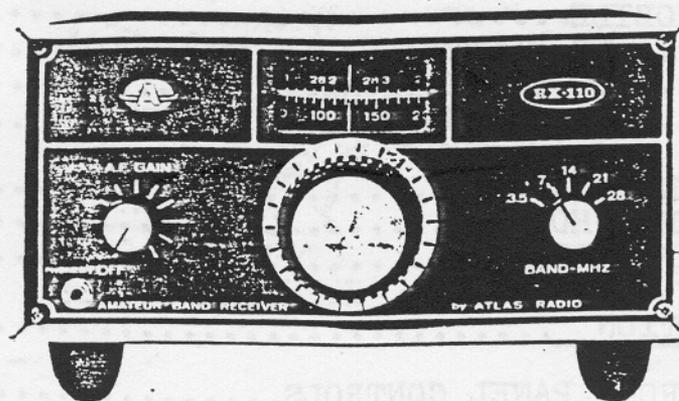


ATLAS RX-110

AMATEUR BAND RECEIVER



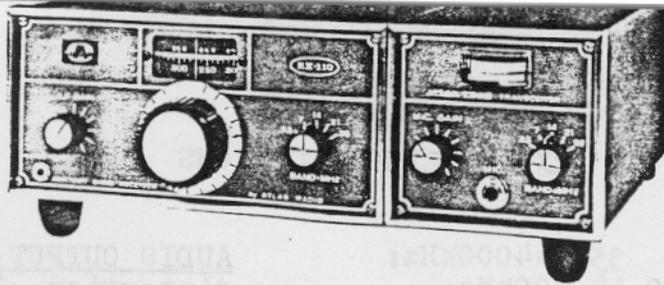
INSTALLATION and OPERATION MANUAL

AMERICAN MADE AND GUARANTEED BY



ATLAS
RADIO INC.

	page
I. <u>GENERAL INFORMATION</u>	
A. INTRODUCTION.....	1
B. SPECIFICATIONS.....	2
II. <u>INSTALLATION</u>	3
A. FIXED.....	3
1. AC SUPPLY.....	3
B. MOBILE.....	3
1. DC BATTERY CABLE (DCC-110).....	3
2. DC CONNECTIONS.....	3
3. MOBILE MOUNTING KIT (MM-110).....	5
C. ANTENNAS.....	5
D. HEADPHONES.....	7
E. SPEAKER.....	7
III. <u>OPERATION</u>	9
A. FRONT PANEL CONTROLS.....	9
1. POWER ON.....	9
2. A.F. GAIN.....	9
3. BAND SELECTOR.....	9
4. MAIN TUNING.....	9
5. TUNING DIAL.....	9
6. PHONES.....	11
B. REAR PANEL CONTROLS.....	11
1. ANTENNA.....	11
2. 14VDC CONNECTORS.....	11
3. AC CONNECTION.....	11
4. TX-110 CONNECTOR.....	11
C. TUNING SINGLE SIDEBAND SIGNALS.....	11
IV. <u>CIRCUIT DESIGN</u>	14
A. RECEIVER.....	14
B. POWER SUPPLY.....	15
C. TRANSCEIVER OPERATION.....	16
D. SCHEMATIC/VOLTAGE CHART.....	17
E. PARTS LIST.....	18
V. <u>ALIGNMENT</u>	20
VI. <u>WARRANTY</u>	back cover



INTRODUCTION

Your Atlas RX-110 is designed to provide excellent reception in the 5 amateur bands, 10 through 80 meters, (28 to 29 MHz on 10 meters). Through careful value engineering, all unnecessary frills have been eliminated, producing a low cost, simple design, but one which will provide you with a high level of sensitivity, selectivity, and dynamic range which is comparable or superior to other receivers costing much more.

If you are a newcomer to amateur radio, you'll be pleasantly surprised to learn how easily you can tune in on radio hams from all over the world with just a random length of wire for an antenna. Later on when you acquire your Novice or General Class License, you can add the TX-110 Transmitter Module, and become one of the signals on the airways, communicating with other hams around the world.

The Atlas RX-110 represents a brand new concept in receiver/transceiver design. For the first time you have a high performance receiver which can be converted into a transceiver by simply plugging the Atlas TX-110 Transmitter Module into the rear connector. You have a choice of 20 watts input power with the TX-110-L, or 200 watts with the TX-110-H.

You'll find that the RX-110, in addition to being an excellent high performance receiver, is also well built with high quality components, and a high level of craftsmanship and quality control. If you ever need repair or servicing, you'll find that the people in our Customer Service Department are dedicated to making every Atlas owner a satisfied customer.

So, here's to many pleasant hours of DXing and eaves dropping with your Atlas RX-110 receiver.

73,

Herb Johnson, W6QKI

ATLAS RADIO, INC.

RX-110 SPECIFICATIONS

FREQUENCY COVERAGE: 3500-4000kHz;
7000-7500kHz; 14,000-14,500kHz;
28,000-29,000kHz. ~~21,000-21,500kHz~~

FREQUENCY CONTROL: Tuning dial reads to 5kHz, with 1kHz increments on skirt of tuning knob. Accuracy of dial is plus or minus 10kHz when trimmer has been adjusted accurately at band center. Tuning rate on lower bands is 22kHz per revolution. On 10 meters tuning rate is double, or 44kHz/rev.

FREQUENCY STABILITY: Less than 2kHz drift during first 30 minutes. Less than 500Hz per hour after 30 minutes operation. Less than 100Hz shift with supply voltage change from 100 to 140 volts AC, or 11 to 15 volts DC.

SOLID STATE DESIGN: 4 IC's, 8 Transistors, 25 Diodes.

MODES OF RECEPTION: CW and SSB on Normally Used Sideband. Lower Sideband on 3.5 and 7MHz bands. Upper Sideband on 14, 21, and 28MHz bands.

CIRCUIT DESIGN: Single conversion to 5595kHz I.F., using double balanced diode ring, providing high dynamic range, at least 80db above noise floor of 130dBm. Triple tuned input filters provide high out of band rejection.

THIRD ORDER INTERCEPT point, +3dBm.

SELECTIVITY is 2.7kHz bandwidth at 6db down, 2.2 shape factor, 6 to 60 db. Ultimate rejection more than 100 db. 6 pole ladder crystal filter at 5595kHz.

SENSITIVITY is 0.25 microvolts at 50 ohms for 10 db signal-plus-noise to noise ratio on 3.5 through 21MHz bands, 0.4 uv at 28MHz.

IMAGE REJECTION better than 60 db. Internal spurious less than equivalent 2 uv signal.

AGC SYSTEM, less than 10 db audio output change from 5 uv to 3 volt signal input.

OVERALL GAIN, requires less than 2 microvolt signal for 0.5 watts audio output, (CW carrier with 1000Hz heterodyne).

AUDIO OUTPUT POWER, 2 watts at distortion, 300 to 3000Hz, plus or minus 3 db, 4 ohm speaker load.

INTERNAL SPEAKER, 3 in. 4 ohm, .68 oz magnet. Front jack provides for plugging in headphones, disconnecting speaker.

HEADPHONES should be 500 ohms resistance, or greater. Low imp. phones may be used, but require a series resistor to reduce audio power.

REAR PANEL: Antenna Jack, RCA Phono Type. (Phono Plug included) 12 pin socket provides for plug-in of TX-110 Transmitter Module to form five band transceiver. A jumper plug is also included with RX-110 for operation without the transmitter module. Banana connectors provide for 12 to 14 volt DC operation from car battery or other battery supply (not included).

AC POWER CONSUMPTION: 100 to 130 volts AC, 50-60Hz, 10 watts with RX-110 alone, (Export model, 200-260 volts AC, 50-60Hz). With TX-110 Transmitter module, peak power consumption in transmit mode will be 40 watts, (Higher power for 200 watt Power Amplifier is supplied by separate AC supply).

DC OPERATION, 12 to 14 VOLTS. CURRENT DRAIN: 0.2 Amps, 12 to 14 volts, for RX-110 alone. With TX-110 Transmitter Module, peak current drain in transmit mode will be 2 amps. to low current line. High current line is for 200 watt Power Amp., if used, and peak current to this line in transmit mode will be 16 amps.

