SIGNAL-3 BC 1032-12

TM 11-4049

T. O. 16-40-BC 1032-6

WAR DEPARTMENT TECHNICAL MANUAL

PANORAMIC ADAPTOR

BC-1032-A

REPAIR INSTRUCTIONS

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WAR DEPARTMENT • *DECEMBER 1945*

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United States Government Printing Office
Washington: 1945

WAR DEPARTMENT

WASHINGTON 25, D. C., 7 DECEMBER 1945

TM 11–4049, Panoramic Adaptor BC–1032–A, Repair Instructions, is published for the information and guidance of all concerned.

[AG 300.7 (5 Oct 45)]

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Refer to RM 21–6 for explanation of distribution formula.

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WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if safety precautions
are not observed.

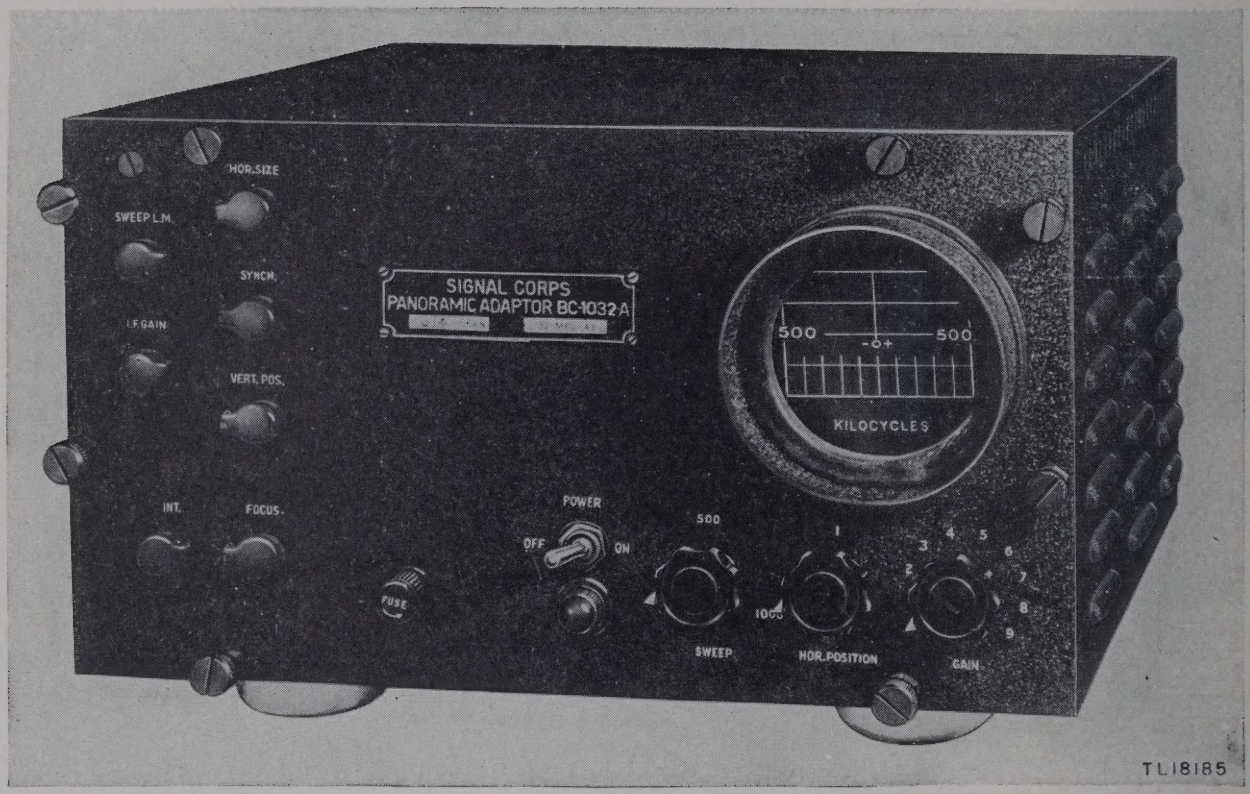


Figure 1. Panoramic Adaptor BC–1032–A.

SECTION I

DESCRIPTION OF PANORAMIC ADAPTOR BC–1032–A[1]

1. Characteristics

a. GENERAL. Panoramic Adaptor BC–1032–A (fig. 1) is an unconventional type of radio receiver which, in conjunction with a companion receiver, is used for monitoring operations. The adaptor gives a visual indication on a calibrated screen of the signal to which the companion receiver is tuned. In addition, it shows visually all signals up to 500 kilocycles on either side of the tuned signal of the companion receiver. The panoramic adaptor is a self-contained unit, but it must be used in conjunction with a receiver having an intermediate frequency (i.f.) of 5.25 megacycles (mc). In addition to giving a visual indication of the signal within 500 kilocycles on either side of the frequency of the companion receiver, the panoramic adaptor gives a rough indication of the strength of the side-band frequencies. This visual indication of the frequency and strength of signals within a 1,000-kilocycle sweep of the companion receiver's tuned frequency provides a quick and accurate means of detecting and monitoring enemy signals. Interference-free channels for transmission and reception are also indicated.

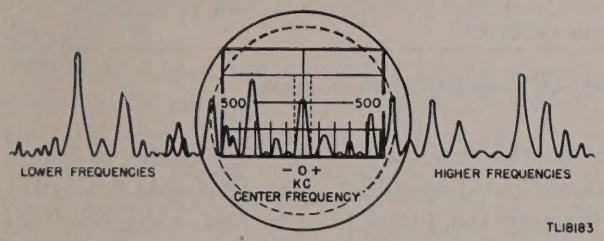


Figure 2. Panoramic Adaptor BC–1032–A screen with radio-frequency spectrum.

b. OPERATING RANGE. Panoramic Adaptor BC–1032–A will cover any frequency range to which the companion receiver is tuned if the intermediate frequency of the companion receiver is 5.25 megacycles.

c. INPUT SIGNAL. The input signal to Panoramic Adaptor BC–1032–A must be 5.25 megacycles. The adaptor will indicate visually either amplitude- or frequency-modulated signals.

d. POWER SUPPLY. The equipment operates on either 115-volt or 230-volt a-c 50- to 60-cycle power line. A change in the transformer connection must be made for 230-volt operation.

e. POWER OUTPUT OF TRANSFORMER.

6.3 volts filament at 3.0 amperes.
2.6 volts filament at 2.0 amperes.
2.5 volts filament at 3.0 amperes.
590 volts centertap (ct) at 50 milliamperes.
700 volts at 1.0 milliampere.

f. MOUNTING. The adaptor is designed for stationary use in the cabinet in which it is supplied. Four shock mount fittings are attached to the bottom of the cabinet to reduce vibration and jolting.

2. Over-all System Function

Panoramic Adaptor BC–1032–A is essentially a superheterodyne receiver consisting of a radio-frequency (r-f) amplifier stage, a mixer (first detector-local oscillator) stage, frequency-modulated (f-m) oscillator stage, an intermediate frequency (i-f) stage, a second detector-video amplifier stage, and a cathode-ray deflection screen stage on which signals in a 1,000-kilocycle band width may be viewed. In addition, the adaptor has a blocking tube oscillator stage, generating a sawtooth wave that frequency-modulates the local oscillator and controls the sweep of the cathode-ray tube simultaneously. A power supply stage includes a high-voltage rectifying tube, a low-voltage rectifying tube, and a regulator tube. For operation, the input of the panoramic adaptor must be connected to the plate of the mixer tube of a companion receiver having an intermediate frequency of 5.25 mc. The above combination of circuits enables the panoramic adaptor to indicate, by means of the cathode-ray tube deflection screen, frequencies that are 500 kilocycles on either side of the frequency to which the companion receiver is tuned and thus provide panoramic reception. For complete theory of operation refer to TM 11–446.

[1] Refer to TM 11-446 for installation, operation, and other maintenance data on this equipment.

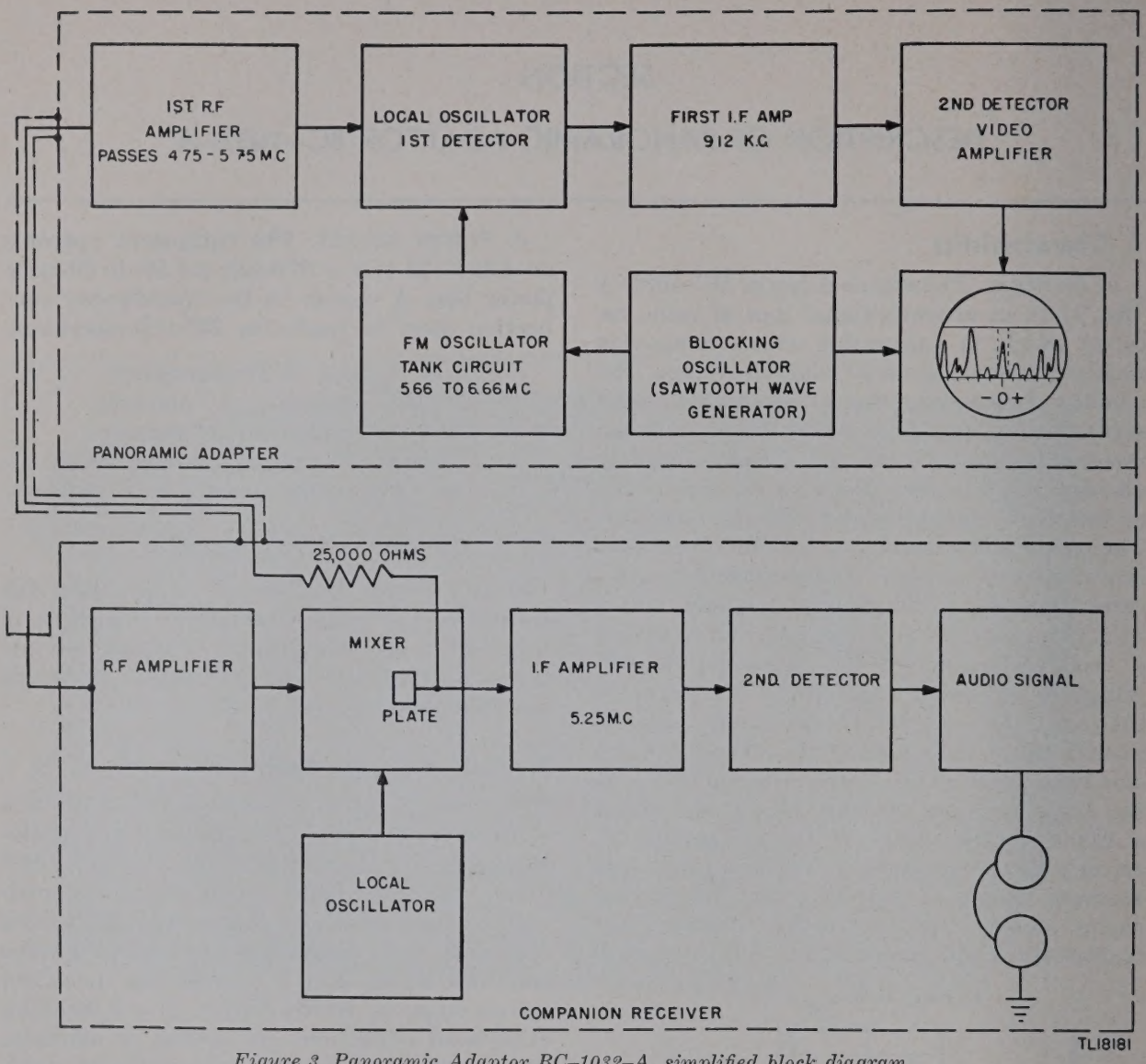


Figure 3. Panoramic Adaptor BC–1032–A, simplified block diagram.

3. Simplified Circuit Analysis

a. The following 10 tubes are used, stage by stage.

Ref symbol	JAN No.	Function
V101	6AC7	First r-f amplifier.
V102	6SA7	Mixer (first detector-local oscillator).
V103	6SG7	1-f amplifier.
V104	6SQ7	Second detector-video amplifier.
V105	6AC7	Reactance modulator.
V106	3AP1	Cathode-ray deflection screen.
V109	6SL7GT	Sawtooth generator and amplifier.
V107	2X2	High-voltage rectifier.
V108	6X5GT	Medium-voltage rectifier.
V110	OC3/VR105	Voltage regulator.

b. The input signal to the adaptor is introduced to r-f amplifier Tube JAN–6AC7 (V101) through the tuned transformer T101–02. This transformer is designed to pass a frequency band 1,000 kc wide, to give a relatively low response at the middle of the band, and to have a considerably greater response at the edges of the band. This feature is necessary to compensate for the reduced strength of the signal at the edges of the band due to the selectivity of the companion receiver. Variable resistor R103 in the cathode circuit is controlled by a front panel knob labelled GAIN.

c. The output of the r-f stage is introduced to mixer Tube JAN–6SA7 (V102) through the tuned transformer T102–02 which, similar to

T101–02, is so designed that the midfrequency response will be lower than the side frequencies. The frequencies of incoming signals are changed or heterodyned to the 912–kc intermediate frequency of the adaptor in the mixer tube by being combined with the f-m signal introduced by the f-m oscillator tank circuit Z101–02. This oscillator frequency changes constantly, sweeping the incoming signal with a frequency from 5.66 to 6.66 megacycles so that each frequency in the 1,000-kc signal input is momentarily converted to the fixed 912-kc intermediate frequency of the adaptor. In this manner, every signal in the 1,000-kc input band is changed for an instant to the intermediate frequency and is thus able to continue through the tuned i-f stage of the adaptor to the cathode-ray tube. Although only an instantaneous portion of each signal reaches the cathode-ray tube, each signal in the 1,000-kc band is swept 30 times a second by the f-m oscillator and can be distinguished on the cathode-ray deflection screen as a steady signal. Thus a series of radio station signals will appear simultaneously. To spread out the signals on the cathode-ray screen and prevent them from being on top of each other, the voltage on the horizontal plate of the cathode-ray tube is swept by a sawtooth wave generated by the blocking tube oscillator. The blocking tube oscillator also frequency-modulates the local oscillator at the same time. Thus the f-m oscillator and the cathode-ray horizontal plate are synchronized to give the signals a sweep of the screen.

d. The output signal of the mixer stage is fed to the i-f amplifier Tube JAN–6SG7 (V103) through tuned transformer Z102–02. This transformer has a resonant frequency of 912 kc, the intermediate frequency of the adaptor. The i-f gain of the stage is controlled by variable resistor R110 which can be adjusted through the front panel of the adaptor at the I-F GAIN cap.

e. The output of the i-f stage is introduced to the second detector-video amplifier stage through the tuned transformer Z103–02 which has a resonant frequency of 912 kc. Tube JAN–6SQ7 (V104) is a combination duplex diode and triode type. One of the diode units is used in a standard diode detector circuit to give rectified signals which are proportionate in strength to the signal output from the i-f stage. This rectified or video voltage is fed into the grid of the triode section of the tube and amplified to a value great enough to operate one vertical plate of the cathode-ray tube.

f. The detected signal from the second detector-video amplifier stage is impressed on one of the vertical deflection plates of the cathode-ray Tube JAN–3AP1 (V106). The purpose of the cathode-ray stage is to translate the electrical information developed by the adaptor into a visual pattern on the deflection screen that can be interpreted by the operator. Two of the deflection plates, one of the accelerating grids, and one of the beam-forming grids are held at a positive potential which can be controlled by adjusting variable resistor R127 through the VERT. POS. cap. This adjustment controls the vertical position of the base line on the screen. An accelerating voltage of approximately 750 volts negative is applied to the cathode of the tube. The first grid also has a negative voltage applied to it which can be adjusted by variable resistor R129 through the INT. cap. Resistor R129 also controls the intensity of the wave pattern. A focusing electrode is also supplied with a negative voltage and can be adjusted by variable resistor R131 at the FOCUS cap. The saw-tooth wave supplied by the blocking tube oscillator is impressed on one horizontal plate of the cathode-ray tube and controls the horizontal position of the wave pattern. It is controlled by resistor R125 at knob control labelled HOR. POSITION on the front panel.

g. The f-m oscillator tank circuit consists of transformer Z101–02 and reactance-modulator Tube JAN–6AC7 (V105). This tube is in parallel with the tank circuit and acts as a capacitor. The apparent capacitance of the reactance-modulator tube is varied by introducing the sawtooth wave to the signal grid from the blocking tube oscillator. Simultaneously, the sawtooth wave is applied to one horizontal deflection plate of the cathode-ray tube, synchronizing the frequency-modulated oscillations with the sawtooth voltage on the cathode-ray tube. The frequency sweep of the f-m oscillator is controlled by the two resistors R123 and R124 in series. Resistor R124 is adjusted at the SWEEP LIM. cap and resistor R123 is rotated by the SWEEP knob control. Variable resistor R121 is a screw driver adjustment accessible from the top of the chassis for setting the operating point of the reactance-modulator tube labelled REACTOR PAD.

h. The blocking tube oscillator which supplies the synchronizing sawtooth wave is a circuit built around Tube JAN–6SL7GT (V109) and transformer T103. The secondary of this transformer is given a small a-c signal at 60 cycles per second which causes the rate of repetition of the sawtooth wave cycle to be exactly one thirtieth of a second. To adjust the cycle, the variable resistor R137 is provided and may be adjusted through the SYNCH. cap.

i. The power supply stage is composed of two rectifying Tubes JAN–2X2 (V107) and JAN–6X5GT (V108) and a regulator Tube JAN–0C3/VR105 (V110), power transformer T104, and associated filter circuits. Tube V107 supplies the high negative voltage for the cathode-ray tube, tube V108 supplies high voltage for other tubes in the set, and tube V110 regulates the voltage supply for various critical circuits.

SECTION II

DIFFERENCES BETWEEN MODELS

(Not applicable)

SECTION III

INITIAL REPAIR PROCEDURES

Note. Before any repairs or adjustments are made, all authorized modification work orders should be applied. See FM 21–6 for list of applicable MWO's.

4. General

a. PRELIMINARY. Methods of locating trouble in electronic equipment are many and varied. Untrained repairmen use various techniques that will detect some troubles but fail to locate others. Some technicians who have a good understanding of radio theory but no practical experience often will indulge in a roundabout method of trouble location when an obvious symptom would have immediately isolated the defective part. If the procedure outlined in this manual is followed, any source of trouble in the panoramic adaptor can be located and repaired in the shortest possible time. In addition to locating a specific defect, the step-by-step procedure will enable maintenance personnel to thoroughly overhaul the equipment, restoring it to an operating condition comparable to that of new equipment.

b. INDICATION OF OPERATIONAL FAULTS. The panoramic adaptor is not a conventional type of radio receiver and for that reason the repair, alignment, and final testing are not always performed according to orthodox methods. However, the diagnosing of operational faults in the adaptor and in the alignment of the set is considerably facilitated because the operator is able at all times to see the signals that are passing through the set on the cathode-ray deflection screen. In other words, the wave pattern on the screen will at all times indicate exactly what is happening in the set. For this reason it is useful, after preliminary checking, to determine that the cathode-ray tube is functioning properly. When this has been determined, the tube itself can be used as an oscilloscope to indicate how the other circuits in the adaptor are performing.

