ZyWAN

**Application Note –
Modem Diagnostics**

Arcom

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Revision History

Revision	Date	Comments
Issue A	October 2007	First full release of Modem Diagnostics Application Note

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Contents

About this manual

This Application Note provides detailed information about gaining access to the modem module on the ZyWAN Cellular Routing Modem.

Symbols

The following symbols are used in this guide:

Symbol	Explanation
	Information that requires your attention.
	A handy hint that may provide a useful alternative or save time.
	Proceeding with a course of action may damage your equipment or result in loss of data.

Introduction

The ZyWAN is a cellular routing modem for GSM/GPRS, EvDO/1xRTT CDMA, and iDEN networks. It contains one of several embedded third-party modules for communication on cellular networks.

Occasionally it is necessary to communicate directly with the cellular modules, for instance to check signal strength or to perform other diagnostics. This Application Note describes the commands necessary to gain access to the modem modules and some of the troubleshooting commands that may be used.

Gaining Access to ZyWAN

In order to perform any of the commands in this Application Note, one must first gain access to an administrative login on the ZyWAN. This may be done in one of the following ways:

- **Serial (Null Modem) Cable** – This option requires a null modem RS-232 serial cable to be connected from a computer (PC) to the ZyWAN.

- **Secure Telnet (SSH)** – This option requires a network connection to the ZyWAN over one of its available networks. Because this procedure will be stopping the IP network connection on the cellular connection, the cellular network may not be used in this case. The Secure Telnet option can be done from an SSH-capable piece of software (this document describes using the PuTTY application), or using the 'ssh' command from a Linux/UNIX computer.

The details of connecting using either of these methods is described below.

Connecting with Serial (Null Modem) Cable

This section describes using Windows HyperTerminal to communicate with the ZyWAN on a local serial port. Connect the null modem RS-232 serial cable from the PC to COM1 of the ZyWAN. The null modem cable can be purchased from Arcom Control Systems, or it may be obtained from an electronics supply store.

1   Select the Windows *Start* menu, *Programs*, *Accessories*, *Communications*, *HyperTerminal*. The *Connection Description* window is displayed.

2   Enter a name for this HyperTerminal configuration, as shown below:
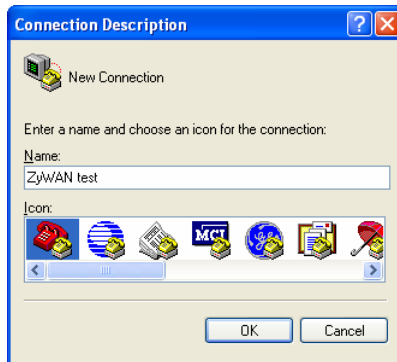
3 Set the *Connect using* option to *COM1*, or whatever free RS-232 port exists on this PC:

4 Make the following settings for the serial communication, then click the **OK** button:
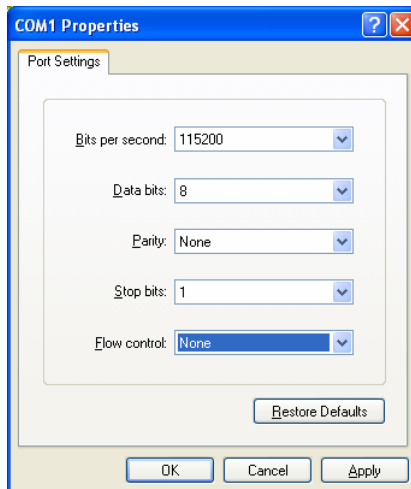
5 If the ZyWAN is already started, press the **Enter** key to get a login prompt. The default administrative login is `root` and the default password is `arcom` (case-sensitive).
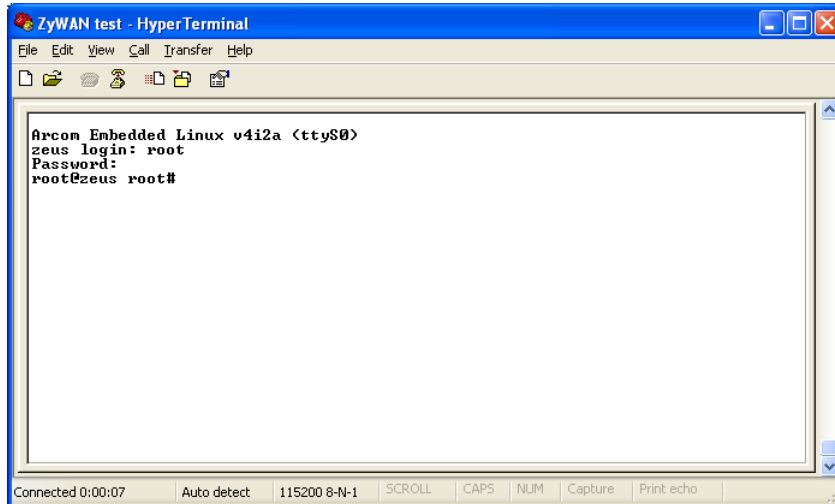
Connecting with PuTTY (SSH)

This section describes using the PuTTY application to communicate with the ZyWAN using a network connection. Make sure the ZyWAN is connected to the network and that its IP address is known.