SIZE AND WEIGHT: 8 1/2 in. (20.6cm) wide, 3 3/4 in. (9.5 cm) cabinet height, 9 3/4 in. (28.4 cm) cabinet depth. 7 lbs. (3.2 Kg) net weight. 9 lbs. (4.1 Kg) shipping weight.

II. INSTALLATION

A. FIXED

The RX-110 is designed to operate on a power source of 14 volts DC. DC power can be delivered to the receiver via the built in AC power supply which provides the 14 volts filtered and regulated for the circuits of the RX-110.

B. MOBILE AND PORTABLE

1. DCC-110. For mobile or portable operation DC power can be delivered to the receiver via a DCC-110 cable available from Atlas dealers. The DC cable is designed with built-in polarity and fuse protection, and is recommended when using battery power. Included with the cable is all necessary hardware.

2. ALTERNATE DC CONNECTION

In the event that you do not use the DCC-110 cable, the receiver comes with two banana plugs for the positive battery lead. If the RX-110 receiver is used alone, it is only necessary to connect the positive lead to the bottom mounted banana plug. The battery lead should be on No. 16 or 18 gauge stranded wire of automotive type. A 3 amp in-line fuse should be installed in the positive lead. The banana jack connects to the negative battery lead.

If the RX-110 is used in conjunction with the TX-110 transmitter module, it is recommended that a 3 amp fuse be connected between the two banana plugs. Then connect the battery lead to the middle or upper banana plug. The wire should be of No. 10 or 12 gauge. A 25 amp. circuit breaker is supplied with the TX-110-H (200 watt version) and should be connected in series with the battery lead next to the battery. Fig. 1 illustrates the proper connection required between the RX-110 and battery.

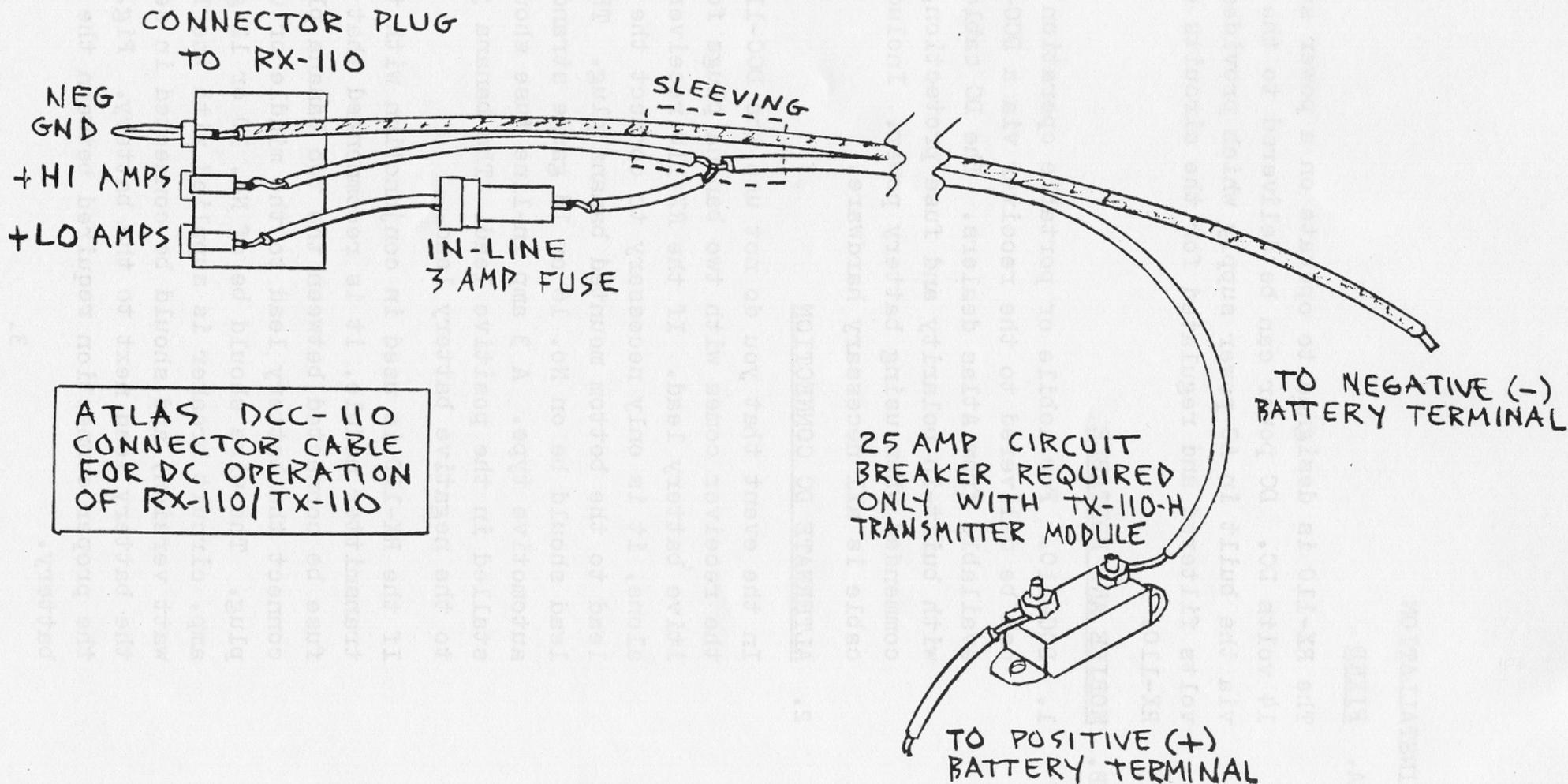


FIG. 1

3. MOBILE MOUNTING KIT (MM-110)

The mobile mounting kit is a plug-in unit designed for easy plug-in removal of the RX-110/TX-110 combination. All DC power connections are made to the MM-110 and all necessary hook-up cables, including the DC battery cable with circuit breaker and hardware are part of the kit.

C. ANTENNAS

Any of the common antenna systems designed for use on the amateur bands may be used with the receiver. Antenna input is designed for 50 ohm input. For receiving only, any random length wire antenna can be used, but the receiver will not perform quite as well as when the antenna has been constructed for use on the amateur bands. Refer to figure 2 for recommended lengths of wire antennas for each amateur band.

On 10, 15, and 20 meters a dipole and most beam antennas will work well across the entire band. On 40 and 80 meters a typical dipole tuned for the band center is sometimes referred to as either the 75 or 80 meter band. The frequency between 3.5 and 3.8 MHz is considered the 80 meter band segment and from 3.8 to 4.0 MHz, the 75 meter band segment. For optimum reception and transmission antennas should be tuned to one band segment or the other. However, because of the difficulty in having more than one antenna of the length required for the 3.5 MHz band it is recommended that one antenna be tuned for the frequency that is likely to be used most often.

The dipole is the basic shortwave receiving and transmitting antenna. Its length is equal to about one-half the wavelength of the desired operating frequency. (The symbol for wavelength is λ). It is usually made of wire and supported at the ends by insulators. The radiation and capture pattern of the horizontal antenna is bi-directional, perpendicular to the plane of the antenna. The dipole is broken at the center point and the 50 ohm coax cable feed line is connected,

to the coax shield to one side; and the coax center conductor to the other side of the dipole. The total length of a wire dipole for any shortwave frequency may be computed from the following formula:

$$\text{Length in Feet} = \frac{468}{\text{Frequency MHz}}$$

EXAMPLE: Desired operating frequency is 14.3 MHz. The length of the half-wave dipole is: length = $\frac{468}{14.3}$ or 32.7 feet end to end.

When space limitations restrict construction of lengthy horizontal antennas, the general coverage vertical antenna may be desired. The vertical antenna receives from all directions and transmits in all directions. They are usually a quarter wavelength in height and require a group of horizontal radials, preferably each being one quarter wavelength in length, spread equally around the vertical radiator. The length of a quarter wave element is Length in feet = $\frac{234}{\text{Freq. MHz}}$

EXAMPLE: Desired operating frequency is 14.3 MHz. Vertical length is length = $\frac{234}{14.3}$ or 16.3 feet. The 50 ohm coaxial cable is fed directly to the antenna. The coax shield is connected to the radial or ground system, and the center conductor is connected to the vertical radiator.

