



C864-1/2

HARDWARE MANUAL

PRELIMINARY



Preliminary

VERSION HISTORY:

This table provides a summary of the document revisions.

| Number | Author | Changes | Change date |
|--------|-----------|--------------------|-------------|
| 1.0.0 | F. Beqiri | - Initial version. | 15/10/2008 |

CAUTIONS

Information furnished herein by FALCOM is believed to be accurate and reliable. However, no responsibility is assumed for its use. It is necessary to read this manual before you start using the device.

Please, read carefully the safety precautions.

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NOTE

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Preliminary

1 INTRODUCTION

1.1 General

The C864 is designed for use on any GSM network in the world. The C864 is a quad-band GSM/GPRS engine that works on four frequencies GSM 850, 900 MHz, DCS 1800 MHz and PCS 1900 MHz.

This module constitutes a self contained, fully integrated implementation of the GSM/GPRS. C864 features GPRS class B, class 10 (making download at speeds up to 85 kbps) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

The C864 module incorporates all your needs to create high-performance GSM/GPRS solutions: base band processor, power supply ASIC, complete radio frequency circuit including a power amplifier, internal and external SIM interfaces, and an antenna interface as well.

The physical interface to the cellular application is made through a board-to-board connector. It consists of 40 pins, required for controlling the unit, transferring data and audio signals and providing power supply lines.

The external dual band or triple band antenna can directly be connected to the integrated 50 Ω connector on the side of module.

The C864 is a mobile station for transmission of voice, data calls and FAX as well as short messages (SMS - **S**hort **M**essage **S**ervice) in GSM Network.

To control the GSM module there is an advanced set of AT commands according to GSM ETSI (**E**uropean **T**elecommunications **S**tandards **I**nstitute) 07.07 and 07.05 implemented.



Figure 1: Views of C864-2

Users are advised to proceed quickly to the "Security" chapter and read the hints carefully.

1.2 Related documents

Some others PDF documents such as FCC approval, application notes, Certificate of Conformity R&TTE etc. are available on the Web at: <http://www.falcom.de/> in the published download area.

In addition to this document, the following files comprise the full set of FALCOM C865-1/2 product manuals which are also available on the Web at: <http://www.falcom.de/> in the published download area.

| NR | PDF file name | Description |
|-----|--|--|
| [1] | Telit_GE864-QUAD-PY_Hardware_User_Guide_r9.pdf | Contains technical information about the GE864 module from Telit. |
| [2] | GSM_eval_board.pdf | Contains information how to get started with the help of GSM evalboard. |
| [3] | Telit_AT_Commands_Reference_Guide_r5.pdf | Description of AT command that can be used to applicate with C864 |
| [4] | Telit_Audio_Settings_Application_Note_r2.pdf | An application note for audio settings. |
| [5] | Telit_RTC_Backup_App_Note_r2.pdf | Contains information how to implement in a customer's application a backup battery / capacitor on the Telit modules. |
| [6] | Telit_Easy_GPRS_User_Guide_r4.pdf | Contains information how to connect the C864 to the GPRS. |
| [7] | Telit_SIM_Holder_Design_Guide_App_Note_r1_.pdf | Gives a basic design guide lines to integrate a SIM holder in applications that uses Telit modules. |

These PDF files are viewable and printable from Adobe Reader. If you do not have the Adobe Reader installed, you can download it from <http://www.adobe.com>.

2 SECURITY

IMPORTANT FOR THE EFFICIENT AND SAFE OPERATION OF YOUR GSM-MODEM, READ THIS INFORMATION BEFORE USE!

Your cellular engine C864 is one of the most exciting and innovative electronic products ever developed. With it, you can stay in contact with your office, your home, emergency services and others, wherever service is provided.

This chapter contains important information for the safe and reliable use of the C864 device. Please read this chapter carefully before starting to use the cellular engine C864.

2.1 General information

Your C864 device utilizes the GSM standard for cellular technology. GSM is a newer radio frequency („RF“) technology than the current FM technology that has been used for radio communications for decades. The GSM standard has been established for use in the European community and elsewhere. Your C864 is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your modem, the cellular system handling your calls controls both the radio frequency and the power level of your cellular modem.

2.2 Exposure to RF energy

There has been some public concern about possible health effects of using a GSM modem. Although research on health effects from RF energy has focused for many years on the current RF technology, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product is fit for use.

If you are concerned about exposure to RF energy, there are things you can do to minimize exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular modem efficiently by following the guidelines below.

2.3 Driving

Check the laws and regulations on the use of cellular devices in the area where you drive. Always obey them. Also, when using your C864 while driving, please pay full attention to driving, pull off the road and park before making or answering a call if driving conditions so require. When applications are prepared for mobile use, they should fulfil road-safety instructions of the current law!

2.4 Electronic devices

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However, RF energy may affect some malfunctioning or improperly shielded electronic equipment.

