PXI Modules

3025 Digital RF Signal Generator

- Frequency range 86 MHz to 6 GHz
- Level range -120 to +5 dBm maximum
- Level accuracy ±0.3 dB typical cw
- Analog, digital and vector modulation
- 28 MHz RF modulation bandwidth
- List mode for fast switching
- Dual-channel deep memory AWG (32 Msample)
- IQCreator waveform creation software
- AWG waveform sequencer
- Data interface for digital IQ streaming
- Low phase noise typically -115 dBc/Hz at 20 kHz offset
- Versatile triggering
- Optional analog I & Q inputs and I & Q outputs
- Used with 3010/3011 PXI RF synthesizer module

The versatile 2 slot wide 3025 RF signal generator covers the entire frequency range from 86 MHz to 6 GHz with an RF output level ranging from -120 dBm to +5 dBm (maximum). Comprehensive modulation capability is provided including internal analog AM/FM, digital and IQ vector modulation modes. Digital modulation with an I and Q bandwidth of up to 14 MHz is supported either with a built in dual-channel AWG supplied as standard or via an external digital IQ data interface. Optional vector modulation analog I and Q inputs increase the IQ bandwidth to over 25 MHz. The dual-channel AWG can be used either as an internal modulation source or a baseband source. Baseband outputs are optional, they can be configured to provide differential I and Q outputs simultaneously with a CW RF output signal. The single slot wide 3010/3011 RF synthesizer module provides the low phase noise, frequency agile local oscillator input to the 3025.

Complex modulation waveforms can be designed using IQCreator. This software application provides design templates for all common digital radio systems including GSM, EDGE, UMTS, IS136, IS95, cdma2000, and IEEE 802.11a, b and g WLAN as well as custom waveform templates for FSK, PSK and QAM modulation types. IQCreator also provides tools to package waveforms into a format compatible with the AWG. This enables waveforms designed using other design tools such as MatLab or MathCad to be loaded.

Creating high quality complex RF test signals has never been more flexible or cost effective.

The combination of PXI modules 3025 and 3010 form a compact 3U high precision RF signal generator with integrated dual-channel arbitrary waveform generator (AWG) occupying just 3 slots. Together their functionality and performance are ideally matched to the needs of RF test systems for manufacturing or design verification.
Advantages of 3025 and PXI

The 3025 digital RF signal generator offers significant economies compared to other general purpose rack and stack instruments while maintaining high performance and broad functionality. In part this is achieved by exploiting the benefits of the PXI specification, an industry standard open architecture for modular instrumentation. Using PXI enables faster measurement speed, smaller size and greater flexibility for integration and future system evolution.

Applications

The 3025 is an essential component within any automated development or manufacturing RF test system designed around the needs of advanced digital communications standards as used in WLAN, WMAN and cellular communications as well as applications in satellite and terrestrial TV broadcasting and military communications. Whether the application is for measurement or system emulation, the 3025 delivers the functionality and performance required. When used in conjunction with other Aeroflex PXI RF modules, complete RF test systems can be designed. The 3025 digital RF signal generator is complementary to the 3035 RF digitizer which provides wideband high dynamic range A to D conversion of RF input signals up to 6 GHz.

Performance Highlights

Wide Frequency Range: The 3025 covers all licensed and unlicensed operating bands for WLAN, WMAN, mobile phones and more with its continuous frequency range from 86 MHz to 6 GHz with 1 Hz resolution below 3 GHz and 2 Hz above 3 GHz.

Low Noise and Frequency Agile: The 3025 module is designed to be used with either a PXI 3010 or 3011 RF synthesizer module. This provides a low noise agile local oscillator signal from which the 3025 phase noise is defined. Phase noise at 20 kHz offset from carrier is typically –116 dBc/Hz at 2 GHz and –108 dBc/Hz at 5 GHz while the noise floor at 2 GHz is typically –135 dBc/Hz from 10 MHz offset. Frequency settling can be achieved in typically 250 µs (3010 opt 01 fitted). This makes the 3025 ideal for high productivity RFIC testing or as a stimulus to frequency hopping radios.

Accurate RF Level: The output level is variable in fine 0.01 dB increments from –120 dBm to a maximum level of +5 dBm up to 3 GHz and 0 dBm above 3 GHz. An all digital levelling control loop ensures that even with modulated signals the output signal is maintained at an accurate level. Levelling control is combined with an electronic high speed RF attenuator making the 3025 very reliable for volume manufacturing. High dynamic range modulated RF bursts can be generated to simulate TDMA signal characteristics as used in a variety of cellular and other wireless applications.

