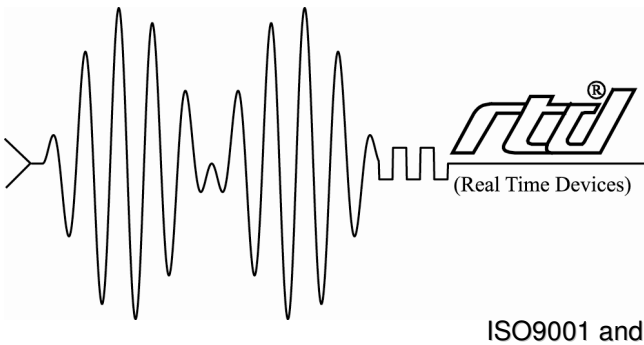
COM17075ER User's Manual

GSM/EDGE/GPRS Modem and GPS

PC/104-Plus Module



(Real Time Devices)

RTD Embedded Technologies, Inc.

"Accessing the Analog World"®

BDM-610020048
Rev. D

ISO9001 and AS9100 Certified

COM17075ER User's Manual

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Manual Revision History

Rev A	New manual
Rev B	Added information on software installation and programming.
Rev C	Added a table to the connector pin-outs, showing the numbering order of the pins.
Rev D	Added LED descriptions and explained access to the MPIO interface

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Table of Contents

Introduction

Product Overview

The COM17075ER is designed to provide quad-band GSM with EDGE and GPRS with a global positioning system (GPS) for PC/104-*Plus* based systems. Included on the COM17075ER is a Siemens MC75 quad-band GSM cellular modem and a Fastrax iTrax03-02 GPS Receiver module. The COM17075ER has a PCI quad-UART chip that permits communication with both serial ports on the GSM as well as both serial ports on the GPS receiver module over the PC/104-*Plus* PCI bus without using other serial ports in the PC/104 system. The GSM module supports an enhanced AT command set and the GPS supports iTalk binary protocol and National Marine Electronics Association (NMEA-0183) messages.

Board Features

COM17075ER Features

- Two direct connections to the Siemens MC75 GSM module
- Quad-band GSM module
  - GSM 850/900/1800/1900 MHz
  - EDGE (E-GPRS) Multislot Class 10
  - GPRS Multislot Class 12
  - AT command set
  - SMS
  - Fax
- Two direct connections to the Fastrax iTrax03-02 GPS receiver module
- GPS message formats
  - iTalk Binary
  - NMEA
- PCI UART Interface
  - Exar XR17D154
  - Four COM Ports (2 connected to GPS, 2 connected to GSM)
- PC/104-*Plus* compliant

GSM Receiver

The COM17075ER wireless EDGE/GPRS/GSM modem unit provides a direct and reliable GPRS connection to EDGE/GPRS/GSM 850/900/1800/1900MHz mobile fields around the world. EDGE/GPRS/GSM connectivity is achieved using the Siemens MC75. This unit works in the 850/900/1800/1900MHz bands supporting GSM release 99 network service provider personalization.

Connect any standard quad-band GSM antenna directly to the OSX connector of the COM17075. The antenna should be connected to the MC75 using a flexible 50-Ohm cable. In IDAN installations the antenna connection is brought to the front side of the IDAN frame.

A SIM-card socket is located on the solder side of the module. The card can only be removed when the MC75 has been placed in shutdown mode.

GPS Receiver

Integrated on your COM17075 is a fast fix 12-channel low power iTrax03-02 GPS receiver from Fastrax. This GPS receiver will work reliably in a variety of installations. The receiver will work with either 3.3V or 5.0 Volt active or with passive antennas. The power consumption of the GPS receiver is 125 mW fully operational. The iTrax03-02 features a fast 1 to 5 Hz update rate. Two output formats are available: the NMEA-0183 ASCII protocol or the iTalk proprietary binary protocol. Each protocol has its own dedicated serial interface.

I/O Interfaces

PCI Quad UART

The GSM and GPS receiver modules communicate through four dedicated UART channels. These channels are connected to the PCI bus and share a single interrupt line, which resolves the IRQ conflict issues traditionally associated with UARTs. The use of a dedicated UART chip keeps the onboard serial ports in the system to be free for the user.

Connector Description

The GSM and GPS antenna interfaces are female MMCX type miniature coaxial connectors. Connect your antenna directly to the COM17075ER antenna connector, or use a short cable inside your enclosure to connect to a feed through connector to allow connection of the antenna to the wall of your enclosure. The GPS module supplies up to 100 mA of 3.3 or 5.0 VDC for antenna LNA.

All other I/O connections to the COM17075ER use 0.1” header type terminals.

Available Options

The COM17075ER is available as a starter kit, bundled with an active antenna. It may also be purchased as an IDAN module for integration into an RTD IDAN system.

