
# RAD-FCSPT-02
# 100 Watt – 200 Watt Full C-Band
# Single Package Transceiver + SSPA

## Installation & Operation Manual

Rev. 2 Sep 2011



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## TABLE OF CONTENTS





WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## List of Figures





WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## List of Tables





WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

# Chapter 1 System Overview

Thank you for choosing Raditek High Power Full C-band Single Package Transceiver (FCSPT) Solution. This manual aims to help you understand, install and integrate all components of this solution into your system.

## 1.1 About this Solution

The Raditek VSAT FCSPT solution integrates three main components into a single package to provide you with a powerful and cost effective solution for your system. The three components includes Full C-band Transceivers, 100W or 200W Solid State Power Amplifiers (SSPA), and an external Phase Lock Low Noise Block (PLLNB).

This solution is designed to achieve high performance bi-directional satellite communication with high speed transmission capability, making it suitable for telephony and high speed data communication. The FCSPT component can be operated with different modulation formats such as BPSK, QPSK and FM, making this solution suitable for the following applications:

- Single Carrier Per Channel (SCPC)
- Multi-Carrier Per Channel (MCPC)

## 1.2 Product Models

This manual is suitable for the following models:

- Product series models

| ODU | Model Type | Model # |
|---|---|---|
| Full C-band Single Package Transceiver (FCSPT) | RAV814 (with AC IN) | RAV8140111 |
| | RAV814 (with DC IN) | RAV8140121 |
| SSPA | 100W | RAA11A0033-M / RAA11A0001-M |
| | 200W | RAA21B0033-MO / RAA21B0001-MO |
| LNB | RCA | RCA1133035 |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 1.3 System Functionalities

This solution consists of two main chains, a transmit and a receive chain. In the receive chain, a PLLNB receives signals from the antenna feed which is then passed into the down-converter of the FCSPT to be converted an IF signal which is then passed to an indoor demodulator.

The transmit chain consists of a double up-conversion path and a SSPA for power amplification. IF signals from an indoor unit are sent to the FCSPT for double up conversion. The converted signals are then fed into the SSPA to be amplified to a power level suitable for transmission.

### 1.3.1 System Block Diagrams

The figure below shows the system's functional block diagram. Note that the 100W and 200W FCSPT solution can be either AC powered or DC powered. The block diagram below represents the DC powered solution.

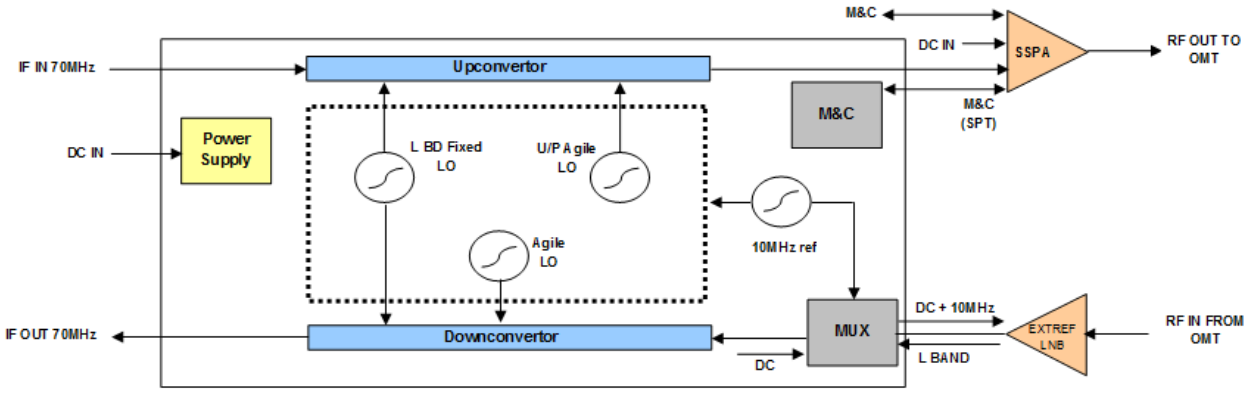



Figure 1.1 The FCSPT Solution functional block diagram

### 1.3.2 Transmit / Receive Frequency Bands

Table 1-1 FCSPT Transmit Frequency Range

| Type | Input Frequency (MHz) | Output Frequency Range (GHz) |
|---|---|---|
| Full C-band | 70/140 ± 18 or<br>70/140 ± 36 (Optional) | 5.850 – 6.725 |

📖 Note: 70MHz or 140MHz pre-configured at factory.

Table 1-2 FCSPT Receive Frequency Range (Including PLLNB)

| Type | Input Frequency Range (GHz) | Output Frequency (MHz) |
|---|---|---|
| Full C-band | 3.400 – 4.200 | 70/140 ± 18 or<br>70/140 ± 36 (Optional) |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 1.3.3 Full C-BAND Single Package Transceiver

The Full C-band Single Package Transceiver (FCSPT) consists of two types of signal flow, receive and transmit.

The receive end consists of an external Phase Lock Low Noise Block (PLLNB) and an internal single down-converter. This flow takes in a 36MHz signal with a range of 3.400 GHz to 4.200 GHz and down converts it to a 70/140 MHz IF signal. This IF signal is then sent to an indoor unit (IDU) system for demodulation.

The transmit end consists of a dual up-converter and amplifier. A 70/140 MHz IF modulated signal is sent from an IDU to the FCSPT. Internally, this signal is up-converted twice and amplified to a frequency range of 5.850 GHz to 6.725 GHz. The converted signal is then passed to the external SSPA to be amplified for transmission via the antenna.

### 1.3.4 Up Converter

An indoor unit (IDU) sends an IF signal, with a frequency of 70 MHz or 140 MHz, into the IF input port of the FCSPT. The FCSPT's dual up converter then converts this signal in two stages. First, it mixes this signal with a LO signal to produce an L-band signal. The signal is then passed through a bandpass filter (to filter LO and harmonics) into the second stage, where it is mixed with an agile LO to achieve the required RF frequency in C-band.

This signal is passed into the SSPA module to be amplified for transmission.

### 1.3.5 Down Converter

RF signals received are first passed into a LNB and an image reject filter. Here, the signals are mixed with an agile LO frequency to be down-converted. Internally, the FCSPT then filters and amplifies this signal before down converting it a second time. This produces a 70 ± 18 MHz or 140 ± 36 MHz IF signal which is once again amplified and filtered before it is sent to the IDU for demodulation.

### 1.3.6 Synthesizer

Synthesizers are referenced to a highly stable 10 MHz oven-controlled crystal oscillator (OCXO) with very low phase noise and high stability. Four independent frequency synthesizers are built into the FCSPT. These synthesizers generate the LO signals required for up/down conversion of signals.

You can select transmit and receive frequencies in step size of 2.5 MHz over an 875 MHz transmit and an 800 MHz receive band.

### 1.3.7 Oven-Controlled Crystal Oscillator (OCXO)

The OCXO used in the FCSPT equipment is a highly stable frequency oscillator reference that warms up to $\pm 10^{-7}$ within 2.5minutes at 25ºC. The OCXO is factory tuned to ±0.01ppm after an hour warm-up.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 1.3.8 Monitor & Control

The FCSPT includes an internal Monitor & Control (M&C) module built on an embedded micro-controller within the ODU. This module allows the ODU to be managed via a terminal workstation (such as a PC) using the appropriate software.

Using the M&C module, you can

- Adjust frequency, up converter gains and down converter gains settings.
- Monitor the operating of the ODU in real-time
- Switch SSPA on or off

### 1.3.9 Solid State Power Amplifier (SSPA)

Signals need to be amplified to a suitable power level for satellite transmission. The ODU feeds up-converted signals into the SSPA which then amplifies it through multiple gain stages based on high performance microwave power GaAs FET. All power GaAs FET are housed in different partitions for EMI isolation, eliminating any interference from the DC component and other gain stages.

This system consists of external SSPA(s). This design boosts the amplified power of the signals to be transmitted via the antenna, providing high gain, high power and low distortion of the signals used in high power satellite communication. The functional block diagram for the external SSPA is shown in the figure below.

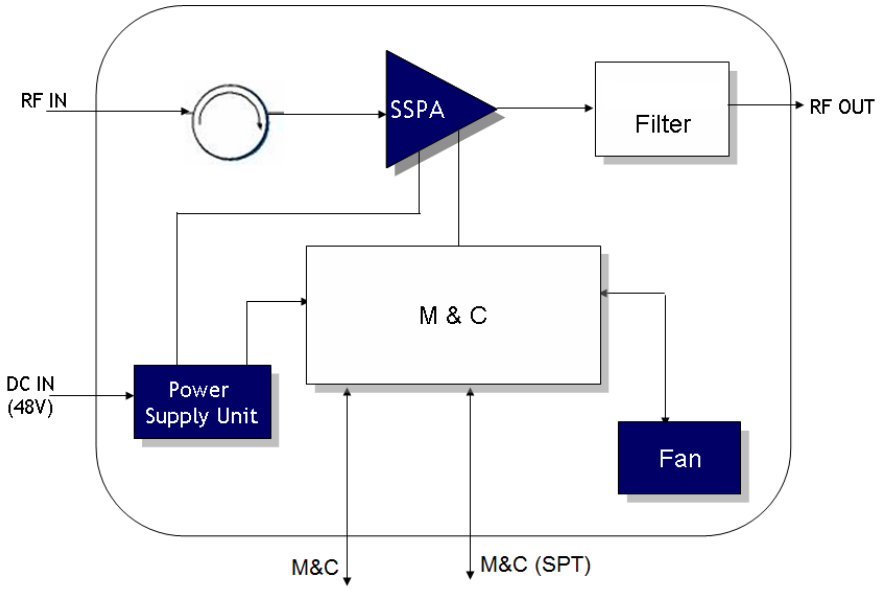



Figure 1.2 SSPA functional block diagram


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 1.3.10 Power Supply System

**WARNING:** Please ensure that the power source is turned OFF before connecting the power cable from the power source to the C-band FCSPT.

All devices in this system require 48V DC voltage to operate. Each device's DC IN interface is connected, via an external MS connector to a power source. The pin-out configuration for the DC IN interface for each device is given in the tables below.

Table 1-3 Full C-band SPT DC IN pin-out configuration

| Pin | Description |
|---|---|
| A | Positive |
| B | Negative |
| C | System Ground |

Table 1-4 SSPA DC IN pin-out configuration

| Pin | Description |
|---|---|
| A | Positive |
| B | Negative |
| C | System Ground |

The FCSPT requires DC power at 48V which is filtered to prevent EMI, rectified and smoothened before being converted to various DC voltages. The power supply system further regulates each of these DC voltages for the different function modules for high ripple rejection and stability. DC power is used to:

- Generate required internal DC operating voltages
- Operate the cooling fans
- Transmit 15V DC power to the LNB via the RF cable.

A protective mechanism designed into the power supply system cuts the power supplied to the internal SSPA when LO is unlocked. This prevents the system from sending out corrupted signals.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 1.3.11 Phase Lock Low Noise Block (PLLNB)

LNBs are mounted near the reflector dish. Wide band of frequency signals are fed into the LNB which then amplifies and converts these signals to OF signals. Raditek' LNB devices are specially designed for satellite earth station receiver front ends and other applications.

Each LNB has two ports. The RF IN port located at the front of the unit is WR229 connector which connects to the OMT or a waveguide switch (for redundancy systems). The output port (RF OUT) is a 50 ohm N-type female connector which is connected to the FCSPT.

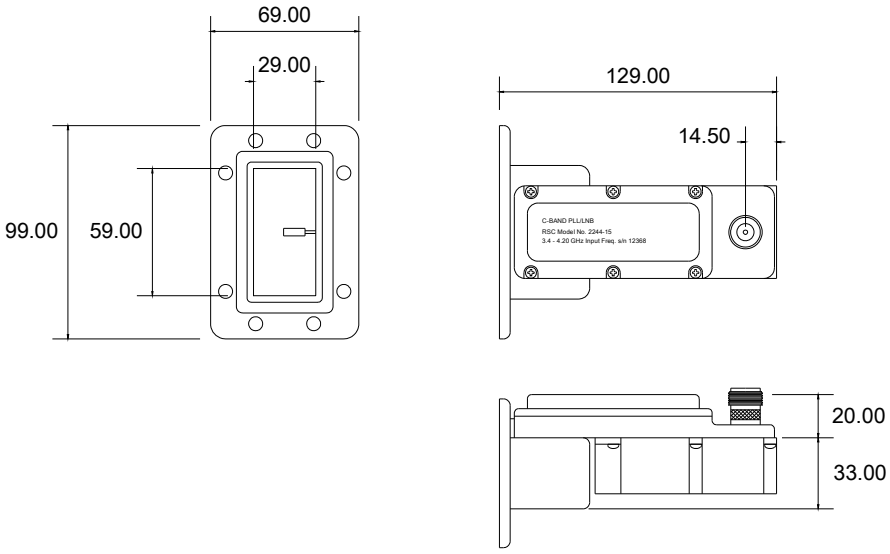



Figure 1.3 Outline diagram of the PLLNB

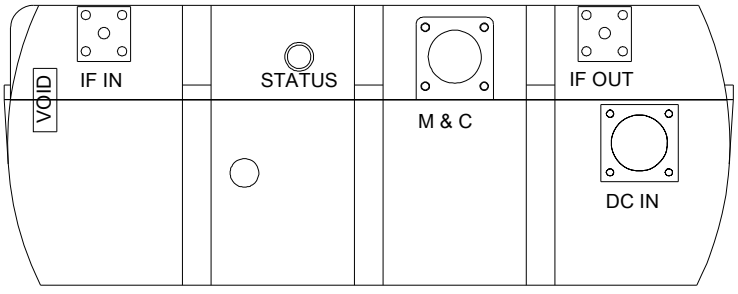
## 1.4 FCSPT Solution Components Interfaces

This section explains the details of each interface found on the panels of the FCSPT and SSPA devices.

### 1.4.1 FCSPT Transceiver Interfaces

#### FRONT VIEW

The figure below shows the front panel of the FCSPT. Each of the interfaces on this panel is explained in the table below.





WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Figure 1.4 Front panel view for the FCSPT

Table 1-5 Interfaces present on the front of the FCSPT

| Port Reference | Connector Type | Signal Details |
|---|---|---|
| IF OUT | 50-Ω female N-type connector. | Transmits 70/140 MHz signal to indoor units. Connects to the IF IN interface of an IDU modem. |
| M&C | 8-pin connector | For connection between the FCSPT and the SSPA. |
| IF IN | 50-Ω female N-type connector. | Receives 70/140 MHz signals from indoor units. Connects to the IF OUT interface of an IDU modem. |
| DC IN | Circular 3 pin male connector | Connects the FCSPT to a 48V DC power source. |

The table below describes the pin and wire connection for the M&C connector.

Table 1-6 PIN and wire connection for the M&C Connector

| Pin # | Function |
|---|---|
| Pin A | +12V DC output |
| Pin B | Ground |
| Pin C | Rx link status |
| Pin D | Tx link status |
| Pin E | Receive Data (RxD) RS232 |
| Pin F | Transmit Data (TxD) RS232 |
| Pin G | RF out voltage (RFV) |
| Pin H | Form ‘C’ relay common |

The table below describes the pin and wire connection for the DC Connector.

Table 1-7 PIN and wire connection for the DC Connector

| Pin # | Function |
|---|---|
| Pin A | Positive |
| Pin B | Negative |
| Pin C | Ground |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### REAR VIEW

The figure below shows the rear panel of the FCSPT. Each of the interfaces on this panel is explained in the table below.

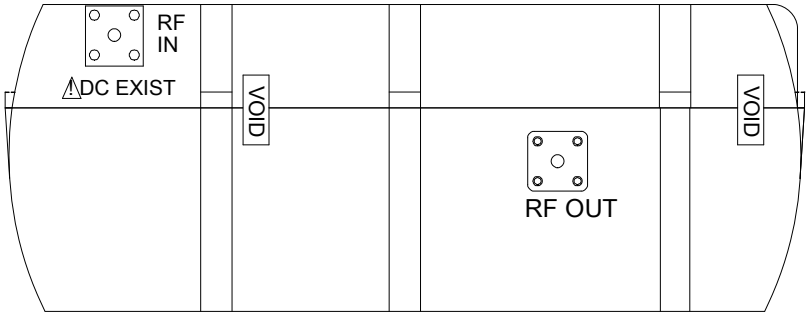



Figure 1.5 Rear panel view of the FCSPT

Table 1-8 Interfaces present on the rear panel of the FCSPT

| Port Reference | Connector Type | Signal Details |
|---|---|---|
| RF OUT | 50-Ω female N-type connector. | This is connected to the external SSPA for further amplification. The signals are then sent from the external SSPA to the antenna OMT for transmission. |
| RF IN<br>DC EXIST | 50-Ω female N-type connector. | This is connected to the N-type female RF OUT connector on the LNB. The LNB receives signals from the antenna which it then passes into the transceiver through this connection.<br>This connection also carries a DC power of 15V from the transceiver to the LNB. |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 1.4.2 SSPA Interfaces

This section explains the front and side views of the SSPA and the interfaces.

**FRONT VIEW**

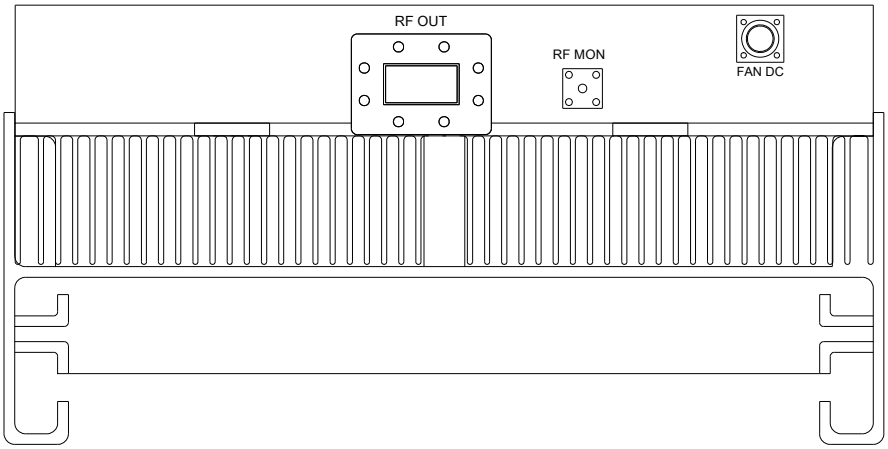



Figure 1.6 Front panel view of the 100W SSPA

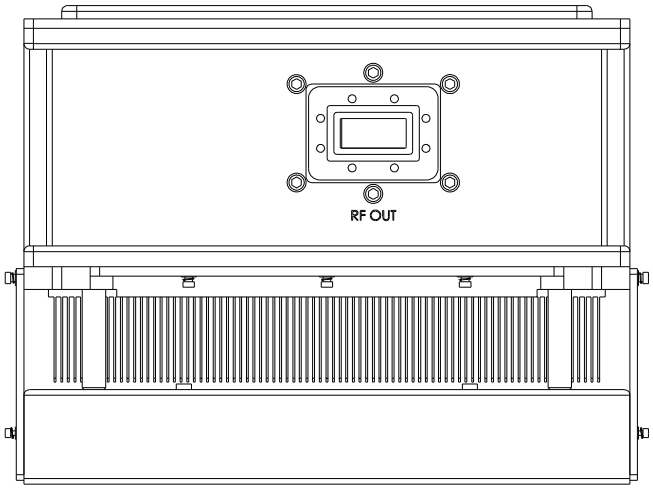



Figure 1.7 Front panel view of the 200W SSPA

Table 1-9 Interfaces present on the front panel of the SSPA

| Port Reference | Connector Type | Signal Details |
|---|---|---|
| RF OUT | WR137 CPRG flange | Connects to the OMT or waveguide switch (for redundancy systems) |
| RF MON | 50 ohm N-type female | Connects to the OMT of the antenna.<br>For 100W – Nominal coupling |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Port Reference | Connector Type | Signal Details |
|---|---|---|
| | | value: 30dB<br>For 200W – Nominal coupling value: 40dB |

Note: The “RF MON” port is present on the rear panel of the 200W SSPA.

