Aphelion Series

Aphelion 500AG

802.11a/b/g Multi-functional Outdoor Wireless Access Point

User Manual

V.05.09.06
August, 2005

Table of Contents

Chapter 1 Warranty and Support

This Chapter describes Aphelion's warranty policy and support

1.1 Warranty

Subject to the terms and conditions set forth herein, Aphelion Communications Inc, Aphelion provides this Limited Warranty:

Only to the person or entity that originally purchased the product from Aphelion or its authorized reseller or distributor.

Limited Warranty: Aphelion warrants that the hardware portion of the Aphelion product described below (Hardware will be free from material defects in workmanship and materials under normal use from the date of original retail purchase of the product, for the period set forth below (Warranty Period) except as otherwise stated herein.

Hardware (excluding power supplies and fans): One (1) Year
Power supplies and fans: One (1) Year
Spare parts and spare kits: Ninety (90) days

The customer's sole and exclusive remedy and the entire liability of Aphelion and its suppliers under this Limited Warranty will be, at Aphelion option, to repair or replace the defective Hardware during the Warranty Period at no charge to the original owner or to refund the actual purchase price paid. Any repair or replacement will be rendered by Aphelion at an Authorized Aphelion Service Office. The replacement hardware need not be new or have an identical make, model or part. Aphelion may, at its option, replace the defective Hardware or any part thereof with any reconditioned product that Aphelion reasonably determines is substantially equivalent (or superior) in all material respects to the defective Hardware. Repaired or replacement hardware will be warranted for the remainder of the original Warranty Period or ninety (90) days, whichever is longer, and is subject to the same limitations and exclusions. If a material defect is incapable of correction, or if Aphelion determines that it is not practical to repair or replace the defective Hardware, the actual price paid by the original purchaser for the defective Hardware will be refunded by Aphelion upon return to Aphelion of the defective Hardware. All Hardware or part thereof that is replaced by Aphelion, or for which the purchase price is refunded, shall become the property of Aphelion upon replacement or refund.

Non-Applicability of Warranty: The Limited Warranty provided hereunder for Hardware and Software portions of Aphelion's products will not be applied to and does not cover any refurbished product and any product purchased through the inventory clearance or liquidation sale or other sales in which Aphelion, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product and in that case, the product is being sold "As-Is" without any warranty whatsoever including, without limitation, the Limited Warranty as described herein, notwithstanding anything stated herein to the contrary.

Submitting A Claim: The customer shall return the product to the original purchase point based on its return policy. In case the return policy period has expired and the product is within warranty, the customer shall submit a claim to Aphelion as outlined below:

The customer must submit with the product as part of the claim a written description of the Hardware defect or Software nonconformance in sufficient detail to allow Aphelion to confirm the same, along with proof of purchase of the product (such as a copy of the dated purchase invoice for the product) if the product is not registered.

The customer must obtain a Case ID Number from Aphelion Technical Support at support@ahelions.com, who will attempt to assist the customer in resolving any suspected defects with the product. If the product is considered defective, the customer must obtain a Return Material Authorization (RMA) number by completing the RMA form and entering the assigned Case ID Number at https://rma.aphelions.com/.

After an RMA number is issued, the defective product must be packaged securely in the original or other suitable shipping package to ensure that it will not be damaged in transit, and the RMA number must be prominently marked on the outside of the package. Do not include any manuals or accessories in the shipping package. Aphelion will only replace the defective portion of the product and will not ship back any accessories.

The customer is responsible for all in-bound shipping charges to Aphelion. No Cash on Delivery (COD) is allowed. Products sent COD will either be rejected by Aphelion or become the property of Aphelion. Products shall be fully insured by the customer and ship back to Taiwan. Aphelion will not be held responsible for any packages that are lost in transit to Aphelion. The repaired or replaced packages will be shipped to the customer via DHL Ground or any common carrier selected by Aphelion. Return shipping charges, we will ship the product to you freight collect. Expedited shipping is available upon request and provided shipping charges are prepaid by the customer.

Aphelion may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The product owner agrees to pay Aphelion reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by Aphelion not to be defective or non-conforming.

What Is Not Covered: The Limited Warranty provided herein by Aphelion does not cover: Products that, in Aphelion judgment, have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; Initial installation, installation and removal of the product for repair, and shipping costs; Operational adjustments covered in the operating manual for the product, and normal maintenance; Damage that occurs in shipment, due to act of God, failures due to power surge, and cosmetic damage; Any hardware, software, firmware or other products or services provided by anyone other than Aphelion; and Products that have been purchased from inventory clearance or liquidation sales or other sales in which Aphelion, the sellers, or the liquidators expressly disclaim their warranty obligation pertaining to the product. While necessary maintenance or repairs on your Product can be performed by any company, we recommend that you use only an Authorized Aphelion Service Office. Improper or incorrectly performed maintenance or repair voids this Limited Warranty.

Disclaimer of Other Warranties: Except for the limited warranty specified herein, the product is provided without any warranty of any kind whatsoever including, without limitation, any warranty of merchantability, fitness for a particular purpose and non-infringement. if any implied warranty cannot be disclaimed in any territory where a product is sold, the duration of such implied warranty shall be limited to the duration of the applicable warranty period set forth above. except as expressly covered under the limited warranty provided herein, the entire risk as to the quality, selection and performance of the product is with the purchaser of the product.

Limitation of Liability: To the maximum extent permitted by law, aphelion is not liable under any contract, negligence, strict liability or other legal or equitable theory for any loss of use of the product, inconvenience or damages of any character, whether direct, special, incidental or consequential (including, but not limited to, damages for loss of goodwill, loss of revenue or profit, work stoppage, computer failure or malfunction, failure of other equipment or computer programs to which aphelion product is connected with, loss of information or data contained in, stored on, or integrated with any product returned to aphelion for warranty service) resulting from the use of the product, relating to warranty service, or arising out of any breach of this limited warranty, even if aphelion has been advised of the possibility of such damages. the sole remedy for a breach of the foregoing limited warranty is repair, replacement or refund of the defective or non-conforming product. the maximum liability of aphelion under this warranty is limited to the purchase price of the product covered by the warranty. The foregoing express written warranties and remedies are exclusive and are in lieu of any other warranties or remedies, express, implied or statutory.

Governing Law: This Limited Warranty shall be governed by the laws of the Taiwan. Some countries do not allow exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the foregoing limitations and exclusions may not apply. This Limited Warranty provides specific legal rights and you may also have other rights which vary from state to state.

Trademarks: Aphelion is a registered trademark of Aphelion Communications Inc. Other trademarks or registered trademarks are the property of their respective owners.

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For detailed warranty information applicable to products purchased outside the United States, please contact the corresponding local Aphelion office.

1.2 Technical Support

Aphelion believes in ONE goal as to achieve total customer satisfaction; for any technical assistance or information assists, please email to support@aphelions.com or where we have professional engineers standing by to assist you.

If you are a qualified reseller of Aphelion, you will be getting usernames and passwords for supporting online where you will find many useful applications notes and FAQs to your needs.

Please have the following information ready when you contact Aphelion support:

1. Serial number and model name
2. Firmware version in system monitoring menu
3. Application of which you are deploying with Aphelion 500s and network topology

Thank you

Chapter 2 Getting Started

This chapter describes Aphelion 500 in short for your applications

802.11a/b/g Intelligent Sequential Outdoor Wireless Access Point World First daisy-chained wireless Access points

The Aphelion 500AG is an outdoor Intelligent Sequential Wireless Access Point. With its powerful engineering design, the Aphelion 500AG can form daisy chained wireless Hot Zones easily when engaging multiple Aphelion 500AGs together to meet the ever increasing needs of different network applications. With it's break through technology innovations, the Aphelion 500AG can offer the following benefits to users in terms of Scalability, Range extension, Expansion in network capacity, powerful routing engine, easy installation and simple management. Aphelion 500AG will be the most ideal candidate for users who wish to deliver carrier class wireless services in multiple market segments such as campuses, hospitality, healthcare, warehousing etc. up to wider metropolitan areas.

Features in a Glance:

Scalable wireless distribution platform

- Daisy chained wireless Hot Zones
- Reliable performance when deploying multiple nodes in bridged or routed environments.
- Bandwidth control module at subscriber level

Comprehensive Security Features

- 802.1x EAP support (client and server modes)
- EAP-MD5, EAP-TLS support and Dynamic WEP keys
- Radius client
- Hide ESSID
- MAC address filtering
- NAT
- SSH secure telnet

Dynamic WAN Interface Assignments

- Easy assignments of WAN exit to fit in different network topology
- Flexible wireless network distribution system

Harsh outdoor environments to keep operation

- Sturdy water-tight housing
- Built-in heater module to facilitate cold regions
- PoE module

System Management

- Firmware upgrade through TFTP, FTP
- Interface status display
- SNMP v1/v2

Simple Installation and Deployment

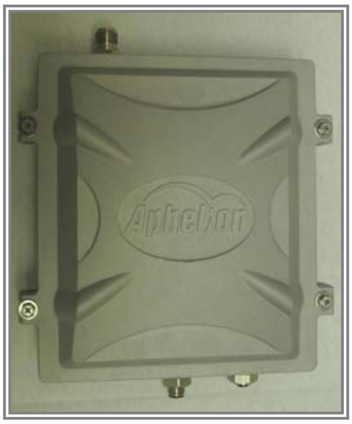
- Alignment tools for technicians
- Deployment tools for RF analysis

Chapter 3 Hardware Installation

This chapter describes the procedures for installing Aphelion 500AG

3.1 Preparing Installations

Package Connects



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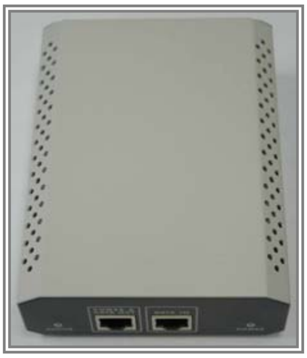

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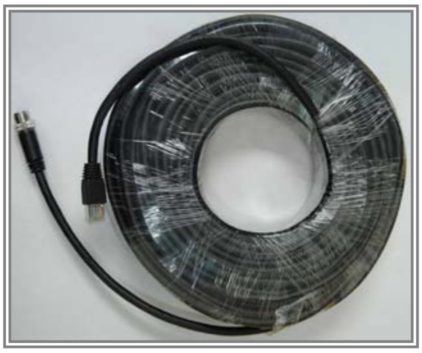

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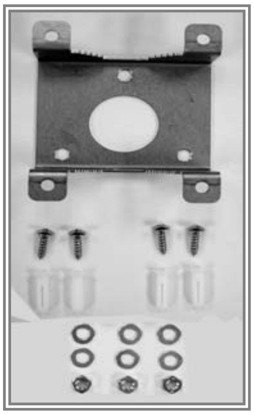

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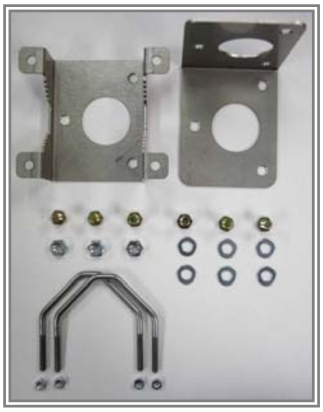

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Contents of Package:

1. Aphelion 500AG 802.11a/b/g Outdoor Wireless AP

2. PoE Power Injector

3. AC Power Cord

4. 30M MIL-C-5015 IP67 Cat-5 Ethernet Cable

5. 2M MIL-C-5015 IP67 RS-232 Consol Cable

6. Wall Mounting Kit & Screw

7. Mast Mounting Kit & Screw

8. CD: User Manual

9. Quick Installation Guide

10. Grounding Wire

If any of the above items are missing, please contact your reseller.

3.2 Hardware Description

The content of the Aphelion 500AG are described below.

1. The outdoor unit

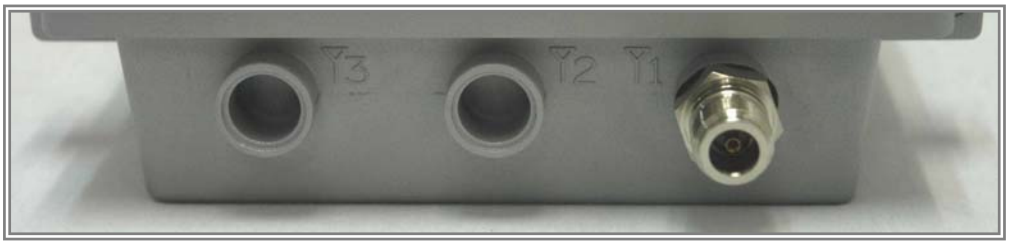
The outdoor unit has one antenna port, one data/power port and one console port. The antenna port is N-Type female connector used to connect to the omni-directional antenna or to the RF cable then to the flat panel antenna. The data/power port is used to link to the cable from the power injector. When the outdoor unit and the network/power injector are connected together, the outdoor unit is turned on and initialized if the network/power injector in the indoor is also installed successfully. The console port is only used at the initial setup and is used to connect to the antenna alignment kit.

Front view of Aphelion 500AG

Case Spec.

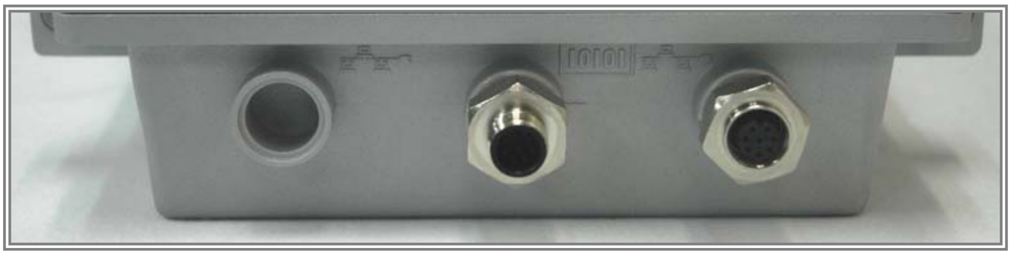
1. L × W × H: 226 × 197 × 79 mm
2. L × W × H: 245 × 197 × 79 mm (including connector)
3. Weight: 1750g
4. Material: aluminums alloy

Front view of RF antenna connector



RF antenna connector : The major interfaces on the top of Aphelion 500AG is **one female N-Type** RF antenna connector with special water proof.

Front view of Power / Signal connector port & Console port



Power / Signal connector port : 8-pin female connector with MIL-C-5015 IP67 water proof Connecting to the indoor interface unit supplying the power and signal.

Console port (TBD): 8-pin male connector with MIL-C-5015 IP67 water proof Connecting to the PC for RF diagnostics & troubleshooting

2. Antenna (Option)

There are three kinds of optional antenna used for Aphelion 500AG.

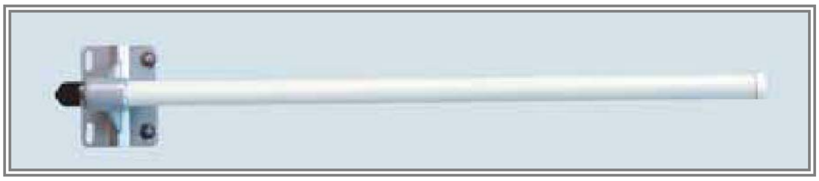
A. 12dBi Omni-directional antenna : This antenna is used in the point-to-Multi-points (PTMP) mode. The antenna is connected directly to the outdoor unit. This antenna is need **Male to Male N-type** RF cable or **Male to Male N-type** RF connector.

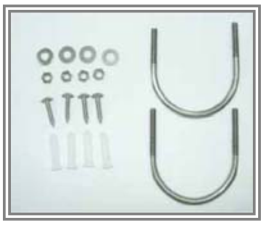
B. 18dBi flat panel antenna : This antenna is used in the point-to-point (PTP) mode or PTMP mode. The antenna is connected to the outdoor unit through an **Male to Male N-type** RF cable.

C. 19dBi flat Dish antenna : This antenna is used in the point-to-point (PTP) mode or PTMP mode. The antenna is connected to the outdoor unit through an **Male to Male N-type** RF cable.

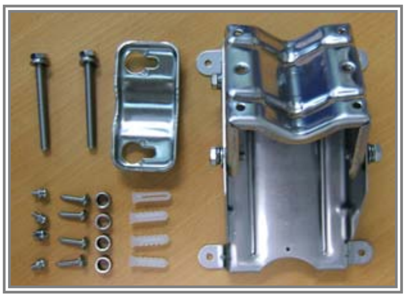
The appearance of the antennas is shown below.

A. 10.5dBi Omni-directional antenna





B. 16dBi flat panel antenna :



C. 19dBi flat Dish antenna :

3. RF cable & Connector

The RF cable is used to connect the outdoor unit and the Omni / panel / Dish antenna. The **Male to Male N-type** CFD 400 type RF cable with 1.5M length is provided.

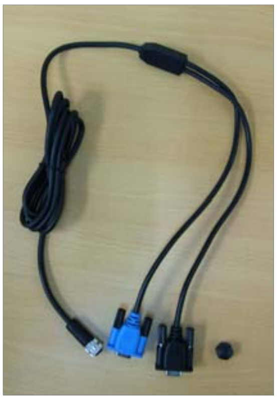
The **Male to Male N-type** RF Connector is used to connect the outdoor unit and the Omni antenna.

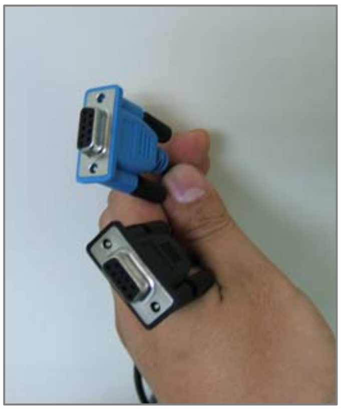
The appearance of the RF cable & Connector are shown below.

A. RF cable-1.5M Male to Male N-type CFD 400 type RF cable

B. Connector- Male to Male N-type RF Connector

4. RS-232 console cable (2M MIL-C-5015 IP67 RS-232 Consol Cable) The RS-232 cable is used to connect the console port of the outdoor unit and the antenna alignment tools or the workstation. The One (RS-232) console port has **black color** for setting up initial configuration information, another (RS-232) console port **(blue color)** for antenna alignment /deployment tools. The appearance of the RS-232 cable is shown below.

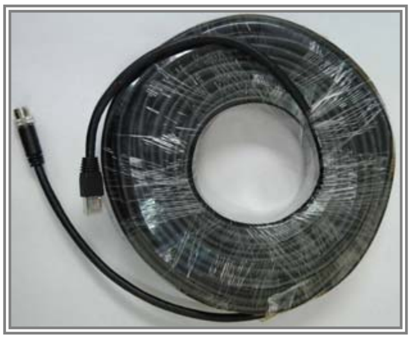




Water proof hat

5. Cat-5 Ethernet cable with MIL-C-5015 connector (30M MIL-C-5015 IP67 Cat-5 Ethernet Cable)

The Cat-5 Ethernet cable with MIL-C-5015 IP67 connector has 30M in length. It is used to provide the path to deliver power for the outdoor unit and the data communication. The appearance is shown below.



6. Grounding wire

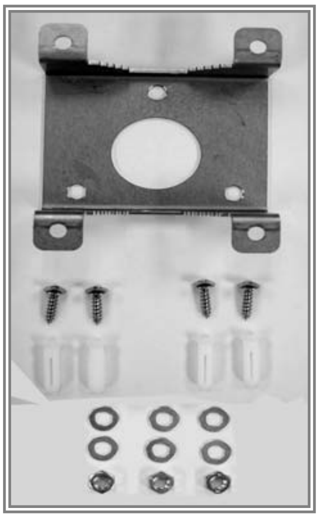
The grounding wire is used to provide the grounding path for the outdoor unit to minimize the impact of lightening and surge.

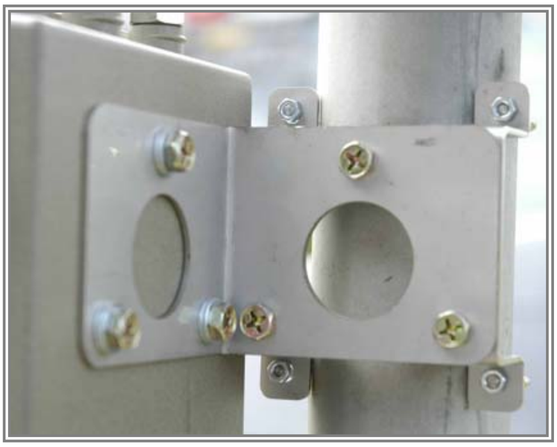
The physical appearance of the grounding wire is shown below.

7. Mounting Kit

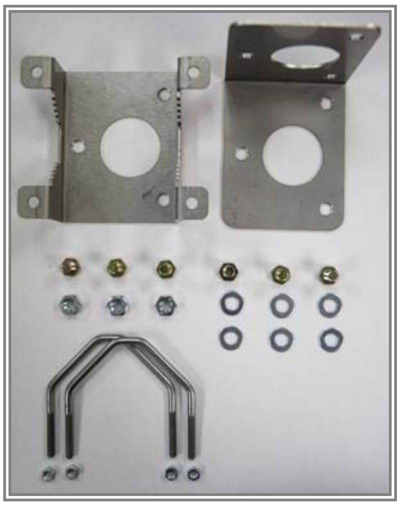
The mounting kit is used to provide a good support for the outdoor unit and the flat panel antenna. Please
follow the installation procedure to mount the outdoor unit and the flat panel antenna. The contents of the
mounting kit are shown below.

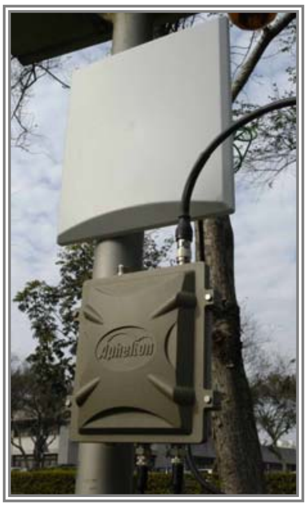
A. Wall Mounting Kit





B. Mast Mounting Kit





8. PoE Power Injector

The PoE Power Injector is used to combine the data stream and power into one cable. It has three ports.

The port named AC IN is for 100~240V power from AC Power via AC Power Cord. The port named Data Input Port isconnected the customer premises equipment (CPE) by Cat-5 cable. The port named Power & Data Output Port is connected to the outdoor unit by the cable described in item 5.

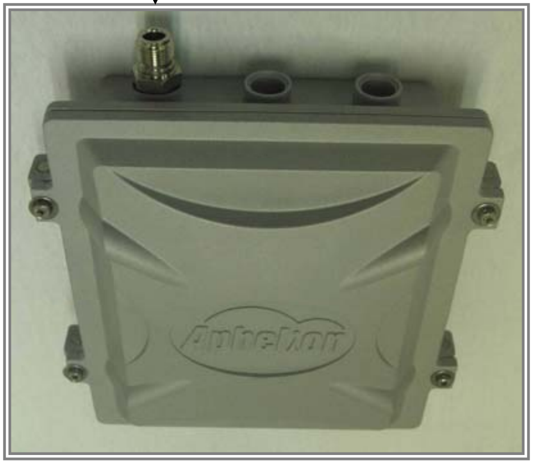
The appearance of the network/power injector is shown below.

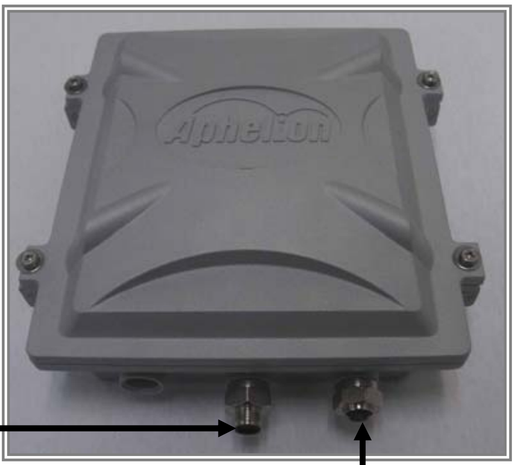
9. AC Power Cord

The AC Power Cord is to supply the 100~240V power for PoE Power Injector.

