2026A/B

10 kHz to 2.05/2.51 GHz MultiSource Generator

Up to three fully functional signal generators in one unit offering a unique solution for complex tests on receivers, components and systems.

- ***Two or three high quality RF signal generators in a space efficient format***
- ***Ideal for intermodulation and receiver characterization***
- ***Wide frequency coverage:-***
  10 kHz to 2.05 GHz (2026A)
  10 kHz to 2.51 GHz (2026B)
- ***+24 dBm RF output for effective component testing***
- ***Support for an external signal generator***
- ***Application specific test modes simplify measurement procedures***
- ***User defined tracking between signal sources***
- ***Adjustable carrier phase to allow peaking of three tone intermodulation***
- ***Built-in switched combiner network improves measurement uncertainty***
- ***Optional GSM modulation for testing multi-carrier power amplifiers***
- ***Optional Bluetooth and GSM modulation***

The 2026A/B are multiple source generators which offer two RF signal generators in one box with a third source available as an option. Each source is a fully functional RF signal generator with AM, FM, ØM, 2FSK, 4FSK and pulse modulation capability.

The 2026A/B are ideal for use in R&D and manufacturing where there is a need for two or three combined sources for conducting tests such as intermodulation and selectivity performance of components and receiver assemblies.

To aid the user to undertake difficult test procedures simply and without ambiguity, the 2026A/B family provide application-specific modes of operation. Application modes include amplifier two and three-tone intermodulation, receiver intermodulation and receiver selectivity. A rotary control and up/down keys allow easy modification of the selected parameters.

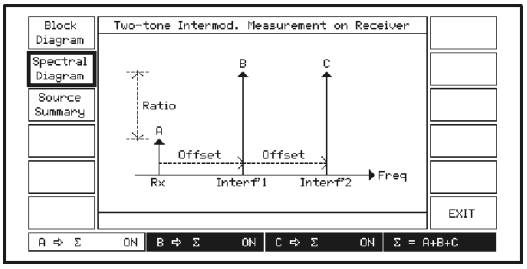
Measurement Accuracy

The use of a built in combiner, switches and cables eliminates many of the measurement uncertainties introduced by connecting together separate signal generators. The 2026A/B family thereby guarantees the level of intermodulation products introduced during amplifier or receiver intermodulation testing.

All alignment processes, including the internal frequency standard and the correction factors for the signal source RF paths, are digitally derived so realignment can be undertaken without removal of external covers. Digital adjustment also eliminates the use of mechanical adjusters, minimizing long term drift and vulnerability to mechanical shock.

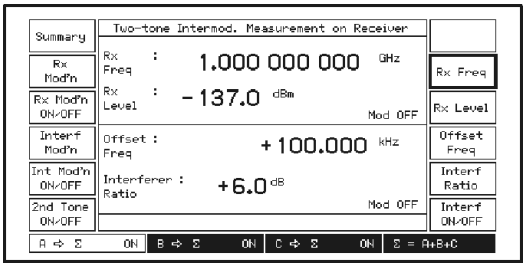
Application Modes

The 2026A/B family has a Set Up Key to enable the applications to be selected. Each Set Up is displayed as a pictorial representation of the internal signal source routing. A spectral diagram is used to show the parameters to be entered in each application in well known engineering terminology.



Spectral diagram of two tone intermodulation on a receiver

For example, selecting 'Intermodulation on a Receiver Test' allows the signal sources to be automatically set by entering the receiver input frequency and level, the ratio of the level of the two interferers (relative to the receiver input level) and the offset frequency (channel spacing).

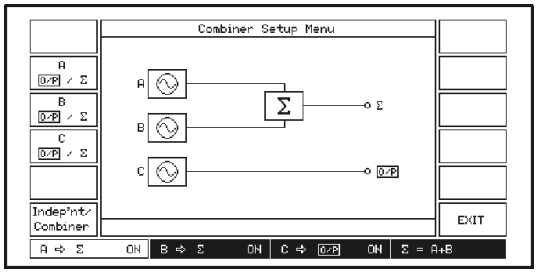


Application mode for intermodulation test on a receiver

Other application modes include 2 and 3 tone intermodulation tests on amplifiers and receiver selectivity.