2.5 Vehicle electronic equipment

Check your vehicle manufacturer's representative to determine if any on board electronic equipment is adequately shielded from RF energy.

2.6 Medical electronic equipment

Consult the manufacturer of any personal medical devices (*such as pacemakers, hearing aids, etc.*) to determine if they are adequately shielded from external RF energy.

Turn your C864 device OFF in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

2.7 Aircraft

Turn your C864 OFF before boarding any aircraft. Use it on the ground only with crew permission. Do not use it in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you to have permission from a crew-member to use your modem while the plane is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem whilst airborne.

2.8 Children

Do not allow children to play with your C864 device. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem or make calls that increase your modem bills.

2.9 Blasting areas

To avoid interfering with blasting operations, turn your device OFF when in a "blasting area" or in areas posted: „turn off two-way radio“. Construction crew often uses remote control RF devices to set off explosives.

2.10 Potentially explosive atmospheres

Turn your C864 device **OFF** when in any area with a potentially explosive atmosphere. It is rare, but your modems or their accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations; below decks on boats; fuel or chemical transfer or storage facilities; and areas where the air contains chemicals or particles, such as grain, dust or metal powders.

Do not transport or store flammable gas, liquid or explosives, in the compartment of your vehicle, which contains your modem or accessories.

Before using your modem in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is to be used.

3 SAFETY STANDARDS

Your GSM/GPRS/GPS device complies with all applicable RF safety standards.

C864 meets the safety standards for RF receivers and the standards and recommendations for the protection of public exposure to RF electromagnetic energy established by government bodies and professional organizations, such as directives of the European Community, Directorate General V in matters of radio frequency electromagnetic energy.

Preliminary

4 TECHNICAL DATA

4.1 Product specifications

↵ **Power supply:**

- Operating voltage **+5 VDC ±5 %**

↵ **Power consumption:**

- Refer to the table in chapter 4.2.

↵ **Extended Temperature Range:**

- - 30 °C to + 80 °C (see chapter 4.3 for further details)

↵ **Physical characteristics of modem:**

- Size: 64.0 ± 0.15 mm x 41.5 ± 0.15 mm x 10.5 ± 0.15 mm (for more details see chapter 7 "Housing")
- Weight: 40 ± 2 g

↵ **Evaluation kit**

- The C864 Evaluation Kit is designed to test and consider it as a Reference-Design for your HW-application, thus, you can save time and money. In this way you can reduce the Time-To-Market (see chapter 8).

↵ **RoHS Compliance:**

- Comply with RoHS directive of the European Union

↵ **Mounting:**

- Through 4 screw holes on the housing

↵ **Frequency bands:**

- Quad-band: 850/900/1800/1900
- Compliant to GSM Phase 2/2+

↵ **Transmit power:**

- Class 4 (2 W) at GSM850/900
- Class 1 (1 W) at GSM 1800/1900

↵ **GPRS connectivity:**

- GPRS mobile station class B, multi-slot class 10

↵ **DATA:**

GPRS ⇒

- GPRS data downlink transfer: max. 85.6 kbps (see table 1).
- GPRS data uplink transfer: max. 42.8 kbps (see table 1).
- Coding scheme: CS-1, CS-2, CS-3 and CS-4.
- Supports two protocols PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol) commonly used for PPP connections.
- Support of Packet Switched Broadcast Control Channel (PBCCH) allows you to benefit from enhanced GPRS performance when offered by the network operators.
- Support TCP/IP stack access via AT commands

CSD ⇒

- Asynchronous transparent Circuit Switched Data (CSD), up to 14,4 kbps
- Asynchronous non-transparent CSD up to 9,6 kbps,
- V.110.

✚ SMS:

- MT, MO, CB, Text and PDU mode.
- SMS storage: SIM card + in the mobile equipment.

✚ FAX:

- Group3, Class 1.

✚ SIM interface:

- Supported SIM card: 1.8 / 3 V
- Integrated SIM card holder (for small SIM card, only)
- Additional SIM interface provided pins on the 40-pin board-to-board connector.

✚ Casing:

- Fully shield (Chromium-plate ABS).

✚ Antenna connector:

- Equipped with a 50 Ohm MC-card or 28 cm cable with FME connector type at the end.

