

# TAHOE<sup>®</sup>



Tahoe 4681  
(4-port G.shdsl.bis/FastEthernet modem card)

## User Manual



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*Tahoe 4681 (4-port G.shdsl.bis/FastEthernet modem card) User Manual*

*Firmware version 1.3.0*

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# Preface




## About this Manual

This manual contains following chapters:

Chapter 1, Introduction	An overview of the modem, description of its interfaces and features
Chapter 2, Installation	How to install the card in a DSL Access Multiplexer
Chapter 3, Advanced Configuration and Management	List of commands used to configure the modem using serial console or telnet connection
Appendix A, Troubleshooting	Description of typical problems that may occur during use of the modem
Appendix B, Technical Specification	Parameters of the modem
Appendix C, Safety Information	Important information about hazards involved with usage of electrical devices
Appendix D, Declaration of Conformity	Information about compliance to European standards

## Document Conventions

This manual uses following conventions:

<b>boldface font</b>	Commands and keywords
< >	Arguments for which you have to supply values
[ ]	Optional arguments
{ a   b   c }	Alternative arguments
[ a   b   c ]	Alternative optional arguments
typewriter font	Information displayed during a serial or telnet connection
<b>boldface typewriter font</b>	Information that must be entered during a serial or telnet connection
LCD font	Information displayed on the LCD
 Note	Notes contain helpful suggestions that may be worth remembering
 Caution	This symbol means a situation that requires you to be careful. Otherwise equipment damage or loss of data may occur.
 Warning	This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

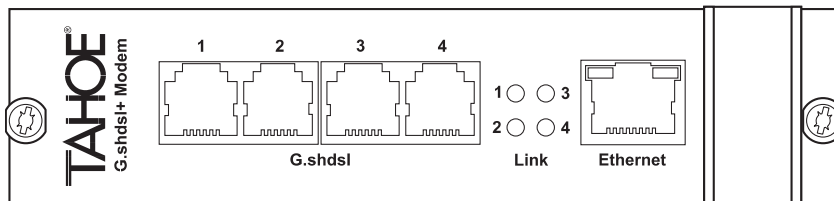


# Introduction

Thank you for purchasing the Tahoe 4681 modem card. We did our best to ensure highest standard of reliability and performance of our products. Devoting many years of research and development we are proud to provide a superior quality device unfolding new possibilities for the use of the copper lines.

Tahoe 4681 modem card contains four G.shdsl.bis modems which allow data transmission with speeds up to 5696 kbps on a 2-wire line, 11392 kbps on a 4-wire line and 22784 kbps on an 8-wire line. Thanks to powerful TCPAM-32 modulation throughputs are much higher than using HDSL technology and reach is nearly twice that of VDSL.

## Front Panel



## Leased Line

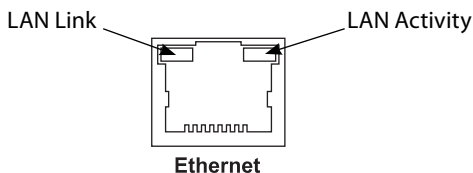
Four 6-pin RJ-11 connectors are used to connect the leased lines. The polarization of a line is not important.

Pin	Signal
1	-
2	-
3	line
4	line
5	-
6	-

## LAN

The Fast Ethernet interface is used to connect the modem to the Local Area Network (LAN). It may work at speeds of 10 Mbps (10Base-T) or 100 Mbps (100Base-Tx), in full-duplex or half-duplex mode. The mode of transmission is selected automatically, although a specific setting can be forced.

Modem should be connected to an Ethernet switch or a hub using a straight patch-cord or to a PC, a router or an uplink port in a switch using a crossed-over. After connecting the cable a LED named “LAN Link” should light up.



## Status LEDs

Besides LEDs on the LAN connector there are four LEDs representing state of the G.shdsl link. Three behaviours of these LEDs are possible:

- off – line is not connected, no signal is detected
- blinking – line is in progress of synchronization
- on – line is synchronized, the data stream may flow through the modem

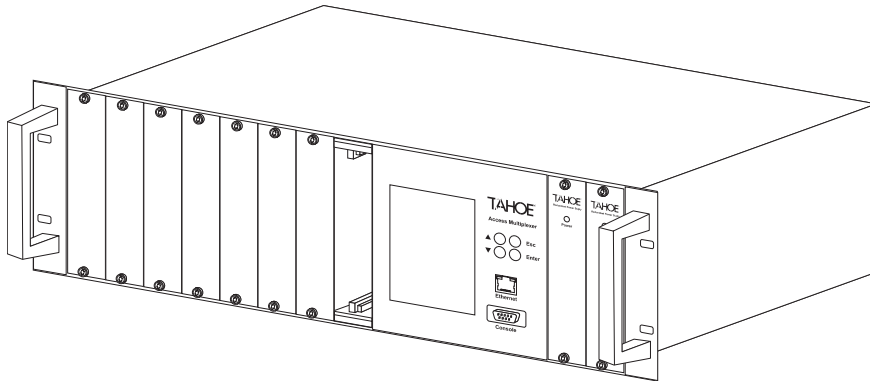
# Installation



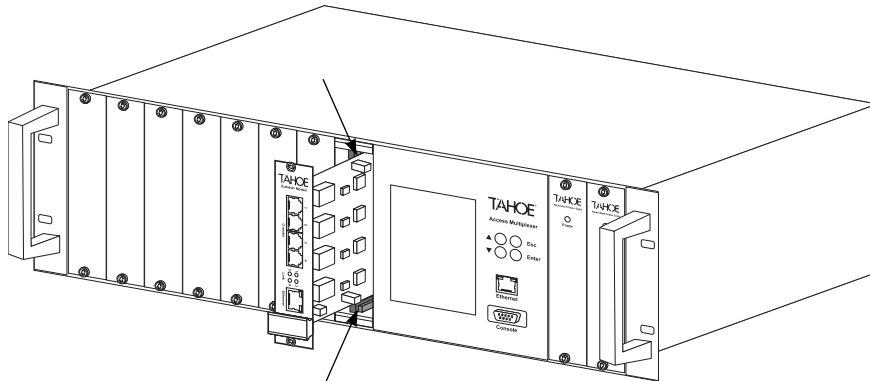
*Before installing the card make sure that your working site is properly grounded. Hold the card by the front panel handler and do not touch other components to prevent damage caused by electrostatic discharge.*

