

# CAN SPIDER

## User's Manual



RTD Embedded Technologies, Inc.

*"Accessing the Analog World"®*



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Rev. A	New Manual
Rev. B	Corrected twisted pair CAN port connector table, added new board photo

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# Table of Contents

<b>CHAPTER 1 INTRODUCTION .....</b>	<b>1</b>
<i>ECAN527-2.....</i>	<i>1</i>
<b>FEATURES.....</b>	<b>1</b>
<i>Connectors.....</i>	<i>1</i>
<i>General Specifications.....</i>	<i>1</i>
<b>CHAPTER 2 CONNECTING THE CAN SPIDER.....</b>	<b>2</b>
JUMPERS.....	2
FIBER OPTIC CAN PORTS .....	4
<b>CHAPTER 3 RETURN POLICY AND WARRANTY .....</b>	<b>9</b>
RETURN POLICY .....	9
LIMITED WARRANTY.....	10



# Chapter 1 INTRODUCTION

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This manual gives information on the CAN Spider active CAN bus hub. The CAN Spider can connect up to four fiber optic ECAN527-2 PC/104 CAN bus interface boards together. Other CAN bus devices may be connected to the galvanically isolated twisted pair CAN port. This structure enables flexible expansion of CAN Spiders as well as connection of twisted pair CAN devices to your network.

## ECAN527-2

The ECAN527-2 is a single channel CAN bus interface module for PC/104 systems. This board features the Intel full CAN 2.0B compliant controller AN82527. The fiber optic interface is integrated onboard. Fiber optic network cables can be directly wired to the ECAN527-2 and the CAN Spider using the Hewlett Packard "VersaLink" cabling system.

## Features

The following are major features of the CAN Spider:

- Fiber optic CAN Ports with data rates up to 1 Mbps
- One galvanically isolated twisted pair CAN port for system expansion
- Onboard bus termination resistors
- Onboard power supply with 8-30V input range
- Power outputs include +5V and isolated +5V

## Connectors

Connectors provided are:

- J11: Power supply input 8-30V
- J3: +5V output from onboard power converter
- J2: Isolated +5V output from onboard DC/DC converter
- J5: 10-pin Header for twisted pair CAN bus
- FIBER: 4 fiber optic CAN ports with 2 transmitters and 2 receivers each

## General Specifications

- Dimensions: 3.8 x 3.9 x 0.6" (97 x 100 x 16 mm)
- Weight (mass): To be defined
- Physical: 4-layer PCB
- Operating conditions:
  - Standard temperature: 0 to + 70 degrees C
  - Extended temperature: -40 to + 85 degrees C
  - Relative humidity: 0 to 95%, non-condensing
  - Storage temperature: -55 to +85 degrees C

## Chapter 2 **CONNECTING THE CAN SPIDER**

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The following sections contain information on configuring the CAN Spider.

Please read this entire section before attempting to use the module!

### ***Jumpers***

One jumper configures the following function:

