# CMT36106/3106/56106/5106 Hard Drive Carrier utilityModule

# User's Manual

RTD Embedded Technologies, Inc.

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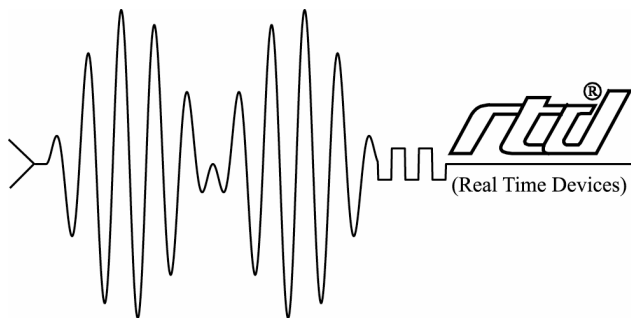
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# CMT36106/3106/56105/5106
# Hard Drive Carrier utilityModule
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Revision History

| | |
|---|---|
| Rev. A | New Manual |
| Rev. B | Corrected the Jumpers section in Chapter 2. |
| Rev. C | Added chapter 5 to describe alternate CMT36106 for various IDAN configurations |
| | Modified technical support chapter |
| Rev. D | Added description of CMT56106/5106 |
| Rev. E | Added block diagram of RHD36106/3106 |

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# TABLE OF CONTENTS

# Chapter 1 INTRODUCTION

This manual gives information on the CMT36106 and CMT56106 Drive Carrier utilityModules. This module attaches to the EIDE and PC/104 connector of a cpuModule, allowing a high speed hard drive interface.

## *CMT36106 and CMT56106 IDE Drive Carrier utilityModule*

The CMT36106 utilityModule was designed to provide an IDE hard drive or Flash drive in the PC/104 stack to support RTD's family of PC/104-*Plus* cpuModules that have integrated EIDE controllers.

The CMT56106 utilityModule is designed to support RTD's PCI-104 cpuModules. It is very similar in function to the CMT36106.

**Notes:**    The CMT36106 and CMT56016 are not IDE controllers. They are only drive carriers. They must be used with a cpuModule that has an on-board IDE controller.

## *CMT3106 and CMT5106 utilityModule with Hard Drive*

The CMT3106 is a CMT36016 shipped with a 2.5" form factor hard drive installed.

The CMT5106 is a CMT56016 shipped with a 2.5" form factor hard drive installed.

## *Features*

The following are major features of the CMT36106 and CMT56106 utilityModules.

- Provides a high speed drive interface up to DMA/100 (if supported by the cpuModule)

- A standard 2.5" form factor drive can be mounted directly onto the module

- A 0.1" 40-pin connector is provided to connect to a second drive, i.e. a CD-ROM drive.

- A stack through connector is provided to allow two CMT36106 or CMT56106 drives in a system.

## *Connectors*

Connectors provided are:

- CN1: PC/104 XT Bus (CMT36106 Only)
- CN2: PC/104 AT Bus (CMT36106 Only)
- CN3: EIDE hard drive connector
- CN4: EIDE stack through connector
- CN5: EIDE cable connector

## *Recommended Cables*

- 40-conductor or 80-conductor EIDE cable which can be used to connect an external drive (hard drive or CD-ROM drive) to the CMT36106 or CMT56106.

## *General Specifications*

- Dimensions:  3.8 x 3.9 x 0.6"  (97 x 100 x 16 mm)
- Weight (mass):  3.0 ounces (85 grams)
- 4-layer PCB
- Operating conditions: (not including drive)
- temperature: -40 - +85  degrees C
- relative humidity: 0 - 95%, non-condensing
- Storage temperature:  -55  to +125  degrees C

# Chapter 2 CONFIGURING THE UTILITYMODULE

The following sections contain information on configuring the utilityModule.

Please read this entire section before attempting to use the utilityModule.

## *Cable modes*

There are two types of cables that are used for EIDE drives: a 40 conductor cable, and an 80 conductor cable. The 80 conductor cable adds a ground wire between each signal, and uses the standard 40 pin connectors. A 40 conductor cable can be used for speeds up to UDMA Mode 2 (Ultra ATA/33). An 80 conductor cable is required for higher speeds. The BIOS or operating system detects the type of cable that is attached, and selects an appropriate speed. The CMT36106/56106 can emulate either 40 conductor or 80 conductor cables based on the jumper settings.

