INSTRUCTION BOOK

FOR

MODEL 1400

SPECIAL PURPOSE RECEIVER

NEMS-CLARKE COMPANY
A Division of Vitro Corporation of America
SILVER SPRING, MARYLAND

PERFORMANCE SPECIFICATIONS

The following table lists the performance specifications of the Model 1400 Receiver.

Frequency Range	216-245 megacycles, determined by plug-in crystals.
Input Impedance	50 ohms, nominal.
Noise Figure	Less than 7 db.
IF Rejection	Greater than 60 db.
Image Rejection	Greater than 48 db without the use of band-restricting filter.
First Local Oscillator	Crystal controlled.
Second local oscillator	Tunable over a frequency range about the second IF frequency of ± 150 kc.
IF Frequency	30 mc, first IF 5 mc, second IF
IF Bandwidth	Wide band--500 kc bandwidth at 3-db points. Attenuation ± 500 kc from center frequency greater than 60 db. Narrow band--100 kc bandwidth at 3-db points. Attenuation ± 250 kc from center frequency greater than 60 db.
Noise Quieting	500 Kc IF Passband 7 uv to produce 20 db quieting. With 2500 cps low-pass filter at output, 1.8 uv produces 20 db quieting. 100 Kc IF Passband 3.5 uv to produce 20 db quieting. With 2500 cps low-pass filter at output, 1.3 uv produces 20 db quieting.
Signal to Noise Ratio	500 Kc Passband S/N ratio is 40 db for 2 uv of input carrier when carrier is modulated ± 100 kc at a 1000 cps rate. 100 Kc Passband S/N ratio is 40 db for 1.5 uv of input carrier when carrier is modulated ± 50 kc at a 1000 cps rate. The above S/N ratios are measured with a 2500 cps RC low-pass filter at the receiver video output.
A. M. Rejection	50% AM reference carrier deviation ± 100 kc 400 cps -- 10 kc greater than 50 db 10 kc -- 30 kc greater than 35 db 30 kc -- 80 kc greater than 25 db
Discriminator	Linear to better than one percent over a bandwidth of ± 150 kc.
Video Output	Sensitivity--0.16 volt per kc of deviation Frequency response within 3 db DC coupled--zero to 100 kc per second AC coupled--10 cps to 100 kc per second
Distortion	Maximum of 1% from 500 to 15000 cps Maximum of 2.5% from 15000 to 40000 cps Maximum of 4.0% from 40000 to 100,000 cps
Panadapter Output	Provision for connecting into a 30-mc panadapter.
Frequency Deviation Meter	Peak reading over frequency range from 400 to 80,000 cps. Three scales 25, 75 and 150 kc.
External Field Strength Meter	Output 10 milliamperes into 500-ohm load.
Size	8 3/4" x 19" x 15 3/4"
Weight	Approximately 40 lbs.
Power Input	117v AC, 60 cycles, approximately 150 watts.

Table 1-1. Performance Specifications

Symbol	Tube Type	Equivalent Standard Type	Function
V-101	5814A	12AU7	Video amplifier
V-102	6AH6	6AH6	Deviation meter amplifier
V-103	5814A	12AU7	Audio amplifier
V-104	6CL6	6CL6	Video output cathode follower
V-105	OA2Wa	OA2	Voltage regulator
V-106	5814A	12AU7	Meter D.C. amplifier
V-201	5842/417A	5842/417A	R.F. amplifier
V-202	5654/6AK5W	6AK5	1st Mixer
V-203	5654/6AK5W	6AK5	Buffer amplifier
V-204	5654/6AK5W	6AK5	Tripler
V-205	5654/6AK5W	6AK5	Amplifier
V-206	6BZ7	6BZ7	Crystal oscillator-doubler
V-207	6AU6WA	6AU6	Second oscillator
V-208	6AU6WA	6AU6	Buffer amplifier
V-209	6AU6WA	6AU6	Second mixer
V-210	5749/6BA6W	6BA6	30 mc IF amplifier
V-301	6AU6WA	6AU6	100 kc IF amplifier
V-302	6AU6WA	6AU6	100 kc IF amplifier
V-303	6AU6WA	6AU6	100 kc IF output
V-304	6AU6WA	6AU6	500 kc IF amplifier
V-305	6AU6WA	6AU6	500 kc IF amplifier
V-306	6AU6WA	6AU6	500 kc IF output
V-401	6BN6	6BN6	1st limiter
V-402	6BN6	6BN6	2nd limiter
V-403	6AU6WA	6AU6	Amplifier
V-404	5726/6AL5W	6AL5	Discriminator

Table 1-2. Tube Complement

SECTION 1

GENERAL DESCRIPTION AND PERFORMANCE

1. INTRODUCTION.

The Model 1400 was designed to meet the need for a high performance receiver to be used in the ground station of telemetering installations. Specifications for this receiver were determined by engineers actually engaged in telemetry system development with the object of designing a receiver equally suitable for FM/FM or PWM/FM telemetering. The diverse bandwidth requirements of these telemeters necessitated the inclusion of two IF amplifiers in the receiver. By the use of a 100 kc wide IF amplifier for the reception of PWM/FM data, increased range is obtained and a greater number of telemeters can be accommodated in a given band. A 500 kc wide IF amplifier is provided for the recovery of FM/FM data. Both amplifiers have extremely steep skirts so a minimum guard band between telemeters is required to prevent interference.

The first local oscillator of the Model 1400 uses a quartz crystal in a constant temperature oven to give a high degree of frequency stability. In the second local oscillator, which operates at 25 megacycles, careful construction and temperature compensation result in excellent frequency stability. The combined result is a receiver with an accurately known stable operating frequency that can be changed by replacing the crystal and oven assembly that plugs into the front panel. When used with a crystal-controlled transmitter, the reduction in carrier frequency drift reduces the bandwidth requirement of the telemeter to a minimum.

2. DESCRIPTION OF EQUIPMENT.

The Model 1400 Receiver is designed for mounting in a standard 19-inch relay rack. If desired, a bracket and slide assembly is available which permits the receiver to be withdrawn from the rack and tilted at either 45 or 90 degrees to facilitate service and repairs.

All connections to the receiver are made on the rear apron. BNC connectors are provided for antenna input, panadapter, and capacitor coupled video output. Other connections can be made to a six-terminal barrier strip. These include a second capacitor coupled video output, a direct coupled video output, and a current output for operating a 10 MA signal strength recorder. The power connection for the cooling fan is also located on the rear of the receiver. This fan, which is built into the removable dust cover, is thermostatically controlled to operate when the internal temperature of the receiver exceeds 80° F.

All operating controls are located on the front panel of the Model 1400. These include tuning, IF selector switch, gain control for the built-in audio monitor, and range switch for the frequency deviation meter. Two other meters are provided to indicate correct tuning of the receiver and the approximate signal input in microvolts.

Subchassis construction has been used extensively in the Model 1400. The RF stage, first mixer, crystal oscillator and multipliers, first IF amplifier, second mixer, and second oscillator are constructed on one subchassis. Another subchassis contains the 100 and 500 kc wide IF strips while the limiter and discriminator stages are built on the third. Power supply and video amplifiers are mounted on the main chassis with terminal boards to hold the components where practical. Because of this construction the receiver, although compact, has component parts which are easily accessible for trouble shooting and repairs. Alignment has been facilitated by the use of permanent test points throughout the equipment. These decoupled points are useful in connecting test equipment to the receiver.

SECTION 2

THEORY OF OPERATION

1. GENERAL.

The Model 1400 is a double superheterodyne receiver covering the frequency range 216 to 245 megacycles by changing plug-in crystal and oven assemblies. It is intended for the reception of frequency-modulated signals only, having been designed for use in the ground stations of FM/FM and PWM/FM telemeters. To accommodate both systems effectively, a choice of second IF amplifiers is provided, having bandwidths of 100 kc and 500 kc, respectively. These amplifiers both have a high degree of skirt selectivity, which minimizes interference problems.

In designing the Model 1400, the reduction of receiver noise figure was given considerable attention, with the object of achieving increased range. In the receiver the RF stage determines the noise figure for all practical purposes. This amplifier uses a Western Electric 5842/417A in a grounded grid amplifier to achieve noise figures less than 7 db.

Image rejection also received considerable attention as part of an overall program to minimize susceptibility to unwanted signals. The receiver as supplied has an image rejection greater than 48 db. If increased image rejection is desired, there is an accessory filter available (Model F-10) which can be mounted on the rear of the receiver and connected in series with the antenna input. When using this filter, the image rejection is a minimum of 55 db at 216 mc and increases rapidly with frequency as shown in

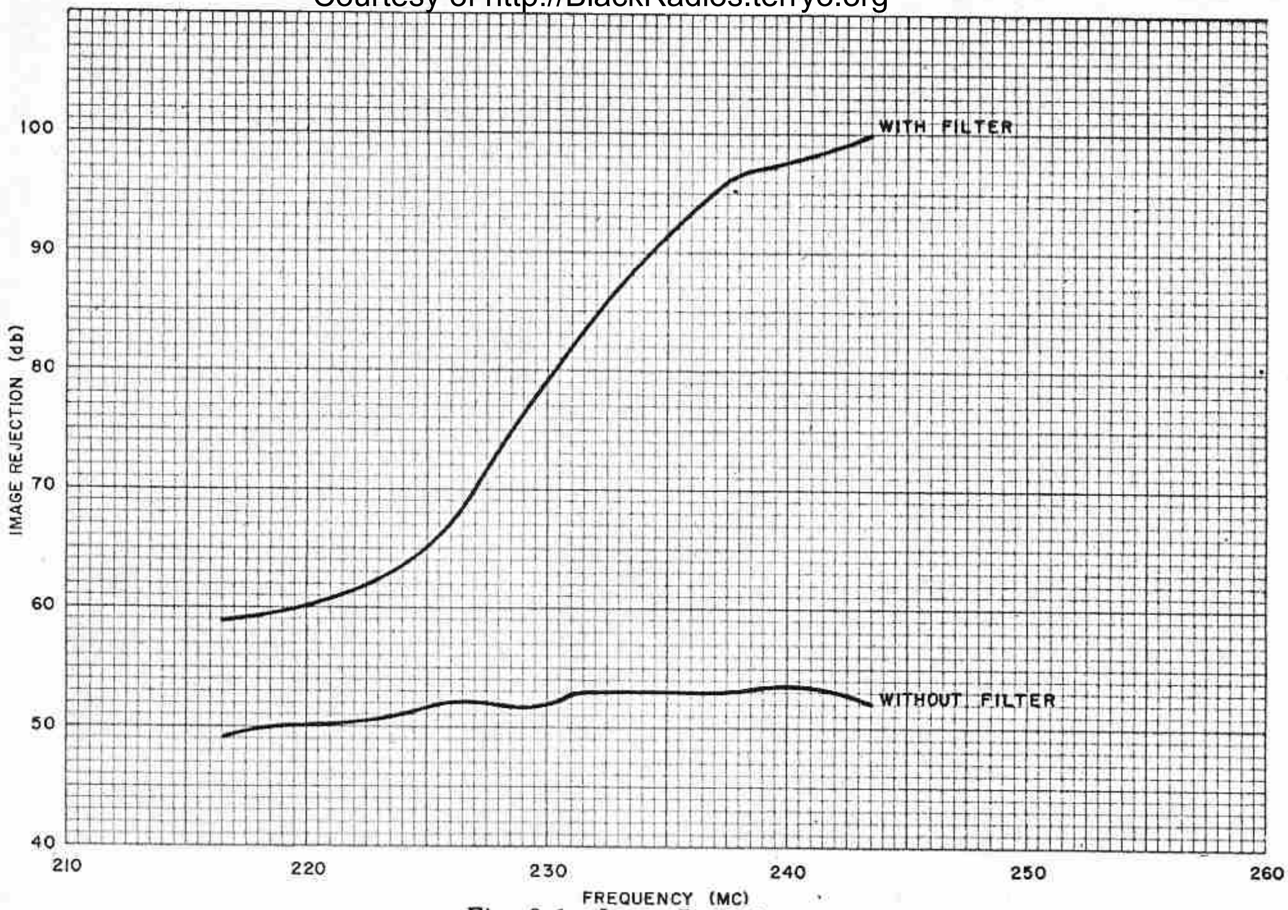


Fig. 2-1. Image Rejection

Fig. 2-1. Use of the filter will not increase the noise figure more than .5 db.

The following is a discussion of the theory of operation on a stage-to-stage basis. Reference to the block diagram, Fig. 2-2, is helpful in following a signal through the receiver.

2. RF AMPLIFIER.

To help achieve low noise performance, a Western Electric 5842/417A is used in a grounded grid circuit. The input is designed to work from a 50-ohm source, and the receiver noise figure thus measured is less than 7 db. A double tuned circuit is used to couple the plate of the RF amplifier to the grid of the mixer. This circuit is inductively tuned using two elements of a three-gang Mallory UHF Inductuner. Excellent tracking is maintained over the band by the use of trimming and padding coils. Primary and secondary circuits are coupled together with a capacitive "T" network with an adjustable shunt arm.

3. MIXER.

A triode-connected 6AK5 is used as a mixer to minimize adverse action on the receiver's noise figure. Neutralization of this circuit has been provided by using a balanced plate circuit and the neutralizing capacitor C-215. The oscillator signal is coupled via C-216 to the grid of the mixer. Oscillator injection is sufficient to cause a DC voltage of approximately 3 volts at the grid.