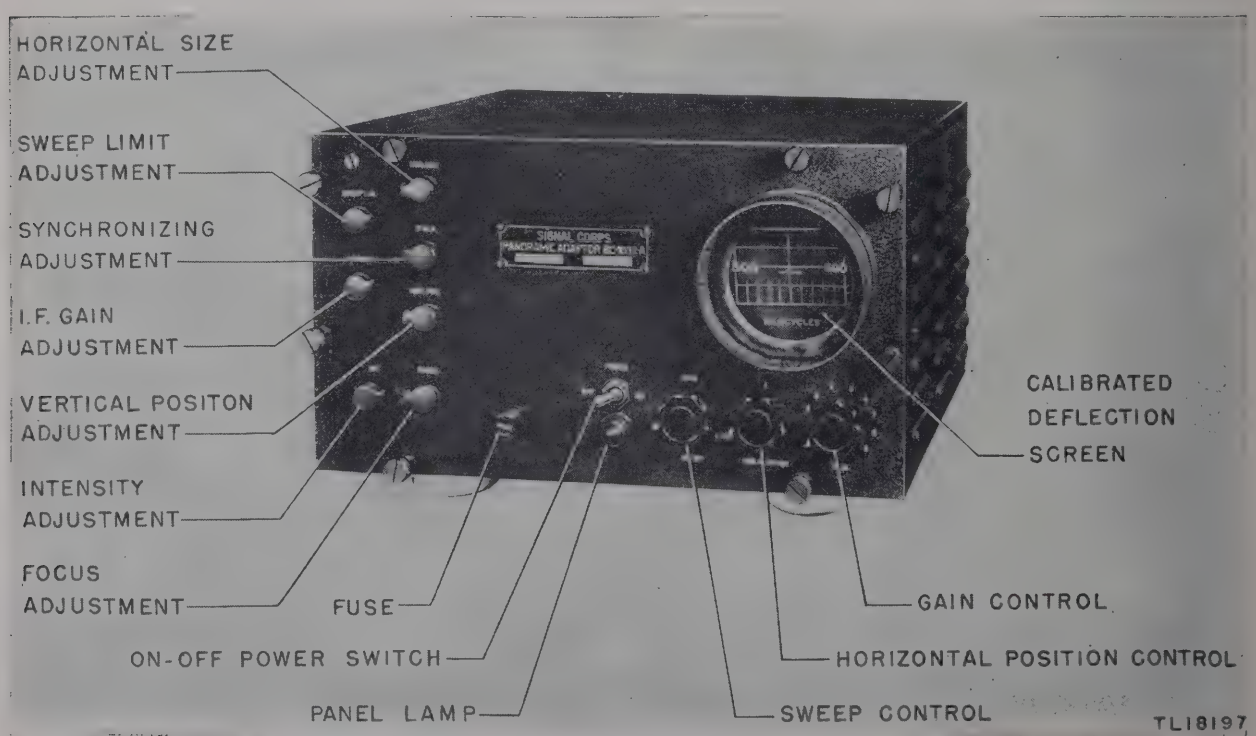


Figure 4. Panoramic Adaptor BC–1032–A, front panel parts.

5. Tools, Test and Cleaning Equipment

The tools, test and cleaning equipment listed below should be available for repairing and overhauling Panoramic Adaptor BC–1032–A.

Table I.

Item	Description
Companion receiver.	Superheterodyne type with intermediate frequency of 5.25 mc such as Radio Receiver BC–787.
Voltohmmeters.	Sensitivity of 1,000 ohms per volt, capable of measuring a-c or d-c voltages from 0 to 1,000 volts; capable of measuring resistances from 0 to 2.0 megohms.
Signal generator.	Capable of accurate output frequencies from 500 to 6,000 kc.
Multivibrator, frequency standard, or suitable instrument.	To give accurate output frequency of 100 kilocycles.
Cathode-ray oscilloscope.	Standard type.
Tube tester.	Standard emission type.
Resistor.	25,000 ohms, ½ watt.
Capacitor.	0.01 mf.
Radio repair hand tools.	Assorted.
Alignment screw driver.	Fiber.
Small flashlight, or probing light.	
Solvent, Dry-cleaning.	
Sandpaper.	#00 and #000.
Clean cloths.	Lint-free.
Crocus cloth.	
Paintbrushes.	Assorted small sizes.

6. Removal of Tubes

Before the tubes can be removed from the panoramic adaptor the chassis must be removed from the cabinet.

a. PRELIMINARY PROCEDURE. (1) Pull power cable from plug and unscrew input cable plug from rear of adaptor (See fig. 40.)

(2) Unscrew slotted screw at middle of rear of cabinet.

(3) Loosen the eight captive knurled screws mounted along the edges of the front panel.

(4) Pull the chassis from the cabinet.

(5) Turn chassis upside down and remove the 10 screws holding bottom cover plate to chassis.

(6) Remove four screws holding shielding cover to f-m oscillator assembly housing.

b. TUBE REMOVAL. (1) Slide clamp of tube V107 to one side and remove grid cap.

(2) Remove all vacuum tubes except cathode-ray tube from sockets, depressing tube clamps to release tubes. If a tube sticks in socket, rock it gently while pulling it. Remove panel lamp I101 by unscrewing cover on front panel.

(3) The cathode-ray tube is held in place by a metal collar. Unclip collar and grab tube firmly near the base and pull it from socket. (See figs. 6 and 7.) Ease the tube out through the front panel. The rubber boot that cushions the tube and holds the calibrated screen may be removed by pulling it off the tube.

7. Cleaning, Inspecting, and Lubricating Chassis

a. CLEANING SETS EXPOSED TO SAND, SILT, OR SALT WATER. (1) If adaptor has been submerged or subjected to salt spray, it is important to remove all traces of sand or salt from the set. Silt or beach sand in the set often deposits small crystals of salt between tube prongs and socket pins and in small crevices that will cause short circuits.

(2) If chassis contains sand or silt, or if the characteristic white salt crystal formation is visible in the equipment, flush the set thoroughly in clean, fresh water. Wipe insulation, tube sockets, and switch contacts carefully with a clean rag soaked in fresh water. Place equipment in a drying oven at a temperature not exceeding 125° until it is thoroughly dry.

b. GENERAL CLEANING PROCEDURE. Follow instructions in the latest Signal Corps publications on the general subject of cleaning. The procedure may be supplemented by the following steps.

(1) Use clean air to blow out dirt from inside and top of chassis.

(2) Use a screw driver or other sharp tool to scrape off drops of solder.

(3) Dampen a clean lint-free rag with dry-cleaning solvent (SD) and wipe dirt and grease from equipment. Use pointed tool wrapped with a strip of cloth to clean points that are hard to reach.

(4) Scrape off all traces of rust or corrosion on metal parts and finish with #000 sandpaper.

(5) Remove all traces of fungi by scraping and sanding. (Materials containing cellulose, such as insulation, adhesive cement, wood, and certain plastics, are likely to have fungi growth.)

(6) If equipment is excessively dirty, remove screws holding resistor cards and pull cards with resistors to one side to give access for cleaning.

c. INSPECTION. After the adaptor has been thoroughly cleaned, make a general visual in-

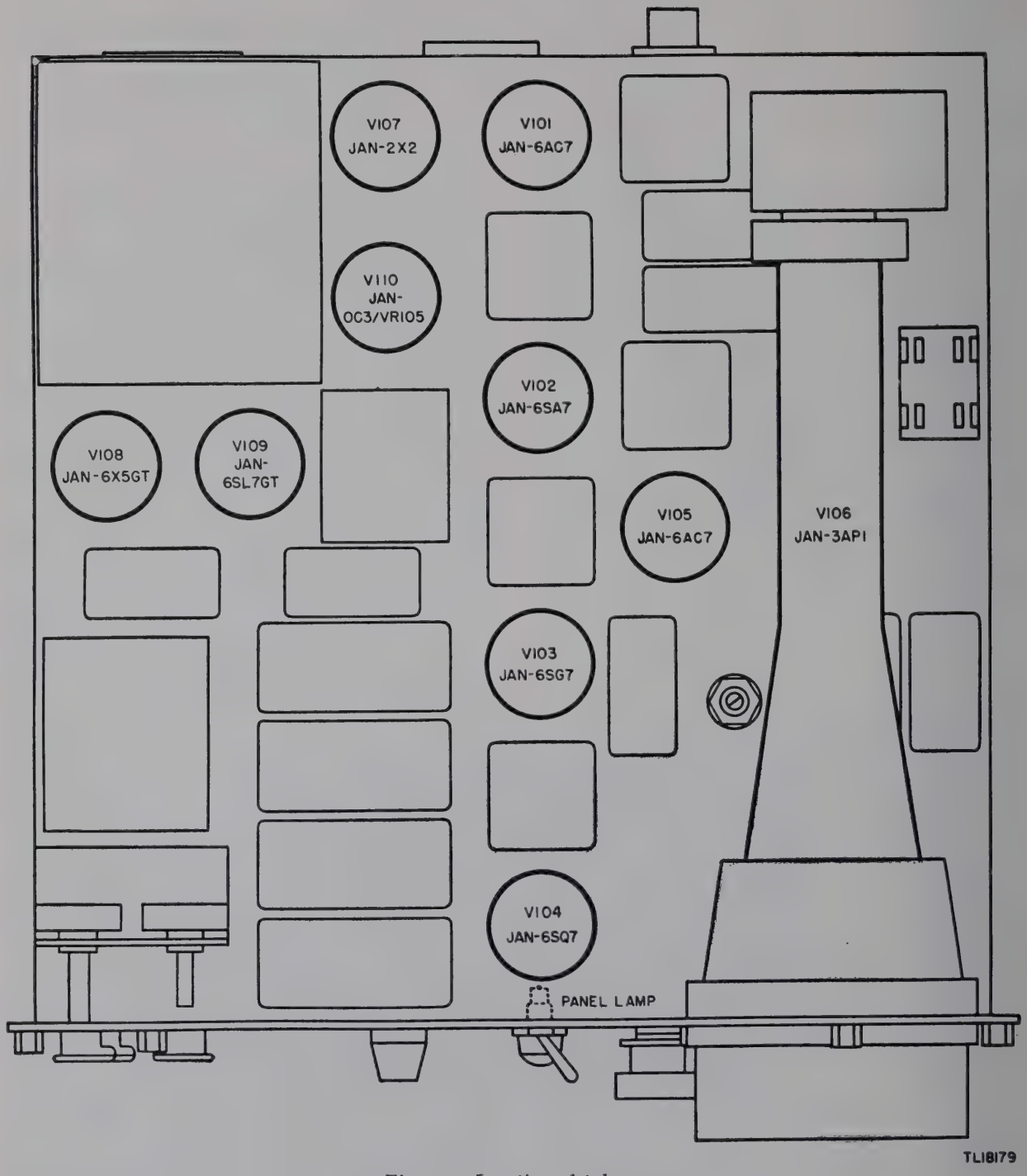


Figure 5. Location of tubes.

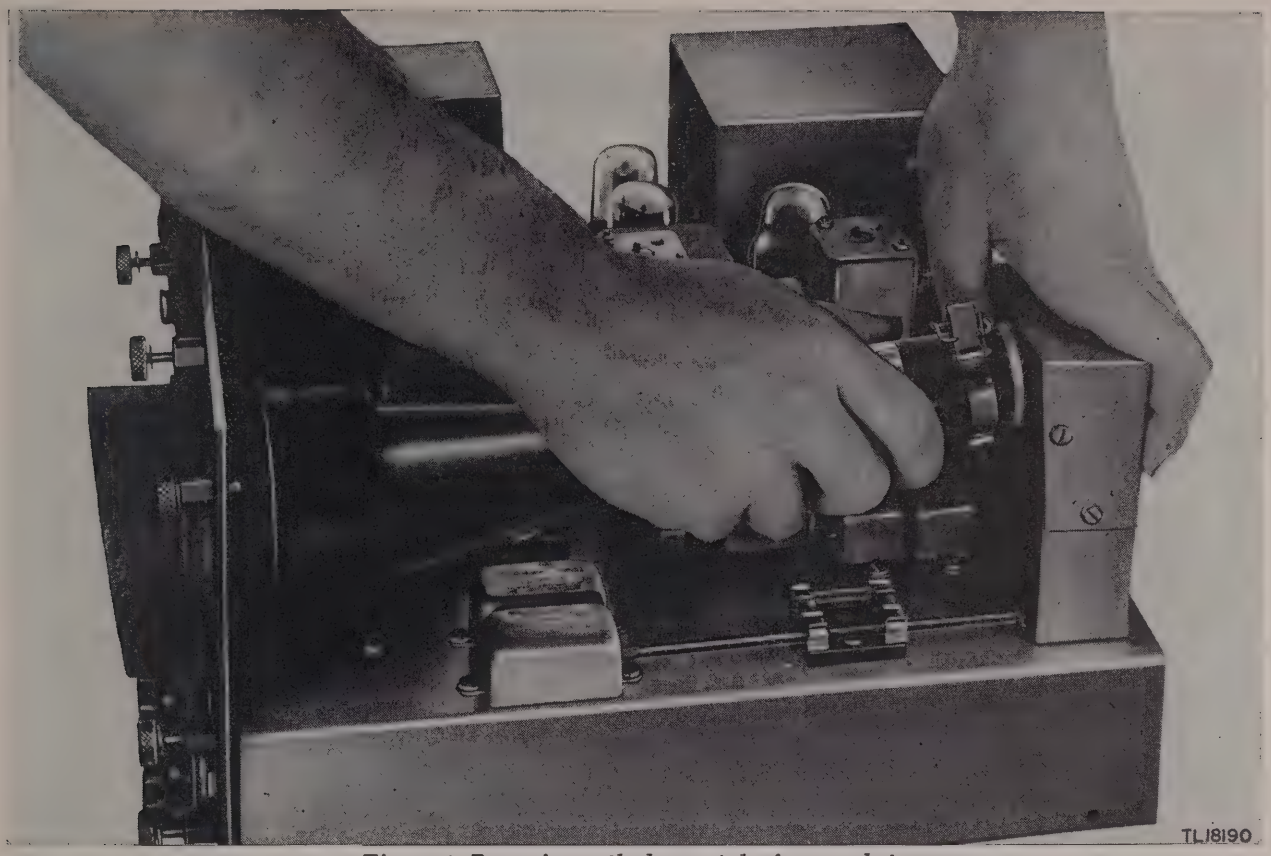


Figure 6. Removing cathode-ray tube from socket.

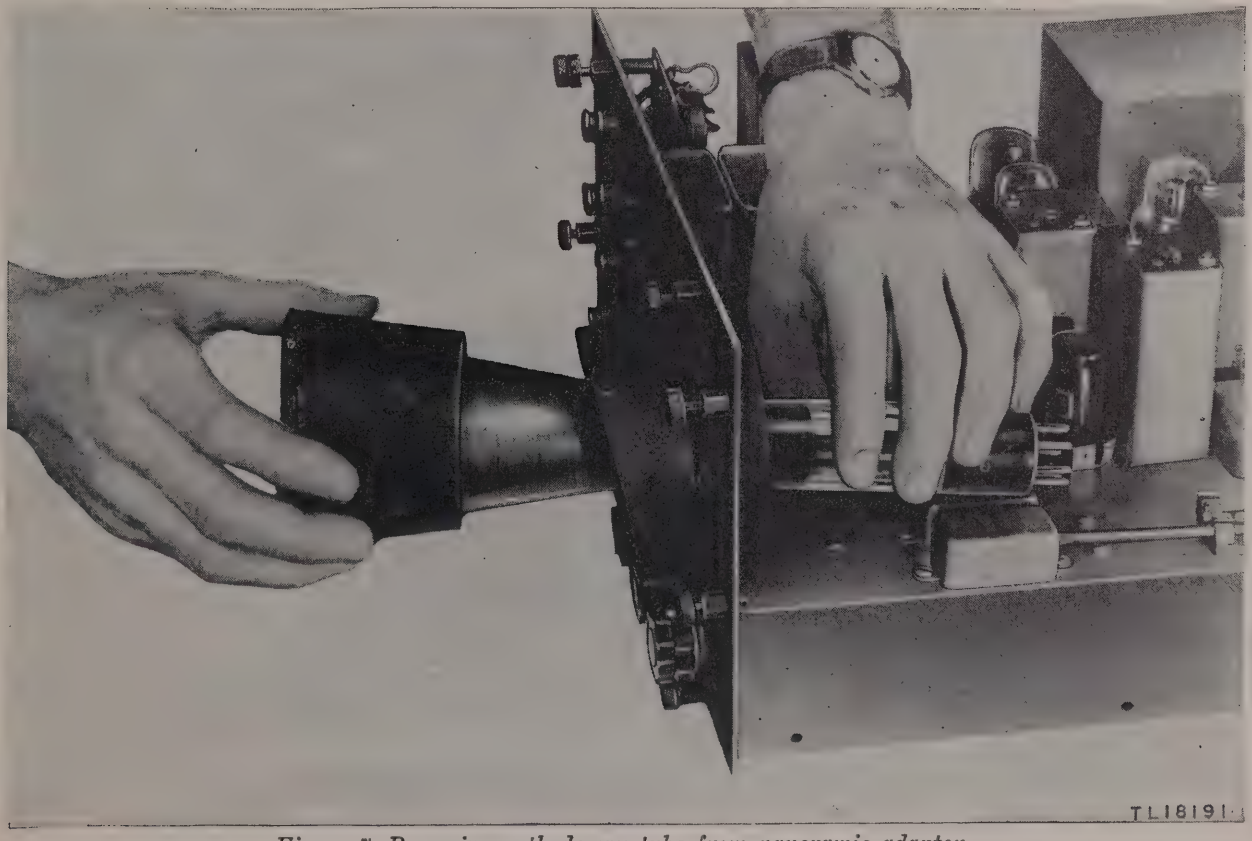


Figure 7. Removing cathode-ray tube from panoramic adaptor.

spection of chassis in accordance with customary shop practice.

(1) Look carefully for defective wiring, loose connections, frayed or burned insulation, loose screws, missing grommets, and burned or charred resistors.

(2) Test the three knob controls on front panel to make certain that they turn easily but that shafts are not actually loose in potentiometers.

(3) Make a careful inspection of tube sockets for broken or bent lugs, loose or bent contacts, and broken insulation.

(4) Inspect bases of coil cans to see that there is sufficient clearance between wires and adjustment screws to avoid obstructing screws.

(5) Test spring caps on front panel, covering adjustment potentiometers, to make sure that caps move freely and that springs are not broken.

d. LUBRICATION. Lubrication is not required for Panoramic Adaptor BC–1032–A.

8. Cleaning, Inspecting, and Testing of Tubes

a. CLEANING AND INSPECTING. Clean glass tubes with a cloth moistened with dry-cleaning solvent (SD). If tube prongs are rusty, clean with crocus cloth. Examine tube to see that glass envelope is tight in plastic base and that base is not cracked. If cement holding glass envelope in base has deteriorated, the tube should be replaced.

b. TESTING. All tubes, with the exception of cathode-ray tube V106, should be tested in a standard type tester and should meet joint Army-Navy specifications. Ordinarily a tube tester is not available for testing the cathode-ray tube. It is important that the condition of this tube be known, because further tests of the adaptor are indicated by the wave pattern of the cathode-ray deflection screen. To test the cathode-ray tube, place it in another panoramic adaptor known to be in proper working order, or in any piece of radio equipment using this type of tube. If the cathode-ray tube in question performs satisfactorily in the test application it can be assumed that it is in satisfactory condition.

SECTION IV

PRELIMINARY TROUBLE-SHOOTING PROCEDURES

9. Input Resistance Measurements

By measuring the input resistance of power transformer T104, a short or open circuit in wires carrying the 115- or 230-volt line voltage can be detected without applying power to the equipment. By determining the condition of this circuit before turning on the power, damage that might otherwise result will be avoided.

a. POWER CABLE. Test condition of Cord CD–807 by continuity check. If both wires in cable check for continuity and are not shorted together, the cable is satisfactory.