## *Connecting External Drives*

External EIDE drives can be connected to CN5 of the CMT36106/56106. This can be either an additional hard drive, or a CD-ROM drive. In this configuration, one of the drive must be configures as a master, and one as a slave.

When using an external drive, a 40 conductor cable is generally used, and the board configured in 40 conductor mode. If higher transfer rates are desired, 80 conductor mode can be used. The ATA specification limits an 80 conductor cable to 18 inches in length. The PC board has about 12 inches of trace, so a cable attached to CN5 in 80 conductor mode may only be 6 inches in length. Also, not all signals go to all connectors on an 80 conductor cable. The section of the cable that attaches to the drives should be used, and the remaining cable should be discarded.

## *Jumpers*

Jumper JP1 configures the following functions:

• 40 or 80 conductor mode

• Master/Slave

Table 2.1 shows the jumper settings to select the cable mode for the CMT36106/56106. When two of these boards are used in the same system, they must both be jumpered for 40-conductor mode.

**Table 2.1 Cable Mode Settings**

| Cable Mode | JP1 | | Fastest Speed |
|---|---|---|---|
| | 5-6 | 7-8 | |
| 40-conductor | Yes | No | Ultra ATA/33 |
| 80-conductor | No | Yes | Ultra ATA/100 |

The first four positions of JP1 directly connect to the master/slave jumpers of the on board EIDE drive. Typical settings are shown in Table 2.2. Note that the settings may be different depending on the drive used. When two CMT36106/56016's are in a system, or a CMT36106/56016 is used with an external drive, one drive must be configured as a master, and the other drive as a slave.

**Table 2.2: Drive Mode Settings**

| Mode | JP1 Setting (position 1-4) |
|---|---|
| Master | None |
| Slave | 3-4 |
| Cable Select (not recommended) | 2-4 |

**Notes:** The CMT36106/56106 only can only connect to two drives. For example, if two CMT36106/56106's are in a system, a CD-ROM cannot also be connected.

# Chapter 3 INSTALLING THE UTILITYMODULE

Since the utilityModule uses an EIDE stack through bus, it must be stacked directly above the cpuModule.

## *Recommended Procedure*

We recommend you follow the procedure below to ensure that stacking of the modules does not damage connectors or electronics.

- Turn off power to the PC/104 system or stack.

- Select and install standoffs to properly position the utilityModule on the PC/104 stack.

- Touch a grounded metal part of the stack to discharge any buildup of static electricity.

- Remove the utilityModule from its anti-static bag.

- Verify the jumper settings of the utilityModule.

- Check that keying pins in the PC/104 bus connector are properly positioned (CMT36106 only).

- Hold the utilityModule by its edges and orient it so the bus connector pins line up with the matching connector on the stack.

- Gently and evenly press the utilityModule onto the PC/104 stack.

---

**CAUTION:** **Do not force the module onto the stack! Wiggling the module or applying too much force may damage it. If the module does not readily press into place, remove it, check for bent pins or out-of-place keying pins, and try again.**

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# Chapter 4 CONNECTING THE UTILITYMODULE

The following sections describe connectors of the utilityModule.

## *Finding Pin 1 of Connectors*

A white area silk-screened on the PC board indicates the pin 1 end of connectors. A square solder pad visible on the bottom of the PC board also indicates it.

Please make certain you have correctly identified pin 1 of a connector before you connect to it and attempt to use the utilityModule.

