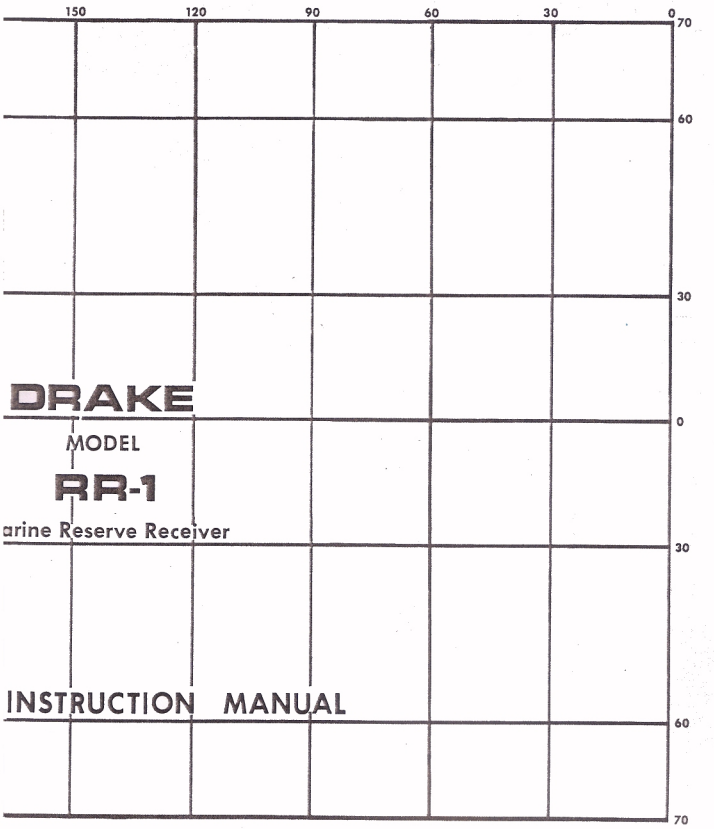

150
120
90
60
30
0
70
60
30
0
30
60
70
DRAKE
MODEL
RR-1
arine Reserve Receiver
INSTRUCTION MANUAL

Table of Contents

1. GENERAL DESCRIPTION

1.1 FEATURES

The RR-1 is an all solid-state communications receiver which can be programmed with accessory crystals to cover 0.5 MHz to 30 MHz. The RR-1 receives AM, CW, SSB (upper and lower) and may be powered from 120 V AC or 240 V AC and 24 V DC or 12 V DC. The receiver is supplied from the factory wired for 240 V AC and 24 V DC.

1.2 SPECIFICATIONS

1.2.1 GENERAL SPECIFICATIONS

Frequency Coverage:

The RR-1 can be programmed with accessory crystals for 23 ranges (each tuning a 500 kHz band) from .5 to 30 MHz. Generous PTO dial overtravel allows additional 50 kHz or more off each end of range. Crystals supplied with the receiver allow coverage on these ranges:

150 - 535 kHz	12.0 - 13.5 MHz
1.5 - 4.5 MHz	16.0 - 17.5 MHz
6.0 - 6.5 MHz	22.0 - 23.0 MHz
8.0 - 9.0 MHz	25.0 - 26.0 MHz

Modes of Operation: AM, CW, SSB (upper and lower).

Selectivity:

AM	4.8 kHz @ 6 dB, 10.0 kHz @ 60 dB
USB	2.4 kHz @ 6 dB, 7.2 kHz @ 60 dB
LSB/CW wide	2.4 kHz @ 6 dB, 7.2 kHz @ 60 dB
CW	.4 kHz @ 6 dB, 2.7 kHz @ 60 dB

Sensitivity and Input Impedance:

350 - 535 kHz:[1]	10.0 uV EMF 10 dB SINAD]	Mode AM
1.5 - 4 MHz:	25.0 uV EMF 20 dB SINAD]	30% modulation
4.0 - 26 MHz:	5.0 uV EMF 20 dB SINAD]	1000 Hz
400 - 535 kHz:[2]	2.5 uV EMF 10 dB SINAD]	Modes CW
1.5 - 4 MHz:	5.0 uV EMF 20 dB SINAD]	and SSB
4.0 - 26 MHz:	1.0 uV EMF 20 dB SINAD]	

Below 4 MHz an artifical antenna of 10 ohms in series with 250 pF is used. Above 4 MHz a standard 50 ohm antenna is used.

[1] British GPO version 100 uV.
[2] British GPO version 25 uV.

1.2.1 GENERAL SPECIFICATIONS (Continued)

Setting Accuracy:
+ - 1 kHz when receiver is calibrated to nearest 100 kHz against the internal 100 kHz crystal calibrator.

Stability After Warm-Up:
Better than 20 Hz for any 15 minute operating period and better than 100 Hz for any 8 hour operating period at constant room temperature within the range 0 to +40 degrees C and 10% variation in the supply voltage.

IF Frequencies:
1st IF = 5645 kHz,
2nd IF = 50 kHz.

IF Rejection:
Better than 60 dB except within the frequency range of 6.0 - 6.5 MHz where rejection is better than 50 dB.

Image Rejection:
Better than 60 dB below 15 MHz.
Better than 50 dB above 15 MHz.

AGC:
Less than 6 dB output variation for a 120 dB increase in input signal from receiver sensitivity level. Time constants are selected for each mode.

Output Power:
3 Watts into a 4.0 Ohm built-in speaker.

Blocking:
An unwanted unmodulated signal, 120 dB above 1 uV and 20 kHz above or below a wanted signal, will not reduce the wanted signal more than 3 dB when measured at the receiver output terminals. The wanted signal has a level of 60 dB above 1 uV and is modulated with a 1 kHz tone 30%.

1.2.1 GENERAL SPECIFICATIONS (Continued)

Cross Modulation:
An unwanted signal 90 dB above 1 uV, 30% modulated with a 1 kHz tone, at a frequency of more than 20 kHz above or below a wanted A1 signal, which has a level of 60 dB above 1 uV, will not give an interference greater than 30 dB below standard output for the wanted signal. Standard output is 50 mW.

Intermodulation:
Between 405 and 535 kHz two interferring signals must have a level of 110 dB or more to give products equal to standard output. Reference signal is 40 dB above 1 uV EMF. Between 1.5 and 26 MHz, the values are 80 dB or more with a reference signal 30 dB above 1 uV EMF.

Antenna Input Protection:
30 Volts RMS

Supply Voltages:
24 V DC and 115/230 V AC 50/60 Hz.

1.2.2 POWER CONSUMPTION:
12 - 15 Watts on DC and 18 Watts on AC.

1.2.3 DIMENSIONS:

Width:	For 19 inch rack mounting. (48.26 cm)
Depth:	11-1/4 inches (28.58 cm)
Height:	7 inches (17.78 cm)
Cabinet:	Can be supplied for table mounting.

1.2.4 ACCESSORIES:
The following accessories are available:

1. Crystals which allow additional coverage of 0.5 MHz each.

2. A line amplifier which provides 1 mW of audio into a 600 Ohm line.

3. A 5-NB Noise Blanker which blanks impulse type noise.

4. A DC to AC isolation power supply.

1.2.5 SEMICONDUCTOR COMPLIMENT:

Symbol	Type	Function
Q2	2N3394	Range Crystal Oscillator
Q3	2N3563	PTO Buffer
Q4	SFC4982,MFE3007	RF Amplifier
Q5	SFC4982,MFE3007	Premixer
Q6	2N5950	PTO Oscillator
Q7	2N5245	1st Mixer
Q8	2N5245	1st Mixer
Q9	B5030	DC Regulator
Q10	SFC4982,MFE3007	2nd Mixer
Q11	2N5245	Crystal Oscillator
Q12	B5030	Audio Amplifier
Q13	B5030	Audio Amplifier
Q14	2N5949,MPF102	S-Meter Amplifier
Q15	2N3394	Audio Amplifier
Q16	2N4125	Audio Amplifier
Q17	2N5950,MPF102	Crystal Oscillator Buffer
Q18	2N4125	AVC Amplifier
Q19	2N3394	Audio Amplifier
Q20	2N3394	Audio Amplifier
Q21	2N3566	Negative Supply Driver
Q22	2N3394	Audio Amplifier
Q23	SFC4982,MFE3007	IF Amplifier
Q24	SFC4982,MFE3007	IF Amplifier
Q25	2N3566	AVC Detector
Q26	2N4125	Mute Control
Q27	2N3394	BFO
Q28	2N3394	AM Detector
Q29	40310	Regulator
IC-1	CA3053	S-Meter Amplifier
CR1	1N270	Premixer Switch
CR2	1N4148	RF Amplifier Protection
CR3	1N4148	RF Amplifier Protection
CR4	1N714	Zener Regulator
CR5	B5G5	Power Supply Rectifier
CR6	B5G5	Power Supply Rectifier
CR7	B5G5	Power Supply Rectifier
CR8	Z13B	Zener Regulator
CR9	1N714	Zener Regulator
CR10	1N4148	AVC Switch
CR11	1N270	AVC Switch
CR12	1N4148	Negative Supply Rectifier
CR13	1N4148	Negative Supply Rectifier
CR14	1N751	Zener Regulator
CR15	1N4148	AVC Switch

1.2.5 SEMICONDUCTOR COMPLIMENT (Continued)

Symbol	Type	Function
CR16	1N4148	AVC Switch
CR17	1N4148	AVC Switch
CR18	1N4148	AVC Switch
CR19	1N270	Product Detector
CR20	1N270	Product Detector
CR21	1N270	AM Detector
CR22	AN994	Zener Regulator (V_Z = 6.5 V)
CR23	AN994	Zener Regulator (V_Z = 6.5 V)
CR24	B5G5	Reverse Polarity Protect

2. INSTALLATION

2.1 UNPACKING

Carefully remove the receiver from the shipping carton, and examine it for evidence of damage. If any damage is discovered, immediately notify the transportation company that delivered the receiver. Be sure to keep the shipping carton and packing material, as the transportation company will want to examine them if there is a damage claim. Keeping the carton and packing material is recommended even when no shipping damage occurs, as having the original carton available makes shipment of the receiver much easier should it ever be necessary to return it to the factory for service.

2.2 LOCATION

The RR-1 will work well in almost any location, Extremely hot areas such as over a radiator should be avoided. No air circulation around the receiver is required.

2.3 POWER REQUIREMENTS

The RR-1 will operate on 120 or 240 V AC 50/60 Hz or from any 24 V DC source with negative ground.

The RR-1 is shipped from the factory ready for 240 V AC or 24 V DC operation with the power cord supplied. A 1/8 amp, slow-blow fuse, Buss type MDL 1/8, is installed in the fuse holder on the rear of the chassis. In addition a 1.5 amp fuse is installed for DC operation.

For operating from 120 V AC, the same power cord is used and the 120/240 volt slide switch at the chassis rear is moved to the 120 V position. This requires moving the small metal keeper from the right to the left mounting screw on the slide switch.

Also for 120 volt operation, the fuse should be changed to a 1/4 amp, slow-blow, Buss type MDL 1/4.

WARNING: NEVER CONNECT THE RR-1 TO 240 VOLTS WITH THE SWITCH IN THE 120 VOLT POSITION!

2.4 HEADPHONE OPERATION

Best results will be obtained with a set of good quality headphones. The headphone connection is made through the jack at the bottom left of the front panel of the RR-1. A standard 1/4 inch phone plug will mate with the jack. Connecting the headphones to the receiver turns off the speaker. The RR-1 will accommodate headphones of any impedance.

2.5 REAR CONTROLS AND CONNECTORS

Refer to Figure 1 for the location of the connectors and controls.

2.5.1 MUTE

A shorted phono connector is normally installed in the MUTE jack. When the shorted connector is removed, the RR-1 will be muted.

2.5.2 GROUND POST

A binding post is provided to allow connecting the RR-1 chassis to earth ground.

2.5.3 AUDIO IN/OUT

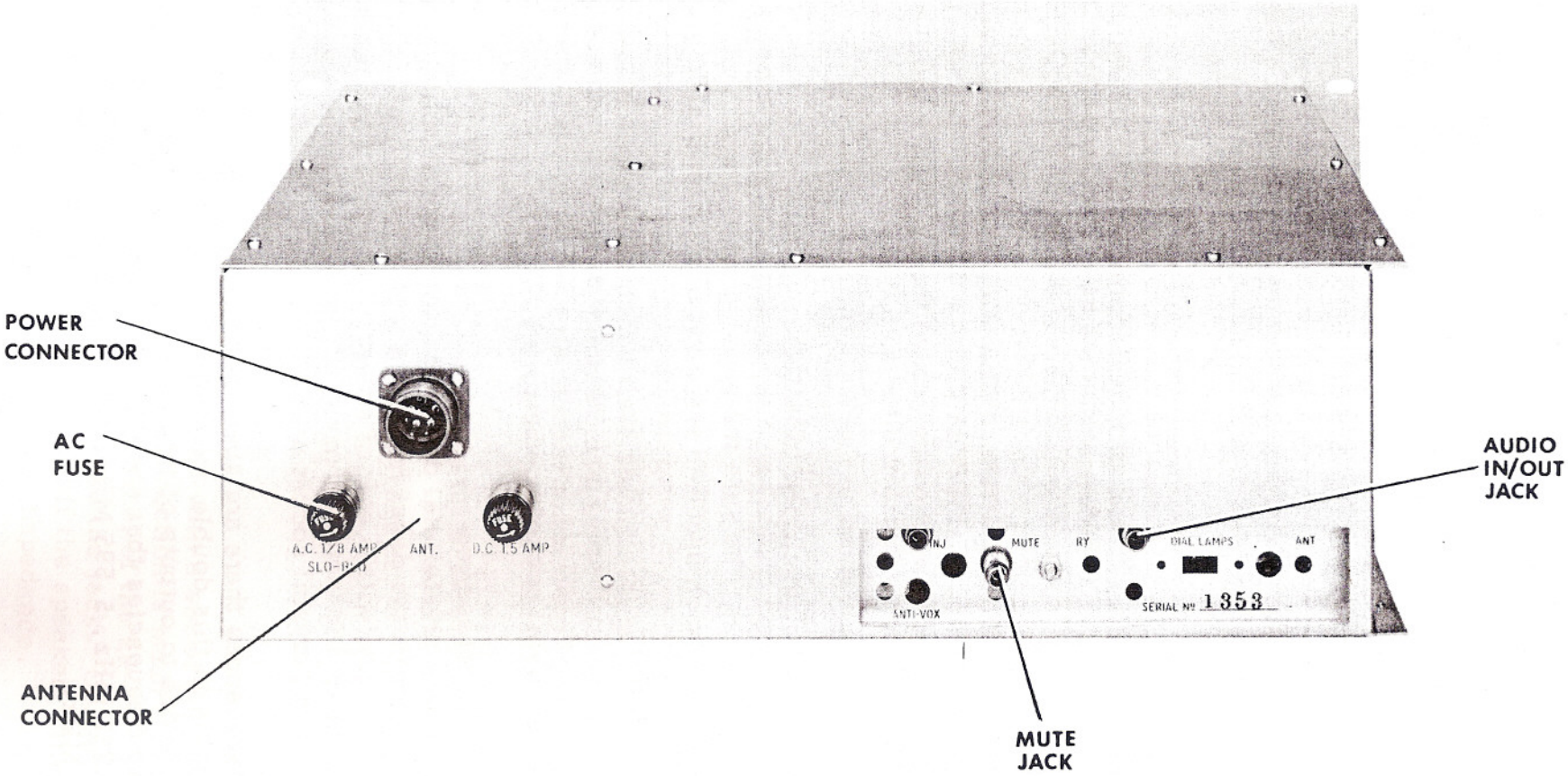
The AUDIO IN/OUT jack provides approximately .08 volts of audio into a high impedance load such as a tape recorder. The output level is independent of the setting of the AUDIO GAIN control. The RR-1 audio amplifier may be used with an external audio source such as a tuner. The level of the external source must be approximately .08 volts into a 3 K load. The received signals may be eliminated by turning the RF GAIN control counter-clockwise or by removing the mute plug.

2.6 ACCESSORY CRYSTAL INSTALLATION

The top of the RR-1 cabinet must be removed in order to install additional crystals. Be sure the power cord is disconnected. At the bottom of each segment of the crystal selector dial is a small number (0 - 23) which corresponds to a particular crystal socket. The crystal location diagram which is located on the chassis behind the crystal sockets indicates the number of each socket. No crystal is required for reception of 400 - 535 kHz, therefore there is no crystal socket numbered zero.

