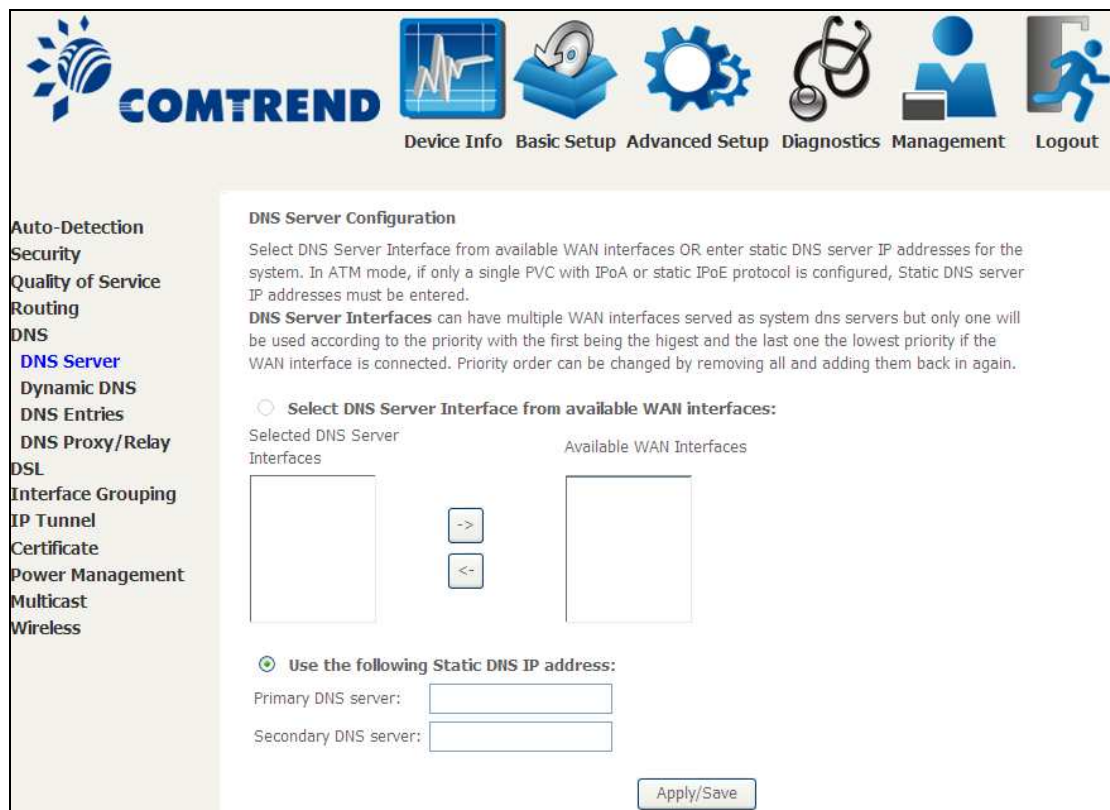


6.5 DNS

6.5.1 DNS Server

Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered. **DNS Server Interfaces** can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.



The screenshot shows the Comtrend web management interface for DNS Server Configuration. At the top, there is a navigation bar with icons for Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. The left sidebar contains a menu with categories like Auto-Detection, Security, Quality of Service, Routing, DNS, DSL, Interface Grouping, IP Tunnel, Certificate, Power Management, Multicast, and Wireless. The main content area is titled "DNS Server Configuration" and contains the following text: "Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered. **DNS Server Interfaces** can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again." Below this text, there are two radio button options: "Select DNS Server Interface from available WAN interfaces:" and "Use the following Static DNS IP address:". The first option is currently unselected. Under the first option, there are two empty list boxes labeled "Selected DNS Server Interfaces" and "Available WAN Interfaces" with arrows between them for moving items. Under the second option, there are two input fields for "Primary DNS server:" and "Secondary DNS server:". At the bottom right of the configuration area is an "Apply/Save" button.

Click **Apply/Save** to save the new configuration.

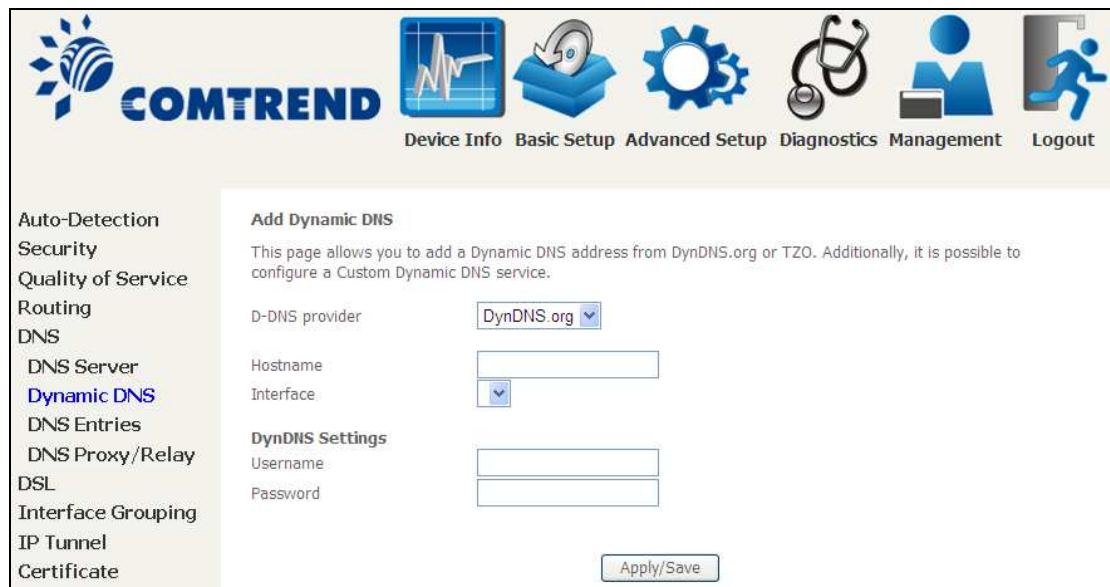
NOTE: You must reboot the router to make the new configuration effective.

6.5.2 Dynamic DNS

The Dynamic DNS service allows you to map a dynamic IP address to a static hostname in any of many domains, allowing the AR-5312u to be more easily accessed from various locations on the Internet.



To add a dynamic DNS service, click **Add**. The following screen will display.



Click Apply/Save to save your settings.

Consult the table below for field descriptions.

| Field | Description |
|----------------|--|
| D-DNS provider | Select a dynamic DNS provider from the list |
| Hostname | Enter the name of the dynamic DNS server |
| Interface | Select the interface from the list |
| Username | Enter the username of the dynamic DNS server |
| Password | Enter the password of the dynamic DNS server |

6.5.3 DNS Entries

The DNS Entry page allows you to add domain names and IP address desired to be resolved by the DSL router.

COMTREND

Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Auto-Detection
Security
Quality of Service
Routing
DNS
DNS Server
Dynamic DNS
DNS Entries
DNS Proxy/Relay

DNS Entries

The DNS Entry page allows you to add domain names and IP address desired to be resolved by the DSL router. Choose Add or Remove to configure DNS Entry. The entries will become active after save/reboot.

A maximum 16 entries can be configured.

| Domain Name | IP Address | Remove |
|-------------|------------|--------|
|-------------|------------|--------|

Add Remove

Choose Add or Remove to configure DNS Entry. The entries will become active after save/reboot.

COMTREND

Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Auto-Detection
Security
Quality of Service
Routing
DNS
DNS Server
Dynamic DNS
DNS Entries
DNS Proxy/Relay

DNS Entry

Enter the domain name and IP address that needs to be resolved locally, and click 'Add Entry.'

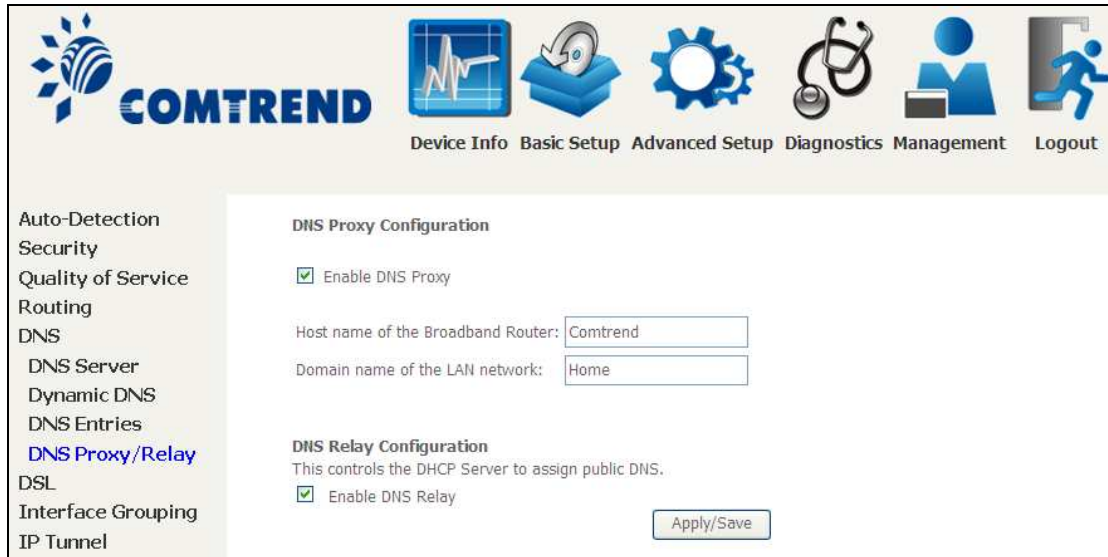
| Domain Name | IP Address |
|----------------------|----------------------|
| <input type="text"/> | <input type="text"/> |

Add Entry

Enter the domain name and IP address that needs to be resolved locally, and click the **Add Entry** button.

6.5.4 DNS Proxy/Relay

DNS proxy receives DNS queries and forwards DNS queries to the Internet. After the CPE gets answers from the DNS server, it replies to the LAN clients. Configure DNS proxy with the default setting, when the PC gets an IP via DHCP, the domain name, Home, will be added to PC's DNS Suffix Search List, and the PC can access route with "Comtrend.Home".



The screenshot displays the Comtrend web management interface. At the top, the Comtrend logo is on the left, and navigation icons for Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout are on the right. A left sidebar lists menu items: Auto-Detection, Security, Quality of Service, Routing, DNS (highlighted), DNS Server, Dynamic DNS, DNS Entries, DNS Proxy/Relay, DSL, Interface Grouping, and IP Tunnel. The main content area is titled "DNS Proxy Configuration" and includes:

- Enable DNS Proxy
- Host name of the Broadband Router:
- Domain name of the LAN network:

Below this is the "DNS Relay Configuration" section, which includes:

- Enable DNS Relay
- A description: "This controls the DHCP Server to assign public DNS."
- An "Apply/Save" button.

6.6 DSL

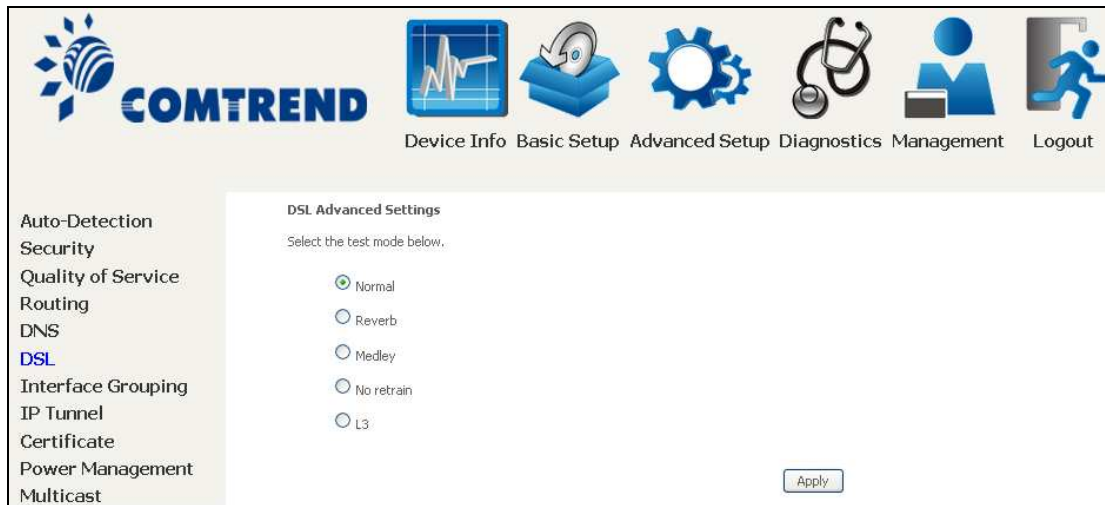
The DSL Settings screen allows for the selection of DSL modulation modes. For optimum performance, the modes selected should match those of your ISP.

| DSL Mode | Data Transmission Rate - Mbps (Megabits per second) | |
|------------------|---|--------------------|
| G.Dmt | Downstream: 12 Mbps | Upstream: 1.3 Mbps |
| G.lite | Downstream: 4 Mbps | Upstream: 0.5 Mbps |
| T1.413 | Downstream: 8 Mbps | Upstream: 1.0 Mbps |
| ADSL2 | Downstream: 12 Mbps | Upstream: 1.0 Mbps |
| AnnexL | Supports longer loops but with reduced transmission rates | |
| ADSL2+ | Downstream: 24 Mbps | Upstream: 1.0 Mbps |
| AnnexM | Downstream: 24 Mbps | Upstream: 3.5 Mbps |
| Options | Description | |
| Inner/Outer Pair | Select the inner or outer pins of the twisted pair (RJ11 cable) | |
| Bitswap Enable | Enables adaptive handshaking functionality | |
| SRA Enable | Enables Seamless Rate Adaptation (SRA) | |

| DSL Mode | Data Transmission Rate - Mbps (Megabits per second) |
|--------------------------------|---|
| Select DSL LED behavior | Normal (TR-68 compliant): Select this option for DSL LED to operate normally (See menu 2.2 LED Indicator) Off:DSL LED will always be OFF |
| G997.1 EOC xTU-R Serial Number | Select Equipment Serial Number or Equipment MAC Address to use router's serial number or MAC address in ADSL EOC messages |

Advanced DSL Settings

Click **Advanced Settings** to reveal additional options.

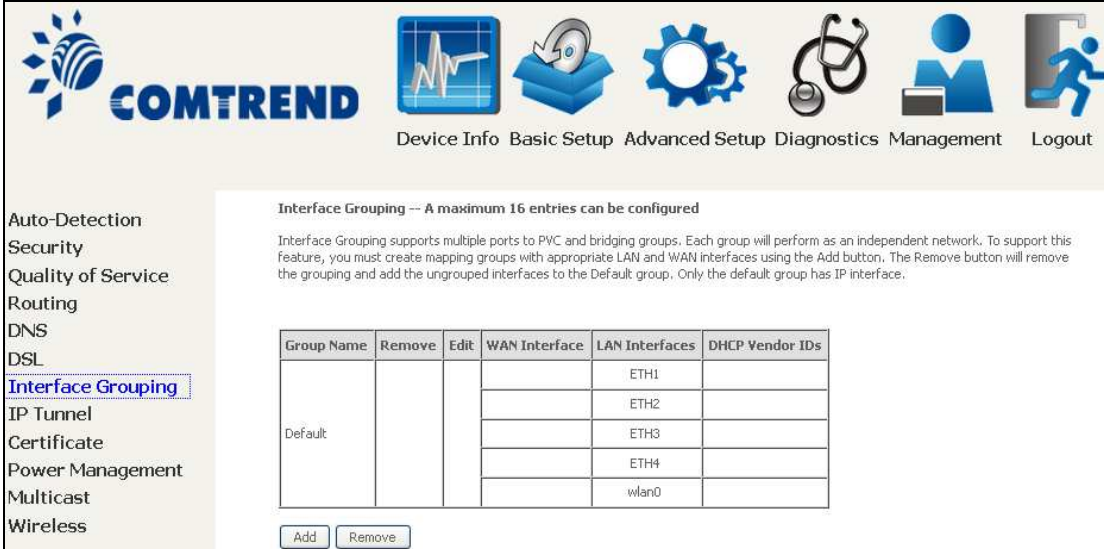


On this screen you select the required test mode, then click the **Apply** button.

| Field | Description |
|------------|---|
| Normal | DSL line signal is detected and sent normally |
| Reverb | DSL line signal is sent continuously in reverb mode |
| Medley | DSL line signal is sent continuously in medley mode |
| No Retrain | DSL line signal will always be on even when DSL line is unplugged |
| L3 | DSL line is set in L3 power mode |

6.7 Interface Grouping

Interface Grouping supports multiple ports to PVC and bridging groups. Each group performs as an independent network. To use this feature, you must create mapping groups with appropriate LAN and WAN interfaces using the **Add** button. The **Remove** button removes mapping groups, returning the ungrouped interfaces to the Default group. Only the default group has an IP interface.



COMTREND

Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Auto-Detection
Security
Quality of Service
Routing
DNS
DSL
Interface Grouping
IP Tunnel
Certificate
Power Management
Multicast
Wireless

Interface Grouping -- A maximum 16 entries can be configured

Interface Grouping supports multiple ports to PVC and bridging groups. Each group will perform as an independent network. To support this feature, you must create mapping groups with appropriate LAN and WAN interfaces using the Add button. The Remove button will remove the grouping and add the ungrouped interfaces to the Default group. Only the default group has IP interface.

| Group Name | Remove | Edit | WAN Interface | LAN Interfaces | DHCP Vendor IDs |
|------------|--------|------|---------------|----------------|-----------------|
| Default | | | | ETH1 | |
| | | | | ETH2 | |
| | | | | ETH3 | |
| | | | | ETH4 | |
| | | | | wlan0 | |

Add Remove

To add an Interface Group, click the **Add** button. The following screen will appear. It lists the available and grouped interfaces. Follow the instructions shown onscreen.

COMTREND

Device Info Basic Setup **Advanced Setup** Diagnostics Management Logout

Auto-Detection
Security
Quality of Service
Routing
DNS
DSL
Interface Grouping
IP Tunnel
Certificate
Power Management
Multicast
Wireless

Interface grouping Configuration

To create a new interface group:

1. Enter the Group name and the group name must be unique and select either 2. (dynamic) or 3. (static) below:
2. If you like to automatically add LAN clients to a WAN Interface in the new group add the DHCP vendor ID string. By configuring a DHCP vendor ID string any DHCP client request with the specified vendor ID (DHCP option 60) will be denied an IP address from the local DHCP server.
3. Select interfaces from the available interface list and add it to the grouped interface list using the arrow buttons to create the required mapping of the ports. **Note that these clients may obtain public IP addresses**
4. Click Apply/Save button to make the changes effective immediately

IMPORTANT If a vendor ID is configured for a specific client device, please **REBOOT** the client device attached to the modem to allow it to obtain an appropriate IP address.

Group Name:

Grouped WAN Interfaces

Available WAN Interfaces

Grouped LAN Interfaces

Available LAN Interfaces

ETH1
ETH2
ETH3
ETH4
wlan0

Automatically Add Clients With the following DHCP Vendor IDs

Automatically Add Clients With Following DHCP Vendor IDs:

Add support to automatically map LAN interfaces to PVC's using DHCP vendor ID (option 60). The local DHCP server will decline and send the requests to a remote DHCP server by mapping the appropriate LAN interface. This will be turned on when Interface Grouping is enabled.

For example, imagine there are 4 PVCs (0/33, 0/36, 0/37, 0/38). VPI/VCI=0/33 is for PPPoE while the other PVCs are for IP set-top box (video). The LAN interfaces are ETH1, ETH2, ETH3, and ETH4.

The Interface Grouping configuration will be:

1. Default: ETH1, ETH2, ETH3, and ETH4.
2. Video: nas_0_36, nas_0_37, and nas_0_38. The DHCP vendor ID is "Video".

If the onboard DHCP server is running on "Default" and the remote DHCP server is running on PVC 0/36 (i.e. for set-top box use only). LAN side clients can get IP addresses from the CPE's DHCP server and access the Internet via PPPoE (0/33).

If a set-top box is connected to ETH1 and sends a DHCP request with vendor ID "Video", the local DHCP server will forward this request to the remote DHCP server. The Interface Grouping configuration will automatically change to the following:

1. Default: ETH2, ETH3, and ETH4
2. Video: nas_0_36, nas_0_37, nas_0_38, and ETH1

6.8 IP Tunnel

6.8.1 IPv6inIPv4

Configure 6in4 tunneling to encapsulate IPv6 traffic over explicitly-configured IPv4 links.

Click the **Add** button to display the following.

| Options | Description |
|-------------------------------|--|
| Tunnel Name | Input a name for the tunnel |
| Mechanism | Mechanism used by the tunnel deployment |
| Associated WAN Interface | Select the WAN interface to be used by the tunnel |
| Associated LAN Interface | Select the LAN interface to be included in the tunnel |
| Manual/Automatic | Select automatic for point-to-multipoint tunneling / manual for point-to-point tunneling |
| IPv4 Mask Length | The subnet mask length used for the IPv4 interface |
| 6rd Prefix with Prefix Length | Prefix and prefix length used for the IPv6 interface |
| Border Relay IPv4 Address | Input the IPv4 address of the other device |

6.8.2 IPv4inIPv6

Configure 4in6 tunneling to encapsulate IPv4 traffic over an IPv6-only environment.

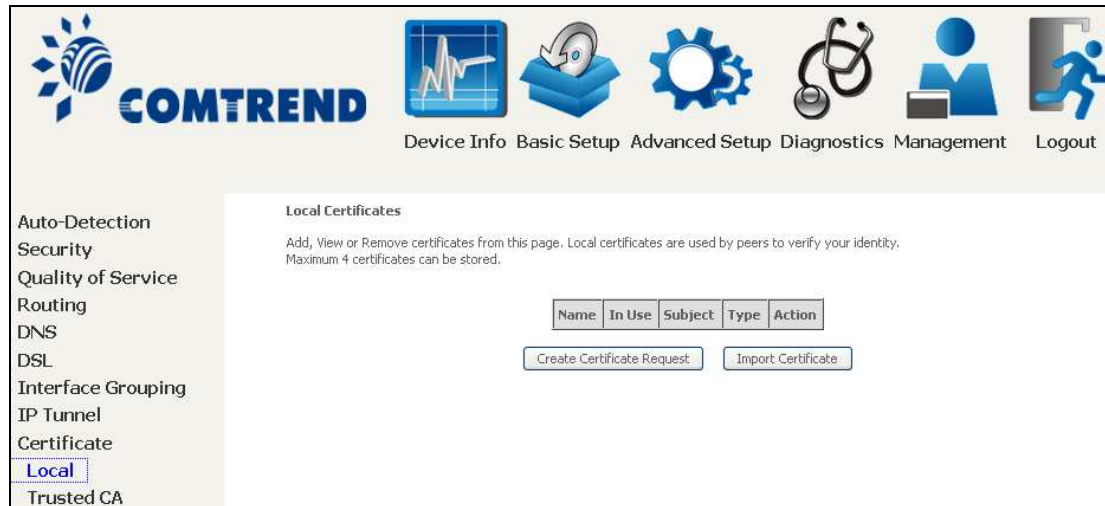
Click the **Add** button to display the following.

| Options | Description |
|--------------------------|--|
| Tunnel Name | Input a name for the tunnel |
| Mechanism | Mechanism used by the tunnel deployment |
| Associated WAN Interface | Select the WAN interface to be used by the tunnel |
| Associated LAN Interface | Select the LAN interface to be included in the tunnel |
| Manual/Automatic | Select automatic for point-to-multipoint tunneling / manual for point-to-point tunneling |
| AFTR | Address of Address Family Translation Router |

6.9 Certificate

A certificate is a public key, attached with its owner's information (company name, server name, personal real name, contact e-mail, postal address, etc) and digital signatures. There will be one or more digital signatures attached to the certificate, indicating that these entities have verified that this certificate is valid.

