

Radicom Research, Inc.

Preliminary

User Manual

for the

RC3000A-E

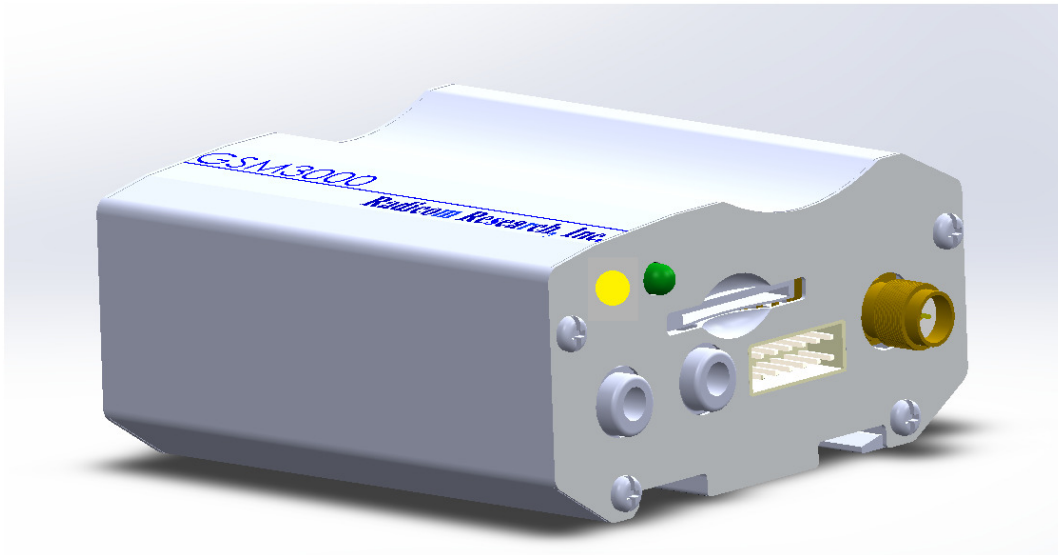


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RC3000A-E Product Introduction

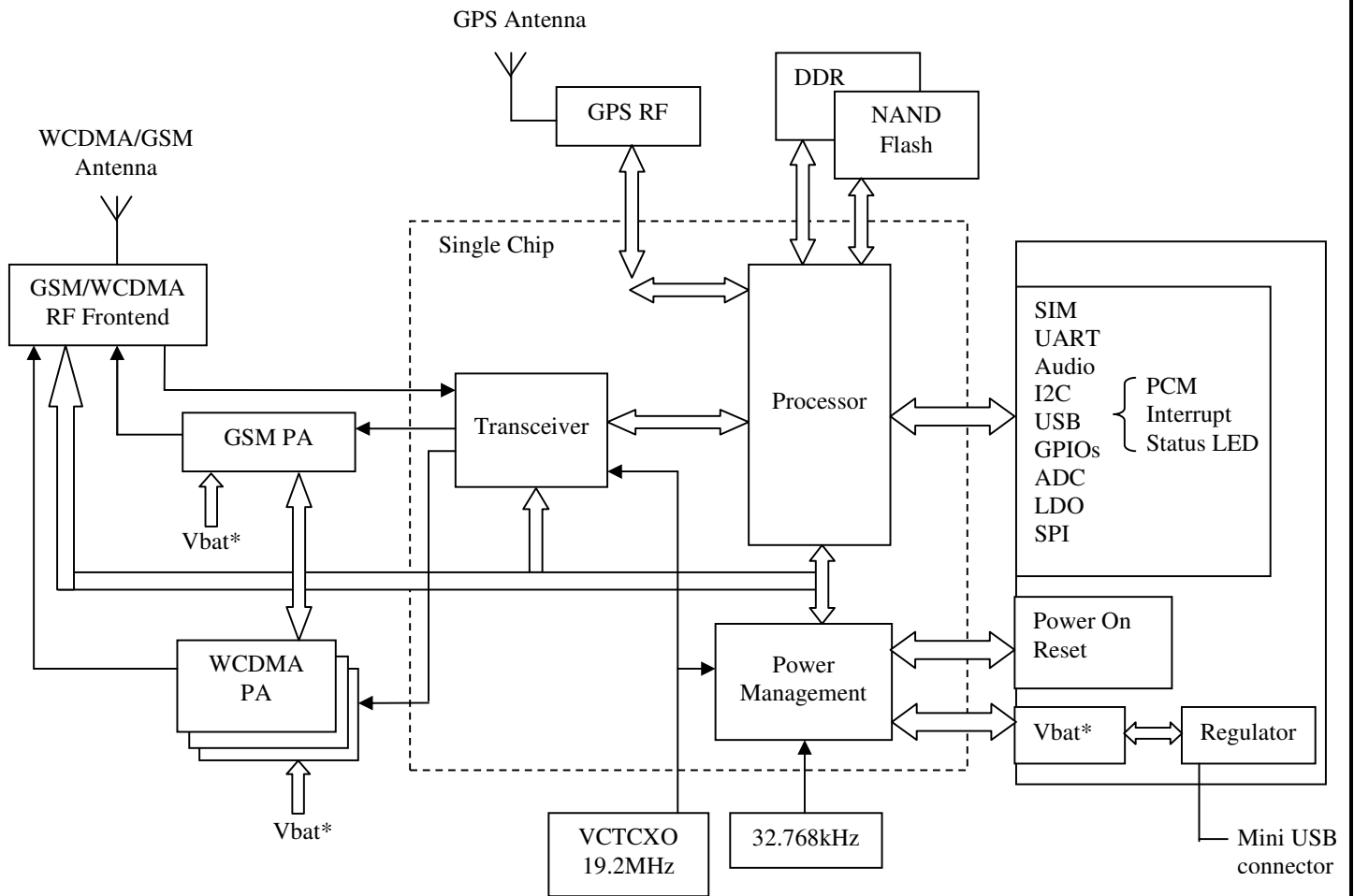
Thank you for purchasing Radicom Research's RC3000A-E product. We are committed to providing you quality service and technical support. The RC3000A-E is the perfect solution for integrating WCDMA applications into many different types of embedded hosts or remote equipment. This product is fully self-contained and requires only a serial TTL interface from your product, SIM card and cellular signal access to provide you with state of the art data, fax, and voice operation.

Designed for the global marketplace, RC3000A-E is a quad-band GSM/GPRS/EDGE and dual-band UMTS/HSDPA that works on frequencies of GSM 850MHz, EGSM 900MHz, DCS 1800MHz, PCS 1900MHz and WCDMA 2100/900MHz, 2100/850MHz or 1900/850MHz. User can choose the module based on the wireless network configuration. The entire radio band configuration of RC3000A-E is described in the following table.

Standard	Frequency	RC3000A
GSM	GSM 850MHz	✓
	EGSM 900MHz	✓
	DCS 1800MHz	✓
	PCS 1900MHz	✓
WCDMA	WCDMA 850MHz	
	WCDMA 900MHz	✓
	WCDMA 1900MHz	
	WCDMA 2100MHz	✓
HSPA	HSDPA	✓
	HSUPA	

This document is a guideline to help you design the RC3000A-E into your system. If further information is needed please contact Radicom and we will provide any additional help you may need.