### Connector Locations

The figure below shows connector locations.
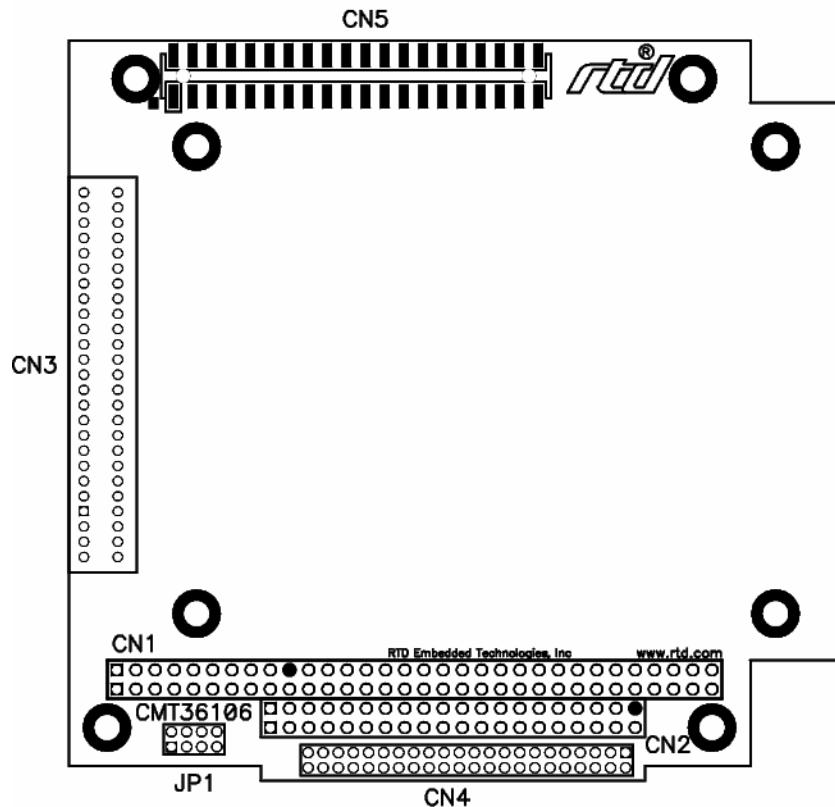


**Figure 4.1 CMT36106 Connector Locations**

| Notes: | With the exception of the PC/104 connectors, the CMT56106 connectors and connector locations are almost identical to the CMT36106. |
|---|---|

| Connectors | | |
|------------|--------|------|
| **Connector** | **Function** | **Size** |
| CN1 | PC/104 XT Bus (CMT36106 only) | 64 pin |
| CN2 | PC/104 AT Bus (CMT36106 only) | 40 pin |
| CN3 | EIDE Drive Connector | 50 pin |
| CN4 | EIDE Stack through Connector | 44 pin |
| CN5 | EIDE Cable Connector | 40 pin |
| JP1 | Options Jumper | 8 pin |

## *PC/104 Bus Connectors, CN1 and CN2 (CMT36106 Only)*

Connectors CN1 and CN2 provide PC/104 bus connections. CN1 carries XT bus signals, and CN2 carries additional signals for the AT bus. The signals on CN1 and CN2 conform to the IEEE P966 standard for the PC/104 bus. The CMT36106 only connects to the power pins of the PC/104 bus.

The following tables list the connector pin outs:

| PC/104 XT Bus Connector, CN1 | | |
|---|---|---|
| **Pin** | **Row A** | **Row B** |
| 1 | IOCHCHK* | 0V |
| 2 | SD7 | RESETDRV |
| 3 | SD6 | +5V |
| 4 | SD5 | IRQ9 |
| 5 | SD4 | -5V |
| 6 | SD3 | DRQ2 |
| 7 | SD2 | -12V |
| 8 | SD1 | ENDXFR* |
| 9 | SD0 | +12V |
| 10 | IOCHRDY | (KEYING PIN) |
| 11 | AEN | SMEMW* |
| 12 | SA19 | SMEMR* |
| 13 | SA18 | IOW* |
| 14 | SA17 | IOR* |
| 15 | SA16 | DACK3 |
| 16 | SA15 | DRQ3 |
| 17 | SA14 | DACK1* |
| 18 | SA13 | DRQ1 |
| 19 | SA12 | REFRESH |
| 20 | SA11 | SYSCLK |
| 21 | SA10 | IRQ7 |
| 22 | SA9 | IRQ6 |
| 23 | SA8 | IRQ5 |
| 24 | SA7 | IRQ4 |
| 25 | SA6 | IRQ3 |
| 26 | SA5 | DACK2* |
| 27 | SA4 | TC |
| 28 | SA3 | BALE |
| 29 | SA2 | +5V |
| 30 | SA1 | OSC |
| 31 | SA0 | 0V |
| 32 | 0V | 0V |