Stability: Frequency and power settings remain stable across both time and temperature variation ensuring consistent measurement results time and time again. Using the 3011’s internal OCXO 10 MHz reference, frequency stability is typically 0.01 ppm across 0 to 50 degrees C.

IQ Digital Modulation: High quality digital modulation is provided with I and Q bandwidths of 14 MHz. IQ calibration ensures that modulator carrier leakage and sideband suppression are typically –50 dBc. Modulation linearity for UMTS W-CDMA (downlink test model 1) is better than 55 dB making the 3025 ideally suited for testing mobile amplifiers. The source of modulation can be either from the internal dual-channel Arbitrary Waveform Generator (AWG), or from external digital IQ data. The VHDCI data interface can be used to input 14 bit digital IQ data and associated control and timing signals.

Optional Analog I & Q Outputs and Analog I & Q Inputs: With this option fitted, the 3025 can provide outputs at base band simultaneously with a CW output at RF making it ideal for testing RFIC modulators. Analog I & Q outputs from the dual-channel AWG can be used as singled ended or differential. Differential output level can be set in the range 100 mV to 4 V pk with or without additional DC biasing control to +/-3V and differential offset voltage control to +/- 600 mV with a limit of 6 V total EMF.

IQ Vector Modulation: Analog I & Q vector modulation inputs provide 25 MHz of IQ bandwidth and permit wideband modulation from external analog I & Q sources including test instruments and device outputs (Analog I & Q inputs for vector modulation are provided as an option together with analog I & Q outputs).

Arbitrary Waveform Generator: The dual-channel AWG has the capacity to store waveforms up to 32 MSamples long. Each sample word consists 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 memory is made fast by virtue of the wide bandwidth of the PXI backplane. The sample rate is user defined up to a maximum of 66 MHz. At the lowest sample rate, (14.333 kHz), the AWG memory depth supports a playback time in excess of 30 minutes.

Triggering and Synchronization: The 3025 is equipped with a variety of triggering facilities to maximize flexibility for synchronous measurements. Trigger scenarios can be configured making it possible for different trigger events to impact different hardware respons-
es. These can be used for a variety of simple or complex switching/control applications including addressed selection or stepped increment of RF frequency, level, AWG file, marker/trigger routing from the front panel to PXI backplane or vice versa, control of modulation on/off, RF on/off status, and RF levelling loop. Trigger sources can be via the front panel or the PXI backplane. The front panel supports triggering from a TTL input or via the LVDS interface. The LVDS interface can be used to supply single line or addressed triggers as well as supporting marker inputs and outputs. Similarly the 3025 supports all PXI backplane trigger sources. The 3025 trigger inputs may be routed to the 3010 using the PXI local bus.

The LVDS front panel connector provides a real time digital IQ data interface in which case clock and IQ select lines are included.

**List Mode:** In List Mode all 3025 internal hardware settings are pre-calculated making it possible to select a new frequency and level in typically 250 µs (with 3010 opt 01 fitted) while maintaining RF output accuracy. This feature is ideally suited for fast receiver alignment applications and is complimented by similar features in the 3030A series RF digitizer in support of corresponding fast transmitter alignment. List Mode supports 128 combinations of different frequency and level settings. The list address can be sourced externally or from an internal counter or register driven by the application controlling the 3025.

Using list mode it is possible to construct a sequence of different AWG waveforms. This can be used to effectively extend the sample memory and thereby create very long waveform playback times.

AWG waveform selection can be combined with frequency and level selection in list mode thus permitting all RF parameters to be configured by a new list address. This allows reconfiguration of signal generator settings in the shortest possible time and thereby accelerate test speed.

List mode supports up to 128 addresses. At each address the file can be played a user defined fixed number of times or continuously until triggered to the next sequence step. AWG sequencing is highly flexible, an AWG file play sequence can also be constructed to include periods of unmodulated or no signal output. Stepping between list address can be triggered as an immediate event or set up to wait for the current waveform file to end before playing the next file. This configuration option ensures continuous baseband generation from the AWG when sequencing through List Mode and hence can avoid switching transients being generated.

