NWTAP-100
Wireless Tap
User Guide

Preliminary Release 1.0, Issue 2
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Netwave Co., Ltd.

Contents

1. Overview

1.1. Introduction

This document describes the features of the wireless tap NWTAP-100 as well as how it can be installed to provide the most effective service to end users.
The NWTAP-100 is an outdoor hardened wireless lan access point solution which uses an internal cable modem as the backbone interface and AC line power from the feeder cable for power. The wireless LAN tap-off is an all-in-one unit which consists of a cable modem, WiFi access point, power supply unit, antenna and tap-off in an outdoor-hardened housing.
It provides a low cost and easy to install WiFi access hotspot to homes and businesses by simply removing the old tap and installing the wireless tap.

Standards based
The internal cable modem is DOCSIS 2.0 compliant based on the Broadcom BCM3349. It is fully interoperable with all CMTS models available in the market today.
The internal WiFi is based on the 802.11g standard which is backwards compatible to the 802.11b. The wireless chipset is based on the Broadcom BCM4318.

Security
Security is of utmost importance in todays wireless networks which are exposed to hackers and other mallicit users. The NWTAP-100 fully supports all the latest 802.11 security enhancements including WPA2.

Future proofed
The NWTAP-100 supports remote software upgrade via TFTP. The modem will maintain the current version of software while downloading the new version in order to provide crash proofing. Netwave will continue to include enhancements and customizations to the existing software so that customers can continue to use the wireless tap most effectively for many years.

Flexible service platform
The software running the wireless tap is a full featured gateway which can be used to support commercial high speed access to homes and offices or provide public hotspot service.
The flexible antenna mounts can be used to support a tap housing mounted antenna. Since the antenna output is based on an SMA connector, various off-the-shelf antennas may also be used.
The unit can be strand mounted or can be mounted at the side of buildings and provides WiFi access as well as wired CATV signals.

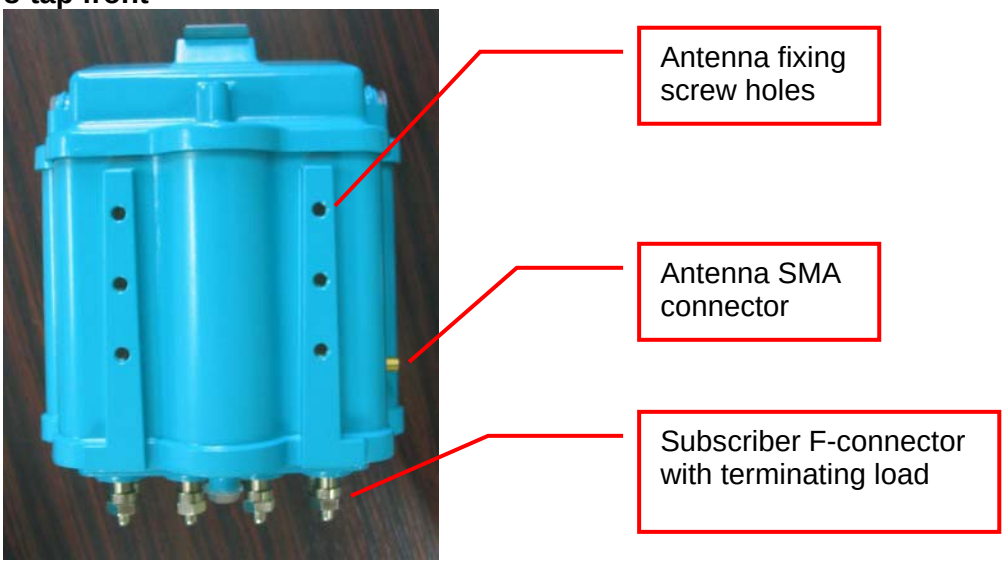
1.2. Product Description

1.2.1. NWTAP-100

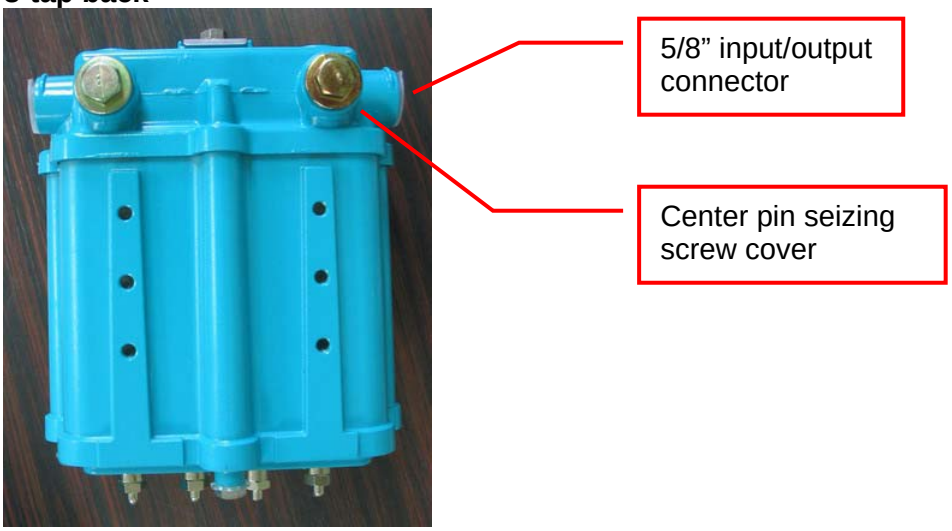
The following is a list of NWTAP-100's main features.

- Includes an internal DOCSIS 2.0 cable modem
- Trunk AC power can be used to power the wireless tap
- Trunk input and output as well as subscriber output ports are in the same configuration as a conventional tap-off
- Conventional tap-off can be removed and replaced with the wireless tap without impacting the electrical characteristics of the CATV signal coming off of the 5C connectors
- 802.11b/g compliant wireless lan service is provided
- Antenna connection is made via an SMA female connector located at the side of the wireless tap

8-tap front



8-tap back



8-tap top

Strand mounting fixture

8-tap bottom

Subscriber F-connector with terminating load

Faceplate screws

Tap dB value

8-tap sides

Plastic cap

Product serial marking.

060602 : production year+month+date
NWT : product name
FF26BA : MAC address which follows the OUI “000200”

Antenna SMA connector

16-tap front

16-tap back

16-port faceplate adaptor

16-tap bottom

16-tap sides

Fig. 1 NWTAP-100 external features

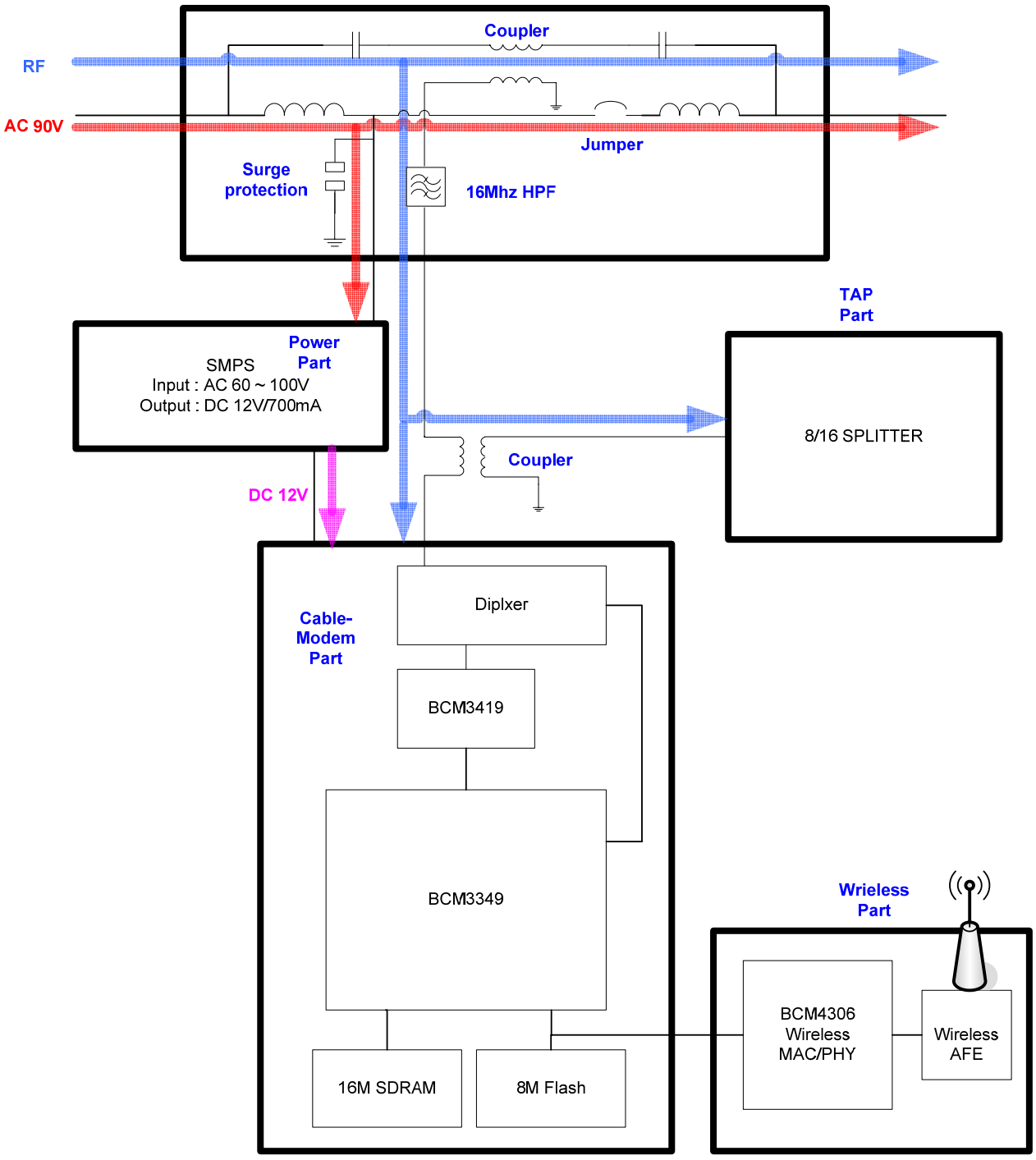


Fig. 2 NWTAP-100 block diagram

As shown in fig. 2, the trunk line RF is sampled to the tap-off splitter circuit as in a conventional tap-off but part of this signal is also coupled to an internal cable modem. The cable modem then transfers the Ethernet packets to the wireless part for communication via 802.11b/g radio.
The AC power existing in the trunk network is also sampled by the power part so that the DC powering for the cable modem and the wireless lan can be provided.

