# NI PXIe-5663 Specifications

## 6.6 GHz RF Vector Signal Analyzer with Digital Downconversion

This document lists specifications for the NI PXIe-5663 RF vector signal analyzer (NI 5663). The NI 5663 comprises the NI PXIe-5601 RF downconverter module, NI PXIe-5622 IF digitizer module, and NI PXI-5652 RF signal generator module (used as an LO source). There is no physical device named "NI PXIe-5663."

Specifications are warranted under the following conditions:

- 30 minutes warm-up time
- Calibration cycle maintained
- Chassis fan speed set to High
- NI-RFSA instrument driver used
- NI-RFSA instrument driver self-calibration performed after instrument temperature is stable
- Module locked to the PXI backplane
- NI 5601 module revision G or later

*Specifications* describe the warranted, traceable product performance over ambient temperature ranges of 0 °C to 55 °C, unless otherwise noted.

*Typical* values describe useful product performance beyond specifications that are not covered by warranty and do not include guardbands for measurement uncertainty or drift. Typical values may not be verified on all units shipped from the factory. Unless otherwise noted, typical values cover the expected performance of units over ambient temperature ranges of 23 °C ± 5 °C with a 90% confidence level, based on measurements taken during development or production.

*Nominal* values (or supplemental information) describe additional information about the product that may be useful, including expected performance that is not covered under *Specifications* or *Typical* values. Nominal values are not covered by warranty.

Specifications are subject to change without notice. For the most recent NI 5663 specifications, visit `ni.com/manuals`.

NATIONAL INSTRUMENTS™

To access NI 5663 documentation, navigate to **Start»All Programs» National Instruments»NI-RFSA»Documentation**.

**Hot Surface** If the NI 5663 has been in use, the device or the shield may exceed safe handling temperatures and may cause burns. Allow the NI 5663 to cool before touching the shield or removing the device from the chassis.

# Contents

# Frequency

Frequency range[1] ..... 10 MHz to 6.6 GHz

Tuning resolution ..... 533 nHz

## Bandwidth

### Equalized Bandwidth

| Tuned Frequency | Equalized Bandwidth |
|---|---|
| 10 MHz to <120 MHz | 10 MHz |
| 120 MHz to <330 MHz | 20 MHz |
| 330 MHz to 6.6 GHz | 50 MHz |
| **Note**: Using automatic calibration correction through the NI-RFSA instrument driver. | |

[1] The NI 5663 is operational to 1 MHz. The maximum tuned frequency = 6.6 GHz – ½ (frequency span).

## Resolution Bandwidth

3 dB bandwidth.....Fully adjustable
(<1 Hz to 10 MHz)

| Selectivity | |
|---|---|
| **Window** | **60 dB : 3 dB Ratio** |
| Flat Top | 2.5, maximum |
| 7-term Blackman-Harris | 4.1, maximum |
| **Note**: The NI-RFSA instrument driver also supports additional window types. | |

# Frequency Reference

Refer to the *NI PXI-565X RF Signal Generator Specifications* for more information about frequency reference.

## Internal Frequency Reference

Frequency .....10 MHz

Temperature stability.....$\pm 1 \times 10^{-6}$, maximum
(15 to 35°C)

Aging per year .....$\pm 5 \times 10^{-6}$, maximum

Initial achievable accuracy .....$\pm 3 \times 10^{-6}$, maximum

## External Frequency Reference Input

Frequency .....10 MHz ($\pm 10 \times 10^{-6}$)

Amplitude .....0.2 $V_{pk\text{-}pk}$ to 1.5 $V_{pk\text{-}pk}$ into 50 Ω

Input impedance .....50 Ω

Lock time to external reference .....1 s, maximum

# Spectral Purity

## Phase Noise

| Single Sideband (SSB) Phase Noise | |
|---|---|
| **Tuned Frequency** | **Noise Density** |
| 100 MHz | <–125 dBc/Hz |
| 500 MHz | <–112 dBc/Hz |
| 1 GHz | <–105 dBc/Hz |
| 2 GHz | <–98 dBc/Hz |
| 3 GHz | <–95 dBc/Hz |
| 4 GHz | <–93 dBc/Hz |
| 5 GHz | <–90 dBc/Hz |
| 6.6 GHz | <–90 dBc/Hz |
| **Note**: 10 kHz offset; measured using NI 5652 with internal Reference clock. | |

