

for the product detector and the first mixer in the transmit mode. Three frequencies are generated:

1. USB 5.60165MHz
2. CW (transmit only) 5.60060MHz
3. LSB 5.59835MHz

Two crystals are used to generate the three frequencies. Switching logic for CW mode is controlled by Q74 and Q75 along with D55 through D58. Transistors Q72 and Q73 select either USB or CW frequencies. Transistors Q68 and Q69 form a crystal oscillator pair. Bias is applied to the proper transistor to generate the desired frequency. Transistor Q67 is the driver to the product detector. Q78 is the driver to the first mixer (balanced modulator mode). RIT frequency control voltage is gated to the varicaps (C170 and C179) through a FET switch (Q70). The switch is controlled by Q71.

Alignment:

1. Tune L11 for maximum amplitude at base of Q60 in product detector (R268).
2. In receive mode set oscillator frequencies as follows:
 - a. USB set C180 for output at R268 equal to 5.60165MHz +10Hz.
 - b. LSB set C174 for output at R268 equal to 5.60165MHz +10Hz.
 - c. CW transmit set C204 for output of Q78 to 5.60060MHz +10Hz. This test must be made in transmit mode and care must be taken to load transmitter with dummy load to prevent undesired transmission.

Note: This frequency can be coupled from the test pin shown in section A at f_{cx} .

7.0 ALC AND METER DRIVERS

Maximum transmitter power can be controlled by one of 4 sources. These are diode "or" coupled to the ALC attenuator. The controls are:

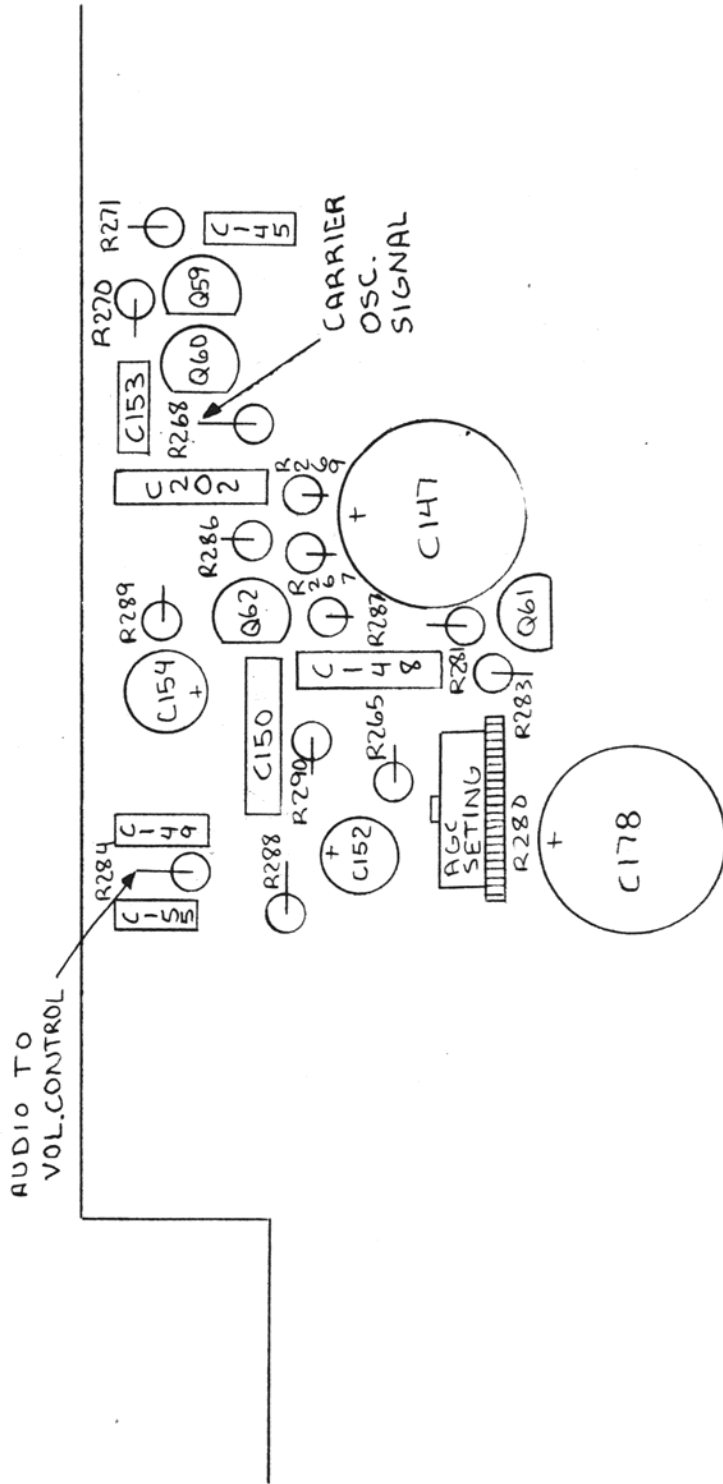
1. Average power detector
2. Reflected power detector
3. CW power set (overrides average power in CW mode)
4. External control.

ALC and Receiver AGC are diode coupled to the meter to read in the ALC meter position.

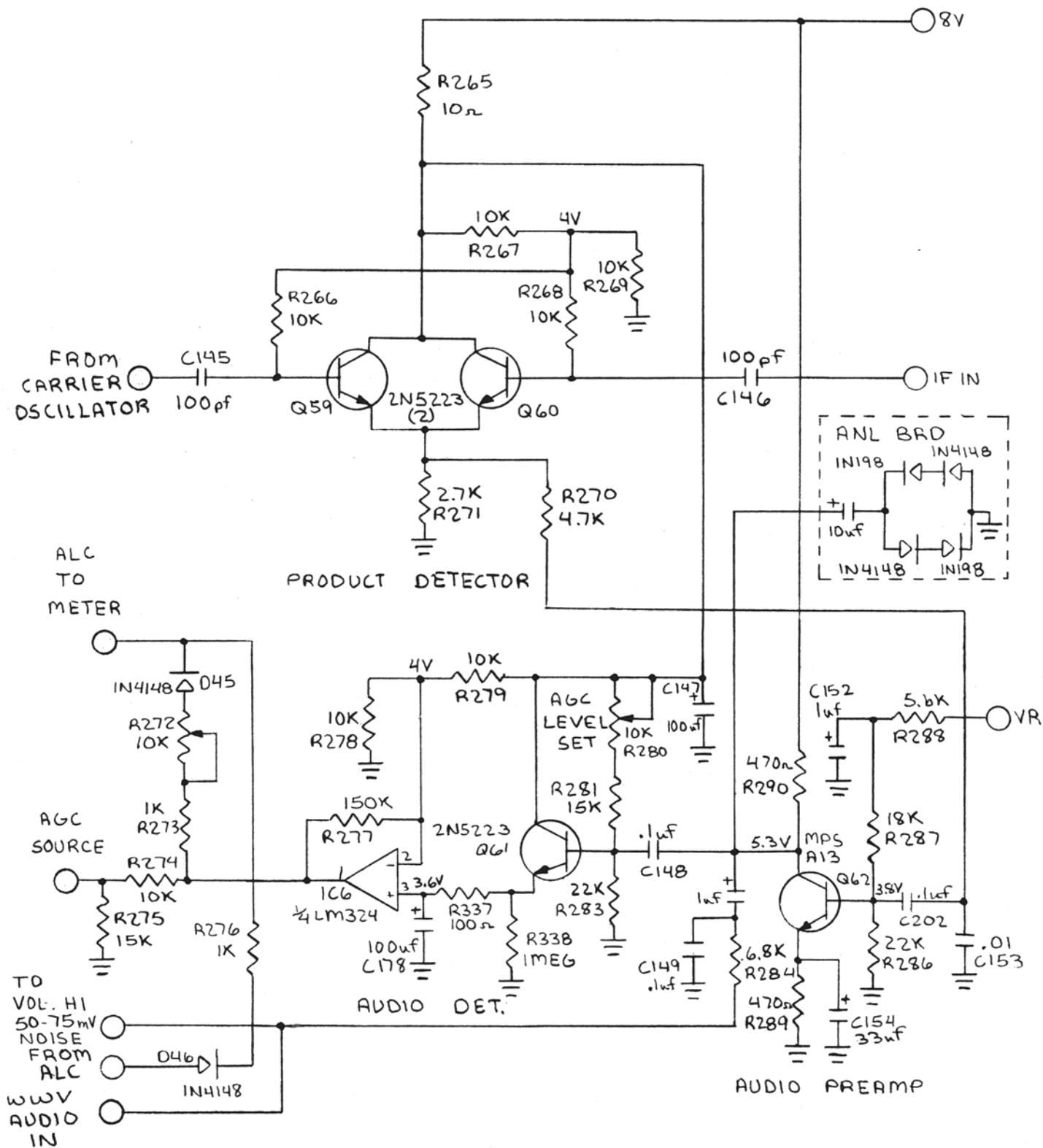
FWD and REF meter readings are derived from buffer amps and signals from the SWR board.

