

APEX 1924

User's Manual



Please read this manual before operating this product.
After you finish reading this manual, store it in a safe place for future reference.

Notice

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Notice

This document describes the specifications, installation, and operation of the APEX 1900-24 repeater.

Hardware and software mentioned in this document are subject to continuous development and improvement. Consequently, there may be minor discrepancies between the information in the document, performance, and design of the product.

Specifications, dimensions, and other statements mentioned in this document are subject to change without notice.

Questions or Comments

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Website: www.rtronamerica.com

Safety Precautions

Warning

Opening the APEX 1900-24 equipment could result in electric shock and may cause severe injury.

Warning

Connect the equipment frame ground to the building ground.

Warning

Operating the APEX 1900-24 with antennas in very close proximity facing each other can lead to severe damage to the repeater.

Caution

RF EXPOSURE INFORMATION

A minimum separation distance of 7.9 inches (20cm) must be maintained between the user and the external antenna of the repeater to satisfy FCC RF exposure requirements. For more information about RF exposure, please visit the FCC website at www.fcc.gov

Caution

This equipment is for indoor use only and enables the communication wiring to communicate inside the building.

Manual Version History List

Revision History		Date	Item/Description	Reason
Approval Ver.	Issue Ver.			

Firmware Version History List

Revision History		Date	Item/Description	Reason
Approval Ver.	Issue Ver.			

WEB GUI Version History List

Revision History		Date	Item/Description	Reason
Approval Ver.	Issue Ver.			

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Glossary

The following is a list of abbreviations and terms used in this manual.

Abbreviation	Definition
AC	Alternating Current
ANT	Antenna
ATT	Attenuator / Attenuation
CDMA	Code Division Multiple Access
DC	Direct Current
DL	Downlink
GND	Grounding
GUI	Graphic User Interface
LED	Light Emitting Diode
PLL	Phase-locked loop
PSU	Power Supply Unit
RF	Radio Frequency
RSSI	Received Signal Strength Indication
TEMP	Temperature
UL	Uplink
VSWR	Voltage Standing Wave Ratio

AGC (Automatic Gain Control)

AGC feature prevents the repeater from exceeding its maximum output power by reducing the gain automatically. AGC is used to adjust the gain to an appropriate level for a range of input signal levels.

ASD (Automatic Shutdown)

ASD does not:

1. prevent oscillation
2. protect from excessive input.

ASD helps protect the amplifier from over load. ASD helps protect the network by preventing excessive signal output power.

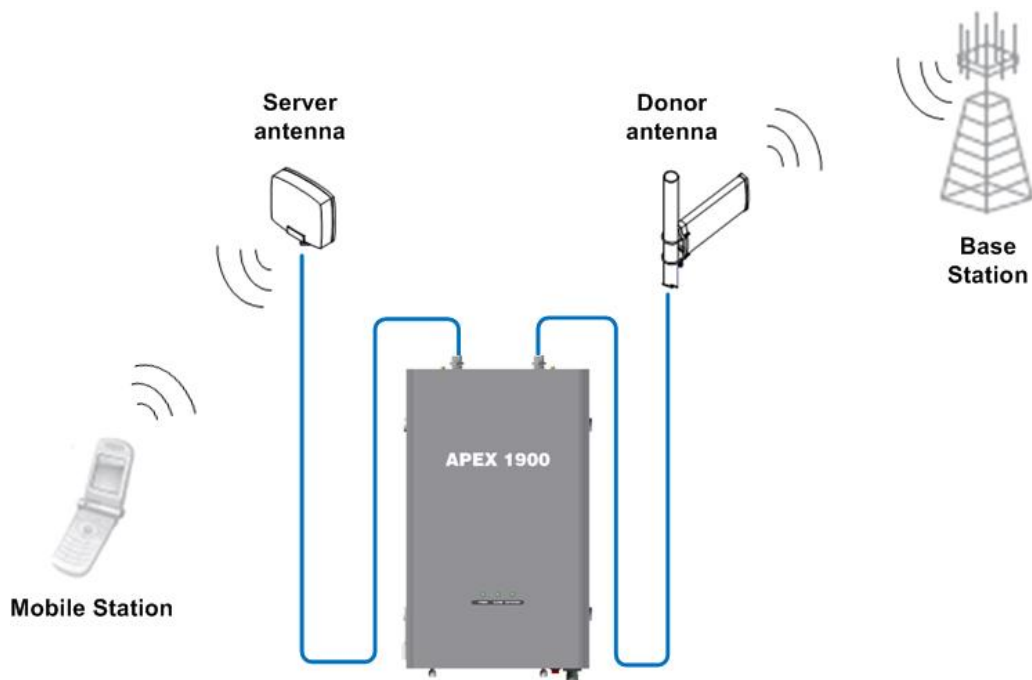
There are three parameters: **ASD Level**, **ASD Time**, and **ASD Iteration**.

If the output power exceeds higher than the “**ASD LEVEL**”, the repeater will shut down for “**ASD TIME**” seconds and it will turn the amp back on to measure the output power again. If this repeats at “Iteration” times, the repeater will shut down completely.

1. Introduction

APEX1900-24 is used to fill out areas in APEX1900-24 systems, such as base station fringe areas, business and industrial building, etc.

APEX1900-24 receives signals from a base station, amplifies and retransmits the signals to the mobile stations. It also receives, amplifies and retransmits signals in the opposite direction. Both directions are served simultaneously with the following features:



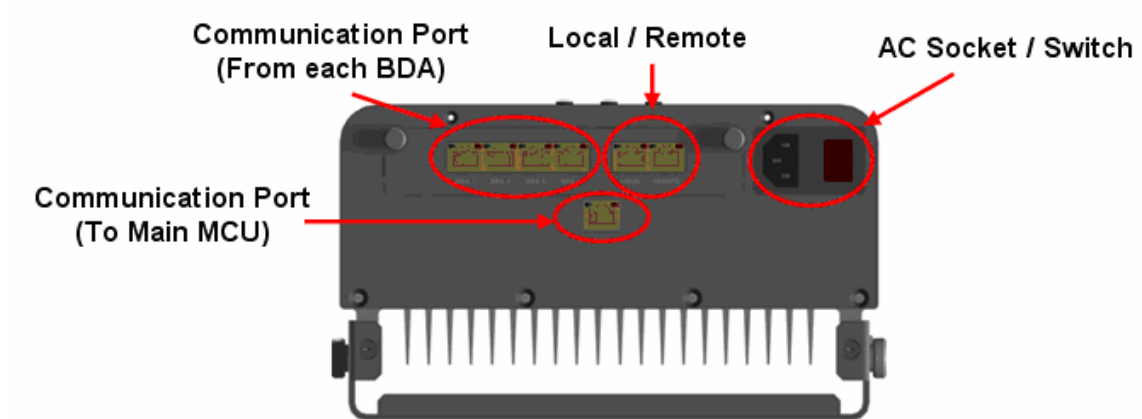
< Basic Organization >

APEX1924 Key Features

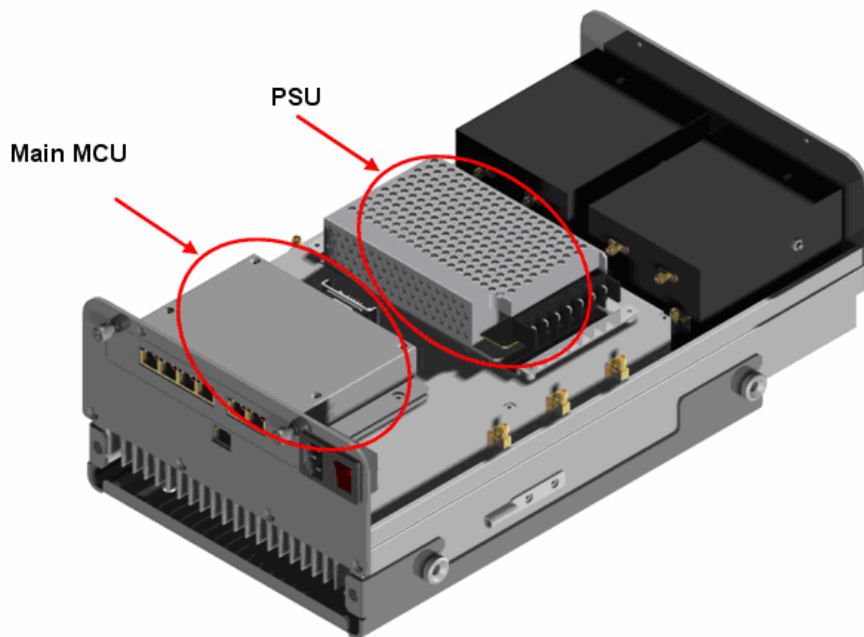
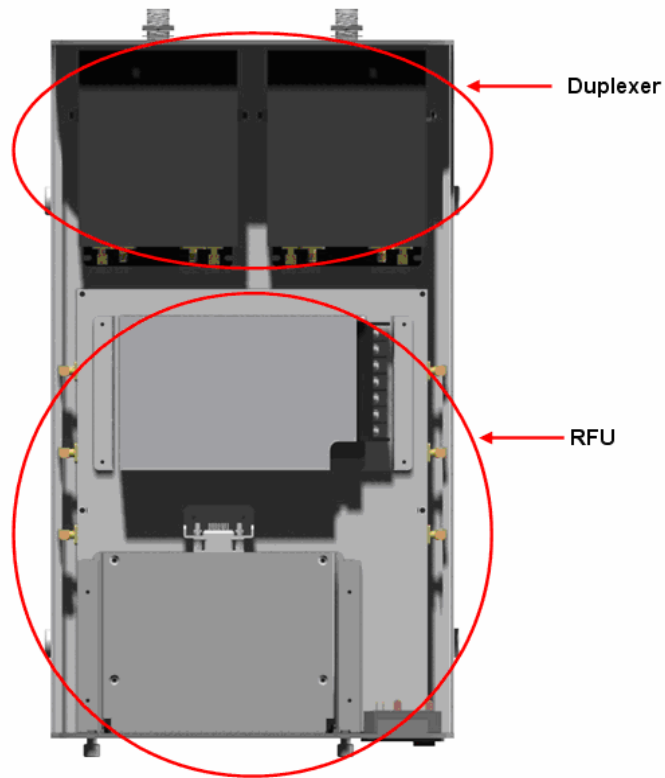
- ◆ Design(Each BDA is possible to service selected channels by the user within a band.)
 - Possible to select any channel combination within a band caused by the Digital Filter.
 - Using the Digital Filter: High quality, out of band rejection, high performance
- ◆ User friendly design.
 - Local monitoring and control through the Web GUI interface
 - Remote monitoring and control through the Remote Access and Control
 - Reports the status of connection as a function of SNMP regularly and reports an alarm if the event occurred.
- ◆ Protection function
 - Isolation Check
 - Auto Gain Control
 - Auto Shutdown

2. Description

2.1 Main Unit Overview



2.2 Internal Configuration



2.2.1 RFU (RF Unit)

The RFU (RF Unit) is a bi-directional amplifier that sharply filters out unwanted noise.