To install the card in a DSL Access Multiplexer follow these steps:

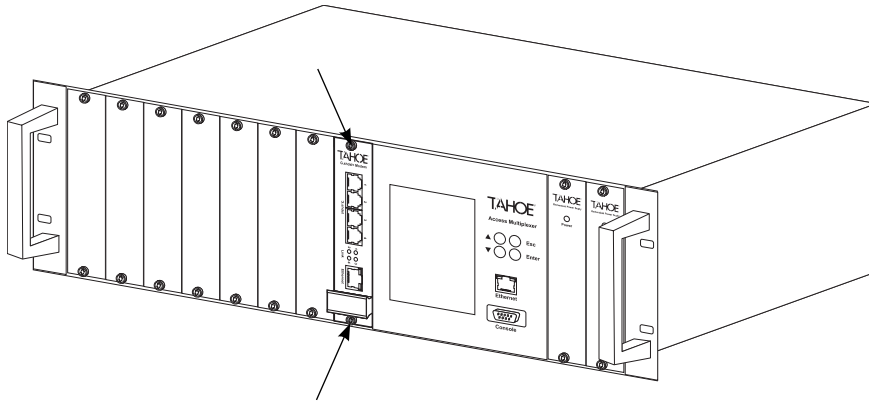
- Find an empty slot and remove a blank panel if the slot is covered:



- Insert the card into the slot. Make sure that the card enters two red rails on the top and the bottom:



- Tighten the card to the DSLAM using two screws:



---

*The card can be inserted and removed without switching the power off. The DSLAM management card will automatically detect new device and display its status on the LCD.*

---

The card can be configured through a telnet connection or using the DSLAM management card. Configuration using telnet is described in next chapter, while the management card configuration is described in Tahoe Network Management Card User Manual.

# Advanced Configuration and Management

## Telnet Connection

To connect to the modem the network interface on PC has to be in the same IP subnet as the modem. By default the modem's Ethernet interface is set to 10.0.0.1 address and 255.0.0.0 netmask, so the PC may have IP address set to 10.0.0.2 and the same netmask.

If the modem was already configured and the routing table is correctly set, a telnet connection to its IP address is possible from anywhere in the network.

After connecting a password prompt will appear:

```
User Access Verification
```

```
Password:
```

The default password is "Tahoe" (case sensitive). If the password entered is correct, a command prompt will appear:

```
Tahoe>
```

## Internal Backplane Connection

If the telnet connection is not possible (e.g. there's no telnet client available or the modem's IP address is unknown), you can connect to the modem through the main DSLAM management card and the internal backplane. After connecting to the management card (using telnet or serial console) type:

```
Tahoe> console connect <slot number>
```

You will get the same connection as if you were connected to the modem using telnet, i.e. the regular command prompt appears:

```
Tahoe>
```

## Commands Summary

Complete command set

?	displays command list
arp	ARP table configuration
bridge	bridge mode settings
bundle	groups DSL lines into bundles
config	displays current configuration
console	console access settings
dhcp	DHCP configuration
dsl	G.shdsl line configuration
eepromdump	dumps EEPROM (configuration memory) contents
eraseconfig	erases EEPROM configuration
exit	closes connection with modem
help	displays command list
http	web server configuration
ifconfig	interface configuration
ipchains	NAT/PAT/firewall settings
keypad	LCD keyboard locking
lang	language selection
lcd	LCD text modification
masq	NAT status
mem	memory usage
mii	MII (Ethernet) transceiver settings
more	enables or disables 'more' prompt
netstat	TCP/IP connections list
ping	checks network device availability
prompt	changes command prompt
ps	displays process list
quit	closes connection with modem
reboot	reboots modem
route	routing table settings
snmp	SNMP settings
strictarp	forcing IP-MAC binding

syslog	sending logs to remote syslogd
tech	system information for tech support
telnet	telnet server settings
tcpdump	shows interface traffic
tftp	TFTP server settings
timeout	login and session timeout settings
uptime	shows router uptime
user	user management
ver	shows firmware version
vlan	VLAN bridging configuration
w	shows router uptime
wake	powers on a LAN station using Wake-On-LAN feature
watchdog	watchdog settings
write	writes settings to EEPROM

?

Shows a list of available commands.

## arp

The **arp** command is used to configure the ARP table. The **arp** alone shows the list of bindings between IP and hardware (MAC) addresses:

```
Tahoe> arp
IP address      Hardware address  Type      Expires
10.0.0.2       00:50:04:0D:70:31  dynamic   215s
Tahoe>
```

The “Type” can be “dynamic” (learnt from the network traffic), “static” (added manually) or “proxy” (a proxy ARP entry). The value in the “Expires” column denotes the time left until the ARP table entry removal. The ARP entries are removed when they are not used for 5 minutes.

ARP table entries can be deleted using **arp del** command:

```
Tahoe> arp del 10.0.0.2
```

(insert the IP address to be deleted instead of “10.0.0.2”).