✚ Audio interfaces:

- 2 x analogue audio interfaces (for Headset and Handsfree-kit)

✚ Serial interface (RS232C):

- 2.8V level, bi-directional bus for AT commands and data
- Serial link↔full-featured 8-wire serial interface for AT commands and data. Supports RTS0/CTS0 hardware handshake and software XON/XOFF flow control.
- Baud rate: 300 bps ... 230 kbps
- Autobauding detects 2400 to 57600 bps

✚ Phonebook management:

- Supported phonebook types: SM, FD, LD, MC, RC, ON, ME

✚ Ringing tones:

- Offers a choice of different ringing tones/melodies, easily selectable with AT command

| Coding scheme | 1 Timeslot | 2 Timeslots | 4 Timeslots |
|---------------|------------|-------------|-------------|
| CS-1: | 9.05 kbps | 18.1 kbps | 36.2 kbps |
| CS-2: | 13.4 kbps | 26.8 kbps | 53.6 kbps |
| CS-3: | 15.6 kbps | 31.2 kbps | 62.4 kbps |
| CS-4: | 21.4 kbps | 42.8 kbps | 85.6 kbps |

Table 1: Coding schemes and maximum net data rates over air interface

Please note that the values listed above are the maximum ratings which, in practice, are influenced by a great variety of factors, primarily, for example, traffic variations and network coverage.

4.2 Power consumption for C864

| POWER CONSUMPTION (Average supply current) | | | | | | |
|---|------|------|------|------|---|------------------------------|
| | Min. | Typ. | Max. | Unit | Description | |
| Supply voltage | 4.75 | 5 | 5.25 | V | Voltage must stay within the min/max values, including voltage drop, ripple and spikes. | |
| GSM | | 12 | | mA | Power saving with AT+CFUN=0: module registered on the network and can receive voice call or an SMS; but it is not possible to send AT commands; module wakes up with an unsolicited code (call or SMS) or rising RTS line | |
| | | | | | MODE | BAND |
| | | 15 | | mA | IDLE mode | EGSM 900 |
| | | 15 | | | | GSM 1800/1900 |
| | | 234 | | mA | TALK mode | EGSM 900 ^{*)} |
| | | 172 | | | | GSM 1800/1900 ^{**)} |
| GPRS | | 15 | | mA | IDLE GPRS | EGSM 900 |
| | | 15 | | | | GSM 1800/1900 |
| | | 238 | | mA | DATA mode GPRS, (4 Rx, 1 Tx) | EGSM 900 ^{*)} |
| | | 186 | | | | GSM 1800/1900 ^{**)} |
| | | 226 | | mA | DATA mode GPRS, (3 Rx, 2 Tx) | EGSM 900 ^{*)} |
| | | 237 | | | | GSM 1800/1900 ^{**)} |

^{*)} Power Control Level (PCL 5); ^{**) Power Control Level (PCL 0).}

Table 2: Power supply

4.3 Operating temperatures

| Parameter | | Min. | Typ. | Max. | Unit |
|--|--|------|------|------|------|
| Operation temperature | Full function; Full specification compliance | - 20 | 25 | + 55 | °C |
| | Full function* | - 30 | | + 80 | °C |
| Temperature in not functional conditions | | - 40 | | + 85 | °C |

^{*)} Temperature outside the -20°C to +55°C range can affect the sensitivity, the performance of the modem.

Table 3: Operating temperature

4.4 Determining the External Equipment Type

C864 is designed for use as a DCE unit. Based on the conventions for DCE-DTE connections it communicates with the customer application (*DTE*) using the following signals:

| C864 Terminal (DCE) | to | Application (DTE) |
|---------------------|--------|-------------------|
| TxD | ←----- | TXD |
| RxD | -----→ | RXD |
| RTS | ←----- | RTS |
| CTS | -----→ | CTS |
| DTR | ←----- | DTR |
| DSR | -----→ | DSR |
| DCD | -----→ | DCD |
| RING | -----→ | RING |

Table 4: The signalling definitions between DTE and DCE.

5 HARDWARE INTERFACES

5.1 Interfaces on the C864

In figure 2 the interfaces of the C864 module are to be seen.

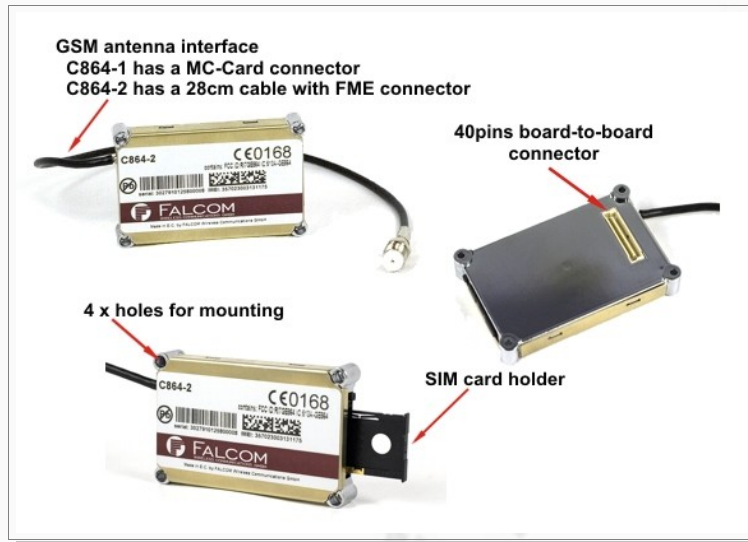


Figure 2: Provided interfaces on the C864 module.