6.9.1 Local




The screenshot shows the Comtrend web interface. At the top, there is a navigation bar with the Comtrend logo and several icons representing different settings: Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. Below the navigation bar, there is a sidebar on the left with a list of menu items: Auto-Detection, Security, Quality of Service, Routing, DNS, DSL, Interface Grouping, IP Tunnel, Certificate, Local (highlighted), and Trusted CA. The main content area is titled "Local Certificates" and contains the following text: "Add, View or Remove certificates from this page. Local certificates are used by peers to verify your identity. Maximum 4 certificates can be stored." Below this text is a table with the following headers: Name, In Use, Subject, Type, and Action. Under the table, there are two buttons: "Create Certificate Request" and "Import Certificate".

CREATE CERTIFICATE REQUEST

Click **Create Certificate Request** to generate a certificate-signing request.

The certificate-signing request can be submitted to the vendor/ISP/ITSP to apply for a certificate. Some information must be included in the certificate-signing request. Your vendor/ISP/ITSP will ask you to provide the information they require and to provide the information in the format they regulate. Enter the required information and click **Apply** to generate a private key and a certificate-signing request.



The screenshot shows the Comtrend web interface. At the top, there is a navigation bar with the Comtrend logo and several icons representing different settings: Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. Below the navigation bar, there is a sidebar on the left with a list of menu items: Auto-Detection, Security, Quality of Service, Routing, DNS, DSL, Interface Grouping, IP Tunnel, Certificate, Local (highlighted), and Trusted CA. The main content area is titled "Create new certificate request" and contains the following text: "To generate a certificate signing request you need to include Common Name, Organization Name, State/Province Name, and the 2-letter Country Code for the certificate." Below this text are several input fields: "Certificate Name:" (text input), "Common Name:" (text input), "Organization Name:" (text input), "State/Province Name:" (text input), and "Country/Region Name:" (dropdown menu). The dropdown menu is currently set to "US (United States)". Below the input fields is an "Apply" button.

The following table is provided for your reference.

| Field | Description |
|---------------------|--|
| Certificate Name | A user-defined name for the certificate. |
| Common Name | Usually, the fully qualified domain name for the machine. |
| Organization Name | The exact legal name of your organization. Do not abbreviate. |
| State/Province Name | The state or province where your organization is located. It cannot be abbreviated. |
| Country/Region Name | The two-letter ISO abbreviation for your country. |

IMPORT CERTIFICATE

Click **Import Certificate** to paste the certificate content and the private key provided by your vendor/ISP/ITSP into the corresponding boxes shown below.

The screenshot shows the Comtrend web interface. The top navigation bar includes icons for Device Info, Basic Setup, **Advanced Setup**, Diagnostics, Management, and Logout. The left sidebar lists various configuration options, with 'Certificate' selected. The main content area is titled 'Import certificate' and contains the following fields:

- Certificate Name:** A text input field.
- Certificate:** A large text area containing the following placeholder text:


```
-----BEGIN CERTIFICATE-----
<insert certificate here>
-----END CERTIFICATE-----
```
- Private Key:** A large text area containing the following placeholder text:

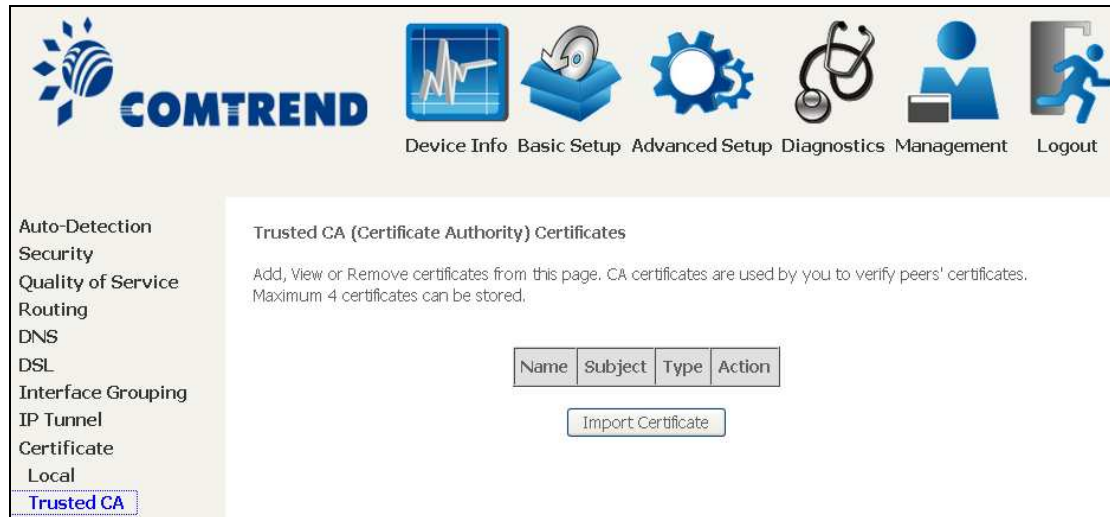

```
-----BEGIN RSA PRIVATE KEY-----
<insert private key here>
-----END RSA PRIVATE KEY-----
```

An 'Apply' button is located at the bottom right of the form.

Enter a certificate name and click the **Apply** button to import the certificate and its private key.

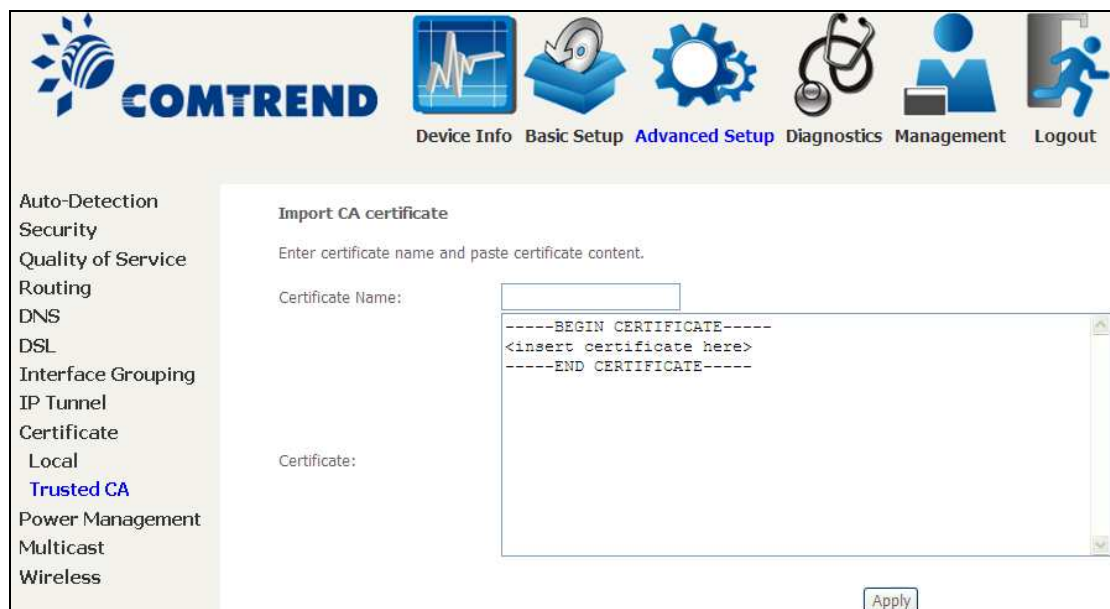
6.9.2 Trusted CA

CA is an abbreviation for Certificate Authority, which is a part of the X.509 system. It is itself a certificate, attached with the owner information of this certificate authority; but its purpose is not encryption/decryption. Its purpose is to sign and issue certificates, in order to prove that these certificates are valid.



The screenshot shows the Comtrend web interface. At the top, there is a navigation bar with the Comtrend logo and several icons representing different settings: Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. Below the navigation bar, there is a sidebar menu on the left with options like Auto-Detection, Security, Quality of Service, Routing, DNS, DSL, Interface Grouping, IP Tunnel, Certificate, Local, and Trusted CA (which is highlighted). The main content area is titled "Trusted CA (Certificate Authority) Certificates" and contains the following text: "Add, View or Remove certificates from this page. CA certificates are used by you to verify peers' certificates. Maximum 4 certificates can be stored." Below this text is a table with columns for Name, Subject, Type, and Action. There is also an "Import Certificate" button.

Click **Import Certificate** to paste the certificate content of your trusted CA. The CA certificate content will be provided by your vendor/ISP/ITSP and is used to authenticate the Auto-Configuration Server (ACS) that the CPE will connect to.

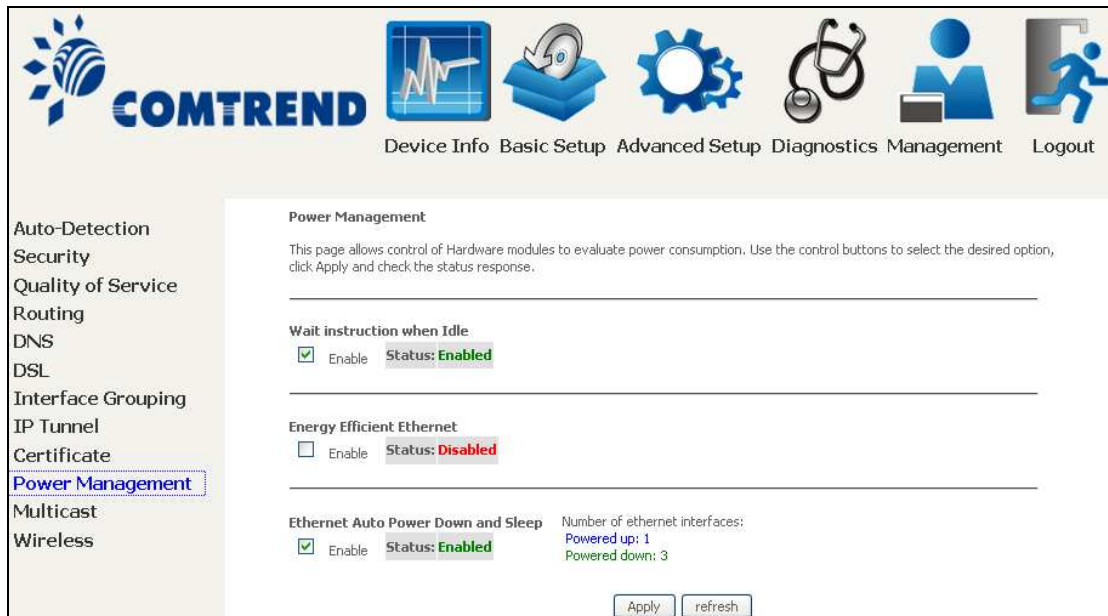


The screenshot shows the Comtrend web interface with the "Advanced Setup" menu item highlighted. The main content area is titled "Import CA certificate" and contains the following text: "Enter certificate name and paste certificate content." Below this text is a form with two fields: "Certificate Name:" and "Certificate:". The "Certificate:" field is a large text area containing the following text: "-----BEGIN CERTIFICATE-----", "<insert certificate here>", and "-----END CERTIFICATE-----". There is an "Apply" button at the bottom right of the form.

Enter a certificate name and click **Apply** to import the CA certificate.

6.10 Power Management

This screen allows for control of hardware modules to evaluate power consumption. Use the buttons to select the desired option, click **Apply** and check the response.



The screenshot shows the COMTREND web interface. At the top, there is a navigation bar with the COMTREND logo and several icons representing different sections: Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. Below the navigation bar is a sidebar menu with the following items: Auto-Detection, Security, Quality of Service, Routing, DNS, DSL, Interface Grouping, IP Tunnel, Certificate, Power Management (highlighted), Multicast, and Wireless. The main content area is titled "Power Management" and contains the following text: "This page allows control of Hardware modules to evaluate power consumption. Use the control buttons to select the desired option, click Apply and check the status response." Below this text are three sections, each with a checkbox and a status indicator: "Wait instruction when Idle" (checked, Status: Enabled), "Energy Efficient Ethernet" (unchecked, Status: Disabled), and "Ethernet Auto Power Down and Sleep" (checked, Status: Enabled). To the right of the "Ethernet Auto Power Down and Sleep" section, there is a summary of the number of ethernet interfaces: "Number of ethernet interfaces: Powered up: 1, Powered down: 3". At the bottom of the page, there are two buttons: "Apply" and "refresh".

6.11 Multicast

Input new IGMP or MLD protocol configuration fields if you want modify default values shown. Then click **Apply/Save**.

COMTREND Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Multicast

IGMP Configuration
Enter IGMP protocol configuration fields if you want modify default values shown below.

Default Version: 3
 Query Interval: 125
 Query Response Interval: 10
 Last Member Query Interval: 10
 Robustness Value: 2
 Maximum Multicast Groups: 25
 Maximum Multicast Data Sources (for IGMPv3 : (1 - 24): 10
 Maximum Multicast Group Members: 25
 Fast Leave Enable:
 LAN to LAN (Intra LAN) Multicast Enable:
 Membership Join Immediate (IPTV):

MLD Configuration
Enter MLD protocol (IPv6 Multicast) configuration fields if you want modify default values shown below.

Default Version: 2
 Query Interval: 125
 Query Response Interval: 10
 Last Member Query Interval: 10
 Robustness Value: 2
 Maximum Multicast Groups: 10
 Maximum Multicast Data Sources (for mldv3): 10
 Maximum Multicast Group Members: 10
 Fast Leave Enable:
 LAN to LAN (Intra LAN) Multicast Enable:

Apply/Save

| Field | Description |
|-----------------|--|
| Default Version | Define IGMP using version with video server. |
| Query Interval | The query interval is the amount of time in seconds between IGMP General Query messages sent by the router (if the router is the querier on this subnet). The default query interval is 125 seconds. |

| Field | Description |
|---|---|
| Query Response Interval | The query response interval is the maximum amount of time in seconds that the IGMP router waits to receive a response to a General Query message. The query response interval is the Maximum Response Time field in the IGMP v2 Host Membership Query message header. The default query response interval is 10 seconds and must be less than the query interval. |
| Last Member Query Interval | The last member query interval is the amount of time in seconds that the IGMP router waits to receive a response to a Group-Specific Query message. The last member query interval is also the amount of time in seconds between successive Group-Specific Query messages. The default last member query interval is 10 seconds. |
| Robustness Value | The robustness variable is a way of indicating how susceptible the subnet is to lost packets. IGMP can recover from robustness variable minus 1 lost IGMP packets. The robustness variable should be set to a value of 2 or greater. The default robustness variable value is 2. |
| Maximum Multicast Groups | Setting the maximum number of Multicast groups. |
| Maximum Multicast Data Sources (for IGMPv3) | Define the maximum multicast video stream number. |
| Maximum Multicast Group Members | Setting the maximum number of groups that ports can accept. |
| Fast Leave Enable | When you enable IGMP fast-leave processing, the switch immediately removes a port when it detects an IGMP version 2 leave message on that port. |
| LAN to LAN (Intra LAN) Multicast Enable | This will activate IGMP snooping for cases where multicast data source and player are all located on the LAN side. |
| Membership to join Immediate (IPTV) | Enable IGMP immediate join feature for multicast membership group. |

6.12 Wireless

6.12.1 Basic

The Basic option allows you to configure basic features of the wireless LAN interface. Among other things, you can enable or disable the wireless LAN interface, hide the network from active scans, set the wireless network name (also known as SSID) and restrict the channel set based on country requirements.

Click **Apply/Save** to apply the selected wireless options.

Consult the table below for descriptions of these options.

| Option | Description |
|-----------------|---|
| Enable Wireless | A checkbox <input checked="" type="checkbox"/> that enables or disables the wireless LAN interface. When selected, a set of basic wireless options will appear. |

| Option | Description |
|--|--|
| Hide Access Point | Select Hide Access Point to protect the access point from detection by wireless active scans. To check AP status in Windows XP, open Network Connections from the start Menu and select View Available Network Connections . If the access point is hidden, it will not be listed there. To connect a client to a hidden access point, the station must add the access point manually to its wireless configuration. |
| Clients Isolation | When enabled, it prevents client PCs from seeing one another in My Network Places or Network Neighborhood. Also, prevents one wireless client communicating with another wireless client. |
| Disable WMM Advertise | Stops the router from 'advertising' its Wireless Multimedia (WMM) functionality, which provides basic quality of service for time-sensitive applications (e.g. VoIP, Video). |
| Enable Wireless Multicast Forwarding | Select the checkbox <input checked="" type="checkbox"/> to enable this function. |
| Enable WiFi Button | Select the checkbox <input checked="" type="checkbox"/> to enable the WiFi button. |
| SSID [1-32 characters] | Sets the wireless network name. SSID stands for Service Set Identifier. All stations must be configured with the correct SSID to access the WLAN. If the SSID does not match, that user will not be granted access. |
| BSSID | The BSSID is a 48-bit identity used to identify a particular BSS (Basic Service Set) within an area. In Infrastructure BSS networks, the BSSID is the MAC (Media Access Control) address of the AP (Access Point); and in Independent BSS or ad hoc networks, the BSSID is generated randomly. |
| Country | A drop-down menu that permits worldwide and specific national settings. Local regulations limit channel range: US= worldwide, Japan=1-14, Jordan= 10-13, Israel= 1-13 |
| Max Clients | The maximum number of clients that can access the router. |
| Wireless - Guest / Virtual Access Points | <p>This router supports multiple SSIDs called Guest SSIDs or Virtual Access Points. To enable one or more Guest SSIDs select the checkboxes <input checked="" type="checkbox"/> in the Enabled column. To hide a Guest SSID select its checkbox <input checked="" type="checkbox"/> in the Hidden column.</p> <p>Do the same for Isolate Clients and Disable WMM Advertise. For a description of these two functions, see the previous entries for "Clients Isolation" and "Disable WMM Advertise". Similarly, for Enable WMF, Max Clients and BSSID, consult the matching entries in this table.</p> <p>NOTE: Remote wireless hosts cannot scan Guest SSIDs.</p> |

6.12.2 Security

The following screen appears when Wireless Security is selected. The options shown here allow you to configure security features of the wireless LAN interface.

The screenshot shows the Comtrend web interface for configuring wireless security. The top navigation bar includes icons for Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. The left sidebar lists various configuration categories, with 'Security' highlighted. The main content area is titled 'Wireless -- Security' and contains the following sections:

- Wireless -- Security:** A text block explaining that this page allows configuring security features of the wireless LAN interface, either manually or through WPS.
- WPS Setup:** A dropdown menu for 'Enable WPS' set to 'Disabled'.
- Manual Setup AP:** A text block explaining that users can set the network authentication method, data encryption, and encryption strength.
- Configuration Fields:**
 - Select SSID:** A dropdown menu set to 'Comtrend9A24'.
 - Network Authentication:** A dropdown menu set to 'WPA2 -PSK'.
 - WPA/WAPI passphrase:** A text input field with masked characters and a 'Click here to display' link.
 - WPA Group Rekey Interval:** A text input field set to '3600'.
 - WPA/WAPI Encryption:** A dropdown menu set to 'TKIP+AES'.
 - WEP Encryption:** A dropdown menu set to 'Disabled'.
- Buttons:** An 'Apply/Save' button at the bottom.

Click **Apply/Save** to implement new configuration settings.

WIRELESS SECURITY

Setup requires that the user configure these settings using the Web User Interface (see the table below).

| Select SSID |
|--|
| Select the wireless network name from the drop-down box. SSID stands for Service Set Identifier. All stations must be configured with the correct SSID to access the WLAN. If the SSID does not match, that client will not be granted access. |

| Network Authentication |
|---|
| This option specifies whether a network key is used for authentication to the wireless network. If network authentication is set to Open, then no authentication is provided. Despite this, the identity of the client is still verified. |
| Each authentication type has its own settings. For example, selecting 802.1X authentication will reveal the RADIUS Server IP address, Port and Key fields. WEP Encryption will also be enabled as shown below. |

| | |
|---------------------------|---------------|
| Network Authentication: | 802.1X |
| RADIUS Server IP Address: | 0.0.0.0 |
| RADIUS Port: | 1812 |
| RADIUS Key: | |
| WEP Encryption: | Enabled |
| Encryption Strength: | 128-bit |
| Current Network Key: | 2 |
| Network Key 1: | 1234567890123 |
| Network Key 2: | 1234567890123 |
| Network Key 3: | 1234567890123 |
| Network Key 4: | 1234567890123 |

Enter 13 ASCII characters or 26 hexadecimal digits for 128-bit encryption keys
Enter 5 ASCII characters or 10 hexadecimal digits for 64-bit encryption keys

The settings for WPA authentication are shown below.

| | |
|---------------------------|----------|
| Network Authentication: | WPA |
| WPA Group Rekey Interval: | 3600 |
| RADIUS Server IP Address: | 0.0.0.0 |
| RADIUS Port: | 1812 |
| RADIUS Key: | |
| WPA/WAPI Encryption: | TKIP+AES |
| WEP Encryption: | Disabled |

The settings for WPA-PSK authentication are shown next.

| | |
|---------------------------|--|
| Network Authentication: | WPA-PSK |
| WPA/WAPI passphrase: | •••••••• Click here to display |
| WPA Group Rekey Interval: | 3600 |
| WPA/WAPI Encryption: | TKIP+AES |
| WEP Encryption: | Disabled |

WEP Encryption

This option specifies whether data sent over the network is encrypted. The same network key is used for data encryption and network authentication. Four network keys can be defined although only one can be used at any one time. Use the Current Network Key list box to select the appropriate network key.

Security options include authentication and encryption services based on the wired equivalent privacy (WEP) algorithm. WEP is a set of security services used to protect 802.11 networks from unauthorized access, such as eavesdropping; in this case, the capture of wireless network traffic.