**Software**

The 3025 is supplied with an easy to use Active X control and associated soft front panel. This provides control of both the 3025 and 3010/11 modules to help simplify integration or can be used in conjunction with a third party LO source driver in the absence of the 3010. Additionally, VXI PNP drivers and associated soft front panels are supplied independently for each of the 3025 and 3010/11 modules. The soft front panel enables manual control of all key features to aid de-bugging during program development.

**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 3025 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. For testing 3G receivers with specific C/N input levels, IQCreator permits AWGN interference to be combined with the modulation waveform. IQCreator provides graphical illustration of waveform, spectrum and CCDF characteristics.

**IQCreator GSM/EDGE waveform templates**

IQCreator is a “free to download” application from the Aeroflex website. Loading waveforms created using IQCreator into the 3025 requires the enable IQCreator option 100 in the 3025. In the absence
of the enable IQCreator option, the software may still be used to package customer files, e.g. from MATLAB or Mathcad into the correct format for use in the 3025.

**Customer Support**

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

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**

**3025**

All 3025 specifications are defined when used in conjunction with a 3010/11 RF synthesizer PXI module.

**RF OUTPUT**

**FREQUENCY**

**Range**

100 MHz to 6 GHz

Lower frequency extended to 86 MHz with internal modulation on

**Resolution**

Below 3 GHz: 1 Hz
Above 3 GHz: 2 Hz

**Accuracy**

As per frequency reference

**Settling Time**

Time taken to be settled at final frequency

List mode with 3010 BW set to Normal loop and 3010 option 01 fitted:

Below 3 GHz, typically 250 µs settled to 0.7 ppm or 1 kHz whichever is the smaller

Above 3 GHz typically 250 µs settled to 2 kHz

3010 BW set to Normal loop:

Typically 1.1 ms

3010 BW set to Narrow loop:

Typically 10 ms

**LEVEL**

**Output Power Range**

Below 3 GHz: -120 to +5 dBm (peak)
Above 3 GHz: -120 to +0 dBm (peak)

**Resolution**

±0.01 dB

**Accuracy (for CW signals) 23°C ±5°C**

100 MHz to 3 GHz:

>-78 dBm, <±0.6 dB (typically ±0.3 dB)
>-93 dBm, <±0.75 dB (typically ±0.5 dB)
>-113 dBm, <±1.0 dB (typically ±0.5 dB)

Above 3 GHz:

>-100 dBm, <±1.0 dB

**Switching Time** (within ±0.3 dB of final value)

List mode hardware triggered:

< 3 ms

**Temperature Stability**

±0.01 dB/°C

**Output Impedance**

50 Ω

**Output VSWR**

Below 3 GHz: 1.5:1 for output levels ≤-1 dBm
Above 3 GHz: 1.6:1 for output levels ≤-6 dBm

**Reverse Power Handling**

Not to exceed +20 dBm

**LIST MODE**

List Mode Channel Parameters

RF frequency, RF level, RF levelling mode, RMS offset, RF out (on/off), Modulation mode, AWG file selection

**List Addresses**

128 numbered 0 to 127

**Settling Time**

See frequency and level data

**Address Sources**

Manual (software commanded)
External (hardware triggered)
Internal (counter timer)

**External Mode Trigger Sources**

PXI Trigger bus, Star trigger, PXI local bus, LVDS Aux 1 to 5, TTL+ve, TTL-ve

**Counter Mode (internal)**

Dwell time 250 µs to 10 seconds with resolution 10 µs

Dwell time may be overridden depending upon AWG sequencer settings.

**SPECTRAL PURITY**

SSB Phase Noise

Typical at 2 GHz and at ambient room temperature

<table>
<thead>
<tr>
<th>3010/11 Loop Bandwidth</th>
<th>Narrow</th>
<th>Wide (normal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset</td>
<td>dBc/Hz</td>
<td>dBc/Hz</td>
</tr>
<tr>
<td>100 Hz</td>
<td>-54</td>
<td>-84</td>
</tr>
<tr>
<td>1 kHz</td>
<td>-84</td>
<td>-102</td>
</tr>
<tr>
<td>10 kHz</td>
<td>-113</td>
<td>-102</td>
</tr>
<tr>
<td>20 kHz</td>
<td>-115</td>
<td>-109</td>
</tr>
<tr>
<td>100 kHz</td>
<td>-132</td>
<td>-129</td>
</tr>
<tr>
<td>1 MHz</td>
<td>-135</td>
<td>-135</td>
</tr>
<tr>
<td>10 MHz</td>
<td>-135</td>
<td>-135</td>
</tr>
</tbody>
</table>

Phase noise below 100 Hz is dependent upon reference phase noise.