1 Download the putty.exe application from the Web site http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html

2 Run putty.exe and enter the IP address of the ZyWAN. Make sure the protocol is set to "SSH" and the port is 22.
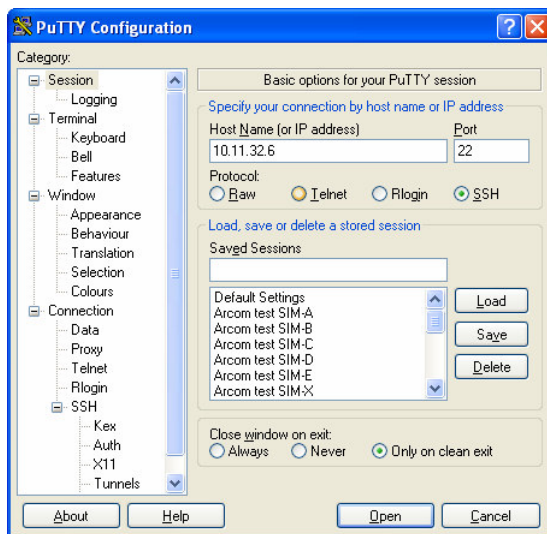
3 Upon the first connection, a security warning will appear. Click **Yes** to go on.

4 Login to the ZyWAN. The default administrative login is `root` and the default password is `arcom` (case-sensitive).

Stop ZyWAN Application

The ZyWAN application internally uses serial connections to the cellular modules. There is at present no way to access the modem modules while the ZyWAN application is running, because these serial connections are in use. The following command will stop the ZyWAN application and close any IP connection to the cellular network.

```
ZyWAN pppstop
```

Power Cycle Modem (gprs, iden)

In some cases, forcibly stopping the application may leave the modem in an indeterminate state, and it may be necessary to power cycle the cellular module. This may only be done with the GPRS (GR64) and IDEN (IO270) modules.

For GPRS:

```
/usr/bin/zeus-modem-off.sh        (to turn off the module)
/usr/bin/zeus-modem-on.sh         (to turn on the module)
```

For IDEN:

```
/usr/bin/iden-off.sh              (to turn off the module)
/usr/bin/iden-on.sh               (to turn on the module)
```

Modem Diagnostics

After stopping the ZyWAN application, enter minicom with one of the following commands:

`minicom gprs`

`minicom iden`

`minicom evdo`

Then, issue the various diagnostic commands for each modem, listed below, as needed.

Modem commands for GPRS (GR64)

The following commands are used with the GPRS model (GR64 cellular module). These commands will be entered in a minicom session (`minicom gprs`) as described above.

Check Signal Strength

To check signal strength, enter the command:

`at+csq`

The response will be something like:

> `+CSQ: 28,99`

The first number goes from 0 to 31, with 31 being the best signal strength. If there is no signal, the first number will go to 99. The values 0 to 31 mean:

> 0 = -113 dbm or less
> 1 = -111 dbm
> 2 to 30 = -109 to -53 dbm
> 31 = -51 dbm or better

The second number is usually 99 (no information), otherwise it will be a number 0 to 7 of a "bit error rate". If the second number isn't 99, 7 is the worst (problems with the over the air communication), and a 0 is best.

Check available cellular providers

To get a list of available cellular providers, enter the command:

> `at+cops=?`

The response will be something like:

> `+COPS: (2,"T-Mobile","T-Mobile","31026")`

> `+COPS: (1,"Cingular","Cingular","31041")`

This command takes several seconds to complete until it returns the response. The first number in each line above might be: 0=unknown, 1=provider available, 2=current (active) provider, 3=forbidden.