The following is a summary of the different COM17075ER configurations:

Part Number	Description
COM17075ER	COM17075ER
SK-COM17075ER	COM17075ER with active antennas for GPS and GSM
IDAN-COM17075ERS	COM17075ER mounted in an IDAN frame
IDAN-SK-COM17075ERS	COM17075ER mounted in an IDAN frame with active antennas for GPS and GSM

For antenna specifications, please refer to the “Additional Information” chapter of this manual.

Getting Technical Support

If you are having problems with your system, please try the following troubleshooting 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.

- **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, obtain the PCI BIOS listing information of the COM17075ER and other modules in the system. After you have this information, contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087

E-Mail: techsupport@rtd.com

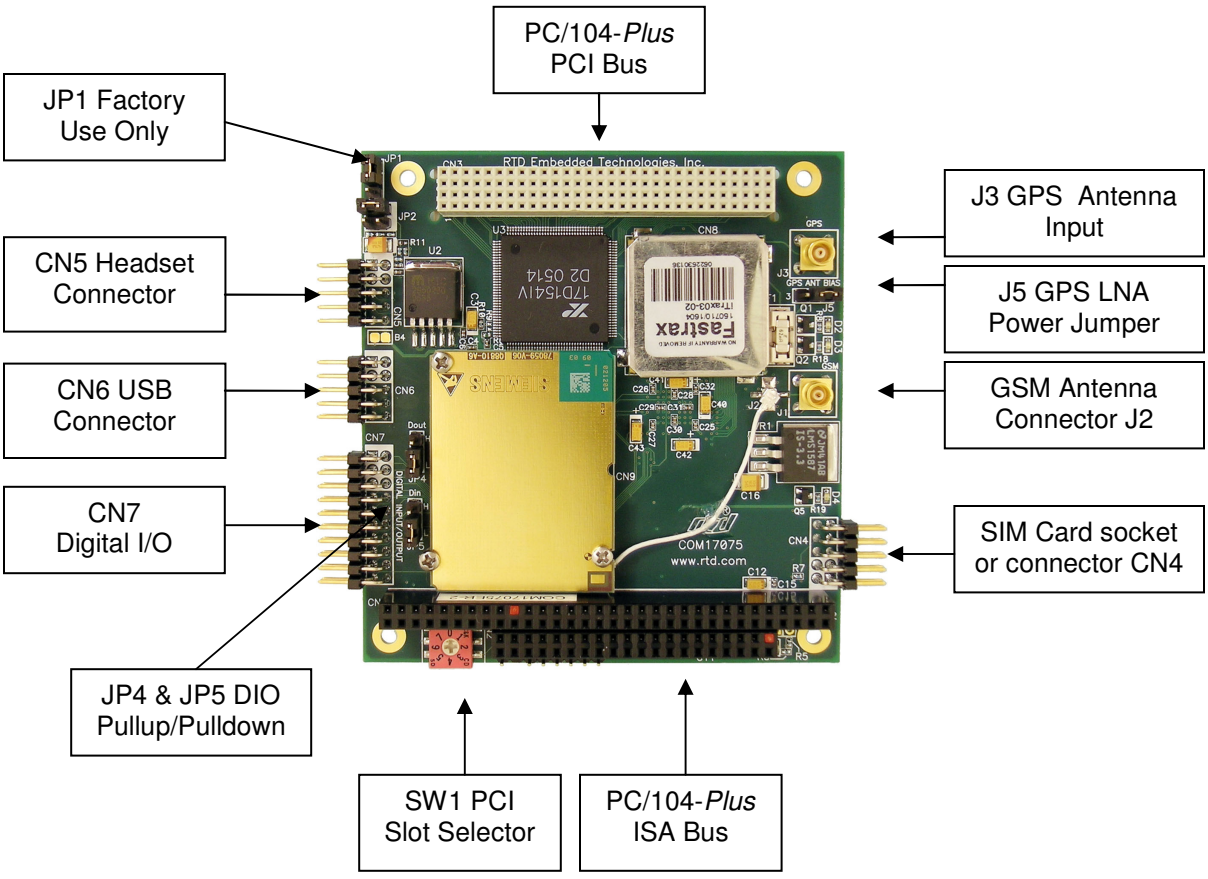
Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

Board Connections

Connector and Jumper Locations

The following diagram shows the location of all connectors and jumpers on the COM17075ER. Future revisions of the COM17075ER may have cosmetic differences. For a description of each jumper and connector, refer to the following sections.

COM17075ER Connector and Jumper Locations

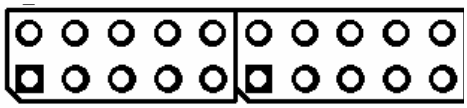


External I/O Connections

The following sections describe the external I/O connections of the COM17075ER.

CN7 – Digital Input/Output Connector

The COM17075 offers 16 bit-programmable digital I/O lines. These can be pulled high or pulled low through 10K Ohm resistors using JP4 to control bits DIO0 – DIO7 and JP5 to control bits DIO8 - DIO15.



