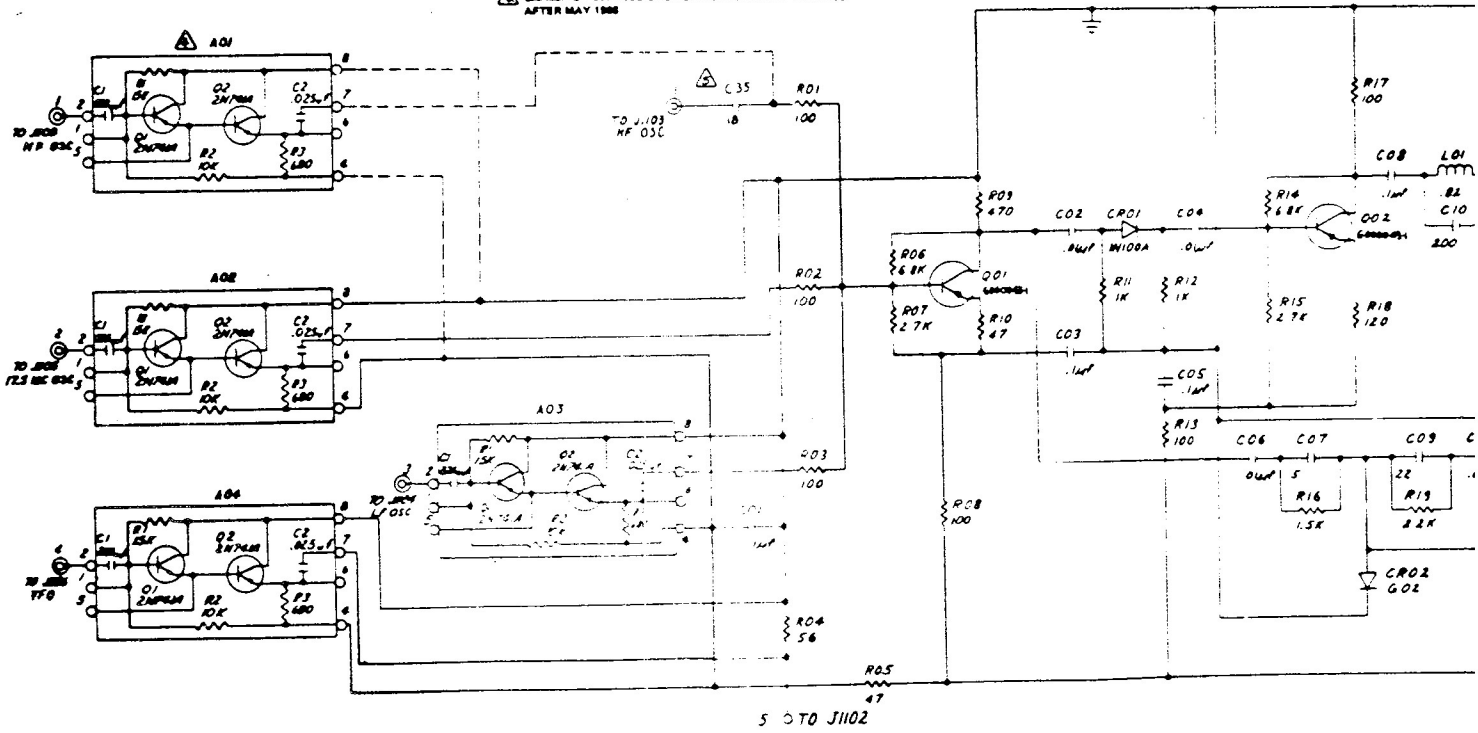


NOTES:

- UNLESS OTHERWISE SPECIFIED  
 1. ALL REFERENCE DESIGNATORS ARE PRECEDED BY 12  
 2. ALL RESISTORS 1/4 W ; 5% VALUE 0-985  
 3. ALL CAPACITORS .1uF  
 4. AMPLIFIER AD1 USED ONLY ON BOARDS MANUFACTURED BEFORE MAY 1968  
 5. CAPACITOR C08 USED ONLY ON BOARDS MANUFACTURED AFTER MAY 1968



