

2.4 GHz VXIbus Signal Generator

- ◆ **9 kHz to 2.4 GHz (1 Hz Resolution)**
- ◆ **-137 dBm to +25 dBm RF Output (0.1 dB resolution)**
- ◆ **Sweep Mode (Lin or Log), and Two Tone Generation**
- ◆ **Reverse Power Protection to 50 W**
- ◆ **Sine, Triangular and Square Wave Modulation Source**
- ◆ **Modulation-Amplitude, Frequency, Phase, Pulse, and 2 or 4 Level FSK**

Racal Instruments™ 3271 VXIbus signal generator packs high-performance signal synthesis and modulation capability into a C-size, dual-slot VXIbus instrument.

The 3271 signal generator, with its wide bandwidth and high level range capability, is ideal for many general-purpose RF laboratory or production test applications required by a wide range of modern digital and analog test systems. The 3271 also provides a compact alternative to GPIB instruments especially where large numbers of signal sources are required, such as in the testing of Frequency Division Multiplexing (FDM) links. Sophisticated features such as mixed mode modulation and swept carrier mode are available.

Operation

The message-based 3271 instrument can be programmed by its high level command language or controlled locally using its soft front panel supplied with the VXI plug & play drivers. Settings of frequency or complete instrument setup can be conveniently stored within the module's memory allowing fast and easy recall.

Features

Features which provide enhanced operation include non-volatile memories, extensive modulation capability, reverse power protection, internal two tone source, memory sequencing and VXIbus triggering for test sequencing.

Frequency Selection

Frequency resolution of 1 Hz across the complete frequency range of 9 kHz to 2.4 GHz ensures ample resolution to characterize narrow band communication systems and components.

RF Output

Output levels up to +19 dBm (+25 dBm below 1.2 GHz) can be set with a resolution of 0.1dB over the entire range. An attenuator hold function allows control of the RF output without introducing RF level dropouts from the step attenuator to facilitate testing of receiver squelch systems. Output level can be programmed as a voltage, as power into 50 Ω, or in units of dBm (decibels relative to 1mv).

50W Protection

A reverse polarity trip mechanism protects the generator output against reverse power of up to 50 W and from source VSWRs of up to 5:1. This feature prevents damage if an RF transmitter or DC power supply is accidentally applied to the output contributing to long service life and low cost of ownership.

Modulation

Comprehensive amplitude, frequency, phase and pulse modulation capabilities are provided for testing all types of receivers.

Modulation Oscillator

The 3271 internal modulation oscillator system provides the capability of generating one or two tones in the frequency range of 0.01 Hz to 20 kHz. As an alternative to a sine wave, a triangular or square wave signal can be provided. Two-tone modulation can be used to simulate marker beacon, position localizer and glide slope path signals needed to test and exercise aircraft avionics radio equipment.

Amplitude and Pulse Modulation

Amplitude modulation with a 1dB bandwidth of 30 kHz and modulation depths of up to 99.9% with a resolution of 0.1% accommodates testing AM systems and taking EMC immunity measurements. The pulse modulation mode has an on/off ratio of better than 45 dB up to 1.2 GHz and a rise time of less than 10µs enabling characterization of TDMA or TDD bursts in RF amplifiers and modules.

2 and 4 Level FSK

In addition to generating analog FM waveforms, the 3271 signal generator transforms external logic levels into 2 or 4 level frequency shift keying (FSK) waveforms. FSK mode is ideal for testing paging receivers and RF modems. Simple programmed commands set FM deviation level.



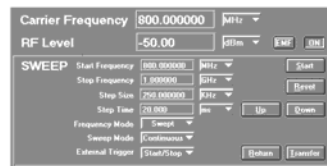
Complex Modulation Setup Screen from VXIplug&play Soft Front Panel

Complex Modulation

A front panel input enables an external source such as a Racial Instruments Model 3151/3152 Waveform Generator to be combined with the internal modulation to simplify the testing of complex receiver systems. Modulation modes may be combined simultaneously to simulate environmental degradation effects on RF signals.

Sweep Mode

The start and stop frequency, step size, time per step, and mode (linear or logarithmic) for sweep are programmed by the user. Sweep mode operates as a single sweep, continuous sweep or in a single-step mode. Sweep mode can be controlled by software or by using a trigger signal from the front panel or VXIbus backplane.



Sweep Mode Setup Screen from the 3271's VXIplug&play Drivers Soft Front Panel

Spectral Purity

Measurement of receiver selectivity and ultimate signal to noise ratio requires good spectral purity. The 3271's low residual FM of 4.5 Hz and typical side-band noise of 124 dBc/Hz (at an offset of 20 kHz) allows demanding measurements to be made at an affordable cost.

EMC

The frequency sweep feature simplifies the making of EMI measurements. A square wave modulation source allows the generation of square wave AM to simulate the effect of TDMA bursts from communication systems. The +25 dBm RF output power minimizes the need for external amplifiers when using small test cells or can drive an amplifier for testing large cell components.