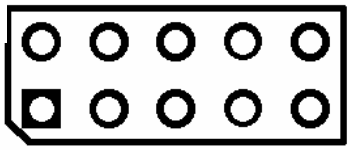
Pin	Name	Description
1	GND	Ground
2	DIO0	Digital Input/Output Bit 0
3	DIO1	Digital Input/Output Bit 1
4	DIO2	Digital Input/Output Bit 2
5	DIO3	Digital Input/Output Bit 3
6	DIO4	Digital Input/Output Bit 4
7	DIO5	Digital Input/Output Bit 5
8	DIO6	Digital Input/Output Bit 6
9	DIO7	Digital Input/Output Bit 7
10	+5 VDC	+5 Volts DC
11	GND	Ground
12	DIO8	Digital Input/Output Bit 8
13	DIO9	Digital Input/Output Bit 9
14	DIO10	Digital Input/Output Bit 10
15	DIO11	Digital Input/Output Bit 11
16	DIO12	Digital Input/Output Bit 12
17	DIO13	Digital Input/Output Bit 13
18	DIO14	Digital Input/Output Bit 14
19	DIO15	Digital Input/Output Bit 15
20	+5 VDC	+5 Volts DC

The pins of CN7 are arranged as follows:

2	4	6	8	10	12	14	16	18	20
1	3	5	7	9	11	13	15	17	19

CN4 – SIM Module/Connector

The COM17075ER can use either an onboard SIM module or an external SIM connected through a cable. The COM17075ER-1 uses an on-board SIM module and will not have CN4 installed. The COM17075ER-2 uses an external SIM module. The pinout of the external connector CN4 is shown below.

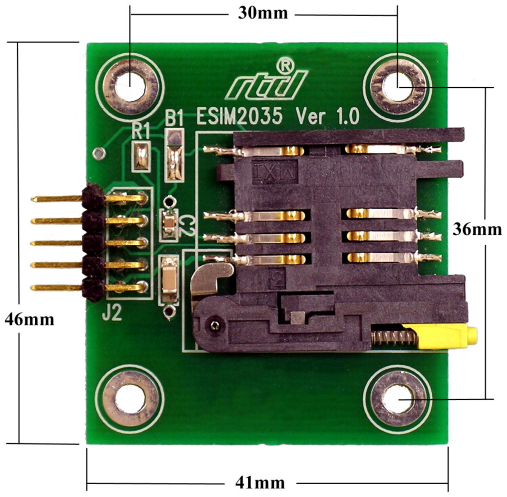


Pin	Name	Description
1	GND	Ground
2	Vcc	SIM Power
3	RST	SIM Reset
4	GND	Ground
5	IO	SIM I/O Data
6	GND	Ground
7	CLK	SIM Clock
8	IN	SIM Card Detect
9	Vcc	SIM Power
10	GND	Ground

The pins of CN4 are arranged as follows:

2	4	6	8	10
1	3	5	7	9

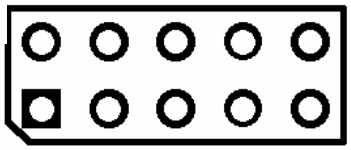
The figure below shows a picture of the external SIM card interface board.



ESIM2035 board

CN5 – GPS Headset Connector

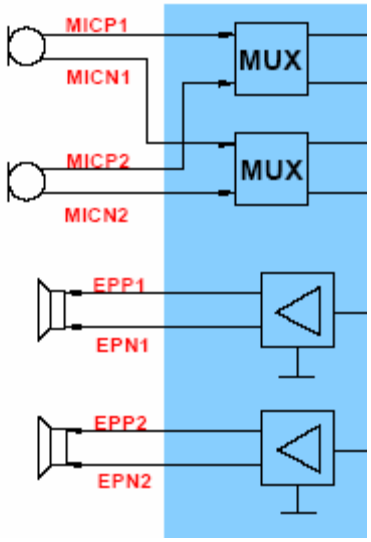
The COM17075ER Headset connector is used to connect a headset to the GSM module for voice operation. The pinout of the external connector CN5 is shown below.



Pin	Name	Description
1	GND	Ground
2	MICP1	Microphone 1+
3	MICN1	Microphone 1-
4	EPP1	Earphone 1+
5	EPN1	Earphone 1-
6	MICP2	Microphone 2+
7	MICN2	Microphone 2-
8	EPP2	Earphone 2+
9	EPN2	Earphone 2-
10	GND	Ground

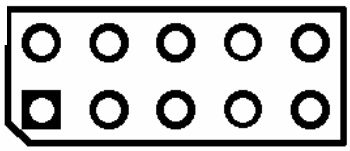
The pins of CN5 are arranged as follows:

2	4	6	8	10
1	3	5	7	9



CN6 – USB Connector

The COM17075ER can use either onboard serial ports or external USB 2.0 full speed (12Mbits/second) slave interface to communicate to the MC75 GSM/GPRS module. This interface can be used for command and data transfer as well as downloading firmware. The pinout of the external USB connector CN6 is shown below.



