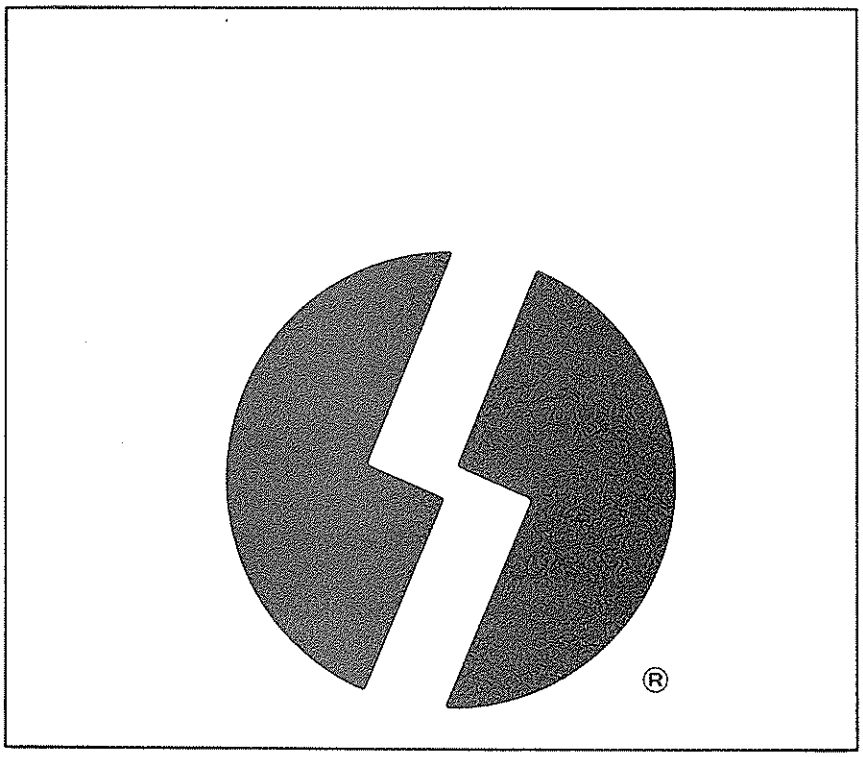
sunair



OPERATION AND MAINTENANCE MANUAL

SSB TRANSCEIVER

ASB—130

SUNAIR ELECTRONICS INC., 3101 Southwest Third Avenue, Ft. Lauderdale, Florida, U.S.A.

WARRANTY POLICY

AVIONICS DIVISION

Sunair Electronics warrants each equipment manufactured by it to be free from defects in material or workmanship, under normal use for which intended, for one (1) year from date of installation. Sunair will hereunder replace or repair (at Sunair's discretion) any defective components (EXCLUDING TUBES AND SEMI-CONDUCTORS).

Any such defective equipment (or component) shall be returned, transportation charges prepaid, to Sunair or to a Sunair authorized warranty station. Provided that the failure is within the terms of this warranty and is not due to damage, misuse, improper installation or unauthorized modification or repair, Sunair will, in addition to replacing component parts within specified periods, also assume warranty labor costs for ninety (90) days from date of original installation. Any such charges must be reasonable and for actual bench repair only and limited to a maximum of four (4) hours. Labor not directly related to correcting the defective condition cannot be honored.

THIS WARRANTY IS ESPECIALLY IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The obligation and responsibility of Sunair shall be limited to that expressly provided herein and Sunair shall not be liable for consequential or other damage or expense whatsoever therefore or by reason thereof.

Sunair reserves the right to make changes in design or additions to or improvements in its equipment without obligation to install such additions or improvements in equipment theretofore manufactured.

AD-7074 A

sunair electronics, inc.®

Last Manual 15 Feb 1971

0994990006 Shock mount 1

0999160001 Shock mount Pa 1010B NONE

0740740 Not in CPU

0744030005 Connector RF BNC 48

0752630008 Connector RF BNC 31

0747020001 Connect RF N 137

090873 Not in CPU

0744030005 RF BNC UG88 48

0747960001 Connector Power 16 Pin NONE

0747400008 Connector Power 34 Pin 10

0750930004 Connector Power 6 Pin 30

0751100005 Cable Clamp MS3057-6A 32

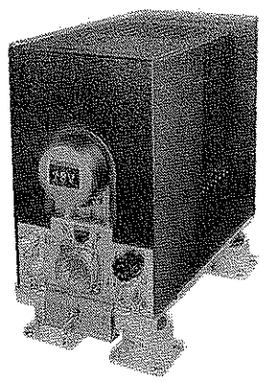
090873 Not in CPU.

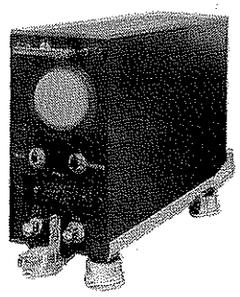
Part #

0994970005	Maintenance Manual
0994971001	Installation Manual
0994970013	

sunair electronics, inc.

3101 S.W. Third Avenue, Fort Lauderdale, Florida 33315 U.S.A.





Maintenance Manual

SSB COMMUNICATIONS EQUIPMENT

ASB-130

NOTICE

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION I

GENERAL INFORMATION

A. INTRODUCTION

The Sunair ASB-130 HF transceiver is a light-weight airborne, 10 channel, single sideband (SSB) and compatible amplitude modulated (AM), transmitting-receiving system for long range voice communications in the 2 to 18 MHz frequency range. The system consists of a remote mounted receiver/exciter and power amplifier/power supply and a panel mounted control head.

B. SPECIFICATIONS FOR ASB-130 HF TRANSCEIVER:

Type Accepted under FCC Rules and Regulations, Parts 83 and 87.

TSO'd under FAA Rules and Regulations Part 37, C31c & C32c; Environmental Category AAAAAX.

Frequency Range	2 to 18 MHz (No channel frequency restrictions).
Number of Channels	10 channels single frequency simplex with up to 8 channels double frequency simplex.
Channeling Time	Two seconds maximum.
Modes of Operation	Compatible AM USB LSB TEL (Public Correspondence)
Input Power - Receive	5.0 amps at 14 volts (ovens on) 2.5 amps at 28 volts (ovens on)
Transmit	25 amps at 14 volts (Peak-Full Modulation) 15 amps at 28 volts (Peak-Full Modulation)

TRANSMITTER:

Output Power	130 watts PEP nominal
Frequency Stability	± 20 Hz

Sidetone	Adjustable to 100 mw into 500 ohms
Duty Cycle	50%
Output Impedance	50 ohms
RECEIVER:	
Input Impedance	50 ohms
Frequency Stability	Single Frequency Simplex ±20 Hz Dual Frequency Simplex ±.0025%
Clarifier	Adjusts carrier oscillator for voice clarity ±100 Hz range.
Selectivity	AM: 5.5 kHz NMT 6 db 20.0 kHZ NLT 60 db SSB: fc +350 Hz and fc +2500 Hz NMT 6 db fc -2150 Hz and fc +5000 Hz NLT 60 db
Sensitivity	AM: NMT 2.0 uv for 6 db (S+N)/N SSB: NMT 0.7 uv for 10 db (S+N)/N
AGC	NMT 10 db change for 10 uv to 500,000 uv input (open circuit)
Audio Output	100 mw into 500 ohms 100 mw into 125 ohms
Audio Response	NMT 6 db from 350 Hz to 2500 Hz
Audio Distortion	AM: NMT 20% at rated output SSB: Third order 25 db below output
Spurious Response	NLT 60 db from .190 MHz to 150 MHz

C. EQUIPMENT SUPPLIED

		Sunair Part No.	Weight
Receiver/Exciter	R/E-1300 14V	99502	6.4 Lb.
	Or		
	R/E-1300 28V	99503	6.4 Lb.
Power Amplifier/Power	PA-1010B 14V	99392	7.7 Lb.

			Sunair Part No.	Weight
Control Head	SCU-13	14V	99504	1.0 Lb.
	Or			
	SCU-13	28V	99505	1.0 Lb.
Shock Rack For	R/E-1300		99499	0.6 Lb.
Shock Rack For	PA-1010B		99916	0.75Lb.
*Connector Kit			99498	0.4 Lb.
Manual			99497	---

*Kit does not include Antenna Coupler Connectors. See Interconnect Diagram for individual connector Part number.

D. EQUIPMENT REQUIRED BUT NOT SUPPLIED:

		Sunair Part No.	Weight
**Antenna Coupler w/Connectors	CU-110 (10 channel)	99816	4.6 Lb.
	Or		
	SAC-69 (Automatic)	99400	14.0 Lb.
Shock Rack For	SAC-69	99405	3.0 Lb.
***Fixed Wire Antenna Kit			
	Bare Wire Antenna	95146	
	Or		
	Anti-Precipitation Antenna	95158	
Electrical Reel Trailing Wire Antenna			
	ER-14 14V	96920	14.0 Lb.
	Or		
	ER-28 28V	96932	14.0 Lb.
Microphone, Shure Model	488T	87151	0.75Lb.
Installation Cables - Custom Made			

** Requires Fixed Wire Antenna.

*** Requires Antenna Coupler.

E. OPTIONAL EQUIPMENT (Not Supplied)

		Sunair Part No.	Weight
Control Head, Miniature	MCU-33 14V	99507	0.7 Lb.
	Or		
	MCU-33 28V	99508	0.7 Lb.
1 Coax. Relay Kit, 14V		98681	0.4 Lb.
Or			
1 Coax. Relay Kit, 28V		98693	0.4 Lb.
1 Switch, DPDT to operate Coax. Relay		32118	---
1 Meter, Relative Power		90859	---
1 Test Set, Less Cable		97818	---
1 Test Set Cable		99521	---

F. SYSTEM DESCRIPTION

1. Receiver/Exciter R/E-1300

The receiver/exciter is a compact solid-state remote mounted compatible AM and single sideband receiver and exciter unit. This unit has an operating frequency range between 2 and 18 MHz. It may be mounted in any convenient space, either in the vertical or horizontal configuration by desired assembly of the shock rack.

2. Power Amplifier/Power Supply, PA-1010B

The PA-1010B power amplifier/power supply unit contains the RF driver amplifier, the RF power amplifier and the power supply. This unit contains a HI-LO power switch for use during antenna tuning operations and contains the system A+ fuse. The PA-1010B amplifies the RF signals from the exciter and delivers the RF power to the antenna system from a 50 ohm output.

The PA-1010B is remote operated and may be mounted in any convenient space. Channeling is accomplished by means of a rotary solenoid. Vibration and shock isolation are provided by the shockmount.

3. Control Head

control head (SCU-13), and the miniature control head (MCU-33).

Control Head Functions:

a) ON-OFF/VOLUME. This control activates the power relay in the PA-1010B power amplifier/power supply and controls the audio gain of the receiver.

b) CHANNEL SELECTOR. Selects the proper transmitter and receiver circuitry in the receiver/exiter, power amplifier/power supply and the antenna load unit.

c) MODE. This control selects the desired mode of operation. Modes available are USB, AM, TEL and LSB (optional).

d) CLARIFIER. The clarifier adjusts the pitch of the receiver single sideband signal for optimum clarity by varying the carrier oscillator frequency.

e) SQUELCH. The squelch control disables the receiver audio and sets the threshold of signal required for reception.

f) INDICATOR. A meter mounted in the control head (SCU-13) or in the instrument panel (MCU-33) indicates relative radiated power of the power amplifier/antenna system.

4. Accessories

The ASB-130 HF transceiver can be used with either a fixed antenna system or a trailing wire antenna. A fixed antenna system includes a fixed antenna, either bare or anti-precipitation type, with an antenna coupler tuned to the antenna. A trailing wire antenna, either manual or electrical, may be installed in place of the coupler and fixed antenna, or may be included as a back-up antenna with a coax change-over relay.

SECTION II

INSTALLATION

A. UNPACKING

Adherence to the suggestions and instructions contained in this section will assure an easier and more satisfactory installation of the ASB-130 transceiver.

Unpack and inspect all parts and equipment as soon as received. Do not accept a shipment where there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage, or if any evidence of damage is noted, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier.

If concealed damage is discovered after a shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report of the damage should also be forwarded to Sunair. Include the following:

a) Order Number
b) Model and Serial Number
c) Name of transportation agency

When Sunair receives this information, arrangement will be made for repair or replacement.

B. INSTALLATION CONSIDERATIONS AND MOUNTING INFORMATION

The location and installation of the ASB-130 transceiver will depend on the type of aircraft in which the equipment is to be installed. However, the following general requirements, applicable to all types of aircraft, should be considered when planning the installation.

1. Type and Location of Antenna to be Installed

It is recommended that a fixed antenna with an antenna coupler be installed as the primary antenna system. If this is not desirable, or a secondary or back-up system is required, then a trailing wire antenna may be installed. If an antenna coupler is installed, it is recommended that it be placed where it is accessible while in flight, if possi-

in flight. Refer to the Coupler Manual for mounting information.

2. Some Factors to Consider Before Installing a Fixed Antenna:

a) Recommended type and length:

Length	Type Antenna	Type Aircraft
45'	Straight, End-Fed	Transport
34'	Straight, End-Fed	Heavy Twin
25'-29'	VEE, End-Fed	Light Twin, Single
*23'-25'	Straight, End-Fed	Light Twin

*Recommended only when lowest frequency is above 5 MHz.

Antenna radiation efficiency is highest when the antenna aperture is greatest. Therefore, it is advantageous to use as long an antenna as is practical. Where antenna length cannot be achieved with a straight antenna, the VEE antenna may be used. This antenna usually runs from fuselage to vertical stabilizer to wingtip.

Straight antennas are recommended when icing may be a factor. On lighter aircraft this antenna runs from the nose compartment over the cockpit and terminates on the vertical stabilizer.

Other antenna configurations are available for helicopters, high speed aircraft and special problem installations. Sunair Customer Service will provide suggestions for special requirements.

b) Location of the antenna coupler

The antenna coupler should be located within 12 inches of the feed-through insulator.

c) Antenna Wire

Antenna wire should be one of the following two types:

2) Anti-precipitation static wire with a tensile strength of 250 pounds.

3. Installation Considerations of the Control Head

The Control Head should be installed on the instrument panel in a location that permits the controls to be easily read and comfortably reached. Consult the mounting outline dimensions, shown in Figure II-1 or II-2, for the space required.

4. Installation Consideration for the R/E-1300 and the PA-1010B

The R/E-1300 and the PA-1010B should be located so that they are accessible for inspection and maintenance, and in an area that is free from excessive vibration and heat. Installation dimensions are shown in Figures II-3 and II-4.

5. Static Dischargers

It is recommended that static dischargers be installed on the aircraft. Consult the aircraft manufacturer for type and location.

6. Microphone

A noise cancelling, transistorized microphone, Shure Model No. 488T, or equivalent, is recommended for use with the ASB-130.

C. INSTALLATION INSTRUCTIONS

1. Installation of the Control Head

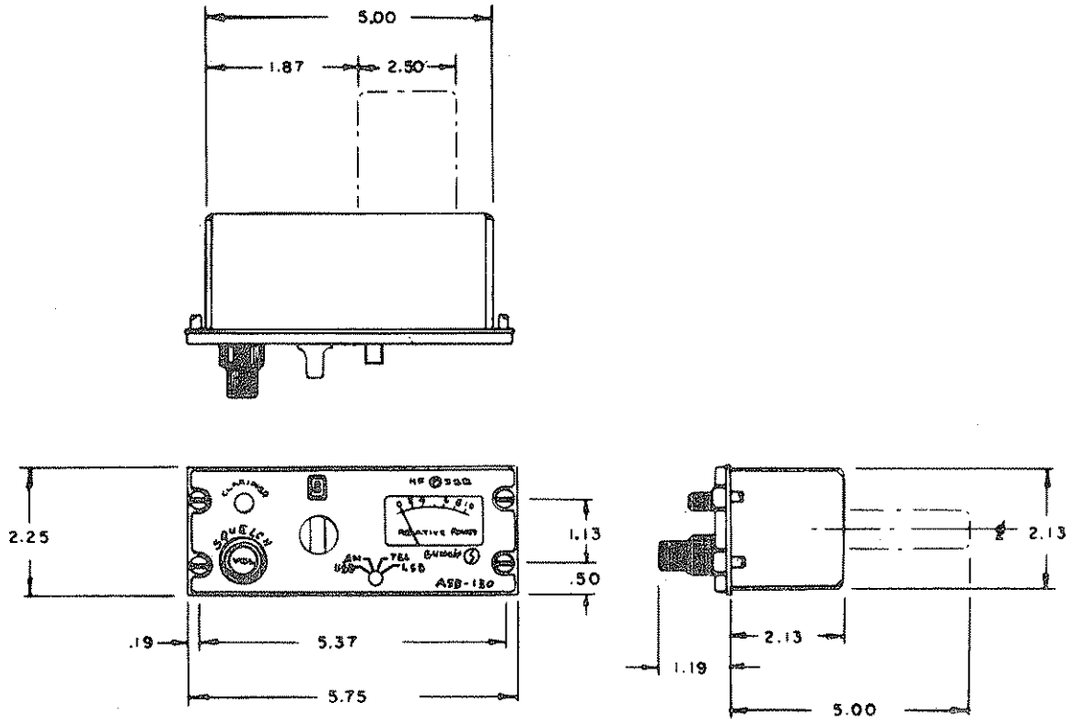
The control head should be mounted within convenient view and reach of the operator.

a) SCU-13

Installation dimensions for the SCU-13 control head are shown in Figure II-1. The SCU-13 is designed for installation in a standard AN console panel.

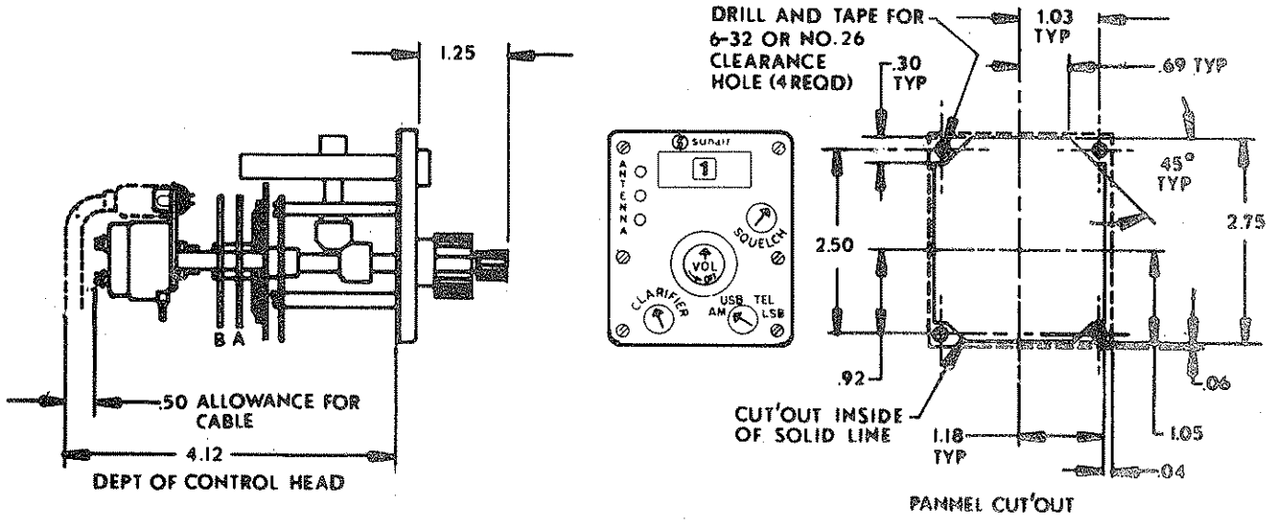
b) MCU-33 (optional)

Installation dimensions for the MCU-33 control head are shown in Figure II-2. The MCU-33 is designed for use in



MOUNTING DRAWING, ASB-130 CONTROL HEAD (STANDARD)

FIGURE II-1 INSTALLATION DIMENSIONS, SCU-13 CONTROL HEAD



MOUNTING DRAWING, ASB-130 CONTROL HEAD (OPTIONAL)