Flexible Source Routing

Each of the signal sources can either be routed to a separate output connector or switched to the input of an RF combiner network before being fed to the combiner output connector. The combiner routing is set up quickly and effectively using the Combiner Set Up menu. The flexibility of the signal routing allows the 2026A/B family to accept an external signal generator, such as the 2050 Digital and Vector Generator, to enable different forms of carrier signals to be produced. Alternatively the output from a 2029 Vector Modulator, driven from one of the 2026A/B sources can be routed in.

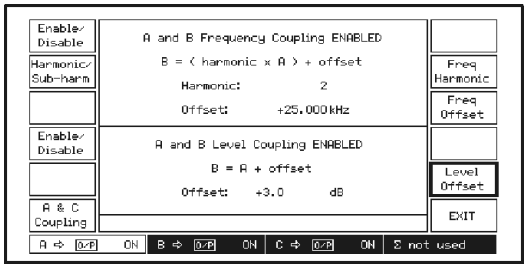


Setting up the source and combiner routing

Automatic Source Coupling

As an alternative to the application modes, the 2026A/B MultiSource Generator family allows the frequency and level of the internal RF sources to be coupled together with a user defined offset. The source frequencies can have an offset with an additional harmonic (or sub-harmonic) relationship to simplify the testing of harmonic converters and divider systems.

The coupling factors are entered by an easily understood format using a dedicated coupling menu.



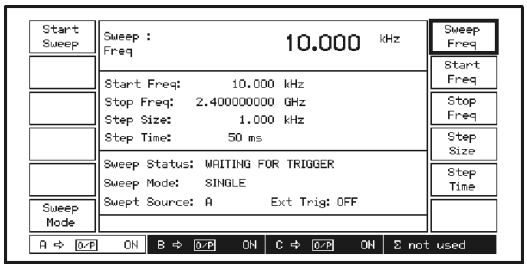
Setting up coupling

The ability to set sources to track each other greatly simplifies the testing of mixers, multipliers and dividers by reducing the number of active controls required.

Sweep

The 2026A/B family allows one of the RF sources to be frequency swept with user defined start, stop, and step values to reduce the amount of operator time or GPIB overhead. By enabling the coupling facility, sweeping one source will simultaneously sweep the other internal RF sources to allow automated swept measurements on frequency conversion devices to be made.

The sweep can be performed with modulation enabled for swept measurements of receiver immunity characteristics.



2026A/B sweep menu

High RF Output

The high RF level of the individual outputs is ideal for testing components and ensures that the 2026A/B family can generate high RF levels at the combiner output while maintaining low levels of intermodulation.

Comprehensive Modulation

Each signal source is capable of being independently modulated from its own fully programmable modulation source to ensure maximum flexibility. The internal modulation sources are each capable of generating sine, triangle or square wave signals.

Amplitude, frequency and phase modulated carriers can be generated from the internal modulation sources or from the

independent external inputs. The frequency modulation system provides excellent performance in the DC coupled mode with very low carrier frequency error and stability ensuring that the generator can accurately test receivers sensitive to small frequency errors.

Pulse Modulation

Each source is capable of being independently pulse modulated to allow the simulation of TDD or TDMA RF signal bursts with pulse on/off ratios of better than 40 dB and a rise time of less than 10 μs.

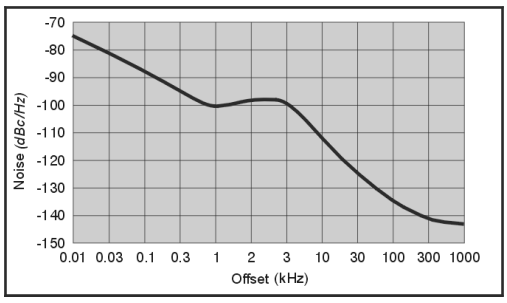
FSK

In addition to the analog FM facilities, the 2026A/B MultiSource Generator family supports 2 and 4-level FSK signals from external logic inputs. The FM deviation generated is set by keyboard entry of the required deviation. The facility is ideal for testing paging receivers and RF modems.