A static ARP entry can be added using **arp add**:

```
Tahoe> arp add 10.0.0.3 00:50:13:E9:5C:01
```

A proxy ARP entry can also be added using **arp add**:

```
Tahoe> arp add 10.0.0.4 proxy
```

When a proxy ARP entry is added, the modem will respond with its own MAC address to the ARP requests asking of the specified IP address. Thanks to such a behaviour you may select an IP address from the network connected to the Ethernet interface and assign it to the device on the other end of WAN link. The modem will pretend to have that IP address, answer to ARP requests and then forward received packets over the WAN link after an appropriate routing entry is added.

The dynamic hardware address resolution may be disabled using the **ifconfig** command. When disabled, only those stations whose IP and MAC addresses are entered statically into the ARP table using the **arp add** command are allowed to connect to the modem.

## bridge

The **bridge** command enables or disables the bridge mode, in which two interconnected LANs create united one in the hardware layer. The stations in both LANs behave like if they were connected to one Ethernet switch, e.g. PCs working under Microsoft® Windows™ operating system will see each other in the network neighbourhood.

Following settings are available:

- **off** – regular TCP/IP (Layer 3) routing
- **on** – the bridge mode is enabled, but the modem is still available under its IP address and thus may be managed remotely
- **transparent** – completely transparent bridge, modem does not respond to its IP address
- **dumb** – the bridge mode is enabled, but no MAC address checking is performed. In the regular bridge mode the modem checks on which interface (G.shdsl or LAN) the packet's destination MAC address was heard and decides whether to forward that packet or not. The dumb mode does not do any MAC checking, thus is more efficient. It will work properly in most cases, because the external Ethernet switch does the MAC checking on its own.
- **dumbtrans** – a combination of two above modes, no MAC address check is performed and the modem isn't available under its IP address



Entering **bridge list** displays a list of MAC addresses with the name of the interface on which certain address was heard.



*If you select **transparent** or **dumbtrans** mode while being connected to the modem via telnet you will lose the possibility of remote management (the modem will stop responding to its IP address). Thus you'll be unable to change that setting back to **on** or **off** remotely – you'll have to change it locally by the serial console or built-in keyboard and LCD display.*



*To enable bridging the Cisco® HDLC link protocol should also be selected using the **bundle** or **dsl** command (selected as factory default)*

## bundle

The **bundle** command allows grouping of several DSL lines into bundles and configures them. There are four WAN interfaces – wan0, wan1, wan2 and wan3.

- **bundle <interface> add <line number>** – adds a line to a bundle:

```
Tahoe> bundle wan0 add 1
```

- **bundle <interface> del <line number>** – removes a line from a bundle:

```
Tahoe> bundle wan0 del 1
```

- **bundle <interface> link { hdlc | raw | fr | ppp }** – selects the link protocol – Cisco® HDLC, raw HDLC, Frame Relay or synchronous PPP. The Cisco® HDLC protocol („hdlc” option) should be used in most cases, the others are provided for compatibility only
- **bundle <interface> speed <value>** – sets total throughput of a bundle. The speed range depends on number of lines belonging to the bundle, i.e. 64 - 5696 kbps in case of one line, 128 - 11392 kbps in case of two lines, etc. New speed is set after renegotiating the DSL connection.
- **bundle <interface> type { master | slave }** – selects modem type of all lines in the bundle. New type is set after renegotiating the DSL connection. One modem should be set as a Master, while the other one as a Slave
- **bundle <interface> mod { auto | tcpam32 | tcpam16 | tcpam8 | tcpam4 | pam16 | pam8 | pam4 | pam2 }** – selects line coding (modulation type) of all lines in the bundle. The TCPAM32 modulation is recommended, as it is the most efficient – the

rest is available to provide compatibility with devices from other manufacturers. Moreover TCPAM32 allows throughputs from 256 kbps to 5696 kbps per line, while TCPAM16 – from 128 kbps to 2304 kbps and TCPAM4 – 64 kbps. The “auto” setting forces use of TCPAM32 for speeds greater than or equal to 256 kbps per line and TCPAM16 or TCPAM4 for lower rates.

- **bundle <interface> txgain <value>** – sets transmitter gain of all lines in the bundle. The gain may be selected from 0.0 – 1.6 range. The modem reach may be slightly higher if the gain is increased. New mode is set after renegotiating the DSL connection.
- **bundle <interface> reset** – renegotiates connection on all lines in the bundle
- **bundle show** – shows current settings

## config

The **config** command displays current configuration. The command output can be entered on another modem to make an exact copy of the configuration.

## console

This command is used to enable or disable password protection of the serial console. By default the console is unprotected and user has full access to the modem. By entering:

```
Tahoe> console passwd on
```

the password requirement is enabled and modem will ask for it in the same manner as during the telnet connection. To disable password protection type:

```
Tahoe> console passwd off
```

## dhcp

The **dhcp** command is used to configure the DHCP server or DHCP relay. Refer to the **DHCP Server Configuration** section for detailed information about that command.

## dsl

This command is used to configure specific DSL line. Following options are available:

- **dsl <line> speed <value>** – sets the throughput of a single line. The speed ranges from from 64 to 5696 kbps. New speed is set after renegotiating the DSL connection.
- **dsl <line> type { master | slave }** – selects modem type. New type is set after renegotiating the DSL connection. One modem is always set as a master, while the other one as a slave
- **dsl <line> mod { auto | tcpam32 | tcpam16 | tcpam8 | tcpam4 | pam16 | pam8 | pam4 | pam2 }** – selects line coding (modulation). The TCPAM32 modulation is recommended, as it is the most efficient – the rest is available to provide compatibility with devices from other manufacturers. The TCPAM32 allows throughputs from 256 kbps to 5696 kbps per line, while TCPAM16 – from 128 kbps to 2304 kbps and TCPAM4 – 64 kbps. The **auto** setting forces use of TCPAM32 for speeds greater than or equal to 256 kbps per line and TCPAM16 or TCPAM4 for lower rates.
- **dsl <line> txgain <value>** – sets transmitter gain. The gain can range from 0.0 to 1.6. The modem reach may be slightly higher if the gain is increased. New mode is set after renegotiating the DSL connection.
- **dsl <line> reset** – renegotiates connection
- **dsl show** – shows current settings

## eepromdump

This command displays the complete contents of the EEPROM (non-volatile) memory in hexadecimal form. It is used for debugging only.