Multi-band vertical and horizontal antennas are also available for amateur band use. Band selection is made possible by the placing of resonant circuits known as "traps" along its length. Once the antenna has been installed there is no need for adjustments when bands are switched.

Directional beam type antennas are also available. Because of size limitations, this type of antenna is normally restricted to 10, 15, and 20 meter use only. This antenna is of the dipole type, but with additional elements added to increase both transmitting and receiving gain.

The multi-element beam antenna is highly efficient for long distant communications. You will usually see these antennas mounted on high towers.

NOTE: Most of these types of antennas and books and magazines describing different kinds of antenna systems are available at most amateur radio dealers.

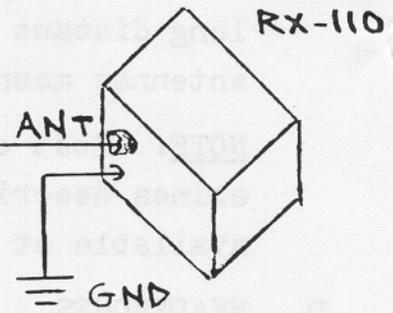
D. HEADPHONES

Headphones should be 500 ohms resistance or greater. If low impedance phones are used a resistor should be connected in series at the headphone plug to make the total resistance approximately 500 ohms. RX-110 requires a 3.5mm, 2 conductor miniature phone plug. Plug is available at your Atlas dealer or most Radio Shack stores. Also, a 1/4" to 3.5mm headphone plug reducer is available at Radio Shack.

E. SPEAKER

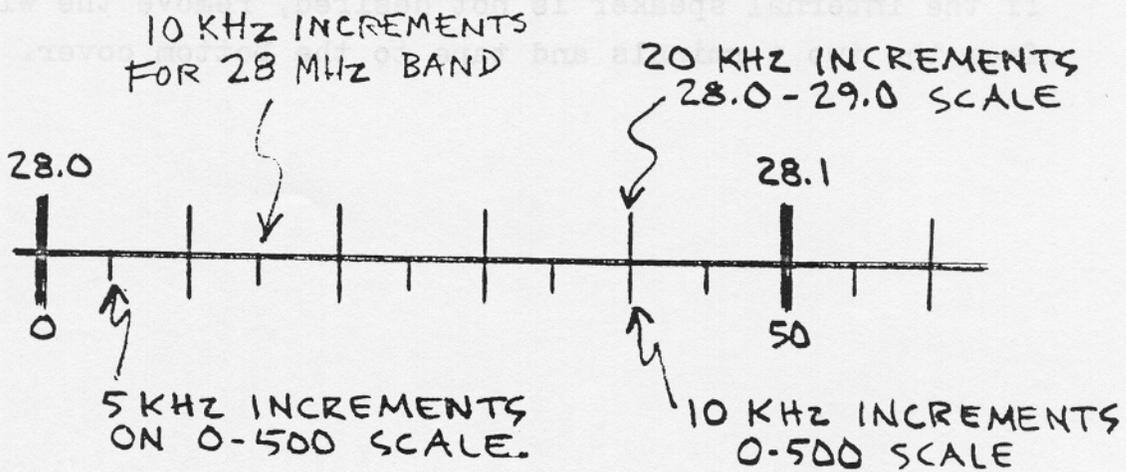
The speaker is mounted on the receiver chassis and faces through the bottom cover. If an external speaker is desired it is only necessary to remove the bottom cover of the RX-110, locate the two speaker terminals on the PC310 board and connect a two wire cable from the external speaker. If the internal speaker is not desired, remove the wires from the two terminals and tape to the bottom cover.

$\frac{\lambda}{4}, \frac{3\lambda}{4}, \frac{5\lambda}{4}$



MHZ	$\frac{\lambda}{4}$	$\frac{3\lambda}{4}$	$\frac{5\lambda}{4}$
3.5	67'	201'	335'
3.8	62'	186'	310'
7.2	32.5'	97.5'	162.5'
14.2	16.5'	49.5'	82.5'
21.3	11'	33'	55'
28.5	8'	24'	40'

FIG. 2



INCREMENT MARKINGS ON RX-110 DIAL SCALE

FIG. 4

A. FRONT PANEL CONTROLS (Fig. 3)

1. POWER ON: The POWER ON switch is part of the A.F. GAIN control. When using either 117 VAC or 12 to 14 VDC for power, the switch must be on.
2. A.F. GAIN: Controls audio volume in receive.
3. BAND SELECTOR: Numbers read in MegaHertz for the respective amateur bands: 3.5 for 80 meters, 7 for 40 meters, 14 for 20 meters, 21 for 15 meters, and 28 for the first megahertz portion of 10 meters. (28 to 29 MHz).
4. MAIN TUNING KNOB: Velvet smooth tuning ratio provides for 22 kHz per revolution on lower bands and 44 kHz per revolution on the 28 MHz band. Increment markings on the tuning knob skirt are 1 kHz apart on the lower bands, and 2 kHz apart on the 28 MHz band.
5. TUNING DIAL: Illuminated analog dial scale is used on all bands. The 0-500 kHz dial scale reads directly on 7, 14 and 21 MHz bands. EXAMPLE: With BAND switch in 14 MHz position and tuning dial at 250 on the 0-500 kHz scale, the operating frequency is 14,250 kHz. On the 3.5 MHz band the dial scale reading is additive. EXAMPLE: With bandswitch in the 3.5 MHz position and tuning dial at 400 on the 0-500 kHz scale, the operating frequency is 3,900 kHz.

The 28 MHz band is calibrated directly above the 0-500 kHz scale and reads from 28.0 to 29.0 MHz. The 28 MHz dial is calibrated in 20 kHz increments. However, by using the 5 kHz increments on the 0-500 kHz scale, it is possible to read down to 10 kHz on the 28.0 - 29.0 scale. See Figure 4.