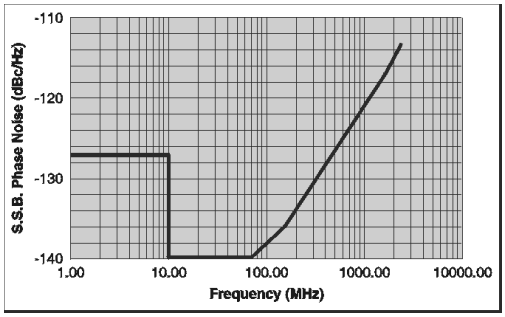
GSM Modulation

Option 116 is available to allow 2026A/B to emulate GSM signals using FM techniques which achieve superior noise floor performance than solutions using IQ systems. The facility is ideal for testing GSM receiver selectivity and for testing the linearity of high performance multi-carrier power amplifiers.

HIGH SPECTRAL PURITY



Typical SSB Phase Noise at 1 GHz



Typical Phase Noise at 20 kHz offset

Measurement of receiver selectivity and ultimate signal-to-noise ratio requires good spectral purity. The 2026A/B family has a low residual FM of typically 3 Hz and typical sideband noise of -121 dBc/Hz at 20 kHz offset from 1 GHz, to allow demanding measurements to be made.

Programming

A GPIB interface is fitted so that all standard signal generator functions are controllable over the bus. The protocol and syntax of GPIB commands has been designed in accordance with IEEE 488.2 standard to facilitate the generation of ATE programs.

Low Cost of Ownership

An electronic trip protects the individual source outputs against the accidental application of reverse power.

Careful attention to the thermal design and the use of well-proven signal generator modules gives high reliability and calibration validity.

The use of flash memory and software download via the RS-232 interface means the 2026A/B family can be upgraded with its covers fitted.

OPTIONS

Option 001 - Third Source

The 2026A/B family as standard is supplied with two RF sources. A version with 3 sources is available as an option to support applications such as intermodulation tests on a receiver.

Option 003 - High Stability Time Base

For applications requiring improved frequency stability and close-in phase noise, the standard TCXO can be replaced by a high performance OCXO.

Option 004 - Rear Panel Connections

The RF connectors for all sources, their associated modulation and pulse inputs and the combiner output connector can be mounted on the rear panel for ease of use within an ATE environment, as a factory option.

Option 116 - GSM PRBS Modulation

This options gives the 2026A/B family the capability for each source to emulate a GSM carrier. This makes the 2026A/B suitable for performing test on GSM multicarrier amplifiers and GSM receivers.

Option 117 - Bluetooth and GSM PRBS Modulation

This option provides modulation facilities for two Bluetooth modulated carriers and a carrier emulating GSM Modulation.

SPECIFICATION

GENERAL DESCRIPTION

The 2026A/B MultiSource Generator family contains synthesized signal generators offering up to three independent RF sources with separate outputs or one or more of the signals routed via a combiner. The 2026B Signal Generator covers the range 10 kHz to 2.51 GHz. 2026A Signal Generators are limited to 2.05 GHz. An external signal generator can be fed into the standard 2-source 2026A or 2026B. Each signal source can be controlled independently in frequency and level and each has its own amplitude, frequency, phase and pulse modulation capability. All parameters can be entered from the front panel keyboard and a rotary control can be used to adjust most settings. The following signal generator specifications apply to all of the sources fitted.

CARRIER FREQUENCY

Range

10 kHz to 2.05 GHz with a resolution of 1 Hz (2026A)

10 kHz to 2.51 GHz with a resolution of 1 Hz (2026B)

Accuracy

As frequency standard

RF OUTPUT

Output Range

Freq Range	Individual	Combiner
10 kHz - 250 kHz	-140 to +13 dBm	Uncalibrated
250 kHz - 1 MHz	-140 to +24 dBm	Uncalibrated
1 MHz - 1.2 GHz	-140 to +24 dBm	-140 to +10 dBm
1.2 GHz - 2.51 GHz	-140 to +20 dBm	-140 to +6 dBm

Maximum output is further reduced by 5 dB when Pulse modulation is selected and/or by up to 6 dB when AM is selected dependant upon AM depth.