Alignment:

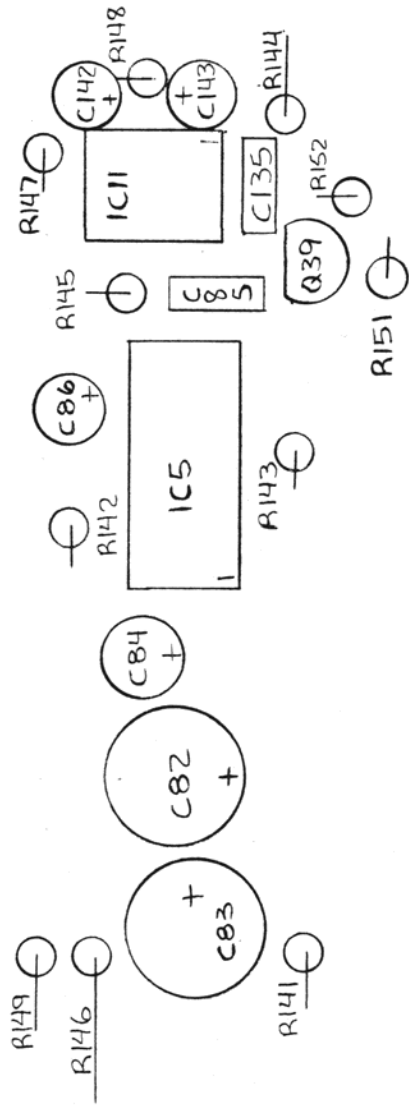
1. AGC. With 50 μ volt signal to receiver adjust R272 for AGC meter reading of S-9.
2. ALC. a. Meter set: In CW turn mic gain full clockwise. With key down adjust R291 for just over full scale deflection.
 - b. Average power control settings:
In a SSB mode set mic gain to 12:00 position whistle loudly into mic and set R296 to hold an average power



