sym Technology, Inc.

Passion for the Mission

Network Vision

User manual for software definable repeater

User Manual for Vision24

< Software Definable Repeater >

This product is intended only for installation in a RESTRICTED ACCESS LOCATION and is designed to operate within the Normal Operating (typical operating) ranges or conditions specified in this document. Operation of this equipment beyond the specified ranges in this document may cause:

1. Spurious emissions that violate regulatory requirements.

2. The equipment to be automatically removed from service when maximum thresholds are exceeded.

3. The equipment to not perform in accordance with its specifications.

It is the operator's responsibility to ensure this equipment is properly installed and operated within SYM Technology operating specifications to obtain proper performance from the equipment and to comply with regulatory requirements.

For PERMANENTLY CONNECTED EQUIPMENT, a readily accessible disconnect device shall be incorporated in the building installation wiring.

Warnings, Cautions, and Notes

Warnings, Cautions, and Notes are found throughout this manual where applicable. The associated icons are used to quickly identify a potential condition that could result in the consequences described below if precautions are not taken. Notes clarify and provide additional information to assist the user.

WARNING: This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical and RF circuitry and be familiar with standard practices for preventing accidents.
To reduce the risk of fire or electric shock, do not expose this appliance to rain or moisture. Working with the repeater while in operation, may expose the technician to RF electromagnetic fields that exceed FCC rules for human exposure.

CAUTION: This caution symbol means user to be careful. In this situation, the user might do something that could result in equipment damage or loss of data.
Use the attached specified power-suply cord. If any another unapproved cord is used, it may cause interference to the equipment. To prevent electric shock, do not use other plug with an extension cord.

NOTE: This note symbol means user to take note. Notes contain helpful suggestions or references to material not covered in the document. Procedures are not contained in notes.

Information in this document is subject to change without notice.
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Revision History

Date	Version	Approval	Description
FEB. 3, 2012	1.0		Document Release
FEB. 22, 2012	1.1		Web GUI change
APR. 1, 2012	2.0		Enclosure and Service Card hardware change
July 18, 2012	2.1		User manual title changed into Vision24
July 24, 2012	2.2		Safety instruction added
Aug 17, 2012	2.3		Photos are replaced

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1. Introduction

This manual contains information and procedures for installation, operation, and maintenance of the Vision indoor system.

The system is future-proof, ready for evolution to advanced modulation schemes like EV-DO (evolution-data optimized) and LTE (Long Term Evolution). Service Cards are available in single- or multi-band configuration for a variety of frequency combinations (3 frequency bands simultaneously), power classes, and system designs.

1.1 Product Description

The Vision platform is a plug-and-play repeater solution that utilizes the medium power and performance for a one sector multi-carrier solution. The Vision provides adjustable downlink power/gain, adjustable uplink power/gain, downlink and uplink signal conditioning, optional remote system status monitoring and remote system configurability via external wireless modem.

The Vision is an in-building RF repeater system and covers SMR 800 MHz/ 900 MHz and CDMA/LTE 1900 MHz bands simultanelosuly. The Vision can provide signal coverage and high quality, fast data transmission.

The Vision has two service cards which are 800/900 MHz card and 1900 MHz card. These cards are bi-directional amplifier units for each band. And the Vision has rectifier and controller card as well. All service cards are mounted through backboard which is located in the main frame enclosure. All RF cables are pre-installed between backboard and filter & combiner units. Filter& combiner units provide common antenna cable connection for all signals.

800/900 MHz service card and 1900 MHz service card include digital filter to select multiple sub-bands (or blocks) easily. When providing LTE service instead of iDEN/CDMA, Vison can provide LTE service without any hardware change as it only requires new bandwith selection for LTE signal. The Vision platform is designed to accommodate a variety and a mixture of different and upcoming technologies.

The Controller of Vision system has the local management ability to control and monitor the status of the repeater and also provides remote monitoring and controlling capability via external wireless modem.

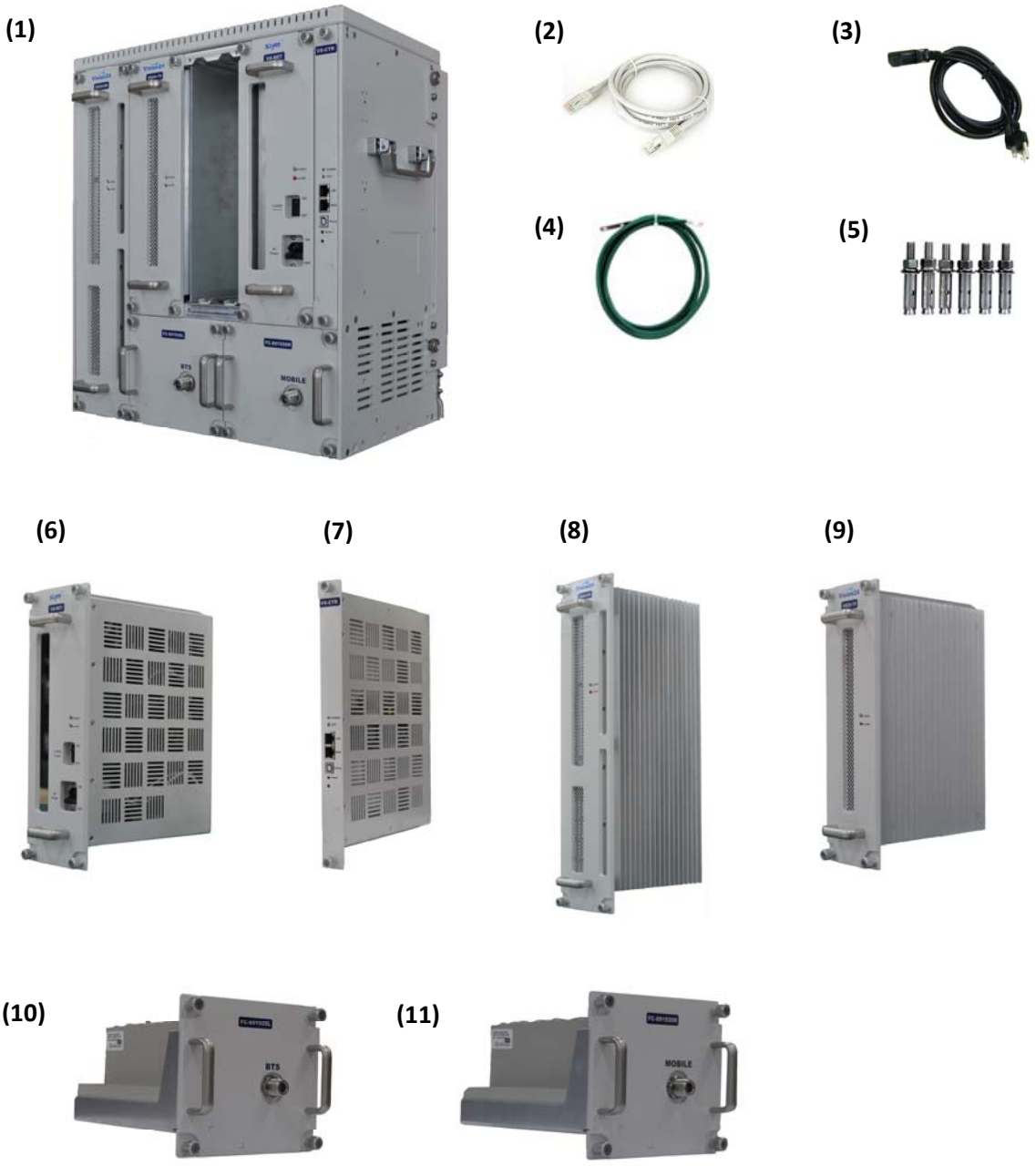
Here are the key features of the Vision.

- Triple-Band Configuration with Selectable Multiple Sub-bands (800/900/1900 MHz)
- Modular Design with Hot Swappable Cards (accommodating up to 2 cards)
- Digital Filtering using High Performance DSP
- Multi-standard platform is technology agnostic (iDEN/CDMA/LTE)
- Installation Wizard: Automatic Installation and Optimization
- Filter & Combiner Units for Common Donor and Sevice Antennas
- Wireless Setup via Wi-Fi
- Downlink Input & Output Power Trend Display (48 hours)
- User Friendly Web-based GUI
- Convection Cooling (No FAN)
- Slim Body Structure

1.2 Contents of Box

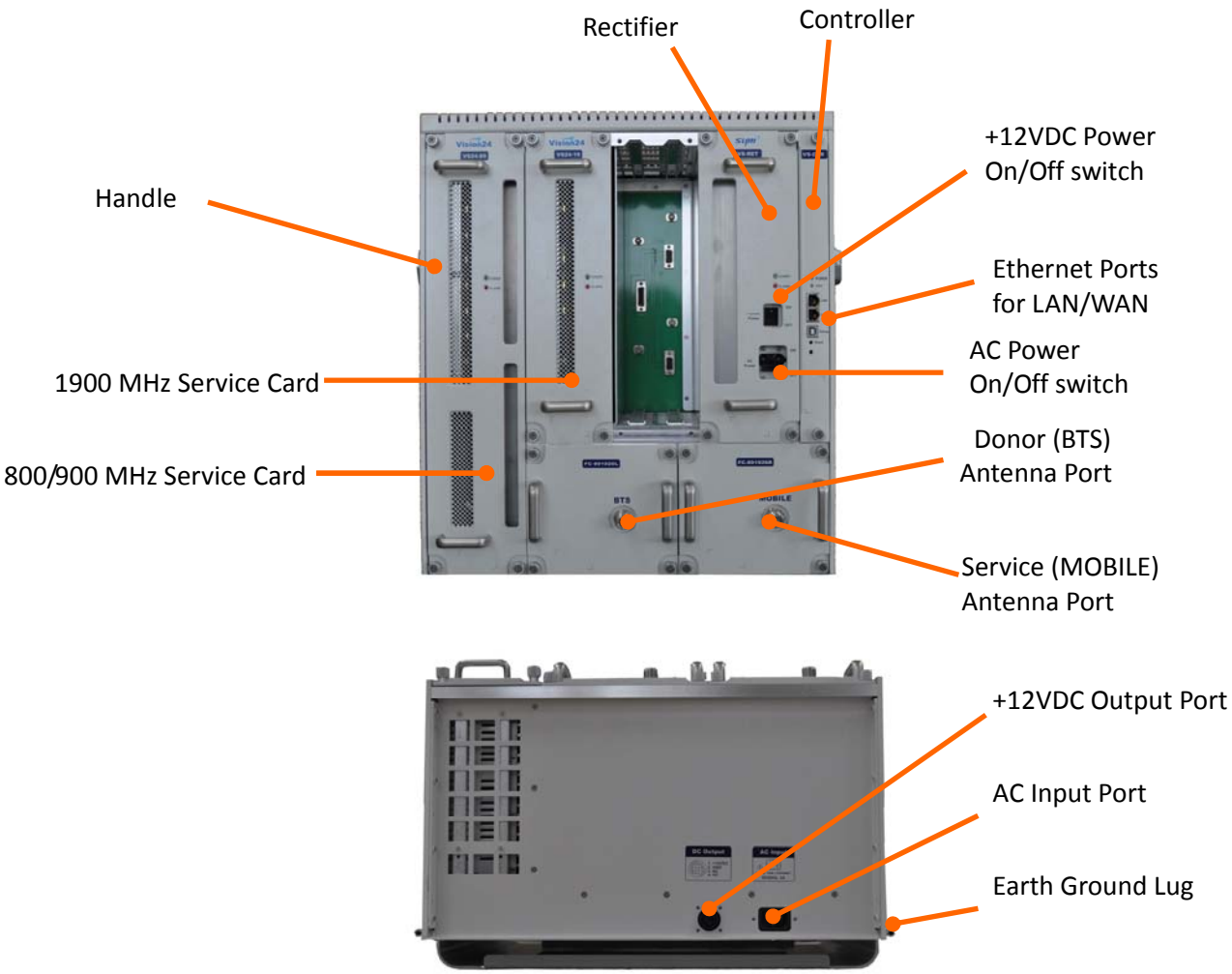
[Table 1-1] Parts List for Vision24 (VS24-F-KIT)

No	Item	Part Number	Qty
1	Vision Main Frame with Filter, RF Cables and wall mount bracket	VS-MF	1
2	Ethernet Cable 6.6ft (2m)	VS-EC01	1
3	Power Cord 5.9ft (1.8m)	VS-PC01	1
4	Ground Cable 6.6ft (2m)	VS-GC01	1
5	Wall Mounting Screws	VS-MB01	6
6	Rectifier	VS-RET	1
7	Controller	VS-CTR	1
8	24dBm, 800/900 MHz Service Card	V24-89	1
9	24dBm, 1900 MHz Service Card	V24-19	1
10	Filter&Combiner for Donor Antena	FC-891926L	1
11	Filter&Combiner for Service Antena	FC-891926R	1