RC3000A-E Functional Architecture



RC3000A-E Features

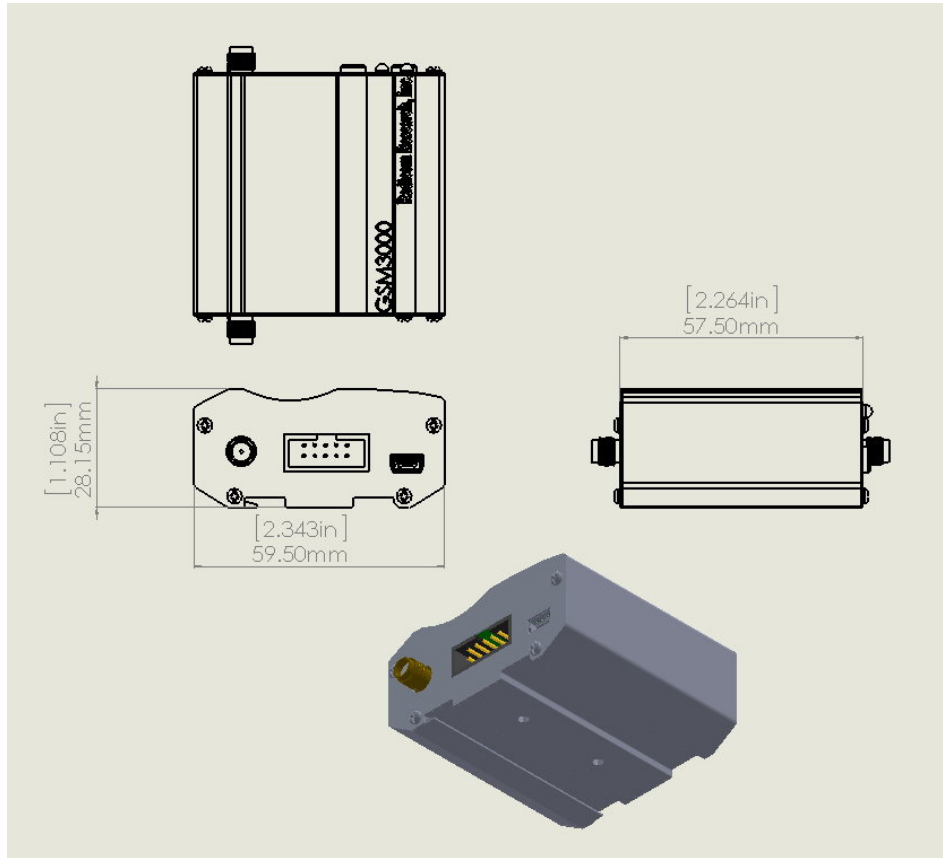
- RC3000A: Dual-Band UMTS/HSDPA 850/1900MHz, Quad-Band GSM/GPRS/EDGE 850/900/1800/1900MHz
- Supported embedded LUA Script Language
- A-GPS: MS-Based, MS-Assisted supported
- Support for Data transfer:
 - HSDPA: Max. 3.6Mbps(DL)
 - WCDMA: Max. 384Kbps(DL), Max. 384Kbps(UL)
 - EDGE Class: Max. 236.8Kbps(DL), Max. 118Kbps(UL)
 - GPRS: Max. 85.6Kbps(DL), Max. 42.8Kbps(UL)
 - CSD:
 - GSM data rate 14.4Kbps
 - WCDMA data rate 57.6Kbps
 - WCDMA 64Kbps CSD for Video Call
- Support in GSM and WCDMA for Network Identity and Time zone (NITZ)
- MMS
- TCP/IP
- MUX protocol
- FTP/FTPS/HTTPS/SMTP/POP3/DNS
- FOTA
- eCall Ready
- Supported interface: USB2.0, UART, SIM card, SPI, I2C, Keypad, Constant current sink, GPIO, RTC, ADC, PCM

Feature	Implementation
Power supply	Single supply voltage 5.0+ - 0.3V
Transmission data	• Dual-mode UMTS/HSDPA/EDGE/GPRS operation • GPRS Class B, multi-slot class 12 operation, supports coding scheme: CS1-4 • EDGE multi-slot class 12 operation, supports coding scheme: MSC1-9 • UMTS R99 data rates-384 kbps DL/UL • HSDPA Category 5/6 -3.6 Mbps Category 12-1.8 Mbps • CSD feature: 9.6, 14.4, 64 kbps UL/DL
GPS	• Mobile-Assisted mode • Mobile-based mode • Standalone mode
SMS	• MT, MO, CB, Text and PDU mode • SMS storage: SIM card • Support transmission of SMS alternatively over CSD or

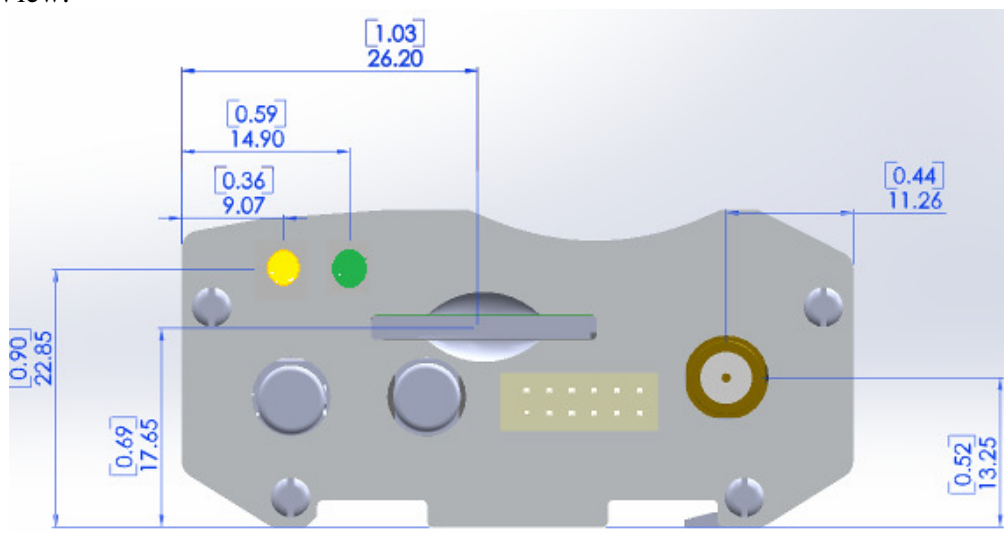
	GPRS. User can choose preferred mode.
Output power	• UMTS 850/1900: 0.25W • UMTS 900/2100: 0.25W • GSM850/GSM900: 2W • DCS1800/PCS1900: 1W
Audio features (optional)	Speech codec modes: • Half Rate (ETS 06.20) • Full Rate (ETS 06.10) • Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) • AMR (WCDMA) • AMR+QCP (GSM) • A5/1, A5/2, and A5/3 ciphering
Serial interface	• Serial Port standard or null modem mode on Serial Port Interface • Serial Port can be used to control module by sending AT command
USB	Support USB2.0 Slave mode
Phonebook management	Support phonebook types: SM, FD, LD, RC, ON, MC
SIM application toolkit	Support SAT class 3, GSM 11.14 Release 98 Support USAT
Real Time Clock	Support RTC
Timer function	Programmable by AT command
Physical characteristics	Size:1.51" x 2.15" Weight:25g
Firmware upgrade	Firmware upgrade over USB interface
PCM	Multiplex on GPIOs. 3 kinds of coding formats: 8 bit (u-law or A-law) and 16 bit (linear)
USB Driver support	• Microsoft Windows 2000/XP/Vista • Windows CE/Mobile • Linux 2.6
Temperature range	• Normal operation temperature: -30°C to +80°C • Storage temperature: -40°C to +90°C
Certification	• RC3000A-A: FCC, PTCRB • RC3000A-E: CE, GCF • RC3000A-J: Telec, JATE

RC3000A-E Mechanical Dimensions

RC3000A-E view:

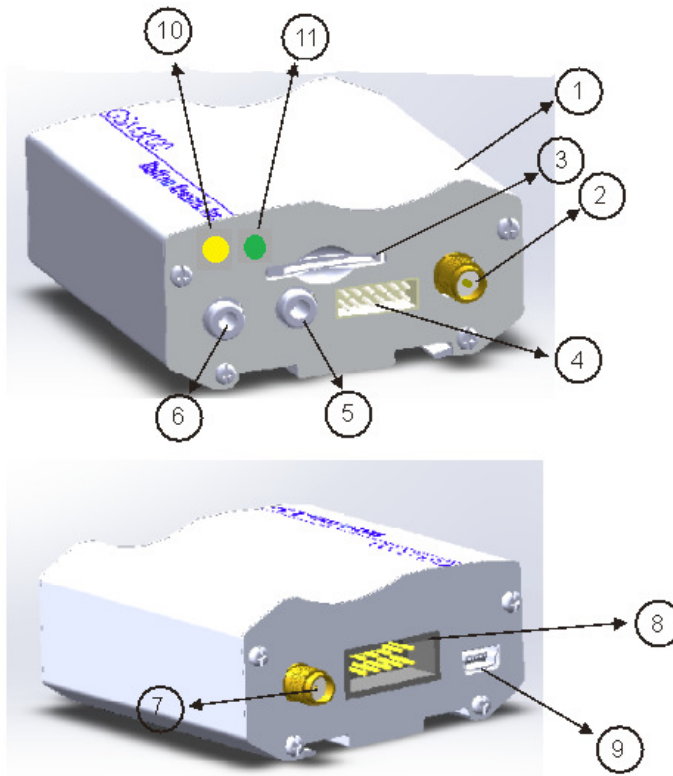


Side View:



