



**Bravo Tech, Inc.**

## Users Manual

## LPA800 Operating Manual Table of Contents

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Table 1 – Functional and Physical Specifications



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## SECTION 1

### GENERAL

#### 1-1. INTRODUCTION.

Congratulation on purchasing Bravo Tech's advanced linear power amplifier. Our goal is to satisfy you with our RF technology expertise, offering the best product with unsurpassed quality, performance and at the best price. In fact, a strong background in wireless communication technologies enables Bravo Tech to provide highly integrated products with the most advanced features in the industry. Our commitment to quality and product excellence makes Bravo Tech a strong contender in the industry.

Bravo Tech designs, manufactures, and markets the most advanced Linear Power Amplifiers for use in wireless communication systems. Our Linear Power Amplifiers are designed with the most advanced RF and digital control technology.

Our focus on high-end power amplifiers at affordable price results in total commitment to offering state of the art products to meet the growing needs of today's exploding wireless communication market. We consider "value" a requirement in every facet of a product, not just a feature. When comparing Power Amplifiers, consider all the essential factors in your decision. Price and performance characteristics such as distortion specifications, flexibility, reliability and design parameters are critical. And not least of all the warranty- will the manufacturer stand behind their products? Bravo Tech will consistently outpace the competition in every category.

This manual contains information and procedures for installation, operation, and maintenance of the LPA800 Series multichannel feed-forward linear power amplifier system. The manual is organized into five sections as follows:

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

#### 1-2. GENERAL DESCRIPTION

The **LPA800 Series** multichannel feed-forward linear power amplifier is specially designed for trunking systems, featuring bandwidth up to 20 MHz and output power up to 200W per system. Our Power Amplifiers are designed with our advanced RF and digital control technology. They provide unsurpassed power, linearity, efficiency, and system flexibility in trunking, cellular, and wireless local loop systems. The intelligent digital control system constantly fine-tunes the amplifiers to ensure optimum operation over a wide variety of electrical and environmental conditions. The amplifiers can be fed up to 16 channels and meet all FCC requirements.

The system is designed to provide trouble free operation with minimum maintenance. The LED-based operational status and fault indicators help minimize downtime. The turn-on and turn-off sequences of voltages are fully automatic, as is overload protection, making the amplifier

virtually impervious to failures caused by system problems.

RF I/O and D.C. Power are connected to the rear panel of the amplifier. The rear panel also has the serial port connectors that interface with the host control system. The system status connector allows the host system to monitor performance of the amplifier. The front panel of the amplifier equipped with fault indicators. D.C. power for the amplifier system is +27 Vdc. Cooling for the amplifier is provided by three fans mounted on the rear of the system. The fans draw outside air through the front of and exhaust hot air through the rear of the rack.

### 1-3. FUNCTIONAL AND PHYSICAL SPECIFICATIONS

Functional and physical specifications for the amplifier system are listed in Table 1.

PARAMETER	SPECIFICATIONS
Frequency Range	850 - 870 MHz
Output Power	100-200 W Average
Peak Power Capacity	1600 W
IMD	Meet FCC Requirements
RF Gain	35 dB
RF Gain Variation Over Frequency Band	+/- 0.5 dB over the whole frequency band
RF Gain Variation Over Temperature	+/- 0.7 dB (Max.)
Input / Output VSWR	<2 : 1
Output Protection	Isolator
Harmonic & Sprurious Emissions	Meet FCC Requirements
DC Power Voltage Current Consumption	27V +/- 1.0 VDC 65A max @ 27VDC
Operation Temperature	0 To + 55C
Physical Dimensions	19" Rack Standard
Over Power Output Alarm	
High Temperature Alarm and Shut-Down	@95C +/- 6 on the case of power transistor and recovery @ 85C +/- 6
Output VSWR Alarm	@ 3: 1

*Table 1 – Functional and physical specifications for the amplifier systems*

### 1-4 EQUIPMENT CHANGES

Bravo Tech reserves the right to make any changes to the equipment without notice, including but not necessarily limited to component substitution and circuitry changes.

**SECTION 2****INSTALLATION****2-1. INTRODUCTION**

This section contains installation recommendations for the LPA800 amplifier. Please read the material in this section prior to installation of the amplifier into a system.

**2-2. ELECTRICAL SERVICE RECOMMENDATIONS**

Bravo Tech recommends that proper AC line conditioning and surge suppression is provided on the primary AC input to the +27 Vdc power source. All electrical service should be installed in accordance with any applicable government or local regulations (codes) and good engineering practice.

