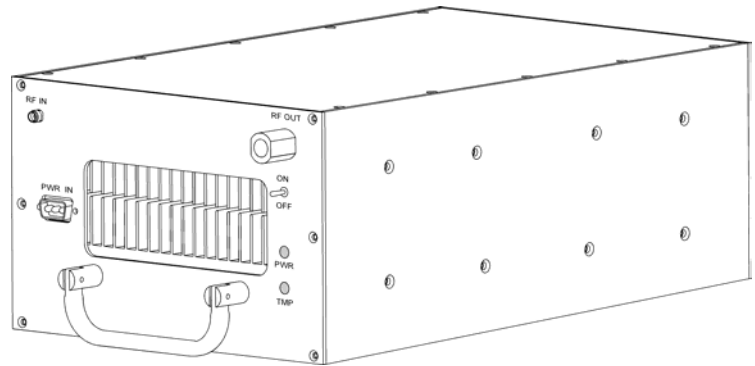


Installation and Service Manual

Powerwave[®]
technologies

THE POWER IN WIRELESS[™]



***Model SPA9329-35
Booster Power Amplifier***



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October 2002

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Section 1 General Description

1-1 Introduction

This manual contains information and procedures for installation, operation, and maintenance of Powerwave's model SPA9329-35 channel booster power amplifier. The manual is organized into six sections as follows:

- Section 1. General Description
- Section 2. Installation
- Section 3. Operating Instructions
- Section 4. Principles of Operation
- Section 5. Maintenance
- Section 6. Troubleshooting

1-2 General Description

The SPA9329-35 is a linear booster amplifier that operates in a frequency range from 1930 MHz to 1990 MHz and provides 100 watts (50 dBm) of output power with a maximum gain of 23 dB. The amplifier is modular in design, and is ideally suited for use in GSM and EDGE base stations.

The amplifier is shown in figures 1-1 through 1-5. Each amplifier module has a power input, one RF input, and an RF output. Controls and indicators consist of a DC power switch with corresponding LED power indicator and an amplifier over-temperature LED indicator (see section 3). Primary power input for the amplifier is +27 VDC. Cooling for the amplifier module is provided by one fan mounted on the rear of the amplifier module, shown in figure 1-1, which provides airflow over the two internal heat sinks.

1-3 Functional & Physical Specifications

Functional and physical specifications for the amplifier are listed in table 1-2.

1-4 Ordering Information

Table 1-1 lists the component numbers and descriptions to be used when ordering booster amplifiers or components.

Table 1-1 Major System Components

Component Number	Description
SPA9329-35	100-Watt Amplifier, +27 VDC

Table 1-2 SPA9329-35 Booster Power Amplifier Functional Specifications

Parameters	+27 VDC Power Model
Frequency Range	1930-1990 MHz
Carrier Spacing (center to center)	200 kHz nominal
Occupied Bandwidth	< 200 kHz/carrier
Max Power Output per Carrier	100 Watts (50 dBm)
Maximum Module Gain	23 dB \pm 1 dB
Max Tx Input Level for 100 Watts	0.5 Watts (27 dBm)
Spurious Emissions	-65 dBc
Gain Flatness Across 20 MHz Band	\pm 0.5 dBm Maximum
Operating Voltage	+27 VDC
Operating Current (per Input Connector X2)	24 Amps @ +27 VDC
Operating Temperature:	-0 °C to +50 °C
Tx Input Connector	SMA-F
Tx Output Connector	Type 'N' Female
Dimensions (+27 VDC Model)	5.25"H x 8.5"W x 16.1"D
Mounting Options	19", 23", or 24" relay rack mounted or outdoor enclosure mounted
Weight	12 lbs maximum

