COMPACT 1.0 Product Technical Specification & User Guidelines

Version V0.1
2016-11-14

Document History

Date	Document Version	Descriptions
2016.11.14	V0.1	Draft

Contents

1 Overview

COMPACT1.0 is a wireless modem that allows connectivity on E-GSM/DCS/GSM850/PCS- GPRS networks.

The Open AT Application Framework is the world's most comprehensive cellular development environment that allows embedded standard ANSI C applications to be natively executed directly on the embedded module. For more information about Open AT Application Framework, refer to the documents listed in section 8.1 Remo Wireless Documentation. With the Open AT Application Framework, customers can embed their own applications in this device and turn it into a solution for their specific market need. The operating system of COMPACT1.0 has the ability to fully control the following functions:

- AT command processing (refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware 7.47 for more information)
- Full GSM or GSM/GPRS Operating System stack
- GPS Plug-In processing

Note: *This document does not cover the programmable capabilities available through Open AT Application Framework.*

1.1. Overall Dimensions

COMPACT1.0 comes in a compact, robust, IP42 grade casing suitable for automotive environments.

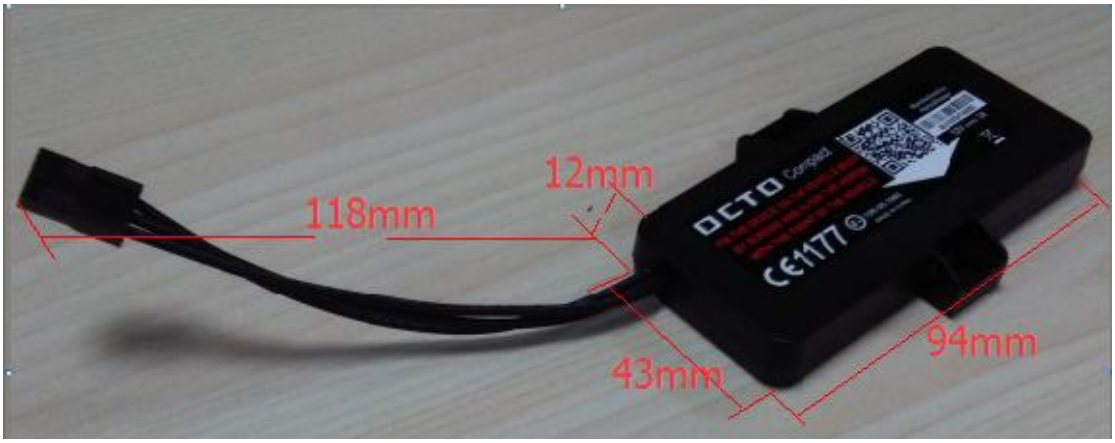


Figure 1. COMPACT1.0 Modem

Table 1. COMPACT1.0 Physical Dimensions

Length	94 mm
Width	43mm
Thickness	12mm
Cable	118mm
Weight	63±5g

1.2. Environmental Compliance

1.2.1. RoHS Compliance

COMPACT1.0 is compliant with RoHS Directive 2011/65/EU which sets limits for the use of certain restricted hazardous substances. This directive states that “from 1st July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)”.

1.2.2. Disposing of the Product

This electronic product is subject to the EU Directive 2002/96/EC for Waste Electrical and Electronic Equipment (WEEE). As such, this product must not be disposed off at a municipal waste collection point. Please refer to local regulations for directions on how to dispose of this product in an environmental friendly manner.

2. Features

The following table enumerates the features available on the COMPACT1.0.

Table 2. COMPACT1.0 Feature Set

Feature		Description
GSM Transceiver	**AT Commands**	3GPP TS 27.007 and TS 27.005 Remo extended AT command
	Supported Band	GSM850 /EGSM900 /DCS1800 /PCS1900
	GPRS	GPRS multi-slot class 12 or class 8 GPRS mobile station class B
	SMS	Supporting MO and MT Supporting TEXT and PDU mode
	Data	GPRS class 12: 85.6kbps DL / 85.6kbps UL
	SIM Interface	Embedded SIM
GPS Receiver		Cold starts: -145 dBm Navigation: -160 dBm Tracking: -162 dBm
Bluetooth BlueNRG		Available output power: Up to +8 dBm RF link budget: up to 96 dB Bluetooth specification v4.1 compliant master and slave single-mode Bluetooth low energy network processor

Feature		Description
Accelerometer and Gyro		always-on 3D accelerometer and 3D gyroscope
Watchdog Timer		1.6S
Main Supply	**Input Voltage**	12V/24V
	ENGINE ON Detection	12V/24V
Emergency Battery		210mAH Li-ion Battery

3. Architecture

3.1. Test Points and Test PIN

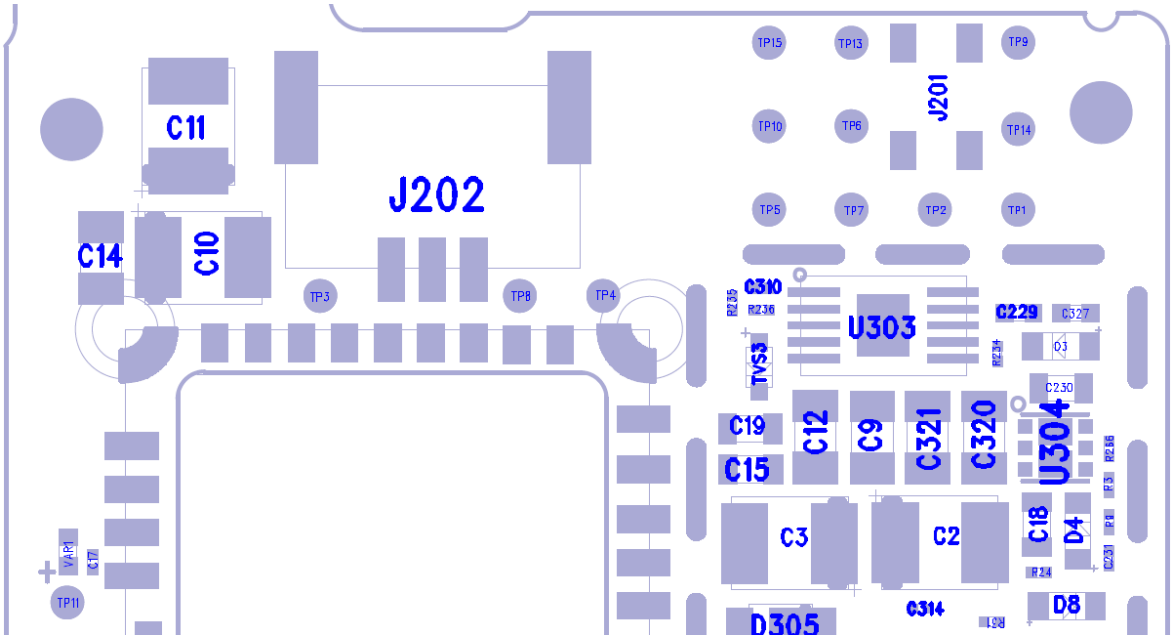


Figure 2.Test points and Test pins

3.2 Power Supply Test Points

Table 3. Power Supply Test Points

TP No.	Signal Name	Viewed As	Level	Comment
TP9	+12V/24V	Vehicle battery voltage detection PIN	+6V~32V	Read from ADC_IN1
TP3	V_SYSTEM	COMPACT1.0 system power supply	+3.6V~+4.2V	
TP711	+3V3	COMPACT1.0 3.3V power supply	3.3V	

3.3 Ground Test Points and Test PIN

Table 4. Ground Test Points

TP No.	Signal Name	Viewed As	Level	Comment
TP4	GND			

3.4 T3 Test Points

Table 5. T3 Test Points

TP No.	Signal Name	Viewed As	Level	Comment
TP2	T3_U2TX_DEBUG/T3_BOOT0	T3 uart2 TXD	3.3V	
TP1	T3_U2RX_DEBUG	T3 uart2 RXD	3.3V	

3.5 2G Test PIN

Table 6. 2G Test Points

TP No.	Signal Name	Viewed As	Level	Comment
TP5	2G_USBDM	2G USB DM	3.3V	
TP7	2G_USBDP	2G USB DP	3.3V	

3.6 Watchdog Test Points

Table 7. Watchdog Test Points

TP No.	Signal Name	Viewed As	Level	Comment
TP6	2G_BOOT/WDG_DISABLE	2G BOOT Watch dog disable	3.3V	

3.7 Power reset Test Point

Table 8. Power reset Test Point

TP No.	Signal Name	Viewed As	Level	Comment
TP10	PWR_RST	System power reset		

3.8 Logistic (transport) mode Test Point

Table 9. Logistic (transport) mode **Test Point**

TP No.	Signal Name	Viewed As	Level	Comment
KM1.11	BATT_BKP_DISC	Logistic mode		

4. Technical Specifications

4.1. Main Power Supply

COMPACT1.0 is powered by an external DC supply. It has a built in DC/DC converter to internally regulate the supply for internal functional uses.

