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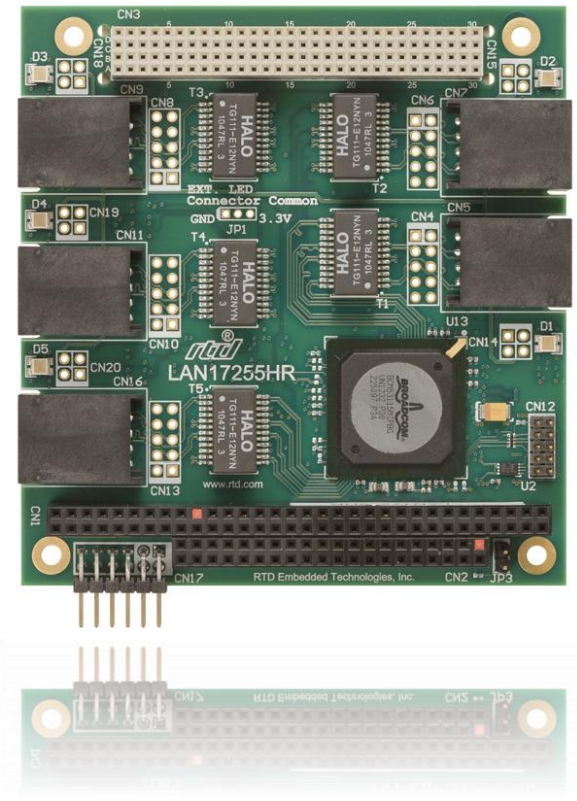
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LAN10255HR/IDAN-LAN10255
LAN16255HR/IDAN-LAN16255
LAN17255HR/IDAN-LAN17255
LAN18255HR/IDAN-LAN18255

5-Port Gigabit Ethernet Unmanaged Switch



User's Manual

BDM-610020107 Rev. D

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AS9100 and ISO 9001 Certified

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Revision History

Rev A	Initial Release	12/5/2012
Rev B	Corrected LED connector and Ethernet DIL connector reference designations	4/3/2013
Rev C	Added reference to LAN10255HR, LAN16255HR, and LAN18255HR versions. Corrected power connector table.	4/8/2013
Rev D	Added Jumbo frame information, cleaned up version naming	8/17/2014

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1 Introduction

1.1 Product Overview

The LAN1x255HR is designed to provide five Gigabit Ethernet ports for expanding the networking capabilities of any system. The board can be used either in a PC/104-*Plus* system or as a standalone module. In a stack it gets power from either the PCI bus, ISA bus, or a power connector. It provides five RJ45 ports with auto-configuration so any of the ports can be upstream or downstream. This board is compatible with all PC/104, PC/104-*Plus*, and PCI-104 cpuModules.

1.2 Board Features

- BroadCom BCM53115 Gigabit Ethernet Switch:
  - 5 Full Duplex Unmanaged Gigabit Ethernet Ports
    - Auto configuration means any of the ports can be an uplink or downlink
  - Any port can be the uplink, remaining links will be downlinks.
  - Ports have automatic MDI crossover to eliminate the need for crossover cables
  - Supports Jumbo frames up to 9720 bytes
  - Industrial Temperature rated: -40 to +85 C
- PC/104, PC/104-*Plus*, or PCI-104
  - PCI and ISA Buses are used as a pass through interfaces on the LAN1x255HR and only provide power to the module.

1.3 Ordering Information

The LAN1x255HR is available with the following options:

Table 1: Ordering Options

Part Number	Description
LAN10255HR	5 port Gigabit Ethernet Switch No Bus Connectors
LAN16255HR	5 port Gigabit Ethernet Switch PC/104
LAN17255HR	5 port Gigabit Ethernet Switch PC/104-*Plus*
LAN18255HR	5 port Gigabit Ethernet Switch PCI-104
IDAN-LAN10255HR	5 port Gigabit Ethernet Switch in IDAN enclosure No Bus Connectors
IDAN-LAN16255HR	5 port Gigabit Ethernet Switch in IDAN enclosure PC/104
IDAN-LAN17255HR	5 port Gigabit Ethernet Switch in IDAN enclosure PC/104-*Plus*
IDAN-LAN18255HR	5 port Gigabit Ethernet Switch in IDAN enclosure PCI-104

The Intelligent Data Acquisition Node (IDAN™) building block can be used in just about any combination with other IDAN building blocks to create a simple but rugged 104™ stack. This module can also be incorporated in a custom-built RTD HiDAN™ or HiDANplus High Reliability Intelligent Data Acquisition Node. Contact RTD sales for more information on our high reliability systems.