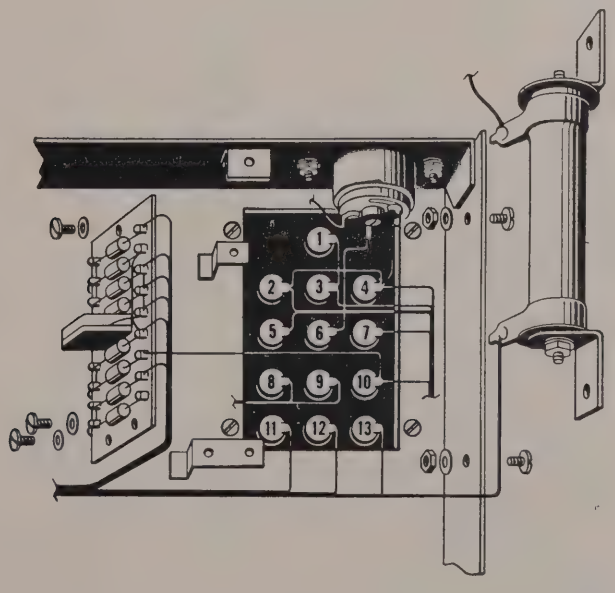
b. POWER TRANSFORMER T104. (1) Disconnect power cable from adaptor and turn power switch S101 to ON. With an ohmmeter, test for resistance at power plug receptacle of set.

(2) With transformer wired for 115-volt operation, resistance of transformer primary is approximately 4½ ohms.

(3) If reading is incorrect by more than ½ ohm, a short in transformer is indicated. If no reading is obtained, either fuse F101, switch S101, wiring, or transformer primary is open. Check fuse, switch, and wiring. If these are not defective, the transformer is at fault and should be replaced. Before replacement, apply correct line voltage to transformer and measure secondary voltages, table II, to make certain that transformer is at fault. Disconnect secondary leads when making test. In replacing transformer, unscrew nuts holding wires to terminals and tag wires with number corresponding to transformer terminal. (See fig. 8.)

Table II.

Transformer terminals	A-c voltage
5 and 6	295.0
6 and 7	295.0
6 and 9	700.0
8 and 9	2.5
10 and 11	6.3
12 and 13	2.6



TL18180

Figure 8. Power transformer and terminal numbers.

10. Operating Test

The preceding tests, inspection, and repairs have indicated that the tubes, power transformer, and wiring are in working order.

a. REASSEMBLY. (1) Replace all tubes. Be careful to return each tube to the socket from which it was removed.

(2) Lock collar holding cathode-ray tube in place.

(3) Make sure that calibration screen in front of cathode-ray tube is square with front panel.

(4) Replace f-m oscillator housing shield.

(5) Replace bottom cover plate and attach temporarily with two or three screws.

b. PREPARATION OF SET FOR OPERATION. (1) The adaptor ordinarily is wired for 105 to 115 volt a-c power. If power source is 230 volts, see figure 9 for wiring changes of power transformer.

(2) Attach cord CD–807 to receptacle on rear of chassis. The plug is polarized. A right turn locks it.

c. OPERATION. (1) Turn the POWER switch of adaptor to ON. The panel lamp should light at once. Set SWEEP control in full clockwise position; set HOR. POSITION control in mid-position; set GAIN control in counterclockwise position.

(2) While adaptor is warming up, notice any abnormalities of operation. Listen for cracking or buzzing noises which indicate arcing of high voltage. Look for smoke; check for the odor of burned or overheated parts.

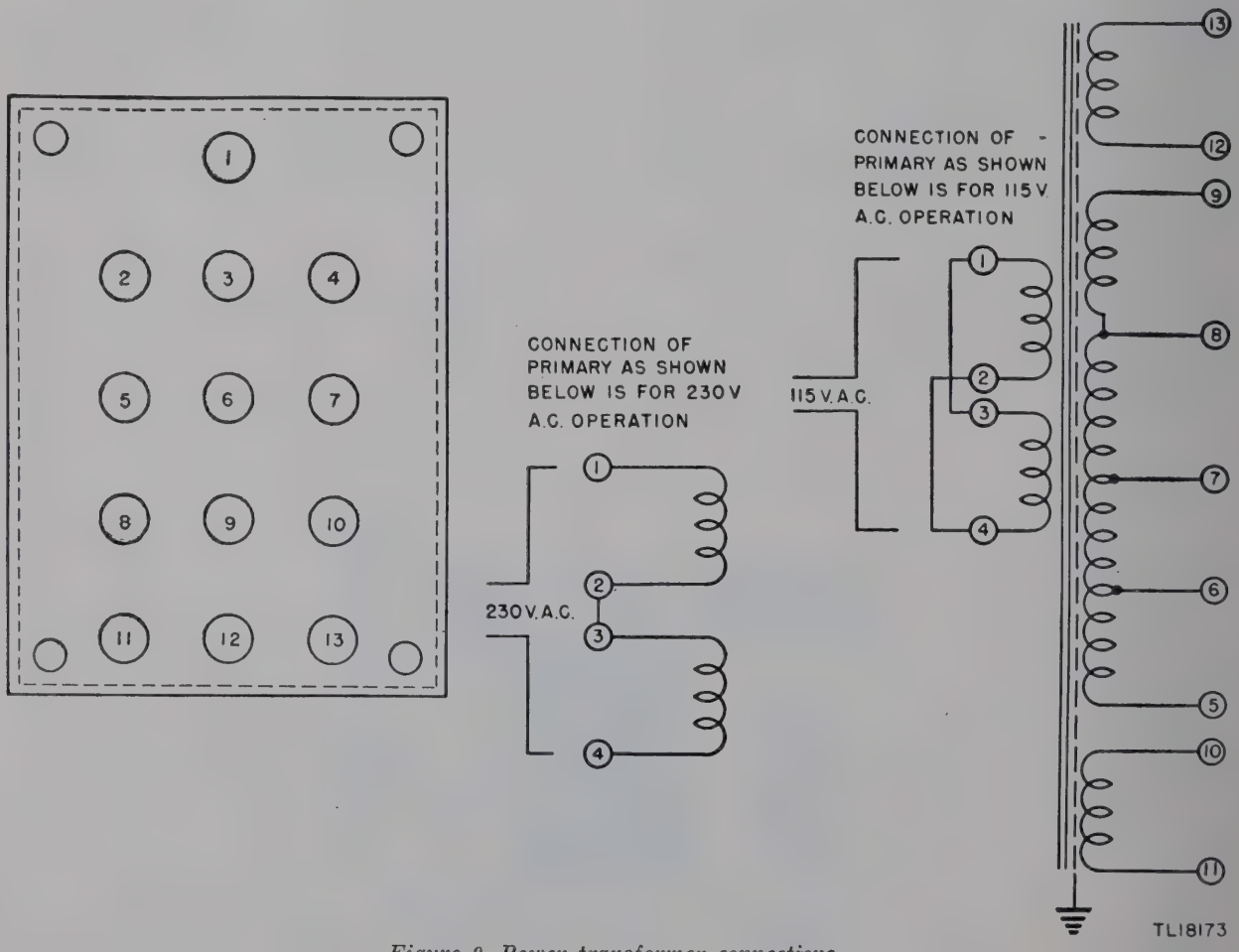
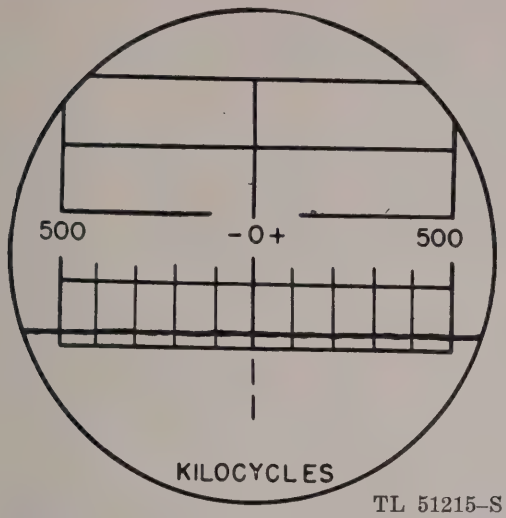


Figure 9. Power transformer connections.

(3) Within half a minute the base line should appear on the panoramic screen as shown in figure 10.



TL 51215–S

Figure 10. Panoramic adaptor base line with minimum gain.

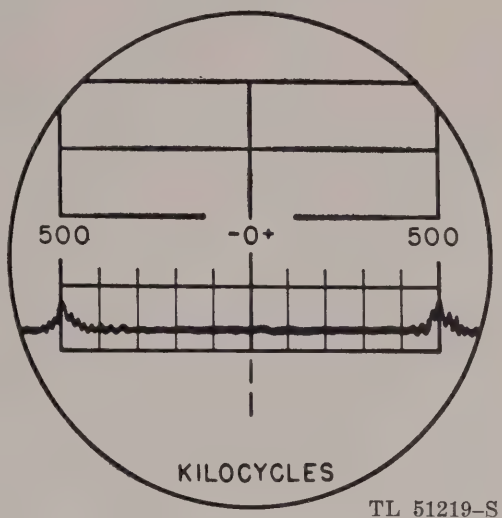
(*a*) Turn GAIN control to full clockwise position. The base line of cathode-ray screen should show "bumps", particularly near each end. This indicates noise. (See fig. 11.)

(*b*) Turn GAIN control full counterclockwise. The base line should be clean from one end to the other.

(4) Turn on an electric motor, electric razor, or any device that produces static in a radio.

(*a*) Connect short piece of wire to input of adaptor to serve as antenna.

(*b*) A multitude of deflections should appear on screen of adaptor, indicating that it is receiving interference from the motor.



TL 51219–S

Figure 11. Panoramic adaptor base line with maximum gain.

d. INTERPRETATION OF RESULTS. (1) If base line appears and noise bumps or interference shows up with maximum GAIN setting, it is probable that adaptor is in working condition and needs only an alignment check. (See sec. VII.)

(2) If base line does not appear or the screen indication is only a dot, it is evident that there are one or more defective stages in the adaptor. Follow the procedure of section V and section VI.

SECTION V

ALIGNMENT PROCEDURE

11. General

a. For satisfactory performance of Panoramic Adapter BC–1032–A the set must be *perfectly* aligned. The conventional type of receiver will operate with fair performance although there is some misalignment. This is not true of the adaptor. Each stage must be properly aligned, particularly the frequency modulated oscillator stage and the r-f bandpass transformers.

b. The term *alignment*, when used with the panoramic adaptor, includes the adjusting of the two r-f and the two i-f transformers, the f-m oscillator transformer and REACTOR PAD, and the seven adjustments on the front panel. (Fig. 12.) The transformers are trimmed inductively by moving the iron cores of the windings. The primary winding, indicated by the letter A on the schematics, is trimmed through the top of the transformer can with the pin end of the tuning tool supplied with the adaptor. The secondary winding, indicated by the letter B on the schematics, can be tuned either from the bottom (under side of chassis) of the transformer or from the top of can by using the screw driver end of tuning tool.

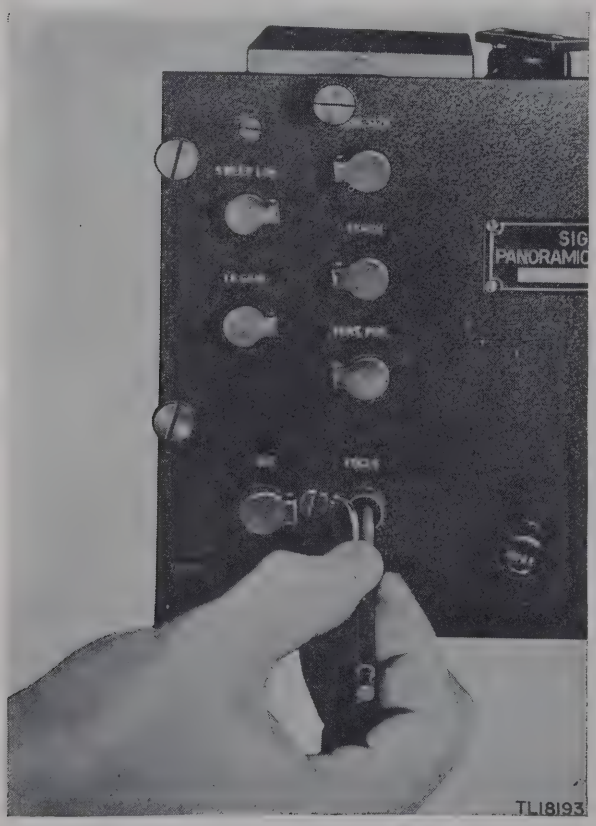


Figure 12. Front panel adjustments.

Note. It is most convenient and accurate to tune both primary and secondary of each transformer from the top of the can with the adaptor in operating position.

c. The panoramic adaptor should be aligned in the order given in this manual. If a circuit cannot be aligned, see section VI. A defective part should be located and repaired or replaced before attempting any further alignment of the adaptor.

d. Because the cathode-ray screen serves as the visual indication of the alignment of the adaptor, it is advisable to check tube V106 pin voltages before starting the alignment. Make certain this tube has the proper voltages applied to it. See paragraph 18 for procedure.

Caution: Use care in measuring cathode-ray tube voltages. They are high enough to be dangerous.

e. Make certain that the signal generator or other signal-producing instrument is accurately calibrated. The value of precise alignment is lost if the frequencies called for in the following procedures are not exact.

Note. When the panoramic adaptor is used with a companion receiver, the (+) sign on the calibration screen indicates high frequency and the (—) sign indicates low frequency. When signals are fed directly to the input of the adaptor from a signal-producing instrument, the (+) sign indicates low frequency and the (—) sign indicates high frequency.

12. I-F Amplifier Alignment

A signal generator capable of producing 912 kc is required for i-f alignment. Proceed as follows:

a. Turn on adaptor and signal generator.

b. Connect signal generator output directly to pin 4, Tube JAN–6SG7 (V103).

c. Adjust signal generator to a frequency of exactly 912 kilocycles.

d. Adjust output of signal generator so that base line is about 1.0 inch up from normal position. (See fig. 15.)

e. Trim the second i-f transformer Z103–02 with both ends of tuning tool for the highest deflection attainable on cathode-ray tube screen.

f. Move signal generator output lead, without changing frequency, to pin 8 of Tube JAN–6SA7 (V102).

g. Adjust output of signal generator so that base line is about 1.0 inch up from normal position.

h. Trim the first i-f transformer Z102–02 for the highest deflection attainable on cathode-ray tube screen.

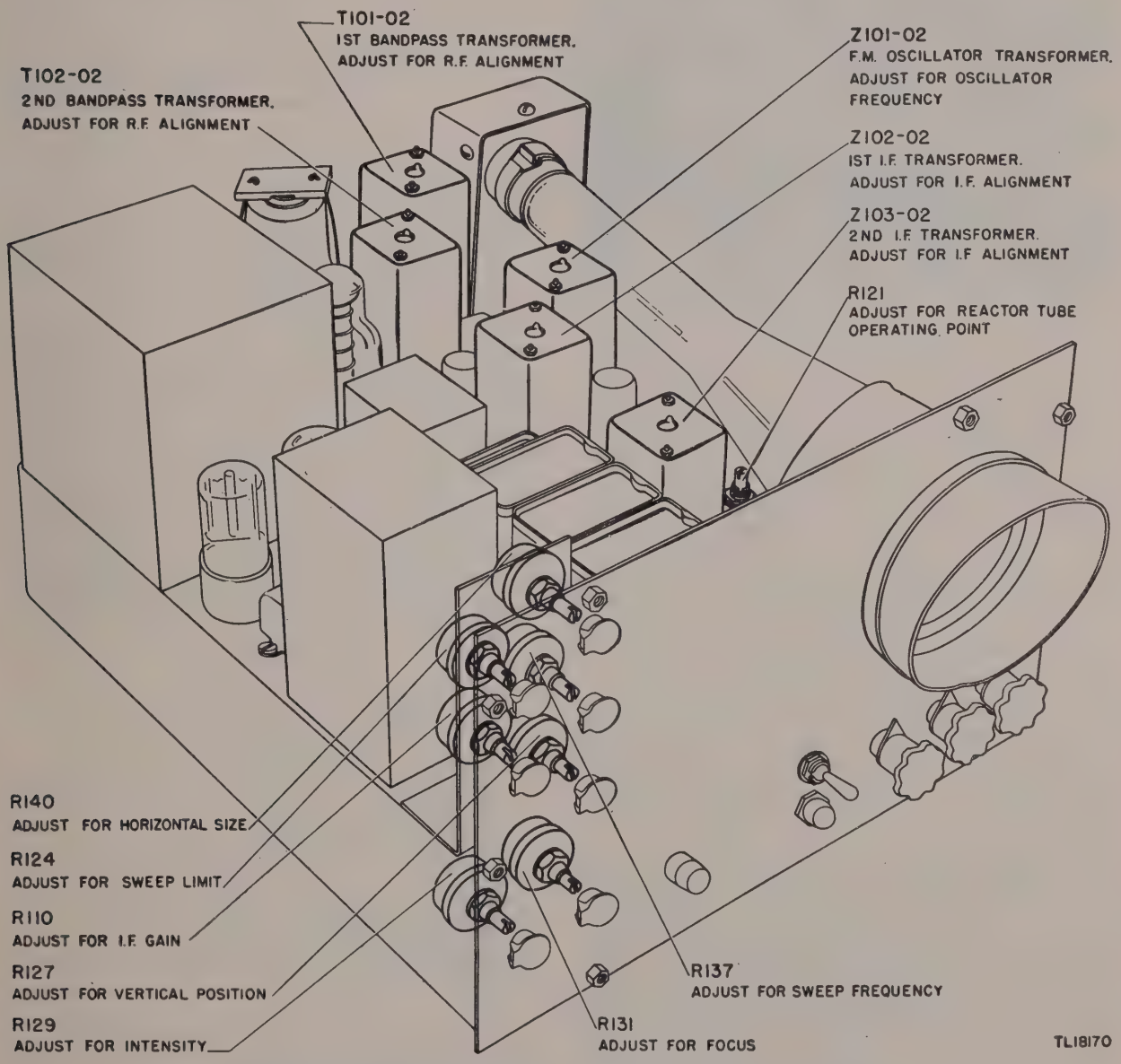


Figure 13. Alignment points of Panoramic Adaptor BC–1032–A.

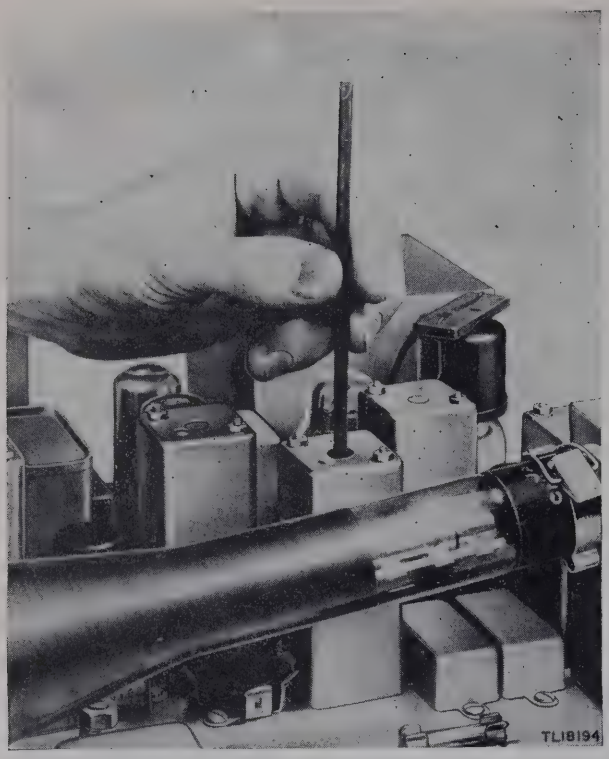


Figure 14. Aligning transformer of Panoramic Adaptor BC–1032–A.