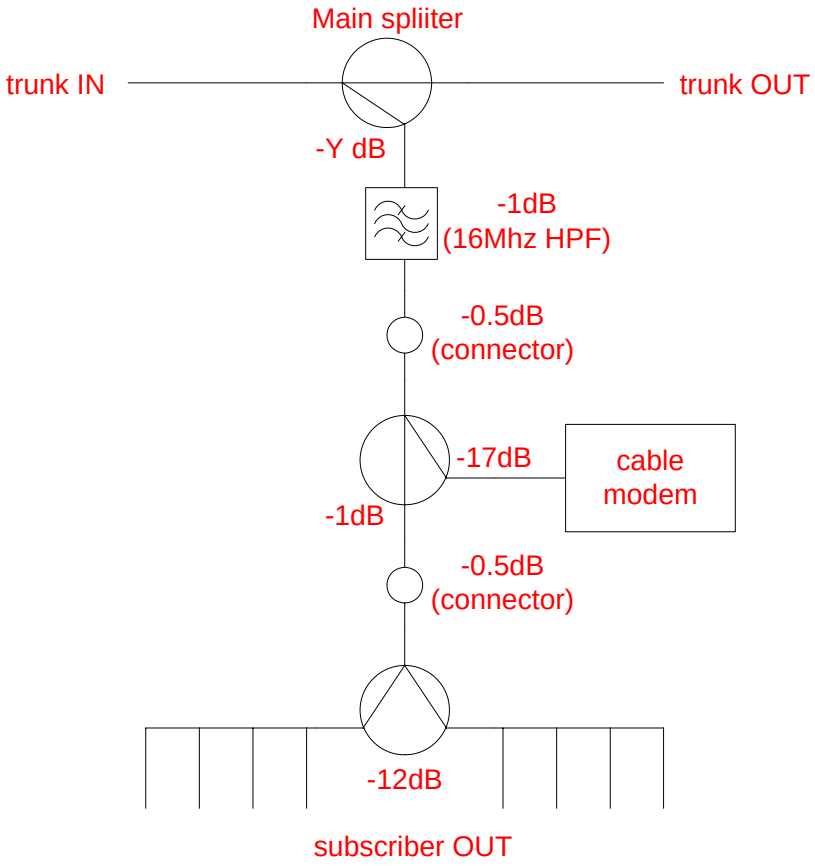


Fig. 3 RF signal level within the wireless tap

The above figure shows the RF signal level attenuation as they pass through the wireless tap with 8 subscriber ports.
The RF signal level output at the subscriber ports are attenuated by approximately, -Y-1-0.5-1-0.5-12 dB
The actual tap value in dB displayed at the bottom of the tap excludes the 1dB attenuation for the 16Mhz HPF and -1dB attenuation for the cable modem.
-Y-0.5-0.5-12 dB
The RF signal level output at the cable modem is attenuated by approximately, -Y-1-0.5-17 dB
This level should be considered so that the appropriate RF level is input into the cable modem. The cable modem input level should be within the range -15~+15dBmV.
The main splitter is implemented in the form of a plug-in type coupler which allows this value to be easily changed in the field as shown in section 5.2.2.

1.2.2. Antenna

The antenna connection via a standard SMA connector and a flexible antenna attaching structure on the housing consisting of 12 screw positions allow a wide range of antennas to be supported. If the antenna size is too big for direct attachment to the housing, it maybe attached to a separate stable structure and connected via RF cable from the SMA connector.

“This device uses an SMA type connector only”

RF exposure compliance information.
“The antenna used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.”

2. Installation

As shown below in the system configuration diagram, the wireless tap is by default a replacement for the conventional tap which is strand mounted. The strand mounting allows the wireless tap to have a wide open coverage which is beneficial towards improving signal reception on the client side.

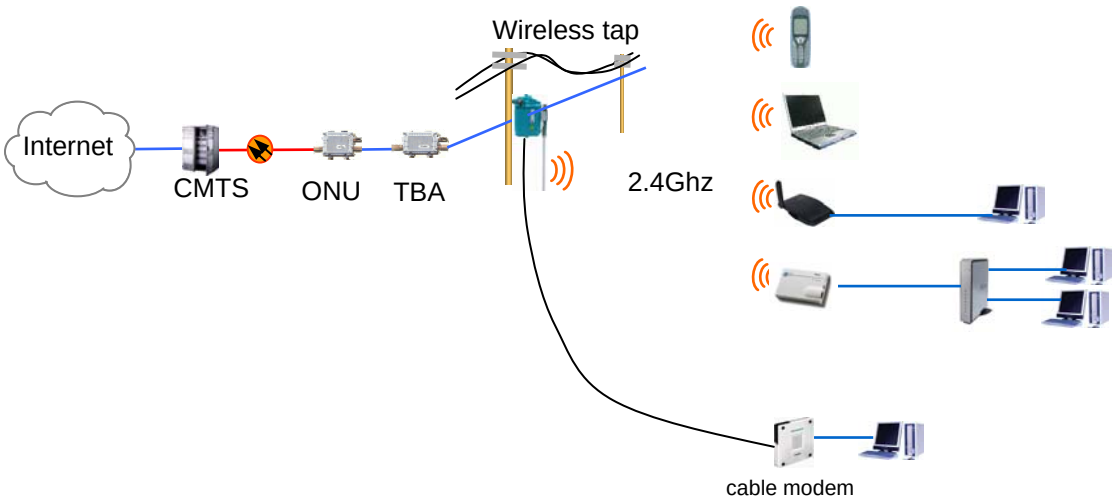


Fig. 4 System configuration

2.1. Unpacking and Content Checking

- The box should be unpacked to reveal the following components.
  - NWTAP-100 main body
  - Antenna cable (SMA male-N male)
  - Four screws for antenna holder fixture
  - Antenna option A (omni directional), or
  - Antenna option B (directional patch)

Please note that other antenna options apart from A and B are also be available. Please refer to a separate manual in this case.

NWTAP-100

Antenna cable

Antenna fixture screws

Omni directional antenna

Fig. 5 Contents

2.2. Remove Current Tap

The wireless tap will replace the conventional tap. The conventional tap to be replaced shall be selected based on the site survey and planning result..

- Identify and record the dB value of the tap
- If the tap is currently passing AC power, block the AC power by turning off the UPS or removing the fuse from the power passing amplifier
- Remove the subscriber cables connected to the tap
- Remove the shrink tubing around the trunk connector
- Separate the strand from the top of the tap
- Unscrew the seizing screw and remove the trunk connector from the tap and remove the tap
- Remove the trunk connector from the trunk cable

Note : the wireless tap may also be installed anywhere on the strand or at the side of buildings as long as an input coaxial cable provides the DOCSIS signal and AC powering

2.3. Install the Wireless Tap

- Connect the trunk connector(main nut and back nut) to the trunk cable

- Mount the wireless tap on the strand using the strand mounting fixture
- Install the body connectors to the wireless tap housing after removing the plastic cover from the input/output ports and unscrewing the seizing screw

- Insert shrink tubing into the trunk cable on the input and output ports
- Mate the main nut and trunk cable to the body connector and tighten
- Secure the center conductor into the tap housing using the seizing screw

- Shrink the tubing with a propane torch

2.4. Attach the Antenna

- Select the Antenna type based on the site survey and planning result
- Select the Antenna position based on the site survey and planning result. Typically the four options shown below are available

Fig. 6 Antenna position options

- Attach the antenna to the housing using the four screws
- Use the antenna cable to connect the N-type connector on the antenna to the SMA type connector on the housing, In order to ensure the best wireless signal level, the connectors should be tightened well

Fig. 7 Antenna connector tightening

Fig. 8 Assembled wireless tap without the shrink tube and strand mounting

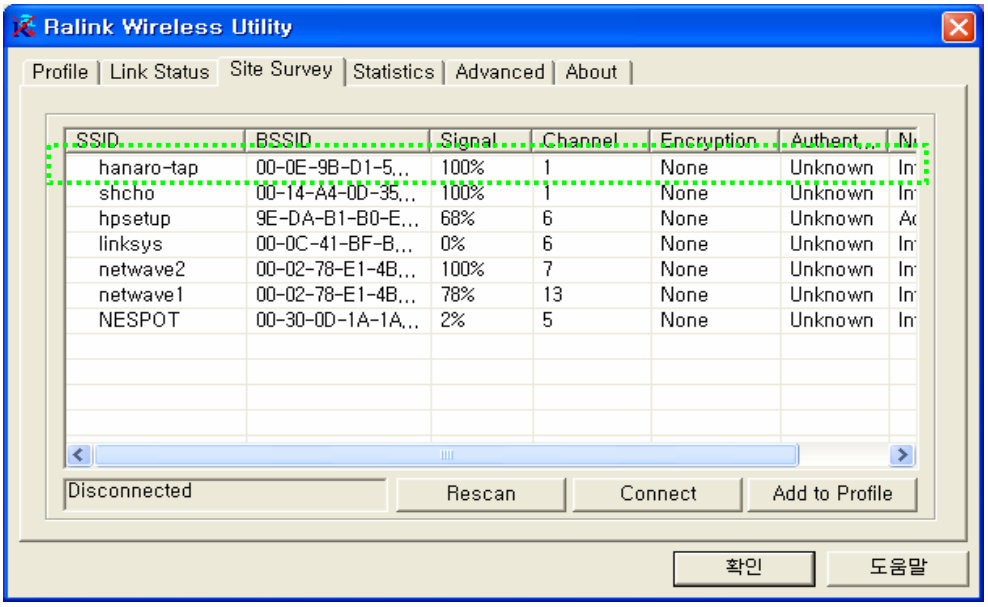
- In case of the patch antenna, the antenna direction should be adjusted to focus the signal towards the client