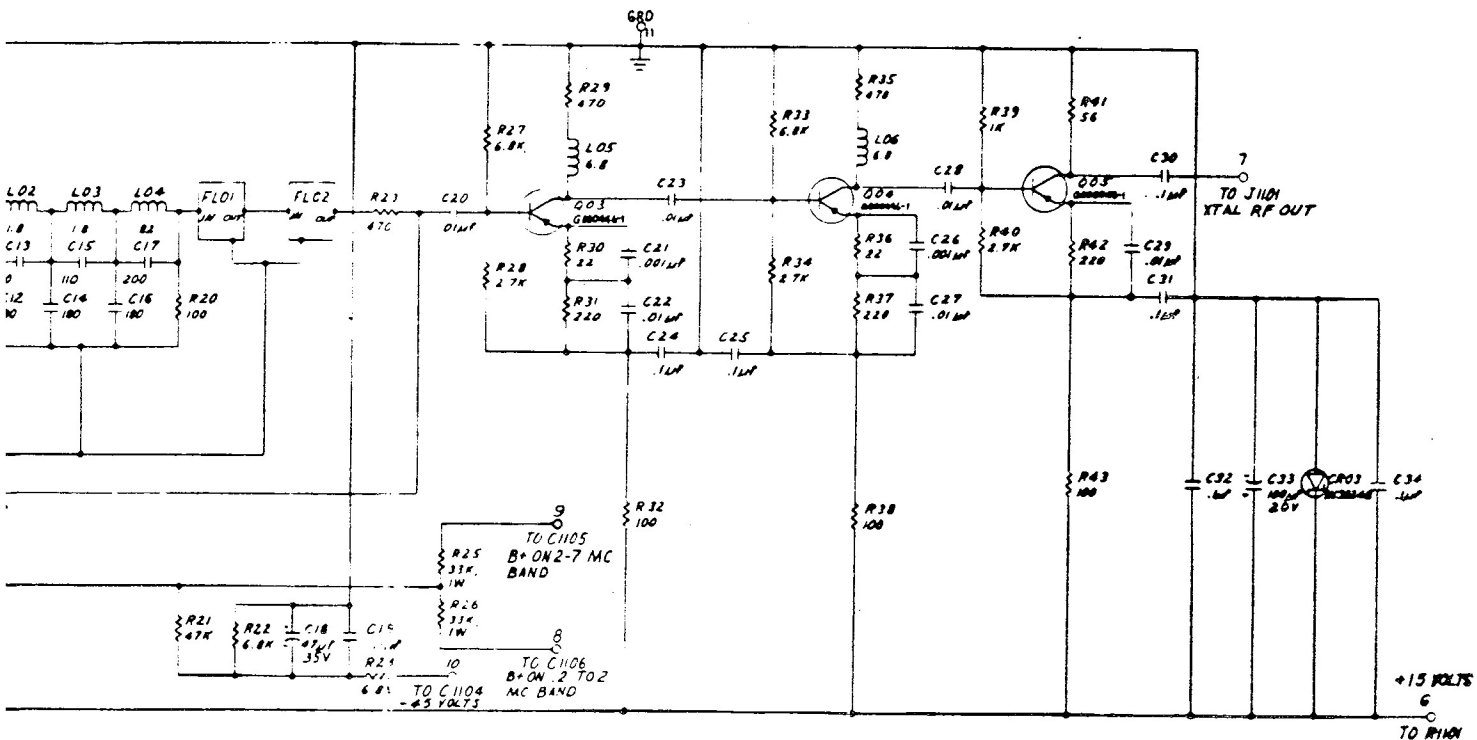


Figure 7-2. G133D12000-1 Mixer Schematic

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Change 3 7-5/7-6

# GTM-D-133F

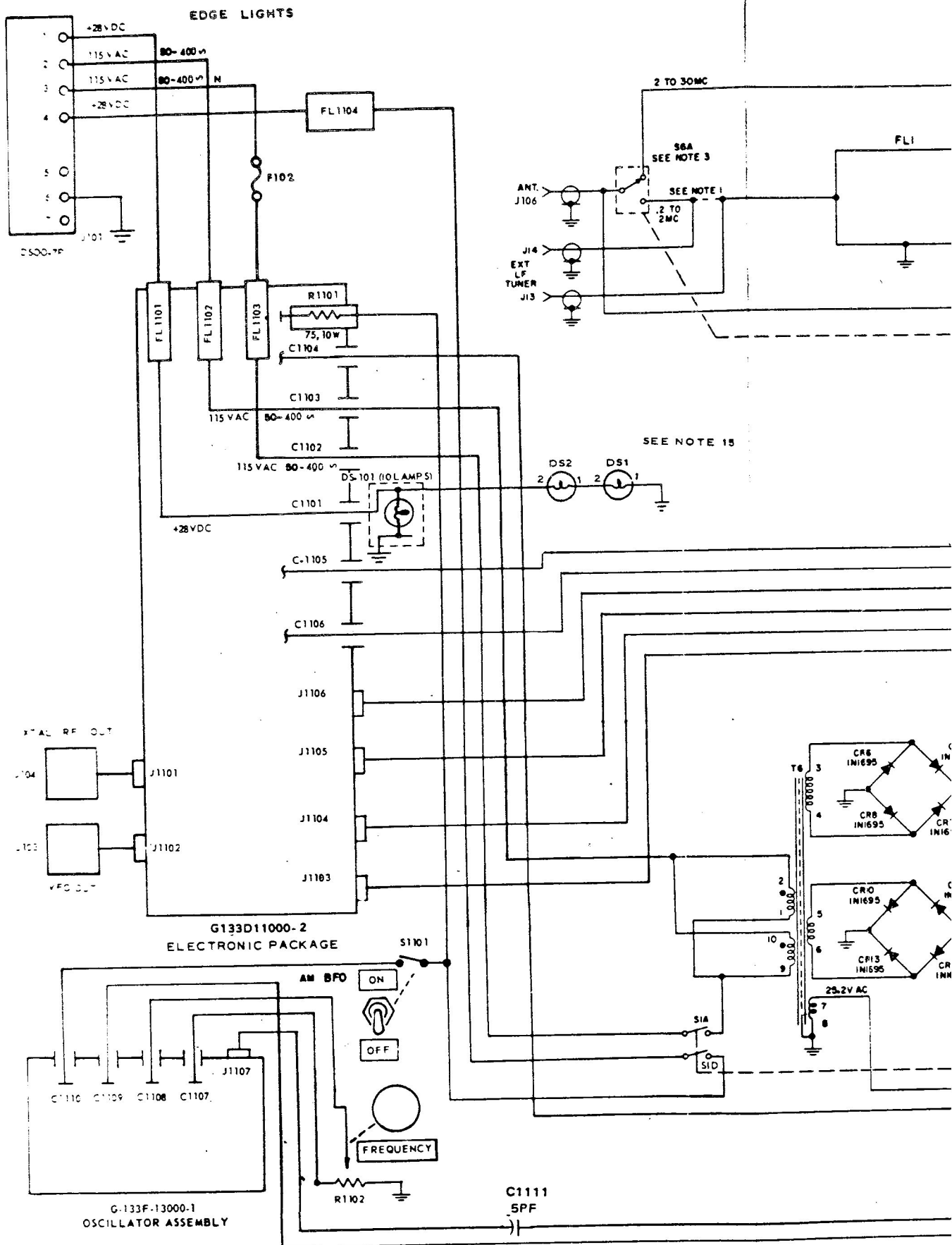
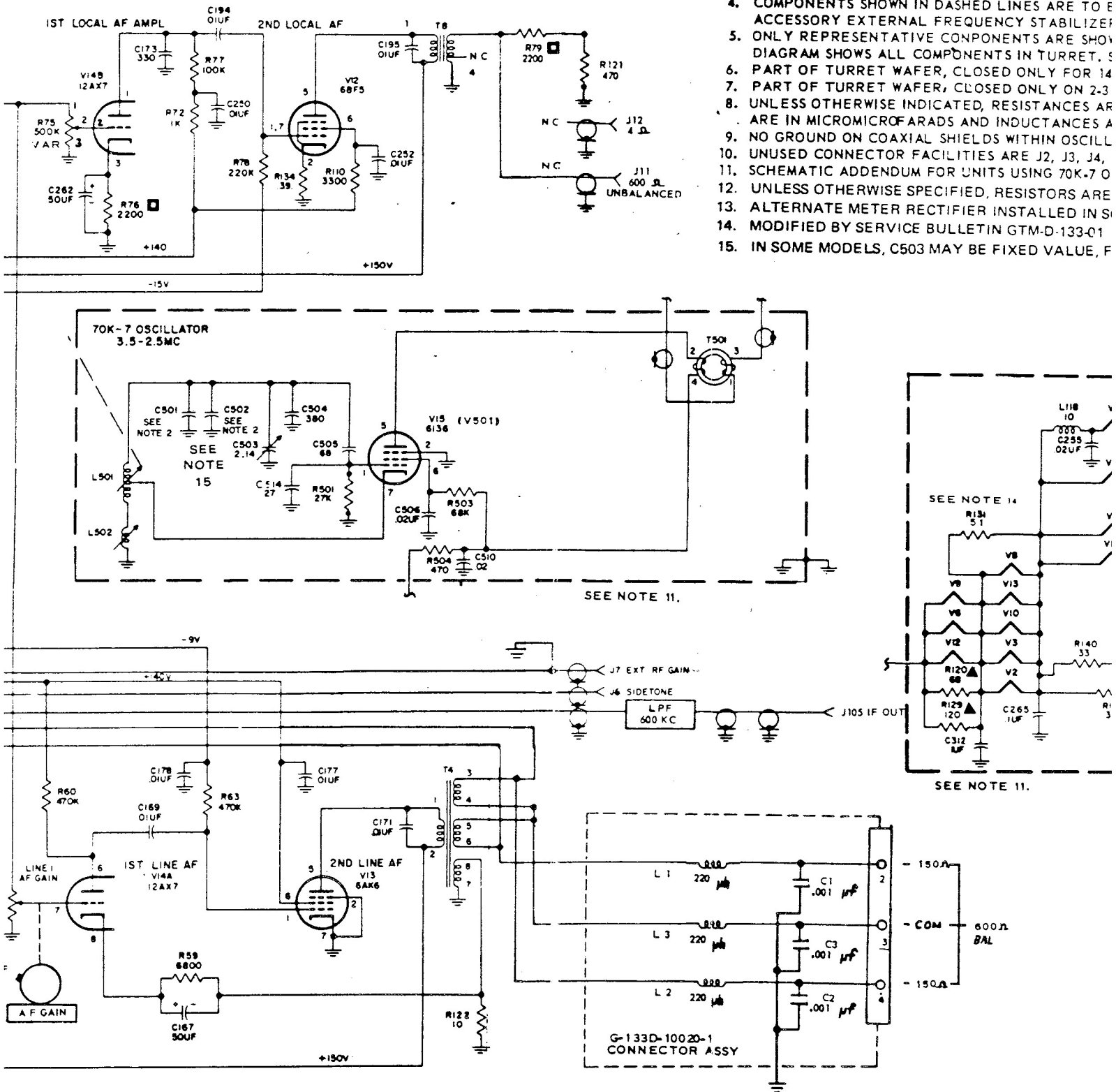


Figure 7-1. G133F HF Receiver (Sheet 1 of 2)

**NOTES:**

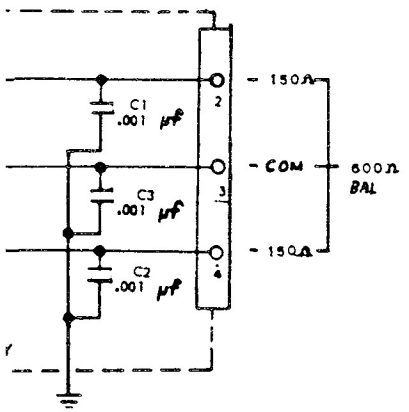
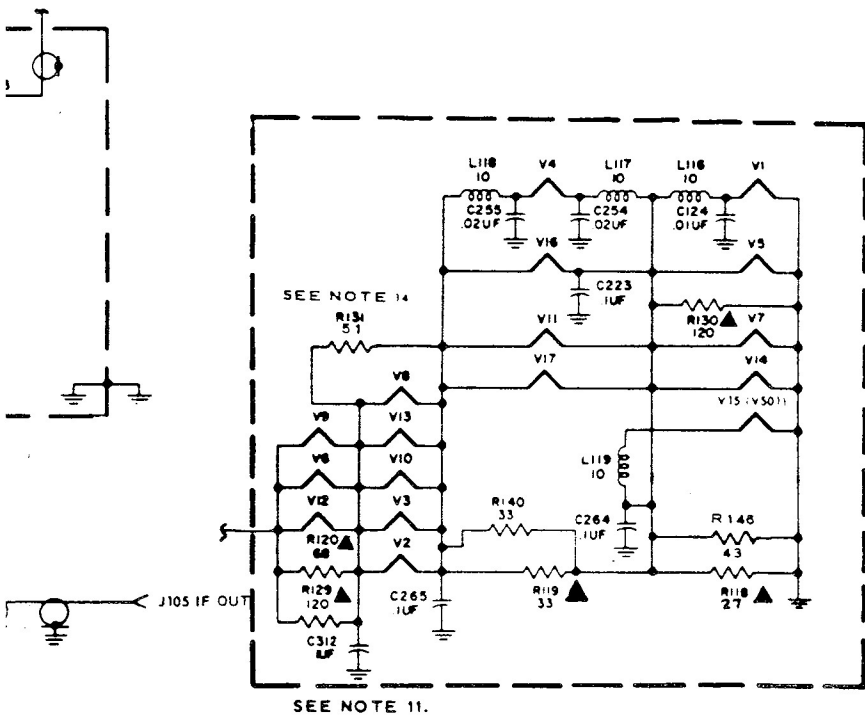
1. REMOVE JUMPER IF ACCESSORY LOW FREQUENCY
2. TEMPERATURE COMPENSATING CAPACITORS, V1
3. THESE CONTACTS ARE PART OF WAFERS IN TUR
4. COMPONENTS SHOWN IN DASHED LINES ARE TO E
5. ONLY REPRESENTATIVE COMPONENTS ARE SHOWN
6. PART OF TURRET WAFER, CLOSED ONLY FOR 14
7. PART OF TURRET WAFER, CLOSED ONLY ON 2-3
8. UNLESS OTHERWISE INDICATED, RESISTANCES AR
9. NO GROUND ON COAXIAL SHIELDS WITHIN OSCILL
10. UNUSED CONNECTOR FACILITIES ARE J2, J3, J4,
11. SCHEMATIC ADDENDUM FOR UNITS USING 70K-7 O
12. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE
13. ALTERNATE METER RECTIFIER INSTALLED IN SI
14. MODIFIED BY SERVICE BULLETIN GTM-D-133-01
15. IN SOME MODELS, C503 MAY BE FIXED VALUE, F



**Figure 7-1. G133F HF Receiver (Sheet 2 of 2)  
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- REMOVE JUMPER IF ACCESSORY LOW FREQUENCY TUNER IS USED.
- TEMPERATURE COMPENSATING CAPACITORS, VALUES SELECTED IN MANUFACTURE.
- THESE CONTACTS ARE PART OF WAFERS IN TURRET.
- COMPONENTS SHOWN IN DASHED LINES ARE TO BE ADDED FOR USE WITH ACCESSORY EXTERNAL FREQUENCY STABILIZERS.
- ONLY REPRESENTATIVE COMPONENTS ARE SHOWN. THE R.F. CIRCUITS SCHEMATIC DIAGRAM SHOWS ALL COMPONENTS IN TURRET. SEE FIGURE 7-3.
- PART OF TURRET WAFER, CLOSED ONLY FOR 14 TO 30 MC OPERATION.
- PART OF TURRET WAFER, CLOSED ONLY ON 2-3 MC BAND.
- UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICROFARADS AND INDUCTANCES ARE IN MICROHENRYS.
- NO GROUND ON COAXIAL SHIELDS WITHIN OSCILLATOR SUBASSEMBLY.
- UNUSED CONNECTOR FACILITIES ARE J2, J3, J4, J9 AND J12.
- SCHEMATIC ADDENDUM FOR UNITS USING 70K-7 OSCILLATOR.
- UNLESS OTHERWISE SPECIFIED, RESISTORS ARE  $\pm 10\%$ , 1/2 WATT (SEE LEGEND).
- ALTERNATE METER RECTIFIER INSTALLED IN SOME UNITS.
- MODIFIED BY SERVICE BULLETIN GTM-D-133-01
- IN SOME MODELS, C503 MAY BE FIXED VALUE, FACTORY SELECT