Using RC3000A-E connecting to Your System

Product picture and Function

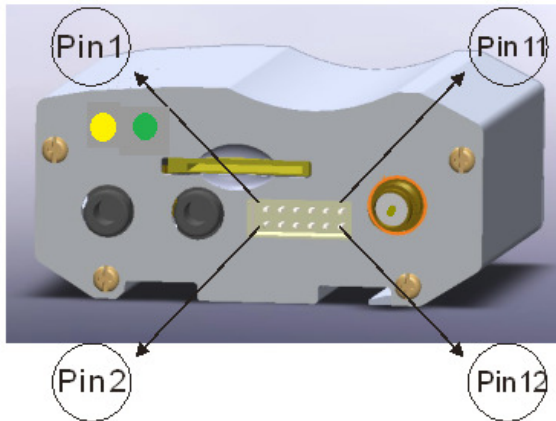


1. RC3000A Module
2. RF RPSMA connector
3. SIM card socket
4. SPI/I2C/GPIO/ADC interface socket (**please see *note1* for pins out orientation**)
5. 3.5mm Ear phone jack
6. 3.5mm Microphone jack
7. GPS RF SMA connector
8. IDC 10 RS232 socket (**please see *note2* for pins out orientation**)
9. Mini USB connector
10. USB_5V power on indicator
11. Network status indicator

Note 1:

SPI/I2C/GPIO/ADC interface socket pins out definition:

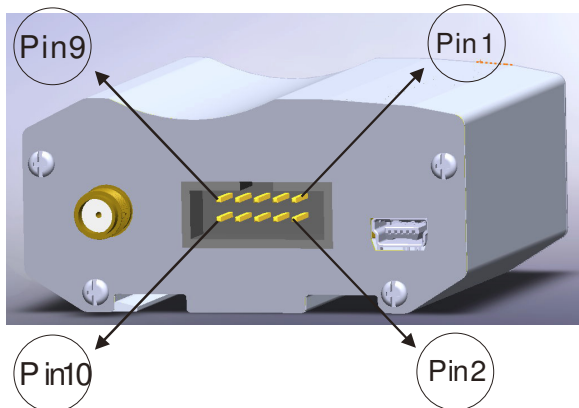
1: ADC_2 2: ADC_1 3: GPIO_1 4: Ground 5: I2C_SDA 6: SPI_CS_N
7: GPIO_2 8: SPI_MOSI_DATA 9: I2C_SCL 10: SPI_MISO_DATA
11: VDD+3.3V 12: SPI_CLK



Note 2:

IDC 10 RS232 socket pins out definition:

1: DCD 2: RXD 3: TXD 4: DTR 5: Ground
6: DSR 7: RTS 8: CTS 9: RI 10: NC



Launch RC3000A-E Product

1. Connect antenna/SIM card/IDC 10 RS232 cable to ① RF RPSMA connector/
③ SIM card socket/ ⑧ IDC 10 RS232 socket accordingly
2. Plug in ⑨ Mini USB connector 5V power
3. ⑪ USB_5V power on indicator (blue LED) will turn on
4. ⑩ Network status indicator (green LED) will be on after blue LED turns on 5 seconds, RC3000AMB is entering power on sequence at this stage.
5. When Docklight screen shows below message which means the UART port is established:

```
6. 2014/1/3 14:51:44.068 [RX] - <NUL> ?<CR><LF>
7. START<CR><LF>
8. <CR><LF>
9. +STIN: 25<CR><LF>
10. <CR><LF>
11. +STIN: 25<CR><LF>
12. <CR><LF>
13. +CPIN: READY<CR><LF>
14. <CR><LF>
15. SMS DONE<CR><LF>
16. <CR><LF>
17. +VOICEMAIL: INIT_STATE, 0, 0<CR><LF>
18. <CR><LF>
19. PB DONE<CR><LF>
```
6. 3G network is connected if the ⑩ Network status indicator (green LED) flashed once/sec
7. Type AT command to control RC3000AMB kit (*please refer to page 36 AT Commands Samples*)
8. Dial SIM card phone number, and type "A" "T" "A" to pick up phone call

```
<CR><LF>
RING<CR><LF>
2014/1/3 15:27:11.249 [TX] - A
2014/1/3 15:27:11.258 [RX] - A
2014/1/3 15:27:11.718 [TX] - T
2014/1/3 15:27:11.728 [RX] - T
2014/1/3 15:27:12.178 [TX] - A
2014/1/3 15:27:12.188 [RX] - A
2014/1/3 15:27:12.959 [TX] - <CR><LF>

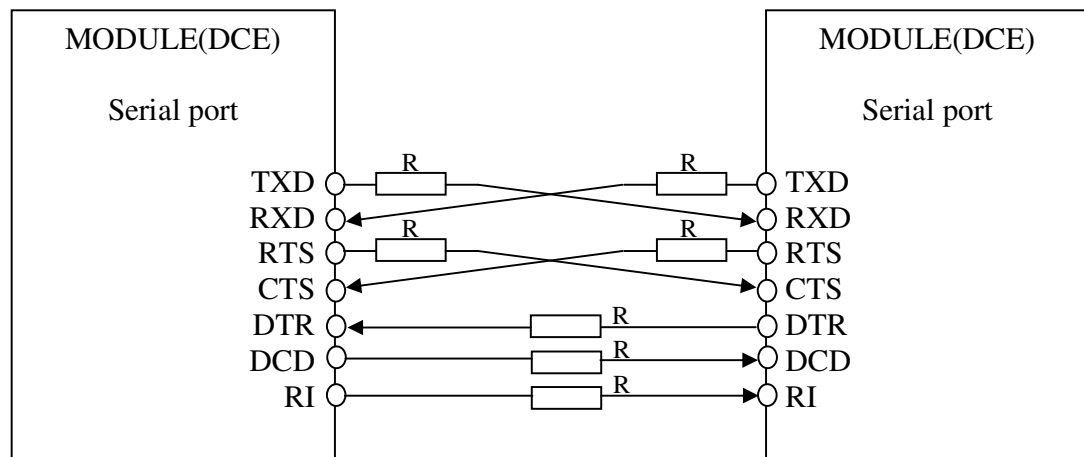
2014/1/3 15:27:12.968 [RX] - <CR>
<CR><LF>
VOICE CALL: BEGIN<CR><LF>
<CR><LF>
OK<CR><LF>
```

Hardware Interface

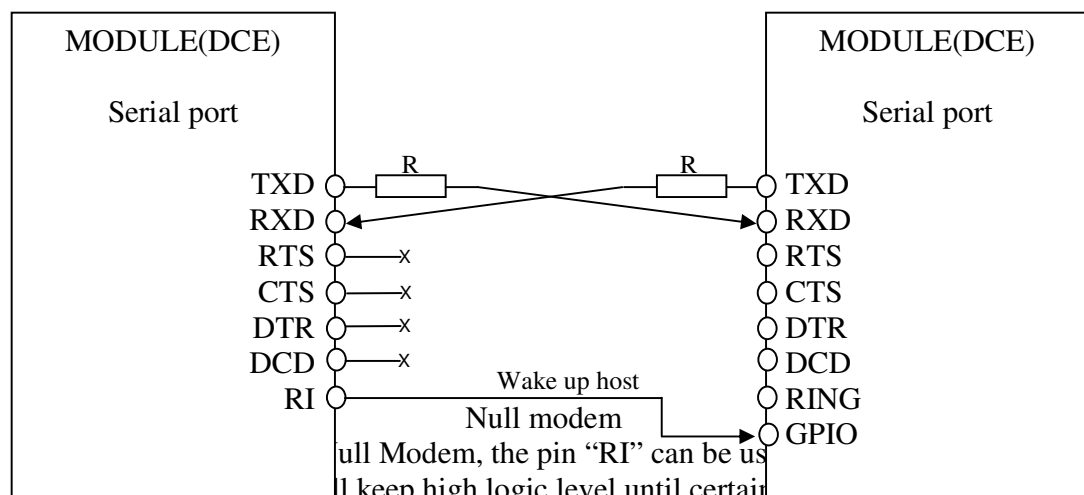
A. UART interface:

The RC3000A-E provides an UART (universal asynchronous serial transmission) port. It consists of a flexible 7-wire serial interface. The module is as the DCE (Data Communication Equipment) and the client PC is as the DTE (Data Terminal Equipment). AT commands are entered and serial communication is performed through UART interface.