[Figure 1-1] Parts List for Vision

1.3 Glance at the Vision



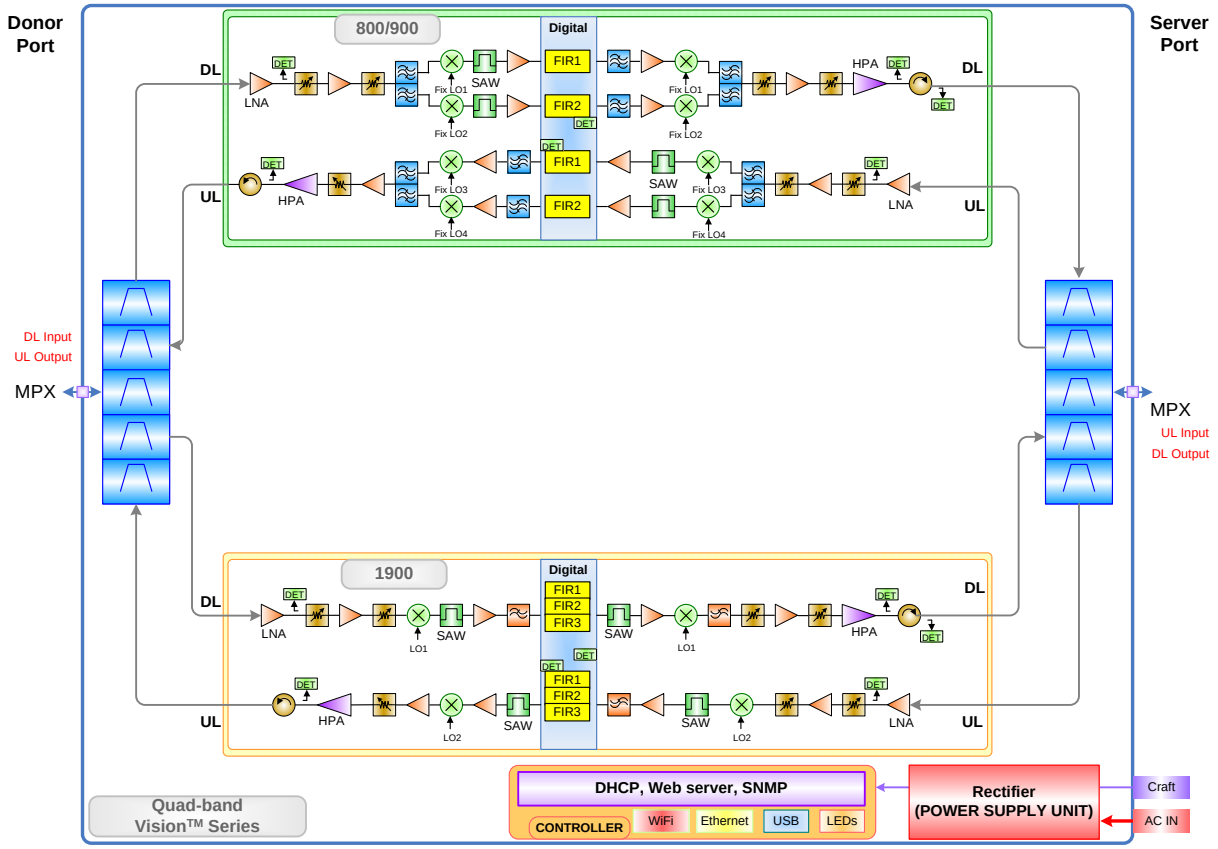
[Figure 1-2] Glance at the Vision

1.4 System Configuration and Technical

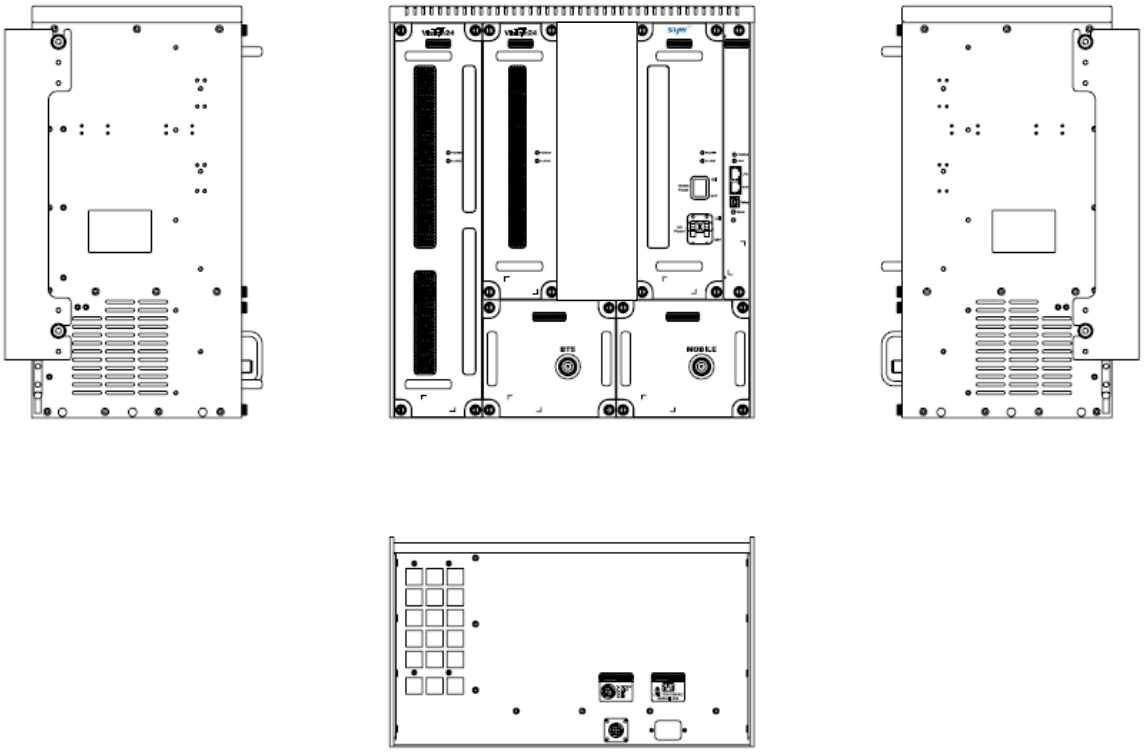
The physical size and enclosure of Vision platform has been optimized for ease of installation. The system is supplied with a heatsink to dissipate heat from the system. The system is designed to withstand its weight when performing wall mounting installation and also provides rack mount brackets to accommodate installation on standard 19” rack. The Vision enclosure includes one rectifier (120 VAC / 60 Hz), one system controller, and filter&combiner units. The IP20 indoor rated enclosure has a sturdy aluminum frame as shown in [Figure 1-2].

The Vision platform is designed with separate service cards where the user can service all two cards

to simultaneously (iDEN and CDMA/LTE network) or may just service one particular network. Each service card has one modularized downlink and uplink converter with power amplifier to minimize the physical size and increase efficiency.



[Figure 1-3] Block Diagram for Vision



[Figure 1-4] Mechanical dimension for Vision platform

[Table 1-2] Mechanical and Environmental Characteristics

Item	Description
Dimenstions (W * H * D)	17.4 * 19.6 * 10 inch (442 * 498 * 254 mm)
Weight	90.6 lbs when fully loaded with an 800/900 card (15.4 lbs) and 1900 card (12.6 lbs)
Cooling	Conventional Cooling (No FAN)
AC Power	110 ~ 125 VAC, 60 Hz
Operating Temperature	+14 °F to +122 °F (-10 °C to +50 °C)
Relative Humidity	5% to 95% non-condensing
RF connectors	N-type female (BTS and MOBILE ports)
Ethernet Interface	RJ-45 jack (LAN and WAN)
12VDC Output Connector	Circular Receptacle (206430-1)
Earth Ground Lug	Copper Compression Terminal (7/8” two hole)
Mounting Method	Wall Mount and 19” Rack Mount
Certificates	UL 60950-1, FCC part 15, part 90 and part 24
Environmental	RoHS compliant (EU Directive 2002/95/EC)

1.4.1. 800/900 MHz Service Card

[Figure 1-5] 800/900 MHz Service Card view

The 800/900 MHz service card consists of up/down converter with internal power amplifier, digital filter module based on high-performance FPGA.

The following are the key features of 800/900 MHz service card.

- Very flexible Bandwidth: 0.25 MHz to 18 MHz (by 0.25 MHz step)
- One Click Frequency Shifting: 200 kHz Band Shifting
- Support 2 Non-contiguous Sub-bands
- Center Frequency is adjustable by 25 KHz step for Each Sub-band

1.4.2. 1900 MHz Service Card

[Figure 1-6] 1900 MHz Service Card view

The 1900 MHz service card consists of up/down converter with internal power amplifier, digital filter module based on high-performance FPGA.

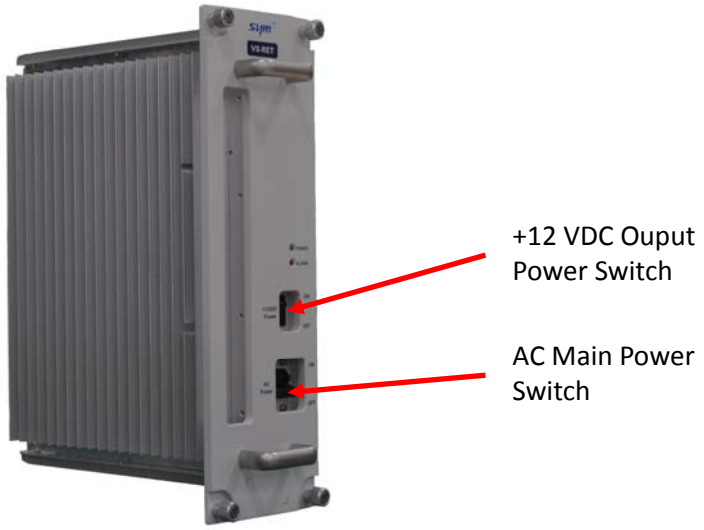
The following are the key features of 1900 MHz service card.

- Very flexible Bandwidth: 1.25 MHz to20 MHz (by 1.25 MHz step)
- Support 3 Non-contiguous Sub-bands
- Center Frequency is adjustable by 50 kHz step for Each Sub-band
- Maximum Instantaneous Bandwidth: up to 60 MHz

1.4.3. Rectifier

The Rectifier is designed to take AC power and supply all necessary power throughout the system and uses only industrial grade components.

It takes in 110 ~ 125 VAC and converts to 3.5 VDC, 6.5 VDC, 12 VDC and 28 VDC and distributes necessary DC power to each module of the system.



[Figure 1-7] Rectifier view

1.4.4. Controller

[Figure 1-8] Controller view

The main functionality of Controller is to monitor the status and control each module of the system via LAN port (RJ-45 jack). The LEDs on front panel of the Controllor display the operation status of each service card. And it has a Wi-Fi AP module in the controller, so then it can support wireless setup without connecting actual Ethernet connection.

CAUTION:

Lithium Battery: Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

1.4.5. Filter & Combiner

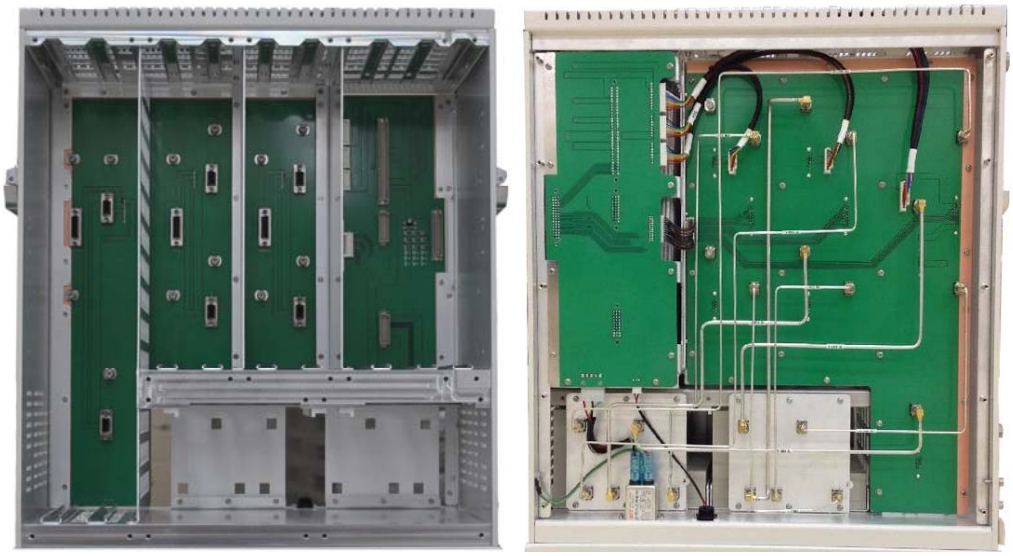
Filter&Combiner for Donor Antenna Filter&Combiner for Service Antenna

[Figure 1-9] Filter&Combiner views

There are no antenna ports on each service card of the system. Instead, all service cards are combined through filter&combiner units for downlink and uplink. This means the Vision system allows you to put a multi-band combiner unit to be able to use multi-band antenna through one combined port. There

are one Filter&Combiner to take signal input from BTS via donor a`ntenna and the other Filter&Combiner to distribute signals to passive DAS (Distribution Antenna System) or service antenna.

1.4.6. Main Frame



[Figure 1-10] Main Frame front and rear views

The Main Frame includes backboard which can have interface with all service cards, rectifier, controller and filter&combiner units. RF cables are pre wired on the rear of the backboard. This helps user install all units without connecting any RF cables except antenna cables.

2. Installation

This chapter contains unpacking, inspection, installation instructions, and recommendations for installing the Vision indoor system.

It is important to perform the following:

- Carefully read all material in this chapter prior to equipment installation.
- Review any government and local codes as they apply to your installation.
- Before operating, read the instructions in chapter 3.

SYM Technology recommends that a site survey be performed by a qualified individual or firm prior to equipment ordering or installation. Performing a detailed site survey reduces or eliminates installation and turn-up delays. Pay particular attention to AC power availability, space and RF cabling required.

2.1 Unpaking and Inspection

This equipment has been operated, tested and calibrated at the factory. Carefully open the containers and remove the equipment. Retain all packing material that can be reassembled in the event that the unit must be returned to the factory. Please perform the following steps:

- Visually inspect for damage that may have occurred during shipment. If possible, inspect the equipment in the presence of the delivery person.
- Check for evidence of water damage, bent or warped chassis, loose screws or nuts, or extraneous packing material in connectors.

If the equipment is damaged, the carrier is the first area of recourse. Determine the extent of damage and then file a claim with the carrier.

If the equipment must be returned to the factory, please refer to chapter 4.3 for information concerning a Return Material Authorization (RMA).

2.2 Installation Considerations

Environmental conditions of the installation location should be within the system operational specifications. In general, areas with good airflow, thus providing natural ventilation

Normal installation requires 120VAC single phase input. Special consideration should be given to lightning protection of all systems in view of the vulnerability of most transmitter sites to lightning. Lightning arrestors are recommended in the service entrance. Straight, short ground runs are recommended. The electrical service must be well grounded.

The Vision is designed for installation in locations that permit access to the bottom of the enclosure for connection of AC input power, DC output power and RF cables.

[Table 2-1] lists the tools that the installer needs. Refer to [Figure 2-3] and [Figure 2-4], for mounting examples and mounting brackets.

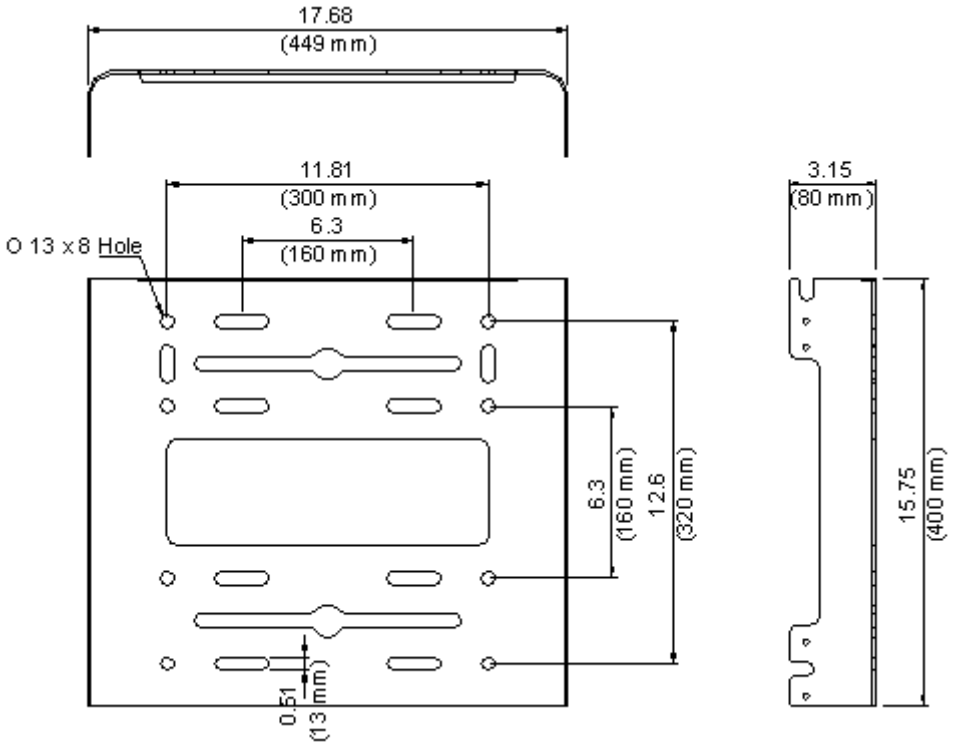
[Table 2-1] Tools needed for installation (not supplied)

Tools needed	Where used
Crimp tool	Ground cables
Electrician's knife	Earth ground
Cable Cutter	Ground cables
Roto Hammer	Wall Mounting Bracket
Drill Bit	Wall Mounting Bracket
20 mm Open-end wrench	Tightening and loosening N connectors
Slotted Screwdriver	Mounting Bracket and Enclosure
Spectrum Analyzer (800 to 3,000 MHz)	System performance checks and setting output power
30 dB; 50-watt Attenuators	Spectrum Analysis
Digital Volt-Ohm Meter	Verify power
RF Cables	Test setup

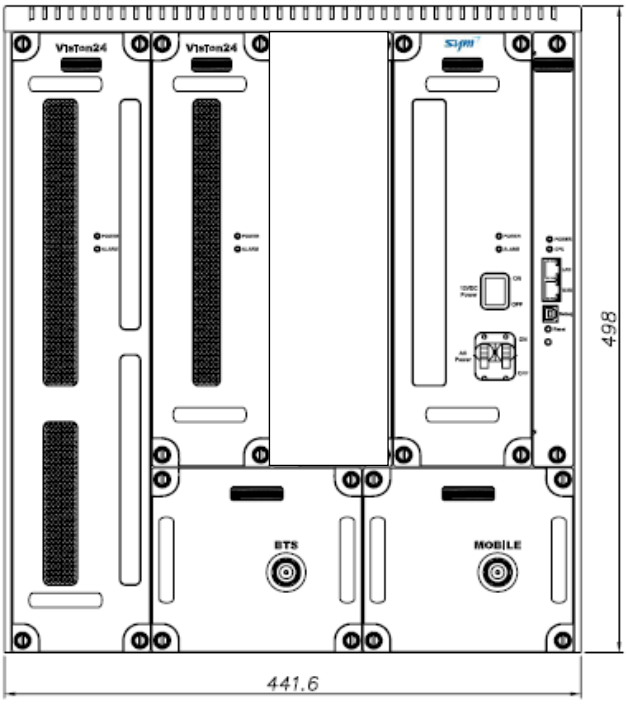
Mount the enclosure onto its designated location. Verify that sufficient space to slide the modules in and out is available and that the air intake and exhaust vents are not blocked. A minimum of 8-inches (203 mm) of free space is required at both the top and bottom of the enclosure to properly cool the system. The mounting dimension with bolt size requirements is shown in [Figure 2-1] and [Figure 2-2].