1.4 Contact Information

1.4.1 Sales Support

For sales inquiries, you can contact RTD Embedded Technologies sales via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: sales@rtd.com

1.4.2 Technical Support

If you are having problems with you system, please try the steps in the Troubleshooting section of this manual.

For help with this product, or any other product made by RTD, you can contact RTD Embedded Technologies technical support via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: techsupport@rtd.com

2 Specifications

2.1 Operating Conditions

Table 2: Operating Conditions

Symbol	Parameter	Test Condition	Min	Max	Unit
V_{cc5}	5V Supply Voltage		4.75	5.25	V
T_a	Operating Temperature		-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%
MTBF	Mean Time Before Failure	30C	TBD		Hours

2.2 Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Typ.	Max	Unit
Power +5V	Power Consumption	0 ports connected 1 port connected 2 ports connected 3 ports connected 4 ports connected 5 ports connected		1.0 1.4 1.9 2.0 2.0 2.1		W

3 Board Connection

3.1 Board Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your board in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the board at the edges, and do not touch the components or connectors. Handle the board in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

3.2 Physical Characteristics

- Weight: Approximately 55 g (0.12 lbs.)
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)

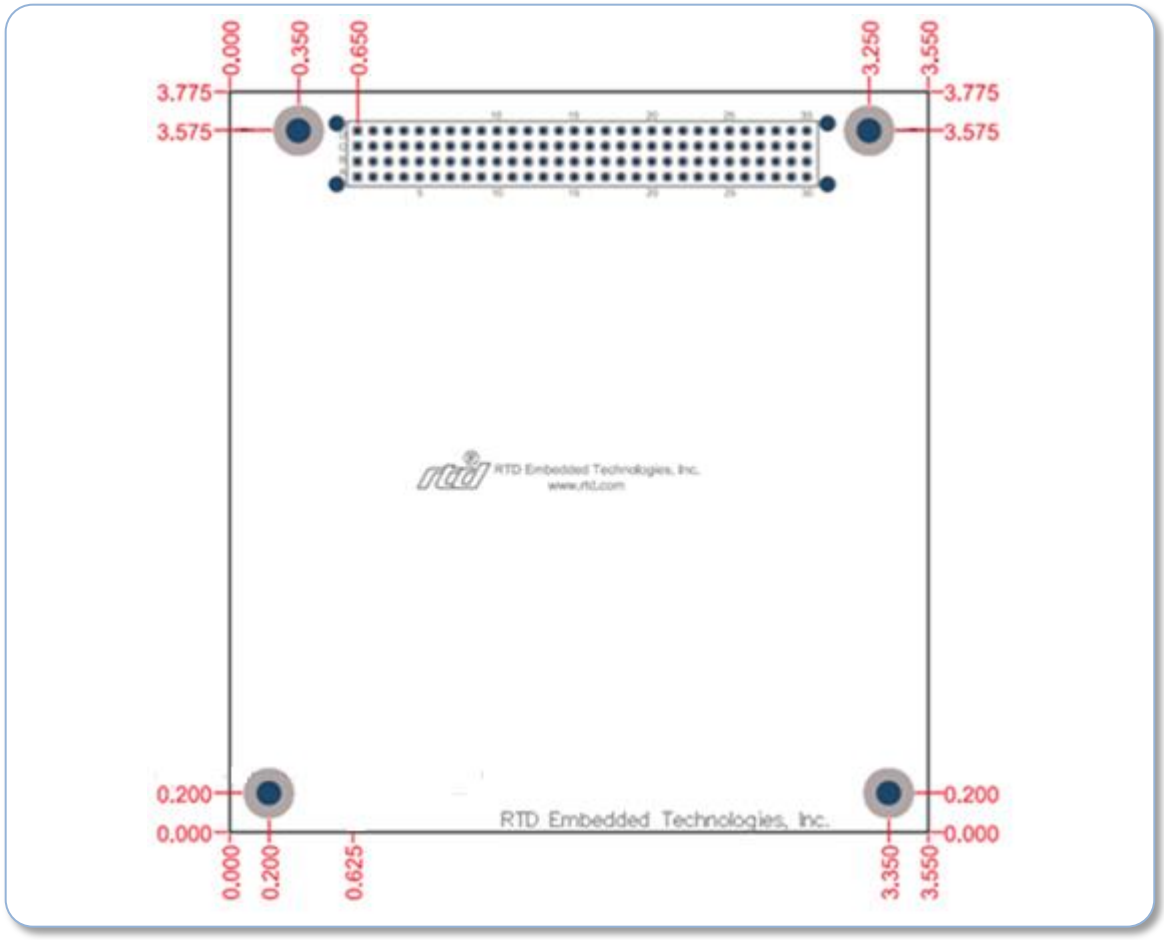


Figure 1: Board Dimensions

3.3 Connectors and Jumpers

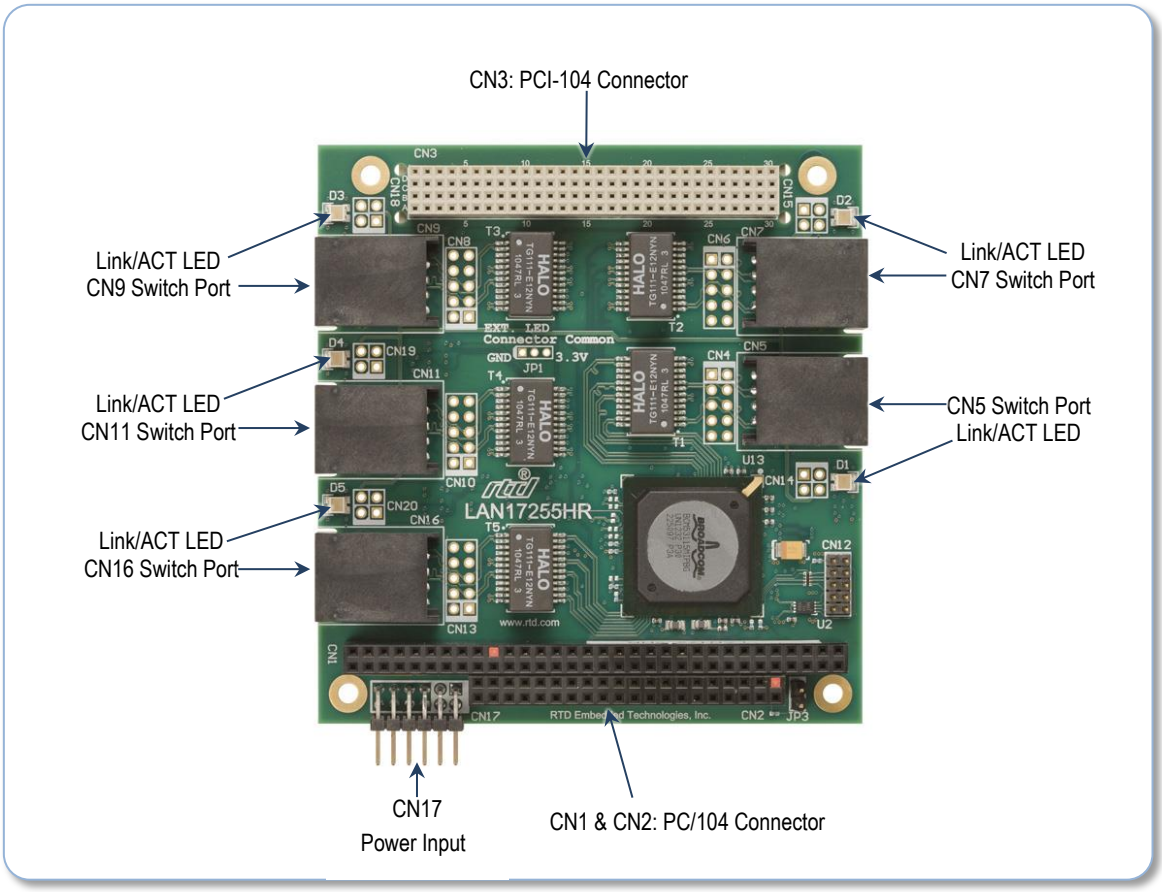


Figure 2: LAN17255HR Board Connections

3.3.1 External I/O Connectors and Jumpers

- CN1 & CN2: PC/104 ISA bus (LAN16255 and LAN17255 only)
- CN3: PCI-104 PCI bus (LAN17255 and LAN18255 only)
- CN5, CN7, CN9, CN11, & CN16: RJ-45 connectors for Ethernet
- CN4, CN6, CN8, CN10, & CN13: 2x5 0.1" DIL connector not populated in standard product. Used for bringing out the Ethernet ports in IDAN, HiDAN, and HiDANplus systems.
- CN14, CN15, CN18, CN19, & CN20: External LED connectors
- JP1: Power/ground selector for external LED connectors CN14, CN15, CN18, CN19, & CN20
- CN17: Power connector for standalone operation
- CN12 & JP3: Factory use only. Leave open.

3.3.2 RJ45 Twisted Pair Ethernet CN5, CN7, CN9, CN11, and CN16

Connectors CN5, CN7, CN9, CN11, and CN16 are for UTP (Unshielded Twisted Pair) wiring normally used for 10/100/1000 Base-T Ethernet. It is the default factory installed twisted pair connector on the board. The following table gives the pin out of CN5, CN7, CN9, CN11, and CN16.