**2-3. UNPACKING AND INSPECTION**

This equipment has been tested and calibrated at the factory. Only in the event of severe shocks or other mistreatment should any substantial readjustment be required. Check the outside of the shipping container for instructions regarding unpacking. Carefully open the container and remove the amplifier module. Retain all packing material that can be reassembled in the event the unit must be returned to the factory.

**CAUTION**

- Exercise care in handling equipment during inspection to prevent damage.
- Visually inspect the amplifier 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 connectors or fans.
- Inspect all connectors for bent connector pins. 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, please contact Bravo Tech for a return authorization. Bravo Tech may not accept returns without a return authorization. Claims for loss or damage may not be withheld from any payment to Bravo Tech, nor may any payment due be withheld pending the outcome thereof.

**2-4. INSTALLATION INSTRUCTIONS**

To install the amplifier proceed as follows:

1. Install amplifier in equipment rack, and secure in place with four screws
2. Connect load cable to RF OUT connector on rear of amplifier.
3. Connect transceiver or exciter input to RF IN on rear of amplifier.
4. Connect +27 Vdc and GROUND to appropriate terminals on the amplifier rear panel.
5. Connect status port on rear panel (if applicable).

6. Check your work before applying DC voltage to the amplifier. Make certain all connections are tight and correct.
7. Measure primary DC input voltage. DC input voltage should be **+26-28 Vdc**. If the DC input voltage is above or below the limits, call and consult Bravo Tech before you apply power to your amplifier.

**2-5. AMPLIFIER STATUS**

The amplifier has a remote alarm connector that is used by the host system to monitor the amplifier. The status connections are made through a **9-pin D-Sub male connector** and are listed and described in Figure 1.



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## SECTION 3

### OPERATING INSTRUCTIONS

#### 3-1. INTRODUCTION.

This section contains operating instructions for the LPA800. Series Amplifier System.

#### 3-2. Connections

##### LPA800 Input/Output Connectors (Rear Panel)

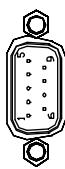
NUMBER	NAME	FUNCTION
1	+27V Input and RTN voltage	Input terminals for primary DC source
2	J1 host	9-pin, male type D-SUB connector. Fault and control signals to system for each of the plug-in amplifier modules. Refer to Figure1 for a description of the signals
3	J2	9-pin, female type D-SUB serial connector.
4	RF IN	Type SMA female bulkhead connector.
5	RF OUT	Type N female bulkhead connector.

## OPERATING REQUIREMENTS

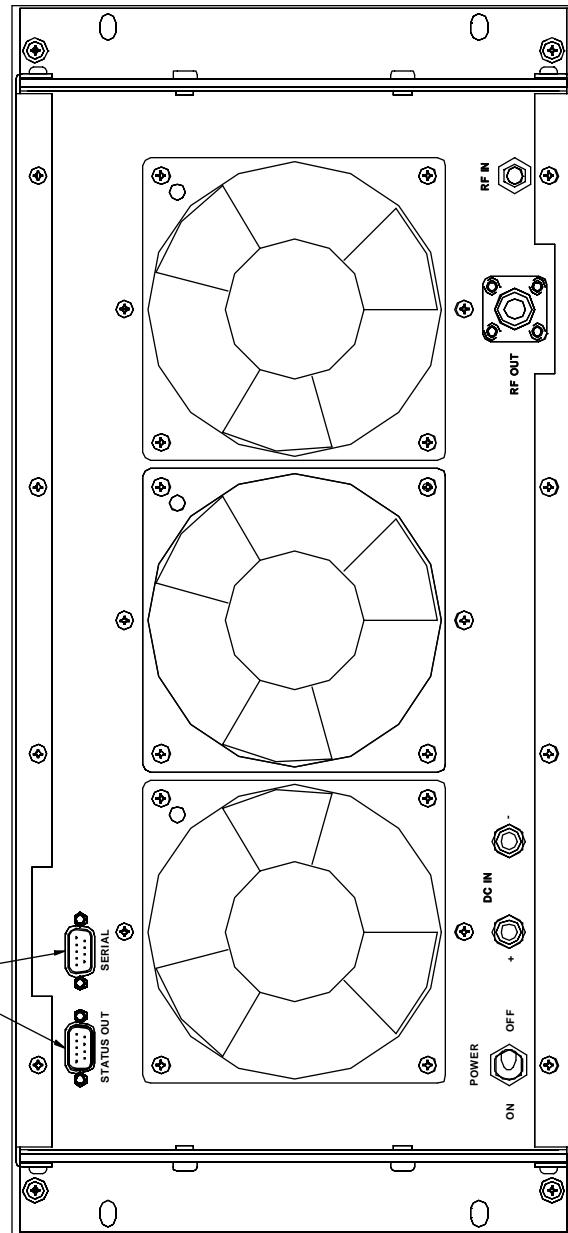
RF Input power = 100 mWatts  
 RF Output power = 150 Watts  
 VDC = 27.0 ±10 Vdc  
 Idc = 60 Amps  
 Connections = see drawing

