2.16 GHz Dual-Core Embedded Controllers for PXI and PXI Express

NI PXI-8106, NI PXIe-8106 *NEW!*

- Intel Core 2 Duo processor T7400 (2.16 GHz dual core)
- Up to 1 GB/s system and slot bandwidth (NI PXIe-8106)
- Up to 132 MB/s system and slot bandwidth (PXI-8106)
- 512 MB (1 x 512 MB DIMM) dual-channel 667 MHz DDR2 RAM standard, 4 GB (2 x 2 GB DIMMs) maximum
- Integrated I/O
  - 10/100/1000BaseTX Ethernet
  - 4 Hi-Speed USB ports
  - ExpressCard/34 slot
  - DVI-I video connector
  - GPIB (IEEE 488) controller
  - RS232 serial port
  - IEEE 1284 ECP/EPP parallel port
  - Integrated hard drive
- Internal PXI trigger bus routing
- Watchdog timer

Software

- OS and drivers already installed
- Hard-drive-based recovery image

PXI System Configuration

- Complete PXI system configuration at **ni.com/pxiadvisor**

Overview

The National Instruments PXI-8106 and PXIe-8106 are high-performance Intel Core 2 Duo processor T7400-based embedded controllers for use in PXI or PXI Express systems, respectively. With the 2.16 GHz dual-core processor and dual-channel 667 MHz DDR2 memory, NI 8106 controllers are ideal for modular instrumentation and data acquisition applications.

CPU	Intel Core 2 Duo processor T7400 (2.16 GHz dual core)	
Front-side bus	667 MHz	
L2 cache	4 MB	
	NI PXI-8106	**NI PXIe-8106**
System bandwidth	Up to 132 MB/s	Up to 1 GB/s
Slot bandwidth	Up to 132 MB/s	Up to 1 GB/s
PXI Express 4-link configuration	–	3 x4 links and 1 x1 link
PXI Express 2-link configuration	–	2 x4 links
Dual-channel 667 MHz DDR2 RAM, standard	512 MB (1 x 512 MB)	
Dual-channel 667 MHz DDR2 RAM, maximum	4 GB (2 x 2 GB)	
Hard drive, minimum	60 GB SATA[1]	
10/100/1000BaseTX (Gigabit) Ethernet	✓	
GPIB (IEEE 488) controller	✓	
Serial port (RS232)	✓	
Parallel port	✓	
Hi-Speed USB ports	4	
ExpressCard/34 slot	✓	
Watchdog/trigger SMB	✓	
Installed OS	Windows XP Professional[2]	

[1]40 GB PATA hard drive for extended temperature, 24/7 operation option
[2]Contact National Instruments or visit **ni.com/pxiadvisor** for information on other available operating systems

Table 1. NI 8106 Features

Dual-Core Processor

NI 8106 embedded controllers include the dual-core Intel Core 2 Duo processor T7400. Dual-core processors contain two cores, or computing engines, in one physical package. Dual-core processors can simultaneously execute two computing tasks, which is advantageous in multitasking environments, such as Windows XP, where multiple applications run simultaneously. Two applications, such as National Instruments LabVIEW and Microsoft Excel, can each execute on a separate core at the same time, which improves overall system performance. Multithreaded applications, such as LabVIEW, take full advantage of dual-core processors because they separate their tasks into independent threads. A dual-core processor can simultaneously execute two of these threads.

NI 8106 embedded controllers deliver a performance improvement of up to 100 percent compared to systems and instruments running traditional single-core processors and up to 46 percent for LabVIEW applications compared to the NI 8105 embedded controllers and other systems using an Intel Core Duo processor, Intel's previous-generation dual-core architecture. Using SYSmark benchmarking software, NI 8106 controllers demonstrate an overall performance improvement of 29 percent compared to NI 8105 controllers.

Figure 1. This NI PXIe-8106 controls an 8-slot PXI Express modular instrument and data acquisition system.

