ARCADIAN Networks

ABSR-757 / BSR-757

Base Station

User Guide

Part Number 1 sector: 9AN0001
Part Number 2 sectors: 9AN0002
Part Number 3 sectors: 9AN0003

User guide PN 3BR0041

Version: 001

Copyright and Compliance Information

FCC Compliance Information

NOTE: This equipment is authorized under FCC ID V72ABSR757 to operate in the A block of the Upper 700 MHz Guard Band pursuant to Part 27 of the FCC's rules.

This equipment is limited for maximum ERP of 60 dBm. The equipment was authorized with antenna gain of 13.3 dBd. A higher gain antenna should not be used.

In addition, this equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC's rules.

These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
In addition, there is no guarantee that interference will not occur in a particular installation.

Warning!

Changes or modifications to this equipment not expressly approved by Arcadian Networks Inc. could void the user's authority to operate the equipment.

This product was tested with shielded coaxial cable (not provided by Arcadian Networks) and Category 5 Ethernet cable (optional) equipped with a shielded RJ-45 connector. These types of cables must be used with the unit to ensure compliance.

Hazard: Avoid of getting the human body closer than 276 Cm to the antenna.

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About This Guide

The ABSR-757 / BSR-757 Base Station User Guide is part of the documentation package for the Arcadian Networks. The guide describes the BSR-757 Base Static and how to install, configure and maintain it. In this guide, the term *Base Station* re to the Base Station Rack hardware, software, and management facilities. It does n refer to the antennas, pole, and antenna cables, and they are not discussed in this guide.
The BSR-757 supports A-Guard Band, transmitting at 757-758 MHz (downstream) receiving at 787-788 MHz (upstream)

Intended Audience

This guide is intended for service personnel required to install, configure or mainta Base Station. Some technical radio understanding is assumed.

Document Objectives

This guide is designed to be used as a tool in the initial installation and periodic maintenance of the Base Station. It contains information on how to perform the following tasks:

- Installing the Base Station
- Configuring the Base Station
- Maintaining the Base Station
- Troubleshooting the Base Station

Document Conventions

The following icons appear throughout this guide:

Note: This is a note. It provides additional information on the current topic.

Warning: *This is a warning. It contains cautionary information on the current to*

Tip: This is a tip. It provides time saving information to the reader.

How This Guide is organized

This guide is organized into the following chapters and appendices:

Chapter 1: Overview

This chapter provides an overview of the Arcadian Networks, the Base Station, an configuration of the system.

Chapter 2: Base Station Components

This chapter includes descriptions of the Base Station rack, and the various Base Station components.

Chapter 3: Installing the Base Station

This chapter details installation prerequisites, explains how to install the various components of the Base Station, and describes initial operation. It also explains hc set the WMTS IP address and connect the WMTS to the backbone network. In adc it provides guidelines for provisioning the monitoring modem, and for verifying prop Base Station operation.

Chapter 4: Configuring the Base Station

This chapter describes the basic frequency setup, and explains how to configure th WMTS and the Upconverter.

Chapter 5: Maintaining the Base Station

This chapter describes the LED functions of various components, and explains hov monitor the Base Station and upgrade the WMTS software version.

Chapter 6: Troubleshooting

This chapter provides troubleshooting information to help solve common problems

Appendix A: Technical Specifications

This chapter provides technical specifications for the Base Station and its compon

Related Documentation

For information on other Arcadian Networks topics, see the following guides:

- *NMS User Guide*
- *AE34WV (V390iA) User Guide*
- *AE11V (V487iA) User Guide*

Obtaining Documentation

To obtain additional documentation, please contact info@arcadiannetworks.com.

Documentation Feedback

We welcome your comments about this guide. Please send comments to:

Email address: helpdesk@arcadiannetworks.com

Please include in the comment the name and version number of the guide.

List of Abbreviations

Following is a list of the abbreviations used in the guide.

Abbreviation	Meaning
BPI	Baseline Privacy Interface
BSR	Base Station Rack
BTS	Base Stations
BW	Bandwidth
CIR	Committed Information Rate
CLI	Command Line Interface
CPE	Customer Premises Equipment
CRC	Cyclic Redundancy Check
dB	Decibels
dBmV	Decibel-Millivolt
DES	Digital Encryption Standard
DHCP	Dynamic Host Configuration Protocol
DOCSIS	Data-Over-Cable Service Interface Specifications
DS	Downstream
DSCP	Differentiated Services Code Point
FAT	Factory Accepted Test
FDD	Frequency Division Duplexing
FEC	Forward Error Correction
FTP	File Transfer Protocol
GHz	Gigahertz
ICMP	Internet Control Message Protocol
IEEE	Institute of Electrical and Electronic Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IP	Internet Protocol
ISO	International Standards Organization
ITU	International Telecommunications Union

Abbreviation	Meaning
ITU-T	Telecommunication Standardization Sector of the International Telecommunication Union
Kbps	Kilobits per second
KHx	Kilohertz
LAN	Local Area Network
LOS	Line of Sight
LLC	Logical Link Control procedure
MAC	Media Access Control
Mbps	Megabits per second
MHz	Megahertz
MIB	Management Information Base
MMU	Monitor Modem Unit
MPEG	Moving Picture Experts Group
Ms	Millisecond
MTU	Maximum Transmission Unit
NLOS	Non Line of Sight
NMS	Network Management System
Ns	Nanosecond
PHY	Physical Layer
PPP	Point-to-Point Protocol
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
QPSK	Quadrature Phase-Shift Keying
RCU	Remote Control Unit
RF	Radio Frequency
RFC	Request For Comments
RTU	Remote Transmission Unit
SCADA	Supervisory Control And Data Acquisition
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
TCP	Transmission Control Protocol

Abbreviation	Meaning
TFTP	Trivial File-Transfer Protocol
US	Upstream
VSWR	Voltage Standing Wave Ratio
WMTS	Wireless Modem Termination System

1 Overview

Arcadian Networks's ABSR-757 / BSR-757 Base Station is a component of the Arcadian Networks access system. This system provides point to multipoint broadb wireless access over the 700 MHz A-Guard Band frequencies. The system enable utilities to operate secure wireless networks for communications and Supervisory Control And Data Acquisition (SCADA) of their remote assets.

Overview of the Arcadian Networks access System

Arcadian Networks access systems consist of a ABSR-757 / BSR-757 Base Statio Rack (BSR) located in base stations, and wireless modems located at the substati site and connected to the utility's Remote Transmission Units (RTU). The system c be remotely managed from any location using Arcadian Networks's Web-based Network Management System (NMS).

The following figure illustrates the Arcadian Networks access system.

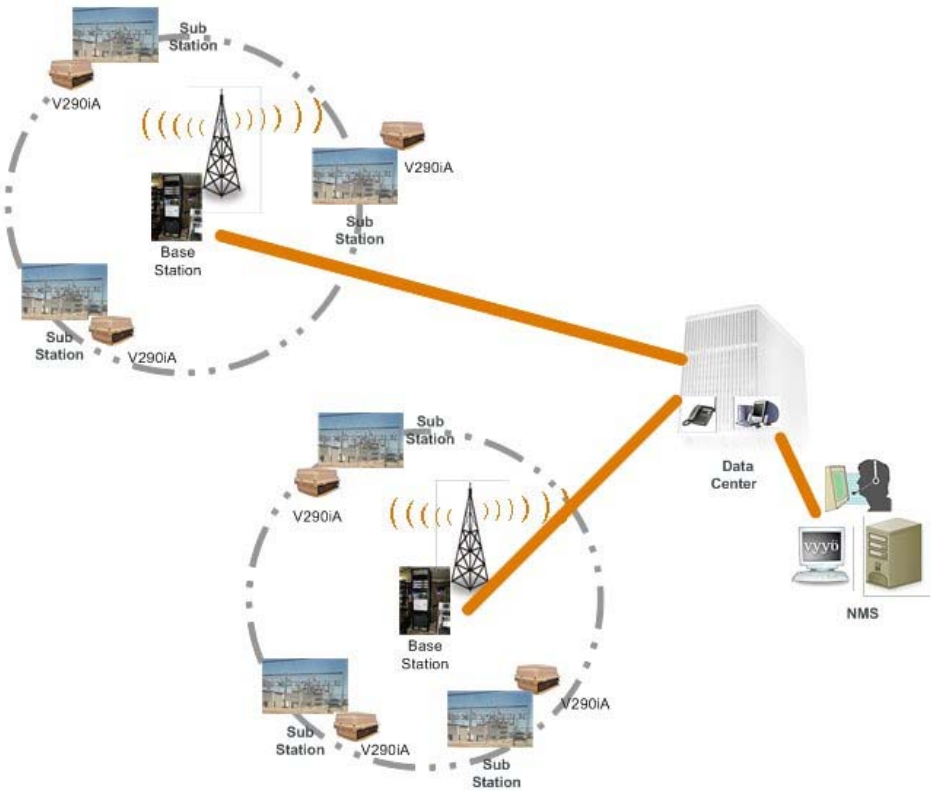


Figure 1: Arcadian Networks System

Arcadian Networks's solutions are standards-based. The Arcadian Networks syste architecture is Internet Protocol (IP)-based and utilizes a version of the cable indus DOCSIS standard, adapted to the wireless environment.

The Arcadian Networks wireless products are designed to provide broadband wire connectivity over two 1 MHz wide bands in the 700 MHz A-Guard Band frequencie

Arcadian Networks equipment supports flexible cellular planning, using one-, two-, three-sector cells, with frequency reuse. Each sector provides a single sub-channe both downstream and upstream connectivity.

As illustrated in

Figure 1, the main components of the system include:

- The ABSR-757 / BSR-757 Base Stations, described in this guide.
- The wireless modems. The Base Station supports several modem types:
  - V490i - this is an industrial wireless modem located in the utility substation s
    It includes a V487i data modem with additional interfaces, such as four seria
    ports (typically for SCADA devices), three Fast Ethernet ports, and a WiFi
    access point. This modem is described in the *V490i User Guide*.
  - V390i – this is an industrial wireless modem located in the utility substation
    It includes a V384iI data modem with additional interfaces, such as four ser
    ports (typically for SCADA devices), three Fast Ethernet ports, and a WiFi
    access point. This modem is described in the *V390i User Guide*.
  - AE11V (V787i) - TBD
  - MMU (monitoring modems) – this is an indoor UHF band A data modem, wh
    is part of the BSR. It is connected by a cable to the BSR antenna test point.
    used to monitor the RF signal quality of a sector.

- The NMS, described in the *NMS User Guide*.

Overview of the Base Station

The Arcadian Networks BSR is a pre-configured rack, containing all the componen necessary for operating a secure wireless network for communications.

The BSR is designed to provide broadband wireless connectivity over two 1 MHz v bands in the 700 MHz A-Guard Band frequencies, separated 30 MHz from each ot These 1 MHz channels are divided into three or four equal subchannels, each subchannel being delivered via each one of a three sector antenna array providing frequency diverse coverage area from each base station tower site. Each BSR has three discrete RF paths to and from its Wireless Modem Termination System (WM to the sector antenna. The base station transmits a “Downstream” RF signal to the CPE, and receives an “Upstream” RF signal from the CPE.

This document describes the three-sector Base Station configuration. One-sector a two-sector configurations are optional, either for Omni coverage, or for support of t sectors out of three. Where a three-sector configuration includes three RF subcomponents (Upconverter, PA, LNA, Downconverter, etc.), the one- or two-sec configurations include the corresponding one or two RF subcomponents. All sectio this document are relevant also for the one- and two-sector configurations.

Base Station Basic Description

The following is a simplified block diagram of the three-sector Base Station.

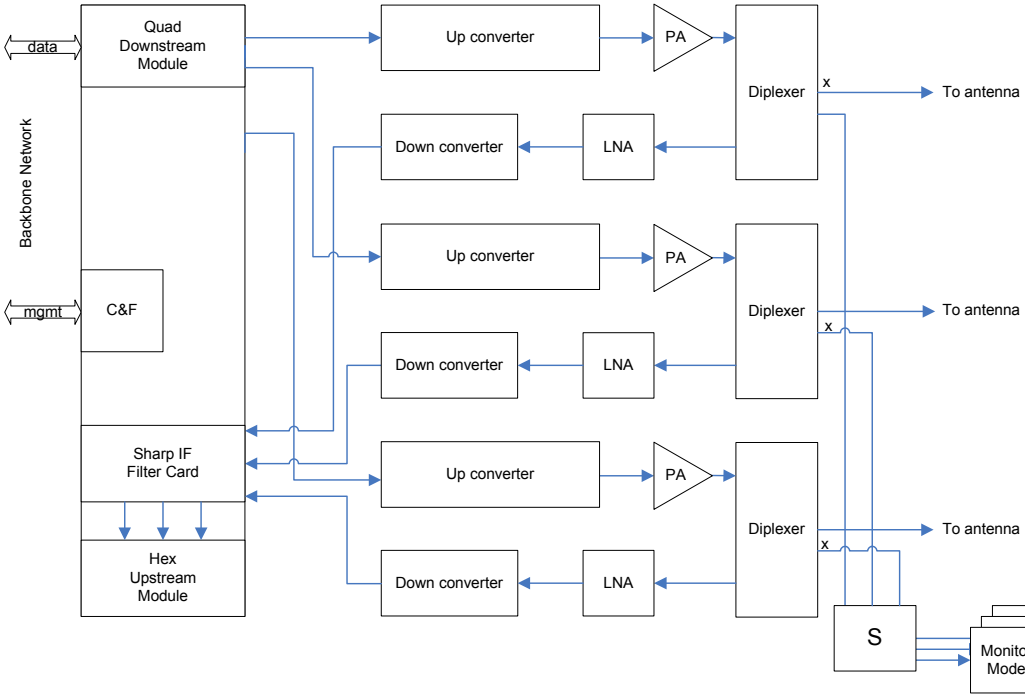


Figure 2: Three-Sector Base Station – Simplified Block Diagram

☑ Note: The Sharp IF Filter card is an optional card that filters out extraneous signals
Without the Sharp IF Filter card, the connection between the Down converter and t
Hex Upstream Module is a straight wire.