The application circuit is in the following figures.



Full modem



receiving SMS, voice call (CSD, video) or URC reporting, then "RI" will change to

low logic level to inform the master (client PC). It will stay low until the master clears the interrupt event with AT command.

If Full Modem is used to establish communication between devices, the pin “RI” is another operation status. Initially it keeps high, when a voice call or CSD call comes, the pin “RI” will change to low for about 5900ms, then it will return to high level for 100ms. It will repeat this procedure until this call is answered or hung up.

Note: RC3000A supports the communication rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 3200000, 3686400, 4000000bps. Default rate is 115200bps.

B. Audio Interface:

RC3000A-E provides two analog signal outputs and one analog input. MIC1P/N is used as microphone, EAR1P/N and SPK_P/N are used as audio output. Regarding audio parameters configuration, please refer to the ATC manual.

There are three audio channels in RC3000A, including speaker output, receiver output and microphone input. SPEAKER circuit in RC3000A is a Class-D amplifier.

Note: RC3000A has integrated MIC bias circuit. There is no need to pull the MIC1P and MIC1N up to the external power, just connect it to microphone. MIC1P and MIC1N must be differential lines.

Main audio parameters can be changed to satisfy users’ requirement. Here primary register parameters and related description are listed. User can adjust them through AT command.

Audio Parameter:

Parameter	Influence to	Range	Gain range	Calculation	AT command
micAmp1	MICP/MICN analogue amplifier gain before ADC	0...1	0...24dB	2 steps	AT+CMICAMP1
txVol	Digital gain of input signal after ADC	0, 1...65535	Mute, -84...+12dB	$20 * \log (txVol/16384)$	AT+CTXVOL
txGain	Digital gain of input signal after summation of sidetone	0, 1...65535	Mute, -84...+12dB	$20 * \log (txGain/16384)$	AT+CTXGAIN

txFilter	Input PCM 13-tap filter parameters, 7 values	0...65535	---	MATLAB calculate	AT+CTXFTR
rxGain	Digital gain of output signal after summation of sidetone	0, 1...65535	Mute, -84...+12dB	$20 * \log (rxGain/16384)$	AT+CRXGAIN
rxVol	Digital Volume of output signal after speech decoder, before summation of sidetone and DAC	-300...300	dbm	-300...300dbm	AT+CLVL AT+CVLVL AT+CRXVOL
stGain	Digital attenuation of sidetone	0, 1...65535	Mute, -96...0dB	$20 * \log (stGain/16384) - 12$	AT+SIDET
rxFilter	Output PCM 13-tap filter parameters, 7 values	0...65535	---	MATLAB calculate	AT+CRXFTR

Note: If users require better experience on audio, users should modify these parameters according to their own electronic and mechanical design.

C. USB Interface:

RC3000A-E module contains an USB interface. This interface is compliant with the USB2.0 specification. The USB2.0 specification requires hosts such as the computer to support all three USB speeds, namely low-speed (1.5Mbps), full-speed (12Mbps) and high-speed (480Mbps). USB charging and USB-OTG is not supported.

Currently RC3000A supports the USB suspend and resume mechanism which can help to save power. If not transaction is on USB bus, RC3000A will enter suspend mode. When some events such as voice call or receiving SMS happen, RC3000A will resume normal mode automatically.

Note: The RC3000A has two kinds of interface (UART and USB) to connect to host CPU. USB interface is mapped to five virtual ports: "SIMTECH USB Modem", "SIMTECH NMEA Device", "SIMTECH ATCOM Device", "SIMTECH Diagnostics interface" and "SIMTECH Wireless Ethernet Adapter".

D. I2C Interface:

I2C is used to communicate with peripheral equipment and can be operated as either a transmitter or receiver, depending on the device function. Use AT Commands “AT+CRIIC and AT+CWIIC” to read/write register values of related peripheral equipment connected with I2C interface.

Both SDA and SCL are bidirectional lines, connected to a positive supply via a pull-up resistor respectively. When the bus is free, both lines are high.

For RC3000A, the data on the I2C bus can be transferred at rates up to 400kbps. The number of peripheral devices connected to the bus is solely dependent on the bus capacitance limit of 400pF. Note that PCB traces length and bending are in users’ control to minimize load capacitance.

Note: I2C_SDA and I2C_SCL have been pulled up with two 2.2kR resistors to 2.6V level in module. So there is no need to pull them up in users’ application circuit.

E. SPI Interface:

SPI interface of RC3000A is master only. It provides a duplex, synchronous, serial communication link with peripheral devices. Its operation voltage is 1.8V, with clock rates up to 26 MHz.

F. GPIO Interface:

RC3000A provides a limited number of GPIO pins. All GPIOs can be configured as inputs or outputs. User can use AT Commands to read or write GPIOs status.

Note-1: If more GPIOs need to be used, users can configure GPIO on other multiple function interfaces, such as PCM.

Note-2: The output driver current of GPIOs is 2mA.

G. PCM Interface:

RC3000A provides hardware PCM interface for external codec. The PCM interface enables communication with an external codec to support hands-free applications. RC3000A PCM interface can be used in two modes: the default mode is auxiliary PCM (8 KHz long sync mode at 128 KHz PCM CLK). In short-sync (primary PCM) mode, RC3000A can be a master or a slave. In long-sync (auxiliary PCM) mode, RC3000A is always a master. RC3000A also supports 3 kinds of coding formats: 8 bits (u-law or A-law) and 16 bits (linear).

Note: PCM interface is multiplexed from GPIO (default setting). The AT command “AT+CPCM” is used to switch between PCM and GPIO functions.

ADC Interface:

RC3000A has a dedicated ADC that is available for digitizing analog signals such as battery voltage and so on; it is on PIN 35 and PIN 36, namely ADC1 and ADC2.

This ADC is 12 bit successive-approximation circuit, and electronic specification is shown in the following table.

Electronic Characteristics:

Specification	Min	Typ	Max	Unit	Comments/Conditions
Resolution		12		Bits	
Differential nonlinearity	-4		+4	LSB	Analog Vdd = ADC reference 2.4MHz sample rate
Integral nonlinearity	-8		+8	LSB	
Gain Error	-2.5		+2.5	%	
Offset Error	-4		+40	LSB	
Input Range	GND		4.4V	V	
Input serial resistance		2		k Ω	Sample and hold switch resistance
Input capacitance		53		pF	
Power-down to wakeup		9.6	19.2	μ s	

User can introduces a signal in the ADC pin directly and use the AT command “AT+CADC” to get the raw data which is between 0 and 4095. The data can be transformed to any type such as voltage, temperature, etc.

Global Positioning System (GPS)

RC3000A merges GPS satellite and network information to provide a high-availability solution that offers industry-leading accuracy and performance. This solution performs well, even in very challenging environment conditions where conventional GPS receivers fail, and provides a platform to enable wireless operators to address both location-based services and emergency mandates.

Technical specification:

Tracking sensitivity	-157dBm
Cold-start sensitivity	-144dBm
Accuracy (Open Sky)	<2m (CEP50)
TTFF (Open Sky)	Hot start <1s Cold start 35s (good signal)/100s (weak signal)
Receiver Type	16-channel, GPS L1 Frequency (1575.42MHz), C/A Code
Update rate	default 1 Hz
GPS data format	NMEA-0183
GPS Current consumption (WCDMA/GSM Sleep mode)	100mA (Total supply current)
GPS antenna	Passive/Active antenna

Note: Performance will vary depending on the environment, antenna type and signal conditions and so on.

RC3000A supports both A-GPS and S-GPS, and then provides three operating modes: mobile-assisted mode, mobile-based mode and standalone mode. A-GPS includes mobile-assisted and mobile-based mode.

In mobile-assisted mode, when a request for position location is issued, available network information is provided to the location server (e.g. Cell-ID) and assistance is requested from the location server. The location server sends the assistance information to the handset. The handset/mobile unit measures the GPS observables and provides the GPS measurements along with available network data (that is appropriate for the given air interface technology) to the location server. The location server then calculates the position location and returns results to the requesting entity.

In mobile-based mode, the assistant data provided by the location server encompasses not only the information required to assist the handset in measuring the satellite signals, but also the information required to calculate the handset's position. Therefore, rather than provide the GPS measurements and available network data back to the location server, the mobile calculates the location on the handset and passes the result to the requesting entity.

In standalone (autonomous) mode, the handset demodulates the data directly from the GPS satellites. This mode has some reduced cold-start sensitivity, and a longer time to first fix as

compared to the assisted modes. However, it requires no server interaction and works out of network coverage.

