RM6000 GPRS Modem / Router

User Manual

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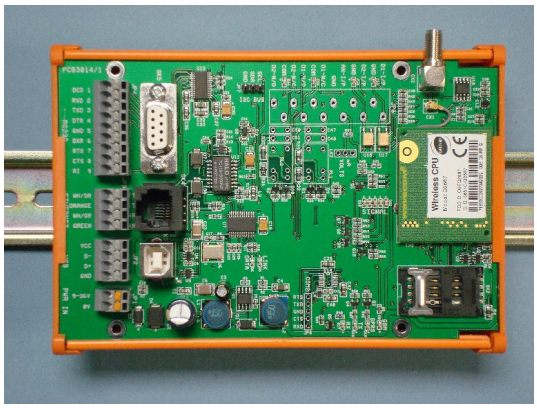
Section 1

Introduction

High performance secure wireless communication over the GSM cellular network. Connects remote sites and equipment to the internet or point-to-point, m2m.



Features

- Quad band radio (850/900/1800/1900MHz)
- GSM / GPRS class B, class 10
- Protocols: UDP, TCP, IP, PPP, ARP, PING
- Modes: FTP, HTTP, SMTP, SNMP, POP3
- NAT Routing, DHCP
- Interfaces: Ethernet, RS232, USB
- On-board I/O (expandable)
- Configuration via USB
- Point-to-point, Transparent Tunnelling
- GPRS 'Always On', maintained connection
- Dynamic DNS (DDNS)
- DIN rail or IP67 enclosure option
- 9 to 36V dc power input

Overview

The RM6000 GPRS modem/router from RDT, uses a GSM/GPRS class B, class 10 Quad band radio, allowing operation on any of the major networks. The modem provides communications to remote devices over the GSM cellular network, where cabling or wire-line connections are difficult or in some cases, impossible.

The RM6000 offers connectivity via Ethernet or RS232 serial ports with a USB port for programming. In addition, there is direct interfacing to sensors and alarms via the on-board I/O, which is expandable with an optional external I/O card.

The modems offer a number of different operational modes as well as many user programmable features. The modems are supplied with RDT's user-friendly configuration software, enabling easy programming, set-up and monitoring, from any windows based PC or laptop. Operating modes include: internet gateway, client-server, point-to-point as well as all the standard GSM functions such as, SMS, email & FTP. For point-to-point applications, we offer a number of options for maintaining the GPRS link ('always on'), including a regular heartbeat, inactivity timer and ping.

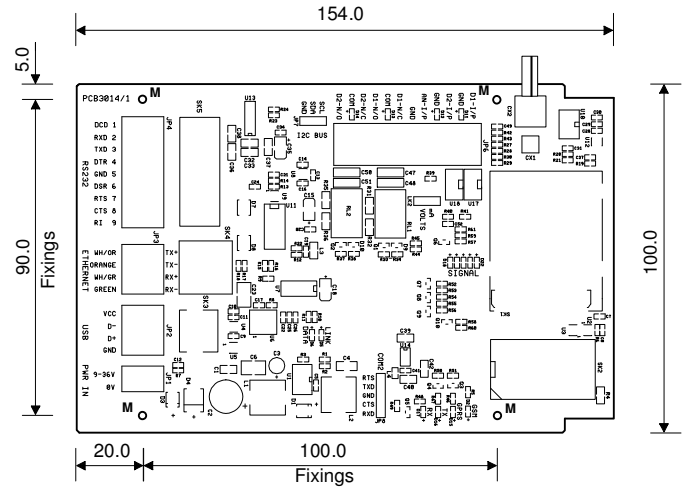
Modems can be configured to operate as a single point-to-point link (RM6000 to RM6000), Many-to-One (a number of clients communicate to a central PC based server), or One-to-Many (a server polls a number of clients).

The modems can work with various SIM cards for use on public or private APNs. They can use SIM cards with a static IP address, use standard SIM cards or cards with public dynamic IP addresses and DynDNS where required.

The modem can be supplied as a board module suitable for DIN rail mounting, or in an IP67 weatherproof enclosure suitable for external installation (on a wall or on a 50mm diameter pole). An SMA connector is provided so that various antennas can be used.

Section 2

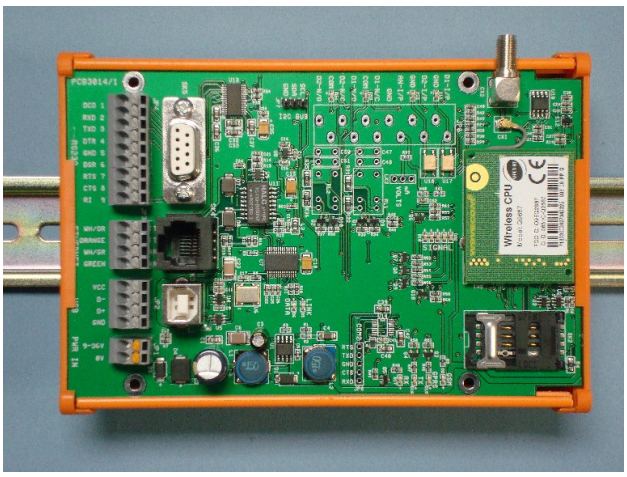
RM6000 Hardware Versions



Diameter of 4 x mounting holes ('M') = 3.2mm

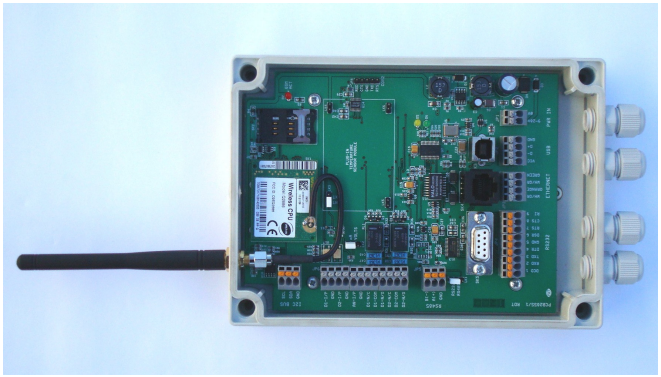
Available as card only for mounting in customer's enclosure or DIN rail.

Order details:
RM6000-000: Modem card, no I/O
RM6000-001: Modem card with I/O



Mounted in 100mm DIN rail carrier.

Order details:
RM6002-000: DIN Modem no I/O
RM6002-001: DIN Modem with I/O



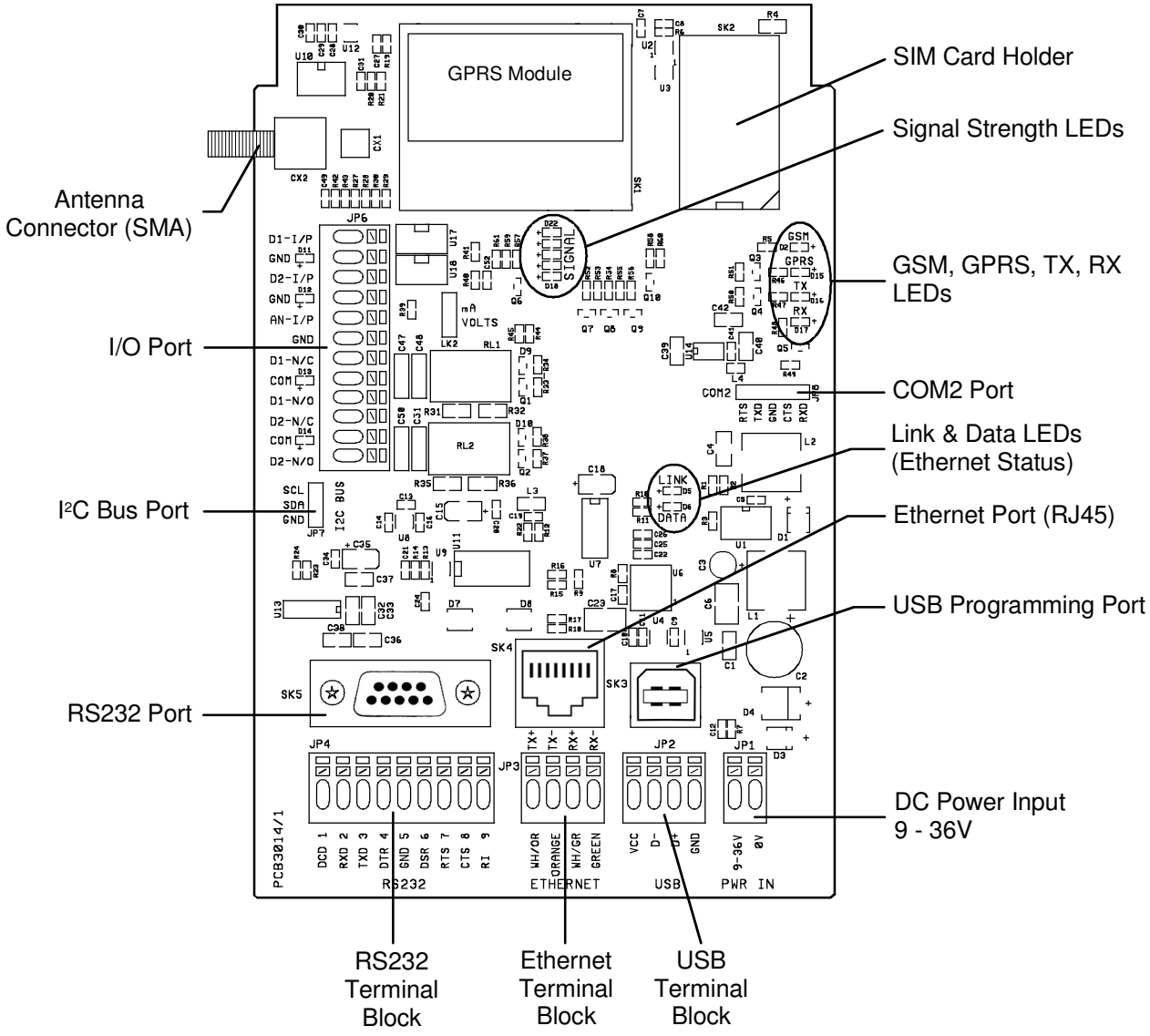
Mounted in IP67 enclosure for external use.

Enclosure dimensions including lid:
180 x 130 x 35

Order details:
RM6001-000: Modem no I/O
RM6001-001: Modem with I/O

Section 3

RM6000 Connections and Indicators



NOTE: Terminal blocks are wired in parallel with their corresponding connector to allow easy wiring connection.

Connectors

1. *DC Power Input (JP1)*
   This connector is a 2-way spring terminal block. An input of 9 – 36V dc is required. The power requirement is 1.2W idle, 10W peak max.

2. *USB type 'B' connector (SK3) and USB spring terminal block (JP2)*
   The USB connector is mainly for use as the programming port. A Windows™ based program (RM6000 Configuration Manager) connects to this port via a USB supplied cable. This port can also be used with the RM6000 configured in 'AT' mode, which allows the RM6000 to act as a standard modem responding only to AT commands.