Phase noise at 5 GHz ≈108 dBc/Hz 20 kHz offset typically

**Noise Floor (10 MHz offset from 2 GHz)**

-135 dBc/Hz typically

**Non-Harmonic Related Spurious (<0 dBm output)**

-60 dBc from >10 kHz offset typically

-70 dBc for C.W signals typically
Sub-Harmonics (0 dBm output)
-30 dBc, typically -55 dBc

Harmonics (0 dBm output)
2nd harmonic, <-30 dBc, typically -45 dBc
3rd harmonic, <-30 dBc, typically -55 dBc

MODULATION

Modulation Modes:
- Internal analog AM or FM
- Internal digital IQ, (AWG)
- External analog IQ (optional)
- External digital IQ (LVDS)

INTERNAL AMPLITUDE MODULATION

Modulation Generator
- Sinusoidal single tone

Modulation Rate
- 1 kHz to 50 kHz

Reference
- 1 Hz

Mod Depth Range
- 0% to 99%

Resolution
- 1%

Accuracy
(1 kHz mod rate, carrier frequency below 3 GHz)
- ±4% of set depth ±1%

Total Harmonic Distortion
(1 kHz mod rate, carrier frequency below 3 GHz)
- <1.5% for depths of <30%
- <2% for depths <80%

INTERNAL FM MODULATION

Modulation Generator
- Sinusoidal single tone

FM Modulation Rate
- 1 kHz to 50 kHz

Resolution
- 1 Hz

FM Deviation Range
- 10 Hz to 500 kHz

Resolution
- 1 Hz to 1 kHz, 10 Hz above

Accuracy (1 kHz mod rate)
- < ±3% of set deviation

Total Harmonic Distortion (at 1 kHz max deviation)
- <1.5% at max deviation

DIGITAL MODULATION

I and Q Bandwidth (Modulation mode Internal/External digital)
- Digital modulation 14 MHz (-3 dB) using the internal AWG / LVDS

Residual Carrier Leak
- -50 dBc typically

IQ Image Suppression
- -50 dBc for a 10 kHz modulation tone typically

Linearity
- >55 dB ACPR on WCDMA signals (Downlink test model 1)
- Meets 802.11a/g spectral mask with >10 dB standoff

Third Order and Intermodulation Distortion
(2 tone with spacing >25 kHz at -6 dBm per tone)
- < -50 dBc relative to each tone

Error Vector Magnitude
- Below 3 GHz: <1.5% EVM on WCDMA signals typically
- 0.5% EVM on EDGE signals typically
- Up to 6 GHz: <2% EVM on IEE 802.11a, b, g signals typically

ARBIRARY WAVEFORM GENERATOR

Memory
- 32 Msamples I O * 14 bit + 4 markers

AWG File Source Data

IQCreator (requires option 100)
- ASC11, 16/32 bit integer, 32 bit floating point*
- *using IQCreator waveform package to convert into a 3025 compatible format

Sample Rates
- 14.323 kHz to 33 MHz, 44 MHz to 66 MHz

AWG SEQUENCER

Number of Segments
- 128

Segment Type
- AWG file, CW (Mod Off)*, RF Off*
- *When used in conjunction with list mode

Number of AWG Files
- 1 to 64

Length of Segment
- Up to limit of AWG memory (32 Msample)

Number of Segment Repeats
- 1 to 4095

Sequence Trigger Modes
- Stepped, Single, Continuous

Sequence Trigger Sources
- PXI trigger bus, Star trigger, PXI local bus, LVDS Aux 1 to 5, TTL+ve, TTL-ve, Software commanded

AWG File Selection Time
- AWG completion On – Seamless
- AWG completion Off – Defined by sample rate

REAL TIME IQ INTERFACE

Input Level
- LVDS (Low voltage differential signalling ANSI/TIA/EIA-644)

Input Data
- 14 bit IQ data + 4 markers, 5 aux, clock, IQ select
Output Data
- 4 markers, 5 aux, clock, IQ select

