PCMCIA-UMTS Interface

Teldat Dm757-I

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Chapter 1 Introduction

1.1 Description

UMTS mobile technology

Universal Mobile Telecommunications System, also known as UMTS technology, is the term used in Europe to refer to third generation mobile services and networks.

It allows for data transmission speeds of up to 384 Kbps, far superior in theory to the data speeds offered by standard ISDN and ADSL lines. Compared to current mobile technology, it can operate eight times faster than GPRS and forty times faster than GSM.

In contrast to GSM and GPRS, which use a mixture of Frequency Division Multiple Access (FDMA) and Time Division Multiple Access (TDMA), UMTS uses Wide Code Division Multiple Access (WCDMA) technology inherited from military technology. The main advantage of WCDMA is that the frequency spectrum of the signal is spread due to a unique spreading code known only to the transmitter and receiver.

This form of modulation offers many advantages:

- High transmission speeds, from using the whole spectrum.
- High level of security and confidentiality due to new techniques approaching maximum channel capacity (such as convolutional encoders).
- Maximum multiple access efficiency as long as the hopping sequences do not coincide.
- High resistance to interference.

Main characteristics

The technology is suitable for a wide variety of users (not just advanced) and services. UMTS offers:

- Ease of use and low cost: UMTS provides easy-to-use, more flexible services.
- New and improved services: UMTS users require high-quality voice services together with data and information services.
- Fast access: The main advantage UMTS has over second generation (2G) mobile communications is the ability to support high data transmission speeds; up to 144 Kbps on high speed vehicles, 384 Kbps in suburban outdoor areas and 2 Mbps in stationary environments (indoors). This capacity, together with the inherent support provided by the Internet Protocol (IP), powerfully combine to deliver interactive multimedia services and new broadband applications.
- Data packet transmission and data transfer speed on request: UMTS combines packet-based data transmission over high-speed switch circuits with the advantage of virtual connectivity to the network at all times and alternative billing methods (for example, pay-per-bit, pay-per-session, flat rate, or asymmetric bandwidth options) as demanded by many upcoming data transmission services.

UMTS network structure

This consists of two large subnets: the telecommunications network and the management network. The former is responsible for sustaining the transfer of data between the endpoints of a connection. The latter provide, among other things, of means of billing and charging subscribers, registering and defining service profiles, the management and security of subscription data, as well as operation of network elements to ensure that the network functions correctly, error detection and correction, and recovery following periods in which network elements have been turned off or disconnected.

A UMTS network consists of the following elements:

- Core Network.

  The Core Network incorporates transmission and intelligence functions. The former supports the transport of traffic data and signaling, including switching. The routing resides in the intelligence functions, which comprise of features such as logic and control of certain services offered through a set of well-defined interfaces; they also include mobility management. The UMTS connects to other telecommunication networks through the Core Network, thus making communication possible not only between UMTS mobile users but also with users connected to other networks.

- Radio access network (UTRAN).

  The radio access network provides the connection between mobile terminals and the Core Network. Known as UTRAN (UMTS Terrestrial Radio Access Network – UTRAN) in UMTS, it consists of a set of radio network systems or Radio Network Controllers (RNC) and a group of dependent B nodes. B nodes are network elements that corres-

pond to the Base stations.

- Mobile Terminals.

  UMTS specifications use the term User Equipment (UE).

Chapter 2 Configuration

2.1 Introduction

The UMTS interface is controlled by means of a set of AT commands internally generated by the device and other commands that can be modified by the user.

Other specific connection parameters are programmed in the dial and PPP protocol profiles.

Before you start configuring, make sure you have the correct carrier information to configure the data connection. Please remember this data is case-sensitive.

	VPN
APN	apnname.es
PDP-Type	IP
Login	OPERADOR_LOGIN
Password	OPERADOR_PASS

Another factor to consider is whether you want an always-on connection (starting when the device is switched on), idle-time = 0, or an on-demand connection with a specific cut-off time, idle-time = x.

You will also need the SIM card PIN number. There is no need to configure this if the SIM card is unlocked (no PIN required).

The steps to configure a fully functional data connection are described below:

2.1.1 Adding a UMTS-PCMCIA device

The UMTS interface currently available on the device is based on the use of UMTS-PCMCIA cards provided by carriers, for example the NOVATEL MERLIN U530 model.

These cards are installed in the PCMCIA connectors available on the device.

Therefore, you must tell the device where the cards are going to be installed (device configuration menu (**p 4**)).

add device pcmcia umts X Y:

> The X value indicates the SLOT where the card will be installed.

> The Y value is an index when multifunction cards are supported.

set data-link at <interface>

> Indicates that an AT commands interface is used over the created interface.

Example:

You are going to insert a UMTS card into the PCMCIA interface in SLOT 2. Create the umts2/0 interface and indicate that AT commands will be used over it.

```
Config>add device pcmcia umts 2 0
Config>set data-link at umts2/0
```

2.1.2 DIAL Connection Profile

The following values must be programmed:

remote-address:

> The remote-address value is always the same (*99***1#) and provides access to the UMTS network. It does not need to be programmed as the remote address is automatically generated when a 3gpp-apn value is programmed.

3gpp-apn:

> This is the UMTS node the connection is executed through; the value varies depending on the carrier.

3gpp-pdp-type:

>> Programs the Packet Data Protocol type to be used in the connection. The value varies depending on the service provided by the carrier. Normally it is the IP that matches the default value.

3gpp-accessibility-control:

>> Allows you to enable a connectivity control on a profile. This allows different profiles to have different access controls. This is explained in more detail in a later section of this manual.

3gpp-bearer-service:

>> CSD connections (i.e., connections to a number, not to an APN) can be programmed with a series of characteristics, including type of norm, speed, etc., as long as it is supported by the inserted module. This is explained in more detail in a later section of this manual.

idle-time:

>> Specifies the time period for disconnection when there is no activity. A 0 idle time value allows the device to establish the UMTS connection immediately. Any other value programs the inactivity timeout period.

Example:

```
Config>global-profiles dial
-- DIAL PROFILE Configuration --
DIALPROF config>
DIALPROF config>profile UMTS default
DIALPROF config>profile UMTS dialout
DIALPROF config>profile UMTS 3gpp-apn movistar.es
DIALPROF config>profile UMTS 3gpp-accessibility-control traffic 6 all
DIALPROF config>profile UMTS idle-time 60
DIALPROF config>
DIALPROF config>exit
Config>
```

2.1.2.1 3GPP-ACCESSIBILITY-CONTROL

One of the disadvantages of UMTS connections is verifying their availability.

The mechanism used by the PPP protocol to control point-to-point connections (Echo-request/Echo-reply) is ineffective on these connections because it only focuses on the local level (that is, connections between the router and the relevant module).

A number of mechanisms have been implemented to check the status of a connection. These can be grouped into two types: intrusive (which originates data traffic online and is billable) and non-intrusive (does not originate data traffic).

Each of the mechanisms described can be configured independently in each profile configured on the interface.

Intrusive

2.1.2.1.1 3GPP-ACCESSIBILITY-CONTROL PING

Once the UMTS connection has been established, pings are sent to the configured IP address every x seconds as specified in the command.

If this time expires and no response has been received from the remote, the next ping is sent with a 10-second response time. If no response is received, two more pings are sent every 5 seconds. The connection is shut down if no response is received.

The command is **3gpp-accessibility-control ping <A.B.C.D> <timer>**.

>> <A.B.C.D>: IP Address to which the pings are sent.

>> <timer>: Time between pings.

Example:

```
Dial Profiles config>profile X 3gpp-accessibility-control ping 10.10.1.1 60
```

```
Dial Profiles config>
```

2.1.2.1.2 3GPP-ACCESSIBILITY-CONTOL TRACE

Same as above, except ICMP trace routes are sent instead of pings.

The command is **3gpp-accessibility-control trace <A.B.C.D> <timer>**.

<A.B.C.D>: IP address to which the traces are sent.

<timer>: Time between them.

Example:

```
Dial Profiles config>profile X 3gpp-accessibility-control trace 10.10.1.1 60
Dial Profiles config>
```

Non-Intrusive

2.1.2.1.3 3GPP-ACCESSIBILITY-CONTROL TIMER

A connection is disconnected when the configured time limit is reached regardless of the idle-time value configured in the connection profile.

The command is **3gpp-accessibility-control timer <A.B.C.D> <timer>.**

<value>: Timer value between 60 and 86399 seconds.

Example:

```
Dial Profiles config>profile X 3gpp-accessibility-control timer 60
Dial Profiles config>
```

2.1.2.1.4 3GPP-ACCESSIIBILITY-CONTROL TRAFFIC

Data flow is monitored in both directions at the IP TCP layer or any layer.

The mechanism works on the assumption that when there is outgoing traffic, there is always incoming traffic. A counter starts counting sent frames (depending on their type) and its value is reset with each entry, regardless of type.

The command is: **3gpp-accessibility-control traffic <counter> <type>** .

<counter>: Represents the limit of outgoing packets (sent to the network) of the type configured without receiving incoming packets. Once this value has been reached, the procedure to disconnect the link is activated in order to attempt a new connection.