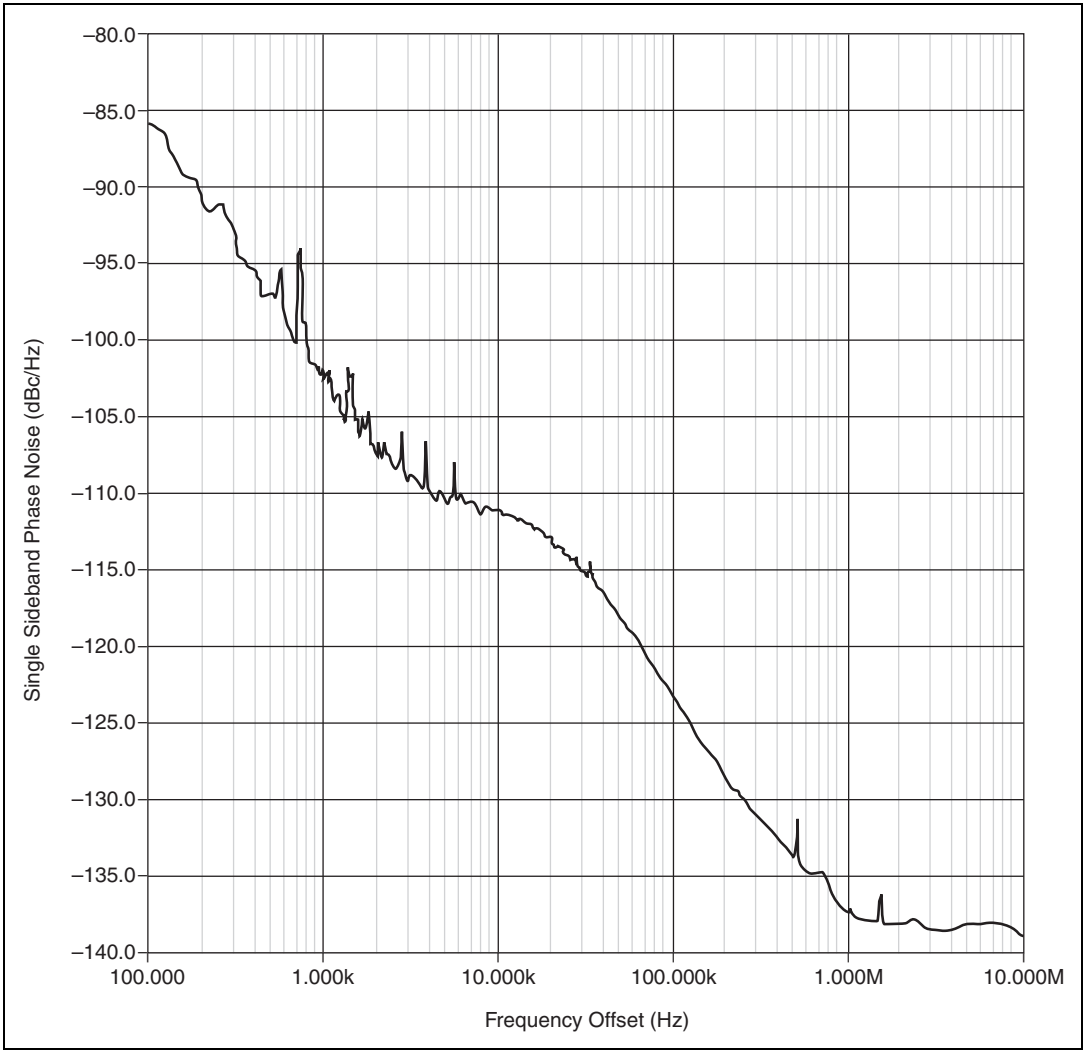


**Figure 1.** Typical Phase Noise at 1 GHz

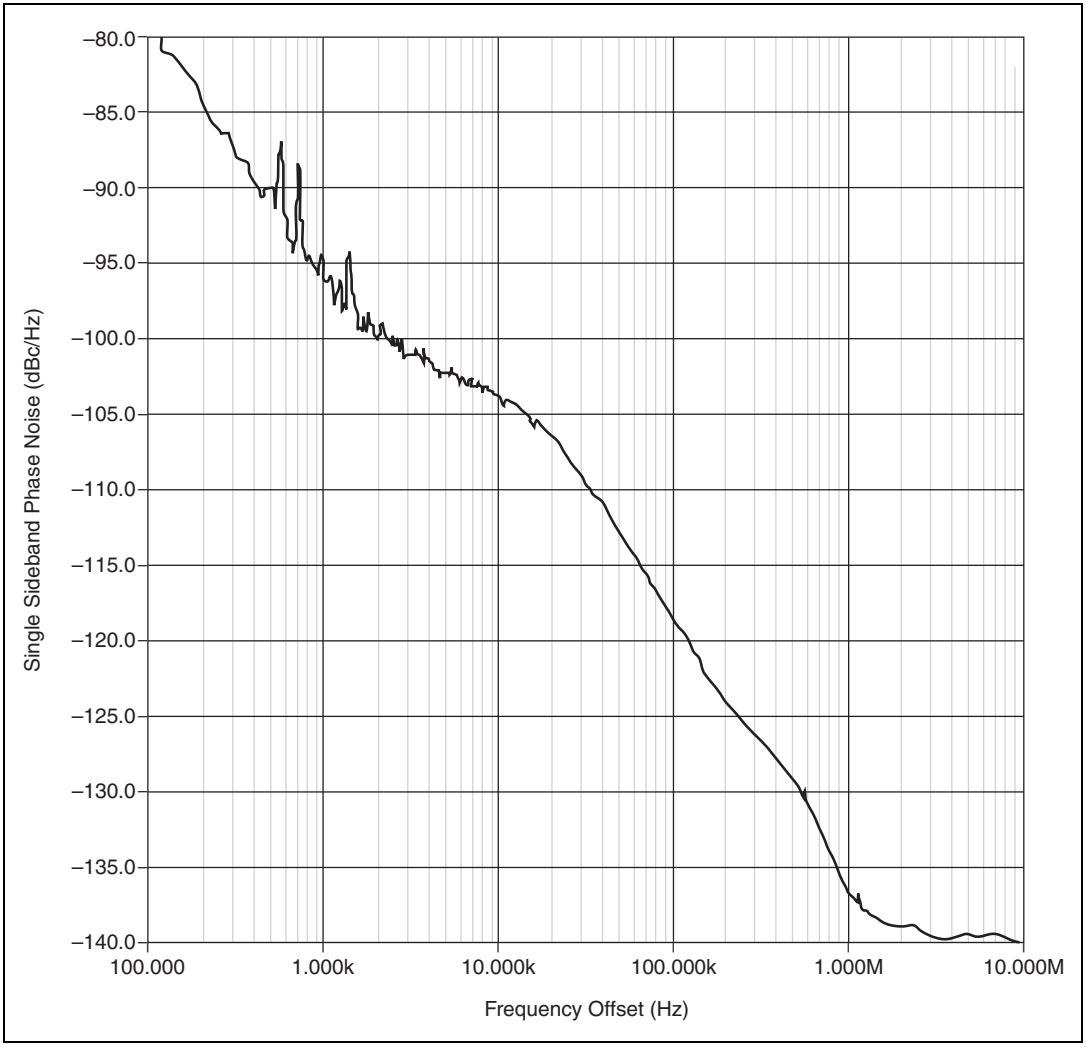


**Figure 2.** Typical Phase Noise at 2.4 GHz

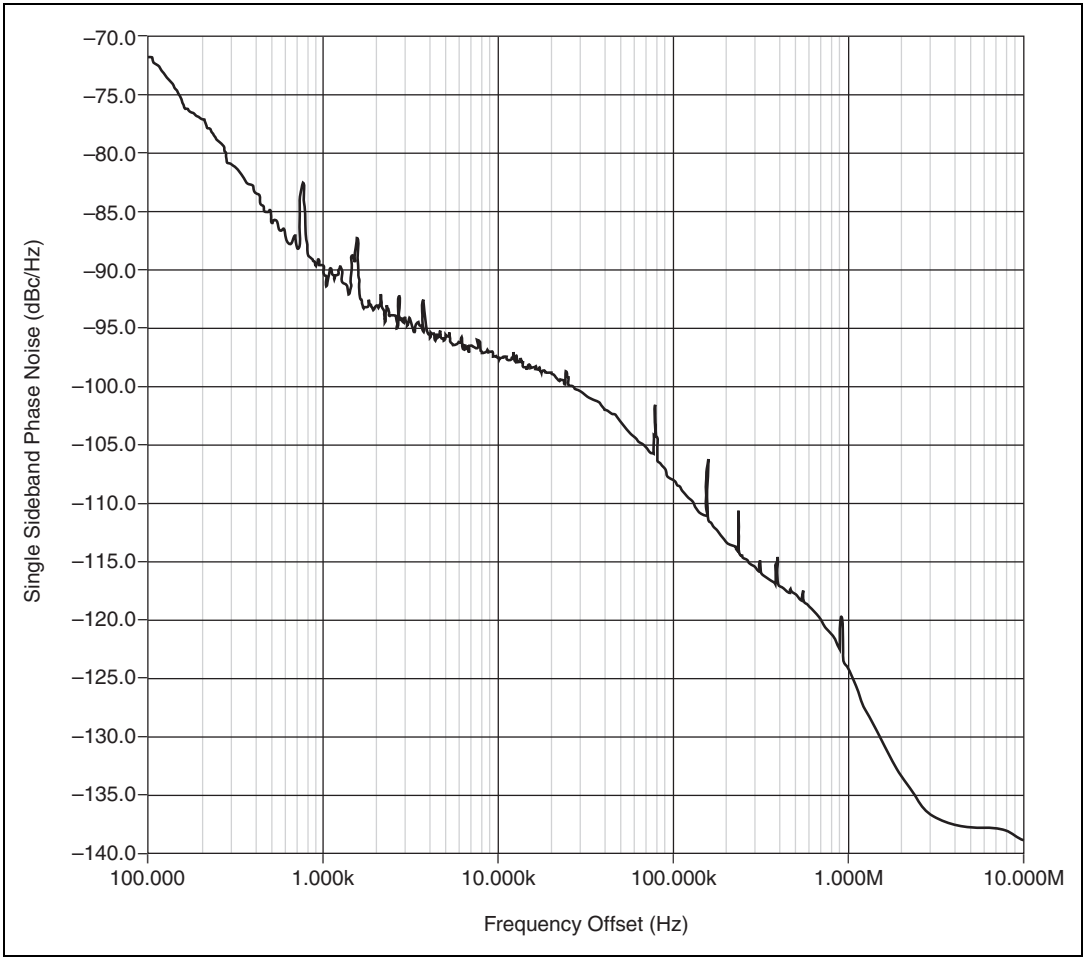


**Figure 3.** Typical Phase Noise at 5.8 GHz

# Amplitude

## Range

Amplitude range..... *Average Noise Level* to +30 dBm

RF input attenuation..... 0 dB to 50 dB in 1 dB steps, nominal

## Average Noise Level

| Frequency | 23 °C ± 5 °C | 0 °C to 55 °C |
|---|---|---|
| 10 MHz to <30 MHz | <–155 dBm/Hz<br><–157 dBm/Hz, typical | <–154 dBm/Hz<br><–156 dBm/Hz, typical |
| 30 MHz to <120 MHz | <–159 dBm/Hz<br><–163 dBm/Hz, typical | <–158 dBm/Hz<br><–162 dBm/Hz, typical |
| 120 MHz to <3 GHz | <–155 dBm/Hz<br><–158 dBm/Hz, typical | <–154 dBm/Hz<br><–157 dBm/Hz, typical |
| 3.0 GHz to <5.0 GHz | <–153 dBm/Hz<br><–156 dBm/Hz, typical | <–152 dBm/Hz<br><–155 dBm/Hz, typical |
| 5.0 GHz to 6.6 GHz | <–151 dBm/Hz<br><–154 dBm/Hz, typical | <–150 dBm/Hz<br><–153 dBm/Hz, typical |

**Notes**: Input terminated; no input signal; 0 dB RF attenuation; –10 dBm reference level at frequencies <100 MHz, –50 dBm reference level elsewhere.

## Absolute Accuracy

| Frequency | Accuracy | |
|---|---|---|
