

## Saving configuration

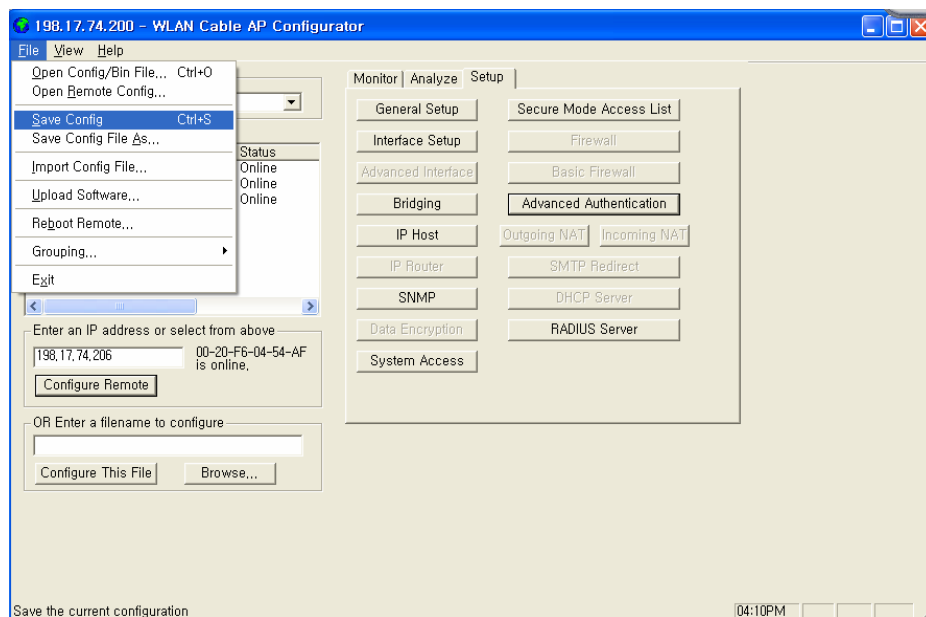
Saving the current configuration settings to the hardware device is a one-step process:

Use this File Menu option to save the base station configuration parameters to the location from which they were read. If the configuration was read from a base station, it will be saved to the CSU from which it was read. If the configuration was read from a file, the modified configuration will be saved back to that file.

To import a saved configuration to an CSU, first connect to the base station using Open Remote Config, then use Import Config File.

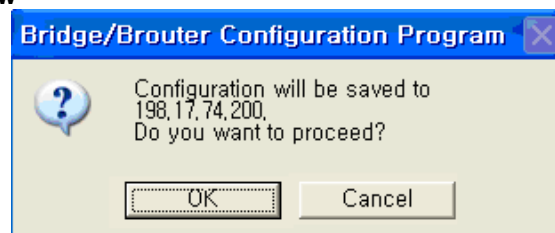
1. From the File Menu, select Save Config.

**Figure 5-1**  
**Save Config Menu**



2. Click on the 'Yes' button

**Figure 5-2**  
**Confirm Save Config Window**



3. The message box will be displayed, as shown below, and then left click on the OK button.

**Figure 5-3**  
**Reboot Message Dialog Box**



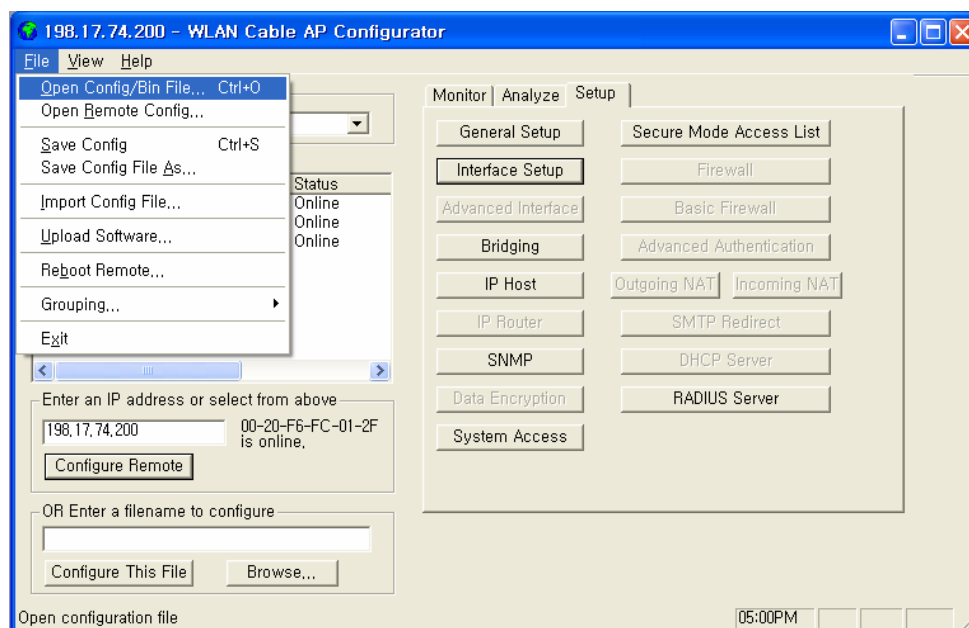
4. Just after this saving, APU or CSU will be restarting automatically.

## Loading new configuration

The 'import config file' option enables you to 'copy' the parameter values that you entered to configure the first Secure Data Mode Station to the other units. The "import config file" option enables you to 'copy' the parameter values that you entered to configure the first Secure Data Mode Station to the other units.

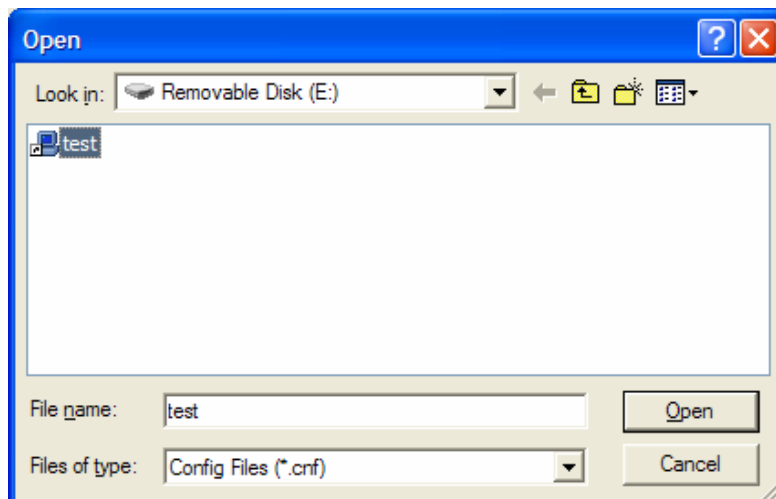
1. From the File menu, select Open/Config Bin File.

**Figure 5-4**  
**Open Config/Bin File Menu**



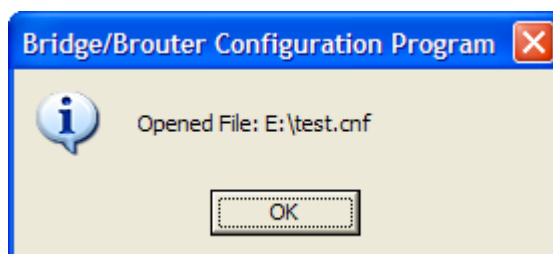
2. And the browse window will appear.

**Figure 5-5**  
**Open Config File Window**



3. Select the configuration file in the specific folder, and Click 'Open' button,
4. Then, bridge/router Configuration Program" screen will appear.

**Figure 5-6**  
**Confirm Open Config File Dialog Box**



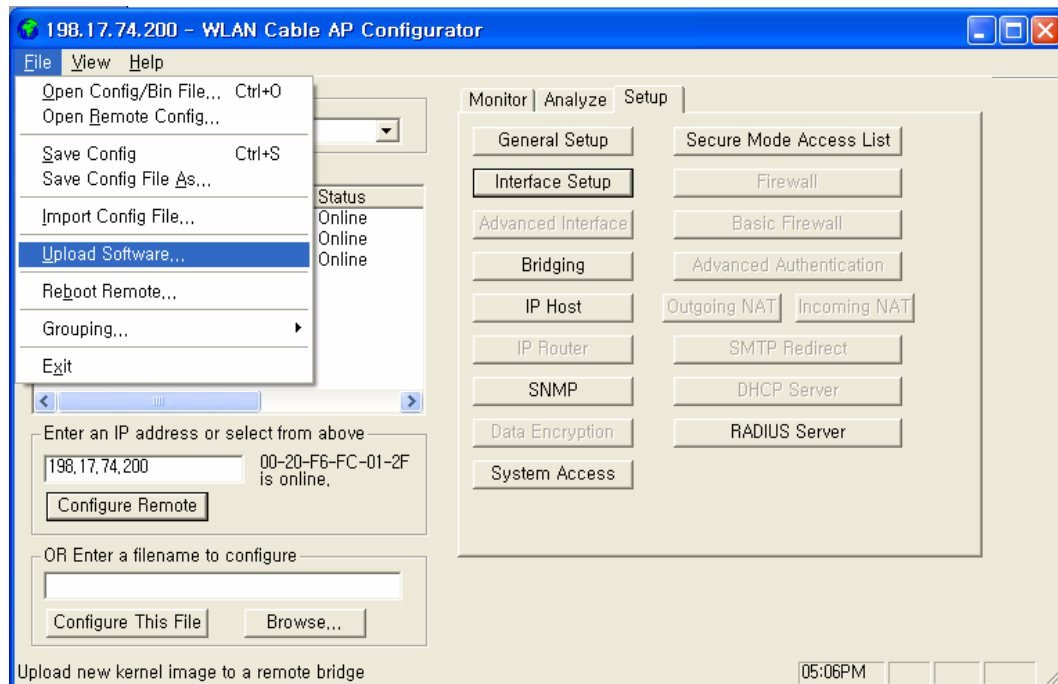
5. Left click on the OK button.