Resolution

0.1 dB

RF Level Units

Units may be set to µV, mV, EMF or PD; dB relative to 1 µV, 1 mV, EMF or PD; or dBm. Conversion between dB and linear units may be achieved by pressing the appropriate units key (dB or V, mV, µV). The output level can be normalized for 75 Ω operation with an optional external impedance converter (applies to all outputs simultaneously).

RF Output Accuracy (over temp. range 17 to 27°C)

Freq Range	Individual	Combiner
10 kHz - 250 kHz	±0.8 dB from -127 to +13 dBm	Unspecified
250 kHz - 1 MHz	±0.8 dB from -127 to +6 dBm ±1.0 dB from +6 to +24 dBm	Unspecified
1 MHz - 1.2 GHz	±0.8 dB from -127 to +6 dBm ±1.0 dB from +6 to +24 dBm	±1.0 dB from -127 to +4 dBm
1.2 GHz - 2.51 GHz	±1.6 dB from -127 to +6 dBm ±2.0 dB from +6 to +20 dBm	±2.0 dB from -127 to 0 dBm

Temperature Stability

Freq Range	Drift(dB/°C)
10 kHz - 1.2 GHz	<±0.02
1.2 GHz - 2.51 GHz	<±0.04

RF level tracking (over temp range +17 to +27°C)

Relative level accuracy between any two or more combined signals (of equal amplitude), is typically: (1)

RF level	1 MHz to 1.2 GHz	1.2 GHz to 2.51 GHz
-18 dBm to +4 dBm	±0.3 dB	±0.6 dB
<-18 dBm	±0.6 dB	±1.2 dB

Attenuator hold

Inhibits operation of the step attenuator from the level at which the key is enabled. Useable for a level reduction of at least 10 dB. Typical accuracy ±3 dB.

VSWR

Individual outputs

For output levels less than -5 dBm, output VSWR is less than 1.5:1 for carrier frequencies up to 1.2 GHz and less than 1.7:1 for carrier frequencies up to 2.51 GHz (2.05 GHz for 2026A).

Combined output

Output VSWR is less than 1.22:1 for carrier frequencies between 1 MHz to 1.2 GHz and less than 1.32:1 for carrier frequencies up to 2.51 GHz (2.05 GHz for 2026A).

RF Output connector

50 Ω type N connector to MIL 390123D.

Output protection

Individual outputs

Protected from a source of reverse power up to 25 W from a source VSWR of 5:1. Protection circuit can be reset from the front panel or via the GPIB or RS-232 interface.

Combined output

No reverse power protection. Maximum total safe power 0.5 W.

SPECTRAL PURITY

Harmonics (above 1 MHz)

Individual outputs:

Typically better than -30 dBc for RF level up to +6 dBm, typically better than -25 dBc for RF levels up to +18 dBm (+14 dBm above 1.2 GHz).

Combined output:

Typically better than -30 dBc for RF level up to -18 dBm, typically better than -25 dBc for RF levels up to +4 dBm. (0 dBm above 1.2 GHz).

Non-Harmonics (for offsets >3 kHz)

Better than -70 dBc to 1 GHz, better than -64 dBc above 1 GHz, better than -60 dBc above 2 GHz.

Isolation

Better than 80 dB between individual outputs in use

Better than 60 dB from a used individual output and the combiner output

Better than 40 dB between the combiner output and an unused individual output

Intermodulation

At an RF output level of 0 dBm on the combiner into a load VSWR of 2.1 or better.

Frequency Range Two Tone Intermodulation*	
10 MHz to 2.51 GHz	<-80 dBc
5 MHz to 10 MHz	<-75 dBc
Useable but unspecified down to 1 MHz	

* Third order intermodulation products. Intermodulation levels reduce with reducing RF Level.

Residual FM (FM off)

Less than 4.5 Hz RMS deviation in a 300 Hz to 3.4 kHz unweighted bandwidth at 1 GHz.