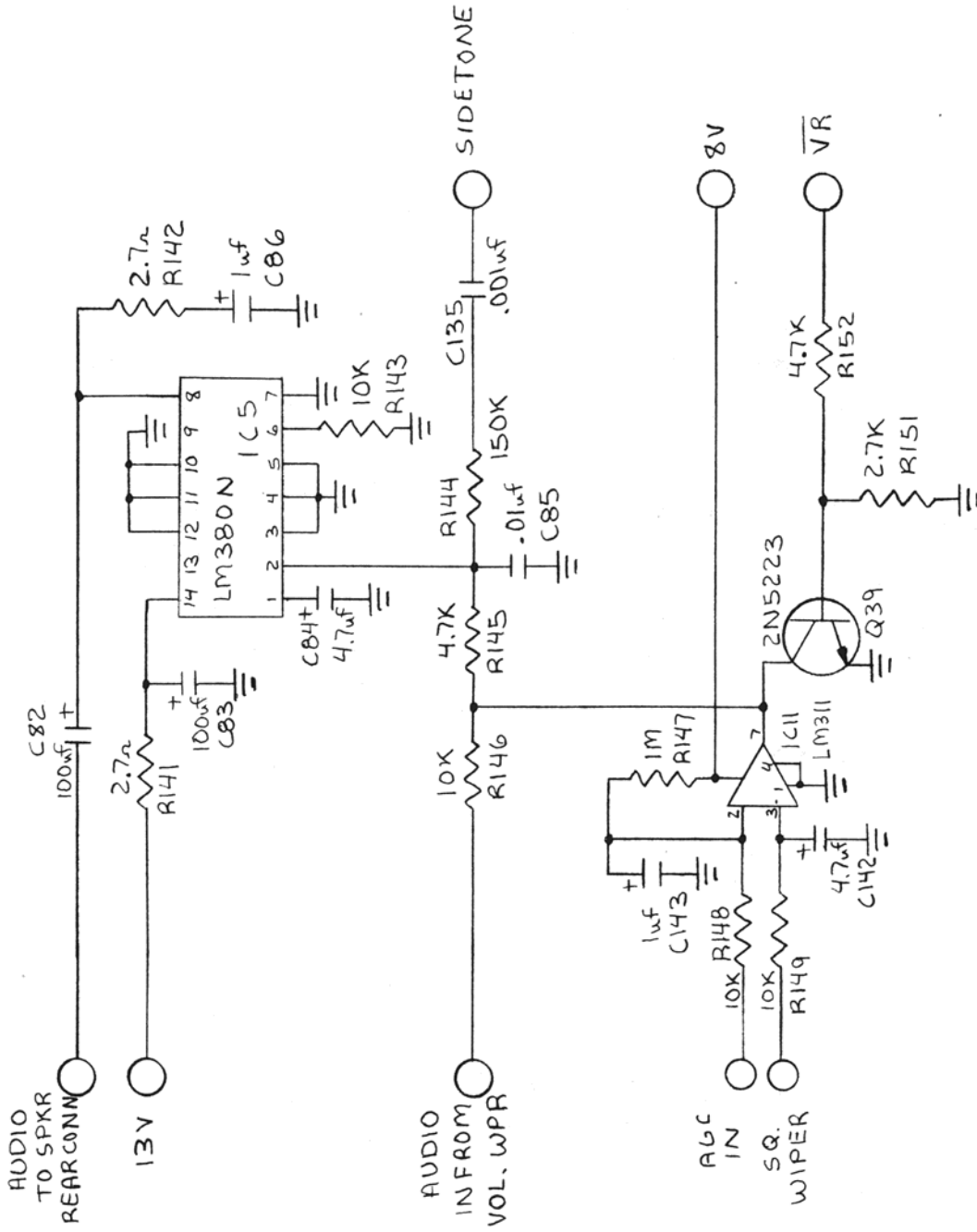
LAYOUT 4.0



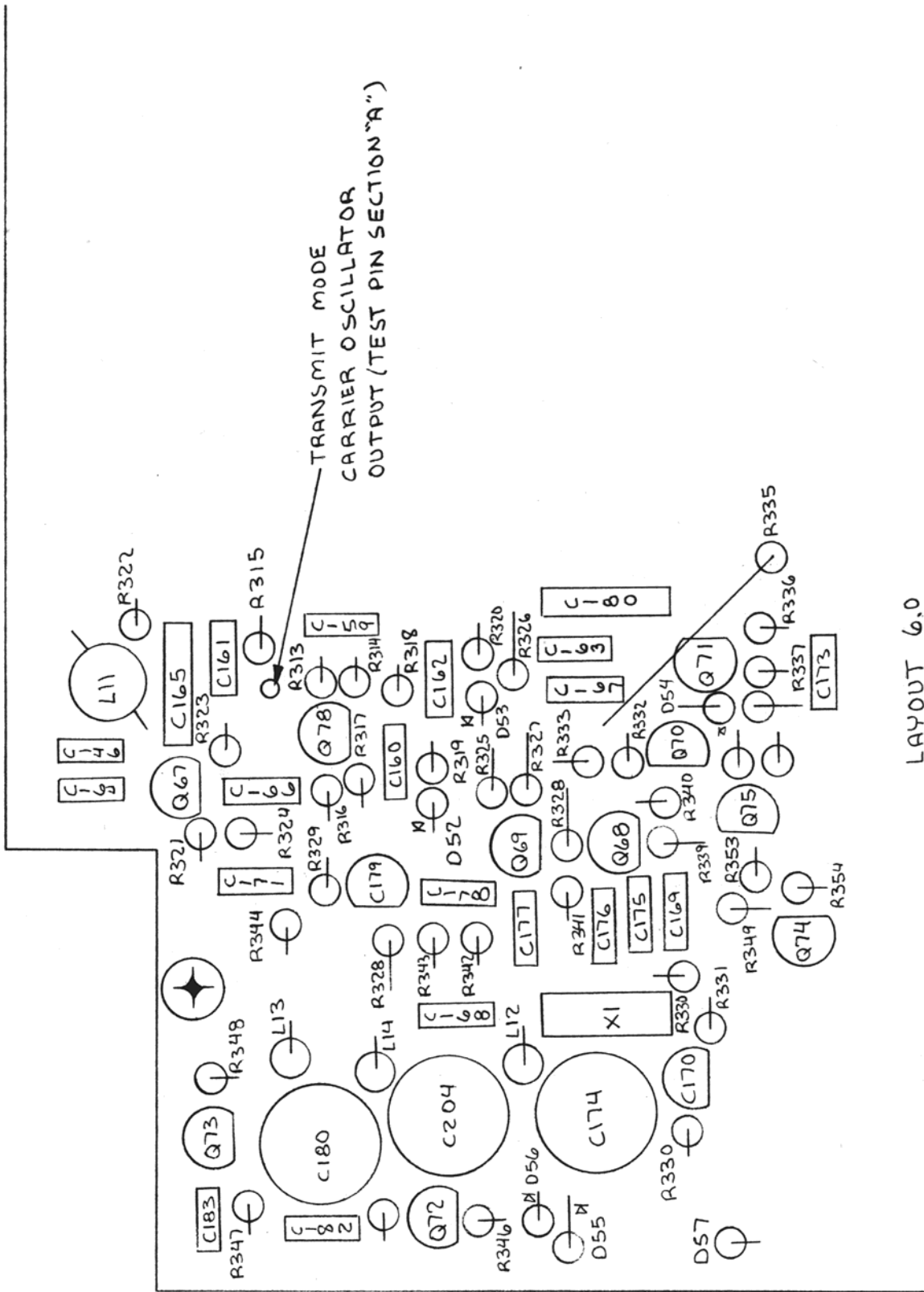
SCHEMATIC 4.0



LAYOUT 5.0



SCHEMATIC 5.0



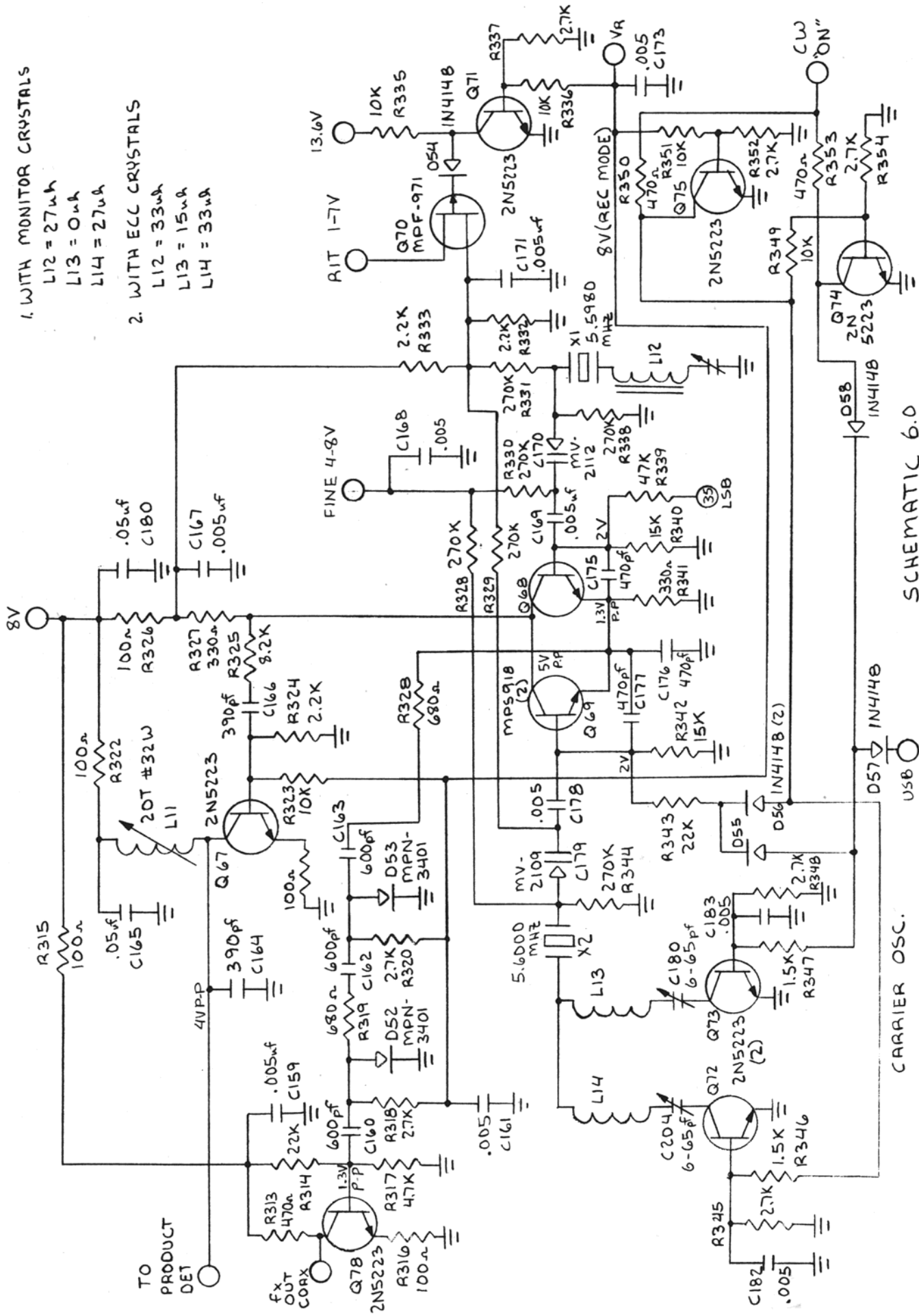
LAYOUT 6.0

1. WITH MONITOR CRYSTALS

- L12 = 27 μ h
- L13 = 0 μ h
- L14 = 27 μ h

2. WITH ECC CRYSTALS

- L12 = 33 μ h
- L13 = 15 μ h
- L14 = 33 μ h



SCHEMATIC 6.0

CARRIER OSC.

USB

CW ON

of 40 watts. This results in a peak power in excess of 100 watts.

c. REF power control settings:

In the CW mode load the transmitter with a 2:1 VSWR (use two dummy loads in parallel). Set the mic gain full counter-clockwise (max power). Key down and adjust R312 to limit power to 100 watts or less on all bands.

d. FWD power set: In the CW

mode with a matched load set the mic gain to generate 100 watts. Adjust R306 for full scale deflection in the FWD meter position.

8.0 TRANSMIT MIXER AND ALC ATTENUATOR

The transmit mixer sums the sideband modulated signal with LO to generate the desired transmit signal. The sideband signal is fed to the ALC attenuator composed of D9 and Q19. The level controlled signal feeds the mixer signal driver Q20. The LO is fed to the buffer and LO switching amp composed of Q22 and Q23. The buffered output drives the mixer LO driver Q21. Mixer output is taken directly to the transmit preamp.

Alignment:

Tune L6 for maximum signal on the collector of Q20. For this test unit should be set to CW mode and mic gain set full counter-clockwise (max power out).

9.0 TRANSMIT PREAMPLIFIER

The transmit preamplifier is a wideband three transistor circuit intended to raise the transmit mixer output to a level of 6 to 8Vpp. Transistors Q44 and Q45 are a low level feedback couple used to drive a transformer coupled driver stage (Q43).

No adjustments are necessary to this circuit.

10.0 VOX AND TRANSMIT SPEECH PROCESSOR

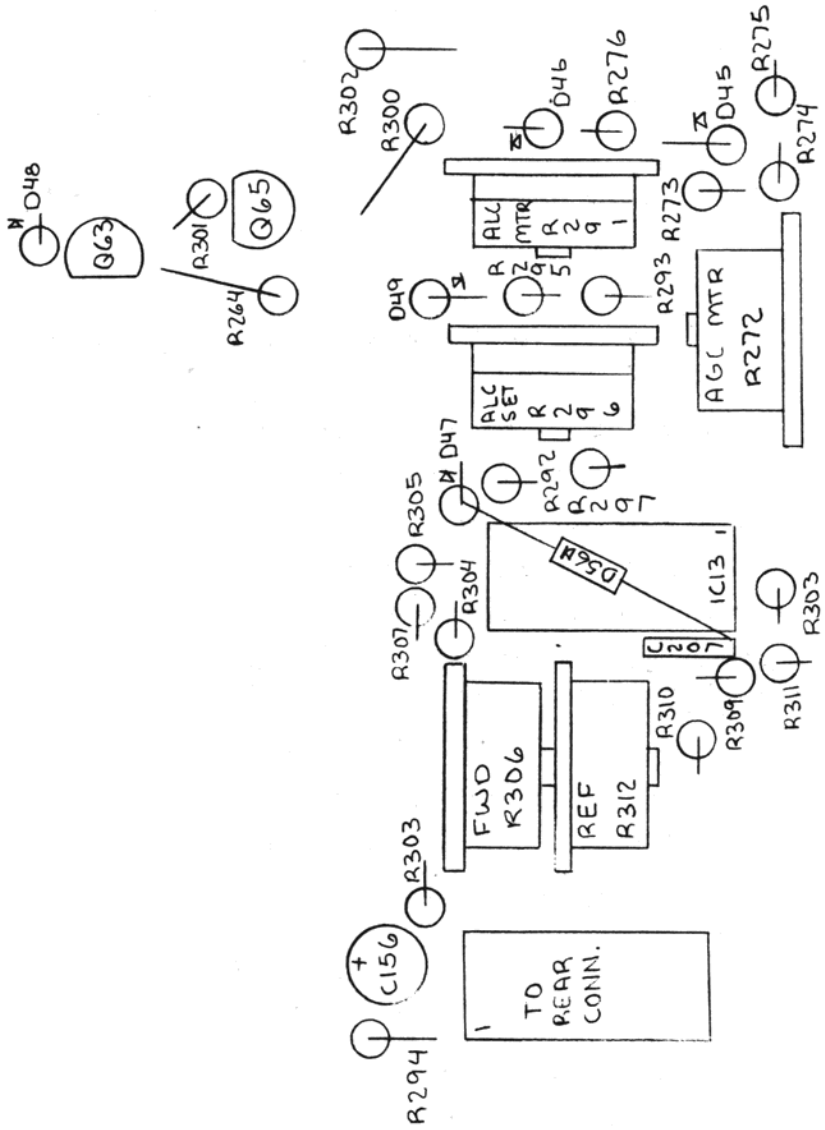
Microphone signals are coupled to the preamplifier, Q41, and then to the log amp, 1/4IC6. The log amp output is coupled to the mic gain control and to the VOX input. Signals from the mic gain wiper are fed to the modulation lowpass filter through the modulation squelch circuit, Q42, and Q49.. Modulation signals are squelched in receive mode and CW mode.

The output of the log amp also drives the VOX amp (1/4 IC6). VOX action is activated by turning the VOX squelch transistor (Q40) off. Antitrip is derived by coupling the audio output signal to the antitrip amp (1/4 IC6). The outputs of the VOX amp/detector and the antitrip amp/detector are summed and compared to a reference level by IC7. The output of IC7 activates the key (PTT) line.

