WAVECOM

AT commands for GPRS
User Guide

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Document Information

Revision	Date	History of the evolution	
001 (1.1)	27/11/01	Added PPP config files for Linux	
002 (1.2)	06/12/01	Added information about 526	
003 (1.3)	05/04/02	Added information about 532	
004 (1.4)	10 Jul 2002	Added information about PPP DNS management on linux	

Contents

1) Introduction

This brief guide aims at explaining the basic steps for getting started with GPRS. It supposes you are a bit familiar with GPRS concepts, like network attachment, session or PDP context.
This guide is not intended to give full details about how GPRS works, all GPRS-specific AT commands (check out the GPRS AT command manual).

2) Getting attached

By default depending on the firmware version, the MS starts up either in class CG (i.e. in GPRS mode and not in GSM mode) or in class B.

With firmwares 520 and 521, which are only class-C capable, the default mode is CG mode.

With firmware 526 and above, the default mode is class B. You can retrieve the firmware version with **AT+CGMR**.

When powering up in mode :
-    CG the MS is automatically attempting to get GPRS attached
-    CC or B the MS is automatically attempting to get IMSI attached.

Therefore it's worth noting that in class B no automatic GPRS attach is done
at startup. This is a request from many network operators which do not want to have all their ressources used up by mobiles not using the GPRS service.

In that case, a GPRS attach is manually forced by **AT+CGATT=1.**
Note that manually forcing GPRS attachment is usually not necessary since the MS automatically attempts to attach prior to opening a session.

The user can check whether the MS is GPRS attached by entering:
AT+CGREG?
which is the counter-part command of AT+CREG? (GSM attachment status).

The response **+CGREG:0,1** means the MS is successfully attached.
The response **+CGREG:0,0** means the MS is trying to attach.
The response **+CGREG:0,2** has failed to attach and stopped trying to attach. This occurs approx. within 1-3 min of powering up.

Alternatively, the registration status can be retrieved using:
AT+CGATT?
The response **+CGATT:1** means the MS is successfully attached.

Whereas response **+CGATT:0** means the MS is not attached, or has failed to attach.
This command is somewhat less accurate than **AT+CGREG**?.

3) Defining a PDP (Packet Data Protocol) context

Before setting up a session, a PDP context has to be defined.

This procedure has to be done only once (or after all objects in flash have been erased). Therefore even though a new firmware and w.e2p file are downloaded, the PDP contexts still remain.

The following command is used for that purpose:

AT+CGDCONT=1,"IP","apn"

whereby apn is a string parameter supplied by the GPRS operator and specifies the gateway to be used between the GPRS network and the internet realm.

If no APN is provided, simply type in:

AT+CGDCONT=1,"IP"

"IP" means that all data exchanged between the MS and the network are IP packets. This is the only type supported rigth now.

Other optional parameters are not relevant for the time being. In this step, no error should occur.

4) Defining a Quality of Service (QoS) profile

The QoS consists of a set of 5 parameters (precedence, delay, reliability, peak throughput, mean throughput) which allow the user to reach a trade-off between contradictory features. For instance, depending on the application the user can favor a better reliability at the expense of the throughput.

For the moment, the QoS is usually ignored by the network, which provides a best-effort service.

However, one parameter matters more than the others: the reliability parameter which determines whether the LLC and RLC layers offer acknowledged or un-acked service.
For the time being this firmware only supports LLC unacked mode and RLC acked mode.
So the QoS shall be defined as follows:

AT+CGQREQ=1,0,0,3,0,0

The first '1' is the number of the PDP for which the QoS is to be defined. '0' means the corresponding parameter will be set by the network upon session activation. '3' sets the reliability to LLC unacked and RLC acked.

Like **AT+CGDCONT**, this command has to be entered only once, just after defining a context.

In this step, no error should occur.

5) Activating a session w/o transferring data

For the first experiment, it could be useful to activate a session without entering the online mode. It is done with:

AT+CGACT=1,1

Which activates the context **#1**. If OK is returned then everything is fine. if ERROR is returned, see Troubleshooting section.

For the sake of learning, now enter:
AT+CGACT?
to get activation status of all defined contexts. It should come back with:
+CGACT:0,0
+CGACT:1,1
which means the context #0 (default context which may be used when no parameter (like APN) needs to be supplied when defining the context) is not activated, whereas our context #1 is activated.

At this stage it's not possible to transfer data because the MS is still offline.
Try deactivating the session with

AT+CGACT=0,1

Now AT+CGACT? should answer back:
+CGACT:0,0
+CGACT:1,0
meaning all contexts are deactivated.

6) Activating a session and transferring data

At this point, things get a little bit more complicated.

But please, before going on further be sure that step 5) is successful. If not successful, it will be easier to investigate in step 5) than in step 6). Since the MS has no embedded applications, the

transfert of data must be carried out using a PC hooked onto the MS via a serial cable.

A bit of theory before getting into details:

It's worth pointing out that **GPRS is IP-centric**. It means that it does not provide a "transparent" link between the MS and the network. This clearly contrasts with CSD (Circuit Swiched Data, or data calls in GSM mode) which provides a transparent link (in which data can be of whatever protocol, format, structure etc the user wants).

