

APEX730

LTE Band Repeater

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.

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1. General

1.1 Notice

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Notice

This document describes the specifications, installation, and operation of the APEX730 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

Address: R-tron Inc. 6402 College Boulevard, Overland Park, KS 66211

Phone: +1-913-344-9977, 1-888-317-8766

Fax: +1-913-344-9988

e-mail: info@r-tronamerica.com

Website: www.rtronamerica.com

1.2 Safety Precautions

Warning ⚠

Opening the APEX730 equipment could result in electric shock and may cause severe injury.

Warning ⚠

Connect the equipment frame ground to the building ground.

Warning ⚠

Operating the APEX730 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.

1.3 Version History

1.3.1 Manual Version History List

Revision History		Date	Item/Description	Reason
Approval Ver.	Issue Ver.			
V1.0	V1.0	2011. 06. 15	Initial Version	

1.3.2 Firmware Version History List

Revision History		Date	Item/Description	Reason
Approval Ver.	Issue Ver.			
V1.0.00	V1.0.00	2011. 06. 15.	Initial Version	

1.3.3 WEB GUI Version History List

Revision History		Date	Item/Description	Reason
Approval Ver.	Issue Ver.			
V1.0.00	V1.0.00	2011. 06. 15	Initial Version	

1.4 Glossary

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

Abbreviation	Definition
AC	Alternating Current
LTE	Long Term Evolution
DC	Direct Current
DL	Downlink
GUI	Graphic User Interface
LED	Light Emitting Diode
PSU	Power Supply Unit
RF	Radio Frequency
UL	Uplink
VSWR	Voltage Standing Wave Ratio
NCU	Network Control Unit
MCU	Main Control Unit

AGC (Automatic Gain Control)

AGC 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 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**.

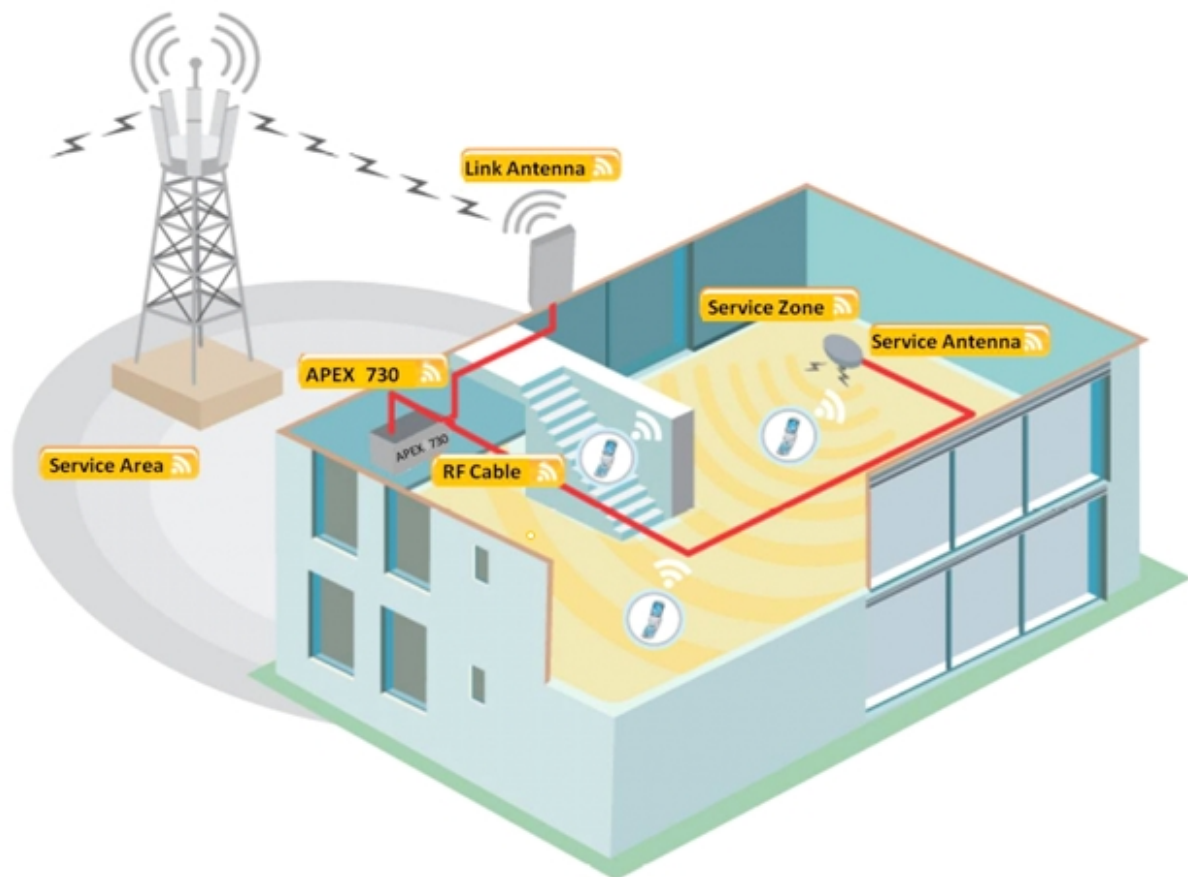
If the output power exceeds higher than the “**ASD LEVEL**”, the repeater will shut down for “**ASD TIME**” seconds. If shutdown repeats “Iteration” times, the repeater will require manual re-start.

2. Introduction

2.1 APEX730

APEX730 is used to fill out areas in APEX systems, such as base station fringe areas, business and industrial building, etc.

APEX730 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 >

2.2 APEX730 Key Features

◆ Design

- Digital filtering allows for customized channel selections.
- Digital filtering high quality, out of band rejection, and high performance

◆ User friendly design.

- Local monitoring and control through the Web GUI interface
- Remote monitoring and control through the Web GUI interface.
- Reports the status of connection as a function of SNMP regularly and reports an alarm if the event occurred.

◆ Protection function

- Easy setup
- Isolation Check
- Auto Gain Control
- Auto Shutdown

2.3 Component

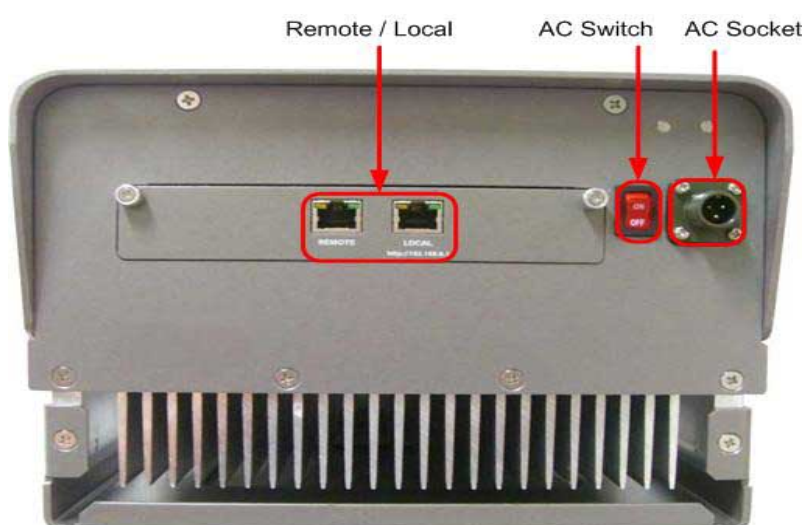
2.3.1 APEX730



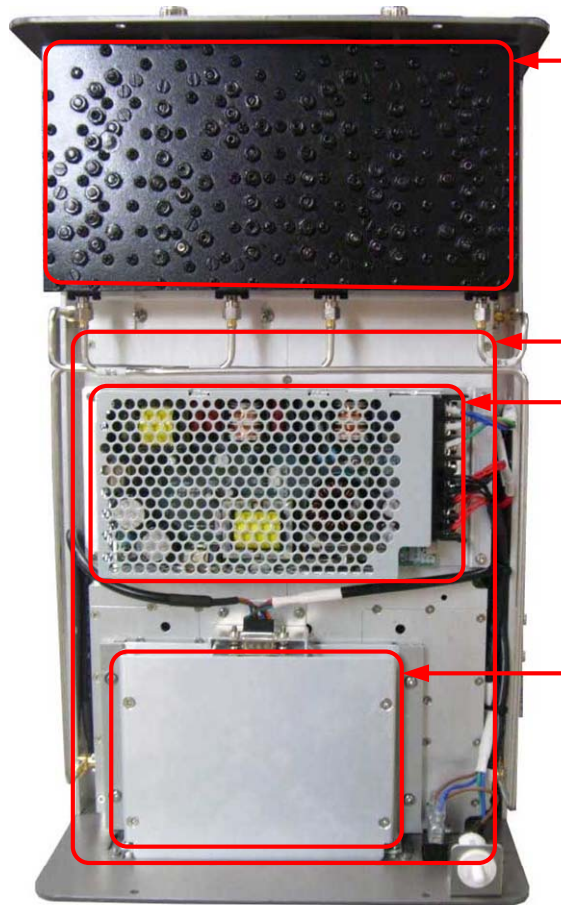
APEX730 Package		
Index	Items	Q'ty
1	Repeater	1
2	Wall Mount Bracket	1
3	LAN Cable	1
4	AC Cable	1
5	Bolt (M4*8mm)	2
6	Bolt (M6*12mm)	4
7	Bolt (16/5*50mm)	4
8	Direct LAN Cable	1
9	Quick Guide	1
10	User's Manual CD	1

2.4 Description

2.4.1 Overview



2.4.2 Internal Configuration



2.4.3 RFU (RF Unit)

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

2.4.4 Duplexer

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

2.4.5 PSU (Power Supply Unit)

The AC-DC adaptor supplies a steady DC power to the APEX730 equipment by drawing power from the general in-wall AC outlets.

2.4.6 NCU (Network Control Unit)

The NCU (Network Control Unit) is the control unit of the APEX730. The NCU controls and monitors operational parameters, alarms, records event and performs many other functions.

3. Mechanical Installation

The installation procedure is as follows:

- Confirm Items from List
- Mounting
- Grounding
- RF Cable Connection
- Power On

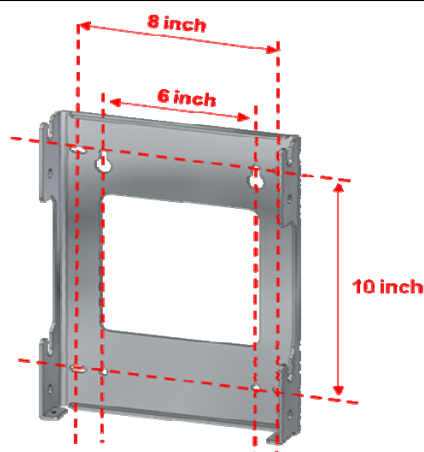
3.1 Confirm Item from List



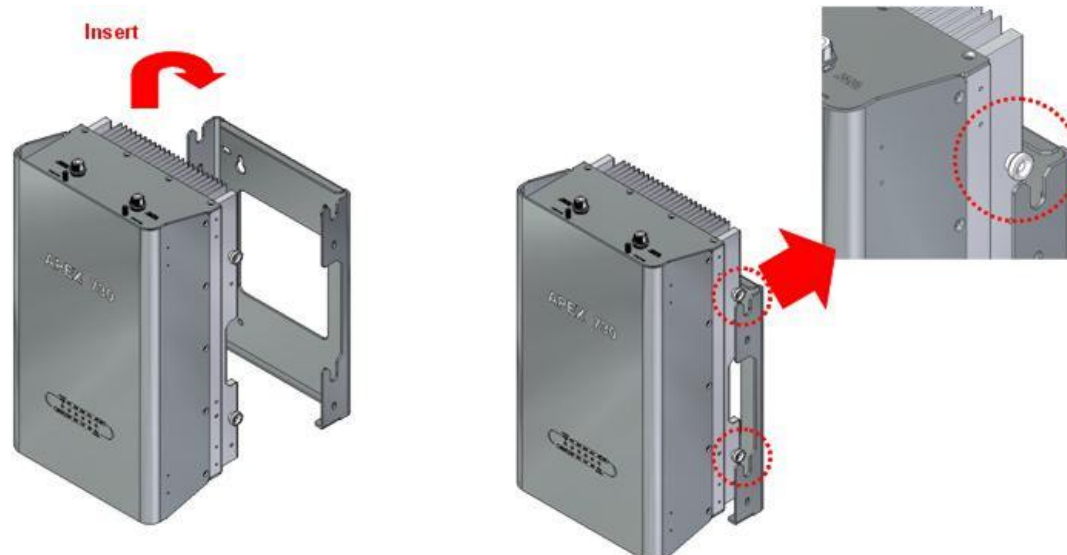
APEX730 Package		
Index	Items	Q'ty
1	Repeater	1
2	Wall Mount Bracket	1
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6	Bolt (M6*12mm)	4
7	Bolt (16/5*50mm)	4
8	Direct LAN Cable	1
9	Quick Guide	1
10	User's Manual CD	1

