

# CAN104

**CANbus® Network Interface Module for PC/104 Bus Computers**

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## INSTALLATION GUIDE

### INTRODUCTION

The CAN104 is a Controller Area Network (CAN) adapter for PC/104 bus computers. CAN is the data link layer technology used by DeviceNet and Smart Distributed System. The CAN104 supports 8-bit transfers and takes advantage of the additional interrupts on the expanded bus.

The CAN104 incorporates the Philips SJA1000 CAN stand-alone controller chip which is used widely in both the automotive and general industrial environments. Besides being backward compatible with the older 82C200, the SJA1000 has more features than its predecessor. The 82C200 is restricted to BasicCAN (11-bit identifiers) while the SJA1000 operates in either BasicCAN or a new mode called PeliCAN™ which supports the CAN 2.0B specification (29-bit identifiers). The SJA1000 maintains extended frame passivity while in the BasicCAN mode.

The SJA1000 features a 16 MHz clock, a larger receive buffer and better acceptance-filtering — including the ability to extend the acceptance mask to the data field. It has the ability to operate at data rates as great as 1 Mbps.

The CAN104 incorporates the DeviceNet physical layer with an optically isolated transceiver providing reverse voltage and short-circuit protection. Field connectors include the DeviceNet 5-position open style and DB-9 as defined by CAN in Automation (CiA).

The PeliCAN mode includes:

- Error counters with read/write access
- Programmable error warning limit
- Last error code register
- Error interrupt for each CANbus error
- Arbitration lost interrupt with detailed bit position
- Single-shot transmission (no re-transmission)
- Listen only mode (no acknowledge, no active error flags)
- Hot plugging support (software driven bit rate detection)
- Acceptance filter extension (4-byte code, 4-byte mask)
- Reception of 'own' messages (self reception request)

**CONTEMPORARY CONTROLS®**

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## SPECIFICATIONS

*Power Requirements*            +5 V  
    80 mA

*Environmental*

Operating temperature:    0°C to +60°C  
Storage temperature:       -40°C to +85°C

*Data Rates*

50 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 1 Mbps

*Dimensions*

3.55" x 3.775" (90 mm x 95 mm)

*Shipping Weight*

1 lb. (.45kg)

*I/O Mapping — BasicCAN*

The CAN104 can occupy any of the following 32-byte blocks of I/O space.

000 020 040 060 080 0A0 0C0 0E0 100 120 140 160 180 1A0 1C0 1E0  
200 220 240 260 280 2A0 2C0 2E0 300 320 340 360 380 3A0 3C0 3E0

*I/O Mapping — PeliCAN*

The CAN104 can occupy any of the following 128-byte blocks of I/O space.

000 080 100 180 200 280 300 380

*Interrupt Lines*

Supports selection of IRQ3 through IRQ15

*Compatibility*

Compliant with CAN 2.0A and CAN 2.0B

*Regulatory Compliance*

CE Mark  
CFR 47, Part 15 Class A

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## INSTALLATION

**HARDWARE:** The CAN104 can be installed in any PC/104 computer bus. With power removed from the computer, remove its cover. Take care when installing the CAN104 because both it and the exposed computer motherboard are sensitive to electrostatic discharge. To prevent inadvertent damage, touch the metal chassis of the internal power supply to discharge yourself, then remove the CAN104 from its protective ESD package.

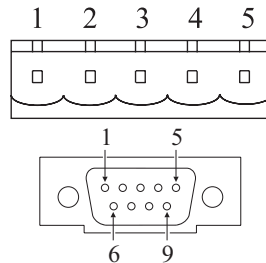
*Before proceeding with the installation, configure the jumpers according to the instructions in the section entitled "Configuring Jumper Settings."*

The CAN104 incorporates stack-through connectors and is shipped with four 0.6" standoffs for mounting in the PC/104 stack. Some older modules have only two mounting holes and two standoffs. The CAN104 should be mounted closer to the motherboard than any 8-bit modules that may be in the stack. If the CAN104 is the last module in the stack, secure it with panhead screws (not provided) to complete the mounting.

Once the CAN104 is mounted, it can be attached to the CANbus with either the screw terminals or the DB-9 connector. To facilitate use of the screw terminals, a mating female connector has been provided. The CAN104 complies to the physical layer specification for isolated ports, therefore bus power (V+, V-) must be present in order for its transceiver to function. Hardware installation is completed by replacing the computer's cover.

### Connector Pin Assignments

Function	Screw Terminal	DB-9
V -	1	3,6
CAN_L	2	2
Drain	3	5
CAN_H	4	7
V +	5	9
Not Used	—	1,4,8



**SOFTWARE:** The CAN104 comes with a disk which contains the driver files which allows the operating system to allocate computer resources to the card. The instructions for installing these files are provided on the disk in the file named **README.TXT**.

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## CONFIGURING JUMPER SETTINGS

### Power Selection

A set of four jumpers, labeled **POWER**, offers the choice between powering the CAN104 transceiver circuitry from the host computer or from the CANbus. By default the jumpers are set to **INT**. To power the transceiver from the CANbus, move all four jumpers to the **EXT** setting.

### DeviceNet Reverse Voltage Protection

By default, diode **D1** protects the CAN104 from overvoltage which would occur if the DeviceNet power connections were accidentally reversed. This protection results in the CAN104 ground being about 700 mV different from the CAN ground. If desired, the CAN104 ground potential can be made equal to the CAN ground by installing a jumper on **JP7**.