The Base Station supports three separate Transmit (TX) and Receive (RX) RF-pat for the three sectors. Each RF path includes a transmitter and a receiver. The actu frequencies for one- and two-sectors will be determined by the customer.

The basic components and process of the Base Station include:

- **Downstream (transmit) path description:** Signals arrive at the WMTS from the customer's backbone network. The WMTS Quad Downstream card output is a T signal. This signal is up-converted to the RF signal, amplified by the Power Amp unit, and then delivered through the Diplexer to the antenna. From the antenna t signal is transmitted to the modems.
- **Upstream (receive) path description:** Signals arrive at the antenna from the re equipment. The RX RF signal from the antenna is delivered through the Diplexe the Low Noise Amplifier (LNA) and Down-converter module, and then delivered IF signal to the WMTS Hex Upstream receiver card. From there it is transmitted customer's backbone network.
- **WMTS:** The Wireless Modem Termination System (WMTS) is the system's hear The WMTS is a mediator between the wireless access system and the customer backbone. The WMTS exchanges the digital signal to/from the customer's backb with the RF signals to/from the CPE modems. Multiple RF paths terminate in a s WMTS device.
- **Monitoring:** The Base Station includes several RF test points to enable local RF signals measurements, and three monitoring modems to enable remote monitori the base station functionality for each sector. The Base Station also includes a Remote Control Unit (RCU). It is intended to provide extended BTS monitoring ir future versions.

☑ **Note:** When a one-sector BTS is built, only channel 1 is used. For two-sectors, channels 1 and 2 are used. For three-sectors, channels 1, 2, and 3 are used.

System Configuration Description

The following table describes the system configuration.

Parameter	One-Sector	Two-Sector	Three-Sector
Number of Sectors	1	2	3
Number of Downstream Channels	1	2	3
Downstream Channel Width	330 KHz	330 KHz	330 KHz
Downstream Channel Modulation	64 QAM	64 QAM	64 QAM
Downstream Channel Frequencies	757.170, 757.5, 757.830 MHz	757.170, 757.5, 757.830 MHz	757.170, 757.5, 757.830 MHz
Number of Upstream Channels	1	2	3
Upstream Channel 1 Port Assignment	1 & 2 with diversity	1 & 2 with diversity	1 & 2 with diversity
Upstream Channel 2 Port Assignment	NA	3 & 4 with diversity	3 & 4 with diversity
Upstream Channel 3 Port Assignment	NA	NA	5 & 6 with diversity
Upstream Channels Bandwidth	325 KHz	325 KHz	325 KHz
Upstream Channels Modulation	16 QAM	16 QAM	16 QAM
Upstream Channels Frequencies	787.170, 787.5, 787.830 MHz	787.170, 787.5, 787.830 MHz	787.170, 787.5, 787.830 MHz

2 Base Station Components

The Base Station is housed in a rack, equipped for three sectors. The following blc diagram describes the base station components for each sector (the WMTS serves the sectors).

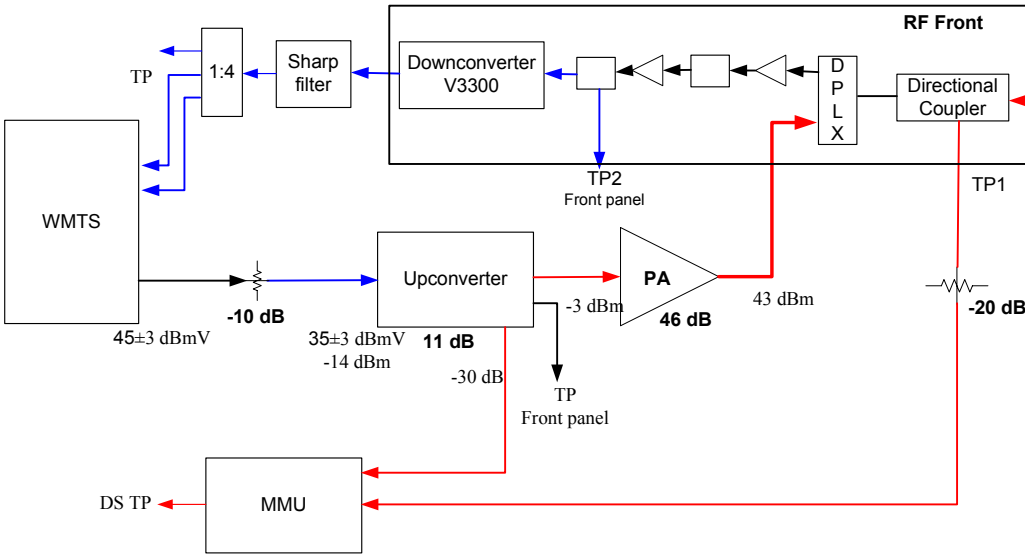


Figure 3 BTS RF block diagram of each sector

Transmit path components (for each sector):

- WMTS model V3000. Information received in the V3000 LAN interface is transm to the V3000 Quad downstream card, where it is being classified and prioritized according to its configuration.
- The V3000 Quad TX card transmits 44 MHz IF signal
- 10 dB attenuator
- Upconverter, which up converts the 44 MHz signal to the 757-758 MHz frequenc range

- Power Amplifier, which is connected to the RF Front box
- RF Front box, including a Diplexer and a Directional coupler

Receive path components (for each sector):

- RF Front Box. The RF front box includes:
  - Diplexer
  - LNA1
  - Bandpass filter
  - LNA2
  - Splitter, for Post-LNA test point
  - Downconverter, which down converts the signal from the 787-788 MHz frequency range to 44 MHz center frequency.
- Splitter (Post Downconverter):
  - 1 connector leads for test point
  - 2 connectors lead to two V3000 Hex upstream card input connectors
- The V3000 upstream card performs diversity on the two received signals. It processes the received data and transmits it to the V3000 LAN interface, which i connected to the customer's network backhaul.

In addition the ABSR757 includes two monitoring units:

- MMU (Modem Monitor unit)
- RCU (Remote Control Unit)

The MMU (Modem Monitoring unit) is connected to the TX and RX chain through the Directio Coupler close to the antenna port. It received a sample of the TX RF signals from the antenna for testing purpose. The MMU can test also the RX chain of the ABSR757 through the same directional coupler.

The RCU (Remote Control Unit) is connected to the RS232 rear panel connector of each of th Upconverter and PA modules. The RCU is monitoring the units parameters, and through a LA connector can deliver the information to the NMS.

Base Station Front and Back Views

Figure 4: ABSR757 front view picture

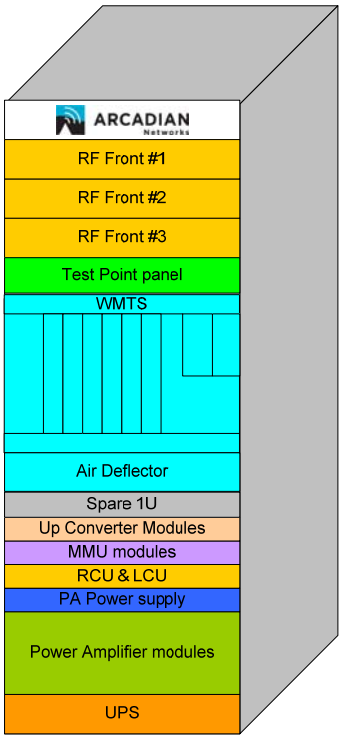


Figure 5: Front view diagram

Figure 6: ABSR757 Rear view picture

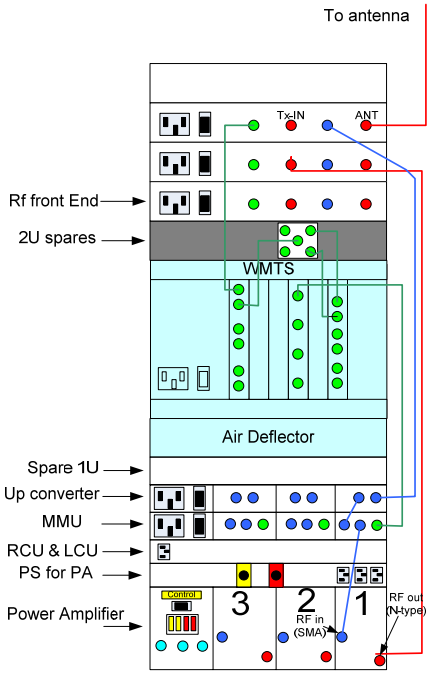


Figure 7: Rear view interconnections

The BSR (Base Station Rack) is a complete unit, assembled and ready to be use v installed.

The various components of the Base Station are described below.

Base Station Main Components

The Base Station includes the following main components:

- *WMTS*, described on page 18.
- Upconverter, described on page 22.
- Power Amplifier, described on page 21.
- *ABSR757 RF Front box* on page 22
- *Test Points*, described on page 25.
- *MMU (Monitoring* Modem, described on page 25.

The following sections describe each component in detail. For the technical specifications of the Base Station rack and of each of the components, refer to *Appendix A: Technical Specifications*, on page 67.

WMTS

The WMTS chassis includes the following cards (see Figure 9: WMTS Chassis – F Panel):

- **Host card** – The host card serves as a PCI bus arbiter and provides system clo and timing.
- **Quad Downstream module** – The quad downstream module consists of a univ card inserted in the front portion of the chassis matched with a modulator card inserted in the rear of the chassis. This downstream module generates IF of four downstream channels. It also serves as the interface to backbone data traffic.
- **Hex Upstream module** – The hex upstream module consists of a universal carc inserted in the front portion of the chassis matched with a demodulator card. It demodulates the data from the six US channels and extracts the Ethernet packe
- **C&F card** – The C&F card runs the WMTS control application. It also serves as interface to backbone management data traffic.
- **Sharp IF Filter card** – The filter card is inserted in the rear of the chassis. It reje unwanted signals, ensuring that the signals received by the base station are free interference. This is an optional card.

The system cards communicate and handle traffic over a standard internal Compa PCI bus.

- To extend the system, more upstream and downstream modules can be inserte the WMTS. Each module consists of a universal card, a rear card (Upstream or Downstream), and an appropriate software application. Two slots are reserved, for the host card and one for the C&F card. The system can be extended to any combination of 6 communication modules.

WMTS Physical Description

The WMTS is mounted in a standard 19” by 6U high rack-mounted chassis, as illustrated in Figure 9: WMTS Chassis – Front Panel. The chassis has a fan tray at the unit, bringing the total height required in the rack, to 8U. The eight bay chassis contains 8 slots in the front, 6 slots in the rear, and a mid-plane card in between, u to interface the cards. Blank panels cover unused slots.

A standard Compaq PCI bus is used to transfer traffic and data between the syste cards. The power supplies, host card and the universal cards are inserted in the fr the chassis. The modulator and hex demodulator cards are inserted in the rear of t chassis.

The ON/OFF power switch and the fuse are located in the rear of the power supply

The rear panel of the chassis is illustrated in Figure 8: WMTS Chassis – Rear Pan and the front panel in Figure 9: WMTS Chassis – Front Panel.