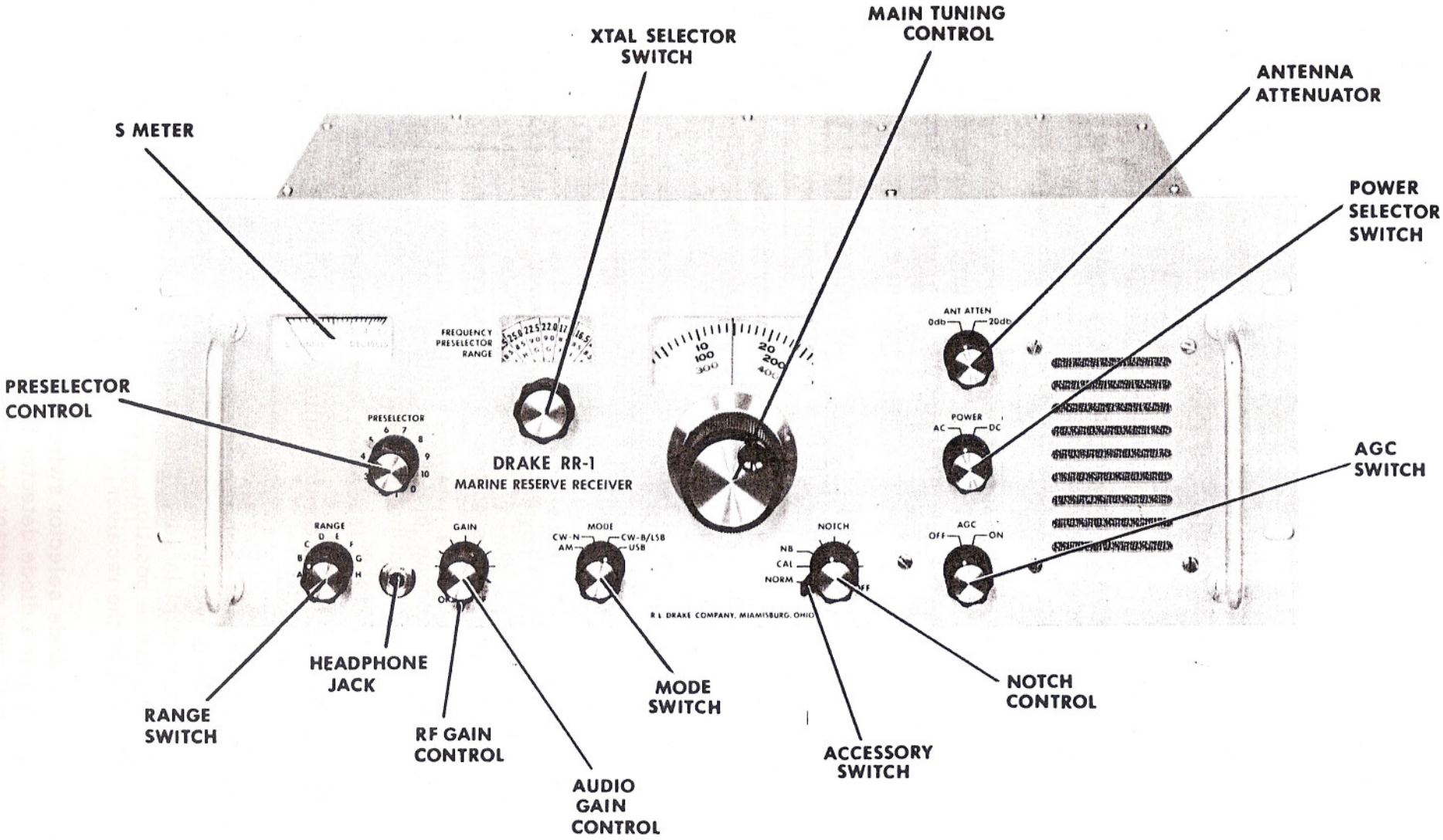
Install the accessory crystal in one of the empty sockets. Locate the appropriate crystal dial decal from the sheet supplied with the crystal. Remove the decal from the sheet by cutting along the appropriate lines with a pair of scissors. Remove the backing from the decal and install it in the dial sector with the same number as the crystal socket used.

On certain ranges there are spurious internal signals which are unavoidable in this double conversion, super-heterodyne receiver. These are due to outputs of internal conversion oscillators. There are fixed frequencies that should be avoided if possible. These are: 5.222 MHz, 5.595 MHz, 5.695 MHz, 9.963 MHz, and 15.334 MHz.



REAR CONTROLS AND CONNECTIONS

Figure 1



FRONT PANEL OPERATING CONTROLS

Figure 2

3. OPERATION

Refer to Figure 2 for the location of the operating controls.

3.1 OPERATING CONTROLS

1. The S-meter indicates the relative level of the received signals.

2. The crystal selector switch selects the band determining crystals. The top line of the dial sector reads the lowest frequency of each band in MHz, the middle line indicates the approximate position for tuning the preselector and the bottom line indicates the proper setting of the range switch.

3. The main tuning dial reads 0 to 500 kHz with 1 kHz graduations. When the tuning dial reading is added to the crystal dial reading, the actual received frequency is indicated to 1 kHz.

   The main tuning dial consists of two concentric transparent discs that rotate at different speeds. Zero to 100 kHz is indicated on one disc and hundreds of kHz are indicated on the other disc. On Band A frequency is indicated by the red scale. The dial may be calibrated by rotating the skirt with respect to the knob.

4. The preselector is set to the position indicated by the number on the middle line of the crystal selector dial and is then fine tuned for peak signal.

5. The range switch sets up the proper tuned circuits to cover the desired band of frequencies. It is set to the position indicated on the bottom line of the crystal selector dial.

6. The headphone jack mates with a standard 1/4 inch phone plug. Connecting the headphones to the receiver will turn off the speaker.

7. The audio gain control adjusts the audio output to the proper level.

8. The RF gain control controls the gain of the receiver for all signals which are below the AVC threshold level to which the control is set. This control is normally set in the full clockwise position. Counterclockwise rotation reduces the gain of the receiver.

9. The mode selector switches in a product detector for CW and SSB or a diode detector for AM. The proper IF bandwidth and AVC time constant are also selected.

3.1 OPERATING CONTROLS (Continued)

10. The notch control may be used to eliminate or reduce an interfering heterodyne or CW signal. The off position, which is shown in Figure 2, has a positive detent. Counter-clockwise rotation of the knob from the off position moves the rejection notch across the receiver passband.

11. The accessory switch turns on the 5-NB Noise Blanker and the SCC-4 Crystal Calibrator if they are installed. The 5-NB and the SCC-4 are off in the NORM position.

12. The AGC switch allows the AGC to be disabled.

13. The Power switch selects either a 24 V DC power source or a 120/240 V AC power source.

14. The Antenna Attenuator switch allows a 20 dB pad to be switched in series with the antenna.

3.2 SIMPLIFIED OPERATING PROCEDURE

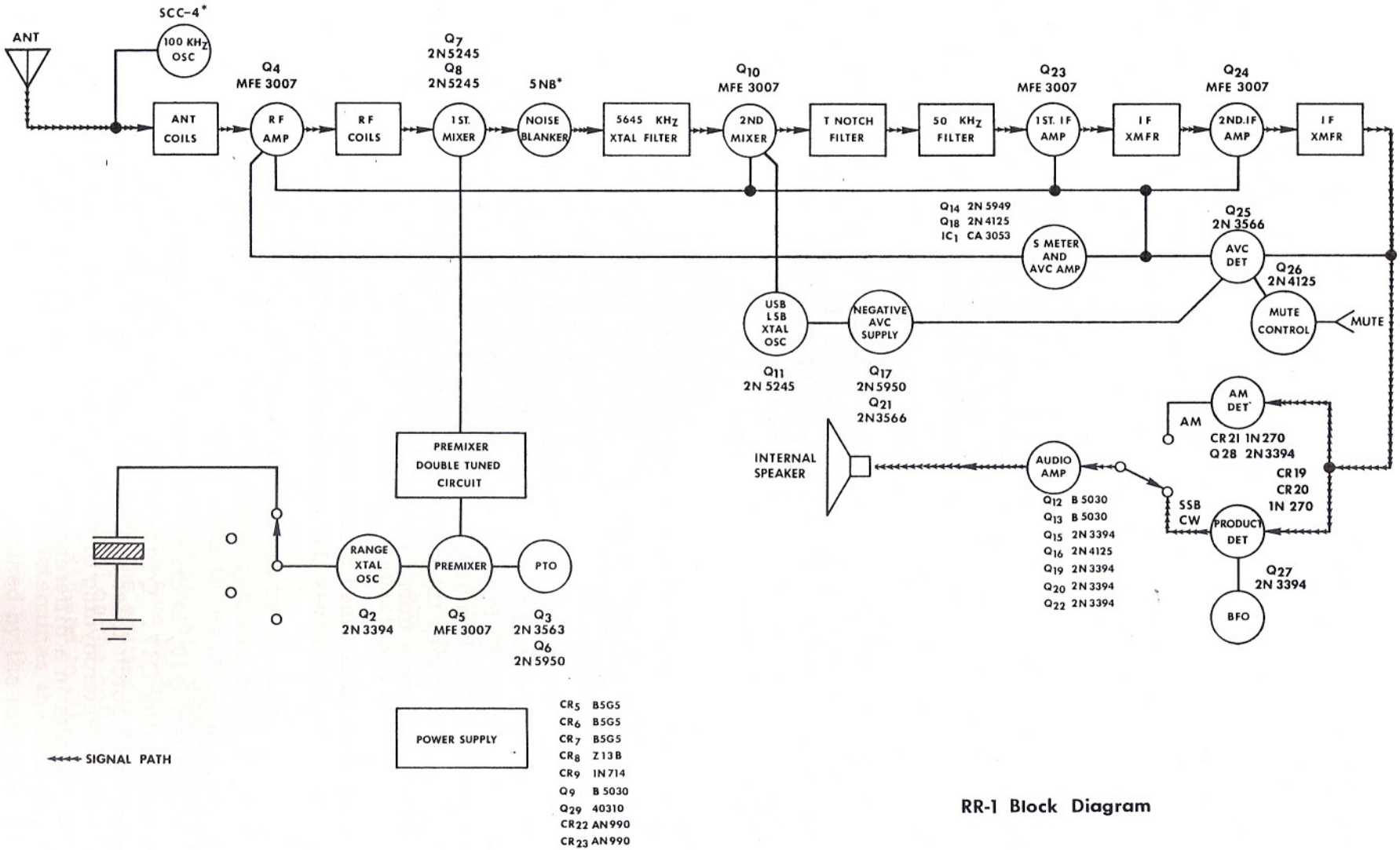
As an example, suppose the RR-1 is to be tuned to 7272 kHz. First turn the crystal selector dial to the 7.0 MHz position. Set the preselector to 5.5 as indicated on the second line of the crystal selector dial. Next set the range switch to E as indicated on the bottom line of the crystal selector dial. Turn the tuning knob until the 100 kHz dial is between 200 and 300 and the one kHz dial is on 72. Select the desired mode of reception with the mode switch. The RF gain control should be full clockwise and the notch should be in the off position. Turn on the receiver with the audio gain control and adjust it for normal audio output. Fine tune the preselector for maximum indication of the S-meter.

The frequency of the received signal is the sum of the crystal dial reading and the main tuning dial reading as shown by the example:

Crystal Selector Reading	7.000 MHz
100 kHz Dial Reading	.200
1 kHz Dial Reading	.072
Frequency of Received Signal	7.272 MHz

3.3 DIAL CALIBRATION

The main tuning dial calibration may be adjusted over a short frequency range by using the known frequency of the SCC-4 crystal calibrator or a station such as the National Bureau of Standards, WWV, on 2.5, 5, 10, 15, 20, and 25 MHz. Usually 10 and 15 MHz WWV signals are the easiest to receive. With the mode switch in the CW, LSB, or USB position, tune the signal from the SCC-4 or WWV to zero beat. Hold the main tuning knob stationary and rotate the skirt until the dial reads correct frequency.



RR-1 Block Diagram

BLOCK DIAGRAM
Figure 3

4. PRINCIPLES OF OPERATION

4.1 RF AMPLIFIER

Signals from an external antenna connected to J2 (ANT) are coupled to Q4 through T3 or T4, and C52. T3 is resonated with C101 and the capacitors connected to S5R. Q4 is protected from large signals by CR2 and CR3 which are reverse biased. CR2 and CR3 limit the signal to a safe level by conducting when a large signal overcomes their reverse bias.

4.2 FIRST MIXER

The 1st mixer is a balanced mixer comprised of Q7 and Q8 and driven by the RF amplifier and the premixer. On Band A, the premixer is bypassed and the 1st mixer is driven from the PTO through R25 and C99. On Bands B through H, the premixer drives the 1st mixer through T6 and C99.

The 1st mixer is balanced by R40 and the output, which is tuned by C102 and T8, drives the 2nd mixer through C110, the 5645 kHz crystal filter, and T9. Heterodyning of the RF amplifier and premixer signals (PTO on Band A) results in a difference frequency output from Q7/Q8 of 5645 kHz.

4.3 PREMIXER

The premixer system consists of the PTO, the crystal oscillator Q2, the premixer transistor Q5, and the tuned circuits associated with S1, S4F, S4R, S8F, and S8R.

The collector of the crystal oscillator Q2 is tuned by L5 and the components connected to S1. The feedback winding on L5 is connected through S2 to the proper range crystal and the output of Q2 is connected to one gate of the premixer, Q5, through C26 and R15. The PTO drives the other gate of Q5 through R25 and C76. The PTO is tuneable from 4955 kHz to 5455 kHz.

The output of Q5 is tuned by the components associated with S4F, S4R, S8F, S8R and drives the 1st mixer through T6, S6R, C99 and C96.

4.4 SECOND MIXER

The 2nd mixer, Q10, is driven by the 1st mixer and the crystal oscillator buffer Q17. Q10 is coupled to the 1st IF amplifier through the T-notch filter and the 50 kHz four pole Hi-Q ferrite LC filter. Heterodyning of the 1st mixer and crystal oscillator signals results in a difference frequency output from Q10 of 50 kHz.

4.5 IF SYSTEM

The IF system is composed of the 1st IF amplifier, Q23, which drives through T15, the 2nd IF amplifier, Q24. C169 and C187 tune T15 and T16 respectively to 50 kHz and T16 drives the detection systems.

4.6 DETECTION SYSTEMS

4.6.1 AM DETECTION

The AM signal from T16 is detected by CR21 and amplified by Q28 to a level matching the output level of the product detector and is applied to the audio gain control through C167 and S14F.

4.6.2 CW AND SSB DETECTION

CW and SSB signals from T16 are detected by the product detector made up of CR19, CR20, and Q27, the beat frequency oscillator. The output of the product detector is applied to the audio gain control through S14F.

4.7 AUDIO AMPLIFIER

A portion of the audio signal, determined by the setting of R101, is applied to Q22 through a low-pass filter consisting of L10, L11, C164, R97, R95, C163 and C159 which eliminates any residual 50 kHz signal from driving the audio amplifier. Q22 amplifies this audio signal and drives Q20 through C148 where further amplification occurs and Q20 drives Q16 directly and Q15 via Q19 which is unity gain common base amplifier. Q12, Q15 and Q13, Q16 are darlington connected amplifiers and the configuration of Q16 establishes a phase inversion permitting Q12 and Q13 to operate in push-pull, Q12 and Q13 operate the speaker or a headphone through coupling capacitor C127.

4.8 AVC SYSTEM

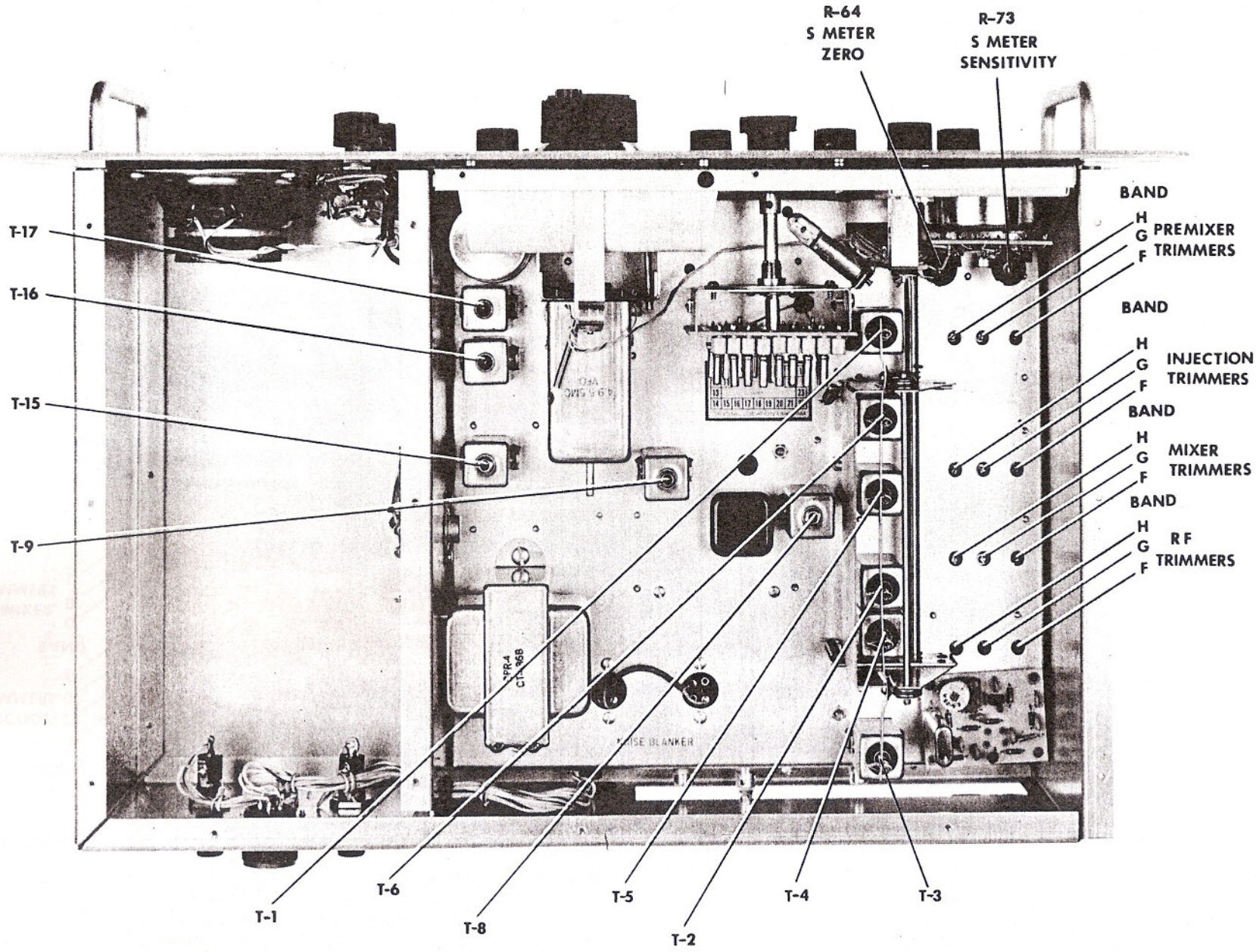
The AVC threshold is established by the setting of R111, the RF gain control. R111 is normally operated fully clockwise. This applies approximately +2 volts to the AVC line through R104, R100 and CR15 with no received signal. Signals from T16 drive Q25 into base current on the positive RF driving cycle which pulls the collector negative because the emitter is returned to the -5 volt line. The negative potential on the collector of Q25 is applied to the AVC line through CR18 and to C171 through CR17. The rate that C162 is charged determines the AVC attack time. The AVC release time is determined by the rate that C171 discharges through R100 allowing C162 to discharge through CR15.

