

# NI 6711/6713/DAQCard-6715 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 6711/6713 and NI DAQCard-6715 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 (Legacy) 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 6711 ..... 4 voltage outputs

NI 6713/DAQCard-6715 ..... 8 voltage outputs

Resolution ..... 12 bits, 1 in 4,096

Max update rate

Number of Channels	Max Update Rate (NI 6711/6713)		Max Update Rate (NI DAQCard-6715)	
	Using Local FIFO (kS/s)*	Using Host PC Memory (kS/s)†	Using Local FIFO (kS/s)	Using Host PC Memory (kS/s)‡
1	1,000	1,000	1,000	833
2	1,000	1,000	850	417
3	1,000	1,000	750	282
4	1,000	1,000	650	211
5	1,000	1,000	600	169
6	952	1,000	550	141

Number of Channels	Max Update Rate (NI 6711/6713)		Max Update Rate (NI DAQCard-6715)	
	Using Local FIFO (kS/s)*	Using Host PC Memory (kS/s)†	Using Local FIFO (kS/s)	Using Host PC Memory (kS/s)‡
7	833	869	510	121
8	740	769	480	105

\* 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.

‡ These results were measured using a DAQCard-6715 with a 266 MHz Pentium II machine. These numbers may change when using more devices or when other CPU or bus activity occurs.

Type of DAC	Data transfers
NI 6711/6713 .....Double-buffered, multiplying	NI 6711/6713..... DMA, interrupts, programmed I/O
NI DAQCard-6715 .....Serial, multiplying	NI DAQCard-6715 ..... Interrupts, programmed I/O
FIFO buffer size	DMA modes
NI 6711/DAQCard-6715 .....8,192 samples	(NI 6711/6713 only) ..... Scatter-gather
NI 6713 .....16,384 samples	
DMA channels	
(NI 6711/6713 only).....3	

## Accuracy Information

Nominal Range at Full Scale (V)	Absolute Accuracy				
	% of Reading			Offset (mV)	Temp Drift (%/°C)
	24 Hours	90 Days	1 Year		
±10	0.0177%	0.0197%	0.0219%	±5.933	0.0005%

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

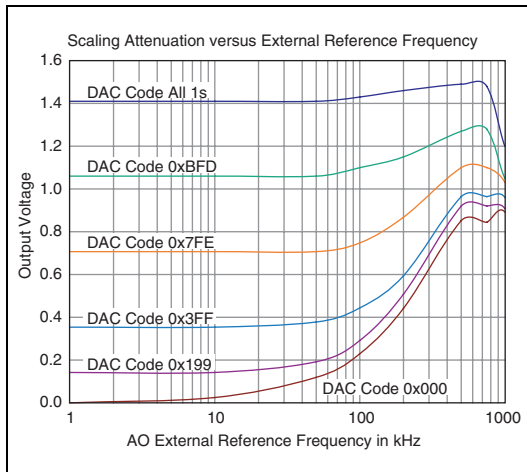
Relative accuracy (INL)	Offset error
After calibration .....±0.3 LSB typ, ±0.5 LSB max	After calibration ..... ±1.0 mV typ, ±5.9 mV max
Before calibration .....±4.0 LSB max	Before calibration ..... ±200 mV max
DNL	Gain error (relative to internal reference)
After calibration .....±0.3 LSB typ, ±1.0 LSB max	After calibration ..... ±0.01% of output max
Before calibration .....±3.0 LSB max	Before calibration ..... ±0.5% of output max
Monotonicity .....12 bits guaranteed after calibration	Gain error (relative to external reference) ..... +0.0 to +0.67% of output max, not adjustable at >4 V

## Voltage Output

Ranges .....	$\pm 10$ V, $\pm$ EXT REF
Output coupling .....	DC
Output impedance .....	0.1 $\Omega$ max
Current drive .....	$\pm 5$ mA max
Output stability .....	Any passive load, up to 1,500 pF
Protection .....	Short-circuit to ground
Power-on state .....	0 V ( $\pm 200$ mV)

## External Reference Input

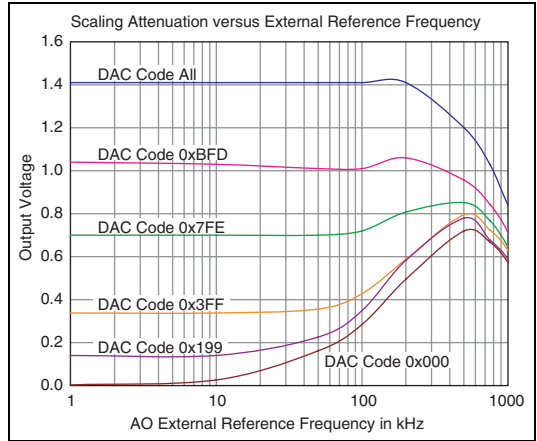
Range .....	$\pm 11$ V
Overvoltage protection .....	$\pm 25$ V powered on, $\pm 15$ V powered off
Input impedance .....	10 k $\Omega$



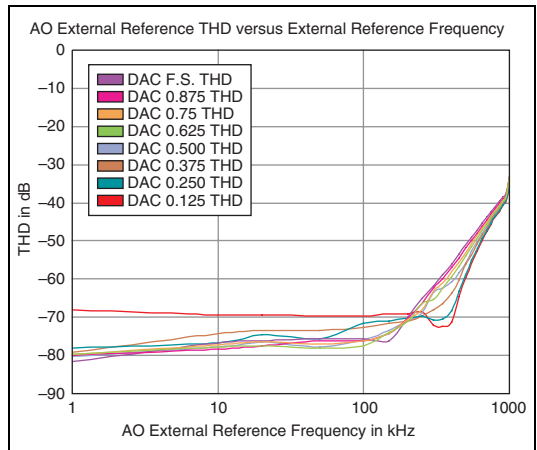
**Figure 1.** NI 6711/6713 Scaling Attenuation versus External Reference Frequency



