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**PXI-6733**

# NI 6731/6733 Specifications

このドキュメントの日本語版については、[ni.com/manuals](http://ni.com/manuals) を参照してください。  
(For a Japanese language version, go to [ni.com/manuals](http://ni.com/manuals).)

This document lists the specifications for the NI 6731/6733 analog output devices. The following specifications are typical at 25 °C unless otherwise noted.



**Note** With NI-DAQmx, National Instruments has revised its terminal names so they are easier to understand and more consistent among NI hardware and software products. The revised terminal names used in this document are usually similar to the names they replace. For a complete list of Traditional NI-DAQ terminal names and their NI-DAQmx equivalents, refer to the *Terminal Name Equivalents* section of Chapter 2, *I/O Connector*, of the *Analog Output Series User Manual*.

## Analog Output

### Output Characteristics

Number of channels

NI 6731 ..... 4 voltage outputs

NI 6733 ..... 8 voltage outputs

Resolution ..... 16 bits, 1 in 65,536

Max update rate

Number of Channels	Max Update Rate	
	Using Local FIFO (kS/s)*	Using Host PC Memory (kS/s)†
1	1,000	1,000
2	1,000	1,000
3	1,000	1,000
4	1,000	1,000
5	1,000	1,000
6	952	1,000

Number of Channels	Max Update Rate	
	Using Local FIFO (kS/s)*	Using Host PC Memory (kS/s)†
7	833	869
8	740	769

\* These numbers apply to continuous waveform generation, which allows for the time it takes to reset the FIFO to the beginning when cycling through it. This additional time, about 200 ns, is not incurred when using host PC memory for waveform generation. Max update rate in FIFO mode does not change regardless of the number of devices in the system.

† These results were measured using a PCI-6711/6713 device with a 90 MHz Pentium machine. These numbers may change when using more devices or when other CPU or bus activity occurs.

Type of DAC ..... Double-buffered, multiplying

FIFO buffer size

NI 6731 ..... 8,192 samples

NI 6733 ..... 16,384 samples

DMA channels ..... 3

Data transfers ..... DMA, interrupts, programmed I/O

DMA modes ..... Scatter-gather

## Accuracy Information

Nominal Range at Full Scale (V)	Absolute Accuracy				
	% of Reading			Offset (mV)	Temp Drift (%/°C)
	24 Hours	90 Days	1 Year		
±10	0.0044%	0.0052%	0.0061%	±1.027	0.0006%

Absolute accuracy = (% of Reading × Voltage) + Offset + (Temp Drift × Voltage)  
**Note:** Temp drift applies only if ambient is greater than ±10 °C of previous external calibration.

## Transfer Characteristics

### Relative accuracy (INL)

After calibration .....±2.2 LSB max  
 Before calibration .....±2.2 LSB max

### DNL

After calibration .....±1.0 LSB max  
 Before calibration .....±1.0 LSB max

Monotonicity ..... 16 bits guaranteed after calibration

### Offset error

After calibration .....±168 µV max  
 Before calibration .....±40 mV max

### Gain error (relative to internal reference)

After calibration .....±30 ppm of output max  
 Before calibration .....±9,000 ppm of output max

### Gain error (relative to external reference)

.....+0.1% of output max, not adjustable

## Voltage Output

Ranges .....±10 V, ±EXT REF

Output coupling .....DC

Output impedance .....0.1 Ω max

Current drive .....±5 mA max

Output stability .....Any passive load, up to 1,500 pF

Protection .....Short-circuit to ground

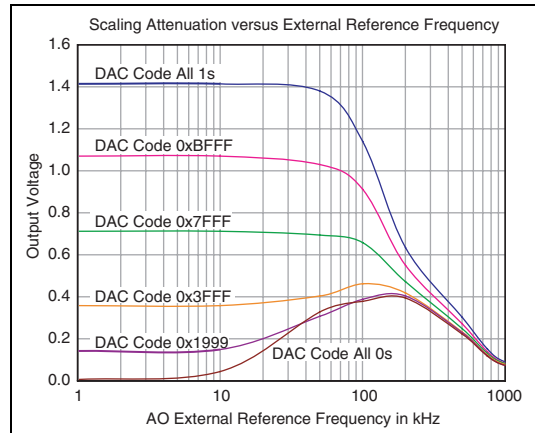
Power-on state .....0 V (±200 mV)

