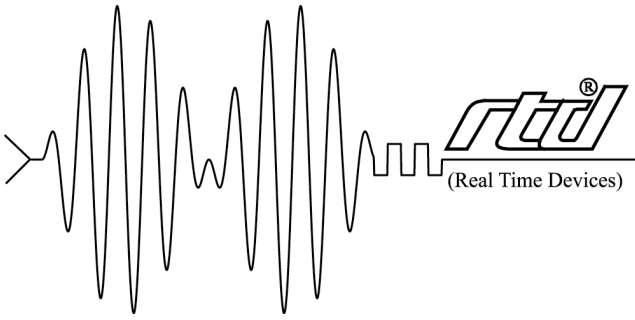
CM310/CM16310
Quad Serial Port utilityModule

User's Manual



RTD Embedded Technologies, Inc.
"Accessing the Analog World"®

BDM-610020016
Rev. C

CM310/CM16310
Quad Serial Port utilityModule
User's Manual

RTD Embedded Technologies, INC.
103 Innovation Blvd.
State College, PA 16803-0906

Phone: +1-814-234-8087
FAX: +1-814-234-5218

E-mail
sales@rtd.com
techsupport@rtd.com

Web site
www.rtd.com

Revision History

08/17/1999	Initial release.
09/14/1999	Pull down resister jumpers added
10/18/1999	Self-explanatory diagnostic program included
10/29/1999	Include 24Mhz clock to support 1.5 Mbps transceiver operation
02/01/2000	Changed SW2 to 8 position and made SW3 and SW4 terminations
02/02/2000	Reversed RS-422 signal names polarity (+/-)
02/08/2000	Removed 25 pin D connector for RS-422 mode
Rev. A	New Manual Naming Method
Rev. B (02/20/2008)	- Corrected default IRQ jumper settings to match current shipping configuration. - Resolved some ambiguity in the COM port numbering - Added a note about IRQ sharing and OS limitations
Rev. C (03/04/2014)	- Added CM16310HR version with 14.7456MHz oscillator - Cleaned up interrupt sharing discussion and added disable bit in common register - Added a table of partial baud rates

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Chapter 1 INTRODUCTION

This manual gives information on the CM310/CM16310 Quad Serial Port utilityModule. This module supports four versatile serial ports for the 16 (Intel) bus interface type, with jumper configurable IRQ lines and I/O addresses for your PC/104 applications.

CM310/CM16310 Quad Serial Port utilityModule

The CM310/CM16310 Quad Serial Port utilityModule was designed to provide four versatile serial ports to support the Real Time Devices cpuModules and other standard PC/104 processor modules.

Features

The following are major features of the CM310/CM16310 utilityModule.

- Compatibility with the Industry Standard 16C550 UART
- **CM16310** features 921.6 Kbps max baud transmit/receive operation with 14.7456 MHz Oscillator (230 Kbps max in RS-232 mode)
- **CM310** features 1.5 Mbps max baud transmit/receive operation with 24.0000 Mhz Oscillator (230 Kbps max in RS-232 mode)
- **CM310/CM16310** both support all standard baud rates 115.2K baud and below.
- 16 byte transmit FIFO/16 byte receive FIFO with error flags
- Independent transmit and receive control
- Standard modem interface
- Jumper selectable interrupt line
- Switch selectable base address
- Switch selectable RS232/RS422-485 mode per port
- Switch selectable enable/disable per port
- 16 different selectable I/O base address combinations
- Extended temperature range: -40 to +85C
- Low power-consumption
- Typical from single +5V power supply

Software Included

- Self-explanatory diagnostic program included

Connectors and Switches

Connectors provided are:

- CN1: PC/104 Bus (XT)
- CN2: PC/104 Bus (AT)
- CN3: First COM port
- CN4: Second COM port
- CN5: Third COM port
- CN6: Fourth COM port

Switches provided are:

- SW1: Base address selection
- SW2: Enable/Disable and RS232/RS422-486 mode
- SW3: First and second port RS422/485 termination
- SW4: Third and forth port RS422/485 termination

Recommended Cables

XK-CM310

General Specifications

- Dimensions: 3.8 x 3.9 x 0.6" (97 x 100 x 16 mm)
- Weight (mass): 3.0 ounces (85 grams)
- 6-layer PCB
- Operating conditions:
- Temperature: -40 - +85 degrees C
- Relative humidity: 0 - 95%, non-condensing
- Storage temperature: -55 to +125 degrees C

Configuring the utilityModule

The following sections contain information on configuring the utilityModule.