13. F-M Oscillator Alignment (with Signal Generator)

The satisfactory operation of the adaptor depends on the correct alignment of the f-m oscillator. The following adjustments are all approximations which are gradually narrowed down until the desired results are obtained. Care and patience are required in making these adjustments. If a signal-producing instrument with an accurate fundamental output of 100 kc is available, see paragraph 14 for procedure.

a. CENTER-FREQUENCY ADJUSTMENT. (1) Connect signal generator output lead to the input of adaptor through a resistor of 25,000 ohms. Connect ground lead of signal generator to adaptor chassis.

(2) Adjust signal generator for a frequency of exactly 5.25 mc and an output sufficient to give a wave deflection about 1.0 inch high with GAIN control in midposition.

(3) Set the SWEEP control at maximum.

(4) Set the HOR. POSITION control in midposition.

(5) Trim oscillator transformer Z101–02 with screw driver end of tuning tool so that deflection on screen is approximately centered.

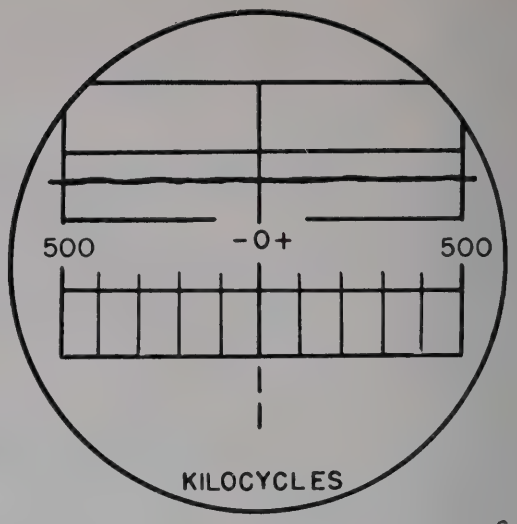


Figure 15. Base line deflection with signal input to i-f stage.

If more than one or two turns of transformer adjusting screw are required, center deflection by adjusting REACTOR PAD (R121).

(6) Rotate SWEEP control slowly counterclockwise. As SWEEP control is rotated, the waveform will open up on screen. For proper alignment the wave pattern must open symmetrically and the peak of deflection must remain near the center of the screen. To achieve this result, continue to adjust transformer as the sweep control is turned toward its minimum position. When waveform opens up symmetrically with SWEEP control approaching its minimum position, the adjustment can be

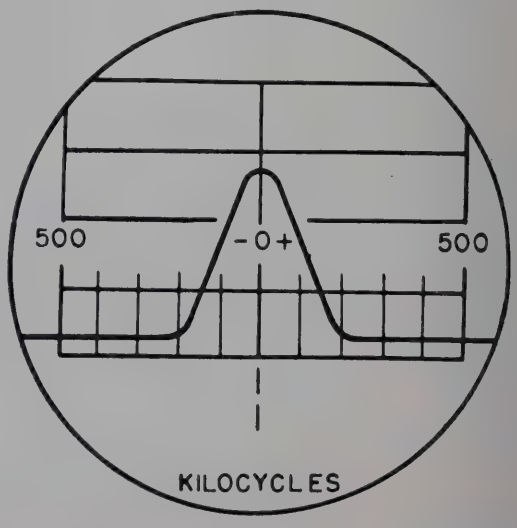


Figure 16. Symmetrically centered waveform.

considered correct. If peak of waveform has moved to one side or the other of the —0+ screen calibration, this can be corrected by the HOR. POSITION control. See figure 16 for partially opened waveform.

b. HIGH-FREQUENCY ADJUSTMENT. (1) Adjust signal generator for a frequency of 5.75 mc.

(2) Set SWEEP control at maximum position.

(3) Deflection should appear at —500 on screen as shown in figure 17.

(4) If deflection is not in the proper position, adjust SWEEP LIM. with screw driver end of tuning tool until deflection appears in proper position.

Note. When the SWEEP LIM. adjustment is made, the original adjustments for the center frequency, explained in *a* above, will be thrown out of line. It is, therefore, necessary to repeat the center-frequency adjustments to obtain correct waveform with SWEEP control approaching its minimum position.

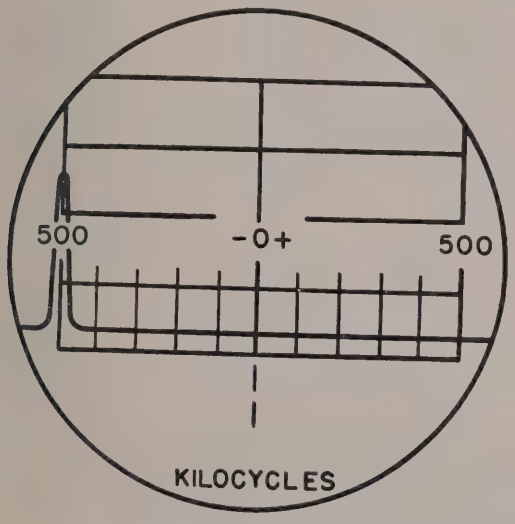


Figure 17. Waveform for high-frequency oscillator alignment.

c. LOW-FREQUENCY ADJUSTMENT. (1) Adjust signal generator for a frequency of 4.75 mc.

(2) Set SWEEP control at maximum position.

(3) Deflection should appear at +500 on screen as shown in figure 18.

(4) If deflection is more or less than +500 it indicates that the sweep limit is too much or too little. Adjust the SWEEP LIM. to bring deflection to proper position.

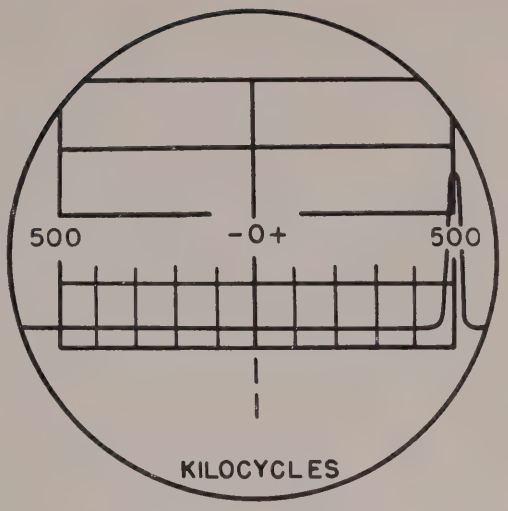


Figure 18. Waveform for low-frequency oscillator alignment.

Note. Remember that the SWEEP LIM. adjustment brings the deflection for both high- and low-frequency adjustments either closer together or farther apart. It is necessary, therefore, to repeat the high-frequency adjustment procedure and then the center-frequency adjustment procedure until the wave pattern is correct for the three signal generator input frequencies. By making these adjustments and each time narrowing down the amount of trimming that is necessary, it will be possible to obtain the proper position for each frequency setting of the signal generator.

14. F-M Oscillator Alignment (with 100-KC Input Signal)

Alignment of the f-m oscillator is considerably simplified if a signal-producing instrument with an accurate 100-kc output is available. A 100-kc fundamental signal may be obtained from a number of different instruments such as a signal generator, square-wave oscillator (multivibrator), audio oscillator, frequency standard, or by obtaining a 100-kc beat frequency from two signal generators. A crystal-controlled oscillator type of signal-producing instrument should be used for accuracy. A 100-kc input signal will supply harmonics every 100 kc, and deflections on the adaptor screen should be spaced as shown in figure 19. Connect the signal-producing instrument to the adaptor input through a resistor of 25,000 ohms. If deflections do not conform to figure 19, trim oscillator transformer Z101–02, REACTOR PAD, and SWEEP LIM., as explained in paragraph 13, to obtain the proper deflections. A tolerance of half a division is permissible.

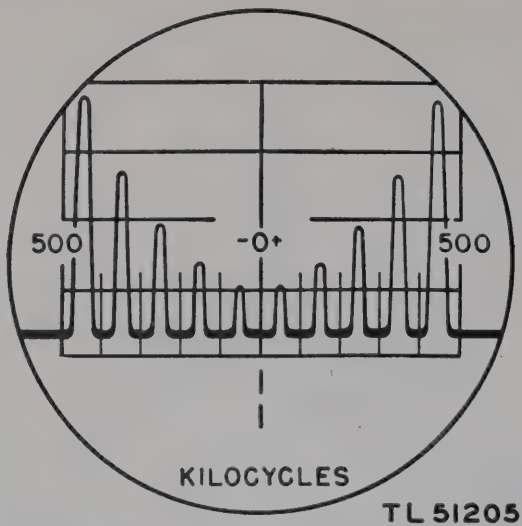


Figure 19. Waveform with 100-kc input signal.

15. R-F Amplifier Alignment (with Signal Generator)

a. Alignment of Secondary (B) of Transformer T102–01. (1) Connect signal generator output lead to pin 8 of Tube JAN–6AC7 (V101) through a 0.01-mf capacitor.

(2) Adjust signal generator for a frequency of 5.25 mc and an output sufficient to give wave deflection of about 1.0 inch with GAIN control in midposition.

(3) Trim secondary of transformer T102–02 with screw driver end of tuning tool for a peak deflection at center of screen.

b. Alignment of Primary (A) of Transformer T102–02. (1) Connect signal generator to pin 4 of Tube JAN–6AC7 (V101).

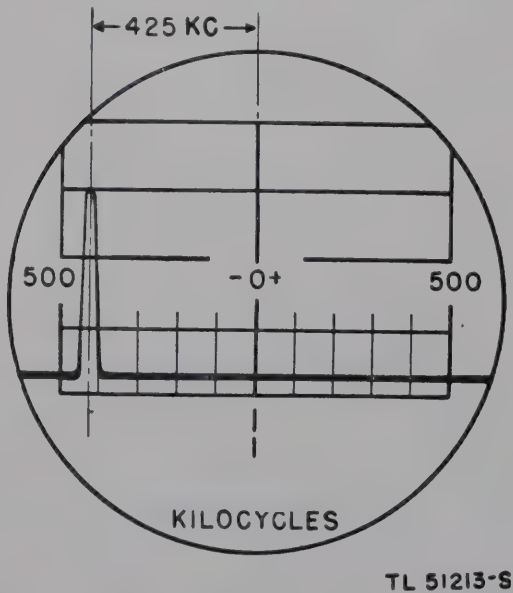


Figure 20. Waveform with input of 5.68 megacycles.

(2) Adjust signal generator for a frequency of 5.68 mc.

(3) Trim primary of transformer T102–02 with pin end of tuning tool for a peak deflection about three-quarters of a division from left end of screen. (See fig. 20.)

c. Readjustment of Secondary (B) of Transformer T102–02. (1) With signal generator connected to pin 4 of Tube JAN–6AC7 (V101), adjust it for a frequency of 4.83 mc.

(2) Trim secondary of transformer T102–02 with screw driver end of tuning tool for a peak deflection about half a division from right side of screen. (See fig. 21.)

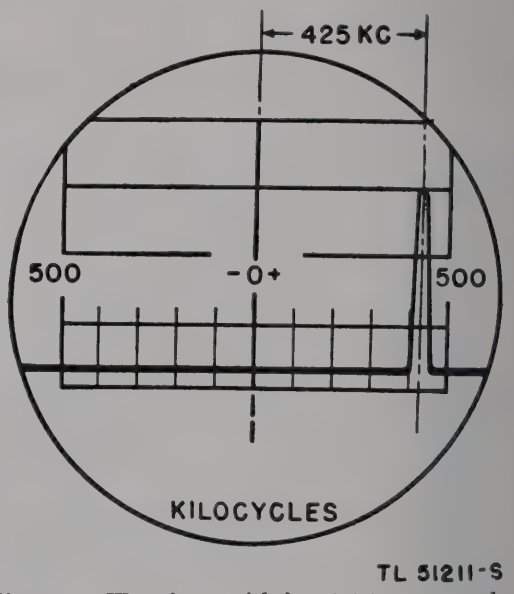


Figure 21. Waveform with input 4.83 megacycles.

d. Alignment of Secondary (B) of Transformer T101–02. (1) Connect signal generator to input of adaptor through a resistor of 25,000 ohms.

(2) Adjust signal generator for frequency of 5.25 mc.

(3) Trim secondary of transformer T101–02 with screw driver end of tuning tool for a peak deflection at the center of the screen.

e. Alignment of Primary (A) of Transformer T101–02. (1) Set signal generator for a frequency of 5.68 mc.

(2) Trim primary of transformer T101–02 with pin end of tuning tool for a peak deflection about three-fourths of a division from the left side of screen.

f. Realignment of Secondary (B) of Transformer T101–02. (1) Set signal generator for frequency of 4.83 mc.

(2) Trim secondary of transformer T101–02 with screw driver end of tuning tool for a peak deflection about three-fourths of a division from right end of screen.

g. Alignment Check of R-F Transformers. (1) Adjust signal generator for 5.68 mc and then 4.83 mc. Check to see that deflections on screen are of approximately equal amplitude within half a division of each end of the screen for the two frequencies.

(2) Variations in amplitude should be corrected by further trimming of r-f transformers.

16. R-F Amplifier Alignment (with 100-KC Input Signal)

The use of a signal-producing instrument with an accurate output of 100 kc (par. 14) greatly simplifies alignment of the r-f transformers T101–02 and T102–02, making it possible to view as one complete picture the bandpass characteristics of the r-f amplifier. The wave pattern on the screen should appear as shown in figure 19.

a. Feed the 100-kc signal to the input of the adaptor through a resistor of 25,000 ohms.

b. Trim the cores of the r-f transformers T101–02 and T102–02 until the wave pattern approximates that shown in figure 19.

SECTION VI

DETAILED TROUBLE-SHOOTING PROCEDURES

17. Localizing Trouble to a Stage

If the adaptor is inoperative or the waveform on the calibrated screen is distorted or of low amplitude when aligning, it is evident that there is trouble in one or more stages. In the conventional type of radio receiver, localizing the trouble to a particular stage is usually accomplished by introducing a signal into the set at different stages and measuring the output of the receiver with an output meter or similar instrument. Because the adaptor incorporates a cathode-ray tube, which in reality can be used as an oscilloscope, it is possible, by watching the cathode-ray tube and interpreting what is seen on its screen, to determine where the trouble can be found in the adaptor. This method will isolate the trouble to one or two stages. The procedure described in paragraphs 12 through 16 will isolate troubles in the i-f and r-f circuits to a particular stage. When the defective stage is located, see the paragraph in section VIII which covers the stage under test and trace the trouble to the defective part.

18. Voltage and Resistance Measurements

If the adaptor is inoperative, see figure 22 for the proper voltage values at each tube socket pin. These values may be supplemented by the resistance values given in figure 23. Make readings according to data given on the charts. For measuring the voltage of the cathode-ray tube, remove the metal housing covering the base of the tube socket and measure the voltage from each pin to ground as shown in figure 24. Voltages may be considered correct if they are within 15 percent of the values on the chart.

Caution: Voltages on the cathode-ray tube are high enough to be dangerous. Observe extreme caution in making measurements. The high negative voltages for the cathode-ray tube are supplied by rectifier Tube JAN 2X2 (V107); the medium voltages for all the tubes are supplied by rectifier Tube JAN–6X5GT (V108). Trouble can be localized to one of these circuits immediately by determining voltages on cathode-ray tube. If medium voltage is low, begin at r-f amplifier stage, and work back through set to power supply, disconnecting B+ lead for each stage until d-c rectified voltage at power tube is correct or nearly so.

Note. With several stages disconnected, voltage on remaining stages will be higher than voltages shown in figure 22, because part of the load has been removed from the circuit.

19. Operation Failure and Probable Cause

a. Base Line Fails to Appear on Screen. If the base line fails to appear on screen, when the adaptor is turned on with no signal input, it is probable that the blocking tube oscillator stage, Tube JAN 6SL7GT (V109) and circuit components are not functioning. (See par. 42 and fig. 35.)

b. Input Signal Fails to Appear on Screen. (1) Connect signal generator to input of adaptor through resistance of 25,000 ohms.

(2) Turn on adaptor and signal generator. Adjust signal generator to frequency of 5.25 megacycles.

(3) Set GAIN and SWEEP controls at maximum.

(4) If signal deflection does not appear on screen, trouble is probably in r-f amplifier, first detector-local oscillator, i-f amplifier, or second detector.

(5) Isolate defective stage by following in order, the procedure given in paragraphs 12, 13, and 15.

c. Input Signal Appears as Shift in Base Line. (1) Follow procedure of *b* above.

(2) If input signal does not appear as a peak but as a shift of the entire base line, it indicates that the reactance-modulator tube is not modulating the frequency of the oscillator tank circuit.

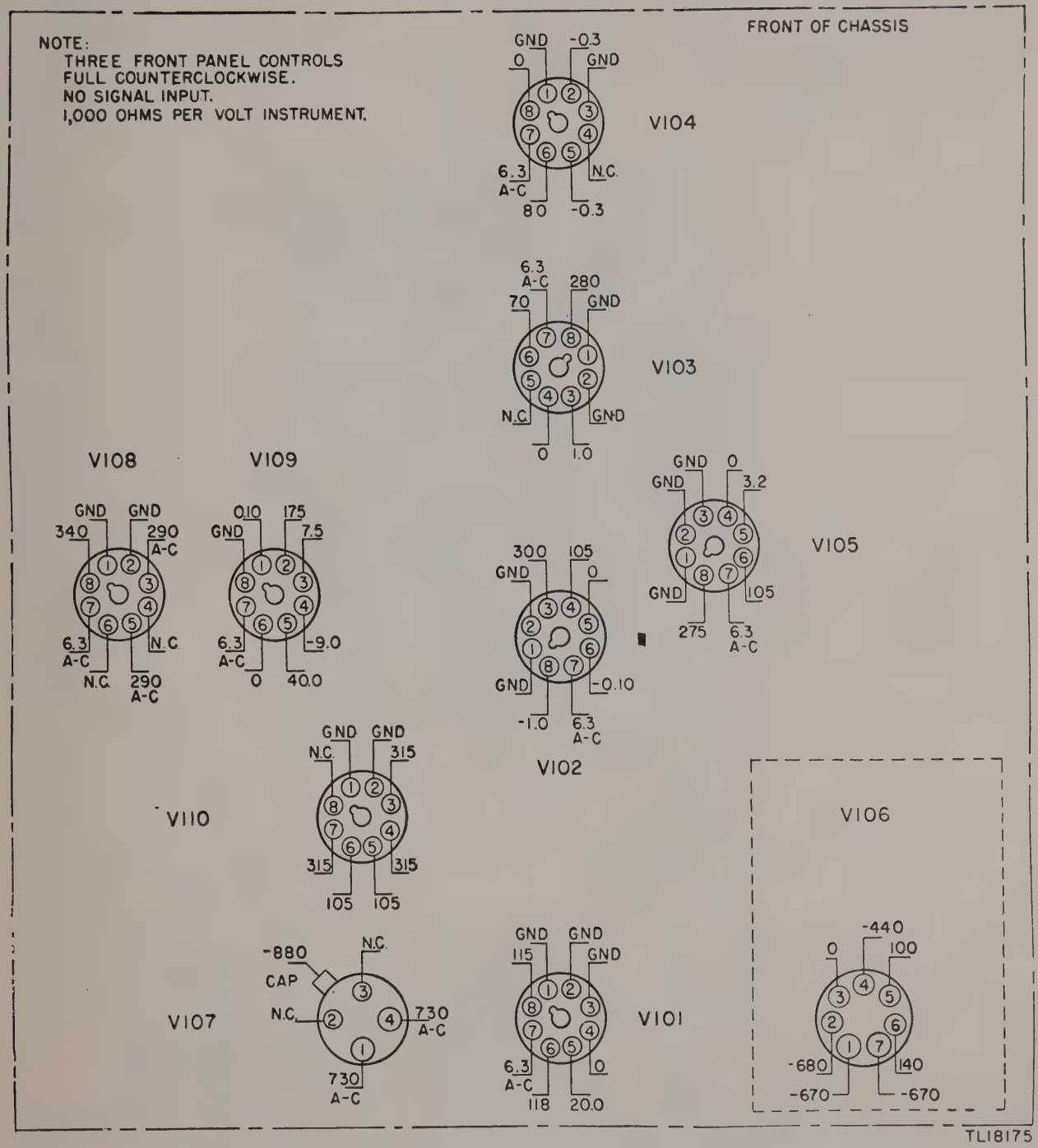


Figure 22. Average voltage values at tube sockets, Panoramic Adaptor BC–1032–A.