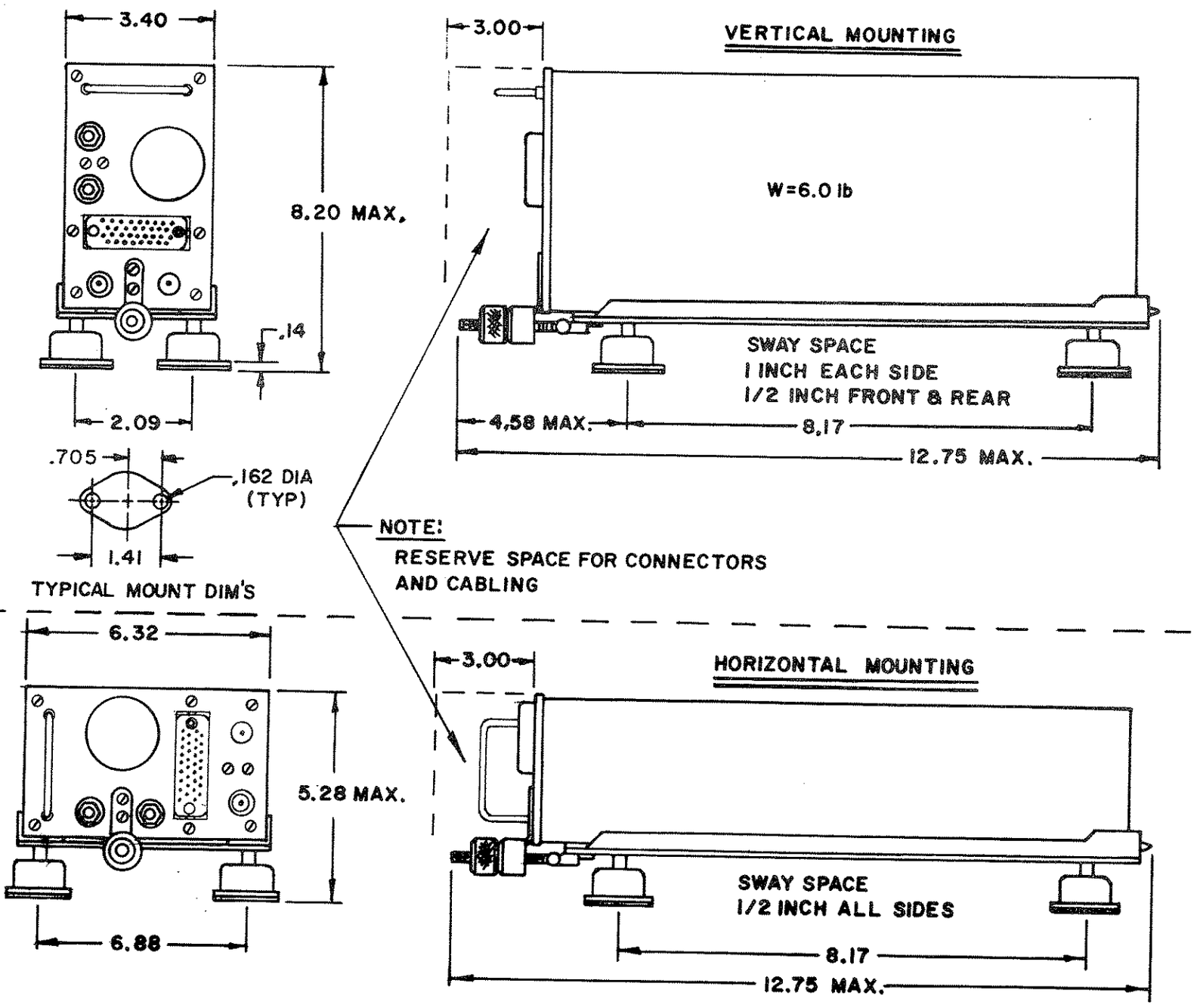
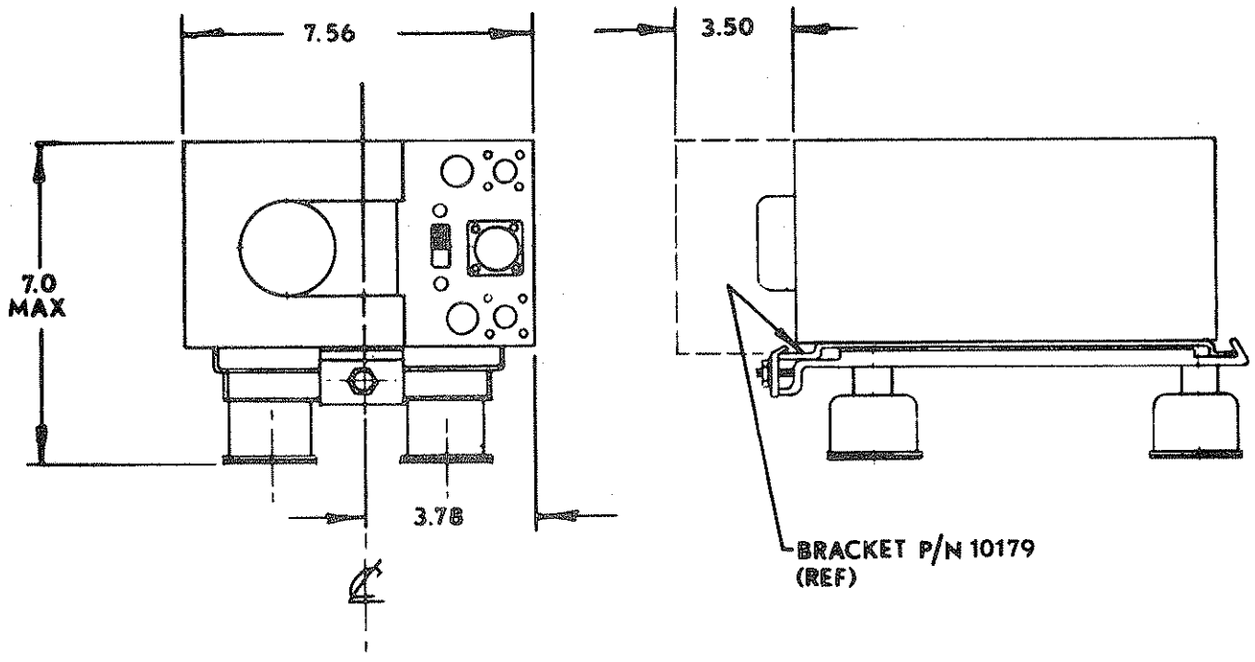
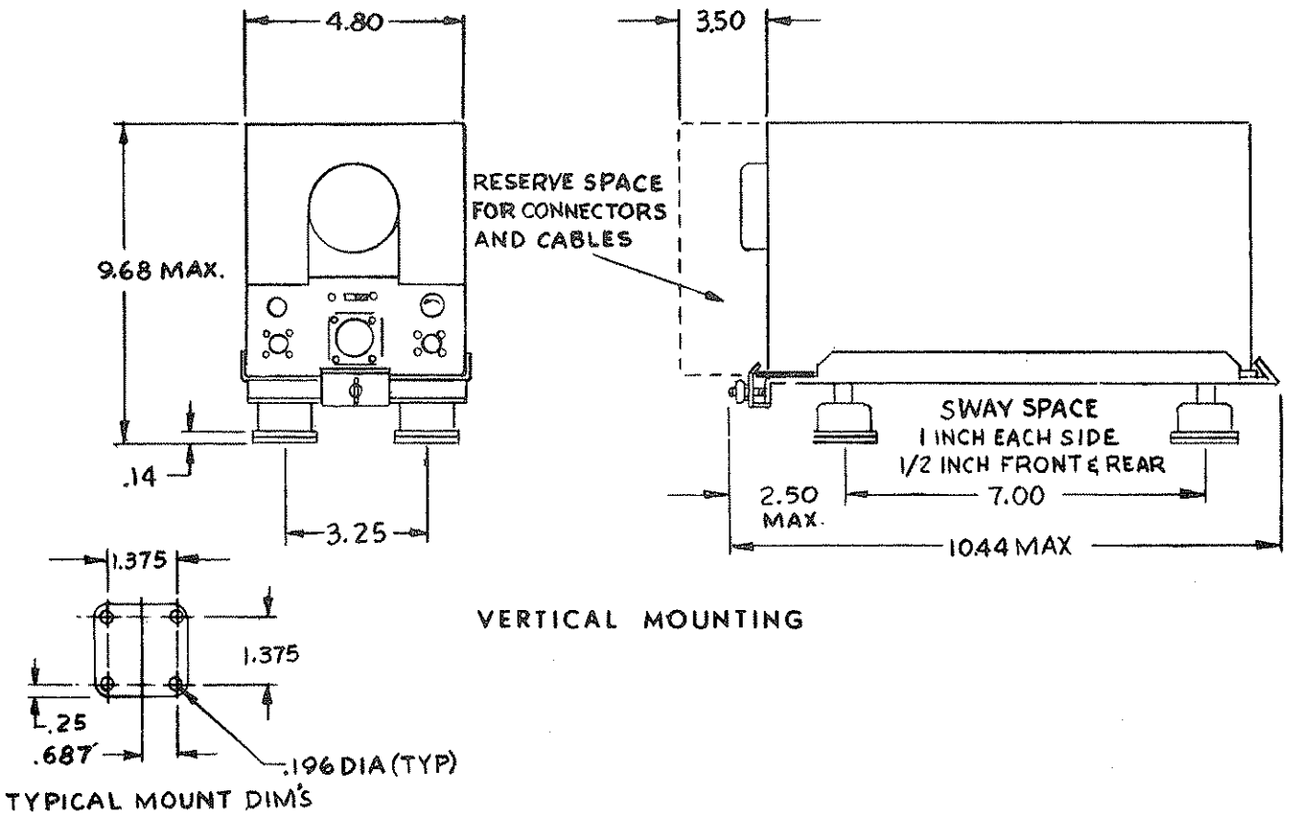


FIG. II-3
INSTALLATION DIMENSIONS, R/ 1300 RECEIVER/EXCITER



SIDE MOUNTING OPTION



VERTICAL MOUNTING

TYPICAL MOUNT DIM'S

2. Installation of the R/E-1300

The R/E-1300 can be mounted in either a vertical or horizontal position. The standard mounting position is vertical. The installation dimensions are shown in Figure II-3.

To change the mounting position of the R/E-1300 shock rack:

a) Remove the fastener and ground straps from the shock-mount.
b) Remove the four shock isolators.
c) Remove the six screws holding the side rails to the front and rear brackets.
d) Rotate the front and rear brackets 90° and align side rail holes to front and rear bracket holes.
e) Install the six screws for securing the side rails to the front and rear brackets.
f) Replace shock isolators, fastener and ground straps.

To change the mounting position of the R/E-1300 Receiver/ Exciter unit:

To change the mounting position of the R/E-1300 Receiver/ Exciter unit:

a) Remove the dust cover from the unit.

b) Remove the back plate.

c) Remove the locating pin on the top of the back plate and re-install pin in the hole not being used.

d) Replace back plate.

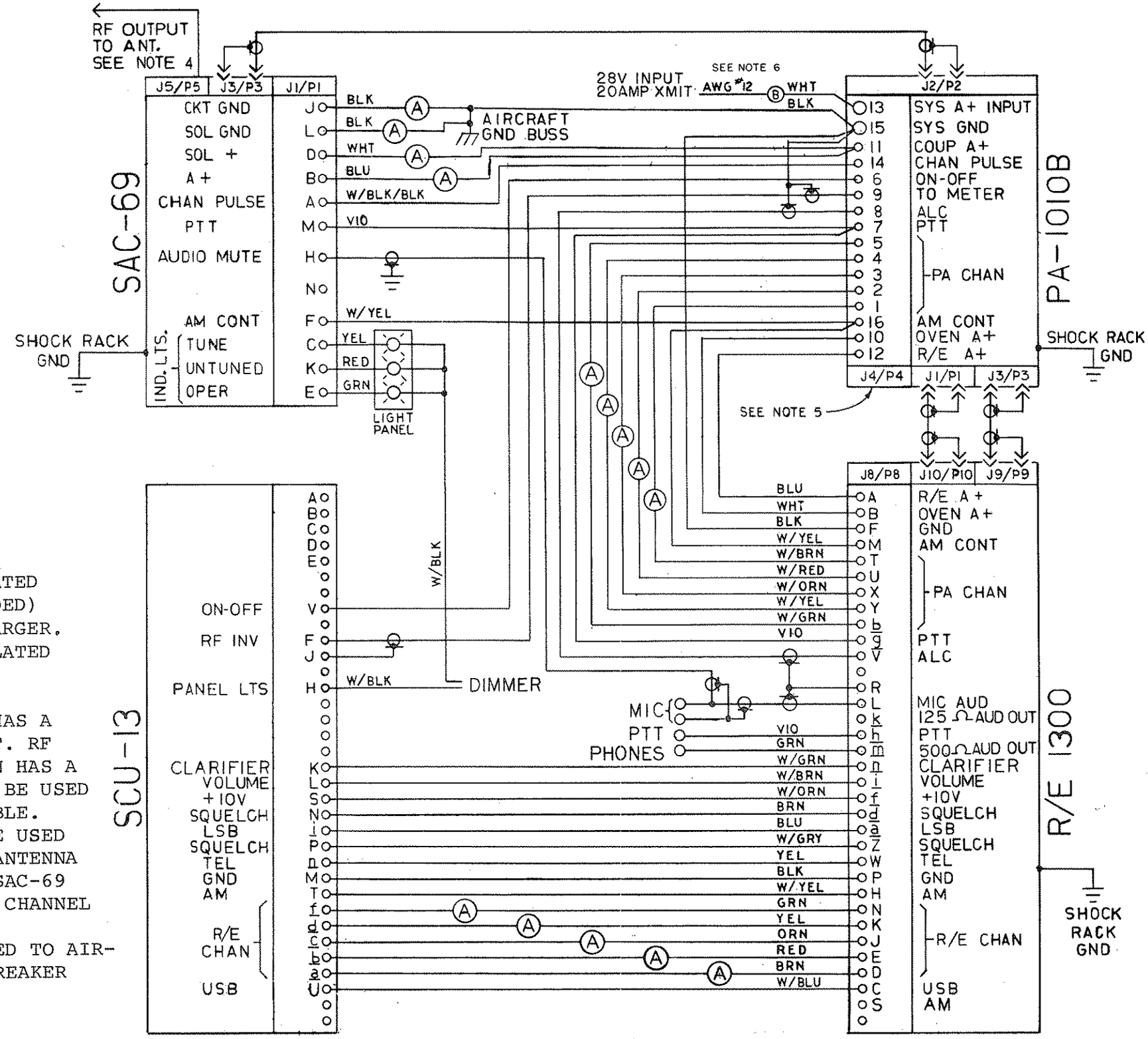
e) Change location of the retaining hook on the front panel.

f) Replace dust cover.

3. Installation of the PA-1010B
Installation dimensions are shown in Figure II-4. This unit may also be mounted horizontally by using adapter plate, Sunair Part No. 10179.
4. Installation of Antenna Coupler

Refer to proper Antenna Coupler Manual for installation and tuning procedures.

D. INTERCONNECTING WIRING



NOTES:

1. UNLESS OTHERWISE INDICATED WIRES (INCLUDING SHIELDED) SHOULD BE AWG #24 OR LARGER.
2. ALL SHIELDED WIRE INSULATED TYPE
3. COAX CABLE RG-58 A/U
4. SAC-69 STANDARD MODEL HAS A FEEDTHRU STUD RF OUTPUT. RF OUTPUT CONNECTOR OPTION HAS A TYPE "HN" CONNECTOR TO BE USED WITH RG-8/U COAXIAL CABLE.
5. PA-1010B MODIFIED TO BE USED WITH SAC-69 AUTOMATIC ANTENNA TUNER. SEE SEC 11-12 SAC-69 MAINTENANCE MANUAL FOR CHANNEL PULSE MODIFICATION.
6. A+ INPUT TO BE CONNECTED TO AIR-CRAFT SYSTEM CIRCUIT BREAKER

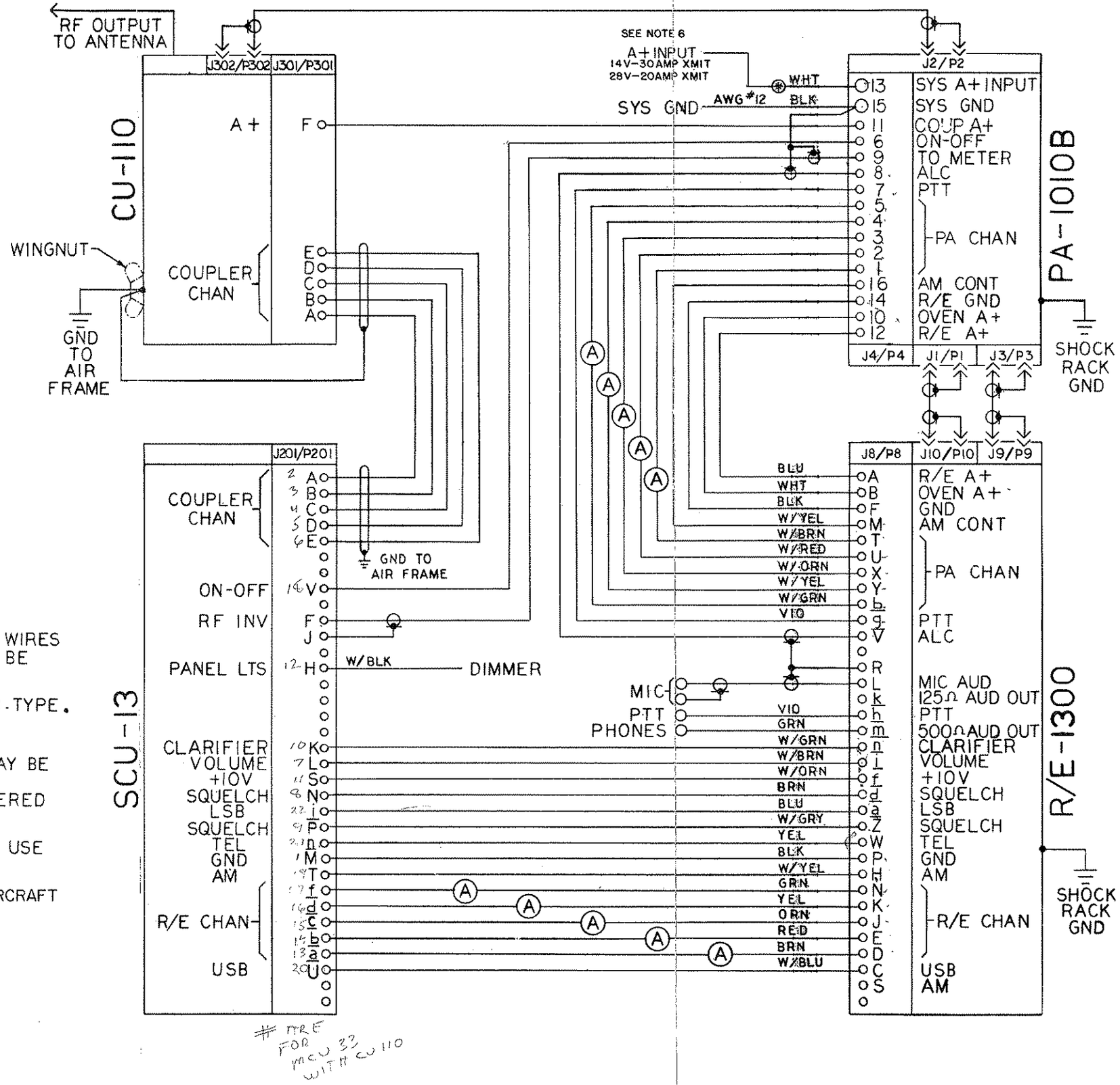
SIZE	
A	LESS TH MORE TH LESS TH MORE TH LESS TH MORE TH
B	LESS TH MORE TH LESS TH MORE TH LESS TH

SYM		
R/E-1300	P8 P9 P10	34 PIN "BNC", 'BNC',
PA-1010B	P1 P2 P3 P4	"N", TY "UHF", "BNC", CANN
SCU-13	P201	34 PI
SAC-69	P1 P5 P3	AMPH (OPTI 'N', TY

INTERC

ASB-13

F



SIZE	LENGTH	SIZE AWG
A	LESS THAN 12 FT	#20
	MORE THAN 12 FT, LESS THAN 20 FT	#18
	MORE THAN 20 FT, LESS THAN 31 FT	#16
	MORE THAN 31 FT	#14
B	LESS THAN 10 FT	#16
	MORE THAN 10 FT, LESS THAN 18 FT	#14
	MORE THAN 18 FT, LESS THAN 35 FT	#12
C	LESS THAN 12 FT	#12
	MORE THAN 12 FT, LESS THAN 20 FT	#10
	MORE THAN 20 FT, LESS THAN 35 FT	#8

SYM		TYPE	PART NO.
R/E-1300	P8	34 PIN RECTANGULAR	74740
	P9	"BNC", TYPE UG-88/U	74403
	P10	"BNC", AMPH NO. 14625	75263
PA-1010B	P1	"N", TYPE UG-536B/U	74702
	P2	"UHF", TYPE PL-259	90873
	P3	"BNC", TYPE UG-88/U	74403
	P4	CANNON "SK" SERIES, 16 PIN	74726
SCU-13	P201	34 PIN RECTANGULAR	74740
CU-110	P301	PLUG, MS TYPE, 6 PIN	75093
		HOOD FOR P301	75110
	P302	COAXIAL PLUG, TYPE "UHF"	90873

ED WIRES
ULD BE

TED-TYPE.

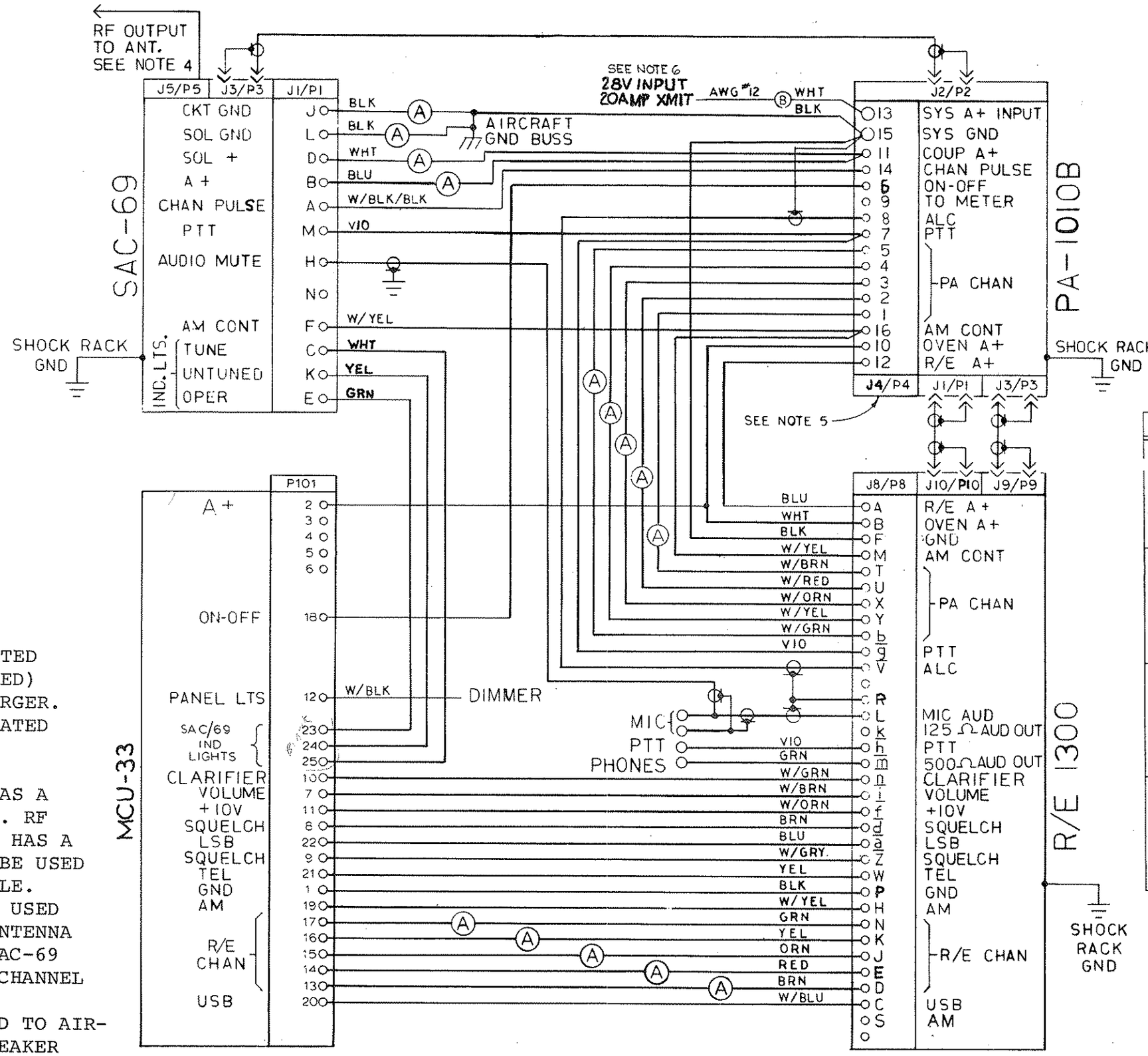
S MAY BE
OR
COVERED

28V USE

D AIRCRAFT

INTERCONNECT DIAGRAM, ASB-130/CU-110 SYSTEM

FIGURE II-6



NOTES:

1. UNLESS OTHERWISE INDICATED WIRES (INCLUDING SHIELDED) SHOULD BE AWG #24 OR LARGER.
2. ALL SHIELDED WIRE INSULATED TYPE
3. COAX CABLE RG-58 A/U
4. SAC-69 STANDARD MODEL HAS A FEEDTHRU STUD RF OUTPUT. RF OUTPUT CONNECTOR OPTION HAS A TYPE "HN" CONNECTOR TO BE USED WITH RG-8/U COAXIAL CABLE.
5. PA-1010B MODIFIED TO BE USED WITH SAC-69 AUTOMATIC ANTENNA TUNER. SEE SEC 11-12 SAC-69 MAINTENANCE MANUAL FOR CHANNEL PULSE MODIFICATION.
6. A+ INPUT TO BE CONNECTED TO AIR-CRAFT SYSTEM CIRCUIT BREAKER