2.5. Insert the Power

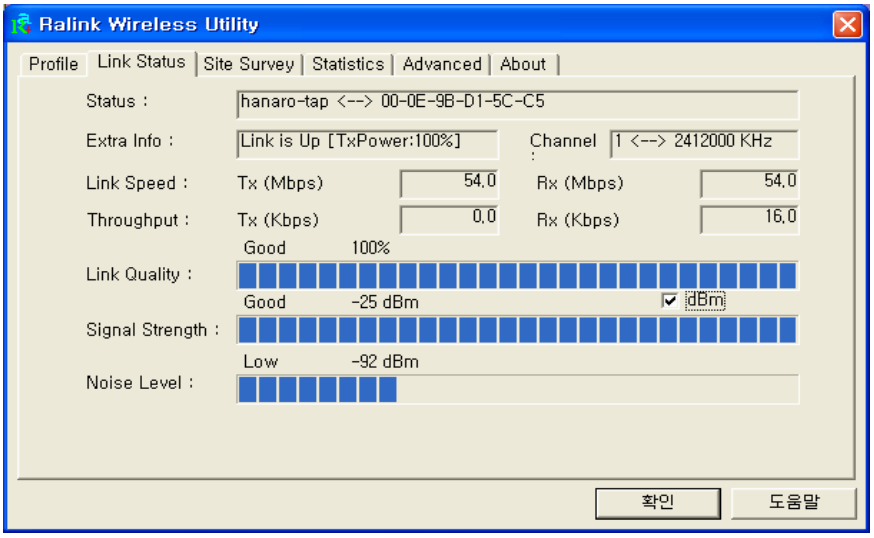
- Insert power into the wireless tap by turning ON the UPS or inserting the fuse into the power passing amplifier

2.6. Check for Proper Operation

- Using the notebook with wireless LAN and a client utility, the wireless channels are scanned for SSID
- If the SSID used by the wireless tap is found(e.g. “hanaro-tap”), the wireless connection should be made to this SSID. The default channel is 1



- Verify that the wireless signal strength(the received power level) shown by the client utility when the client is below or close to the wireless tap is >-55dBm



- Check the notebook IP using the “ipconfig” command in the command prompt and verify that it has acquired the correct IP from the CMTS DHCP server or has acquired the IP 192.168.x.x from the DHCP server in the wireless tap. The wireless tap has an internal DHCP server which takes over when an external DHCP server is not available.
- Access the web management page of the wireless tap via the address “http://192.168.100.1:64680”. The special port number 64680 is used in order to secure the web access as much as possible.
- If web access is still not possible, please set the static IP of the notebook to 192.168.100.10 and the subnet mask to 255.255.255.0
- Login using the id/password = admin/cableroot
- As described in section “4.1 Webui Based Configuration”, the proper operation of the cable modem is verified

2.7. Performance Measurement

- At the client location, the signal strength shown by the client utility should typically be >-75dBm. At such a power level, wireless tap can produce the maximum throughput which would be a limitation of the cable modem.
- Once the client has established RF link to the wireless tap and has acquired the proper IP address to be able to access the Internet, the performance test for actual TCP data throughput can be performed
- The throughput can be checked by using any of the three following methods. In order to make the throughput shown as reliable as possible, the server accessed should preferably belong to the MSO or ISP that has the wireless tap connected to it's CMTS.
    1) A speed checking web site can be used to check the throughput
    2) FTP can be performed
    3) Web download can be performed
- Any of the three methods will show the TCP data throughput which should will be limited mostly by the throughput of the cable modem. Even the raw data throughput of the 802.11g wireless is 54Mbps, the actual TCP throughput can reach roughly half this rate. However, the cable modem throughput is mostly limited by the MSO to be less than 15Mbps.

3. WLAN Site Survey and Planning

The 802.11b/g standard uses the 2.4Ghz frequency. This high frequency radio travels in a straight forward line and a clear LOS(Line Of Sight) path between the wireless tap antenna and the subscriber antenna is the ideal situation.
However in the real world situation, the 2.4Ghz frequency used by the wireless lan belongs to the ISM/UNII band which is shared with various other applications including the digital cordless phone. Also, current and future obstructions need to be considered. Therefore, a strong RF signal is a must.
The most basic steps for the installation include.

1. Identify the target subscriber location
2. Determine the location of the tap to be replaced or location where the wireless tap will be installed
3. Choose and install the antenna for the best radio link
4. Perform a RF scan around the wireless tap and choose the optimal RF channel
5. Perform a throughput check so that greater than 10Mbps throughput performance for TCP or UDP data can be achieved

3.1. Location

- Select the location which provides the closest distance and minimal obstruction to the current or potential future client location. The ideal case would be LOS.
- Since the wireless tap is most easy to install if the legacy outdoor strand mounted tap is replaced, a legacy tap location with good reach of client location should be taken as first priority.
- If such a tap is not available, a separate strand mounting or mounting at the side wall of a building or similar tall structure should be considered. In such a case, the availability of CATV coaxial cable with AC power and DOCSIS signal should be considered.

3.2. Radio Link Path

- After the location is selected and wireless tap installed, the radio link path should be measured and determined if adequate signal level can be received at both ends.
- Perform a site survey by measuring the radio signal strength at various locations around the wireless tap where current or future clients maybe located.
- Radio signal level detection procedures are described in more detail in the “Installation” chapter.
- If the radio signal level is determined to be below the required level, the antenna position and/or direction should be adjusted first. If this is also not adequate, the antenna type maybe changed to a type with more directivity. However a more directive antenna implies that the radio signal tapering outside of the target area needs to be considered for future clients.
- Also, the client side AT(Access Terminal) device can be changed to one with higher antenna gain for better radio detection.

3.3. RF Channel Selection

- As described in the “Installation” chapter, the frequency band occupied by the wireless LAN can be scanned using a client utility or it can be scanned using measurement equipment such as spectrum analyzer.
- The client utility can detect the presence and signal strength of all wireless LAN channels that can be detected while a measurement equipment can also detect the presence of all other signals that share the ISM/UNII band.
- After the RF scanning is completed, the operating channel can be selected based on the results.
- As shown below, if any other wireless LAN channel can be detected, the selected channel should be spaced at least 4 channels apart to minimize signal overlap. If this is not possible, the selected channel should be spaced as far away from other wireless channels as possible. At the same time, it should be free of RF signals from other equipment that share the ISM/UNII frequency.
- If a particular channel has a signal strength of <-90dBm, this channel can be considered unoccupied during the channel planning.