3. *Ethernet connector (SK4) and Ethernet spring terminal block (JP3)*
   This connector allows Ethernet connectivity between the RM6000 and external Ethernet-capable equipment. The port conforms to IEEE 802.3 with 10 Base T (10Mbps) capability. The port has no auto-polarity detect. A connection to a laptop requires a crossover LAN cable.

4. *RS232 DB9 connector (SK5) and RS232 spring terminal block (JP4)*
   The RS232 serial port is used for serial port transparent link modes, for 'AT' command communication and for firmware upgrades.
   Support for signals TXD, RXD, RTS, CTS, DTR, DSR, DCD with both hardware and software flow control capabilities. Baud rates between 1200 and 115,200bps can be set, together with various parity and stop bit settings.
   The serial port is configured as a DCE (Data Communications Equipment).

   DB9 and spring terminal connector pin assignments

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

5. *I^2C Bus connector (JP7)*
   This is a 3-pin 'Molex' type connector. It is used for external I/O expansion cards.

6. *I/O spring terminal block (JP6)*

Pin Name	Description
D1 - I/P	Digital 1 input
GND	Digital 1 ground
D2 - I/P	Digital 2 input
GND	Digital 2 ground
AN - I/P	Analogue input
GND	Analogue ground
D1 - N/C	Digital 1 relay output, normally closed
COM	Digital 1 relay common
D1 - N/O	Digital 1 relay output, normally open
D2 - N/C	Digital 2 relay output, normally closed
COM	Digital 2 relay common
D2 - N/O	Digital 2 relay output, normally closed

The two digital inputs are volt-free contacts.
The two digital outputs are SPCO relay contacts, 1A @ 24V.
The analogue input is 0-5V or 0-20mA (link selectable, LK2). This input is not used, but could be tailored to customers' requirements.

7. *COM2 connector (JP8)*
   This is the second RS232 serial port on a 'Molex' type connector. The port is not used, but could be tailored to customers' requirements.

8. *Antenna Connector*
   The antenna connector is an SMA socket (female).
   An external antenna mates with this connector. The minimum antenna characteristics should be:-
   Frequency Range: Quad-band GSM850/GSM900/DCS1800/PCS1900 MHz
   Impedance: 50 Ohms nominal

LED Indicators

1. *GSM LED (D2)*

LED Status	LED light activity	RM6000 Status
ON	LED ON permanently	RM6000 is switched ON but not registered on the GSM network
	LED Flashing slowly	RM6000 is switched ON and registered on the GSM network, but no communication is in progress (Idle mode)
	LED Flashing rapidly	RM6000 is switched ON and registered on the GSM network, and a communication is in progress
OFF	LED OFF	RM6000 is switched OFF

2. *GPRS LED (D15)*

LED Status	LED light activity	RM6000 Status
ON	LED ON permanently	RM6000 has successfully attached to GPRS and has a GPRS data communication link established with a server or a client
	LED Flashing slowly	RM6000 has successfully attached to GPRS, but has no GPRS data communication link established
	LED Flashing rapidly	If DDNS (Dynamic DNS) is enabled and a DynDNS update is not successful
OFF	LED OFF	RM6000 is attempting to attached to GPRS, but has not yet succeeded

3. *TX LED (D16)*
   This LED turns ON when data is transmitted over an established GPRS link.

4. *RX LED (D17)*
   This LED turns ON when data is received over an established GPRS link.

NOTE- In 'AT' mode of operation, only the GSM LED performs as indicated above. The GPRS, TX and RX LEDs are permanently OFF.

5. *Signal Strength LEDs (D18 to D22)*
   The Signal Strength LEDs indicate the strength of the received GSM signal. The higher the signal strength, the more LEDs will be lit.
   A minimum of two LEDs should be lit in order to achieve a usable connection. Three or more lit LEDs will make for a more stable connection.

6. *Ethernet Data and Link LEDs (D5 and D6)*
   If the LAN port is enabled, these LEDs indicate the status of the port.
   The LINK LED will turn ON when a physical Ethernet connection exists.
   The DATA LED will flash during the transmission or reception of Ethernet data.

7. *I/O LEDs*
   There are four LEDs next to the I/O connector (JP6)
   D11 turns ON when digital 1 input is activated.
   D12 turns ON when digital 2 input is activated.
   D13 turns ON when digital 1 output relay is activated.
   D14 turns ON when digital 2 output relay is activated.
   The appropriate LED turns OFF when the input/output is de-activated.

Section 4

SIM Cards

There are various types of SIM cards: -

'Standard' type
This is the type of SIM card that is used, for example, in mobile phones, and can be used in GPRS modems/routers provided that the modem is configured as a client (initiating calls). This SIM card is connected to the service provider's general network. When a device using a 'standard' SIM card is powered up, it will connect to the service provider's wireless network (GPRS) and be assigned a local IP address on the service provider's public APN (Access Point Name). The local IP address cannot be directly accessed by another GPRS device i.e. the IP address is not truly 'visible' on the Internet. Devices that only *initiate* calls can use this type of SIM card.
Can be used for an RM6000 in Internet Gateway mode or point-to-point for the client (not the server).

SIM card with a public, static IP address
This type of SIM card is assigned a permanent IP address that is 'visible' on the Internet. Any GPRS device can initiate calls to the assigned, public IP address. An RM6000 modem configured as a *server* (listener) would use this type of SIM card.

SIM card with public, dynamic IP address
This type of SIM card is similar to the one above, but has a public *dynamic* IP address assigned to it by the service provider's APN. Because the IP address is dynamic and can change at random, it is difficult to contact a modem with a dynamic IP address. There are a couple of methods of discovering the current IP address (SMS or Dynamic DNS).
There are various ways for a remote unit to access this public dynamic IP address. A common method is for the server unit (that has the public dynamic IP address) to automatically connect to a third party DDNS (Dynamic DNS) service after an IP address has been assigned to it. The server then informs the DDNS service what its assigned IP address is. The DDNS service logs this new IP address against a previously configured domain name. Remote units will then be able to contact the server using the domain name instead of an IP address.

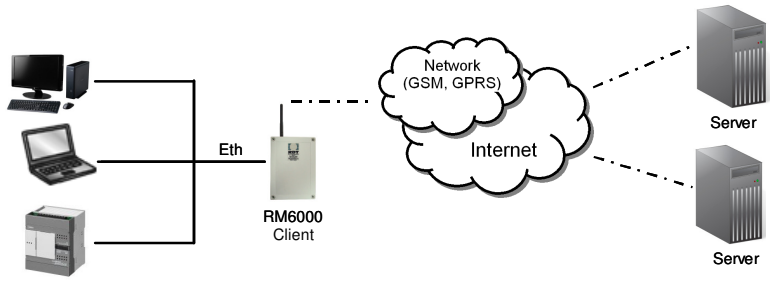
For example: -
A GPRS modem configured as a server, powers up. It is assigned a public IP address of 123.456.789.0. (A public IP address is one that is visible on the Internet).
The server contacts its DDNS service and informs it that its IP address is 123.456.789.0. The DDNS service logs this IP address against a previous agreed domain name e.g. www.iamhappy.com. Remote units always initiate calls to this fixed domain name www.iamhappy.com . At random intervals the service provider allocates a new IP address. This is sent to the DDNS service, which updates its records and assigns the new address to the domain name www.iamhappy.com.

Private APNs
Most service providers and many third party companies offer private APN's and private VPN's (Virtual Private Network). The main advantage of using an APN is that each modem usually has a static IP address and the connection is much more secure. An APN in effect offers a closed user group, so there is no public access to the web, which cuts out unwanted traffic, spam etc.

Section 5

Modem Operation - Program Modes

Internet Gateway Mode



Use this setting to configure the RM6000 as an Internet gateway. The LAN (Ethernet) port must be used. The RM6000 acts as a DHCP server (see LAN tab in RM6000 Configuration Manager), allocating IP addresses etc. to the units connected to its LAN port. The Gateway address will automatically be set the same as the RM6000's IP address. In this mode, the RM6000 also acts as a NAT router, allowing the connected units to gain complete access to any server on the Internet. The APN information must be entered and optionally a ping address and ping period can also be entered.

Details of the APN (Access Point Name), User Name and Password, are supplied by the network provider when obtaining a SIM card.

Operation

On power-up, the RM6000 will attempt to obtain a GSM and GPRS connection. When the router is logged onto the GSM network, the 'GSM' LED will flash. When attachment has been made to GPRS, the 'GPRS' LED will flash.

Unlike in other operational modes, the TX and RX LEDs will not function, except when a ping is in progress.

AT Mode

This mode should be selected if you wish to use the RM6000 as a standard GSM/GPRS modem using 'AT' commands. In this mode you can use either the RS232 port or the USB port. Other than programming the unit, the USB connection can only be used in AT mode. In AT mode, both the Digital I/O and the Diagnostics screens of the RM6000 Configuration Manager are disabled.

After connecting, send the string 'ATE0V1' in order to get command replies.

The list of 'AT' commands are given in appendix 1.

Point-to-Point Mode

In this mode an RM6000 client connects to a server. Once connected, data can be exchanged. If the server is an RM6000 then digital I/O can also be exchanged. The link provides a tunnel for either transparent Ethernet or RS232 data. There are two types of client connection modes – Client General or Client Point-to-Point. Client General is like dialup; it connects when there is data to send. Client Point-to-Point tries to maintain a permanent link.

Client General

Use this setting to configure the RM6000 as a general client router. The server's IP address (Remote Address) and port (Remote Port) must be pre-programmed into the RM6000 (using the RM6000 Configuration Manager). A domain name can also be entered as the remote address.

Note that in this mode, there is no NAT. If the LAN port is used, *the connected unit must use the entered IP address information (see LAN tab in RM6000 Configuration Manager) as its destination address.* The RM6000 will then automatically route the packets to the server entered in the Remote Address box.

Operation

On power-up, the RM6000 will attempt to obtain a GSM and GPRS connection. When the router is logged onto the GSM network, the 'GSM' LED will flash. When attachment has been made to GPRS, the 'GPRS' LED will flash.

When data comes in to the LAN or Serial ports (dependant on COM port selection), the RM6000 will attempt to attach to the server. If successful, the 'GPRS' LED will stop flashing and remain permanently ON and the data will be sent. Data can now be exchanged between the client and the server.

After 30 seconds of data inactivity, the client will detach itself from the server and the 'GPRS' LED will once again flash.

To setup a 'Client General', select: -

1. 'Client General'
2. 'Serial' or 'LAN' comms port
3. **In the 'I/O' tab, ensure that I/O is NOT enabled if the server is *not* another RM6000**

Client P-P (Point-to-Point)

The difference between this mode and the Client General mode is that after a successful GPRS attachment has been made, the unit will then immediately try to connect to the server without first waiting for incoming Ethernet data. The server could be an RM6000 or any other type of server. The Client P-P mode will always try to maintain a permanent connection to a server, i.e. there is no disconnection after 30 seconds of inactivity.