**REAR VIEW**

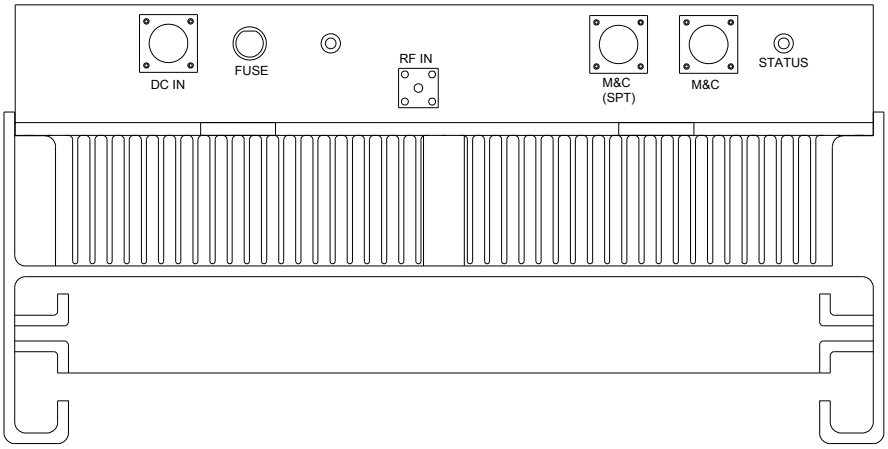



Figure 1.8 Rear panel view of the 100W SSPA

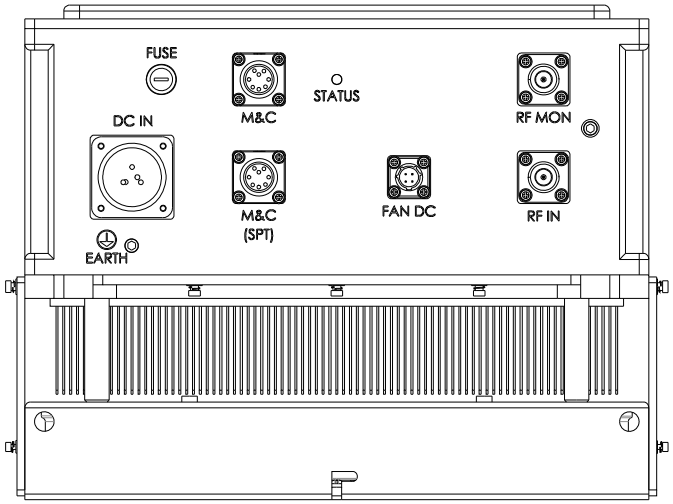



Figure 1.9 Rear panel view of the 200W SSPA

Table 1-10 Interfaces present on the rear panel of the SSPA

| Port Reference | Connector Type | Signal Details |
|---|---|---|


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Port Reference | Connector Type | Signal Details |
|---|---|---|
| DC IN | 100W – Circular 3 pin female connector; MS3112E-12-3P<br>200W – CON box mount receptacle square flange 9-pin; 5702210009 | Connects the SSPA to a 48V DC power source. |
| RF IN | 50 ohm N-type female | Connects to the RF OUT port of the FCSPT. |
| M&C | 8-pin connector<br>KPT02E12-8S | For control between the SSPA and a terminal workstation or a RCU (for redundancy systems). |
| M&C (SPT) | 8-pin connector<br>KPT02E12-8S | M&C between SSPA and the FCSPT. |

📖 Note: Please refer to Table 1-5 for the interface details of the "RF MON" port on the rear panel of the 200W SSPA.

The table below describes the pin and wire connection for the M&C connectors.

Table 1-11 PIN and wire connection for the M&C and M&C (SPT) connector

| Pin # | Function |
|---|---|
| Pin A | +12V DC |
| Pin B | Ground |
| Pin C | Rx link status (Normally close of Rx Form "C" Relay) |
| Pin D | Tx link status (Normally close of Tx Form "C" Relay) |
| Pin E | Rx232 |
| Pin F | Tx232 |
| Pin G | RF Out/Voltage (Reserved) |
| Pin H | Com of Form "C" Relay (Reserved) |

📖 Note: Pin A voltage extended from SPT.

The table below describes the pin and wire connection for the DC IN connector.

Table 1-12 PIN and wire connection for the DC IN connector

| Pin # | Function |
|---|---|
| Pin A | Positive (Red) |
| Pin B | Negative (Blue) |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Pin # | Function |
|---|---|
| Pin C | System Ground |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 1.5 System Configuration

The FCSPT solution can be implemented in either a standalone system or a 1:1 redundancy system.

### 1.5.1 Standalone System Configuration

The connectivity diagram for a standalone system is shown in the figure below.

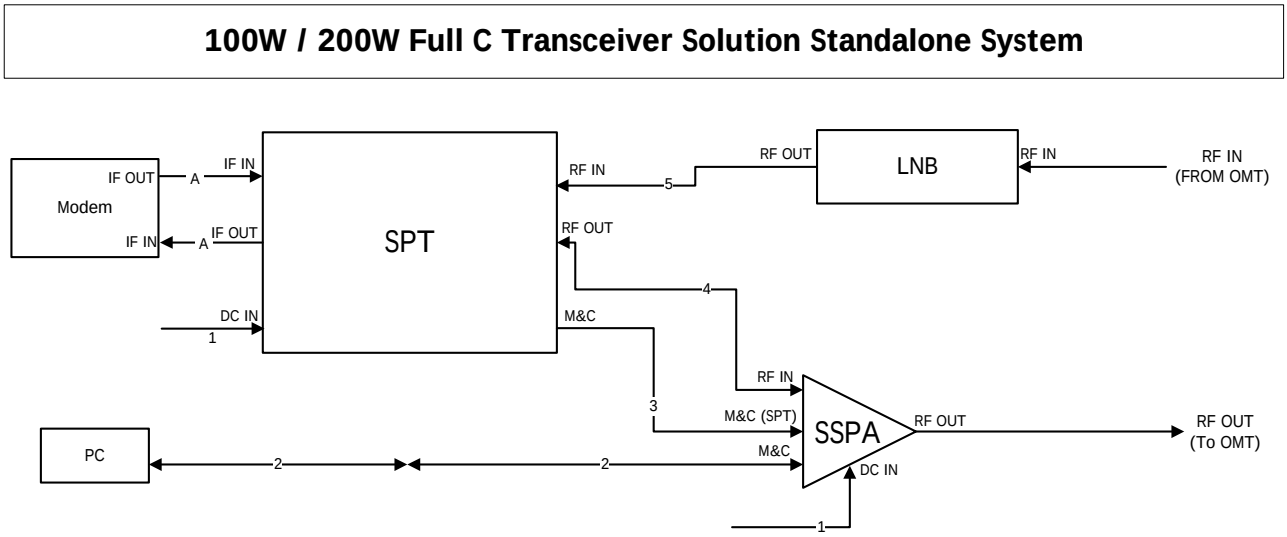



Figure 1.10 FCSPT solution standalone system configuration

The table below details the cables and components needed to setup this system.

📖 Note: This table lists the typical accessories required for the connection. Please contact Raditek for purchase of any of these accessories if needed.

Table 1-13 Details of accessories used in Stand-Alone Configuration

| Item | Raditek Part No. | Description | Length (m) | Quantity |
|---|---|---|---|---|
| 1 | TBA | Power cable | 2 | 2 |
| 2 | 2502040699 & 6103480008 | RS485 M&C cable with converter | 2 | 1 |
| 3 | 2502040562 | M&C cable from SPT to SSPA | 2 | 1 |
| 4 | 2502040135 | FSJ cable from SPT to SSPA | 1 | 1 |
| 5 | 2502040109 | RF cable from SPT to LNB | 7 | 1 |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Item | Raditek Part No. | Description | Length (m) | Quantity |
|---|---|---|---|---|
| A | - | RF cable (L-Band) from indoor to outdoor, N(M) to N(M) | To be arranged by the customer | |
| - | RAV8140121 | FCSPT | - | 1 |
| - | RAAx1xxxxx-x | SSPA | - | 1 |
| - | RCA1133035 | LNB | - | 1 |

### 1.5.2 1:1 Redundancy System Configuration

The connectivity diagram for a 1:1 redundancy system is shown in the figure below.

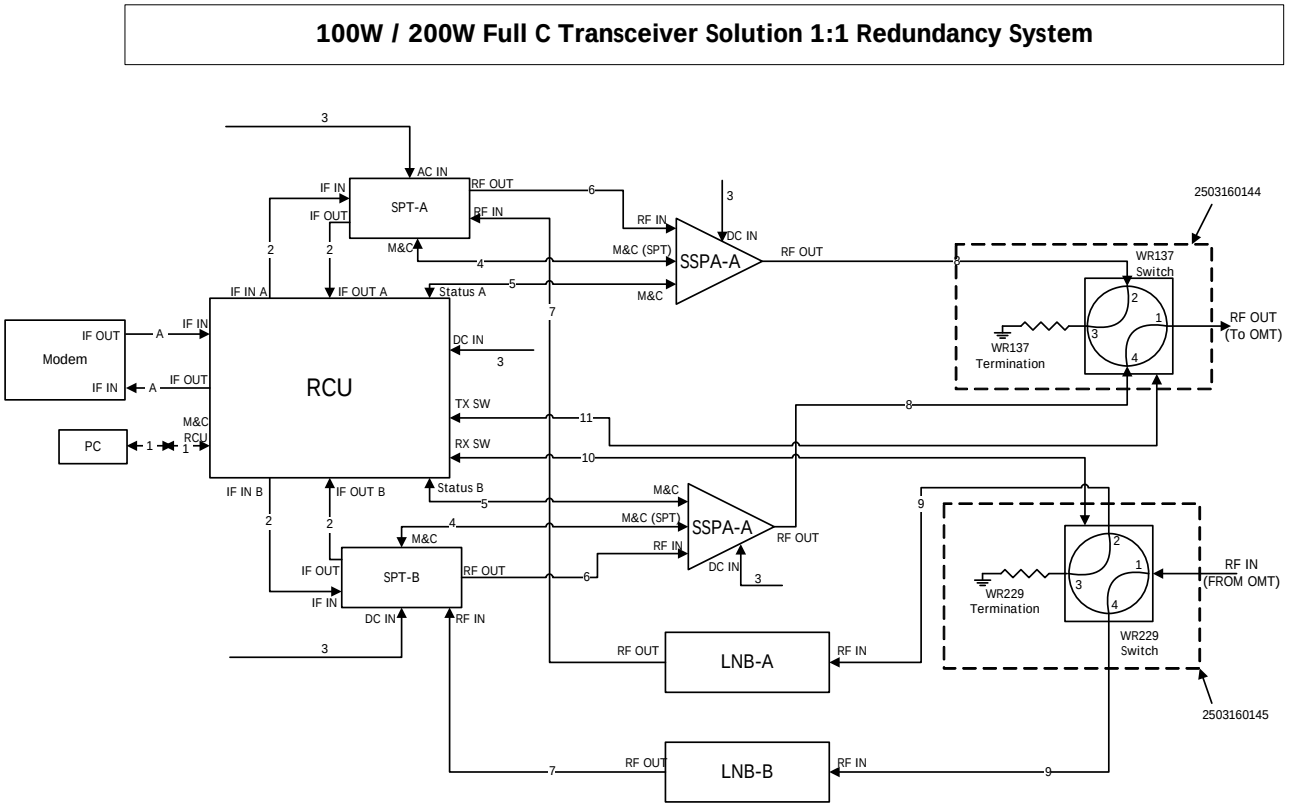



Figure 1.11 FCSPT solution system configuration

The table below details the cables and components needed to setup this system.

📖 Note: This table lists the typical accessories required for the connection. Please contact Raditek for purchase of any of these accessories if needed.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Table 1-14 Details of accessories used in Stand-Alone Configuration

| Item | Raditek Part No. | Description | Length (m) | Quantity |
|---|---|---|---|---|
| 1 | 2502040669 & 6103480008 | RS485 M&C cable with converter | 2 | 1 |
| 2 | 2502040137 | IFL cable | 3 | 1 |
| 3 | TBA | Power cable | 3 | 5 |
| 4 | 2502040562 | M&C cable from SPT to SSPA | 2 | 2 |
| 5 | 2502040561 | M&C cable from RCU to SSPA | 2 | 2 |
| 6 | 2502040135 | FSJ cable from SPT to SSPA | 1 | 2 |
| 7 | 2502040109 | RG cable from SPT to LNB | 7 | 2 |
| 8 | 4203490057 | Flexible waveguide cable | 1 | 2 |
| 9 | 4203490106 | Feed Mounted (LNB to WG SW) | - | 2 |
| 10 | 2502040108 | Rx WG SW control cable from RCU | 7 | 1 |
| 11 | 2502040155 | Tx WG SW control cable from RCU | 3 | 1 |
| A | - | RF cable (L-Band) from indoor to outdoor, N(M) to N(M) | To be arranged by the customer | |
| - | RAV8140121 | FCSPT | - | 1 |
| - | RAAx1xxxxx-x | SSPA | - | 1 |
| - | RCA1133035 | LNB | - | 1 |
| - | RAV610XXXX | Redundancy Control Unit (RCU) | - | 1 |
| - | 2503160144 | WR137 Tx WG SW with accessories | - | 1 |
| - | 2503160145 | WR229 Rx WG SW with accessories | - | 1 |

### 1.5.3 Redundancy Control Unit

The Redundancy Controller Unit (RCU) is used to control redundancy operation for the six devices connected in the system. This includes SPT-A, SPT-B, SSPA-A, SSPA-B and LNB-A and LNB-B. A fault condition in any of the online


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

devices, or an operator-generated command, will switch the offline device into the transmission path and the online device out of the transmission path. For example, if a fault condition is raised in SSPA-A, the RCU automatically switches the transmit path such that signals now flow through SSPA-B instead.

Fault condition is determined by the alarm status of the devices. If the status signal is lower than 1.4V, an alarm will be generated. Traffic disruption due to a switch operation is less than half a second.

The RCU can operate in two redundancy modes, “Manual” and “Auto”. Under “Manual” mode, users control the switching mechanism. The RCU does not automatically generate a switch even when an online device is faulty. This mode allows users to repair faults or perform routine maintenance of any device without disrupting signal transmission.

Under “Auto” mode, the RCU automatically control the switching mechanism based on the operating status of each online device. This is the recommended mode for daily operations.

🕮 Note: This manual provides basic information on the RCU unit. Please refer to the RCU manual for detailed explanations.

### RCU FRONT PANEL INTERFACES

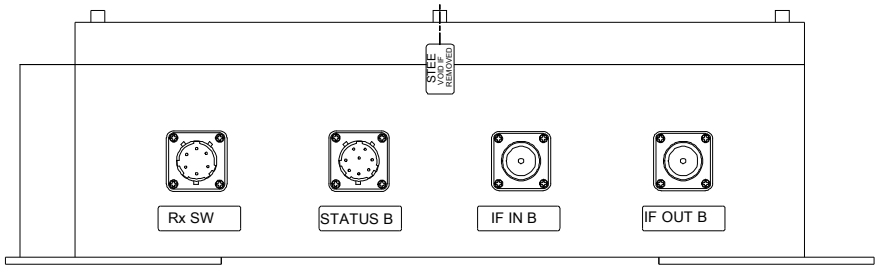



Figure 1.12 Front panel view of the RCU

Table 1-15 Interfaces present on the front of the RCU unit

| Port Reference | Connector Type | Description |
|---|---|---|
| RX SW | MS3112E-10-6S | Connects to the WR229 waveguide transfer switch |
| STATUS B | MS311E-12-8P | Serial connection to the M&C port of SSPA-B |
| IF IN B | 50 ohm N-type F connector | Connects to the IF OUT port of SPT-B |
| IF OUT B | 50 ohm N-type F connector | Connects to the IF IN port of SPT-B |

Table 1-16 Pin-out configuration for TX SW and TX SW

| Pin # | Function |
|---|---|
| Pin A | Position 1 (Command) |
| Pin B | Common (Command) |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Pin # | Function |
|---|---|
| Pin C | Position 2 (Command) |
| Pin D | Position 1 (Indicator) |
| Pin E | Common (Indicator) |
| Pin F | Position 2 (Indicator) |

### RCU REAR PANEL INTERFACES

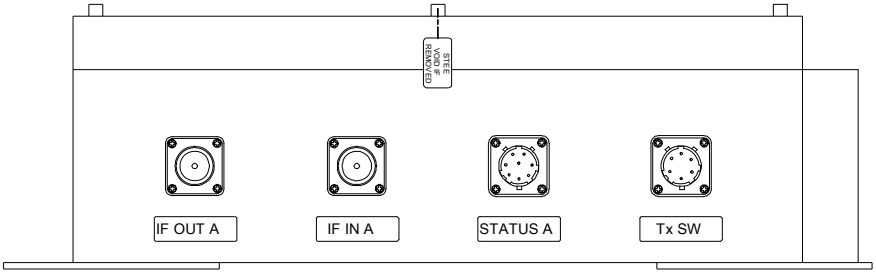



Figure 1.13 Rear panel view of the RCU

Table 1-17 Interfaces present on the rear of the RCU unit

| Port Reference | Connector Type | Description |
|---|---|---|
| TX SW | MS3112E-10-6S (6-pin, socket) | Connects to the WR137 waveguide transfer switch |
| STATUS A | MS3112E-12-8P | Serial connection to the M&C port of SSPA-A |
| IF IN A | 50 ohm N-type F connector | Connects to the IF OUT port of SPT-A |
| IF OUT A | 50 ohm N-type F connector | Connects to the IF IN port of SPT-A |

Table 1-18 STATUS A and STATUS B pin-out configuration

| Pin # | Function |
|---|---|
| Pin A | +12V to +15V DC |
| Pin B | Ground |
| Pin C | Rx status |
| Pin D | Rx status |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Pin # | Function |
|---|---|
| Pin E | RS485 + |
| Pin F | RS485 - |
| Pin G | Reserved |
| Pin H | Reserved |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### RCU SIDE PANEL INTERFACES

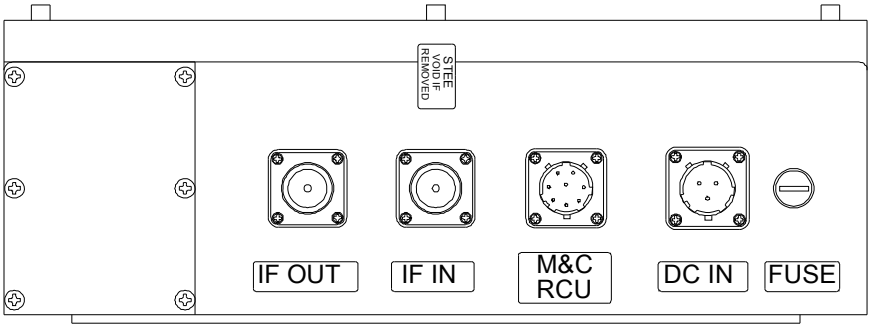



Figure 1.14 Side panel view of the RCU

Table 1-19 Interfaces present on the side of the RCU unit

| Port Reference | Connector Type | Description |
|---|---|---|
| DC IN | MS3112E-12-3P | For connection to a 48V DC power source |
| M&C RCU | MS3112E-12-8P | Serial connection to an indoor station (usually PC) for monitor and control |
| IF IN | 50 ohm N-type F connector | Connects to the IF OUT port of an indoor modem |
| IF OUT | 50 ohm N-type F connector | Connects to the IF IN port of an indoor modem |

Table 1-20 DC IN pin-out configuration

| Pin # | Function |
|---|---|
| Pin A | Positive |
| Pin B | Negative |
| Pin C | System Ground |

Table 1-21 M&C pin-out configuration

| Pin # | Function |
|---|---|
| Pin A | Reserved |
| Pin B | Ground |
| Pin C | Reserved |
| Pin D | Reserved |
| Pin E | RS485 + |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Pin # | Function |
|---|---|
| Pin F | RS485 - |
| Pin G | Reserved |
| Pin H | Reserved |

### 1.5.4 Waveguide Switch

The outdoor RF waveguide transfer switches are electromechanical switches with manual override feature. The switches do not consume any power while idling.

The switch over can be automatically or manually controlled by the operator. In “Auto” mode, the RCU initiates a switching operation at the waveguide switch when a fault is detected at either the transmit or receive streams. This allows the link to be maintained while performing fault diagnosis on the faulty device. You can also manually initiate this switch operation for maintenance or diagnosis purposes.

The RF waveguide transfer switch is a four ports waveguide switch. Two ports are connected to the two devices (SSPA for transmit chain and LNB for receive chain). A third port connects to the dummy load while the last connects to the antenna feed. Each switch also includes one control port that is connected to the RCU to control the switching operation.

