



■ TANGO864-1/2

■ HARDWARE MANUAL



VERSION HISTORY:

This table provides a summary of the document revisions.

Number	Author	Changes	Modified
		-	
1.0.1	F. Beqiri	- Removed headset <i>HS-TWIST/TANGO</i> from this document - <i>this headset is no longer available.</i>	25/11/2009
1.0.0	F. Beqiri	- Initial version.	15/09/2008

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.

If you have any technical questions regarding this document or the product described in it, please contact your vendor.

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NOTE

Specifications and information given in this document are subject to change by FALCOM without notice.

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1 INTRODUCTION

This product manual is only addressed to qualified personnel which is well skilled in electronical/electrical installation and not addressed to private consumers/end user. The installation, implementing or setting into operation of the product can only be performed by this qualified personnel.

The status of the product described in the data sheet may have changed since publication of the data sheet and therefore information in this data sheet on product status may be outdated. The latest information of the product is available on the download area of the FALCOM website.

1.1 General

TANGO864 modem is a Quad-Band GSM/GPRS engine that work on four frequencies GSM 850/900 MHz, DCS 1800 MHz and PCS 1900 MHz. It is designed for use on any GSM network in the world. This modem constitutes a self contained, fully integrated implementation of the GSM/GPRS. It features GPRS class B, class 10 (making download at speeds up to 85 kbps) and supports GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. It incorporates all you need to create high-performance GSM/GPRS solutions; base band processor, power supply ASIC, complete radio frequency circuit including a power amplifier, integrated internal SIM interface, pins for audio connection and an SMB or FME connector for connecting a GSM antenna. The physical interface to the cellular application is made through a RS-232 connector or through a RJ45 connector. Both interfaces couldn't be used at the same time. Once one interface is put in use (Rx, Tx) the other one (Rx, Tx) stay deactivated. The first communication interface consists of 9-pin RS232 interface, required for controlling the unit and transferring data. It can be directly connected via a RS232 serial cable to a serial port of your desktop or notebook computer. While the second RJ45 interface provides two lines Rx and Tx for serial communication to the modem. This interface provides also an audio channel for connecting a microphone and speaker and making and receiving voice calls via a headset or hands-free kit. You can connect such devices (headset or hands-free kit) with RJ45 connector directly to interface. Additionally, a 4-pin connector provided on the modem's front panel allows to apply power from different external power sources via the included power cable. An external dual-band, tri-band or a quad-band GSM antenna can be connected directly to the integrated 50 Ω SMB or FME connector on the modem. TANGO864 can be used for transmission of voice, data calls and FAX as well as short messages (SMS - **Short Message Service**) in any 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.

About GPRS:

GPRS is standard for General Packet Radio Service that is an add-on to the GSM (Global System for Mobile Communications) cellular network - a type of network used to provide cellular phone service. In regions where GPRS is not available, users can still access their important information with GSM 14.4 kbps data connections.

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

1.2 Used abbreviations

Abbreviation	Description
CHAP	Challenge Handshake Authentication Protocol
CPU	Central Processing Unit
CS	Coding Scheme
CSD	Circuit Switched Data
DCE	Data Communication Equipment (typically modems, e.g. XF55-AVL GSM engine)
DCS 1800	Digital Cellular System, also referred to as PCN
DSR	Data Set Ready
DTE	Data Terminal Equipment (typically computer or, for example, GSM application)
DTR	Data Terminal Ready
EGSM	Enhanced GSM
ESD	Electrostatic Discharge
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
IMEI	International Mobile Equipment Identity
kbps	kbits per second
PCS	Personal Communication System, also referred to as GSM 1900
PDU	Protocol Data Unit
PPP	Point-to-point protocol
Rx	Receive Direction
SIM	Subscriber Identification Module
SMS	Short Message Service
Tx	Transmit Direction
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
ME	Mobile Equipment phonebook
SM	SIM phonebook

1.3 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.

NR	PDF file name	Description
[1]	gprs_startup_user_guide.pdf	Contains the description of the internal firmware and the supported Configuration Command Set for the TANGO864.
[2]	Telit_AT_Commands_Reference_Guide.pdf	Contains the description of the supported AT Commands Set for the Telit module GE864-QUAD.
[3]	AppNote_in_vehicle_mounting.pdf	Contains information of how to install your TANGO864 in a vehicle.

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 TANGO864 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 TANGO864 device. Please read this chapter carefully before starting to use the cellular engine TANGO864.

2.1 General information

Your TANGO864 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 TANGO864 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.

For the use of the acquired devices SIM cards are needed, which are not included in the scope of delivery of the device. The SIM cards can be acquired e.g. by specific providers. From the use of the SIM cards can result additional costs, which are to be borne by the purchaser (client) of the devices. The seller does not cover the extra costs for the use of the devices. The seller gives no recommendation for the use of specific SIM cards and does not liable also for the fact that the devices are usable with all available SIM cards. The seller also covers no other costs, that are needed for the application of the customer in connection with this device.

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 TANGO864 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 TANGO864 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 TANGO864 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 TANGO864 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 TANGO864 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.

2.11 Safety standards

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

TANGO864 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.

3 TECHNICAL DATA

3.1 Technical specifications of GSM/GPRS engine

✚ Power supply:

- Supply voltage in range of **10.8 ... 31.2 V DC $\pm 5\%$**

✚ Power consumption:

- Refer to the table in chapter 3.2.

