

# Gamma 4.0, 5.0 & 6kW Operating Manual and User Guide

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## *Revision History*

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Version 1.0.....	Feb 2011
Version 1.2.....	May 2011

## Safety Instructions

To maximize user safety and ensure correct device operation, all instructions contained in this section should be read carefully.



**Caution:** It is important that the user observe all warnings and instructions that are on the device and contained in this manual.

### Before Applying Power



**Warning:** DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Operation of the Gamma in the presence of flammable gasses or fumes can endanger persons proximate to the site of operation.

Verify that the line voltage is 220VAC.

### Ground the Amplifier



**Caution:** NO NOT REMOVE THE AMPLIFIER COVER

Removal of the exciter cover will invalidate the Gamma Warranty. Component replacement and internal adjustments must be made only by PTEK qualified service personnel.

To minimize shock hazard, the exciter chassis must be connected to an electrical ground, the exciter must be connected to the AC power mains through a three-conductor power cable, with the third wire connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. If the exciter is to be energized by any other source be certain that the chassis is connected to a separate safety ground.

## AC Line Fuses and trips

The Gamma series power amplifiers are provided with an 8 gauge or 12 gauge (depending on model) 3 conductor “pig tail” AC Line cord. This should be wired into a breaker box and feed with a 2 pole 35A or 20A (respectively) breaker

## Output Connector



Warning: The Flange output connector carries dangerously high RF voltages that present shock and burn hazards. Never operate the Gamma power amp with -out properly terminating the output connector in either an adequately rated load or antenna.

## Electrostatic Discharge (ESD)

A sudden discharge of electrostatic electricity can destroy static-sensitive devices or micro-circuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. Always take industry-standard precautions.

## Grounding Methods

Guard against electrostatic damage at workstations by following these steps:

1. Cover workstations with approved anti-static material. Provide a wrist strap connected to a work surface and properly grounded tools and equipment.
2. Use anti-static mats, heel straps, or air ionizers to give added protection.
3. Handle electrostatic-sensitive components, boards, and assemblies by the case or the PCB edge.
4. Avoid contact with pins, leads, or circuitry.
5. Turn off power and input signals before inserting and removing connectors or test equipment.
6. Keep the work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.
7. Use field service tools, such as cutters, screwdrivers, and vacuums that are conductive.

## General Safety Rules

- The device must be used in accordance with the instructions for use.
- Electrical installations in the room must correspond to the requirements of respective regulations.
- Take care that there are no cables, particularly mains cables, in areas where persons can trip over them.
- Do not use a mains connection in sockets shared by a number of other power consumers. Do not use an extension cable.
- Only use the mains cable supplied.
- The unit is completely disconnected from the power source only when the power cord is disconnected from the power source. Therefore the power cord and its connectors must always remain easily accessible.
- Do not set up the device in the proximity of heat sources or in a damp location. Make sure the device has adequate ventilation.
- All plugs on the connection cables must be screwed or locked to the chassis housing.
- The device is designed to be used in horizontal position only.
- The device is no longer safe to operate when the device has visible damage or the device no longer functions.
- In case of system malfunction or visible damage to the Transmitter, the device must be shut down and secured against unintentional operation.
- Repairs may only be carried out by a person authorized by PTEK LLC.
- If extensions are made to the Transmitter the legal stipulations and the device specifications must be observed.
- The Transmitter must be switched off and disconnected from all power source before removing any covers.

# Table of Contents

Limited Warranty .....	4
Warranty Service .....	4
Safety Instructions .....	5
Preface .....	12
Website Information .....	13
Your Comments are Welcome .....	13
Notes, Cautions, Warnings, and Sidebars .....	14
1. Overview and Specifications .....	15
1.1 Overview .....	15
1.2 Specifications .....	19
1.2.1 General .....	19
1.2.2 Electrical .....	20
1.2.2.1 System Power .....	20
1.2.3 Environmental .....	21
1.2.3.1 Noise Level .....	21
1.3 Packaging and Shipping .....	22
1.3.1 Rack-Mount Slides .....	22
2. Installation .....	24
2.1 Installation Procedures .....	24
2.2 Mounting in a rack .....	25
2.3 Installing the Power Supplies .....	28
2.4 Electrical Connections .....	29

3. Operation.....	30
3.1 Set Up the System .....	30
3.2 Power Up the System .....	31
3.3.4 Final Check .....	34
3.4 Faults .....	35
3.4.1 Over Temperature .....	35
3.4.2 High VSWR .....	36
3.4.3 Power Supplies .....	36
3.5 Power Down the System .....	36
Appendix A. Connector Pinouts.....	37
A.1 Accessory Port .....	37