This system uses two switches, one at each chain. On the transmit chain, a WR137 transmit waveguide switch is used to control the switching of streams between the two SSPAs. On the receive chain, a WR229 receive waveguide switch performs switching of streams between the two LNBs. The figure below shows the outline dimensions of both types of waveguide switches. The time for each switch operation is 50ms.

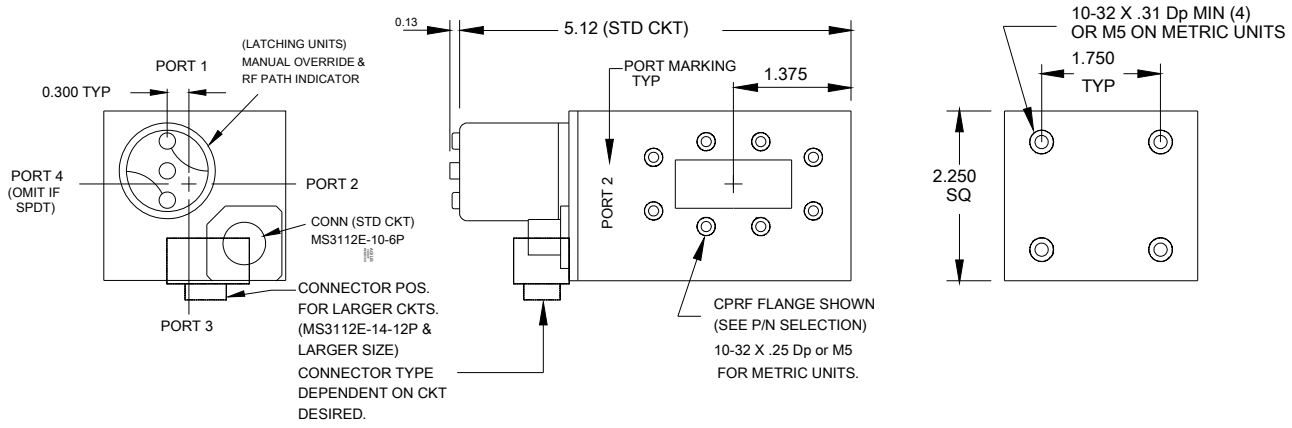



Figure 1.15 WR137 Waveguide switch outline diagrams

Table 1-22 WR137 Waveguide switch port interfaces

| Port Reference | Connector Type | Description |
|---|---|---|
| Port 1 | CPR137-G | Connects to the antenna feed to send RF signals |
| Port 2 | | Connects to a SSPA |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| | | |
|---|---|---|
| Port 3 | | Connects to a dummy load for output protection |
| Port 4 | | Connects to a SSPA |
| Control | MS3112E-10-6P | Connects to the TX SW port of the RCU. This connection allows the RCU to initiate a switching operation and monitor the status of the waveguide switch position |

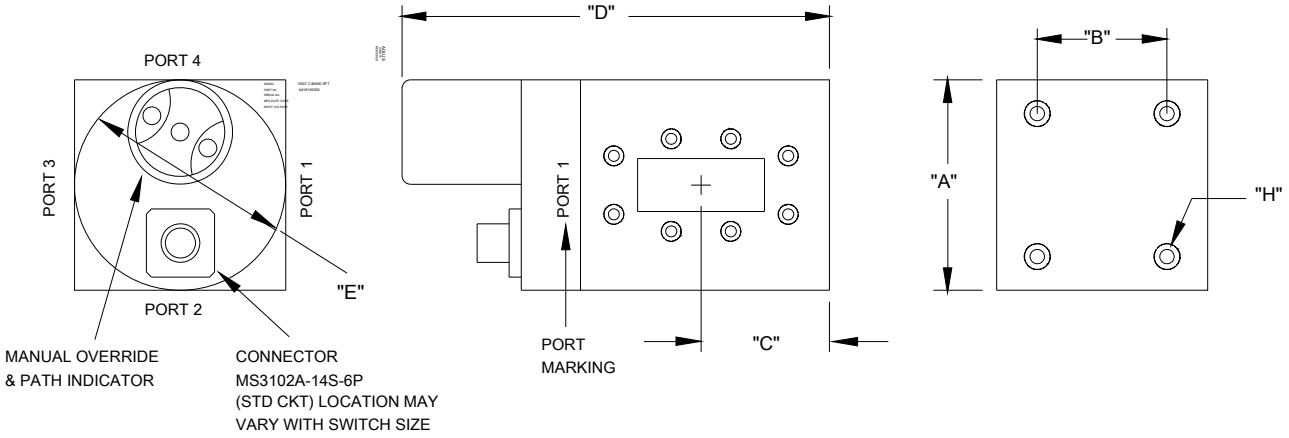



Figure 1.16 WR229 Waveguide switch outline diagrams

Table 1-23 WR229 Waveguide switch port interfaces

| Port Reference | Connector Type | Description |
|---|---|---|
| Port 1 | CPR229-G | Connects to the antenna feed to send RF signals |
| Port 2 | CPR229-F | Connects to a LNB |
| Port 3 | CPR229-G | Connects to a dummy load for output protection |
| Port 4 | CPR229-F | Connects to a LNB |
| Control | MS3112E-10-6P | Connects to the RX SW port of the RCU. This connection allows the RCU to initiate a switching operation and monitor the status of the waveguide switch position |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

# Chapter 2 Installation

This chapter explains a step-by-step process to safely mount and install your Raditek product.

**WARNING:** Handle all ODUs with care. Shock from dropping or knocking ODUs against other objects may cause damage to the units. Please note that Raditek' warranty agreement does not extend to defects in the units caused by excessive shock or vibration.

## 2.1 Unpacking the Box

Before unpacking the box, check if it had been damaged or opened. If the shipment may have been tempered with, open the box in front of a representative from the shipping company.

Upon opening the box, carefully remove the items in the package and check them against the packing list. If any of the items are damaged or missing, please contact Raditek or your local Raditek representative before proceeding.

We recommend that you keep the original packing materials until you have completed the checks and confirmed that the unit is in working order.

If you need to repack the product for shipping, please use the original shipping container and packing materials whenever possible. Alternatively, you may also use high quality commercial packing materials to repack the unit. Wrap the units with shock-absorbing materials to provide a firm cushion and prevent movement within the container. Please seal the container firmly and clearly mark "**FRAGILE Electronic Equipment"** on the exterior.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 2.2 Pre-Installation Preparations

### 2.2.1 Environmental Considerations

All components in this solution are weatherproof, outdoor units mounted directly onto the orthogonal mount transducer (OMT) of the antenna. This design allows the transmitter (power amplifier) to be installed close to the transmitter antenna. The unit's aluminium chassis is coated with white, enamelled epoxy for environmental protection. All interface connectors are sealed to prevent air and moisture from entering the unit.

Before proceeding with the mounting process, please ensure that the environmental conditions in the area where the components are to be mounted is appropriate for its optimal operation. These include:

- Temperature: -20ºC to +60ºC
- Relative Humidity: 0 to 90%

### 2.2.2 Tools Required

We highly recommend having the following tools on hand before starting the installation:

- 1 set of socket wrench
- 1 Phillips head screwdriver
- 1 cutter
- 1 bag of cable ties (Long and medium)
- 2 rolls of insulator tape
- 1 roll of 3M tape
- 1 multimeter
- 1 hand drill
- 1 tube of silicon compound (MS4)

### 2.2.3 Site Preparation Checklist

The following table provides a simple checklist to help you ensure that your site is adequately equipped to perform the installation.

Table 2-1 Site Preparation Checklist

| Checklist Item | Y/N |
|---|---|
| Equipment required for site survey | ☐ Inclinometer<br>☐ Compass / DataScope<br>☐ 1-meter rectangular bar<br>☐ Scientific calculator<br>☐ 100-meter measuring tape<br>☐ Site location map<br>☐ GPS receiver |



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Checklist Item | Y/N |
|---|---|
| | ☐ Road distance wheel<br>☐ Vernier calliper<br>☐ Location markers / flags |
| Is site in the satellite footprint? | ☐ Yes ☐ No |
| Approximate length of cables between ODU and IDU | |
| IF cable routing method | ☐ Underground ☐ Surface |
| Is there a clear path for cables from ODU to IDU? | ☐ Yes ☐ No |
| Proposed mounting location | ☐ Antenna structure<br>☐ Near the antenna<br>☐ Inside the shelter<br>☐ Other: _____ |
| Does the mounting location provide the best route for cables from IDU to ODU to antenna? | ☐ Yes ☐ No |
| Is there an unobstructed view from the satellite(s) of interest? | ☐ Yes ☐ No |
| Are there any hazards near the site location that may damage or obstruct the ODU? (old buildings, trees, planned future construction) | ☐ Yes ☐ No<br>If yes, please specify:<br>_____ |
| Is there possible RF interference from other nearby telecommunication towers? | ☐ Yes ☐ No |
| Will your installation cause interference to other nearby setup? | ☐ Yes ☐ No |
| Is sufficient power supply available? | ☐ Yes ☐ No |
| Is grounding available? | ☐ Yes ☐ No |
| Is the site prone to the following? | ☐ Heavy wind<br>☐ Heavy rainfall<br>☐ Ice/snow accumulation<br>☐ Extreme temperatures<br>☐ Sand/Dust storms<br>☐ Others: _____ |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 2.2.4 Pre-Installation Test

Performing a pre-installation test prior to the actual field installation helps you to:

- Confirm that the unit has not been damaged during shipment.
- Check that the unit is in working order before performing a tiring and costly mounting procedure on your antenna.

Hence, we strongly recommend that you perform the testing as detailed below.

🕮 Note: Ensure that no alarm or fault appears on the FCSPT before performing any test.

There are two main test procedures for this system, uplink test and downlink test.

🕮 Note: The test procedures detailed below explains how to test all three components the system as a whole, including the FCSPT, SSPA, PSU and PLLNB. If you wish to isolate each component for separate testing, please refer to the operator manual for each product separately to perform the testing procedures.

**UPLINK TEST PROCEDURE**

⚠ **WARNING:** Please connect a 30dB, 200W power attenuator to the RF OUT connector on the FCSPT to avoid damaging the ODU accidentally.

Step 1 Connect the ODU interfaces as follows:

1. Connect the FCSPT IF IN port to the IF OUT port of a modem.
2. Connect the FCSPT RF OUT port to the SSPA RF IN port.
3. Connect the SSPA RF OUT port to a spectrum analyzer.
4. Connect the ODUs to DC power supply as required.

Step 2 From the modem, input a 70 MHz or 140 MHz pure carrier. Adjust the modem output power so that the IF input to the FCSPT is -40 dBm.

Step 3 Using the spectrum analyzer, measure the RF OUT from the SSPA at C-band. Calculate the transmit gain using the formula below. You should obtain a minimum gain of 25dB.

*Transmit gain = RF OUT power – IF IN power + Attenuation*

Check that the channel setting is correct if no signal is shown on the spectrum analyzer.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

**DOWNLINK TEST PROCEDURE**

Step 1 Connect the ODU interfaces as follows:

1. Connect a waveguide adapter to the input port of the PLLNB.
2. Connect FCSPT RF IN port to the output port of the PLLNB.
3. Connect the FCSPT IF OUT to a spectrum analyzer.
4. Connect the ODUs to DC power supply as required.

Step 2 Input a -100 dBm C-band signal to the PLLNB that is of the correct channel according to the setting on the FCSPT.

Step 3 Using the spectrum analyzer, measure the IF OUT from the FCSPT at 70 MHz or 140MHz. Calculate the receive gain using the formula below. You should obtain a minimum gain of 80dB.

*Receive gain = RF IN power – IF OUT power*


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 2.3 Installing the Components – Standalone System

### 2.3.1 Mounting the physical units

All components in this solution package are outdoor mounted equipments designed to withstand most weather conditions. The PLLNB is to be flanged mounted to the OMT of the dish antenna while the FCSPT should be mounted just under the antenna. An overview of the system when mounted is shown in the figures below.

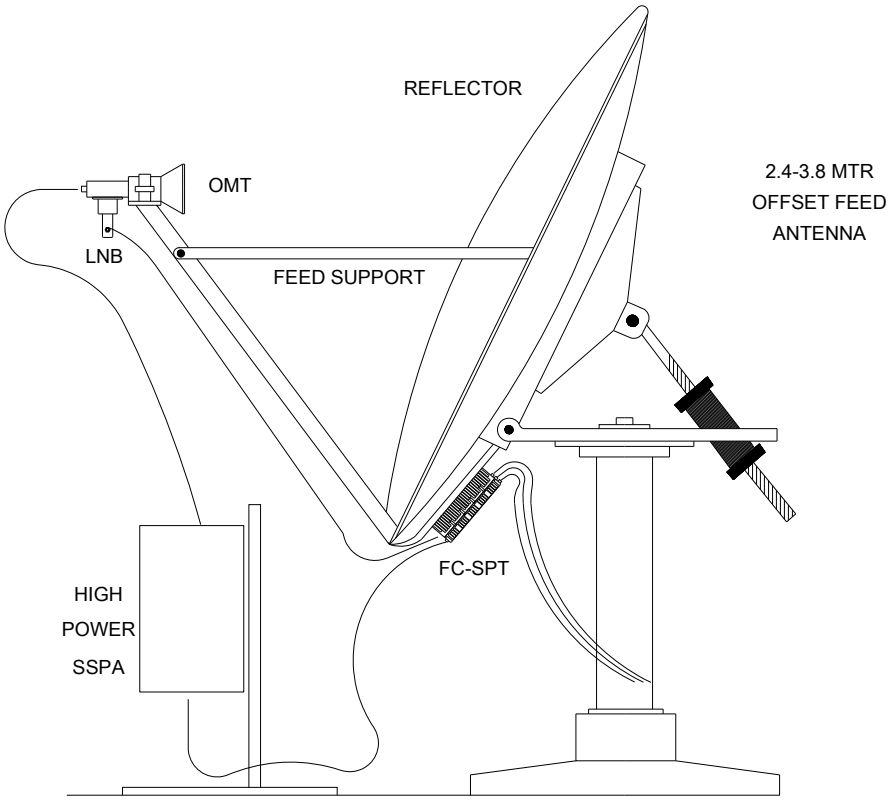



Figure 2.1 Overview of mounted components in standalone system

Multiple ODUs need to be mounted to the outdoor antenna including the PLLNB, FCSPT and SSPA. Mounting accessories are provided. Part number is: 2503160038.

1. Mounting the FCSPT

   We recommend mounting the FCSPT directly below the antenna. Use the mounting brackets provided to mount the ODU to the mounting pole as shown in the figure below.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

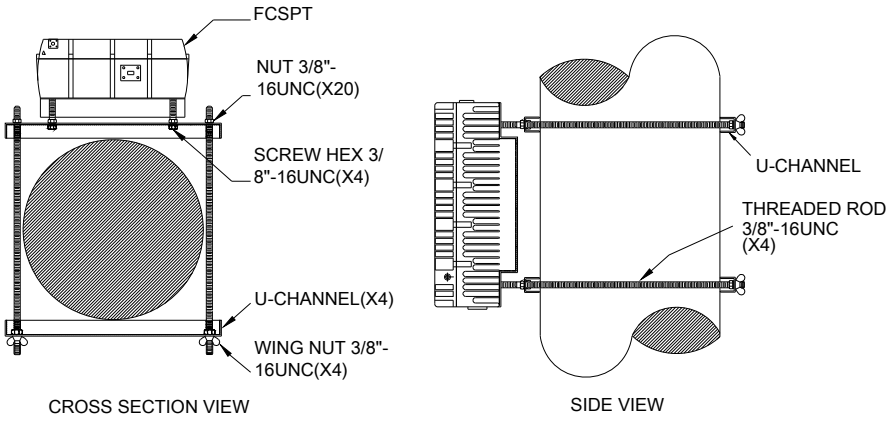



Figure 2.2 FCSPT mounting diagram

2. Mounting the PPLNB

Mount the PPLNB onto the waveguide flange of the transmit rejection filter. You must install the weather gasket to prevent water from leaking through the waveguide joint.

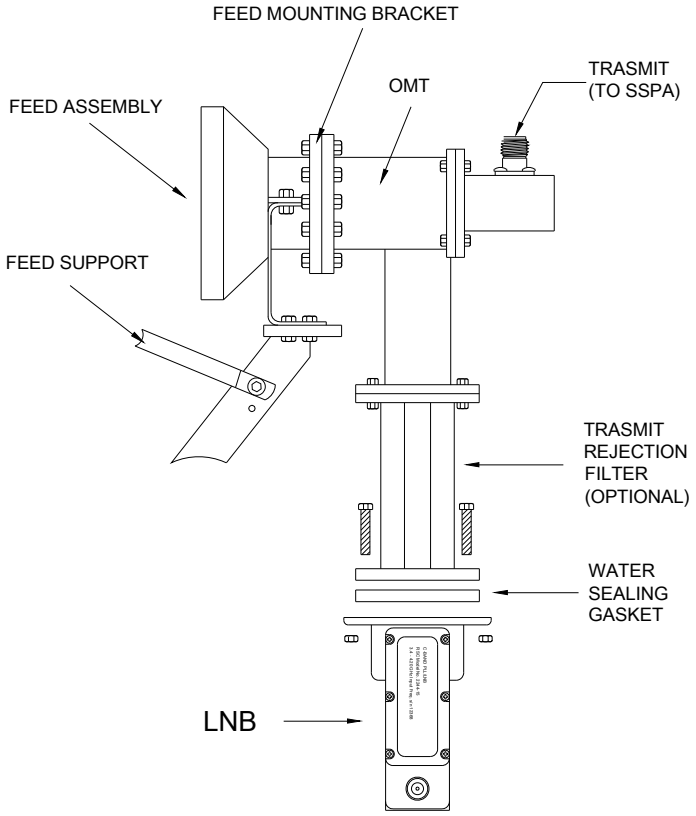



Figure 2.3 PLLNB mounting diagram


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

3. Mounting the SSPA

If the SSPA is to be mounted on a structural wall of concrete, mounting holes should be drilled into the wall according to the dimensions of the actual unit. Wall anchors should be inserted into the mounting structure and dimensioned to allow 6½" x 2½" lag bolts. All hardware must be stainless steel or equivalent in strength.

If the SSPA is to be mounted on a support structure (such as a metal channel), please use a 6½" stainless steel or equivalent bolts that are sufficiently long such that it is able to project through the support structure and still allow for flat, lock washer and nut attachment.

**WARNING:** The SSPAs weigh a significant amount. Hence, do not attempt to lift or move the unit alone. Always use the carrying handles provided when moving the unit.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 2.3.2 Connecting the Devices

Connect the devices according to the procedure below to setup your standalone system.

When cabling, please note the following:

- Do not cut the DC power cables provided by Raditek
- Cables should not have any sharp turnings or bends
- Tighten all cable connections by holding the cable with one hand and ONLY turning the head of the connector with the other.
- Ensure that all cables are connected correctly. Any wrong connections may damage the unit.

Step 1 Interconnect the outdoor units

The connection between all outdoor units is illustrated in the figure below. The table that follows provides details including the type of cable (part number) used and which connectors are involved.

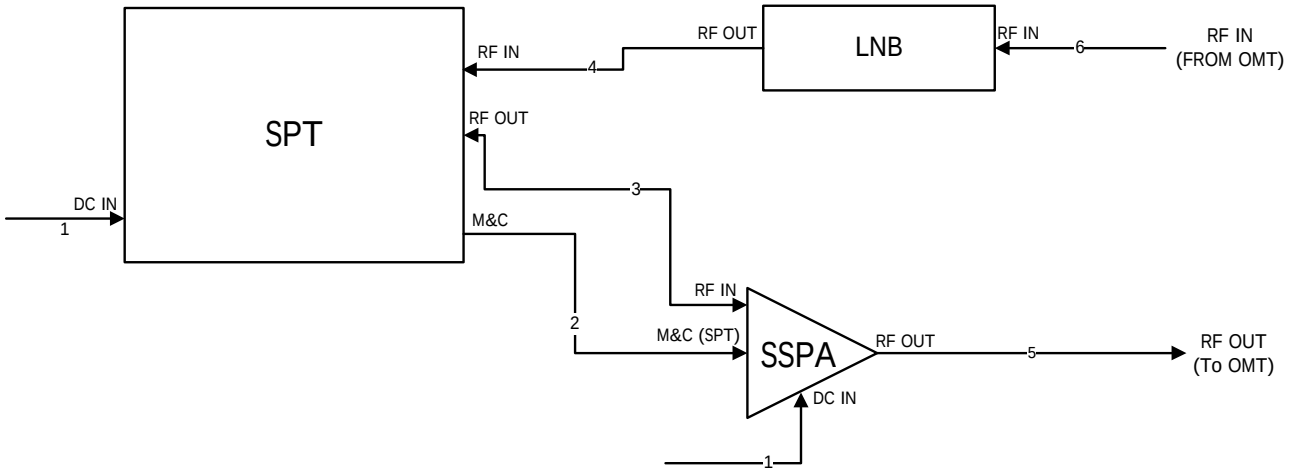



Figure 2.4 Basic cabling between the outdoor units

Cable connection between each device is listed in the table below. Please complete all listed connections.