Note that if the connection to the server is lost, the connection will automatically be re-established when data enters the LAN or Serial ports (dependant on COM port selection) of the client. 'Keep Alive' options can also be set in order to help maintain a permanent connection.

To setup a 'Client P-P', select: -

1. 'Client P-P'
2. 'Serial' or 'LAN' comms port
3. 'Keep Alive' options
4. **In the 'I/O' tab, ensure that I/O is NOT enabled if the server is *not* another RM6000**

'Keep Alive' Options

1. Heartbeat (RM6000 client to RM6000 server only)

Unlike the 'Client General', the 'Client P-P' will try to maintain a permanent connection to an RM6000 server. In the event that the connection is lost, it will attempt re-connection when data comes in.

In order to help maintain a permanent connection, a 'Heartbeat' period can be configured. Every x minutes (x = entered minutes), a proprietary 'heartbeat' command is sent to the server. An ACK has to be sent from the server back to the client. If no ACK is received after three attempts, the client will (in this order) clear down the server connection and try to obtain a new one, detach and reattach to GPRS, and finally, if there is no success, the unit will reboot. Note that entering zero minutes can disable the heartbeat.

If the heartbeat is disabled and the network times out the server connection, incoming data will force reconnection.

NOTE that the heartbeat and its ACK command are proprietary and should therefore only be used between two RM6000 routers.

2. TCP Inactivity

After 'x' minutes of no TCP activity, the RM6000 client will kill the client to server connection and re-establish it. Entering a zero will disable this function.

3. Auto Reconnect

If the GSM network has timed out the client to server connection *and* cleanly cleared down the connection to both units, the client will re-establish the connection. It is strongly recommended to enable this function should a permanent link be required.

4. PING

The PING will not guarantee an end-to-end connection. It can be used to PING a named IP address and set to transmit at regular intervals. The network will see the traffic generated, which should help maintain the link. (Some networks close the connection if there is no activity after a certain period. This period varies between networks and may also be traffic related i.e. shorter when the network is busy).

Server Mode

The RM6000 can be used as a server. For example, it could be connected to a PLC that is receiving data from remote PLCs. Connection between the RM6000 and the PLC could either be by RS232 (transparent serial data link), or by Ethernet.

A server port number must be entered. This is the port that client modem/routers connecting to this server have to program into their remote server parameters.

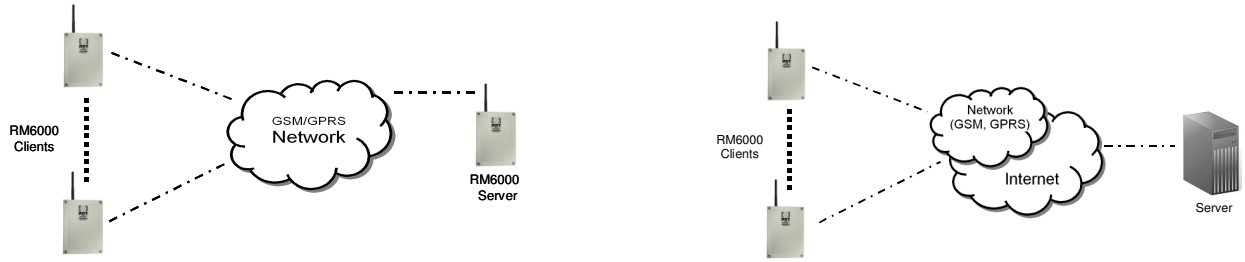
Note that in this mode, there is no NAT. If the LAN port is used, *the connected unit must use the entered IP address information (see LAN tab) as its destination address.* The RM6000 will then automatically route the packets to the remote client.

Operation

On power-up, the RM6000 will attempt to obtain a GSM and GPRS connection. When the router is logged onto the GSM network, the 'GSM' LED will flash. When attachment has been made to GPRS, the 'GPRS' LED will flash. The server will now 'listen' for clients.

When a client connects, the 'GPRS' LED will permanently illuminate and data can be exchanged.

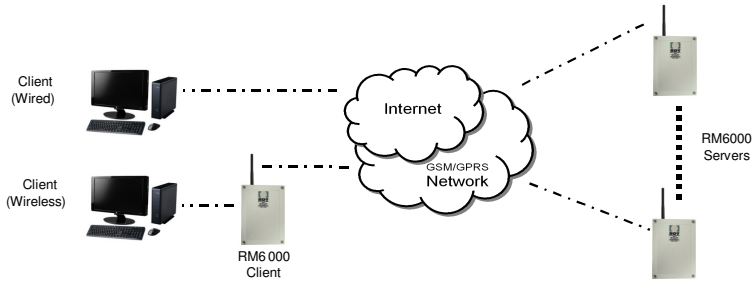
Many-to-One



RM6000 clients configured in either 'Client General' or 'Client Point-to-Point' modes can connect to either an RM6000 server or any other server visible on the Internet.

If the server is an RM6000, a maximum of twelve RM6000 clients can be connected at any one time. If the server is *not* an RM6000, the maximum number of clients is dependant on the program/s running on the server.

One-to-Many

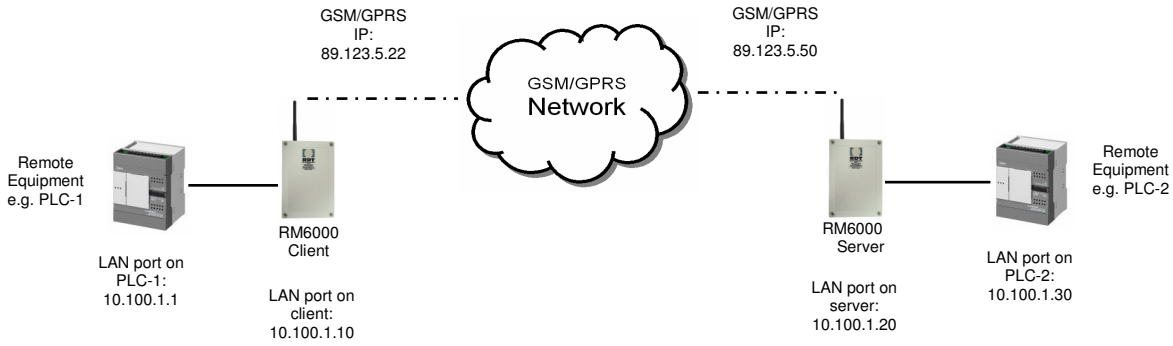


One (or more) clients can connect to any particular RM6000 server visible on the Internet. In the above picture, there are two PC clients; one of them is wired (e.g. using a broadband router) and the other connects via an RM6000 configured as an Internet Gateway.

RM6000 Configuration Examples

This section contains real examples of how to configure the RM6000. The RM6000 Configuration Manager program must be used.

Example 1 – Point to point, PLC to PLC



Two PLCs (Programmable Logic Controllers) need to be connected to each other. Both have LAN ports. PLC-1 is connected to an RM6000 client and PLC-2 is connected to an RM6000 server. The RM6000 server has a public, static IP address (89.123.5.50), which is accessible over the Internet. The RM6000 client has a 'standard' SIM and was allocated an IP address of 89.123.5.22 by its APN.

When the RM6000 is configured as 'ClientP-P', 'Client General' or 'Server', then whatever TCP data enters its LAN port will automatically be routed over GPRS. Similarly, all received GPRS data will automatically be routed to and output from the router's LAN port. Note that in these operational modes, there is no NAT routing and only one external LAN device can be connected to the RM6000.

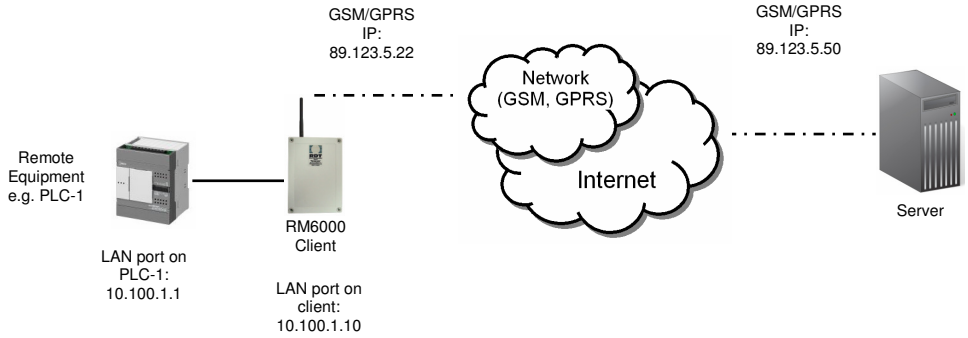
The destination addresses and ports of both PLC-1 and PLC-2 have to be the LAN IP addresses and ports of the RM6000 client and server respectively.

Setup

PLC-1 LAN port IP address	-	10.100.1.1	Port 2222
PLC-1 destination address	-	10.100.1.10	Port 2222
RM6000 client LAN port IP address	-	10.100.1.10	Port 2222
RM6000 client 'Remote Address'	-	89.123.5.50	(that of the RM6000 server)
RM6000 client 'Remote Port'	-	8080	(that of the RM6000 server)
RM6000 server 'Server Port'	-	8080	
PLC-2 LAN port IP address	-	10.100.1.30	Port 2222
PLC-2 destination address	-	10.100.1.20	Port 2222
RM6000 server LAN port IP address	-	10.100.1.20	Port 2222

If the TCP socket connection (link) between the client and server has to be permanent, then the 'Keep Alive' options on the server should be set. See chapter ?? for more information on these.

Example 2 – Point to point, PLC to Server



The principle is similar to that of example 1 above, except that the server is connected to the Internet via e.g. broadband rather than using an RM6000 server.

Setup

PLC-1 LAN port IP address	-	10.100.1.1	Port 2222
PLC-1 destination address	-	10.100.1.10	Port 2222
RM6000 client LAN port IP address	-	10.100.1.10	Port 2222
RM6000 client 'Remote Address'	-	89.123.5.50	(that of the server)
RM6000 client 'Remote Port'	-	8080	(that of the server for this client)

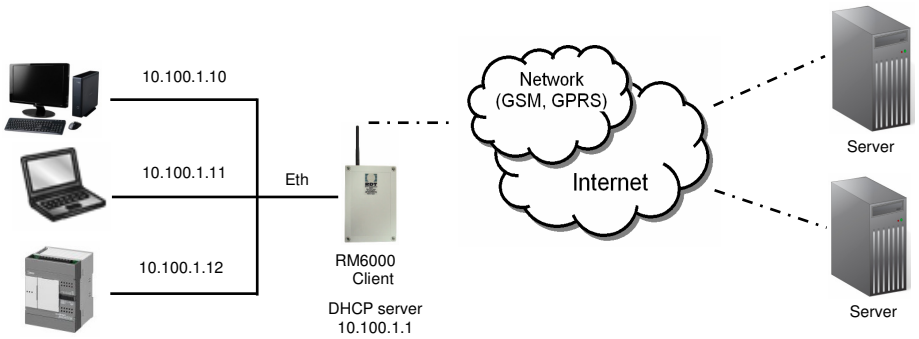
NOTE: Ensure that the I/O on the RM6000 is NOT enabled!