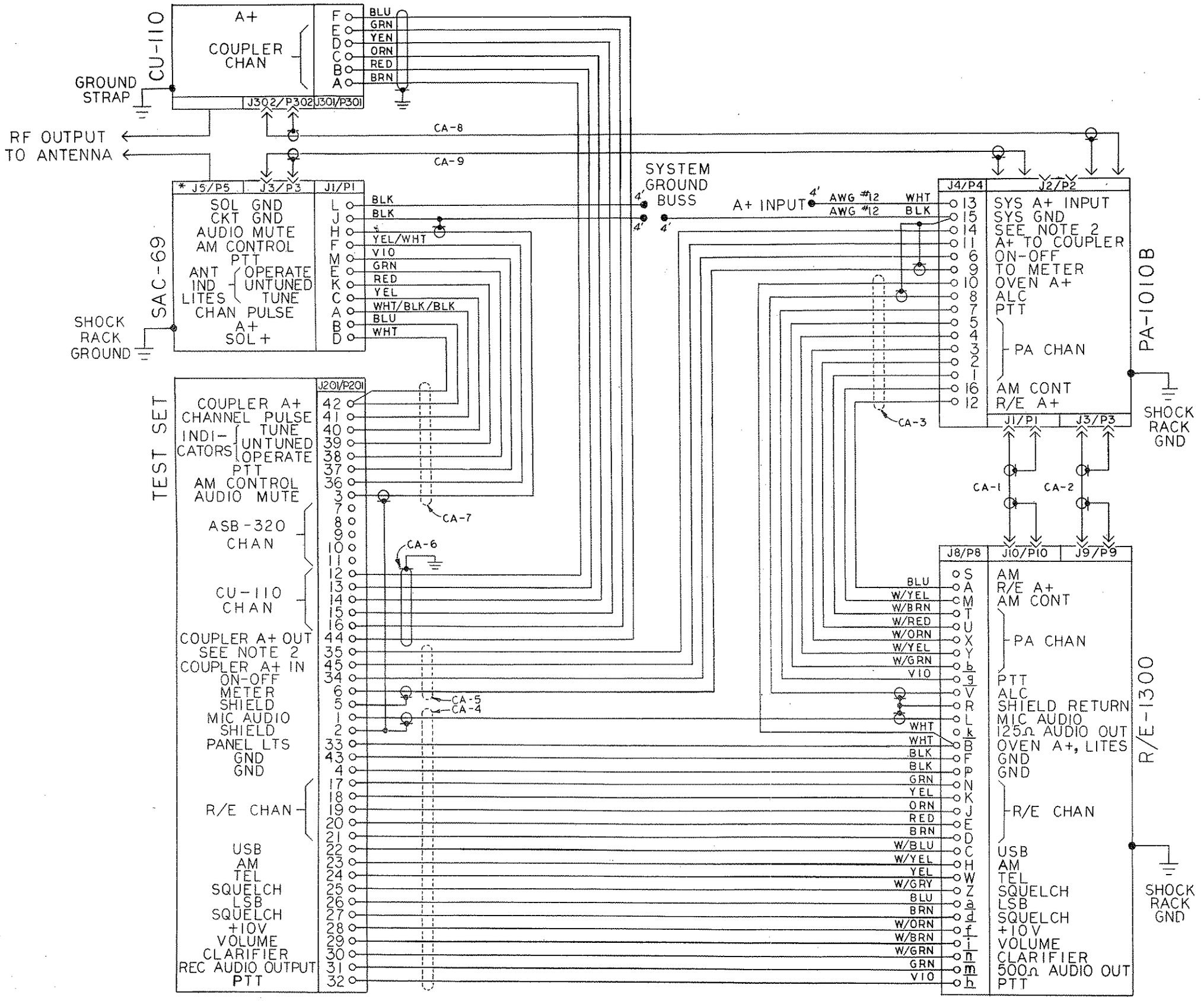
SIZE	
A	LESS MORE LESS MORE LESS MORE
B	LESS MORE LESS MORE LESS

SYM		
R/E-1300	P8 P9 P10	34 PIN "BNC", "BNC",
PA-1010B	P1. P2 P3 P4	"N", TY "UHF", "BNC", CANN
MCU-33	P101	25 PIN
SAC-69	P1 P5 P3	AMPH (OPTI "N", T

INTE

MCU-3

F



SYM		
TEST SET	P201	45 PIN CLAMP
R/E-1300	P8	34 PIN
	P9	"BNC", T
	P10	"BNC", A
PA-1010B	P1	"N", TYP
	P2	"UHF", T
	P3	"BNC" T
	P4	CANNON
CU-110	P301	PLUG, M
	P302	HOOD F COAXIAL
SAC-69	P1	AMPH N
	P3	TYPE "N
	*P5	(OPTIONAL

NOTES:

1. UNLESS OTHERWIS SHIELDED) SHOUL
2. PIN 34 OF J201 (T (PA-1010B) IS AT IS OPERATED WI WHEN SYSTEN IS AUTOMATIC ANTE MANUAL FOR MO PA-1010B
3. CABLES CA-1 TH 4 FEET EACH, CABLES CA-8 A
4. CA-1, CA-2, CA-8 RG-58A/U. CA-6 TYPE.

9. Volume

   With receiver unsquelched, rotate volume control clockwise and check for increase in audio output.

10. Clarifier

    Select a channel that has SSB traffic and vary clarifier knob and note change in voice pitch.

11. After the system has been checked using ground power, start the aircraft engine(s) and turn all equipment on. Check all channels for any interference or noise from any of the other equipment. Sources of noise and interference would be generators, alternators, power supplies, and motors. Filters may have to be installed to eliminate any noise and interference present.

12. It is recommended that a test flight be made to check the performance of the system in flight. Antenna tuning should be monitored and if detuning occurs in flight, the coupler should be repeaked.

SECTION III

OPERATION

A. GENERAL

The ASB-130 HF transceiver is simple to operate, requiring only a knowledge of the type of emission required for the channel; either sideband, AM or telephone for public correspondence. All controls are located on the control head mounted in the aircraft panel.

B. OPERATING CONTROLS

CONTROL	FUNCTION
OFF-GAIN	Applies power to system via relay in PA-1010B and controls receiver audio gain.
MODE	USB - For upper sideband operation AM - For compatible AM operation and full AM reception. TEL - For upper sideband with reduced carrier (Used for public correspondence telephone, ship-to-shore). LSB - (Option) For Lower sideband operation (Not legal in U.S., Canada and most other countries).
CLARIFIER	Used to "clarify" single sideband speech during RECEIVE.
CHANNEL SELECTOR	Selects desired channel. Also selects AM Mode if channel frequency is 2003 kHz, 2182 kHz, or 2638 kHz. (Automatic AM Required).

C. OPERATING PROCEDURE

Step 1: Turn the aircraft master power switch to ON.

Step 2: Turn the OFF-GAIN control clockwise and allow 5 minutes warm-up for sideband and one minute for AM operation.

Step 3: Select the desired channel with the CHANNEL SELECTOR.

Step 4: Select the proper modulation with the MODE switch.

Step 5: Turn the SQUELCH counterclockwise and adjust the audio GAIN for normal noise output, then slowly adjust the SQUELCH clockwise until the receiver is silent.

Step 6: When an RF signal is received, adjust the CLARIFIER for maximum signal clarity.

Step 7: To transmit, select HF COMM with the microphone selector on the aircraft instrument panel and then depress the microphone button and talk. Speak only loud enough for midscale swings on the REL PWR meter while in SB. PA Hi/Lo power switch must be in Hi position.

In AM operation, the meter should indicate 1/4 to 1/2 scale when the microphone is keyed. When speaking into the microphone, the meter needle should move just slightly.

The meter indicates total system operation, including antenna system tuning. If the antenna system is detuned, the meter will indicate a lower output. For complete detuning, the meter will show zero or even a negative deflection, indicating that the antenna system must be checked.

D. LEGAL REQUIREMENTS FOR USE

Legal use of this equipment requires that it be included on the Aircraft Station License in the United States and most foreign countries and that the operator have at least a Restricted Radiotelephone Operator's Permit. These documents may be obtained from the Federal Communications Commission.

For sideband operation in the United States, Canada and various other countries, ONLY UPPER SIDEBAND MAY BE USED. Use of lower sideband is prohibited.

ONLY AM TRANSMISSIONS ARE PERMITTED ON THE FREQUENCIES 2003 kHz, 2182 kHz, and 2638 kHz. The switching for these frequencies is performed automatically upon channel selection.

SECTION IV

PRINCIPLES OF OPERATION

A. GENERAL

This section contains the principles of operation for the ASB-130 HF transceiver.

In single sideband (SSB) transmission, only one sideband is used to carry the intelligence. The carrier is suppressed and the unwanted sideband is filtered out, leaving the desired sideband. Thus the entire power capability of the transmitter is utilized to transmit only the necessary portion of the signal. There is no output from the transmitter except when speech modulation is present. For this reason, SSB transmitters are rated in peak envelope power (PEP).

In compatible AM transmission, again only the upper sideband is transmitted. However, the carrier is not suppressed and, therefore, is also transmitted. Since only one sideband is transmitted, this form of emission is essentially still single sideband but with a full carrier, which the receiver uses as the reference for detection.

The ASB-130 operates in two modes - single sideband and compatible AM. In the compatible AM mode, the carrier is reinserted so that the signal can be received by a standard AM receiver for those stations which do not have SSB capability. In the United States, the Federal Communications Commission requires that only this mode be used on certain frequencies (2003, 2182 and 2638 kHz). The capability to automatically switch to the AM mode when using these frequencies is provided in the exciter in order to comply with this requirement.

Since the two units are primarily transceivers for light aircraft, size and weight have been kept small. The receiver/exciter unit is completely transistorized and, therefore, requires very little power for operation. The power amplifier uses pentodes for final power amplification to 130 watts peak envelope power (PEP). Frequency stability is maintained by crystal-controlled oscillators housed in ovens at a constant +65°C to insure precise frequency stability. A regulated voltage supply for the oscillators further insures frequency stability. A warm-up time of five minutes is required to allow the crystals to reach their operating temperature and the frequency to stabilize.

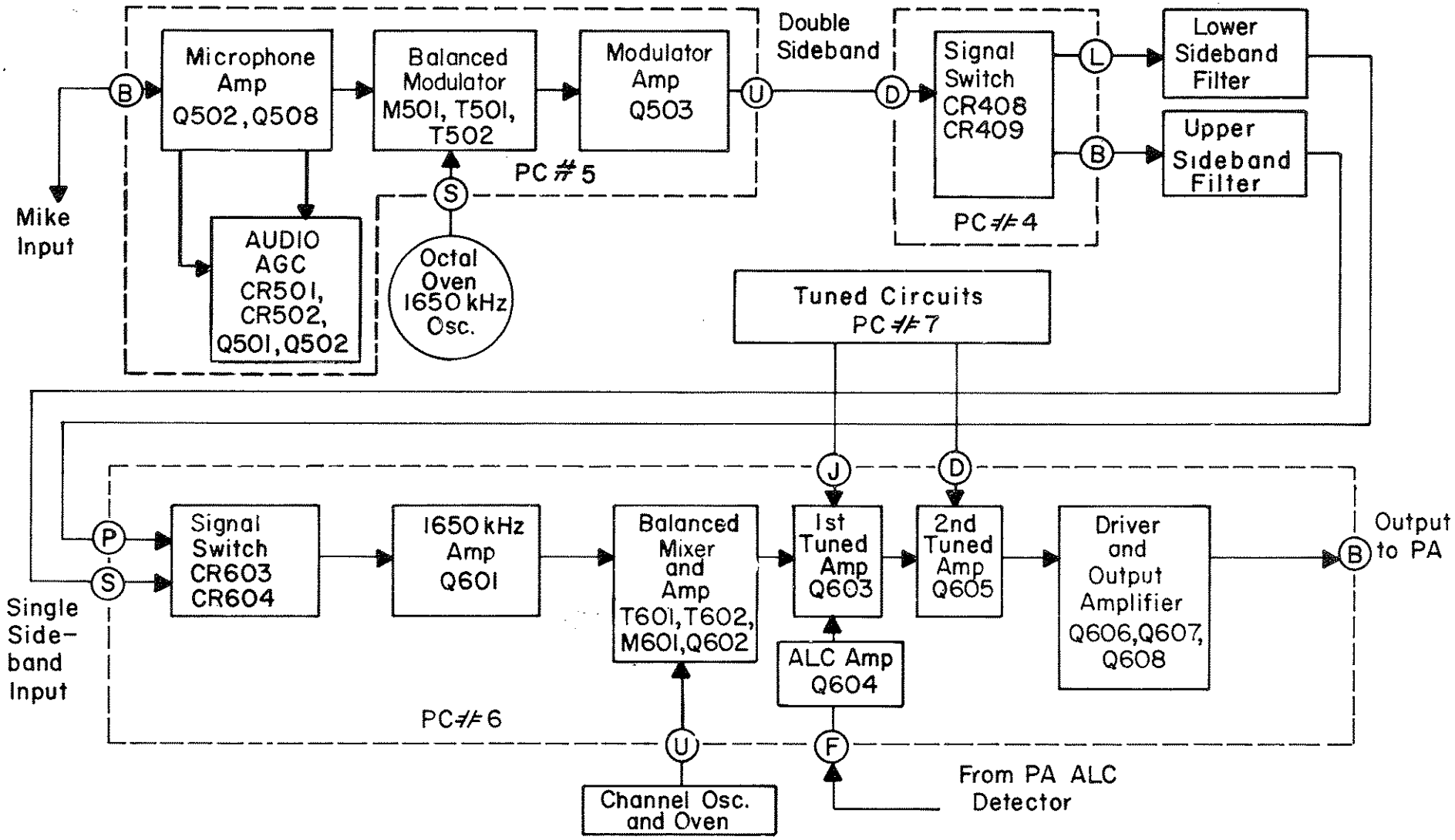


Figure IV-1
Block Diagram, Exciter

The units can operate on either 14 or 28 VDC nominal voltage, negative ground. Each unit is wired for an A+ voltage of 14 or 28 volts at the factory and can only be converted by replacing certain components and making several wiring changes. See Section VIII.

Nominal voltage to most circuits in the receiver/exciter is +10VDC regulated by a series transistor regulator.

Final power amplification requires +420 VDC, +840 VDC and -32 to -62 VDC furnished by the power supply converter.

B. EXCITER

The receiver/exciter unit contains all transmitter circuitry except for the final power amplifiers, which are contained in the separate power amplifier unit. Figure IV-1 is a block diagram of the basic elements of the exciter. The component numbers in the blocks refer to the symbols on the P.C. Board schematic diagrams.

1. Microphone Amplifiers PC-5

The microphone amplifier provides current to the microphone and amplifies the voice signal in Q502 and Q508. Diodes CR501, CR502, and transistors Q507 and Q501 detect and respond to any high input audio signal and will limit the amount of audio input to the balanced modulator. This audio AGC circuit allows the ASB-130 to be used with different types of microphones without gain adjustments. Either a carbon or a transistorized microphone may be used. Potentiometer R535 is automatically switched in when AM is selected in order to control the signal level for correct AM modulation percentage. R535 is used to adjust the AM modulation percentage.

2. Balanced Modulator, PC-5

The output of Q508 is connected to the balanced modulator via R511, the audio balance control for the diode quad, M501. Two diodes of the ring modulator are switched on with one-half cycle of the 1650 kHz carrier oscillator and the other two diodes are turned on with the other half cycle. When no audio is present, there is no signal to unbalance the modulator and the output from the modulator amplifier, Q503, is reduced approximately 35 to 40 db below that present when audio is present. The output of Q503 with audio is a double sideband suppressed carrier

signal that has been transformed up to 1650 kHz.

3. Carrier Reinsertion, PC-5

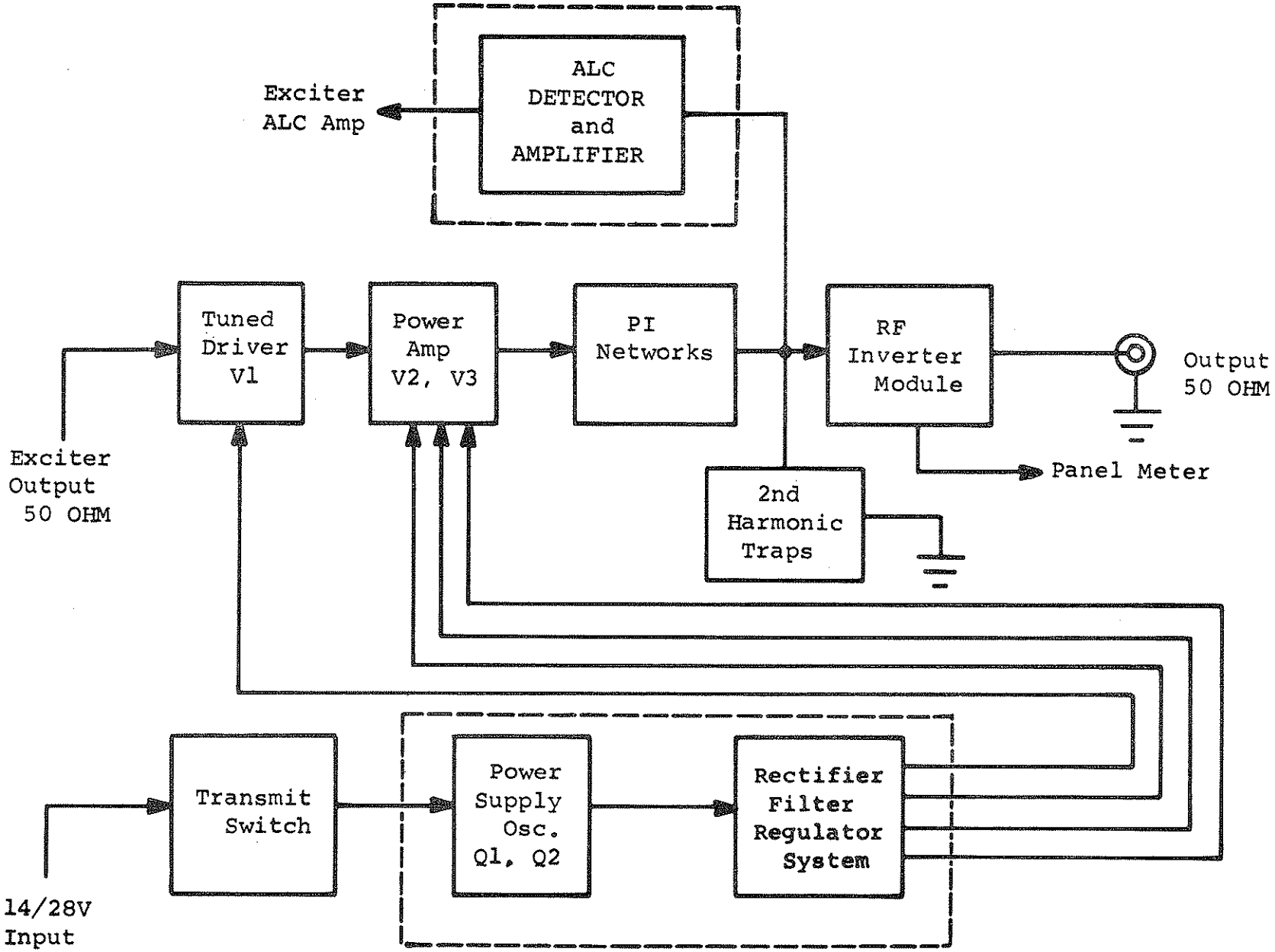
For AM operation, it is necessary to reinsert the carrier since it has been suppressed in the balanced modulator. This is accomplished by the mode switch applying +10V to Pin "J" which turns on diodes CR505 and CR507 and allows the 1650 kHz carrier to be routed to PC-6, Pin "P". The 1650 kHz reinserted level is controlled by C519. Since the United States Federal Communications Commission requires AM operation only on 2003, 2182 and 2638 kHz, it is necessary to automatically switch to AM if any of these frequencies are installed and selected by the operator. This is accomplished by connecting the appropriate channel switch position to either Pin "E", "F" or "H" on PC-5. Upon selection of one of the restricted frequencies, the 1650 kHz carrier is automatically reinserted as described above.

Another mode of emission used in the public correspondence AT&T System in the United States is the TEL mode. When selected, this allows a small amount of carrier to be transmitted which is used by the ground station to activate the ringer and lock the receiver to the transmit frequency. For this mode of operation, the carrier is transmitted 16 $\pm$2 db below peak envelope power. The mode switch when in the TEL position applies +10V to Pin "M", turning on diode switches CR504 and CR506 and allows the carrier to be routed to PC-6, Pin "P". Carrier level is controlled by R517.

4. Balanced Mixer, PC-6

The outputs from the two sideband filters are connected to PC-6, Pin "P" for USB operation and Pin "S" for LSB operation. As above, the mode switch applies +10V to diode switches to select the correct filter, CR604 for USB and CR603 for lower sideband. The selected sideband signal is routed to amplifier Q601 whose collector drives transformer T601, whose tuned secondary (1650 kHz) couples out-of-phase (Push-Pull) signals to the diode ring M601. The channel oscillator is connected to the center tap of the secondary of T601.

The balanced output transformer, T602, will cancel the channel oscillator frequency since equal current flows in both halves of T602 primary. Circuit balance is achieved by the transformer being wound balanced, and the setting of



Power Amplifier/Power Supply, PA-1010B
Figure IV-2

R-609. The output of the mixer is the sum and difference of the channel oscillator and the 1650 kHz signal component and is applied to the wide band amplifier Q602. The tuned amplifiers, Q603 and Q605, whose tuned circuits are on PC-7, are tuned to the difference component of the two frequencies. The source follower, Q606, emitter follower, Q607 and amplifier Q608 are used as power amplifiers to transform the impedance and drive the remote power amplifier from a 50 ohm source.

5. ALC Amplifier, PC-6

The ALC amplifier is a PNP device which receives its drive from the ALC detector located in the power amplifier. As the power output of the final amplifier increases, the drive signal on Pin "F" decreases, which increases the conduction of Q604 and drives the collector more positive. This applies degenerative bias to the source of Q603 and reduces the gain of the amplifier and subsequent power output of the system. The opposite events occur when the final amplifier power decreases.

C. POWER AMPLIFIER/POWER SUPPLY, Figure IV-2

The purpose of the PA/PS unit is to amplify the low level signal from the exciter to a power level of 130 watts PEP for sideband operation and 30 watts average for AM emission.

1. Driver, V1

The exciter signal from the wide-band amplifier in the receiver/exciter unit drives the control grid of the tuned amplifier, V1. The signal, which has been at a relatively low level throughout the previous portions of the exciter is now amplified approximately 30 db to drive the final amplifier.

2. Power Amplifier, V2, V3

The final amplifier stage is a linear amplifier operated class AB1 and consists of two tubes, V2 and V3. For linear operation, zero signal tube current is set to 30 ma per tube by adjusting R110. This corresponds to approximately -60 VDC bias level and 0.3 VDC on each of the two cathodes. If V2 or V3 is replaced, they should be checked for approximately equal zero signal current. For 130 watts PEP output with a standard two-tone test signal input, the power

input to each tube is approximately 84 watts average; 100 ma with plate voltage at 840 VDC.

3. ALC Detector and Amplifier

The ALC detector receives an input from the 50 ohm output of the power amplifier. The peak DC voltage produced by the diodes CR-1405 and CR-1406 is proportional to the power output and frequency compsensated by C-1405 and C-1408 for SSB and AM respectively.

The DC voltage from the detector is applied to the ALC amplifiers which operate in two distinct modes. In SSB operation Q-1401 becomes forward biased by the DC output of CR-1406 and keeps Q-1402 cutoff. However, the DC output from CR-1405 is applied to the differential input of IC-1401 thru threshold adjustment R-1403. If the voltage on Pin 7 of IC-1401 exceeds the voltage set by the divider R-1405 and R-1406 on Pin 1, IC-140 conducts. The negative pulse developed across R-1412 is then coupled thru diode CR-1402 to the ALC amp. on PC-6 resulting in a reduction of output power. If the voltage on Pin 7 of IC-1401 is decreased by the adjustment of R-1403 or there is a decrease in output voltage the output power will increase. In AM operation Q-1401 is initially reverse biased by the voltage on the wiper of R-1402. The DC produced by CR-1406 and applied to the gate of Q-1402, if sufficient to overcome the reverse bias on the source, causes Q-1402 to conduct and a reduction in power results. If the voltage on the gate is decreased by the adjustment of R-1404 the power is increased. Q-1401 now acts as a limiter. As the carrier is modulated the reverse bias on Q-1401 is overcome and the DC level at the gate of Q-1402 is not allowed to increase any further. This causes the AM modulation peaks to double the carrier value or approach to PEP output on SSB. IC-1401 prevents the peaks from increasing beyond the present level of SSB PEP.