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Hardware

With state-of-the-art packaging, NI 8106 embedded controllers integrate the Intel Core 2 Duo processor T7400 and all standard and extended PC I/O ports into a single unit. By integrating many I/O ports on the controller, all active slots in the chassis remain available for measurement and control modules. This rugged one-piece controller design minimizes integration issues and eliminates the need for complex cabling to daughter boards. NI 8106 controllers also use the Mobile Intel 945GM Express chipset to deliver maximum performance, flexibility, and stability. NI 8106 block diagrams are shown in figures 2 and 3.

Peripheral I/O

NI 8106 embedded controllers include high-performance peripheral I/O such as 10/100/1000BaseTX (Gigabit) Ethernet and four Hi-Speed USB ports for connection to a keyboard, a mouse, a CD-ROM/DVD-ROM drive for software installation, or other standard PC peripherals such as speakers, printers, or memory sticks. Use the IEEE 1284 ECP/EPP parallel port to connect to a wide variety of devices, including tape backup drives, printers, and scanners. An RS232 port is available for connecting to serial devices. Additionally, NI 8106 controllers include an integrated GPIB (IEEE 488) controller, which provides control of external instrumentation, saving additional cost and a slot.

ExpressCard

NI 8106 embedded controllers include an ExpressCard/34 slot. ExpressCard uses the PCI Express and Hi-Speed USB serial interfaces to provide up to 2.5 Gb/s of bidirectional throughput. Use the ExpressCard/34 slot to add a second Gigabit Ethernet port to your system or additional peripheral I/O such as external hard drives, RAID arrays, 802.11 wireless LAN, IEEE 1394, Bluetooth, or various memory adapters.

Video

NI 8106 embedded controllers feature the integrated Intel GMA 950 graphics media accelerator, which delivers intense, realistic 3D graphics with sharp images, fast rendering, smooth motion, and high detail, without the need for an additional video card or peripheral. This unique architecture provides balanced memory usage between graphics and the system for optimal performance. Additionally, NI 8106 controllers include a DVI-I video connector, compatible with digital (DVI) and analog (VGA) monitors. A DVI-I to VGA adapter is included with the controller for use with VGA monitors.