If the TCP socket connection (link) between the client and server has to be permanent, then the 'Keep Alive' options on the server should be set. See chapter ?? for more information on these.

Usually the server would be running a special program that, for example, would collect data from one or more remote clients. A client could be identified by a port number, so in the above example, port number 8080 identifies the client with PLC-1 connected to it.

If more clients (with different port numbers) are added to connect to the one server, a 'Many-to-One' topology can be realised.

Example 3 – Internet Gateway Mode



In this mode the RM6000 client is configured in Internet Gateway Mode and as a DHCP server. Any LAN device connected to the LAN port of the RM6000 will be allocated an IP address. In this case the RM6000 is a NAT router, allowing the connected units to gain complete access to any server on the Internet.

RM6000 setup

On the GPRS tab, select 'Internet Gateway' mode.

On the 'LAN' tab, select: -

IP Address - 10.100.1.1

Subnet Mask - 255.255.255.0

DHCP Start Address - 10.100.1.10

DHCP Range - Range of IP addresses to allocate (default 8)

For example, if the DHCP Start Address is 10.100.1.10 and the DHCP Range is 8, then the addresses from 10.100.1.10 to 10.100.1.17 will be used to allocate to connected units.

The connected units must be set to obtain an IP address automatically.

Section 6

RM6000 Configuration Manager

Installation

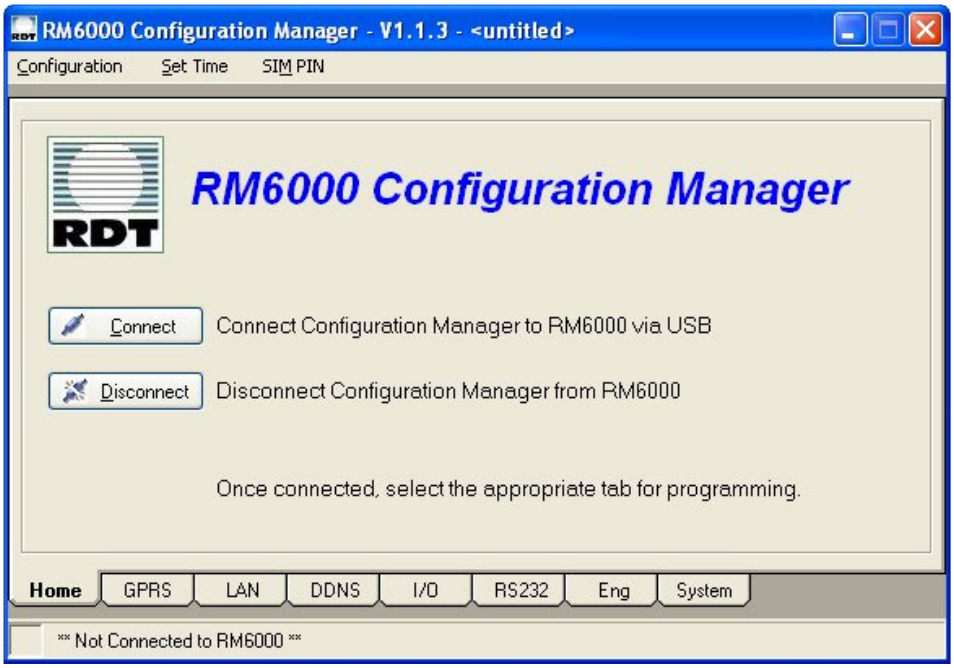
The RM6000 Configuration Manager program runs under Windows™. The connection from the PC running the program to the RM6000 is via a supplied USB cable.

You *must* install the USB driver first before you run the RM6000 Configuration Manager.

On the supplied CD, navigate to the 'Wavecom USB driver' folder and select 'setup'. This automatically installs the required USB driver.

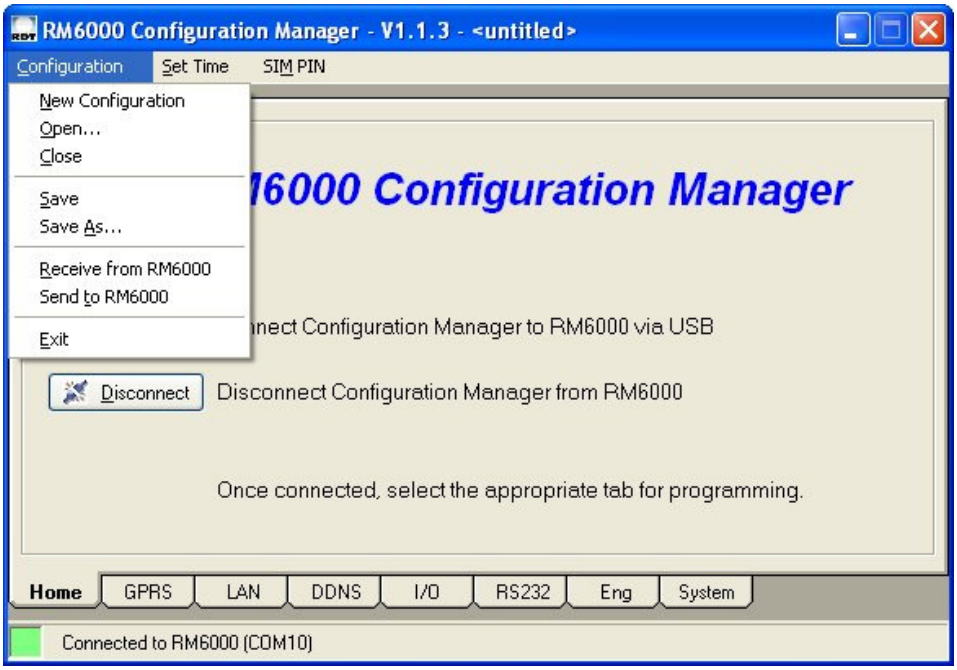
After this has been installed, navigate to the 'RM6000 Configuration Manager' folder and select 'setup'. After installation, run the program.

The following screen will be displayed: -



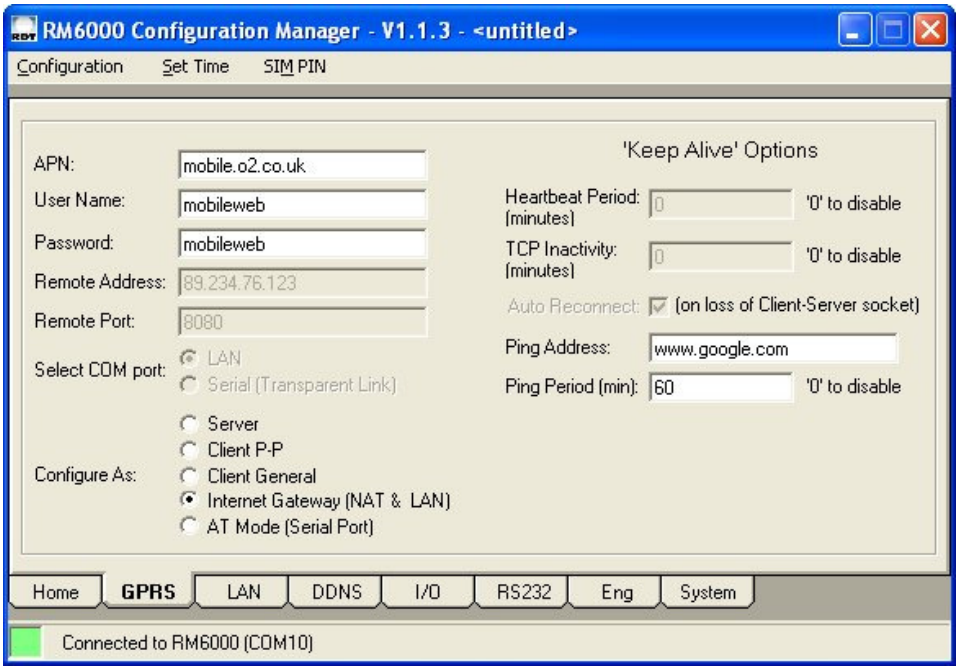
Turn OFF the RM6000 and connect the PC to the RM6000 using the supplied USB cable. Turn ON the RM6000.

Click on the ‘Connect’ button. After a few seconds, the program should indicate a successful connection as follows: -



Configuration Menu

New Configuration	- Clears the contents of all tab pages, ready for new parameters
Open…	- Load in a previously saved parameter file (.rm6 file)
Close	- Close a loaded file
Save	- Save all entered parameters into a file
Save As…	- Same as above but with the option of changing the file name
Receive from RM6000	- Upload parameters from the RM6000 to the program
Send to RM6000	- Download parameters from the program to the RM6000
Exit	- Exit the program



Operating Modes

For greater detail regarding the various operating modes, please see chapter ?

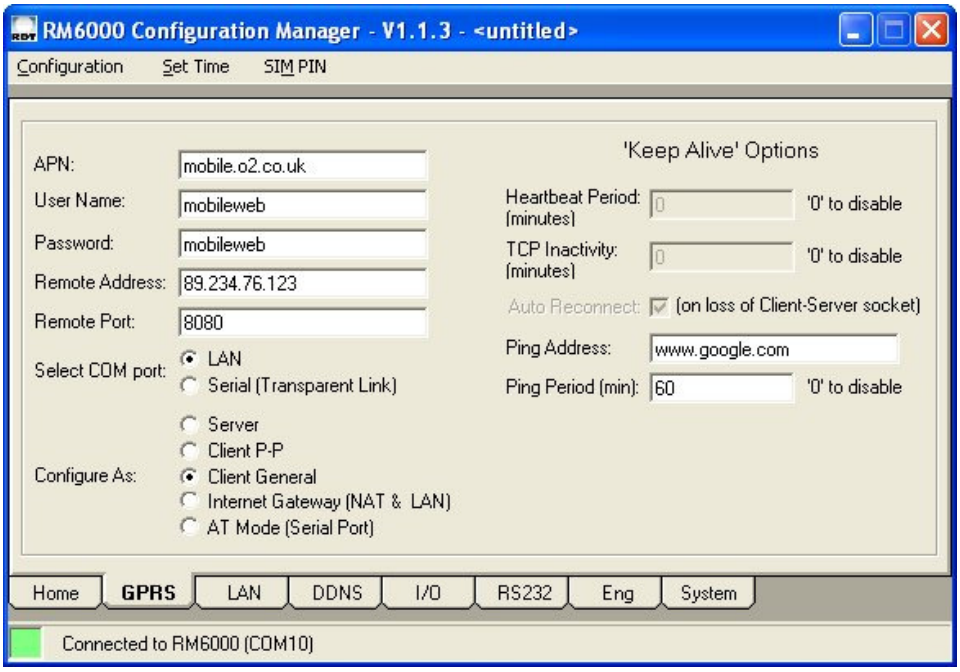
Internet Gateway

In this setting the LAN (Ethernet) port must be used. The RM6000 acts as a DHCP server, allocating IP addresses to the units connected to its LAN port. In this mode, the RM6000 also acts as a NAT router, allowing the connected units to gain complete access to any server on the Internet.