When data encryption is enabled, secret shared encryption keys are generated and used by the source station and the destination station to alter frame bits, thus avoiding disclosure to eavesdroppers.

Under shared key authentication, each wireless station is assumed to have received a secret shared key over a secure channel that is independent from the 802.11 wireless network communications channel.

Encryption Strength

This drop-down list box will display when WEP Encryption is enabled. The key strength is proportional to the number of binary bits comprising the key. This means that keys with a greater number of bits have a greater degree of security and are considerably more difficult to crack. Encryption strength can be set to either 64-bit or 128-bit. A 64-bit key is equivalent to 5 ASCII characters or 10 hexadecimal numbers. A 128-bit key contains 13 ASCII characters or 26 hexadecimal numbers. Each key contains a 24-bit header (an initiation vector) which enables parallel decoding of multiple streams of encrypted data.

6.12.3 WPS

Wi-Fi Protected Setup (WPS) is an industry standard that simplifies wireless security setup for certified network devices. Every WPS certified device has both a PIN number and a push button, located on the device or accessed through device software. The AR-5312u has a WPS button on the device.

Devices with the WPS logo (shown here) support WPS. If the WPS logo is not present on your device it still may support WPS, in this case, check the device documentation for the phrase "Wi-Fi Protected Setup".



NOTE: WPS is only available in Open, WPA-PSK, WPA2-PSK and Mixed WPA2/WPA-PSK network authentication modes. Other authentication modes do not use WPS so they must be configured manually.

To configure security settings with WPS, follow the procedures below. You must choose either the Push-Button or PIN configuration method for Steps 6 and 7.

I. Setup

Step 1: Enable WPS by selecting **Enabled** from the drop down list box shown.

A screenshot of a web interface for WPS Setup. It shows a label "WPS Setup" at the top left. Below it is the text "Enable WPS" followed by a dropdown menu currently displaying "Enabled" with a downward arrow.

Step 2: Set the WPS AP Mode. **Configured** is used when the AR-5312u will assign security settings to clients. **Unconfigured** is used when an external client assigns security settings to the AR-5312u.

A screenshot of a web interface for setting WPS AP Mode. It shows the text "Set WPS AP Mode" followed by a dropdown menu currently displaying "Configured" with a downward arrow.

NOTES: Your client may or may not have the ability to provide security settings to the AR-5312u. If it does not, then you must set the WPS AP mode to Configured. Consult the device documentation to check its capabilities.

In addition, using Windows 7, you can add an external registrar using the **Config AP** button ([Appendix F - WPS OPERATION](#) has detailed instructions).

II. NETWORK AUTHENTICATION

Step 3: Select Open, WPA-PSK, WPA2-PSK, or Mixed WPA2/WPA-PSK network authentication mode from the Manual Setup AP section of the Wireless Security screen. The example below shows WPA2-PSK mode.

Manual Setup AP

You can set the network authentication method, selecting data encryption, specify whether a network key is required to authenticate to this wireless network and specify the encryption strength.
Click "Apply/Save" when done.

Select SSID:

Network Authentication:

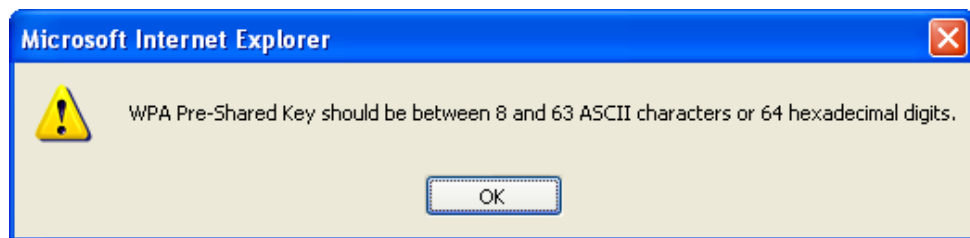
WPA/WAPI passphrase: [Click here to display](#)

WPA Group Rekey Interval:

WPA/WAPI Encryption:

WEP Encryption:

Step 4: For the Pre-Shared Key (PSK) modes, enter a WPA Pre-Shared Key. You will see the following dialog box if the Key is too short or too long.



Step 5: Click the **Apply/Save** button at the bottom of the screen.

IIIa. PUSH-BUTTON CONFIGURATION

The WPS push-button configuration provides a semi-automated configuration method. The WPS button on the rear panel of the router can be used for this purpose or the Web User Interface (WUI) can be used exclusively.

The WPS push-button configuration is described in the procedure below. It is assumed that the Wireless function is Enabled and that the router is configured as the Wireless Access Point (AP) of your WLAN. In addition, the wireless client must also be configured correctly and turned on, with WPS function enabled.

NOTE: The wireless AP on the router searches for 2 minutes. If the router stops searching before you complete Step 7, return to Step 6.

Step 6: Press WPS button

Press the WPS button on the front panel of the router. The WPS LED will blink to show that the router has begun searching for the client.

Step 7: Go to your WPS wireless client and activate the push-button function. A typical WPS client screenshot is shown below as an example.



Now go to Step 8 (part IV. Check Connection) to check the WPS connection.

IIIb. WPS – PIN CONFIGURATION

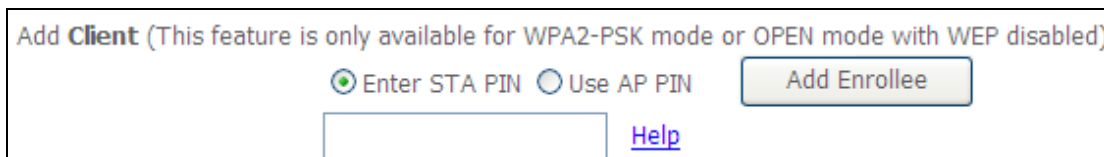
Using this method, security settings are configured with a personal identification number (PIN). The PIN can be found on the device itself or within the software. The PIN may be generated randomly in the latter case. To obtain a PIN number for your client, check the device documentation for specific instructions.

The WPS PIN configuration is described in the procedure below. It is assumed that the Wireless function is Enabled and that the router is configured as the Wireless Access Point (AP) of your wireless LAN. In addition, the wireless client must also be configured correctly and turned on, with WPS function enabled.

NOTE: Unlike the push-button method, the pin method has no set time limit. This means that the router will continue searching until it finds a client.

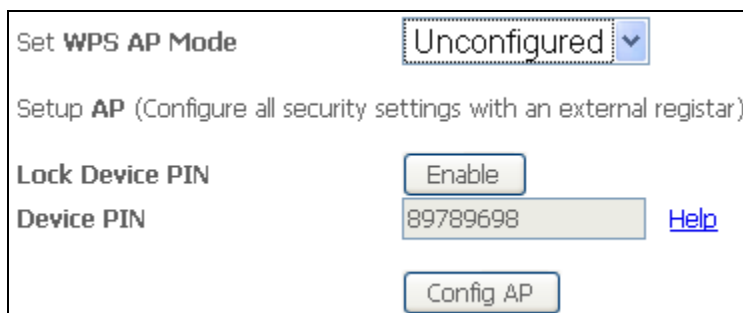
Step 6: Select the PIN radio button in the WSC Setup section of the Wireless Security screen, as shown in **A** or **B** below, and then click the appropriate button based on the WSC AP mode selected in step 2.

A - For Configured mode, click the Add Enrollee button.



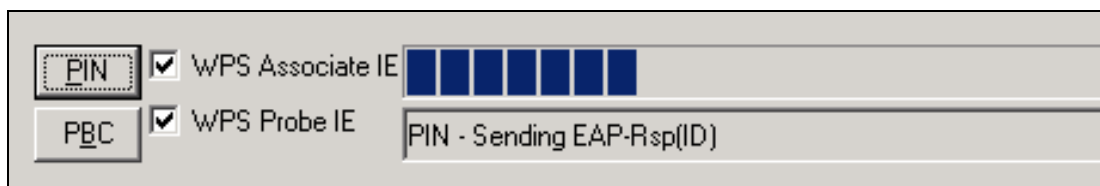
Enter STA PIN: a **Personal Identification Number** (PIN) has to be read from either a sticker or the display on the new **wireless device**. This PIN must then be inputted at representing the network, usually the **Access Point** of the network.

B - For Unconfigured mode, click the Config AP button.



Step 7: Activate the PIN function on the wireless client. For **Configured** mode, the client must be configured as an Enrollee. For **Unconfigured** mode, the client must be configured as the Registrar. This is different from the External Registrar function provided in Windows Vista.

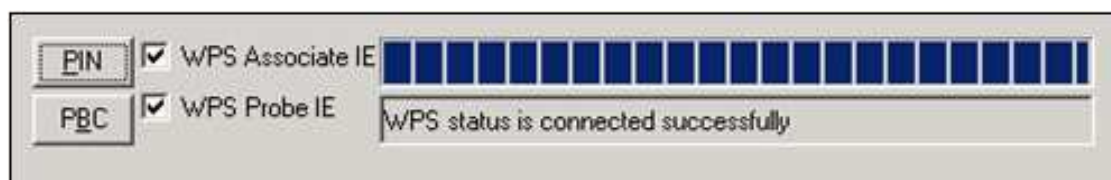
The figure below provides an example of a WPS client PIN function in-progress.



Now go to Step 8 (part IV. Check Connection) to check the WPS connection.

IV. CHECK CONNECTION

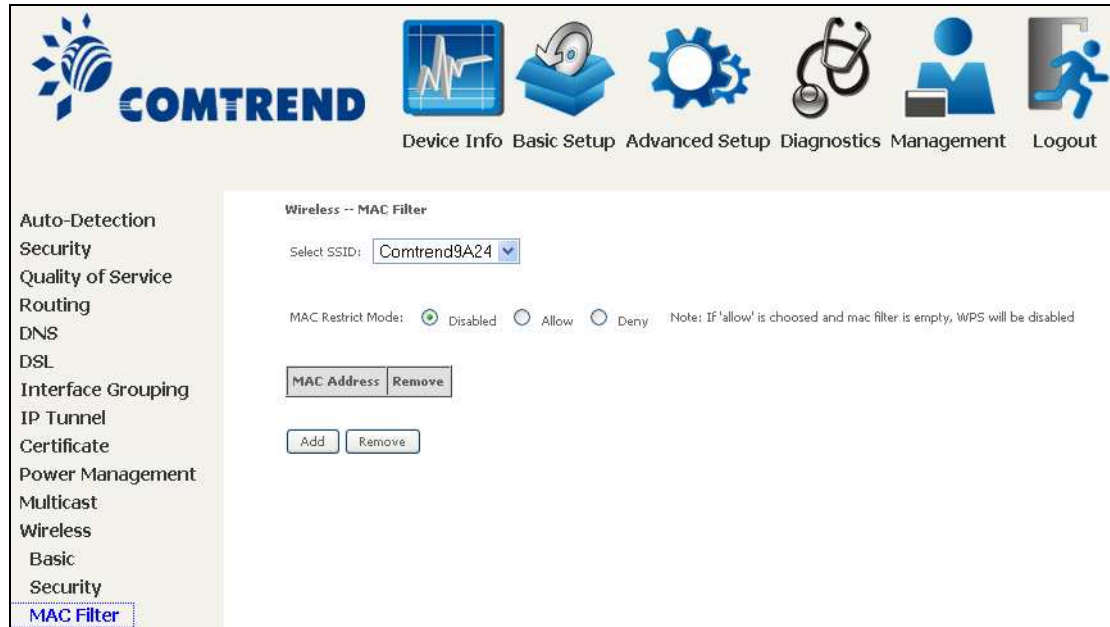
Step 8: If the WPS setup method was successful, you will be able access the wireless AP from the client. The client software should show the status. The example below shows that the connection established successfully.



You can also double-click the Wireless Network Connection icon from the Network Connections window (or the system tray) to confirm the status of the new connection.

6.12.4 MAC Filter

This option allows access to the router to be restricted based upon MAC addresses. To add a MAC Address filter, click the **Add** button shown below. To delete a filter, select it from the MAC Address table below and click the **Remove** button.



| Option | Description |
|-------------------|--|
| Select SSID | Select the wireless network name from the drop-down box. SSID stands for Service Set Identifier. All stations must be configured with the correct SSID to access the WLAN. If the SSID does not match, that user will not be granted access. |
| MAC Restrict Mode | Disabled: MAC filtering is disabled. Allow: Permits access for the specified MAC addresses. Deny: Rejects access for the specified MAC addresses. |
| MAC Address | Lists the MAC addresses subject to the MAC Restrict Mode. A maximum of 60 MAC addresses can be added. Every network device has a unique 48-bit MAC address. This is usually shown as xx.xx.xx.xx.xx.xx, where xx are hexadecimal numbers. |

After clicking the **Add** button, the following screen appears.

The screenshot displays the Comtrend web management interface. At the top, the Comtrend logo is on the left, and a navigation bar contains icons and labels for Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. A left-hand menu lists various configuration categories, with 'MAC Filter' under the 'Wireless' section highlighted in blue. The main content area is titled 'Wireless -- MAC Filter' and contains the following text: 'Enter the MAC address and click "Apply/Save" to add the MAC address to the wireless MAC address filters:'. Below this text is a label 'MAC Address:' followed by an empty text input box. To the right of the input box is a button labeled 'Apply/Save'.

Enter the MAC address in the box provided and click **Apply/Save**.

6.12.5 Wireless Bridge

This screen allows for the configuration of wireless bridge features of the WIFI interface. See the table beneath for detailed explanations of the various options.

COMTREND Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Wireless -- Bridge

This page allows you to configure wireless bridge features of the wireless LAN interface. You can select Wireless Bridge (also known as Wireless Distribution System) to disable access point functionality. Selecting Access Point enables access point functionality. Wireless bridge functionality will still be available and wireless stations will be able to associate to the AP. Select Disabled in Bridge Restrict which disables wireless bridge restriction. Any wireless bridge will be granted access. Selecting Enabled or Enabled(Scan) enables wireless bridge restriction. Only those bridges selected in Remote Bridges will be granted access. Click "Refresh" to update the remote bridges. Wait for few seconds to update. Click "Apply/Save" to configure the wireless bridge options.

AP Mode:

Bridge Restrict:

Remote Bridges MAC Address:

Click **Apply/Save** to implement new configuration settings.

| Feature | Description |
|-----------------|---|
| AP Mode | Selecting Wireless Bridge (aka Wireless Distribution System) disables Access Point (AP) functionality, while selecting Access Point enables AP functionality. In Access Point mode, wireless bridge functionality will still be available and wireless stations will be able to associate to the AP. |
| Bridge Restrict | Selecting Disabled disables wireless bridge restriction, which means that any wireless bridge will be granted access. Selecting Enabled or Enabled (Scan) enables wireless bridge restriction. Only those bridges selected in the Remote Bridges list will be granted access. Click Refresh to update the station list when Bridge Restrict is enabled. |

6.12.6 Advanced

The Advanced screen allows you to configure advanced features of the wireless LAN interface. You can select a particular channel on which to operate, force the transmission rate to a particular speed, set the fragmentation threshold, set the RTS threshold, set the wakeup interval for clients in power-save mode, set the beacon interval for the access point, set XPress mode and set whether short or long preambles are used. Click **Apply/Save** to set new advanced wireless options.

The screenshot shows the Comtrend Advanced Setup page for Wireless LAN configuration. The page title is "Wireless -- Advanced". The left sidebar contains a navigation menu with the following items: Auto-Detection, Security, Quality of Service, Routing, DNS, DSL, Interface Grouping, IP Tunnel, Certificate, Power Management, Multicast, Wireless, Basic, Security, MAC Filter, Wireless Bridge, and **Advanced** (highlighted). The main content area contains the following configuration options:

- Band: 2.4GHz (Current: 6 (interference: acceptable))
- Channel: Auto (Current: 6 (interference: acceptable))
- Auto Channel Timer(min): 0
- 802.11n/EWC: Auto
- Bandwidth: 20MHz (Current: 20MHz)
- Control Sideband: Lower (Current: N/A)
- 802.11n Rate: Auto
- 802.11n Protection: Auto
- Support 802.11n Client Only: Off
- RIFS Advertisement: Auto
- OBS5 Coexistence: Enable
- RX Chain Power Save: Disable (Power Save status: Full Power)
- RX Chain Power Save Quiet Time: 10
- RX Chain Power Save PPS: 10
- 54g™ Rate: 1 Mbps
- Multicast Rate: Auto
- Basic Rate: Default
- Fragmentation Threshold: 2346
- RTS Threshold: 2347
- DTIM Interval: 1
- Beacon Interval: 100
- Global Max Clients: 32
- XPress™ Technology: Disabled
- Transmit Power: 100%
- WMM(Wi-Fi Multimedia): Enabled
- WMM No Acknowledgement: Disabled
- WMM APSD: Enabled

An "Apply/Save" button is located at the bottom right of the configuration area.

| Field | Description |
|-------|--|
| Band | Set to 2.4 GHz for compatibility with IEEE 802.11x standards. The new amendment allows IEEE 802.11n units to fall back to slower speeds so that legacy IEEE 802.11x devices can coexist in the same network. IEEE 802.11g creates data-rate parity at 2.4 GHz with the IEEE 802.11a standard, which has a 54 Mbps rate at 5 GHz. (IEEE 802.11a has other differences compared to IEEE 802.11b or g, such as offering more channels.) |

| Field | Description |
|--------------------------------|---|
| Channel | Drop-down menu that allows selection of a specific channel. |
| Auto Channel Timer (min) | Auto channel scan timer in minutes (0 to disable) |
| 802.11n/EWC | An equipment interoperability standard setting based on IEEE 802.11n Draft 2.0 and Enhanced Wireless Consortium (EWC) |
| Bandwidth | Select 20MHz or 40MHz bandwidth. 40MHz bandwidth uses two adjacent 20MHz bands for increased data throughput. |
| Control Sideband | Select Upper or Lower sideband when in 40MHz mode. |
| 802.11n Rate | Set the physical transmission rate (PHY). |
| 802.11n Protection | Turn Off for maximized throughput. Turn On for greater security. |
| Support 802.11n Client Only | Turn Off to allow 802.11b/g clients access to the router. Turn On to prohibit 802.11b/g client's access to the router. |
| RIFS Advertisement | One of several draft-n features designed to improve efficiency. Provides a shorter delay between OFDM transmissions than in 802.11a or g. |
| OBSS Co-Existence | Co-existence between 20 MHz AND 40 MHz overlapping Basic Service Set (OBSS) in WLAN. |
| RX Chain Power Save | Enabling this feature turns off one of the Receive chains, going from 2x2 to 2x1 to save power. |
| RX Chain Power Save Quiet Time | The number of seconds the traffic must be below the PPS value below before the Rx Chain Power Save feature activates itself. |
| RX Chain Power Save PPS | The maximum number of packets per seconds that can be processed by the WLAN interface for a duration of Quiet Time, described above, before the Rx Chain Power Save feature activates itself. |
| 54g Rate | Drop-down menu that specifies the following fixed rates: Auto: Default. Uses the 11 Mbps data rate when possible but drops to lower rates when necessary. 1 Mbps, 2Mbps, 5.5Mbps, or 11Mbps fixed rates. The appropriate setting is dependent on signal strength. |
| Multicast Rate | Setting for multicast packet transmit rate (1-54 Mbps) |
| Basic Rate | Setting for basic transmission rate. |
| Fragmentation Threshold | A threshold, specified in bytes, that determines whether packets will be fragmented and at what size. On an 802.11 WLAN, packets that exceed the fragmentation threshold are fragmented, i.e., split into, smaller units suitable for the circuit size. Packets smaller than the specified fragmentation threshold value are not fragmented. Enter a value between 256 and 2346. If you experience a high packet error rate, try to slightly increase your Fragmentation Threshold. The value should remain at its default setting of 2346. Setting the Fragmentation Threshold too low may result in poor performance. |

| Field | Description |
|------------------------|--|
| RTS Threshold | Request to Send, when set in bytes, specifies the packet size beyond which the WLAN Card invokes its RTS/CTS mechanism. Packets that exceed the specified RTS threshold trigger the RTS/CTS mechanism. The NIC transmits smaller packet without using RTS/CTS. The default setting of 2347 (maximum length) disables RTS Threshold. |
| DTIM Interval | Delivery Traffic Indication Message (DTIM) is also known as Beacon Rate. The entry range is a value between 1 and 65535. A DTIM is a countdown variable that informs clients of the next window for listening to broadcast and multicast messages. When the AP has buffered broadcast or multicast messages for associated clients, it sends the next DTIM with a DTIM Interval value. AP Clients hear the beacons and awaken to receive the broadcast and multicast messages. The default is 1. |
| Beacon Interval | The amount of time between beacon transmissions in milliseconds. The default is 100 ms and the acceptable range is 1 – 65535. The beacon transmissions identify the presence of an access point. By default, network devices passively scan all RF channels listening for beacons coming from access points. Before a station enters power save mode, the station needs the beacon interval to know when to wake up to receive the beacon (and learn whether there are buffered frames at the access point). |
| Global Max Clients | The maximum number of clients that can connect to the router. |
| Xpress™ Technology | Xpress Technology is compliant with draft specifications of two planned wireless industry standards. |
| Transmit Power | Set the power output (by percentage) as desired. |
| WMM (Wi-Fi Multimedia) | The technology maintains the priority of audio, video and voice applications in a Wi-Fi network. It allows multimedia service get higher priority. |
| WMM No Acknowledgement | Refers to the acknowledge policy used at the MAC level. Enabling no Acknowledgement can result in more efficient throughput but higher error rates in a noisy Radio Frequency (RF) environment. |
| WMM APSD | This is Automatic Power Save Delivery. It saves power. |

Chapter 7 Diagnostics

You can reach this page by clicking on the following icon located at the top of the screen.



7.1 Diagnostics – Individual Tests

The first Diagnostics screen is a dashboard that shows overall connection status.

LAN

| | ETH1 | ETH2 | ETH3 | ETH4 |
|------------------|-----------------------------|------|------|------|
| LAN IPv4 Address | 192.168.1.1 | | | |
| LAN Subnet Mask | 255.255.255.0 | | | |
| LAN MAC Address | f8:0e:85:f5:9a:24 | | | |
| DHCP Server | Enabled | | | |
| DHCP IP Range | 192.168.1.2 - 192.168.1.254 | | | |

Device

| | |
|--------------------------|-------------------------------------|
| Model | AR-5312u |
| Serial Number | 1465312UXF-AA000251 |
| Firmware Version | JC31-412CTU-C03_R01.A2pG039k.d25f |
| Bootloader (CFE) Version | 1.0.38-112.118-46 |
| Up Time | 2 mins:11 secs |
| System Log | <input type="button" value="Show"/> |

Click the Diagnostics Menu item on the left side of the screen to display the individual connections.