## Uploading Software

There are ten steps that must be done to import the .bin file and its corresponding license file. Be sure you have downloaded and know the location of your files before you start.

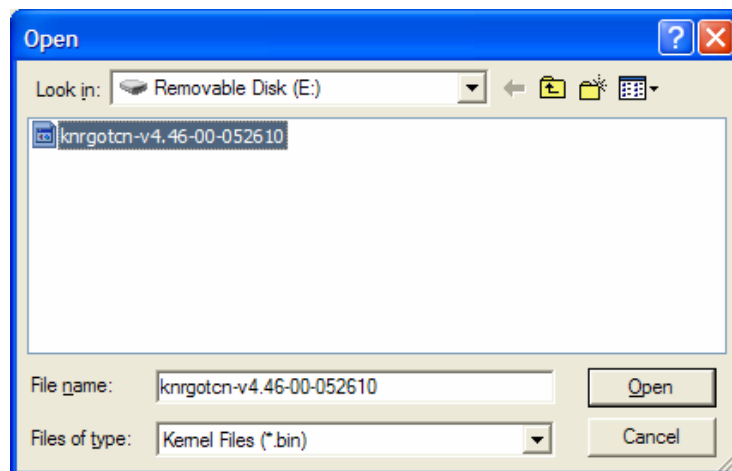
1. From the File menu, select Upload Software, and the browse window will appear.

**Figure 5-7**  
**Upload Software Menu**



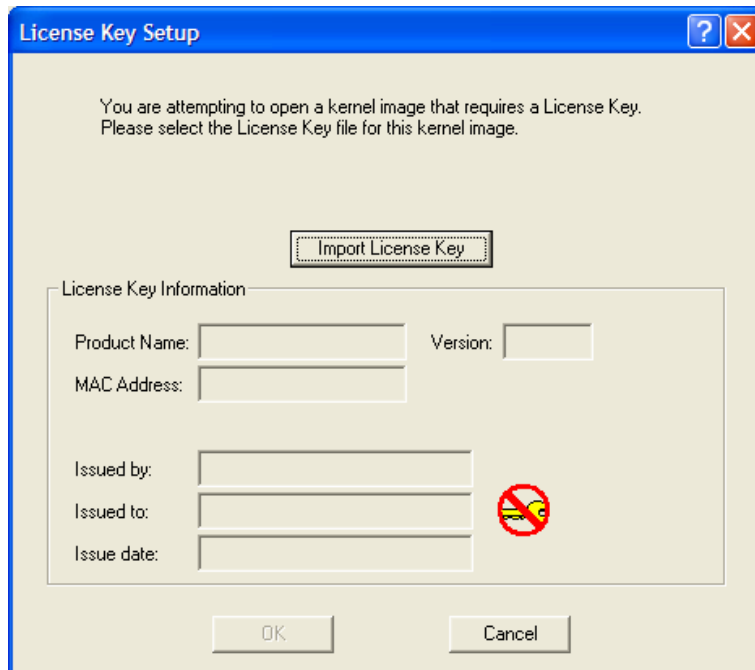
2. Browse to the location of your .bin file, and select it.

**Figure 5-8**  
**Open binary Window**



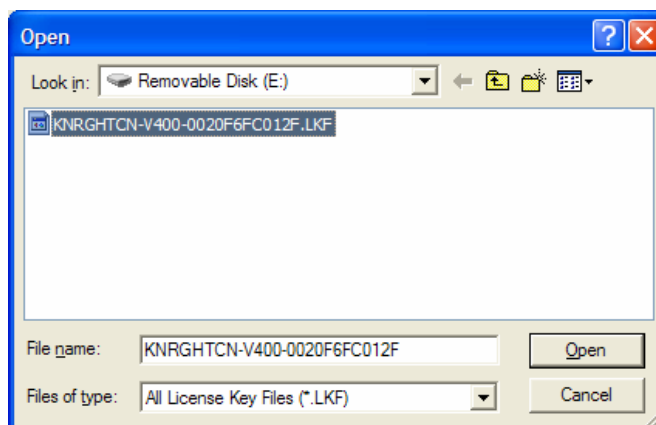
3. Click on the 'Open' button, and the "License Key Setup" screen will appear:

**Figure 5-9**  
**License Key Setup Window**



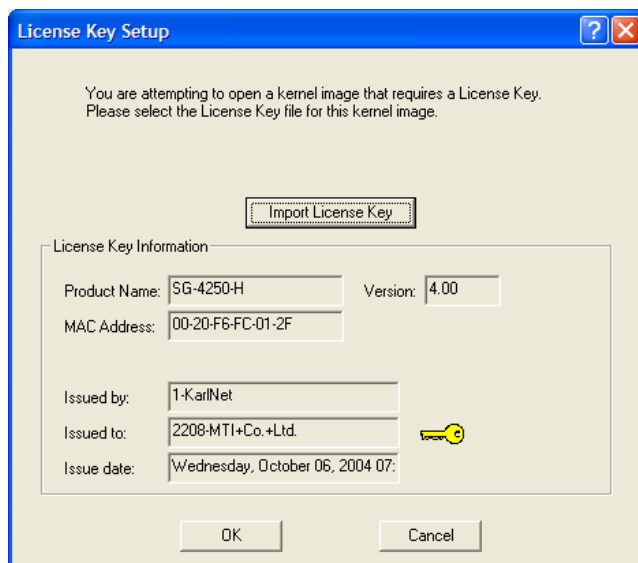
4. Click on the "Import License Key" button, and an "Open" dialog box will appear:

**Figure 5-10**  
**Open License Key Window**



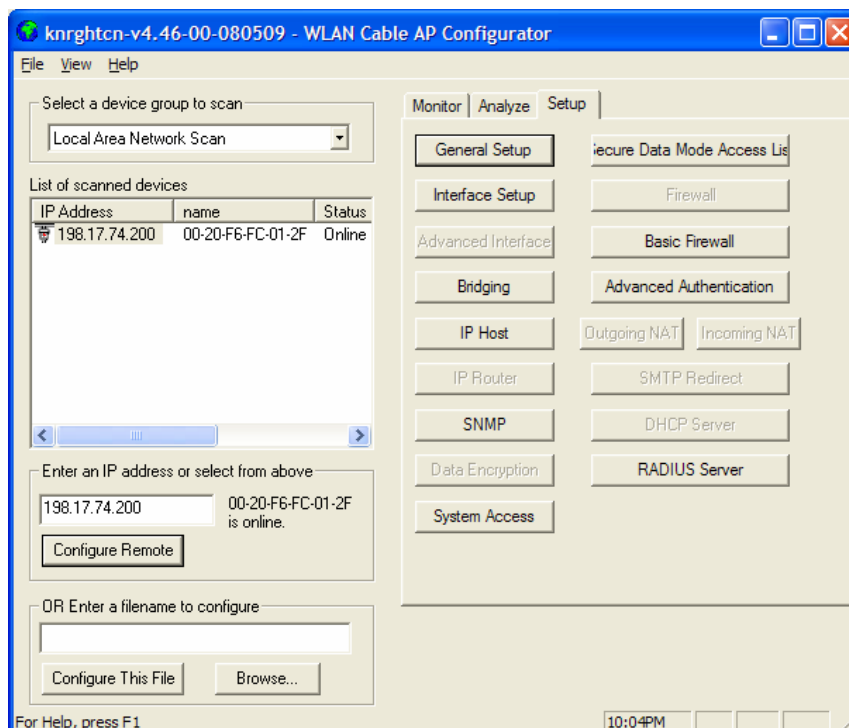
5. Select the license file that corresponds to the Ethernet MAC of the unit you are working with. (If you have "Licenses for this MAC address" selected in the file type drop box, only the licenses for the MAC of the current unit will appear.)
6. Click on the 'Open' button

