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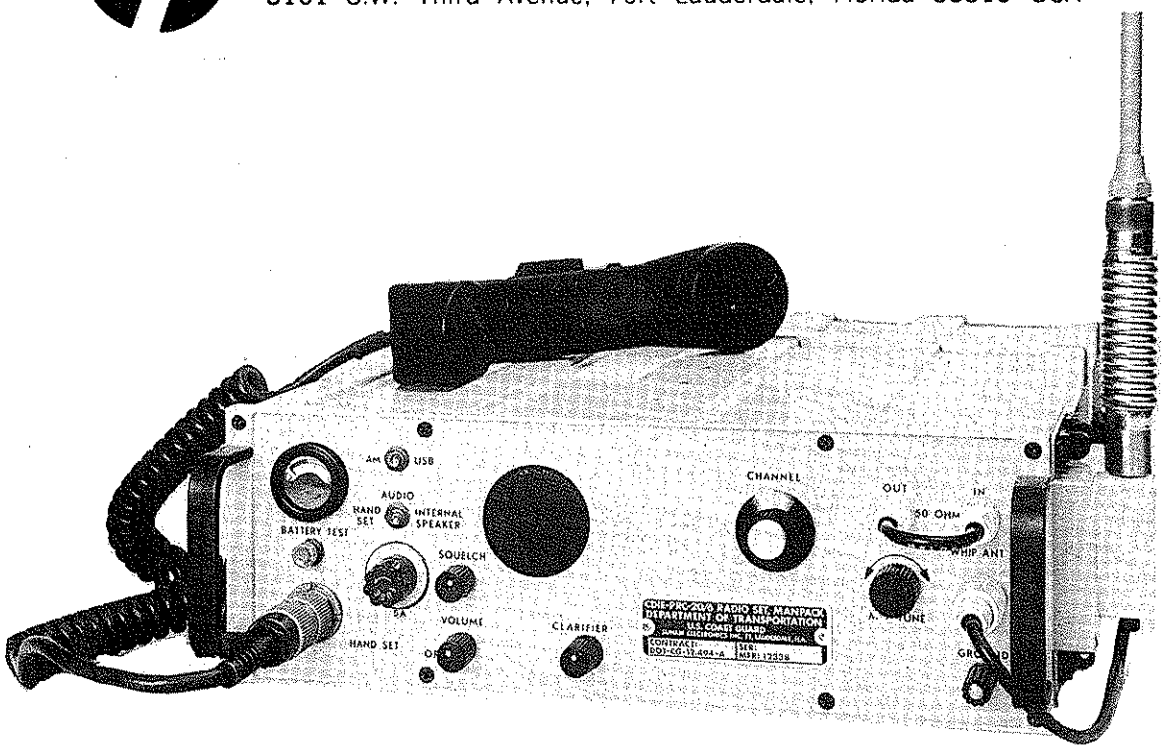

INSTRUCTION MANUAL

SSB PORTABLE TRANSCEIVER

PRC-20/6

NOTICE
Important equipment information may be contained in the addendums located in the last section of this manual.

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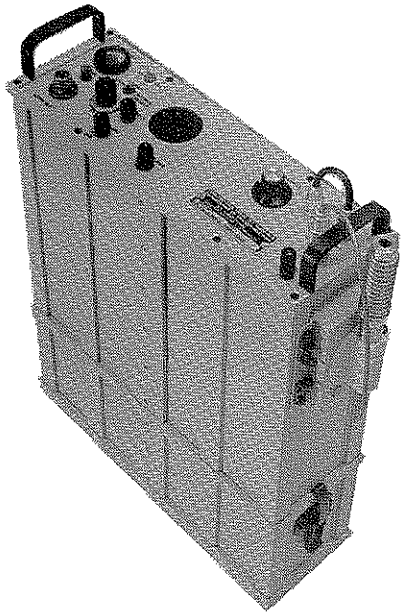
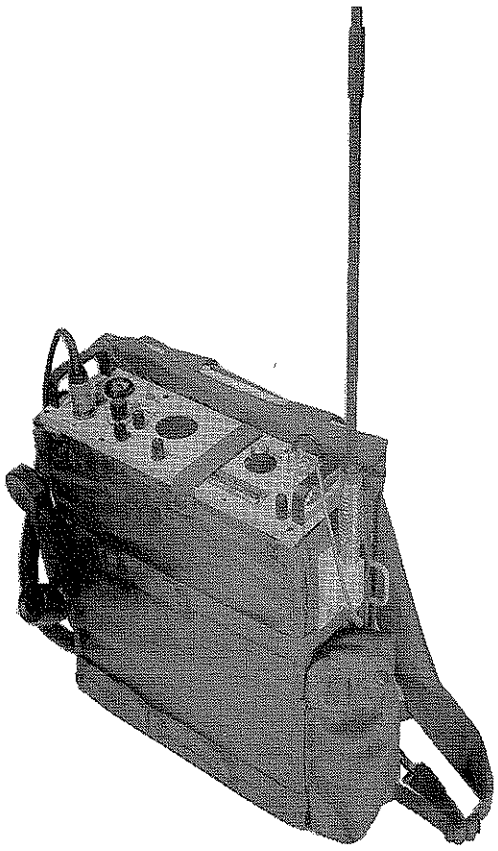


RADIO SET, PRC-20
WITH BATTERY PACK



RADIO SET, PRC-20
WITH ACCESSORIES

SECTION I

GENERAL INFORMATION

A. SYSTEM DESCRIPTION

The Sunair PRC 20/6 is a portable single sideband (SSB) and compatible AM (AME) 6 channel transceiver. It is designed for man-pack, mobile or base station use. The transceiver and battery pack are housed in rugged aluminum housings and with proper hardware on the transceiver front panel is water-tight.

The system consists of the transmitter/receiver, detachable battery pack, quick disconnect antenna and antenna mount and microphone. A nylon carrying case and back pack rack is available for man-pack operation.

The battery pack attaches to the bottom of the transceiver with two quick release fasteners and is designed to accept various types of 12 volt ni-cad, and sealed lead acid batteries. Removal of the battery pack allows a vehicular battery to be connected to the transceiver power connector for mobile installation.

B. SPECIFICATIONS

Frequency Range.....	2 to 12 MHz
Channels.....	6
Operating Modes.....	USB, AM, (LSB and CW optional)
Power.....	12V; 2 amp average transmit 200ma receive with signal
Battery.....	12V 7AH Ni-Cad or 8AH lead acid
Antenna.....	9 ft. metal, collapsible spring loaded whip.
Microphone.....	Handheld microphone, carbon
Meter.....	Monitors power out and battery
Size.....	Transceiver: 11.5x13x4.4 in. HWD 29.2x33x11.2 CM Battery Pack: 4.7x13x4.4 in. HWD 11.9x33x11.2 CM

Weight.....	Transceiver: 16 lb., (7.3kg) Battery pack w/o battery: 4.2 lb., (1.9kg)

TRANSMITTER:

Power Output.....	20 watts PEP min. 25W typical
Frequency Stability.....	±50Hz-20°C to +50°C
Duty Cycle.....	Continuous
ALC.....	NMT 1.5W change for 10db audio change
Carrier Suppression.....	SB: 40db, AM: 3-6db
Audio Bandwidth.....	350 to 2450 Hz: 6db
	fo-2.0 kHz to fo+5.0 kHz: 60db
IM Distortion.....	NLT 27db
Sidetone.....	With CW, optional with handset

RECEIVER:

Sensitivity.....	SB: 1uv for 15db S+N/N AM: 2uv for 10db S+N/N
Gain.....	Rated audio output at 5uv
AGC.....	NMT 10db change from 10 to 300,000uv
Selectivity.....	SB: 2.15 kHz 6db 7.0 kHz 60db AM: 6 kHz 6db 20 kHz 60db
Audio Response.....	350 to 2450 Hz 6db
Audio Output.....	Speaker: 500mw Handset: 10mw
Audio Distortion.....	NMT 10%
Clarifier.....	±100 Hz range
Spurious Response.....	60db
Squelch.....	Front panel control

C. ACCESSORIES AND OPTIONS

The following accessories and options are available with the standard transceiver:

1. Ground radial)
2. Long wire antenna) Recommended for longer range communications
3. Ni-Cad battery, 4 AH
4. Ni-Cad battery, 7 AH
5. Sealed lead acid battery 8 AH
6. Nylon carrying case
7. Metal frame back pack
8. Lower Sideband operation
9. CW with key and leg strap
10. Handset, military battle phone
11. Battery charger 115/230 Vac
12. Mobile mount rack
13. Mobile whip antenna and mount
14. Remote manually switched antenna coupler
15. Waterproof front panel hardware

D. ORDERING OF REPLACEMENT PARTS

When ordering replacement parts, furnish the following information as applicable:

1. Sunair type number, name and serial number of basic equipment, PRC 20/6
2. Unit sub-assembly if known
3. Sunair part number and description
4. Item or symbol number from parts list or schematic drawing.
5. Quantity required.
6. Mode of Shipment if critical

SECTION II

OPERATING INSTRUCTIONS

A. CONTROLS, METERING AND CONNECTORS

1. Mode Switch: Selects operating mode of transceiver, USB, AM, (LSB, CW, optional).

2. Channel Selector: Selects operating channel of transceiver and antenna tuner.

3. Gain: Controls the receiver audio output, and ON/OFF power switch.

4. Clarifier: Varies the receiver audio output frequency in SB mode to achieve natural voice pitch.

5. Audio Switch: Switches audio between internal speaker and handset.

6. Meter: Monitors RF power output and battery condition.

7. Battery Test Switch: When depressed, keys transmitter and connects meter to battery. Mode switch must be in AM position to transmit carrier.

8. Transmitter Output: 50 ohm output of transmitter power amplifier. Normally connected to antenna tuner input. For transmitter power measurements can be connected to 50 ohm load.

9. Antenna Tuner Input: 50 ohm input to antenna tuner. Normally is connected to transmitter 50 ohm output.

10. Antenna Tuner Output: Normally connected to lead from whip antenna mount. Can be connected to long wire antenna.

11. Ground Terminal: Normally used to connect ground radial to transceiver case.

12. Antenna Trimmer: A variable capacitor that compensates for variations in antenna impedance.

B. ANTENNA SYSTEMS

1. Sectional Whip Antenna-The standard portable antenna is a seven section, nine foot metal whip. It is internally spring loaded and can be assembled by holding the base section and dropping the remaining sections. By shaking the section held in the hand the internal spring will cause the sections to retract into their sockets. Disassembly of the antenna must start at the small end (tip) of the antenna, proceeding down to the base section.

   For longer range communications it is recommended that the ground radial be connected to the ground terminal of the case, unrolled and layed out on the ground.

2. Long Wire Antenna-For base station or semi-fixed station operation several types of wire antenna systems may be installed:

   a. End Fed-If two or more frequencies seperated by more than 5% are used, the long wire antenna and internal coupler is recommended. The case of the radio should be grounded or connected to any large mass of metal or the ground radial can be used.

   b. Di-pole-If only one frequency is used or the frequencies are within a 5% spread a di-pole type wire antenna may be used. The wire antenna is ½ wave length long cut in the middle with one half connected to the center conductor of RG-58 coax and the other half connected to the coax shield. The coax is connected to the transmitter 50 ohm output and the antenna tuner is not used. The SWR must be checked and the antenna trimmed for minimum SWR.

3. Mobile Whip Antenna-For mobile installations the mobile whip is recommended. If the antenna and transceiver are in close proximity the antenna tuner in the transceiver may be used to tune the antenna. If the antenna is mounted remote (more than 3 feet) the remote mounted, manually switched antenna tuner should be used.

C. TRANSCEIVER

1. Receiver-To operate the receiver perform the following steps:

   a. Select desired channel and operating mode.

   b. Select either speaker audio or handset audio. (if handset used)

   c. Set squelch control off. (full counter clockwise)

   d. Set volume to desired listening level.

   e. With no signal present set squelch clockwise until radio is silenced and then back off control slightly.

   f. When receiving single sideband, set clarifier for natural voice tone.

2. Transmitter-To operate the transmitter perform the following steps:

   a. Select desired channel, turn mode switch to AM.

   b. Key microphone or handset and adjust antenna tune control for peak indication on panel meter. On some frequencies two peaks may appear, tune to the highest of the two.

   c. Select desired operating mode and speak into microphone at a normal to below normal voice level. Panel meter should indicate relative power output.

D. BATTERY CHARGER

The battery charger is designed to operate from 115/230 Vac. Changing from one voltage to the other is accomplished on the internal terminal strip per the directions on the charger cover. To charge the battery pack proceed as follows:

1. Connect battery pack connector to charger output connector.

2. Connect charger to AC power source.

3. Turn on power switch.

4. Set charge switch to Fast Charge for discharged battery. Battery charge current will be approximately 600 to 800 ma and will charge a 7 AH

battery in approximately 10 hours.

5. To maintain a charged battery on charge, set switch to trickle charge. Charge current will be approximately 50 to 60ma and battery may be left on charge indefinitely.

E. CARRYING CASE AND BACK RACK

The carrying case and rack are designed to house the transceiver and provide a comfortable carrying harness for the unit. In addition to stowing the transceiver unit, pockets are provided to stow the handset or microphone, whip antenna and ground radial.

A clip is provided on one carrying strap to secure the handset while carrying and operating the transceiver.

SECTION III

THEORY OF OPERATION

A. RECEIVER

The receiver circuitry is mounted on four printed circuit plug-in boards. The discussion of the theory of operation will be by pc board and reference to Block Diagram III-1.

1. RF Signal Preselector, PC-1: The RF signal is routed from the antenna system through antenna change-over relay K-1 to the RF preselector. The preselector is a three stage filter which discriminates against unwanted signals. Selection of the desired tuned circuits is accomplished by diode switching. The output is connected to PC-2.