| | **23 °C ± 5 °C** | **0 °C to 55 °C*** |
| 10 MHz to <120 MHz | ±2.2 dB<br>±1.4 dB, typical | ±2.3 dB<br>±1.5 dB, typical |
| 120 MHz to < 400 MHz | ±1.7 dB<br>±0.65 dB, typical | ±1.8 dB<br>±0.75 dB, typical |
| 400 MHz to < 3.0 GHz | ±1.6 dB<br>±0.65 dB, typical | ±1.8 dB<br>±0.75 dB, typical |
| 3.0 GHz to < 5.5 GHz | ±1.7 dB<br>±0.65 dB, typical | ±1.8 dB<br>±0.75 dB, typical |
| 5.5 GHz to 6.6 GHz | ±1.6 dB<br>±0.65 dB, typical | ±2.0 dB<br>±1.0 dB, typical |

**Notes**: RF attenuation ≥8 dB; signal-to-noise ratio ≥20 dB.

* Using automatic calibration correction of the NI-RFSA instrument driver, within ±5 °C of a self calibration by the niRFSA Self Cal VI or the `niRFSA_SelfCal` function.

# Spurious Responses

The single downconversion stage architecture does not provide RF image rejection.

## IF Rejection[1]

(Typical)

| Tuned Frequency | Interference Frequency | Level |
|---|---|---|
| 10 MHz to <120 MHz | 187.5 MHz | <–75 dBc |
| 120 MHz to <330 MHz | 53 MHz | <–52 dBc |
| 330 MHz to 6.6 GHz | 187.5 MHz | <–52 dBc |

**Notes**: –30 dBm input signal; –30 dBm reference level; 0 dB attenuation.

[1] IF rejection is the suppression of an input signal at the IF frequency when the vector signal analyzer is tuned elsewhere.