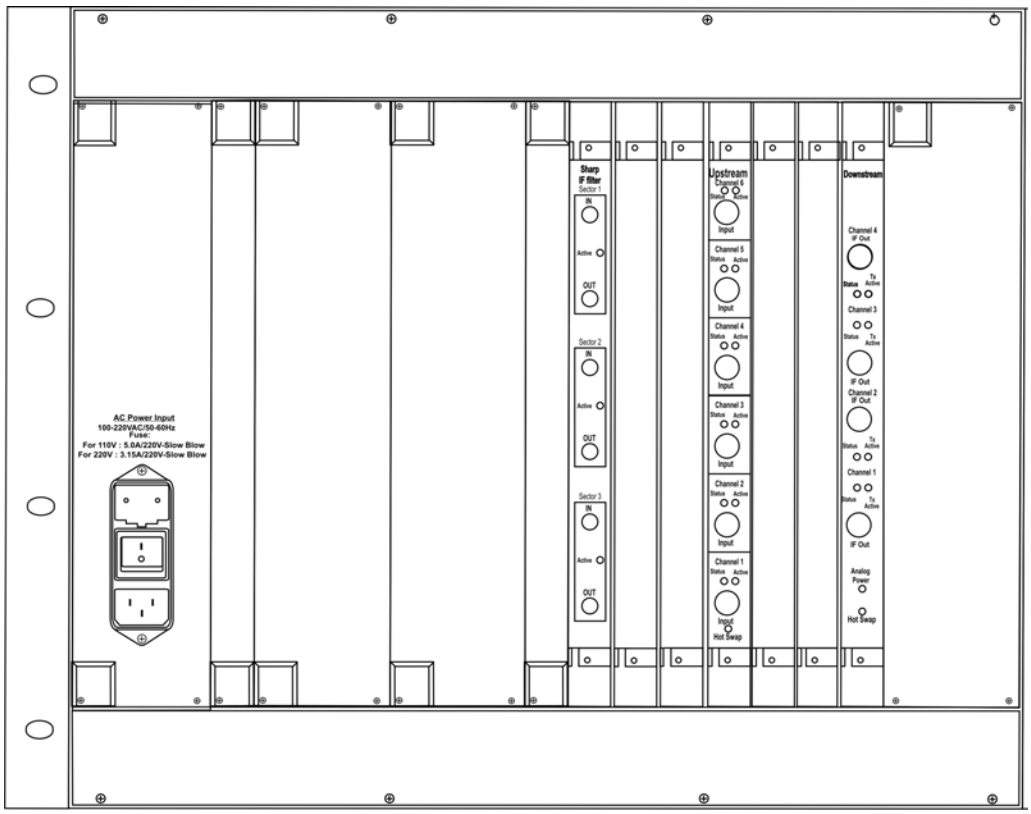


Figure 8: WMTS Chassis – Rear Panel

Figure 9: WMTS Chassis – Front Panel shows the WMTS chassis with (from left tc
right) Upstream module, Downstream module, Control and Forward card, Host car
and Power Supplies.

Figure 9: WMTS Chassis – Front Panel

Upconverter

The digital QAM Upconverter includes three independent plug-in Upconverte modules. The unit uses a common power supply. The Upconverter converts 44 MHz IF signal to the RF 757-758 band, implementing spectrum inversion. T unit utilizes high quality circuit, enabling high quality RF signal.
Each Upconverter module rear panel includes IF In, RF Out and RF -30 dB tes point. The RF test point is use for permanently connect the Upconverter to th MMU (monitor modem unit), enabling BTS self test. The module rear panel includes also a 6 pin RS232 connector, permanently connected to the RCU (remote control unit) for remote control and monitoring.
Each Upconverter module front panel includes -20 dB test point. In addition t is a front panel RS232 connector for local remote control and monitoring (through Lap top or Local Control Unit).

Figure 10: Upconverter rear panel

Figure 11: Upconverter module front panel

Power Amplifier

The ABSR757 PA (Power Amplifier) includes three independent plug-in power amp modules in a 4U box. A common external 28VDC power supply is connected to th box. The box delivers the DC to each module.
Each module includes a PA RF module, a control circuit and two fans. Each PA ca supplies up to 20 watts of 64QAM digitally modulated signal. The PA monitors the forward and reflected RF power, and DC voltage. Each PA rear panel includes a 6 RS232 connector, permanently connected to the RCU (remote control unit) for rem control and monitoring.
Each PA includes a front panel RS232 connector for local remote control and monitoring (through Lap top or Local Control Unit).

Figure 12: Power Amplifier Front panel (above PA Power supply)

Figure 13: Power Amplifier Rear panel

ABSR757 RF Front box

The BSR includes three RF Front boxes, each for a sector.

The RF front box includes (figure 2):

- Diplexer
  The Diplexer separates the TX/RX signal being transmitted to/from the ante
  The Diplexer supports a very high TX to RX signal separation.
- LNA
  The LNA the upstream received signal from the Diplexer, amplifies it, and

delivers it to the Downconverter. The LNA module includes two Low Noise Amplifiers in series. A narrow band BPF (band pass filter) is placed betwee amplifiers to improve received signal filtering. The LNA module has a fixed
- Splitter, for Post-LNA RF test point
- Downconverter, which down converts the signal center frequency 787.5 MH 44 MHz, implementing spectrum inversion.

The RF Front box rear panel connectors definition:

- Antenna – connected to antenna port
- RX Out – 44 MHz output (post downconverter)
- TX In – Input TX signal from the PA
- Ant. TP -30 dB – A RF test point, -30 dB of the antenna output signal, permanently connected to the MMU for monitoring the sector RF performan

The RF Front box front panel includes a Post LNA Test Point (787.5MHz).

Figure 14: RF Front box rear panel

Test Points summary

The BSR includes test points that enable measuring output of the Downstream Upconverters pre-PA, and provide RF samples of various upstream and downstrea signals. The following table lists the test points.

Table 1: BSR Test Points

Location in BSR	Test Points	Description
Upconverter module	Front panel TP	Upconverter output -20 dB
Upconverter module	Rear panel TP	Upconverter output -30 dB, permanently connected to MMU
RF Front box	Rear panel TP	Antenna output -30 dB, permanently connected to MMU
RF Front box	Front panel TP	Upstream post LNA output
Rack Front panel (above WMTS)	TP1, TP2, TP3 (for sectors 1,2,3)	Upstream post Downconverter output (44 MHz)
MMU module	Front panel TP	Downstream TX signal -80 dB

☑ **Note:** When a one-sector BTS is built, only channel 1 is used. For two-sectors, channels 1 and 2 are used. For three-sectors, channels 1, 2, and 3 are used.

MMU (Monitoring Modem Unit)

The MMU 1U box includes three independent plug-in Monitoring Modem modules. unit uses a common power supply.

Each Monitoring Modem is a modem integrated with a built-in UHF radio that provi an upstream RF output in the 787-788 MHz range and downstream frequency inpu which ranges from 757-758MHz. Each monitoring modem serves a single sector, enabling monitoring of downstream and upstream paths. The modems can be monitored locally via the rear panel Ethernet connector, or via the NMS.
The MMU main signal is from the antenna test point. In addition the MMU is conne to the Upconverter test point, for monitoring the signal quality. When the PA failed, MMU automatically switch to monitor the Upconverter, enabling problem diagnosti

3 Installing the Base Station

The Base Station Rack is delivered as a complete unit. All the sub-components we installed, wired and pre-tested in the rack. The installation you need to perform cor of the following steps:

- *Installation Prerequisites*, described on page 26.
- *Unpacking and Inspection*, described on page 29.
- *Physical Installation*, described on page 30.
- *Initial Operation Procedure*, described on page 30.
-
- *Setting the WMTS Network* Properties, described on page 31.
- *Connecting the WMTS to the Backbone Network*, described on page 37.
- *Adding the WMTS to the NMS*, described on page 38.
- *Provisioning the Monitoring Modems*, described on page 38.
- *Verifying Proper BSR Operation*, described on page 38.

Installation Prerequisites

Prior to installation, make sure you meet the following prerequisites:

- **Building recommendations** – The quality of the building is of great importance you are to expect long life and continued performance from the Base Station. Th building must be clean, dry, temperature controlled and secure. Don't forget to a space in the building for any additional racks to house test equipment, a workbe area, line regulating transformers, ladders, equipment and parts storage, first aic emergency generator if uses, as well as heating and cooling devices that may b unique to your installation. A sloping roof will tend to develop leaks less rapidly. building should be well roofed with good material. The cooling load will be lowere with reflective or light colored roofing material. These requirements are not a complete list, but are merely provided for your information.
- **Physical rack space** – Leave rack space of 30" depth x 70" height x 23.5" width Reserve door space of 30" in the front and in the back of the rack.
- **Environmental conditions** – The rack environment temperature should be kep between 0 to 50 ºC. Humidity should be kept below 80%, non-condensed.

- **Vibration** – The BSR should be placed on a stable pedestal, to prevent vibratior nearby equipment, such as generators.
- **Power delivery** – The power should be capable of delivering 110V 2KVA. In ad place an appropriate AC power line protector, conditioner, and/or surge suppres across the AC supply line.
- **Grounding** – Good 8AWG wire grounding should be connected from an externa GND source to the BSR.
- **BSR Cable connection** – For proper base station operation, a low loss cable sh be used between the BSR antenna ports and the antennas. The cable's desired should be below 2.5 dB. The typical cables are LMR900 or 7/8 Heliax.
- **Antenna installation** – The base station antennas should be installed and corre directed, before full Base Station operation.
- **Technician's laptop and cables** – The installing technician should come with a laptop that has a 10/100 BaseT connection. It is also strongly recommended tha laptop have a serial port. Use of USB to serial converters is not recommended. T laptop LAN connection Internet Protocol (TCP/IP) properties should be set to IP address: 10.10.10.x, subnet mask: 255.255.255.0.

  In addition, the technician should bring either:

  - Straight-Through Ethernet Cable to connect the laptop to a Base Station sw
  - Crossover Ethernet Cable to connect the laptop directly to the WMTS.
- **Tools and Utilities** – Two disks are included in the package. The technician sho copy the one called *tools&utilities* to the laptop.
- **Backbone connection** – A switch or router with at least two (recommended: thr available 100 BaseT ports is required to connect the Base Station to the backbo network. The ports' designations are as follows:

  - One port for Arcadian Networks management traffic.
  - One port for data traffic.
  - An additional available port is recommended for a technician's local mainte connection.

  If traffic prioritization is required, it is recommended that the data traffic interfac configured to prioritize ToS marked traffic.
- **Backbone connection cables** – Two Straight-Through Ethernet Cables are req to connect the Base Station to the backbone.

Antenna and Tower Recommendations

Your preliminary engineering workgroup should establish your antenna and tower requirements. Construction of sturdy, high quality antenna/tower systems will pay c terms of coverage of your service area, the overall quality of your radiated signal, a reduced maintenance expenses. Transmitting antennas can enhance or seriously impair the transmitter output.

The selection, routing, and length of coaxial cable are extremely important in the installation. Buy the best cable you can obtain, route it via the shortest way to the antenna, and keep it straight. Do not form it into sharp bends on its way. Do not us more cable fittings for the installation than absolutely necessary. All cautions here equally to all coaxial cables in the system, both input and output.

Pay attention to radial ice accumulation when designing the transmission system. I not uncommon for at least an inch of ice to build up on the tower and antenna. This turn significantly increases the weight, cross section, and wind loading of the syste

Attaching the transmission line to the tower is crucial to maintain a safe and reliabl operation. Nylon wire ties and electrical tape will break down in the sunlight and ultimately fail, creating a potentially dangerous situation. It is important to use prop clamps and hoisting grips and also ensure that the transmission line is grounded a tower in several locations. When high currents flow through the tower in the event lightening strikes, some of that current will flow through the outer conductors of the transmission lines. Due to the resistance difference between the steel tower and c transmission line, a significant voltage can be developed, often resulting in arcing between the outer jacket and outer conductor, thus pitting the conductor.

Preventative maintenance is crucial in ensuring that safety is maintained. Specifica check that transmission line grounds are tight and are not missing any hardware. Frequently inspect support clamps or spring hangers. Consider investing in an ice break, if you haven't already done so, as shards of falling ice can damage the transmission line. Check the tower light photocells and conduit.

The better-known tower manufacturers offer complete technical and safety documentation with their towers. Be sure that you have this information as it regarc wind loading, guying, etc. The best-designed antenna system will function poorly if shortcuts and compromises are used during installation. Follow the manufacturer's instructions exactly, along with an engineering data prepared for the site. Be absol safe and certain about this aspect since human lives may be at stake.

Electrical Service Recommendations

We recommend that a qualified, licensed local electrician be consulted for the requ electrical service. We suggest local electricians because they know the local codes they can be on site readily, and you are apt to get better overall support if you use suppliers.

We recommend that proper AC line conditioning and surge suppression be provide the primary AC input to the power amplifier. All electrical service should be installe with your national electrical code in your area, any applicable provincial or state co and good engineering practice. Special consideration should be given to lightning protection of all systems in view of the vulnerability of most transmitter sites to ligh Lightning arrestors are recommended in the service entrance. Straight and short grounds are recommended. The electrical service must be well grounded. Do not connect the unit to an open delta primary power supply, as voltage fluctuations cou harm the unit. Branch your circuits. Do not allow your lights, your workbench plugs your transmitting equipment to operate on one circuit breaker. Each transmitter sh have its own circuit breaker, so a failure in one does not shut off the whole installat

Shelter Security

The FCC requires that the transmitter be secure from entry or control by unauthori persons, and that any hazardous voltages or other dangers, including most tower bases, be protected by locks or fences as necessary to protect personnel and prev unauthorized tampering or operation. Security of the building further implies that it secure from wildlife. Use sturdy construction materials, including sheet metal if necessary. Holes around conduit, cable, and other similar entry points should be s with steel wool and caulked to prevent entry of wildlife. Other features of security f your shelter may include its location with respect to the prevailing wind conditions. location leeward of some natural topographical feature will prevent wind damage a snowdrifts. Check the soil runoff conditions that may slow or hasten wind or water erosion and other concerns that may be unique to your location.

Unpacking and Inspection

Check the outside of the container. Carefully open the container and remove the contents. Retain all packing material that can be reassembled in the event that the equipment must be returned to the factory.

☑ **Note:** Exercise care in handling equipment during inspection to prevent damage d rough or careless handling.

Visually inspect the contents for damage that may have occurred during shipment. Check for evidence of water damage, bent or warped chassis, loose screws or nut extraneous packing material in connectors or fan failures. Inspect all connectors fo bent connector pins. If the equipment is damaged, a claim should be filed with the carrier once the extent of the damage is assessed.