2. RF Amplifier, Mixer, 1st IF Amp and AM Oscillator/Filter, PC-2: The signal from PC-1 passed through a variable attenuation network to the r-f amplifier, Q201. AGC voltage controls the signal level and gain of each. The signal is then routed to the mixer Q202, where channel oscillator frequency (1.650 MHz above the incoming signal) is injected. The signal is then further amplified in the 1st IF amplifier Q203 which is connected to the AM mixer/filter and the sideband input filter switch on PC-4. For AM operation the AM oscillator (2105 kHz) is turned on and the 1650 kHz signal is mixed and filtered in Q204 and the 455 kHz filter. For SB operation the signal is routed to PC-4 and is switched to either the USB filter or LSB filter by CR408, Q410 or CR 409, Q411 respectively which selects the desired sideband.

3. IF Amplifier, AGC, AM and Product Detector, PC-3: The AM or SB signal is connected to one of three input transistor switches Q301, 302, 303 whose emitters are in turn connected to the 2nd IF amplifier. The mode switch applies +10V to the appropriate transistor which routes the signal

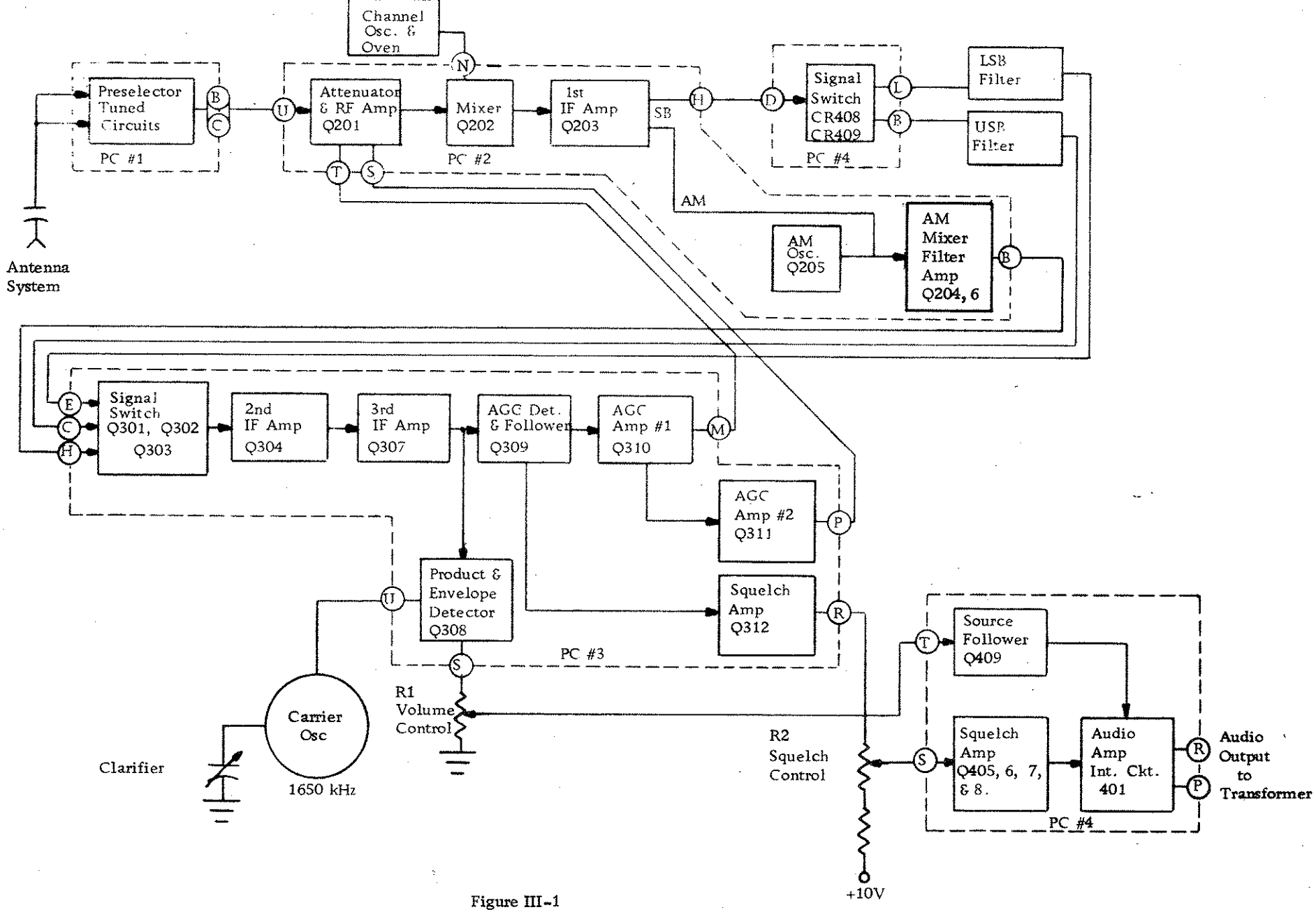


Figure III-1
Block Diagram - Receiver

to the 2nd and 3rd IF amplifier. The tuned load for the 2nd IF amplifier is switched between 455 kHz and 1.65 MHz by +10V from the mode switch when in the SB position. The output from the 3rd IF amplifier drives the AGC detector/amplifiers, CR303,304 and Q310, 311 and the squelch amplifier, Q309, 312 and the SB and AM detector, Q308. During SB operation the 1.65 MHz oscillator, PC-9, is switched on and provides the signal required for product detection in Q308. For AM operation Q308 in conjunction with the r-c filter is used as an envelop detector. The resultant audio output is connected to volume control, R1, and then to the audio amplifier located on PC-4.

4. Audio Amplifier, Squelch Amplifier and Switching, PC-4: The switching circuits are used in the signal processing prior to introduction of the signal to PC-3 and are not used for audio switching.

   The audio from the volume control is routed to source follower, Q409, and then into the audio amplifier, integrated circuit, IC401. The output of IC401 drives transformer, T1, push-pull which has two outputs 8 ohms for the speaker and 1000 ohms for the handset, selectable by S3, the panel mounted audio selector switch.

   The squelch amplifier, Q405-408 receives its signal from the squelch control, R2, located on the front panel. The maximum level signal that the potentiometer R2 can squelch is set by R415 which is normally set for 15uv but can be increased to a much higher level if desired.

B. EXCITER

The exciter circuitry is mounted on three plug in printed circuit boards plus two pc boards, the ALC and microphone preamp mounted on the underside of the chassis. Refer to Block Diagram III-2.

1. Microphone Preamp PC-10: If the H-33 handset or the standard carbon microphone is supplied this amplifier is not required. However for operation with the H-189 handset approximately 50db of gain is necessary before the audio signal can be injected into the microphone amplifier on PC-5. PC-10 amplifies the 1 to 2 millivolts of signal

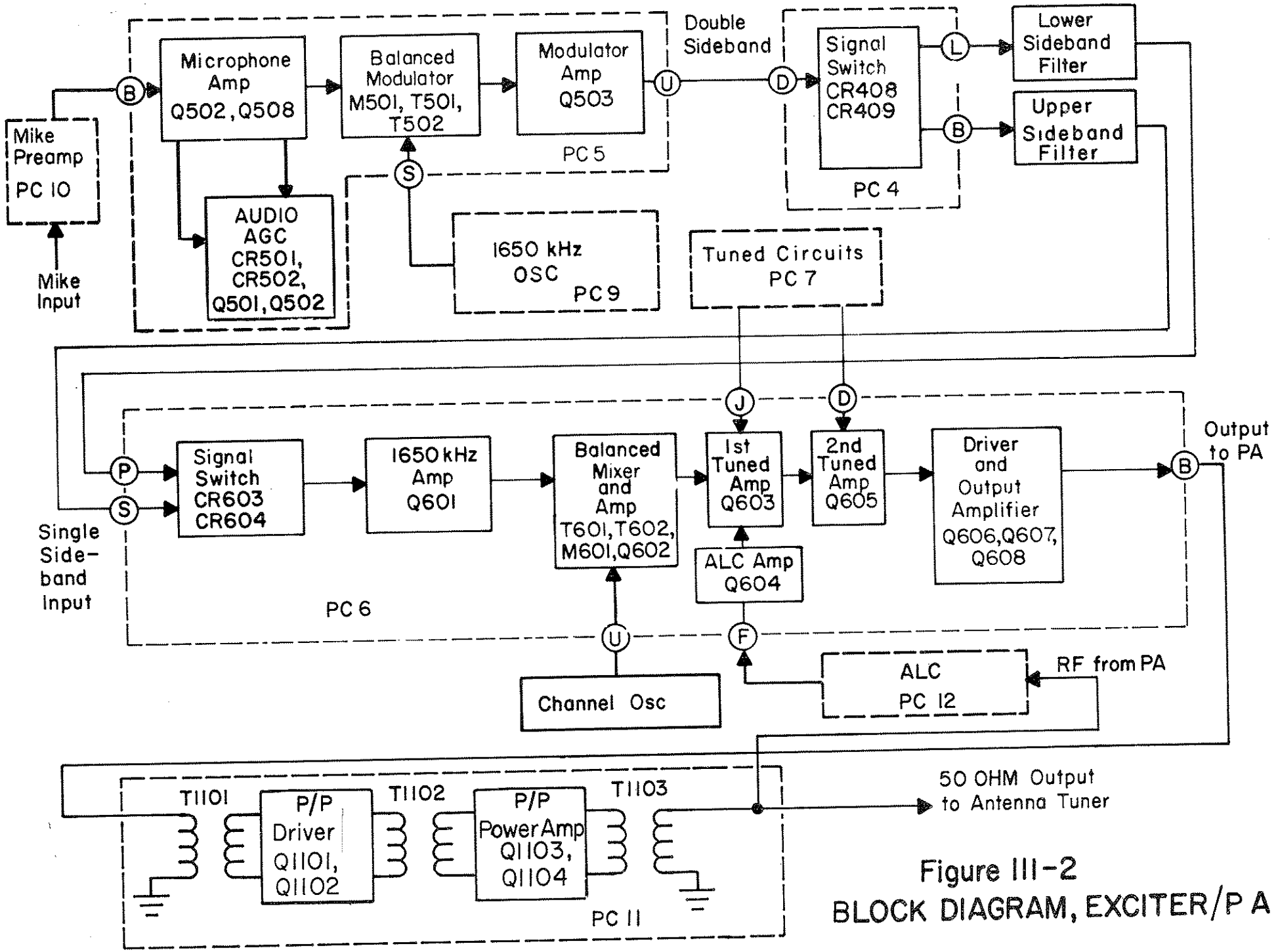


Figure III-2
BLOCK DIAGRAM, EXCITER/P A

from the H-189 to approximately 200mv.

2. Microphone Amp, Balanced Modulator PC-5: The microphone audio is routed to Q501 a series variable attenuator whose gain is controlled by diode detectors CR501, 502 and transistor Q507. Amplification of the signal occurs in Q502 and Q508 serves as a driver for the balanced modulator. A lower audio level is required for AM operation and CR503 is turned on by the AM select 10V which reduces the audio signal into the modulator.

   Ring modulator M501 and the two transformers T501 and 502 serve as the balanced modulator. The carrier oscillator is injected along with the audio and the signal is translated up to a double sideband suppressed carrier signal symmetrical about 1.65 MHz. Q503 amplifies the signal which is then routed to PC-4 for switching to the upper or lower sideband filter.

   For AM operation the carrier must be re-inserted after the balanced modulator. This is accomplished by switching on doides CR505 and 507 with the AM select 10V.

3. Balanced Mixer, Tuned Amplifiers PC-6: The upper or lower sideband filter selects the desired sideband and the signal is then routed to Q601 the amplifier driver for the balanced mixer M601. The channel oscillator, 1650 kHz above the channel frequency, is injected into the mixer in a balanced mode such that it does not appear in the output of T602. The sideband signal from Q601 is mixed with the oscillator frequency by the mixer and is amplified by Q603 and Q605, tuned amplifiers, (the tuned components are located on PC-7) which discriminate against the unwanted mixing component, channel osc. plus signal and selects the component, channel osc. minus signal. Since the difference of the two signals are selected the lower sideband filter is actually used to transmit upper sideband.

   Q608 is a broadband amplifier used to drive the input stage of the broad band power amplifier.

C. POWER AMPLIFIER PC-11

The power amplifier is a non-tuned wideband linear amplifier which increases the power level from approximately 100 milliwatts to 20-25 watts PEP.

Signal from the exciter is coupled to the push-pull drivers, Q1101 and 1102 through transformer T1101. The output of the drivers in turn drives the push-pull output stage, Q1103, 1104 through T1102. The final output is coupled to the coupler or panel mounted output connector through T1103.

Both stages must have forward bias in order to operate in a linear fashion. This bias is set by potentiometers R1107 and R1106 for approximately 2ma through each driver transistor and 30ma through each output transistor.

D. ALC DETECTOR AND AMPLIFIER

The peak output power of the broadband amplifier is limited by the ALC circuit. In single sideband operation a sample of the output voltage, developed across R1217 is detected and the resulting DC voltage drives Q1204 into conduction. The negative pulse developed at the drain of Q1204 is then coupled thru CR1205 to the base of the ALC amplifier on PC-6 and a reduction in gain occurs. This reduction in gain decreases the sample voltage at R1217, which in turn reduces the negative pulse at the drain of Q1204 and the system gain again increases. However, the resulting oscillations in the loop are damped by the combination of C1206 and R1220 allowing for a stable adjustment of the peak output power by R1217. During SB operation a DC voltage is also coupled to the base of Q1202. The resulting low collector impedance in series with CR1201 shunts the RF signal to ground. This disables the AM ALC during SB operation.

The average output power is controlled by Q1203 and set with R1202. During AM operation CR1203 detects the sampled RF voltage and forces Q1204 to conduct. The negative pulse developed at the drain now controls the average system gain. However, the SB detector is still active and limits the peak excursion of the modulation.