Typically <1 Hz at 249 MHz, <2 Hz at 501 MHz <3 Hz at 1001 MHz <6 Hz at 2001 MHz.

SSB phase noise

Better than -124 dBc/Hz at 20 kHz offset from a carrier frequency of 470 MHz, typically -121 dBc/Hz at 20 kHz offset from a carrier frequency of 1 GHz.

Carrier Leakage

Less than 0.5 µV PD at the carrier frequency in a two turn 25 mm diameter loop, 25 mm from the surface of the signal generator.

MODULATION CAPABILITY

FM, AM or phase modulation can be applied to the carriers generated by each signal source from independent internal or external modulation sources. The internal modulation sources are capable of generating two simultaneous signals into any one of the modulation channels. Each internal and external modulation source can be simultaneously enabled to produce combined amplitude and frequency (or phase) modulation. Pulse modulation can be applied to each of the carriers from external pulse sources. The pulse modulation can be used in combination with the other forms of modulation. 2 level or 4 level FSK modulation can be applied to each carrier using data from an external source.

FREQUENCY MODULATION

Deviation

Resolution 3 digits or 1 Hz

CW Range (MHz)	***Max Deviation (kHz)***
1200 - 2510	12800
600 - 1200	6400
300 - 600	3200
150 - 300	1600
75 - 150	800
37.5 - 75	400
18.75 - 37.5	200
0.01 - 18.75	100

Accuracy at 1 kHz

±5%

Bandwidth (1 dB)

DC to 275 kHz (DC coupled)

10 Hz to 275 kHz (AC coupled)

20 Hz to 275 kHz (AC coupled with ALC)

Group delay

Less then 5 µs to 100 kHz

Carrier frequency offset (DC coupled)

Less than 1% of the set frequency deviation

Distortion

<1% at 1 kHz rate for deviations up to 20% of max available deviation, typically 0.1% for deviations of 2% of max available deviation and <3% at max available deviation

Modulation source

Internal modulation oscillator or external via front panel BNC

FSK

Modes

2 level or 4 level FSK, external data input via a 25 way rear panel D Type connector

Frequency shift

Variable up to ±100 kHz

Accuracy

As FM deviation accuracy, timing jitter ±3.2 µs

Filter

8th order Bessel BW 3.9 kHz

PHASE MODULATION

Deviation

0 to 10 radians, resolution 3 digits or 0.01 radians

Accuracy at 1 kHz

±5% of indicated deviation excluding residual phase modulation

3 dB Bandwidth

100 Hz to 10 kHz

Distortion

Less than 3% at 10 radians at 1 kHz modulation rate. Typically <0.5% for deviations up to 1 radian at 1 kHz

Modulation source

Internal LF generator or external via front panel BNC.

AMPLITUDE MODULATION

Individual Outputs

For carrier frequencies <500 MHz useable to 1.5 GHz

Combined Output

Unspecified below 5 MHz useable to 1 MHz, otherwise as individual outputs.

Range

0 to 99.9%, resolution 0.1%

Accuracy(2)

±5% of set depth at 1 kHz, over temperature range 17°C to 27°C Temperature coefficient < 0.02%/°C

1 dB Bandwidth

DC to 30 kHz (DC coupled)

10 Hz to 30 kHz (AC coupled)

20 Hz to 30 kHz (AC coupled with ALC)

Distortion(2)

<1.5% at 1 kHz rate for modulation depths up to 30%

<2.5% at 1 kHz rate for modulation depths up to 80%

Modulation source

Internal LF generator or external, via front panel BNC

PM on AM

Typically 0.1 radians at 30% depth at 470 MHz

PULSE MODULATION

Frequency range

32 MHz to 2.51 GHz (2.05 GHz for 2026A), useable to 10 MHz

RF level range

Maximum guaranteed output is reduced by 5 dB when pulse modulation is selected

RF level accuracy

When pulse modulation is enabled, adds ±0.5 dB to the RF level accuracy specification

Control

Pulse input is on a front panel BNC with 10 kΩ nominal input impedance. A logic 0 (0 V to 1 V) turns the carrier off, a logic 1 (3.5 V to 5 V) turns the carrier on. Maximum input is ±15 V

On/off ratio

Better than 45 dB below 1.2 GHz, better than 40 dB above 1.2 GHz

Rise and fall times

Less than 10 µs, overshoot <1 dB

MODULATION OSCILLATOR

The internal modulation oscillator for each signal source is capable of generating one or two modulation tones simultaneously in one modulation channel.