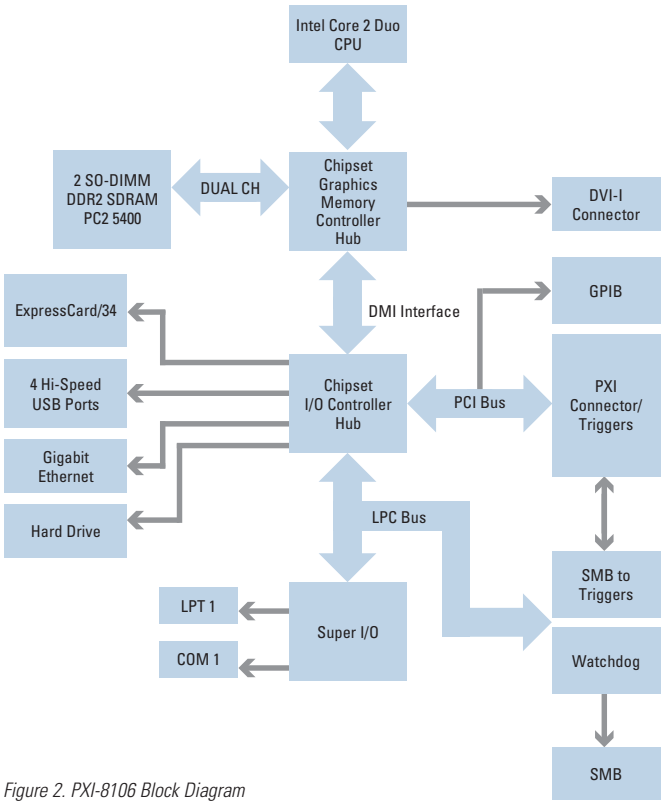

Figure 2. PXI-8106 Block Diagram

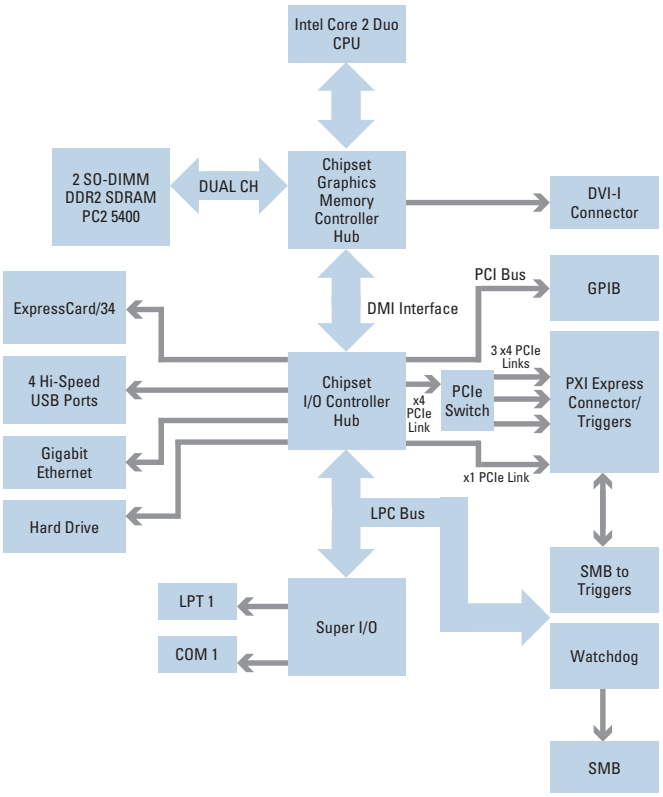

Figure 3. NI PXIe-8106 Block Diagram

Memory

NI 8106 embedded controllers use dual-channel 667 MHz DDR2 SDRAM, which makes the controllers ideal for data-intensive applications requiring significant analysis. NI 8106 controllers have two SO-DIMM sockets for the DDR2 SDRAM. 512 MB (1 x 512 MB DIMM) of RAM is standard with upgrade options to 1, 2, 3, or 4 GB.

Extended Temperature and 24/7 Operation Option

NI 8106 embedded controllers are available in two versions to address different environmental and usage conditions. The primary difference is that the version for extended temperature and 24/7 operation uses a different hard drive, designed for both reliability in low and high temperature extremes and 24/7 operation. The standard version of the controllers has an operating temperature of 5 to 50 °C and a storage temperature of -40 to 65 °C. The extended temperature and 24/7 operation version has an operating temperature of 0 to 55 °C and a storage temperature of -40 to 71 °C.

You can also use the extended temperature and 24/7 operation version for applications that require continuous operation for up to 24 hours/day, seven days/week because the hard drive is rated for 24/7 operation. The hard drive in the standard version of the controllers is designed to be powered on for eight hours/day, five days/week. Additionally, 24/7 operation applications may subject the hard drive to a high duty cycle (the percentage of the maximum sustained throughput of the hard drive). The hard drive in the standard version of the controllers is designed for a 20 percent duty cycle. The hard drive in the extended temperature and 24/7 operation version has a capacity of 40 GB (minimum) versus the 60 GB (minimum) hard drive used in the standard version of the controllers. See specifications for further details.

Software

NI 8106 controllers come with the following minimum set of software already installed:

- Microsoft Windows XP Professional OS (contact National Instruments or visit **ni.com/pxiadvisor** for localized versions of Windows XP and for other available operating systems)
- Hard-drive-based recovery image
- NI-VISA and NI-488.2 drivers
- Drivers for all built-in I/O ports (Table 1)

With NI Factory Installation Services (FIS) added to a PXI system order, your embedded controller is shipped already configured with all software and drivers applicable for your system. For example, assume you order a PXI system that includes LabVIEW and NI TestStand software, as well as data acquisition modules, a digitizer, an arbitrary waveform generator, and a digital multimeter (DMM). With FIS, NI not only assembles and tests your system, but also fully configures the embedded controller with the appropriate NI-DAQmx, NI-SCOPE, NI-FGEN, and NI-DMM drivers, as well as LabVIEW and NI TestStand. Additionally, your embedded controller is configured with a customized hard drive-based recovery image, so you can restore your controller to the as-shipped configuration at any time. This combination of software configuration and recovery tools provides both a productive and reliable development experience with your PXI system out of the box. To configure a complete PXI system with FIS, contact National Instruments or visit **ni.com/pxiadvisor**.

