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Requirements and Compatibility | Ordering Information | Detailed Specifications
For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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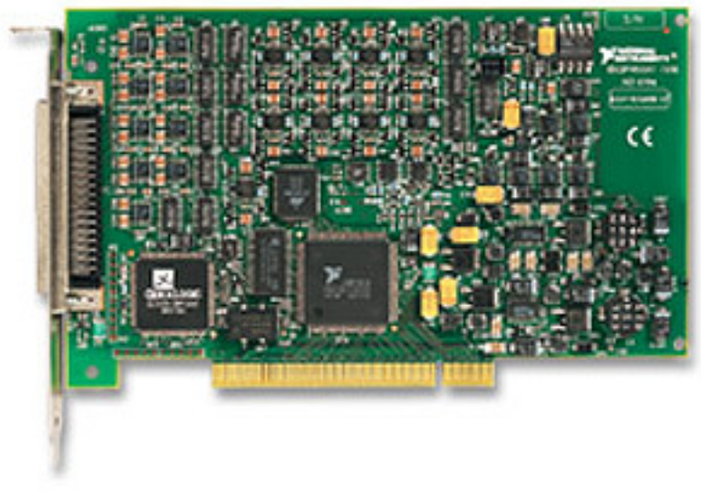
Software-Timed Analog Output – 16-Bit, 16 or 32 Channels



Overview

NI 670x devices are software-timed voltage and current output devices for PCI and PXI. With NI 6704 devices, you get 16 voltage outputs and 16 current outputs that you can use at the same time independently, as well as eight digital I/O (DIO) lines. You can independently set each output from ±10 V or 0 to 20 mA. The NI 6703 delivers 16 voltage outputs in addition to eight DIO lines.

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Requirements and Compatibility

OS Information

- Windows 2000/XP
- Windows Vista x64/x86

Driver Information

- NI-DAQmx

Software Compatibility

- ANSI C
- LabVIEW
- LabWindows/CVI
- Measurement Studio
- Visual Basic
- Visual Studio
- Visual Studio .NET

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Comparison Tables

Product	Bus	Analog Outputs	Resolution	Output Rate	Output Range	Digital I/O	Current Sinks
NI 6703	PCI	16 voltage	16 bits	Static	±10 V	8	-
NI 6704	PCI, PXI	16 voltage, 16 current	16 bits	Static	±10 V, 0 to 20 mA	8	3

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Application and Technology

Voltage Output Channels

All 16 voltage outputs on the NI 6703 and NI 6704 devices are identical. You can set each channel for a bipolar voltage output of ±10 V. Each output is accurate to ±1 mV.

Current Output Channels (NI 6704 only)

All 16 current outputs are identical. You can set each channel to source current from 0 to 20 mA – the channels do not sink current. The channels source current without requiring an external excitation source. Each output is accurate to ±2 µA.

I/O Connector

The analog outputs are available at a 68-pin SCSI II shielded connector. VCH<0..15> are the voltage output channels. ICH<16..31> are the current output channels. Each channel is referenced to a ground line, AO GND<0...31>, which is shared between a voltage and current channel. A fused 5 VDC power signal from the PCI or PXI bus is available at the I/O connector as well.

NI 670x Hardware Block Diagram

Accessories

National Instruments recommends the NI SCB-68 shielded connector block and NI SH68-68-D1 shielded cable for use with NI 670x devices.

I/O Connector Blocks

SCB-68 – Shielded I/O connector block for rugged, very low-noise signal termination. It houses silk-screened component locations for easy addition of simple signal conditioning circuitry for your AO channels.

SCB-68 776844-01
Dimensions – 19.5 by 15.2 by 4.5 cm (7.7 by 6.0 by 1.8 in.)

CB-68LP, CB-68LPR – 68 screw terminals for easy connection of field signals to AO devices. They include one 68-pin male connector for direct connection to 68-pin cables. The connector blocks include standoffs for use on a desktop or for mounting in a custom panel. The CB-68LP has a vertical mounted 68-pin connector. The CB-68LPR has a right-angle mounted connector and can be used with the CA-1000.

CB-68LP 777145-01
Dimensions – 14.35 by 10.74 cm (5.65 by 4.23 in.)

CB-68LPR.....777145-02
Dimensions – 7.62 by 16.19 cm (3.00 by 6.36 in.)

Shielded I/O Cables

SH68-68-D1 – Similar to the SH68-68-EP cable but dedicated for use with NI 670x devices.
1 m 183432-01
2 m 183432-02

Ribbon I/O Cables

R6868 – 68-conductor flat ribbon cable terminated with two 68-pin connectors. Use this cable to connect the NI 670x, NI PCI-671x, NI PXI-671x, and NI 673x devices to low-cost 68-pin accessories.
1 m 182482-01

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Ordering Information

For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
NI PCI-6703			
NI PCI-6703 Each NI PCI-6703 requires: 1 Cable, 1 Connector Block	778316-01	**Cable:** Shielded - SH68-68-D1 Cable (2m) ***Also available: Unshielded* **Connector Block:** Screw Terminals - SCB-68	183432-02 776844-01
NI PCI-6704			
NI PCI-6704 Each NI PCI-6704 requires: 1 Cable, 1 Connector Block	777306-01	**Cable:** Shielded - SH68-68-D1 Cable (2m) ***Also available: Unshielded* **Connector Block:** Screw Terminals - SCB-68	183432-02 776844-01
NI PXI-6704			
NI PXI-6704 Each NI PXI-6704 requires: 1 Cable, 1 Connector Block	777796-01	**Cable:** Shielded - SH68-68-D1 Cable (2m) ***Also available: Unshielded* **Connector Block:** Screw Terminals - SCB-68	183432-02 776844-01