2.2.2 Duplexer

A duplexer is a device that combines two or more signals onto a common channel or medium to increase its transmission efficiency.

2.2.3 PSU (Power Supply Unit)

The AC-DC adaptor supplies a steady DC power to the APEX1924 equipment by drawing power from the general in-wall AC outlets.

Specification

Item		Specification
Environmental	Operating Temp	-10°C~50°C (14°F~122°F)
	Humidity	20%~90%RH
	Cooling method	Convection.
Voltage		AC 85-264V
Current		+24V/6.5A (150W)
Frequency		50/60(47-63)

2.2.4 MCU (Main Control Unit)

The MCU (Main Control Unit) is the control unit of a APEX1924. It controls and monitors operational parameters. It is also responsible alarms, keeping event logs and performing many other functions of the APEX1924.

3. Hardware Installation

The installation procedure is as follows:

- Confirm Items from List

- Mounting
- Grounding
- RF Cable Connection
- Power On

3.1 Check List of Items

Index	Items	Quantity
1	Repeater	1
2	AC Cable	1
3	LAN Cable	1
4	Anchor Bolt	4
5	Quick Installation Guide	1
6	User's Manual	1

3.2 Mounting

Step 1: Drill holes directly through the template. and attach the mounting bracket to the wall using provided bolts or extra screws.



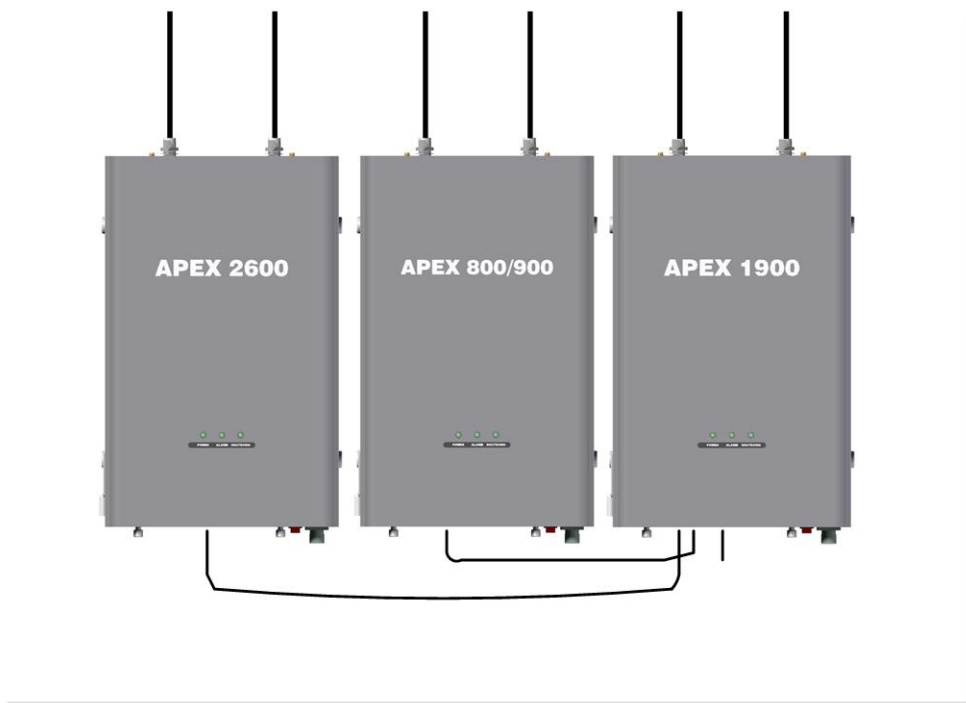
Step 2: Lean the APEX1924 to hang the topside of the Guide Ring on the mounting bracket, and push toward the wall to mount.



Step 3: Fix the APEX1924 using the 4 screws provided.



Step 4: Example



3.3 Grounding

A rod on the left side is intended for a building ground. Connect the ground cable to the rod.



3.4 Cable Connection

Step 1: Connect a cable from the donor antenna to the Donor Antenna Port.

Step 2: Connect a cable from a repeater's service antenna to the Sever Antenna Port.



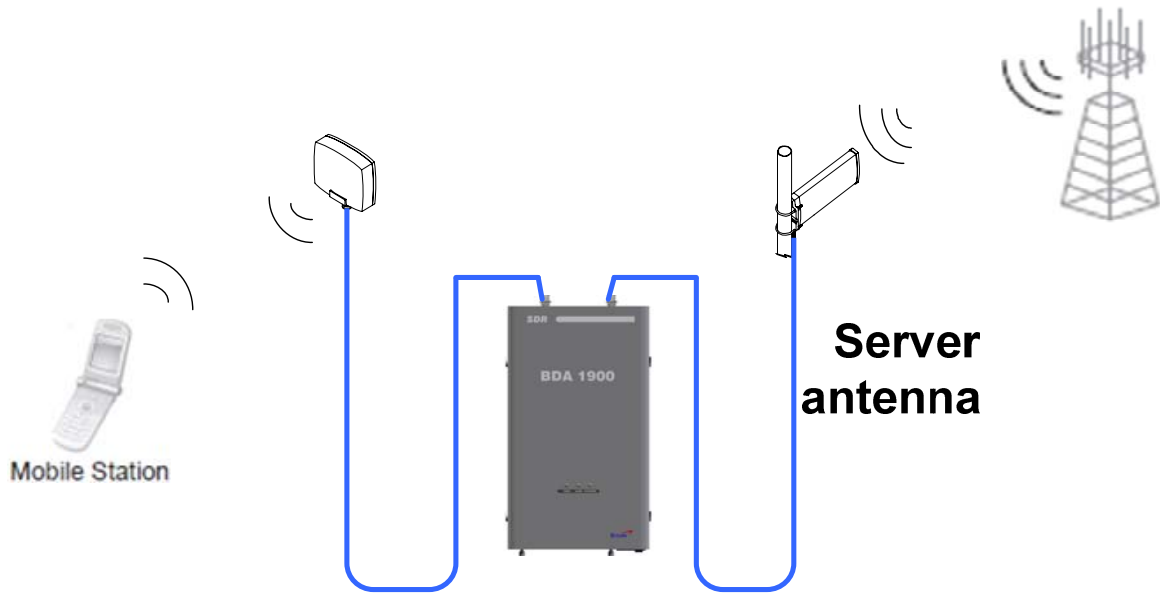
Note

Enough isolation?

Antenna isolation = Path loss between the server antenna port and the donor antenna port

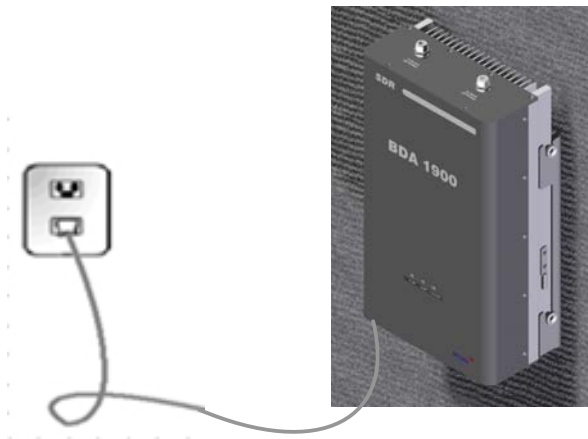
Antenna isolation \geq Repeater max. gain +15dB

If antenna isolation < Repeater max. gain +15dB \rightarrow System oscillation or Low gain



3.5 Power On

- Step 1: Connect the power cord.
- Step 2: Plug the power cord into a wall outlet.
- Step 3: Check if the green LED at the Top turns on.



4. Operation

4.1 System Requirements

APEX1900-24 operates on a customer provided PC based platform with the following system requirements:

- Windows® XP or Windows® Vista, Windows 7
- Internet Explorer 6.0(Recommended) or higher
- 128 MB RAM or higher
- Pentium III processor or higher
- RJ-45 jack required

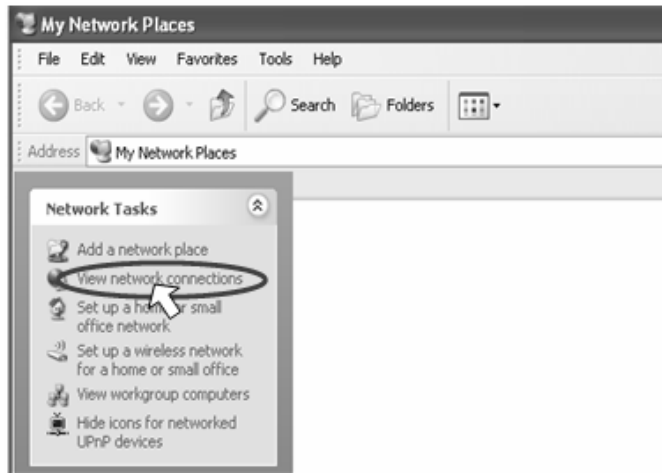
4.2 Network Setup

4.2.1 Windows XP

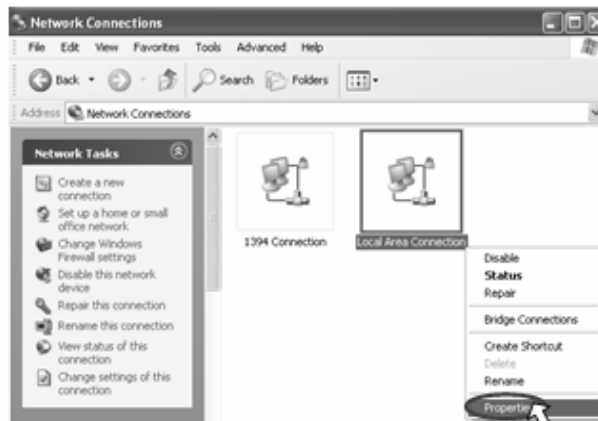
Step 1: Click the **Start** button and select **My Network Places**.



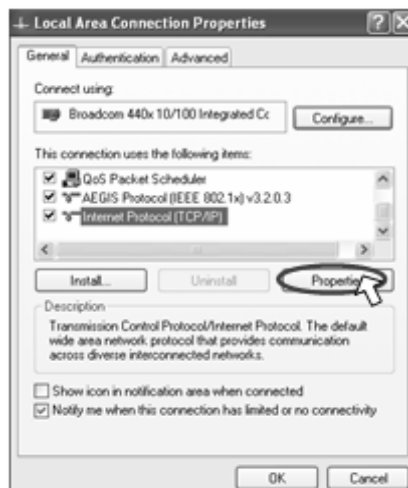
Step 2: Click **View network connections**.



Step 3: Right-click on the **Local Area Connection** and select **Properties** to view the shortcut menu.