## Status Out, pin connections:

- 1 - Ground
- 2 - 5V
- 3 - Fan Fault
- 4 - Over Input
- 5 - VSWR
- 6 - Over Temperature
- 7 - Under/Over DC
- 8 - RF Off
- 9 - Shutdown Control Input



CONNECTORS



## LPA800 STATUS INDICATORS (Front Panel)

## NUMBER NAME FUNCTION

1	POWER ON Indicator	Green Led. When lit, indicates that +27 Vdc is applied to the amplifier module.
2	OVER TEMP	Red Led indicates over temperature conditions
3	DC VOLTAGE	Red Led indicates under or over voltage conditions
4	FAN FAULT	Red Led indicates fan fault conditions
5	OVER INPUT	Red Led indicates over input power conditions
6	VSWR	Red Led indicates bad antenna connections
7	RF OFF	Red Led indicates RF power is turned off by system controller

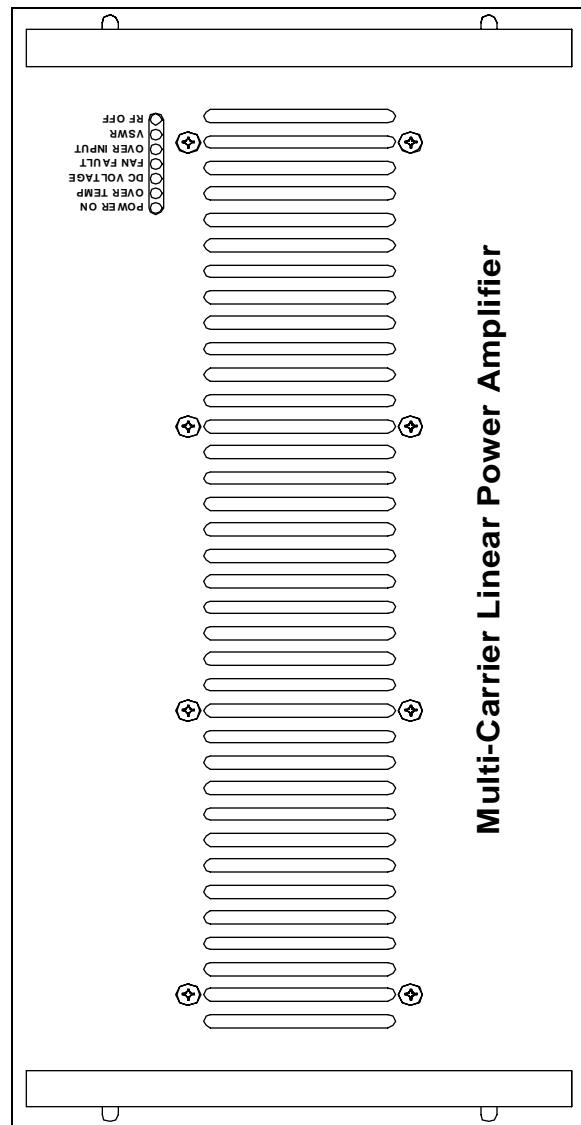


Figure 2 - FRONT PANEL

### **3-3. INITIAL START-UP AND OPERATING PROCEDURES**

Double check to ensure that all input and output cables are properly connected.

#### **WARNING**

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 Table1 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
- Turn on supply that provides +26-28 Vdc to the amplifier system. Visually check the amplifier as it is turned on, and verify that the DC ON indicator (green) comes on.
- As the LPA800 is controlled by an internal microprocessor-based optimization loop, the specified linearity performance may not be obtained until several minutes after initial turn-on.



## SECTION 4

### PRINCIPLES OF OPERATION

#### 4-1. INTRODUCTION

This section contains a functional description of the LPA800 Series linear amplifier.

#### 4-2. RF INPUT SIGNAL

The maximum input power for all carrier frequencies should not exceed the limits specified in table 1. The input VSWR should be 2:1 maximum (or better).

