SPECIFICATIONS

VHF AIRCRAFT BAND RF AMPLIFIER
MODEL PA3-2AB-AIR-RS

1. Frequency Range:	118-136 MHZ
2. Operating Voltage:	24-28 VDC
3. Spurious & Harmonics:	70 dBc Typical
4. Input & Output Impedance:	50 Ohm
5. Power Gain:	10 dB Minimum
6. Input Power Range:	4-8 Watts
7. RF Power Output Flatness:	±1 dB
8. Insertion Loss on Receive:	<1 dB
9. RF Power Output:	25 Watts CW
10. Peak Envelope Power:	90 Watts PEP @ 90% Modulation 25W Carrier Power
11. Modulation Linearity:	6% Maximum Distortion @ 90% Modulation, 50W Carrier Power
12. Transmit Current:	3 Amps @ 25W CW
13. Standby Current:	220 mA
14. Operating Temperature:	-30°C to +60°C
15. Duty Cycle:	100%

OPERATIONAL DESCRIPTION

Model PA3-2AB-AIR, 25 Watt (100W PEP) Max. Linear Power Amplifier.
Test unit used for testing: Park Air 5610 ground-to-air transceiver, FCC ID C8L5610.

General:

DX radio Systems' Model PA3-2AB-AIR, 25 Watt Linear Power Amplifiers are designed to easily interface to the DX supplied Park Air 5610 line of AM transceivers (hereinafter referred to as 5610), and are intended to be used to increase the power output and hence, the operational range of these.

The interface between the antenna port of the 5610 and the input of the Power Amplifier is a coaxial RF cable. The antenna connects to the RF output terminal of the amplifier.

The amplifier is tuned for maximum performance and optimum current using its recommended tuning procedure, it may not be de-tuned to reduce output power. Power adjustment, if needed should be done at the transmitter of the transceiver (RV451) within the parameters of the relevant tuning instructions in the 5610 service manual.

Description:

Receive cycle (RX). In the receive cycle, the Carrier Operated Relay (COR), which is comprised of K1 and K2 on module 100817, is deactivated. In the "receive mode", signal from the antenna is fed via J2 (the amplifier's RF output port) to the 5610 via J1 (the amplifier's RF input port). The COR remains inactive as the RX signal is not capable of activating the carrier detect circuitry on the 100817 module.

During the transmit (TX) cycle, RF from the 5610 enters "RF IN" and C1 couples the signal to a RF detector circuitry comprised of D1, D2, C2 and C3. When RF is detected from the 5610's transmitter, a DC voltage of approximately 1.4 Volts is presented to the base of Darlington transistor Q1, which switches this transistor on, causing its collector to go low. When the collector of Q1 is low, relays K1 and K2 will activate, switching "RF IN" to the input of the Power Amplifier, and "RF OUT" to the output of the Power Amplifier. D3 and D4 are spike protection diodes and C6 functions as is RF filter/bypass capacitor. VCC enters module 100817 via pin-6 and pin-1 is ground.

Amplifier section. In order to allow the 5610 to operate at an optimum performance level, a 6 dB power attenuator (A1) is incorporated in the power amplifier's input circuitry. C1 is the input coupling (DC isolator) capacitor. C2, C3, C4, C5, C6 and C7, together with L1 and L2 form the input matching circuitry. C2 is tunable to fine-tune the network.

Q1 (MRF 317) is the RF Power transistor. Q1 receives its input voltage (VCC) through feed-through capacitor C34 and (collector coil) L4. C16 and C15 are RF-bypass/DC filter capacitors, respectively. Q1 is biased in class AB. Base voltage is supplied via R1, R2 and L3. The voltage into L3 is limited by power diode, D1 - - C35 and C17 are DC filter capacitors, C8 and C9 are RF bypass capacitors.

C14 is the output coupling (DC isolator) capacitor. C10, C11, C12 and C13 together with L5 and L6 form the output matching circuitry. C12 is tunable to fine-tune the network.

The Low-Pass Filter (LPF) is a quasi-elliptic 7-Pole Filter, it is comprised of coils L11, L12 and L13, and Capacitors, C24, C25, C26, C27, C28 and C29.

The amplified signal is passed through a dual directional coupler to the COR.

R5, D2 and C30 produce the voltage proportional to the "forward power" to the antenna. The forward voltage level is accessible at the output of feed-through capacitor, C33.

R7, D3 and C31 produce the voltage proportional to the "reflected power" from the antenna. The reflected voltage level is accessible at the output of feed-through capacitor, C32.