## Non-Input-Related Spurs (Residual Spurs)[1]

10 MHz to 6.6 GHz[2] ..... <–100 dBm, typical

## Sideband Spurs[3]

(Typical)

### >1 kHz to ≤ 100 kHz Offset

| Tuned Frequency | Level |
|---|---|
| 10 MHz to <3.3 GHz | <–65 dBc |
| 3.3 GHz to 6.6 GHz | <–50 dBc |
| **Notes**: 0 dBm input level; 0 dBm reference level; automatic attenuation settings. | |

### >100 kHz Offset

| Tuned Frequency | Level |
|---|---|
| 10 MHz to <50 MHz | <–75 dBc |
| 50 MHz to <3.3 GHz | <–70 dBc |
| 3.3 GHz to 6.6 GHz | <–65 dBc |
| **Notes**: 0 dBm input level; 0 dBm reference level; automatic attenuation settings. | |

## Input-Related Spurs

(Typical)

| RF Frequency | Level |
|---|---|
| 10 MHz to <120 MHz | –70 dBc |
| 120 MHz to <330 MHz | –50 dBc |
| 330 MHz to <410 MHz | –35 dBc |
| 410 MHz to <3.3 GHz | –65 dBc |
| 3.3 GHz to 6.6 GHz | –50 dBc |
| **Notes**: 0 dB input level; 0 dBm reference level; automatic attenuation settings. | |

[1] Residual responses are the responses observed when no input signal is present.

[2] Input terminated; no input signal; 0 dB attenuation; ≤–60 dBm reference level; does not include LO leakage.

[3] Sideband spurs are due to system operation and appear on signals being observed.

## LO Leakage[1]

(Typical)

### RF Input Port

| RF Frequency | Level |
|---|---|
| 10 MHz to <3.0 GHz | <–60 dBm |
| 3.0 GHz to 6.6 GHz | <–55 dBm |
| **Notes**: 0 dB attenuation; –30 dBm reference level. | |

# Linearity

## Third-Order Intermodulation Distortion (Input $IP_3$ ($IIP_3$))

(Typical)

| –20 dBm Reference Level | |
|---|---|
| **Frequency Range** | **Input $IP_3$** |
| 10 MHz to <30 MHz | ≥5 dBm |
| 30 MHz to <330 MHz | ≥7 dBm |
| 330 MHz to <3.0 GHz | ≥12 dBm |
| 3.0 GHz to 6.6 GHz | ≥9 dBm |
| **Note**: Two –24 dBm input tones = 200 kHz apart. | |

| 0 dBm Reference Level | |
|---|---|
| **Frequency Range** | **Input $IP_3$** |
| 10 MHz to <30 MHz | ≥21 dBm |
| 30 MHz to <330 MHz | ≥18 dBm |
| 330 MHz to <3.0 GHz | ≥21 dBm |
| 3.0 GHz to 6.6 GHz | ≥21 dBm |
| **Note**: Two –4 dBm input tones = 200 kHz apart. | |

[1] LO leakage is the local oscillator signal that appears at the RF input port.

# Dynamic Range[1]

## Dynamic Range (Noise and Third-Order Intermodulation Distortion (IMD3))

(Nominal)

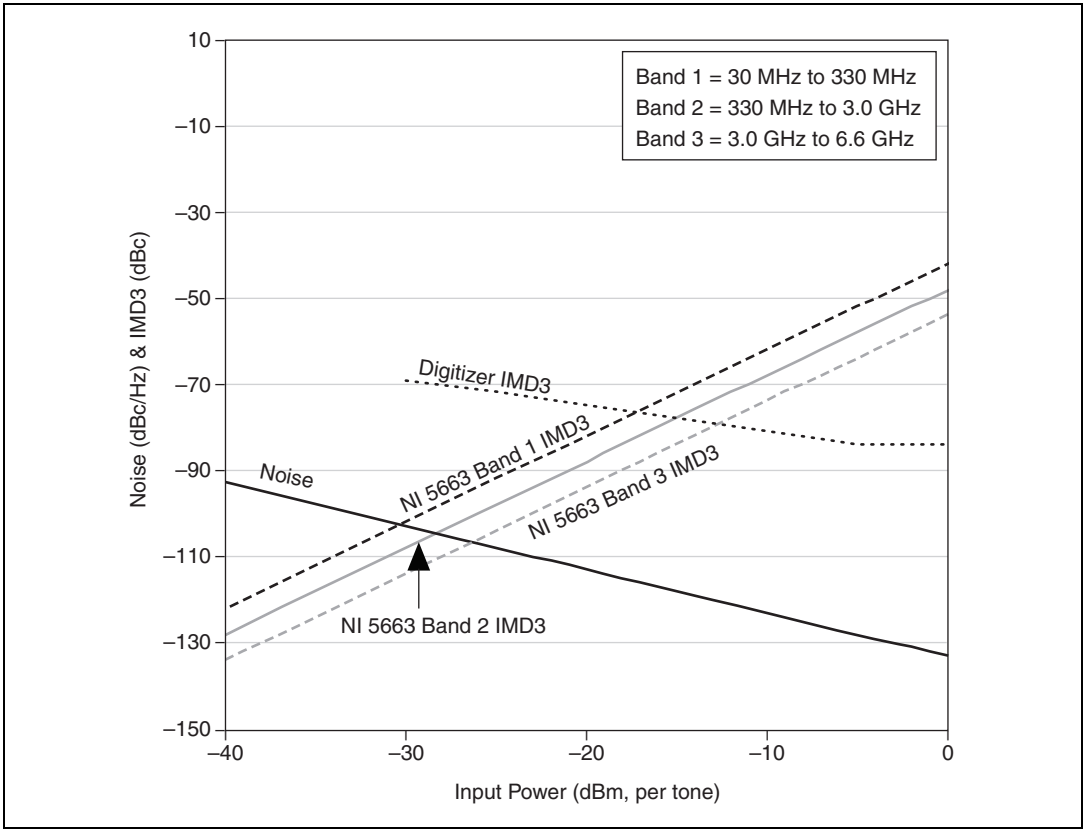


**Figure 4.** NI 5663 Vector Signal Analyzer Nominal Dynamic Range, 0 dBm Reference Level

[1] Reference level allows 10 dB headroom for single-tone input signals before digitizer clipping occurs.