✚ Extended Temperature Range:

- - 30 °C to + 80 °C (see chapter 3.3 for further details)

✚ Physical characteristics of modem:

- Size: 115.0 \pm 0.15 mm x 52.0 \pm 0.15 mm x 26.6 \pm 0.15 mm (for more details see chapter 5 "Housing")
- Weight: 82.6 \pm 2 g (with SMB connector)
88.0 \pm 2g (with FME connector)

✚ RoHS Compliance:

- Comply with RoHS directive of the European Union

✚ Dimension of cradle:

- Size: 119.4mm x 66.7mm x 31.8mm (L x B x H)
- Weight: 21 gr.

✚ Mounting:

- Through 2 screw holes on the cradle

✚ 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 \Rightarrow

- 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: 3/1.8 V.
- Built-in SIM Card Holder (for small SIM card, only).

✚ Option:

- TANGO864-PY - Script interpreter (allows driving the modem "internally" implementing the application code directly in the Python language. PY (Python) is a dynamic object-oriented programming language that can be used for many kinds of software development.

✚ Casing:

- Fully shield (Chromium-plate ABS).

✚ Antenna connector:

- Equipped with a 50 Ohm SMB or FME connector type

✚ Audio interfaces:

- On RJ45 interface an analog audio channel (incl. microphone + speaker)

Speech code modes:

- Half Rate (ETS 06.20), Full Rate (ETS 06.10), Enhanced Full Rate (ETS 06.50/06.60/06.80), Adaptive Multi Rate (AMR)

Handset & Hands-free operation

- Superior Echo cancellation & Noise reduction

✚ Serial interface (RS232C):

- 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 (default = 9600 bps)
- 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.

3.2 Power consumption for TANGO864

POWER CONSUMPTION (Average supply current)						
	Min	Typ.	Max	Unit	Description	
Supply voltage	10.8	12	31.2	V	Voltage must stay within the min/max values, including voltage drop, ripple and spikes.	
GSM		24		mA	SLEEP mode (AT+CFUN=1) - RS232 cable plugged in	
					MODE	BAND
		34		mA	IDLE mode	EGSM 900
		34				GSM 1800/1900
		172		mA	TALK mode	EGSM 900 ^{*)}
		177				GSM 1800/1900 ^{**)}
GPRS		34		mA	IDLE GPRS	EGSM 900
		34				GSM 1800/1900
		120		mA	DATA mode GPRS, (4 Rx, 1 Tx)	EGSM 900 ^{*)}
		121				GSM 1800/1900 ^{**)}
		127		mA	DATA mode GPRS, (3 Rx, 2 Tx)	EGSM 900 ^{*)}
		122				GSM 1800/1900 ^{**)}

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

Table 2: Power supply

3.3 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

3.4 Determining the External Equipment Type

TANGO864 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:

TANGO864 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.

4 HARDWARE INTERFACES

Interface specifications	
Interface A	4-pin Micro-Fit™ 3.0 Molex - Part number: 43045-0406 (Female)
Interface B	Standard RS232 serial interface
Interface C	Audio 8-pin RJ45, RS232 (Rx, Tx) serial interface
Interface D	GSM antenna interface with SMB or FME antenna connector.
Interface E	SIM card reader for small SIM cards (3/1.8 V)
Interface F	LED's for status indication

Table 5: Interface specifications of the modem

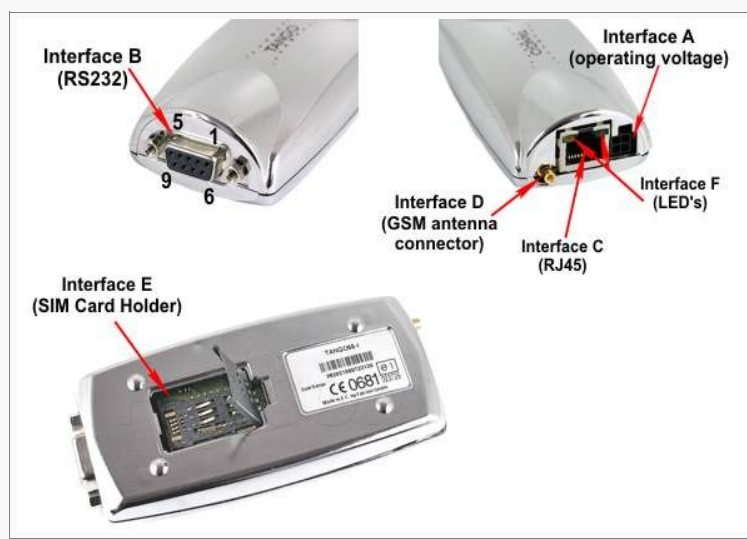


Figure 1: View of modem interfaces.

4.1 Getting started

4.1.1 Hardware & software requirements

- ✓ A valid SIM card for data and voice.
- ✓ Free compatible COM serial port
- ✓ Pentium 90 or higher.
- ✓ System memory: At least 64MB
- ✓ Operating system: Windows® 95, 98/Me/2000/XP

For data, Web and email applications.

- ✓ Dial-up networking configured to your ISP (Internet Service Provider).

4.1.2 Minimum hardware interface to get started

Installing the TANGO864 in seven-step process:

1. Install an external GSM antenna
2. Install an SIM card
3. Mount the modem in the cradle (if required)
4. Connect either an RS232 cable or RJ45 special cable
5. Apply power to the modem
6. Start a terminal program to execute AT commands
7. Configure GPRS settings and perform a dial-up network connection

1- Connecting an external antenna (with SMB connector type)

There are two different TANGO864 versions: TANGO864-1 and TANGO864-2. The difference between them is the GSM antenna cable: the first one has an antenna interface with an SMB connector (Figure 2.a) while the second one has an antenna cable with a FME connector at the end (Figure 2.b). The length of antenna cable is 23.3 cm. However, the specifications and functions of both modems are the same.