Instrument Setup Memory

The 3271 signal generator provides extensive data storage for simplifying repetitive test scenarios. Up to 100 carrier frequency values and 100 complete instrument setups can be safely stored in non-volatile memory. An additional one hundred complete instrument setups can also be stored in volatile memory allowing access to setup information on-the-fly. This quick access mode produces fast ATE systems.

Sequencing

A software feature allows sequences of stored instrument settings to be defined. The trigger commands, front panel trigger or backplane trigger can then be used to cycle through the sequence of settings to give the highest throughput rates in automatic test systems.

Calibration Data

All alignment data, including the internal frequency standard adjustment, is digitally derived. Realignment can be accomplished with protected functions and does not require disassembly of the unit. An elapsed time feature allows the monitoring of the number of hours the product has been in use. The recommended calibration interval of two years keeps ownership costs low.

CARRIER FREQUENCY

Range

9 kHz to 2.4 GHz

Resolution

1 Hz

Accuracy

Equal to frequency standard used.

RF OUTPUT

Range (FM and PM)

≤1.2 GHz: -137 dBm to +25 dBm
(20 dBm in pulse mode)

>1.2 GHz: -137 dBm to +19 dBm
(14 dBm in pulse mode)

AM: Reduced with increasing modulation.

Resolution

0.1 dB

Level Accuracy

(> -127 dBm, 17° C to 27° C)

≤1.2 GHz: ± 1 dB (± 1.5 dB in pulse mode)

>1.2 GHz: ± 2 dB (± 2.5 dB in pulse mode)

Temperature Stability (0 to 55° C)

≤1.2 GHz: ± 0.02 dB/°C

>1.2 GHz: ± 0.04 dB/°C

VSWR (< -5 dBm output level)

≤1.2 GHz: < 1.3:1

>1.2 GHz: < 1.5:1

Output Impedance

50 Ω (Female SMA),

75 Ω via external converter

Reverse Power Protection (into 50 W)

50 W (LED indicated)

Attenuator Hold (step attenuator inhibit)

Allows a 28 dB range (except at min/max levels)

SPECTRAL PURITY

Harmonics (7 dBm output level)

<-30 dBc, typical

Non-harmonics (offsets > 3 kHz)

≤1 GHz: <70 dBc

±2 GHz: <64 dBc

≥2 GHz: <60 dBc

Residual FM (FM off, RMS)

$f_c = 1$ GHz (300 Hz to 3.4 kHz BW) <4.5 Hz

$f_c < 249$ MHz: <1 Hz (typical)

$f_c < 501$ MHz: <2 Hz (typical)

$f_c < 1001$ MHz: <3 Hz (typical)

SSB Phase Noise (at 20 kHz offset)

$f_c = 470$ MHz: <-124 dBc/Hz

$f_c = 1$ GHz: -121 dBc/Hz (typical)

FREQUENCY MODULATION

Deviation

0 to 100 kHz

Accuracy (at 1 kHz)

±5%

1dB Bandwidth

DC to 100 kHz (DC coupled)

10 Hz to 100 kHz (AC coupled)

20 Hz to 10 kHz (AC coupled with ALC)

Carrier Frequency Offset

(DC coupled)

<1% of set frequency deviation

Distortion (1 kHz rate)

Frequency deviations 10 kHz: <0.5%, typical

Frequency deviations 100 kHz: <3%

Group Delay (<100 kHz)

<5 ms

PHASE MODULATION

Deviation

0 to 10 radians

Accuracy

(at 1 kHz, excluding residual PM)

±5%

3dB Bandwidth

100 Hz to 10 kHz

Distortion (at 1 kHz rate)

phase deviations ≤1radian: <0.5% (typical)

phase deviations ≤10 radians: <1%

Resolution

3 digits or 0.01 radians

AMPLITUDE MODULATION

($f_c < 500$ MHz, usable to 2 GHz)

Range

0 to 99%

Resolution

0.1%

Accuracy (at 1 kHz rate, 17° C to 27° C)

±5% of set depth

Temperature Stability

<0.02% / 0° C

1dB Bandwidth

DC to 30 kHz (DC coupled)

10 Hz to 30 kHz (AC coupled)

20 Hz to 30 kHz (AC coupled with ALC)

Distortion (at 1kHz rate)

<2.5% @ depths <80%

<1.5% @ depths <30%

PM on AM

0.1 radians (typical)

PULSE MODULATION

(May be combined with all other modulation modes.)

