TPL COMMUNICATIONS
Employee Owned Company

USER MANUAL MID-BAND VHF CONTINUOUS DUTY POWER AMPLIFIERS

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L-PA2-2AX-RXRPS/RSP1U/L5

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GENERAL SPECIFICATIONS

FREQUENCY RANGE: 72-76 MHz

MODEL	POWER INPUT	POWER OUTPUT	DC CURRENT DRAIN
PA2-2AB-RSPS-P1	0.5-1 W	10 W	1.5 Amps.
PA2-2AC-RXR-PS-P1	0.5-1 W	60 W	4 Amps.

OPERATING MODE: FM / CW

OPERATING VOLTAGE: 110 VAC

EIA DUTY CYCLE: 100% / Continuous

HARMONIC AND SPURIUS EMISSIONS ATTENUATION: Meets or exceeds FCC Certification requirements.

IN/OUT IMPEDANCE: 50 Ohms.

IN/OUT RF CONNECTORS: Type "N"

RECEIVER PATH INSERTION LOSS: 1 dB maximum

OPERATING TEMPERATURE:- 20° to +50° Celsius.

STORAGE TEMPERATURE:- 40° to +85° Celsius.

OPERATING HUMIDITY: 0% - 85% RH (non-condensing).

STORAGE HUMIDITY: 0% - 95% RH (non-condensing).

OPERATING PRECAUTIONS

CAUTION: This amplifier produces RF voltages that can cause painful and dangerous RF burns. Use caution! Connect and disconnect all RF connections with the DC power and drive power off.

DRIVE POWER: RF power transistors, although quite rugged in most respects, are easily damaged by overdrive. Be careful no to overdrive this amplifier, even for an instant. Higher than rated drive power may destroy the transistor and **VOID ANY WARRANTY.**

TERMINATIONS: The efficiency of this amplifier will degrade if it is operated into anything but a **50 Ohm** load. Lowered effeciency may mean any, or all, of the follow ing: lower power output, increased current drain, higher opearating temperature, and reduced life time.

INSTALLATION

This unit is designed for mounting in a standard 19" rack. When picking a location in the rack, cosideration must be given to the RF power output cable lengths, as well as cooling considerations.

Mount the unit where dust and other debris are not likely to clog the cooling fins. Avoid mounting the amplifier directly above hot pieces of equipment that could artificially raise the amplifiers temperature.

Connect the radio tranmsitter to the **"RF INPUT"** connector with a **50 Ohm** cable and a type **"N"** plug. Connect the antenna to the **"RF OUTPUT"** connector on the amplifier with **50 Ohm** coaxial cable and a type **"N"** plug.

Plug the AC line cord into the system AC power receptacle.

For safety, ensure that the rack and all equipment connected to the amplifier have proper AC grounds. Do not rely on coaxial cable shielding. Assure the installation has proper lightning protection (e.g. in line coaxial protectors manufactured by PolyPhaser Corporation or equivalent).

WARRANTY

TPL COMMUNICATIONS has tested and found this unit to function properly and to operate within the parameters of its stated specifications.

TPL COMMUNICATIONS warrants that this product is free from defects in material and workmanship. If found to be defective within two (2) years from the date of purchase, the factory at its discretion, will either repair or replace the unit at no cost provided the unit is delivered by the owner to the factory intact. Warranty does not apply to any product which has been subjected to misuse, neglect, accident, improper installation or used in violation of instructions furnished by us, nor does it extend to units which have been repaired or altered outside our service department, nor where the serial number has been removed, defaced or changed.

SERVICE

For service on this amplifier, contact:

TPL COMMUNICATIONS
Customer Service Department
PHONE (323) 256-3000
PHONE: (800) HI POWER - (800) 447-6937
FAX: (323) 254-3210
E-Mail: sales@tplcom.com
For information on other **TPL** products
visit our website at
www.tplcom.com

RF CIRCUIT DESCRIPTION

The PA2-2AB and -2AC are designed to amplify 72 – 76 MHz RF signals to produce up to 10 watts (-2AB) and 60 watts (-2AC) RF output.

PA2-2AB

This model consists of six main blocks; a gain stage, low-pass filter, solid-state relay, RF input sensor, bias circuitry, and a voltage regulator.