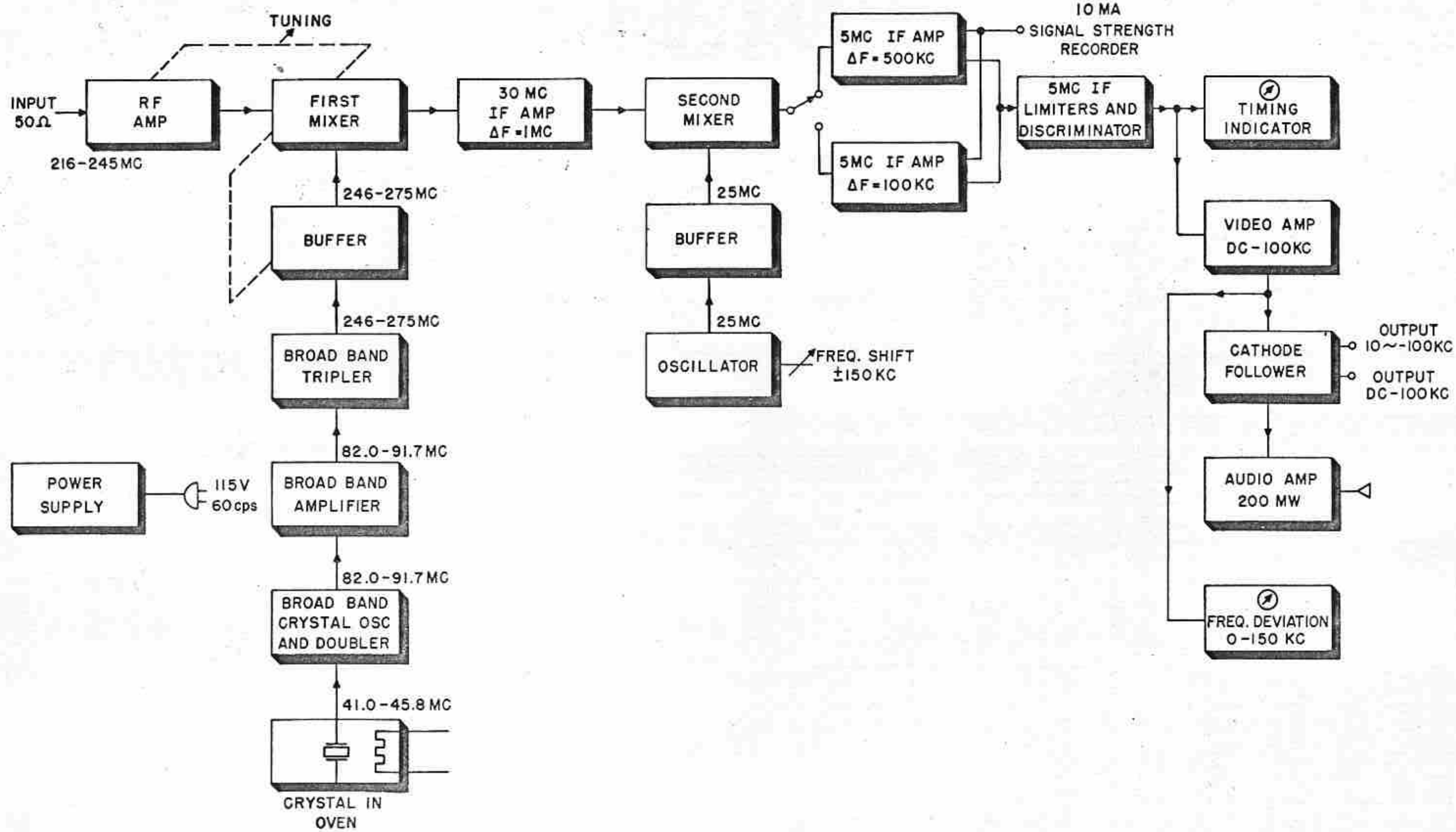


Fig. 2-2. Block Diagram, Model 1400 Receiver

4. FIRST LOCAL OSCILLATOR.

The first local oscillator of the Model 1400 is basically a crystal oscillator followed by a multiplier chain which multiplies the crystal frequency by a factor of 6. The crystal oscillator circuit is of the Butler type, operating the crystal at series resonance. Third-overtone crystals between 41 and 46 megacycles are used. The crystal is mounted in a constant-temperature oven to obtain the desired frequency stability of plus or minus 0.001% over an operating range of 0 to 120° F.

The main feature of the crystal oscillator and multiplier chain is that broad-band circuits are used up to the final tripler plate. This avoids the difficulties that would be encountered if all the tuned circuits were ganged together and had to track over the band. To accomplish this broad-band operation effectively, tubes that are capable of a large gain bandwidth product are used.

Doubling action is obtained in the plate of the cathode follower section of the Butler oscillator. The voltage is then amplified by V-203 to obtain sufficient drive to operate the tripler. After tripling, the output voltage is amplified by the buffer stage V-203. This stage has a plate tank circuit that is ganged with the RF tuning. The third section of the UHF inductuner is used for this purpose. With the exception of the buffer plate circuit, all other interstage networks are double-tuned circuits. Two advantages are gained from their use: higher gain, and increased rejection to submultiples of the local oscillator frequency.

5. THIRTY MEGACYCLE IF AMPLIFIER.

The 30-megacycle output of the first mixer is amplified by V-210. A 6BA6 semi-remote cutoff tube was chosen for this purpose, as this stage is the first to which AGC is applied. A double-tuned interstage network with a bandwidth of approximately 1 megacycle is used to couple the 30-megacycle amplifier to the second mixer.

6. SECOND MIXER.

The second mixer combines the output of the 30-megacycle amplifier with a 25-megacycle signal to produce a 5-megacycle output signal. Since the gain prior to this stage is sufficient to remove it from noise figure considerations, a pentode mixer is used. A double-tuned circuit is used in the plate of the second mixer to couple the 5-megacycle output to either the 100 kc or 500 kc wide second amplifier. As different double-tuned circuits are required, a common primary is provided that works with either of the 5-megacycle amplifiers.

7. SECOND LOCAL OSCILLATOR.

The second local oscillator is comprised of a 6AU6 electron coupled oscillator operating at 25 megacycles, and a buffer stage. Every effort has been made to realize the utmost in frequency stability in the oscillator circuit. The coil is of metallized glass construction which gives a small, stable, positive temperature coefficient of inductance. Temperature compensation by the use of negative coefficient capacitors results in an oscillator that is extremely stable with temperature. In most general cases the transmitter and receiver will not be operating at exactly the same frequency. It is therefore necessary that a small variation in frequency be obtainable in this oscillator to permit the receiver to be tuned to the transmitter. A vernier frequency range of ± 150 kilocycles is provided for this purpose.

8. FIVE MEGACYCLE IF AMPLIFIERS.

The two 5-megacycle IF amplifiers in the Model 1400 Receiver are similar except for bandwidth. Each is comprised of three 6AU6 amplifier stages and two M-derived filter networks. These networks are responsible for the extreme skirt selectivity of the amplifiers. AGC is applied to the first tube in each, and the current is brought out to the rear to operate an external signal strength recorder.

9. LIMITERS.

Two cascaded limiters are used in the Model 1400 to eliminate the effects of amplitude modulation; 6BN6 gated beam tubes are used for this purpose to obtain good limiting action without the use of grid time constants. The interstage networks are double-tuned circuits, and the approximate bandwidth from the grid of the first limiter to the grid of the discriminator driver stage is two megacycles. Wide band limiters are desirable from the standpoint of reducing co-channel interference effects. A germanium diode is used as an AGC rectifier at the grid of the first limiter. In addition, its output is used to operate the signal strength meter. A small amount of delay voltage is used on the diode. Adjustment of this voltage provides a means of setting up the low end of the signal strength meter.

10. DISCRIMINATOR AMPLIFIER AND DISCRIMINATOR.

Additional filtering is applied through the double-tuned circuit in the plate of the second limiter to V-403, in order to prevent undue distortion in the limiter's output to the discriminator. The discriminator amplifier drives a conventional phase discriminator. This discriminator has been carefully designed to minimize distortion. To accomplish this the positive and negative peaks of the "S" shaped response curve are separated 750 kilocycles. What small distortion is generated in the discriminator has been phased in such a manner that the video amplifier aids in reducing it. As the zero point on the discriminator characteristic is as important in determining the operating frequency of the receiver as the first or second local oscillator, the discriminator has been carefully temperature compensated.

11. VIDEO AMPLIFIER.

The output of the discriminator is coupled through a voltage divider to the grid of one half of V-101. This voltage divider has a frequency response that can be controlled by C-101, an adjustment that is used to equalize the frequency response of the deviation meter. The output of the first video amplifier (one-half V-101) is used to drive the output cathode follower. A power tube (6CL6) is used for this purpose because the receiver is designed to work into fairly low capacitive impedances. The receiver will operate into a load consisting of 3,000 micromicrofarads in parallel with 10,000 ohms resistive. Both capacitive coupled and direct coupled outputs are provided.

12. AUDIO AMPLIFIER.

A signal for driving the audio amplifier stage is taken from the cathode of V-104. This signal is coupled through the audio gain control to the grid one half of V-103. This stage operates a small speaker mounted on the front panel.

13. DEVIATION METER.

The other half of V-101 is used as a cathode follower to drive the deviation meter range switch located on the front panel of the receiver. A voltage from this divider is applied to the grid of V-102. The output of V-102 is used to operate the other half of V-103, which is connected as a cathode follower. The output of this follower is applied to a voltage doubler circuit using two germanium diodes. By using the proper time constant a meter indication is obtained which is proportional to the peak-to-peak value of the voltage input. The deviation meter is calibrated in terms of peak frequency deviation, one half this value.

14. TUNING INDICATOR.

The output of the discriminator is also used to drive half of V-106 as a cathode follower. The other half of V-106 is used as part of a bridge so that the output voltage is zero when the discriminator output is zero. If the discriminator output is positive or negative, the tuning meter will read accordingly. This is the condition for a CW or sinusoidally frequency-modulated signal when the receiver is off tune. When the output of the discriminator is a series of pulses of varying duty cycle, it is desirable to tune the receiver so the positive and negative excursions are equal. In effect, this centers the pass band of the receiver about the frequency variations of the transmitter. When such a waveform is applied to the grid of V-106, a similar output is obtained at the cathode with a much lower source impedance. This output is applied to two diode rectifiers with a meter connected in such a fashion that it indicates the difference between positive and negative peak voltages. Thus, when the meter is made to read zero, the desired condition of tuning exists in the receiver.

15. POWER SUPPLY.

The power supply of the Model 1400 uses a center tapped transformer and four silenium rectifiers in a bridge circuit to supply the various output voltages. These are 300 volts unregulated, 150 volts regulated, and 150 unregulated. The latter is obtained from the center tap of the same transformer driving the full wave bridge rectifier and uses the two rectifiers at the ground end of the bridge in a split-phase, full-wave rectifier. The regulated 150 volts is used where voltage stability is required, as in the second local oscillator and limiter. The filtering in this supply is not sufficient to accomplish an output signal to noise ratio needed under some conditions of operation. This has been overcome by coupling some of the output ripple voltage into the video amplifier in such a manner as to oppose the direct ripple voltage contribution.

SECTION 3

OPERATION

1. PRELIMINARY.

Connect the Model 1400 Receiver to a source of 115-volt 60-cycle AC current. Plug a crystal and oven assembly for the desired signal frequency into the front panel receptacle. Table 3-1 gives the crystal frequency to use for operating frequencies on the megacycle and half megacycle between 215.5 and 245 megacycles. The crystal for other operating frequencies can be determined using the following formula:

$$Fc = \frac{Fr + 30}{6}$$

Fc = Crystal frequency in megacycles

Fr = Receiver operating frequency in megacycles

Connect auxiliary equipment to the receiver using the terminals on the rear apron. This includes such equipment as a panadapter, signal strength recorder and subcarrier discriminators. The antenna should be connected to the antenna input jack, using an accessory low-pass filter if desired. Provisions are made for attaching the filter on the rear of the receiver.

Operating Frequency (mc)	Crystal Frequency (mc)	Operating Frequency (mc)	Crystal Frequency (mc)	Operating Frequency (mc)	Crystal Frequency (mc)
215.5	40.9166	225.5	42.5833	235.5	44.2500
216.0	41.0000	226.0	42.6666	236.0	44.3333
216.5	41.0833	226.5	42.7500	236.5	44.4166
217.0	41.1666	227.0	42.8333	237.0	44.5000
217.5	41.2500	227.5	42.9166	237.5	44.5833
218.0	41.3333	228.0	43.0000	238.0	44.6666
218.5	41.4166	228.5	43.0833	238.5	44.7500
219.0	41.5000	229.0	43.1666	239.0	44.8333
219.5	41.5833	229.5	43.2500	239.5	44.9166
220.0	41.6666	230.0	43.3333	240.0	45.0000
220.5	41.7500	230.5	43.4166	240.5	45.0833
221.0	41.8333	231.0	43.5000	241.0	45.1666
221.5	41.9166	231.5	43.5833	241.5	45.2500
222.0	42.0000	232.0	43.6666	242.0	45.3333
222.5	42.0833	232.5	43.7500	242.5	45.4166
223.0	42.1666	233.0	43.8333	243.0	45.5000
223.5	42.2500	233.5	43.9166	243.5	45.5833
224.0	42.3333	234.0	44.0000	244.0	45.6666
224.5	42.4166	234.5	44.0833	244.5	45.7500
225.0	42.5000	235.0	44.1666	245.0	45.8333

Table 3-1. Crystal Frequency

2. CONTROL SETTINGS

Set the "Tuning" dial on the front panel of the Model 1400 to the proper operating frequency. The "Freq." dial should be set to zero. Advance the "Audio Gain" control clockwise. Set the "IF Selector" switch to the "100 KC" or "500 KC" position and the deviation meter range switch to "150 Kilocycles."

3. OPERATING PROCEDURE

Place the off-on power switch in the "on" position. Both pilot lamps on the front panel will light. The lamp nearest the off-on switch indicates the power-on condition; the other tells that the crystal oven is heating. In five or six minutes the "oven on" light will go off, indicating the oven has reached operating temperature. At this time the receiver is ready for operation. While the receiver is in operation the "oven on" light will flicker on and off, indicating the cycling action of the oven.

If there is no signal at the operating frequency, the only output of the receiver will be noise that can be heard as a hiss in the speaker. In the presence of a carrier this noise will disappear, and if the carrier is frequency modulated by an audible signal, audio output will be obtained. The condition of tuning is shown on the tuning meter. This meter pointer should be brought to zero by tuning the "Freq." dial. The dial will then indicate in kilocycles the frequency difference of the transmitter and receiver.

The signal level meter will indicate the approximate signal level in microvolts. This meter can be peaked using the "Tuning" control; however, it is generally recommended that the dial be set to the specified frequency, as this properly centers the RF bandwidth around the operating frequency.

If the carrier is frequency modulated, a reading will be obtained on the deviation meter. Full scale ranges of 25, 75, and 150 kilocycles are provided so that the deviation of an individual subcarrier in an FM/FM telemeter can be set up. The deviation meter has a frequency response that permits making accurate peak frequency deviation measurements to 80 kilocycles.

Caution: The deviation meter will not accurately read the peak deviation of a number of simultaneous subcarriers as used in the RDB FM/FM telemeter. The deviation meter will accurately indicate peak deviations of the pulses used in the RDB PWM/FM telemetering system.

The tuning meter of the Model 1400 has been designed to provide proper tuning of the receiver on FM/FM or PWM/FM telemetering signals. In the case of PWM/FM signals the tuning meter's characteristics are such that the meter reads zero when the peak-to-peak frequency excursions of the transmitter are centered in the IF pass band of the receiver. This is important in PWM/FM reception, where the 100 kilocycle wide IF is used, because often the transmitter will have peak-to-peak frequency deviations as large as 100 kilocycles. Without such a circuit serious distortion would result.

A direct coupled video output from the Model 1400 is available on the terminal block on the rear of the receiver. This point is approximately 150 volts above ground, and caution should be used in connecting equipment to it. A fuse is used in the lead to prevent damage to the output cathode follower stage in case of an accidental short. When the receiver functions normally otherwise, yet no output is present at this point, F-102 should be replaced. This fuse is located on a terminal board mounted on the inside rear flange of the chassis.

4. RECORDER OPERATION AND ADJUSTMENT.

The field strength recorder terminals on the rear apron of the receiver are provided for the operation of a 10-milliampere recorder. If the recorder resistance is greater than 500 ohms, difficulty may be experienced in setting the recorder to full scale. Full scale adjustment is made by placing the "IF SELECTOR" switch in the desired position and adjusting the appropriate "REC. ADJ." located on the RF chassis. This adjustment should be made with no signal input to the receiver.