📖 Note: This table lists the typical accessories required for the connection. Please contact Raditek for purchase of any of these accessories if needed.

Table 2-2 Basic cable and connector details for ODU connection

| No. | Connect from Port | Connect to Port | Cable Part No., Length |
|---|---|---|---|
| 1 | FCSPT DC IN | DC power source | 1001520980, 2meters |
| 2 | FCSPT RF IN | PPLNB RF OUT | 2502040109, 7meters |
| 3 | FCSPT RF OUT | SSPA RF IN | 2502040135, 3meter |
| 4 | FCSPT M&C | SSPA M&C | 2502040562, 2meters |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| No. | Connect from Port | Connect to Port | Cable Part No., Length |
|---|---|---|---|
| | | (SPT) | |
| 5 | SSPA RF OUT | OMT Tx | Feed mounted |
| 6 | PPLNB Input | OMT Rx | Feed mounted |

Step 2 Connecting the ODU system to the IDU equipment

The next step is to connect the equipment in the ODU system to those in the indoor units. IDU equipment includes a satellite modem and a terminal workstation (such as a PC) for monitoring and control purposes.

The required connections between all outdoor units and indoor units are illustrated in the figure below. The table that follows provides details including the type of cable (part number) used and which connectors are involved.

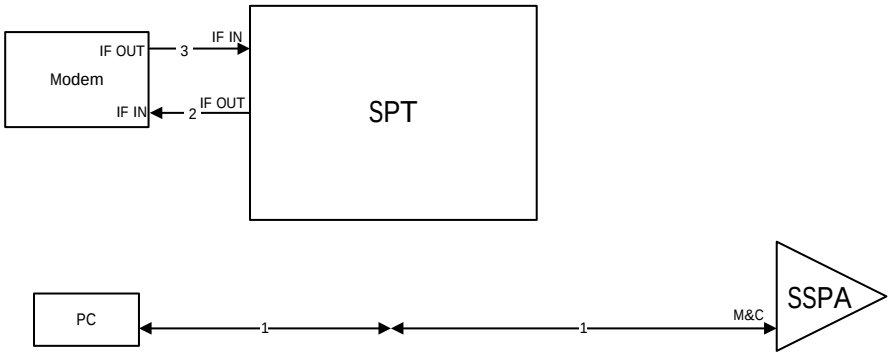



Figure 2.5 Basic cabling between the outdoor units and indoor units

Cable connection between each device is listed in the table below. Please complete all listed connections.

📖 Note: This table lists the typical accessories required for the connection. Please contact Raditek for purchase of any of these accessories if needed.

Table 2-3 Basic cable and connector details for ODU connection

| No. | Connect from Port | Connect to Port | Cable Part Number |
|---|---|---|---|
| 1 | SSPA M&C | PC COM Port | 2502040669 & 6103480008 , 2 meters |
| 2 | FCSPT IF OUT | Modem IF IN | NA, Arranged by customer |
| 3 | FCSPT IF IN | Modem IF OUT | NA, Arranged by customer |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 2.4 Installing the Components – 1:1 Redundancy System

### 2.4.1 Mounting the physical units

All components in this solution package are outdoor mounted equipments designed to withstand most weather conditions. The PLLNBs are to be flanged mounted to the OMT of the dish antenna while the FCSPTs, SSPAs and RCU is mounted onto a mounting frame. An overview of the system when mounted is shown in the figures below.

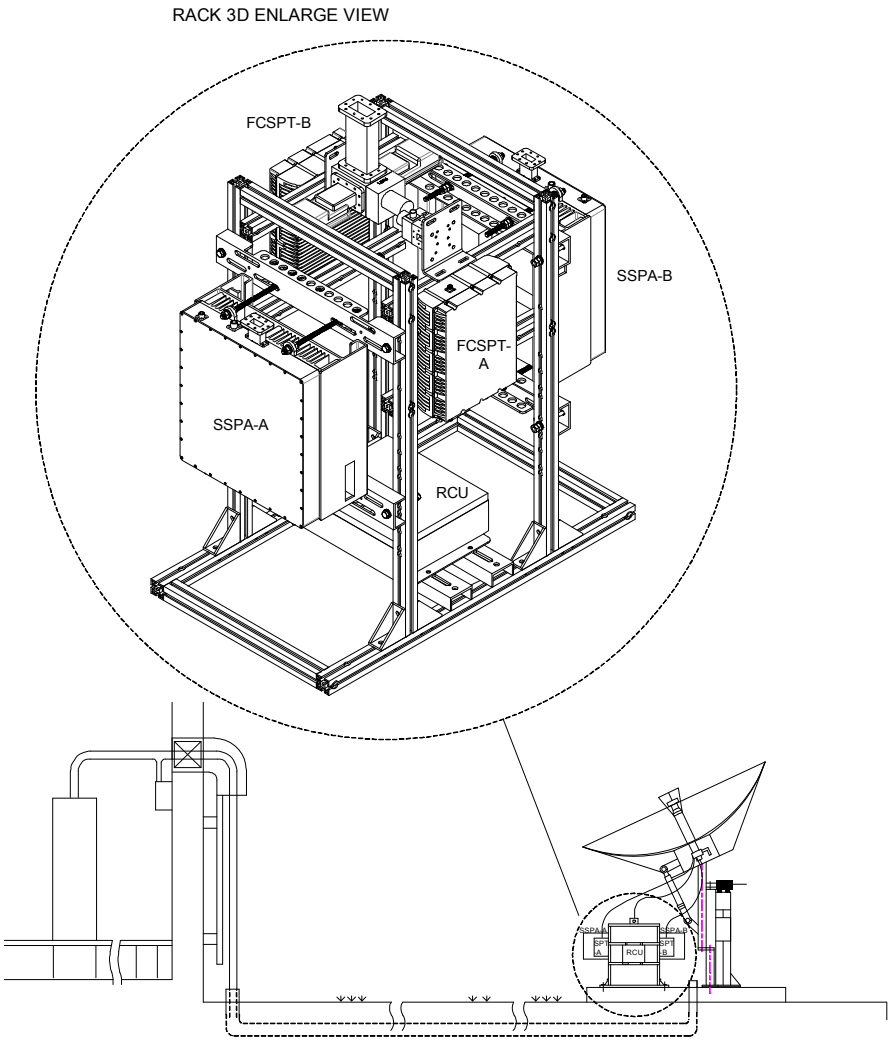



Figure 2.6 Overview of mounted components in 1:1 redundancy system


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

1. Mount the FCSPTs, SSPAs, and RCU on the mounting frame as shown in the figure below.

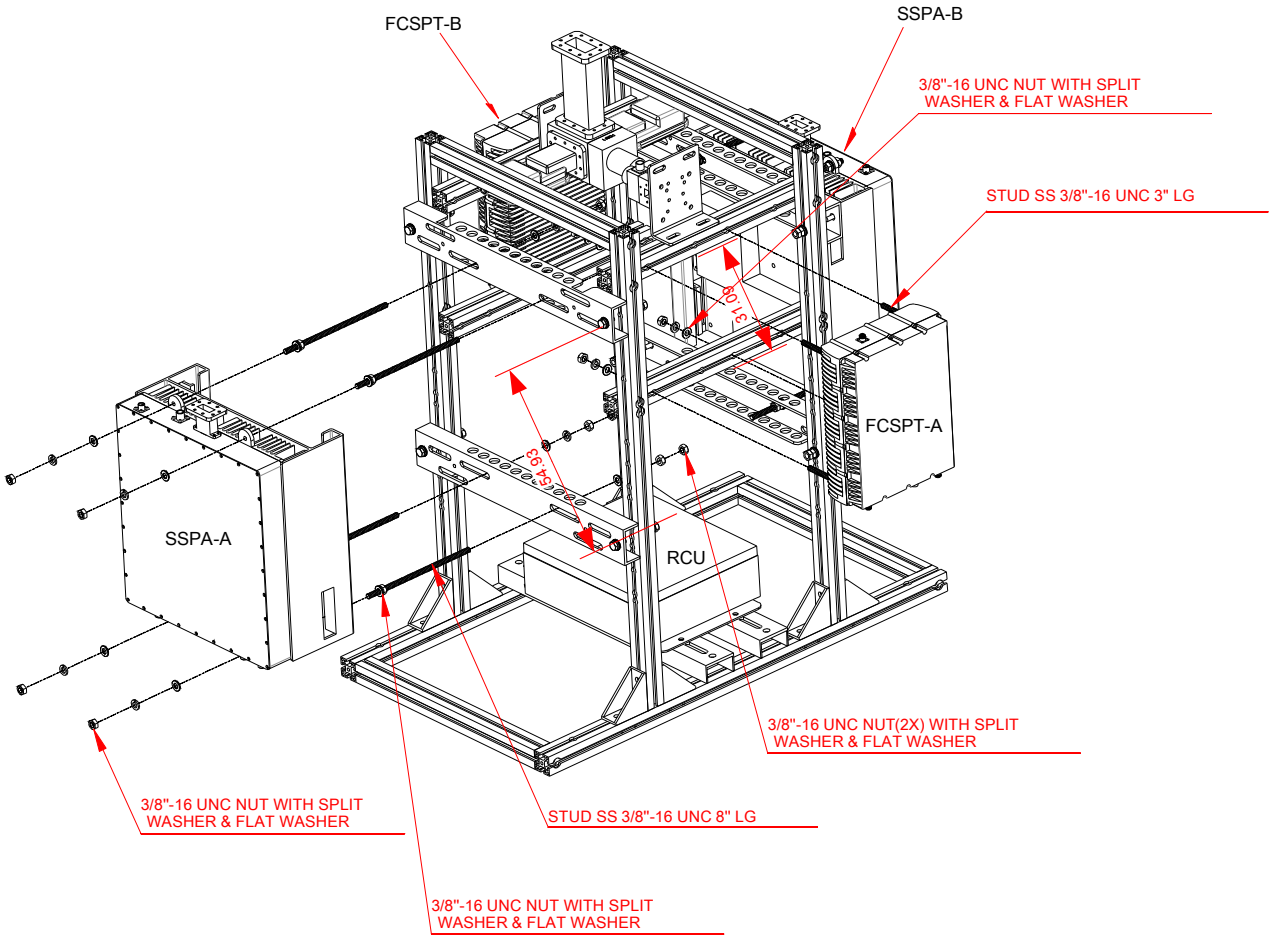



Figure 2.7 RCU, SSPA, FCSPT mounting frame


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

2. Mount the PPLNB onto the waveguide flange of the transmit rejection filter. You must install the weather gasket to prevent water from leaking through the waveguide joint.

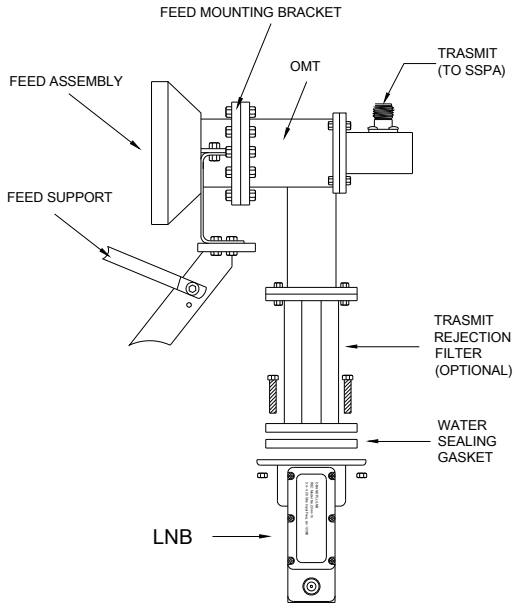



Figure 2.8 PLLNB mounting diagram

### 2.4.2 Connecting the Devices

Connect the devices according to the procedure below to setup your 1:1 redundancy system. The overall connectivity diagram can be viewed from 1.5.2 1:1 Redundancy System Configuration. A full page copy is also attached to the last page of this manual for your convenience.

When cabling, please note the following:

- Do not cut the DC power cables provided by Raditek
- Cables should not have any sharp turnings or bends
- Tighten all cable connections by holding the cable with one hand and ONLY turning the head of the connector with the other.
- Ensure that all cables are connected correctly. Any wrong connections may damage the unit.

Step 1 Connect the RCU to the indoor units

The RCU is the only device in this setup that is connected to the indoor units. Connect the RCU to the PC and modem as follows:


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

1. Connect the IF IN port of the RCU to the IF IN port of the modem using a standard IFL cable.
2. Connect the IF OUT port of the RCU to the IF OUT port of the modem using a standard IFL cable.
3. Connect the M&C port of the RCU to the USB port of a PC using the USB-RS485 converter. (P/N: 2502040699 & 6103480008).

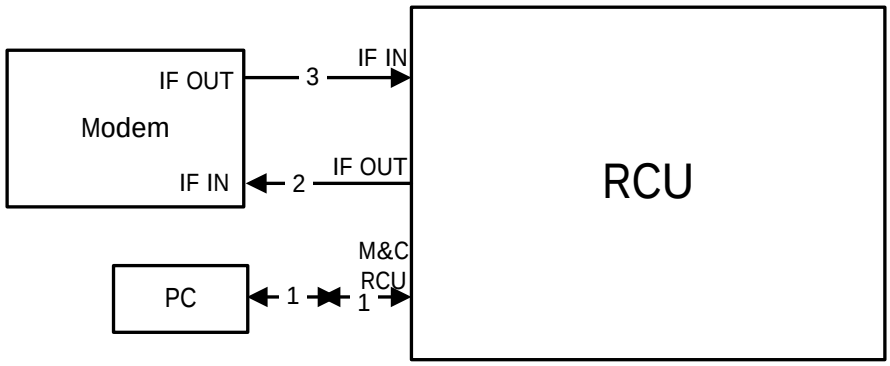



Figure 2.9 Connecting the RCU to indoor units


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Step 2 Connect the RCU to the FCSPTs

Connect the two FCSPTs to the RCU as follows:

1. Connect the IF IN A port of` the RCU to the FCSPT-A's IF IN port.
2. Connect the IF OUT A port of the RCU to the FCSPT-A's IF OUT port.
3. Connect the IF IN B port of the RCU to the FCSPT-B's IF IN port.
4. Connect the IF OUT B port of the RCU to the FCSPT-B's IF OUT port.

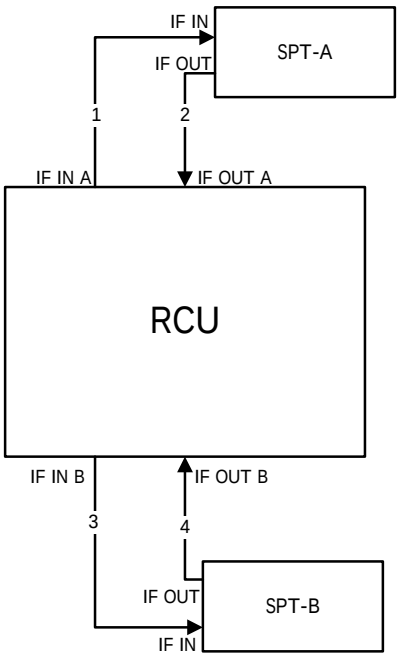



Figure 2.10 Connecting RCU and FCSPTs



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Step 3 Connect the RCU to the control ports of the waveguide switches

1. Connect the RCU's TX SW port to the control port of the transmit waveguide switch (WR137).
2. Connect the RCU's RX SW port to the control port of the receive waveguide switch (WR229).

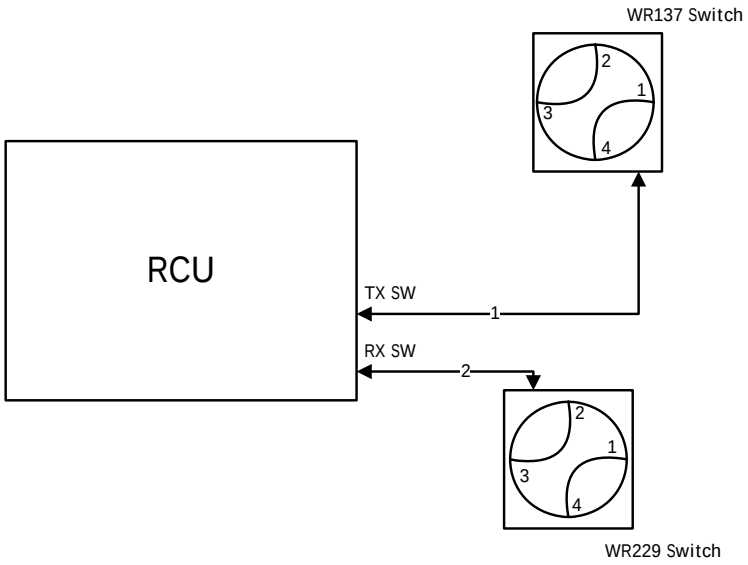



Figure 2.11 Connecting RCU and waveguide switches


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Step 4 Connect the SSPAs to the FCSPTs and RCU

1. Connect SSPA-A RF IN port to the RF OUT port of FCSPT-A.
2. Connect SSPA-B RF IN port to the RF OUT port of FCSPT-B.
3. Connect SSPA-A M&C-2 to FCSPT-A M&C port.
4. Connect SSPA-B M&C-2 to FCSPT-B M&C port.
5. Connect SSPA-A's and SSPA-B's M&C-1 ports to the STATUS A and STATUS B ports on the RCU respectively.

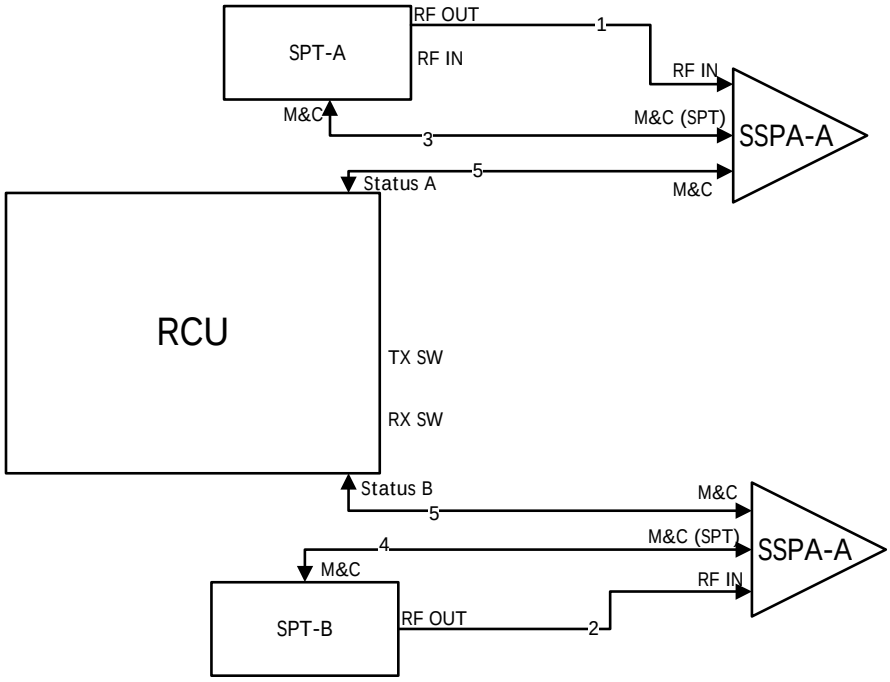
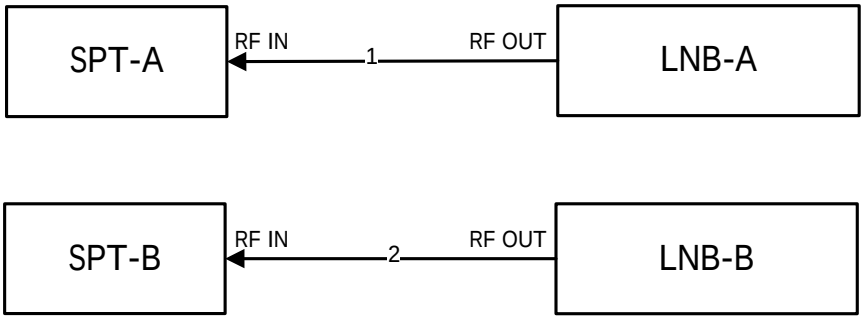



Figure 2.12 Connecting the SSPAs to the RCU and FCSPTs

Step 5 Connect the LNBs to the FCSPT

1. Connect the RF OUT port of LNB-A to the RF IN port of FCSPT-A.
2. Connect the RF OUT port of LNB-B to the RF IN port of FCSPT-B.





WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Figure 2.13 Connecting the LNBs to the FCSPTs


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Step 6 Connecting the transmit waveguide switch

The transmit waveguide switch is connected to the two SSPAs, a dummy termination load and the OMT feed as shown in the figure below:

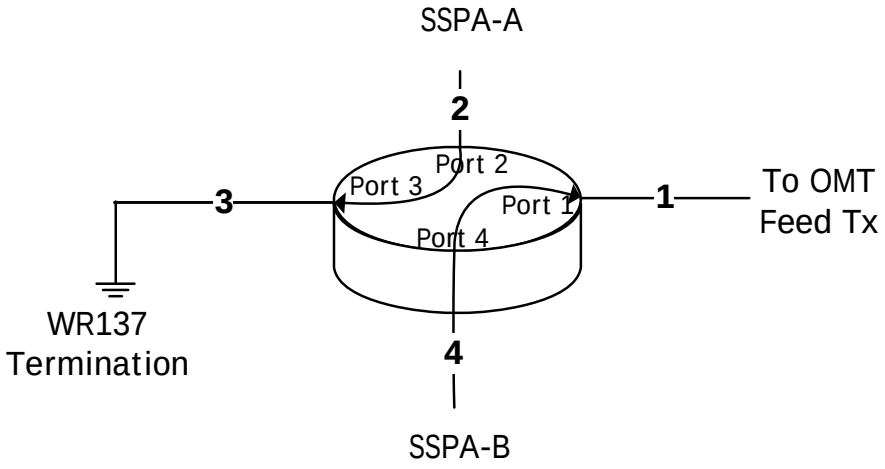



Figure 2.14 Transmit waveguide switch connection diagram

📖 Note: This table lists the typical accessories required for the connection. Please contact Raditek for purchase of any of these accessories if needed.

Table 2-4 Cable details for transmit waveguide switch connection

| Port | Description | Part Number |
|---|---|---|
| 1 | WR137 waveguide connected to feed | - |
| 2 | Flexible waveguide cable | 4203490057 |
| 3 | WR137 Termination load | 5701200008 |
| 4 | Flexible waveguide cable | 4203490057 |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Step 7 Connecting the receive waveguide switch

The receive waveguide switch is connected to the two LNBs, a dummy termination load and the OMT feed as shown in the figure below:

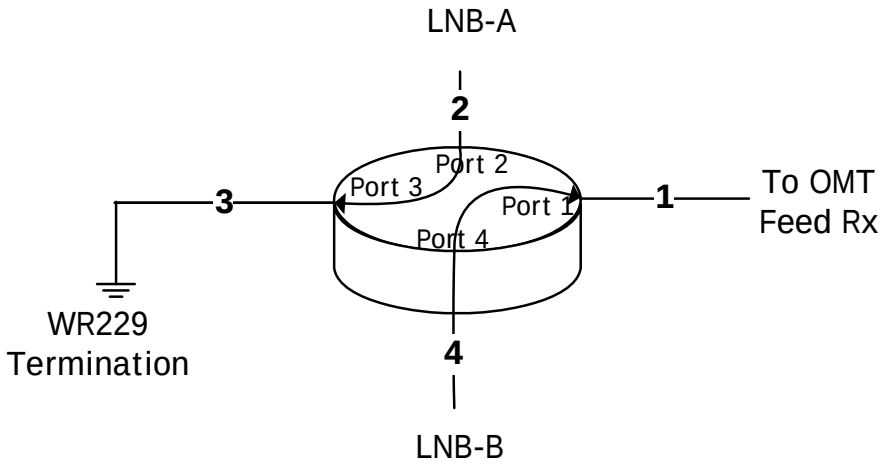



Figure 2.15 Receive waveguide switch connection diagram

📖 Note: This table lists the typical accessories required for the connection. Please contact Raditek for purchase of any of these accessories if needed.

Table 2-5 Cable details for receive waveguide switch connection

| Port | Description | Part Number |
|---|---|---|
| 1 | WR229 waveguide connected to feed | - |
| 2 | Flexible waveguide cable | 4203490106 |
| 3 | WR229 Termination load | 5701200009 |
| 4 | Flexible waveguide cable | 4203490106 |

Step 8 Connecting the power supply

⚠ **WARNING:** Please ensure that all power sources are turned OFF before connecting the power cables. Only turn on the power supply when all connections have been completed.

Using the power cables, connect:


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

1. DC IN of the RCU to a 48V DC power source.
2. DC IN of FCSPT-A and FCSPT-B to a 48V DC power source.
3. DC IN of the two SSPAs to a DC power source.

**WARNING:** Ground all devices appropriately.

## 2.5 Completing the Installation

Step 1 Grounding the installation

This process provides a conductive path for static electrical charges to be discharged safely from the equipment to the ground. This prevents a build up of static charges that may cause the equipment to spark.

1. Locate an appropriate grounding spot. Most soil has sufficient conductivity to allow for an efficient grounding connection. Soils that are mainly rock may need to be treated with additional minerals like rock salt, copper sulphate or magnesium sulphate to increase their conductivity.
2. Drive a 3m lightning rod into the ground about 30cm from the antenna pole. Bolt an aluminium wire, minimum 9mm in diameter, to the ground pole. A tight clamp is used to make contact at the top end. Avoid sharp bends when routing the wire as these may impede current flow.

**WARNING:** Please ensure that the wire is tightly connected between the rod and the equipment to prevent sparks.

3. Connect the devices to the grounding rod, ensuring that the “clean” power lines (supplying power to the ODUs) are kept away from the “dirty” lines (connected to the earth).

The figure below shows a typical grounding kit.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

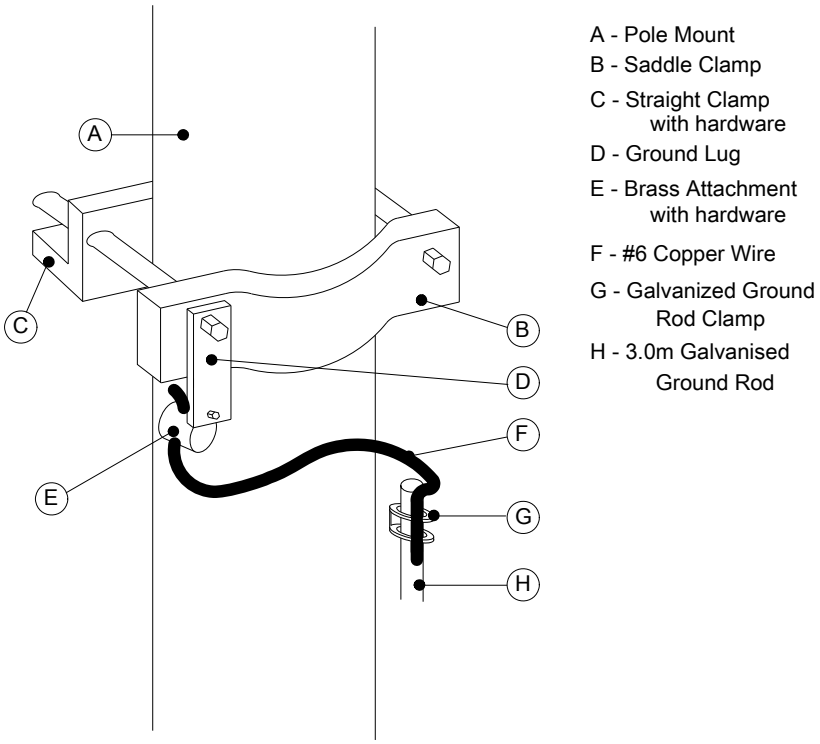



Figure 2.16 Typical grounding kit


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Step 2 Switch on the power supply

Once you are sure that all connections have been properly made, turn on the DC power sources connected to the various devices to start up the system.

When the FCSPT is switched on, the STATUS LED on the front panel of the LED should be lighted. The various status of this LED is explained in the table below.

Table 2-6 FCSPT STATUS LED

| LED Color | Explanation |
|---|---|
| Green | FCSPT is operating normally |
| Red | FCSPT is faulty |
| Not lighted | Either the power supply or M&C board is faulty |

Step 3 Sealing the cables

To complete the physical installation, all connectors and important joints in the system must be sealed. Note that the sealing must begin from the chassis of the ODUs up to the heatshrink of the cable.

All unused connections must be sealed to prevent water ingress. Waveguide joints should be equipped with a gasket and sealed. Please ensure that all connectors are tightened before sealing.

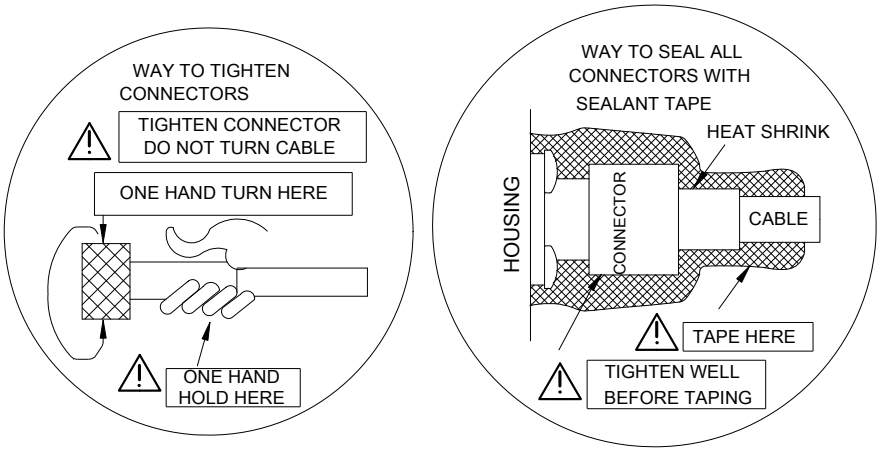



Figure 2.17 Sealing the connectors


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

# Chapter 3 Set Up and Management

## 3.1 Monitor & Control

Monitoring and control for this system can be made using the software provided by Raditek inc..
The RAD-FCSPT-02 is connected to the external SSPA which is in turn connected to an indoor workstation (such as a PC) where this software is installed.

## 3.2 Understanding the M&C Software

RM&C software was developed to monitor its products including the various BUC, SSPAs, and RCUs etc. This software is able to monitor units deployed in either a stand alone or a redundancy configuration.

The RM&C software comes packaged with all compatible models. In this manual, we shall concentrate on the operations of the RM&C catered to the RAD-FCSPT-02 unit.

### 3.2.1 Connecting the PC to the System

Connecting the system to your PC involves connecting the RAD-FCSPT-02 transceiver to the SSPA and the SSPA to your PC via the RS485 cable in the case of a standalone system. If you are using a 1:1 redundancy setup, your PC should be connected to the RCU for management of all devices in the system. Please refer to 2.3 Installing the Components for details on connecting the devices.

The table below details the pin-out configuration of the RS485 cable and converter used for connection.

Table 3-1 RS485 cable (P/N: 2502040669) pin-out configuration

| RS485 cable | | | USB-RS485 converter | |
|---|---|---|---|---|
| Male Circular | Female DB-9 | Signal | Male DB-9 | Signal |
| Pin E | Pin 2 | Data+ | Pin 2 | Data+ |
| Pin F | Pin 1 | Data- | Pin 1 | Data- |
| Pin B | Pin 5 | Ground | Pin 5 | Ground |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 3.2.2 Installing the M&C Software

The RM&C software must be installed into a PC terminal to be used to monitor your Raditek ODUs. If you are configuring a standalone system, your PC terminal should be connected to the M&C port of the SSPA. If you are configuring a 1:1 redundancy system, connect your PC to the RCU's M&C port. Please refer to 2.3 Installing the Components – Standalone System or 2.4 Installing the Components – 1:1 Redundancy System for details.

#### MINIMUM SYSTEM REQUIREMENTS

Your PC must meet the following minimum requirements to install the M&C software:

- A Pentium computer or higher version with a SVGA card installed
- Windows 95 operating system

#### SOFTWARE INSTALLATION

Here, we provide a step-by-step installation guide to help you install the RM&C software into your PC.

Step 1 Ensure that your Windows operating system is working in English.

The software will only launch in an English operating system environment. From your system's "Control Panel", check your language settings.

Select an "English" region (Format). Click [OK] to save the settings. You may need to restart your PC for the change to take effect.

📖 Note: The instructions above may differ according to your Windows operating system version.

Step 2 Insert USB Flash memory into the USB port.

Step 3 Install the USB-RS485 converter driver into your PC.

Step 4 Click the folder named RMC201-Release-v102.

Step 5 Double-Click the file named, "Setup.exe"

Step 6 Follow the on-screen instructions of the installer to install the software.

### 3.2.3 Launching the Software

You can launch the software in 2 ways:

- Click **"Start > All Programs > RMC201(Win) 1.0.2"**.
- Double-click the short-cut icon of the software on your desktop.

📖 Note: This short-cut icon should be automatically created at the end of the installation. You may also create a short-cut icon and move it to the desktop or quick launch bar manually.

By default, the software displays the "Monitor" screen as shown in the figure below when launched. In this screen, the status of the ODU currently being monitored is shown. You may not modify any ODU settings under this mode.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

The default screen remembers some of the last configured state when the software was last closed.
It doesn't auto detect which device is connected to the software.
We recommend to perform a configuration fresh on re-starting the software

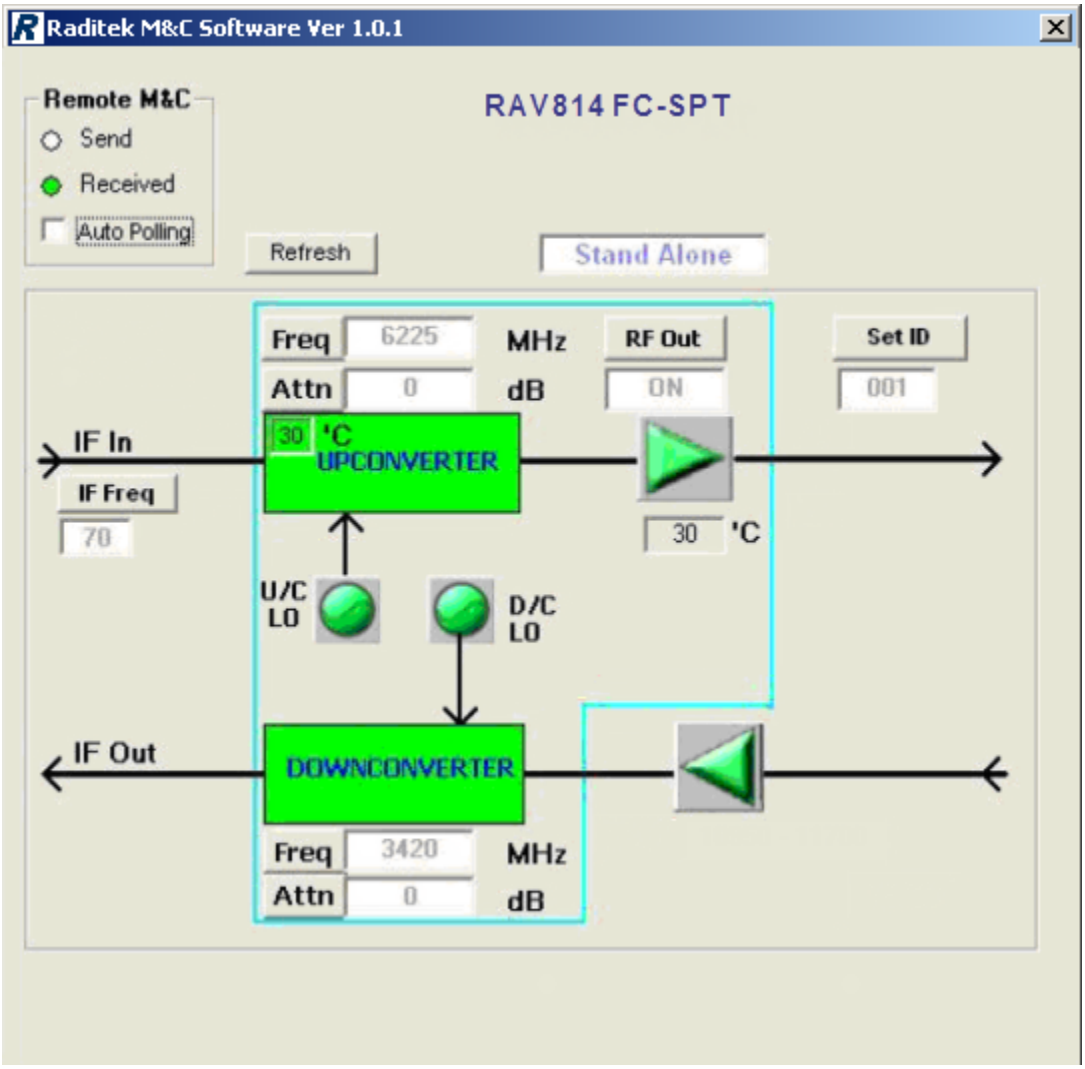



Figure 3.1 Default "Monitor" screen


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 3.2.4 Understanding the Monitoring Screen

The software displays the monitoring screen when it is launched. The default screen includes two paths:

- Transmit Path

  The transmit path displays the Up-Converter local oscillator (U/C LO), Up-Converter Block and SSPA Block. Green indicates that the corresponding component is operating properly while red indicates that the corresponding component has failed. The SSPA Block may be displayed in yellow, which indicates that SSPA transmission is off.

  When one or more component fails, the entire transmit path will be colored in red, indicating that the transceiver is unable to transmit signals.

- Receive Path

  The receive path displays the Down-Converter local oscillator (U/C LO), Down-Converter Block and LNB Block. Green indicates that the corresponding component is operating properly while red indicates that the corresponding component has failed. The SSPA Block may be displayed in yellow, which indicates that SSPA transmission is off.

  When one or more component fails, the entire receive path will be colored in red, indicating that the transceiver is unable to receive signals.

On this screen, you can also view the following information:

- Transmit and receive frequency
- Transmit and receive attenuation
- “RF OUT” indicating whether SSPA is on or off
- IF Frequency
- Device ID


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

In addition to the status display, two other operations can be performed on this screen in “Monitor” mode.

- **[Establish]:** Establish a connection with the selected device.

  Each unit includes two features, “Auto Scan” and “Auto Scrolling”. “Auto Scan” scans the two M&C interfaces (RS232 and RS485), locking it to the interface that has a valid instruction command. This can only be unlocked if a manual instruction to perform “Auto Scan” is given or when the unit resets.

  “Auto Scrolling” is where the device sends a series of messages to the M&C link indicating the device status. While scrolling, any M&C commands from the PC will be jammed. Auto scrolling stops when a valid instruction from the M&C interface is detected.

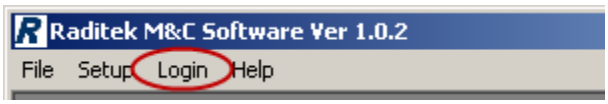
  Both features are turned on during a power reset. Hence, the PC must first establish the link with the device to lock it to the correct interface and stop “Auto Scrolling”. This can be done using the **[Establish]** button.

- **[Refresh]**: Polls the device for updated status and parameters information. You can also set up the software to poll the device periodically by selecting the “Auto Polling” option.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 3.2.5 Logging In

If you wish to monitor any configurations, you will need to login to switch to "Command" mode. To login, click **"Login"** on the top menu bar as shown below:




Enter the **Password** and click **[OK]** to enter "Command" mode. The default login password is "PASSWORD".

#### CHANGING THE LOGIN PASSWORD

For security purposes, we recommend that you change the default password. To change the login password, click **"Setup"** from the top menu bar. In the dialog box that displays, click the **"Password"** tab.