Physical Installation

Physically install the BSR according to the following steps. Perform the steps in the given order:

1. Follow all the prerequisite requirements (refer to Installation Prerequisites on page 26).
2. Follow the unpacking and inspection instructions (refer to Unpacking and Inspe on page 29).
3. Ensure the rack is physically stable.
4. Open the back and front doors, and visually inspect the all the components in t rack to make sure they are intact (devices, cables, connectors, etc.).
5. Make sure that the WMTS rear panel Power switch is OFF.
6. Make sure all the Power Amplifiers are OFF.
7. Connect properly the appropriate cables to the antenna ports.
8. Check for proper antenna connection, as follows: Confirm that all the RF cable (one per sector) that should be connected from the Rack's Antenna Ports to the antennas are properly connected. Check for VSWR below 1.4 on the cables (R loss below -16 dB).

Note: For testing purposes, the antenna ports may be connected to Dummy Loads instead of to the antennas. The Dummy Loads' power should be above 50W.

Warning: *Do not apply AC power and turn on power to the transmitter at this tir since the RF output must be properly loaded before operation.*

Initial Operation Procedure

The base station rack is adjusted and tested before shipment. The following initial operation procedure is enabling a proper operation without using of additional test equipment.

After carrying out the steps in *Installation Prerequisites*, *Unpacking and Inspection Physical Installation* , perform the following:

1. Verify that the power switch of all PAs is OFF.
2. Connect the rack's main power cord to the 110V power source.
3. *Power ON the WMTS.*
4. Check the WMTS LEDs. Refer to *WMTS LEDs and Connectors* on page 51.
5. Perform the following steps for each sector
6. Verify that the Upconverter box is active.

7. Check the Upconverter front panel LEDs (PLL, IF level, RF level). The LEDs sh be Green.
8. Connect the serial port of the PC to **local monitor serial port located in front** the Upconverter module.
    i. At the prompt (>>), type the command **adc**
    ii. The Upconverter parameters (input level, output level, voltage) will appe
    iii. Check for proper signal levels.
9. Power ON the PA with the rear panel On/Off switch.
10. Verify that the PA enclosure's fan is ON. You should be able to hear the fan, ar feel air blowing.
11. Check the PA front panel LEDs (FWD Power, RVS Power, fans, temperature, status). The LEDs should be Green.
12. Connect the serial port of the PC to **local monitor serial port located in front** the PA module.
    i. At the prompt (>>), type the command **all_status**
    ii. The PA parameters (FWD Power, RVS Power, fans, voltage) will appea
    iii. Check for proper signal levels.
        1. The system was pre-adjusted for the correct output level. Check the PA's Forward power (output level) is 40±0.5 dBm.
        2. The Reverse power should be at least 10 dB below the Forward power.
        3. The voltage should be 28±0.5V

    If the expected value is not achieved, refer to *Initial Operation – Troubleshooting Issues* on page 59
13. Repeat steps 7 to 2 for the other sectors.
14. Verify that the Monitoring Modems front panel LEDs behave as follows:
    - Power LED is steady ON.
    - Status LED is steady ON.

Setting the WMTS Network Properties

To set the WMTS network properties, you must modify the file `regtree.txt` to cor the updated WMTS network properties, then compile it into `regtree.rtr` and dow it to the WMTS. You must therefore perform the following:

- Edit and compile the Regtree.txt file, and download it to the WMTS as described *Editing and Downloading the Regtree File* on page 32.
- Restart the WMTS described in *Restarting the WMTS* on page 37.

Make sure you have the following necessary equipment:

- PC
- Crossed Ethernet cable (or straight if there is a switch between WMTS and the F

Editing and Downloading the Regtree File

This process includes the following steps:

- Editing the Regtree file.
- Setting the network properties in the Regtree file.
- Compiling the Regtree file.
- Running TFTP server.
- Running WmtsConfig tool.
- Connecting to the WMTS.
- Downloading the new Regtree file.

To edit the Regtree file:

- The `regtree.txt` file is located under directory *{build}*\Wmts*{swversion}*\SET-I Open the `regtree.txt` using a standard text editor, such as Notepad.

> **Note:** There may be several versions of the Regtree file available (e.g., `regtree_bandA.txt`). If so, copy the version you wish to use and rename it to `regtree.txt` since that is the file that `SETIP.bat` expects as its input file.

To set the WMTS network properties in Regtree.txt:

1. Scroll down, or use the Find function, to locate the **CmtsIPAddress** entry. In th example (Figure 15) its value is `10.10.10.210`. The default network address fo Arcadian Networks equipment is `10.10.10.xxx`.

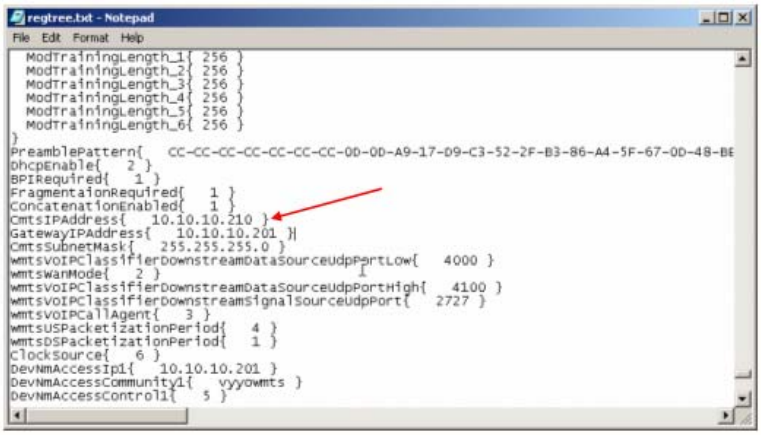


Figure 15: Regtree.txt File Contents

2. Change the following entries as follows:
   - **CmtsIPAddress** – IP address of the WMTS.
   - **CmtsSubnetMask** – subnet mask of the WMTS.
   - **GatewayIPAddress** – gateway IP address for the WMTS.
3. To enable SNMP access to the WMTS, change the following entries:
   - **DevNMAccessIP1** – IP address of Arcadian Networks NMS server.
   - **DevNMAccessCommunity** – SNMP community attribute for authorizing th NMS.
   - **DevNMAccessControl1** – the type of access level allowed to the NMS (1-r access, 2-read only, 3-read&write, 4-read only with traps, 5-read&write with traps, 6-traps only).

> ☑ **Note:** For proper operation of Arcadian Networks NMS do not change the **DevNMAccessControl1** and **DevNMAccessCommunity** entries.

4. To add support of a second NMS server, or any other SNMP management tool additional server duplicate the three lines: **DevNMAccessIP1**, **DevNMAccessCommunity1**, and **DevNMAccessControl1**. Change to **DevNMAccessIP2**, **DevNMAccessCommunity2**, and **DevNMAccessControl** and change the values accordingly.
   For northbound NMS, you may want to set the **DevNMAccessControl2** entry t traps only or read-only with traps, to avoid management overhead on the WMT

To compile the Regtree file:

1. Compile `regtree.txt` by executing `SETIP.bat`, which is located in the same directory as `regtree.txt` (see Figure 16). `SETIP.bat` is a batch file that conve the `regtree.txt` text file to a special format readable by the WMTS. The resul file is named `RegTree.rtr` and is placed in the same directory as the `regtree`

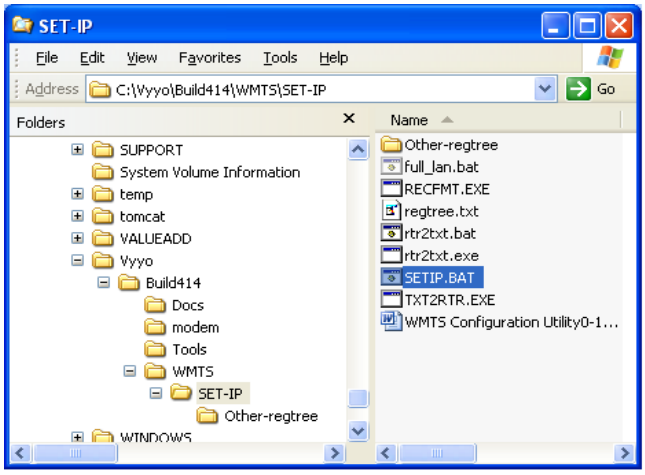


Figure 16: Location of SETIP.bat

2. Copy the `regtree.rtr` to the directory in which the WMTS image file are locat

To Run the TFTP server:

1. Open the TFTP server, in this example, `Pumpkin.exe`. You can bring up the Op dialog window by clicking **Options** (see Figure 17). This enables you to chang download directory.

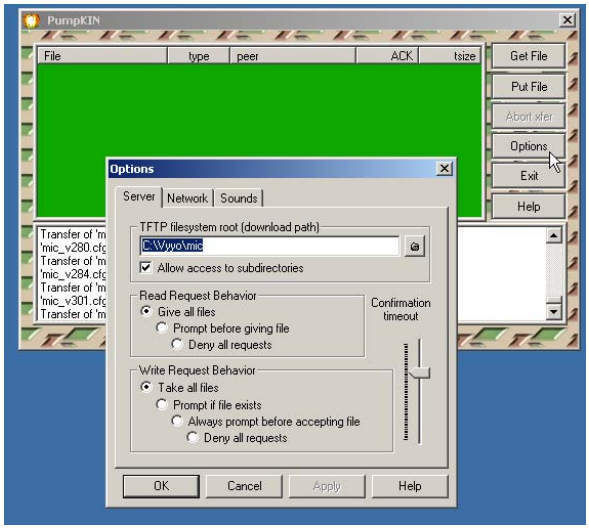


Figure 17: PumpKIN TFTP Settings

2. Change the download path to the directory path of the WMTS image files and t `RegTree.rtr` file.

3. Save the TFTP server download path as the default value by exiting and then restarting the TFTP server.

To Run the WMTSConfig tool:

1. Open WMTSConfig.exe tool to perform the download to the WMTS. This tool is located in the ...*{build}*\\Tools\WMTSConfig directory of the build.

   The initial screen appears.

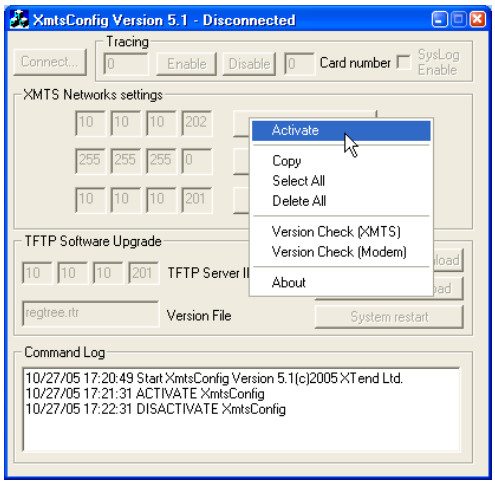


Figure 18: WMTS Configuration Tool

2. Right-click to display a popup window from which you select **Activate** (see Figure 18).

   The WMTSConfig screen is enabled.

Note: The WMTSConfig screen is enabled for one minute only, to prevent acciden downloads and restarts. You may therefore have to activate the screen and conne the WMTS (explained in the next step) several times during this procedure.

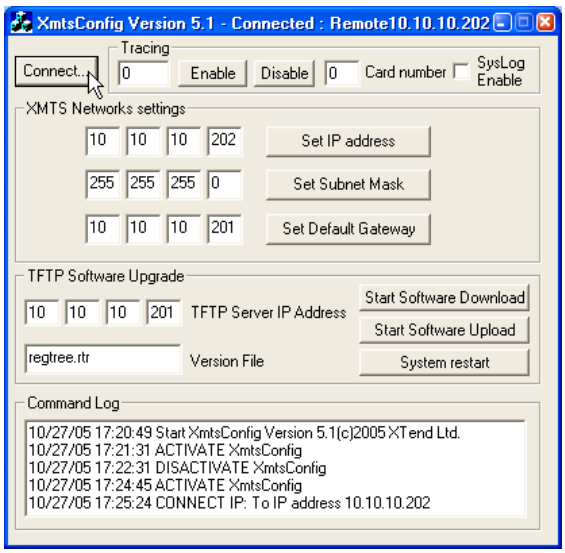


Figure 19: Active WMTS Configuration Tool

To Connect to the WMTS:

1. While the application is active, click **Connect** (see Figure 19).

   The Connect window appears, enabling you to choose the type of connection t open (Serial or IP).

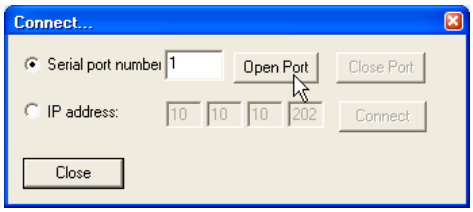


Figure 20: Specifying the Connection Type

2. Connect the Ethernet cable from the PC to the Ethernet port on the WMTS Cor & Forward card.
3. In the Connect window (Figure 20):
   - Select **IP address** and specify the IP address of the WMTS.

Note: The WMTS is shipped with the default IP address of 10.10.10.2. If this is a f time installation use this address.

To Download RegTree.rtr:

1. In the main application window (Figure 21), in the TFTP Software Upgrade sec

- Enter your PC IP address in the **TFTP Server IP Address** field
- Enter the file name, `regtree.rtr`, in the **Version File** field.