- CAN Bus Termination Jumper

#### ***Jumper options***

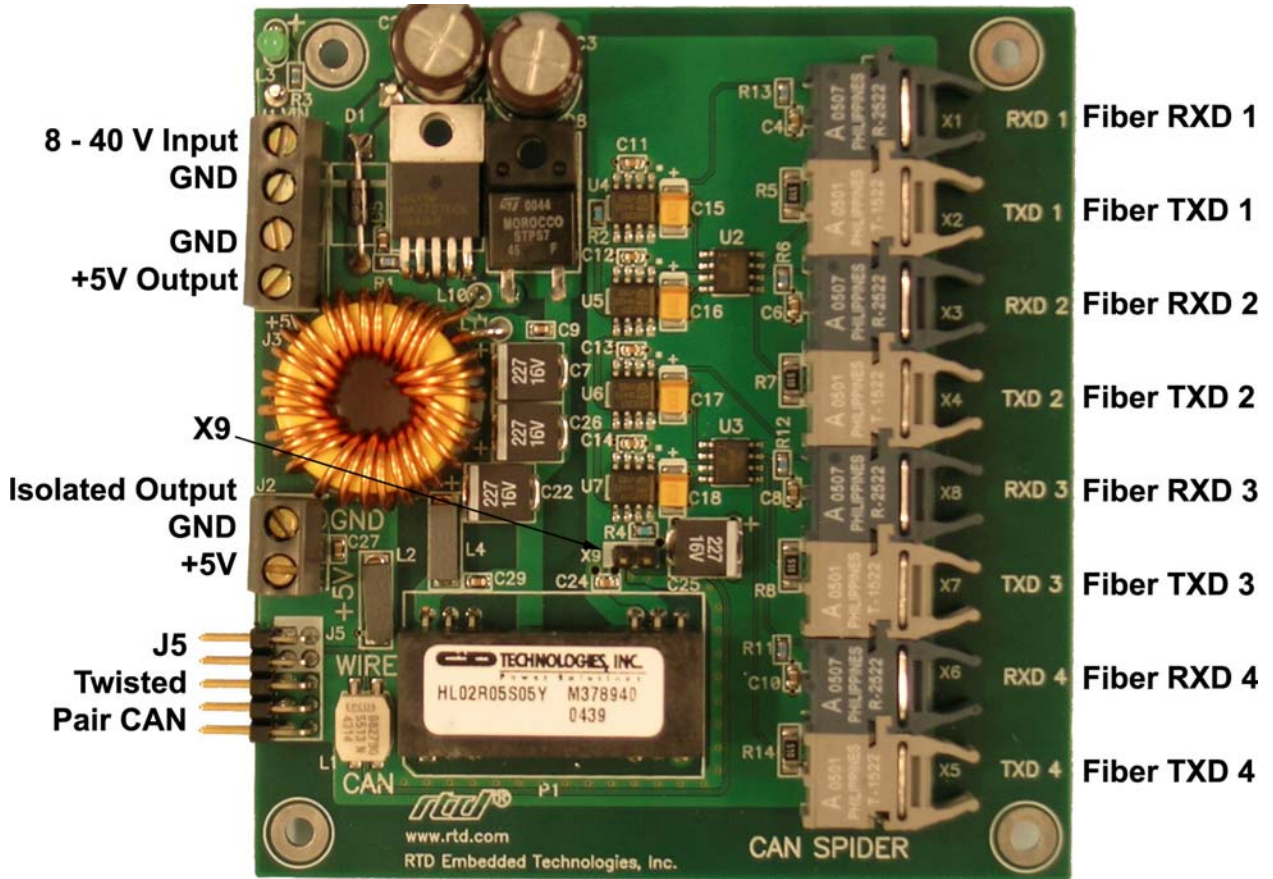
The CAN Spider is delivered from the factory configured according to the following table.

<b>Default Jumper Settings</b>		
<b>Jumper</b>	<b>Setting</b>	<b>Function</b>
X9	1-2	CAN bus terminated

For most applications, you will not have to change this setting. If you do, refer to the following pages for details.

### Locations

The figure below shows jumper locations.



### Descriptions

The following table describes the function of this jumper:

Jumper	Use
<b>X9</b>	Connects or Disconnects a 120 Ohm onboard CAN-bus termination resistor
1-2:	No bus expansion, CAN bus terminated with 2 termination resistors onboard
Disconnected:	Only one onboard 120 Ohm resistor terminates the bus
Default: 1-2,	Bus termination connected

The CAN Spider converts the four fiber optic CAN ports into a galvanic CAN bus. The galvanic CAN bus is implemented with traces on the Spider board. Therefore bus termination must be performed to make the network operate correctly. If no other CAN devices are connected, the Spider and the onboard CAN bus must be terminated at both ends of the physical bus. To do that you should close jumper X9.

## ***Fiber optic CAN Ports***

Up to four fiber optic CAN boards can be connected to the RTD CAN Spider. Each port consists of a separate transmitter and receiver. The ECAN527-2 board also features a separate fiber optic transmit and receive transceiver.

To connect your ECAN527-2 to the CAN Spider you should use the correct fiber optic cable. Failure to do so may result in unreliable or degraded network operation. We recommend that you purchase the SK-CAN-FIBER starter kit when you are evaluating and testing your system. The correct ready-made duplex cables can be purchased from RTD. The factory recommended Hewlett Packard cable part number is: HFBR-END-XXX (where XXX is the cable length). The SK-CAN-FIBER includes 2 pieces of the HFBR-END-002 (2 meter length).

The ECAN527-2, as well as the CAN Spider, uses the following transceivers:

Transmitter: HFBR-1522

Receiver: HFBR-2522

These parts support 1Mbd data rates with cable lengths up to 45 meters. For more detailed information on the fiber optic performance please visit the Hewlett Packard website at:

**[www.hp.com/HP-COMP/fiber/hfbr0501.htm](http://www.hp.com/HP-COMP/fiber/hfbr0501.htm)**

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**NOTE:** The fiber optic transceivers are classified as IEC 825-1 Accessible Emission Limit (AEL) Class 1 based upon the current proposed draft scheduled to go to effect on January 1, 1997. AEL Class 1 LED devices are considered eye safe. For more information please contact your local Hewlett Packard sales representative.