## eraseconfig

The eraseconfig command erases whole configuration from the EEPROM. After rebooting the modem it will return to its factory defaults. Until the reboot it will continue to run with its current settings, which can be saved again using write command.

## exit

This command closes the configuration session and disconnects user from the modem.

## help

Shows a list of available commands.

## http

The `http` command configures the built-in web server. It is used to provide an access to modem statistics. Server can be enabled or disabled by entering, respectively:

```
http on
```

or

```
http off
```

The access to the server can be limited by entering:

```
Tahoe> http host <IP address>
```

Then the server is only reachable from the given IP address. To remove the limitation enter 0.0.0.0 as the IP address.

## ifconfig

That command allows configuring the network interfaces. Following interface names are available:

- **eth0** – Ethernet interface
- **eth0.1**, **eth0.2**, etc. – VLAN networks (LAN networks separated from each other, although using the same cabling)
- **wan0**, **wan1**, etc. – G.shdsl bundle, the WAN interface

This command has similar syntax as the Linux `ifconfig`:

```
Tahoe> ifconfig <interface name> [<IP address>] [netmask <network mask>]  
[bcast <broadcast address>] [ static | dynamic ] [bridge { on | off }]
```

The `ifconfig` alone displays information about all active interfaces. Entering `ifconfig <interface name>` shows information about a specific interface. An information about the interface's IP address, number of packets and bytes sent and received, number of transmission errors and other important data is displayed.

You can assign an IP address to an interface, together with subnet mask and broadcast address. You can also enable or disable dynamic Address Resolution Protocol (ARP, enabled by default).

## ipchains

This command is used to control the firewall and the network address translation (NAT, called also “masquerade” – gives network an access to the Internet using only one public IP address). To configure the firewall you should make a list of rules that define actions that should be taken when a matching packet is received.

- **ipchains add** – adds an entry at the end of the list
- **ipchains insert** – adds an entry at the beginning of the list
- **ipchains del** – removes an entry
- **ipchains list** – displays current settings
- **ipchains flush** – removes all entries from the list

After the **add**, **insert** or **del** option, following parameters can be added:

```
Tahoe> ipchains { add | insert | del } [-s <source subnet>/<netmask>
  [<port range>]] [-d <destination subnet>/<netmask> [<port range>]] [-p
  { tcp | udp | icmp }] [-y] [-m <IP address>] { accept | deny | masq |
  pat <IP address>[:<port>]}
```

- **-s <source subnet>/<netmask> [<port range>]**  
Defines the source addresses that this entry concerns. If this parameter is omitted, then the entry applies to all source addresses. The port range can be specified only if the TCP or UDP protocol is selected using **-p** option.
- **-d <destination subnet>/<netmask> [<port range>]**  
Defines the destination addresses that this entry concerns. If this parameter is omitted, then the entry applies to all destination addresses. The port range can be specified only if the TCP or UDP protocol is selected using **-p** option.
- **-p { tcp | udp | icmp }**  
Optionally the application of this rule can be limited to a specified protocol
- **-y**  
The rule can be applied to the TCP SYN packets only (i.e. the packets that initiate the TCP connection). It allows inhibiting the incoming connections while the returning packets for the outgoing connections will pass.

- **-m <IP address>**  
During the masquerade process the outgoing interface's IP address is used by default. The option above allows force use of other address.
- **accept**  
A packet that matches the rule will be accepted, i.e. will be forwarded for further processing. No other firewall rule will be apply.
- **deny**  
A packet that matches the rule will be dropped. No other firewall rule will be applied.
- **masq**  
A packet will be masqueraded, i.e. its IP address will be changed to the IP address of an outgoing interface of the modem to allow access to the Internet to stations without public IP addresses.
- **pat <IP address[:port]>**  
Do Port Address Translation, i.e. change the destination IP address (and port) and forward the packet to another station in the network. Allows certain ports on the modem to be redirected to stations without public IP addresses that are hidden from the outside network.



*The modem always chooses the first matching rule from the list. So if the more general rule comes first, and the more specific is later, then the former will be applied and the latter ignored. Thus the specific rule has to be inserted before the general one, as in following example:*

```
Tahoe> ipchains add -s 215.16.11.0/24 deny
Tahoe> ipchains insert -s 215.16.11.5 accept
```

*Commands above inhibit the access for the whole 215.16.11.0/24 subnet except the 215.16.11.5 address.*

*The specific **accept** rule (concerning one IP address) has to be inserted before the general rule (concerning the whole subnet), by using the **insert** command as in the example above or by adding the specific rule first and then the general rule after.*

*Otherwise the router will always apply the first **deny** rule and will never reach the second one, as the packet coming from 215.16.11.5 fits both of them and if the general one is first, then it will be applied.*

More examples:

```
Tahoe> ipchains add d 0.0.0.0/0 80-80 p tcp deny
```

Inhibits access to the port 80 on all external servers.

```
Tahoe> ipchains add s 192.168.0.0/16 masq
```

Enables masquerade for the 192.168.0.0/16 subnet (packets coming from other addresses remain unchanged).