CAUTION: Do not install the service card until the enclosure is completely installed at a permanent location.

WARNINGS: Thumbscrews should be tightened with a tool after both initial installation and subsequent access to the panel.



[Figure 2-1] Wall Mount Bracket Dimension



[Figure 2-2] Rack Mount Dimension Drawings

2.3 Wall Mounting Procedure

Eight mounting holes are provided on the wall-mounting bracket to attach it to the wall. The wall bracket must be securely attached to sufficiently carry the weight of the Vision enclosure, which is bolted to the wall bracket through four aligned mounting holes.

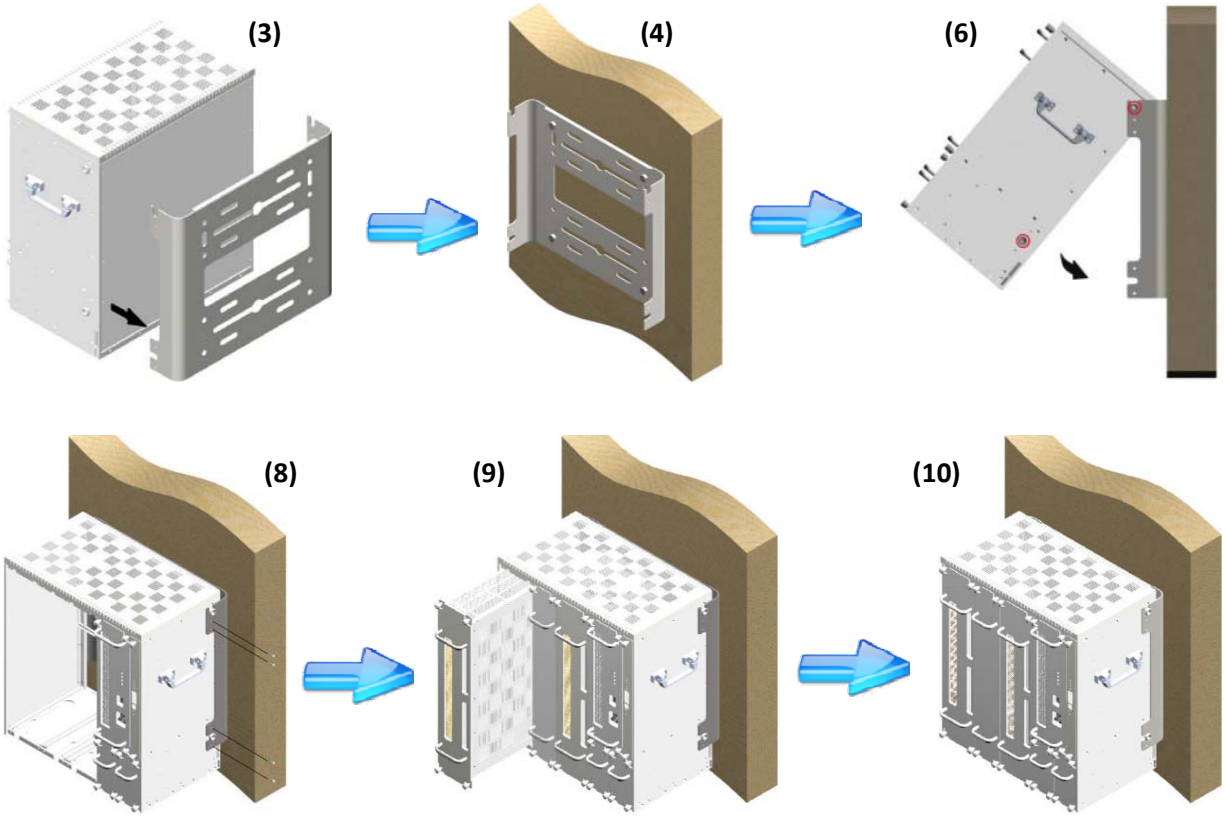
The following steps should be followed while mounting the Vision enclosure:

(1) Take the Vision enclosure out of the box
(2) Take the all Service Cards out of the enclosure
(3) Detach the mounting bracket from the Vision enclosure by unscrewing the 8 screws on the bracket. (4 on each side)
(4) Using the four anchor bolts, mount the bracket on the wall
(5) Make sure the bracket is securely mounted
(6) Slightly tilt the Vision enclosure and mount the enclosure onto the wall as shown in the picture. Hook the upper 2 guard screws first and then slide/push in the lower 2 guard screws into the place.
(7) Make sure the Vision enclousre is securely placed onto the wall bracket
(8) Fasten the 8 bracket screws back properly
(9) Slide each Service Card into the slot and make sure they are pushed in all the way

Note: Inspect Service Card rear 15-pin D-Sub connector. Verify all pins are straight, not recessed, and alignment shield is not bent.

CAUTION: When installing the Service Card, do not use excessive force. Forcing the Service Card into the enclosure will cause the pins on the 15-pin D-Sub connector of the Service Card to become recessed or broken.

(10) After sliding Service Cards into enclosure, to secure Service Cards, tighten top and bottom four captive screws.
(11) Inspect everything is secure
(12) Refer to chapter 3.2 for initial turn-on, checkout, and power setting procedures.



[Figure 2-3] Wall mounting installation

2.4 Rack Mounting Procedure

Eight mounting holes are provided on the rack-mounting bracket to attach it to the 19” rack. The rack bracket must be securely attached to sufficiently carry the weight of the Vision enclosure, which is bolted to the rack bracket through eight aligned mounting holes.

The following steps should be followed while mounting the Vision enclosure:

(1) Take the Vision enclosure and rack mount brackets out of the box
(2) Take the all Service Cards out of the enclosure
(3) Detach the wall mounting bracket and handles from the Vision enclosure by unscrewing the 8 screws on the bracket. (4 on each side)
(4) Attach the rack mounting bracket to the Vision enclosure by screwing the eighteen flat head screws on the bracket. (9 on each side)

(5) Identify the exact location for Vision enclosure and use the 8 mount bolts to stabilize the Vision encousure. (4 on each side)

(6) Make sure the bracket is securely mounted

(7) Slide each Service Card into the slot and make sure they are pushed in all the way.

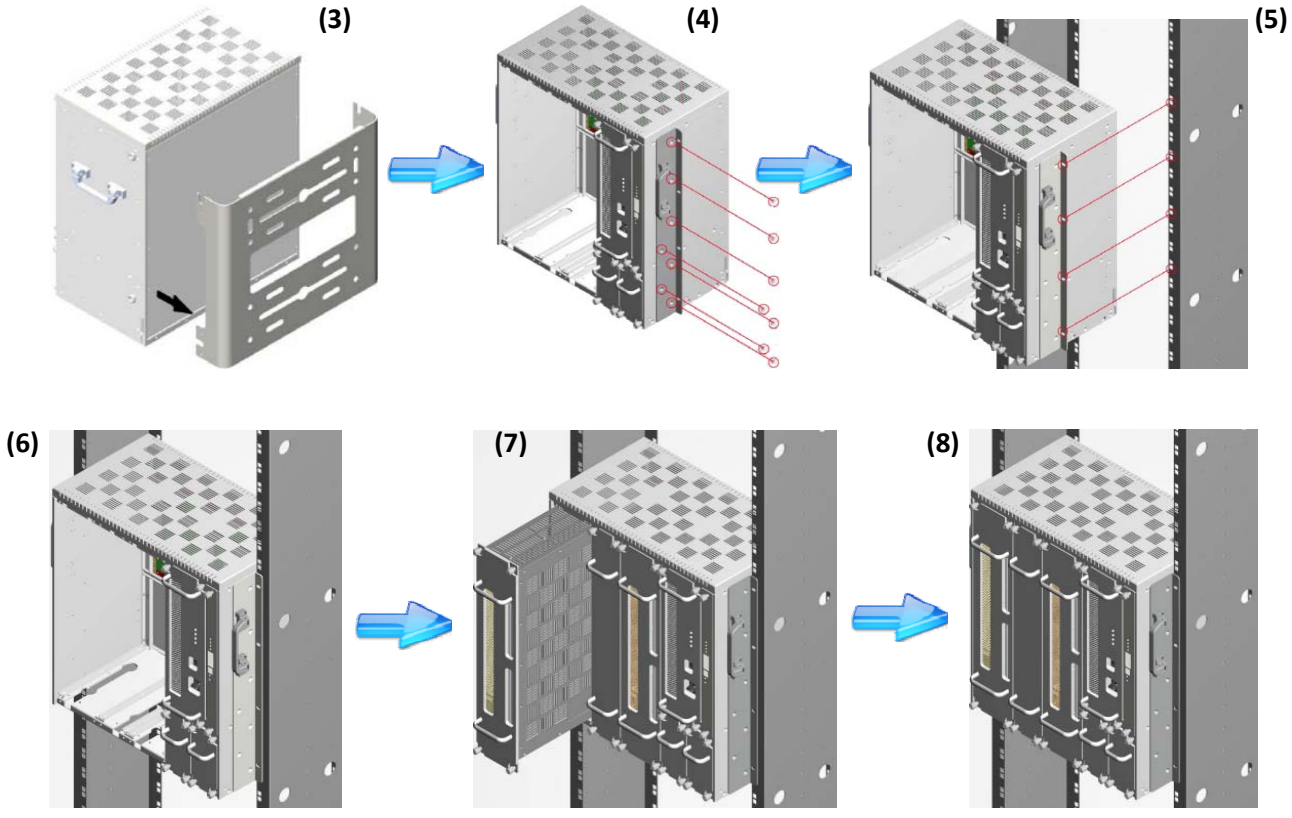
Note: Inspect Service Card rear 15-pin D-Sub connector. Verify all pins are straight, not recessed, and alignment shield is not bent.

CAUTION: When installing the Service Card, do not use excessive force. Forcing the Service Card into the enclosure will cause the pins on the 15-pin D-Sub connector of the Service Card to become recessed or broken.

(8) After sliding Service Cards into enclosure, to secure Service Card, tighten top and bottom four captive screws.

(9) Inspect everything is secure

(10) Refer to chapter 3.2 for initial turn-on, checkout, and power setting procedures.



[Figure 2-4] Rack mounting installation

WARNINGS:

A) Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

B) Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

C) Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

D) Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

E) Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips)."

2.5 Electrical Installation

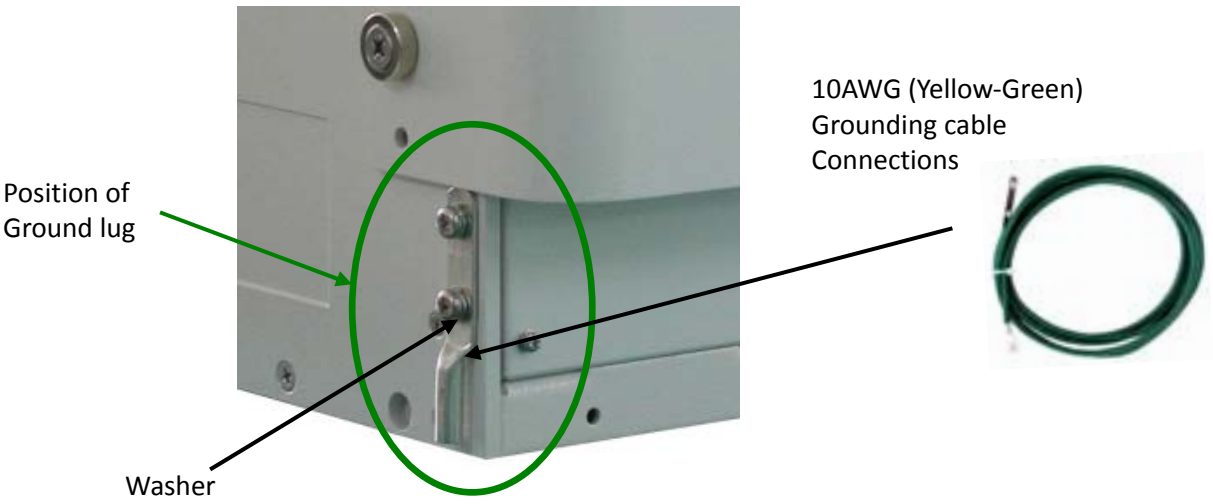
Read the Warnings, Cautions, and Notes.

The Vision is designed for installation in locations that permit access to the bottom of the enclosure for connection of AC input power, +12VDC output power (for external wireless modem, UWMS-01) and RF cables.

WARNINGS: This unit used dangerous voltages. Loss of life, severe personal injury or property damage can be the result if the instructions contained in this manual are not followed. It is compulsory to ground the unit before connecting power supply. A grounding cable (yellow-green, 10AWG) is provided on the enclosure to connect the earth ground cable.

2.5.1 Grounding

Grounding must be carried out. Connect an earth-bonding cable to the grounding connection provided at the both side panels of the Vision enclosure. Do not use the grounding connection to connect external devices.



[Figure 2-5] Grounding cable connection

Connect the ground cable, provided in the Vision enclosure box, with PH5 * 8 mm pan head bolts.

CAUTION: The PE cables must have a minimum cross section of 5.5 mm^2. The local ground cable requires an adequate ear for the M5 GND bolt.

2.5.2 Connection of the Antenna Cables

The connections for antennas are located at the front of the The Vision.

