



## Racal Instruments™

# 3164

## Dual/Quad 125 MS/s VXI Arbitrary Waveform Generator

The Racal Instruments™ 3164 Series is a single-wide VXIbus Module. The 3164-2 has two 14-bit Arbitrary Waveform Generator (AWG) channels that operate independently, and the 3164-4 AWG has four channels. The maximum sample rate for each channel is 125 MS/s. All waveforms can be sampled from data previously loaded into waveform memory or loaded and output on the fly.

### Key Features

- Register-based for high speed
- Ping-pong memory architecture supports on-the-fly waveform update
- 16 V<sub>pk-pk</sub> output into 50 Ω (32 V<sub>pk-pk</sub> into high impedance)
- Modular design supports low-level sparing for better maintainability
- Powerful sequencer supports Insert/Replace, Pseudo-Random Noise, and Nested Looping and Branching
- Emulation of Wavetek products available

### Product Information

#### Built-In Waveforms

Standard waveforms such as Sine, Square, Triangle, Ramp, and Pulse are calculated and loaded into waveform memory automatically based on their specified parameters. An AM modulation input is provided for the main AWG channel.

#### Powerful Sweep Capability

A large two-page waveform memory (512 k samples/page) is provided so that multiple waveforms can be loaded into memory for fast test execution.

Additionally, the contents of one page can be output while the other page is being loaded with fresh data allowing for real-time operation.

#### Wavetek AWG Emulation (optional version)

An optional version of the 3164 is available. This option emulates the SCPI command sets of obsolete Wavetek AWGs. While not providing a “drop-in” replacement, this feature helps ease the transition from Wavetek models 1370, 1395, and 1396. Please contact the factory for further details regarding this version.

# Specifications

Note: The Astronics Test Systems policy is one of continuous development and improvement. Consequently, the equipment may vary in detail from the description and specifications in this publication.

## Amplitude Characteristics

(Applies to all main output channels)

### Amplitude Range

- 6 mV to 32 V<sub>pk-pk</sub> into 1 M $\Omega$
- 3 mV to 16 V<sub>pk-pk</sub> into 50  $\Omega$

### Output Impedance (selectable)

- <5  $\Omega$ , 50  $\Omega$ , or 75  $\Omega$

### Accuracy (at 1 kHz) <sup>1</sup>

- 1% of setting + 1% of range

### Amplitude Ranges

- R1: 3 mV to 125 mV
- R2: >125 mV to 250 mV
- R3: >250 mV to 500 mV
- R4: >500 mV to 1.00 V
- R5: >1.00 V to 2.00 V
- R6: >2.00 V to 4.00 V
- R7: >4.00 V to 8.00 V
- R8: 8.00 V to 16.00 V

### Offset Range (impedance matched)

- 0 to  $\pm 8$  V\*

### DC Offset Accuracy

- 1% of setting  $\pm 16$  mV

### Resolution

- 3.5 digits

### Low-Pass Filter

- 50 MHz, 7-pole, elliptic

### Standby (Output disconnected)

- Output On or Off

### Output Protection

- Short circuit

## Standard Waveforms

(Sine, Triangle, Square, Pulse, Ramp, Noise, DC)

### Sine

#### Frequency Range

- 1 mHz to 25 MHz

#### Phase Range <sup>3</sup>

- 0 to 360°

#### THD (1 to 15 V<sub>pk-pk</sub>)

- 20 Hz to 100 kHz <0.25%

### Harmonics

- <5 MHz: >45 dBc
- <10 MHz: >40 dBc
- <25 MHz: >40 dBc (filter on)

### Flatness

- <100 kHz: 0.1 dB
- <1 MHz: 0.2 dB
- <10 MHz: 1 dB
- <20 MHz: 2.5 dB
- <25 MHz: 3.5 dB

### SFDR (SCLK = 100 MHz)

- <1 MHz: >50 dBc

### Crosstalk (fc = 10 MHz)

- -70 dB, typical

### Triangle/Ramp Function

#### Frequency Range

- 1 mHz to 10 MHz

#### Phase Range <sup>3</sup>

- 0 to 360°

### Square Wave/Pulse Function

#### Frequency Range

- 1 mHz to 25 MHz

#### Duty Cycle Range <sup>2,3</sup>

- 1% to 99%

#### Rise/Fall Time

- <10 ns (20% to 80%)
- <15 ns (10% to 90%)

### Noise Functions

#### Types

- White, quasi-gaussian, or pink noise

#### Generation

- Real-time, pseudo-random

#### Period

- Pre-defined (min and max samples specifiable) or pseudo-random

## Arbitrary Waveforms

### Waveform Memory

- 1 M/chan

### Vertical Resolution

- 14 bits

### Minimum Segment Size

- 2 pts

### Segments/Channel

- 1 to 512

## Sequenced Waveforms

### Sequencer Step Limits

- 1 to 512

### Segment Loops

- 1 to 64 k or continuous

## Sweep Waveforms

### Sweep Range

- Sine: 1 mHz to 25 MHz
- Square: 1 mHz to 20 MHz
- Triangle: 1 mHz to 10 MHz

### Waveforms

- Sine, Square, Triangle

### Type

- Linear, Logarithmic

### Direction

- Up or down

### Sweep Duration

- 200  $\mu$ s to 335 s

## Sampling Clock

### Frequency Resolution

- 4 digits

### Accuracy

- 50 ppm (internal crystal)