In operation the recorder will read backwards as the signal strength increases. A calibrated scale can be obtained by using a signal generator to provide a known voltage at the receiver input. This voltage can be set to different values and the pen deflections marked on the chart.

SECTION 4

MAINTENANCE

1. GENERAL.

Model 1400 Receivers are designed to give trouble-free performance in the field with a minimum of routine maintenance. High-quality components are used throughout with emphasis placed on operation well within ratings. All meters, transformers, and filter chokes are hermetically sealed. Electrolytic capacitors have been avoided except in the power supply filter, where an improved signal-to-noise ratio justifies their use. These capacitors are of the plug-in type for ease of replacement in the field. The cooling fan motor is designed to give quiet trouble-free operation without oiling or other service.

2. TROUBLE SHOOTING.

a. RECEIVER OPERATES IMPROPERLY.--If the receiver operates improperly, it is usually possible to deduce the general area of trouble by the symptoms present. Familiarity with the theory of operation and the schematic diagram of the receiver (Fig. 4-13) is invaluable in successfully locating the trouble. Once the area of trouble is located, the circuits in question can be examined. Experience has shown that a tube is often the fault. Visual inspection may give some clue to the difficulty in the form of a burned or broken resistor, short or broken connection in the wiring, damaged component, etc. Table 4-1 is a voltage chart that gives the approximate voltage at the tube socket pins when the receiver is operating properly. Any significant deviation from these figures could point to the source of trouble.

b. RECEIVER INOPERATIVE.--First check for such obvious faults as power cord troubles or an open fuse in the power transformer primary (F-101). Measure the output voltage of the power supply to eliminate the possibility of trouble in this portion of the receiver.

VOLTAGE CHART

The following table lists the pin voltages of the vacuum tubes used in the Model 1400 Receiver.

SYMBOL	TYPE	PIN NO.								
		1	2	3	4	5	6	7	8	9
V-101	5814A	290	155	160	6.35AC	6.35AC	155	-.75	7.6	Gnd
V-102	6AH6	0	3.1	Gnd	6.35AC	255	270	3.1		
V-103	5814A	280	0	9.2	6.35AC	6.35AC	290	40	53	Gnd
V-104	6CL6	160	155	290	6.3AC*	6.3AC*	290	160	290	155
V-105	OD3		Gnd	148		148		148		
V-106	5814A	292	1.8	160	6.35AC	6.35AC	292		15.5	
V-201	5842/417A	103	Gnd	Gnd	Gnd	Gnd	1.1	Gnd	Gnd	6.35AC
V-202	5654/6AK5W	-2.3 [(1)]	Gnd	6.35AC	Gnd	60	60	Gnd		
V-203	5654/6AK5W	-2.35 [(2)]	Gnd	6.35AC	Gnd	113	105	Gnd		
V-204	5654/6AK5W	-7.5 [(3)]	Gnd	6.35AC	Gnd	131	90	Gnd		
V-205	5654/6AK5W	-.73 [(4)]	Gnd	6.35AC	Gnd	127	85	Gnd		
V-206	6B27	135	Gnd	2.3	Gnd	6.35AC	123	-1.22 [(5)]	6.0	Gnd
V-207	6AU6WA	-1.5	Gnd	6.35AC	Gnd	141	122	Do not Measure		
V-208	6AU6WA	-12 [(6)]	Gnd	6.35AC	Gnd	143	89	Gnd		
V-209	6AU6WA	-1.7 [(7)]	Gnd	6.35AC	Gnd	146	110	Gnd		
V-210	5749/6BA6W	-0.2	Gnd	6.35AC	Gnd	146	40	-.48		
V-301	6AU6WA	0	Gnd	6.3AC	Gnd	134	130	1.14		
V-302	6AU6WA	0	Gnd	6.3AC	Gnd	142	124	2.4		
V-303	6AU6WA	0	Gnd	6.3AC	Gnd	142	101	0.89		
V-304	6AU6WA	0	Gnd	6.3AC	Gnd	132	125	1.02		
V-305	6AU6WA	0	Gnd	6.3AC	Gnd	138	102	0.9		
V-306	6AU6WA	0	Gnd	6.3AC	Gnd	142	100	0.98		
V-401	6BN6	5.8	2.1	6.25AC	Gnd	101	5.8	137		
V-402	6BN6	1.45	0	6.25AC	Gnd	65	1.45	46		
V-403	6AU6WA	0	Gnd	6.25AC	Gnd	144	144	1.0		
V-404	5726/6AL5W	1.7		5.05AC	Gnd	Gnd				

Table 4-1. Voltage Chart

NOTES: Line voltage 115 V AC, 60 c.p.s.
Receiver operating at 228.5 mc; no signal input; audio gain minimum.
DC voltages taken with 11 megohm VTVM to ground.
* AC voltage measured between these points.
IF switch on "100 kc" for V-301, V-302, and V-303.
IF switch on "500 kc" for V-304, V-305, and V-306.
(1) Measured at TP-203.
(2) Measured at TP-204.
(3) Measured at TP-205.
(4) Measured at TP-206.
(5) Measured at TP-207.
(6) Measured at TP-208.
(7) Measured at TP-209.

Apply a three-volt 1000-cycle voltage to feed through terminal number four of the limiter-discriminator strip. Correct video amplifier operation is indicated by an output voltage of approximately 7.4 volts. The deviation meter will read approximately 105 on the 150 kc full-scale range. Audio-amplifier operation is evident by speaker output when the audio gain control is advanced. As this part of the audio amplifier is common to the video, there will be no audio output if the video section is inoperative.

The limiter-discriminator strip can be tested by applying a 5 mc signal through a blocking capacitor to P-302 after disconnecting it from J-302. A low-impedance generator with an output of about one volt is desirable. With this signal input the tuning meter will function normally if the limiter-discriminator strip is working.

The five-megacycle second IF amplifier can be checked for operation by applying a 5 mc signal through a blocking capacitor to P-203 after disconnecting it from J-203. A low-impedance generator with an output of .01 volt is desirable. With this signal input the tuning meter will function normally if the 5 mc amplifiers are working. Some reading on the signal strength meter will also be obtained.

Operation of the first mixer, 30 mc IF amplifier, second mixer and second oscillator can be determined by connecting a 30-megacycle signal to TP-203. A fairly large signal is required as the mixer grid is being fed through a capacitive divider consisting of the stray capacity of R-203 and C-209. With a signal of 10K microvolts the tuning meter will function normally, and a reading on the signal strength meter will be obtained if this portion of the receiver is operative.

The remainder of the receiver is comprised of the RF amplifier and first oscillator. These circuits can be checked by plugging in a crystal and connecting a signal source of the proper frequency to the antenna input.

In the course of these tests the defective portion of the receiver will become evident. Once the trouble is localized, the cause can be determined by a thorough check of the circuits involved. Tubes should always be considered as possible trouble sources, and often a simple visual inspection will reveal a component failure. Table 4-1 is a voltage chart giving the approximate voltage at the tube socket pins when the receiver is operating normally. Any significant deviation from these figures will point to the source of trouble.

3. ALIGNMENT.

Normally the receiver will maintain good alignment for long periods of time. Changing a tube will cause only minor detuning of the RF and IF circuits, so realignment is unnecessary. In case the user wishes to check or realign the receiver in the field, the following procedure may be followed.

a. DISCRIMINATOR (T-404) 5 MC.

(1) Place IF selector switch in "off" position.

(2) Connect sweep (1)* and marker (2) generators to pin 1 of V-403.

(3) Connect oscilloscope (3) to feed through No. "3" on limiter discriminator unit.

(4) Adjust primary and secondary tuning and coupling until the discriminator "S" curve has the following characteristics:

(a) Zero output at 5 mc.

(b) Peak-to-peak spacing of 750 kc.

(c) Equal positive and negative peaks.

Note 1. Use a 2V peak-to-peak response on the oscilloscope (3).

Note 2. Push coupling link toward coils to decrease coupling.

b. SECOND LIMITER (T-403) 5 MC.

(1) Place IF selector switch in "off" position.

(2) Connect sweep (1) and marker (2) generators to pin 2 of V-402.

(3) Disconnect plate of V-403 and connect detector (Fig. 4-1) between plate of V-403 and screen grid.

(4) Adjust primary and secondary tuning and coupling until a transitionally coupled (flat top) response is obtained with a 3-db bandwidth of 2 mc.

Note: Use a 2V peak-to-peak response on the oscilloscope (3).

c. FIRST LIMITER (T-402) 5 MC.

(1) Place IF selector switch in "off" position.

(2) Connect sweep (1) and marker (2) generators to pin 2 ov V-401.

Use a .0047 uf blocking capacitor.

*For significance of numbers see Table 4-2.

1.	RCA WR59B sweep generator modified for continuous coverage 0-260 mc.
2.	Measurements 65-B signal generator. (Standardize 5 mc against a crystal oscillator.)
3.	Dumont oscilloscope.
4.	Signal Corps BC 221Q frequency meter.
5.	RCA Voltohmyst.
6.	Hewlett-Packard 608A signal generator.
7.	Modified RCA WR86A UHF sweep generator.

Table 4-2. Equipment Used in Alignment of Model 1400 Receiver

(3) Disconnect plate of V-402 and connect detector (Fig. 4-1) between plate of V-402 and screen grid.

(4) Adjust primary and secondary tuning until an overcoupled response is obtained with a 3 db bandwidth of about 2.5 mc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

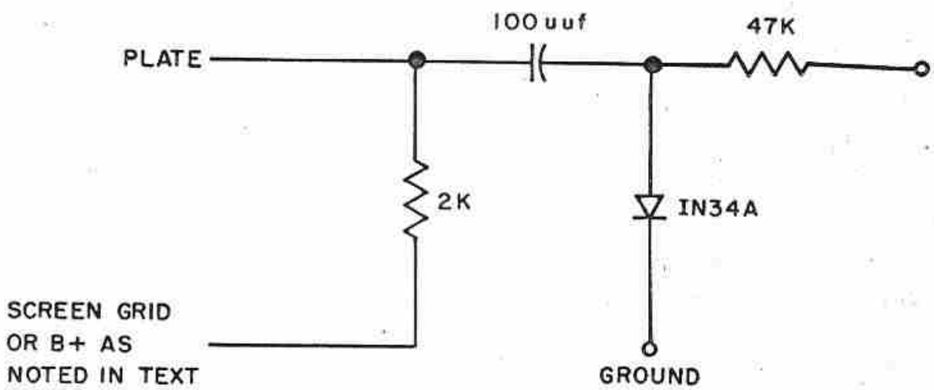


Fig. 4-1. Detector Used in IF Alignment, Schematic Diagram

d. T-401 5 MC.

(1) Place IF selector switch in "500 kc" position.

(2) Connect sweep (1) and marker (2) generators to pin 1 of V-306.

(3) Ground pin B of T-401 to remove delay voltage on diode.

(4) Remove the second oscillator V-207.

(5) Connect oscilloscope (3) to feedthrough No. "2" on limiter-discriminator unit. Disconnect AGC bus from feedthrough No. "2."

(6) Adjust primary and secondary tuning and coupling until a transitionally coupled (flat top) response is obtained with a 3 db bandwidth of 600 kc.

(7) Move sweep and marker generators to pin 1 of V-303.

(8) Place IF selector switch in "100 kc" position.

(9) The same response curve as that in step 5 should be obtained.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

e. M-DERIVED FILTER IN PLATE OF V-305 (500 KC IF).

(1) Place IF selector switch in "500 kc" position.

(2) Connect sweep (1) and marker (2) generators to pin 1 of V-305.

(3) Disconnect connecting cable between 5-mc IF amplifiers and limiter-discriminator unit.

(4) Connect detector (Fig. 4-1) between plate of V-306 and B+.

(5) Adjust primary (T-315) and secondary (T-316) tuning and traps for a response similar to that of Fig. 4-2A. The 1-db bandwidth should be 500 kc. T-317 is tuned above and T-318 is tuned below 5 mc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

f. M-DERIVED FILTER IN PLATE OF V-304 (500 KC IF).

(1) Place IF selector switch in "500 kc" position.

(2) Connect sweep (1) and marker (2) generators to pin 1 of V-304.

(3) Disconnect plate of V-305 and connect detector (Fig. 4-1) between plate of V-305 and B+.

(4) Disconnect cable connecting 5-mc IF amplifier and front end.

(5) Adjust primary (T-311) and secondary (T-312) tuning and traps for a response similar to that of Fig. 4-2B. The 1 db bandwidth should be 500 kc. T-313 is tuned below and T-314 is tuned above 5 mc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

g. SECOND MIXER PLATE CIRCUIT (T-313 AND T-314) (500 KC IF).

(1) Place IF selector switch in "500 kc" position.

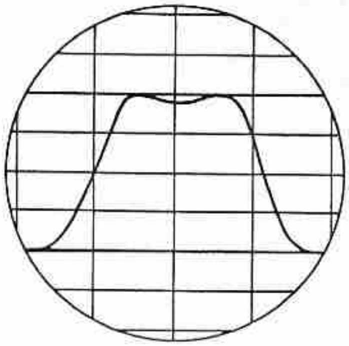
(2) Remove the second oscillator tube V-207.

(3) Connect sweep (1) and marker (2) generators to pin 1 of V-209.

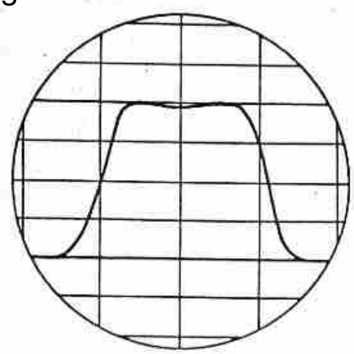
(4) Disconnect plate of V-304 and connect detector (Fig. 4-1) between plate of V-304 and pin C on T-311.

(5) Adjust primary and secondary tuning and coupling until a transitionally coupled response (flat top) is obtained with a 1/2 db bandwidth of 500 kc.

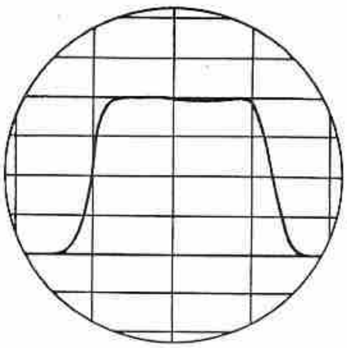
Note: Use a 1V peak-to-peak response on the oscilloscope (3).



