dB/°C up to 3 GHz, 0.02 dB/°C up to 6 GHz* Specification applies ≥-120 dBm up to 3 GHz, ≥-100 dBm up to 6 GHz and ≤+16 dBm above 5 GHz		
Repeatability	*Better than ±0.05 dB after warm up following a return from a change of frequency or level valid for at least 2 hours and excluding temperature influence*		
Monotonicity	*Typically better than 0.05 dB (-30 dBm to +13 dBm or to +20 dBm wirh option 003)* *Better than 0.2 dB typ. at an RF level between +3.0 and +4.5 dBm and between +9.0 dBm and +10.5 dBm.*		
Switching Time	*<100 µs to within 0.1 dB of final value (23°C ±5°C) after trigger pulse in List Mode* *<150 µs when changing carrier frequency*		
Output Impedance	*50 Ω nominal*		
Output VSWR		*<+3.5 dBm*	*<+9.5 dBm*
	>1 MHz -3 GHz	*<1.4:1*	*<1.5:1 typ.*
		<+2.5 dBm	*<+8.5 dBm*
	>3 GHz	*<1.6:1*	*<1.7:1 typ.*
Reverse Power Damage Level	*+25 dBm, ±16 V DC*		
RF Level Offsets	*Up to the maximum output level range* *A given RF level offset over a given frequency band* *A profiled RF level offset between two given frequencies* *A selection of both of the above*		

SPECTRAL PURITY

SSB Phase Noise (CW Mode)	*All values in dBc/Hz*			
	Carrier freq	*1 kHz*	*20 kHz*	*10 MHz*
	100 MHz	*-130*	*-140*	*-150 typ.*
	250 MHz	*-129*	*-140*	*-150 typ.*
	500 MHz	*-123*	*-136*	*-150 typ.*
	1 GHz	*-117*	*-130 (-135 typ)*	*-148 (-152 typ)*
	2 GHz	*-111*	*-124*	*-148*
	4 GHz	*-105*	*-118*	*-140*
	6 GHz	*-101*	*-115*	*-135*
	Phase noise below 100 Hz offset is dependent upon reference phase noise			
Non-Harmonic Related Spurious (CW Mode)	*At offsets >10 kHz:* *≤1 GHz, better than -80 dBc* *>1 GHz, better than -76 dBc* *>2 GHz, better than -70 dBc* *>5 GHz, better than -68 dBc* *>5.5 GHz, better than -55 dBc* *At carrier frequencies between 3.4 GHz and 4.0 GHz, spurious outputs between 2.3 GHz and 2.7 GHz are specified at better than -62 dBc.*			
Sub-harmonics	*<1.5 GHz, better than -80 dBc* *<3 GHz, better than -75 dBc* *≤6 GHz, better than -40 dBc*			
Harmonics (CW Mode)	*1 MHz - 6 GHz*	*≤-2 dBm, better than -30 dBc* *≤+8 dBm, better than -30 dBc typ.*		
Residual FM (CW mode)	*Less than 1 Hz RMS deviation in a 300 Hz to 3.4 kHz unweighted bandwidth at 1 GHz*			
RF Leakage	*Less than 0.5 µV at the carrier frequency into a single turn 25 mm loop 25 mm or more from the case*			
RMS Jitter (CW mode)	*Carrier freq.*	*RMS Jitter Bandwidth*	*RMS Jitter (measured performance)*	
	1 GHz	*1 Hz - 10 MHz*	*450 fs*	
	155 MHz	*100 Hz -1.5 MHz*	*58 fs*	
	622 MHz	*1 kHz - 5 MHz*	*31 fs*	
	2.488 GHz	*5 kHz - 15 MHz*	*25 fs*	



Typical phase noise performance at 250 MHz, 500 MHz, 1 GHz, 2 GHz, 4 GHz and 6 GHz

MODULATION

Modes

AM, FM, phase modulation – (Option 001)

Pulse modulation – (Option 004)

	AM1	AM2	FM1	FM2	PM1	PM2	Pulse
AM1		✓	✓	✓	✓	✓	✓
AM2	✓		✓	✓	✓	✓	✓
FM1	✓	✓		✓	✗	✗	✓
FM2	✓	✓	✓		✗	✗	✓
PM1	✓	✓	✗	✗		✓	✓
PM2	✓	✓	✗	✗	✓		✓
Pulse	✓	✓	✓	✓	✓	✓	