Details of the APN (Access Point Name), User Name and Password, are supplied by the network provider when obtaining a SIM card.

APN	- Access Point Name
User Name	- APN user name
Password	- APN password
Ping Address	- IP address or domain name to ping
Ping Period	- Time period between pings in minutes. Enter ‘0’ to disable the ping.

Fields greyed out are not required in this mode.



Client General

When data comes into the LAN or Serial ports (dependant on COM port selection), the RM6000 will attach to the server (pre-defined parameters). Data can now be exchanged between the client and the server. After 30 seconds of data inactivity, the client will detach itself from the server.

Note that in this mode, there is no NAT. If the LAN port is used, *the connected unit must use the entered IP address information (see LAN tab) as its destination address.* The RM6000 will then automatically route the packets to the server entered in the Remote Address box.

APN - Access Point Name

User Name - APN user name

Password - APN password

Remote Address - IP address (or domain name) of the server

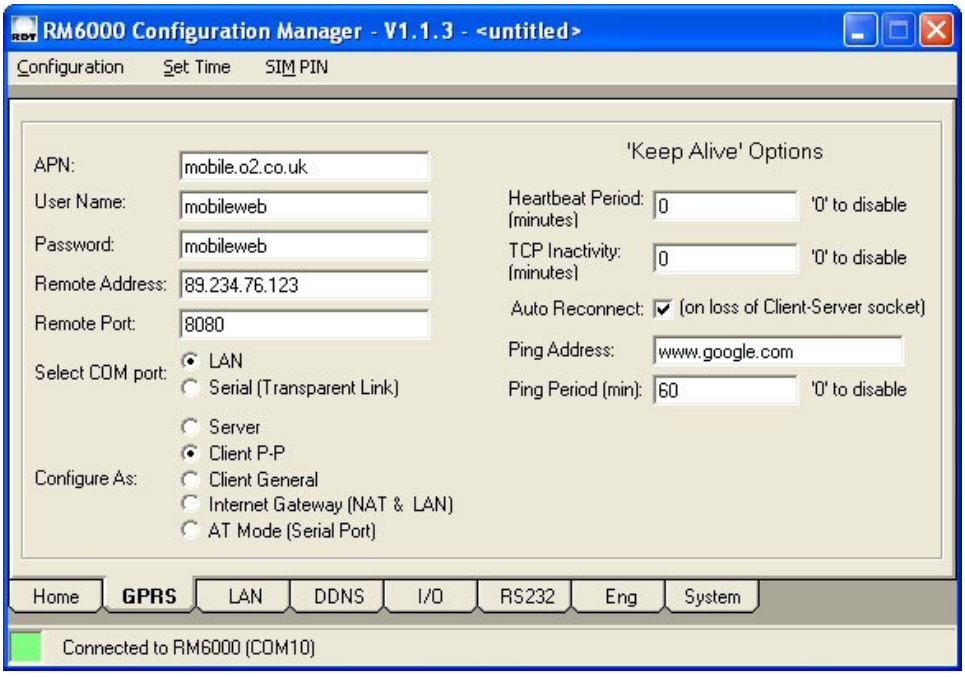
Remote Port - Remote port of the server

Ping Address - IP address or domain name to ping

Ping Period - Time period between pings in minutes. Enter ‘0’ to disable the ping.

Select COM Port - LAN (Ethernet) or Serial (for transparent link)

NOTE: If the remote server is *not* an RM6000 or if I/O is not being used, then ensure that I/O is NOT enabled (See I/O tab).



Client P-P (Point-to-Point)

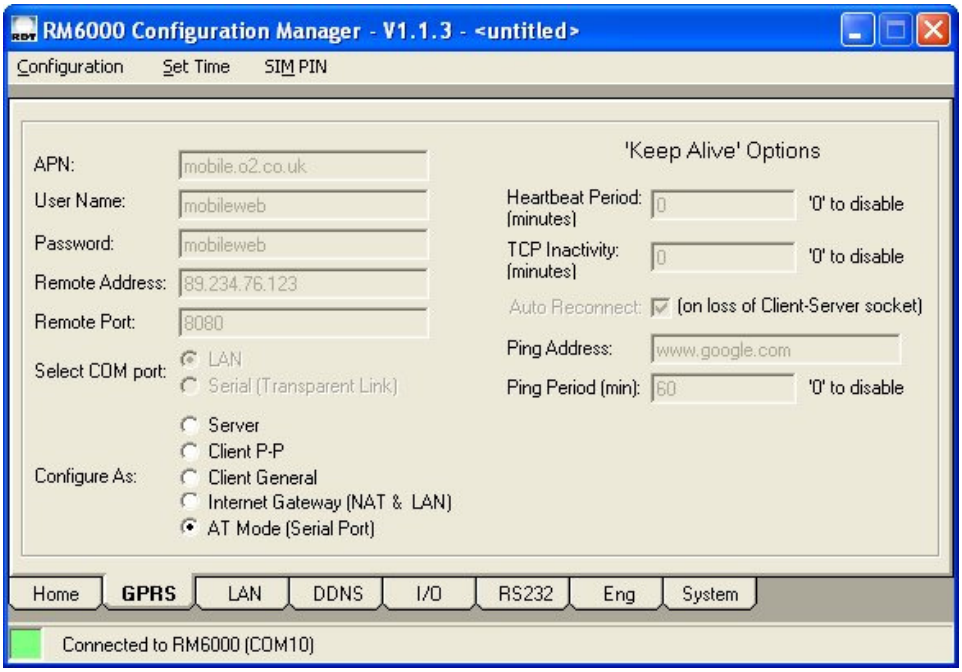
In this mode the RM6000 automatically connects to a pre-defined server on power up, and using various 'Keep Alive' options, attempts to maintain a permanent connection to the server.

Note that in this mode, there is no NAT. If the LAN port is used*, the connected unit must use the entered IP address information (see LAN tab) as its destination address.* The RM6000 will then automatically route the packets to the server entered in the Remote Address box.

APN	- Access Point Name
User Name	- APN user name
Password	- APN password
Remote Address	- IP address (or domain name) of the server
Remote Port	- Remote port of the server
Ping Address	- IP address or domain name to ping
Ping Period	- Time period between pings in minutes. Enter '0' to disable the ping.
Select COM Port	- LAN (Ethernet) or Serial (for transparent link)
Heartbeat Period	- Time (in minutes) between heartbeat transmissions
TCP Inactivity	- Time (in minutes) of inactivity before clear down and establish a new link
Auto Reconnect	- If the network drops the connection, the RM6000 attempts to connect again

NOTE 1: The Heartbeat Period must only be used if the server is another RM6000.

NOTE 2: If the remote server is *not* an RM6000, then ensure that I/O is NOT enabled (See I/O tab).



AT Mode

This mode should be selected if you wish to use the RM6000 as a standard GSM/GPRS modem using ‘AT’ commands. In this mode you can use either the RS232 port or the USB port. Other than programming the unit, the USB connection can only be used in AT mode. In AT mode, both the Digital I/O and the Diagnostics screens are disabled.

After connecting, send the string ‘ATE0V1’ in order to get command replies.

Server

The RM6000 can be used as a server. For example, it could be connected to a PLC that is receiving data from remote PLCs. Connection between the RM6000 and the PLC could either be by RS232 (transparent serial data link), or by Ethernet.

Note that in this mode, there is no NAT If the LAN port is used, *the connected unit must use the entered IP address information (see LAN tab) as its destination address.* The RM6000 will then automatically route the packets to the remote client.

APN - Access Point Name

User Name - APN user name

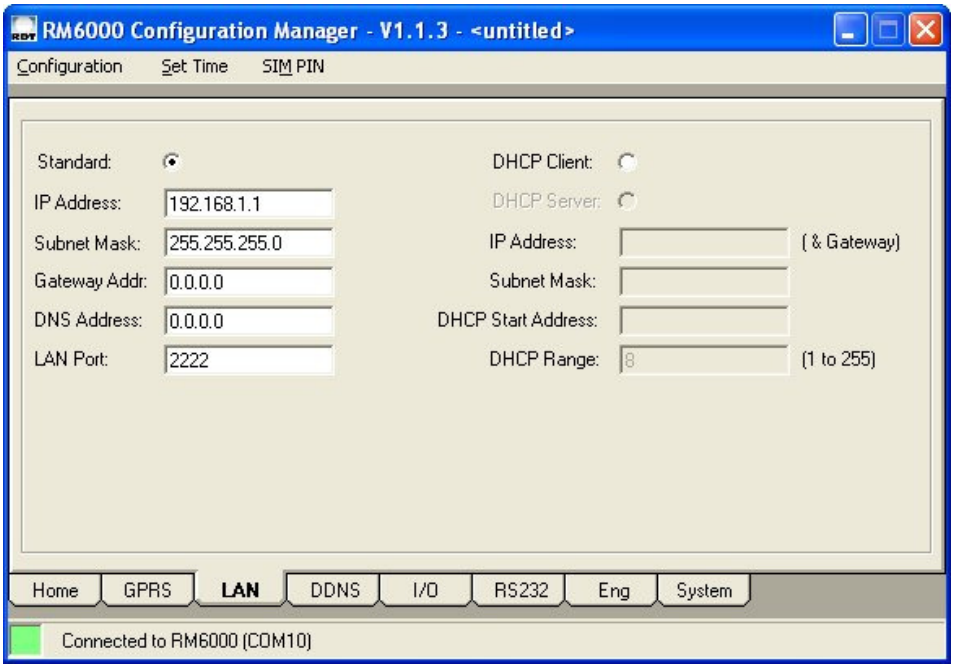
Password - APN password

Server Port - Port number that clients must use for server connections

Ping Address - IP address or domain name to ping

Ping Period - Time period between pings in minutes. Enter ‘0’ to disable the ping.

Select COM Port - LAN (Ethernet) or Serial (for transparent link)



LAN Port details

If 'LAN' was selected as the communications port (on the GPRS page), the details of the local LAN port must be entered here.