4. Pi Network

The output from amplifiers V2 and V3 is connected to a tuned, capacitive input pi network that transforms the plate impedance to a 50 ohm resistive output and attenuates harmonics of the fundamental frequency. Second harmonic traps are connected to the output to further attenuate the second harmonic to greater than 60 db below the fundamental frequency.

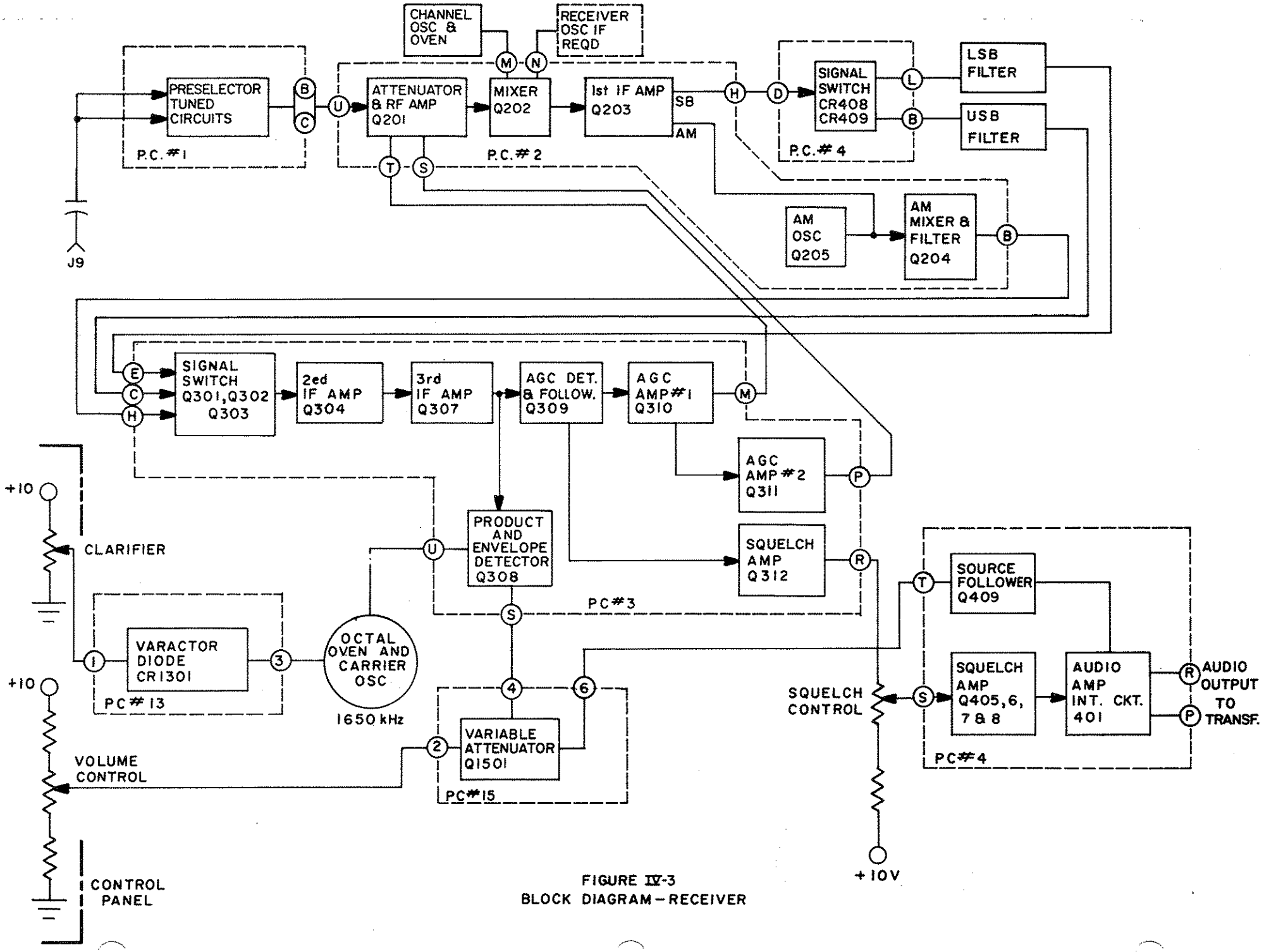


FIGURE IV-3
BLOCK DIAGRAM – RECEIVER

5. Resultant Power Detector

The detector is designed as a standing wave detector and will detect standing waves in the forward and reverse direction and with respect to the amplifier output. The two detected signals are added algebraically and connected to the meter in the control panel. Therefore, for 100% reflected power, the detector output would be zero and the meter would read zero. For a perfect match, the reflected power is zero and the meter would be driven to maximum deflection.

6. Power Supply

The Power Supply furnishes high voltages for the driver, V1, and the power amplifier, V2 and V3. A+ voltage is supplied to transistors, Q101 and Q102, which are connected to the square loop transformer, T101. The transistors and transformer form an oscillator circuit that oscillates at approximately 1 kHz and couples a square wave output to the bridge rectifiers, CR-101-CR-104, and half wave rectifier, CR-105. The output of the bridge circuit is approximately 840 VDC for the two final amplifiers. The 420 VDC centertap of the output winding supplies 300 VDC to the driver, V1, thru R15. High B+ is generated by the oscillator only when the microphone is keyed and relay K101 actuated. Rectifier CR-105 output is -32 to -62 VDC and is the bias supply for V2 and V3. The 420 VDC output is also regulated by CR-3 and CR-4 at approximately 250 VDC and is the screen grid supply for V2 and V3. Regulating the grid supply results in improved power stability and linearity over input voltage variations.

D. RECEIVER, Figure IV-3

The receiver operates as a single sideband or an AM receiver. The principal difference between the two modes is that double conversion is used for AM, single conversion for SB, and signal demodulation for AM is an envelope detector and a product detector is used for SB.

The receiver oscillator frequency is crystal controlled and, depending upon the number of two frequency simplex channels installed in the radio, is derived from the transmit oscillator, receiver oscillator or a combination of both. The oscillator theory is contained in Section IV-E.

1. Preselector Tuned Circuits, PC-1

A three section tuned circuit selects the signal for each channel and is contained on PC-1. The input signal from the antenna relay is connected directly to PC-1 via two coax cables and pins on each end of the board and presented to all of the input diodes. The BNC connector, J9, is isolated from the chassis and the coax shields are then only rf grounded on PC-1. This reduces circulating rf currents and maintains the image frequency greater than 60 db below signal level. The channel switch applies +10V to the selected channel which forward biases one diode and reverse biases all others and allows the signal to pass only throught the selected three section filter which is tuned to the channel frequency. The output diodes are connected to Pins "B" and "C" and are selected and reverse biased the same as the input diodes.

2. RF Amplifier Mixer, PC-2

The output from the preselector tuned circuits is connected to Pin "U" of PC-2 and goes through a variable attenuator which is controlled by AGC #2 amplifier. High level signals therefore are attenuated before they reach the base of the RF amplifier, Q201, which is an untuned broad band amplifier whose gain is controlled by AGC #1 amplifier. The output of the RF amplifier is connected to mixer Q202. The oscillator is injected at the base of Q201. (Two oscillators may be installed, dependent upon frequency requirements, see IV-E for description of oscillators). Mixing action takes place in the FET amplifier and the difference product, 1650 kHz, is selected by the drain tuned circuits.

3. First IF Amplifier, AM Conversion, PC-2

The output of the mixer is connected to Q203, the first IF amplifier. Two outputs are taken from Q203, one from the drain is routed to PC#4 for USB or LSB selection and the output from the source is connected to Q204, the AM mixer. Q206 serves as the oscillator ON-OFF switch. When the mode switch is in the SB position, +.6 is applied to Pin "E", which turns on Q206, grounds the drain of Q205 and inhibits the AM oscillator. For AM operation, Q206 is off which allows Q205, the AM oscillator (1195 or 2105 kHz) to start. The receiver AM output from Q204 is connected to Q206 along with the oscillator signal. The difference frequency (1650-1195 = 455 kHz or 2105-1650 = 455 kHz) is selected in the collector load, which is a 455 kHz band-pass filter. In order to reduce the effects of oscillator harmonics, the

AM oscillator frequency may be 1195 kHz or 2105 kHz, depending upon channel frequency.

4. IF Amplifiers, PC-3

The SB output from Q203 is switched by the circuitry on PC-4 and is routed through the selected SB filter to PC-3, Pin "E", for LSB operation and Pin "C" for USB operation. The output of the AM filter is connected directly to Pin "H". The mode selector switch applies +10V to one of the three transistor switches Q301, Q302, or Q303. The selected transistor is forward biased allowing the signal to appear at the emitters along with the turn-on DC voltage which back biases the unselected transistor switches. Q304, the second IF amplifier, and Q307, the third IF amplifier, increase the signal level sufficiently for the detector and AGC system. Q307 has two drain loads, one for SB tuned to 1650 kHz and the other for AM tuned to 455 kHz. The correct load is selected by diodes CR-301 and CR-302. For SB operation, the switching ckts. apply 10V to Pin "K" which forward biases CR-301 and connects the 1650 kHz load to Q307. The 10V on Pin "K" turns on Q305 which removes the base drive from Q306 which turns off the transistor and removes the forward bias from CR-302 and isolates the 455 kHz load from Q-307. The signal is then routed to the AGC detectors, CR-303 and CR-304, and audio detector, Q308.

5. AGC and Detector, PC-3

The AGC system controls the gain of the second IF amplifier, Q-304, the RF amplifier, Q201, and the input attenuator. The input attenuator AGC is voltage delayed and does not take effect until after AGC-1 has reduced the gain of Q304 and Q201. The two diodes CR-303 and CR-304 form a voltage doubler detector to rectify the IF output and is amplified by Q309, Q310, and Q311. R-330 controls the point that Q311 begins conducting by taking current through the attenuator diodes and increases the signal loss through the attenuator. The squelch amplifier, Q312, also receives its drive from Q309, the detector emitter follower. The emitter of Q312 is connected to the panel mounted squelch control potentiometer which sets the level of squelch operation.

The detector, Q308, receives its signal from the third IF amplifier, Q307. For SB operation, the input is 1650 kHz and the detector serves as a square law product detector which requires an input from the 1650 kHz carrier oscillator for detection. The resultant outputs are the audio signal and multiples of the 1650 kHz oscillator. The high fre-

quencies are filtered out by the pi-filter C329, R326 and C330, leaving only the audio component. R336 in the source of Q308 is set for optimum dynamic range capability of Q308. For AM operation, the oscillator is turned off and Q308 serves as an envelope detector conducting only on positive half cycles. The pi-filter removes the 455 kHz component leaving the audio envelope which is taken from Pin "S" and connected to the drain of Q1501, the variable attenuator, used to adjust the audio input to PC-4. Bias is provided from the volume control located on the control head.

6. Squelch and Audio Amplifier, PC-4.

The wiper arm of the squelch control potentiometer is connected to Q405 base and provides the DC control voltage for operation of the squelch system. An increase in signal level or a resetting of the potentiometer toward A+ will cause the base voltage of Q405 to increase which makes the emitter of Q406 increase until the diode CR411 starts to conduct and the collector of Q406 will decrease. Q407 starts to cut off which removes drive from Q408. This reduces the current through Q408 which reduces the voltage across CR411 and allows Q406 to conduct harder. This regenerative action continues until Q408 is turned off and the voltage on Pin 11 of the audio amplifier, integrated circuit IC401, increases enough to turn on the amplifier. When the signal decreases below the threshold the reverse action occurs but not in a regenerative fashion and therefore is slower.

The audio amplifier is an integrated circuit and supplies more than 100 milliwatts of audio power to the audio output transformer. Receiver audio is connected to Pin 10 from the drain of Q1501, variable attenuator via Q409. Input to the audio amplifier is approximately 30 to 50 millivolts and output approximately 7 to 10 volts.

The sidetone from the exciter is also amplified by the audio amplifier. The desired sidetone level is set by R423.

E. OSCILLATORS

The standard transceiver has two oscillators, a 1650 kHz carrier oscillator and a channel oscillator used for transmit and receive. The channel oscillator may contain up to ten crystals which can be used in both the receive and trasmit mode if the frequencies are the same, commonly termed "simplex." However, if one or more channels have different receive and transmit frequencies, commonly termed "two frequency simplex,"

the number of channels must be reduced accordingly to utilize a maximum of ten crystals. This could be 5 transmit and 5 receive, each a two frequency simplex channel, or 6 and 4, 4 two frequency simplex requiring 8 crystals and two simplex channels requiring two crystals for a total of ten.

However, there is an optional receive oscillator that can house eight crystals that may be installed in the space for the optional lower sideband filter. This increases the transceiver capacity to 18 crystals, which could be 10 transmit channels of which 8 could be two frequency simplex and two simplex or nine two frequency simplex channels with a blank tenth channel as the crystal capacity does not allow for more than 18 crystals.

1. Carrier Oscillator 1650 kHz, PC-10

The carrier oscillator and crystal are housed in an octal plug-in oven immediately behind the front panel. The oven temperature is maintained at +65° C. over an ambient range of -54° C. to +55° C. Since the oscillator is also in the oven, frequency stability is maintained within two cycles over the above temperature range. Warm-up time of the oven from -54° C. to oscillator stabilization time is about 6 minutes.

The carrier oscillator is activated during both receive and transmit, being used in the balanced modulator for transmit and the product detector for receive. In order to provide a tunable oscillator during the receive function for natural voice clarity on SB, provision is made to vary the oscillator by a control labeled "Clarifier". This varactor diode is activated only during receive and will not affect the oscillator frequency during transmit.

During the receive function, 10V is applied to pin 4 of the octal socket through R5 and CR2 which back biases CR1001 and shunts the 1650 kHz crystal to ground through L1301 and CR1301, the varactor diode. The remote clarifier control provides bias for CR1301, and can now vary the oscillator 100 Hz about the 1650kHz center frequency. During transmit, 10V is removed from pin 4 and applied to pin 8 through R4 and CR3. This voltage turns on CR1001 and connects the 1650 kHz crystal to ground through C1001 which bypasses and inactivates the "Clarifier" control. The oscillator is set on frequency by C1003 (accessible through inner enclosure cover) while in the transmit mode. The oscillator supply voltage is also applied by the switching voltage through L1001.

2. Channel Oscillator, PC-8, PC-9

The channel oscillator and crystals are housed in the 10 crystal rectangular oven mounted to the chassis. The oven temperature is maintained at +65° C. over the ambient range of -54° C. to +55°C. Since the oscillator is also housed in the oven, stability is maintained to within ±20 Hz. The oscillator is an integrated circuit connected as a wideband amplifier with feedback. The feedback loop gain is controlled by the channel crystals which allow the oscillator gain to exceed unity only at the resonant frequency of the crystal. The crystal channel selection and crystal trimmer circuitry are contained on PC-9, mounted directly below the oven on the bottom of the chassis. The channel switch applies 10V from the program board to the selected channel. This turns on one of the diodes, CR901-CR910, back biasing the other diodes and connects the selected crystal into the circuit of the oscillator feedback loop. Correct crystal capacity and frequency trimming are provided by three capacitors for each channel mounted on PC-9. The 36pf capacitor is a temperature compensating type. The trimmer capacitor, 2-8pf, allows the channel crystal to be set to the exact frequency. The oscillator may be used for both receive and transmit, depending upon the number of crystals required. Programming the oscillator for transmit and/or receive is done on the program board, which will be discussed in the switching section.

3. Receive Oscillator Option, PC-11, PC-12

This oscillator is installed only as an optional accessory when two-frequency simplex operation requires more than 10 crystals in the radio. The electrical design of this oscillator is identical to the channel oscillator discussed in Paragraph 2 of this Section. Mechanically, the oscillator is packaged on two PC boards and housed in a can similar to the SB filter can. It is mounted in the same space as occupied by the lower SB filter, which is also an optional accessory. Therefore, only one or the other may be installed.

Only receive two-frequency simplex crystals are installed in the receiver oscillator. That is, all simplex channels (same transmit and receive frequency) utilize a single crystal housed in the oven. Additionally, if the total number of crystals does not exceed 10, with some channels being two-frequency simplex, the receive crystal will also

	R/E-1300					CU-106,110 CU-1000 GCU-1000					R/E-1300					PA-1010B				
	Master S1-B					Slave					Master S1-C					Slave				
CHANNEL	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
1	x	o	o	x	x	o	x	x	o	o	x	o	o	x	o	o	x	x	o	x
2	o	o	x	x	o	x	x	o	o	x	o	x	o	x	o	x	o	x	o	x
3	o	x	x	o	x	x	o	o	x	o	o	x	o	o	o	x	o	x	x	x
4	x	x	o	x	x	o	o	x	o	o	o	o	o	o	x	x	x	x	x	o
5	x	o	x	x	o	o	x	o	o	x	o	o	x	x	x	x	x	o	o	o
6	o	x	x	o	o	x	o	o	x	x	x	x	x	x	o	o	o	o	o	x
7	x	x	o	o	x	o	o	x	x	o	x	x	o	o	o	o	o	x	x	x
8	x	o	o	x	o	o	x	x	o	x	o	o	o	x	o	x	x	x	o	x
9	o	o	x	o	x	x	x	o	x	o	o	x	o	o	x	x	o	x	x	o
10	o	x	o	x	o	x	o	x	o	x	o	o	x	x	o	x	x	o	o	x
R/E-1300	A	B	C	D	E	J8 Pins					F	H	J	K	L					
CU-106,110 CU-1000 GCU-1000	J301 Pins					A	B	C	D	E										
PA-1010B											J4 Pins					1	2	3	4	5

An "x" indicates connection of switch wafer terminals A, B, C, D, or E to pin F.

An "o" indicates connection of switch wafer terminals A, B, C, D, or E together.

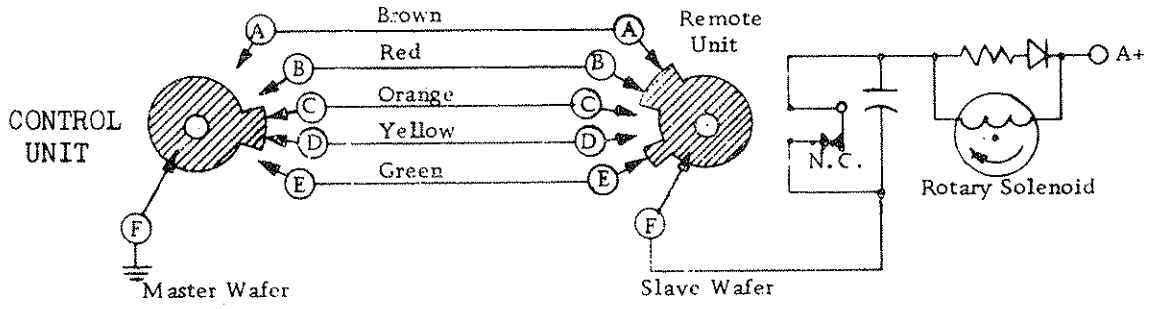
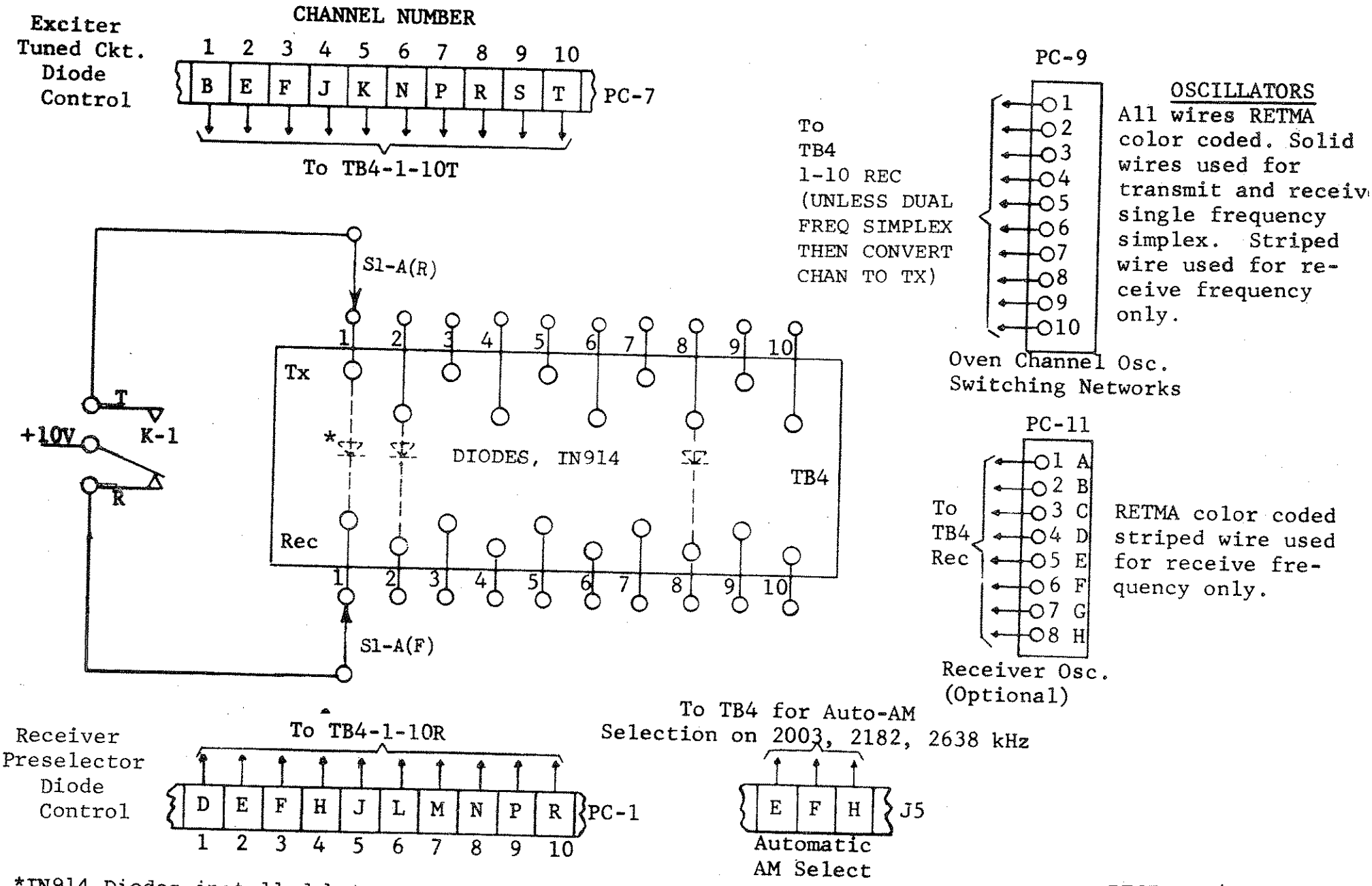


Figure IV-4

Channel Switching Code Diagram



*IN914 Diodes installed between Tx and Rec pins of same channel when one oven crystal is used for Tx and Rec. (Single Frequency Simplex).