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## Twisted Pair CAN Port

The CAN Spider module features a 10-pin header connector that carries the galvanically isolated CAN bus interface. The interface is wired according to the ISO11898 /2/ definition. The power output in this connector is derived from the isolating DC/DC converter. The output is +5V DC and it is short circuit protected.

The pin out of this connector (facing the pins) is shown below:

	2	4	6	8	10
	I_GND	BUS_H	N.C.	I_+5V	N.C.
	N.C.	BUS_L	I_GND	N.C.	I_GND
	1	3	5	7	9

In this connector specification I\_GND is the isolated ground and the I\_+5V is the isolated power output. When making connections in twisted pair CAN network you connect the BUS\_H and BUS\_L terminals together for all the nodes and terminate the bus at both ends with a 120 Ohm termination resistor.

### Connection Procedure

Please follow these steps when you set up your system:

- Set up your ECAN527-2 CAN interface boards in their PC/104 systems
- Connect the duplex fiber optic cables to the ECAN527-2 modules: blue plug to blue socket and gray plug to gray socket.
- Connect the duplex fiber optic cables to the CAN Spider module ports: blue plug to blue socket and gray plug to gray socket.
- Make sure your power supply for the CAN Spider provides a voltage between 8-30 VDC
- Power off the power supply that should power the CAN Spider
- Wire the power supply to the CAN Spider
- Power up your ECAN527-2 systems as well as your CAN Spider
- Now run the diagnostic software on your host CAN computers and make sure everything is working.

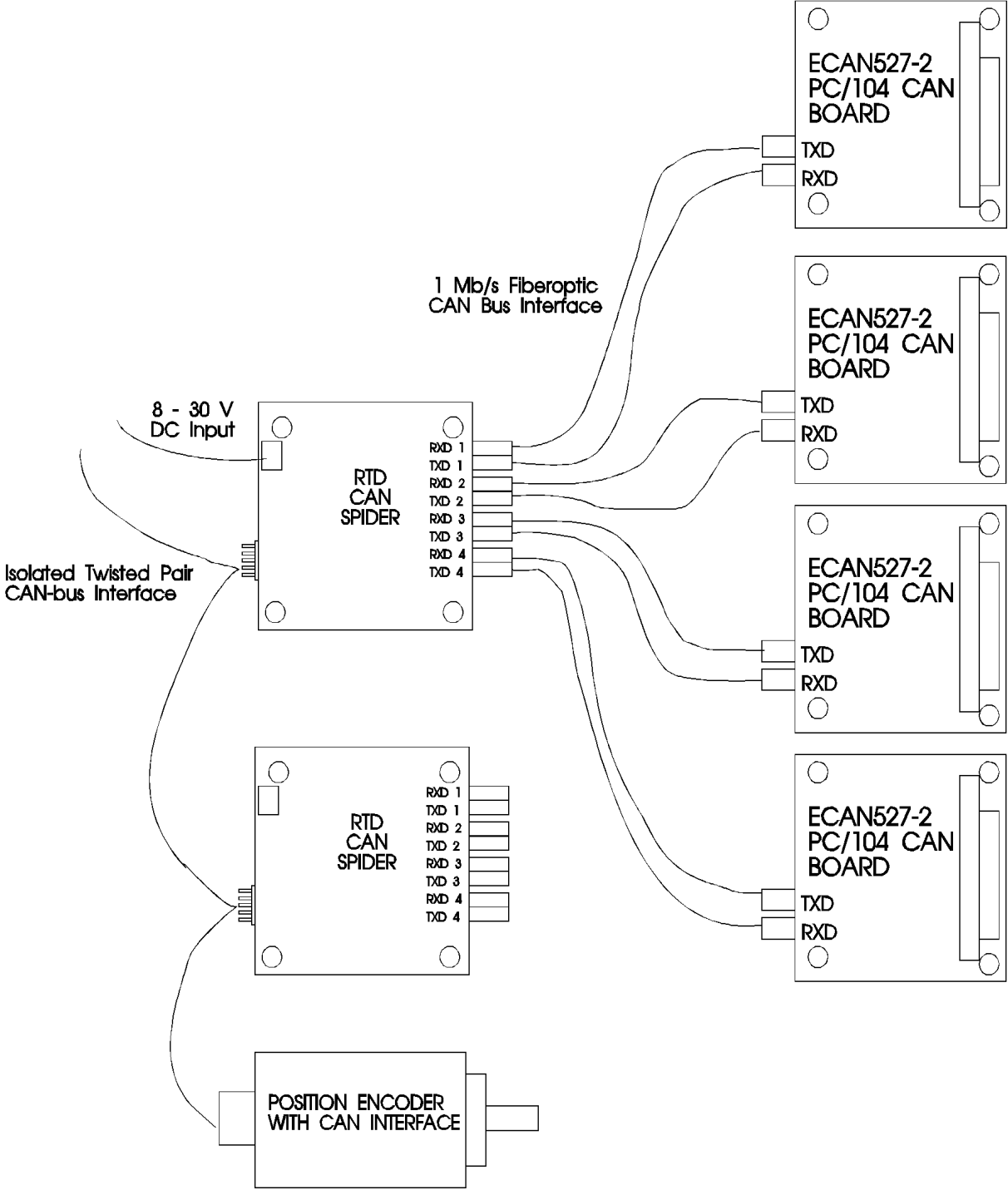
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**CAUTION:** The power supply of the CAN Spider is over voltage protected with a 30V Zener diode as well as reverse polarity protected with a Schottky diode. These devices are designed to protect the CAN Spider power supply from transients and spikes in automotive and industrial installations. They are not designed to withstand wrong polarity or over voltage for indefinite periods of time.