3.2 Mounting

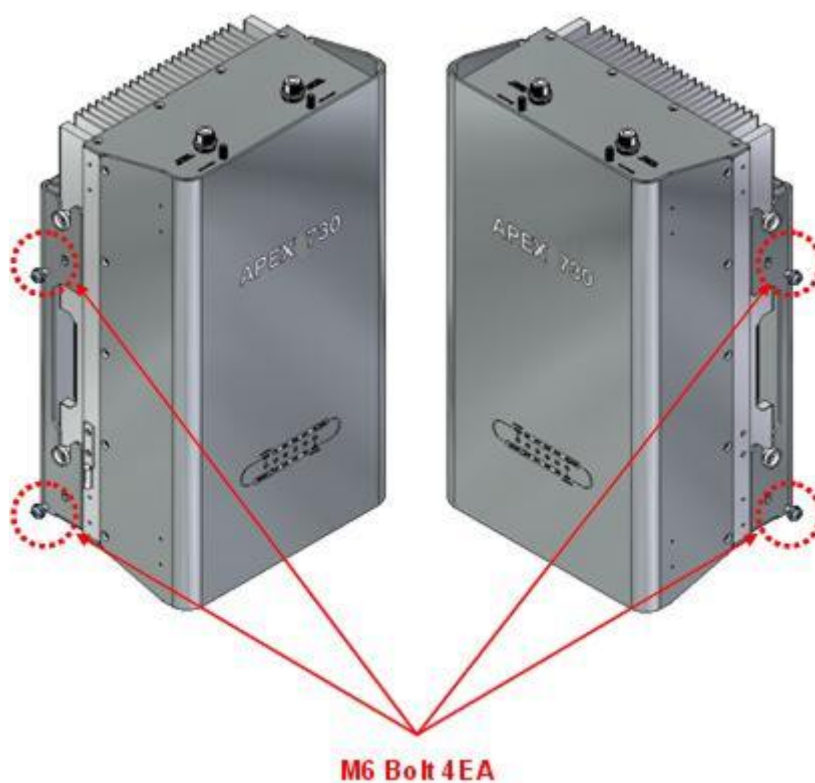
Step 1 Drill holes directly through the template. Attach the mounting bracket to the wall using provided bolts (16/5*50mm) or extra screws.



Step 2 Lean the APEX730 to hang the topside of the Guide Ring on the mounting bracket, and push toward the wall to mount.



Step 3 Fix the repeater using the 4 bolts (M6*12mm) provided.



Step 4 Fix the repeater using the 2 Bolts (M4*8mm) provided.



3.3 Grounding



Step 1: A rod on the left side is intended for a building ground.

Step 2: Connect the ground cable to the rod.



Dangerously high voltages may occur and damage the equipment if the equipment is not grounded properly.

3.4 RF 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.



DO NOT connect or disconnect the coaxial cable while the power is on.

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

Notice: Antenna cables must be installed before connecting AC Power.



Step 1: Connect the power cord to the Repeater

Step 2: Plug the power cord into a wall outlet.

Step 3: Turn the red power button on

Step 4: Check if the green LED at the Top turns on.

4. GUI Operation

APEX730 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 Cable required

4.1 GUI Operation Flow Chart

[1] Internet Network Setup

Setting in order to acquire the IP address automatically.



[2] GUI Log-in

APEX730 operation access to Web GUI and Log in.

User ID	operator
Password	•••••

[3] GUI Network Setup

1. Time Setting

Automatically set to your PC time.

TIME SETTING	
>> System Information	
Date :	06 / 13 / 2011
Time :	14 : 33 : 53
>> New System Time	
Date :	6 / 13 / 2011
Time :	14 : 54 : 50
Set Time	

2. System Information Input

Input Cascade Code and Location Information.

SYSTEM	
>> Cascade Code Apply	
Cascade Code	APEX0730
>> Location Information Apply	
Latitude	2
Longitude	3
>> Serial Number Apply	
Serial Number	4
>> Refresh Time Apply	
Local	15
Remote	15

3. Ethernet Setting

IP address and SNMP IP Input.

ETHERNET SETTING	
>> Ethernet Apply	
IP Mode	☒ Auto ☐ Static
IP Address	218 . 239 . 217 . 74
Subnet Mask	255 . 255 . 255 . 0
Gateway	218 . 239 . 217 . 1
>> SNMP	
ServerIP	218 . 239 . 217 . 190
>> HeartBeat	
Heartbeat	20.0

[4] GUI System Control

The user can control the repeater locally using the built-in WEB GUI.

1. Band Select

Set the center frequency and bandwidth.

BAND SELECT				
>> Filter Rejection ☐ Normal ☒ High Apply				
	Center Frequency[MHz]			
Band	Down-Link	Up-Link	Band Width[MHz]	
☐ A	731.000	701.000	4.60	
☐ B	737.000	707.000	4.60	
☐ C(Lower)	743.000	713.000	4.60	
☒ C(Upper)	751.000	782.000	9.05	

2. Isolation Check

Isolation will calculate the Available Maximum Gain.

SYSTEM	
>> Easy Setup	Execute
>> Isolation Check	Execute
>> Factory Default	Execute
>> System Reset	Execute

3. AGC control

AGC automatically assigns gain.

>> Automatic Gain Control

AGC Mode	☒ On ☐ Off
AGC Level [dBm]	30.0
UL Gain Offset[dB]	-2

4. Manual Control

Gain value set by User.

>> Automatic Gain Control

AGC Mode	☐ On ☒ Off
AGC Level [dBm]	30.0
UL Gain Offset[dB]	-2

[5] GUI Status Check

You can see system, operating, and alarm information on Status page.

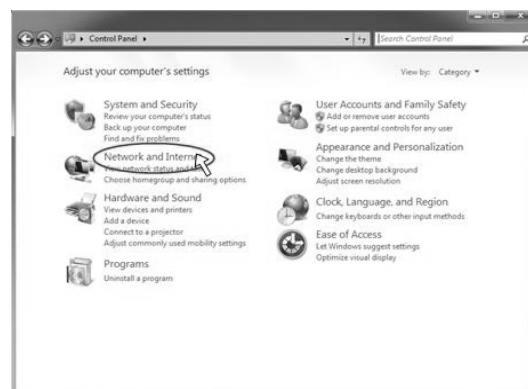
4.2 Internet Network Setup

4.2.1 Windows 7 (Refer to 5.9 for other versions of Windows)

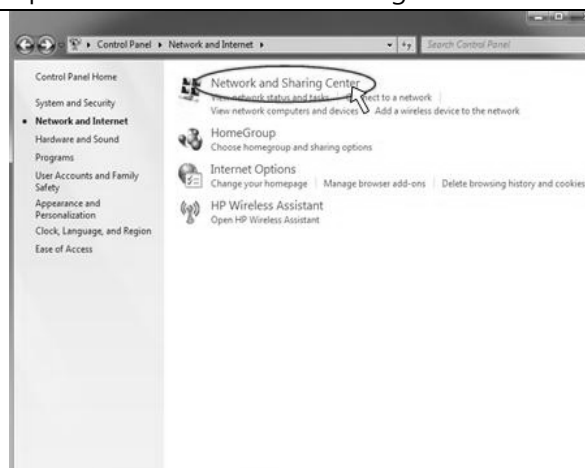
Step 1: Click the Start button and select Control Panel.



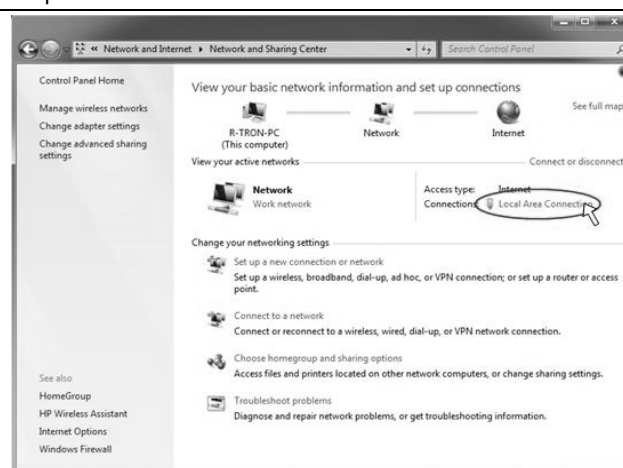
Step 2: Click **Network and Internet**.



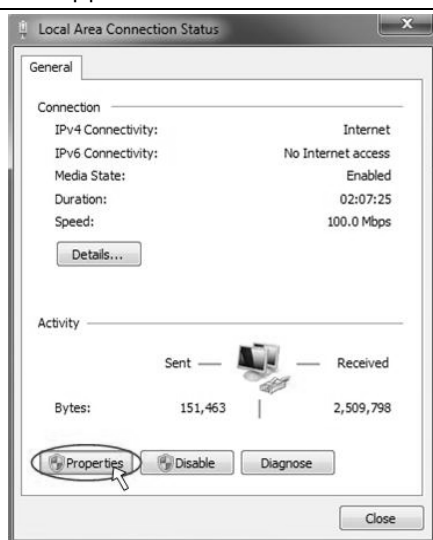
Step 3: Click Network and Sharing Center.



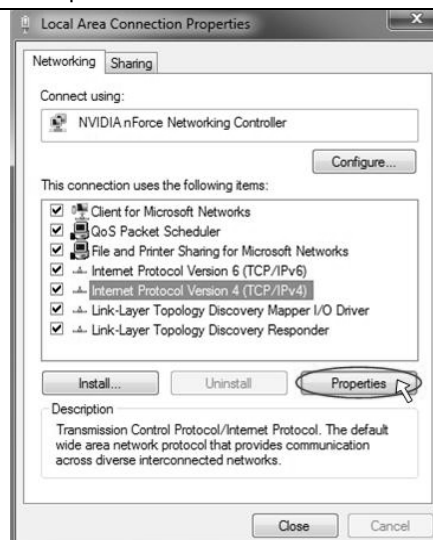
Step 4: Click View status of Local Area Connection.



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

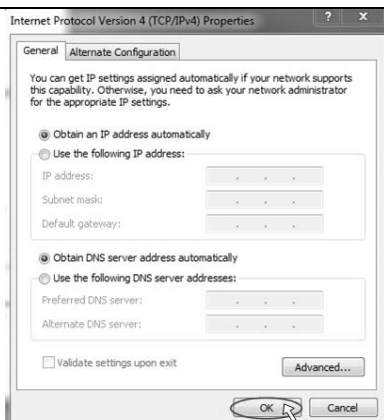


Step 6: Select Internet Protocol Version 4 (TCP/IPv4) and click Properties.