Connections

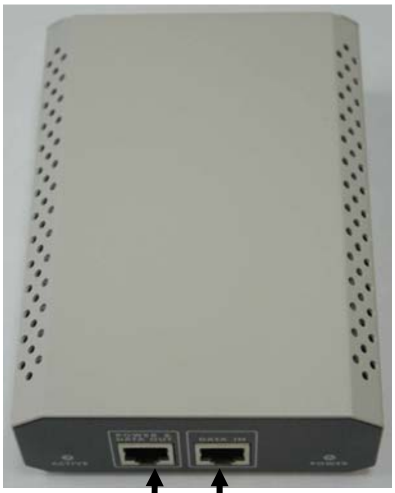
Antenna Connector: 1 × Reversed Female N-type
Connect to Antenna base by **Male to Male N-type** CFD 400 RF Cable





Special Consol Port
Connect one end of the 2M MIL-C-5015 IP67 RS-232 console port cable to this port; connect the other end to a Serial Port on a computer that is running a terminal emulation program; connect the another end to a Serial Port on a notebook or PDA that is running Alignment / Deployment tools program for technicians to analysis RF equipments.
Note: Use this console connection only if you are configuring the Aphelion 500AG via the console. (Or when you fail to configure the unit through the Web based utility).

Special Ethernet Port
Connect one end of the 30M MIL-C-5015 IP67 Cat-5 Ethernet Cable into this port; connect the other end into the Power and Data Output Port on Inline Power Injector.



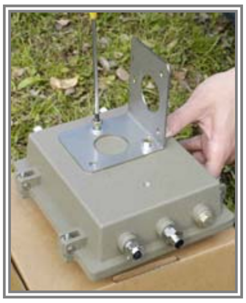
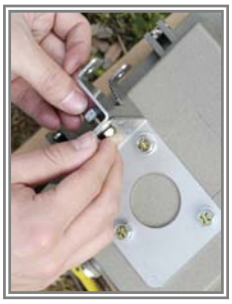
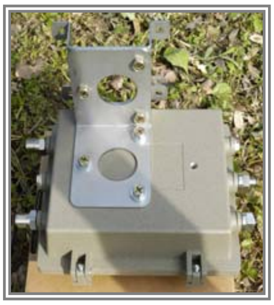
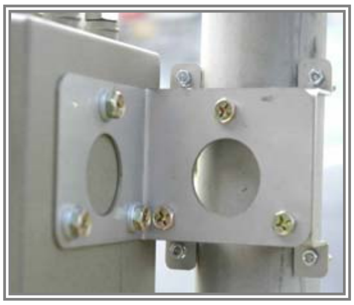
Power & Data Output Port
Attach one end of the IP67 Cat-5 Ethernet cable to this port;
attach the other end to the 30M IP67 Cat-5 Ethernet Port on the Aphelion 500AG.

Data Input Port
Connect one end of the cross-over Ethernet cable to this port; connect the other end to the Ethernet port on the computer.

3.3 Outdoor Installations

Aphelion 500AG can be mounted on the side of building or mounted on an antenna mast as shown in following：

Step 1 To compose the holder of Aphelion 500AG

Step 2 Plug the female end of the power cord into the PoE Injector and then plug the male end of the power cord into a power outlet or power strip. The Power LED on the front of the PoE Injector will light up.

Step 3 Plug the RJ-45 Ethernet connector, which is from Aphelion 500AG, into the Power & Data Output Port on the front of the PoE Power Injector, when the Access Point receives power over the Ethernet cable, the Access Point will start its boot sequence and the Active LED on the front of the PoE will light up.

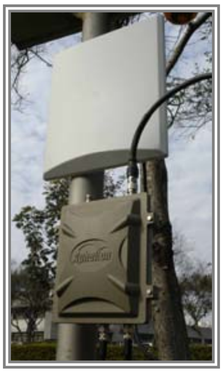
Step 4 Run the crossover Ethernet cable from Data Input Port（on the front of the PoE Power Injector）to the Ethernet Port on the PC or notebook.

Step 5 Plug the MIL-C-5015 RJ-45 Ethernet cable into the MIL-C-5015 Ethernet port on the back of the access point.

Step 6: Attach the RS-232 Cable（Console Port cable） to the Serial Port. Attach the other cable end （with a marked black spot） to the Serial Port on a PC for setting up initial configuration information; another cable end for antenna alignment /deployment tools.

NOTE: This connection is required for setting up initial configuration information. After configuration is completed, this cable may be removed and put on water proof hat until additional configuration is required via the Serial Port.

Step 7 Attach the antenna to the antenna connector as shown in following figure.

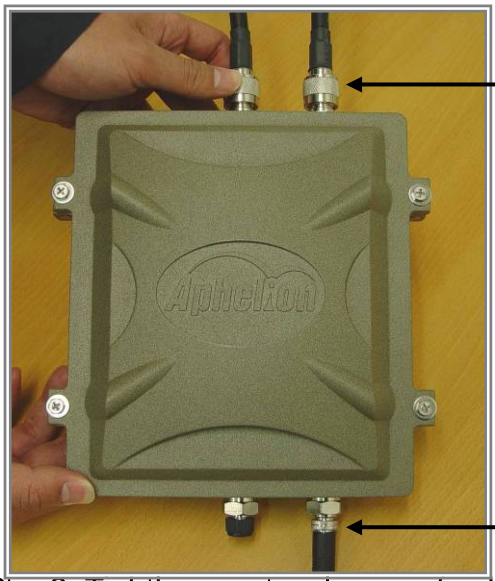


Special Notice for Waterproofing Installation

Most outdoor model problems are caused from the connector connections that loosen due to vibration or other forces，even allowing moisture to penetrate the connector will seriously affect the data & radio single transmit.

The following recommendation is used for all outdoor installation to be waterproofed.

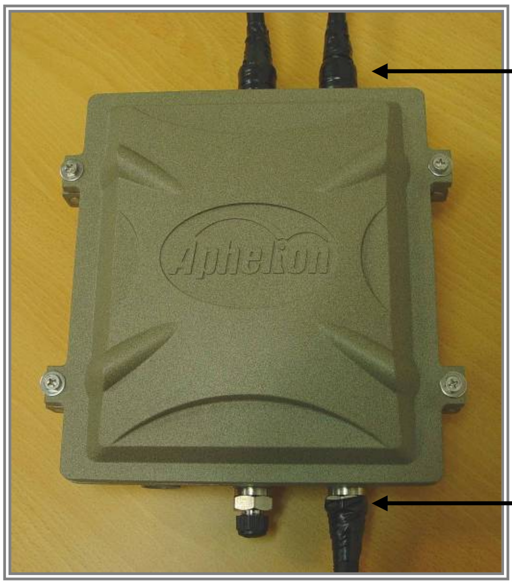
Step1: Ensure you already fasten all connectors securely together.



RF Extend Cable Connection

PoE Cable Connection

Step2: Tightly warp two layers of self-bonding insulating tape (the tape from a good brand is recommended) forward and backward over the physical connection extending two inches beyond the connectors or beyond the end of heat-shrinkable tubing on the RF Coaxial cable or Omini Antenna connector, and overlapping the tape on each turn.



RF Extend Cable and Connector on the Tape for waterproofing

PoE Cable and Connector on the Tape for waterproofing

3.4 Antenna concepts and Installations

RF Path Loss and Transmission Distance Calculations

Explanation of Terms

Before getting to the nuts and bolts of designing a link, some fundamental terms and concepts need to be reviewed.

Transmit Power

The transmit power is the RF power coming out of the antenna port of a transmitter. It is measured in dBm, Watts or milliWatts and does not include the signal loss of the coax cable or the gain of the antenna.

Receiver Sensitivity

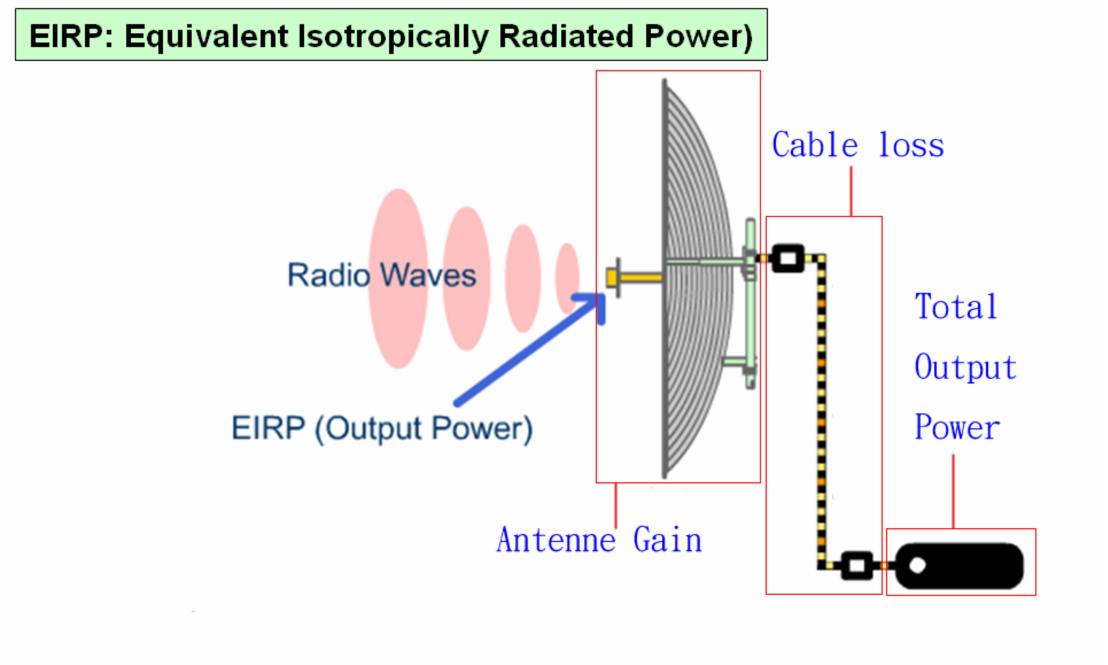
Receiver sensitivity is the weakest RF signal level (usually measured in negative dBm) that a radio needs receive in order to demodulate and decode a packet of data without errors.

Antenna Gain

Antenna gain is the ratio of how much an antenna boosts the RF signal over a specified low-gain radiator. Antennas achieve gain simply by focusing RF energy.

EIRP

EIRP (Equivalent Isotropically Radiated Power) is the power actually radiated by the antenna element. EIRP takes into account the gain of the antenna.



EIRP (Effective Isotropically Radiated Power) (dBm)

performance of transmitting system

= Total Output Power of device – Cable Loss + Antenna Gain

Free Space Loss

As signals spread out from a radiating source, the energy is spread out over a larger surface area. As this occurs, the strength of that signal gets weaker. Free space loss (FSL), measured in dB, specifies how much the signal has weakened over a given distance.

Take into calculations

System Gain (dBm)

Total gain of radio without antenna/cable

System Gain = Tx power – Rx Sensitivity

Free Space Loss (FSL)

FSPL(dB)

= Transmit Power

+ Gain of the Transmit Antenna + Gain of the Receive Antenna

–Receiver Sensitivity

= 32.4 + 20Log10F(MHz) + 20Log10D(km)

= 36.4 + 20Log10F(MHz) + 20Log10D(mile)

= 92.4 + 20Log10F(GHz) + 20Log10D(km)

= 96.4 + 20Log10F(GHz) + 20Log10D(mile)

(F : Radio Frequency D : Distance between Transmitter and Receiver)

Fade Margin (dB)

Fade Margin is "extra" signal power added to ensure the link working

Fade Margin = System Gain + Antenna Gain – FSPL – Cable Loss

When the calculation of Fade Margin is equal to zero, it means the ultimate connection between the transmitting and receiving system. The more the data of Fade Margin above zero means that the signal is stronger for connection. Otherwise, the connection will be fail if the data of Fade Margin is lower than zero.

Example of Aphelion 500G

Here is an example of Aphelion 500G with 12 dBi Gain antenna (We ignore the cable loss in this case).

As we know the specification of Aphelion 500G below :
Transmission power : 14 dBm
Receiver sensitivity : -74 dBm
Antenna gain : 12 dBi
Frequency : 802.11g (2.4GHz)

According to the specification, we can calculate the Free Space Loss :
FSPL = 14 + (12 +12) – (-74) = 112

We can also estimate the ultimate distance between transmitting and receiving antenna.
FSPL = 112 = 32.4 + 20Log10(2400) + 20Log10D(km)
D = 3.08 km

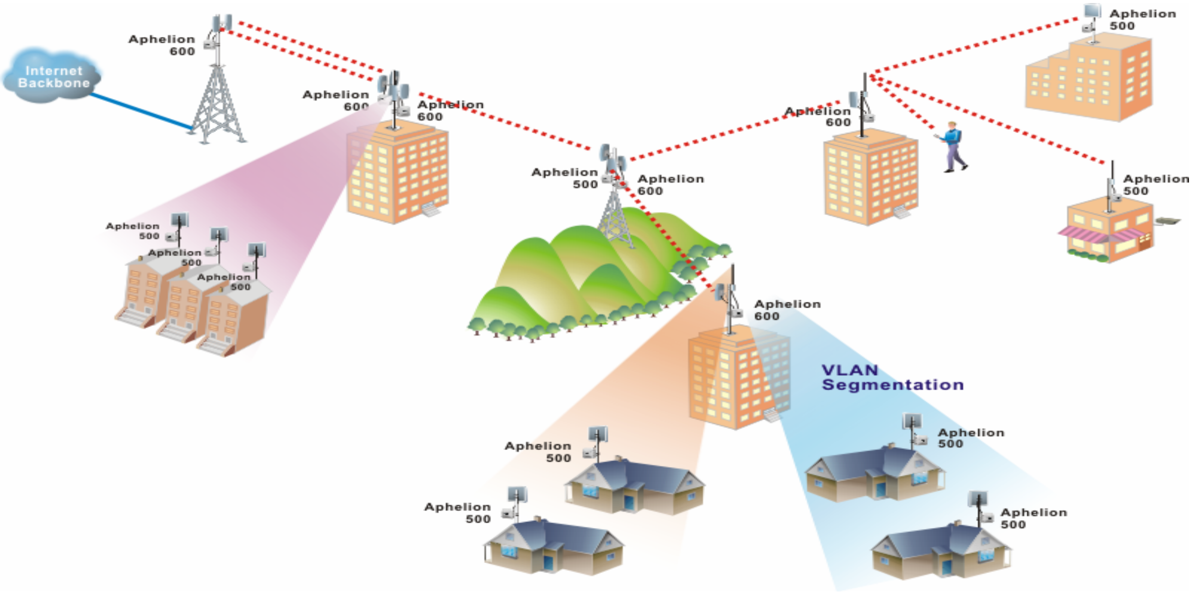
Chapter 4 Wireless Network Topologies

4.1 Special Daisy Chained Sequential Configuration

For optimal performance, it is suggested to configure the 1st RF module as AP Client and 2nd RF module as Access Point

4.2 Point to Multi-point configuration

In the following diagram, Aphelion 500s are configured as daisy chained, point to point and point to multi-points.



You will be able to engage multiple Aphelion 500 in a daisy chained topology and yet be maintaining a stable throughput and performance.

Application will be range extension, IP camera for environment monitoring, etc..

Chapter 5 Introduction to Aphelion Menus

General Configuration

System General Setup (Menu 11)

Device Name
Description
System Operation Mode
Set System Date
Set System Time

Interface Configuration (Menu 12)

Interface selection
Interface shutdown/enable
RIP enable/disable
RIP mode
IP Address Assignment
Operation Mode (Wireless)
ESSID (Wireless)
Band (Wireless) 802.11a/b/g/bg
Channel (Wireless)
Tx Power (Wireless)
RTS Threshold (Wireless)
Frag Threshold (Wireless)
Link Rate (Wireless)
Distance (Wireless) (Will be available in firmware version 0.973)

Assign WAN Interface (Menu 13)

Default Gateway

Static Routing Configuration (Menu 14)

Destination
Subnet Mask
Gateway IP
Metric

Advanced setting

System Password (Menu 21)

System Password Setting

Bandwidth Control (Menu 22)

Bandwidth Limit : Enable/Disable

General Limit

Asymmetrical Bandwidth Limit
Default Download Bandwidth Limit
Default Upload Bandwidth Limit

Symmetrical Bandwidth Limit
Total Bandwidth Limit

Specific Limit

Specific Limit by MAC Address

DHCP Configuration (Menu 23)

Interface selection

DHCP Server : Enabled/Disabled

DNS Enabled

Primary DNS Server Address
Secondary DNS Server Address

DHCP Subnet Scope Setup

Subnet
Mask
IP Start
IP End
Lease(D)
Lease(M)

NAT Configuration (Menu 24)

1.Port Forwarding NAT(Server Set)
2.Static NAT(one-to-one mapping)

3.Dynamic NAT(many-to-many mapping)
4.Single Address NAT(PAT)

SNMP Configuration (Menu 25)

SNMP : Enable/Disable
SNMP Version
SNMP Read-only Community setup
SNMP Read and Write Community setup
Trusted Host IP address

Wireless Security Setting (Menu 26)

Interface selection
Hide ESSID : Enable/Disable
Encryption Mode : (WEP/EAP_MD5/EAP_TLS)

MAC Address Filter
MAC Filter : Disable/Enable
Filter Policy : Block/Accept

RADIUS Server
Authentication Server:
Server Address
Port
Shared Secret
Accounting Server:
Server Address
Port
Shared Secret

System Management

Configuration Management (Menu 31)

Configuration : Backup/Restore/Factory Default
TFTP Server IP Address
TFTP Server Port Number
File Name

Security File Management (Menu 32)

Interface Selection
EAP TLS
TFTP Server IP Address
TFTP Server Port Number
User CA
RAS Key file
Root CA

Firmware Upgrade (Menu 33)

Transfer Type : TFTP Transfer
TFTP Server IP Address
TFTP Server Port Number
Firmware File Name

Transfer Type : FTP Transfer
FTP Server IP Address
FTP Server Port Number
Login UserName
Login Password
Remote Directory
Firmware File Name

System reboot (Menu 34)

System Monitoring

Interface Link Status (Menu 41)

Connecting Client List (Wireless Clients) (Menu 42)

System log (Menu 43)

1.Setting System Log

SYSLOG file : Enable/Disable

Level

SYSLOG Server : Enable/Disable

Level

2.View System Log

System Information (Menu 44)

Command Line (Menu 45)

alt (Software Alignment tool)

arp (Show arp information)

date (System time)

ping (Ping)

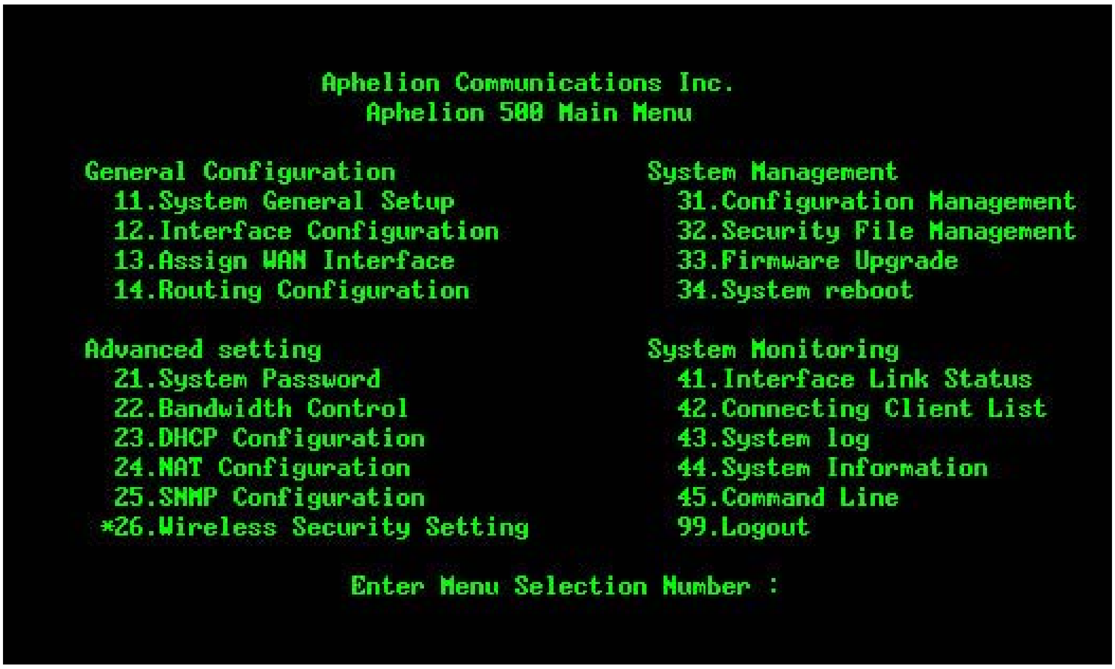
reboot (System reboot)

tracert (Routing path trace)

ver (Show firmware version)

Chapter 6 Basic configurations with Aphelion 500.