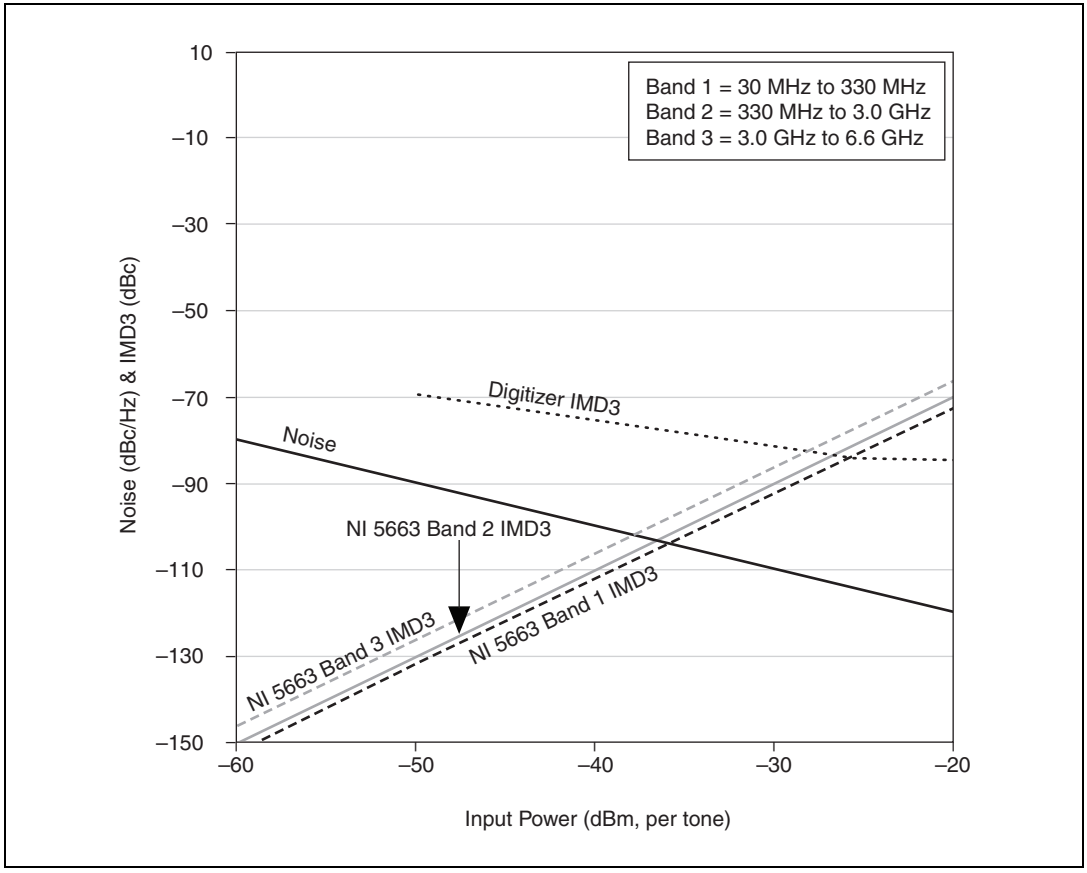


**Figure 5.** NI 5663 Vector Signal Analyzer Nominal Dynamic Range, –20 dBm Reference Level

The dynamic range plots in the two preceding figures show nominal performance with NI-RFSA automatic coupled settings that are optimized for noise performance. If you use the RF attenuation manual settings, IMD3 performance can improve with minimal degradation in noise floor, thus increasing the effective SFDR in the power per tone signal range of –10 dB to 0 dB below reference level.

## IF Flatness

(Typical)

| IF Amplitude Flatness, 23 °C ± 5 °C | | |
|---|---|---|
| **Tuned Frequency** | **Bandwidth** | **Amplitude Flatness** |
| 10 MHz to <75 MHz | 5 MHz | ±0.25 dB |
| | 10 MHz | ±0.3 dB |
| 75 MHz to <120 MHz | 5 MHz | ±0.4 dB |
| | 10 MHz | ±0.6 dB |
| 120 MHz to <140 MHz | 5 MHz | ±0.45 dB |
| | 10 MHz | ±0.65 dB |
| | 20 MHz | ±0.9 dB |
| 140 MHz to <330 MHz | 5 MHz | ±0.2 dB |
| | 10 MHz | ±0.4 dB |
| | 20 MHz | ±0.5 dB |
| 330 MHz to <6.6 GHz | 10 MHz | ±0.2 dB |
| | 20 MHz | ±0.35 dB |
| | 50 MHz | ±0.60 dB |

**Notes**: RF attenuation ≥8 dB, 18 °C to 28 °C, with calibration correction; bandwidth centered about tuned frequency. *Typical* represents the worst ripple expected for *any* reference level setting across the specified frequency range.

| IF Amplitude Flatness, 0 °C to 55 °C | | |
|---|---|---|
| **Tuned Frequency** | **Bandwidth** | **Amplitude Flatness** |
| 10 MHz to <75 MHz | 5 MHz | ±0.3 dB |
| | 10 MHz | ±0.45 dB |
| 75 MHz to <120 MHz | 5 MHz | ±0.35 dB |
| | 10 MHz | ±0.6 dB |
| 120 MHz to <140 MHz | 5 MHz | ±0.55 dB |
| | 10 MHz | ±0.85 dB |
| | 20 MHz | ±1.1 dB |
| 140 MHz to <330 MHz | 5 MHz | ±0.35 dB |
| | 10 MHz | ±0.8 dB |
| | 20 MHz | ±0.8 dB |
| 330 MHz to <6.6 GHz | 10 MHz | ±0.25 dB |
| | 20 MHz | ±0.4 dB |
| | 50 MHz | ±0.7 dB |
| **Notes**: RF attenuation ≥8 dB, 0 °C to 55 °C, with calibration correction; bandwidth about tuned frequency. *Typical* represents the worst ripple expected for *any* reference level setting across the specified frequency range. | | |