## List of Figures

Figure 1-1	Gamma Broadcast Transmitter .....	15
Figure 1-2	Gamma System Block Diagram .....	16
Figure 1-3	Gamma front Panel .....	17
Figure 1-4	GammaRear Panel .....	18
Figure 2-4	Gamma Rack Slides .....	25
Figure 2-2	Typical Rack Instalation .....	26
Figure 2-3	Fitting the Gamma into a Rack .....	27
Figure 2-5	Inserting the power supplies .....	28
Figure 2-6	Locking the power supplies .....	28
Figure 2-7	Gamma Rear Panel .....	29
Figure 3-1	Gamma front Panel .....	31
Figure 3-2	Gamma front Panel .....	32
Figure 3-3	Press the Function Key to read Powers .....	34
Figure 3-4	Press the Function Key to read Voltage and Current .....	34
Figure 3-5	Over Temperature Indication .....	35
Figure 3-6	Power Supply LEDs .....	36
Figure A-1	Accessory Port Pinout .....	37

## ***List of Tables***

Table 1-1	Gamma Series General Specifications .....	19
Table 1-2	Electrical Specifications .....	16
Table 1-3	Typical Noise Level of the Gamma Series .....	21
Table 3-1	Exciter drive powers .....	18
Table 3-2	Power Readings .....	25
Table A-1	Accessory Port Pinout Signal Descriptions .....	38

## Preface

This document, entitled *Gamma Operating Manual and User Guide*, provides instructions on how to install, configure, power up, and perform diagnostics on the 4, 5 and 6kW Gamma FM Broadcast Transmitter. (see photo below). The information contained within is intended for an experienced system operator with a knowledge of high-performance broadcast transmission systems. The 18RU-high Gamma transmitter is contained in a 19" rack and comprises 2 separate Gamma amplifiers and an exciter.



Gamma FM Broadcast transmitter

Key features of the Gamma FM Broadcast Transmitter include:

- Totally solid-state no-tune construction
- Wide input range from 210 to 264 VAC
- 3-year warranty on all parts and labor
- Remote-control interface
- Optional built-in stereo encoder
- Meets or exceeds all FCC and CCIR standards
- Designed and manufactured in the United States

The Gamma series are FCC-type verified for use on FM stations. Frequency stability for each unit is ensured by using PLL (phase-locked loop) frequency synthesis from a highly stable crystal oscillator. All units incorporate over-temperature protection and VSWR foldback to automatically reduce power output to safe operating levels

Switch-mode power supplies provide consistent performance even when there are frequent power outages and voltage fluctuations that make stressful demands on power dependence. An overview and specifications of the Gamma series Broadcast Transmitters is given in Chapter 1, "Overview and Specifications", of this manual.

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## Website Information

PTEK corporate and product information may be accessed on the World Wide Web by browsing the website <http://www.ptekpower.com>.

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## Notes, Cautions, Warnings, and Sidebars

The following icons and formatted text are included in this document for the reasons described:



**Note:** A note provides additional information concerning the procedure or action being described.



**Caution:** A caution describes a procedure or action that may result in injury to the operator or equipment. This may involve—but is not restricted to—heavy equipment or sharp objects. To reduce the risk, follow the instructions accompanying this symbol.



**Warning:** A warning describes a procedure or action that may cause injury to the operator or equipment as a result of hazardous voltages. To reduce the risk of electrical shock and danger, follow the instructions accompanying this symbol.



**Sidebar:** A “sidebar” adds detail to the section within which it is placed, but is not absolutely vital to the description or procedure of the section.