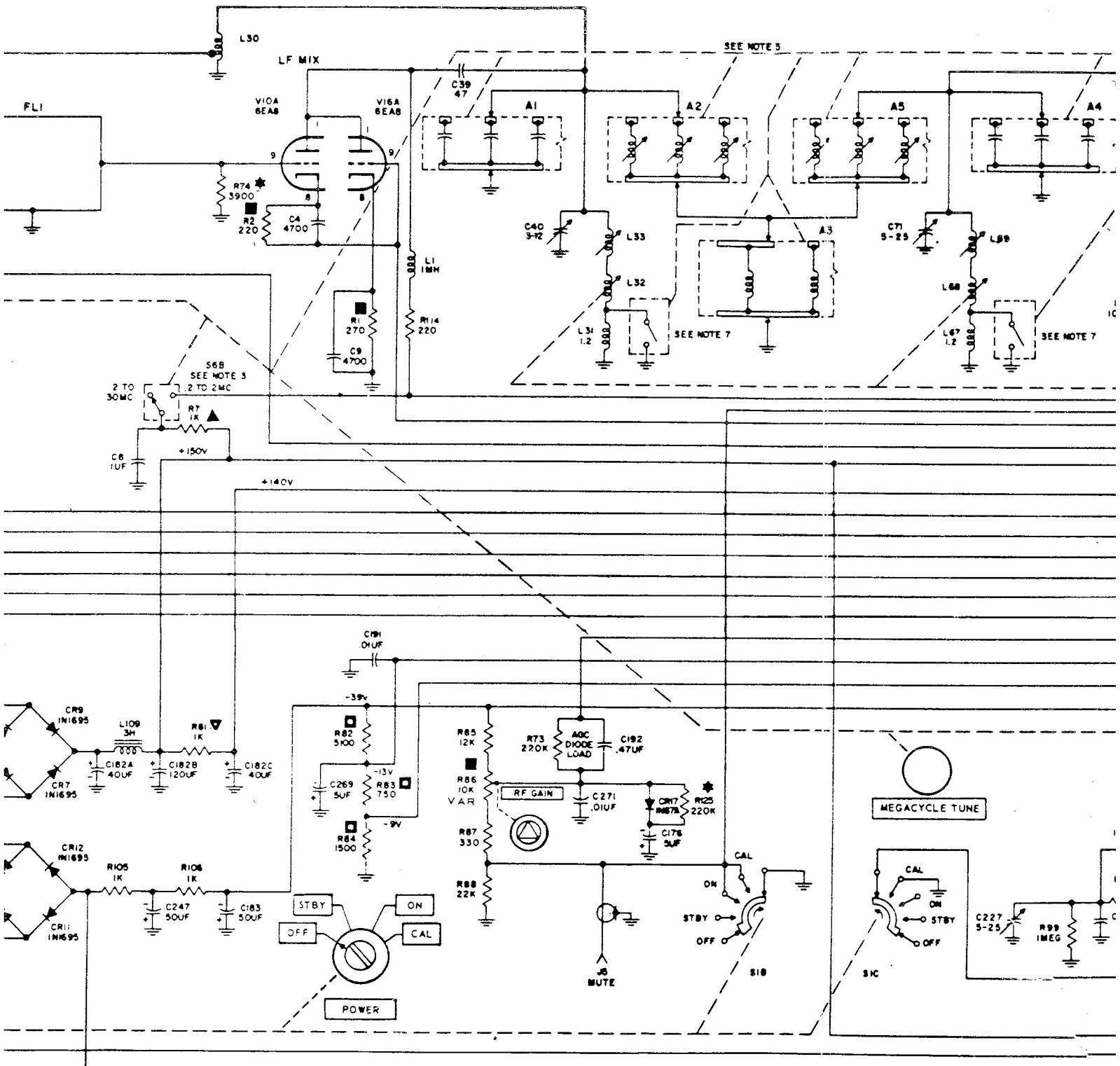
**RESISTOR LEGEND**

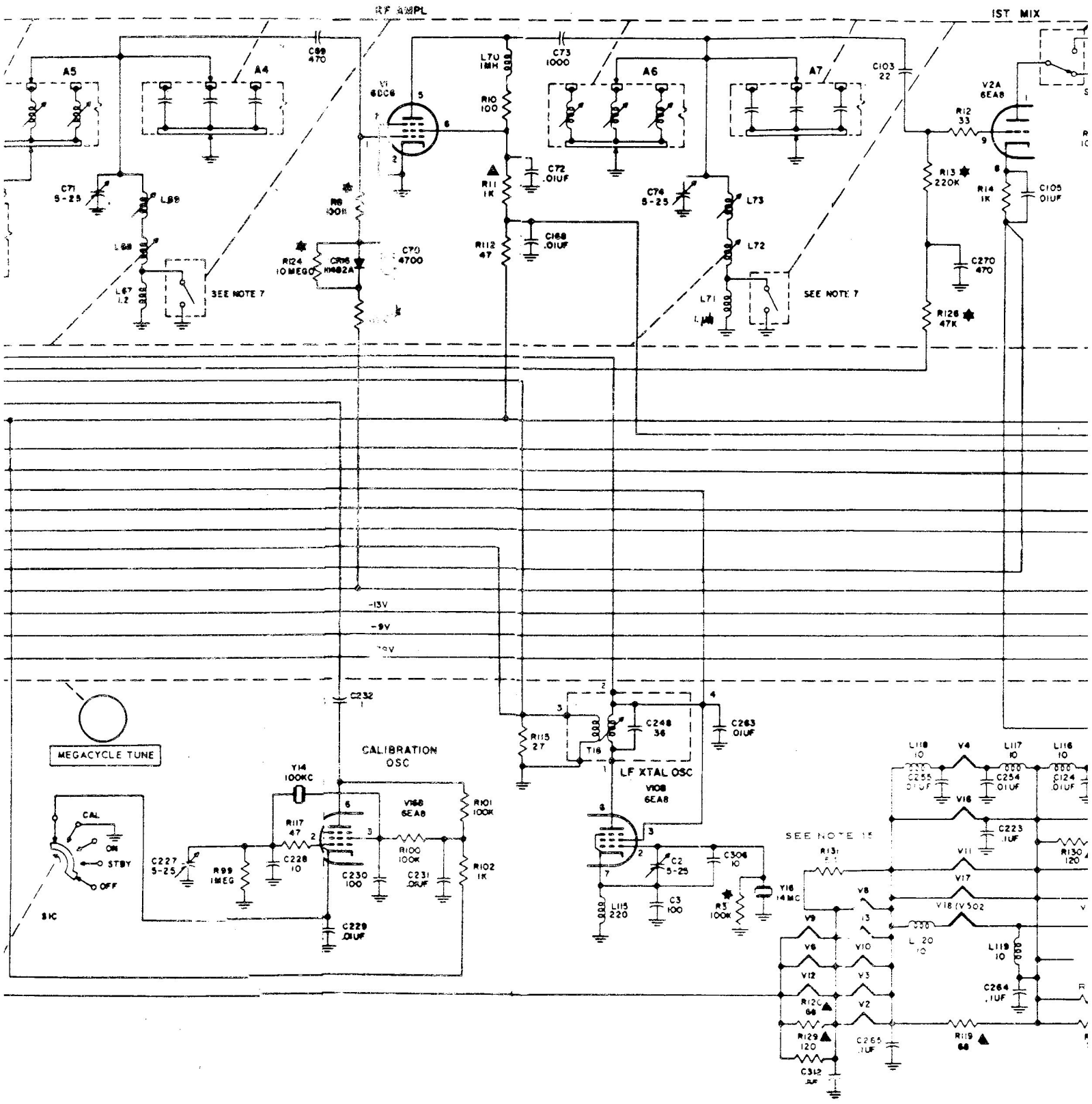
- 5%, 1/2 WATT
- ★ 10%, 1/4 WATT
- ▲ 10%, 1 WATT
- ▼ 10%, 2 WATT
- 30%, 3/4 WATT