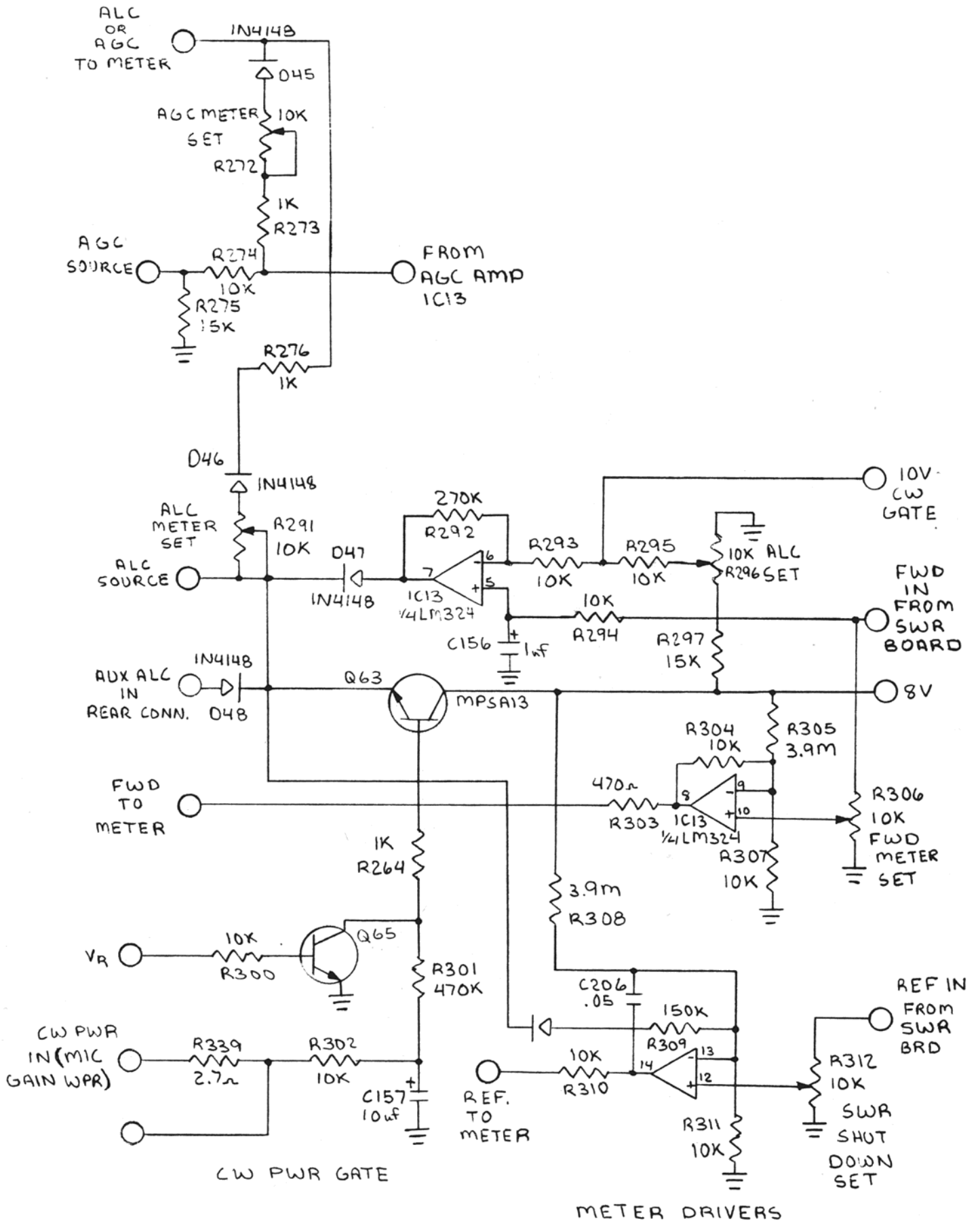
Adjustments: Antitrip sensitivity R178

VOX sensitivity R181

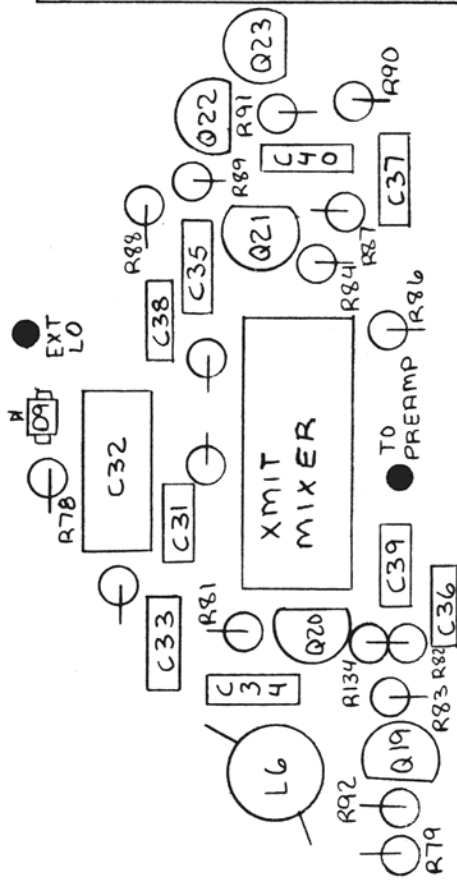
These are operator adjusted to suit operating conditions. These circuits are located in area "G".