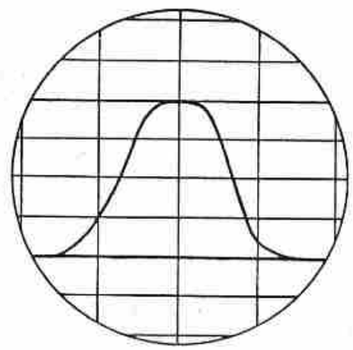
A. RESPONSE OF M-DERIVED FILTER IN PLATE OF V-305



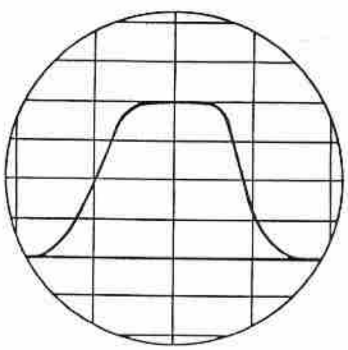
B. RESPONSE OF M-DERIVED FILTER IN PLATE OF V-304



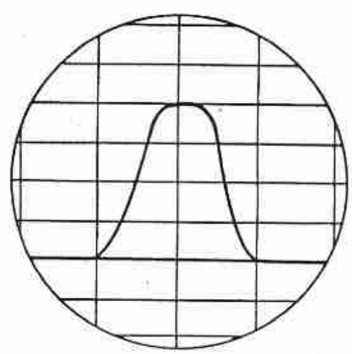
C. OVERALL RESPONSE 500 KC WIDE IF AMPLIFIER



D. RESPONSE OF M-DERIVED FILTER IN PLATE OF V-302



E. RESPONSE OF M-DERIVED FILTER IN PLATE OF V-301



F. OVERALL RESPONSE 100 KC WIDE IF AMPLIFIER

Fig. 4-2. Response Curves

h. OVERALL RESPONSE -- 500 KC IF AMPLIFIER.

(1) Place IF selector switch in "500 kc" position.

(2) Remove the second oscillator tube V-207.

(3) Connect sweep (1) and marker (2) generators to pin 1 of V-209, using a divider consisting of a 1K ohm series and 10-ohm shunt resistor from grid to ground.

(4) Disconnect AGC lead from feedthrough No. "2" on limiter-discriminator unit. Connect oscilloscope (3) to feedthrough No. "2" and shunt with a 1000 uuf capacitor. Short terminal "B" on T-401 to ground.

(5) The overall response should resemble Fig. 4-2C with a 3-db bandwidth of 500 kc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

i. M-DERIVED FILTER IN PLATE OF V-302 (100 KC IF).

(1) Place IF selector switch in "100 kc" position.

(2) Connect sweep (1) and Marker (2) generators to pin 1 of V-302.

(3) Disconnect connecting cable between 5-mc IF amplifiers and limiter-discriminator unit.

(4) Connect detector (Fig. 4-1) between plate of V-303 and B+.

(5) Adjust primary (T-306) and secondary (T-307) tuning and traps for a response similar to that of Fig. 4-2D. The 1 1/2 db bandwidth should be 100 kc. T-308 is tuned above and T-309 is tuned below 5 mc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

j. M-DERIVED FILTER IN PLATE OF V-301 (100 KC IF).

(1) Place IF selector switch in "100 kc" position.

(2) Connect sweep (1) and marker (2) generators to pin 1 of V-301.

(3) Disconnect plate of V-302 and connect detector (Fig. 4-1) between plate of V-302 and B+.

(4) Disconnect cable connecting 5 mc IF amplifiers and front end.

(5) Adjust primary (T-302) and secondary (T-303) tuning and traps for a response similar to Fig. 4-2E. The 1 1/2 db bandwidth should be 100 kc. T-304 is tuned above and T-305 is tuned below 5 mc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

k. SECOND MIXER PLATE CIRCUIT -- 100 KC (T-205 AND T-301).

(1) Place IF selector switch in "100 kc" position.

(2) Remove the second oscillator tube V-207.

(3) Connect sweep (1) and marker (2) generators to pin 1 of V-209.

(4) Disconnect plate of V-301 and connect detector (Fig. 4-1) between plate of V-301 and B+.

(5) Adjust primary and secondary and coupling until a transitionally coupled (flat top) response with a 100 kc flat top is obtained.

Note: Use 1V peak-to-peak response on the oscilloscope (3).

l. OVERALL RESPONSE OF 100 KC IF AMPLIFIER.

(1) Place IF selector switch in "100" kc position.

(2) Remove second oscillator tube V-207.

(3) Connect sweep (1) and marker (2) generators to pin 1 of V-209, using a divider consisting of a 1K ohm series and a 10-ohm shunt resistor.

(4) Disconnect AGC lead from feedthrough No. "2" on limiter-discriminator unit. Connect oscilloscope to feedthrough No. "2" and shunt with 1000 uuf capacitor. Short terminal "B" on T-401 to ground.

(5) The overall response should resemble Fig. 4-2F with a 3-db bandwidth of 100 kc.

Note: Use a 1V peak-to-peak response on the oscilloscope (3).

m. 25 MC SECOND OSCILLATOR.

(1) Adjust slug in oscillator grid coil for a frequency of 25 mc when the vernier capacitor is set to "0." A frequency meter (4) can be loosely coupled to the plate circuit for this adjustment.

(2) Tune T-203 for maximum voltage (5) at test point TP-208 in the grid circuit of V-208. This will be about 15V.

(3) As there is some interaction between steps 1 and 2, the frequency should be checked and step 1 repeated if necessary.

n. 25 MC BUFFER.

(1) Tune T-204 for maximum voltage (5) at test point TP-209 in the grid circuit of V-209. This voltage will normally be about 1.5 volts when the 30 mc circuit in the second mixer grid is properly tuned.

o. 30 MC IF AMPLIFIER STAGE (T-206 AND T-207)

(1) Place the IF selector switch in the "off" position.

(2) Connect sweep (1) and marker (6) generators to grid of V-210.

(3) Connect oscilloscope (3) to test point TP-209 in grid circuit of V-209.

(4) Adjust primary and secondary tuning and coupling for a slightly overcoupled response with a 3 db bandwidth of 1.3 mc.

Note: Use .3V peak-to-peak response on the oscilloscope (3).

p. FIRST MIXER TRANSFORMER (30 MC) T-201 AND T-202.

(1) Place the IF selector switch in the "off" position.

(2) Remove the crystal.

(3) Connect sweep (1) and marker (6) generators to pin 1 of V-202.

(4) Disconnect plate of V-210 and connect detector (Fig. 4-1) between plate and B+.

(5) Adjust primary and secondary tuning and coupling for a slightly overcoupled response with a 3 db bandwidth of 1.5 mc.

Note: Use .3V peak-to-peak response on the oscilloscope (3).

q. OVERALL 30 MC IF AND FIRST MIXER NEUTRALIZATION.

(1) Place the IF selector switch in the "off" position.

(2) Remove the crystal.

(3) Connect sweep (1) and marker (6) generators to pin 1 of V-202.

(4) Connect oscilloscope (3) to test point TP-209 in grid circuit of V-209.

(5) The overall response should be slightly overcoupled and have a 3-db bandwidth of 1.1 mc. Touch up if necessary.

Note: Use .3V peak-to-peak response on the oscilloscope (3).

(6) Remove filament voltage from V-202.

(7) Increase input from sweep generator (1) until response curve is observed.

(8) Adjust neutral capacitor C-215 for minimum output on the oscilloscope (3).

r. FIRST OSCILLATOR L-220.

(1) Plug in 43.0833-mc crystal.

(2) Attach VTVM (5) to test point TP-207.

(3) Adjust L-220 for maximum voltage (about 3 volts).

s. DOUBLER (L-218 and L-219) 86 MC CENTER FREQUENCY.

(1) Remove crystal.

(2) Couple sweep (1) and marker (6) generators into pin 7 of V-206. Use balance-to-unbalance converter (Fig. 4-3) and a length of RG55/U cable terminated in 50 ohms.

(3) Connect oscilloscope (3) to test point TP-206 in grid circuit of V-205.

(4) Tune primary and secondary for overcoupled response with a peak-to-peak bandwidth of about 15 mc.

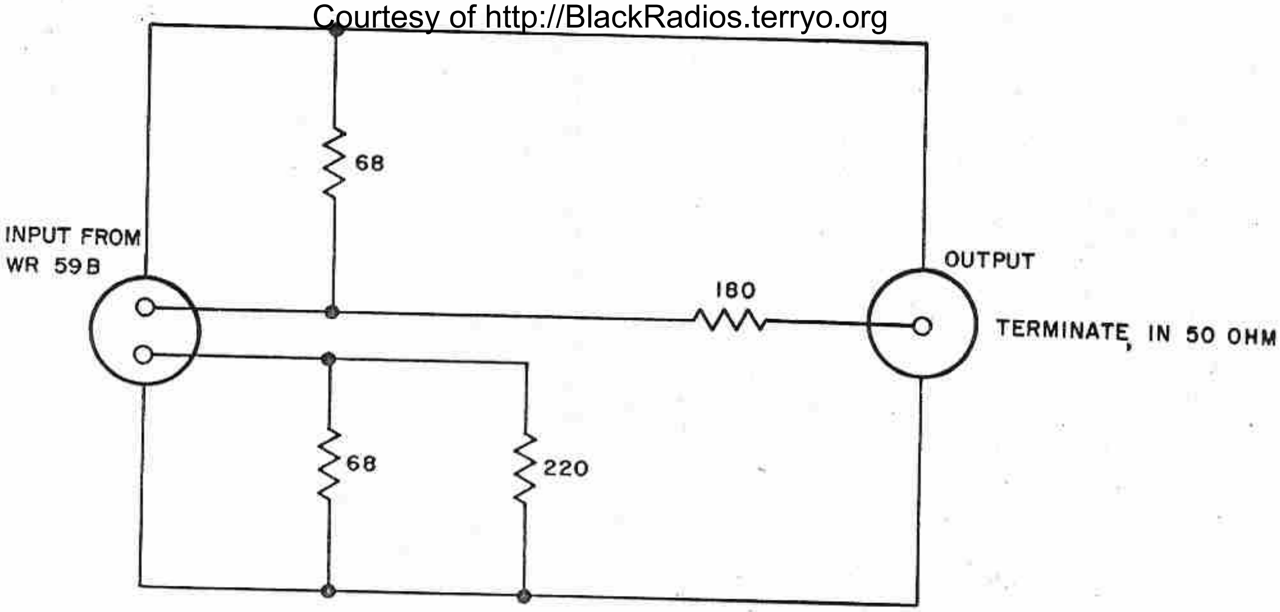


Fig. 4-3. Balance to Unbalance Converter, Schematic Diagram

t. AMPLIFIER (L-216 AND L-217) 86 MC CENTER FREQUENCY

(1) Remove crystal.

(2) Couple sweep (1) and marker (6) generators into pin 1 of V-205. Use balance-to-unbalance converter (Fig. 4-3) and a length of RG55/U cable terminated in 50 ohms.

(3) Connect oscilloscope (3) to test point TP-205 in grid circuit of V-204.

(4) Tune primary and secondary for overcoupled response with a peak-to-peak bandwidth of about 11 mc.

u. DOUBLER AND AMPLIFIER TUNED CIRCUITS (86 MC).

(1) Remove crystal.

(2) Couple sweep (1) and marker (6) generators into pin 7 of V-206. Use balance-to-unbalance converter (Fig. 4-3) and a length of RG55/U cable terminated in 50 ohms.

(3) Connect oscilloscope (3) to test point TP-205 in grid circuit of V-204.

(4) Observed response should have a 3-db bandwidth of about 17 mc and a 45% dip.

v. TRIPLER (OUTPUT 258.5 MC) L-214 AND L-215.

(1) Remove crystal.

(2) Couple sweep (7) and marker (6) generators into pin 1 of V-204.

(3) Connect oscilloscope (3) to test point TP-204 in grid circuit of V-203.

(4) Short plate of V-203 to ground using 1000 uuf ceramic disc capacitor with short leads.

(5) Tune primary and secondary for overcoupled response with a 3 db bandwidth of about 35 mc and dip of approximately 22%.

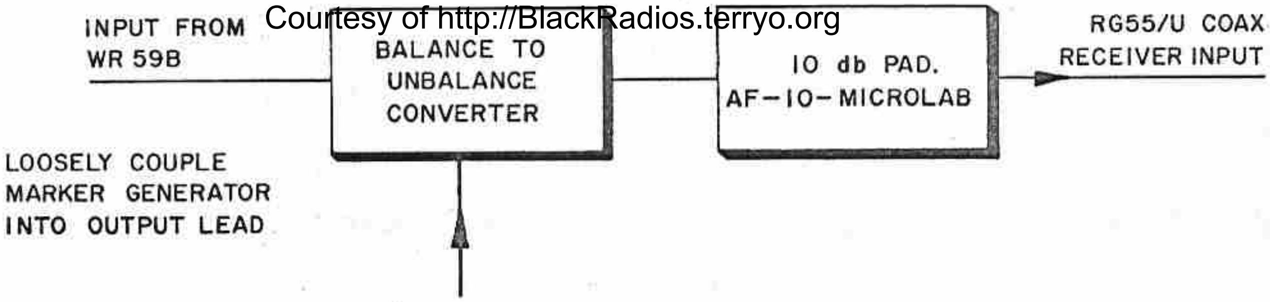


Fig. 4-4. Input Connection for Front End Alignment

w. TRACKING FRONT END.

(1) Connect sweep (1) and marker (6) generators to the RF input as shown in Fig. 4-4.

(2) Connect oscilloscope (3) and VTVM (5) to test point TP-203 in grid of V-202.

(3) Set RF dial to 240.5 mc and plug in appropriate crystal.

(4) Adjust L-213 for maximum voltage as indicated by the VTVM.

(5) Adjust L-205 and L-208 and the coupling capacitor for a slightly overcoupled response centered at 240.5 mc. The 3 db bandwidth should be about 4 mc. See Fig. 4-5.

(6) Set RF dial to 216.5 mc and plug in appropriate crystal. Change sweep and marker generators accordingly.

(7) Adjust L-212 for maximum voltage as indicated by the VTVM.

(8) Adjust L-209 and L-203 for a slightly overcoupled response centered at 216.5 mc. The 3 db bandwidth should be about 4 mc. See Fig. 4-5.

(9) Return to step 3 and readjust high end if necessary.

(10) Return to step 6 and readjust low end if necessary.

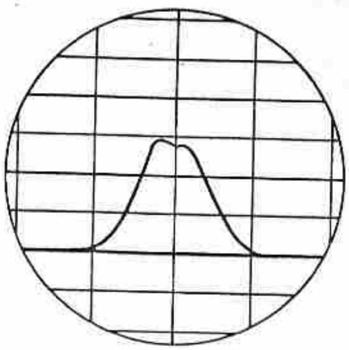
(11) Continue alternating between high and low frequency tracking points until conditions are simultaneously met.

(12) Check front-end response at 222.5 mc, 228.5 mc, 234.5 mc, and 243.5 mc. The 3 db bandwidth should be constant at approximately 4 mc, and the curves should resemble those of Fig. 4-5. The oscillator injection voltage measured at the test point TP-203 should be about 1.5 volts at all frequencies in the band.

