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600AG / M600AG
802.11a/b/g Intelligent Sequential Outdoor Wireless Access Point

User Manual

V.1.002

July, 2010

Table of Contents

Chapter 1. 600AG/M600AG

This chapter describes 600AG in brief for your applications

1.1. Features

600AG is an Intelligent Outdoor Wireless Access Point built (AP). With its powerful engineering design, 600AG can form daisy chained wireless Hot Zones easily when engaging multiple 600AGs together to meet the ever increasing needs of different network applications. With its breakthrough technologies, 600AG offers benefits to users in terms of scalability, range extension, expansion in network capacity, powerful routing engine, easy installation and simple management. 600AG is the most ideal candidate for users who wish to deliver carrier class wireless services in multiple market segments, such as campuses, hospitality, warehousing etc. up to wider metropolitan areas.

- Features in a Glance :
  Scalable wireless distribution platform
  Daisy chained wireless Hot Zones
  Reliable multiple nodes performance in bridged or routed environments.
  Bandwidth control module at subscriber level
  High Speed Mobility (M Serial)
  --High speed mobility roaming
  --Support more than 12Mbps Throughput for backbone or AC link
  --Support more than 140km/h high speed mobility application

- Comprehensive Security Features :
  WPA-PSK / WPA-EAP with TKIP/ CCMP WPA Encryption Type support
  WPA2-PSK / WPA2-EAP with TKIP/ CCMP WPA2 Encryption Type support
  802.1x EAP-TLS / MD5 WEP Key support (Client and Server modes)
  64/128/152 bits Dynamic WEP keys
  Radius client
  Hide ESSID
  MAC address filtering
  NAT
  SSH secure telnet

- Special Security Features :
  Maximum AC connect limits amount
  Support Isolation to protect AP Hotspot by ping
  Support pac to protect illegal client link AP configuration
  Support VLAN mgmtvid for WISP engineers to management system
  Support VLAN ethervid for WISP engineers to management system

Support pppoeflag for WISP engineers to management system

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

- Harsh Outdoor Environments Sustainable
  Certified IP68 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

This chapter describes 600AG serial in brief for your applications

1.2. Specifications

Outdoor WiFi Access Point Product SPEC List Ver:10_01	
Product Name	**600AG / M600AG**
Model Number	**IOP-OAPNB-N600AG / IOP-OAPNB-M600AG**
Product Description	**802.11a/b/g Intelligent Sequential Outdoor Wireless (Hi-mobile) Access Point**
Product Pictures	
Operation Mode	System : Bridge / Transparent Bridge / Router Wireless : Access Point (AP) / Wireless Station (AC)
Standard Support	
Wireless	IEEE 802.11a, IEEE802.11b/g
Ethernet	IEEE 802.3, IEEE 802.3u, IEEE 802.3af

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Interface	
Consol	RS-232 Port
Wireless	Antenna Connector：2* Reversed Female N-type
Ethernet	1*10/100 Base-T RJ-45 Power over Ethernet (PoE)
Memory	
SDRAM	64Mbyte
Flash	16Mbyte
Ethernet	
Max. Bandwidth	Full Duplex：100Mbps (100Base), 10Mbps (10Base) Half Duplex：50Mbps (100Base), 5Mbps (10Base)
Physical Spec.	
Power	DC 48Volt / 1A ; AC Adapter 100V~240V Power over Ethernet (PoE)
Dimension	L*W*H：226*197*79 mm
Weight	1700g
Dusty & Waterproof	IP68
Antenna	Reversed N-type (Option)
Regulation and Compliance	
US	FCC Part 15 Class B & C & E
Europe	EN 300 328, EN 301 489-1&17, EN 301 893, EN 60950 Compliant and CE Mark
Enviroment Spec.	
Operating Temp	-30 (-40) - 65℃
Storage	--40 - 80℃
Humidity	0% ~ 95% Non-condensing
System Setting	
Interface Operation Mode	Access Point (AP) / Wireless Station (AP Client)
System Operation Mode	Bridge / Transparent Bridge / Router
Wireless RF Spec.	
Modulation Technique	802.11 b/g：DSSS (DBPSK, DQPSK, CCK) OFDM (BPSK, QPSK, 16-QAM, 32-QAM, 64-QAM) 802.11 a ：OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Receiver Sensitivity	Receiver sensitivity: (PER < 8% for 11b ; PER < 10% for 11g &11a) 802.11b Sensitivity: DBPSK (1Mbps) -93dBm DQPSK (2.2Mbps) -92dBm CCK (5.5Mbps) -90dBm CCK (11Mbps) -88dBm 802.11g Sensitivity: BPSK(6Mbps) -89 dBm BPSK(9Mbps) -88 dBm QPSK(12Mbps) -86 dBm QPSK(18Mbps) -85 dBm 16QAM(24Mbps) -83 dBm 16QAM(36Mbps) -80 dBm 64QAM(48Mbps) -77 dBm 64QAM(54Mbps) -72 dBm 802.11a Sensitivity:

	BPSK(6Mbps) -88 dBm BPSK(9Mbps) -87 dBm QPSK(12Mbps) -85 dBm QPSK(18Mbps) -84 dBm 16QAM(24Mbps) -82 dBm 16QAM(36Mbps) -80 dBm 64QAM(48Mbps) -76 dBm 64QAM(54Mbps) -71 dBm
Wireless Transmission Rate	802.11 b/g : 11, 5.5, 2, 1 Mbps, Auto-fallback, up to 54Mbps 802.11 a : 54, 48, 36, 24, 18, 12, 9, 6 Mbps, Auto-fallback
Transmitted Power	802.11b Mode : 17dBm 802.11g Mode : 17dBm @ 6Mbps, 15dBm @54Mbps 802.11a Mode : 15dBm @ 6Mbps, 13dBm @54Mbps
Product Operate Setting	
Feature	**Main Feature :** 1.Daisy Chain 2.Trunk 3.DC-Mesh 4.High Speed Mobility (M Series) **Special Feature :** 1.Bridge Mode LAN DHCP 2.Dynamic WAN/LAN 3.Multiple RF Module 4.Multiple ESSID (VLAN) 5.Multicast Filter 6.Wireless Limited / Fixed Rate 7.Wireless Multicast Rate 8.Max RF Distance 9.Wireless Bandwidth Control 10.QoS 11.Wireless Survey 12.SNMP 13.NTP **Command Line :** 1.rateadaption 2.alt 3.nodeinfo 4.wlosthreshold 5.wlretry 6.apbmcfilter 7.brstp 8.wlmtoucast 9.mcastforward 10.mintxrate 11.mgmtvid 12.ethervid 13.pureg 14.cpeport 15.pac 16.pppoeflag
Security	**Main Security :** 1.MS NetBIOS Filter 2.Access ESSID 3.Hide ESSID 4.WEP-64/128/152bit 5.802.1x EAP-TLS / EAP-MD5 6.WPA-PSK / WPA-EAP 7. WPA2-PSK / WPA2-EAP 8.MAC Address Accept / Filter 9.RADIUS Server Client 10.Maximux AC connection Number **Special Security :** 1.Isolation 2.pac 3.mgmtvid 4.ethervid 5.service 6.pppoeflag

Notes on 802.11a operation frequency:

Some countries have allocated certain 802.11a frequency bands strictly for indoor use only, for example :

CE : 5.15 ~ 5.35GHz is for indoor only. Outdoor should use 5.47 ~ 5.725GHz.

FCC : 5.15 ~ 5.25GHz is for indoor only.

DGT : 5.15 ~ 5.25GHz is not allowed to use. 5.25 ~ 5.35GHz is for indoor only.

Japan : 5.15 ~ 5.35GHz for indoor only. Need to change the band to 4.9GHz.

Do make sure the operation frequency of 600AG serial follows your local regulation. Some areas may have penalty when operating outdoor AP in a wrong frequency band. We take no responsibility for any penalty or loss caused by using illegal frequency band for 600AG serial.

Chapter 2. Hardware Installation

This chapter describes the installation procedure of 600AG serial

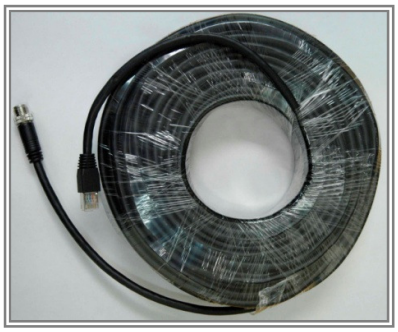
2.1. Package Contents

600AG/M600AG

1

2

4



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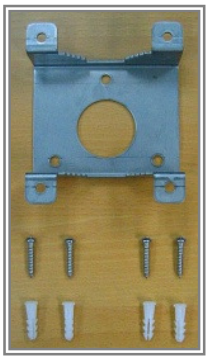

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1. 600AG/M600AG 802.11a/b/g Outdoor Wireless Access Point
2. PoE Power Injector
3. AC Power Cord
4. 2m MIL-C-5015 IP67 RS-232 Console Cable
5. 30m MIL-C-5015 IP67 Cat-5 Ethernet Cable
6. Wall Mounting Kit & Screw
7. Mast Mounting Kit & Screw
8. Grounding Wire
9. Quick Installation Guide (or download from ftp server)
10. CD: User Manual (or download from ftp server)

Please contact your local distributor if any of the above items is missing.

2.2. Hardware Description

1. The Outdoor AP Unit

The outdoor AP unit has two antenna ports on top, one data/power port and one console port at the bottom. The antenna ports are N-type female connectors. The data/power port is used to link to the cable from the PoE. When the outdoor AP unit and the PoE are connected together with proper power supply, the outdoor unit is turned on and initialized. The console port is used at the initial setup and to connect to the antenna alignment kit.

Front view of the 600AG/M600AG

Case Spec.

1. L × W × H: 226 × 197 × 79 mm
2. L × W × H: 245 × 197 × 79 mm (including connectors)
3. Weight: 1700g
4. Material: aluminums alloy

Top view of RF antenna connectors of 600AG

RF antenna connectors are major interfaces on the top of the 600AG/M600AG. They are two female N-type RF antenna connectors with special waterproof.

Bottom view of power/signal connector port & console port of 600AG

The port on right side of the photo is power/signal connector port. It is an 8-pin female connector with MIL-C-5015 IP67 waterproof. Connecting to the Power & Data Output Port of PoE.

The port on right side of the photo is Console port (TBD). It is an 8-pin male connector with MIL-C-5015 IP67 waterproof. Connecting to the PC for initial configuration and diagnostics & troubleshooting.

2. PoE Power Injector

PoE Power Injector is used to combine the data stream and power into one cable. It has three ports, AC IN is for 100~240V AC power from AC Power Cord, Data Input Port is connected the customer premises equipment (CPE) by Cat-5 cable, and Power & Data Output Port is connected to the outdoor unit by the cable described in item 5.

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Connections

Antenna Connector: 2 × Reversed Female N-type
Connect to Antenna base by Male to Male N-type CFD 400 RF Cable

Console 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 other end to a serial port on a notebook or a PDA that is running alignment / deployment tools program to analysis RF equipments.
Note: Use this console connection only when configuring the 600AG serial via the console.

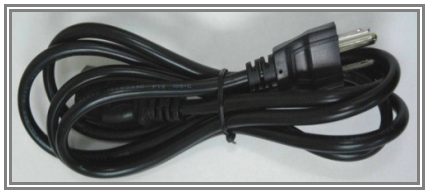
Ethernet Port
Connect one end of the 30m MIL-C-5015 IP67 Cat-5 Ethernet Cable into this port; connect the other end into the Power & Data Output Port on PoE Injector.

Power & Data Output Port
Attach one end of the IP67 Cat-5 Ethernet cable to this port, and the other end of this Ethernet cable is to Ethernet port on the 600AG serial.

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

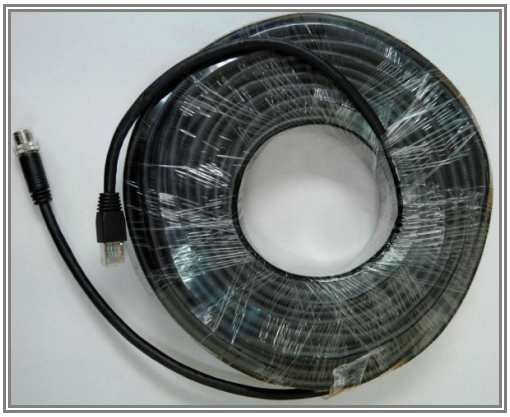
3. AC Power Cord

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



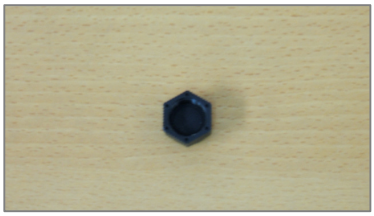
4. Cat-5 Ethernet cable with MIL-C-5015 connector

The Cat-5 Ethernet cable with MIL-C-5015 IP67 is used to provide the path to deliver power for the outdoor unit and the data communication.



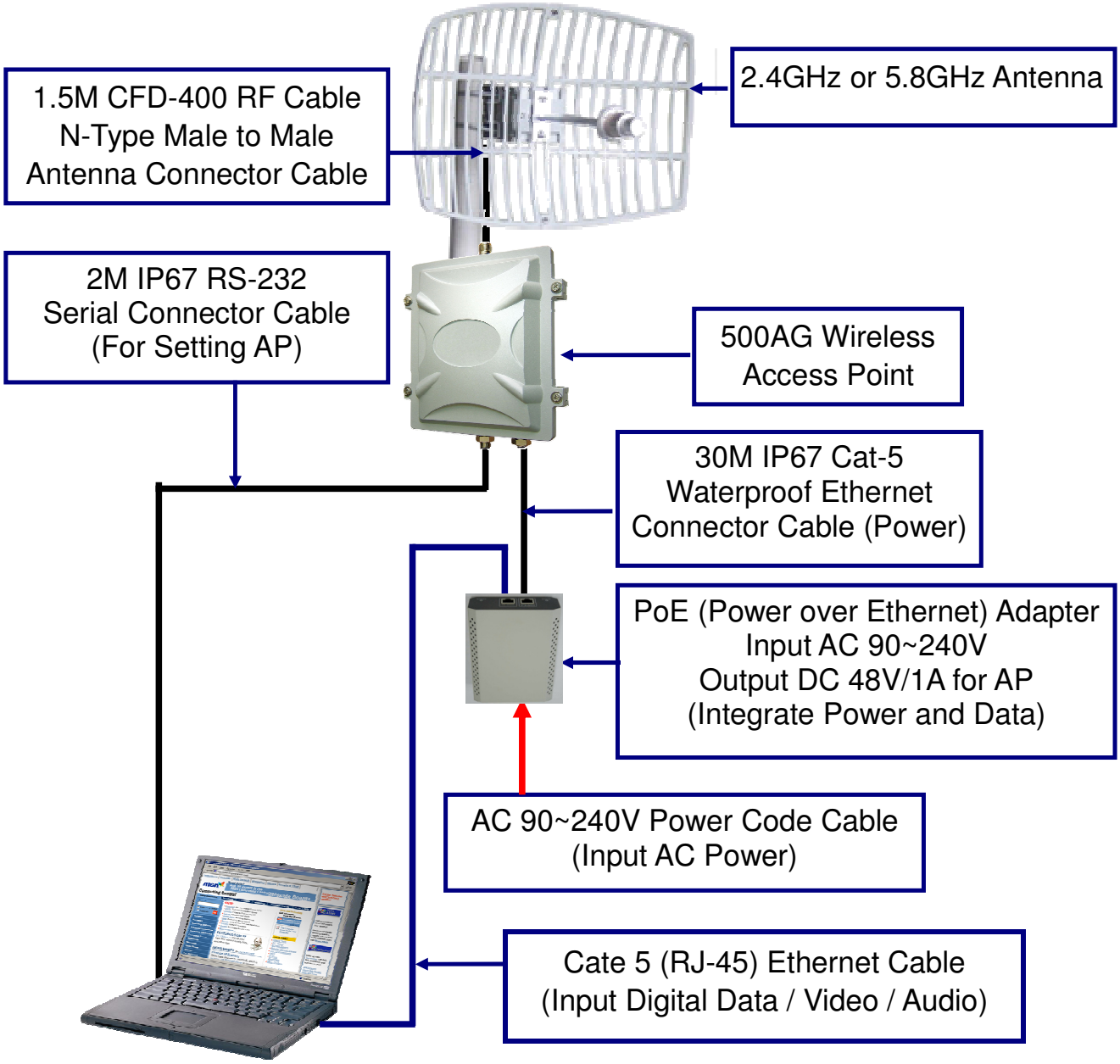
5. RS-232 console cable (2m MIL-C-5015 IP67 RS-232 Console Cable)

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



Water proof cap

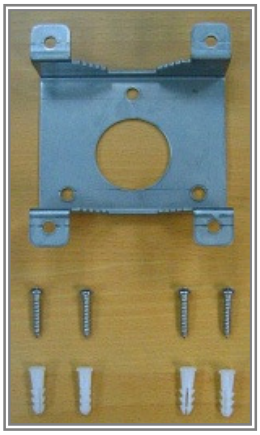
Outdoor Access Point Install Diagram



6. 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

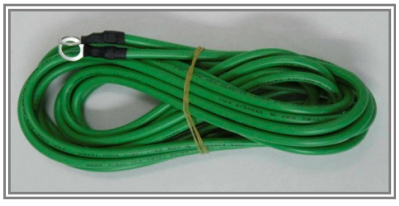



B. Mast Mounting Kit



7. Grounding wire

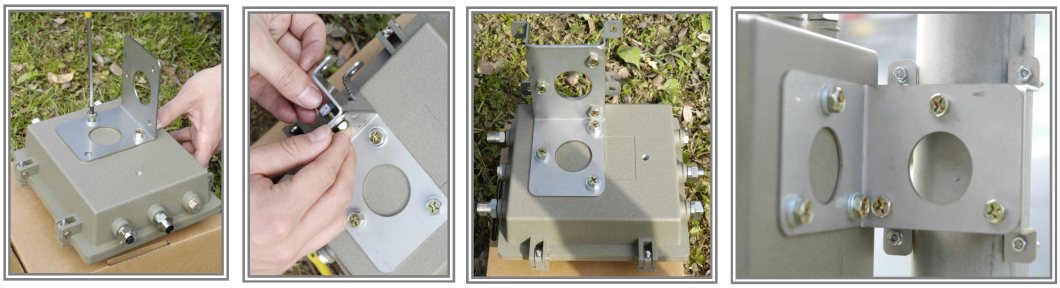
The grounding wire is used to provide the grounding path for the outdoor unit to minimize the impact of lightening and surge.



2.3. Outdoor Installation

The 600AG can be mounted on the wall or an antenna mast as shown in the following：

Step 1 Compose the holder of the 600AG



Step 2 Connect the female end of the power cord into the PoE Injector, and then connect the male end of the power cord into a power outlet. The red Power LED at the front of the PoE Injector will be on.

Step 3 Connect RJ-45 Ethernet connector from the 600AG into the Power & Data Output Port on the PoE. When the 600AG receives power over Ethernet cable, the 600AG will start its boot sequence and the yellow Active LED at the front of the PoE will be on.

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

Step 5 Connect MIL-C-5015 RJ-45 Ethernet cable into MIL-C-5015 Ethernet port at the bottom of the access point.

Step 6: Connect RS-232 Cable（Console Port cable） to the Serial Port. Connect the other end of RS-232 （the black one or the one marked with a black dot） to the serial port on a PC for setting up initial configuration; the other connector at the same end of RS-232（the blue one or the one without a black dot）is for antenna alignment /deployment tools.