**Figure 5-11**  
License key setup window



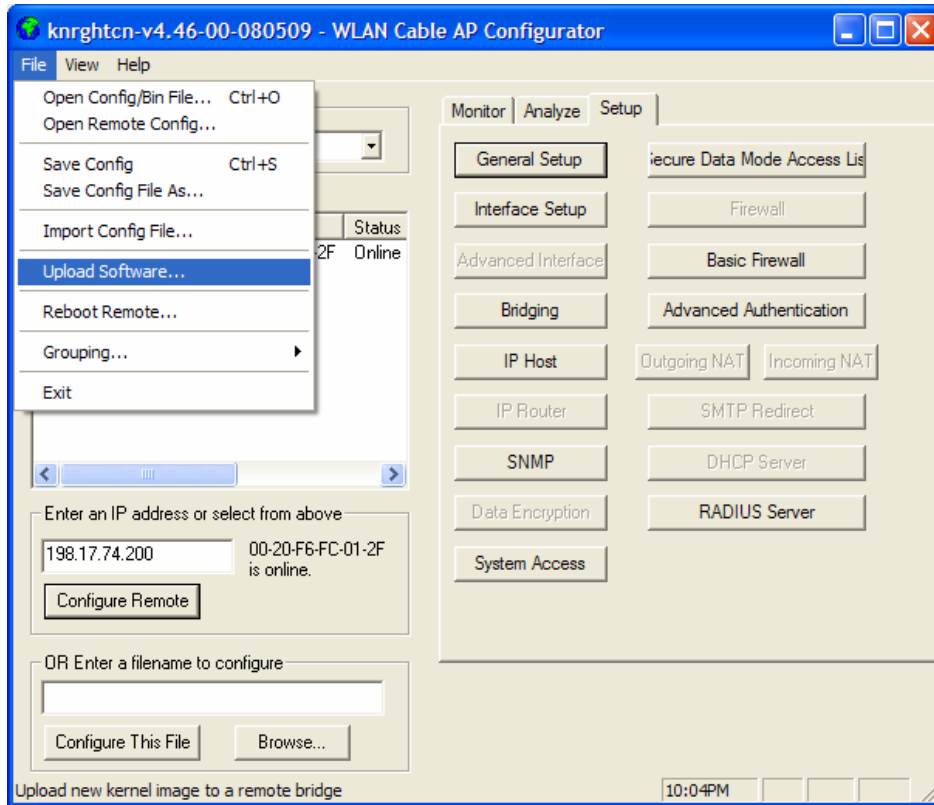
7. Click on the 'OK' button

**Figure 5-12**  
Setup window



8. You can see an initial setup windows and then, From the File menu, select upload software as below.

**Figure 5-13**  
**Selecting Upload Software**

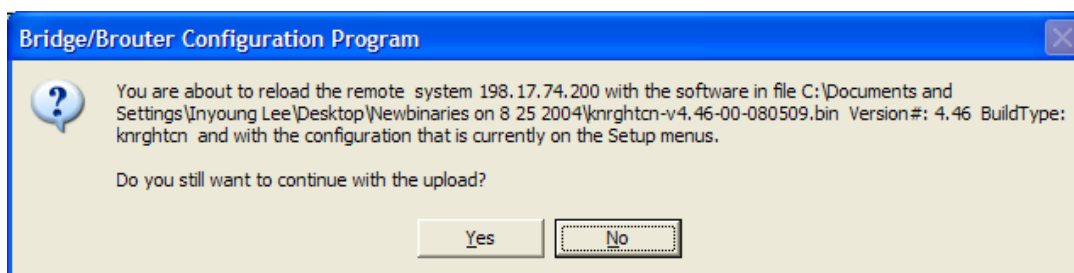


**Figure 5-14**  
**Enter IP address dialog**



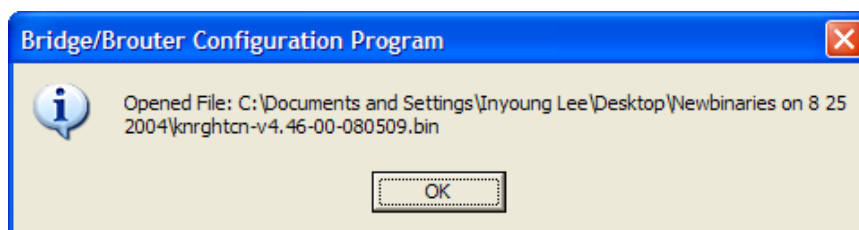
9. Enter the IP address of the unit to upload new software binary and Click on the 'OK' button.

**Figure 5-15**  
**Uploading Confirmation Dialog 1**



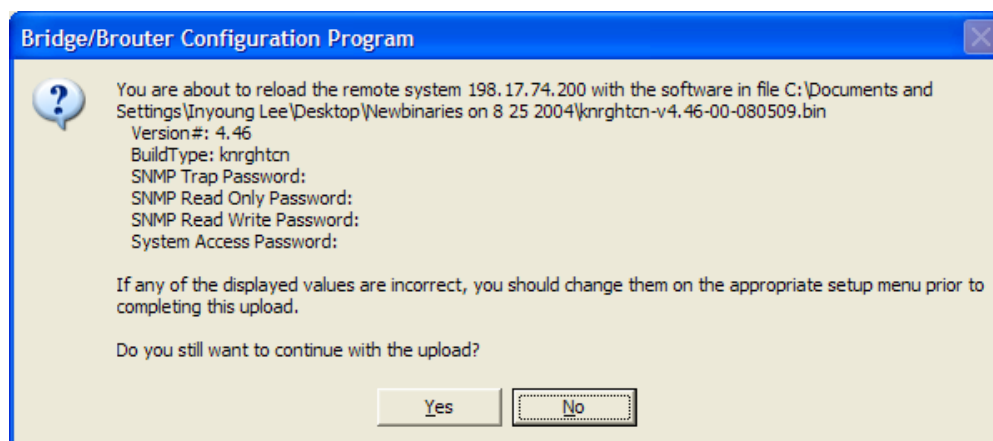
10. Click on the 'OK' button

**Figure 5-16**  
**Uploading Confirmation Dialog 2**



11. Click on the 'OK' button

**Figure 5-17**  
**Uploading Binary Information Dialog Box**

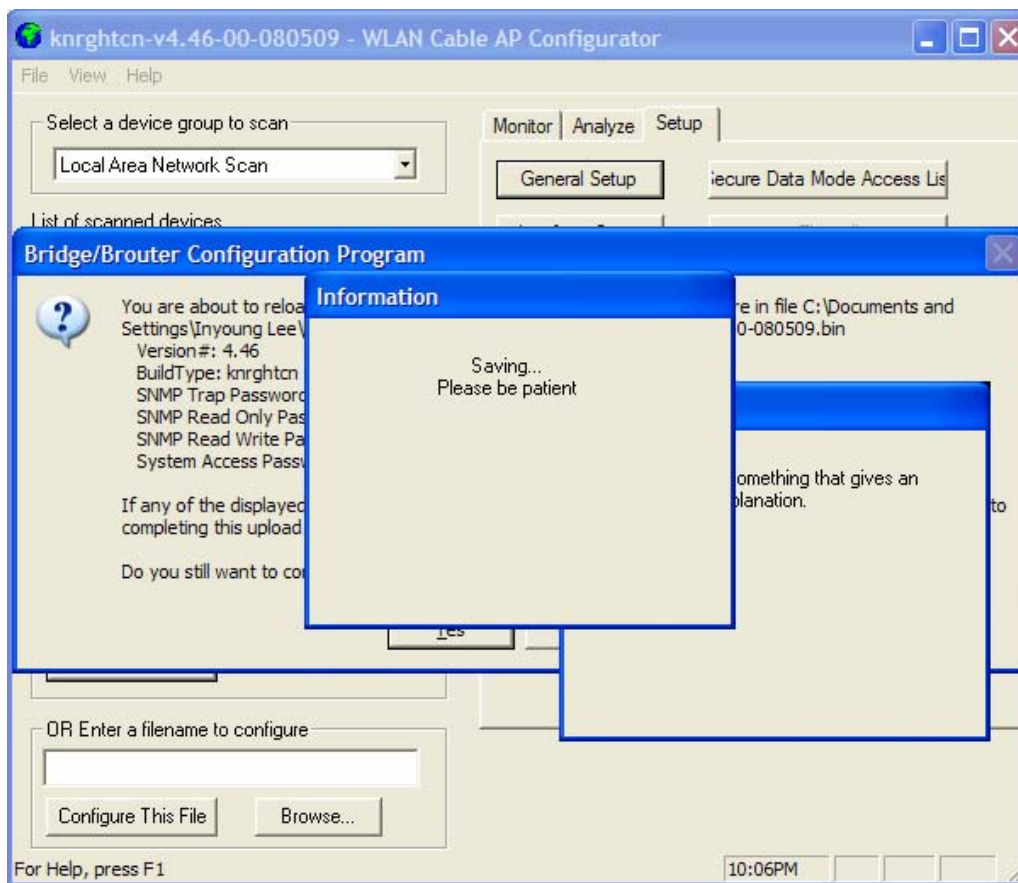


12. Click on the 'OK' button

13. "Saving ....Please be patient" screen will appear as below

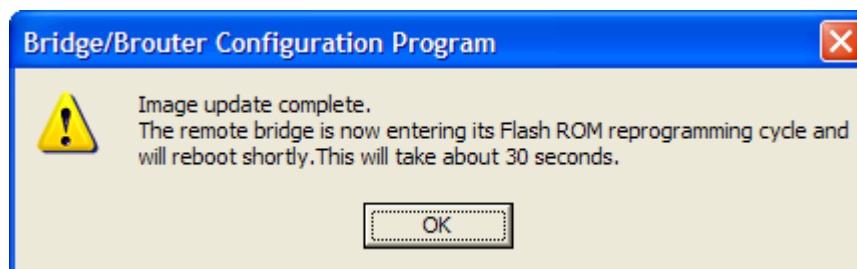


**Figure 5-18**  
Saving software uploading window



14. Click on the 'OK' button

**Figure 5-19**  
Reboot Message Dialog Box



15. Click on the 'OK' button

16. Software Uploading complete.

## Reboot a Remote Station(APU and CSU)

The Reboot Remote option of the file menu allows you to reboot remote devices if stations get dropped from the network.

Please follow the rebooting procedure to reboot a station from a remote location.

1. Select File/Open Remote Config.
2. Enter the IP address and read/write password for the target base station.
3. Once the configuration has been read from bridge, select File/Reboot Remote.
4. The APU or CSU will restart and run startup diagnostics.

**Note:** After approximately 60 seconds, the unit will start bridging operation using the configuration parameters as they were stored in the remote station prior to the Reboot.

**Note:** If you would like to display the configuration file or monitor the unit's performance after a Reboot, you may have to wait until the unit completes the start-up diagnostics. Once the startup diagnostics are complete, the unit can be accessed again.

# Troubleshooting

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**1. APU Power cannot be Turned ON.**

Check that the CATV Power (45VAC ~ 95VAC) is supplied thorough the coaxial line by measuring the AC Voltage Level.