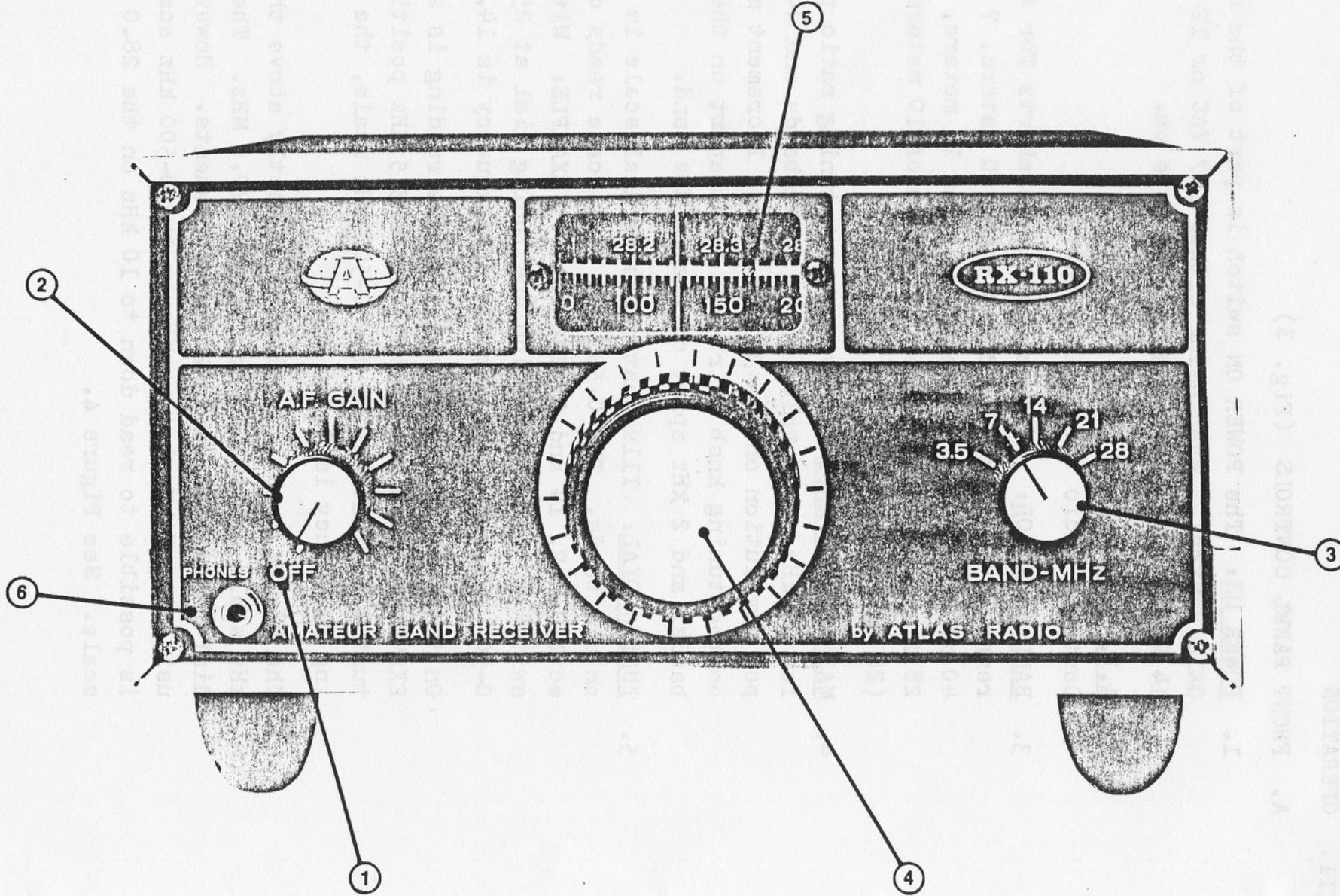


FIG
FRONT VIEW

6. PHONES: 3.5mm, 2 conductor miniature for headphones of 500 ohms resistance or greater.

III. B. REAR PANEL CONTROLS (Fig. 5)

7. ANTENNA: RCA phono type (included with receiver) connects receiver with antenna system.
8. 14 VDC CONNECTORS: Connectors are used, when receiver is operated from a direct 12 to 14 VDC source. The two banana plugs are used for the positive voltage connections and the banana jack is for the ground connection. The lower mounted plug is used for the RX-110 receiver. Current drain is 0.2 Amps. When using the TX-110 transmit module, the lower mounted jack is also used. Peak current drain in the transmit mode will then be 2 Amps.

If the 200 watt power amplifier is used, the upper jack (high current) is connected and peak current to the line in transmit mode will be 16 Amps. Atlas DCC-110 cable is recommended for DC operation.

9. AC CONNECTION: For use when receiver is to be used with 100-130 volts AC, 50-60 Hz (200-260 volts AC, 50-60 Hz, EXPORT MODEL). Power drain is 10 watts for receiver alone. Peak power with TX-110 transmit module is 40 watts. Power for 200 watt power amplifier is supplied by separate AC supply.
10. TX-110 CONNECTOR: 12 pin socket provides for plug-in of TX-110 transmit module to form the 110 transceiver. A jumper plug is included with RX-110 for operation without the TX-110 Module.

C. TUNING OF SINGLE SIDEBAND SIGNALS

Precise tuning of a single sideband signal is very important. Do not be satisfied to merely tune until the voice can be understood, but take extra care of setting the dial to the exact spot where the voice sounds natural.

Avoid the habit of tuning so that the voice is pitched higher than normal. This is an unfortunate habit practiced by a number of operators. Mistuning results in distortion on the voice and should be quite noticeable to the average ear. Some voices are relatively rich in harmonics and are easier to tune in than a person with a "flat" voice. There is no mistaking when you have a station tuned exactly right on. It will sound just like "AM" Broadcast signal.

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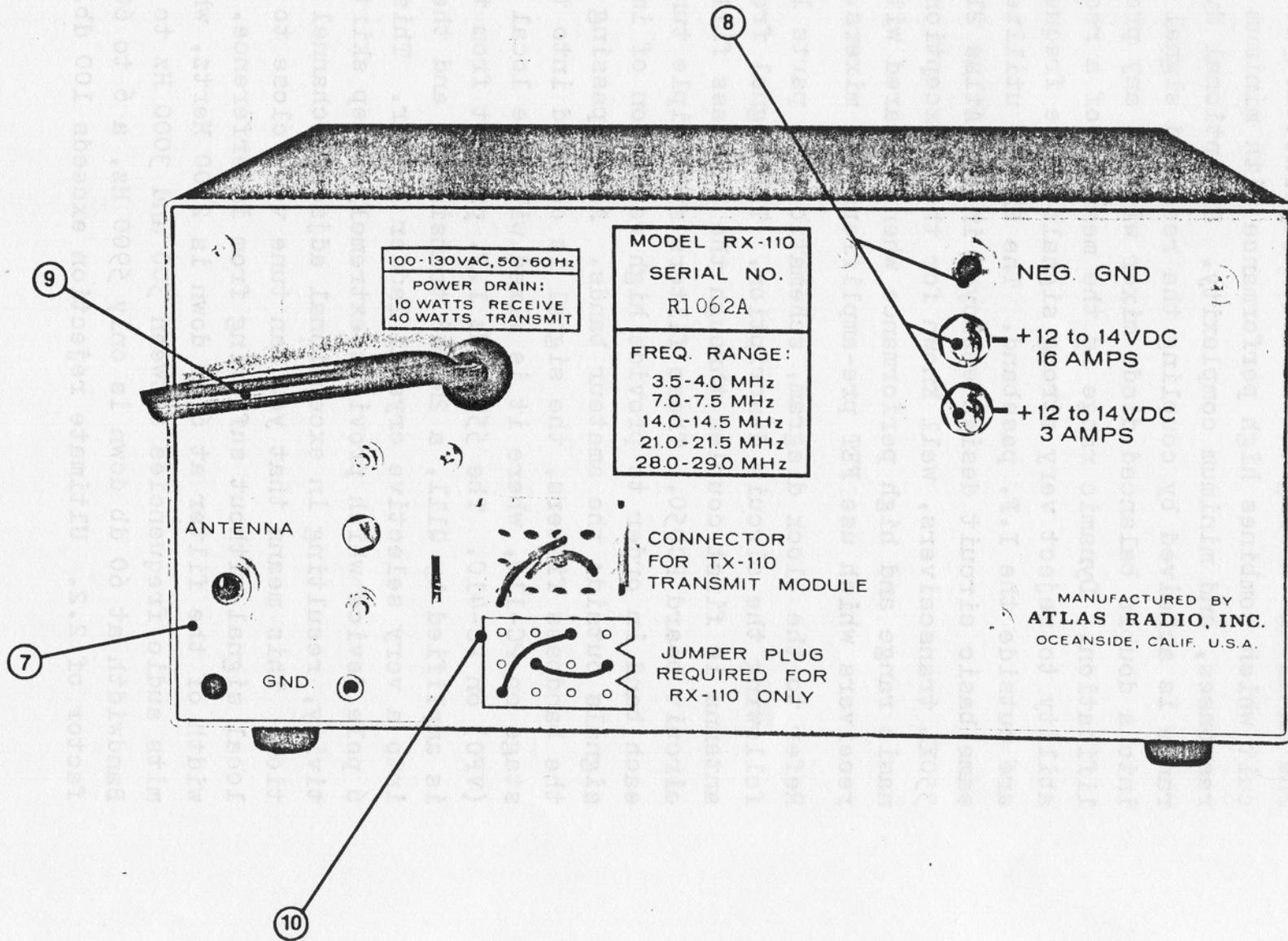


FIG. 5
REAR VIEW

A. RECEIVER

The RX-110 is a single conversion superheterodyne circuit which combines high performance with minimum spurious responses, and minimum complexity. Exceptional dynamic range is achieved by coupling the received signal directly into a double balanced diode mixer without any pre-amplification. Dynamic range is the measure of a receiver's ability to reject very strong signals whose frequencies are outside the I.F. passband. The RX-110 utilizes the same basic circuit design employed in the Atlas 210X and 350XL transceivers, well known for their exceptional dynamic range and high performance when compared with other receivers which use FET pre-amplifiers and mixers.