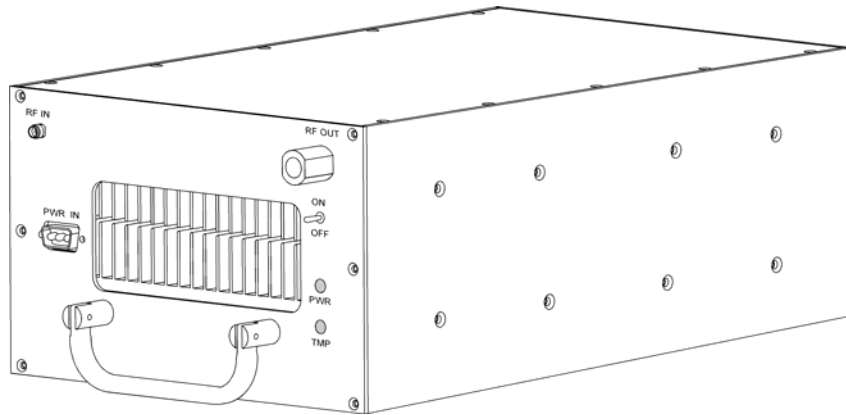


Figure 1-1. SPA9329-35 Front Isometric View

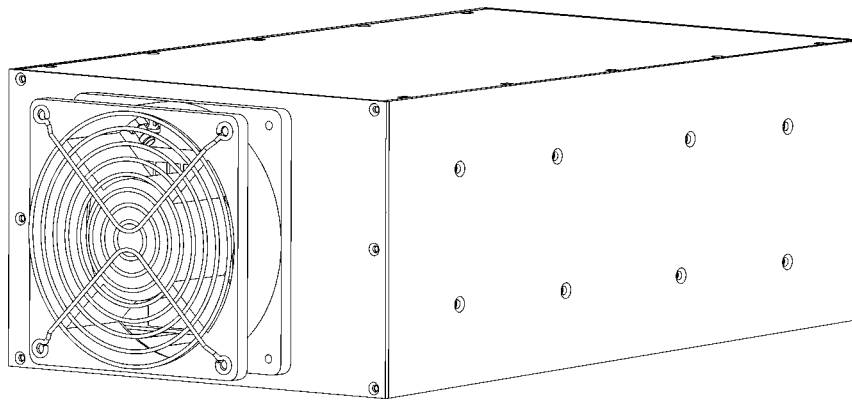


Figure 1-2. SPA9329-35 Rear Isometric View

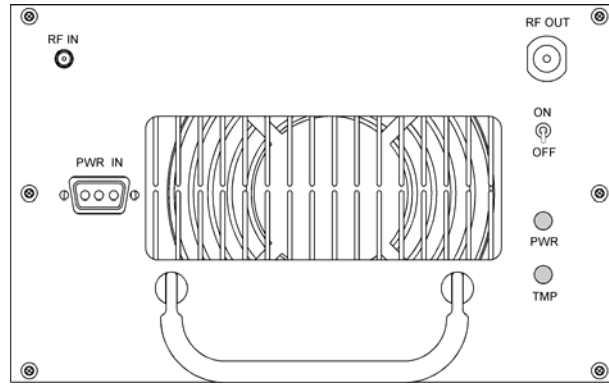


Figure 1-3. SPA9329-35 Front View

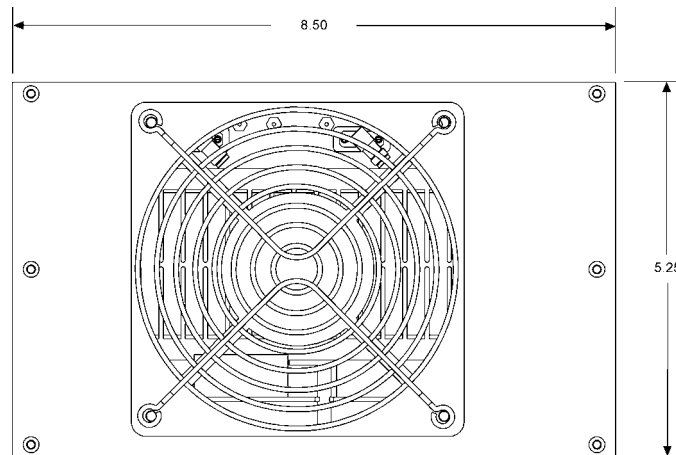


Figure 1-4. SPA9329-35 Rear View

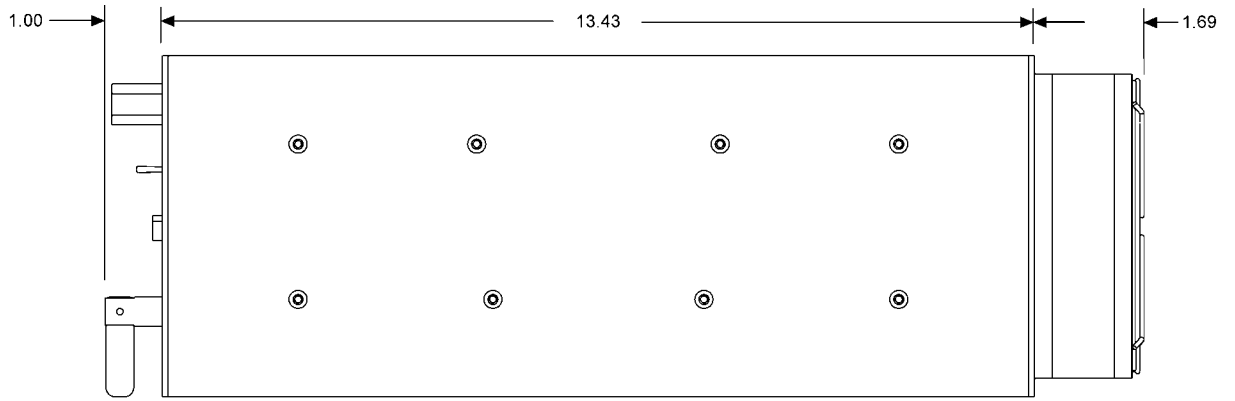


Figure 1-5. SPA9329-35 Side View

Section 2 Installation

2-1 Introduction

This section contains unpacking, inspection, and installation instructions and recommendations for the Powerwave model SPA9329-35 booster power amplifier. Carefully read all material in this section prior to equipment unpacking or installation. Also read and review the operating procedures in section 3 prior to installing the equipment. It is important that the licensee perform these tasks correctly and in good faith. If applicable, carefully read the appropriate parts of the Federal Communications Commission (FCC) rules to determine how they apply to your installation. DON'T TAKE CHANCES WITH YOUR LICENSE.

2-2 Electrical Service Recommendations

Powerwave Technologies recommends that proper AC line conditioning and surge suppression be provided on the primary AC input to the +27 Vdc power source. All electrical service should be installed in accordance with the National Electrical Code, any applicable state or local codes, and good engineering practice. Special consideration should be given to lightning protection of all systems in view of the vulnerability of most transmitter sites to lightning. Lightning arrestors are recommended in the service entrance. Straight, short ground runs are recommended. The electrical service must be well grounded.

Each amplifier system should have its own circuit breaker, so a failure in one does not shut off the whole installation. Circuit breakers should be thermal type, capable of handling the maximum anticipated inrush current, in a load center with a master switch.

2-3 Unpacking & Inspection

This equipment has been operated, tested and calibrated at the factory. Carefully open the container(s) and remove the amplifier module(s). Retain all packing material that can be reassembled in the event that the unit must be returned to the factory.

CAUTION