If no power signal is detected at the end of the coaxial cable, you should search a problem point on the CATV Network while moving up toward the ONU and UPS Power supply.

**2. LED 2(Link 1) is continuously blinking after running a long time and all network entity including APU cannot receive IP address from DHCP server.**

Measure the RF signal level at the end of the coaxial cable or monitoring port in the APU enclosure. Also check whether or not the RF signal level is beside the range of required signal. If so, adjust the power level by tuning all related network facility to meet the requirements for the operation of the Cable Modem.

\* Normal Power level (DOCSIS): +15 to -15 dBmV

**3. LED 3(Link 2)/LED 4(Radio Link) are turned off.**

In the AP Configurator, select and click the setup tap, move to “interface” to see whether or not Ethernet 2 and 802.11 is enabled. If disabled, check each interface. If the LED lights are still turned off in spite of this work, the APU system may have failed. If so, contact the Nortel local representative or technical support center.

**4. How do I see and configure a setup parameter of the CSU without a radio connection to the APU?**

The only devices that will display in the Configurator local scan window are the units in the same subnet as your management computer. If the device in question is not displayed in your local scan window, change the IP address (Client PC) to any one of the subnet IP address groups “198.17.74.XXX” and then, you can find out the CSU entity with the IP address “198.17.74.254”.

**5. Why can CSU setup a radio connection to the APU?**

Such situations are caused by various reasons as below:

- Mismatching between the radio setup parameter of APU and that of CSU
  - + Radio Channel
  - + Network ID (NWID)
  - + WEP Encryption Key
- Radio Link Designing Problem(Link Distance, Antenna Direction and so on)

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**6. How many CSU subscribers can connect to a single WLAN Cable Access Point (APU Secure Data mode)?**

Eight CSU subscribers can connect to a single WLAN Cable Access Point in secure data mode.

**7. How does the number of CSU Secure Data modes affect wireless throughput?**

As more CSU Secure Data modes are added, the APU Secure Data mode Base Station mode is still able to effectively manage the throughput of the overall wireless link. Just as on any shared medium, each station's throughput is determined by the overall usage of the wireless link. The more stations transmitting on the link at a time, the lower each individual station's throughput goes. However, Secure Data mode performs in such a way that up to a point, the more heavily loaded the network becomes, the higher the overall throughput becomes.

For example, due to the intricacies of our Adaptive Dynamic Polling algorithms and Secure Data mode 'fairness' principles, a single-user FTP session does not use all of the possible wireless bandwidth. But when performing several different transfers to and from different CSU Secure Data modes, the actual overall bandwidth of the Secure Data mode network increases. In general, the heavier a Secure Data mode network is loaded, the higher the total bandwidth used becomes.

**8. How do I check throughput?**

Network throughput can be tested and analyzed using the Ping Fill test. This test dynamically fills the network connection with ICMP Echo (ping) packets and waits for the responses from the target station. Since each packet sent is echoed back to the sender, this tests the overall wireless throughput in both directions. Choosing the correct parameters is crucial to obtaining accurate Ping Fill test results. The speed at which the target station responds to the ICMP Echo packets is crucial to correctly assess the speed of the wireless link.

The IP stacks in some PC operating systems, such as Microsoft Windows, often do not respond quickly enough to the ICMP Echo packets to obtain an accurate assessment of your network throughput. When running the Ping Fill test to a Microsoft Windows system, your results may be slightly lower than normal throughput.

**9. How do I read the configuration from a device if I cannot see the unit in the local scan window?**

The only devices that will display in the Configurator local scan window are the units in the same subnet as your management computer. For example your PC has an IP address 64.22.33.13 with a subnet mask of 255.255.255.0 and your

device has an IP address of 65.23.11.2 with a subnet mask of 255.255.0.0. The device in question would not display in your local scan window.

Even though you may be able to ping the unit it may not be visible in the local scan window. In the Configurator, select the file menu, and then open remote config and then type in the IP and the password. It may be necessary to select the "this device is in my local subnet" check box to actually read the configuration from the unit. Attempt to read the configuration with it un-checked first. If the configuration cannot be read try with this box checked.

**10. I seem to have lost or forgotten the read/write password to manage my product.  
How can I get back in to manage the unit?**

If the read/write password has been lost or forgotten, there is only one thing that can be done about this in order to be able to manage the unit again. The unit must be put into force reload mode and the firmware must be reloaded. All configuration settings will be lost. Physical access to the unit is required in order to accomplish this procedure.

**11. I am performing a wireless link test from a CSU Secure Data mode and one of my CSU Secure Data modes on the other side of my base station is showing up, is this a problem?**

It is a normal function to be able to see the other units in the wireless link test this way. This shows you what devices are within range so that the radio can "hear". As long as the units are set as Secure Data mode CSU Secure Data modes, there is no way they will actually be communicating with each other. They are receiving radio signals from each other that they have to interpret and dump. This is not an optimal solution and should be changed when it is practical to do so by isolating antennas, changing polarity or reducing output power if possible.

**12. Please provide the list of parameters for the different levels of signal strengths i.e. No Connection, Poor, Acceptable, Good, and Excellent. How do I determine what is good and bad?**

What these values will mean, is somewhat specific to the environment being worked under. For example, a Signal to Noise Ratio of 15 may be fine for one area and 15 may not work very well in a high noise area. So here are some general guidelines. Keep in mind all the information below is related to Secure Data mode, for 802.11b mode replaces retransmit with dropped packets:

There are some further items to note:

Link planning should be done in your general geographic area and your links should be set up with an extra margin that your company determines.

Links are best performed when possible with high gain antennas as opposed to

low gain amplified antennas

Noise is typically introduced by failing amplifiers and problems with connectors and defective radios. Signal typically drops with bad cabling, connectors or antenna misalignment, radio power issues Network ID and Channel values being the same, may help stability in marginal links.

Marginal (sporadic links) typically occur in SNR ranges from 5-9, 10-15 usually will keep association with retransmits or some packet loss. SNR from 16 and up usually are acceptable for every day operation.

If SNR is over 25 and throughput is poor, overdriving or multi-path may be the cause of the problems.

Secure Data Mode Station Entries - Provides information on octal packet, retransmitted packets and failed packets. A value other than 0 under failed packets typically points to a link issue. Keep in mind TC retransmits a packet 9 times, (with the initial packet 10 total).

This has occurred and the packet has been dropped when a failure occurs. Retransmits should be 15% or less of total transmits, this may indicate signal, noise or antenna alignment issues.

Remote Statistics - Check each Ethernet Interface, any errors or collisions may be signs of link speed or greater network related issues.

Check each wireless interface. Specifically, compare the Frame Check Sequence errors to the bytes in values. Typically FCS occurs on any wireless connection. This should only be a concern if the value exceeds approximately 10% of the bytes in value. This may be an indicator of signal/multi-path issues.

### **13. Can I block unwanted MAC addresses from the Ethernet interface?**

It is possible to set an Access Control List to set all of your allowable MAC's on the Ethernet (everything else on the Ethernet will be denied) by reading the configuration from the unit with the WLAN Cable AP Configurator. Go to the Setup tab -- General Setup -- Select the Mac Authentication Access control radio button and click OK. Then select the Setup tab -- Advanced Authentication -- check the Access Control List and then click the Setup button. Add all your allowable MAC's and select the Ethernet interface to apply the ACL.

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# Appendix

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- A. Specification**
- B. DOCSIS Specification**
- C. Antenna**
- D. Enclosure Dimension**



## Appendix A. Specification

### Access Point Unit (APU)

#### Physical

- Dimension
  - 300(W) \* 232.6(L) \* 112(D) [Unit: mm]
  - 11.81 (W) \* 9.157 (L) \* 4.40 (D) [Unit: inch]
- Weight(without antenna): 6.9234 lbs(<7 lbs), 3.14 Kg
- Enclosure: Strong Aluminum alloyed –Steel with anodizing coating surface(Waterproof, EMI protection, Vibration Robust)
- Power consumption: Max 12W(65Vac/180mA)
- System elements: Access Point, Cable Modem, HFC Signal Filter, Power Supply Unit
- Interface Ports: Coaxial Port, Monitoring Port, Antenna Port (N-type)
- Strand mountable and Antenna included

#### Wireless LAN

- Wireless LAN standard: IEEE 802.11a/b/g
- Frequency Band & Channel
- 2.4~2.4835GHz(ISM), 5.725 ~ 5.825GHz (U-NII Upper band)

##### 802.11a(U-NII)

Frequency Channel	
149	5745 MHz
153	5765 MHz
157	5785 MHz
161	5805 MHz

##### 802.11b/g(ISM)

Frequency Channel		6	2437 MHz
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz

- Modulation: DSSS(DBPSK,DQPSK,CCK), OFDM(16QAM, QPSK,BPSK)
- Data rate: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps, 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps
- Power adjustment (4 steps): 100%(Max), 50%, 25%, 12.5%

## ■ Maximum Transmit Power(Radio)

Output power table [dBm] in 802.11a

CH	5745MHz	5765MHz	5785MHz	5805MHz	remark
6~24 Mbps	11.6	12.1	11.8	12.0	+/-1.5dB
36 Mbps	11.3	11.6	11.4	11.6	+/-1.5dB
48 Mbps	11.2	11.5	11.2	11.5	+/-1.5dB
54Mbps	10.6	10.8	10.2	10.6	+/-1.5dB

Output power table [dBm] in 802.11g

CH	2412 MHz	2447MHz	2462 MHz	remark
6~24 Mbps	3	13.2	2.3	+/-1.5dB
36 Mbps	2.6	12.8	1.8	+/-1.5dB
48 Mbps	2.3	12.6	1.8	+/-1.5dB
54Mbps	2.3	12.6	1.7	+/-1.5dB

Output power table [dBm] in 802.11b

CH	2412 MHz	2447MHz	2462 MHz	remark
1 Mbps	8	13	7.7	+/-1.5dB
2 Mbps	8	13	7.7	+/-1.5dB
5.5 Mbps	8	13	7.4	+/-1.5dB
11 Mbps	8	13	7.2	+/-1.5dB

## ■ Max EIRP [dBm] for PMP topology

- 802.11a with 22dBi antenna (NTA-5807): 34.1 dBm
- 802.11g/b

Mode	NTA-2407	NTA-2412	NTA-2400	EIRP Limit
11g	27.2	22.2	20.2	36 dBm(4W)
11b	27	21	20	36 dBm(4W)

Note: Unlike 802.11b (DSSS), in case of 802.11g (OFDM), it's been calibrated to transmit much less output power than 802.11b because the transmit power at both edge channels is restricted by FCC rules.