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

Jumpers and Switches

Locations

The figure below shows switch and jumper locations.

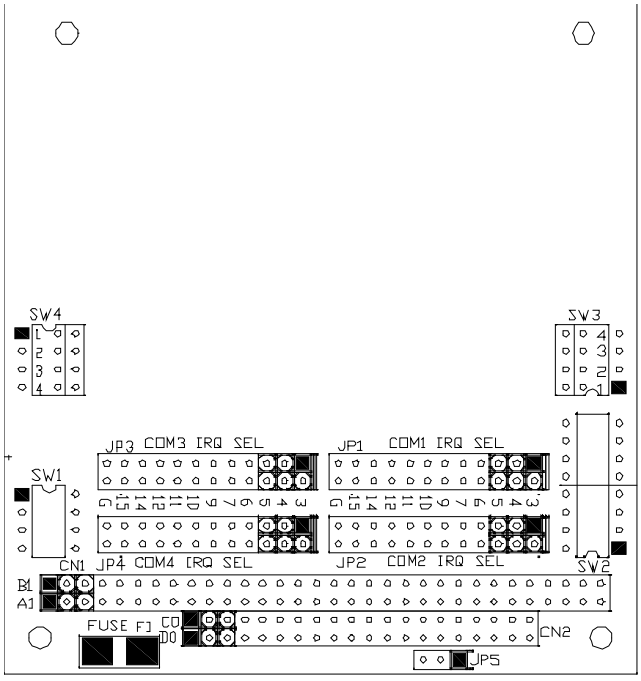

Figure 1 Switch & Jumper Locations

Default Settings

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

Table 1 Default Jumper Settings

Jumper	Setting	Function
JP1 G jumper	Not Installed Installed	Interrupts Disabled for 1st COM port 1K pull down resister on IRQ4 line
JP2 G jumper	Not Installed Installed	Interrupts Disabled for 2nd COM port 1K pull down resister on IRQ3 line
JP3 G jumper	Not Installed Installed	Interrupts Disabled for 3rd COM port 1K pull down resister on IRQ5 line
JP4 G jumper	Not Installed Installed	Interrupts Disabled for 4th COM port 1K pull down resister on IRQ10 line
JP5 CLK jumper	2-3 installed	1.8432 MHz clock selected for baud rates 115.2 K baud and below.
SW1	All down	I/O base addresses at 3E8, 2E8, 280, 288 for 1st, 2nd,3rd and 4th COM port respectively
SW2	1-4 up 5-8 down	All COM ports enabled All ports in RS232 mode
SW3	All up	No serial termination resistors
SW4	All up	No serial termination resistors

Descriptions

The following table describes the functions of the jumpers.