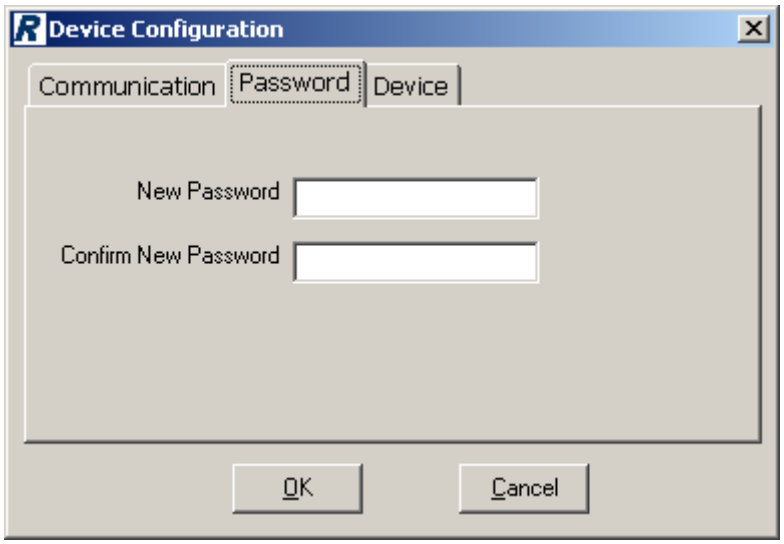



Figure 3.2 Change password dialog box

Enter the new desired password and click **[OK]** to save the changes.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 3.2.6 Setting Up the Software to Communicate with the Devices

To configure the software such that the PC is able to correctly communicate with the devices, set up the communication settings according to the procedure below:

Step 1 Click **"Setup > Configuration"** from the top menu bar. In the dialog box that appears, click the **"Communication"** tab.

📖 Note: To view the port number of the PC port used in the connection, please check the corresponding port number by going to the **"Control Panel > System > Device Manager"** dialog box on your Windows PC.

Step 2 Configure the parameters as follows:

**PC COM Port:** Port number of the serial/USB port connected to the unit.

**Baud Rate:** 9600 bps

**Device Mode:** Select "RS-485"

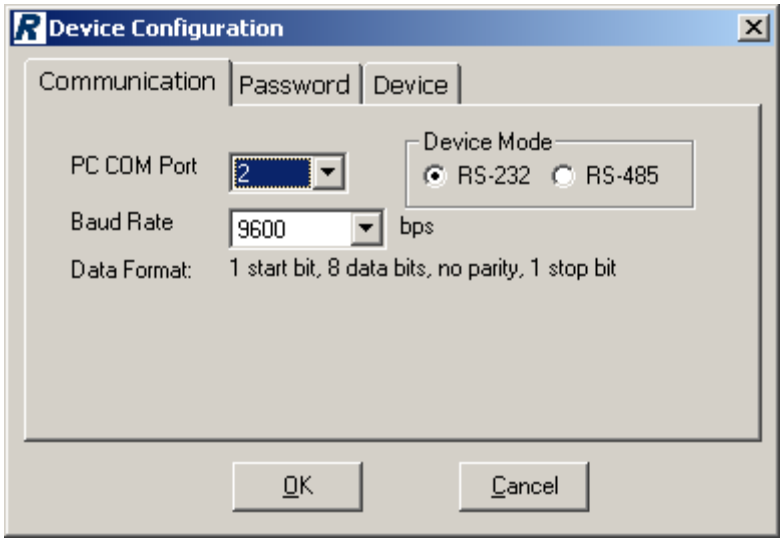



Figure 3.3 Setting up the communication parameters

Step 3 Click **[OK]** to save the settings.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 3.2.7 Selecting the Device to Manage

As the software is only able to display one device at each time, you will need to select the device to be managed if multiple devices are connected to the PC. To select a device, click **"Setup > Configuration"** from the top menu bar and click the **"Device"** tab in the dialog box that appears.

Table 3-2 Parameters explanation in the **"Setup > Device"** tab

| Parameter | Description |
|---|---|
| Device ID | ID of the device used by the M&C module to broadcast commands.<br>During the initial setup, you may wish to set the device ID to "000". Note that this is a global address for all supported devices. Hence, any device connected to the PC will respond to this command regardless of their ID.<br>If you are configuring a 1:1 redundancy setup, the device ID of FCSPT-A and FCSPT-B are 001 and 002 respective. Device ID for SSPA-A and SSPA-B will be 801 and 802 respectively. These addresses are automatically assigned by the system and cannot be modified. |
| Driver Model | Select your SPT model |
| Boostr Model | Select your booster model |
| Redundancy System | Enables redundancy mode if the BUC is connected to an RCU. |

Click **[OK]** to execute the selection.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 3.2.8 Modifying the Operating Parameters of the ODU

In "Command" mode, you can modify the operating parameters of the ODU to adjust its operation according to your requirements.

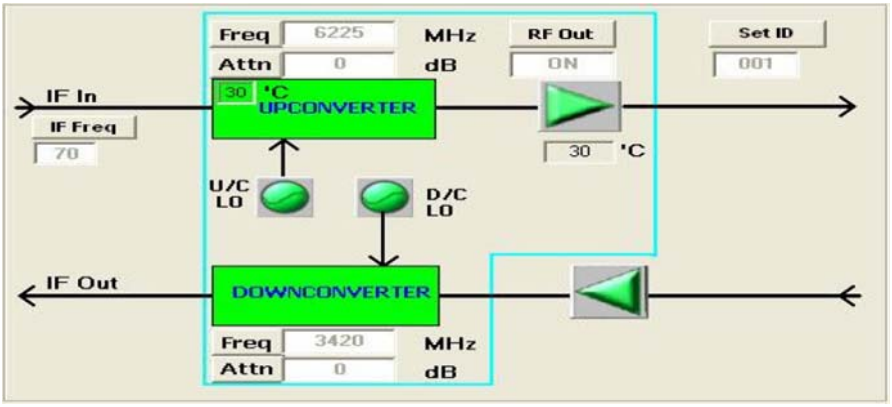



Figure 3.4 Modifying ODU parameters

The values shown in the textboxes are the current operating parameters of the unit. To modify any of these parameters, click the button corresponding to the parameter to be modified. The configurable parameters are described in the table below.

Table 3-3 Configurable parameters

| Parameter | Description |
|---|---|
| Freq | The **[Freq]** field on the top of the UPCONVERTER block refers to the transmit frequency. The **[Freq]** field on the bottom of the DOWNCONVERTER block refers to the receive frequency.<br>To alter the transmit or receive frequency, click the corresponding **[Freq]** button to display a dropdown box. Choose the required frequency from the list. |
| Attenuation | The **[Attn]** fields on the top of the UPCONVERTER block and the bottom of the DOWNCONVERTER block refers to the transmit and receive attenuation value respectively.<br>To alter this value, click the corresponding **[Attn]** button. A dropdown box will appear. Choose the required attenuation from the list. |
| RF OUT | Click this button to display a drop down menu with 3 options.<br>"On" – Enable SSPA<br>"Off" – Disable SSPA |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Parameter | Description |
|---|---|
| | "Delay" – Enable SSPA only after the delay timer expires. When selected, a new prompt will display requesting you to specify a delay time (in minutes). Click **[OK]** to begin the timer countdown. SSPA will be enabled at the end of this countdown.<br>Note: The SSPA cannot be enabled if the U/C LO is unlocked. |
| IF Frequency | The FCSPT can communicate with an indoor modem at either 70 MHz or 140MHz. The default setting is 70MHz.<br>Click the **[IF Freq]** button to display a dropdown menu. Select the desired frequency from that menu. |

## 3.3 Redundancy System M&C

For 1:1 redundancy systems, the RCU status ports connect to the M&C ports of the SSPAs. Each SSPA is then connected to the M&C port of one FCSPT. The indoor PC is then connected to the RCU for overall monitor and control. Please refer to 2.4 Installing the Components – 1:1 Redundancy System for connection details.

To setup the system to work in redundancy mode, complete the following procedure:

Step 1 Launch the software on your PC and activate the redundancy option for the FCSPT.

The SEND and RECEVED circles to the top left corner of this interface will begin to flash. The letter next to "SEND" indicates whether the software is currently polling unit A or unit B. This flashing shows that the software is attempting to establish a link with the RCU. The indicator circles will remain green once a link is established.

Step 2 Disable **Auto Polling** on the main interface. This prevents the software from polling data from the devices before you can complete setting up the addresses.

Step 3 Initializing the addresses

For the redundancy function to work correctly, you must initialize the addresses of the connected devices. The software performs address initialization by broadcasting a change of ID command, changing the device ID of every connected device except the RCU.

The procedure to initialize the address is as follows:


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

1. Disconnect all devices from the RCU.
2. Click **[Init Address]** in the RCU configuration screen.
3. Follow the on-screen guide which will instruct you on which devices to connect the RCU to and when the connection should be made.
4. At the end of this process, the software will prompt you to re-connect all devices to the RCU.

At this stage, you have completed setting up your system to operate in redundancy mode. You can choose to remain in the RCU control screen or return to the FCSPT control screen by clicking the unit box representing your FCSPT.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### OTHER REDUNDANCY OPERATIONS

Using the software, you can control other operations of your RCU including:

- Changing the redundancy mode

  Each RCU can operate in two modes, “Auto” and “Manual”. You can change this mode using the software. RCU devices operate in “Auto” mode by default.

  In “Auto” mode, when any of the paths fails, the RCU will attempt to switch both paths to the offline unit. If one of the paths to the offline unit is also faulty, the RCU will then switch that path back to the original path.

  For example, if transmit path A “TxA” fails, the RCU will switch both the transmit and receive paths to the offline units. If the offline receive path “RxB” has already failed or fails subsequently, and “TxA” remains faulty, the RCU will then only switch the “RxB” path to the original receive path. Hence, the active transmit and receive paths at this stage is “TxB” and “RxA”.

  In “Manual” mode, the active transmit and receive paths are controlled by the user. Note that switching will not take place automatically when a path fails. “Manual” mode is generally recommended only for maintenance or debugging purposes.

- Changing the online and offline devices

  In “Manual” mode, you can initiate a switch between the online and offline devices, redirecting signals from one device to another. This is useful when you wish to perform routine maintenance on either device or for testing purposes.

  On the software screen, a green line indicates that signals are currently being transmitted along this path to the connected device while a grey line indicates otherwise.

- Returning to the control screen for each ODU unit

  From the main RCU screen, you can click on the block diagram representing each ODU unit. This brings up the individual M&C screen for the corresponding ODU unit. You can monitor and configure the ODU unit individually here. Close the screen to return to the main RCU screen.

  For more information about the RCU devices and its functions, please refer to the corresponding RCU operator manual.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

# Chapter 4 Maintenance & Troubleshooting

This chapter details various system maintenance operations to help ensure that your system works under optimal conditions.

**WARNING:** Disconnect all power sources before performing any system maintenance and repair.

## 4.1 Maintenance

This section explains the various maintenance checks that should be routinely carried out to ensure that the system is working correctly and in optimal condition.

Ideally, you should perform a complete maintenance on the system at least twice a year and record all updates and changes made to each ODU in a “SETUP RECORD”. Notify all users that may be affected of a system down time of roughly 2 hours prior to maintenance.

### 4.1.1 Environmental Wear & Tear

Clean and check the outer chassis and all connectors and openings for damage due to environmental wear and tear. These include:

- Cleaning the exterior of each ODU with a mild detergent and water. Do not use any solvents on any part of the ODU.
- Ensure all connectors are free from dust and water.
- Check all connectors and replace if necessary.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 4.1.2 Gains Testing

The test procedure is as follows:

Step 1 Look at the demodulator status and check that is “LOCKED” to the receive signal

Step 2 Record the modem’s configuration including transmit and receive frequencies, power and BER reading.

Step 3 Ensure that the IF frequency is identical to the record in your “SETUP RECORD”.

Step 4 Turn on the pure carrier of the modem

Step 5 Switch off the ODU

**WARNING:** Please be careful when connecting/disconnecting any cables. Connecting or disconnecting any cables improperly may cause intermittent problems in the future.

Step 6 Mark the IF cable connected to the IF IN interface of the FCSPT.

Step 7 Switch on the ODU

Step 8 Set up a spectrum analyzer with the following:

- SPAN = 5MHz (or to the value recorded in your “SETUP RECORD”)
- Center Freq. = IF frequency of the modem
- Power level = 5dB/div (or to the value recorded in your “SETUP RECORD”)

Step 9 Connect the spectrum analyzer to the IF output of the modem and compare the result to your “SETUP RECORD”.

If the result differs from the “SETUP RECORD”, tune the modem’s transmit power till they match.

Step 10 Connect the IF OUT of the modem to the FCSPT’s IF IN interface and check the FCSPT’s RF OUT power level.

**WARNING:** Please connect a 30dB, 200W power attenuator to the RF OUT connector on the FCSPT to avoid damaging the ODU accidentally.

Compare the result with your “SETUP RECORD”.

Step 11 Connect the FCSPT’s IF IN interface to the spectrum analyzer. Compare the power level reading to your “SETUP RECORD”.



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

### 4.1.3 Completing the Maintenance

Completing each maintenance service requires the following actions:

- Tighten and re-seal all connections and important joints.
- Ensure that the FCSPT window access panel is tightened with the O-ring installed.
- Cover all unused connectors with a cap and seal.
- Update the maintenance record.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 4.2 Understanding Faults in the System

The table below lists the faults that may arise in the system. The following information can be found in this table:

- Fault Indication: How do you tell that a fault has occurred?
- Possible Causes: What may have caused the fault and how do you check?
- Solution: How do you resolve the fault?

Table 4-1 Troubleshooting faults in the system

| Fault Indication | Possible Causes | Solution |
|---|---|---|
| Frequency Drift | Frequency drift occurs when the OCXO age over a period of time.<br>The OCXO will drift ±0.5e-7 over a year. This translates to ±300 Hz at 6GHz over a year. | If this figure is unacceptable for your network, you can fine tune the OCXO.<br>1) Open the OSC cover<br>2) Using a trimmer, tune the OCXO's frequency. |
| Ground Loop | When two grounding points which offer slightly different ground resistance are present, a ground loop occurs.<br>This may occur in installations where the length of the cable between the antenna and indoor equipment is sufficiently long such that there is a substantial difference in the ground resistance. | If a ground loop occurs, you may need to "float" indoor components from the wall outlet and use only a single common ground at the antenna. |
| LED on RCU is off | Unit is not receiving DC power supply | Check that the DC power source connected to the RCU is on and tighten the power cables. |
| Unable to perform a user-initiated switch operation | RCU is operating in "Auto" mode | Change the mode to "Manual". |
| | Switch is faulty | Replace the switch and return the faulty switch to Raditek for repair |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Fault Indication | Possible Causes | Solution |
|---|---|---|
| | Switch control cable connecting RCU to switch may be faulty | Replace the cables. |
| Unable to install the software | Language setting of PC is non-English | Please ensure that your PC is operating under an English environment. You can configure this via the regional and language setting on the Control Panel. |
| | PC installation restricted to administrators only | You may need administrator permission to install software on your PC. Please contact your network administrator. |
| Software cannot launch after installation | Language setting of PC is non-English | Please ensure that your PC is operating under an English environment. You can configure this via the regional and language setting on the Control Panel. |
| Software cannot detect the devices | USB to RS485 converter driver was not installed | If you are connected via RS485, you must install the USB to RS485 driver into your PC before connecting to the devices. Please insert the CD that was included in your package to install the driver. |
| | Incorrect communication settings | Ensure that the Baud rate setting is 9600.<br>Check that COM port specified in the communication settings is correct. You can check the COM port of your PC from the “Device Manager” application. |
| | M&C cable faulty | Replace the M&C cable. |
| | M&C board failure | The devices’ M&C board is faulty. Please contact Raditek for further support. |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

# Appendix A Customer Service

Raditek provides a variety of after-sales services. This chapter explains some of the services offered including warranty information, the Return Material Authorization process, parts replacement etc.

## A.1 Warranty Information

If the unit fails due to defects in materials or workmanship, Raditek will, at its sole discretion, repair or replace the defective parts, free of charge, within two years from the date of its shipment from the Raditek production factory.

Note that shipping cost to and from Raditek will not be covered under this warranty guarantee.

This warranty will be voided, freeing Raditek from any liability or obligation to the Purchaser with respect to the product in the following situations:

- The product has been damaged during shipment
- Failure caused by products not supplied by Raditek or its authorized contractors and agents.
- Failure caused by operation of the product outside of its published electrical and environmental specifications or any causes other than ordinary use.
- Water ingress due to improper installation.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## A.2 Return Material Authorization

### PRE-RMA CHECKLIST

Shipping the unit to and from your supplier or the factory for repair is a costly and time consuming procedure that may cause disruption in your system for a prolonged period of time. Hence, please inspect your system thoroughly using the checklist below to help us determine if return shipping is necessary.

Table A-1 Pre-RMA Request Checklist

| Please check | | |
|---|---|---|
| Product model / serial no: | | |
| When did the unit fail: | ☐ Initial startup<br>☐ Unit worked normally before failure | |
| Initial Fault Symptom: | | |
| Consistent or intermittent fault | ☐ Consistent | ☐ Intermittent |
| Duration of operation before the failure | | |
| Are fans working normally? | ☐ Yes | ☐ No |
| Is the airflow path blocked? | ☐ Yes | ☐ No |
| 10 MHz Ref. level at failure | | |
| IF input level at failure | | |
| Output power at failure | | |
| LED status | | |
| Is the device and setup properly grounded? | ☐ Yes | ☐ No |
| Weather conditions just before failure | Air Temperature: _____<br>Heavy rain/snowfall/storms: _____ | |
| AC Potential | Live – Neutral | |
| | Live – Ground | |
| | Neutral – Ground | |
| AC-DC converter working status | | |
| Is the primary power source working and free of power spikes? | ☐ Yes | ☐ No |
| Were there any recent power outages that affected the device? | ☐ Yes | ☐ No |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Please check | |
|---|---|
| Are connectors properly sealed and free from debris/water? | ☐ Yes ☐ No |
| Replace the device with a working one (if available) and check if the system works. | ☐ Works with the new device<br>☐ Does not work with the new device |
| Detail the diagnosis performed that localized the fault to the unit as the point of failure | |

If you need to return the devices or any components for repair, please contact us to obtain a Return Material Authorization (RMA) number by filling in our RMA Request form. You can obtain this form by contactinig us via our email at sales@Raditek.com. Once you receive a RMA number, carefully repack the unit and attach this number to the unit to be shipped to Raditek.

Raditek provides repair services for products both under or out of warranty.