Allowable combinations:

Up to two simultaneous AM and or

Up to two simultaneous FM or ØM

A maximum of four modulation channels are available using any combination of four internal modulation oscillators and two external sources

All the above available with pulse modulation

FREQUENCY MODULATION – (OPTION 001)

Range	N
100 kHz - <30 MHz	1
30.0 - <46.875 MHz	1/64
46.875 - <93.75 MHz	1/32
93.75 - <187.5 MHz	1/16
187.5 - <375 MHz	1/8
375 - <750 MHz	¼
750 MHz - <1.5 GHz	½
1.5 - <3 GHz	1
3 - 6 GHz	2

Deviation	N x 10 MHz in wide mode N x 50 kHz in narrow mode		
Resolution	1 Hz		
Accuracy	±3 % of set deviation (1 kHz mod rate)		
Total Harmonic Distortion	<0.15% (at 1 kHz mod rate and 2% max deviation) <0.5% (at 1 kHz mod rate and 20% max deviation)		
Frequency response (1 dB typ.)	10 Hz - 10 MHz DC - 10 MHz	AC coupled DC coupled	Wide mode
	10 Hz - 50 kHz DC - 50 kHz	AC coupled DC coupled	Narrow mode

When internally modulated, the FM mode is automatically selected for optimum performance. When external modulation is selected, the user can select wide or narrow-band FM mode as required.

PHASE MODULATION – (OPTION 001)

Deviation	*N x 100 rad*
Resolution	*0.01 rad*
Accuracy	*±3% of set deviation (1 kHz mod rate)*
Total Harmonic Distortion	*<0.5% (at 1 kHz mod rate and 10 rad deviation)* *Typ.<0.1% (at 1 kHz mod rate and 1 rad deviation)*
Frequency response (1 dB)	*100 Hz – 10 kHz*

AMPLITUDE MODULATION – (OPTION 001)

Depth	*0 - 99.9%*
Resolution	*0.1%*
Accuracy	*+3% of set depth +1%, for carrier frequencies up to 2 GHz. AM is usable to 6 GHz.* *Add 0.2 dB for AM.*
Total Harmonic Distortion *1 kHz mod rate*	*<1% for depths ≤30%* *<2% for depths ≤80%*
Frequency Response (3 dB)	*10 Hz - 7 MHz AC coupled >50 MHz* *DC - 7 MHz DC coupled* *10 Hz - 50 kHz AC coupled <50 MHz* *DC - 50 kHz DC coupled*

INTERNAL MODULATION - (OPTION 001)

Four internal modulation sources.

Waveforms	*Sine, 0 - 10 MHz* *Triangle, 0 - 1 MHz* *Square, 0 - 1 MHz* *+ve and –ve Ramp, 0 - 1 MHz*
Resolution	*0.01 Hz*
Accuracy	*As reference frequency oscillator*
Total Harmonic Distortion	*<0.1%*
Frequency Response (1 dB)	*DC to 10 MHz*

Internal LF Output

One internal modulation source is available on the LF output rear panel BNC connector from a 50 Ω source impedance. The output level is variable from 1 mV - 1 V RMS at full scale modulation setting.

Output Level	*1 mV - 1V RMS, full scale*
Level Accuracy	*2% at 1 kHz*
Level Flatness	*<1 dB, DC - 10 MHz, relative to 1 kHz*

Function Generator Mode

One internal modulation source is available on the LF output rear panel BNC connector from a 50 Ω source impedance as an independent function generator.

EXTERNAL MODULATION – (OPTION 001)

Two external modulation inputs of >100 kΩ or 600 Ω (selectable)

Both inputs may be configured as AC or DC coupled

The modulation is calibrated for 1 V RMS or 1 V peak (selectable)

SWEEP FACILITY

Provides a digital sweep of carrier frequency, RF level and modulation source in discrete steps

Control of start, stop, number of steps and step time

Sweep can be externally triggered from a rear panel BNC connector (TTL) for Start, Start/Stop and Step

Modes	*Continuous; single; externally triggered*
Carrier Sweep Type	*Linear, logarithmic*
RF Level Step Size	*0.01 dB minimum*
Maximum Number of Steps	*65536*
Marker "event" Output	*A TTL pulse will appear on the sweep marker output when specified parameter values have been reached. Up to 6 markers can be set.*
Step Time Settings	*Up to 10 s*

List Mode Sweep Facility

Provides a table of carrier frequency and RF level values.