Pin	Name	Description
1	Vcc	USB Vcc input
2	DN	USB Data-
3	DP	USB Data+
4	GND	Ground
5	GND	Ground
6	N/C	No connect
7	N/C	No connect
8	N/C	No connect
9	N/C	No connect
10	N/C	No connect

The pins of CN6 are arranged as follows:

2	4	6	8	10
1	3	5	7	9

Jumpers

The following sections describe the jumper configuration options available on the COM17075ER. For a reference that shows the location of each set of jumpers, refer to the diagram of the COM17075ER at the beginning of this chapter. The default factory jumper settings are listed in the following table:

Jumper	Description	Default Factory Setting
JP1	Bypass PCI bus EEPROM	1-2 for Normal operation
JP4	Pullup or Pulldown for DIO0-7	1-2 – Pullup 2-3 – Pulldown (default) No connect – Neither
JP5	Pullup or Pulldown for DIO8-15	1-2 – Pullup 2-3 – Pulldown (default) No connect – Neither
J5	GPS Active Antenna Power (100 ma max)	1-2 – +5.0 VDC (default) 2-3 – +3.3 VDC Open for passive antennas

LED Indicators

D1 – Is on when the SIM card is being powered from the cellular module.

D2 – Provides GPS status information

- Continuously low state – Navigation stopped or not tracking satellites
- Short blink 20% on – Tracking satellites but not enough information to calculate pseudo-ranges
- Long blink 80% on – Pseudo-range information available but not navigating
- Continuously high state – Navigating, Valid fix

D3 – GPS 1 PPS (not implemented in early firmware versions). Supplies a 1 Herz signal synched to the GPS satellite time.

D4 – GSM Sync signal

The GSM AT^SSYNC command serves to configure the SYNC pin of the application interface. The pin can either be used to indicate the current consumption in a transmit burst (default setting) or to drive a status LED connected to the pin. See the AT^SSYNC command for details.

PCI Board Selector, SW1

Since the utilityModule™ uses stack through buses, the only hardware installation you will need to do is to place the module onto the PC/104-*Plus* or PCI-104 stack. To do this, you will connect the PCI and/or ISA bus connectors on the CM17407HR to the respective connectors of your stack.

The CM17075 uses a rotary switch to select the PCI slot. Before you can use this module you have to set the PCI board selector switch. The procedure is if this module is the first module from the CPU module select '0,' if it is the second module select '1,' etc. Positions 4 - 7 are simply repeats of positions 0 – 3.

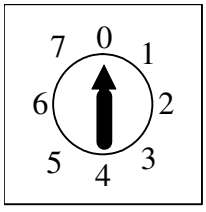


Figure 1: PCI Selector Rotary Switch PCI Board Selector

Board Installation

Installing the Hardware

The COM17075ER can be installed into a PC/104-*Plus* or PCI-104 stack. It can be located almost anywhere in the stack, above or below the CPU as long as all PCI bus constraints are met.

Static Precautions

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.

Steps for Installing

1. Shut down the PC/104 system and unplug the power cord.
2. Ground yourself with an anti-static strap.
3. Line up the pins of the COM17075ER's PC/104 connector with the PC/104 bus of the stack and gently press the board onto the stack. The board should slide into the matching PC/104 connector easily. Do not attempt to force the board, as this can lead to bent/broken pins.
4. Attach the external antenna to the MMCX connector.
5. If any boards are to be stacked above the COM17075ER, install them.
6. Attach any necessary cables to the PC/104 stack.
7. Re-connect the power cord and apply power to the stack.
8. Apply power to the system, and verify that all of the hardware is working properly. Once power is applied, the GSM module and GPS receiver will automatically initialize.

Installing and Configuring Software

Before the GSM or GPS modules can be used, drivers for the PCI UART must be installed and configured. Instructions for doing so are provided with the PCI UART drivers. Once these drivers are functioning properly, four extra COM ports should appear in the system (2 for the GSM, and 2 for the GPS).

Once the COM ports are functioning, any standard terminal emulation program (e.g. HyperTerminal for Windows, Minicom for Linux) should be able to access the modules. Additional software is provided by RTD to simplify use of GSM/GPS modules. However, this software is not necessary for basic operation.