The supply inputs are protected from supply line reversal.

Table 10. COMPACT1.0 Power Supply Requirement

Voltage Range	Current

12V/24V	1A

4.1.1. Supply Terminals

COMPACT1.0 is powered through the available supply terminals. These are connected to an external DC Supply with voltages from 12V to 24V such as car batteries.

Figure 3. Power Supply Terminals

Table 11. Supply Terminal Specifications

No.	Comments
1	3-pin connector of COMPACT1.0
2	ENGINE_ON
3	V+
4	GND

4.2. ENGINE_ON Monitoring

COMPACT1.0 is equipped with ENGINE_ON monitoring circuit. A level shift circuit that can sense the ENGINE ON signal and wakeup the device from the stanby model.

4.3. Watchdog Timer

Teseo III systems inside the COMPACT1.0 are equipped with Watchdog Timer, if any system application software have mistakes, within a power cycle, the Watchdog Timer will generate a reset signal, to reset the system.

Referring to Figure 4 Watchdog Timer Circuit, the watchdog timer is activated by pulling /RST of the STA8090FG to low. Once activated, the watchdog input (WDI) must be edge toggled every 1.6 seconds to clear the watchdog timer from any event that may assert the power cycle.

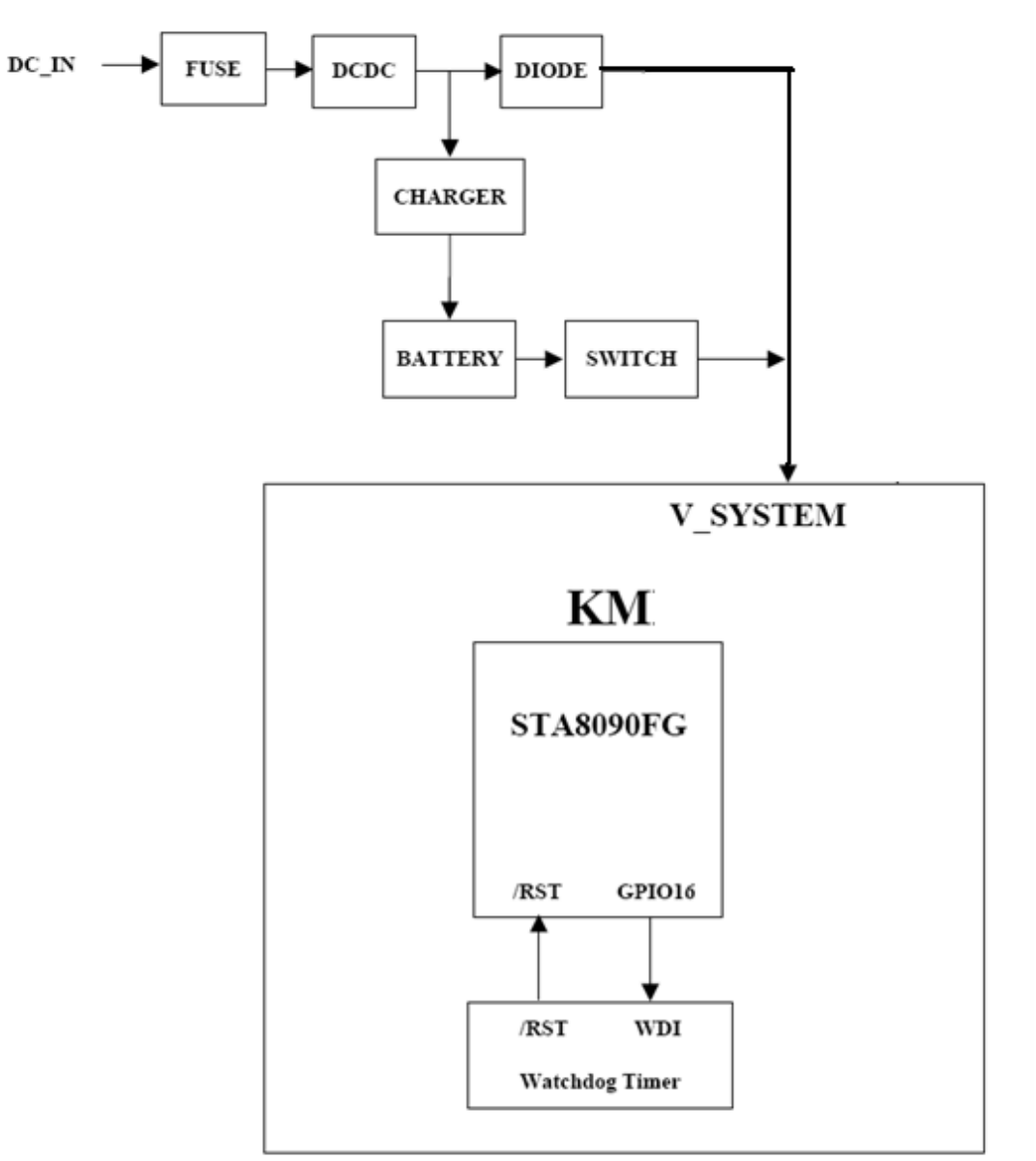


Figure 4. Watchdog Timer Circuit

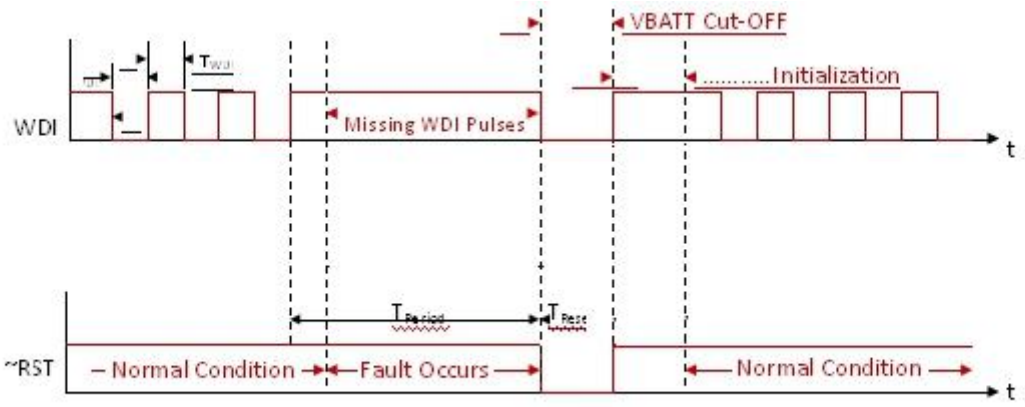


Figure 5. Watchdog Timer Timing Diagram

The following table lists the electrical characteristics of the watchdog timer.

Table 12. Watchdog Timer Electrical Characteristics

Parameter	Temperature	Minimum	Typical	Maximum	Unit
Watchdog Input (T_{WDI})	+25°C		1		sec
Timeout Period (T_{Period})	+25°C	1.12	1.6	2.24	sec
	+85°C		1.68		sec
	-40°C		1.66		sec
Reset Period (T_{Reset})	+25°C	0.14	0.2	0.28	sec
	+85°C		0.2		sec
	-40°C		0.2		sec

4.4. GSM Transceiver

The GSM radio frequency (RF) component of the COMPACT1.0 is based on the RFMD dual- band module.

The Radio Frequency (RF) range complies with Phase II EGSM 900/DCS 1800 and GSM 850/PCS 1900 recommendations. The corresponding frequency recommendations for both transmission and reception bands are listed in the table below.

Table 13. Supported RF Frequencies

GSM Band	Transmit Band (Tx)	Receive Band (Rx)
GSM 850	824 to 849 MHz	869 to 894 MHz
EGSM 900	880 to 915 MHz	925 to 960 MHz
DCS 1800	1710 to 1785 MHz	1805 to 1880 MHz
PCS 1900	1850 to 1910 MHz	1930 to 1990 MHz

RF performance is compliant with ETSI recommendation GSM 05.05.

Table 14. Main Receiver

Parameters	Values
GSM850 Reference Sensitivity	-108 dBm typical (Static & TUHigh)
EGSM900 Reference Sensitivity	-108 dBm typical (Static & TUHigh)
DCS1800 Reference Sensitivity	-108 dBm typical (Static & TUHigh)
PCS1900 Reference Sensitivity	-108 dBm typical (Static & TUHigh)
Selectivity @ 200 kHz	> +9 dBc
Selectivity @ 400 kHz	> +41 dBc
Linear dynamic range	63 dB
Co-channel rejection	>= 9 dBc

Table 15. Main Transmitter Parameters

Parameters	Values
Maximum output power (EGSM900 & GSM850)	33dBm +/- 2dB at ambient temperature
Maximum output power (GSM1800 & PCS1900)	30dBm +/- 2dB at ambient temperature
Minimum output power (EGSM 900& GSM850)	5dBm +/- 5dB at ambient temperature

Minimum output power (GSM1800 & PCS1900)	0 dBm +/- 5dB at ambient temperature

4.4.1. Built-In Internal GSM Antenna

COMPACT1.0 has a built-in antenna located on the indicated area of the case. It is recommended to avoid placing metallic objects near this portion of the casing for best GSM performance.