## lang

Selects the language used to display messages during the telnet or console connection and on the LCD.

## masq

The **masq** command displays a list of masqueraded connections. The list consists of the source and destination addresses, the port assigned by the modem, the time remaining to the removal of an entry in case of connection inactivity and the amount of remaining free table entries that can be used for new connections.

## mem

**Mem** shows the memory usage statistics. The **free** entry shows how much free memory is left and the **free bufs** informs about the amount of free memory destined for network packet.

## mii

The **mii** command allows access to the Ethernet transceiver. Following options are available:

- **status** – displays Ethernet port status (link state, negotiated speed, etc.)
- **reset** – resets the transceiver to the default settings
- **auto** – enables Ethernet auto-negotiation (default)
- **adv { mode [, mode,...] }** – sets a list of modes used during the auto-negotiation. The modes may be selected from following values: **100BaseTx-FD**, **100BaseTx-HD**, **10BaseT-FD**, **10BaseT-HD**
- **force { mode }** – forces a specific mode and disables auto-negotiation

- **power { on | off }** – enables or disables the Ethernet port
- **read [ address ]** – read all or selected MII registers
- **write { address } { value }** – writes to a MII register



---

*Configuring the Ethernet transceiver may cause loss of the LAN connection, which in turn may make it impossible to manage the modem remotely.*

---

## more

The **more** command enables (default) or disables the “-- more --” prompt. This prompt is displayed after each screen of command output when the results of this command do not fit one screen. The syntax is:

```
more { on | off }
```

## netstat

Shows a list of TCP connections.

## ping

Checks the availability of a device with selected IP address. For example ping **10.0.0.2** displays the time necessary to send packet to the 10.0.0.2 station and back or reports its unavailability:

```
Tahoe> ping 10.0.0.2
PING 10.0.0.2: 64 bytes
64 bytes from 10.0.0.2: seq=0 ttl=64 time=0.623 ms
64 bytes from 10.0.0.2: seq=1 ttl=64 time=0.471 ms
64 bytes from 10.0.0.2: seq=2 ttl=64 time=0.471 ms
--- 10.0.0.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.471/0.522/0.623 ms
Tahoe>
```

To stop pinging press Ctrl+C.



## prompt

By using the **prompt** command you may change the default Tahoe> prompt to any other text that will help you identifying the device.

## ps

Shows the processes list

## quit

This command closes the configuration session and disconnects from the modem.

## reboot

Reboots the modem.



*All unsaved changes to the configuration will be lost.*

---

## route

The **route** command is similar to analogous Linux command. It is used to configure the IP routing. The **route** alone shows the current routing table. It may be modified using following options:

- **route add <address> <interface>** – adds the route to a specific host directly through the interface (the station with this address has to be in the network directly connected to that interface)
- **route add <address> gw <gateway>** – adds the route to a specific host through a gateway
- **route add -net <address> netmask <network mask> <interface>** – adds the route to a subnet with given address and network mask directly on the specified interface
- **route add -net <address> netmask <network mask> gw <gateway>** – adds the route to a subnet with given address and network mask through the specified gateway
- **route add default gw <address>** – adds the default route through the specified gateway

- **route del <address>** – removes route to the specified IP address
- **route del -net <address> netmask <network mask>** – removes route to the specified subnet
- **route del default** – removes the default route

## snmp

The **snmp** command is used to configure the SNMP (Simple Network Management Protocol) support. It has following syntax:

- **snmp** – shows current settings:

```
Tahoe> snmp
SNMP on
Read community: public
Write community: private
SNMP host1: <any>
SNMP host2: <disabled>
SNMP host3: <disabled>
Tahoe>
```

- **snmp on** – enables SNMP support
- **snmp off** – disables SNMP support
- **snmp rdcomm <community>** – sets the read community – the password used to read the SNMP parameters
- **snmp wrcomm <community>** – sets the write community – the password used to write the SNMP parameters
- **snmp host1 <address>**
- **snmp host2 <address>**
- **snmp host3 <address>** – allows setting of up to 3 addresses, from which the SNMP access will be permitted. Entering 0.0.0.0 allows access from any address, while 255.255.255.255 disables an entry (entering 255.255.255.255 in all three positions is equal to disabling the SNMP service)

## strictarp

The **strictarp** command helps protecting the LAN against the unauthorized access. After enabling the “strictarp” mode (by typing **strictarp on**) and entering the static IP-MAC assignments (using **arp add**) the modem would listen to incoming ARP requests asking for the addresses it has in its static table. If the request comes from another MAC address than in the modem’s ARP table, it will send an answer with the correct MAC address.

Such request is sent by the PCs working under the Microsoft® Windows™ operating system during the boot-up. After the ARP reply from the modem is received, the PC will show an error message saying that the IP address is occupied and an illegal use of that IP address would be impossible. The “strictarp” mode may be disabled using **strictarp off**.

## syslog

The modem may send the messages about its status and important events to a syslog server. To configure syslog logging following commands may be used:

- **syslog on** – enables logging
- **syslog off** – disables logging
- **syslog host <IP address>** – sets the IP address to which the messages will be sent

## tech

The **tech** command displays a detailed report about modem’s internal state. That output may be used by the technical support for debugging purposes.

## telnet

The command allows limiting the telnet access to the modem. The access may be enabled or disabled by entering:

```
telnet on
```

or

```
telnet off
```

respectively. Moreover the access may be limited to a certain IP address:

```
Tahoe> telnet host <IP address>
```

If the IP address is set as 0.0.0.0, then the access is possible from anywhere in the network.




