Development KIT for TM1 GSM/GPRS module

User's Manual v1.1

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Attention!

Do not rip the device. Do not touch the device if its block is broken or its connecting wires are without isolation.

All wireless devices for data transferring may be susceptible to interference, which could affect performance.

Only qualified personnel may install or repair this product.

Use only in normal projected position. Don't touch the antenna if not necessary.

Pay attention that the device is connected to ~220V supply network.

Your device is not water resistant. Keep it dry.

Do not mount or serve device during a thunderbolt.

1. BASIC SAFETY REQUIREMENTS

In this document you will be introduced to how to use the **"Development KIT for TM1 GSM/GPRS module"** device safely. You will avoid dangerous situations and will not harm yourself if you will follow these recommendations. You have to be familiar with the safety requirements before starting to use the device!

To avoid burning and voltage caused traumas of the personnel working with device please follow these safety requirements.

Only a qualified personnel or a person who has enough knowledge about this device and safety requirements can perform installation and technical support of the device.

The device requires 9V --- power supply. The PC to which the device **"Development KIT for TM1 GSM/GPRS module"** will be connected must have RS232 or USB port compatible with USB 1.1/2.0 standards. Nominal power supply voltage is 9V ---. Used power supply source should range from 6V...15V ---, power up to 300 mW.

The PC and power supply source to which the device **"Development KIT for TM1 GSM/GPRS module"** is connected should satisfy LST EN 60950 standard. The device can be used on first (Personal Computer) or second (Notebook) computer safety class.

To avoid mechanical damage of the device it is recommended to transport the device packed in damage-proof pack. While using the device it should be placed so that its indication diodes would be visible as they inform in which working mode the device is and if it has any working problems.

In the installation place and supply circuits should be tool up protective devices (bipolar release device) which will protect the device from short-circuit and wrong ground installation. The power of connected device should satisfy the power of released device. The interstice between contacts should not be less than 3 mm. Power supply network should be installed near device in well accessible place.

If the device starts to work insufficiently only qualified personnel may repair this product. We recommend to dismantle the device and send it to repair centre or to manufacturers. No exchangeable parts inside of the device.

2. GENERAL INFORMATION

2.1. Introduction

"Development KIT for TM1 GSM/GPRS module" is a device designed for testing TM1 module features and functionality. The design of this board enables the connection to your PC via RS232 or USB interface. Once the board is connected to the PC, you can get access to the TM1 module. Using AT commands you can test its functionality, such as write SMS, perform calls or even send DATA through GPRS.

2.2. About this document

This document describes **"Development KIT for TM1 GSM/GPRS module"** hardware, quick guide, plug-in and operation. It should help users to deploy the product.

2.3. Legal notice

Copyright © 2008 UAB „Teltonika". All rights reserved.
Reproduction, transfer, distribution or storage of part or all of the contents in this document in any form without the prior written permission of "Teltonika" is prohibited.
Other product and company names mentioned herein may be trademarks or trade names of their respective owners.

2.4. Contacts

If you encounter any problems when using our products and cannot solve them by yourself, please contact our technical support by writing e-mail to support@teltonika.lt. We will be glad to help you.

2.5. Acronyms

GPRS	General Packet Ratio Service
SIM	Subscriber Identity Module
USB	Universal Serial Bus
SMS	Short Message Service
GSM	Global System for Mobile communications
CSD	Circuit Switched Data

3. PACKAGE CONTENTS

"Development KIT for TM1 GSM/GPRS module" is packed in carton box and contains all accessories needed for normal operation:

1. Carton box
2. CD with User's guide, schematics and software
3. Development KIT for TM1 GSM/GPRS module device
4. 2xTM1 GSM/GPRS module device
5. External GSM antenna
6. Serial cable
7. USB A ↔ mini USB B cable
8. Hands free set
9. AC/DC adapter

> *Note: the manufacturer does not provide SIM card, which is necessary for connecting to the GSM network! SIM card can be obtained from your GSM operator!*

If any of the components is missing from your package, please contact manufacturer's representative or reseller (www.teltonika.lt).

4. TECHNICAL SPECIFICATIONS

4.1. Data transfer

"Development KIT for TM1 GSM/GPRS module" supports below written carriers of GSM Network. Which data type is used depends on GSM operator and data transfer capacity in the chosen GSM Network.

- GPRS class 10 (class B)
- CSD
- SMS (text/data)