# General Section

# Chapter 1

## Overview and Specifications

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### 1.1 Overview

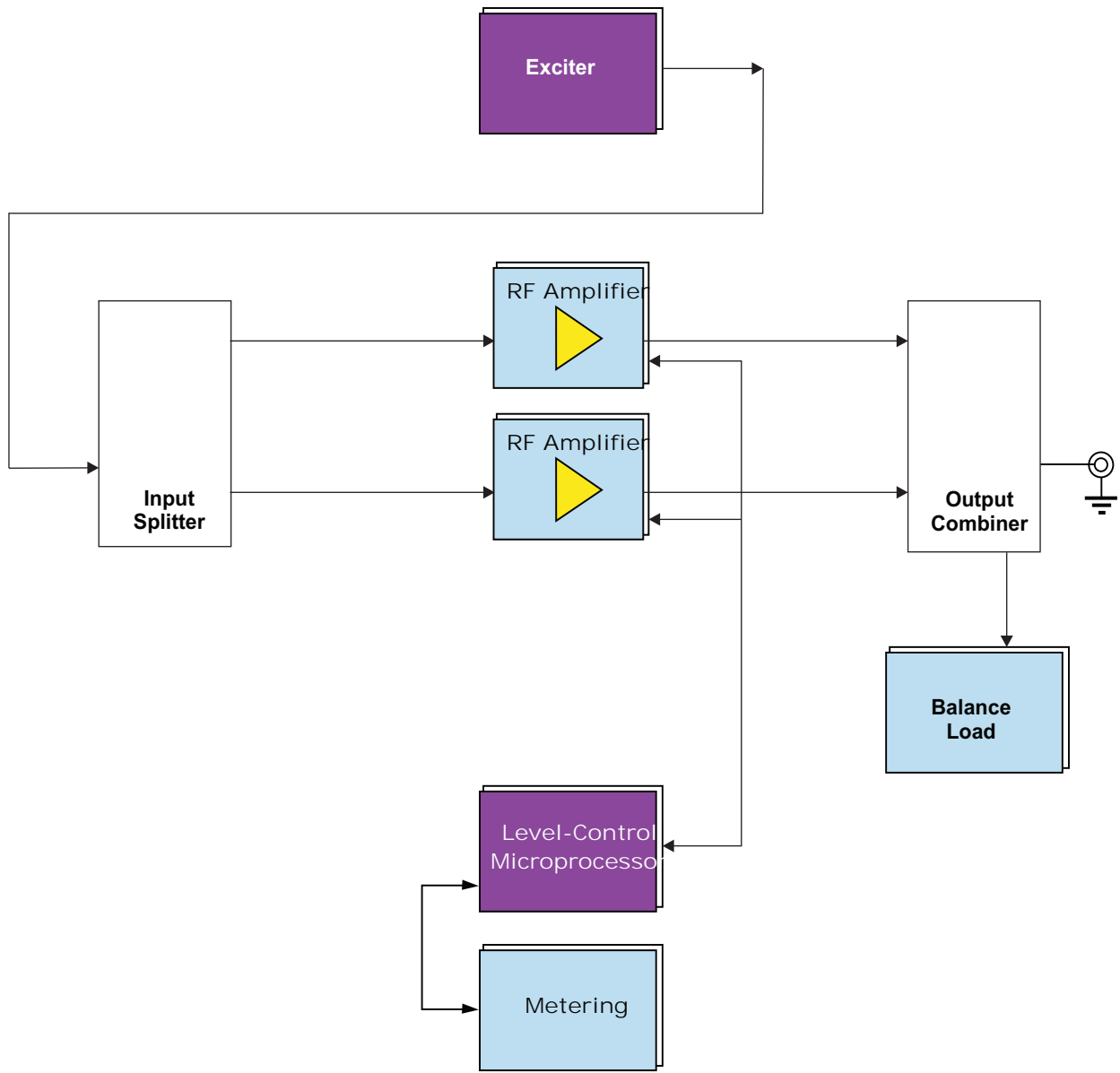
The Gamma series are FCC-type verified for use on FM stations. Frequency stability for each unit is ensured by using PLL (phase-locked loop) frequency synthesis from a highly stable crystal oscillator. All units incorporate over-temperature protection and VSWR foldback to automatically reduce power output to safe operating levels

Switch-mode power supplies provide consistent performance even when there are frequent power outages and voltage fluctuations that make stressful demands on power dependence.

The 18RU-high Gamma transmitter is contained in a 19" rack and comprises 2 separate Gamma amplifiers and an exciter.



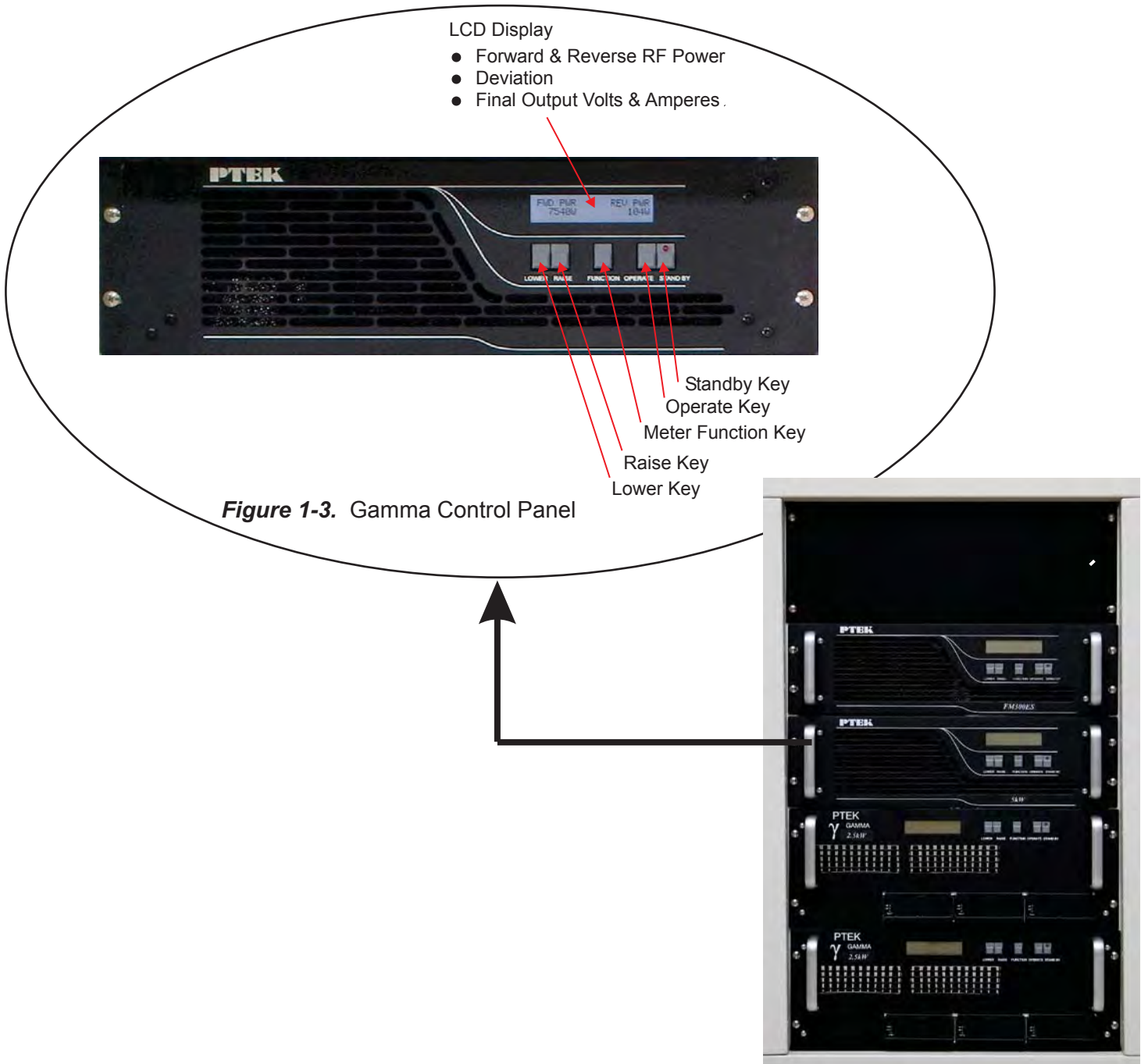
**Figure 1-1.** Gamma Broadcast Transmitter



