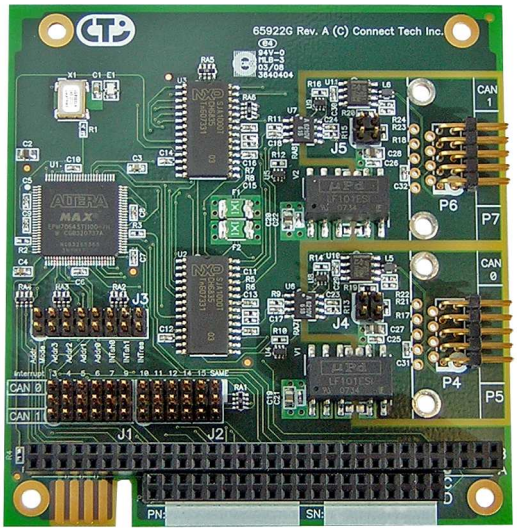
Connect Tech Inc.
Industrial Strength Communications

USER MANUAL

CANpro/104



CTIM-00043 (0.01) - December 22, 2008

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Revision History

Revision 0.01	**December 22, 2008** Updated manual to new format Updated Table 3
Revision 0.00	Original Document

Table of Contents

Introduction

CANpro/104 combines the power of two independent NXP SJA1000 CAN controllers with the compact size and rugged stability of PC/104. CANpro/104 is ideal for industrial control applications exposed to harsh conditions or environments. CANpro/104 Opto models feature 500 volts of data and power isolation.