Start address, stop address and dwell time can be controlled.

Can be externally triggered from a rear panel BNC connector (TTL).

List can run with modulation applied, but can not be changed during playing of list.

Dwell Time Settings	*161 µs to 10 s*
List Size	*Up to 1000 entries*

REFERENCE FREQUENCY OSCILLATOR

Type	*OCXO*
Frequency	*10 MHz*
Temperature Stability (0° to 40°C)	*Typically better than ±1 x 10^{-8}*
Ageing Rate	*1 in 10^9 per day* *1 in 10^7 per year*
Warm Up Time	*<10 minutes*

MEMORY (80 GB HARD DISK)

Up to 500 full instrument setting stores

Each memory store can be given a unique name

Removable Hard Disk – (Option 005)

For use in secure areas, the removable hard disk may be extracted from the rear panel by releasing two screws.

The removable hard disk also contains the instrument's operating software.

PULSE MODULATOR/GENERATOR (OPTION 004)

Pulse Modulator	
On/off ratio	*>80 dB*
Rise/fall time	*<10 ns*
Maximum PRF	*10 MHz*
Video Breakthrough	*<100 mV*

Internal Pulse Generator	
Modes	*Free-run; triggered; single pulse; double pulse; adjustable doublet; external trigger*
PRF/pulse period	*0.01 Hz-10 MHz/100 ns-100s*
Width	*10 ns-60 s*
Delay	*0-60 s*
Double-pulse spacing	*10 ns-60 s*
Resolution (delay/width/period)	*10 ns*

Effects of Option 004 on RF Level Specification			
Instruments not fitted with option 003 (high power)	*Maximum specified RF level reduced to +7 dBm with pulse enabled*		
	Maximum specified RF level reduced to +10 dBm with pulse disabled		
Instruments fitted with option 003	*Maximum specified RF level reduced by 6 dB with pulse enabled*		
	Maximum specified RF level reduced by 3 dB with pulse disabled		
RF Level Accuracy	*Add 0.2 dB* *<25 MHz, >7 dBm (units with option 003, high power), add 0.5 dB* *Temperature stability:* *≤3 GHz, additional 0.005 dB/°C* *>3 GHz, additional 0.01 dB/°C*		
Outout VSWR (all output levels)	*Pulse disabled* *≤3 GHz* *<1.6:1 typ.* *>3 GHz* *<1.8:1 typ.* *Pulse enabled* *Pulse enabled (off state)* *<5 GHz* *<1.7:1 typ.* *<2.3:1 typ.* *5-6 GHz* *<2.1:1 typ.* *<2.3:1 typ.*		
Carrier Harmonics	*Unspecified below 50 MHz*		

All other RF level dependent limits reduced by 3 dB with pulse disabled, and 6 dB with pulse enabled.

ILS Mode	
Tone Frequencies	*90 Hz, 150 Hz nominal.* *Tone frequency may be changed by varying the ILS repetition rate of 30 Hz in 0.1 Hz steps. Tone frequencies maintain 3:1 and 5:1 relationships with the ILS rate.*
Frequency Accuracy	*As frequency standard*
Tone Suppression	*Either tone can be suppressed*
Sum of Depth of Modulation (SDM) Range	*0 to 99.9% in 0.1% steps representing the arithmetic sum of each tone depth*
RF Accuracy of SDM	*±2% of SDM setting for carrier frequencies up to 400 MHz* *At 40% SDM accuracy is ±0.8% depth* *At 80% SDM accuracy is ±1.6% depth*
Difference in Depth of Modulation (DDM) Range	*0 to 20% in 0.01% steps* *20 to 99.9% in 0.1% steps*
RF Accuracy of DDM	*±0.02 of DDM setting ±0.0003 DDM (0.03% depth)* *At 0 DDM (on course) accuracy is ±0.0003 DDM (0.03% depth)* *At 0.155 DDM accuracy is ±0.0034 DDM (0.34% depth)*
LF Output	*Available from the LF Output connector*
LF Accuracy of DDM	*Equivalent to ±0.0003 DDM ±0.005 of setting* *At 0 DDM (on course) accuracy is ±0.0003 DDM*