Table 2 Switch and Jumper tables

Jumper	Use
JP 1	IRQ selection for 1st COM Port (CN3) G setting: jumper installed = 1K pull down resistor for the selected IRQ Jumper removed = no pull down for the selected IRQ
JP 2	IRQ selection for 2nd COM Port (CN4) G setting: jumper installed = 1K pull down resistor for the selected IRQ Jumper removed = no pull down for the selected IRQ
JP3	IRQ selection for 3rd COM Port (CN5) G setting: jumper installed = 1K pull down resistor for the selected IRQ Jumper removed = no pull down for the selected IRQ
JP 4	IRQ selection for 4th COM Port (CN6) G setting: jumper installed = 1K pull down resistor for the selected IRQ Jumper removed = no pull down for the selected IRQ
JP5	Input clock selection for serial ports for **CM310** 1-2 = select 24.0000 MHz UART clock 2-3 = select 1.8462 MHz UART clock (default) Input clock selection for serial ports for **CM16310** 1-2 = select 14.7456 MHz UART clock 2-3 = select 1.8432 MHz UART clock (default)
SW1	I/O base address switch. See Base Address Table for details
SW2 Positions 1-4	Up = enable serial port, Down = disable serial port Switch position Port 1 CN3 2 CN4 3 CN5 4 CN6
SW2 Positions 5-8	Up = RS422/485 mode, Down = RS232 mode Switch position Port 5 CN3 6 CN4 7 CN5 8 CN6
SW3	Up = Don't use on-board serial termination resistor Down = Use 120 on-board serial termination resistor for RS422/485 mode Switch position Port and signal 1 CN3 -- RxD 2 CN3 -- CTS 3 CN4 -- RxD 4 CN4 -- CTS
SW4	Up = Don't use on-board serial termination resistor Down = Use 120 on-board serial termination resistor for RS422/485 mode Switch position Port and signal 1 CN5 -- RxD 2 CN5 -- CTS 3 CN6 -- RxD 4 CN6 -- CTS

Table 3 Base address table for COM ports

COM port addresses – base address in Hex for eight 8-bit registers							
SW1-4	**SW-3**	**SW-2**	**SW-1**	**CN3**	**CN4**	**CN5**	**CN6**
Down	Down	Down	Down	3E8	2E8	280	288
Down	Down	Down	Up	280	288	290	298
Down	Down	Up	Down	290	298	2A0	2A8
Down	Down	Up	Up	2A0	2A8	2B0	2B8
Down	Up	Down	Down	100	108	110	118
Down	Up	Down	Up	120	128	130	138
Down	Up	Up	Down	140	148	150	158
Down	Up	Up	Up	160	168	170	178
Up	Down	Down	Down	100	108	500	508
Up	Down	Down	Up	120	128	520	528
Up	Down	Up	Down	280	288	680	688
Up	Down	Up	Up	290	298	690	698
Up	Up	Down	Down	2A0	2A8	6A0	6A8
Up	Up	Down	Up	2B0	2B8	6B0	6B8
Up	Up	Up	Down	3E8	2E8	7E8	6E8
Up	Up	Up	Up	3F8	2F8	3E8	2E8

Table 4 Partial baud rate table in Kbaud

Divider	**JP5 1-2 (Fast baud rates)**		**JP5 2-3 (Standard baud rates)**	
	CM16310HR	**CM310HR**	**CM16310HR**	**CM310HR**
1	921,600	1,500,000	115,200	115,385
2	460,800	750,000	57,600	57,692
3	307,200	500,000	38,400	38,462
4	230,400	375,000	28,800	28,846
5	184,320	300,000	23,040	23,077
6	153,600	250,000	19,200	19,231
7	131,657	214,286	16,457	16,484
8	115,200	187,500	14,400	14,423
9	102,400	166,667	12,800	12,821
10	92,160	150,000	11,520	11,538
11	83,782	136,364	10,473	10,490
12	76,800	125,000	9,600	9,615

Chapter 2 INSTALLING THE UTILITYMODULE

Since the utilityModule uses a PC/104 stackthrough bus, the only hardware installation you will do is placing the module to the PC/104 stack. To do this, you will connect the PC/104 bus connector with the matching connector of another module.

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.
- Check that keying pins in the PC/104 bus connector are properly positioned.
- Check the stacking order: make sure an XT bus card will not be placed between two AT bus cards, or it will interrupt the AT bus signals.
- 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.

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 pin 1 of connectors. A square solder pad visible on the bottom of the PC board also indicates it.

Locations

The figure below shows connector locations.