<type>: Type of monitored outgoing traffic.

IP: All IP traffic (TCP, UDP, etc.).

TCP: Only TCP traffic is considered for connection control.

ALL: All traffic is considered, including non-IP traffic.

Example:

```
Dial Profiles config>profile X 3gpp-accessibility-control traffic 6 IP
Dial Profiles config>
```

2.1.2.2 3GPP-BEARER-SERVICE-TYPE

The following commands appear in the profile:

```
Dial Profiles config> profile X 3gpp-bearer-service speed <value>
Dial Profiles config> profile X 3gpp-bearer-service name <value>
Dial Profiles config> profile X 3gpp-bearer-service name <value>
Dial Profiles config>
```

These commands allow CSD calls (i.e., those to a number, not to an APN) to have a series of characteristics.

For example, you can make calls to ISDN numbers (those indicating V.110 in speed) if the module allows this.

The figures that appear as values are those defined in the 3GPP TS 27.007 standard for CSD calls.

Not all values are possible; they depend on the module installed and the network. If they are not programmed correctly, the module will return an error but will still try to execute the call. It is advisable to take care when using this command.

The following command will appear before making an ATDXXXXXXXX call when the events are enabled:

AT+CBST=speed,name,ce

Default is 0,0,1 --> Automode.

To find out what values are allowed by a particular module or card, enter command mode (as explained in the section on monitoring) and run **AT+CBST=?**.

2.1.3 Adding a PPP Interface

Adds a PPP interface.

Example:

```
Config>add device ppp 1
Added PPP interface ppp1
Config>
```

2.2 PPP Configuration

2.2.1 Base Interface

Configures the PPP parameters related to the base interface to be used.

Example:

```
Config>network umts2/0
-- Interface AT. Configuration  --
umts2/0 AT config>
umts2/0 AT config>ppp lcp-options acfc
umts2/0 AT config>ppp lcp-options pfc
umts2/0 AT config>ppp lcp-options accm 0
Config>
```

2.2.2 PPP Connection Profile

Tells the PPP interface to use the UMTS interface as the base interface (**base-interface umts2/0 link** command) and the UMTS profile for dialing (**base-interface umts2/0 profile UMTS** command).

Likewise, program the appropriate parameters for the protocol.

The username and password sent during authentication must be appropriate for the carrier and service you are connecting to (**authentication sent-user XXXXXX password YYYYY** command). The ones shown here are examples.

The IP address is usually assigned during the negotiation phase (**ipcp local address assigned** command).

Echo functionality is not required (**lcp echo-req off** command). PPP is only locally significant, i.e., between the router and the connected UMTS module. The echo DOES NOT detect link failures nor loss of signal.

The remote end IP address that appears during negotiation is an internal IP address belonging to the module. Including it in the routing table is not necessary either. You can ignore it by running **no ipcp peer-route**.

Example:

```
Config>network ppp1
-- Generic PPP User Configuration --
ppp1 config>   base-interface
-- Base Interface Configuration --
ppp1 Base IFC config>
ppp1 Base IFC config>base-interface umts2/0 link
ppp1 Base IFC config>base-interface umts2/0 profile UMTS
ppp1 Base IFC config>
```

```
ppp1 Base IFC config> ppp
-- PPP Configuration -
ppp1 PPP config>
ppp1 PPP config> authentication sent-user MOVISTAR password MOVISTAR
ppp1 PPP config> ipcp local address assigned
ppp1 PPP config> lcp echo-req off
ppp1 PPP config> no ipcp peer-route
ppp1 PPP config>
ppp1 PPP config>exit
ppp1 config>
ppp1 config>exit
Config>
```

2.3 Configuring the UMTS Interface

The UMTS interface itself is an AT commands interface.

Certain commands are common to all device interfaces. These commands are described in manual **Dm 772-I Common Configuration for Interfaces**.

The programming commands available are:

Command	Function
?(HELP)	Lists the available commands or their options.
ADDITIONAL-CON-TROL-COMMAND	Configures connectivity control.
ALWAYS-ATTACHED	Attaches/detaches module to the network control.
DISABLE	Disables functionalities.
ENABLE	Enables functionalities.
FRAME-SIZE	Configures the base interface frame size.
NO	Configures default values or negates a command.
PIN	Programs the PIN number for the SIM module used.
SPEED	Programs the interface speed.
UMTS	Configures UMTS connection parameters.
WAIT-TIME	Configures the physical connection maximum wait time.
EXIT	Returns to the configuration menu.

2.3.1 ? (HELP)

Displays a list of the available commands or their options.

Syntax:

```
umts2/0 AT config>?
```

Example:

```
umts2/0 AT config>?
  accessibility-control      Set GPRS accessibility control
  always-attached            In PDP context disconnection not perform detach
  disable                    Disable some features
  enable                     Enable some features
  frame-size                 Set frame size
  no                         Set default config
  pin                        Set PIN number for internal Module
  speed                      Set speed
  umts                       UMTS configuration
  wait-time                  Set maximum connection time
  exit                       Return to previous menu
umts2/0 AT config>
```

2.3.2 ADDITIONAL-CONTROL-COMMAND

Configures additional AT commands for modem configuration. It accepts a string of up to 59 characters. Nothing is configured by default. This command is sent to the module after the last initialization command.

Syntax:

```
umts2/0 AT config>additional-control-command ?
  no-command    No command for this action
  <word>        Text
```

Example:

```
umts2/0 AT config>additional-control-command i
```

Example:

```
umts2/0 AT config>additional-control-command no-command
```

2.3.3 ALWAYS-ATTACHED

When modules are configured internally, they usually perform an attach to the network.

The attach procedure is a mechanism through which the module registers with the data network and indicates its availability. You should not confuse registering with the data network with registering with the mobile network.

Each time a particular context is disconnected, you can opt to deregister (detach) the module from the data network or you can allow it to remain registered by running **always-attached**.

Example:

```
umts2/0 AT config>always-attached
```

2.3.4 DISABLE

Run **disable** to disable modem flow control.

Syntax:

```
gprs0/0 AT config>disable <parameter>
```

Example:

```
gprs0/0 AT config>disable ?
  flow-ctrl-option    Enable flow control
gprs0/0 AT config>
```

2.3.4.1 DISABLE FLOW-CTRL-OPTION

Disables flow control. When this parameter is disabled, the flow control mechanism is not available on the interface. Default is disabled.

Syntax:

```
gprs0/0 AT config>disable flow-ctrl-option
```

Example:

```
gprs0/0 AT config>disable flow-ctrl-option
gprs0/0 AT config>
```

2.3.5 ENABLE

Enables modem flow control.

Syntax:

```
gprs0/0 AT config>enable <parameter>
```

Example:

```
umts2/0 AT config>enable ?
```

```
  flow-ctrl-option    Enable flow control
umts2/0 AT config>
```

2.3.5.1 ENABLE FLOW-CTRL-OPTION

Enables flow control. When this parameter is enabled, flow control is available on the interface. Default is disabled.

Syntax:

```
umts2/0 AT config>enable flow-ctrl-option
```

Example:

```
umts2/0 AT config>enable flow-ctrl-option
umts2/0 AT config>
```

2.3.6 FRAME-SIZE

Command used to configure the maximum base interface frame size to a range between 576 and 4096 bytes.

Example:

```
umts2/0 AT config>frame-size 2048
```

2.3.7 NO

Configures default values.

Syntax:

```
umts2/0 AT config>no <command>
```

Example:

```
umts2/0 AT config>no ?
  always-attached          In PDP context disconnection perform detach
  frame-size
  pin
  speed
  umts
  wait-time
umts2/0 AT config>
```

2.3.8 PIN

Configures the PIN number of the SIM card inserted in the module.

Example:

```
umts2/0 AT config>pin plain 1235
```

> **Note**
>
> The PIN number is shown in encrypted mode when you list the interface configuration. For the above example it looks like this:

Example:

```
umts2/0 AT config>show conf
  pin ciphered 0xFEC7DB8210108C93
```

2.3.9 SPEED

Configures the data speed for the base interface.

Example:

```
umts2/0 AT config>speed ?
  <9600..460800>    Value in the specified range
```

```
umts2/0 AT config>speed 460800
```

2.3.10 UMTS

Configures the device with UMTS options.

The options are:

Command	Function
DOMAIN	Selects the type of data domain to be used (Data, Packets or Both).
MODE	Selects the network mode to use (GPRS, WCDMA or AUTO).

2.3.10.1 UMTS DOMAIN

Selects the data mode.

PS (Packet Service) mode is the mode normally used for UMTS and supported by the carrier.

Example:

```
umts2/0 AT config>umts domain ?
  cs      Circuit switched only
  ps      Packet switched only
  cs+ps   CS+PS
umts2/0 AT config>umts domain ps
```

2.3.10.2 UMTS MODE

Selects the type of network to connect to.

Example:

```
umts2/0 AT config>umts mode ?
  automatic    Automatic
  gprs         GPRS only
  wcdma        UMTS only
umts2/0 AT config>umts mode wcdma
```

2.3.11 WAIT-TIME

Sets the maximum waiting time for GSM connections.