Pin	1000 Mbps Function	10/100 Mbsp Function
1	MDI_A+	Transmit +
2	MDI_A-	Transmit -
3	MDI_B+	Receive +
4	MDI_C+	Not Used
5	MDI_C-	Not Used
6	MDI_B-	Receive -
7	MDI_D+	Not Used
8	MDI_D-	Not Used

Table 4: RJ45 Signal Assignments

CN5, CN7, CN9, CN11, and CN16 are standard female RJ-45 connectors. The figure below shows the pin numbering when **looking into the connector**:

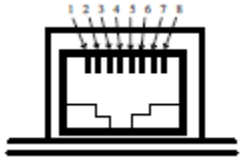


Figure 3: RJ-45 Jack Connector

3.3.3 TWISTED PAIR ETHERNET CN4, CN6, CN8, CN10, AND CN13

CN4, CN6, CN8, CN10, and CN13 are optional connectors which can be factory installed in place of the RJ45 connector. These connectors can be connected to a 9-pin "D" connector using ribbon cable. The pin out of CN4, CN6, CN8, CN10, and CN13 is in the table below.

10-pin DIL	1000 Mbsp Function	10/100 Mbsp Function	9-Pin "D"
1	MDI_B+	Receive +	1
2	MDI_B-	Receive -	6
3	MDI_C+	Not Used	2
4	MDI_C-	Not Used	7
5	MDI_A+	Transmit +	3
6	MDI_A-	Transmit -	8
7	MDI_D+	Not Used	4
8	MDI_D-	Not Used	9
9	Shield Ground		5
10	Shield Ground		N/C

Table 5: DIL Signal Assignments

3.3.4 STATUS LEDS

The tri-color LEDs on the board are used to indicate the status of the Ethernet ports.

LED Color	Description
Off	No Link
Green	Link at 1000 Mbps
Blue	Link at 100 Mbps
Red	Link at 10 Mbps
Any color blinking	Activity

Table 6: Status LEDs

3.3.5 EXTERNAL STATUS LED CONNECTORS CN14, CN15, CN18, CN19, AND CN20

CN14, CN15, CN18, CN19, and CN20 are the status LED signals that are buffered and able to source or sink 24 mA. Additionally, JP1 can select either 3.3 volts or ground to use with these signals. These connectors are not installed when the Ethernet RJ45 connectors and LEDs are installed. The pin out is in the table below.

CNxx Pin	Function	10/100 Function
1	Link at 10 Mbps	Low when linked at 10 Mbps, blink for activity
2	Link at 100 Mbps	Low when linked at 100 Mbps, blink for activity
3	Link at 1000 Mbps	Low when linked at 1000 Mbps, blink for activity
4	3.3 volts or ground Depends on JP1 setting	If JP1 1-2 is shorted these pins will be ground If JP1 2-3 is shorted these pins will be 3.3 volts

Table 7: CN14 External LED Drive

3.3.6 CN17 Power Connector

CN17 is a power connector for standalone operation. The LAN1x255HR operates on +5 volts. The pin out of the connector is shown in the table below.

CN17 Pin	Signal	Description
1	GND	Ground
2	+5V	Power
3	RSVD	Reserved
4	RSVD	Reserved
5	RSVD	Reserved
6	RSVD	Reserved
7	GND	Ground
8	+5V	Power
9	GND	Ground
10	RSVD	Reserved
11	RSVD	Reserved
12	RSVD	Reserved

Table 8: CN17 Power Connector

Facing the connector, the pin assignments are as follows:

11	9	7	2	3	1
RSVD	GND	GND	RSVD	RSVD	GND
RSVD	RSVD	+5V	RSVD	RSVD	+5V
12	10	8	6	4	2

3.3.7 CN1 & CN2: PC/104 ISA Bus Connector

The ISA bus connector is the connection to the system CPU. This connector is used only as a +5V and ground source. The position and pin assignments are compliant with the *PC/104 Specification*. (See PC/104 Specifications on page 19).

3.3.8 CN3: PCI-104 PCI Bus Connector

The PCI connector is the connection to PCI peripheral modules. This connector is used only as a +5V and ground source. The position and pin assignments are compliant with the *PC/104*-Plus *Specification*. (See PC/104 Specifications on page 19).