[Figure 2-6] Antenna port on the Vision

CAUTION: Tighten the N connectors only by hand or torque wrench. The use of pliers may cause damage to the connector and impair the performance of the Vision.

WARNINGS: Exposure to Radio Frequency Radiation

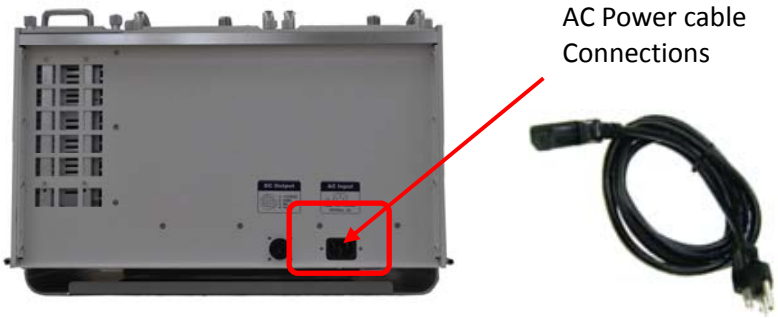
The radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, this device should be used in such a manner that the potential for human contact during normal operation is minimized. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, the minimum separation distance of 7.9 inches (20 cm) must be maintained between human body and antenna of the Vision to satisfy FCC RF exposure requirements. For more RF exposure information, please visit the FCC website at www.FCC.gov

Note: Separation between Donor (BTS) antenna and Service (MOBILE) antenna is necessary to prevent oscillation. Oscillation occurs when the signal entering the system continually re-enters, due to the lack of separation between the Donor and Service antennas. As a result, the noise level rises above the signal level. To prevent feedback, the Donor and Service antennas must be separated by an appropriate distance to provide sufficient isolation. This distance is dependent on the gain of the repeater. A sufficient isolation value is 15 dB greater than the maximum gain of the Vision.

2.5.3 AC Power Connection

Before connecting electrical power to the unit, the system must be grounded as described in the previous chapter (2.5.1).

The main AC power input socket is located on the bottom of Vision enclosure. Main power must be connected at the mains connector. The power cable is included with the Vision enclosure packing box.



[Figure 2-7] AC power input socket on the Vision

CAUTION: A minimum cross section of 0.83 mm^2 is required for the power supply connection. Each wire must observe the applicable national regulations regarding loop impedance, voltage drop, and methods of installation.

CAUTION: Do not connect or disconnect the power cord at the AC main connector while power is on. Turn off AC power switch before connecting the power cord at the unit, then turn on AC switch again.

2.5.4 Ethernet Connection

The Ethernet ports are located on front of the Vision controller as shown below in **Error! Reference source not found.**8].

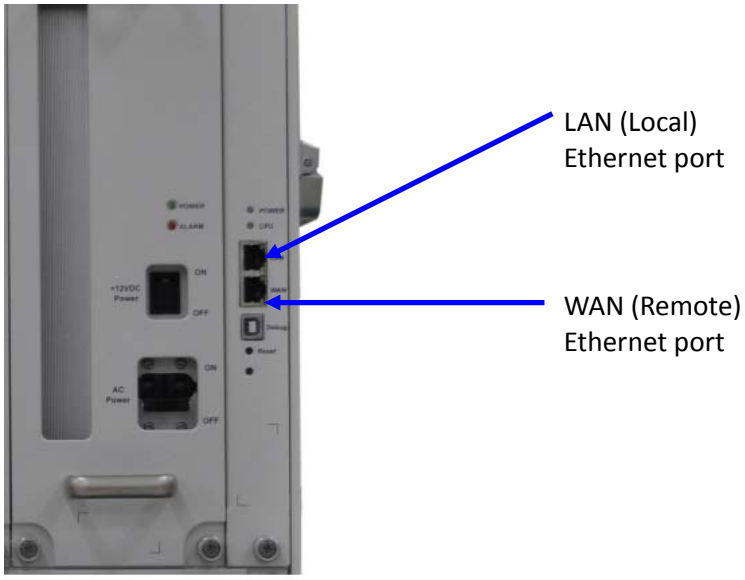
LAN Ethernet Port (for laptop connection)

The Vision can be configured locally with the built-in web-based graphical user interface. Using a provided standard Ethernet cable, connect your laptop to the “LAN” port on the Vision controller. The LAN connection is easy to set up and much faster in operation. The LAN connection should be used for initial setup and whenever the operator is at site.

However, before you connect your laptop to the LAN port, verify your laptop’s Local Area Connection

setting. For more detail information, please refer to “3.3.1 network connection”.

After the connection is made properly, the red and green LEDs near the Vision’s Ethernet connector will flash. The network hardware will determine the highest speed supported by both devices. With most PC’s, the operating system will automatically establish the hardware and software network connection.

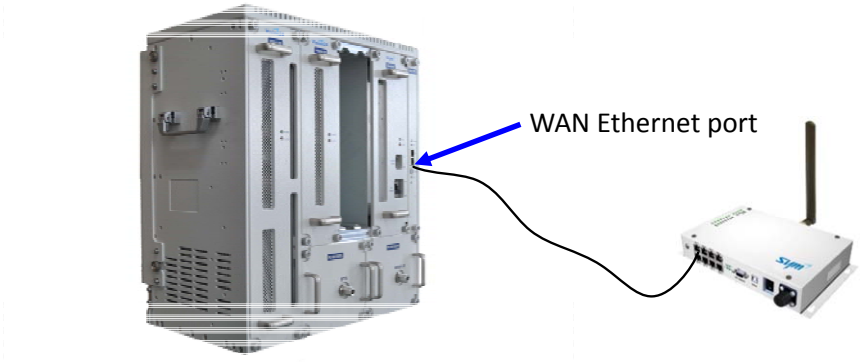


[Figure 2-8] Ethernet port on the Vision

WARNINGS: Ethernet Instructions: This equipment is for indoor use and all the communication wiring is limited to inside of the building.

WAN Ethernet Port (for external wireless modem, UWMS-01)

This port is used for connection of Vision and external wireless modem for remote access. This port should be selected if a CDMA/EVDO modem box (UWMS-01) is being installed along with the Vision. An IP address of the WAN port is configured with **192.168.1.2**, static address.



[Figure 2-9] WAN port connection to an UWMS-01

3. Operation

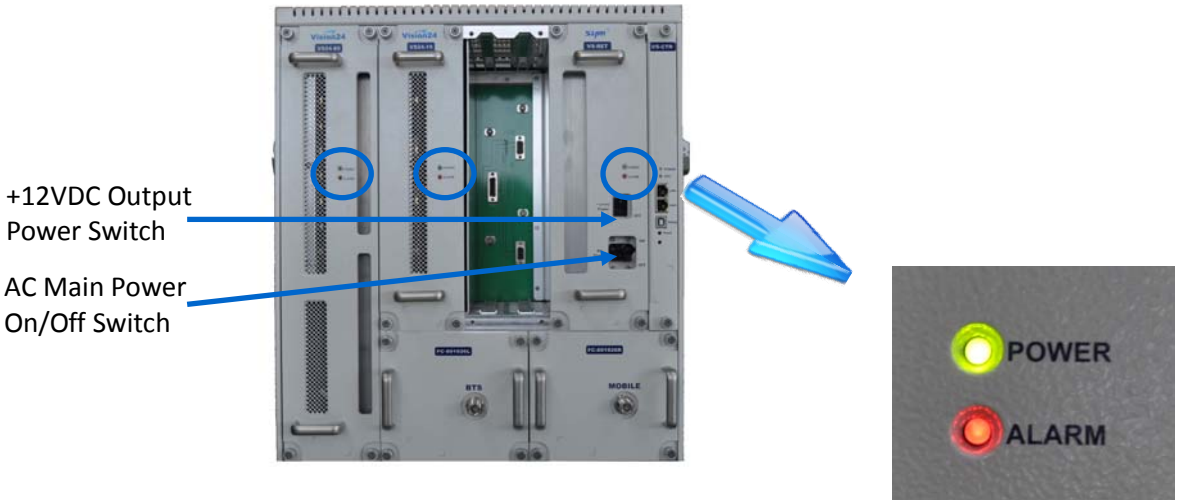
This chapter contains a description of the SYM Technology Vision indoor System controls and indicators, initial start-up and operating procedures, and power setting procedures.

3.1 System Indicators

When installation of the Vision enclosure, Service Cards, grounding cable, antenna connection and AC power cord is completed, turn on the AC power switch on the front panel of the rectifier, as shown on [Figure 3-1] below.

3.1.1 System Status Indicators

The system front panel status indicators are shown in [Figure 3-1] and descriptions are listed in [Table 3-1]. The rectifier powers up automatically when system AC power is set to “ON”.



[Figure 3-1] Front Panel

[Table 3-1] System Status Indicators

LED Indicators	Descriptions
800/900 MHz Service Card	- POWER (Solid Green): Power on - ALARM (Solid Red): Alarm & shutdown
1900 MHz Service Card	- POWER (Solid Green): Power on - ALARM (Solid Red): Alarm & shutdown
Rectifier	- POWER (Solid Green): Power on - ALARM (Solid Red): Alarm (Service Card off)

Note: The Vision platform is a plug-and-play and the power will be supplied to service cards, once AC

power switch is set to “ON”. There is no separate DC swtich for service cards.

3.1.2 Controller Status Indicators

The location and function of the Vision controls and indicators is shown in [Figure 3-2] and described in the paragraphs that follow. The controls and indicators for the Controller consist of the LAN port, WAN port, Debug port, Boot/Reset button and status indicator LED as shown in [Figure 3-2]. The status indicator LED has two-color capability: Green, Red, and indicates the status of the controller as listed and described in [Table 3-2].

[Figure 3-2] Controller Front Panel Controls and Indicators

[Table 3-2] Controller Status Indicators

Item	Descriptions	
LED Indicators	POWER	-Solid Green: Power on
	CPU	- Solid Green or Off: Abnormal status - Blinking Green: Normal status
Ethernet Interface	LAN	- Laptop Connection
	WAN	- External Wireless Modem connect
USB	Debug	- CPU Debug port
Reset	Controller Reboot	

3.2 Initial start-up and power setting procedures

Before start up Vision, please read chapter 3.3 if you are not familiar with Vision web GUI.

> **Note:** The Vision must be warmed up for a minimum of 10 minutes prior to setting power levels. Failure to properly warm the Vision may result in lower output power, once the Vision reaches operating temperature.

To perform the initial start-up, proceed as follows:

(1) Verify that all Donor (BTS) and Service (MOBILE) antenna port cables are properly connected.

(2) Check the connection status between Power cable and Ground cable.

CAUTION: Do not operate the Vision without a load attached. Excessive input power may damage the service card.

(3) Check to make sure the 120VAC power cord is properly connected to the system.

(4) Check the antenna connections.

(5) Turn on the AC power switch on the rectifier front panel.

(6) Access web based GUI through web browser and LAN port

(7) Check the level of input power of each service card. And change the antenna position in case of input over drive alarm is triggered.

(8) Check the system alarm on health windows of Web-based GUI. If any signal doesn't come from donor RSSI input when the system is turned on, Input Low alarms arises. But the Vision is normal.

(9) Refer to chapter 3.2.1 for the power setting instructions. How to set up the gain is explained in chapter 3.3.4.2.

3.2.1 800/900 MHz Power Setting Procedures

(1) Ensure the composite downlink input power to the 800/900 MHz service card is < -27 dBm.

(2) When Downlink input power to the 800/900 MHz service card is at a proper level, turn on the DL HPA using Web based GUI.

(3) Adjust the DL gain setting to generate maximum output power using Web based GUI. Refer to [Table 3-3] below.

(4) Determine the output power level at the Service (MOBILE) antenna port.

[Table 3-3] DL Gain setting of Downlink input power in case of V24-89 (24dBm model)

DL Input Power	DL Gain	DL Output Power
-57 dBm	81 dB	24 dBm
-47 dBm	71 dB	24 dBm
-37 dBm	61 dB	24 dBm
-27 dBm	51 dB	24 dBm

Note: Downlink and uplink gain is factory present to minimum gain. Refer to system specifications in chapter 5.

CAUTION: If the output power level at the front of the Service antenna port exceeds the Vision's specified capability, reduce the DL gain until the Vision output power rating is met.

(5) Adjust DL/UL AGC Limit Level below the System maximum output power, if AGC operation needed.

(6) Adjust the UL Gain level equal to or below DL Gain level.

Note: When using UL Gain Tracking in Web GUI, UL Gain will be automatically set based on DL Gain setting.

(7) Turn on the UL HPA after setting UL Gain or UL Gain Tracking.

(8) When all setting is completed, check to make sure system gain and output power are at proper level.

(9) Check the system alarm on health windows of Web-based GUI

(10) Measure the Downlink ouput power and spurious to make sure they are properly set.

3.2.2 1900 MHz Power Setting Procedures

(1) Ensure the composite downlink input power to the 1900 MHz service card is < -30 dBm.

(2) When Downlink input power to the 1900 MHz service card is at a proper level, turn on the DL HPA using Web based GUI.

(3) Adjust the DL gain setting to generate maximum output power using Web based GUI. Refer to [Table 3-4] below.

(4) Determine the output power level at the Service (MOBILE) antenna port.

[Table 3-4] DL Gain setting of Downlink input power in case of V24-19 (24dBm model)

DL Input Power	DL Gain	DL Output Power
-60 dBm	84 dB	24 dBm
-50 dBm	74 dB	24 dBm
-40 dBm	64 dB	24 dBm
-30 dBm	54 dB	24 dBm

Note: Downlink and uplink gain is factory present to minimum gain. Refer to system specifications in chapter 5.

CAUTION: If the output power level at the front of the Service antenna port exceeds the Vision's specified capability, reduce the DL gain until the Vision output power rating is met.

(5) Adjust DL/UL AGC Limit Level below the System maximum output power, if AGC operation needed.
(6) Adjust the UL Gain level equal to or below DL Gain level.

Note: When using UL Gain Tracking in Web GUI, UL Gain will be automatically set based on DL Gain setting.

(7) Turn on the UL HPA after setting UL Gain or UL Gain Tracking.
(8) When all setting is completed, check to make sure system gain and output power are at proper level.
(9) Check the system alarm on health windows of Web-based GUI
(10) Measure the Downlink ouput power and spurious to make sure they are properly set.

3.3 Web-based GUI operation

Web-Based GUI is provided for ease of management and maintenance of the Vision system. This chapter explains Web-based GUI of the Vision platform.

Note: Web GUI is accessible through the Internet Explorer 6,7,8,9, Google Chrome and Fire Fox.

3.3.1 Network Connection

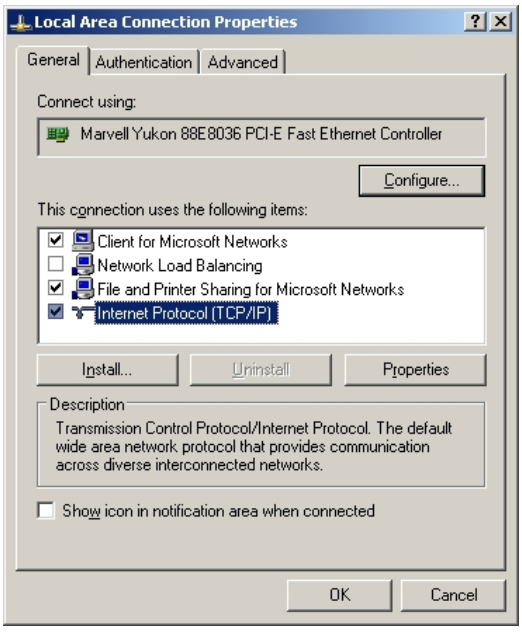
Before using Web GUI, make sure the Ethernet connection between user's laptop (or PC) and the Controller, LAN port of the Vision is established.