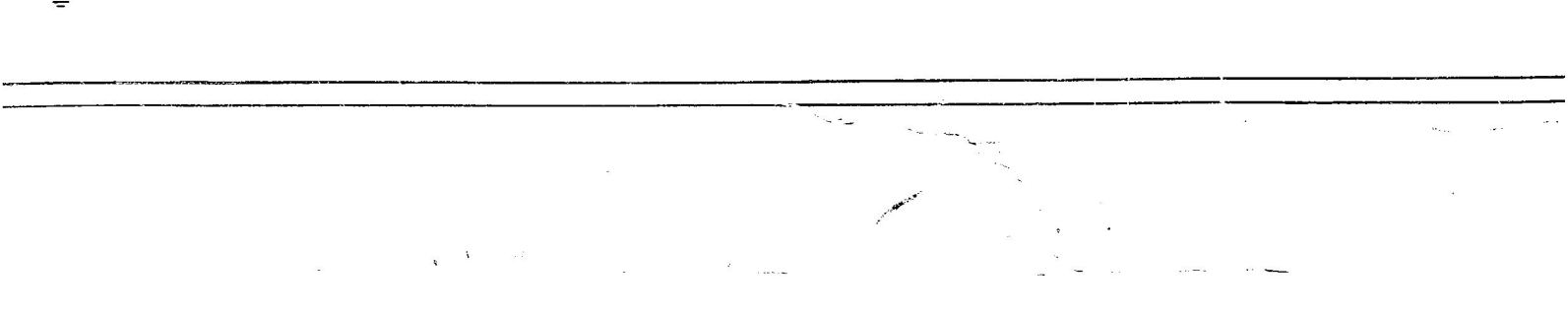
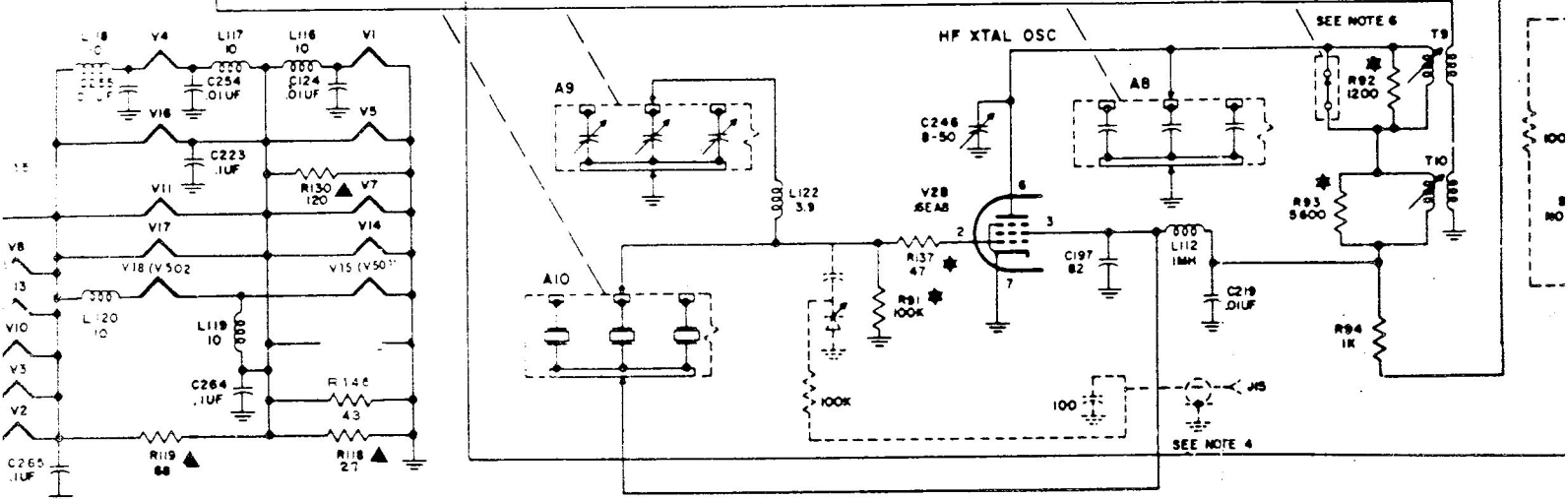
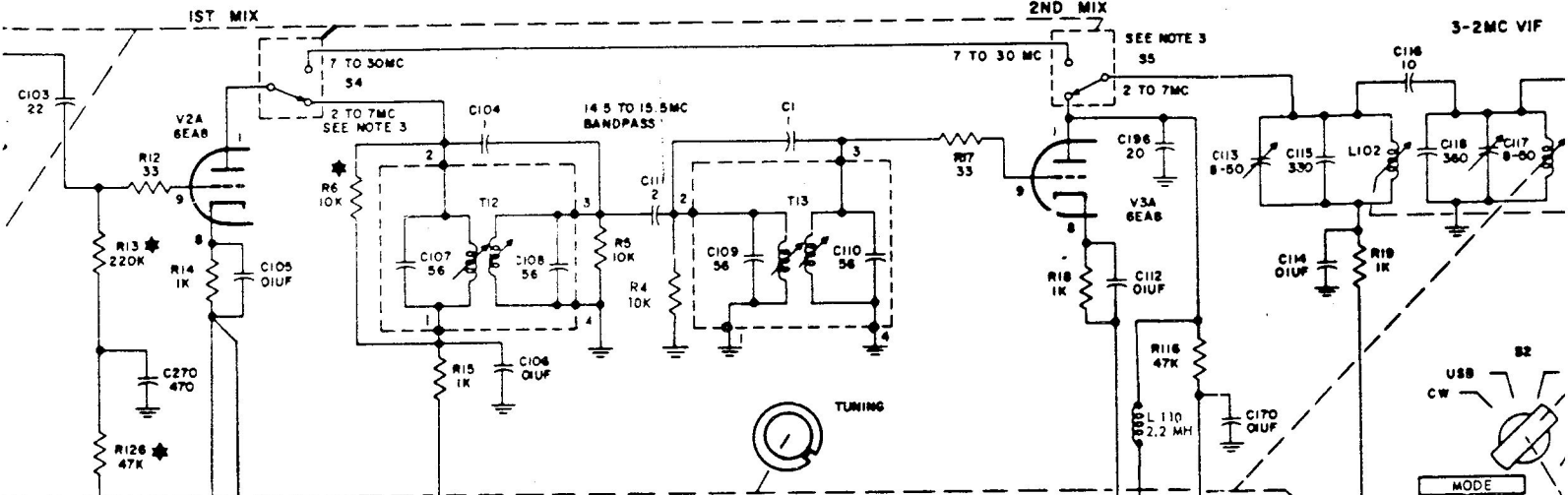
Figure 7-1. G133F HF Receiver (Sheet 2 of 2)