RECEIVER/EXCITER
CHANNEL SWITCHING
FIGURE IV-5

be installed in the oven. However, if the total crystal requirements exceed ten, which requires installation of the receiver oscillator function, then all two-frequency simplex receive crystals will be installed in the receiver oscillator module. This could take the form of eight channels, four being two-frequency simplex, for a total of 12 crystals. Then eight crystals would be installed in the oven and four crystals installed in the receiver oscillator module. Of the eight crystals in the oven, all eight would be used for transmit and four of the eight would also serve as the receive crystal for the four single frequency simplex channels. The four two-frequency simplex channel receiver crystals would be installed in the receiver oscillator module. This method would allow the addition of two channels at a later date with no change in the original crystals. This is necessary as the transmit and receive two-frequency simplex crystals cannot be interchanged because the transmit crystals are cut to operate at +65°C. and the receiver module crystals at +25° C.

The receiver oscillator channel line-up is programmed by the wiring on the program board. Channel A in the receiver oscillator is the lowest channel number two-frequency simplex channel; channel B the next, and so forth up to a maximum of eight receive only crystals.

F. CHANNEL SWITCHING CONTROL AND SYSTEM WIRING

1. Solenoid Channeling

The basic channel switching functions are controlled by two master switch wafers located in the control panel, and one master wafer located in the Receiver/Exciter. SW1 controls the antenna coupler solenoid. SW2 controls the Rec./Exc. solenoid, which in turn controls the solenoid located in the power amplifier.

The solenoid motors are controlled by a coded five wire system connected to the master wafers in the receiver/exciter and control panel. The channeling diagram for the PA, coupler and receiver/exciter is shown in Figure IV-4. A+ voltage is wired to the rotary solenoids and if the corresponding master wafer is rotated to a new position, an A+ return or ground is provided for the solenoid and it rotates, moving its slave wafer, until all five wires are open circuited and current ceases to flow.

2. Receiver/Exciter Control Wiring, Figure IV-5

All receiver/exciter channel control wires from S1-a are terminated on TB4, which is mounted directly under the wafer switches. Switch S1-A is a two-pole, ten-position rotary switch. The pole S1-A, front, (side toward front panel back plate) controls the receiver and is connected to the bottom of the ten pins of TB4 on the receive side. The rear side, S1-A, is the transmit side and is connected to the bottom of the ten pins of TB4 on the transmit side. 10V receive and transmit is supplied to S1-A through the change-over relay K1. The channel switch S1-A must provide +10V to the following functions in the receiver/exciter:

(1) PC-1, receiver preselector.

(2) PC-9, channel oscillator.

(3) Receiver oscillator (if installed).

(4) PC-7, exciter tuned circuits.

(5) PC-5, Pins "E", "F", "H" for automatic AM selection if 2003, 2182 or 2638 kHz is installed in radio.

When a single frequency simplex channel is installed in the radio, the same crystal is used for both transmit and receive. This crystal is housed in the channel oscillator oven and the selection network is on PC-9. PC-9 central wires are connected to the receive terminals of TB-4. When relay K1 is in the transmit position, 10V is supplied through switch S1A rear and diode CR8-17 to the selected TB-4 transmit terminal and then to PC-9, PC-7 and PC-5, if applicable. When the microphone switch is released, relay K1 returns to the receive position and 10V is now applied to the receive side of TB-4 and subsequently to PC-1. Since the channel is single frequency simplex, a diode must be installed between the transmit and receive side on the selected channel. The diode prevents the tuned ckt. amplifiers on PC-6 from being activated while in receive.

If the channel is two-frequency simplex, the diode is not required and a separate receive crystal is selected when the relay K1 is de-energized. However, the wire from PC-9 is now connected to the transmit side of TB-4, and the receive oscillator PC-11 is connected to the receive side of TB-4. Whether

the receive crystal is in the channel oscillator oven or receiver oscillator module depends upon the number of channels and crystals installed.
See Section IV-E.

SECTION V

SPECIFICATION TEST PROCEDURE

A. GENERAL INFORMATION

1. The checks outlined in this Section should be performed after equipment maintenance or if a specification check is desired.

B. EQUIPMENT REQUIRED

1.	RF Voltmeter	H-P Model 410B, or equivalent
2.	RMS Voltmeter	H-P Model 400L, or equivalent
3.	Distortion Analyzer	H-P Model 330C, or equivalent
4.	RF Signal Generator	H-P Model 606B, or equivalent
5.	Frequency Counter	H-P Model 5245L, or equivalent
6.	Audio Oscillator	H-P Model 200CD, or equivalent (2)
7.	Attenuator	Kay Electric Model 30-0, or equivalent
8.	Wattmeter (100W Element)	Bird Model 43, or equivalent
9.	Dummy Load, 50 ohms	Bird Model 81B, or equivalent
10.	Oscilloscope	Tektronix Model 543B, or equivalent

C. OSCILLATORS

1. Channel Oscillator (10 Crystal Oven Unit)

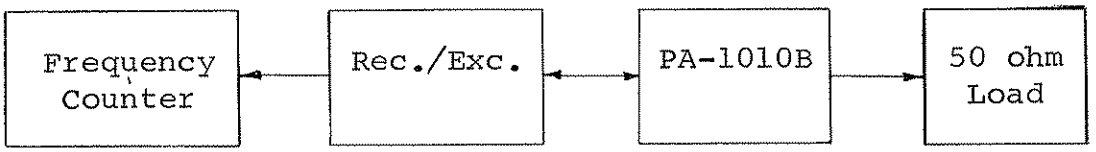


Figure V-1

(a) Off/On switch in "ON" position.

(b) Channel selector switch in Channel 1 position.

(c) Exciter Output J10 disconnected from PA-1010B.

(d) Receiver/Exciter in transmit (Refer to Section IV-E for other than one frequency simplex channel frequency assignment).

(e) Allow equipment to warm up 15 minutes.

(f) Connect frequency counter to Pin "N" of PC-2 and record frequency.

(g) Turn channel selector switch to successive positions and record frequency.

(h) Frequency readings must be within ±20 Hz of assigned frequency plus 1650 kHz. NOTE: Oscillator should be set to exact channel frequency.

(i) If this requirement is not met, refer to Section VI-C for alignment or Section VII-C for repair.

2. Receive Oscillator (8 Crystal Positions)

(a) Refer to Figure V-1 for equipment hook-up.

(b) OFF/ON switch in "ON" position.

(c) Channel selector switch in position(s) outlined in Section IV-E.

(d) Receiver/Exciter in "receive".

(e) Connect frequency counter to Pin "M" of PC-2 and record frequency(ies).

(f) Frequency reading(s) must not vary more than ± 0.0025% from assigned frequency plus 1650 kHz.

(g) If this requirement is not met, refer to Section VI-C for alignment or Section VII-C for repair.

3. Carrier Oscillator (1650 kHz)

(a) Refer to Figure V-1 for equipment hook-up. (Exciter output J10 disconnected from PA-1010B.)

(b) OFF/ON switch in "ON" position.

(c) Receiver/Exciter in "receive" mode.

(d) Mode switch in USB, TEL or LSB position.

(e) Clarifier in CCW position.

(f) Connect frequency counter to Pin "6" of XV-1 and record frequency.

(g) Turn clarifier to the extreme CW position and record frequency.

(h) Frequency difference between steps (f) and (g) must not be less than 200 Hz.

(i) Receiver/Exciter in "transmit".

(j) Frequency must not be more than ±2 Hz from 1650 KHz.

(k) If the requirements in steps (h) and (j) are not met, refer to Section VI-C for alignment or Section VII-C for repair.

D. RECEIVER

1. Sensitivity Measurements

a. SSB

(1) OFF/ON switch to "ON" position.

(2) Channel selector switch in desired frequency position.

(3) Squelch control full CCW.

(4) Receiver/Exciter in "receive".

(5) Connect test equipment as shown in Figure V-2.

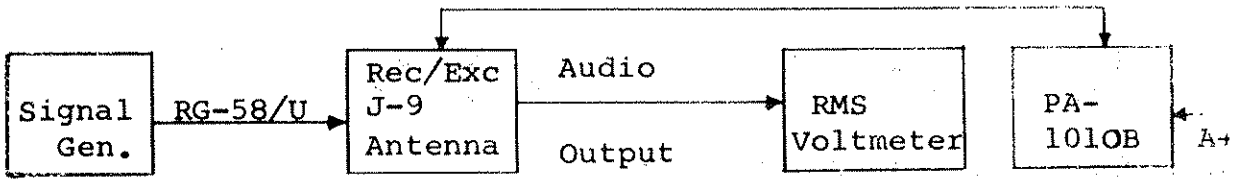


Figure V-2

(6) Set RMS voltmeter to 3 volt scale.

(7) Increase volume control on control panel until noise is observed on voltmeter.

(8) Turn mode switch to USB, TEL or LSB position.

(9) Set output of signal generator to luv (rms) and tune frequency dial for maximum indication on voltmeter, adjusting volume control to maintain 1V reading.

(10) Remove cable from J-9 (antenna input); output on voltmeter must be no less than 10 db down from reading in step (9).

(11) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

b. AM

(1) Follow steps (1) through (7) of Paragraph 1-a.

(2) Turn mode switch to AM position.

(3) Set output of signal generator to 2uv (rms), 30% modulation, 1000 Hz, and tune frequency dial for maximum indication on voltmeter, adjusting volume control to maintain 1V reading.

(4) Turn modulation on signal generator to "OFF" position; output on voltmeter must be no less than 6 db down from reading in step (3).

(5) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

2. Gain Measurements

a. SSB

(1) Follow steps (1) through (5) of Paragraph 1-a.

(2) Set RMS volmeter to 10V scale.

(3) Turn volume control full CW.

(4) Turn mode switch to USB, TEL or LSB position.

(5) Set output of signal generator to luv (rms) and tune for maximum deflection on voltmeter; adjust output of generator for 7.1 volt indication on voltmeter. Re-peak voltmeter reading with frequency dial.

(6) Output of signal generator must be no more than 5uv (rms).

(7) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

b. AM

(1) Follow steps (1) through (5) of Paragraph 1-a and steps (2) and (3) of Paragraph 2-a.

(2) Turn mode switch to AM position.

(3) Set output of signal generator to 1 uv (rms); 30% modulation, 1000 Hz and tune for maximum deflection on voltmeter, adjust output of generator for 7.1 volt indication on voltmeter. Repeak meter reading with frequency dial.

(4) Output of signal generator must be no more than 10 uv (rms).

(5) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

3. Selectivity Measurement

a. SSB

(1) Follow steps (1) through (4) of Paragraph 1-a.

(2) Connect test equipment, as shown in Figure V-3.

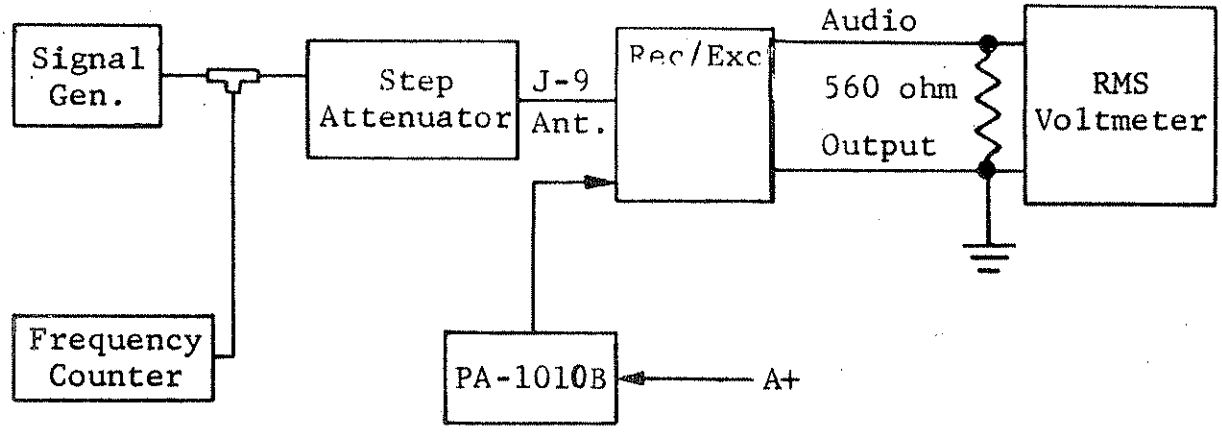


Figure V-3

(3) Set RMS voltmeter to 3 volt scale.

(4) Insert 100 db attenuation with step attenuator.

(5) Turn mode switch to USB, TEL or LSB position.

(6) Set signal generator to 100 MV (rms) and tune for maximum deflection on RMS voltmeter, adjust volume control for desired reading and record.

(7) Tune signal generator higher in frequency until meter reading is 6 db down from that in step (6). Record the frequency. Tune signal generator lower in frequency until meter reading is down 6 db from that in step (6). Record the frequency.

(8) The frequency difference between the readings in step (7) must be no less than 2.1 kHz.

(9) Retune signal generator for maximum indication on RMS meter and record reading.

(10) Increase signal input 60 db by switching attenuator.

(11) Tune signal generator higher in frequency until voltmeter reading is the same as recorded in step (9). Record the frequency. Tune signal generator lower in frequency until voltmeter reading is the same as recorded in step (9). Record the frequency.

(12) The frequency difference between the readings in step (11) must be no more than 6.5 kHz.

(13) If the requirement in step (8) and step (12) are not met, refer to Section VI-D for alignment or Section VII-D for repair.

b. AM

(1) Follow steps (1) through (4) Paragraph 1-a and steps (2) through (4) of Paragraph 3-a.

(2) Turn mode switch to AM position.

(3) Set signal generator to 100 MV (rms); 30% modulation, 1000 Hz and tune for maximum deflection on RMS voltmeter, adjust volume control for desired reading and record.

(4) Tune signal generator higher in frequency until meter reading is 6 db down from that in step (3). Turn modulation "OFF" and record frequency. Turn modulation "ON" and tune signal generator lower in frequency until meter reading os 6 db down from that in step (3). Turn modulation "OFF" and record frequency.

(5) The frequency difference between the readings in step (4) must be no less than 5.5 kHz.

(6) Turn modulation "ON" and tune signal generator for maximum indication on voltmeter and record reading.

(7) Repeat steps (10) and (11) of Paragraph 3-a, but turn modulation off each time frequency is measured.

(8) The frequency difference between the readings in step (7) must be no more than 20 kHz.

(9) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

4. AGC Range Measurement

a. SSB

(1) Follow steps (1) through (5) of Paragraph 1-a.

(2) Set RMS voltmeter to 10 volt scale.

(3) Turn mode switch to USB, TEL, LSB position.

(4) Set signal generator to 1uv (rms) and tune for maximum deflection on voltmeter.

(5) Increase signal generator output to 250,000uv (500,000uv,open circuit) and set volume control for 7.1 volt on the RMS voltmeter, Reduce generator output on 5uv (rms).

(6) Output measured on voltmeter must be no more than 10 db down from 7.1 volt.

(7) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

5. Audio Response Measurement

a. SSB

(1) Follow steps (1) through (4) of Paragraph 1-a.

(2) Connect test equipment, as shown in Figure V-4.

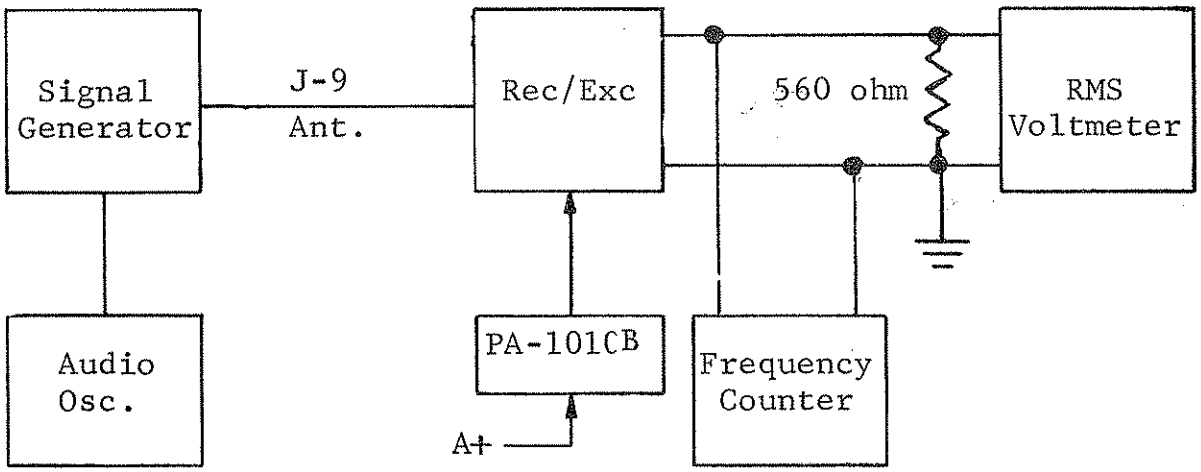


Figure V-4

(3) Set RMS voltmeter to 10 volt scale.

(4) Turn mode switch to USB, TEL or LSB position.

(5) Set signal generator to 1uv (rms) and tune until frequency counter indicates 1000 Hz. Increase generator output to 50uv (rms) and adjust volume control until voltmeter indicates 7.1 volts.

(6) Tune signal generator until frequency counter displays 350 Hz. Record voltmeter reading. Tune signal generator until frequency counter displays 2450 Hz. Record voltmeter reading.

(7) Meter readings obtained in step (6) must be no more than 6 db down from 7.1 volts.

(8) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

b. AM

(1) Follow steps (1) through (4) of Paragraph 1-a and steps (2) and (3) of Paragraph 5-a.

(2) Turn mode switch to AM position.

(3) Connect audio oscillator to external modulation on signal generator and set for 30% modulation, 1000 Hz.

(4) Set signal generator to 1uv (rms) and tune for maximum indication on RMS meter. Increase generator output to 50uv (rms) and set volume control until voltmeter indicates 7.1 volts.

(5) Turn audio oscillator to 350 Hz and record voltmeter reading. Turn audio oscillator to 3000 Hz and record voltmeter reading.

(6) Meter readings obtained in step (5) must be no more than 8 db down from 7.1 volts.

(7) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

6. Audio Distortion Measurements

a. SSB

(1) Follow steps (1) through (4) Paragraph 1-a.

(2) Connect test equipment, as shown in Figure V-5.

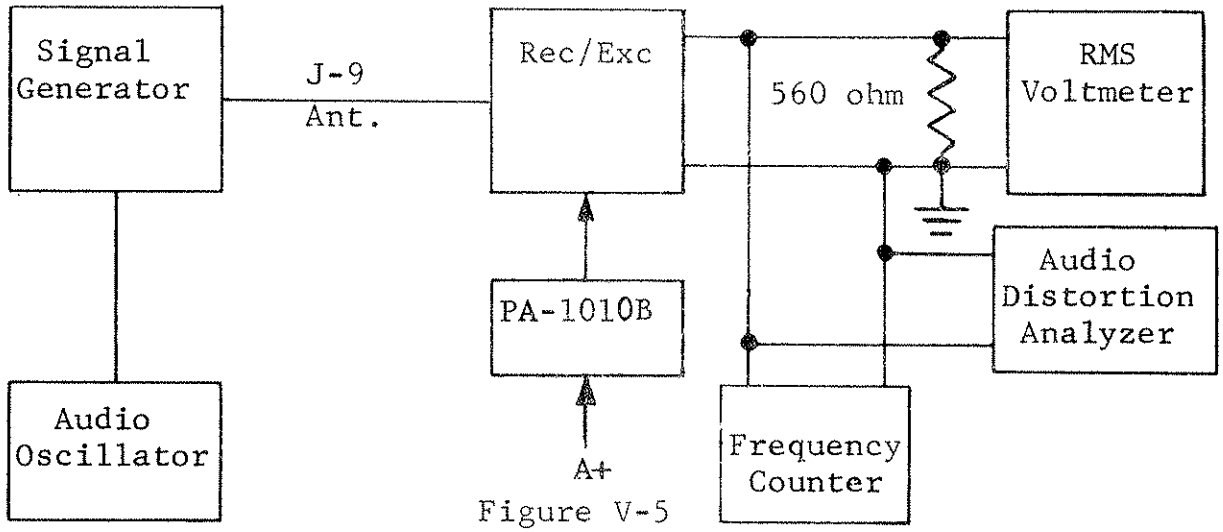


Figure V-5

(3) Set RMS voltmeter to 10 volt scale.

(4) Turn mode switch to USB, TEL or LSB position.

(5) Set signal generator to 1uv (rms) and tune until frequency counter displays 1000 Hz. Increase generator output to 100,000uv and set volume control until voltmeter indicates 7.1 volts.

(6) Set distortion analyzer for 100% reference indication.

(7) Turn analyzer function switch to distortion and tune analyzer for minimum deflection on analyzer meter. Record reading.

(8) Repeat steps (5) through (7) at 350 Hz and 2450 Hz.

(9) Readings obtained in steps (7) and (8) must be no more than 10%.

(10) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

b. AM

(1) Follow steps (1) through (4) of Paragraph 1-a and steps (2) and (3) of Paragraph 6-a.

(2) Turn mode switch to AM position.

(3) Connect audio oscillator to external modulation on signal generator and set for 85% modulation, 1000 Hz.

(4) Set signal generator to luv (rms) and tune for maximum indication on RMS meter. Increase generator output to 250,000uv (500,000uv open circuit) and set volume control until RMS voltmeter indicates 7.1 volts.

(5) Set distortion analyzer for 100% reference indication.

(6) Turn analyzer function switch to distortion and tune analyzer for minimum deflection on analyzer meter. Record reading.

(7) Repeat steps (3) through (6) for 350 Hz and 3000 Hz.

(8) Readings obtained in steps (6) and (7) must be no more than 20%.

(9) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

7. Intermediate Frequency Rejection Measurement (1650 kHz)

a. SSB

(1) Follow steps (1) through (9) of Paragraph 1-a.

(2) Increase signal generator output 60 db and tune frequency to 1650 kHz.

(3) Peak RMS voltmeter with frequency dial on generator.

(4) Meter indication must be no more than reference indication (1 volt).

(5) If this requirement is not met, refer to Section VI-D for alignment or Section VII-D for repair.

8. Image Frequency Rejection Measurement (fc + 3.3 MHz).

a. SSB

(1) Follow steps (1) through (9) of Paragraph 1-a.

(2) Increase signal generator output 60 db and tune frequency 3300 kHz above channel frequency.

(3) Peak RMS voltmeter with frequency dial on generator.

(4) Meter indication must be no more than reference indication (1 volt).

(5) If this requirement is not met, refer to Section VII-D for repair.

9. Squelch Sensitivity and Range Measurement

a. SSB

(1) Follow steps (1) through (9) of Paragraph 1-a.

(2) Remove cable frome J-9 (antenna input). Receiver must not squelch.

(3) Reconnect cable to J-9.

(4) Turn squelch control full CW.

(5) Increase signal generator output until voltmeter deflects.

(6) Signal generator output should be 15 uv (nominal).

(7) If the requirements in steps (2) and (5) are not met, refer to Section VI-D for alignment or Section VII-D for repair.

E. TRANSMITTER

1. Power Output Measurement

(a) SSB

(1) Connect test equipment, as shown in Figure V-6.

(2) OFF/ON switch in "ON" position.

(3) Channel selector in desired frequency position.

(4) Allow 15 minutes for equipment warm-up.