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

Step 8: Close all windows.



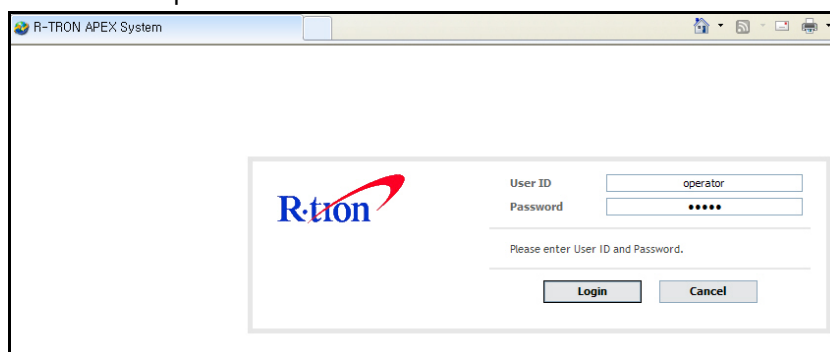
4.3 System Login

For APEX730 operation access, go to Web GUI and Log in.

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. Confirm a User ID and type the password into the password box. User ID is **"operator"**, Type **"rtron"** for the password and then click **OK**.



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



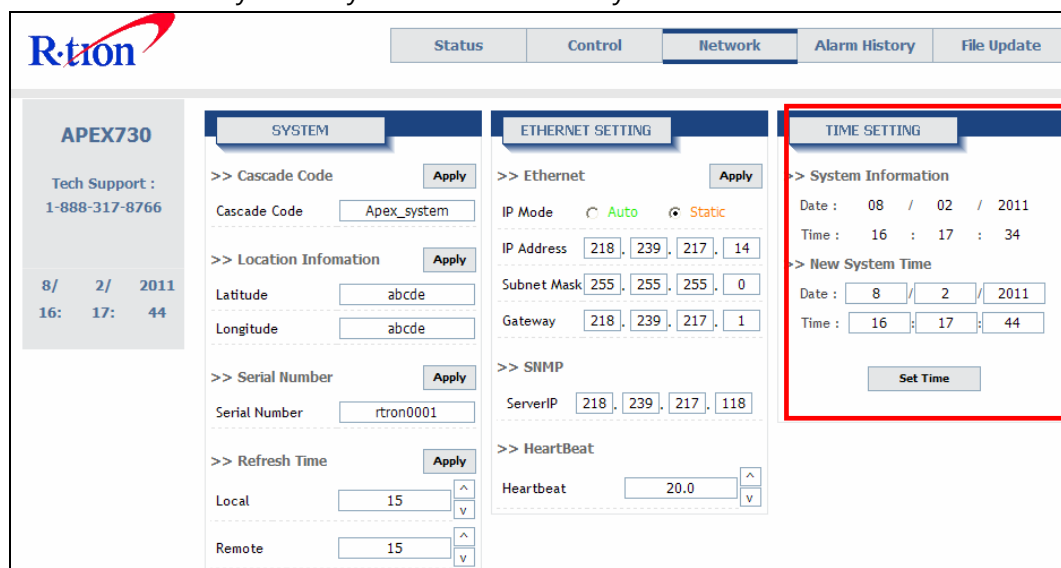
Step 4. When the login process is complete, the initial screen will appear.

4.4 System Setup

When you click Network you can set up User Note, Comment, Ethernet, and time setting.

4.4.1 Time Setting

The time will automatically set to your PC time when you click the set time

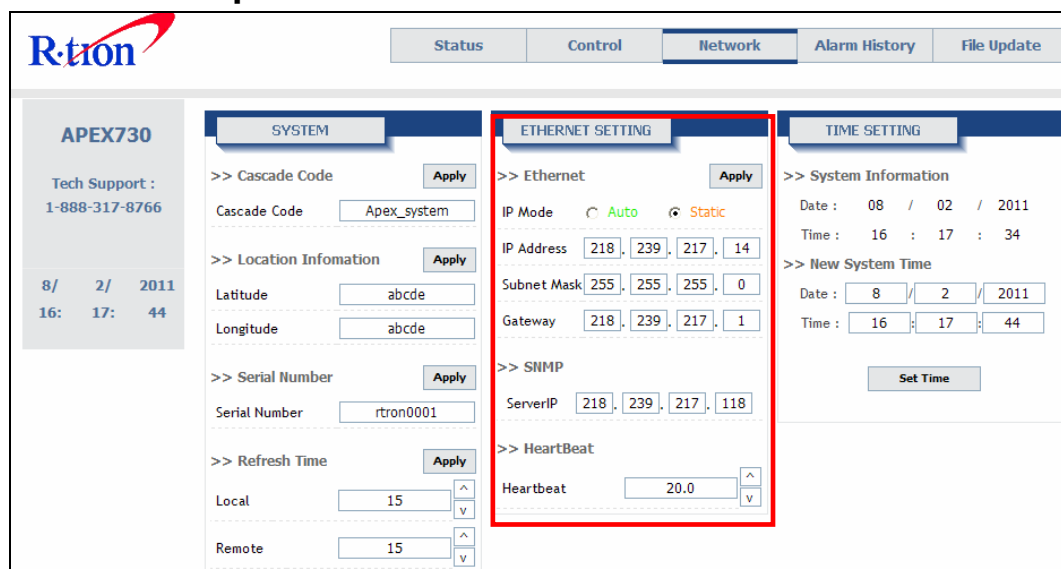


The screenshot shows the R-tion APEX730 web interface. The 'Network' tab is selected in the top navigation bar. The 'TIME SETTING' sub-tab is highlighted with a red box. It contains the following information:

- System Information:** Date: 08 / 02 / 2011, Time: 16 : 17 : 34
- New System Time:** Date: 8 / 2 / 2011, Time: 16 : 17 : 44
- Set Time** button

In the above page, you can set system time and update time-related information.

4.4.2 Network Setup



The screenshot shows the R-tion APEX730 web interface. The 'Network' tab is selected in the top navigation bar. The 'ETHERNET SETTING' sub-tab is highlighted with a red box. It contains the following information:

- Ethernet:** IP Mode: Auto (selected), Static; IP Address: 218, 239, 217, 14; Subnet Mask: 255, 255, 255, 0; Gateway: 218, 239, 217, 1
- SNMP:** ServerIP: 218, 239, 217, 118
- HeartBeat:** Heartbeat: 20.0

<Network Set-ups>

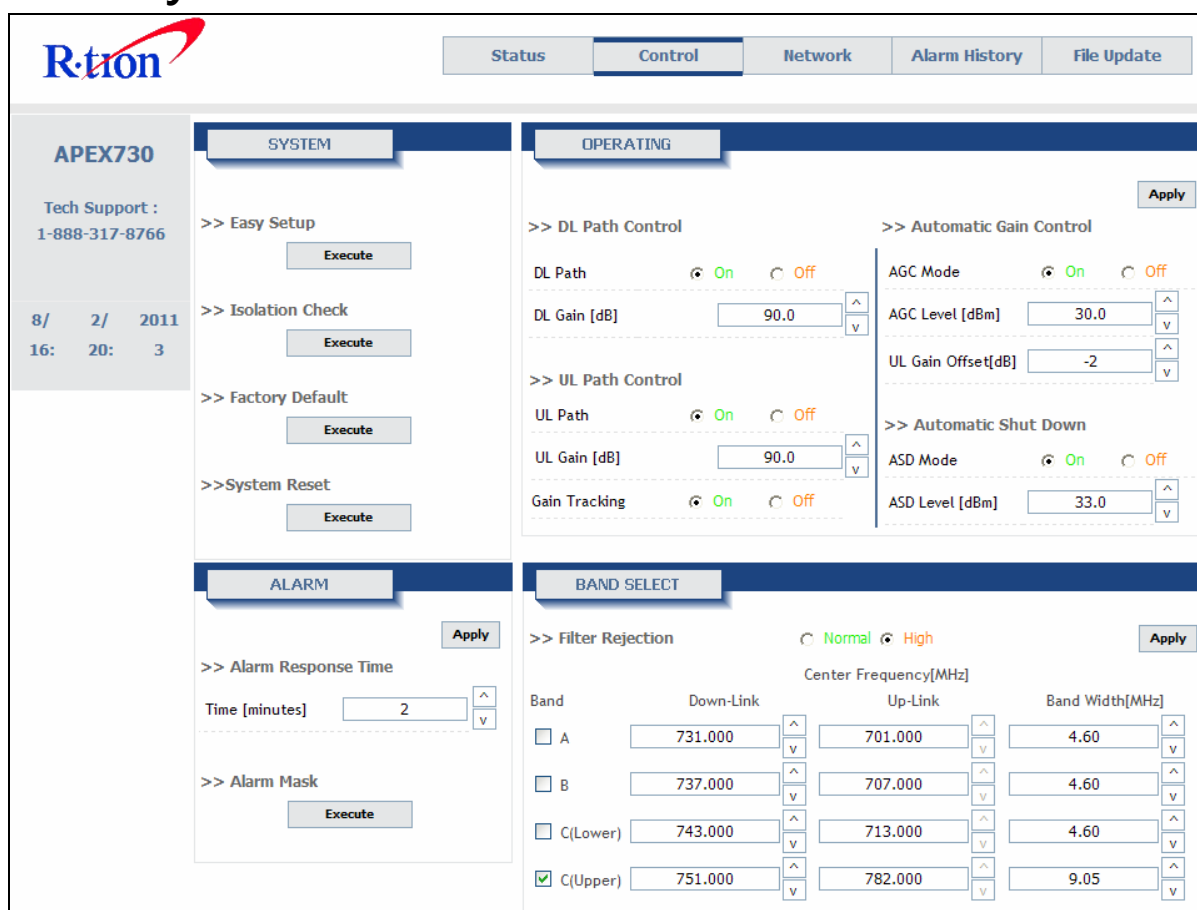
➤ SYSTEM

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

➤ ETHERNET SETTING

- **Ethernet IP Mode / IP Address:** Enables you to set a connection mode for the network connected to the APEX730 remote LAN 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.)

4.5 GUI System Control



The screenshot displays the APEX730 GUI System Control interface. The top navigation bar includes tabs for Status, Control (selected), Network, Alarm History, and File Update. The left sidebar shows the APEX730 logo, Tech Support contact information (1-888-317-8766), and a date/time display (8/2/2011 16:20:3).

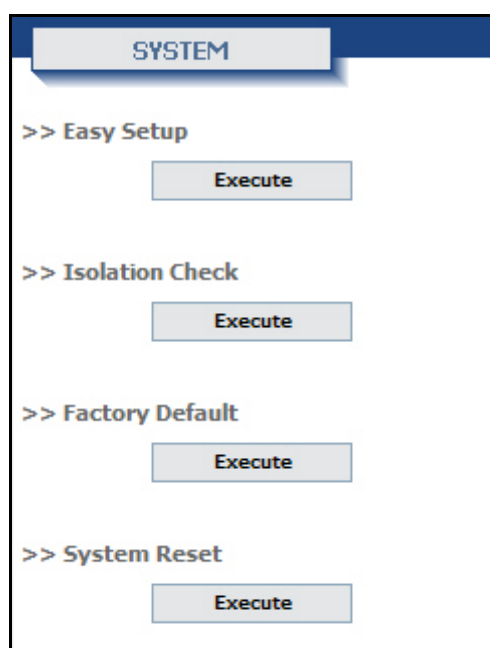
The main content area is divided into four sections:

- SYSTEM:** Contains four sub-sections:
 - >> Easy Setup: Execute button
 - >> Isolation Check: Execute button
 - >> Factory Default: Execute button
 - >> System Reset: Execute button
- OPERATING:** Contains three sub-sections:
 - >> DL Path Control: DL Path (On/Off), DL Gain [dB] (90.0)
 - >> UL Path Control: UL Path (On/Off), UL Gain [dB] (90.0), Gain Tracking (On/Off)
 - >> Automatic Gain Control: AGC Mode (On/Off), AGC Level [dBm] (30.0), UL Gain Offset [dB] (-2)
- ALARM:** Contains two sub-sections:
 - >> Alarm Response Time: Time [minutes] (2)
 - >> Alarm Mask: Execute button
- BAND SELECT:** Contains one sub-section:
 - >> Filter Rejection: Filter Rejection (Normal/High)

The Filter Rejection section includes a table with columns: Band, Down-Link, Up-Link, and Band Width [MHz]. The table lists four bands: A, B, C(Lower), and C(Upper). Band C(Upper) is selected with a checkmark.