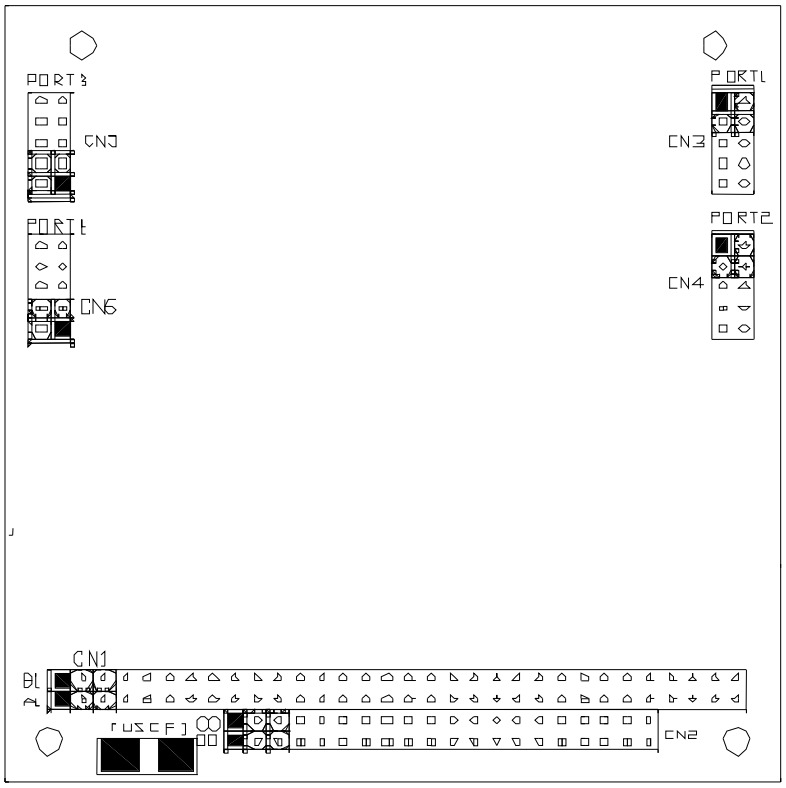

Figure 2 Connector Locations

Table 5 Connector Table

Connector	Function	Size
CN1	PC/104 XT Bus	64 pin
CN2	PC/104 AT Bus	40 pin
CN3	1st COM port	10 pin
CN4	2nd COM port	10 pin
CN5	3rd COM port	10 pin
CN6	4th COM port	10 pin

PC/104 Bus Connectors, CN1 and CN2

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 following tables list the connector pinouts:

Table 6 PC/104 XT Bus Connector

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

Table 7 PC/104 AT Bus Connector

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	DRQ6
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.

First COM port, CN3

The first serial port is implemented on connector CN3. It can be configured as a PC compatible full duplex RS232 port or as half- or full duplex RS422 or RS485 through mode SW3. The I/O address is configurable in respect to SW1 address table, and corresponding interrupt is also selectable through jumper JP1 to be IRQ3, IRQ4, IRQ5, IR6, IRQ7, IRQ9, IRQ10, IRQ11, IRQ12, IRQ14 and IRQ15. But you need to make sure that there are no resource conflicts on the I/O base address and interrupt line you choose.

The serial port is implemented with a 16C550-compatible UART (Universal Asynchronous Receiver/Transmitter). This UART is capable of baud rates up to 115.2K.

RS232 Serial Port (Default)

The full-duplex RS232 mode is the default setting on the utilityModule. With this mode enabled, connector CN3 must be connected to RS232 compatible devices. The following table gives the connector pinout and shows how to connect to an external serial connector, either DB25 or DB9 compatible.

Connector CN3 in RS-232 Mode

Table 8 Connector CN3 in RS-232 Mode (I)

CN3 Pin	Signal	Function	In/out	DB25	DB9
1	DCD	Data Carrier Detect	In	8	1
2	DSR	Data Set Ready	In	6	6
3	RXD	Receive Data	In	3	2
4	RTS	Request To Send	Out	4	7
5	TXD	Transmit Data	Out	2	3
6	CTS	Clear To Send	In	5	8
7	DTR	Data Terminal Ready	Out	20	4
8	RI	Ring Indicate	In	22	9
9,10	GND	Signal Ground	--	7	5

Facing the connector pins, the pinout is pictured in the following,

Table 9 Connector CN3 in RS-232 Mode (II)

9	7	5	3	1
GND	DTR	TXD	RXD	DCD
GND	RI	CTS	RTS	DSR
10	8	6	4	2

RS422 or RS485 Serial Port

You can change the mode switch to set the first port as RS422 or RS485. In this case, you must connect CN3 to an RS422 or RS485 compatible device.