VOR Mode	
Bearing Control	*Relative phase of 30 Hz tone and subcarrier modulation adjustable from 0° to 359.99° in 0.01° steps by entering VOR bearing. Bearing can be entered as TO or FROM the beacon.*
Bearing Accuracy	*±0.05°*
Additional modulation	*Available on 0° bearing from an internal or external modulation source*
AM Depth Accuracy	*±3% of setting ±0.5% for carrier frequencies up to 400 MHz*

Frequency	*The VOR repetition frequency of 30 Hz may be varied in 0.1 Hz steps.* *The subcarrier frequency and deviation maintain a fixed relationship with the VOR repetition rate*
Frequency Accuracy	*As frequency standard*
9.96 kHz subcarrier - AM Range	*0 to 49.9% depth in 0.1% steps*
9.96 kHz subcarrier - Modulation	*Frequency modulated by a 30 Hz tone with settable deviations of 240 Hz, 300 Hz, 360 Hz, 420 Hz, 450 Hz, 480 Hz, 510 Hz and 540 Hz*
30 Hz Tone - AM Range	*0 to 49.9% depth in 0.1% steps* *Arithmetic sum of 30 Hz tone and sub carrier limited to 99.8%*

Marker Beacon

Provides default carrier of 75 MHz, 95% AM depth and a modulation frequency of 400 Hz, 1.3 kHz or 3 kHz corresponding to Outer, Middle and Inner Markers. Carrier frequencies, AM depth and modulation frequency can be adjusted from the default values.

ADF Mode

Provides default carrier of 190 kHz with 30% AM depth at 1 kHz rate.

Carrier frequency, AM depth, modulation rate and RF level can be varied from the default values.

COM/ID Mode

Provides a facility for modulating the RF carrier with morse code airport identifier code.

DME - (OPTION 010)

Option 010 uses option 004 pulse modulator/generator to generate the double-pulses required for DME.

The following specifications apply over the frequency range 960 MHz to 1215 MHz, although the full frequency range of the SGA is available.

RF Output	
Range	*-130 to +7 dBm* *-130 to +13 dBm with option 003 (high power)*
Pulse Pair Level Accuracy	*As per RF level accuracy*
Pulse On/Off Ratio	*>80 dB*

DME Pulses	
Pulse Characteristics	*Double pulses, Gaussian shaped*
Pulse Width	*0.70 µs to 8.00 µs, resolution 10 ns*
Rise Time	*0.50 µs to 6.00 µs, resolution 10 ns*
Fall Time	*0.50 µs to 6.00 µs, resolution 10 ns*
Pulse Pair Spacing	*7.00 µs to 50.00 µs, resolution 10 ns*
Repetition Rate	*10 pp/s to 6000 pp/s*

Video Output (via LF Output) - Same DME pulses as applied to the RF modulator	
Level	*Analog waveform: Nominal ±3 V, ±1.5 V into 50Ω*

Sync Output (via Trig Output)	
Pulse Width	*Typically 400 ns*
Rise/Fall Time	*Typically 5 ns*
Level	*LVTTL Nominal 0 to 3.3 V, 0 to 1.65 V into 50Ω*

External Trigger (via Pulse/Trig Input)	
Characteristics	*Rising-edge, LVTTL into high-impedance* *Min. pulse width 2 ns*
Trigger to SYNC Delay	*Typically 110 ns*
Jitter	*Typically 10 ns*

GENERAL DATA

Remote Control	
Systems	*GPIB (IEEE 488)* *Ethernet (TCP/IP)*
Command set	*SCPI*
Interface functions	*SH1; AH1; T6; L4; SR1; RL1; PP0; DC1; DT1; C0; E2*
Emulation	*Aeroflex 2030, 2031, 2032, 2040, 2041, 2042, NAV-750C*
Recommended Calibration Cycle	*24 months*
Weight	*<8 kg (17.6 lbs)*
Dimensions - H x W x D	*177 mm (4U) x 222 mm x 490 mm (6.97 x 8.74 x 19.29 in.)*

Instrument includes side strap handle and front tilt feet.

Instrument includes Aerolock™ interlocking mechanism with modules mounted above and below, and to another SGA on either side.