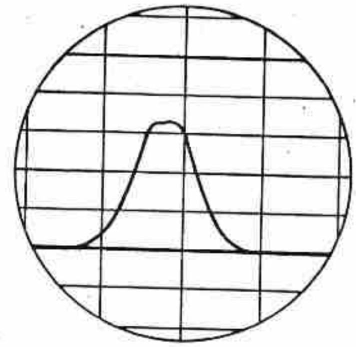
x. ZERO ADJUSTMENT OF TUNING METER.

(1) Remove V-403 from tube socket.

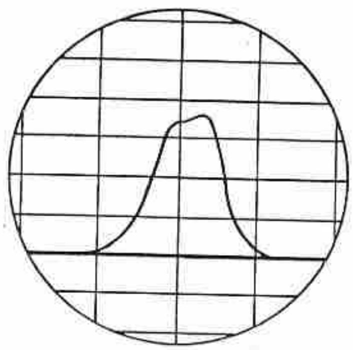
(2) Adjust R-135 for zero reading of the tuning meter.



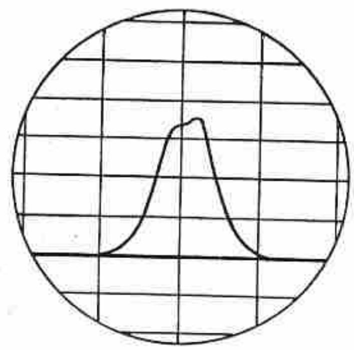
216.5 MC



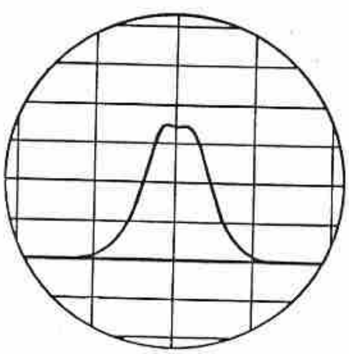
222.5 MC



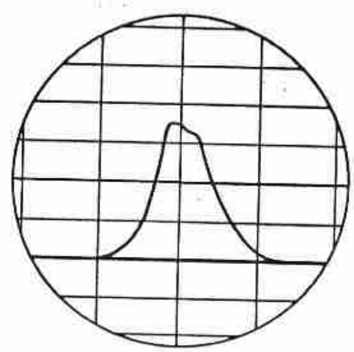
228.5 MC



234.5 MC



240.5 MC



243.5 MC

Fig. 4-5. Circuit Response for Alignment of Front End

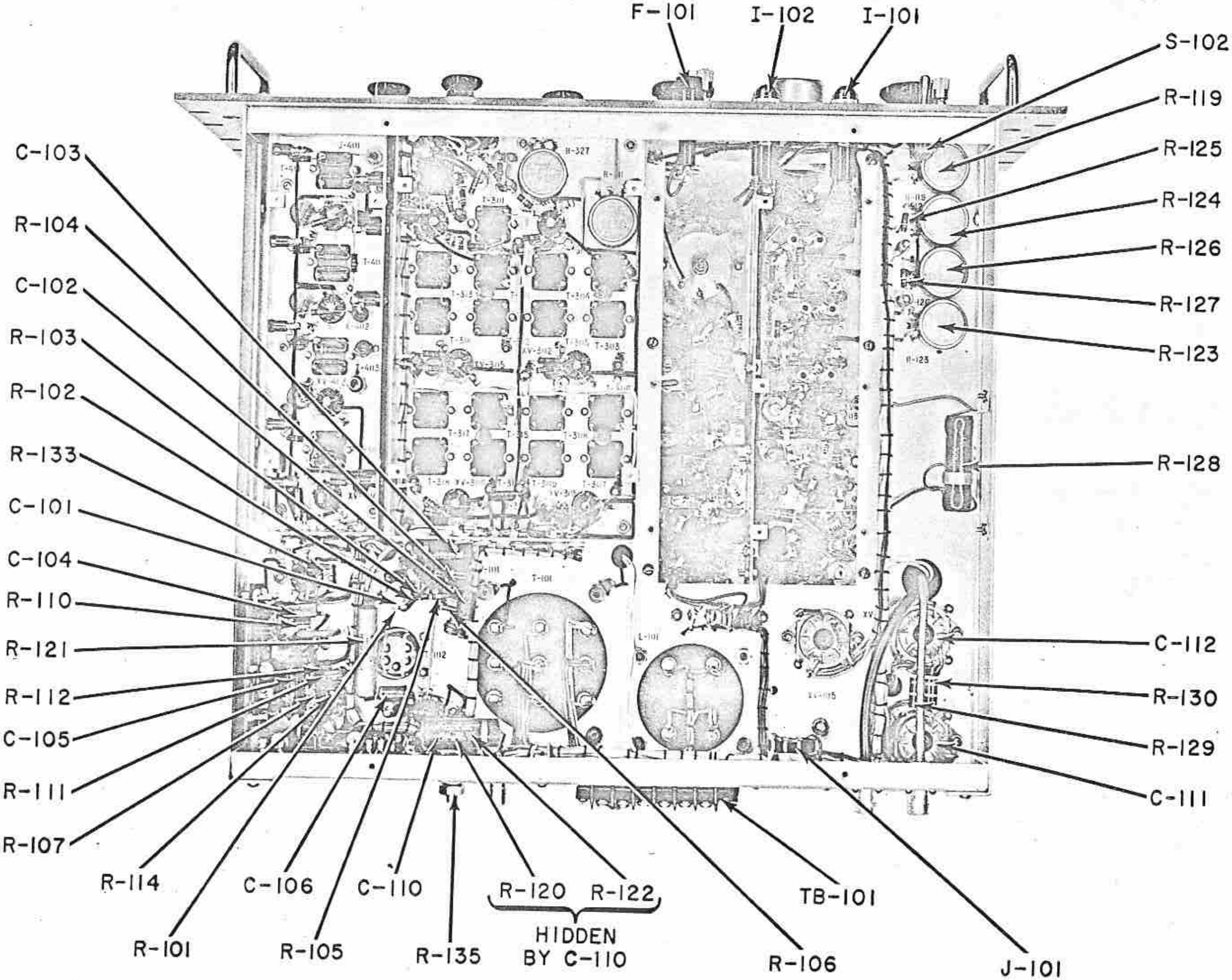


Fig. 4-7. Model 1400 Receiver, Bottom View