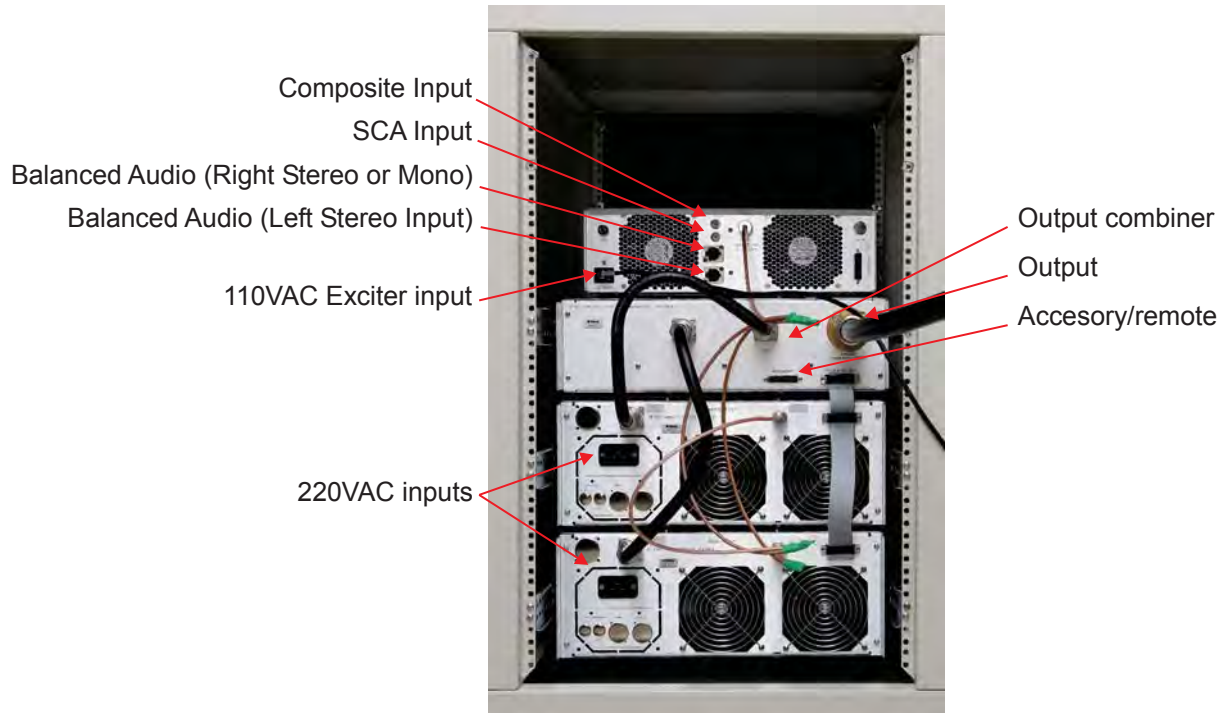
**Figure 1-2.** Gamma System Block Diagram

The Gamma series is designed within a 18RU-high cabinet 30" deep 21" wide.