### Termination

If the CAN104 is located at the end of a trunk, line-matching impedance is required. A 121-ohm resistor is supplied for this purpose. If a different impedance is needed, jumper **JP8** should be removed and the alternative impedance connected to screw terminals CAN\_H and CAN\_L.

### Interrupts

Jumper block **JP6** makes available all possible interrupt selections. Interrupt 5 has been chosen as the default.

### I/O Address Map

The CAN104 has two modes of operation—BasicCAN and PeliCAN—that affect how the I/O space is defined. I/O addressing is set with jumper block **JP9** using jumpers S0–S4 and RA. By default, jumper **RA** (Range) is open causing the I/O space to be 32 contiguous bytes in size. This setting is used in BasicCAN, but may also be used in PeliCAN. For full PeliCAN functionality, jumper RA must be installed, extending the I/O space to 128 contiguous bytes.

The CAN104 uses an I/O space within the range 0x000–0x3FF as illustrated in **Tables 1–3**. Regardless of the RA setting, jumpers **S0–S4** are used to select the address at which the I/O space begins. The default setting is 0x300. Remember, RA determines only the *size* of the I/O space: 32 or 128 bytes.

An unused jumper may be left on the board with no effect, by attaching the jumper to only one of the two pins that constitute a jumper pair.

## BasicCAN Jumper Settings

(■ = jumper installed)

**Table 1 — 32-byte Addressing for BasicCAN**

RA	S4	S3	S2	S1	S0	I/O Address
	■	■	■	■	■	000
	■	■	■	■		020
	■	■	■		■	040
	■	■	■			060
	■	■		■	■	080
	■	■		■		0A0
	■	■			■	0C0
	■	■				0E0
	■		■	■	■	100
	■		■	■		120
	■		■		■	140
	■		■			160
	■			■	■	180
	■			■		1A0
	■				■	1C0
	■					1E0
		■	■	■	■	200
		■	■	■		220
		■	■		■	240
		■	■			260
		■		■	■	280
		■		■		2A0
		■			■	2C0
		■				2E0
			■	■	■	300
			■	■		320
			■		■	340
			■			360
				■	■	380
				■		3A0
					■	3C0
						3E0

## PeliCAN Jumper Settings

(■ = jumper installed      X = don't care)

**Table 2 — 32-byte Addressing**

RA	S4	S3	S2	S1	S0	I/O
						Address
■	■	■	■	■	■	000
■	■			■	■	080
■		■	■	■	■	100
■				■	■	180
	■	■	■	■	■	200
		■		■	■	280
			■	■	■	300
				■	■	380

**Table 3 — 128-byte Addressing**

RA	S4	S3	S2	S1	S0	I/O
						Address
■	■	■	■	X	X	000
■	■	■		X	X	080
■	■		■	X	X	100
■				X	X	180
■		■	■	X	X	200
■		■		X	X	280
■			■	X	X	300
■				X	X	380

### CAN Operation

CAN is currently described by ISO 11898. In terms of the Open Systems Interconnection model (OSI), CAN partially defines the services for layer 1 (physical) and layer 2 (data link). Higher-layer protocols such as DeviceNet and Smart Distributed System define additional services of the seven layer OSI model. Both of these protocols use CAN circuitry and, therefore, comply with the data link layer defined by CAN.

Medium access control (MAC) is accomplished through non-destructive bit-wise arbitration. If a station attempting transmission fails to confirm that its data is being accurately propagated, it assumes a higher priority message is present on the network. Consequently, it halts transmission and reverts to receiving mode. The highest priority message gets through and lower priority messages are resent later. In this way network collisions do not destroy data and eventually all stations gain access to the network.

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## DECLARATION OF CONFORMITY

### Applied Council Directives:

Electromagnetic Compatibility Directive, 2004/108/EEC Council Directive

### Standard to which Conformity is Declared

EN 55022:1998/A2:2003 CISPR 22:1997/A2:2002, Class A, Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment

EN 55024:1998/A2:2003 CISPR 24:1997/A2:2002., Information Technology Equipment — Immunity Characteristics — Limits and Methods of Measurement

### Manufacturer:

Contemporary Control Systems, Inc.  
2431 Curtiss Street  
Downers Grove, IL 60515 USA

### Authorized Representative:

Contemporary Controls Ltd  
Sovereign Court Two  
University of Warwick Science Park  
Sir William Lyons Road  
Coventry CV4 7EZ  
UNITED KINGDOM

### Type of Equipment:

CANBUS Network Interface Module

Model	Directive
	<b>EMC</b>
CAN104	Yes

**Manufacturer's Declaration:** I, the undersigned, hereby declare that the product(s) specified above conforms to the listed directives and standards.

George M. Thomas, President

January 2, 2004

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## NEED MORE HELP INSTALLING THIS PRODUCT?

More comprehensive information can be found on our web site at [www.ccontrols.com](http://www.ccontrols.com). Browse the Technical Support section of our site for a look at our interactive on-line technical manuals, downloadable software drivers and utility programs that can test the product. When contacting one of our offices, just ask for technical support.

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Contemporary Controls (CC) warrants its new product to the original purchaser for two years from the product shipping date. Product returned to CC for repair is warranted for one year from the date that the repaired product is shipped back to the purchaser or for the remainder of the original warranty period, whichever is longer.

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Before returning a product for repair, contact Customer Service. A representative will instruct you on our returns procedure.

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