Frequency range

0.01 Hz to 20 kHz with a resolution of 0.01 Hz, frequency accuracy as frequency standard

Distortion

Less than 0.1% THD at 1 kHz

Waveforms

Sine wave to 20 kHz and a triangular or square wave to 3 kHz

Square wave jitter

<6.4 µs on any edge

Audio Output

The modulation oscillator signal from each source is available on the front panel Modulation Input/Output BNC connector at a nominal level of 2 V RMS EMF from a 600 Ω source impedance.

EXTERNAL MODULATION

Input on the front panel Modulation Input/Output connector. The modulation is calibrated with 1.414 V peak (1 V RMS sine wave) applied. Input impedance is 100 kΩ nominal. Maximum safe input ±15 V.

MODULATION ALC

The external modulation input can be levelled by a peak levelling ALC system over the input voltage range of 0.75 V to 1.25 V RMS sine wave. High and low indicators in the display indicate when the input is outside levelling range.

SWEEP MODE

The carrier frequency of one source can be swept. To enable more than one source to be swept the coupling facility must be invoked.

The start/stop values of carrier frequency, frequency step size and time per step can be set.

Step time

50 ms to 10 s per step

Trigger

A trigger input is available on a rear panel BNC connector and can be used in single, continuous, start/stop or single step mode.

FREQUENCY STANDARD

FREQUENCY STANDARD (TCXO)

Frequency 10 MHz

Temperature Stability

Better than ±7 in 10^7 over the operating range of 0 to 55°C

Ageing rate

Less than ±1 in 10^6 per year

External input/output

Rear panel BNC connector accepts an external input of 1 MHz or 10 MHz at a level of 220 mV RMS to 1.8 V RMS into 1 kΩ. Rear panel BNC connector provides an output of 10 MHz at a nominal level of 2 V pk-pk into 50 Ω.

EXTERNAL RF INPUT

The following applies when an external input is connected at the rear panel.

Insertion loss	*15 dB ±1.5 dB*
Frequency range	*1 MHz to 3 GHz*
Return loss	*>20 dB to 2.51 GHz*
Max input power	*0.5 W*

GENERAL

GPIB INTERFACE

All signal source parameters except the supply switch are remotely programmable.

Designed in accordance with IEEE 488.2.

RS-232

All signal source parameters except the supply switch are remotely programmable.
Connector is 9 way D type, baud rate 300 to 9600 bits per second. Handshake hardware is DTR, RTS, CTS and DSR and software is XON and XOFF. Electrical interface is to EIA-232-D.

ELECTROMAGNETIC COMPATIBILITY

Conforms with the protection requirements of Council Directive 89/336/EEC. Complies with the limits specified in the following standards:

IEC/EN61326-1 : 1997, RF Emission Class B, Immunity Table 1, Performance Criteria B

SAFETY

Conforms with the requirements of EWEC Council Directive 73/23/EEC and Standard IEC/EN 61010-1 : 1993

RATED RANGE OF USE

(Over which full specification is met unless otherwise indicated.)

Temperature 0 to 55°C, Humidity up to 93% at 40°C
Altitude up to 3050 m (10,000 ft)

CONDITIONS OF STORAGE AND TRANSPORT

Temperature -40 to +71°C, Humidity up to 93% at 40°C
Altitude up to 4600 m (15,000 ft)

POWER REQUIREMENTS

AC Supply

90 to 132 V or 188 to 255 V, 47 Hz to 63 Hz, 250 VA maximum

CALIBRATION INTERVAL

2 years

DIMENSIONS AND WEIGHT

(over projections but excluding front panel handles)