| PC/104 AT Bus Connector, CN2 | | |
|---|---|---|
| **Pin** | **Row C** | **Row D** |
| 0 | 0V | 0V |
| 1 | SBHE* | MEMCS16* |
| 2 | LA23 | IOCS16* |
| 3 | LA22 | IRQ10 |
| 4 | LA21 | IRQ11 |
| 5 | LA20 | IRQ12 |
| 6 | LA19 | IRQ15 |
| 7 | LA18 | IRQ14 |
| 8 | LA17 | DACK0* |
| 9 | MEMR* | DRQ0 |
| 10 | MEMW* | DACK5* |
| 11 | SD8 | DRQ5 |
| 12 | SD9 | DACK6* |
| 13 | SD10 | DRQ6 |
| 14 | SD11 | DACK7* |
| 15 | SD12 | DRQ7 |
| 16 | SD13 | +5V |
| 17 | SD14 | MASTER* |
| 18 | SD15 | 0V |
| 19 | (KEYING PIN) | 0V |

**Note:** Two locations on the bus have mechanical keying pins to help prevent misconnection of the PC/104 bus. These keying pins are a part of the PC/104 standard, and we strongly recommend you leave them in place.

If you have other modules without keying pins, we suggest you modify them to include keying.

## *EIDE Drive Connector, CN3*

CN3 is a 50-pin 2mm DIL connector used to attach to the board mounted hard drive. The pin out of this connector is shown below.

| EIDE Hard Drive Connector, CN3 | | | |
|---|---|---|---|
| **Pin** | **Signal** | **Function** | **in/out** |
| A | | Option Selection Pin | |
| B | | Option Selection Pin | |
| C | | Option Selection Pin | |
| D | | Option Selection Pin | |
| Key | n.c. | | |
| Key | n.c. | | |
| 1 | RESET* | Reset HD | out |
| 2 | GND | Ground signal | -- |
| 3 | HD7 | HD data 7 | in/out |
| 4 | HD8 | HD data 8 | in/out |

| 5 | HD6 | HD data 6 | in/out |
|---|---|---|---|
| 6 | HD9 | HD data 9 | in/out |
| 7 | HD5 | HD data 5 | in/out |
| 8 | HD10 | HD data 10 | in/out |
| 9 | HD4 | HD data 4 | in/out |
| 10 | HD11 | HD data 11 | in/out |
| 11 | HD3 | HD data 3 | in/out |
| 12 | HD12 | HD data 12 | in/out |
| 13 | HD2 | HD data 2 | in/out |
| 14 | HD13 | HD data 13 | in/out |
| 15 | HD1 | HD data 1 | in/out |
| 16 | HD14 | HD data 14 | in/out |
| 17 | HD0 | HD data 0 | in/out |
| 18 | HD15 | HD data 15 | in/out |
| 19 | GND | Ground signal | -- |
| 20 | n.c. | | -- |
| 21 | AEN | Address Enable | out |
| 22 | GND | Ground signal | -- |
| 23 | IOW* | I/O Write | out |
| 24 | GND | Ground signal | -- |
| 25 | IOR* | I/O Read | out |
| 26 | GND | Ground signal | -- |
| 27 | IOCHRDY | I/O Channel Ready | in |
| 28 | BALE | Bus Address Latch Enable | out |
| 29 | n.c. | | |
| 30 | GND | Ground signal | -- |
| 31 | IRQ | Interrupt Request | in |
| 32 | IOCS16* | 16 bit transfer | in |
| 33 | A1 | Address 1 | out |
| 34 | GND | Ground signal | -- |
| 35 | A0 | Address 0 | out |
| 36 | A2 | Address 2 | out |
| 37 | HCS0* | HD Select 0 | out |
| 38 | HCS1* | HD Select 1 | out |
| 39 | LED | HDD activity LED (-) | in |
| 40 | GND | Ground signal | -- |
| 41 | +5V | Logic Power | Pwr |
| 42 | +5V | Motor Power | Pwr |
| 43 | GND | Power Ground | -- |
| 44 | n.c. | | |

## *EIDE Stack through Connector, CN4*

CN4 is a 44-pin 2mm DIL connector is the EIDE stack through connector. The pin out of this connector is the same as pins 1-44 of CN3.

