CAN Interfaces

PCI-CAN Series, PXI-846x Series, AT-CAN Series, PCMCIA-CAN Series

- Full Windows 2000/Me/9x Plug and Play compatibility for switchless resource configuration
- PXI-846x modules work in PXI real-time systems
- RTSI bus for synchronization with National Instruments DAQ, vision, and motion boards
- 1 and 2 ports
- Intel 80386EX microprocessor
- ISO 11898 physical layer for high-speed CAN
- ISO 11519 physical layer for low-speed CAN
- 500 V optically isolated physical layer
- Uses standard (11-bit) and extended (29-bit) CAN arbitration IDs
- Timestamping of incoming CAN frames
- Timed transfer of CAN frames, such as periodic transmission
- 1 Mb/s maximum transfer rate

Driver Software

- NI-CAN
  - Windows 2000/NT/Me/9x

Application Software

- NI LabVIEW
- NI Measurement Studio
- C/C++

Software

- Bus monitor utility
- LabVIEW VIs for
  - J1939
  - Interface to automotive database

Overview

National Instruments CAN interfaces are available in 1 or 2-port configurations. Full Windows 2000/Me/9x Plug and Play compatibility gives you the benefit of automatic configuration for easier installation and maintenance. CAN interfaces meet the physical and electrical requirements for in-vehicle (automotive) networks based on CAN. With all CAN interfaces, we include NI-CAN device driver software, which provides a high-level API for reading and writing data frames.

With a National Instruments CAN interface device and NI-CAN software, you can use a desktop, industrial, or notebook PC running Windows 2000/NT/Me/9x for a variety of CAN applications, including automotive testing and diagnostics, factory automation, and machine control.

CAN Bus and Analog Data Synchronization

Recent advances in automotive test applications have demanded tighter integration of measurements made with CAN and other measurement devices. In many applications, engineers need to synchronize the physical parameters measured in time to correlate the data. You can program this synchronization in software, but the latency of the operating system introduces delays that are sometimes not acceptable for some automotive test applications. National Instruments CAN, DAQ, vision, and motion boards for PCI, PXI, and ISA are equipped with the RTSI bus for routing timing/trigger signals between them. In a system coupled using the RTSI bus, a CAN or other device acts as the master, driving the timing/trigger signals while other DAQ or CAN boards are slaves to this timing signal and base their actions on this signal. Determinism is maintained between the trigger signal and the desired response because the RTSI bus timing signals are handled in hardware. The host PC software interacts only to retrieve the data once it is acquired or to write new data.

INFO CODES
For more information or to order products online, visit *ni.com/info* and enter:

can
pxi8460

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The RTSI bus connector sits on top of the boards, and a ribbon cable connects adjacent boards to share triggering and timing signals. For PXI modules, the PXI Trigger bus on the PXI backplane performs the functions of the RTSI bus; therefore, you do not need additional cables to take advantage of synchronization.

LabVIEW Real-Time Compatibility

PXI-846x hardware now works with LabVIEW Real-Time running on a PXI controller. You can now either port your existing LabVIEW application or develop a new LabVIEW application for download to the PXI controller without specialized knowledge of real-time operating system programming. In addition to getting real-time performance, you also gain the ability to integrate and synchronize (via the PXI Triggerbus) CAN, DAQ, and motion boards for automotive test and embedded applications.

CAN Interfaces

High-Speed CAN Hardware

Engineers typically use high-speed CAN is to connect all control devices, such as transmission and brake systems, within an automobile using transfer rates up to 1Mb/s. This serial communication network is defined in the ISO 11898 specification.

National Instruments high-speed CAN interfaces are available in four formats. The PCI-CAN is a short PCI board. The PXI-8461 is a 3U size module compatible with the PXI modular instrumentation standard and the CompactPCI industrial computer standard. The AT-CAN is a half-length ISA Plug and Play interface board that offers complete software configuration with no jumper or switch settings under Windows Me/9x. The PCMCIA-CAN is a PCMCIA Type II card fully compliant with the PC Card standard. You can use the PCMCIA-CAN in a notebook or other computer with either a Type II or Type III slot.

Low-Speed CAN Hardware

Engineers typically use low-speed CAN is typically used to control comfort devices such as seat and mirror adjustments within an automobile. It differs from high-speed CAN in that the maximum baud rate is 125 kb/s, and it uses CAN transceivers that offer fault-tolerant capabilities. Low-speed CAN is defined in the ISO 11519 specification.

National Instruments low-speed CAN interfaces are available in three formats. The PCI-CAN/LS is a short PCI board. The PXI-8460 is a 3U size module compatible with the PXI modular instrumentation standard and the CompactPCI industrial computer standard. The PCMCIA-CAN/LS is a PCMCIA Type II card that is fully compliant to the PC Card standard. You can use the PCMCIA-CAN/LS in a notebook or other computer with either a Type II or Type III slot.