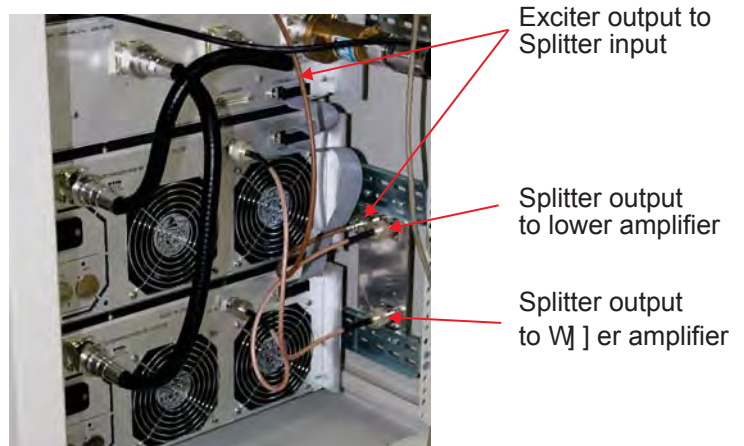
Features on the Gamma front panel are shown in Figure 1-3.







Shown with input phasing harness



Shown with input 3db Splitter

**Figure 1-4.** Gamma Rear Panel

## 1.2 Specifications

### 1.2.1 General

Table 1-1 lists general specifications for the 4, 5 & 6kW.

**Table 1-1.** Gamma Series General Specifications

Parameter	Description
Dimensions	<ul style="list-style-type: none"> <li>⌘ 7.0" (4RU) high</li> <li>⌘ 19" wide including the front panel</li> <li>⌘ 24" deep (including the front panel and rear protective flanges; the chassis body itself is 17" deep)</li> </ul>
Weight	<p>Total shipping weight is 400 pounds and includes the following:</p> <ul style="list-style-type: none"> <li>⌘ Chassis 310 pounds</li> <li>⌘ Packing crate 90 pounds</li> </ul>
19" Rack-Mountable with Slide capability	<ul style="list-style-type: none"> <li>⌘ Left and right rack-mount tabs and handles are attached directly to the chassis. Rack-mount slides are provided</li> </ul>
Temperature Operating: Non-Operating:	<ul style="list-style-type: none"> <li>⌘ 0°C to +30°C</li> <li>⌘ -40°C to +70°C</li> </ul>
Relative Humidity Operating: Non-Operating:	<ul style="list-style-type: none"> <li>⌘ 8% to 90% non-condensing</li> <li>⌘ 5% to 95% non-condensing</li> </ul>
Maximum Wet Bulb Operating: Non-Operating:	<ul style="list-style-type: none"> <li>⌘ 27°C, non-condensing</li> <li>⌘ 35°C, non-condensing</li> </ul>
Altitude Operating: Non-Operating	<ul style="list-style-type: none"> <li>⌘ 0 to 10,000 feet above sea level</li> <li>⌘ 0 to 40,000 feet above sea level</li> </ul>

## 1.2.2 Electrical

Table 1-2 lists the electrical specifications for the Gamma with FM150ES Exciter.

**Table 1-2.** Electrical Specifications

Parameter	Description
Frequency Range	⌘ 87.7 MHz to 108 MHz
Audio Input Impedance	⌘ 600 ohms
Audio Input Level (Composite)	⌘ -10 dBm
Audio Input Level R & L Stereo Encoder ( <i>optional</i> )	⌘ -10 dBm
Frequency Response (Composite)	⌘ 20 Hz to 15(90) KHz
Pre-Emphasis	⌘ 50 or 75 uS
Harmonic Distortion	⌘ < 0.15% max
Signal-to-Noise Ratio	⌘ > 80 dB rms
RF Output Impedance	⌘ 50 ohms
Output Connector	⌘ 7/8 EIA Flange
RF Power Output	⌘ 4200W for 4kW ⌘ 5250 for 5kW ⌘ 6300 for 6kW
Harmonic Attenuation	⌘ < -70 dB
Power Requirements	⌘ 220-264 VAC, 75A (7.5kW) 100A(10kW)

### 1.2.2.1 System Power

The Gamma series is shipped with 4 (per amplifier dependant on model) “plug in” AC power supplies packed separately to avoid damage. Each AC power supply has a 1500-watt output capacity that auto-ranges single-phase input from a 220 to 264 VAC (47 to 63 Hertz) source. AC is supplied from a rear-mounted power

## 1.2.3 Environmental

### 1.2.3.1 Noise Level

Typical noise levels emitted by the Gamma series are outlined in Table 1-3. The chassis is installed with three 4.7" fans mounted side-by-side at the rear of the system. In addition, each AC power supply has its own cooling fan.

**Table 1-3.** Typical Noise Levels of the Gamma series

Measured at:	1 Meter	2 Meters
Front	81.24 dB	72.57 dB
Rear	86.53 dB	77.93 dB

## 1.2.3 Packaging and Shipping

The Gamma Series Broadcast Transmitter is packaged in a reusable shipping crate. Approximate weight of an empty crate 90 pounds. The approximate weight of a Gamma series transmitter 310 pounds.

# Installation Section

# Chapter 2

## *Installation*

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### 2.1 Installation Procedures



Caution: Use industry-standard ESD grounding techniques when handling all components. Wear an antistatic wrist strap and use an ESD-protected mat. Store ESD-sensitive components in antistatic bags before placing them on any surface. Handle all IC cards by the front panel or edges only.