Example:

```
umts2/0 AT config>wait-time ?
  <0..65535>    Value in the specified range
umts2/0 AT config>wait-time 60
```

2.3.12 EXIT

Returns to the previous menu.

Example:

```
umts2/0 AT config>exit
Config>
```

2.4 Configuring IP

The UMTS connection assigns an IP address (public or private) to the device for each connection.

The following shows how to configure the IP addresses with the default route to the UMTS interface.

Example:

```
Config>network ppp1
-- Generic PPP User Configuration --
ppp1 config>ip address unnumbered
```

```
ppp1 config>exit
Config>
Config>network ethernet0/0
-- Ethernet Interface User Configuration --
ethernet0/0 config>ip address 172.24.79.12 255.255.0.0
ethernet0/0 config>exit
Config>exit
Config>protocol ip
-- Internet protocol user configuration --
IP config>
IP config>route 0.0.0.0 0.0.0.0 ppp1 1
IP config>
IP config>classless
IP config>
IP config>
IP config>exit
```

2.4.1 Events

This command is optional but useful when it comes to identifying problems.

Example:

```
Config>event
-- ELS Config --
ELS config>
ELS config>enable trace subsystem PPP ALL
ELS config>enable trace subsystem AT ALL
ELS config>exit
Config>
```

2.4.2 Saving the configuration

For new settings to take effect, the configuration must be saved and the device restarted.

Example:

```
Config>save
Save configuration [n]? y
Performing memory requirements calculations, please wait
Building system configuration, please wait
Configuration built, saving ...
OK on Flash
Config>
```

2.4.3 Checking card detection

Once configuration is complete and the device has restarted, check that the card is operational.

PCMCIA cards are hot-swappable (i.e, they can be inserted and removed without having to restart the device).

```
*p 2
12/28/04 11:21:16  AT.020 Module PCMCIA detected intf umts2/0
12/28/04 11:21:19  AT.020 CTS change OFF --> ON  intf umts2/0
12/28/04 11:21:19  AT.020 DSR change OFF --> ON  intf umts2/0
12/28/04 11:21:21  AT.020 ATCMD-->AT intf umts2/0
12/28/04 11:21:22  AT.020 ATCMD-->AT+CPIN? intf umts2/0
12/28/04 11:21:23  AT.020 Wakeup started on intf umts2/0
12/28/04 11:21:24  AT.020 Setup module on intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT&F intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT&C1&D2+IFC=2,2 intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT+CMEE=1 intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT+CGMI intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT+CGMM intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT+GMR intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT+CGSN intf umts2/0
12/28/04 11:21:24  AT.020 ATCMD-->AT+CIMI intf umts2/0
```

```
12/28/04 11:21:24  AT.020 ATCMD-->AT$NWRAT=0,1 intf umts2/0
12/28/04 11:21:26  AT.001 Modem initialized sucessfully intf umts2/0
12/28/04 11:21:26  PPP.001 Interface ppp1 ready
```

2.4.4 Checking the connection

Executes a ping to a known IP address and monitors the events.

```
*ping 216.239.37.99
PING 216.239.37.99: 56 data bytes
12/28/04 11:36:46  AT.020 Dialer UMTS command CIR_OPEN local st 1 intf umts2/0
12/28/04 11:36:46  AT.020 Connection request on intf umts2/0
12/28/04 11:36:46  AT.020 ATCMD-->AT+CGDCONT=1,"IP","movistar.es" intf umts2/0
12/28/04 11:36:46  AT.020 ATCMD-->AT+CGATT=1 intf umts2/0
12/28/04 11:36:46  AT.020 Attach successful intf umts2/0
12/28/04 11:36:46  AT.020 ATCMD-->AT+CSQ intf umts2/0
12/28/04 11:36:46 *AT.020 Dialer UMTS command CIR_FLOWCONTROL local st 5 intf umts2/0
12/28/04 11:36:46 *AT.020 Dialer UMTS command CIR_CONFIG local st 5 intf umts2/0
12/28/04 11:36:46  AT.003 Received Bad CRC, fr sz 14 intf umts2/0
12/28/04 11:36:46  PPP.011 ppp1:umts2/0 In frame, type 0xc021, size 27
12/28/04 11:36:46  PPP.051 ppp1:umts2/0 LCP In CONF-REQ [req-sent] id 0 len 25
12/28/04 11:36:46  PPP.053 ppp1:umts2/0 LCP   AsyncMap 0 (0x020600000000)
12/28/04 11:36:46  PPP.054 ppp1:umts2/0 LCP   AuthProt CHAP (0x0305c22305)
12/28/04 11:36:46  PPP.055 ppp1:umts2/0 LCP   MagicNumber 4019eaf (0x050604019eaf)
12/28/04 11:36:46  PPP.056 ppp1:umts2/0 LCP   ProtComp available (0x0702)
12/28/04 11:36:46  PPP.057 ppp1:umts2/0 LCP   AddrCtrlComp available (0x0802)
12/28/04 11:36:46  PPP.051 ppp1:umts2/0 LCP Out CONF-NAK [req-sent] id 0 len 10
12/28/04 11:36:46  PPP.053 ppp1:umts2/0 LCP   AsyncMap a0000 (0x0206000a0000)
12/28/04 11:36:46  PPP.011 ppp1:umts2/0 In frame, type 0xc021, size 22
12/28/04 11:36:46  PPP.051 ppp1:umts2/0 LCP In CONF-ACK [req-sent] id 3 len 20
12/28/04 11:36:46  PPP.053 ppp1:umts2/0 LCP   AsyncMap a0000 (0x0206000a0000)
12/28/04 11:36:46  PPP.055 ppp1:umts2/0 LCP   MagicNumber 8a026850 (0x05068a026850)
12/28/04 11:36:46  PPP.056 ppp1:umts2/0 LCP   ProtComp available (0x0702)
12/28/04 11:36:46  PPP.057 ppp1:umts2/0 LCP   AddrCtrlComp available (0x0802)
12/28/04 11:36:46  PPP.011 ppp1:umts2/0 In frame, type 0xc021, size 27
12/28/04 11:36:46  PPP.051 ppp1:umts2/0 LCP In CONF-REQ [ack-rcvd] id 1 len 25
12/28/04 11:36:46  PPP.053 ppp1:umts2/0 LCP   AsyncMap a0000 (0x0206000a0000)
12/28/04 11:36:46  PPP.054 ppp1:umts2/0 LCP   AuthProt CHAP (0x0305c22305)
12/28/04 11:36:46  PPP.055 ppp1:umts2/0 LCP   MagicNumber 4019eaf (0x050604019eaf)
12/28/04 11:36:46  PPP.056 ppp1:umts2/0 LCP   ProtComp available (0x0702)
12/28/04 11:36:46  PPP.057 ppp1:umts2/0 LCP   AddrCtrlComp available (0x0802)
12/28/04 11:36:46  PPP.051 ppp1:umts2/0 LCP Out CONF-ACK [ack-rcvd] id 1 len 25
12/28/04 11:36:46  PPP.053 ppp1:umts2/0 LCP   AsyncMap a0000 (0x0206000a0000)
12/28/04 11:36:46  PPP.054 ppp1:umts2/0 LCP   AuthProt CHAP (0x0305c22305)
12/28/04 11:36:46  PPP.055 ppp1:umts2/0 LCP   MagicNumber 4019eaf (0x050604019eaf)
12/28/04 11:36:46  PPP.056 ppp1:umts2/0 LCP   ProtComp available (0x0702)
12/28/04 11:36:46  PPP.057 ppp1:umts2/0 LCP   AddrCtrlComp available (0x0802)
12/28/04 11:36:46  PPP.087 ppp1:umts2/0 LCP Negotiation successful
12/28/04 11:36:46  AT.020 Dialer UMTS command CIR_FLOWCONTROL local st 5 intf umts2/0
12/28/04 11:36:46  AT.020 Dialer UMTS command CIR_CONFIG local st 5 intf umts2/0
12/28/04 11:36:46  PPP.085 ppp1:umts2/0 CHAP required by peer
12/28/04 11:36:46  PPP.011 ppp1:umts2/0 In frame, type 0xc021, size 10
12/28/04 11:36:46  PPP.051 ppp1:umts2/0 LCP In DISC-REQ [opened] id 2 len 8
12/28/04 11:36:46  PPP.011 ppp1:umts2/0 In frame, type 0xc223, size 37
12/28/04 11:36:46  PPP.067 ppp1:umts2/0 CHAP In CHALLENGE [ack-sent] id 1 len 35
12/28/04 11:36:46  PPP.070 ppp1:umts2/0 CHAP   Challenge 06c617dd5025ca43f4c9578c26fa8bd7
12/28/04 11:36:46  PPP.068 ppp1:umts2/0 CHAP   Peer-Name UMTS_CHAP_SRVR
12/28/04 11:36:46  PPP.067 ppp1:umts2/0 CHAP Out RESPONSE [ack-sent] id 1 len 29
12/28/04 11:36:46  PPP.071 ppp1:umts2/0 CHAP   MD5 241abe9b7cfcb0a8a5277c6c6fb678b7
12/28/04 11:36:46  PPP.068 ppp1:umts2/0 CHAP   Peer-Name MOVISTAR
12/28/04 11:36:46  PPP.011 ppp1:umts2/0 In frame, type 0xc223, size 6
12/28/04 11:36:46  PPP.067 ppp1:umts2/0 CHAP In SUCCESS [ack-sent] id 1 len 4
12/28/04 11:36:46  PPP.088 ppp1 IPCP Negotiation started
12/28/04 11:36:46  PPP.072 ppp1 IPCP Out CONF-REQ [starting] id 1 len 10
12/28/04 11:36:46  PPP.073 ppp1 IPCP   Address 0.0.0.0 (0x030600000000)
12/28/04 11:36:46  PPP.001 Interface ppp1 ready
12/28/04 11:36:47  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 18
```

```
12/28/04 11:36:47  PPP.072 ppp1 IPCP In CONF-NAK [req-sent] id 1 len 16
12/28/04 11:36:47  PPP.076 ppp1 IPCP    Unknown option (0x81060a0b0c0d)
12/28/04 11:36:47  PPP.076 ppp1 IPCP    Unknown option (0x83060a0b0c0e)
12/28/04 11:36:47  PPP.072 ppp1 IPCP Out CONF-REQ [req-sent] id 2 len 10
12/28/04 11:36:47  PPP.073 ppp1 IPCP    Address 0.0.0.0 (0x030600000000)
12/28/04 11:36:48  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 18
12/28/04 11:36:48  PPP.072 ppp1 IPCP In CONF-NAK [req-sent] id 2 len 16
12/28/04 11:36:48  PPP.076 ppp1 IPCP    Unknown option (0x81060a0b0c0d)
12/28/04 11:36:48  PPP.076 ppp1 IPCP    Unknown option (0x83060a0b0c0e)
12/28/04 11:36:48  PPP.072 ppp1 IPCP Out CONF-REQ [req-sent] id 3 len 10
12/28/04 11:36:48  PPP.073 ppp1 IPCP    Address 0.0.0.0 (0x030600000000)
12/28/04 11:36:49  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 18
12/28/04 11:36:49  PPP.072 ppp1 IPCP In CONF-NAK [req-sent] id 3 len 16
12/28/04 11:36:49  PPP.076 ppp1 IPCP    Unknown option (0x81060a0b0c0d)64 bytes from 216.239.37.99:
12/28/04 11:36:49  PPP.076 ppp1 IPCP    Unknown option (0x83060a0b0c0e)
12/28/04 11:36:49  PPP.072 ppp1 IPCP Out CONF-REQ [req-sent] id 4 len 10
icmp_seq=5.
12/28/04 11:36:49  PPP.073 ppp1 IPCP    Address 0.0.0.0 (0x030600000000)
12/28/04 11:36:50  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 18
12/28/04 11:36:50  PPP.072 ppp1 IPCP In CONF-NAK [req-sent] id 4 len 16
12/28/04 11:36:50  PPP.076 ppp1 IPCP    Unknown option (0x81060a0b0c0d)
12/28/04 11:36:50  PPP.076 ppp1 IPCP    Unknown option (0x83060a0b0c0e)
12/28/04 11:36:50  PPP.072 ppp1 IPCP Out CONF-REQ [req-sent] id 5 len 10
time=272. ms
12/28/04 11:36:50  PPP.073 ppp1 IPCP    Address 0.0.0.0 (0x030600000000)
12/28/04 11:36:50  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 6
12/28/04 11:36:50  PPP.072 ppp1 IPCP In CONF-REQ [req-sent] id 3 len 4
12/28/04 11:36:50  PPP.072 ppp1 IPCP Out CONF-ACK [req-sent] id 3 len 4
12/28/04 11:36:50  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 12
12/28/04 11:36:50  PPP.072 ppp1 IPCP In CONF-NAK [ack-sent] id 5 len 10
12/28/04 11:36:50  PPP.073 ppp1 IPCP    Address 80.27.13.42 (0x0306501b0d2a)
12/28/04 11:36:50  PPP.072 ppp1 IPCP Out CONF-REQ [ack-sent] id 6 len 10
12/28/04 11:36:50  PPP.073 ppp1 IPCP    Address 80.27.13.42 (0x0306501b0d2a)
12/28/04 11:36:50  PPP.011 ppp1:umts2/0 In frame, type 0x8021, size 12
12/28/04 11:36:50  PPP.072 ppp1 IPCP In CONF-ACK [ack-sent] id 6 len 10
12/28/04 11:36:50  PPP.073 ppp1 IPCP    Address 80.27.13.42 (0x0306501b0d2a)
12/28/04 11:36:50  PPP.088 ppp1 IPCP Negotiation successful
12/28/04 11:36:50  PPP.011 ppp1:umts2/0 Out frame, type 0x0021, size 85
12/28/04 11:36:51  PPP.012 ppp1:umts2/0 In PFC frame, 0x21 [OK]64 bytes from 216.239.37.99:
12/28/04 11:36:51  PPP.011 ppp1:umts2/0 In frame, type 0x0021, size 85
12/28/04 11:36:51  PPP.011 ppp1:umts2/0 Out frame, type 0x0021, size 85
12/28/04 11:36:52  PPP.012 ppp1:umts2/0 In PFC frame, 0x21 [OK]
12/28/04 11:36:52  PPP.011 ppp1:umts2/0 In frame, type 0x0021, size 85
icmp_seq=6. time=292. ms
12/28/04 11:36:53  PPP.011 ppp1:umts2/0 Out frame, type 0x0021, size 85
12/28/04 11:36:53  PPP.012 ppp1:umts2/0 In PFC frame, 0x21 [OK]64 bytes from 216.239.37.99:
12/28/04 11:36:53  PPP.011 ppp1:umts2/0 In frame, type 0x0021, size 85
icmp_seq=7. time=281. ms
----216.239.37.99 PING Statistics----
10 packets transmitted, 4 packets received, 60% packet loss
round-trip (ms)  min/avg/max = 733/837/944
*hide
```