6.1 A look at Aphelion main menu



```
                  Aphelion Communications Inc.
                     Aphelion 500 Main Menu

   General Configuration                System Management
     11.System General Setup              31.Configuration Management
     12.Interface Configuration           32.Security File Management
     13.Assign WAN Interface              33.Firmware Upgrade
     14.Routing Configuration             34.System reboot

   Advanced setting                     System Monitoring
     21.System Password                   41.Interface Link Status
     22.Bandwidth Control                 42.Connecting Client List
     23.DHCP Configuration                43.System log
     24.NAT Configuration                 44.System Information
     25.SNMP Configuration                45.Command Line
    *26.Wireless Security Setting         99.Logout

                    Enter Menu Selection Number :
```

The main menu is organized into 4 major functions:

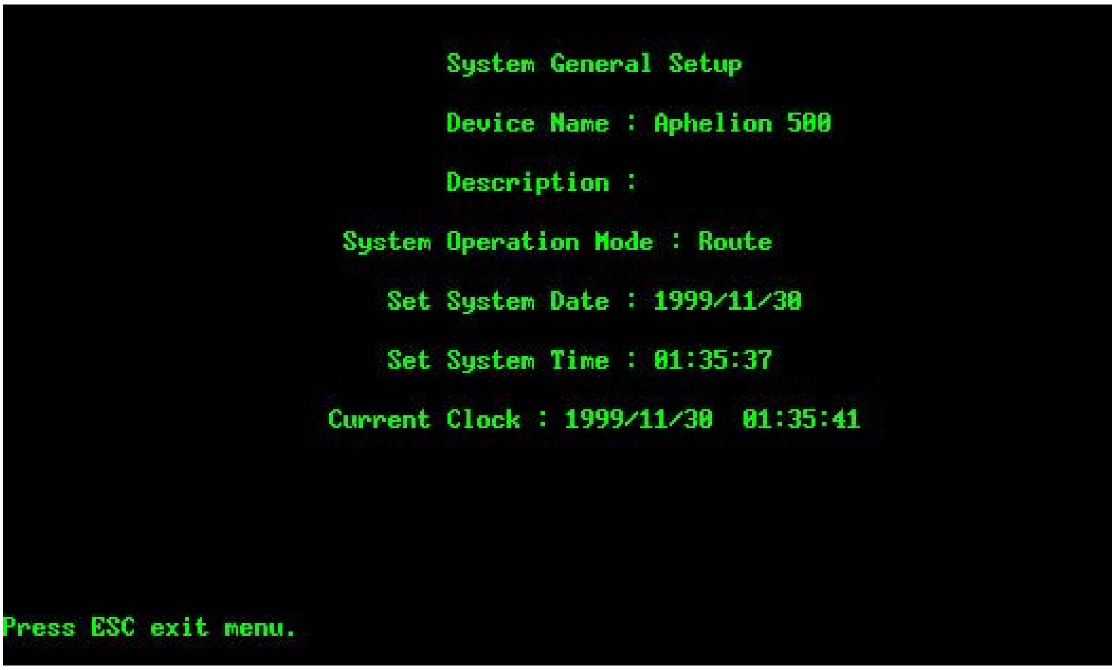
1. General Configuration
2. Advanced Setting
3. System Management
4. System Monitoring

■ 6.2 General Configuration

The General configuration consists of four major parts:

11. System General Setup
12. Interface Configuration
13. Assign WAN interface
14. Routing Configuration

6.2.1 System General Setup

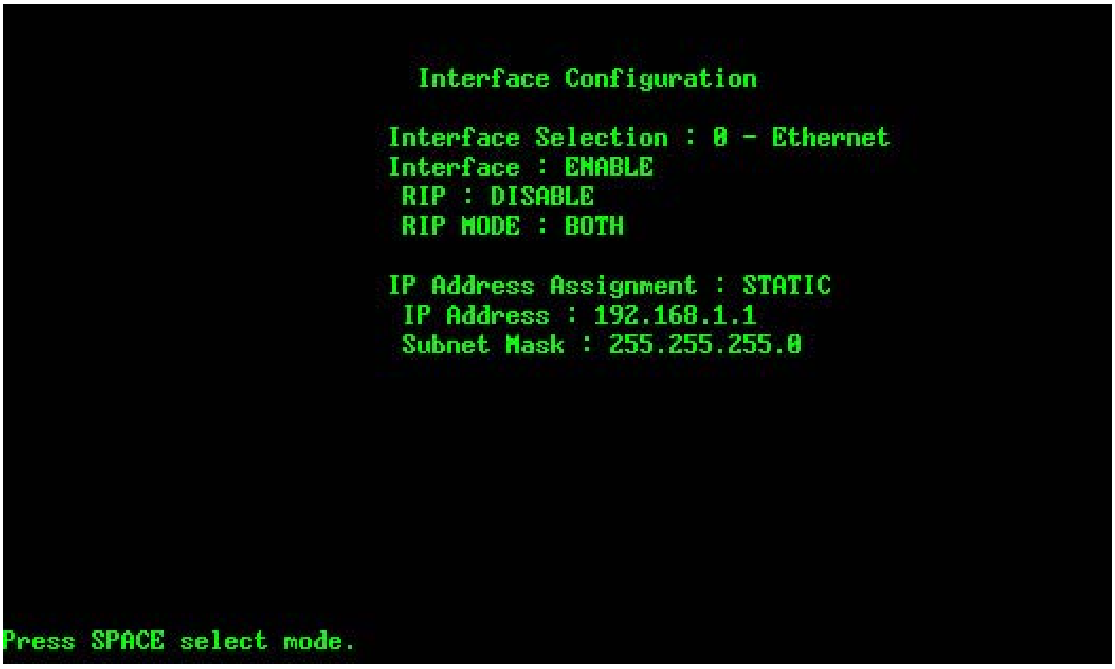


```
                            System General Setup

                            Device Name : Aphelion 500

                            Description :

                     System Operation Mode : Route

                         Set System Date : 1999/11/30

                         Set System Time : 01:35:37

                   Current Clock : 1999/11/30  01:35:41




Press ESC exit menu.
```

On this menu you will be able to:

1. Assign name to Aphelion 500
2. description of Purpose
3. Select routing or bridging mode
4. Set system time

6.2.2 Interface Configuration



```
                              Interface Configuration

                            Interface Selection : 0 - Ethernet
                            Interface : ENABLE
                             RIP : DISABLE
                             RIP MODE : BOTH

                            IP Address Assignment : STATIC
                             IP Address : 192.168.1.1
                             Subnet Mask : 255.255.255.0






Press SPACE select mode.
```

As there are mainly 2 interfaces on the Aphelion 500

On this menu, you will be able to :

1. Select the interface to be configured
2. Enabling and Disabling selected interfaces
3. Address the selected interface as whether to use Static IP address or Dynamic IP address for this interface.
4. RIP (Routing Information Protocol) enable or disable.
5. If RF interface is selected, you can define its wireless parameters here:

Operation modes : Access Point or Wireless Station (Access points or access clients) (For more information, please see the **Remark.1** below)

ESSID : ChangeMe

Band : 802.11a/b/g/bg

Channel : auto or define

Transmit power : 15 dbm

RTS Threshold : 2432 by default

Fragment Threshold : 2432 by default

Link Rate: Auto or define

RF signal transferring distance (Will be available in firmware version 0.973)

Remark.1

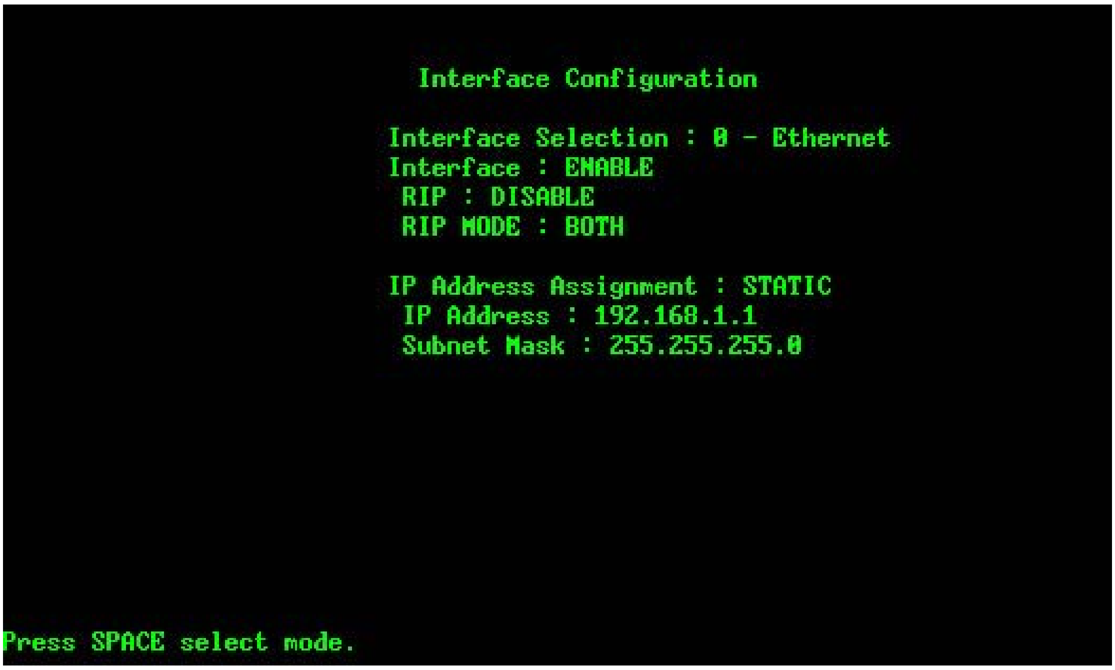
Introduce two operation mode in menu "12.Interface Configuration".

As we know, there are two operation mode of wireless interface in APHELION 500AG, one is "Access Point" and the other is "Wireless Station".

When you configure the wireless interface into "Access Point" mode, it means that the wireless interface will be an access point to accept connection requirements from wireless clients, such as wireless notebooks and work stations.

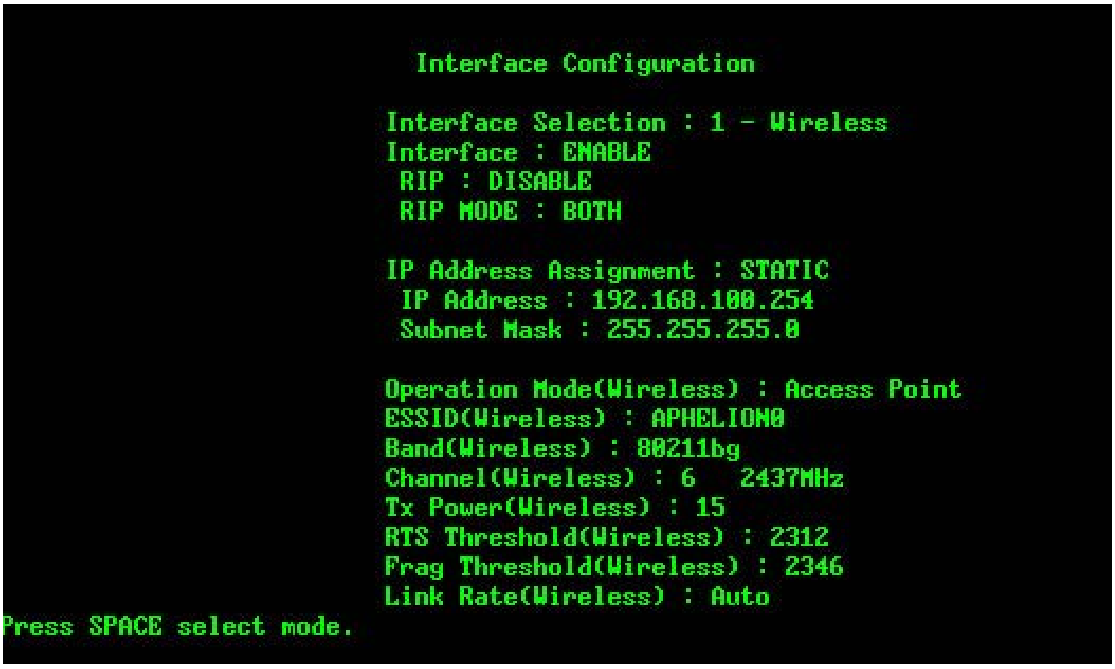
Otherwise, if you configure the wireless interface into "Wireless Station" mode, it means that the wireless interface will be a wireless client in your network. The wireless client (just like a wireless notebook) is only looking for the access point which is configured same ESSID exactly. In "Wireless Station" mode, the wireless interface won't accept any connection requirements from other wireless clients.

Example 1:



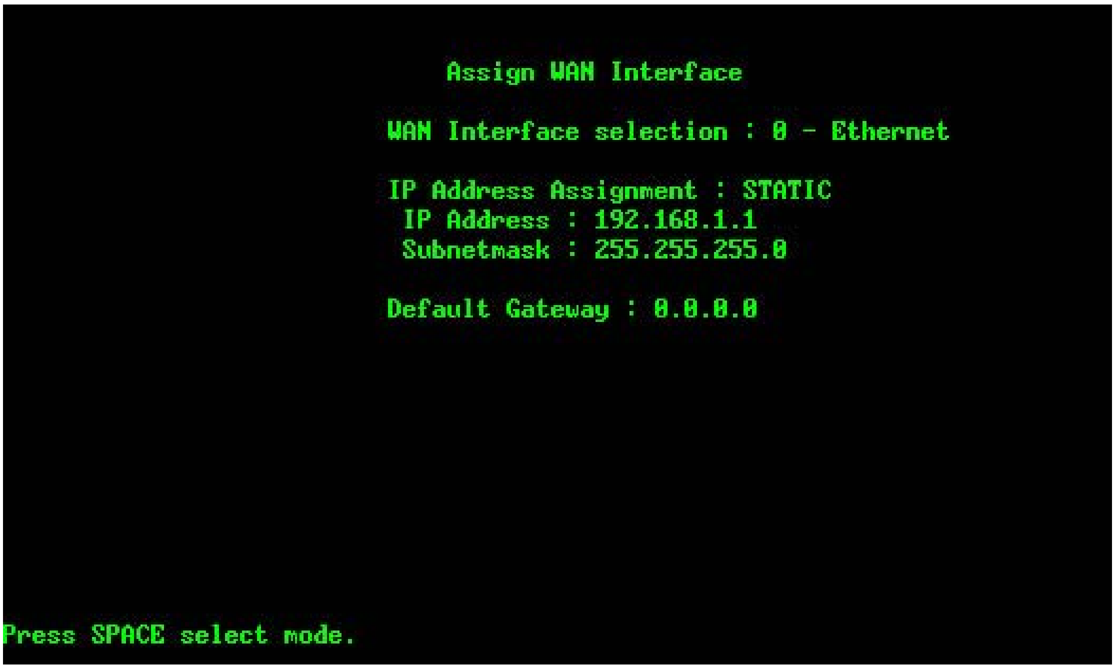
```
                          Interface Configuration

                        Interface Selection : 0 - Ethernet
                        Interface : ENABLE
                         RIP : DISABLE
                         RIP MODE : BOTH

                        IP Address Assignment : STATIC
                         IP Address : 192.168.1.1
                         Subnet Mask : 255.255.255.0







Press SPACE select mode.
```

Example 2:

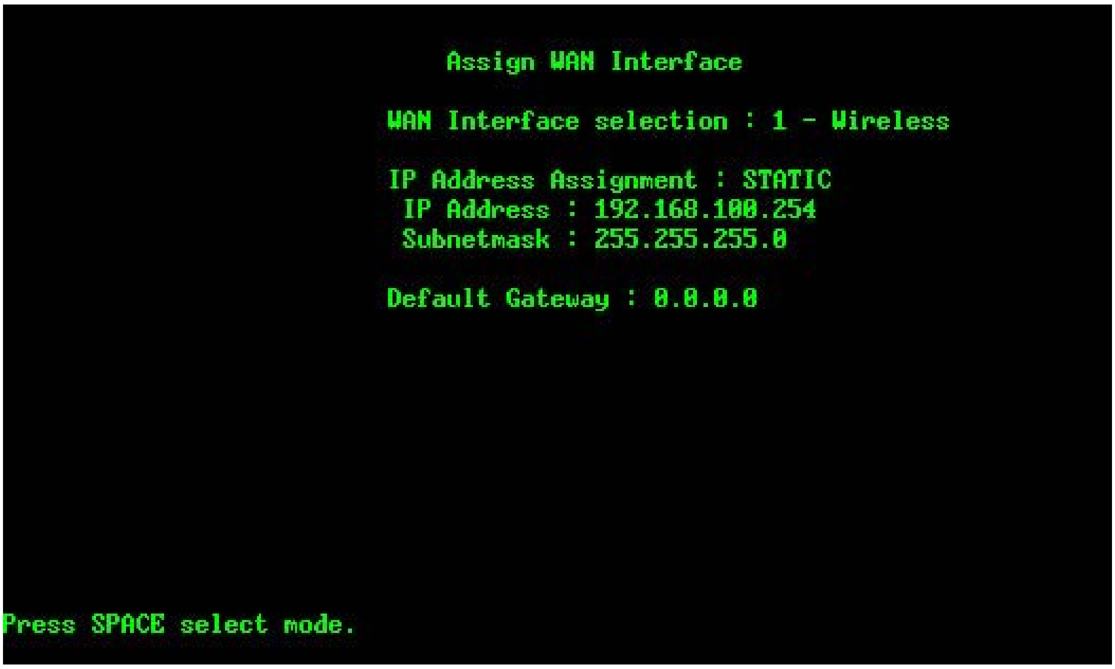


```
                          Interface Configuration

                        Interface Selection : 1 - Wireless
                        Interface : ENABLE
                         RIP : DISABLE
                         RIP MODE : BOTH

                        IP Address Assignment : STATIC
                         IP Address : 192.168.100.254
                         Subnet Mask : 255.255.255.0

                        Operation Mode(Wireless) : Access Point
                        ESSID(Wireless) : APHELION0
                        Band(Wireless) : 80211bg
                        Channel(Wireless) : 6   2437MHz
                        Tx Power(Wireless) : 15
                        RTS Threshold(Wireless) : 2312
                        Frag Threshold(Wireless) : 2346
                        Link Rate(Wireless) : Auto
Press SPACE select mode.
```

6.2.3 Assign WAN Interface



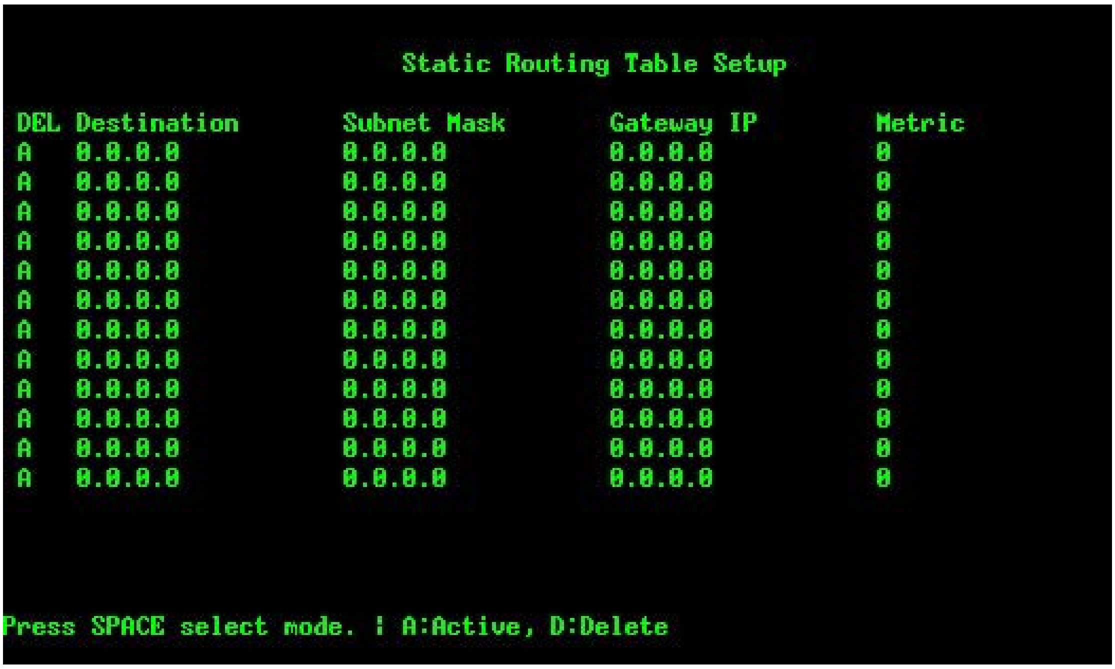
```
                            Assign WAN Interface

                        WAN Interface selection : 0 - Ethernet

                        IP Address Assignment : STATIC
                         IP Address : 192.168.1.1
                         Subnetmask : 255.255.255.0

                        Default Gateway : 0.0.0.0









Press SPACE select mode.
```



```
                         Assign WAN Interface

                     WAN Interface selection : 1 - Wireless

                     IP Address Assignment : STATIC
                      IP Address : 192.168.100.254
                      Subnetmask : 255.255.255.0

                     Default Gateway : 0.0.0.0










Press SPACE select mode.
```

This menu allows you to assign your exit for WAN for the Aphelion 500. The Aphelion 500 has 2 interfaces; one Ethernet and one RF interface, you can specify any one to be as WAN; Example, by configuring Ethernet as WAN, you can serve two hotspots simultaneously.

6.2.4 Routing Configuration



```
                          Static Routing Table Setup

 DEL Destination          Subnet Mask        Gateway IP         Metric
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0
 A   0.0.0.0              0.0.0.0            0.0.0.0            0




Press SPACE select mode. ¦ A:Active, D:Delete
```

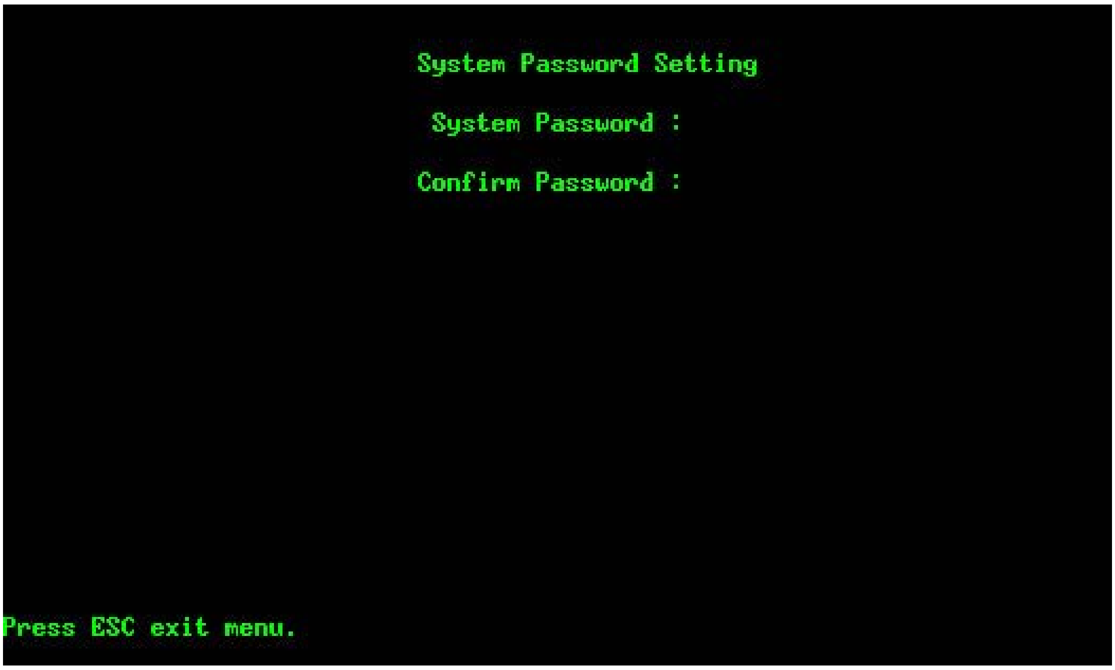
In this menu you can configure up to 12 rules of Static routes; You will need to input the destination IP address of the next hop gateway together with the associated subnet mask.

6.3 Advanced Setting

Under advanced settings, you will be able to configure the following:

21. System Password
22. Bandwidth Control
23. DHCP Configuration
24. NAT Configuration
25. SNMP configuration
26. Wireless Security Setting

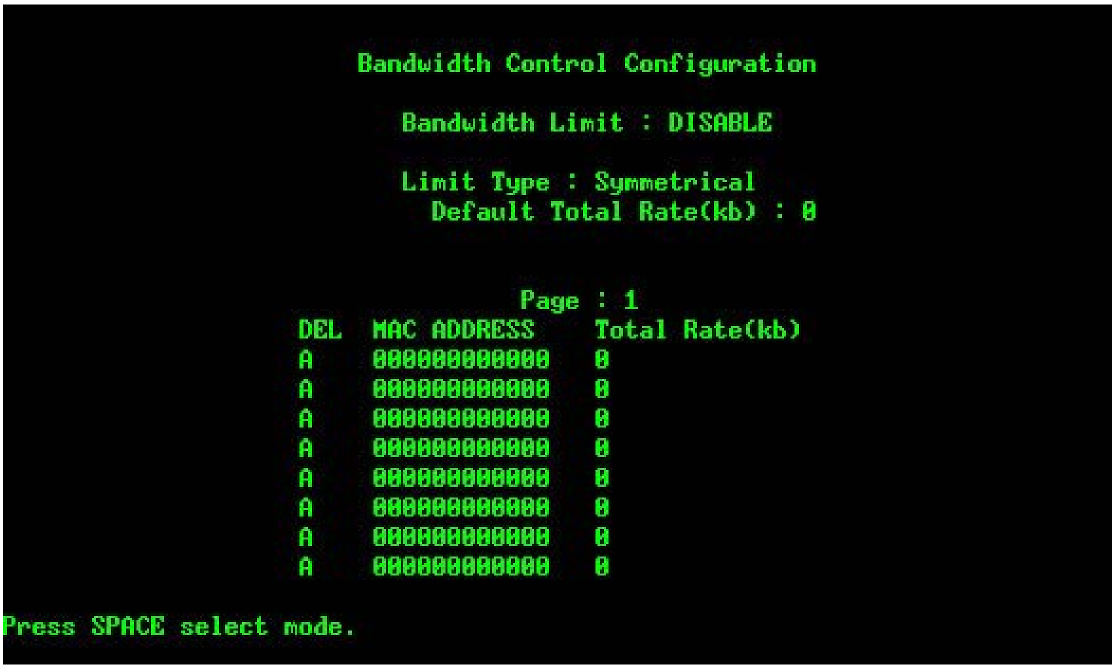
6.3.1 System Password



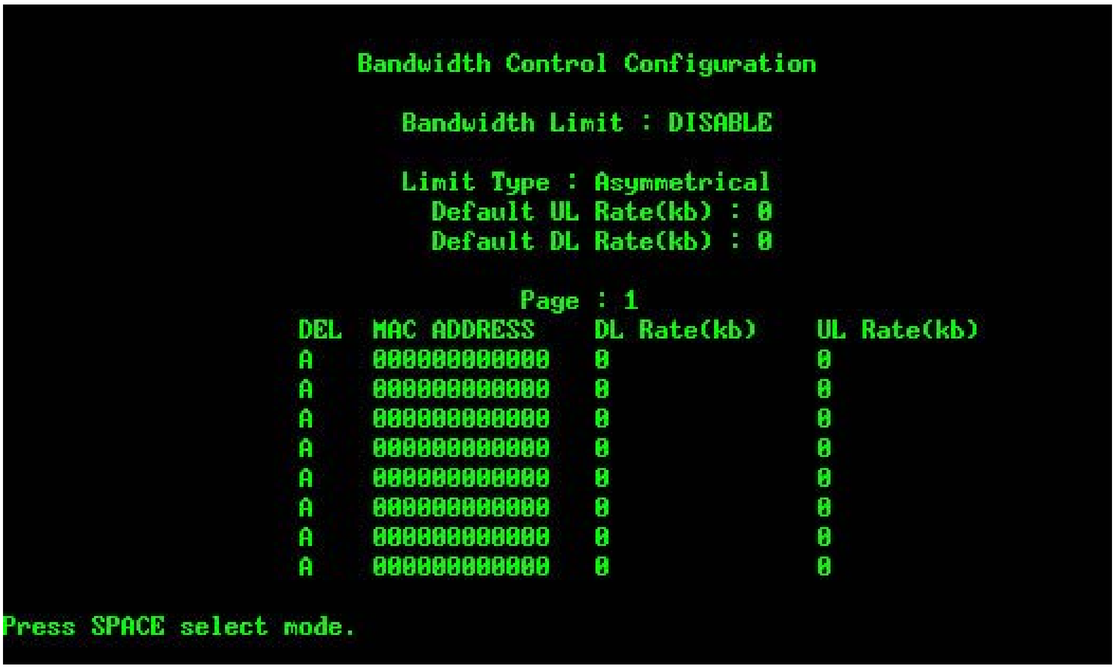
```
                         System Password Setting

                          System Password :

                         Confirm Password :







Press ESC exit menu.
```

In this menu, you will be able to change your admin password. The new password will effect when you login next time.