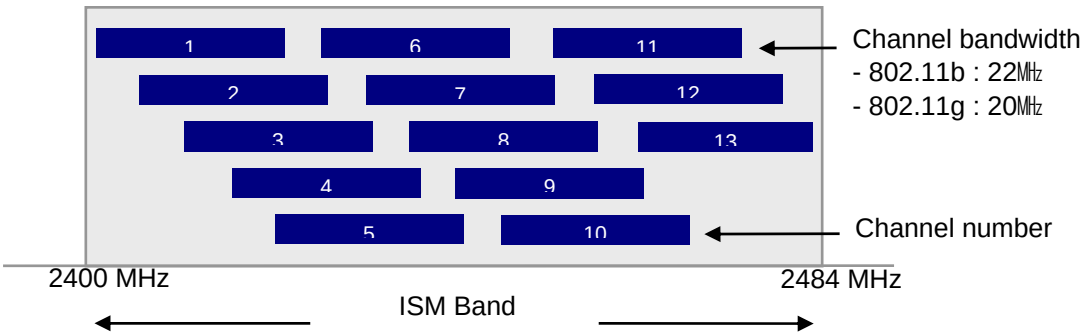


Fig. 9 Channels and frequency coverage

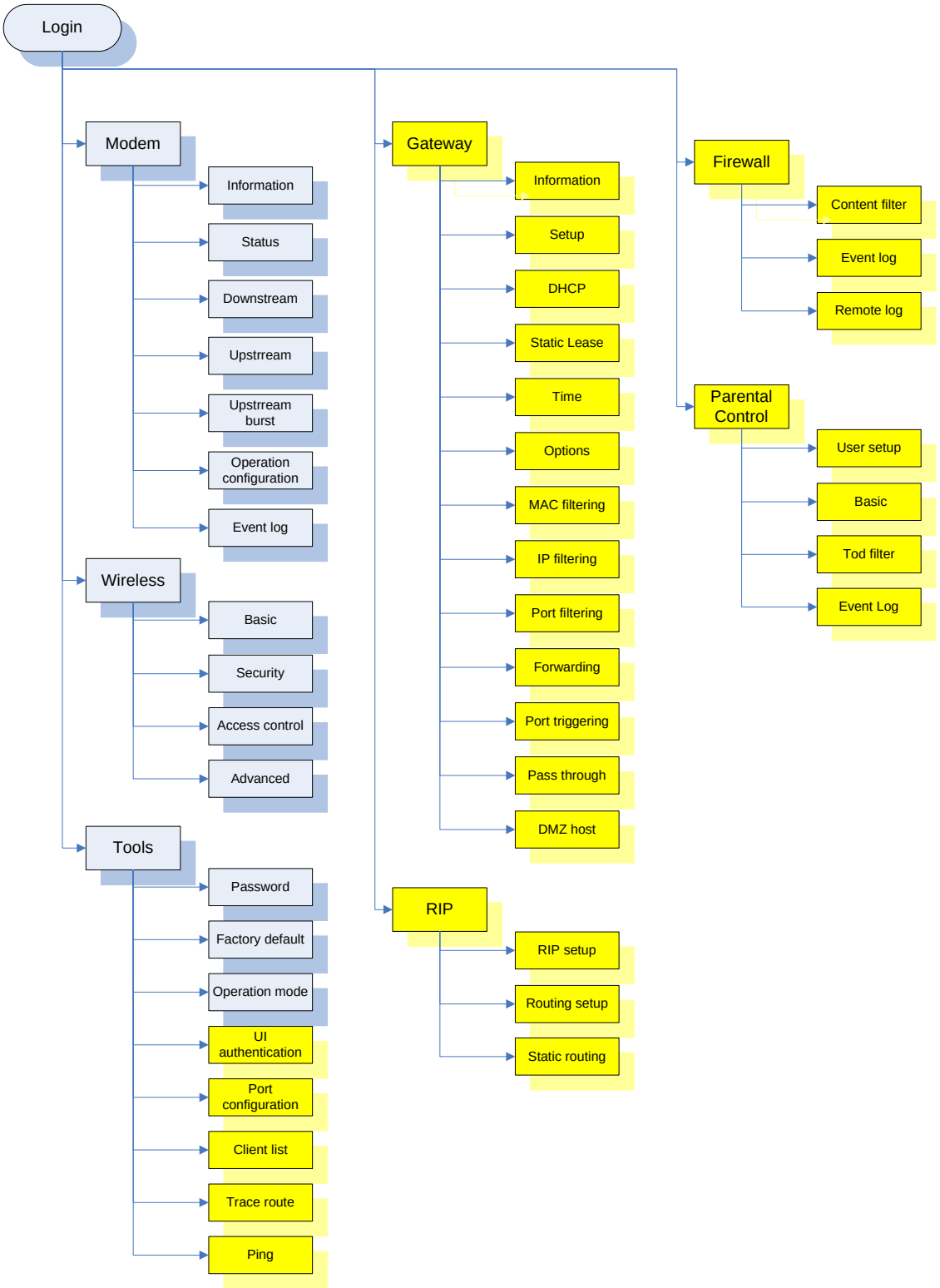
3.4. Performance check

- The throughput performance can be checked as described in section “2.7 Performance Measurement”

4. Configuration

4.1. Webui based configuration

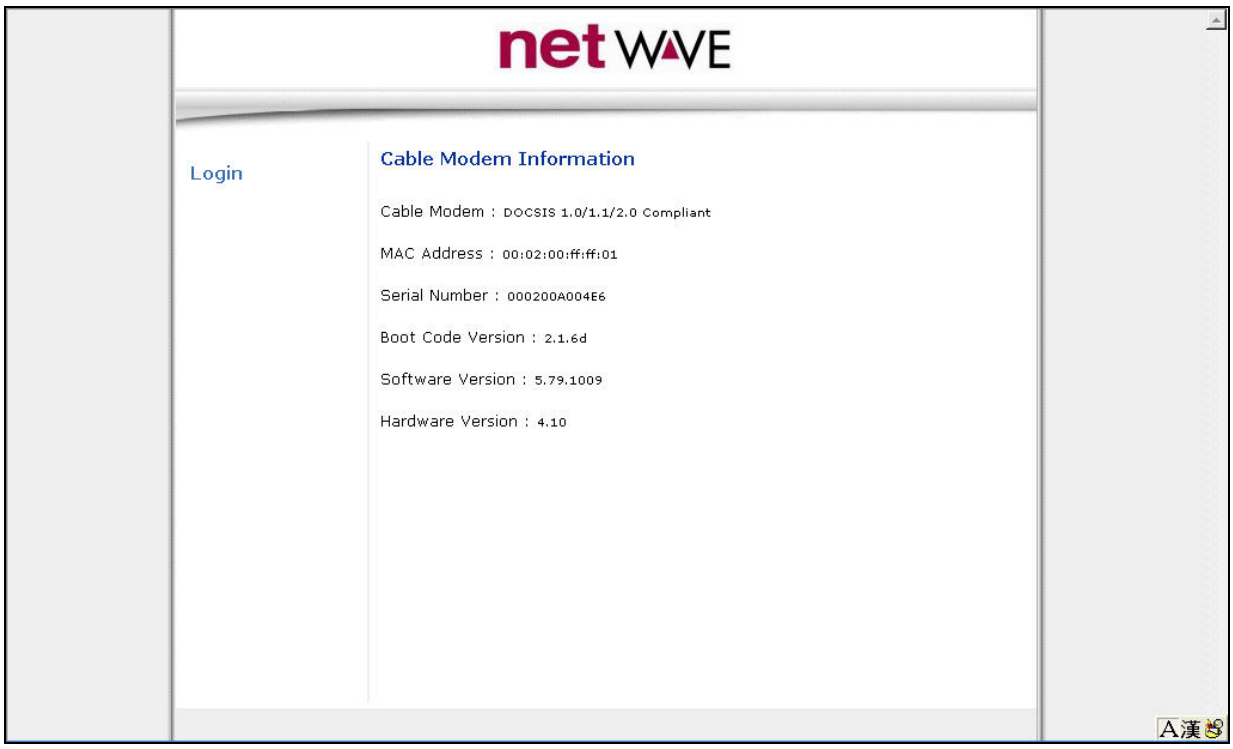
4.1.1. Web menu structure



Blue : Menu available in always available
Yellow : Menu available if NAT is selected from the “operation mode” menu

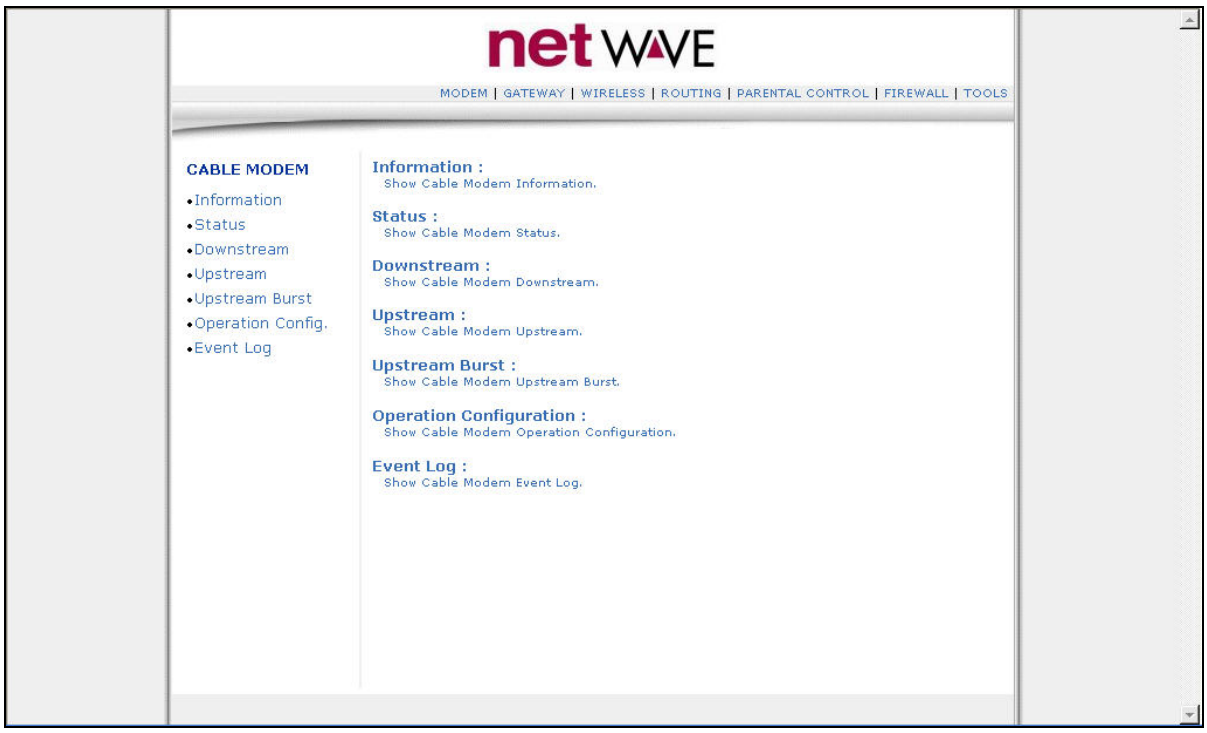
4.1.2. Login method

- After establishing wireless link to the wireless tap web page maybe accessed locally using http://192.168.100.1:64680. This IP address can be accessed if the PC’ s IP address is set to 192.168.100.x or the PC has acquired IP via a DHCP Server.
- Remote web access is possible through http://cm ip address:64680.
- When “ Login” menu is selected, ID/Password is requested.
- ID/Password = admin/cableroot