There are no operator serviceable parts inside the Gamma ; therefore, replacement, inspection, or adjustment of internal components within the Gamma requires service by a PTEK technician only. **DO NOT REMOVE THE TOP PROTECTIVE COVER OF THE Gamma CHASSIS** (see following Warning).



Warning: Removal of the top protective cover of the Gamma by anyone other than an authorized PTEK technician will void the product warranty.

## 2.2 Placement

The transmitter has casters mounted to the bottom of the case to ease movement. Position the transmitter with at least 2 foot clearance from the rear to any wall or obstruction.

## 2.2 AC Connections

Each power amplifier has a separate AC input. The transmitter is supplied with a 2 X #8 conductor cables for the 6kW, 2 X # 12 for the 4 & 5kW. These cables should be connected to an electrical panel with separate 20A for 4 & 5kW or 35A breakers 6kW.

The exciter and metering each require a 110V AC input and are supplied with separate AC cords with NEMA 5-15P Plug.

## 2.3 RF Connection

The transmitter has a 7/8 EIA Flange output connector. This should be connected to the RF Transmission line customer supplied short bullet required.

# Operation Section

# Chapter 3

## Operation

This chapter describes:

- How to set up the Gamma system to begin operation
- How to turn the Gamma on and off
- How to monitor and change the operational settings of the Gamma

---

### 3.1 Set Up the System

To successfully operate the Gamma Transmitter, it must be connected to a correctly matched antenna, an exciter and a 220V single phase supply.



Warning: PREVENT FIRES!

Ensure each 220V line is connected to a circuit breaker rated at 35A or 20A. Use the supplied 8 or 12 gauge 3 conductor cable.

Refer to the exciter manual for set up of the exciter. Set the power out put of the exciter to the following power levels dependant on the Gamma model.

Model	Exciter Drive Power
4000	250W
5000	300W
6000	330W

**Table 3-1.** Exciter drive powers

## 3.2 Power Up the System

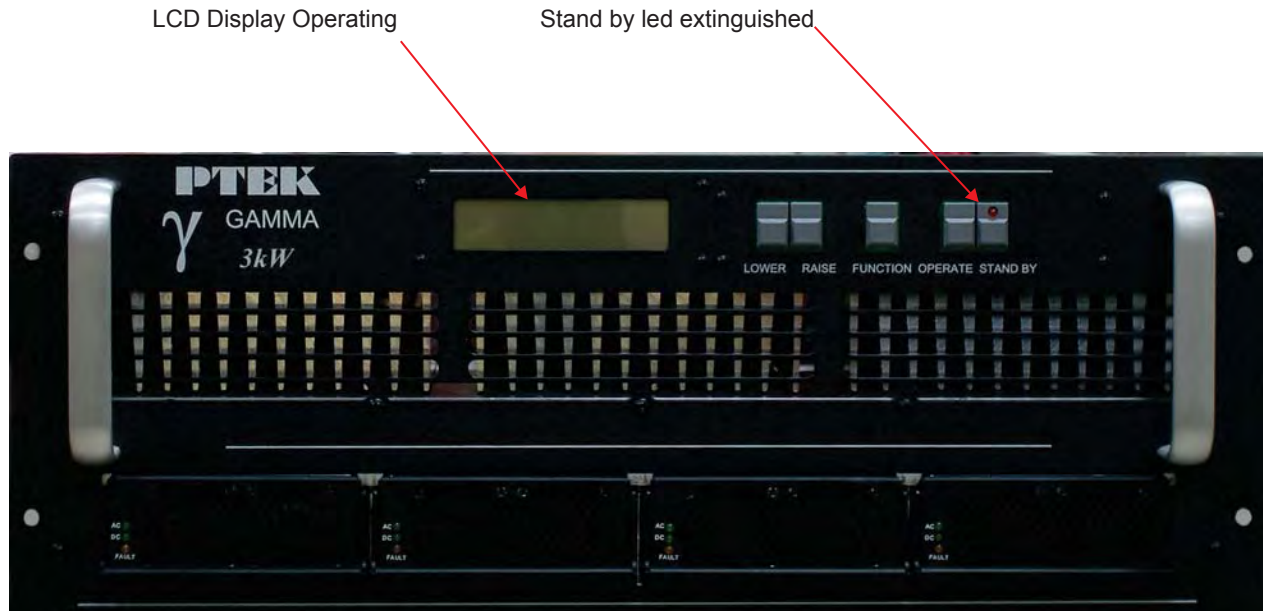
1. Check that the exciter power is as above.
2. Switch the exciter to standby.
3. Operate the breakers to apply 220AC to the Gamma.
4. Check that the stand-by LED on each amplifier is illuminated



**Figure 3-1.** Gamma Power amplifier



Press the OPERATE key on the control panel of the Gamma. Check that the fans are running on the power amplifiers and that each power amplifier has the indications below:



**Figure 3-2.** Gamma Front Panel

Switch the exciter to OPERATE

After the start up sequence has completed and the exciter is generating power the Gamma will also produce power.