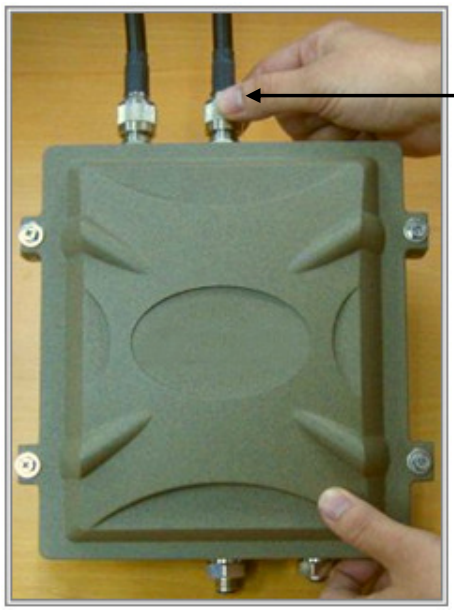
NOTE: This connection is required for setting initial configuration. After configuration is completed, this cable may be removed and put the waterproof hat on until additional configuration is required via the serial port.

Step 7 Attach the antenna to the antenna connector shown as follow.

Special Notice for Waterproof Installation

Most of the problems for outdoor models are from the connector connections that loosen over time due to vibration or other forces, even allowing moisture to penetrate the connector and seriously affecting the data and radio signal transmit. The following recommendation is used for all outdoor installation to be waterproofed.

Step1: Ensure fasten all connectors securely together.



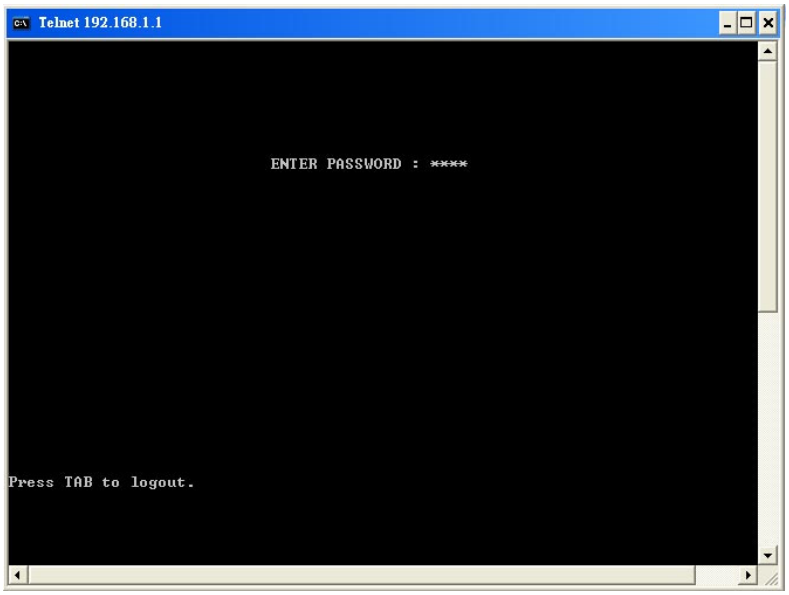
Step2: Tightly wrap two layers of self-bonding insulating tape (tapes from well-known brands are recommended) forward and backward over the physical connection extending 2 inches beyond the connectors or the end of heat-shrinkable tubing on the RF coaxial cable or omni-antenna connector, and overlapping the tape on each turn.

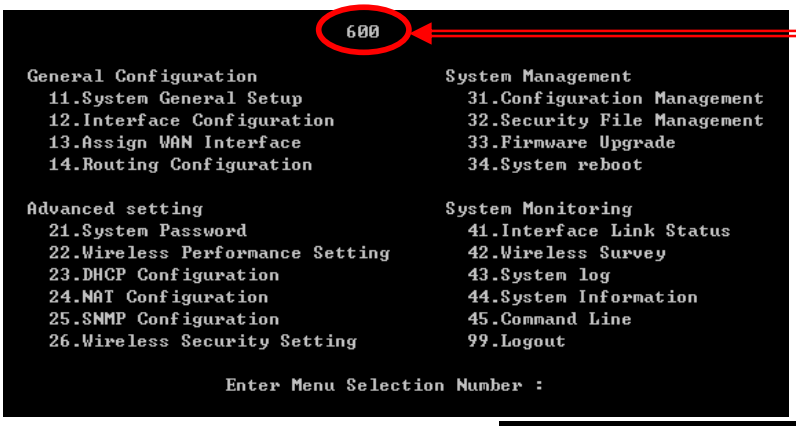
Chapter 3. Basic Configurations

This chapter introduces SMT of 600AG serial

3.1. System Menu Tree (SMT)

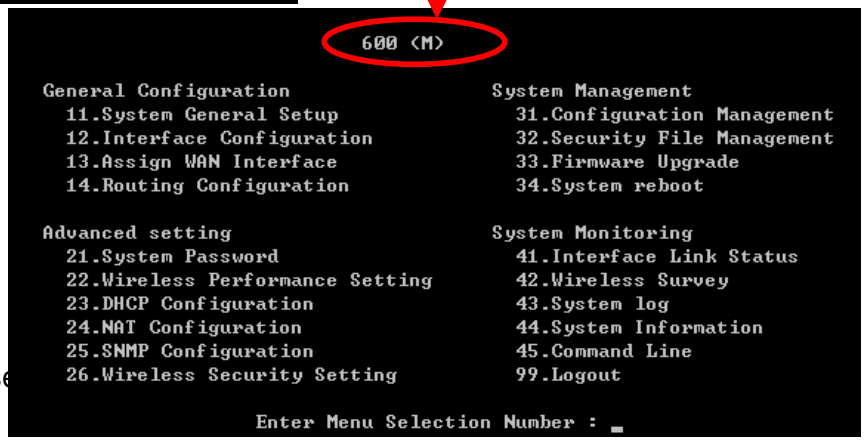
The 600AG main menu of the system menu tree (SMT) will appear after entering correct password of 600AG serial **(the default IP: 192.168.1.1 ; default password is 0000)**. **(Note: The Web UI is ID: admin / PW: password.)**





Normal Serial

Hi-mobile Serial
It has "M" Character



The main SMT menu is organized into four major sections:

- General Configuration
- Advanced Setting
- System Management
- System Monitoring

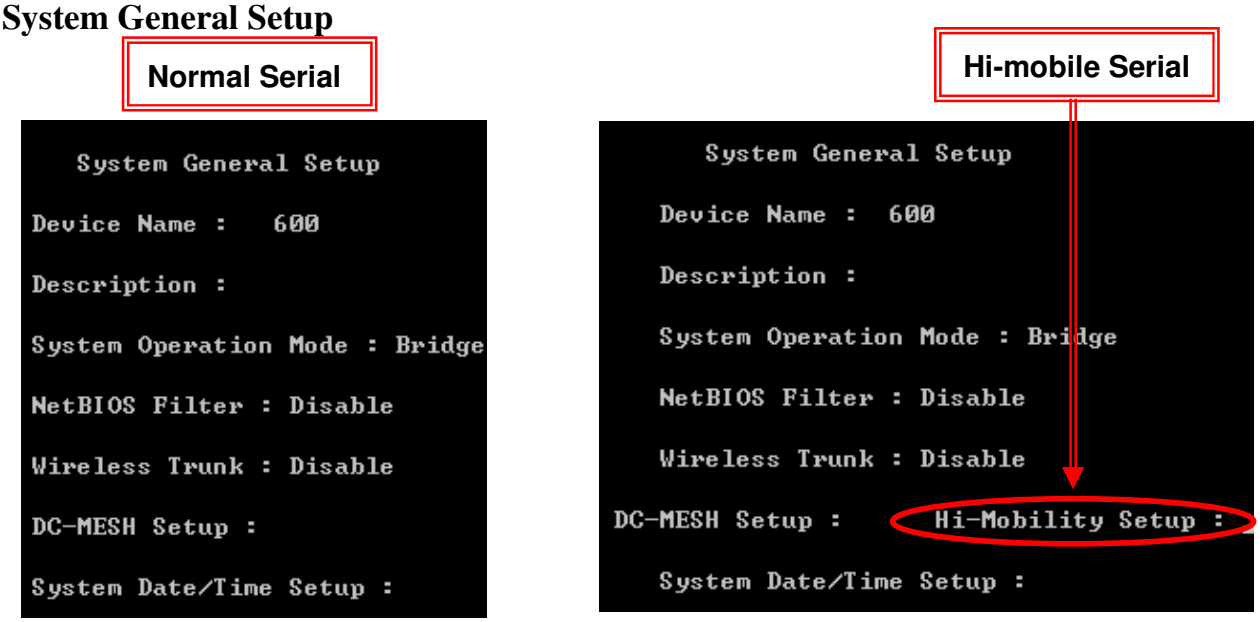
The following sections outline each se

3.2. General Configuration

The General configuration consists of four major parts:

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

11. System General Setup



- **Device Name**
  "Device Name" is a 32 bytes alphabetical string for naming the device for identification.
- **Description**
  "Description" is a 128 bytes alphabetical string to identifying a particular outdoor access point.
- **System Operation Mode**
  the AP can operate in **Bridge** mode, **Transparent Bridge** mode and **Router** mode. Note that when the AP is configured to operate in bridge mode, all interfaces operate as bridge. When it is operating in route mode, all interfaces have its own IP address. Here is a table showing the default IP setting in different operation mode below:

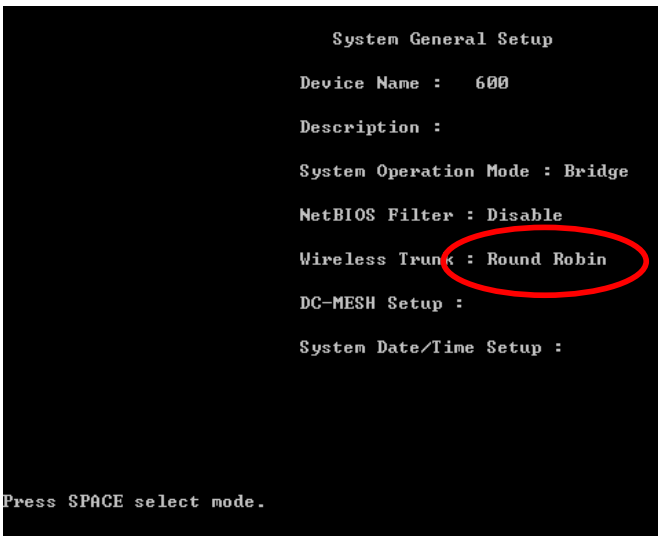
Operation Mode	Default IP Address		
	Bridge	Ethernet	Wireless-1
Bridge	192.168.1.1		192.168.1.1
Transparent Bridge	192.168.1.1		192.168.1.1
Router		192.168.1.1	192.168.100.254

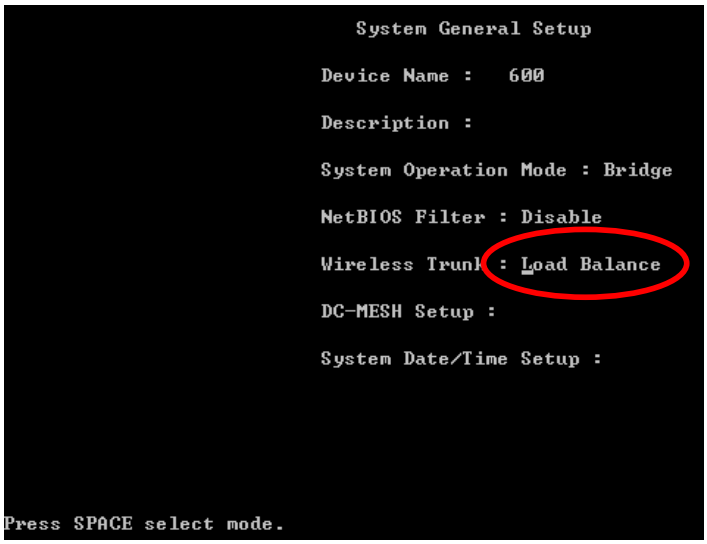
- **NetBIOS Filter**

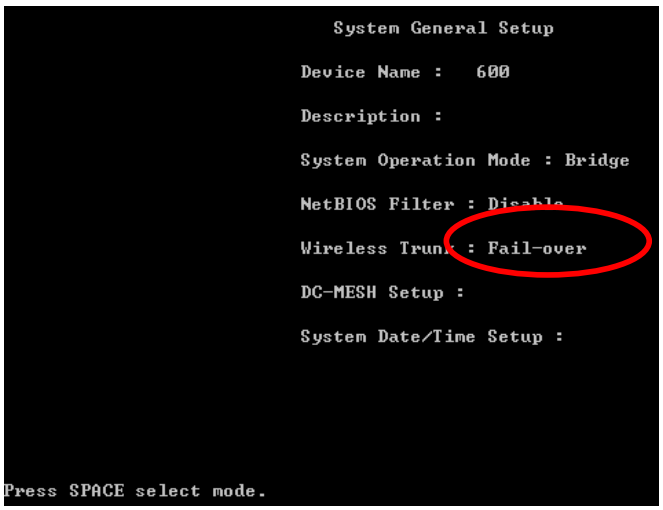
  When enabled, each client cannot be seen on Microsoft Network Neighborhood.

- **Wireless Trunk**

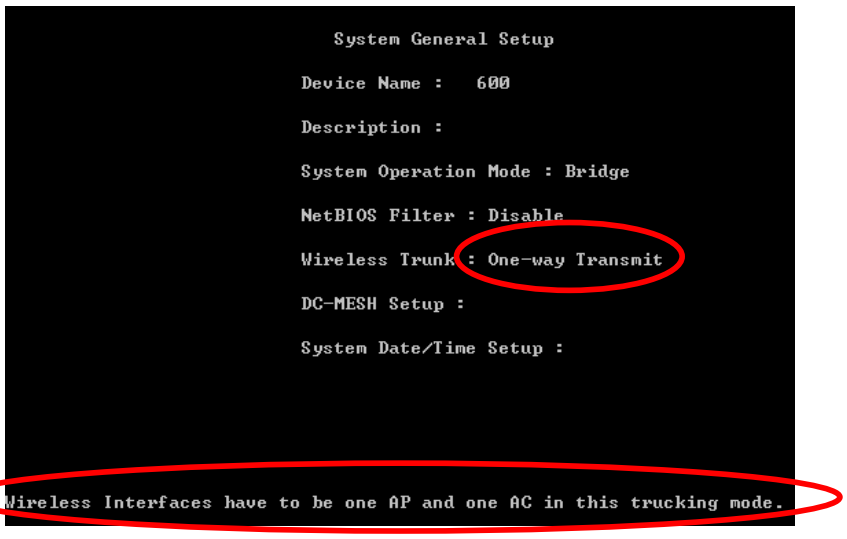
  Select different wireless trunking mode, namely Round Robin, Load Balance, One-way Transmit and Fail-over, to meet the system requirement.







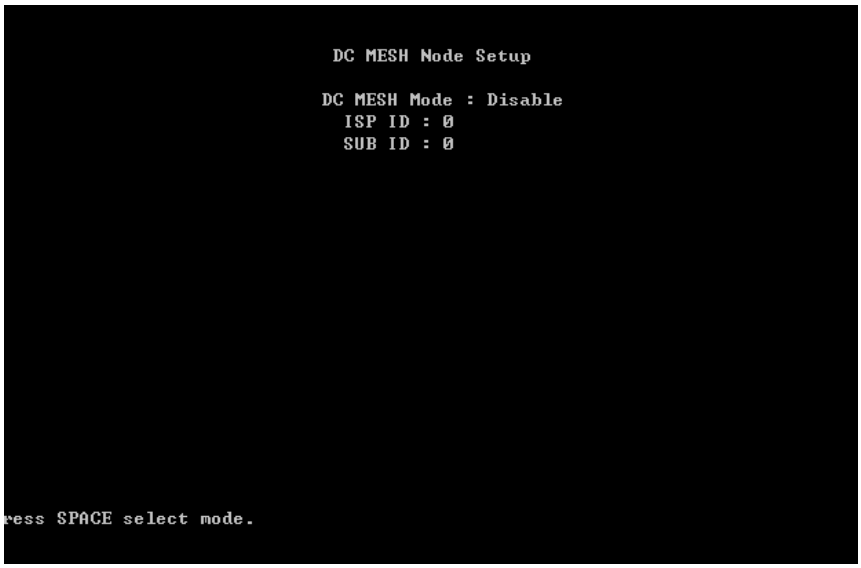
1. Round Robin can integrate two wireless links data rate and provide double throughput.
2. Load Balance can auto and smooth balance two links transmit data rate.
3. Fail Over is when design transmit frequency, one is 2.4GHz another one is 5.8GHz, normally use one link to transmit data, when this link is interrupted, another one link will auto continue to transmit data.
4. One Way Transmit can provide more low system loading and more stable link.



- **DC-MESH Setup**

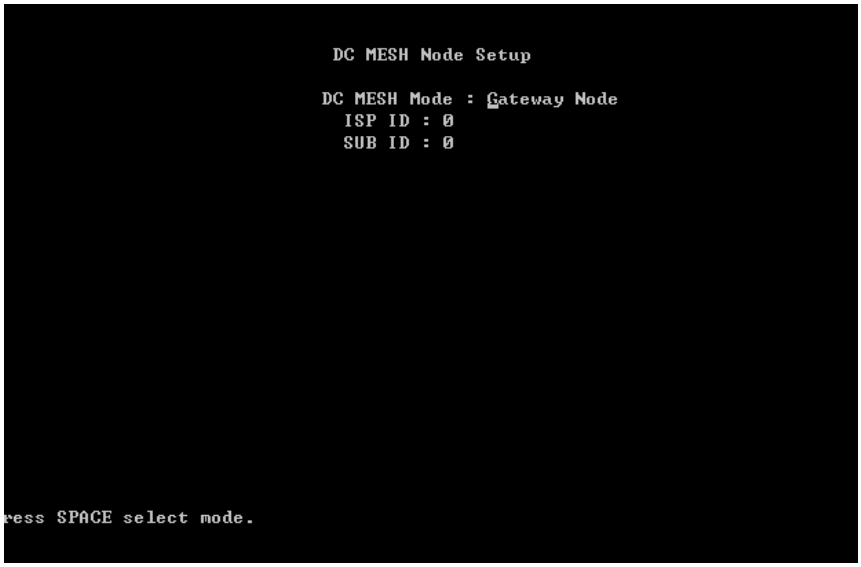
  To click the "→" key to enter a page which will help you to setup a Daisy Chain MESH node. There are 3 DC-MESH node statuses for configuration: Disable, Gateway Node and Normal Node. Parameters will change while DC-MESH mode is switching.

  DC-MESH mode: Disable



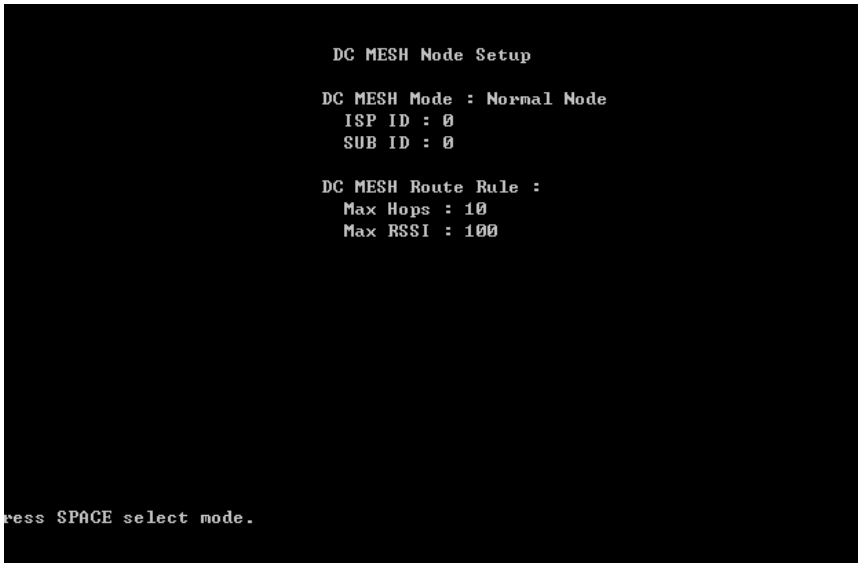
  Same DC-Mesh Group working need same ISP ID & SUB ID.

  DC-MESH mode: Gateway Node



  Any DC-Mesh Network Group need at least "One Gateway Node".