4.8.1 MUTING

Muting is accomplished by placing an open circuit at J9 which removes base current from Q26, lowering its collector voltage to -5 volts. The cathode of CR16 will also be at -5 volts causing it to conduct, applying cut-off voltage on the AVC line which turns off Q4, Q10, Q23, and Q24 and mutes the receiver.

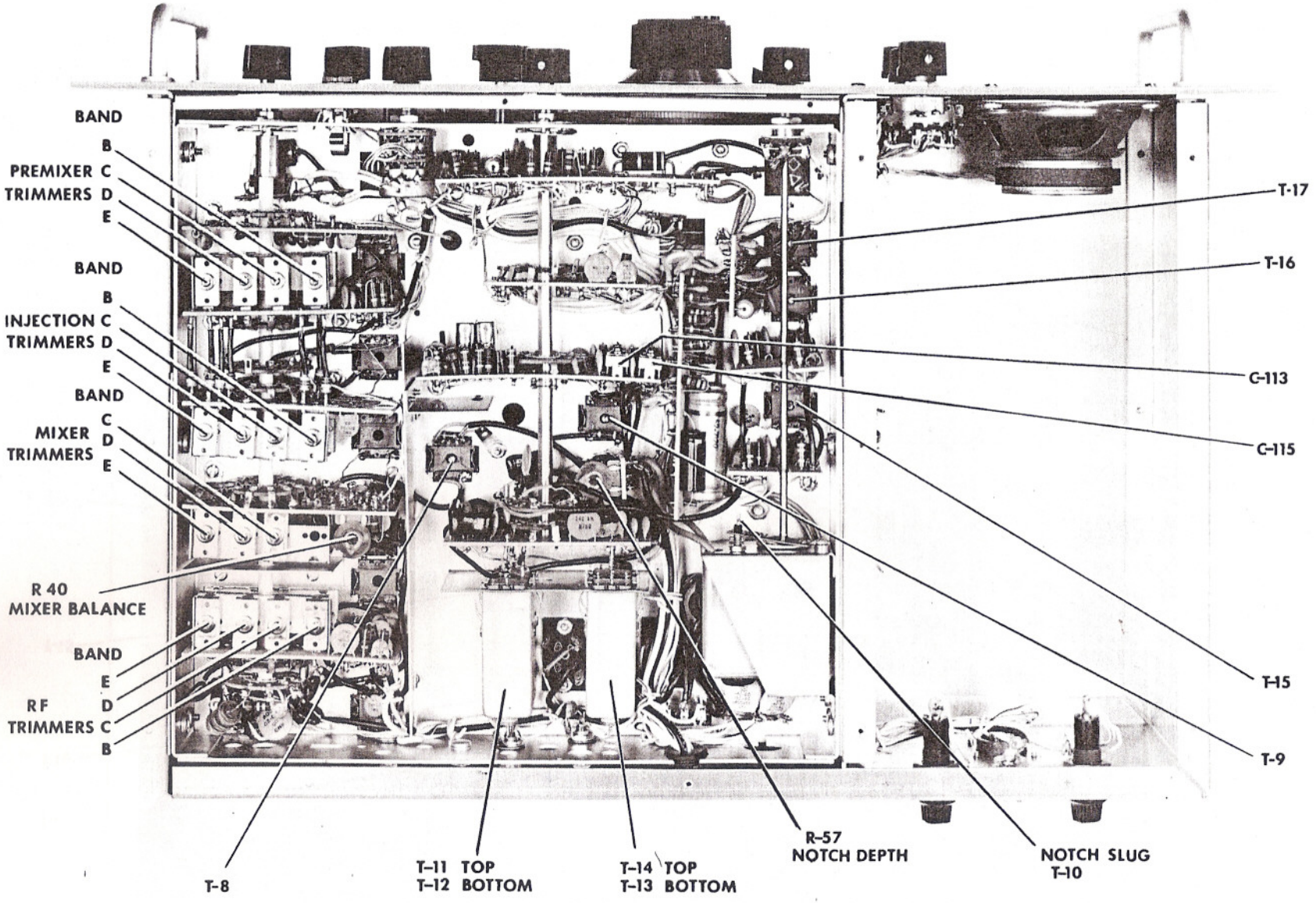
4.9 S-METER

The S-meter is a voltmeter that measures the AVC voltage and is calibrated in "S" units. The source follower Q14, is connected to the AVC line and drives IC-1 which is a differential amplifier that operates the S-meter. The zero adjustment is affected by R64 and the S-meter full scale sensitivity is set by R73.



TOP ALIGNMENT ADJUSTMENT POINTS

Figure 4



BOTTOM ALIGNMENT ADJUSTMENT POINTS
Figure 5

5. ALIGNMENT

5.1 TROUBLE SHOOTING

Careful consideration has been given in the design of the RR-1 to keeping maintenance problems to a minimum. If you experience difficulty we recommend that you return the unit to your Drake dealer or write direct to our Customer Service Department describing your problem in detail. Include full information concerning external connections, control settings, antenna used, serial number, et cetera.

NOTE: DO NOT RETURN EQUIPMENT TO THE FACTORY WITHOUT PRIOR AUTHORIZATION!

The voltage and parts location charts which follow should be valuable in isolating service problems. However, no attempt should be made to service the RR-1 unless you are thoroughly familiar with electronic circuitry, transistors, and printed circuit servicing technique.

CARE SHOULD BE TAKEN NOT TO DISTURB THE LEAD DRESS IN THE RR-1 SINCE THIS IS CRITICAL IN SEVERAL CIRCUITS.

5.2 ALIGNMENT INSTRUCTIONS

Alignment of the RR-1 requires the use of the following equipment.

1. A stable RF signal generator with variable output that can be accurately set to any frequency in the range from 50 kHz to 30 MHz.

2. A voltmeter having an input impedance of 11 Megohms or greater such as a VTVM.

3. The following accessory crystals:

   40.59 MHz for 29.5 - 30.0 MHz reception
   12.09 MHz for 1.0 - 1.5 MHz reception

4. An accessory crystal for reception of WWV standard frequency transmission that is most reliably received in your area.

5. A 47 ohm 1/2 watt composition resistor connected across a BNC connector to serve as an antenna load.

5.2 ALIGNMENT INSTRUCTIONS (Continued)

6. A scale with accurate 1/32 inch divisions.

7. An alignment tuning wand such as General Cement GC 8273 or Walsco 2516.

5.2.1 50 kHZ IF, BFO, AND 50 kHz LC FILTER ALIGNMENT

1. The settings of the range, preselector, crystal selector, and PTO controls are unimportant for this portion of the alignment. Set the audio gain at 12 o'clock, the RF gain fully clockwise, mode switch to LSB, notch to OFF, and accessory switch to NORM.

2. Connect a VTVM to the AVC line. This line is accessible at the terminal on the 1st IF board with the two white/green tracer wires attached.

3. Connect a 50.0 kHz unmodulated signal generator to Gate 1 (pin 3) of Q10 which is the terminal on T9, right side and closest to the front panel when looking into the bottom of the RR-1 and front panel facing you.

4. Set the generator level so that slight AVC deflection (negative going) can be observed and adjust T17 for zero beat.

5. Adjust T15 and then T16 for maximum deflection of AVC voltage.

6. Set the signal generator to precisely 50.8 kHz and put the mode switch on CW and tune T11, T12, T13, and T14 for maximum AVC deflection. Repeat tuning T11 through T14 until no further improvement can be obtained.

5.2.2 5645 kHz IF ALIGNMENT

1. With the receiver set up as in 5.2.1, connect the signal generator to the junction of R27 and C90. This point is accessible at the terminal on the RF amplifier board at the left top corner, looking into the bottom of the RR-1 and front panel facing you. This terminal has coax connected to it. Care should be taken not to short this point to ground because Q4 will be ruined.

2. Preset the balance pot on the 1st mixer board fully clockwise.

5.2.2 5645 kHz IF ALIGNMENT (Continued)

3. Set the signal generator to 5645 kHz and adjust its level for a slight AVC deflection.

4. Place the mode switch in LSB and adjust C115, the outer trimmer capacitor on the mixer oscillator board for zero beat.

5. Place the mode switch in USB and adjust C113, the inner trimmer capacitor on the mixer oscillator board for zero beat.

6. Set the signal generator to 5650 kHz, the mode switch to LSB and adjust T8 and then T9 for maximum AVC.

7. Set the generator to 5645 kHz and adjust the mixer balance pot for minimum AVC deflection (most positive going).

5.3.3 PRESELECTOR AND INJECTION ALIGNMENT

1. The settings of the range, preselector, crystal selector, and PTO will be indicated before each adjustment. Set the audio gain at 12 o'clock, the RF gain fully clockwise, mode switch to LSB, notch to OFF, and accessory switch to NORM.

2. Install the accessory crystals listed in 5.2. Plug the 47 ohm resistor into the antenna jack, J2.

3. Turn the preselector control fully clockwise and check the shield cans marked T1, T2, T3, T4, T5, and T6 for proper slug engagement. The distance from the top of the slugs to the top of the white coil forms should be 9/16" (1.43 cm). T2 and T4 may differ from this figure by 1/32" (.079 cm) on receivers from the factory. These slugs may be left alone for "Touch Up" alignment. For complete alignment, set all slugs to 9/16" (1.43 cm). Turn the preselector control fully counterclockwise and set the pointer to zero.

4. Tune in the calibrator signal or an unmodulated signal generator loosely coupled to the 47 ohm antenna load at 30.0 MHz (range switch on H with 40.59 MHz crystal dial on 500). Rough tune all H band trimmers for maximum S-meter reading and/or maximum AVC deflection.

5.3.3 PRESELECTOR AND INJECTION ALIGNMENT (Continued)

5. Tune in the calibrator or a signal generator at 25.5 MHz and repeak the preselector for maximum AVC deflection. Tune the H band RF and mixer trimmers for maximum AVC deflection. Detune T6 by grasping a metal screwdriver shaft and touching it to the rotor contact of S4R, and tune the rear H band injection trimmer for maximum AVC deflection. Detune T1 by touching the rotor contact of S8F and tune the front H band injection trimmer for maximum AVC deflection.

6. Tune the G through C bands with the following setup, tuning the RF and mixer trimmers first, followed by the injection trimmers taking care to use the loading techniques described in 5 (above). The identification and location of the trimmers can be found in Figure 4 and Figure 5. Use an artificial antenna consisting of a 10 ohm resistor on a 250 pF capacitor in series for Band C alignment.

BAND	Calibrator or Signal Gen. Frequency in MHz.	Preselector Setting
G	22.5	9.3
F	16.0	8.3
E	6.5	5.0
D	3.8	RF slug tops flush with white coil form.
C	3.0	7.3

7. BANDS A AND B ALIGNMENT

Connect a signal generator tuned to 535 kHz with an artificial antenna (10 ohms and 250 pF in series) to the RR-1 antenna jack. Adjust the Preselector for maximum S-meter reading. Adjust T2 and T4 for maximum S-meter reading.

On Band B tune the signal generator to 1600 kHz and turn the preselector control fully clockwise and rough tune all B band trimmers for maximum AVC deflection. Retune to 1400 kHz and carefully peak the signal with the preselector control. Tune the B band RF, mixer and injection trimmers (properly loaded) for maximum AVC deflection. The accessory crystal used for alignment may now be removed.

5.3.4 NOTCH FILTER ALIGNMENT

Tune in the calibrator or signal generator on LSB for a zero beat and set the notch knob to 3 o'clock. The notch slug should be as far into the coil as it will go without engaging the stop. If it isn't, rotate the notch knob to its OFF detent, loosen the notch knob setscrew and tighten it in the OFF position. Return the knob to the 3 o'clock position and adjust the notch slug for maximum AVC voltage (positive going). Switch to AM, set the notch control at 12 o'clock and adjust the main tuning knob for maximum AVC voltage (positive going). Alternately adjust the notch control and the notch depth control, R57, for maximum AVC voltage (positive going).

5.3.5 S-METER ADJUSTMENT

Tune in a 10,000 microvolt signal on 6.5 MHz LSB and looking into the top of the chassis with the front panel facing you, adjust R73, the left control on the S-meter circuit board for + 4.5 volts on the middle top terminal of the meter board which has a white/ black tracer wire connected to it. Remove the 10,000 microvolt signal and adjust R64, the right control for meter zero. Because these controls interact slightly, repeat the above procedure until no further interaction occurs.

6. ACCESSORIES

6.1 MODEL SCC-4 CRYSTAL CALIBRATOR

6.1.1 GENERAL DESCRIPTION

The SCC-4 is a 100 kHz crystal controlled oscillator that injects into the receiver a harmonic every 100 kHz throughout the RR-1 frequency coverage.

6.1.2 INSTALLATION

Disconnect the power cord and remove the cabinet top. Install the SCC-4 by inserting it into the socket marked CALIBRATOR at the left rear of the RR-1 chassis. Replace the cabinet top and power cord.

6.1.3 OPERATION

The calibrator is switched on by placing the accessory switch on the front panel in the CAL position.

6.1.4 CIRCUIT DESCRIPTION

Transistor Q2 and the 100 kHz crystal form the oscillator which drives the harmonic amplifier Q1. Harmonics of 100 kHz are generated by the wave shaping diode CR1. The amplified 100 kHz harmonics are coupled to the RR-1 antenna input through C2.

6.1.5 SERVICE DATA

A voltage chart, schematic diagram and a circuit board layout, Figure 6, are provided for servicing the SCC-4.

6.1.6 ALIGNMENT

The SCC-4 is factory aligned, but due to shock and vibration during shipment, or normal long term drift, adjustment is sometimes necessary. Turn on the receiver and the calibrator and allow it to warm up for at least 30 minutes. Tune in a standard frequency station such as WWV. Carefully adjust the ceramic trimmer capacitor located on top of the calibrator circuit board for zero beat. This completes all necessary alignment.

6.2 MODEL 5-NB NOISE BLANKER

6.2.1 GENERAL DESCRIPTION

The 5-NB is a solid state noise blanker for use with the RR-1 Receiver. The 5-NB works by muting the receiver for the duration of the noise pulse. Between noise pulses, full receiver gain is restored. Receiver AVC is affected only by the desired signal and not by noise when the 5-NB is in use. The 5-NB is most effective on strong, periodic impulse noise such as ignition noise.

6.2.2 INSTALLATION

To install the 5-NB, remove the top of the RR-1 Receiver cabinet. Disconnect the power cord. Unplug the jumper cable from the two sockets near the power transformer and marked noise blanker. Retain the jumper cable so that it may be used if the 5-NB should ever require service. Install the 5-NB by plugging it into the two sockets on the top of the RR-1 chassis. Be sure that the 5-NB is seated in the sockets and do not disturb any components on the 5-NB circuit board. Replace the cabinet top and power cord.

6.2.3 OPERATION

The 5-NB is controlled by the RR-1 accessory switch. When the accessory switch is in NB position, the 5-NB is turned on. The accessory switch may be left in the NB position for full time protection against noise interference. Some distortion may be noted when using the 5-NB on extremely strong signals.

6.2.4 CIRCUIT DESCRIPTION

Signals at the IF frequency from the 1st mixer in the RR-1 pass through the two pole crystal filter in the 5-NB and are amplified by Q4. The signal on the collector of Q4 is coupled to Q9 and Q10 through T2, C27, T3 and C33 where it is amplified further and passes through T4 to the series gate CR1, CR2 and into the RR-1 IF through T5. The IF signal on the emitter of Q4 is coupled through C16 to Q1 which drives the balanced mixer, Q5 and Q6. The balanced mixer subtracts the IF signal from the crystal oscillator, Q3, and the difference frequency is coupled to Q7 through T7 and C23. Transistors Q7 and Q8 amplify the mixer output. The collector of Q8 drives the pulse detector, Q15, and the AGC amplifiers, Q11, Q13 and Q14. Q14 drives Q2 and Q16 which control the gain of Q1 and Q7 respectively. The AGC system maintains the amplitude of the signals at the collector of Q8 so that the pulse detector, Q15, remains cut-off for normal radio communication signals. When transistor Q15 is cut-off, Q12 conducts and applies a positive potential to the center tap of the secondary winding of T4 which is greater than the +1 volt applied to the center tap of T5 primary maintaining the series gate in the

6.2.4 CIRCUIT DESCRIPTION (Continued)

"on" state. With the series gate "on", radio signals pass through the 5-NB unaffected. Noise impulses larger than the average communication signal will turn on Q15 for the duration of the impulse. This turns off Q12 for the same duration causing the series gate to be reverse biased and turned "off". With the series gate "off", the signal path through the 5-NB is broken and reception is blanked for the duration of the interferring noise pulse. The 5-NB is turned on by the accessory switch in the RR-1 which removes the ground from Pin 1 of P-5 and allows Q3 in the 5-NB to oscillate permitting signals to mix in the 5-NB balanced mixer and eventually operates the series gate.

6.2.5 SERVICE DATA

A voltage chart, schematic diagram and a circuit board layout are provided for servicing the 5-NB. See Figures 8 and 9.

6.2.6 ALIGNMENT

The 5-NB requires no alignment at the time of installation. However, should alignment become necessary, the following procedure should be used.

Connect a VTVM at 15 volts full scale between the chassis and R46 of the 5-NB (see Figure 8). Tune the RR-1 to 22.9 MHz while using a signal generator as a signal source. With the 5-NB turned off, adjust C-21, C-24, and C-28 for maximum S-meter reading. It may be necessary to touch up the adjustment of C-21 for the best AM passband as indicated by the S-meter. With the accessory switch in NB position, and the signal source turned off, adjust R-19 for maximum positive voltage on R-46. With the signal source turned on, adjust C-7 and C-18 for minimum voltage on R-46. Tune the RR-1 to 22.5 MHz while using the 22.5 MHz crystal. With the signal generator turned off, adjust the spacing between C-12 and C-49 for maximum voltage on R-46. With the signal generator turned on, and still on 22.9 MHz, adjust R-38 so that the S-meter has the same reading with the 5-NB installed as it does with the jumper cable installed.