This combination of GPS measurements and available network information provides:

- High-sensitivity solution that works in all terrains: Indoor, outdoor, urban, and rural
- High availability that is enabled by using both satellite and network information

Therefore, while network solutions typically perform poorly in rural areas and areas of poor cell geometry/density, and while unassisted, GPS-only solutions typically perform poorly indoors. The RC3000A GPS solution provides optimal time to fix, accuracy, sensitivity, availability, and reduced network utilization in both of these environments, depending on the given condition.

Federal Communication Commission Interference Statement

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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

IMPORTANT NOTE:

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Industry Canada statement:

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:

(1) Ce dispositif ne peut causer d'interférences; et(2) Ce dispositif doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This radio transmitter (IC: **2377A-RC3000A**) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device

Cet émetteur radio (IC: **2377A-RC3000A**) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximal admissible indiqué. Types d'antennes ne figurent pas dans cette liste, ayant un gain supérieur au gain maximum indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil

Type	Manufacture	Gain	Connector
Dipole	New Premier	1.5dBi	SMA

Safety Rules and Recommendations

READ CAREFULLY

Be sure the use of this product is allowed in the country. It is responsibility of the user to enforce the country regulation and the specific environment regulation. The product has to supply a stabilized voltage source and the wiring may have to conform to local security and fire prevention regulations.

The use of this product may be dangerous and has to avoid in the following areas:

- Where it can interfere with other electronic devices in environment such as hospitals, airports, aircrafts, etc.
- Where there is risk of explosion such as gasoline stations, oil refineries, etc.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. The same cautions have to be taken for the SIM card, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Antenna Requirements



WARNING: Using an antenna other than the type approved for use with this product requires the finished product, with the module and new antenna type installed to be tested to comply with all sections of FCC Part 15 requirements!

Every module has to be equipped with a proper antenna with specific characteristics. The antenna for RC3000A must meet the following requirements:

ANTENNA REQUIREMENTS	
Frequency Range	Depending by frequency band(s) provided by the network operator, the customer must use the most suitable antenna for that/those band(s).
Bandwidth	80 MHz in EGSM 900, 70 MHz if GSM 850, 170 MHz in DCS, 140 MHz PCS band
Gain	Gain < 1.5dBi
Impedance	50 ohm
Input Power	> 2 W peak power
VSWR Absolute max	<= 10:1
VSWR Recommend	<= 2:1

This device is to be used only for mobile and fixed application. End-users must be provided with transmitter operation conditions for satisfying RF exposure compliance. OEM integrators must ensure that the end user has no manual instructions to remove or install RC3000A modem. Antennas used for this OEM module must not exceed 3dBi gain for mobile and fixed operating configurations.

GSM Antenna – Installation Guidelines

- Install the antenna in a place covered by the GSM signal. The Antenna must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter. In case of this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.
- Due to the RC3000A antenna characteristics to environmental sensitivity, the antennas location should consider that the performance could be affected by a building's characteristics or other obstructions that may interfere with the modules ability to make a strong connection to the intended cellular signal provider.

- The Antenna must not be co-located or operated in conjunction with any other antenna or transmitter.
- Antenna shall not be installed inside metal cases.
- Antenna shall be installed also according Antenna manufacturer instructions.

SIM (Subscriber Identity Module) Card Information

To access a cellular network you must purchase a compatible SIM card. The GSM modules have a SIM card slot located on the bottom of the PCB. The SIM card has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Please read the SIM manufactures instructions prior to installing.

Do not insert or remove the SIM card when the product is in power saving mode.

The SIM interface complies with the GSM Phase 1 specification as well as GSM Phase 2+ specification for FAST 64 kbps SIM card. The module supports both 1.8Volt and 3 Volt SIM cards. The SIM card is enabled with the AT+CSDT command.

Introduction to Modem Operation-The AT Command Set

RC3000A modules are used to originate or answer telephone calls and establish links with other devices for the purpose of transmitting voice, data, or fax information between two locations. Please refer to the SIM900 AT Command Manual for complete AT command listings and information

After installation, you will now be able to communicate with the modem and establish connections with remote devices. Controlling the modem functions is accomplished by using “AT” commands. These commands are used to instruct the modem to perform functions such as dialing or to answers calls. These commands are normally automatically issued by communication software. However for some applications, custom software may have to be written due to the absence of a normal operating system such as DOS or Windows.

NOTE: The first AT command issued must be Upper Case AT. Subsequent AT commands can be either Upper Case or Lower Case.

The modem will automatically accept and process “AT” commands at most standard DTE (Data Terminal Equipment) speeds and parity settings. For each command issued, the modem will respond with a result code informing you of the modem’s status. The format of a basic “AT” command and result code is as follows:

AT <Command> <CR>

OK

AT = ATtention what follows is a command

<Command> = any valid command

<CR> = Carriage Return or Enter Key

OK = Result code meaning: the modem has accepted the command

AT Commands Samples

A. General Commands

	Syntax	Expect Result	Description
1	ATI		Display product identification information.
2	AT+CGMI		Request manufacturer identification.
3	AT+CGMM		Request model identification.
4	AT+CGMR		Request revision identification.
5	AT+CGSN		Request product serial number

			identification.
6	AT+CSCS		Select TE character set.
7	AT+CIMI		Request international mobile subscriber identity.
8	AT+GCAP		Request overall capabilities.
9	AT+CATR		Configure URC destination interface.
10	A/		Repeat last command.
11	AT+CFGRI		Indicate RI when using URC.

B. Call Control Commands

	Syntax	Expect Result	Description
1	AT+CSTA		Select type of address.
2	AT+CMOD		Call mode.
3	ATD		Dial command.
4	ATD><mem><n>		Originate call from specified memory.
5	ATD><n>		Originate call from active memory (1).
6	ATD><str>		Originate call from active memory (2).
7	ATA		Call answer.
8	+++		Switch from data mode to command mode.
9	ATO		Switch from command mode to data mode.
10	AT+CVHU		Voice hang up control.
11	ATH		Disconnect existing call.
12	AT+CHUP		Hang up call.
13	AT+CBST		Select bearer service type.
14	AT+CRLP		Radio link protocol.
15	AT+CR		Service reporting control.
16	AT+CEER		Extended error report.
17	AT+CRC		Cellular result codes.
18	AT+VTS		DTMF and tone generation.
19	AT+CLVL		Loudspeaker volume level.
20	AT+VMUTE		Speaker mute control.
21	AT+CMUT		Microphone mute control.
22	AT+AUTOANSWER		Automatic answer quickly.
23	ATS0		Automatic answer.
24	AT+CALM		Alert sound mode.
25	AT+CRSL		Ringer sound level.
26	AT+CSDVC		Switch voice channel device.
27	AT+CPTONE		Play tone.

28	AT+CPCM		External PCM codec mode configuration.
29	AT+CPCMFMT		Change the PCM format.
30	AT+CPCMREG		Control PCM data transfer by diagnostics port.
31	AT+VTD		Tone duration.
32	AT+CODEC		Set audio codec mode.
33	AT+CVOC		Get the current vocoder capability in a call.

C. SMS Commands

	Syntax	Expect Result	Description
1	+CMS ERROR		Message service failure result code.
2	AT+CSMS		Select message service.
3	AT+CPMS		Preferred message storage.
4	AT+CMGF		Select SMS message format.
5	AT+CSCA		SMS service centre address.
6	AT+CSCB		Select cell broadcast message indication.
7	AT+CSDH		Show text mode parameters.
8	AT+CNMA		New message acknowledgement to ME/TA.
9	AT+CNMI		New message indications to TE.
10	AT+CMGL		List SMS messages from preferred store.
11	AT+CMGR		Read message.
12	AT+CMGS		Send message.
13	AT+CMSS		Send message from storage.
14	AT+CMGW		Write message to memory.
15	AT+CMGD		Delete message.
16	AT+CSMP		Set text mode parameters.
17	AT+CMGRO		Read message only.
18	AT+CMGMT		Change message status.
19	AT+CMVP		Set message valid period.
20	AT+CMGRD		Read and delete message.
21	AT+CMGSO		Send message quickly.
22	AT+CMGWO		Write message to memory quickly.
23	AT+CMGSEX		Send message.
24	AT+CMGENREF		Generate a new message reference.
25	AT+CMSSEX		Send multi messages from storage.
26	AT+CMSSEXM		Send message from storage to multi DA.