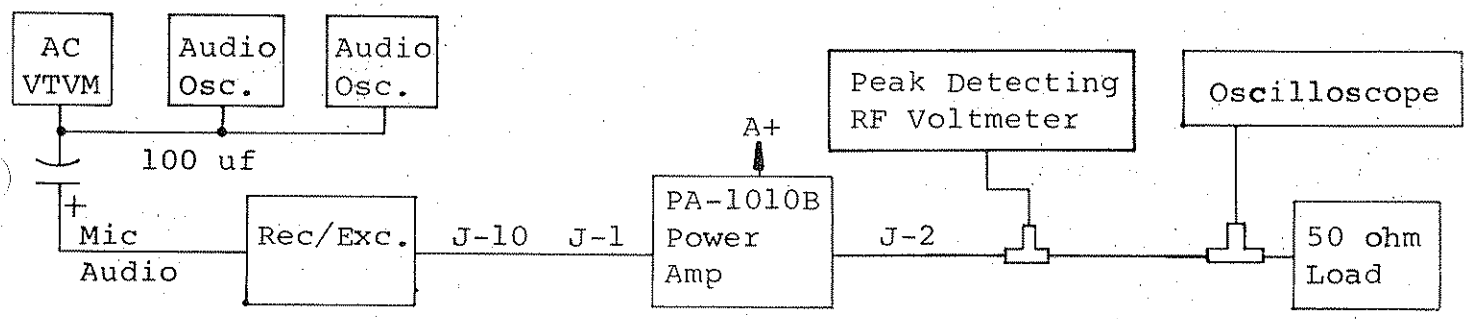


Figure V-6

(5) Turn mode switch to USB or LSB position.

(6) Set audio oscillators to 1800 Hz and 800 Hz respectively.

(7) Adjust combined audio oscillator output to 0.15 volt (rms) on AC VTVM.

(8) Key transmitter.

(9) Record output power (PEP) indicated on RF volt meter on all used channels.

NOTE: $PEP = \frac{(Vrms)^2}{50}$

(10) Output should be no less than 44W (110W PEP on any channel.

(11) If this requirement is not met, refer to Section VI-E and F for alignment or Section VII-E and F for repair.

b. AM

(1) Repeat steps (1) through (4) of Paragraph 1-a.

(2) Turn mode switch to AM.

(3) Remove audio oscillator input from Receiver/Exciter.

(4) Key transmitter.

(5) Record output power (average) indicated on wattmeter on all channels.

(6) Output should be no less than 30W average.

(7) If this requirement is nto met, refer to Section VI-E and F for alignment or Section VII-E and F for repair.

2. Carrier Attenuation

a. SSB

(1) Repeat steps (1) through (8) of Paragraph 1-a.

(2) Record output voltage measured at 50 ohm load.

(3) Remove audio input to Exciter.

(4) The output measured at 50 ohm load must be no less than 40 db below the output measured in step (2).

(5) If this requirement is not met, refer to Section VI-E and F for alignment or Section VII-E and F for repair.

b. Telephone

(1) Repeat steps (1) through (8) of Paragraph 1-a.

(2) Turn mode switch to TEL.

(3) Record output volt measured at 50 ohm load.

(4) Remove audio input from Exciter.

(5) The resulting output measured at the 50 ohm load must be no less than 14 db and no more than 18 db below the output in step (3).

(6) If this requirement is not met, refer to Section VI-E and F for alignment or Section VII-E and F for repair.

SECTION VI

ADJUSTMENT AND ALIGNMENT PROCEDURES

A. GENERAL INFORMATION

1. The receiver/exciter and power amplifier/power supply are designed for minimum variations in specifications. After the initial factory alignment further alignment is not required unless circuit boards are replaced, channel frequencies are altered, or periodic inspections are scheduled to insure peak performance of the equipment.

2. The procedure outlined in this Section should be utilized whenever alignment or adjustment is required.

B. EQUIPMENT REQUIRED

1.	Rf Voltmeter	H-P Model 410B, or equivalent
2.	RMS Voltmeter	H-P Model 400L, or equivalent
3.	Frequency Counter	H-P Model 330C, or equivalent
4.	RF Signal Generator	H-P Model 606B, or equivalent
5.	Audio Oscillator	H-P Model 200CD, or equivalent
6.	Wattmeter (100W Element)	Bird Model 43, or equivalent
7.	Dummy Load (50 ohms)	Bird Model, 81B, or equivalent
8.	Oscilloscope	Tektronix Model 543B, or equivalent
9.	DC VTVM	H-P Model 412A, or equivalent
10.	Tunable Receiver (4-36 MHz with S Meter) or Field Intensity Meter.	

C. OSCILLATORS

1. Channel Oscillator (10 Crystal Oven Unit)

   (a) For test setup, refer to Section V-C, Paragraph 1.

   (b) Adjust C-901 through C-910 until frequency is within ±5 Hz of assigned frequency plus 1650 kHz.

2. Receive Oscillator (8 Crystal Module Unit)

   (a) For test set up, refer to Section V-C, Paragraph 2.

   (b) Adjust C-1101 through C-1108 until frequency is within ±0.0010% of assigned frequency plus 1650 kHz.

3. Carrier Oscillator (1650 kHz)

(a) Refer to Section V-C, Paragraph 3-(h).

(b) Adjust C-1003 until frequency is within ±2 Hz of 1650 kHz.

D. RECEIVER

1. Mixer and IF Alignment

(a) Refer to Section V-D, Paragraph 7-a for equipment hook-up.

(b) Remove PC-3 from receiver/exciter.

(c) Connect 2200 ohm resistor from Pin "T" of PC-2 to + 10 volts.

(d) Connect oscilloscope to Pin "H" of PC-2.

(e) Adjust L-211, L-212, L-213 (PC-2) for maximum output at Pin "H", reducing signal generator output to prevent saturation.

(f) Adjust L-207, L-210 for minimum output at Pin "H", increase signal generator to maintain readable presentation on oscilloscope.

(g) Repeat step (e) above.

(h) Remove 2200 ohm resistor from Pin "T" of PC-2.

(i) Reinstall PC-3.

2. Preselector Alignment

(a) Refer to Section V-D, Paragraph 1-a for equipment hook-up.

(b) Adjust coils corresponding to selected channel, L-101 through L-130, for maximum audio output on RMS meter.

3. Volume Control Threshold Adjustment

(a) Refer to Section V-D, Paragraph 2a for equipment hook-up.

(b) Adjust R-1501 until out-put does not increase any more.

(c) Turn volume control slightly CCW, output should decrease. If output does not decrease, adjust R1501 until output just starts to decrease.

3. AM and SSB Gain Equalizations

   (a) Refer to Section V-D, Paragraph 1-a, steps 1 through 8.

   (b) Connect DC VTVM to Pin "T" of PC-2.

   (c) Increase signal generator output to 10 uv and tune for minimum DC on VTVM. Record this voltage.

   (d) Switch to AM position and tune signal generator for minimum DC on VTVM. Record this voltage.

   (e) If the recorded voltages in steps (c) and (d) are unequal, adjust C-230 (AM oscillator injection) until voltages are as equal as possible.

4. AGC-2 Threshold and Distortion Adjustment

   (a) Refer to Section V-D, Paragraph 4-a.

   (b) Adjust R-330 so that a 10 db decrease in signal from 250,000 uv (500,000 uv open circuit) results in no change in output and minimum sine wave distortion is observed.

5. Detector Bias Adjustment

   (a) Refer to Section V-D, Paragraph 5-b.

   (b) Adjust R-336 for minimum sine wave distortion while maintaining output within $\pm$2 db of rated output.

6. Squelch Threshold Adjustment

   (a) Refer to Section V-D, Paragraph 9-a.

   (b) Turn squelch control CW.

   (c) Increase signal generator output until RMS meter indicates audio output.

   (d) Adjust R-415 so that squelch breaks with 15 uv nominal input signal.

E. EXCITER

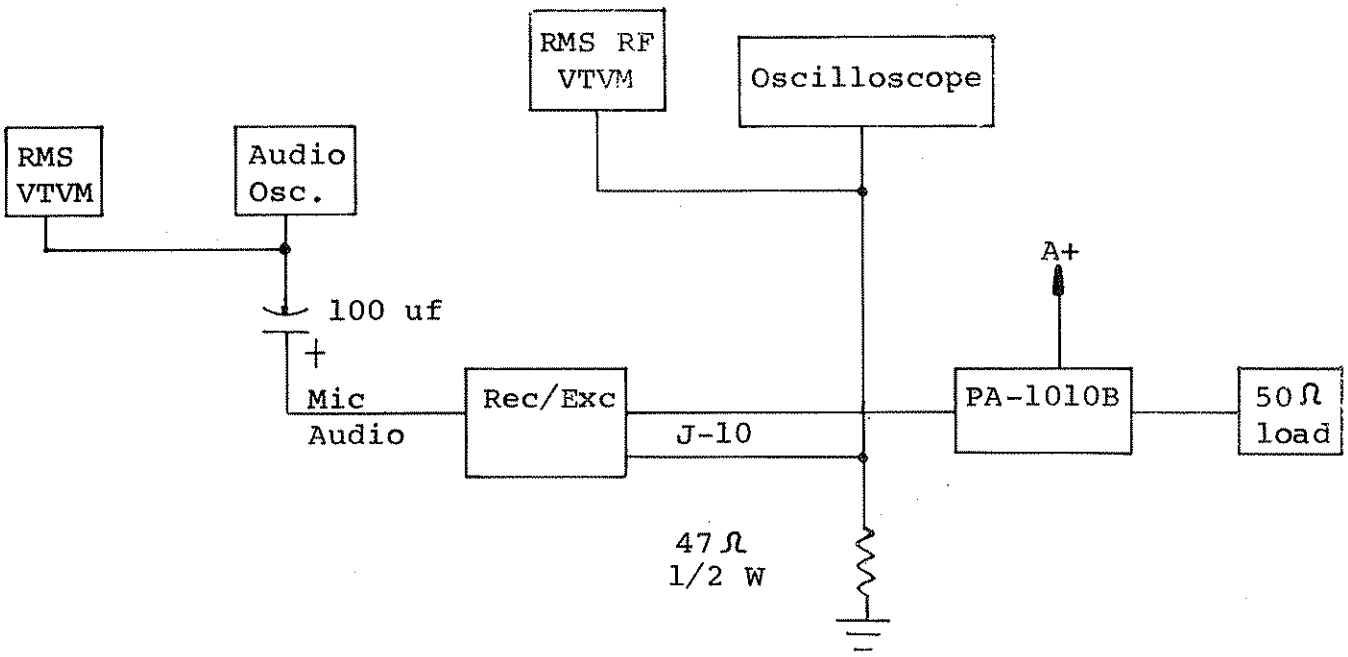


Figure VI-I

1. Modulation Adjustment

(a) Set up equipment as shown in Figure VI-I.

(b) Turn ON/OFF switch to "ON" position.

(c) Allow 15 minutes for equipment warm-up.

(d) Set audio oscillator output for 0.150V rms at 1000 Hz.

(e) Turn mode switch to AM position.

(f) Key transmitter.

(g) Adjust R-535 until signal on oscilloscope is modulated 100%.

2. Balanced Modulator Adjustment

(a) Set up equipment, as shown in Figure VI-I.

(b) Refer to Paragraphs 1-(b) through 1-(f).

(c) Connect oscilloscope to the base of Q-503.

(d) Adjust R-511 until adjacent peaks at the top and bottom of the wave-form are of equal amplitude (See Figure VI-2).

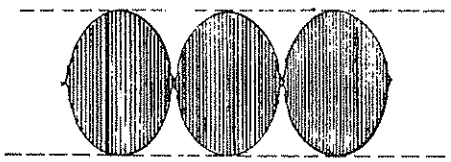


Figure VI-2
Signal Wavefrom at Base of Q-503

3. Balanced Mixer Adjustment

(a) Set up equipment, as shown in Figure VI-I.

(b) Turn channel selector switch to highest transmit frequency.

(c) Refer to Paragraphs 1-(b) through 1-(e).

(d) Turn mode select switch to "USB".

(e) Key transmitter.

(f) Remove audio oscillator input from Receiver/Exciter.

(g) Adjust R-609 for minimum output on RF VTVM or oscilloscope.

4. Exciter Tuned Circuit Alignments

(a) Set up equipment, as shown in Figure VI-I.

(b) Set channel selector switch to desired frequency.

(c) Refer to Paragraphs 1-a through 1-f.

(d) Turn slugs of selected channel coils L701-L710 and L711-L720 all the way into the form.

(e) Slowly turn slugs CCW until signal appears on scope, alternately tune the coils until the oscilloscope shows a peak.

NOTE: Care must be taken not to tune the Exciter to the channel oscillator frequency (1650 kHz) above the transmit frequency.

5. Sidetone Adjustment

(a) For this adjustment, refer to Section II-E.

F. POWER AMPLIFIER (PA-1010B)

CAUTION: VOLTAGES IN THIS UNIT ARE HAZARDOUS TO LIFE.

1. Bias Adjustment

(a) Connect equipment as shown in Figure VI-3.

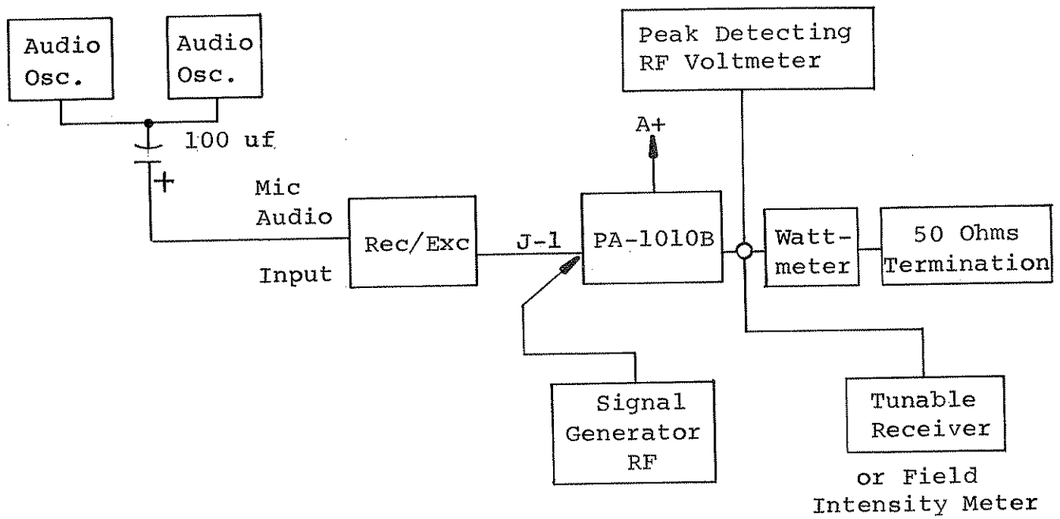


Figure VI-3

(b) Disconnect cable from J-1 of PA-1010B.

(c) Turn OFF/ON switch to "ON".

(d) Allow 15 minutes for equipment warm-up.

(e) Connect DC voltmeter to Pin 1 of V-2.

(f) Turn voltmeter to "3 volt" scale.

(g) Key transmitter.

(h) Adjust R-110 until meter indicates 0.3 volts DC.

(i) Connect DC VTVM to Pin 1 of V1; voltage should be between .25-.35 volts.

2. Driver and Output Coil Tuning.

(a) Connect equipment as shown in Figure VI-3.

(b) Disconnect Receiver/Exciter and connect signal generator to J-1 of PA-1010B.

(c) Turn channel selector to desired channel.

(d) Turn OFF/ON switch to "ON".

(e) Allow 15 minutes for equipment warm-up.

(f) Place HI/LOW switch on PA-1010B in "HI" position.

(g) Key transmitter.

(h) Tune signal generator for maximum output on wattmeter.

(i) Increase or reduce generator output until wattmeter indicates 50W.

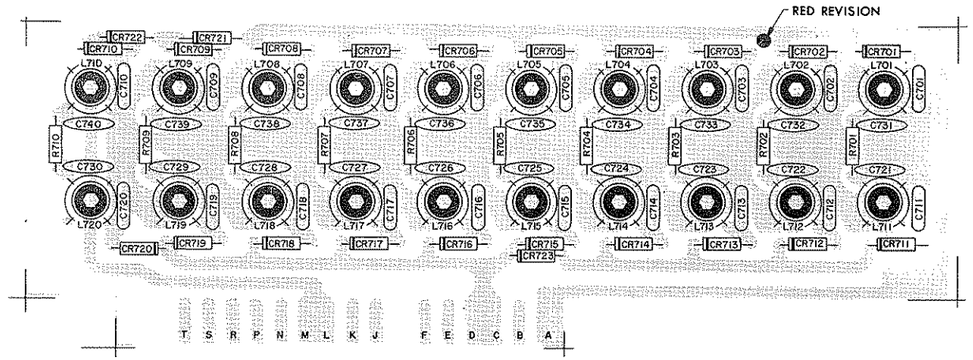
(j) Alternately tune driver coil (L-2 through L-11) and output coil (L13 through L22) for peak indication on wattmeter. Reduce generator output to maintain 50W on wattmeter.

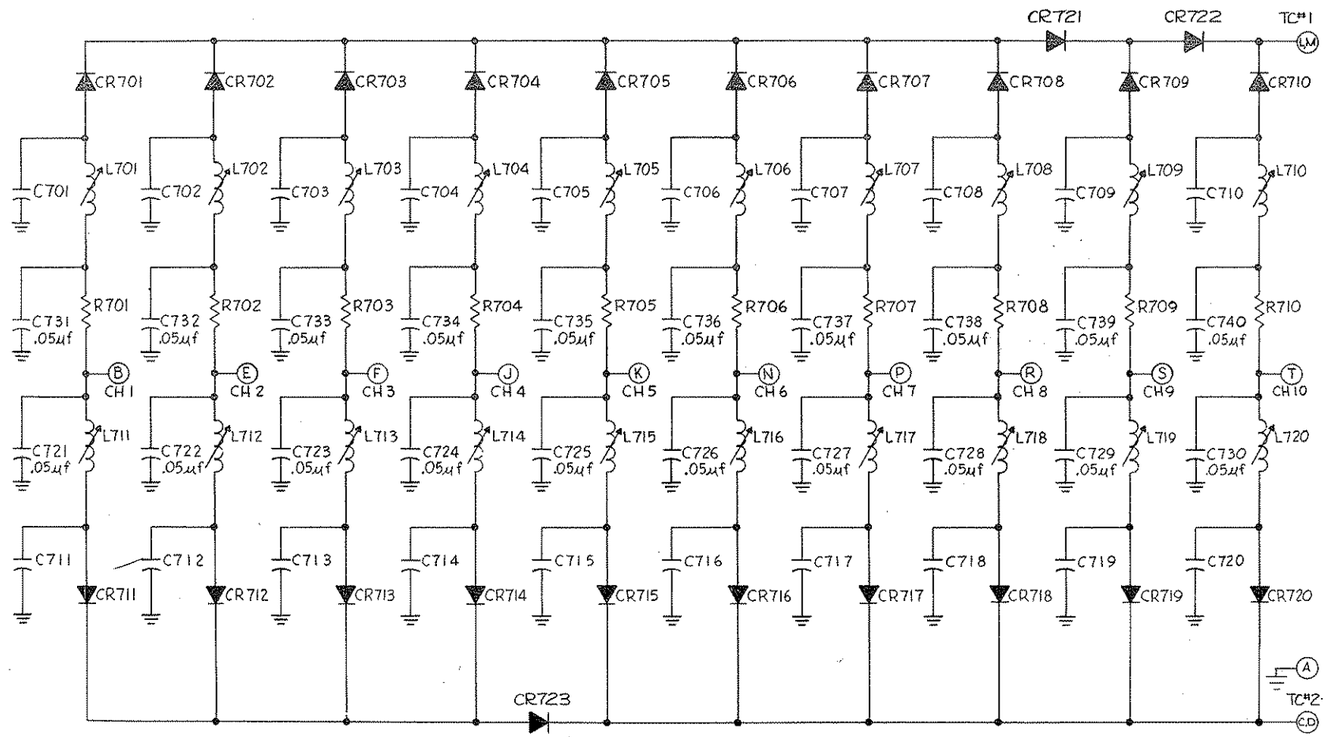
3. Neutralizing Capacitor Adjustment

(a) Refer to Figure VI-3 for test set-up.
(b) Place HI-LOW power switch on PA-1010B in "HI" position.
(c) Connect oscilloscope to Pin 3 of the driver V-1.
(d) Select highest frequency channel.
(e) Disconnect exciter output from J-1 of PA-1010B.
(f) Key transmitter.
(g) Inject channel frequency from signal generator into J-2 (RF output) of PA-1010B. Caution: Use fused generator and connect to J-2 after keying, if no power output is observed on the wattmeter.
(h) Adjust C-33 neutralizing capacitor for minimum signal observed on the oscilloscope.
(j) Unkey transmitter and disconnect signal generator from J-2.

CKT. SYM.	PART NO.	DESCRIPTION
	99797	P.C. Board Ass'y. Without Customizing Components
PC7	10203	P.C. Board for 99797
C701 thru C720		Capacitor - Frequency Dependent - See Customizing Chart, Page 81
C721 thru C740	27357	Capacitor .05uf 25V
CR701 thru CR723	40510	Diode 1N914B
L701 thru L720	62993	Coil, Variable - Frequency Dependent - See Customzing Chart, Page 81
R701 thru R710		Resistor - Frequency Dependent - See Customizing Chart, Page 81

REVISION	DESCRIPTION
RED	CR701 THRU CR723 DIODES CHANGED FROM 1N914 (44290) TO 1N914B (40510)



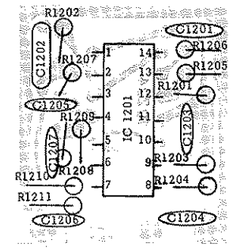


NOTES:
1. L701-L720, C701-C720, R701-R710 FREQUENCY DEPENDENT. SEE CUSTOMIZING CHART.

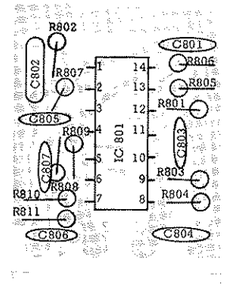
P.C. #7, EXCITER TUNED CIRCUITS (10 CHAN.)

CKT. SYM.	PART NO.	DESCRIPTION		
	99798	P.C. Board Ass'y. With all Components		
PC8	10210	P.C. Board for 99798		
C801	26913	Capacitor	.02uf	25V
C802	28090	"	150pf	500V
C803	25000	"	2.2pf	100V
C804	26913	"	.02uf	25V
C805	26913	"	"	"
C806	25036	"	6pf	100V
C807	26834	"	10pf	500V
IC801	44551	Integrated Circuit	CA3046	
R801	17077	Resistor	4.7K ohm	1/4W
R802	17041	"	10K "	"
R803	17156	"	1K "	"
R804	17118	"	100 "	"
R805	18667	"	2.7K "	"
R806	18411	"	470 "	"
R807	17041	"	10K "	"
R808	17077	"	4.7K "	"
R809	17845	"	270 "	"
R810	18411	"	470 "	"
R811	17118	"	100 "	"

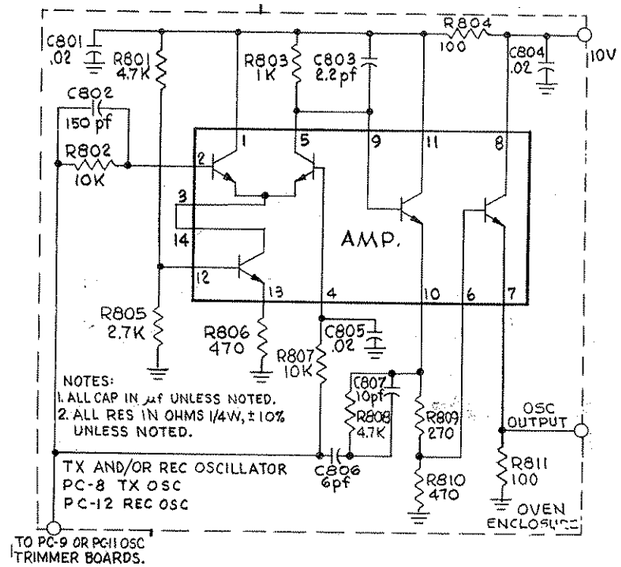
CKT. SYM.	PART NO.	DESCRIPTION		
	99802	P.C. Board Ass'y. With All Components		
PC12	10224	P.C. Board for 99802		
C1201	26913	Capacitor	.02uf	25V
C1202	28090	"	150pf	500V
C1203	25000	"	2.2pf	100V
C1204	26913	"	.02uf	25V
C1205	26913	"	"	"
C1206	25036	"	6pf	100V
C1207	26834	"	10pf	500V
IC1201	44551	Integrated Circuit	CA3046	
R1201	17077	Resistor	4.7K ohm	1/4W
R1202	17041	"	10K "	"
R1203	17156	"	1K "	"
R1204	17118	"	100 "	"
R1205	18667	"	2.7K "	"
R1206	18411	"	470 "	"
R1207	17041	"	10K "	"
R1208	17077	"	4.7K "	"
R1209	17845	"	270 "	"
R1210	18411	"	470 "	"
R1211	17118	"	100 "	"



P.C. #12 REC. OSC.