2. Click **Start Software Download**.

   After the download command is sent to the WMTS, a message appears in the Command Log window of the WMTSConfig tool (see Figure 21). This message does NOT indicate that the download has occurred.

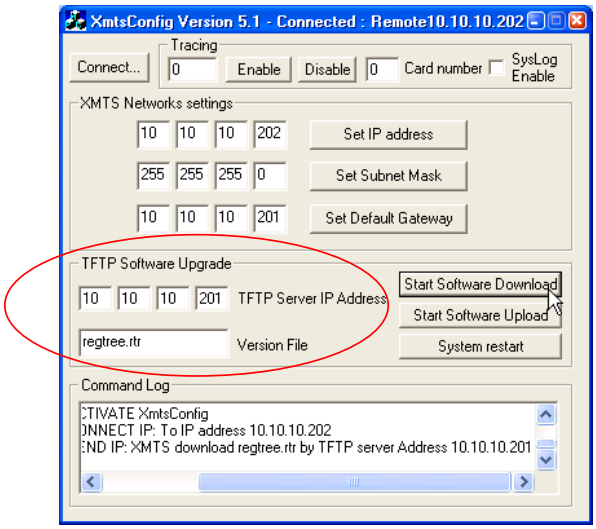


Figure 21: WMTS Download of Regtree File

Restarting the WMTS

The new RegTree properties will go into effect only after the next WMTS boot up. T restart the WMTS, click **System Reset** in the WmtsConfig tool.

Connecting the WMTS to the Backbone Network

To Connect the WMTS to the backbone network:

- Connect the Ethernet port located on the WMTS C&F card to the base station switch/router port connected to the management backbone network. The Ethern port on the C&F card transmits and receives Arcadian Networks network management information.
- Connect the Ethernet port located on the WMTS downstream module front to the base station switch/router port connected to the data backbone network. The Ethernet port located on the downstream module transmits and receives data of devices outside the Arcadian Networks network, such as SCADA devices, secur devices, and PCs.

> **Note:** The Cisco router located in the V390iA is considered outside the Arcadian Networks network.

Adding the WMTS to the NMS

Once you have the WMTS permanent IP address, you should add the WMTS to th NMS. Refer to the *NMS User Guide* for instructions.

Provisioning the Monitoring Modems

The procedure for provisioning a monitoring modem is identical to any other mode provisioning. Refer to the *NMS User Guide* for instructions. The MAC address of e monitoring modem appears on a sticker attached to the modem, visible from the re the Base Station rack.

Follow these guidelines:

- It is recommended to select a name for the monitoring modem that will indicate i functionality (e.g., *Monitoring modem sector A*).
- The monitoring modem configuration file should be set to a single best effort ser and must not include any QoS features such as priority or CIR.

Verifying Proper BSR Operation

The initial tests for verifying proper operations are performed using the Monitoring Mod The tests verify proper operation of the base station rack, even before connection to th CPE modems. The MMUs monitor the three channels covered by the BTS. Each MMU monitors a single channel. MMU1 is connected to channel 1, and so on.

For each of the three channels, check the following parameters through the NMS. Verif that the actual values are within the expected values.

- Check the modem Downstream Received Power and SNR (refer to the *NMS Us Guide* for instructions).
- Check the MMU Transmit Output Power (refer to the *NMS User Guide* for instructions).
- Check the channel Upstream Received SNR (refer to the *NMS User Guide* for instructions).

Parameter	Expected Value
Downstream Received Power	- 16 ± 3 dBmV

Downstream SNR	≥ 33 dB
MMU Output Power	62 ± 4 dBmV
Upstream Received SNR	≥ 22 dB

Note: More extensive RF tests can be run using the test points (refer to *Test Point Signal Verifications* on page 71), and integration with the remote CPE modems.

4 Configuring the Base Station

> ***Caution:*** *The Base Station arrives pre-configured.*
>
> *Under ordinary circumstances, there is* ***no need*** *to configure it.*
>
> *Do not reconfigure the Base Station unless it is really necessary.*

This chapter includes the following:

- Learning the *Basic Base Station Frequency Setup*, described on page 43. This is important for an understanding of the any Base Station configuration.
- *Configuring the WMTS*, described on page 46.
- *Monitoring the PA*

The PA includes 3 separate PA modules. The PA parameters can be locally or remotely controlled and monitor. The remote monitoring is through the RCU (see N instruction manual).

Locally Monitoring the PA

1. In order to configure the Upconverter gain, connect the serial port of the PC to **local monit serial port located in front** of the Upconverter module.

Open the Windows HyperTerminal (or other terminal) application and set the PC serial port accordi the following configuration:

- *Baud rate: 19200*
- *Data bits: 8*
- *Parity: None*
- *Stop Bits: 1*
- *No Flow Control*

2. In order to check the current PA status, at the prompt (>>), type the command **all_statu** The following PA parameters will appear:

3. State Machine Status:
4. ==========
5. ***Active FAN: #1***
   Fan#1

   Status: ***RUNNING***
   PWM duty cycle: 100

Protection: false
Voltage: %24.1 V ***(23.8/24.1/24.3)***
LED: Green
Blocked tick: 0
Fan#2

- Status: BLOCKED

PWM duty cycle: 0
Protection: false
Voltage: %24.1 V (23.8/24.1/24.3)
LED: Red
Blocked tick: 13560

Power Supply1

AC: OK
DC: OK
Temp: NORMAL

PA:
--
Enable: true
Status: activated
Voltage: 27.9 V (%27.6/%28.0/%28.3f)
Current: %4.2 A (%3.9/%4.1/%4.6)
Output Power: 40 dBm (40/40/40)
Reverse Power: 20 dBm (20/20/20)
Output power LOW threshold (for LED): 37 dBm
Output power HIGH threshold (for LED): 45 dBm
Reverse power HIGH threshold (for LED): %d dBm
Current vs Output power ratio: 0
Fwd LED state: 1
Pa STATUS LED state: 1
RVS LED state: 0
Cut reason: %00
Self protection flag: false
Self protection counter: 0
Self protection tick: 0
Pa enabling debounce tick: 0

Temperature:

Unit: oC
Temp: 30 oC (27/28/30)
Threshold (for LED): 45 oC
Threshold (for PA cut): 48 oC
Temp LED state: Green

6. Additional commands:

- “ver”command:

BoardRev = 6
SW Ver = PA-0.0.8
HW Ver = 0

- "pa_enable"command:

  pa_enable [0/1]

- "temp_unit"command:

  temp_unit 0/1 (oC/oF)

- Configuring the Upconverter, described on page 47.

Basic Base Station Frequency Setup

The following sections describe the basic downstream and upstream frequency se the Base Station.

Downstream Channel Frequency Setup

The WMTS downstream channel is configured for 330 KHz width at 64QAM for ea sector. The three upconverters, one per sector, are pre-set to the same RF frequer The nominal upconverter IF (input) frequency is 44.0 MHz and its RF (center) outp frequency is 757.5 MHz. The actual RF frequency of each sector is determined by setting the related IF frequency at the WMTS using the Arcadian Networks Configuration Tool. The Upconverter includes spectral inversion, and therefore the RF frequencies' association is designed accordingly (e.g., higher RF frequency is associated with lower IF frequency). For a three-sector configuration the downstrea settings are as follows:

Table 2: Base Station Downstream Frequencies

Downstream Channel	Downstream Center IF Freq.	Actual Downstream Center RF Freq. after Conversion
1	44.330 MHz	757.170 MHz
2	44.0 MHz	757.500 MHz
3	43.670 MHz	757.830 MHz

☑ **Note:** When a one-sector BTS is built, only channel 1 is used. For two-sectors, channels 1 and 2 are used. For three-sectors, channels 1, 2, and 3 are used.

The downstream IF frequencies are pre-assigned at the WMTS. You can change t settings using the Downstream Channel Configuration Menu of the Arcadian Netw Configuration Tool (refer to the *NMS User Guide*).

Upstream Channel Frequency Setup

The received upstream signal from the antenna is delivered to the Downconverter, amplification in the LNA module. The Downconverter receives a fixed upstream RF frequency (787.5 MHz) and converts it to a fixed IF frequency (44.0 MHz). All Downconverters are set to the same frequency. The actual RF received frequency converted to IF with spectrum inversion. Each of the Upstream receivers at the WM receives the corresponding actual IF frequency. The actual IF frequencies are liste Table 3.

Each upstream channel is associated with the corresponding downstream channel the sector. You can change the WMTS channel associations using the Upstream Channel Configuration Menu of the Arcadian Networks Configuration Tool (refer to *NMS User Guide*).

☑ **Note:** The related CPE IF TX Frequency is also set using the Upstream Channel Configuration Menu in the Arcadian Networks Configuration Tool. Use the CPE val appearing in Table 3.

☑ **Note:** Make sure to check the **Spectral Inversion** box on the Arcadian Networks Configuration Tool Upstream menu, since only one stage of the Downconverter wi used.

Table 3: Base Station Upstream Frequencies

Upstream Channel	Actual Upstream Freq. Before Conversion (MHz)	Actual IF RX Frequency (MHz)	Related CPE IF TX Frequency (MHz)
1	787.170 MHz	44.330 MHz	43.670 MHz
2	787.5 MHz	44.0 MHz	44.0 MHz
3	787.830 MHz	43.670 MHz	44.330 MHz

☑ **Note:** When a one-sector BTS is built, only channel 1 is used. For two-sectors, channels 1 and 2 are used. For three-sectors, channels 1, 2, and 3 are used.

Upstream Received level and SNR Setup

The upstream received level and the related received RF SNR are determined by t
received level at the WMTS Hex card receiver input port, since the RF RX path (LN
Downconverter, etc) has a constant gain. The optimum RF SNR delivers the maxir
SNR for the maximum required coverage. The typical RF SNR is 24 dB (for 325 KH
16QAM upstream channel and 20 miles coverage).

The WMTS received level is adjusted through the FAT procedure for optimum RF

Warning: *Adjustment of the Upstream Received level and RF SNR should be d
only by a trained technician. Decreasing the RF SNR below a certain threshold
harmfully reduce the received SNR and even stop upstream connection. Increa
the RF SNR beyond a certain level may also limit the coverage.*

Note: The RF SNR is the RF Signal to Noise levels Ratio at the antenna (which is
same as at the WMTS receiver input). The RF SNR may vary from the SNR report
the receiver, since the receiver SNR is influenced by additional parameters (phase
noise, interference, etc.).

The WMTS Hex card receiver input level is set using the upstream “Gain” feature i
Upstream Channel Configuration Menu of the Arcadian Networks Configuration To
(refer to the *NMS User Guide*).
Following the Hex card receiver input level setting, and integration with the Monitor
Modem, the RF SNR should carefully be checked at the relevant Post Downconve
test points (TP1, TP2, and TP3). The full procedure is described in paragraph 3.3.
the FAT document.

Configuration Tools

The configuration tools listed below are located in the *tool&utilities* disk that arrives the Base Station and which the technician should copy to his/her laptop.

Table 4: Base Station Configuration Tools

Tool	Configured File or Device	Description
WMTSConfigurationFileEditor (any standard ASCII text file editor may also be used to edit the text version of the file)	Regtree.txt Regtree.rtr (downloadable version of the text file)	Regtree.txt contains the permanen IP address of the WMTS. This too is a convenient way to edit the mor common items in the file. However when editing the WMTS IP addres you must use a standard text edito The Regtree file may be saved in either text or downloadable format using this tool.
SETIP.BAT	Regtree.txt	This batch file is used to convert th text version of the Regtree file to th downloadable format (Regtree.rtr). This batch file calls RTR2TXT.EXE and RECFMT.EXE to perform the conversion.
RTR2TXT.EXE	Regtree.rtr	Used to convert the Regtree.rtr file a standard text file (Regtree.txt)
WMTSConfig	WMTS	Used to assign temporary IP settin to the WMTS and to download files to the WMTS. Specifically, it must l used to download the compiled version of the Regtree.txt file to the WMTS. This is primarily used duri initial setup.
Arcadian Networks Configuration Tool	WMTS MIB database	This is a standalone JAVA based tool that can be accessed from the NMS. It is used to modify and configure the WMTS operating parameters.

Configuring the WMTS

You can optionally configure the WMTS upstream or downstream parameters usin Arcadian Networks Configuration Tool. To do so, refer to the *NMS User Guide*.

Monitoring the PA

The PA includes 3 separate PA modules. The PA parameters can be locally or remotely controlled and monitor. The remote monitoring is through the RCU (see N instruction manual).

Locally Monitoring the PA

7. In order to configure the Upconverter gain, connect the serial port of the PC to **local monit serial port located in front** of the Upconverter module.