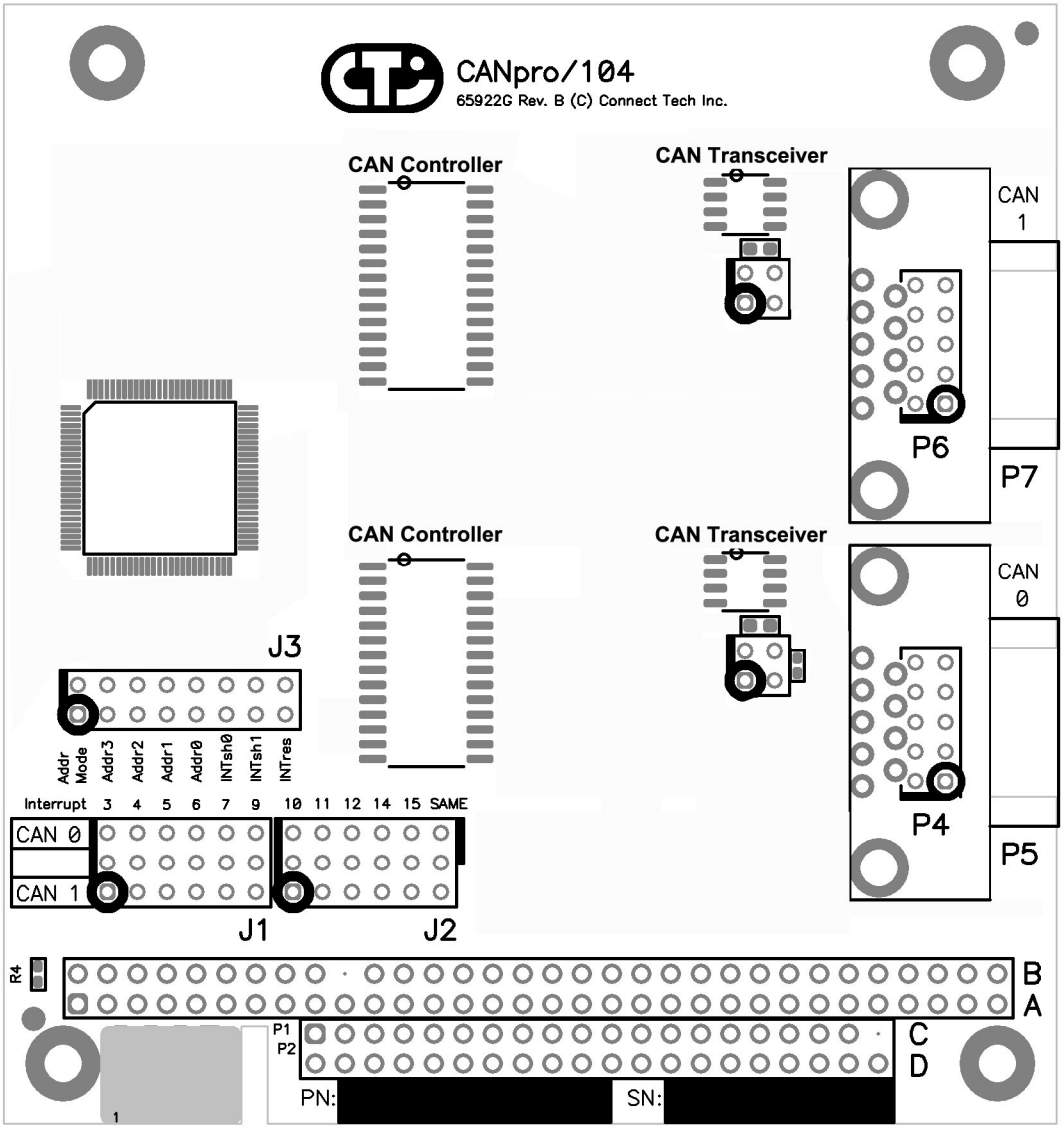
Features

- Two independent, industry standard NXP SJA1000 CAN controllers
- PC/104 compliant
- 16MHz input clock (24MHz build option available)
- Fail-safe power-up/power-down using on-board impendence transceivers to maximize nodes on the bus and ensure glitch-free operation.
- Supports up to 1.0 Mbps operation and over 120 nodes on the bus
- 500V optical and power isolation for each port from the host system (on CANpro/104 Opto models only)
- Jumper configurable:
  -address range and interrupt sharing
  -output slew rate limiting for lower radiated emissions
  -120 Ohm CAN bus termination
- Decoded address range is configurable for BasicCAN and PeliCAN modes
- Ten pin right angled header standard as an I/O connector (DB-9 option available)
- Operating temperature range of -40°C to +85°C
- +5V power output on some models
- RoHS compliant

CANpro/104 Opto Diagrams

Figure 1 shows the locations of various hardware components found on the CANpro/104.

Figure 1: CANpro/104 Board Diagram



Hardware Installation

Before you begin, take a minute to ensure that your package includes the required components that should have shipped with your CANpro/104.

- One CANpro/104 CAN controller board
- One CD containing documentation

If any of these components is missing, contact Connect Tech (See Contact Details) or your reseller. Also, visit the Download Zone of the Support Center on the Connect Tech website for the latest product manuals, installation guides, diagnostic utilities and device driver software.

Interrupts and Memory I/O Range Selection

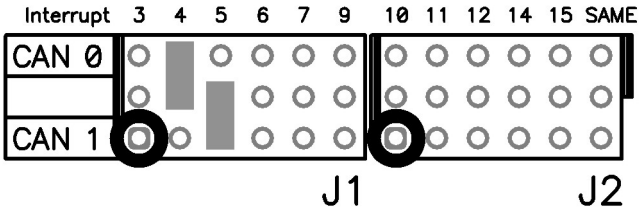
CANpro/104's interrupt lines and I/O ranges are jumper assignable.

Interrupt Selection

J1 and J2 are used for interrupt selection. Interrupt selection for the first CAN controller is achieved via the upper and centre rows of pins on the connector. The lower and center rows of pins allow selection of interrupts for the second CAN controller. Please refer to Figure 1 to locate jumper blocks J1 and J2. CANpro/104 offers flexible interrupt configuration. Each CANpro/104 card can use one PC/104 interrupt per controller, share one interrupt across both controllers or use no interrupts at all.