4.2. Mechanical characteristics
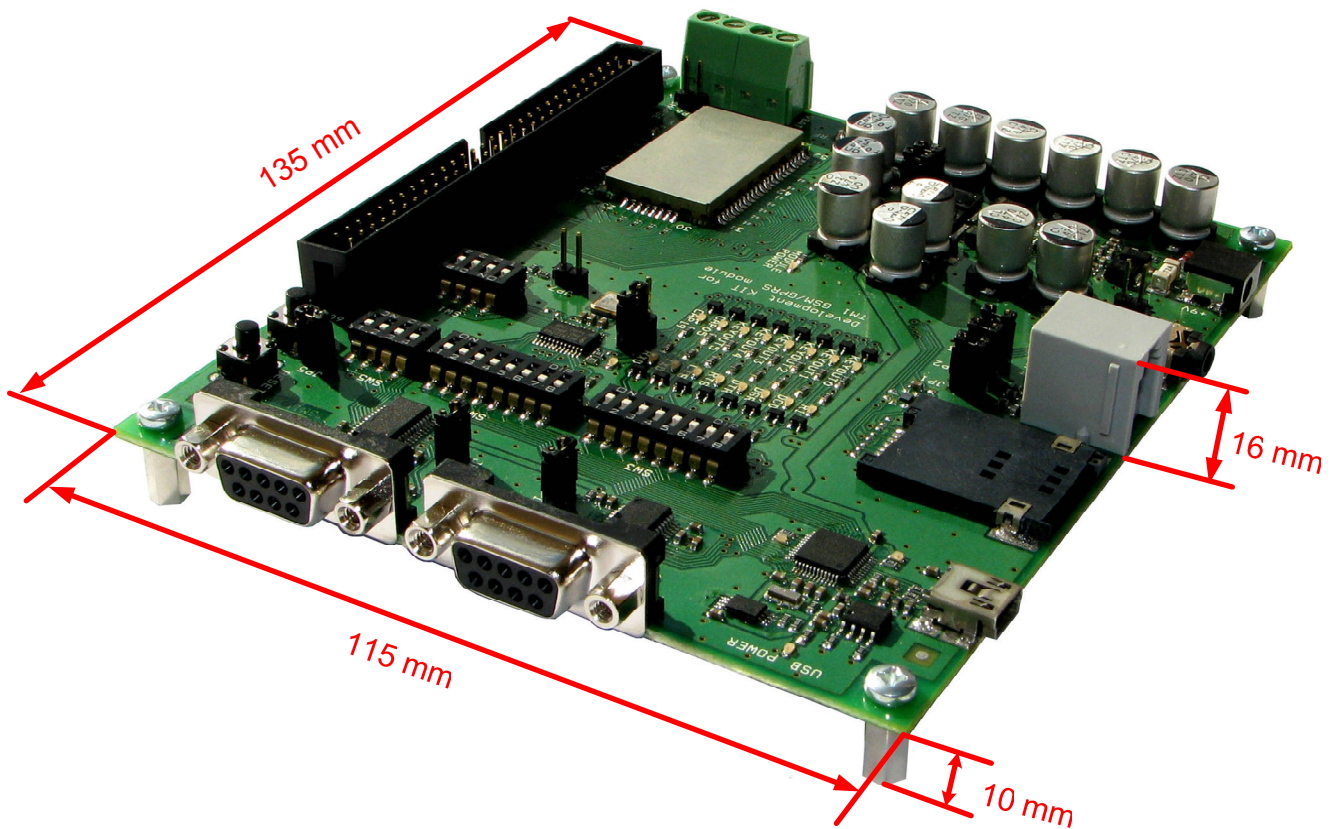
Device dimensions and general view is shown in Figure 4.1.

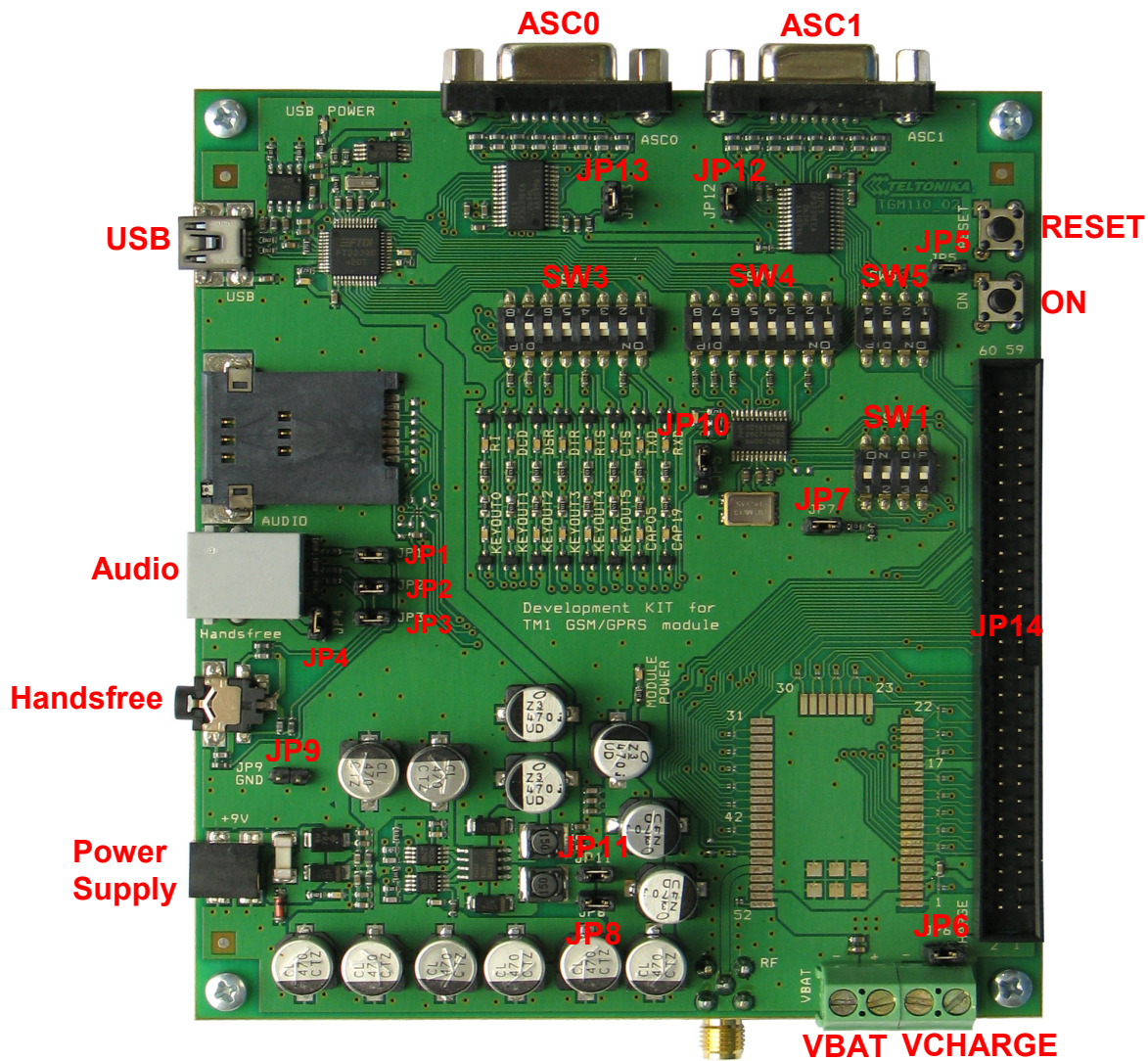**Fig. 4.1** Development KIT for TM1 GSM/GPRS module

