# Signal Sources

# 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.

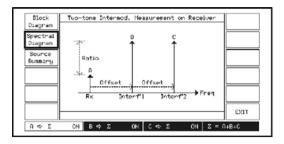
# Measurement Accuracy

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.

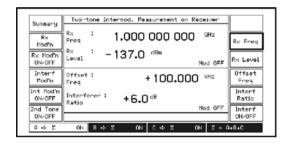
# **Application Modes**

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).

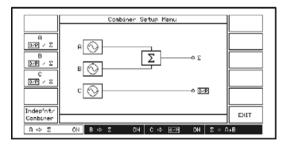


Application mode for intermodulation test on a receiver

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 3410 Digital RF Signal Generator, to enable different forms of carrier signals to be produced.



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.



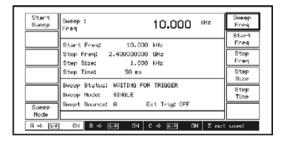
Setting up coupling

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 us.

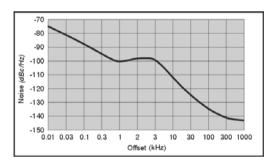
#### **FSK**

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.

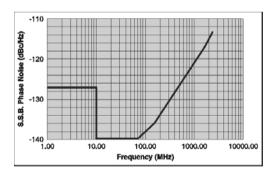
#### **GSM Modulation**

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 closein 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 modated 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 combined with the internal sources. 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  $\mu$ V, mV, EMF or PD; dB relative to 1  $\mu$ V, 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,  $\mu$ V). The output level can be normalized for 75 W 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	±1.0 dB from -127 to -100 dBm ±0.8 dB from -100 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  $\pm 3$  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 W type N connector to MIL-PRF-39102.

#### 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).

# Sub- and 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 \* 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 2 GHz\*

\*for frequencies above 1.2 GHz, up to 40°C max temperature

# Combined Output

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

# Range

0 to 99.9%, resolution 0.1%

# Accuracy<sup>20</sup>

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

#### 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<sup>20</sup>

<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  $\pm 0.5$  dB to the RF level accuracy specification

### **Control**

Pulse input is on a front panel BNC with 10 kW 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  $\pm 15$  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 W 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 kW nominal. Maximum safe input  $\pm 15$  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<sup>7</sup> over the operating range of 0 to 55°C

#### Ageing rate

Less than ±1 in 10° 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 kW. Rear panel BNC connector provides an output of 10 MHz at a nominal level of 2 V pk-pk into 50 W.

#### 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, RF Emission Class B, Immunity Table 1, Performance Criteria B

#### **SAFETY**

Conforms with the requirements of EEC Council Directive 73/72/EEC (as amended) and the product safety standard IEC/EN 61010-1 for class 1 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an installation category 2 supply.

#### RATED RANGE OF USE

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

Temperature 0 to 50°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

#### Voltage

100 - 240 V ~(Limit 90 - 264 V~)

#### Frequency

50 - 60 Hz (Limit 45 - 66 Hz)

#### **Power Consumption**

250 VA maximum

#### **CALIBRATION INTERVAL**

2 years

#### DIMENSIONS AND WEIGHT

(over projections but excluding front panel handles)

#### Height

177 mm

# Width

419 mm

# Depth

488 mm

# Weight

16 kg or 20 kg with option 001 fitted

#### **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

 $\pm 2.5$  in  $10^{\circ}$  per year,  $<\pm 5$  in  $10^{\circ}$  per day after two months continuous use

#### Stability

Better than ±5 in 10<sup>8</sup> 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  $20^{\circ}\text{C}$ 

# **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

(215 -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)

# **Optional Accessories**

46882/466 Operating Manual (paper format)

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

# Supplied with

AC power supply lead

Operating Manual on CD-ROM

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.