---

*If you disable telnet access while connected through telnet connection you will lose possibility to manage the modem remotely and you won't be able to enable telnet access again without a reboot or local management through serial console.*

---

## tcpdump

The **tcpdump** command is used to monitor the network traffic on a specified interface. When no interface is specified eth0 is used by default:

```
Tahoe> tcpdump wan0
05:51:27.453 > cisco hdlc (56)
      IP 192.168.20.101 -> 192.168.14.67
      ICMP echo request seq 2
05:51:27.541 < cisco hdlc (62)
      IP 192.168.14.67 -> 192.168.20.101
      ICMP echo reply seq 2
```

To stop monitoring traffic press Ctrl+C.

## tftp

The command allows limiting the TFTP access used for the firmware upgrade. The access may be enabled or disabled by entering:

```
tftp on
```

or

```
tftp off
```

respectively. Moreover the access may be limited to a certain IP address:

```
Tahoe> tftp host <IP address>
```

If the IP address is set as 0.0.0.0, then the access is possible from anywhere in the network.

## timeout

The command sets the inactivity time (in seconds), after which the telnet connection is closed:

```
Tahoe> timeout <during the session> [<during logging in>]
```

The first parameter is used after logging in, while the second one (optional) during the login process. Entering **0** disables the timer.

These settings are also applied to the serial console if its access is password protected (i.e. **console passwd on** command was used).

**Timeout** without any arguments displays current settings.

## uptime

Shows the time elapsed since the modem booting and the current processor temperature.

## user

The **user** command is used to manage users having access to the modem. The modem may work in two different modes:

- **single user** – only the password is necessary to access the modem. The user that logs in has the full access to the device (default mode)
- **multiple users** – allows creating many users with different names, passwords and access levels

The user command has following syntax:

- **user list** – shows the user list
- **user add** <name> – adds a new user
- **user del** <name> – removes an user
- **user passwd** <name> <password> – changes the user's password
- **user level** <name> <access level> – changes the user's access level. The <access level> argument may be one of:

- **admin** – full access to the device
- **read-only** – permits only reading of the configuration and the statistics
- **user mode { single | multi }** – selects the working mode – to either single or multi-user

## ver

Displays current firmware version and compilation date.

## vlan

The **vlan** command is used to manage VLAN configuration. The modem may work in one of following modes:

- **transparent** – the VLAN-tagged packets are passed transparently. The modem is transparent to the traffic and it's up to user to manage VLANs on external devices (default)
- **non-transparent** – the modem may be set up to analyse the traffic and some packets may be directed to specified interfaces, while others may be filtered. Also VLAN headers may be removed or added while forwarding a packet, thus encapsulating a data stream from a specified interface into a VLAN.

The command has following syntax:

- **vlan show** – shows current settings
- **vlan transparent { on | off }** – enables or disables the transparent mode
- **vlan create <vid>** – inserts a new VLAN ID into the list of supported VLANs
- **vlan remove <vid>** – removes a VLAN ID from that list
- **vlan <vid> add <interface>** – adds an interface to a VLAN
- **vlan <vid> del <interface>** – removes an interface from a VLAN
- **vlan <vid> name <name>** – sets a VLAN name to ease identification
- **vlan <vid> { tag | untag } <interface>** – sets an interface as tagged or untagged.

To manage VLAN traffic first you have to follow these steps:

1. Disable transparent mode using **vlan transparent off** command.
2. Add VLANs you want to forward using **vlan create <vid>**.
3. Add interfaces to that VLAN using **vlan <vid> add <interface>**.
4. Decide whether interfaces should be tagged or untagged using **vlan <vid> { tag | untag } <interface>** command. A tagged interface means that all traffic belonging to specified VLAN will be transmitted through that interface without modification (with a VLAN header). Such traffic can be further separated using an external VLAN-aware switch.

In case of an untagged interface the VLAN headers will be stripped from the packets before they are transmitted over that interface. In the opposite direction the VLAN headers will be added to all untagged (i.e. regular) packets received on that interface. This way only regular Ethernet packets would appear on that interface (so you can connect regular Ethernet devices) while the modem will see VLAN traffic only. Such VLAN traffic can be sent further to other devices without being mixed with packets coming from other sources.

The non-VLAN traffic is directed to a default VLAN with ID 1. That VLAN is used for internal processing only. All interfaces are added to that VLAN by default and are marked as untagged.

## W

Shows the time elapsed since the modem booting and the current processor temperature.

## wake

The wake command is used to power-on LAN devices that have Wake-On-LAN feature enabled. To send a wake-up packet to a specified MAC address type:

```
Tahoe> wake <MAC address>
```

An **-b** option may be added before MAC address to generate a broadcast packet. This may be necessary in some cases, when the regular packet isn't forwarded through the Ethernet switch or another device.

## watchdog

The **watchdog** command gives additional control over the modem's unpredicted behavior (i.e. a misconfiguration disabling further communication with the modem). The modem sends ICMP ping packets to check the availability of certain IP addresses and reboots, if it doesn't receive ping reply from one of them.

The command has following syntax:

- **watchdog on** – enables the watchdog
- **watchdog off** – disables the watchdog
- **watchdog <interval> <amount> <wait> <IP address> [<additional IP address>]**  
– configures the watchdog. After <interval> seconds the modem sends <amount> of pings to the <IP address> (and the <additional IP address> if set) waiting <wait> seconds after each of them. If there is no answer for any of the pings sent to the first address or for any of the pings sent to the second address, then the modem is rebooted.

## write

Saves the current configuration to the EEPROM (non-volatile memory) so the modem keeps it after reboot or power off. The command also displays an information about the EEPROM usage. If the configuration is too large to be stored some settings should be deleted, like static ARP entries, DHCP options, etc.