Open the Windows HyperTerminal (or other terminal) application and set the PC serial port accordi the following configuration:

- *Baud rate: 19200*
- *Data bits: 8*
- *Parity: None*
- *Stop Bits: 1*
- *No Flow Control*

8. In order to check the current PA status, at the prompt (>>), type the command **all_statu** The following PA parameters will appear:

```
State Machine Status:
 ====================

 Active FAN: #1
  Fan#1
  -----
  Status: RUNNING
  PWM duty cycle: 100
  Protection: false
  Voltage: %24.1 V (23.8/24.1/24.3)
  LED: Green
  Blocked tick: 0
  Fan#2
  -----
  Status: BLOCKED
  PWM duty cycle: 0
  Protection: false
  Voltage: %24.1 V (23.8/24.1/24.3)
  LED: Red
  Blocked tick: 13560

  Power Supply1
  -------------
  AC: OK
  DC: OK
  Temp: NORMAL

 PA:
 --
 Enable: true
 Status: activated
 Voltage: 27.9 V (%27.6/%28.0/%28.3f)
```

Current: %4.2 A (%3.9/%4.1/%4.6)
Output Power: 40 dBm (40/40/40)
Reverse Power: 20 dBm (20/20/20)
Output power LOW threshold (for LED): 37 dBm
Output power HIGH threshold (for LED): 45 dBm
Reverse power HIGH threshold (for LED): %d dBm
Current vs Output power ratio: 0
Fwd LED state: 1
Pa STATUS LED state: 1
RVS LED state: 0
Cut reason: %00
Self protection flag: false
Self protection counter: 0
Self protection tick: 0
Pa enabling debounce tick: 0

Temperature:

Unit: oC
Temp: 30 oC (27/28/30)
Threshold (for LED): 45 oC
Threshold (for PA cut): 48 oC
Temp LED state: Green

9. Additional commands:

- "***ver***"command:

  BoardRev = 6
  SW Ver = PA-0.0.8
  HW Ver = 0

- "***pa_enable***"command:

  pa_enable [0/1]

- "***temp_unit***"command:

  temp_unit 0/1 (oC/oF)

Configuring the Upconverter

The Upconverter includes 3 separate Upconverter modules. The Upconverter parameters can be locally or remotely controlled and monitor. The remote monitori through the RCU (see NMS instruction manual).

Locally Configuring the Upconverter

10. In order to configure the Upconverter gain, connect the serial port of the PC to **local monit serial port located in front** of the Upconverter module.

Open the Windows HyperTerminal (or other terminal) application and set the PC serial port accordi
the following configuration:

- *Baud rate: 19200*
- *Data bits: 8*
- *Parity: None*
- *Stop Bits: 1*
- *No Flow Control*

11. In order to check the current attenuation setting, at the prompt (>>), type the command
    >> att
    ATTENUATOR - rotary = 0
    ATTENUATOR - setting = 6
    ATTENUATOR - total = 6
    ATTENUATOR - Value 6 dB
12. **Upconverter attenuation changing**
    At the prompt (>>), type the command **att** with the value of the attenuation from 0 to 31
    >> att 31
    If you want to save this value in the non volatile memory, type the write command.
    >> write

13. In order to check the current attenuation setting, at the prompt (>>), type the command
    >> att
    ATTENUATOR - rotary = 0
    ATTENUATOR - setting = 31
    ATTENUATOR - total = 31
    ATTENUATOR - Value 31 dB
14. Additional commands
    1. ***ver***"command:

       SW Ver = UC-0.0.9
       Board Rev = 5

    2. "***Serial_num***"command:

       Serial_num (string): 123456XYZ987

    3. "***synth_lock***"command:

       Synthesizer locked=true

☑ **Note:** The Upconverter Gain is preset in the Base Station rack for the overall requi
downstream output level. Do not to change the Gain settings unless a significant
change has occurred.

5 Maintaining the Base Station

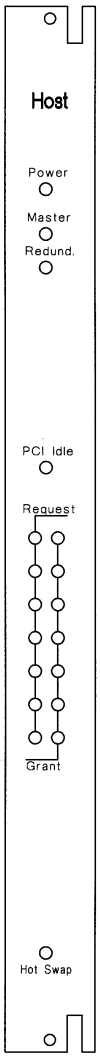
Base station maintenance includes the following:

- WMTS LED indications and connector/switch functions.
- Downconverter connectors and LEDs functions.
- Power Amplifier controls.
- Power and Signal level tracking to check that the values of the following items ar within the expected value range.
- WMTS version upgrade.

WMTS LEDs and Connectors

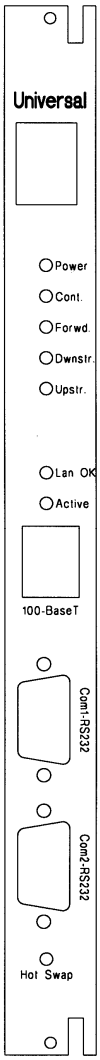
The following sections describe the functions of the LEDs and connectors/switches located on the various WMTS cards.

Host Card LEDs



LED	Color	Indication
Power	*Green*	ON when card is powered on
Master	*Green*	Lit when card is the master host card
Redundant	*Green*	Lit when card is the redundant host card
PCI Idle	*Green*	Lit when PCI Bus is active
Request	*Green*	Indicates that bus parking request is in process
Grant	*Green*	Indicates the bus parking; the last card is always granted
Hot Swap	*Red*	If lit, after pressing HOT SWAP switch, the card can be pulled out and released

Universal Cards LEDs and Connectors



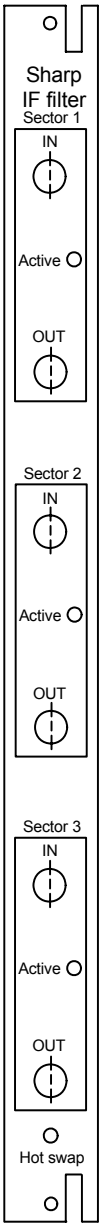
LED	Color	Indication
Dot Matrix		Channel Number (*)
Power	*Green*	ON when rear card is present
Cnt	*Green*	Flashing when Controller and Forwarder (C&F) application is active
Fwd	*Green*	Flashing when Controller and Forwarder (C&F) application is active
Dwnstr	*Green*	Indicating transmit data traffic when channel is active (only when used for downstream)
Upstr	*Green*	Indicating receive data traffic when channel is active (only when used for upstream)
100M Lan OK	Green	Indicating network integrity of the Ethernet bus
Active	*Yellow*	Flashing when traffic is transferred over Ethernet bus
Hot Swap	*Red*	If lit, after pressing HOT SWAP switch, the card can be pulled out and released

Connector/Switch	Type	Function
100 Base T	*RJ45*	Connection to router/hub
Com 1	*D-type*	RS-232 link reserved for R&D
Com 2	*D-type*	RS-232 link used for software download
Hot Swap	*Push button*	Request for Card release while system is ON

(*) A dot matrix display is located near the top of each universal card. Each display indicat channel number assigned to the Universal Card. The C&F card is indicated as 0. The othe universal cards are indicated from 1 to N, according to the card number assigned. The car number will be displayed on the transmitting universal cards attached to the modulators, a the receiving universal cards attached to the demodulators.

System initialization phases are indicated on the C&F card dot matrix display. This display detailed in *WMTS Digital Display and LED Indications* on page 67.

Sharp IF Filter Card LEDs



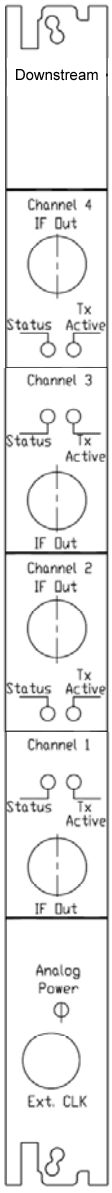
LED	Color	Indication
Active	*Green*	ON when WMTS power is on
Hot Swap	*Red*	If lit, after pressing HOT SWAP switch, the card can be pulled out and released

Connector/Switch	Type	Function
IN	*F-type*	Connection to 43100A downconverter, used to input signals for filtering
OUT	*F-type*	Connection to 4-way splitter, used to output filtered signals
Hot Swap	*Push button*	Request for Card release while system is ON

☑ **Note:** The Sharp IF Filter card is optional.

Modulator Rear Card LEDs and Connectors

The modulator card holds four ports to connect four downstream channels. The tw indicators are specific for each channel, while the hot swap indicator is common to card.

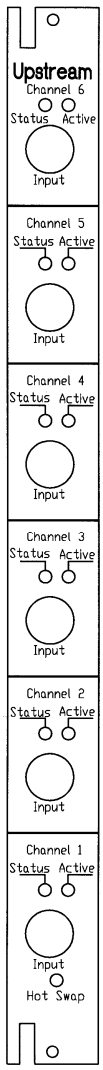


LED	Color	Indication
Status	*Green*	Lit when PLL is locked
TX Active	*Green*	Lit when downstream traffic is transferred
Analog Power	*Green*	ON when card is powered on

Connector/Switch	Type	Function
IF OUT	*F-type*	IF to RF transmitter
Hot Swap	*Push button*	Request for Card release while system is ON

Demodulator Card LEDs and Connectors

The demodulator card holds six ports to connect six upstream channels. The two t
indicators are specific for each channel, the hot swap is common to the card.



LED	Color	Indication
Active	*Green*	Lit when up stream traffic is transferred
Status	*Green*	Lit when PLL is locked
Hot Swap	*Red*	If lit, after pressing HOT SWAP switch, the card can be pulled out and released

Connector/Switch	Type	Function
Input	*F-type*	IF from Downconverter
Hot Swap	*Push button*	Request for Card release while system is ON

Power Supply Cards

The Power Supply panel contains two indicators: **Power On** and **Fail**.

Power Amplifier Controls

The Power Amplifier controls include the following:

PA Front Panel local RS232 Controls

PA Rear Panel Controls

- **DC Main ON/OFF** – DC rocker switch (SPST) to supply DC to the PA box When Main DC is supplied but the DC ON/OFF switch of specific PA module is (the rear panel DC LED will be RED.
- **DC ON**/OFF per module – DC rocker switch (SPST) to supply DC to each PA module. When Main DC is supplied and the DC ON/OFF switch of specific PA module is set ON, the rear panel DC LED will be GREEN.
- **Rear Panel remote RS232 Controls**
  This connector is permanently connected to the RCU and serves for remote con through the NMS.

Power and Signal Level Tracking

The following parameters are tracked by the NMS. The default sampling time is ev 20 minutes. Check that the values of the following items are within the expected va range. If there is a deviation, refer to *NMS Monitored Parameters* on page 70.

Parameter	Expected Value	Measured at
Downstream Received Power	- 16 ± 3 dBmV	MMU
Downstream SNR	≥ 30 dB	MMU
MMU Output Power	62 ± 4 dBmV	MMU
Upstream Received SNR	≥ 22 dB	WMTS

Upgrading the WMTS Software

Note: In general, the application upgrade process is intended for trained technical support people who have authorization to perform WMTS installation and upgrade

The software/firmware upgrade includes update of the control, upstream and downstream applications on the universal cards.

The upgrade process includes the following steps:

1. Edit and compile the Regtree.txt file, and download it to the WMTS as describe *Editing and Downloading the Regtree File* on page 32.
2. Download the updated WMTS image files (refer to *Downloading New WMTS Ir Files*, on page 57).
3. Check the WMTS version (refer to *Checking the WMTS Version*, on page 59) t verify that the download has taken effect.
4. Update the Base Station label (refer to *Updating the Base Station Label* on page 60).

Make sure you have the following equipment/software necessary for the upgrade:

- PC
- Crossed Ethernet cable (or straight if there is a switch between WMTS and the F
- The new build, downloaded from the FTP and copied to the PC hard disk.

Downloading New WMTS Image Files

This procedure is a continuation of the WMTS upgrade process (refer to *Upgradin WMTS Software* on page 57), in which the WMTS Configuration Tool is used.

To Download WMTS image files:

1. Open WMTSConfig.exe tool if it is not currently open. This tool is located in the …*{build}*\\`Tools\WMTSConfig` directory of the build.
   Right-click to display a popup window from which you select **Activate** (see Figure 18).

   The WMTSConfig screen is enabled.
2. In the main window of the WMTS Configuration Tool (Figure 22), perform the following in the TFTP Software Upgrade section:
   - Enter your PC IP address in the **TFTP Server IP Address** field
   - Enter the WMTS image file name, `Full_lan.txt`, in the **Version File** field

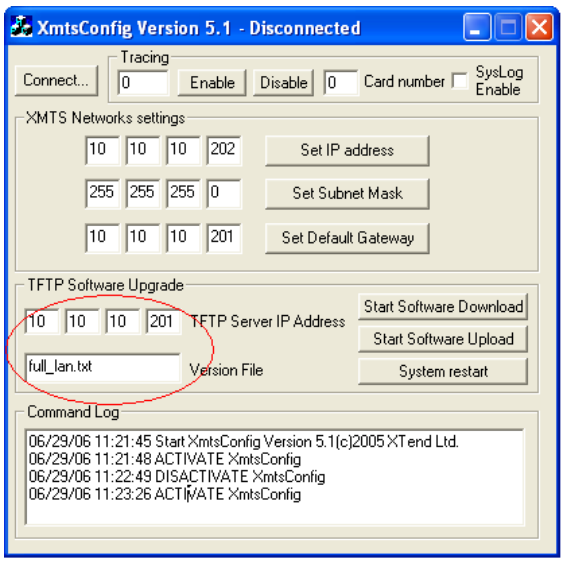


Figure 22: Download of WMTS Image File

3. Click **Start Software Download**.
4. Monitor the TFTP application window (see Figure 23) to verify that download to WMTS has occurred.