## EIDE Cable Connector, CN5

CN5 is a 40-pin 0.1" DIL connector is the EIDE cable connector. The pin out of this connector is the same as pins 1-40 of CN3.

# Chapter 5 CMT36106/56106 FOR SYSTEMS

For some RTD system configurations, an alternate version of the CMT36106 or CMT56106 is installed to add a battery and PC speaker to the system. The RHD36106 is also available to add a removable hard drive configuration to a system. This chapter describes the connections for the alternate CMT36106/56106 modules.
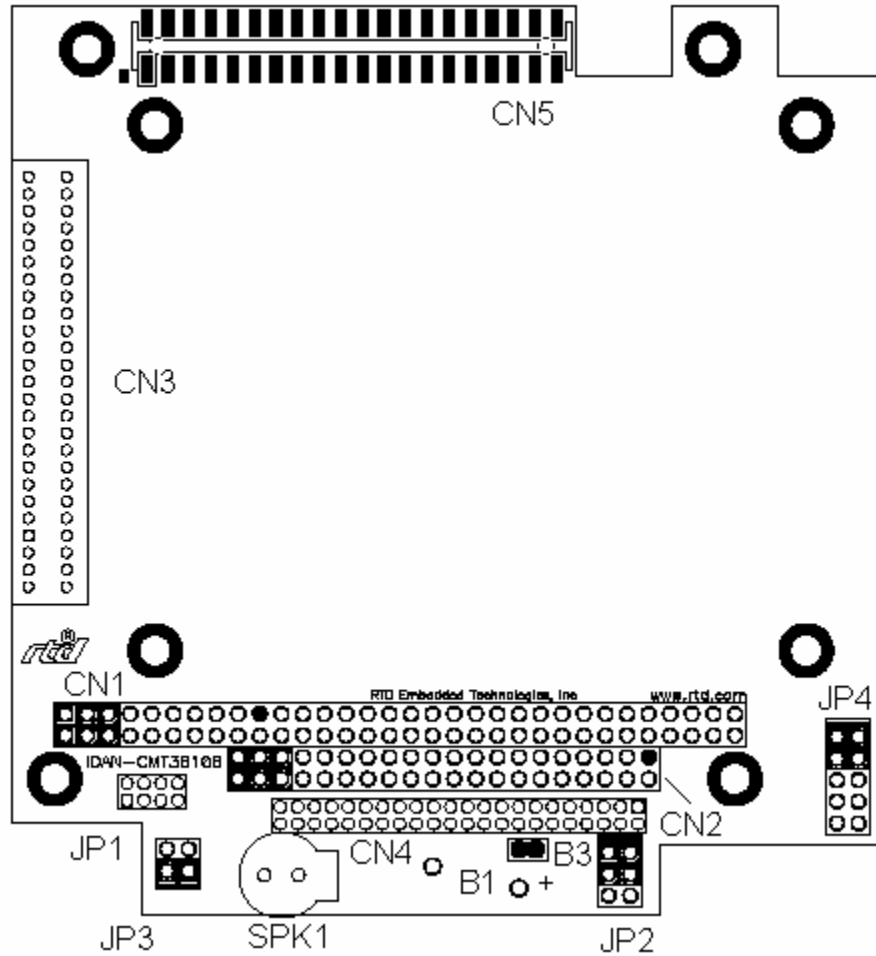
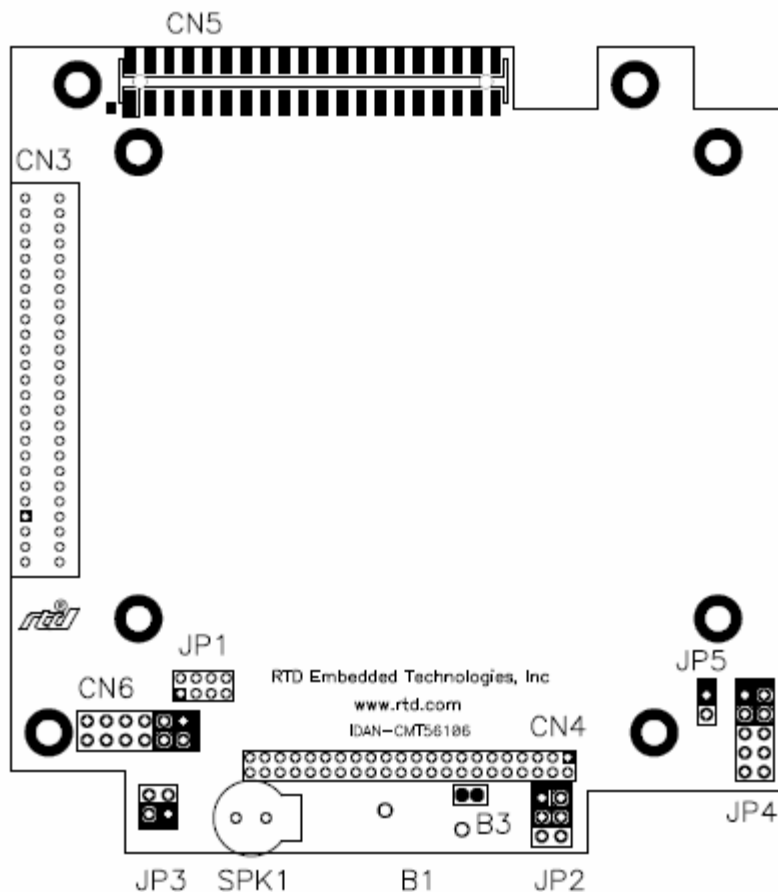## *Connector Locations*