## DHCP Server Configuration

The **dhcp** command is used to configure DHCP/BOOTP server and relay agent. The server is used to assign IP addresses, network masks, gateway and DNS addresses and other parameters to the network stations. It is easy to reconfigure a network that uses a DHCP server – it is enough to change server settings and every station will automatically retrieve new configuration.

The BOOTP protocol is an earlier and simpler version of DHCP. Its common use is booting of diskless workstations. A workstation uses BOOTP to get its IP address and other network parameters together with TFTP server address, from which the operating system may be downloaded.

The DHCP protocol may deliver more working parameters including domain name, DNS address, print server, syslog server, XWindow fontserver, MTU and TTL settings, and many others.

DHCP/BOOTP Relay Agent transfers DHCP and BOOTP requests and replies between separate networks. The DHCP and BOOTP protocols work only within one physical subnet. The station using such protocols doesn't know its IP address yet, so its packets cannot be routed to other networks. Relay Agent listens for such requests and forwards them to a DHCP server, which may be placed anywhere in the network.

## Review of the settings

Entering **dhcp** alone displays current server settings. Here is an example:

```
Tahoe> dhcp
DHCP/BOOTP server
default-lease-time 43200
max-lease-time 86400
network "lan" (eth0):
default-lease-time 43200
max-lease-time 86400
domain-name tahoe.pl
subnet "local": 10.0.0.0/255.255.255.0
default-lease-time 43200
max-lease-time 86400
filename vmlinuz.2.6.15
next-server 192.168.0.5
routers 10.0.0.1
domain-name-servers 192.168.0.4
domain-name tahoe.pl
address ranges: 10.0.0.3-10.0.0.15
relay server 192.168.0.5 67
```

The meaning of subsequent entries is described later in this chapter.

## Basic DHCP server configuration rules

Before starting using DHCP server please read following guidelines:

- the configuration is organized in a hierarchical manner – the most general group of settings is a **network** – the physical interface of a modem. Any number of IP **subnets** may exist within a network. Inside an IP subnet an IP address **range** may be selected – IP addresses from that range will be dynamically assigned to the network stations. A static connection between an IP address and a hardware address may also be set.

Each group (**network, subnet**) has its own options (name server addresses, domain names, etc.). Creating a new group (e.g. a **subnet** within a **network**) causes copying of the options from the parent group (e.g. if the **lan** network has a **domain-name** option, after adding a subnet named **local** within the **lan** the option will be automatically copied – it may be modified or deleted later)

- on the beginning a **network** for each interface should be created
- in each of the **networks** an IP **subnet** should be created according to IP subnets connected to that interface (modem may not have the routing set up to each of them – it's enough that they are in the same physical network)
- now IP ranges and static IP entries may be added

## dhcp { on | off | relay }

DHCP/BOOTP server may work in one of three modes:

- **on** – the server is enabled and answers to the requests
- **off** – the server is disabled
- **relay** – the server is disabled, but the relay agent is enabled and listens for the requests to be forwarded to other DHCP server

## dhcp add

The **dhcp add** commands add a network, subnet, IP range, etc. Following variants are supported:

- **dhcp add network <name>**

Adds a new physical network connected to the modem's interface. There should be the same number of **networks** and interfaces. The interface name will be assigned automatically after adding the IP subnets.

```
Tahoe> dhcp add network lan
```

- **dhcp add subnet <name> <network> <address> <netmask>**

Adds a IP subnet to a given network. For each IP subnet connected to the LAN or WAN interface an DHCP subnet should be added (with the same IP addresses, as configured on each of the interfaces). Moreover additional IP subnets may be added – those which are not set up on any of the interfaces, but do exist in the same physical network or behind a DHCP relay:

```
Tahoe> dhcp add subnet local lan 10.0.0.0 255.0.0.0
```

- **dhcp add host <name> <MAC address> <IP address>**

Adds a static connection between hardware (MAC) and IP addresses. The IP address must belong to one of the configured subnets. Only this IP address will be assigned to the given MAC address:

```
Tahoe> dhcp add host server 00:50:13:2e:15:ca 10.0.0.5
```

- **dhcp add range <start address> <end address>**

Adds an IP address range, from which addresses will be assigned to the network stations. The address range must be contained inside one of the subnets:

```
Tahoe> dhcp add range 10.0.0.5 10.0.0.37
```

The DHCP server will automatically decide to which subnet that IP address range belongs.

- **dhcp add option <option> <value>**

Adds a global DHCP option sent to the requesting station. Available options are:

- **routers** – network gateways (usually the gateways should be separate for each subnet, so they shouldn't be defined globally)
- **domain-name** – domain name
- **domain-name-servers** – DNS addresses
- **filename** – name of the file containing the operating system
- **next-server** – server from which the mentioned above file will be downloaded using TFTP protocol

Example:

```
Tahoe> dhcp add option domain-name tahoe-group.com
```

- **dhcp add relay <address> [<port>]**  
Adds a DHCP server address to which the DHCP requests are forwarded, when the Relay Agent mode is enabled. The <port> parameter is optional – its default value is 67:

```
Tahoe> dhcp add relay 192.168.0.3
```

## dhcp del

The command deletes a network, subnet, address range, etc.

- **dhcp del network <name>**
- **dhcp del subnet <name>**
- **dhcp del host <name>**  
The commands above delete, respectively, a network, an IP subnet or a host (a static IP-MAC connection) with given name.
- **dhcp del relay <address>**  
Deletes a DHCP server address used in the Relay Agent mode.
- **dhcp del range <start address> <end address>**  
Deletes an IP address range assigned to the network stations.
- **dhcp del option <name> <value>**  
Deletes a global option. Besides the option name, its value should also be given, because some options may have more than one value (e.g. domain name servers, routers, etc.).

