CHAPTER 1

INTRODUCTION

1.1 PURPOSE AND FUNCTIONS.

1.1.1 Purpose. The SG-1207A/U portable synthesized signal generator is used to test communication equipment with a wide variety of modulation methods.

1.1.2 Functions.

1.1.2.1 Front Panel Control. Front panel control is by a tactile membrane switch assembly, completely sealed against the ingress of moisture and dust, and incorporating an EMC shield. A high visibility 40 character alphanumeric LED display is used to indicate carrier frequency, carrier level, modulation frequency and modulation level settings simultaneously. The addition of a rotary control enables displayed data to be conveniently adjusted in integer steps of any resolvable size.

1.1.2.2 Volatile Memory. The entire parameters of the last front panel settings and 99 user defined set ups are retained in volatile memory. Individual memories are available for recall or store and protect, with a memory step facility incorporated to enable rapid switching between predetermined tests. Automatic conversion calculations are performed by the microprocessor enabling carrier level to be entered and displayed in the various units of dBm, dBμV, μV, mV, V (pd).

1.1.2.3 Modulation. Comprehensive modulation capability is provided with a wide band 0.1Hz to 500kHz internal audio synthesizer fitted as standard. Pulse modulation is also fitted as standard.

1.1.2.4 Secondary Function Key. Extra features include a secondary function key for access to special facilities and digital sweep of displayed data with the ability to set start, stop points and the total sweep time.

1.2 CAPABILITIES.

The signal generator output range covers virtually all radio services in the MF, HF, VHF, UHF bands and also L band microwave.

1.3 PERFORMANCE CHARACTERISTICS.

Specifications and performance characteristics of the signal generator are as follows:

FREQUENCY

Range	100kHz to 2.0GHz.
Resolution	5Hz (carrier 100kHz to <37.5MHz), 1Hz (carrier 37.5MHz to <75MHz), 2Hz (carrier 75MHz to <150MHZ), 5Hz (carrier 150MHz to <600MHz), 10Hz (carrier 600MHz to <1.2GHz), 20Hz (carrier 1.2GHz to 2.4GHz).
Stability	$\pm 1E^{-6}$ (0 to +50°C) and within 10 minutes from power on. $\pm 8E^{-8}$ per month during first year, $\pm 4E^{-8}$ per month after first year.

RF OUTPUT

Range	-125.0dBm to + 13dBm, (0.13µV to 1.0V rms pd).
Resolution	0.05dB (carrier ≥ -100dBm), 0.1dB (carrier < -100dBm).
Units	dBm, dBµV, V, mV, µV (pd).
Absolute level accuracy	±1.5dB for carrier frequency ≤ 1GHz. ±2.5dB for carrier frequency < 2GHz.
Source impedance	50Ω nominal
VSWR	<2.0:1
Reverse power protection	25W maximum (from 50Ω source), 100kHz to 2.0GHz, user reset. 25V DC maximum.
Trip level	100mW typical.

SPECTRAL PURITY

Harmonics	<-30dBc up to +3dBm and < -25dBc up to +13dBm.
Sub-harmonics	<-40dBc up to +3dBm for frequency < 1.2GHz; <-30dBc up to +3dBm for frequency ≤2GHz; <-20dBc up to +13dBm for frequency ≤2GHz.
Non-harmonics	<-50dBc at carrier offsets ≥5kHz.
Residual FM	<20Hz rms (300Hz to 3kHz bandwidth)
Residual AM	<0.1% rms, 300Hz to 3kHz bandwidth.
Noise floor	<-120dBc/Hz at 3MHz offset.

AM on 20kHz FM (incidental AM)	<1.0% at 1kHz rate, 300Hz to 3kHz bandwidth.
FM on 30% AM (incidental FM)	<200Hz at 1kHz rate, 300Hz to 3kHz bandwidth.

AMPLITUDE MODULATION

Depth	0 to 99.9%. AM depth reduces from 99.9% at <+7dBm to 0% at +13.0dBm .
Resolution	0.1%.
Accuracy	All at 1kHz rate: ±7% of reading from 30% to 70% depth, excluding residual AM
Modulation response	Relative to 1kHz rate: Internal/External: ±1dB 250Hz to 10kHz.
Modulation bandwidth (3dB)	50Hz to 25kHz.
Distortion (THD)	All at 1kHz rate, 300Hz to 3kHz bandwidth: <3% from 30% to 70% depth.

FREQUENCY MODULATION

Peak deviation	10Hz to 200kHz
Resolution	10Hz (<10kHz peak), 100Hz (<100kHz peak), 1kHz (<200kHz peak),
Accuracy	±5% of reading at 1kHz rate, excluding residual FM.
Modulation bandwidth (3dB)	Internal/external: 50Hz to 100kHz,
Distortion (THD)	<2% at 1kHz rate, 300Hz to 3kHz bandwidth with deviations > 8kHz.

PHASE MODULATION

Deviation	0 to 10.0 rads.
Resolution	0.01 rad.
Accuracy	±10% of reading at 1kHz rate, excluding residual PM.
Modulation response	Internal/external relative to 1kHz rate: ±2dB 100Hz to 10kHz.
Distortion(THD)	<2% at 1kHz rate, 300Hz to 3kHz bandwidth.