Check Registration Status with Cell Provider

To check the current registration status on the cellular network, enter the command:

`at+cgreg?`

The response will be something like:

+CGREG: 0,1

The last digit above might be:

0=not registered on the network & not searching
1=registered
2=not registered on the network, but searching
3=registration denied
4=unknown
5=registered but roaming on a non-home network

Read SIM Serial Number

To read the SIM number from the current SIM card, enter the command:

`at*e2ssn`

The response will be something like:

*E2SSN: 8901260900036162037

If this doesn't return the SIM number, it may be that the card isn't seated properly, or the SIM card has a problem.

Check Modem Software Revision

To check the modem software revision, enter the following command:

`at+cgmr`

The response will be something like:

R7B004   CXC1122610

Check Modem Serial Number

To check the modem serial number, enter the following command:

`at+cgsn`

The response will be something like:

01025700183855009

Modem commands for IDEN (iO270)

The following commands are used with the IDEN model (iO270 cellular module). These commands will be entered in a minicom session (`minicom iden`) as described above.

Check Signal Strength

To check signal strength, enter the command:

```
at+wvtrace=10,1,1
```

This should return an output once per second that looks something like the following:

```
+WVTRACE: 10, SQE:26.2 BS:02 CAR:083-E1 OB:-00 POW:-76 TA:0 TEMP:+24 SL:+0
LVL:0 NUM_CHANS:0 AGC:0 CH:SC

+WVTRACE: 10, SQE:27.5 BS:02 CAR:083-E1 OB:-00 POW:-76 TA:0 TEMP:+24 SL:+0
LVL:0 NUM_CHANS:0 AGC:0 CH:SC

+WVTRACE: 10, SQE:26.6 BS:02 CAR:083-E1 OB:-00 POW:-77 TA:0 TEMP:+24 SL:+0
LVL:0 NUM_CHANS:0 AGC:0 CH:SC

+WVTRACE: 10, SQE:27.3 BS:02 CAR:083-E1 OB:-00 POW:-77 TA:0 TEMP:+24 SL:+0
LVL:0 NUM_CHANS:0 AGC:0 CH:SC
```

Each line contains many pieces of information, including.

SQE = signal quality (good signals typically > 18)
CAR = unique identifier for the current cell tower
POW = signal strength in dBm (good signals typically > -85)

To turn off the signal strength output, enter the following command while the signal strength data is being displayed:

```
at+wvtrace=10,0
```

Check Registration Status with Cell Provider

To check the current registration status on the cellular network, enter the command:

```
at+wpstate
```

The response will be something like:

```
PACKET              SERVICE TYPE
72.7.0.149          VALID NEI
REGISTERED          REGISTRATION STATUS
REGISTERED          MIP REGISTRATION STATUS
```

or,

```
PACKET              SERVICE TYPE
72.7.0.149          VALID NEI
NO                  REGISTRATION STATUS
NOT REGISTERED      MIP REGISTRATION STATUS
```

Use the following command to read the active bandmap of the modem:

`at+wvtrace=21`

The response will be something like:

```
+WVTRACE: 21, 02 0x07 Nextel/TELUS
```

Read Public IP Address and Direct Connect Number

To read the public IP address of the SIM card, enter the command:

`at+wvnum`

The response will be something like:

```
+WVNUM: ,"9139275105",144,,4
+WVNUM: ,"00000000000000000000000000000000000000000",144,,11
+WVNUM: ,"00000000000000000000",128,19200,0
+WVNUM: ,"140*22*4031",128,,6
+WVNUM: ,"72.7.0.149",128,,7
+WVNUM: ,"0.0.0.0",128,,8
+WVNUM: ,"0.0.0.0",128,,9
+WVNUM: ,"1",128,,10
```

The public IP address is in the 4th line (72.7.0.149) and the Direct Connect number is in the 4th (140*22*4031).

Read SIM Serial Number and Configuration

To read the SIM number from the current SIM card, enter the command:

`at+wvtrace=12`

The response will be something like:

```
+WVTRACE: 12, SIMID: 00082932686431
```

If this doesn't return the SIM number, it may be that the card isn't seated properly, or the SIM card has a problem.

Issue the following two commands to check the SIM card for the correct provisioning.

`at+ws45?`

The response should be 4 (PPP).

`at+ws46?`

The response should be 24 (packet switch data mode). If either of these responses are not correct, there is a problem with the SIM card provisioning.