RR-1 ACCESSORY CRYSTAL CHART

OPERATING FREQ. in MHz	CRYSTAL FREQ. in MHz	OPERATING FREQ. in MHz	CRYSTAL FREQ. in MHz
.15 - .5	None Required	15.0 - 15.5	26.09
.5 - 1.0	11.59	15.5 - 16.0	26.59
1.0 - 1.5	12.09	16.0 - 16.5	27.09
1.5 - 2.0	12.59	16.5 - 17.0	27.59
2.0 - 2.5	13.09	17.0 - 17.5	28.09
2.5 - 3.0	13.59	17.5 - 18.0	28.59
3.0 - 3.5	14.09	18.0 - 18.5	29.09
3.5 - 4.0	14.59	18.5 - 19.0	29.59
4.0 - 4.5	15.09	19.0 - 19.5	30.09
4.5 - 5.0	15.59	19.5 - 20.0	30.59
5.0 - 5.5	16.09	20.0 - 20.5	31.09
5.5 - 6.0	16.59	20.5 - 21.0	31.59
6.0 - 6.5	17.09	21.0 - 21.5	32.09
6.5 - 7.0	17.59	21.5 - 22.0	32.59
7.0 - 7.5	18.09	22.0 - 22.5	33.09
7.5 - 8.0	18.59	22.5 - 23.0	33.59
8.0 - 8.5	19.09	23.0 - 23.5	34.09
8.5 - 9.0	19.59	23.5 - 24.0	34.59
9.0 - 9.5	20.09	24.0 - 24.5	35.09
9.5 - 10.0	20.59	24.5 - 25.0	35.59
10.0 - 10.5	21.09	25.0 - 25.5	36.09
10.5 - 11.0	21.59	25.5 - 26.0	36.59
11.0 - 11.5	22.09	26.0 - 26.5	37.09
11.5 - 12.0	22.59	26.5 - 27.0	37.59
12.0 - 12.5	23.09	27.0 - 27.5	38.09
12.5 - 13.0	23.59	27.5 - 28.0	38.59
13.0 - 13.5	24.09	28.0 - 28.5	39.09
13.5 - 14.0	24.59	28.5 - 29.0	39.59
14.0 - 14.5	25.09	29.0 - 29.5	40.09
14.5 - 15.0	25.59	29.5 - 30.0	40.59

6.3 SERVICE DATA FOR RR-1 ACCESSORIES

SCC-4 DC AND RF VOLTAGE CHART

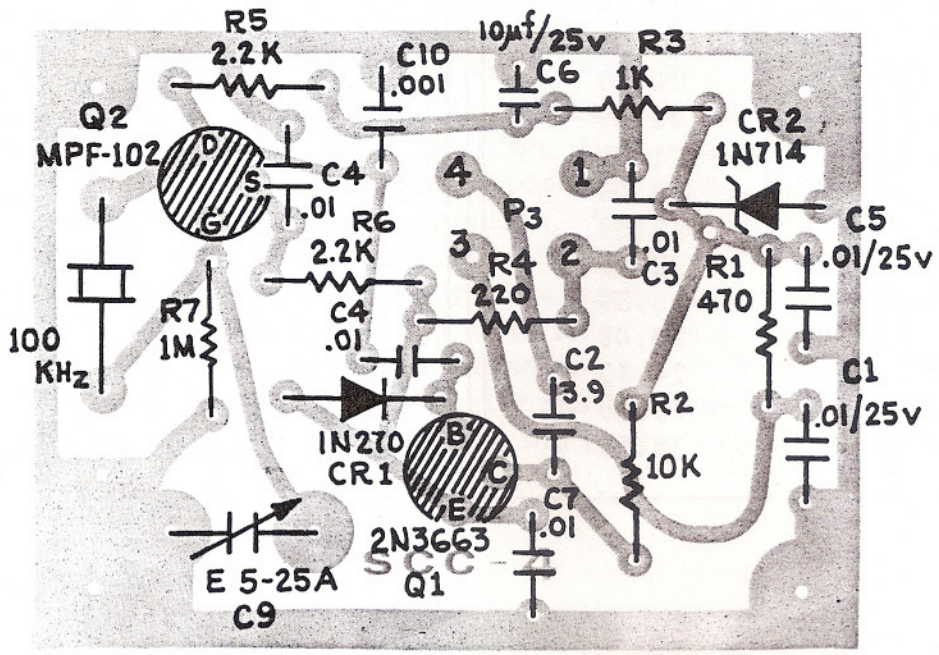
Transistor	Drain Collector	Source Emitter	Gate Base
Q1	3.3 (3 V)	3.0	.8
Q2	6.2 (670 mV)	2.4	0.0

MEASUREMENT CONDITIONS

Conditions same as the RR-1 RF Voltage Chart with the accessory switch in CAL position.

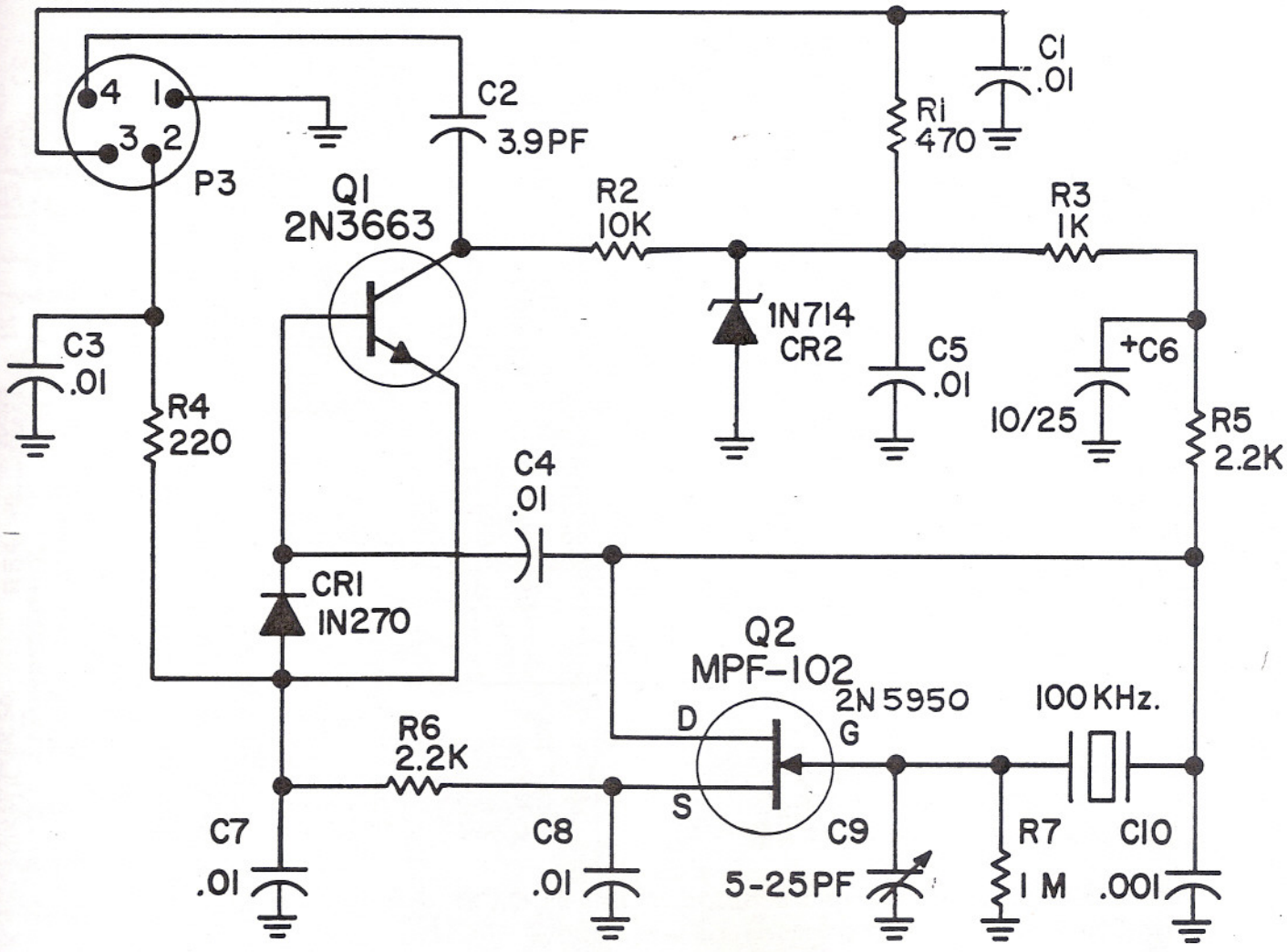
11 Megohm VTVM and Boonton Model 91 CA RF voltmeter used. 100:1 divider used on measurements above 500 mV.

Measurements in parenthesis are RF voltages.



SCC-4 CIRCUIT BOARD

Figure 6



SCC-4

SCC-4 SCHEMATIC DIAGRAM

Figure 7

5-NB DC AND RF VOLTAGE CHART

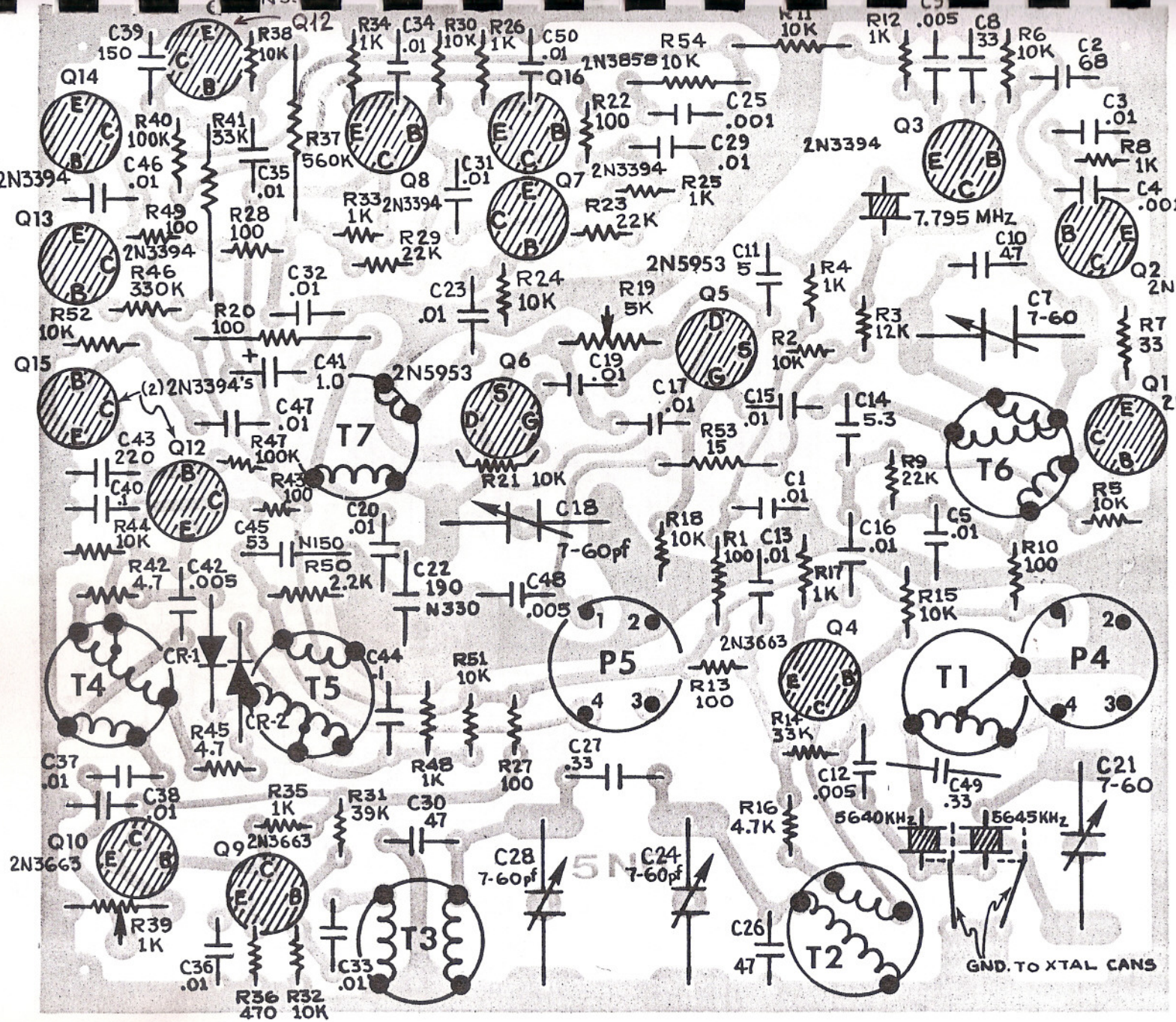
Transistor	Drain Collector	Source Emitter	Gate Base
Q1	12.1 (31)	2.7	3.4 (4)
Q2	2.6	2.4	3.0
Q3	8.5 (3.4 V)	3.4	3.0
Q4	3.1 (9.4)	1.8 (6.4)	2.5 (3.8)
Q5	12.3 (57)	1.0	0.0 (480)
Q6	12.3 (57)	1.4	0.0 (480)
Q7	9.6 (12.5)	2.7	3.4 (12)
Q8	9.3 (290)	2.7	3.4
Q9	9.0	1.25	1.8 (8)
Q10	11.5	8.2 (21)	8.8
Q11	4.4 (650)	0.0	0.2
Q12	11.8	5.5	6.1
Q13	12.3	3.85	4.3
Q14	12.3	3.3	3.8
Q15	6.2	0.0	0.0
Q16	2.7	2.4	3.4

MEASUREMENT CONDITIONS

Conditions same as the RR-1 RF Voltage Chart with the accessory switch in NB position.

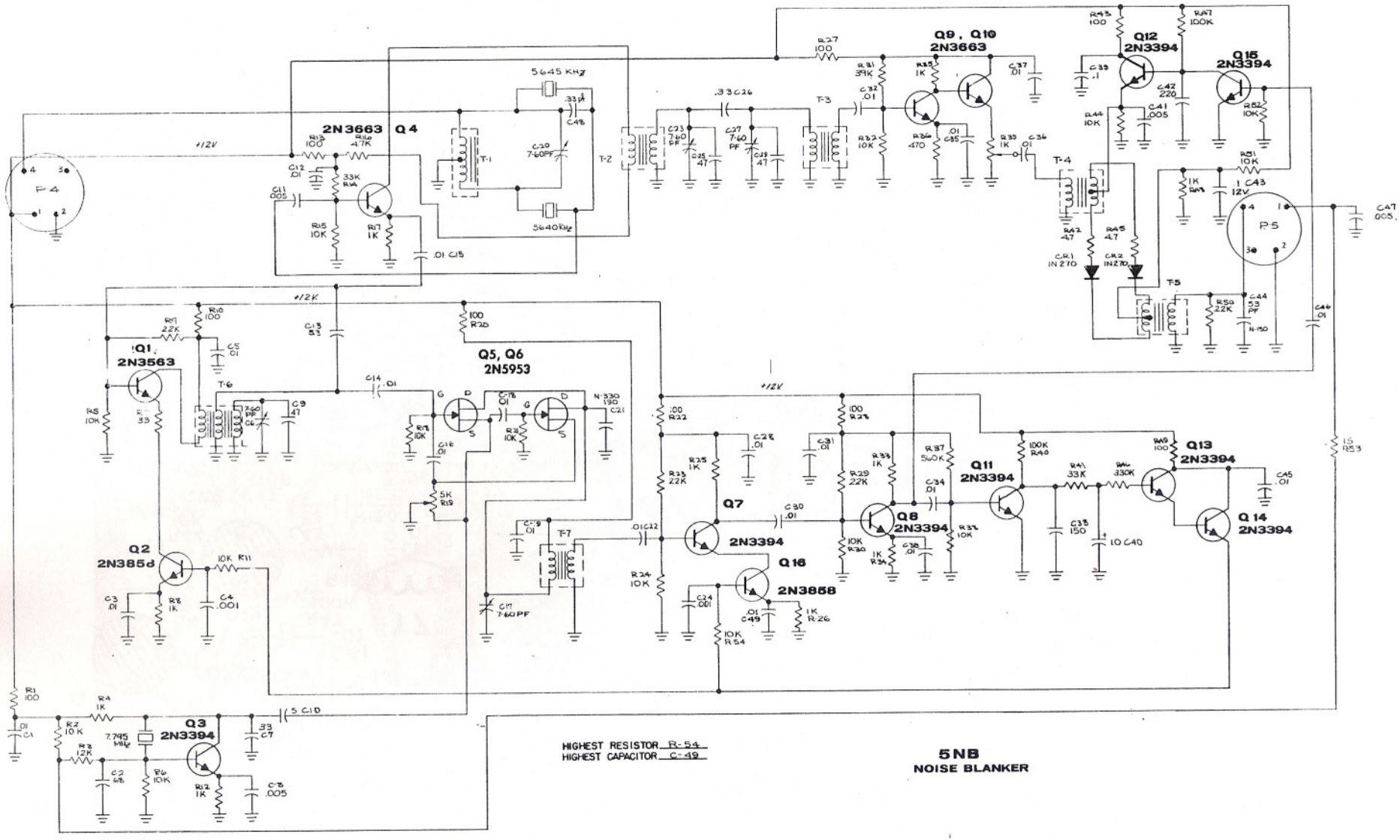
11 Megohm VTVM and Boonton Model 91 CA RF voltmeter used. 100:1 divider used on measurements above 500 mV.

Measurements in parenthesis are RF voltages.