E. OSCILLATORS

1. CHANNEL OSCILLATORS (channel 1) all channels typical.

PC-8, the high frequency crystal oscillator is activated either on transmit or receive by DC applied thru CR802 or CR801 to the collectors of Q802 and Q801. The oscillator Q802 is crystal controlled and receives feedback thru C803 to sustain oscillations. It's output is isolated from the load by emitter follower Q801. C806 in shunt with the crystal is used to adjust the oscillator frequency, which ranges from 3.65 MHz to 13.650 MHz, depending on the channel frequency.

2. CARRIER OSCILLATOR

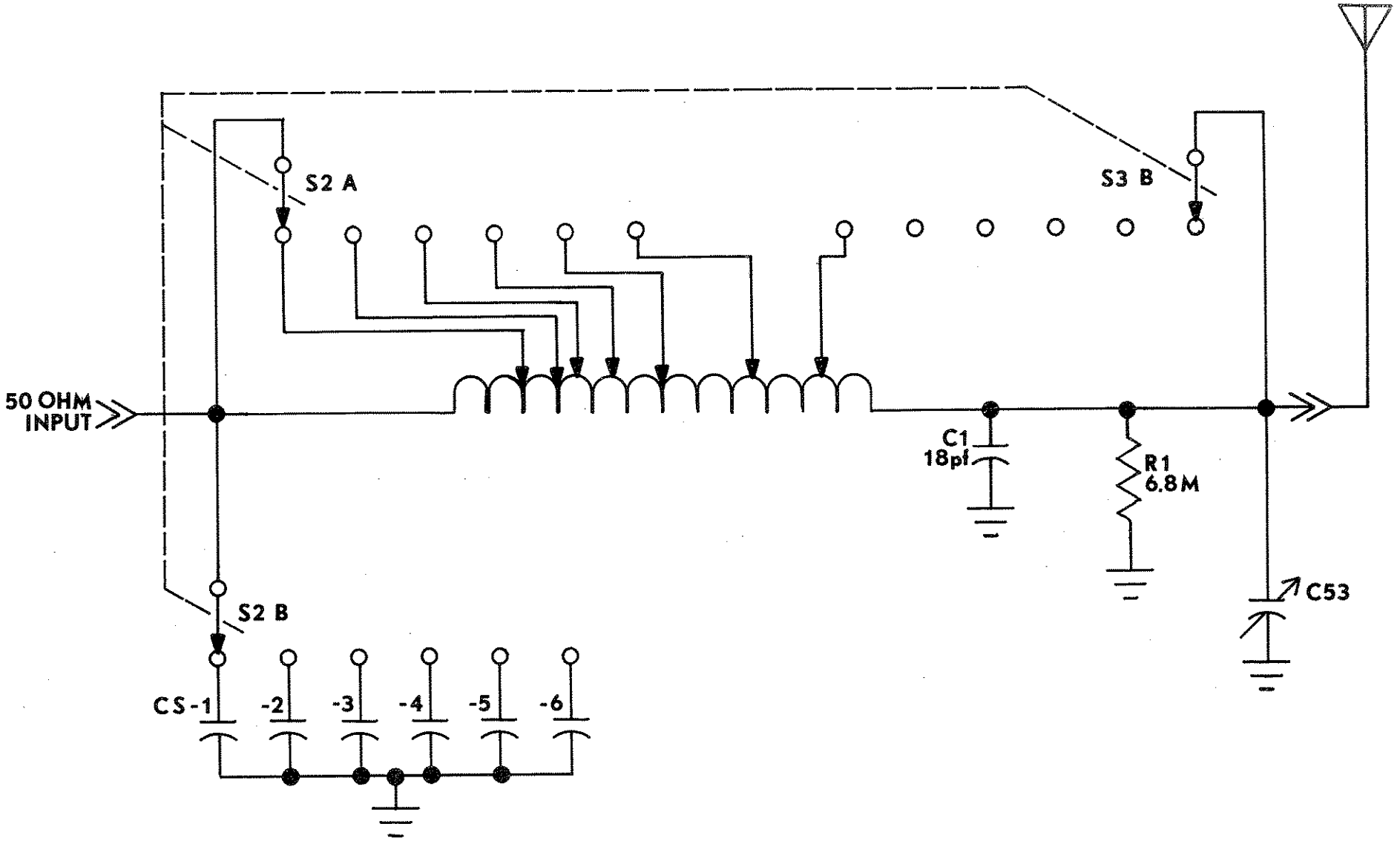
The carrier oscillator is also crystal controlled, however, in SB receive the crystal anti resonant frequency can be altered by C901 and L901. In transmit CR903 conducts and the crystal is returned to DC ground potential thru C902. The transmit frequency may be altered with the shunt capacitor C906. The oscillator output is isolated by emitter follower Q902 and coupled thru the series tuned circuit C910 and C902 to PC-5 and PC-3.

F. ANTENNA COUPLER

The antenna coupler or tuner shown in Figure III-3 performs the necessary function of transforming the antenna impedance to the impedance of the power amplifier to accomplish maximum power transfer to the antenna system.

The impedance of a short whip antenna at HF frequencies is normally capacitive or negative reactance along with a real component of the impedance. It is the function of the antenna coupler to cancel out the reactive quantity and transform the real part such that the power amplifier is loaded with a 50 ohm pure resistance.

The components required to perform this transformation are installed in the tuner and a chart showing these values by frequency is in Section V-C.



ANTENNA TUNER
FIGURE III-3

SECTION IV

ADJUSTMENT AND ALIGNMENT PROCEDURE

A. GENERAL INFORMATION

The receiver is designed for minimum variations in specifications. After the initial factory adjustments further adjustment are not required unless circuit boards are replaced, channel frequencies are changed, or periodic inspections are scheduled to insure peak performance of the equipment.

B. EQUIPMENT REQUIRED

1.	RMS Voltmeter	H-P	Model	400L,	or Equivalent
2.	Frequency Counter	"	"	5245L,	"
3.	RF Signal Generator	"	"	606B,	"
4.	Audio Oscillator	"	"	200CD,	"
5.	Wattmeter 50W Element	Bird	"	43,	"
6.	Coaxial Resistor 50 ohm	"	"	81B,	"
7.	Oscilloscope	Tek.	"	543B,	"
8.	DC VTVM	H-P	"	412A,	"
9.	DC Current Meter	"	"	428B,	"

C. RECEIVER

1. Channel Oscillator

   a. Connect frequency counter to pin "l" or "m" of J-8

   b. Turn channel knob to channel "1"

   c. Adjust C806 until frequency counter indicates channel frequency plus 1.650 MHz.

   d. Turn channel knob to successive channels and adjust C-812, 818, 824, 830 and 836.

2. Preselector Alignment

   a. Connect coax from signal generator to J-11 on front panel

   b. Connect RMS voltmeter to pin "B" of J10 (Hand set connector)

   c. Turn mode switch to "AM", audio selector to hand set and squelch control full (CCW)

d. Increase (CW) volume control until noise appears on RMS voltmeter

e. Inject channel frequency (30% MOD @ 1000 Hz) from signal generator

f. Tune L101, 107, 113 (Channel 1) for maximum output on RMS meter. Reduce signal generator and volume control as required to maintain undistorted output.

g. Tune coils corresponding to other channels as outlined above. (See preselector overlay for component location)

3. Mixer and IF Alignment

a. Repeat steps a thru d of par 2

b. Inject 1650 kHz (30% MOD @ 1000 Hz) from signal generator

c. Increase signal generator output until audio appears on RMS voltmeter

d. Adjust L-211, L212 and L213 for maximum indication on RMS voltmeter, reduce signal generator output and volume control to prevent saturation

e. Adjust L-207 and L210 for minimum output on RMS voltmeter increase signal generator output to maintain output indication.

4. AM and SSB Gain Equalization

a. Connect DC VTVM to pin "T" of PC-2, turn mode switch to USB.

b. Inject channel frequency from signal generator into J-11.

c. Tune signal generator (10uv input) for minimum reading on DC VTVM

d. Record reading. Turn mode switch to "AM" and tune generator for minimum reading on VTVM

e. Adjust C-230 (2nd mixer oscillator injection) until DC VTVM indicates the same as in step d above.

5. AGC-2 Threshold

   a. Connect RMS voltmeter & oscilloscope to pin "B" of J10 (Hand set connector)

   b. Turn mode switch to AM, and connect signal generator to J-11 on front panel.

   c. Tune signal generator to desired channel frequency (30% MOD @ 1000 Hz)

   d. Increase signal generator output to 250,000uv, and adjust volume control to obtain an undistorted output on the oscilloscope.

   e. Increase signal generator output to 500,000uv and adjust R-330 for minimum change in audio output referenced to step d above.

6. Detector Bias Adjustment

   a. Repeat steps a thru c of par. 5

   b. Set signal generator output to 10uv

   c. Adjust R-336 for maximum output on RMS voltmeter.

7. Squelch Threshold Adjustment

   a. Repeat steps a thru c of par. 5

   b. Turn Squelch control (front panel adjustment) full CW.

   c. Increase signal generator output to 15uv

   d. Adjust R-415 until RMS voltmeter indicates audio output.

C. EXCITER/POWER AMPLIFIER

1. Power Amplifier Bias Adjustments

   a. Turn mode switch to USB, connect coaxial cable from J-11 to thru-line wattmeter and terminate with 50 ohm coaxial resistor.

   b. Connect DC VTVM to junction of R1102 and Q1102.

c. Turn bias potentiometers R1107 and R1108 full CCW.

d. Push battery test switch and adjust R1107 CW until VTVM indicates 2mv. Release test switch.

e. Connect current probe to the wire from the positive terminal of the battery. Set range to lamp full scale

f. Push battery test switch and adjust R1108 CW until meter reading increases 40 ma. Release test switch.

2. Modulation Adjustment

a. Turn mode switch to AM, connect coaxial cable from J-11 to thru-line wattmeter and terminate with 50 ohm coaxial resistor.

b. Turn R1217 CCW and R1202 CW

c. Connect audio oscillator (1000 Hz) to J10 pin D, set level to 2 mv rms.

d. Connect oscilloscope to pin "B" of J6

e. Push battery test switch and adjust R-535 until 100% modulated waveform appears on oscilloscope.

3. Balanced Modulator Adjustment

a. Repeat step a of par. 1

b. Connect audio oscillator to J10 pin D, set level to 2 mv rms.

c. Connect oscilloscope to the base of Q-503

d. Push battery test switch and adjust R-511 until adjacent peaks of waveform are of equal amplitude.

4. Balanced Mixer Adjustment

a. Repeat step a of par. 1

b. Connect oscilloscope to pin "B" of J6

c. Turn channel selector to highest frequency channel.

d. Push battery test switch and adjust R-609 for minimum indication on oscilloscope.

5. Exciter Tuned Circuit Alignment

a. Repeat step a of par. 1

b. Connect audio oscillator to J10 pin D (2 mv rms)

c. Connect oscilloscope to pin "B" of J6

d. Turn channel selector to channel 1

e. Push battery test switch and adjust L701 and L707 for peak output on oscilloscope. (Start with maximum inductance)

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

f. Repeat Tuning for all active channels using corresponding coils.

6. ALC Adjustment (AM)

a. Repeat step a of par. 2

b. Push battery test switch and turn R1202 CCW until wattmeter indicates 6 watts.

c. Check all other active channels. Wattmeter should read between 5 and 7 W.

7. ALC Adjustment (SSB)

a. Repeat step a of par. 1

b. Connect audio oscillator (800 Hz and 1800 Hz) respectively to pin D of J10 (combined output of 2 mv rms, both tones of equal amplitude).

c. Push battery test switch and adjust R1217 until wattmeter indicates 9 watts (22.5 W PEP)

d. Check all other active channels. Wattmeter should indicate 8 to 10 watts (20-25 PEP)

8. Coupler Tuning See Section V-C

E. GENERAL INFORMATION

1. When the transceiver is scheduled for maintenance, a visual inspection should be performed to check for broken wires, loose or shorted contacts or damaged components.

2. Malfunctions in the transceiver may be isolated quite rapidly by the substitution of circuit boards. However, if no spare circuit boards are available, a general signal tracing procedure in conjunction with the procedure outlined in this section may be used. Once the faulty circuit board has been isolated it may be repaired utilizing the DC voltage measurements specified on the transceiver schematic diagram or returned to Sunair Electronics, Inc.