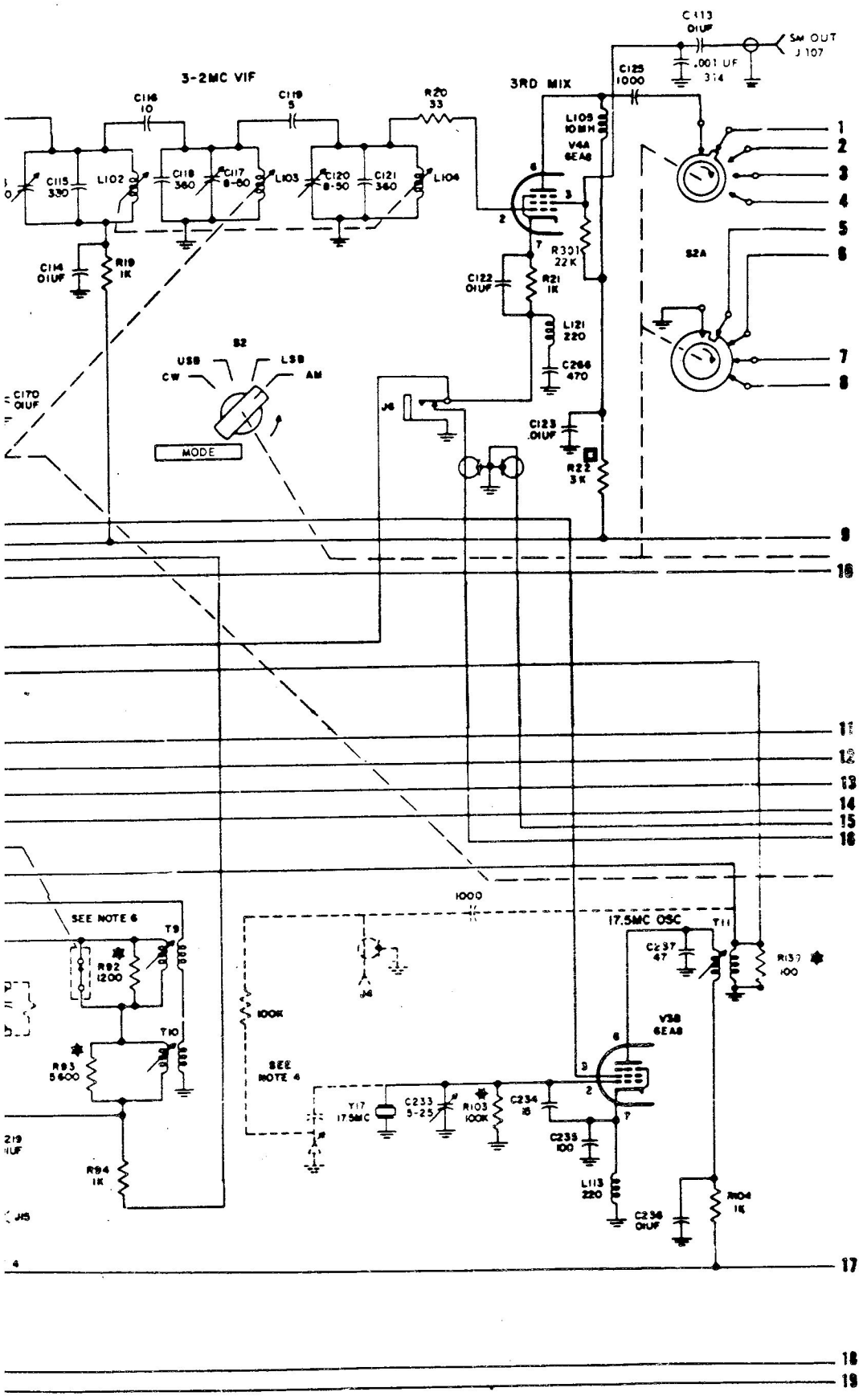
FOR OFFICIAL USE ONLY

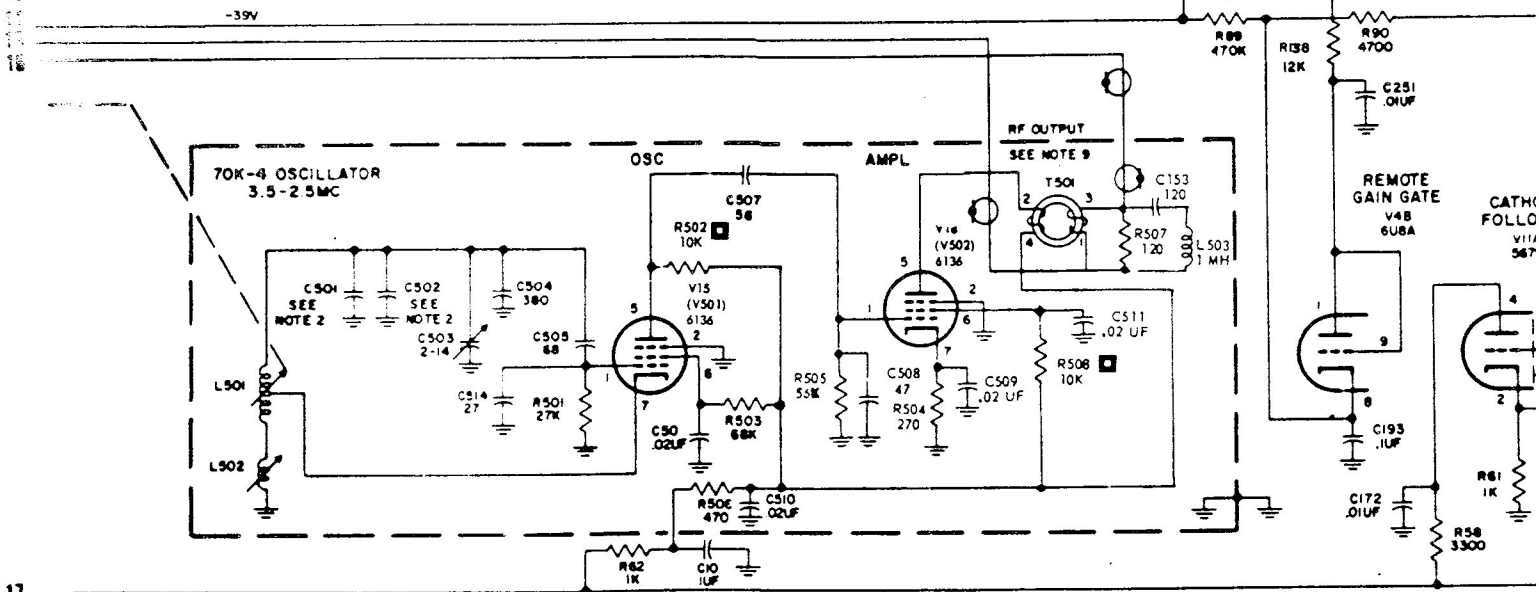
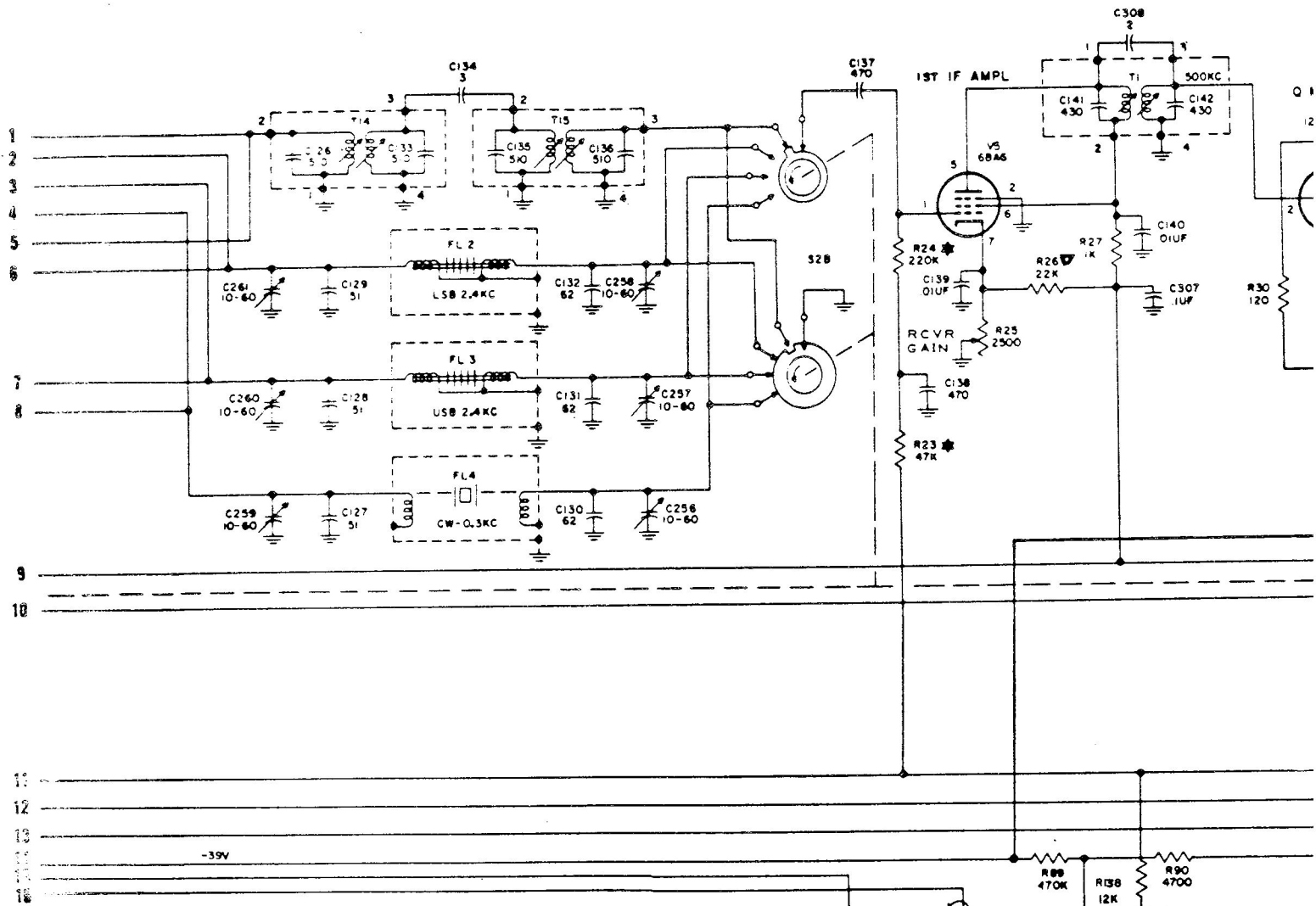