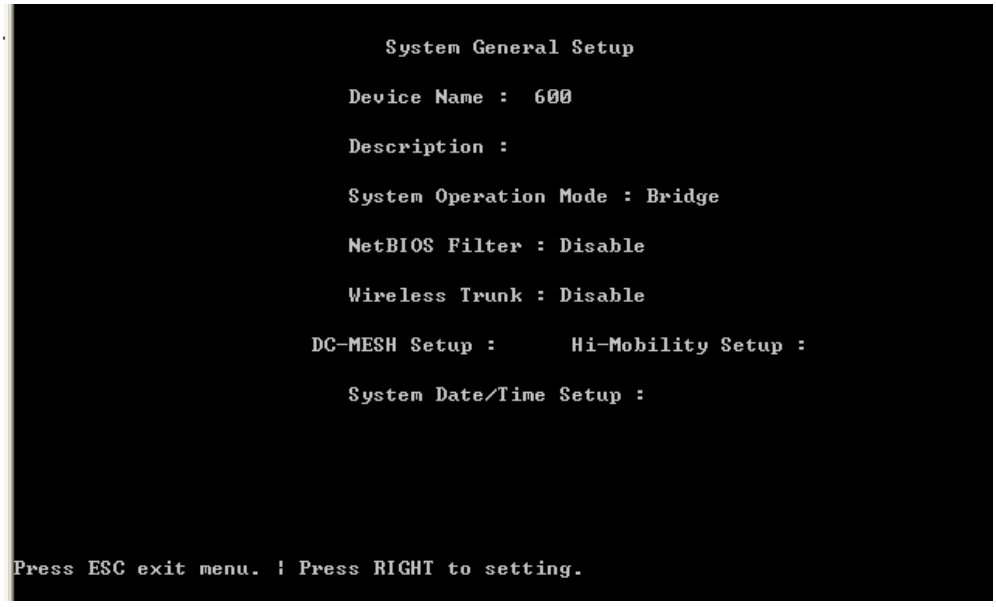
DC-MESH mode: Normal Node



DC-Mesh Route Rule base on Daisy Chain hops times and signal value calculate.

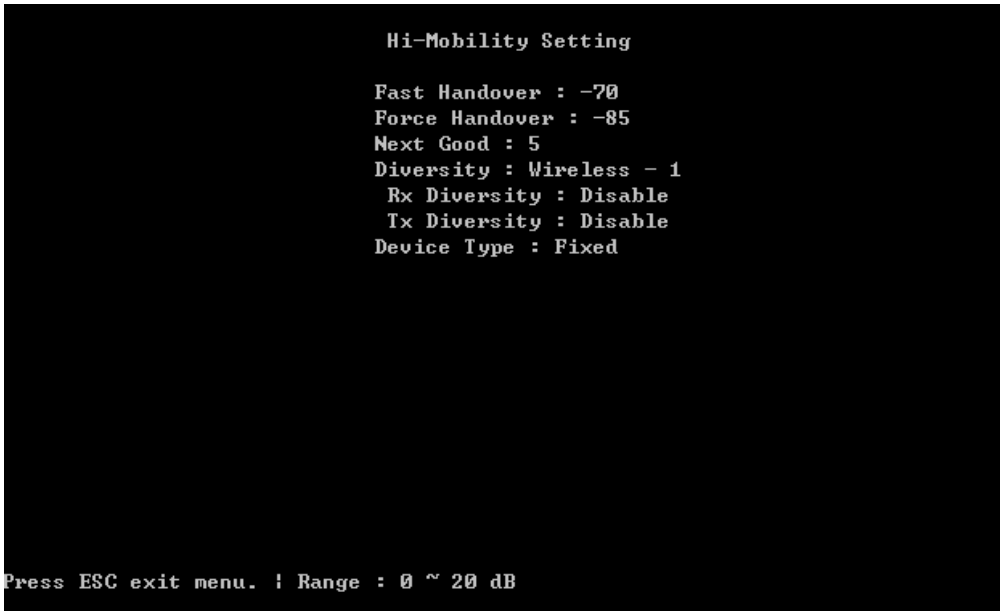
- Set System Date & Set System Time
  Set the date and time
- Current Clock
  Indicating the current clock of the AP (set by user).

- **Hi Mobility Setup**
  In SMT-11 ” Hi Mobility Setup:” Press RIGHT to setting, Hi Mobile features base on Daisy Chain system structure to be backhaul transmit bandwidth and Hopping to Center Control Area. Special design Auto Detect Signal handover functions for Hi Mobile AC to handover different APs.



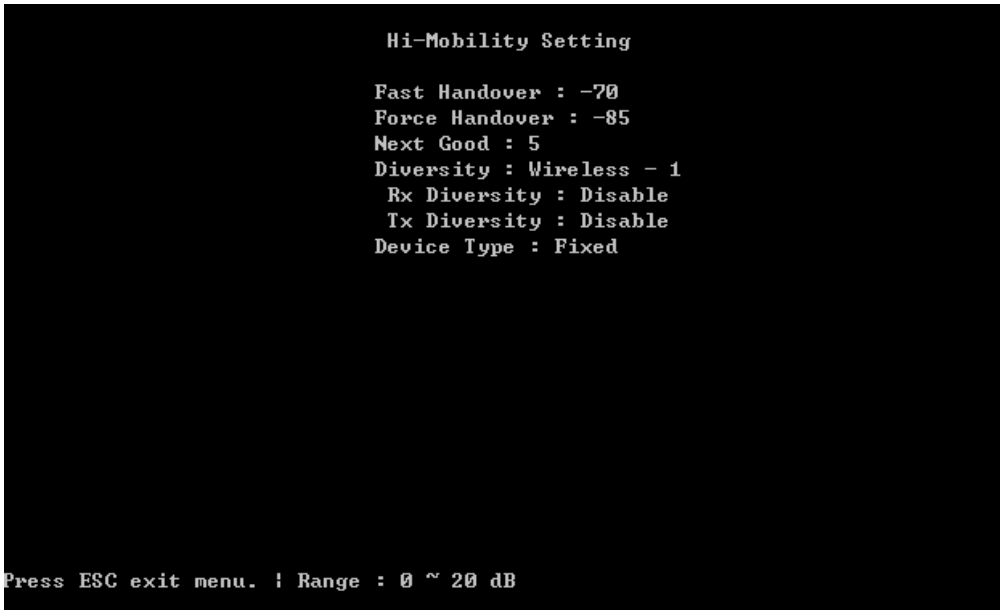
Fast Handover:

When the Hi Mobile AC link to Hi Mobile AP and find out the AP wireless signal RSSI value is under Fast Handover, then the Hi Mobile AC will start and auto to search another AP. When another AP signal RSSI is better more than linking AP, Hi Mobile AC will standby to handover to another AP (or direct to handover to another AP).



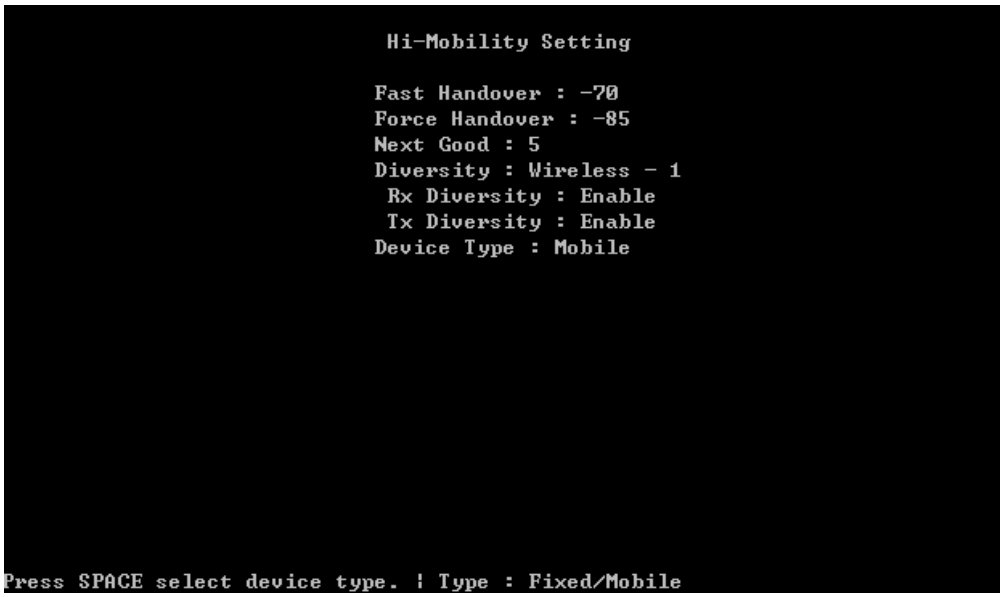
Force Handover:

When the Hi Mobile AC link to Hi Mobile AP and find out the AP wireless signal RSSI value is under Force Handover, the Hi Mobile AC will director disconnecting and try link to another Fast Handover better signal RSSI AP.



Next Good:

When the Hi Mobile AC link to Hi Mobile AP and find out the another AP wireless signal RSSI value is compare better more than 5dBm with linking AP, the Hi Mobile AC will director disconnecting linking AP and try link to another AP.



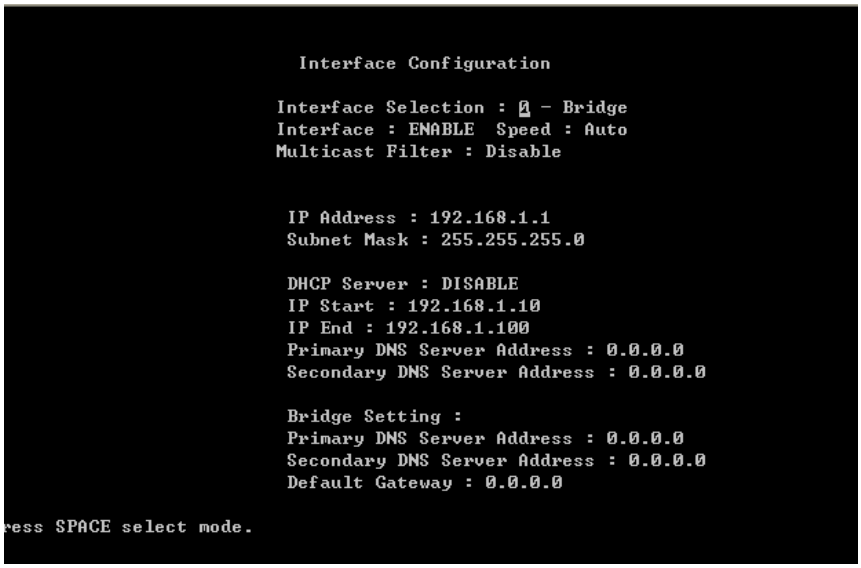
Diversity & Device Type:

Hi Mobility features base on Daisy Chain system structure, but it still can work DC-Mesh network at the same time.

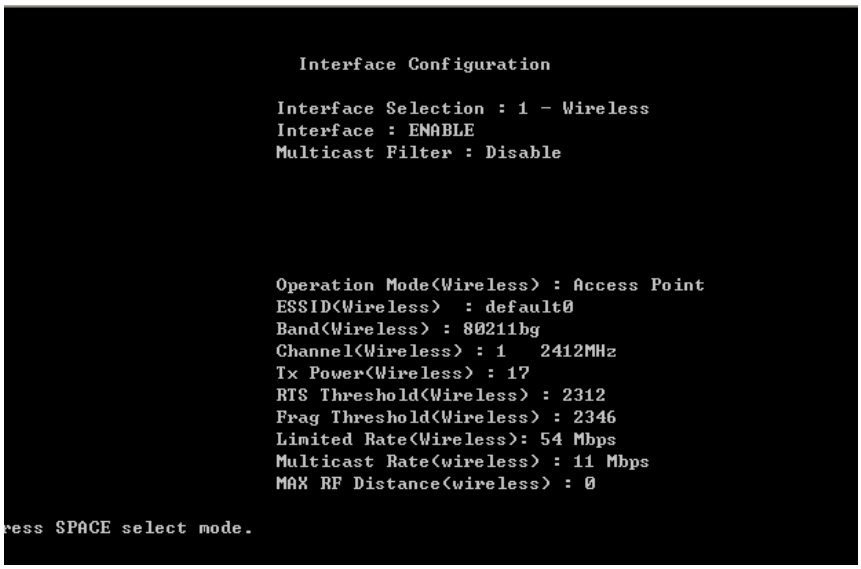
Diversity function is designed for Daisy Chain backhaul run with DC-Mesh and need to set Daisy Chain backhaul interface by Rx Diversity and Tx Diversity, when you have run “Daisy Chain” + ”DC Mesh” + ”Hi Mobility” at the same time, you need to enable Device Type at “Mobile”. If you just have run “Daisy Chain” + ”Hi Mobility” at the same time, you just need to enable Device Type at “Fixed”

12. Interface Configuration

SMT-12 is for configure the Ethernet interface and two wireless interfaces in 600AG. All the physical settings of the three interfaces are configured here. Each interface can be individually enable/disable. Note the message displayed at lower left-hand corner for more information for each selection item.



When 600AG is configured as a bridge, the IP address of 600AG is set in the Ethernet interface. Depends on the system, DHCP server and gateway can also be set in SMT-12. When 600AG is configured as a router, the interface configuration looks slightly different and its DHCP is set in SMT-23 DHCP Configuration, and the gateway is set in SMT-13 Assign WAN interface.



The following settings can be configured for the wireless interface:

- **Operation Mode**

  Wireless interface can be set as an access point (AP) or a wireless station (also called AP client

(AC)). When the interface is an AP, it accepts connection requests from wireless clients, such as wireless internet cards in PC or WiFi phones. When the interface is a wireless station, it looks for the AP with the same ESSID to connect. It will not accept any connection request from other wireless clients.

- **ESSID/MESSID**
  Assign ESSID to the interface for connection identification. Multiple ESSID (MESSID) can be assigned by pressing right key. Up to eight different ESSID can be assigned for each wireless interface.

- **Band**
  Select between 2.4GHz 802.11b/g or 5GHz 802.11a.

- **Channel**
  Operation channel for the wireless interface. When the interface is set as a wireless station, selecting Channel 0 AUTO let the interface automatically detect the appropriate channel used by the AP with the same ESSID.

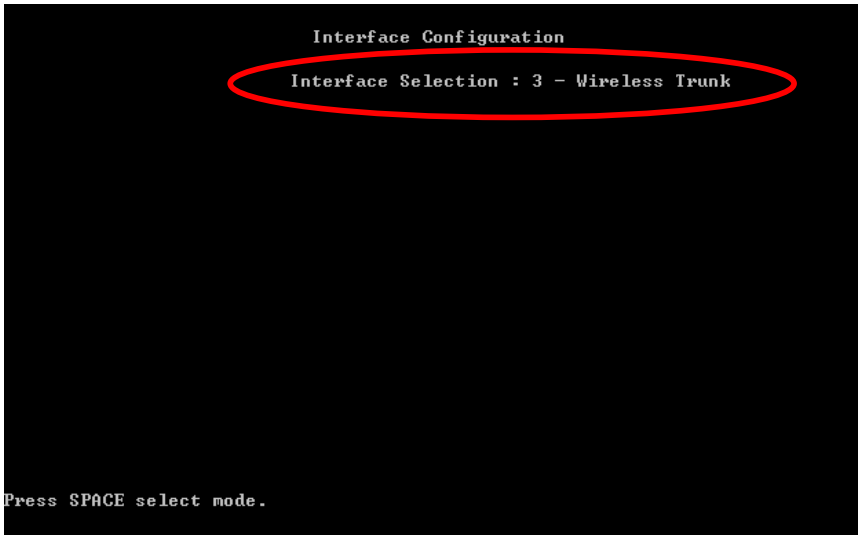
- **Tx Power**
  Set the transmit power of the interface (the RF card).
- **RTS Threshold**
  Setting the packet size to trigger RTS/CTS enable. This is normally set in AC side only because the hidden station problem does not exit from the perspective of the AP. RTS Threshold can be set between 1 and 2312 bytes.

- **Frag Threshold**
  Setting the packet size to activate fragmentation. Frag Threshold can be set between 1 and 2312 bytes.

- **Link Rate**
  Set the data link rate for 600AG. When it is set to AUTO, 600AG will use the maximum possible link rate to transmit the data.

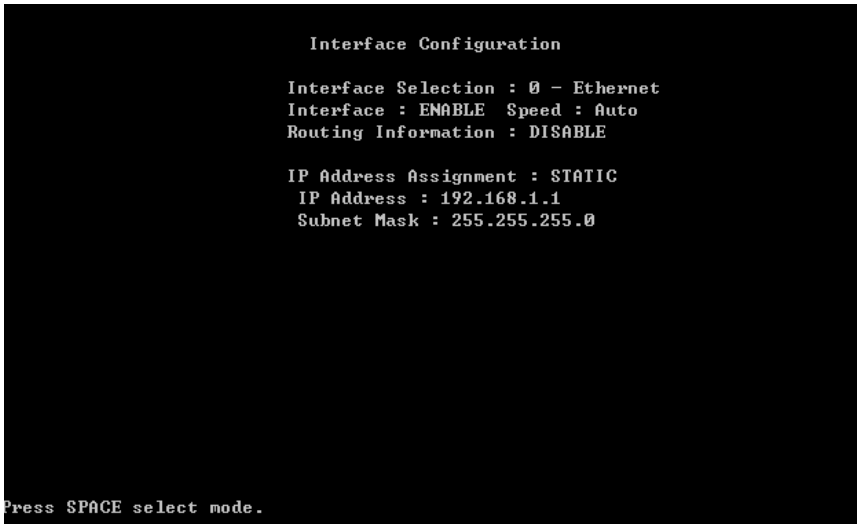
- **MAX RF Distance**
  600AG can adjust the TTL of packets according to the given distance to improve the communication quality. It is recommended to set MAX RF Distance when the distance of point to point connection is greater than 7km. (Suggest you, when the distance under 1km still setting 10)

In addition, when 600AG is operating in Router Mode, each interface can be individually assigned IP address and gateway.



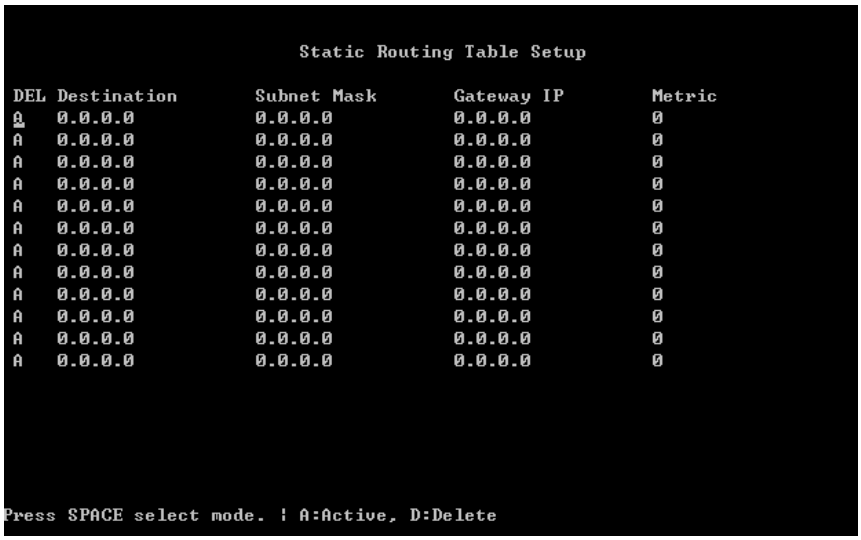
This " 3 – Wireless Trunk" interface will appear when wireless trunk is enabled in SMT-11. When 600AG is operating in bridge mode, additional IP address can be assigned to this wireless trunk.

13. Assign WAN Interface



Either the Ethernet or the wireless interface can be specified as WAN and assign gateway. This only available when the 600AG is operating in router mode.

14. Routing Configuration



Up to 12 rules of static routes can be configured here.