F. TROUBLE ANALYSIS

SYMPTOM	PROBABLE CAUSE	REMEDY
No output on any channel (Rec and Tx)	Discharged battery Defective voltage regulator Defective fuse	Replace battery, check voltage on emitter of Q-1, check fuse
No output on some channels (Rec and Tx)	Defective crystal or component on PC-8	Check oscillator, replace crystal
No output on any channel, AM rec. normal	Defective crystal or component on PC-9	Replace PC-9 or PC-5
No output on SSB rec; transmit normal	Defective component on PC-9, or PC-5	

SYMPTOM	PROBABLE CAUSE	REMEDY
No audio output on any channel	Squelch control on front panel set to quiet receiver squelch threshold R-415 not adjusted properly. Defective circuit boards PC-2, 3 or 4	Turn squelch control completely CCW readjust R-415 replace PC-2, 3 or 4
No audio output on some channels	Defective crystal or component on PC-8, PC-1 misaligned or defective component	Check oscillator align PC-1
No audio output on AM, SSB normal	Defective mode switch S-1 Defective circuit board PC-2, 3 or 4	Check S-1, replace circuit boards
No audio output on SSB AM normal	Defective oscillator PC-9, Defective filter FL-1 defective circuit boards PC-3, 4 or 5.	Check oscillator replace circuit boards, filter
Sensitivity low, poor noise figure	Preselector, PC-1 misaligned PC-2 defective	Align preselector replace PC-2
Audio output distorted. Unreadable on SSB.	Clarifier, C901 not adjusted properly. R-336 not adjusted properly.	Adjust C-901 Adjust R-336
Unable to squelch receiver	R-415 not adjusted properly. Faulty squelch circuit on PC-4	Adjust R-415 replace PC-4
AGC defective, audio output increases excessively with increasing RF input	AGC potentiometer not adjusted properly, faulty AGC circuit on PC-3	Adjust R-330 replace PC-3
Transmitter No power output on any channel	Defective voltage regulator, or K-1 defective carrier oscillator PC-9 Defective circuit board PC-4, 5, 6 PC-10, 11 or 12	Check voltage at emitter of Q-1 check oscillator replace faulty circuit board

SYMPTOM	PROBABLE CAUSE	REMEDY
No power output on some channels	Defective oscillator PC-8 coils misaligned on PC-7	Check oscillator align PC-7
No output on SSB	R-511 not adjusted properly	Adjust R-511
No modulation on AM AM carrier normal	Defective circuit board PC-10, or 5	Replace Defective circuit board
No carrier output on AM SSB normal	Defective mode switch	Check S-1
	Defective carrier insertion on PC-5	Replace PC-5
Output on SSB without Audio input	Defective PC-5, R-609 not adjusted properly. Defective PC-6	Adjust R-609 Replace defective circuit boards
Output low	ALC potentiometers (R1202 & R1217) not adjusted properly. Bias adjustments, (R1107 & R1108) not adjusted properly.	Adjust ALC potentiometers or bias potentiometers.

SECTION V

FREQUENCY CHANGES

A. RECEIVER

1. PC-8: Crystal Oscillators- The crystal and oscillator circuitry is mounted on PC-8. When changing or adding a channel frequency the new crystal must be installed in its appropriate socket and the oscillator set on frequency by adjustment of the trimmer capacitor on PC-8. Connect a frequency counter to the appropriate receiver channel output pin on PC-8 as shown in the overall schematic diagram. Adjust the associated ceramic trimmer capacitor until the frequency counter indicates 1.65 MHz ±10Hz above the channel frequency.

2. Preselector, PC-1: If the new frequency falls within the frequency band of the components installed on PC-1 it is only necessary to retune the variable coils in the effected channel. The frequency bands are indicated in Table V-1.

   Connect a signal generator to the BNC connector on the front panel labeled "50 ohm out". Connect an audio voltmeter to the green wire terminal on PC-10, (handset audio) and switch audio selector to handset. Set signal generator to AM 30% modulation and receiver mode to AM, squelch CCW and gain CW. Increase generator output and tune generator output until approximately 5uv of r-f input produces 7 to 10V rms of audio output.

   If the new frequency is outside the installed preselector range determine what kit number as indicated in Table V-1 is required and install as shown on the component overlay for PC-1. The kit is composed of 3 tunable coils and 7 capacitors. After installation tune the preselector as outlined above.

RECEIVER RF PRESELECTOR TUNED CIRCUITS PC-1

Kit No.	Frequency Range (MHz)	L101-L118	C101-C106	C107-C112	C113-C118	C119-C124	C125-C130	C131-C136	C137-C142
R1	2.00-2.40	62981-1 Brn	.0033uf 28871	360pf 28727	20pf 28674	330pf 28865	20pf 28674	360pf 28727	.0018uf 28869
R2	2.40-2.88	62981-2 Red	.0027uf 28870	300pf 28864	20pf 28674	270pf 28863	20pf 28674	300pf 28864	.0018uf 28869
R3	2.88-3.46	62981-3 Orn	.0027uf 28870	270pf 28863	18pf 28862	220pf 28861	18pf 28862	270pf 28863	.0018uf 28869
R4	3.46-4.15	62981-4 Yel	.0018uf 28869	220pf 28861	15pf 28650	180pf 28105	15pf 28650	220pf 28861	.0013uf 28868
R5	4.15-5.00	62981-5 Grn	.0018uf 28869	200pf 28715	12pf 28648	150pf 28090	12pf 28648	200pf 28715	.0012uf 28867
R6	5.00-6.00	62981-6 Blu	.0013uf 28868	150pf 28090	10pf 28859	130pf 28703	10pf 28859	150pf 28090	.0012uf 28867
R7	6.00-7.20	62981-7 Vio	.0012uf 28867	130pf 28703	9pf 28636	110pf 28131	9pf 28636	130pf 28703	.0012uf 28867
R8	7.20-8.65	62981-8 Gry	910pf 28866	110pf 28131	7pf 28858	91pf 28860	7pf 28858	110pf 28131	910pf 28866
R9	8.65-10.40	62981-9 Wht	820pf 28399	91pf 28860	7pf 28858	82pf 26652	7pf 28858	91pf 28860	820pf 28399
R10	10.40-12.45	62981-10 Blk	820pf 28399	82pf 26652	5pf 28857	75pf 28466	5pf 28857	82pf 26652	820pf 28399

Table V-I - Receiver Customizing

FIRST AND SECOND TUNED AMPLIFIER, PC-7

Kit No.	Freq. MHz	P/N	Color	Capacitor P/N	Capacitor pf
E1	2.0- 2.3	62993-1	Brn	28399	820
E2	2.3- 2.6	62993-1	Brn	28624	680
E3	2.6- 2.9	62993-2	Red	28624	680
E4	2.9- 3.5	62993-2	Red	28612	500
E5	3.5- 4.0	62993-3	Orn	28612	500
E6	4.0- 4.5	62993-3	Orn	28600	390
E7	4.5- 5.2	62993-4	Yel	28600	390
E8	5.2- 6.0	62993-4	Yel	27632	300
E9	6.0- 6.9	62993-5	Grn	27632	300
E10	6.9- 7.9	62993-5	Grn	28595	220
E11	7.9- 9.0	62993-6	Blu	28595	220
E12	9.0-10.3	62993-6	Blu	28583	180
E13	10.3-12.1	62993-7	Vio	28583	180

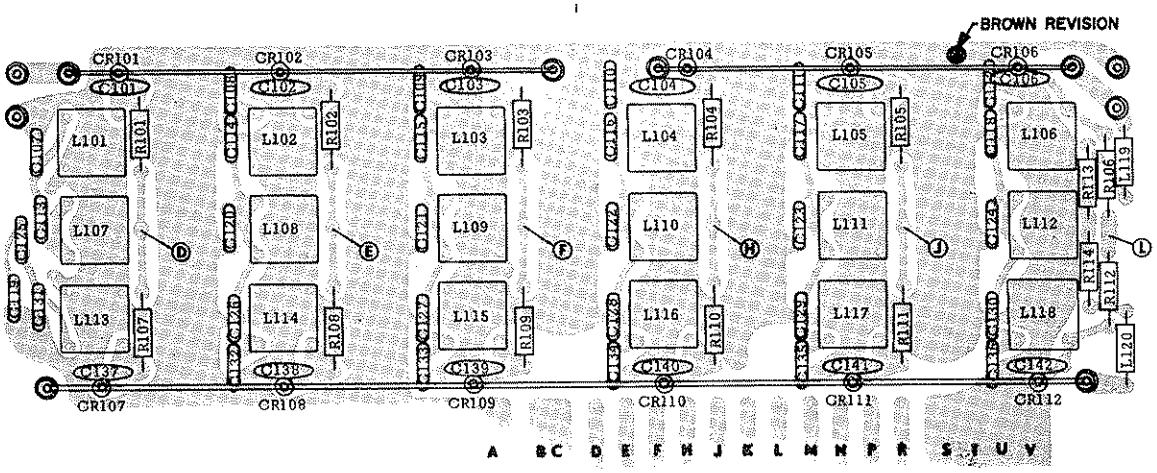
Table V-2
Exciter Customizing

ANTENNA COUPLER COMPONENT SELECTION

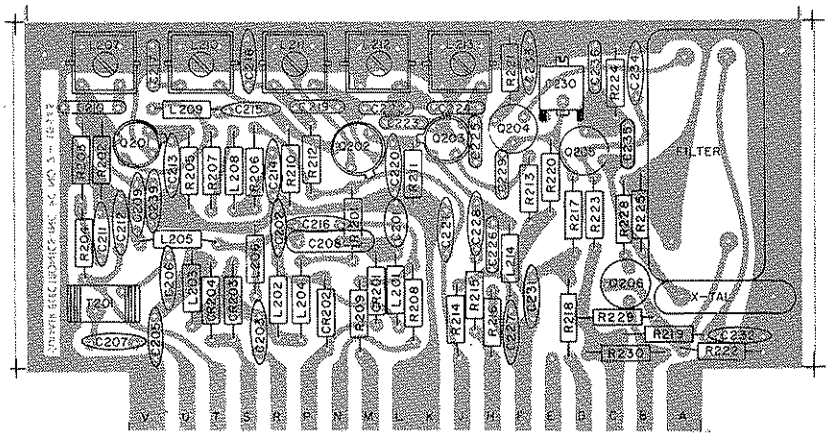
Freq. MHz	Input Cap (Cs) pf	Inductance (L_1) uhy	Tap
2.0	500	79	8
2.2	750	73	12
2.4	750	70	14
2.6	1000	61	21
2.8	1500	53	27
3.0	1500	46	32
3.5	1500	33	42
4.0	1500	22	52
4.5	1000	20	53
5.0	750	16	56
5.5	500	14	58
6.0	500	12	60
6.5	500	10	62 64 39 8
7.0	500	9	63
7.5	750	7	65
8.0	750	6	66
8.5	500	5	67
9.0	500	5	67
*10.0	250	4	68
*11.0	330	3.5	69
*12.0	330	3	70

*If trouble experienced in tuning these frequencies move L_1 tap back to approx. tap 20 and add wire from S3B to a turn on L_1 at front portion. Select tap for minimum SWR.