Refer to the block diagram, schematic, and parts list in following the circuit description. The signal from the antenna is first coupled through the bandpass filters on circuit board PC050. These filters are triple tuned on each band in order to provide high rejection of image signals outside the amateur bands. After passing through the bandpass filters, the signal is coupled into the mixer stage on PC-110, where it is mixed with the local oscillator (VFO) on PC-410. The 5595 kHz I.F. product from the mixer is amplified by Q111, a 2N3866 transistor, and then coupled into a very selective crystal ladder filter. This is a 6 pole device which provides extremely steep skirt selectivity, resulting in exceptional adjacent channel rejection. This means that you can tune very close to a strong local signal without suffering from interference. Bandwidth of the filter at 6 db down is 2700 Hertz, which permits audio frequencies between 300 and 3000 Hz to pass. Bandwidth at 60 db down is only 5900 Hz, a 6 to 60 db shape factor of 2.2. Ultimate rejection exceeds 100 db.

After the crystal filter the I.F. signal goes to PC-310 where it is amplified by Q315, an MCL350P integrated circuit. Then it is coupled into one gate of Q314, a 40673 FET product detector. The BFO (Beat Frequency Oscillator), made up of Q312 and Q313, is coupled to the other gate, and the product coming from the FET drain will be the desired audio frequency signal, (voice signal). This audio frequency is coupled into Q316, an I.C. containing four Op. Amps. Section A is used for amplifying the audio signal, after which it is coupled through the A.F. Gain control to Q319, the LM380N power amplifier I.C. 2 watts of audio power is available for the 4 ohm loudspeaker.

Section B of Q316 also amplifies the audio signal, and then couples into the AGC rectifiers, producing a DC control voltage. Q318 amplifies this DC voltage, which is then fed to the gain control terminal of Q315, the MCL350P I.F. amplifier. This AGC loop results in a nearly flat gain curve, with less than 10 db change in audio output with signal variation from 5 microvolts to 1 volt. The remaining 2 sections of Q316 are unused.

B. POWER SUPPLY

The built-in AC transformer provides 12 volts RMS to a diode bridge (PC-080) to produce about 16 volts DC. Actual voltage varies with current drain being about 16.5 in receive mode and dropping to 12.5 at full transmit power. Q81 is an IC voltage regulator which provides 9 volts of highly filtered and regulated supply for the receiver. The only part of the receiver operating on the unregulated higher voltage is the output portion of the LM380N audio amplifier. It is rated up to 20 volts.

Primary voltage to the AC supply is 100 to 130 volts AC, 50 to 60 Hz in the domestic model. The export model has a 200 to 260 volt primary.

12 to 14 volts DC will operate the RX-110, with connections made at the rear banana plug and jack terminals. The Atlas DCC-110 cable kit is recommended for this purpose. Normally an auto type storage battery will be used for mobile or portable operation, although the RX-110 draws only 150 to 200 milliamperes, so will operate from a 12 volt lantern battery for several hours. With the TX-110 transmitter module connected, current drain will increase sharply during transmit.

A series diode in the RX-110 provides protection from accidental wrong polarity. This diode protects all circuits except the 200 watt transmitter amplifier, which is protected by a shunt diode contained in the DCC-110 cable kit.

C. TRANSCIVER OPERATION

When the Atlas TX-110 Transmitter Module is plugged into the RX-110 receiver, the combination becomes a transceiver. The TX-110 alone is not a complete transmitter, since it requires the following circuits from the RX-110:

(a) The BFO (carrier oscillator), (b) Balanced Modulator
(c) Crystal Filter, (d) IF Amplifier, (e) Diode Ring Mixer
(f) VFO, and (g) Bandpass Filters.

The TX-110 contains a microphone amplifier, 800 Hz side-tone oscillator for CW, R.F. pre-amplifier for the transmit signal, driver stage, and push-pull 15 watt power amplifier. The 200 watt model of the TX-110 includes a 200 watt power amplifier, driven by the 15 watt stage. Low pass filters for each band, 10 through 80 meters, are selected with a bandswitch. These filters reduce harmonic output to meet FCC requirements. Typically harmonic output is down more than 50 db.

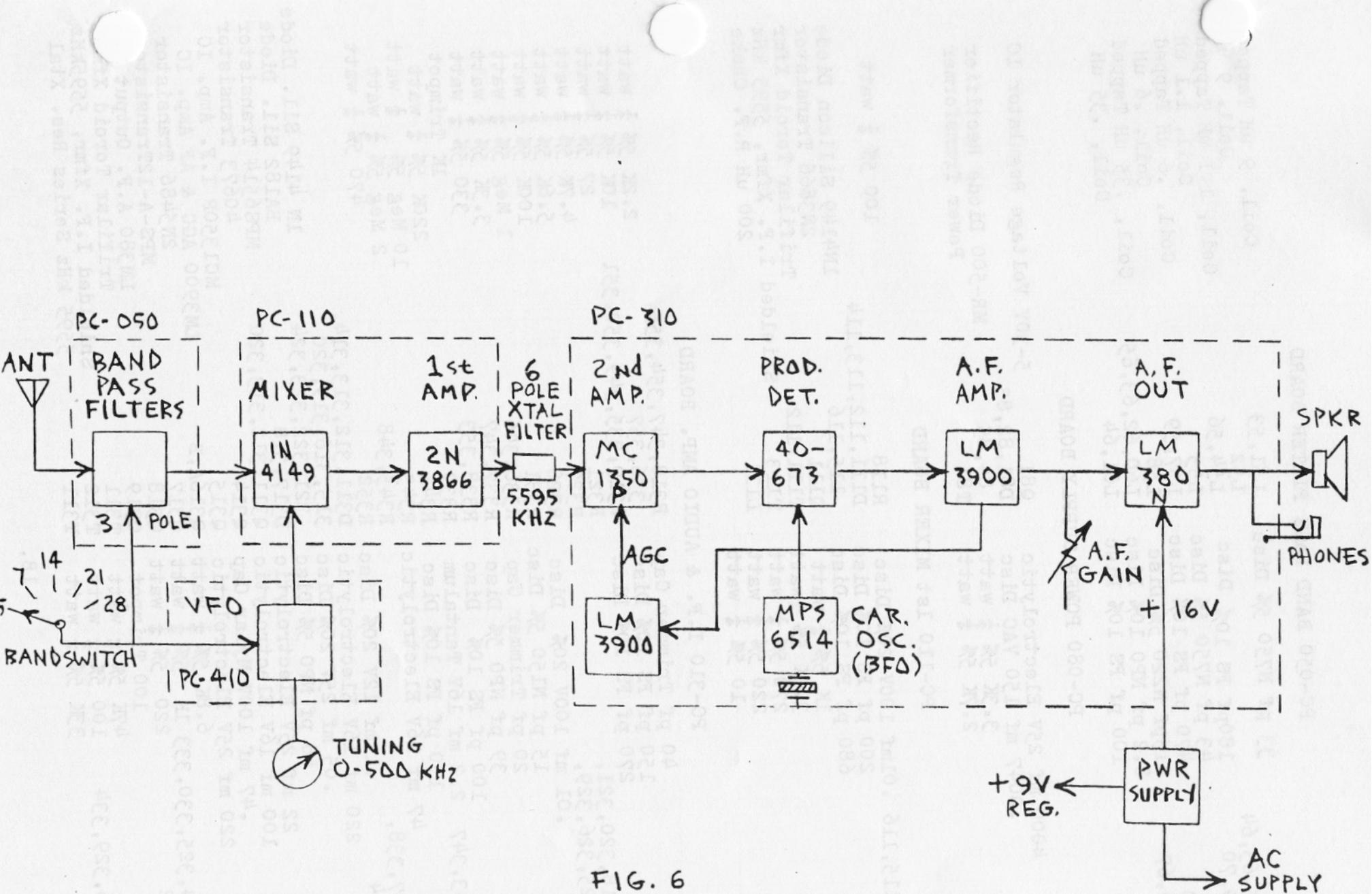


FIG. 6
MODEL RX-110 BLOCK DIAGRAM

PC-050 BAND PASS FILTER BOARD

C51,52	33 pf N750 5% Disc	L51,53	Coil, 9 uH Tapped
C53,54,55,63,64		L52	Coil, 9 uH
65,68,69,70	180pf FS 10% Disc	L54,56	Coil, 1.1 uH Tapped
C56,57	43 pf N750 5% Disc	L55	Coil, 1.1 uH
C58,59,60	470 pf FS 10% Disc	L57,59	Coil, .6 uH Tapped
C61,62,66,67	15pf N220 5% Disc	L58	Coil, .6 uH
C71,72	8.2 pf NPO 10% Disc	L60,62,63,65	Coil, .35 uH Tapped
C73,74,75	100 pf FS 10% Disc	L61,64	Coil, .35 uH