2.5 Configuration Templates

The following is an example aimed at making user configuration easier:

```
log-command-errors
no configuration
add device ppp 1
add device pcmcia umts 2 0
set data-link at umts2/0
set data-link sync serial0/0
set data-link sync serial0/1
set data-link sync serial0/2
set hostname ATLAS-UMTS
```

```
global-profiles dial
; -- Dial Profiles Configuration --
   profile UMTS default
   profile UMTS dialout
   profile UMTS 3gpp-apn movistar.es
   profile UMTS idle-time 300
;
exit
;
network  umts2/0
; -- Interface AT. Configuration  --
     ppp lcp-options acfc
     ppp lcp-options pfc
     ppp lcp-options accm a0000
   exit
;
;
network ethernet0/0
; -- Ethernet Interface User Configuration --
   ip address 172.24.79.1 255.255.0.0
;
;
;
;
exit
;
network umts2/0
; -- Interface AT. Configuration  --
   pin plain 1234
   always-attached
exit
;
network ppp1
; -- Generic PPP User Configuration --
   ip address unnumbered
;
;
;
;
   ppp
; -- PPP Configuration --
     authentication sent-user MOVISTAR password MOVISTAR
     ipcp local address assigned
     no ipcp peer-route
     lcp echo-req off
   exit
;
   base-interface
; -- Base Interface Configuration --
     base-interface umts2/0 link
     base-interface umts2/0 profile UMTS
;
   exit
;
exit
;
event
; -- ELS Config --
   enable trace subsystem AT ALL
   enable trace subsystem PPP ALL
exit
;
;
protocol ip
; -- Internet protocol user configuration --
;
;
```

```
   route 0.0.0.0 0.0.0.0 ppp1
;
   rule 1 default
   rule 1 local-ip ppp1
   rule 1 napt translation
;
   classless
;
;
exit
;
feature dns
; -- DNS resolver user configuration --
   server 195.235.113.3
   server 195.235.96.90
exit
;
dump-command-errors
end
; --- end ---
```

Chapter 3 Monitoring

3.1 Interface Monitoring Commands

This section lists and describes the commands added to the generic AT commands interface to control the GPRS/ UMTS connection. The result of these commands will vary depending on the type of module installed in the device.

Command	Function
? (HELP)	Displays available commands and options available within a command.
AT-MODE	Sends AT commands directly to the module.
BITRATE	Real-time monitoring of the connection data speed.
COMMAND	Sends AT commands to the module.
DISCONNECT	Sends disconnection command.
GPRS	Sends predefined AT commands to the module for information.
LIST	Lists the current parameters for the interface.
EXIT	Returns to the previous menu.

3.1.1 ? (HELP)

Lists all the valid commands at the router monitoring layer. This command can also be used after a specific command to list all available options.

Syntax:

```
umts2/0 AT+?
```

Example:

```
umts2/0 AT+ ?
  at-mode       Send AT commands directly to the module
  bitrate       Bit rate monitor
  buffer        Display saved commands and answers
  command       Send AT command to the module
  disconnect    Send disconnect command
  gprs          GPRS/UMTS commands
  list          List interface and module parameters
  exit
```

3.1.2 AT-MODE

Sends AT commands directly over the connected device.

