PXI Modules

3020 PXI Digital RF Signal Generator

Fully featured PXI Digital RF Signal Generator module for complex digital IQ waveform applications in communications system test

- Frequency range 250 MHz to 2.5 GHz

- Output level range -120 to +5 dBm

- Level accuracy ±0.5 dB typical cw

- 12 MHz IQ bandwidth

- Real time LDVS digital IQ input

- 32 MSample dual-channel AWG

- Compatible with IQCreator waveform creation software

- LO input for use with 3010/3011 PXI RF Synthesizer

Introduction

The 3020 together with the 3010 or 3011 PXI RF synthesizer modules form a compact precision digital RF signal generator occupying a total of 3 slots in a 3U PXI chassis. The versatile 2 slot wide 3020 module produces IQ modulated or CW signals between 250 MHz and 2.5 GHz with an IQ bandwidth of up to 12 MHz while the single slot 3010 / 3011 module (supplied separately), provides a low noise frequency agile local oscillator input. The performance of the 3020 makes it ideal for generating the complex modulated signals for digital radio communications test applications.

The module can be optioned to function with IQCreator, a software application for waveform design for common radio systems such as GSM, EDGE, UMTS, IS136, IS95, cdma2000 and WLAN as well as custom waveforms for FSK, PSK and QAM modulation types.

Advantages of PXI

The 3020 digital RF signal generator offers significant economies compared to general purpose rack and stack instruments while maintaining high performance and broad functionality. The PXI format offers the opportunity to build integrated test systems using other modules from Aeroflex and from the growing range of products from other suppliers. The features of the PXI bus, such as triggering and fast communications, offer tight integration and fast test speeds.

Applications

The 3020 forms an essential component within any development or manufacturing PXI based RF test system. Whether the application is for measurement or system emulation, the 3020 delivers the functionality and performance required. The 3020 is designed around the needs of today's advanced digital communications standards as used in cellular communications i.e GSM, EDGE, UMTS, cdma2000 as well as applications in satellite and terrestrial TV broadcasting, military communications and WLAN. Used in conjunction with other Aeroflex PXI RF modules, complete RF test systems can be designed. The 3020 digital RF generator is complementary to the 3030 RF digitizer which provides wideband A to D conversion of RF input signals in the range 330 MHz to 3 GHz.

Performance Highlights

Wide Frequency Coverage: The 3020 provides continuous frequency coverage from 250 MHz to 2.5 GHz. This makes the 3020 ideal for multi-purpose applications in radio communications especially important when testing multi-mode cellular terminals.

Low Noise and Frequency Agile: The phase noise and frequency switching characteristics are fundamentally defined by the separate 3010 / 3011 RF synthesizer module.   Phase noise is typically

–115 dBc/Hz at 20 kHz offset with a noise floor at 10 MHz offset of –135 dBc/Hz and frequency settling can be achieved in typically under 200 μs. This makes the 3020 ideal for high productivity RFIC testing or as a stimulus to frequency hopping radios.

Accurate RF Level: The output level is variable in 0.01 dB increments over the range of +5 dBm to -120 dBm with an outstanding accuracy of typically ±0.5 dB. Additionally modulated RF bursts can be generated to simulate TDMA signal characteristics as used in a variety of cellular and other wireless applications.

IQ Vector Modulation: High quality vector modulation is provided with an IQ bandwidth of 12 MHz sufficient for all common radio communications applications. Modulator carrier leakage and sideband suppression are maintained of typically –50 dBc with 10 kHz modulation tone. Modulation linearity for UMTS W-CDMA signals is better than 55 dB making the 3020 ideally suited for testing mobile amplifiers. The IQ waveform source can be either from the internal Arbitrary Waveform Generator (AWG) or via an external LVDS interface.

Arbitrary Waveform Generator: The AWG has the capacity to store 32 MSamples, each sample word consisting of 14 bit I, 14 bit Q, and 4 bit marker data. The AWG memory can be used to store either a single long waveform or any number of smaller waveforms up to the limit of the sample memory. Transfer of waveforms between the controller and the AWG is made fast by virtue of the wide bandwidth of the PXI backplane.