3.3.1.1 Local Network Connection

To network connection, proceed as follows:

(1) Connect the Vision, Controller LAN port to Laptop (or PC) using Ethernet Cable (RJ-45).

(2) Select TCP/IP in Local Network Properties.



[Figure 3-3] Local Area Connection Properties

(3) IP Setting

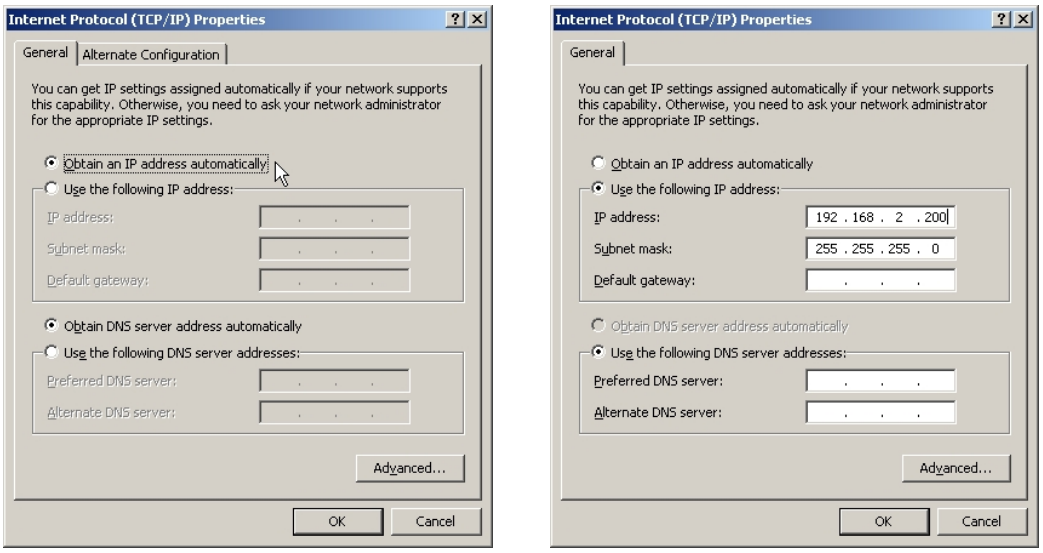
Under Internet Protocol (TCP/IP) properties, make sure to select "Obtain an IP address automatically". Or when selecting "Use the following IP address", be sure to use 192.168.2.XXX (only except 1) and the recommended IP address is 192.168.2.200.

So, assign the IP addresses as follows:

IP address: **192.168.2.200**, Subnet mask: **255.255.255.0**, Default gateway: **Leave it blank**

(4) Open Internet Explorer and type in **http://192.168.2.1**

(5) Once login screen comes up, login to the Vision.



Automatically (Dynamic) IP assignment Manually (Static) IP assignment

[Figure 3-4] Internet Protocol Properties

3.3.1.2 Sprint Private Network

In order to connect to the Sprint Private Network, the WAN port of the Vision needs to be connected to an external modem box, UWMS-01 as shown in [Figure 2-9]. UWMS-01, universal modem box is also provided by SYM Technology, and refer to UWMS manual at www.symtechnology.com

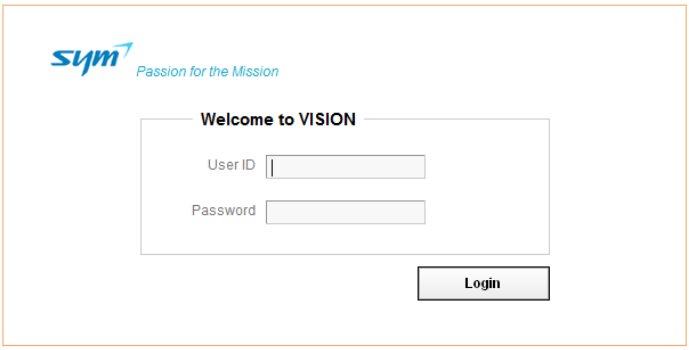
3.3.2 Web based GUI Login

For security purpose, only the authorized user can log in to the Web GUI.

(1) Open a web browser, such as Internet Explorer, google chrome, FireFox and Safari.

(2) In the URL field, enter **http://192.168.2.1** and press **Enter**.

The Login Window displays.



[Figure 3-5] Web GUI Login

Authorized user(s) may log in with default ID and Password as shown in [Table 3-9] below.

[Table 3-5] Web GUI Access ID/Password

Access Level	ID	Password
Administrator	admin	admin
User	vision	vision

Once logged in, status page will be displayed.

3.3.3 Menu List

There are four main menus in the Web GUI.

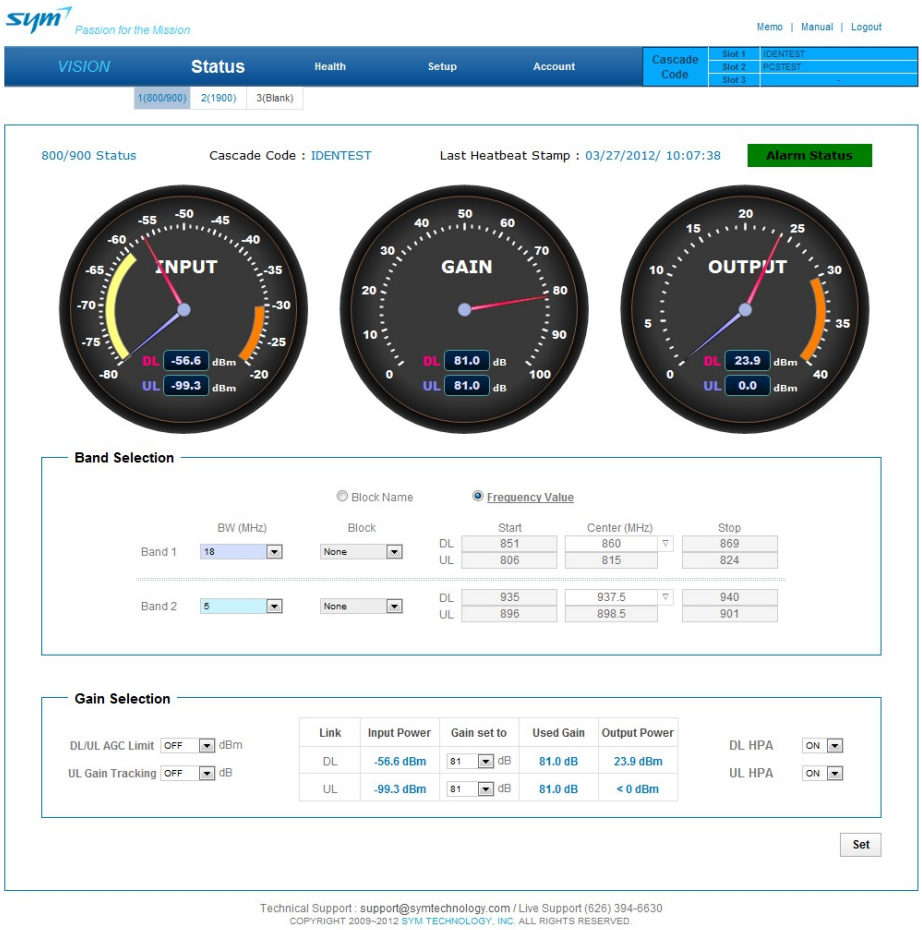
[Figure 3-6] Web GUI Main Menu

[Table 3-6] Web GUI Main Menu

No	Main Menu	Sub Menu	Description
1	Status	800/900	- Input/Gain/Output Level display - Sub band selection - Gain Setting - HPA ON/OFF - Summary alarm status
		1900	
2	Health	-	- Alarm check for each Service card - Set Threshold level for each Service card - Event Log Display - Test SNMP Alarm & Clear - Provide Input & Output Graph for each Service card
3	Setup	Network	- Set Cascade and Heartbeat Interval for each Service card - Set IP Address of WAN Port - Set location Informaiton of where the Device is installed - Set SNMP Destination IP of SNMP Trap/Inform Data - Set Device System Time
		Install & Update	- Provide each Service card's Installation - Device Firmware Update - Each Service card's Factory Set - Reboot functionality of Service Cards including Controller
4	Account	User List	Display of registered accounts
		New Account	Register new User(s) and Administrator(s)

3.3.4 Status

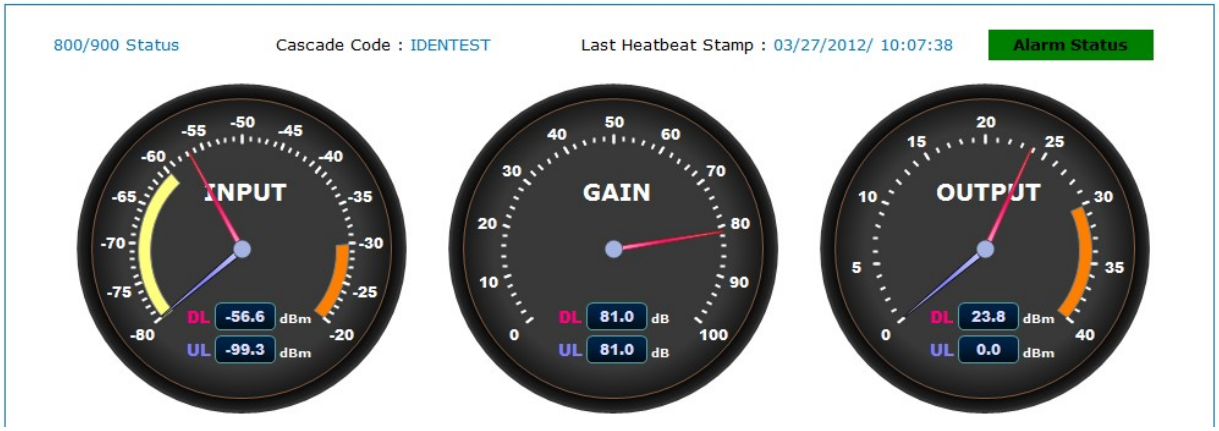
The status page is designed to provide a comprehensive status of the system at a glance. The staus update in displayed in gauge and is updated every five seconds.



[Figure 3-7] Service Band Status

3.3.4.1 Gauge

The status of each Service Card is monitored and displayed in the gauge and an alarm message will be shown when alarm is trigged, as shown in **Error! Reference source not found.**8] below. Status also has sub menus for 800/900 and 1900 bands and displays input power, gain, output power of downlink/uplink of each Service Card.



[Figure 3-8] Status Page

3.3.4.2 Band & Gain Control

Status Page provides an interface where user can set and adjust Frequency, Gain, AGC, Uplink Tracking, and HPA On/Off of each card. This Interface is available only when the card is plugged in. When service card is not plugged in, sub menu will be inactive.

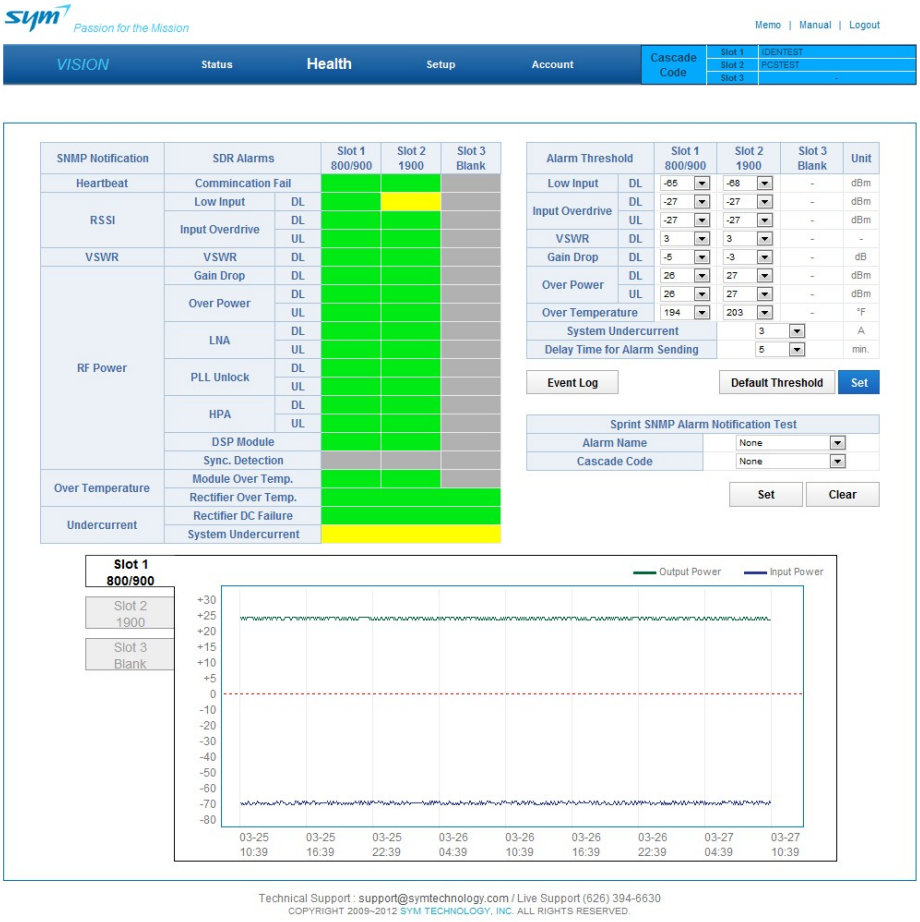
In Band Selection part, user can set up to two bands for 800/900 service and up to three bands for 1900 service.

CAUTION: An error message will be displayed when there is an overlap in frequency in setting bands. There must be 0.5MHz frequency offset in bands selection for 800/900 and 1900 service. You cannot go on to the next step in setting when there is an error message.

Gain Selection part allows user to set DL/UL AGC limit, UL Gain Tracking, DL Gain, UL Gain, DL HPA and UL HPA. Input Power, Used Gain and Output Power displayed in the Gain Selection are automatically updated according to the guage.

3.3.5 Health

Health page displays each service card's alarm staus, alarm threshold level setting, event log, SNMP test alarm transmission, downlink input power and output power in graph.



[Figure 3-9] Health Page

3.3.5.1 Alarm Status Monitoring for Service Card

Health Page checks and monitors module's alarm status in real-time. There are four different colors of display depending on the severity of alarms as shown below.

[Table 3-7] Alarm Status for Health Page

Green	NORMAL
Yellow	Minor Alarm
Red	Major Alarm
Gray	Service Card not inserted

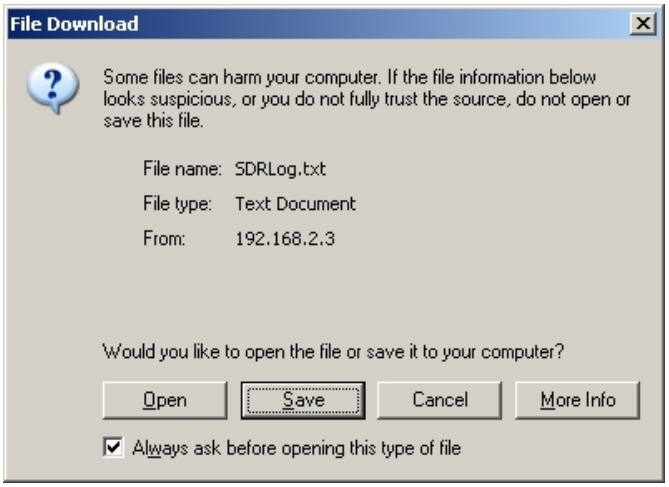
Note: Health Page provides help notes on alarm status. When placing your mouse on the alarm, a ballon help note will pop up.