**Figure 5.1 CMT36106 Connector Locations**

**Figure 5.2 CMT56106 Connector Locations**

| CMT36106/56106 Connectors | | |
|---|---|---|
| **Connector** | **Function** | **Size** |
| CN1 | PC/104 XT Bus (CMT36106 only) | 64 pin |
| CN2 | PC/104 AT Bus (CMT36106 only) | 40 pin |
| CN3 | EIDE Drive Connector | 50 pin |
| CN4 | EIDE Stack through Connector | 44 pin |
| CN5 | EIDE Cable Connector | 40 pin |
| CN6 | Power Connector (CMT56106 Only) | 12 pin |
| JP1 | Configuration Jumpers | 8 pin |
| JP2 | Keyboard and Push-Button Reset | 6 pin |
| JP3 | Bus Mouse | 4 pin |
| JP4 | Multifunction Connector | 10 pin |
| JP5 | ATX Power Switch Connector (CMT56106 Only) | 2 pin |
| B1 | Battery  (Factory Installed) | 2 pin |
| B3 | Solder Jumper (to bypass battery protection diode) | 2 pin |
| SPK1 | PC Speaker (Factory Installed) | 2 pin |
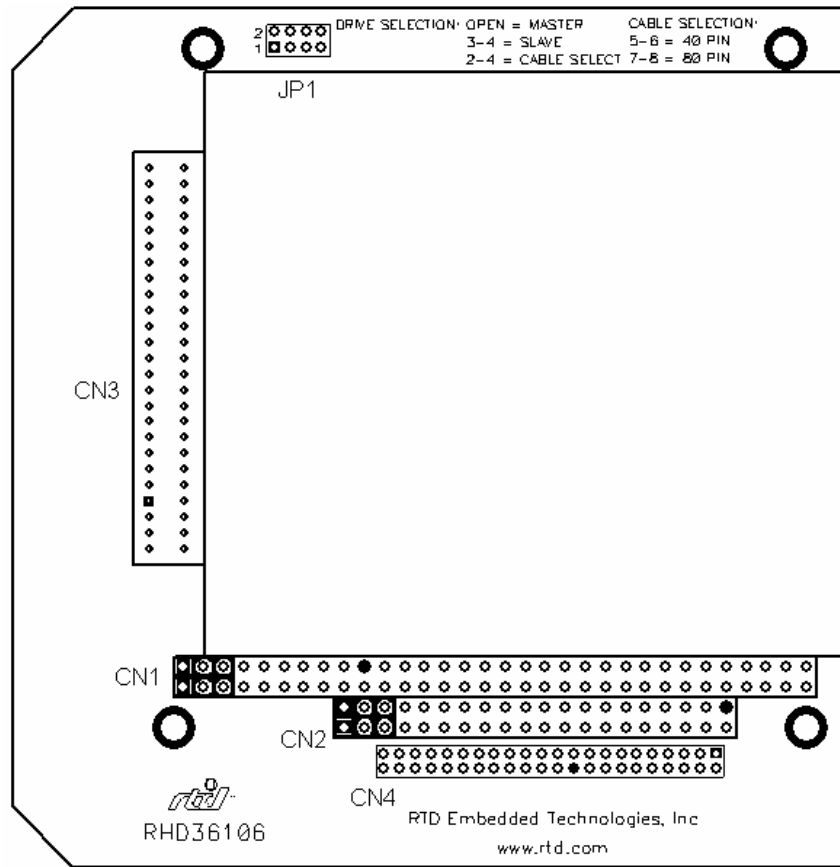
**Figure 5.3 RHD36106 Connector Locations**