6.3.2 Bandwidth Control



```
                    Bandwidth Control Configuration

                       Bandwidth Limit : DISABLE

                       Limit Type : Symmetrical
                         Default Total Rate(kb) : 0


                              Page : 1
                  DEL  MAC ADDRESS    Total Rate(kb)
                  A    000000000000   0
                  A    000000000000   0
                  A    000000000000   0
                  A    000000000000   0
                  A    000000000000   0
                  A    000000000000   0
                  A    000000000000   0
                  A    000000000000   0

Press SPACE select mode.
```



```
                    Bandwidth Control Configuration

                       Bandwidth Limit : DISABLE

                       Limit Type : Asymmetrical
                         Default UL Rate(kb) : 0
                         Default DL Rate(kb) : 0

                              Page : 1
                  DEL  MAC ADDRESS    DL Rate(kb)    UL Rate(kb)
                  A    000000000000   0              0
                  A    000000000000   0              0
                  A    000000000000   0              0
                  A    000000000000   0              0
                  A    000000000000   0              0
                  A    000000000000   0              0
                  A    000000000000   0              0
                  A    000000000000   0              0

Press SPACE select mode.
```

In this menu, you will be able to offer class of services at a subscriber level where segregated bandwidth is where you can define asymmetric and symmetric downstream and upstream data rates for the subscriber or the client devices connecting to Aphelion 500s.

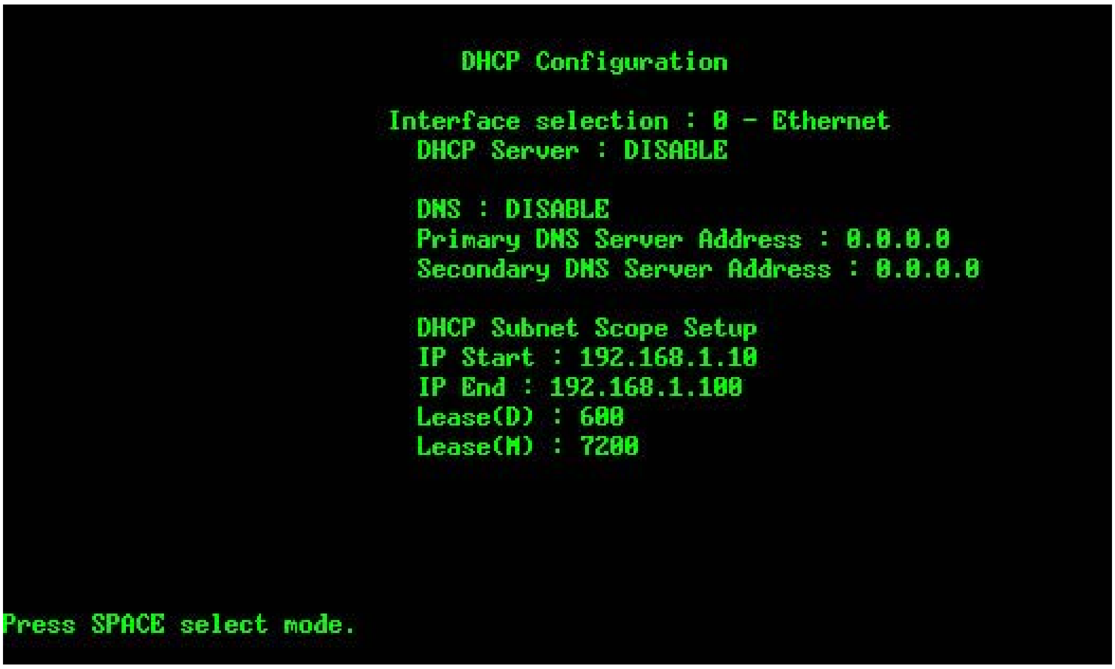
There are two bandwidth limit types in Aphelion system (Symmetrical and Asymmetrical) for network administrator to manage the bandwidth of client connections. Once the bandwidth limit is enabled, the limitation will be applied to every client connection.

In Symmetrical bandwidth limit type, network administrator can be able to limit consolidated download and upload rate of each single client connection.

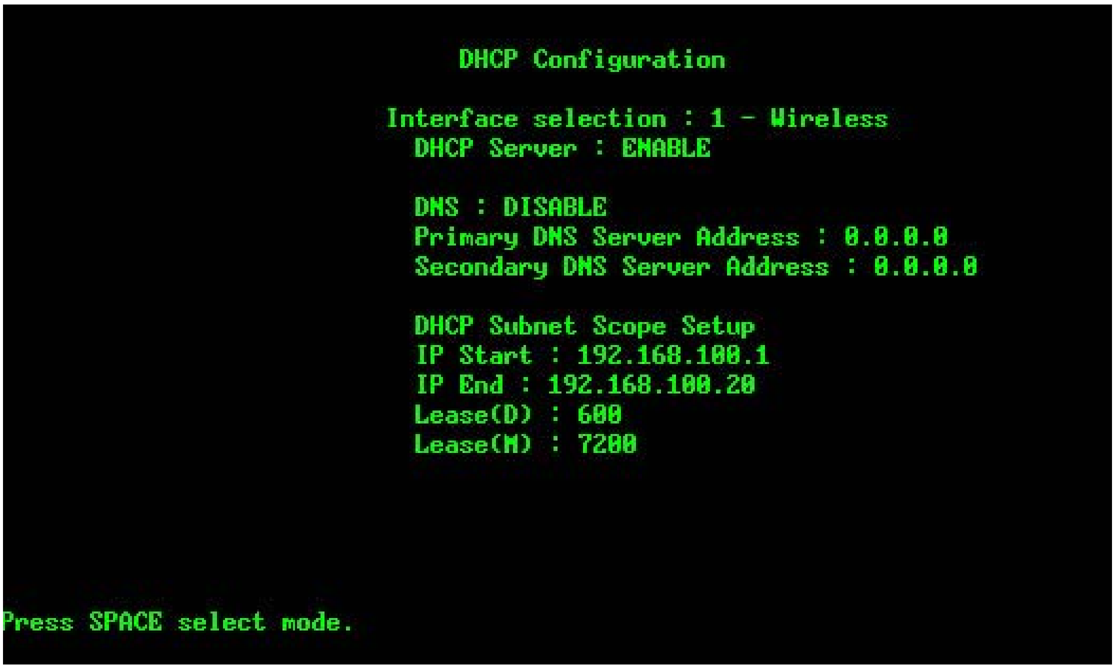
In Asymmetrical bandwidth limit type, network administrator can be able to limit download and upload rate of client connections specifically.

For specific client connection, Aphelion system provides a specific table for network administrator to limit bandwidth of individual client by MAC address. Once the client MAC address is set in MAC table, the general bandwidth limit rule will not take effect in specific MAC address connection but particular bandwidth limit rule.

6.3.3 DHCP Configuration



```
                              DHCP Configuration

                         Interface selection : 0 - Ethernet
                           DHCP Server : DISABLE

                           DNS : DISABLE
                           Primary DNS Server Address : 0.0.0.0
                           Secondary DNS Server Address : 0.0.0.0

                           DHCP Subnet Scope Setup
                           IP Start : 192.168.1.10
                           IP End : 192.168.1.100
                           Lease(D) : 600
                           Lease(M) : 7200




Press SPACE select mode.
```

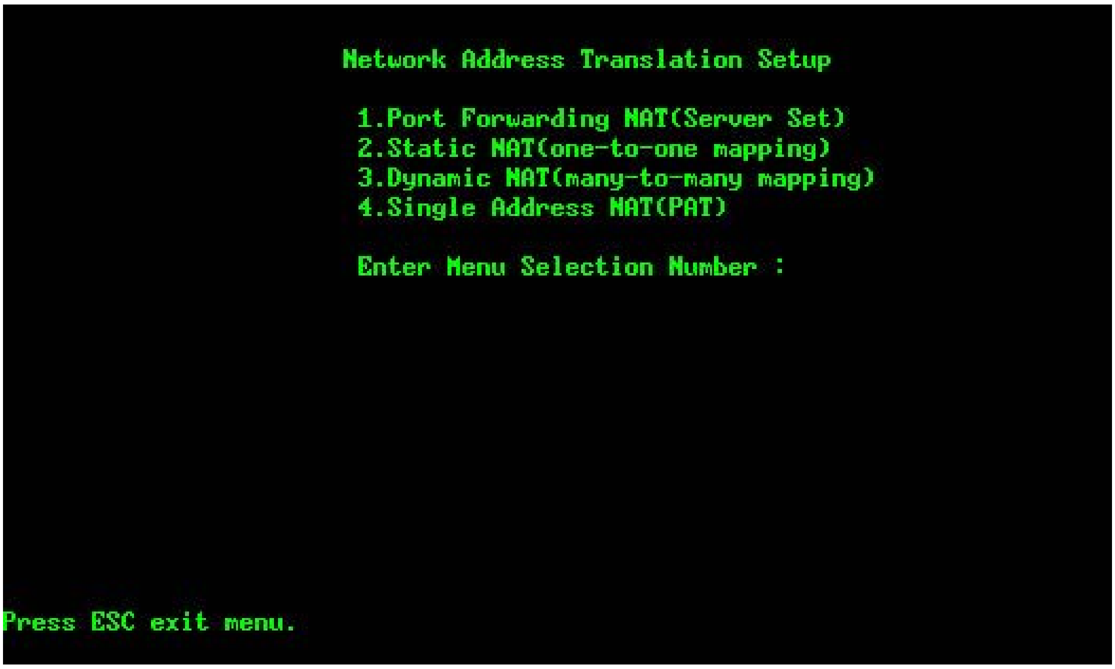


```
                              DHCP Configuration

                         Interface selection : 1 - Wireless
                           DHCP Server : ENABLE

                           DNS : DISABLE
                           Primary DNS Server Address : 0.0.0.0
                           Secondary DNS Server Address : 0.0.0.0

                           DHCP Subnet Scope Setup
                           IP Start : 192.168.100.1
                           IP End : 192.168.100.20
                           Lease(D) : 600
                           Lease(M) : 7200




Press SPACE select mode.
```

In this menu you will be able to define the scope of DHCP client pool as corresponding to the selected interface and subnet defined. Lease (D) is duration and Lease (M) is maximum.

In routing mode configuration, each interface (including Ethernet and Wireless) can be the gateway of its own subnet. It means administrator can have two subnet domains in Aphelion 500AG in routing mode.

6.3.4 NAT Configuration

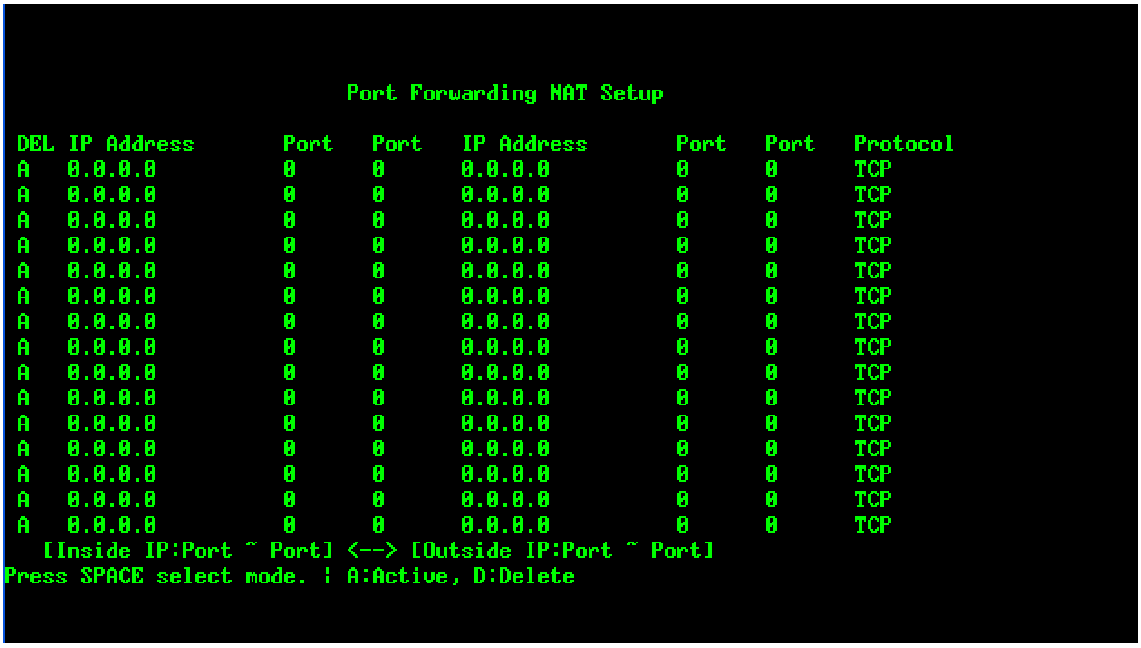


```
                         Network Address Translation Setup

                          1.Port Forwarding NAT(Server Set)
                          2.Static NAT(one-to-one mapping)
                          3.Dynamic NAT(many-to-many mapping)
                          4.Single Address NAT(PAT)

                          Enter Menu Selection Number :










Press ESC exit menu.
```

In this menu, there are 4 sub menus as related to NAT configurations.

1. Port forwarding (Server sets)
2. Static NAT (One to One Mapping)
3. Dynamic NAT (Many to Many Mapping)
4. Single Address (NAT/PAT)

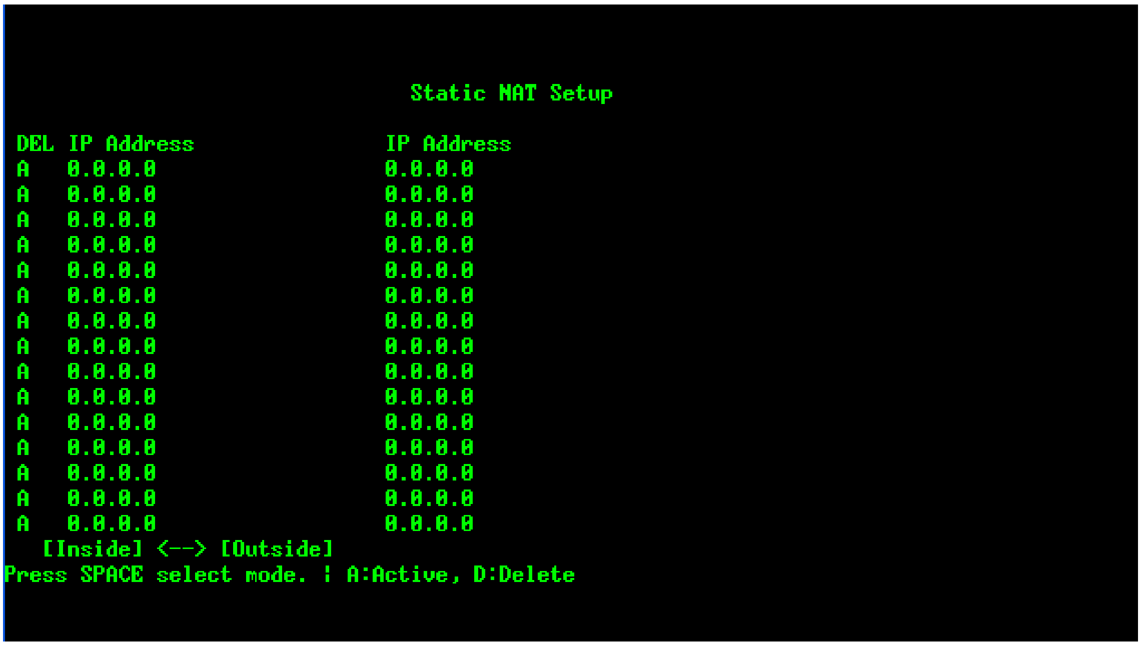
6.3.4.1 Port Forwarding



```
                           Port Forwarding NAT Setup

 DEL IP Address       Port   Port   IP Address       Port   Port   Protocol
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
 A   0.0.0.0          0      0      0.0.0.0          0      0      TCP
   [Inside IP:Port ~ Port] <--> [Outside IP:Port ~ Port]
Press SPACE select mode. ¦ A:Active, D:Delete
```

In this menu, you will be able to define server sets where internal IP address will be mapped upon according to the TCP or UDP port that you have defined for your applications.

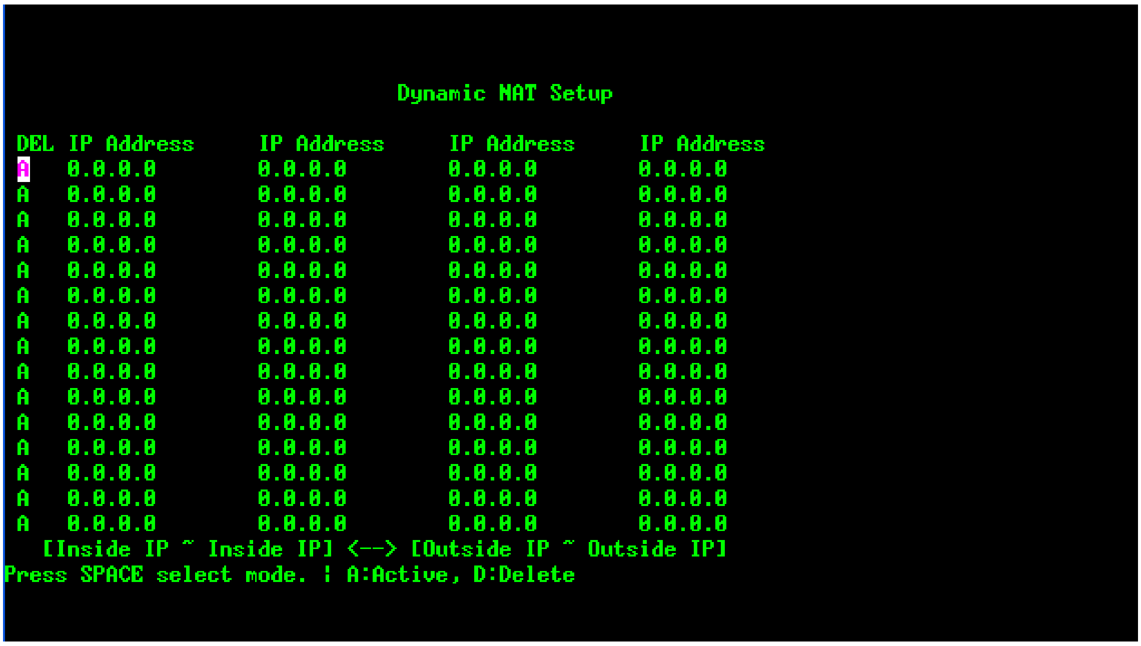
6.3.4.2 Static NAT



```
                                Static NAT Setup

 DEL IP Address                IP Address
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
 A   0.0.0.0                   0.0.0.0
   [Inside] <--> [Outside]
Press SPACE select mode. ¦ A:Active, D:Delete
```

In this menu, you will be able to map internal private IP address to a global WAN IP address.

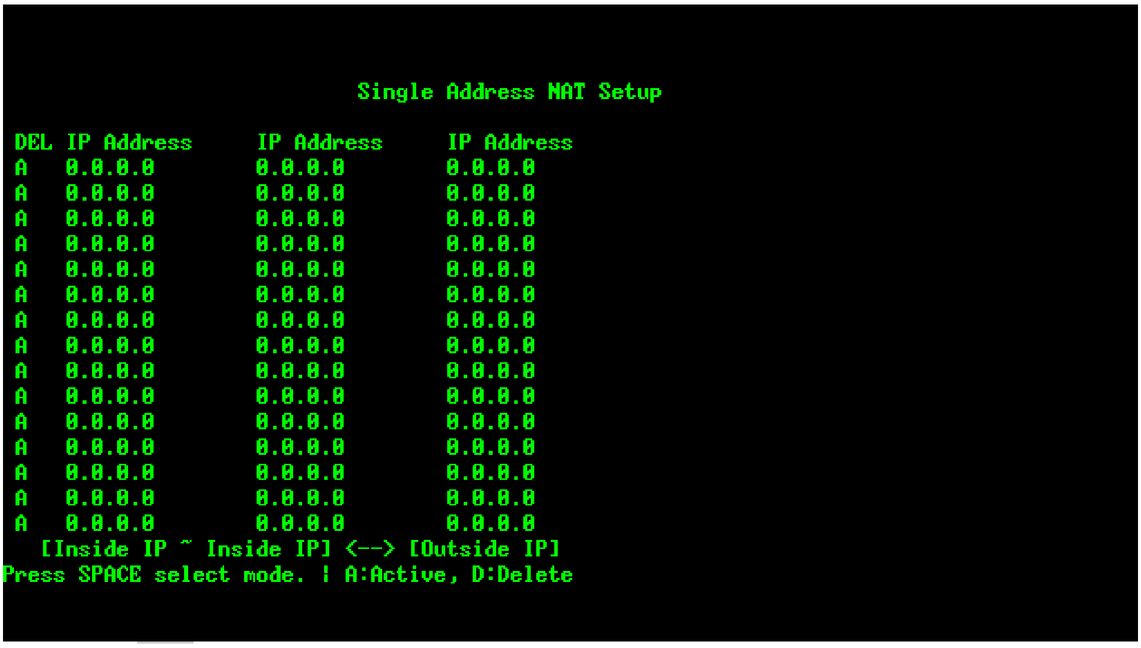
6.3.4.3 Dynamic NAT



```
                               Dynamic NAT Setup

DEL IP Address     IP Address     IP Address     IP Address
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0        0.0.0.0
   [Inside IP ~ Inside IP] <--> [Outside IP ~ Outside IP]
Press SPACE select mode. ¦ A:Active, D:Delete
```

In this menu, you will be able to map a range of internal IP addresses to a range of global IP addresses.