3.3.5.2 Setting Alarm Threshold

Health Page provides an Interface where user can set Alarm Thresholds. User can define Alarm thresholds or use the default thresholds provided by system.

3.3.5.3 Event Log

Health Page allows user to save and view event log. Click on the “Event Log" to see the Pop-up Message as shown below. User can either save or open the Event Log.



[Figure 3-10] Event Log Pop-up

The following are the descriptions of Event Log.

[Table 3-8] Event Log Description

Message	Parameter	Description
Date & Time	MM / DD / YY hh:mm	-
Cascade Code	Upper letters	Site ID of Service Card
Level	System, 800/900, 1900	Field Replaceable Units
Status	Event, Trap, Alarm, Clear	Status Information
Description	Event Name	Alarm Information

3.3.5.4 SNMP Test Alarm

Health Page provides an interface for user to check the connection status of the device by sending test alarm. Test alarm transmits SNMP Trap to the IP address set in Setup Page -> Network’s SNMP Manager IP.

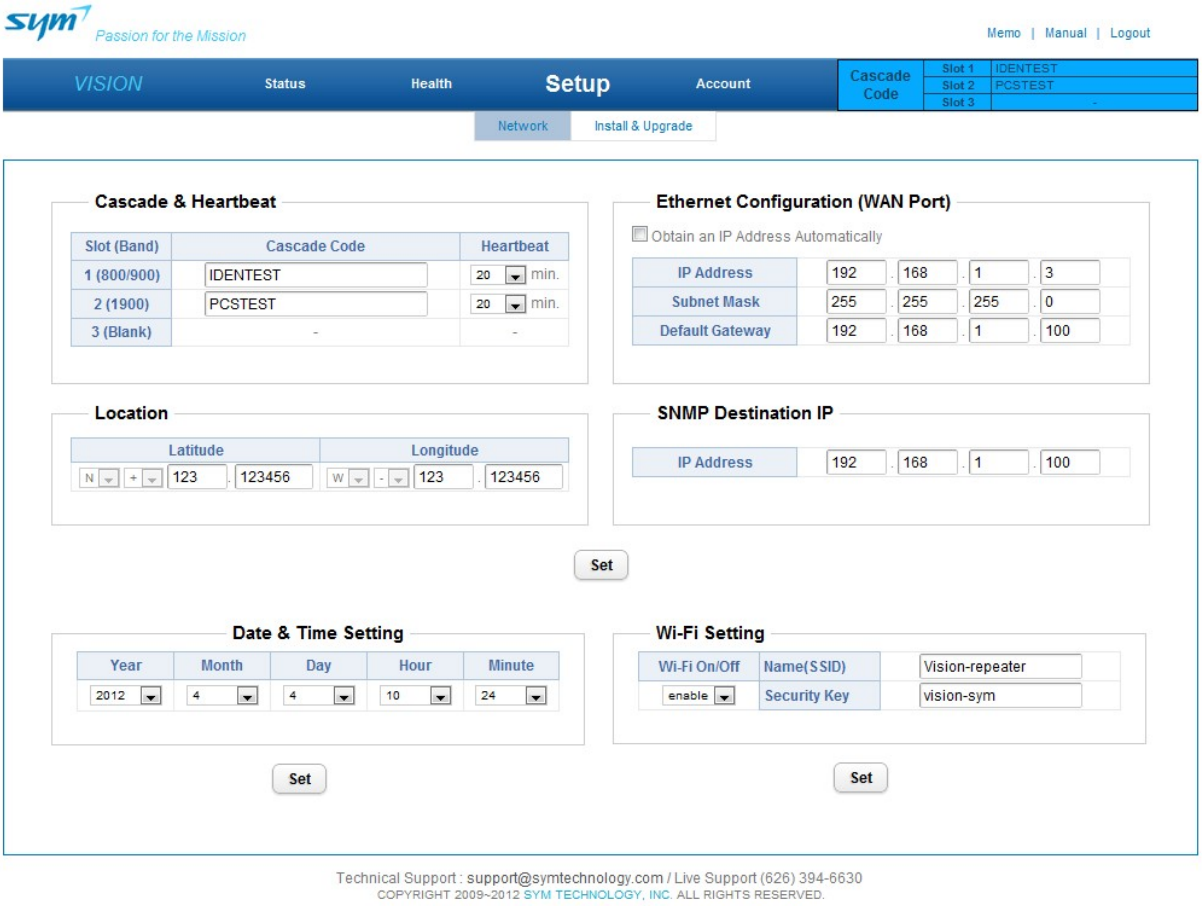
3.3.5.5 Input & Output Graph

Health Page displays each service card’s Input Power and Output Power in Graph. Each dot is displayed every five minutes and system keeps and dispalys last 48 hours of data. Click on 800/900 and 1900 tabs to move over to its service band’s graph.

3.3.6 Setup

3.3.6.1 Network

Network Page allows user to set Device's Network environment, system installed location and time.



[Figure 3-11] Network Page

3.3.6.1.1 Cascade & Heartbeat

Up to 3 cascade codes can be assigned based on inserted service cards. Each cascade code should be unigue given by Sprint. Duplicated cascade code won't be assigned on the web GUI. User can put in up to 23 capital letters as Cascade Code and set the Heartbeat interval from 1 to 120 minutes. Heartbeat can be off as well. Heartbeat time set at 20 minutes by default.

If heartbeat interval is set to 1 to 5 minutes for connecting UWMS-01, this heartbeat interval will be automatically set to 20 minutes after 30 minutes later.

3.3.6.1.2 Location

Latitude and Longitude: Type in the GPS information of the site where the Vision is installed. Without the location information, heartbeats will not be generated. The latitude format is N+ ddd.dddddd, e.g., N+39.006957. The longitude format is W-ddd.dddddd, e.g., W-94.532306.

3.3.6.1.3 Ethernet Configuration

This Ethernet setup is for WAN port in case of external wireless modem, UWMS-01 or T1/ DSL connection if the Vision sends out alarm to the public network). This port can work at DHCP client (Obtain IP address automatically) or Static IP address mode. By default, Static IP address is assigned to be connected to an UWMS-01 as follows:

IP address: **192.168.1.2**, Subnet mask: **255.255.255.0**, Default gateway: **192.168.1.100.**

3.3.6.1.4 SNMP Destination IP

This is the target IP addresses to which the Vision's data is directed. Use **10.22.25.15** (default value) (or **192.168.1.100** when UWMS-01 is connected) as the SNMP Destination IP.
When the Vision is connected to the public network, the SNMP Destination IP address should be changed to proper one.

3.3.6.1.5 Date & Time Setting

Assign correct Date and Time information. Event log will recod all event based on this date and time.

3.3.6.1.6 Wi-Fi Setting

The Vision includes 802.11 b/g/n wireless USB module, which operates in the 2.4GHz frequency spectrum. This means the Vision24/30 can work as Wi-Fi AP. User can connect a laptop or smartphone wirelessly via Wi-Fi. This will let user not to climb up a ladder to connect a laptop to the Vison when it is located on the high level.

WARNINGS: Exposure to Radio Frequency Radiation
The radiated output power of this device requires the minimum separation distance of 7.9 inches (20 cm) must be maintained between human body and antenna of the Vision to satisfy FCC RF exposure requirements. For more RF exposure information, please visit the FCC website at www.FCC.gov

By default, Wi-Fi is enabled. Vision's default Wi-Fi SSID is Vision-repeater and password is vision-sym

Note: This Wi-Fi AP doesn't have actual internet connection. It wil help only wireless connection to the Vision to access its web GUI wirelessly.

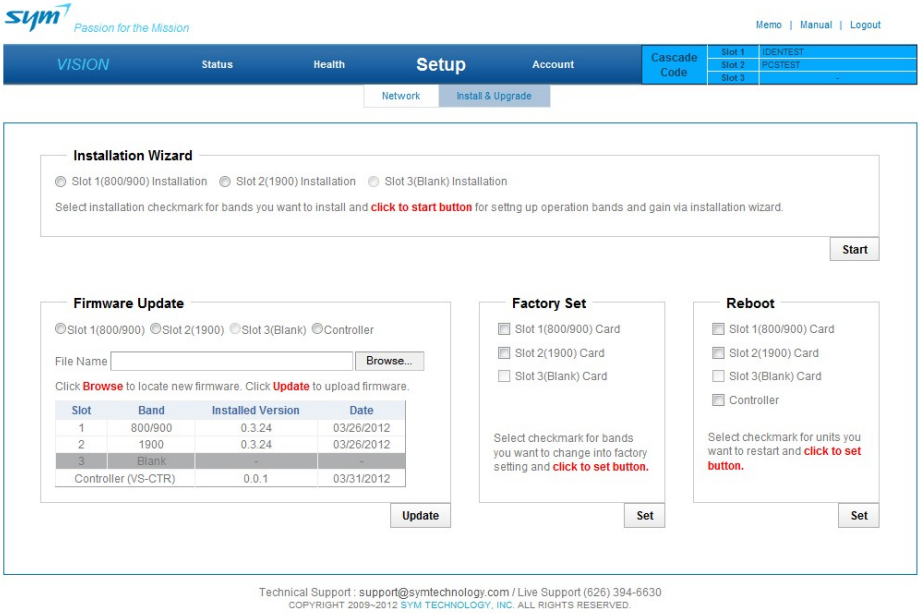
To access Vision Web GUI through Wi-Fi, use below URL after connecting Vison-repeater.

(1) Open a web browser of Laptop or Smart Phone, such as Internet Explorer, google chrome, firefox, Safari.

(2) In the URL field, enter **http://192.168.3.254** and press **Login Button**.

3.3.6.2 Install & Update

Install & Upgrade page is provided for ease of System's initial sep-up. This page provides Installation Wizard, Firmware updates, Factory Set and Reboot.

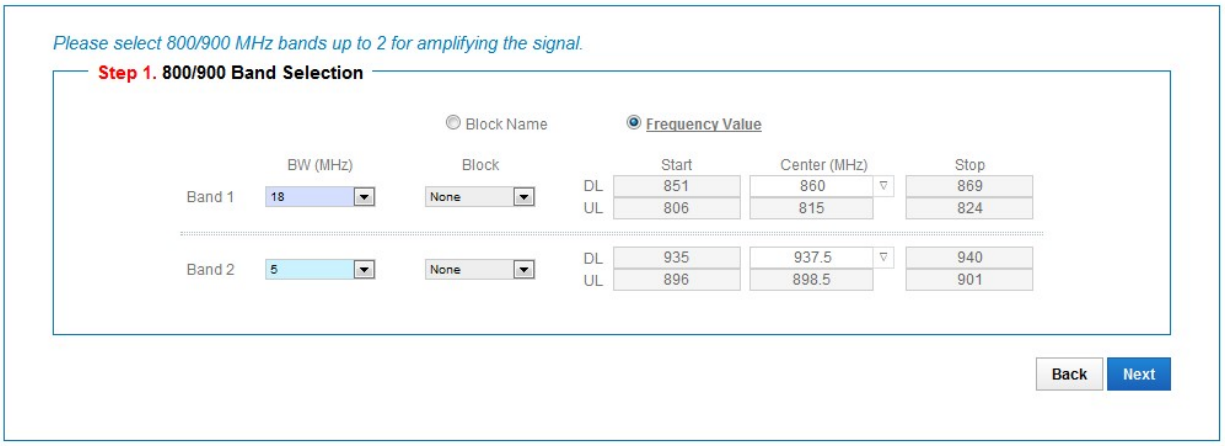


[Figure 3-12] Install & Upgrade page

3.3.6.2.1 Installation Wizard

Installation Wizard provides an interface for an easy set up. Select the service band to be installed and then click on "Start" button to see the next steps shown below. (This chapter will show 800/900 service card instllation as an example).

Step 1. Band Selection

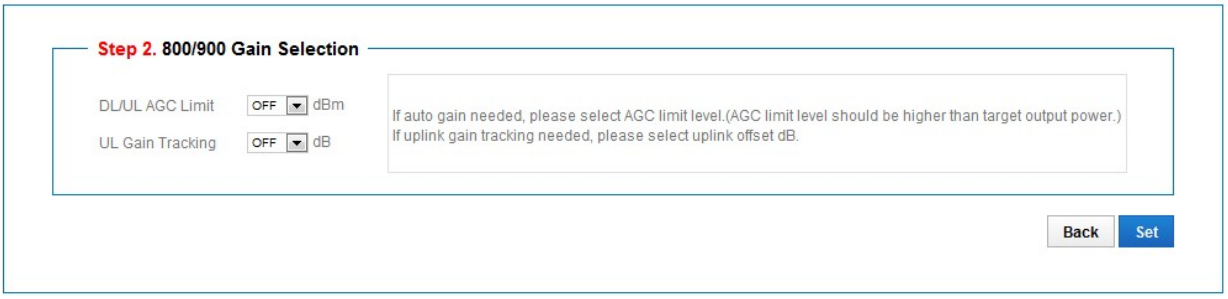


[Figure 3-13] Installation Wizard via Step 1

In Band Selection, user sets Frequency to be serviced and has Block Name and Frequency Value. Block Name has Bandwidth and Block, and Frequency Value has Bandwidth and center frequency to be selected.

CAUTION: An error message will be displayed when there is an overlap in frequency in setting bands. There must be 0.5MHz frequency offset in bands selection for 800/900 and 1900 service. You cannot go on to the next step in setting when there is an error message.

Step 2. Gain Selection



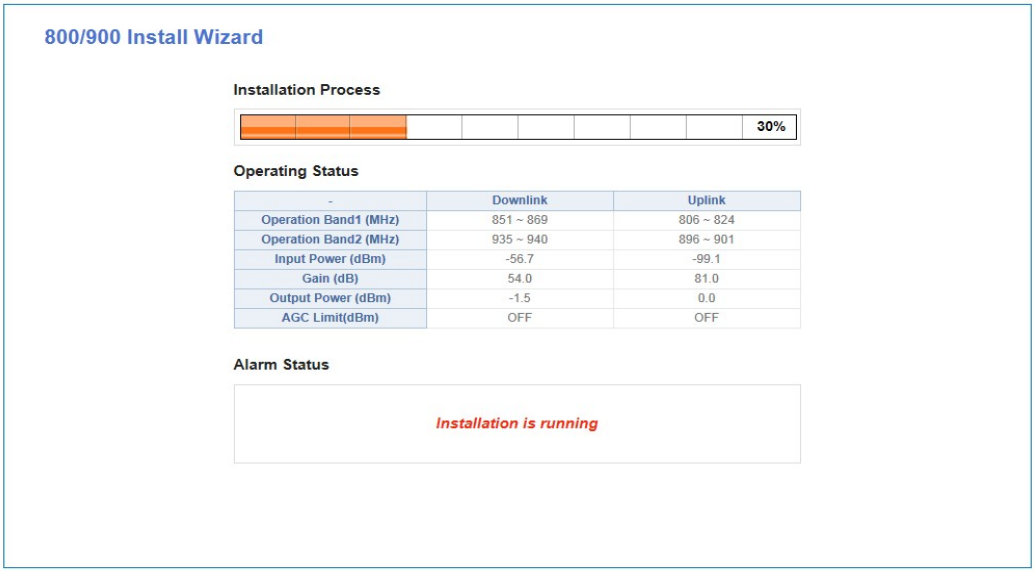
[Figure 3-14] Installation Wizard via Step 2

Gain Selection Page allows user to set the gain of service card based on user defined output.