Dual-Speed CAN Hardware

Dual-speed CAN interfaces have two CAN ports, one high-speed (ISO 11898) and one low-speed (ISO 11519). The dual-speed devices offer the perfect solution for applications that require both communications standards.

National Instruments dual-speed CAN interfaces are available in three formats. The PCI-CAN/DS is a short PCI board. The PXI-8462 is a 3U size module compatible with the PXI modular instrumentation standard and the CompactPCI industrial computer standards. The PCMCIA-CAN/DS is a PCMCIA Type II card fully compliant with the PC Card standard. You can use the PCMCIA-CAN/DS in a notebook or other computers with either a Type II or Type III slot.

Common Hardware

All National Instruments CAN devices use the Intel 80386EX microprocessor to handle communications directly on the interface board. The 80386EX provides a dedicated environment for reliable, high-performance execution of the CAN communications protocol stack. The physical layer of all National Instruments CAN devices fully conforms to either the ISO 11898 or 11519 physical layer specification for CAN and is optically isolated to 500 V. Interfacing to the CAN bus is by means of a DB-9 connector. You can configure PCI, PXI, and ISA CAN interfaces to have their transceivers either internally powered or bus powered. You can order PCMCIA-CAN cards with either an internally powered or bus-powered transceiver cable. PCI, PXI/CompactPCI, and ISA devices also can synchronize with other National Instruments hardware.

NI-CAN Communications Software

National Instruments CAN devices are shipped with NI-CAN software for Windows 2000/NT/Me/9x (Windows Me/9x only for AT-CAN boards). NI-CAN software includes device drivers that engineers use for application development and firmware that runs on the embedded 80386EX microprocessor. The NI-CAN device drivers are full 32-bit drivers designed for Windows 2000/NT/Me/9x. These device drivers are compatible with standard programming environments such as Microsoft Visual C/C++ and Borland C/C++, as well as NI LabVIEW and Measurement Studio. Engineers use firmware to implement time-critical features provided by the NI-CAN software. NI-CAN software provides flexible yet easy-to-use functions for configuration and I/O on CAN networks.

The 80386EX processor on a National Instruments CAN interface provides the operating environment for execution of the CAN protocol communications stack. CAN specifies timing requirements to ensure reliable, deterministic operation of the bus. In a typical system, a National Instruments CAN interface must provide the necessary system responsiveness. Because the majority of the CAN protocol executes on the embedded 80386EX of a National Instruments CAN interface, you can achieve improved response to incoming messages. Embedded execution of the CAN protocol stack also results in more deterministic network performance because the onboard microprocessor is dedicated to CAN communications activities.

CAN Interfaces

For program development, NI-CAN provides two levels of access to a CAN network – the CAN network interface object and CAN objects. Both forms of access offer time-stamping of incoming data and various forms of queuing.

The CAN network interface object provides low-level access to a CAN network. Each CAN network interface object maps to a specific CAN port, up to a maximum of 32 ports (for example, two AT-CAN/2 interfaces provide CAN0 through CAN3). You can use this object to send and receive entire CAN frames. For example, to send a CAN frame, you specify the outgoing arbitration ID, frame type (data or remote), data length, and data.

The CAN objects provide higher-level access to a CAN network. Each CAN object maps to a specific data item (arbitration ID), and you can use CAN objects for a given port. When configuring a CAN object for use, you specify the arbitration ID, direction of data transfer, data length, and also how you want to access the data (such as periodically). For example, you could configure a CAN object to send an outgoing data frame for a specific arbitration ID every 100 ms. After opening this CAN object, you use the write function to provide data to send, and NI-CAN embedded firmware handles all periodic timing.

Bus Monitoring Utility

In addition to the driver software, NI-CAN is shipped with a utility that you can use to monitor the CAN network traffic. This utility provides an easy-to-use interface to view and log all CAN network traffic to disk. It also provides options to control, display, and view bus statistics.

Cabling

AT-CAN, PCI-CAN, PCI-CAN/LS, PCI-CAN/DS, and PXI-8460 Series devices do not include interface cables. All interfaces use DB-9 male connectors for network connection. We include full documentation of the DB-9 connector with the interfaces.

PCMCIA-CAN, PCMCIA-CAN/LS, and PCMCIA-CAN/DS cards include interface cables for connections to the CAN bus. PCMCIA cables provide two connections – DB-9 male D-Sub and Combicon-style pluggable screw terminals. We include full documentation of connector pin-outs (DB-9 and Combicon) with each board. PCMCIA-CAN boards require a different cable depending on whether the board is used for internally powered or externally powered transceiver applications. As with high-speed CAN, low-speed and dual-speed interfaces also require appropriate cables for those applications. You must specify which cable you need when purchasing a PCMCIA-CAN interface. You can purchase separate cables if necessary for using your PCMCIA-CAN interface in various applications.