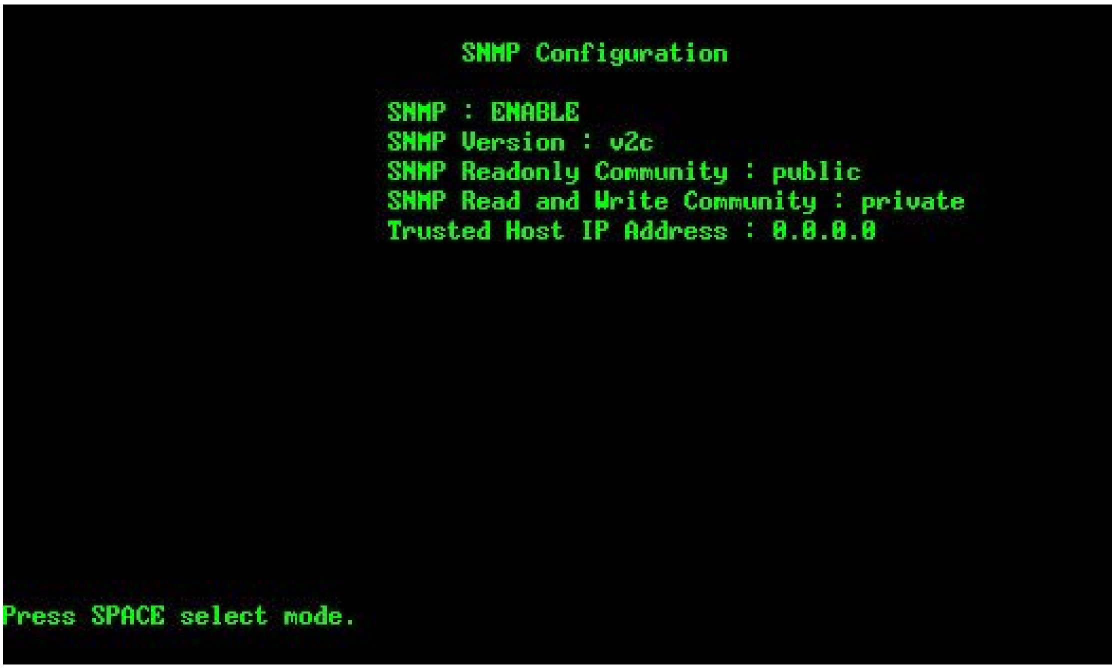
6.3.4.4 Single Address (NAT/PAT)



```
                           Single Address NAT Setup

DEL IP Address     IP Address     IP Address
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
A   0.0.0.0        0.0.0.0        0.0.0.0
   [Inside IP ~ Inside IP] <--> [Outside IP]
Press SPACE select mode. ¦ A:Active, D:Delete
```

In this menu, you will be able to configure the general NAT, many to one mapping; you will be able to map a range of internal IP addresses to a single global WAN IP address.

6.3.5 SNMP configuration



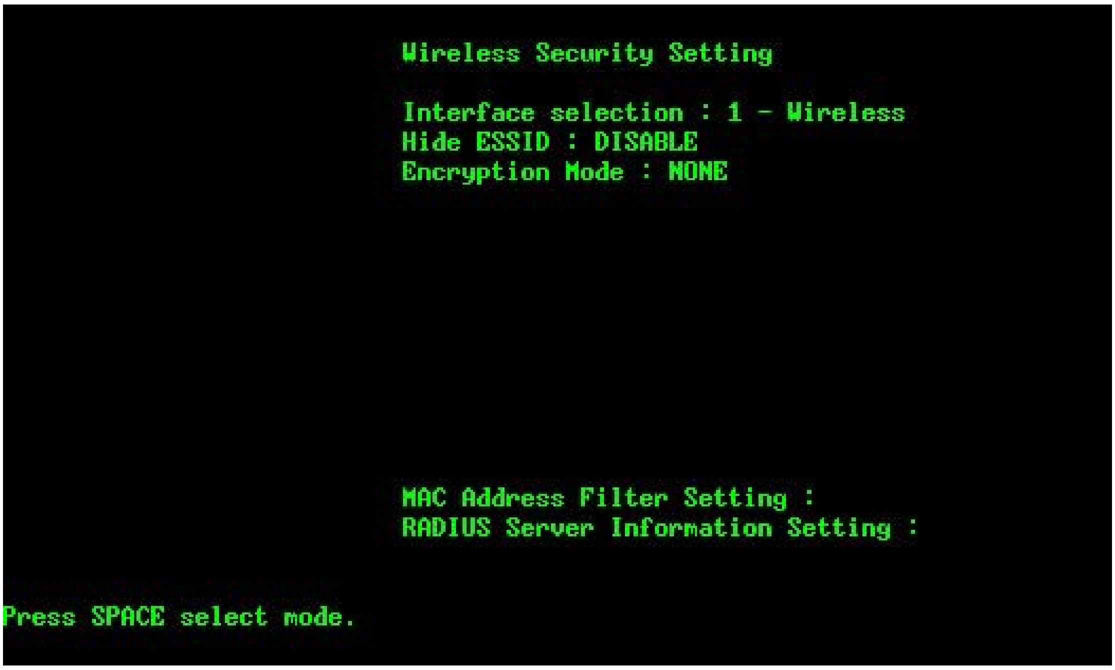
```
                    SNMP Configuration

                 SNMP : ENABLE
                 SNMP Version : v2c
                 SNMP Readonly Community : public
                 SNMP Read and Write Community : private
                 Trusted Host IP Address : 0.0.0.0

Press SPACE select mode.
```

In this menu, you will be able to configure SNMP for simple network management, Aphelion 500 supports SNMP v1, v2 as well as version 3.

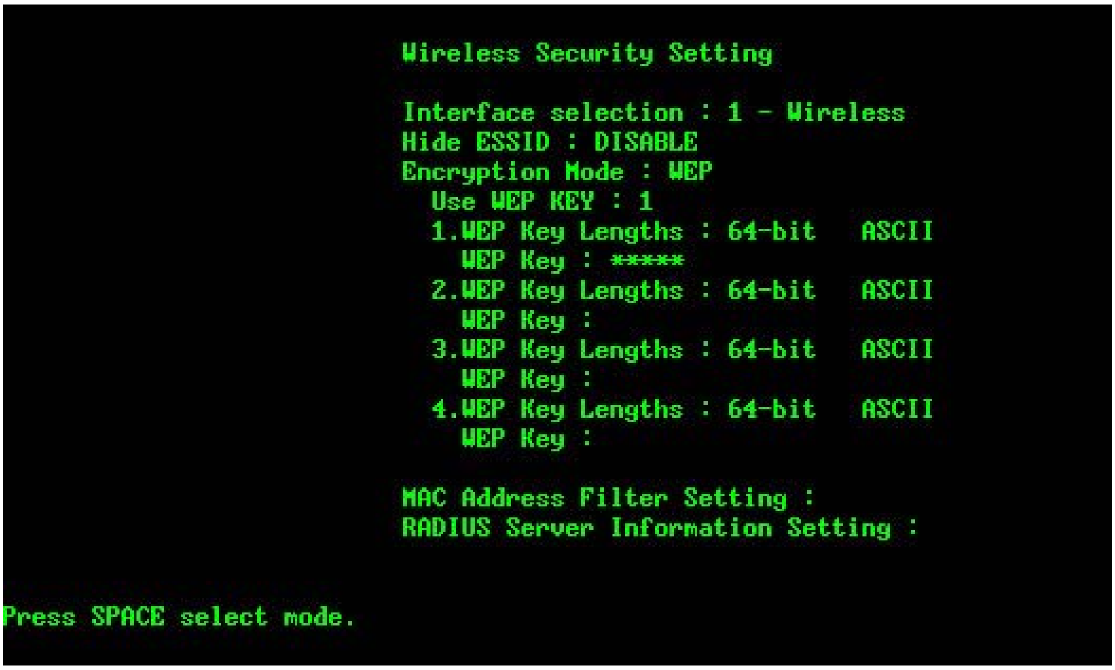
Aphelion has experience working with ILECs, CLECs, WISPs and MSOs, for customized MIB requirements, please contact support@aphelions.com for assistance.

6.3.6 Wireless Security Setting

6.3.6.1 Encryption Mode

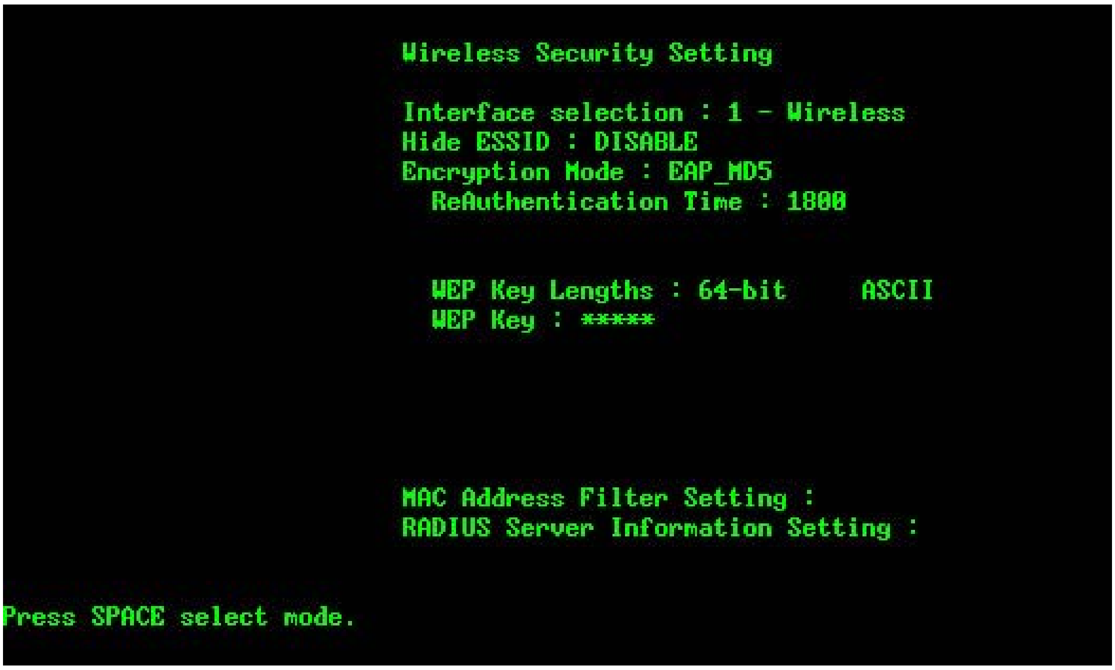


```
                  Wireless Security Setting

                  Interface selection : 1 - Wireless
                  Hide ESSID : DISABLE
                  Encryption Mode : NONE

                  MAC Address Filter Setting :
                  RADIUS Server Information Setting :

Press SPACE select mode.
```



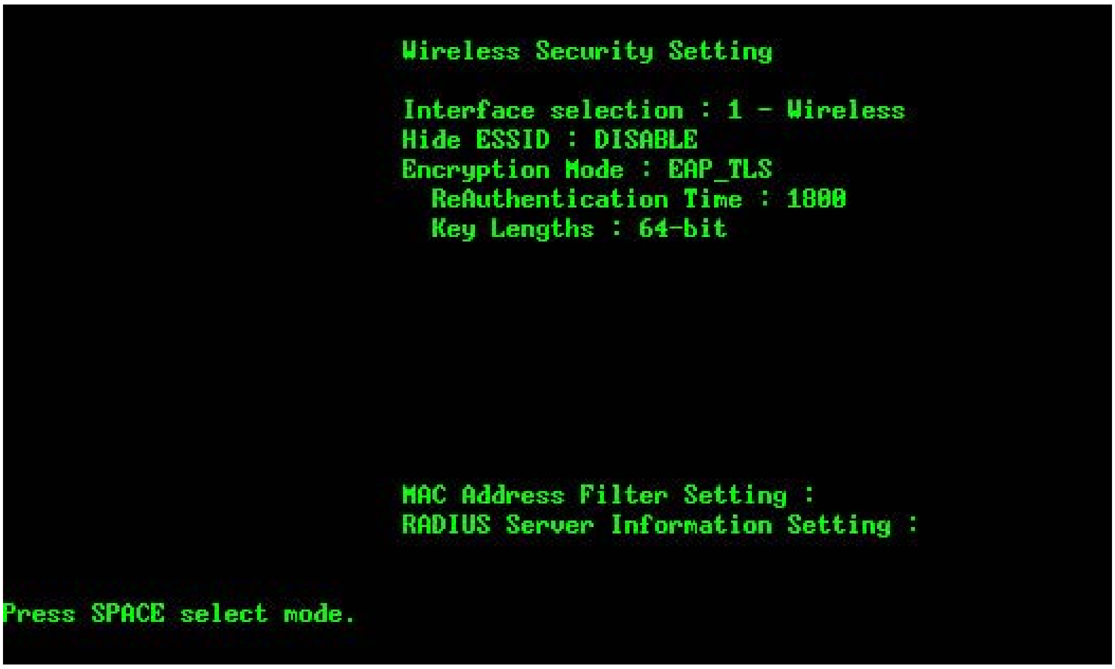
```
                          Wireless Security Setting

                          Interface selection : 1 - Wireless
                          Hide ESSID : DISABLE
                          Encryption Mode : WEP
                            Use WEP KEY : 1
                            1.WEP Key Lengths : 64-bit   ASCII
                              WEP Key : *****
                            2.WEP Key Lengths : 64-bit   ASCII
                              WEP Key :
                            3.WEP Key Lengths : 64-bit   ASCII
                              WEP Key :
                            4.WEP Key Lengths : 64-bit   ASCII
                              WEP Key :

                          MAC Address Filter Setting :
                          RADIUS Server Information Setting :


Press SPACE select mode.
```

In this menu, you will be able to configure wireless security where you will be able to HIDE ESSID and turn on encryption. Aphelion 500 supports 64 bit and 128 bit encryption. WPA1 and WPA2 (TKIP and AES) will be supported in later firmware release, please check www.aphelions.com for firmware updates.



```
                          Wireless Security Setting

                          Interface selection : 1 - Wireless
                          Hide ESSID : DISABLE
                          Encryption Mode : EAP_MD5
                            ReAuthentication Time : 1800


                            WEP Key Lengths : 64-bit     ASCII
                            WEP Key : *****





                          MAC Address Filter Setting :
                          RADIUS Server Information Setting :

Press SPACE select mode.
```

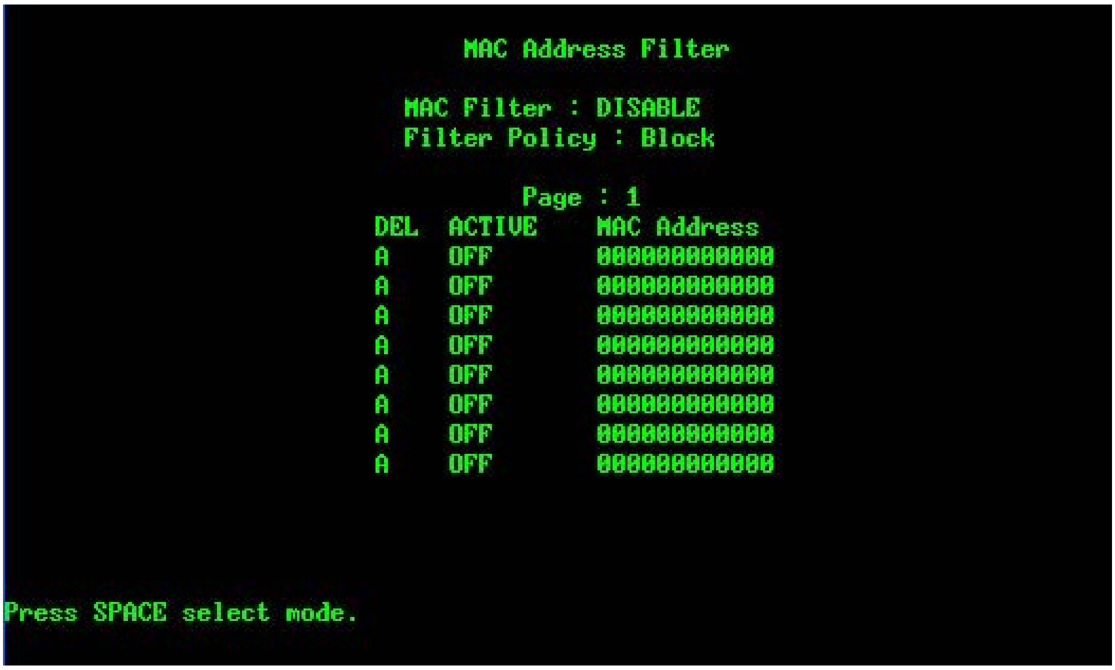
In this menu, you will be able to configure EAP_MD5 settings.



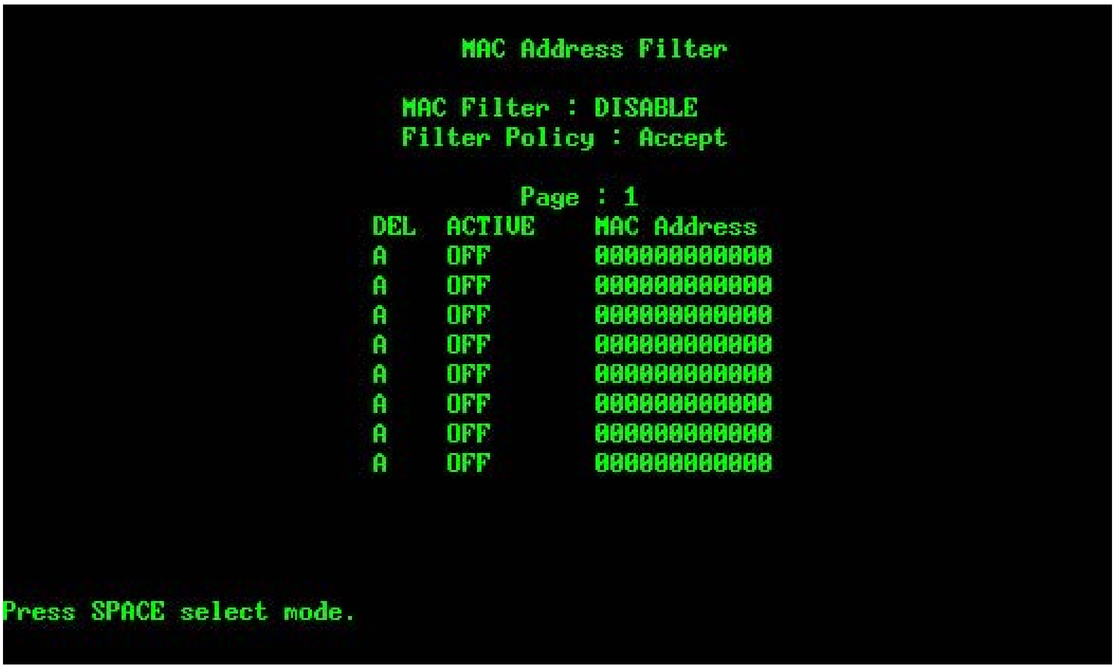
```
                           Wireless Security Setting

                           Interface selection : 1 - Wireless
                           Hide ESSID : DISABLE
                           Encryption Mode : EAP_TLS
                             ReAuthentication Time : 1800
                             Key Lengths : 64-bit







                           MAC Address Filter Setting :
                           RADIUS Server Information Setting :


Press SPACE select mode.
```

In this menu, for EAP-TLS, you will be able to upload the digital certificates.

6.3.6.2 MAC Address filtering



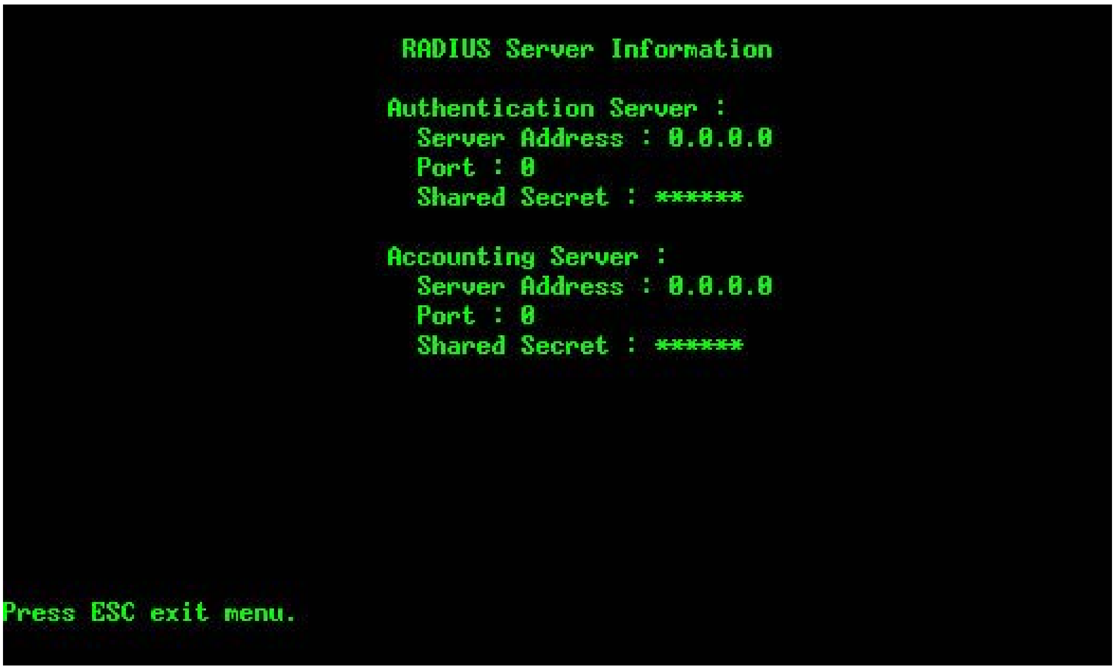
```
                               MAC Address Filter

                           MAC Filter : DISABLE
                           Filter Policy : Block

                                   Page : 1
                         DEL  ACTIVE    MAC Address
                         A    OFF       000000000000
                         A    OFF       000000000000
                         A    OFF       000000000000
                         A    OFF       000000000000
                         A    OFF       000000000000
                         A    OFF       000000000000
                         A    OFF       000000000000
                         A    OFF       000000000000




Press SPACE select mode.
```



```
                    MAC Address Filter

                  MAC Filter : DISABLE
                  Filter Policy : Accept

                      Page : 1
                 DEL  ACTIVE    MAC Address
                 A    OFF       000000000000
                 A    OFF       000000000000
                 A    OFF       000000000000
                 A    OFF       000000000000
                 A    OFF       000000000000
                 A    OFF       000000000000
                 A    OFF       000000000000
                 A    OFF       000000000000




Press SPACE select mode.
```

In this menu, you will be able to configure security setting base on MAC address of the connecting client, either to Accept or block the traffic from the specific MAC.

6.3.6.3 RADIUS Server



```
                  RADIUS Server Information

                 Authentication Server :
                   Server Address : 0.0.0.0
                   Port : 0
                   Shared Secret : ******

                 Accounting Server :
                   Server Address : 0.0.0.0
                   Port : 0
                   Shared Secret : ******







Press ESC exit menu.
```

In this menu, you will be able to configure your radius settings for 802.1x protocol authenticating with the remote radius server for AAA (Authenticating, Authorization and Accounting.