USB Peripherals

National Instruments offers a USB-to-dual-PS/2 keyboard/mouse adapter cable to connect a legacy PS/2 keyboard and mouse to a single USB port on your embedded controller. Additionally, NI offers external USB CD-ROM/DVD-ROM and USB floppy drives for use with your embedded controller. Connect these drives to your embedded controller for easy software installation and upgrades. Both are completely powered through the USB ports, so no external power connections are required. Additional USB peripherals, such as USB speakers to add audio, or USB memory sticks to add easily removable memory, are widely available from PC peripheral manufacturers.

Additional Peripheral I/O

National Instruments offers numerous plug-in modules to add more peripheral I/O to your PXI system. With the wide variety of peripheral I/O modules available, you can choose modules that add communication with serial, IEEE 1394, and SCSI, in addition to numerous others. You also can obtain modules for controlling other PXI or VXI/VME systems. Visit **ni.com/pxiadvisor** to configure a system with additional peripheral I/O modules.

Ordering Information

For online configuration of a complete PXI system, including Factory Installation Services, visit **ni.com/pxiadvisor**.

Step 1. Controller Model – select one of the following.

NI PXI-8106
- Base 779886-xx
- Extended Temperature and 24/7 Operation 779887-xx

NI PXIe-8106
- Base 779920-xx
- Extended Temperature and 24/7 Operation 779921-xx

Step 2. Replace "xx" to select installed OS.

Windows XP Professional (English) 01

Localized Windows XP or Other OS[1] 00

[1]Contact National Instruments or visit **ni.com/pxiadvisor** for the latest operating systems.

Step 3. Memory upgrades – select the amount of upgrade memory.

Standard:
- 512 MB (1 x 512 MB DIMM)

Recommended upgraded memory configurations:
- 1 GB (1 x 512 MB DIMM must be purchased)
- 2 GB (2 x 1 GB DIMMs must be purchased)
- 4 GB (2 x 2 GB DIMMs must be purchased)

512 MB DDR2 RAM 779301-512

1 GB DDR2 RAM 779302-1024

2 GB DDR2 RAM 780031-2048

Step 4. Accessories[2]

USB-to-dual-PS/2 keyboard/mouse adapter cable 778713-02

External USB CD-ROM/DVD-ROM drive 778492-01

External USB floppy drive 778492-02

USB English keyboard and optical mouse 779660-01

Parallel port adapter cable (6 in.) 777169-01

Micro-GPIB to GPIB adapter cable (0.2 m) 183285-0R2

Micro-GPIB to GPIB cable (1 m) 183285-01

Micro-GPIB to GPIB cable (2 m) 183285-02

ExpressCard strain-relief accessory for embedded controllers 192524-01

NI MKD-1117 (rack-mount 1U LCD monitor, keyboard, mouse drawer) 779872-01

(Flat panel monitor with VGA input) 779559-01

NI FPT-1015 flat panel touch screen with VGA interface and USB 779560-01

[2]For additional peripheral I/O modules, including serial, IEEE 1394, and SCSI, please visit **ni.com/pxiadvisor**.

BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to **ni.com/pxi**.

Specifications

Specifications subject to change without notice.