Frequency Range

32 MHz - $f_c \pm 2.4$ GHz, usable down to 10 MHz

Modulation Input

(TTL/CMOS, $R_{in} = 10$ kW)

Logic '0' (carrier off): 0 to 1 Volt

Logic '1' (carrier on): 3.5 to 5 Volts

Max/Min: ±15 Volts

On/Off Ratio

RF level reduced by 5 dBm and accuracy by ±0.5 dB

EXTERNAL MODULATION

(front panel BNC input)

Input Level

1 Volt RMS (1.414 Volts pk-pk)

Input Impedance

100 kΩ nominal

Modulation ALC (applied modulation level shift)

0.75 to 1.25 Volts RMS

INTERNAL MODULATION

OSCILLATOR

(single channel, 1 tone or sum of 2 independent tones)

Frequency Range

0.01 Hz to 20 kHz

Resolution

<100 Hz: 0.01 Hz

<1 kHz: 0.1 Hz

<20 kHz: 1 Hz

Distortion

<0.1% at 1 kHz

Sine Wave Frequency Response

<20 kHz: 1 dB (typical)

Waveforms

Sine: <20 kHz

Triangle: <3 kHz

Square: <3 kHz

(< 6.4 μs jitter on any edge)

Output (front panel BNC)

2 Volts RMS, 600 Ω output impedance

FSK

Modes

2 level and 4 level

Data Stream Source (logic level)

2 level: Trigger input connector

4 level: Trigger and Pulse input connectors



3271 PRODUCT SPECIFICATIONS

Frequency Shift Range

-100 kHz to +100 kHz

Accuracy (at 1 kHz)

±5%

Timing Jitter

±3.2 μs

Filter

8th order Bessel (-3 dB at 20 kHz)

SWEEP MODE

Modes

Linear or Logarithmic

Step Size (min)

Log Sweep: 0.01% to 50%

Linear Sweep: 1 Hz

Control Parameters

Start Frequency, Step Size, Sweep Type,

Stop Frequency, Step Time

Control Modes

Single Step, Continuous Sweep, Single

Sweep

Trigger Modes

VXIbus Backplane (0-7)

External

Software

Time Step Increments

50 ms to 10 s

INTERNAL FREQUENCY

STANDARD

Frequency Source

10 MHz TCXO

Aging Rate

±1 ppm/year

Temperature Stability (0° C to 55° C)

±0.5 ppm

EXTERNAL FREQUENCY

STANDARD

Input Frequency

1 MHz or 10 MHz

Input Level

220 mV to 1.8 Volts RMS

Input Impedance

1 kΩ

CALIBRATION

Interval

2 years

Realignment

Remote

Mechanical Adjustments

None

FRONT PANEL I/O

Inputs

Frequency Standard: BNC, 1 kΩ, 220

mW to 1.8 Vrms, 1 MHz or 10 MHz

Inputs

External Modulation: BNC, 100 KW

Trigger/FSK: BNC, TTL/CMOS Pulse:

BNC, TTL/CMOS

Outputs

RF: SMA (female), 50Ω, 50 W Reserve

Power Protection

LF: BNC, 600 W, 2 Vrms

Internal Frequency Standard: BNC, 50

W, 10 MHz

VXIbus INTERFACE DATA

(Message based, VXIbus specifications.

1.3/1.4 compliant)

Protocol

Word serial, IEEE-488.2

VXI plug&play Compliant Drivers

WIN Framework (includes

LabWindows/CVI driver and soft front

panel)

Status Lights

Red: System Failure

Red: Reverse Power Protection Tripped

Green: Power OK

Cooling (10° C rise)

Airflow: 2.4 l/s

Backpressure: 1 mm H₂O

Peak Current & Power Consumption

	+24	+12	+5	-12
I _{Pm} (A)	1.2	1.0	2.0	0.6
I _{Dm} (A)	0.1	0.1	1.3	0.1

Total Power: 60 Watts

MTBF (per MIL-HDBK-217F)

23,008 hours

ENVIRONMENTAL DATA

Temperature Range

Operating: 0° to 55° C

Storage: -40° C to +70° C

Relative Humidity (at 40° C)

Operating: 93%

Storage: 95%

Altitude

Operating: 10,000 ft (3050 m)

Storage: 15,000 ft (4600 m)

RFI Compatibility

<1 GHz: VXIbus Spec. Rev. 1.3/1.4

EMC (Council Directive 89/336/EEC)

EN55011 Class B EN50082-1 CISPR

11IEC 801-2,3,4

Safety (Low Voltage Directive 73/23/EEC)

EN61010-1/IEC1010-1 Class III portable

equipment, UL3111-1, CSA 222#1010

Weight

8.8 lbs (< 4 kg)

Dimensions

C-size, double-wide VXIbus module

CE The CE Mark indicates that the product has completed and passed rigorous testing in the area of RF Emissions, Immunity to Electromagnetic Disturbances and complies with European electrical safety standards.

ORDERING INFORMATION

MODEL/DESCRIPTION

Racal Instruments 3271, 9kHz to 2.4GHz VXIbus Signal Generator

PART NUMBER

R-3271

The EADS North America Defense Test and Services policy is one of continuous development, consequently the equipment may vary in detail from the description and specification in this publication.



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