Figure 2.a: TANGO864 with SMB antenna connector



Figure 2.b: TANGO864 with FME antenna connector

If you are using an antenna from FALCOM (see possible antenna added in chapter 6.2), connect the adapter cable “KA08-F” to the antenna connector ([ANT-001-M](#)) and then connect the assembled one to the modem. When using other external antennas, please refer to the manual of antenna used. Here below is shown how to connect a FALCOM antenna to the modem.

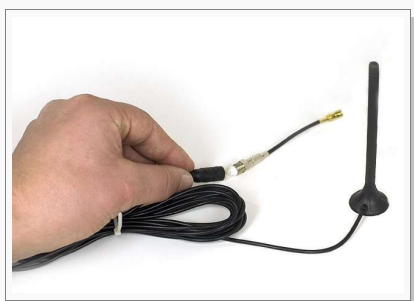


Figure 2.c: Connect the adapter cable to the antenna



Figure 2.d: Connect the GSM antenna to modem

2- Installing the SIM card

Open the cover cap on the underside of the modem, push the SIM card holder forwards on the inscription "**PUSH > OPEN**", flap the holder upwards and insert the SIM card into the SIM card holder and then push it down (ensure that the beveled corner is on the top right and the golden contact area is facing downwards). Make sure that the SIM card is fit in the SIM card holder. Push the cap of SIM card holder down until it closed. Close the opening with the cover cap.

Keep all miniature SIM cards out small children's reach. The SIM card and its contacts can be damaged by scratches or bending, so be careful when handling, inserting or removing the SIM card.



Figure 3.a: Open the cover cap.



Figure 3.b: Push the inscription "**PUSH ▲ OPEN**" to open the SIM card holder.

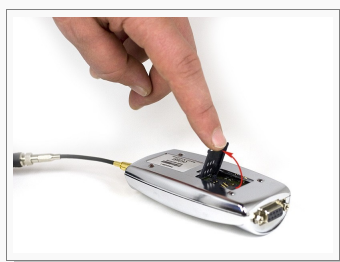


Figure 3.c: Open the SIM card holder.

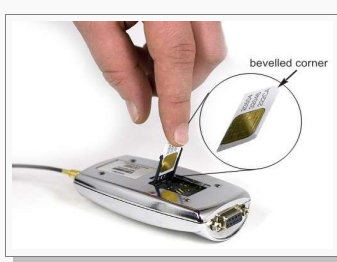


Figure 3.d: Insert the SIM card.

Hints: To remove the SIM card follow the same steps as described above.

Important: Do not insert or remove the SIM card while the modem is under power.

3 - Mounting the modem on the cradle

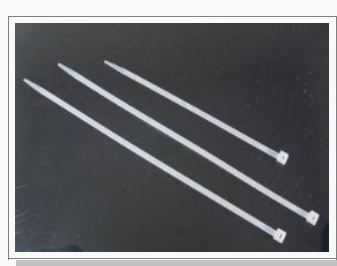
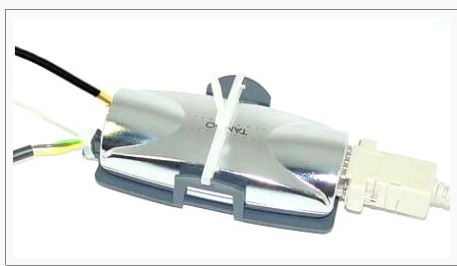


Figure 4: Firmly fixing the modem on the cradle.

Place the modem (if it is needed) on the cradle and push it down, make sure that the modem does not move up and down inside the cradle, the cradle is in the sales package. After that, the user have to use the cables ties for fixing the modem and the power supply cable (figure 12.a). For power supply cable use the small cable ties and for modem use the length cable ties. The dimensions of cable ties are 200 x 3.5 mm and 140 x 3.5 mm.

Note: *If you want to mount the modem on a wall or vehicle, first attach the cradle as described below before placing the modem on the cradle.*

Place the modem in a proper location, for example, on the desk far enough from your PC or . It is also possible to install the terminal to a wall or a vehicle:

1. Choose a location far enough from electronic devices so that no interference occurs.
2. Drill appropriate screws through the two holes on the cradle.
3. After you have secured the cradle to the wall or vehicle, place the terminal as described above in section "Mounting the terminal"



Figure 5: Place modem on the cradle.

Caution: *In order to comply with RF exposure requirements, install the modem so that a minimum distance of 20 cm can be maintained between the antenna and all persons. If you use an external antenna, install the antenna so that a minimum distance of 20 cm can be maintained between the antenna and all persons, with antenna gain not exceeding 3 dBi.*

Note: All radio transmitting devices send signals which may cause interference in different electronic devices (PC, television etc). To avoid interference, place the terminal far enough from other electronic devices.

4 - Connecting either a RS232 data cable or RJ45 special cable

TANGO864 allows control of the GSM/GPRS modem over the RS232 or RJ45 interface. The RS232 interface is implemented corresponding to EIA-RS232-C. Both RS232 and RJ45 interfaces couldn't be used at the same time. The RS232 interface has higher priority than RJ45 interface. To be able to use RJ45, you must deactivate the signal RTS on the RS232 interface (or remove the connection). How to reset your TANGO864 via used terminal program, refer to the chapter 6.3.2.