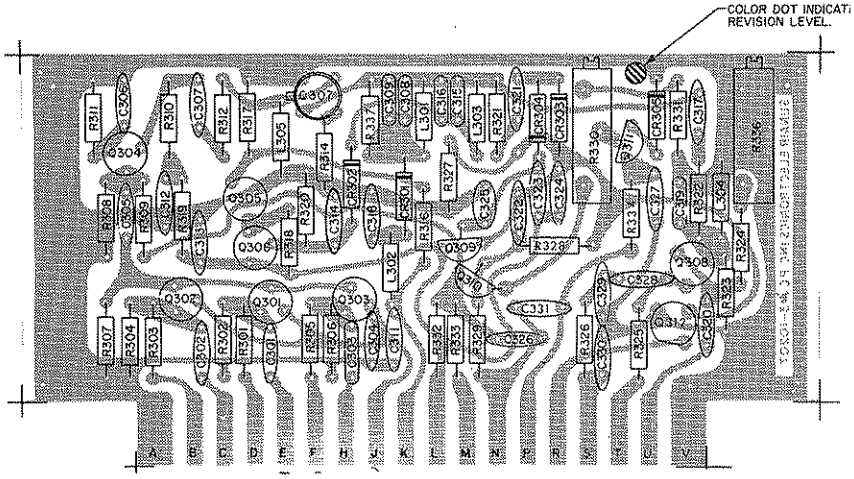
Table V-3



PC-1 PRESELECTOR P/N 99803



PC-2 RF AMP/MIXER P/N 99574

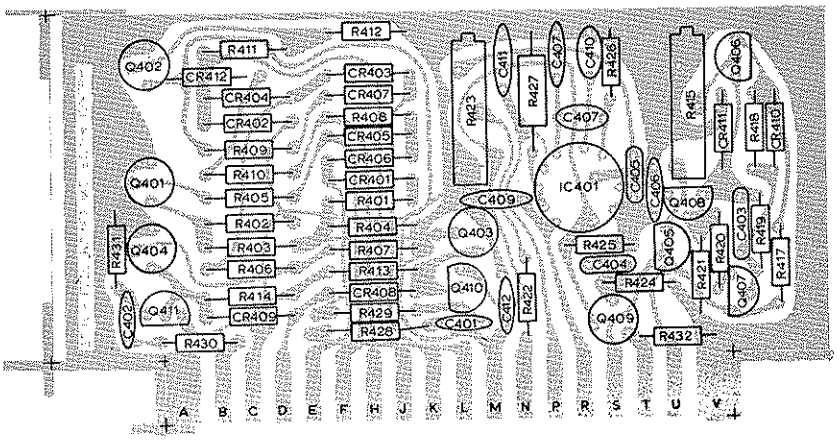


PC-3 IF AMP/DETECTOR P/N 99793

99793-1

C301, R301, R302, Q30

NOT INSTALLED

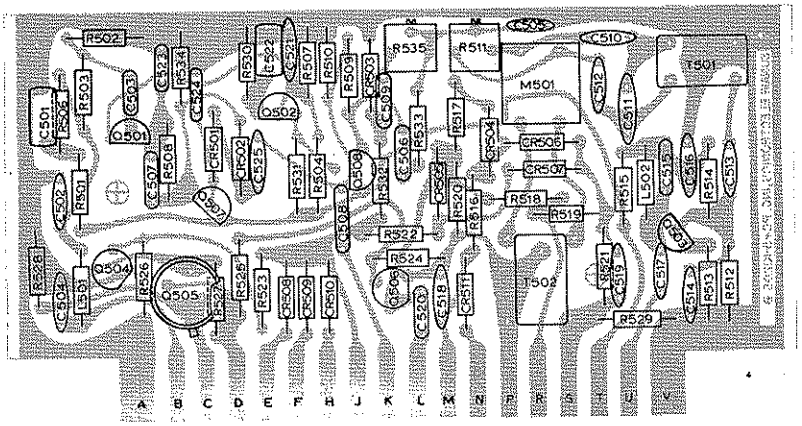


PC-4 MODE SELECTOR/AUDIO P/N 99794

99794-1

CR401, 403, 404, 405, 406, 409, 412, C402, R401, 406, 407, 408, 410, 414, R430, 431, Q404, 411, C405, R422 R423

NOT INSTALLED

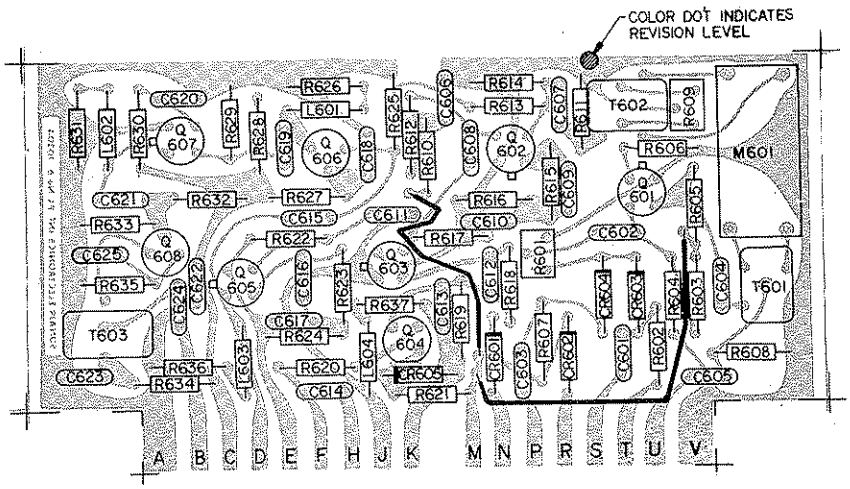


PC-5 BALANCED MODULATOR P/N 99795

99795-1

C508, CR504, 506, 511, R516, 517, C518, CR508, 509, 510

NOT INSTALLED

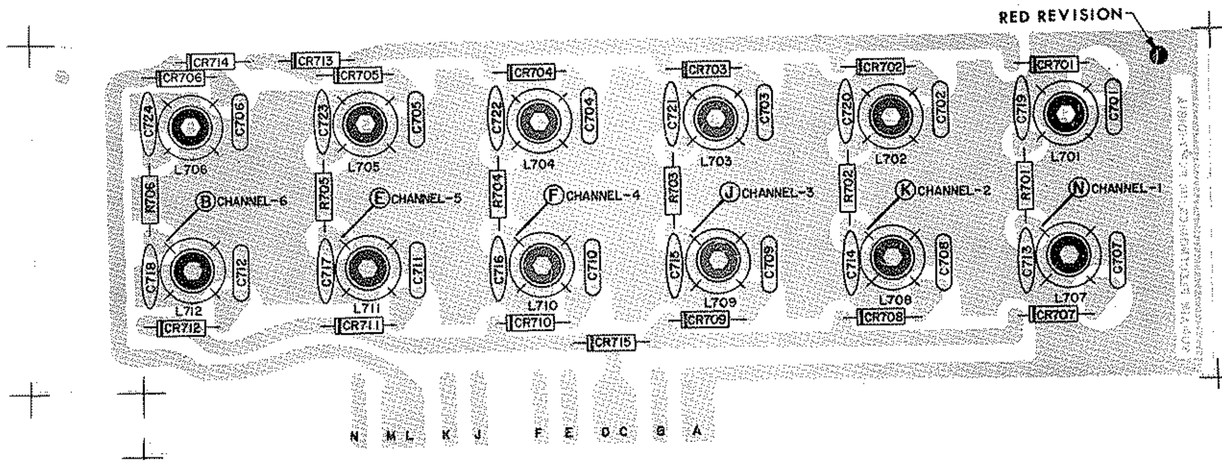


PC-6 EXCITER P/N 99796

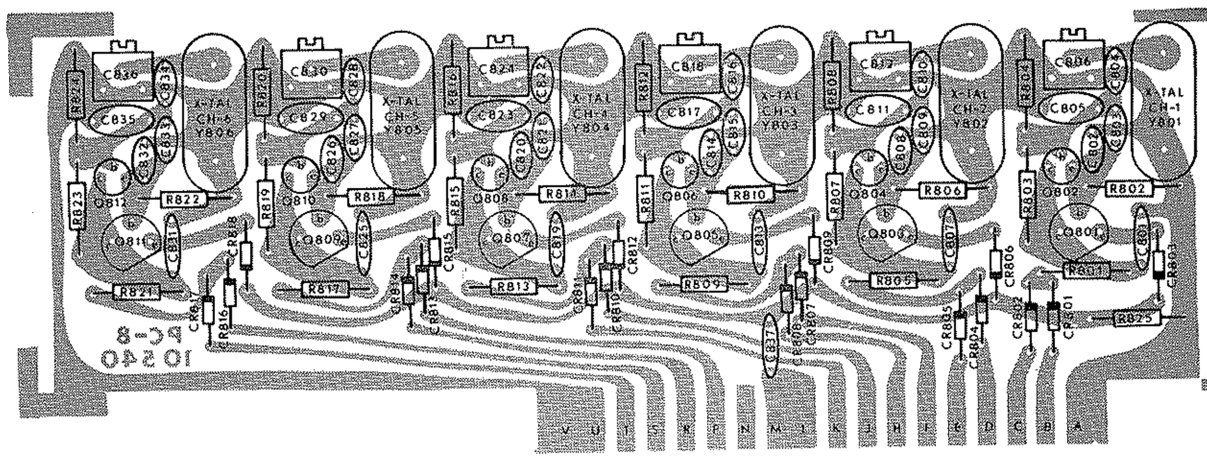
99796-1

C601, R602, CR603

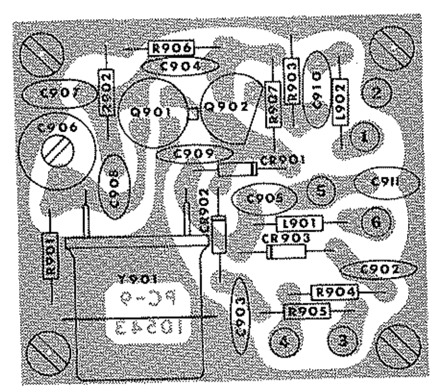
NOT INSTALLED



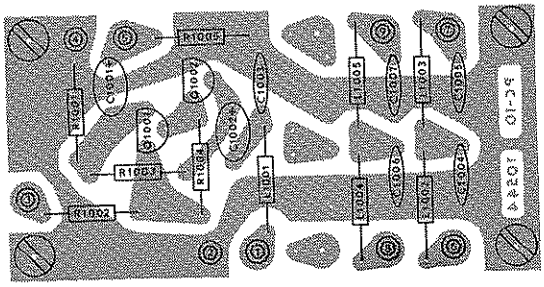
PC-7 EXCITER TUNED CIRCUITS P/N 99804



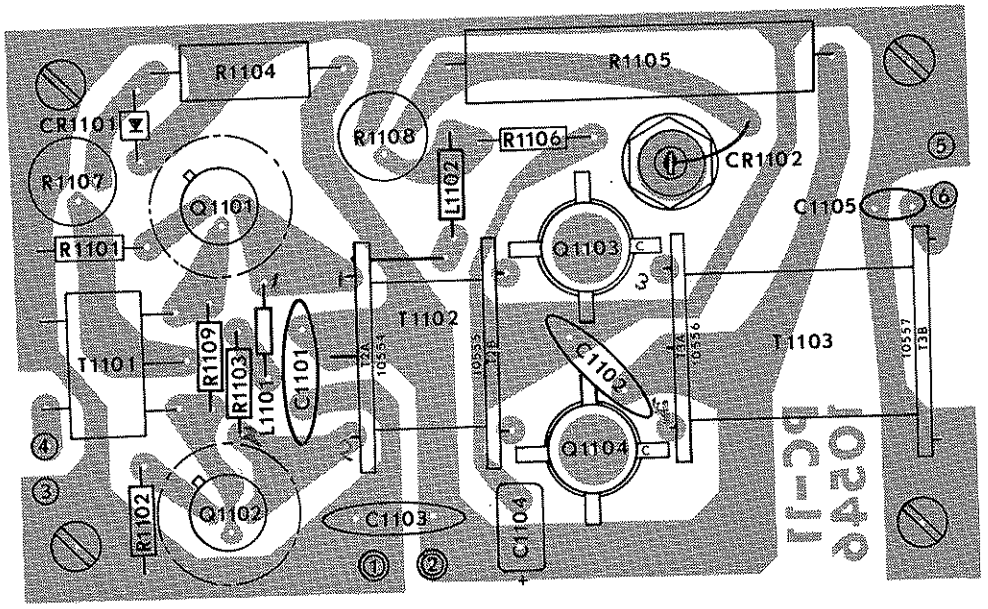
PC-8 CHANNEL OSCILLATOR P/N 99560



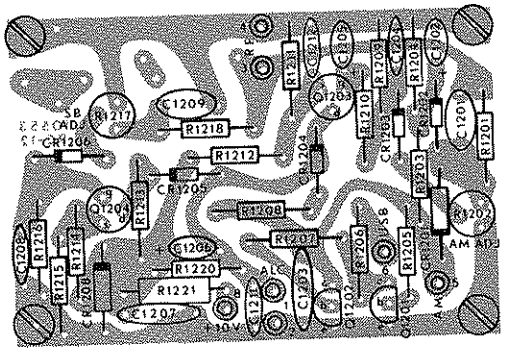
PC-9 CARRIER OSCILLATOR P/N 99561



PC-10 MIC AMP P/N 99562



PC-11 POWER AMP P/N 99563



PC-12 ALC DETECTOR/AMP P/N 99567

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
PC1	10180	P.C. Board for 99791
	99803	P.C. Board Assy. Without Customizing Components
C101 thru C142		Capacitor-Frequency Dependent-See Customizing Chart, Sec. V
CR101 thru CR112	40510	Diode IN914B
L101 thru L118		Coil, Variable-Frequency Dependent-See Customizing Chart-Sec. V
L119	64800	Choke, Molded 390uh
L120	64800	Choke, Molded 390uh
R101 thru R112	17156	Resistor 1K ohm 1/4W
R113	17132	Resistor 220 " "
R114	17132	" " " "
	99574	P.C. Board Ass'y. with all components
PC#2	10545	P.C. Board for 99574
C201	25024	Capacitor 4.7pf 500V
C202	28636	" 9.0pf "
C203	28636	" " "
C205	25024	" 4.7pf "
C206	27345	" .02uf 100V
C207	27345	" " "
C208	26913	" .02uf 25V
C209	27345	" .02uf 100V
C210	28129	" 56pf 500V
C211	27357	" .05uf 25V
C212	27357	" .05uf 25V
C213	27357	" " "
C214	27357	" " "
C215	27345	" .02uf 100V
C216	25000	" 2.2pf 500V
C217	28533	" 43pf 500V
C218	27345	" .02uf 100V
C219	28569	" 560pf 100V
C220	27357	" .05uf 25V
C221	27357	" " "
C222	28674	" 20pf 500V
C223	28569	" 560pf 100V
C224	28674	" 20pf 500V
C225	28569	" 560pf 100V
C226	28088	" 120pf 300V
C227	27357	" .05uf 25V
C228	27345	" .02uf 100V
C229	26834	" 10pf 500V
C230	28739	" Variable 7-35pf
C231	27357	" .05uf 25V
C232	27357	" " "
C233	27357	" " "
C234	27357	" " "
C235	28521	" 36pf 500V
C236	28454	" 430pf 100V
C239	28858	" 7pf 500V
CR201 thru CR204	44290	Diode 1N914

CKT. SYM.	PART NO.	DESCRIPTION
FL201	81810	Filter, Ceramic 455 kHz
L201	66420	Choke, Molded .33uh
L202	66420	" " "
L203	66420	" " "
L204	65919	" " 150uh
L205	56425	" " 4.7uh
L206	66406	" " 22uh
L207	62967	Coil, Variable 150uh
L208	66391	Choke, Molded 1.2uh
L209	66418	" " 6.8uh
L210	62967	Coil, Variable 150uh
L211	62979	" " 15uh
L212	62979	" " "
L213	62979	" " "
L214	65945	Choke, Molded 82uh
Q201	44513	Transistor 2N5179
Q202	44575	FET 3N143
Q203	44484	FET 3N128
Q204	44329	Transistor 2N3563
Q205	44393	FET 2N4303
Q206	44329	Transistor 2N3563
R201	17118	Resistor 100 ohm 1/4W
R202	17077	" 4.7K " "
R203	17077	" 4.7K " "
R204	17223	" 22K " "
R205	17522	" 180 " "
R206	17091	" 330 " "
R207	17663	" 680 " "
R208	17118	" 100 " "
R209	17118	" " " "
R210	17041	" 10K " "
R211	17883	" 3.9K " "
R212	17132	" 220 " "
R213	18655	" 120 " "
R214	17091	" 330 " "
R215	17156	" 1K " "
R216	18306	" 5.6K " "
R217	17120	" 27K " "
R218	18306	" 5.6K " "
R219	17807	" 2.2K " "
R220	17041	" 10K " "
R221	17807	" 2.2K " "
R222	17247	" 1.5K " "
R223	18306	" 5.6K " "
R224	17077	" 4.7K " "
R225	17120	" 27K " "
R228	17091	" 330 " "
R229	18162	" 8.2K " "
R230	17807	" 2.2K " "
T201	99692	Transformer
Y201*	81846	Crystal 1195kHz
Y201	81884	Crystal 2105kHz

* 1195 kHz or 2105 kHz may be utilized, depending upon channel frequency.