Diagnostics

The individual tests are listed below. If a test displays a fail status, click "Rerun Diagnostic Tests" at the bottom of this page to make sure the fail status is consistent. If the test continues to fail, click "Help" and follow the troubleshooting procedures.

Test the connection to your local network

| | | |
|--------------------------------|-------------|----------------------|
| Test your ETH1 Connection: | FAIL | Help |
| Test your ETH2 Connection: | FAIL | Help |
| Test your ETH3 Connection: | FAIL | Help |
| Test your ETH4 Connection: | PASS | Help |
| Test your Wireless Connection: | PASS | Help |

7.2 Fault Management

802.1ag Connectivity Fault Management

This diagnostic is only used for VDSL PTM mode.

Maintenance Domain (MD) Level:

Destination MAC Address:

802.1Q VLAN ID: [0-4095]

VDSL Traffic Type:

Test the connection to another Maintenance End Point (MEP)

Loopback Message (LBM):

Find Maintenance End Points (MEPs)

| Linktrace Message (LTM): | | | | |
|--------------------------|--|--|--|--|
| | | | | |
| | | | | |
| | | | | |

Set MD Level Send Loopback Send Linktrace

| Item | Description |
|-------------------------------|--|
| Maintenance Domain (MD) Level | Management space on the network, the larger the domain, the higher the level value |
| Destination MAC Address | Destination MAC address for sending the loopback message |
| 802.1Q VLAN ID: [0-4095] | 802.1Q VLAN used in VDSL PTM mode |

Set MD Level

Save the Maintenance domain level.

Send Loopback

Send loopback message to destination MAC address.

Send Linktrace

Send traceroute message to destination MAC address.

7.3 Uptime Status

This page shows System, DSL, ETH and Layer 3 uptime. If the DSL line, ETH or Layer 3 connection is down, the uptime will stop incrementing. If the service is restored, the counter will reset and start from 0. A Bridge interface will follow the DSL or ETH timer.

The screenshot displays the Comtrend web interface for the Uptime Status page. At the top, there is a navigation bar with the Comtrend logo and five icons representing different system functions: Device Info, Basic Setup, Advanced Setup, Diagnostics, and Management. Below the navigation bar, the page is divided into a left sidebar and a main content area. The sidebar contains a list of menu items: Diagnostics, Fault Management, Uptime Status (highlighted in blue), Ping, TraceRoute, and System Utilization. The main content area is titled 'Uptime Status' and contains the following text: 'This page shows System, DSL, ETH and Layer 3 uptime. If the DSL line, ETH or Layer 3 connection is down, the uptime will stop incrementing. If the service is restored, the counter will reset and start from 0. A Bridge interface will follow the DSL or ETH timer.' Below this text, there is a paragraph explaining the 'ClearAll' button: 'The "ClearAll" button will restart the counters from 0 or show "Not Connected" if the interface is down.' The page features two data fields: 'System Up Time' with a value of '25 mins:20 secs' and 'DSL Up Time' with a value of 'Not Connected'. A 'ClearAll' button is located at the bottom right of the main content area.

The "ClearAll" button will restart the counters from 0 or show "Not Connected" if the interface is down.

7.4 Ping

Input the IP address/hostname and click the **Ping** button to execute ping diagnostic test to send the ICMP request to the specified host.



The screenshot displays the Comtrend web management interface. At the top, the Comtrend logo is on the left, and a navigation bar contains icons and labels for Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. The Diagnostics section is selected in the left-hand menu. The main content area shows the 'Ping' tool interface. It includes a text input field for the IP address or hostname, a 'Ping' button, and a text area displaying the test results for 192.168.1.1.

COMTREND

Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Diagnostics
Fault Management
Uptime Status
Ping
TraceRoute
System Utilization

Ping

Send ICMP ECHO_REQUEST packets to network hosts.

Ping IP Address / Hostname:

PING 192.168.1.1 (192.168.1.1): 56 data bytes
64 bytes from 192.168.1.1: seq=0 ttl=64 time=3.414 ms
64 bytes from 192.168.1.1: seq=1 ttl=64 time=0.589 ms
64 bytes from 192.168.1.1: seq=2 ttl=64 time=0.584 ms
64 bytes from 192.168.1.1: seq=3 ttl=64 time=0.585 ms

--- 192.168.1.1 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max = 0.584/1.293/3.414 ms

7.5 Trace Route

Input the IP address/hostname and click the **TraceRoute** button to execute the trace route diagnostic test to send the ICMP packets to the specified host.



The screenshot displays the COMTREND web interface. At the top, the COMTREND logo is on the left, and a navigation menu with icons and labels is on the right: Device Info, Basic Setup, Advanced Setup, Diagnostics, Management, and Logout. The Diagnostics menu item is highlighted. On the left side of the main content area, a vertical sidebar lists: Diagnostics, Fault Management, Uptime Status, Ping, TraceRoute (highlighted), and System Utilization. The main content area is titled "TraceRoute" and contains the following text: "Trace the route ip packets follow going to 'host'." Below this is a form with the label "TraceRoute IP Address / Hostname:" followed by an empty text input field and a "TraceRoute" button. At the bottom of the main content area, the results of a test are shown: "traceroute to 192.168.1.1 (192.168.1.1), 30 hops max, 38 byte packets" and "1 192.168.1.1 (192.168.1.1) 0.503 ms".

7.6 System Utilization



The screenshot shows the COMTREND web interface. At the top, there is a navigation bar with the COMTREND logo and icons for Device Info, Basic Setup, Advanced Setup, Diagnostics, and Management. The Diagnostics menu is expanded, showing options like Fault Management, Uptime Status, Ping, TraceRoute, and System Utilization. The System Utilization page is active, displaying a 'Start' button and instructions to initialize CPU and Memory utilization calculation.

COMTREND Device Info Basic Setup Advanced Setup Diagnostics Management

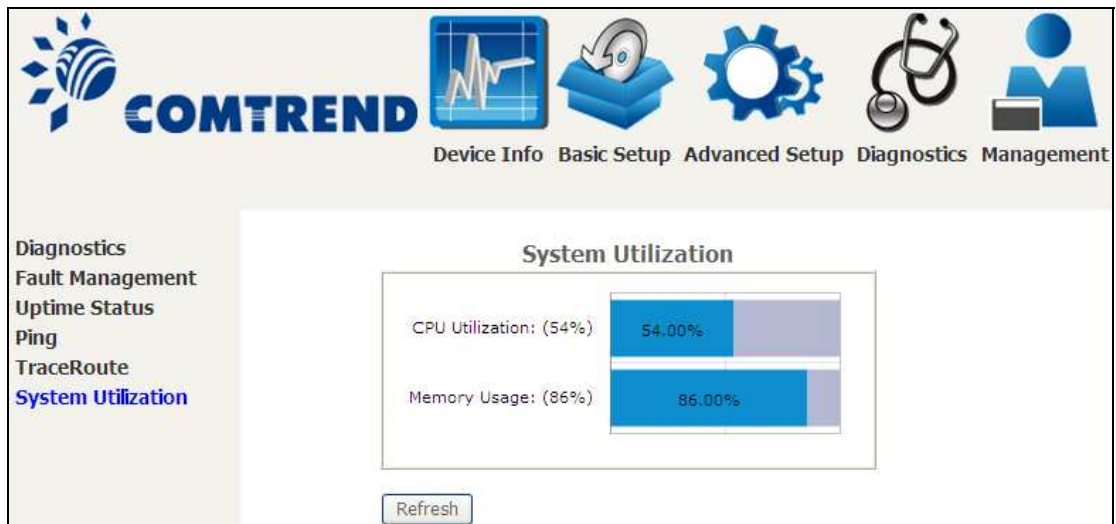
Diagnostics
Fault Management
Uptime Status
Ping
TraceRoute
System Utilization

System Utilization

Click "Start" button to initialize CPU and Memory utilization calculation.
Please wait 10 seconds for the test to run.

Start

Click "Start" button to initialize CPU and Memory utilization calculation.
Please wait 10 seconds for the test to run.



The screenshot shows the same COMTREND web interface as the previous one, but now displaying the results of the system utilization test. The 'Start' button has been replaced by a 'Refresh' button. The results are shown in a table with two rows: CPU Utilization at 54.00% and Memory Usage at 86.00%. Each row has a corresponding horizontal bar chart showing the percentage of utilization.

COMTREND Device Info Basic Setup Advanced Setup Diagnostics Management

Diagnostics
Fault Management
Uptime Status
Ping
TraceRoute
System Utilization

System Utilization

| | |
|------------------------|--------|
| CPU Utilization: (54%) | 54.00% |
| Memory Usage: (86%) | 86.00% |

Refresh

Chapter 8 Management

You can reach this page by clicking on the following icon located at the top of the screen.



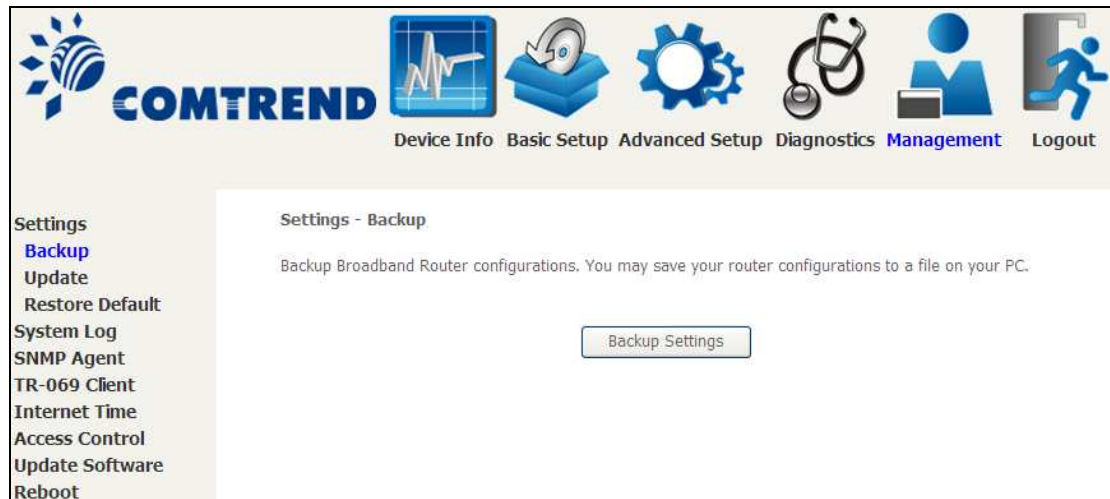
The Management menu has the following maintenance functions and processes:

8.1 Settings

This includes [Backup Settings](#), [Update Settings](#), and [Restore Default](#) screens.

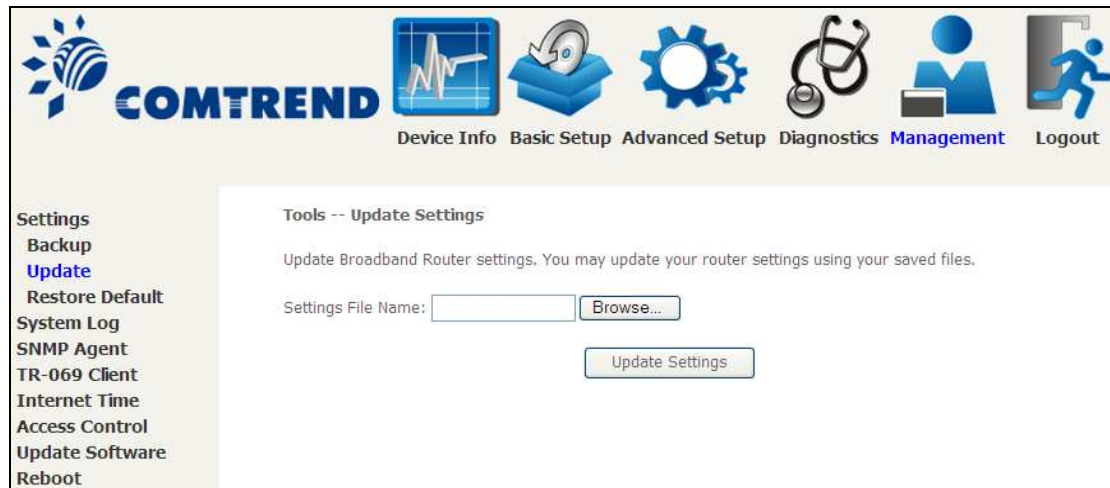
8.1.1 Backup Settings

To save the current configuration to a file on your PC, click **Backup Settings**. You will be prompted for backup file location. This file can later be used to recover settings on the **Update Settings** screen, as described below.



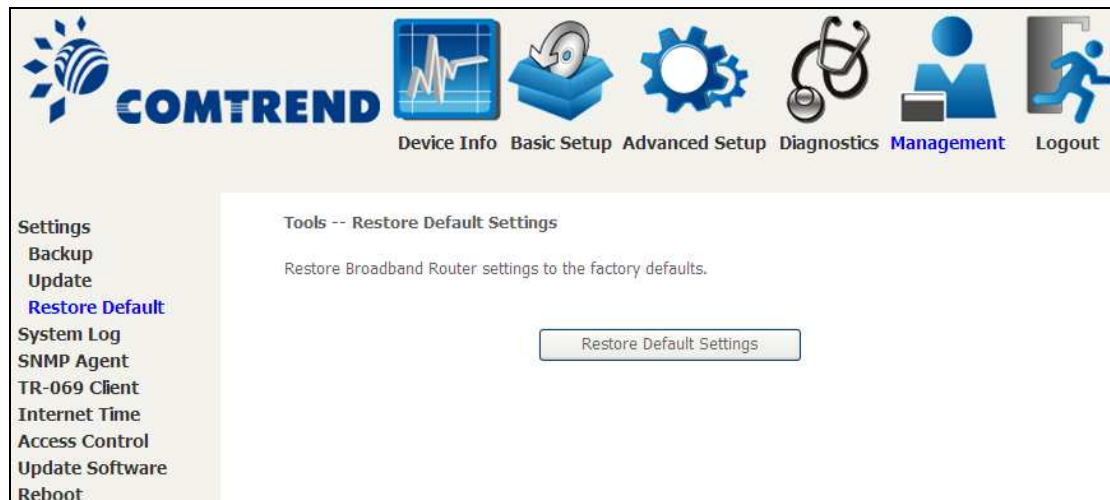
8.1.2 Update Settings

This option recovers configuration files previously saved using **Backup Settings**. Enter the file name (including folder path) in the **Settings File Name** box, or press **Browse...** to search for the file, then click **Update Settings** to recover settings.

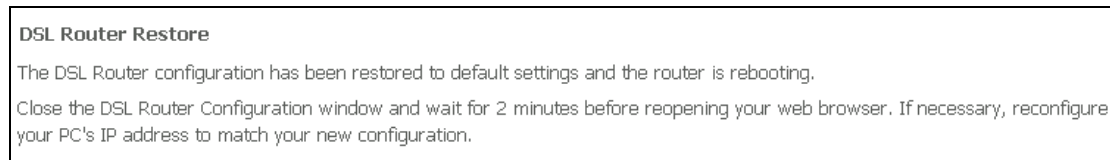


8.1.3 Restore Default

Click **Restore Default Settings** to restore factory default settings.



After **Restore Default Settings** is clicked, the following screen appears.



Close the browser and wait for 2 minutes before reopening it. It may also be necessary, to reconfigure your PC IP configuration to match any new settings.

NOTE: This entry has the same effect as the **Reset** button. The AR-5312u board hardware and the boot loader support the reset to default. If the **Reset** button is continuously pressed for more than 10 seconds, the boot loader will erase the configuration data saved in flash memory.

8.2 System Log

This function allows a system log to be kept and viewed upon request.

Follow the steps below to configure, enable, and view the system log.

STEP 1: Click **Configure System Log**, as shown below (circled in **Red**).



STEP 2: Select desired options and click **Apply/Save**.



Consult the table below for detailed descriptions of each system log option.

| Option | Description |
|--------|--|
| Log | Indicates whether the system is currently recording events. The user can enable or disable event logging. By default, it is disabled. To enable it, select the Enable radio button and then click Apply/Save . |

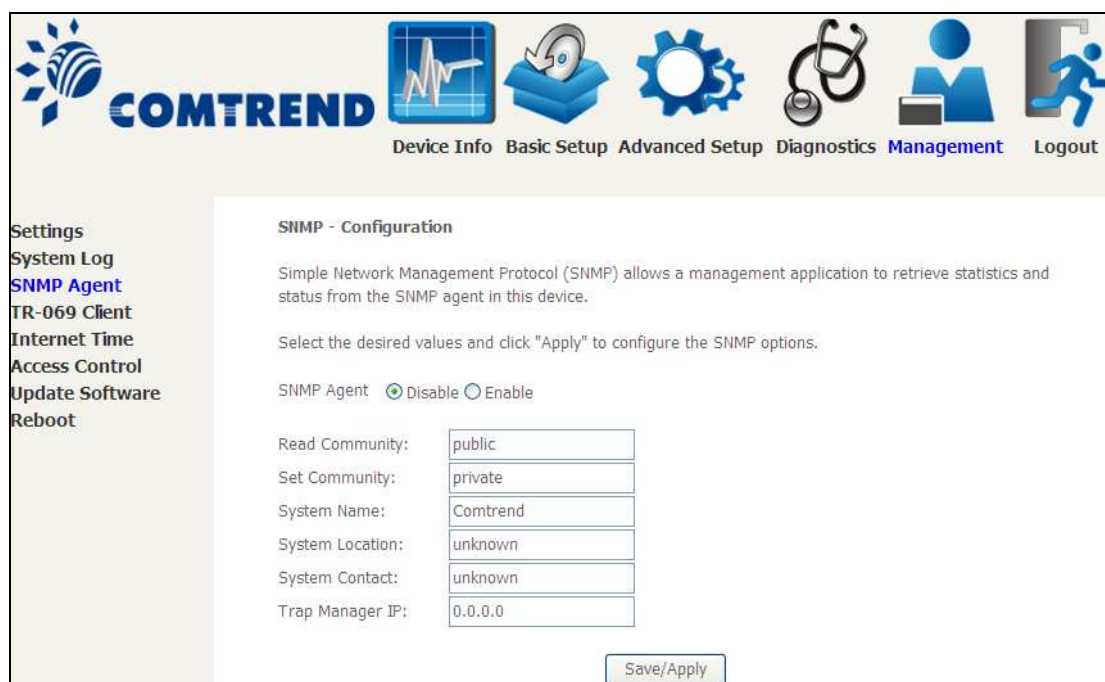
| Option | Description |
|---------------|---|
| Log Level | <p>Allows you to configure the event level and filter out unwanted events below this level. The events ranging from the highest critical level "Emergency" down to this configured level will be recorded to the log buffer on the AR-5312u SDRAM. When the log buffer is full, the newer event will wrap up to the top of the log buffer and overwrite the old event. By default, the log level is "Debugging", which is the lowest critical level.</p> <p>The log levels are defined as follows:</p> <ul style="list-style-type: none"> • Emergency = system is unusable • Alert = action must be taken immediately • Critical = critical conditions • Error = Error conditions • Warning = normal but significant condition • Notice= normal but insignificant condition • Informational= provides information for reference • Debugging = debug-level messages <p>Emergency is the most serious event level, whereas Debugging is the least important. For instance, if the log level is set to Debugging, all the events from the lowest Debugging level to the most critical level Emergency level will be recorded. If the log level is set to Error, only Error and the level above will be logged.</p> |
| Display Level | <p>Allows the user to select the logged events and displays on the View System Log window for events of this level and above to the highest Emergency level.</p> |
| Mode | <p>Allows you to specify whether events should be stored in the local memory, or be sent to a remote system log server, or both simultaneously. If remote mode is selected, view system log will not be able to display events saved in the remote system log server. When either Remote mode or Both mode is configured, the WEB UI will prompt the user to enter the Server IP address and Server UDP port.</p> |

STEP 3: Click **View System Log**. The results are displayed as follows.

| System Log | | | |
|----------------|----------|----------|---|
| Date/Time | Facility | Severity | Message |
| Jan 1 00:00:12 | syslog | emerg | BCM96345 started: BusyBox v0.60.4 (2004.09.14-06:30+0000) |
| Jan 1 00:00:17 | user | crit | klogd: USB Link UP. |
| Jan 1 00:00:19 | user | crit | klogd: eth0 Link UP. |

8.3 SNMP Agent

Simple Network Management Protocol (SNMP) allows a management application to retrieve statistics and status from the SNMP agent in this device. Select the **Enable** radio button, configure options, and click **Save/Apply** to activate SNMP.



COMTREND Device Info Basic Setup Advanced Setup Diagnostics **Management** Logout

Settings
System Log
SNMP Agent
TR-069 Client
Internet Time
Access Control
Update Software
Reboot

SNMP - Configuration

Simple Network Management Protocol (SNMP) allows a management application to retrieve statistics and status from the SNMP agent in this device.

Select the desired values and click "Apply" to configure the SNMP options.

SNMP Agent Disable Enable

Read Community:

Set Community:

System Name:

System Location:

System Contact:

Trap Manager IP:

8.4 TR-069 Client

WAN Management Protocol (TR-069) allows an Auto-Configuration Server (ACS) to perform auto-configuration, provision, collection, and diagnostics to this device. Select desired values and click **Apply/Save** to configure TR-069 client options.

The table below is provided for ease of reference.