Features

Processor	Intel Core 2 Duo processor T7400 (2.16 GHz dual core)
Chipset	Mobile Intel 945GM Express chipset
Ethernet	10/100/1000BaseTX, RJ45 connector
Video	Intel GMA 950 graphics media accelerator, DVI-I connector
Serial	1 (RS232)
Parallel Port	IEEE 1284 Type C miniature connector (adapter cable not included)
GPIB	PCI-GPIB/TNT, micro D25 connector IEEE 488 and HS488 transfers (adapter cable not included)
Hi-Speed USB	4
RAM	2 SO-DIMM sockets, DDR2 SDRAM, PC2 5400, dual channel 512 MB (1 x 512 DIMM) standard, 4 GB (2 x 2 GB DIMMs) maximum
Hard Drive	
Base	60 GB minimum, internal 2.5 in., 9.5 mm Serial ATA 1.0 interface
Extended Temperature and 24/7 Operation Option	40 GB minimum, internal 2.5 in., 9.5 mm Fast Ultra ATA100 interface
V (I/O) Keying (PXI-8106)	Chassis V (I/O) = +5 VDC (blue key)

PXI Express Link Configurations (NI PXIe-8106)

PXI Express 4-link configuration ..... 3 x4 links and 1 x1 link
PXI Express 2-link configuration ..... 2 x4 links

Power Requirements

NI PXIe-8106

Voltage (V)	Current (A)	
	Typical	Maximum
+3.3	2.70	2.80
+5	2.45	2.55
+5_STBY	0.70	1.15
+12	2.45	3.20
-12	0	0

PXI-8106

Voltage (V)	Current (A)	
	Typical	Maximum
+3.3	3.60	3.75
+5	7.50	8.50
+12	0.005	0.005
-12	0	0

Physical

PXI-8106

Board dimensions ..... 4-slot 3U PXI module
Slot requirements ..... 1 system slot plus 3 controller expansion slots
Compatibility ..... Fully compatible with PXI Specification 2.0
Weight ..... 0.94 kg (2.1 lb) typical

NI PXIe-8106

Board dimensions ..... 4-slot 3U PXI Express module
Slot requirements ..... 1 system slot plus 3 controller expansion slots
Compatibility ..... Fully compatible with PXI Express Specification 1.0
Weight ..... 0.97 kg (2.14 lb) typical

Environment

Maximum altitude ..... 2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution degree 2
For indoor use only.

Operating Environment

Ambient temperature[1]
NI PXI-8106
Base ..... 5 to 50 °C[2] (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Extended Temperature ..... 0 to 55 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
NI PXIe-8106
Base ..... 5 to 50 °C[2] (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 high temperature limit.)
Extended Temperature ..... 0 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 ..... 10 to 90% noncondensing (tested in accordance with IEC-60068-2-56)

[1]For chassis that are not available in the online catalog at **ni.com**, please contact National Instruments for supported operating temperatures.

[2]5 to 40 °C for the PXI-8106 in the PXI-1000B DC.

Storage Environment

Ambient temperature	
NI PXI-8106	
Base	-40 to 65 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Extended Temperature	-40 to 71 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
NI PXIe-8106	
Base	-40 to 65 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit.)
Extended Temperature	-40 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	5 to 95% noncondensing (tested in accordance with IEC-60068-2-56)

Shock and Vibration

Operational shock	
NI PXI-8106	30 g peak, half-sine, 11 ms pulse (tested in accordance with IEC-60068-2-27; test profile developed in accordance with MIL-PRF-28800F)
NI PXIe-8106	30 g peak, half-sine, 11 ms pulse (tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 3 limits.)
Random vibration	
Operating	5 to 500 Hz, 0.3 grms (with solid-state hard drive)
Nonoperating	5 to 500 Hz, 2.4 grms (tested in accordance with IEC-60068-2-64; nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3)

Note: Specifications subject to change without notice.

Safety Compliance

EN 61010-1, IEC 61010-1, UL 61010-01, CSA 61010-1

Electromagnetic Compatibility

Refer to the Declaration of Conformity (DoC) for regulatory compliance information.
To obtain the DoC for this product, click Declaration of Conformity at **ni.com/hardref.nsf**.

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Hardware Services

NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with **ni.com/pxiadvisor**.

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