## External Reference Input

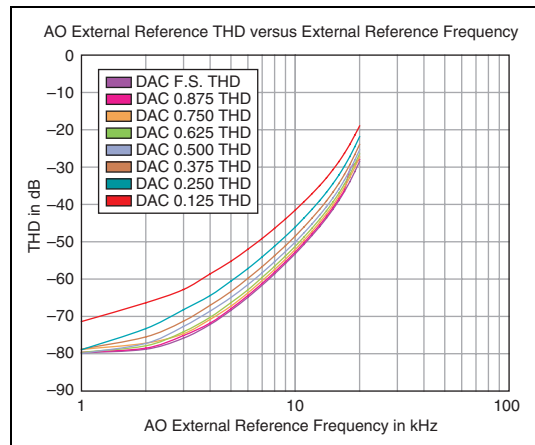
Range .....±11 V

Overvoltage protection .....±25 V powered on,  
 ±15 V powered off

Input impedance ..... 1 MΩ



**Figure 1.** Scaling Attenuation versus External Reference Frequency



**Figure 2.** AO External Reference THD versus External Reference Frequency

## Dynamic Characteristics

Slew rate .....	15 V/ $\mu$ s
Noise .....	80 $\mu$ V <sub>rms</sub> , DC to 1 MHz
Channel crosstalk .....	-95 dB with SH68-68-EP cable (generating a 10 V, 10 point sinusoidal at 100 kHz on the reference channel)
Settling time .....	2.8 $\mu$ s to $\pm$ 1.0 LSB accuracy
Total harmonic distortion .....	-90 dB typ (generating a 10 V, 1,000 point, 750 Hz sine wave, summing 9 harmonics)

## Stability

Offset temperature coefficient .....	$\pm$ 35 $\mu$ V/ $^{\circ}$ C
Gain temperature coefficient	
Internal reference .....	$\pm$ 6.5 ppm/ $^{\circ}$ C
External reference .....	$\pm$ 5.0 ppm/ $^{\circ}$ C
Onboard calibration reference	
Level .....	5.000 V (1.0 mV) (actual value stored in EEPROM)
Temperature coefficient .....	$\pm$ 0.6 ppm/ $^{\circ}$ C max
Long-term stability .....	$\pm$ 15 ppm/ $\sqrt{1,000}$ h

## Digital I/O

Number of channels .....	8 input/output
Compatibility .....	TTL/CMOS
Digital logic levels	

Level	Min	Max
Input low voltage	0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Input low current ( $V_{in} = 0$ V)	—	-320 $\mu$ A
Input high current ( $V_{in} = 5$ V)	—	10 $\mu$ A
Output low voltage ( $I_{OL} = 24$ mA)	—	0.4 V
Output high voltage ( $I_{OH} = -13$ mA)	4.35 V	—

Power-on state .....	Input (high-impedance)
Data transfers .....	DMA, interrupts, programmed I/O
Input buffer .....	2,000 bytes

Output buffer .....	2,000 bytes
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## Timing I/O

Number of channels .....	2 up/down counter/timers, 1 frequency scaler
Resolution	
Counter/timers .....	24 bits
Frequency scaler .....	4 bits
Compatibility .....	TTL/CMOS
Base clocks available	
Counter/timers .....	20 MHz, 100 kHz
Frequency scaler .....	10 MHz, 100 kHz
Base clock accuracy .....	$\pm$ 0.01% over operating temperature
Max source frequency .....	20 MHz
Min source pulse duration .....	10 ns, edge-detect mode
Min gate pulse duration .....	10 ns, edge-detect mode
Data transfers .....	DMA, interrupts, programmed I/O
DMA modes .....	Scatter-gather

## Triggers

### Digital Trigger

Purpose	
Analog output .....	Start trigger, gate, clock
Counter/timers .....	Source, gate
Source .....	PFI <0..9>
Compatibility .....	TTL
Response .....	Rising or falling edge
Pulse width .....	10 ns min

### RTSI Bus (PCI Only)

Trigger lines <0..6> .....	7
RTSI clock .....	1

### PXI Trigger Bus (PXI Only)

Trigger lines <0..5> .....	6
Star trigger .....	1
Clock .....	1

## Bus Interface

NI PCI-6731/6733 .....	5 V PCI master, slave
NI PXI-6733 .....	PXI/CompactPCI master, slave