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Software Recommendations

NI LabVIEW Professional Development System for Windows

- Easy-to-use graphical development environment
- Tight integration with a wide range of measurement hardware
- Rapid user interface development for displaying live data
- Extensive signal processing, analysis, and math functionality
- Source code control integration and code complexity metrics
- Support for Windows XP/Vista/7 (32-bit) and Windows Vista/7 (64-bit)

NI LabWindows™/CVI for Windows

- Real-time advanced 2D graphs and charts with support for Windows Vista/XP/2000
- Complete hardware compatibility with IVI, VISA, DAQ, GPIB, and serial
- Analysis tools for array manipulation, signal processing statistics, and curve fitting
- Simplified cross-platform communication with network variables
- Measurement Studio .NET tools (included in LabWindows/CVI Full only)
- The mark LabWindows is used under a license from Microsoft Corporation.

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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application

development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. NI offers a number of calibration services to help maintain the ongoing accuracy of your measurement hardware. These services allow you to be completely confident in your measurements, and help you maintain compliance to standards like ISO 9001, ANSI/NCSL Z540-1 and ISO/IEC 17025. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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Detailed Specifications

This document lists specifications for the NI PCI-6703 and NI PCI/PXI-6704. These specifications are valid for an ambient temperature of 0 to 55 °C, unless otherwise noted.

Analog Output	
Number of voltage channels	16
Number of current channels (NI 6704 only)	16
Resolution	16-bit
Recommended warm-up time	15 minutes
Transfer Characteristics	
INL	±1 LSB max
DNL	±1 LSB max
Monotonicity	16 bits, guaranteed
Voltage Output	
Range	±10.1 V
Output coupling	DC
Output impedance	0.1 Ω max
Current drive	±10 mA max
Load capacitance	10,000 pF max
Protection	Short-circuit to ground
Noise	100 μV_{rms}, DC to 1 MHz
Power-on state	Independent, user-defined values
Accuracy Information	

Output Type	Nominal Range at Full Scale	Absolute Accuracy					Absolute Accuracy at Full Scale	
		% of Reading			Offset	Temp Drift (%/°C)		
		24 Hours	90 Days	1 Year			24 Hours	1 Year
Voltage	±10.1 V	0.0019%	0.0026%	0.0035%	±710 µV	0.0001%	0.91 mV	1.07 mV
Current	0.1–20.2 mA	0.0034%	0.0088%	0.0150%	±1.435.0 nA	0.0002%	2.16 µA	4.48 µA

Note Temp drift applies only if ambient is greater than ±10 °C of previous external calibration. Absolute Accuracy at Full Scale calculations assume full scale output.

Current Output (NI 6704 Only)	
Range	0.1 to 20.2 mA
Type	Source, does not require external excitation source
Output impedance	1 GΩ min
Output compliance	0 to 10 V, not clamped
Noise	1 μA_{rms}, DC to 1 MHz
Protection	Short-circuit and open circuit
Power-up state	Independent, user-defined values

Dynamic Characteristics

Settling time (including channel latency)	
Accuracy	Time
±0.1%	1.8 ms typ, 5.6 ms max
±0.01%	3.6 ms typ, 11.2 ms max
±0.001%	14.4 ms typ, 48.8 ms max

Stability	
Offset temperature coefficient	
Voltage	5 µV/ °C
Current (NI 6704 only)	10 nA/ °C
Gain temperature coefficient	
Voltage	1 ppm/ °C
Current (NI 6704 only)	2 ppm/ °C

Digital I/O	
Number of channels	8
Compatibility	TTL
Power-on state	Input (high impedance)

Digital logic levels		
Level	Min	Max
Input low voltage	—	0.8 V
Input high voltage	2.0 V	—
Output low voltage	—	0.55 V, I_{OL} = 16 mA
Output high voltage	2.4 V, I_{OH} = 16 mA	—
Input leakage current	—	10 µA

Bus Interface

Type	Slave

Power Requirement

+5 V	
NI 6703	1.5 A
NI 6704	2.6 A
+12 V	70 mA
–12 V	70 mA

Note These power usage figures do not include the power used by external devices that are connected to the fused supply present on the I/O connector. They assume that all voltage and current outputs are fully loaded.

Power available at I/O connector	+4.5 to +5.25 VDC at 0.75 A

Physical

Dimensions (not including connectors)	
NI PCI-6703/6704	9.9 × 17.5 cm (3.9 × 6.9 in.)
NI PXI-6704	10 × 16 cm (3.9 × 6.3 in.)
I/O connector	68-pin male

Maximum Working Voltage

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

Channel-to-earth	11 V, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

Caution Do *not* use this device for connection to signals or for measurements within Measurement Categories II, III, or IV.

Environmental

The NI 6703/6704 is intended for indoor use only.

Operating temperature	0 to 55 °C

Storage temperature	–20 to 70 °C
Humidity	5 to 90% RH, noncondensing
Maximum altitude	2,000 m

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 the Online Product Certification section.

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 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note For the standards applied to assess the EMC of this product, refer to the Online Product Certification section.

Note For EMC compliance, operate this device with shielded cables.

CE Compliance

This product meets the essential requirements of applicable European Directives as follows:

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

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification , search by module 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 . 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 .

NI 6704 only

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