#### 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 amplifier is designed based on the feed-forward technique. The input RF carriers are split into two paths at the coupler 1. One path is to the 1 loop delay line and the other path is to the main amplifier path. The carriers' are amplified by the main output stage where distortion signal components are generated. The amplified signals, carriers plus distortions, are fed into the second loop delay line while very small part of the output signals are coupled by coupler 2 into the coupler 3, where the carrier components of the coupled signals are cancelled with the pure input carriers at the coupler 3, resulting in error signals. The phase-1 and attenuator-1 are adjusted to ensure the carrier cancellation at the coupler 3 so that only error signals are fed into the second loop and amplified by the error amplifier, which is a linear relatively low power amplifier. The phase and amplitude of the amplified error signals are adjusted by phase-2 and attenuator\_2, respectively, so that they are cancelled with the error signals from the second loop delay line at the coupler 4. After the cancellation, the output signals will be cleaned up so that the amplifier can meet the FCC requirements.

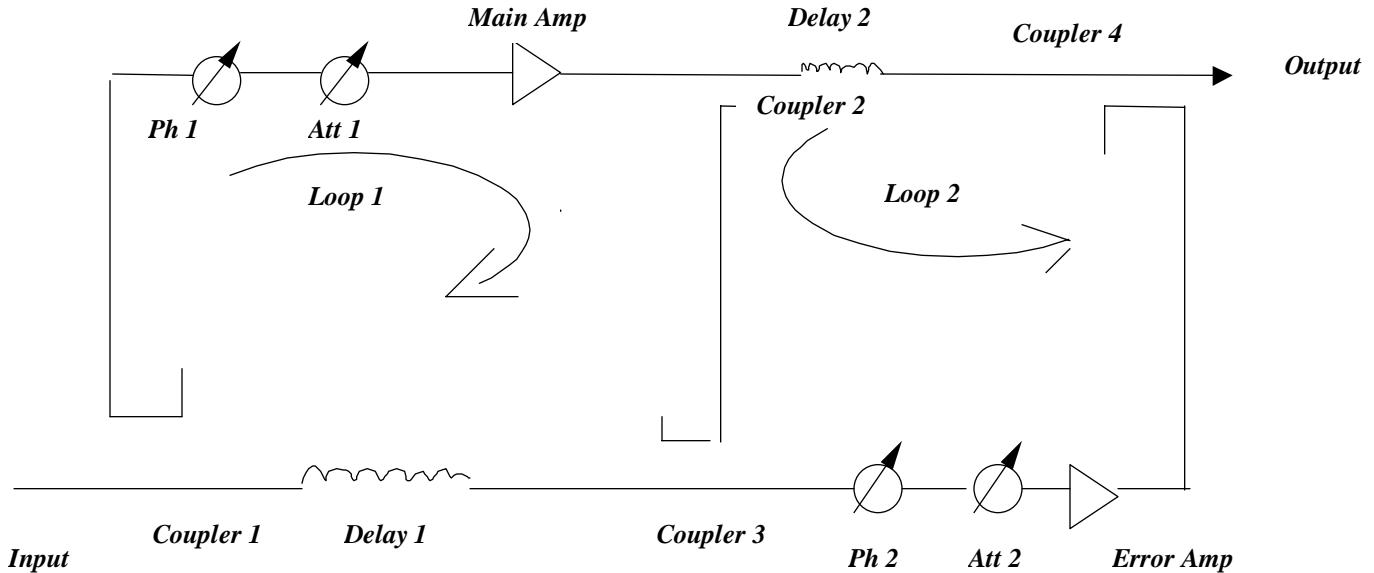


Figure 3 – Loop Feed Forward

#### 4-5. AMPLIFIER MONITORING

The microprocessor control allows the amplifier to protect itself against external occurrences. In routine operation, all normal variations are automatically compensated for. When large variations occur the modules generate alarm outputs. The alarms are displayed on the front panel indicator and output via a connector on the rear of the rack for remote monitoring. Faults and alarms are summarized in Figure 1.

#### 4-6. AMPLIFIER MODULE COOLING

Three fans are used for forced air cooling. The fans are located on the rear of the amplifier and exhaust hot air out the back of the module.



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## **SECTION 5**

### **MAINTENANCE**

The LPA800 amplifier contains no user-serviceable parts. There is no maintenance that can be performed by the user other than ensuring that the external connections to the amplifier are sound. Breaking the seals around the outside of the unit will render the warranty null and void. If your LPA800 amplifier requires any servicing, or fails to perform to specifications in any way, please contact factory for RMA number and ship in the original packing box to:

**Bravo Tech Inc.  
4260 Cerritos Ave.  
Los Alamitos, CA 90720  
Phone: 714-952-8324  
Fax: 714-952-0107**