Step 4: Select **Internet Protocol (TCP/IP)** and click **Properties**.



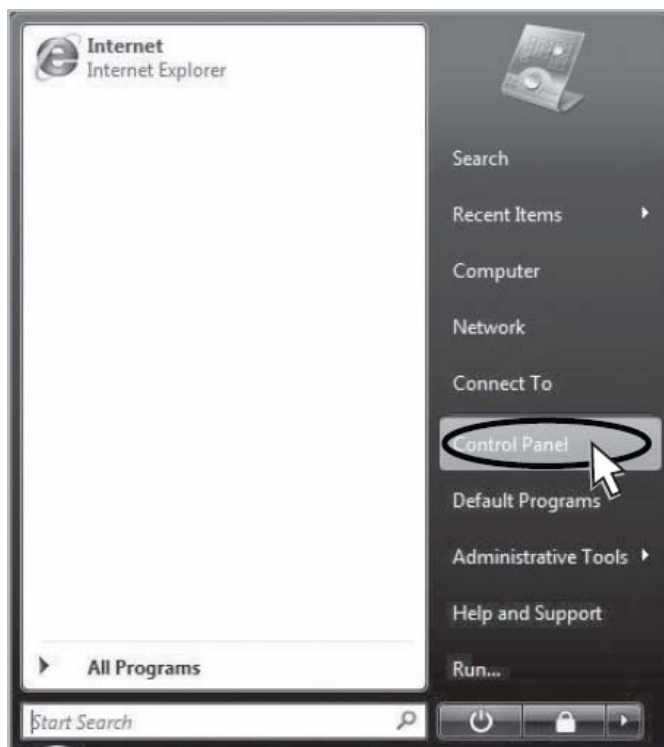
Step 5: Check **Obtain an IP address automatically** and click **OK**.



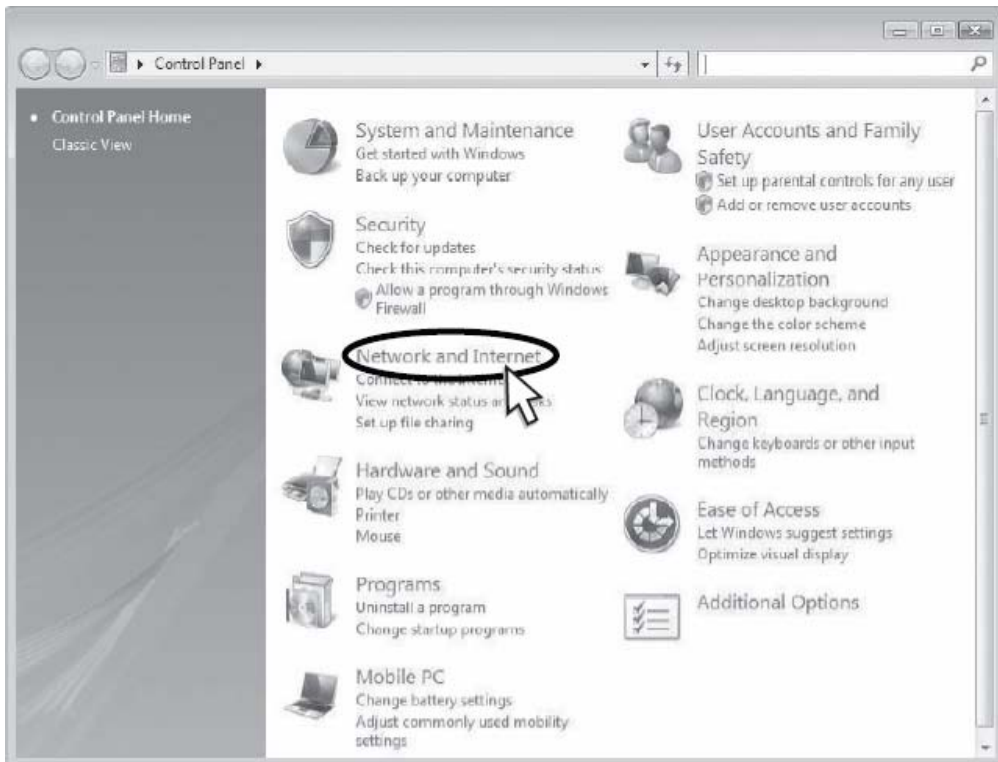
Step 6: Close all widows.

4.2.2 Windows Vista

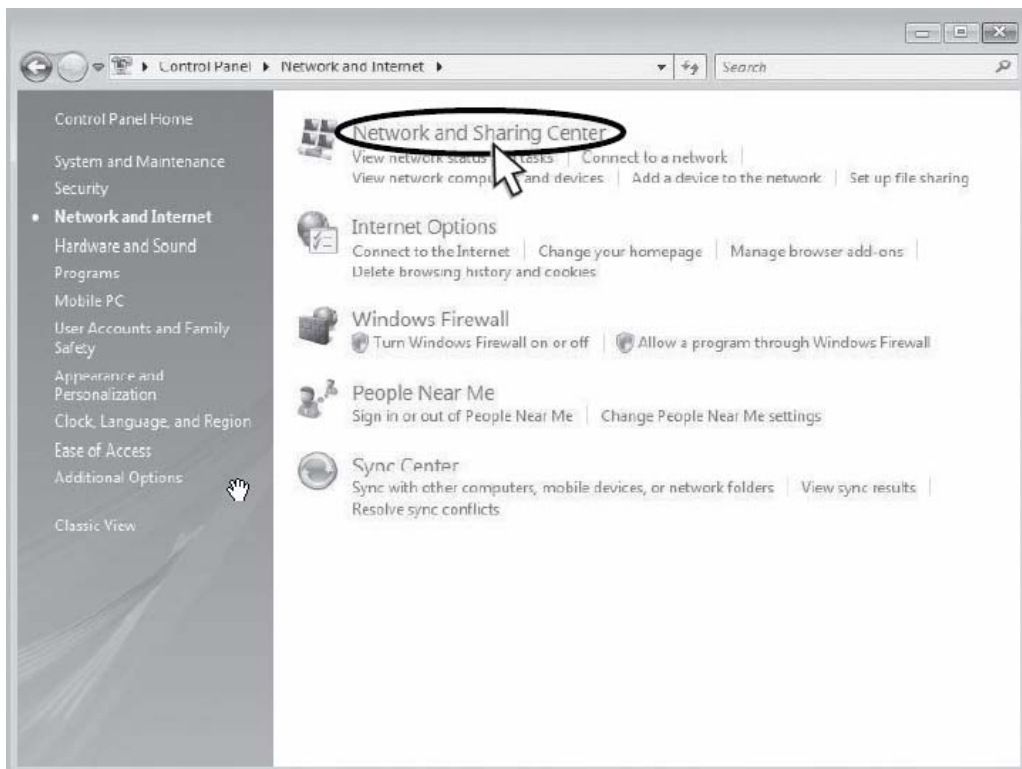
Step 1: Click the **Start** button and select **Control Panel**.



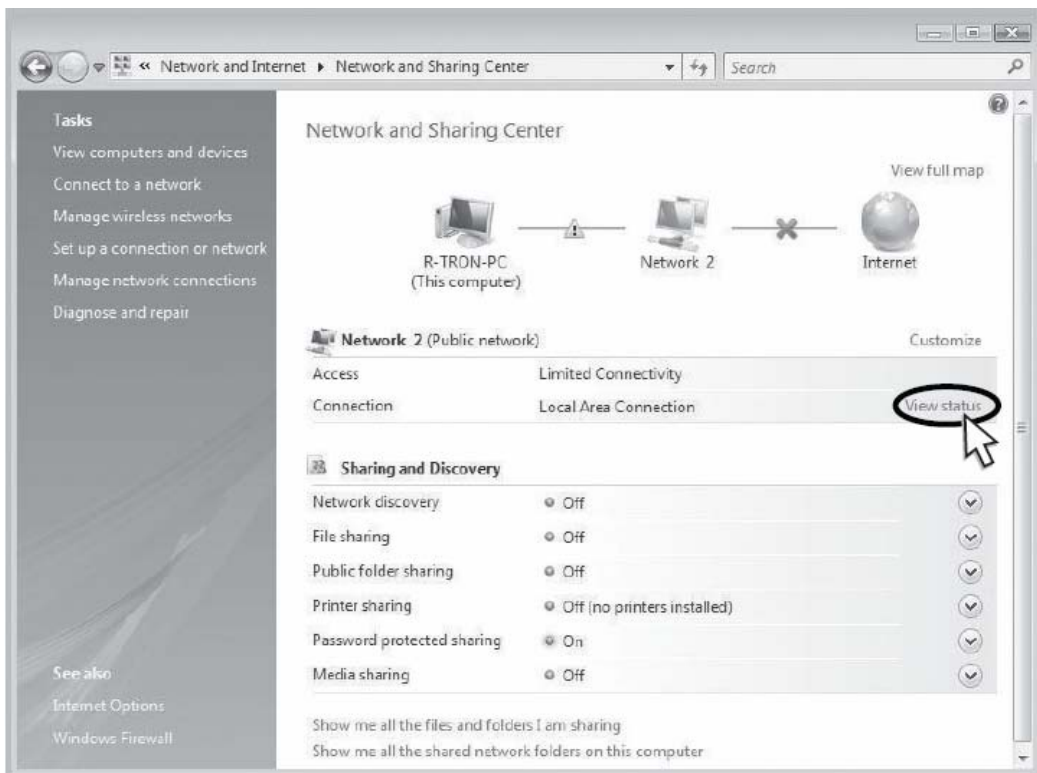
Step 2: Click **Network and Internet**.



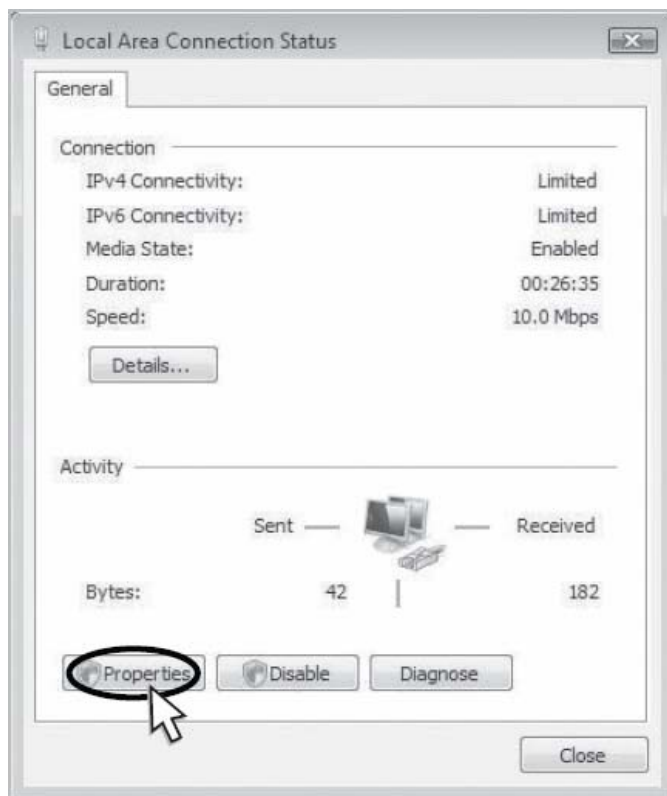
Step 3: Click **Network and Sharing Center**.