Figure 6. Built-In GSM Antenna

4.5. GPS

The GPS radio frequency (RF) range of COMPACT1.0 complies with GPS L1 frequency recommendations.

4.5.1. Built-In GPS Patch Antenna

COMPACT1.0 has a built-in GPS patch antenna located on the following area of the case. It is recommended to avoid placing metallic objects near this area of the casing for best GPS performance.

Figure 7. Built-In GNSS Patch Antenna

4.5.2. Receiver Sensitivity

The sensitivity level provided in the following table is the signal strength expected at the RF input.

Table 16. GPS Receiver Sensitivity

Sensitivity Level	Value
Cold Start	-145 dBm
Warm start	-145 dBm
Hot start	-156 dBm

Navigation	-160 dBm
Tracking	-162 dBm

4.5.3. Time-To-First-Fix

The following data show only GPS time acquisition without library startup time and module firmware download period. Depending on the initial state, this period should or should not be added to the global start time.

Table 17. Time to First Fix

Mode	Signal Level (dBm)	50 Percentile TTFF (sec)	95 Percentile TTFF (sec)
Cold start	-130	35	38
	-142	91	102
Warm start	-130	34	38
	-142	54	70
Hot start	-130	1.4	1.5
	-148	6	8

4.5.4. 2D Position Accuracy

The following table provides the first fix accuracy of COMPACT1.0.

Table 18. First Fix Accuracy

Parameter	Description	Conditions	Value	Unit
Horizontal accuracy	Cold start	50% CEP accuracy of first fix, at -130dBm	<1.0	m
	Warm start	50% CEP accuracy of first fix, at -130dBm	<0.9	m
	Hot start	50% CEP accuracy of first fix, at -130dBm	<0.9	m

4.6. Bluetooth BlueNRG

4.6.1 Features

- Bluetooth specification v4.1 compliant master and slave single-mode Bluetooth low energy network processor
- Embedded Bluetooth low energy protocol stack: GAP, GATT, SM, L2CAP, LL, RF-PHY
- Bluetooth low energy profiles provided separately
- Operating supply voltage: from 1.7 to 3.6 V
- 8.2 mA maximum TX current (@0 dBm, 3.0 V)
- Down to 1.7 µA current consumption with active BLE stack
- Integrated linear regulator and DC-DC stepdown converter
- Up to +8 dBm available output power (at antenna connector)
- Excellent RF link budget (up to 96 dB)
- Accurate RSSI to allow power control
- Proprietary application controller interface (ACI), SPI based, allows interfacing with an external host application microcontroller
- Full link controller and host security
- High performance, ultra-low power Cortex-M0 32-bit based architecture core
- On-chip non-volatile Flash memory
- AES security co-processor
- Low power modes
- 16 or 32 MHz crystal oscillator
- 12 MHz ring oscillator
- 32 kHz crystal oscillator
- 32 kHz ring oscillator
- Battery voltage monitor and temperature sensor
- Compliant with the following radio frequency regulations: ETSI EN 300 328, FCC CFR47 Part 15, ARIB STD-T66
- Available in QFN32 (5 x 5 mm) and WLCSP34 (2.66 x 2.56 mm) packages
- Operating temperature range: -40 °C to 85 °C

4.6.2 Applications

- Watches
- Fitness, wellness and sports
- Consumer medical
- Security/proximity
- Remote control
- Home and industrial automation
- Assisted living
- Mobile phone peripherals
- PC peripherals

4.7. Accelerometer&Gyroscope

4.6.1. Accelerometer & Gyroscope

COMPACT1.0 has a built-in accelerometer and gyroscope capable of detecting X, Y, Z axis movements and inclination. The accelerometer and gyroscope device used on COMPACT1.0 is LSM6DS3TR. This device communicates with Teseo III through a 4–wire SPI bus. Please refer to document [7] LSM6DS3TR - Accelerometer Specifications for programming configurations of this device.

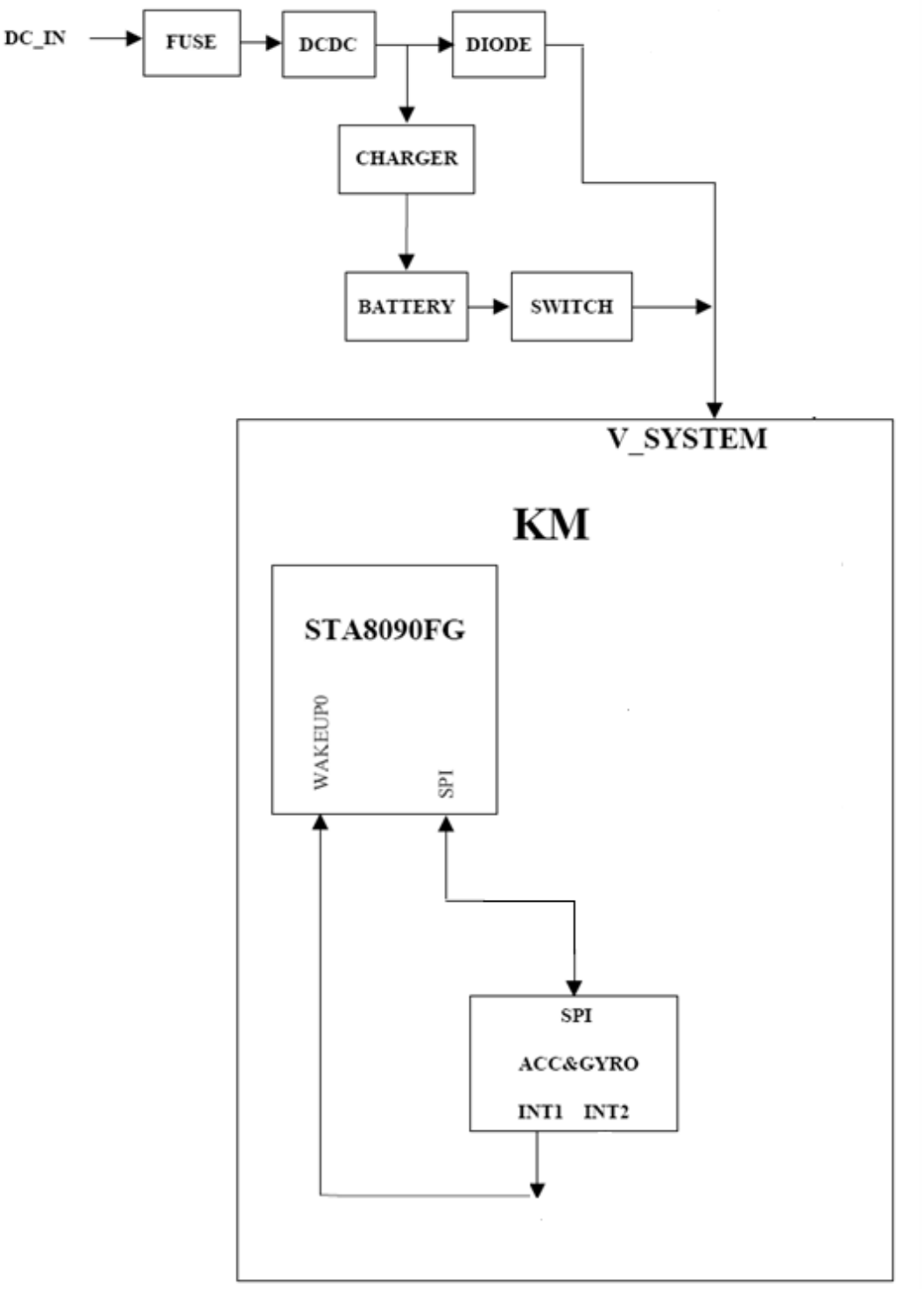


Figure 8 Accelerometer and Gyroscope Communication Interface

Figure 9. Accelerator Axis with Respect to Casing

Table 19. Output Response vs. Orientation to Gravity

Orientation	Output Response
	Xout = 0g Yout = 1g Zout = 0g
	Xout = 1g Yout = 0g Zout = 0g

	Xout = 0g Yout = -1g Zout = 0g
	Xout = -1g Yout = 0g Zout = 0g
Orientation	**Output Response**
	Xout = 0g Yout = 0g Zout = -1g
	Xout = 0g Yout = 0g Zout = +1g

4.8. Auxiliary Power Supply

COMPACT1.0 is supplied with a 210mAh Li-ion battery and it can be charged fast. When vehicle battery voltage is ON and charged be open, the 210mAh Li-ion battery will be changed to 4.2V within 3 hours.