| RHD36106 Connectors | | |
|---|---|---|
| **Connector** | **Function** | **Size** |
| CN1 | PC/104 XT Bus (CMT36106 only) | 64 pin |
| CN2 | PC/104 AT Bus (CMT36106 only) | 40 pin |
| CN3 | EIDE Drive Connector | 50 pin |
| CN4 | EIDE Stack through Connector | 44 pin |
| JP1 | Configuration Jumpers | 8 pin |

## Configuration Jumpers, JP1

The operation of JP1 is described in Chapter 2.

## Keyboard and Push-Button Reset, JP2

The Keyboard and Push-Button Reset connector implements the following functions:

- AT keyboard

- System reset input

The following table gives the pinout of JP2.

| Keyboard and Push-Button Reset, JP2 | | | |
|---|---|---|---|
| Pin | Signal | Function | Input/Output |
| 1 | KBP_SPKR- | Keyboard Power (+5V) | Output |
| 2 | CPU_GND | CPU Ground | -- |
| 3 | KBD | Keyboard Data | Input |
| 4 | KBC | Keyboard Clock | Output |
| 5 | RESET* | Manual push button reset | Input |
| 6 | CPU_GND | CPU Ground | -- |

*Keyboard*

An AT compatible keyboard can be connected to JP2. Usually PC keyboards come with a cable ending with a 5-pin male PS/2 connector. The following table lists the relationship between the pins on JP2 and a standard PS/2 keyboard connector.

| Keyboard Connector Pins on JP2 | | | |
|---|---|---|---|
| JP2 | Signal | Function | PS/2 |
| 1 | KBP_SPKR- | Keyboard Power (+5 Volts) | 4 |
| 2 | CPU_GND | CPU Ground | 3 |
| 3 | KBD | Keyboard Data | 1 |
| 4 | KBC | Keyboard Clock | 5 |

*System Reset*

Pin 5 of JP2 allows connection of an external push-button to manually reset the system. The push-button should be normally open, and connect to ground when pushed.

# Bus Mouse, JP3

The following table gives the function of the Bus Mouse connector.

Facing the connector pins, the pinout is:

| Bus Mouse, JP3 | | | |
|---|---|---|---|
| Pin | Signal | Function | Input/Output |
| 1 | KBP_SPKR- | Speaker output (+5V) | Output |
| 2 | CPU_GND | CPU Ground | -- |
| 3 | MCLK | Mouse Clock | Output |
| 4 | MDATA | Mouse Data | Input/Output |

# Multifunction Connector, JP4

The Multifunction connector connects the following functions to the cpuModule:

- Speaker

- AT Keyboard

- Bus Mouse

- System Reset

- Battery

- ATX Power Button (CMT56106 only)

The following table gives the pinout of JP4.