Fig. 4.2 TM1 development board

| ASC0	Serial interface 0
ASC1	Serial interface 1
USB	USB interface
Power Supply	Power Supply +9V
Audio	Configurable Audio interface
Handsfree	Audio interface for handsfree set
SW1,SW5	Serial interface control switches
SW3, SW4	USB interface control switches
JP1, JP2, JP3, JP4	Audio configuration jumpers, please refer to TM1 User manual for more detailed information.
JP5	Power ON button control
JP6	Connects VBAT with VCHARGE
JP7	ADC1 control jumper
JP8, JP11	Board power jumpers
JP9	Ground
JP10	I2C/SPI interface selection
JP12, JP13	Serial interface enable/disable jumpers
JP14	60 pin connector
VBAT	Connection of external battery
VCHARGE	Connection of charger for battery

4.3. Switches

Switch – SW5
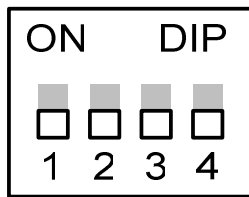
1 (RXD_1) Receiving data (ON/OFF). If switch 1 is ON, then TM1 module asynchronous serial interface input port is connected to peripheral devices through RS232 (ASC1). Otherwise, it is disconnected.

2 (TXD_1) Transmitting data (ON/OFF). If switch 2 is ON, then TM1 module asynchronous serial interface output port is connected to peripheral devices through RS232 (ASC1). Otherwise, it is disconnected.

3 (CTS_1) Clear to send (ON/OFF). If switch 3 is ON, then TM1 module clear to send port input is connected to peripheral devices through RS232 (ASC1). Otherwise, it is disconnected.

4 (RTS_1) Request to send to TM1 module (ON/OFF). If switch 4 is (ON), then data transmit request to TM1 module output port is connected to peripheral devices through RS232 (ASC1). Otherwise, it is disconnected

Switch – SW3
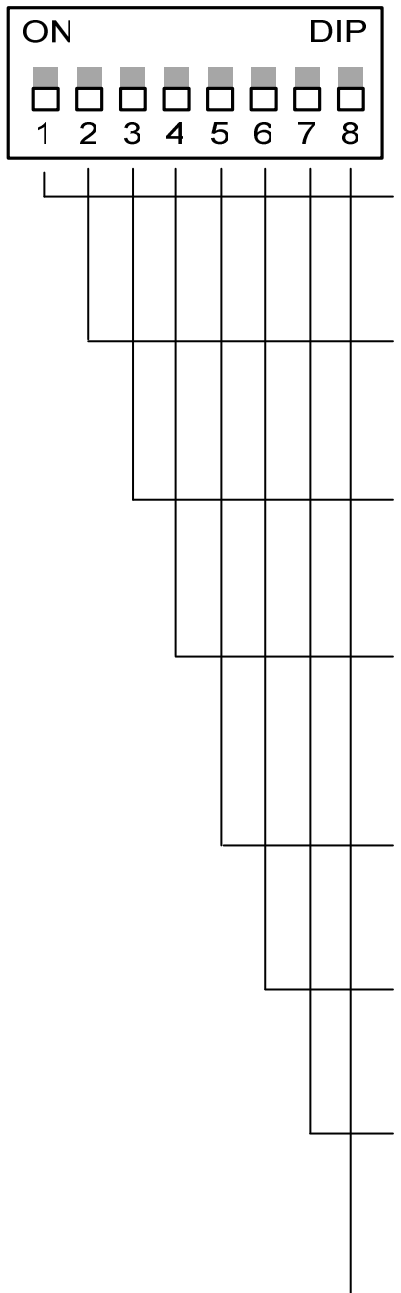
1 (RXD) Receiving serial data (ON/OFF). If switch 1 is ON, then TM1 module receiving serial data output is connected to peripheral devices through USB port. Otherwise, it is disconnected.

2 (TXD) Transmitting serial data (ON/OFF). If switch 2 is ON, then TM1 module transmitting serial data output is connected to peripheral devices through USB port. Otherwise, it is disconnected.

3 (CTS) Clear to send (ON/OFF). If switch 3 is ON, then TM1 module clear to send port input is connected to peripheral devices through USB port. Otherwise, it is disconnected.
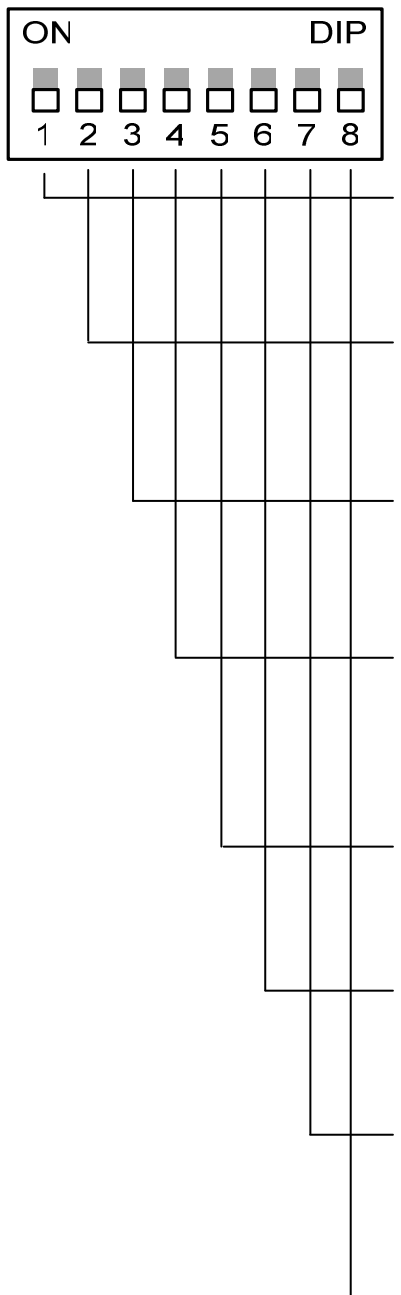
4 (RTS) Request to send to TM1 module (ON/OFF). If switch 4 is (ON), then data transmit request to TM1 module output port is connected to peripheral devices through USB port. Otherwise, it is disconnected.