Exercise care in handling equipment during inspection to prevent damage caused by rough or careless handling.

Visually inspect the amplifier module for damage that may have occurred during shipment. Check for evidence of water damage, bent or warped chassis, loose screws or nuts, or extraneous packing material in the connector. If the equipment is damaged, a claim should be filed with the carrier once the extent of any damage is assessed. We cannot stress too strongly the importance of IMMEDIATE careful inspection of the equipment and the subsequent IMMEDIATE filing of the necessary claims against the carrier if necessary. If possible, inspect the equipment in the presence of the delivery person. If the equipment is damaged, the carrier is your first area of recourse. If the equipment is damaged and must be returned to the factory, write or phone for a return authorization. Powerwave may not accept returns without a return authorization. Claims for loss or damage may not be withheld from any payment to Powerwave, nor may any payment due be withheld pending the outcome thereof. WE CANNOT GUARANTEE THE FREIGHT CARRIER'S PERFORMANCE

2-4 Installation Instructions

The SPA9329-35 booster amplifier module is designed for installation in an enclosure that permits access to the front of the module for connection of the RF cables and the power connectors.

WARNING

Turn external primary DC power off before connecting any cables.

1. Connect the +27 VDC power source to the booster power input connector (see figures 2-1, 3-1, and table 2-1). Do not apply power at this time.
2. Connect the RF input cable to the RF IN connector.
3. Connect the RF output cable to the RF OUT connector.
4. Refer to section 3 for initial turn-on and checkout procedures.

2-5 +27 VDC Power & Ground Connector

The +27 Vdc power and ground connections on the amplifier are made through a 3-pin female D-Sub connector (figure 2-1) and are listed and described in table 2-1.

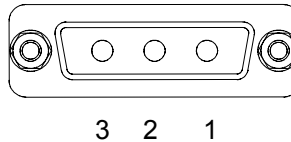


Figure 2-1 +27 Vdc Power & Ground Connector

Table 2-1 +27 Vdc Power & Ground Connector Descriptions

Pin	Signal	Description
1	Open	
2	+27V	+27 Vdc
3	RTN	+27 Vdc return

Section 3 Operating Instructions

3-1 Introduction

This section contains operating instructions for the SPA9329-35 power booster amplifier.