IP Address - IP address of LAN port

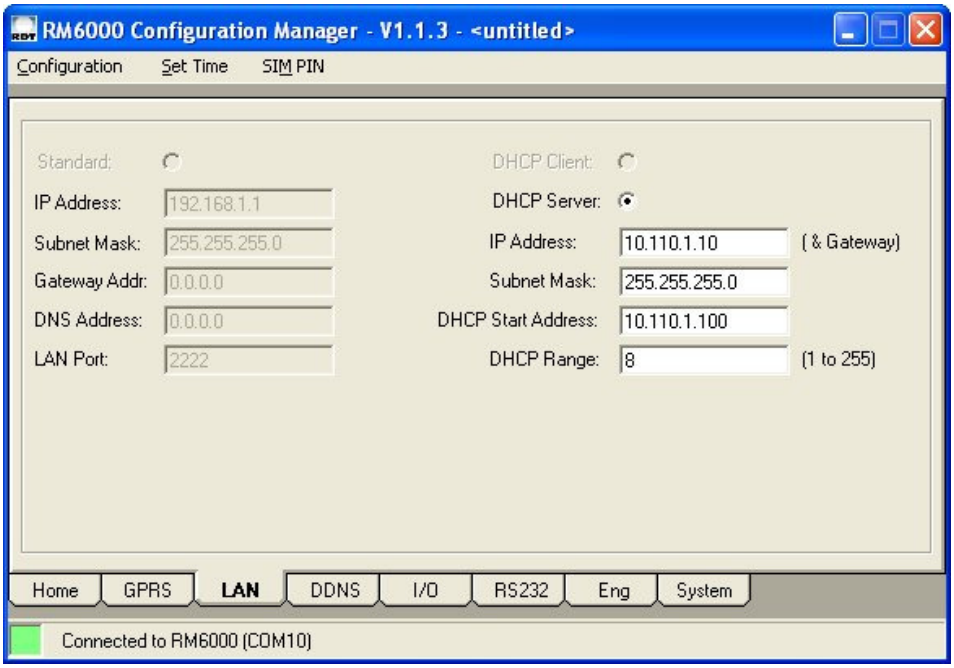
Subnet Mask - Subnet Mask of LAN port

Gateway Address - If not known or used, enter '0.0.0.0'

DNA Address - If not known or used, enter '0.0.0.0'

LAN Port - LAN port number

If using the client modes other than the Internet Gateway mode, *the connected unit must use the entered IP address information as its destination address.* The RM6000 will then automatically route the packets to the server entered in the Remote Address box.



DHCP (Dynamic Host Control Protocol) server details

If using the Internet Gateway mode, only the DHCP server section will be visible on this page. All the details must be entered.

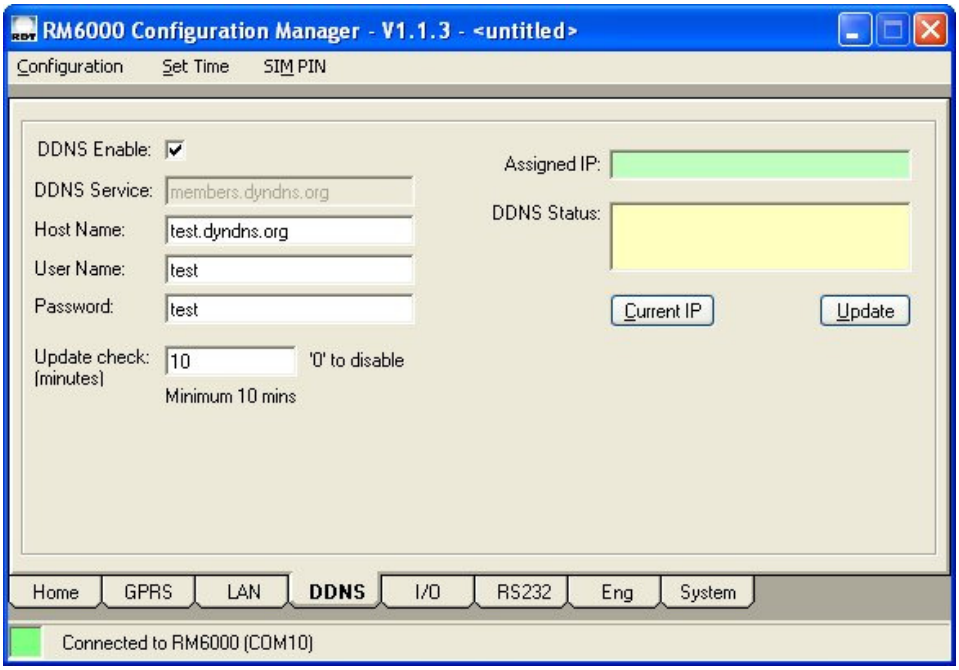
IP Address - IP address of LAN port (also becomes the Gateway address)

Subnet Mask - Subnet Mask of LAN port

DHCP Start Address - The first IP address allocated by DHCP to connected units

DHCP Range - Range of IP addresses to allocate (default 8)

For example, if the DHCP Start Address is 10.110.1.100 and the DHCP Range is 8, then the addresses from 10.110.1.100 to 10.110.1.107 will be used to allocate to connected units.



Dynamic DNS (DDNS)

If the RM6000 has a special SIM card with a **public, dynamic IP address**, then the DDNS information can be added. If the RM6000 is configured as a server, then connected clients can then use a domain name instead of an IP address as its 'Remote Server' (see GPRS tab).

A DDNS account must be first be set up at www.dyndns.com. Information on how to do this can be obtained from their web site. You will be allocated a Host Name, User Name and Password. These details must be entered on this page.

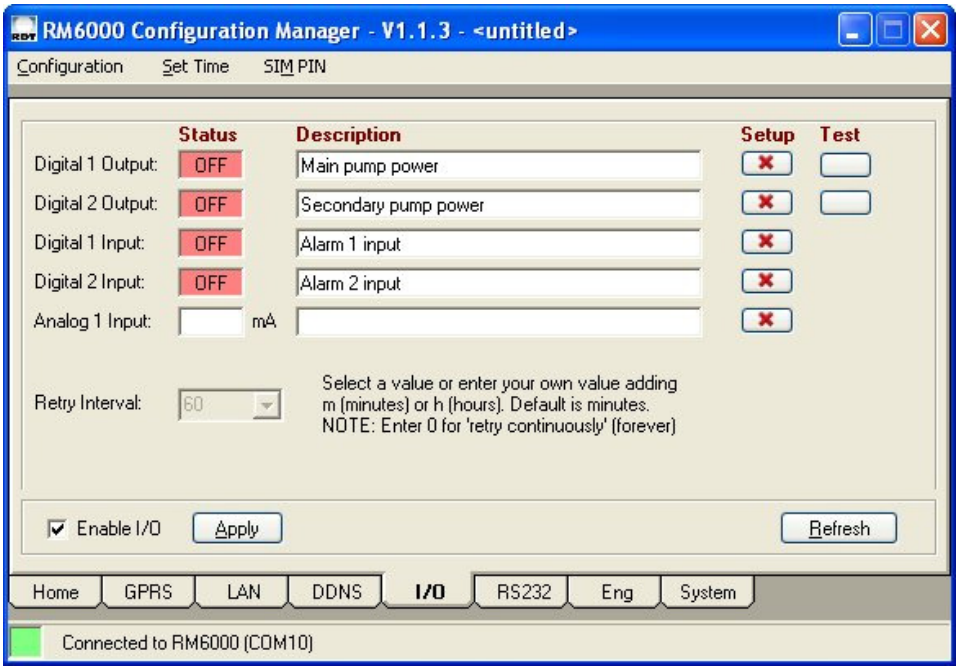
As the server's allocated IP address can change, it is important to periodically update the DDNS server. Enter the time in minutes for the update interval.

A 28-day timer will also be started on power up. When this expires, the DDNS server will be unconditionally updated. This is to avoid the DDNS service from removing your account due to inactivity. (If the allocated IP address never changes and an update check interval occurs, the unit does not update the DDNS server; hence the 28-day unconditional update).

Clicking on the 'Update' button will perform a manual update check. The progress of the update will be displayed in the 'DDNS Status' box and the assigned IP address will be displayed in the 'Assigned IP' address box. (The IP address assigned to the unit by the APN).

NOTE: Do not manually update the DDNS in quick succession as you could be blacklisted by the DDNS service if the update occurs too often (in less than 10 minute intervals).

Also note that the DDNS service will only work with a special SIM account that has a public, dynamic IP address. The allocated IP address of a 'standard' SIM card will not be accessible over the Internet.



Telemetry

I/O

The RM6000 has two digital inputs, two digital outputs, and one analogue input. Currently only the digital ports are operational. The digital inputs need volt-free signals to operate (e.g. short D1 or D2 inputs to GND to activate) and the digital outputs are relay contacts (N/O, Common, N/C).

The analogue input is link-selectable (LK2) for 0-5V or 0-20mA. This input is not currently used, but could be customised to transmit its results via SMS, FTP or email, for example.

In order to enable the I/O, tick the 'Enable I/O' box and press 'Apply'. Enabling or disabling I/O can be done 'on the fly', without having to download the parameters to the modem.

If I/O is enabled, activating the digital inputs will send proprietary commands to a connected RM6000 server and activate the corresponding relay on the server. The same is true in reverse i.e. from the server to the client. When the server activates a digital input, the corresponding relay on the client will activate.

The digital input activation/deactivation commands require an ACK. If no ACK is received after three attempts (15 seconds apart) in succession, then re-tries will occur after the 'Retry Interval' period. The retry methodology also includes trying to initiate a server connection (from a client) should none exist and trying to reattach to GPRS if necessary.

Commands

The commands sent over an existing TCP socket link between client and server, are as follows:

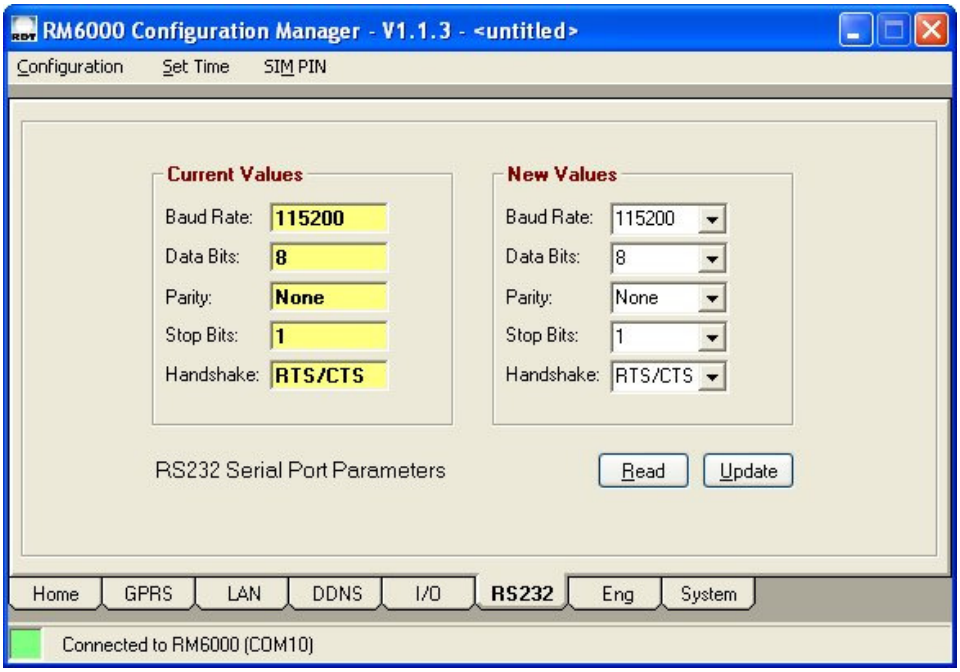
[*#D01ON#*]	Activate D1's relay
[*#D02ON#*]	Activate D2's relay
[*#D01OF#*]	De-activate D1's relay
[*#D02OF#*]	De-activate D2's relay
[*#D01ON_ACK#*]	ACK for Activate D1's relay
[*#D02ON_ACK#*]	ACK for Activate D2's relay
[*#D01OF_ACK#*]	ACK for De-activate D1's relay
[*#D02OF_ACK#*]	ACK for De-activate D2's relay

An activation or de-activation command MUST be acknowledged. If it is not, the RM6000 will retry after the entered Retry Interval.