5 (DTR) Data terminal ready (ON/OFF). If switch 5 is ON, then TM1 module asynchronous serial interface input port is connected to peripheral devices through USB port. Otherwise, it is disconnected.

6 (DSR) Data set ready (ON/OFF). If switch 6 is (ON), then peripheral devices are connected to jumper JP4 pin through USB port. Otherwise, it is disconnected.

7 (DCD) Data carrier detect (ON/OFF). If switch 7 is ON, then TM1 module asynchronous serial interface output port is connected to peripheral devices through USB port. Otherwise, it is disconnected.

8 (RI) Ring indicator (ON/OFF). If switch 8 is ON, then TM1 module ring indicator output port is connected to peripheral devices through and USB ports. Otherwise, it is disconnected.

Switch – SW4

1 (RXD_1) Receiving serial data (ON/OFF). If switch 1 is ON, then TM1 module receiving serial data output is connected to peripheral devices through USB port. Otherwise, it is disconnected.

2 (TXD_1) Transmitting serial data (ON/OFF). If switch 2 is ON, then TM1 module transmitting serial data output is connected to peripheral devices through USB port. Otherwise, it is disconnected.

3 (CTS_1) Clear to send (ON/OFF). If switch 3 is ON, then TM1 module clear to send port input is connected to peripheral devices through USB port. Otherwise, it is disconnected.

4 (RTS_1) Request to send to TM1 module (ON/OFF). If switch 4 is (ON), then data transmit request to TM1 module output port is connected to peripheral devices through USB port. Otherwise, it is disconnected.

5 (DTR_1) Data terminal ready (ON/OFF). If switch 5 is ON, then TM1 module asynchronous serial interface input port is connected to peripheral devices through USB port. Otherwise, it is disconnected.

6 (DSR_1) Data set ready (ON/OFF). If switch 6 is (ON), then peripheral devices are connected to jumper JP4 pin through USB port. Otherwise, it is disconnected.

7 (DCD_1) Data carrier detect (ON/OFF). If switch 7 is ON, then TM1 module asynchronous serial interface output port is connected to peripheral devices through USB port. Otherwise, it is disconnected.

8 (RI_1) Ring indicator (ON/OFF). If switch 8 is ON, then TM1 module ring indicator output port is connected to peripheral devices through USB ports. Otherwise, it is disconnected.

4.4. Jumpers

Jumper ports are numbered from left to right. The first jumper port is marked by a square and crossed upper left corner.

Jumper – JP1

Set JP1 to connect AUDIO interface speaker with AUON

Jumper - JP2

Set JP2 to connect AUDIO interface speaker with MIC

Jumper - JP3

Set JP3 to connect AUDIO interface speaker with AUOP

Jumper - JP4

Set JP4 to connect AUDIO interface speaker with GND

Jumper - JP5

Set J5 to short Power ON button

Jumper – JP6

Set JP6 to connect VBAT and VCHARGE

Jumper – JP7

Set JP7 for setting ADC1 to low level

Jumper - JP8

Set JP8 to connect board power

Jumper - JP9

GND Jumper

Jumper - JP10

Set 1-2 to select SPI interface.
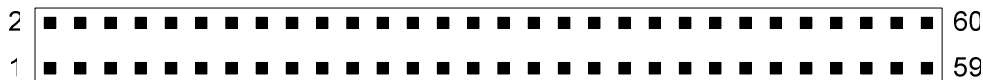Set 2-3 to select I2C interface.

Jumper - JP11

Set JP8 to connect board power

Jumper – JP12

Set this pin to disable serial port ASC1.

Jumper – JP13

Set this pin to disable serial port ASC0.

4.5. Connector - JP14

Fig. 4.3 General view of JP14 connector

Table 4.1 Port description of JP14 connector

PIN #	Name	I/O	Function	I/O type	Description
1	VBAT	PWR	GSM Power Supply	Module Supply	Should be connected with pins 2, 51, 52
2	VBAT	PWR	GSM Power Supply	Module Supply	Should be connected with pins 1, 51,52
3	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 6, 17, 42, 45, 47, 49, 50
4	VCHARGE	PWR	GSM Power Supply	Module Charge	Should be connected with pin 5
5	VCHARGE	PWR	GSM Power Supply	Module Charge	Should be connected with pin 4
6	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 3, 17, 42, 45, 47, 49, 50
7	KEYOUT0/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad output pin 0 / GPIO 00
8	KEYOUT1/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad output pin 1 / GPIO 01
9	KEYOUT2/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad output pin 2 / GPIO 02
10	KEYOUT3/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V	Keypad output pin 3 / GPIO

PIN #	Name	I/O	Function	I/O type	Description
				compatible	03
11	KEYOUT4/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad output pin 4 / GPIO 04
12	KEYOUT5/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad output pin 5 / GPIO 05
13	KEYIN0/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad input pin 0 / GPIO 06
14	KEYIN1/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad input pin 1 / GPIO 07
15	KEYIN2 / GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad input pin 2 / GPIO 08
16	KEYIN3/GPIO	I/O	Keypad interface / GPIO	CMOS 3.3V compatible	Keypad input pin 3 / GPIO 09
17	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 3, 6, 42, 45, 47, 49, 50
18	CAP00_EX5IN/GPIO	I	External Interrupt	Generic digital signal	Ext Int 5B
19	PWR_ON	I	Power on	Generic digital signal	Power on button
20	CAP05/GPIO	I/O	GPIO	Generic digital signal	GPIO 37
21	CAP19_GPIO	I/O	GPIO	Generic digital signal	GPIO 36
22	EXTRSTN	I	External reset	Generic digital signal	External HW reset
23	DSR	O	Asynchronous Serial Interface 0	Generic digital signal	Data Set Ready
24	RI	O	Asynchronous Serial Interface 0	Generic digital signal	Ring Indicator
25	DCD	O	Asynchronous Serial Interface 0	Generic digital signal	Data Carrier Detect
26	DTR	I	Asynchronous Serial Interface 0	Generic digital signal	Data Terminal Ready
27	CTS	I	Asynchronous Serial Interface 0	Generic digital signal	RTS (DCE)
28	RTS	O	Asynchronous Serial Interface 0	Generic digital signal	CTS (DCE)
29	RXD	I	Asynchronous Serial Interface 0	Generic digital signal	RX (DCE)
30	TXD	O	Asynchronous Serial Interface 0	Generic digital signal	TX (DCE)
31	WA0_DAI	I/O	Digital Audio Interface / Synchronous Serial Interface	Generic digital signal	DAI Reset / Master Transmit Slave Receive
32	TXD_DAI	O	Digital Audio Interface / Synchronous Serial Interface	Generic digital signal	DAI Transmit / SSC chip select
33	CLK0_DAI	I/O	Digital Audio Interface / Synchronous Serial Interface	Generic digital signal	DAI Clock / Shift Clock
34	RXD_DAI	I	Digital Audio Interface / Synchronous Serial Interface	Generic digital signal	DAI Receive / Master Receive Slave Transmit
35	SCL	O	I2C bus interface	Generic digital signal	Serial Clock Line
36	SDA	I/O	I2C bus interface	Generic digital signal	Serial Data Line
37	SIM_CLK	O	SIM interface	SIM interface signal	SIM clock signal
38	SIM_IO	I/O	SIM interface	SIM interface signal	SIM I/O serial data