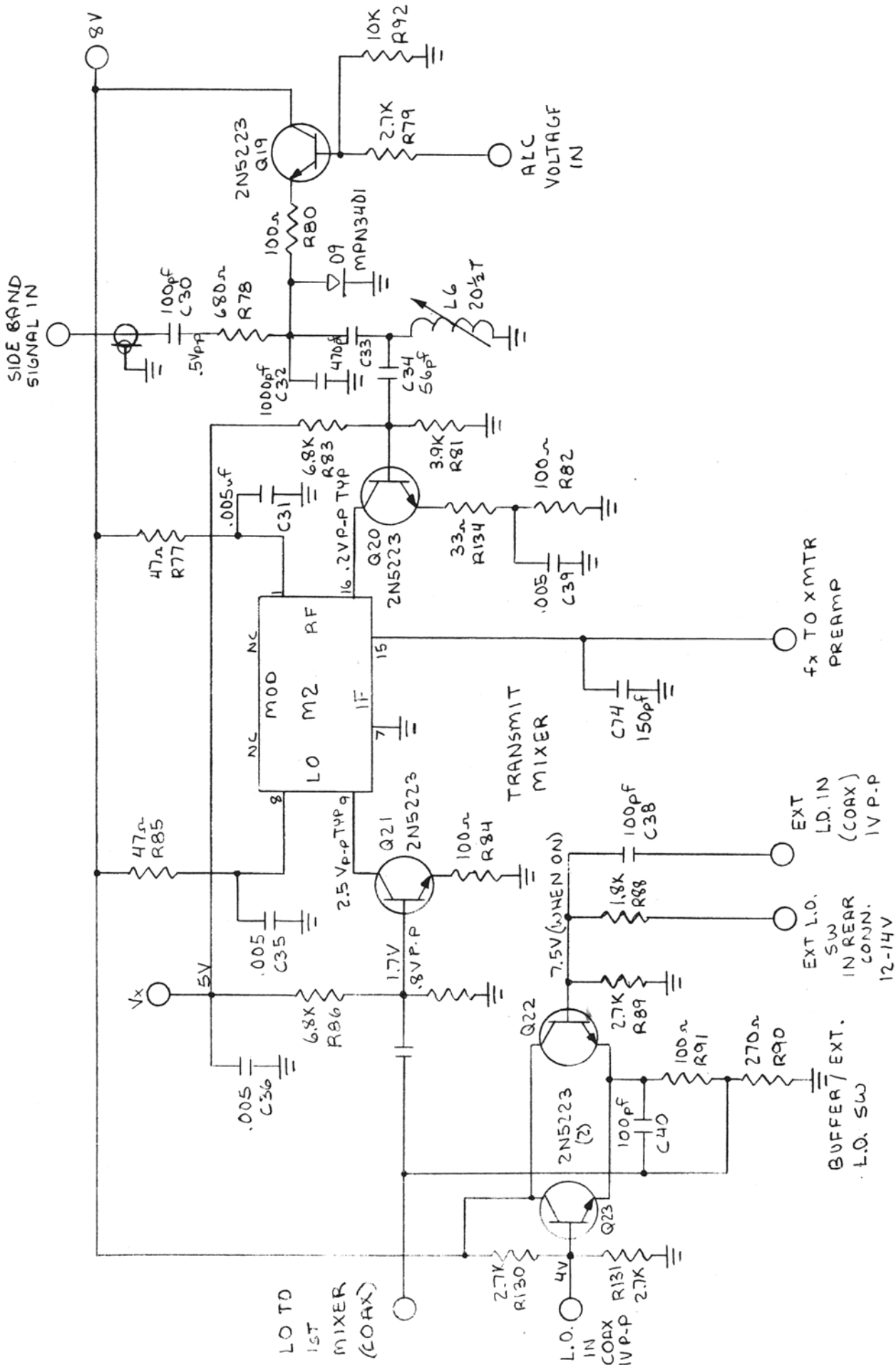
LAYOUT 7.0



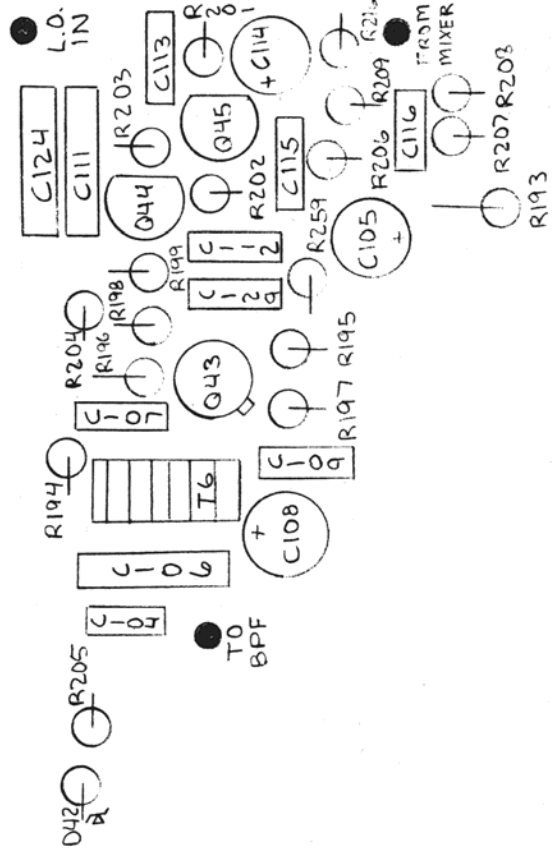
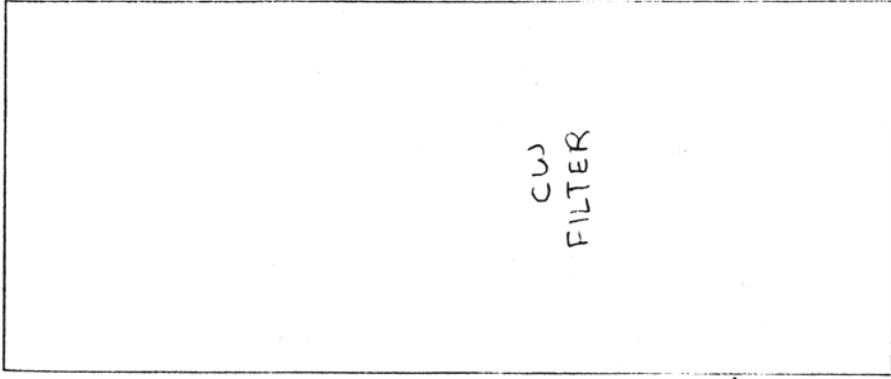
SCHEMATIC 7.0



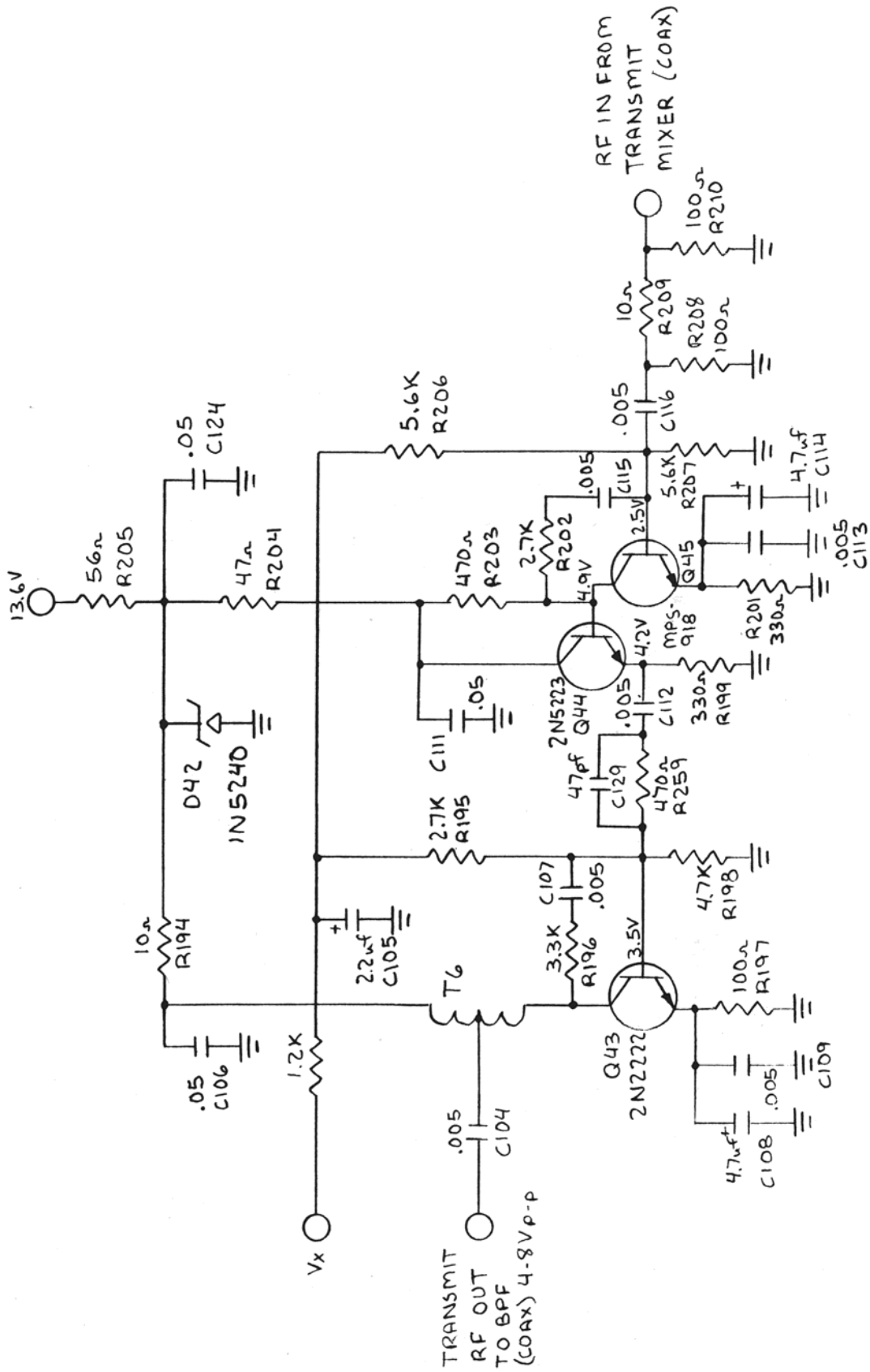
LAYOUT 8.0



SCHEMATIC 8.0

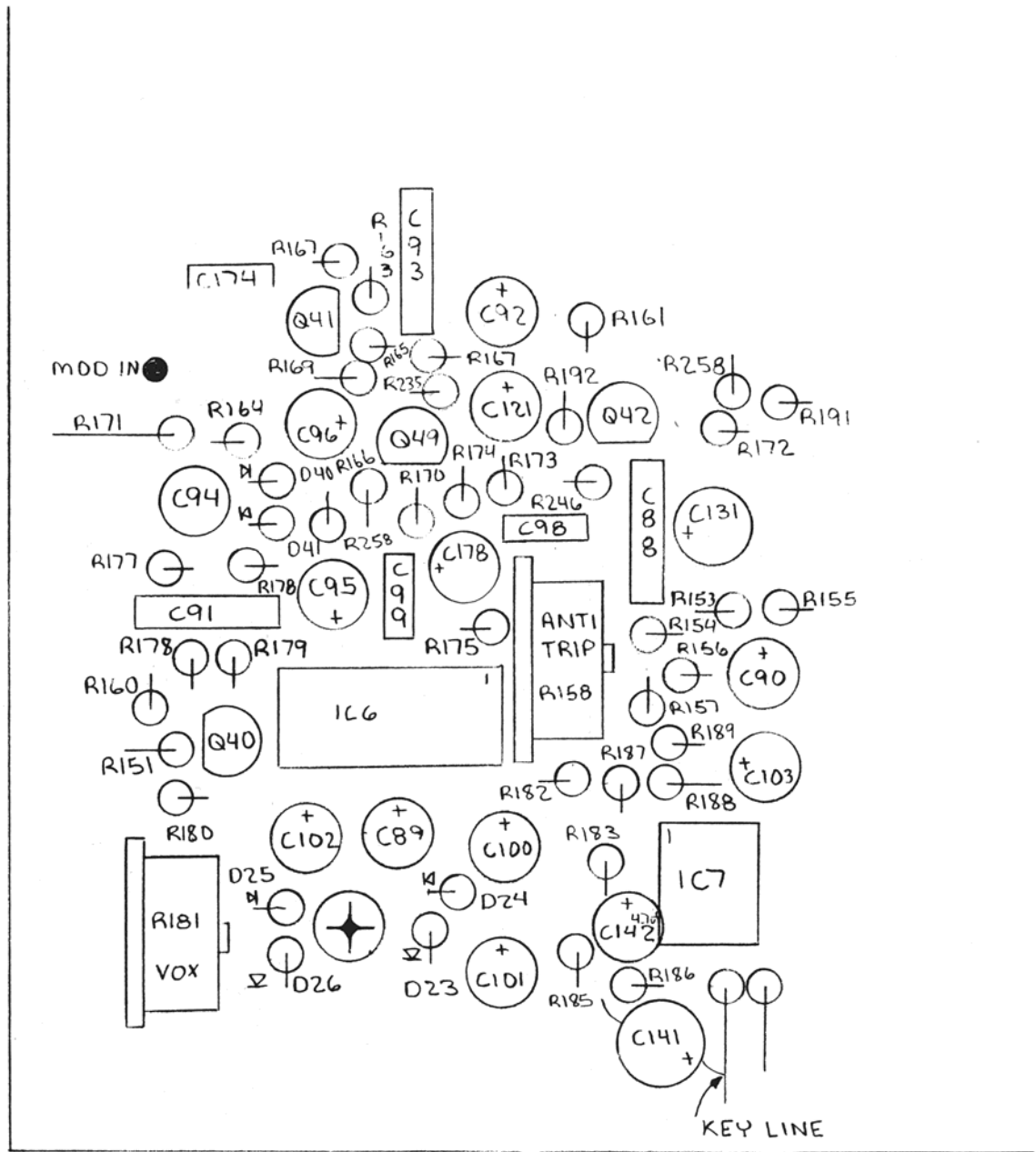


LAYOUT 9.0



TRANSMIT PREAMP

SCHEMATIC 9.0



LAYOUT 10.0

11.0 WWV RECEIVER

The WWV receiver is a direct audio conversion type. Usual sensitivity is better than 2u volts. Audio noise output is normally 6 to 10dB less than SSB mode. Local oscillator for the receiver is the 5MHz crystal reference multiplied by 2 by Q77. The receiver circuits are located in area "H" of the receiver board.