NOTE: If I/O is not used, then disable it (by un-ticking the 'Enable I/O' box).

Pressing the 'Refresh' button will show the current I/O settings.

Pressing the 'Test' buttons for digital 1 and digital 2 outputs will activate their relays for a 5 second period and then de-activate them.



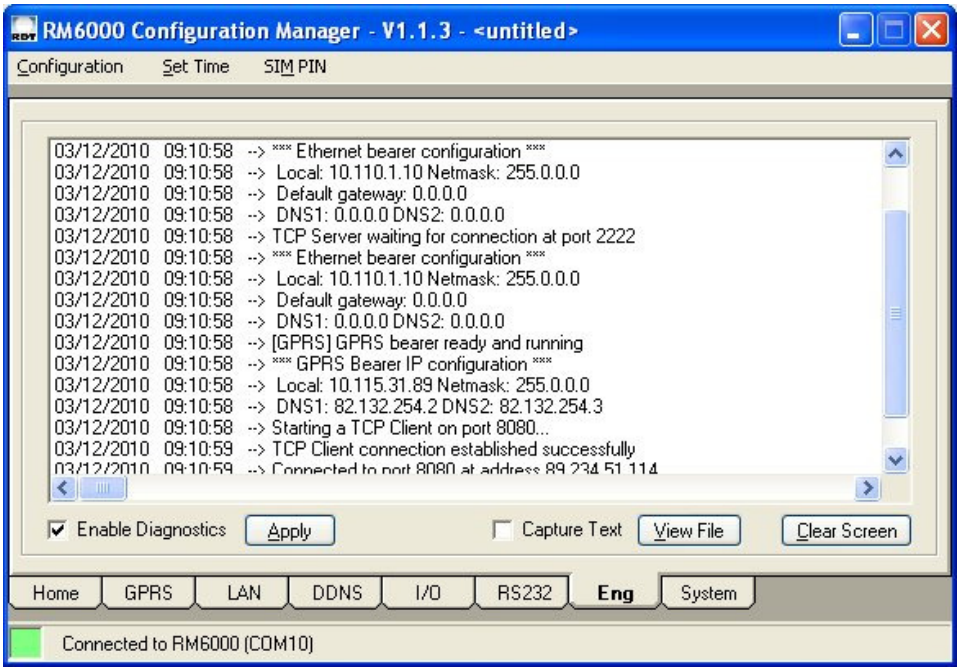
RS232 Port

Use this screen to update the RS232 port parameters.

Select the 'Read' button to read the current parameters.

Once the new values have been selected, select the 'Update' button. If the new values have been successfully updated, the parameters in the 'Current Values' section will be updated and the background colour will change to green.

NOTE: If using the RS232 port as a transparent serial connection between a client and a server, do not select a baud rate greater than **38400**. This is to ensure that there is no RS232 input buffer overrun on the RM6000.



Diagnostics

In order to enable the diagnostics, tick the 'Enable Diagnostics' box and press 'Apply'. Enabling or disabling diagnostics can be done 'on the fly', without having to download the parameters to the modem.

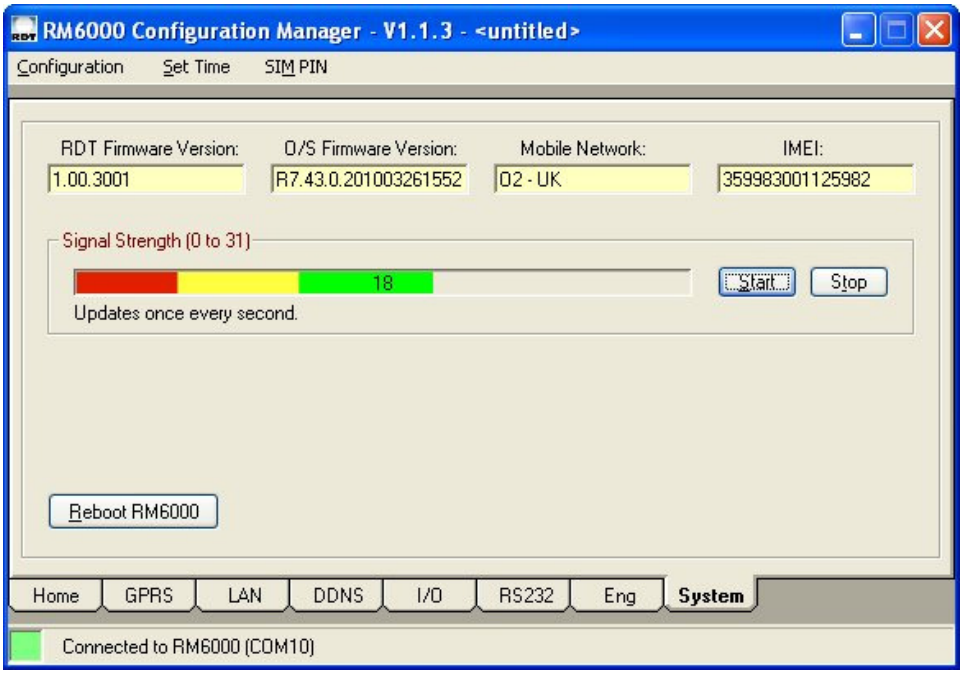
Each diagnostic entry is time stamped. The entries allow the user to see what processors are happening in the modem in real time.

Select 'Capture Text' in order to save the diagnostic information to a file. To stop capturing, untick the 'Capture Text' box.

'View File' allows the user to view a previously captured text file.

'Clear Screen' clears the diagnostic screen.

If the USB port is ever used as a data port by connected equipment, the diagnostics should be disabled.



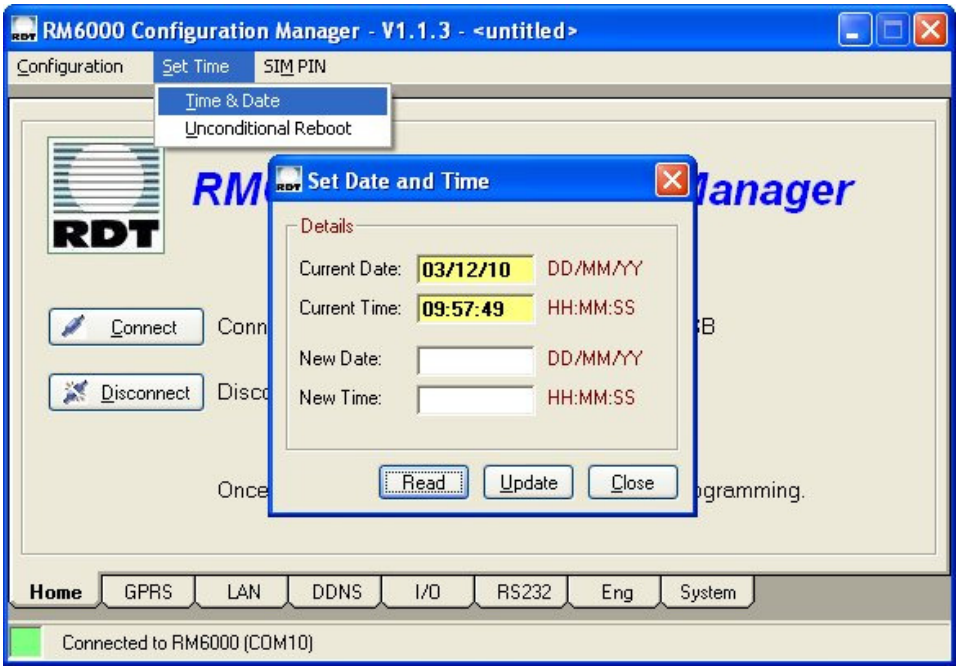
System Information

This screen displays some system information:

RDT Firmware Version
O/S (Operating System) Firmware Version
Mobile Network
IMEI Number

The current signal strength can be displayed by selecting the ‘Start’ button and stopped by selecting the ‘Stop’ button. A ‘good’ signal strength should lie between 10 and 31.
Should you forget to stop the signal strength display, it stops automatically when the configuration manager program is exited, or when any other parameter in any page is edited. It also stops if any item on the Configuration pull-down menu is selected.

The RM6000 can be manually re-booted by selecting the ‘Reboot RM6000’ button.



Set Time and Date

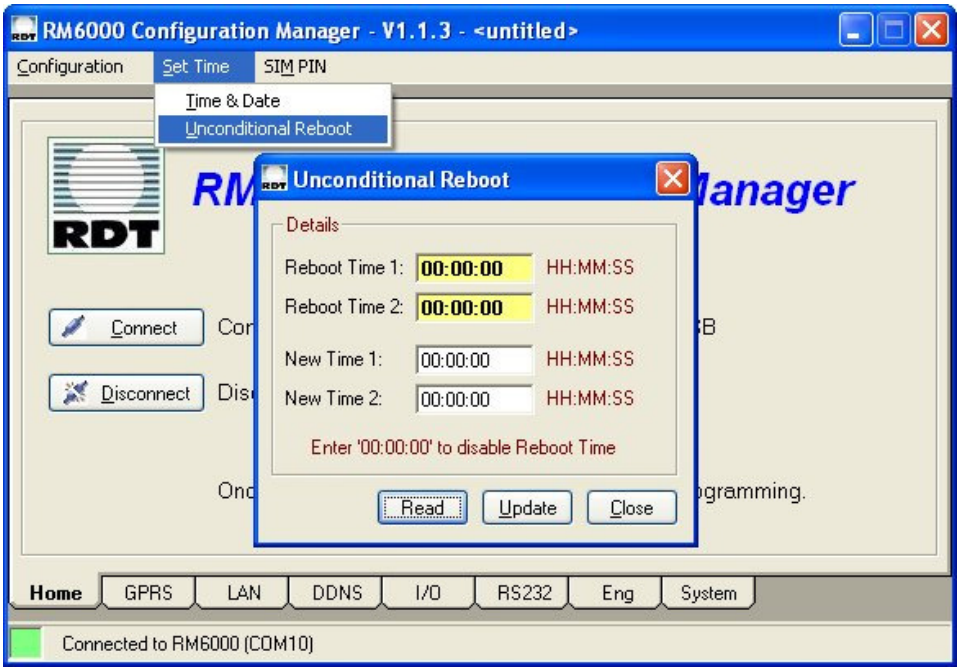
The RM6000 has a Real Time Clock (RTC). This is used for time stamping and also for the 'Unconditional Reboot' function.

Select 'Set Time' then 'Time & Date' as shown above. A new window will be displayed.

Select the 'Read' button to read the current date and time. Enter the new date and time in the appropriate boxes.

Once the new values have been entered, select the 'Update' button. If the new values have been successfully updated, the current date and time will be updated and the background colour will change to green.