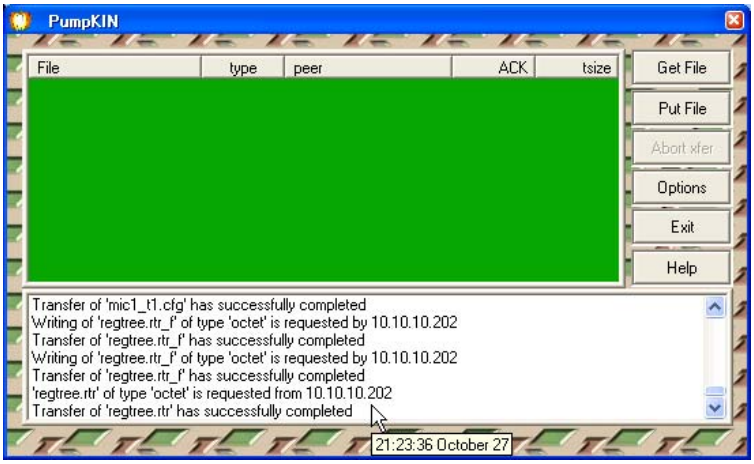


Figure 23: TFTP Download Message

5. When the file transfer is complete, click **System Restart** in the WMTS Configu Tool window (see Figure 24).

Note: The WMTS will not execute a System Restart command before the file trans complete.

Verify that the last line in the Command Log window is 'WMTS Restart'. The W reboots and uses the new `RegTree.rtr` *file to configure itself.*

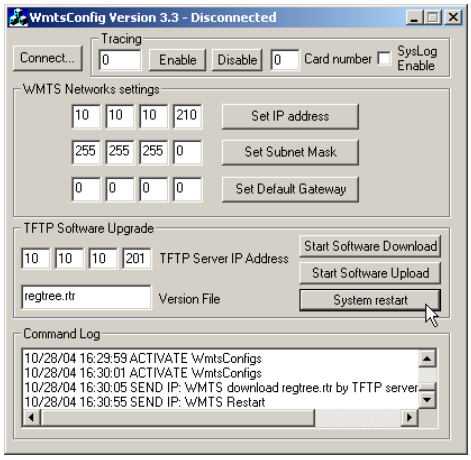


Figure 24: System Restart Message

Note: The WMTSConfig Command Log only displays messages sent to the WMTS does not know whether any of the commands succeeded.

Checking the WMTS Version

This procedure is a continuation of the WMTS upgrade process (refer to *Upgradin WMTS Software* on page 57), in which the WMTS Configuration Tool is used.

To Verify the WMTS version:

1. Open WMTSConfig.exe tool if it is not currently open. This tool is located in the …*{build}*\\`Tools\WMTSConfig` directory of the build.
   Right-click to display a popup window from which you select **Activate** (see Figure 18).

   The WMTSConfig screen is enabled.

2. Right click any open area in the main window of the WMTS Configuration Tool bring up the popup menu.

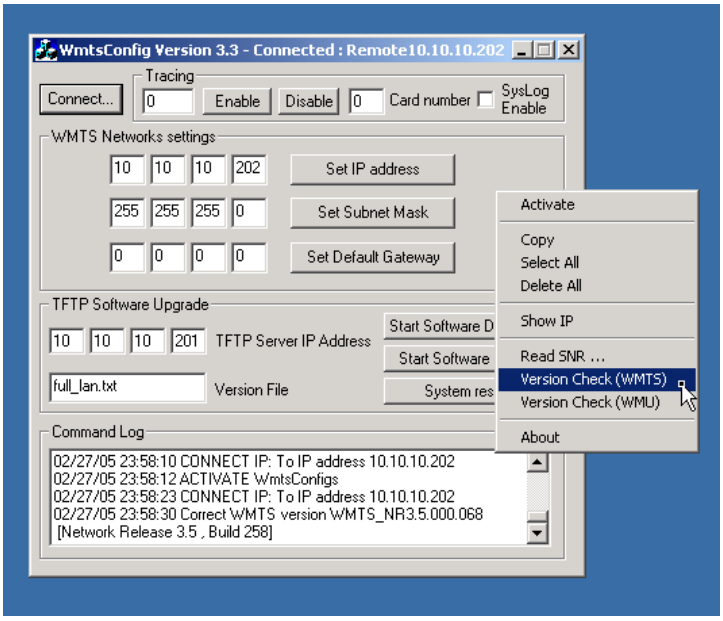


Figure 25: Viewing the WMTS Version

3. Select **Version Check (WMTS)** from the popup menu (Figure 25). The WMTS version is displayed in the Command Log window.

Updating the Base Station Label

To update the label:

1. Update the WMTS SW version number printed on the label to the new SW vers number (see Figure 26). The label is located on the left side of the BTS Rack.

Figure 26: Base Station Label for 1, 2, 3 sectors

6 Troubleshooting

This chapter provides troubleshooting information.

On-Site Troubleshooting

General Troubleshooting Guidelines

The first and most important aspect of troubleshooting is to be systematic. Note wh you looked and what you found.

Look first for the obvious.

- Make a physical inspection of the entire facility. Are all necessary connections properly made? Do you see any signs of obvious damage within the equipments
- Is the AC power ON to the site and the equipment? Check fuses and circuit brea if necessary.
- Are all the switches in the correct operating position?
- Is the input signal present?
- Check PA LCD readings for presence of forward and reflected power and 30 V D supply levels.

Initial Operation – Troubleshooting Issues

The following troubleshooting issues relate to the *Initial Operation Procedure* on page 30. These issues may occur during the course of initial operation. The recommended corrections do not require any external test equipment.

Symptom	Possible Fault	Correction
The WMTS LEDs are not lit	UPS or WMTS are not operating	1. Check UPS On/Off switch. 2. Check WMTS On/Off switch.
A WMTS LED behaves abnormally		Restart WMTS using the rear panel On/Off switch.

Symptom	Possible Fault	Correction
Upconverter LCD display not lit	Power cord not properly connected	Check power cord connection.

Symptom	Possible Fault	Correction
Upconverter frequency value in LCD display not correct	The value was changed by mistake.	Set the frequency to the correct value (746.5 MHz). For instructions, refer to *Monitoring the PA*

The PA includes 3 separate PA modules. The PA parameters can be locally or remotely controlled and monitor. The remote monitoring is through the RCU (see NMS instruction manual).

Locally Monitoring the PA

15. In order to configure the Upconverter gain, connect the serial port of the PC to **local monitor serial port located in front** of the Upconverter module. Open the Windows HyperTerminal (or other terminal) application and set the PC serial port according to the following configuration:
    - *Baud rate: 19200*
    - *Data bits: 8*
    - *Parity: None*
    - *Stop Bits: 1*
    - *No Flow Control*
16. In order to check the current PA status, at the prompt (>>), type the command **all_status** The following PA parameters wil appear:

State Machine Status:

==========

Active FAN: #1
Fan#1

Status: RUNNING
PWM duty cycle: 100
Protection: false
Voltage: %24.1 V (23.8/24.1/24.3)
LED: Green
Blocked tick: 0
Fan#2

Status: BLOCKED
PWM duty cycle: 0
Protection: false
Voltage: %24.1 V (23.8/24.1/24.3)
LED: Red

Symptom	Possible Fault	Correction
Power Amplifier LED & fan not operating	AC power not connected to the Power Amplifier	3. Check power cord connection. 4. Check UPS operation.
Power Amplifier display not lit	The screen saver is in operation	Push the front panel NAVIGATE tactile button to refresh display
Power Amplifier display indicates HIGH REFLECTED POWER(1)	Output cable or antenna not connected	Check cables and antenna connection
Power Amplifier display shows a Voltage Indication that differs from about 30V	Internal fault	Call technician or replace PA
Power Amplifier display indicates OUTPUT POWER below 5W	Low drive power to the PA (or wrong display)	5. Check cables connection. 6. Validate WMTS and Upconverter operation. 7. Compare PA reported received level to the FAT result (section 5.1.2.1 in the FAT document). 8. Check the MMU reported received level Compare to the FAT result (section 5.1.3.1). 9. If the level difference is more than 4 dB, call a technician to perform RF test poin signal verification. ☑ **Note:** Output level can be increased by increasing the Upconverter gain on the Upconverter front panel.
Power amplifier display indicates OUTPUT POWER above 20W	High drive power to the PA (or wrong display)	10. Compare PA reported received level to the FAT result (section 5.1.2.1). 1. Check the MMU reported received level Compare to the FAT result (section 5.1.3.1). 2. If the level difference is more than 4 dB, call a technician. ☑ **Note:** Output level can be decreased by decreasing the Upconverter gain on the Upconverter front panel.
Power amplifier display indicates AMPLIFIER OVERDRIVEN (2)	Excessive PA input level	Check the PA input level on TP5, TP6, TP7.

Symptom	Possible Fault	Correction
MMU acquires downstream signal, but doesn't finish upstream registration process	Upstream spectrum Inversion is not ON	Check the Spectrum Inversion box on the Arcadian Networks Configuration Tool Upstream menu (refer to the *NMS User Guide* for instructions). It should be ON.

When the HIGH REFLECTED POWER message appears, the PA shuts down for t minutes, after which it turns back on and checks again for high VSWR. It then retu the same power level it was set to.

When the AMPLIFIER OVERDRIVEN message appears, the PA shuts down for or minute, after which it turns back on and checks again for an overdriven amplifier. It returns to the same power level it was set to.

WMTS Digital Display and LED Indications

During system initialization, the universal cards' digital display combined with the C four LED indicators, provide detailed information about the status of the WMTS, as detailed below.

If problems occur in the initialization process, observe these indicators and check i indications are accurate. This information should be recorded and transmitted to Arcadian Networks Support as an aid in identifying faults.

Digital Display Indications at System Initialization for all Universal Car

- H - Start of initialization
- X - Hardware failure
- Y - Missing software file
- x - Missing software file
- Z - Hardware failure
- W - Memory read error
- V - Read error from flash memory
- U - Application download to flash memory
- m - Mapping
- L - Download to FPAG
- M - End of download
- e -No initialization
- g- Jump to application
- s- Suspend application
- ? - Default card mapping

- 2 - Default mapping
- 3 - Address acknowledge
- 4 - End of mapping
- 5 - N/A
- 6 - Memory address
- 7 - End of memory download
- 8 - End of address mapping
- 9 - End of initialization

C&F Card LED Indicators

Function	LED Status			
	Cnt	Fwd	Dwnst	Upst
Set card base address	Off	Off	Off	On
Set window base address	Off	Off	On	Off
Set download address	Off	Off	On	On
Download application to card	Off	On	Off	On
Download firmware	Off	On	On	On
Set entry point	On	Off	Off	Off
Set label to card	On	Off	Off	On
End of download	On	Off	Off	On

WMTS Troubleshooting

Symptom	Recommended Action
None of the LEDs are on	1. Check the On/Off Switch and see that its state is ON. 2. Check if the power cable is connected. 3. Check the fuse box and see if the fuses are conductible. 4. If all of the above is working properly, call a technician.
The LEDs in one of the card are not on	1. Check if the card is inserted properly. 2. If the card is not inserted properly then power down the WMTS, pull the card out, and insert it back in again. Make sure that the card is inserted using the same parallel rails and that it is pushed in all the way. 3. If the card was or is now inserted properly and the LEDs still are not working, call a technician.
No connection between the WMTS and the PC	1. Check if the “Control & Forward” card is connected to the network of the PC directly / through a hub or switch. 2. Check the PC network interface card and see that it is not disabled. 3. Check if the PC and the “Control & Forward” card are on the same network and subnet. 4. If all of the above is correct and there is still no connection between the PC and the WMTS, call a technician.
None of the Modems are up	1. Check if the downstream cable is connected to the appropriate channel. 2. Check if the upstream cable is connected to the appropriate channel. 3. Check if the “DHCP” server is on and is working properly. 4. Check if the “TIME-OF-DAY” server is on and is working properly. 5. Check if the “TFTP” server is on and is working properly.
One of the power supplies is reporting a failure	1. Check if the DC power supply is connected properly. 2. Change the DC power supply with a new power supply. 3. If the problem isn’t solved, call a technician.
The fans report a failure	1. Check if the fans drawer is inserted properly. 2. Change the fans drawer with a new drawer. 3. If the problem isn’t solved, call a technician.

Remote Troubleshooting Via the NMS

There are several parameters that are measured by either the WMTS or the MMU. These parameters are polled periodically by the NMS, and kept in a database for statistics. A threshold can be set for some of these parameters. When such a thres is crossed, the NMS issues an alarm event. The following is a list of these parame and their functionality.

NMS Monitored Parameters

Channel Statistic Parameters at the Monitoring Modem

- **Downstream Received Power** – Checks all the downstream TX path (WMTS downstream card output, Upconverter, PA, Diplexer, Directional power, and cabl and the monitoring path (splitter, combiner, attenuators) to the MMU.
  Monitoring the downstream received power enables long term tracking of this pa
- **Downstream SNR** – Checks the TX signal quality, from the WMTS downstream output, through the Upconverter and PA.
  Monitoring the Downstream SNR enables long term tracking of signal quality.
- **Upstream Output Power** – Checks the receiver path, from the MMU through th monitoring path (splitter, combiner, attenuators) and the entire upstream receive (LNA module, Downconverter, to the WMTS Hex card RX port).
  Tracing the output level enables validating the stability of the US path.