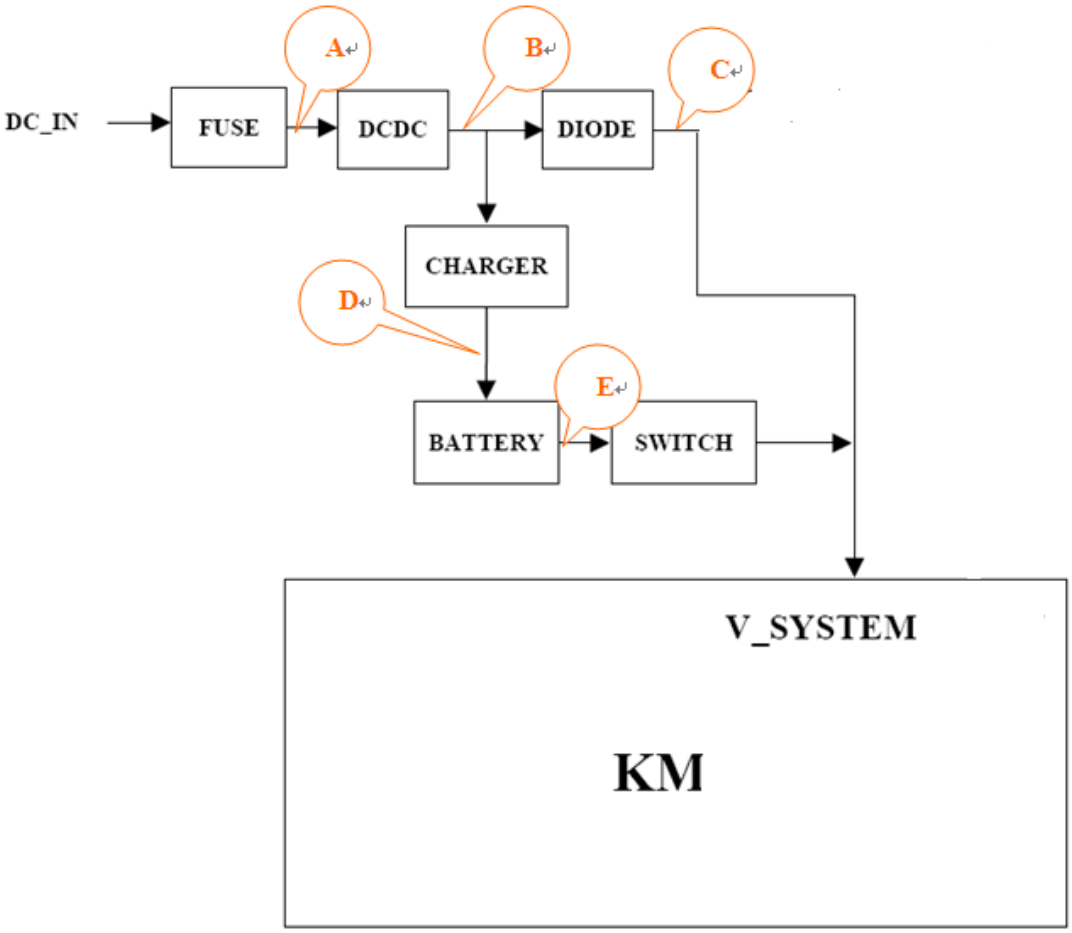


Figure 10. Auxiliary Supply Circuit

Table 20. Emergency Battery Operation

DC_I	A	B	C	D	E	Remarks
Available	6-32V	4.6V	4.1V	4.2V	3.6-4.2 V	COMPACT1.0 is supplied by vehicle battery

Not Available	0V	0V	3.6-4.2V	0V	3.6-4.2 V	COMPACT1.0 is supplied by Li-ion battery

4.8.1. Battery Duration of Use

For reference, the following chart shows the useable battery time when operated continuously at GSM900 (PCL5). It is important to note that temperature has great influence on the battery's useable time.

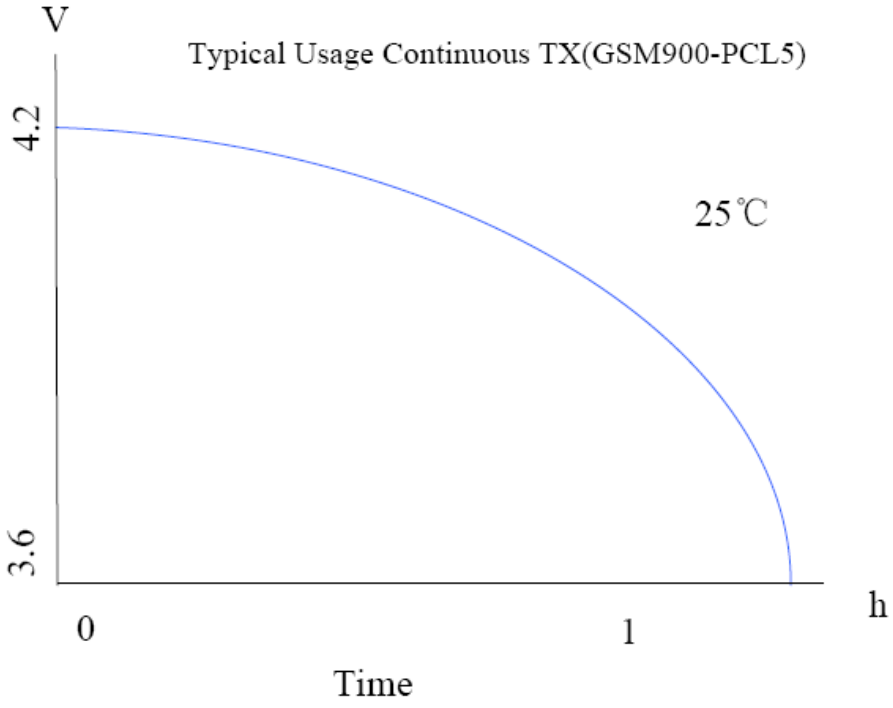


Figure 11. Typical Battery Usage Time at GSM900 (PCL5)

The table below shows the typical useable time of the battery at different operating temperatures before reaching the minimum voltage of 3.6V.

Table 21. Typical Useable Time of Battery at Different Operating Temperatures

Minimum Battery Voltage	-15°C	+25°C	+55°C
3.6V	>40min	>40min	>40min

4.9. Embedded SIM

COMPACT1.0 is provided with a pre-provisioned Embedded SIM.

4.10. Connector interface assignment

3-pin Connector

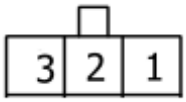


Figure 12. Diagram of 6-pin connector

Table 22. 3-pin Connector assignment

6-pin Connector	
1	GND
2	V+
3	ENGINE_ON

4.11. Power Consumption

The following sub-sections details out the power consumption values of COMPACT1.0

in various operating modes. These consumption values were obtained by performing measurements on COMPACT1.0 samples at a temperature of 25°C with the assumption of a 50Ω RF output and a 3V Embedded SIM card.

4.11.1. Various Operating Modes

The power consumption levels of COMPACT1.0 vary depending on the operating mode used and following table explains the various types of operating modes available on the COMPACT1.0.

Table 23. Typical Current Consumption vs. Operating Modes

Operating Mode Temp = +25◦C DC-IN Supply = 12V	Active Comm. (GSM900)	Active Paging	Active RF-OFF	Alarm Mode	Sleep Paging	Sleep RF-OFF
Main PSU (DC/DC Converter)	ON	ON	ON	ON	ON	ON
Open AT	Running	Running	Running	OFF	Idle	Idle
GSM State	Comm.	Paging	OFF	OFF	Paging	OFF
Accelerometer&Gyro	ON	ON	ON	OFF	ON	ON
GPS Receiver	ON	ON	ON	OFF	OFF	OFF
Watchdog Timer	ON	ON	ON	OFF	ON	ON
Emergency Battery Charger	FULL	FULL	FULL	FULL	FULL	FULL
Average Current Consumption	< 150mA @ CL10	< 40mA @P9 < 50mA @P2	< 50mA	< 1mA	< 4mA @P9 < 5mA @P2	< 2mA

Caution: *Insufficient supply to COMPACT1.0 may affect proper operation of the device. GSM/GPRS/EDGE communication is not guaranteed when operated at this condition.*

Table 24. Effects of Insufficient Power Supply

Main Supply	Device's Behavior
Falls below 6V	GSM communication and GPS location update is not guaranteed
Over 32V (transient peaks)	COMPACT1.0's protection is guaranteed by internal clamping diodes and filter circuits.

Over 32V (continuous over voltage)	COMPACT1.0's protection is done by a clamping diode and resettable PTC fuse (supply voltage is disconnected).

Caution: *The minimum input voltage specified here is for COMPACT1.0 input supply terminals. Voltage drop caused by any additional supply cables must be taken to account when supplying the device at minimum voltage.*

The power supply must withstand a current peak of 1.5A in 6V input voltage.