- Receive sensitivity: Min. -71dBm at 54Mbps / Min -88dBm at 11Mbps

## Cable modem

[Receiver/Downstream]

- Downstream Modulation: 64/256 QAM
- Symbol Rate: 5.056941Msym/sec(64QAM), 5.360537Msym/sec (265QAM)
- Frequency Range: 88-860 MHz
- Channel Width : 6MHz
- Maximum Downstream Data Rate: 27/38 Mbps {64QAM/256QAM}
- RF Input Sensitivity:
  - A. Cable modem only : -21 to +21dBmV
  - B. Cable Modem + HFC Filter: -15 to +15dBmV
- 64 QAM Performance @ 23 dB Es/No: BER < 10E-8
- Input Impedance: 75 Ohm

[Transmitter/Upstream]

- Frequency Range: 5-42 MHz
- Bandwidth
  - A-TDMA : 200,400,800,1600,3200,6400KHz
  - S-CDMA : 1600,3200,6400KHz
- Upstream Modulation: QPSK/16QAM, 32QAM/64QAM(A-TDMA), 128QAM(S-CDMA)
- Encoding: Reed-Solomon (RS), Trellis Coded Modulation (TCM)
- Max Data Rate: 30.72 Mbps(DOCSIS 2.0)
- RF Output Level: -2 to +60 dBmV
- Output Power Level
  - A-TDMA : +5 ~ +61dBmV (32QAM,64QAM)
  - +5 ~ +61dBmV(8QAM,16QAM)
  - +5 ~ +62dBmV(QPSK)
  - S-CDMA : +6 ~ +55dBmV(All modulation)
- Gain Control Range: 63dB
- Frequency Stability: ± 5 kHz
- Output Impedance: 75 Ohms

## Software

- Firmware : APU Secure Data Mode (Base Station)
- Wireless Service Protocol : Secure Data Mode, Dynamic Polling
- MAC access control – 32 local MAC Address Table (SDM mode)\*
- Standard RADIUS server support
- Wired Equivalent Privacy encryption - 64, 128, AES
- Firewall (ICMP/UDP/TCP/IP Protocol Filtering)
- Layer 2 Protocol Filtering
- BOOTP/DHCP (Server, Relay, Client), Static IP
- NAT (Incoming/Outgoing)
- Routing Protocol (RIP v2, Static)

- Restriction of Broadcast Storm
- SNMP v1, Software upgrade via TFTP (only applicable to cable modem)
- GUI Program : Windows Based
- Throughput Analysis: Ping Fill
- Radio Performance Testing Tool: Antenna Alignment
- Remote Statistics Monitoring
- SNMP Traps
- MIB II

(\*) There is a limit of 32 if you use MAC address and comment per entry. However each APU can support 64 CSU's associating with it in SDM mode if you use only MAC address per entry. If you use a RADIUS server for this setup, there is no limitation.

## Environmental

- Operating Temperature: -40°C to +60°C
- Storage Temperature: -40°C to +85°C
- Humidity: 5% to 100% non-condensing
- Weather Rating: IP67 weather tight
- Operating Altitude/Solar Load Test: <3,000 meter above sea level
- Salt/Fog/Rust Resistance: ASTM B 117 (Tested for 30 days)
- Shock & Vibration
  - Operation
    - ETS 300 019-2-4 Class 4.1/4.1E: Subclass 4M3 IEC 68-2-64
    - ETS 300 019-2-3 referencies IEC 68-2-27 Shock tolerance
  - Transportation(Non-operating & Shipping)
    - ETS 300 019-2-4 Class 1.2 (storage)
    - ETS 300 019-2-4 Class 2.3 (transportation)
- Impact: GR-950-CORE section 6.4.7(ASTM D 2444 Tup “B” Nose Detail)
- Chemical resistance of nonmetallic components
  - CRC226 Water Displacement Lubricant
  - WD40 Water Displacement Lubricant
  - Cable Filling compound, as used in the field
  - Splice encapsulating Compound
  - Isopropy Alcohol Grade HPLC
  - 3% H2SO4 (sulphuric acid)
  - 0.2% NaOH (Sodium Hydroxide)
  - Wasp & Hornet Spray
- Rain resistance
  - ETS 300 019-1-2 Class 2.3(transportation)
  - ETS 300 019-1-4 Class 4.1(operating)
- Immunity
  - Radiated RF/EMV Field (IEC 61000 4-3): 5V/M (5 MHz ~ 1GHz)
  - ESD(IEC 61000 4-2) : +/- 15kV (air) and +/- 8kV (contact)
  - Surge (IEC 61000 4-5) : 6kV Combination Wave (IEEE C62.41)

### **Certification**

- Radio / EMC
  - FCC CFR47 Part 15, Class A
- Safety
  - Plenum rated, UL 50, UL 60950-1

## Corporate Service Unit (CSU)

### Physical

- Dimension
  - 180(W) \* 180(L) \* 81(D) [Unit: mm]
  - 180(W) \* 239(L) \* 81(D) with the EMI cap [Unit:inch]
- Weight(without antenna): 2.8659 lbs(1.30 Kg) with the mounting bracket kit
- Enclosure: Gray UV Stabilized ASA(Cover), Aluminum and HDG Steel(Body)
- Power consumption: Max 6W(3.3Vdc/1.5A)
- System elements: Access Point, POE PD(Power Device)
- Interface Ports: Ethernet Port(CAT5/POE/802.3af)
- Pole mountable and Built-in type Antenna

### Pole mountable and Built-in type Antenna Wireless LAN

- Wireless LAN standard: IEEE 802.11a/b/g
- Frequency Band & Channel
- 2.4~2.4835GHz(ISM), 5.725 ~ 5.825GHz (U-NII Upper band)

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- Data rate: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps, 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps
- Power adjustment (4 steps): 100%(Max), 50%, 25%, 12.5%

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Output power table [dBm] in 802.11a

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6~24 Mbps	11.6	12.1	11.8	12.0	+/-1.5dB
36 Mbps	11.3	11.6	11.4	11.6	+/-1.5dB
48 Mbps	11.2	11.5	11.2	11.5	+/-1.5dB
54Mbps	10.6	10.8	10.2	10.6	+/-1.5dB

Output power table [dBm] in 802.11g

CH	2412 MHz	2447MHz	2462 MHz	remark
6~24 Mbps	3	13.2	2.3	+/-1.5dB
36 Mbps	2.6	12.8	1.8	+/-1.5dB
48 Mbps	2.3	12.6	1.8	+/-1.5dB
54Mbps	2.3	12.6	1.7	+/-1.5dB

Output power table [dBm] in 802.11b

CH	2412 MHz	2447MHz	2462 MHz	remark
1 Mbps	8	13	7.7	+/-1.5dB
2 Mbps	8	13	7.7	+/-1.5dB
5.5 Mbps	8	13	7.4	+/-1.5dB
11 Mbps	8	13	7.2	+/-1.5dB

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- 802.11a with 22dBi antenna (NTA-5807): 34.1 dBm
- 802.11g/b

Mode	NTA-2407	NTA-2412	NTA-2400	EIRP Limit
11g	27.2	22.2	20.2	36 dBm(4W)
11b	27	21	20	36 dBm(4W)

Note: Unlike 802.11b (DSSS), in case of 802.11g (OFDM), it's been calibrated to transmit much less output power than 802.11b because the transmit power at both edge channels is restricted by FCC rules.

- Receive sensitivity: Min. -71dBm at 54Mbps / Min -88dBm at 11Mbps

## Software

- Firmware : APU CSU Secure Data Mode (Base Station)
- Wireless Service Protocol : Secure Data Mode
- MAC access control – 32 local MAC Address Table (SDM mode)\*

- Standard RADIUS server support
- Wired Equivalent Privacy encryption - 64, 128, AES
- Firewall (ICMP/UDP/TCP/IP Protocol Filtering)
- Layer 2 Protocol Filtering
- BOOTP/DHCP (Server, Relay, Client), Static IP
- NAT (Incoming/Outgoing)
- Routing Protocol (RIP v2, Static)
- Restriction of Broadcast Storm
- SNMP v1, Software upgrade via TFTP (only applicable to cable modem)
- GUI Program : Windows Based
- Throughput Analysis: Ping Fill
- Radio Performance Testing Tool: Antenna Alignment
- Remote Statistics Monitoring
- SNMP Traps
- MIB II

(\*) There is a limit of 32 if you use MAC address and comment per entry. However each APU can support 64 CSU's associating with it in SDM mode if you use only MAC address per entry. If you use a RADIUS server for this setup, there is no limitation.