Change 4 7-3/7-4

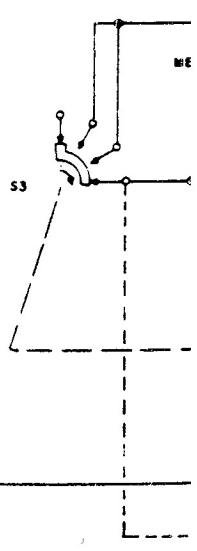
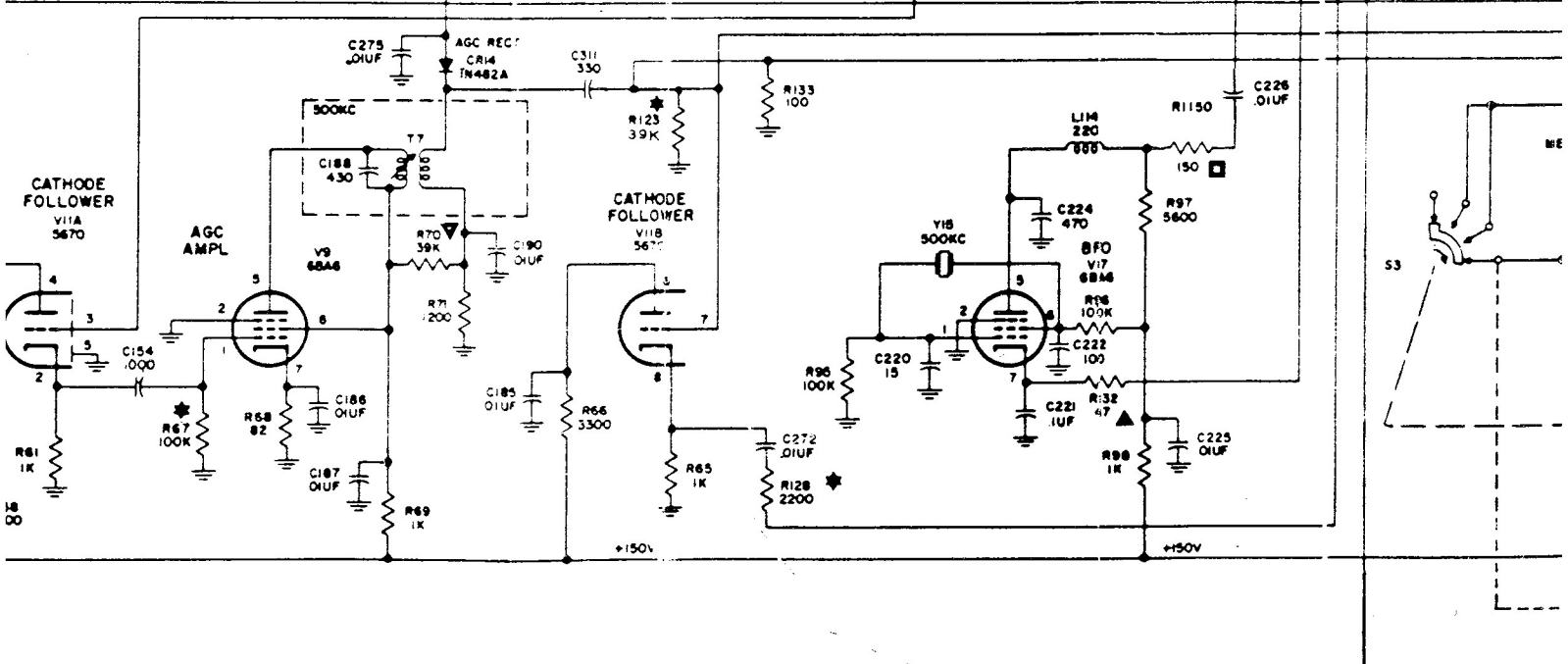
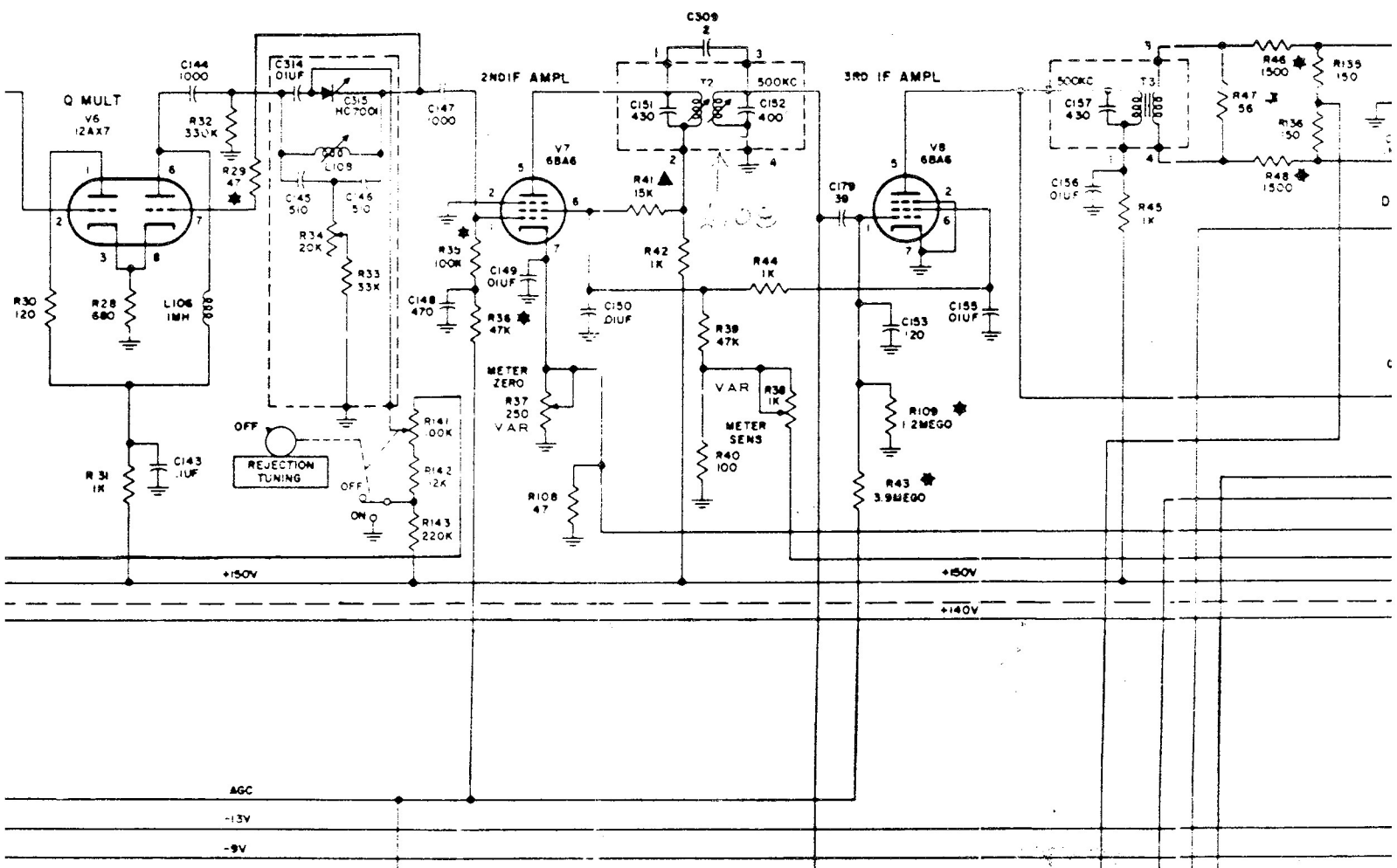