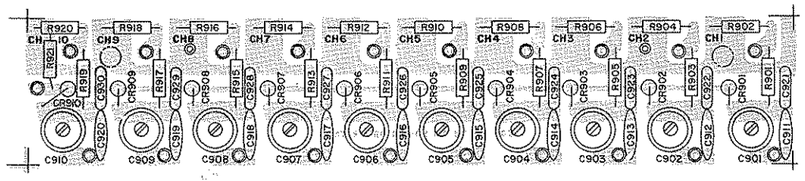
P.C. #8 - TX OSC.



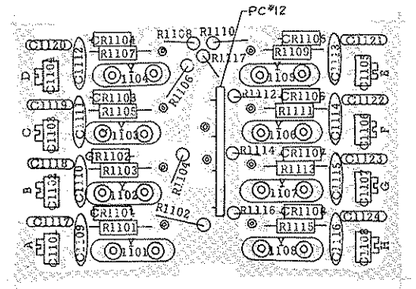
P.C. #8, TX OSC. & P.C. #12, REC. OSC.

CKT. SYM.	PART NO.	DESCRIPTION
	99799	P.C. Board Ass'y. With All Components
PC9	10211	P.C. Board for 99799
C901 thru C910	26822	Capacitor, Variable 2-8pf
C911 thru C920	28478	" 36pf
C921 thru C930	28131	" 110pf
CR901 thru CR910	44290	Diode 1N914
R901 thru R910	18306	Resistor 5.6K ohm 1/4W
R911 thru R920	17089	" 3.3K " "
R921	18306	" 5.6K " "

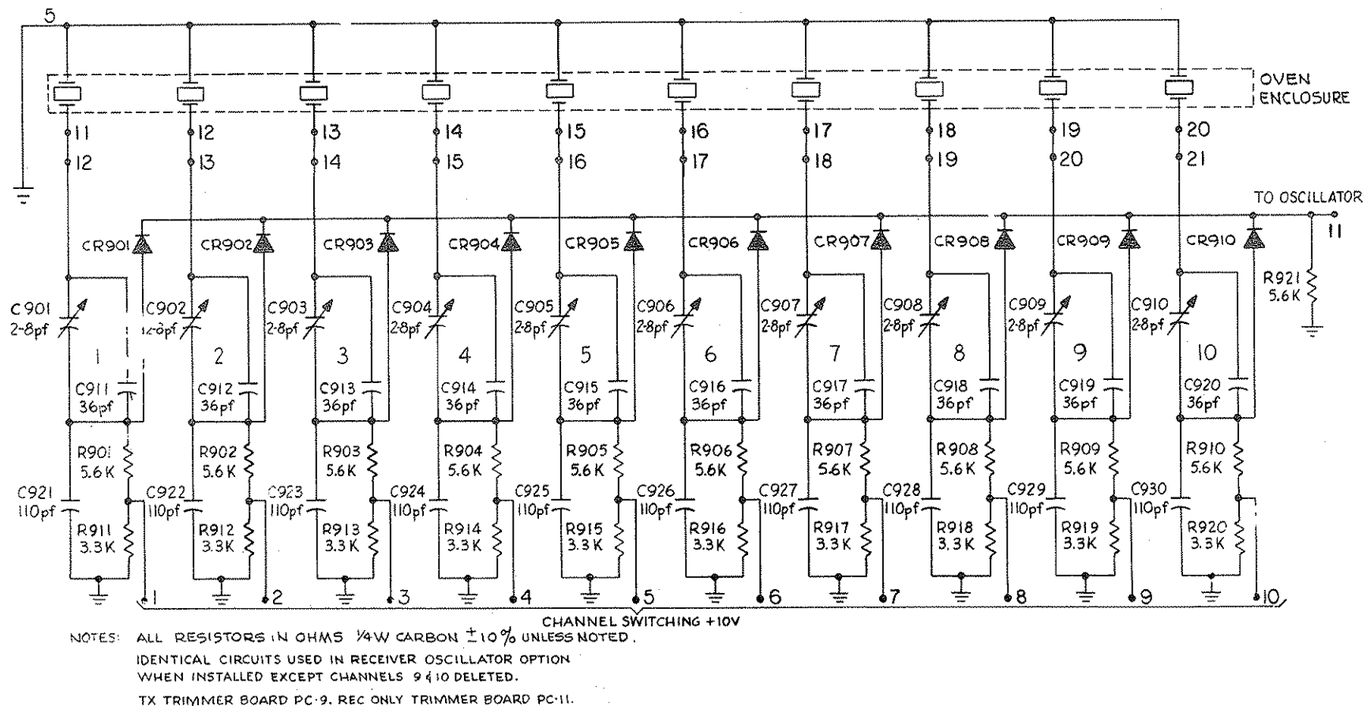
CKT. SYM.	PART NO.	DESCRIPTION
	99708	Rec. Osc. Ass'y. With PC11 & PC12
PC11	10233	P.C. Board
C1101 thru C1108	28741	Capacitor, Variable 3-9pf
C1109 thru C1116	28478	" 36pf
C1117 thru C1124	28131	" 110pf
CR1101 thru CR1108	44290	Diode 1N914
R1101 thru R1115 (odd #s)	18306	Resistor 5.6K ohm 1/4W
R1102 thru R1116 (even #)	17089	" 3.3K " "
R1117	18306	" 5.6K " "
Y1101 thru Y1108	81860	Crystal, Channel, 27°C



P.C. #9 - TX TRIMMER



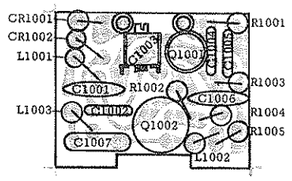
P.C. #11, REC. TRIMMER

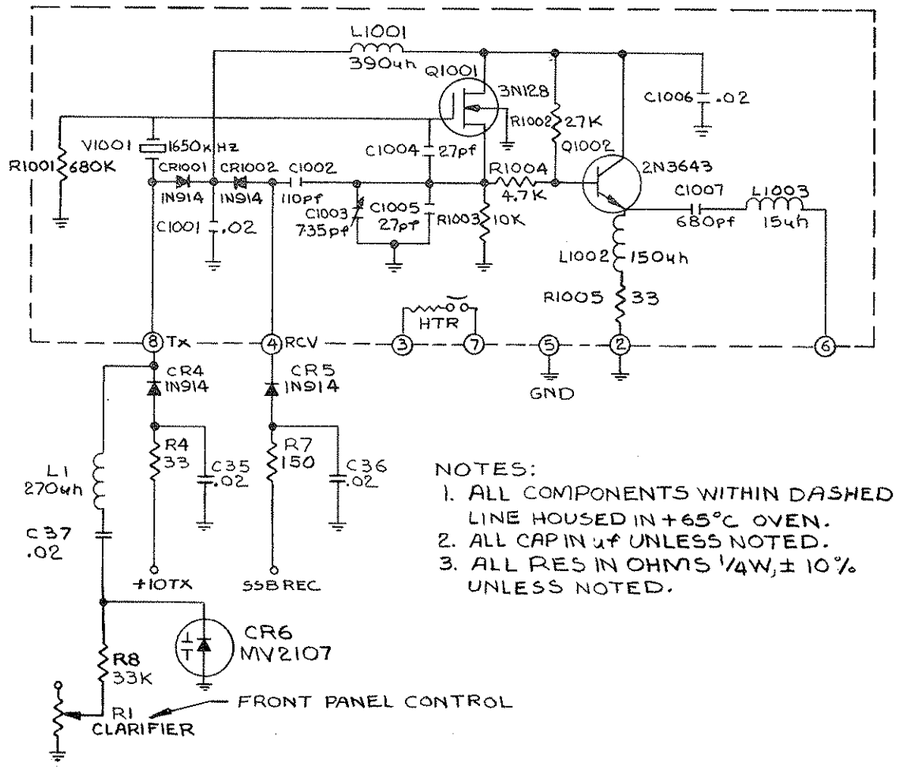


NOTES: ALL RESISTORS IN OHMS ¼W CARBON ±10% UNLESS NOTED.
IDENTICAL CIRCUITS USED IN RECEIVER OSCILLATOR OPTION WHEN INSTALLED EXCEPT CHANNELS 9 & 10 DELETED.
TX TRIMMER BOARD PC-9. REC ONLY TRIMMER BOARD PC-11.

Figure X-19 - P.C. #9, TX TRIMMER & P.C. #11, REC. TRIMMER

CKT. SYM.	PART NO.	DESCRIPTION		
	99800	P.C. Board Ass'y. with all Components		
PC #10	10212	P.C. Board for 99800		
C1001	26913	Capacitor	.02uf	25V
C1002	28131	"	110pf	500V
C1003	28739	" Variable	7-35pf	
C1004	28519	"	27pf	500V
C1005	28519	"	27pf	500V
C1006	26913	"	.02uf	25V
C1007	28428	"	680pf	100V
CR1001	44290	Diode	1N914	
CR1002	44290	"	1N914	
L1001	64800	Choke	390uh	
L1002	65919	"	150uh	
L1003	65907	"	15uh	
Q1001	44484	FET	3N128	
Q1002	44331	Transistor	2N3643	
R1001	18148	Resistor	680K ohm	1/4W
R1002	17120	"	27K "	"
R1003	17041	"	10K "	"
R1004	17077	"	4.7K "	"
R1005	18253	"	33 "	"
Y1001	81834	Crystal	1650 kHz	+65°C





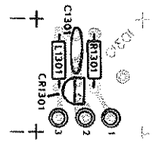
NOTES:
1. ALL COMPONENTS WITHIN DASHED LINE HOUSED IN +65°C OVEN.
2. ALL CAP IN uf UNLESS NOTED.
3. ALL RES IN OHMS 1/4W, ± 10% UNLESS NOTED.

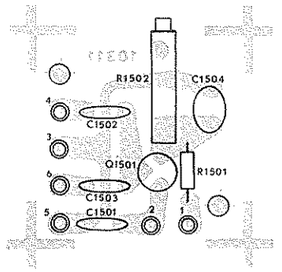
P.C. #10, 1650 OSCILLATOR

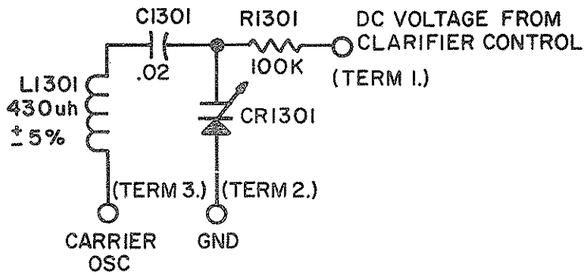
PARTS LIST

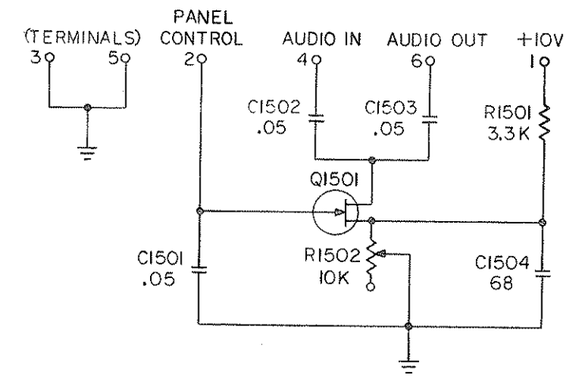
CKT. SYM.	PART NO.	DESCRIPTION
	99510	P C Board Assembly with Comp.
PC#13	10310	P C Board for 99510
C1301	26913	Capacitor, Ceramic Disc .02uf 25V
L1301	65910	Choke, 430uh ± 5%
CR1301	40476	Diode, Varicap MV-2107
R1301	17039	Resistor, 100K ± 10% 1/4W Carbon

CKT. SYM.	PART NO.	DESCRIPTION
	99511	P C Board Assembly with Comp.
PC#15	10311	P C Board for 99511
R1501	17089	Resistor, 3.3K ±10% 1/2W Carbon
R1502	33849-4	Potentiometer, 10K
C1501 Thru C1503	27357	Capacitor, Ceramic .05uf 25V
C1504	28038	" 68uf Tant. 15V
Q1501	44393	Transistor 2N4303







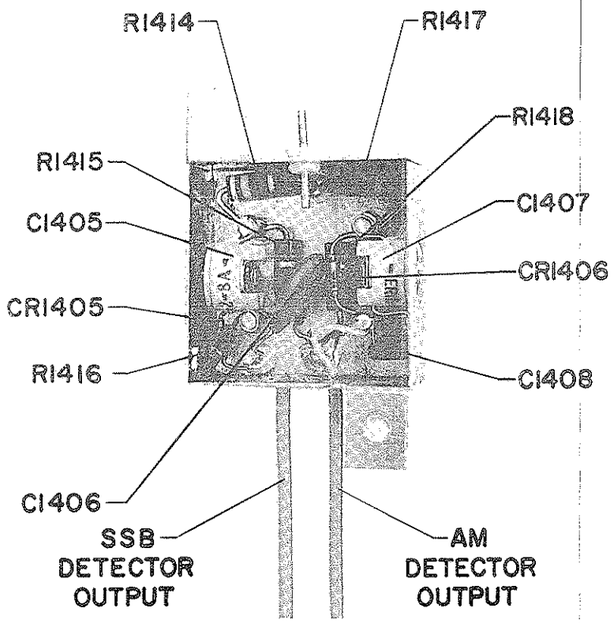


NOTES
1. ALL CAPACITORS IN μf UNLESS NOTED.
2. ALL RESISTORS IN OHMS 1/4W CARBON ±10% UNLESS NOTED.
3. ALL INDUCTORS IN μh UNLESS NOTED.

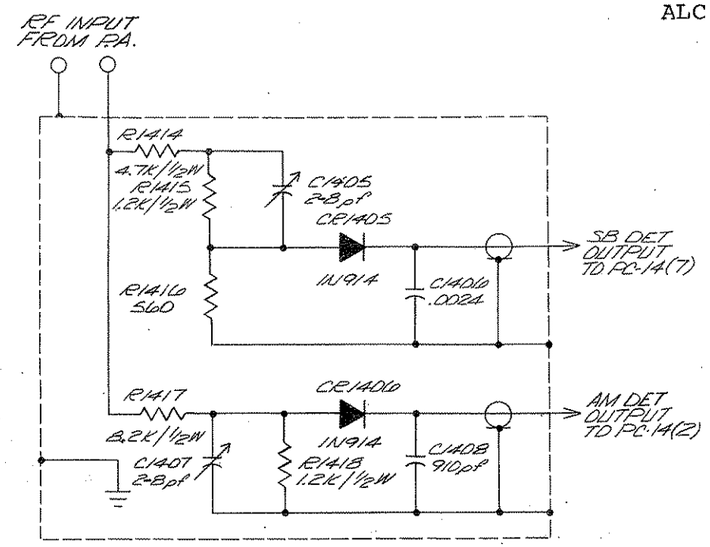
P.C. #13 AND P.C. #15,

REMOTE CLARIFIER AND VOLUME CONTROL

CKT. SYM.	PART NO.	DESCRIPTION
	97769	ALC Detector Ass'y
C1405	27840	Capacitor, Variable, 2-8 pf
C1406	28246	" Disc. .0024 uf
C1407	27840	" Variable 2-8 pf
C1408	28866	" Dip Mica 910 pf
CR1405	44290	Diode, 1N914
CR1406	44290	" "
R1414	16920	Resistor, 4.7K, 1/2W ±5%
R1415	17596	" 1.2K, 1/2W ±5%
R1416	18320	" 560 , 1/4W ±5%
R1417	18954	" 8.2K, 1/2W ±5%
R1418	17596	" 1.2K, 1/2W ±5%

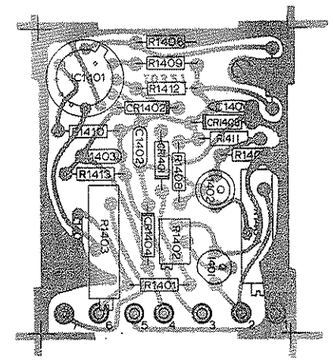


ALC DETECTOR

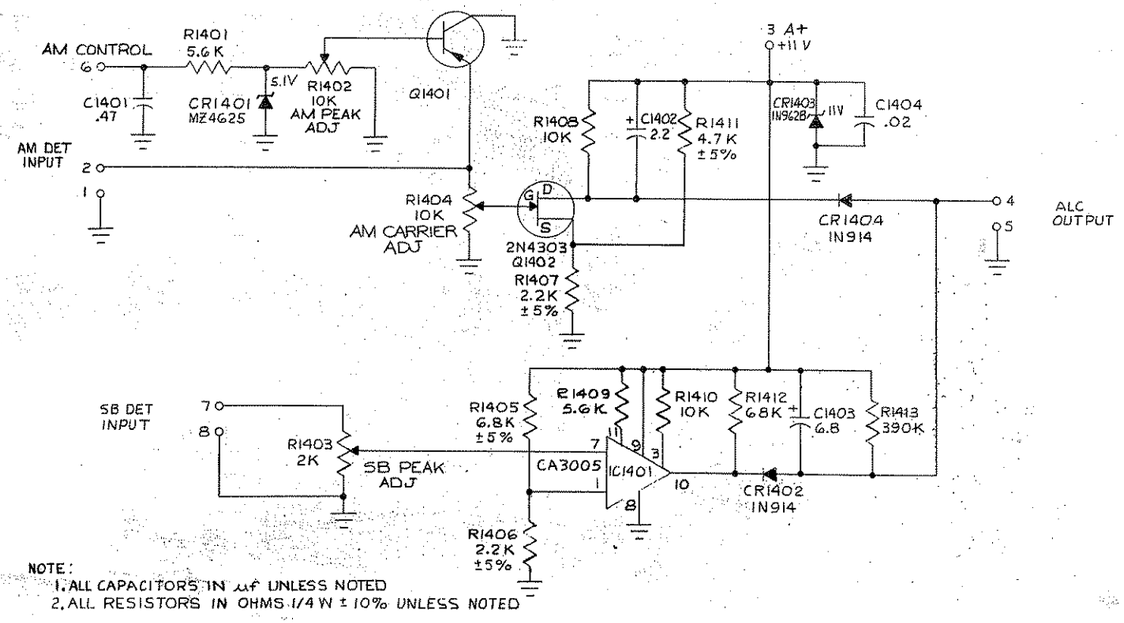


NOTES:
1. COMPONENTS ARE LOCATED INSIDE THE ALC DETECTOR ENCLOSURE.

CKT. SYM.	PART NO.	DESCRIPTION
	97767	P.C. Board Ass'y with all components
PC#14	10327	P.C. Board for 97767
C1401	28337	Capacitor .47 uf 50V
C1402	24472	" 2.2 uf 15V
C1403	28753	" 6.8 uf 15V
C1404	26913	" .02 uf 25V
CR1401	40508	Diode, Zener MZ4625
CR1402	44290	" 1N914
CR1403	40464	" Zener 1N962B
CR1404	44290	" 1N914
IC1401	44446	Integrated Circuit CA3005
R1401	18306	Resistor 5.6K ohm 1/4W
R1402	34441	Potentiometer 10K "
R1403	33849-6	" 2K "
R1404	33849-4	" 10K "
R1405	17481	Resistor 6.8K " 1/4W ±5%
R1406	17807	" 2.2K " " ±5%
R1407	17807	" 2.2K " " ±5%
R1408	17041	" 10K " "
R1409	18306	" 5.6K " "
R1410	17041	" 10K " "
R1411	17077	" 4.7K " " ±5%
R1412	17352	" 68K " "
R1413	18992	" 390K " "
Q1401	44678	Transistor 2N4249
Q1402	44393	" 2N4303