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# Example System Setup

The figure below illustrates a possible system configuration. Use the twisted pair CAN port to expand with multiple Spiders as well as other sensors or actuators with a CAN interface.



## ***Power Supply Connections***

The RTD Embedded Technologies CAN Spider is designed to operate in standalone mode removed from the main computer. This module has an integrated wide input range power supply unit. The power supply system of the CAN Spider consists of two DC/DC converters in series.

The first DC/DC converter is a non isolated step-down DC/DC converter that converts a wide input range of 8-30V to +5V. The total output power of this stage is 25W, i.e. 5A of current. This output power rating can not be reached without adding a heatsink to the TO-220 DC/DC converter chip. The output of the step down converter is located at terminal block J3 next to the input terminal block. This output can be used to power other 5V devices in the system.

The output of the step down converter is connected to an isolated monolithic regulated DC/DC converter. This power unit supplies the onboard circuitry. It also provides power out from the CAN bus header as well as the screw terminal block J2 that is located close by. This DC/DC converter has a maximum output power of 3W. You may load this converter with 1.5W max. The output of this converter is short circuit protected to improve reliability.

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**Note:** Power wiring to the CAN Spider must be sufficiently heavy to supply needed current without excessive voltage drop, or erratic operation or no startup may occur.

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## Chapter 3 RETURN POLICY AND WARRANTY

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### ***Return Policy***

If you wish to return a product to the factory for service, please follow this procedure:

Read the Limited Warranty to familiarize yourself with our warranty policy.

Contact the factory for a Return Merchandise Authorization (RMA) number.

Please have the following available:

- Complete board name
- Board serial number
- A detailed description of the board's behavior

**List the name of a contact person**, familiar with technical details of the problem or situation, **along with their phone and fax numbers, address, and e-mail address** (if available).

**List your shipping address!!**

Indicate the shipping method you would like used to return the product to you.

*We will not ship by next-day service without your pre-approval.*

*Carefully package the product, using proper anti-static packaging.*

*Write the RMA number in large (1") letters on the outside of the package.*

*Return the package to:*

*RTD Embedded Technologies, Inc.*

*103 Innovation Blvd.*

*State College PA 16803-0906*

*USA*

## ***Limited Warranty***

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, INC. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for an RMA number.

THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCTS WHICH HAVE BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, "acts of God" or other contingencies beyond the control of RTD Embedded Technologies), OR AS A RESULT OF SERVICE OR MODIFICATION BY ANYONE OTHER THAN RTD Embedded Technologies. EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND RTD Embedded Technologies EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED HEREIN. ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES FOR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THIS WARRANTY. IN THE EVENT THE PRODUCT IS NOT FREE FROM DEFECTS AS WARRANTED ABOVE, THE PURCHASER'S SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED ABOVE. UNDER NO CIRCUMSTANCES WILL RTD Embedded Technologies BE LIABLE TO THE PURCHASER OR ANY USER FOR ANY DAMAGES, INCLUDING ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOST PROFITS, LOST SAVINGS, OR OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT.

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