## IF Phase Linearity

(Typical)

| Tuned Frequency | Bandwidth | Maximum Phase Deviation* |
|---|---|---|
| 10 MHz to <120 MHz | 10 MHz | ±3.0 degrees |
| 120 MHz to <330 MHz | 10 MHz | ±1.5 degrees |
| | 20 MHz | ±5.0 degrees |
| 330 MHz to 6.6 GHz | 10 MHz | ±1.0 degree |
| | 20 MHz | ±2.0 degrees |
| | 40 MHz | ±3.0 degrees |
| | 50 MHz | ±4.5 degrees |
| * Measured at 23 °C ambient temperature. | | |

## Error Vector Magnitude (EVM) and Modulation Error Ratio (MER)

(Nominal)

Data length in the following three tables is 1,250 symbols pseudorandom bit sequence (PRBS) at –30 dBm power level. These results were obtained using the NI 5663 onboard clock (the NI 5652 LO source onboard clock) and do not include software equalization using the NI Modulation Toolkit. Results are the composite effect of both the NI 5663 and the NI 5673 RF vector signal generator.

| 825 MHz Carrier Frequency | | | | |
|---|---|---|---|---|
| **QAM Order** | **Symbol Rate (kS/s)** | **$\alpha_{RRC}$** | **EVM (% RMS)** | **MER (dB)** |
| **M = 4** | 160 | 0.25 | 0.3 | 52 |
| | 800 | 0.25 | 0.4 | 49 |
| | 4,090 | 0.22 | 0.5 | 46 |
| **M = 16** | 17,600 | 0.25 | 0.7 | 41 |
| | 32,000 | 0.25 | 1.0 | 37 |
| **M = 64** | 5,360 | 0.15 | 0.4 | 44 |
| | 6,952 | 0.15 | 0.5 | 43 |
| | 40,990 | 0.22 | 1.1 | 35 |
| **M = 256** | 6,952 | 0.15 | 0.4 | 43 |

| 3.4 GHz Carrier Frequency | | | | |
|---|---|---|---|---|
| **QAM Order** | **Symbol Rate (kS/s)** | **$\alpha_{RRC}$** | **EVM (% RMS)** | **MER (dB)** |
| **M = 4** | 160 | 0.25 | 0.65 | 44 |
| | 800 | 0.25 | 0.65 | 44 |
| | 4,090 | 0.22 | 0.74 | 43 |
| **M = 16** | 17,600 | 0.25 | 1.13 | 36 |
| | 32,000 | 0.25 | 1.94 | 32 |
| **M = 64** | 5,360 | 0.15 | 0.59 | 41 |
| | 6,952 | 0.15 | 0.66 | 40 |
| | 40,990 | 0.22 | 2.15 | 30 |
| **M = 256** | 6,952 | 0.15 | 0.64 | 40 |

| 5.8 GHz Carrier Frequency | | | | |
|---|---|---|---|---|
| **QAM Order** | **Symbol Rate (kS/s)** | **$\alpha_{RRC}$** | **EVM (% RMS)** | **MER (dB)** |
| **M = 4** | 160 | 0.25 | 0.89 | 41 |
| | 800 | 0.25 | 0.85 | 41 |
| | 4,090 | 0.22 | 1.04 | 40 |
| **M = 16** | 17,600 | 0.25 | 1.49 | 34 |
| | 32,000 | 0.25 | 2.00 | 31 |
| **M = 64** | 5,360 | 0.15 | 0.83 | 38 |
| | 6,952 | 0.15 | 0.90 | 37 |
| | 40,990 | 0.22 | 2.06 | 30 |
| **M = 256** | 6,952 | 0.15 | 1.00 | 36 |

# Measurement Speed

Measurement time is made up of tuning time plus analysis time. Tuning time includes programming time, frequency settling time, and amplitude settling time. Programming time partially overlaps frequency settling time and amplitude settling time. Measurement time is dependent on the specific measurement settings used.

## Frequency Settling Time[1]

(Nominal)

| Accuracy | Frequency Settling Time* |
|---|---|
| $0.1 \times 10^{-6}$ of final frequency | 1.5 ms |
| $0.01 \times 10^{-6}$ of final frequency | 6.5 ms |
| *Typical for tuning between any two frequencies. Settling time can be reduced using a wide downconverter loop bandwidth. | |

## Amplitude Settling Time[1]

(Nominal)

| Accuracy | Amplitude Settling Time |
|---|---|
| 0.1 dB of final amplitude | 62.5 µs*, 1.2 ms |
| *Mechanical attenuator not used. | |

## Tuning Time

(Nominal)

| Accuracy | Tuning Time* | |
|---|---|---|
| | Narrow Loop Bandwidth | Wide Loop Bandwidth |
| $0.1 \times 10^{-6}$ of final frequency, 0.1 dB of final amplitude | 7.0 ms | 3.7 ms |
| $0.01 \times 10^{-6}$ of final frequency, 0.1 dB of final amplitude | 14.1 ms | 10.0 ms |
| *Typical for tuning between any two frequencies. | | |

[1] Frequency and amplitude settling times partially overlap.