## Environmental

- Operating Temperature: -40°C to +60°C
- Storage Temperature: -40°C to +85°C
- Humidity: 5% to 100% non-condensing
- Weather Rating: IP67 weather tight
- Operating Altitude/Solar Load Test: <3,000 meter above sea level
- Salt/Fog/Rust Resistance: ASTM B 117 (Tested for 30 days)
- Shock & Vibration
  - Operation
    - ETS 300 019-2-4 Class 4.1/4.1E: Subclass 4M3 IEC 68-2-64
    - ETS 300 019-2-3 referencies IEC 68-2-27 Shock tolerance
  - Transportation(Non-operating & Shipping)
    - ETS 300 019-2-4 Class 1.2 (storage)
    - ETS 300 019-2-4 Class 2.3 (transportation)
- Impact: GR-950-CORE section 6.4.7(ASTM D 2444 Tup "B" Nose Detail)
- Chemical resistance of nonmetallic components
  - CRC226 Water Displacement Lubricant
  - WD40 Water Displacement Lubricant
  - Cable Filling compound, as used in the field
  - Splice encapsulating Compound
  - Isopropyl Alcohol Grade HPLC
  - 3% H<sub>2</sub>SO<sub>4</sub> (sulphuric acid)
  - 0.2% NaOH (Sodium Hydroxide)



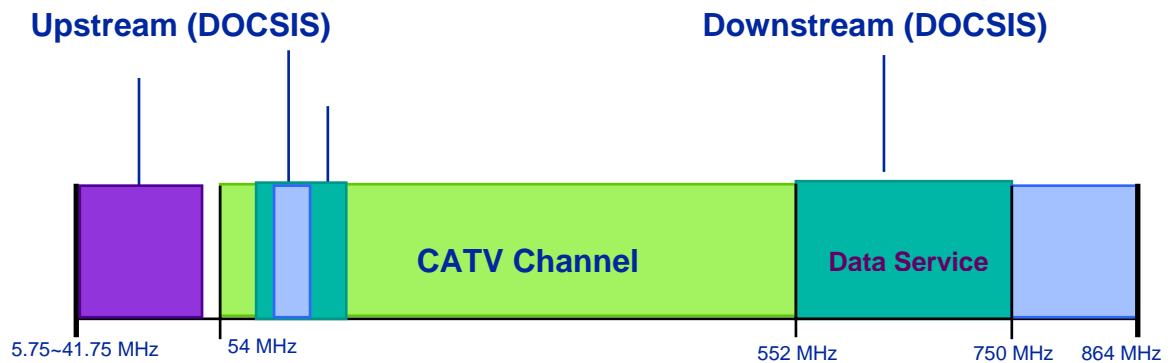
- Wasp & Hornet Spray
- Rain resistance
  - ETS 300 019-1-2 Class 2.3(transportation)
  - ETS 300 019-1-4 Class 4.1(operating)
- Immunity
  - Radiated RF/EMV Field (IEC 61000 4-3): 5V/M (5 MHz ~ 1GHz)
  - ESD(IEC 61000 4-2) : +/- 15kV (air) and +/- 8kV (contact)
  - Surge (IEC 61000 4-5) : 6kV Combination Wave (IEEE C62.41)

### **Certification**

- Radio / EMC
  - FCC CFR47 Part 15, Class A
- Safety
  - Plenum rated, UL 50, UL 60950-1

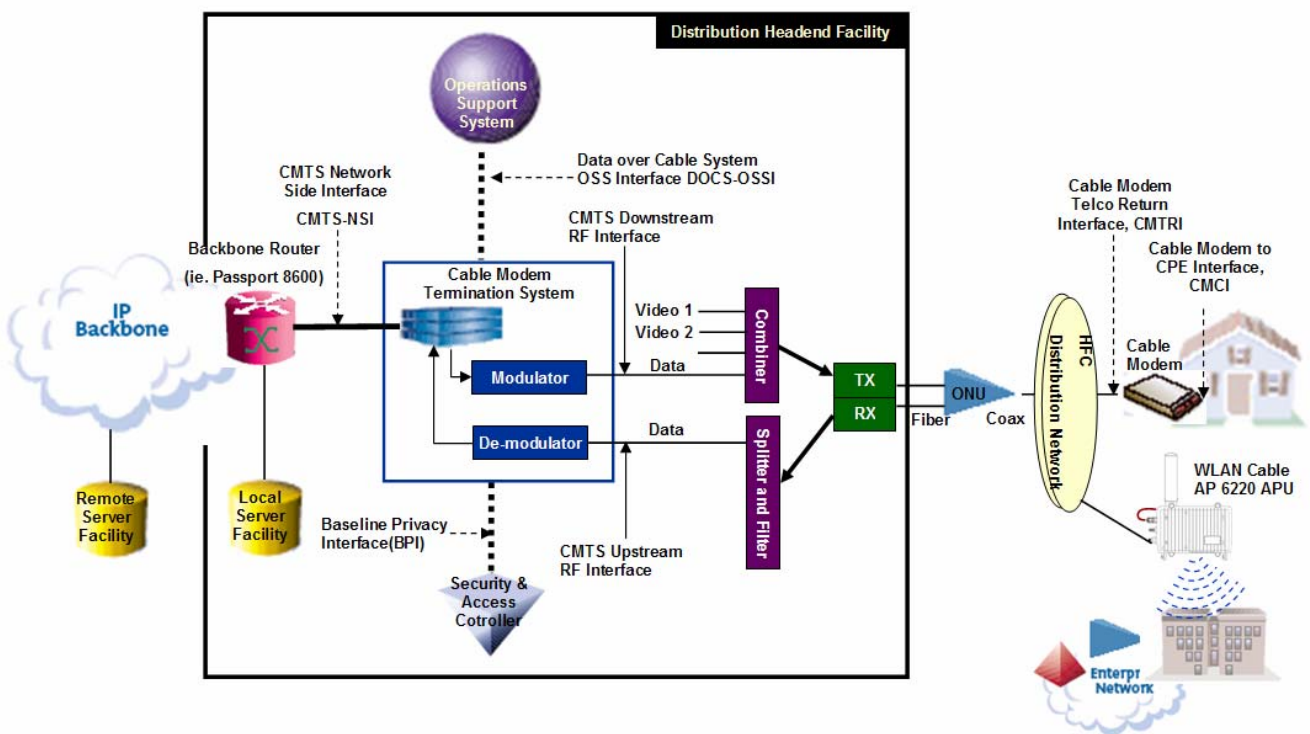
## Appendix B. DOCSIS Specification

Figure A.1  
CATV Frequency Range



CATV: UPSTREAM 5-42(30) MHz, DOWNSTREAM 50-750 (550) MHz  
 DATA: UPSTREAM 5-65MHz, DOWNSTREAM 88-750 (550) MHz

Figure A.2  
DOCSIS Reference System Diagram



**Table A.1  
DOCSIS RF Specification Table**

RF BW	200 KHz	400 KHz	800 KHz	1.6MHz	3.2MHz	6.4MHz
Modulation TYPE	QPSK					
SYMBOL Rate	0.16Msps	0.32Msps	0.64Msps	1.28Msps	2.56Msps	5.12Msps
Total Data Rate	0.32Mbps	0.64Mbps	1.28Mbps	2.56Mbps	5.12Mbps	10.24Mbps
Effective Data Rate	0.3Mbps	0.6Mbps	1.2Mbps	2.3Mbps	4.6Mbps	9.2Mbps
Modulation TYPE	16QAM					
SYMBOL Rate	0.16Msps	0.32Msps	0.64Msps	1.28Msps	2.56Msps	5.12Msps
Total Data Rate	0.64Mbps	1.28Mbps	2.56Mbps	5.12Mbps	10.24Mbps	20.48Mbps
Effective Data Rate	0.6Mbps	1.2Mbps	2.3Mbps	4.5Mbps	9.2Mbps	18.4Mbps
RF BW	6MHz					
Modulation TYPE	64QAM					
SYMBOL Rate	5.057Msps					
Total Data Rate	30.34Mbps					
Effective Data Rate	27Mbps					
Modulation TYPE	256QAM					
SYMBOL Rate	5.360Mbps					
Total Data Rate	42.9Mbps					
Effective Data Rate	37Mbps					

**DOCSIS 1.1  
Upstream  
Maximum**

**DOCSIS 2.0  
Upstream  
Maximum**

**DOCSIS  
1.1&2.0  
Down stream**

## Appendix C. Antenna

### NTA.2407 Panel Antenna (For 11b/g Radio Only)

The NTA-2407 is a compact, light-weight, vertically polarized panel antenna intended to mount to the APU Enclosure. The antenna consists of a printed patch array enclosed in an aluminum cavity with a UV stabilized ASA radome. The antenna is sealed and intended for outdoor use.