PIN #	Name	I/O	Function	I/O type	Description
39	SIM_RST	O	SIM interface	SIM interface signal	SIM reset signal
40	SIM_VCC	PWR	SIM interface	SIM Supply	SIM power supply
41	ADC1	I	Measurement interface	ADC 12bits 0-0.96 V	Analog to Digital Converter
42	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 3, 6, 17, 45, 47, 49, 50
43	AUOP	O	Audio Interface	Analog signal	Balanced power audio out
44	AUON	O	Audio Interface	Analog signal	Balanced power audio out
45	MIC_GND	PWR	GSM Power Supply MIC reference	Ground	Should be connected to microphone ground
46	MIC	I	Audio Interface	Analog signal	Handset microphone bias (+)
47	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 3, 6, 17, 42, 45, 49, 50
48	ANT	RF	GSM antenna	RF	Should be connected with 50 ohm PCB line
49	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 3, 6, 17, 42, 45, 47, 50
50	GND	PWR	GSM Power Supply	Ground	Should be connected with pins 3, 6, 17, 42, 45, 47, 49
51	VBAT	PWR	GSM Power Supply	Module Supply	Should be connected with pins 1, 2, 52
52	VBAT	PWR	GSM Power Supply	Module Supply	Should be connected with pins 1, 2, 51

4.6. Connectors ASC0 (BL09) and ASC1 (BL09)

There are two ASC0 (BL09) (Fig. 4.4) and ASC1 (BL09) (Fig. 4.5) connectors integrated in the test board. Figures show port numeration and incoming/outgoing signal names.
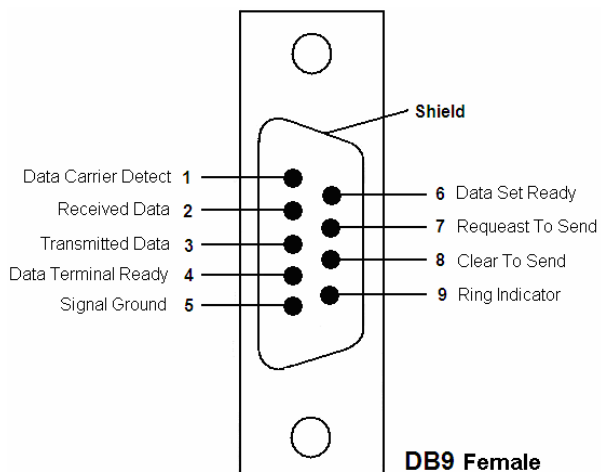
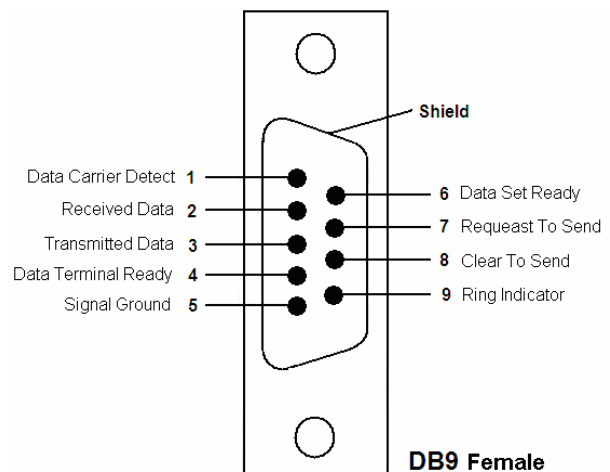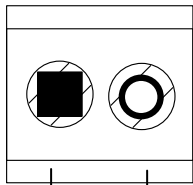**Fig. 4.4** General view of ASC0 connector   **Fig. 4.5** General view of ASC1 connector

4.7. Outlets

4.7.1. Power supply outlet - VCHARGE

Outlet ports are numbered from left to right. A square port marks the first port.
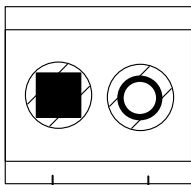
The power supply provides 0 - 12V --- (nominal: 6V), 300 mA current. Voltage is connected to the VCHARGE power supply outlet.

1 Negative voltage power supply wire (-) (GND) is connected to the first power supply outlet port.

2 Positive voltage power supply wire (+) is connected to the second power supply outlet port.
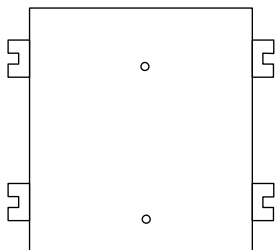
4.7.2. Power supply outlet - VBAT

The power supply provides 3.5 - 4.2 V --- (Typical: 3.8 V). Voltage is connected to the VBAT power supply outlet.