4.12. Mechanical Specifications

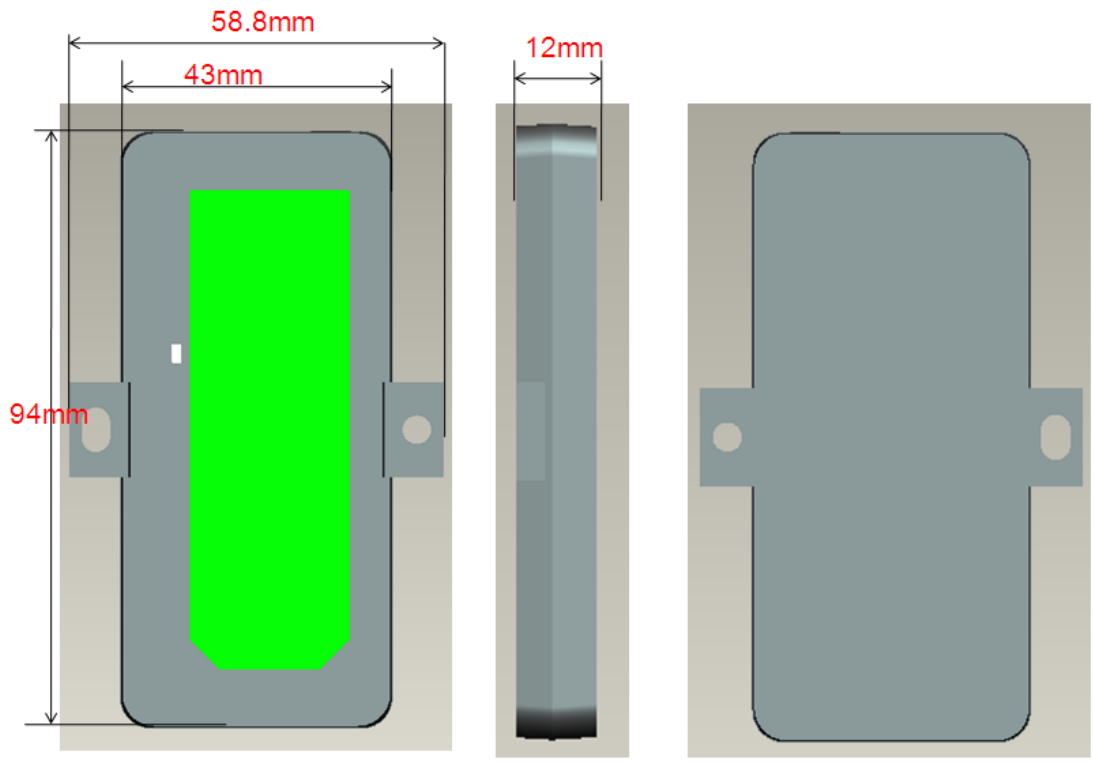


Figure 13. COMPACT1.0 Mechanical Drawing

5. Communicating with COMPACT1.0

COMPACT1.0 is provided with debug test points for firmware upgrade and application software download. To utilize communication on this port, it is recommended to use a proper interface circuit, which is described in the following sub-sections.

After setting up COMPACT1.0, communications can be established by directly sending AT commands to the device using terminal software such as HyperTerminal for MS Windows. The following sub- sections also describe how this is done.

5.1. Debug Interface

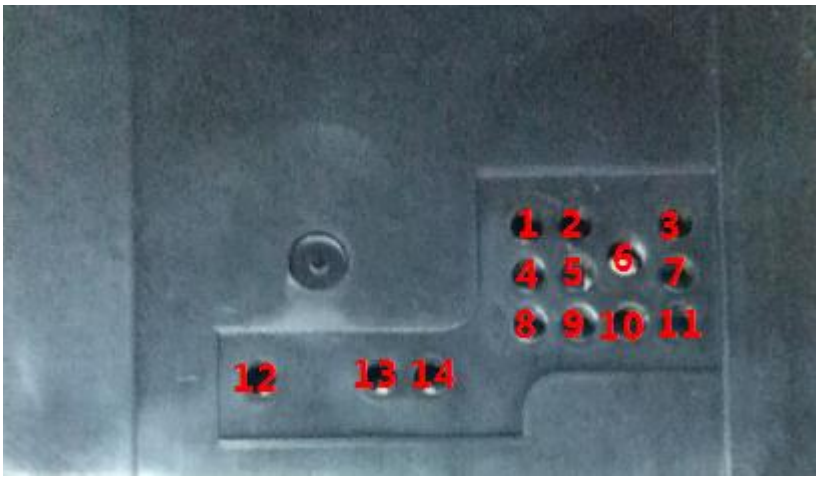


Figure 14. Debug Interface

The following table lists the I/O type and electrical characteristics of the debug interface.

Table 25. Debug Interface Description and Electrical Characteristics

Pin	NET	I/O Type	Description
1	BATT_TEMP	IN	BATT Tempture Test Point
2	TS	IN	Charger IC TS Test Point
3	VIN	IN	V+ Input Test Point
4	PWR_RSTN	IN	System Power reset
5	2G_BOOT/WDG_DISABLE	IN	2G_BOOT AND WDG_DISABLE
6	PWR_KEY_RST	IN	Key Botton, System Power reset, with 2-4s delay
7	GS	OUT	BATT SWITCH GS Test Point
8	2G_USBDM	IN/OUT	2G USB data signal D-
9	2G_USBDP	IN/OUT	2G USB data signal D+
10	T3_U2TX_DEBUG/T3_BOOT0	OUT	T3 GPIO29,UART2 Tx data / BOOT0,active high T3 will in boot modes
11	T3_U2RX_DEBUG	IN	T3 GPIO28,UART2 Rx data
12	V_SYSTEM	OUT	SYSTEM power supply, 3.8V-4.2V
13	V_BAT	OUT	V_BAT power supply, 3.6V-4.2V
14	GND	Ground	GND

5.2. Communication Terminal Set-Up

To perform a communications test after COMPACT1.0 has been setup, do the following:

1. Connect the RS-232 link between the external application (DTE) and COMPACT1.0 (DCE).
2. Configure the RS-232 port of the DTE as follows:
   - ⊡ Bits per second: 115,200 bps
   - ⊡ Data bits: 8
   - ⊡ Parity: None
   - ⊡ Stop bits: 1
   - ⊡ Flow control: hardware
3. Using a communication software such as HyperTerminal, enter:

   AT[A/Z]

4. When communications have been established, COMPACT1.0 will respond with an “OK”, which is displayed in the HyperTerminal window.

If communications cannot be established with COMPACT1.0, do the following:

- Check the RS-232 connection between the application (DTE) and COMPACT1.0 (DCE).
- Check the configuration of the COM port used on the DTE.

Refer to the table below for other AT commands that can be used after getting COMPACT1.0 started.

Table 26. Basic AT Commands for COMPACT1.0

AT Command	Description
AT+CGMI	To check if the serial link is OK. COMPACT1.0 will respond with "Remo Wireless" when it is OK.

AT Command	Description
AT+CPIN=xxxx	To enter a PIN code, xxxx (if activated).
AT+CSQ	To verify the received signal strength.
AT+CREG?	To verify the registration of COMPACT1.0 on the network.
ATD<phone number>	To initiate a GSM call.
ATH	To hang up (end of GSM call).

For further information about these AT commands and their associated parameters, refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware 7.47.

5.3. Verifying the Received Signal Strength

COMPACT1.0 only establishes a call if the received signal strength is strong enough. Using communication software such as HyperTerminal, enter **AT+CSQ** to check the received signal strength. The response returned will follow the format **+CSQ: <rssi>,<ber>**.

where: <rssi> = received signal strength indication, and <ber> = channel bit error rate.

Refer to the table below for the description of the <rssi> values returned.

Table 27. <RSSI> Value Description

<rssi> Value	Description
0 – 10	Received signal strength is insufficient.
11 – 31	Received signal strength is sufficient.

32 – 98	Not defined.
99	No measure available.

Refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware7.47 for more information regarding the **AT+CSQ** AT Command.

5.4. Verifying the Network Registration

To check the network registration, make sure that the Embedded SIM has been properly registered. Using a communication software such as HyperTerminal, enter **AT+CREG?** to verify the network

registration of COMPACT1.0. Refer to the table below for the list of main responses returned.

Table 28. AT+CREG Main Responses

AT+CREG Response	Description
+CREG: 0,0	Not registered.
+CREG: 0,1	Registered on the home network.
+CREG: 0,5	Registered on a roaming network.

If COMPACT1.0 is not registered on the network, verify the signal strength to determine the received signal strength (refer to section 5.3 Verifying the Received Signal Strength).

Refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware7.47 for more information regarding the **AT+CREG** AT Command and other AT commands relating to network registration in GPRS mode.

5.5. Checking the Band Selection

Using a communication software such as HyperTerminal, enter **AT+WMBS?** to check the band selection of COMPACT1.0. Refer to the table below for the list of main responses returned.

Table 29. AT+WMBS Responses

AT+WMBS Response	Description
+WMBS: 0,x	Mono band mode 850MHz is selected
+WMBS: 1,x	Mono band mode extended 900MHz is selected
+WMBS: 2,x	Mono band mode 1800MHz is selected
+WMBS: 3,x	Mono band mode 1900MHz is selected
+WMBS: 4,x	Dual band mode 850/1900MHz are selected
+WMBS: 5,x	Dual band mode extended 900MHz/1800MHz are selected
+WMBS: 6,x	Dual band mode extended 900MHz/1900MHz are selected
+WMBS: 7,x	Quad band mode 850/ extended 900MHz/1800MHz/1900MHz are selected

Where:

When x = 0, the band has not been modified since the last boot of COMPACT1.0;

When x = 1, the band has been modified since the last boot of COMPACT1.0, and will have to be reset in order to take the previous modification(s) into account.

Refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware7.47 for more information regarding the **AT+WMBS** AT Command.

5.6. Switching Bands

Using communication software such as HyperTerminal, enter **AT+WMBS** to change the band settings of COMPACT1.0 and switch between EU (EGSM900/DCS1800) and US (GSM850/ PCS1900) bands and vice versa. Refer to the following table for the list of **AT+WMBS** parameters that can be used and their corresponding description.

Table 30. AT+WMBS Band Selection

AT+WMBS Command	Description

AT+WMBS=0,x	Switch to mono band mode 850MHz
AT+WMBS=1,x	Switch to mono band mode extended 900MHz
AT+WMBS=2,x	Switch to mono band mode 1800MHz
AT+WMBS=3,x	Switch to mono band mode 1900MHz
AT+WMBS=4,x	Switch to dual band mode 850/1900MHz

AT+WMBS Command	Description
AT+WMBS=5,x	Switch to dual band mode extended 900MHz/1800MHz
AT+WMBS=6,x	Switch to dual band mode extended 900MHz/1900MHz
AT+WMBS=7,x	Switch to quad band mode 850/ extended 900MHz/1800MHz/1900MHz

Where:

When x = 0, COMPACT1.0 will have to be reset to start on the specified band(s);

When x = 1, the band switch is effective immediately. However, this mode is forbidden while in Connected mode and during COMPACT1.0 initialization.

Refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware7.47 for more information regarding the **AT+WMBS** AT Command.

5.7. Checking the PIN Code Status

Using a communication software such as HyperTerminal, enter **AT+CPIN?** to check the PIN code status. Refer to the table below for the list of main responses returned.

Table 31. AT+CPIN Main Responses

AT+CPIN Response	Description
+CPIN: READY	The PIN code has been entered.
+CPIN: SIM PIN	The PIN code has not been entered.

Refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware7.47 for more information regarding the **AT+CPIN** AT Command.

5.8. Resetting COMPACT1.0

Resetting COMPACT1.0 could be triggered by the AT command **AT+CFUN=1**, or by unplugging and then re-plugging the power supply (Vin).

5.9. Operating System Upgrade Procedure

COMPACT1.0 operating system is stored in flash memory and can be easily upgraded.

The operating system file can be downloaded into the modem using the X-modem protocol. The

AT+WDWL command allows the download process to be

launched.

The operating system file can also be downloaded into the modem using the DOTA (download over the air) feature. This feature is available with the Open AT Application Framework interface.

Refer to document [2] AT Commands Interface Guide for Open AT Application Framework Firmware7.47 for more information regarding this procedure.

6. Reliability Compliance and Recommended Standards

6.1. Reliability Compliance

COMPACT1.0 is compliant with the following requirements:

Table 32. Standards Conformity

Abbreviation	Definition
IEC	International Electro technical Commission
ISO	International Organization for Standardization

6.2. Applicable Standards Listing

The table hereafter gives the basic list of standards applicable to COMPACT1.0.

Note: References to any features can be found from these standards.

Table 33. Applicable Standards and Requirements

Document	Current Version	Title
IEC6006826	7.0	Environmental testing - Part 2.6: Test FC: Sinusoidal Vibration.
IEC60068234	73	Basic environmental testing procedures part 2: Test FD: random vibration wide band - general requirements. Cancelled and replaced by **IEC60068-2-64**. For reference only.
IEC60068264	2.0	Environmental testing - part 2-64: Test FH: vibration, broadband random and guidance.
IEC60068232	2.0	Basic environmental testing procedures - part 2: Test ED: (procedure 1) Withdrawn & replaced by **IEC60068-2-31**. For reference only.
IEC60068231	2.0	Environmental testing part 2-31: Test EC: rough handling shocks, primarily for equipment-type specimens.
IEC60068229	2.0	Basic environmental testing procedures - part 2: Test EB and guidance: bump. Withdrawn and replaced by **IEC60068-2-27**. For reference only.
IEC60068227	4.0	Environmental testing - part 2-27: Test EA and guidance: shock.
IEC60068214	6.0	Environmental testing - part 2-14: Test N: change of temperature.
IEC6006822	5.0	Environmental testing - part 2-2: Test B: dry heat.
IEC6006821	6.0	Environmental testing - part 2-1: Test A: cold.
IEC60068230	3.0	Environmental testing - part 2-30: Test DB: damp heat, cyclic (12 h + 12 h cycle).
IEC6006823	69 w/A1	Basic environmental testing procedures part 2: Test CA: damp heat, steady State. Withdrawn and replaced by **IEC60068-2-78**. For reference only.
IEC60068278	1.0	Environmental testing part 2-78: Test CAB: damp heat, steady state.

Document	Current Version	Title
IEC60068238	2.0	Environmental testing - part 2-38: Test Z/AD: composite temperature/humidity cyclic test.
IEC60068240	1.0 w/A1	Basic environmental testing procedures - part 2: Test Z/AM combined cold/low air pressure tests.
ISO167501	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 1: general.
ISO167502	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 2: electrical loads.
ISO167503	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 3: mechanical loads.
ISO167504	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 4: climatic loads.
IEC60529	2.1 w/COR2	Degrees of protection provided by enclosures (IP code).
IEC60068217	4.0	Basic environmental testing procedures - part 2: Test Q: sealing.
IEC60068218	2.0	Environmental testing - part 2-18: Tests - R and guidance: water.
IEC60068270	1.0	Environmental testing - part 2: tests - test XB: abrasion of markings and letterings caused by rubbing of fingers and hands.
IEC60068268	1.0	Environmental testing - part 2: tests - test l: dust and sand.
IEC60068211	3.0	Basic environmental testing procedures, part 2: test KA: salt mist.
IEC60068260	2.0	Environmental testing - part 2: Test KE: flowing mixed gas corrosion test.
IEC60068252	2.0 w/COR	Environmental testing - part 2: Test KB: salt mist, cyclic (sodium chloride solution).

6.3. Additional Applicable Standard IEC

Table 34. Applicable Standards and Requirements

Document	Current Version	Title
IEC60529	Edition 2.1	IP65 Test – Degrees of protection provided by enclosures (IP Code)

	2001-02	

6.4. Environmental Specifications

COMPACT1.0 is compliant with the operating classes listed in the table below. The ideal temperature range of the environment for each operating class is also specified.

Table 35. Operating Class Temperature Range

Conditions	Temperature Range
Operating/Class A*	0°C to +50°C
Operating/Class B (usable with restriction)	-20°C to +70°C
Storage (6 months without deep discharge)	-20°C to +35°C
Emergency battery charging	+5°C to +45°C

* Limited by battery characteristics

6.4.1. Function Status Classification

The classes reported below comply with the Annex “ISO Failure Mode Severity Classification”, ISO Standard 7637, and Section 1.

Note: The word “function” used here only concerns the function performed by COMPACT1.0.

Table 35. ISO Failure Mode Severity Classification

Class	Definition
CLASS A	All equipment/system functions are fulfilled normally (100% functional) during and after the constraint. COMPACT1.0 shall exhibit normal function during and after environmental exposure. COMPACT1.0 performance shall meet the minimum requirements of 3GPP or appropriate wireless standards.

CLASS B	All equipment/system functions are fulfilled normally during application of the constraint; however, one or several of them may be out of the specified tolerances. After application of the constraint, all functions automatically return within standard limits. The memories shall remain in compliance with Class A. COMPACT1.0 shall exhibit the possibility at all times to establish a voice, SMS or DATA call. Unless otherwise stated, full performance should return to normal after the external influence has been removed.

6.5. Reliability Prediction Model

6.5.1. Life Stress Test

The following tests COMPACT1.0's product performance.

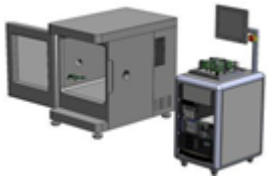
Table 36. Life Stress Test

Designation	Condition
Performance Test FT3T° & PT 	Standard: N/A
	Special conditions: Temperature: ⊡ Class A: -30°C to +70°C ⊡ Class B: -40°C to +85°C Rate of temperature change: ± 3°C/min Recovery time: 3 hours
	Operating conditions: Powered
	Duration: 10 days

6.5.2. Thermal Resistance Stress Tests

The following tests COMPACT1.0's resistance to extreme temperature.