Example:

```
umts2/0 AT+at-mode
You are now entering AT command mode on interface umts2/0
Please type CTRL-C to exit AT command mode
ati
Manufacturer: Novatel Wireless Incorporated
Model: Merlin U530 (HW REV E.3)
Revision: 37.0-37.0  [2004-07-05 09:34:05]
IMEI: 353018000013586
+GCAP: +CGSM,+ES
OK
AT command mode finished
ATLAS-UMTS *
```

3.1.3 BITRATE

Monitors the interface's data transmission speed.

Example:

```
umts2/0 AT+bit
                           Interface umts2/0
------------------------------------------------------------------------
 Current trx rate (bps)  =        2000   Current rcv rate (bps)  =       96000
 Current trx rate (bps)  =       12000   Current rcv rate (bps)  =           0
 Current trx rate (bps)  =       24000   Current rcv rate (bps)  =       94000
 Current trx rate (bps)  =        4000   Current rcv rate (bps)  =      128000
 Current trx rate (bps)  =        4000   Current rcv rate (bps)  =      166000
 Current trx rate (bps)  =        8000   Current rcv rate (bps)  =      336000
 Current trx rate (bps)  =        8000   Current rcv rate (bps)  =      356000
 Current trx rate (bps)  =        8000   Current rcv rate (bps)  =      370000
 Current trx rate (bps)  =       20000   Current rcv rate (bps)  =      174000
umts2/0 AT+
```

3.1.4 COMMAND

Sends AT commands to the module. Sending AT commands to the module will be available when this is not connected.

Press any key to abort sending a command or waiting for the result.

Example:

```
umts2/0 AT+command ?
  <2..509 chars>    AT command
umts2/0 AT+command ati
ati
ati
Manufacturer: Novatel Wireless Incorporated
Model: Merlin U530 (HW REV E.3)
Revision: 37.0-37.0  [2004-07-05 09:34:05]
IMEI: 353018000013586
+GCAP: +CGSM,+ES
OK
umts2/0 AT+
```

3.1.5 DISCONNECT

Forces disconnection of an active context.

Example:

```
umts2/0 AT+disconnect
umts2/0 AT+
```

3.1.6 GPRS

Sends predefined AT-GPRS commands to the module. These commands are shared by UMTS and GPRS modules.

This option is available when you are not connected. The results of the informative commands shall vary depending on the module used.

Syntax:

```
umts2/0 AT+ gprs ?
  attach      Perform manually network attach
  detach      Perform manually network detach
  imei        Display IMEI module number
  imsi        Display SIM IMSI module number
  list        List GPRS/UMTS connection status
  operator    Operator information menu
  quality     Display signal quality
  sms         SMS menu
```

3.1.6.1 GPRS ATTACH

Manually performs an **attach** (register) procedure to the GPRS or UMTS network.

> **Note**
>
> The device attempts to attach to the network before each call to verify that it is still registered.

Example:

```
umts2/0 AT+gprs attach
AT+CGATT=1
OK
```

3.1.6.2 GPRS DETACH

Manually performs a **detach** (deregister) procedure from the GPRS or UMTS network.

Example:

```
umts2/0 AT+gprs detach
AT+CGATT=0
OK
+CGREG: 0
```

3.1.6.3 GPRS IMEI

Used to obtain the module's International Mobile station Equipment Identity (IMEI).

Example:

```
umts2/0 AT+gprs imei
AT+CGSN
500161111199050
OK
```

3.1.6.4 GPRS IMSI

Used to identify the SIM card's International Mobile Subscriber Identity (IMSI).

Example:

```
umts2/0 AT+gprs imsi
AT+CIMI
214031303057905
OK
```

3.1.6.5 GPRS LIST

Provides information on the status of the radio link, as well as the network registration (mode and domain).

Example:

```
umts2/0 AT+gprs list
   Last Measure:          42s
   UMTS preferred mode:    AUTO
   UMTS preferred domain:  PS Only
   UMTS radio access state: WCDMA PS
   RSSI when connecting:   10 (-93 dBm)
```

3.1.6.6 GPRS OPERATOR

Provides information on the operators available.

Syntax:

```
gprs0/0 AT+gprs operator ?
  available     List operators available
  registered    List operator registered
```

Example:

```
umts2/0 AT+gprs operator available
AT+COPS=?
+COPS: (2,"MOVISTAR","MSTAR","21407")
+COPS: (3,"E AMENA","AMENA","21403")
+COPS: (1,"vodafone ES","voda ES","21401")
OK
```

Example:

```
umts2/0 AT+gprs operator registered
+COPS: 0,2,"Movistar"
OK
```

3.1.6.7 GPRS QUALITY

Provides information on the quality of the signal received by the module.

Example:

```
umts2/0 AT+gprs quality
+CSQ: 10,99
OK
```

The module returns the detected signal level with the following format +CSQ:<rssi>,<ber>.

<rssi> Receive level:

> 0 #-113 dBm or less.
>
> 1 #-111 dBm.
>
> 2...30 # -109... -53 dBm.
>
> 31 # -51 dBm or higher.
>
> 99 not detectable.

<ber> Bit error rate:

> 0...7 according to the values described in the GSM 05.08 section 8.2.4 specification.
>
> 99 unknown (cannot be measured or has not made any call).

3.1.7 LIST

Monitors information on the status of the interface.

Example:

```
umts2/0 AT+list
        GPRS Daughter Board       = Unknown board Rev 0
        GPRS Manufacturer         = Novatel Wireless Incorporated
        GPRS Module Model         = Merlin U530 (HW REV E.3)
        GPRS Module Firmware      = 37.0-37.0  [2004-07-05 09:34:05]
        GPRS Module IMEI          = 353018000013586
        GPRS Module IMSI          = 214072530000440
        Dialers registered        = UMTS
        Current dialer registered = none
        State                     = (1) DISCONNECT
        Call request              = 0
        Telephone number          =
        Total connection time     = 0 seconds
        Current connection time   = 0 seconds
        Time to stablish connection = 0 sec
umts2/0 AT+
```

3.1.8 EXIT

Returns to the previous menu.

Example:

```
umts2/0 AT+exit
+
```

3.2 PCMCIA Monitoring Commands

This section describes the commands used to monitor the PCMCIA interface status at the physical layer (controller and card).

While these commands do not normally provide operating information, they are useful for diagnosing problems with PCMCIA card installation (for example, a defective card).

Access the commands from the p3 menu by running **system pcmcia**:

```
*p 3
+
```

Command	Function
DEBUG	Enables or disables debug tracing (p 2) on the PCMCIA controller.
DUMP	Displays information on the controller and card.

3.2.1 SYSTEM PCMCIA DEBUG

Enables or disables PCMCIA debug tracing.

Enable:

```
+system pcmcia debug enable
PCMCIA debug enabled
```

Disable:

```
+system pcmcia debug disable
PCMCIA debug disabled
```

Example:

The following shows the traces detected when a PCMCIA/USB UMTS card has been correctly inserted and detected:

```
12/28/04 12:26:47  i82365: socket event 0x0080
12/28/04 12:26:47  i82365: socket event 0x0080
12/28/04 12:26:48  cs: setup_socket(0): applying power
12/28/04 12:26:52  cs: resetting socket 0
12/28/04 12:26:53  cs: reset end socket 0
12/28/04 12:26:56  cs: reset done on socket 0
12/28/04 12:26:56  cdrmngr: do_insert 0
12/28/04 12:26:56  Socket 0: Novatel Wireless Merlin UMTS Modem NRM6831 PC Card
12/28/04 12:26:56  Card product info: [Novatel Wireless], [Merlin UMTS Modem], [NRM6831], []
12/28/04 12:26:56  Card manfid: 0x00a4, 0x1aaf
12/28/04 12:26:56  Card function: 2 [serial]
12/28/04 12:26:56  serial_attach()
12/28/04 12:26:56  serial_event(0x01010810): (0x000004)-> card insertion
12/28/04 12:26:56  serial_config(0x01010810)
12/28/04 12:26:56  rscmng: register base:0x3f8 num:0x8 owner:serial_cs
12/28/04 12:26:56  serial_cs: register_serial() at 0xf20003f8,irq 34 slot 2 line 0 success
12/28/04 12:26:56  serial_attach() success on 0x01010810
12/28/04 12:26:56  cdrmngr: do_insert 0 success
12/28/04 12:26:57  uart_speed at 460800 (0x6)
```

3.2.2 SYSTEM PCMCIA DUMP

Displays status information about the controller and card. The options are:

Command	Function
CIS-CARD	Displays the card's CIS (Card Information Structure) information.
CIS-REG	Displays information on how the card has been configured.
SOCKET-LIST	Displays information on the detected PCMCIA controllers and the installed cards.
SOCKET-STATE	Displays information on how the SLOT PCMCIA controller has been configured.
PCI	Displays information on how the controller PCI registers have been configured.

3.2.2.1 SYSTEM PCMCIA DUMP CIS-CARD

Displays information contained in the card's CIS (Card Information Structure).