PC-080 POWER SUPPLY BOARD

C81	4000 mf 25V Electrolytic	Q81	5-30V Voltage Regulator IC
C82,83	.0047 mf 150 VAC Disc	D81,82,83	
R81	3.3K 5% $\frac{1}{4}$ watt	84,85	MR-500 Diode Rectifier
R82	2.7K 5% $\frac{1}{4}$ watt	T81	Power Transformer

PC-110 1st MIXER BOARD

C111,114,115,116	.01mf 100V 20% Disc	R118	100 5% $\frac{1}{4}$ watt
C112	200 pf FS 10% Disc	D111,112,113,114	
C113	680 pf FS 10% Disc	115,116	1N4149 Silicon Diode
R111,117	1K 5% $\frac{1}{4}$ watt	Q111	2N3866 Transistor
R112,113	3.3K 5% $\frac{1}{4}$ watt	T111,112	Trifilar Toroid Xfmr
R114	270 5% $\frac{1}{4}$ watt	T113	Shielded I.F. Xfmr, 5595 kHz
R115	220 5% $\frac{1}{4}$ watt	L111	200 uH R.F. Choke
R116	10 5% $\frac{1}{4}$ watt		

PC-310 I.F. & AUDIO AMP. BOARD

C311	40 pf Trimmer Cap	R318,347,354,355,	
C312	150 pf FS 10% Disc	356,357	2.2K 5% $\frac{1}{4}$ watt
C313	270 pf FS 10% Disc	R319,335,349,350,351	10K 5% $\frac{1}{4}$ watt
C314,316,318,320,321,		R321	27 5% $\frac{1}{4}$ watt
323,324,325,326,329,		R327	4.7K 5% $\frac{1}{4}$ watt
331,345	.01 mf 100V 20% Disc	R328	5.6K 5% $\frac{1}{4}$ watt
C315	15 pf N150 5% Disc	R331	100K 5% $\frac{1}{4}$ watt
C317	20 pf Trimmer Cap	R336,346	1 Meg 5% $\frac{1}{4}$ watt
C319	39 pf NPO 5% Disc	R337,347	3.3K 5% $\frac{1}{4}$ watt
C322	100 pf FS 10% Disc	R338,353	330 5% $\frac{1}{4}$ watt
C327,340,343,347	2.2 mf 16V Tantalum	R339	1K Trimpot
C328	130 pf FS 10% Disc	R341	220K 5% $\frac{1}{4}$ watt
C330	47 mf 16V Electrolytic	R343	10 Meg 5% $\frac{1}{4}$ watt
C332,333,337,338,		R345,348	2 Meg 5% $\frac{1}{4}$ watt
341,342,344	.1 mf 12V 20% Disc	R352	470 5% $\frac{1}{4}$ watt
C334,335	220 mf 16V Electrolytic	D311,312,313,314,	
C336	.05 mf 25V 20% Disc	315,316,319,320	
C339	68 pf NPO 5% Disc	321,322,323,324	1N 4149 Sil. Diode
C346	22 mf 25V Electrolytic	D317,318	BA182 Sil. Diode
C347	100 mf 16V Electrolytic	Q311,312,313,320	MPS6514 Transistor
C349	.47 mf 100V Mylar Cap	Q314	40673 Transistor
C350	220 mf 25V Electrolytic	Q315	MC1350P I.F. Amp. IC
R311,344	6.8K 5% $\frac{1}{4}$ watt	Q316A,B	LM3900 AGC & AF Amp. IC
R312,323,324,325,330,333	1K 5% $\frac{1}{4}$ watt	Q317	2N5486 Transistor
R313,320,332	220 5% $\frac{1}{4}$ watt	Q318	MPS-A-12 Transistor
R314	100 Trimpot	Q319	LM380 A.F. Output
R315,340	47K 5% $\frac{1}{4}$ watt	T311	Trifilar Toroid Xfmr
R316,322,326,329,334	100 5% $\frac{1}{4}$ watt	T312	Shielded I.F. Xfmr, 5595kHz
R317	33K 5% $\frac{1}{4}$ watt	Y311	5595 kHz Series Res. Xtal

PC-410 VFO BOARD

C411,415	.01 mf 100V 20% Disc	C432	4.7 pf N470 10% Disc
C412	.001 mf 100V 20% Disc	C435	22 pf NPO 5% Disc
C413	47 pf N1500 5% Disc	R411,420	470 5% $\frac{1}{4}$ watt
C414	68 pf N1500 5% Disc	R412	47K 5% $\frac{1}{4}$ watt
C416	4.7 pf NPO 10% Disc	R413	10K 5% $\frac{1}{4}$ watt
C417,418	68 pf 5% DM-15 Silver Mica	R414	1K 5% $\frac{1}{4}$ watt
C419	15 pf N150 5% Disc	R415	1.5K 5% $\frac{1}{4}$ watt
C420A,B	4 and 8 pf VFO Tuning Cap	R416	27 5% $\frac{1}{4}$ watt
C421,425,428,		R417	100K 5% $\frac{1}{4}$ watt
431,434	.8-12 pf Piston Trimmer	R418	330 5% $\frac{1}{4}$ watt
C422	10 pf N750 5% Disc	R419	150K 5% $\frac{1}{4}$ watt
C423,433	4.7 pf N750 10% Disc	L411	3.6 uH R.F. Choke
C424	4.7 pf N1500 10% Disc	L412	33 uH R.F. Choke
C426	10 pf N330 5% Disc	L413	Tapped VFO Coil
C427	10 pf N220 5% Disc	Q411	MPS6514 Transistor
C429,436	22 pf N330 5% Disc	Q412,413	2N4416 Transistor
C430	27 pf NPO 5% Disc		

CHASSIS ASSEMBLY

B1	Dial Lamp, 9	E1	Speaker, 3.2 ohm
R1	A.F. Gain Pot, 10K	S1	Bandswitch
J1	Antenna Jack	S2	Power Switch (A.F. Gain Pot)
J2	Negative/Ground	P1	+14V Low Amps
J3	Connector	P2	+14V High Amps
J4	Headphone Jack	P3	RX-110 Jumper Plug
F1	6 Pole Crystal Filter, 5595 kHz		

1. VFO FREQUENCY ADJUSTMENT

- A. Connect a calibrated signal source to the antenna jack on the RX-110 rear panel. (Fig. 5)
- B. Move bandswitch to frequency range requiring adjustment.
- C. Set tuning dial to frequency of the calibrated signal.
- D. The VFO trimmers, item 11, can be located through the ventilating slots on top of the cabinet or the cabinet can be removed if desired.
- E. Adjust the proper trimmer for the correct dial reading.
- F. If a calibrated signal source is not available use a station of known frequency for reference. This may be someone locally who will put a test signal on for you, or a daily net which operates on the same frequency every day.

2. I.F. TRANSFORMER ADJUSTMENT

- A. Switch receiver to the 14MHz position.
- B. Disconnect antenna and turn A.F. Gain control up for normal background noise.
- C. Locate the I.F. transformers on PC-110, item 12, and PC-310, item 13, and adjust for maximum background noise.
- D. If a multi-meter or VTVM is available, switch to AC volts, lowest range, and connect to speaker terminals. If background noise can be read on the meter, then use meter reading as indication of peak adjustment.

3. AGC THRESHOLD ADJUSTMENT

- A. Switch receiver to 14MHz position and disconnect antenna.
- B. Connect voltmeter across R328, item 14, a 5.6K resistor. Connect the (-) negative lead from voltmeter to the resistor lead that connects to the long pin on the PC-310 board. The (+) positive lead from the voltmeter connects to the other side of the resistor. Switch voltmeter to the lowest DC volt scale.
- C. Locate the AGC threshold trimpot, item 15, and adjust until voltmeter reads 0.3 volt DC.