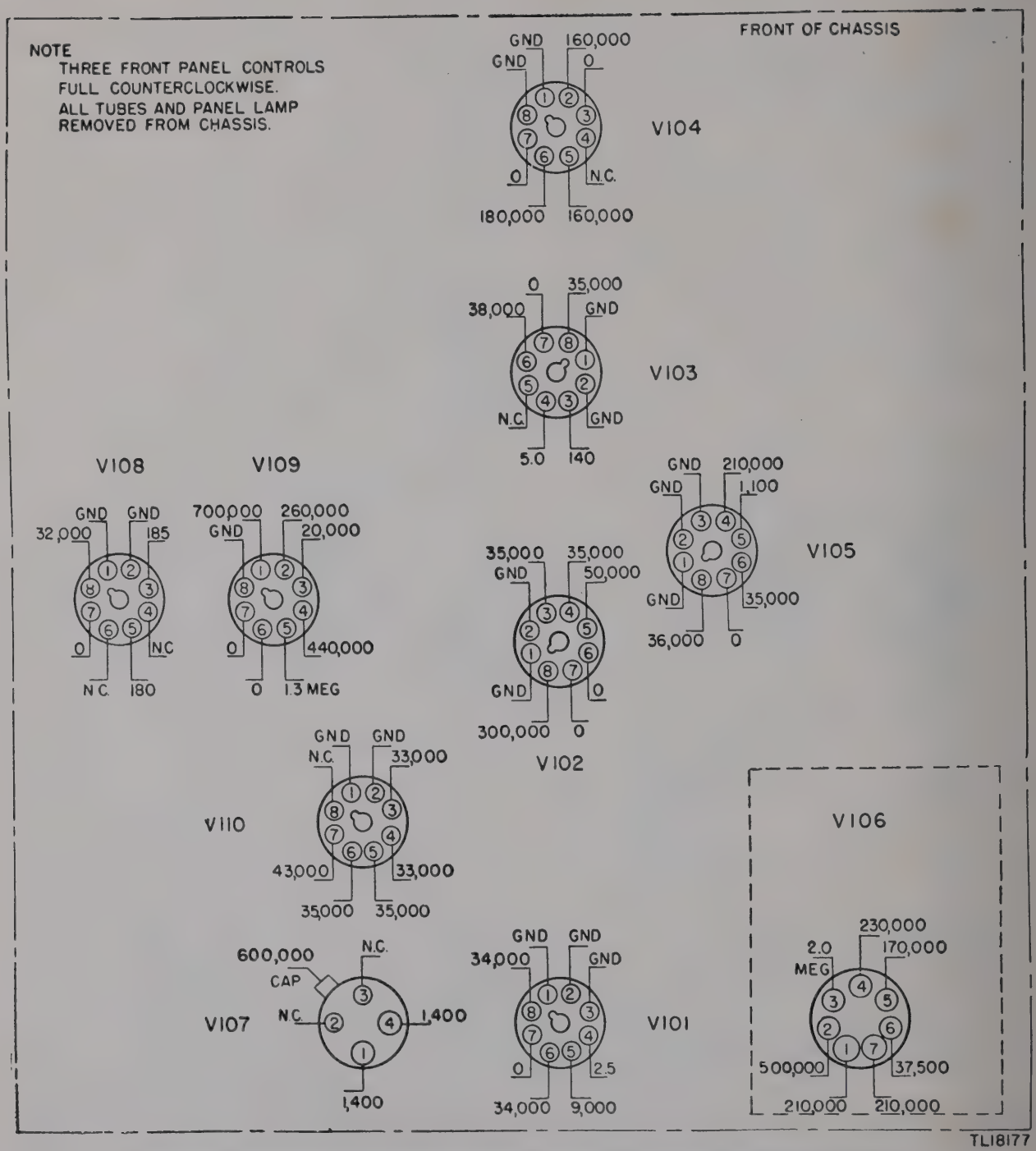


Figure 23. Average resistance values at tube sockets, Panoramic Adaptor BC–1032–A.

(3) Check reactance-modulator Tube JAN–6AC7 (V105) and associated circuit. See paragraph 38 for parts data, and figure 31.

20. Moistureproofing, Fungiproofing, and Refinishing

After the adaptor has been repaired, see TB SIG 13 for general instructions on moisture-proofing and fungiproofing. If the adaptor cabinet or chassis have been scarred or chipped, remove rough spots with #00 or #000 sandpaper and apply paint with a small brush. If the cabinet is sufficiently scarred and scratched to warrant complete refinishing, it should be thoroughly cleaned of rust and dirt. Spray with paint authorized by existing regulations.

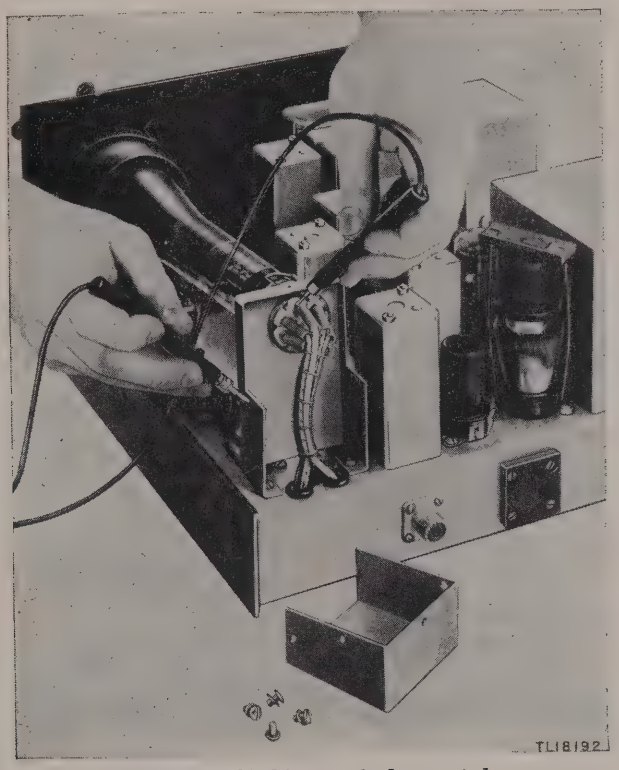


Figure 24. Making cathode-ray tube voltage measurements.

SECTION VII

FINAL TESTING

21. Alignment Check

After repairs have been made and the equipment has been moistureproofed and fungiproofed, the adaptor should be in proper operating order. However, a series of final tests are necessary to make certain that the set is in condition for tactical use. Although the adaptor has been properly aligned, as explained in section V, a recheck of the alignment should be performed after moistureproofing and fungiproofing. After realignment make the final over-all performance tests as given in the following paragraphs.

22. Synchronization of Sweep Frequency

The frequency of the sawtooth voltage supplied by the blocking tube oscillator stage is adjusted at the front panel SYNCH. cap to a submultiple of the a-c line frequency. The standard frequency for the adaptor is 30 cycles when used with a 60-cycle line, and 25 cycles when used with a 50-cycle line. To check this adjustment, a-c voltage is obtained from terminal No. 1 of transformer T104 and fed through a coupling capacitor of 0.01 mf to pin 6 of Tube JAN 6SQ7 (V104). Two complete waves will appear on the screen if frequency is correct. If frequency is incorrect, adjust SYNCH. until waveform approximates that shown in figure 25.

23. Noise Test

a. Short input of adaptor to chassis.

b. Set SWEEP and GAIN controls at full clockwise position.

c. Noise peaks at each end of base line should be approximately one-fourth inch. (See fig. 11.)

Note. In the following tests, an input to the adaptor of exactly 100 kc is required. This frequency must be exact. See paragraph 14 for procedure. Connect the signal-producing instrument to the input of the adaptor through a resistance of 25,000 ohms and adjust output to produce a wave deflection about 1.0 inch high with GAIN in midposition. Set SWEEP control in full clockwise position.

24. Intensity Test

a. Lift INT. cap and turn screw fully clockwise then counterclockwise with screw driver end of tuning tool.

b. As screw is turned, intensity of wave pattern on screen must change from invisible to very bright.

c. Average or normal intensity must appear at a point approximately midway in rotation of the adjusting screw.

25. Vertical Position Test

a. Lift VERT. POS. cap and turn screw fully clockwise then counterclockwise with screw driver end of tuning tool.

b. As screw is turned, pattern must move across screen between lower left and upper right.

c. It must be possible to position base line of the tube a distance equal to two divisions above or below the base line on the screen.

d. Set base line about $\frac{1}{16}$ inch above lowest horizontal line of screen.

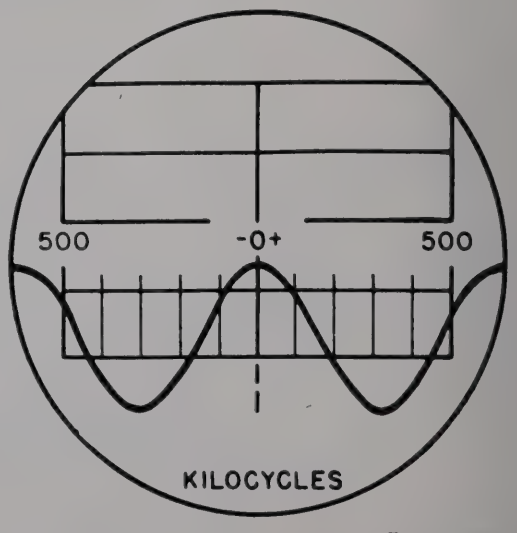


Figure 25. Waveform for 30-cycle synchronization.

26. Focus Test

a. Lift FOCUS cap and turn screw fully clockwise then counterclockwise with screw driver end of tuning tool.

b. As screw is turned, pattern must change from indistinct to clear and then to indistinct.

c. It must be possible to bring all 10 wave deflections of pattern into focus simultaneously on the screen.

d. Make adjustment for most distinct pattern.

27. Horizontal Size Test

a. Rotate HOR. POSITION control knob until extreme right end of base line is on screen.

b. Lift cover on panel marked HOR. SIZE and turn screw until length of horizontal base line from the last marker to the end of base line is between one and two divisions. (See fig. 28.)

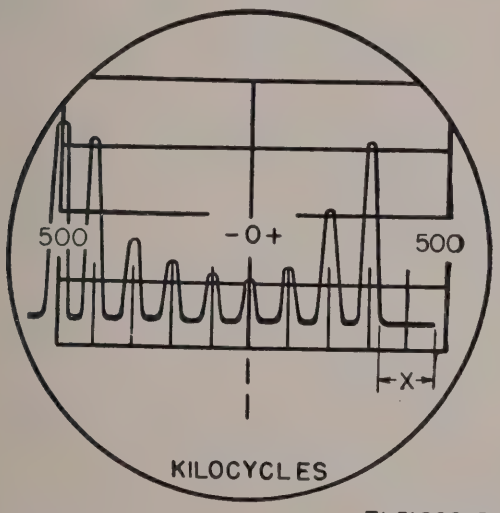


Figure 26. Horizontal size adjustment.

28. Linearity of Screen Scale Calibration

a. Turn SWEEP knob control to extreme clockwise position.

b. Peaks must appear on screen at each 100-kc interval (one division) ±one-half division as shown in figure 27.

Note. Disconnect frequency standard or other instrument used to produce accurate 100-kc input signal, and connect signal generator capable of producing exact frequencies from 4.75 mc to 5.75 mc to adaptor input through a resistance of 25,000 ohms. Set SWEEP control at full clockwise position.

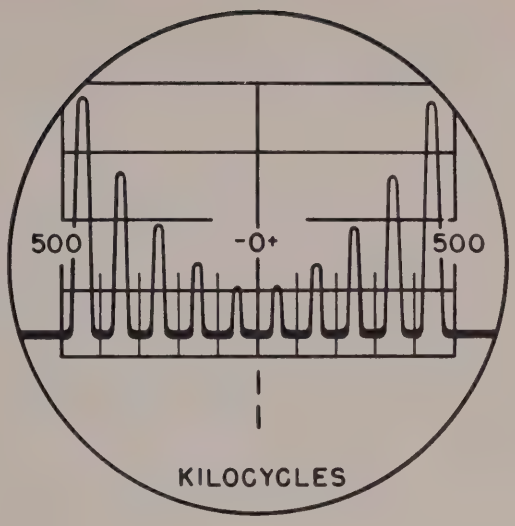


Figure 27. Wave pattern with proper screen calibration.

29. Center Frequency Range Test

a. Adjust signal generator for a frequency of 5.30 megacycles and an output of 1,000 microvolts.

b. Set GAIN control knob until height of wave pattern is approximately three divisions.

c. Turn SWEEP control knob slowly counterclockwise, at the same time adjusting signal-generator frequency to center wave pattern on screen.

d. When SWEEP control reaches zero, pattern must have become a straight horizontal line more than three divisions above the base line.

e. The frequency of the signal generator should now be between 5.30 and 5.33 megacycles.

30. Sensitivity Test

a. Adjust signal generator for a frequency of 5.25 megacycles and an output of 800 microvolts.

(1) Set GAIN and SWEEP controls at full clockwise positions.

(2) Turn i-f GAIN adjustments with screw driver end of tuning tool until deflection at center of screen is 1.0 inch above base line.

b. Adjust signal generator for frequency of 5.68 megacycles and an output of 100 microvolts. Deflection at left of screen should be at least 1½ inches.

c. Adjust signal generator for frequency of 4.83 megacycles and an output of 100 microvolts. Deflection at right of screen should be at least 1½ inches.

31. Resolution Test

a. Adjust signal generator for a frequency of 5.25 megacycles.

b. Set SWEEP control full clockwise; set GAIN control just below point at which noise bumps show on base line.

c. Adjust signal generator for an output sufficient to give a 1½-inch deflection at the center of the screen.

d. Width of the wave deflection one third of the distance from the peak should be about one-tenth of a division or 11.0 kc. See figure 28.

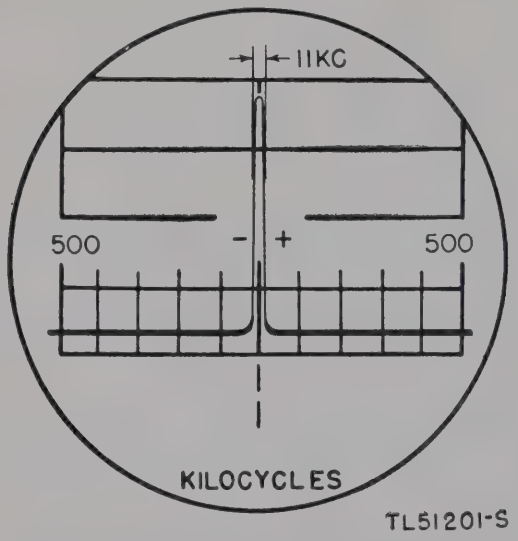


Figure 28. Resolution test of wave pattern.

32. Gain Control Test

a. Adjust signal generator for frequency of 5.25 mc and an output sufficient for center screen deflection of one division with GAIN control in midposition.

b. Turn GAIN control back and forth.

c. As knob is turned back and forth, peak on screen must smoothly and continuously increase and decrease within the limits of four divisions.

33. Peak-Frequency Size and Location Test

a. Rotate frequency dial on signal generator.

b. Wave deflection peak in center of screen must move back and forth across screen.

c. The highest peak at each side of the screen must appear between screen division indicating 490 to 500 kc.

34. Ratio of Right to Center Peak Amplitude Test

a. Adjust signal generator for a frequency of 4.83 mc.

b. Turn GAIN control knob for a peak amplitude of two divisions.

c. Adjust signal generator for frequency of 5.25 mc.

d. Increase signal generator output to 10 times its initial value.

e. Height of the deflection peak at center of screen must be less than one and one-fourth divisions.

35. Operational Test

If the adaptor meets the foregoing final tests, it is in good condition. However, as one final check, the adaptor should be operated with a companion receiver.

Note. The companion receiver that is used with the adaptor must be properly aligned. Misalignment in the receiver will show up on the screen of the adaptor, making side-band signals larger or smaller in amplitude than they actually might be. This would lead the operator to the conclusion that the adaptor was not working properly.

a. Replace adaptor chassis in cabinet and fasten screw in rear and eight captive screws on the front panel.

b. Connect companion receiver to input of adaptor through receptacle provided on a receiver such as Radio Receiver BC–787. Any superheterodyne receiver with an intermediate frequency of 5.25 mc may be used. If a receptacle is not provided on the receiver for the adaptor, connect the input of the adaptor to the plate of the mixer tube of the receiver through a resistance of 25,000 ohms. (See fig. 3.)

c. Tune the companion receiver to any signal. This signal should appear on the center of the screen of the adaptor. Adjust HOR. POSITION control to center wave deflection. Other signals within 500 kc above and below the frequency to which the receiver is tuned should show on the screen of the adaptor.