When using RS422 or RS485 mode, you can use the port in either half-duplex (two-wire) or full-duplex (four-wire) configurations. For half-duplex (2-wire) operation, you must connect RXD+ to TDX+, and connect RXD- to TXD-.

Note! A 120-ohm termination resistor is provided on the utilityModule. Termination is usually necessary on all RS422 receivers and at the ends of the RS485 bus. If the termination resistor is required, it can be enabled by closing corresponding bits on SW3 or SW4.

RS422 and RS485 Mode Pinout

The following table gives the pinout of connector CN3 when RS422 or RS485 modes are enabled.

Table 10 Connector CN3 in RS422/485 Mode (I)

CN3 Pin	Signal	Function	In/out	DB9
1	RTS-	Request to send (-)	Out	1
2	RTS+	Request to send (+)	Out	6
3	RXD-	Receive Data (-)	In	2
4	TXD+	Transmit Data (+)	Out	7
5	TXD-	Transmit Data(-)	Out	3
6	RXD+	Receive Data (+)	In	8
7	CTS-	Clear to send (-)	In	4
8	CTS+	Clear to send (+)	In	9
9,10	GND	Signal Ground	--	5

Facing the connector pins, the pinout is pictured in the following,

Table 11 Connector CN3 in RS422/485 Mode (II)

9	7	5	3	1
GND	CTS-	TXD-	RXD-	RTS-
GND	CTS+	RXD+	TXD+	RTS+
10	8	6	4	2

Notes on using RS422 or RS485 Modes

When using the serial port in RS422 or RS485 mode, the serial receiver is always enabled, however the serial transmitter is enabled and disabled under software control in the following two ways.

By default, the transmitter is enabled by manipulating the Request To Send (RTS*) signal of the serial port controller. This signal is controlled by writing bit 1 of the Modem Control Register (MCR) as follows:

- If MCR bit 1 = 1, then RTS* = 0, and serial transmitter is disabled
- If MCR bit 1 = 0, then RTS* = 1, and serial transmitter is enabled

For more information on the serial port registers, including the MCR, please refer to a standard PC-AT hardware reference for the 16C550 UART, or refer to RTDUSA application note ANC102 at http://www.rtdusa.com

The other way to enable the serial transmitter is to write 1 to its corresponding bit of the utilityModule's internal common register 4, which sets the serial transmitter in "always on" mode. Please refer to Internal Common Register Section for detail.

Second COM port, CN4

Please refer to the previous section on the first COM port CN3 for the description on CN4.

Third COM port, CN5

Please refer to the previous section on the first COM port CN3 for the description on CN5.

Fourth COM port, CN6

Please refer to the previous section on the first COM port CN3 for the description on CN6.

CM310/CM16310 common registers

The utilityModule includes 5 common registers to provide additional information and software control that is not required for normal COM port operation, but may be helpful in determining the status of the board and configuring of the board. The following two sections give the location and definition of the common registers.

Base Address of Common Registers

The utilityModule common registers are located 800h above the address of the first enabled COM port. That is, assuming that "X" in hex is the first enabled COM port base address, which can be any of the valid addresses listed in the Com Port Address Table, the base address for the common registers is "Y" in hex, then,

Y = X + 800h

For example, if the switches of SW4 are set all DOWN position which makes CN3 = 3E8h, CN4 = 2E8h, CN5 = 280h and CN6 = 288h, then according to the algorithm, the common registers base address (BA) will be the following depending the setting of enable switch SW2 for each serial port,