Alignment: 1. Tune L15 for maximum audio output.
2. Tune L16 for maximum 10MHz at collector of Q77. Typical audio output is .1Vpp at pin 14 of IC10 with 5u volt input.

12.0 T-R SWITCHING, DELAY AND SIDETONE

T-R switching is controlled by a combination of diode gates and the PTT line. Receiver turn on delay is controlled by Q56 in the CW and VOX modes. Transistor Q54 is the transmit voltage switch and Q53 is the receive voltage switch. The receive switch also turns on Q52 which in turn operates the relay drivers Q51 and Q50.

In the CW mode the sidetone oscillator (1/4 IC10) supplies an audio pulse to the Audio power amplifier each time the key line is grounded. Transistor Q56 acts as a squelch to the oscillator in modes other than CW.

Adjustments: 1. Sidetone level: Set R257 to give desired sidetone level.

2. Delay: Set R239 to give desired receiver turn on delay.

These circuits are found in area "E".

13.0 NOISE BLANKING

Noise blanking action is performed by a wideband IF amplifier with self-contained AGC loop. The NB circuits are contained on the main receiver board in section "A" and on the small auxiliary noise blanking board. The signal is amplified by Q47, Q48 and Q2. The average detector D28 and D29 feed the AGC amplifier and AGC attenuator on the noise blanker board. The pulse detector, D30 and D2 drives a comparator, IC8. If the pulse amplitude is greater than a fixed reference a blanking pulse is generated.

Alignment: With the set turned to an input signal of about 100u volts tune L9 and L10 for maximum output on D30.

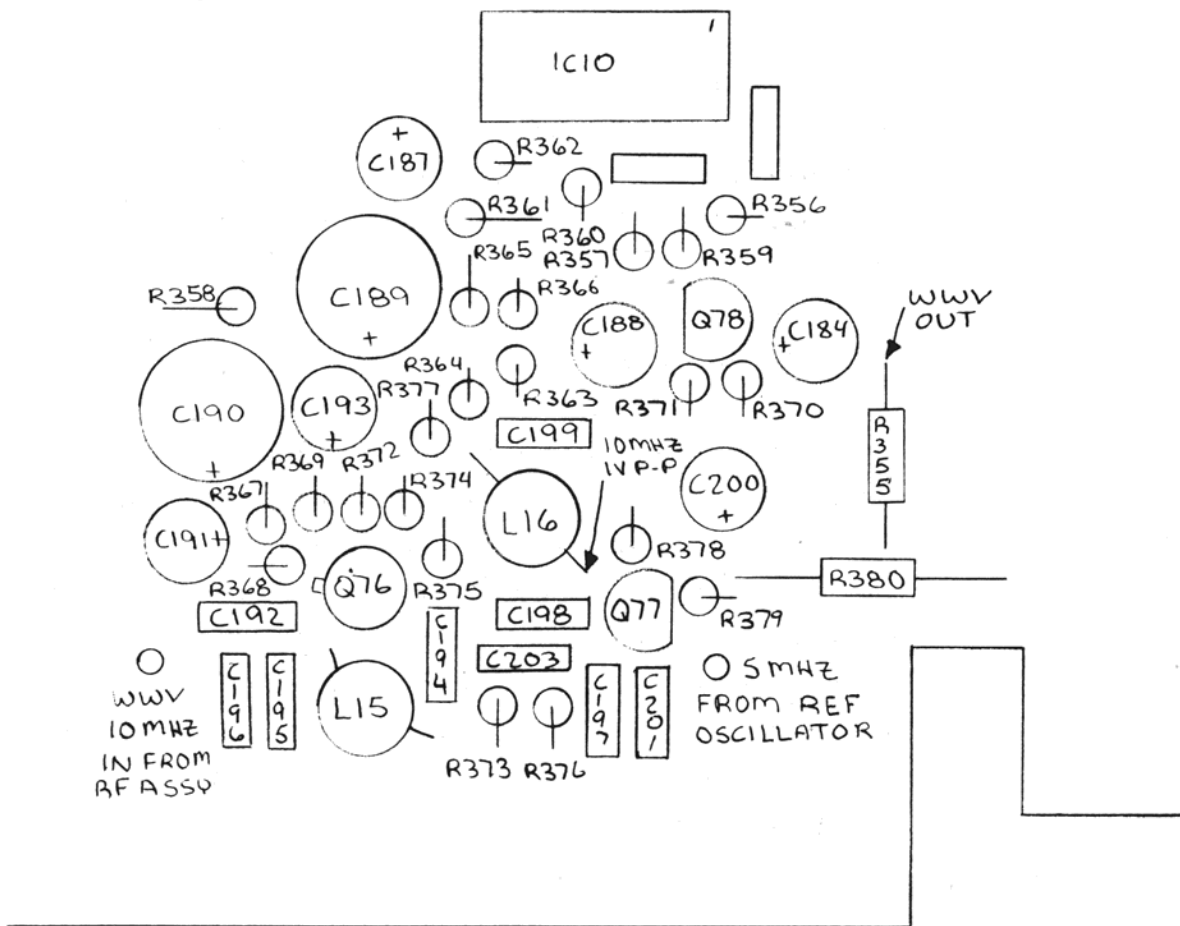
14.0 SWR/WATTMETER CIRCUIT

The forward and reflected power meter bridge is mounted to the inside chassis on the antenna connector. The bridge is a standard configuration.

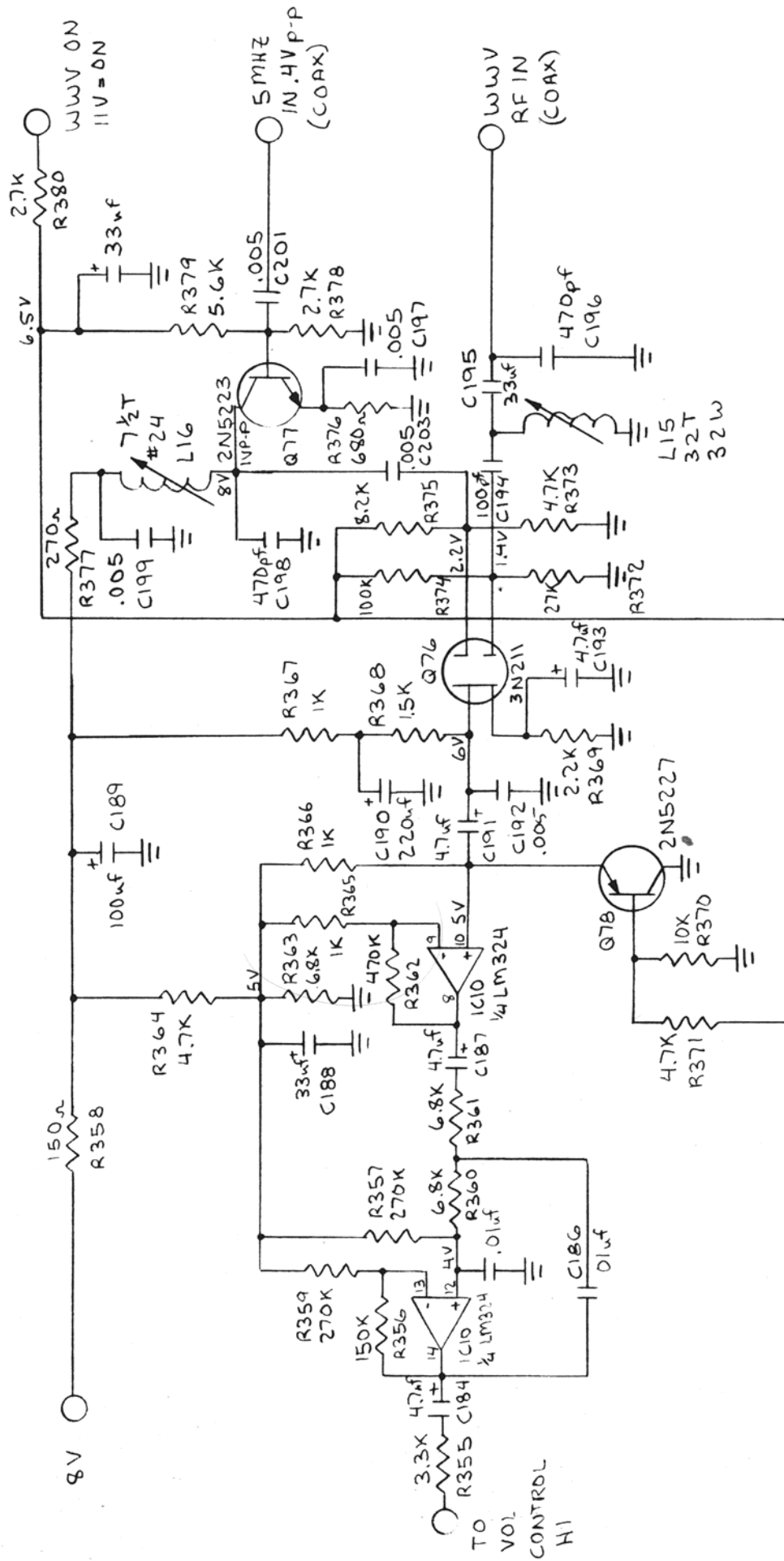
Adjustment: Set C3 for flat response of power shut down circuit when transmitting into a VSWR + 2:1. Power should limit between 80 and 105 watts on all bands 80 thru 15M. Since power output on 10M band is lower the available output may limit in the 70-80 watt area on 10M.