Height	Width	Depth	Weight
177 mm	419 mm	488 mm	16 kg

OPTIONS

OPTION 001 - 3 SOURCE SIGNAL GENERATOR

Includes 3 signal sources

OPTION 003 - HIGH STABILITY FREQUENCY STANDARD

Replaces the internal TCXO with a high stability OCXO. Specification as standard instrument with the following exceptions:

Ageing rate

± 2.5 in 10^7 per year, $< \pm 5$ in 10^9 per day after two months continuous use

Stability

Better than ± 5 in 10^8 over the temperature range 0 to 50°C

Warm up time

Within 2 in 10^7 of final frequency 10 minutes after switch on at a temperature of 20°C

OPTION 004 - REAR PANEL INPUTS

RF output, modulation input and LF output connectors are transferred to the rear panel. The signal generator specification is not altered.

OPTION 116 - GSM MODULATION

Option 116 is available on 2026Q and 2026A/B signal generators.

Baseband source

Data rate

270.833333 kHz (13 MHz/48).

Data rate accuracy

As 10 MHz frequency standard.

Filter

Gaussian filter approximated by eight-pole RC network.

Number of outputs

3

Data pattern

(2^{15} -1) PRBS sequence.

The outputs are separated in time to ensure that they are not correlated.

ACCURACY

FM deviation

Typically better than 2% when used as described.

SPECTRAL CHARACTERISTIC

Wideband noise

For an output of +10 dBm on the individual output typically -75 dBc measured in a 100 kHz bandwidth relative to the modulated signal measured in a 30 kHz bandwidth at 6 MHz offset, in accordance with ETSI-defined measurement methods on wideband noise.

Option 117 Bluetooth and GSM Modulation

Option 117 is available on the 2026A/B Signal Generators and provides a facility for generating two independant Bluetooth modulated carriers and a simulated GSM carrier. The modulation data source for each channel can be independantly selected as either internal PRBS (Bluetooth PN 9, GSM Bluetooth PN 15) or external data. Refer to separate option 117 application note for further information.

Notes

(1) Does not apply to external RF input signals to combiner.

(2) For RF levels not exceeding +10 dBm (individual output) or -4 dBm (combined output).

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers

Versions

2026A	10 kHz to 2.05 GHz MultiSource Generator (2 internal sources)
2026B	10 kHz to 2.51 GHz MultiSource Generator (2 internal sources)

Options

Option 001	Add third internal source
Option 003	High stability frequency standard
Option 004	Rear panel outputs
Option 116	GSM PRBS modulation (not with Option 117)
Option 117	GSM and Bluetooth Modulation (not with Option 116)

Supplied with

	AC power supply lead
46882/466	Operating Manual

Optional Accessories

46880/100	Service manual
46884/293	Rack mounting kit, depths from 480 mm to 680 mm
46884/294	Rack mounting kit, depths from 680 mm to 840 mm
46884/931	Rack mounting kit containing front panel brackets only
46662/614	Soft carrying case
43129/189	1.5 m GPIB lead
46884/650	RS-232 Cable 9 way female to a 9 way female 1.5 m
46884/649	RS-232 Cable 9 way female to a 25 way female 1.5 m
54112/165	Hard carrying case

CHINA
Tel: [+86] (10) 6467 2823
Fax: [+86] (10) 6467 2821

EUROPE NORTH
Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601

EUROPE SOUTH
Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601

FRANCE
Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY
Tel: [+49] (8131) 29260
Fax: [+49] (8131) 2926130

HONG KONG
Tel: [+852] 2832 7988
Fax: [+852] 2834 5364

LATIN AMERICA
Tel: [+1] (972) 899 5150
Fax: [+1] (972) 899 5154

SCANDINAVIA
Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SPAIN
Tel: [+34] (91) 640 11 34
Fax: [+34] (91) 640 06 40

UNITED KINGDOM
Tel: [+44] (0) 1438 742200
Toll Free: [+44] (0800) 282 388 (UK only)
Fax: [+44] (0) 1438 727601

USA
Tel: [+1] (316) 522 4981
Toll Free: [+1] (800) 835 2352 (US only)
Fax: [+1] (316) 522 1360

email ***info@ifrsys.com***

web ***www.ifrsys.com***

Part No. 46891/119
Issue 7
08/2002