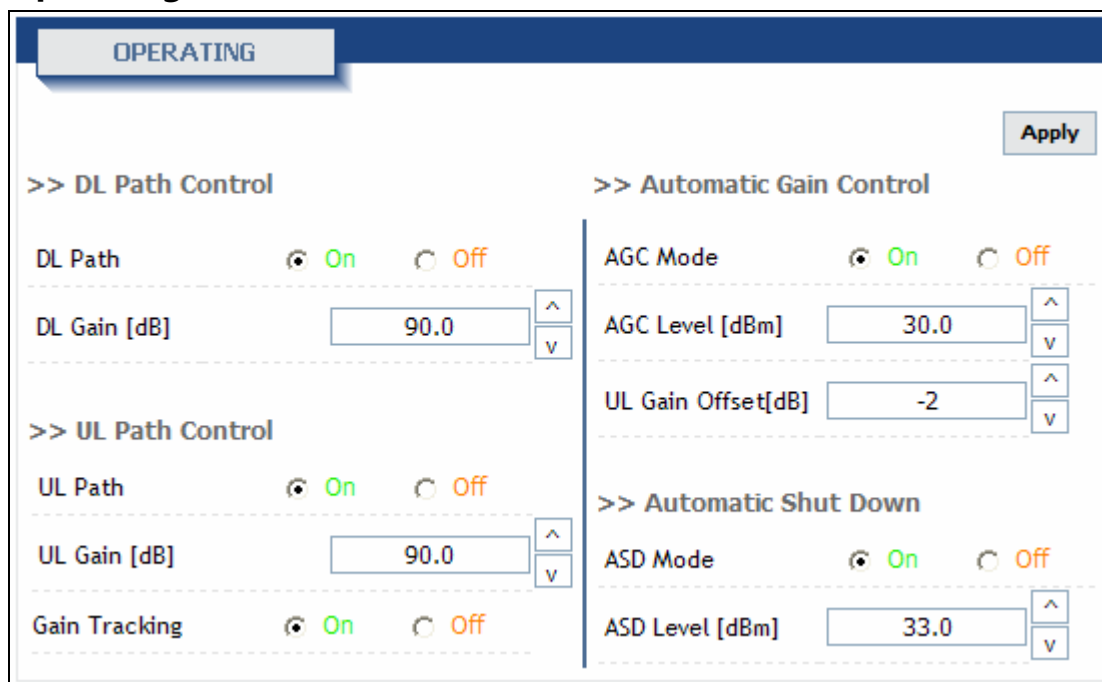
Band	Down-Link	Up-Link	Band Width [MHz]
☐ A	731.000	701.000	4.60
☐ B	737.000	707.000	4.60
☐ C(Lower)	743.000	713.000	4.60
☒ C(Upper)	751.000	782.000	9.05

4.5.1 System Control



- **Easy Setup** is a fast start function. The function measures isolation, detects input level and assign gain to achieve maximum output power. The function ends with the repeater set to amplify signals in both directions within the confines of the band selection. Before running easy setup, set the center frequency and bandwidth
Maximum output power requires at least -60dBm input power and sufficient antenna isolation.
- **Isolation Check** can be executed at anytime to measure isolation between the donor and server antennas. Isolation Check momentarily disables service. Isolation check automatically runs when factory default is initiated.
- **Factory Default** restores the amplifier to its initial state. The function ends with amplifiers off, AGC mode off, gain set to minimum(60dB) and UL gain offset set to 0dB. Band selection and all other system parameters are not changed. The feature is useful in clearing abnormal conditions.
- **System Reset** cycles the microprocessor unit. The function is similar to switching off/on the repeater power switch.

4.5.2 Operating Control



The screenshot shows the 'OPERATING' control interface with an 'Apply' button in the top right. It is divided into four main sections:

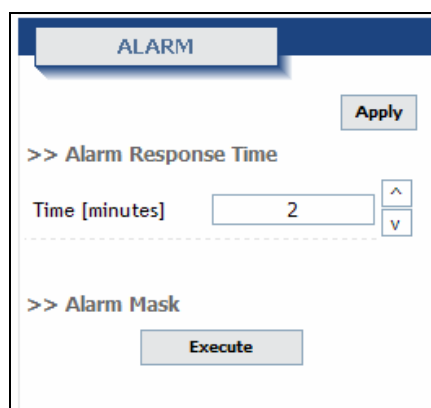
- >> DL Path Control:**
 - DL Path: ☒ On ☐ Off
 - DL Gain [dB]: with up/down arrows.
- >> UL Path Control:**
 - UL Path: ☒ On ☐ Off
 - UL Gain [dB]: with up/down arrows.
 - Gain Tracking: ☒ On ☐ Off
- >> Automatic Gain Control:**
 - AGC Mode: ☒ On ☐ Off
 - AGC Level [dBm]: with up/down arrows.
 - UL Gain Offset[dB]: with up/down arrows.
- >> Automatic Shut Down:**
 - ASD Mode: ☒ On ☐ Off
 - ASD Level [dBm]: with up/down arrows.

- **DL and UL Path Control** allows the user to toggle on or off the power amplifiers.
- **DL and UL Gain** is available when AGC mode is off. The user may enter gain values manually. Manual gain control is an alternative to automatic gain control (AGC). Manual gain is disabled (grayed out) when AGC mode is on. Gain cannot be controlled manually above the available gain found on the status page. The system will not allow gain to be increased such that maximum output power (30dBm) is exceeded.
- **Gain Tracking** sets UL gain equal to DL gain. The feature helps maintain forward and reverse link balance. The function control is grayed out when AGC mode is on.
- **Automatic Gain Control :**
 - In contrast to manual gain control, **automatic gain control (AGC)** sets gain such that the desired amplifier output level (dBm) is automatically set.
 - The user controls gain by adjusting the **AGC level**. The user may set the level from 0dBm to 30dBm. AGC can be used to control the signal level radiated from the server antenna.
 - AGC may also be used to match the repeater to a DAS (distributed antenna system). AGC level may be restricted by available gain and DL input power.
- **UL Gain offset** is used in conjunction with AGC to reduce the amount of amplification in the reverse direction (uplink). In the cases UL offset is set to -2dB.
- **Automatic Shutdown (ASD):**
 - ASD temporarily shuts down the amplifier if the ASD level is exceeded. It is not necessary to turn off ASD. ASD events are stored in the alarm history log. Repeated ASD events will

eventually shutdown the amplifier permanently and trigger the external shutdown lamp.

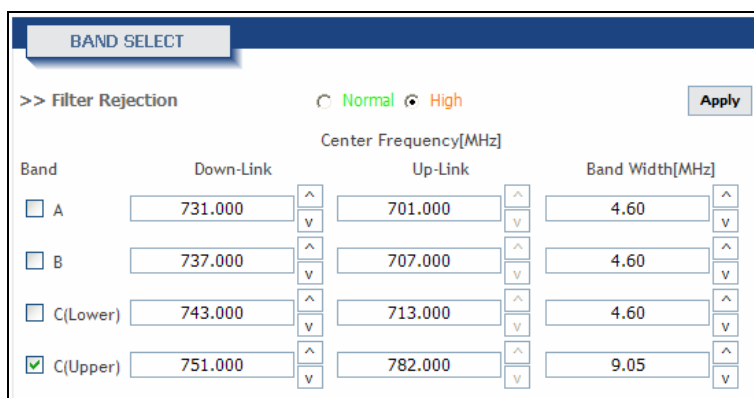
- ASD Level is set to 33dBm by default. It is not necessary to change the default level.

4.5.3 Alarm Control



- **Alarm response time** may be set between 1 and 5 minutes.
- **Alam Mask** allows the user to customize the type of alarms sent to the SNMP server when remote monitoring is in use.

4.5.4 Band Select



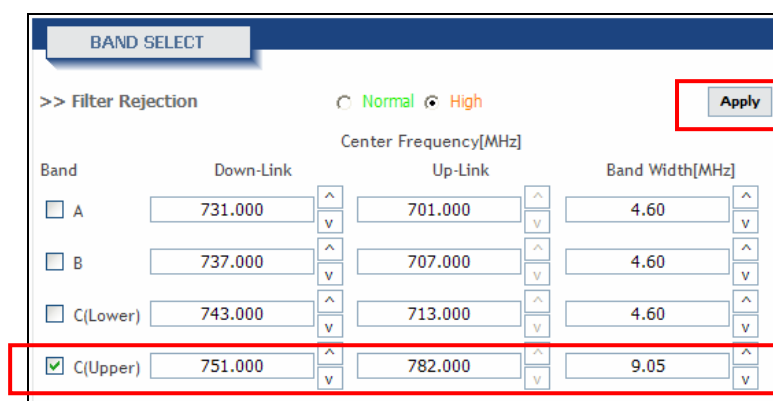
Band	Down-Link	Up-Link	Band Width[MHz]
☐ A	731.000	701.000	4.60
☐ B	737.000	707.000	4.60
☐ C(Lower)	743.000	713.000	4.60
☒ C(Upper)	751.000	782.000	9.05

- Band select sets the digital filter to the **center frequency and bandwidth** of the local service for which the repeater is intended to amplify. Likewise, all other signals outside of the selected **Center Frequency and Bandwidth** are rejected.
- The user can select one, two three distinct sections within the LTE band. Each of the **1st, 2nd and 3rd** filter blocks can be set to 4.52MHz or 9.02MHz of **Bandwidth**. Only the downlink center frequency is set by the user. The uplink center frequency are automatically set in accordance with the downlink frequencies.

4.6 GUI System Setup

4.6.1 Easy Setup

Step 1. Click Apply after setting Center Frequency and Band Width in use.

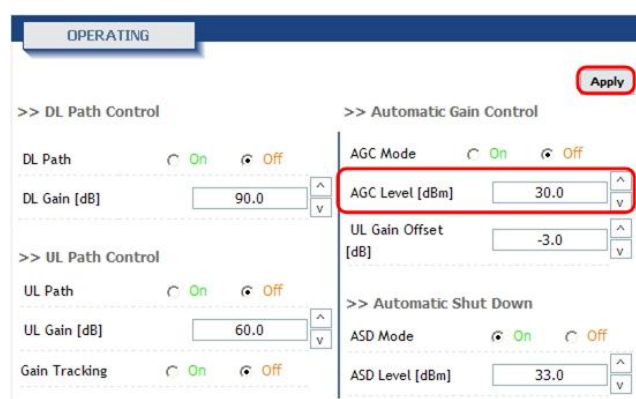
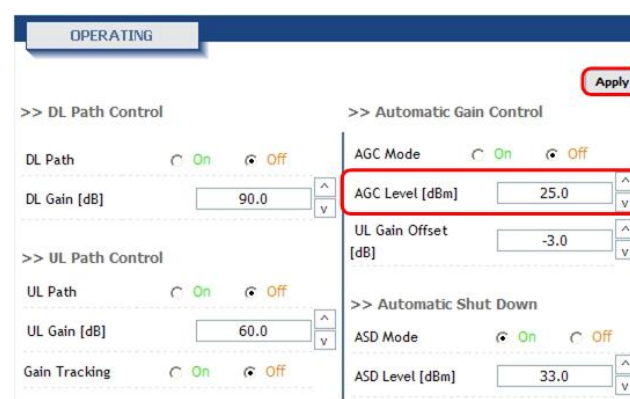


Band	Down-Link	Up-Link	Band Width
☐ A	731.000	701.000	4.60
☐ B	737.000	707.000	4.60
☐ C(Lower)	743.000	713.000	4.60
☒ C(Upper)	751.000	782.000	9.05

Step 2. Input AGC Level desired and click Apply.