Typically the power is set at the factory to a mid value i.e. 2500W for the 5000W Gamma. This should now be indicated on the LCD display similar to this:



**Figure 3-2.** LCD Display Power

Pressing the function button will change the display to read Voltage and Current



**Figure 3-3.** LCD Display Current & Voltage

Pressing the function key will revert the display to read Forward and Reverse Power. At this point the power can be adjusted to the required output power by operating the raise or lower key as appropriate.

Note all the readings for future reference.

Below is a table of expected power outputs, current and efficiency.

---

## 3.3 Power Readings

Power Output	Gamma 4000		Gamma 5000		Gamma 6000	
	Current	Efficiency	Current	Efficiency	Current	Efficiency
2000	106	39%	114	37%	136	31%
2500	116	45%	130	40%	144	36%
3000	130	48%	140	45%	152	41%
3500	140	52%	150	49%	160	46%
4000	150	56%	160	52%	168	50%
4500			170	55%	176	53%
5000			180	58%	184	57%
5500					192	60%
6000					200	63%

**Table 3-2.** power Readings

### 3.3.4 Final Check

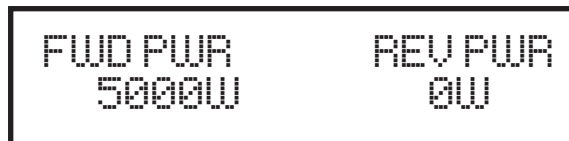
Pressing the FUNCTION key rotates the LCD display through the following screens:



Note: At each screen, pressing the LOWER or RAISE key changes the output power only. PA VOLTS and PA AMPS is another way of indicating the power output, accomplished by multiplying the voltage by the amperage (current), then multiplying the result by the efficiency.

Readings should be recorded weekly to keep track of changes, which may indicate developing problems such as antenna or coax deterioration.

1. After pressing the FUNCTION key on the front of the Gamma, the Forward and Reverse power readings appear on the LCD display (see Figure 3-9).



**Figure 3-4.** Press the FUNCTION Key to read Powers

2. Pressing the FUNCTION key again will display Voltage and Current on the LCD display (see Figure 3-10).



**Figure 3-4.** Press the FUNCTION Key to read Voltage and Current

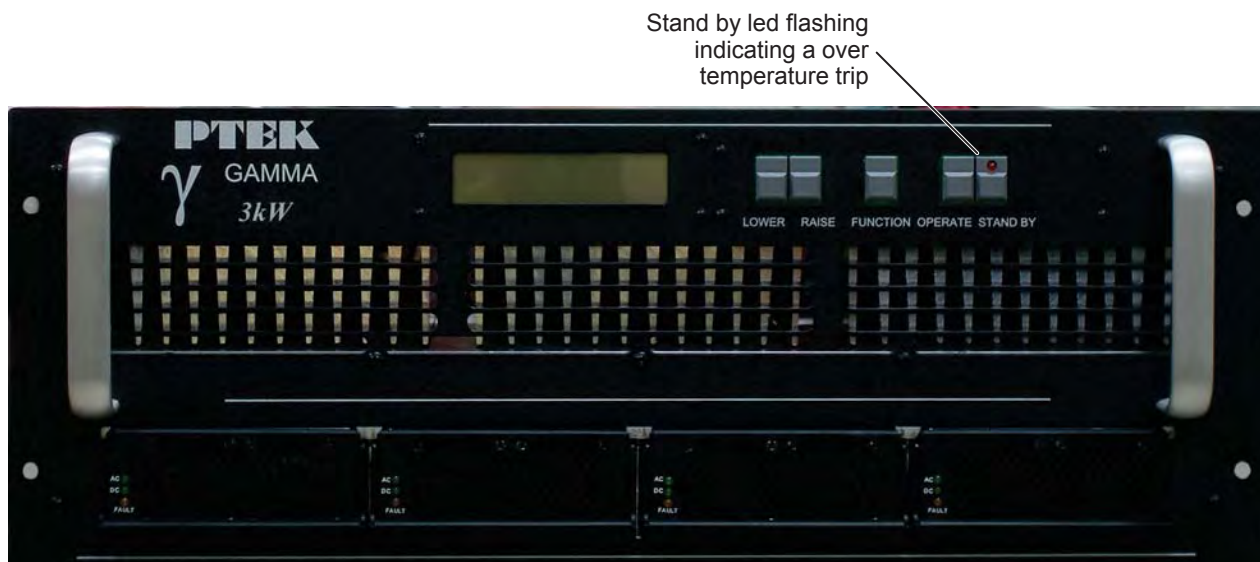
## 3.4 Faults



Warning: Removal of the top protective cover of the Gamma by anyone other than an authorized PTEK technician will void the product warranty.

### 3.4.1 Over Temperature

Should the internal temperature exceed 40 degrees Centigrade the power will be reduced to a low value (typically around 300W). At this time the all the controls will be locked out and the stand by LED will flash. After a couple of minuets the system will retry and power will be reset to the previous value. If the temperature is still in excess of 40 degrees Centigrade then again the power will be reduced as above.