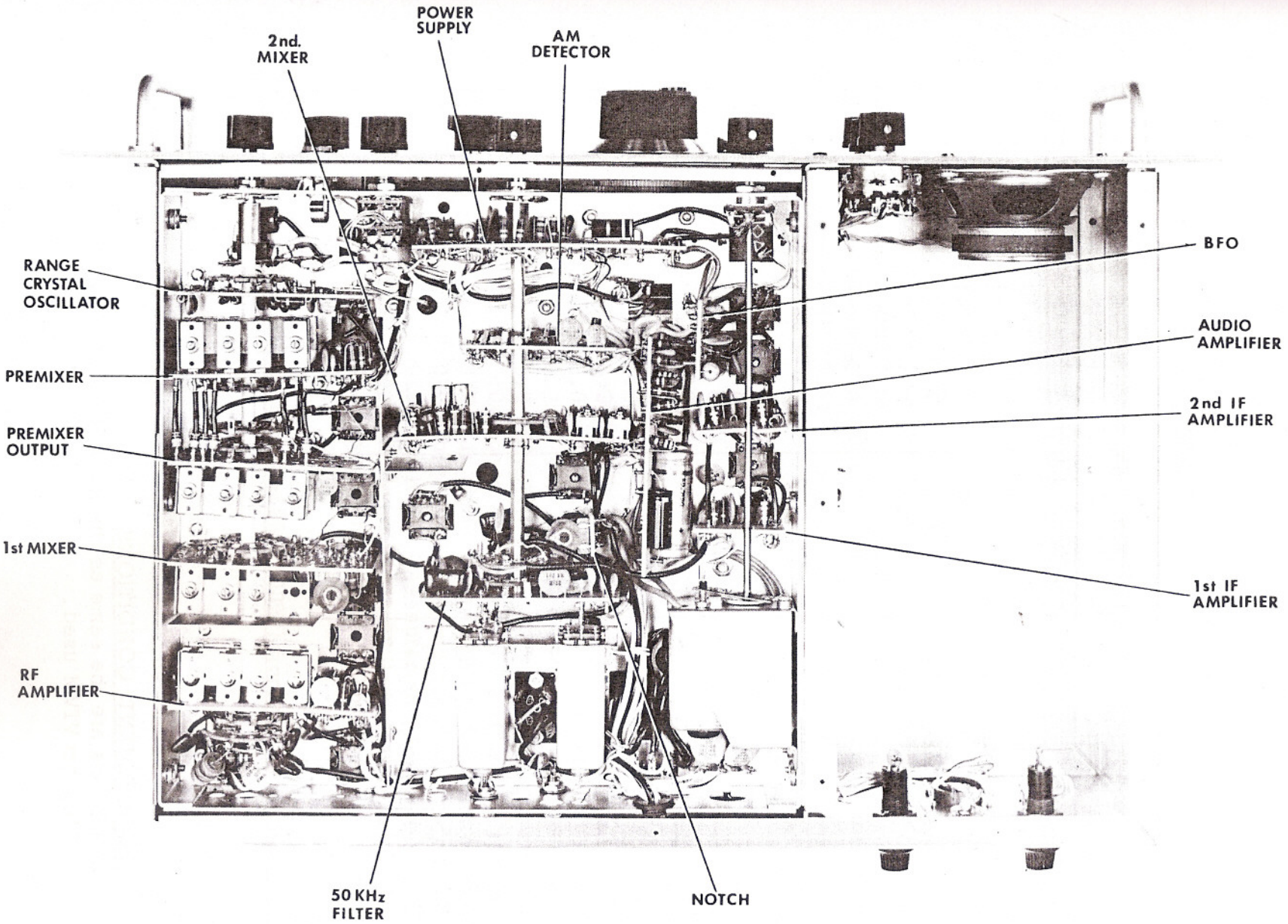
5-NB PRINTED CIRCUIT BOARD

Figure 8



5-NB SCHEMATIC DIAGRAM

Figure 9



BOTTOM VIEW

CIRCUIT BOARD LOCATIONS

Figure 10

RR-1 DC VOLTAGE CHART

Transistor	Drain Collector	Source Emitter	Gate 1 Base	Gate 2
Q2	9.0	4.3	3.9	----
Q3	PTO	----	----	----
Q4	9.7	.3	1.3	.35
Q5	9.8	.8	0.0	.90
Q6	PTO	----	----	----
Q7	10.2	3.0	0.0	----
Q8	10.2	2.8	0.0	----
Q9	17.0	12.7	13.2	----
Q10	11.8	.25	0.0	.30
Q11	6.3	1.8	0.0	----
Q12	12.2	6.0	6.5	----
Q13	6.0	0.0	0.5	----
Q14	6.0	4.0	0.4	----
Q15	12.2	6.5	7.0	----
Q16	0.5	6.0	5.4	----
Q17	10.0	3.9	2.8	----
Q18	1.7	11.0	10.5	----
Q19	7.0	5.4	5.9	----
Q20	5.4	0.0	0.5	----
Q21	5.5	0.3	-0.1	----
Q22	8.8	0.15	0.65	----
Q23	11.2	0.15	0.0	.35
Q24	11.6	0.3	0.0	.35
Q25	1.6	-4.7	-4.6	----
Q26	4.6	4.6	4.0	----
Q27	8.6	2.5	3.0	----
Q28	4.8 *	0.2 *	0.8 *	----

MEASUREMENT CONDITIONS

Conditions are the same as the RR-1 RF Voltage Chart.
11 Megohm VTVM used.

* Mode switch in AM for these measurements.

RR-1 RF VOLTAGE CHART

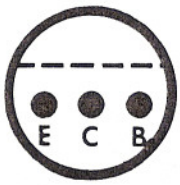
Transistor	Function	Drain Collector	Gate 1	Gate 2	Source
Q4	RF Amp	16			
Q7,Q8	1st Mixer	215 *			
Q10	2nd Mixer	900 *			
Q23	1st IF Amp	310			
Q24	2nd IF Amp	1 V			
Q2	Range Xtal Osc.	4 V			
Q5	Premixer	2.5 V	2.15V	480	
Q11	Xtal Osc.	3 V			
Q17	Xtal Osc.Buffer				1.35 V
Q21	Neg.SupplyDriver	2.8 V			
Q27	BFO	4.25 V			

All voltages are Millivolts RMS except those marked "V" (volts).

MEASUREMENT CONDITIONS

Set signal generator to 7.0 MHz and 1 Millivolt at the RR-1 antenna jack. Tune in generator on LSB for maximum S-meter reading with RF Gain fully clockwise and accessory switch on NORM and notch in OFF position. Measurements taken without 5-NB installed. Boonton Model 91 CA RF Voltmeter used. 100:1 divider used on measurements above 500 mV.

* Large variations (-50% +100%) from values shown are typical.