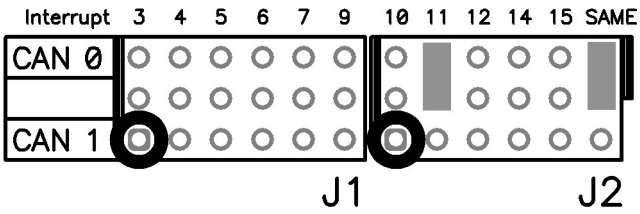
Unique Interrupt Lines

The example below illustrates CANpro/104 configured for two unique interrupts with controller 0 interrupting on IRQ 4 and controller interrupting on IRQ 5.



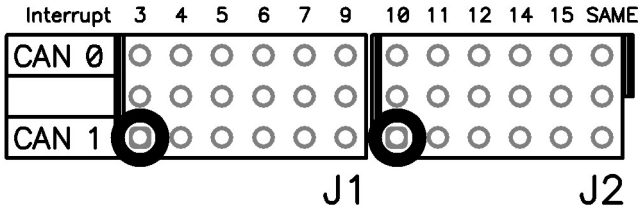
Sharing a Single Interrupt Line

CANpro/104's CAN controllers can also interrupt on the same interrupt line. The diagram below demonstrates both controllers interrupting on line IRQ 11. Please note that the interrupt selection for the interrupt that both controllers share must be made on the CAN 0 rows.



No Interrupts

To force operation without interrupts, simply leave the interrupt jumper blocks J1 and J2 unpopulated. This requires software polling to determine an interrupt condition.

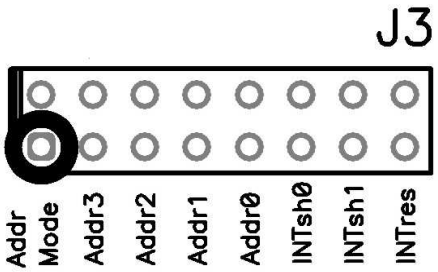


Address Mode and Range Selection

The first five jumper locations of jumper block J3 are used for board address selection. The first jumper location (Addr Mode) selects the number of address bits to use for the decoding of the board address. The next four jumpers configure the actual board address.

If you intend to configure both of the board's controllers in BasicCAN mode, install a jumper in the Addr Mode location. This configures the board to respond to a 64 byte address range (32 bytes per controller).

Alternatively, if you intend to operate one or both of the CAN controllers in PeliCAN mode, leave the Addr Mode location unpopulated. This configures the board to respond to a 256 byte address range (128 bytes per controller).



The address range for the board itself is directly selected by the Addr3, Addr2, Addr1 and Addr0 jumper locations. The following table describes the base addresses of the controllers 0 and 1 (CAN 0 and CAN 1) for every possible combination of Addr Mode and AddrX jumper locations.

Table 1: CAN 0 and CAN 1 Base Addresses

Jumper Location				Board Mode Selection			
				ON (BasicCAN)		OFF (PeliCAN)	
Addr3	Addr2	Addr1	Addr0	CAN 0	CAN 1	CAN 0	CAN 1
ON	ON	ON	ON	0x000	0x020	0x000	0x080
ON	ON	ON	OFF	0x040	0x060	0x000	0x080
ON	ON	OFF	ON	0x080	0x0A0	0x000	0x080
ON	ON	OFF	OFF	0x0C0	0x0E0	0x000	0x080
ON	OFF	ON	ON	0x100	0x120	0x100	0x180
ON	OFF	ON	OFF	0x140	0x160	0x100	0x180
ON	OFF	OFF	ON	0x180	0x1A0	0x100	0x180
ON	OFF	OFF	OFF	0x1C0	0x1E0	0x100	0x180
OFF	ON	ON	ON	0x200	0x220	0x200	0x280
OFF	ON	ON	OFF	0x240	0x260	0x200	0x280
OFF	ON	OFF	ON	0x280	0x2A0	0x200	0x280
OFF	ON	OFF	OFF	0x2C0	0x2E0	0x200	0x280
OFF	OFF	ON	ON	0x300	0x320	0x300	0x380
OFF	OFF	ON	OFF	0x340	0x360	0x300	0x380
OFF	OFF	OFF	ON	0x380	0x3A0	0x300	0x380
OFF	OFF	OFF	OFF	0x3C0	0x3E0	0x300	0x380