1) AGC Level 30dBm

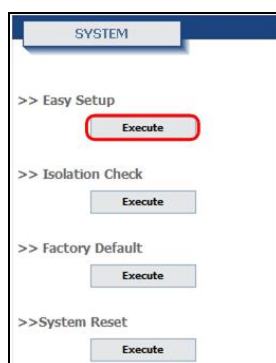
2) AGC Level 25dBm

Step 3. Easy Setup proceeds to:

- Data Initial execution
- Isolation Test executed
- Calculation of Available Maximum Gain by the isolation
- DL/UL Path On
- AGC On to obtain DL Output Power AGC Level or Maximum Gain 90dB
- ASD On
- AGC Off
- Easy setup takes about 60seconds.

Click Execute button of Easy Setup



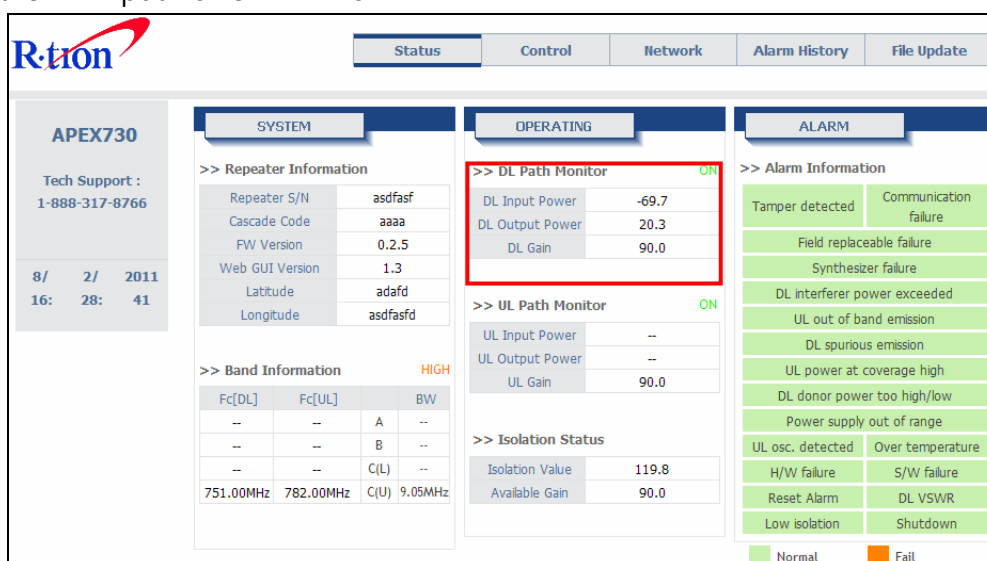
Result 1. Constant Maximum DL Output Power 30dBm (AGC Level 30dBm)

If the DL input Power $\geq$ -60dBm



Result 2. Constant Maximum DL Output Power 20dBm (AGC Level 20dBm)

If the DL input Power $\geq$ -71dBm



4.6.2 Manual Gain Setting

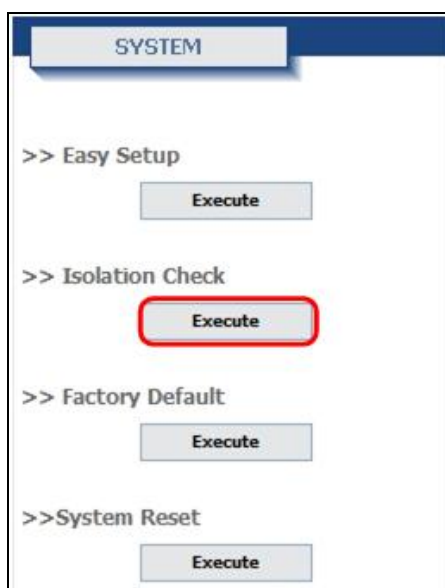
4.6.2.1 AGC mode On Setting

Step 1. Repeat Step 1 through Step 2

Step 2. Isolation Check

The Isolation will calculate the Available Maximum Gain which defines the maximum gain to be setup.

Click Isolation



Step 3. AGC must be turned on. AGC automatically assigns gain in accordance with **AGC level**.

Use AGC level to increase or decrease gain.

(**Gain Offset** is a gain differential between DL Output gain and UL output gain.)

Ex>**AGC Level 30dBm, Gain Offset -3dB → DL Gain 90dB, UL Gain 87dB**

AGC Level 25dBm, Gain Offset 0dB → DL Gain 85dB, UL Gain 85dB

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 Mode ☒ On ☐ Off

AGC Level [dBm]

UL Gain Offset [dB]

>> Automatic Shut Down

ASD Mode ☐ On ☒ Off

ASD Level [dBm]

Step 4. Turn on the **DL** and **UL** path controls.

R-tion
Status Control Network Alarm History File Update

APEX730

Tech Support :
1-888-317-8766

8/ 2/ 2011
16: 20: 3

SYSTEM
OPERATING

>> Easy Setup

>> Isolation Check

>> Factory Default

>> System Reset

ALARM
BAND SELECT

>> Alarm Response Time

Time [minutes]

>> Alarm Mask

>> DL Path Control
>> Automatic Gain Control

DL Path ☒ On ☐ Off

DL Gain [dB]

>> UL Path Control

UL Path ☒ On ☐ Off

UL Gain [dB]

Gain Tracking ☒ On ☐ Off

AGC Mode ☒ On ☐ Off

AGC Level [dBm]

UL Gain Offset [dB]

>> Automatic Shut Down

ASD Mode ☒ On ☐ Off

ASD Level [dBm]

>> Filter Rejection ☐ Normal ☒ High

Band	Down-Link	Up-Link	Band Width [MHz]
☐ A	731.000	701.000	4.60
☐ B	737.000	707.000	4.60
☐ C(Lower)	743.000	713.000	4.60
☒ C(Upper)	751.000	782.000	9.05

4.6.2.2 AGC mode Off setting

When you want to set gain value not using Auto Gain control refer to the following.

Step 1. For manual gain control AGC must be turned off.

APEX730 USER MANUAL V1.0.00

Tech Support: 1-888-317-8766

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Apply

>> Automatic Gain Control

AGC Mode ☐ On ☒ Off

AGC Level [dBm]

UL Gain Offset [dB]

>> Automatic Shut Down

ASD Mode ☒ On ☐ Off

ASD Level [dBm]

Step 2. The user can select any gain value as long as it does over-drive the amplifier or exceed isolation requirements. Gain is automatically limited where conditions do not permit high gain. Select the **DL** and **UL Gain values**. Turn on the **DL** and **UL path controls**.



 Status **Control** Network Alarm History File Update

APEX730

Tech Support :
1-888-317-8766

8/ 2/ 2011
16: 32: 29

SYSTEM

OPERATING

>> Easy Setup

Execute

>> Isolation Check

Execute

>> Factory Default

Execute

>> System Reset

Execute

>> DL Path Control

DL Path ☒ On ☐ Off

DL Gain [dB]

90.0

>> UL Path Control

UL Path ☒ On ☐ Off

UL Gain [dB]

90.0

Gain Tracking ☐ On ☒ Off

>> Automatic Gain Control

AGC Mode ☐ On ☒ Off

AGC Level [dBm]

UL Gain Offset[dB]

>> Automatic Shut Down

ASD Mode ☒ On ☐ Off

ASD Level [dBm]

ALARM

BAND SELECT

>> Alarm Response Time

Apply

Time [minutes]

>> Alarm Mask

Execute

>> Filter Rejection ☐ Normal ☒ High **Apply**

Band	Down-Link	Center Frequency[MHz]	Up-Link	Band Width[MHz]
☐ A	731.000		701.000	4.60
☐ B	737.000		707.000	4.60
☐ C(Lower)	743.000		713.000	4.60
☒ C(Upper)	751.000		782.000	9.05

APEX730 USER MANUAL V1.0.00

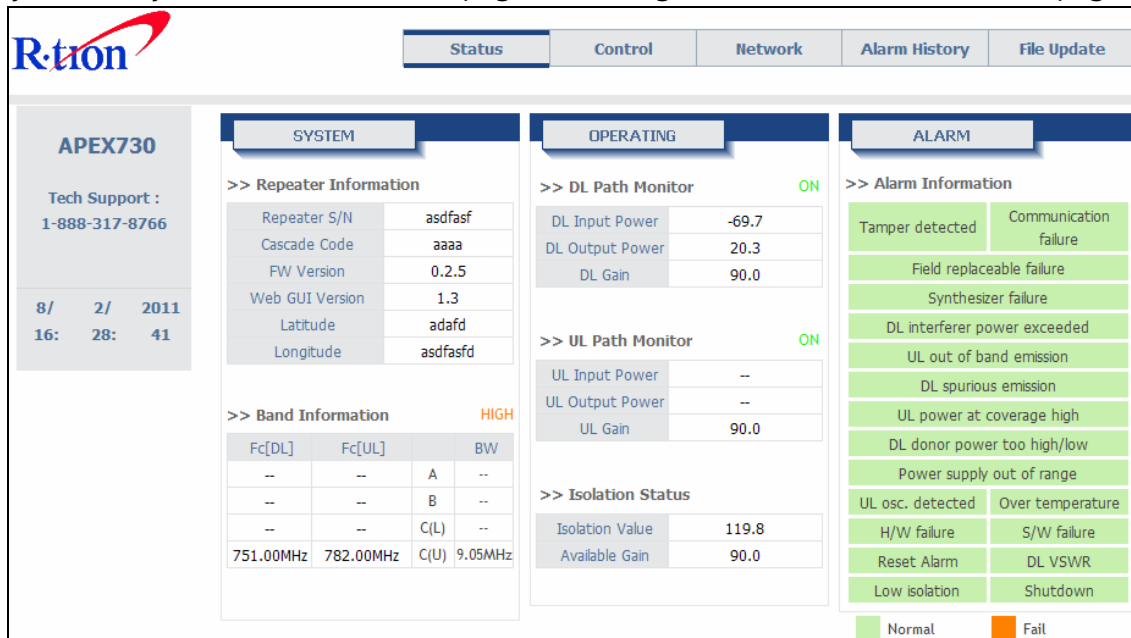
Tech Support: 1-888-317-8766

26

4.7 GUI Status

The status page display system, control, and alarm information.

When you set any value on the Control page the change will be reflected on Status page.