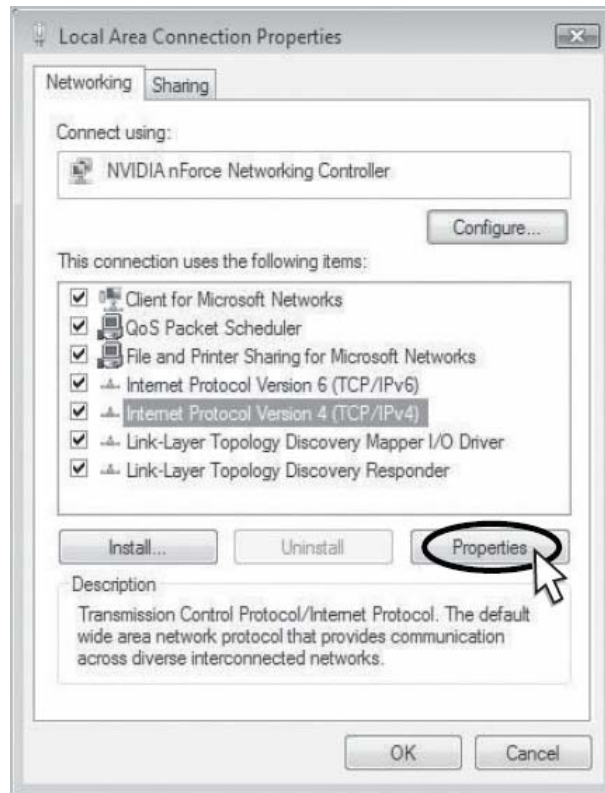
Step 4: Click **View status** of **Local Area Connection**.



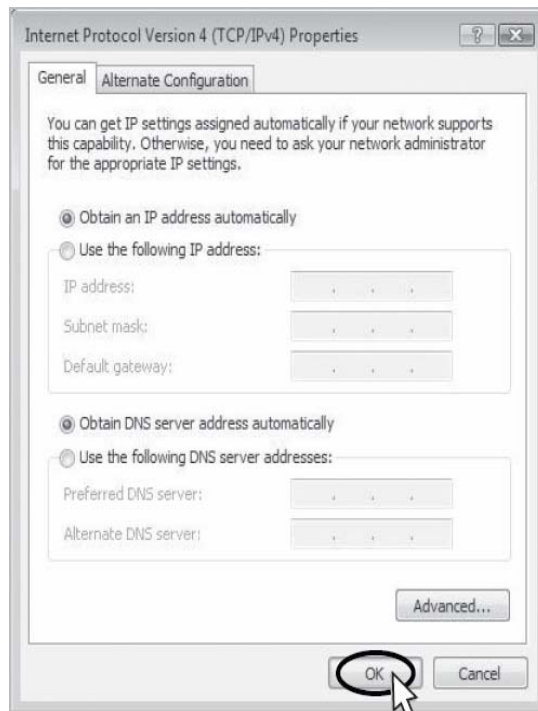
Step 5: Click **Properties** and a caution pop-up window will appear. Click **OK**.



Step 6: Select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.



Step 7: Check **Obtain an IP address automatically** and click **OK**.



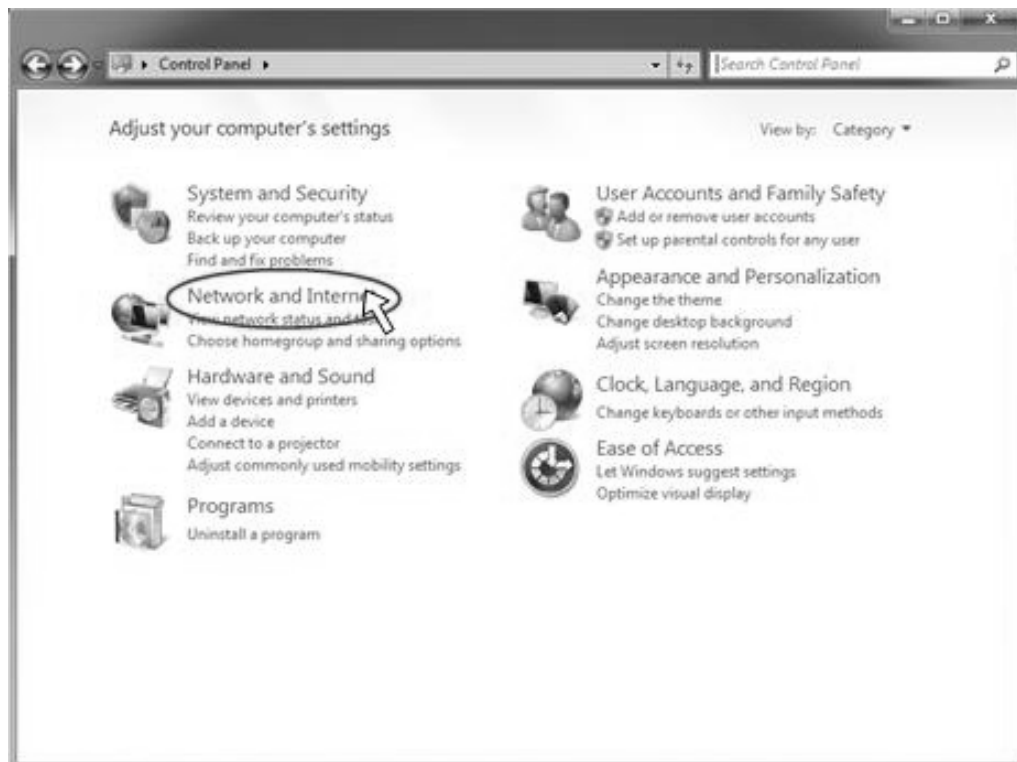
Step 8: Close all windows.

4.2.3 Windows 7

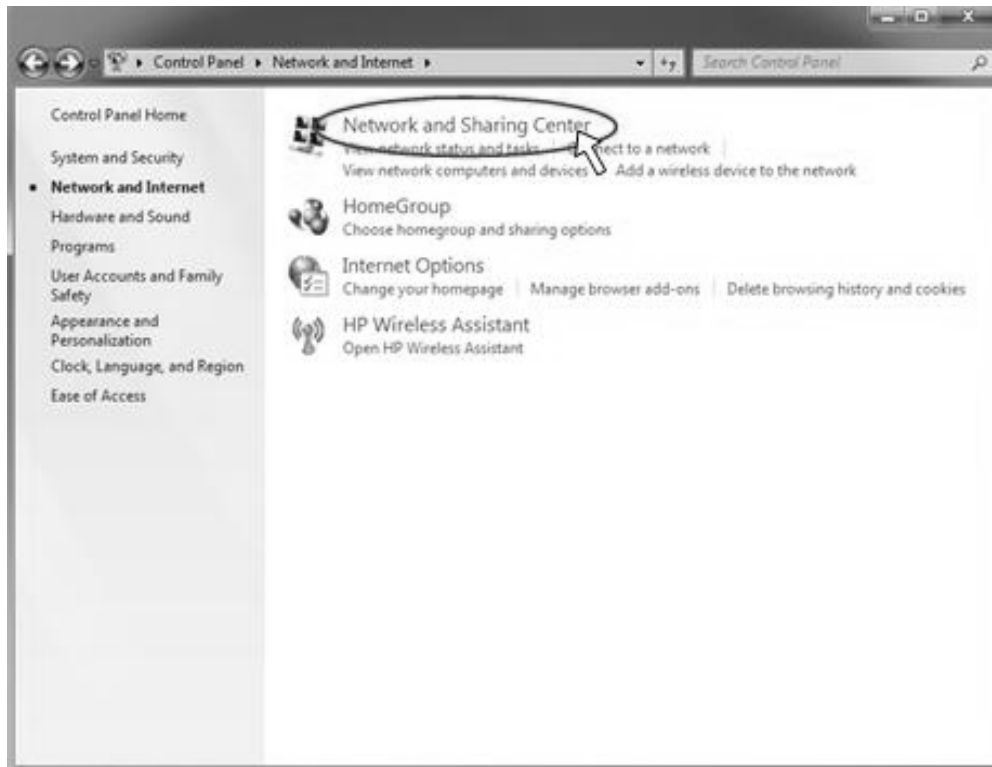
Step 1: Click the **Start** button and select **Control Panel**.



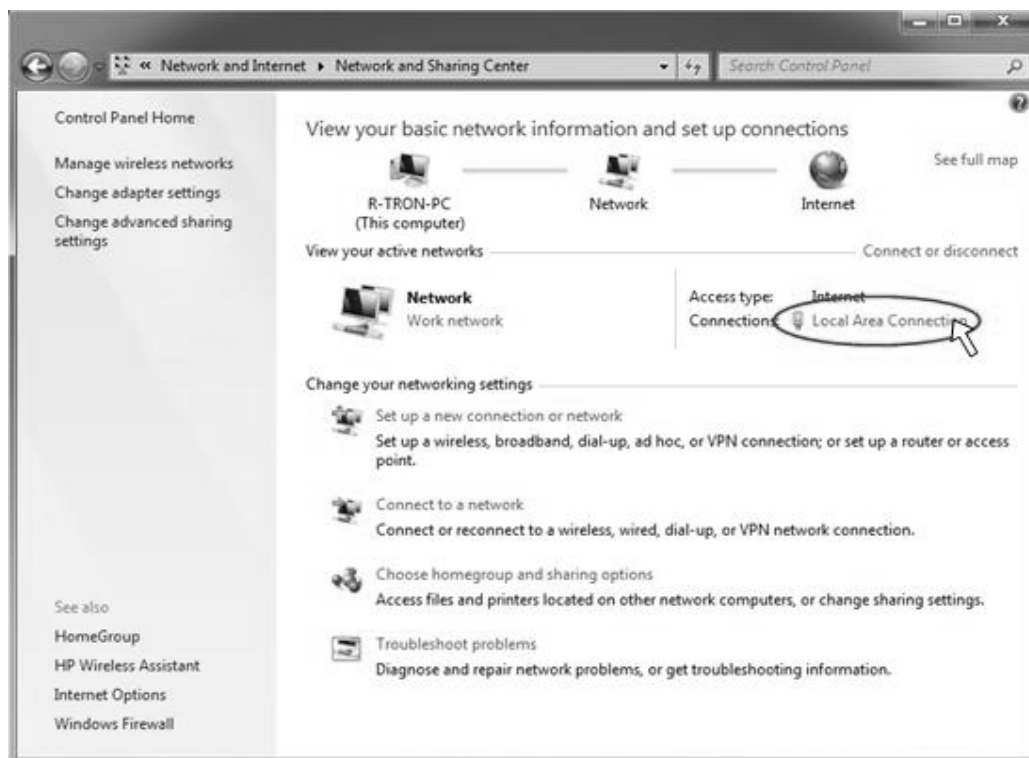
Step 2: Click **Network and Internet**.