3.3. Advanced Setting

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

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

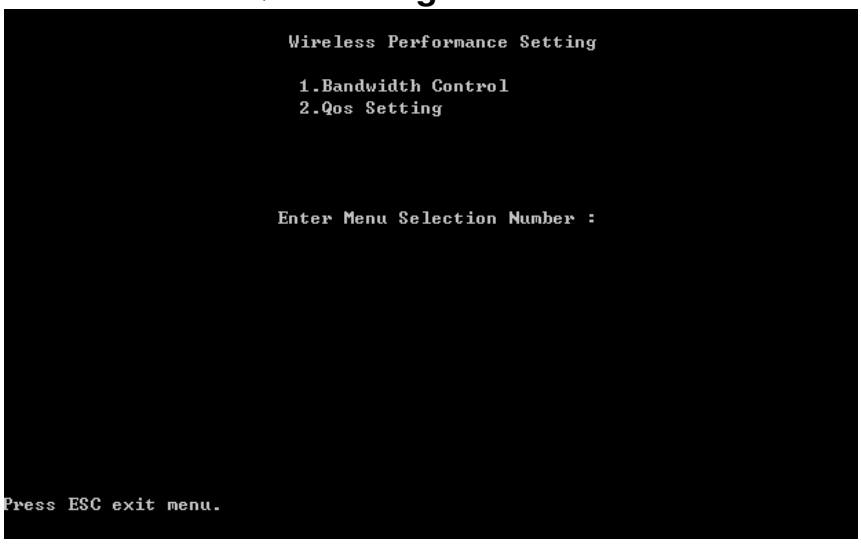
21. System Password

The default password to enter 600AG serial SMT is 0000. SMT-21 let the user change the password to control 600AG. The new password will take in place on the next login.

(Note: The Web UI is ID: admin / PW: password.)

In the case of forgotten password, the only way to enter SMT to control 600AG is by hard resetting the 600AG to factory default, detailed in Chapter 5 of this manual. However, hard reset will erase all the configurations that had on the 600AG and make all the setting back to factory default.

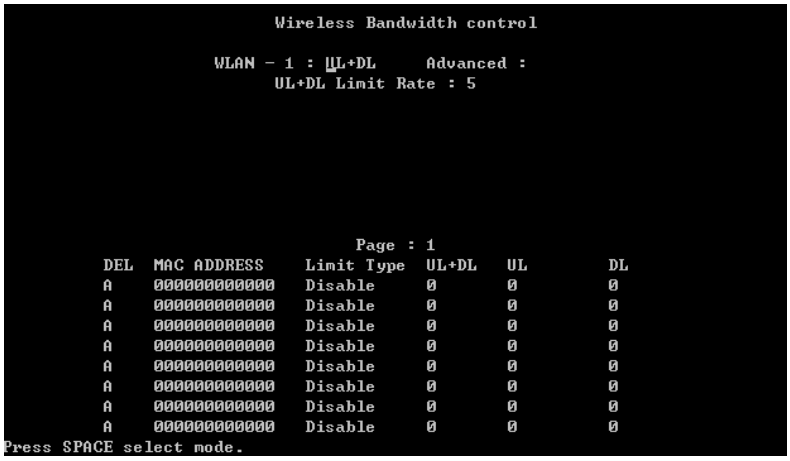
22. Bandwidth Control & Qos Setting



Bandwidth Control is special design for wireless AP & AC to run Up Load (UL) and Down Load (DL) transmit more stable and more user can working at same time.

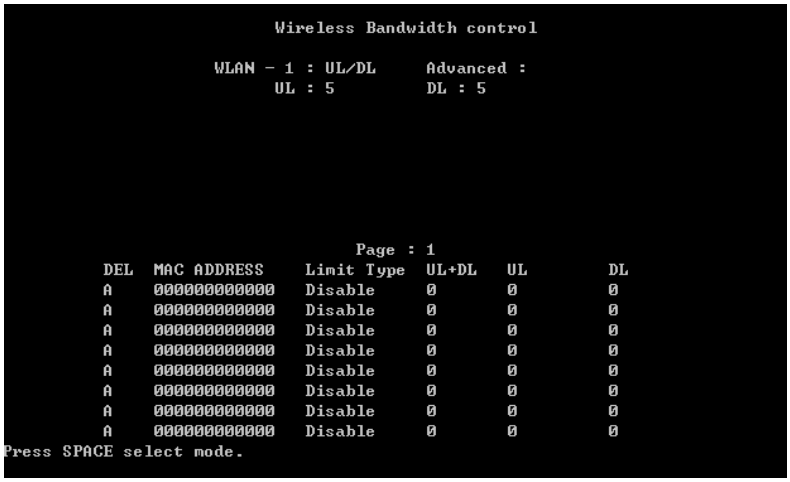
Bandwidth Control

- **UL+DL Limit Rate**



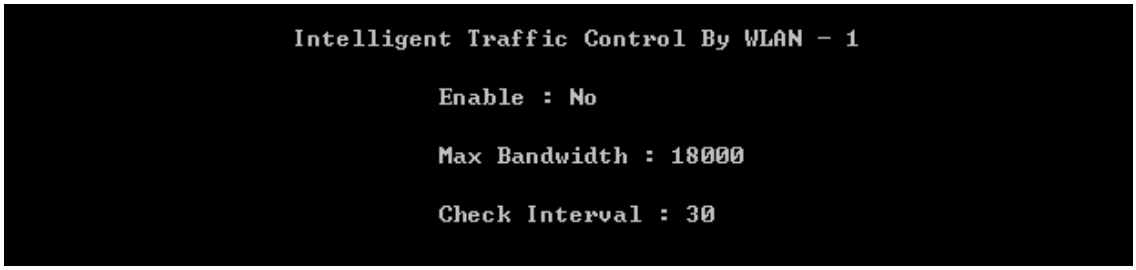
UL+DL as bandwidth control running by total bandwidth base on UL+DL setting link rate.

- **UL / DL Limit Rate**



UL / DL as bandwidth control run by Independent Upstream and Downstream bandwidth base on UL / DL setting link rate.

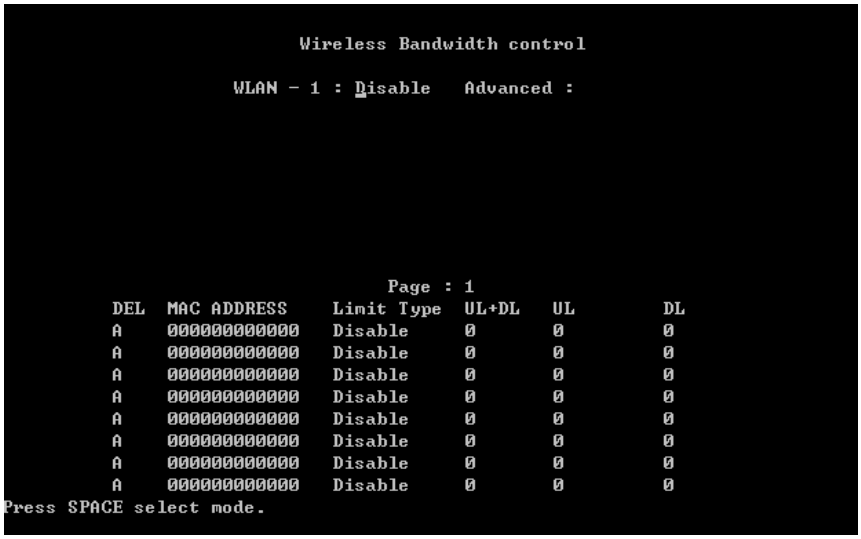
- **Intelligent Traffic Control**



Intelligent Traffic Control is auto check AC link amount then base on Check Interval time setting to control Max Bandwidth for all links to share bandwidth.

When you had setting UL+DL or UL / DL first, you still can set Intelligent Traffic Control functions; all bandwidth control feature can work at the same time to provide very various applications.

- **Bandwidth Control by each MAC address**



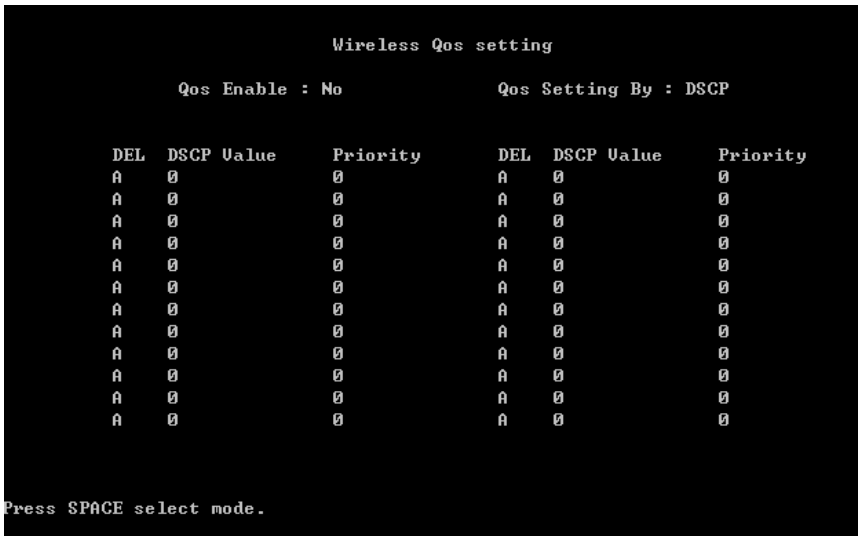
Downstream and upstream data rates for subscriber or the client devices connecting to 600AG can be defined here. There are two bandwidth limit types in 600AG serial. Symmetrical bandwidth limit consolidates download and upload rate of each single client connection. Asymmetrical bandwidth limit specifies download and upload rate of client connections. Once the bandwidth limit is enabled, the limitation applies to all clients that connect to the 600AG.

For specific client connections, the system provides a table for network administrator to limit bandwidth of each individual client by MAC address. Once these client MAC addresses are set in the table, the general bandwidth limit rule will not apply to the connection of devices with these MAC address. Only the specified bandwidth limit rule applied.

At the same time, bandwidth control all function setting, those MAC addresses bear the highest priority.

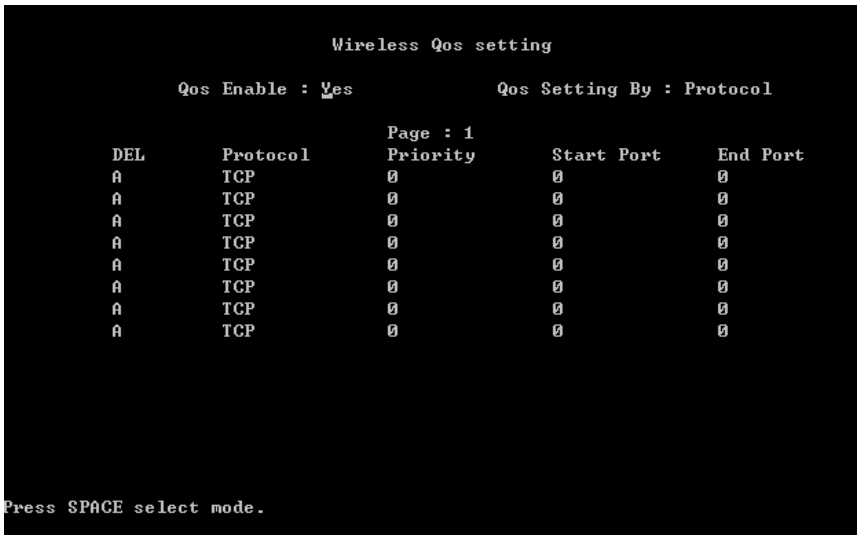
Wireless Qos setting

- **Qos Setting By DSCP (Differentiated Services Code Point)**



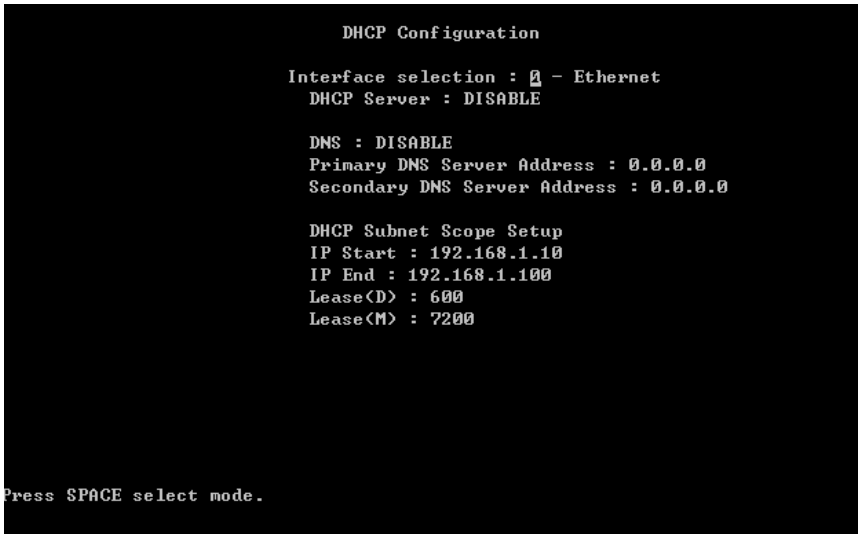
Differentiated Services Code Point base on different service package styles have different transmit priority. QoS-DSCP standard to setting Priority including Mail 、FTP 、Audio、Video 。

- **Qos Setting By Protocol**

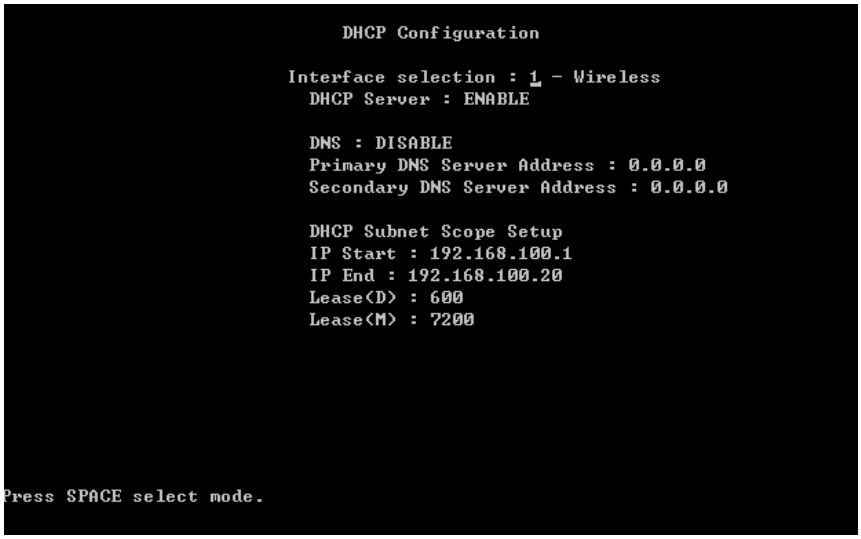


Base on TCP/UDP protocol and transmit Port number range to decide transmit priority. Port to setting Priority including Mail 、FTP 、Audio、Video

23. DHCP Configuration



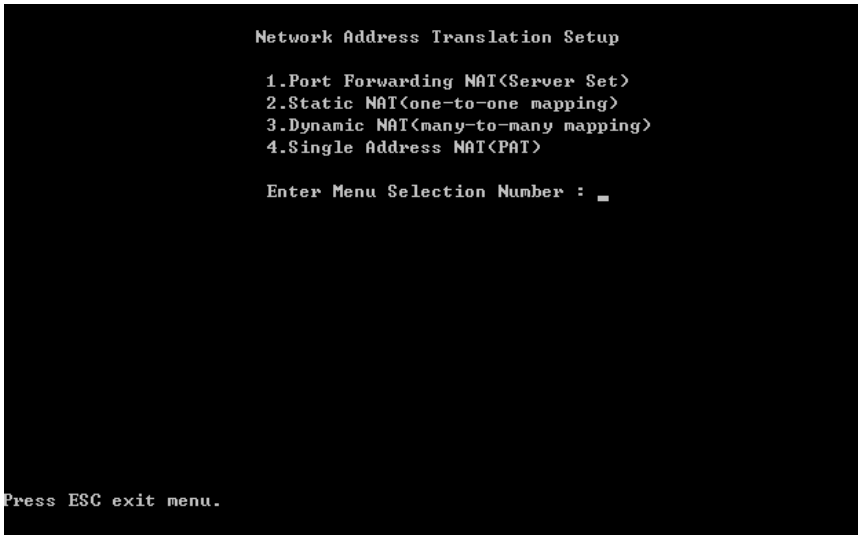
DHCP can work at bridge intranet LAN enviroment or router mode.



The scope of DHCP client pool that corresponds to the selected interface and subnet are defined in this menu. Lease (D) is the duration that the DHCP server grants to the DHCP client permission to use a particular IP address. Lease (M) is the maximum lease time.

Each Ethernet or wireless interface can be the gateway of its own subnet. Hence there can be three subnet domains in one 600AG serial in routing mode. This DHCP configuration is only available when 600AG is operating in router mode.

24. NAT Configuration

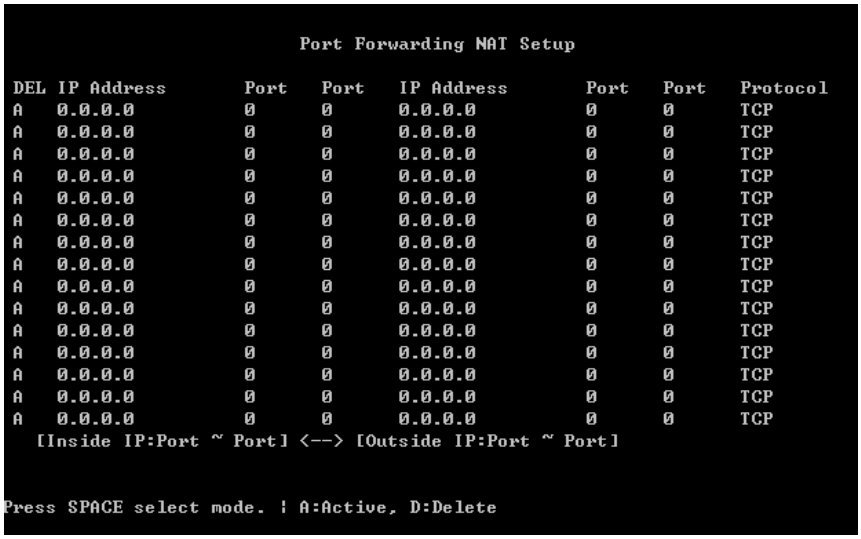


Network Address Translation can be setup in four different ways :

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

This configuration in only available when 600AG is operating in router mode.

Port Forwarding

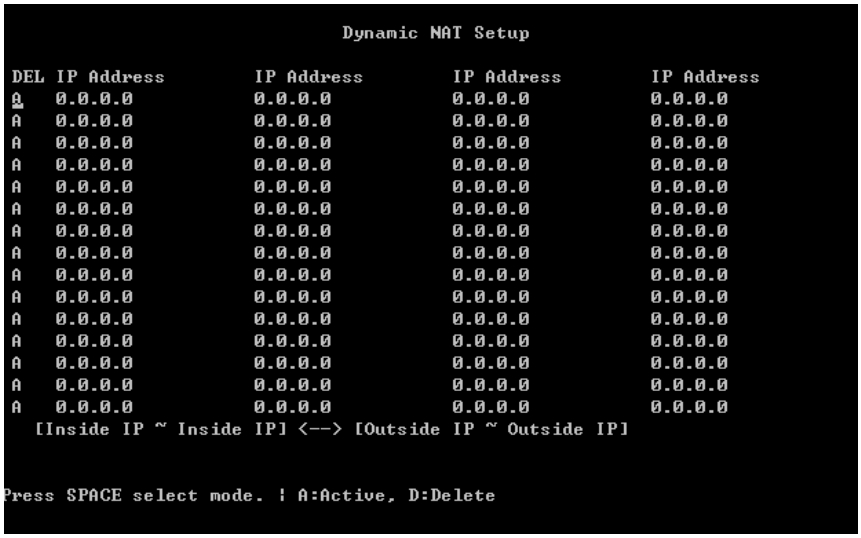


Server sets where internal IP addresses are mapped according to the TCP or UDP port are defined in this Port Forwarding NAT sub-menu.