3-2 Initial Start-Up & Operating Procedures

Operating controls, indicators, and connectors located on the SPA9329-35 booster amplifier module are listed in table 3-1 and corresponding locations for each are shown in figure 3-1. To perform the initial start-up, proceed as follows:

1. Verify that all power and RF input and output cables are properly connected, per section 2.

CAUTION

Before applying power, make sure that the input and output of the amplifier are properly terminated at 50 ohms. Do not operate the amplifier without a load attached. Refer to table 1-2 for input power requirements. Excessive input power may damage the amplifier.

NOTE

The output coaxial cable between the amplifier and the antenna must be 50-ohm coaxial cable. Use of any other cable will distort the output.

2. Turn on supply that provides +27 Vdc to the amplifier system.
3. Set the DC power ON-OFF switch to ON. The corresponding PWR and TMP LED indicators should illuminate.
4. Apply the RF input signal.

Table 3-1 SPA9329-35 Controls, Indicators, and Connectors

Function	Description
RF IN	RF channel input connector
RF OUT	RF output connector
PWR IN	+27 VDC power input connector
ON-OFF	ON-OFF switch. Applies DC power to channel amplifier
PWR	LED indicator – Illuminates when corresponding ON-OFF switch is set to ON
TMP	LED indicator – Illuminates when corresponding ON-OFF switch is set to ON. Goes out if amplifier overheats or VSWR is high.

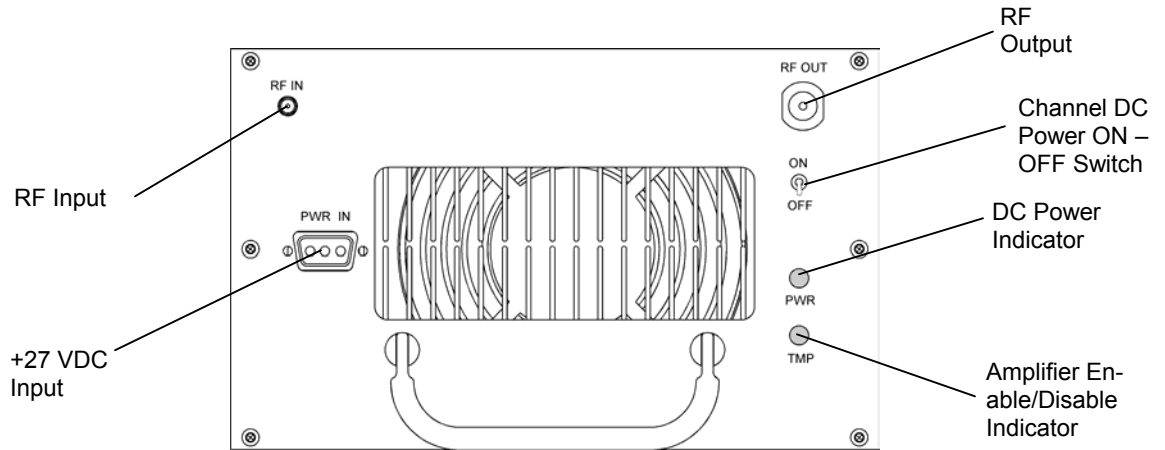


Figure 3-1 SPA9329-35 Controls, Indicators, and Connector Locations

Section 4 Principles of Operation

4-1 Introduction

This section contains a functional description of the SPA9329-35 power booster amplifier.

4-2 RF Input Signal

The maximum input power should not exceed the limits specified in table 1-1.

4-3 RF Output Load

The load impedance should be as good as possible (1.5:1 or better) in the working band for good power transfer to the load.

4-4 Amplifier Functional Description

The SPA9329-35 power booster amplifier, shown in figure 4-1, operates in the 1930 MHz to 1990 MHz range. The operating band is determined by the operating frequency selection(s) of the base station (refer to table 1-2). The amplifier module consists of a single carrier amplifier pallet with the necessary combining and filtering to produce up to 100 watts (50 dBm) of output power with a maximum gain of 23 dB. The amplifier employs a class AB amplifier for maximum efficiency. The amplifier operates on +27 Vdc.

The amplifier is compliant to the requirements of FCC Part 24 with respect to spurious emissions (see table 1-2). All gain variations, for example those due to temperature, are reduced to the passive reference variations.