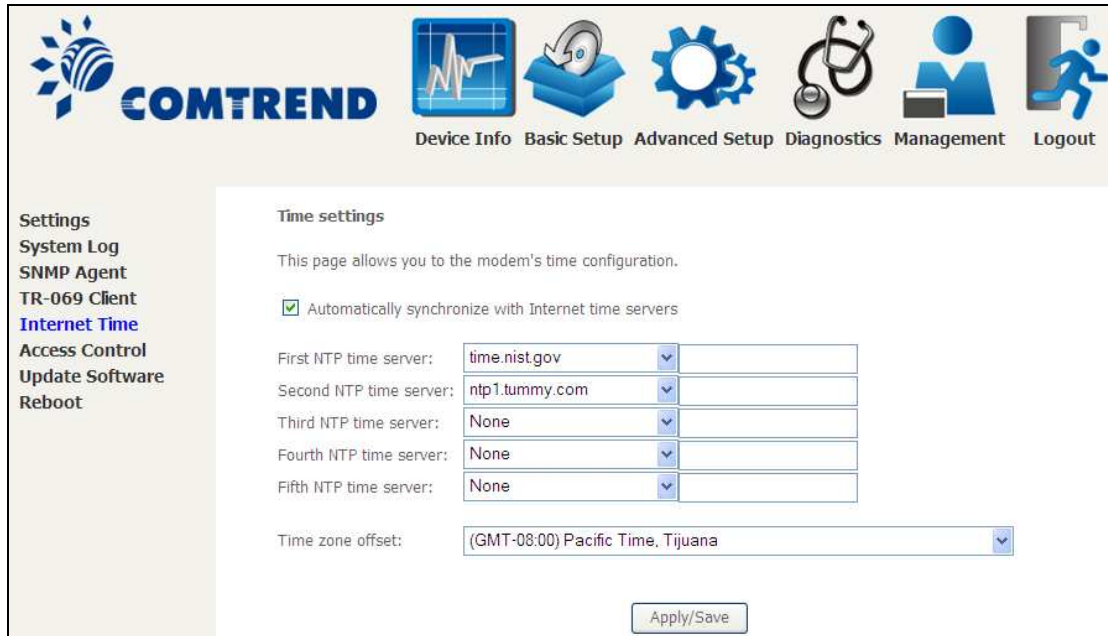
| Option | Description |
|-----------------|---|
| Enable TR-069 | Tick the checkbox <input checked="" type="checkbox"/> to enable. |
| OUI-serial | The serial number used to identify the CPE when making a connection to the ACS using the CPE WAN Management Protocol. Select MAC to use the router's MAC address as serial number to authenticate with ACS or select serial number to use router's serial number. |
| Inform | Disable/Enable TR-069 client on the CPE. |
| Inform Interval | The duration in seconds of the interval for which the CPE MUST attempt to connect with the ACS and call the Inform method. |

| Option | Description |
|-------------------------------------|--|
| ACS URL | URL for the CPE to connect to the ACS using the CPE WAN Management Protocol. This parameter MUST be in the form of a valid HTTP or HTTPS URL. An HTTPS URL indicates that the ACS supports SSL. The "host" portion of this URL is used by the CPE for validating the certificate from the ACS when using certificate-based authentication. |
| ACS User Name | Username used to authenticate the CPE when making a connection to the ACS using the CPE WAN Management Protocol. This username is used only for HTTP-based authentication of the CPE. |
| ACS Password | Password used to authenticate the CPE when making a connection to the ACS using the CPE WAN Management Protocol. This password is used only for HTTP-based authentication of the CPE. |
| WAN Interface used by TR-069 client | Choose Any_WAN, LAN, Loopback or a configured connection. |
| Connection Request | |
| Authentication | Tick the checkbox <input checked="" type="checkbox"/> to enable. |
| User Name | Username used to authenticate an ACS making a Connection Request to the CPE. |
| Password | Password used to authenticate an ACS making a Connection Request to the CPE. |
| URL | IP address and port the ACS uses to connect to router. |

The **Send Inform** button forces the CPE to establish an immediate connection to the ACS.

8.5 Internet Time

This option automatically synchronizes the router time with Internet timeservers. To enable time synchronization, tick the corresponding checkbox , choose your preferred time server(s), select the correct time zone offset, and click **Save/Apply**.



The screenshot shows the COMTREND router's web interface. At the top, there is a navigation bar with icons and labels for 'Device Info', 'Basic Setup', 'Advanced Setup', 'Diagnostics', 'Management', and 'Logout'. The 'Internet Time' option is highlighted in the left sidebar. The main content area is titled 'Time settings' and contains the following configuration options:

- Automatically synchronize with Internet time servers
- First NTP time server:
- Second NTP time server:
- Third NTP time server:
- Fourth NTP time server:
- Fifth NTP time server:
- Time zone offset:

An 'Apply/Save' button is located at the bottom of the configuration area.

NOTE: Internet Time must be activated to use [Parental Control](#). In addition, this menu item is not displayed when in Bridge mode since the router would not be able to connect to the NTP timeserver.

8.6 Access Control

8.6.1 Passwords

This screen is used to configure the user account access passwords for the device. Access to the AR-5312u is controlled through the following user accounts:

- The root account has unrestricted access to view and change the configuration of your Broadband router.
- The support account is typically utilized by Carrier/ISP technicians for maintenance and diagnostics.
- The user account is typically utilized by End-Users to view configuration settings and statistics, with limited ability to configure certain settings.
- The apuser account is typically utilized by End-Users to view configuration settings and statistics, with limited ability to configure wireless settings.

Use the fields to update passwords for the accounts, add/remove accounts (max of 5 accounts) as well as adjust their specific privileges.

- Settings
- System Log
- SNMP Agent
- TR-069 Client
- Internet Time
- Access Control
- Accounts
- Service Access
- IP Address
- Update Software
- Reboot

Access Control -- Accounts/Passwords

By default, access to your Broadband router is controlled through three user accounts: root, support, and user.

The root account has unrestricted access to view and change the configuration of your Broadband router.

The support account is typically utilized by Carrier/ISP technicians for maintenance and diagnostics.

The user account is typically utilized by End-Users to view configuration settings and statistics, with limited ability to configure certain settings.

Use the fields below to update passwords for the accounts, add/remove accounts (max of 5 accounts). Note: Passwords may be as long as 16 characters but must not contain a space.

Select an account:

 Create an account:

Old Password:

 New Password:

 Confirm Password:

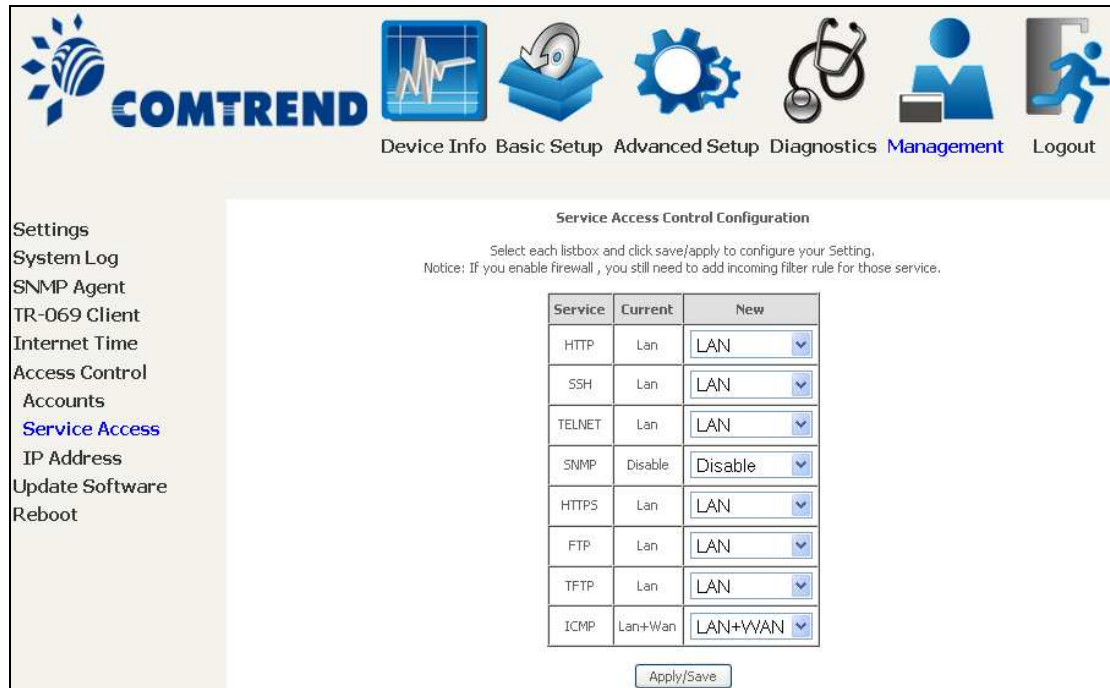
Use the fields below to enable/disable accounts as well as adjust their specific privileges.

| Feature | root | support | user | apuser |
|---------------------|---------|---------------------------------------|---------------------------------------|---------------------------------------|
| Account access | Both | None <input type="button" value="v"/> | None <input type="button" value="v"/> | None <input type="button" value="v"/> |
| Add/Remove WAN | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wireless - Basic | Enabled | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Wireless - Advanced | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| LAN Settings | Enabled | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| LAN Port Mapping | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| NAT Settings | Enabled | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Update Software | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Security | Enabled | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Quality of Service | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Management Settings | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Advanced Setup | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Home Networking | Enabled | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Parental Control | Enabled | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Note: Passwords may be as long as 16 characters but must not contain a space. Click **Save/Apply** to continue.

8.6.2 Service Access

The Services option limits or opens the access services over the LAN or WAN. These access services available are: FTP, HTTP, ICMP, SNMP, TELNET and TFTP. Enable a service by selecting its dropdown listbox. Click **APPLY/SAVE** to activate.

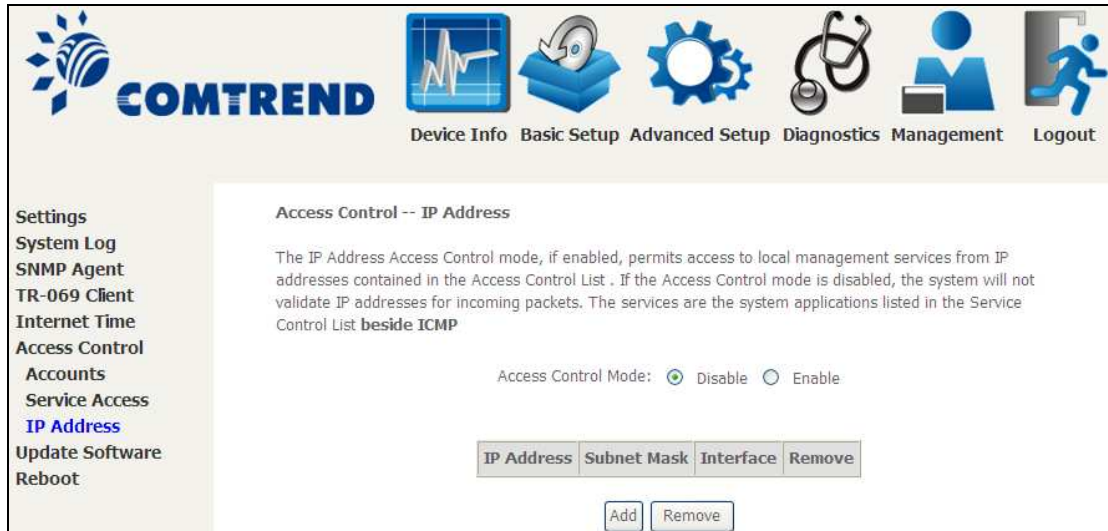


The screenshot displays the Comtrend Management web interface. At the top, there is a navigation bar with icons and labels for Device Info, Basic Setup, Advanced Setup, Diagnostics, Management (highlighted), and Logout. The left sidebar contains a menu with options: Settings, System Log, SNMP Agent, TR-069 Client, Internet Time, Access Control, Accounts, Service Access (highlighted), IP Address, Update Software, and Reboot. The main content area is titled "Service Access Control Configuration" and includes a notice: "Select each listbox and click save/apply to configure your Setting. Notice: If you enable firewall, you still need to add incoming filter rule for those service." Below the notice is a table with columns for Service, Current, and New. The table lists services and their current and new configurations. At the bottom of the table is an "Apply/Save" button.

| Service | Current | New |
|---------|---------|---------|
| HTTP | Lan | LAN |
| SSH | Lan | LAN |
| TELNET | Lan | LAN |
| SNMP | Disable | Disable |
| HTTPS | Lan | LAN |
| FTP | Lan | LAN |
| TFTP | Lan | LAN |
| ICMP | Lan+Wan | LAN+WAN |

8.6.3 IP Address

The IP Address Access Control mode, if enabled, permits access to local management services from IP addresses contained in the Access Control List. If the Access Control mode is disabled, the system will not validate IP addresses for incoming packets. The services are the system applications listed in the Service Control List **beside ICMP**.



Click the **Add** button to display the following.



Configure the address and subnet of the management station permitted to access the local management services, and click **Save/Apply**.

IP Address – IP address of the management station.

Subnet Mask – Subnet address for the management station.

Interface – Access permission for the specified address, allowing the address to access the local management service from none/lan/wan/lan&wan interfaces.

8.7 Update Software

This option allows for firmware upgrades from a locally stored file.

COMTREND

Device Info Basic Setup Advanced Setup Diagnostics Management Logout

Settings
System Log
SNMP Agent
TR-069 Client
Internet Time
Access Control
Update Software
Reboot

Tools -- Update Software

Step 1: Obtain an updated software image file from your ISP.

Step 2: Enter the path to the image file location in the box below or click the "Browse" button to locate the image file.

Step 3: Click the "Update Software" button once to upload the new image file.

NOTE: The update process takes about 2 minutes to complete, and your Broadband Router will reboot.

Configuration: No Change

Software File Name: Browse...

Update Software

STEP 1: Obtain an updated software image file from your ISP.

STEP 2: Select the configuration from the drop-down menu.

Configuration options:

No change – upgrade software directly.

Erase current config – If the router has save_default configuration, this option will erase the current configuration and restore to save_default configuration after software upgrade.

Erase All – Router will be restored to factory default configuration after software upgrade.

STEP 3: Enter the path and filename of the firmware image file in the **Software File Name** field or click the Browse button to locate the image file.

STEP 4: Click the **Update Software** button once to upload and install the file.

NOTE: The update process will take about 2 minutes to complete. The device will reboot and the browser window will refresh to the default screen upon successful installation. It is recommended that you compare the **Software Version** on the [Device Information](#) screen with the firmware version installed, to confirm the installation was successful.

8.8 Reboot

To save the current configuration and reboot the router, click **Save/Reboot**.



NOTE: You may need to close the browser window and wait for 2 minutes before reopening it. It may also be necessary, to reset your PC IP configuration.



Chapter 9 Logout

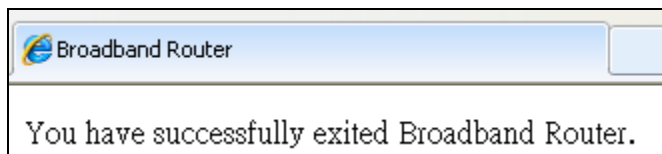
To log out from the device simply click the following icon located at the top of your screen.



When the following window pops up, click the **OK** button to exit the router.



Upon successful exit, the following message will be displayed.



Appendix A - Firewall

STATEFUL PACKET INSPECTION

Refers to an architecture, where the firewall keeps track of packets on each connection traversing all its interfaces and makes sure they are valid. This is in contrast to static packet filtering which only examines a packet based on the information in the packet header.

DENIAL OF SERVICE ATTACK

Is an incident in which a user or organization is deprived of the services of a resource they would normally expect to have. Various DoS attacks the device can withstand are ARP Attack, Ping Attack, Ping of Death, Land, SYN Attack, Smurf Attack, and Tear Drop.

TCP/IP/PORT/INTERFACE FILTER

These rules help in the filtering of traffic at the Network layer (i.e. Layer 3). When a Routing interface is created, **Enable Firewall** must be checked. Navigate to Advanced Setup → Security → IP Filtering.

OUTGOING IP FILTER

Helps in setting rules to DROP packets from the LAN interface. By default, if the Firewall is Enabled, all IP traffic from the LAN is allowed. By setting up one or more filters, specific packet types coming from the LAN can be dropped.

Example 1:

| | |
|--------------------|-----------------|
| Filter Name | : Out_Filter1 |
| Protocol | : TCP |
| Source IP address | : 192.168.1.45 |
| Source Subnet Mask | : 255.255.255.0 |
| Source Port | : 80 |
| Dest. IP Address | : NA |
| Dest. Subnet Mask | : NA |
| Dest. Port | : NA |

This filter will Drop all TCP packets coming from the LAN with IP Address/Subnet Mask of 192.168.1.45/24 having a source port of 80 irrespective of the destination. All other packets will be Accepted.

Example 2:

| | |
|--------------------|-----------------|
| Filter Name | : Out_Filter2 |
| Protocol | : UDP |
| Source IP Address | : 192.168.1.45 |
| Source Subnet Mask | : 255.255.255.0 |
| Source Port | : 5060:6060 |
| Dest. IP Address | : 172.16.13.4 |
| Dest. Subnet Mask | : 255.255.255.0 |
| Dest. Port | : 6060:7070 |

This filter will drop all UDP packets coming from the LAN with IP Address / Subnet Mask of 192.168.1.45/24 and a source port range of 5060 to 6060, destined to 172.16.13.4/24 and a destination port range of 6060 to 7070.

INCOMING IP FILTER

Helps in setting rules to Allow or Deny packets from the WAN interface. By default, all incoming IP traffic from the WAN is Blocked, if the Firewall is Enabled. By setting up one or more filters, specific packet types coming from the WAN can be Accepted.

Example 1: Filter Name : In_Filter1
 Protocol : TCP
 Policy : Allow
 Source IP Address : 210.168.219.45
 Source Subnet Mask : 255.255.0.0
 Source Port : 80
 Dest. IP Address : NA
 Dest. Subnet Mask : NA
 Dest. Port : NA
 Selected WAN interface : br0

This filter will ACCEPT all TCP packets coming from WAN interface "br0" with IP Address/Subnet Mask 210.168.219.45/16 with a source port of 80, irrespective of the destination. All other incoming packets on this interface are DROPPED.

Example 2: Filter Name : In_Filter2
 Protocol : UDP
 Policy : Allow
 Source IP Address : 210.168.219.45
 Source Subnet Mask : 255.255.0.0
 Source Port : 5060:6060
 Dest. IP Address : 192.168.1.45
 Dest. Sub. Mask : 255.255.255.0
 Dest. Port : 6060:7070
 Selected WAN interface : br0

This rule will ACCEPT all UDP packets coming from WAN interface "br0" with IP Address/Subnet Mask 210.168.219.45/16 and a source port in the range of 5060 to 6060, destined to 192.168.1.45/24 and a destination port in the range of 6060 to 7070. All other incoming packets on this interface are DROPPED.

MAC LAYER FILTER

These rules help in the filtering of Layer 2 traffic. MAC Filtering is only effective in Bridge mode. After a Bridge mode connection is created, navigate to Advanced Setup → Security → MAC Filtering in the WUI.

Example 1: Global Policy : Forwarded
 Protocol Type : PPPoE
 Dest. MAC Address : 00:12:34:56:78:90
 Source MAC Address : NA
 Src. Interface : eth1
 Dest. Interface : eth2

Addition of this rule drops all PPPoE frames going from eth1 to eth2 with a Destination MAC Address of 00:12:34:56:78:90 irrespective of its Source MAC Address. All other frames on this interface are forwarded.

Example 2: Global Policy : Blocked
 Protocol Type : PPPoE
 Dest. MAC Address : 00:12:34:56:78:90
 Source MAC Address : 00:34:12:78:90:56
 Src. Interface : eth1
 Dest. Interface : eth2

Addition of this rule forwards all PPPoE frames going from eth1 to eth2 with a Destination MAC Address of 00:12:34:56:78 and Source MAC Address of 00:34:12:78:90:56. All other frames on this interface are dropped.

DAYTIME PARENTAL CONTROL

This feature restricts access of a selected LAN device to an outside Network through the AR-5312u , as per chosen days of the week and the chosen times.

Example: User Name : FilterJohn
 Browser's MAC Address : 00:25:46:78:63:21
 Days of the Week : Mon, Wed, Fri
 Start Blocking Time : 14:00
 End Blocking Time : 18:00

With this rule, a LAN device with MAC Address of 00:25:46:78:63:21 will have no access to the WAN on Mondays, Wednesdays, and Fridays, from 2pm to 6pm. On all other days and times, this device will have access to the outside Network.

Appendix B - Pin Assignments

ETHERNET Ports (RJ45)

ETHERNET LAN Ports (10/100Base-T)

Table 1

| Pin | Definition | Pin | Definition |
|-----|----------------|-----|---------------|
| 1 | Transmit data+ | 5 | NC |
| 2 | Transmit data- | 6 | Receive data- |
| 3 | Receive data+ | 7 | NC |
| 4 | NC | 8 | NC |

Signals for ETHERNET WAN port (10/100/1000Base-T)

Table 2

| Pin | Signal name | Signal definition |
|-----|-------------|---|
| 1 | TRD+(0) | Transmit/Receive data 0 (positive lead) |
| 2 | TRD-(0) | Transmit/Receive data 0 (negative lead) |
| 3 | TRD+(1) | Transmit/Receive data 1 (positive lead) |
| 4 | TRD+(2) | Transmit/Receive data 2 (positive lead) |
| 5 | TRD-(2) | Transmit/Receive data 2 (negative lead) |
| 6 | TRD-(1) | Transmit/Receive data 1 (negative lead) |
| 7 | TRD+(3) | Transmit/Receive data 3 (positive lead) |
| 8 | TRD-(3) | Transmit/Receive data 3 (negative lead) |

DSL Port

Table 3

| Pin | Signal definition |
|-----|-------------------|
| 1 | LINE2 TIP |
| 2 | LINE1 TIP |
| 3 | LINE1 RING |
| 4 | LINE2 RING |

Appendix C – Specifications

Hardware Interface

- RJ-11 X 1 for ADSL
- RJ-45 X 4 for LAN (10/100 Base-T auto-sense)
- WPS/Wi-Fi Button X 1
- On/Off Button X 1
- Reset Button X 1
- USB Host X 1
- Wi-Fi Antenna X 2

WAN Interface

- Downstream up to 12M for ADSL, 24 Mbps for ADSL2+; Upstream up to 1.3 Mbps,
- ITU-T G.992.5, ITU-T G.992.3, ITU-T G.992.1, ANSI T1.413 Issue 2, Annex A/L/M

LAN Interface

- Standard IEEE 802.3, IEEE 802.3u
- Support MDI/MDX
- 10/100 Base T Auto-sense

Wireless Interface

- IEEE802.11b/g/n
- 64, 128-bit Wired Equivalent Privacy (WEP) Data Encryption
- 11 Channels (US, Canada)/ 13 Channels (Europe)/ 14 Channels (Japan)
- WDS/WEP/WPA/WPA2 Yes

Management

- Remote upgrade
- TFTP/FTP upgrade
- Telnet remote access support
- Support Web based configuration
- Support for backup & restore configuration to/from PC

Networking Protocols

- RFC 2684 VC-MUX, LLC/SNAP encapsulations for bridged or routed packet
- RFC 2364 PPP over AAL5
- IPoA, PPPoA, PPPoE, Multiple PPPoE sessions on single PVC, PPPoE pass-through
- PPPoE filtering of on-PPPoE packets between WAN and LAN
- Transparent bridging between all LAN and WAN interfaces
- 802.1p/802.1q VLAN support
- Spanning Tree Algorithm
- IGMP Proxy V1/V2/V3, IGMP Snooping V1/V2/V3, Fast leave
- Static route, RIP v1/v2, ARP, RARP, SNTP
- DHCP Server/Client/Relay,
- DNS Proxy/Relay, Dynamic DNS,
- UPnP IGD v1.0
- IPv6 subset

Security Functions

- PAP, CHAP, Packet and MAC address filtering, SSH
- VPN termination
- Three level login including local admin, local user and remote technical support access

QoS

- Packet level QoS classification rules,
- Priority queuing using ATM/PTM TX queues,
- IP TOS/Precedence,
- 802.1p marking,
- DiffServ DSCP marking
- Src/dest MAC addresses classification

Firewall/Filtering

- Stateful Inspection Firewall
- Stateless Packet Filter
- Denial of Service (DOS): ARP attacks, Ping attacks, Ping of Death, LAND, SYNC, Smurf, Unreachable, Teardrop
- TCP/IP/Port/interface filtering rules Support both incoming and outgoing filtering

NAT/NAPT

- Support Port Triggering and Port forwarding
- Symmetric port-overloading NAT, Full-Cone NAT
- Dynamic NAPT (NAPT N-to-1)
- Support DMZ host
- Virtual Server (Port forwarding)
- VPN Passthrough (PPTP, L2TP, IPsec)

Application Passthrough

PPTP, L2TP, IPsec, Yahoo messenger, ICQ, RealPlayer, NetMeeting, MSN, X-box, etc.