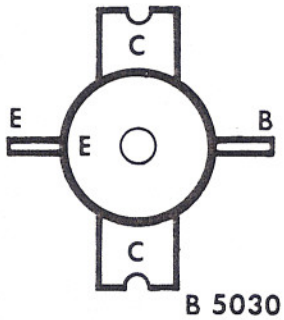
2N 3394

MFE 3007
*SFC 4982

MPF 102

*2N 5949
*2N 5950

TIS 88
*2N 5245
*2N 5246



B 5030

2N 4125

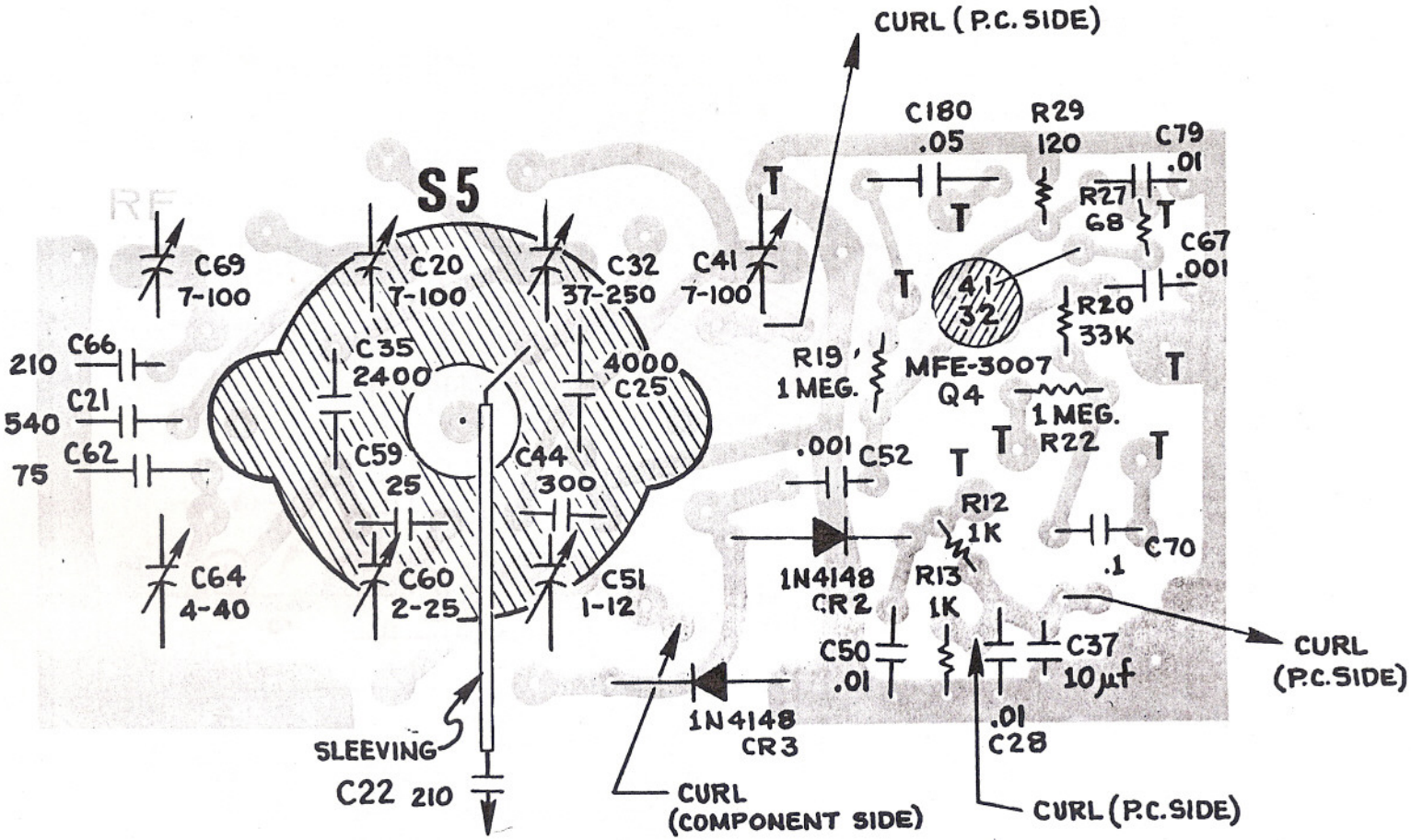
2N 3566

CA 3053

* SERIAL NO'S. ABOVE 1000

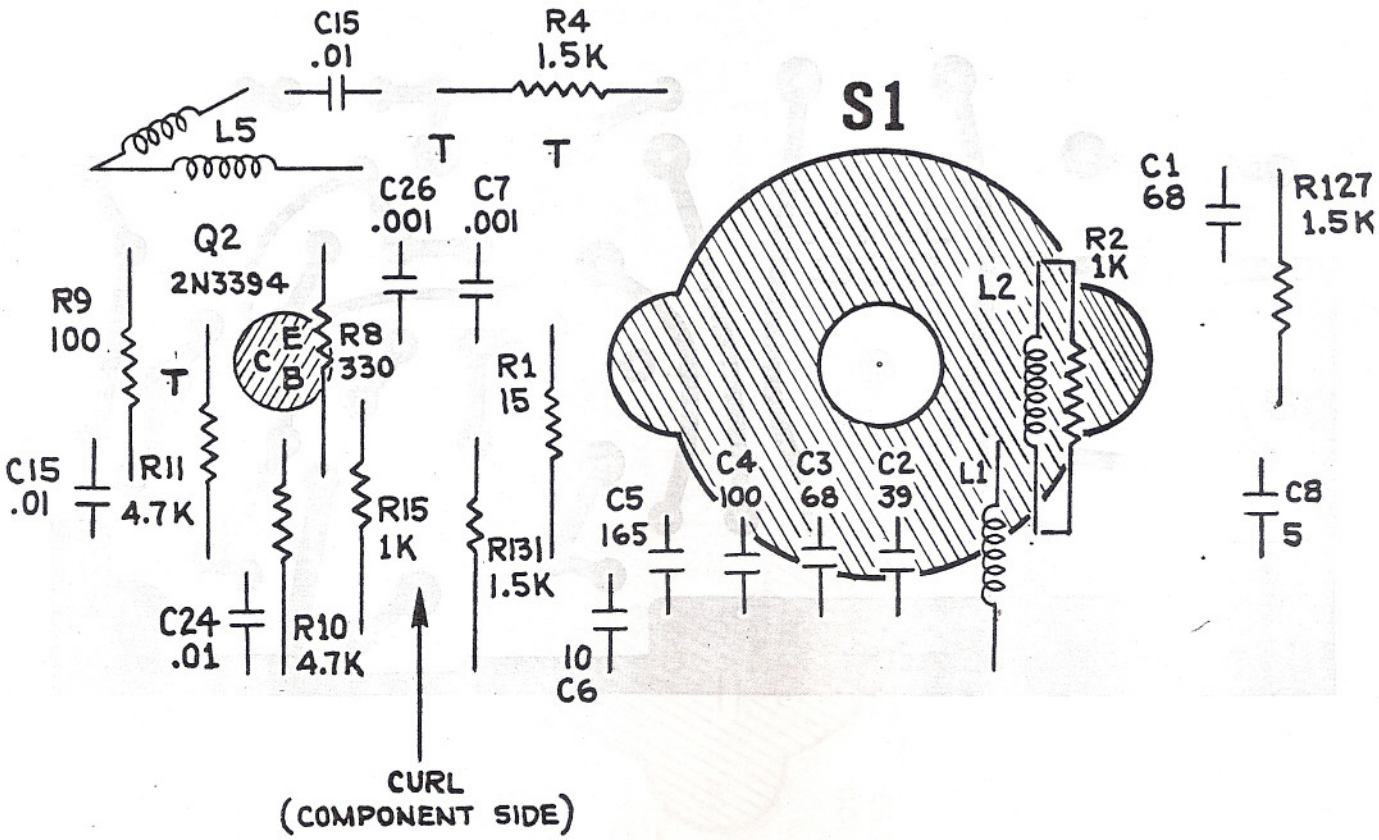
TRANSISTOR LEAD CONFIGURATION

Figure 11



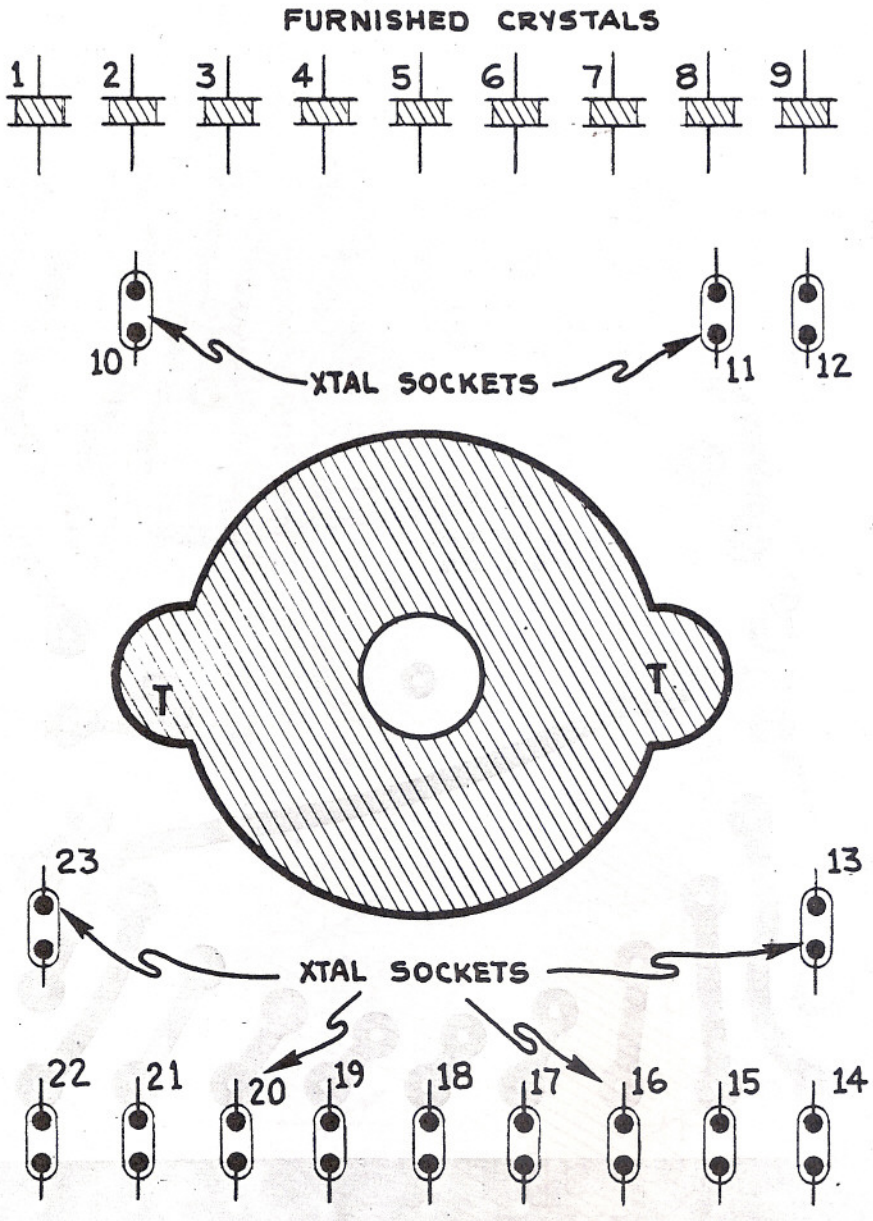
RF AMPLIFIER CIRCUIT BOARD

Figure 12



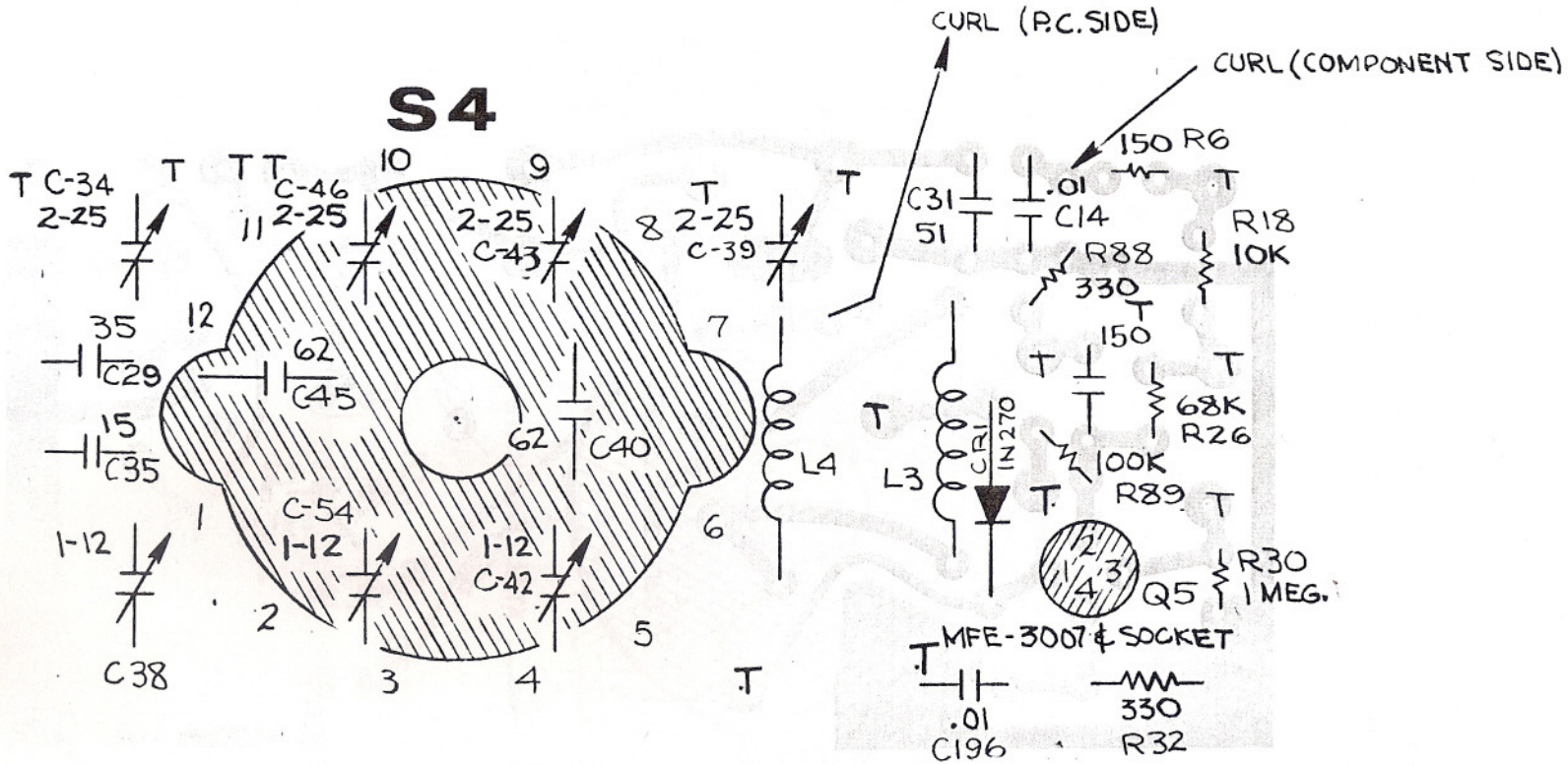
RANGE CRYSTAL OSCILLATOR CIRCUIT BOARD

Figure 13



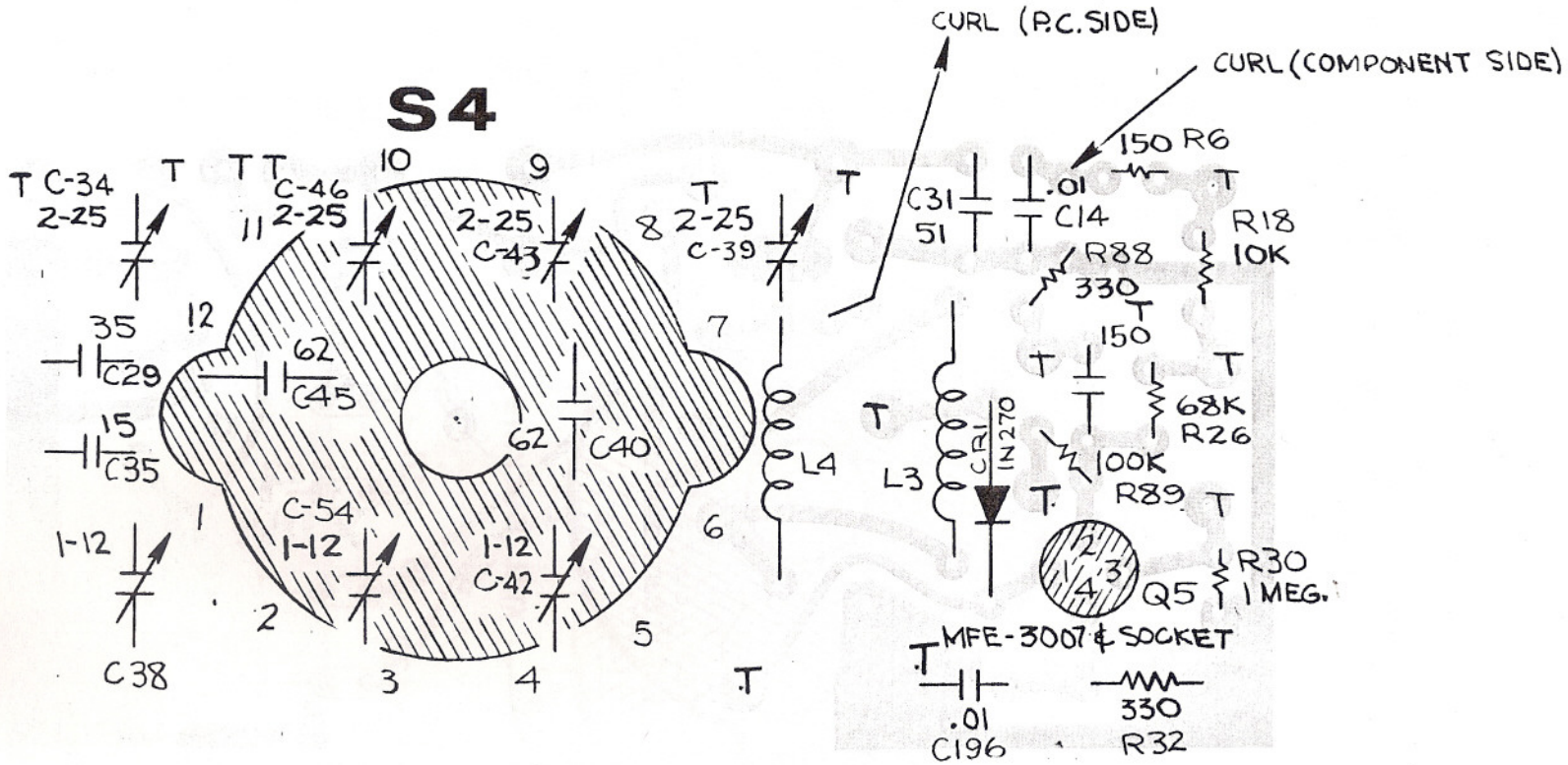
ACCESSORY CRYSTAL CIRCUIT BOARD

Figure 14



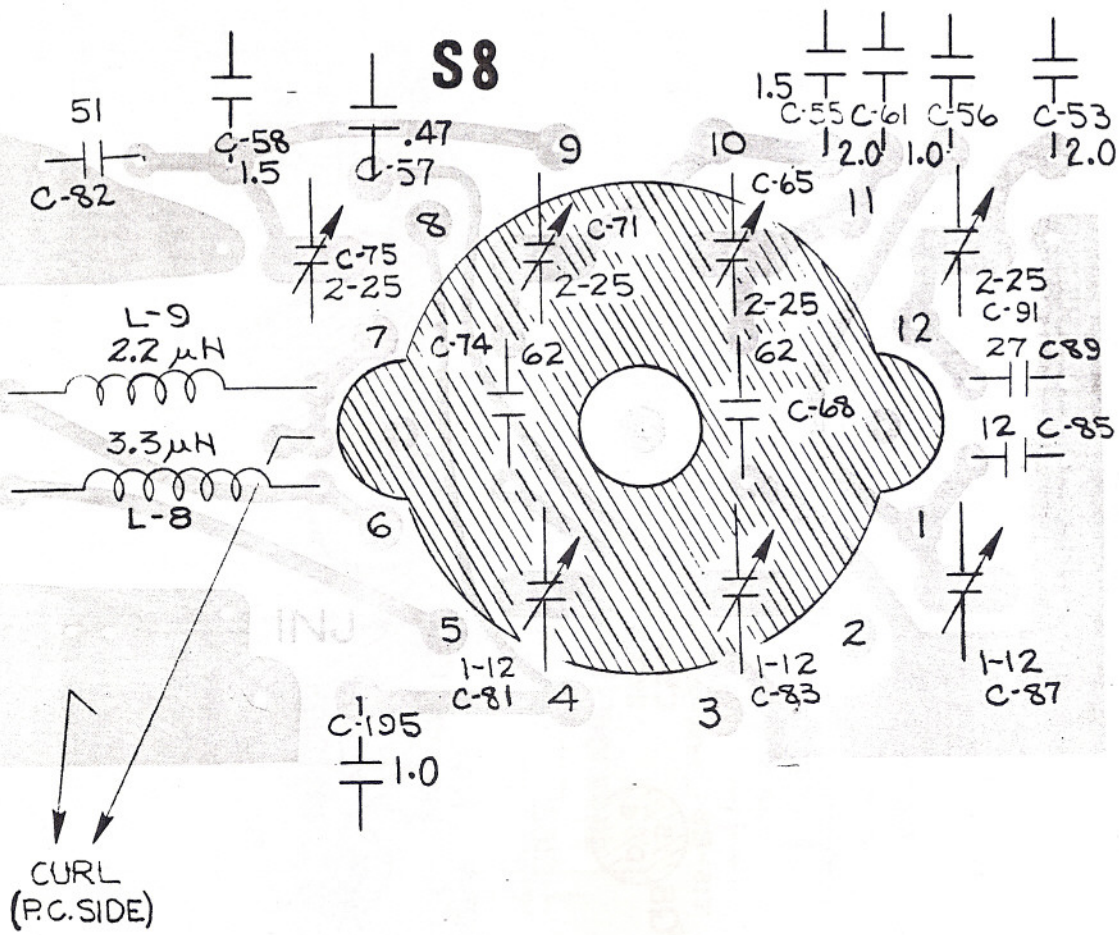
PREMIXER CIRCUIT BOARD

Figure 15



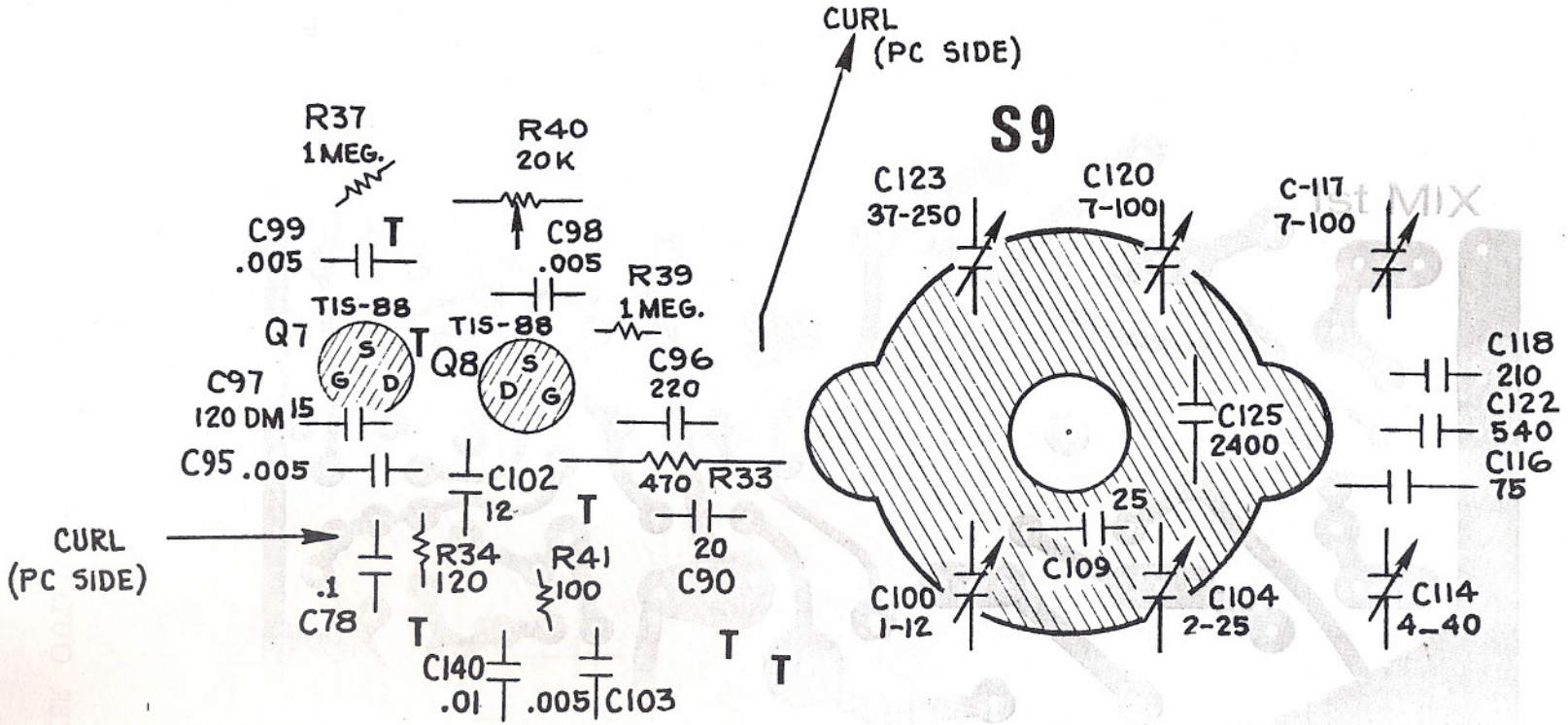
PREMIXER CIRCUIT BOARD

Figure 15



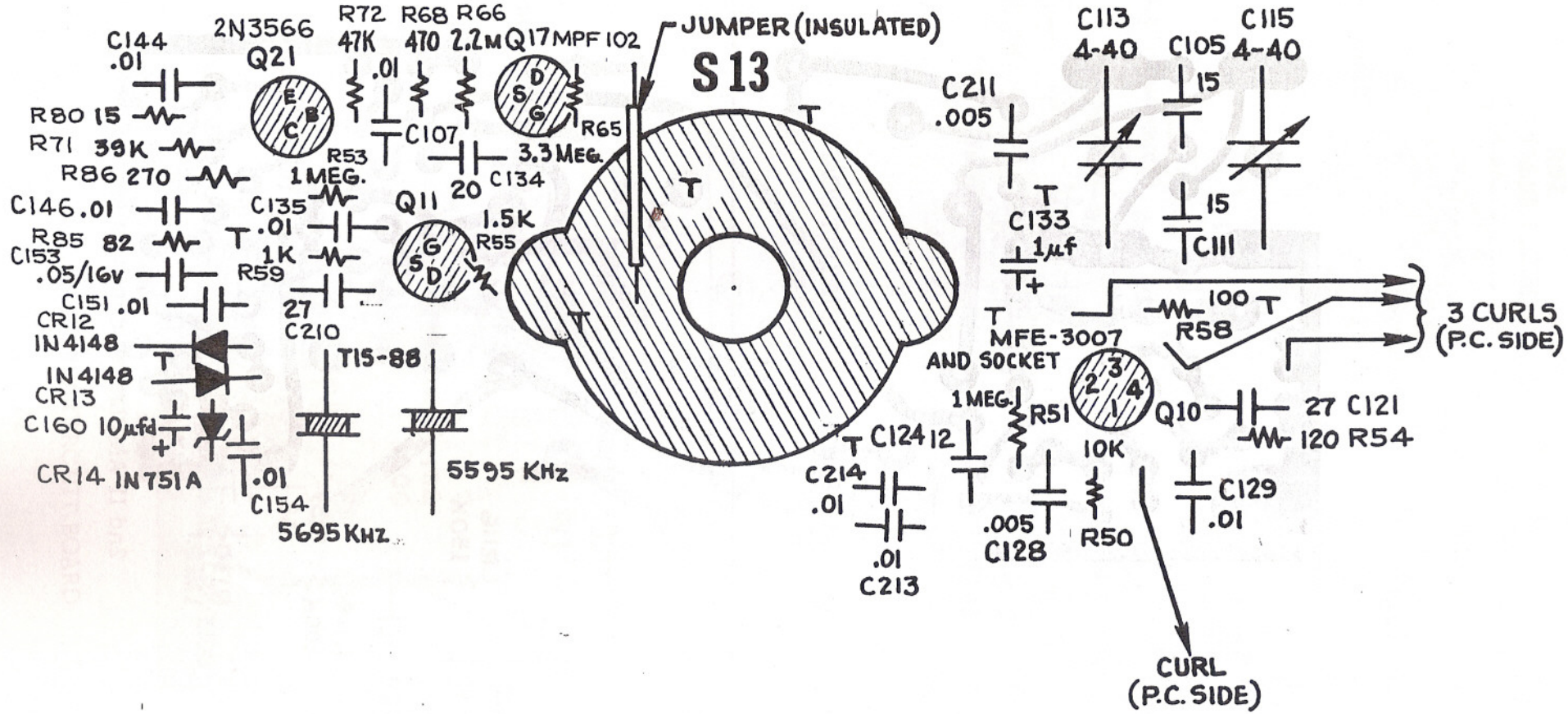
PREMIXER OUTPUT CIRCUIT BOARD

Figure 16



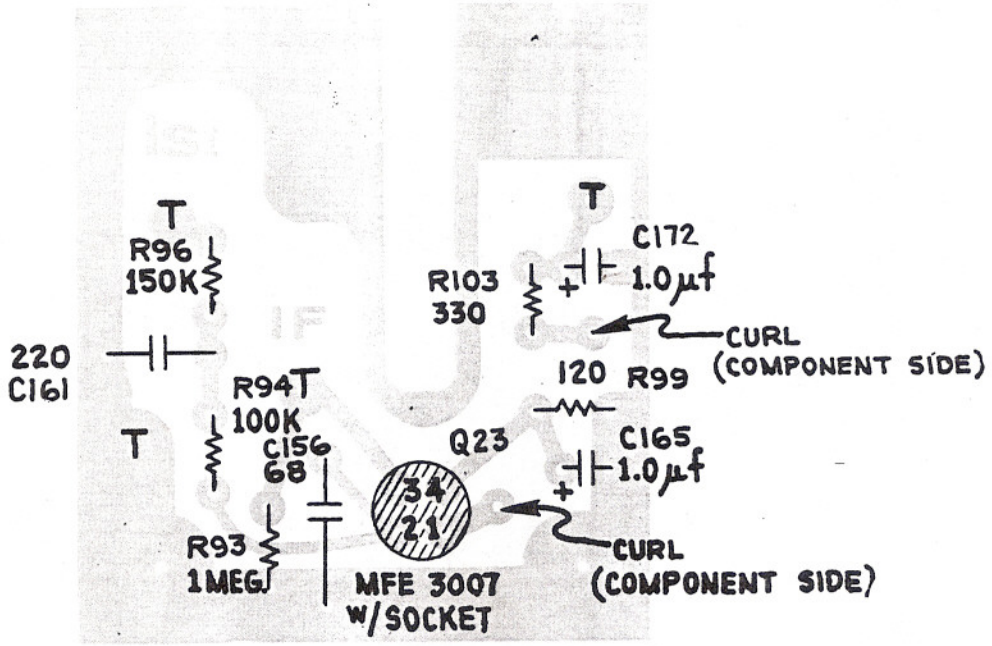
1st MIXER CIRCUIT BOARD