Triggering and Synchronization

The 3020 supports a variety of triggering facilities. Trigger inputs can be routed either directly through the LVDS front panel input or across the PXI backplane. Trigger inputs can be used to generate power bursts, e.g. to simulate TDMA signal characteristics as used in GSM/EDGE. Triggers (markers) can also be programmed into waveform files. When the waveform file is played, the marker is used to generate trigger outputs to control other instruments such as a signal analyzer or a test fixture.

Software

The 3020 is supplied with a VXI PNP driver and soft front panel.

IQCreator, Windows™ 9x, 2000, XP application:

IQCreator enables the design of a wide range of user defined or system specific complex digital modulation waveform files for use with the 3020 AWG. Generic capabilities include FSK, MSK, PSK and QAM modulation types with user defined symbol rates and a choice of filter characteristics. Data sources can be PRBS, fixed pattern or user defined. In addition, the user can enter deliberate IQ errors. Also included are standard waveforms and design templates for 2G, 2.5G and 3G TDMA and CDMA digital cellular standards together with WLAN and cordless telephone standards. IQCreator also supports the development of multi-tone, multi-carrier and multi-standard waveforms. IQCreator provides graphical illustration of waveform spectrum and CCDF characteristics. Loading waveforms created using IQCreator into the 3020 requires the enable IQCreator option in 3020. Without the enable IQCreator option, IQCreator can be used to convert customer files, e.g. from MATLAB or Mathcad into the correct format for use in 3020.

Customer Support.

Users can elect to purchase PXI modules with optional warranty extensions.

Enhanced Standard Warranty provides the benefit of guaranteed product repair times in the event of failure during the standard 12 month warranty period.

Standard Extended Warranty provides either 36 months or 60 months warranty period plus the benefits of guaranteed product repair times in the event of failure.

Standard Extended Warranty can also be provided inclusive of scheduled calibration.

On request Aeroflex can provide customized Premium Warranty support designed around your specific needs.

SPECIFICATION

All specifications are defined with 3020 used in conjunction with 3010/11.

RF OUTPUT

Frequency Range

250 MHz to 2.5 GHz

Resolution

1 Hz

Frequency Accuracy

As per 3010 / 3011 RF synthesizer LO input

Frequency Settling Time

As per 3010 / 3011 RF synthesizer

RF Leakage

<5 μV PD at the carrier frequency into a two turn 25 mm loop, 25 mm or more from the front panel

Output Power Range

-120 to +5 dBm for CW signals

Resolution

± 0.01 dB

Accuracy

0.75 dB, typically ± 0.5 dB for C.W. signals below –3 dBm 18 °C to 28 °C Temperature coefficient 0.01 dB/°C

Level Repeatability

± 0.1 dB

Output Impedance

50 Ω

Output VSWR

1: 1.3 for ouput levels below –3 dBm

Reverse Power Handling

Not to exceed +20 dBm

SPECTRAL PURITY *(used with 3010 / 3011 in normal mode)*

SSB Phase Noise

-115 dBc/Hz at 20 kHz offset typically

Noise Floor

Typically <-135 dBc/Hz noise floor at 10 MHz offset

Spurious

Typically better than −60 dBc from >10 kHz offset. Typically better than −70 dBc for C.W signals

Harmonics and Sub-Harmonics (0 dBm output)

Better than −30 dBc, typically better than −55 dBc

MODULATION

Baseband I and Q Bandwidth

12 MHz (-3 dB)

Residual Carrier Leak[1]

Typically -50 dBc

IQ Image Supression[1]

Tyically -50 dBc for a 10 kHz modulation tone

Linearity

>55 dB ACPR on WCDMA signals

IMD Distortion (2 tone with spacing >25 kHz at -6 dBm per tone)

Better than -50 dBc relative to each tone

Error Vector Magnitude

<2% EVM on WCDMA signals, <0.5% EVM on GSM EDGE signals

ARBITRARY WAVEFORM GENERATOR

Memory

32 Msamples I Q * 14 bit + 4 markers

AWG File Source Data

IQCreator (requires option 100)