D. Network Service Related Commands

	Syntax	Expect Result	Description
1	AT+CREG		Network registration.
2	AT+COPS		Operator selection.
3	AT+CLCK		Facility lock.
4	AT+CPWD		Change password.
5	AT+CLIP		Calling line identification presentation.
6	AT+CLIR		Calling line identification restriction.
7	AT+COLP		Connected line identification presentation.
8	AT+CCUG		Closed user group.
9	AT+CCFC		Call forwarding number and conditions.
10	AT+CCWA		Call waiting.
11	AT+CHLD		Call related supplementary services.
12	AT+CUSD		Unstructured supplementary service data.
13	AT+CAOC		Advice of charge.
14	AT+CSSN		Supplementary service notifications.
15	AT+CLCC		List current calls.
16	AT+CPOL		Preferred operator list.
17	AT+COPN		Read operator names.
18	AT+CNMP		Preferred mode selection.
19	AT+CNBP		Preferred band selection.
20	AT+CNAOP		Acquisitions order preference.
21	AT+CNSDP		Preferred service domain selection.
22	AT+CPSI		Inquiring UE system information.
23	AT+CNSMOD		Show network system mode.
24	AT+CTZU		Automatic time and time zone update.
25	AT+CTZR		Time and time zone reporting.
26	AT+CCINFO		Show cell system information.
27	AT+CSCHN		Show cell channel information.
28	AT+CSRP		Show serving cell radio parameter.
29	AT+CRUS		Show cell set system information.
30	AT+CPLMNWLST		Manage PLMNs allowed by customer.
31	AT+CPASSMGR		Manage password.
32	AT+CNSVSQ		Network band scan quickly.
33	AT+CNSVS		Network full band scan in string format.

34	AT+CNSVN		Network full band scan in numeric format.
35	AT+CNSVUS		Network band scan by channels in string.
36	AT+CNSVUN		Network band scan by channels in numeric.
37	AT+CCGMDF		Enable single mode in RAT balancing mode.
38	AT+CPLMNPASS		Manage PLMN filter password.
39	AT*CNTI		Query Network Mode.

E. Mobile Equipment Control and Status Commands

	Syntax	Expect Result	Description
1	+CME ERROR		Mobile Equipment error result code.
2	AT+CMEE		Report mobile equipment error.
3	AT+CPAS		Phone activity status.
4	AT+CFUN		Set phone functionality.
5	AT+CPIN		Enter PIN.
6	AT+CSQ		Signal quality.
7	AT+AUTOCSQ		Set CSQ report.
8	AT+CACM		Accumulated call meter.
9	AT+CAMM		Accumulated call meter maximum.
10	AT+CPUC		Price per unit and currency table.
11	AT+CPOF		Control phone to power down.
12	AT+CCLK		Real time clock.
13	AT+CRFEN		RF check at initialization.
14	AT+CRESET		Reset ME.
15	AT+SIMEI		Set module IMEI.
16	AT+DSWITCH		Change diagnostics port mode.
17	AT+CDELTA		Write delta package to FOTA partition.
18	AT+CDIPR		Set UART baud rate.
19	AT+CUDIAG		Switch UART from AT service to DIAG service.
20	AT+CUDLOADS		Switch to UART download mode.

F. SIMCard Related Commands

	Syntax	Expect Result	Description
1	AT+CICCID		Read ICCID in SIM card.
2	AT+CSIM		Generic SIM access.

3	AT+CRSM		Restricted SIM access.
4	AT+SPIC		Time remain to input SIM PIN/PUK
5	AT+CSPN		Get service provider name from SIM.
6	AT+CRFSIM		Reinitialize the SIM card.

G. Hardware Related Commands

	Syntax	Expect Result	Description
1	AT+CTXGAIN		Set TX gain.
2	AT+CRXGAIN		Set RX gain.
3	AT+CTXVOL		Set TX volume.
4	AT+CRXVOL		Set RX volume.
5	AT+CTXFTR		Set TX filter.
6	AT+CRXFTR		Set RX filter.
7	AT+CVALARM		Low voltage Alarm.
8	AT+CRIIC		Read values from register of IIC device.
9	AT+CWIIC		Write values to register of IIC device.
10	AT+CVAUXS		Set state of the pin named VREG_AUX1.
11	AT+CVAUXV		Set voltage value of the pin named VREG_AUX1.
12	AT+CGPIO		Set Trigger mode of interrupt GPIO.
13	AT+CGDRT		Set the direction of specified GPIO.
14	AT+CGSETV		Set the value of specified GPIO.
15	AT+CGGETV		Get the value of specified GPIO.
16	AT+CGISR		Set interrupt trigger condition and start such interruption.
17	AT+CADC		Read ADC value.
18	AT+CMICAMP1		Set value of micamp1.
19	AT+CVLVL		Set value of sound level.
20	AT+SIDET		Digital attenuation of sidetone.
21	AT+CECM		Enable/Disable Echo Canceller.
22	AT+CNSM		Enable/Disable Noise Suppression.
23	AT+CECSET		Adjust the effect for the given echo cancellation mode.
24	AT+CRIRS		Reset RI pin of serial port.
25	AT+CSUART		Switch UART line mode.
26	AT+CMUX		Enable the multiplexer over the UART.
27	AT+CMUXSRVPORT		Configure the specific virtual com port to the appropriate service.

28	AT+CDCDMD		Set DCD pin mode.
29	AT+CDCDVL		Set DCD pin high-low in GPIO mode.
30	AT+CBC		Battery charge.
31	AT+CDTRISRMD		Configure the trigger condition for DTR's interrupt.
32	AT+CDTRISRS		Enable/Disable the pin of DTR's awakening function.
33	AT+CGFUNC		Enable/Disable the function for the special GPIO.
34	AT+CGWHOST		Reset GPIO 41 to high level.
35	AT+CGWISRMD		Configure the trigger condition for GPIO43's.
36	AT+CKGSWT		Switch pins' function.
37	+KEY		Keypad result code.
38	AT+CUSBSPD		Switch USB high or full speed.
39	AT+CLEDITST		Adjust the LED's intensity.
40	AT+CADCA		Read the value from the second ADC.
41	AT+CAPWRON		Auto power on setting.
42	AT+CAPWROFF		Auto power off setting.
43	AT+CBVTBP		Set 800-850 band indicator.
44	AT+CRFOP		Set the value of RF output power.

H. SPI Related Commands

	Syntax	Expect Result	Description
1	AT+CSPISETCLK		SPI clock rate setting.
2	AT+CSPISETCS		SPI chip select setting.
3	AT+CSPISETF		SPI clock frequency setting.
4	AT+CSPISETPARA		SPI transfer parameters setting.
5	AT+CSPIW		Write data to SPI.
6	AT+CSPIR		Read data from SPI.

I. Phonebook Related Commands

	Syntax	Expect Result	Description
1	AT+CNUM		Subscriber number.
2	AT+CPBS		Select phonebook memory storage.
3	AT+CPBR		Read phonebook entries.
4	AT+CPBF		Find phonebook entries.
5	AT+CPBW		Write phonebook entry.

6	AT+CEMNLIST		Set the list of emergency number.
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J. File System Related Commands

	Syntax	Expect Result	Description
1	AT+FSCD		Select directory as current directory.
2	AT+FSMKDIR		Make new directory in current directory.
3	AT+FSRMDIR		Delete directory in current directory.
4	AT+FSLS		List directories/files in current directory.
5	AT+FSDEL		Delete file in current directory.
6	AT+FSRENAME		Rename file in current directory.
7	AT+FSATTRI		Request file attributes.
8	AT+FSMEM		Check the size of available memory.
9	AT+FSLOCA		Select storage place.
10	AT+FSCOPY		Copy an appointed file.

K. File Transmission Related Commands

	Syntax	Expect Result	Description
1	AT+CTXFILE		Select file transmitted to PC host.
2	AT+CRXFILE		Set name of file received from PC host.
3	AT+CMWAIT		Config the waiting seconds before xmodem start receiving.
4	AT+CFTRANRX		Transfer a file to EFS.
5	AT+CFTRANRX		Transfer a file from EFS to external host.

L. V24-V25 Commands

	Syntax	Expect Result	Description
1	AT+IPR		Set local baud rate temporarily.
2	AT+IPREX		Set local baud rate permanently.
3	AT+ICF		Set control character framing.
4	AT+IFC		Set local data flow control.
5	AT&C		Set DCD function mode.
6	ATE		Enable command echo.