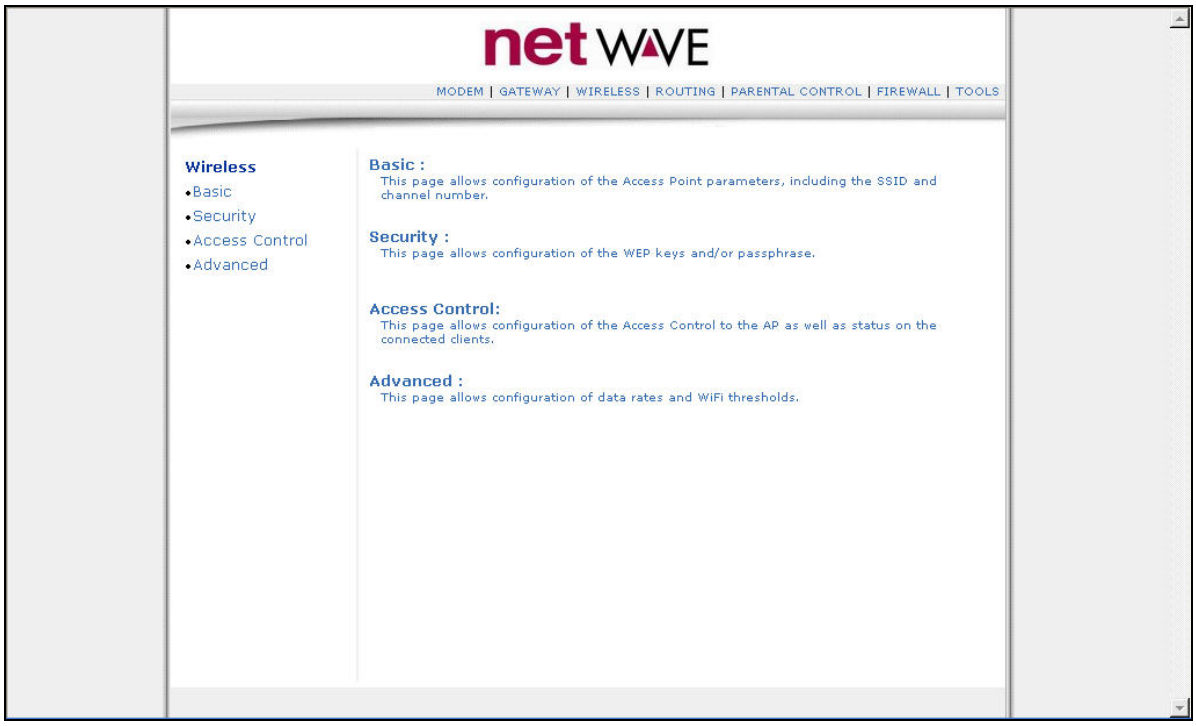
4.1.3. MODEM

- This page shows the relevant pages related to management of the cable modem internal to the wireless tap.
- Information : shows the cable modem mac address or it’ s software and hardware version.
- Status : shows the current status of the cable modem.
- Downstream : shows whether the cable modem is locked to the downstream signal.
- Upstream : shows whether the cable modem is locked to the upstream signal.
- Upstream Burst : shows the upstream burst signal information.
- Operation Config : shows the config file information for the modem.
- Event log : shows the event log of the modem.



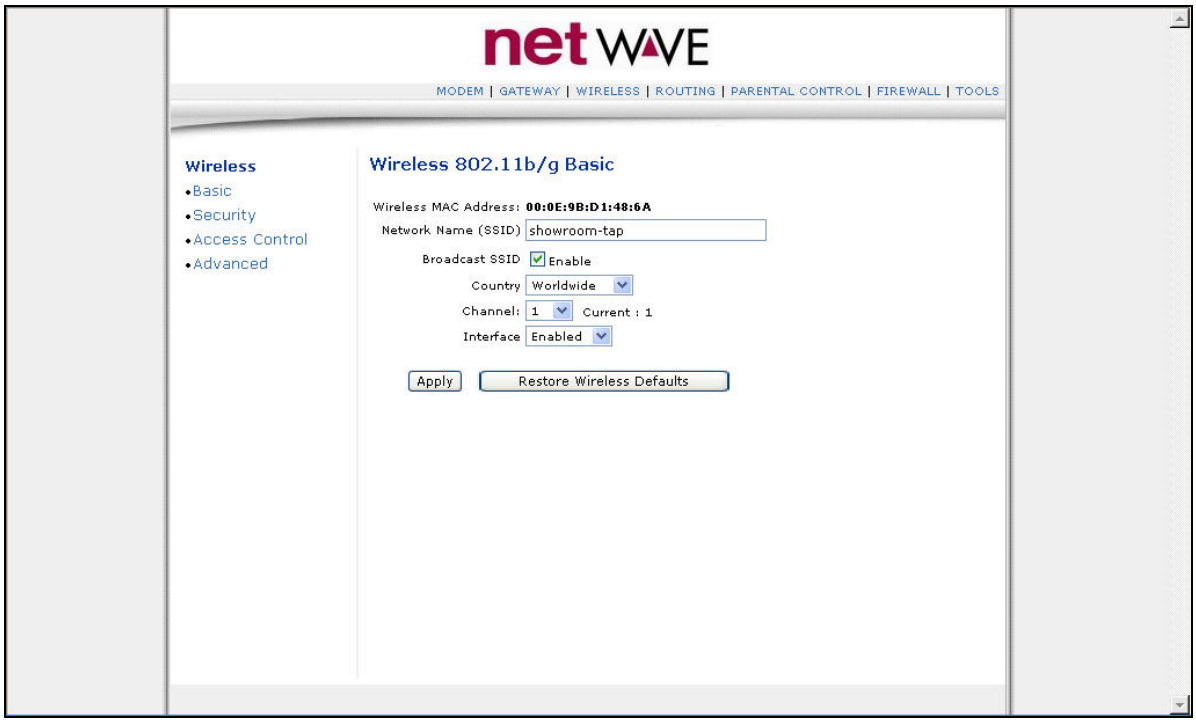
4.2. WIRELESS

- This menu is displayed when the " WIRELESS" menu is selected on the top right corner.
- Four submenus show the wireless LAN related information.



4.3. Wireless/Basic submenu

- Network Name (SSID) : the default SSID is “hanaro-tap”
- Broadcast SSID : SSID maybe broadcast or hidden (default : enable)
- Channel : used to set the WLAN channel (default : 1)
- Interface : disable or enable WLAN (default : enable)

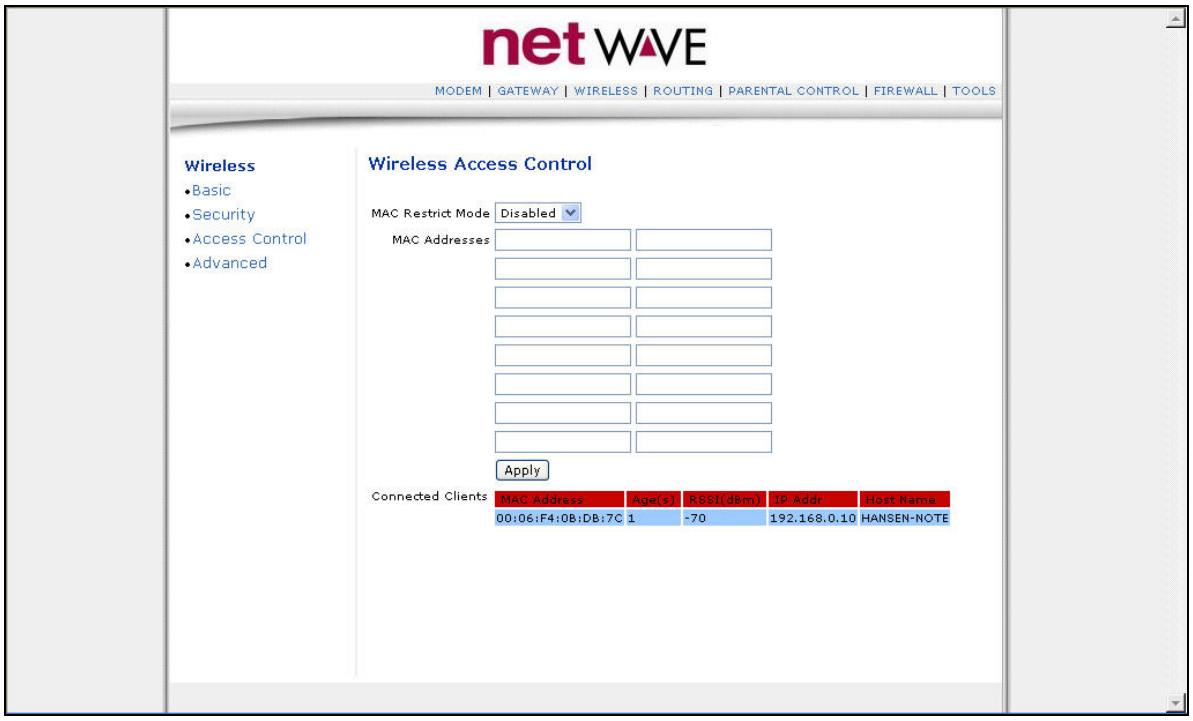


4.4. Wireless/Security submenu

- is used to set security parameters related to the radius server.