#### Electrical Specifications

**Frequency Range:** 2400-2483 MHz

**Gain:** 14 +/- 1 dBi

**VSWR:** 2.0:1 max.

**Polarization:** Vertical

**Power:** 20 Watts

**H-Plane Beamwidth:** 27 degrees

**E-Plane Beamwidth:** 36 degrees

**Front to Back Ratio:** 25 dB min. (azimuth)

**Cross Pol. Discrimination:** 13 dB min.

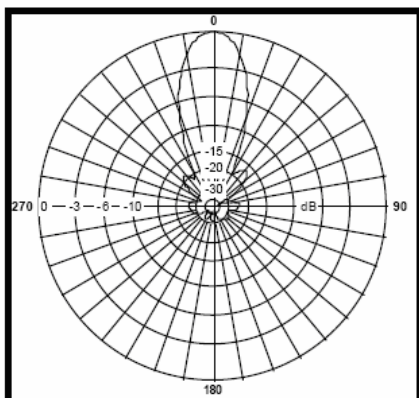
**Electrical Beamtilt:** N/A

**Impedance:** 50 ohms nominal

**Termination:** SMA female

#### Radiation Patterns/Masks

H-Plane



#### Mechanical Specifications

**Length:** 8 in. (203 mm)

**Diameter:** N/A

**Width:** 11 in. (279.4 mm)

**Depth:** 0.44 in. (11 mm)

**Weight (incl. hardware):** 1.66 lb. (0.75 kg)

**Rated Wind Velocity:** 125 mph (200 km/h)

**Horizontal Thrust at rated wind:** 38 lb. (17.2 kg)

**Mechanical Tilt:** 0 +/- 22.5° Pan

**Mounting:** Mounts to APU Enclosure

**Pig-Tail Length:** N/A

#### Material Specifications

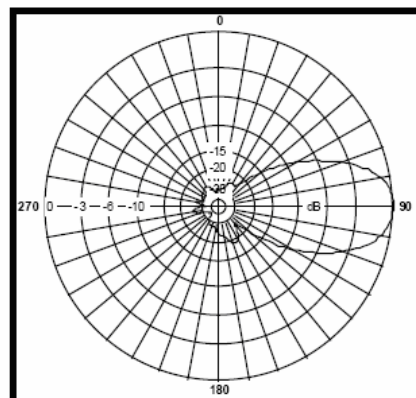
**Radiating Elements:** Plated copper on PCB

**Reflector:** Irridited aluminum

**Radome:** Gray UV stabilized ASA

**Mounting Hardware:** Aluminum and HDG steel

E-Plane



## NTA.2412 Bidirectional Antenna (For 11b/g Radio Only)

The NTA-2412 is a vertically polarized bidirectional antenna intended to mount to the APU Enclosure. The antenna consists of a printed dipole array enclosed in a UV stabilized ASA radome for superior weatherability. It is designed for wireless data in the ISM band and is at DC ground to aid in lightning protection.

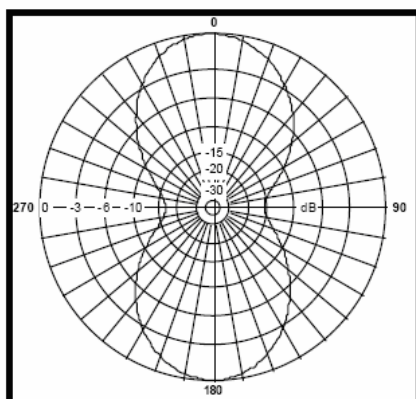


### Electrical Specifications

**Frequency Range:** 2400-2483 MHz  
**Gain:** 9 dBi (peak)  
**VSWR:** 1.5:1 max.  
**Polarization:** Vertical  
**Power:** 5 Watts  
**H-Plane Beamwidth:** 60 degrees  
**E-Plane Beamwidth:** 28 degrees  
**Front to Back Ratio:** N/A  
**Cross Pol. Discrimination:** 20 dB min.  
**Electrical Beamtilt:** N/A  
**Impedance:** 50 ohms nominal  
**Termination:** N male

### Radiation Patterns/Masks

H-Plane



### Mechanical Specifications

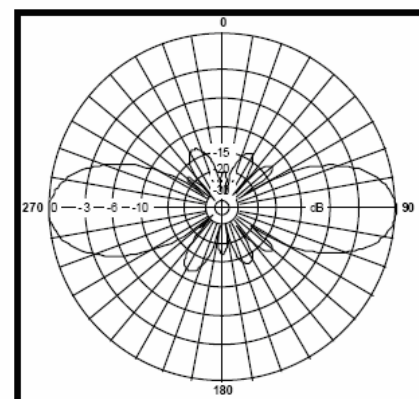
**Length:** 10.5 in. (267 mm)  
**Diameter:** 3 in. (76 mm)  
**Width:** N/A  
**Depth:** N/A  
**Weight (incl. hardware):** 2 lb. (0.9 kg)  
**Rated Wind Velocity:** 125 mph (200 km/h)  
**Horizontal Thrust at rated wind:** 9 lb. (4 kg)  
**Mechanical Tilt:** N/A  
**Mounting:** Mounts to APU Enclosure

**Pig-Tail Length:** 12 in. (304.8mm)

### Material Specifications

**Radiating Elements:** Plated copper on PCB  
**Reflector:** Irridited aluminum  
**Radome:** Gray UV stabilized ASA  
**Mounting Hardware:** Aluminum and HDG steel

E-Plane



## NTA.2400 Omni directional Antenna (For 11b/g Radio Only)

The NTA-2400 is a vertically polarized, medium gain, omni-directional antenna that covers the 2.4-2.5 GHz ISM band. This antenna is a robust point to multi-point antenna designed to be completely waterproof. The antenna is intended to mount to the APU Enclosure.

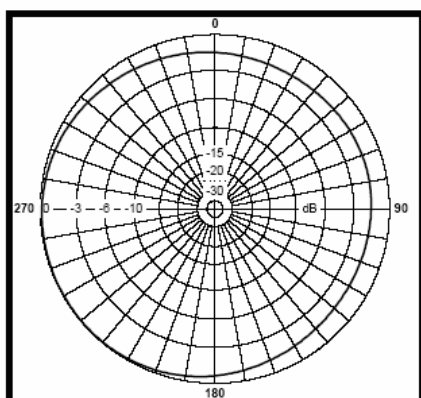


### Electrical Specifications

**Frequency Range:** 2400-2483 MHz  
**Gain:** 7 dBi typ.  
**VSWR:** 2.0:1 typ.  
**Polarization:** Vertical  
**Power:** 5 Watts  
**H-Plane Beamwidth:** 360 degrees  
**E-Plane Beamwidth:** 14 degrees typ.  
**Front to Back Ratio:** N/A  
**Cross Pol. Discrimination:** 18 dB typ.  
**Electrical Beamtilt:** N/A  
**Impedance:** 50 ohms nominal  
**Termination:** N female

### Radiation Patterns/Masks

H-Plane



### Mechanical Specifications

**Length:** 26 in. (660 mm)  
**Diameter:** 3.9 in. (100 mm)  
**Width:** N/A  
**Depth:** N/A  
**Weight (incl. hardware):** 1.25 lb. (0.57 kg)  
**Rated Wind Velocity:** 125 mph (200 km)  
**Horizontal Thrust at rated wind:** 7 lb. (3.2 kg)

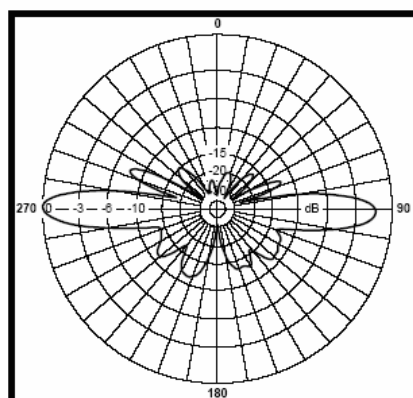
**Mechanical Tilt:** N/A  
**Mounting:** Mounts to APU Enclosure

**Pig-Tail Length:** N/A

### Material Specifications

**Radiating Elements:** Copper  
**Reflector:** N/A  
**Radome:** Gray UV stabilized PVC  
**Mounting Hardware:** Aluminum and Stainless steel

E-Plane



## MT-485028/N



### Electrical Specifications

**Frequency Range** : 5150-5875 MHz

**Gain** : 21.5 dBi @ 5150-5250 MHz  
22 dBi @ 5250-5875 MHz

**VSWR** : 1.9 : 1 @ 5150-5250 MHz  
1.7 : 1 @ 5250-5875 MHz

**Polarization** : Linear (Vertical or Horizontal)

**Input Impedance** : 50 (ohm)

**Input Power** : 6W (max)

**3dB Beamwidth Azimuth** : 9 degrees (typ)

**3dB Beamwidth Elevation** : 9 degrees (typ)

**Front to Back Ratio** : -35 dB (max)

**Cross Polar Discrimination** : -28dB

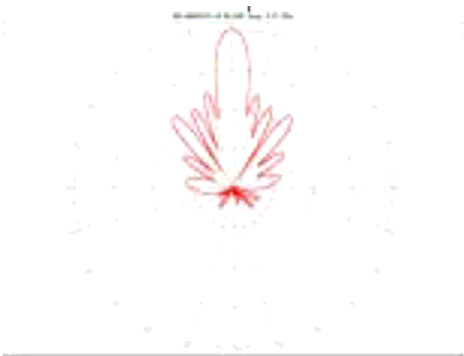
**Connector** : N-Type Female

**Lightning Protection** : DC Ground

### Radiation Patterns/Masks

Azimuth Radiation Pattern

Midband Freq. 5470MHz



### Mechanical Specifications

**Length** : 305 mm

**Diameter** : N/A

**Width** : 305mm

**Depth** : 15 mm

**Weight** : 1.2 kg (max)

**Wind Speed Survival** : 220 km/h

**Wind Speed Operation** : 160 km/h

**Wind Load (Survival) Front Thrust** : 26.8 kg

**Wind Load (Survival) Side Thrust** : 1.3 kg

### Material Specifications

**Base Plate** : Aluminum with chemical conversion coating

**Radome** : Plastic

**Mounting Kit** : MT-120018

Elevation Radiation Pattern

Midband Freq. 5470MHz



## ET-PR12 Built-in Panel Antenna (For CSU 11b/g Radio Only)

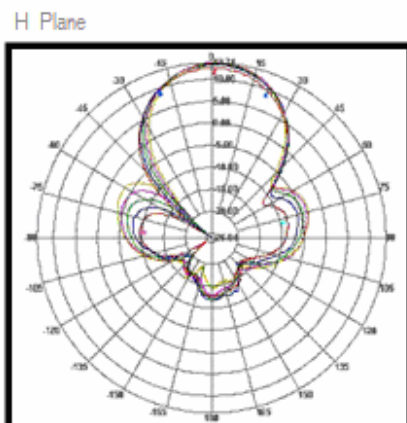
The ET-PR12 is a compact, light-weight, vertically polarized panel antenna intended to be built in the CSU Enclosure. The antenna consists of a printed patch array enclosed in an aluminum cavity with a UV stabilized ASA radome. The antenna is sealed and intended for outdoor use.