## dhcp rename

The command changes the name of a network, subnet or host:

- **dhcp rename network <old name> <new name>**
- **dhcp rename subnet <old name> <new name>**
- **dhcp rename host <old name> <new name>**

## dhcp { network | subnet | host }

The command adds or deletes an option within a specified group – network, subnet or host. To add an option to a network type:

- **dhcp network <name> add <option name> <value>**

To remove an option:

- **dhcp network <name> del <option name> <value>**

Similarly subnet and host options may be added or deleted by replacing the network keyword by subnet or host. Example:

```
Tahoe> dhcp subnet local add domain-name tahoe-group.com
```

Options are valid only for a given network, subnet or host. The option list is available in the **dhcp add** command description above.

Besides these standard options two other parameters can be set:

- **dhcp network default-lease-time <value>**  
Sets the time (in second), for which the IP address is assigned to the station. After that time the station must inform the DHCP server that it still uses that address. Otherwise the address will be considered as unused. This time-out prevents blocking an IP address when a station is switched off without releasing that address.
- **dhcp network max-lease-time <value>**  
A station may request a lease time other than the default value – the negotiated time may not be higher than this setting.

## dhcp default-lease-time <value> dhcp max-lease-time <value>

These commands are similar to those described in the previous paragraph, but their meaning is global.



# Appendix A, Troubleshooting

Problem	Possible solutions
The modems cannot synchronize with each other	<ul style="list-style-type: none"> <li>▪ check the cables and connector pinouts</li> <li>▪ check if the speed setting is the same on both modems</li> <li>▪ check if one modem is set as Master and the other one as Slave</li> <li>▪ the line may be too long for selected speed – lower the speed setting on both modems</li> </ul>
The modems are synchronized, but no data flows	<ul style="list-style-type: none"> <li>▪ if transparent bridge is required – check if it is enabled.</li> <li>▪ check if the Noise Margin (Signal/Noise Ratio) is greater or equal to 6 dB – decrease the line throughput if the NMR is too low</li> <li>▪ check the LAN cables</li> <li>▪ issue <b>mii reset</b> command to reset the Ethernet interface</li> </ul>
The data isn't transferred at full speed or the throughputs are asymmetrical (higher in one direction and lower in the other direction)	<ul style="list-style-type: none"> <li>▪ check if the Noise Margin (Signal/Noise Ratio) is greater or equal to 6 dB – decrease the line throughput if the NMR is too low</li> <li>▪ ensure that the modem and the LAN device on the other end of the cable has the same Ethernet interface setting – either autonegotiation, or forced mode</li> </ul>
The modems loose synchronization from time to time	<ul style="list-style-type: none"> <li>▪ check if the Noise Margin (Signal/Noise Ratio) is greater or equal to 6 dB – decrease the line throughput if the NMR is too low</li> <li>▪ try to change the leased line or at least some sections of it – there may be loose connectors, damaged insulation or other transient problems with the line</li> <li>▪ telecom line consists of two twisted wires – ensure that both wires of a twisted pair are connected to pins of the same line</li> </ul>





## Appendix B, Technical Specification

**processor:**

Motorola PowerPC, 100MHz

**memory:**

4MB SDRAM

**network protocols:**

IP, TCP, UDP, ICMP, TFTP, SNMP, DHCP, BOOTP, RFC-1490, PPP, Frame Relay, Cisco® HDLC, IEEE 802.1q

**G.shdsl interface:**

connector: 4 x RJ-11

standards: ITU G.991.2 (G.shdsl), ITU G.994.1 (G.hs)

modulations: TCPAM-32, TCPAM-16, TCPAM-8, TCPAM-4, PAM-16, PAM-8, PAM-4, PAM-2

**throughput:**

64-5696 kbps per line, 256-22784 kbps aggregate

**Ethernet interface:**

10/100Base-T, RJ-45 connector

**dimensions:**

30 mm (width) x 128 mm (height) x 185 mm (depth)

**power consumption:**

10W

**environmental conditions:**






storage: temperature -20°C to 65°C, humidity 5 to 95%

operation: temperature 0°C to 50°C, humidity 0 to 85%



## Appendix C, Safety Information

Read the following safety notices before installing or using the Tahoe modem:

- 
-  *This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.*
- 
-  *Read the installation instructions before you connect the device to its power source.*
- 
-  *Do not work on the system or connect or disconnect cables during periods of lightning activity.*
- 
-  *Do not connect the low voltage circuits (LAN port) to leased line circuits (G.shdsl port). Some LAN and WAN ports use RJ-45 connectors. Use caution when connecting cables.*
- 
-  *This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse no larger than 240 VAC, 16A is used.*
-



## Appendix D, Declaration of Conformity



TAHOE  
Piotr Kaczmarzyk  
ul. Uniwersytecka 1  
50-951 Wrocław, Poland

We declare that the product Tahoe 4681 complies with the regulations of the following European Directives:

- **73/23/EEC** low voltage safety requirements
- **89/336/EEC** EMC requirements
- **99/5/EEC** radio & telecommunication terminal equipment requirements

The compliance of Tahoe 4681 with the requirements of the above mentioned directives is ensured by complete application of the following harmonized European Standards:

- **EN 60950:2000**
- **EN 55022:1998**
- **EN 61000-6-1:2002**
- **EN 61000-6-3:2002**

The product also complies with the Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment („RoHS Directive”) with the exemptions applicable for network infrastructure equipment for switching, signalling, transmission and network management (according to the clause 7 of the Annex to the Directive).

Signed: Piotr Kaczmarzyk  
Position: Director

Signature: 

Date: 30 June 2006  
Place: Wrocław, Poland















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