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## A.3 Additional Technical Support

If you require further technical support, please contact Raditek using the contact information below:


| | |
|---|---|
| Address: | Raditek Inc.<br>1702L Meridian Ave #127, San Jose CA 95125 |
| Phone: | (408) 266-7404 |
| Fax: | (408) 266-4483 |
| Email: | sales@raditek.com |

# Appendix B Unit Specifications & Outline

## B.1 FCSPT Specifications and Outline

### 1MW FCSPT SPECIFICATIONS

Table B-1 FCSPT Specification Tables

| Full C-Band Frequency Range (GHz) | |
|---|---|
| Transmit | 5850MHz ~ 6725MHz |
| Receive | 950MHz ~ 1750MHz (Exclude PLLNB)<br>3400MHz ~ 4200MHz (Include PLLNB) |

| Transmit | | |
|---|---|---|
| Output Power dBm | | 0 |
| Min Gain (dB) | | 75 |
| Typical AC Power Consumption (VA) | | 700 |
| Input Frequency | | 70 ± 18 MHz |
| Output Frequency | | 5850MHz ~ 6725MHz |
| Frequency Step Size | | 2.5 MHz |
| IF Input Power Range | | -25 to -5 dBm |
| Gain flatness | 875Hz BW | ±2.0 dB max |
| | 36MHz BW | ±1.0 dB max |
| Gain Stability (-40ºC to +60ºC) | | ±2.0 dB max |
| Gain Adjustment | | 20 dB @ 1 dB step |
| 3rd order Intermodulation distortion for single tones with power 6dB below rated P1dB | | -25 dBc max |
| Spurious (36 MHz BW) | | -60 dBc max |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Transmit | | |
|---|---|---|
| Phase Noise | 100Hz offset | -63 dBc/Hz max. |
| | 1kHz offset | -73 dBc/Hz max. |
| | 10kHz offset | -80 dBc/Hz max. |
| | 100kHz offset | -90 dBc/Hz max. |
| IF Input Interface | | 50Ω N-Type Female |
| RF Output Interface | | 50Ω N-Type Female |
| Frequency Stability | | ±0.5 x 10-9/day |
| Tx in VSWR | | 1.5:1 max |
| Tx out VSWR | | 1.3:1 max |

| Receive (exclude LNB) | | |
|---|---|---|
| Input Frequency | | 950 to 1750 MHz |
| Output Frequency | | 70 ± 18 MHz |
| Output Power @ P1dB | | 0 dBm min |
| Frequency Step Size | | 2.5 MHz |
| Gain | | 27 dB min |
| Gain Adjustment | | 20 dB @ 1 dB steps |
| Gain Flatness (36MHz BW) | | ±1.25 dB max |
| Gain Stability (-40ºC to +60ºC) | | ±2.0 dB max |
| Intermodulation product | | -35 dBc max |
| Spurious (36 MHz BW) | | -55 dBc max |
| Phase Noise | 100Hz offset | -60 dBc/Hz max. |
| | 1kHz offset | -70 dBc/Hz max. |
| | 10kHz offset | -80 dBc/Hz max. |
| | 100kHz offset | -90 dBc/Hz max. |
| Input Interface | | 50Ω N-Type Female |
| Output Interface | | 50Ω N-Type Female |
| Tx in VSWR | | 1.5:1 max |
| Tx out VSWR | | 1.5:1 max |
| Frequency Stability | | ±0.5 x 10-9/day |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Power Supply | |
|---|---|
| Input Voltage (Factory Preset) | 220 Vac ±15% (47Hz ~ 63Hz) |
| DC Output Voltage to LNB | +13Vdc at RF IN connector |

| Phase Locked Low Noise Block (PLL LNB) | |
|---|---|
| Input Frequency | 3400 ~ 4200MHz |
| Output Frequency | 950 to 1750 MHz |
| Noise Figure / Temperature at +25ºC | 1.0 dB/75ºK |
| Gain | 58 dB typ |
| Gain Flatness (36MHz BW) | ±0.25 dB max |
| External Reference | 10 MHz |
| Input Interface | 50ohms WR229/G |
| Output Interface | 50ohms N-Type Female |

| Monitor And Control | |
|---|---|
| Interface | RS232/485 |
| Optional Interface | Ethernet (SNMP)<br>with optional External Module |
| Form ‘C’ Relay Contacts | Optional |

| Compliance Standard | |
|---|---|
| IEC 60950 | International Safety Standard for Information Technology Equipment |
| ETSI EN 300 673 | Electromagnetic Compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) Standard for Very Small Aperture Terminal (VSAT) |
| ETSI EN 301 489-1 | Electromagnetic Compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility Standard for Radio Equipment and Services |

| Environmental | |
|---|---|
| Operating Temperature | -40ºC to +60ºC |
| Relative Humidity | Up to 100% |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Mechanical | |
|---|---|
| Dimensions LxWxH (mm) | 289 x 209 x 160* |
| Weight | 8.5kg |
| Color | White Powder Coat |

*Dimensions exclude connectors

### 1MW FCSPT OUTLINE

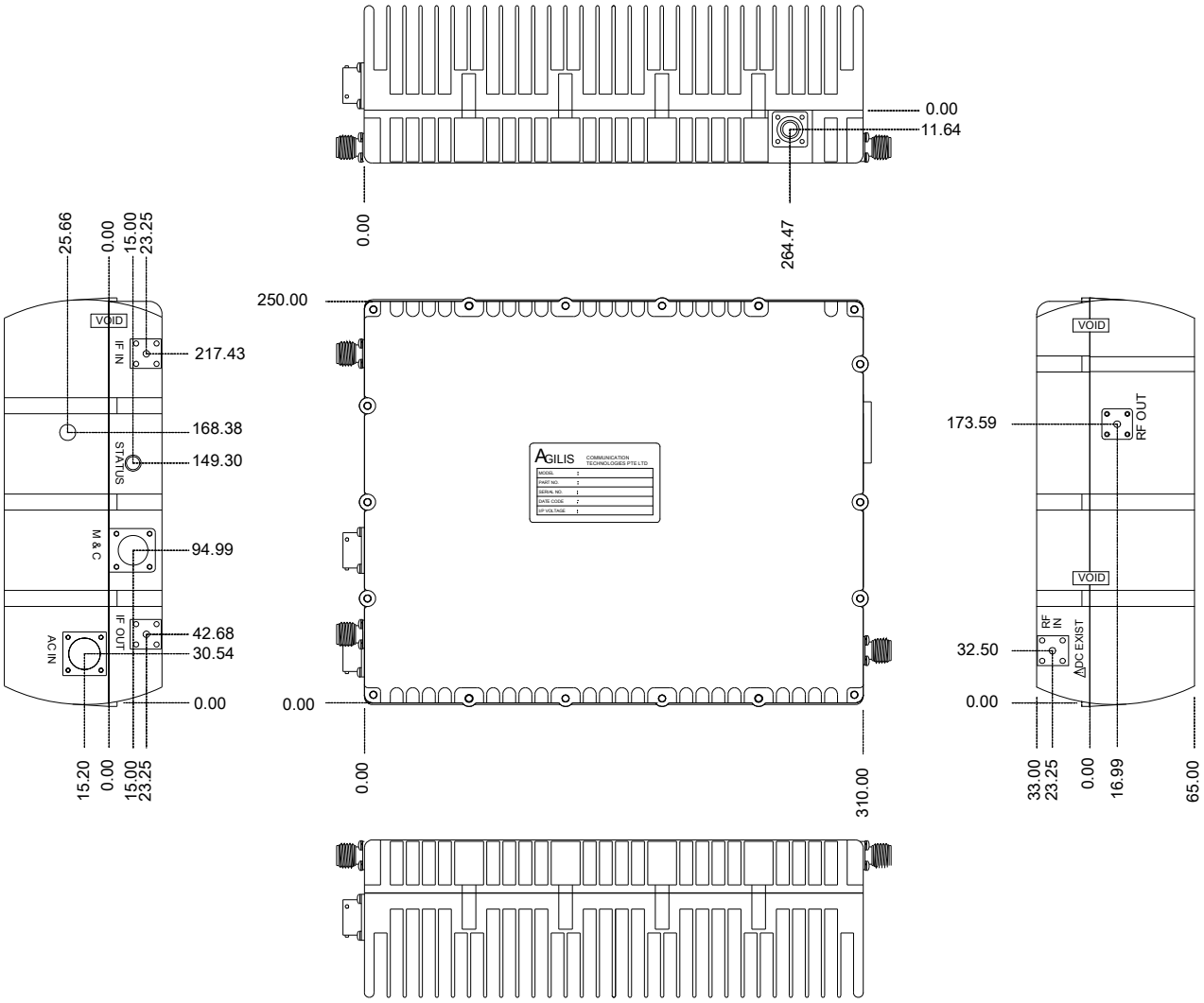



Figure B-1 FCSPT unit outline


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## B.2 SSPA Specifications and Unit Outline

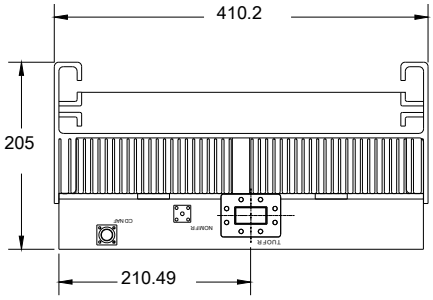
### SSPA SPECIFICATIONS

Table B-2 100W SSPA Specifications

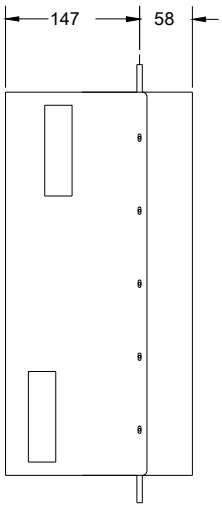
| Characteristics | Specifications | |
|---|---|---|
| Frequency Range | 5.850 GHz – 6.725 GHz | |
| Output Power | 50 dBm min | |
| Gain | 55 dB min | |
| Gain Flatness (5.850 - 6.725 GHz BW) | 1.50 dB max | |
| Gain Slope | 2 dB max | |
| Gain Stability | ± 2.0 dB | |
| 3rd order Intermodulation distortion for 2 tones with composite power | 6 dB below rated power | -25 dBc max |
| AM/PM @ rated power | 3 º/dB typ. | |
| Spurious @ rated power | -60 dBc max. | |
| Harmonics @ rated power | -30 dBc Max. | |
| Input / Output VSWR | 1.3:1 max | |
| Noise Temperature | 10 dB typ. | |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

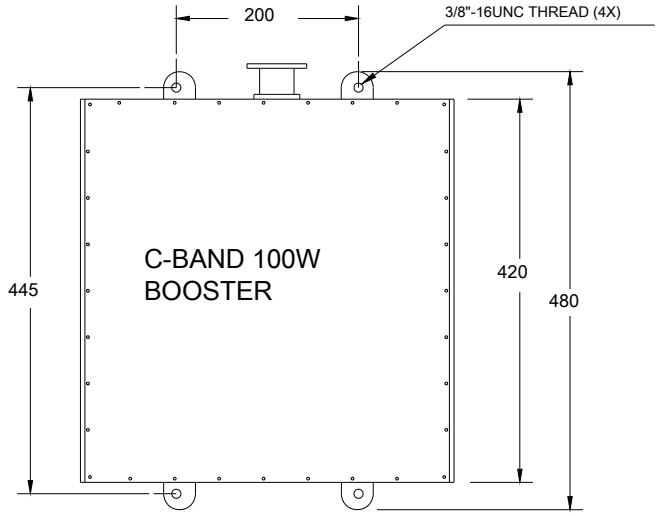
## 100W SSPA UNIT OUTLINE



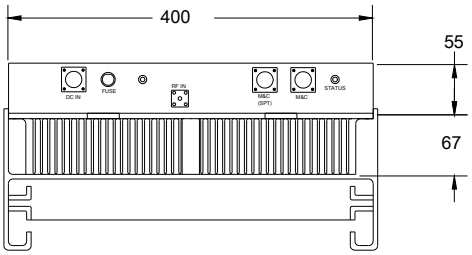

SIDE VIEW




SIDE VIEW




TOP VIEW




SIDE VIEW



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

Figure 4.1 100W SSPA unit outline

Table B-3 200W SSPA Specifications

| Characteristics | Specifications | |
|---|---|---|
| Frequency Range | 5.850 GHz – 6.725 GHz | |
| Output Power | 53 dBm min | |
| Gain | 57 dB min | |
| Gain Flatness (5.850 - 6.725 GHz BW) | 5.00 dB max | |
| Gain Slope | 2 dB max | |
| Gain Stability | ± 2.0 dB | |
| 3rd order Intermodulation distortion for 2 tones with composite power | 6 dB below rated power | -25 dBc max |
| AM/PM @ rated power | 3 º/dB typ. | |
| Spurious @ rated power | -60 dBc max. | |
| Harmonics @ rated power | -30 dBc Max. | |
| Input / Output VSWR | 1.3:1 max | |
| Noise Temperature | 10 dB typ. | |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

**200W SSPA UNIT OUTLINE**

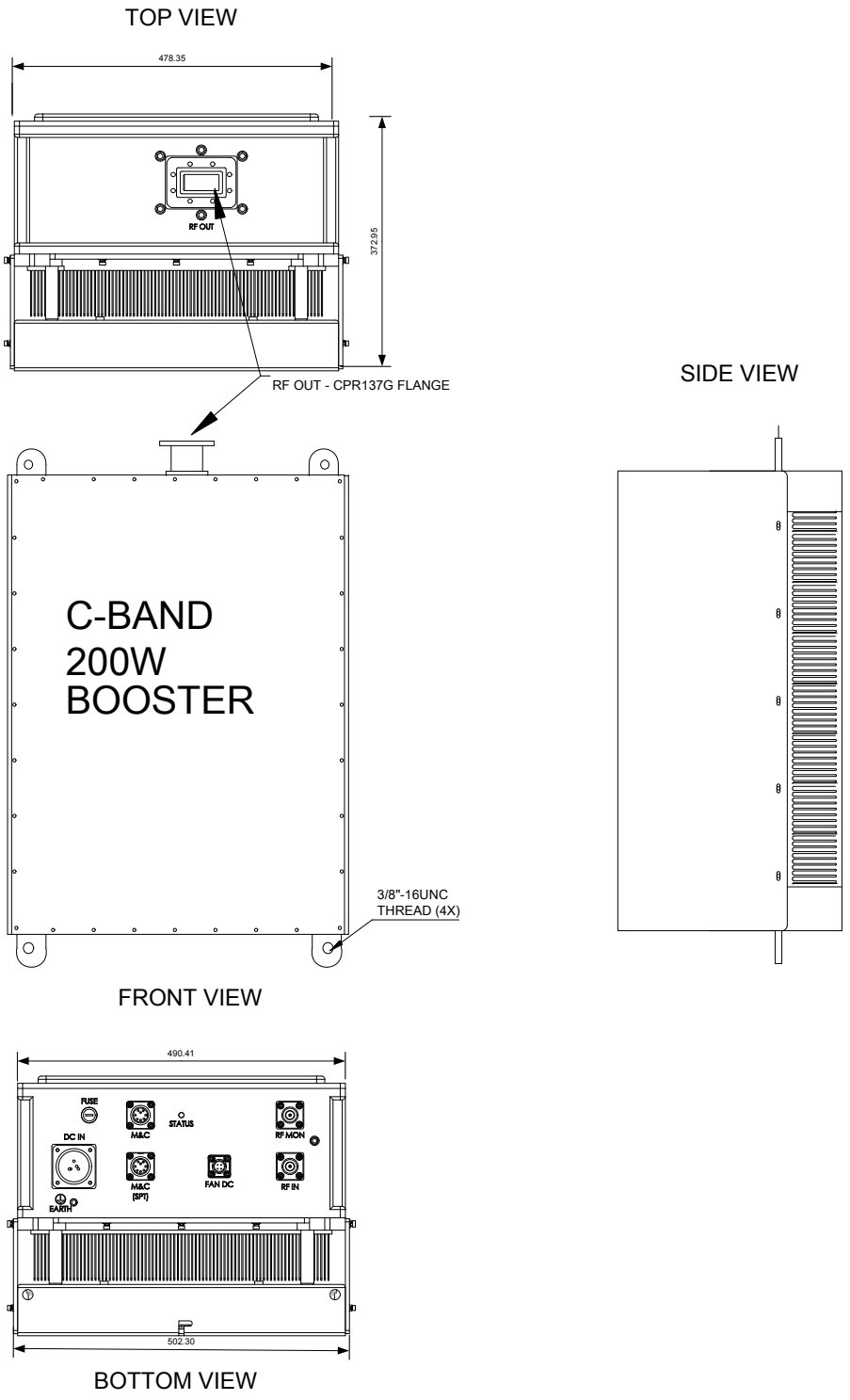



Figure B-2 200W SSPA unit outline



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## B.3 PLLNB Specifications and Unit Outline

### PLLNB SPECIFICATIONS

Table B-4 PLLNB Specifications

| Characteristics | Specifications | |
|---|---|---|
| Noise Temperature | 20K – 30K (depends on model) | |
| LO Stability (over temperature excluding offset) | ± 2kHz - ±25kHz (depends on model) | |
| Phase Noise (SSB) | -73 dBc/Hz @ 1kHz<br>-83 dBc/Hz @ 10kHz<br>-93 dBc/Hz @ 100kHz | |
| Input VSWR | 2.2:1 | |
| Output VSWR | 2.2:1 | |
| Input Frequency | Intelsat | 3.625 – 4.200 GHz |
| | Gorizont | 3.400 – 3.950 GHz |
| | Insat | 4.500 – 4.800 GHz |
| | ST-1/Palapa C | 3.400 – 3.700 GHz |
| | Full-C | 3.400 – 4.200 GHz |
| LO Frequency | Intelsat | 5.150 GHz |
| | Gorizont | 4.900 GHz |
| | Insat | 5.760 GHz |
| | ST-1/Palapa C | 4.650 GHz |
| | Full-C | 5.150 GHz |
| Output Frequency | Intelsat | 950 – 1525 MHz |
| | Gorizont | 950 – 1500 MHz |
| | Insat | 960 – 1260 MHz |
| | ST-1/Palapa C | 950 – 1250 MHz |
| | Full-C | 950 – 1750 MHz |
| Conversion Gain | 62 dB | |
| Output P1dB | 9 dBm | |
| Power Supply | 13V – 28V, supplied through IF cable | |
| Current Drain | 330 mA | |
| Input Waveguide | WR229 | |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Characteristics | Specifications |
|---|---|
| Dimensions<br>(Length x Width x Height) | 180mm x 100mm x 70mm<br>7.1” x 4.0” x 2.8” |
| Weight | 700g (25oz) |
| Operating Temperature | -40ºC to 60ºC |

**PLLNB UNIT OUTLINE**

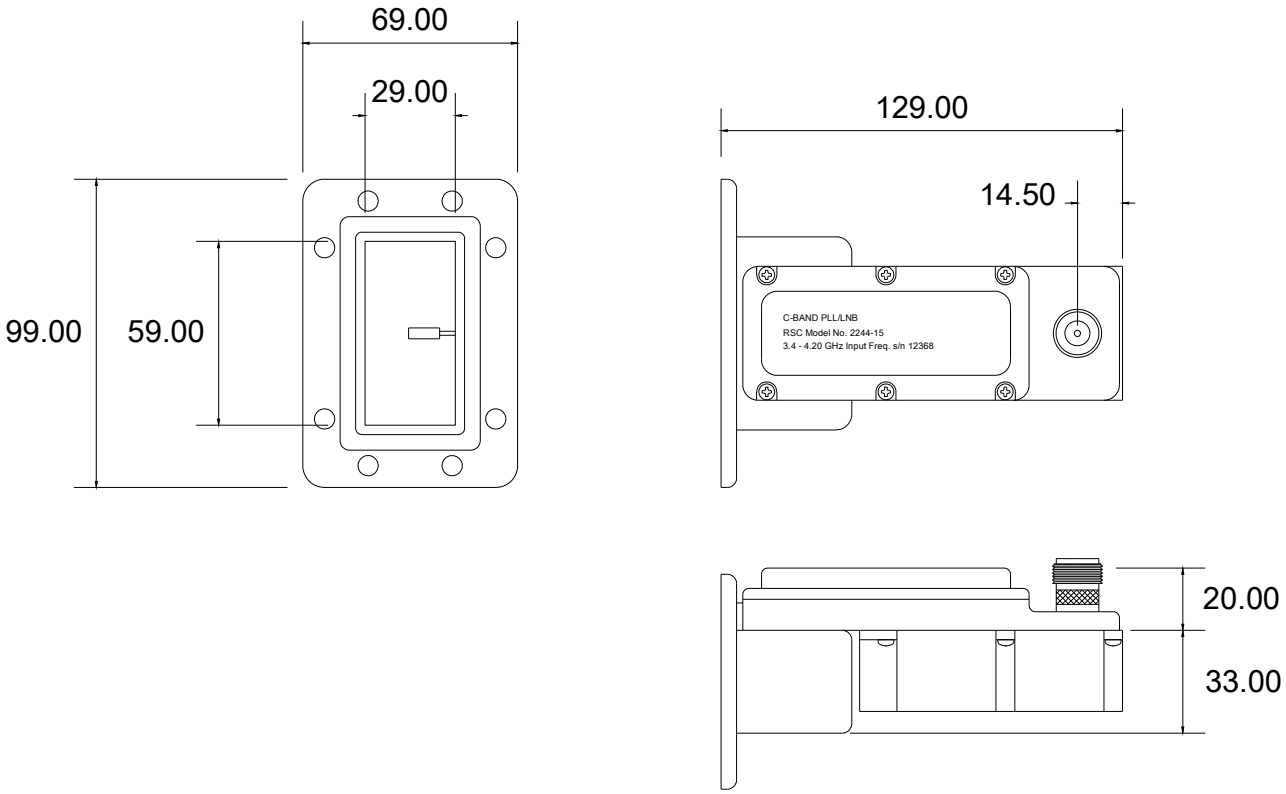



Figure B-3 PLLNB unit outline


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## B.4 RCU Specifications and Unit Outline