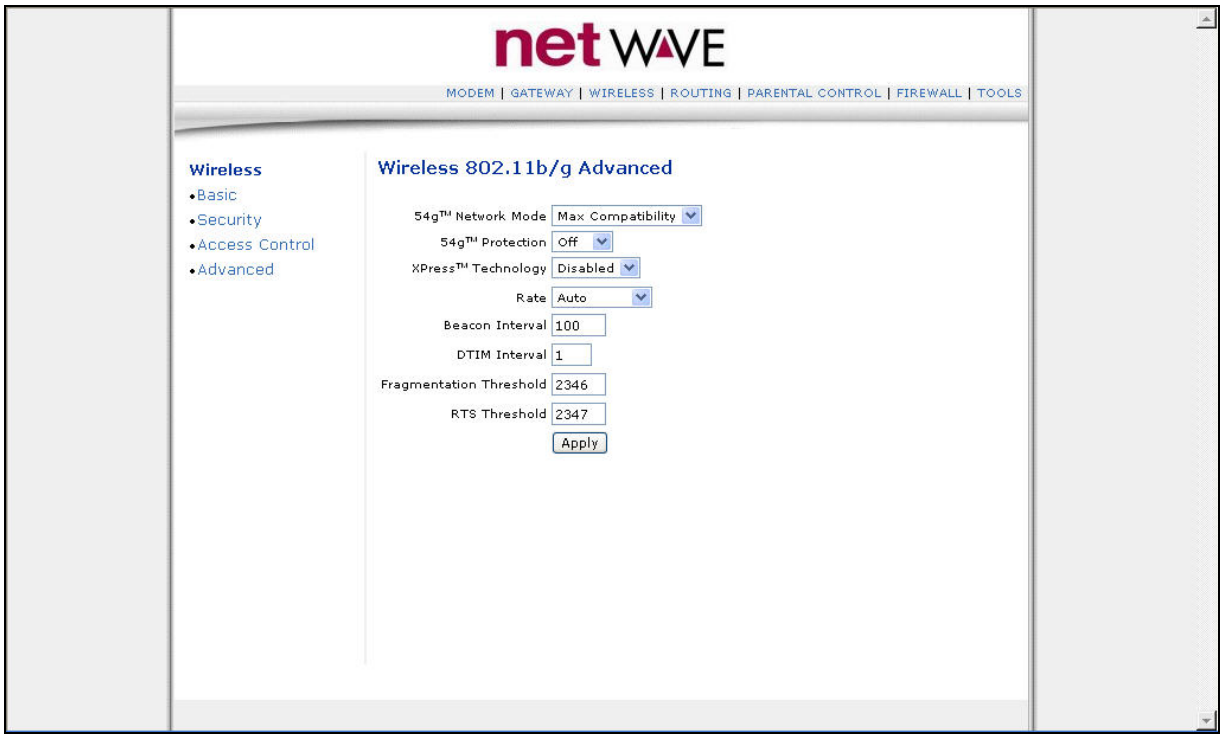
4.5. Wireless/Access Control submenu

- MAC Restrict Mode : the following rules will be applied to the mac addresses listed in the " MAC Addresses" field (in the format 00:02:00:5b:63:01)
  - Disabled : not used(default)
  - Allow : only listed MAC Addresses may establish link via WLAN
  - Deny : is the opposite of allow and only listed MAC Addresses will be denied link via WLAN
  - Connected Clients : shows the clients currently connected via WLAN



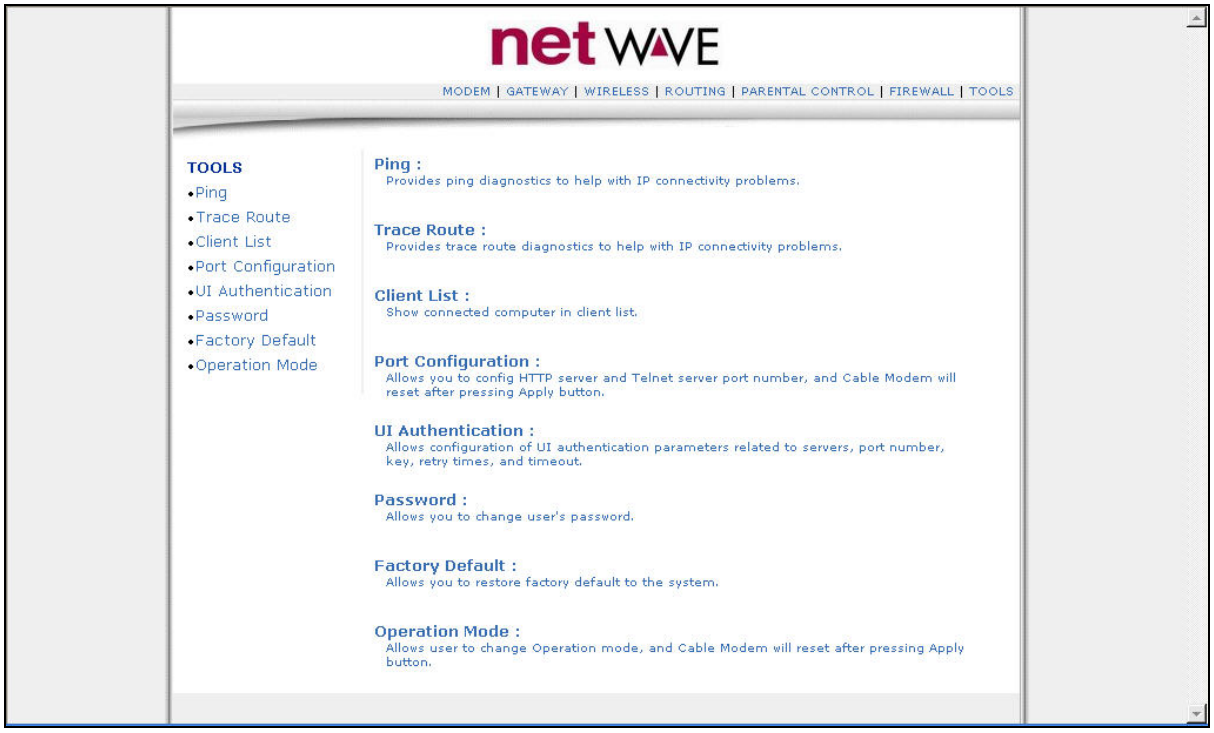
4.6. Wireless/Advanced submenu

- 54g™ Network Mode : WLAN operation mode is selected.
  - 11b Only : only 11b link is supported
  - 54g Only : supports only 54g™(Broadcom) and 11g link
  - Max Compatibility : provides maximum compatibility by supporting all 54g™, 11b & 11g clients
  - Max Performance : supports only 54g™ and provides the highest throughput
- 54g™ Protection : In Auto mode the AP will use RTS/CTS protection to improve 802.11g performance in mixed 802.11g + 802.11b networks. Turn protection Off to maximize 802.11g throughput under most conditions.
- Rate : Forces the transmission rate for the AP to a particular speed. Auto will provide the best performance in nearly all situations. (default : auto)



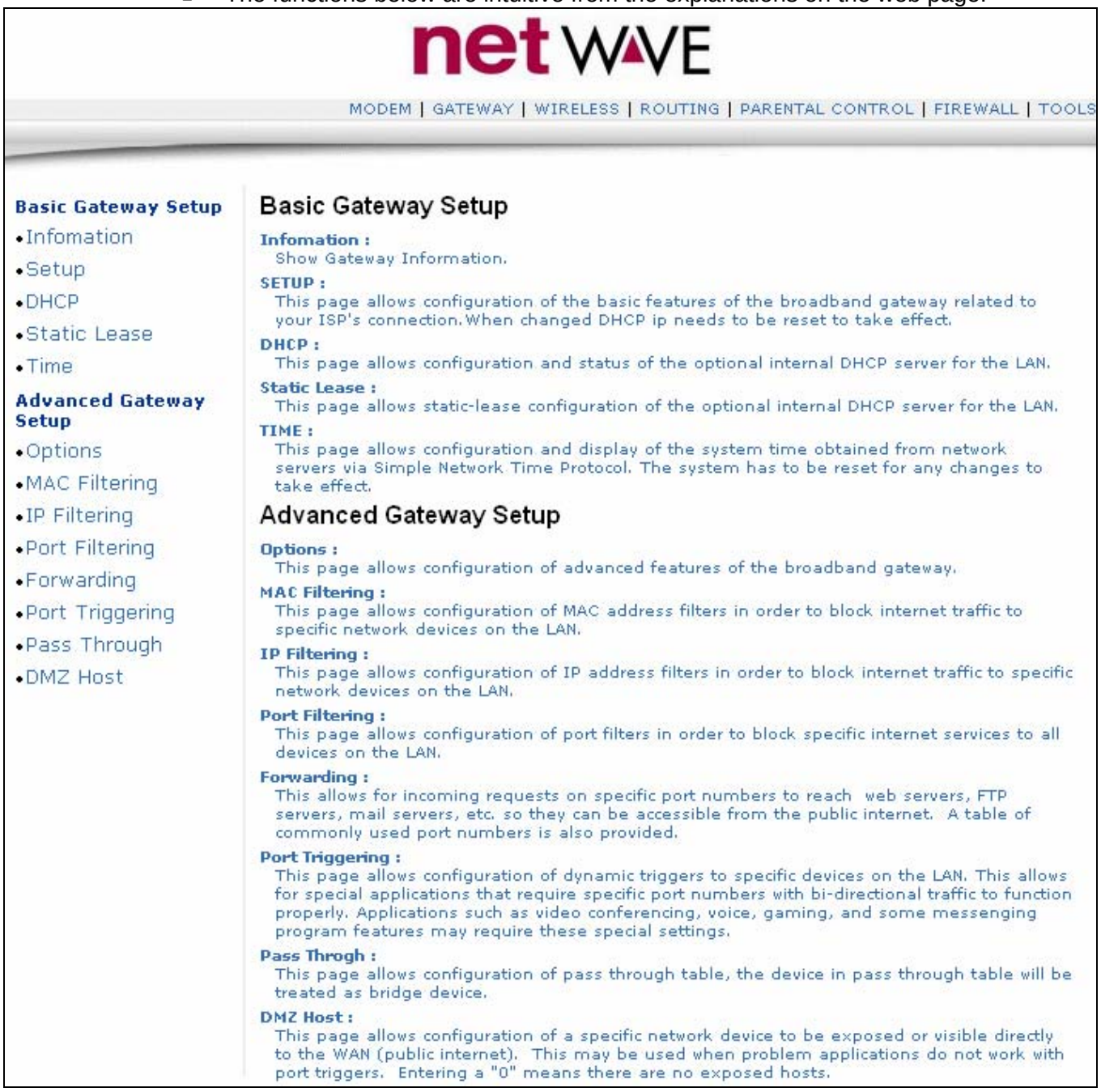
4.7. TOOLS

- This menu is displayed when the “ TOOLS” menu is selected on the top right corner.
  - Password : web access ID and password maybe used.
  - Factory Default : reset to factory default.
  - Operation Mode : select between bridge and NAT mode for wireless LAN operation.