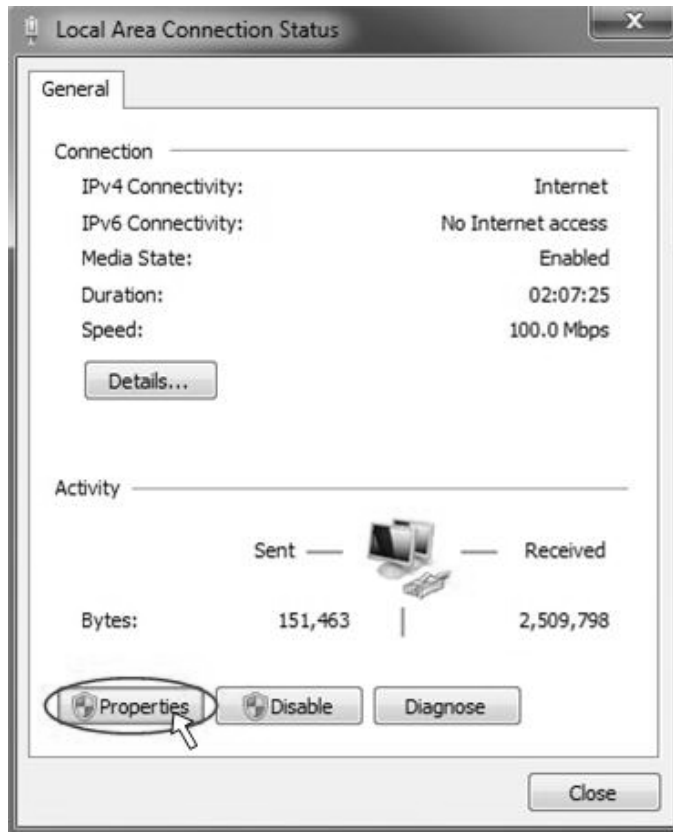
Step 3: Click **Network and Sharing Center**.



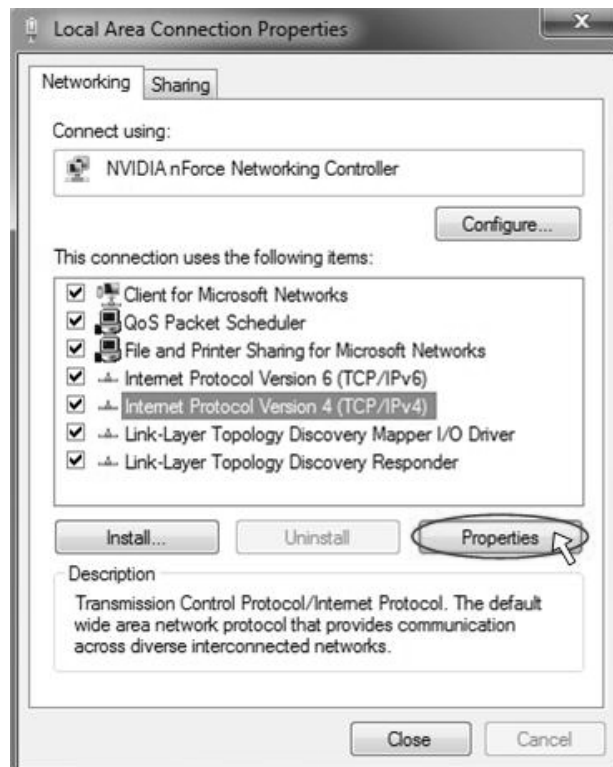
Step 4: Click **View status** of **Local Area Connection**.



Step 5: Click **Properties** and a caution pop-up window will appear. Click **OK**.



Step 6: Select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.



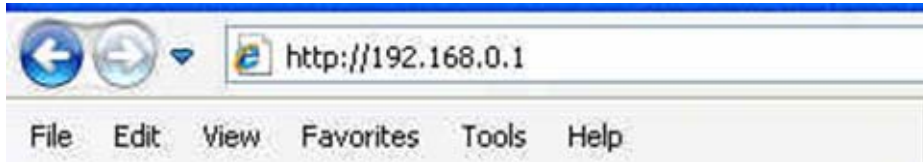
Step 7: Check **Obtain an IP address automatically** and click **OK**.



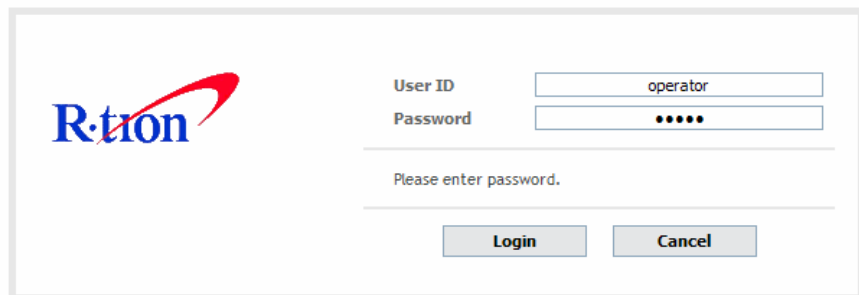
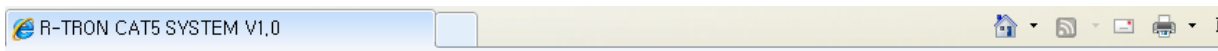
Step 8: Close all windows.

4.3 System Login

Step 1 Open your Web browser and type **http://192.168.0.1** into the URL address box. Then press the Enter key.



Step 2 The login screen will appear. Type **"operator"** for the ID and **"rtron"** for the password and then Click **OK**.



Step 3 The pop-up message for the login success will appear. Click **OK**.



Step 4 When the login process is complete, the initial screen will appear.

4.3.1 Network

① Clock



Status	Control	Network	Alarm History	File Update
--------	---------	----------------	---------------	-------------

APEX Tech Support : 1-888-317-8766 Cascade Code : APEX 03 / 08 / 2011 17 : 53 : 50 Clock Network Setup User Note User Comment	TIME SETTING
	>> System Information : Date / Time Date: 03 / 08 / 2011 (MM/DD/YYYY) Time: 17 : 53 : 50 (HH:MM:SS)
	>> New System Date and Time (GMT) Date: 3 / 8 / 2011 (MM/DD/YYYY) Time: 17 : 53 : 1 (HH:MM:SS)
	Set Time

<Network Clock Status and Set-up>

In the above page, you can set device time and update time-related information. Click the "set time" button to save your settings.

② Network Set-up



Status	Control	Network	Alarm History	File Update
--------	---------	----------------	---------------	-------------

APEX Tech Support : 1-888-317-8766 Cascade Code : APEX 03 / 08 / 2011 18 : 01 : 52 Clock Network Setup User Note User Comment	SYSTEM	ETHERNET SETTING	
	>> Cascade Code Cascade Code <input type="text"/> Apply	>> Ethernet IP Mode <input checked="" type="radio"/> Auto <input type="radio"/> Static IP Address <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> Subnet Mask <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> Gateway <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/>	Apply
	>> Location Information Latitude <input type="text"/> Longitude <input type="text"/> Apply	>> SNMP ServerIP <input type="text"/> . <input type="text"/> . <input type="text"/> . <input type="text"/> MAC Address 00:0D:AA:00:00:02	Apply
	>> System Reset (NCU) Execute	>> HeartBeat Heartbeat Interval(Min) <input type="text"/> 20 <input type="button" value="↑"/> <input type="button" value="↓"/>	Apply

<Network Set-up>

➤ SYSTEM

- **Cascade Code:** Type the pre-assigned cascade code. Otherwise, you cannot access the system setup.

- **Location Information:** Enter the latitude and longitude. You can input values either in Decimal Degrees or Degrees-Minutes-Seconds.

[Example]

('N/S' | 'E/W') ddd.dddddd: (Latitude: N 39.006967 Longitude: W 94.532306)

- **Product Information:** This is for manufacturer use only. Do not change this value.

➤ **ETHERNET SETTING**

- **IP Mode/IP Address:** Enables you to set a connection mode for the network connected to the CAT5DAS-RU port. When you "select" Auto, the device automatically assigns the IP address. When you select "Static", it is possible to set an IP address of your choosing.

- **SNMP:** In order to send Heartbeat and alarm related information to a remote monitoring server, you can set a server IP address. The factory default IP address is 10.22.25.15.

- **Heartbeat Interval:** Sets the time to transmit the Heartbeat to the NMC Server.
(Default value is 20 minutes.)

③ **User Note**



		Status	Control	Network	Alarm History	File Update
APEX Tech Support : 1-888-317-8766 Cascade Code : undefined 03 / 08 / 2011 18 : 04 : 12	LOCATION		DONOR SITE			
	>> Location Information Apply		>> Donor Site Information Apply			
	Site Name	<input type="text" value="R-tron"/>	Site ID1	<input type="text" value="Korea"/>		
	Address 1	<input type="text" value="Doksan-dong"/>	Site ID2	<input type="text" value="SEOUL"/>		
Address 2	<input type="text" value="1004-9"/>			INSTALLER		
City, State, Zip Code	<input type="text" value="SEOUL"/>			>> Installer Information Apply		
Telephone	<input type="text" value="02-6343-1000"/>			Company	<input type="text" value="RTRON"/>	
				Name	<input type="text" value="KIM"/>	
				Telephone	<input type="text" value="02-6343-1000"/>	

<Network User Note set-up>

- **Location Information:** Type the location information such as the building name, address, city, state, zip code and telephone, and then click **Apply**.
- **Donor Site Information:** Type the base station's ID, and then click **Apply**.
- **Installer Information:** Type the installer information such as the company, name and telephone, Click **Apply**.