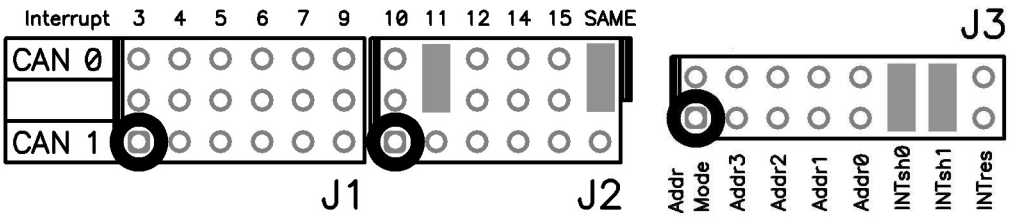
Interrupt Sharing

Jumper block J3 also plays a part in the interrupt sharing. PC/104 supports the sharing of an interrupt between multiple cards. For example, two separate CANpro/104 cards are able to share the same interrupt across all four controllers. To accomplish interrupt sharing, the following steps must be taken:

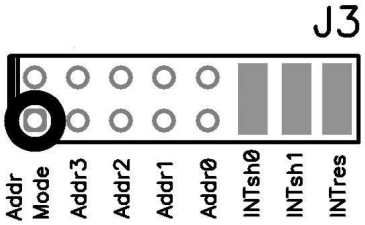
1. All cards that share the same interrupt, but are not actively asserting an interrupt, must tri-state their outputs. On CANpro/104 cards, this is accomplished by installing a jumper on the INTshrX jumper location of each CAN controller(s) you wish to share interrupts.
2. One 1K Ohm resistor must also be attached to each shared interrupt. With the example of two CANpro/104 cards, the INTres jumper would be installed on only one of the cards.

NOTE:
CANpro/104 has the capability to tri-state its interrupt outputs and the 1K Ohm resistor is jumper configurable. Other cards may not be able to share interrupts. Please check the manual for each card.

The example below has configured both cards to interrupt on IRQ 11. Both controllers will tri-state their outputs when not driving the interrupt line active. This example assumes that another card in the stack has enabled the 1K Ohm pull-down resistor. Only one card in the group of cards sharing the same interrupt should enable a pull-down resistor.



To enable the resistor, simply install a jumper on the INTres jumper location, as shown below.



Please note that the Interrupt Resistor Enable controls the Interrupt Resistor for all shared CAN controller interrupts on the card. You cannot enable the Interrupt Termination Resistor for one controller only if both are configured for interrupt sharing.

If a card has interrupt sharing enabled for only one of its controllers, the resistor will only be enabled on the interrupt of the controller that is sharing interrupts.

Other On-board Jumper Selection

Near each I/O connector a 2x2 jumper block (either J4 or J5) will allow the configuration of both bus termination and slew rate limiting for the transceiver. J4 configures options for CAN controller 0, while J5 configures options for CAN controller 1.

Installing a jumper on the first location of J4 or J5 (the gray area above) will enable a 120 Ohm termination resistor across the CAN-H and CAN-L lines. Termination is recommended for improved signal integrity in longer transmission lines. Termination requirements should be evaluated on a case by case basis. Typically both ends of a CAN bus are terminated, but no termination is enabled on cards that sit in the middle of the bus.

Installing a jumper on the second location of J4 or J5 (the gray area above) will disable slew rate limiting for the associated CAN port. Slew rate limiting will reduce the emitted switching noise that is sent out onto the CAN bus lines and radiated from those lines. Switching noise may cause EMI / EMC incompatibilities depending on the cabling used to support the system. The use of slew rate limiting may aid in a system that is close to the limit of emissions already. Properly shielded cabling will dramatically reduce emissions.