| Multifunction Connector, JP4 | | | |
|---|---|---|---|
| Pin | Signal | Function | Input/Output |
| 1 | SPKR+ | Speaker output (open collector) | Input |
| 2 | KBP_SPKR- | Speaker output (+5V) | Input |
| 3 | RESET* | Manual push button reset | Output |
| 4 | PWR_BUTTON | ATX Power Button | Output |
| 5 | KBD | Keyboard Data | Output |
| 6 | KBC | Keyboard Clock | Input |
| 7 | CPU_GND | CPU Ground | -- |
| 8 | MCLK | Mouse Clock | Input |
| 9 | BAT+ | Battery output | Output |
| 10 | MDATA | Mouse Data | Input/Output |

**Notes:** Pin 4, the ATX Power Button is only connected on the CMT56106. On the CMT36106, this pin is not connected.

## *ATX Power Button, JP5*

| Power Button, JP5 | | | |
|---|---|---|---|
| Pin | Signal | Function | Input/Output |
| 1 | GND | Ground | -- |
| 2 | PWR_BUTTON | Soft Power Button | Input |

## *Battery, B1 (Factory Installed)*

Connection B1 on the CMT36106/56106 is the connection for a backup battery (in the range 2.40 V to 4.15 V; typically 3.0 or 3.6 V). This battery is used by the cpuModule. Battery functions are described in the cpuModule's hardware manual.

| Battery, B1 | | | |
|---|---|---|---|
| Pin | Signal | Pin | Signal |
| 1 | Battery + | 2 | Battery - |

## *Solder Jumper, B3 (to bypass battery protection diode)*

To bypass the onboard battery protection diode, short pins one and two of solder jumper B3.

## *PC Speaker, SPK1 (Factory Installed)*

A speaker is available on pins 1 and 2 of SPK1. These outputs are controlled by a transistor to supply 0.1 watt of power to an external speaker. The factory installed speaker has an impedance of 8 ohms and is connected between pins 1 and 2.

| PC Speaker, SPK1 | | | |
|---|---|---|---|
| Pin | Signal | Function | Input/Output |
| 1 | SPKR+ | Speaker Output (open collector) | Output |
| 2 | KBP_SPKR- | Speaker output (+5 volts) | Output |

## *PC/104 Bus Connectors, CN1 and CN2 (CMT36106 Only)*

Connectors CN1 and CN2 provide PC/104 bus connections. CN1 carries XT bus signals, and CN2 carries additional signals for the AT bus. The signals on CN1 and CN2 conform to the IEEE P966 standard for the PC/104 bus. The CMT36106 only connects to the power pins of the PC/104 bus.

These connectors are described in a previous chapter.

## *EIDE Drive Connector, CN3*

The function of CN3 is described in a previous chapter.

## *EIDE Stack through Connector, CN4*

CN4 is a 44-pin 2mm DIL connector is the EIDE stack through connector. The pin out of this connector is the same as pins 1-44 of CN3.

# EIDE Cable Connector, CN5

CN5 is a 40-pin 0.1" DIL connector is the EIDE cable connector. The pin out of this connector is the same as pins 1-40 of CN3.

# Power Connector, CN6 (CMT56106 Only)

CN5 is a 12-pin 0.1" DIL connector.

| Power Connector, CN6 | | | |
|---|---|---|---|
| Pin | Signal | Function | Input/Output |
| 1 | GND | Ground | -- |
| 2 | +5V | 5V Supply | -- |
| 3 | n.c. | Not Connected (Pass-through) | -- |
| 4 | n.c. | Not Connected (Pass-through) | -- |
| 5 | n.c. | Not Connected (Pass-through) | -- |
| 6 | n.c. | Not Connected (Pass-through) | -- |
| 7 | GND | Ground | -- |
| 8 | +5V | 5V Supply | -- |
| 9 | GND | Ground | -- |
| 10 | n.c. | Not Connected (Pass-through) | -- |
| 11 | n.c. | Not Connected (Pass-through) | -- |
| 12 | n.c. | Not Connected (Pass-through) | -- |

# Chapter 6 GETTING TECHNICAL SUPPORT

For help with this product, or any other product made by RTD, you can 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.

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