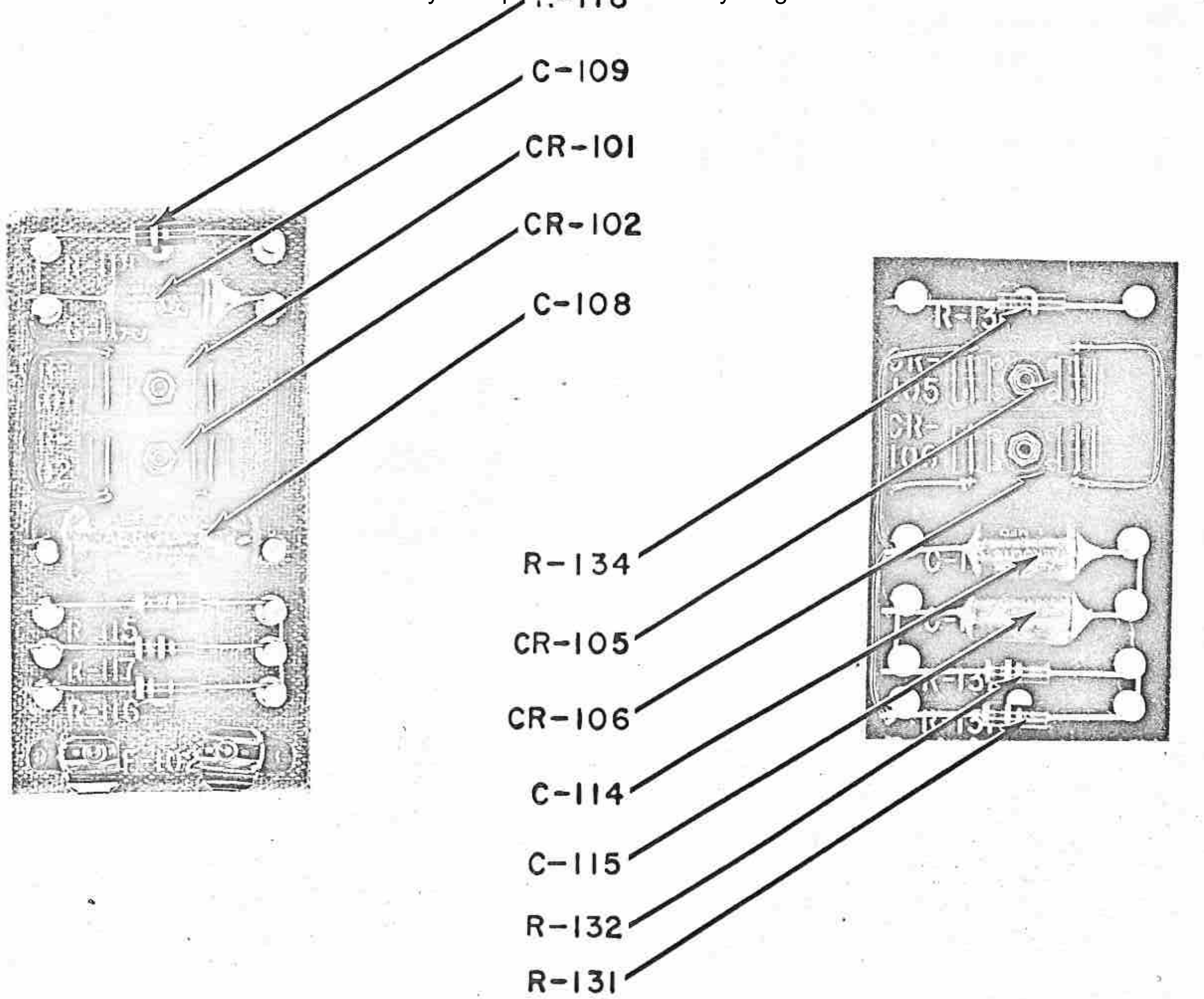


Fig. 4-9. Model 1400 Receiver, Components Board

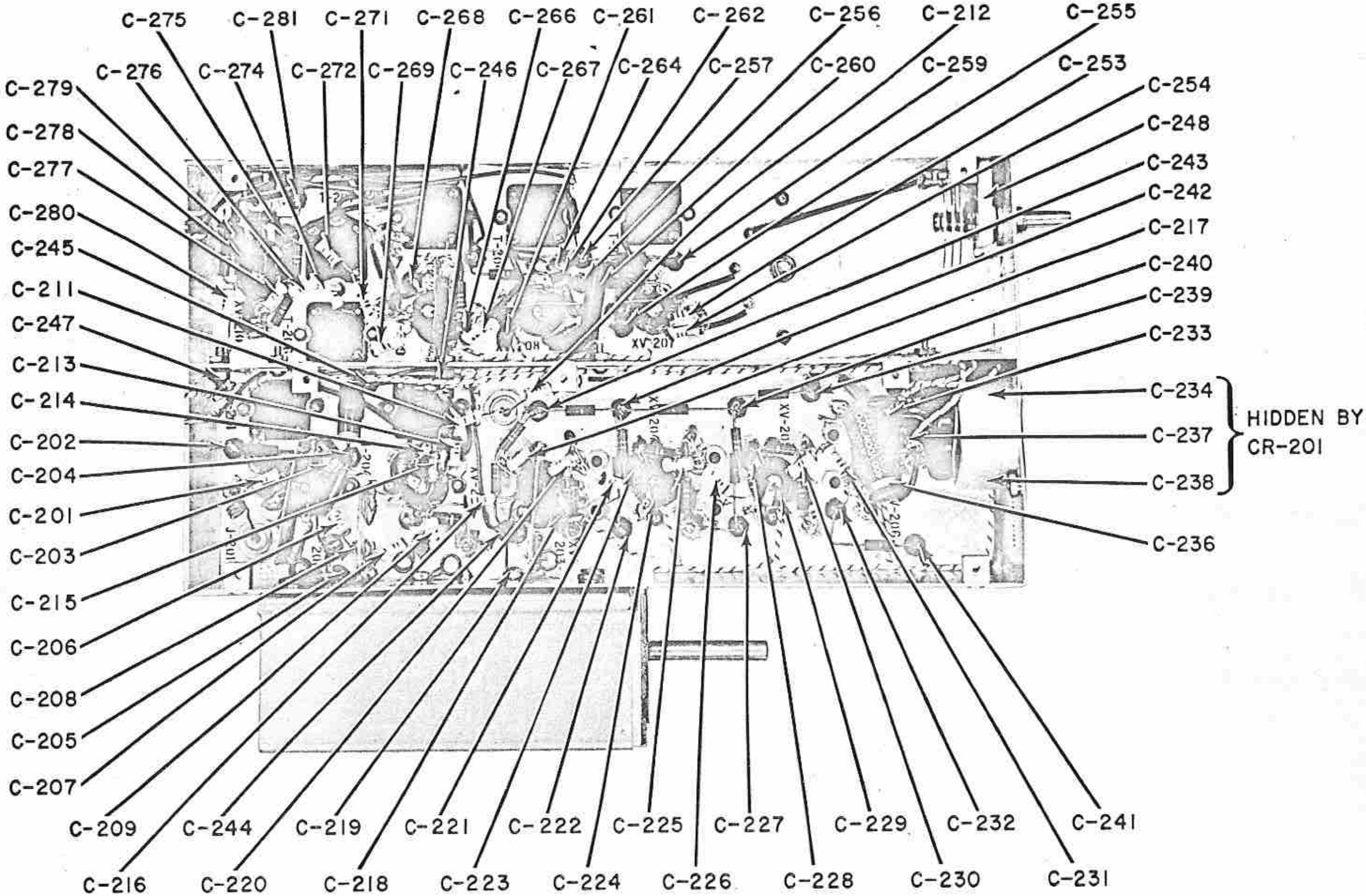


Fig. 4-10A. Model 1400 Receiver, RF Chassis--Capacitors

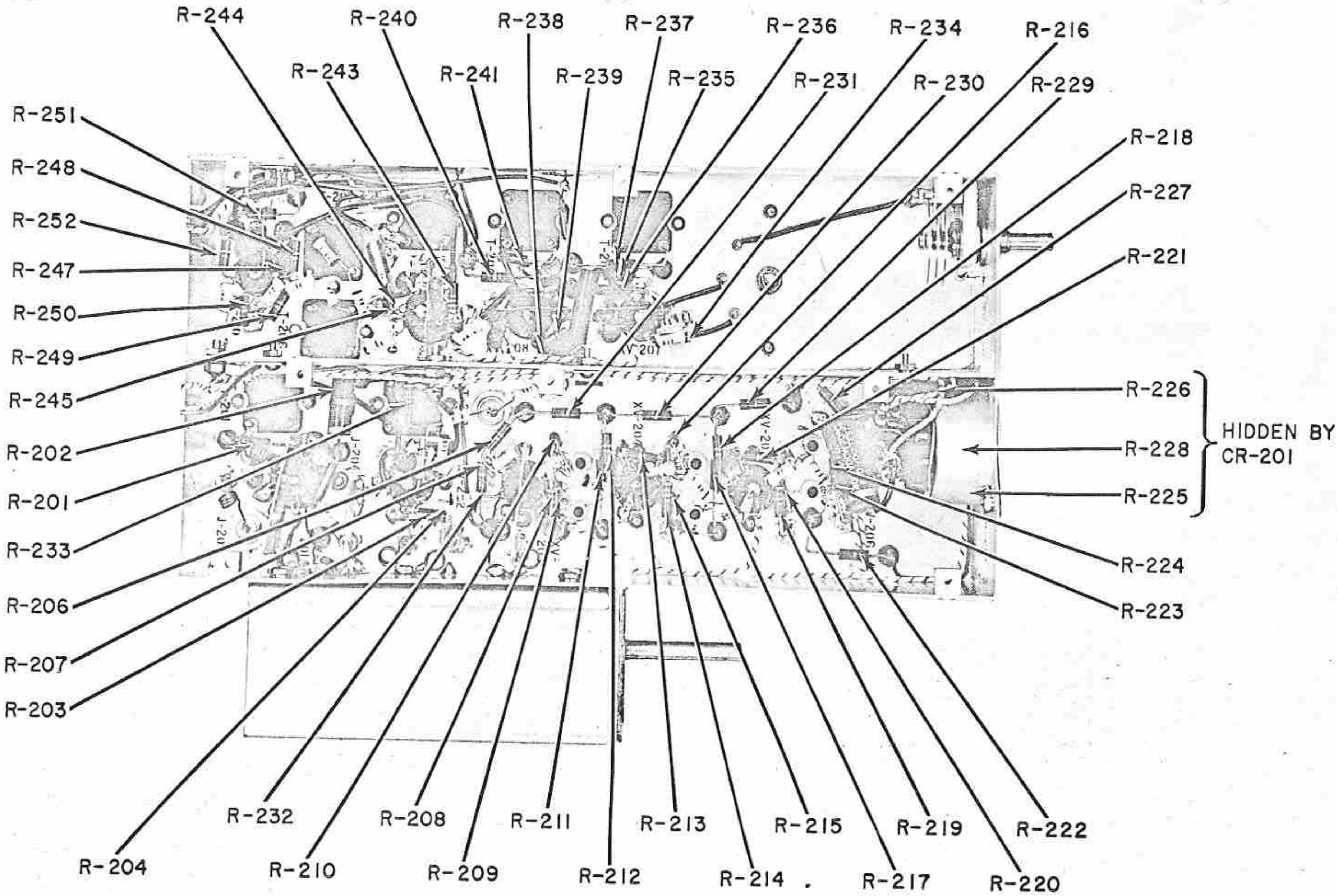


Fig. 4-10B. Model 1400 Receiver, RF Chassis--Resistors

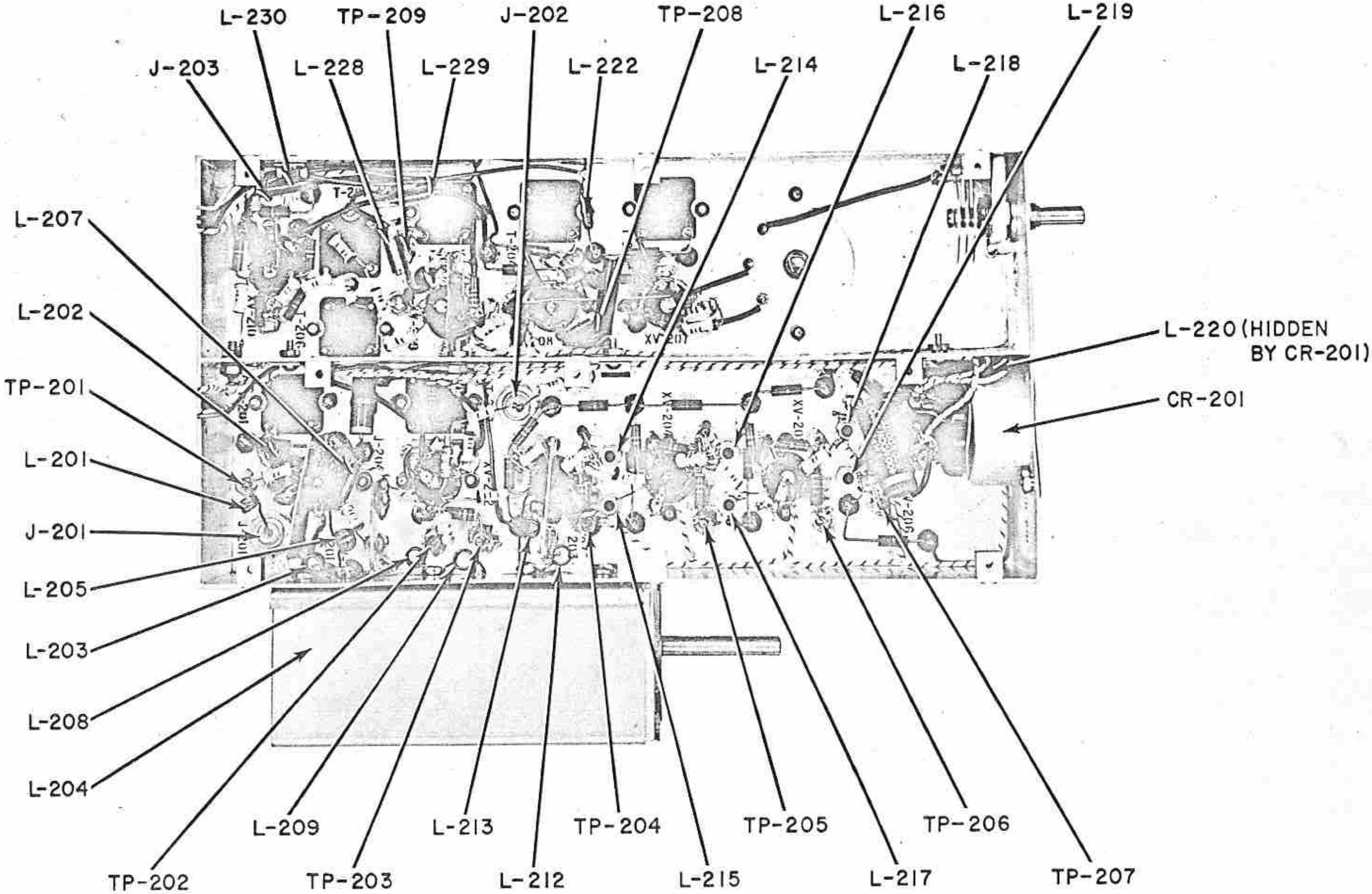


Fig. 4-10. Model 1400 Receiver, RF Chassis--Miscellaneous

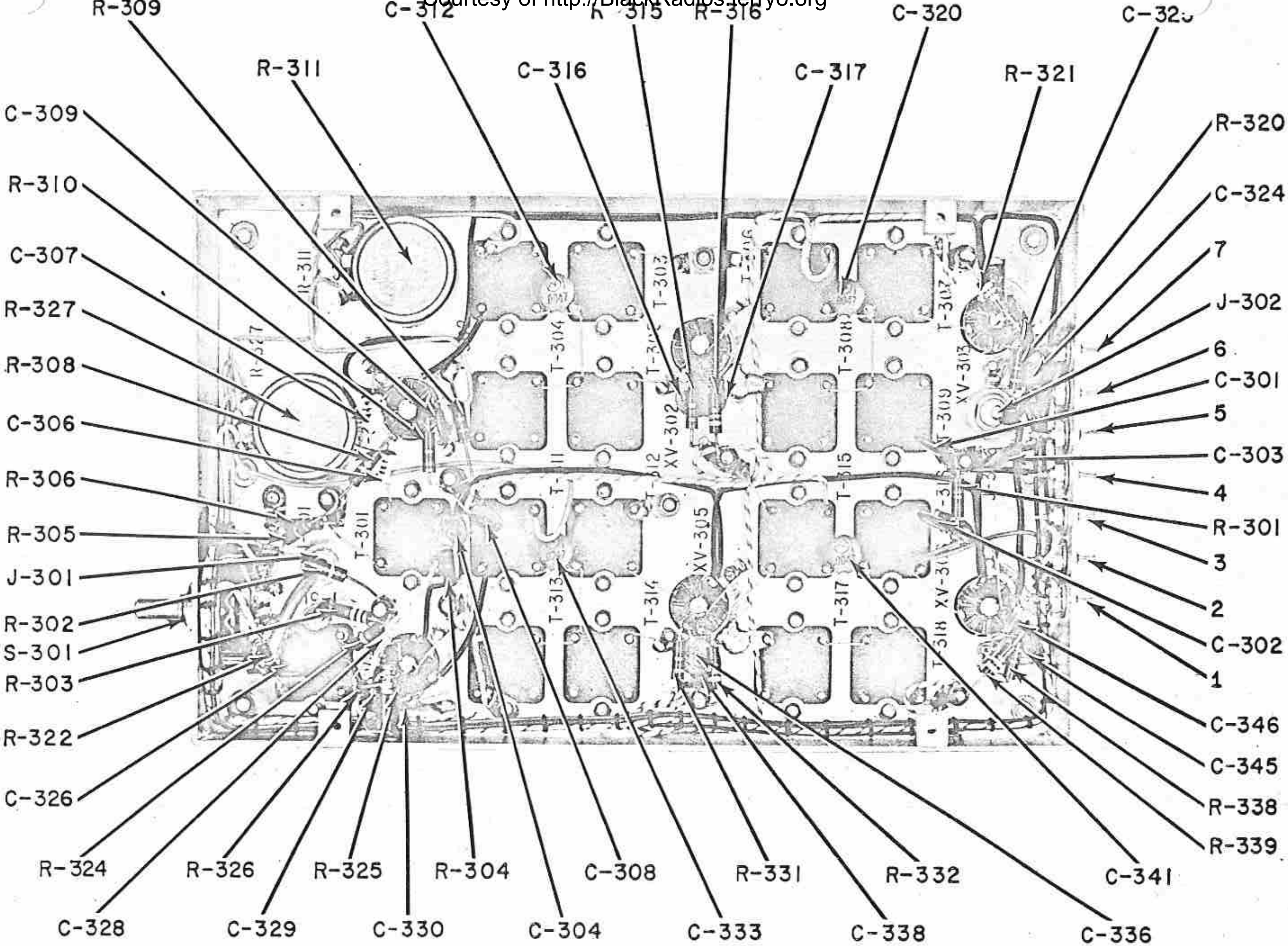


Fig. 4-11. Model 1400 Receiver, IF Chassis

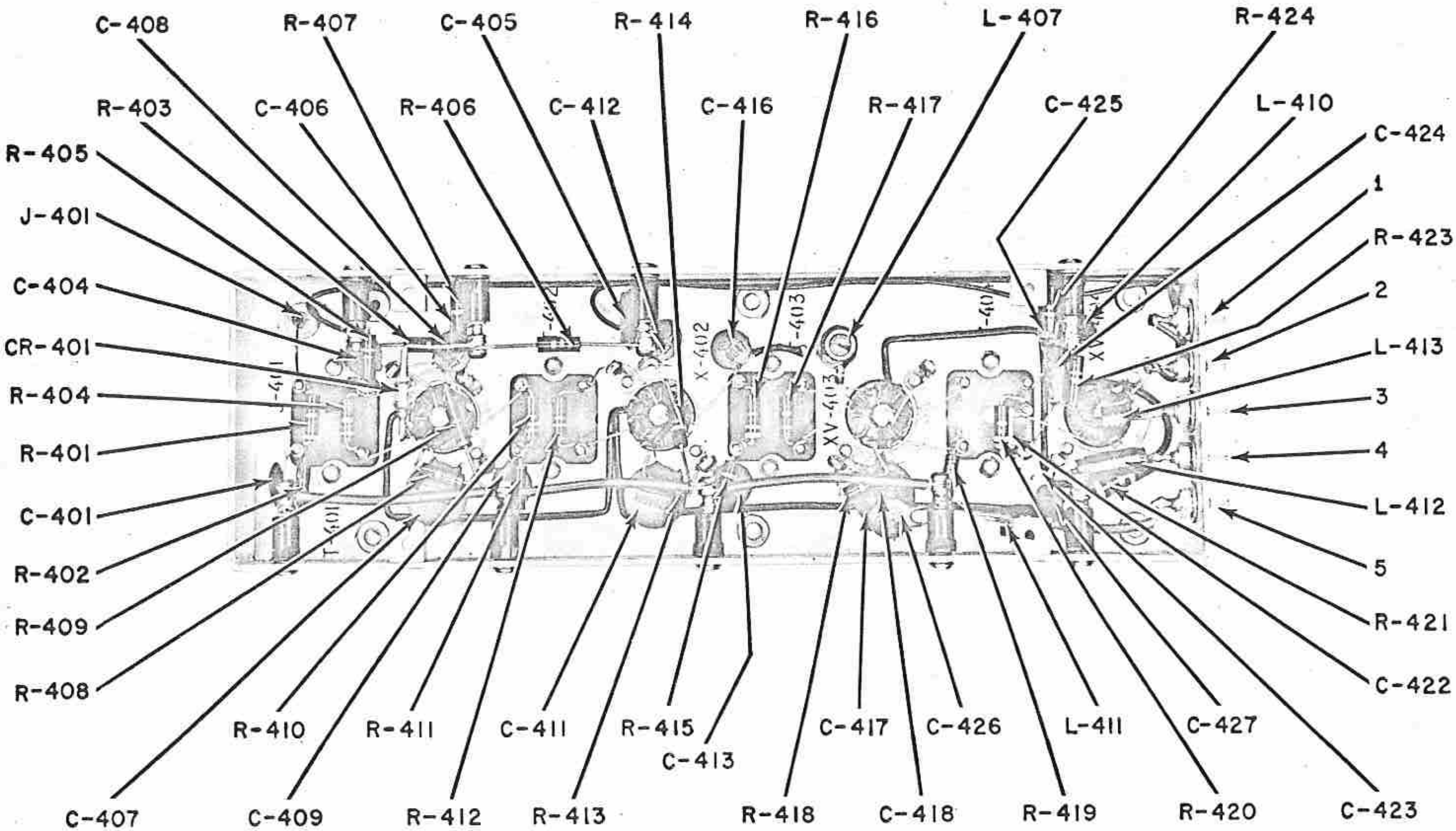
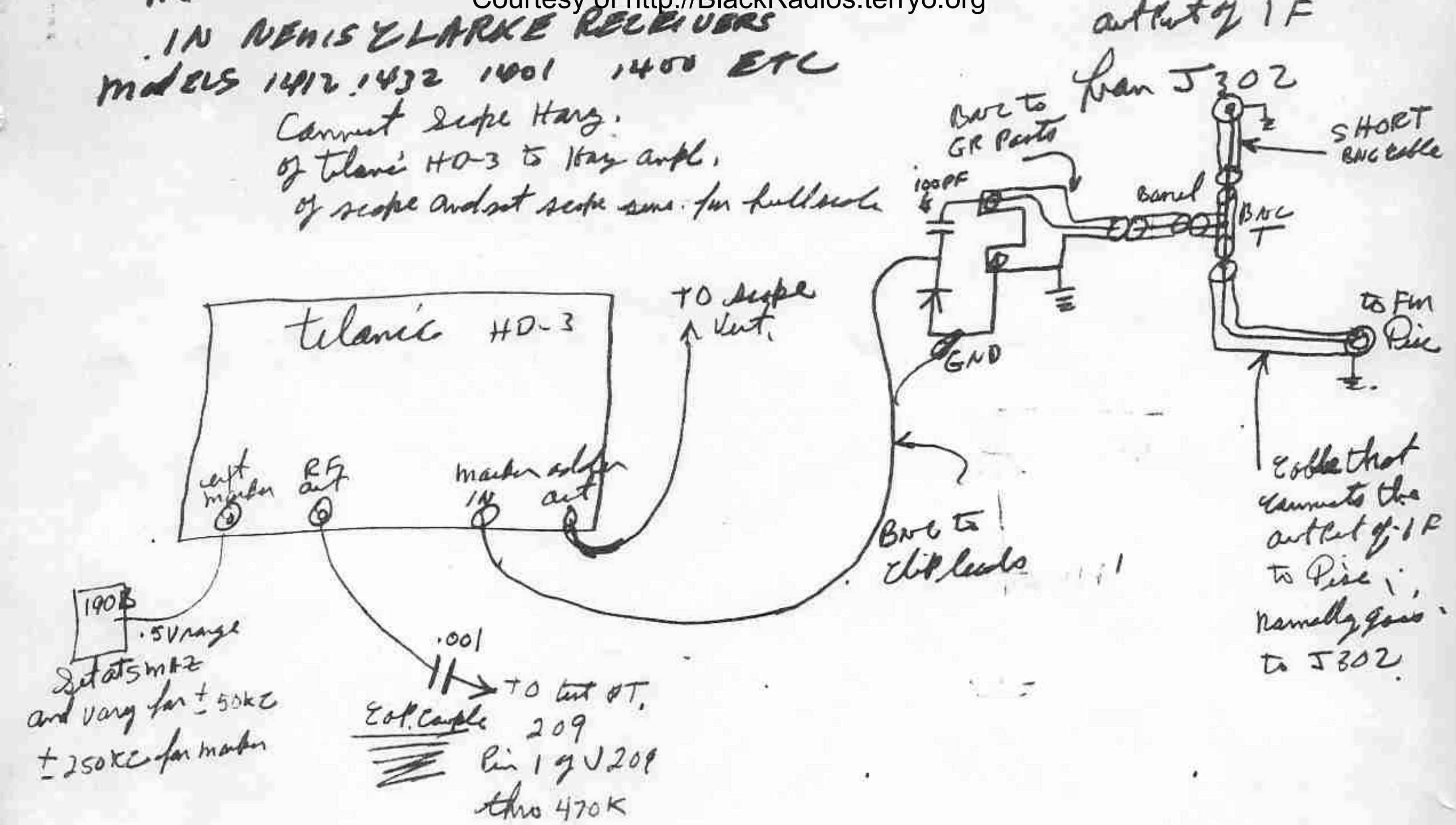