### Electrical Specifications

Frequency Range : 2400~2500 MHz  
 Gain : 12.0dBi (Minimum)  
 VSWR : 1 : 1.5 (Typical)  
 Polarization : Linear (Vertical or Horizontal)  
 Power : 3 Watts  
 H-Plane Beam width : 35 degrees  
 E-Plane Beam width : 35 degrees  
 Front to Back Ratio : > 30dB  
 Cross Pol. Discrimination : 20 dB min.  
 Electrical Beam tilt : N/A  
 Impedance : 50 ohms nominal  
 Termination : SMB male

### Radiation Patterns/Masks

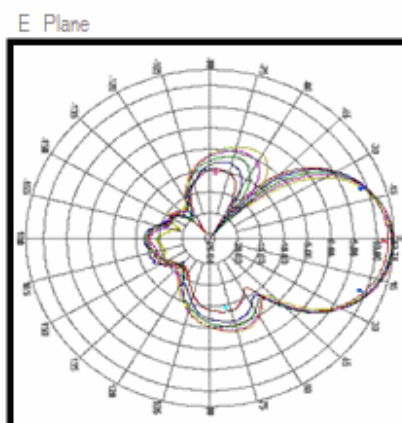


### Mechanical Specifications

Length : 7 in. (180mm)  
 Diameter : N/A  
 Width : 7 in. (180mm)  
 Depth : 0.79 in. (20mm)  
 Weight (Incl. hardware) : 1.0kg  
 Rated Wind Velocity : 75 N (160 km/h)  
 Horizontal Trust at rated wind : 75 N (160km/h)  
 Mechanical Tilt : 90° ~ - 45°  
 Built-in : Built in CSU Enclosure  
 Pig-Tail Length : N/A

### Material Specifications

Radiating Elements : Plated copper on PCB  
 Reflector : aluminum  
 Radome : Gray UV Stabilized ASA  
 Built-in Hardware : Aluminum and HDG Steel





## ET-5PR12W Built-in Panel Antenna (For CSU 11a Radio Only)

The ET-5PP12W is a compact, light-weight, vertically polarized panel antenna intended to be built in the CSU Enclosure. The antenna consists of a printed patch array enclosed in an aluminum cavity with a UV stabilized ASA radome. The antenna is sealed and intended for outdoor use.



### Mechanical Specifications

- ✓ Length : 7 in. (180mm)
- ✓ Diameter : N/A
- ✓ Width : 7 in. (180mm)
- ✓ Depth : 0.79 in. (20mm)
- ✓ Weight (Incl. hardware) : 1.0kg
- ✓ Rated Wind Velocity : 75 N (160 km/h)  
; for outdoor
- ✓ Horizontal Trust at rated wind : 75 N (160km/h)  
; for outdoor
- ✓ Mechanical Tilt : 90° ~ - 45°
- ✓ Built-in : Built in CSU Enclosure
- ✓ Pig-Tail Length : N/A

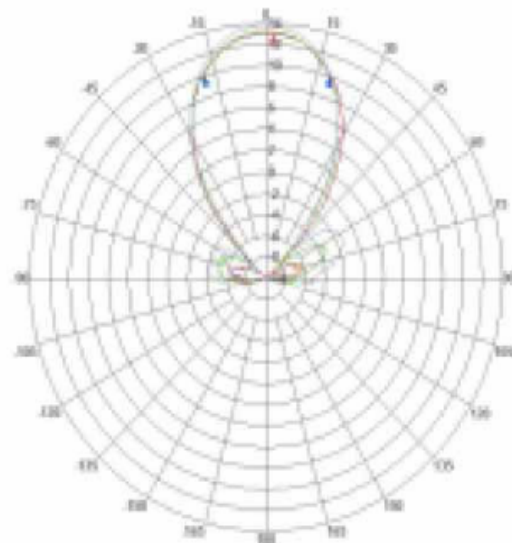
### Material Specifications

- ✓ Radiating Elements : Plated copper on PCB
- ✓ Reflector : aluminum
- ✓ Radome : Gray UV Stabilized ASA
- ✓ Built-in Hardware : Aluminum and HDG Steel

### Electrical Specifications

- ✓ Frequency Range : 5.85GHz
- ✓ Gain : 12.0dBi(Minimum)
- ✓ VSWR : 1 :1.5 (Typical)
- ✓ Polarization : Linear (Vertical or Horizontal)
- ✓ Power : 3 Watts
- ✓ H-Plane Beam width : 35 degrees
- ✓ E-Plane Beam width : 35 degrees
- ✓ Front to Back Ratio : > 30dB
- ✓ Cross Pol. Discrimination : 20 dB min.
- ✓ Electrical Beam tilt : N/A
- ✓ Impedance : 50 ohms nominal
- ✓ Termination : MCX male

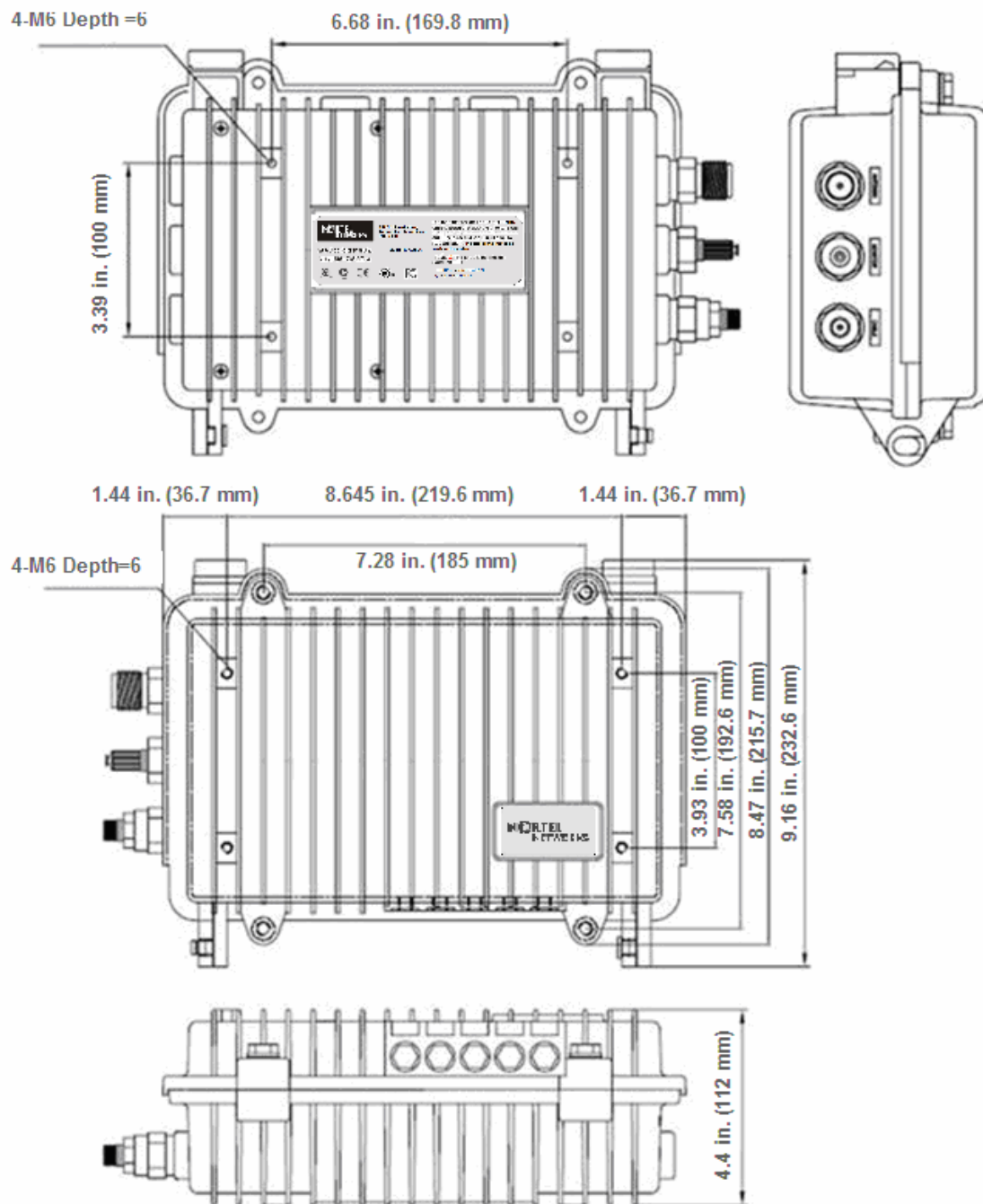
### Radiation Patterns/Masks (H/E-Plane)



## Appendix D. Enclosure Dimension

### Access Point Unit (APU)

Figure A.3  
APU Dimension



## Corporate Service Unit (CSU)

Figure A.4  
CSU Dimension

