

Option 118 Fast Pulse Modulator

2026A MultiSource Generator

Option 118 Fast Pulse Modulator extends the application of 2026A 2 and 3 source signal generators to the testing of IFF radar and ECM receivers



- **Two or three high quality RF signal generators in a space efficient format**
- **Fast pulse capability, typically 15 ns rise and fall times**
- **Wide frequency coverage:**
10 kHz to 2.05 GHz (2026A)
- **+24 dBm RF output for effective component testing**
- **Support for an external signal generator**
- **User defined tracking between signal sources**
- **Adjustable carrier phase**
- **Built-in switched combiner network improves measurement uncertainty**

The 2026A with Option 118 retains all the functionality of standard 2026A/B family including application modes. For a full product description refer to the 2026A/B family datasheet

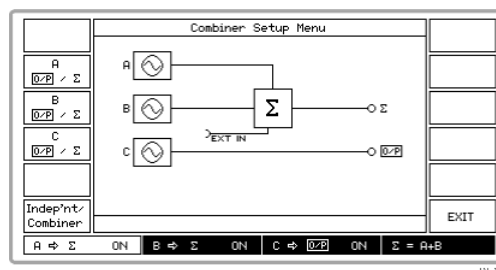
Measurement Accuracy

The use of a built in combiner, switches and cables eliminates many of the measurement uncertainties introduced by connecting together separate signal generators.

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.

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.



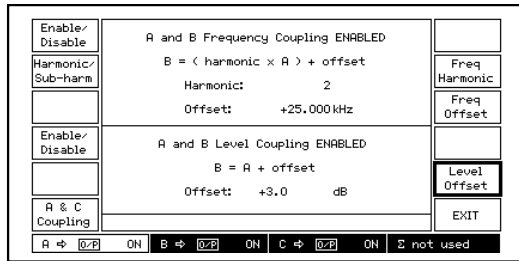
Setting up the source and combiner routing

Automatic Source Coupling

The 2026A with Option 118 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.



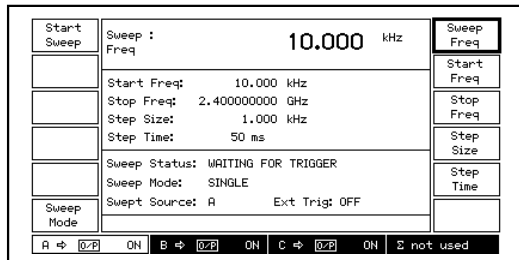
Setting up coupling

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 with Option 118 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 sweep menu

High RF Output

The high RF level of the individual outputs is ideal for testing components and ensures that the 2026A with Option 118 can generate high RF levels at the combiner output.

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.

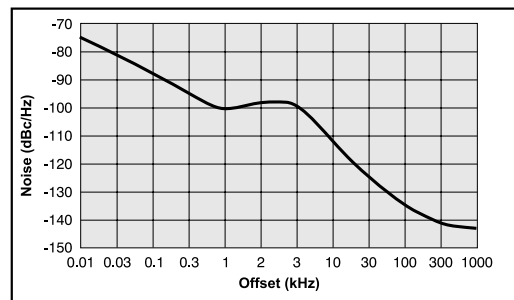
Pulse Modulation

With Option 118 Fast Pulse Modulator fitted the pulse modulation performance is greatly enhanced compared to the standard 2026A/B. This option configuration offers higher on/off ratios of typically >80 dB with faster rise and fall times of 20 ns, typically 15 ns.

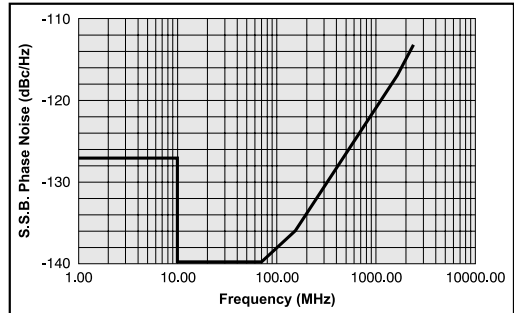
FSK

In addition to the analog FM facilities, the 2026A with Option 118 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.

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 with Option 118 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 with Option 118 can be upgraded with its covers fitted.

OPTIONS

Option 001 - Third Source

The 2026A as standard is supplied with two RF sources. A version with 3 sources is available as an option.