Check Modem Software Revision

To check the modem software revision, enter the following commands:

`at+wvtrace=3`

at+wvtrace=4

at+wvtrace=5

at+wvtrace=6

The responses will be something like:

+WVTRACE: 3, 60.01/1A.00   (codeplug version)

+WVTRACE: 4, 01.06.11   (CSD version)

+WVTRACE: 5, 3CB.01.01   (USR version)

+WVTRACE: 6, R3C.02.03   (software version)

Check Modem Serial Number and IMEI number

To check the modem serial number and IMEI, enter the following commands:

`at+cgsn`

`at+wvtrace=11`

The responses will be something like:

364YHJ4C59   (serial number)

+WVTRACE: 11, IMEI: 001500026804600   (IMEI number)

IO270 Port Forward Table

To read the port forward table of the modem, enter the following command.

`at+wv330?`

The response will be something like:

```
+WV330: 12000,12000,6,"10.23.6.2"
+WV330: 12000,12000,17,"10.23.6.2"
+WV330: 80,80,6,"10.23.6.2"
+WV330: 80,80,17,"10.23.6.2"
+WV330: 22,22,6,"10.23.6.2"
+WV330: 22,22,17,"10.23.6.2"
```

Each line defines a port forward entry, which is the list of allowed IP ports which will be passed through the modem. The first number (e.g. 80) is the incoming port. The second number (e.g. 80) is the port to be forwarded to on the ZyWAN. The next number is 6=TCP or 17=UDP. The last portion is the internal IP address of the modem in the ZyWAN system, which appears in its `ifconfig ppp0` command.

Modem Reset Commands

The following command is used to perform a master reset of the iO270 modem. Use this only when necessary.

```
at+wvmr="000000"
```

The following command will perform a soft reset of the iO270 modem.

```
at+wvreset
```

Modem commands for EvDO (MC5725)

The following commands are used with the EvDO model (MC5725 cellular module). These commands will be entered in a minicom session (`minicom evdo`) as described above.

Check Signal Strength

To check signal strength, enter the command:

```
at+!rssi?
```

This should return a number in dBm, such as -85.

Check Registration Status with Cell Provider

To check the current registration status on the cellular network, enter the command:

```
at!status
```

The response will be something like:

```
Current band: PCS Sleep
Current channel: 875|
SID: 0   NID: 0   1xRoam: 0 HDRRoam: 0
Temp: 14   State: 500   Sys Mode: NO SRV
Pilot acquired
Modem has NOT registered
```

Check Modem Software Revision

To check the modem software revision, enter the following command:

```
at+gmr
```

The responses will be something like:

```
        p1820200,20212 [Sep 20 2005 15:06:16],
        Boot: MC5720_FP_18.02.02 2005/09/22 11:33:29, VID: 4505 PID: 24
```

Check Modem Serial Number and IMEI number

To check the modem serial number and IMEI, enter the following command:

```
at+gsn
```

The responses will be something like:

```
        0x602C6D13
```

Account Activation

The ZyWAN provides for account activation of the modem module through its Web interface. If necessary for troubleshooting, these commands can be issued directly to the modem module.

<u>Read NAM profile</u>:

```
at~namval?0
```

where 0 or 1 is used for the profile to read.

The response to this command is something like:

```
MDN: 9135299437
MIN: 9852534784
SID: 0
NID: 65535
```

<u>Enter activation code</u>:

```
at~namlck=<n>
```

where `<n>` must be entered as the Master Subsidy Lock for this module.

<u>Set the NAM Profile</u>:

```
at~namval=0,9135299437,9852534784,0,65535
```

where (in this example)
0=profile (0 or 1)
9135299438 = MDN (mobile directory number)
9852534784 = MSID (mobile station identifier)
0 = SID (System ID)
65535 = NID (Network ID)

Then issue the command to reset the modem.

```
at!reset
```

<u>Start IOTA Provisioning</u>:

```
at!iotastart
```

This will take several minutes to complete.

Appendix A – Contacting Arcom

Sales Support

Arcom's sales team is always available to assist you in choosing the product that best meets your requirements. Contact your local sales office or hotline.

Sales office US

Arcom
7500W 161st Street
Overland Park
Kansas
66085
USA

Tel: 913 549 1000
Fax: 913 549 1002
E-mail: us-sales@arcom.com

Sales office Europe

Eurotech Ltd.
3 Clifton Court
Cambridge
CB1 7BN
United Kingdom

Tel: +44 (0)1223 403410
Fax: +44 (0)1223 410457
E-mail: sales@eurotech-ltd.co.uk

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Technical support

Arcom has a team of technical support engineers who can provide assistance if you have any problems with your ZyWAN.

Technical support US

Tel: 913 549 1010
Fax: 913 549 1001
E-mail: us-support@arcom.com

Technical support Europe

Tel: +44 (0)1223 412428
Fax: +44 (0)1223 403409
E-mail: support@eurotech-ltd.co.uk