Power SupplyInput: 100 - 240 Vac
Output: 12 Vdc / 0.5 A

Environment Condition

Operating temperature0 ~ 40 degrees Celsius
Humidity.....10 ~ 90% (non-condensing, standard operating)

Dimensions 173 mm (W) x 39 mm (H) x 135.8 mm (D)

Certifications..... CE

Kit Weight

(1*AR-5312u, 1*RJ11 cable, 1*RJ45 cable, 1*power adapter, 1*CD-ROM)

| |
|--|
| NOTE: Specifications are subject to change without notice |
|--|

Appendix D - SSH Client

Unlike Microsoft Windows, Linux OS has a ssh client included. For Windows users, there is a public domain one called "putty" that can be downloaded from here:

<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

To access the ssh client you must first enable SSH access for the LAN or WAN from the Management → Access Control → Services menu in the web user interface.

To access the router using the Linux ssh client

For LAN access, type: `ssh -l root 192.168.1.1`

For WAN access, type: `ssh -l support WAN IP address`

To access the router using the Windows "putty" ssh client

For LAN access, type: `putty -ssh -l root 192.168.1.1`

For WAN access, type: `putty -ssh -l support WAN IP address`

NOTE: The WAN IP address can be found on the Device Info → WAN screen

Appendix E - Connection Setup

Creating a WAN connection is a two-stage process.

- 1 - Setup a Layer 2 Interface (ATM, PTM or Ethernet).
- 2 - Add a WAN connection to the Layer 2 Interface.

The following sections describe each stage in turn.

E1 ~ Layer 2 Interfaces

Every layer2 interface operates in Multi-Service Connection (VLAN MUX) mode, which supports multiple connections over a single interface. Note that PPPoA and IPoA connection types are not supported for Ethernet WAN interfaces. After adding WAN connections to an interface, you must also create an Interface Group to connect LAN/WAN interfaces.

E1.1 ATM Interfaces

Follow these procedures to configure an ATM interface.

NOTE: The AR-5312u supports up to 16 ATM interfaces.



STEP 1: Go to Basic Setup → WAN Setup → Select ATM Interface from the drop-down menu.

The screenshot shows the COMTREND web interface. The top navigation bar includes: Device Info, Basic Setup (highlighted), Advanced Setup, Diagnostics, Management, and Logout. The left sidebar lists: WAN Setup (highlighted), NAT, LAN, Wireless, and Parental Control. The main content area is titled 'Step 1: Layer 2 Interface'. It features a dropdown menu with 'ATM Interface' selected and an 'Add' button. Below this are three configuration tables:

| DSL ATM Interface Configuration | | | | | | | | | | | | |
|---------------------------------|-----|-----|-------------|----------|--------------------------|---------------------------------|------------------------|-----------|-----------|--------|---------------------|--------|
| Interface | Vpi | Vci | DSL Latency | Category | Peak Cell Rate (cells/s) | Sustainable Cell Rate (cells/s) | Max Burst Size (bytes) | Link Type | Conn Mode | IP QoS | MPAAL Prec/Alg/Wght | Remove |
| | | | | | | | | | | | | |

| DSL PTM Interface Configuration | | | | | |
|---------------------------------|-------------|--------------|-----------|--------|--------|
| Interface | DSL Latency | PTM Priority | Conn Mode | IP QoS | Remove |
| | | | | | |

| ETH WAN Interface Configuration | | |
|---------------------------------|-----------------|--------|
| Interface/(Name) | Connection Mode | Remove |
| | | |

This table is provided here for ease of reference.

| Heading | Description |
|-----------------------|--|
| Interface | WAN interface name. |
| VPI | ATM VPI (0-255) |
| VCI | ATM VCI (32-65535) |
| DSL Latency | {Path0} → portID = 0 {Path1} → port ID = 1 {Path0&1} → port ID = 4 |
| Category | ATM service category |
| Peak Cell Rate | Maximum allowed traffic rate for the ATM PCR service connection |
| Sustainable Cell Rate | The average allowable, long-term cell transfer rate on the VBR service connection |
| Max Burst Size | The maximum allowable burst size of cells that can be transmitted contiguously on the VBR service connection |
| Link Type | Choose EoA (for PPPoE, IPoE, and Bridge), PPPoA, or IPoA. |
| Connection Mode | Default Mode – Single service over one connection Vlan Mux Mode – Multiple Vlan service over one connection |
| IP QoS | Quality of Service (QoS) status |
| MPAAL | QoS Scheduler algorithm and queue weight defined for the connection |
| Remove | Select items for removal |

STEP 2: Click **Add** to proceed to the next screen.

NOTE: To add WAN connections to one interface type, you must delete existing connections from the other interface type using the **remove** button.

ATM PVC Configuration

This screen allows you to configure a ATM PVC.

VPI: [0-255]
VCI: [32-65535]

Select DSL Link Type (EoA is for PPPoE, IPoE, and Bridge.)

EoA
 PPPoA
 IPoA

Encapsulation Mode: ▾

Service Category: ▾

Select Scheduler for Queues of Equal Precedence as the Default Queue

Weighted Round Robin
 Weighted Fair Queuing

Default Queue Weight: [1-63]
Default Queue Precedence: [1-8] (lower value, higher priority)

VC WRR Weight: [1-63]
VC Precedence: [1-8] (lower value, higher priority)

Note: VC scheduling will be SP among unequal precedence VC's and WRR among equal precedence VC's.
For single queue VC, the default queue precedence and weight will be used for arbitration.
For multi-queue VC, its VC precedence and weight will be used for arbitration.

There are many settings here including: VPI/VCI, DSL Link Type, Encapsulation Mode, Service Category, Connection Mode and Quality of Service.

Here are the available encapsulations for each xDSL Link Type:

- ◆ EoA- LLC/SNAP-BRIDGING, VC/MUX
- ◆ PPPoA- VC/MUX, LLC/ENCAPSULATION
- ◆ IPoA- LLC/SNAP-ROUTING, VC MUX

STEP 3: Click **Apply/Save** to confirm your choices.

On the next screen, check that the ATM interface is added to the list. For example, an ATM interface on PVC 0/35 in Default Mode with an EoA Link type is shown below.

| DSL ATM Interface Configuration | | | | | | | | | | | | |
|--|-----|-----|-------------|----------|--------------------------|---------------------------------|------------------------|-----------|-------------|---------|---------------------|--------------------------|
| Choose Add, or Remove to configure DSL ATM interfaces. | | | | | | | | | | | | |
| Interface | Vpi | Vci | DSL Latency | Category | Peak Cell Rate (cells/s) | Sustainable Cell Rate (cells/s) | Max Burst Size (bytes) | Link Type | Conn Mode | IP QoS | MPAAL Prec/Alg/Wght | Remove |
| atm0 | 0 | 35 | Path0 | UBR | | | | EoA | VlanMuxMode | Support | 8/WRR/1 | <input type="checkbox"/> |

To add a WAN connection go to [E2 ~ WAN Connections](#).

E1.2 PTM Interfaces

Follow these procedures to configure a PTM interface.

NOTE: The AR-5312u supports up to four PTM interfaces.



STEP 4: Go to Basic Setup → WAN Setup → Select PTM Interface from the drop-down menu.

This table is provided here for ease of reference.

| Heading | Description |
|-----------------|---|
| Interface | WAN interface name. |
| DSL Latency | {Path0} → portID = 0 {Path1} → port ID = 1 {Path0&1} → port ID = 4 |
| PTM Priority | Normal or High Priority (Preemption). |
| Connection Mode | Default Mode – Single service over one interface. Vlan Mux Mode – Multiple Vlan services over one interface. |
| IP QoS | Quality of Service (QoS) status. |
| Remove | Select interfaces to remove. |

STEP 5: Click **Add** to proceed to the next screen.

NOTE: To add WAN connections to one interface type, you must delete existing connections from the other interface type using the **remove** button.

PTM Configuration

This screen allows you to configure a PTM flow.

Select Scheduler for Queues of Equal Precedence as the Default Queue

- Weighted Round Robin
- Weighted Fair Queuing

Default Queue Weight: [1-63]

Default Queue Precedence: [1-8] (lower value, higher priority)

Default Queue Shaping Rate: [Kbits/s] (blank indicates no shaping)

Default Queue Shaping Burst Size: [bytes] (shall be ≥ 1600)

Back

Apply/Save

There are many settings that can be configured here including: PTM Priority, Connection Mode and Quality of Service.

STEP 6: Click **Apply/Save** to confirm your choices.

On the next screen, check that the PTM interface is added to the list.

For example, an PTM interface in Default Mode is shown below.

| DSL PTM Interface Configuration | | | | | |
|---------------------------------|-------------|--------------|-------------|---------|---------------------------------------|
| Interface | DSL Latency | PTM Priority | Conn Mode | IP QoS | Remove |
| ptm0 | Path0 | Normal&High | VlanMuxMode | Support | <input type="button" value="Remove"/> |

To add a WAN connection go to section [E2 WAN Connections](#).

E1.3 ETHERNET Interfaces

Follow these procedures to configure a PTM interface.



STEP 1: Go to Basic Setup → WAN Setup → Select ETHERNET Interface from the drop-down menu.

COMTREND Device Info **Basic Setup** Advanced Setup Diagnostics Management Logout

WAN Setup
 NAT
 LAN
 Wireless
 Parental Control

Step 1: Layer 2 Interface

Select new interface to add: ETHERNET Interface

DSL ATM Interface Configuration

| Interface | Vpi | Vci | DSL Latency | Category | Peak Cell Rate (cells/s) | Sustainable Cell Rate (cells/s) | Max Burst Size (bytes) | Link Type | Conn Mode | IP QoS | MPAAL Prec/Alg/Wght | Remove |
|-----------|-----|-----|-------------|----------|--------------------------|---------------------------------|------------------------|-----------|-----------|--------|---------------------|--------|
| | | | | | | | | | | | | |

DSL PTM Interface Configuration

| Interface | DSL Latency | PTM Priority | Conn Mode | IP QoS | Remove |
|-----------|-------------|--------------|-------------|---------|---------------------------------------|
| ptm0 | Path0 | Normal&High | VlanMuxMode | Support | <input type="button" value="Remove"/> |

ETH WAN Interface Configuration

| Interface/(Name) | Connection Mode | Remove |
|------------------|-----------------|--------|
| | | |

Step 2: Wide Area Network (WAN) Service Setup

PPP Redirect: Disable Enable

| Interface | Description | Type | Vlan8021p | VlanMuxId | Igmp | NAT | Firewall | IPv6 | Mld | Remove | Edit |
|-----------|-------------|------|-----------|-----------|------|-----|----------|------|-----|--------|------|
| | | | | | | | | | | | |

This table is provided here for ease of reference.

| Heading | Description |
|-------------------|---|
| Interface/ (Name) | WAN interface name. |
| Connection Mode | Default Mode – Single service over one interface. Vlan Mux Mode – Multiple Vlan services over one interface. |
| Remove | Select interfaces to remove. |

STEP 2: Click **Add** to proceed to the next screen.

ETH WAN Configuration
 This screen allows you to configure a ETH port .

Select a ETH port:

eth0/GBETH ▼

STEP 3: Select an Ethernet port and Click **Apply/Save** to confirm your choices.

On the next screen, check that the ETHERNET interface is added to the list.

| ETH WAN Interface Configuration | | |
|--|-----------------|---------------------------------------|
| Interface/(Name) | Connection Mode | Remove |
| eth0/GBETH | VlanMuxMode | <input type="button" value="Remove"/> |

E2 ~ WAN Connections

The AR-5312u supports one WAN connection for each interface, up to a maximum of 16 connections.

To setup a WAN connection follow these instructions.



STEP 1: Go to Basic Setup → WAN Setup.

Step 2: Wide Area Network (WAN) Service Setup

PPP Redirect: Disable Enable

| Interface | Description | Type | Vlan8021p | VlanMuxId | Igmp | IAT | Firewall | IPv6 | Mld | Remove | Edit |
|-----------|-------------|------|-----------|-----------|------|-----|----------|------|-----|--------|------|
|-----------|-------------|------|-----------|-----------|------|-----|----------|------|-----|--------|------|

STEP 2: Click **Add** to create a WAN connection. The following screen will display.

WAN Service Interface Configuration

Select a layer 2 interface for this service

Note: For ATM interface, the descriptor string is (portId_vpi_vci)
For PTM interface, the descriptor string is (portId_high_low)
Where portId=0 --> DSL Latency PATH0
portId=1 --> DSL Latency PATH1
portId=4 --> DSL Latency PATH0&1
low =0 --> Low PTM Priority not set
low =1 --> Low PTM Priority set
high =0 --> High PTM Priority not set
high =1 --> High PTM Priority set

atm0/(0_0_35) ▼

STEP 3: Choose a layer 2 interface from the drop-down box and click **Next**. The WAN Service Configuration screen will display as shown below.

WAN Service Configuration

Select WAN service type:

PPP over Ethernet (PPPoE)
 IP over Ethernet
 Bridging

Enter Service Description:

For tagged service, enter valid 802.1P Priority and 802.1Q VLAN ID.
For untagged service, set -1 to both 802.1P Priority and 802.1Q VLAN ID.

Enter 802.1P Priority [0-7]:

Enter 802.1Q VLAN ID [0-4094]:

Network Protocol Selection:

NOTE: The WAN services shown here are those supported by the layer 2 interface you selected in the previous step. If you wish to change your selection click the **Back** button and select a different layer 2 interface.

STEP 4: For VLAN Mux Connections only, you must enter Priority & VLAN ID tags.

Enter 802.1P Priority [0-7]:

Enter 802.1Q VLAN ID [0-4094]:

STEP 5: You will now follow the instructions specific to the WAN service type you wish to establish. This list should help you locate the correct procedure:

- (1) For [PPP over ETHERNET \(PPPoE\)](#), go to page 157.
- (2) For [IP over ETHERNET \(IPoE\)](#), go to page 163.
- (3) For [Bridging](#), go to page 168.
- (4) For [PPP over ATM \(PPPoA\)](#), go to page 170.
- (5) For [IP over ATM \(IPoA\)](#), go to page 175.

The subsections that follow continue the WAN service setup procedure.

E2.1 PPP over ETHERNET (PPPoE)

STEP 1: Select the PPP over Ethernet radio button and click **Next**. You can also enable IPv6 by ticking the checkbox at the bottom of this screen.

WAN Service Configuration

Select WAN service type:

PPP over Ethernet (PPPoE)
 IP over Ethernet
 Bridging

Enter Service Description:

For tagged service, enter valid 802.1P Priority and 802.1Q VLAN ID.
For untagged service, set -1 to both 802.1P Priority and 802.1Q VLAN ID.

Enter 802.1P Priority [0-7]:

Enter 802.1Q VLAN ID [0-4094]:

Network Protocol Selection:

STEP 2: On the next screen, enter the PPP settings as provided by your ISP. Click **Next** to continue or click **Back** to return to the previous step.

PPP Username and Password

PPP usually requires that you have a user name and password to establish your connection. In the boxes below, enter the user name and password that your ISP has provided to you.

PPP Username:

PPP Password:

PPPoE Service Name:

Authentication Method: ▼

Enable Fullcone NAT

Dial on demand (with idle timeout timer)

PPP IP extension

Enable NAT

Enable Firewall

Use Static IPv4 Address

Fixed MTU

MTU:

Enable PPP Debug Mode

Bridge PPPoE Frames Between WAN and Local Ports

Multicast Proxy

Enable IGMP Multicast Proxy

No Multicast VLAN Filter

WAN interface with base MAC.

Notice: Only one WAN interface can be cloned to base MAC address.

Enable WAN interface with base MAC

The settings shown above are described below.

PPP SETTINGS

The PPP Username, PPP password and the PPPoE Service Name entries are dependent on the particular requirements of the ISP. The user name can be a maximum of 256 characters and the password a maximum of 32 characters in length. For Authentication Method, choose from AUTO, PAP, CHAP, and MSCHAP.

ENABLE FULLCONE NAT

This option becomes available when NAT is enabled. Known as one-to-one NAT, all requests from the same internal IP address and port are mapped to the same external IP address and port. An external host can send a packet to the internal host, by sending a packet to the mapped external address.

DIAL ON DEMAND

The AR-5312u can be configured to disconnect if there is no activity for a period of time by selecting the **Dial on demand** checkbox . You must also enter an inactivity timeout period in the range of 1 to 4320 minutes.

| |
|--|
| <input checked="" type="checkbox"/> Dial on demand (with idle timeout timer) |
| Inactivity Timeout (minutes) [1-4320]: <input type="text"/> |

PPP IP EXTENSION

The PPP IP Extension is a special feature deployed by some service providers. Unless your service provider specifically requires this setup, do not select it.

PPP IP Extension does the following:

- Allows only one PC on the LAN.
- Disables NAT and Firewall.
- The device becomes the default gateway and DNS server to the PC through DHCP using the LAN interface IP address.
- The device extends the IP subnet at the remote service provider to the LAN PC. i.e. the PC becomes a host belonging to the same IP subnet.
- The device bridges the IP packets between WAN and LAN ports, unless the packet is addressed to the device's LAN IP address.
- The public IP address assigned by the remote side using the PPP/IPCP protocol is actually not used on the WAN PPP interface. Instead, it is forwarded to the PC LAN interface through DHCP. Only one PC on the LAN can be connected to the remote, since the DHCP server within the device has only a single IP address to assign to a LAN device.

ENABLE NAT

If the LAN is configured with a private IP address, the user should select this checkbox . The NAT submenu will appear in the Advanced Setup menu after reboot. On the other hand, if a private IP address is not used on the LAN side (i.e. the LAN side is using a public IP), this checkbox should not be selected to free up system resources for better performance.

ENABLE FIREWALL

If this checkbox is selected, the Security submenu will be displayed on the Advanced Setup menu after reboot. If firewall is not necessary, this checkbox should not be selected to free up system resources for better performance.

USE STATIC IPv4 ADDRESS

Unless your service provider specially requires it, do not select this checkbox . If selected, enter the static IP address in the **IPv4 Address** field. Don't forget to adjust the IP configuration to Static IP Mode as described in [section 3.2](#).

FIXED MTU

Maximum Transmission Unit. The size (in bytes) of largest protocol data unit which the layer can pass onwards. This value is 1500 for PPPoA.

ENABLE PPP DEBUG MODE

When this option is selected, the system will put more PPP connection information into the system log. This is for debugging errors and not for normal usage.

BRIDGE PPPOE FRAMES BETWEEN WAN AND LOCAL PORTS

(This option is hidden when PPP IP Extension is enabled)

When Enabled, this creates local PPPoE connections to the WAN side. Enable this option only if all LAN-side devices are running PPPoE clients, otherwise disable it. The AR-5312u supports pass-through PPPoE sessions from the LAN side while simultaneously running a PPPoE client from non-PPPoE LAN devices.

ENABLE IGMP MULTICAST PROXY

Tick the checkbox to enable Internet Group Membership Protocol (IGMP) multicast. This protocol is used by IPv4 hosts to report their multicast group memberships to any neighboring multicast routers.

NO MULTICAST VLAN FILTER

Tick the checkbox to Enable/Disable multicast VLAN filter.

Enable WAN interface with base MAC

Enable this option to use the router's base MAC address as the MAC address for this WAN interface.

STEP 3: Choose an interface to be the default gateway.

Routing -- Default Gateway

Default gateway interface list can have multiple WAN interfaces served as system default gateways but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

| Selected Default Gateway Interfaces | | Available Routed WAN Interfaces |
|--|--|--|
| ppp0.1 | <input type="button" value="->"/> <input type="button" value="<-"/> | |

Click **Next** to continue or click **Back** to return to the previous step.

Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered.

DNS Server Configuration

Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered. **DNS Server Interfaces** can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

Select DNS Server Interface from available WAN interfaces:

| Selected DNS Server Interfaces | | Available WAN Interfaces |
|--|---|--|
| <div style="border: 1px solid #ccc; padding: 5px; min-height: 100px;">ppp0.1</div> | <div style="border: 1px solid #ccc; padding: 2px 10px; margin: 5px;">-></div> <div style="border: 1px solid #ccc; padding: 2px 10px; margin: 5px;"><-</div> | <div style="border: 1px solid #ccc; padding: 5px; min-height: 100px;"></div> |

Use the following Static DNS IP address:

Primary DNS server:

Secondary DNS server:

Click **Next** to continue or click **Back** to return to the previous step.

STEP 5: The WAN Setup - Summary screen shows a preview of the WAN service you have configured. Check these settings and click **Apply/Save** if they are correct, or click **Back** to modify them.

WAN Setup - Summary

Make sure that the settings below match the settings provided by your ISP.

| | |
|----------------------------|----------|
| Connection Type: | PPPoE |
| NAT: | Enabled |
| Full Cone NAT: | Disabled |
| Firewall: | Disabled |
| IGMP Multicast: | Disabled |
| Quality Of Service: | Disabled |

Click "Apply/Save" to have this interface to be effective. Click "Back" to make any modifications.

After clicking **Apply/Save**, the new service should appear on the main screen. To activate it you must reboot. Go to Management → Reboot and click **Reboot**.

E2.2 IP over ETHERNET (IPoE)

STEP 1: *Select the IP over Ethernet radio button and click **Next**.

WAN Service Configuration

Select WAN service type:

PPP over Ethernet (PPPoE)

IP over Ethernet

Bridging

Enter Service Description:

For tagged service, enter valid 802.1P Priority and 802.1Q VLAN ID.
For untagged service, set -1 to both 802.1P Priority and 802.1Q VLAN ID.

Enter 802.1P Priority [0-7]:

Enter 802.1Q VLAN ID [0-4094]:

Network Protocol Selection:

▼

*

For tagged service, enter valid 802.1P Priority and 802.1Q VLAN ID.