Fig. 4-12. Model 1400 Receiver, Limiter Discriminator

HOOK-UP FOR DOING IF RESPONSE IN NEMIS CLARKE RECEIVERS MODELS 1412. 1432 1401 1400 ETC

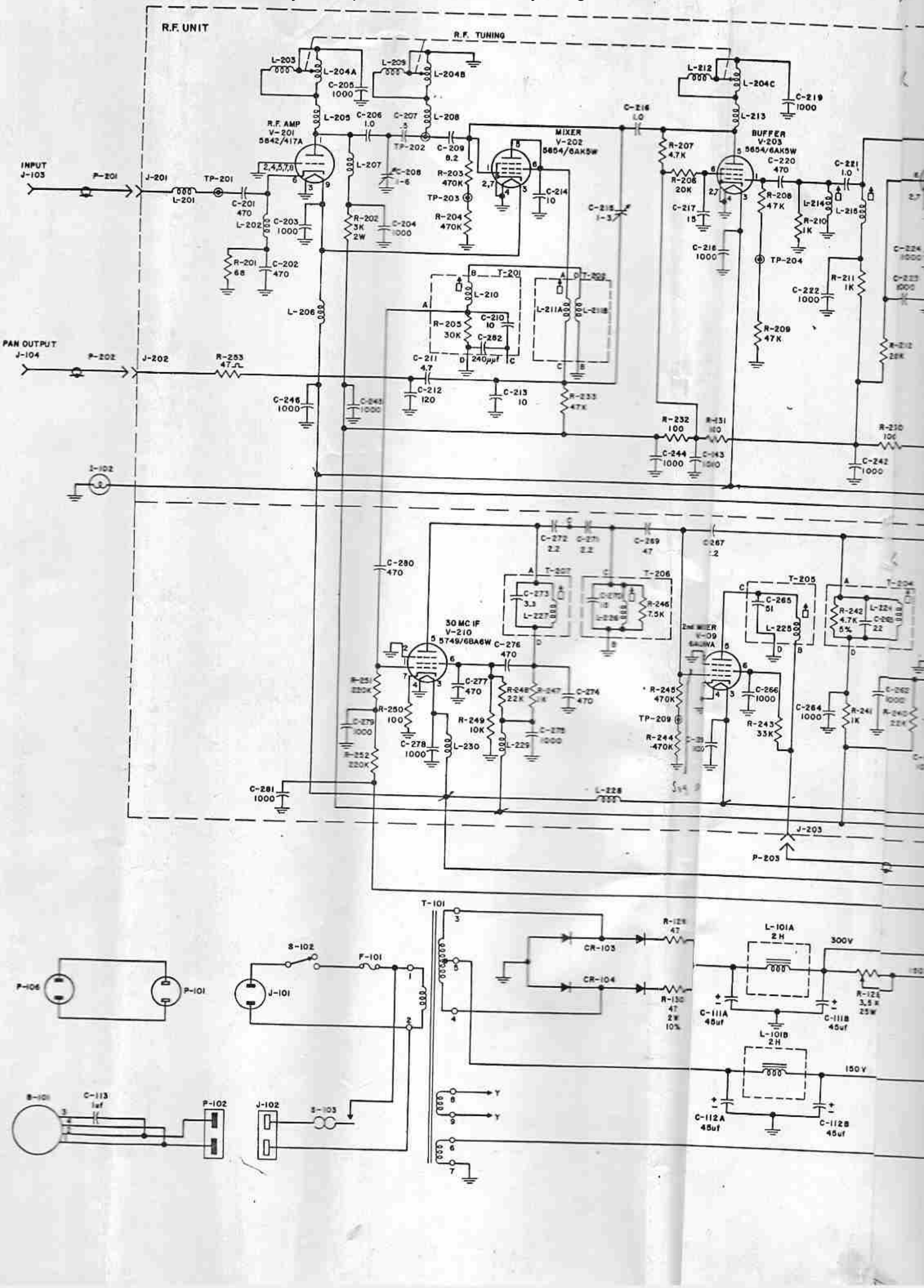
Connect Scope Horz. of telonic HD-3 to Horz ampl. of scope and set scope sens. for full scale

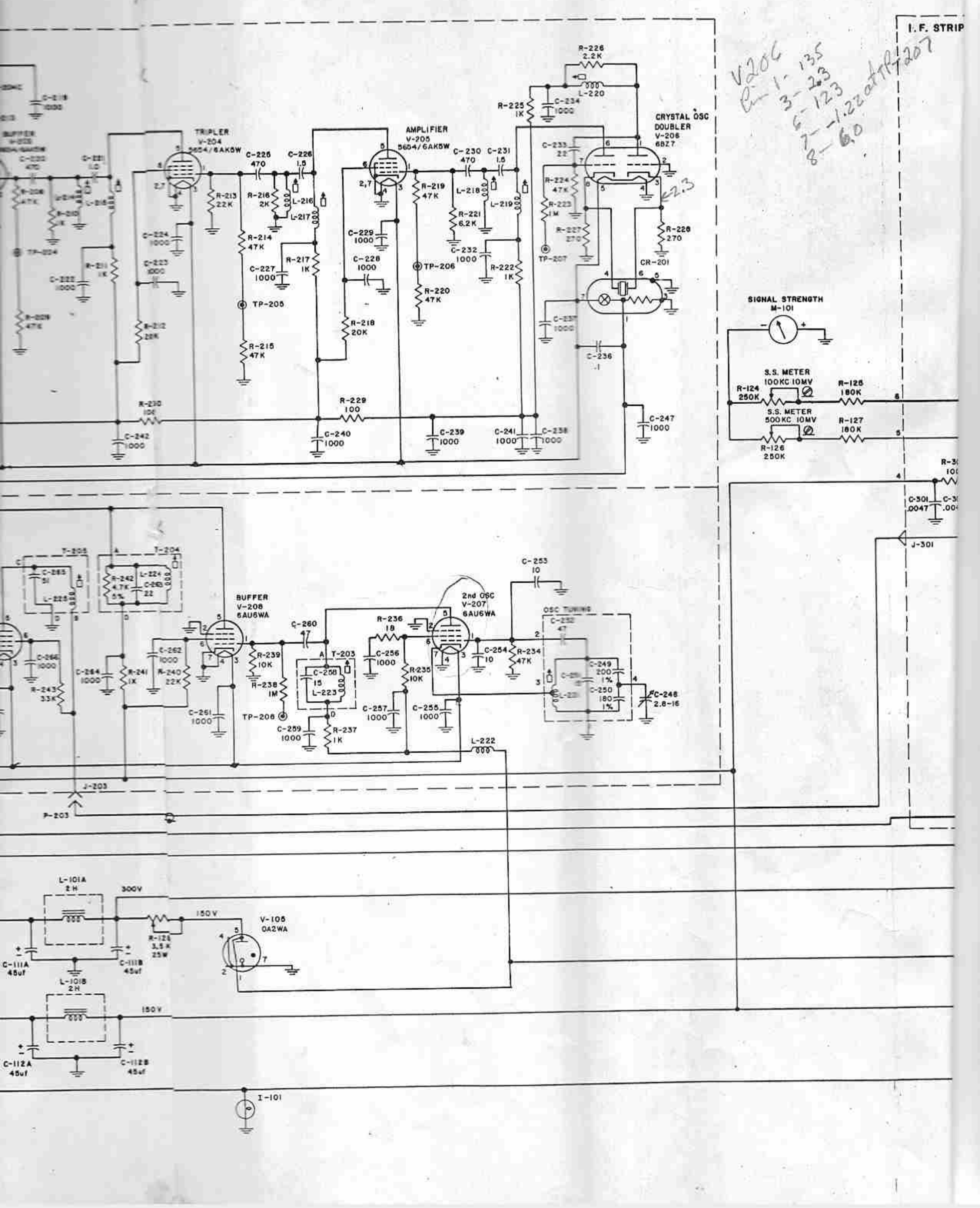


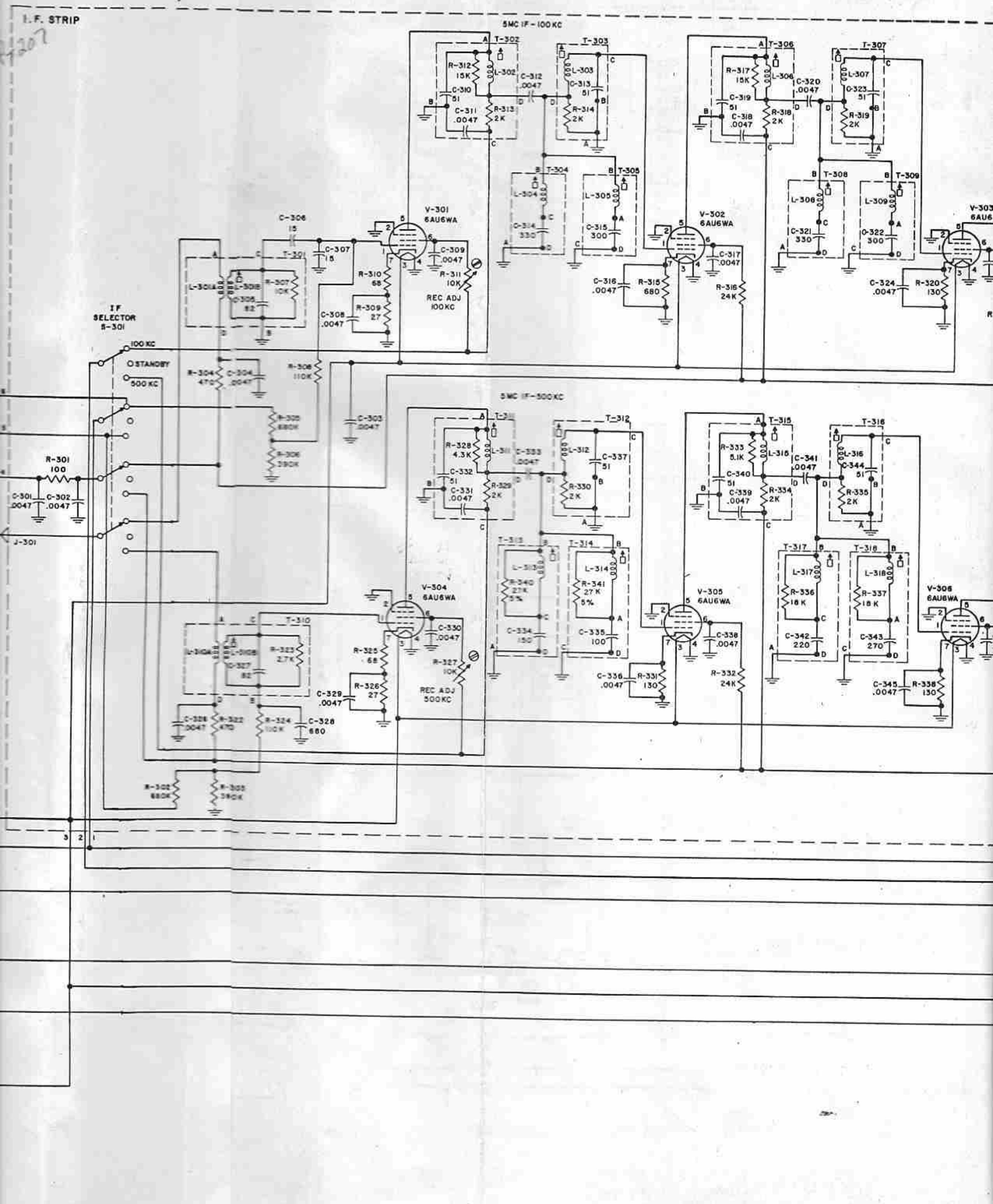
① Do not connect a signal to the ant. input while working on IF's the modulation will look like ripple on IF response wave forms.