| Interface specifications | |
|---------------------------------|--|
| Board-to-board connector | 40-pin connector Tyco (AMP) 2-0177986-1 ²⁾ |
| Antenna interface | antenna interface 50 Ω , MC-Card connector (Radiall) or 28 cm cable with FME connector |
| Card holder | Card reader for small SIM cards (1.8 / 3 V) |
| Mounting holes | Holes for fixing Recommended screws: 2,2 x 16 mm The screw could be longer and it depends on the customer's application. |

Table 5: Interface specifications

2) 40-pin connector Tyco (AMP) 2-0177986-1

Counterpart for application ³⁾: CON 100 5-179010-1 (13 mm height)

CON 101 5-177985-1 (Standard 5 mm height)

CON 102 5-179180-1 (9 mm height)

3) The module C864 is for flat mounting and the space between the highest point of the module and its bottom is 1,5 mm.

5.2 Description of the 40-pin double-row connector

Please note that the reference voltages listed in table 7 are the values measured directly on the C864 module. C864 module is equipped with a board-to-board connector that connects to the cellular application platform. The Tyco (AMP) board-to-board connector is a 40-pin double-row receptacle. The position of the pins can be seen on the figure 3 below which shows the bottom view of C864. This interface incorporates several sub-interfaces described in the following chapters. The connector pinout is given in Table 7 below. To avoid any mistake on structured table below, note that, all sub-interfaces included on the board-to-board connector are grouped, sequencing is not taken into account.

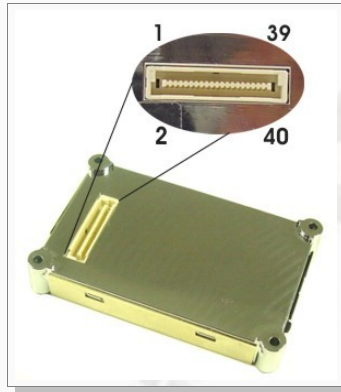



Figure 3: Pin assignment on the 40-pin connector (bottom view on C864)

| PIN | GSM modem | I/O | DESCRIPTION | LEVEL |
|----------------|-----------|-----|---|---|
| 5 | SIMGND* | - | External SIM interface. <i>SP_Out is connected to the SIMIN pin of the GE864 module via an open collector transistor of the NPN type.</i> | 0 V (Ground) |
| 19 | SP_Out | I | | $V_{nNmin} = 1\text{ V}$ $V_{Inmax} = VC5$ |
| 1 | SIMRST* | O | | 1.8 / 3 V |
| 3 | SIMDATA* | I/O | | 1.8 / 3 V |
| 2 | SIMCLK* | O | | 1.8 / 3 V |
| 4 | SIMVCC* | O | | 1.8 / 3 V |
| 6,7,8,9,10 | GND | - | Negative operating voltage (grounds). | 0 V |
| 11 | OUT11* | O | TX data for debug monitoring. | CMOS 2.8V |
| 22 | OUT22* | I | RX data for debug monitoring. | CMOS 2.8V |
| 20 | OUT20 | - | NC | - |
| 12 | ENABLE | I | Internal power enable/disable (HIGH=enable) | Schmitt-Trigger $V_{OFFmin} = 0\text{ V}$, $V_{OFFmax} = 0.4\text{ V}$. $R_i = 10\text{ k}\Omega$; $I_{OFFmin} = 120\mu\text{A}$ $V_{Onmin} = 1.2\text{ V}$, $V_{Onmax} = VCC$. |
| 13 | OUT1* | O | Status indicator LED. | CMOS 1.8V |
| 14,15,16,17,18 | VC5 | I | Power supply input. 5 VC5 pins to be connected in parallel. 5 GND pins to be connected in parallel. The power supply must be able to meet the requirements of current consumption in a Tx burst (<i>up to 2 A</i>). | $V_i = +5\text{V} \pm 5\%$ $I_{max} < 2\text{ A}$ (during Tx burst) |