Sampling Rate
- 14.323 kHz to 33 MHz, 44 MHz to 66 MHz

3025 OPTION 01: ANALOG I & Q INPUTS AND I & Q OUTPUTS

I & Q ANALOG OUTPUTS
- Single ended I & Q outputs, 50 ohms
- Differential I & Q outputs, 100 ohms

Output Level Range
- Single ended: 100 mV to 4 V pk-pk into 50 Ω load
- Differential: 200 mV to 8 V pk-pk into 100 Ω load

Output Level Resolution
- 100 µV

Output Level Accuracy
- <2% at 20 kHz, typ 1.5%, excludes termination errors

I/Q Level Imbalance Adjust
- ±4 dB nominal continuously variable

Output Bias Range
- ±3 V

Output Bias Resolution
- 1.5 mV

Output Bias Accuracy
- <±0.5% ±8 mV

Differential Offset Range
- ±600 mV, differential into 100 Ω load

Differential Offset Resolution
- 100 µV

Differential Offset Accuracy
- <±2% ±3.3 mV max, ±1% ±0.7 mV typical

Differential Signal Balance
- Typically 0.15 dB @ 10 MHz

Frequency Response
- 15 MHz 3 dB bandwidth at max output level

Spectral Purity (2 V pk-pk set voltage at 1 MHz)
- 2nd harmonic <-60 dBc
- 3rd harmonic <-65 dBc
- IMD <-60 dBc (100 kHz tone spacing)

I & Q ANALOG INPUTS
- Single ended I & Q inputs, selectable 50 Ω or 100 kΩ

Input Level (for nominal set RF level)
- 0.5 Vrms complex signal on I and Q
- 0.5 Vdc on I or Q

Bandwidth
- Nominally ≥25 MHz (50 Ω only) for carrier frequencies above 375 MHz

INTERFACES

3010/11:
- LO output (SMA)
- 10 MHz reference I/O (SMA x 2)
- PCI bus interface including PXI triggering functions

3025:
- RF output (SMA)
- LO 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)
- Data I/Q interface (VHCDI)
- Ext. trigger In: LVDS, TTL (SMB) or PXI
- Trigger out: LVDS or PXI
- PCI bus interface including PXI triggering functions
- I & Q In (SMB x 2) with 3020 option 01 fitted
- -I,+I, -Q,+Q Out (SMB x 4) with 3020 option 01 fitted

POWER CONSUMPTION (TYPICAL)

<table>
<thead>
<tr>
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<th>3025</th>
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<tbody>
<tr>
<td>+3.3 V</td>
<td>50 mA(2)</td>
<td>1 A</td>
</tr>
<tr>
<td>+5 V</td>
<td>650 mA</td>
<td>1.6 A</td>
</tr>
<tr>
<td>+12 V</td>
<td>50 mA(2)</td>
<td>210 mA</td>
</tr>
<tr>
<td>-12 V</td>
<td>30 mA</td>
<td>280 mA</td>
</tr>
</tbody>
</table>

(1) 250 mA transiently during power up
(2) 3011 OCXO requires 300 mA startup reducing to 150 mA after 5 minutes

DIMENSIONS AND WEIGHT

<table>
<thead>
<tr>
<th></th>
<th>3010/11</th>
<th>3025</th>
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<tbody>
<tr>
<td>Dimensions</td>
<td>Single width 3U PXI module</td>
<td>Double width 3U PXI module</td>
</tr>
<tr>
<td>Weight</td>
<td>375 g (0.8 lbs)</td>
<td>390 g (0.86 lbs)</td>
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</table>

FREQUENCY REFERENCE IN

<table>
<thead>
<tr>
<th>Source</th>
<th>3010/11</th>
<th>3025</th>
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</thead>
<tbody>
<tr>
<td>External SMA</td>
<td>External SMA and external PCI</td>
<td></td>
</tr>
</tbody>
</table>

Input
- 0.4 V to 4 V pk-pk into 50 ohms or looped through

Frequency
- 10 MHz ± 100 Hz

GENERAL

The following general specifications are common to the 3010, 3011 and 3025.