15.0 POWER AMPLIFIER

The power amplifier is mounted on the rear of the unit. The amplifier is a three stage design; the first, biased

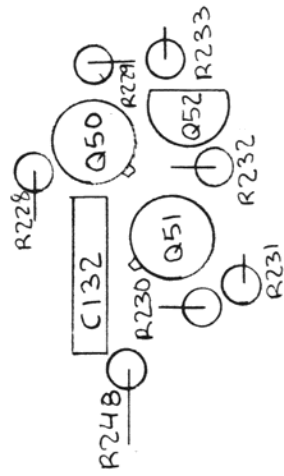
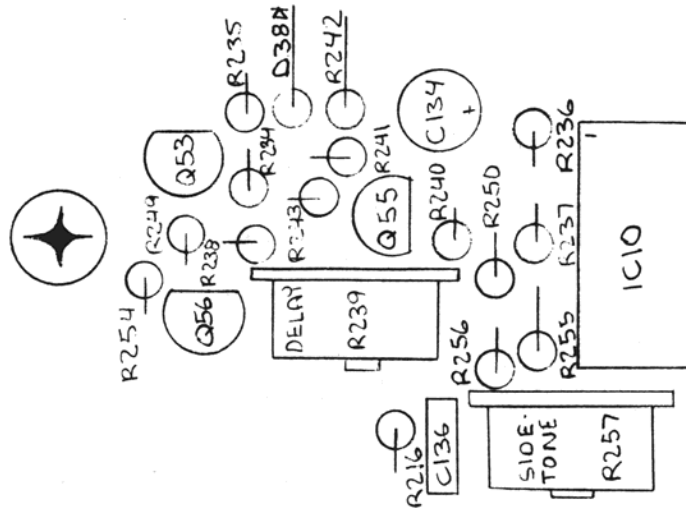


LAYOUT 11.0

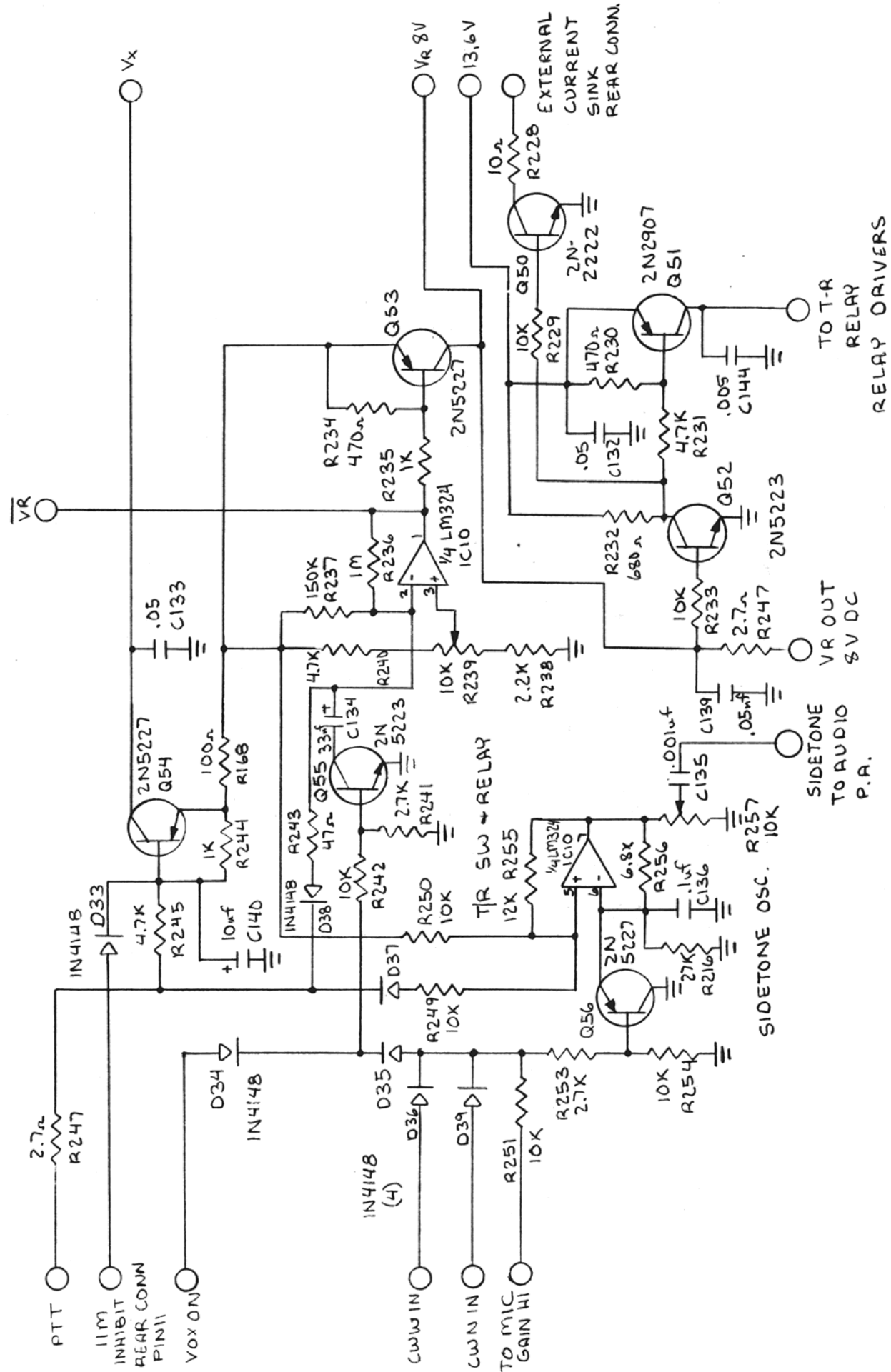


WWV REC.