So, in a nutshell, using GPRS implies that IP packets be exchanged between MS the and the network. In the case a PC is hooked to the MS, it also implies that IP packets be exchanged between the PC and the MS. That's why the GPRS link is not considered as a transparent link since the MS only expects IP packets from the PC, and no longer unstructured plain data.

Going on further, it's not possible to carry plain IP packets over a serial link due to loss of packet boundaries since serial links are not packet-oriented. So to overcome this and to manage the IP configuration, a low level protocol named PPP is used. This protocol embeds IP packets into PPP frames which then are sent over the serial link. On M$ Windows, **PPP** is basically refered to as a dial-up connection which is configured as follows.

6a) Defining a remote dial-up connection on PC

On the PC side, a dial-up connection has first to be defined. Following instructions are only applicable with W95/W98:

a) Click on the MyComputer icon on the desktop

b) Select dial-up networking

c) Select Make New connection

d) Enter the name of the connection

e) Select a 'standard 19200' and configure the max speed to 115200 (after clicking the 'configure' button) and the COM according to your needs.

Should the standard 19200 modem not installed, you have to install it prior moving on: select the 'modems' icon from the configuration panel, select 'Add' and check the 'Do not detect my modem…' item.
Select a 'Standard modem types' from the manufacturer list and then select a standard modem 19200 or higher. When you're done with the installation, click the 'Properties' button from the modem panel and set the speed to 115200.

f) proceed to the next screen

g) leave the area code field blank, do not alter the country code
field and type in in the telephone number field : ***99***1#**
(star 99 star star star 1 hash).
The '1' tells the MS to activate PDP context number 1. If you
defined a context as number 2 then replace 1 with 2.
Note: enter 0 in the area code if Windows complains that it is
empty.

h) Hit Next and Finish.

i) On the window displaying dialup connection icons,
rigth-click on your brand new connection icon and select
'properties'.
h) On the 'General' tab, be sure to uncheck the 'Use country and area
code' item.

g) On the 'Server types' tab, uncheck everything except the last
'TCP/IP' item.

i) Hit 'TCP/IP settings' button
Activate 'Click on 'Server assigned IP address'
Activate 'Specify name server addresses'
and then enter the DNS IP addresses supplied by the GPRS
operator.
if no DNS IP addresses are supplied by the operator then leave
these fields blank.
They will be automatically assigned when activating a session.
Uncheck 'IP header compression'
Be sure 'Use default gateway' is checked.
j) Press OK and OK from the main menu.

k) You're done with your PPP connection

6b) Activating your dialup connection

Before activating your connection, check that the MS is registered
into the network. For that purpose launch HyperTerminal and
proceed as described in step 1). Also be sure the serial rate of MS is
set to 115200 baud
If not, issue **AT+IPR=115200;&W**
Then close HyperTerminal.

Double-click on your dialup connection icon.
Leave the 'user' and 'password' field empty unless the GPRS
operator supplies them.
Hit 'Connect'.

Normally, if everything's going smoothly the dialup window should
go down to the tray bar within 2 or 3 seconds of launching.

6c) Pinging a remote server

Pinging is the simplest way to check whether the dialup
connection is up.
Pinging consists of sending so-called a PING request (using the
ICMP protocol) and waiting for a PING response.

To ping, open a DOS window and run ping as follows:
ping www.wavecom.com -w 10000

Four PING requests for 32 bytes in length with a 10 sec timeout will
be sent. You can replace www.wavecom.com with whatever
nameserver you want.

If the loss percentage is 100%, then there's very likely something
wrong!
Try increasing the timeout duration (set it to 20000). If it does not
go better, check dialup connection parameters (especially DNS) and
the context's APN. Or try another nameserver.
Some GPRS networks have been reported to bar PING packets.

If loss percentage is, say, less than 10%, try longer PINGs with: ping
www.wavecom.com -w 15000 -l 1000 It will send PINGs of 1000
bytes in length. The max length is 1460.

If loss percentage is in between, it means the dialup connection is
likely to be properly configured. Try another nameserver or ...
try during off-peak hours - networks may allocate a very limited
bandwidth for GPRS service in case of high voice traffic load.

Should you want to test the loss rate over extended period of time,
enter ping www.wavecom.com -w 15000 -n 100
Il will send 100 PINGs of 32 bytes.
Of course you can specify the length with '-l'.

As a rule of thumb, if the loss rate is less than 5% (with 100 PINGs)
then the link is running well.
You may proceed to next stage. There's no need for rebooting the
module.

6d) Browsing the Web

At this stage, you can fire your preferred web browser. Just be sure
to configure it to use a direct connection (ie no proxy):
With Netscape, it's done through the menu
Edition -> Preferences -> advanced -> proxy.
With IE, get around by yourself !

6e) Using FTP

The vanilla FTP client from Window could be used to download files. Just run it (ftp.exe) and enter open nameserver and then type in 'cd', 'dir' and 'get' to navigate through the site and download files. Also Web browsers can be used.