SECTION VIII

INDIVIDUAL STAGE AND CIRCUIT REPAIR DATA

36. R-F Amplifier Stage (fig. 29)

a. CIRCUIT REPAIR FEATURES. The r-f amplifier stage is composed essentially of a bandpass transformer T101–02 and amplifier Tube JAN–6AC7 (V101). If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values. If any part of transformer T101–02 is defective, the entire unit should be replaced.

b. VOLTAGE AND RESISTANCE MEASUREMENTS. The voltage and resistance values shown in figure 29 are made at the pin connections to the tube sockets on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

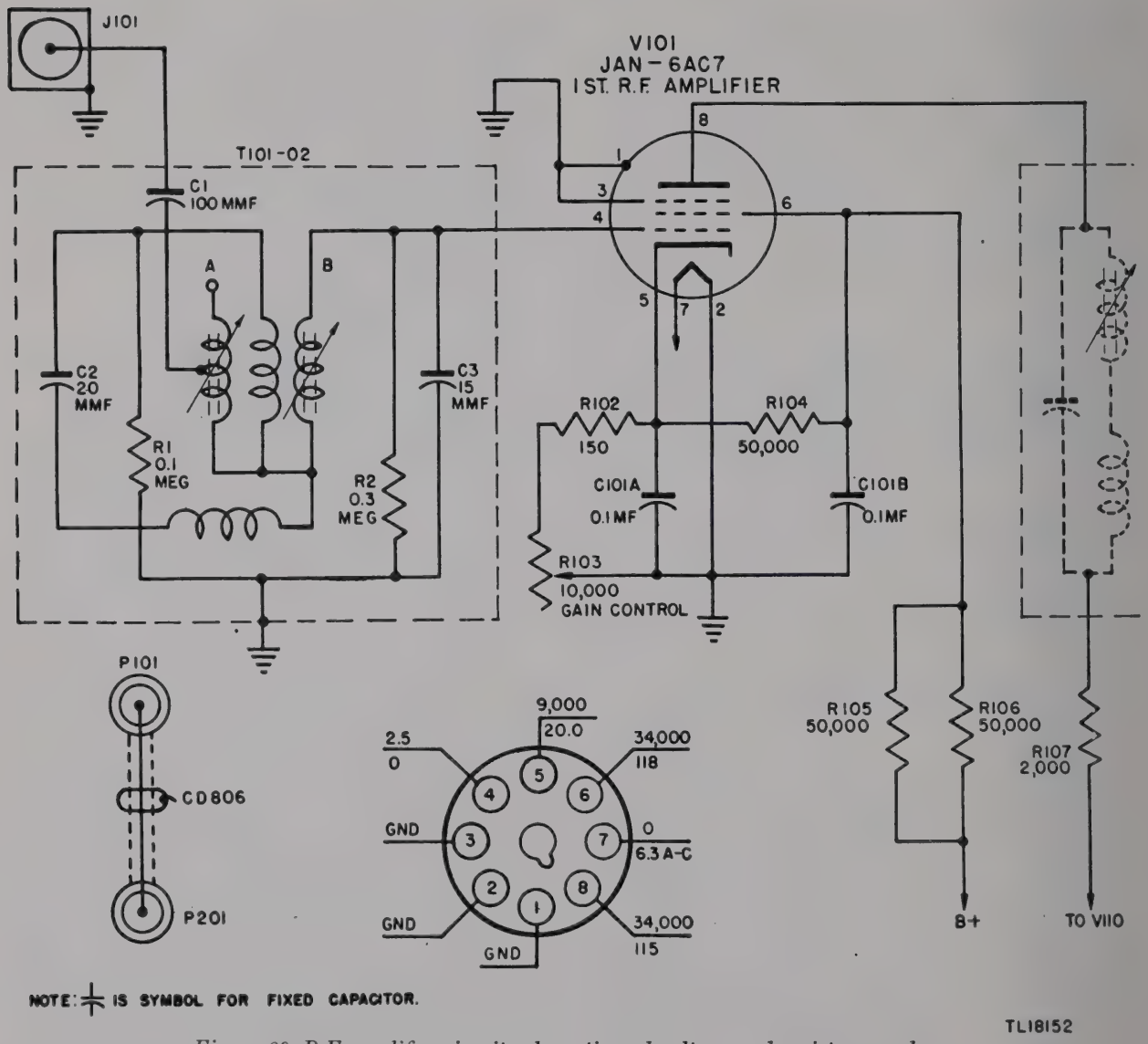


Figure 29. R-F amplifier circuit schematic and voltage and resistance values.

c. FIRST R-F AMPLIFIER STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C1		CAPACITOR: fixed; silvered mica; 100 mmf ±10%; 500 vdcw. Part of transformer T101–02.	Blocking capacitor.
C2		CAPACITOR: fixed; silvered mica; 20 mmf ±10%; 500 vdcw. Part of transformer T101–02.	Tank capacitor for primary coil T101–02.
C3		CAPACITOR: fixed; silvered mica; 15 mmf ±10%; 500 vdcw. Part of transformer T101–02.	Tank capacitor for secondary coil T101–02.
C101A	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Cathode V101 bypass to ground.
C101B	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	R-f signal screen bypass V101.
CD806	3E1806	CORD: single-conductor h-f copolene; 3 feet, terminating in plugs at each end.	R-f input cable.
J101		RECEPTACLE: 1 pole; female; threaded	Chassis input receptacle.
P101		PLUG: 1 pole; male; threaded	Connect input cable to chassis receptacle.
P201		PLUG: 1 pole; male; threaded	Connect input cable to companion receiver.
R1		RESISTOR: fixed; carbon; ceramic insulated; 100,000 ohms +10%; ½ w. Part of transformer T101–02.	Load resistor.
R2		RESISTOR: fixed; carbon; ceramic insulated; 300,000 ohms; ±10%; ½ w. Part of transformer T101–02.	Load resistor.
R102	3Z6015–22	RESISTOR: fixed; carbon; ceramic insulated; 150 ohms ±10; ½ w.	Cathode bias V101.
R103	2Z7269.24	POTENTIOMETER: carbon; linear taper; 10,000 ohms; 1 w.	R-f GAIN control V101.
R104	3Z6650–51	RESISTOR: fixed; carbon; ceramic insulated; 50,000 ohms ±10%; 1 w.	Screen bleeder V101.
R105	3Z6650–51	RESISTOR: fixed; carbon; ceramic insulated; 50,000 ohms ±10%; 1 w. Used in parallel with R106.	Screen dropping resistor V101.
R106	3Z6650–51	RESISTOR: fixed; carbon; ceramic insulated; 50,000 ohms ±10%; 1 w. Used in parallel with R105.	Screen dropping resistor.
R107	3Z6200–72	RESISTOR: fixed; carbon; ceramic insulated; 2,000 ohms ±10%; 1 w.	Plate isolating resistor
T101–02	2C2832B/C1	TRANSFORMER: permeability tuned; primary d-c resistance 2 ohms; secondary d-c resistance 2 ohms. Includes C1, C2, C3, and R1 and R2.	Inductively couples input to r-f amplifier V101.
V101	2J6AC7	TUBE JAN–6AC7: pentode; amplifier	First r-f amplifier.

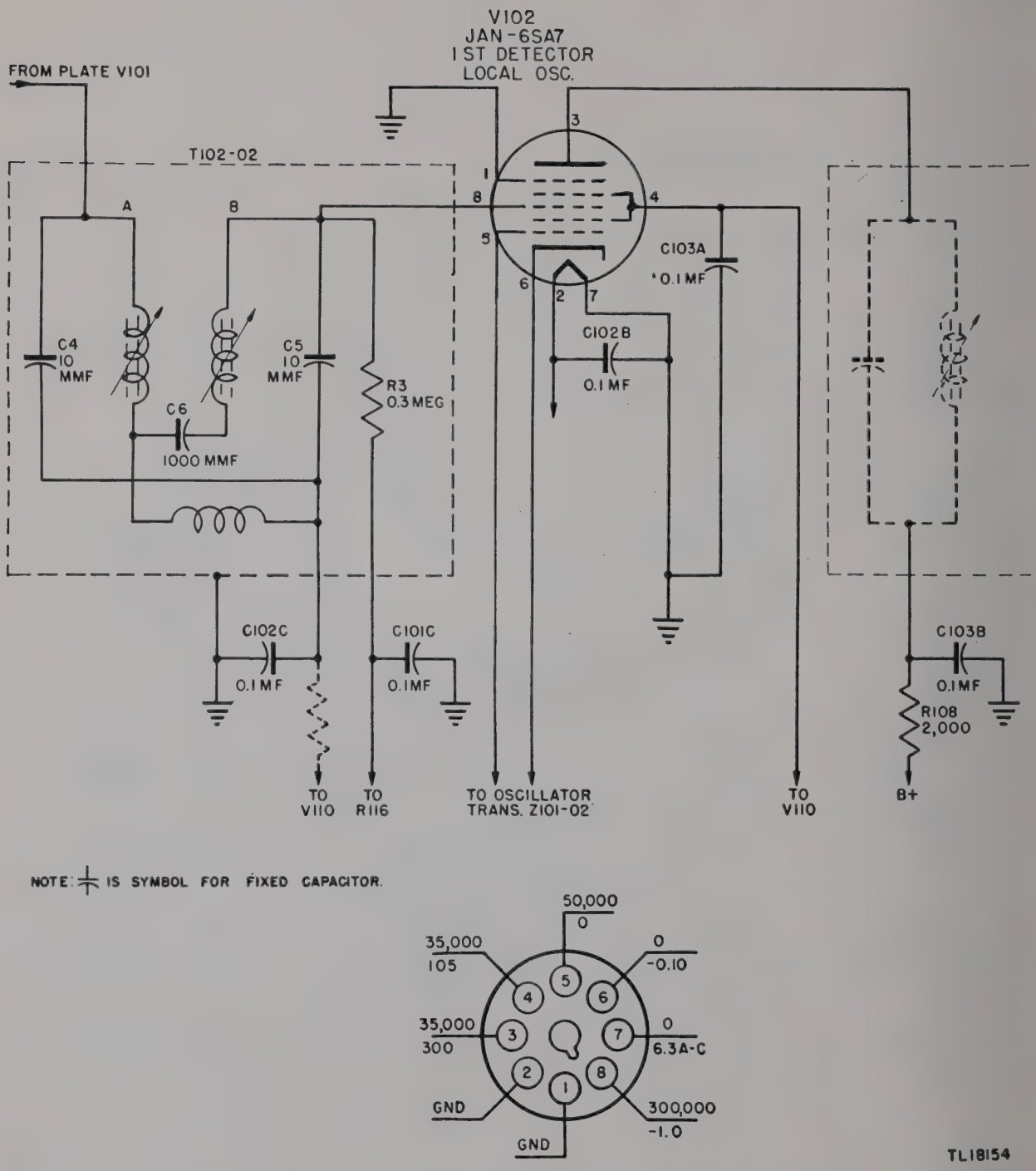


Figure 30. First detector-local oscillator circuit schematic and voltage and resistance values.

37. Mixer (First Detector-Local Oscillator) Stage (fig. 30)

a. CIRCUIT REPAIR FEATURES. The mixer stage is composed essentially of the bandpass transformer T102–02 and the mixer Tube JAN–6SA7 (V102). The first grid and cathode of tube V102 serve as the local oscillator of the f-m oscillator stage. The mixer and f-m oscillator stages are, therefore, dependent on each other and should be considered together in isolating defective parts or testing the heterodyne oscillation. If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values. If any part of transformer T102–02 is defective, the entire unit should be replaced.

b. VOLTAGE AND RESISTANCE MEASUREMENTS. The voltage and resistance values shown in figure 30 are made at the pin connections to the tube sockets on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

c. FIRST DETECTOR, LOCAL OSCILLATOR STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C4		CAPACITOR: fixed; silvered mica; 10 mmf ±10%; 500 vdcw. Part of transformer T102–02.	Tank capacitor of primary coil T102–02.
C5		CAPACITOR: fixed; silvered mica; 10 mmf ±10%; 500 vdcw. Part of transformer T102–02.	Tank capacitor of secondary coil T102–02.
C6		CAPACITOR: fixed; silvered mica; 1,000 mmf ±10%; 500 vdcw. Part of transformer T102–02.	Coupling capacitor.
C101C	3DA100–126.2	CAPACITOR: fixed; paper, oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Bypass through T102–02 primary.
C102B	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Filament bypass V102.
C102C	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Grid bypass V102.
C103A	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Screen bypass V102.
C103B	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Plate V102 bypass through primary Z102–02.
R3		RESISTOR: fixed; carbon; ceramic insulated; 300,000 ohms ±10%; ½ w.	Load resistor.
R108	3Z6200–72	RESISTOR: fixed; carbon; ceramic insulated; 2,000 ohms ±10%; 1 w.	Plate isolating resistor through primary Z102–02.
T102–02	2C2832B/C2	TRANSFORMER: permeability tuned; d-c resistance for primary and secondary coils is 2 ohms each; d-c resistance for choke is 1 ohm.	Inductively couples first r-f amplifier V101 to first detector-local oscillator V102.
V102	2J6SA7	TUBE JAN–6SA7: pentagrid converter	First detector and local oscillator.

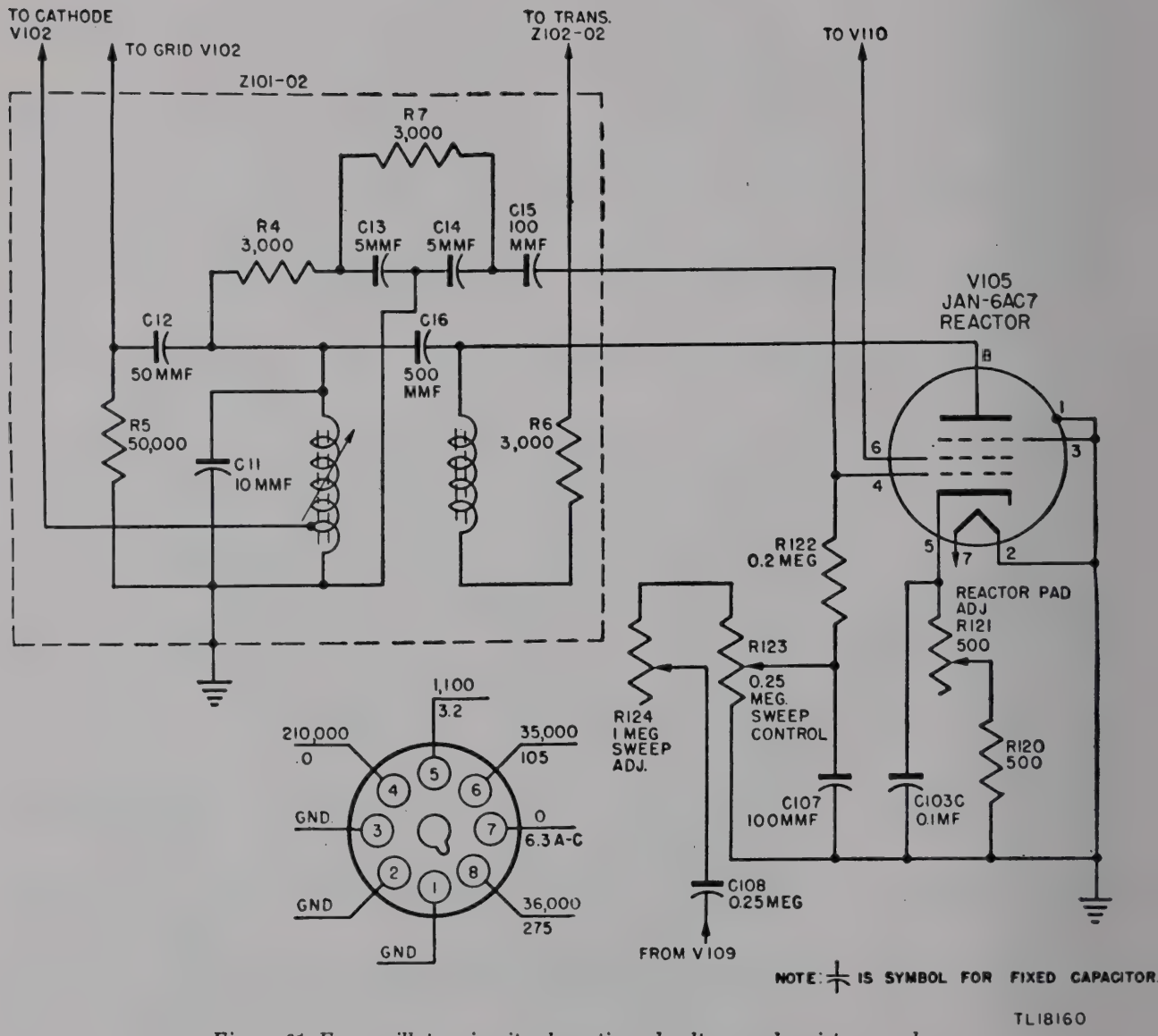


Figure 31. F-m oscillator circuit schematic and voltage and resistance values.

38. F-M Oscillator Stage (fig. 31)

a. CIRCUIT REPAIR FEATURES. The f-m oscillator stage is composed essentially of the oscillator tank transformer Z101–02 and the reactor Tube JAN–6AC7 (V105). The local oscillator for the tank circuit is a part of the first detector-local oscillator stage and in isolating defective parts the f-m oscillator stage and the first detector-local oscillator stage should be considered together. If tube socket voltages are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values. If any part of transformer Z101–02 is defective, the entire unit should be replaced.

b. VOLTAGE AND RESISTANCE MEASUREMENTS. The voltage and resistance values shown in figure 31 are made at the pin connections to the tube socket on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

c. LOCAL F-M OSCILLATOR STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C11		CAPACITOR: fixed; silvered mica; 10 mmf ±10%; 500 vdcw. Part of transformer Z101–02.	Tank capacitor.
C12		CAPACITOR: fixed, silvered mica; 50 mmf ±10%; 500 vdcw. Part of transformer Z101–02.	Coupling capacitor.
C13		CAPACITOR: fixed; silvered mica; 5 mmf ±10%; 500 vdcw. Part of transformer Z101–02.	Phase network capacitor.
C14		CAPACITOR: fixed; silvered mica; 5 mmf ±10%; 500 vdcw. Part of transformer Z101–02.	Phase network capacitor.
C15		CAPACITOR: fixed; silvered mica; 100 mmf ±10%; 500 vdcw. Part of transformer Z101–02.	Blocking capacitor.
C16		CAPACITOR: fixed; silvered mica; 500 mmf ±10%; 500 vdcw. Part of transformer Z101–02.	Blocking capacitor.
C103C	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Cathode V105 bypass.
C107	3K2010121	CAPACITOR: fixed; mica; 100 mmf ±10%; 500 vdcw	R-f bypass grid V105.
C108	3DA250–63	CAPACITOR: fixed; paper; oil-filled; metal case; 0.25 mf ±10%; 600 vdcw.	Sawtooth wave coupling capacitor.
R4		RESISTOR: fixed; carbon; ceramic insulated; 3,000 ohms ±10%; ½ w. Part of transformer Z101-02.	Damping resistor.
R5		RESISTOR: fixed; carbon; ceramic insulated; 50,000 ohms ±10%; ½ w. Part of transformer Z101–02.	Load resistor.
R6		RESISTOR: fixed; carbon; ceramic insulated; 3,000 ohms ±10%; ½ w. Part of transformer Z101–02.	Damping resistor.
R7		RESISTOR: fixed; carbon; ceramic insulated; 3,000 ohms ±10%; ½ w. Part of transformer Z101–02.	Phase network resistor.
R120	3Z6050–65	RESISTOR: fixed; carbon; ceramic insulated; 500 ohms ±10%; ½ w.	Cathode bias V105.
R121	2Z7267.6	POTENTIOMETER: carbon; linear taper; 500 ohms; 1 w.	Operating point adjustment V105.
R122	3Z6720–15	RESISTOR: fixed; carbon; ceramic insulated; 200,000 ohms ±10%; ½ w.	Isolating resistor grid V105.
R123	2Z7272–19	POTENTIOMETER: carbon; linear taper; 250,000 ohms; 1 w.	SWEEP control.
R124	2Z7273–6	POTENTIOMETER: carbon; linear taper; 1.0 megohm; 1 w.	Sweep adjustment.
V105	2J6AC7	TUBE JAN–6AC7: amplifier pentode	Reactance modulator.
Z101–02	3C323–17A	TRANSFORMER: permeability tuned. Transformer includes oscillator coil and h-f choke, and C11, C12, C13, C14, C15, C16, R4, R5, R7.	F-m oscillator coil reactance modulator coil and resistance capacitor phasing network.