1 Negative voltage power supply wire (-) (GND) is connected to the first power supply outlet port.

2 Positive voltage power supply wire (+) is connected to the second power supply outlet port.

4.7.3. Power supply outlet

The power supply, which provides 6 - 15V DC voltage, is connected to power supply outlet.
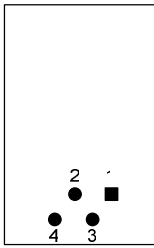
4.8. Buttons

4.8.1. Button "RESET"

Button "RESET" is useful to reset TM1 module.

4.8.2. Button "ON"

Button "ON" is a TM1 module power ON button. To turn TM1 module ON, push "ON" button and hold it for approximately 2 seconds. To check the module status – send an AT command. If TM1 module replies, then it is ON.
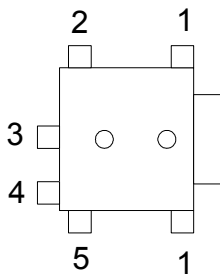
4.9. Audio

4.9.1. Audio 1

Port description:

1 – Handset microphone reference
2 – Balanced power audio out
3 – Balanced power audio out
4 – Handset microphone bias

4.9.2. Handsfree

Port description:

1 – AUON – Balanced power audio out
2 – AUOP – Balanced power audio out
3 – GND – Ground
4 – MIC – Handset microphone reference
5 – MIC – Handset microphone bias

5. ESD PROTECTION

5.1. ESD Basics

Normal day-to-day activities can cause people to build up static electricity, which might later be transferred to objects like electronic devices. An electrostatic discharge (ESD) is the transfer of energy between two bodies (dissimilar materials) at different electrostatic potentials, either through contact or via an ionized ambient discharge (a spark). ESD in this context is a high-voltage transient with fast rise time and fast decay time. Several thousand volts of ESD with a high rise time could break through the junction layer of protective devices easily and cause damage. The ESD can cause IC failure during the manufacturing, the testing, the handling and the assembly of ICs.

To help reduce losses due to ESD, ESD protection diodes can be used. ESD protection diodes are designed to absorb ESD energy that is introduced from I/O ports and travels through the connector onto the system board. ESD protection diodes thus provide protection against ESD induced system malfunction and/or damage to ICs.

In the Table 5.1 pins which require ESD protection (in case that they will be used) are shown.

Table 5.1 Pins for ESD protection

Name	PIN #	Name	PIN #
VBAT	1	DTR	26
VBAT	2	CTS	27
VCHARGE	4	RTS	28
VCHARGE	5	RXD	29
KEYOUT0	7	TXD	30
KEYOUT1	8	WA0_DAI	31
KEYOUT2	9	TXD_DAI	32
KEYOUT3	10	CLK0_DAI	33
KEYOUT4	11	RXD_DAI	34
KEYOUT5	12	SCL	35
KEYIN0	13	SDA	36
KEYIN1	14	SIM_CLK	37
KEYIN2	15	SIM_IO	38
KEYIN3	16	SIM_RST	39
CAP00_EX5IN	18	SIM_VCC	40
PWR_ON	19	ADC1	41
CAP05	20	AUOP	43
CAP19	21	AUON	44
EXTRSTN	22	GND	45
DSR	23	MIC	46
RI	24	VBAT	51
DCD	25	VBAT	52

6. HOW TO START?

6.1. Setting the device to work

Before connecting "**Development KIT for TM1 GSM/GPRS module**" to PC, perform next steps:

1. Set switch SW3 to 00000000

2. Set switch SW4 to 00000000
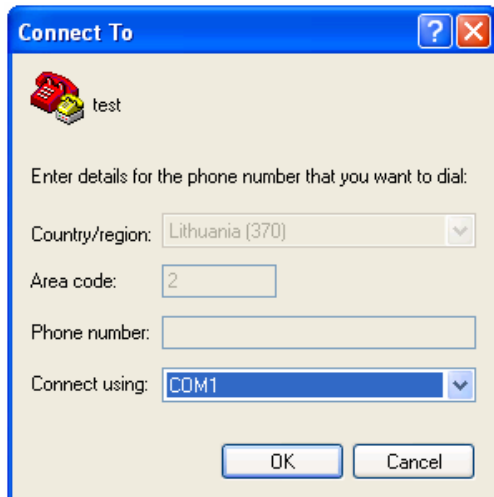
3. Set switch SW5 to 0000

4. Set switch SW1 to 0000
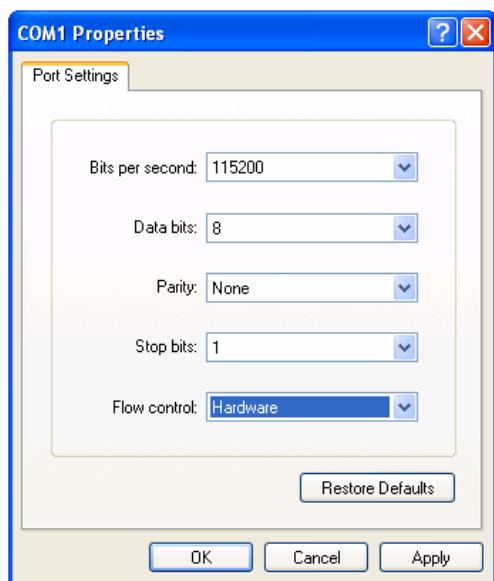
If you are using the RS232 port on your computer:

1. Do not set jumper JP13.
2. Insert the SIM card into SIM cardholder. Follow the instructions on the device sticker. Make sure, the SIM card is pushed inside till it fixes.
3. Connect the RS232 cable to the ASC0 serial interface on the development board and into an empty serial port on your PC.
4. Plug in the GSM Antenna into the SMA connector on the side of the development board.
5. Connect the power supply to the power supply outlet.
6. If jumper JP5 is not set, press ON button.
7. Start the HyperTerminal to access the TM1 module and follow next steps:

Enter any connection name

Choose communication port to which development board is connected (COM1, COM2, etc.)