PULSE MODULATION

Frequency range	100kHz to 2.0GHz.
Carrier on/off ratio	>60dB.
Rise/fall times	<25ns.
Minimum pulse width	50ns.
Pulse repetition frequency	50Hz to 10MHz.
External control (via front panel BNC)	TTL High = carrier on, TTL Low = carrier off. +5V peak maximum.

INTERNAL MODULATION

Synthesizer range	0.1Hz to 500kHz.
Resolution	0.1Hz, frequency <1kHz, 1Hz, frequency <10kHz, 10Hz, frequency <100kHz, 100Hz, frequency ≥100kHz.
Accuracy	Same as Carrier Frequency Stability.
Distortion (THD)	<0.2% at 1kHz/400Hz rate (300Hz to 3kHz bandwidth),

MODULATION OUTPUT

Fixed level	1V rms into 50Ω nominal.

EXTERNAL MODULATION

Impedance	600Ω nominal.
Level	1V peak for calibration.
Input connector	Female type BNC
Maximum input level	±5 volts peak.

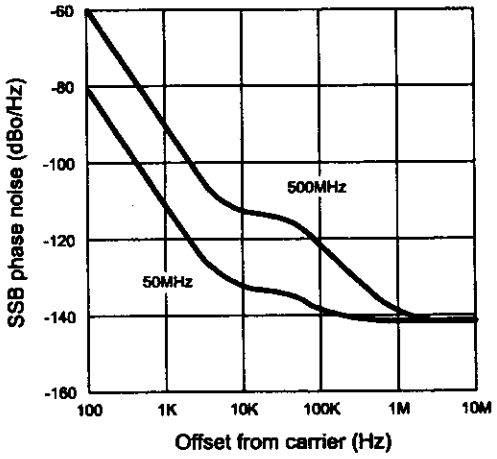
GENERAL

Programmability	GPIB (IEEE 488.2). Functions supported: SH1, AH1, T6, TEO, L4, LEO, SR1, RL1, PPO, DC1, DT0, CO, E2.
Internal crystal reference	TCXO, 10MHz.
Internal reference output	>0.6V pk-pk into 50Ω, nominal.

External reference frequency	10MHz.
External reference level	1Volt rms.

TYPICAL (NON WARRANTED) CHARACTERISTICS.

FREQUENCY	Extended range to 2.4GHz (with error limits removed). See para. 4.3y, secondary commands.
RF OUTPUT	
Range	-143.0dBm to +13dBm, (0.016µV to 1.0V rms pd) Extended range to +16dBm with error limits removed. See para. 4.3y, secondary commands.
Absolute level accuracy	±1dB for carrier levels of +1dBm to +13dBm.
SSB phase noise	Typical characteristics shown for carrier frequencies of 50 and 500MHz.



Carrier leakage	<0.5µV (2 turn 25mm loop, 25mm away).
FREQUENCY MODULATION	
Peak deviation	300MHz to <600MHz, 500kHz, 600MHz to <1.2GHz, 1.0MHz 1.2GHz to 2.4GHz, 2.0MHz. Refer to 4.3y secondary commands. } extended range with error limits removed
PULSE MODULATION	
Simultaneous modulation	Pulse modulation may be used in conjunction with any combination of AM, FM (phase modulation).
EXTERNAL MODULATION	
Simultaneous tones	The external input may be mixed with source one.

SWEEP

Functions	Carrier frequency, carrier level, modulation frequency, modulation level.
Range (start, stop)	Any within setting range.
Total sweep time	1 to 999 seconds.

GENERAL

Setting time (after receipt of last GPIB character):	<200ms typical, to within 100Hz of final carrier frequency. <100ms typical, for carrier level and modulation functions.
Memory (volatile)	100 complete front panel set ups including last front panel settings. IEEE-488 address.

Wayne Kerr Electronics Limited reserves the right to amend specifications without notification.

1.4 DESCRIPTION.

The signal generator is a microprocessor-based synthesized signal source. It covers the frequency range 100kHz to 2.0GHz with 13dBm to -125dBm output level range. Designed to operate from any standard AC supply the compact lightweight unit is ideal for bench, field, or system use. The GPIB interface for system use conforms to the IEEE 488.2 standard. Reverse power protection to 25 watts safeguards the RF output from accidental damage. The SG-1207A/U dimensions are listed in Table 1-1.

Table 1-1. Overall Dimensions

Width	13 in. (330 mm)
Height (including feet)	5.7 in. (145 mm)
Depth	20.75 in. (527 mm)
Weight	33.8 lbs. (15.3 kg)

1.5 POWER AND UTILITY INFORMATION.

Power requirements are 100, 120, 220, 240V AC (+10%, -14%) 45 to 440 Hz. Consumption rate is 60V ac maximum.

1.6 ENVIRONMENT.

Table 1-2 lists the environmental conditions for the SG-1207A/U.

Table 1-2. Environmental Conditions

Temperature (operating)	32 to 82°F (0 to 50°C)
(storage)	-40 to 158°F (-40 to 70°C)
Altitude	Up to 3050m
Installation Category	II (in accordance with IEC664)
Pollution degree	2
Relative humidity	95% to +72°F (+40°C) non-condensing
Vibration	5 to 150Hz at 2G sinussoidal, 15 minutes in each of 3 orthogonal planes
Shock	10 off 25 mm drops on each of 6 faces
Safety	Designed to meet the requirements of IEC publications EN61010-1
EMC	Designed to meet European Standards EN 50 081-1 (generic emission) and EN 50 082-1 (generic immunity)