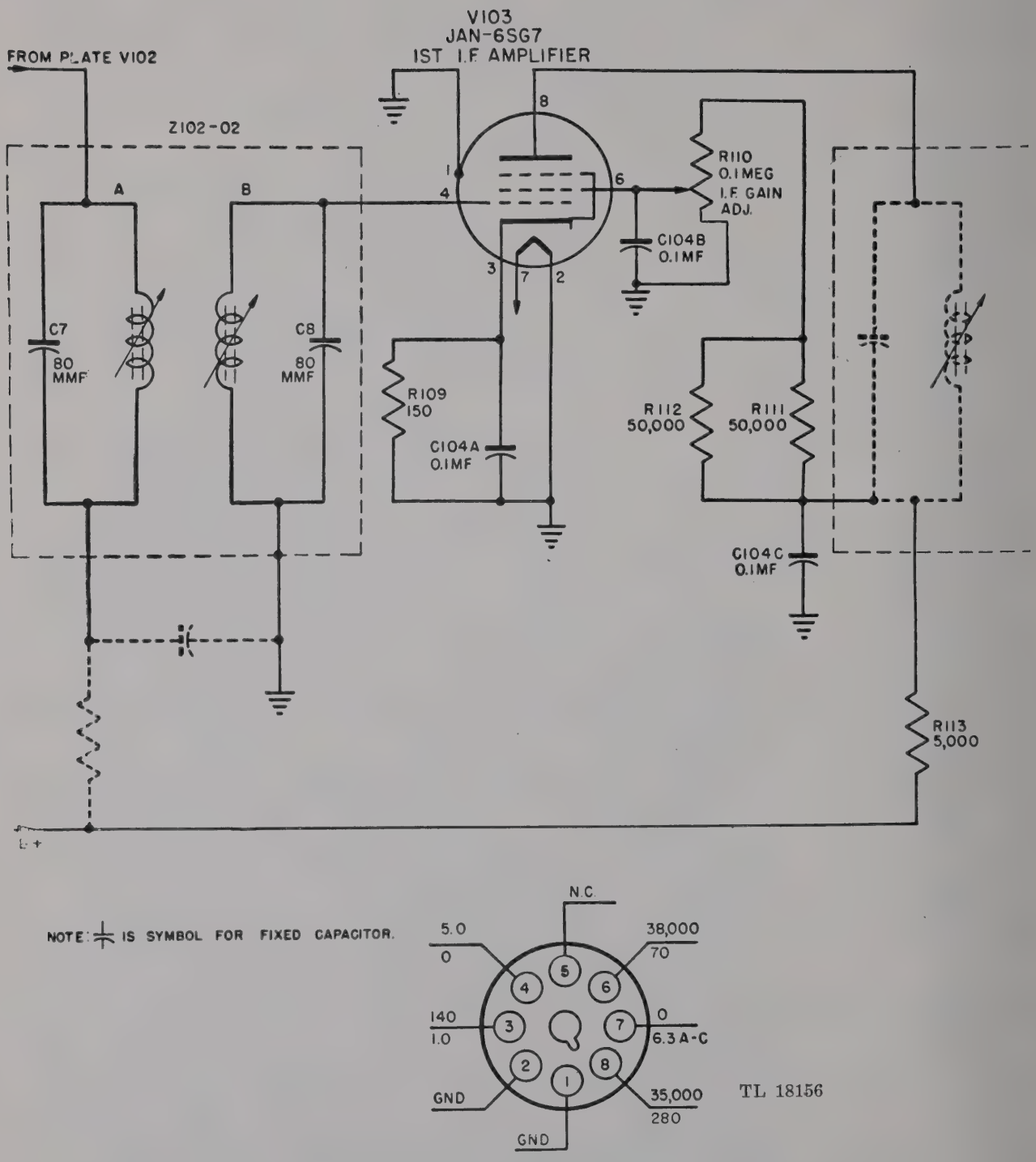


Figure 32. I-f amplifier circuit schematic and voltage and resistance values.

39. First I-F Amplifier Stage (fig. 32)

a. Circuit Repair Features. The first i-f amplifier stage is composed essentially of the i-f transformer Z102–02 and i-f amplifier Tube JAN–6SG7 (V103). If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values. If any part of transformer Z102–02 is defective, the entire unit should be replaced.

b. Voltage and Resistance Measurements. The voltage and resistance values shown in figure 32 are made at the pin connections to the tube socket on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

c. First I-F Amplifier Stage Parts Data.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C7		CAPACITOR: fixed; silvered mica; 80 mmf ±5%; 500 vdcw. Part of transformer Z102–02.	Tank capacitor of primary coil.
C8		CAPACITOR: fixed; silvered mica; 80 mmf ±5%; 500 vdcw. Part of transformer Z102–02.	Tank capacitor of secondary coil.
C104A	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Cathode V103 bypass.
C104B	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Screen V103 bypass.
C104C	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Plate V103 bypass through primary Z103–02.
R109	3Z6050–65	RESISTOR: fixed; carbon; ceramic insulated; 150 ohms ±10%; ½ w.	Bias resistor V103.
R110	2Z7271–17	POTENTIOMETER: carbon; linear taper; 100,000 ohms; 1 w.	I-f GAIN adjustment controls screen voltage V103.
R111	3Z6650–51	RESISTOR: fixed; carbon; ceramic insulated; 50,000 ohms ±10%; 1w. In parallel with R112.	Screen voltage dropping resistor V103.
R112	3Z6650–51	RESISTOR: fixed; carbon; ceramic insulated; 50,000 ohms; ±10%; 1 w. In parallel with R111.	Screen voltage dropping resistor V103.
R113	3Z6500–113	RESISTOR: fixed; carbon; ceramic insulated; 5,000 ohms ±10%; 1 w.	Plate isolating resistor V103.
V103	2J6SG7	TUBE JAN–6SG7: remote cut-off pentode	First i-f amplifier.
Z102–02	2Z9642.34	TRANSFORMER: permeability tuned; primary and secondary identical; d-c resistance of each is 3.5 ohms. Transformer includes C7 and C8.	Inductively couples first detector-local oscillator and first i-f amplifier stages.

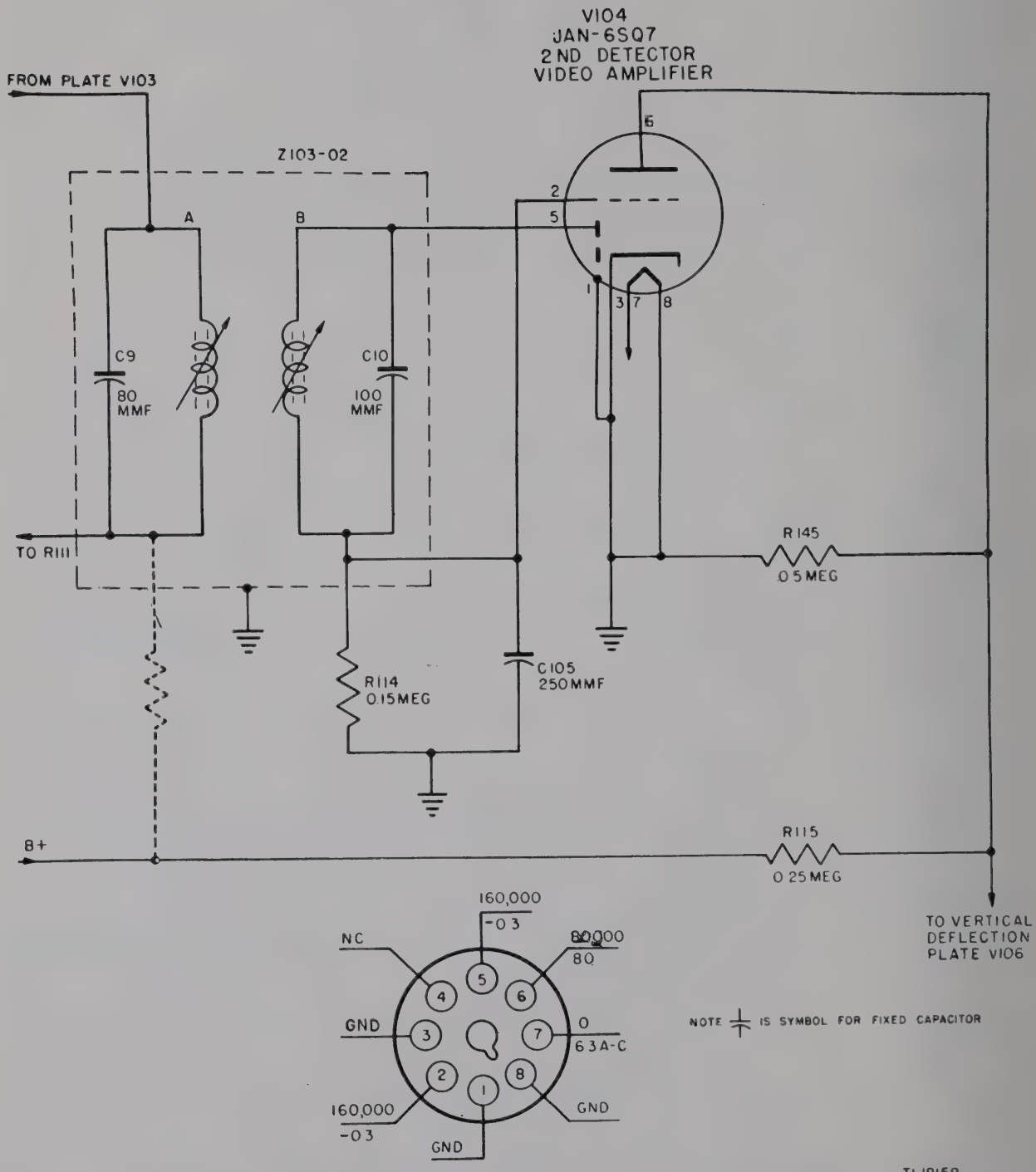


Figure 33. Second detector-video amplifier circuit schematic and voltage and resistance values.

40. Second Detector-Video Amplifier Stage (fig. 33)

a. CIRCUIT REPAIR FEATURES. The second detector-video amplifier stage is composed essentially of the coupling transformer Z103–02 and detector-amplifier Tube JAN–6SQ7 (V104). The i-f signal is detected by one of the diodes of tube V104 and fed into the triode amplifier section of the tube. If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values. If any part of transformer Z103–01 is defective, the entire unit should be replaced.

b. VOLTAGES AND RESISTANCE MEASUREMENTS. The voltage and resistance values shown in figure 33 are made at the pin connections to the tube socket on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

c. SECOND DETECTOR, VIDEO AMPLIFIER STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C9		CAPACITOR: fixed; silvered mica; 80 mmf ±5%; 500 vdcw	Tank capacitor.
C10		CAPACITOR: fixed; silvered mica; 100 mmf ±5%; 500 vdcw	Tank capacitor.
C105	3D9250–9	CAPACITOR; fixed; mica; 250 mmf ±10%; 500 vdcw	Diode load V104 bypass.
R114	3ZK6715–33	RESISTOR: fixed; carbon; ceramic insulated; 150,000 ohms ±10%; ½ w.	Diode load bias V104.
R115	3Z6725–38	RESISTOR: fixed; carbon; ceramic insulated; 250,000 ohms ±10%; ½ w.	Plate load V104.
R145	3ZK6750–40	RESISTOR: fixed; carbon; ceramic insulated; 500,000 ohms ±10%; ½ w.	Plate overload V104.
V104	2J6SQ7	TUBE JAN–6SQ7: duplex diode; high-mu triode; metal type	Second detector and video amplifier.
Z103–02	2Z9642.35	TRANSFORMER: permeability tuned; primary d-c resistance 3.5 ohms; secondary d-c resistance 2.5 ohms. Transformer includes C9 and C10.	Inductively couples first i-f amplifier and second detector-video amplifier stages.

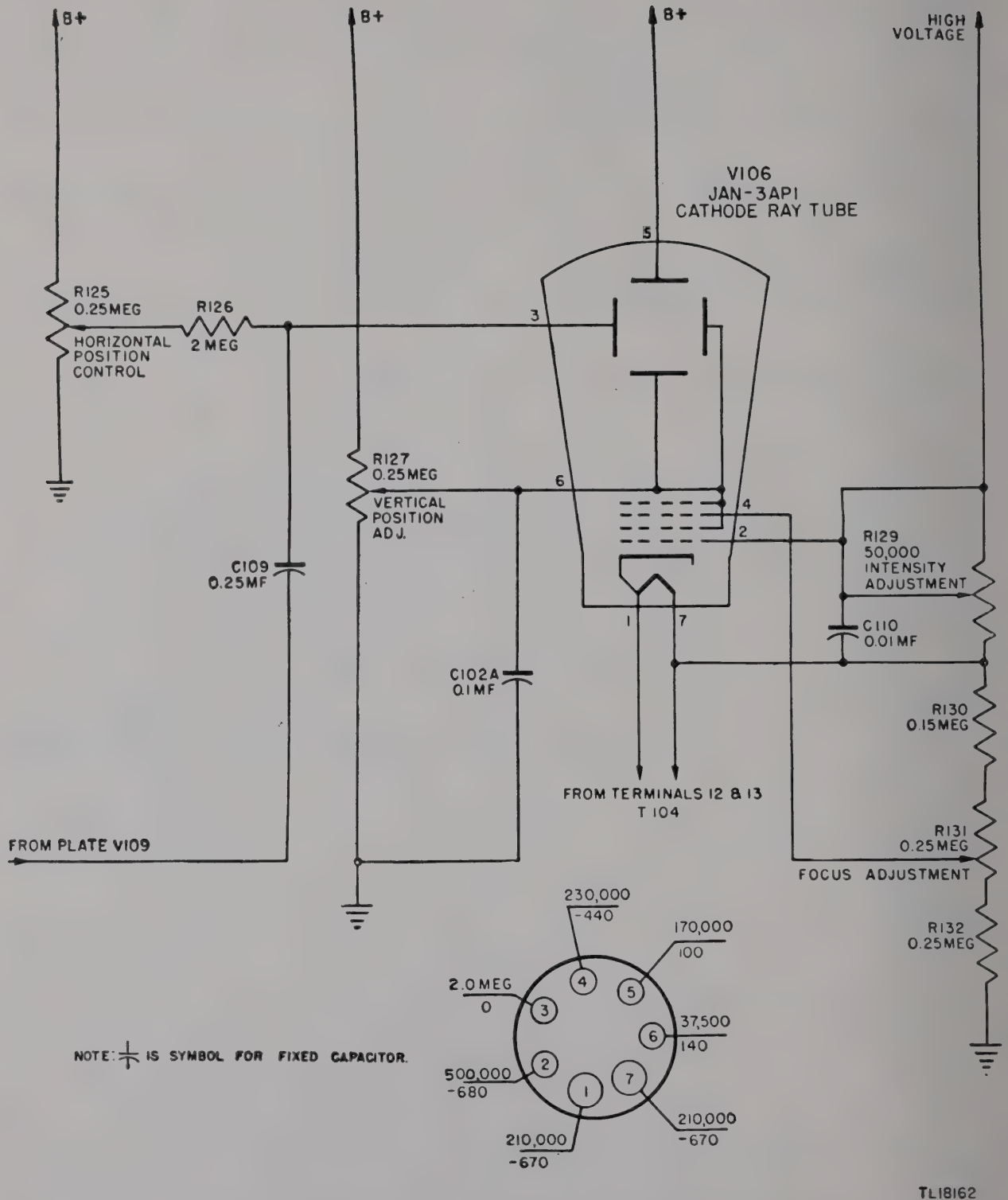


Figure 34. Cathode-ray circuit schematic and voltage and resistance values.

41. Cathode-Ray Stage (fig. 34)

a. CIRCUIT REPAIR FEATURES. The cathode-ray is composed essentially of a voltage divider circuit and cathode-ray Tube JAN–3AP1 (V106). If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values.

b. VOLTAGE AND RESISTANCE MEASUREMENTS. The voltage and resistance values shown in figure 34 are made at the pin connections to the tube socket on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

c. CATHODE-RAY TUBE STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C102A	3DZ100–126.2	CAPACITOR: fixed, paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Deflection plates V106 bypass.
C109	3DA250–63	CAPACITOR: fixed; paper; oil-filled; metal case; 0.25 mf ±10%; 600 vdcw.	Horizontal sweep coupling to blocking tube oscillator.
C110	3DA10–44	CAPACITOR: fixed; mica; 0.01 mf ±10%; 300 vdcw	Grid to cathode coupling V106.
R125	2Z7272–19	POTENTIOMETER: carbon; linear taper; 250,000 ohms; 1 w	HOR. POSITION control V106.
R126	3Z6802–21	RESISTOR: fixed; carbon; ceramic insulated; 2.0 megohms ±10%; ½ w.	Isolating resistor V106.
R127	2Z7272–19	POTENTIOMETER: carbon; linear taper; 250,000 ohms; 1 w	VERT. POS. adjustment V106.
R129	2Z7270–10	POTENTIOMETER: carbon; linear taper; 50,000 ohms; 1 w	High-voltage bleeder; INT. adjustment V106.
R130	3Z6715–41	RESISTOR: fixed; carbon; ceramic insulated; 150,000 ohms ±10%; 1 w.	High-voltage bleeder V106.
R131	2Z7272–19	POTENTIOMETER: carbon; linear taper; 250,000 ohms; 1 w	High-voltage bleeder FOCUS adjustment V106.
R132	3Z6725–26	RESISTOR: fixed; carbon; ceramic insulated; 250,000 ohms ±10%; 1 w.	High-voltage bleeder V106.
V106	2J3AP1	TUBE JAN–3AP1: high-vacuum cathode-ray 3″ diam; electrostatic deflection.	Panoramic wave pattern indicator.

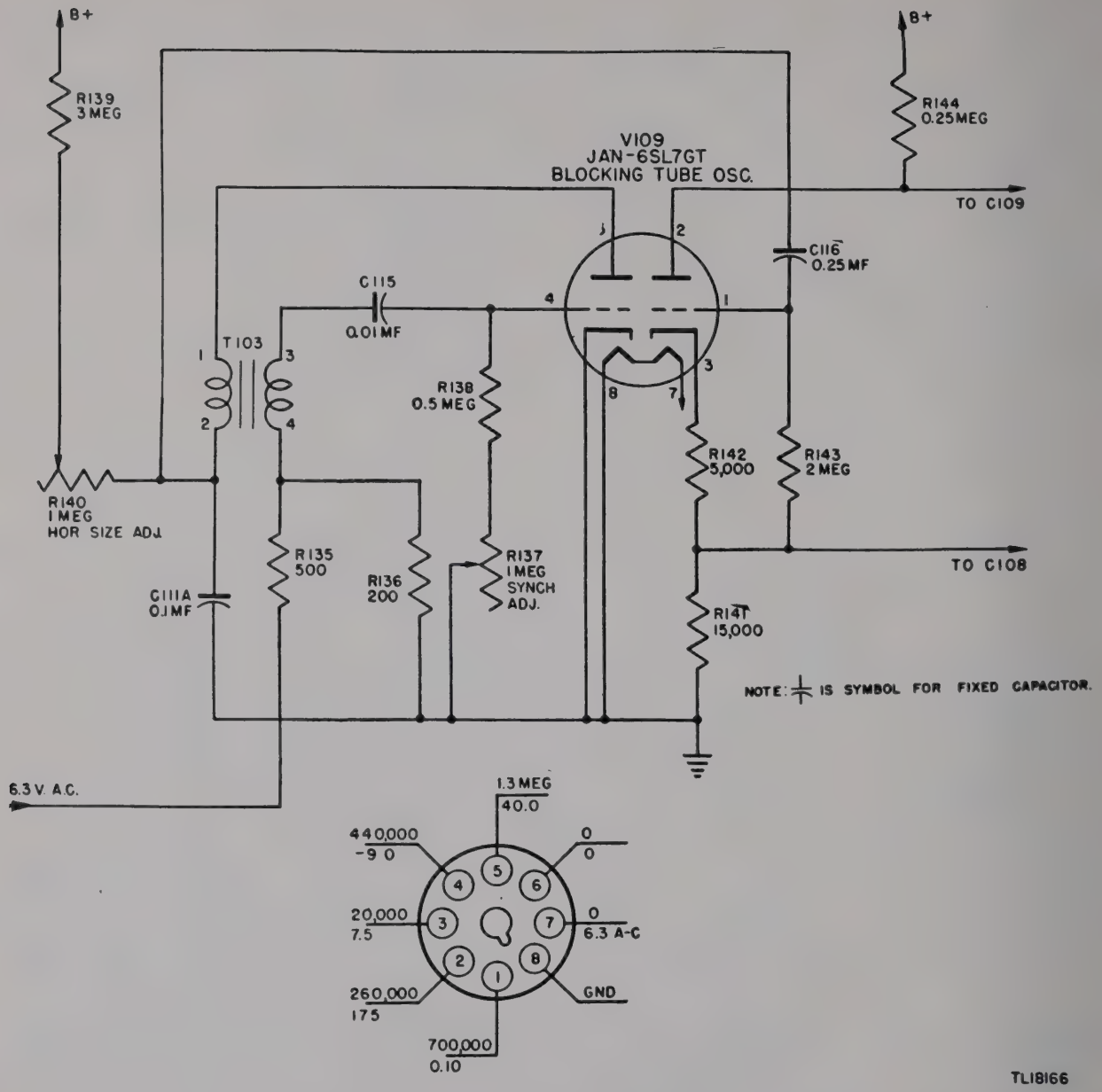


Figure 35. Blocking tube oscillator circuit schematic and voltage and resistance values.