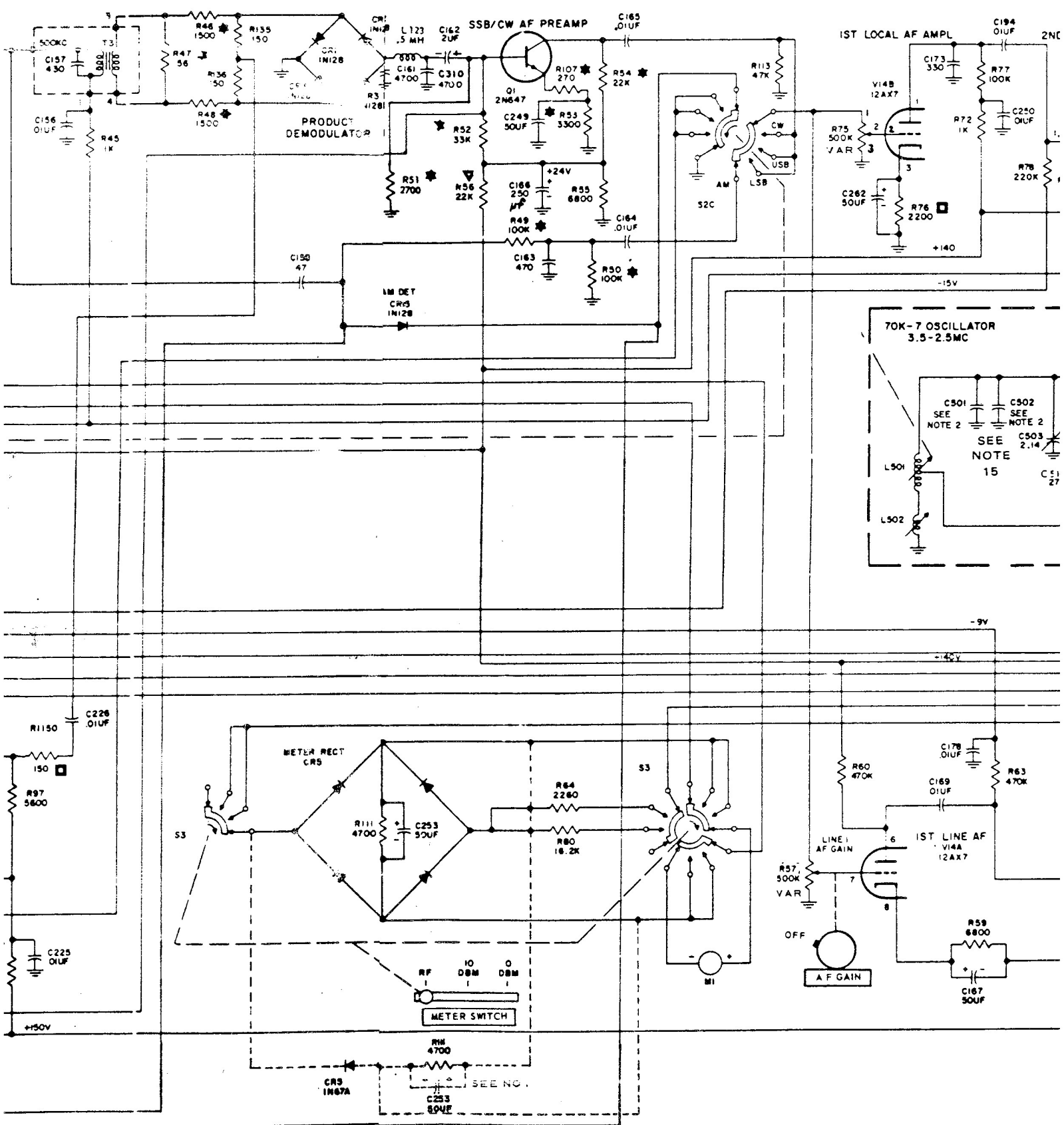








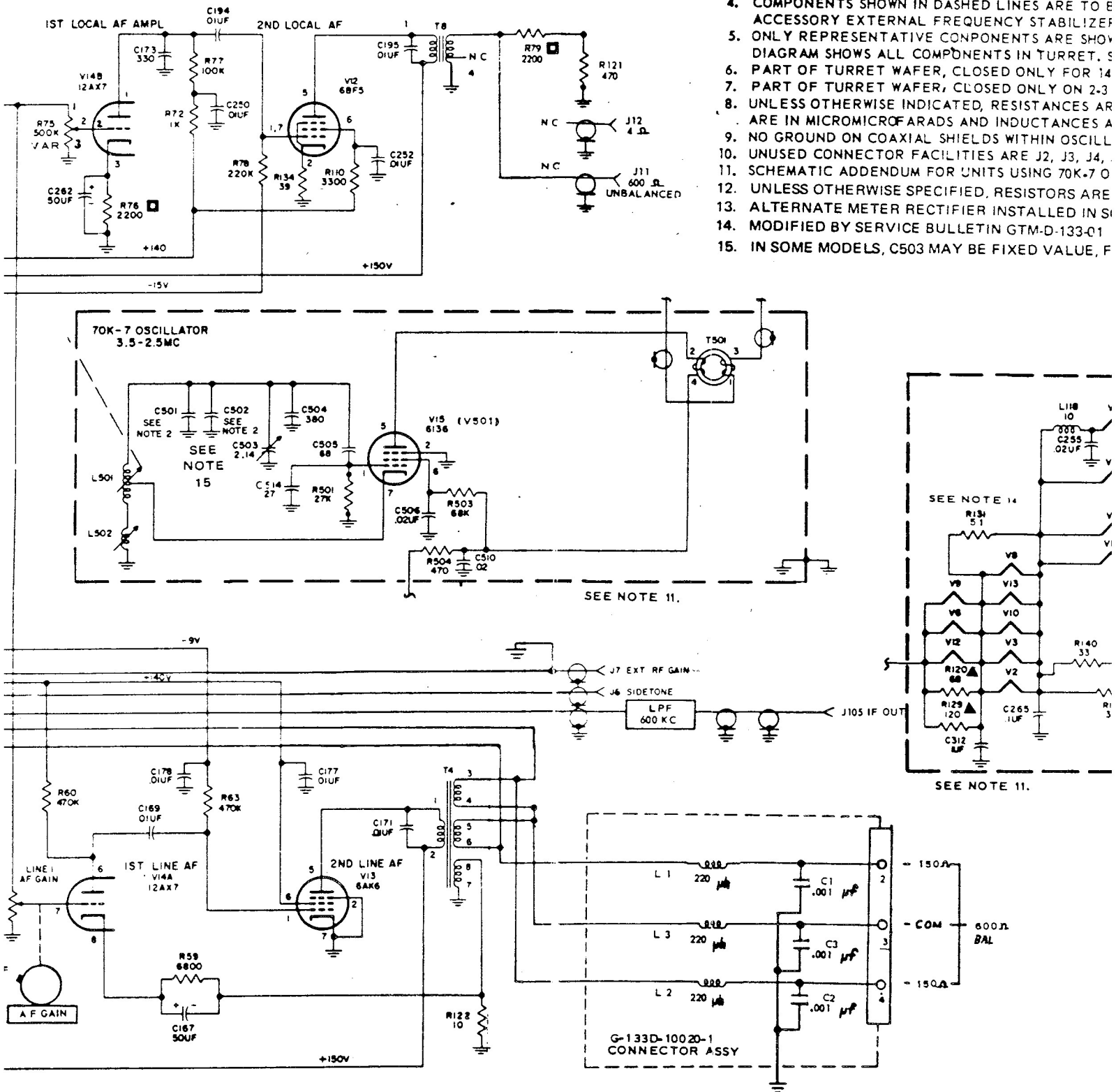






**NOTES:**

1. REMOVE JUMPER IF ACCESSORY LOW FREQU
2. TEMPERATURE COMPENSATING CAPACITORS, V
3. THESE CONTACTS ARE PART OF WAFERS IN TUR
4. COMPONENTS SHOWN IN DASHED LINES ARE TO E
5. ONLY REPRESENTATIVE COMPONENTS ARE SHOV
6. PART OF TURRET WAFER, CLOSED ONLY FOR 14
7. PART OF TURRET WAFER, CLOSED ONLY ON 2-3
8. UNLESS OTHERWISE INDICATED, RESISTANCES AR
9. NO GROUND ON COAXIAL SHIELDS WITHIN OSCILL
10. UNUSED CONNECTOR FACILITIES ARE J2, J3, J4,
11. SCHEMATIC ADDENDUM FOR UNITS USING 70K-7 O
12. UNLESS OTHERWISE SPECIFIED, RESISTORS ARE
13. ALTERNATE METER RECTIFIER INSTALLED IN SI
14. MODIFIED BY SERVICE BULLETIN GTM-D-133-01
15. IN SOME MODELS, C503 MAY BE FIXED VALUE, F



**Figure 7-1. G133F HF Receiver (Sheet 2 of 2)  
FOR OFFICIAL USE ONLY**



# SECTION IV

## THEORY OF OPERATION

### 4-1. GENERAL

The G133F Receiver is shown in block diagram form in figures 4-1 and 4-2. The G133F covers the frequency range from 0.2 to 30 megacycles. Both double-conversion and triple-conversion are used. Triple-conversion is used for the 0.2-mc to 7-mc bands, and double-conversion is used for the 7-mc to 30-mc bands. For 7-mc to 30-mc operation the 14.5-mc to 15.5-mc bandpass network and second mixer are bypassed.

The G133F utilizes a built-in low frequency converter to tune frequencies below 2 mc. The tuning mechanism, counter dials, and turret are arranged so that the two lowest bands, 0.2 to 1 mc and 1 to 2 mc, use the 28-mc to 29-mc and the 29-mc to 30-mc bands of the receiver as a variable i-f (conversion) frequency. As the MEGACYCLE counter is reduced in setting below 2 mc (lowest band on the turret), a segment switch S6 connects the low frequency converter and its low pass filter between the antenna and the turret input, which is now the 29-mc to 30-mc band. When the MEGACYCLE counter setting is reduced below 1 mc, the segment switch S6 maintains the low frequency converter connection, but the turret is changed to the 28-mc to 29-mc band. In this manner, the 28 positions of the turret plus the two positions of overtravel provide 30 frequency bands, each 1-megacycle wide. The 0.2-mc limitation of the lowest band is a function of the frequency rolloff in the low pass filter and low frequency losses in the mixer.

The electronic package of the G133F is shown in block diagram form in figure 4-2. This assembly prepares the local oscillator frequencies of the receiver for processing by external equipment to accurately determine the tuned frequency of the G133F. During receiver operation in the first seven frequency ranges (0.2-7 mc), the output of the high frequency crystal-controlled oscillator is mixed with the output of either the 17.5-mc oscillator or the low frequency crystal-controlled oscillator (depending on which one is in use), and the resulting mixed frequency is applied to a notch filter (see figures 4-3 and 4-4). The notch filter attenuates the basic crystal oscillator frequencies of 8.5, 9.5, and 10.5 mc of the receiver which appear in the mixer output. These frequencies closely approximate the desired output frequency during some receiver operating modes and must therefore be suppressed. The notch filter has lumped constant components which attenuate all frequencies above 9.5 mc so that they will be suppressed in the output. During

operation in the remaining 23 frequency ranges (7-30 mc), the low frequency crystal-controlled oscillator and 17.5-mc oscillator are off, and the output of the high frequency crystal-controlled oscillator goes through the by-pass circuit to the electronic switch. The output of the electronic switch is amplified and applied to output jack J1101 of the electronic package. The output of the variable frequency oscillator, which functions during operation in all 30 bands, is applied through a Darlington amplifier to output jack J1102 of the electronic package. The outputs of J1101 (3 to 32 mc) and J1102 (2.5 to 3.5 mc) are routed to external equipment which accurately determines the G133F tuned frequency. The G133F13000-1 Oscillator Assembly provides BFO operation in the AM mode.

### 4-2. DARLINGTON AMPLIFIERS

There are three Darlington amplifiers in the electronic package, one for the output of each receiver oscillator except the HF crystal oscillator. The output of the HF crystal oscillator is capacitively coupled to the base of Q01. The Darlington amplifier is a two-transistor cascaded emitter follower (see figure 7-2). Each amplifier provides more than 60-db of decoupling between input and output. Because of the low output impedance of this circuit, output voltages and waveforms are not affected by cable lengths of 25 feet or less. The amplifiers are encapsulated in epoxy resin, and are shown in enclosures on the schematic diagram of the electronic package, figure 7-2.

### 4-3. DETAILED THEORY OF OPERATION

A detailed description of the operation of the circuits of the G133F Receiver is given in the following paragraphs. Figure 7-1 is a schematic diagram of the G133F Receiver.

### 4-4. R-F INPUT TUNING

Signals from the antenna are applied to connector J106 and are routed through switch S6 to impedance-matching transformer L30. The output of L30 is coupled to the first section of the double-tuned input network (see figure 4-6). The double-tuned input circuits are composed of capacitors C40 and C71; chokes L33, L32, L31, L69, L68, L67; and the detailed parts mounted on turret wafers A1 through A5. All r-f section detailed parts and turret wafers