Table 37. Environmental Resistance Stress Tests

Designation	Condition
Cold Test A **ctive COTA**	Standard: IEC 680068-2-1, Test Ad
	Special conditions: Temperature: -40°C (Automotive) Temperature -30°C (Industrial) Rate of temperature change: dT/dt >= ± 3°C/min Recovery time: 3 hours
	Operating conditions: Powered, (Automotive – one hours duty power cycle; Industrial – one minute on and 2 minutes off power cycle)
	Duration: 72 hours
Resistance **to Heat RH** 	Standard: IEC60068-2-2 Test Db
	Special conditions: Temperature: 85°C Temperature variation: 1°C / min Power level: Maximum
	Operation conditions: Industrial 1 min power cycle; Automotive 1 hour power cycle
	Duration: Industrial 50 days; Automotive 60 days

6.5.3. Corrosive Resistance Stress Tests

The following tests COMPACT1.0's resistance to corrosive atmosphere.

Table 38. Corrosive Resistance Stress Tests

Designation	Condition
Moist Heat Cyclic **Test MHCT**  	Standard: IEC 60068-2-30, Test Db

	Special con
	ditions:
	- Upper temperature: +40 ± 2°C
	- Lower temperature: +25 ± 2°C
	- RH:
	  - Upper temperature: 93%
	  - Lower temperature: 95%
	- Number of cycles: 21 (1 cycle/24 hours)
	- Rate of temperature change: dT/dt >= ± 3°C/min
	- Recovery time: 3 hours

	Operating conditions: Un-powered
	Duration: 21 days

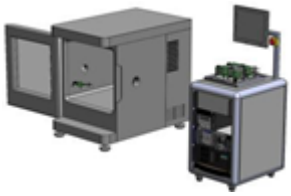
Designation	Condition
Humidity **Test HUT** 	Standard: IEC 60068-2-3, Test CA
	Special conditions: - Temperature +65°C - Humidity 95% - Recovery time: 1 hour - Power level: Maximum
	Operating condition: 15 minutes power cycle
	Duration: 10 days

6.5.4. Thermal Resistance Cycle Stress Tests

The following tests COMPACT1.0's resistance to extreme temperature cycling.

Table 39. Thermal Resistance Cycle Stress Tests

Designation	Condition
	Standard: IEC 60068-2-14

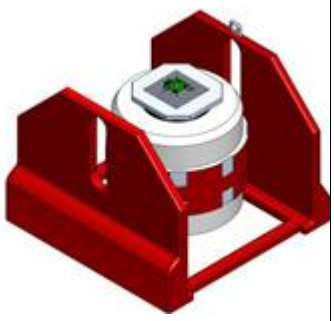
Thermal Shock Test TSKT	Special conditions: - Upper temperature: +90°C - Lower temperature: -40°C - Rate of temperature change: 30s - Number of cycles: 300 (industrial) - Number of cycles: 1000 (automotive) - Duration of exposure: 20 minutes - Recovery time: 3 hours
	Operating conditions: Un-powered
	Duration: 203 hours for industrial and 670 hours for Automotive
Temperature Change TCH 	Standard: IEC 60068-2-4 Test Nb
	Special conditions: - Upper temperature: 90°C - Lower temperature: -40°C - Rate of Temperature change: dT/dt=3 ±0.6°C/min - Number of cycles: 400 - Duration of exposure: 10 minutes - Recovery period: 1 hour
	Operation condition: un-powered
	Duration: 400 hours

6.5.5. Mechanical Resistance Stress Tests

The following tests COMPACT1.0's resistance to vibrations and mechanical shocks.

Table 40. Mechanical Resistance Stress Tests

Designation	Condition
Sinusoidal Vibration Test SVT 	Standard: IEC 60068-2-6, Test Fc
	Special conditions: 35 17 Industrial: ⊡ Frequency range 10Hz to 16kHz ⊡ Displacement: 0.35mm (peak-peak) ⊡ Frequency range 16Hz to 1000Hz ⊡ Acceleration ⊡ 5g from 16Hz to 62Hz ⊡ 3g from 62Hz to 200Hz ⊡ 1g from 200Hz to 1000Hz 35 17 Automotive: ⊡ Frequency range 10Hz to 30kHz ⊡ Displacement: 0.35mm (peak-peak) ⊡ Frequency range 30Hz to 500Hz ⊡ Acceleration ⊡ 5g from 30Hz to 62Hz ⊡ 3g from 62Hz to 200Hz ⊡ 1g from 200Hz to 500Hz
	Sweep rate: 35 17 Industrial - 1Octave/ Minute 35 17 Automotive - 15 minutes / cycle
	Sweep direction: X, Y and Z
	Operating conditions: Un-powered
	Duration: industrial – 20 sweeps and Automotive 36 sweeps
	Standard: IEC 60068-2-64

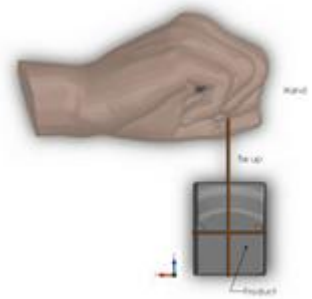
Random Vibration Test RVT 	Special conditions: 35 17 Density spectrum: 0.96m²/s3 35 17 Frequency range: ⊡ 0.1 g2/Hz at 10Hz ⊡ 0.01 g2/Hz at 250Hz ⊡ 0.0005 g2/Hz at 1000Hz ⊡ 0.0005 g^2/Hz at 2000Hz 35 17 Slope: -3dB/octave 35 17 Acceleration: 0.9gRMS 35 17 Number of axis: 3
	Operating conditions: Un-powered
	Duration: Industrial 1hr/axis and automotive 8hr/axis
Designation	**Condition**
Mechanical Shock Test MST 	Standard: IEC 60068-2-27, Test Ea
	Special conditions: 35 17 Shock Test 1: ⊡ Wave form: Half sine ⊡ Peak acceleration: 30G ⊡ Duration: 11ms ⊡ Number of shocks: 8 per direction ⊡ Number of directions: 6 (±X, ±Y, ±Z) 35 17 Shock Test 2: ⊡ Wave form: Half sine ⊡ Peak acceleration: 100G ⊡ Duration: 6ms ⊡ Number of shocks: 3 per direction ⊡ Number of directions: 6 (±X, ±Y, ±Z)
	Operating conditions: Un-powered
	Duration: 72 hours

6.5.6. Handling Resistance Stress Tests

The following tests COMPACT1.0's resistance to handling malfunctions and damages.

Table41. Handling Resistance Stress Tests

Designation	Condition
ESD Test 	Standard: IEC 1000-4-2
	Special conditions: Contact discharges: 10 positive and 10 negative applied Industrial: ⊡ Contact discharge Voltage: ±2kV, ±4kV, ±6kV ⊡ Air discharge Voltage: ±2kV, ±4kV, ±8kV Automotive : ⊡ Contact discharge Voltage: ±4kV, ±6kV, ±8kV ⊡ Air discharge Voltage: ±4kV, ±8kV, ±15kV
	Operating conditions: Powered and on call
	Duration: 24 hours
Designation	**Condition**
	Standard : N/A

Operational **Durability OD**	Special conditions: 35 17 SIM Connector: ⊡ Cycles : 20 ⊡ Repetition Rate : 3s per cycle ⊡ Objective : Mating and de-mating 35 17 System Connector: ⊡ Cycles : 20 ⊡ Repetition Rate : 3s per cycle ⊡ Objective : Mating and de-mating 35 17 RF Connector : ⊡ Cycles : 10 ⊡ Repetition Rate : 5s per cycle ⊡ Objective : Mating and de-mating
	Operating conditions: Un-powered
	Duration: 24 hours
Free Fall **Test FFT** 	Standard : IEC 60068-2-32, Test Ed
	Special conditions: 35 17 Drop: 2 samples for each direction 35 17 Equivalent drop height: 1m 35 17 Number of directions: 6 (±X, ±Y, ±Z) 35 17 Number of drops/face: 2
	Operating conditions: Un-powered
	Duration: 24 hours

7. Certification Compliance and Recommended Standards

7.1. Certification Compliance

COMPACT1.0 is compliant with the following requirements.

Table 42. Standards Conformity

Domain	Applicable Standard
Safety standard	EN 60950-1 (ed.2006)
Health standard (EMF Exposure Evaluation)	EN 62311 (ed. 2008)
Efficient use of the radio frequency spectrum	EN 301 511 (V 9.0.2)
EMC	EN 301 489-1 (v1.8.1) EN 301 489-7 (v1.3.1)
E-Marking	Directive 661/2009/EC

7.2. Applicable Standards Listing

The table hereafter gives the basic list of standards applicable for 2G (R99/Rel.4).

Note: References to any features can be found from these standards.

Table 43. Applicable Standards and Requirements

Document	Current Version	Title
GCF	3.49.1	GSM Certification Forum - Certification Criteria
TS 51.010-1	10.3.0	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Digital cellular telecommunications system (Phase 2+); Mobile Station (MS)

		conformance specification; Part 1: Conformance specification
TS 51.010-2	10.3.0	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification
TS 51.010-4	4.14.1	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 4: SIM Application Toolkit Conformance specification
EN 301 511	9.0.2	Global System for Mobile Communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)

8. Reference Documents

For more details, several reference documents can be consulted. The Remo Wireless documents referenced herein are provided in the Remo Wireless documentation package; however, the general reference documents which are not Remo Wireless owned are not provided in the documentation package.