| | | | | |
|----|---------|------|---|---|
| 24 | VCCRTC* | I/O | Supplies the RTC with power via an external capacitor or buffer battery if VC5 is not applied. If not used leave it open. | $V_{Omin} = 1.95\text{ V}$ (output) $V_{Omax} = 2.15\text{ V}$ (output) $V_{Imin} = 1.1\text{ V}$ (input) $I_{Imin} = 130\text{ }\mu\text{A}$ |
| 26 | RESET* | | Reset input | Input $V_{RESET} = 0 \dots 0.2\text{ V}$ |
| 29 | SOFT-ON | I | Input to switch the module ON. The pulse to be sent to the C864 must be equal or greater than 1 second. <i>SOFT_ON</i> is connected to the ON/OFF pin of the GE864 module via an open collector transistor of the NPN type. | $V_{Openmin} = 1\text{ V}$ $V_{Openmax} = VC5$ ON  Active HIGH $\geq 1\text{ s}$ |
| 27 | RXD_0* | O | First serial interface for AT commands or data stream. | CMOS 2.8 V |
| 28 | TXD_0* | I | | |
| 31 | RING_0* | O | | |
| 32 | DCD_0* | O | | |
| 33 | DSR_0* | O | | |
| 34 | RTS_0* | I | | |
| 35 | DTR_0* | I | | |
| 36 | CTS_0* | O | | |
| 37 | SPK1P* | O(+) | Handset earphone signal output. Can be used to directly operate an earpiece. <i>Directly connected to the EAR_MT(-) (+) respectively.</i> | nom. 50mVrms |
| 38 | SPK1N* | O(-) | | |
| 39 | MIC1P* | I(+) | Handset mic. signal input. Do not require any noise filter. It is built in. <i>A common electret microphone can be connected directly to these pins. Directly connected to the MIC_MT(-) (+) respectively.</i> | nom. 50mVrms |
| 40 | MIC1N* | I(-) | | |
| 21 | MIC2P* | I(+) | Handsfree mic. input Do not require any noise filter. It is built in. Can be used to directly feed an active microphone. <i>Directly connected to the MIC_HF(-) (+) respectively.</i> | nom. 3mVrms |
| 23 | MIC2N* | I(-) | | |
| 25 | SPK2P* | O(+) | Handsfree ear output. Can be used to directly operate an earpiece. <i>Directly connected to the EAR_HF(-) (+) respectively.</i> | nom. 3mVrms |
| 30 | SPK2N* | O(-) | | |

* For more detailed information about these pins, refer to the hardware manual of the GE864 module (see related documents [1]) available on the FALCOM website.

Table 6: Description of the 40-pin connector

5.3 Special functionality pins

5.3.1 Power supply

The power supply for the GSM/GPRS engine of the C864 module has to be a single voltage source of $V_{VC5+} = 4.75 \dots 5.25$ V. It must be able to provide sufficient current in a transmit burst which typically rises to 2 A.

All the key functions for supplying power to the device are handled by an ASIC power supply. The ASIC0 provides the following features:

- Stabilizes the supply voltages for the GSM base band using low drop linear voltage regulators.
- Controls the module's power up and power down procedures.

5.3.2 Power supply pins (14...18) on the board-to-board connector

Five VC5 pins of the board-to-board connector are dedicated to connect the supply voltage, five GND pins are recommended for grounding.

| Signal name | I/O | Parameter | Description |
|-------------|-----|--|-----------------------------|
| VC5+ | I | 4.75 V...5.25 V, $I_{typ} \leq 2$ A during transmit burst. The minimum operating voltage must not fall below 4.75 V, not even in case of voltage drop. | Positive operating voltage. |
| GND | - | 0 V | Ground |

Table 7: Power supply pins on board-to-board connector.

5.3.3 Serial interface

The serial port on the C864 is the core of the interface between the module and external host device.

2 serial ports are available on the module:

- First serial port
- Second serial port (debug).

Several configurations can be designed for the serial port, but the most common are:

- RS232 PC COM port
- Microcontroller UART @ 2.8V - 3V (Universal Asynchronous Receive Transmit).
- Microcontroller UART@ 5V or other voltages different from 2.8V.

For more detailed information refer to the hardware manual [1].

5.3.4 Turn on the C864 module using the SOFT_ON line

To switch on the C864 module the SOFT_ON signal needs to be set to HIGH level for at least 1 second after applying power to the module.

5.3.5 Turn off the GSM/GPRS engine of C864 module

To switch the module off the following procedures may be used:

- Normal shutdown procedure: Software controlled by sending the `AT#SHDN` command over the first serial interface. Executing of this command lets GSM engine log off from the network and allows the software to enter into a secure state and save data before disconnecting the power supply.
- Emergency shutdown: Hardware driven by switching the RESET line (Pin 26) of the board-to-board connector to ground=immediate shutdown of supply voltages.
- Automatic shutdown:
 - a) Takes effect if under voltage is detected.
 - b) Takes effect if C864 board temperature exceeds critical limit.

5.3.6 EN pin (Pin 12)

The enable signal is an input for the internal voltage regulator. The internal regulator comes with an active-high enable pin that when this pin is driven to Low disables the voltage regulator while voltage VC5+ is permanently applied to the module.

- Forcing the Enable pin to LOW (GND) disables the regulator and sends the C864 module into the off state. The module stays off as long as this pin is LOW. Disconnecting this pin from GND while the voltage Vvc5+ is applied, enables the input voltage to the C864. To turn on the GSM engine inside the C864 and to access the serial interface the SOFT_ON signal needs to be driven to HIGH level for at least 1 second.
- If not used leave the enable signal open.