Hardware Description

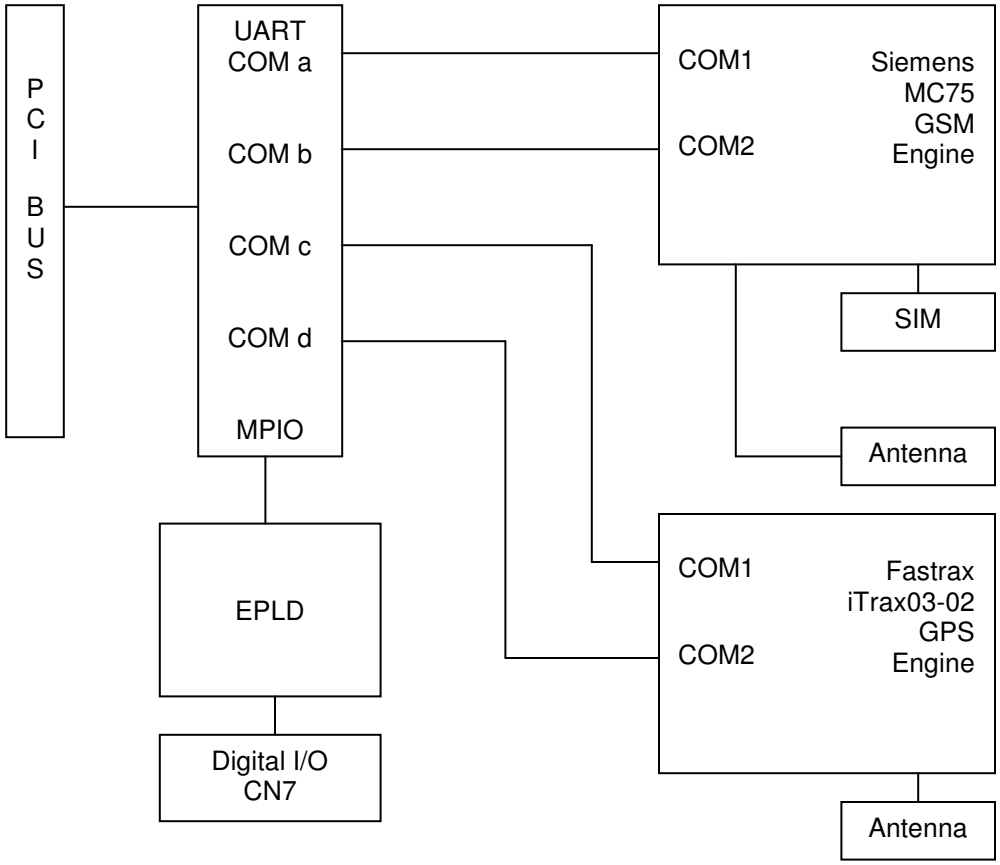
Overview

This chapter describes the major hardware building blocks of the COM17075ER. The components discussed in this chapter include:

- Siemens MC75 GSM Module
- Fastrax iTrax03-02 GPS Receiver Module
- Antennas

Block Diagram

Below is a block diagram of the COM17075ER.



Siemens MC75 Quad-Band Cellular Engine

The COM17075 wireless E-GPRS/GSM modem is built around the Siemens MC75 quad-band 850/900/1800/1900 MHz E-GPRS cellular engine. It is designed both for handling complex industrial applications such as telemetry, telematics or communication, and for integration in stationary or mobile fields all over the world.

The COM17075 is capable of powerful communication using GSM data interfacing. EDGE (E-GPRS) data rates can reach up to 236.8 kbit/s max downlink depending on the network capacity and the network load. In very loaded GSM networks GPRS data throughput may be at the level of 9600 baud. Engineers must take into account that GPRS data rates will vary dynamically depending on network conditions. This must be considered when designing software and system specifications. Roaming agreements and GPRS data support may not in all cases be available when moving from country to country. Check with your local network provider for GPRS coverage.

The COM17075ER is capable of FAX and standard SMS text messages. The data terminal rate is 9600 baud for all host commands (AT commands). The COM17075ER modem module antenna interface connector uses an OSX connector. The mating antenna connectors and cables are supplied by RTD.

MC75 Module Interface Options

The COM17075 E-GPRS/GSM modem is connected to the host computer through two of the four dedicated PCI serial ports. The first serial port is connected to GSM ASC0 and the second serial port is connected to GSM ASC1. The remaining two ports are connected to the GPS module. The default configuration for the GSM serial ports is:

GSM Interface

- 115,200 baud
- 8 data bits
- No parity
- 1 stop bit

The modem can also connect through the USB interface. Simply load the USB driver and connect the USB to the USB port on your host computer.

GSM Antenna Considerations

Typically standard GSM antennas use a female FME connector. This connector needs an adapter unit before it can be connected to the COM17075ER.

RTD recommends the use of high quality antennas with the COM17075ER. We have tested successfully with antennas from Hirschmann Rheinmetall Elektronik.

Visit http://www.hirschmann.de/ for information on GSM antennae.

A very useful AT command that shows quality of the signal reception is: AT+CSQ. The format of the response is AT+CSQ: received signal strength, bit error rate. The received signal strength shows the quality of the network signal and ranges from 0 to 31 as shown in the table below. A value of greater than 10 should give an acceptable connection. The bit error rate number will range between 0 and 7.