Example:

```
+system pcmcia dump cis-card 1
Slot[3-1]? 2
Socket 0: validate CIS: ok 20 tuples found
Tuple #1, offset 0x02, tuple_code 0x01, link_length 0x03
  00 00 ff
  dev_info   NULL 0ns, 512b
Tuple #2, offset 0x07, tuple_code 0x17, link_length 0x03
  00 00 ff
  attr_dev_info   NULL 0ns, 512b
Tuple #3, offset 0x0c, tuple_code 0x06, link_length 0x0b
  02 00 4f 00 00 00 00 ce 00 00 00
  mfc_long_link
  function 0: attr 0x004f
  function 1: attr 0x00ce
Tuple #4, offset 0x19, tuple_code 0x20, link_length 0x04
  a4 00 af 1a
  manfid 0x00a4, 0x1aaf
Tuple #5, offset 0x1f, tuple_code 0x15, link_length 0x2f
  06 01 4e 6f 76 61 74 65 6c 20 57 69 72 65 6c 65
  73 73 00 4d 65 72 6c 69 6e 20 55 4d 54 53 20 4d
  6f 64 65 6d 00 4e 52 4d 36 38 33 31 00 00 ff
  vers_1 6.1, "Novatel Wireless", "Merlin UMTS Modem", "NRM6831", ""
Tuple #6, offset 0x51, tuple_code 0x13, link_length 0x03
  43 49 53
  link_target
Tuple #7, offset 0x56, tuple_code 0x21, link_length 0x02
  02 01
  funcid serial_port [post]
Tuple #8, offset 0x5a, tuple_code 0x22, link_length 0x04
  00 02 0f 7f
  serial_interface
    uart 16550 [space/mark/odd/even] [5/6/7/8] [1/1.5/2]
Tuple #9, offset 0x60, tuple_code 0x1a, link_length 0x06
  05 05 00 04 63 02
  config base 0x0400 mask 0x0263 last_index 0x05
Tuple #10, offset 0x68, tuple_code 0x1b, link_length 0x19
  c7 01 99 69 55 1d f6 32 2d a3 60 f8 03 07 50 ff
  ff 48 c1 05 43 4f 4d 31 00
  cftable_entry 0x07 [default]
    [audio]
    Vcc Vnom 5V Istatic 15mA Ipeak 850mA Idown 25mA
    io 0x03f8-0x03ff [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #11, offset 0x83, tuple_code 0x1b, link_length 0x12
  0f 98 a3 60 f8 02 07 50 ff ff 48 c1 05 43 4f 4d
  32 00
  cftable_entry 0x0f
    [audio]
    io 0x02f8-0x02ff [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #12, offset 0x97, tuple_code 0x1b, link_length 0x12
```

```
  17 98 a3 60 e8 03 07 50 ff ff 48 c1 05 43 4f 4d
  33 00
  cftable_entry 0x17
    [audio]
    io 0x03e8-0x03ef [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #13, offset 0xab, tuple_code 0x1b, link_length 0x12
  1f 98 a3 60 e8 02 07 50 ff ff 48 c1 05 43 4f 4d
  34 00
  cftable_entry 0x1f
    [audio]
    io 0x02e8-0x02ef [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #14, offset 0xbf, tuple_code 0x1b, link_length 0x0e
  27 98 23 50 ff ff 48 c1 05 43 4f 4d 78 00
  cftable_entry 0x27
    [audio]
    io 0x0000-0x0007 [lines=3] [8bit]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #15, offset 0xd0, tuple_code 0x13, link_length 0x03
  43 49 53
  link_target
Tuple #16, offset 0xd5, tuple_code 0x21, link_length 0x02
  02 01
  funcid serial_port [post]
Tuple #17, offset 0xd9, tuple_code 0x22, link_length 0x04
  00 02 0f 7f
  serial_interface
    uart 16550 [space/mark/odd/even] [5/6/7/8] [1/1.5/2]
Tuple #18, offset 0xdf, tuple_code 0x1a, link_length 0x06
  05 0a 20 04 63 02
  config base 0x0420 mask 0x0263 last_index 0x0a
Tuple #19, offset 0xe7, tuple_code 0x1b, link_length 0x19
  c7 01 99 69 55 1d f6 32 2d a3 60 f8 02 07 50 ff
  ff 48 c1 05 43 4f 4d 36 00
  cftable_entry 0x07 [default]
    [audio]
    Vcc Vnom 5V Istatic 15mA Ipeak 850mA Idown 25mA
    io 0x02f8-0x02ff [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #20, offset 0x102, tuple_code 0x1b, link_length 0x12
  0f 98 a3 60 f8 03 07 50 ff ff 48 c1 05 43 4f 4d
  37 00
  cftable_entry 0x0f
    [audio]
    io 0x03f8-0x03ff [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #21, offset 0x116, tuple_code 0x1b, link_length 0x12
  17 98 a3 60 e8 02 07 50 ff ff 48 c1 05 43 4f 4d
  38 00
  cftable_entry 0x17
    [audio]
    io 0x02e8-0x02ef [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
Tuple #22, offset 0x12a, tuple_code 0x1b, link_length 0x12
  1f 98 a3 60 e8 03 07 50 ff ff 48 c1 05 43 4f 4d
  39 00
  cftable_entry 0x1f
    [audio]
    io 0x03e8-0x03ef [lines=3] [8bit] [range]
    irq mask 0xffff [pulse]
```

```
    7 bytes in subtuples
Tuple #23, offset 0x13e, tuple_code 0x1b, link_length 0x0e
  27 98 23 50 ff ff 48 c1 05 43 4f 4d 79 00
  cftable_entry 0x27
    [audio]
    io 0x0000-0x0007 [lines=3] [8bit]
    irq mask 0xffff [pulse]
    7 bytes in subtuples
+
```

3.2.2.2 SYSTEM PCMCIA DUMP CIS-REG

Displays information on how the card has been configured.

Example:

```
+system pcmcia dump cis-reg 2
Socket 0 function 0:
  Config register base = 0x0400, mask = 0x0263
  Configuration option register [COR] = 0x47
    [level_req] [func_ena] [addr_decode] [ireq_ena] [index = 00]
  Card configuration and status register [CCSR] = 00

  IO base = 0x03f8
  IO size = 7

Socket 0 function 1:
  Config register base = 0x0420, mask = 0x0263
  read config register error
ATLAS-UMTS +
```

3.2.2.3 SYSTEM PCMCIA DUMP SOCKET-LIST

Displays information on the detected PCMCIA controllers and installed cards.

Example:

```
+sys pcmcia dump socket-list
SLOT 3: CARDBUS controller type TI 1510 socket number 0
  Card type detected Novatel Wireless Merlin UMTS Modem NRM6831 PC Card
  product info: "Novatel Wireless", "Merlin UMTS Modem", "NRM6831", ""
  manfid: 0x00a4, 0x1aaf
  function: 2 (serial)
+
```

3.2.2.4 SYSTEM PCMCIA DUMP SOCKET-STATE

Displays information on how the SLOT PCMCIA controller has been configured.

Example:

```
+system pcmcia dump socket-state
 Identification and revision= *(0x00)=0x84
 Chip information           = *(0x1f)=0x00

PCMCIA Socket -0/A- Controller Registers
-------------------------------------------
 Interface status          = *(0x01)=0x7f:  [bvd1/stschg] [bvd2/spkr] [detect] [wrprot] [ready] [poweron]
 Power control             = *(0x02)=0x90:  [output] [resetdrv] [Vcc=5v] [Vpp off]
 Interrupts and control    = *(0x03)=0x70:  [iocard] [intr ena] [irq=0]
 Card status changes       = *(0x04)=0x00:
 Card status chng int cntrl = *(0x05)=0x09:  [bvd1/stschg] [detect] [irq=0]
 Misc control 1            = *(0x16)=0xc0:  [inpack]
 Misc control 2            = *(0x1e)=0x00:
 MemMap(0) = 0x21, 240 ns, 0xf0001000-0xf0001fff, 00000 [active] [attrib]
 MemMap(1) = 00, 0 ns, 00000-0x01fff, 00000
 MemMap(2) = 00, 0 ns, 00000-0x01fff, 00000
 MemMap(3) = 00, 0 ns, 00000-0x01fff, 00000
 MemMap(4) = 00, 0 ns, 00000-0x01fff, 00000
```

```
 IoMap (0) = 0x09, 0 ns, 0x03f8-0x03ff [active] [0ws]
 IoMap (1) = 00, 0 ns, 0000-0x0001
 TmrSet(0) = setup = 0, command = 0, recovery = 0
 TmrSet(1) = setup = 0, command = 0, recovery = 0
 ExtRegs   = mask 0 = 0x7f, mask 1 = 0x90, DMA ctl = 0x70 [dreq is inpack] [pullup]
+
```

3.2.2.5 SYSTEM PCMCIA DUMP PCI

Displays information on how the controller PCI registers have been configured.