APEX730

Tech Support :
1-888-317-8766

8/ 2/ 2011
16: 28: 41

SYSTEM

>> Repeater Information

Repeater S/N	asdfasf
Cascade Code	aaaa
FW Version	0.2.5
Web GUI Version	1.3
Latitude	adafd
Longitude	asdfasfd

>> Band Information **HIGH**

Fc[DL]	Fc[UL]	BW
--	--	A
--	--	B
--	--	C(L)
751.00MHz	782.00MHz	C(U) 9.05MHz

OPERATING

>> DL Path Monitor **ON**

DL Input Power	-69.7
DL Output Power	20.3
DL Gain	90.0

>> UL Path Monitor **ON**

UL Input Power	--
UL Output Power	--
UL Gain	90.0

>> Isolation Status

Isolation Value	119.8
Available Gain	90.0

ALARM

>> Alarm Information

Tamper detected	Communication failure
Field replaceable failure	
Synthesizer failure	
DL interferer power exceeded	
UL out of band emission	
DL spurious emission	
UL power at coverage high	
DL donor power too high/low	
Power supply out of range	
UL osc. detected	Over temperature
H/W failure	S/W failure
Reset Alarm	DL VSWR
Low isolation	Shutdown

Normal Fail

<Status>

4.7.1 System

- Firmware version and location are displayed under **Repeater Information**.
- The **Band Information** setting, set from the control page, is shown in bold font.

4.7.2 Operating

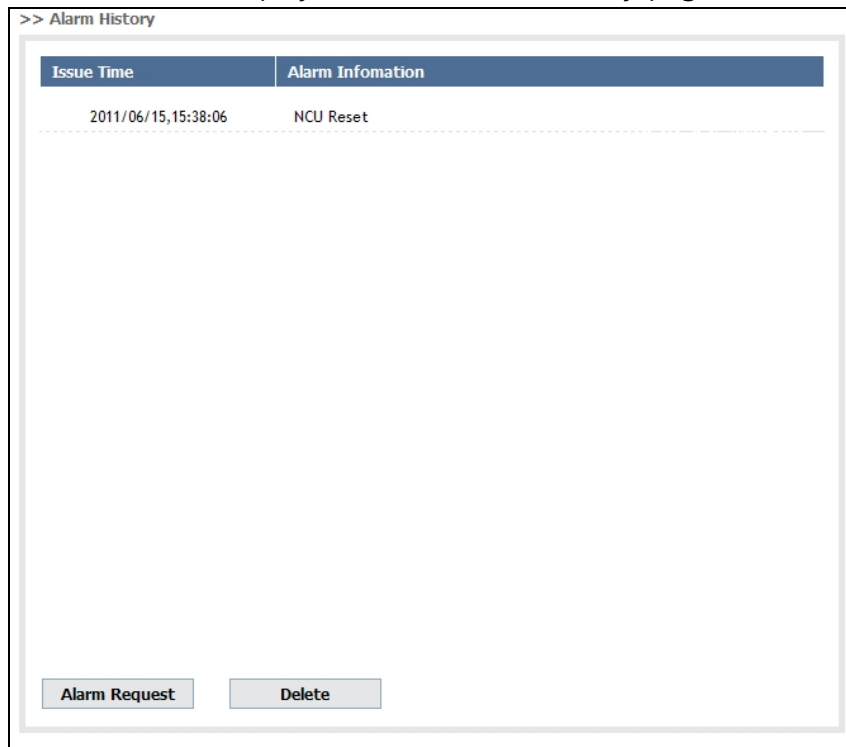
- DL Path Monitor** displays input from the donor antenna circuit, output power at repeater server antenna port, and downlink amplifier gain.
- UL Path Monitor** displays input from the server antenna circuit, output power at repeater donor port, and uplink amplifier gain.
- Isolation Status** shows isolation value (dB) between the donor antenna and server antennas.
- Available gain** allowed by isolation measurement. Available gain is derived from the antenna isolation value plus 15dB. Full system gain (90dB) is available if the antenna isolation value is at least 105dB.

4.7.3 Alarm

- If an alarm occurs, the alarm LED on the repeater will turn on.

Alarms shown on the status page will have orange (alarm) or green (normal) background.

- Details for alarm events are displayed on the Alarm History page.



Issue Time	Alarm Information
2011/06/15,15:38:06	NCU Reset

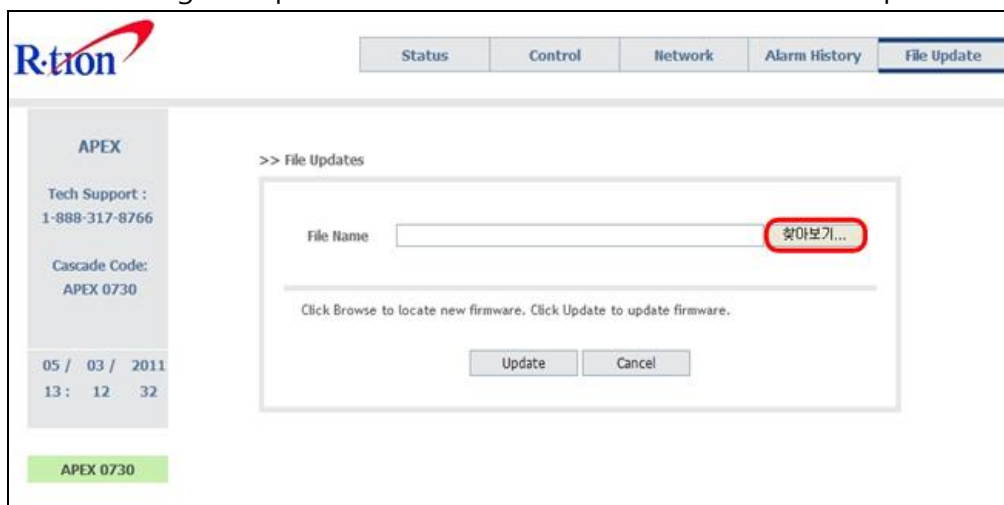
Alarm Request Delete

For corrective action please refer to 6. Troubleshooting section.

4.8 File Update

4.8.1 MCU Firmware, Web GUI Download

Step 1. If you are not sure, follow the LAN cable from the repeater receiving the update to the host repeater. The LAN port number on the host repeater is the slot number for the repeater receiving the update. Use the browse button to locate the update file.

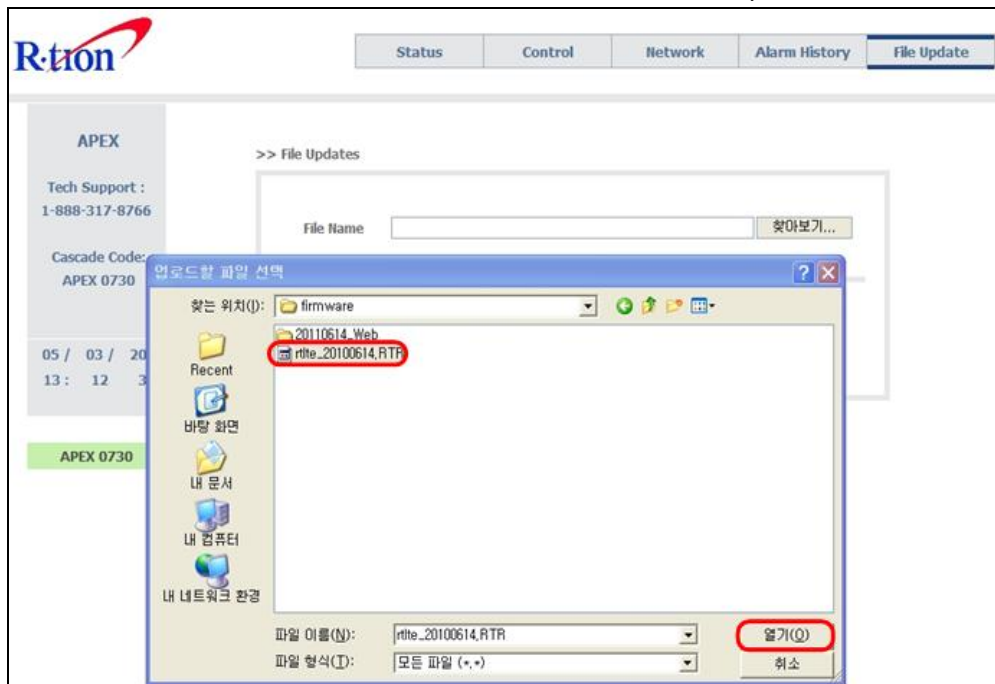


File Name 찾아보기...

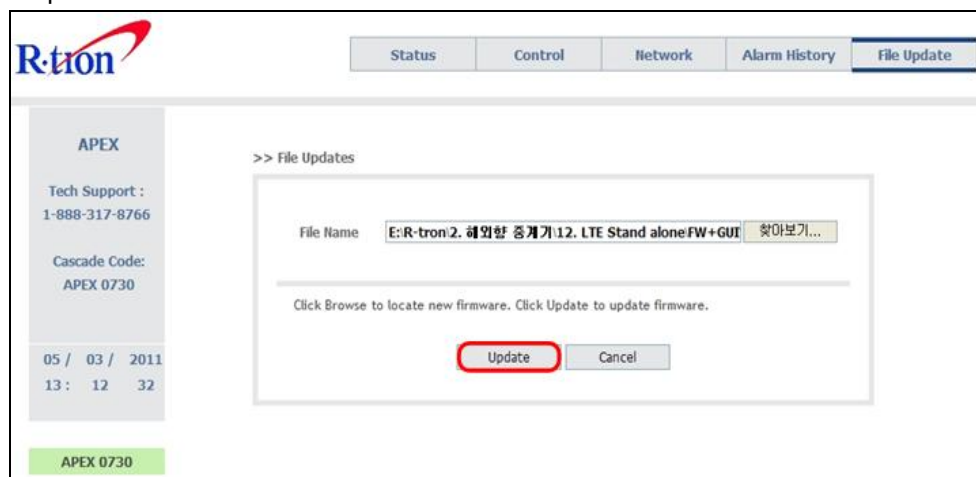
Click Browse to locate new firmware. Click Update to update firmware.

Update Cancel

Step 2. NCU firmware file has a ".RTR" filename extension. Click Open.

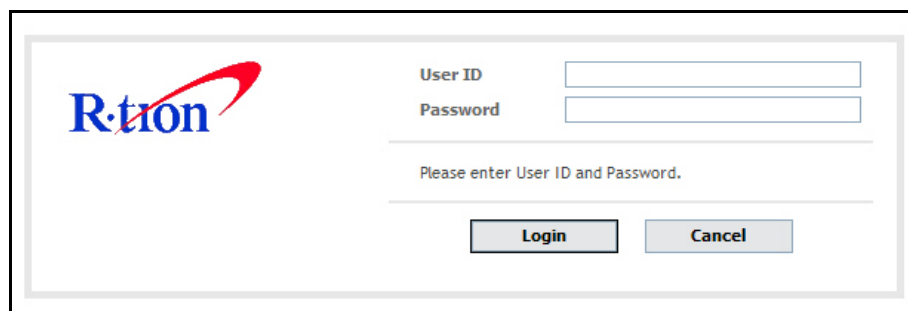


Step 3. Click Update.



Step 4. When File updating completed, go to Log-in page.

Log-in and confirm the firmware version has been updated.