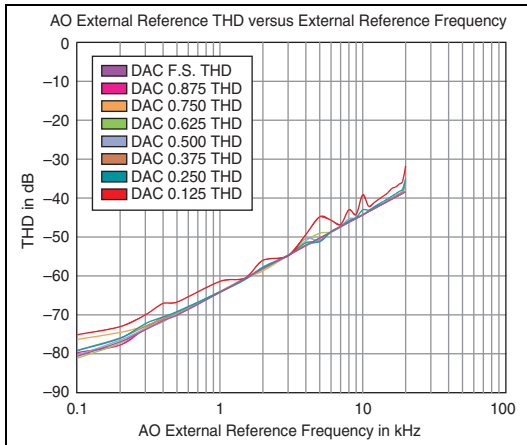
**Note (NI 6711/6713 Only)** External reference input is always a 1.414 V peak-to-peak sine wave.



**Figure 2.** NI DAQCard-6715 Scaling Attenuation versus External Reference Frequency



**Figure 3.** NI 6711/6713 AO External Reference THD versus External Reference Frequency



**Figure 4.** NI DAQCard-6715 AO External Reference THD versus External Reference Frequency

## Dynamic Characteristics

Slew rate .....	20 V/ $\mu$ s
Noise	
NI 6711/6713 .....	200 V <sub>rms</sub> , DC to 1 MHz
NI DAQCard-6715 .....	400 $\mu$ V <sub>rms</sub> , DC to 1 MHz
Glitch energy (at mid-scale transition, NI DAQCard-6715 only)	
Magnitude	
Reglitching disabled .....	$\pm$ 20 mV
Reglitching enabled .....	$\pm$ 4 mV
Duration .....	1.5 $\mu$ s
Channel crosstalk	
NI 6711/6713 .....	-70 dB with SH68-68-EP cable (generating a 10 V, 10 point sinusoidal at 100 kHz on the reference channel)
NI DAQCard-6715 .....	-60 dB (generating a 10 V, 10 point sinusoidal at 100 kHz on the reference channel)
Settling time .....	3.0 $\mu$ s to $\pm$ 0.5 LSB accuracy
Total harmonic distortion .....	-80 dB typ (generating a 10 V, 1,000 point, 750 Hz sine wave, summing 9 harmonics)

## Stability

Offset temperature coefficient .....	$\pm$ 50 $\mu$ V/ $^{\circ}$ C
Gain temperature coefficient	
Internal reference .....	$\pm$ 25 ppm/ $^{\circ}$ C
External reference .....	$\pm$ 25 ppm/ $^{\circ}$ C
Onboard calibration reference	
Level .....	5.000 V ( $\pm$ 2.5 mV) (actual value stored in EEPROM)
Temperature coefficient .....	$\pm$ 5.0 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 .....

## Timing I/O

Number of channels .....

Resolution

Counter/timers .....

Frequency scaler .....

Compatibility .....

Base clocks available

Counter/timers .....

Frequency scaler .....

Base clock accuracy .....

Max source frequency.....	20 MHz
External source selections (NI DAQCard-6715 only).....	PFI <0..9>, software-selectable
External gate selections (NI DAQCard-6715 only).....	PFI <0..9>, software-selectable
Min source pulse duration.....	10 ns, edge-detect mode
Min gate pulse duration .....	10 ns, edge-detect mode
Data transfers	
NI 6711/6713.....	DMA, interrupts, programmed I/O
NI DAQCard-6715.....	Interrupts, programmed I/O
DMA modes (NI 6711/6713 only) .....	Scatter-gather

## Triggers

### Digital Trigger

Purpose	
Analog output .....	Start trigger, gate, clock
Counter/timers .....	Source, gate
Source .....	PFI <0..9>
Slope (NI DAQCard-6715 only).....	Positive or negative; software-selectable
Compatibility .....	TTL
Response .....	Rising or falling edge
Pulse width.....	10 ns min

### RTSI Bus (PCI-6711/6713 Only)

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

### PXI Trigger Bus (PXI-6711/6713 Only)

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

### Bus Interface

NI PCI-6711/6713.....	5 V PCI master, slave
NI PXI-6711/6713 .....	PXI/CompactPCI master, slave

NI DAQCard-6715 .....	16-bit PC Card (PCMCIA)
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## Power Requirement

NI 6711	
+5 VDC ( $\pm 5\%$ ) .....	0.80 A typ, 1.0 A max
Power available at I/O connector .....	+4.65 to +5.25 VDC at 1 A
NI 6713	
+5 VDC ( $\pm 5\%$ ) .....	1.25 A typ, 1.5 A max
Power available at I/O connector .....	+4.65 to +5.25 VDC at 1 A
NI DAQCard-6715	
+5 VDC ( $\pm 5\%$ ) .....	160 mA typ, 250 mA max plus any current used from the I/O connector

## Physical

Dimensions (not including connectors)

NI PCI-6711/6713.....	17.5 × 10.7 cm (6.87 × 4.2 in.)
NI PXI-6711/6713 .....	16 × 10 cm (6.3 × 3.9 in.)
NI DAQCard-6715 .....	Type II PC Card

I/O connector

NI 6711/6713 .....	68-pin male SCSI-II type
NI DAQCard-6715 .....	68-pin female Honda connector

## 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 6711/6713/DAQCard-6715 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:

- 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](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

National Instruments 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](http://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](http://ni.com/environment/weee.htm).

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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 5.** NI 6711 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 6.** NI 6713/DAQCard-6715 68-Pin AO I/O Connector Pin Assignments

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