Static NAT

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

Dynamic NAT

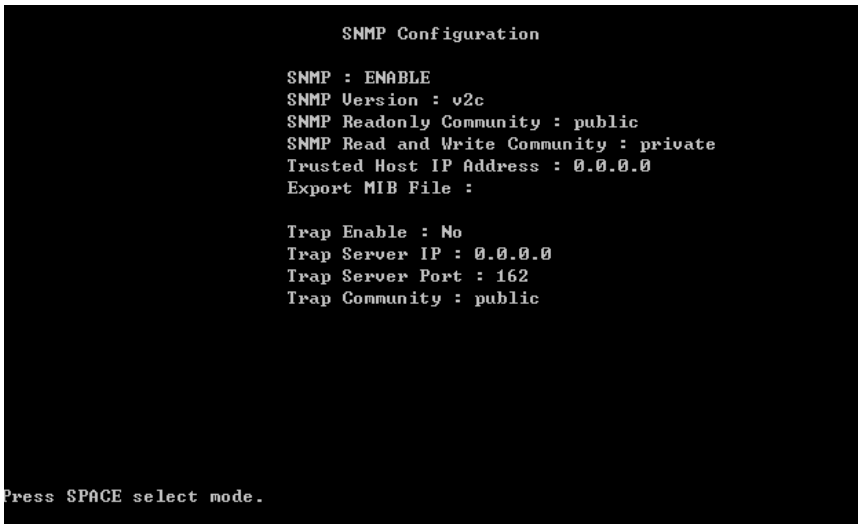


A range of internal IP address can be mapped to a range of global IP address.

Single Address (NAT/PAT)

A range of internal IP addresses can be mapped to a single global WAN IP addresses here.

25. SNMP configuration



SNMP is configured here for simple network management. 600AG serial supports all SNMP v1, v2 and v3. we has experience working with ILECs, CLECs, WISPs and MSOs.

26. Wireless Security Setting

Comprehensive security settings are available on 600AG serial in this menu. These include Hide ESSID, WEP Keys, 802.1x EAP-TLS, 802.1x EAP-MD5, WPA/WPA2-PSK, WPA/WPA2-EAP, MAC Address Filtering and RADIUS. Details of each type of security are in appendix. The security setting of each wireless interface is configured separately. Note the message at the bottom of SMT page for information on each selection items.

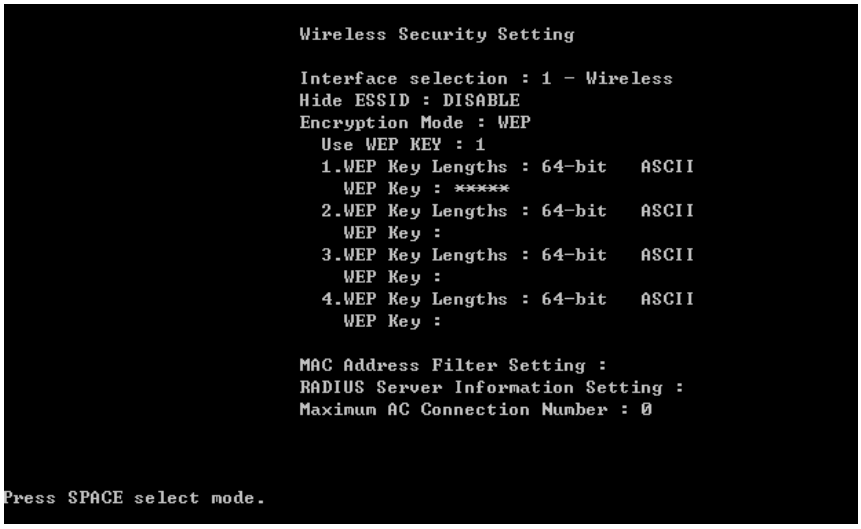
- **Hide ESSID**

  When Hide ESSID is enabled, the ESSID of an AP will not be seen so only the authorized AC knows the existence of the AP. This prevents an unexpected client connecting to the AP.

- **WEP**

  600AG serial supports 64-bit, 128-bit and 152-bit WEP key in both ASCII and HEX format. Do make sure the correctly number of digits/characters and format of WEP key as shown in the table are entered. Note that in HEX format, HEX number cannot start with "0". An error message will appear upon exiting SMT-26 when an illegal WEP key is entered.

Number of digit / character	ASCII	HEX
64-bit	5	10
128-bit	13	26
152-bit	16	32
Can use Number or Character	0~9 & a~z	0~9 & a~f
Example1-64bit	power	abcdef1230
Example2-128bit	1power5429395	0123456789abcdef9876543210
Example3-152bit	lopower035429395	fedcba0123456789abcdef9876543210

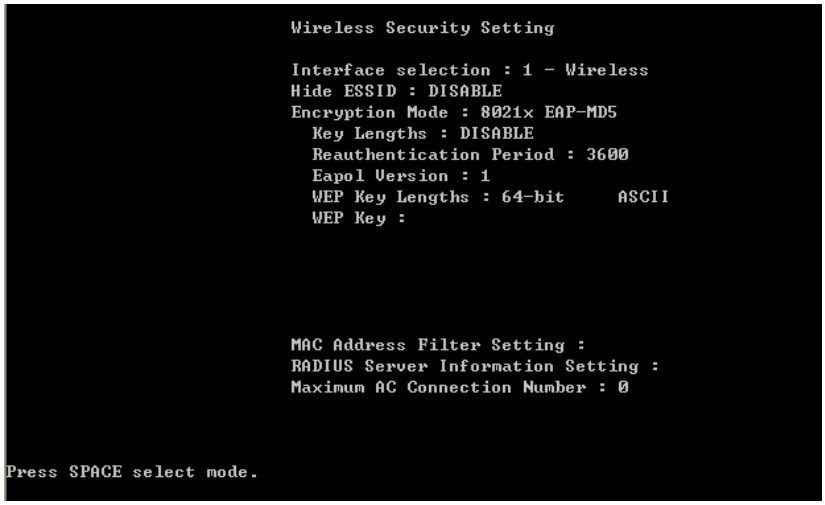


- **802.1x EAP-TLS**

  Both 64-bit and 128-bit WEP can be set for reauthentication period up to 65535 seconds. Two Eapol (EAP over LAN) versions are available.

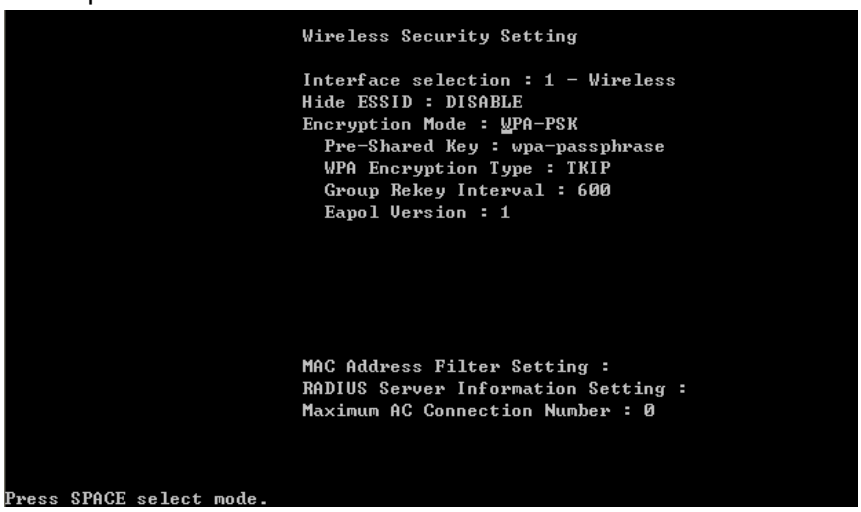
- **802.1x EAP-MD5**

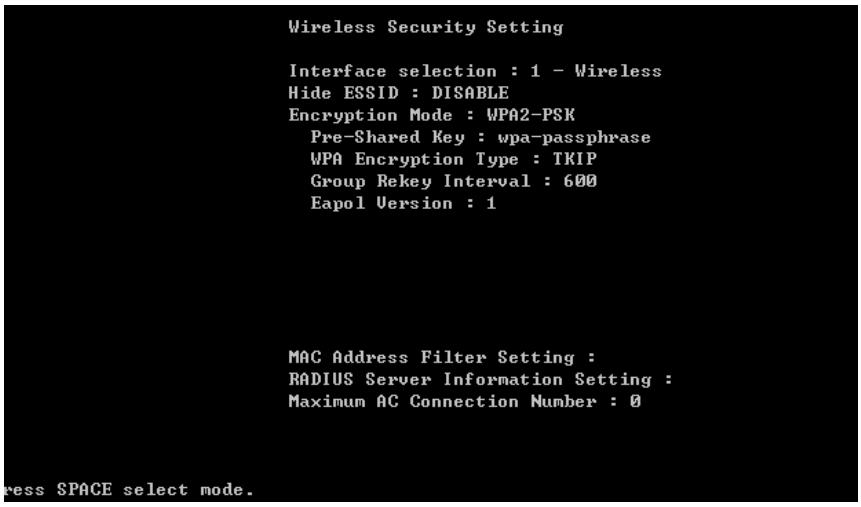
WEP Key of 64-bit, 128-bit and 152-bit in both ASCII and HEX format can be set for EAP-MD5. Two Eapol version are available with reauthentication period of up to 65535 seconds.

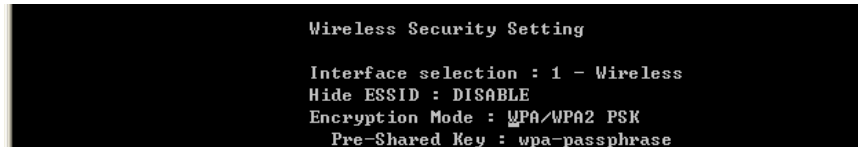


- **WPA-PSK / WPA2-PSK / WPA/WPA2-PSK**

Both TKIP and CCMP encryption are available for WPA-PSK / WPA2-PSK / WPA/WPA2-PSK. Pre-shared key of 8 to 63 characters are required. Group Rekey Interval can be set up to 65536 seconds. Two Eapol version are available.

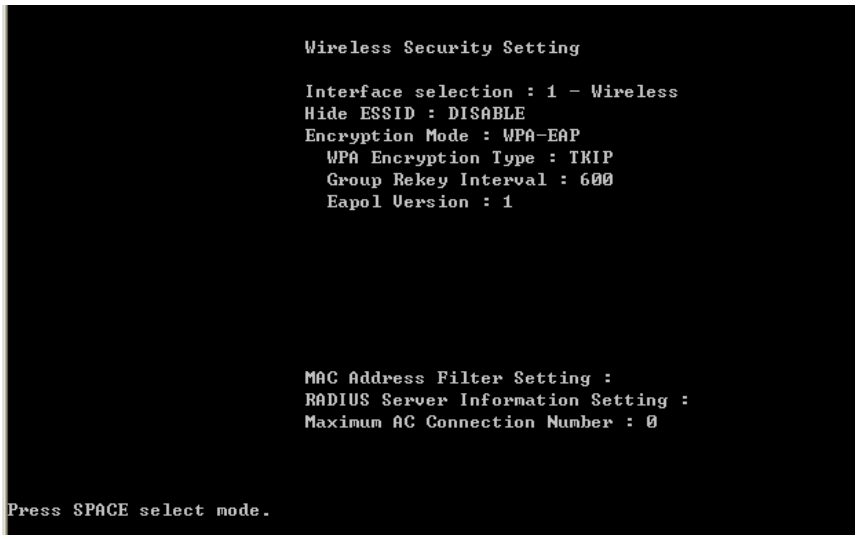


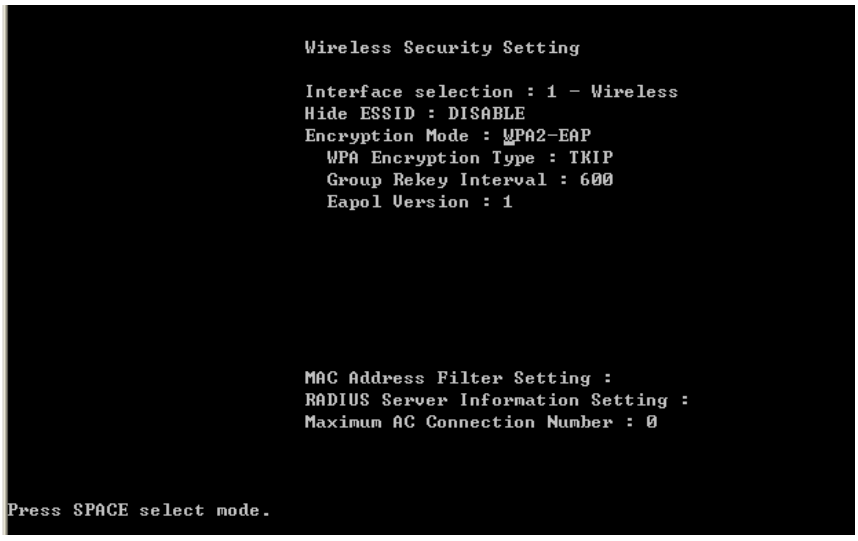


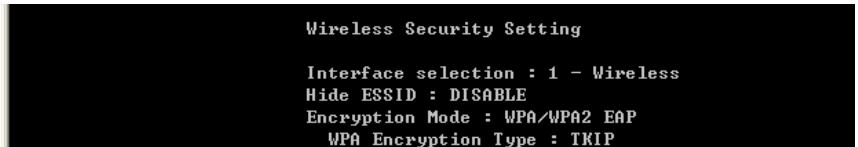


- **WPA-EAP / WPA2-EAP / WPA/WPA2-EAP**

  Both TKIP and CCMP encryption are available for WPA-EAP / WPA2-EAP / WPA/WPA2-EAP. Pre-shared key of 8 to 63 characters are required. Group Rekey Interval can be set up to 65536 seconds. Two Eapol version are available.

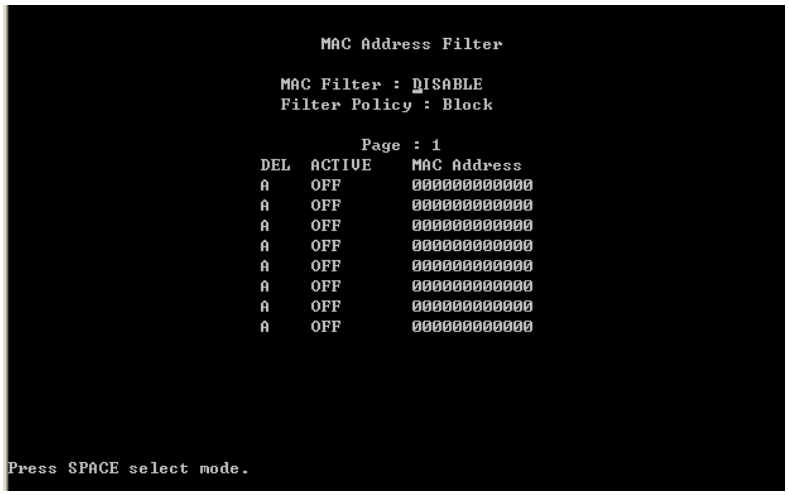






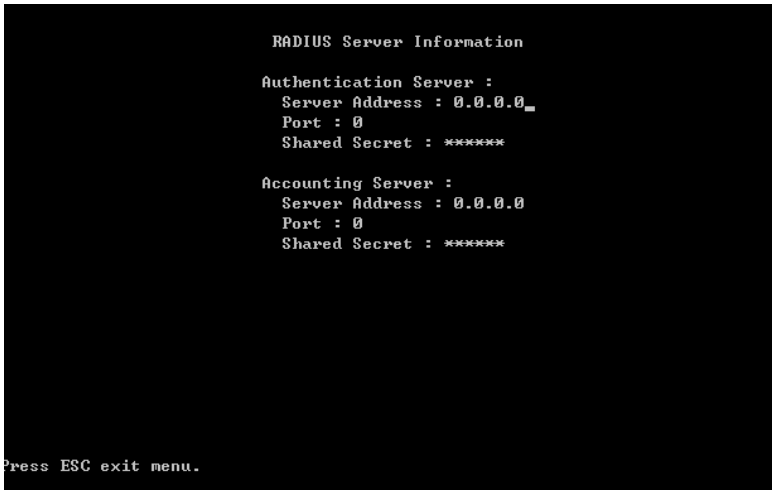
- **MAC Address Filtering**

  600AG serial can control the client connection by accepting or blocking the traffic from devices of specific MAC addresses.

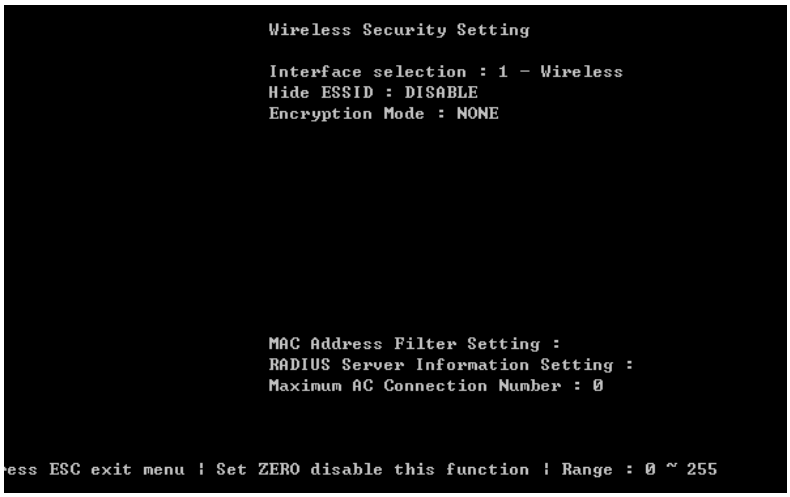


- **RADIUS**

RADIUS settings for 802.1x protocol authenticating with the remote RADIUS server for authenticating, authorization and accounting are set in this menu.



- **Maximum AC Connection Number**



Depend on your deployments system and service design plan, you can set Maximum AC connection amounts from 1~255 AC. (Default 0 is disable this function)

When too many AC demand to link AP, need the useful AC release connection after new AC just can has connect right to get AP service.