## Analysis Time vs. Span

(Nominal)

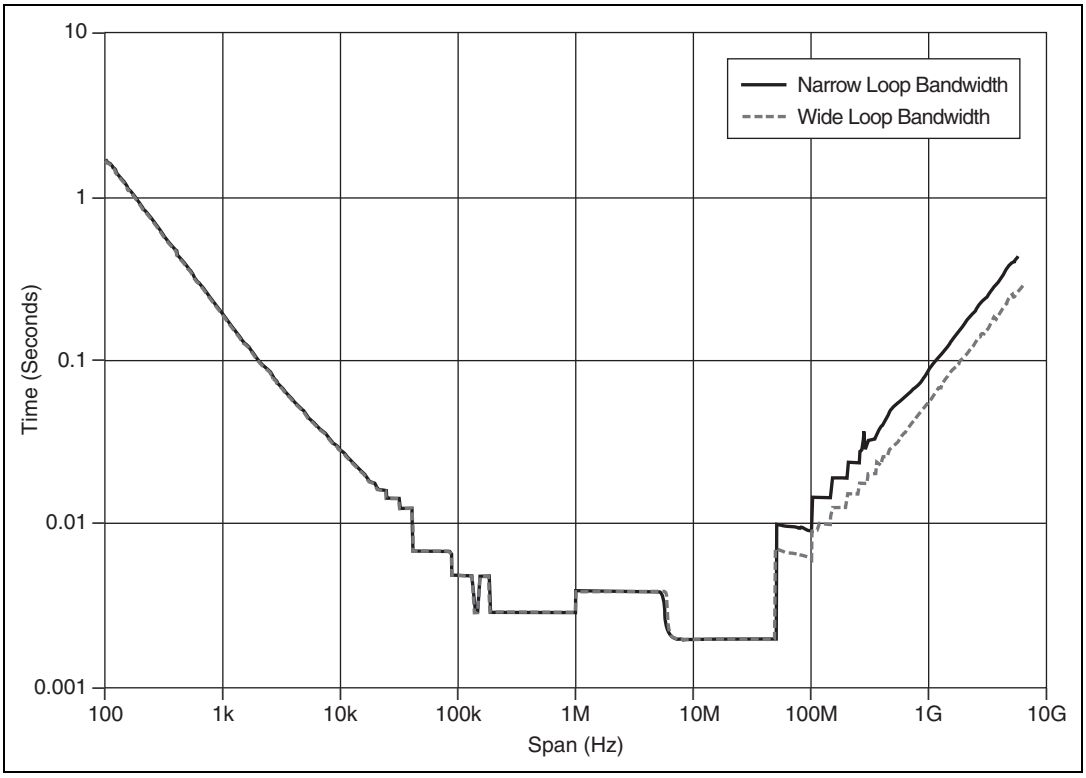


**Figure 6.** NI 5663 Measurement Time

*Analysis Time vs. Span* was measured with a tuned frequency ≥330 MHz. Below 1 MHz span, 190 frequency points were measured; above 1 MHz span, 1,000 frequency points were measured. Analysis time includes acquisition, FFT analysis, and data transfer time. For spans >50 MHz analysis time also includes tuning time.

## Data Streaming[1]

(Nominal)

Maximum continuous transfer rate.....300 MB/s

[1] Refer to the *NI PXIe-5622 Specifications* for more information about data streaming. Data streaming specification measured using the NI PXIe-1065 chassis and the NI PXIe-8130 controller. Performance is system dependent.

# Input and Output Characteristics

(Nominal)

## IF/Baseband

(NI 5622 IF digitizer)

Resolution ..... 16 bits

System IF frequency range ..... 187.5 MHz ±25 MHz[1] or
53 MHz ±10 MHz[2]

Sample rate..... 150 MS/s

Digital downconverter
(OSP) bandwidth..... Adjustable between 60 MHz and 0.9 kHz using 150 MS Sample clock timebase.[3]

Onboard memory ..... 64 MB
256 MB

**Note** Refer to the *NI PXIe-5622 Specifications* document for additional IF/baseband and onboard signal processing (OSP) specifications.

## NI 5601 RF Downconverter Module

RF IN

Connector..... SMA female

Impedance..... 50 Ω, nominal

Coupling..... AC

Maximum safe DC input voltage.... ±5 V, nominal

### Maximum Safe Continuous RF Power

| RF Attenuation | Level |
|---|---|
| Enabled (≥8 dB) | +30 dBm |
| Disabled (0 dB) | +20 dBm |

[1] When input RF frequency is ≥10 MHz to <120 MHz, and ≥330 MHz to 6.6 GHz.

[2] When input RF frequency is ≥120 MHz to <330 MHz.

[3] The OSP bandwidth is 0.4 times the sample rate in real acquisition mode, where sample rate varies between 150 MS/s to 2.289 kS/s.

## Voltage Standing Wave Ratio (VSWR)

(Nominal)

| Attenuation | Frequency | VSWR |
|---|---|---|
| Enabled (≥8 dB)* | 10 MHz to <1.3 GHz | 1.4:1 |
| | 1.3 GHz to <5.0 GHz | 2.0:1 |
| | 5.0 GHz to 6.6 GHz | 3.0:1 |
| Disabled (0 dB) | 10 MHz to <5.0 GHz | 2.0:1 |
| | 5.0 GHz to 6.6 GHz | 3.0:1 |
| *Available in 1 dB steps. | | |

IF OUT

Connector .....SMA female

Impedance.....50 Ω, nominal

Coupling .....AC

Amplitude.....4 dBm, digitizer full-scale, –6 dBm, nominal, with reference level input

Maximum IF output level.....+23 dBm

Maximum reverse power level .....+20 dBm

Maximum safe DC voltage.....±5 V

IF center frequency.....53 MHz,187.5 MHz[1], or Bypass[2], nominal

VSWR

53 MHz.....2.1:1

187.5 MHz.....1.65:1

Bypass .....1.4:1[2]

[1] Dependent on frequency range of RF input signal.