5.3.7 SIM interface

The C864 module provides two SIM interfaces which could not concurrently be used:

- an integrated SIM card holder, part of C864 module, for small 1.8 and 3 V SIM cards.
- and an integrated 6pins interface on board-to-board connector for user application. This SIM circuit can be implemented outside the module on the application platform. For more detailed information how to use this pin refer to the application note [7].

5.4 RTC backup for GSM/GPRS engine of C864

The internal Real Time Clock of the C864 module is supplied from a separate voltage regulator in the power supply ASIC which is also active when the GSM/GPRS engine of the C864 is shutdown. For more detailed information how to use this pin refer to the application note [5].

5.5 Audio interface

The C864 module provides two different audio channels; both in transmit (*Uplink*) and in receive (*Downlink*) direction:

“**SPK1** and **MIC1** lines” should be used for handset function. **MIC** can also be directly connected to an Electret microphone.

“**SPK2** and **MIC2** lines” is suited for hands -free function (car kit).

For more detailed information about the microphone and speaker characteristic and requirements, refer to the application note [4].

5.6 GPIO1-Status indicator LED

The GPIO1 pin status shows information on the network service availability and Call status. In the C864 module, the GPIO1 usually needs an external transistor to drive an external LED. Therefore, the status indicated in the following table is reversed with respect to the pin status. For more detailed information how to use this pin refer to the hardware manual [1].

| LED status | Device status |
|-------------------------------------|--|
| Permanently off | Device off |
| Fast blinking (Period 1s, Ton 0,5s) | Net search / Not registered / turning off. |
| Slow blinking (Period 3s, Ton 0,3s) | Registered full service. |
| Permanently on | A call is active. |

Table 8: Coding of the status LE

6 FIRST STEPS TO MAKE IT WORK

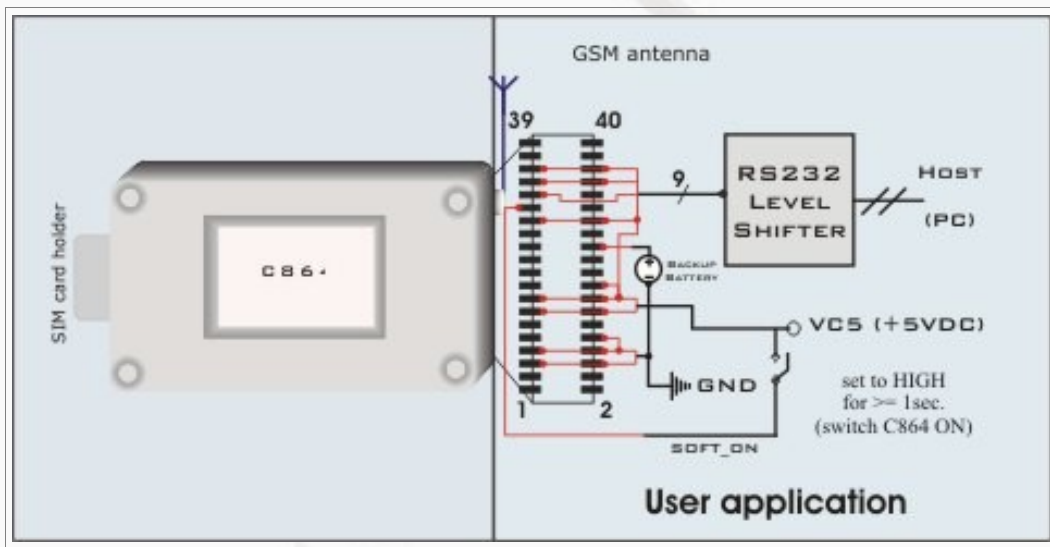
The quickest way to get first results with the C864 embedded GSM/GPRS module is to operate it with the GSM-EVAL-KIT which is available by FALCOM upon request. It saves design, time and reduces "Time-to-Market" period. For more details about the FALCOM GSM-EVAL-KIT, refer to the chapter "[GSM Evaluation Kit \(GSM EVAL-KIT\)](#)".

NOTE: The GSM/GPRS module C864 is compatible to the C2D module as far as the pin-out on the 40-pins board-to-board connector is concerned. By evaluating the C864 module a C2D adapter board is required to perform the connection between the C864 and GSM-EVAL-KIT. This applies for the users who already have an adapter and a GSM-EVAL-KIT. For other users they have to purchase one.

6.1 Minimum set-up connection

This section and subsections below describe the minimum hardware connection of C864 module to get started without using the FALCOM GSM-EVAL-KIT.

As a minimum, to set-up a connection between your PC and the C864, it is necessary to connect the following interfaces to operate the C864 module properly. Please, follow step-by-step the instructions below. The figure below shows in a visual form the connection of the C864 hardware interfaces.