A thermostatically controlled fan (FAN 28VDC) is incorporated. SW1 is a 45° C thermostat which causes the fan to operate when the heat-sink temperature exceeds 45° C.

ALIGNMENT PROCEDURE

Model PA3-2AB-AIR, 25 Watt (100W PEP max.) Linear Power Amplifier.

TEST AND AUXILIARY EQUIPMENT REQUIRED/SUGGESTED.

Transceiver:	Park Air 5610 ground-to-air transceiver, "5610".
Test adapter:	Microphone plug with transmit (TX) switch and Audio port, "TA".
Service Monitor:	HP-8920B (or equivalent), "8920"
Oscilloscope:	Oscilloscope, "Scope"
DC/DC Converter:	VICOR VI-J12-EW (or equivalent) 24 to 12 V DC/DC Converter.
Power Supply:	Adjustable 0-35V DC, 5 Amp. min., "PS"
Digital Voltmeter:	High-impedance, capable of measuring 0-35V, "DVM".
Watt Meter:	Bird Through line (or equivalent), "Watt Meter I"
Watt Meter:	Bird Through line (or equivalent), "Watt Meter II"
Meas. Elements:	10W and 50W elements for above (100-250 MHz).
Load:	30dB, through-line 50 Ohm, 100W or compatible dummy-load, "Load"

General:

DX radio Systems' Model PA3-2AB-AIR, 25 Watt Linear Power Amplifiers are designed for 28V DC operation. The 5610 transceivers are designed to operate on 13.8V DC (12V nominal). For test and alignment, the 5610 is powered by a 28 to 13.8V DC/DC converter. Alternately, two power supplies (one 13.8V, 3A and one 28V, 3A) may be utilized.

Alignment:

Prior to power amplifier alignment and prior to connecting any equipment to the power supply, its output must be set and confirmed with the DVM. Upon completion, switch off the power supply!

Next, the DC/DC converter must be connected between the power supply and the 5610 (unless separate supplies are used). All critical parameters of the 5610 must be confirmed before the amplifier is connected to it.

To test the 5610, connect its output via Watt Meter I (10 Watt element) and the Load to the monitor port of the 8920, connect the Scope to the demodulated output of the 8920. Connect the test adapter (TA) to the microphone jack. Switch on the power supply and key the TX switch on the TA. Check to make sure that the power supply's current limiter, if so equipped, is not set too low, adjust it, if necessary. (The voltage at the power supply should remain at 28 Volts and must be reconfirmed during transmit, increase the limit as required). The 5610's output power should be set for 8 Watts and the distortion (@ 60% modulation) must be within specs. Unkey the TX switch and switch off the power supply!

Disconnect the Load from Watt Meter I and install the power amplifier's RF input to the output of Watt Meter I. Connect the second Watt Meter, Watt Meter II (50W element), to the RF output side of the amplifier and connect the output of this Watt Meter to the input of the Load.

Switch on the power supply, watch the power supply's current reading and monitor its voltage with the DVM. Next key the TX while watching the current and voltage. Increase the current limit to re-obtain 28V. (If the current is excessive, switch off the power supply and correct the problems.) If all appears normal, the amplifier can be tuned.

Reverse the element in Watt Meter I to read reflected power and switch the 8920 to its Spectrum Analyzer mode. Key the TX and tune C2 and C19 for minimum reflected power. Next, watch Watt Meter II and tune C12 and C20 maximum power (monitor the current meter - tune for best combination of lowest current, and maximum power). After this, tune the Low Pass Filter (LPF), by slightly expanding or compressing L11, L12, and L13 for best rejection of harmonics and best performance.

Switch on the modulation, and repeat the tuning of C12 and C20 for maximum power and least distortion (monitor the current meter, Watt Meter II and scope - - tune for best combination of lowest current and distortion and maximum power).

Next, repeat the above steps but with the 8920 in the Audio Distortion Analyzer position, fine tune C12 and C20 for minimum distortion at the best power output level and optimum current.

When the amplifier meets, or exceeds stated specifications, vary the power supply's voltage +/- 20% while observing the Spectrum Analyzer and Distortion Meter (8920). Although the output power varies proportionally, the amplifier may not become spurious, or exceed distortion and harmonic radiation specifications. Reset the voltage to 28V, then leave the transmitter keyed until the fan starts up.

Next, unkey the transmitter, switch the service monitor to the "generate" mode and verify that the Carrier Operated Relay (COR) passes the "receive" signal to the 5610.

Switch off the 5610 and switch off the power supply.