3.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the PC/104 system or stack.
3. Select and install stand-offs to properly position the module on the stack.
4. Remove the module from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
7. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
8. Gently and evenly press the module onto the PC/104 stack.
9. If any boards are to be stacked above this module, install them.
10. Attach any necessary cables to the PC/104 stack.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

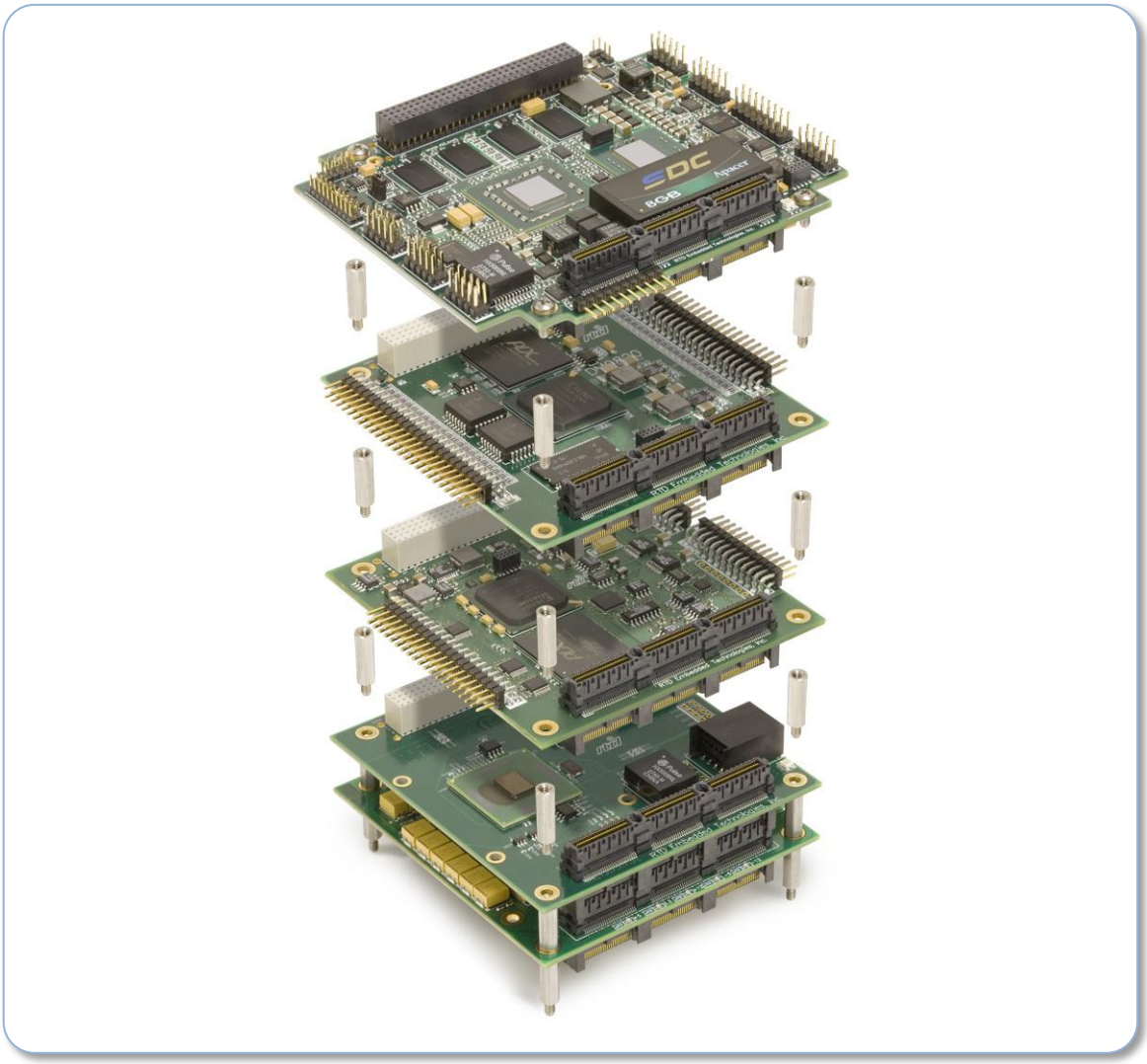


Figure 4: Example 104™ Stack

4 Functional Description

4.1 Block Diagram

The Figure below shows the functional block diagram of the LAN1x255HR. The various parts of the block diagram are discussed in the following sections.