Example:

```
+system pcmcia dump pci
CARDBUS PCI Bridge Registers Socket 0
-------------------------------------
Offset 0000 -->  AC56104C
Offset 0004 -->  02100007
Offset 0008 -->  06070000
Offset 000c -->  0002A804
Offset 0010 -->  F0000000
Offset 0014 -->  020000A0
Offset 0018 -->  B0222000
Offset 001c -->  00000000
Offset 0020 -->  00000000
Offset 0024 -->  00000000
Offset 0028 -->  00000000
Offset 002c -->  F2000000
Offset 0030 -->  F2000000
Offset 0034 -->  F2000000
Offset 0038 -->  F2000000
Offset 003c -->  07400102
Offset 0040 -->  00000000
Offset 0044 -->  00000001
Offset 0080 -->  0844B060
Offset 008c -->  00001022
Offset 0090 -->  606003C0
Offset 00a0 -->  FE120001
Offset 00a4 -->  00C08000
Offset 00a8 -->  0000080B
Offset 00ac -->  0000000F
Offset 00b0 -->  08000000
+
```

3.2.2.6 SYSTEM PCMCIA DUMP SUPPORTED

Displays information on the PCMCIA cards supported by the current CIT release, as well as on the drivers internally used for installation purposes.

Example:

```
Novatel Wireless Merlin UMTS Modem NRM6831 PC Card
   Identification type PCMCIA Manufacturer id
   Manufacturer ID 0x00a4 Card ID 0x1aaf
   Card Bindings
   (0) : serial
Novatel Wireless Merlin UMTS Modem U630 PC Card
   Identification type PCMCIA Manufacturer id
   Manufacturer ID 0x00a4 Card ID 0x0276
   Card Bindings
   (0) : serial
Novatel Wireless Merlin HSDPA Modem U740 PC Card
   Identification type PCI Header Subvendor and Subsystem
   Manufacturer ID 0x1033 Card ID 0x0035
   Card Bindings
   (0) : usb_cb
Novatel Wireless Merlin CDMA EV-DO V620 PC Card
   Identification type PCI Header Vendor and System
```

```
   Manufacturer ID 0x1033 Card ID 0x0035
   Card Bindings
   (0) : usb_cb
Olicom GoCard Combo Eth/Modem 336 PC Card
   Identification type PCMCIA Manufacturer id
   Manufacturer ID 0x0121 Card ID 0x3222
   Card Bindings
   (0) : serial
Option Wireless 3G WCDMA CardBus
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x1045 Card ID 0xc861
   Card Bindings
   (0) : usb_cb
Option Globetrotter Fusion GPRS/WCDMA/WLAN CardBus
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x11ab Card ID 0x1fa6
   Card Bindings
   (0) : dummy_cb
   (1) : usb_cb
Option Globetrotter Fusion+ EMEA Cardbus
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x11ab Card ID 0x1faa
   Card Bindings
   (0) : dummy_cb
   (1) : dummy_cb
   (2) : serial_cb
Option Globetrotter Quad GPRS/WCDMA CardBus
   Identification type PCI Header Subvendor and Subsystem
   Manufacturer ID 0x1931 Card ID 0x000a
   Card Bindings
   (0) : dummy_cb
   (1) : usb_cb
Option Globetrotter GT 3G (Fusion Lite) Cardbus
   Identification type PCI Header Subvendor and Subsystem
   Manufacturer ID 0x1931 Card ID 0x0006
   Card Bindings
   (0) : dummy_cb
   (1) : usb_cb
Option Globetrotter GT 3G+ EMEA Cardbus
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x1931 Card ID 0x000c
   Card Bindings
   (0) : serial_cb
Option Globetrotter GTMax Cardbus
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x1931 Card ID 0x000d
   Card Bindings
   (0) : serial_cb
Option Globetrotter GTMax2 Cardbus
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x1931 Card ID 0x000f
   Card Bindings
   (0) : serial_cb
Option Globetrotter EDGE CardBus
   Identification type PCMCIA Manufacturer id
   Manufacturer ID 0x0314 Card ID 0x0007
   Card Bindings
   (0) : serial
Sierra Wireless AirCard7xx/8xx
   Identification type PCMCIA Manufacturer id
   Manufacturer ID 0x0192 Card ID 0x0710
   Card Bindings
   (0) : serial
Sierra Wireless AirCard510
   Identification type PCMCIA Manufacturer id
   Manufacturer ID 0x013f Card ID 0x0710
   Card Bindings
```

```
   (0) : serial
Sierra Wireless AirCard580
   Identification type PCI Header Vendor and System
   Manufacturer ID 0x11c1 Card ID 0x5802
   Card Bindings
   (0) : usb_cb
Sierra Wireless AirCard875
   Identification type PCI Header Subvendor and Subsystem
   Manufacturer ID 0x18d7 Card ID 0x0001
   Card Bindings
   (0) : usb_cb
Huawei Mobile Connect E612 CardBus
   Identification type PCI Header Subvendor and Subsystem
   Manufacturer ID 0x12d1 Card ID 0x0035
   Card Bindings
   (0) : usb_cb
   (1) : dummy_cb
Kyocera Passport KPC650 CDMA EV-DO PC Card
   Identification type PCI Header Subvendor and Subsystem
   Manufacturer ID 0x0c88 Card ID 0x17da
   Card Bindings
   (0) : usb_cb
```

Command history:

Release	Modification
11.00.00	This command is obsolete as of version 11.00.00.

3.3 USB Monitoring Commands

Some cellular connection cards have been developed with a USB interface.

This section describes the commands that monitor the status of the USB interface at the physical layer (controller and card).

While these commands do not normally provide operating information, they are useful when it comes to diagnosing problems related to PCMCIA/USB card installation (i.e, a defective card or a card that is not supported).

Access the commands from the p 3 menu by running **system usb**:

```
*p 3
+
```

Command	Function
DEBUG	Enables or disables debugging traces (p 2) over the PCMCIA controller.
LIST	Displays information on the controller and the card.

3.3.1 SYSTEM USB DEBUG

Enables or disables USB events debugging traces

Enable:

```
+system usb debug enable
USB debug enabled
```

Disable:

```
+system usb debug disable
USB debug disabled
```

Example:

The following shows the traces detected when a PCMCIA/USB UMTS card has been correctly inserted and detected:

```
02/21/07 10:19:58  USB HC found: irq= 34 membase= f003b000
02/21/07 10:19:58  USB HC reset_hc: 0 ;
02/21/07 10:19:58  usb_register_bus new USB bus registered, assigned bus number 1
```

```
02/21/07 10:19:58  USB new device connect, assigned device number 1
02/21/07 10:19:58  kmalloc IF f3b2e0, numif 1
02/21/07 10:19:58  new device strings: Mfr=0, Product=0, SerialNumber=0
02/21/07 10:19:58  USB hub/1 found
02/21/07 10:19:58  1 port detected
02/21/07 10:19:58  ganged power switching
02/21/07 10:19:58  standalone hub
02/21/07 10:19:58  global over-current protection
02/21/07 10:19:58  power on to power good time: 30ms
02/21/07 10:19:58  hub controller current requirement: 0mA
02/21/07 10:19:58  port 1 is removable
02/21/07 10:19:58  local power source is good
02/21/07 10:19:58  no over-current condition exists
02/21/07 10:19:58  enabling power on all ports
02/21/07 10:19:58  usb-bandwidth-alloc: was: 0, new: 17, bustime = 17 us, Pipe allowed: yes
02/21/07 10:19:58  bw_alloc bumped to 17 for 1 requesters
02/21/07 10:19:58  USB hubmngr task started
02/21/07 10:19:58  hub driver claimed interface f3b2e0
02/21/07 10:20:00  USB hub/1 event
02/21/07 10:20:00  port 1 connection change
02/21/07 10:20:00  portstatus 100, change 1, High Speed
02/21/07 10:20:01  USB hub/1 event
02/21/07 10:20:01  port 1 connection change
02/21/07 10:20:01  portstatus 101, change 1, High Speed
02/21/07 10:20:01  portstatus 103, change 10, High Speed
02/21/07 10:20:01  USB new device connect, assigned device number 2
02/21/07 10:20:02  kmalloc IF f3b0e0, numif 1
02/21/07 10:20:02  new device strings: Mfr=1, Product=2, SerialNumber=0
02/21/07 10:20:02  USB device number 2 default language ID 0x409
02/21/07 10:20:02  Manufacturer: Sierra Wireless, Incorporated
02/21/07 10:20:02  Product: AirCard
02/21/07 10:20:02  USB serial proble Vendor id=1199 Product id=6820
02/21/07 10:20:02  Looking at Option Fusion Globetrotter Vendor id=0af0 Product id=6000
02/21/07 10:20:02  Looking at Vodafone Connect 3G Vendor id=0af0 Product id=5000
02/21/07 10:20:02  Looking at Option Globetrotter Quad Vendor id=0af0 Product id=6300
02/21/07 10:20:02  Looking at Option Globetrotter 3G GT Fusion Lite Vendor id=0af0 Product id=6100
02/21/07 10:20:02  Looking at Novatel Merlin U740 R.0 HSDPA Vendor id=1410 Product id=1400
02/21/07 10:20:02  Looking at Novatel Merlin U740 HSDPA Vendor id=1410 Product id=1410
02/21/07 10:20:02  Looking at Novatel Merlin V620 CDMA EV-DO Vendor id=1410 Product id=1110
02/21/07 10:20:02  Looking at Sierra Aircard 580 Vendor id=1199 Product id=0112
02/21/07 10:20:02  Looking at Sierra Aircard 875 Vendor id=1199 Product id=6820
02/21/07 10:20:02  descriptor matches...looking at the endpoints
02/21/07 10:20:02  found interrupt in
02/21/07 10:20:02  found bulk in
02/21/07 10:20:02  found bulk out
02/21/07 10:20:02  found bulk in
02/21/07 10:20:02  found bulk out
02/21/07 10:20:02  found bulk in
02/21/07 10:20:02  found bulk out
02/21/07 10:20:02  Sierra Aircard 875 converter detected
02/21/07 10:20:02  Sierra Aircard 875 converter now attached to ttyUSB1/0
02/21/07 10:20:02  Sierra Aircard 875 converter now attached to upper_handler 0xeddec0
02/21/07 10:20:02  serial driver claimed interface f3b0e0
```

3.3.2 SYSTEM USB LIST

Displays status information on the controller and the card. The options are:

Command	Function
DEVICE	Displays information on the detected USB devices.
HCCA	Displays information on the content of the Host controller area.
HCREGS	Displays information on how the card host controller has been configured.
MEMORY	Displays information on memory use.
SUPPORTED	Displays information on the supported cards.