② Pull out V207 osc. tube (6AU6) leaving tube in will cause very low sens. HD-3 will be a zero db to get small signal, normally HD-3 should be set at -20db for a waveform on scope set a .1V/cm

Fig. 4-13. Model 1400 Receiver, Schematic


R.F. UNIT
R.F. TUNING
R.F. AMP V-201 5842/417A
MIXER V-202 5654/6AK5W
BUFFER V-203 5654/6AK5W
INPUT J-103
P-201
J-201
TP-201
PAN OUTPUT J-104
P-202
J-202
R-253 47
I-102
30 MC IF V-210 5749/6BA6W
2nd MIXER V-209
T-201
T-202
T-204
T-205
T-206
T-207
J-203
P-203
T-101
S-102
F-101
J-101
P-106
P-101
B-101
C-113 1uf
P-102
J-102
S-103
CR-103
CR-104
L-101A 2H
L-101B 2H
300V
150V
C-111A 45uf
C-111B 45uf
C-112A 45uf
C-112B 45uf


I. F. STRIP
TRIPLER
V-204
5654/6AK5W
AMPLIFIER
V-205
5654/6AK5W
CRYSTAL OSC
DOUBLER
V-206
6BZ7
R-226
2.2K
L-220
R-225
1K
C-234
1000
C-233
22
R-224
47K
R-223
1M
R-227
270
R-228
270
TP-207
CR-201
C-237
1000
C-236
.1
C-247
1000
C-225
470
C-226
1.5
R-213
22K
R-216
2K
L-216
L-217
R-214
47K
C-227
1000
TP-205
R-215
47K
R-217
1K
C-228
1000
R-218
20K
C-229
1000
R-219
47K
TP-206
R-220
47K
C-230
470
C-231
1.5
L-218
L-219
R-221
6.2K
C-232
1000
R-222
1K
R-229
100
C-240
1000
C-239
1000
C-241
1000
C-238
1000
R-230
10K
C-242
1000
C-224
1000
C-223
1000
C-222
1000
R-211
1K
R-212
22K
R-209
47K
TP-204
SIGNAL STRENGTH
M-101
S.S. METER
100KC 10MV
S.S. METER
500KC 10MV
R-124
250K
R-125
180K
R-127
180K
R-126
250K
C-301
.0047
J-301
T-205
T-204
C-265
51
L-225
R-242
4.7K
5%
L-224
C-263
22
C-266
1000
R-243
33K
C-264
1000
R-241
1K
C-262
1000
R-240
22K
BUFFER
V-208
6AU6WA
R-239
10K
R-238
1M
TP-208
C-261
1000
C-260
47
T-203
C-258
15
L-223
C-259
1000
R-237
1K
R-236
18
C-256
1000
R-235
10K
C-257
1000
C-255
1000
2nd OSC
V-207
6AU6WA
C-254
10
R-234
47K
C-253
10
OSC TUNING
C-252
47
C-249
200
1%
C-250
180
1%
L-221
C-248
2.8-16
L-222
J-203
P-203
L-101A
2 H
300V
150V
R-128
3.5K
25W
V-105
OA2WA
C-111A
45uf
C-111B
45uf
L-101B
2H
150V
C-112A
45uf
C-112B
45uf
I-101
V206
1 - 1.35
3 - 2.3
6 - 123
7 - -1.22 at TP-207
8 - 6.0
2.3


I.F. STRIP
5MC IF - 100KC
5MC IF - 500KC
IF SELECTOR S-301
100KC
STANDBY
500KC
J-301
V-301 6AU6WA
V-302 6AU6WA
V-304 6AU6WA
V-305 6AU6WA
V-306 6AU6WA
REC ADJ 100KC
REC ADJ 500KC
T-301
T-302
T-303
T-304
T-305
T-306
T-307
T-308
T-309
T-310
T-311
T-312
T-313
T-314
T-315
T-316
T-317
T-318
R-301 100
C-301 .0047
C-302 .0047
R-304 470
C-304 .0047
R-305 680K
R-306 390K
R-308 110K
C-303 .0047
C-306 15
C-307 15
R-307 10K
C-305 82
R-310 68
R-309 27
C-308 .0047
C-309 .0047
R-311 10K
R-312 15K
C-310 51
C-311 .0047
R-313 2K
C-312 .0047
C-313 51
R-314 2K
C-314 330
C-315 300
C-316 .0047
R-315 680
C-317 .0047
R-316 24K
R-317 15K
C-319 51
C-318 .0047
R-318 2K
C-320 .0047
C-323 51
R-319 2K
C-321 330
C-322 300
C-324 .0047
R-320 130
R-328 4.3K
C-332 51
C-331 .0047
R-329 2K
C-333 .0047
C-337 51
R-330 2K
R-340 27K 5%
R-341 27K 5%
C-334 150
C-335 100
R-323 2.7K
C-327 82
R-325 68
R-326 27
C-329 .0047
C-330 .0047
R-327 10K
C-326 .0047
R-322 470
R-324 110K
C-328 680
R-302 680K
R-303 390K
C-336 .0047
R-331 130
C-338 .0047
R-332 24K
R-333 5.1K
C-340 51
C-339 .0047
R-334 2K
C-341 .0047
C-344 51
R-335 2K
R-336 18K
R-337 18K
C-342 220
C-343 270
C-345 .0047
R-338 130

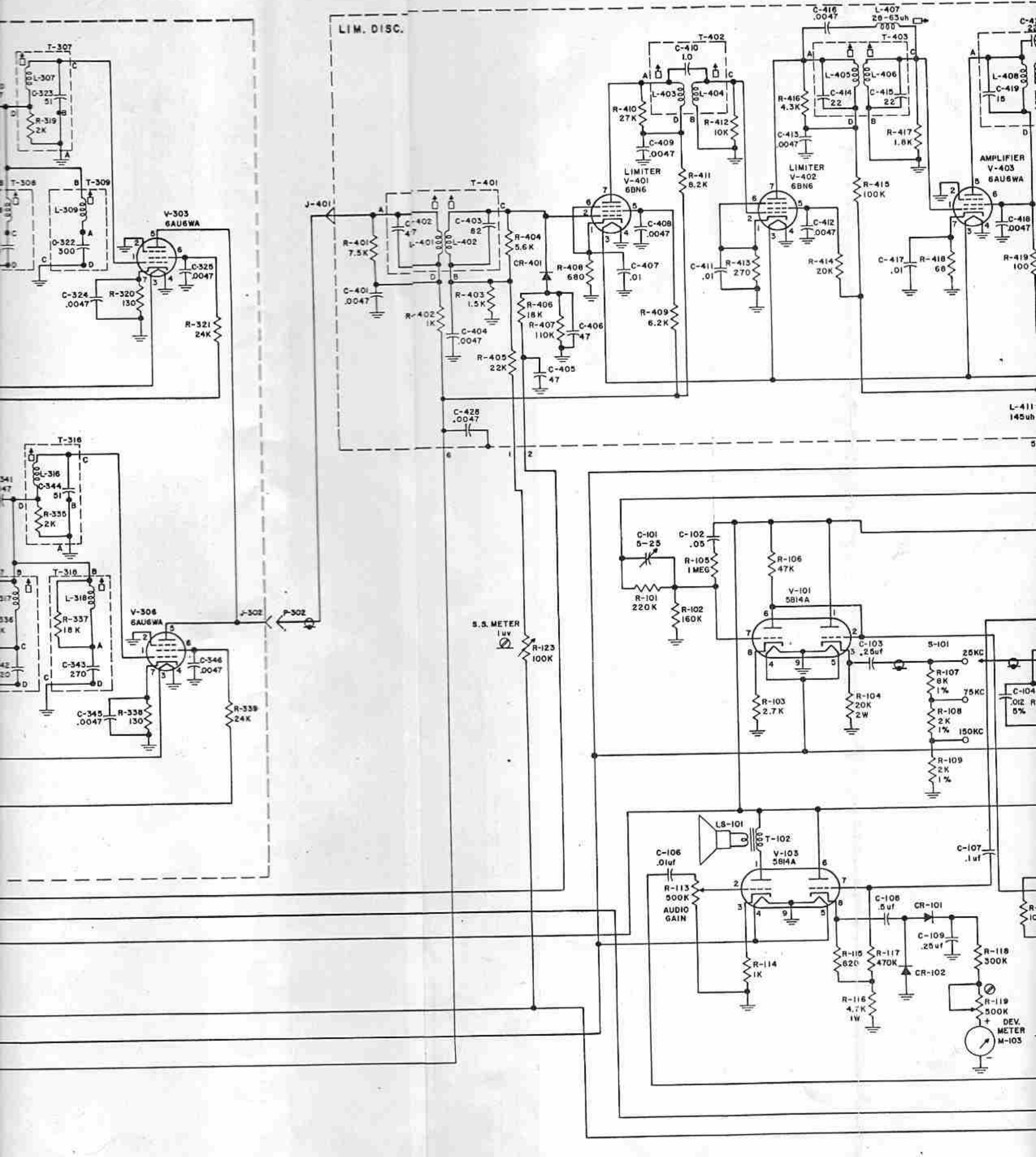

LIM. DISC.
T-307
L-307
C-323 51
R-319 2K
T-308
T-309
L-309
C-322 300
V-303 6AU6WA
C-324 .0047
R-320 130
C-325 .0047
R-321 24K
T-316
L-316
C-344 51
R-335 2K
T-318
L-318
R-337 18K
C-343 270
V-306 6AU6WA
C-345 .0047
R-338 130
C-346 .0047
R-339 24K
J-302
P-302
J-401
T-401
C-402 47
C-403 82
L-401
L-402
R-401 7.5K
C-401 .0047
R-402 1K
R-403 1.5K
C-404 .0047
R-404 5.6K
CR-401
R-406 18K
R-407 110K
C-406 47
R-405 22K
C-405 47
C-428 .0047
T-402
C-410 1.0
L-403
L-404
R-410 27K
C-409 .0047
R-412 10K
R-411 8.2K
LIMITER V-401 6BN6
C-408 .0047
R-408 680
C-407 .01
R-409 6.2K
C-416 .0047
L-407 28-63uh
T-403
L-405
L-406
C-414 22
C-415 22
R-416 4.3K
C-413 .0047
R-417 1.8K
LIMITER V-402 6BN6
R-415 100K
C-412 .0047
C-411 .01
R-413 270
R-414 20K
L-408
C-419 15
AMPLIFIER V-403 6AU6WA
C-418 .0047
C-417 .01
R-418 68
R-419 100
L-411 145uh
C-101 5-25
C-102 .05
R-105 1 MEG
R-101 220K
R-102 160K
R-106 47K
V-101 5814A
C-103 .25uf
S-101
25KC
75KC
150KC
R-107 8K 1%
R-108 2K 1%
R-109 2K 1%
C-104 .012 5%
R-103 2.7K
R-104 20K 2W
S.S. METER 1uv
R-123 100K
LS-101
T-102
V-103 5814A
C-106 .01uf
R-113 500K AUDIO GAIN
R-114 1K
C-107 .1uf
C-108 .5uf
CR-101
C-109 .25uf
R-115 620
R-117 470K
CR-102
R-116 4.7K 1W
R-118 300K
R-119 500K
DEV. METER M-103

Fig. 4-13.

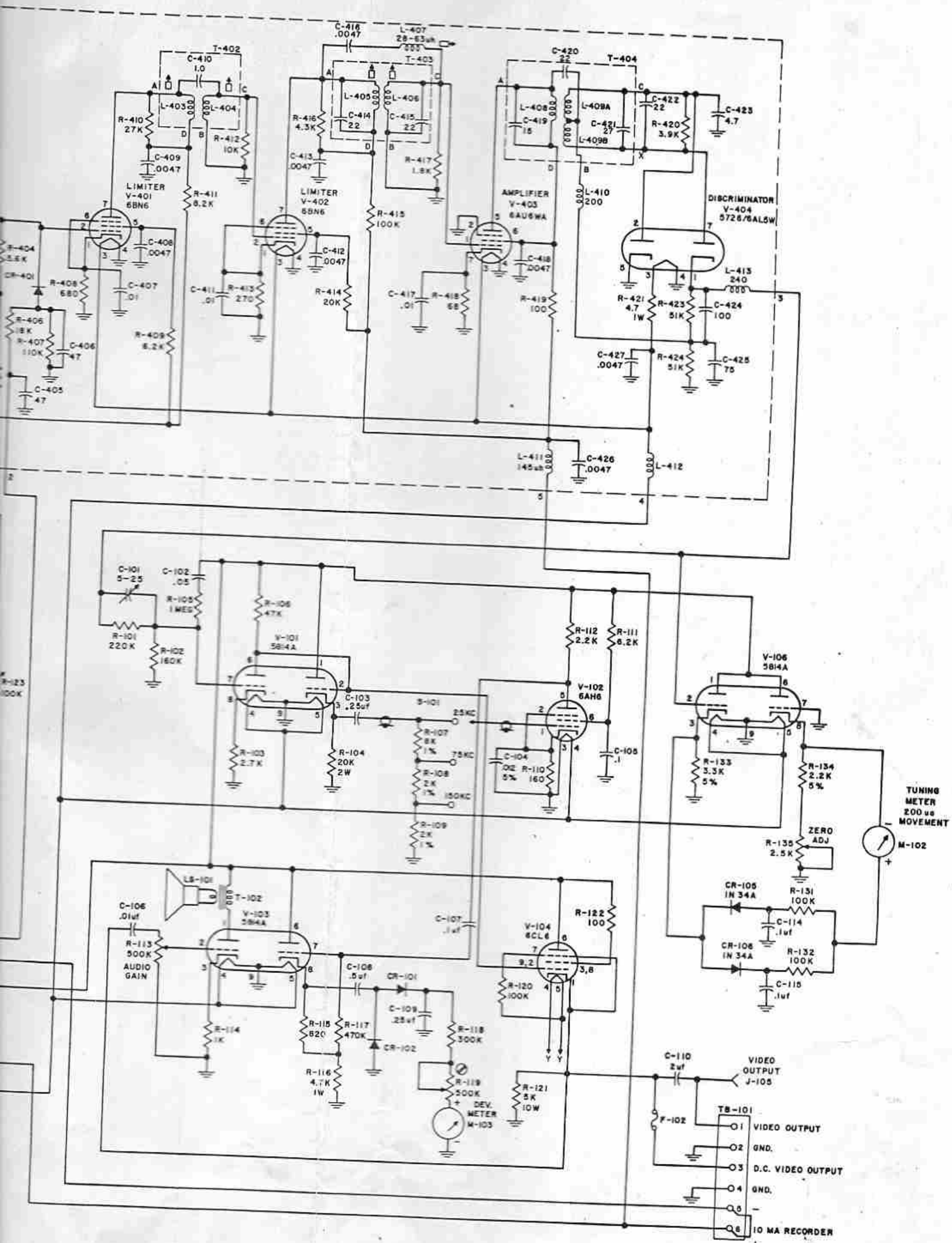


Fig. 4-13. Model 1400 Receiver, Schematic