④ **User Comment**

The screenshot displays the R-tron network management interface. At the top, there is a navigation bar with tabs for 'Status', 'Control', 'Network', 'Alarm History', and 'File Update'. Below this, a sidebar on the left contains the following information:

- APEX**
- Tech Support : 1-888-317-8766
- Cascade Code : undefined
- 03 / 08 / 2011 18 : 06 : 36
- Clock
- Network Setup
- User Note
- User Comment (highlighted)

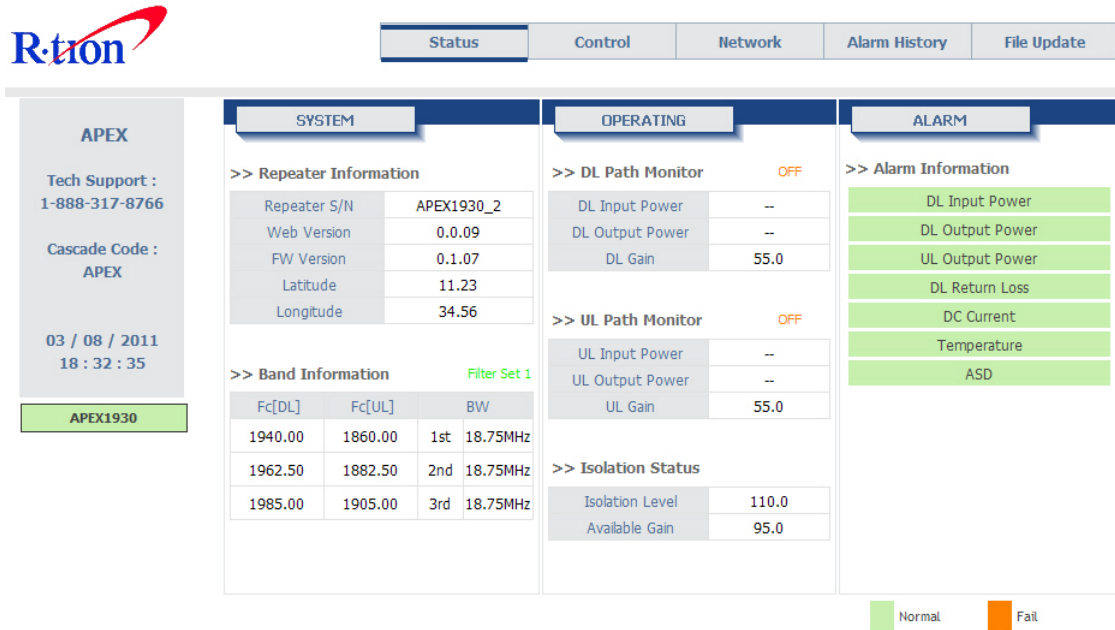
The main content area is titled 'USER COMMENT' and contains a table with the following structure:

Time	Comment	Name	Company	Apply
2011/03/08 18:06:36				Apply
2011/03/08/ 18:05:13	APEX Test	KIM	RTRON	▲

<Network User Comment set-up>

- **User Comment:** You can store up to 50 comments in memory. The length of each comment is limited to 20 characters.

4.3.2 Status



SYSTEM

>> Repeater Information

Repeater S/N	APEX1930_2
Web Version	0.0.09
FW Version	0.1.07
Latitude	11.23
Longitude	34.56

>> Band Information Filter Set 1

Fc[DL]	Fc[UL]	1st	BW
1940.00	1860.00	1st	18.75MHz
1962.50	1882.50	2nd	18.75MHz
1985.00	1905.00	3rd	18.75MHz

OPERATING

>> DL Path Monitor OFF

DL Input Power	--
DL Output Power	--
DL Gain	55.0

>> UL Path Monitor OFF

UL Input Power	--
UL Output Power	--
UL Gain	55.0

>> Isolation Status

Isolation Level	110.0
Available Gain	95.0

ALARM

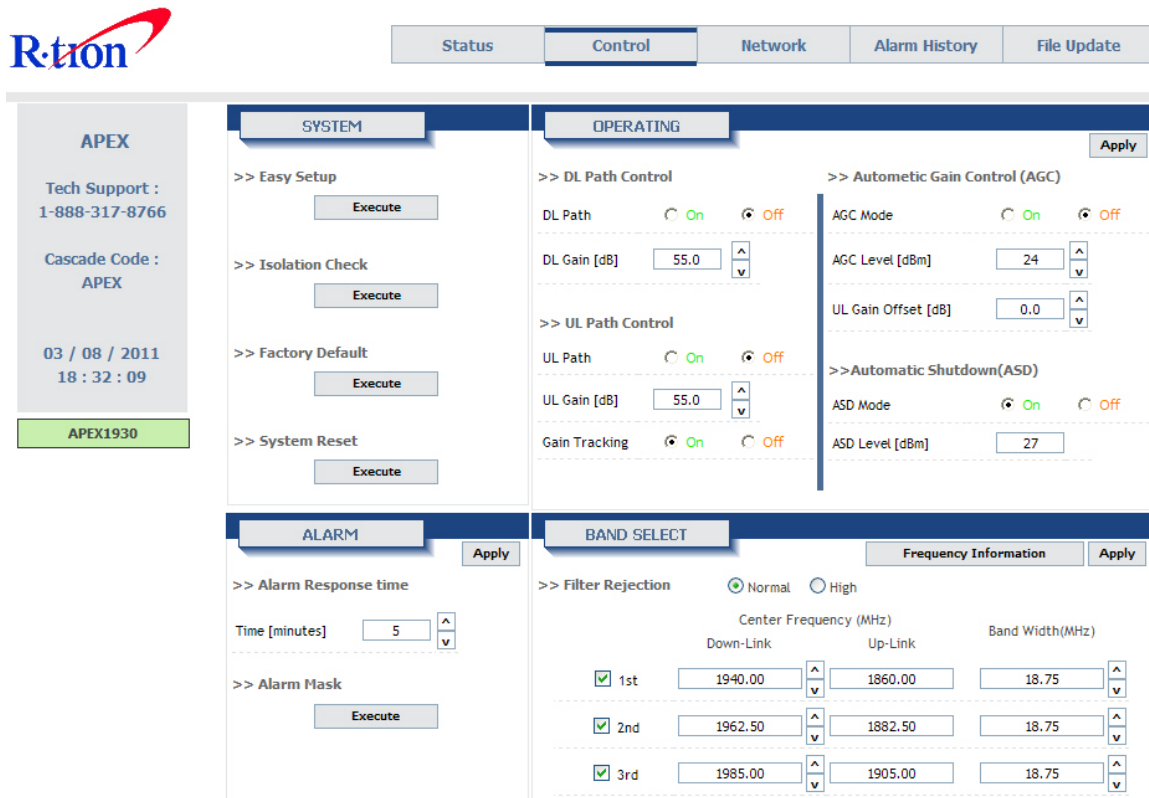
>> Alarm Information

- DL Input Power
- DL Output Power
- UL Output Power
- DL Return Loss
- DC Current
- Temperature
- ASD

Legend: █ Normal █ Fail

<Status>

4.3.3 Control



SYSTEM

>> Easy Setup Execute

>> Isolation Check Execute

>> Factory Default Execute

>> System Reset Execute

OPERATING

>> DL Path Control

DL Path On Off

DL Gain [dB] ▲ ▼

>> UL Path Control

UL Path On Off

UL Gain [dB] ▲ ▼

Gain Tracking On Off

>> Automatic Gain Control (AGC)

AGC Mode On Off

AGC Level [dBm] ▲ ▼

UL Gain Offset [dB] ▲ ▼

>> Automatic Shutdown(ASD)

ASD Mode On Off

ASD Level [dBm]

ALARM Apply

>> Alarm Response time

Time [minutes] ▲ ▼

>> Alarm Mask Execute

BAND SELECT Apply

>> Filter Rejection Normal High

	Center Frequency (MHz)		Band Width(MHz)
	Down-Link	Up-Link	
<input checked="" type="checkbox"/> 1st	<input type="text" value="1940.00"/>	<input type="text" value="1860.00"/>	<input type="text" value="18.75"/>
<input checked="" type="checkbox"/> 2nd	<input type="text" value="1962.50"/>	<input type="text" value="1882.50"/>	<input type="text" value="18.75"/>
<input checked="" type="checkbox"/> 3rd	<input type="text" value="1985.00"/>	<input type="text" value="1905.00"/>	<input type="text" value="18.75"/>

<Control>

4.3.4 File Update



APEX

Tech Support :
1-888-317-8766

Cascade Code :
APEX

03 / 08 / 2011
18 : 08 : 42

>> File Updates

Target MCU FPGA WEB

Target Slot repeater 1 repeater 2 repeater 3 repeater 4

File Name

Click Browse to locate new firmware. Click Update to update firmware.

4.3.5 Alarm History

Alarm history page allows you to record alarm information of each unit. Up to 300 lists can be accommodated.



APEX

Tech Support :
1-888-317-TRON

Cascade Code :
SDR

>> Alarm History

Issue Time	Alarm Infomation
20226/01/01 00:00:00	Slot#1 - 1900M : undefined Normal
20226/01/01 00:00:00	Slot#1 - 1900M : undefined Normal
20226/01/01 00:00:00	Slot#1 - 1900M : undefined Normal
20226/01/01 00:00:00	Slot#1 - 1900M : undefined Normal
20247/12/04 20:40:29	Slot#1 - 1900M : undefined Normal
2028/08/02 16:26:08	Slot#1 - 1900M : undefined Normal
20243/01/30 08:16:52	Slot#1 - 1900M : undefined Normal
20247/11/12 18:40:32	Slot#1 - 1900M : undefined Normal
2026/01/19 12:48:57	Slot#1 - 1900M : undefined Normal
2031/05/16 07:14:39	Slot#1 - 1900M : undefined Normal
20252/02/29 04:48:41	Slot#1 - 1900M : undefined Normal
20243/03/22 05:28:01	Slot#1 - 1900M : undefined Normal
2033/05/07 22:39:28	Slot#1 - 1900M : undefined Normal
20254/04/12 02:38:24	Slot#1 - 1900M : undefined Normal
2025/07/05 17:56:56	Slot#1 - 1900M : undefined Normal
2028/08/02 15:52:53	Slot#1 - 1900M : undefined Normal
2002/07/01 14:04:36	Slot#1 - 1900M : undefined Normal


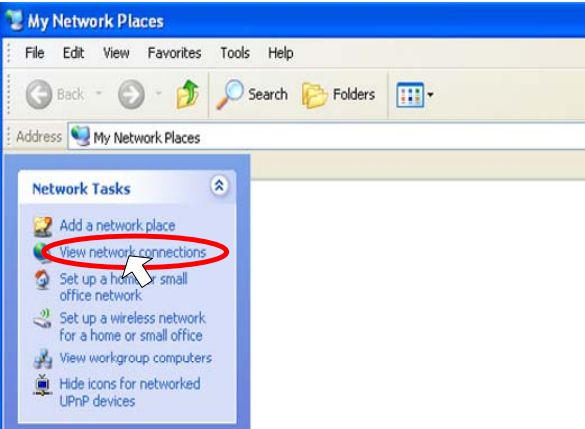
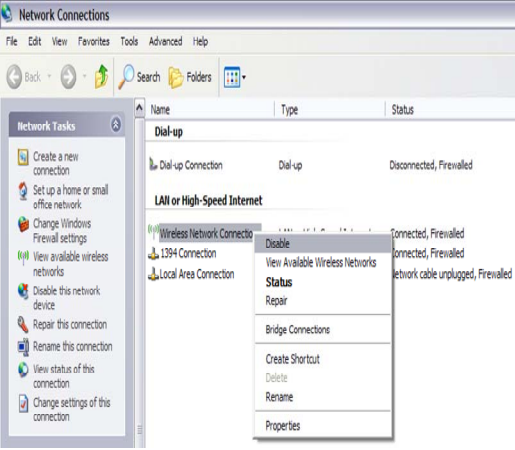
<Alarm History>