3.3.2.1 SYSTEM USB LIST DEVICE

Displays information on the USB devices, which have been detected and configured.

Example:

```
+sys usb list device

-------------------------------------------
USB Slot 1 device number 2
-------------------------------------------
Descriptor:
  Length             = 18
  DescriptorType     = 01
  USB version        = 1.10
  Vendor:Product     = 1199:6820
  MaxPacketSize0     = 64
  NumConfigurations  = 1
  Device version     = 0.02
  Device Class:SubClass:Protocol = 00:00:00
    Per-interface classes
Configuration:
  bLength            =     9
  bDescriptorType    =    02
  wTotalLength       = 0043
  bNumInterfaces     =    01
  bConfigurationValue =   01
  iConfiguration     =    00
  bmAttributes       =    80
  MaxPower           =   500mA

  Interface: 0
  Alternate Setting:  0
    bLength            =     9
    bDescriptorType    =    04
    bInterfaceNumber   =    00
    bAlternateSetting  =    00
    bNumEndpoints      =    07
    bInterface Class:SubClass:Protocol =   ff:ff:ff
    iInterface         =    03
    Endpoint:
      bLength            =     7
      bDescriptorType    =    05
      bEndpointAddress   =    81 (in)
      bmAttributes       =    03 (Interrupt)
      wMaxPacketSize     = 0010
      bInterval          =    80
    Endpoint:
      bLength            =     7
      bDescriptorType    =    05
      bEndpointAddress   =    82 (in)
      bmAttributes       =    02 (Bulk)
      wMaxPacketSize     = 0040
      bInterval          =    00
    Endpoint:
      bLength            =     7
      bDescriptorType    =    05
      bEndpointAddress   =    02 (out)
      bmAttributes       =    02 (Bulk)
      wMaxPacketSize     = 0040
      bInterval          =    00
    Endpoint:
      bLength            =     7
      bDescriptorType    =    05
      bEndpointAddress   =    84 (in)
      bmAttributes       =    02 (Bulk)
      wMaxPacketSize     = 0040
```

```
      bInterval         =    00
    Endpoint:
      bLength           =     7
      bDescriptorType   =    05
      bEndpointAddress  =    04 (out)
      bmAttributes      =    02 (Bulk)
      wMaxPacketSize    = 0040
      bInterval         =    00
    Endpoint:
      bLength           =     7
      bDescriptorType   =    05
      bEndpointAddress  =    85 (in)
      bmAttributes      =    02 (Bulk)
      wMaxPacketSize    = 0040
      bInterval         =    00
    Endpoint:
      bLength           =     7
      bDescriptorType   =    05
      bEndpointAddress  =    05 (out)
      bmAttributes      =    02 (Bulk)
      wMaxPacketSize    = 0040
      bInterval         =    00


-----------------------------------------
USB Slot 1 device number 1
-----------------------------------------
Descriptor:
  Length            = 18
  DescriptorType    = 01
  USB version       = 1.00
  Vendor:Product    = 0000:0000
  MaxPacketSize0    = 8
  NumConfigurations = 1
  Device version    = 0.00
  Device Class:SubClass:Protocol = 09:00:00
    Hub device class
Configuration:
  bLength           =     9
  bDescriptorType   =    02
  wTotalLength      = 0019
  bNumInterfaces    =    01
  bConfigurationValue =  01
  iConfiguration    =    00
  bmAttributes      =    40
  MaxPower          =     0mA

  Interface: 0
  Alternate Setting:  0
    bLength           =     9
    bDescriptorType   =    04
    bInterfaceNumber  =    00
    bAlternateSetting =    00
    bNumEndpoints     =    01
    bInterface Class:SubClass:Protocol =   09:00:00
    iInterface        =    00
    Endpoint:
      bLength           =     7
      bDescriptorType   =    05
      bEndpointAddress  =    81 (in)
      bmAttributes      =    03 (Interrupt)
      wMaxPacketSize    = 0008
      bInterval         =    ff
```

3.3.2.2 SYSTEM USB LIST HCCA

Displays information on the host controller area.

Example:

```
+ sys usb list hcca
HCCA branch int  0( 0):
HCCA branch int  1( 1):
HCCA branch int  2( 2):
HCCA branch int  3( 3):
HCCA branch int  4( 4):
HCCA branch int  5( 5):
HCCA branch int  6( 6):
HCCA branch int  7( 7):
HCCA branch int  8( 8):
HCCA branch int  9( 9):
HCCA branch int 10( a):
HCCA branch int 11( b):
HCCA branch int 12( c):
HCCA branch int 13( d):
HCCA branch int 14( e):
HCCA branch int 15( f):
HCCA branch int 16(10):
HCCA branch int 17(11):
HCCA branch int 18(12):
HCCA branch int 19(13):
HCCA branch int 20(14):
HCCA branch int 21(15):
HCCA branch int 22(16):
HCCA branch int 23(17):
HCCA branch int 24(18):
HCCA branch int 25(19):
HCCA branch int 26(1a):
HCCA branch int 27(1b):
HCCA branch int 28(1c):
HCCA branch int 29(1d):
HCCA branch int 30(1e):
HCCA branch int 31(1f):
```

3.3.2.3 SYSTEM USB LIST HCREGS

Displays information on the host controller register configuration.

Example:

```
+sys usb list hcregs
HcRevision          ... 00000010
HcControl           ... 000000bf
HcCommandStatus     ... 00000004
HcInterruptStatus   ... 00000064
HcInterrupt Enable  ... 80000003
HcInterrupt Disable ... 80000003
HcHCCA              ... 035c0600
HcPeriodCurrentED   ... 00000000
HcControlHeadED     ... 00000000
HcControlCurrentED  ... 00000000
HcBulkHeadED        ... 035bfbd0
HcBulkCurrentED     ... 00000000
HcDoneHead          ... 00000000
HcFmInterval        ... 27782edf
HcFrameRemaining    ... 00002ace
HcFmNumber          ... 00004933
HcPeriodicStart     ... 00002a2f
HcLSThreshold       ... 00000628
HcRhDescriptorA     ... 0f000a01
HcRhDescriptorB     ... 00020000
HcRhStatus          ... 00000000
HcRhPort1Status     ... 00000103
HcRhPort2Status     ... ffffffff
Interrupt counter   ... 92
Interrupt lastcause ... 2
```

3.3.2.4 SYSTEM USB LIST MEMORY

Displays information on the host controller memory use.

Example:

```
+sys usb list memory

Kmalloc called in interrupt context ... 0
Incomplete writes in serial driver  ... 0
Interrupt writes in serial driver   ... 20
TDs in free queue ........... 390
URB_PRIVs in free queue ..... 394
```

3.3.2.5 SYSTEM USB LIST SUPPORTED

Displays a list of the cards supporting USB technology.

Example:

```
+sys usb list supported
Option Fusion Globetrotter
   Manufacturer ID 0x0af0 Card ID 0x6000
Vodafone Connect 3G
   Manufacturer ID 0x0af0 Card ID 0x5000
Option Globetrotter Quad
   Manufacturer ID 0x0af0 Card ID 0x6300
Option Globetrotter 3G GT Fusion Lite
   Manufacturer ID 0x0af0 Card ID 0x6100
Novatel Merlin U740 R.0 HSDPA
   Manufacturer ID 0x1410 Card ID 0x1400
Novatel Merlin U740 HSDPA
   Manufacturer ID 0x1410 Card ID 0x1410
Novatel Merlin V620 CDMA EV-DO
   Manufacturer ID 0x1410 Card ID 0x1110
Sierra Aircard 580
   Manufacturer ID 0x1199 Card ID 0x0112
Sierra Aircard 875
   Manufacturer ID 0x1199 Card ID 0x6820
Huawei Mobile Connect E612
   Manufacturer ID 0x12d1 Card ID 0x1001
Kyocera Passport KPC650
   Manufacturer ID 0x0c88 Card ID 0x17da
```