[2] 10 MHz to 300 MHz

LO IN and LO OUT

Connector ..... SMA female

Impedance ..... 50 Ω, nominal

Coupling ..... AC

Frequency ..... 173 MHz to 6.4125 GHz, nominal

Amplitude ..... 0 dBm, nominal, input and output

Maximum safe RF input level ..... +20 dBm

Maximum reverse power level ..... +20 dBm

Maximum safe DC voltage ..... ±5 V

LO input to output noise figure ..... 15 dB, nominal

## NI 5622 IF Digitizer Module

IF IN

Connector ..... SMA female

Impedance ..... 50 Ω

PFI 1

Connector ..... SMB

Impedance ..... 150 kΩ

CLK IN

Connector ..... SMA female

Impedance ..... 50 Ω

Input amplitude, sine wave ..... 0.63 $V_{pp}$ to 2.8 $V_{pp}$ (0 dBm to +13 dBm)

Input amplitude, square wave ..... 0.25 $V_{pp}$ to 2.8 $V_{pp}$

Maximum input overload ..... 6.3 $V_{pp}$ (+20 dBm)

CLK OUT

Connector ..... SMA

Output impedance ..... 50 Ω

Output amplitude, 50 Ω load ..... >+10 dBm

Output amplitude, 1 kΩ load ..... >2 $V_{pp}$

## NI 5652 LO Source Module

RF OUT

Connector .....SMA Female

Impedance.....50 Ω

REF IN/OUT

Connector .....SMA Female

Impedance.....50 Ω

Input amplitude.....–5 dBm to +15 dBm

Maximum safe input level.....+16 dBm

Maximum DC input voltage.....±5 V

Input frequency range.....10 MHz ± 100 Hz

# Power Requirements

(Nominal)

| Module | +3.3 VDC | +5 VDC | +12 VDC | –12 VDC |
|---|---|---|---|---|
| NI 5601<br>RF downconverter | 640 mA | — | 740 mA | — |
| NI 5622<br>IF digitizer | 1.75 A | — | 2.25 A | — |
| NI 5652<br>LO source | 500 mA | 700 mA | 550 mA | 90 mA |
| **Note**: Voltages ±5%. | | | | |

# Calibration

Interval.....1 year for NI 5601, NI 5622, NI 5652

# Hardware Front Panels

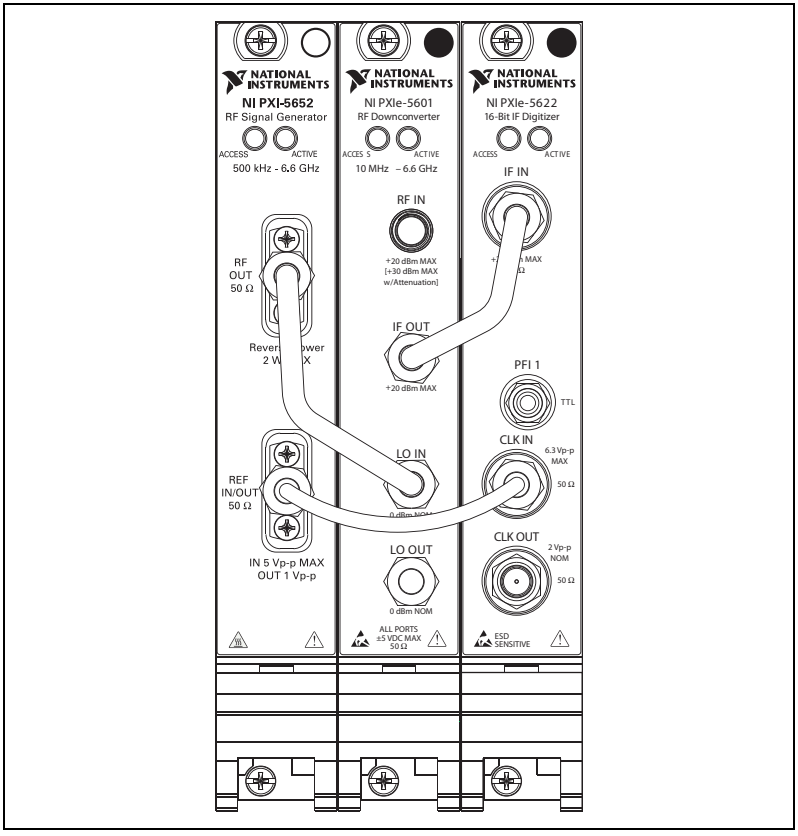


**Figure 7.** NI 5663 Front Panels

# Physical Dimensions

NI 5601 (1 PXIe slot) .....3U, One Slot,
PXI Express module
21.6 cm × 2.0 cm × 13.0 cm
(8.5 in. × 0.8 in. × 5.1 in.)

NI 5622 (1 PXIe slot) .....3U, One Slot,
PXI Express module
21.6 cm × 2.0 cm × 13.0 cm
(8.5 in. × 0.8 in. × 5.1 in.)

NI 5652 (1 PXI slot) .....3U, One Slot, PXI/cPCI module
21.6 cm × 2.0 cm × 13.0 cm
(8.5 in. × 0.8 in. × 5.1 in.)

Weight

- NI 5601 .....454 g (16.0 oz)
- NI 5622 .....376 g (13.3 oz)
- NI 5652 .....415 g (14.6 oz)
- Combined unit .....1,245 g (43.9 oz)

# Environmental

Specifications in this document are guaranteed under the following specified environmental conditions unless otherwise stated.

Altitude .....0 m to 2,000 m (at 25 °C ambient temperature)

Pollution Degree .....2

Indoor use only.

## Operating Environment

Warm-up time ..... 30 minutes

Ambient temperature range..... 0 °C to 55 °C
(Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL PRF-28800F Class 3 low temperature limit and MIL PRF-28800F Class 2 high temperature limit.)

Relative humidity range ..... 10% to 90%, noncondensing
(Tested in accordance with IEC 60068-2-56.)

## Storage Environment

Ambient temperature range..... –41 °C to +71 °C
(Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL PRF-28800F Class 3 limits.)

Relative humidity range ..... 5% to 95%, noncondensing
(Tested in accordance with IEC 60068-2-56.)

## Shock and Vibration

Operating Shock..... 30 g peak, half-sine, 11 ms pulse
(Tested in accordance with IEC 60068-2-27. Meets MIL PRF-28800F Class 2 limits.)

Random Vibration

Operating ..... 5 Hz to 500 Hz, 0.3 $g_{rms}$

Non-operating ..... 5 Hz to 500 Hz, 2.4 $g_{rms}$
(Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL PRF-28800F, Class 3.)

# Safety, Electromagnetic Compatibility, and CE Compliance

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

**Note** For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

## Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

**Note** For EMC compliance, operate this device according to product documentation.

## CE Compliance CE

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

**Note** Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

# Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

## Waste Electrical and Electronic Equipment (WEEE)

**EU Customers** At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

## 电子信息产品污染控制管理办法 （中国 RoHS）

**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。
关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。
(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

374957B-01 Aug09