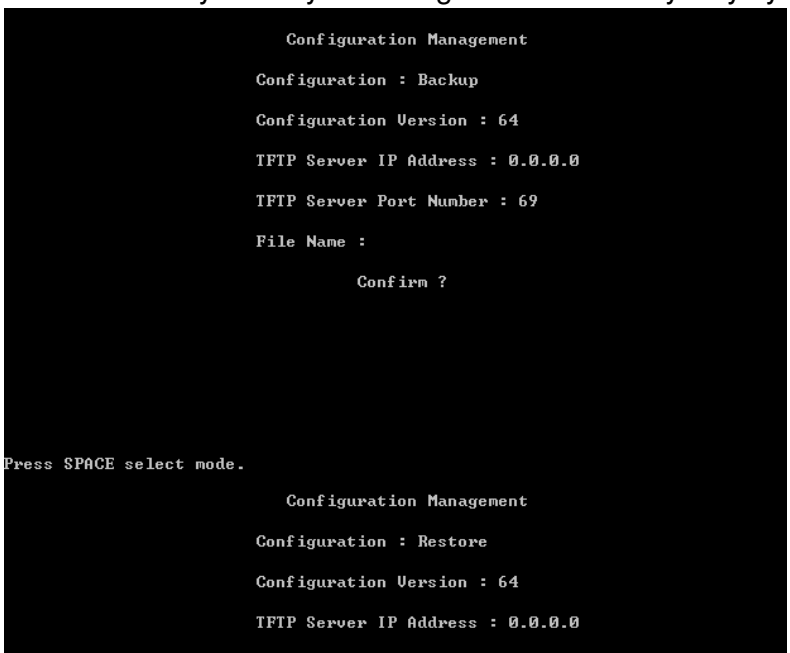
3.4. System Management

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

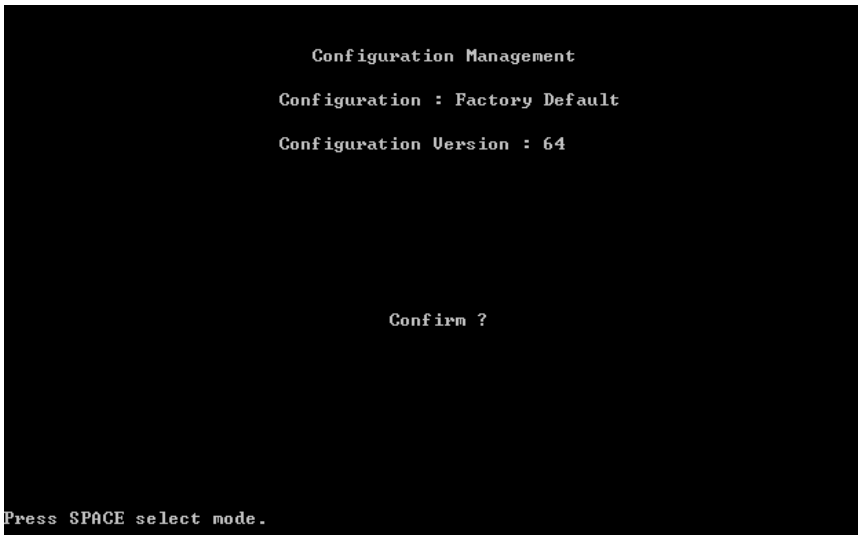
31. Configuration Management
32. Security File Management
33. Firmware Upgrade
34. System reboot

31. Configuration management

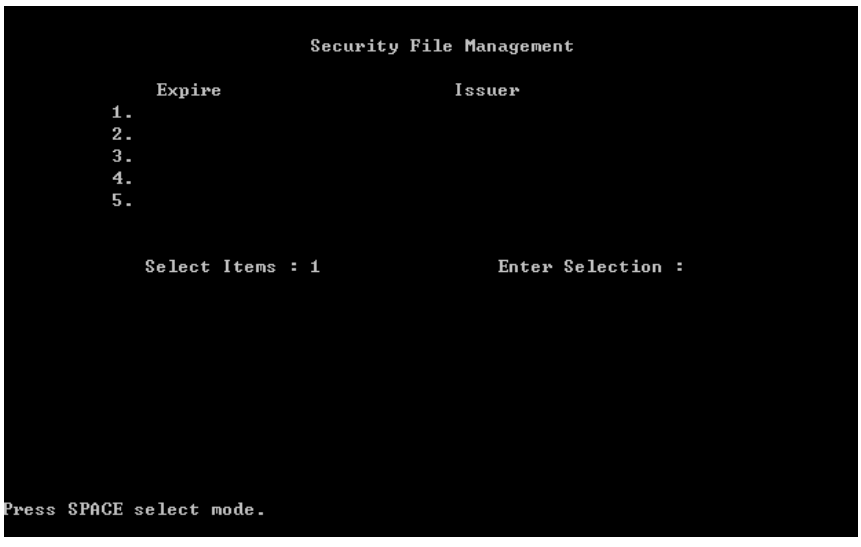
The configuration of 600AG can be backed-up or restored by using TFTP here. In a daisy chained sequential configurations, it is recommended to backup all configurations before uploading / upgrading firmware. You may name your configuration file in any ways you like.



The configuration of 600AG serial can be reset to factory default by using this menu.

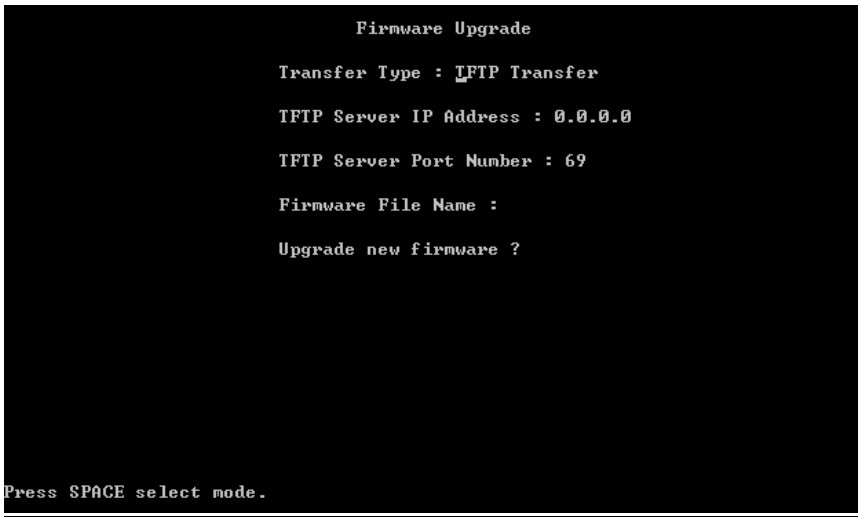


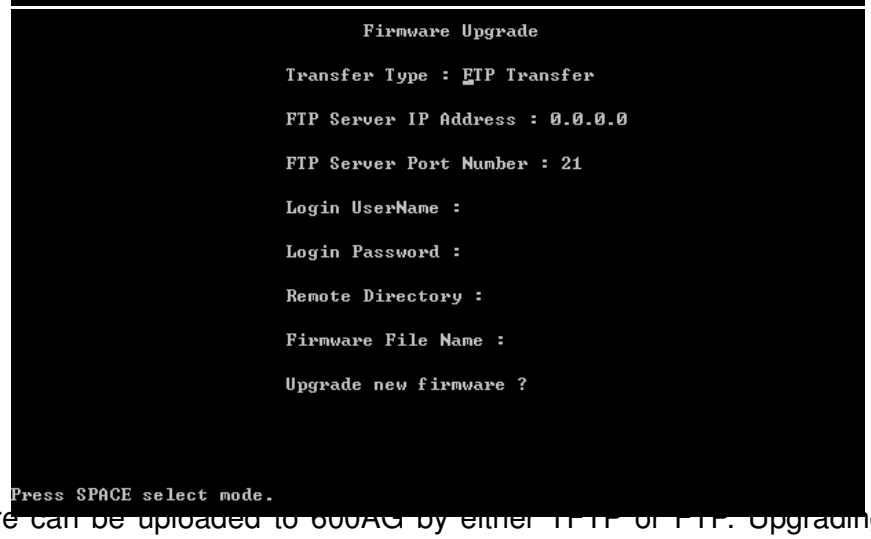
32. Security File Management



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. Please refer Annotations for more on wireless security.

33. Firmware Upgrade

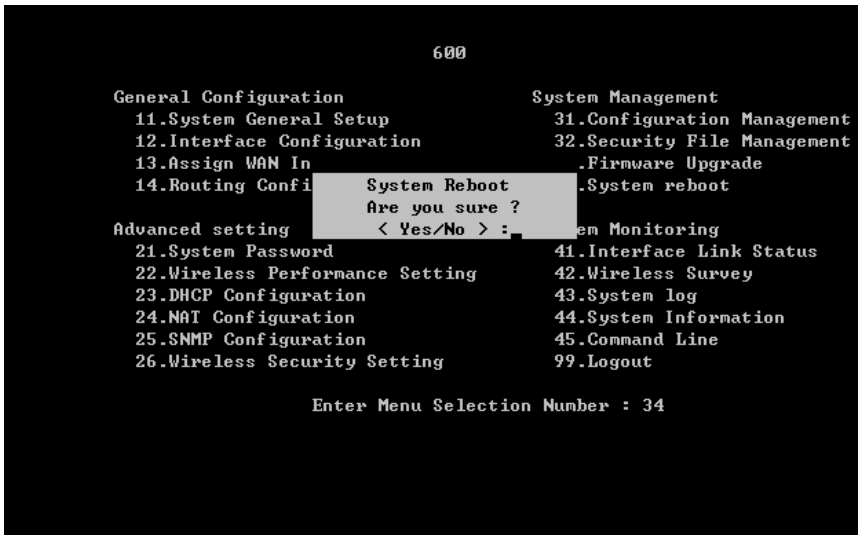




New firmware can be uploaded to 600AG by either TFTP or FTP. Upgrading firmware from FTP

server may need username and password for login. Upgrading progress will show on the menu. **Please do not shutdown the system during the upgrading process to prevent unexpected system failure**. System will automatically reboot and perform image backup after the upgrade. New firmware will take effect after system reboot. Please refer to application note on firmware upgrade for step by step upgrading process.

34. System Reboot



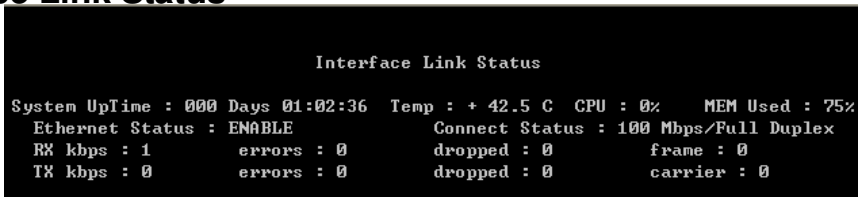
Reboot 600AG from SMT without disconnecting power cable or changing any connection. Certain configurations require system reboot to take place, such as configuration restore.

3.5. System Monitoring

SMT-41 ~ 45 provides system monitoring for 600AG. The following sections introduce each menu :

41. Interface Link Status
42. Wireless Survey
43. System log
44. System Information
45. Command Line

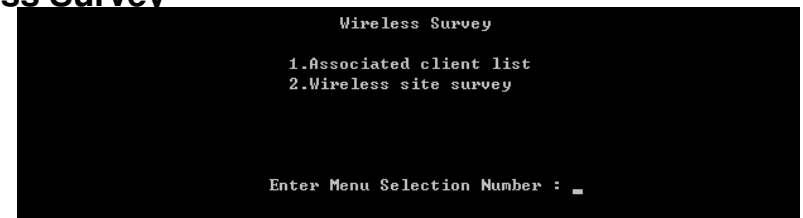
41. Interface Link Status



Real-time link statuses of all interfaces are shown in the menu.

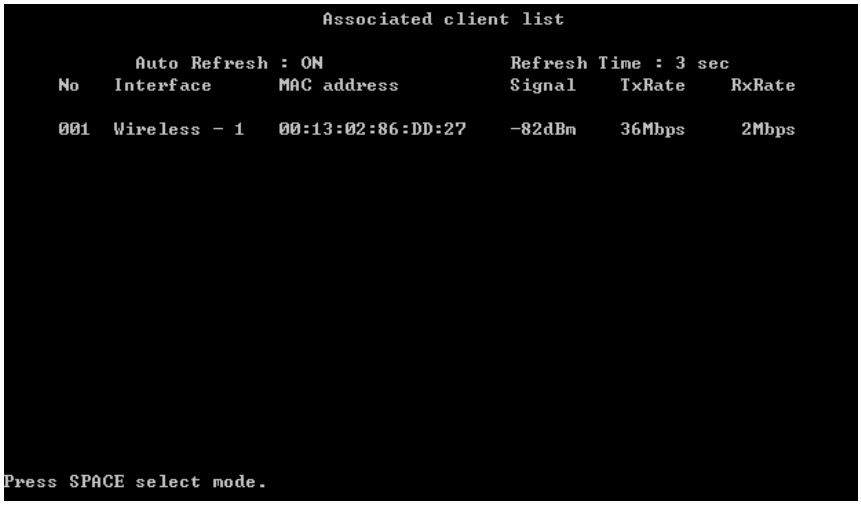
- **System Up Time**
  Display how long 600AG has been operating since last boot-up.
- **Temperature**
  The temperature inside the waterproof housing.
- **Interface Status**
  Indicate the interface is ENABLE or DISABLE.
- **Type**
  Indicate the wireless interface is configured as an AP or wireless station.
- **Tx-Power**
  Transmit power of wireless interface set in SMT-12.
- **Data Link Rate**
  Real-time data transmission rate. When Data Link Rate in SMT-12 is set, it displays here. Otherwise, when it is set as AUTO in SMT-12, Data Link Rate here indicates the maximum transmission rate available, and can be used as an indication of link quality. The maximum link rate according to 802.11a/g is 54Mbps. Only available when the interface is set as an AC.
- **Link Quality**
  Calculated from RSSI, signal and noise level to indicate the quality of the communication link in percentage.
- **Channel**
  The channel used by the wireless interface.
- **Signal Level**
  A -70 ~ -50dBm signal level is recommended for a good connection. Too low a signal, the wireless link between AP and AC can not be established. Too high a signal level, the power amplifier at the receiver might be forced to operate in saturation region and distorts the signal waveform. Hence likely to result in reception error. Since the signal level at AP is defined by the user, Signal Level is only available when the interface is set as an AC.

42. Wireless Survey



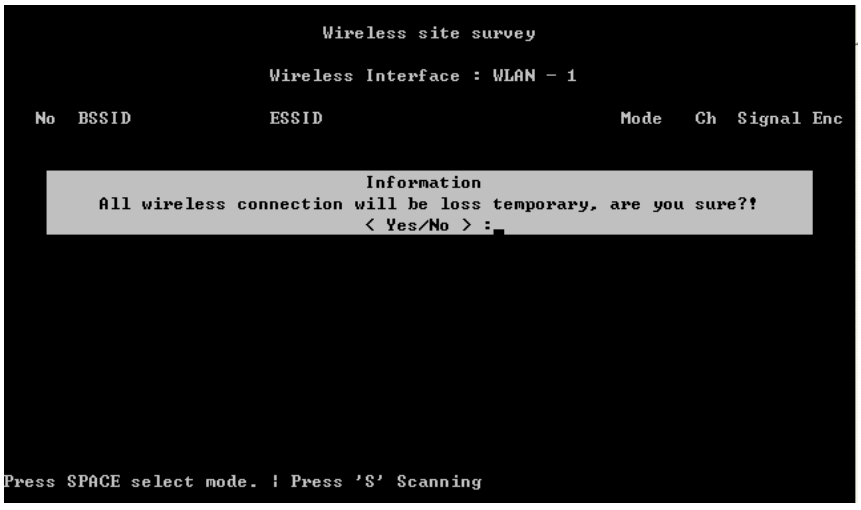
- **Associated client list**

MAC addresses of all clients associate with AP wireless interface on 600AG are shown here.



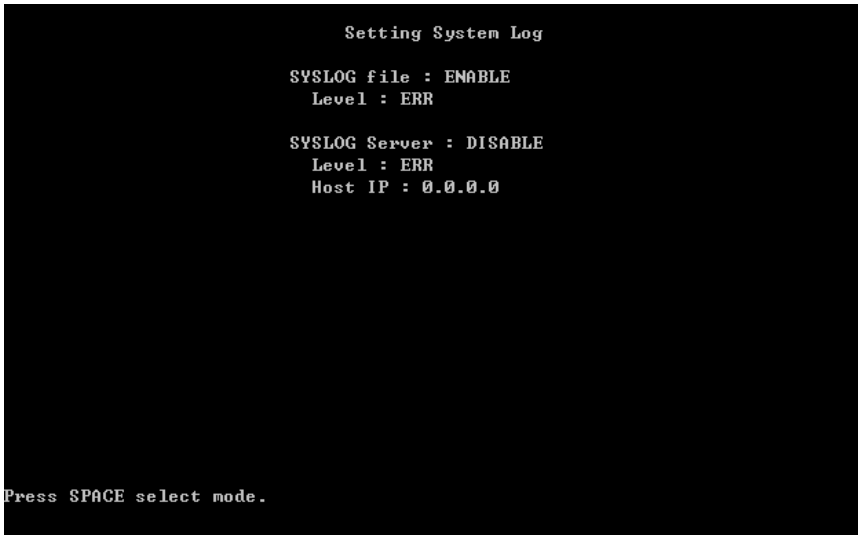
You can enable Auto Refresh and change Refresh time.

- **Wireless site survey**



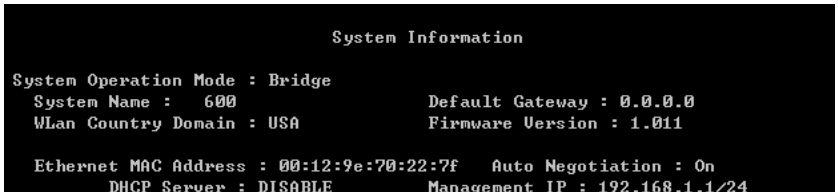
Base on AC status to scan space AP signal, but when the interface set AP mode, it also can momentary change from AP status to AC status; the system will auto show information to warm operator.

43. System Log



600AG serial provides seven system log levels (Level1=Debug Level2=Emergency Level3=Alert Level4=Critical Level5=Error Level8=Warning Level7=Notice Level8=Info) to indicate the level of attention needed for each log. Through setting Syslog server IP address, all system log will send back to the specific log server for centralizing monitoring all devices in the network.

44. System Information



System Information summarizes all the configuration and hardware information of the 600AG.

45. Command Line

Type any key and enter, system will show all Command Line items.

- alt
  Alignment tool. alt wireless AC displays the real-time Link Quality, RSSI (receive signal strength indication) and Noise Level continuously. alt is similar to the information in SMT-41, and only available when the wireless is configured as AC.
- arp
  Display ARP information of the 600AG.
- date
  Display system time.
- ping
  Ping the remote host IP address from the 600AG.
- reboot
  Reboot the 600AG.
- route
  Display the route table of 600AG.

- tracert
  Trace the remote destination IP address to view the routing path.
- ver
  Display the firmware version and the minimum downgradable version of the current firm ware.
- debug
  Enable debug mode (by typing debug 1 in command line) displays real-time syslog in command line.
- dfs
  Dynamic Frequency Selection is to avoid the AP using the same channel as military radars. When dfs is on and detects a radar signal, the AP will automatically occupy the next channel available.
- tpc
  Transmit power control to set auto power control on/off. This enables a particular AP to adjust its transmit power to optimal according to the signal strength of the associated AP.
- etsi5800 (only available with ETSI standard)
  etsi5800 on releases the 5.7GHz ~ 5.8GHz high frequency bands for 600AG with ETSI standard. Available channel in different country domain shows on table below:

Channel	Frequency	Etsi5800 off	Etsi5800 on	USA
36	5180MHz	V	V	V
40	5200MHz	V	V	V
42	5210MHz	-	-	V
44	5220MHz	V	V	V
48	5240MHz	V	V	V
50	5250MHz	-	-	V
52	5260MHz	V	V	V
56	5280MHz	V	V	V
58	5290MHz	-	-	V
60	5300MHz	V	V	V
64	5320MHz	V	V	V
100	5500MHz	V	V	-
104	5520MHz	V	V	-
108	5540MHz	V	V	-
112	5560MHz	V	V	-
116	5580MHz	V	V	-
120	5600MHz	V	V	-
124	5620MHz	V	V	-
128	5640MHz	V	V	-
132	5660MHz	V	V	-
136	5680MHz	V	V	-
140	5700MHz	V	V	-

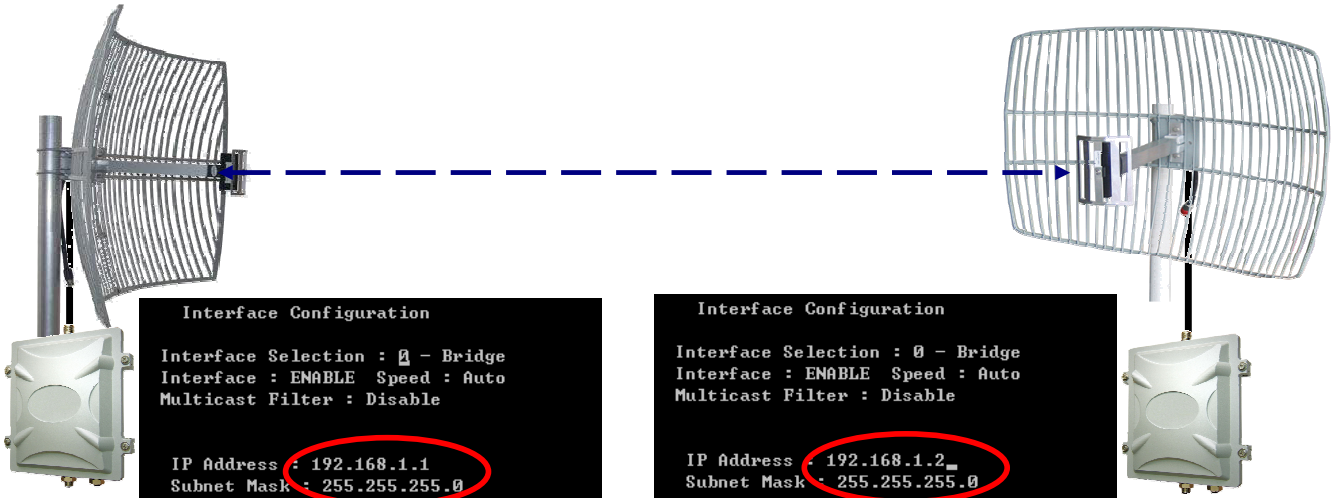
149	5745MHz	-	V	V
152	5760MHz	-	-	V
153	5765MHz	-	V	V
157	5785MHz	-	V	V
160	5800MHz	-	-	V
161	5805MHz	-	V	V
165	5825MHz	-	V	V