4.8. Gateway

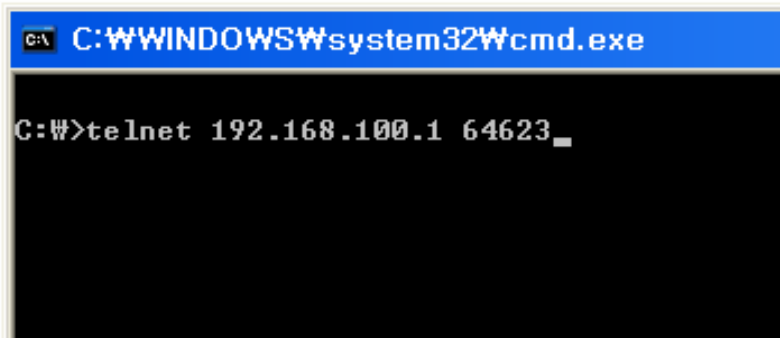
- Contains all the settings related to the gateway features.
- This menu is enabled only when NAT is enabled via the “operations mode” menu.
- The functions below are intuitive from the explanations on the web page.



4.9. Telnet based configuration

4.9.1. Telnet access

- Similar to the webui, Telnet access can be made locally through the wireless link
  C:\>telnet 192.168.100.1 64623
- Or remotely through,
  C:\>telnet [IP address of wireless tap] 64623
- After telnet is established, please type ID and password as shown below. (ID:admin / Password: cableroot)



- Command format is similar to the CISCO network equipment interface. “Tab” shortcut key can be used and “?” will display information related to commands.

```
login: admin
password:
>?
access-list          Access List Control
arpclear             Clear ARP table
authentication       Authentication Configuration
arp-storms           ARP Storm configurations
banner               Banner-text
copy                 Copy command
cpe-limit            Limit connected CPE range
debug                Debugging functions
dhcp                 DHCP commands
dns                  Assign domain name server
exec-timeout         Configure login timeout
exit                 Disconnect
firewall             Enable/Disable firewall
fragmented-ip        Block fragmented IP packets
host-name            Host name command
interface            Interface commands
nvram                NVRAM command
oper-mode            Configure the system operation mode
ping                 Ping specified IP address
pwd                  Change password
quit                 Disconnect
reset                Resetting system
rip                  RIP commands
route                Static route command
sess-timer           Configure TCP/UDP/ICMP session timer
show                 Show commands
snmp-configuration   SNMP Configuration
telnet-access        Telnet access control command
tracert              Trace route
txpwrlevel           Shows the current WLAN Tx Power level setting.
undebug              Disable debugging functions
wan-connection       Configurate for WAN Connection
web-access           Web access control command
write                Write configuratoin to nvram
802.1x               Sets/Shows the current Wifi authentication settings.

>
```

4.9.2. Telnet commands

Commonly used menus related to the wireless interface include the following,

```
>interface wireless ?
configuration       configuration wireless UI enable/disable in user level
shutdown            Shutdown interface
startup             Startup interface
ssid                Set SSID
channel             Set wireless channel number
country             Set wireless country
defaultkey          Set default WEP key
encryption_mode     Set encryption mode
wep                 Set WEP 64 or 128 bits key table
passphrase          Set WEP Passphrase
broadcast_ssid      If disable, a station cannot obtain the SSID through
                    passive scanning and authenticate without the exact SSID.
restric_mode        Set/Show MAC Restric Mode and Table
radius              Wifi Radius client configurations
gmode               Sets the mode of the 54g interface
wds                 Shows/Sets the current WDS setting
```

- interface wireless shutdown : will disable WLAN
- interface wireless startup : will enable WLAN
- interface wireless ssid xxx : change the SSID name of WLAN to xxx
- interface wireless channel x : change the WLAN RF channel to x
- interface wireless restrict_mode disable : disable MAC filtering
- interface wireless restrict_mode allow : allow clients on MAC list to have access
- interface wireless restrict_mode deny : deny access to clients on MAC list
- interface wireless restrict_mode add : add MAC address to list
- interface wireless restrict_mode delete : delete MAC address from list

Other commonly used menus may include the following.

- cpe-limit wireless : will limit the number of clients linked via WLAN (note : if the cable modem Max CPE value is smaller, the smaller number will take precedence)
- pwd : Telnet id, password can be changed
- reset : perform software reset of wireless tap
- show : will show the current status of WLAN and cable modem related parameters. Various submenus are available to provide more detailed information.
- show cpe-info : show clients linked via WLAN
- show interface cable downstream : shows cable modem downstream status
- show interface cable upstream : shows cable modem upstream status
- telnet-access port : can change the port number for Telnet access. (default: 64623)
- quit : finish the Telnet session

4.10. SNMP based configuration

4.11. Software upgrade

5. Troubleshooting

5.1. Troubleshooting for various symptoms

Section	Symptom	Action
Cable modem	1) Cable modem not online 2) Webui accessible via wireless	1) Verify cable modem MAC is registered on server 2) Verify that the DOCSIS signal level into the cable modem is at an appropriate level. This can be done by measuring the signal output from the subscriber connector and subtracting 3.5dB(12+0.5+1-17) as explained in section 1.2.1. 3) Verify that there is no signal quality problem on the HFC network 4) Try replacing the wireless tap(possibly cable modem failure)
	1) Cable modem not online 2) Wireless link is now working	1) Verify that AC power is available on the trunk cable 2) Try replacing the wireless tap(possibly wireless card failure)
Wireless LAN	1) Wireless receive strength close to the wireless tap is >-55dBm	1) Check that the antenna cable connection to the wireless tap and antenna is tight 2) Try replacing the antenna cable 3) Try replacing the wireless tap

5.2. Disassembling the wireless tap

It is recommended not to disassemble the wireless tap in any circumstances. The following material is provided just as a reference.

5.2.1. Unscrew the four hexagonal screws that can be found on the subscriber port side.

- These screws hold together the body as well as the top of the tap-off. Unscrewing the screws will separate the wireless tap into the three sections as shown in fig. 10

Fig. 10 Unscrew the four main screws

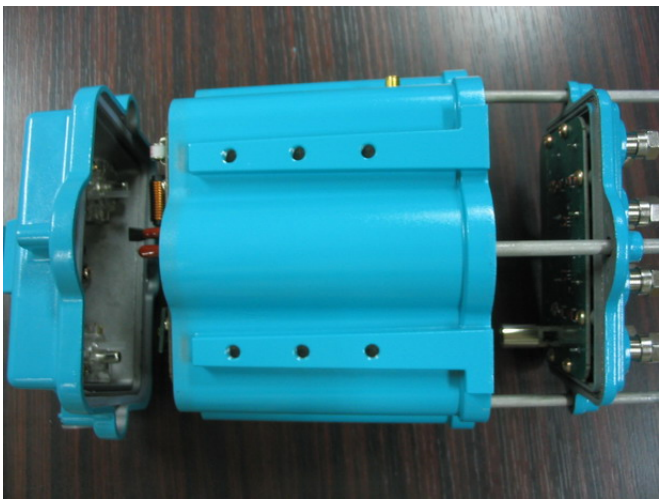


Fig. 11 Separated into three sections after screw removal

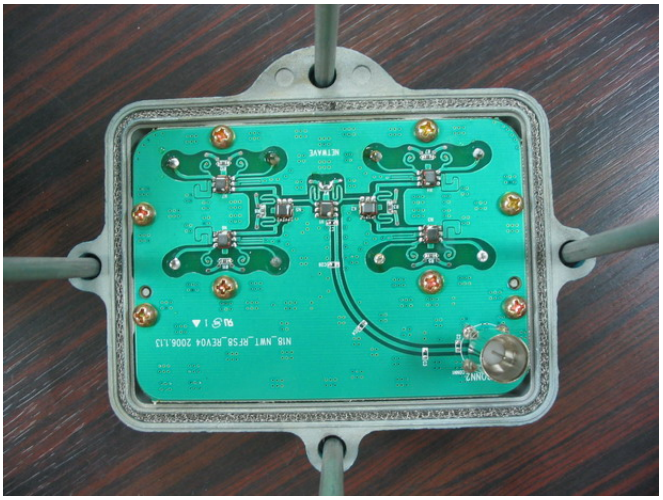


Fig. 12 Splitter circuit for the bottom tap ports

Fig. 13 Cable modem with wireless lan

Fig. 14 Top cover with connection to the trunk cable

5.2.2. Removing the RF and AC coupling board

- The RF and AC coupling board is situated on the top of the main body an it can disassembled by removing the eight screws that hold this board.
- After the screws are removed, the board can be removed by lifting the area where the RF connector is located using a flat head screw driver.
- As shown in fig. 16, the AC cable is disconnected from the internal power module by pressing the side of the plastic flap as shown.
- The plug-in coupler can be easily replaced by hand as shown in fig. 18. The same coupler will have a 3dB difference in coupling ratio between an 8 port and 16 port design. The module shown in the example will result in a 17dB tap for 8 ports and 20dB tap for 16 ports.