For untagged service, set -1 to both 802.1P Priority and 802.1Q VLAN ID.

STEP 2: The WAN IP settings screen provides access to the DHCP server settings. You can select the **Obtain an IP address automatically** radio button to enable DHCP (use the DHCP Options only if necessary). However, if you prefer, you can instead use the **Static IP address** method to assign WAN IP address, Subnet Mask and Default Gateway manually.

WAN IP Settings

Enter information provided to you by your ISP to configure the WAN IP settings.
Notice: If "Obtain an IP address automatically" is chosen, DHCP will be enabled for PVC in IPoE mode.
If "Use the following Static IP address" is chosen, enter the WAN IP address, subnet mask and interface gateway.

Obtain an IP address automatically

Option 60 Vendor ID:

Option 61 IAID: (8 hexadecimal digits)

Option 61 DUID: (hexadecimal digit)

Option 125: Disable Enable

Use the following Static IP address:

WAN IP Address:

WAN Subnet Mask:

WAN gateway IP Address:

NOTE: If IPv6 networking is enabled, an additional set of instructions, radio buttons, and text entry boxes will appear at the bottom of the screen. These configuration options are quite similar to those for IPv4 networks.

Click **Next** to continue or click **Back** to return to the previous step.

STEP 3: This screen provides access to NAT, Firewall and IGMP Multicast settings. Enable each by selecting the appropriate checkbox . Click **Next** to continue or click **Back** to return to the previous step.

Network Address Translation Settings

Network Address Translation (NAT) allows you to share one Wide Area Network (WAN) IP address for multiple computers on your Local Area Network (LAN).

- Enable NAT
- Enable Fullcone NAT
- Enable Firewall

IGMP Multicast

- Enable IGMP Multicast

WAN interface with base MAC.

Notice: Only one WAN interface can be cloned to base MAC address.

- Enable WAN interface with base MAC

ENABLE NAT

If the LAN is configured with a private IP address, the user should select this checkbox . The NAT submenu will appear in the Advanced Setup menu after reboot. On the other hand, if a private IP address is not used on the LAN side (i.e. the LAN side is using a public IP), this checkbox should not be selected, so as to free up system resources for improved performance.

ENABLE FULLCONE NAT

This option becomes available when NAT is enabled. Known as one-to-one NAT, all requests from the same internal IP address and port are mapped to the same external IP address and port. An external host can send a packet to the internal host, by sending a packet to the mapped external address.

ENABLE FIREWALL

If this checkbox is selected, the Security submenu will be displayed on the Advanced Setup menu after reboot. If firewall is not necessary, this checkbox should not be selected so as to free up system resources for better performance.

ENABLE IGMP MULTICAST

Tick the checkbox to enable Internet Group Membership Protocol (IGMP) multicast. IGMP is a protocol used by IPv4 hosts to report their multicast group memberships to any neighboring multicast routers.

Enable WAN interface with base MAC

Enable this option to use the router's base MAC address as the MAC address for this WAN interface.

STEP 4: To choose an interface to be the default gateway.

Routing -- Default Gateway

Default gateway interface list can have multiple WAN interfaces served as system default gateways but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

| Selected Default Gateway Interfaces | | Available Routed WAN Interfaces |
|---|--|---------------------------------|
| atm0.1 | <input type="button" value="->"/> <input type="button" value="<-"/> | |
| <input type="button" value="Back"/> <input type="button" value="Next"/> | | |

Click **Next** to continue or click **Back** to return to the previous step.

STEP 5: Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA

or static IPoE protocol is configured, Static DNS server IP addresses must be entered.

DNS Server Configuration

Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered.

DNS Server Interfaces can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

Select DNS Server Interface from available WAN interfaces:

| Selected DNS Server Interfaces | Available WAN Interfaces |
|--------------------------------|--------------------------|
| atm0.1 | |

Use the following Static DNS IP address:

Primary DNS server:

Secondary DNS server:

If IPv6 is enabled, an additional set of options will be shown.

Obtain IPv6 DNS info from a WAN interface:

WAN Interface selected:

Use the following Static IPv6 DNS address:

Primary IPv6 DNS server:

Secondary IPv6 DNS server:

IPv6: Select the configured WAN interface for IPv6 DNS server information OR enter the static IPv6 DNS server Addresses.
Note that selecting a WAN interface for IPv6 DNS server will enable DHCPv6 Client on that interface.

Click **Next** to continue or click **Back** to return to the previous step.

STEP 6: The WAN Setup - Summary screen shows a preview of the WAN service you have configured. Check these settings and click **Apply/Save** if they are correct, or click **Back** to modify them.

WAN Setup - Summary

Make sure that the settings below match the settings provided by your ISP.

| | |
|----------------------------|----------|
| Connection Type: | IPoE |
| NAT: | Disabled |
| Full Cone NAT: | Disabled |
| Firewall: | Disabled |
| IGMP Multicast: | Disabled |
| Quality Of Service: | Disabled |

Click "Apply/Save" to have this interface to be effective. Click "Back" to make any modifications.

After clicking **Apply/Save**, the new service should appear on the main screen. To activate it you must reboot. Go to Management → Reboot and click **Reboot**.

E2.3 Bridging

NOTE: This connection type is not available on the Ethernet WAN interface.

STEP 1: *Select the Bridging radio button and click **Next**.

WAN Service Configuration

Select WAN service type:

PPP over Ethernet (PPPoE)

IP over Ethernet

Bridging

Enter Service Description:

For tagged service, enter valid 802.1P Priority and 802.1Q VLAN ID.
For untagged service, set -1 to both 802.1P Priority and 802.1Q VLAN ID.

Enter 802.1P Priority [0-7]:

Enter 802.1Q VLAN ID [0-4094]:

*

For tagged service, enter valid 802.1P Priority and 802.1Q VLAN ID.

For untagged service, set -1 to both 802.1P Priority and 802.1Q VLAN ID.

STEP 2: The WAN Setup - Summary screen shows a preview of the WAN service you have configured. Check these settings and click **Apply/Save** if they are correct, or click **Back** to return to the previous screen.

WAN Setup - Summary

Make sure that the settings below match the settings provided by your ISP.

| | |
|----------------------------|----------------|
| Connection Type: | Bridge |
| NAT: | N/A |
| Full Cone NAT: | Disabled |
| Firewall: | Disabled |
| IGMP Multicast: | Not Applicable |
| Quality Of Service: | Enabled |

Click "Apply/Save" to have this interface to be effective. Click "Back" to make any modifications.

After clicking **Apply/Save**, the new service should appear on the main screen. To activate it you must reboot. Go to Management → Reboot and click **Reboot**.

NOTE: If this bridge connection is your only WAN service, the AR-5312u will be inaccessible for remote management or technical support from the WAN.

E2.4 PPP over ATM (PPPoA)

WAN Service Configuration

Enter Service Description:

Network Protocol Selection:

STEP 1: Click **Next** to continue.

STEP 2: On the next screen, enter the PPP settings as provided by your ISP. Click **Next** to continue or click **Back** to return to the previous step.

PPP Username and Password

PPP usually requires that you have a user name and password to establish your connection. In the boxes below, enter the user name and password that your ISP has provided to you.

PPP Username:

PPP Password:

Authentication Method: ▼

Enable Fullcone NAT

Dial on demand (with idle timeout timer)

PPP IP extension

Enable NAT

Enable Firewall

Use Static IPv4 Address

Fixed MTU

MTU:

Enable PPP Debug Mode

Multicast Proxy

Enable IGMP Multicast Proxy

No Multicast VLAN Filter

WAN interface with base MAC.

Notice: Only one WAN interface can be cloned to base MAC address.

Enable WAN interface with base MAC

PPP SETTINGS

The PPP username and password are dependent on the requirements of the ISP. The user name can be a maximum of 256 characters and the password a maximum of 32 characters in length. (Authentication Method: AUTO, PAP, CHAP, or MSCHAP.)

KEEP ALIVE INTERVAL

This option configures the interval between each PPP LCP request and the amount of time to wait for the PPP server to reply to the LCP request. If the time expired on all requests, the current PPP session would be dropped.

ENABLE FULLCONE NAT

This option becomes available when NAT is enabled. Known as one-to-one NAT, all requests from the same internal IP address and port are mapped to the same external IP address and port. An external host can send a packet to the internal host, by sending a packet to the mapped external address.

DIAL ON DEMAND

The AR-5312u can be configured to disconnect if there is no activity for a period of time by selecting the **Dial on demand** checkbox . You must also enter an inactivity timeout period in the range of 1 to 4320 minutes.

| |
|--|
| <input checked="" type="checkbox"/> Dial on demand (with idle timeout timer) |
| Inactivity Timeout (minutes) [1-4320]: <input type="text"/> |

PPP IP EXTENSION

The PPP IP Extension is a special feature deployed by some service providers. Unless your service provider specifically requires this setup, do not select it.

PPP IP Extension does the following:

- Allows only one PC on the LAN.
- Disables NAT and Firewall.
- The device becomes the default gateway and DNS server to the PC through DHCP using the LAN interface IP address.
- The device extends the IP subnet at the remote service provider to the LAN PC. i.e. the PC becomes a host belonging to the same IP subnet.
- The device bridges the IP packets between WAN and LAN ports, unless the packet is addressed to the device's LAN IP address.
- The public IP address assigned by the remote side using the PPP/IPCP protocol is actually not used on the WAN PPP interface. Instead, it is forwarded to the PC LAN interface through DHCP. Only one PC on the LAN can be connected to the remote, since the DHCP server within the device has only a single IP address to assign to a LAN device.

ENABLE NAT

If the LAN is configured with a private IP address, the user should select this checkbox . The NAT submenu will appear in the Advanced Setup menu after reboot. On the other hand, if a private IP address is not used on the LAN side (i.e. the LAN side is using a public IP), this checkbox should not be selected to free up system resources for better performance.

ENABLE FIREWALL

If this checkbox is selected, the Security submenu will be displayed on the Advanced Setup menu after reboot. If firewall is not necessary, this checkbox should not be selected to free up system resources for better performance.

USE STATIC IPv4 ADDRESS

Unless your service provider specially requires it, do not select this checkbox . If selected, enter the static IP address in the **IP Address** field. Also, don't forget to adjust the IP configuration to Static IP Mode as described in [section 3.2](#).

Fixed MTU

Fixed Maximum Transmission Unit. The size (in bytes) of largest protocol data unit which the layer can pass onwards. This value is 1500 for PPPoA.

ENABLE PPP DEBUG MODE

When this option is selected, the system will put more PPP connection information into the system log. This is for debugging errors and not for normal usage.

ENABLE IGMP MULTICAST PROXY

Tick the checkbox to enable Internet Group Membership Protocol (IGMP) multicast. This protocol is used by IPv4 hosts to report their multicast group memberships to any neighboring multicast routers.

NO MULTICAST VLAN FILTER

Tick the checkbox to Enable/Disable multicast VLAN filter.

Enable WAN interface with base MAC

Enable this option to use the router's base MAC address as the MAC address for this WAN interface.

STEP 3: Choose an interface to be the default gateway.

Routing -- Default Gateway

Default gateway interface list can have multiple WAN interfaces served as system default gateways but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

| Selected Default Gateway Interfaces | Available Routed WAN Interfaces |
|-------------------------------------|---------------------------------|
| pppoa0 | |

Click **Next** to continue or click **Back** to return to the previous step.

STEP 4: Choose an interface to be the default gateway.

DNS Server Configuration

Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered.

DNS Server Interfaces can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

Select DNS Server Interface from available WAN interfaces:

Selected DNS Server Interfaces: pppoa0

Available WAN Interfaces:

[->]
[-<]

Use the following Static DNS IP address:

Primary DNS server:

Secondary DNS server:

Click **Next** to continue or click **Back** to return to the previous step.

STEP 5: The WAN Setup - Summary screen shows a preview of the WAN service you have configured. Check these settings and click **Apply/Save** if they are correct, or click **Back** to modify them.

WAN Setup - Summary

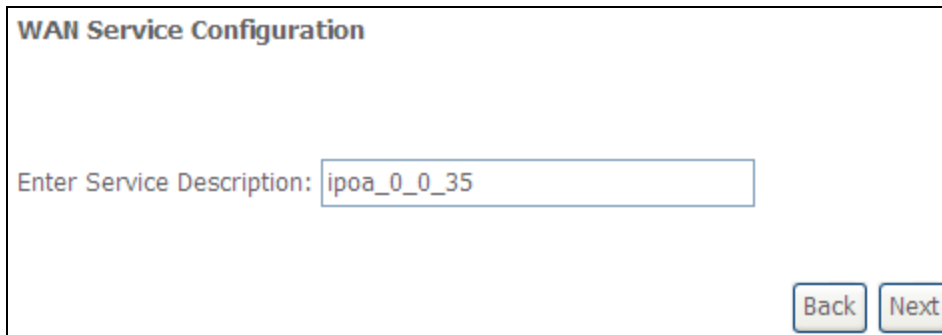
Make sure that the settings below match the settings provided by your ISP.

| | |
|----------------------------|----------|
| Connection Type: | PPPoA |
| NAT: | Enabled |
| Full Cone NAT: | Disabled |
| Firewall: | Disabled |
| IGMP Multicast: | Disabled |
| Quality Of Service: | Enabled |

Click "Apply/Save" to have this interface to be effective. Click "Back" to make any modifications.

After clicking **Apply/Save**, the new service should appear on the main screen. To activate it you must reboot. Go to Management → Reboot and click **Reboot**.

E2.5 IP over ATM (IPoA)

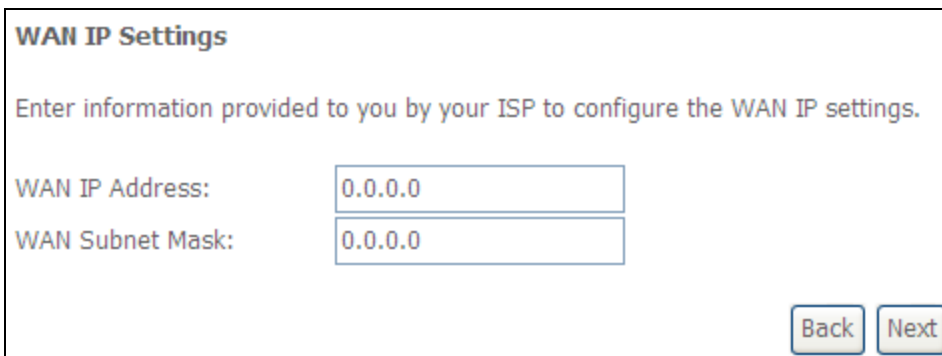


WAN Service Configuration

Enter Service Description:

STEP 1: Click **Next** to continue.

STEP 2: Enter the WAN IP settings provided by your ISP. Click **Next** to continue.



WAN IP Settings

Enter information provided to you by your ISP to configure the WAN IP settings.

WAN IP Address:

WAN Subnet Mask:

STEP 3: This screen provides access to NAT, Firewall and IGMP Multicast settings. Enable each by selecting the appropriate checkbox . Click **Next** to continue or click **Back** to return to the previous step.

Network Address Translation Settings

Network Address Translation (NAT) allows you to share one Wide Area Network (WAN) IP address for multiple computers on your Local Area Network (LAN).

Enable NAT

Enable Fullcone NAT

Enable Firewall

IGMP Multicast

Enable IGMP Multicast

WAN interface with base MAC.
Notice: Only one WAN interface can be cloned to base MAC address.

Enable WAN interface with base MAC

ENABLE NAT

If the LAN is configured with a private IP address, the user should select this checkbox . The NAT submenu will appear in the Advanced Setup menu after reboot. On the other hand, if a private IP address is not used on the LAN side (i.e. the LAN side is using a public IP), this checkbox should not be selected, so as to free up system resources for improved performance.

ENABLE FULLCONE NAT

This option becomes available when NAT is enabled. Known as one-to-one NAT, all requests from the same internal IP address and port are mapped to the same external IP address and port. An external host can send a packet to the internal host by sending a packet to the mapped external address.

ENABLE FIREWALL

If this checkbox is selected, the Security submenu will be displayed on the Advanced Setup menu after reboot. If firewall is not necessary, this checkbox should not be selected so as to free up system resources for better performance.

ENABLE IGMP MULTICAST

Tick the checkbox to enable Internet Group Membership Protocol (IGMP) multicast. IGMP is a protocol used by IPv4 hosts to report their multicast group memberships to any neighboring multicast routers.

Enable WAN interface with base MAC

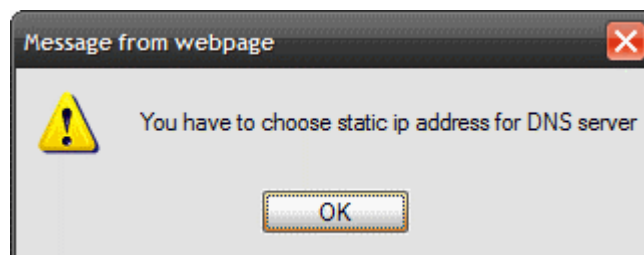
Enable this option to use the router's base MAC address as the MAC address for this WAN interface.

STEP 4: Choose an interface to be the default gateway.



Click **Next** to continue or click **Back** to return to the previous step.

NOTE: If the DHCP server is not enabled on another WAN interface then the following notification will be shown before the next screen.



STEP 5: Choose an interface to be the default gateway.

DNS Server Configuration

Select DNS Server Interface from available WAN interfaces OR enter static DNS server IP addresses for the system. In ATM mode, if only a single PVC with IPoA or static IPoE protocol is configured, Static DNS server IP addresses must be entered.

DNS Server Interfaces can have multiple WAN interfaces served as system dns servers but only one will be used according to the priority with the first being the highest and the last one the lowest priority if the WAN interface is connected. Priority order can be changed by removing all and adding them back in again.

Select DNS Server Interface from available WAN interfaces:

Selected DNS Server Interfaces: Available WAN Interfaces

Use the following Static DNS IP address:

Primary DNS server:

Secondary DNS server:

Click **Next** to continue or click **Back** to return to the previous step.

STEP 6: The WAN Setup - Summary screen shows a preview of the WAN service you have configured. Check these settings and click **Apply/Save** if they are correct, or click **Back** to modify them.

WAN Setup - Summary

Make sure that the settings below match the settings provided by your ISP.

| | |
|----------------------------|----------|
| Connection Type: | IPoA |
| NAT: | Enabled |
| Full Cone NAT: | Disabled |
| Firewall: | Disabled |
| IGMP Multicast: | Disabled |
| Quality Of Service: | Enabled |

Click "Apply/Save" to have this interface to be effective. Click "Back" to make any modifications.

After clicking **Apply/Save**, the new service should appear on the main screen. To activate it you must reboot. Go to Management → Reboot and click **Reboot**.

Appendix F - WPS OPERATION

This Section shows the basic AP WPS Operation procedure.

F1 Add Enrollee with Pin Method

- 1) Select **Enabled** from the Enable WPS dropdown menu.
- 2) Click the **Apply/Save** button at the bottom of the screen.

The screenshot shows the Comtrend web interface for configuring wireless security. The 'Wireless -- Security' page is active. The 'Enable WPS' dropdown menu is set to 'Enabled'. The 'Add Client' section is highlighted with a red box, showing the 'Enter STA PIN' radio button selected and the 'Add Enrollee' button highlighted with a red box. The 'Device PIN' field contains '89789698'. The 'Apply/Save' button at the bottom is also highlighted with a red box.

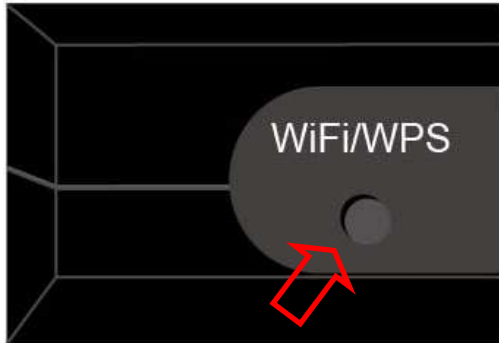
- 3) When the screen refreshes select the Radio button "Enter STA Pin"
- 4) Input Pin from Enrollee Station (15624697 in this example)
- 5) Click "Add Enrollee"

This is a close-up of the 'Add Client' section. The 'Enter STA PIN' radio button is selected. The 'Device PIN' field contains '15624697'. The 'Add Enrollee' button is highlighted with a red box.

- 4) Operate Station to start WPS Adding Enrollee.

F2 Add Enrollee with PBC Method

1) Press the WiFi/WPS button on the front of the router to activate WPS PBC operation.



2) Operate Station (your dongle for example) to start WPS Adding Enrollee.

F3 – Configure WPS External Registrar

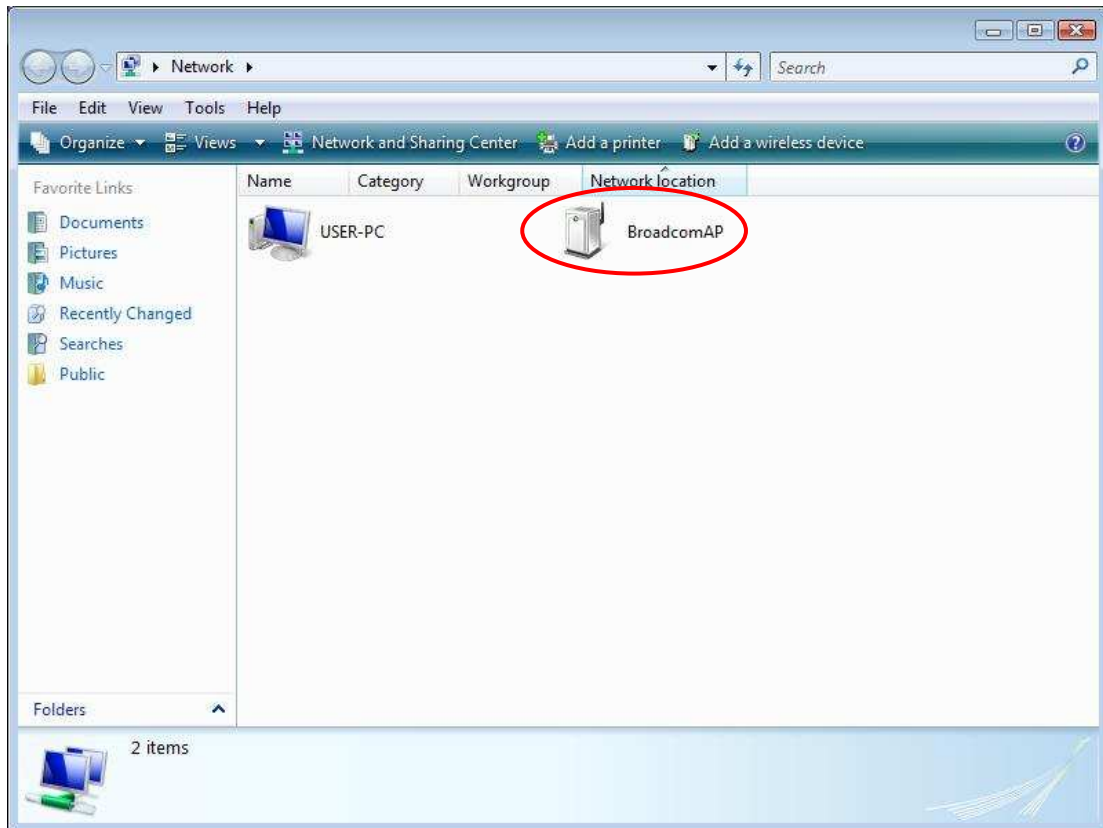
Follow these steps to add an external registrar using the web user interface (WUI) on a personal computer running the Windows 7 operating system:

Step 1: Enable UPnP on the Advanced Setup → LAN screen in the WUI.