It is also important to note that PCMCIA uses common hardware for all configurations, which means the only difference is the connector cable. For example, you can use a 2-port CAN interface with internally or externally powered high-speed CAN, low-speed CAN, or dual-speed CAN. To make sure the operating system reports the correct interface, National Instruments PCMCIA-CAN products offer autocable detection. This frees you from having to keep track of which cable is in use and what the operating system has installed. The NI-CAN driver also provides fundamental error checking to make sure the appropriate program parameters are provided to the application.

CAN Interfaces

Ordering Information

High-Speed CAN Interfaces

PCI-CAN (1 port)....777357-01
PCI-CAN/2 (2 ports)....777357-02
PXI-8461 (1 port)....777707-01
PXI-8461 (2 ports)....777707-02
AT-CAN (1 port, Windows Me/9x only)....777289-01
AT-CAN/2 (2 ports, Windows Me/9x only)....777289-02
PCMCIA-CAN (1 port)
- Bus-powered transceiver....777498-01
- Internally powered transceiver....777499-01

PCMCIA-CAN/2 (2 ports)
- Bus-powered transceivers....777498-02
- Internally powered transceivers....777499-02

Dual-Speed CAN Interfaces (1 high and 1 low-speed port)

PCI-CAN/DS....778267-01
PXI-8462....778265-01
PCMCIA-CAN/DS....778266-01

Low-Speed CAN Interfaces*

PCI-CAN/LS (1 port)....778007-01
PCI-CAN/LS2 (2 ports)....778007-02
PXI-8460 (1 port)....778008-01
PXI-8460 (2 port)....778008-02
PCMCIA-CAN/LS (1 port)....778054-01
PCMCIA-CAN/LS2 (2 ports)....778054-02

*Low-speed boards are internally powered. Kits contain hardware and NI-CAN software for Windows 2000/NT/Me/9x unless otherwise specified.

Accessories

PCMCIA-CAN bus-powered transceiver cables (1 m)
- 1-port....183907-01
- 2-port....183908-01

PCMCIA-CAN internally powered transceiver cables (1 m)
- 1-port....184354-01
- 2-port....184402-01
- PCMCIA-CAN/LS cables (1 m)....186854-01
- PCMCIA-CAN/LS2 cable (1 m)....186855-01
- PCMCIA-CAN/DS cable (1 m)....187457-01

RTSI Bus Cables
- 2 boards....776249-02
- 3 boards....776249-03
- 4 boards....776249-04
- 5 boards....776249-05
- Extended, 5 boards....777562-05

Specifications

Power Requirements from ISA, PCI, or PCMCIA I/O Channel
+5 VDC

Device	Typical Current	Maximum Current
PCI-CAN	750 mA	950 mA
PCI-CAN/2	800 mA	1.0 A
PCI-CAN/LS	750 mA	950 mA
PCI-CAN/LS2	800 mA	1.0 A
PCI-CAN/DS	800 mA	1.0 A
PXI-8460 (1 port)	750 mA	950 mA
PXI-8460 (2 ports)	800 mA	1.0 A
PXI-8461 (1 port)	750 mA	950 mA
PXI-8461 (2 ports)	800 mA	1.0 A
PXI-8462	800 mA	1.0 A
AT-CAN	500 mA	800 mA
AT-CAN/2	520 mA	850 mA
PCMCIA-CAN	500 mA	750 mA
PCMCIA-CAN/2	500 mA	750 mA
PCMCIA-CAN/LS	500 mA	750 mA
PCMCIA-CAN/LS2	500 mA	750 mA
PCMCIA-CAN/DS	500 mA	750 mA

Physical

Dimensions
- PCI....10.7 by 17.5 cm (4.2 by 6.9 in.)
- PXI....16.0 by 10.0 cm (6.3 by 3.9 in.)
- AT....10.7 by 16.5 cm (4.2 by 6.5 in.)
- PCMCIA....Type II PC Card

I/O connections
- PCI, PXI, and AT....DB-9 male per channel
- PCMCIA....DB-9 male and Combicon-style pluggable screw terminals

Operating Environment

Ambient temperature....0 to 70 °C
Relative humidity....10 to 90%, noncondensing

Storage Environment

Ambient temperature....-40 to 125 °C
Relative humidity....5 to 90%, noncondensing

Noise Emission

AT....FCC Class A Verified
PCI, PCMCIA....FCC Class A Verified
PXI....FCC Class A Verified