## Power Requirement

NI 6731	
+5 VDC ( $\pm 5\%$ ).....	0.80 A typ, 1.25 A max
+3.3 VDC ( $\pm 5\%$ ).....	125 mA typ, 250 mA max
Power available at I/O connector .....	+4.65 to +5.25 VDC at 1 A
NI 6733	
+5 VDC ( $\pm 5\%$ ).....	1.25 A typ, 1.8 A max
+3.3 VDC ( $\pm 5\%$ ).....	125 mA typ, 250 mA max
Power available at I/O connector .....	+4.65 to +5.25 VDC at 1 A

## Physical

Dimensions (not including connectors)	
NI PCI-6731/6733.....	17.5 × 10.7 cm (6.87 × 4.2 in.)
NI PXI-6733 .....	16 × 10 cm (6.3 × 3.9 in.)
I/O connector.....	68-pin male SCSI-II type

## Maximum Working Voltage

Maximum working voltage refers to the signal voltage plus the common-mode voltage.

Channel-to-earth.....	$\pm 11$ V, Installation Category I
Channel-to-channel .....	$\pm 22$ V, Installation Category I

## Environmental

The NI 6731/6733 is intended for indoor use only.

Operating temperature.....	0 to 50 °C
Storage temperature.....	-20 to 70 °C
Humidity.....	5 to 90% RH, noncondensing
Maximum altitude .....	2,000 meters
Pollution Degree.....	2



**Note** Clean the device with a soft, non-metallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

## Safety

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](http://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 with shielded cabling.

## CE Compliance

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

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; 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](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

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## Device Pinouts

AO GND	34	68	NC
NC	33	67	AO GND
AO GND	32	66	AO GND
AO GND	31	65	NC
NC	30	64	AO GND
AO GND	29	63	AO GND
NC	28	62	NC
AO GND	27	61	AO GND
AO GND	26	60	NC
AO 3	25	59	AO GND
AO GND	24	58	AO GND
AO GND	23	57	AO 2
AO 0	22	56	AO GND
AO 1	21	55	AO GND
AO EXT REF	20	54	AO GND
P0.4	19	53	D GND
D GND	18	52	P0.0
P0.1	17	51	P0.5
P0.6	16	50	D GND
D GND	15	49	P0.2
+5 V	14	48	P0.7
D GND	13	47	P0.3
D GND	12	46	NC
PFI 0	11	45	EXT STROBE
PFI 1	10	44	D GND
D GND	9	43	PFI 2
+5 V	8	42	PFI 3/CTR 1 SOURCE
D GND	7	41	PFI 4/CTR 1 GATE
PFI 5/AO SAMP CLK	6	40	CTR 1 OUT
PFI 6/AO START TRIG	5	39	D GND
D GND	4	38	PFI 7
PFI 9/CTR 0 GATE	3	37	PFI 8/CTR 0 SOURCE
CTR 0 OUT	2	36	D GND
FREQ OUT	1	35	D GND

NC = No Connect

**Figure 3.** NI 6731 68-Pin AO I/O Connector Pin Assignments

AO GND	34	68	NC
NC	33	67	AO GND
AO GND	32	66	AO GND
AO GND	31	65	AO 7
AO 6	30	64	AO GND
AO GND	29	63	AO GND
AO 5	28	62	NC
AO GND	27	61	AO GND
AO GND	26	60	AO 4
AO 3	25	59	AO GND
AO GND	24	58	AO GND
AO GND	23	57	AO 2
AO 0	22	56	AO GND
AO 1	21	55	AO GND
AO EXT REF	20	54	AO GND
P0.4	19	53	D GND
D GND	18	52	P0.0
P0.1	17	51	P0.5
P0.6	16	50	D GND
D GND	15	49	P0.2
+5 V	14	48	P0.7
D GND	13	47	P0.3
D GND	12	46	NC
PFI 0	11	45	EXT STROBE
PFI 1	10	44	D GND
D GND	9	43	PFI 2
+5 V	8	42	PFI 3/CTR 1 SOURCE
D GND	7	41	PFI 4/CTR 1 GATE
PFI 5/AO SAMP CLK	6	40	CTR 1 OUT
PFI 6/AO START TRIG	5	39	D GND
D GND	4	38	PFI 7
PFI 9/CTR 0 GATE	3	37	PFI 8/CTR 0 SOURCE
CTR 0 OUT	2	36	D GND
FREQ OUT	1	35	D GND

NC = No Connect

**Figure 4.** NI 6733 68-Pin AO I/O Connector Pin Assignments

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