Channel Statistic Parameters at the Channel

- **Upstream Received SNR** – Checks the entire upstream receiver signal path. It enables validation of US signal quality and proper operation. This test can also b used as an indication for external interference.

NMS Troubleshooting Tests – Troubleshooting Procedu

The following are trouble shooting procedures for cases where the measureme differ from the expected levels. Note that the FAT results for the device are incl in the package.

Parameter	Expected Value	Possible Fault	Correction
Downstream Received Power	- 16 ± 3 dBmV	Fault in one of the following: WMTS DS card, Upconverter, PA, splitters, cables and connectors.	Call technician to check test point and compare with the FAT results.
Downstream SNR	≥ 30 dB	Fault in one of the following: WMTS DS card, Upconverter, PA.	Call technician to check test point and compare with the FAT results.
MMU Output Power	62±4 dBmV	Fault in one of the following: LNAs, Downconverter, WMTS Hex US card, cables and connectors.	Call technician to check test point and compare with the FAT results.
Upstream Received SNR	≥ 22 dB	Fault in one of the following: LNAs, Downconverter, WMTS Hex US card	Call technician to check test point and compare with the FAT results.

Test Points Signal Verifications

The Base Station rack is pre-adjusted and tested before shipment. After the initial operating process, all base station's functions should operate properly, and **no adjustment is needed**. Most functions can be tested using the MMU, via the NMS MMU tests enable long-term local and remote tracking and monitoring of the syste performances.

The RF test points enable more in-depth tracking of the downstream and upstrean signal. The downstream test points are used for monitoring the signal level, as wel the signal quality (spectrum re-growth and side lobes). The upstream test points ar used to check the upstream signal level, the SNR, and the Signal to External Interference ratio. The tests you can run using the tests points are **not required** fo initial operation. They should be performed only if there is a significant difference between the measured and expected results.

The following table describes the RF Test points and the related expected nominal levels with the spectrum analyzer setting for these tests. For comparison, the table includes also the FAT (Factory Accepted Test) expected results and related FAT paragraph with the tests conditions. Note that for a real comparison you should foll the full FAT procedure as described in the related paragraph.

☑ **Note:** The following tests should be performed by a **trained technician** only. Thes tests require external equipment such as a calibrated Spectrum Analyzer.

Test point #	Sector	Function	Expected Level	
			Nominal Value	FAT Value
1	1	Upconverter output	49±3 dBmV (1)	34±2 dBmV (2) par. 5.1.1.3
2	2			
3	3			
4	All	Downstream cluster combined signal (3)	5±4 dBmV each channel (1)	5±3 dBmV each channel (1) par. 5.1.1.3
5	1	Upstream Post LNA RF signal	Level: -54±4 dBm (1) SNR: 24±3 dB (4)	
6	2			
7	3			
8	1	Upstream Post Downconverter IF signal(6)	Level: -43±4 dBm (1) Noise level -31 ± 3 dBmv (5) SNR: 24±3 dB (4)	Noise level -31 ± 3 dBmv (5) par. 5.2.2.3
9	2			
10	3			

(1) Measured with Spectrum Analyzer set at: RBW=1 MHz, VBW=1 KHz

(2) Measured with Spectrum Analyzer set at: RBW=10 KHz, VBW=300 Hz

(3) The downstream signal level at this test point is about 84 dB below the Base Station output power. This test point can serve to connect an external modem to the system for testing purposes.

(4) Measured with Spectrum Analyzer at: RBW=100 KHz, VBW=3 KHz

(5) Measured with Spectrum Analyzer at: RBW=10 KHz, VBW=100 KHz

(6) Inserting the Sharp IF Filter and the attenuator before the V3100 (for gain compensation) do not change the Test Points levels (up to ± 1 dB).

☑ **Note:** When a one-sector BTS is built, only channel 1 is used. For two-sectors, channels 1 and 2 are used. For three-sectors, channels 1, 2, and 3 are used.

A Technical Specifications

BRS-757 Base Station Specifications

	Parameter	Specification
General	Dimensions	23” width x 90” height x 27.5” depth
	Rack door opening space	30" in front and in back
	Operating temperature	0 – 50ºC
	Humidity	Up to 80% (non condensed)
	Power consumption	2400W
RF	Duplexing method	FDD
	Downstream frequency	757-758 MHz
	Downstream frequency accuracy	5 KHz
	Downstream modulation	QPSK, 16QAM, 64QAM
	Downstream Output Power	10 W Typical (41 dBm max)
	Downstream channel BW	330 KHz
	Upstream frequency	787-788 MHz
	Upstream modulation	QPSK, 16QAM
	Upstream channel BW	325 KHz
	Upstream RX level	Adjustable, typical -90 dBm (for 20 miles coverage)
	Upstream SNR for BER < 10E-6	19 dB
	Upstream adjacent channel capability	Up to 10 dBc
	Upstream out of band interference mitigation (with Sharp IF Filter card) Note that the Sharp IF Filter card is optional.	+50dBc for single interferer @ 300KHz from channel edge +40dBcfor dual interferers @ 300KHz from channel edge

WMTS Specifications

	Parameter	Specification
Mechanical	Mounting	Rack mount
	Dimensions	19” x 15” x 15”, 48.26 x 38 x 38 cm
	Operating temperature	32ºF – 122ºF, 0ºC to 50ºC
	Power supply	110 VAC
	Power consumption	84 Watts
IF	IF frequency range	40-46 MHz
	Channel bandwidth	330 KHz down, 325 KHz up
	Modulation	64QAM down, 16QAM up
	FEC	Reed Solomon / Trellis decoding
Interfaces	LAN	RJ45, Full duplex 100 BaseT
	Downstream channel	F-Type
	Upstream channel	F-Type
Performance	Downstream Channel	1.1 Mbps
	Upstream Channel	700 Kbps
Access Protocol		TDMA (DOCSIS based)
Security	Encryption	64 bits 3-DES
	Key Management	DOCSIS BPI, 1024 bits RSA public key
QoS	Downstream classification	Up to 3 classifiers by: ■ VLAN ID ■ TCP/UDP source & destination ports
	Downstream scheduling	Priority queuing Up to three data priority queues
	Upstream scheduling	Up to 256 prioritized services
Management	Protocol	SNMPv1
	MIBs	MIB II(RFC-1213), Bridge MIB (RFC-1493), Interfaces group MIB (RFC-2233), DOCSIS RF MIB (RFC-2670), DOCSIS BPI MIB

Downconverter Specifications

Parameter	Specification
Input frequency	787.5 MHz
Output Frequency	44 MHz
Spectrum inversion	Yes
Flatness @ 44 ±1MHz	±0.3 dB
Frequency accuracy	<3 KHz
Gain	18 dB
Phase noise [dBc/Hz]	■ -80 @ 500 Hz ■ -95 @ 1 KHz ■ -100 @10KHz ■ -105 @100KHz
Output P1dB	+10 dBm
Supply	6.5 V, 870 mA
Dimensions	180 x 88 x 50 mm
MTBF	428000 h

Upconverter Specifications

Upconverter specifications:

Parameter	Specification
RF parameters	
Input frequency	44 MHz
Output frequency	757.5 MHz
LO frequency	801.5 MHz
Frequency stability	5 KHz
Bandwidth	1 MHz
Gain (nominal)	11±1 dB
Gain adjustment range	31 dB
Typical output level	-3 dBm
Spurious	-60 dBc
General	
Number of Upconverter modules in the box	3
RF Connector per Upconverter	Rear panel: IF In: F-type 75 ohm RF Out : SMA Female 50 ohm Out -30 dB : SMA Female 50 ohm Front panel: TP Out -20 dB : SMA Female 50 ohm
RS232 Rear panel connector per	6 pin:

Upconverter	Pin 1 – Data 1 Pin 2 – Data 2 Pin 3 – GND
RS232 Front panel connector per Upconverter	Plug connector 6 pins: Pin 1 – DC IN Pin 2 – GND Pin 3 – Data 1 Pin 4 – Data 2
Dimension	Width 19” Height 1U Depth 200mm
Power supply (internal)	110/220 VAC Out 8.5VDC 35W
Operating temperature	0 to 50 ºc
Storage temperature	-30 to 70 ºc
Humidity	0 to 90% RH

Comment [s1]: Check with Hillel

Power Amplifier Specifications

	Parameter	Specification
Transmission Performance	Gain	45 dB
	Frequency	757.5±5 MHz
	QAM output power	20W max
	P1dB minimum	60W
	In/Out VSWR	1.2:1 typical 1.5:1 max
	VSWR protected	RF output into open (internal isolator installed)
	Input return loss	Min -16 dB
	Output return loss	Min -18 dB

	Parameter	Specification
	Spurious emission	> 60 dBc
	Harmonic suppression	> 60 dBc
Electrical Characteristics	Input RF connector	SMA
	Output RF connector	N-Type
	EMI Filtered max AC power	7A AC Max, 110V
Physical characteristics	Minimal rack space	4U
	Weight	3 Kg
	Operating temperature	32˚F to +122˚F, +0˚C to +50˚C
Fan	Number of fans per PA module	one in operation, second for backup
	Operating voltage and power	24 V, 1.35 A
General	Number of modules in the box	3
	Front panel control per module	RS232, Circular 6 pins
	Rear panel control per module	RS232, Circular 6 pins

Power supply for PA

The Mean Well rack mount power supply RCP-1000-28 is used. The power supply includes two internal modules for redundancy, each of them can supply up to 1KW The power supply is operated by 115/220 VAC, and is adjusted for 28.5 V output voltage.

Power supply specifications

MEAN WELL 1000 ~ 3000W Front End Power System **RCP**

■Features :

- Universal AC input / Full range
- Built-in 5V/0.3A auxiliary power
- Built-in active PFC function, PF>0.96
- Protections:Short circuit/Over load/Over voltage/Over ter
- Forced air cooling by built-in DC fan with fan speed contr
- Low profile:1U height
- Active current sharing up to 3000W (3 units)in 19" rack
- Remote control for single unit
- Built-in remote sense function
- Output voltage trimming function
- Hot-swap operation
- Optional I²C serial data bus
- AC OK & DC OK signal
- Internal ORing diode
- 3 years warranty

■SELECTION GUIDE

Single Unit: RCP-1000-[12]-[C]
- C: With I²C Interface
- –: Without I²C Interface
- Output Voltage

Rack: RCP-1U[I]
- I: AC Inlet(IEC320-C14)
- T: Terminal Block

Whole System: RCP-3K1U[I]-[12]-[C]
- C: With I²C Interface
- –: Without I²C Interface
- Output Voltage
- I: AC Inlet(IEC320-C14)
- T: Terminal Block

SPECIFICATION - Rack System

MODEL		RCP-3K1U□-12	RCP-3K1U□-24	RCP-3K1U□-48
OUTPUT	MODULE	RCP-1000-12	RCP-1000-24	RCP-1000-48
	RACK	RCP-1UI or RCP-1UT		
	OUTPUT VOLTAGE	12V	24V	48V
	MAX. OUTPUT CURRENT	180A	120A	63A
	MAX. OUTPUT POWER Note.6	2160W	2880W	3024W
INPUT	VOLTAGE RANGE Note.5	90 ~ 264VAC 127 ~ 370VDC		
	FREQUENCY RANGE	47 ~ 63Hz		
	AC CURRENT (Typ.)FOR EACH UNIT/L	8.5A/115VAC 4.5A/230VAC	10.5A/115VAC 5.5A/230VAC	11A/115VAC 5.5A/230VA
	LEAKAGE CURRENT	<3.5mA / 230VAC		
FUNCTION	AUXILIARY POWER	5V @ 0.3A		
	REMOTE ON/OFF CONTROL	By electrical signal or dry contact ON:short OFF:open		
	REMOTE SENSE	Compensate voltage drop on the load wiring up to 0.5V. "Local Sense" should be connected in order to get the correct output voltage if the "Remote Se		
	DC OK SIGNAL	Open collector signal, on when Vout ≧ 80%±5%, max. sink current:10mA		
	AC FAIL SIGNAL	Open collector signal, refer to function manual		
	OUTPUT VOLTAGE TRIM	Adjustment of output voltage, possible between 90 ~ 110% of rated output		
	OVER TEMP WARNING	Logic " High" for over temperature warning, refer to function manual		
ENVIRONMENT	WORKING TEMP.	-20 ~ +60℃ (Refer to output load derating curve)		
	WORKING HUMIDITY	20 ~ 90% RH non-condensing		
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH		
	TEMP. COEFFICIENT	±0.02%/℃ (0 ~ 50℃)		
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes		
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL60950-1, TUV EN60950-1 Approved		
	WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:1.5KVAC O/P-FG:0.7KVDC		
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms/500VDC		
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22) Class B		
	HARMONIC CURRENT	Compliance to EN61000-3-2,-3		
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11, ENV50204, EN61000-6-2 (EN50082-2) Heavy industry level, criteria A		
OTHERS	DIMENSION	Rack 483.6*350.8*44(L*W*H)		
	PACKING	11Kg; 1pcs/11Kg/2.67CUFT		
NOTE	1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it stil EMC directives. 5. Derating may be needed under low input voltages. Please check the derating curve for more details. 6. Output of all the RCP-1000 modules are connected in parallel in the rack.			

File Name:RCP series-SPE