4.1 - Connecting a RS232 data cable

The RS232 interface provides a standard D-SUB-female serial connector. The pin out of the RS232 connector is shown in figure below:



Figure 6: RS232_pin-out

The pin out of the RS232 connector is listed in table below:

Pin	Description	Direction
1	DCD ↔ Data Carrier Detect	OUT
2	RxD ↔ Received Data	OUT
3	TxD ↔ Transmitted Data	IN
4	DTR ↔ Data Terminal Ready	IN
5	GND ↔ Signal Ground	-
6	DSR ↔ Data Set Ready	OUT
7	RTS ↔ Request To Send	IN
8	CTS ↔ Clear To Send	OUT
9	RI ↔ Ring Indicator	OUT

Table 7: Pin assignment of the standard RS232 connector

You can use the optional RS232 serial cable to connect the D-SUB connector to external controller/computer. Connect the 9-pin Sub D-female serial cable to COM1 or COM2 on your PC (or to another free serial interface port), as shown in **Fig. 7.a**. Connect the other end of the 9-pin Sub D-male serial cable to the 9-pin serial interface port on the TANGO864 modem, as shown in **Fig. 7.b**.

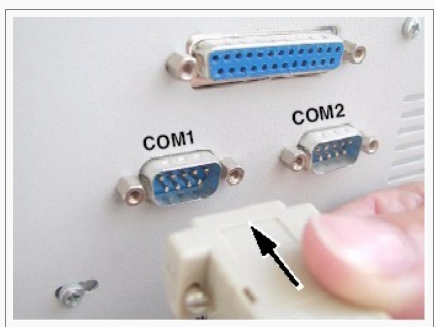


Figure 7.a: Connect 9-pin serial cable to PC



Figure 7.b: Connect 9-pin serial to modem.

4.1 - Connecting a special RJ45 cable

TANGO864 modem provides an RJ45 connector for serial data and audio connections. It can be used to be connected to an external controller (*without HW handshake*). If the RS232 interface is in use, the **Rx**, **Tx** lines on the RJ45 connector are automatically deactivated. In this case, only the audio channel (**MIC[+,-]** and **SPK[+,-]**) is available. However, while the RS232 is in use a (active) headset can be connected to this channel (*for more details, see chapter "Appendix" section 6.3 headset's characteristic*).



Figure 8: Audio interface pin-out

The pin out of the RJ45 connector is listed in table below:

Pin	Description	Direction
1	Power output 10V \pm 5% 150mA	OUT
2	TxD \leftarrow Transmitted Data	IN
3	RxD \rightarrow Received Data	OUT
4	Ground	-
5	SPK+	OUT
6	SPK-	OUT
7	MIC+	IN
8	MIC-	IN

Table 7: Pin assignment of RJ45

5 - Connecting the DC power cable

TANGO864 offers a 4-pin Micro-Fit™ 3.0 Molex connector to connect the supplied power cable and apply power to the modem from external sources. For more details about the supplied power cable, refer to the chapter "Appendix" sections 6.1.1.

The overview and pin out of the 4-pin Micro-Fit™ 3.0 Molex connector is shown in figure below:

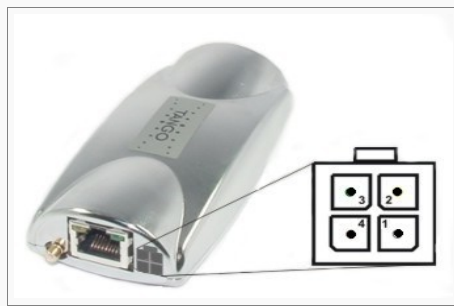


Figure 9.a: Pin out of 4-pin power connector (front view)

The pin function on this connector is listed in table below:

Power input: 10,8....31,2 V DC		
Pin number	Name	Functions
1	POWER (+Vin)	DC power positive input
2	IGN	Ignition line (connect to positive DC power)
3	Mute	Do not connect
4	GND	DC power negative input line

Table 8: Description of modem power connector

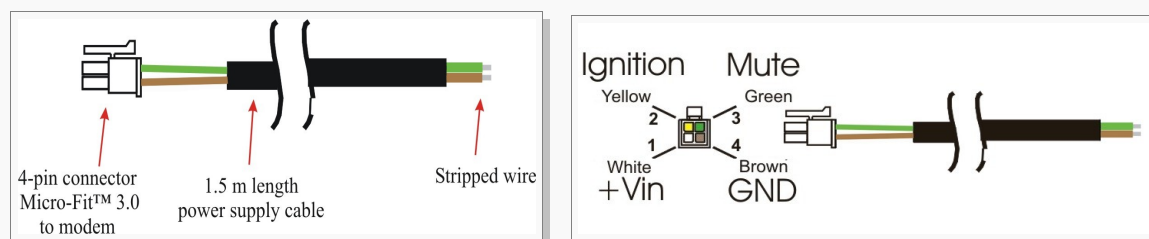


Figure 9.b: View of external cable for power supply (front view of the connector)

To power the modem, plug the 4-pin Micro-Fit™ 3.0 Molex connector of the cable to the 4-pin Micro-Fit™ 3.0 Molex connector of the modem. Thereafter, connect the open ending of the power cable to an external power source (e.g. Vehicle battery 12 or 4 V).

The following table show the power supply requirements:

Parameters	Min	Typical	Max	Unit
Supply voltage (V+)	10.8	12 or 24	31.2	V DC

Table 9: Required power supply

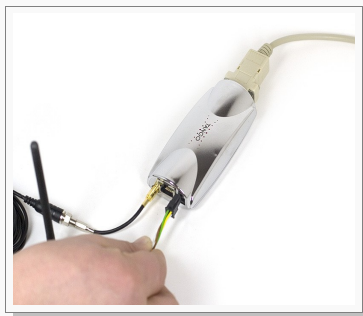


Figure 10: Apply power via supplied cable

Now, to turn it on pull the IGN line high (just connect the pin 3 on the modem's 4-pin connector to the V+ pin). For more details how to use the IGN pin, refer to the chapter 6.3.2. How to install the modem in a vehicle, refer to the application note "[**AppNote_in_vehicle_mounting.pdf**](#)", which is available on the FALCOM's homepage.