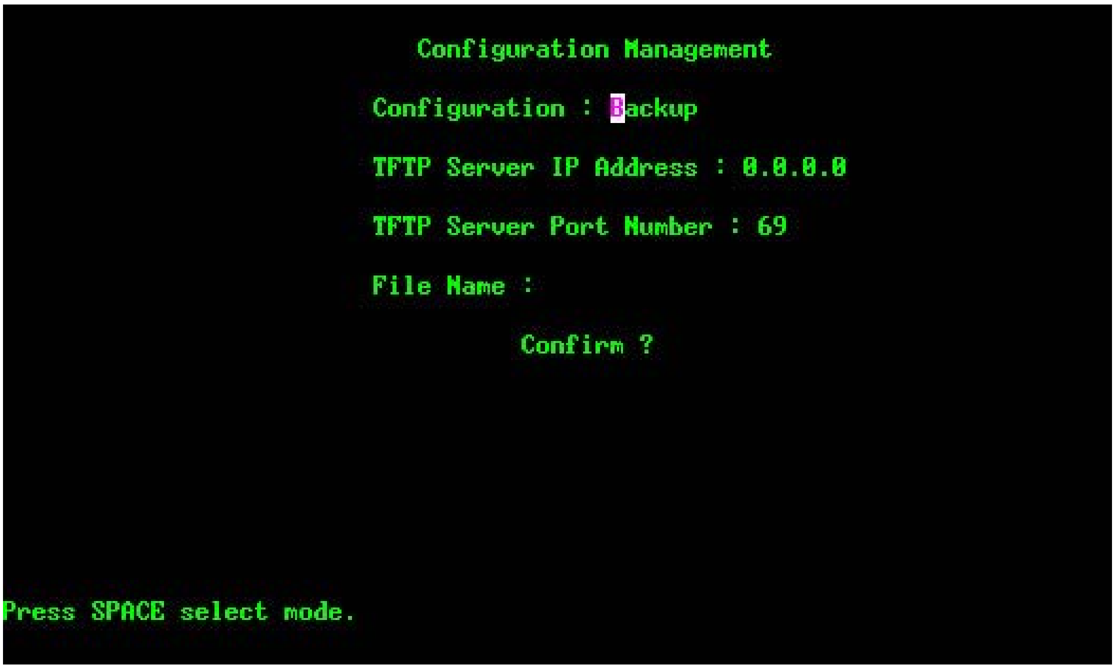
6.4 System Management

Under System Management, you will be able to operate the system by following:

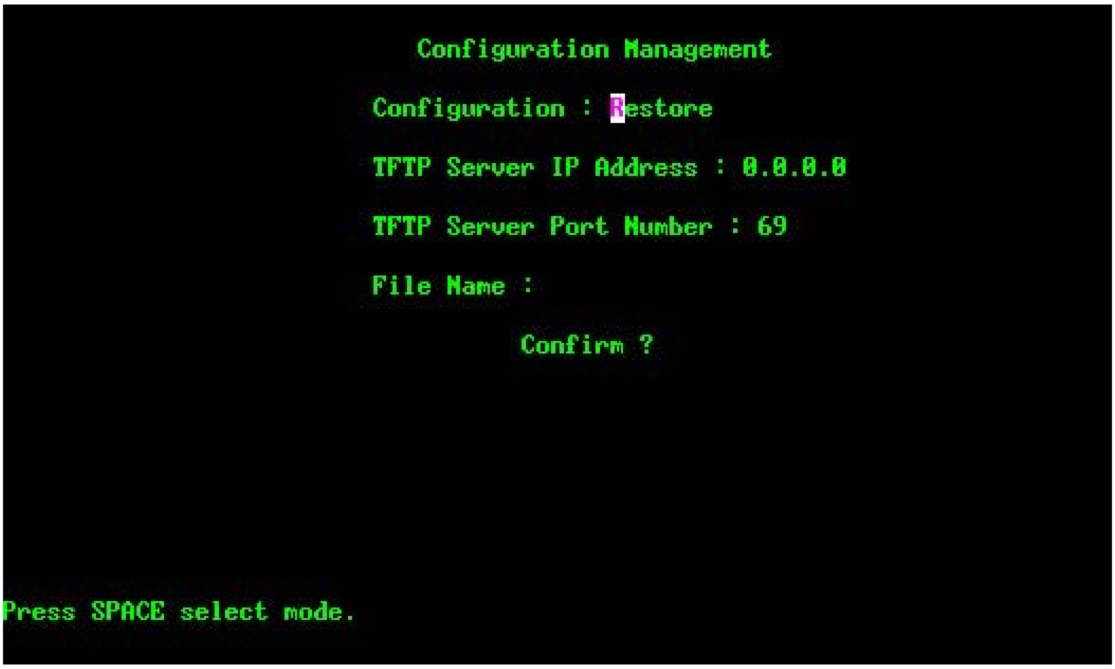
31. Configuration Management
32. Security File Management
33. Firmware Upgrade
34. System reboot

6.4.1 Configuration management

6.4.1.1 Back up and Restore Configuration



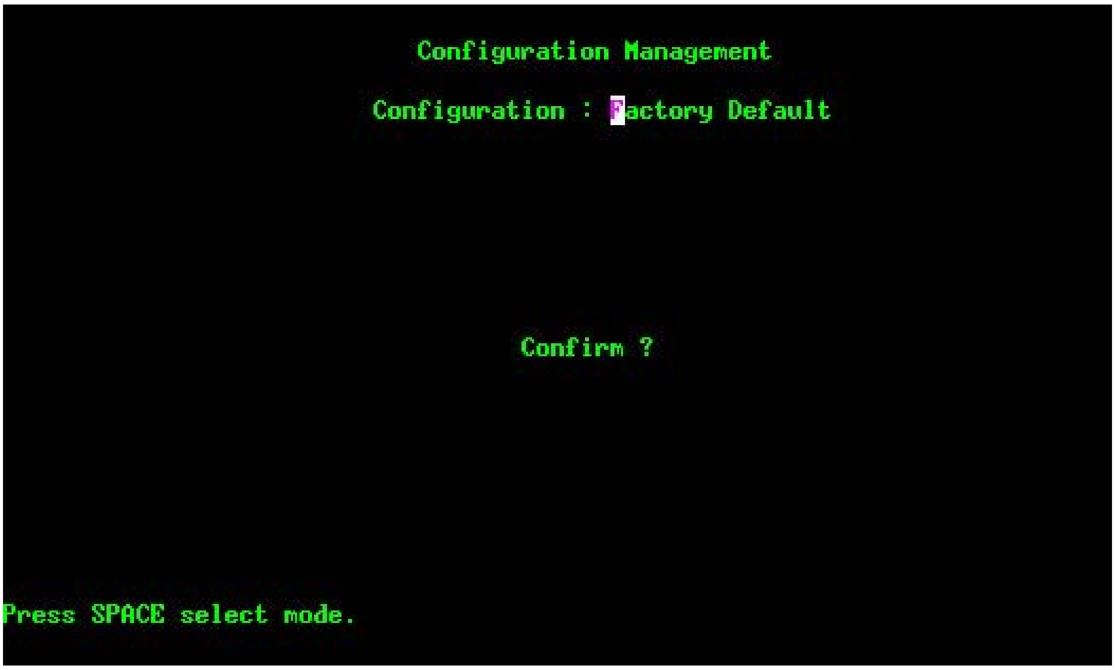
```
                         Configuration Management

                      Configuration : Backup

                      TFTP Server IP Address : 0.0.0.0

                      TFTP Server Port Number : 69

                      File Name :

                                Confirm ?




Press SPACE select mode.
```



```
                    Configuration Management

                 Configuration : Restore

                 TFTP Server IP Address : 0.0.0.0

                 TFTP Server Port Number : 69

                 File Name :

                           Confirm ?

Press SPACE select mode.
```

In this menu, you will be able to backup and restore your configurations; in a daisy chained sequential configurations using Aphelion 500s in a chain, it is recommended that you backup all configurations before uploading firmware. You may name your configuration file in any ways you like.

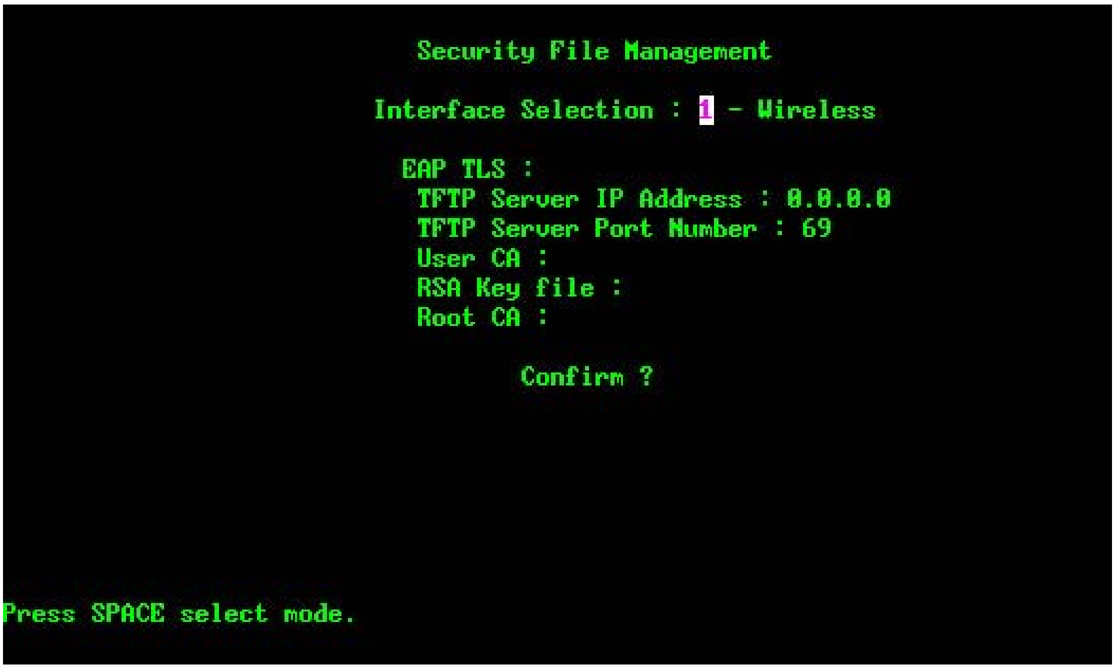
6.4.1.2 Factory Default loading



```
                    Configuration Management

                 Configuration : Factory Default




                           Confirm ?

Press SPACE select mode.
```

You will be able to reset back to factory default from this menu.

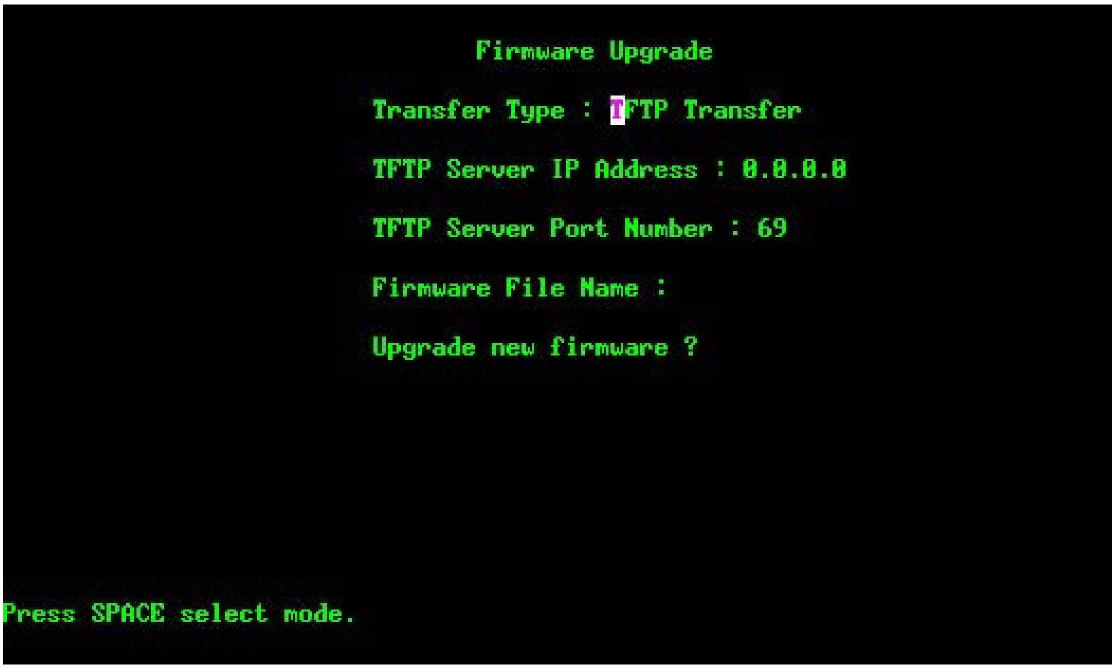
6.4.2 Security File Management



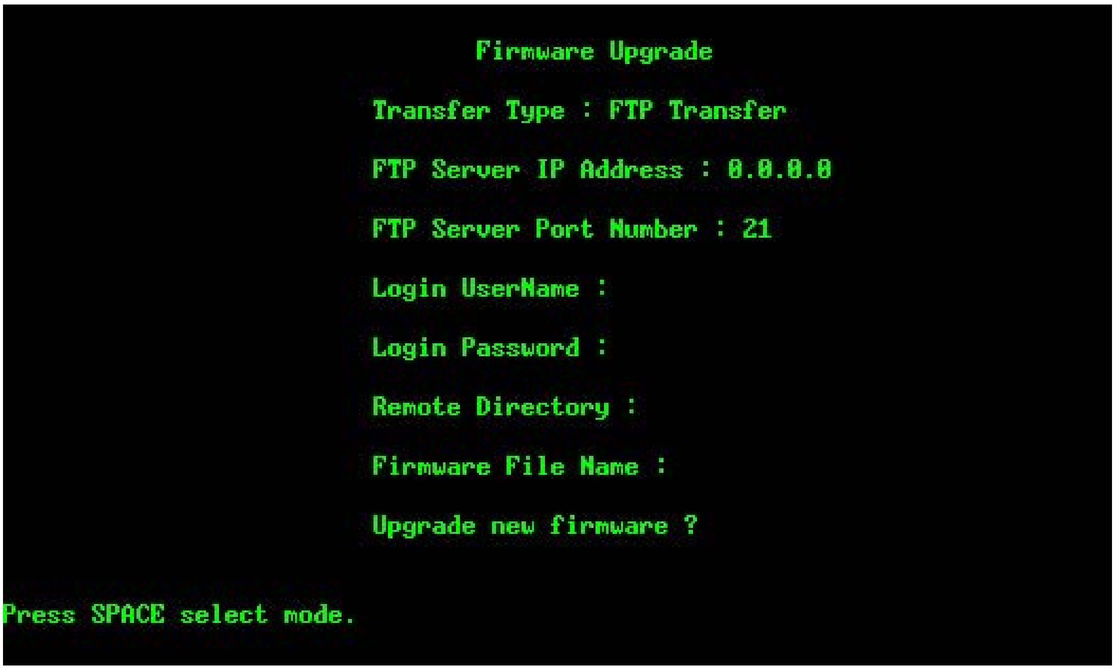
```
                         Security File Management

                      Interface Selection : 1 - Wireless

                        EAP TLS :
                         TFTP Server IP Address : 0.0.0.0
                         TFTP Server Port Number : 69
                         User CA :
                         RSA Key file :
                         Root CA :

                                Confirm ?





Press SPACE select mode.
```

For running EAP_TLS secure connection, network administrators may need to able to upload User Certificate, Root Certificate and RSA Key file to the system. In this menu, system allowed administrators to upload these Certificate files through TFTP server to the access point. (For learning more about wireless security, please refer to Annotations “Wireless Security Concept” in the end of this document.)

6.4.3 Firmware Upgrade



```
                    Firmware Upgrade

              Transfer Type : TFTP Transfer

              TFTP Server IP Address : 0.0.0.0

              TFTP Server Port Number : 69

              Firmware File Name :

              Upgrade new firmware ?






Press SPACE select mode.
```



```
                    Firmware Upgrade

              Transfer Type : FTP Transfer

              FTP Server IP Address : 0.0.0.0

              FTP Server Port Number : 21

              Login UserName :

              Login Password :

              Remote Directory :

              Firmware File Name :

              Upgrade new firmware ?

Press SPACE select mode.
```

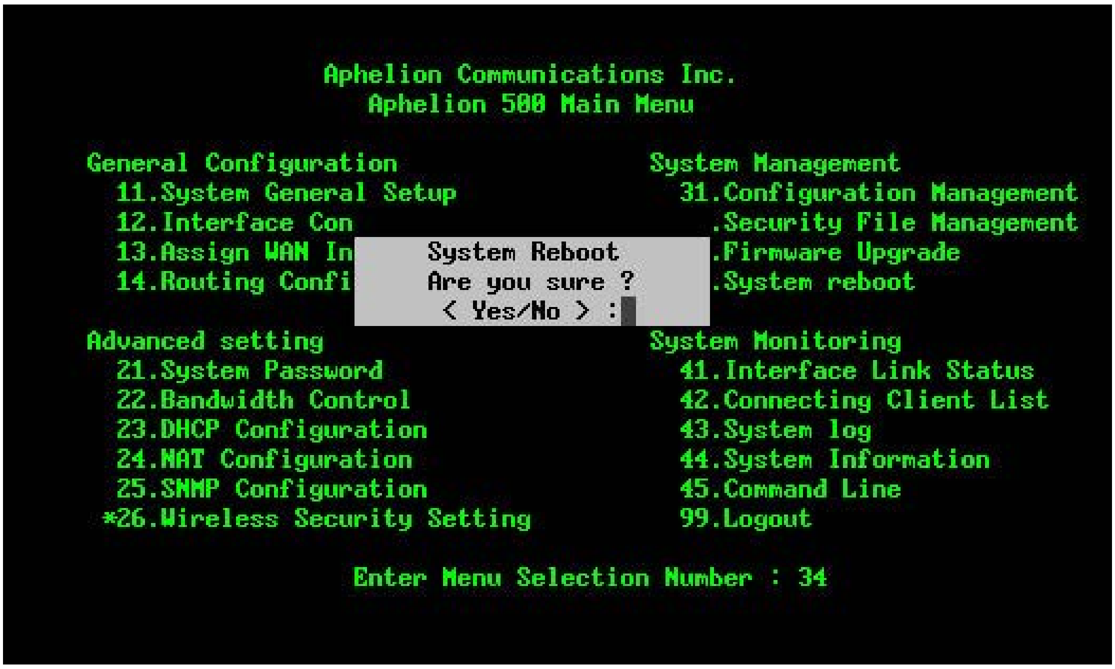
In this menu, you will be able to upload new released firmware from TFTP or FTP server.

For upgrading firmware from FTP server, you may need to enter the Username and Password for login FTP server.

During the upgrade, you will see the upgrading rate of progress show on the page by percentage. To prevent unexpected fail of system, please do not shutdown the system during the upgrade.

After the upgrade, system will automatically reboot. New firmware will take effect after system reboot.

6.4.4 System Reboot



```
                    Aphelion Communications Inc.
                       Aphelion 500 Main Menu

     General Configuration                    System Management
       11.System General Setup                  31.Configuration Management
       12.Interface Con                           .Security File Management
       13.Assign WAN In       System Reboot       .Firmware Upgrade
       14.Routing Confi      Are you sure ?       .System reboot
                              < Yes/No > :
     Advanced setting                         System Monitoring
       21.System Password                       41.Interface Link Status
       22.Bandwidth Control                     42.Connecting Client List
       23.DHCP Configuration                    43.System log
       24.NAT Configuration                     44.System Information
       25.SNMP Configuration                    45.Command Line
      *26.Wireless Security Setting             99.Logout

                      Enter Menu Selection Number : 34
```

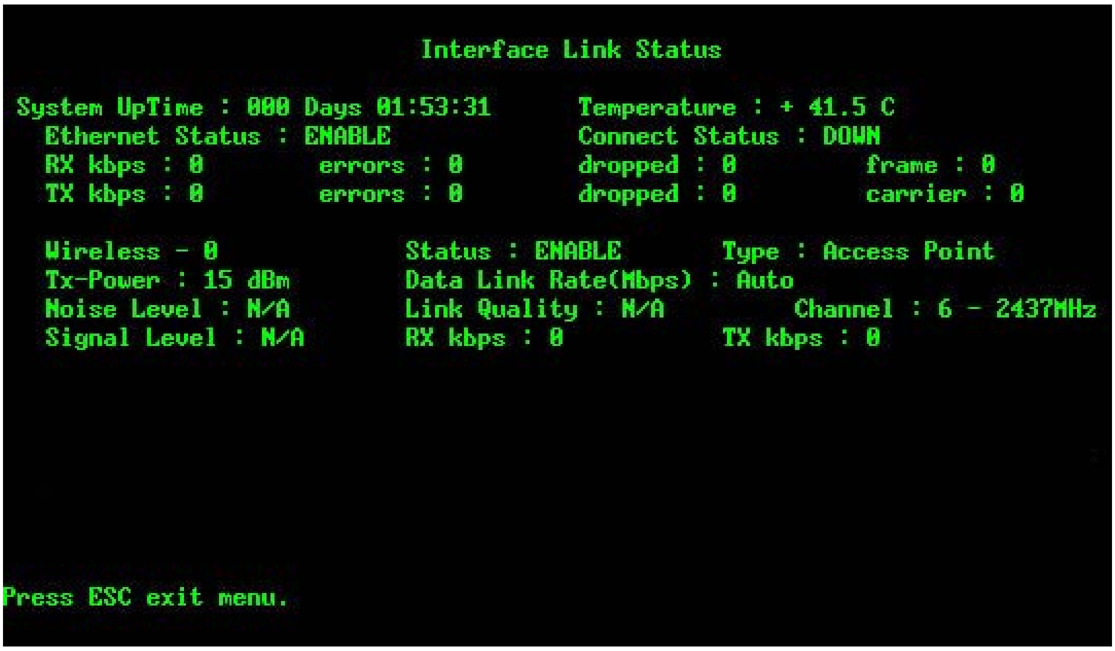
By selecting menu “34.System reboot”, administrator can be able to reboot the system. Systems will pop-up a confirming dialogue to confirm the reboot requirement.

6.5 System Monitoring

In System Monitoring, administrators can monitor the system information through following:

41. Interface Link Status
42. Connecting Client List (Wireless Clients)
43. System log
44. System Information
45. Command Line

6.5.1 Interface Link Status

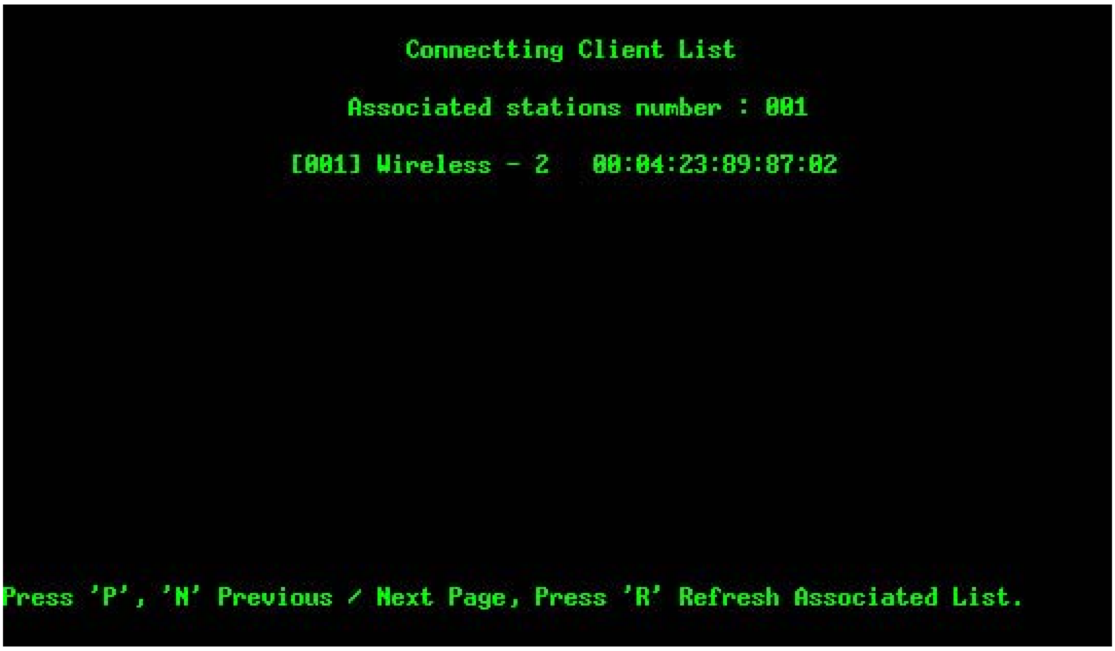


```
                            Interface Link Status

System UpTime : 000 Days 01:53:31       Temperature : + 41.5 C
  Ethernet Status : ENABLE              Connect Status : DOWN
  RX kbps : 0         errors : 0        dropped : 0         frame : 0
  TX kbps : 0         errors : 0        dropped : 0         carrier : 0

  Wireless - 0              Status : ENABLE       Type : Access Point
  Tx-Power : 15 dBm         Data Link Rate(Mbps) : Auto
  Noise Level : N/A         Link Quality : N/A         Channel : 6 - 2437MHz
  Signal Level : N/A        RX kbps : 0           TX kbps : 0







Press ESC exit menu.
```

In this menu, administrators can monitor the real-time information of all interfaces of Aphelion 500AG. It will include System Uptime, System Temperature, Tx rate, Rx rate and Noise Level, Data Link Rate, Signal Level in wireless interfaces.