Received Signal Strength Values (99 = undetectable signal)							
0	- 113 dBm	8	- 97 dBm	16	- 81 dBm	24	- 65 dBm
1	- 111 dBm	9	- 95 dBm	17	- 79 dBm	25	- 63 dBm
2	- 109 dBm	10	- 93 dBm	18	- 77 dBm	26	- 61 dBm
3	- 107 dBm	11	- 91 dBm	19	- 75 dBm	27	- 59 dBm
4	- 105 dBm	21	- 89 dBm	20	- 73 dBm	28	- 57 dBm
5	- 103 dBm	13	- 87 dBm	21	- 71 dBm	29	- 55 dBm
6	- 101 dBm	14	- 85 dBm	22	- 69 dBm	30	- 53 dBm
7	- 99 dBm	15	- 83 dBm	23	- 67 dBm	31	=> - 51 dBm

SIM-card reader

Standard 3V and dual voltage SIM-cards can be used with the COM17075. Older 5V SIM cards will not work, though they may operate in standard GSM cellular phones. The SIM-card holder has a card detection circuit that will in theory allow hot insertion and removal of the card. This is **NOT** recommended, since the SIM card contents can become corrupted if it is removed while the MC75 GSM modem is writing to it.

LED D1 will turn on when a SIM card is enabled.

A very useful AT command that shows detection of the SIM card is: **AT^SCID**. The SIM card identifier is given as a reply **^SCID: value** shows the ID of the SIM card. If no ID is detected the MC75 can not read the SIM card and can not connect to the GSM service provider network.

To add an entry to your SIM card you may use the AT+CPBW command. In this example we add the RTD phone number +1-814-234-8087 to the SIM card memory location “1” with the following AT command set:

AT+CPBW=1, 18142348087, 145, RTD

AT+CREG? Will indicate if the COM17075 is logged into the network. If the reply for example is **+CREG: 0, 1** it means that connection to the home network is valid. A complete AT-instruction set documentation is included in the MC75 user’s manual.

Fastrax iTrax03-02 GPS Receiver

Integrated on the COM17075 is an iTrax03-02 low power fast-fix 12-channel GPS receiver from Fastrax. This GPS receiver is especially designed for portable and mobile applications. This version of the GPS does not support differential operation.

The iTrax03-02 sensitivity provides continuous tracking and navigation down to a signal level of –145 dBm and a cold start TTFF of 50 seconds (no initialization), 30 seconds for warm start (almanac) and one second for quick start. Even with this performance, the power consumption is approximately 100mW with a 1s update-rate. This figure does not include the active antenna power consumption. A complete GPS configuration program for the iTrax03-02 GPS Workbench is available from the manufacturer’s website at http://www.fastrax.fi/. This program allows you to completely reconfigure the operation of the GPS receive.

GPS data is output only when the receiver has a fix. The COM17075 is configured to output NMEA-0183 version 3.0 data on one serial port and Fastrax's binary protocol on another.

GPS Module Interface Options

The iTrax03 GPS is connected to the host computer through two of the four dedicated PCI serial ports. The first two serial ports are connected to the GSM modem. The third serial port is connected to GPS iTalk interface. The fourth serial port is connected to the GPS NEMA interface. The default configuration for the serial ports is:

iTalk Interface

- 115,200 baud
- 8 data bits
- No parity
- 1 stop bit

NEMA Interface

- 4800 baud
- 8 data bits
- No parity
- 1 stop bit

GPS Antenna considerations

Most GPS antennas are "active" which means they have a low noise amplifier (LNA) built into the antenna that requires a power source for the GPS module. While the COM17075 will work with a passive antenna, better performance will be achieved with an active antenna. The COM17075 provides either +5.0 V or +3.3 V for active GPS antennas. A three-terminal header is used to select the operating voltage of the antenna. The internal gain of the GPS receiver can be adjusted to low-output signals or even to interface to passive antennas. This operation is normally not needed, but it can be done using the Fastrax GPS Workbench program.

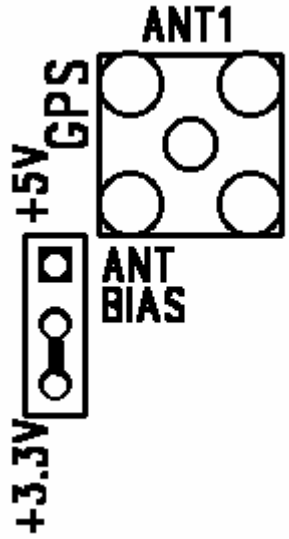


Fig. 4-2 GPS antenna bias voltage

A 90 degree 50 Ohm OSX connector should be selected to directly plug into the antenna connector on the board. High quality low loss antenna cable should be used. Try to reduce the number of connectors on the cable to minimize signal reflections. Signal reflections on the antenna line may cause incorrect readings for altitude information.

COM17075ER Digital I/O

The COM17075ER has 16 bit-programmable digital I/O bits. JP4 controls a 10K Ohm pull up/down on DIO bits 1-8 and JP5 controls a 10K Ohm pull up/down on DIO bits 9 -16.

Software Programming

The information provided below is intended as general guide for installing and configuring the software. A complete explanation of cellular and GPS programming is beyond the scope of this manual.