When the modem is turned on, the green LED indicator on the top-right of the RJ45 connector will go flashing, while the yellow LED indicator on the top-left of this connector will be on continuously.

The following table show the modem operation state via LED indicators:

Indicators	State	Meaning
Green LED (GSM)	Off	Modem is off
	Fast blinking (Period 1s, Ton 0.5s)	No SIM card inserted or no PIN entered, or network search in progress, or network login in progress.
	Slow blinking (Period 3s, Ton 0.3s)	Registered full service. No call in progress.
	On	On Depending on type of call: <i>Voice call:</i> Connected to remote party. <i>Data call:</i> Connected to remote party or exchange of parameters while setting up or disconnecting a call.
Yellow LED	Off	Power off or RJ45 interface is in use.
	On	Power on, RS232 interface in use or both the RS232 and RJ45 interfaces are not connected.

Table 10: Description of modem power connector

6 - Starting a terminal program to communicate

The instructions below describe how to communicate with the TANGO864 modem via the HyperTerminal program on the Windows 2000.

To communicate with the modem through RS232 serial port follow the steps listed below:

1. On Windows 2000, start the Hyper Terminal program. Assign the name for a new session on the displayed window (e.g. TANGO864).

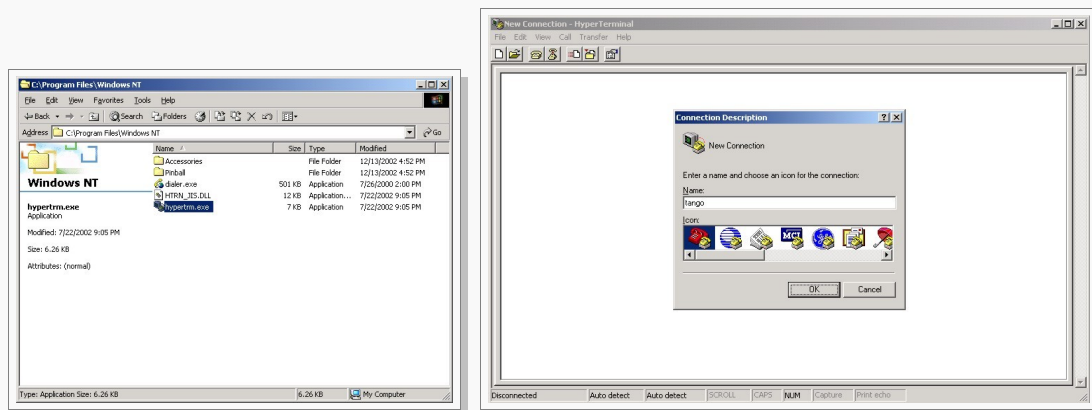


Figure 11: Start HyperTerminal and assign the name for a new session

2. Choose the correct COM Port and baud rate settings (9600bps, 8 bit, no parity bit, 1 stop bit). On the terminal screen, type "AT" to check the "OK" response from the Modem.

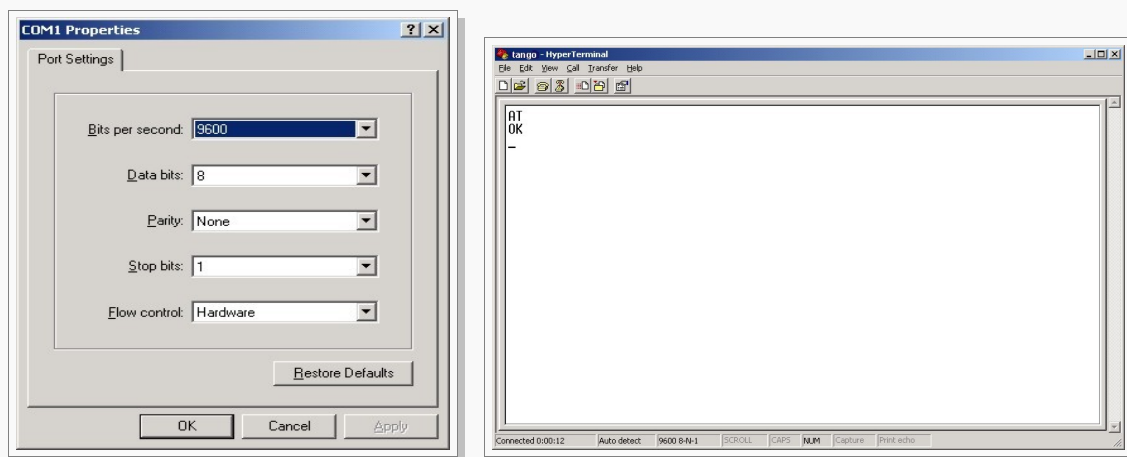


Figure 12: COM Port settings and type AT to check the response

Now, you can configure your modem according to your requirements by using the manual - AT commands set - available on the FALCOM's Webpage: <http://www.falcom.de/>

7 - Configure GPRS settings and perform a dial-up network connection

For detailed information how to perform a dial-up network connection and get connected to the Internet refer to the manual "gprs_startup_user_guide.pdf" available on the Falcom's Website: <http://www.falcom.de/>

4.2 Basic Operation

Followings are examples of some AT-commands. Please refer to the AT Command manual for a full description.