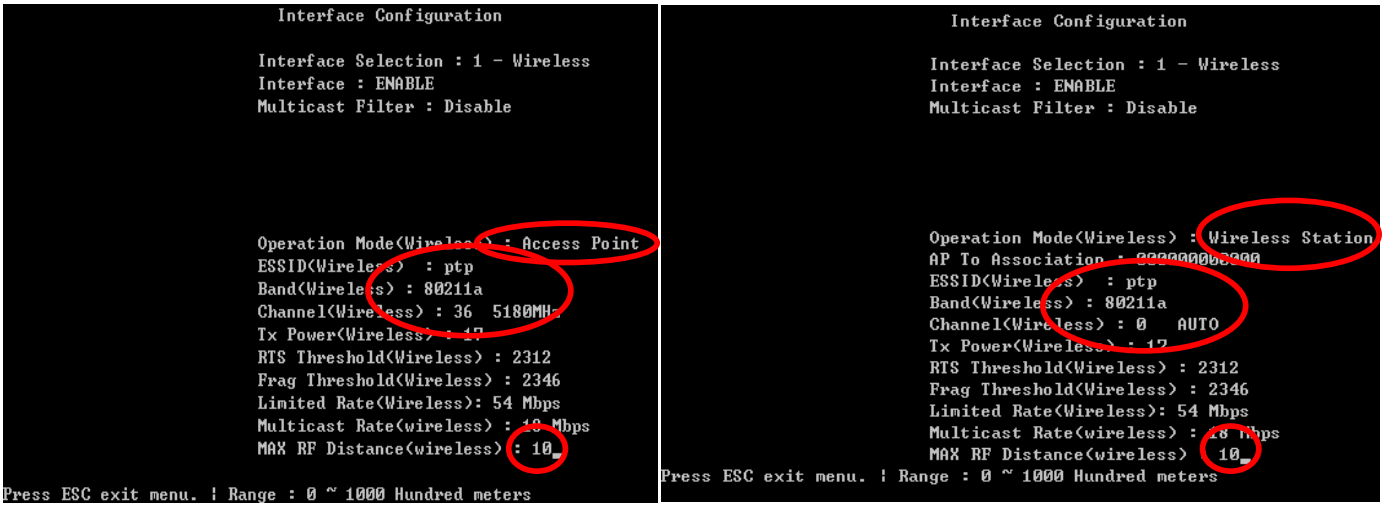
- exit
  Leave Command Line and back to SMT main page.

Chapter 4. Application Notes

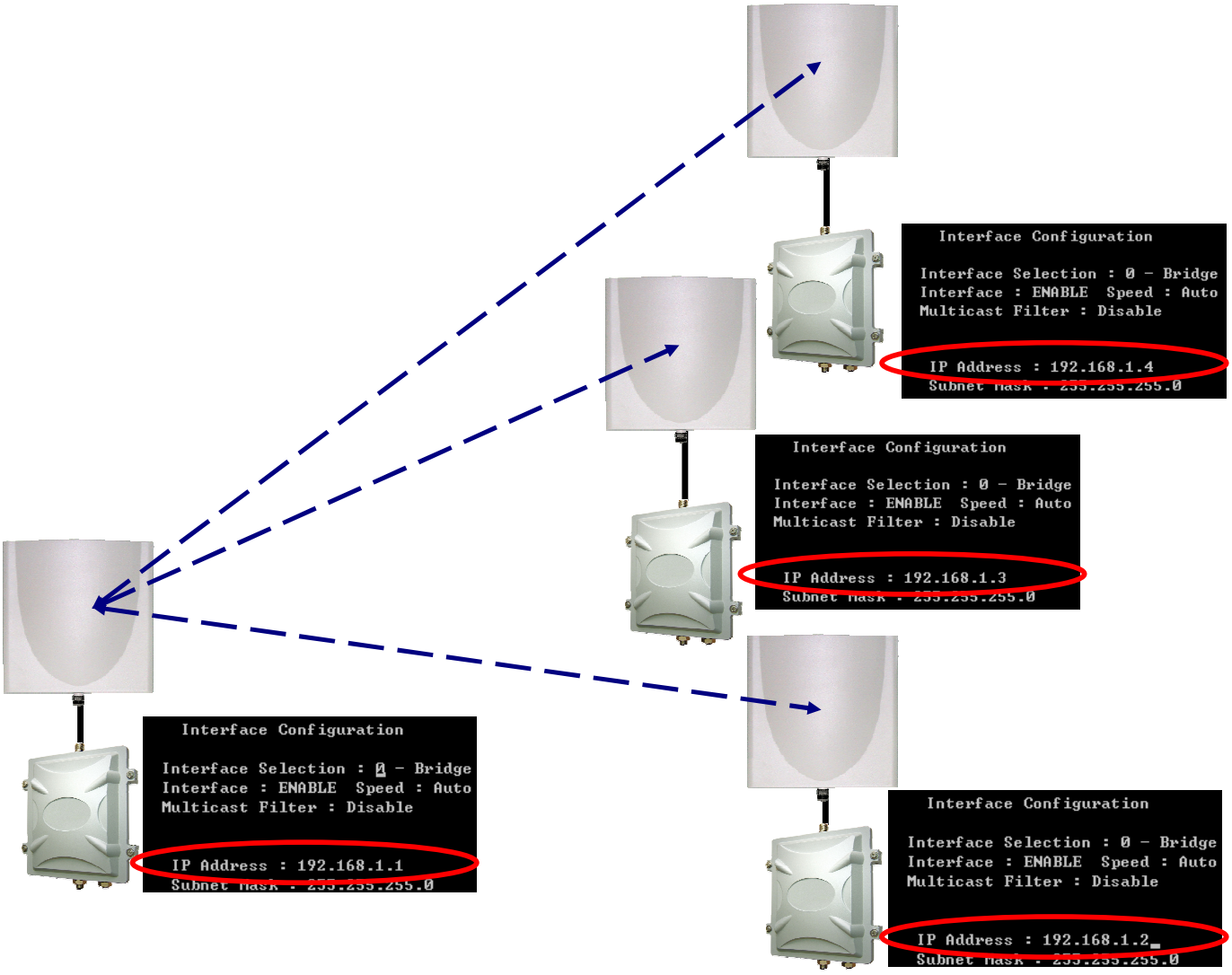
4.1. Point-to-Point Installation

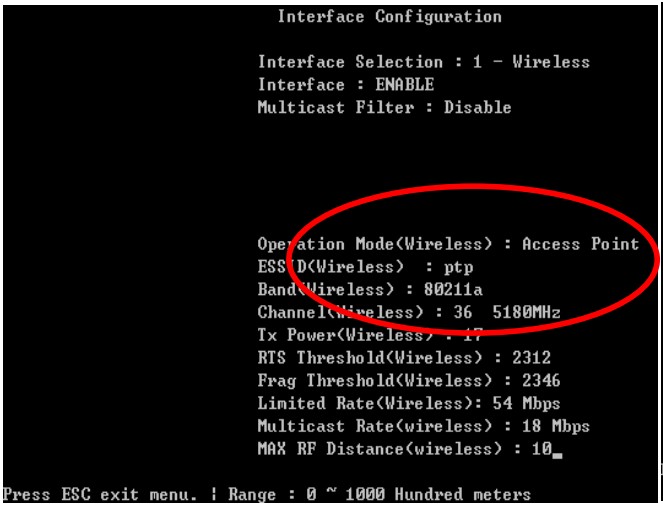
One of the main applications for 600AG serial is to connect two points wirelessly to save the cable cost or overcome certain geographical difficulty to have wire between two points. The figure illustrates a typical point-to-point connection of two buildings a distance apart. The outdoor APs can act as bridges to connect two points in the same net scope, or act as routers to join two different subnets together. Semi-directional or directional antennas are normally used for this application to have a focus beam for distant signal transmission. The following sections detail both bridge mode and router mode settings of the APs for this point to point application.

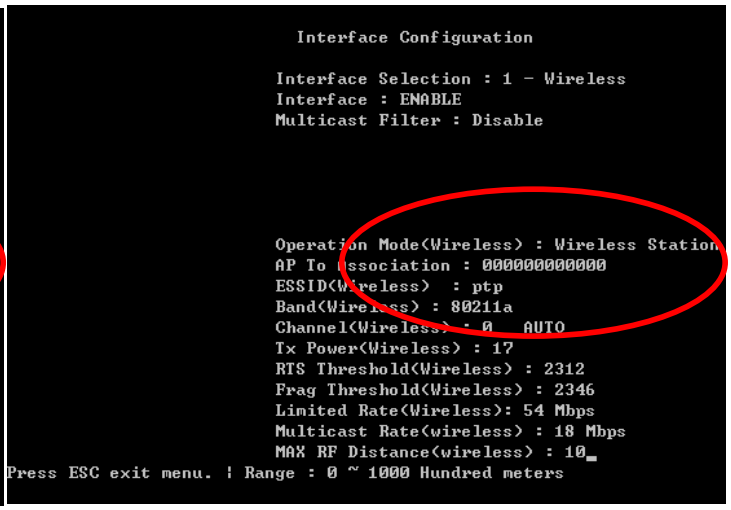




4.2. Point-to-Multi Point Installation



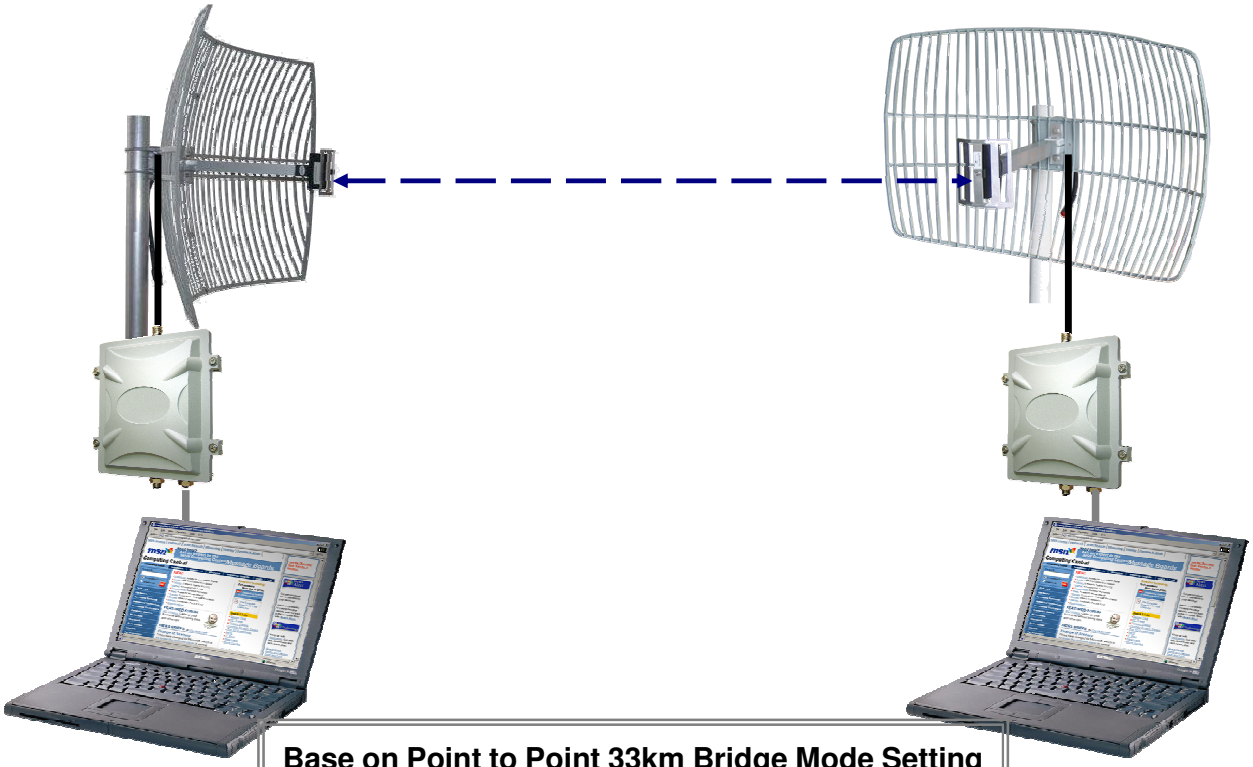




Point to Multi-Point application suggest enable Bandwidth Control Function to set UL & DL transmit bandwidth link rate.

4.3. Bridge Mode

Bridge mode is used when connecting two points in the same net scope. Here, the LAN of 192.168.1.0/24 is used as example to demonstrate how to configure two APs for point to point connection in bridge mode. The figure is the topology for this point to point connection with appropriate IP addresses for APs and PCs.

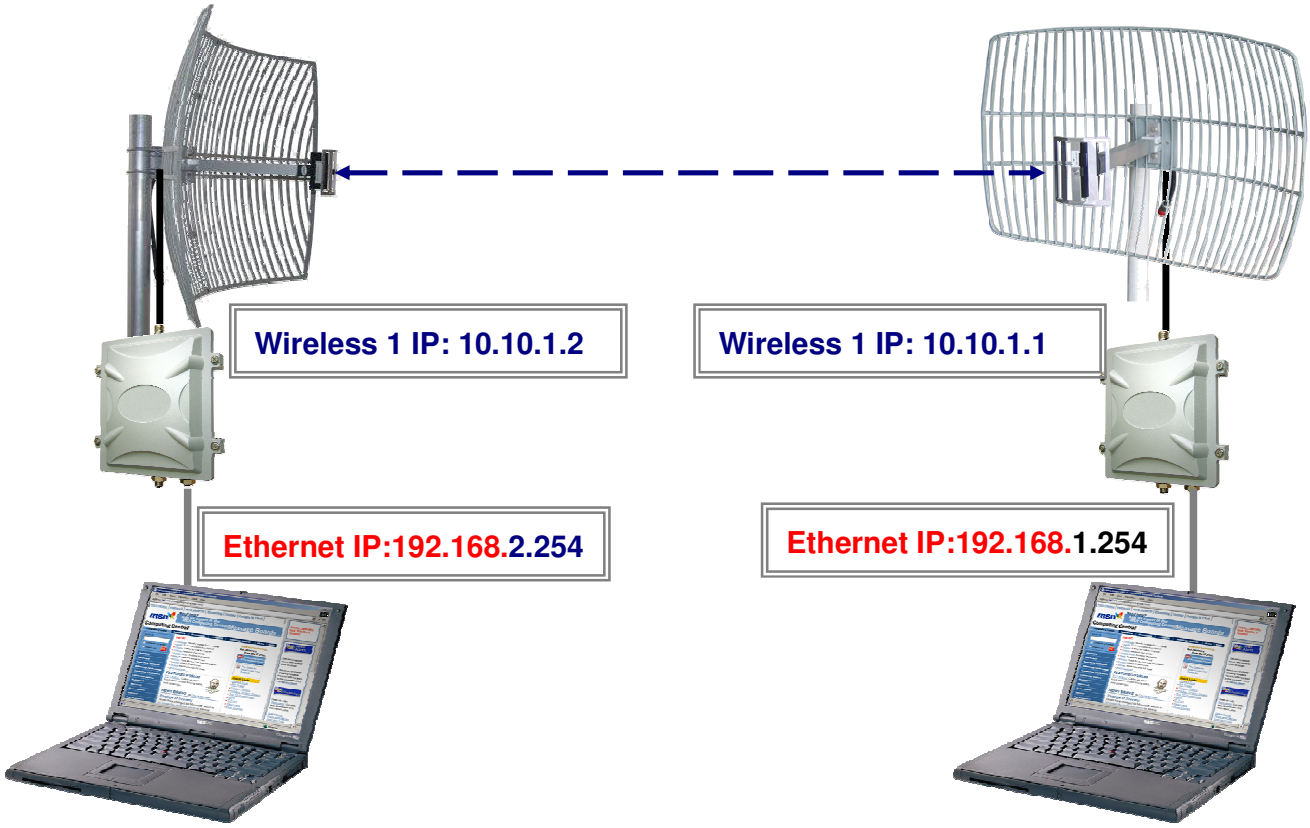


Base on Point to Point 33km Bridge Mode Setting

Taiwan Taichung Port South area	Taiwan Yuan-li (Miaoli)
NB1 192.168.1.33	**NB2 192.168.1.20**
Device: M500AG	Device: M500AG
System Mode: Bridge	System Mode: Bridge
IP: 192.168.1.2	**IP: 192.168.1.1**
Interface: RF1	Interface: RF1
Operation Mode: **AC (Wireless Station)**	**Operation Mode: AP**
ESSID: pczonetest	**ESSID: pczonetest**
Band: 802.11g (only)	Band: 802.11g (only)
Channel: 9	Channel: 9
RF Output Power: 50mW = 17dBm	RF Output Power: 50mW = 17dBm
Limit Rate: 54Mbps	Limit Rate: 54Mbps
Multicast Rate: 11Mbps	Multicast Rate: 11Mbps
Max RF Distance: 350	**Max RF Distance: 350**
Command Line: rateadaption 0 13 rateadaption 1 3	Command Line: rateadaption 0 13 rateadaption 1 3

4.4. Router Mode

When using point to point to connect two LANs together, router mode configuration is required. The setting of router mode point to point is similar to that of bridge mode, but need to be careful with the setting of IP addresses and gateway to let the data packet be able to go the desired way.