6.1.1 Mounting the C864

The C864 contains four holes for mounting screws. The module can be assembled to various applications without using the screws.

6.1.2 Antenna interface

The antenna must be located on the places where the signal strength is sufficient. Maybe a mobile phone is required to be used to verify the best location for the C864 connected antenna.

Electronic devices can cause interference, which affects the performance of the C864. Do not locate the antenna nearby electric devices or other antennas.

The C864 uses either a **MC-card** female antenna connector supplied from Radiall or a 28 cm antenna cable with a FME connector at the end. The GSM RF connector has impedance 50 Ω . A dual- or tri band GSM antenna can be directly connected to this connector. Mating plugs and cables can also be chosen from FALCOM. In addition to the GSM antenna, FALCOM provides antenna cable sets which connects a MC card connector to the FME connector (*if you are using a GSM antenna with FME connector only*) through 20 cm RG.174 antenna cable. The ordering number of this antenna adapter is **KA05**.

The antenna selection and connection is the most important part that strongly reflects on the product performances, hence read carefully and follow the requirements for a proper operation.

| ANTENNA REQUIREMENTS | |
|----------------------|--|
| Frequency range | Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s) |
| Bandwidth | 70 MHz in GSM850, 80 MHz in GSM900, 170 MHz in DCS & 140 MHz PCS band |
| Gain | Gain < 3dBi |
| Impedance | 50 ohm |
| Input power | > 2 W peak power |
| VSWR absolute max. | <= 10:1 |
| VSWR recommended | <= 2:1 |
| Connector | FME-male or MC-card male (<i>depending on the C865 order</i>) |

6.1.3 SIM interface

The integrated SIM interface in the C864 module controls 3/1.8 V SIM cards. This interface is fully compliant with GSM 11.11 recommendations concerning SIM functions. The C864 requires a small SIM card, which is provided by your mobile phone service provider. This contains the telephone number of C864 you will use, as well as other customer information. If your SIM is larger credit-card size, it may have a snap-out area that allows the small SIM to be removed by gentle twisting. Otherwise apply to your service provider for a small SIM. The SIM card must be enabled for all services that you want to use – *VOICE, DATA, and/or FAX*; if in doubt contact your service provider. Via pushing the eject button on the right side of the card reader, the card holder can be taken off. Put the SIM card into the card holder. The bevelled corner of SIM card has to be on the same side to bevelled corner of card holder and the golden contact area is facing upwards. Make sure that the SIM card is sitting firmly in the SIM card holder slot. Then insert the tray (with SIM card) into the card reader, and push it forwards till it snaps in.

6.1.4 Serial communication signals

The physical interface to the integrated C864 is performed through available lines on the 40-pin board-to-board connector. This interface is provided with 8-lines and ground. In order to provide RS232 compatible levels and to communicate with a

host device serial port a level shifter should be used. For more details how to implement a level shifter on the C864, refer to the hardware manual [1].

6.1.5 Power supply

The power supply to the C864 module has to be a single voltage source of $V_{VC5+} = 4,75 \dots 5,25$ V. It must be able to provide sufficient current in a transmit burst which typically rises to 2 A.

6.1.6 Turn on the GSM/GPRS engine of C864

In general, be sure not to turn on GSM/GPRS engine of the C864 module while it is out of the operating range of voltage and temperature stated in [Table 3](#). The GSM/GPRS engine of the C864 would immediately switch off after having started and detected these inappropriate conditions.

To switch on the C864 GSM/GPRS engine the `SOFT_ON` signal needs to be driven to HIGH level for at least 1 second.

To be able to send AT commands to the module, start an application software (e.g. HyperTerminal) which can be found in the following directory:

- ✓ Go to Start > Program > Accessories > Communication and click the HyperTerminal program.
- ✓ On the appeared screen assign the name for the current connection (e.g. "C864") and click OK.
- ✓ Then choose the correct COM Port on which the module is connected as well select the baud rate of (115200 bps, 8 bit, no parity bit, 1 stop bit) and click OK.
- ✓ Type **AT** and then press **<ENTER>** key, the module will respond **OK**.
- ✓ To evaluate with C864 module, refer to the AT command reference guide [3].