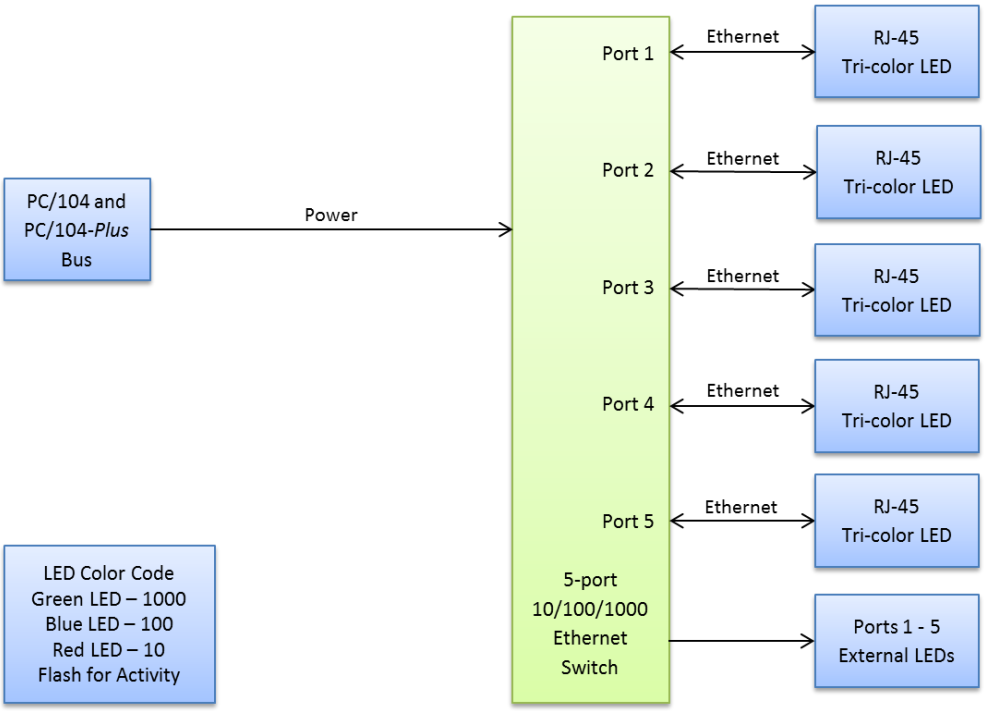


Figure 5: LAN1x255HR Block Diagram

4.2 BroadCom Gig-Ethernet Switch

The main component of the LAN1x255HR is the BroadCom BCM53115 Gigabit Ethernet switch. This is an industrial temperature rated, 5 port Gigabit Ethernet switch. This switch contains 5 full-duplex 10/100/1000 BASE-TX Ethernet transceivers for network interfacing. All 5 ports are brought to RJ-45 connectors on the board. This allows the LAN1x255HR to work as a switch in a stacked system. In a stand-alone system the BroadCom switch acts as a basic Ethernet switch. Any port can be used as an upstream port to supply a connection to the 4 other ports.

4.3 Jumbo Frame Support

The Broadcom Ethernet switch is capable of forwarding Ethernet frames up to 9720 bytes. The maximum frame size supported by the Intel Ethernet controller is 9014 bytes. To use Jumbo frames, it must be enabled in the Ethernet Controller driver settings (e.g. via the Device Manager in Windows). Until this is enabled, the Intel controller will drop any Jumbo frames it receives. Note that to use Jumbo frames effectively, all devices connected to the network must have Jumbo frames enabled, AND must agree on the frame size (mismatched frame sizes will result in dropped packets).

4.4 Onboard LEDs and External LED Connectors

The LAN1x255HR has onboard LEDs for each of the five Ethernet ports on the board. The setting for the onboard LEDs is to show link activity, link status and speed at 10/100/1000M. To bring the LEDs out of an enclosed system, there are 4-pin 0.1 inch DIL connectors for each port that can be wired to external LED circuitry. These signals can source or sink 24 mA and the board has a jumper option for 3.3 volt or ground to facilitate external LED configuration.

5 IDAN Connections

5.1 Module Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your module in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the module by the aluminum enclosure, and do not touch the components or connectors. Handle the module in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

5.2 Physical Characteristics

- Weight: Approximately 0.21 Kg (0.46 lbs.)
- Dimensions: 151.972 mm L x 129.978 mm W x 16.993 mm H (5.983 in L x 5.117 in W x 0.669 in H)