If auto gain (AGC) needed, please select AGC limit level. AGC limit level should be higher than target output power. If uplink gain tracking needed, please select uplink offset dB. Uplink gain tracking maintains the difference the offset dB from the downlink gain.

Step 3. Installation Process

Installation Process illustrates the pocess of installation. In the event of an error, the alarm will be displayed in alarm status and installation will fail. In such case, all set values will be reset to the previous values.



[Figure 3-15] Installation Wizard Process via Step 3

3.3.6.2.2 Firmware Update

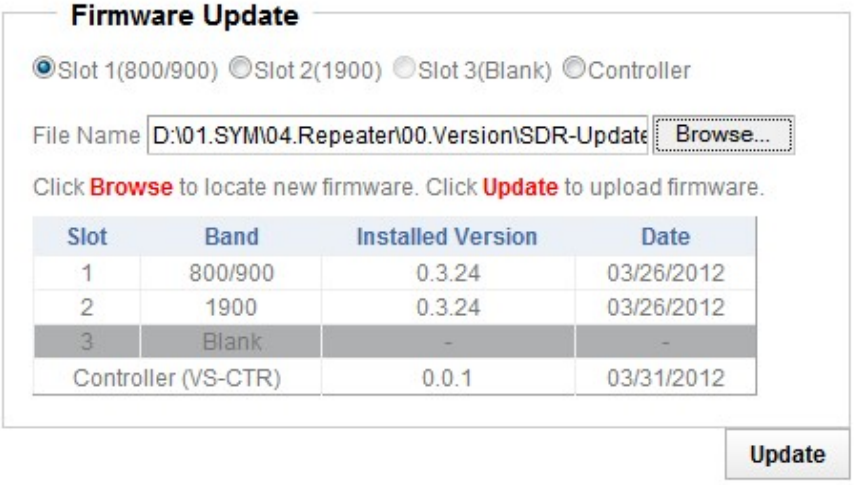
Perform Firmware Update of the Vision.

(1) Check the slot or controller to be updated on the Firmware Update block.

(2) Click “Browse” button.

(3) Select the file needed to update from the Dialogue.

When completing Firmware Update, the Web GUI will close automatically and the system will reboot.



[Figure 3-16] Firmware Update

3.3.6.2.3 Factory Set

This feature resets all parameters to Factory default setting. The check box for feature is only available to installed service card(s).

[Figure 3-17] Factory Set

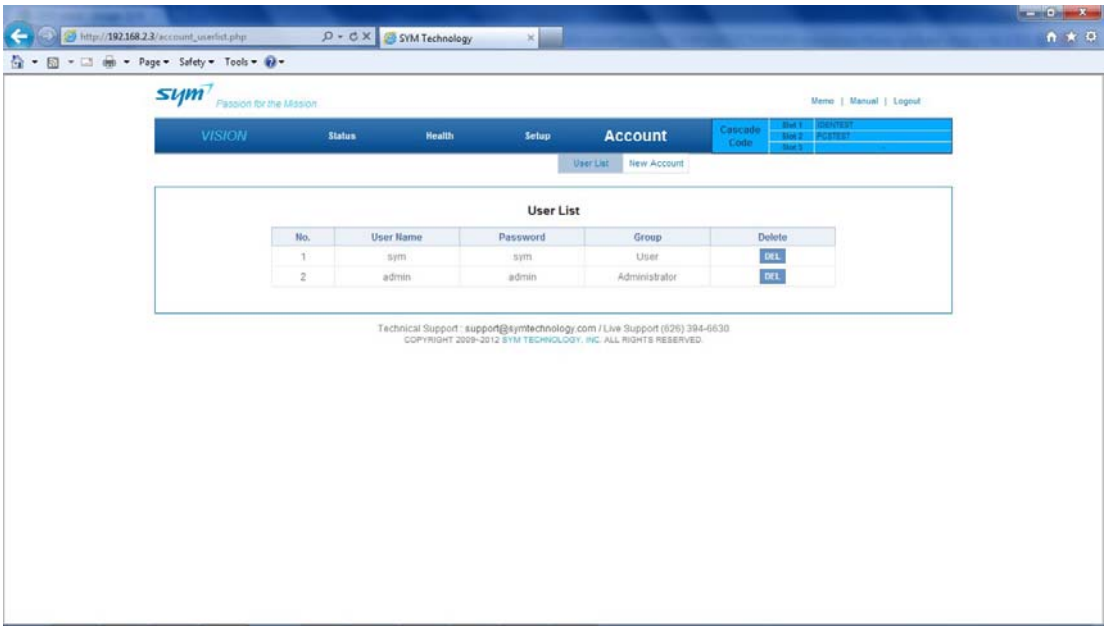
3.3.6.2.4 Reboot

This feature reboots selected service card(s) and the check box for feature is only available to installed service card(s). When selecting this feature, the Web GUI will close automatically and the system will reboot.

3.3.7 Account

3.3.7.1 User List

This feature displays authorized operators for Web GUI access.



[Figure 3-18] User List Page

User Group has Administrator and User and their access authority is shown below.

[Table 3-9] User Group Access Authority

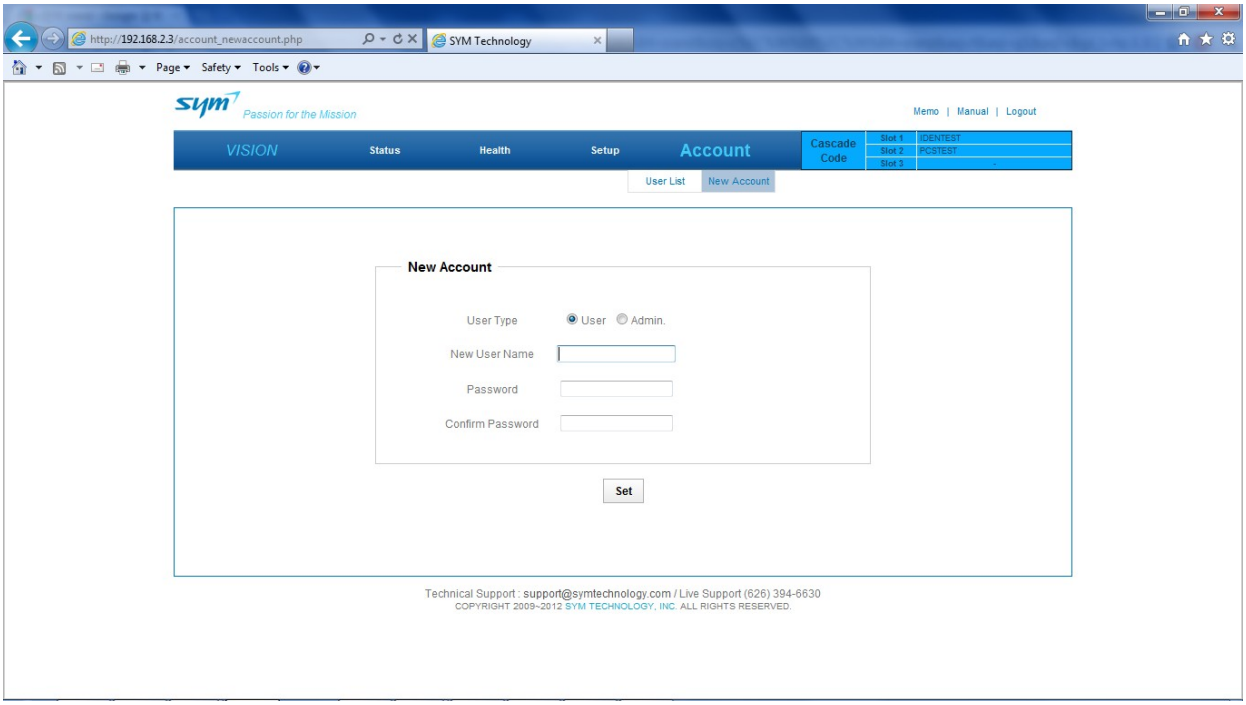
Web GUI page	Item	User Group	
		Administrator	User
Status	800/900	O	O
	1900	O	O
Health	SDR Alarm (SNMP)	O	O
	Alarm Threshold	O	△
	Default Threshold	O	△
	Event Log	O	O
	Test Alarm (SNMP)	O	△
	Power History	O	O
Setup	Network	O	△
	Install & Upgrade	O	△
Account	User List	O	X
	New Account	O	X

*△: View only, X: Access not allowed

Administrator account is limited to 5 only. User account(s) can be added or deleted by Administrator(s).

3.3.7.2 New Account

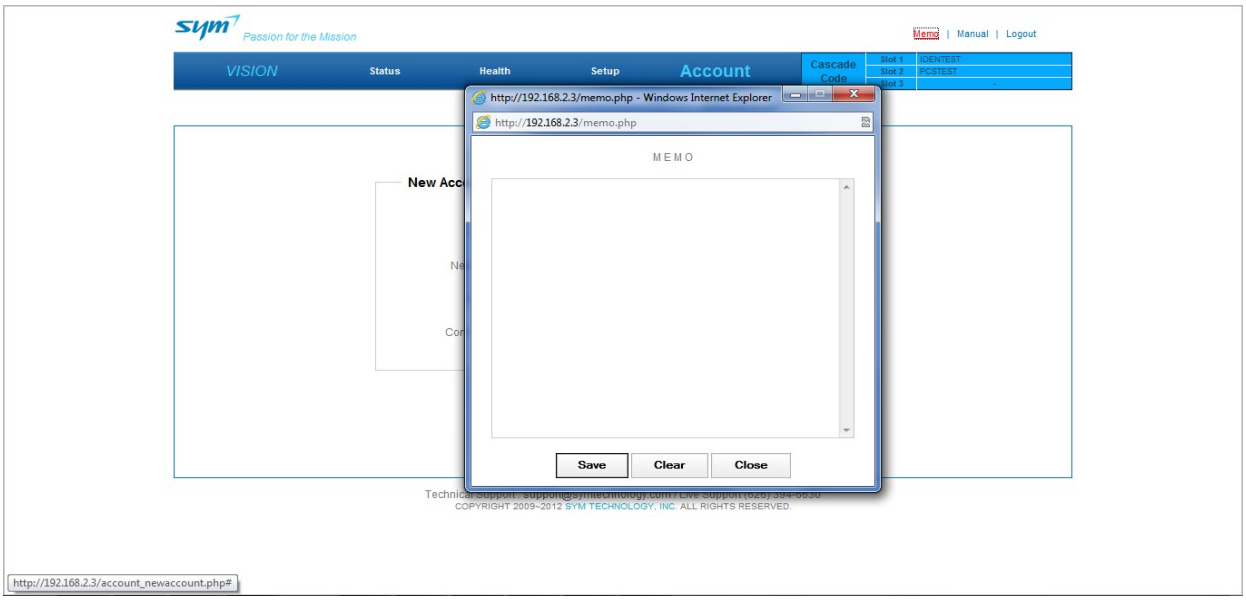
New Account Page allows operator to register User and Administrator in the Group. User account and passsword up to 35 alpha-numeric characters, upper and lower case are allowed.



[Figure 3-19] New Account Page

3.3.8 Memo Pad

The Memo pad is available on the upper right had corner of Web GUI for operator and/or System Manager to take notes. Click on the Memo and a Memo browser will be displayed as shown below.



[Figure 3-20] Memo Page

Make sure to click on "Save", otherwise notes will be lost.

3.3.9 Other Miscellaneous Features

System's manual is available for download on the upper right corner of Web GUI. Logout Menu allows operator to logout from the Web GUI. When clicking Logout, a Login window will be displayed.

4. Maintenance

This section contains periodic maintenance and performance test procedures for the Vision.

> **Note:** Check your order and equipment warranty before attempting to service or repair the Vision. Do not break the seals on equipment under warranty or the warranty will be null and void. Do not return equipment for warranty or repair service until proper shipping instructions are received from the factory.

In the event of a malfunction, the user should check the status of the antennas, feeder cables, connectors, and mains power before replacing any compoents.

4.1 Troubleshooting

The Health window in the GUI indicates when and how often faults have occurred. See **Error! Reference source not found.**] for more information. The POWER and ALARM LEDs located on the each service card, controller and the rectifier front panel display the current operating condition of the Vision (refer to chapter 3.1). If the LEDs indicate a problem, suggestions are listed in [Table 4-1] and [Table 4-2].

CAUTION: The manual contains information and procedures for installation, operation, and maintenance of the Vision. It is highly recommended to read the manual thoroughly before beginning troubleshooting. SYM Technology recommends that maintenance be performed by a qualified individual or firm prior to equipment installation or replacement.

[Table 4-1] LED Indicators Troubleshooting guide

Problem	Suggested Action
No rectifier LEDs are lit	1. Check to see whether proper power is being supplied through AC power cord. 2. Set rectifier front panel AC Power switch to ON position. 3. Defective rectifier – replace.
No service card LEDs are lit	1. Set rectifier front panel AC Power switch to ON (I) position. 2. Check to see if Service Card is inserted properly. 3. Defective controller – replace.
No controller LEDs are lit	1. Set rectifier front panel AC Power switch to ON (I) position. 2. Push ‘Reset’ button on controller front 3. Defective controller – replace.
Not communication Ethernet	1. Verify supplied Ethernet cable 2. Set TCP/IP properties of PC : “Obtain an IP address

	automatically” 3. Confirm if IP address is 192.168.2.200 in case of “Use the following IP address” of TCP/IP properties 4.Make sure if a laptop is connected to a LAN port 5. Push ‘Reset’ button on controller front panel and then reboot laptop PC. 6. Defective controller – replace
Rectifier alarm LED red on at rectifier front panel.	1. Out of range of AC power voltage (105 to 125 VAC) or DC power voltage 2. Set rectifier front panel AC Power switch to ON (I) position 3. Defective rectifier – replace.
1900 LED red on at service card front panel	1. An alarm has been detected in 1900 service card. Check health window in the Web GUI. 2. Follow troubleshooting procedure of [Table 4-2].
800/900 LED red on at service card front panel	1. An alarm has been detected in 800/900 service card. Check health window in the Web GUI. 2. Follow troubleshooting procedure of [Table 4-2].
CPU LED solid green on or Off at controller front panel	1. Controller is in Sleep Mode. 2. Push ‘Reset’ button on controller front 3. Defective controller – replace

[Table 4-2] System Alarm on the Web GUI Troubleshooting guide

Problem	Suggested Action
Communication Fail red alarm	1. Check to see if the Service Card is inserted properly. 2. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 3. Defective service card – replace.
Low Input yellow alarm	1. Check downlink input power level on BTS (donor) port. System will still operate normally even there is low Input power. 2. Try tilting the donor antenna.
Input Overdrive red alarm	1. Check downlink input power level on BTS (donor) port. 2. Verify high limit threshold level of input overdrive 3. Try tilting the donor antenna to adjust to the proper input power level. 4. Oscillation due to lack of isolation between the Antennas. Try relocating or tilting the antennas.
VSWR red alarm	1. Check the cable connected to MOBILE (service) port. 2. Reconnect RF Cable to MOBILE port 3. Verify high limit threshold level of VSWR. 4. Turn on the DL HPA. 5. Defective service card – replace.
Gain Drop yellow alarm	1. Check downlink input power and output power level. 2. Verify Gain Drop threshold level and then downgrade low power threshold level. 3. Defective service card – replace.