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
PC #3	10207	P.C. Board for 99793
	99793	P.C. Board Ass'y. with all Components
C301	27345	Capacitor .02uf 100V
C302	"	" " "
C303	28545	" 100pf 500V
C304	27357	" .05uf 25V
C305	27345	" .02uf 100V
C306	27357	" .05uf 25V
C307	27498	" 150pf 500V
C308	28569	" 560pf 300V
C309		" Selected Value
C310	27357	" .05uf 25V
C311	"	" " "
C312	"	" " "
C313	"	" " "
C314	"	" " "
C315	28428	" 680pf 300V
C316		" Selected Value
C317	27357	" .05uf 25V
C319	28105	" 180pf 300V
C320	24472	" 2.2uf 15V
C321	27357	" .05uf 25V
C322	"	" " "
C323	27010	" .1uf 12V
C324	"	" " "
C325	28735	" 6.8uf 15V
C326	27357	" .05uf 25V
C327	"	" " "
C328	27321	" .01uf 100V
C329	24018	" 220pf 500V
C330	"	" " "
C331	27357	" .05uf 25V
CR301	44290	Diode 1N914
CR302	"	" "
CR303	40139	" 1N54A
CR304	"	" "
CR305	44290	" 1N914
L301	65907	Choke, Molded 15uh
L302	64800	" " 390uh
L303	65919	" " 150uh
L304	66432	" " 680uh
L305	64800	" " 390uh
Q301	44252	Transistor 2N3646
Q302	"	" "
Q303	44329	" 2N3563
Q304	"	" "
Q305	44252	" 2N3646
Q306	"	" "
Q307	44484	FET 3N128
Q308	44393	FET 2N4303
Q309	44434	Transistor MPS2925
Q310	"	" "
Q311	"	" "
Q312	44678	" 2N4249
R301 thru R306	17792	Resistor 33K ohm 1/4W
R307	17247	" 1.5K " "
R308	17883	" 3.9K " "
R309	18318	" 12K " "
R310	17156	Resistor 1K ohm 1/4W

CKT. SYM.	PART NO.	DESCRIPTION
R311	18411	" 470 " "
R312	17118	" 100 " "
R314	17132	" 220 " "
R316	18306	" 5.6K " "
R317	17089	" 3.3K " "
R318	17156	" 1K " "
R319	17091	" 330 " "
R320	17041	" 10K " "
R321	18306	" 5.6K " "
R322	17235	" 15K " "
R323	18306	" 5.6K " "
R324	17077	" 4.7K " "
R325	17144	" 56K " "
R326	17106	" 47K " "
R327	17089	" 3.3K " "
R328	18318	" 12K " "
R329	"	" " "
R330	33849-2	Potentiometer 100 " "
R331	17936	47 " "
R332	17091	Resistor 330 " "
R333	17156	" 1K " "
R334	17118	" 100 " "
R336	33849-5	Potentiometer 100K " "
R337	17077	Resistor 4.7K " "
PC4	10206	P.C. Board for 99794
	99794	P.C. Board Ass'y with all Components
C401	26913	Capacitor .02uf 25V
C402	26913	" .02uf 25V
C403	27400	" 15uf 35V
C404	28337	" .47uf 50V
C405	28337	" .47uf 50V
C406	26913	" .02uf 25V
C407	24472	" 2.2uf 15V
C408	26913	" .02uf 25V
C409	27357	" .05uf 25V
C410	24472	" 2.2uf 15V
C411	27357	" .05uf 25V
C412	27357	" " "
CR401 thru CR412	44290	Diode 1N914
IC401	44460	Integrated Circuit, Audio Amp.
	87187	Heat Sink For IC 401
Q401 thru Q404	44252	Transistor 2N3646
Q405 thru Q408	44434	" MPS2925
Q409	44393	" FET 2N4303
Q410	44434	" MPS2925
Q411	44434	" "
R401 thru R412	17120	Resistor 27K ohm 1/4W
R413	17156	" 1K " "
R414	17156	" 1K " "
R415	33849-4	Potentiometer 10K " 1/2W
R417	17807	Resistor 2.2K " 1/4W
R418	17039	" 100K " "
R419	17039	" 100K " "

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
R420	18306	" 5.6K " "
R421	18306	" 5.6K " "
R422	18306	" 5.6K " "
R423	33849-4	Potentiometer 10K " 1/2W
R424	18306	Resistor 5.6K " 1/4W
R425	18057	" 470K " "
R426	17077	" 4.7K " "
R427	18849	" 1.2 " 1/2W
R428	18411	" 470 " 1/4W
R429	17883	" 3.9K " "
R430	18411	" 470 " "
R431	17883	" 3.9K " "
R432	17039	" 100K " "
	99795	P.C. Board Ass'y with all Components
PC#5	10205	P.C. Board for 99795
C501	28038	Capacitor, 68uf 15V
C502	27333	" .005uf 100V
C503	27412	" 22uf 15V
C504	27333	" .005uf 100V
C505	26913	" .02uf 25V
C506	27412	" 22uf 15V
C507	28337	" .47uf 50V
C508	28337	" .47uf 50V
C509	27412	" 22uf 15V
C510	28208	" .001uf 100V
C511	27993	" 130pf
C512	28208	" .001uf 100V
C513	28208	" .001uf 100V
C514	26834	" 10pf
C515	28387	" 620pf
C516	27357	" .05uf 25V
C517	24020	" 150pf
C518	27357	" .05uf 25V
C519	28478	" 36pf
C520	28519	" 27pf
C521	27357	" .05uf 25V
C522	28038	" 68uf 15V
C523	28337	" .47uf 50V
C524	28351	" .22uf 15V
C525	27010	" .1uf 12V
CR501	40139	Diode 1N54A
CR502	40139	Diode 1N54A
CR503 thru CR511	44290	Diode 1N914
L501	65933	Choke 120uh
L502	65907	Choke 15uh
M501	40311	Module, Diode Ring
Q501	44616	Transistor 2N5461
Q502	44434	" MPS-2925
Q503	44434	" MPS-2925
Q504	44252	" 2N3646
Q505	44379	" 40347
Q506	44252	" 2N3646
Q507	44434	" MPS-2925
Q508	44434	" MPS-2925

CKT. SYM.	PART NO.	DESCRIPTION
R501	17663	Resistor 680 OHM 1/4W
R502	17663	" 680 " "
R503	18318	" 12K " "
R504	17120	" 27K " "
R506	17132	" 220 " "
R507	17077	" 4.7K " "
R508	17510	" 120K " "
R509	17778	" 220K " "
R510	17663	" 680 " "
R511	34207	Pot. 1K "
R512	17077	Resistor 4.7K OHM 1/4W
R513	17845	" 270 " "
R514	17792	" 33K " "
R515	17132	" 220 " "
R516	18162	" 8.2K " "
R517	17572	" 18K " "
R518	17792	" 33K " "
R519	17792	" 33K " "
R520	18318	" 12K " "
R521	17077	" 4.7K " "
R522	18162	" 8.2K " "
R523	17481	" 6.8K " "
R524	17089	" 3.3K " "
R525	17481	" 6.8K " "
R526	17089	" 3.3K " "
R527	17156	" 1K " "
R528	17041	" 10K " "
R529	18796	" 68 " "
R530	17522	" 180 " "
R531	18186	" 1.2K " "
R532	18186	" 1.2K " "
R533	18655	" 120 " "
R534	18306	" 5.6K " "
R535	34207	Pot. 1K
T501	99693	Balanced Modulator Output Transformer
T502	99693	Balanced Modulator Input Transformer
PC#6	10204	P.C. Board for 99796
	99796	P.C. Board Ass'y with all components
C601	27333	CAPACITOR .005 uf 100V
C602	27333	" .005 uf 100V
C603	27333	" .005 uf 100V
C604	26913	" .02 uf 25V
C605	28533	" 43 pf
C606	26913	" .02 uf 25V
C607	28533	" 43 pf
C608	28545	" 100 pf
C609	28686	" 33 pf
C610	26913	" .02 uf 25V
C611	28686	" 33 pf
C612	28686	" 33 pf
C613	28337	" .47 uf 50V
C614	25098	" 500 pf
C615	28686	" 33 pf
C616	28686	" 33 pf
C617	26913	" .02 uf 25V
C618	26913	" .02 uf 25V
C619	28703	" 130 pf
C620	26913	" .02 uf 25V
C621	26913	" .02 uf 25V
C622	28337	" .47 uf 50V

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
C623	28337	" .47 uf 50V
C624	28208	" .001 uf 100V
C625	28868	" 1300 pf
CR601	44290	DIODE, SILICON 1N914
CR602	44290	" " 1N914
CR603	44290	" " 1N914
CR604	44290	" " 1N914
CR605	44305	" Zener 1N756
L601	66494	INDUCTOR, 1 mh
L602	66494	" 1 mh
M601	40323	MODULE, DIODE RING
Q601	44513	TRANSISTOR, SILICON 2N5180
Q602	44513	" " 2N5180
Q603	44484	" " 3N128
Q604	44678	" " 2N4249
Q605	44484	" " 3N128
Q606	44393	" " 2N4303
Q607	44513	TRANSISTOR, SILICON 2N5180
Q608	44331	" " 2N3643
R601	34441	POT 10K ohm .6 W
R602	18318	RESISTOR 12K " 1/4 W
R603	18318	" 12K " " "
R604	17819	" 1.8K " " "
R605	17118	" 100 " " "
R606	17936	" 47 " " "
R607	18318	" 12K " " "
R608	17663	" 680 " " "
R609	34439	POT 100 " .6 W
R610	17156	RESISTOR 1K " 1/4 W
R611	18174	" 15 " " "
R612	17077	" 4.7K " " "
R613	18318	" 12K " " "
R614	18667	" 2.7K " " "
R615	18320	" 560 " " "
R616	18320	" 560 " " "
R617	17675	" 150K " " "
R618	17845	" 270 " " "
R619	18186	" 1.2K " " "
R620	17106	" 47K " " "
R621	17118	" 100 " " "
R622	17675	" 150K " " "
R623	17845	" 270 " " "
R624	18186	" 1.2K " " "
R625	17675	" 150K " " "
R626	17118	" 100 " " "
R627	17118	" 100 " " "
R628	18318	" 12K " " "
R629	18667	" 2.7K " " "
R630	17118	" 100 " " "
R631	17118	" 100 " " "
R632	17247	" 1.5K " " "
R633	17273	" 150 " " "
R634	18174	" 15 " " "
R635	17716	" 10 " " "
T601	99693	TRANSFORMER, TOROID, TRIFILAR
T602	99693	" " "
T603	99692	" " BIFILAR
PC7	10121	P.C. Board for 99804
	99804	P.C. Board Ass'y. Without Customizing Components

CKT. SYM.	PART NO.	DESCRIPTION
C701 thru C712		Capacitor-Frequency Dependent-See Customizing Chart, Section V
C713 thru C724	27357	Capacitor .05uf 25V
CR701 thru CR715	40510	Diode 1N914B
L701 thru L712	62993	Coil, Variable-Frequency Dependent See Customizing Chart, Sec. V
R701 thru R706	17091	Resistor 330ohm 1/4W
	99560	P.C. Board Assy. with all components
PC#8	10540	P.C. Board for 99560
C801	27321	Capacitor .01uf 100V
C802	25220	" 56pf N750
C803	28674	" 20pf 500V
C804	28105	" 180pf 500V
C805	25036	" 6pf+.25pf NPO
C806	28741	" Variable 3-9pf N075
C807	27321	" .01uf 100V
C808	25220	" 56pf N750
C809	28674	" 20pf 500V
C810	28105	" 180pf 500V
C811	25036	" 6pf+.25pf NPO
C812	28741	" Variable 3-9pf N075
C813	27321	" .01uf 100V
C814	25220	" 56pf N750
C815	28674	" 20pf 500V
C816	28105	" 180pf 500V
C817	25036	" 6pf+.25pf NPO
C818	28741	" Variable 3-9pf N075
C819	27321	" .01uf 100V
C820	25220	" 56pf N750
C821	28674	" 20pf 500V
C822	28105	" 180pf 500V
C823	25036	" 6pf+.25pf NPO
C824	28741	" Variable 3-9pf N075
C825	27321	" .01uf 100V
C826	25220	" 56pf N750
C827	28674	" 20pf 500V
C828	28105	" 180pf 500V
C829	25036	" 6pf+.25pf NPO
C830	28741	" Variable 3-9pf N075
C831	27321	" .01uf 100V
C832	25220	" 56pf N750
C833	28674	" 20pf 500V
C834	28105	" 180pf 500V
C835	25036	" 6pf+.25pf NPO
C836	28741	" Variable 3-9pf N075
C837	27321	" .01uf 100V
CR801 thru CR818	44290	Diode 1N914
Q801	44331	Transistor 2N3643
Q802	44329	" 2N3563
Q803	44331	" 2N3643
Q804	44329	" 2N3563