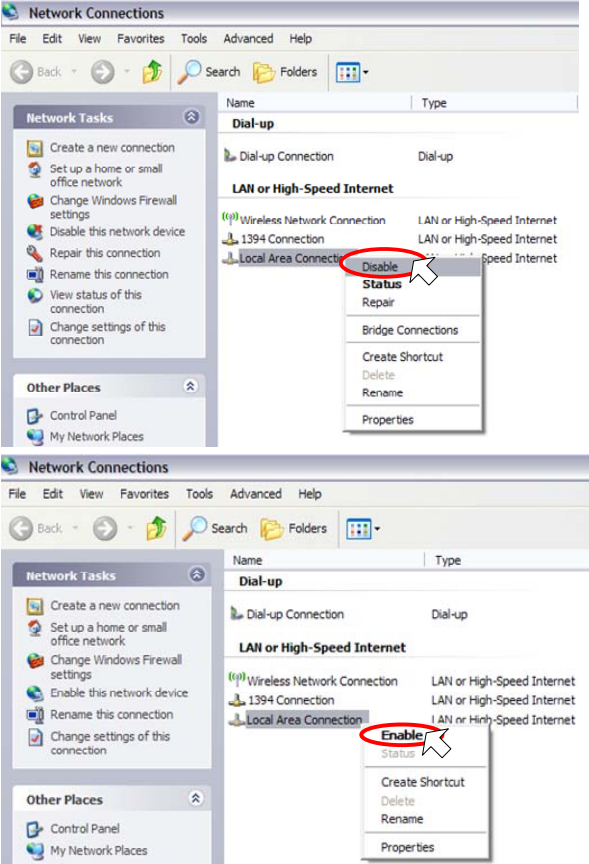
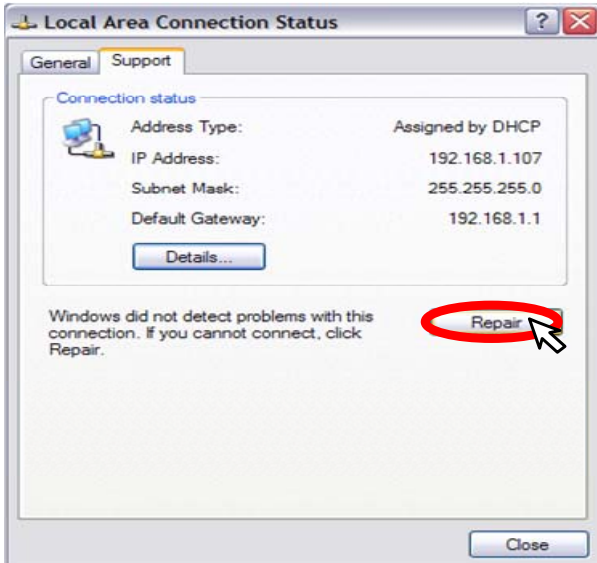
5. Troubleshooting

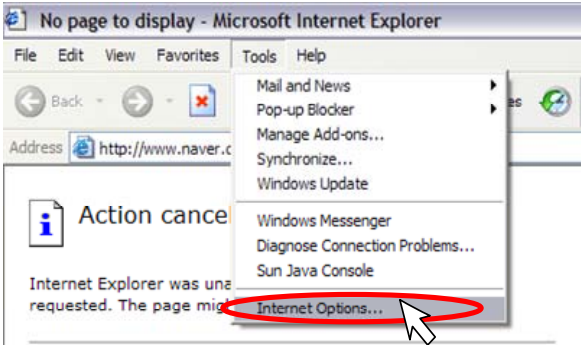


Before contacting your service dealer, please make sure you refer to the following guidelines. If the APEX1900-24 repeater does not work normally after completing the following troubleshooting, please contact your local dealer or R-tron America's Tech support line (1-888-31R-TRON).

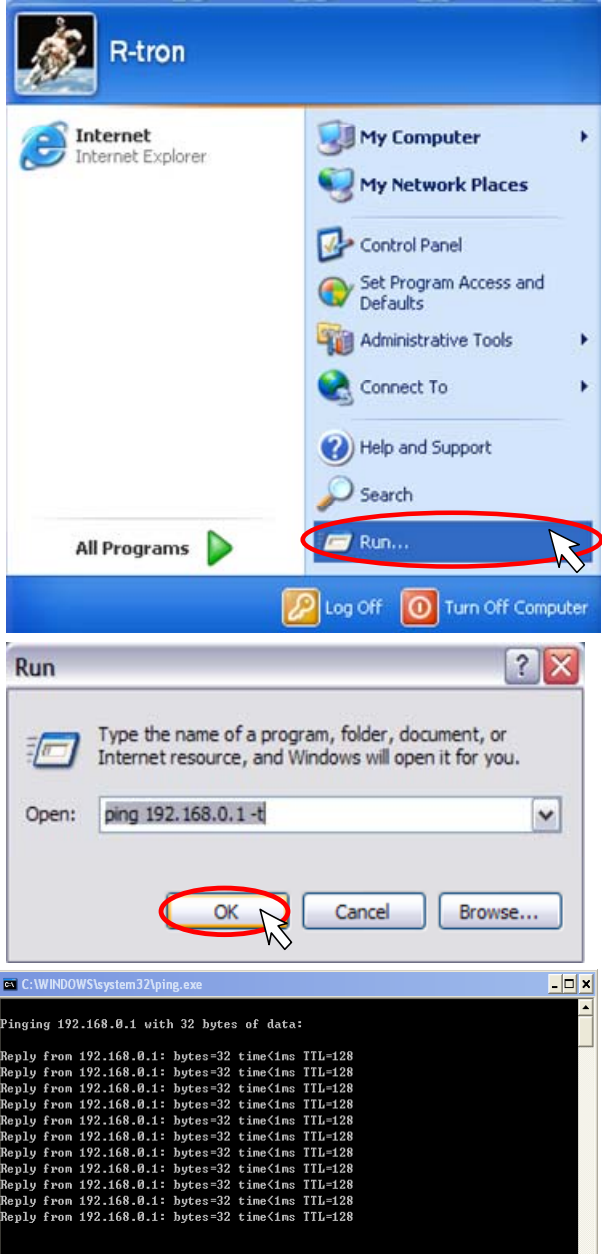
The alarm information is displayed by the LED lights on the APEX1900-24 repeater.

Problem	Cause	Solution
No LED on		Check the power cord for secure connection
The mobile phone is not working well.		Check if the power is ON. Check if the DL Amplifier and the UL Amplifier of parameter Status are displayed as "ON"
1. Gain, Input/ Output power or DC Current are changed randomly under operating of DL ALC, UL ALC and ASD. 2. Over isolation attenuation range.	Oscillation	a. Turn off the repeater. b. Measure the isolation and verify if the isolation between the donor antenna and the service antenna is enough for the repeater. Refer to the note on page 19. If the measured isolation value is greater than the required isolation value, turn Power On.
The red light Turns on.		Check if DL Input Power, DL Output Power, UL Output Power, Temperature, DC Voltage, DC Current is out of range. Especially, if the Input Power or Output Power is out of range, please contact. Technical Support Web site: www.r-tronamerica.com Toll Free: 888-317-8766

Problem	Cause	Solution
<p>Cannot communicate with the CAT-5 DAS</p>		<p>1. Click My Network places → View network connections. Right-click on the Wireless Network Connection and then click Disable.</p>   

Problem	Cause	Solution
		<p>2. Right-click on the Local Area Connection and then click Disable. After clicking Disable, click Enable again.</p>  <p>3. Double click the Local Area Connection and then click the Support tab → Repair.</p> 

Problem	Cause	solution
		<p>4. Open the Internet Browser and then select Tools → Internet Options.</p> <p>Click Delete Files button in the Temporary Internet files section.</p>  <p>The first screenshot shows the 'Tools' menu in Microsoft Internet Explorer. The 'Internet Options...' option is circled in red, and a mouse cursor is pointing at it.</p>  <p>The second screenshot shows the 'Internet Options' dialog box. The 'Delete Files...' button in the 'Temporary Internet files' section is circled in pink, and a mouse cursor is pointing at it.</p>  <p>The third screenshot shows the 'Delete Files' dialog box. The 'Delete all offline content' checkbox is checked, and the 'OK' button is circled in pink, with a mouse cursor pointing at it.</p>

Problem	Cause	Solution
		<p>5. Click Start and select Run.</p> <p>Type "ping 192.168.0.1-t" and click OK.</p> 