Configurations	AP A	AP B
System Operation Mode	Route	Route
Ethernet IP Address	192.168.2.254/24	192.168.1.254/24
Wireless 1	Enable	Enable
Routing Information	BOTH	BOTH
Wireless 1 IP Address	10.10.1.2/30	10.10.1.1/30
ESSID	PTPRoute	PTPRoute
Operation mode	Access Point	Wireless Station
Band	802.11b/g	802.11b/g
Channel	1 2412MHz	AUTO
MAX RF Distance	100 (10km)	100 (10km)
WAN Interface	Wireless 1	Wireless 1
Default Gateway	10.10.1.1	10.10.1.2

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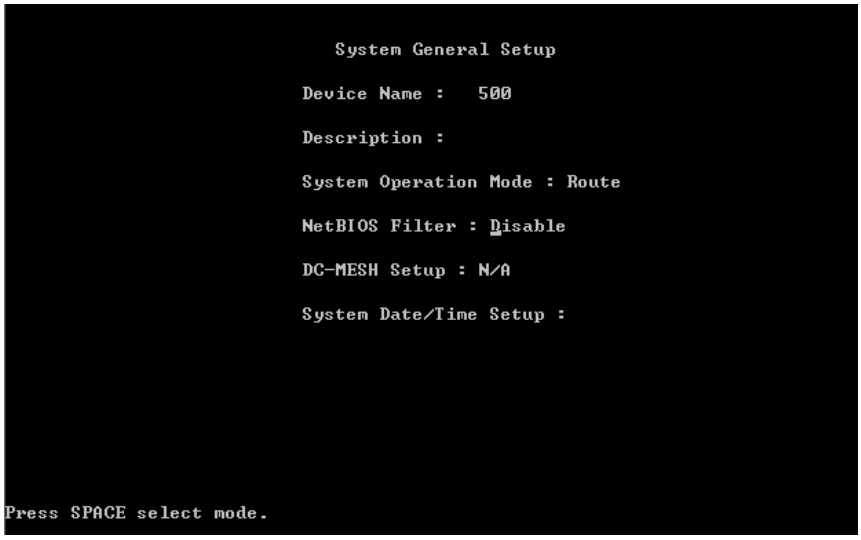
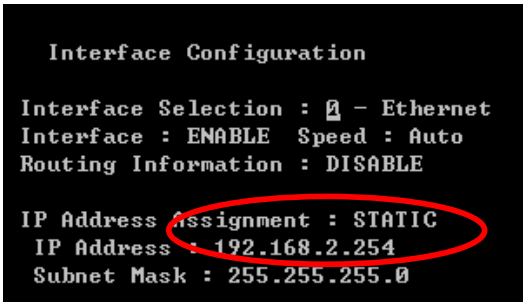
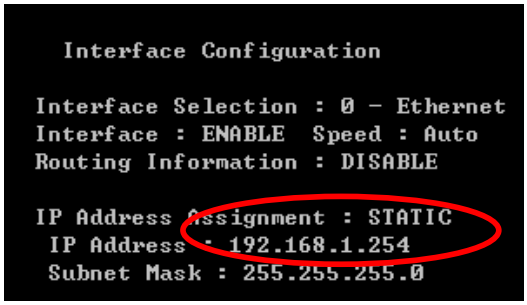
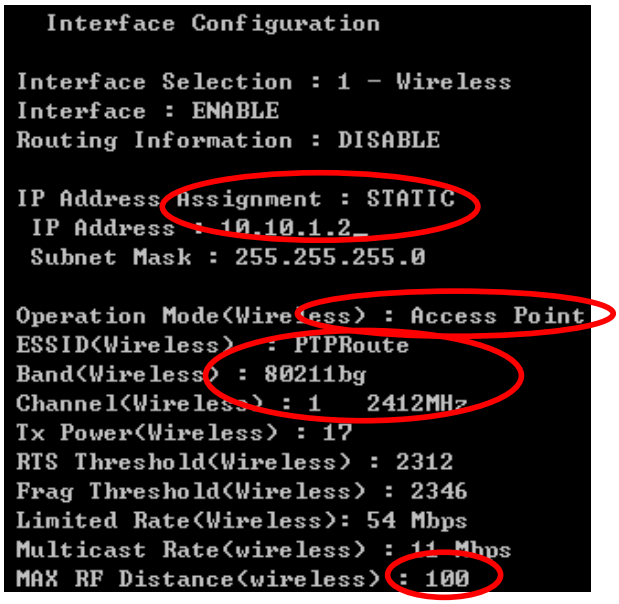
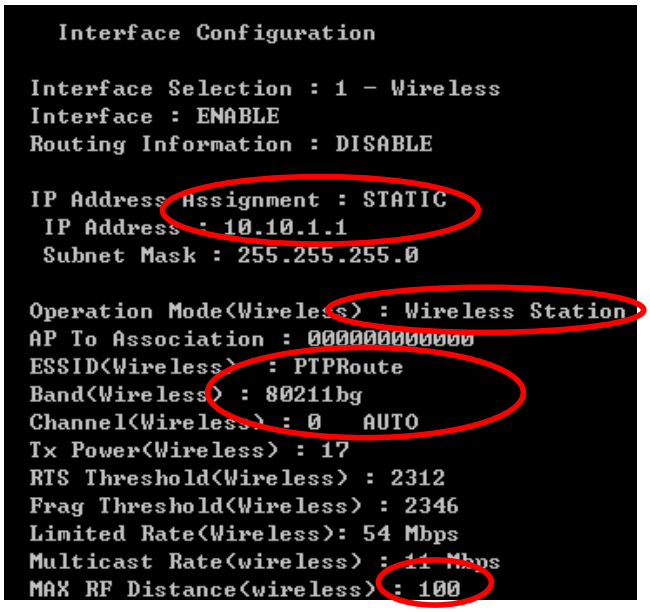










Note :

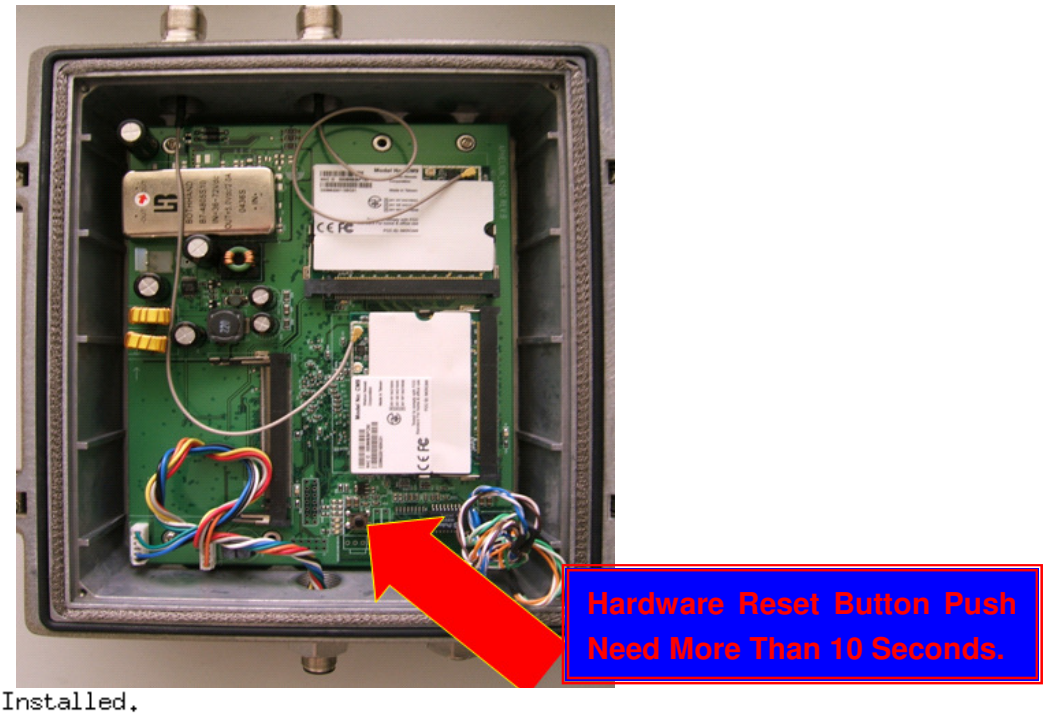
- This is an example for point to point configuration. Depends on your system, you may use different IP addresses, ESSID, operation frequency and swap AP/AC. It is recommended to set MAX RF Distance when the distance between the two 600AG serials is greater than 7km.
- 600AG serial is set as a router, so each interface (Ethernet and wireless) needs to have its own IP addresses.
- Routing Information is set to BOTH so 600AG will both receive and give routing information. If Routing Information is set to DISABLE, SMT-14 Routing Configuration needed to be set for AP to know where to set the data packets.

- 600AG serials are operating in router mode so it is necessary to set WAN interface with appropriate gateway. In this example, because the data packet is only going from one PC to another, 600AGs set each other as default gateway.

It is recommended to confirm all the configurations are correct and properly saved by using SMT-44 System Information. If directional antennas are used for this point to point application, please check if the antennas are aligned properly by using SMT-41 Interface Link Status or the command alt in SMT-45 Command Line.

4.5. Hard Reset to Factory Default

In the case of forgotten system password or any other situations that require setting 600AG back to factory default without entering SMT, there is a reset button on the PCB inside the waterproof housing for hard reset.




```
Temperature Sensor Installed.
Real Time Clock Installed.
Iface monitor ver 1.01 Installed.
Daisy Chained MESH is supported!
BandWidth Control module 1.01 initialized successful
Wireless LAN Transmit Packet Qos module 1.00 initialized successful
l2nlmgmt 1.0 initialized successful
tmpfs on /dev/shm type tmpfs (rw)
Setting up IP spoofing protection\: rp_filter.
Disable TCP/IP Explicit Congestion Notification\: done.
Configuring network interfaces\: done.
Starting portmap daemon\: portmap.
INIT: Entering runlevel: 3
Enable interface ixp0.
Enable interface ath0.
```

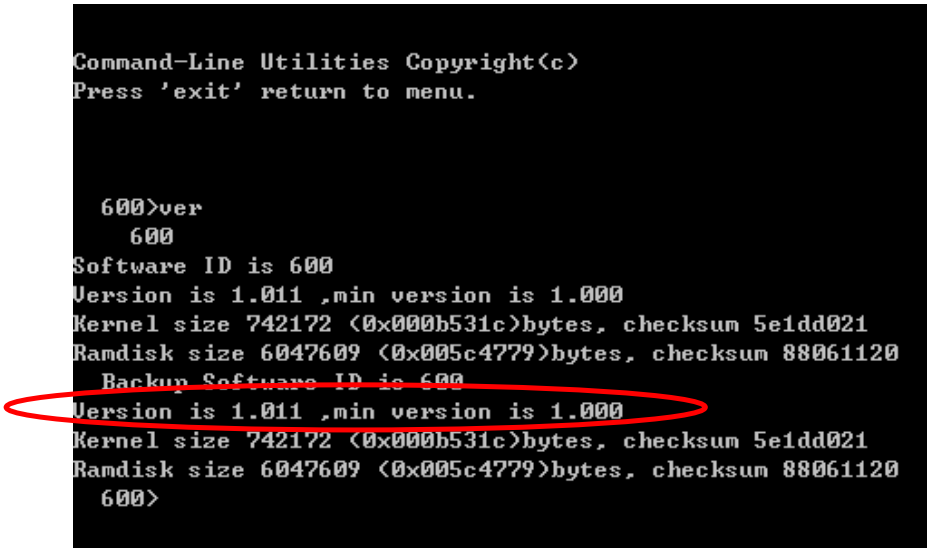
The reset button can be pressed any time after 600AG has enabled all the interface and shows “Enable interface ath0” on the boot log when accessing 600AG with console.

4.6. Firmware Upgrade

As device always strives to achieve total customer satisfaction, new features and functions are designed from time to time. To have these new functions in your 600AG serial, you will need to upgrade the firmware.

Please note before performing firmware upgrade:

- Certain versions of firmware are non-interoperable with other versions. Please confirm the interoperability of the new firmware with the existing one in your system.
- If the APs are upgraded through a daisy chain, please ensure the AP furthest away is upgraded first. As not all the newer version firmware is interoperable with the older one. Also if you upgrade a very old version firmware to a very new one, the configuration of the AP might be set to factory default and make the AP no longer in the same net scope as the existing daisy chain.
- Not all the new version firmware can be downgraded to the previous one. The minimum downgradeable version is shown by typing “ver” in SMT-45 Command Line.



The easiest way to upgrade 600AG serial is through the use of SMT and Trivial File Transfer Protocol (TFTP). A PC is made as the TFTP server, and connected to the AP via the DATA IN port on the PoE unit.

The first step is to configure both the TFTP server (the PC) and the AP to the same net scope, namely the IP address and subnet mask. Here 192.168.1.11/24 for the PC and 192.168.1.1/24 for the AP are used as an example to demonstrate the upgrade procedure with TFTP.

The IP address and subnet mask of PC can be either configured through Internet Protocol (TCP/IP) selection in Network Neighborhood or your usual way. The AP is configured to 192.168.1.1 with subnet mask of 255.255.255.0 in SMT-12, as shown below:

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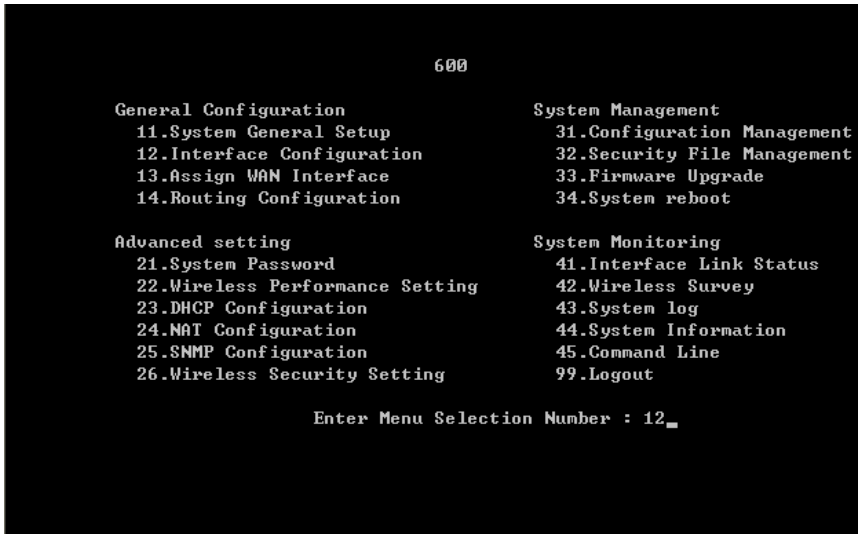
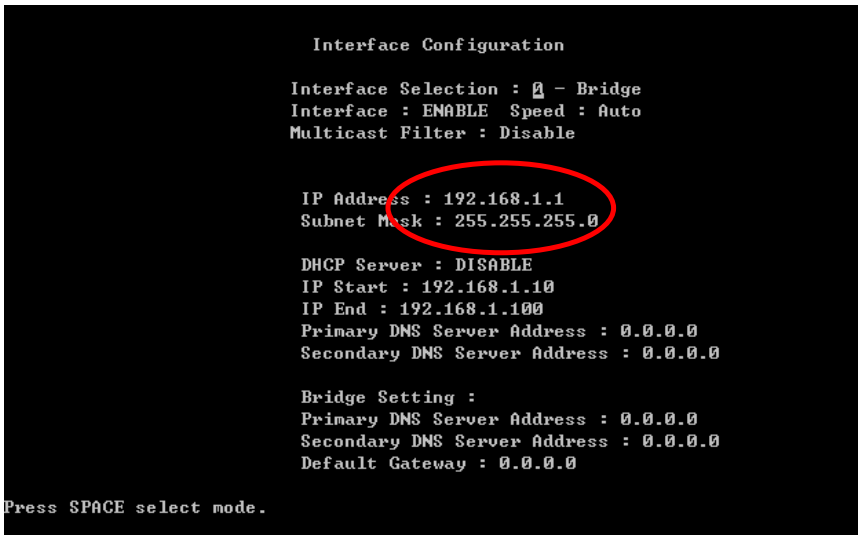
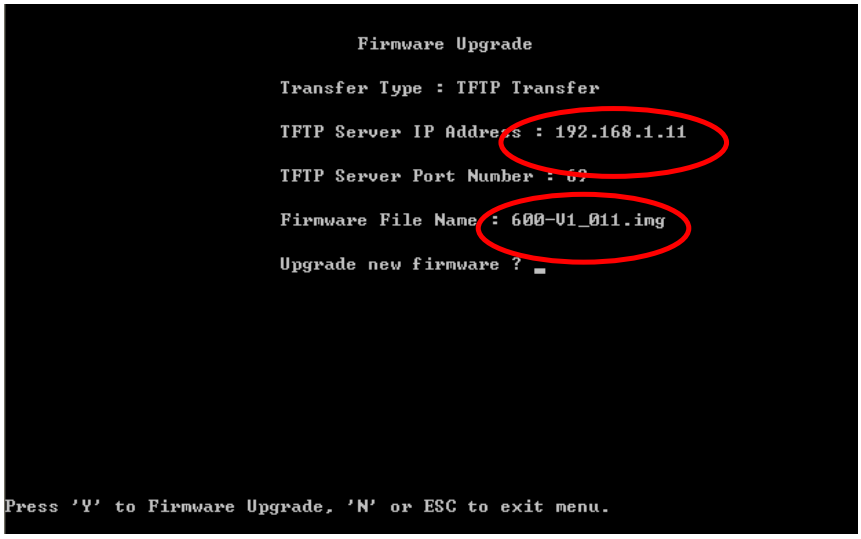




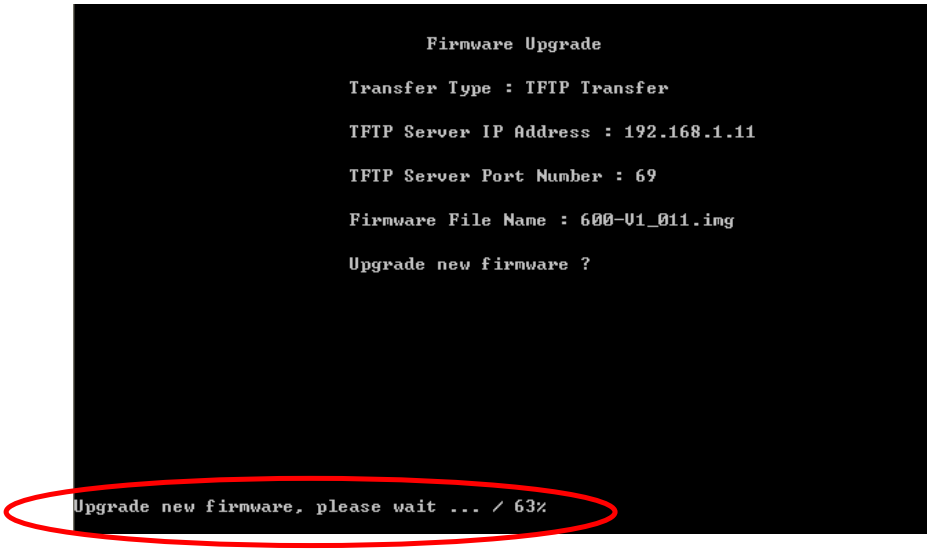
Use the space bar to move the cursor. Press ESC and save the change before exit SMT-12.

Make sure the firmware image file, for example 600-v1_011.img, is in your TFTP upload/download directory. Then go to SMT-33 Firmware Upgrade.



Enter the IP address of the TFTP server, 192.168.1.11 and the firmware image file 600-v1_011.img in the fields indicated in the circles. Do use the exact file name because it is case sensitive. Move the cursor to the last selection “Upgrade new firmware? “ and press “Y” to begin firmware upgrading. Please keep both the TFTP connection and the power on during the whole upgrading process to ensure a successful upgrading.

After the firmware has downloaded to the AP successfully, a message will show at the bottom of the screen indicating the percentage of the upgrading.



Please follow the instruction to reboot the AP to make the new firmware take place. After the first successful reboot, the new image will be written to the system backup. Please be patient and keep the power on all the time until the SMT main menu appear on the screen.

If the upgrade is unsuccessful, the following upgrade new firmware fail message will appear.

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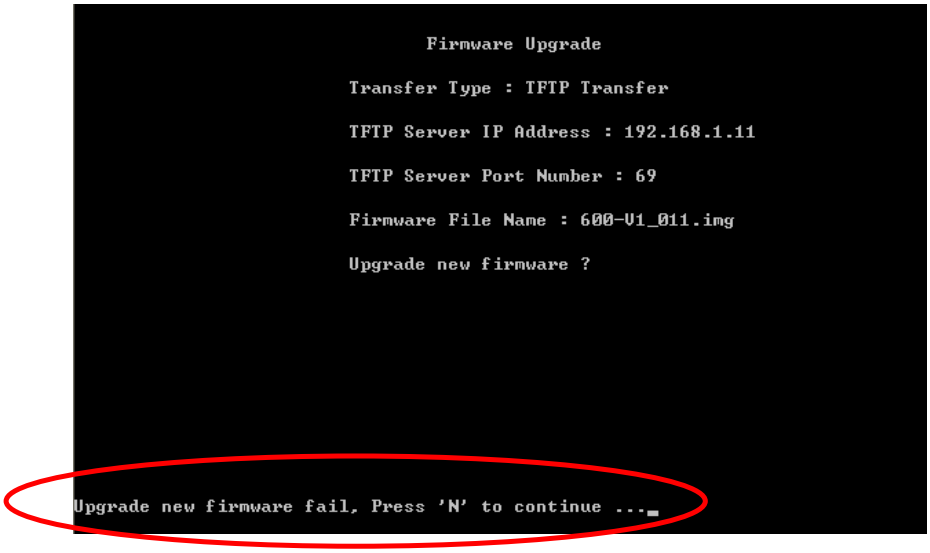

Please press “N” to make the cursor active again. Double check if the TFTP server is up and set in the same net scope with the AP. Also check if the firmware image file is in the appropriate directory and all the fields in SMT-33 are entered correctly.

Alternatively, firmware can be upgraded with FTP. The steps of upgrading are similar to that of TFTP upgrade.