(Notice : The Data Rate, Signal Level and Link Quality will show on the screen only when wireless interface is configured as Wireless Station type.)

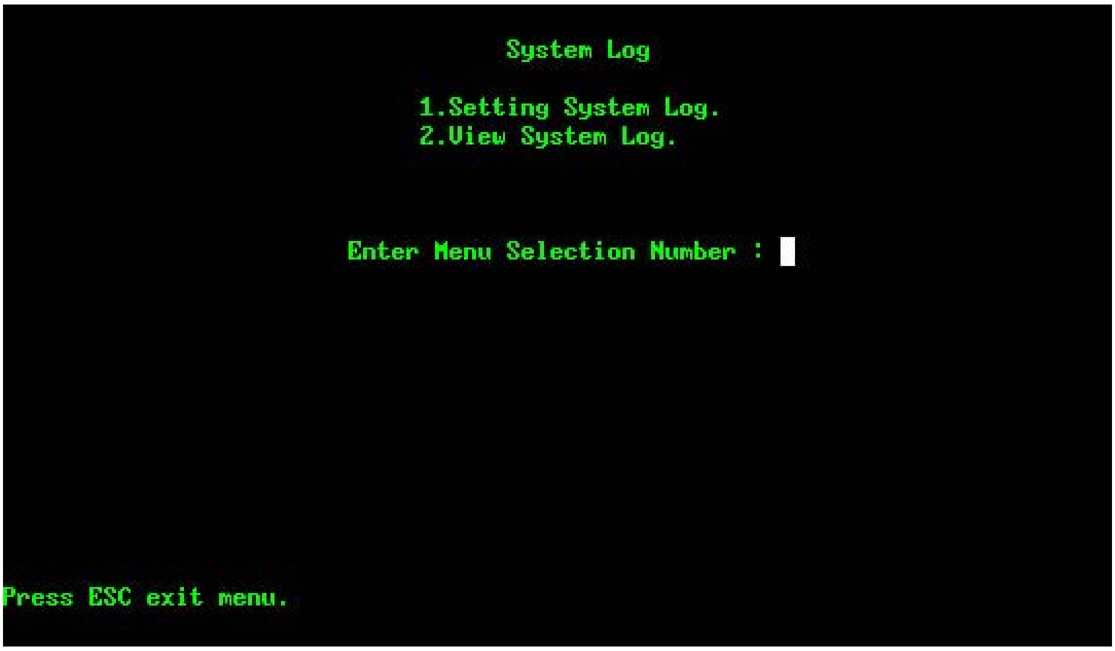
6.5.2 Connecting Client List



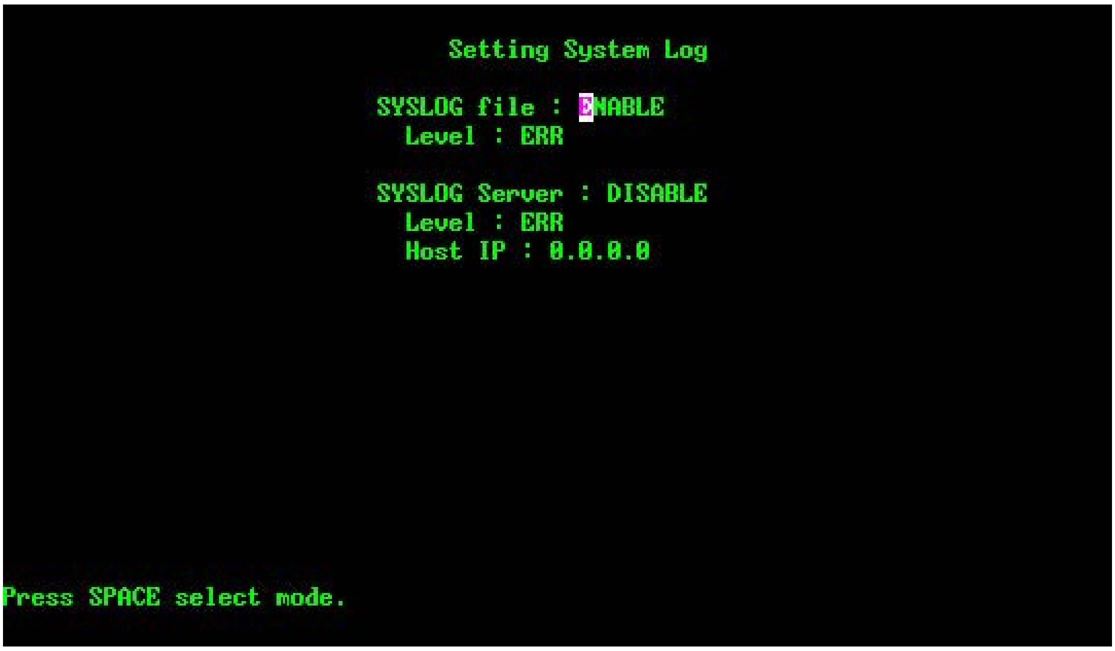
```
                    Connectting Client List

                 Associated stations number : 001

              [001] Wireless - 2   00:04:23:89:87:02









Press 'P', 'N' Previous / Next Page, Press 'R' Refresh Associated List.
```

In this menu, administrators can monitor all the client connections form wireless interfaces. The connections will show by listing MAC address in this table.

6.5.3 System Log



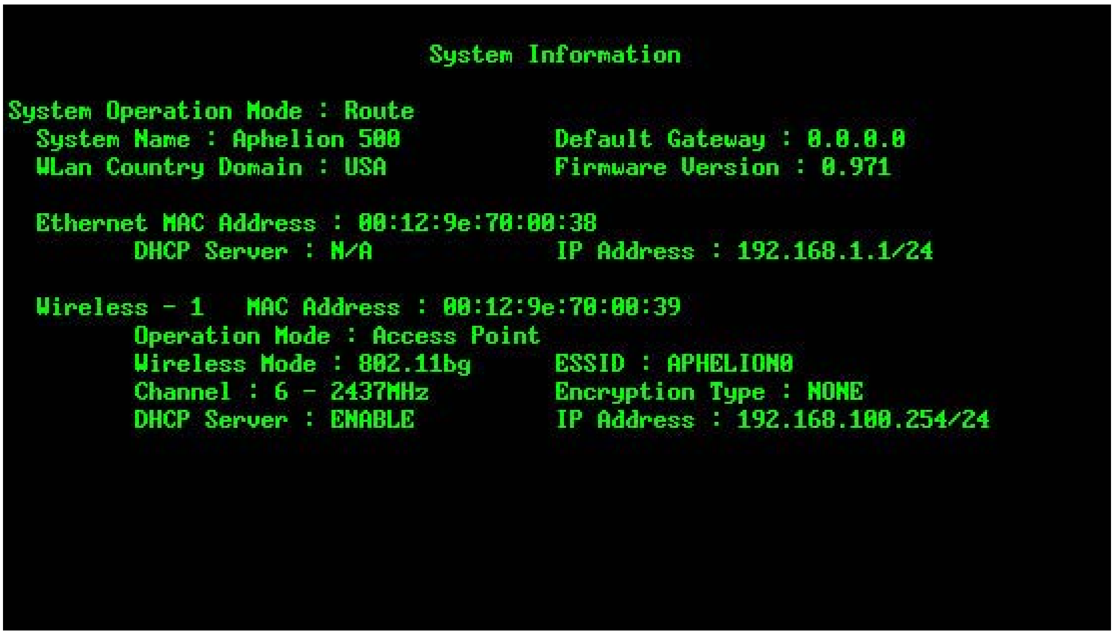
```
                          System Log

                    1.Setting System Log.
                    2.View System Log.


                 Enter Menu Selection Number :









Press ESC exit menu.
```



```
                         Setting System Log

                    SYSLOG file : ENABLE
                      Level : ERR

                    SYSLOG Server : DISABLE
                      Level : ERR
                      Host IP : 0.0.0.0









Press SPACE select mode.
```

In Aphelion System, system provides seven system log levels (Level1=DEBUG Level2=EMERGENCY Level3=ALERT Level4=CRITICAL Level5=ERROR Level8=WARNING Level7=NOTICE Level8=INFO) for network administrators to adjust the system log level flexibly. Through setting Syslog server IP address, all the system log will send back to the specific log server for centralizing monitoring all the Aphelion devices in the network.

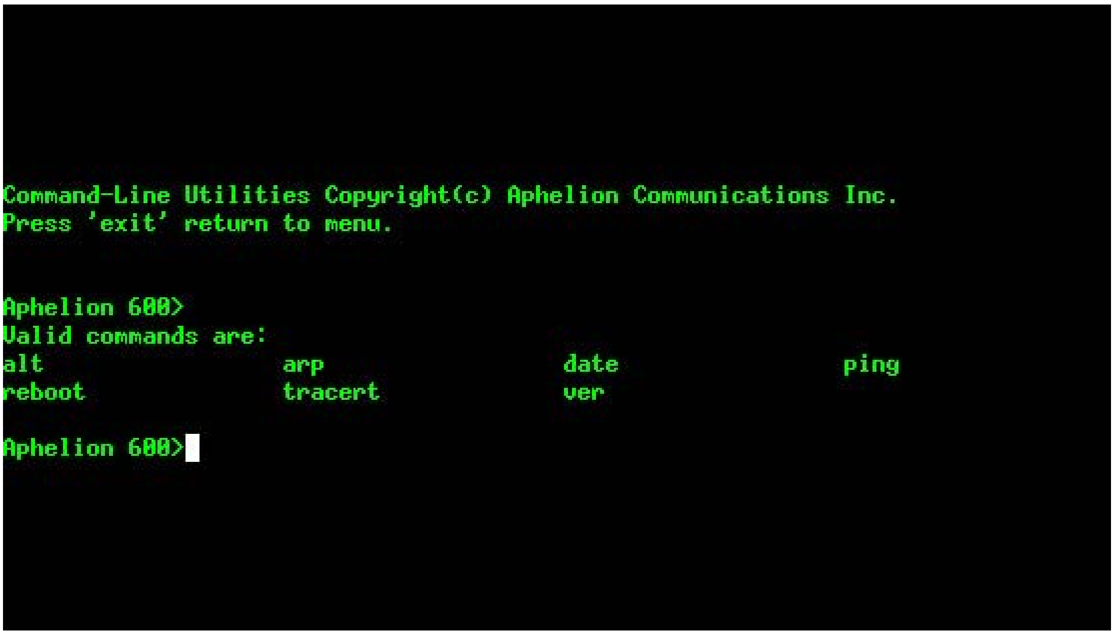
6.5.4 System Information



```
                              System Information

System Operation Mode : Route
  System Name : Aphelion 500            Default Gateway : 0.0.0.0
  WLan Country Domain : USA             Firmware Version : 0.971

  Ethernet MAC Address : 00:12:9e:70:00:38
         DHCP Server : N/A              IP Address : 192.168.1.1/24

  Wireless - 1   MAC Address : 00:12:9e:70:00:39
         Operation Mode : Access Point
         Wireless Mode : 802.11bg       ESSID : APHELION0
         Channel : 6 - 2437MHz          Encryption Type : NONE
         DHCP Server : ENABLE           IP Address : 192.168.100.254/24
```

In this menu, administrators can summarize all the configuration and hardware information of the unit.

6.5.5 Command Line



```
Command-Line Utilities Copyright(c) Aphelion Communications Inc.
Press 'exit' return to menu.


Aphelion 600>
Valid commands are:
alt                 arp                 date                ping
reboot              tracert             ver

Aphelion 600>
```

In this menu, Aphelion System provides few command for network administrators doing the debug when manage.

alt

Software Alignment tool, by applying this command, system will show the real-time "Link Quality", "RSSI"(Receive Signal Strength Indication)" and "Noise Level" continually. To stop the Software Alignment tool command, please press "Ctrl"+C on your keyboard.

(Notice : Software Alignment tool is only available when wireless interface is configured as "Wireless Station" mode. To have stable wireless connection, we strongly recommend that "Link Quality" should higher than 30% and "RSSI" should higher than -70dbm)

arp

Show ARP information of the system.

date

Show System time.

ping

Ping the remote host IP address from system.

reboot

Reboot the system.

tracert

Trace the remote destination IP address to check the routing path.

ver

To check the system firmware version

Chapter 7 Specifications

Standard support	Wireless	IEEE802.11a IEEE802.11b IEEE802.11g IEEE802.11b/g
	Ethernet	IEEE802.3 IEEE802.3u IEEE802.3af
	Ethernet	1×10/100 Base-T RJ-45 Power over Ethernet(PoE)
	Wireless	Antenna Connector: 1 × Reversed Female N-type
Memory	SDRAM	32Mbyte
	Flash	8Mbyte
Ethernet	Max. Bandwidth	Full Duplex: 200Mbps (for 100BASETX), 20Mbps (for 10BaseT) Half Duplex: 100Mbps (for 100BaseTX), 10Mbps (for 10BaseT)
System Setting	Standard	AP / AP Client / Router / Bridge
	Frequency Range	**USA:** 2.400 – 2.483GHz, 5.15 ~ 5.35Ghz, 5.725 ~ 5.825Ghz **Europe:** 2.400 – 2.483GHz, 5.15~ 5.35Ghz, 5.47 ~ 5.725Ghz **Japan:** 2.400 – 2.483GHz, 4.90 – 5.091GHz, 5.15 – 5.25GHz **China:** 2.400 – 2.483GHz, 5.725 ~5.85Ghz
	Modulation Technique	**802.11b/g** DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK,QPSK, 16-QAM, 64-QAM) **802.11a** OFDM(BPSK,QPSK, 16-QAM, 64-QAM)
	Channels Support	**802.11b/g** US/Canada: 11 (1 ~ 11) Major European country: 13 (1 ~ 13) France: 4 (10 ~ 13) Japan: 11b: 14 (1~13 or 14th), 11g: 13 (1 ~ 13) China: 13 (1 ~ 13) **802.11a** 1). US/Canada:12 non-overlapping channels (5.15 ~ 5.35GHz, 5.725 ~ 5.825GHz) 2). Europe: 19 non-overlapping channel (5.15 ~ 5.35GHz, 5.47 ~ 5.725GHz) 3). Japan: 4 non-overlapping channels (5.15 ~ 5.25GHz) 4). China : 5 non-overlapping channels (5.725 ~ 5.85GHz)
	Wireless Transmission Rate	802.11b/g: 11, 5.5, 2, 1 Mbps, auto-fallback, up to 54 Mbps 802.11a : 54, 48, 36, 24, 18, 12, 9, 6Mbps, auto-fallback

	Output Power	**802.11b** 18 dBm **802.11g** 18dBm @6Mbps 15dBm @54Mbps **802.11a** 17dBm @6Mbps 13dBm @54Mbps
	Wireless Other Setting	IEEE 802.11b/g Mode Selection Enable / Disable Broadcast SSID MAC Address Filtering Fixed Channel DHCP Client / Server, Fixed IP NAT Static Routing SNMP v1v2
Wireless Security	SSID	Support Enable / Disable Broadcast
	WEP	Support 64bit / 128bit / 152bit Data Encryption Authentication type: Open System / Shared Key
	802.1x	Support 802.1x Client and Server
	Radius	Support Radius Client
	WPA	WI-FI Protected Access (EAP, TKIP) WPA/PSK
	MAC	Support MAC Address Filtering
	Firewall	Support NAT
Configuration & Management	Software / Firmware	System configuration interface: Web-base UI via popular browser (MS IE, Netscape…) Firmware upgrade , Reset to default and configuration backup via Web-based Support Telnet to Configuration
Physical Spec.	Power	DC 48Volt / 0.8A ; AC Adapter 100V~240V Support Power over Ethernet (PoE)
	Dimension	L × W × H: 226 × 197 × 79 mm
	Weight	1700g
	Antenna	Reversed N-type (Option)
Regulation and Compliance	US	FCC Part 15 Class B & C & E
	Europe	ETS 300 328, ETS 301 489-1&17, ETS 301 893 ,EN 60950 compliant and CE Mark
Environment Spec.	Operating Temp	Non Heater：-30~65 ℃ With Heater：-40~65 ℃ Built-in heater module is option.
	Storage	-40℃ ~ 80℃
	Humidity	0% ~ 95% non-condensing

Chapter 8 Annotations

8.1 Wireless Security Concept

Security For 802.11 Network

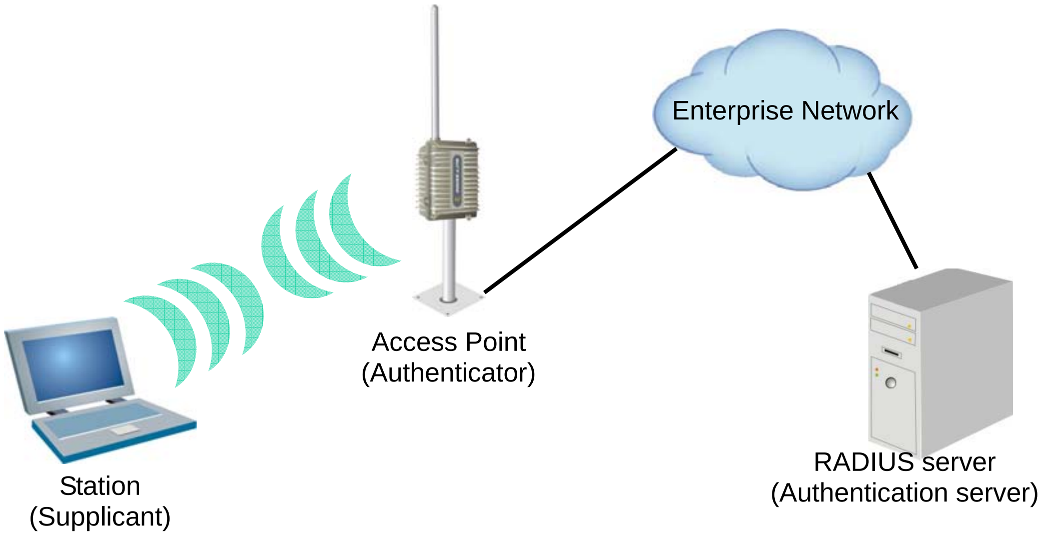
Security for 802.11 networks can be simplified into two main components: authentication and encryption. WEP(Wired Equivalent Privacy) is part of the system security of 802.11, and its goals are to provide confidentiality and data integrity, and to protect access to the network infrastructure by rejecting all non-WEP packets.

With 802.11's WEP (Wired Equivalent Privacy), all access points and client radio NICs on a particular wireless LAN must use the same encryption key. Sending stations encrypt the frames with a WEP key before transmission, and the receiving station decrypts it using the same key upon reception. This process reduces the risk of someone eavesdropping the transmission and gaining access to the information that the frames are carrying.

Why 802.1X

The major problem with the 802.11 standard is that the keys are cumbersome to change. If you don't update the WEP keys often, an unauthorized person with a sniffing tool, such as AirSnort or WEPcrack, can monitor your network and decode the encrypted messages. In order to use different keys, you must manually configure each access point and radio NIC with new common keys. But the job of renewing keys on larger networks can be a monumental task. IEEE 802.1x standard helps authenticate and secure wireless LANs. The use of IEEE 802.1X offers an effective framework for authenticating and controlling user traffic to a protected network, as well as dynamically varying encryption keys. 802.1X ties a protocol called EAP (Extensible Authentication Protocol) to both the wired and wireless LAN media and supports multiple authentication methods, such as token cards, Kerberos, one-time passwords, certificates, and public key authentication.

It's important to note that 802.1X doesn't provide the actual authentication mechanisms. When utilizing 802.1X, you need to choose an EAP type, such as Transport Layer Security (EAP-TLS) or EAP Tunneled Transport Layer Security (EAP-TTLS), which defines how the authentication takes place. There are many EAP types, so we'll leave details on EAP types to a future tutorial. The important part to know at this point is that the software supporting the specific EAP type resides on the authentication server and within the operating system or application software on the client devices. The access point acts as a "pass through" for 802.1X messages, which means that you can specify any EAP type without needing to upgrade an 802.1X-compliant access point. As a result, you can update the EAP authentication type as newer types become available and your requirements for security change.



EAP

802.1X uses the Extensible Authentication Protocol (EAP) to relay port access requests between LAN stations ("supplicants"), Ethernet switches or wireless access points ("authenticators"), and RADIUS servers ("authentication servers"). The EAP protocol can support multiple authentication mechanisms without having to pre-negotiate a particular one.

EAP Types

Different types of EAP have been defined to support authentication methods and associated network security policies. Here are few widely-deployed EAP types below:

EAP-MD5

EAP-Message Digest 5 Challenge Handshake Authentication Protocol (EAP-MD5 CHAP) is a required EAP type that uses the same challenge handshake protocol as PPP-based CHAP, but the challenges and responses are sent as EAP messages. EAP-MD5 CHAP is described in RFC 2284. A typical use for EAP-MD5 CHAP is to authenticate the credentials of remote access clients by using user name and password security systems. You can also use EAP-MD5 CHAP to test EAP interoperability.

LEAP (Cisco's Lightweight EAP)

Cisco LEAP is a mutual authentication algorithm that supports dynamic derivation of session keys. With Cisco LEAP, mutual authentication relies on a shared secret, the user's logon password—which is known by the client and the network, and is used to respond to challenges between the user and the Remote Authentication Dial-In User Service (RADIUS) server As with most password-based authentication algorithms, Cisco LEAP is vulnerable to dictionary attacks.

EAP-TLS (EAP with Transport Layer Security)

Transport Level Security (TLS) provides mutual authentication, integrity-protected negotiation, and key exchange between two endpoints. Therefore, EAP-TLS, which includes support for fragmentation and reassembly, provides for these TLS mechanisms within EAP. Windows CE .NET supports EAP-TLS.

EAP-TTLS (EAP with Tunneled TLS)

In EAP-TTLS, only a Radius Server needs to acquire a Digital Certificate, but a Wireless Station needs to import the certificate of CA (Certificate Authority) so that it can verify the received certificate .

The RADIUS server sends it's certificate for stations's verification. And a secure tunnel will be also created at this stage. The station then sends it's user name, password via the secure tunnel.

After authentication, both ends begin with Dynamic Key exchanging as in EAP-TLS.

PEAP (Protected EAP)

PEAP is an EAP extension for Windows CE .NET that enhances the security of the authentication phase. PEAP provides the security framework for mutual authentication between an EAP client and an EAP server. PEAP is not as secure as Transport Level Security (TLS), but has the advantage of being able to use username/password authentication instead of client certificate authentication.

RADIUS overview

The Remote Authentication Dial-In User Service (RADIUS) is an Internet draft standard protocol.(See RFCs 2138 and 2139 for more information on RADIUS.) RADIUS is always connected with all kinds of Network Access Server (NAS), such as router, switche, RAS, and all kinds of NAS possible to take responsibility for authentication, authorization, and accounting in telecommunication networks.