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 118 - Fast Pulse Modulator

This option when fitted replaces the standard 2026A pulse modulator with a high performance modulator with much enhanced carrier on/off ratio and improved pulse rise and fall times.

Specification

General Description

The 2026A MultiSource Generator with Option 118 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. 2026A Signal Generators cover the frequency range 10 kHz to 2.05 GHz. 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)

Accuracy

As frequency standard

RF Output

Output Range

Freq Range	Individual	Combiner
10 kHz - 1 MHz	-140 to +24 dBm	Uncalibrated
1 MHz - 1.2 GHz	-140 to +24 dBm	-140 to +10 dBm
1.2 GHz - 2.05 GHz	-140 to +18 dBm*	-140 to +4 dBm**

Maximum output is further reduced by 3 dB when Pulse modulation is selected and/or by up to 6 dB when AM is selected dependant upon AM depth.

* Uncalibrated above +18 dBm - settable to +24 dBm

** Uncalibrated above +4 dBm - settable to +10 dBm

Resolution

0.1 dB

RF Level Units

Units may be set to μ V, mV, EMF or PD; dB relative to 1 μ 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, μ V). 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 - 1 MHz	\pm 0.8 dB from -127 to +6 dBm \pm 1.0 dB from +6 to +24 dBm	Unspecified
1 MHz - 1.2 GHz	\pm 0.8 dB from -127 to +6 dBm \pm 1.0 dB from +6 to +24 dBm	\pm 1.0 dB from -127 to +4 dBm
1.2 GHz - 2.05 GHz	\pm 1.6 dB from -127 to +6 dBm \pm 2.0 dB from +6 to +18 dBm	\pm 2.0 dB from -127 to 0 dBm

Temperature Stability

Freq Range	Drift(dB/°C)
10 kHz - 1.2 GHz	< \pm 0.02
1.2 GHz - 2.05 GHz	< \pm 0.04

RF level tracking (over temp range +18 to +28°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 2.05 GHz
-18 dBm to +4 dBm	\pm 0.3 dB	\pm 0.6 dB
<-18 dBm	\pm 0.6 dB	\pm 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 2.05 GHz.

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 2.05 GHz.

RF Output connector

50 Ω type N connector to MIL 390123D

Output protection

Individual outputs

Protected from a source of reverse power up to 50 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 (+12 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. (-2 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

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 2.05 GHz	<-80 dBc
5 MHz to 10 MHz	<-75 dBc
Useable but unspecified down to 1 MHz	

* Third order intermodulation products for tone spacings ≥ 30 kHz

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 μ V 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 - 2050	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

$\pm 5\%$

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 than 5 μ s 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 $\pm 3.2 \mu\text{s}$

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

$\pm 5\%$ 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 2.05 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⁾

$\pm 5\%$ 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

With Option 118 fitted the pulse modulation performance of 2026A is as follows:

Frequency range

100 kHz to 2.05 GHz (useable to 10 kHz)

RF level accuracy

Additional ± 0.01 dB/°C temperature coefficient when pulse enabled

When pulse modulation is enabled, adds ± 0.25 dB to the RF level accuracy specification for carrier frequencies below 10 MHz.

On/Off ratio

>80 dB below 1.2 GHz

>70 dB up to 2.05 GHz (typically >80 dB)

Rise & fall times

≤ 20 ns typically 15 ns

Maximum repetition frequency

10 MHz

Control

50 Ω input impedance. A logic 0 (0 V to 0.8 V) turns the carrier off, a logic 1 (2.0 V to 5 V) turns the carrier on.
Maximum input is ± 10 V.

RF output range

Maximum output level is reduced by 3 dB when Pulse Modulation is selected.

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 k Ω 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 k Ω . 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 2.05 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/output and pulse input connectors are transferred to the rear panel. The signal generator specification is not altered.

OPTION 118 - FAST PULSE MODULATOR

See pulse modulation section.

Notes

- (1) Does not apply to external RF input signals to combiner.
 - (2) For RF levels not exceeding +15 dBm (individual output) or +1 dBm (combined output).
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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)

Options

Option 001 Add third internal source
Option 003 High stability frequency standard
Option 004 Rear panel outputs
Option 118 Fast Pulse Modulator

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

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