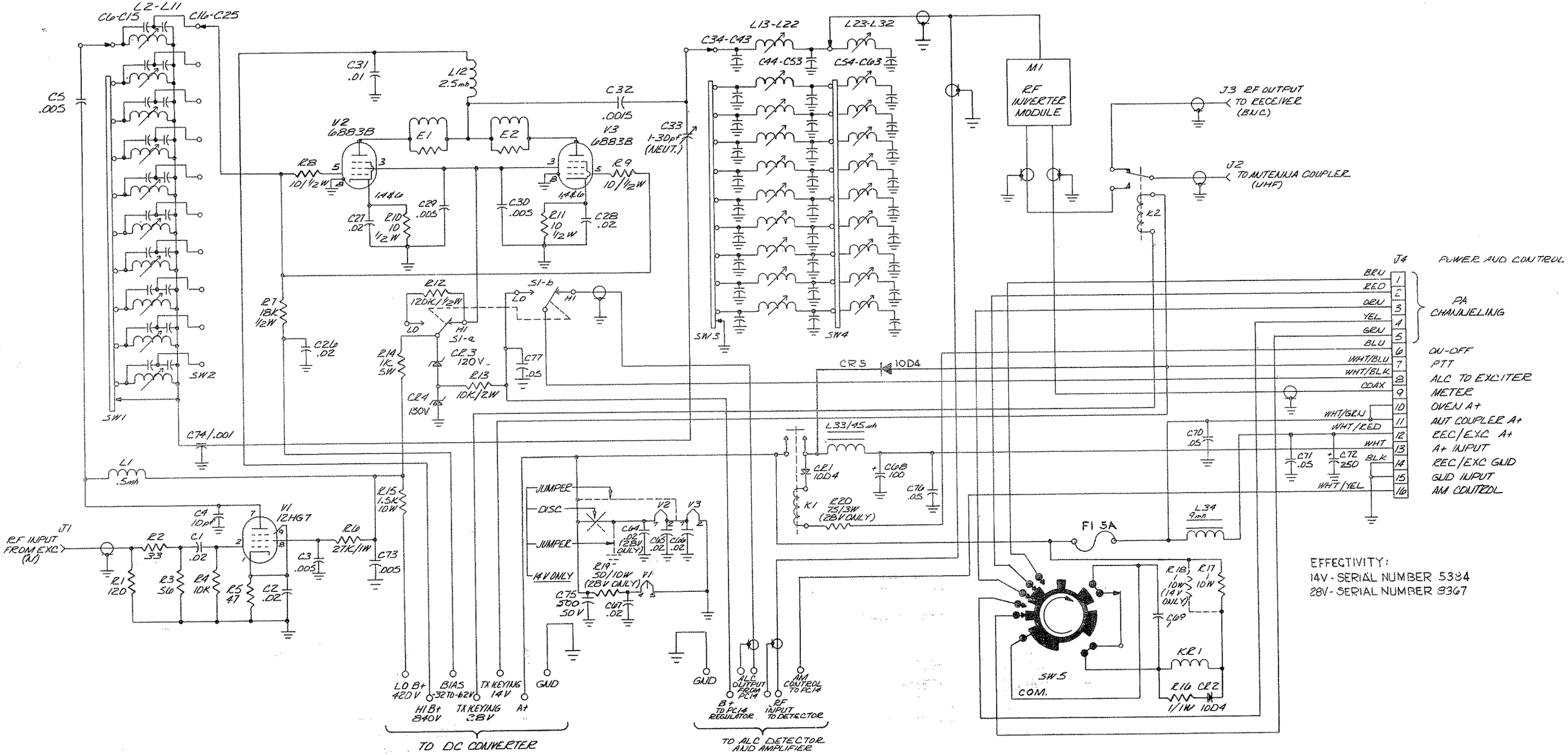


ALC AMPLIFIER



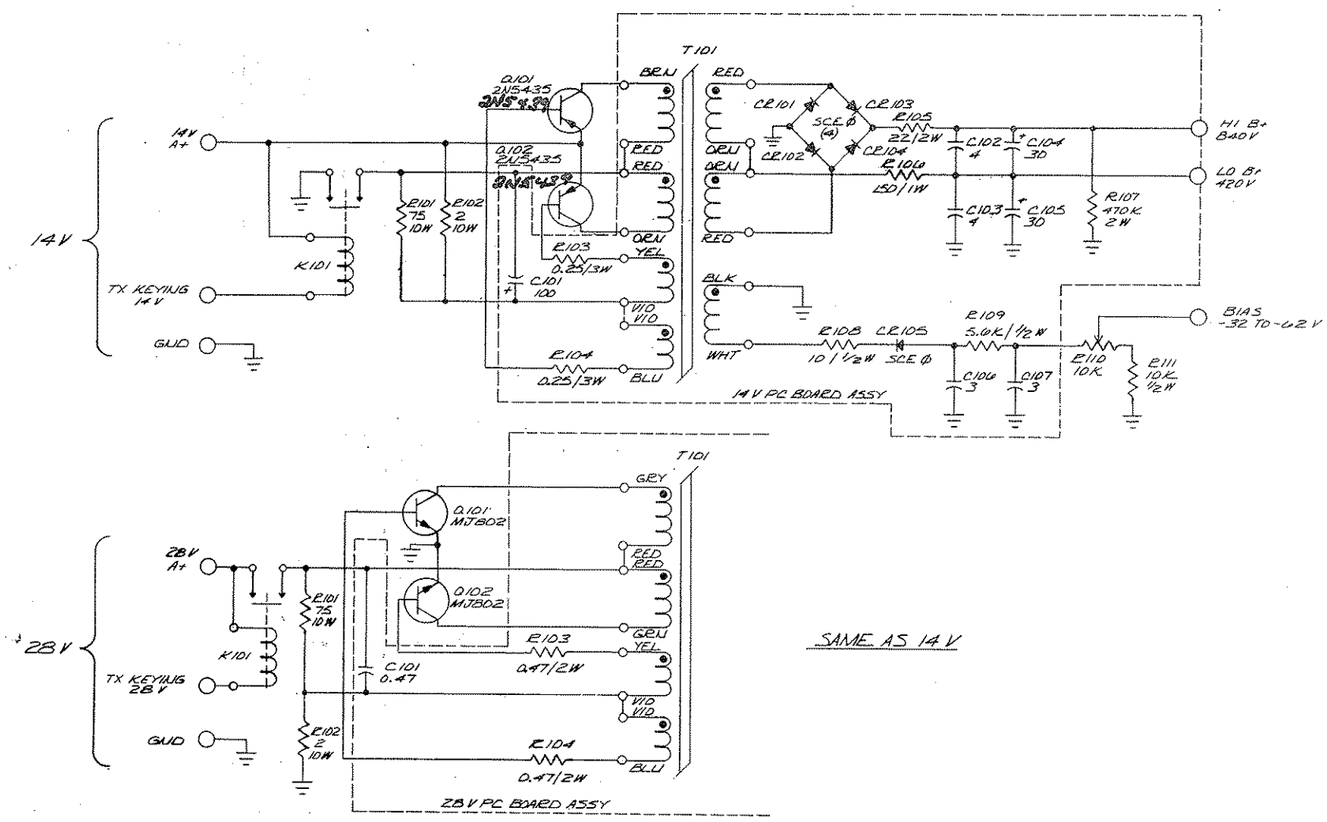
NOTE:
1. ALL CAPACITORS IN uf UNLESS NOTED
2. ALL RESISTORS IN OHMS 1/4 W ± 10% UNLESS NOTED

- ALC DETECTOR AND AMPLIFIER



EFFECTIVITY:
14V - SERIAL NUMBER 5384
28V - SERIAL NUMBER 9367

DRIVER & POWER AMPLIFIER



- POWER SUPPLY

ADDENDUMS

Information contained in this section supplements the information contained in the manual. References to this section may be indicated where necessary in the manual.

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-60/125
ASB130

ADDENDUM 1
DATE: 6-2-71

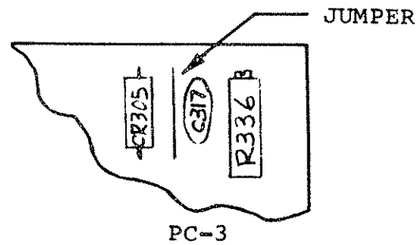
REFERENCE: COMPONENT ADDITION TO PC-3, AND PART NO. CORRECTION.

REVISION: RED

PURPOSE: CHANGE AGC-2 THRESHOLD

MANUAL REFERENCE: PAGE 102

TEXT: C-325, 6.8uf, 15V TANT. CAPACITOR, SUNAIR PART NO. 28357 CHANGED TO SUNAIR PART NO. 28753.
REMOVE JUMPER AND REPLACE WITH 47 OHM, 1/4W FIXED COMPOSITION RESISTOR SUNAIR PART NO. 17936 AND REFERENCE DESIGNATION R-331.



PC-3

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-60/125
ASB130

ADDENDUM 2
DATE: 6-2-71

REFERENCE: COMPONENT CHANGE ON PC-7 ASB-60/125

REVISION: RED

PURPOSE: INCREASE GAIN OF EXCITER OUTPUT, BY USE OF HIGHER CONDUCTANCE DIODE.

MANUAL REFERENCE: PAGE 106, 107, PC-7 EXCITER TUNED CIRCUITS.

TEXT: REPLACE DIODES CR-701 THRU CR-715 (ASB-60 AND CR-701 THRU 723 (ASB-125) SUNAIR PART NO. 44290 WITH 1N914B SUNAIR PART NO. 40510.

SUNAIR ELECTRONICS, INC. **ADDENDUM #3**
ASB-130 **DATE:** 3/10/72

REFERENCE: Carrier oscillator and clarifier

REVISION: Brn (PC-13, PC-10)

PURPOSE: Improve linearity of clarifier and extend range of frequency adjustment in transmit function.

MANUAL REFERENCE: PC-10, PC-13 and RE-1300 wiring diagram.

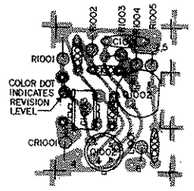
TEXT: PC-13 L1301 changed from 270uh P/N 66470 to 430uh ± 5% P/N 65910.

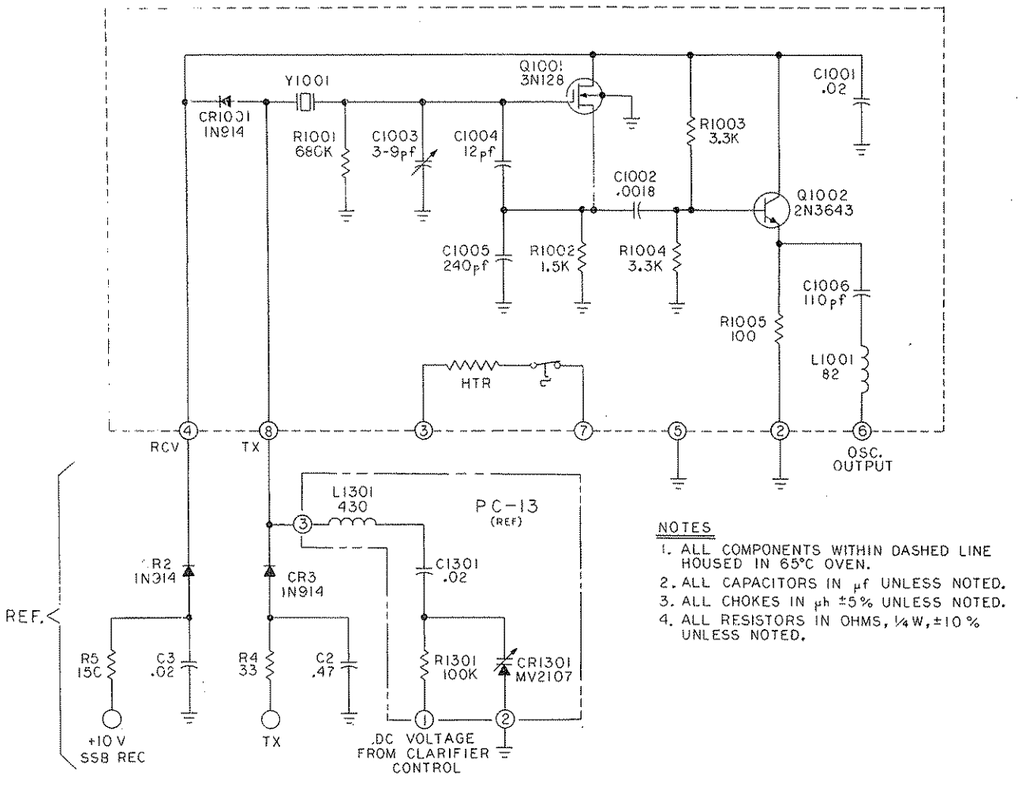
R1301 changed from 33k ohm P/N 17792 to 100k ohm P/N 17039

RE-1300 Wiring Diagram.
(Ref. Only) L1301 changed from 270uh to 430uh

PC-10 See following schematic diagram and parts list.

CKT. SYM.	PART NO.	DESCRIPTION
	99800	P.C. Board Ass'y with all Components
PC#10	10212	P.C. Board for 99800
C1001	26913	Capacitor, .02uf 25V
C1002	28869	" .0018uf
C1003	28741	" Variable 3-9pf
C1004	28648	" 12pf 500V
C1005	28862	" 240pf 500V
C1006	28131	" 110pf 500V
CR1001	44290	Diode IN914
L1001	65908	Choke, Molded 82uh±5%
Q1001	44484	FET 3N128
Q1002	44331	Transistor 2N3643
R1001	18148	Resistor 680K ohm 1/4W
R1002	17247	" 1.5K " "
R1003	17089	" 3.3K " "
R1004	17089	" 3.3K " "
R1005	17118	" 100 " "
Y1001	81834	Crystal 1650kHz +65°C





NOTES

1. ALL COMPONENTS WITHIN DASHED LINE HOUSED IN 65°C OVEN.
2. ALL CAPACITORS IN μf UNLESS NOTED.
3. ALL CHOKES IN μh ±5% UNLESS NOTED.
4. ALL RESISTORS IN OHMS, ¼W, ±10% UNLESS NOTED.

P.C. #10, 1650 OSCILLATOR

SUNAIR ELECTRONICS, INC.
ASB-130

ADDENDUM 4
DATE: 10/26/71

REFERENCE: Component Changes on PC-1, 2, 3

REVISION: PC-1 "Red", PC-2 "Red", PC-3 "Orn".

PURPOSE: Gain and Noise Figure Improvement.

MANUAL REFERENCE: PC-2, and PC-3 and Receiver Customizing

TEXT:

R 209 Changed from 100 ohm to 220 ohm	Sunair Part	#17132
R 205 Changed from 330 ohm to 180 ohm	Sunair Part	#17522
L-205 Changed from 6.8 uh to 4.7 uh	Sunair Part	#56425
Addition of C-239 7 pf Capacitor	Sunair Part	#28858

R-323 Selected Value (Nominally 5.6 K)
R-337 Selected Value (Nominally 4.7 K)

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM 5
DATE: 8/23/71

REFERENCE: High Voltage Zener Diodes of PA-1010B

PURPOSE: Zener Diode Z4892 P/N 40282 is discontinued.

MANUAL REFERENCE: PA-1010B Schematic
Page 86,91

TEXT: CR 3 Changed from Z4892 P/N 40282 to 1N3008B, P/N 40506
CR 4 Changed from Z4892 P/N 40282 to 1N3009B, P/N 40507

SUNAIR ELECTRONICS, INC.
ASB-130

ADDENDUM 6
DATE: 25 Aug. 71

REFERENCE: Microphone amplifier PC-5

REVISION: (1) Brown (PC-5)
(2) Brown (PC-5) with revision E printed circuit board

PURPOSE: (1) Reduce input sensitivity of audio amplifier
(2) Inprove linearity of amplifier below AGC threshold

MANUAL REFERENCE: PC-5 schematic; installation and checkout procedure (page 17)

TEXT: (1) R502 1.5k P/N 17247 changed to 680 ohm P/N 17663
(2) Add capacitor 6.8 uf P/N 28753 from emitter of Q507 to ground.

NOTE: The microphone amplifier is equipped with an AGC loop to maintain a constant amplitude audio input to the balanced modulator regardless of microphone gain variations. However, the loop gain of the system is high enough, that in extremely noisy environments and without the aid of a noise cancelling type microphone, output may appear on the relative power meter, in that case, a reduction of R502 reduces the input sensitivity and makes the system less susceptable to ambient noise.

SUNAIR ELECTRONICS, INC.
ASB-130

ADDENDUM 7
DATE: 25, Aug. 71

REFERENCE: ALC Amplifier PC-6

REVISION: Red

PURPOSE: Maintain ALC operation at below normal input voltage.
Replace transistor Q-604

MANUAL REFERENCE: PC-6 Schematic Diagram

TEXT: Add Zener Diode CR605 P/N 44305 from the emitter of Q-604 to ground
Q-604 2N4288 P/N 44587 Replaced by 2N4249 P/N 44678

SUNAIR ELECTRONICS, INC.
ASB-130

ADDENDUM 8
DATE: 12/1/71

REFERENCE: Replacement of transistor
REVISION: Yel(PC-3), Brn(PC-14)
ECN: 062-136

PURPOSE: Item discontinued by manufacturer

MANUAL REFERENCE: PC-3 and ALC amplifier (PC-14)

TEXT: 2N4288 P/N 44587 replaced by 2N4249 P/N 44678

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM #9
DATE: August 3, 1972

REFERENCE: PA1010B Power Supply

PURPOSE: Improve reliability of power supply during converter start period

MANUAL REFERENCE: Power supply schematic diagram, parts list
Page 87

TEXT: R108, 10 ohm 1/2W resistor is deleted and replaced with 1K ohm 1/2W carbon resistor PN 16748

R109, 5.6K ohm 1/2W resistor is deleted and replaced with 3.3K ohm 1/2W carbon resistor PN 18409

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM #10
DATE: 8/9/72

REFERENCE: MCU-33 Control Head

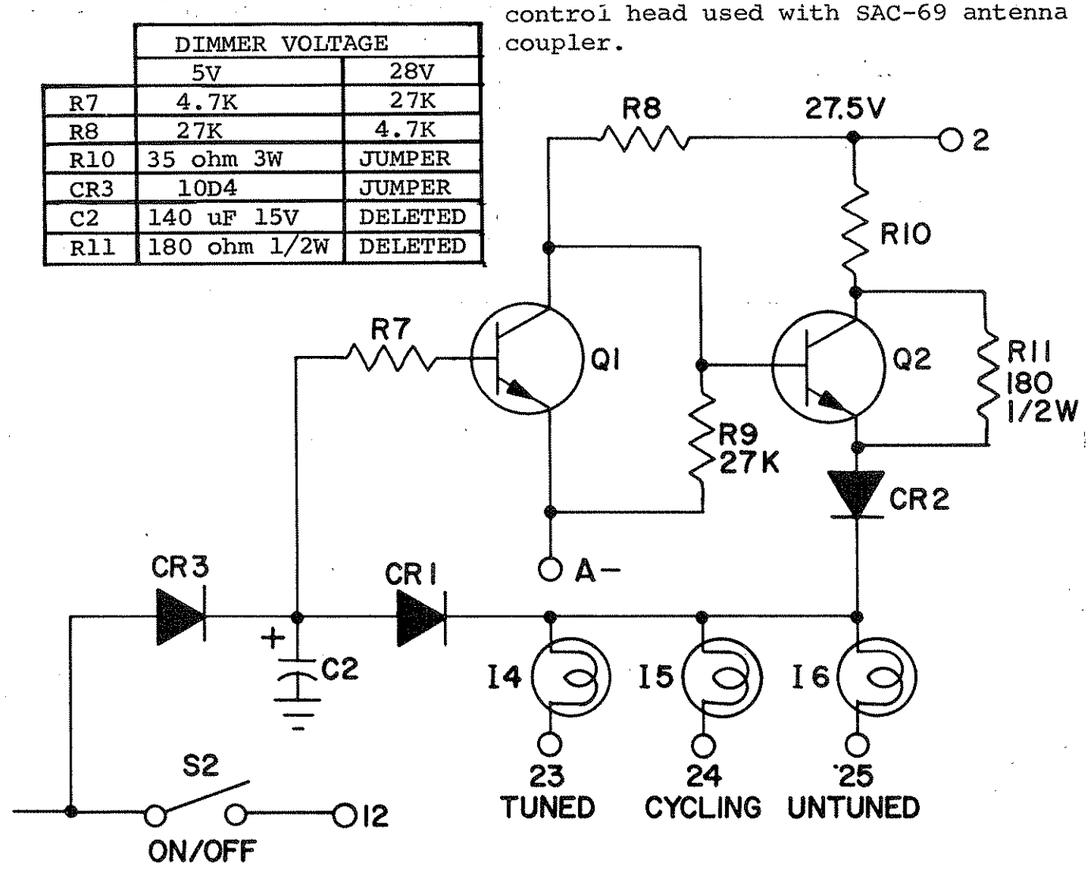
PURPOSE: Add electronic dimmer control circuitry to control head when used with SAC-69 antenna coupler.

MANUAL REFERENCE: MCU-33 Schematic

TEXT:

Add CR3 (10D4, PN 40165), C2 (136 uF, (2) 68 uF @15V, PN 28038), and R11 (180 ohm , 1/2 W PN 17364), to 5 volt control head used with SAC-69 antenna coupler.

	DIMMER VOLTAGE	
	5V	28V
R7	4.7K	27K
R8	27K	4.7K
R10	35 ohm 3W	JUMPER
CR3	10D4	JUMPER
C2	140 uF 15V	DELETED
R11	180 ohm 1/2W	DELETED



SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM 11
DATE: Sept. 5, 1972

REFERENCE: ECN 067-002
D.C. Power supply PC board ass'y 99379(28V) and 99390(14V)

PURPOSE: Reduce turn-on time of power supply and improve reliability

MANUAL REFERENCE: ASB-130
Section X power supply schematic diagram
Parts list page 87

TEXT: Remove 2 30mf 500V capacitors, C104,C105, from power supply PC board, ass'y 99379 or 99390

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM 12
DATE: Oct. 5, 1972

REFERENCE: DCN 145
75pf Capacitor, PA-1010B Customizing
560pf " " "

PURPOSE: Change part number

MANUAL REFERENCE: ASB-130
Page 82 PA-1010B Customizing

TEXT: Change P/N 25237 to 25232
P/N 28973 to 28375

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM #13
DATE: 12/1/72

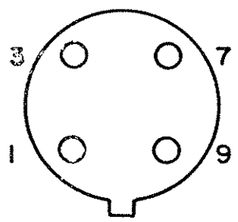
REFERENCE: Balance Modulator, Diode Ring, M501

ECN: 054-038

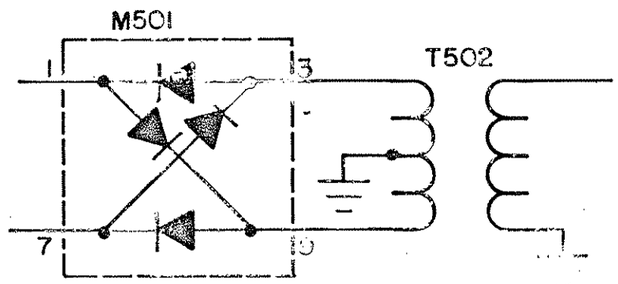
PURPOSE: Module M501, PN 40311, Package Change

MANUAL REFERENCE: PC-5 Schematic Diagram

TEXT: The modulator diode ring package has been changed to a TO-5 package. Schematic diagram and modulator connections are as shown below.



DIODE RING
TO5 PACKAGE
BOTTOM VIEW



NOTE: It will be necessary to form the diode ring leads in order to pair 1 with 7, and 3 with 9 to conform to the p-c board configuration.

SUNAIR ELECTRONICS, INC.
MANUAL: ASB-130

ADDENDUM 14
DATE: 12/6/72

REFERENCE: PA-1010B Power Supply

ECN: 063-018

PURPOSE: Improve reliability of power supply during low voltage starting condition

MANUAL REFERENCE: Power Supply schematic, parts list page 87

TEXT: Add capacitor C108, 1 uf/100V P/N 27230 from collector of Q101 to collector of Q102.

SUNAIR ELECTRONICS, INC.
ASB-130

ADDENDUM 15
DATE: 26 Dec. 72

REFERENCE: Component changes on PC-3 IF Amplifier

REVISION: Green

PURPOSE: Eliminate interference with cover

MANUAL REFERENCE: PC-3 IF Amplifier

TEXT: C301, C302 changed from .02uf 100V P/N 27345 to .02uf 25V P/N 26913

C304, C306, C311, C317, C321 changed from .05uf 25V P/N 27357 to .02uf 25V P/N 26913

SUNAIR ELECTRONICS, INC. ADDENDUM 16

MANUAL: ASB-130 DATE: 4/2/73

REFERENCE:	Component changes on PC-14 ALC Amplifier.
ECN:	064-029
PURPOSE:	Disable SSB ALC amplifier during AM operation.
MANUAL REFERENCE:	PC-14 schematic diagram and parts list.
TEXT:	Add diode CR1405, 1N914 P/N 44290 from R1401 and C1401 to pin 10 of IC1401, cathode connected to IC1401. R1401 changed from 5.6K/10%/$\frac{1}{4}$W P/N 18306 to 1.5K/10%/$\frac{1}{4}$W P/N 17247. CR1401 changed from MZ4625 to 1N751A.

SUNAIR ELECTRONICS, INC. ADDENDUM 17
MANUAL: ASB-130 DATE: 4/27/73

REFERENCE:	Balanced Modulator, Diode Ring M501.
ECN:	1841
PURPOSE:	Module M501, P/N 40311 discontinued by manufacturer.
MANUAL REFERENCE:	PC-5 schematic diagram and parts list.
TEXT:	Change diode ring module M501 to 4 individual diodes CR512 thru CR515, MBD102, P/N 40528.

SUNAIR ELECTRONICS, INC.

MANUAL: ASB-130

ADDENDUM 18

DATE: 4/12/79

REFERENCE: PC-10, 1650 KHz Oscillator

ECN: 062-254

PURPOSE: Increase oscillator feedback.

MANUAL REFERENCE: Addendum 3

TEXT: Move grounded side of capacitor C1003 (3-9pf) to junction of C1004 and C1005.