PARTS LIST

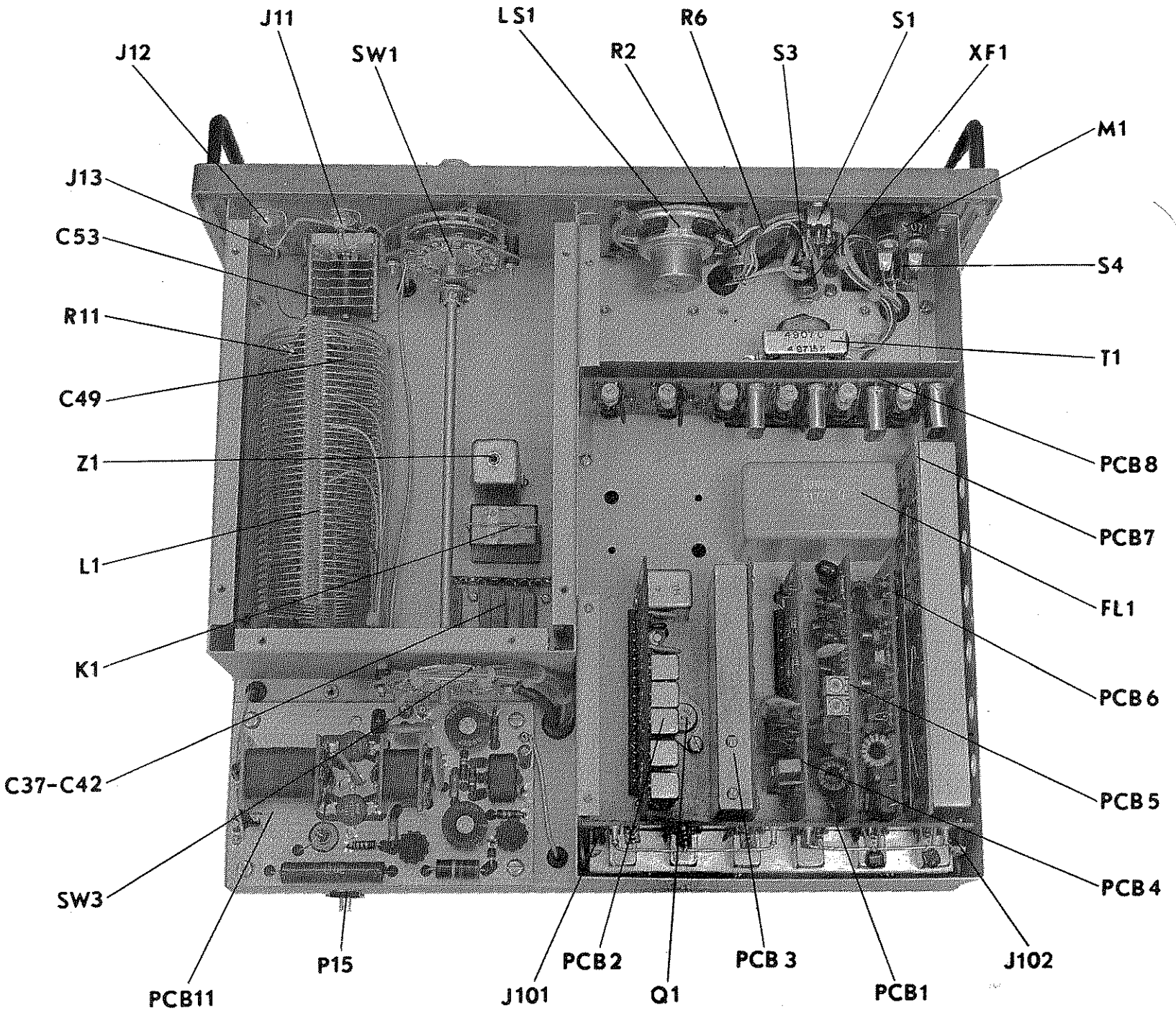
CKT. SYM.	PART NO.	DESCRIPTION		
Q805	44331	"	2N3643	
Q806	44329	"	2N3563	
Q807	44331	"	2N3643	
Q808	44329	"	2N3563	
Q809	44331	"	2N3643	
Q810	44329	"	2N3563	
Q811	44331	"	2N3643	
Q812	44329	"	2N3563	
R801	17132	Resistor	220ohm ±10%	1/4W
R802	18162	"	8.2K "	"
R803	17039	"	100K "	"
R804	17675	"	150K "	"
R805	17132	Resistor	220ohm ±10%	1/4W
R806	18162	"	8.2K "	"
R807	17039	"	100K "	"
R808	17675	"	150K "	"
R809	17132	"	220ohm "	"
R810	18162	"	8.2K "	"
R811	17039	"	100K "	"
R812	17675	"	150K "	"
R813	17132	"	220ohm "	"
R814	18162	"	8.2K "	"
R815	17039	"	100K "	"
R816	17675	"	150K "	"
R817	17132	"	220ohm "	"
R818	18162	"	8.2K "	"
R819	17039	"	100K "	"
R820	17675	"	150K "	"
R821	17132	"	220ohm "	"
R822	18162	"	8.2K "	"
R823	17039	"	100K "	"
R824	17675	"	150K "	"
R825	18411	"	470ohm "	"
Y801 thru Y806	81896	Crystal	Quartz 3650 thru 13650kHz	
	99561	P.C. Board Assy. with all Components		
PC#9	10543	P.C. Board for 99561		
C901	99672	Capacitor	Variable	5-125pf
C902	27345	"	.02uf	100V
C903	27345	"	"	"
C904	27345	"	"	"
C905	26078	"	33pf	500V
C906	26822	"	Variable, NPO	2-8pf
C907	25763	"	250pf	500V
C908	26028	"	12pf	500V
C909	27345	"	.02uf	100V
C910	28624	"	680pf	500V
C911	26054	"	22pf	500V
CR901	44290	Diode	1N914	
CR902	44290	"	"	
CR903	44290	"	"	
L901	65909	Choke	220uh±5%	
L902	65907	Choke	15uh±10%	

CKT. SYM.	PART NO.	DESCRIPTION		
Q901	44484	Transistor	Mosfet	3N128
Q902	44331	"	Si	2N3643
R901	18148	Resistor	680K ±10%	1/4W
R902	17247	"	1.5K "	"
R903	17118	"	100ohm "	"
R904	18253	"	33ohm "	"
R905	17273	"	150ohm "	"
R906	17089	"	3.3K "	"
R907	17089	"	" "	"
Y901	81901	Crystal	Quartz 27°C	1650kHz
	99562	P.C. Board Assy with all components		
PC#10	10544	P.C. Board for 99562		
C1001	28753	Capacitor	6.8uf	15V
C1002	28753	"	6.8uf	15V
C1003	27321	"	.01uf	100V
C1004	27321	"	.01uf	100V
C1005	27321	"	.01uf	100V
C1006	27321	"	.01uf	100V
C1007	27321	"	.01uf	100V
L1001	64678	Choke	RF	150uh
L1002	64678	"	"	"
L1003	64678	"	"	"
L1004	64678	"	"	"
L1005	64678	"	"	"
Q1001	44434	Transistor	MPS2925	
Q1002	44434	"	"	
R1001	17132	Resistor	220 ohm	10% 1/4W
R1002	17118	"	100 ohm	" "
R1003	17211	"	270 k	" "
R1004	18186	"	1.2 k	" "
R1005	17156	"	1.0 k	" "
	99563	P.C. Board Assy with all components		
PC#11	10546	P.C. Board for 99563		
C1101	24408	Capacitor	.1uf	100V
C1102	24408	"	"	"
C1103	24408	"	"	"
C1104	28038	"	68uf	15V
C1105	28090	"	150pf	500V
CR1101	40165	Diode	10D4	
CR1102	40513	"	IN1612	
L1101	63430	Choke	RF	1uh
L1102	64604	"	"	6.8uh
Q1101	44472	Transistor	40081	
Q1102	44472	"	"	

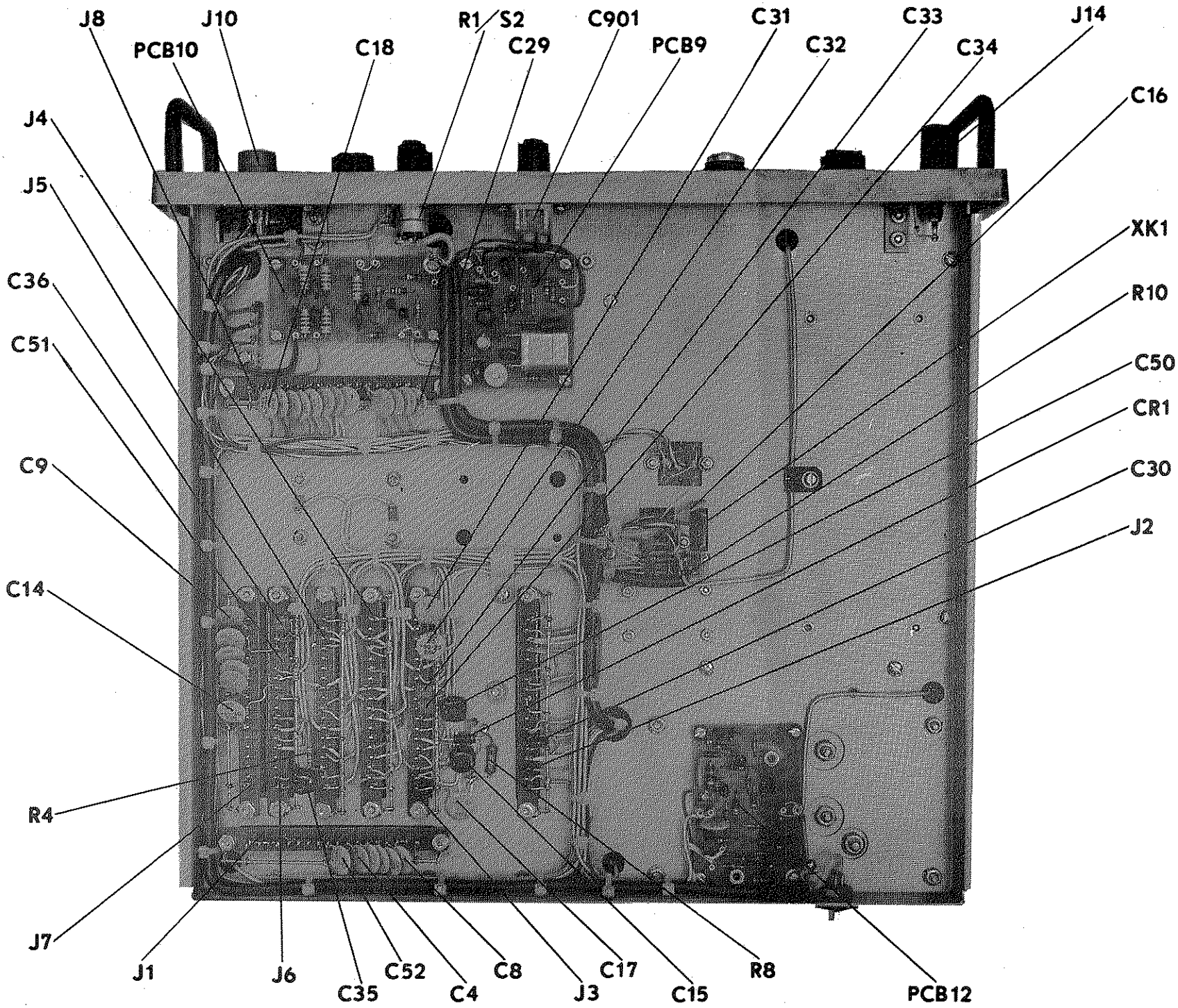
PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
Q1103	44680	" PT5740
Q1104	44680	" "
R1101	19477	Resistor 1ohm ± 5% 1/2W
R1102	19477	" " " "
R1103	17479	" 100ohm±10% 1/2W
R1104	19453	" 120ohm±10% 2W
R1105	19465	" 30ohm 10W
R1106	18605	" 3.3ohm±10% 1/2W
R1107	34580	Potentiometer 50ohm
R1108	34581	" 10ohm
R1109	17479	Resistor 100ohm±10% 1/2W
T1101	99564	Transformer Input
T1102	99565	" Interstage
T1103	99566	" Output
	87187	Heat Sink for Q1101
	87187	" " " Q1102
	99567	P.C. Board Assy with all components
PC#12	10553	P.C. Board for 99567
C1201	28296	Capacitor 1.5pf 1200V
C1202	24472	" 2.2uf 15V
C1203	27357	" .05uf 25V
C1204	28866	" 910pf 100V
C1205	24472	" 2.2uf 15V
C1206	28753	" 6.8uf 15V
C1207	27357	" .05uf 25V
C1208	28208	" .001uf 100V
C1209	28857	" 5pf 500V
C1211	28337	" .47uf 50V
C1212	28155	" 390pf 100V
CR1201	40139	Diode 1N54A
CR1202	40510	" 1N914B
CR1203	44290	" 1N914
CR1204	44290	" "
CR1205	44290	" "
CR1206	44290	" "
CR1208	44305	Diode, Zener 1N756 8.2V
Q1201	44434	Transistor, Si MPS2925
Q1202	44434	" " " "
Q1203	44393	" FET 2N4303
Q1204	44393	" " "
R1201	17883	Resistor 3.9K ±10% 1/4W
R1202	34154	Potentiometer 1K
R1203	17247	Resistor 1.5K±10% 1/4W
R1204	18320	" 560 ohm±10% "
R1205	17041	" 10K " "
R1206	17089	" 3.3K " "
R1207	17089	" " " "

CKT. SYM.	PART NO.	DESCRIPTION
R1208	17041	" 10K " "
R1209	17041	" " " "
R1210	17120	" 27K " "
R1211	17156	" 1.0K " "
R1212	17247	" 1.5K " "
R1213	17041	" 10K " "
R1214	17247	" 1.5K " "
R1215	17156	" 1.0K " "
R1216	17041	" 10K " "
R1217	34154	Potentiometer 1K
R1218	17077	Resistor 4.7K ±10% 1/4W
R1220	18992	" 390K " "
R1221	16889	" 56ohm " 1/2W