In large networks, security information can be scattered throughout the network on different devices. RADIUS allows user information to be stored on one host, minimizing the risk of security loopholes. All authentication and access to network services is managed by the host functioning as the RADIUS server.

The RADIUS messages which are sent between RADIUS server and RADIUS client are defined by RFCs 2865 and 2866 as follow types:

Access-Request

A message sent from an access client to an access server in order to request authentication and authorization for a network access connection attempt.

Access-accept

A message sent from an access server to an access client to response the access-request message which informs the RADIUS client that the connection attempt is authenticated and authorized.

Access-reject

A message sent from an access server to an access client to response the access-request message which informs the RADIUS client that the connection attempt is not authenticated or authorized.

Access-challenge

A message sent by a RADIUS client to specify accounting information for a connection that was accepted.

Accounting-Request

A message sent by a RADIUS client to specify accounting information for a connection that was accepted.

Accounting-Response

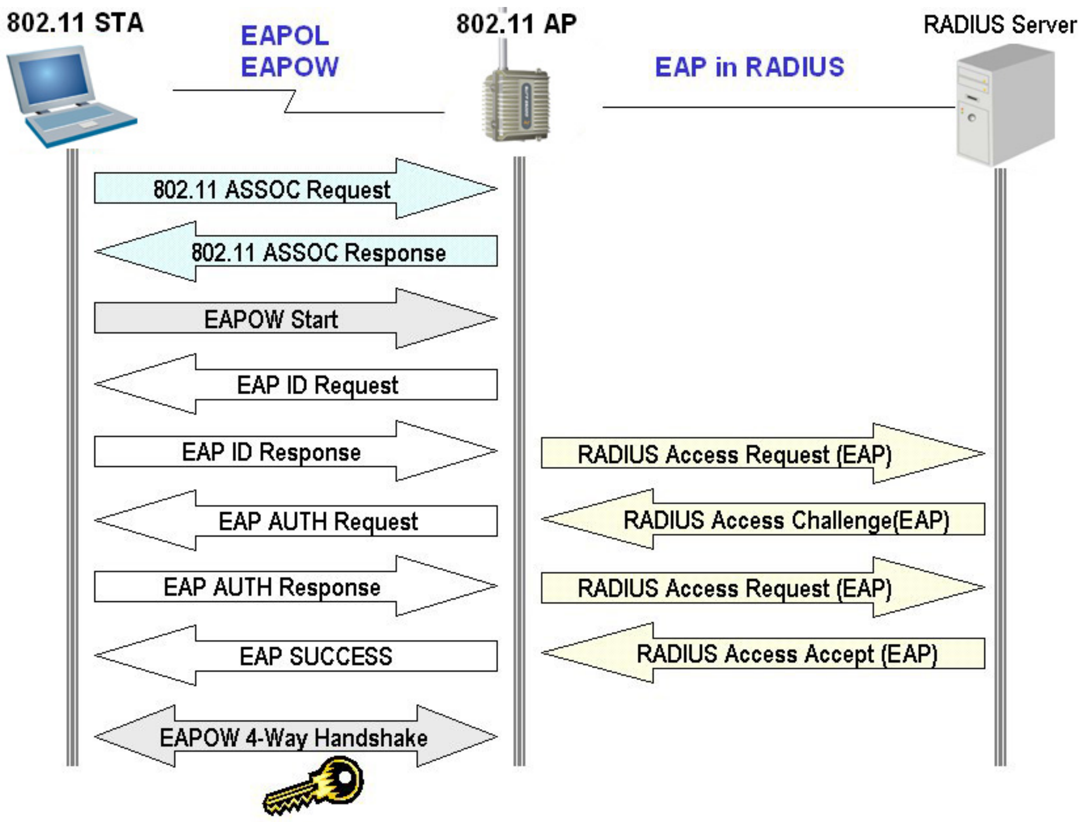
A message sent by access server to acknowledge the successful receipt and processing of the Accounting-Request message

RADIUS messages are sent as User Datagram Protocol (UDP) messages. UDP port 1812 is used for RADIUS authentication messages and UDP port 1813 is used for RADIUS accounting messages.

How EAP-TLS works with FreeRADIUS and Windows XP

EAP-TLS authentication is based on 802.1x/EAP architecture. Components involved in the 802.1x/EAP authentication process are: supplicant (the wireless station), the authenticator (the access point), and the authentication server (back-end RADIUS server). The supplicant and the authentication server must support EAP-TLS authentication. The access point has to support the 802.1x/EAP authentication process. (The access point is not aware of the EAP authentication protocol type.)

The fallowing diagram illustrates the overall 802.1x/EAP authentication process with EAP-TLS as the authentication protocol. (Note that LEAP and EAP MD5 also use the same 802.1x/EAP authentication process.)



Initial 802.1X communications begins with an unauthenticated supplicant (wireless station) attempting to connect with an authenticator (802.11 access point). The access point responds by enabling a port for passing only EAP packets from the client to an authentication server located on the wired side of the access point. The access point blocks all other traffic, such as HTTP, DHCP, and POP3 packets, until the access point can verify the client's identity using an authentication server (RADIUS server). Once authenticated, the access point opens the client's port for other types of traffic.

To get a better idea of how 802.1X operates, the following are specific interactions that take place among the various 802.1X elements:

1. The client sends an EAP-start message. This begins a series of message exchanges to authenticate the client; think of this as a group of visitors entering the front gate of a theme park and the group's leader (wireless station) asking the gatekeeper (access point) whether they can enter.

2. The access point replies with an EAP-request identity message. In the case of the theme park, the gatekeeper will ask the leader for their name and drivers license.

3. The client sends an EAP-response packet containing the identity to the authentication server. The leader in our example will provide their name and drivers license, and the gatekeeper forwards this information to the group tour manager (RADIUS server) who determines whether the group has rights to enter the park.

4. The authentication server uses a specific authentication algorithm to verify the client's identity. This could be through the use of digital certificates or other EAP authentication type. In the case of our example, this process simply involves verifying the validity of the leader's drivers' license and ensuring that the picture on the license matches the leader. In our example, we'll assume the leader is authorized.

5. The authentication server will either send an accept or reject message to the access point. So the group tour manager at the theme park tells the gatekeeper to let the group enter.

6. The access point sends an EAP-success packet (or reject packet) to the client. The gatekeeper informs the leader that the group can enter the park. Of course the gatekeeper would not let the group in if the group tour manager had rejected the group's admittance.

7. If the authentication server accepts the client, then the access point will transition the client's port to an authorized state and forward additional traffic. This is similar to the gatekeeper automatically opening the gate to let in only people belonging to the group cleared for entry.

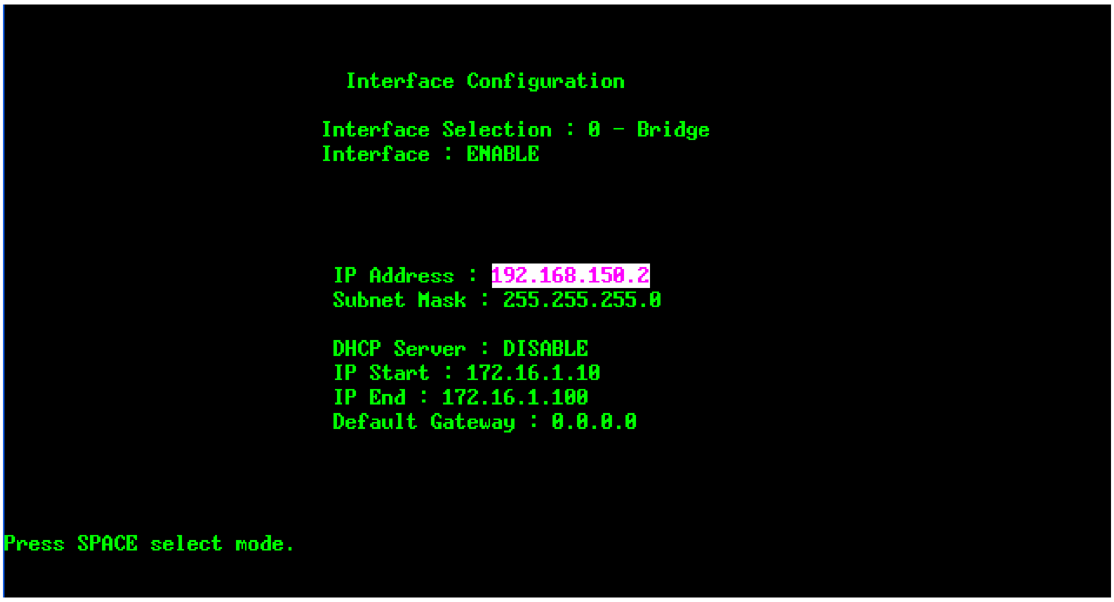
The basic 802.1X protocol provides effective authentication regardless of whether you implement 802.11 WEP keys or no encryption at all. Most of major wireless LAN vendors, however, are offering proprietary versions of dynamic key management using 802.1X as a delivery mechanism. If configured to implement dynamic key exchange, the 802.1X authentication server can return session keys to the access point along with the accept message. The access point uses the session keys to build, sign and encrypt an EAP key message that is sent to the client immediately after sending the success message. The client can then use contents of the key message to define applicable encryption keys. In typical 802.1X implementations, the client can automatically change encryption keys as often as necessary to minimize the possibility of eavesdroppers having enough time to crack the key in current use.

8.2 Firmware Upgrade

In order to upgrade firmware, please prepare a TFTP (Trivial File Transfer Protocol) or FTP server first, make it available via the data-in port on the PoE device.

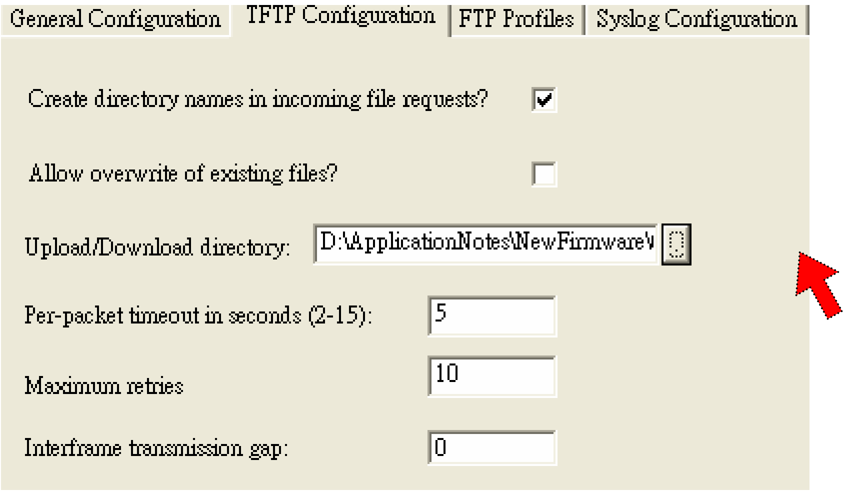
NB: This function is also available in the daisy chain (route mode or bridge mode), just replace the Ethernet connection by the daisy chain connection.

1. Configuration of TFTP server:
   i. The AP device and TFTP server must place in the same net scope (IP and subnet mask). Use the menu “12. Interface Configuration” user menu to set up the Ethernet interface.



```
                              Interface Configuration

                            Interface Selection : 0 - Bridge
                            Interface : ENABLE



                             IP Address : 192.168.150.2
                             Subnet Mask : 255.255.255.0

                             DHCP Server : DISABLE
                             IP Start : 172.16.1.10
                             IP End : 172.16.1.100
                             Default Gateway : 0.0.0.0



Press SPACE select mode.
```

   ii. Precise the file directory for download, this is the path where you keep the firmware file: here we use the path “D:\ApplicationNotes \NewFirmware \500_firmware\0962” as example.



Create directory names in incoming file requests? ☑

Allow overwrite of existing files? □

Upload/Download directory: D:\ApplicationNotes\NewFirmware\

Per-packet timeout in seconds (2-15): 5

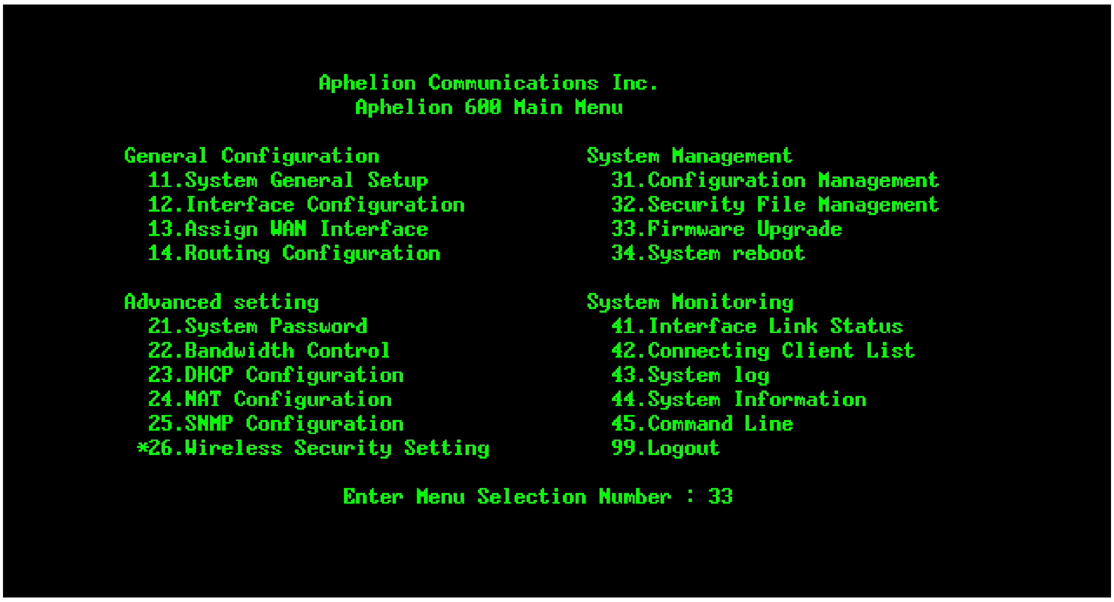
Maximum retries 10

Interframe transmission gap: 0

Upgrade firmware via TFTP server and FTP sever

A. TFTP server upgrade

Boot the device; enter to the user interface as below, after the password screen:
To upgrade the firmware, please select “33. Firmware Upgrade”.

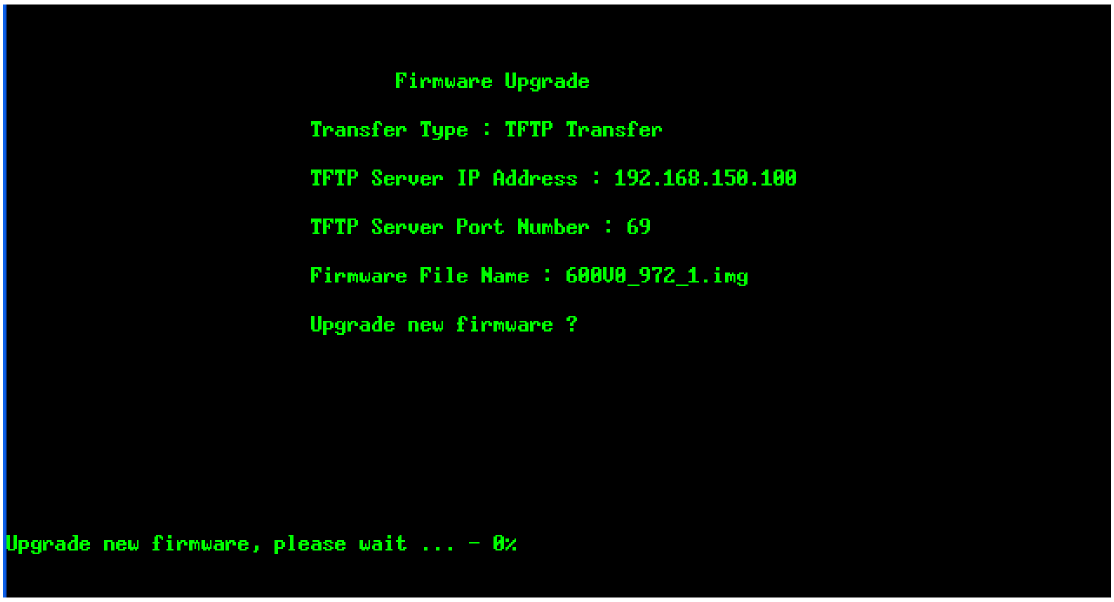


```
                    Aphelion Communications Inc.
                       Aphelion 600 Main Menu

      General Configuration                  System Management
        11.System General Setup                31.Configuration Management
        12.Interface Configuration             32.Security File Management
        13.Assign WAN Interface                33.Firmware Upgrade
        14.Routing Configuration               34.System reboot

      Advanced setting                       System Monitoring
        21.System Password                     41.Interface Link Status
        22.Bandwidth Control                   42.Connecting Client List
        23.DHCP Configuration                  43.System log
        24.NAT Configuration                   44.System Information
        25.SNMP Configuration                  45.Command Line
       *26.Wireless Security Setting           99.Logout

                     Enter Menu Selection Number : 33
```

iii. Choose the Transfer type by pressing the space bar, till the TFTP transfer shows. Move cursor to next field.

iv. In the field of TFTP Server IP Address, input the TFTP server IP, in our demonstration, this IP is “192.168.150.100.”

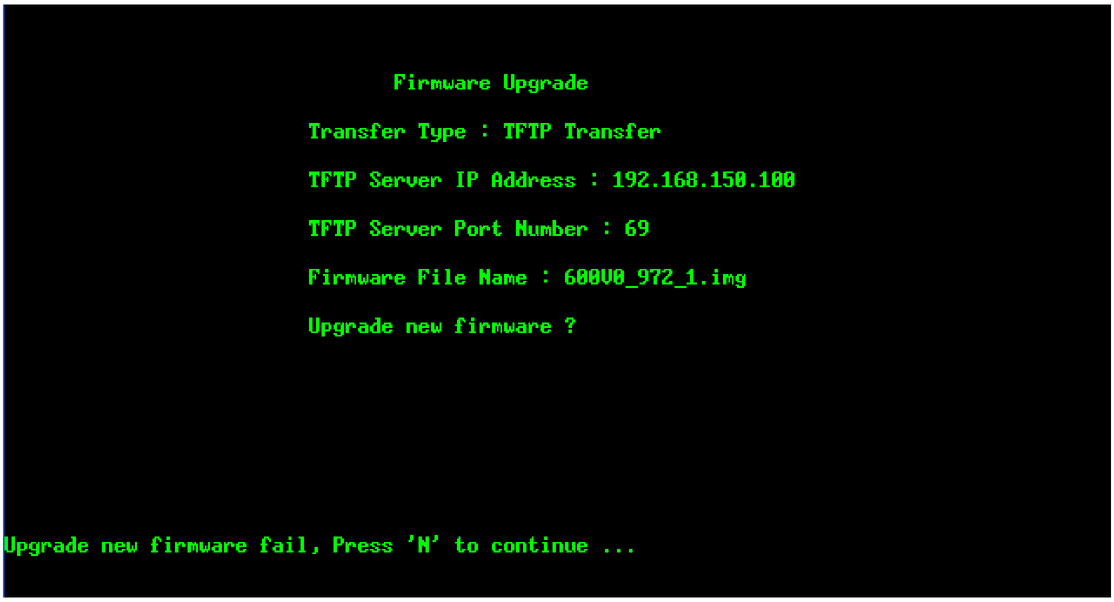
v. Use arrow keys to go to file name field, input the firmware file name in this demonstration, this is “500V0_972_1.img”. Do use the exact filename, respecting the upper and lower case of file name.



```
                Firmware Upgrade

         Transfer Type : TFTP Transfer

         TFTP Server IP Address : 192.168.150.100

         TFTP Server Port Number : 69

         Firmware File Name : 600V0_972_1.img

         Upgrade new firmware ?



Upgrade new firmware, please wait ... - 0%
```

vi. Move cursor to the line of “Upgrade new firmware?” press “Y” to confirm and begin the firmware upgrade process. While the firmware has been upgraded after few minutes, system will automatically reboot.

vii. If encounter any problem to upgrade firmware with message “Upgrade new firmware fail, Press 'N' to continue ...” shows.

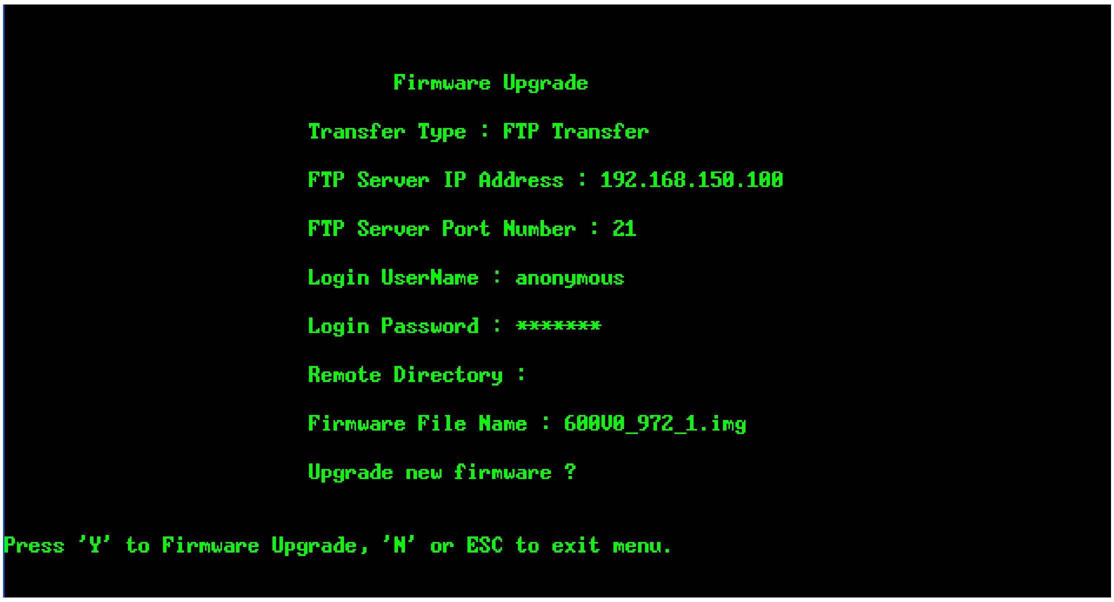


```
                Firmware Upgrade

         Transfer Type : TFTP Transfer

         TFTP Server IP Address : 192.168.150.100

         TFTP Server Port Number : 69

         Firmware File Name : 600V0_972_1.img

         Upgrade new firmware ?



Upgrade new firmware fail, Press 'N' to continue ...
```

In this case, please verify your TFTP configuration, network and check the file name are exact, launch this procedure above again.

B. FTP server upgrade

This option is available from the firmware version 0.971, In order to upgrade firmware, please prepare a FTP server first, make it available via the data-in port on the PoE device.



```
                         Firmware Upgrade

                  Transfer Type : FTP Transfer

                  FTP Server IP Address : 192.168.150.100

                  FTP Server Port Number : 21

                  Login UserName : anonymous

                  Login Password : *******

                  Remote Directory :

                  Firmware File Name : 600V0_972_1.img

                  Upgrade new firmware ?

Press 'Y' to Firmware Upgrade, 'N' or ESC to exit menu.
```

i. Choose the Transfer type by pressing the space bar, till the FTP transfer shows. Move cursor to next field.

ii. In the field of FTP Server IP Address, input the FTP server IP, in our demonstration, this IP is “192.168.150.100.”

iii. Use arrow keys to go to file name field, input the firmware file name in this demonstration, this is “500V0_972_1.img”. Do use the exact filename, respecting the upper and lower case of file name.

iv. Please input correctly the IP, user name, password and file name.

v. If the firmware file is down to the sub directory in this FTP server, precise its path in the filed of “Remote Directory”, else leave this filed blank.

vi. Move cursor to the line of “Upgrade new firmware?” press “Y” to confirm and begin the firmware upgrade process. While the firmware has been upgraded after few minutes, system will automatically reboot.