If CN3 is enabled then,

BA = 3E8h + 800h = BE8h

Else if CN3 is disabled AND CN4 is enabled then,

BA = 2E8h + 800h = AE8h

Else if CN3 and CN4 are disabled AND CN5 is enabled then,

BA = 280h + 800h = A80h

Else if CN3, CN4 and CN5 are disabled AND CN4 is enabled then,

BA = 288h + 800h = A88 A80h

Else if CN3, CN4, CN5 and CN6 are disabled then,

Common Registers are disabled

End If

Common Register definitions

BA + 0 – Interrupt Status (Read Only)							
7	6	5	4	3	2	1	0
Reserved	Reserved	TxRDY*	RxRDY*	CN6	CN5	CN4	CN3

For each CNx bit:

0 = Not interrupting

1 = Interrupt set

TxRDY*

0 = indicates a buffer ready for at least one of the four transmit channels

1 = indicates that all transmit buffers are full

RxRDY*

0 = indicates one or more of the receive channels has data ready to read

1 = indicates that all receive buffers are empty

Reserved reads as 0

BA + 1 – Address Switch (Read Only)							
7	6	5	4	3	2	1	0
Reserved	Reserved	Reserved	Reserved	SW1-4	SW1-3	SW1-2	SW1-1

For each bit, see table above

0 = Down

1 = Up

Reserved reads as A to tag on the address register.

BA + 2 -- Enable/Disable Switch (Read Only)							
7	6	5	4	3	2	1	0
Reserved	Reserved	Reserved	Reserved	CN6	CN5	CN4	CN3

For each CNx bit:

0 = Port is disabled

1 = Port is enabled

Reserved reads as 0xA for clarity

BA + 3—Mode Switch (Read Only)							
7	6	5	4	3	2	1	0
Reserved	Reserved	Reserved	Reserved	CN6	CN5	CN4	CN3

For each CNx bit:

If

0 = RS-232

1 = RS-422/485

Reserved reads as 0

BA + 4-- RS-422 RTS operation (R/W)							
7	6	5	4	3	2	1	0
Reserved	Reserved	IntShare	IntSel	CN6	CN5	CN4	CN3

IntShare:

0 = Interrupt sharing enabled, interrupts driven high only. Requires G jumper installed to pull interrupt low even if not sharing interrupts.

1 = Disable interrupt sharing and drive all interrupts both high and low. You must use a separate interrupt for each serial port. G jumper does not need to be installed.

Default to 0 to allow interrupt sharing.

IntSel:

0 = MCR bit-3 controls the three state interrupt output.

1 = Overrides MCR bit-3 and interrupt outputs are enabled continuously.

Default to 0 to set COM ports in normal mode

For each CNx bit:

If Mode = RS-232 then
Not used, Reads as 0
Else If Mode = RS-422/485 then
0 = use RTS to enable transmitter, default case
1 = transmitter always on

Chapter 3 USING THE UTILITYMODULE

COM ports

The utilityModule features EXAR quad UART 16C550 compatible 16C554D part.

EXAR Documentation

Due to the complexity of the EXAR serial chip, it is impossible for us to reproduce all programming information in this manual. If you will be doing in-depth programming of the serial port controller, we suggest you obtain the 16C554D datasheet from the manufacturer.

The 16C554D datasheet is available on-line in electronic format as an Adobe Acrobat (. PDF) file on the EXAR website:

www.exar.com

You may also contact:

EXAR Corporation

248720 Kato Road

Fremont, CA 94538

CM310 1.5 Mbps support

With the 24 MHz clock selected (JP5, 1-2), the utilityModule is capable of provide data rates up to 1.5 Mbps in RS422/RS485 mode. The RS-232 mode drivers are limited to 230 Kbps.

CM16310 921.6 Kbps support

With 14.7456 MHz clock selected (JP5, 1-2), the utilityModule is capable of provide data rates up to 921.6 Kbps in RS422/RS485 mode. The RS-232 mode drivers are limited to 230 Kbps.