6f) Monitoring transfert progress

Windows provides a system tool to monitor the instant throughput (in fact averaged over a few seconds).

To run it: Start -> Programs -> Accessories -> System tools -> system monitor

If it does not appear then it is not installed. Install it now. In system monitor, grab the Edit menu, then choose 'Add item' and add the 'remote adapter' item and select incoming/outgoing options.

6g) Using Linux

Using Linux and the pppd deamon on the client PC works fine. You can even get the DNS from the GPRS operator, provided you use at least pppd release 2.3.7. Take care to disable any compression parameter. Do 'man pppd' for configuration. Don't forget to enter the DNS parameters in */etc/resolv.conf*

Here below is a sample of the pppd configuration file:

```
nodetach
debug
kdebug 7
crtscts
name my_usersame
connect "chat -vs ECHO OFF AT\r OK ATE0V1\r OK ATDT*99***1#
CONNECT"
novj
nomagicnumber
asyncmap 0
defaultroute
usepeerdns
```

Create a new file called *option.gprs* in */etc/ppp* from this excerpt. Then add the following line in */etc/pap-secrets* :
```
my_username * my_password *
```

my_username and my_password should be supplied by the GPRS operator. If not, enter any dummy name and password.
Finally invoke pppd as :

```
pppd ttyS0 115200 file /etc/ppp/options.gprs
```

Be sure the context #1 is defined, serial baud rate is set to 115200 baud and modem is connected to COM1 (aka ttyS0).
Also be sure that *option.gprs* is readable by the user who has invoked pppd.

In order to update the DNS server address of your linux workstation, you will have to create a template file in directory /etc/ppp, called for instance **resolv.gprs**

```
#/resolv file template for GPRS provider myisp.com
domain myisp.com
search myisp.com
```

where "myisp.com" is the domain of the GPRS provider.

and then add the following lines in /**etc/pppp/ip-up (or /etc/ppp/ip-up.local** if it exists)

```
#/etc/ppp/ip-up
…
if [ -f /etc/resolv.conf ]; then
cp -p /etc/resolv.conf /etc/ppp/resolv.conf.bak
cp /etc/ppp/resolv.gprs /etc/resolv.conf
echo "nameserver $DNS1" >> /etc/resolv.conf
echo "nameserver $DNS2" >> /etc/resolv.conf
chmod 644 /etc/resolv.conf
fi
```

Finally, you will have to update the /etc/ppp/ip-down (or /etc/ppp/ip-down.local) file to put the old dns servers back.

```
#/etc/ppp/ip-down
…
if [ -f /etc/ppp/resolv.conf.bak ]; then
\rm -f /etc/resolv.conf
cp -p /etc/ppp/resolv.gpr.bak /etc/resolv.conf
fi
```

In case of negociation failure, it's may be worth to have a look at the trace log /var/log/messages.

7) Troubleshooting

As already mentionned, GPRS is a rather new technology and as a consequence networks and mobiles haven't reached yet the stability level they've been enjoying in GSM.

So expect some failures every so often or total failure on some networks!
And bear with us.

Unfortunalety, if you experience a failure (to attach, to activate a session, etc) , there aren't many workarounds you can try.

7a) Failure to log onto the GPRS network.

In such a case, try logging onto the GSM network by issueing:

AT+CGCLASS="CC"

if MS was in class CG.
Registration progress can be checked with:
AT+CREG?
See the ATcommand guide for more information about this command.
Basically if after a short while it responds +CREG:0,1 then the MS has successfully completed GSM attachment.

As consequence, failure to GPRS attachment is likely due to either:
- MS firmware fault, see section 'Making logs'.
- the cell the MS is camped on does not support GPRS. So far, there isn't any means to check whether a cell has support for GPRS.

In case GSM registration fails as well, faulty hardware or bad antenna/power connection may be suspected.
Check also the SIM card, and be sure to enter PIN code if any.
It's also worth checking the MS's IMEI.

6b) Failure to activate a session

If you had entered **AT+CGQREQ = 1,0,0,3,0,0**
then try with **AT+CGQREQ=1,0,0,0,0,0** and vice-versa.

Also, be sure to properly enter the APN which is case sensitive. See section 'Making traces'

6c) Failure to send data after entering an URL

The MS is GPRS attached, the session is successfully open, the remote dialup connection is running fine on PC but when I enter an URL in the web browser, nothing seems to happen.

So first of all, double click on dialup connection icon from the tray ar and check whether the number of sent bytes increases whenever you enter an URL (and press ENTER).

If that number does not increase there is much likely a routing problem coming from the PC.
In that case, run the winipcfg tool and check for entries different from 'PPP adapter' from the combo-list.

If they are so, select them one by one, and for each one hit 'free' to tell Windows this inferface is now down and must done ignored when routing.

In some cases this may not be enough for Window to route packets to the default PPP interface so, on a laptop, try deactivating the ethernet
PCMCIA card through the PCMCIA deamon in the tray bar.

If none of these advices fixes the problem, try tweaking the network parameters in the config panel. In case it still persists, dump Windows and use Linux!