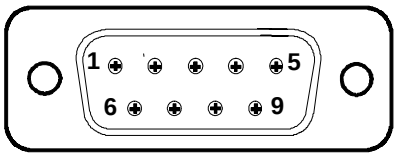
Slew rate limiting may only be used on busses operating at slower baud rates. With the jumper installed, full 1Mbps operation is possible.

Connector Pinouts

Table 2: DB-9 Cable Connector Pinouts

Pin No.	Signal
1	+5V
2	CAN-L
3	CAN GND (isolated or non)
4	N/C
5	N/C
6	CAN GND (isolated or non)
7	CAN-H
8	N/C
9	+5V

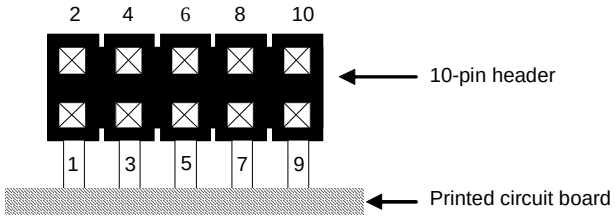
Male DB-9 Connector



For boards populated with right angled 2x5 0.100” headers, cable CAG104 will break out from the onboard 2x5 header to a DB-9 connector.

Table 3: 10-pin Header Pinouts

Pin No.	Signal
1	+5V
2	CAN-GND (isolated or non)
3	CAN-L
4	CANH
5	CAN-GND (isolated or non)
6	NC
7	NC
8	+5V
9	NC
10	NC



Specifications

Operating Environment

Storage temperature: -40° C to 125° C
Operating temperature: -40° C to 85° C
Humidity: 95%, non-condensing

Power Requirements

+5 VDC @ 500mA (maximum)
380 mA (minimum)

> **NOTE:**
> Power output on CAN connectors may draw up to an additional 1A per port (non-isolated models). 190 mA per port (isolated models) given 150mA current draw in the +5V output.

PC Bus Interface

PC/104

Optical/Power Isolation (CANpro/104 Opto models only)

500V for each CAN port from the host system and other isolated CAN ports.

Dimensions

Compliant to PC/104 specification 2.5

Connectors/Interface

Standard: 10-pin, right angled header (+5V power output)
Optional: DB-9

Certification

Certification for CANpro/104

The CANpro/104 product family is to be included into a device ultimately subject to FCC, DOC/IC, and CE certification. The customer is responsible for bringing the completed device into compliance prior to resale.

Connect Tech has designed CANpro/104 with EMI and EMC considerations such as:

Ground and power planes

Controlled slew-rate signals

EMI/EMC reducing PCB layout

Limited Lifetime Warranty

Connect Tech Inc. provides a Lifetime Warranty for all Connect Tech Inc. products. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at its option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non Connect Tech Inc. authorized modification or repair.

You may obtain warranty service by delivering this product to an authorized Connect Tech Inc. business partner or to Connect Tech Inc. along with proof of purchase. Product returned to Connect Tech Inc. must be pre-authorized by Connect Tech Inc. with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured and packaged for safe shipment. Connect Tech Inc. will return this product by prepaid shipment service.

The Connect Tech Inc. lifetime warranty is defined as the serviceable life of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, Connect Tech Inc. reserves the right to substitute an equivalent product if available or to retract lifetime warranty if no replacement is available.

The above warranty is the only warranty authorized by Connect Tech Inc. Under no circumstances will Connect Tech Inc. be liable in any way for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, such product.

Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Our online Support Center is available 24 hours a day, seven days a week on our website at: www.connecttech.com/sub/support/support.asp. Please go to the Download Zone or the Knowledge Database for product manuals, installation guides, device driver software and technical tips. Submit your questions to our technical support engineers at support@connecttech.com. Our technical support is always free.

Contact Information

Telephone/Facsimile
Technical Support representatives are ready to answer your call Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time. Our numbers for calls are:
Toll: 800-426-8979 (North America only) | Tel: 519-836-1291 | Fax: 519-836-4878 (online 24 hours)

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