Interrupt Sharing

Interrupt sharing is a mechanism which allows different devices sharing the same active high IRQ line on the PC/104 bus, given that there is a interrupt sharing circuit associated with each device. The utilityModule provides interrupt-sharing circuits for all the serial ports; thus it allows sharing of one IRQ line among the serial ports in the utilityModule. However, the user needs to be careful when sharing an IRQ line with devices in the system elsewhere, and be sure that other devices also share their IRQ lines as well. For instance, users should be aware of that the IRQ3/IRQ4 associated with serial port J3/J4 on some RTD cpuModules are not shareable. And if the utilityModule is in the same system with these cpuModules, be advised not to use/share IRQ3/IRQ4 for the utilityModule unless you have serial ports on the cpuModule disabled.

Interrupt sharing in a PC/104 system requires the interrupt source to drive the interrupt line high when there is an interrupt and tri-state the interrupt and use a 1K pull-down resistor to pull the line low when not interrupting. There should be only one resistor per IRQ line for all the devices that share an IRQ. Installing a G jumper in the utilityModule will pull its associated IRQ line down with a 1K resistor. That is, for example, if IRQn is shared among four serial ports on the utilityModule, only one G jumper needs to be installed for IRQn line. If more than one G jumper

are installed, the pull-down on IRQn line will be much stronger that expected 1K ohm, which may prevent interrupt controller from functioning correctly.

NOTE: *Some operating systems do not support IRQ sharing for ISA devices. If the OS does not support ISA IRQ sharing, then you must assign each com port to its own IRQ.*

Let consider two cases to demonstrate the concepts for the above discussion. Let us assume that IRQ5 and IRQ10 are not used and driven by other devices in the system. For the first case, IRQ10 line is shared among the four serial ports and for the second case IRQ5 is shared for port 1 and port 2, while IRQ10 is shared among port 3 and port 4.

The following two tables listed the interrupt jumper settings for each case respectively.

Table 11 Jumper Settings for interrupt sharing Case 1

Jumper	Setting	Function
JP1 G jumper	13-14 Installed	IRQ10 for 1st COM port 1K pull down resister added on IRQ10 from PORT1
JP2 G jumper	13-14 Removed	IRQ10 for 2nd COM port No pull down resister added on IRQ10 from PORT2
JP3 G jumper	13-14 Removed	IRQ10 for 3rd COM port No pull down resister added on IRQ10 from PORT3
JP4 G jumper	13-14 Removed	IRQ10 for 4th COM port No pull down resister added on IRQ10 from PORT4

Table 12 Jumper Settings for interrupt sharing Case 2

Jumper	Setting	Function
JP1 G jumper	5-6 Installed	IRQ5 for 1st COM port 1K pull down resister added on IRQ5 from PORT1
JP2 G jumper	5-6 Removed	IRQ5 for 2nd COM port No pull down resister added on IRQ5 from PORT2
JP3 G jumper	13-14 Installed	IRQ10 for 3rd COM port 1K pull down resister added on IRQ10 from PORT3
JP4 G jumper	13-14 Removed	IRQ10 for 4th COM port No pull down resister added on IRQ10 from PORT4

See common register at BA + 4 for information about disabling interrupt sharing.

Diagnostic Software

The companion CD for the utilityModule includes a menu driven diagnostic program. Loop back plugs are required to run this program.

Power Protection Circuitry

To reduce the risk of damage due to power-supply problems, the utilityModule includes several protective components.

Module Power-Supply Protection

The utilityModule includes a component to help prevent damage due to problems with the +5Vdc power supply from the PC/104 bus. Protection is provided for:

- Over-current
- Reversed polarity
- Excessive voltage

This protection is only for the utilityModule, and will not protect other devices in a PC/104 stack.

The protective fuse is replaceable and is available from electronics suppliers. Its description and part number is:

Littelfuse Nano^2 SMF 1.0 amp, R451-001

Caution:	Replace fuses only with parts of identical current and voltage rating.

Chapter 4 RETURN POLICY AND WARRANTY

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 MECHANTABILITY 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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THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

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103 Innovation Blvd.
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USA
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