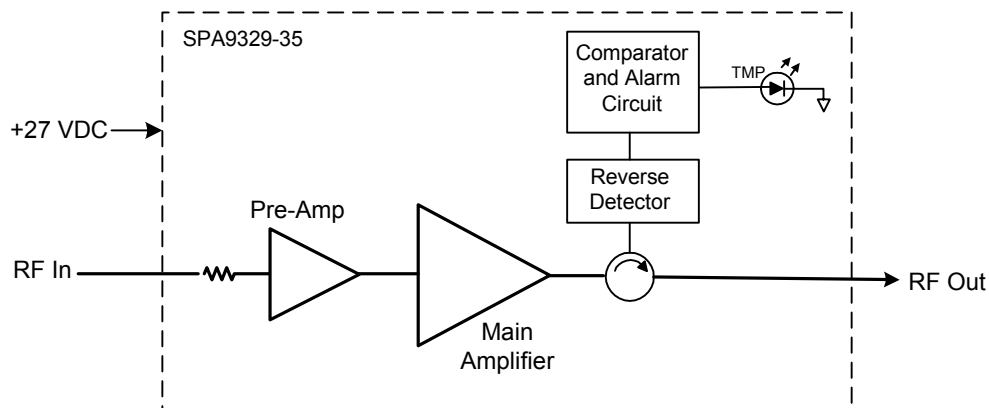


Figure 4-1 SPA9329-35 Booster Amplifier Block Diagram

4-5 Amplifier Module Cooling

Each amplifier module is cooled using a rear-mounted fan circulating air flow across the amplifier heat sinks, the air then exits out the front of the module. This provides sufficient cooling to maintain the amplifier within the specified operating temperature range.

4-6 Power Distribution

Primary DC power for the amplifier is provided by the host system. The amplifier generates all the required voltages internally from the main source.

Section 5 Maintenance

5-1 Introduction

This section contains periodic maintenance and performance test procedures for the SPA9329-35 power booster amplifier. It also contains a list of test equipment required to perform the identified tasks.

NOTE

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

5-2 Periodic Maintenance

Periodic maintenance requirements are listed in table 5-1. Table 5-1 also lists the intervals at which the tasks should be performed.

Table 5-1 Periodic Maintenance

Task	Interval	Action
Inspection Cables & Connectors	12 Months	Inspect signal and power cables for frayed insulation. Check RF connectors to be sure that they are tight.
Performance Tests		No periodic maintenance is necessary beyond that recommended by the base station manufacturer.

5-3 Module Field Replacement

The SPA9329-35 power booster amplifier module can be replaced in the field on site by a qualified technician with adequate ESD protection and experience maintaining RF power amplifiers and similar equipment.

To replace a power amplifier module, proceed as follows:

1. Set the amplifier module DC power ON–OFF switch to OFF.
2. Disconnect the DC power cable from the amplifier module.
3. Disconnect the RF IN cable.
4. Disconnect the RF OUT cable.
5. Carefully remove the amplifier module.
6. Install replacement in reverse order.

Section 6 Troubleshooting

6-1 Introduction

This section contains a list of problems and a few suggested actions that may correct any problem with the SPA9329-35 power booster amplifier. If the suggested corrective action does not eliminate the problem, please contact your Powerwave field representative or the factory for further instructions.

NOTE

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

6-2 Troubleshooting

Refer to table 6-1 for troubleshooting suggestions.

Table 6-1 Troubleshooting

Symptom	Suggested Action
Amplifier Module Inoperative	Check for proper power supply voltage and that power input connector is properly seated in mating connector.
Amplifier Module Not Enabled	Check that the module ON-OFF power switch is set to the ON position.
TMP Indicator Not Illuminated	Verify input RF is within specified power and frequency limits. Check that the cooling fan is operating.

6-3 Return For Service Procedures

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

6-3.1 Obtaining An RMA

A Return Material Authorization (RMA) number must be obtained prior to returning equipment to the factory for service. Please contact our Repair Department at (888) 797-9283 or (714) 466-1000 to obtain this number, or FAX your request to (714) 466-5816. Failure to obtain this RMA number may result in delays in receiving repair service.

6-3.2 Repackaging For Shipment

To ensure safe shipment of the amplifier, it is recommended that the package designed for the amplifier be used. The original packaging material is reusable. If it is not available, contact Powerwave's Customer Service Department for packing materials and information.