Figure 17



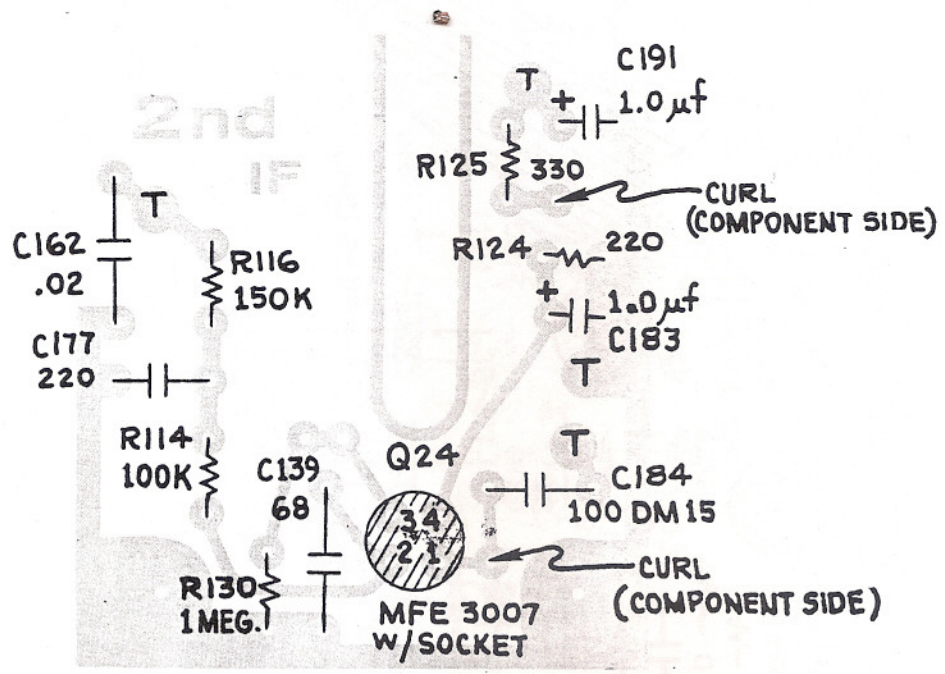
2nd MIXER CIRCUIT BOARD

Figure 18



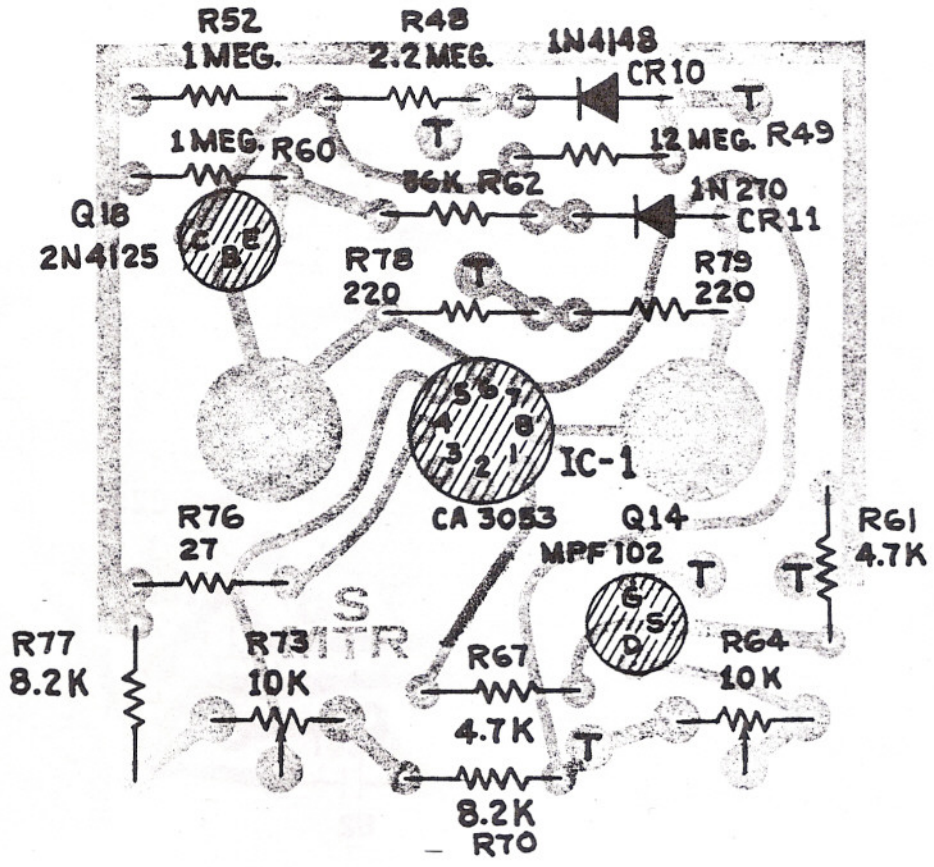
1st IF AMPLIFIER CIRCUIT BOARD

Figure 19



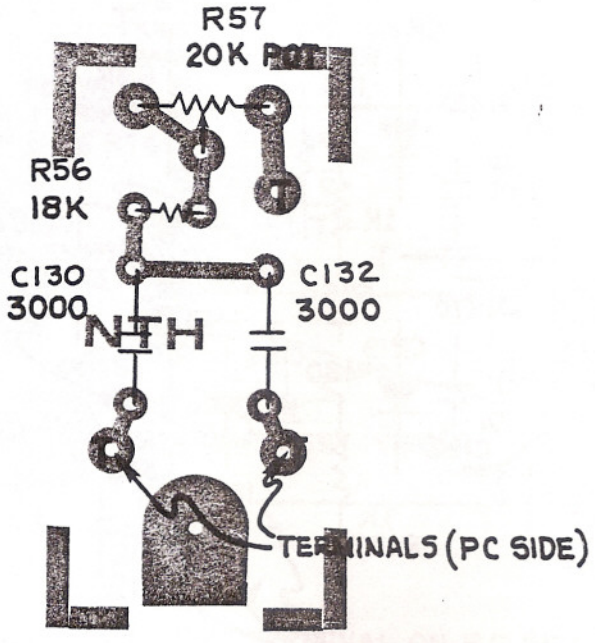
2nd IF AMPLIFIER CIRCUIT BOARD

Figure 20



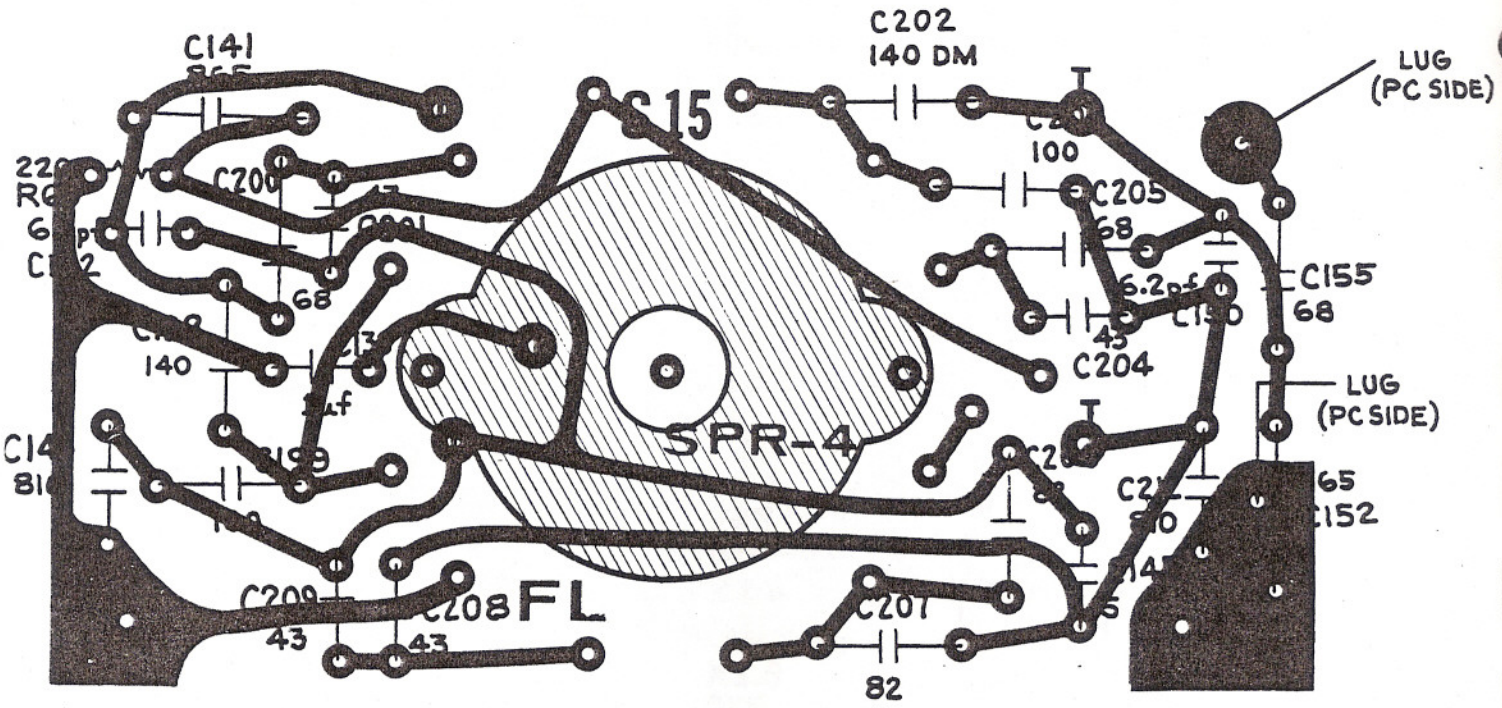
S-METER CIRCUIT BOARD

Figure 21



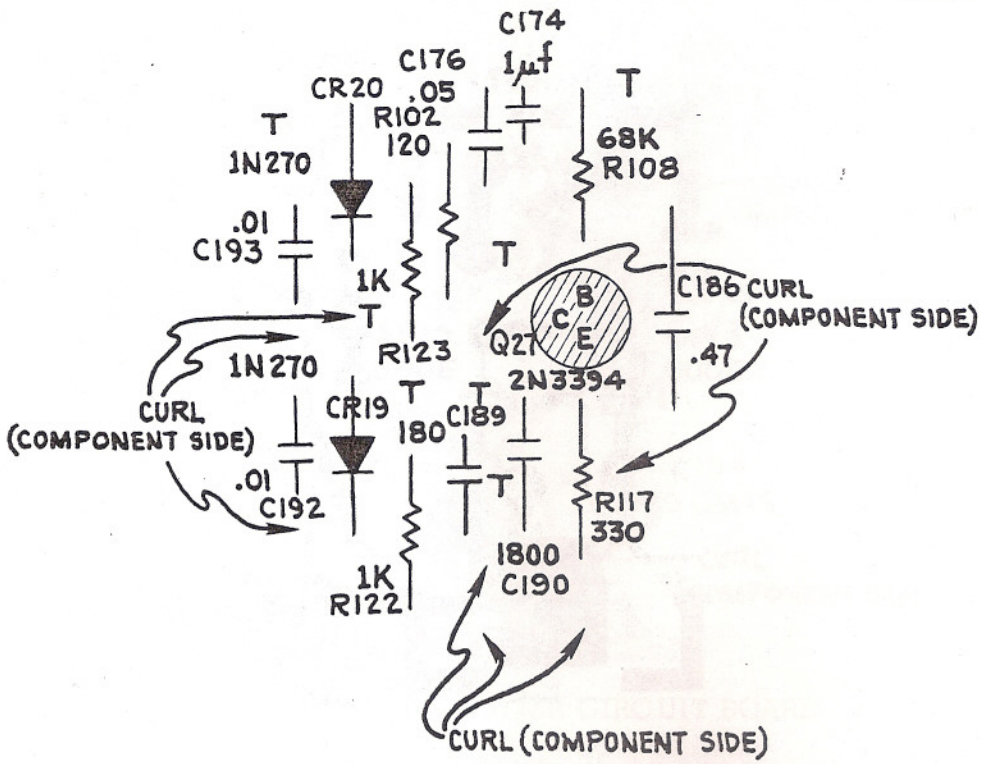
NOTCH FILTER CIRCUIT BOARD

Figure 22



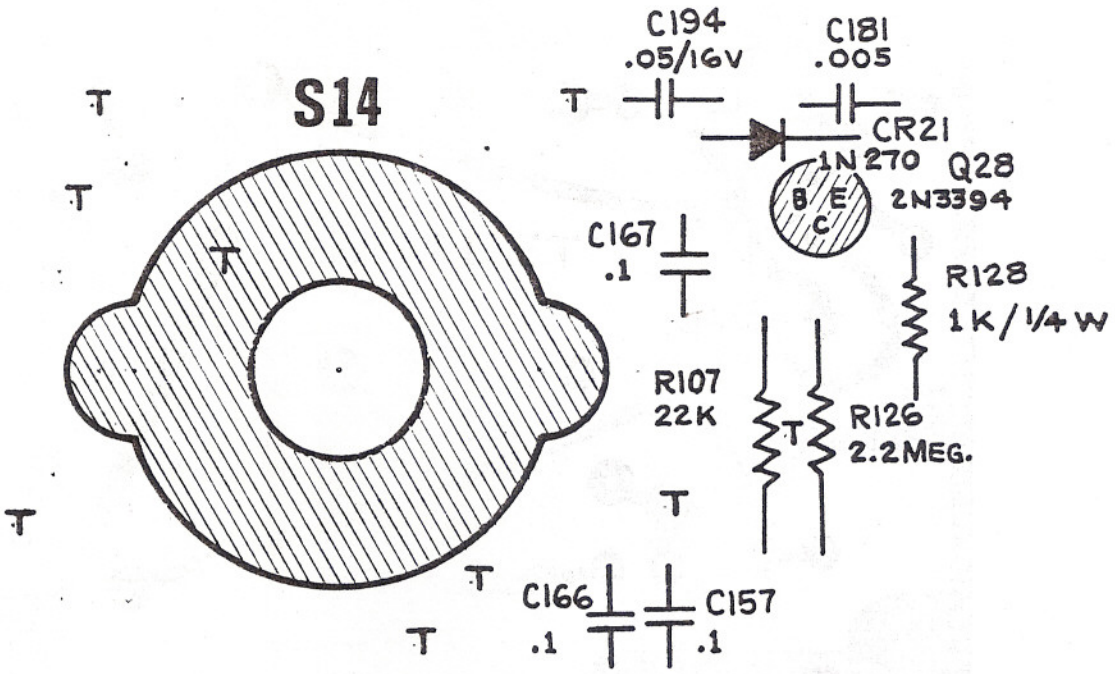
50 kHz FILTER CIRCUIT BOARD

Figure 23

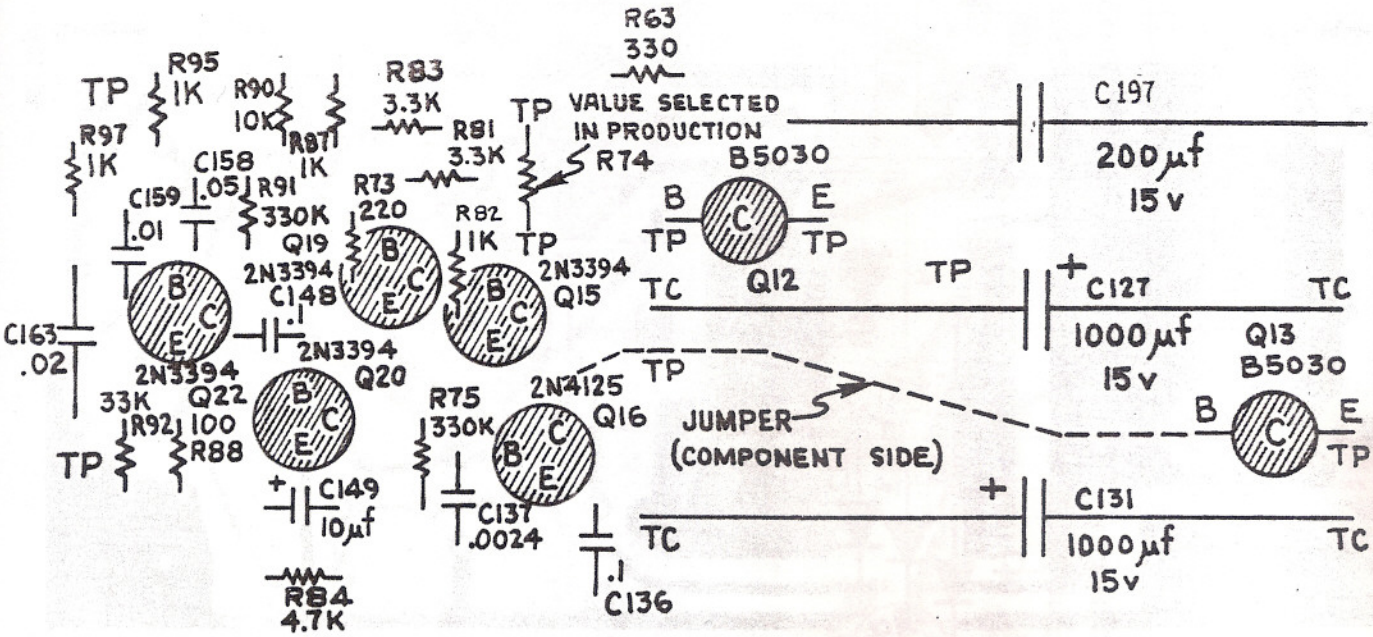


BFO CIRCUIT BOARD

Figure 24



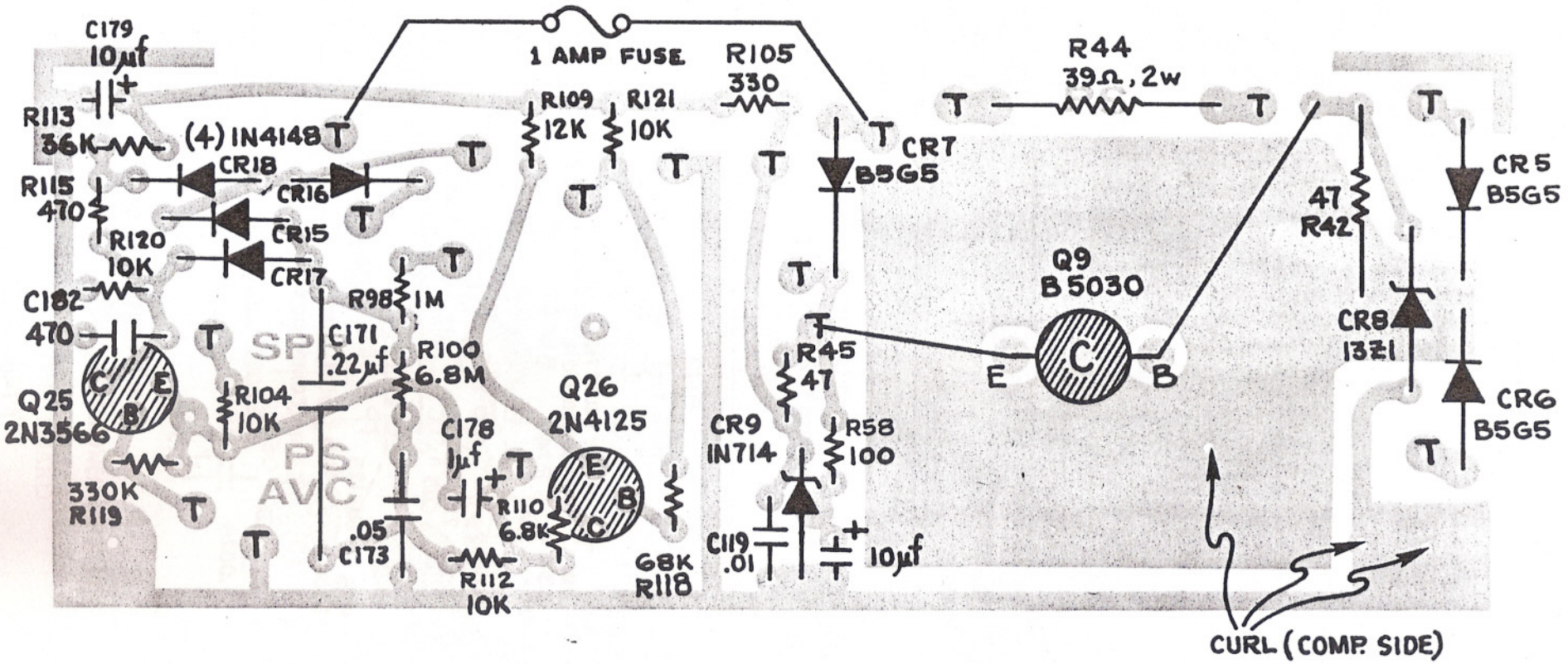
AM DETECTOR CIRCUIT BOARD
Figure 25



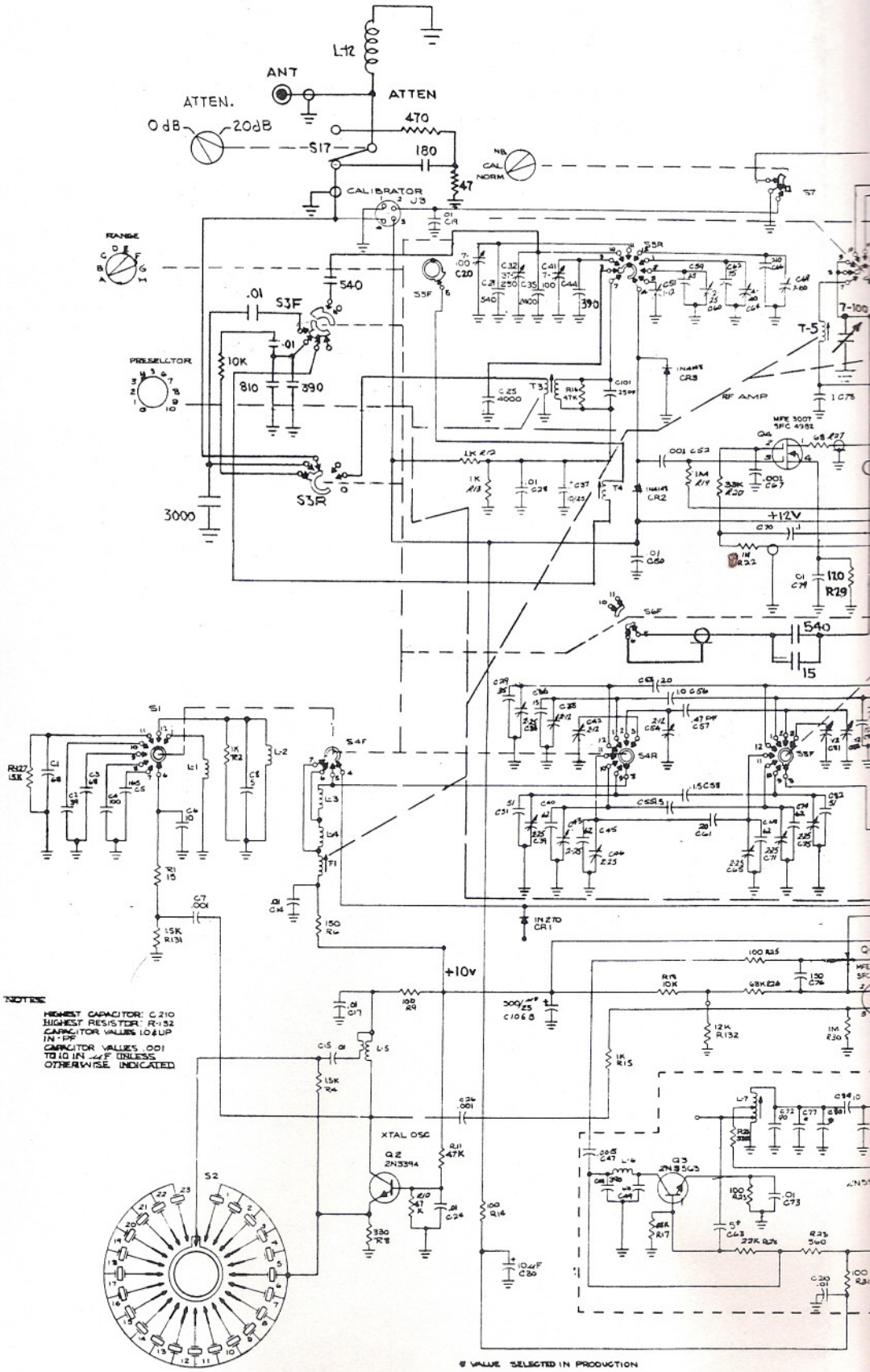
TP : TERMINAL ON P C SIDE
TC : TERMINAL ON COMPONENT SIDE

AUDIO AMPLIFIER CIRCUIT BOARD

Figure 26



POWER SUPPLY CIRCUIT BOARD
Figure 27



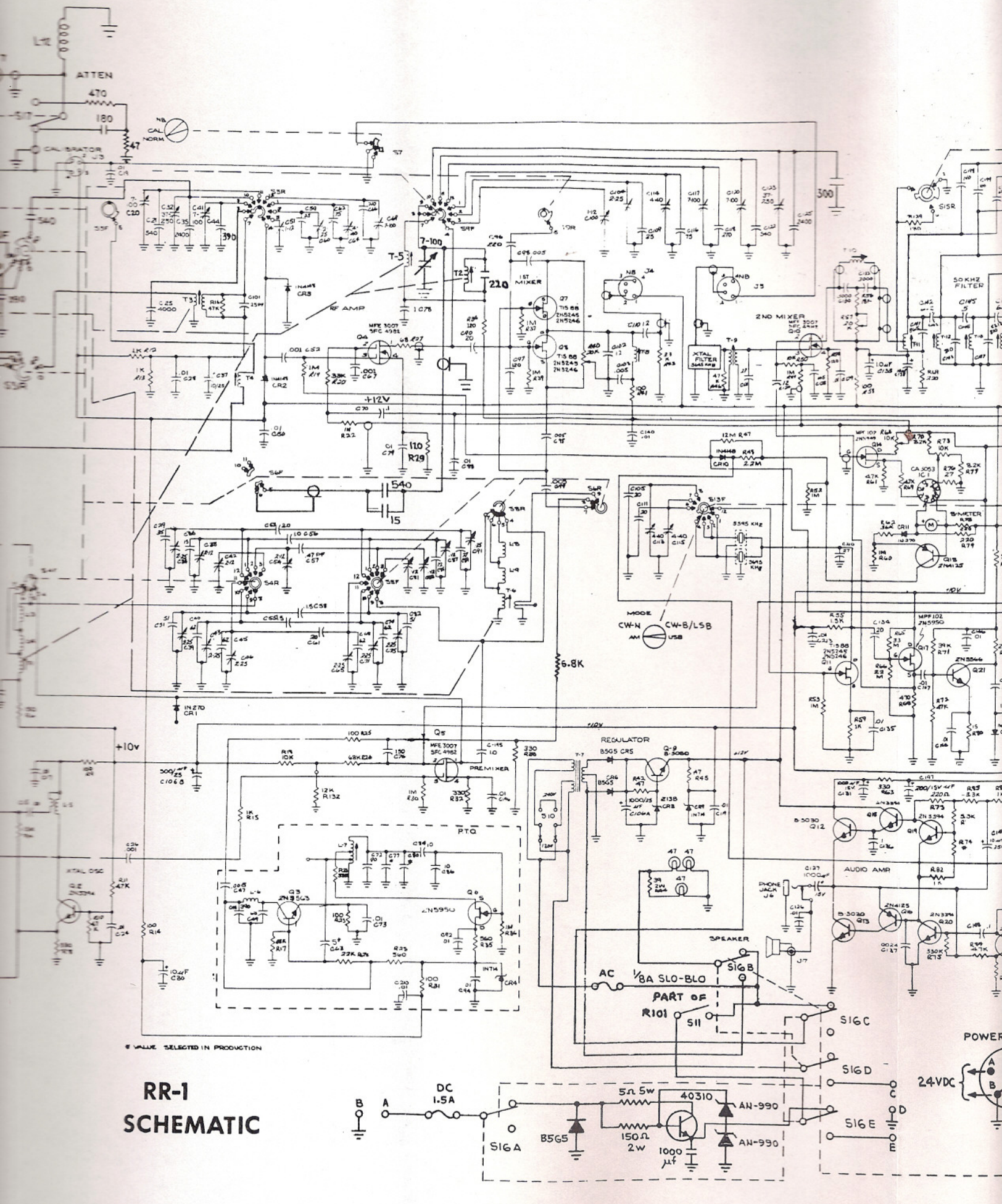