Cellular Modem

The Siemens MC75 should appear as a standard modem device. Most operating systems have built-in software for making data connections (e.g. Dial Up Networking in Windows). You can typically use this software to connect to a GSM/GPRS/EDGE cellular network. The wireless provider should provide details on how to configure the modem for their network. Some wireless companies also offer their own proprietary software for the network connection. Check with your wireless provider to verify compatibility.

It is also possible to control the MC75 directly via the AT command set. The AT command set is a fairly universal method of controlling modems via ASCII command strings. A document describing the various AT commands supported by the MC75 is available from Siemens.

GPS

The Fastrax GPS module outputs data in two formats: NMEA-0183 (ASCII) and iTalk (Binary). The data formats are standard and well-documented. RTD provides software which demonstrates how to parse the incoming GPS data. Since the GPS data is output in a standard format, several commercial programs are also available which can parse and display the data.

It is also possible to monitor the incoming GPS data without a special GPS program. Simply connect a terminal emulation program to one of the GPS's COM ports, and you should be able to watch the stream of GPS data. Depending on the COM port you select, the data will be in either ASCII or binary format.

MPIO

RTD provides software to demonstrate the MPIO features of the board. If the MPIO is not used, then no special MPIO software is required.

These registers are exposed via the MPIO interface of the Exar PCI UART. RTD provides examples programs that demonstrate how to access the MPIO. For more information on the MPIO interface, consult the Exar datasheet.

Table 1: MPIO Registers

Idle State	**MPIO Register**	Outputs Always				Inputs/Outputs			
		MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	Out	Out	Out	Out
Set Idle State	MPIOLVL	0	Last State	1	1	Don't Care			
Write Pointer Register	**MPIO Register**	Outputs Always				Inputs/Outputs			
		MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Write To Register	MPIOLVL	0	0	1	0	Register n			
Set Idle State	MPIOLVL	0	0	1	1	Register n			
Read Pointer Register	**MPIO Register**	Outputs Always				Inputs/Outputs			
		MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	In	In	In	In
Read Register	MPIOLVL	0	0	0	1	Register			
Set Idle State	MPIOLVL	0	0	1	1	Don't Care			
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	Out	Out	Out	Out
Write Register @ Pointer	**MPIO Register**	Outputs Always				Inputs/Outputs			
		MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Write To Register	MPIOLVL	0	1	1	0	Register Data			
Set Idle State	MPIOLVL	0	1	1	1	Register Data			
Read Register @ Pointer	**MPIO Register**	Outputs Always				Inputs/Outputs			
		MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	In	In	In	In
Read Register	MPIOLVL	0	1	0	1	Read Register Data			
Set Idle State	MPIOLVL	0	1	1	1	Don't Care			
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	Out	Out	Out	Out
Write Register w/ Pointer Increment	**MPIO Register**	Outputs Always				Inputs/Outputs			
		MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Write To Register n	MPIOLVL	1	1	1	0	Register n Data			
Set Idle State	MPIOLVL	1	1	1	1	Register n Data			
Write To Register n+1	MPIOLVL	1	1	1	0	Register n+1 Data			
Set Idle State	MPIOLVL	1	1	1	1	Register n+1 Data			
Write To Register n+2	MPIOLVL	1	1	1	0	Register n+2 Data			
…	MPIOLVL					Register n+3 Data			
Read Register w/	**MPIO**	Outputs Always				Inputs/Outputs			

Pointer Increment	**Register**	MPIO8	MPIO7	MPIO6	MPIO5	MPIO4	MPIO3	MPIO2	MPIO1
		Auto-inc	D/P	Read	Write	4	3	2	1
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	In	In	In	In
Read Register n	MPIOLVL	1	1	0	1	Register Data n			
Set Idle State	MPIOLVL	1	1	1	1	Don't Care			
Read Register n+1	MPIOLVL	1	1	0	1	Register Data n+1			
Set Idle State	MPIOLVL	1	1	1	1	Don't Care			
Read Register n+2	MPIOLVL	1	1	0	1	Register Data n+2			
Set Idle State	MPIOLVL	1	1	1	1	Don't Care			
…	MPIOLVL								
Set MPIO Direction	MPIOSEL	Out	Out	Out	Out	Out	Out	Out	Out

Function		Pointer Address			3	2	1	0
DIO 0-3		0			Data			
DIO 4-7		1			Data			
DIO 8-11		2			Data			
DIO 12-15		3			Data			
DIO 0-3 Direction		4			1 = in (default), 0 = out			
DIO 4-7 Direction		5			1 = in (default), 0 = out			
DIO 8-11 Direction		6			1 = in (default), 0 = out			
DIO 12-15 Direction		7			1 = in (default), 0 = out			
COM17075 Control		8			Rsvd	Rsvd	Rsvd	Rsvd
GPS Status		9			Rsvd	GPIO8	PPS	Reset*
GSM Status (Read Only)		10			Rsvd	Sync	PwrInd	Reset*
Reserved		11 - 15			Rsvd	Rsvd	Rsvd	Rsvd