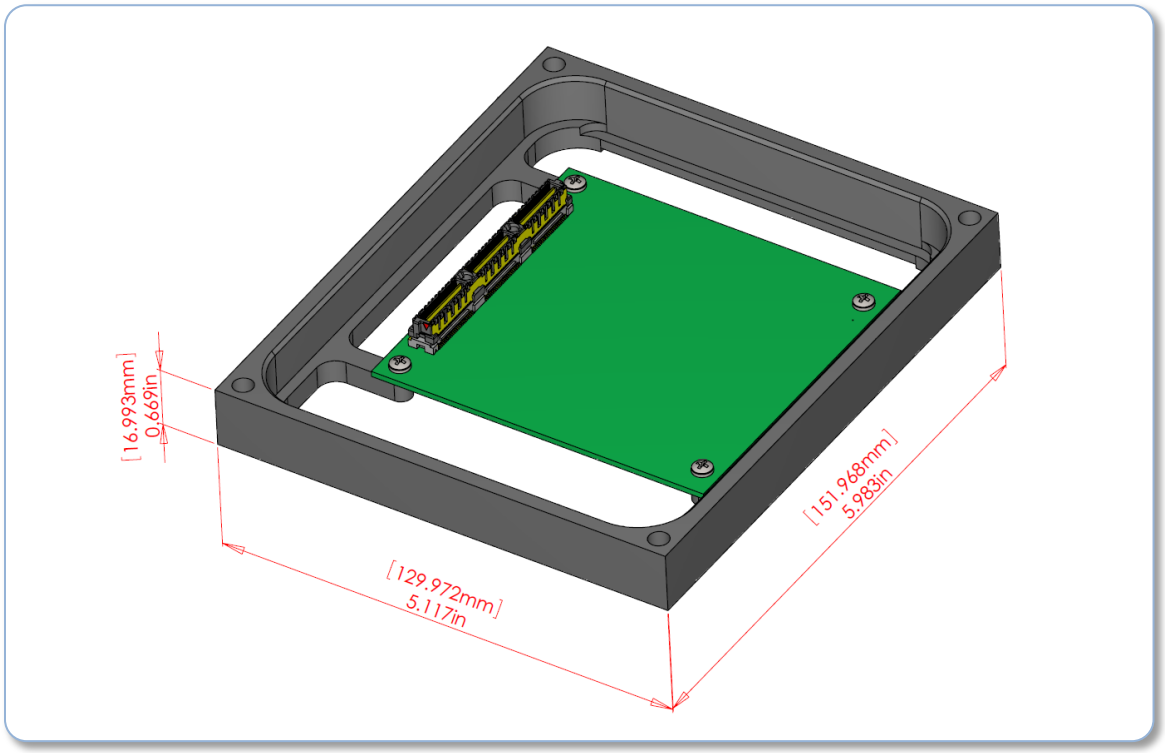


Figure 6: IDAN Dimensions

5.3 IDAN Connector Location

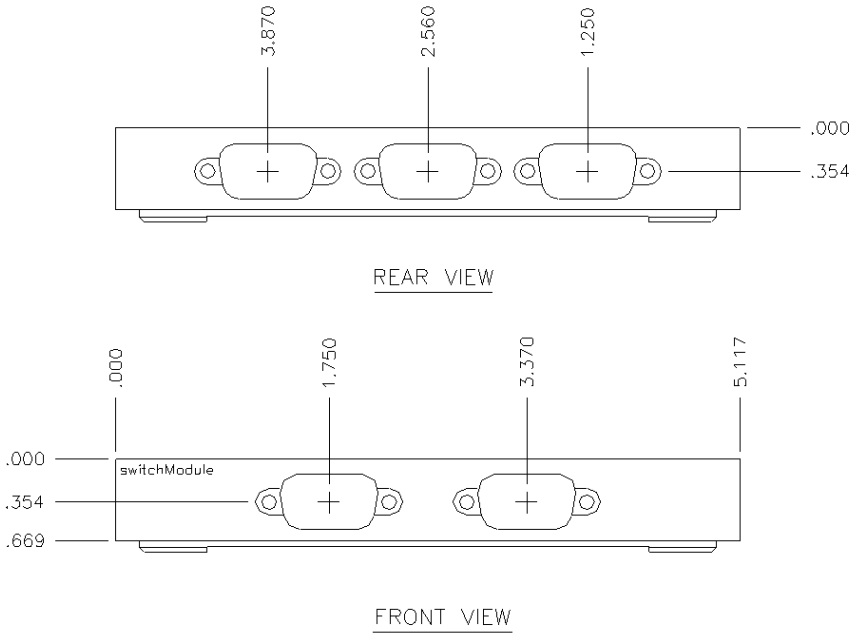


Figure 7: IDAN Connector Location

5.4 IDAN-LAN1x255HR

This utilityModule is also available in an IDAN configuration. The IDAN module is shown below.



Figure 8: IDAN-LAN1x255HR Front View



Figure 9: IDAN-LAN1x255HR Rear View

5.5 IDAN Twisted Pair Ethernet PORT1, PORT2, PORT3, PORT4, and PORT5

As an IDAN, the Ethernet signals are available on five "D" connectors, two on the front and three on the back. A DB-9 to RJ-45 adapter is also included for each port. The pin out is listed in the table below.