### RCU SPECIFICATIONS

Table B-5 RCU Specifications

| Transmit Path | | |
|---|---|---|
| Input Frequency Range | 70 ± 18MHz / 140 ± 36 MHz | |
| Power | -28 dBm to -8 dBm | |
| Max. power without damage | +20 dBm | |
| Input VSWR | 1.5:1 max | |
| Impedance | 50 ohm | |
| Insertion Loss (Input) | 3.8 dB max | |
| Amplitude Unbalance | 0.15 dB max | |
| Ripple | 0.10 dB max | |
| IF power Splitter VSWR | 1.05:1 max | |
| Output Frequency Range | Intelsat | 5.850 – 6.425 GHz |
| | Gorizont | 5.725 – 6.275 GHz |
| | Insat Ex C-Band | 6.725 – 7.025 GHz |
| | Palapa Ex C-Band | 6.425 – 6.725 GHz |
| | JCSAT | 6.225 – 6.485 GHz |
| Insertion Loss (Output) | 0.02 dB max | |
| Isolation | 60 dB min | |
| Switching time | 60 ms typ. | |
| Actuating Voltage | 48V DC typ. | |
| Switch position indicators | Form ‘C’ relays | |
| Output VSWR | 1.05:1 max | |

| Receive Path | |
|---|---|
| Input Frequency Range | 70 ± 18MHz / 140 ± 36 MHz |
| Input VSWR | 1.5:1 max |
| Impedance | 50 ohm |
| Insertion Loss (Output) | 0.90 dB max |
| Isolation (in-out) | 50 dB min |
| IF Switch VSWR | 1.2:1 max |



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| Receive Path | | |
|---|---|---|
| Impedance | 50 ohm | |
| Output Frequency Range | Intelsat | 3.625 – 4.200 GHz |
| | Gorizont | 3.400 – 3.925 GHz |
| | Insat Ex C-Band | 4.500 – 4.800 GHz |
| | Palapa Ex C-Band | 3.400 – 3.700 GHz |
| | JCSAT | 3.940 – 4.200 GHz |
| Insertion Loss (Input) | 0.02 dB max | |
| Isolation | 80 dB min | |
| Switching time | 100 ms typ. | |
| Actuating Voltage | 48V DC typ. | |
| Switch position indicators | Form 'C' relays | |
| Output VSWR | 1.05:1 max | |

| Power | |
|---|---|
| DC input | 48V DC |
| Consumption | 7.0W max |

| Environment | |
|---|---|
| Operating Temperature | -40ºC to +60ºC |
| Relative Humidity | 95% max |

| Mechanical | |
|---|---|
| Weight | 1.5kg |
| Dimension | 393 x 293 x 109 mm |
| Material | Aluminium |
| Color | Off white power coat |


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

**RCU UNIT OUTLINE**

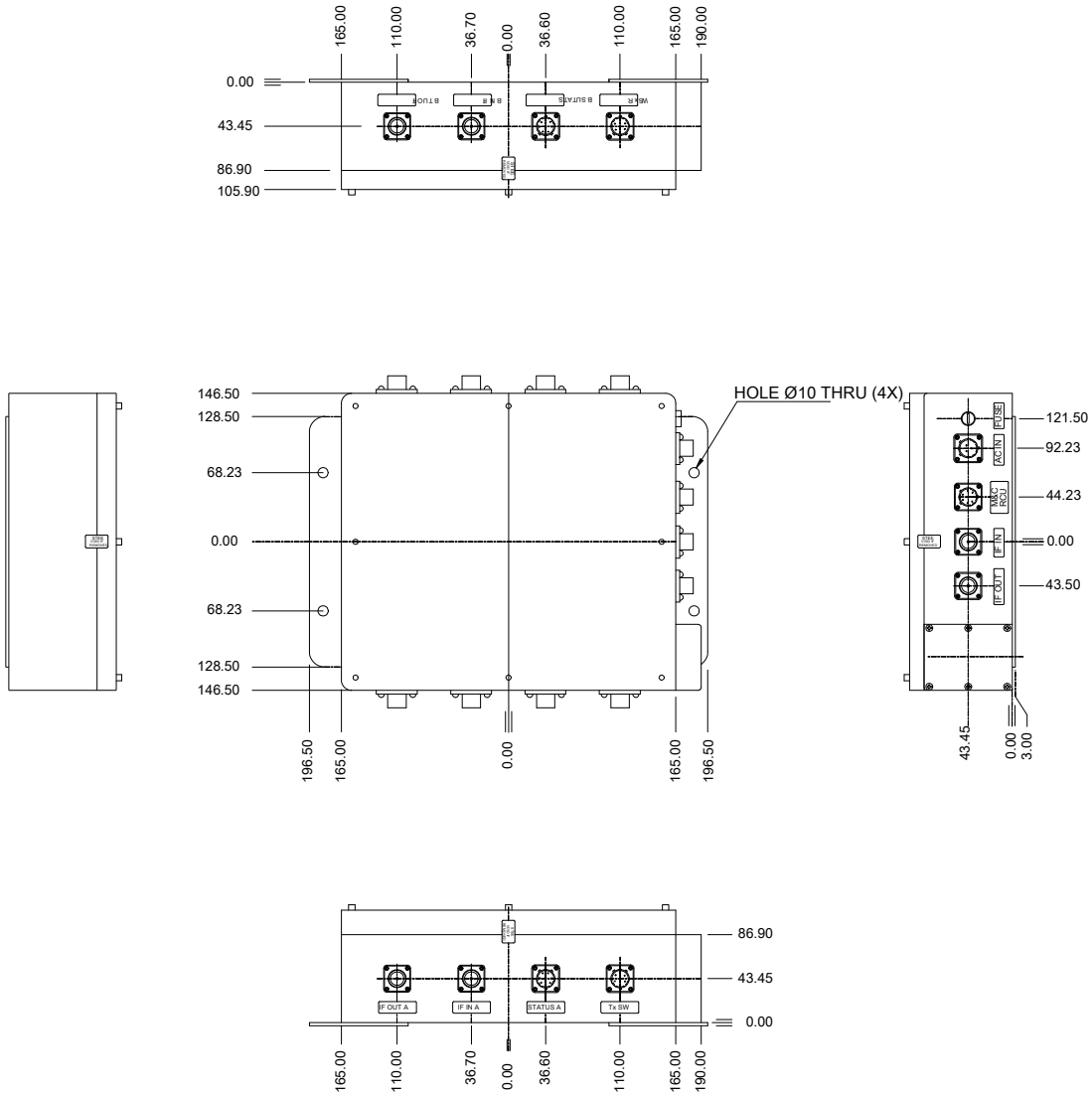



Figure B-4 RCU unit outline



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## B.5 WR137 Waveguide Switch Specifications and Outline

### WR137 WAVEGUIDE SWITCH SPECIFICATIONS

Table B-6 WR137 Waveguide Switch Specifications

| Characteristics | Specifications |
|---|---|
| Frequency Band | C-Band |
| Maximum Insertion Loss | 0.05 dB |
| Isolation | 60 dB mm |
| Maximum Switching Time | 50 ms |
| Actuating Voltage | 48V DC |
| Switch Position Indicators | Form “C” relays |
| Maximum VSWR | 1.05:1 |
| Impedance | 50 Ω |
| Interface | WR75 |
| Switching Current | 1.4A typ |
| Operating Temperature | -40ºC to +60ºC |
| Relative Humidity | 100% max |
| Weight | 0.8 kg |
| Dimension | 130 x 70 x 70 mm |

### WR137 WAVEGUIDE SWITCH OUTLINE

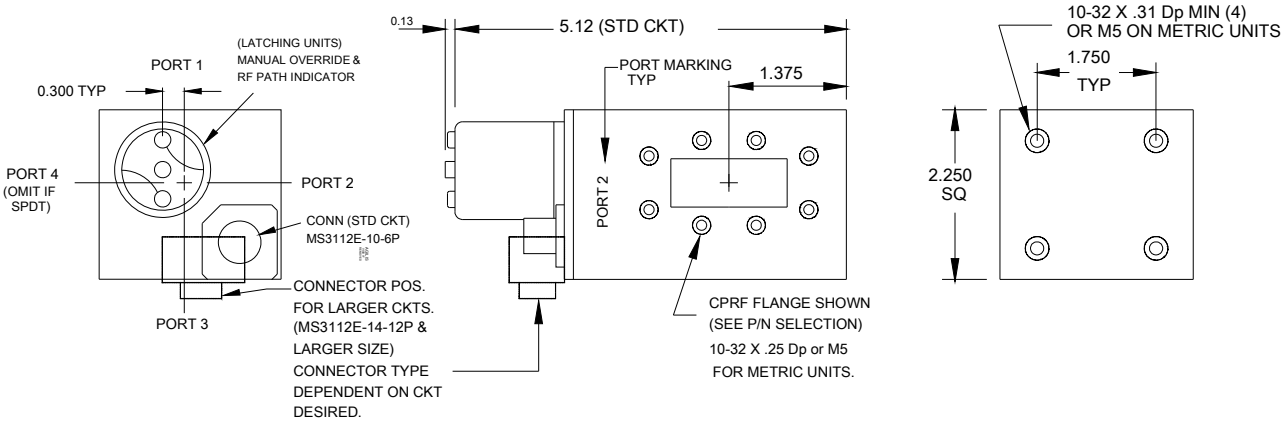



Figure B-5 WR137 waveguide switch unit outline


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## B.6 WR229 Waveguide Switch Specifications and Outline

### WR229 WAVEGUIDE SWITCH SPECIFICATIONS

Table B-7 WR229 Waveguide Switch Specifications

| Characteristics | Specifications |
|---|---|
| Frequency Band | C-Band |
| Maximum Insertion Loss | 0.05 dB |
| Isolation | 60 dB mm |
| Maximum Switching Time | 50 ms |
| DC input | 48V DC |
| Switch Position Indicators | Form “C” relays |
| Maximum VSWR | 1.05:1 |
| Impedance | 50 Ω |
| Interface | WR75 |
| Switching Current | 1.4A typ |
| Operating Temperature | -40ºC to +60ºC |
| Relative Humidity | 100% max |
| Weight | 2.4kg |
| Dimension | 210 x 90 x 90 mm |

### WR229 WAVEGUIDE SWITCH UNIT OUTLINE

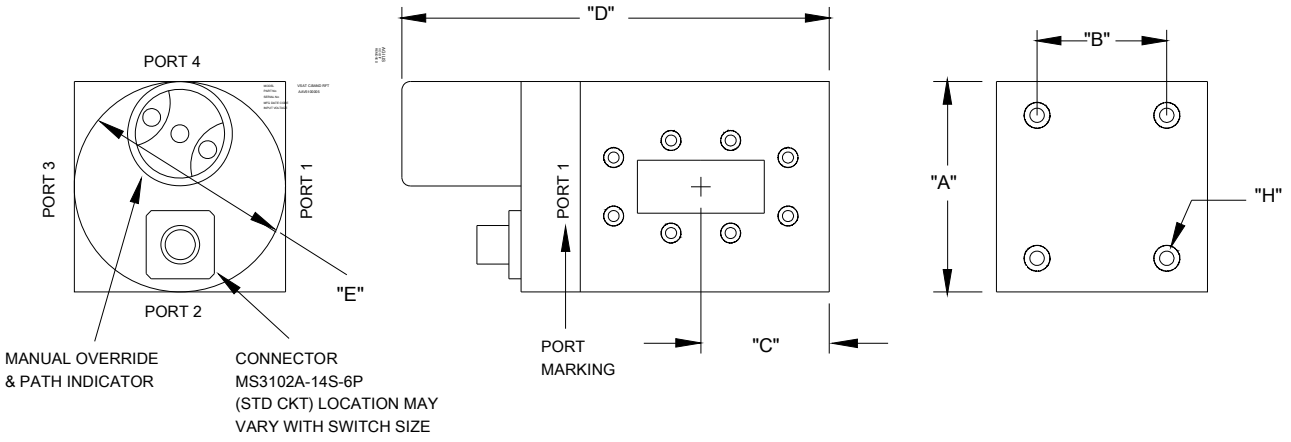
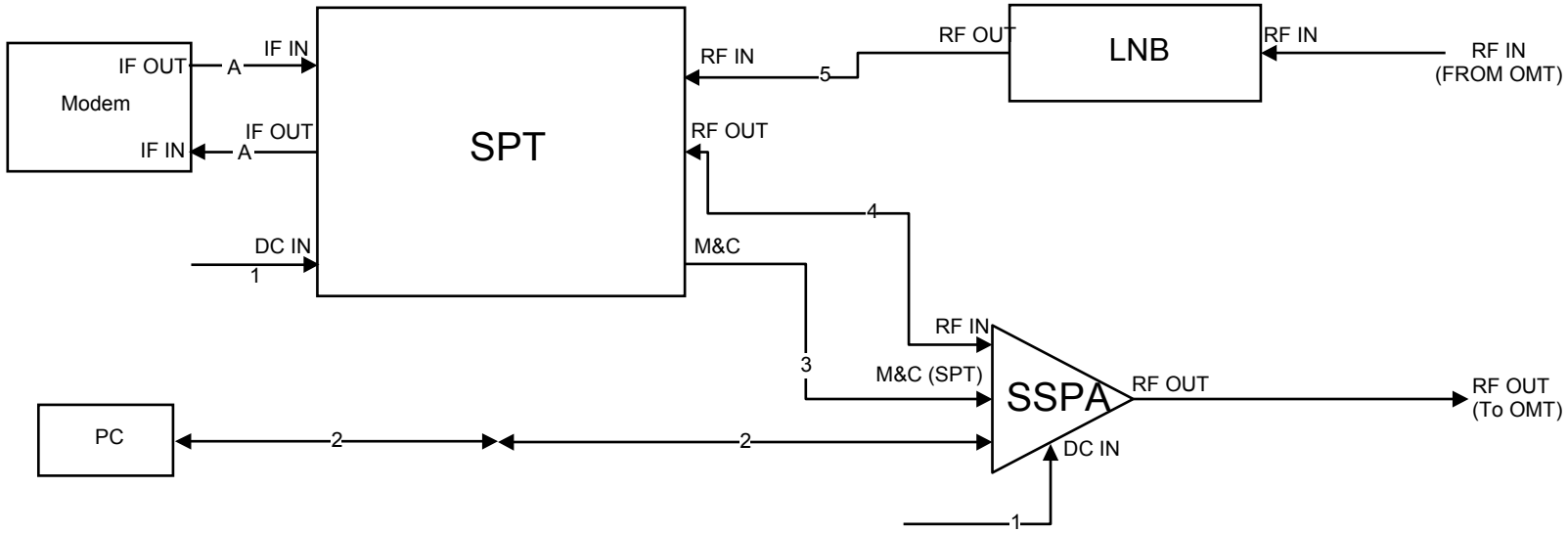



Figure B-6 WR229 waveguide switch unit outline


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 100W / 200 W Full C Transceiver Solution Standalone System




### LIST OF ACCESSORIES

| Item No | Part No | Description | Length (m) | Quantity |
|---|---|---|---|---|
| 1 | TBA | Power Cable | 2 | 2 |
| 2 | 2502040699 & 6103480008 | RS485 M&C Cable with Converter | 2 | 1 |
| 3 | 2502040562 | M&C Cable from SPT to SSPA | 2 | 1 |
| 4 | 2502040135 | RF Cable from SPT to SSPA | 1 | 1 |
| 5 | 2502040109 | RF Cable from SPT to LNB | 7 | 1 |
| A | | RF Cable (L-Band) from Indoor to Outdoor, N(M) to N(M) | To be arranged by customer | |

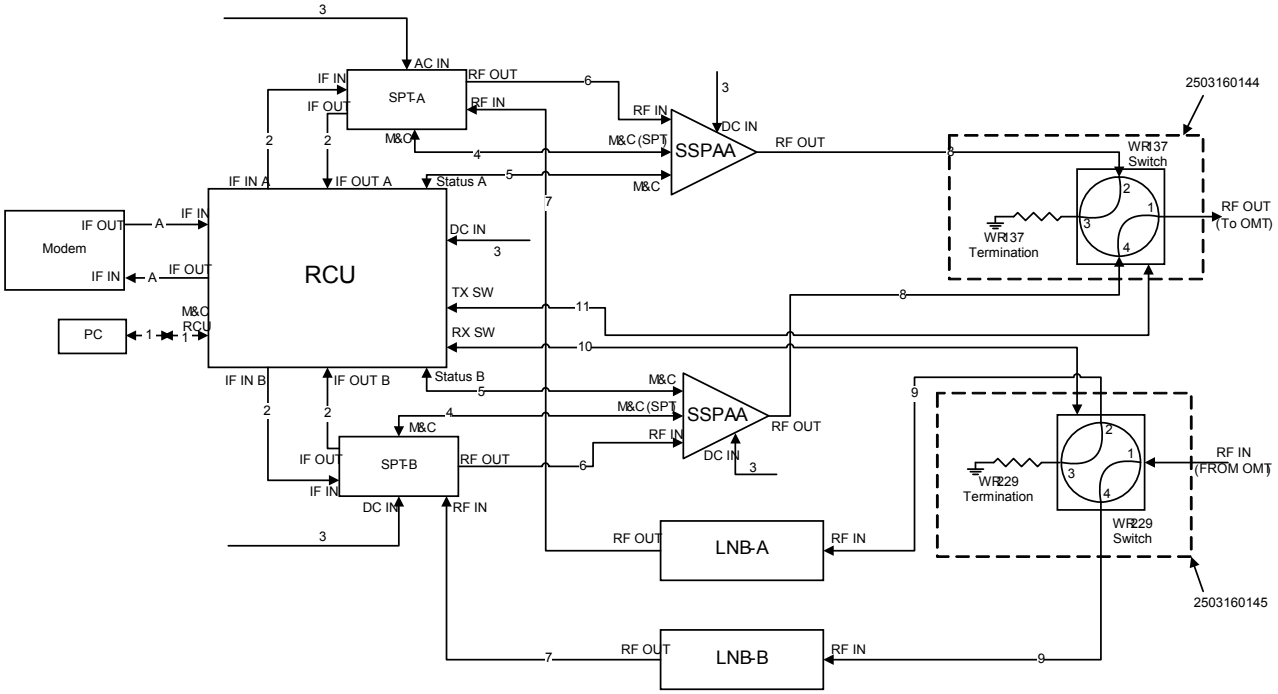
### LIST OF SYSTEM COMPONENTS

| Part No | Description | Quantity |
|---|---|---|
| RAV8140121 | FC SPT | 2 |
| RAAXXXXX-FM | SSPA | 2 |
| RCA1133035 | LNB | 2 |
| - | Indoor units (PC &L-Band Modem) | - |



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

## 100W / 200 W Full C Transceiver Solution 1:1 Redundancy System




## LIST OF ACCESSORIES

| Item No | Part No | Description | Length (m) | Quantity |
|---|---|---|---|---|
| 1 | 2502040669<br>6103480008 | RS485 M&C Cable + Converter | 2 | 1 |
| 2 | 2502040137 | IF Cable | 3 | 1 |
| 3 | TBA | Power Cable | 3 | 5 |
| 4 | 2502040562 | M&C Cable from SPT to SSPA | 2 | 2 |
| 5 | 2502040561 | M&C Cable from RCU to SSPA | 2 | 2 |
| 6 | 2502040135 | FSJ Cable from SPT to SSPA | 1 | 2 |
| 7 | 2502040109 | RF Cable from SPT to LNB | 7 | 2 |
| 8 | 4203490057 | Flexible Waveguide Cable | 1 | 2 |
| 9 | 4203490106 | Feed Mounted (LNB to WG SW) | - | 2 |

## LIST OF SYSTEM COMPONENTS

| Part No | Description | Quantity |
|---|---|---|
| RAV8140121 | FC SPT | 2 |
| RAAXXXXX-FM | SSPA | 2 |
| RCA1133035 | LNB | 2 |
| - | Indoor units (PC &L-Band Modem) | - |



WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com

| | | | | |
|---|---|---|---|---|
| 10 | 2502040108 | Rx WG SW control cable from RCU | 7 | 1 |
| 11 | 2502040155 | Tx WG SW control cable from RCU | 3 | 1 |
| A | | RF Cable (L-Band) from Indoor to Outdoor, N(M) to N(M) | To be arranged by customer | |



If you have any enquiry or require any technical assistance or training, please contact us at sales@raditek.com


WORLD HQ: 1702L Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.
Tel: (408) 266-7404 FAX: (408) 266-4483
WEB: www.raditek.com E-mail: sales@raditek.com