4.9 Attachment

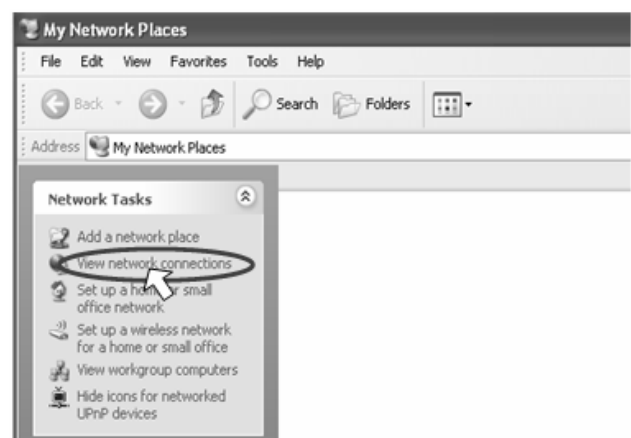
5.9.1 Internet Network Setting

4.9.1.1 Window XP

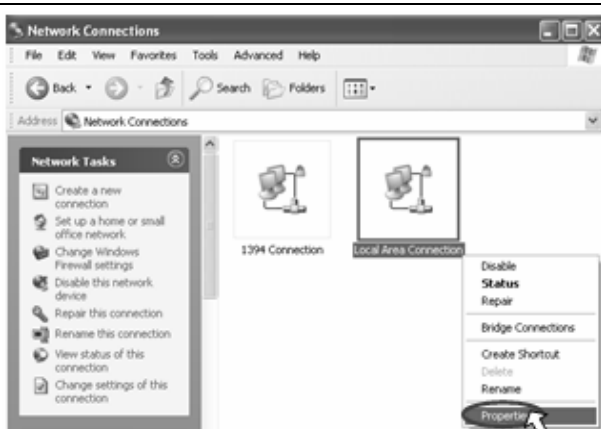
Step 1: Click the Start button and select My Network places.



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.



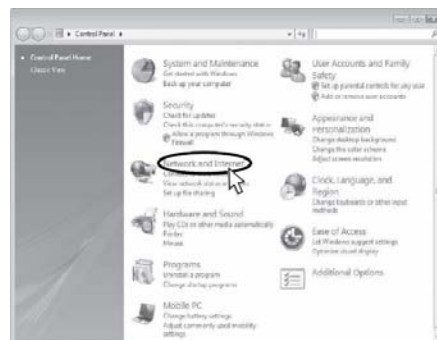
Step 6: Close all widows.

4.9.1.2 Windows Vista

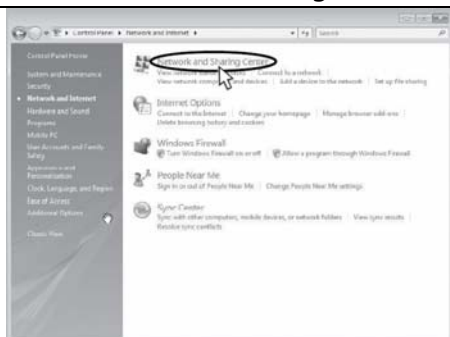
Step 1: Click the Start button and select Control panel.



Step 2: Click Network and Internet



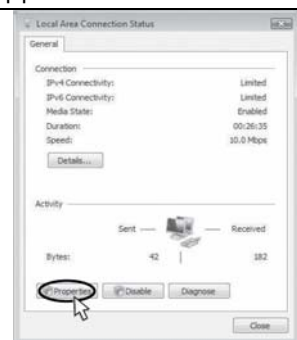
Step 3: Click Network and Sharing Center.



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.

5. Troubleshooting

Before contacting your service dealer, refer to the following guidelines. If the APEX730 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).

External alarm lamps on the front of the repeater indicate current condition. Green lamp indicates power to the repeater, yellow indicates caution, and red indicates shut down

5.1 LED Alarm

Problem	Check Point	Solution
Critical	PWR LED is Flicking	Power supply out of range - Confirm AC 110 - 220V common use power and power cable.
	TD LED is red	Tamper detected - Front Cover open 상태인지 확인한다.
	BTF LED is red	Built-in test failure - Web GUI alarm 상태를 통하여 아래 알람 중 어느 알람이 발생하였는지 확인한다. - UL Out-of-band emissions, DL Spurious emissions, DL Interferer power exceeded, DL Low isolation, Over temperature - Case 2) When Alarm indicator 으로 문제 해결
	RMF LED is red	Replaceable module failure - reset Repeater's power - Repeater's alarm LED is still red, Contact Technical Support
	OSC LED is red	Oscillation detected - Donor / Server ant. Isolation을 확인하여 Gain+15dB 이하인 경우 ant 위치 조정을 하여 Isolation을 확보한다.
	SD LED is red	Shutdown - Web GUI를 이용하여 S/D reason을 확인한다. - Manual HPA Off인 경우 다시 On 시킨다. - Overpower S/D이 발생하고, Manual Gain 설정 상태인 경우 Gain 설정을 적절하게 낮춘다. - Overpower S/D이 발생하고, ALC 기능이 On되어 있는 경우 ALC Level을 1~3dB 낮게 설정하고 장시간 모니터링한 후 이상이 없으면 확정한다. (본 증상은 Input Power 변화가 심한 환경에서 발생할 수 있음)
Minor	DCF LED is orange	Donor Circuitry failure - DL Donor Power too high - 중계기 입력으로 들어오는 DL input Power를 확인한 후 중계기 허용치 이상일 경우 외부 Atten을 달거나 ant 위치를 조정하여 허용치 이내로 들어오게 한다.
	DPL LED is orange	Donor power too low - DL Donor Power too low - 중계기 입력으로 들어오는 DL input Power가

		너무 낮은 경우이며, 입력을 높일 수 있게 ant 위치를 조정한다.
	CCF LED is orange	Coverage Circuitry failure - UL Power at coverage high, DL VSWR - DPL LED가 정상인 상태에서 CCF LED만 발생한 경우 UL Gain을 줄인다. (ALC On 상태에서는 Gain Offset 조정으로 줄일 수 있다.)
	RE LED is orange	Reset engaged - Reset alarm - 중계기가 reset 되는 중이므로 외부에서 절대 중계기 조작을 해서는 안된다.
	AGC LED is Flicking	AGC active - AGC On시 - ALC On 상태로 동작되고 있음을 표시하며 알람 상황은 아님.

5.2 GUI Alarm

Problem	Check Point	Solution
General	Tamper detected	장비의 조립 상태를 확인하고 front cover의 조립 상태가 정상인지 확인한다.
	Power supply out of range	- 입력 전원이 AC 110 - 220V 이내인지 확인 후 이상이 없으면 Contact Technical Support
	Communication failure	장비의 전원을 reset한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Field replaceable module failure	장비의 전원을 reset한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Reset alarm	중계기가 reset 되는 중이므로 외부에서 절대 중계기 조작을 해서는 안된다.
	Manual shutdown alarm	설치 환경을 재 확인 후 이상이 없을 경우 해당 HPA On 한다.
	Heartbeat	Remote NMS Cable 연결 상태를 확인한다. Web GUI내 Heartbeat 주기를 확인한다.
Uplink	Oscillation detected	Donor / Server ant. Isolation을 확인하여 Gain+15dB 이하인 경우 ant 위치 조정을 하여 Isolation을 확보한다.
	Power at coverage port too high	UL Input Power가 너무 높은 경우이며, Coverage ant 설치 환경을 다시 확인한다.
	Synthesizer failure	장비의 전원을 reset한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Hardware failure	장비의 전원을 reset한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Software failure	장비의 전원을 reset한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Out-of-band emissions out of spec	타사 신호등 불요파 성분을 너무 높을 경우 발생할 수 있으며, ant 위치 조정이 필요함.
Downlink	Donor Power too high/low	DL Input Power를 확인하고, ant 위치 조정이 필요
	Low isolation	Donor / Server ant. Isolation을 확인하여 Gain+15dB 이하인 경우 ant 위치 조정을 하여 Isolation을 확보한다.

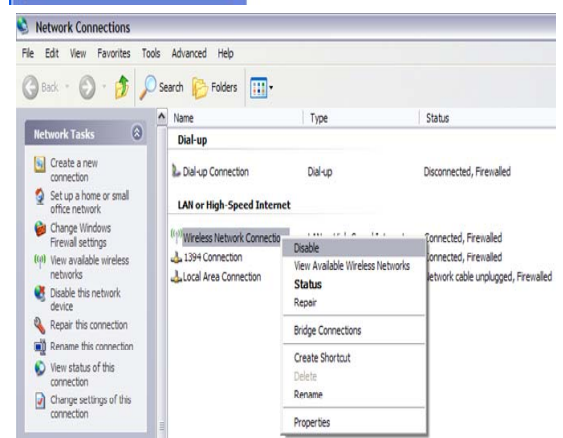
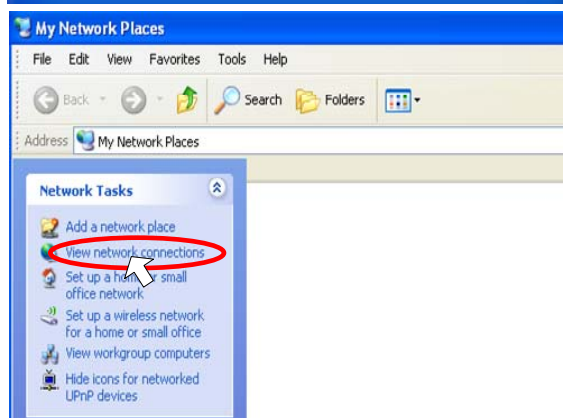
	Synthesizer failure	장비의 전원을 reset 한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Hardware failure	장비의 전원을 reset 한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Software failure	장비의 전원을 reset 한 후에도 동일한 알람이 유지되면 Contact Technical Support
	Spurious emissions out of spec	타사 신호등 불요파 성분을 너무 높을 경우 발생할 수 있으며, ant 위치 조정이 필요함.
	Interferer power exceeded	타사 신호등 불요파 성분을 너무 높을 경우 발생할 수 있으며, ant 위치 조정이 필요함.

5.3 Communication Alarm

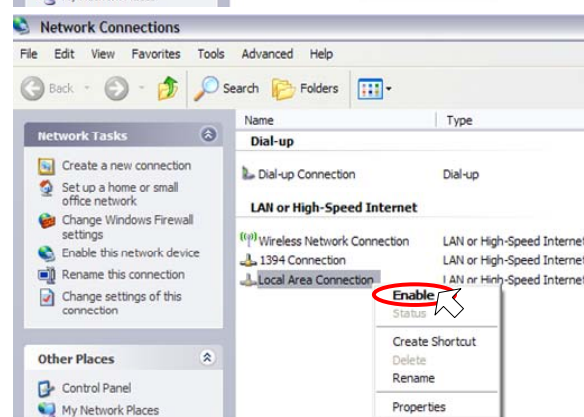
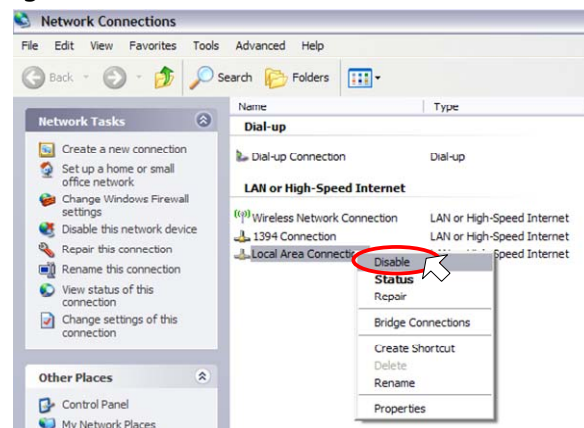
When you cannot login to the web GUI.

Solution

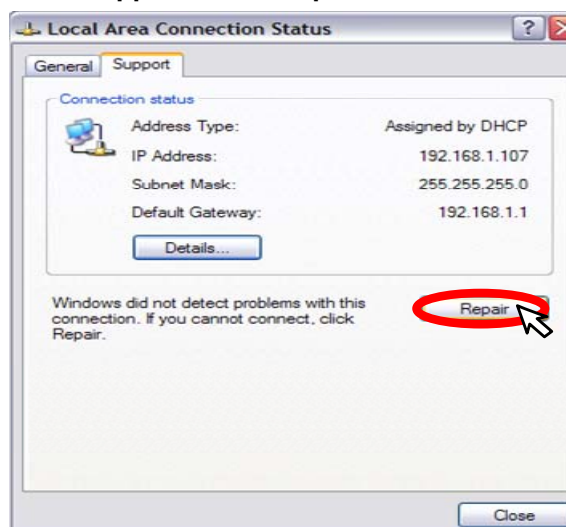
1. Click **My Network places** → **View network connections**. Right-click on the **Wireless Network Connection** and then click **Disable**.