Set these settings:

Bits per second = 115200
Data bits = 8
Parity = None
Stop bits = 1
Flow control = Hardware

If flow control is set to None, then module will not wake up immediately

If you are using the USB port on your computer:

1. Set switch SW3 to 11111111.

```
ON           DIP
□ □ □ □ □ □ □ □
1 2 3 4 5 6 7 8
```

2. Set jumper JP13.
3. Insert the SIM card into SIM cardholder. Follow the instructions on the device sticker. Make sure, the SIM card is pushed inside till it fixes.
4. Plug in USB cable to the development board ant to your PC.
5. Plug in the GSM Antenna into the SMA connector on the side of the development board.
6. Connect the power supply to the power supply outlet.
7. If jumper JP5 is not set, press ON button.
8. Install the drivers by following steps:

The user can install the USB driver only if he (she) is the administrator of the PC. After the insertion of the administration password the following window will be displayed:
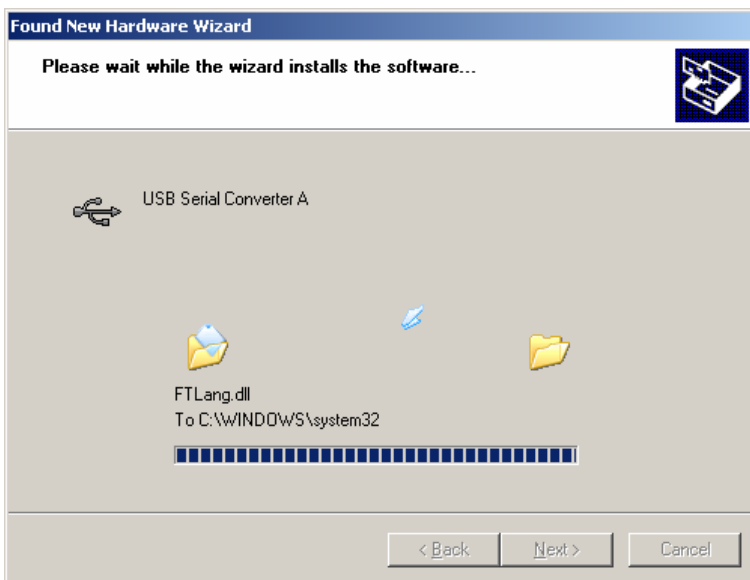
In this window choose "No, not this time" and press "Next" button
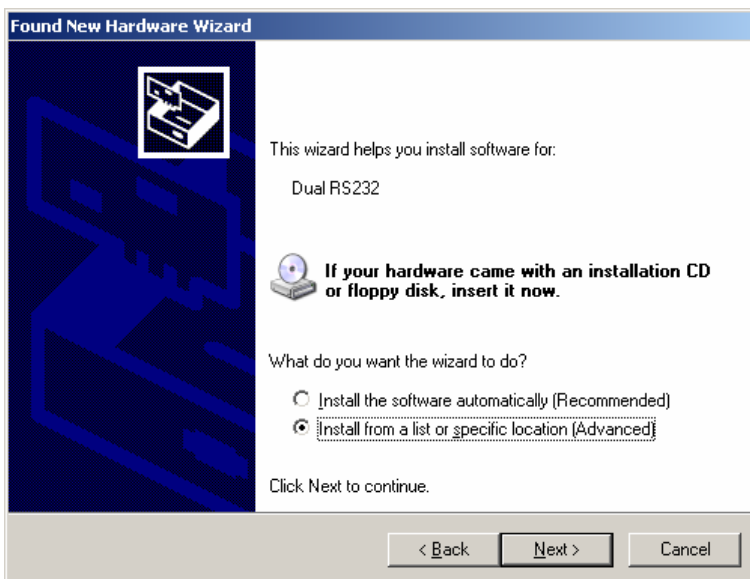
In this window choose "Install from a list or specific location (Advanced)" and press "Next" button
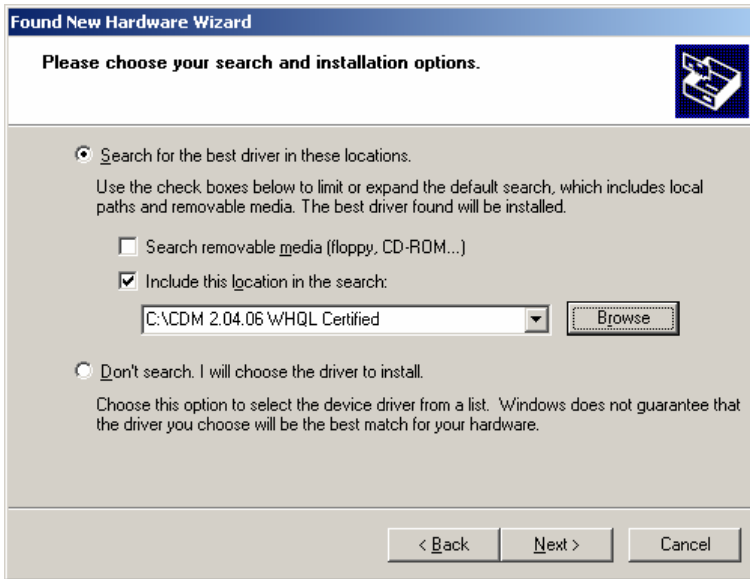
In this window select "Search for the best driver in these locations" and "Include this location in the search". Press "Browse" button and find location of the folder with drivers, choose it and press "Next" button.
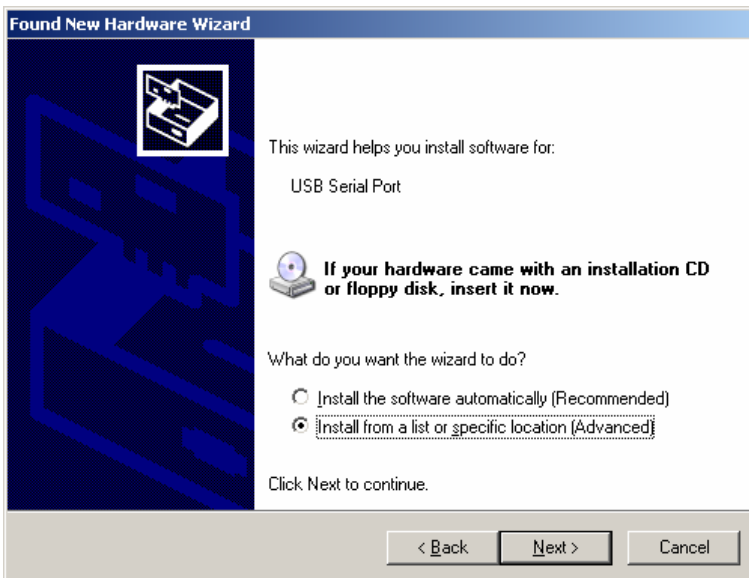