7 HOUSING

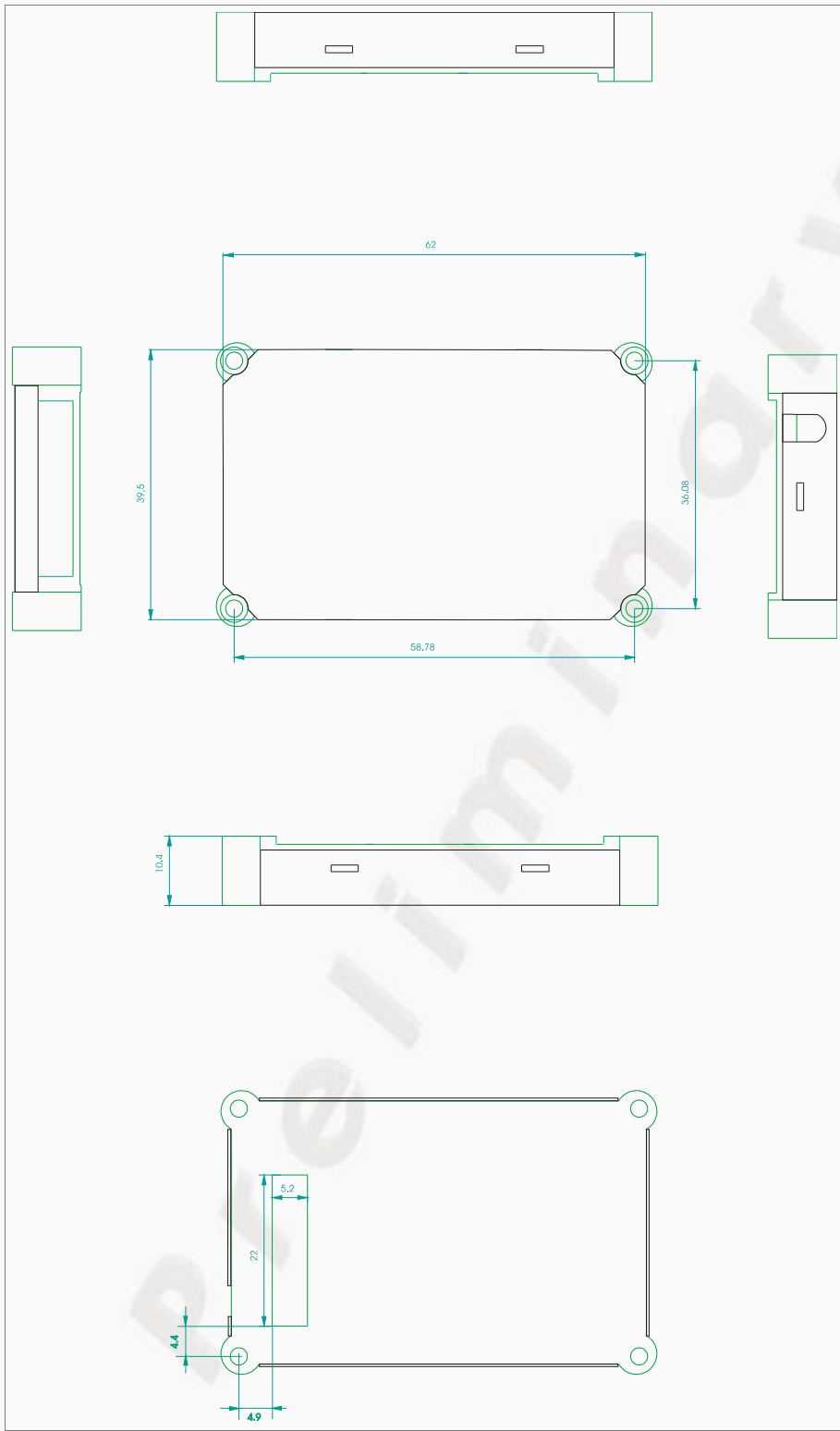


Figure 4: Housing of C864

8 GSM EVALUATION KIT (GSM EVAL-KIT)

The quickest way to get first results with the embedded GSM module is the activation by the GSM-EVAL-KIT by means of a terminal program.

The FALCOM GSM-EVAL-KIT provides design engineers with all necessary hard- and software information for the creation of embedded applications based on FALCOM GSM/DCS embedded modules. It saves design, time and reduces "Time-to-Market" period.

The GSM EVAL-KIT set contains:

- ✓ EVAL-Board
- ✓ Adapter PCB for A2D/F35/C2D/C55/I56/C864 modules called FALCOM adapter
- ✓ Adapter PCB for C864 module called CM adapter
- ✓ Wall mount power adapter
- ✓ 9-pin serial cable (pin to pin direct connection, male to female connectors)
- ✓ GSM antenna (900/1800/1900) and cable (30 cm) with coaxial plug
- ✓ Coaxial adapter MC card
- ✓ Headset with RJ45 plug
- ✓ Set of connectors:
 - 2 pieces 40-pin stacking connector (plug and socket)
 - 2 pieces coaxial antenna plug (plug and socket)
 - 2 pieces 15-pin cable connector (plug and socket)
 - 2 pieces external SIM card reader
 - 3 pieces short circuit bridges
 - 4 pieces mounting clamps
 - 4 pieces dowel
- ✓ CD:
 - Layout data (PROTEL/GERBER format) of module
 - Evaluation board user manual and other manuals

Schematics of the evaluation platform and adapter PCB's (power supply, external SIM card, serial interface).