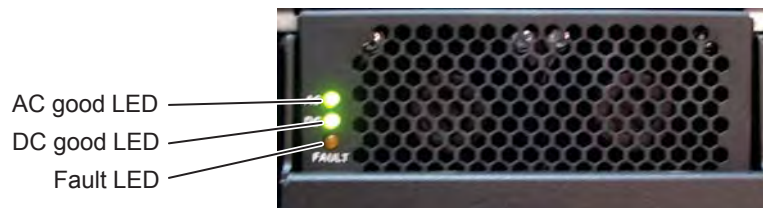
**Figure 3-5.** Over Temperature Indication

### 3.4.1 High VSWR

If the load VSWR is high indicated by a high reading on the reverse power meter (greater than 5% of the Forward Power reading). The power will be reduced progressively so as to limit the maximum reverse power. If the Load VSWR improves the power will be increased, ultimately to the previous set value.

### 3.4.2 Power Supplies

Each power supply has 3 LEDs AC good, DC good and Fault. In the stand-by mode the AC good and Fault will be illuminated. This is a normal condition. In operate mode both the AC good and DC good will be illuminated, the fault LED will be extinguished. Any other combination would indicate a fault with that power supply. Further confirmation of this would be that the other power supply are operating as expected.



**Figure 3-6.** Power Supply LEDs

---

## 3.5 Power Down the System

To power down (turn off) the Gamma, press the STANDBY key, then disconnect the AC power cord from the AC power socket on the rear panel of the chassis.

# Appendix A

## Connector Pinouts

This appendix provides connector pinouts and signal descriptions for the user I/O connectors that are installed on the Gamma Broadcast Transmitter rear I/O Panel (see Figure 1-4, page 1-3, in Chapter 1, "Overview and Specifications").

### A.1 Accessory Port

The Gamma rear I/O Panel provides a 25-pin female DB25 connector as an accessory-port interface. A pinout is provided in Figure A-1; signal descriptions are defined in Table A-1 on page A-2.

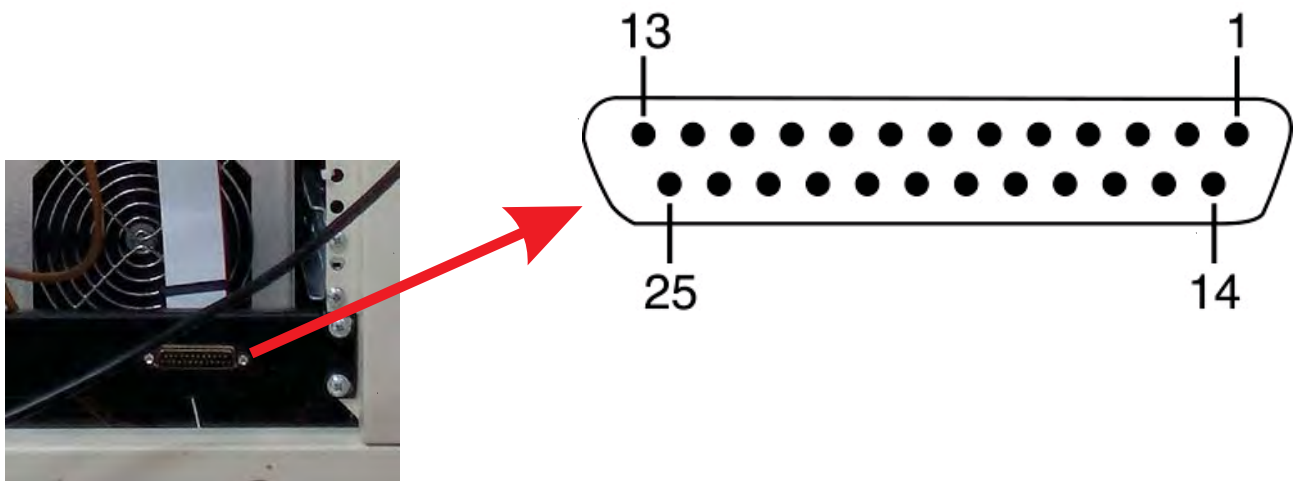


Figure A-1. Accessory Port Pinout

Table A-1. Accessory Port Pinout Signal Descriptions

Pin	Signal Function
1	Forward power DC indication; $2.4V = 3000W$
2	Final voltage DC indication; $V = V/10$
3	<i>Not used</i>
4	<i>Not used</i>
5, 6, 18, 19	<i>Not used</i>
7	<i>Not used</i>
8	Raise; ground to raise the output power
9	<i>Not used</i>
10	<i>Not used</i>
11, 12, 23, 24	Ground
13	Remote on (ground to turn the unit on momentarily only)
14	Reverse power DC indication; $2.4V = 3000W$
15	<i>Not used</i>
16	<i>Not used</i>
17	<i>Not used</i>
20	Lower; ground to lower the output power
21	Final current DC indication; Full scale = 2.5V
22	<i>Not used</i>
25	Remote off (ground to turn the unit off momentarily only)