NOTE: A PVC must exist to see this option.

Step 2: Open the Network folder and look for the BroadcomAP icon.



Step 3: On the Wireless → Security screen, enable WSC by selecting **Enabled** from the drop down list box and set the WPS AP Mode to Unconfigured.

COMTREND Device Info Basic Setup **Advanced Setup** Diagnostics Management Logout

Auto-Detection
Security
Quality of Service
Routing
DNS
DSL
Interface Grouping
IP Tunnel
Certificate
Power Management
Multicast
Wireless
Basic
Security
MAC Filter
Wireless Bridge
Advanced

Wireless -- Security

This page allows you to configure security features of the wireless LAN interface.
You may setup configuration manually
OR
through WiFi Protected Setup(WPS)
Note: When both STA PIN and Authorized MAC are empty, PBC is used. If Hide Access Point enabled or Mac filter list is empty with "allow" chosen, WPS will be disabled

WPS Setup

Enable WPS **Enabled**

Add Client (This feature is only available for WPA2-PSK mode or OPEN mode with WEP disabled)
 Enter STA PIN Use AP PIN
 [Help](#)

Set Authorized Station MAC [Help](#)

Set WPS AP Mode **Unconfigured**

Setup AP (Configure all security settings with an external registrar)

Lock Device PIN

Device PIN [Help](#)

Manual Setup AP

You can set the network authentication method, selecting data encryption, specify whether a network key is required to authenticate to this wireless network and specify the encryption strength. Click "Apply/Save" when done.

Select SSID: **Comtrend9A24**

Network Authentication: **WPA2 -PSK**

WPA/WAPI passphrase: [Click here to display](#)

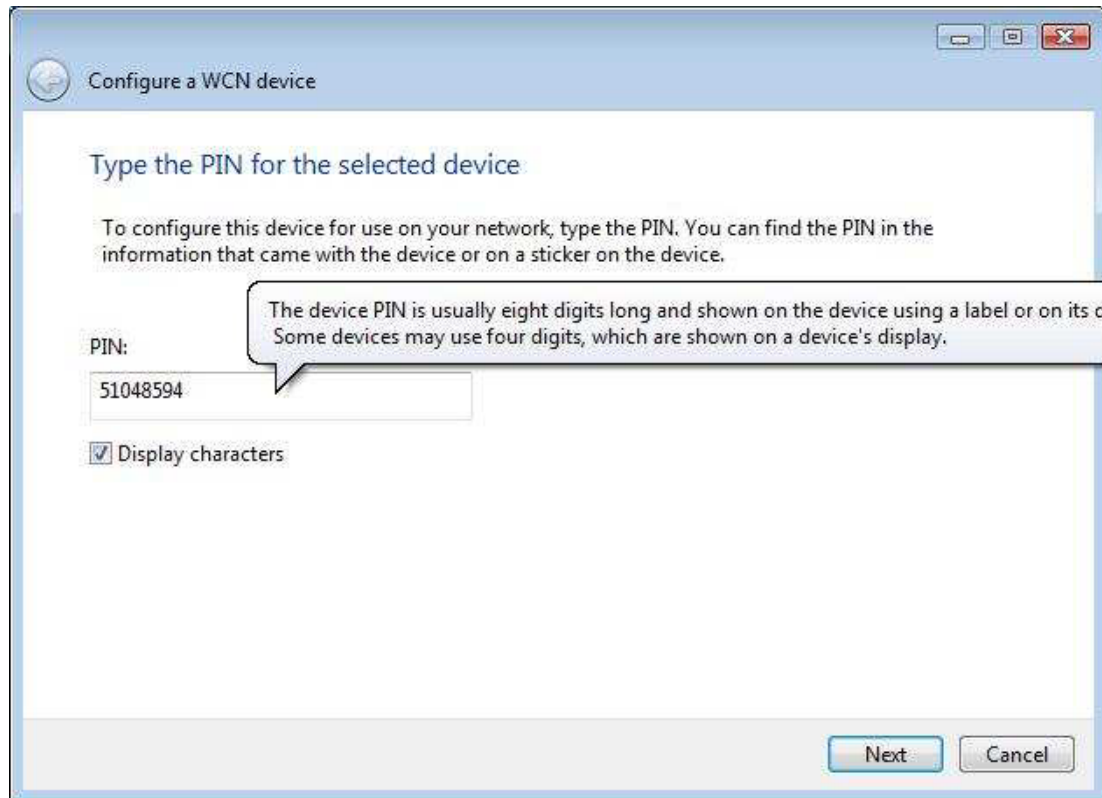
WPA Group Rekey Interval:

WPA/WAPI Encryption: **TKIP+AES**

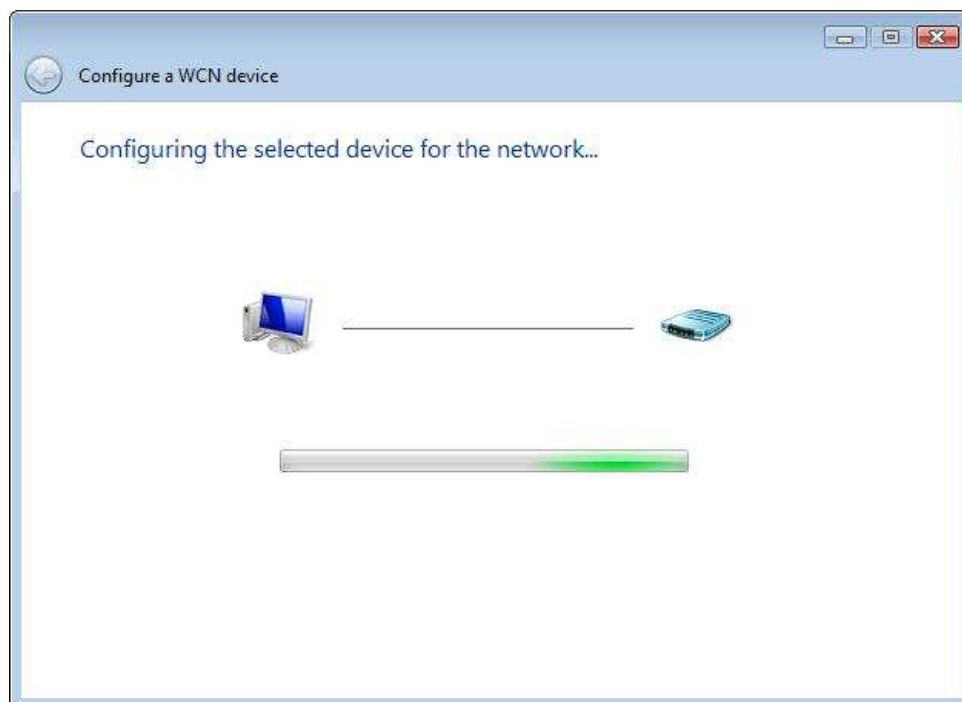
WEP Encryption: **Disabled**

Step 4: Click the **Apply/Save** button at the bottom of the screen. The screen will go blank while the router applies the new Wireless settings.

Step 5: Now return to the Network folder and click the BroadcomAP icon. A dialog box will appear asking for the Device PIN number. Enter the Device PIN as shown on the Wireless → Security screen. Click **Next**.



Step 6: Windows 7 will attempt to configure the wireless security settings.



Step 7: If successful, the security settings will match those in Windows 7.

Appendix G - Printer Server

These steps explain the procedure for enabling the Printer Server.

NOTE: This function only applies to models with an USB host port.

STEP 1: Enable Print Server from Web User Interface. Select Enable on-board print server checkbox and enter Printer name and Make and model

NOTE: The **Printer name** can be any text string up to 40 characters.
The **Make and model** can be any text string up to 128 characters.

Print Server settings

This page allows you to enable / disable printer support.

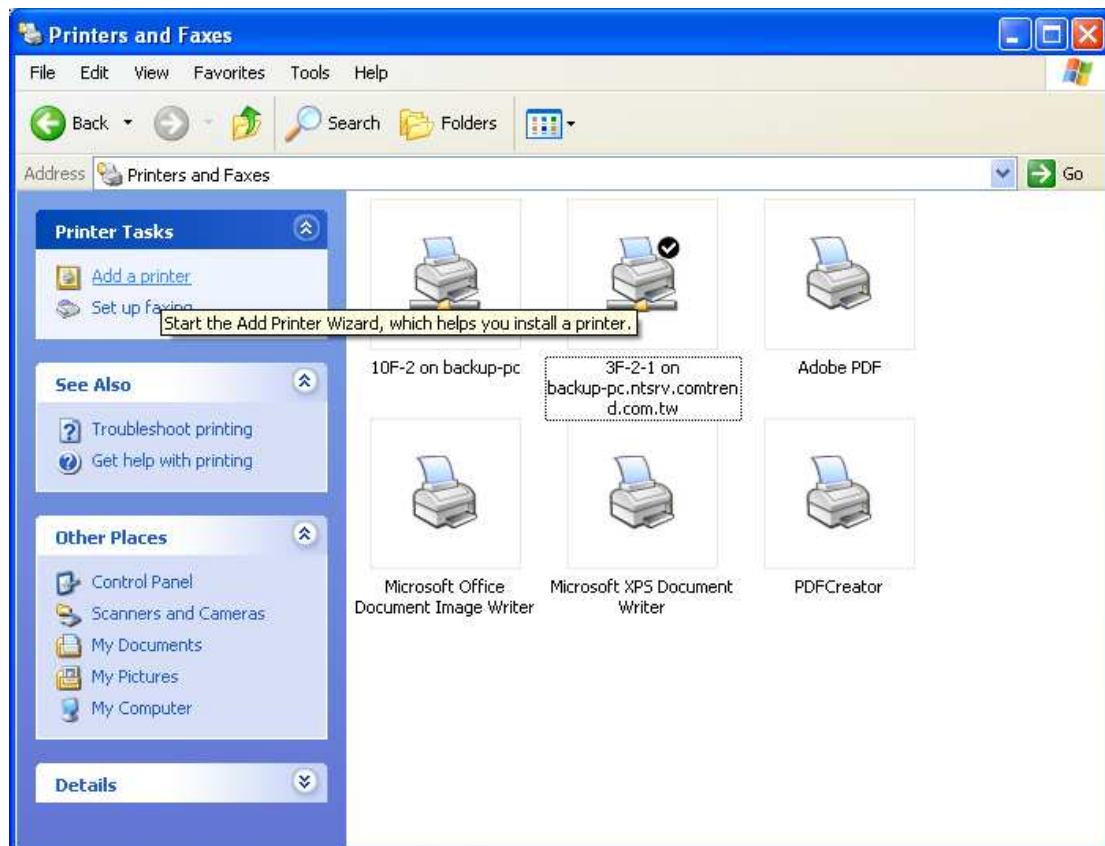
| Manufacturer | Product | Serial Number |
|--------------|---------|---------------|
|--------------|---------|---------------|

Enable on-board print server.

Printer name

Make and model

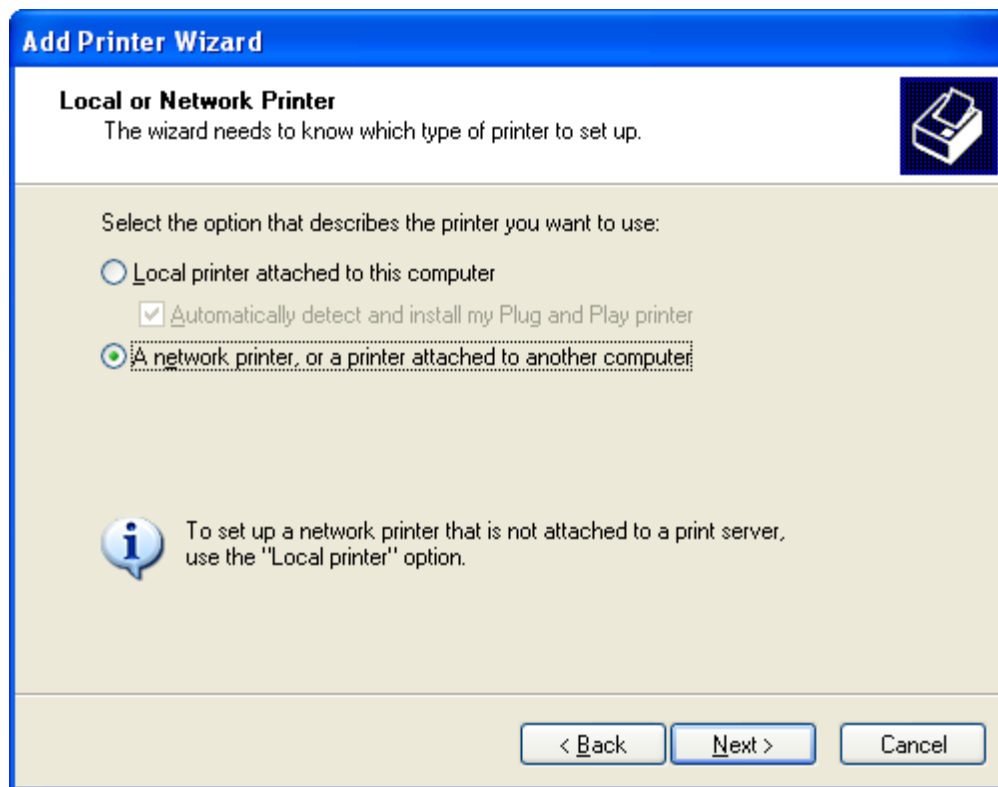
STEP 2: Go to the **Printers and Faxes** application in the **Control Panel** and select the **Add a printer** function (as located on the side menu below).



STEP 3: Click **Next** to continue when you see the dialog box below.

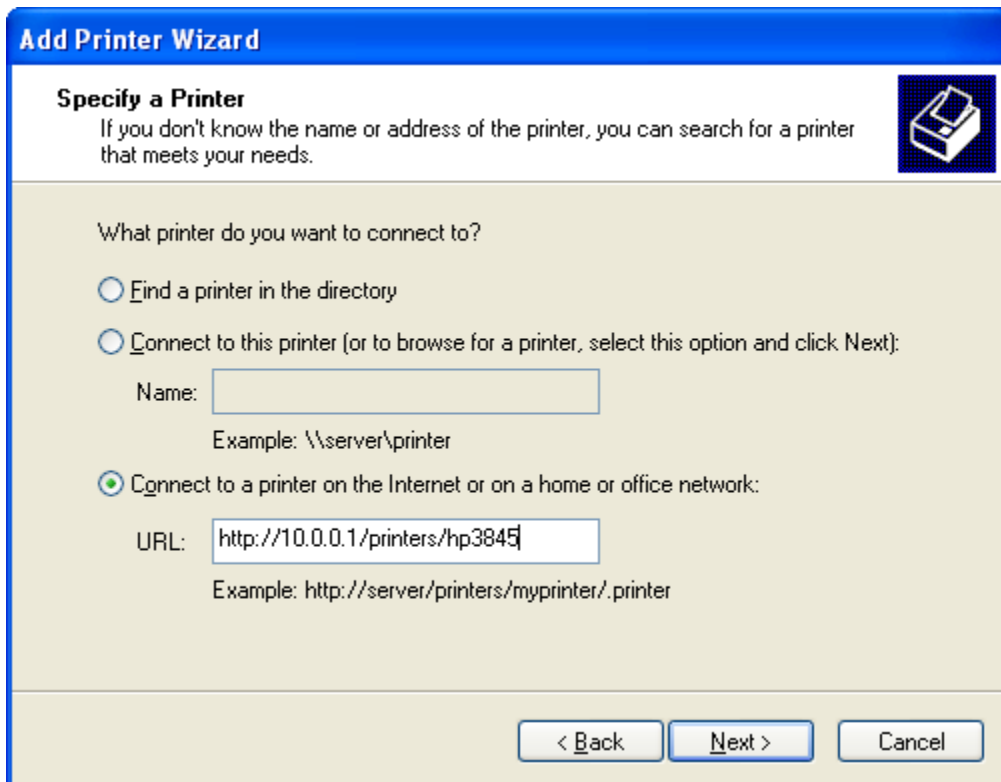


STEP 4: Select **Network Printer** and click **Next**.

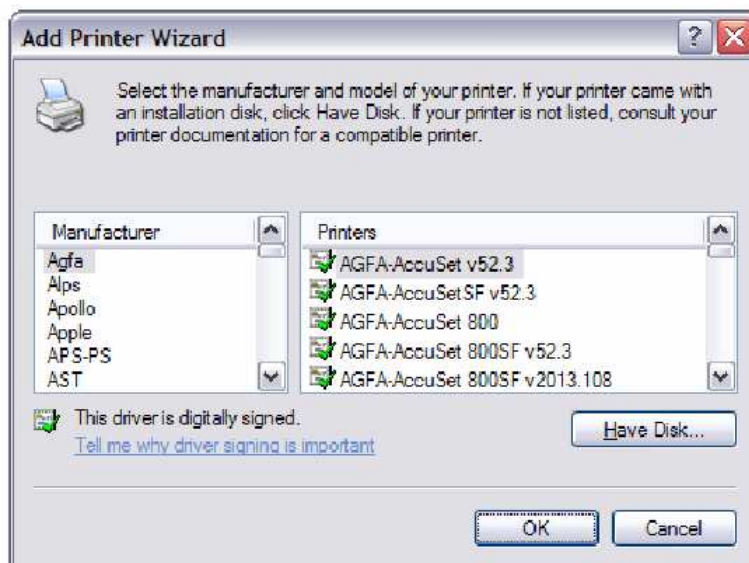


STEP 5: Select Connect to a printer on the Internet and enter your printer link. (e.g. <http://192.168.1.1:631/printers/hp3845>) and click **Next**.

NOTE: The printer name must be the same name entered in the ADSL modem WEB UI "printer server setting" as in step 1.



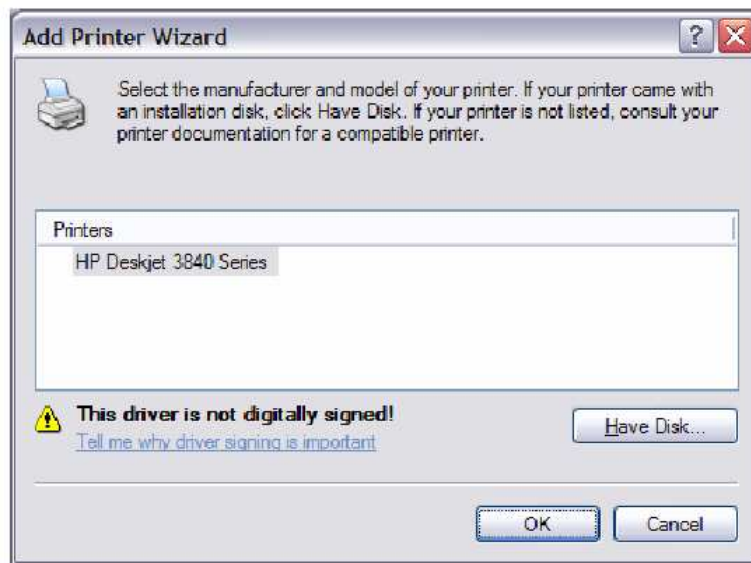
STEP 6: Click **Have Disk** and insert the printer driver CD.



STEP 7: Select driver file directory on CD-ROM and click **OK**.



STEP 8: Once the printer name appears, click **OK**.



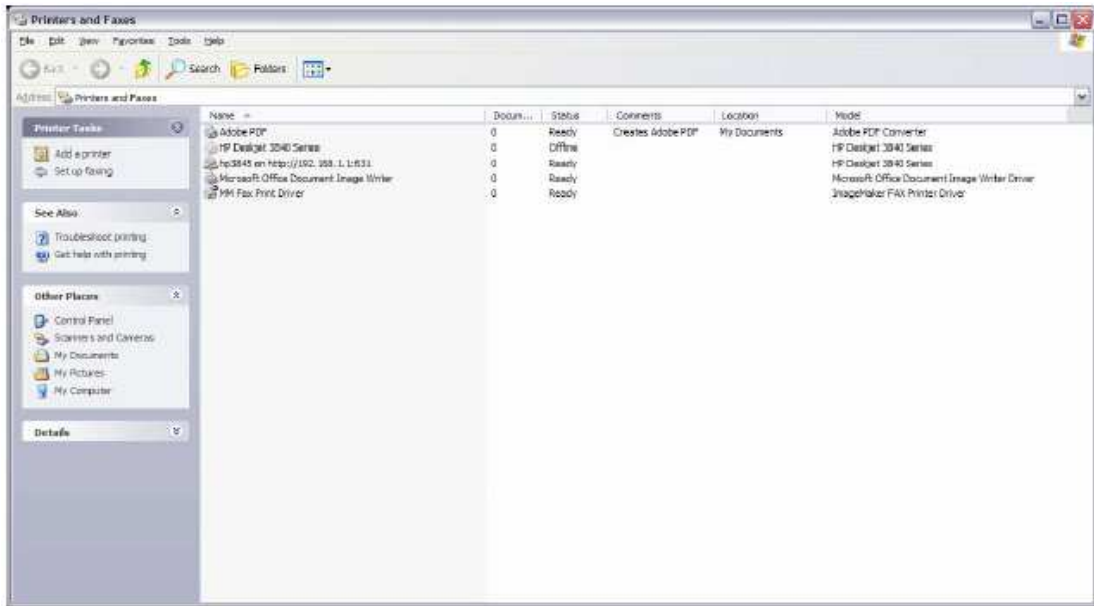
STEP 9: Choose **Yes** or **No** for default printer setting and click **Next**.



STEP 10: Click Finish.



STEP 11: Check the status of printer from Windows Control Panel, printer window. Status should show as **Ready**.



FCC Part 15.21

CAUTION:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Part 2.1091

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.