GPS	Reset*	Read/Write, active low and is is high at power on
	PPS	Read only 1 PPS signal
	GPIO8	Read only Nav status
	Rsvd	Reserved, read as 0

GSM	Reset*	Read/Write, active low and is is high at power on
	PwrInd	High = in power down mode, 0 = normal operation
	Sync	Transmitting or status controlled by AT^SSYNC and AT^CFUN

COM17075ER Specifications

COM17075ER Specifications

- PC/104-*Plus* interface
  - 32-bit, 33 MHz
  - Target only
  - One PCI Interrupt for all ports
- Digital I/O
  - 16 bit-programmable
  - Jumper selected 10K pull up/down in 8-bit blocks
- Size: 3.6”L x 3.8”W x 0.6”H (90mm L x 96mm W x 15mm H)
- Weight: 0.24bs (0.10 Kg)
- Power Consumption: 2W @ 5 VDC Typical

Siemens MC75 GSM Modem Specifications

General Features:

- Quad-Band GSM
  - 850/900/1800/1900 MHz
- GSM release 99
- Output power:
  - class 4 (2 W) for EGSM850
  - class 4 (2 W) for EGSM900
  - class 1 (1 W) for GSM1800
  - class 1 (1 W) for GSM1900
- AT commands Hayes GSM 07.05 and GSM 07.07
- AT commands for RIL compatibility (RIL/NDIS)
- TCP/IP stack access via AT commands
- SIM application toolkit
- (SAT Release 99)
- Ambient temperature: –30 ºC…+70 ºC
- Auto switch-off at +75 ºC

Specification for fax:

- Group 3, class 1

Specifications for data EDGE (E-GPRS):

- Multislot class 10: max 236.8 kbit/s (downlink)
- Modulation and coding scheme MCS 1– 9
- Mobile station class B

Specifications for data (GPRS):

- Multislot class 12
- Full PBCCH support

- Mobile station class B
- Coding scheme 1– 4

Specifications for SMS:

- Via GSM or GPRS
- Point-to-point MO and MT
- Text and PDU mode
- SMS cell broadcast

Specifications for voice:

- Half rate (HR)
- Full rate (FR)
- Enhanced full rate (EFR)
- Adaptive multi rate (AMR)
- Basic hands free operation:
  - Echo cancellation
  - Noise reduction

SIM card reader:

- 3V or 1.8V cards
- SIM card detection

Antenna Interface

- 50 Ohms Impedance
- MCX straight jack receptacle connector

Fastrax iTrax03-0202 GPS Receiver Specifications

Specifications (based on 3.11 firmware)

General:

- L1 frequency, C/A code (SPS)
- 12 independent tracking channels
- Separate search and acquisition engine

Update rate:

- 1 fix/s (user configurable up to 5Hz)

Accuracy:

- Position: 3m (CEP), 8m (95%)
- Velocity: 0.2m/s RMS
- Time: TBD

Time to first fix:

- Cold Start (out of the box): 40s typical
- Warm Start 33s typical
- Hot start: 4s typical

Sensitivity:

- Acquisition (cold): -139 dBm
- Acquisition (hot, warm): -149 dBm
- Tracking: -153 dBm
- Navigation: -152 dBm

Power Drain
- Navigating 1 fix/s: 100mW typical
- Idle Mode: 15mW typical
- Sleep Mode: 60uW typical

Operating temperature: -40C..+85C
Storage temperature: -40C..+85C
Flash memory:
- iTrax03-02/8: 8MBit

I/O ports:
- Two asynchronous serial ports
- 1PPS output

Protocol:
- NMEA 0183
- iTalk Binary Protocol

Antenna Input:
- 50ohm
- MCX straight jack receptacle connector

Antenna bias:
- External input

Chipset:
- u-Nav uN8021 RF
- u-Nav uN8130 Baseband

SW Features:
- Kalman Navigation
- Reprogramming on the fly
- Data-logger
- A-GPS Support
- WAAS / EGNOS Support (in 4Q-2005)
- Multipath mitigation
- Automatic Interval mode
- 1 PPS

PCI UART

Model	Exar XR17D154
Number of Channels	4
FIFO Size	64 bytes
Oscillator frequency	14.7456 MHz

COM17075ER Operating Conditions

Cooling	Convection
Operating temperature	-30º to +70º C
Limited operation (Emergency voice calls only)	-30º to +75º C
Humidity	RH up to 95% non-condensing

Storage temperature range	-40^{o} C to $+85^{o}$ C

Additional Information

Exar XR17D154 PCI UART

More information on the Exar PCI UART, including a register map, visit Exar's web site:

http://www.exar.com

Siemens MC75 Cellular Engine

For more information on the Siemens module, including a list of the supported AT command, contact Siemens:

http://www.siemens.com

Fastrax iTrax03-02 GPS Receiver

For a downloadable datasheet for the iTrax03-02 GPS receiver visit the receiver Fastrax's website:

http://www.fastrax.fi

The Fastrax web site also contains documentation of the NMEA-0183 ASCII and iTalk binary protocols.

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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