### Jitter

- <30 ps<sub>rms</sub>

### Internal Source Range

- 1 Hz to 125 MHz

### External Source Range

- Up to 100 MHz

### External Source Characteristics

- Connector: Front Panel MCX Range: 50 mV<sub>pk-pk</sub> to  $\pm 5$  V
- Threshold:  $\pm 4.75$  V, programmable
- Impedance: 50  $\Omega$

## Reference Clock

### Internal Reference

- 10 MHz  $\pm 50$  ppm

### External Reference

- Impedance: 50  $\Omega$  or 10 k $\Omega$
- Range: 50 mV<sub>pk-pk</sub> to  $\pm 10$  V
- Threshold:  $\pm 4.75$  V, programmable

## Triggering Characteristics

### Sources

- External Analog: 50 mV<sub>pk-pk</sub> to  $\pm 10$  V
- Input Impedance: 50  $\Omega$  or 10 k $\Omega$
- Level (Programmable):  $\pm 9.75$  V
- Resolution: 5 mV
- Accuracy: 100 mV
- VXIbus Backplane: TTLTrg0-7

### Maximum Trigger Frequency

- DC to 20 MHz

### Minimum External Trigger Pulse Width

- 20 ns

## Specifications

continued

### Trigger Slope

- Pos or Neg

### Trigger Delay

- 0 to 128 k pts (multiple of 2)

### System Delay (trig/gate input to waveform output)

- 20 ns + 7 Sample Clock

### Sync Output

- Front Panel: TTL
- VXIbus Backplane: TTLTrg0-7
- Sync Width: 1 to 4097 pts, programmable individual memory words within a segment.

## Interface

(Single-wide, register-based, VXI 1.4)

### Peak Current & Power Consumption

- Total Peak Power: 55 W

	$I_{PM}$ (A)
+24 V	0.75
+12 V	0.32
+5 V	2.10
-12 V	0.45
-24 V	0.75

### Self-Test

- Internal: 95%
- External: 90% (via front panel I/O)

## Front Panel I/O

### Inputs (3164-2: 1 set, 3164-4: 2 sets)

- Trig In 1 A (T1A): MCX,  $Z_{in} = 10\text{ k}\Omega$ ,  $\pm 9.75\text{ V}$
- Ext Clk In (EC): MCX,  $Z_{in} = 50\ \Omega$ ,  $\pm 5\text{ V}$
- Ext Waveform In (IN): MCX
- Ext Sync In (SI): MCX
- Ref Clk In (RI): MCX,  $Z_{in} = 50\ \Omega$ , 50 mV to 20 V<sub>pk-pk</sub>
- AM In: Positronic 9-Pin, 1 k $\Omega$ , 2 V<sub>pk-pk</sub> for 90% depth
- Trig In 1B, 2B (T1A, T1B): Positronic 9-pin,  $Z_{in} = 10\text{ k}\Omega$ ,  $\pm 9.75\text{ V}$

### Outputs (3164-2: 1 set, 3164-4: 2 sets)

- Waveform (OA, OB): MCX,  $Z_{out} = <5\ \Omega$ , 50  $\Omega$ , or 75  $\Omega$
- Waveform/7 (O7): MCX,  $Z_{out} = 650\ \Omega$
- Sync (SOA, SOB): MCX, LVTTTL
- Trig Out (TO): MCX
- Ref Clk Out (RO): MCX,  $Z_{out} = 50\ \Omega$

## Software

### Drivers

- IVI-COM, IVI-C, LabVIEW™, VXIplug&play support for frameworks based on Microsoft Win32® application programming interface

## Environmental

### Temperature

- Operating: 0° C to 50° C
- Storage: -40° C to 70° C

### Humidity (non-condensing)

- 5 to 95%

### MTBF (ground benign)

- 3164-2: 18,999 hrs
- 3164-4: 11,197 hrs

### EMC (Council Directive 89/336/EEC)

- Emission: EN61326-1: 1997+ A1:1998,
- Class A

### Immunity: EN61326-1:1997+ A1:1998,

- Table 1

### Safety (Low Voltage Directive 73/23/EEC)

- BS EN61010-1:1993/A2 1995

## Mechanical

### Weight

- 3164-2: 2.5 lb (1.2 kg)
- 3164-4: 3.2 lb (1.5 kg)

### Cooling (10° C Rise)

- 4.3 l/s @ 0.45 mm H<sub>2</sub>O

\* Amplitude requested + DC offset should be less or equal to the top of amplitude range.

Notes:

1 Measured with AC<sub>rms</sub> Voltmeter

2 Subject to minimum pulse width

3 Subject to Sampling Clock Frequency (more information in manual)

## Ordering Information

### VX405C-S-2272-2 : Racal Instruments™ 3164-2

Dual Arbitrary Waveform Generator

### VX405C-S-2272-4 : Racal Instruments™ 3164-4 (Mature)

Quad Arbitrary Waveform Generator



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