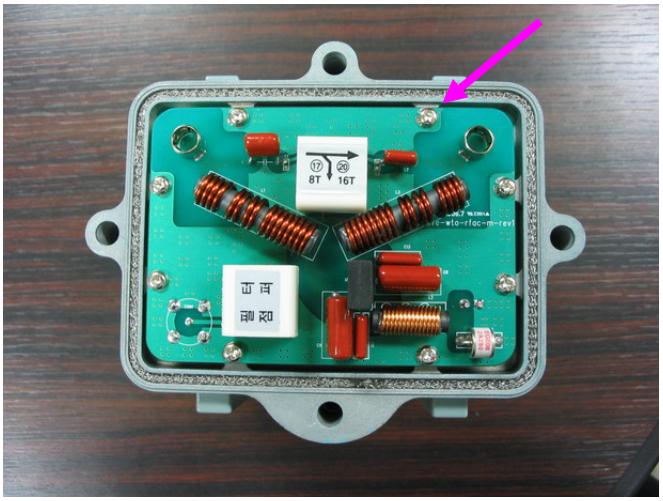


Fig. 15 Remove the eight screws holding the RF and AC coupling board

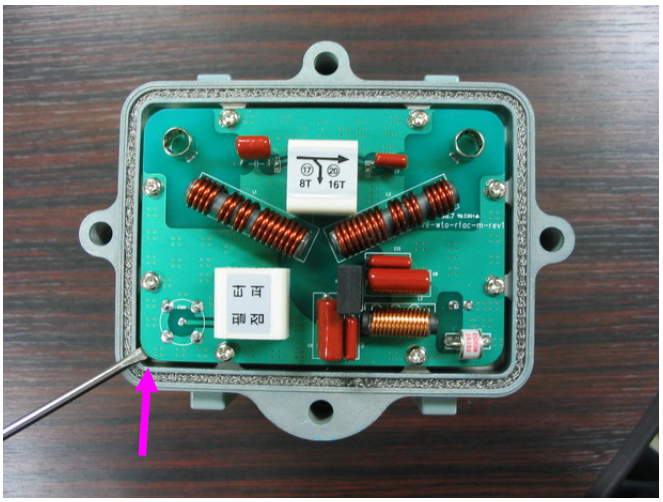


Fig. 16 Dislodge the board by lifting the board as shown

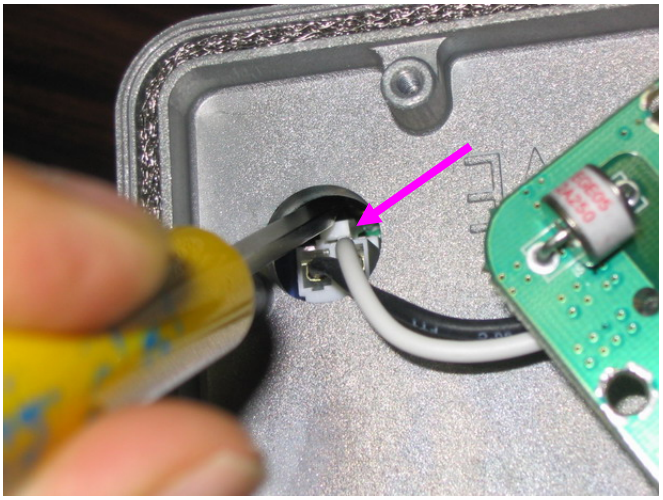


Fig. 17 AC cable disconnection

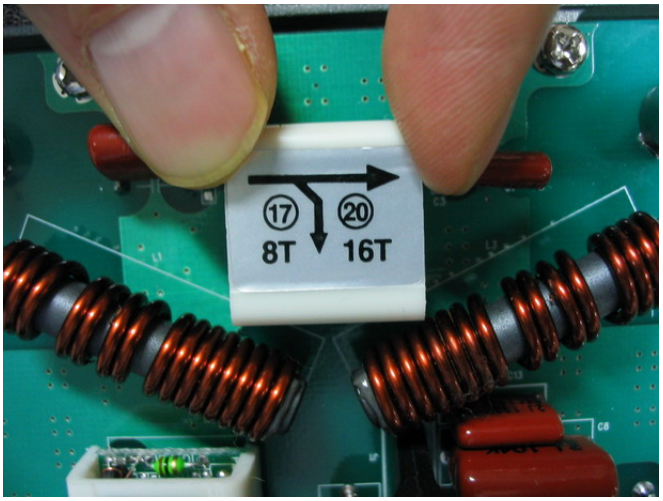


Fig. 18 Plug-in coupler module can be removed by hand

5.2.3. Removing the modem board

- The modem board with the wireless lan daughterboard can be removed by unscrewing the four screws holding the board to the housing.
- The bottom of the modem is occupied by a power module that is isolated with a cover. You can find a DC cable connecting the modem board to the power module.

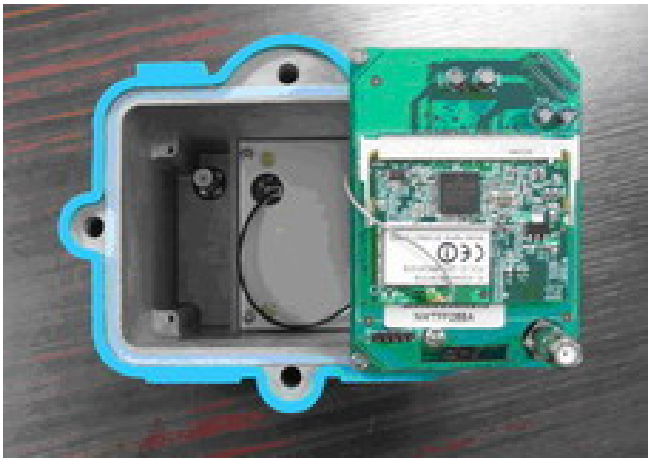


Fig. 19 Modem board unscrewed

6. Appendix

6.1. Ordering table

6.2. NWTAP-100 specifications

6.2.1. Cable Modem

ITEM	Downstream (Receiver)	Upstream (Transmitter)
Main IC	Broadcom BCM3349	
Frequency Range	88MHz ~ 860MHz	5MHz ~ 42MHz
Channel Bandwidth	6 MHz	200K, 400K, 800K, 1.6M, 3.2M, 6.4MHz
Modulation	64QAM/256QAM	QPSK, 8 QAM, 16 QAM, 32 QAM, 64QAM, 128 QAM(S-CDMA Only)
Symbol Rate	5.057/5.361Msymbols/sec	160, 320, 640, 1280, 2560,5120 Ksymbols/sec
Bits per Symbol	64QAM: 6 bits 256QAM: 8 bits	QPSK: 2 bits 8QAM: 3 bits 16QAM: 4 bits 32QAM: 5 bits 64QAM: 6 bits 128QAM: 7 bits
Data Rate	30Mbits/sec(64QAM) 43Mbits/sec(256QAM)	0.32 ~ 5.12Mbs (QPSK) 0.48~15.36 Mbps(8QAM) 0.64 ~ 10.24Mbs (16QAM) 0.80~25.60 Mbps(32QAM) 0.96 ~ 30.72Mbps(64QAM, 128QAM)
Input Power	-15dBmV ~ +15dBmV	
Output Power		TDMA: +8 to +54 dBmV (32QAM, 64QAM) +8 to +55 dBmV (8QAM, 16QAM) +8 to +58 dBmV (QPSK) S-CDMA: +8 to +53 dBmV (all modulations)
RF Interface	75Ω F-type female connector	
Ethernet Interface	Standard RJ45 connector	
Forward Error Correction	RS(122,128) Trellis	Reed Solomon
Carrier To Noise Ratio	64QAM: 23.5dB@BER<10^{-8} 256QAM: 30dB@BER<10^{-8}	

6.2.2. Wireless LAN

Item	Spec
Main IC	Broadcom BCM4318
Wireless standard	IEEE 802.11b/g
Data Rate	802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11b, 11, 5.5, 2, 1 Mbps
Modulation	OFDM, CCK, DQPSK, DBPSK

Operating Frequencies/Operating Channels	2.4GHz~2.497GHz (14 channels for Japan) 2.4GHz~2.472GHz (13 channels for Europe, Korea) 2.4GHz~2.462GHz (11 channels for North America)
RF Output Power	20 dBm maximum (>17dBm output from antenna connector)
Antenna diversity	Antenna diversity is supported
Antenna connector	SMA (female)
Antenna type	Various types supported

Attestation
FCC ID : QWFNWTAP-100
Product : Wireless Tap
Model : NWTAP-100

Wd don't provide any controls or software to allow operation outside the USA frequency bands when this product is sold within the USA.

6.2.3. Authentication & Gateway

Item	Spec
Authentication	MAC, EAP-MD5, WPA2
Client count	Maximum client count limiting
Accounting	Radius accounting
Filters	mac, ip and port filtering
DHCP	DHCP server
Forwarding	Port forwarding and triggering
DMZ	DMZ host
Firewall	Parental control and firewall
VPN	IPSec & PPTP passthrough
Router	RIPv2

6.2.4. TAP

Item		Unit	Spec							Comments
Frequency range		MHz	5.75 ~ 870MHz							
Tap off value		dB	11	14	17	20	23	26	29	
Max insertion loss	8-tap	dB	-	4.9	3.5	2.7	2.0	1.9	1.8	Down
			-	3.9	2.0	1.4	1.1	1.1	1.1	Up
	16-tap	dB		-	4.9	3.5	2.7	2.0	1.9	Down
				-	3.9	2.0	1.4	1.1	1.1	Up
Min reverse isolation	8-tap	dB	-	23	26	27	30	33	36	Down
			-	25	25	28	31	31	31	Up
	16-tap	dB		-	23	26	27	30	33	Down
				-	25	25	28	31	31	Up
Tap off variation		dB	< ±1.5							
Subscriber port coupling		dB	> 20							
Reflection loss		dB	> 16 (input, output, subscriber port)							
Frequency response		dB	< ±0.75 (tap-off value)							
Hum modulation		dB	> 65							
Current capacity		A	> 10A							

6.2.5. General

Item	Spec
Management	HTTP, Telnet and SNMP
Upgrade	Remote software upgrade
Feeder power input range	60~130V AC
Power consumption	<7watts
Size	19x12x15cm(for 8 tap)
	20x14x16cm(for 16 tap)
Weight	2.21 Kg
Environment	Temperature : -35°C ~ + 60°C
	Humidity : 5% ~ 85%

6.3. FCC warning

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio, TV technical for help.
- Only shielded interface cable should be used.

Finally, any changes or modifications to the equipment by the user not expressly approved by the grantee or manufacturer could void the users' authority to operate such equipment.

1) Sales
The device cannot be sold retail to the general public or by mail order. It is only sold to professional dealers or service operators.
2) Installation
This device requires a professional installation by someone trained in CATV HFC networks as well as WiFi equipment.
The NWTAP-100 is mounted on strands that are located high on poles. The input and output connectors need to be connected to 12C coaxial cables which feed CATV signals as well as AC powering. Therefore, it is dangerous for an untrained person to install this equipment. Furthermore, a person trained in WiFi should support the installation work so that the optimal reception of WiFi signals at intended locations can be achieved.
3) Application
The NWTAP-100 is not intended for personal use. This equipment should be installed and maintained by a service operator who will provide Internet access through this equipment.