The AT Command manual is available on the Falcom's Website: <http://www.falcom.de/>

NOTE: Issue *AT+CMEE=1* to have extended error code (*+CME ERROR*)

Description	AT Commands	Modem response	Comments
Network registration checking	AT+CREG?	+CREG=<mode>,0	Not registered, Modem is not currently searching a new operator to register to
		+CREG=<mode>,1	Registered, home network
		+CREG=<mode>,2	Not registered, but ME is currently searching a new operator to register to
		+CREG=<mode>,3	Registration denied
		+CREG=<mode>,4	unknown
		+CREG=<mode>,5	Registered, roaming
Receiving an incoming call	ATA	RING	Used to answer an incoming call.
		OK	Answer the call
Make a voice call	ATD0123456789;		Do not forget the < ; > at the end of phone number
		OK	Communication established
		+CME ERROR: 10	You have to insert the SIM card
		SIM PIN	PIN code not entered
Make an emergency call	ATD112;		Do not forget the < ; > at the end of phone number
		OK	
Communication loss		NO CARRIER	
Hang up	ATH	OK	Ends an incoming or outgoing voice call
Enter PIN code	AT+CPIN=0123	OK	PIN code accepted
		READY	PIN already entered
		ERROR	PIN code incorrect
Save parameter non-volatile memory	AT&W	OK	The configuration settings are stored