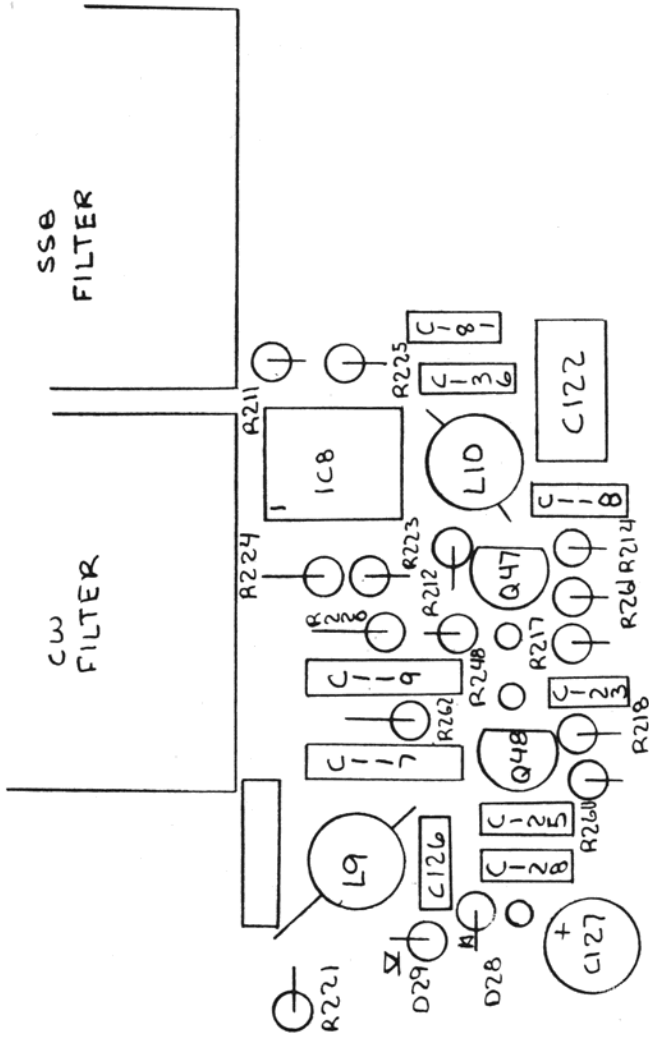
SCHEMATIC 11.D



LAYOUT 12.D

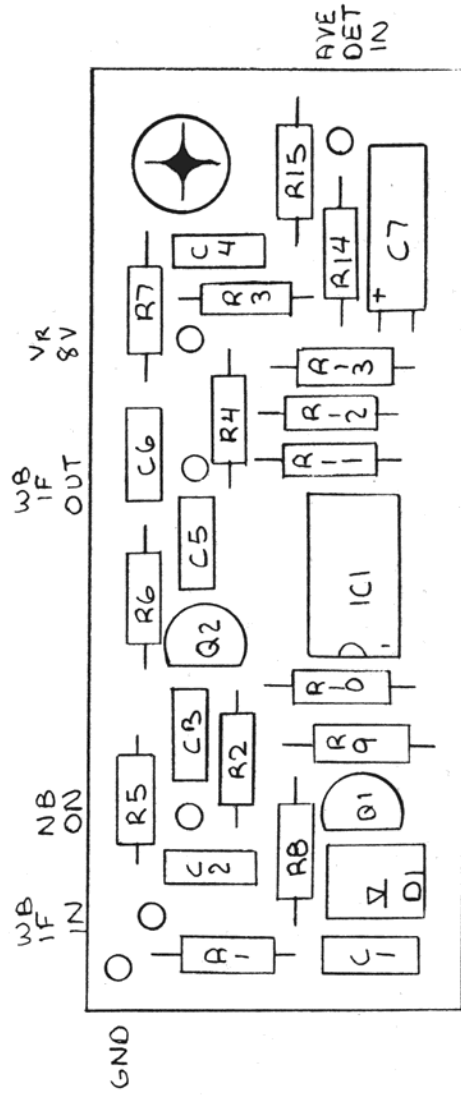


SCHEMATIC 12.0



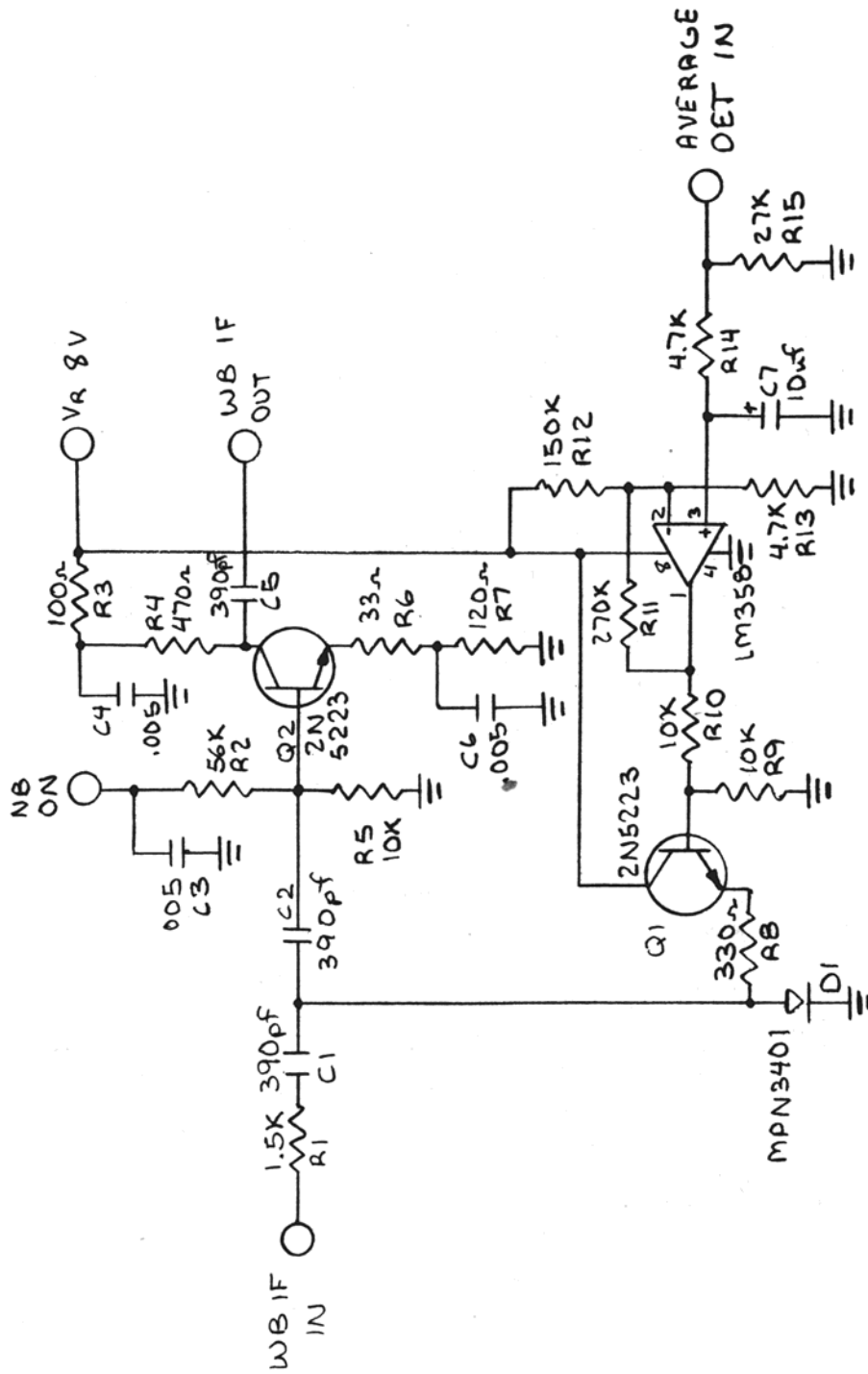
REC BRD N.B. CIRCUIT

LAYOUT 13 PAGE 10F2

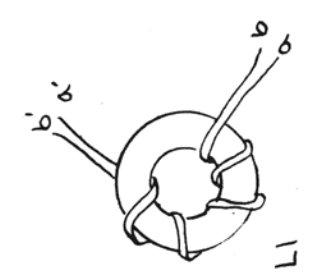
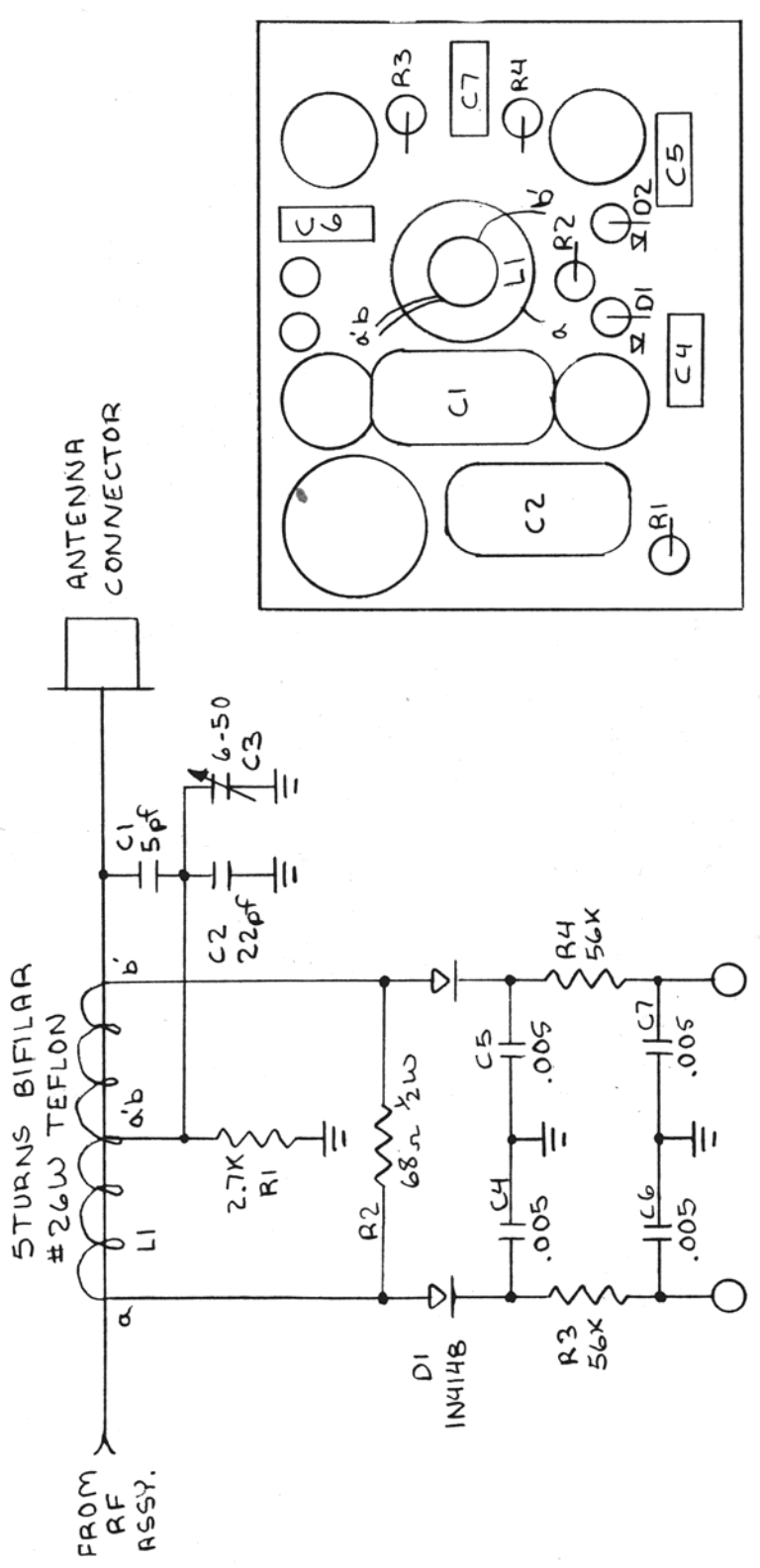


N.B. BOARD LAYOUT

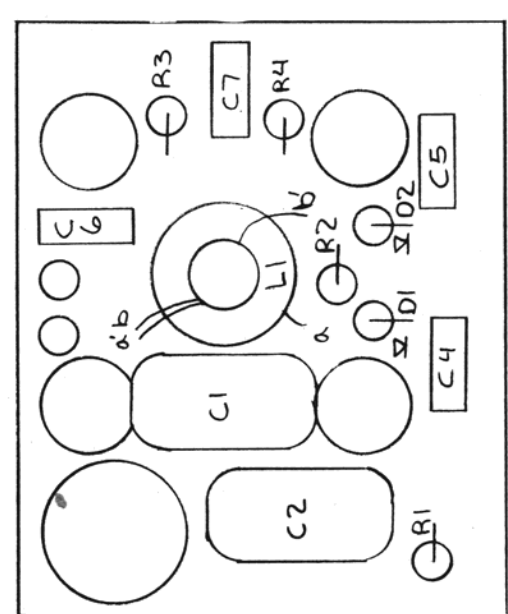
LAYOUT 13.0 PAGE 2 OF 2



N.B. BOARD SCHEMATIC
 SCHEMATIC 13 PAGE 2 OF 2



STURNS
THRU
CENTER
#26
TEFLON
WIRE



SCHEMATIC + LAYOUT 14.D