RF Leakage (for carrier frequencies <3 GHz)
- <5 µV PD at the carrier frequency into a single turn 25 mm loop, 25 mm or more from the front panel

Standard Warranty
- 24 months

Calibration Interval
- Recommended 24 months
**Electromagnetic Compatibility**
EN 61326-1:1997, Emissions Class A, Immunity Table 1 – Performance Criteria B

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

**Driver Software**
VXIplug compliant software driver

**Rated Range of Use**

**Operating Temperature**
0 to 50°C. Meets IEC-60668-2-1 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, 2.46 g rms non-operating. Tested in accordance with IEC-60068-2-64

**Compliance**
PXI Specification, Revision 2.2 VXIplug&play specifications (VPP-2, VPP-3.x, VPP-4.x and VPP-7)

**3010/3011 Specific Specifications**
Specifications are common to the 3010 and 3011 unless otherwise stated.

**Local Oscillator Out**

**Frequency Range**
1.5 GHz to 3.0 GHz

**Resolution**
1 Hz

**Accuracy**
As frequency standard

**Output Power**
Fixed level in the range -4 dBm to +3 dBm

**Output Impedance**
50 Ω Nominal

**VSWR**
<2:1

**Frequency Reference Out (3011 Only)**

**Level**
2 V pk-pk nominal square wave into 50 Ω

**Frequency**
10 MHz

**Aging Rate**
1 in 10⁷ per day 1 in 10⁵ per year

**Temperature Stability (0 to 50°C)**
Typically better than ±1 x 10⁻⁸

**Warm-Up Time**
<5 minutes

For the very latest specifications visit www.aeroflex.com
<table>
<thead>
<tr>
<th>Ordering Numbers</th>
<th>Versions</th>
<th>Supply with</th>
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<tbody>
<tr>
<td>3025</td>
<td>PXI Digital RF Signal Generator (6 GHz)</td>
<td>The 3025 and 3010/11 are each supplied with:</td>
</tr>
<tr>
<td>3010</td>
<td>PXI RF synthesizer</td>
<td>CD ROM containing VXI PNP driver, soft front panel and user documentation.</td>
</tr>
<tr>
<td>3011</td>
<td>PXI RF synthesizer (including OCXO 10 MHz reference)</td>
<td>2 SMA link cables</td>
</tr>
</tbody>
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### Options

| 3020 Opt 01      | Analog I & Q inputs and I & Q outputs   |
| 3010/11 Opt 01   | High speed frequency switching          |

**Waveform Creation Application Software**

| 3020 Opt 100     | Enable IQCreator (2)                   |
| 3020 Opt 101     | Enable IQCreator 2G CDMA (3)           |
| 3020 Opt 102     | Enable IQCreator 2G CDMA + 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 CDMA + 3G CDMA

### Service Options

<table>
<thead>
<tr>
<th>Service Options</th>
<th>Description</th>
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<tbody>
<tr>
<td>W3010/103</td>
<td>Standard extended warranty 36 months</td>
</tr>
<tr>
<td>W3020/103</td>
<td>Standard extended warranty 36 months</td>
</tr>
<tr>
<td>W3010/103C</td>
<td>Standard extended warranty 36 months with scheduled calibration</td>
</tr>
<tr>
<td>W3020/103C</td>
<td>Standard extended warranty 36 months with scheduled calibration</td>
</tr>
<tr>
<td>W3010/105</td>
<td>Standard extended warranty 60 months</td>
</tr>
<tr>
<td>W3020/105</td>
<td>Standard extended warranty 60 months</td>
</tr>
<tr>
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<td>Standard extended warranty 60 months with scheduled calibration</td>
</tr>
</tbody>
</table>

### Optional Accessories

| Part No. 23435/698                      | 68 way VHDCI to SCSI-3 cable assembly 1.8 m            |
| Part No. 23435/699                      | 68 way VHDCI to VHDCI cable assembly 1.8 m             |
| Part No. 43139/590                      | SMA link cable                                         |
| Part No. 46885/224                      | SMA connector saver                                    |
| Part No. 82536                          | PXI assay, 8 slot chassis with 2.2 GHz P4 embedded controller (Windows XP) |
| Part No. 82544                          | PXI assay, 8 slot chassis with MXI-4 PCI-PXI interface |
| Part No. 82538                          | PXI assay, 18 slot chassis with 2.2 GHz P4 embedded controller (Windows XP) |
| Part No. 82545                          | PXI assay, 18 slot chassis with MXI-4 PCI-PXI interface |
| Part No. 46662/767                      | PXI hard carry case (for use with 82536, 82544)        |

**Notes**

1. After warm-up and self calibration valid for temp range 5°C
2. Supplied with CD ROM containing IQCreator Windows application
3. Requires option 100
4. Following warmup and self calibration

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