4. CARRIER FREQUENCY AND CARRIER BALANCE ADJUSTMENTS.

These adjustments, item 16 and 17, do not normally require alignment when the RX-110 is used as a receiver only, and should not be touched. Alignment procedures for these will be outlined in the TX-110 manual.

5. BANDPASS COILS (Fig. 9)

NOTE: If a TX-110 transmitter module is used, disregard the following steps, and instead refer to alignment instructions in TX-110 manual. The following steps are to be used only if the RX-110 is used alone as a receiver. They should not be attempted unless there is good reason to suspect that they are misaligned, because they have been originally tuned at the factory for peak transmitter output with the TX-110 module.

- A. Move bandswitch to frequency range requiring adjustment.
- B. Connect signal generator (Hewlett Packard model 606B or equivalent) to antenna jack on rear panel.
- C. Adjust input, center, and output coils of selected frequency range for maximum signal output. Refer to figure 9 for coil placement. Item 18, 3.5MHz range; Item 19, 7MHz range; Item 20, 14MHz range; Item 21, 21MHz range; and Item 22, 28MHz range

EXTENDED FREQUENCY RANGES BY ADJUSTMENT OF VFO TRIMMERS

BAND, MHz	VFO INJECTIONS, KHz	VFO, KHz	OPERATING RANGE, KHz
3.5	8,895 - 9,195	5595	3,300 - 4,200
7	12,395 - 13,195	5595	6,800 - 7,000
14	8,105 - 9,200	5595	13,700 - 14,800
21	14,905 - 16,705	5595	20,500 - 22,300
28	22,305 - 24,405	5595	27,900 - 30,000

FIG. 7
SIGNAL FREQUENCY RANGES AND LOCAL OSCILLATOR FREQUENCIES

STANDARD FREQUENCY RANGES

BAND, MHZ	VFO INJECTIONS, KHZ	I.F. KHZ.	OPERATING RANGE, KHZ
3.5	9,095 - 9,595	5595	3,500 - 4,000
7	12,595 - 13,095	5595	7,000 - 7,500
14	8,405 - 8,905	5595	14,000 - 14,500
21	15,405 - 15,905	5595	21,000 - 21,500
28	22,405 - 23,405	5595	28,000 - 29,000

EXTENDED FREQUENCY RANGES BY ADJUSTMENT OF VFO TRIMMERS

BAND, MHZ	VFO INJECTIONS, KHZ	I.F. KHZ.	OPERATING RANGE, KHZ
3.5	8,895 - 9,795	5595	3,300 - 4,200
7	12,395 - 13,195	5595	6,800 - 7,000
14	8,105 - 9,200	5595	13,700 - 14,800
21	14,905 - 16,705	5595	20,500 - 22,300
28	22,305 - 24,405	5595	27,900 - 30,000