TRANSCEIVER TOP VIEW

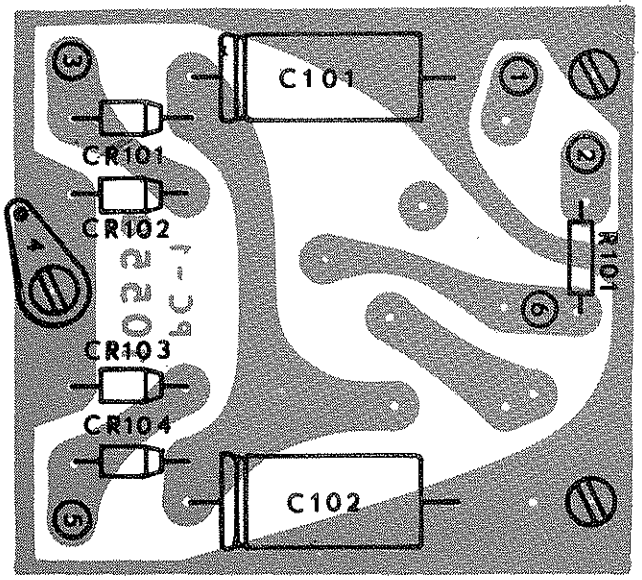


TRANSCEIVER, BOTTOM VIEW

PARTS LIST

CKT. SYM.	PART NO.	DESCRIPTION
		TRANSCEIVER CHASSIS PARTS
C4 thru C14	27357	Capacitor, Disc .05uf 25V
C15	28038	Capacitor, Tant. 68uf 15V
C16 thru C29	27357	Capacitor, Disc .05uf 25V
C30	27412	Capacitor, Tant. 22uf 15V
C31	27357	Capacitor, Disc. .05uf 25V
C32	27357	" " " "
C33	28337	" Tant. .47uf 50V
C34	28337	" " " "
C35	28038	" " 68uf 15V
C36	28337	" " .47uf 50V
C50	28038	Capacitor Tant. 68uf 15V
C51	28337	" " .47uf 50V
C52	27357	" Disc .05uf 25V
J1 thru J8	74972	Connector, PC Card
J10		Connector H33 Handset
J10	75331	Connector, H189 Handset
J11	74374	BNC, Transceiver Input/Output
J12	74374	BNC, Coupler Input
J13	75330	Connector, UHF, Coupler Output
J14	74879	Jack, Binding Post, ground
P15	74568	Connector, Power
Q1	44355	Transistor, 2N3054
CR1	40505	Diode, Zener 10V, 5W
FL1	81721	Filter, USB operation
FL2	81743	" LSB "
M1	87668	Meter, Power / Battery
R1/S2	34192	Pot/Switch 1 Meg/ON-OFF
R2	33928	Potentiometer 10K, Squelch
R3		Deleted
R4	18253	Resistor, Carbon, 10% 1/4W 33
R5		Deleted
R6	17041	Resistor, Carbon, 10% 1/4W 10K
R7		Deleted
R8	17558	Resistor, WW 20 ohm 3W
R9		Deleted
R10	17223	Resistor, Carbon, 10% 1/4W 22K
	87682	Speaker, 8 ohm
K1	66444	Relay, 4PDT
XK1	66638	Socket, Relay K1
S1	32388	Switch, DPDT, Mode
S3	32388	" " Audio Selector
S4	34575	Switch, Push button, Battery
SW1A	34348	Switch, Wafer
SW2A	34348	" "
SW3A	34348	" "

CKT. SYM.	PART NO.	DESCRIPTION
XF1	84862	Fuse holder
F1	84898	Fuse 3 AG 5A
	99572	Cable, rf, external, PA/Coupler
	34582	Knob, channel
	33980-3	" clarifier
	33980-1	" volume/ON-OFF
	33980-1	" squelch
	32091	" Antenna Tune
XS3	33019	Detent, Switch
	99573	Antenna, whip
T1	49068	Transformer, Audio
	10642	Gasket, panel
	10640	Spring Antenna
	99571	Base and plate, Antenna
	98863-1	Inverter, RF
		BATTERY PACK
	87682	Battery Ni Cad 7AH
	99877	Battery, Lead Dioxide, 8AH
	52118	Catch, Fastener
J15	74594	Connector, Power
		ANTENNA COUPLER
C49	71590	Capacitor, Disc 18pf, 500V
L1	99644	Air Dux, Inductor
R11	18722	Resistor, Carbon 6.8M 2W
C53	29068	Capacitor, Variable 5-25pf
Cs		Capacitor, molded Mica 500V
		Freq. Dependent, See Chart V-3
	25438	250pf
	25464	330pf
	25517	500pf
	25543	620pf
	25567	750pf
	25593	1000pf
	24939	1500pf
		BATTERY CHARGER
PC-1	10558	PC Board for 99531 Assy
	99531	PC Board Assy with component
C101	25816	Capacitor, Electlr. 200uf 35V
C102	25816	" " " "
CR101 thru CR104	40397	Rectifier 1N5400
R101	18332	Resistor WW 180 ohms 3W
R102	18930	" " 7.5 ohms 10W
S1, S2	32118	Switch, DPDT
J1	74568	Connector, D-C output
T1	49070	Transformer, A/C input
XF1	84862	Fuseholder
F1	86248	Fuse, 1/4, 3 AG
	99880	ACline and plug



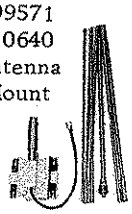
PC-1 VOLTAGE REGULATOR P/N 99531

99614
Antenna Tuner

99659
10M Wire Antenna

99660
Ground Radial

99571
10640
Antenna
Mount

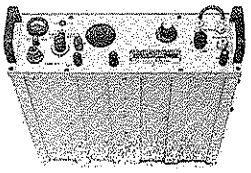


10633-1
9' Whip

87711
Handset

98021
Charger

99538
Transceiver



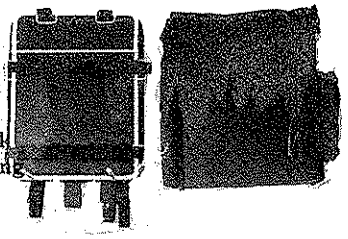
99558
Battery Pack

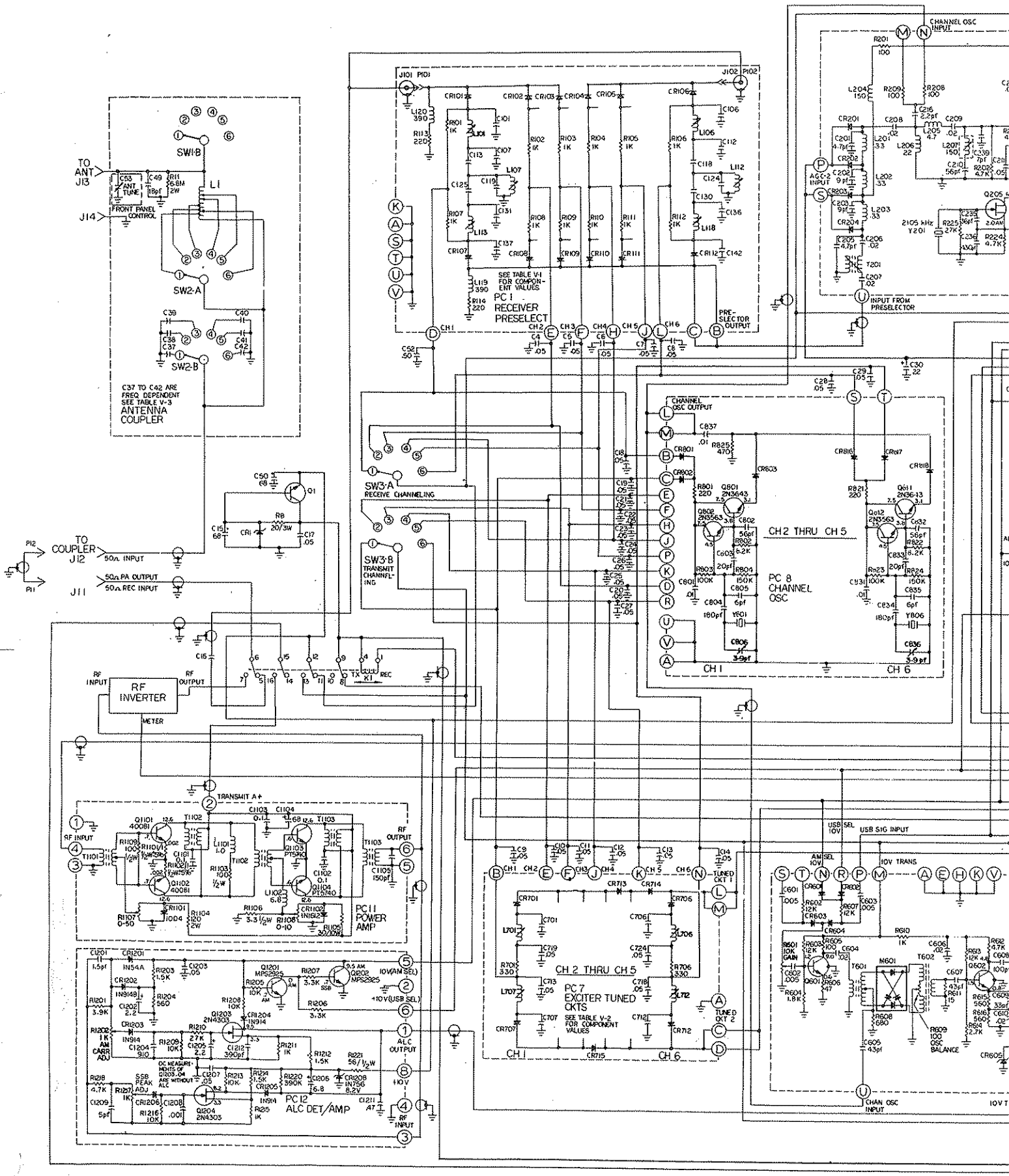
87371
Microphone

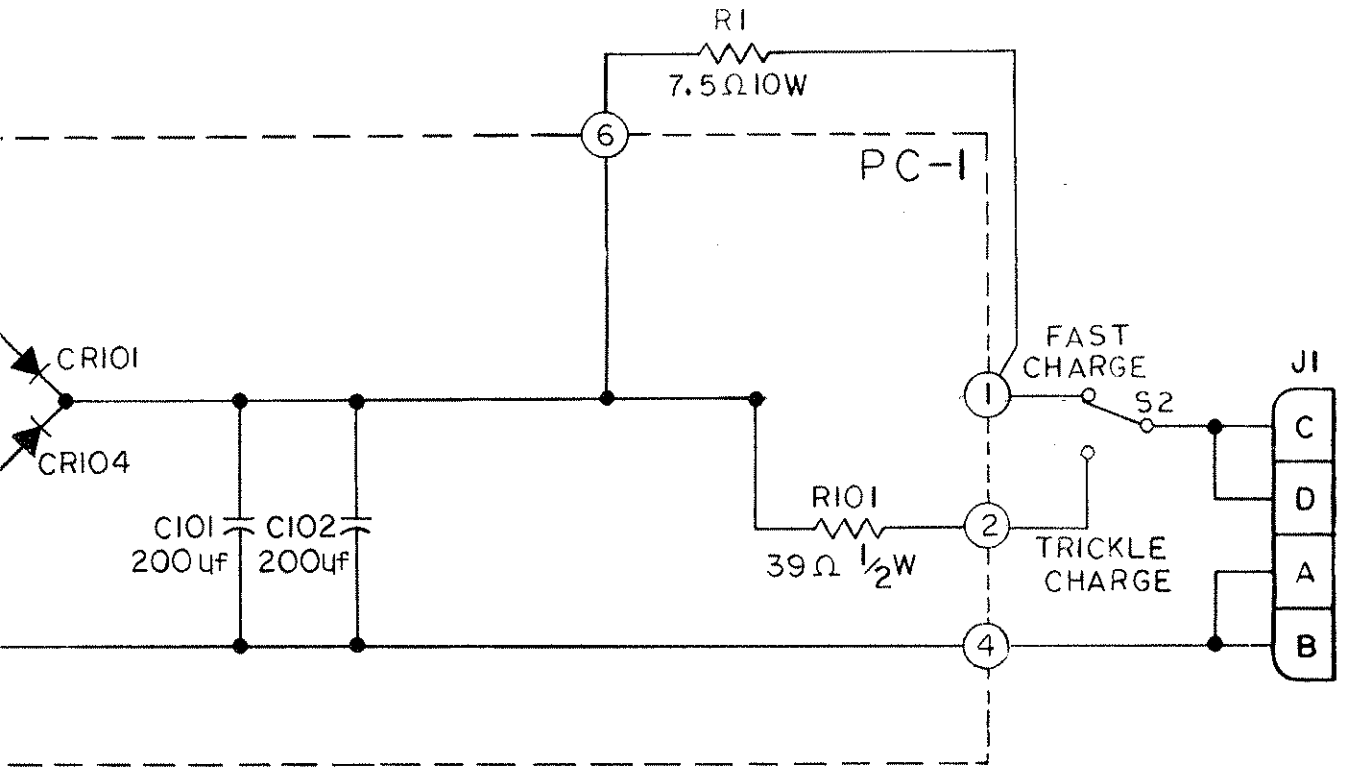
99883
CW Key

10636
Carrying Case

99559
10637
Back Pack
with Padding




SW1-B
SW2-A
SW2-B
TO ANT J13
J14
FRONT PANEL CONTROL
ANTENNA COUPLER
C37 TO C42 ARE FREQ DEPENDENT SEE TABLE V-3
PC 1 RECEIVER PRESELECT
SEE TABLE VI FOR COMPONENT VALUES
PRE-SELECTOR OUTPUT
CHANNEL OSC INPUT
INPUT FROM PRESELECTOR
SW3-A RECEIVE CHANNELING
SW3-B TRANSMIT CHANNELING
CHANNEL OSC OUTPUT
PC 8 CHANNEL OSC
CH 2 THRU CH 5
CH 1
CH 6
TO COUPLER J12
50Ω INPUT
50Ω PA OUTPUT
50Ω REC INPUT
J11
RF INVERTER
METER
TRANSMIT A+
PC 11 POWER AMP
PC 12 ALC DET/AMP
PC 7 EXCITER TUNED CKTS
SEE TABLE V-2 FOR COMPONENT VALUES
TUNED CKT 1
TUNED CKT 2
USB SEL
USB SIG INPUT
10V TRANS
CHAN OSC INPUT
ALC OUTPUT
+10V
RF INPUT
RF OUTPUT



ODEL BC20-14

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