Over Power red alarm	1. Check for correct setting of the over power threshold level 2. Set minimum gain and then turn on the DL HPA or UL HPA. 3. Adjust the gain not to exceed the over power threshold level. 4. Defective service card – replace.
LNA red alarm	1. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 2. Defective service card – replace.
PLL Unlock red alarm	1. Reset Service frequency. 2. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 3. Defective service card – replace.
DSP Module red alarm	1. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 2. Defective service card – replace.
Module Over Temp. red alarm	1. Check for blocked air vents (insufficient clearance). 2. Check for ambient temperature over +50° C (122° F) 3. Verify high limit threshold level of Over temperature. 4. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 5. Defective service card – replace.
Rectifier Over Temp. red alarm	1. Check for blocked air vents (insufficient clearance). 2. Check for ambient temperature over +50° C (122° F) 3. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 4. Defective rectifier – replace.
Rectifier DC Failure red alarm	1. Select Reboot in Web GUI setup > install & upgrade window and click on Apply. 2. Turn the AC Power switch to OFF located on the Rectifier front panel, and then turn it on. 3. Defective rectifier – replace.
System Undercurrent red alarm	1. Check to see if all HPA are On. 2. Check system current. 3. Verify low limit threshold level of Undercurrent

4.2 Replacement of Components

Maintenance of the Vision should be performed on a field replaceable unit (FRU) basis only. Do not damage the warranty labels on the components as this voids the warranty.

The spare parts list contains only unit that can be replaced without tuning or soldering work. It is not recommended to replace any components inside the Vision itself, except of rectifier and controller.

CAUTION: Defect parts should only be replaced by original parts from the supplier. All interventions inside the housing are at one's own risk.

4.2.1 Field Replaceable Units (FRU)

The parts listed in [Table 4-3] can be replaced in the field on site by a qualified technician with experience maintaining RF power amplifiers and similar equipment.

[Table 4-3] Field Replaceable Units

Category	Part	Item No.
Common	Rectifier	VS-RET
	Controller	VS-CTR
	Donor Combiner & Server Combiner	FC-891926
Vision24	800/900 MHz Service Card	V24-89
	1900 MHz Service Card	V24-19

4.2.2 800/900 MHz Service Card

To replace an 800/900 MHz service card, refer to [Figure 4-1] and proceed as described in the steps that follow:

(1) Set the DL HPA and UL HPA to OFF at the Web basded GUI.

(2) Using a screwdriver, loosen the four captive screws securing the service card to the Vision enclosure.

(3) Use the 800/900 MHz service card's front handles to pull the service card out of the enclosure.

CAUTION: When removing the service card from the enclosure, support the service card so the rear of the service card does not suddenly drop and damage the rear D-sub conector. The service card weight is approximately 7 kg (15.4 lbs).

(4) Install the replacement 800/900 MHz service card in reverse order.

(5) Align the guide rails on the top and bottom of the service card with guide rails in the Vision enclosure and then slide the service card gently into place.

CAUTION: Ensure the service card is in the proper orientation before attempting to install into the Vision enclosure. Damage to the rear connectors could occur if improperly installed.

[Figure 4-1] 800/900 MHz Service Card Replacement

4.2.3 1900 MHz Service Card

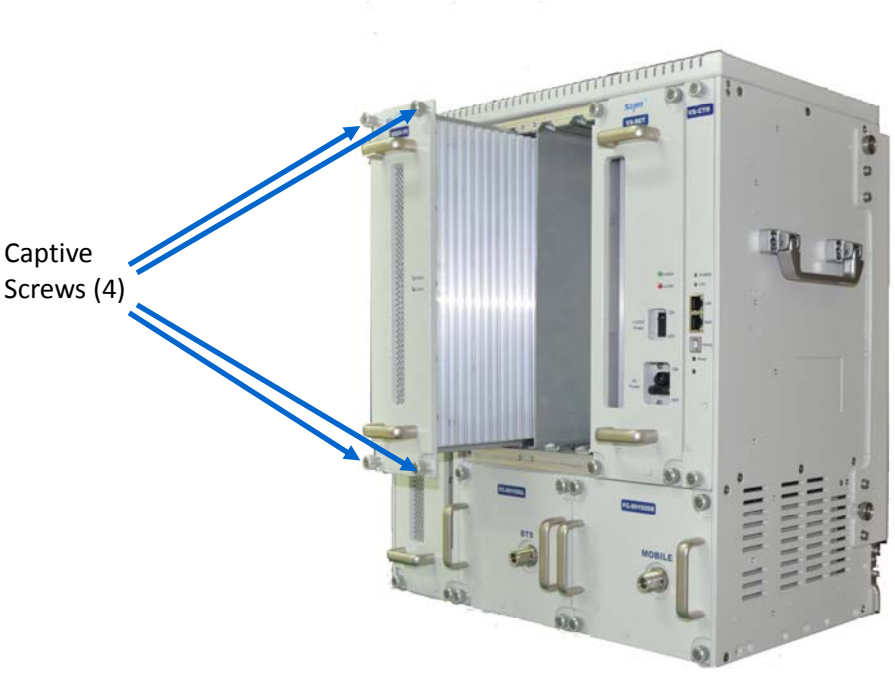
To replace a 1900 MHz service card, refer to [Figure 4-2] and proceed as described in the steps that follow:

(1) Set the DL HPA and UL HPA to OFF at the Web basded GUI.
(2) Using a screwdriver, loosen the four captive screws securing the service card to the Vision enclosure.
(3) Use the 1900 MHz service card's front handles to pull the service card out of the enclosure.

CAUTION: When removing the service card from the enclosure, support the service card so the rear of the service card does not suddenly drop and damage the rear D-sub conector. The service card weight is approximately 5.7 kg (12.6 lbs).

(4) Install the replacement 1900 MHz service card in reverse order.
(5) Align the guide rails on the top and bottom of the service card with guide rails in the Vision enclosure and then slide the service card gently into place.

CAUTION: Ensure the service card is in the proper orientation before attempting to install into the Vision enclosure. Damage to the rear connectors could occur if improperly installed.



[Figure 4-2] 1900 MHz Service Card Replacement

4.2.4 Rectifier

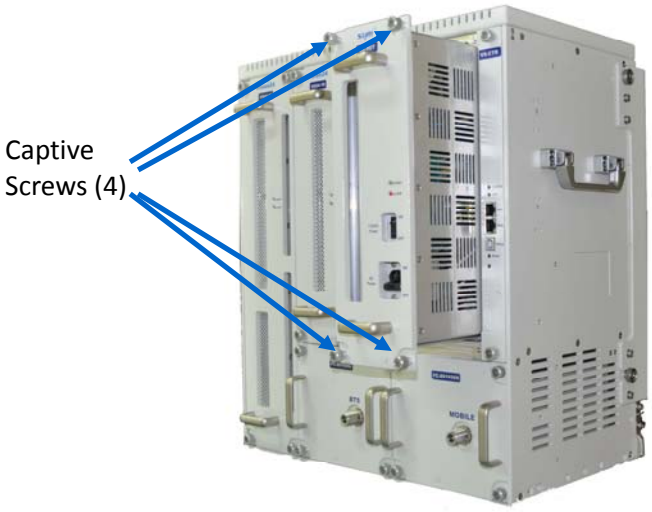
To replace a rectifier, refer to [Figure 4-4] and proceed as described in the steps that follow:

(1) Set the rectifier AC Power switches to oFF.
(2) AC main power turns off or disconnect to AC power cord.
(3) Using a screwdriver, loosen the four captive screws securing the rectifier to the Vision enclosure.
(4) Use the rectifier's front handles to pull the rectifier out of the enclosure.

CAUTION: When removing the rectifier from the enclosure, support the rectifier so the rear of the rectifier does not suddenly drop and damage the rear DIN conector. The rectifier weight is approximately 5.2 kg (11.4 lbs).

(5) Install the replacement rectifier in reverse order.
(6) Align the guide rails on the top and bottom of the rectifier with guide rails in the Vision enclosure and then slide the rectifier gently into place.

CAUTION: Ensure the rectifier is in the proper orientation before attempting to install into the Vision enclosure. Damage to the rear connectors could occur if improperly installed.



[Figure 4-3] Rectifier Replacement

4.2.5 Controller

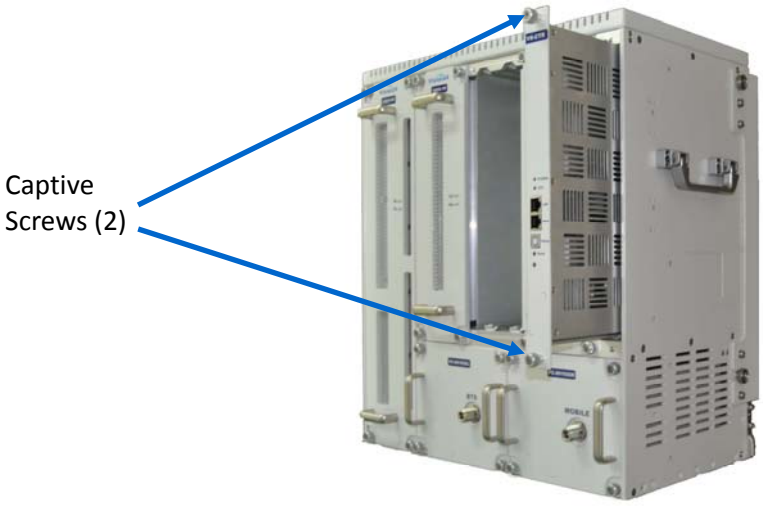
To replace a controller, refer to [Figure 4-4] and proceed as described in the steps that follow:

(1) Set the rectifier AC Power switches to oFF.
(2) Using a screwdriver, loosen the two captive screws securing the rectifier to the Vision enclosure.
(3) Pull the controller out of the enclosure.

CAUTION: When removing the controller from the enclosure, support the controller so the rear of the controller does not suddenly drop and damage the rear DIN conector.

(4) Install the replacement controller in reverse order.
(5) Align the guide rails on the top and bottom of the controller with guide rails in the Vision enclosure and then slide the controller gently into place.

CAUTION: Ensure the controller is in the proper orientation before attempting to install into the Vision enclosure. Damage to the rear connectors could occur if improperly installed.



[Figure 4-4] Controller Replacement

4.3 Return for Service Procedures

When returning products to SYM Technology, the following procedures will ensure optimum response.

Manufacturer's Limited Warranty

SYM Technology, Inc. offers a limited warranty that the Vision will be free from defects in material or workmanship as follows:

TWO (2) YEAR LIMITED WARRANTY: For a period of two (2) years from the date of original purchase, SYM Technology will, at its option, either repair or replace a defective Vision (with new or rebuilt parts/replacement).

LIMITED WARRANTY ON REPAIRED/REPLACED PRODUCTS: After SYM Technology repairs or replaces the Vision, the repaired or replaced Vision shall be covered by warranty for the remaining time of the original warranty period or for ninety (90) days from the date of repair, whichever is longer. Repair or replacement may include the use of functionally equivalent reconditioned units. Replaced faulty parts or components will become the property of SYM Technology.

This limited warranty does not cover and is void with respect to the following: (i) Vision which have been improperly installed, maintained, modified, or repaired; (ii) Vision which have been subject to outdoor use, misuse, physical damage, abnormal use or operation, improper handling or storage, exposure to fire, water, excessive moisture or extreme temperature; (iii) Vision operated outside published maximum ratings; (iv) Vision on which warranty seals or product serial numbers have been

removed, broken, or altered; (v) cost of installation, set up, removal or reinstallation; (vi) signal reception problems or network problems; (vii) damage as a result of fire, flood, power surge, lightening, acts of God or other acts which are not the fault of SYM Technology and which the Vision is not specified to tolerate; and (viii) any Vision which have been opened, modified, or repaired by anyone other than SYM Technology or a SYM Technology authorized service center.

Obtaining an RMA

A Return Material Authorization (RMA) number must be obtained prior to returning equipment to the factory for service. Please contact our Repair Deparent at (626) 356-0817 to obtain this number, or FAX your request to (626) 356-9087. Failure to obtain this RMA number may result in delays in receiving repair service.

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

5. Specifications

5.1 800/900 MHz Service Band

[Table 5-1] 800/900 MHz Service Band Specifications

Item	Downlink	Uplink	Description
Frequency Band	851-869 / 935-940 MHz	806-824 / 896-901 MHz	BW: 18 & 5 MHz
Air Interface	iDEN		
Band Selection	2 non-contiguous blocks simultaneously		
Bandwidth	0.25 to 18 MHz / 250 kHz step (Addition: 4.6, 4.8, 6.6, 6.8, 17.6, 17.8 MHz)		Fc shifting: 25 kHz step
Output Power	24 dBm		
Gain / Adjustment Range	51-81 dB / 30 dB		
Band Gain Ripple	± 1.5 dB peak to peak		
Roll Off at Band Edge	≥ 65 dBc at 500 kHz		
System Delay	≤ 7.5 us		
Adjacent Channel Power	> 50 dBc at 25 kHz, > 55 dBc at 50 kHz, > 65 dBc at 500 kHz, > 65 dBc at 1 MHz		@ single channel
Out of band Emission	≤ - 13 dBm (In-band), ≥65dBc (Out of Band)		> FCC requirements
Waveform Quality	SQE ≤10%		
Frequency Error	≤±0.05 ppm (±40 Hz)		
VSWR	< 1.4 : 1		
Uplink Noise Figure	< 5 dB at maximum gain < 12 dB at minimum gain		

5.2 1900 MHz Service Band

[Table 5-2] 1900 MHz Service Band Specifications

Item	Downlink	Uplink	Description
Frequency Band	1930-1995 MHz	1850-1915 MHz	BW: 65 MHz
Air Interface	CDMA/LTE		
Band Selection	3 non-contiguous blocks simultaneously		
Bandwidth	1.25 to 20 MHz / 1.25 MHz step		Fc shifting: 50 kHz step
Output Power	24 dBm		
Gain / Adjustment Range	54-84 dB / 30 dB		
Band Gain Ripple	± 1.5 dB peak to peak		
Roll Off at Band Edge	≥ 50 dBc at 1 MHz		
System Delay	≤ 7.5 us		
Adjacent Channel Power	> 45 dBc at 885 kHz, > 55 dBc at 1.98 MHz, < -13 dBm at ±2.25 MHz (1 MHz RBW)		@ single channel
Out of band Emission	< - 13 dBm		> FCC requirements
Waveform Quality	Rho ≥ 0.96		
Frequency Error	≤± 0.05 ppm (±90 Hz)		
VSWR	< 1.4 : 1		
Uplink Noise Figure	< 5 dB at maximum gain < 12 dB at minimum gain		
ACLR	> 45 dBc at ± 5 MHz > 45 dBc at ± 10 MHz		LTE signal (E-TM1.1)
EVM / Frequency Error	≤ 5% difference from reference source / < ± 0.05 ppm + 12 Hz		LTE signal (E-TM3.1)
Operating band Unwanted Emission	< -10 dBm at ±2.55-7.55 MHz (100 kHz RBW) < -14 dBm at ±7.55-12.55 MHz (100 kHz RBW) < -15 dBm at ±13-15 MHz (1 MHz RBW)		LTE signal (E-TM1.1)