7	AT&V		Display current configuration.
8	AT&D		Set DTR function mode.
9	AT&S		Set DSR function mode.
10	ATV		Set result code format mode.
11	AT&F		Set all current parameters to manufacturer defaults.

M. Commands for Packet Domain

	Syntax	Expect Result	Description
1	AT+CGDCONT		Define PDP Context.
2	AT+CGDSCONT		Define Secondary PDP Context.
3	AT+CGTFT		Define Secondary PDP Context.
4	AT+CGQREQ		Quality of service profile (requested).
5	AT+CGEQREQ		3G quality of service profile (requested).
6	AT+CGQMIN		Quality of service profile (minimum acceptable).
7	AT+CGEQMIN		3G quality of service profile (minimum acceptable).
8	AT+CGATT		Packet domain attach or detach.
9	AT+CGACT		PDP context activate or deactivate.
10	AT+CGDATA		Enter data state.
11	AT+CGPADDR		Show PDP address.
12	AT+CGCLASS		GPRS mobile station class.
13	AT+CGEREP		GPRS event reporting.
14	AT+CGREG		GPRS network registration status.
15	AT+CGSMS		Select service for MO SMS messages.
16	AT+CGAUTH		Set type of authentication for PDP-IP connections of GPRS.

N. TCP/IP Related Commands

	Syntax	Expect Result	Description
1	AT+CGSOCKCONT		Define socket PDP context.
2	AT+CSOCKSETPN		Set active PDP context's profile number.
3	AT+CSOCKAUTH		Set type of authentication for PDP-IP connections of socket.
4	AT+CGSOCKQREQ		Quality of service profile

			(requested).
5	AT+CGSOCKEQREQ		3G quality of service profile (requested).
6	AT+CGSOCKQMIN		Quality of service profile (minimum acceptable).
7	AT+CGSOCKEQMIN		3G quality of service profile (minimum acceptable).
8	AT+IPADDR		Inquire socket PDP address.
9	AT+NETOPEN		Open socket.
10	AT+TCPCONNECT		Establish TCP connection.
11	AT+TCPWRITE		Send TCP data.
12	AT+UDPSSEND		Send UDP data.
13	AT+SERVERSTART		Startup TCP server.
14	AT+LISTCLIENT		List all of clients' information.
15	AT+CLOSECLIENT		Disconnect specified client.
16	AT+ACTCLIENT		Activate specified client.
17	AT+NETCLOSE		Close socket.
18	AT+CIPHEAD		Add an IP head when receiving data.
19	AT+CIPSRIP		Set whether display IP address and port of sender when receiving data.
20	AT+CIPCCFG		Configure parameters of socket.
21	AT+CIOPEN		Establish connection in multi-client mode.
22	AT+CIPSEND		Send data in multi-client mode.
23	AT+CIPCLOSE		Close connection in Multi-client mode.
24	AT+CDNSGIP		Query the IP address of given domain name.
25	AT+CDNSGHNNAME		Query the domain name of given IP address.
26	AT+CIPMODE		Select TCPIP application mode.
27	AT+CIPSTAT		Statistic the total size of data sent or received.
28	AT+CTCPFIN		Wait for TCP_FIN in TCP_FINWAIT2 state.
29	AT+CENDUPPDP		Enable duplicate PDP activation.
30	AT+CTCPKA		Set TCP_KEEP_ALIVE parameters.
31	AT+CPING		Ping some destination address.
32	AT+CPINGSTOP		Stop an ongoing ping session.
33	AT+CTEUTP		Set unknown incoming TCP packet echo.
34	AT+CUPURE		Set UDP port unreachable ICMP echo.
35	AT+CINICMPALLOW		Preferred ICMP filter.
36	AT+TCPCLOSE		Close the TCP connection.
37	Information elements		

	related to TCP/IP		
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O. SIM Application Toolkit (SAT) Commands

	Syntax	Expect Result	Description
1	AT+STIN		SAT Indication.
2	AT+STGI		Get SAT information.
3	AT+STGR		SAT respond.
4	AT+STK		STK switch.

P. Internet Service Commands

P-1 Simple Mail Transfer Protocol Service

	Syntax	Expect Result	Description
1	AT+SMTPSRV		SMTP server address and port number.
2	AT+SMTPAUTH		SMTP server authentication.
3	AT+SMTPFROM		Sender address and name.
4	AT+SMTPRCPT		Recipient address and name (TO/CC/BCC).
5	AT+SMTPSUB		E-mail subject.
6	AT+SMTPBODY		E-mail body.
7	AT+SMTPBCH		E-mail body character set.
8	AT+SMTPFILE		Select attachment.
9	AT+SMTPSEND		Initiate session and send e-mail.
10	AT+SMTPSTOP		Force to stop sending e-mail.

P-2 Post Office Protocol 3 Service

	Syntax	Expect Result	Description
1	AT+POP3SRV		POP3 server and account.
2	AT+POP3IN		Log in POP3 server.
3	AT+POP3NUM		Get e-mail number and total size.
4	AT+POP3LIST		List e-mail ID and size.
5	AT+POP3HDR		Get e-mail header.
6	AT+POP3GET		Get an e-mail from POP3 server.
7	AT+POP3DEL		Mark an e-mail to delete from POP3 server.
8	AT+POP3OUT		Log out POP3 server.
9	AT+POP3STOP		Force to stop receiving e-mail/close

			the session.
10	AT+POP3READ		Read an e-mail from file system.

P-3 File Transfer Protocol Service

	Syntax	Expect Result	Description
1	AT+CFTPPORT		Set FTP server port.
2	AT+CFTPMODE		Set FTP mode.
3	AT+CFTPTYPE		Set FTP type.
4	AT+CFTPSERV		Set FTP server domain name or IP address.
5	AT+CFTPUN		Set user name for FTP access.
6	AT+CFTPPW		Set user password for FTP access.
7	AT+CFTPGETFILE		Get a file from FTP server to EFS.
8	AT+CFTPPUTFILE		Put a file in module EFS to FTP server.
9	AT+CFTPGET		Get a file from FTP server and output it from SIO.
10	AT+CFTPPUT		Put a file to FTP server.
11	AT+CFTPLIST		List the items in the directory on FTP server.
12	AT+CFTPMKD		Create a new directory on FTP server.
13	AT+CFTPRMD		Delete a directory on FTP server.
14	AT+CFTPDELE		Delete a file on FTP server.
15	Unsolicited FTP Codes (Summary of CME ERROR Codes)		

P-4 Hyper Text Transfer Protocol Service

	Syntax	Expect Result	Description
1	AT+CHTTPACT		Launch a HTTP operation.
2	Unsolicited HTTP codes (summary of CME ERROR codes)		

P-5 Secure Hyper Text Transfer Protocol Service

	Syntax	Expect Result	Description
1	AT+CHTTPSSTART		Acquire HTTPS protocol stack.
2	AT+CHTTPSSTOP		Release HTTPS protocol stack.
3	AT+CHTTPSOPSE		Open HTTPS session.
4	AT+CHTTPSCLSE		Close HTTPS session.
5	AT+CHTTPSSEND		Send HTTPS request.
6	AT+CHTTPSRECV		Receive HTTPS response.

7	Unsolicited HTTPS Codes		
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P-6 Secure File Transfer Protocol Service

	Syntax	Expect Result	Description
1	AT+CFTPSSTART		Acquire FTPS protocol stack.
2	AT+CFTPSSSTOP		Stop FTPS protocol stack.
3	AT+CFTPSLOGIN		Login the FTPS server.
4	AT+CFTPSLOGOUT		Logout the FTPS server.
5	AT+CFTPSMKD		Create a new directory on FTPS server.
6	AT+CFTPSRMD		Delete a directory on FTPS server.
7	AT+CFTPSDELE		Delete a file on FTPS server.
8	AT+CFTPSCWD		Change the current directory on FTPS server.
9	AT+CFTPSPWD		Get the current directory on FTPS server.
10	AT+CFTPSTYPE		Set the transfer type on FTPS server.
11	AT+CFTPSLIST		List the items in the directory on FTPS server.
12	AT+CFTPSGETFILE		Get a file from FTPS server to EFS.
13	AT+CFTPSPUTFILE		Put a file in module EFS to FTPS server.
14	AT+CFTPSGET		Get a file from FTPS server to serial port.
15	AT+CFTPSPUT		Put a file to FTPS server.
16	AT+CFTPS SINGLEIP		Set FTPS data socket address type.
17	Unsolicited FTPS Codes		

P-7 HTTP Time Synchronization Service

	Syntax	Expect Result	Description
1	AT+CHTPSERV		Set HTP server info.
2	AT+CHTPUPDATE		Updating date time using HTP protocol.
3	Unsolicited HTP Codes		

P-8 Common Secure Socket Layer Service

	Syntax	Expect Result	Description
1	AT+CSSLSTART		Acquire common SSL stack.