ASC11, 16/32 bit integer, 32 bit floating point*

*using IQCreator waveform packager to generate compatible .AIQ file

Sample rates

14.323 kHz to 33 MHz, 44 MHz to 66 MHz

REAL TIME IQ INTERFACE

Input Level

LVDS

Input Data

14 bit IQ data

Sampling rate

14.323 kHz to 33 MHz, 44 MHz to 66 MHz

GENERAL

Standard Warranty

12 months

Calibration Interval

Recommended 2 year

Power Consumption (Typical)

+3.3 V 1.2 A
+5 V   0.9 A
+12 V   100 mA
-12 V   100 mA

Electromagnetic Compatibility

EN 61326-1:1997, Emissions Class A, Immunity Table 1 – Performance Critieria B

Safety

EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use-Part 1, General requirements

Driver Software

VXIpnp compliant software driver

FREQUENCY REFERENCE

Source

External SMA External PCI

Frequency

10 MHz ± 100 Hz

Level

- 10 dBm to +10 dBm sine / TTL

INTERFACES

RF output, (SMA)
Local oscillator input 1.5 GHz to 3 GHz, nominally 0 dBm (SMA) 50 Ω
10 MHz reference input for sampling clock (SMA)
10 MHz reference link through (SMA)
Real Time IQ interface (SCSI-3)
Ext. Trigger In, LVDS or PXI
Trigger Out, LVDS or PXI
PCI bus interface including PXI triggering functions

DIMENSIONS AND WEIGHT

Dimensions

Double width 3U PXI module

Weight

650 g

RATED RANGE OF USE

Operating Temperature

0 to 50°C. Meets IEC-60068-2-1 and 60068-2-2

Operating Humidity

10 to 90% non-condensing, meets IEC-60068-2-56

CONDITIONS OF STORAGE AND TRANSPORT

Storage Temperature

-20 to +70°C, meets IEC-60068-2-1 and 60068-2-2

Storage Humidity

5 to 93% non-condensing, meets IEC-60068-2-56

Shock

30 G peak, half sine, 9 ms pulse. Tested in accordance with IEC-60068-2-27

Random vibration 5 Hz to 500 Hz, 0.31 g rms operating, 2.46 g rms non-operating. Tested in accordance with IEC-60068-2-64

VERSIONS, OPTIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers — Versions

3020	PXI RF signal generator

Note: For use in conjunction with 3010 or 3011, supplied separately

Supplied with

CD ROM containing VXI PNP driver, soft front panel and user documentation

SMA link cable

SMA connector saver

Service Options

W3000/101	Enhanced Standard Warranty
W3020/103	Standard Extended Warranty 36 months
W3020/103C	Standard Extended Warranty 60 months
W3020/105	Standard Extended Warranty 36 months with scheduled calibration
W3020/105C	Standard Extended Warranty 60 months with scheduled calibration

Optional Accessories

43138/421	SMA link cable
46885/224	SMA connector saver
82531	NI PXI-1042 8 slot PXI Chassis (see note 2)
82530	NI PXI-1006 18 slot PXI Chassis with rack mount (see note 2)
82534	NI PXI-8186 2.2 GHz Pentium 4 Embedded controller with Windows XP (see note 2)
82535	NI PXI-PCI8330 MXI 3 kit

Waveform Creation Application Software

Option 100	Enable IQCreator *
Option 101	Enable IQCreator 2G CDMA [3]
Option 102	Enable IQCreator 2G & 3G CDMA [3]

When purchased as an upgrade, then order as:

RTROPT100/3020	Enable IQCreator
RTROPT101/3020	Enable IQCreator 2G CDMA
RTROPT102/3020	Enable IQCreator 2G + 3G CDMA

* Supplied with CD ROM containing IQCreator Windows application

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Notes

(1) After warm-up and self calibration valid for temp range 5°C

(2) For a configured solution, add the line item 'PXI ASSY' to your order. Configuration includes system assembly and where appropriate, driver installation.

(3) Requires option 100

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A passion for performance.

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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.