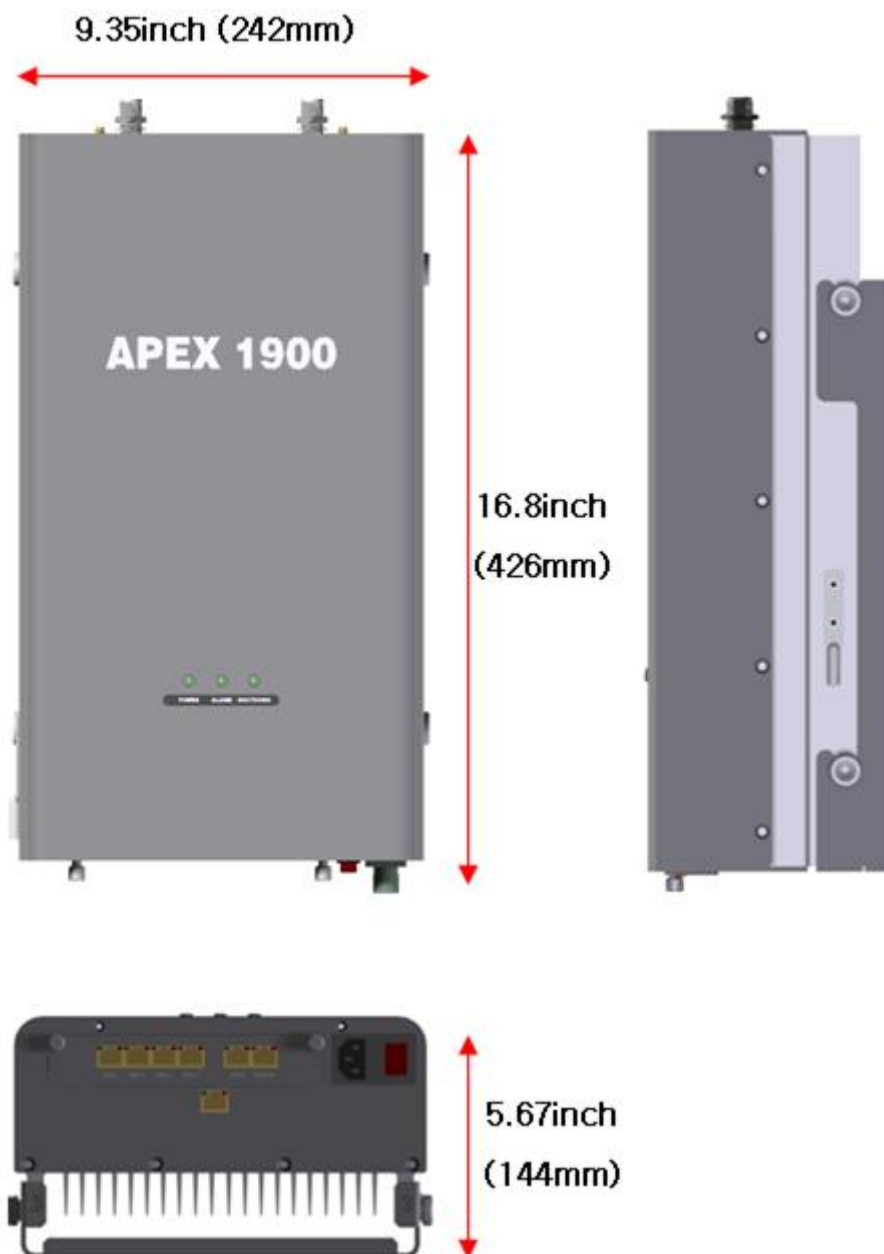
6. Specifications

6.1 RF Characteristics

Electrical Specifications			
Parameter	Down-Link	Up-Link	
Frequency Range	1930 - 1995 MHz (65M B.W)	1850 - 1915 MHz (65M B.W)	
Service	CDMA2000 or LTE(FDD) Service		
Channel Select	Center frequency + BW (1M - 20MHz) Non-continuous 3 channel		
Input Power Range	-71 – -31 dBm	-71 – -31 dBm	
Composite Output Power Range	24 dBm	24 dBm	
Gain Range	55 - 95 dB	55 - 95 dB	
AGC	Range	40 dB (min)	
	Time	the AGC must track only slow variations with time on the order of 100ms.	
Gain Ripple	± 1.5 dB		
Noise Figure	Max Gain	5 dB (max)	5 dB (max)
	Min Gain	–	12 dB (max)
Roll-off	Filter set 1	> 50dBc at ± 1 MHz from band edge	
		> 50dBc at ± 2 MHz from band edge	
	Filter set 2	> 65dBc at ± 0.5 MHz from band edge	
		> 65dBc at ± 2 MHz from band edge	
Propagation Delay	Filter set 1	6 μs (max)	
	Filter set 2	8 μs (max)	
Spurious Emission	Section 24 and section 27 of FCC		
VSWR	1.4 : 1 (max)		
Impedance	50Ω		
Operating Temperature	-10 - +50 °C		

6.2 Mechanical Specification

Parameter	Specifications	Remark
RF connectors	N-female x 2	
Dimensions (WxHxD)	9.35 * 16.8 * 5.67 Inch 242 * 426 * 144 mm	W * D * H
Weight	44.09 lb 20 Kg max	



7. Appendix

USPCS Channel

USPCS			Down Link				Up Link			
No	Block	Channel	Center	Start	Stop	BW	Center	Start	Stop	BW
1	A1	25	1931.250	1930.625	1931.875	1.25	1851.250	1850.625	1851.875	1.25
2		50	1932.500	1931.875	1933.125	1.25	1852.500	1851.875	1853.125	1.25
3		75	1933.750	1933.125	1934.375	1.25	1853.750	1853.125	1854.375	1.25
4		100	1935.000	1934.375	1935.625	1.25	1855.000	1854.375	1855.625	1.25
5	A2	125	1936.250	1935.625	1936.875	1.25	1856.250	1855.625	1856.875	1.25
6		150	1937.500	1936.875	1938.125	1.25	1857.500	1856.875	1858.125	1.25
7		175	1938.750	1938.125	1939.375	1.25	1858.750	1858.125	1859.375	1.25
8		200	1940.000	1939.375	1940.625	1.25	1860.000	1859.375	1860.625	1.25
9	A3	225	1941.250	1940.625	1941.875	1.25	1861.250	1860.625	1861.875	1.25
10		250	1942.500	1941.875	1943.125	1.25	1862.500	1861.875	1863.125	1.25
11		275	1943.750	1943.125	1944.375	1.25	1863.750	1863.125	1864.375	1.25
12		300	1945.000	1944.375	1945.625	1.25	1865.000	1864.375	1865.625	1.25
13	D	325	1946.250	1945.625	1946.875	1.25	1866.250	1865.625	1866.875	1.25
14		350	1947.500	1946.875	1948.125	1.25	1867.500	1866.875	1868.125	1.25
15		375	1948.750	1948.125	1949.375	1.25	1868.750	1868.125	1869.375	1.25
16		400	1950.000	1949.375	1950.625	1.25	1870.000	1869.375	1870.625	1.25
17	B1	425	1951.250	1950.625	1951.875	1.25	1871.250	1870.625	1871.875	1.25
18		450	1952.500	1951.875	1953.125	1.25	1872.500	1871.875	1873.125	1.25
19		475	1953.750	1953.125	1954.375	1.25	1873.750	1873.125	1874.375	1.25
20		500	1955.000	1954.375	1955.625	1.25	1875.000	1874.375	1875.625	1.25
21	B2	525	1956.250	1955.625	1956.875	1.25	1876.250	1875.625	1876.875	1.25
22		550	1957.500	1956.875	1958.125	1.25	1877.500	1876.875	1878.125	1.25
23		575	1958.750	1958.125	1959.375	1.25	1878.750	1878.125	1879.375	1.25
24		600	1960.000	1959.375	1960.625	1.25	1880.000	1879.375	1880.625	1.25
25	B3	625	1961.250	1960.625	1961.875	1.25	1881.250	1880.625	1881.875	1.25
26		650	1962.500	1961.875	1963.125	1.25	1882.500	1881.875	1883.125	1.25
27		675	1963.750	1963.125	1964.375	1.25	1883.750	1883.125	1884.375	1.25
28		700	1965.000	1964.375	1965.625	1.25	1885.000	1884.375	1885.625	1.25
29	E	725	1966.250	1965.625	1966.875	1.25	1948.313	1885.625	1886.875	1.25
30		750	1967.500	1966.875	1968.125	1.25	1948.375	1886.875	1888.125	1.25
31		775	1968.750	1968.125	1969.375	1.25	1948.438	1888.125	1889.375	1.25
32		800	1970.000	1969.375	1970.625	1.25	1890.000	1889.375	1890.625	1.25
33	F	825	1971.250	1970.625	1971.875	1.25	1891.250	1890.625	1891.875	1.25
34		850	1972.500	1971.875	1973.125	1.25	1892.500	1891.875	1893.125	1.25
35		875	1973.750	1973.125	1974.375	1.25	1893.750	1893.125	1894.375	1.25
36		900	1975.000	1974.375	1975.625	1.25	1895.000	1894.375	1895.625	1.25
37	C3	925	1976.250	1975.625	1976.875	1.25	1896.250	1895.625	1896.875	1.25
38		950	1977.500	1976.875	1978.125	1.25	1897.500	1896.875	1898.125	1.25
39		975	1978.750	1978.125	1979.375	1.25	1898.750	1898.125	1899.375	1.25
40		1000	1980.000	1979.375	1980.625	1.25	1900.000	1899.375	1900.625	1.25
41	C4	1025	1981.250	1980.625	1981.875	1.25	1901.250	1900.625	1901.875	1.25
42		1050	1982.500	1981.875	1983.125	1.25	1902.500	1901.875	1903.125	1.25
43		1075	1983.750	1983.125	1984.375	1.25	1903.750	1903.125	1904.375	1.25
44		1100	1985.000	1984.375	1985.625	1.25	1905.000	1904.375	1905.625	1.25
45	C5	1125	1986.250	1985.625	1986.875	1.25	1906.250	1905.625	1906.875	1.25
46		1150	1987.500	1986.875	1988.125	1.25	1907.500	1906.875	1908.125	1.25
47		1175	1988.750	1988.125	1989.375	1.25	1908.750	1908.125	1909.375	1.25
48		1200	1990.000	1989.375	1990.625	1.25	1910.000	1909.375	1910.625	1.25
49	G	1225	1991.250	1990.625	1991.875	1.25	1911.250	1910.625	1911.875	1.25
50		1250	1992.500	1991.875	1993.125	1.25	1912.500	1911.875	1913.125	1.25
51		1275	1993.750	1993.125	1994.375	1.25	1913.750	1913.125	1914.375	1.25
52		1300	1995.000	1994.375	1995.625	1.25	1915.000	1914.375	1915.625	1.25

Warranty

LIMITED WARRANTY

This product, as supplied and distributed by R-tron, in the original carton, is warranted by R-tron against manufacturing defects in materials and workmanship for a limited warranty period of:

Five (5) Year Parts and Labor

This limited warranty begins on the original date of purchase, and is valid only on products purchased and used in the United States. R-tron will repair or replace this product, at our option and at no charge as stipulated herein, with new or reconditioned parts or products if found to be defective during the limited warranty period specified above. All replaced parts and products become the property of R-tron and must be returned to R-tron. Replacement parts and products assume the remaining original warranty.

This limited warranty covers manufacturing defects in materials and workmanship encountered in normal, and except to the extent otherwise expressly provided for in this statement, use of this product, and shall not apply to the following, including, but not limited to: damage which occurs in installation; applications and uses for which this product was not intended; altered product or serial numbers; cosmetic damage or exterior finish; accidents, abuse, neglect, fire, water, lightning or other acts of nature; use of products, equipment, systems, utilities, services, parts, supplies, accessories, applications, installations, repairs, external wiring or connectors not supplied or authorized by R-tron which damage this product or result in service problems; or incorrect electrical line voltage, fluctuations and surges; customer adjustments and failure to follow operating instruction. R-tron does not warrant uninterrupted or error-free operation of the product.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE LISTED AND DESCRIBED ABOVE, AND NO WARRANTIES WHETHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL APPLY AFTER THE EXPRESS WARRANTY PERIODS STATED ABOVE, AND NO OTHER EXPRESS WARRANTY OR GUARANTY GIVEN BY ANY PERSON, FIRM OR CORPORATION WITH RESPECT TO THIS PRODUCT SHALL BE BINDING ON R-tron.

Return Material Authorization(RMA) Procedure

The return and exchange of products are not allowed without prior approval from R-tron America, Inc. Please follow the exchange procedure below.

1. Call Tech Support for troubleshooting.
2. If the device has a hardware problem, R-tron will replace it if it is within warranty.
A RMA number will be issued for the return.
3. R-tron will ship the replacement unit with a return shipping label.
4. The customer must return the product using the original packaging, including all accessories and/or parts.