The RTC has a small, re-chargeable battery (mounted under the main circuit board) connected to it. Fully charged, the battery should power the RTC for a minimum of 2 to 3 months if there is no DC input supply.



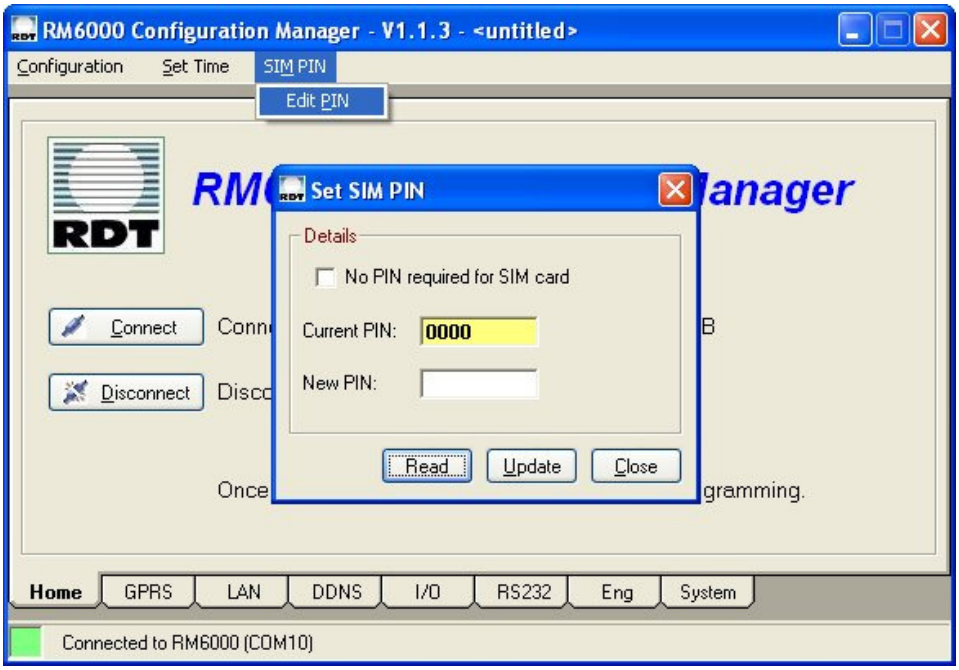
Unconditional Reboot

If a modem/router is registered on the GPRS network but is inactive for a certain period of time, it is possible that the network provider will de-register the unit making the unit inoperable. It is for this reason that an unconditional reboot facility has been provided in order that the RM6000 can simulate a 'Power ON Reset'. After a reset, the unit will perform the GSM/GPRS sequence of network registration and GPRS attachment. The network provider should then update its registration records for the unit.

The de-registration time is network dependant and very rarely can an end user ever obtain information about the de-registration period. It is more common for a static unit to be de-registered as it usually locks onto one GSM cell without roaming to other cells.

In cases where it is necessary to occasionally reboot, the 'Unconditional Reboot' window can be called up by selecting 'Set Time' followed by 'Unconditional Reboot' as shown above. Select 'Read' in order to display the current reboot times. There are two reboot times that can be programmed to operate in a 24-hour period. In order to update the times, enter the new values in 'New Time 1' and 'New Time 2'. Select 'Update'. If the times are successfully updated, they will be displayed in the top half of the window, with the background colour changing to green.

Note that to disable Time 1 or Time 2, '00:00:00' must be entered, otherwise the entry must be in the form 'HH/MM/SS' (Hours/Minutes/Seconds). Also note that it is not necessary to enter *both* Time 1 and Time 2.



SIM PIN

If the SIM card requires an unlocking PIN, it can be entered here.

Select 'SIM PIN' followed by 'Edit PIN' as shown above. A new window will appear. If the SIM card is already unlocked, tick the box 'No PIN required for SIM card'. In this case, '0000' will be set as the PIN.

Select 'Read' to display the current PIN. Enter the new PIN in the appropriate box and select 'Update'. If the update is successful, the new PIN will be displayed in the 'Current PIN' box, with the background colour changing to green.

Note: The RM6000 automatically assumes that no PIN is required unless told otherwise. If the SIM does not need an unlocking PIN, it is not necessary to update the PIN using the above-mentioned procedures.

Updating the Firmware of the RM6000 GPRS modem/router – Section 8

There are two types of firmware; the Operating System and the User Firmware.

The current Operating System is V7.43. The User Firmware is the software that we at RDT write for controlling the RM6000. This is the firmware that is more likely to change as we update features and functions of the modem/router.

NOTE: In this document, <CR> means press the 'Enter' (or 'Return') button.

Update Procedure

1. Turn ON the RM6000.

2. Connect the serial port of the RM6000 to the serial port of a PC. The cable must be a pin–to-pin type and *not* a null modem cable.

3. The serial port of the RM6000 must be set to 115200 baud, 8 bits, no parity, 1 stop bit, RTS/CTS handshaking. If e.g. the baud rate is not 115200, then change it to 115200 baud from within the RM6000 Configuration program. (The RS232 parameters can be changed 'on the fly', i.e. there is no need to perform a 'Send to RM6000'.)

4. Using the RM6000 Configuration program, upload and store all the current network parameters of the RM6000 into a file.

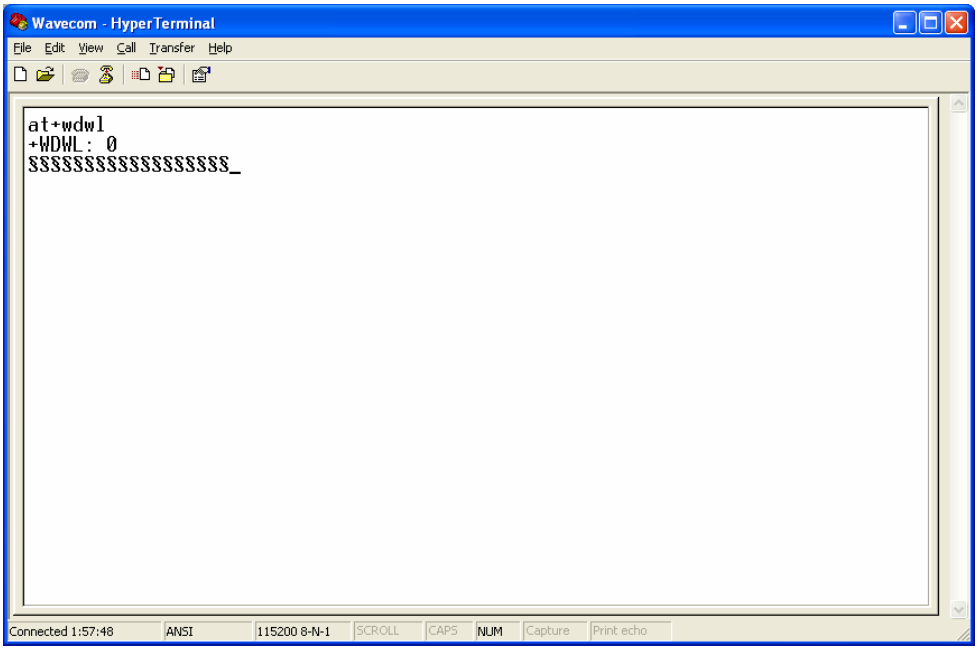
5. Run 'HyperTerminal' on the PC or laptop. Set the program to use the correct COM port (PC dependant). Set the COM port parameters to 115200 baud, 8 bits, no parity, 1 stop bit, and hardware flow control.

6. Check that you have communication with the RM6000 i.e. type 'AT' <CR>. The RM6000 should respond with 'OK'. Now type 'ATE1V1' <CR>. The modem will respond with 'OK'. From now on whatever you type is echoed to the screen.

7. Type 'AT+WOPEN=0' <CR> (Stops current program from running). Wait for the 'OK' response.

8. Type 'AT+WOPEN=3' <CR> (Deletes the network parameters from flash memory). Wait for the 'OK' response.

9. Type 'AT+WDWL' <CR>. The screen will start displaying NACK characters as follows:



10. Whilst the characters are being displayed, select ‘Transfer’ then ‘Send File…’.

11. Select the .DWL file to download (e.g. RM6000_R743_NAT.DWL).

12. **Select the protocol ‘1K Xmodem’.** Press ‘Send’

13. You will see that the file is being downloaded (from another window that automatically opens). When the downloading is complete, the download window closes, and the display returns to displaying the NACK characters again.

14. Whilst the characters are being displayed, reset the RM6000 by typing in ‘AT+CFUN=1’ <CR> and wait for the ‘OK’. The unit will now reboot.

15. After the reboot, type ‘AT+WOPEN=1’ <CR>. This will start the new firmware running.

16. Using the RM6000 Configuration Program, restore the network parameters from the same file that you originally saved them in, connect the program to the RM6000, and send the parameters to the RM6000.

Section 9

Specification / Features

Features:

Quad band radio
850/900/1800/1900MHz

Network Protocols
TCP, IP, UDP, PPP, DNS, ARP, PING, DHCP

Serial point-to-point
Always on mode – wireless connection maintained
NAT Routing
One-to-Many (Sever to multiple clients)
Many-to-One (Multiple clients to Server)
On-board SIM card holder

GSM / GPRS modes
GPRS class 'B' class 10
CSD, SMS, SMTP, POP3, FTP, HTTP

Interfaces :

Ethernet
IEEE 802.3
10 Base T, data rate 10Mbps
Full or half duplex mode (auto)
RJ45 connector and spring terminals

Serial
RS232 DB-9 and spring terminals
Support for signals: TXD, RXD, RTS, CTS, DTR, DSR, DCD
Hardware flow control
Baud rates 300 to 115,200bps

USB 2.0
USB type 'B' connector and spring terminals

LED Indicators:

Signal strength
GSM – connected
GPRS – connected
TX data
RX data
Ethernet link
Ethernet data

Power requirements:

Input 9 – 36 V dc
Current:
1.2Watt idle
10Watt peak max
Surge protection to IEC1000-4-2 and IEC 61000-4-2
15kV (air gap) 8kV (contact discharge)

I/O

2 x Digital inputs (volt free contacts)
2 x Digital outputs (SPCO relay, 1A @ 24V)
1 x Analogue input (0-5V or 0-20mA)
Optional I/O expansion card

Dimensions:

180 x 130 x 36mm
Weight: 420 grams (excl mounting brackets)

Environmental:

Temperature: -20^0 C to + 60^0 C
Relative humidity: 5% to 95% (non Condensing)
Ethernet isolation to IEC 61000-4-5
RS232 isolation to IEC 1000-4-2
USB isolation to IEC 61000-4-2

Enclosure

IP67 weatherproof
Mounting brackets (for 50mm pole)
Din rail option

Antenna

SMA (female) connector
Whip antenna supplied

Approvals

Safety – EN60950

RF - EN301 489-1 V1.6.1
EN301 489-7 V1.3.1
EN301 419-1 V4.1.1
EN301 511 V9.0.2
TS51.010
CE Notified body 0682
FCC 09E – Q2686

RM6000 in IP67 enclosure