Table 10: AT-commands for basic operation

5 HOUSING

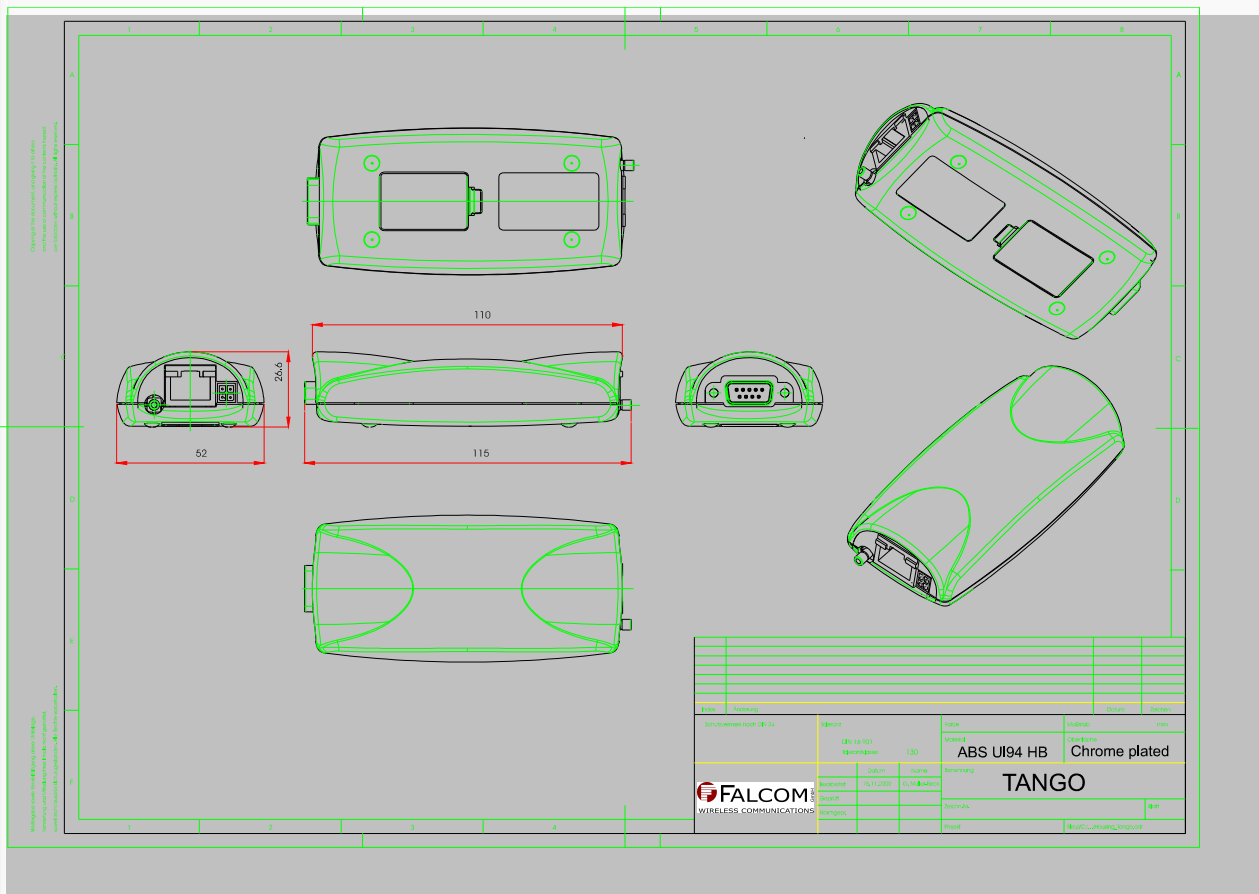


Figure 13: Housing of TANGO864

5.1 Housing of cradle

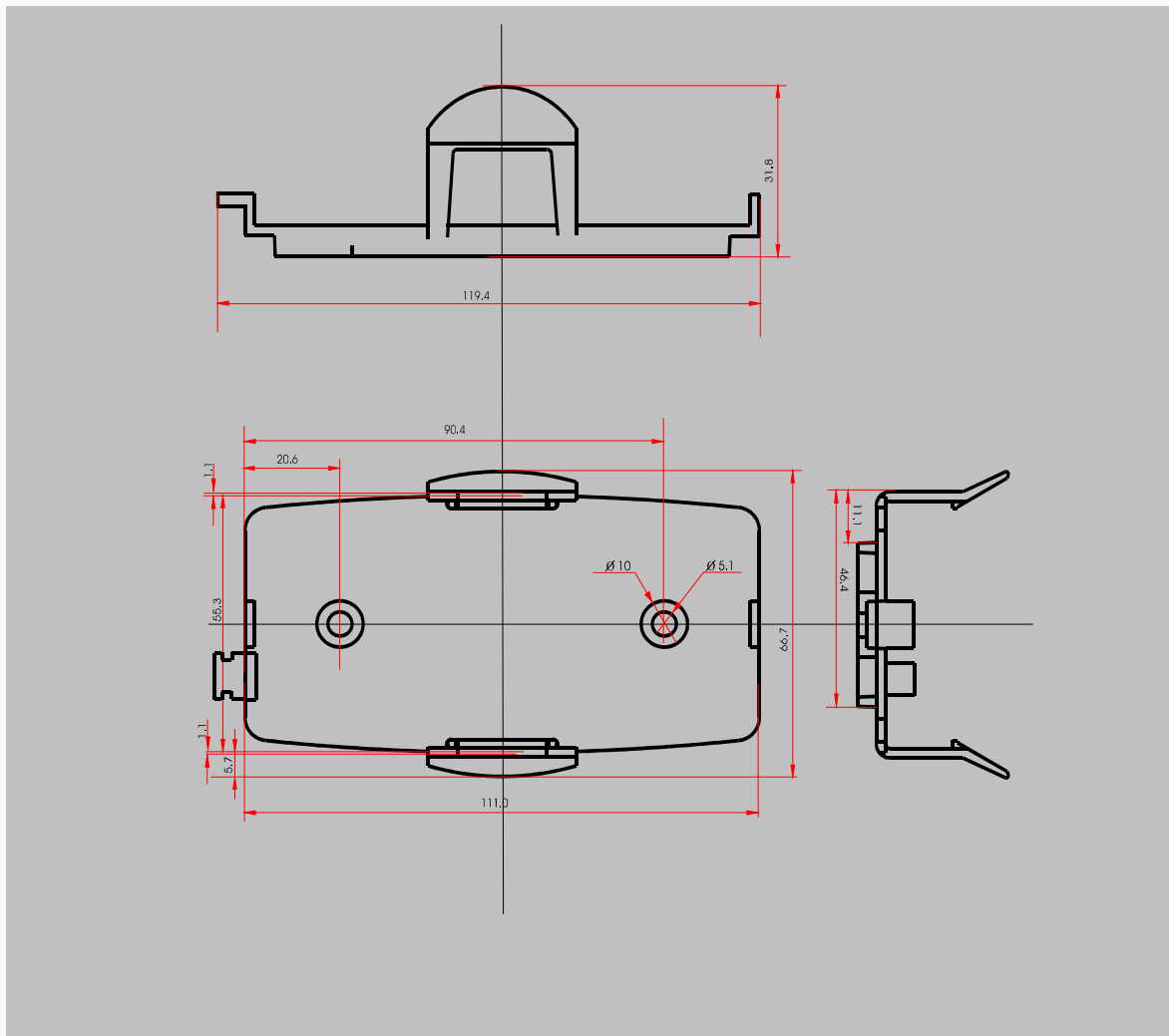


Figure 14: Dimensions of the cradle.



Figure 15: View of the cradle.

6 APPENDIX

6.1 Recommendations for power supply

FALCOM offers a power supply AC/DC wall charger - model PS002 - that can be used to access EU socket outlets and apply power to the modem. However, any other power supply in the range of 10.8 ... 31,2 V DC can be used.

6.1.1 External cable for power supply

Power cable, included in the package, shall be used for power supply connection. The external power cable is a four-conductor cable with stripped and tinned ends. Connect the white and yellow leads of the external power cable to the positive side of the DC power source. Connect the brown lead of the external power cable to the negative side of the DC power source. The green lead of the external power cable should be left open (not connected).

To turn the modem on, the IGN line needs to be driven to high level (10.8 ... 31,2 V) for at least 400 ms.

CAUTION: Observe polarity when connecting the external power cable. Incorrect input polarity can damage the power adapter.

The connector of power cable is a Micro-Fit 3.0 one.

Part number: 43025-0400 (male)

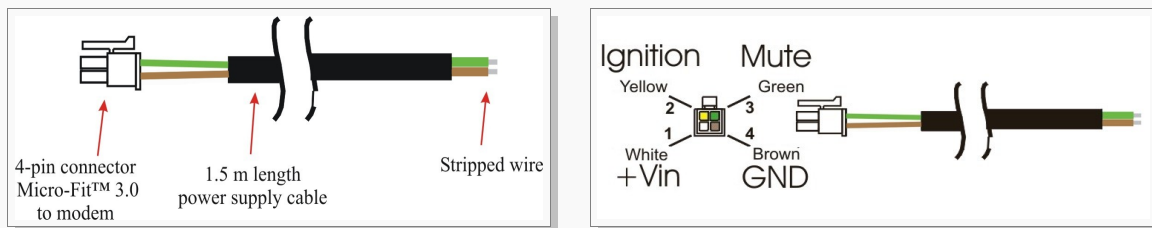


Figure 16: View of external cable for power supply (front view of the connector)

6.2 Possible external antenna

There is no antenna included in the deliver package, however, the below designed antennas provided by FALCOM can be used (*available upon request*).