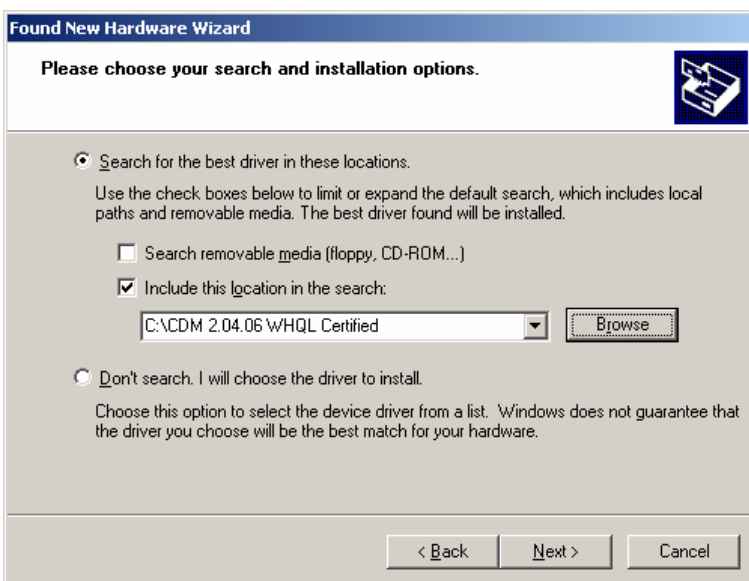Installation progress

Press "Finish"

After the installation of TM1 USB Serial Converter A, a new hardware will be detected; the procedure that must be followed is the same as for TM1 USB Serial Converter A.

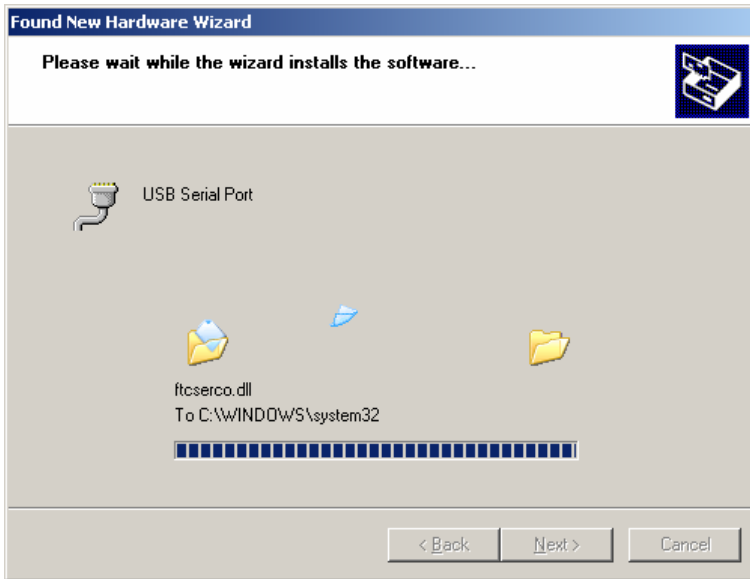Again choose "No, not this time" and press "Next" button

Choose "Install from a list or specific location (Advanced)" and press "Next" button

Select "Search for the best driver in these locations" and "Include this location in the search". Press "Browse" button and find location of the folder with drivers, choose it and press "Next" button.

Installation progress

Press "Finish". It will be needed to restart the PC in order to take affect the new settings.

9. Start the HyperTerminal to access the TM1 module and use the same steps as in RS232 connection.

6.2. AT Commands examples

6.2.1. Registering on the network

```
AT
OK

AT+CPIN?                    Check PIN status
+CPIN: READY               When CPIN: READY you don't need to write PIN number.
or                         When CPIN: SIM PIN, please use next command to write PIN
+CPIN: SIM PIN             number.

AT+CPIN="xxxx"             Insert the PIN number xxxx ()
                           To check PIN type "AT+CPIN?"
OK

AT+COPS=0                  Register the phone on the network
OK
AT+CREG?                   Verify registration
+CREG: 0, 1
OK

AT+CSQ                     Check signal intensity
+CSQ: 15,95
OK

AT+COPS?                   Read operator name
+COPS: 0, 0, " OPERATOR"
OK
```

6.2.2. Incoming and outgoing calls

```
ATD(telephone number);     After ATD write telephone number without brackets, at the end
                           of the command there must be semicolon.
OK

ATH                        Hang up
OK

AT+CLIP=1                  Activation of caller line ID
OK

RING                       Incoming Call
RING
RING

ATA                        Answer to Voice Call
OK

ATH                        Hang up
OK
```

6.2.3. Incoming and outgoing SMS

AT+CMGS="Telephone number"   Enter to the text mode
>SMS text massage 12345<CTRL+Z>
+CMGS:0
OK

AT+CMGL   List all incoming SMS
+CMGL:302,"REC UNREAD", "Telephone
number",,"06/10/19, 15:45:25+08"
SMS text massage 12345

7. TECHNICAL SUPPORT

Troubleshooting

Problem	Solution
TM1 module is not answering after approximately 23 s.	This means that Flow Control is set to NONE. Set Flow Control to Hardware (RTS/CTS), in other case module will response only after pressing "RESET" button.
TM1 module is not responding to AT commands	Check module power jumper. It must be set.

Final notice

The label on the package indicates that before using the product the User's Guide contained in the package must be read and understood.

The label on the package indicates that used electronic and electric equipment should be disposed separately.

If you encounter any problems while using the device and you are not able to solve them yourself, then you are always welcome to contact our technical support department by e-mail support@teltonika.lt. We will be glad to help you.