SINGLE GAIN STAGE

The gain stage is composed of a common-source RF power MOSFET transistor, Q1, providing 21 dB of gain. The input matching network consists of microstrip lines Z1, Z2, Z3, capacitors C6, C7, C12, C14, and inductors L7 and L8. The output matching network contains microstrip lines Z4, Z5, capacitors C8, C9, C13, C15, C16, and inductors L2 and L3. Capacitors C10, C11 and C36 serve as DC blocks. R18 and C38 provide a negative feedback path and R3 and C5 improve stability. A 6 dB input attenuator, ATT1, is necessary to place the overall gain near 15 dB.

LOW-PASS FILTER

The low-pass filter is a seven pole Chebychev filter including inductors L4, L5, L6 and capacitors C17, C18, C19 and C20. It provides a minimum of 45 – 55 dB of attenuation of the 2nd and higher harmonics.

RF INPUT SENSOR

An RF input sensor detects the presence of drive from the exciter to energize the Solid State Relay and bias circuit for Q1. It is made up of diodes D7 and D8, transistors Q2 and Q3, capacitor C35, and resistors R10, R11, R12, R13, R14, R15, R16 and R17.

SOLID STATE RELAY

The Solid State antenna switch relay (SSR) is activated by RF signal from the input of the amplifier through RF input sensor. The SSR circuit switches an RF signal through the amplifier during transmit and bypass it during receive cycle. It is accomplished by PIN diodes D2, D3, D4, D5, capacitors C30, C31, C32, C33, and inductors L14, L15 and L16. The PIN diode bias circuit consists of resistors R7, R8, R9, capacitors C22, C23, C24, C25, C26, C27, and inductors L10, L11, L12 and L13. Capacitors C29 and C34 prevent the bias voltage from appearing on the RF ports.

BIAS CIRCUIT

A bias circuit provides a temperature-compensated voltage to the gate of the RF power MOSFET which operates in a Class AB mode. This includes resistors R4, R5, R6, thermistor RT1, inductor L9, diode D1 and capacitor C21.

VOLTAGE REGULATOR

The voltage regulator supplies the RF transistor bias circuit and Solid State Relay diodes. This includes integrated circuit U1, resistors R1, R2, and capacitors C1, C2, C3 and C4.

PA2-2AC

This model consists of six main blocks; a gain stage, low-pass filter, solid-state relay, RF input sensor, bias circuitry, and a voltage regulator.

SINGLE GAIN STAGE

The gain stage is composed of a common-source RF power MOSFET transistor, Q1, providing 22 dB of gain. The input matching network consists of microstrip lines Z1, Z2, Z3, capacitors C6, C7, C12, C14, and inductors L7 and L8. The output matching network contains microstrip lines Z4, Z5, capacitors C8, C9, C13, C15, C16, and inductors L2 and L3. Capacitors C10 and C11 serve as DC blocks. R3 and C5 reduce gain and improve stability.

LOW-PASS FILTER

The low-pass filter is a seven pole Chebychev filter including inductors L4, L5, L6 and capacitors C17, C18, C19 and C20. It provides a minimum of 45 – 55 dB of attenuation of the 2nd and higher harmonics.

RF INPUT SENSOR

An RF input sensor detects the presence of drive from the exciter to energize the Solid State Relay and bias circuit for Q1. It is made up of diodes D7 and D8, transistors Q2 and Q3, capacitor C35, and resistors R10, R11, R12, R13, R14, R15, R16 and R17.

SOLID STATE RELAY

The Solid State antenna switch relay (SSR) is activated by RF signal from the input of the amplifier through RF input sensor. The SSR circuit switches an RF signal through the amplifier during transmit and bypass it during receive cycle. It is accomplished by PIN diodes D2, D3, D4, D5, capacitors C30, C31, C32, C33, and inductors L14, L15 and L16. The PIN diode bias circuit consists of resistors R7, R8, R9, capacitors C22, C23, C24, C25, C26, C27, and inductors L10, L11, L12 and L13. Capacitors C29 and C34 prevent the bias voltage from appearing on the RF ports.

BIAS CIRCUIT

A bias circuit provides a temperature-compensated voltage to the gate of the RF power MOSFET which operates in a Class AB mode. This includes resistors R4, R5, R6, thermistor RT1, inductor L9, diode D1 and capacitor C21.

VOLTAGE REGULATOR

The voltage regulator provides the RF transistor bias supply and Solid State Relay supply. This includes integrated circuit U1, resistors R1, R2, and capacitors C1, C2, C3 and C4.