8.1. Remo Wireless Documentation

[1] ADL User Guide for Open AT Application Framework OS 6.37

[2] AT Commands Interface Guide for Open AT Application Framework Firmware 7.47

[3] Product Technical Specification and Customer Design Guidelines

[4] STA8090 Product Technical Specification and Customer Design Guidelines

8.2. General Reference Documentation

[5] "I^2C Bus Specification", Version 2.0, Philips Semiconductor 1998

[6] ISO 7816-3 Standard

[7] LSM6DS3TR - Accelerometer Specifications

[8] TCA9535RTWR - IO Expander Specifications

9. List of Abbreviations

Abbreviation	Definition
AC	Alternative Current
ADC	Analog to Digital Converter
A/D	Analog to Digital conversion
AF	Audio-Frequency
AT	ATtention (prefix for modem commands)
AUX	AUXiliary
CAN	Controller Area Network
CB	Cell Broadcast
CEP	Circular Error Probable
CLK	CLocK

CMOS	Complementary Metal Oxide Semiconductor
CS	Coding Scheme
CTS	Clear To Send
DAC	Digital to Analogue Converter
dB	Decibel
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DCS	Digital Cellular System
DR	Dynamic Range
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
E-GSM	Extended GSM
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EMS	Enhanced Message Service
EN	ENable
ESD	Electro Static Discharges
FIFO	First In First Out
FR	Full Rate
FTA	Full Type Approval
GND	GrouND
GPI	General Purpose Input
GPC	General Purpose Connector
GPIO	General Purpose Input Output
GPO	General Purpose Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
HR	Half Rate
I/O	Input / Output
JTAG	Joint Test Action Group
LED	Light Emitting Diode
LNA	Low Noise Amplifier
MAX	MAXimum
MIC	MICrophone
MIN	MINimum
MMS	Multimedia Message Service
MO	Mobile Originated

MT	Mobile Terminated
na	Not Applicable
NF	Noise Factor
NMEA	National Marine Electronics Association
NOM	NOMinal
NTC	Négative Temperature Coefficient
PA	Power Amplifier
Pa	Pascal (for speaker sound pressure measurements)
PBCCH	Packet Broadcast Control CHannel
PC	Personal Computer
PCB	Printed Circuit Board
PDA	Personal Digital Assistant
PFM	Power Frequency Modulation
PSM	Phase Shift Modulation
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RHCP	Right Hand Circular Polarization
RI	Ring Indicator
RST	ReSeT
RTC	Real Time Clock
RTCM	Radio Technical Commission for Maritime services
RTS	Request To Send
RX	Receive
SCL	Serial CLock
SDA	Serial DAta
SIM	Subscriber Identification Module
SMS	Short Message Service
SPI	Serial Peripheral Interface
SPL	Sound Pressure Level
SPK	SPeaKer
SW	SoftWare
PSRAM	Pseudo Static RAM
TBC	To Be Confirmed
TDMA	Time Division Multiple Access
TP	Test Point
TVS	Transient Voltage Suppressor
TX	Transmit
TYP	TYPical
UART	Universal Asynchronous Receiver-Transmitter

USB	Universal Serial Bus
USSD	Unstructured Supplementary Services Data
VSWR	Voltage Standing Wave Ratio
WMP	Wireless MicroProcessor

10. Product Labeling

Two product labels are available at the back of COMPACT1.0.

10.1. Black Label

Figure 15. Black Label

The dimension of the black label is 7.5cm x 2.5cm and provides the following information:

- Product name (COMPACT1.0 Telematic Unit)
- OCTO label
- E-marking
- WEEE logo
- CE marking with certification number
- Warning

10.2. White Label

Figure 16. White Label

The dimension of the white label is also 7cm x 3cm and provides the following information:

- IMEI number, 2D barcode
- Serial number, 2D barcode
- Item number
- Label specification reference
- QR Code

11. Packaging

COMPACT1.0 is packed in heat-sealed ESD bags. These packages are then packed into an outer box and then sealed with security tape. Each outer box can contain up to 50 COMPACT1.0 packages.

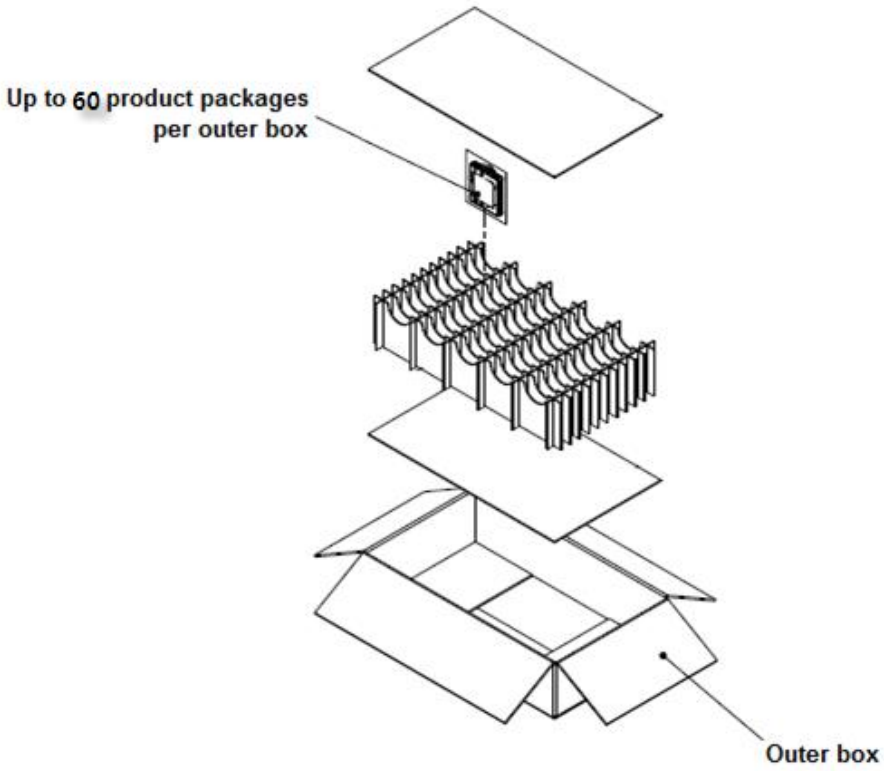


Figure 17. COMPACT1.0 Outer Box Assembly

12. Safety Recommendations (for Information Only)

For the efficient and safe operation of your GSM device, please read the following information carefully.

12.1.RF Safety

12.1.1. General

Your GSM terminal is based on the GSM standard for cellular technology. The GSM standard is spread all over the world. It covers Europe, Asia and some parts of

America and Africa. This is the most used telecommunication standard.

Your GSM terminal is actually a low power radio transmitter and receiver. It sends out and receives radio frequency energy. When you use your GSM application, the cellular system which handles your calls controls both the radio frequency and the power level of your cellular modem.

12.1.2. Exposure to RF Energy

There has been some public concern about possible health effects from using GSM terminals. Although research on health effects from RF energy has focused on the current RF technology for many years, 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 was 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 terminal efficiently by following the guidelines below.

12.1.3. Efficient Terminal Operation

For your GSM terminal to operate at the lowest power level, consistent with satisfactory call quality: If your terminal has an extendible antenna, extend it fully. Some models allow you to place a call with

the antenna retracted. However, your GSM terminal operates more efficiently with the antenna fully extended.

Do not hold the antenna when the terminal is « IN USE ». Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

12.1.4. Antenna Care and Replacement

Do not use the GSM terminal with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. Consult your manual to see if you may change the antenna yourself. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.

Use only the supplied or approved antenna. Unauthorized antennas, modifications or attachments could damage the terminal and may contravene local RF emission regulations or invalidate type approval.

12.2. General Safety

12.2.1. Driving

Check the laws and the regulations regarding the use of cellular devices in the area where you have to drive as you always have to comply with them. When using your GSM terminal while driving, please:

- give full attention to driving,
- pull off the road and park before making or answering a call if driving conditions so require.

12.2.2. Electronic Devices

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

12.2.3. Vehicle Electronic Equipment

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

12.2.4. 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 terminal **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.

12.2.5. Aircraft

Turn your terminal 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 terminal while the aircraft is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem while airborne.

12.2.6. Children

Do not allow children to play with your GSM terminal. 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.

12.2.7. Blasting Areas

To avoid interfering with blasting operations, turn your unit OFF when in a « blasting area » or in areas posted: « turn off two-way radio ». Construction crews often use remote control RF devices to set off explosives.

12.2.8. Potentially Explosive Atmospheres

Turn your terminal **OFF** when in any area with a potentially explosive atmosphere. It is

rare, but your application or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injuries 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 terminal or accessories.

Before using your terminal 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.

RF Exposure Statement:

For the product,under normal use condition is at least 20cm away from the b ody of the user,the

user must keeping at least 20cm distance to the product.

WARNING:

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

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

IC Caution

Attention IC

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1.this device may not cause interference,

2.and this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1.l'appareil ne doit pas produire de brouillage, et

2.l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.