FRONT PANEL CONNECTORS

RF Output	*50 Ω N-type*
External Modulation Inputs	*100 kΩ / 600 Ω BNC* *Damage levels: ±5 V*
2 x USB 2.0	*Used with a memory stick for transferring memory stores, or other files in or out of the instrument* *Mouse or keyboard input*

REAR PANEL CONNECTORS

RF Output (Option 007)	*50 Ω N-type*
External Modulation Inputs (Option 007)	*100 kΩ / 600 Ω* *Damage levels: ±5 V*
Pulse Modulation Input	*50 Ω BNC – TTL and CMOS compatible*
4 x USB 2.0	*Used with a memory stick for transferring memory stores or other files in or out of the instrument* *Module plug and play connection*
Sweep out	*BNC – Generates 0 – 10 V into Zin >1 kΩ when the generator is sweeping*
Event Markers Output	*BNC - User selectable markers for frequency or level provide an indication when the specified parameter values have been reached. LVTTL logic output levels* *Damage levels: -5 V/+10 V*
Trigger/Input	*BNC – Applying 0 V or a switch closure starts the sweep or steps from point to point on the sweep. LVTTL logic input thresholds* *Damage levels: -5 V/+10 V*
Reference Frequency Input	*BNC accepts 10 MHz at 200 mV to 2 V RMS into 50 Ω or 100 kΩ nominal.* *Damage levels: -0.5 V/+3 V*
Reference Frequency Output	*BNC – 10 MHz at 1.5 V pk-pk into 50 Ω* *Damage levels: -0.5 V/+6 V*
LF Output	*50 Ω BNC – The output may be configured to give an output from the internal modulation oscillator or from the internal modulation paths or as an independent function generator*
GPIB Interface	*As described under Remote Control*
LAN Interface	*As described under Remote Control*

ENVIRONMENTAL

Rated Range of Use	
Temperature	*0 to 50°C*
Humidity	*Up to 93% at 40°C*
Altitude	*Up to 3050 m*
Conditions of Storage and Transport	
Temperature	*-40 to +71°C*
Humidity	*Up to 95% at 40°C*
Altitude	*Up to 4600 m*
EMC	*EN 61326-1:2006, Emissions Class B, Immunity Table 1 – Performance Criteria B*
Safety	*EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use-Part 1, General requirements.*
Mechanical	*MIL-PRF-28800F Class 3*
Power Requirements	
AC Supply	*100 – 240 V ~ (Limit 90 - 264 V)* *50 - 60 Hz ~ (Limit 45 - 66 Hz)* *<100 VA*

USER INTERFACE

Screen Size	*8.5 inch, 16:9 aspect ratio, colour touch-screen*
Keys/Switches	*Power on/standby* *Home key*

ORDERING INFORMATION/PRODUCT STRUCTURE

SGA-3	100 kHz to 3 GHz analog signal generator
SGA-6	100 kHz to 6 GHz analog signal generator
Option 001	AM, FM and phase modulation
Option 003	High power (+20 dBm)
Option 004	Fast pulse modulation
Option 005	Removable hard disk
Option 006	Avionics (requires option 001)
Option 007	Rear panel connectors
Option 010	DME (requires options 001, 004 and 006)

Extended Warranty Options

Option 203	3 year warranty
Option 204	4 year warranty
Option 205	5 year warranty

Supplied Accessories

AC supply lead

Getting started manual

CD-ROM containing operating manual

CD-ROM containing factory test results and electronic calibration certificate

Optional Accessories

47000/068	Operating manual (paper format)
46880/124	Service manual supporting repair to module level
43129/189	1.5 m GPIB lead
46662/836	Soft carry case
46662/835	Hard transit case
46885/505	Single instrument rack mounting kit (front panel brackets)
46885/506	Double instrument rack mounting kit (front panel brackets)
43139/042	RF double screened connector cable 50 Ω, 1.5 m, BNC (m)
54311/095	RF double screened connector cable 50 Ω, 1 m, type N connectors
54311/092	Coaxial adapter N male to BNC female
59999/163	Precision coaxial adapter N male to SMA female

Complementary Modules (see separate datasheets)

SCO-6	10 MHz - 6 GHz Combiner module
SPA-6	10 MHz - 6 GHz Power amplifier module