FIG. 7
SIGNAL FREQUENCY RANGES AND LOCAL OSCILLATOR FREQUENCIES

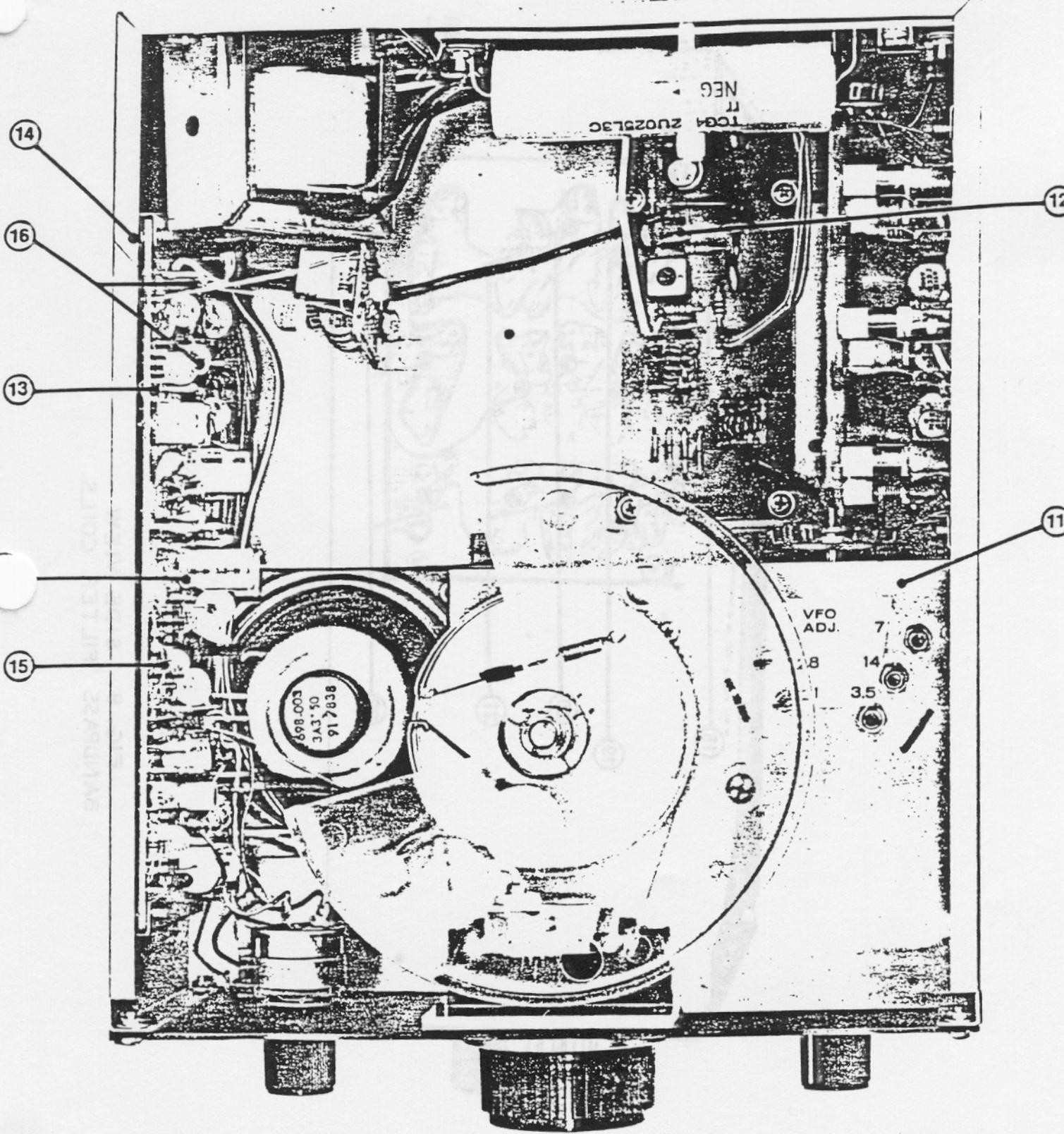


FIG. 8 TOP VIEW

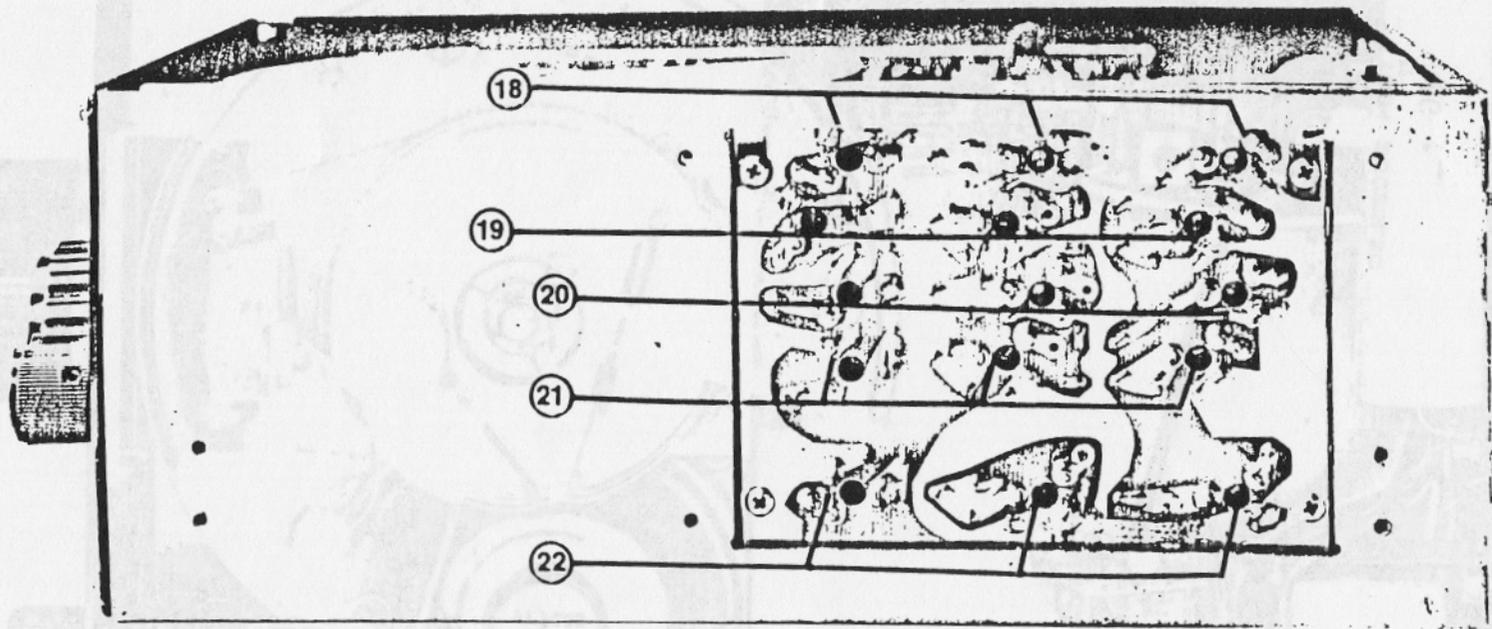
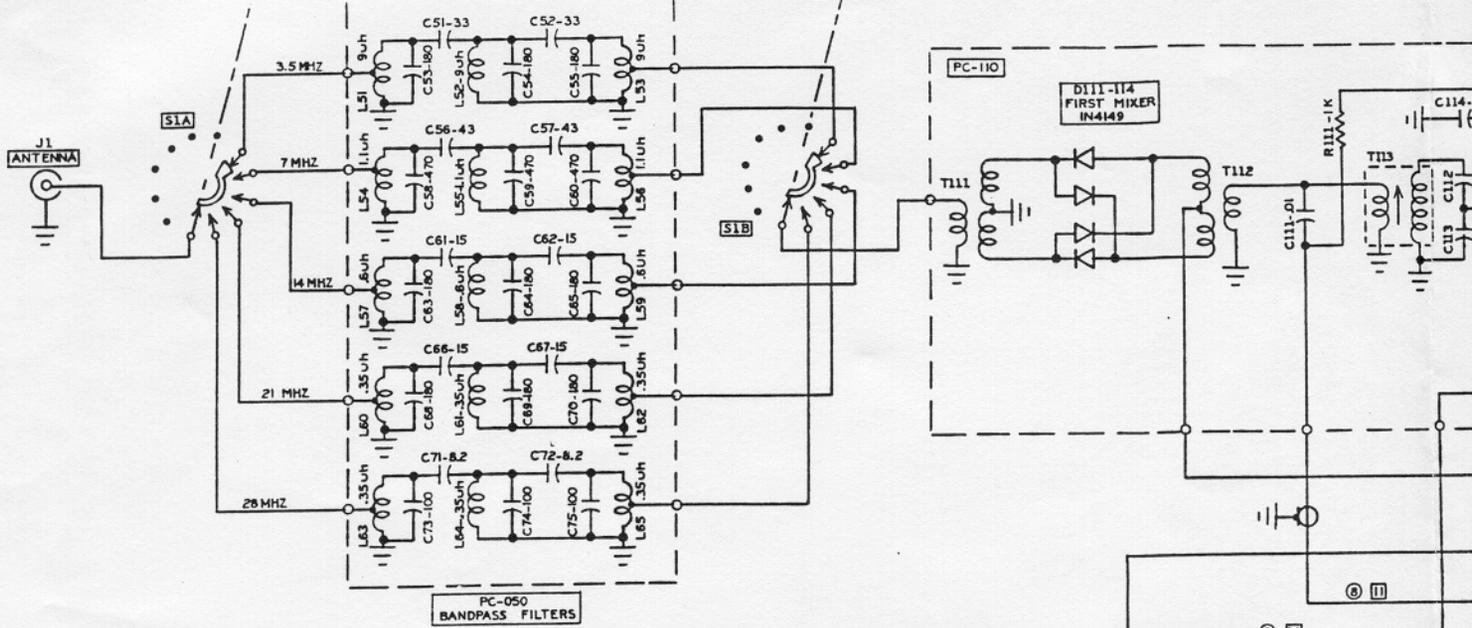
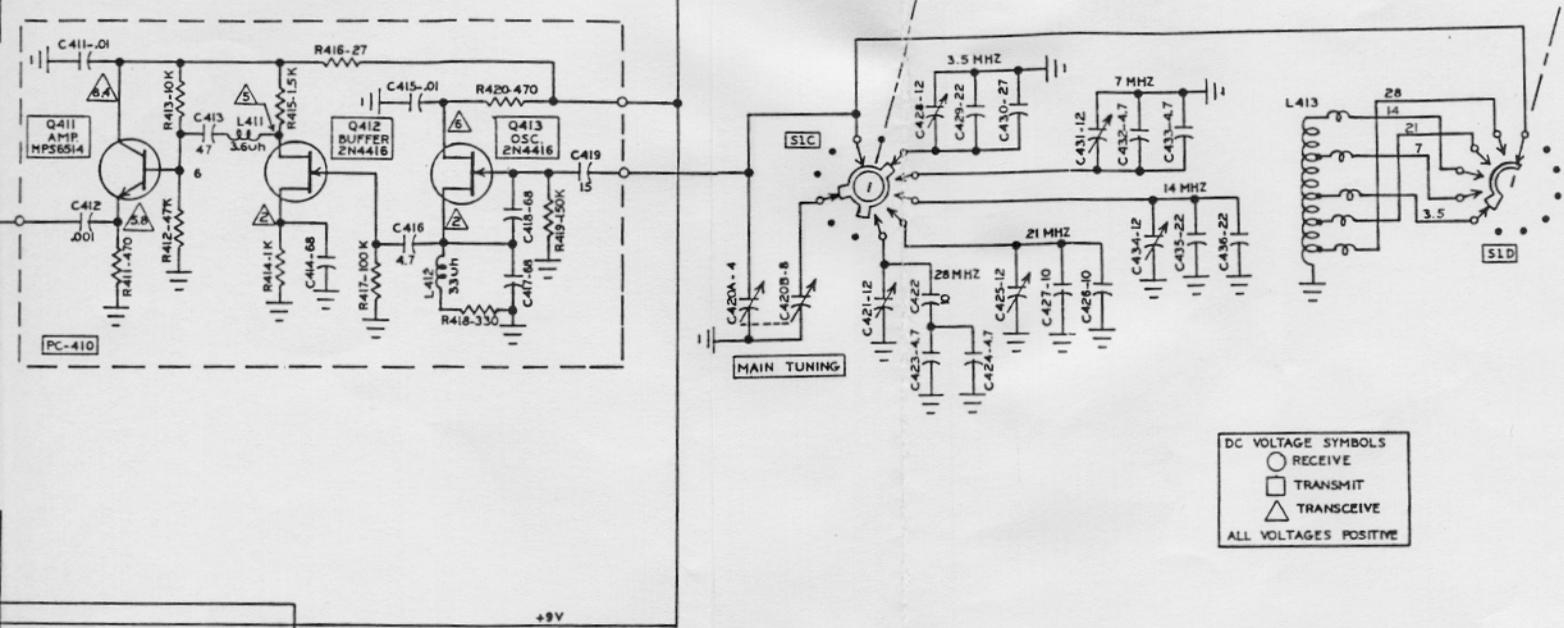


FIG. 9 SIDE VIEW
BANDPASS FILTER COILS





DC VOLTAGE SYMBOLS
 ○ RECEIVE
 □ TRANSMIT
 △ TRANSCIVE
 ALL VOLTAGES POSITIVE

