The Racal 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 VXIplug&play drivers.

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.

Settings of frequency or complete instrument setup can be conveniently stored within the module’s memory allowing fast and easy recall.
Frequency Selection
Frequency resolution of 1Hz across the complete frequency range of 9kHz to 2.4GHz ensures ample resolution to characterize narrow band communication systems and components.

RF Output
Output levels up to +19dBm (+25dBm below 1.2GHz) 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 into50Ω, 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 50W 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 0.01Hz to 20kHz. 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 localize and glide slope path signals needed to test and exercise aircraft avionics radio equipment.

Frequency and Phase Modulation
With a 1dB FM bandwidth of 100kHz and a deviation range of 0 to 100kHz, the 3271 signal generator offers wide frequency modulation capability. AC or DC coupled FM can be selected with low carrier frequency error and drift in the DC coupled mode. The DC coupled mode accurately tests tone and message paging type equipment. Phase modulation is ideal for testing narrow band analog radios with a deviation range of 0 to 10 radians and a 3dB bandwidth of up to 9kHz.

By combining the 3271’s phase modulation feature with a Racal Model 3151 or 3152 Waveform Generator, direction finding signals can be produced which can simplify calibration of shipboard navigational equipment.

Amplitude and Pulse Modulation
Amplitude modulation with a 1dB bandwidth of 30kHz 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 45dB up to 1.2GHz 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.

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 +25dBm 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.

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.

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.
3271 Specifications

CARRIER FREQUENCY
Range
9kHz to 2.4GHz
Resolution
1Hz
Accuracy
Equal to frequency standard used.

RF OUTPUT
Range (FM and PM)
≤1.2GHz: -137dBm to +25dBm
(20dBm in pulse mode)
>1.2GHz: -137dBm to +19dBm
(14dBm in pulse mode)
AM: Reduced with increasing modulation.
Resolution
0.1dB
Level Accuracy
≤1.2GHz: ±1dB
(±1.5dB in pulse mode)
>1.2GHz: ±2dB
(±2.5dB in pulse mode)

Temperature Stability
0 to 55°C
≤1.2GHz: ±0.02dB/°C
>1.2GHz: ±0.04dB/°C

VSWR
< -5dBm output level
≤1.2GHz: <1.3:1
>1.2GHz: <1.5:1

Output Impedance
50Ω (Female SMA),
75Ω via external converter

Reverse Power Protection
50 Watts (LED indicated)

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

SPECTRAL PURITY
Harmonics
<30dBc, typical
Non-harmonics
≤1GHz: <70dBc
<2GHz: <64dBc
≥2GHz: <60dBc

Residual FM
≤1GHz: <4.5Hz
≥2GHz: <124dBc/Hz

SSB Phase Noise
≤1GHz: <470MHz: <1.9dBc/Hz
≤1kHz: <1.9dBc/Hz

FREQUENCY MODULATION
Deviation
0 to 100kHz
Accuracy (at 1kHz)
±5%

1dB Bandwidth
DC to 100kHz (DC coupled)
10 Hz to 100kHz (AC coupled)
20 Hz to 100kHz (AC coupled with ALC)

Carrier Frequency Offset
<1% of set frequency deviation
Distortion (at 1kHz rate)
Frequency deviations: 10kHz: <0.5%, typical
Frequency deviations: 100kHz: <3%

Group Delay
<5μs

PHASE MODULATION
Deviation
0 to 10 radians
Accuracy (at 1kHz, excluding residual PM)
±5%

3dB Bandwidth
100Hz to 10kHz

Distortion (at 1kHz rate)
Frequency deviations: 1radial: <0.5%, typical
Frequency deviations: 10 radians: <1%

Resolution
3 digits or 0.01 radians

AMPLITUDE MODULATION
(f, < 500MHz, usable to 2GHz)
Range
0 to 99%
Resolution
0.1%
Accuracy (at 1kHz rate, 17°C to 27°C)
±5% of set depth
Temperature Stability
<0.02%/°C

1dB Bandwidth
DC to 30kHz (DC coupled)
10Hz to 30kHz (AC coupled)
20Hz to 30kHz (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
32MHz sf –<2.4GHz, usable down to 10MHz

Modulation Input
(TTL/CMOS, R_i = 10 kΩ)
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 5dBm and accuracy by ±0.5dB

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
(f, single channel, 1 tone or sum of 2 independent tones)
Frequency Range
0.01Hz to 20kHz
Resolution
<100Hz: 0.01Hz
<1kHz: 0.1Hz
<20kHz: 1Hz
Distortion
<0.1% at 1kHz
Sine Wave Frequency Response
<20kHz: 1dB (typical)
Waveforms
Sine: <20kHz
Triangle: <3kHz
Square: <3kHz
<6.4µs jitter on any edge

Output
2 Volts RMS, 600Ω 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
Frequency Shift Range
-100kHz to +100kHz
Accuracy (at 1kHz)
±5%
Timing Jitter
±3.2µs

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

SWEEP MODE
Modes
Linear or Logarithmic
Step Size
Log Sweep: 0.01% to 50%
Linear Sweep: 1Hz
Control Parameters
Start Frequency, Step Size, Sweep
Type, Stop Frequency, Step Time
Control Modes
Single Step, Continuous Sweep,
Single Sweep
3271 Specifications Continued

Trigger Modes
VXIbus Backplane (0-7)
External
Software
Time Step Increments
50ms to 10s

INTERNAL FREQUENCY
STANDARD
Frequency Source
10MHz TCXO
Aging Rate
±1 ppm/year
Temperature Stability (0°C to 55°C)
±0.5 ppm

EXTERNAL FREQUENCY
STANDARD
Input Frequency
1MHz or 10MHz
Input Level
220 mV to 1.8 Volts RMS
Input Impedance
1kΩ

CALIBRATION
Interval
2 years
Realignment
Remote
Mechanical Adjustments
None

FRONT PANEL I/O
Inputs
Frequency Standard: BNC, 1KΩ, 220mV to 1.8Vrms, 1MHz or 10MHz
External Modulation: BNC, 100KW
Trigger/FSK: BNC, TTL/CMOS
Pulse: BNC, TTL/CMOS

Outputs
RF: SMA (female), 50Ω, 50W
Reserve Power Protection
LF: BNC, 600Ω, 2Vrms
Internal Frequency Standard: BNC, 50W, 10MHz

VXIbus INTERFACE DATA
(Message based, VXIbus specifications. 1.3/1.4 compliant)
Protocol
Word serial, IEEE-488.2
VXIplug&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: 2.4l/s
Backpressure: 1mm H₂O
Peak Current & Power Consumption
I_{+24} (A) 1.2
I_{+12} (A) 1.0
I_{+5} (A) 2.0
I_{-12} (A) 0.6
Total Power: 60 Watts
MTBF (per MIL-HDBK-217F)
23,006 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
<1GHz: VXIbus Spec. Rev. 1.3/1.4
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
8.8lbs (< 4 kg)
Dimensions
C-size, double-wide VXIbus module

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

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<th>Model</th>
<th>Description</th>
<th>Part Number</th>
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<td>3271</td>
<td>9kHz to 2.4GHz VXIbus Signal Generator</td>
<td>R-3271</td>
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