Board CNx	1000 Mbsp Function	10/100 Mbsp Function	9-Pin "D"	RJ-45 Adapter
1	MDI_B+	Receive +	1	3
2	MDI_B-	Receive -	6	6
3	MDI_C+	Not Used	2	4
4	MDI_C-	Not Used	7	5
5	MDI_A+	Transmit +	3	1
6	MDI_A-	Transmit -	8	2
7	MDI_D+	Not Used	4	7
8	MDI_D-	Not Used	9	8
9/10	Shield Ground		5/NC	

Table 9: LAN1x255HR IDAN Pin Out

5.6 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the IDAN system.
3. Remove the module from its anti-static bag.
4. Check that pins of the bus connector are properly positioned.
5. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
6. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
7. Gently and evenly press the module onto the IDAN system.
8. If any boards are to be stacked above this module, install them.
9. Finish assembling the IDAN stack by installing screws of an appropriate length.
10. Attach any necessary cables to the IDAN system.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

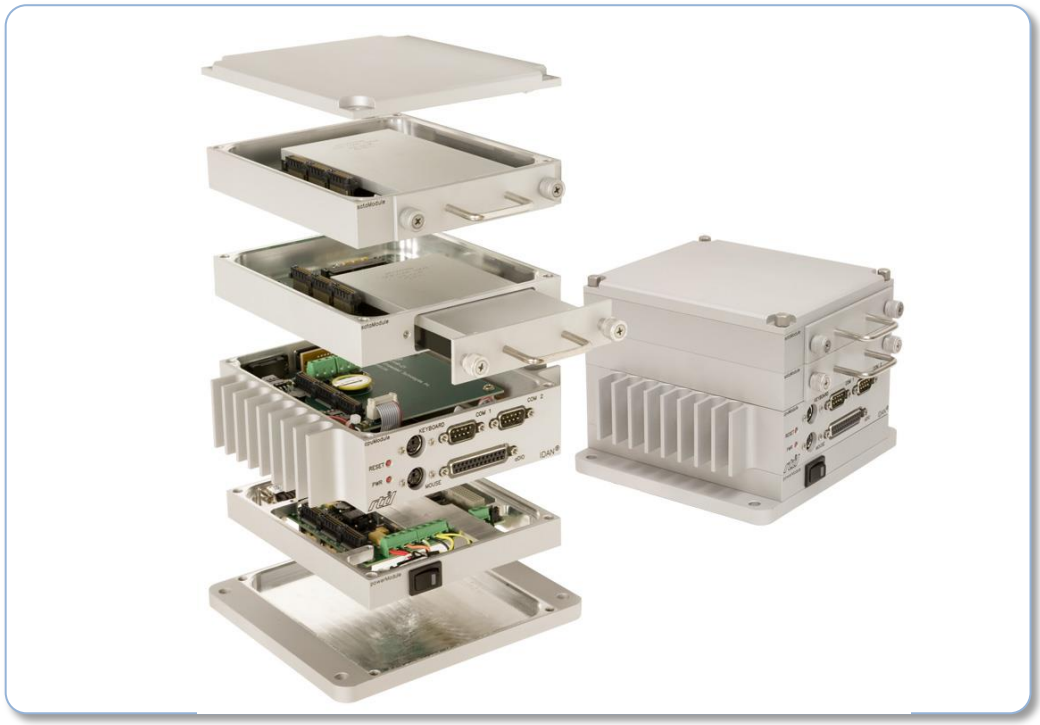


Figure 10: Example IDAN System

6 Troubleshooting

If you are having problems with your system, please try the following initial steps:

- **Simplify the System** – Remove modules one at a time from your system to see if there is a specific module that is causing a problem. Perform you troubleshooting with the least number of modules in the system possible.

- **Swap Components** – Try replacing parts in the system one at a time with similar parts to determine if a part is faulty or if a type of part is configured incorrectly.

If problems persist, or you have questions about configuring this product, contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087
E-Mail: techsupport@rtd.com

Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

7 Additional Information

7.1 PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Consortium:

www.pc104.org

8 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 a Return Material Authorization (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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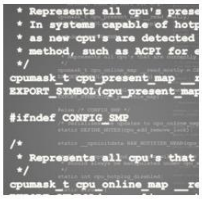
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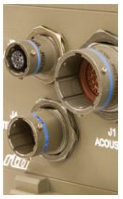
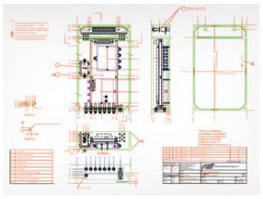
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