Order option	Description
ANT-001-M	GSM antenna: 900/1800 for TANGO55 Connector type: FME-male Cable length: 2.5 m Mounting: magnetic base Antenna Type: external Max. Antenna Gain: 1dBi
KA08-F	Antenna cable with SMB-female and FME-female connector.

Table 11: Description of modem power connector

The TANGO864 modem with SMB connector incorporates a 'Snap On' latching action in order to make the connection easier with an excellent RF performance. An additional advantage is its small physical size. Fig. 17.a below shows the external GSM/GPRS antenna model **ANT-001-M**.

A special adapter cable - model **KA08-F** - provided by FALCOM enables you to connect your TANGO864 to the antenna **ANT-001-M**.



Figure 17.a: ANT-001-M with FME-male connector.

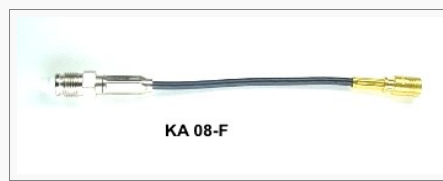


Figure 17.b: KA08-F Adapter cable with SMB-FME-female connector.

6.3 Possible external headset

A balanced microphone input and a balanced speaker output are supported by the TANGO864 modem on the RJ45 connector, so you can connect directly an external headset to this interface.

Following are listed the characteristics for different microphone inputs and different speaker outputs:

- Microphone characteristics

Microphone type	Electret microphone
Line coupling	AC
Line type	balanced
Differential input voltage	$\leq 65\text{mVpp}$ (23mVrms)
Microphone nominal sensitivity	-45 dBVrms/Pa
Analog gain suggested	+10dB
Microphone voltage	3 V

Table 12: Microphone characteristics

- Speaker characteristics

This audio path is suited for hands-free function (*car kit*).

Line coupling	DC
Line type	bridged
Output load resistance	$\geq 16 \Omega$
Internal output resistance	4Ω ($> 1.7\Omega$)
Signal bandwidth	150 - 4000 Hz @ -3 dB
Max. differential output voltage	1310 mVrms (typ, open circuit)
Max. single ended output voltage	656 mVrms (typ, open circuit)
SW volume level step	-2 dB
Number of SW volume steps	10

Table 13: Speaker characteristics

6.3.1 Ignition line (IGN)

The power ON/OFF process of the modem is controlled by the IGN line state. While the Ignition line state is controlled by a processor inside the modem. *How to use this line is given below:*

- ✓ To turn the modem on, first connect it to an external power source and then pull the IGN line high (10.8 to 31.2 Volt). After the modem is powered on, the IGN line may be pulled low.
- ✓ To put the modem into sleep, pull the IGN line low and then execute the command `AT+CFUN=n` via serial line (where $n=0,5,6,7,8,9$).
- ✓ To shut down the modem, pull the IGN line low and then execute the command `AT^SMSO` via serial line.

See also AT command set description.

After the modem is powered on, the following SLEEP modes are possible:

- | | |
|-----------------------|---|
| With IGN low, | <i>SLEEP modes are applicable, however, in error condition no automatically reset is performed.</i> |
| With IGN high, | <i>modem resets automatically in error condition, and SLEEP modes are not applicable.</i> |

6.3.2 Reset configuration

To manually reset the GSM/GPRS modem in case of malfunction, follow the steps listed below:

- ➡ Operating voltage remains applied and the IGN line is pulled high (drive it to 10,8V ... 31,2V level).
- ➡ Thereafter, send for at least 100ms a LOW signal to the Transmit Data [TxD] pin of the serial interface (means: send a "BREAK" signal to the used Transmit Data [TxD] line from your terminal program). The "BREAK" signal forces the modem to perform a reset by driving the TxD pin of modem to the ground.
- ➡ Once the system detects an incoming signal through TxD pin (e.g. type `AT <enter>` on the program terminal screen) the modem set itself into the command mode.

If the GSM software is still running, while the user feels the need to reset the modem, `AT+CFUN=1,1` could be used. This will de-register the modem from the network and bring it into the state before the PIN has been entered.

6.3.3 Troubleshooting

↙ **The modem status indicators do not light:**

- Check if the modem is connected to a 10.8 .. 31.2 V DC power supply properly.
- Check if also the Ignition Line is connected to a 10.8 .. 31.2 V DC power supply properly.
- Check if the power connector is properly inserted.

↙ **The modem does not respond to the terminal program:**

- Check if the RS232 cable is properly connected.
- Check if your terminal program has proper settings. Manufacture default settings of the modem are:

9600	<i>bps</i>
8	<i>data bits</i>
No	<i>parity bit</i>
1	<i>stop bit</i>
Hardware	<i>Flow control</i>

↙ **GPRS troubleshooting**

- Refer to the manual "[gprs_startup_user_guide.pdf](#)" available on the **FALCOM's Webpage**.

7 RF EXPOSURES

This device contains 850/900/1800/1900 MHz GSM/GPRS functions that is operational in all these frequencies.

The TANGO864 terminal contains 900/1800 MHz GSM functions that are not operational (must not be used) in U.S. Territories. Filing is only applicable for 850MHz GSM/1900 MHz PCS operations, whereby only these frequencies (850MHz GSM/1900 MHz PCS) are possible to be used in U.S. Territories.

Statement according to FCC part 15.19:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- *this device may not cause harmful interference, and*
- *this device must accept any interference received, including interference that may cause undesired operation.*

Statement according to FCC part 15.21:

Modifications not expressly approved by this company could void the user's authority to operate the equipment.

Statement according to FCC part 15.105:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*