# G133D11000-2 ELECTRONIC PACKAGE, BLOCK DIAGRAM

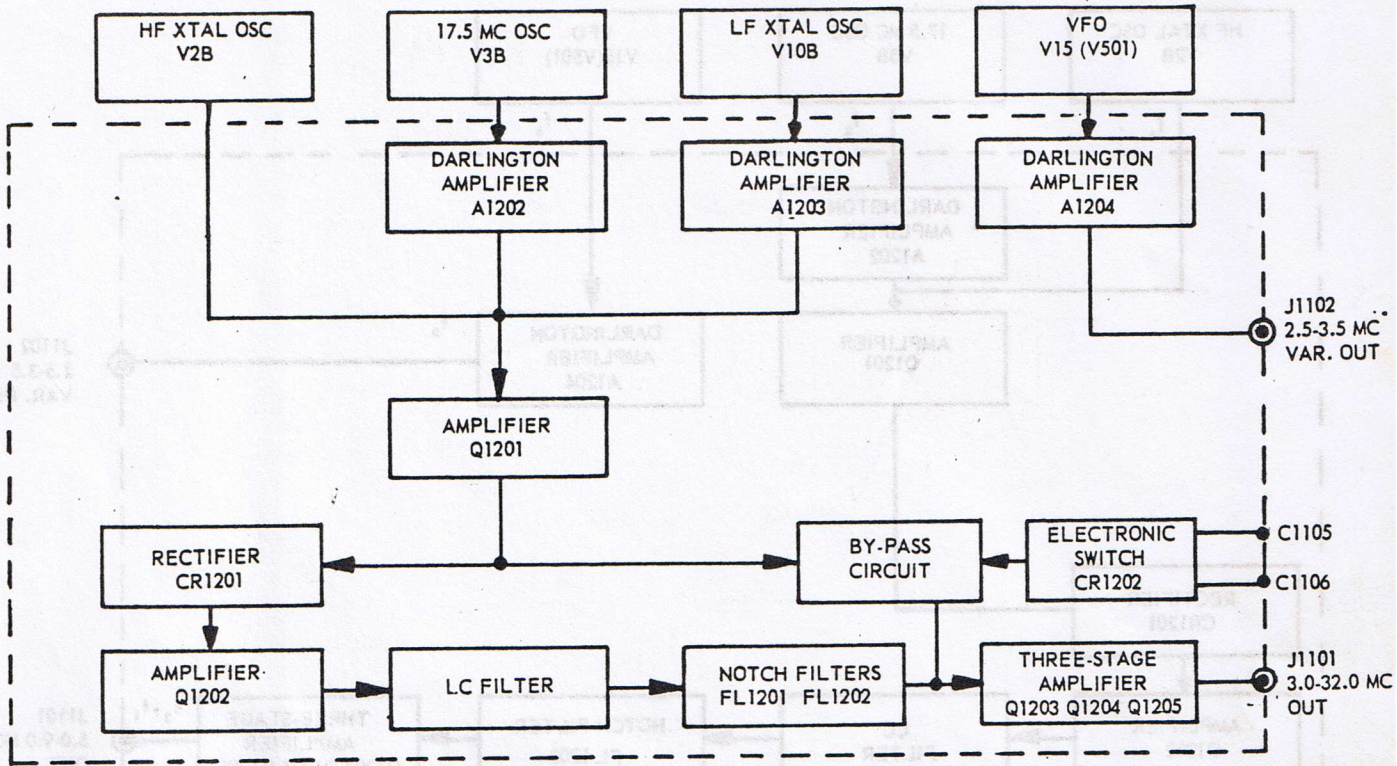


Figure 4-2

# G133D11000-2 ELECTRONIC PACKAGE, PARTIAL BLOCK DIAGRAM

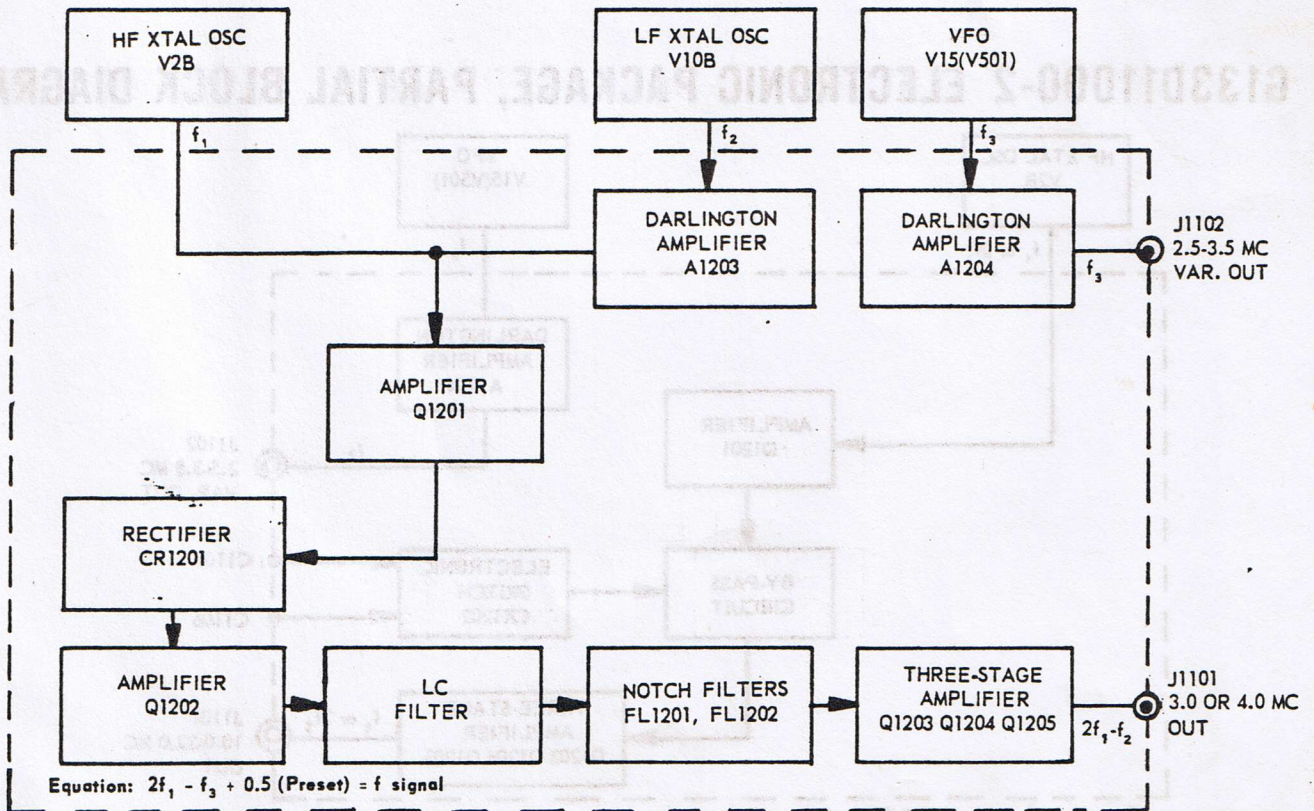


Figure 4-3



# G133D11000-2 ELECTRONIC PACKAGE, PARTIAL BLOCK DIAGRAM

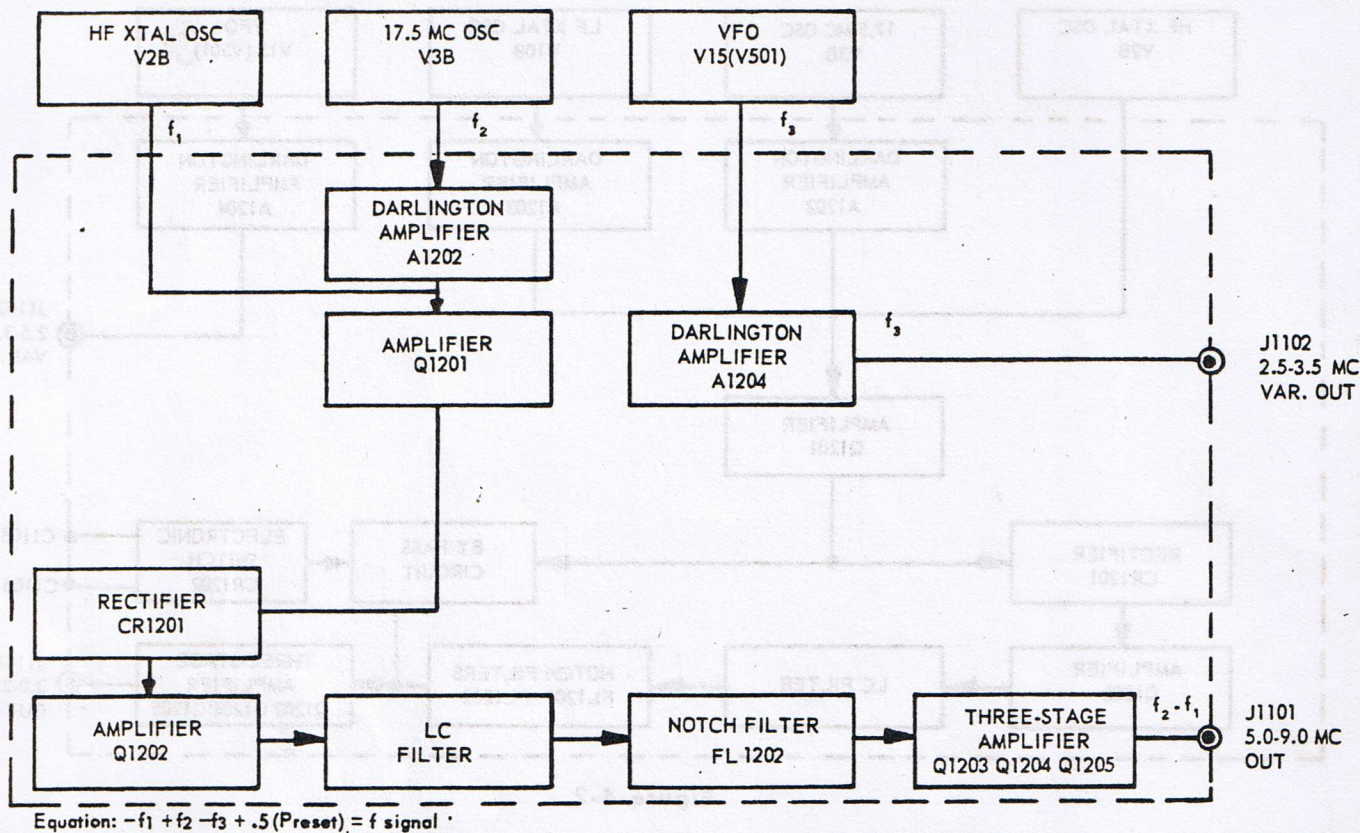


Figure 4-4

# G133D11000-2 ELECTRONIC PACKAGE, PARTIAL BLOCK DIAGRAM

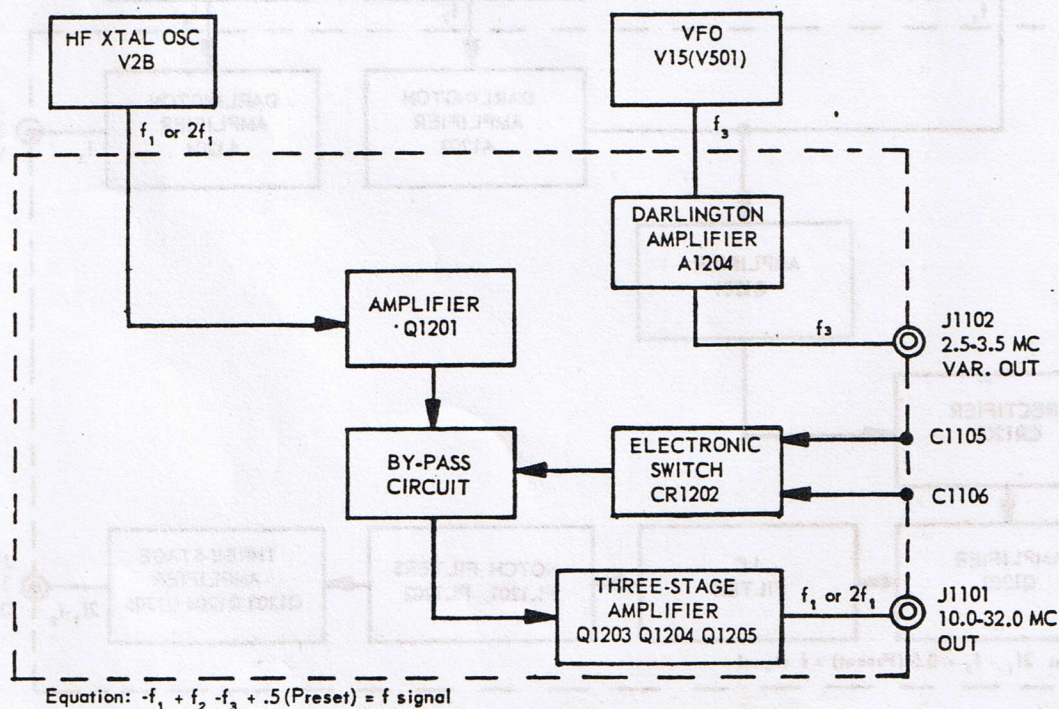


Figure 4-5