2. Right-click on the **Local Area Connection** and then click **Disable**. After clicking **Disable**, click **Enable** again.



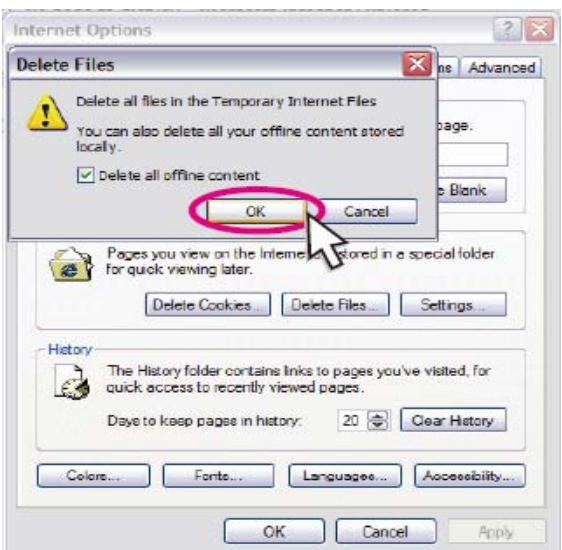
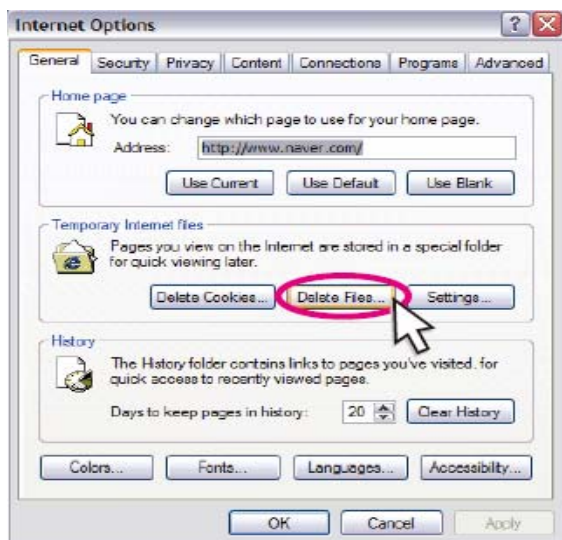
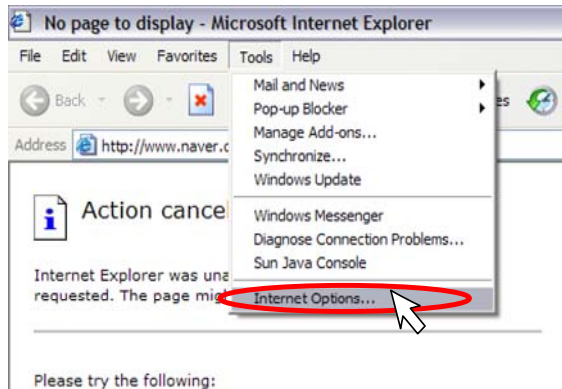
3. Double click the **Local Area Connection** and then click the **Support** tab → **Repair**.



Solution

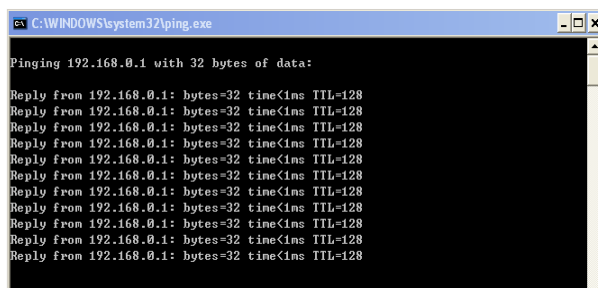
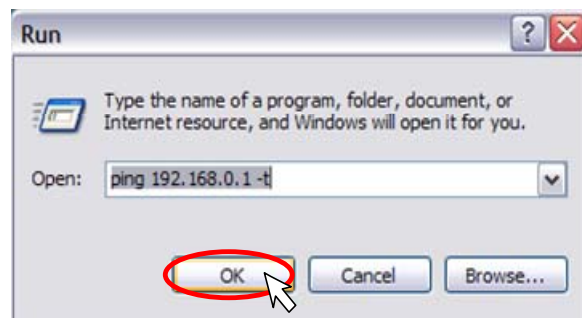
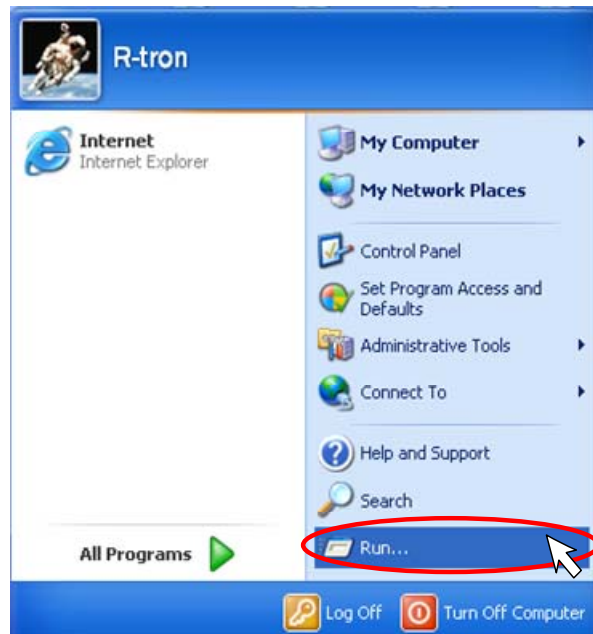
4. Open the Internet Browser, select **Tools** → **Internet Options**.

Click **Delete Files** in the Temporary Internet files section.



5. Click **Start** and select **Run**.

Type "ping 192.168.0.1-t" and click **OK**.



6. Specifications

6.1 RF Characteristics

Parameter		700MHz Band	
		TX(Down-Link)	RX(Up-Link)
Frequency Range		728~745 MHz (ABC block) 746 - 756 MHz (C block)	698~715 MHz (ABC block) 777 - 787 MHz (C block)
Channel Select		Non-continuous A/B/C(Lower)/C(Upper) band Selectable.	
Service		LTE Service	
Max. Composite Input Power		-30dBm	
Composite Output Power Range		30 dBm	30 dBm
Gain Range		60 - 90 dB	60 - 90 dB
Gain Offset		recommend -2dB	
Waveform		EVM Compliance @carrier to noise ratio 25dB (max output, max gain, AGC 30dB)	EVM Compliance @carrier to noise ratio 20dB (max output, max gain, AGC 30dB)
ALC	Range	30 dB	
Gain Ripple		± 0.5-1 dB peak to peak	
Noise Figure		≤ 5 dB	≤ 5 dB
EVM		8%-12.5%	12.5%-17.5%
Spurious Emission		FCC role	
Inter-modulation (two tone)		-40dBm Input@1MHz from band edge (@MAX GAIN, MAX OUT PWR) -40dBm Input@2MHz from band edge (@MAX GAIN, MAX OUT PWR) Output Power Variation<10dB / EVM 규격 변동 없을 것.	
Single Tone Input		-40dBm Input@1MHz from band edge (@MAX GAIN, MAX OUT PWR) Output Power Variation +2 to -4dBm / EVM 규격 변동 없을 것.	
Return Loss		> 15dB	
Propagation Delay		< 6 μs @ high roll-off performance(60 dBc) < 3 μs @ normal roll-off performance(50 dBc)	

6.2 Environmental Specification

Parameter		Specification
Environmental	Operating Temp	-10°C~50°C (14°F~122°F)
	Humidity	20%~90%RH

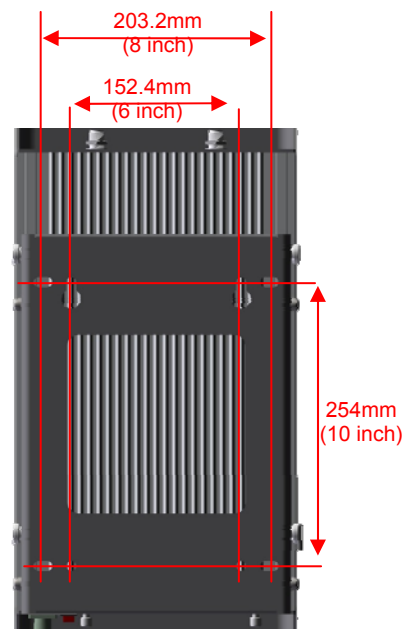
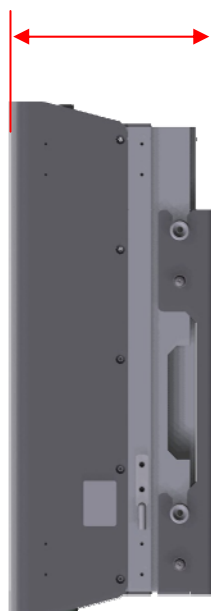
	Cooling method	Convection.
--	----------------	-------------

6.3 Electrical Specification

Parameter	Specification
AC Input	AC 110-220V
DC Output	+24V/6.5A (150W)
Frequency	60Hz

6.4 Mechanical Specification

Parameter	Specifications	Remark
RF connectors	N-female x 2	
Dimensions (WxHxD)	10.1 * 17.91 * 7.38 Inch 257 * 455 * 187.5 mm	W * D * H
Weight	37.04lbs 16.8 Kg max	

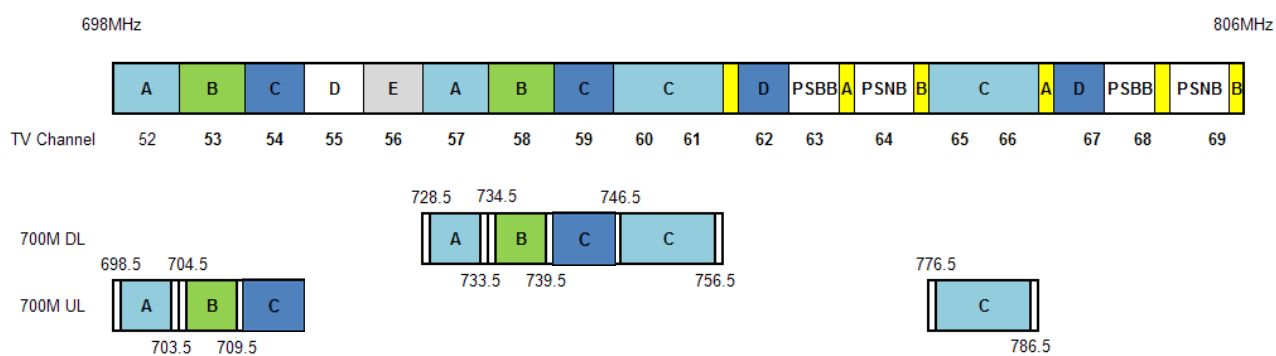


7. Appendix

7.1 US LTE Channel

700M Band			Down Link				Up Link			
No	Block	Channel	Center	Start	Stop	BW	Center	Start	Stop	BW
1	A		731.000	728.7425	733.2575	4.515	701.000	698.7425	703.2575	4.515
2	B		737.000	734.7425	739.2575	4.515	707.000	704.7425	709.2575	4.515
4	C(L)		743.000	740.7425	745.2575	4.515	713.000	710.7425	715.2575	4.515
3	C(U)		751.000	746.4925	755.5075	9.015	782.000	777.4925	786.5075	9.015

700MHz Band



7.2 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.

7.3 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.