2	AT+CSSLSTOP		Stop common SSL stack.
3	AT+CSSLOPEN		Connect to server using SSL.
4	AT+CSSLCONT		Continue to connect to server in ALERT state.
5	AT+CSSLCLOSE		Disconnect from server.
6	AT+CSSLSEND		Send data to server.
7	AT+CSSLSET		Set the parameter of common SSL function.
8	AT+CSSLMODE		Set the mode of common SSL function.
9	Unsolicited common SSL Codes		

Q. MMS Commands

	Syntax	Expect Result	Description
1	AT+CMMSURL		Set the URL of MMS center.
2	AT+CMMSPROTO		Set the protocol parameters and MMS proxy.
3	AT+CMMSSENDCFG		Set the parameters for sending MMS.
4	AT+CMMSEDIT		Enter or exit edit mode.
5	AT+CMMSDOWN		Download the file data or title from UART.
6	AT+CMMSDELFILE		Delete a file within the editing MMS body.
7	AT+CMMSSEND		Start MMS sending.
8	AT+CMMSRECP		Add recipients.
9	AT+CMMSCC		Add copy-to recipients.
10	AT+CMMSBCC		Add secret recipients.
11	AT+CMMSDELRECP		Delete recipients.
12	AT+CMMSDELCC		Delete copy-to recipients.
13	AT+CMMSDELBCC		Delete secret recipients.
14	AT+CMMSRECV		Receive MMS.
15	AT+CMMSVIEW		View information of MMS in box or memory.
16	AT+CMMSREAD		Snatch the given file in MMS.
17	AT+CMMSASNATCH		Save the MMS to a mail box.
18	AT+CMMSSAVE		Delete MMS in the mail box.
19	AT+CMMSDELETE		Delete MMS in the mail box.
20	AT+CMMSYSSET		Configure MMS transferring parameters.
21	AT+CMMSINCLN		Increase the length of audio/video attachment header.

22	AT+CMMSUA		Set the User-Agent of MMS packet.
23	AT+CMMSPROFILE		Set the User-Agent profile of MMS packet.
24	Supported Unsolicited Result Codes in MMS		
24.1	Indication of Sending/Receiving MMS		
24.2	Summary of CME ERROR Codes for MMS		

R. CSCRIPT Commands

	Syntax	Expect Result	Description
1	AT+CSCRIPTSTART		Start running a LUA script file.
2	AT+CSCRIPTSTOP		Stop the current running LUA script.
3	AT+CSCRIPTCL		Compile a LUA script file.
4	AT+CSCRIPTPASS		Set the password for +CSCRIPTCL
5	AT+CSCRIPTCMD		Send data to the running LUA script.
6	AT+PRINDIR		Set the value of LUA printdir function.
7	Unsolicited CSCRIPT codes		

S. GPS Related Commands

	Syntax	Expect Result	Description
1	AT+CGPS		Start/stop GPS session.
2	AT+CGPSINFO		Get GPS fixed position information.
3	AT+CGPSCOLD		Cold start GPS.
4	AT+CGPSHOT		Hot start GPS.
5	AT+CGPSSWITCH		Configure output port for NMEA sentence.
6	AT+CGPSURL		Set AGPS default server URL.
7	AT+CGPSSSL		Set AGPS transport security.
8	AT+CGPSAUTO		Start GPS automatic.
9	AT+CGPSNMEA		Configure NMEA sentence type.
10	AT+CGPSSMD		Configure AGPS MO method.
11	AT+CGPSFTM		Start GPS test mode.
12	AT+CGPSDEL		Delete the GPS information.
13	AT+CGPSNOTIFY		LCS respond positioning request.

14	AT+CGPSXE		Enable/disable GPS XTRA function.
15	AT+CGPSXD		Download XTRA assistant file.
16	AT+CGPSXDAUTO		Download XTRA assistant file automatically.
17	AT+CGPSINFOCFG		Report GPS NMEA-0183 sentence.
18	AT+CGPSPMD		Configure positioning mode.
19	AT+CGPSMSB		Configure based mode switch to standalone.
20	AT+CGPSHOR		Configure positioning desired accuracy.
21	Unsolicited XTRA download Codes		
22	Cell Assistant Location		
22.1	AT+CASSISTLOC		Start/stop assist location.
22.2	AT+CASSISTLOCFORMAT		Set assist location report information's format.
22.3	AT+CASSISTLOCRTYTIMES		Set retry times.
22.4	AT+CASSISTLOC MODE		Set assist location mode.

T. Voice Mail Related Commands

	Syntax	Expect Result	Description
1	AT+CSVM		Subscriber number.
2	Indication of Voice Mail		

U. EONS Related AT Commands

	Syntax	Expect Result	Description
1	Indication of EONS		

V. OTAD Commands

	Syntax	Expect Result	Description
1	AT+COTADPHONE NUMBER		Modify OTAD phone number.

W. Result codes

	Syntax	Expect Result	Description
1	Verbose code and numeric code		
2	Response string of AT+CEER		

Limited Warranty

Warranty Coverage and Duration

Radicom Research, Inc. ("RRI") warrants to the original purchaser its RRI-manufactured products ("Product") against defects in material and workmanship under normal use and service for a period of one year from the date of delivery.

During the applicable warranty period, at no charge, RRI will, at its option, either repair, replace or refund the purchase price of this Product, provided it is returned in accordance with the terms of this warranty to RRI. Repair, at the option of RRI, may include the replacement of parts, boards or other components with functionally equivalent reconditioned or new parts, boards or other components. Replaced parts, boards or other components are warranted for the balance of the original applicable warranty period. All replaced items shall become the property of RRI.

RRI MAKES NO GUARANTEE OR WARRANTY THAT THE PRODUCT WILL PREVENT OCCURRENCES, OR THE CONSEQUENCES THEREOF, WHICH THE PRODUCT IS DESIGNED TO DETECT.

This expressed limited warranty is extended by RRI to the original end-user purchaser only, and is not assignable or transferable to any other party. This is the complete warranty for the Product manufactured by RRI, and RRI assumes no obligation or liability for additions or modifications to this warranty. In no case does RRI warrant the installation, maintenance or service of the Product.

RRI is not responsible in any way for any ancillary equipment not furnished by RRI that is attached to or used in connection with the Product, or for operation of the Product with any ancillary equipment, and all such equipment is expressly excluded from this warranty. Because of wide variations in topographical and atmospheric conditions, which may require availability of repeater stations or of particular radio frequencies, RRI assumes no liability for range, coverage or suitability of the Product for any particular application. Buyer acknowledges that RRI does not know a particular purpose for which buyer wants the Product, and that buyer is not relying on RRI's skill and judgment to select or furnish suitable goods.

What this Warranty does NOT Cover:

- (a) Defects or damage resulting from use of the Product in other than its normal and customary manner.

- (b) Defects or damage from misuse, accident or neglect.
- (c) Defects of damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment.
- (d) Disassembly or repair of the Product in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim.
- (e) Any Product that has had its serial number or date code removed or made illegible.

How to Receive Warranty Service:

To obtain warranty service, contact RRI by phone (408)-383 9006 for RMA Department or email to rma@radi.com for an RMA (Return Merchandise Authorization) number. Deliver or send the Product, transportation and insurance prepaid to RRI, with the RMA number clearly marked on the outside of the package.

General Provision

This warranty sets forth the full extent of RRI's responsibilities regarding the Product. Repair, replacement or refund of the purchase price, at RRI's option, is the exclusive remedy.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY APPLICABLE IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTY OF MERCHANTABILITY, ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. TO THE FULLEST EXTENT PERMITTED BY LAW, RRI DISCLAIMS ANY LIABILITY FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVING OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE OR FAILURE OF SUCH PRODUCT.

Contacting Radicom Research

If more information or technical support is needed, please contact us:



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San Jose, CA. 95131

Telephone: (408) 383 9006

Fax: (408) 383 9007

or

e-mail: sales@radi.com

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