NOTES:

HIGHEST CAPACITOR: C 210
HIGHEST RESISTOR: R-132
CAPACITOR VALUES 10 & UP IN PF
CAPACITOR VALUES .001 TO 10 IN µF UNLESS OTHERWISE INDICATED

* VALUE SELECTED IN PRODUCTION

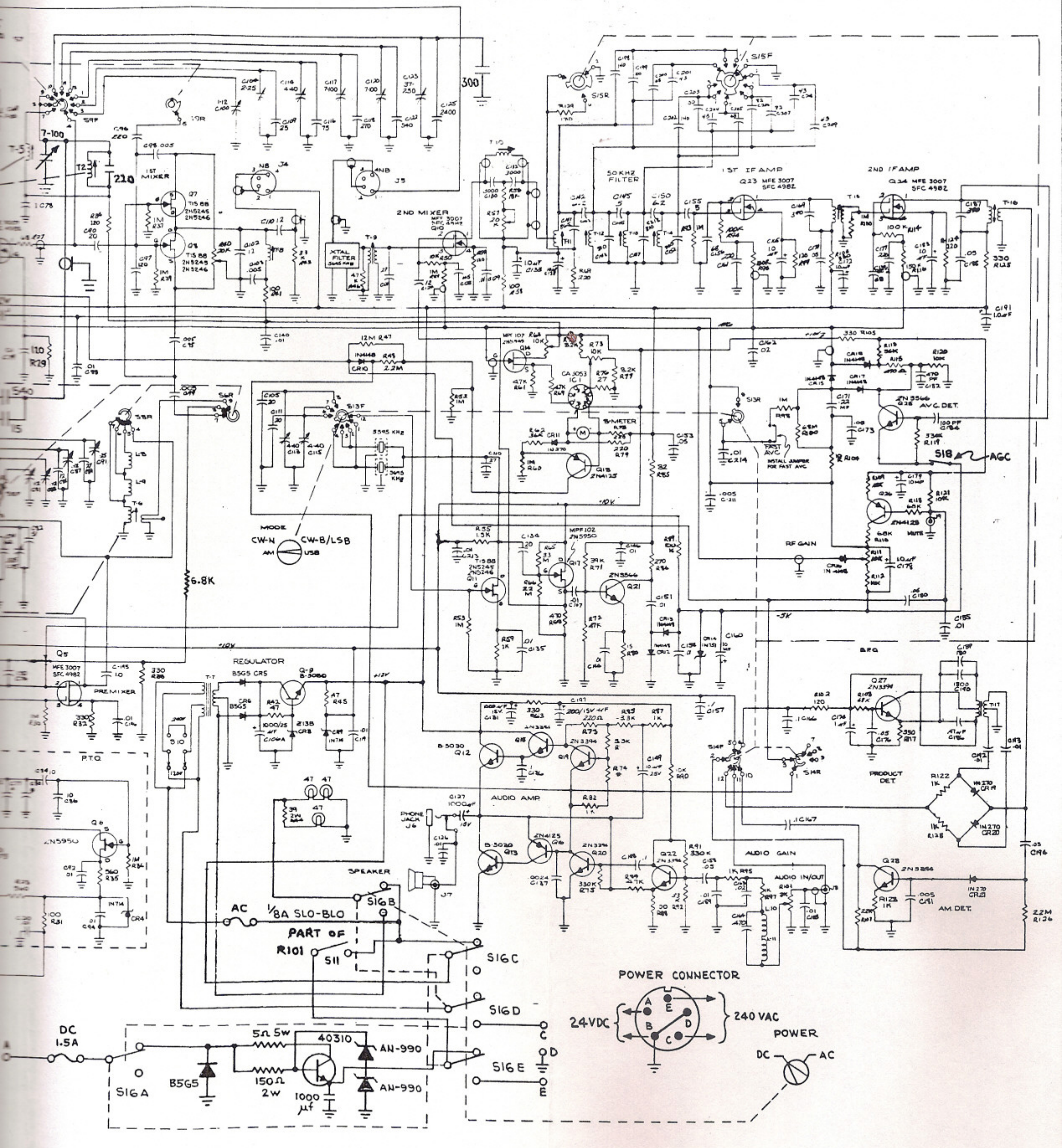
1-12-59	10-23.09	19-36.59
2-13.09	11-23.59	
3-13.59	12-24.09	
4-14.09	13-27.09	
5-14.59	14-27.59	
6-15.09	15-28.09	
7-17.09	16-33.09	
8-19.09	17-33.59	
9-19.59	18-36.09	

RR-1
SCHEMATIC



* VALUE SELECTED IN PRODUCTION

RR-1 SCHEMATIC


1ST MIXER
2ND MIXER
XTAL FILTER
50KHZ FILTER
1ST IF AMP
2ND IF AMP
MODE
CW-N
CW-B/LSB
AM
USB
S-METER
AVC DET.
AGC
S18
RF GAIN
MUTE
FAST AVC
REGULATOR
PREMIXER
PTO
BFO
PRODUCT DET.
AUDIO AMP
AUDIO GAIN
AUDIO IN/OUT
AM. DET.
PHONE JACK
SPEAKER
AC
1/8A SLO-BLO
PART OF
R101
S11
S16B
S16C
S16D
S16E
S16A
DC
1.5A
5Ω 5W
150Ω
2W
1000 μf
40310
AN-990
B5G5
POWER CONNECTOR
24VDC
240 VAC
POWER
DC
AC
6.8K
300
220
7-100