42. Blocking Tube Oscillator Stage (fig. 35)

a. Circuit Repair Features. The blocking tube oscillator stage is composed essentially of the transformer T103 and oscillator Tube JAN–6SL7GT (V109). This stage generates the sawtooth voltage that controls the f-m modulation of the f-m oscillator circuit and also supplies sawtooth voltage to one horizontal plate of the cathode-ray tube. The sawtooth wave generated by the blocking tube oscillator may be checked with an oscilloscope between pin 2 of tube V108 and the chassis. If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below, for correct values.

b. Voltage and Resistance Measurements. The voltage and resistance values shown in figure 35 are made at the pin connections to the tube socket on the under side of the chassis. Connect the meter between the pin and chassis to make the readings. Use highest voltmeter scale on which value can be read.

A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

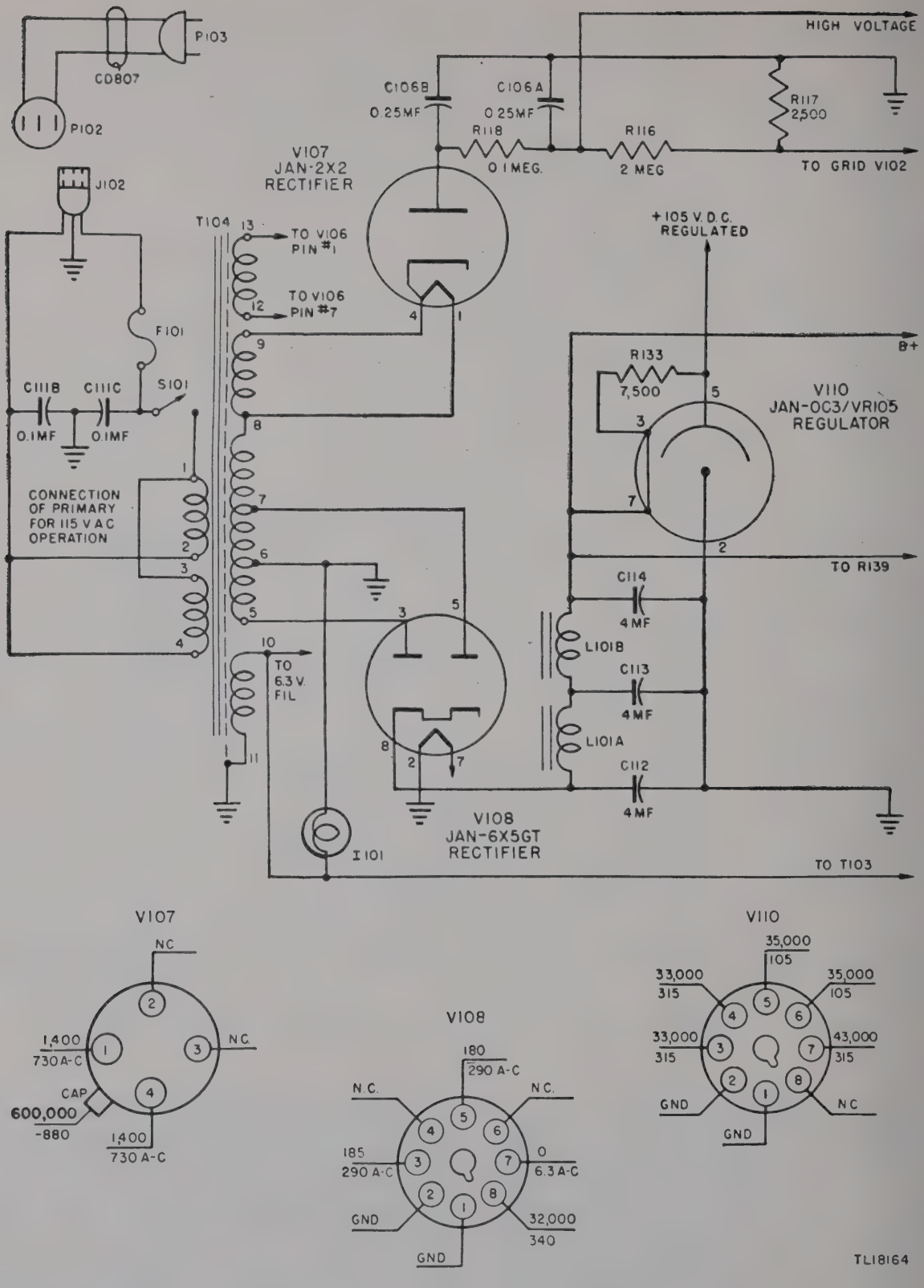
c. BLOCKING TUBE OSCILLATOR STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C111A	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Blocking tube oscillator plate bypass.
C115	3DA10–44	CAPACITOR: fixed; mica; 0.01 mf ±10%; 300 vdcw.	Part of grid leak circuit V109.
C116	3DA250–63	CAPACITOR: fixed; paper; oil-filled; metal case; 0.25 mf ±10%; 600 vdcw.	Grip coupling capacitor V109.
R135	3Z6050–65	RESISTOR: fixed; carbon; ceramic insulated; 500 ohms ±10%; ½ w.	6.3 a-c volt injector network V109.
R136	3Z6020–37	RESISTOR: fixed; carbon; ceramic insulated; 200 ohms ±10%; ½ w.	6.3 a-c volt injector network V109.
R137	2Z7273–6	POTENTIOMETER: carbon; linear taper; 1.0 megohm; 1 w.	SWEEP LIM. pad adjustment V109.
R138	3ZK6750–14	RESISTOR: fixed; carbon; ceramic insulated; 500,000 ohms ±10%; ½ w.	Sweep frequency grid resistor V109.
R139	3Z6803–6	RESISTOR: fixed; carbon; ceramic insulated; 3.0 megohms ±10%; ½ w.	Plate V109 dropping resistor.
R140	2Z7273–6	POTENTIOMETER: carbon; 1.0 megohm; 1 w; linear taper screw driver slot.	HOR. SIZE adjustment V109.
R141	3Z6615–26	RESISTOR: fixed; carbon; ceramic insulated; 15,000 ohms ±10%; ½ w.	Cathode load resistor V109.
R142	3Z6500–83	RESISTOR: fixed; carbon; ceramic insulated; 5,000 ohms ±10%; ½ w.	Bias and load resistor V109.
R143	3Z6802–21	RESISTOR: fixed; carbon; ceramic insulated; 2.0 megohms ±10%; ½ w.	Grid return V109.
R144	3Z6725–38	RESISTOR: fixed; carbon; ceramic insulated; 250,000 ohms ±10%; ½ w.	Plate V109 dropping resistor.
T103	2Z9638–8	TRANSFORMER: 2:1 ratio secondary to primary; d-c primary resistance 700 ohms; d-c secondary resistance 1,700 ohms.	Used in blocking tube oscillator circuit to generate sawtooth wave.
V109	2J6SL7GT	TUBE JAN–6SL7GT: twin triode high-mu amplifier	Used in blocking tube oscillator circuit to generate and amplify sawtooth wave.

43. Power Supply Stage (fig. 36)

a. CIRCUIT REPAIR FEATURES. The power supply stage is composed essentially of the power transformer T104, high-voltage Tube JAN–2X2 (V107), medium-voltage Tube JAN–6X5GT (V108), and regulator Tube JAN–OC3/VR105 (V110). This stage supplies all d-c voltage for operation of the adaptor. The high-voltage output of tube V107 can be measured where the wire from the cap of the tube connects to filter capacitor C106B. The medium voltage may be checked between pin 8 of tube V108 and chassis. If tube socket voltages or resistances are incorrect, parts should be tested individually. See the parts data, *c* below for correct values.

b. VOLTAGE AND RESISTANCE MEASUREMENTS. The voltage and resistance values in figure 36 are made at the pin connections to the tube socket on the under side of the chassis. Connect the meter between the pin and chassis



NOTE: ⏚ IS SYMBOL FOR FIXED CAPACITOR.

Figure 36. Power supply stage circuit schematic and voltage and resistance values.

to make the readings. Use highest voltmeter scale on which value can be read. A variation in values of as much as 15 percent is permissible. Make test under the following conditions:

(1) *Voltage measurements.* (*a*) Use 1,000-ohm-per-volt instrument.

(*b*) No signal.

(*c*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

(2) *Resistance measurements.* (*a*) Tubes and panel lamp removed.

(*b*) SWEEP, HOR. POSITION, and GAIN controls full counterclockwise.

c. POWER SUPPLY STAGE PARTS DATA.

Ref symbol	Signal Corps stock No.	Name of part and description	Function
C106A	3DA250–71	CAPACITOR: fixed; paper; oil-filled; metal case; 2 × 0.25 mf ±10%; 2,000 vdcw.	High-voltage filter.
C106B	3DA250–71	CAPACITOR: fixed; paper; oil-filled; metal case; 2 × 0.25 mf ±10%; 2,000 vdcw.	High-voltage filter.
C111B	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Power line filter bypass.
C111C	3DA100–126.2	CAPACITOR: fixed; paper; oil-filled; metal case; 3 × 0.1 mf ±10%; 600 vdcw.	Power line filter bypass.
C112	3DB4–74	CAPACITOR: fixed; paper; oil-filled; metal case; 4.0 mf ±10%; 600 vdcw.	Medium-voltage filter.
C113	3DB4–74	CAPACITOR: fixed; paper; oil-filled; metal case; 4.0 mf ±10%; 600 vdcw.	Medium-voltage filter.
C114	3DB4–74	CAPACITOR: fixed; paper; oil-filled; metal case; 4.0 mf ±10%; 600 vdcw.	Medium-voltage filter.
CD807	3E1807	CORD: rubber-covered; two-conductor	Power input cable.
F101	3Z1927	FUSE: 2A; 250 volt; glass inclosed; nonrenewable	Prevent damage from overload.
I101	2J5952	LAMP: pilot light; bayonet base; 6 to 8 v; 150 μa.	ON-OFF indicator.
J102		RECEPTACLE: molded phenolic twist type; 3 pole; flush male base; 10 amp, 250 v.	Power input receptable in chassis.
L101A	3C323–6B	CHOKE: dual; each section; 6.5 h, 40 μa, d-c resistance 200 ohms	Medium-voltage filter.
L101B	3C323–6B	CHOKE: dual; each section; 6.5 h, 40 μa, d-c resistance 200 ohms	Medium-voltage filter.
P102		PLUG: 2 pole; female; 10 amp; 250 v.	Power cord end plug.
P103		PLUG: 2 pole; male; 10 amp; 250 v.	Power line plug.
R116	3Z6802–20	RESISTOR: fixed; carbon; ceramic insulated; 2.0 meg ±10%; 1 w.	Bias bleeder V102.
R117	3ZK6250–56	RESISTOR: fixed; carbon; ceramic insulated; 2,500 ohms ±10%; ½ w.	Bias bleeder V102.
R118	3Z6700–100	RESISTOR: fixed; carbon; ceramic insulated; 100,000 ohms ±10%; 1 w.	High-voltage filter.
R133	3Z6575–44	RESISTOR: fixed; wire-round; cement coated; 7,500 ohms ±10%; 10 w; type DH.	Voltage dropping resistor V110.
S101	3Z9847–3	SWITCH: toggle; SPST; 3 amp; 250 v.	ON-OFF power switch.
T104	2Z9613.56	TRANSFORMER: primary 115 v; 230 v, 60 cycles; 5 secondary windings, 590 v ct at 50 μa, 700 v at 1 μa, 2.6 v at 2 amp, 6.3 v at 3 amp, 2.5 v at 3 amp.	Supply set operating voltages.
V107	2J2X2	TUBE JAN–2X2: high-voltage rectifier	Cathode-ray tube power supply rectifier.
V108	2J6X5GT	TUBE JAN–6X5GT: full-wave rectifier	Medium-voltage power supply rectifier.
V110	2JVR105–30	TUBE JAN–OC3/VR105: voltage regulator	Regulates voltage.

44. Parts Identification

The following illustrations are provided to aid in identifying and servicing the various component parts of Panoramic Adaptor BC–1032–A.

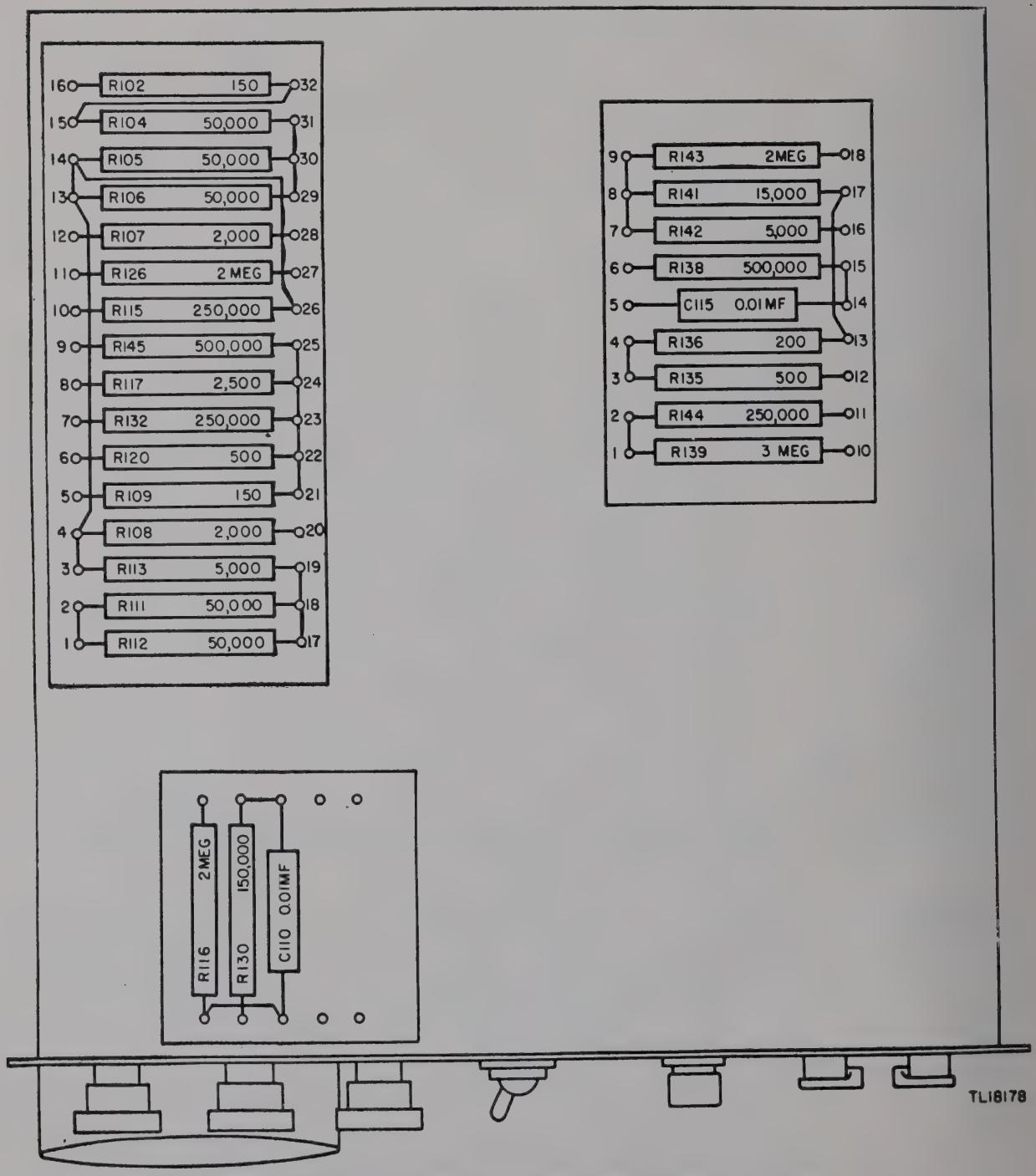


Figure 37. Panoramic Adaptor BC–1032–A, resistor cards and values.

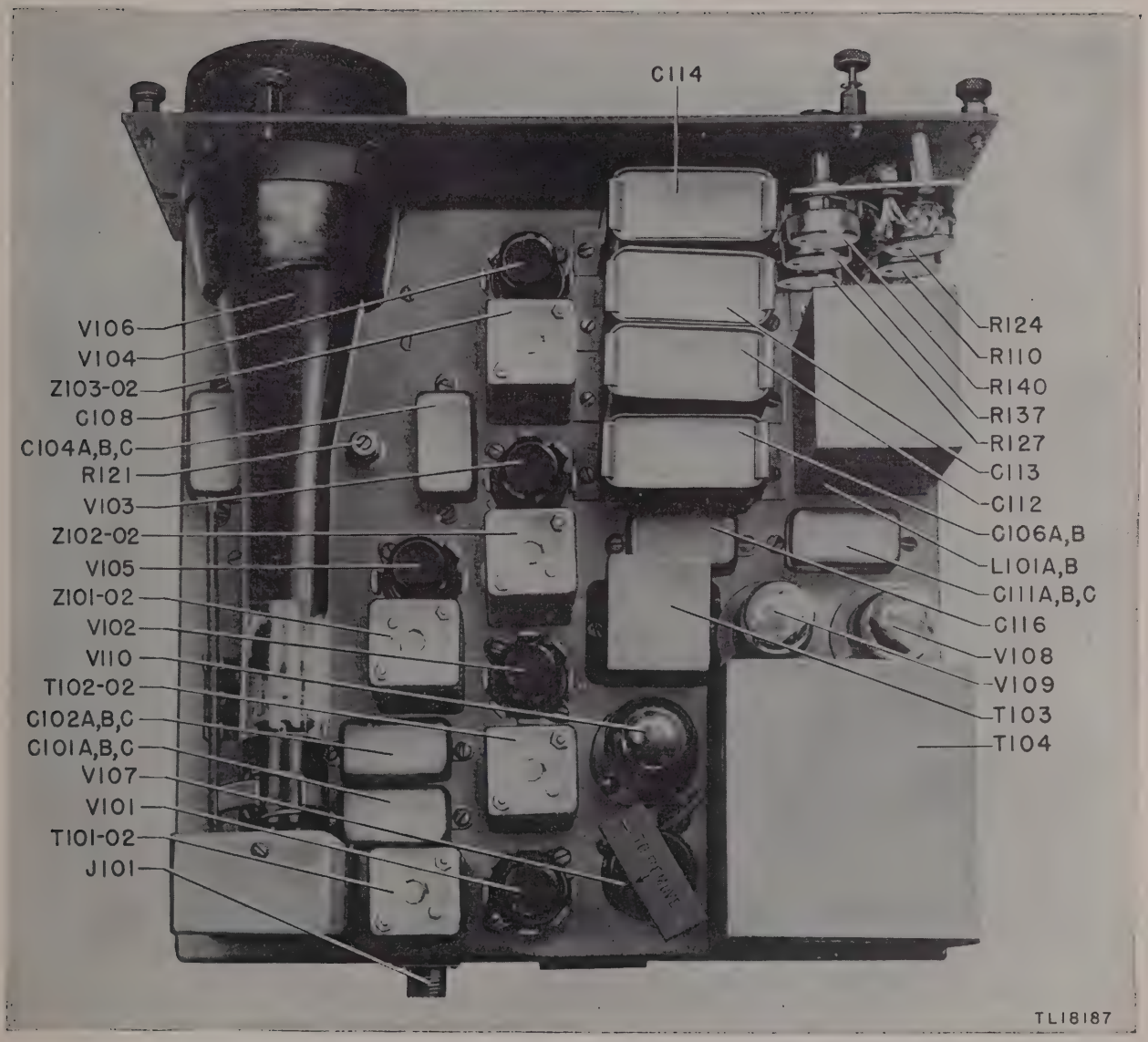


Figure 38. Panoramic Adaptor BC–1032–A, top view with reference symbols.

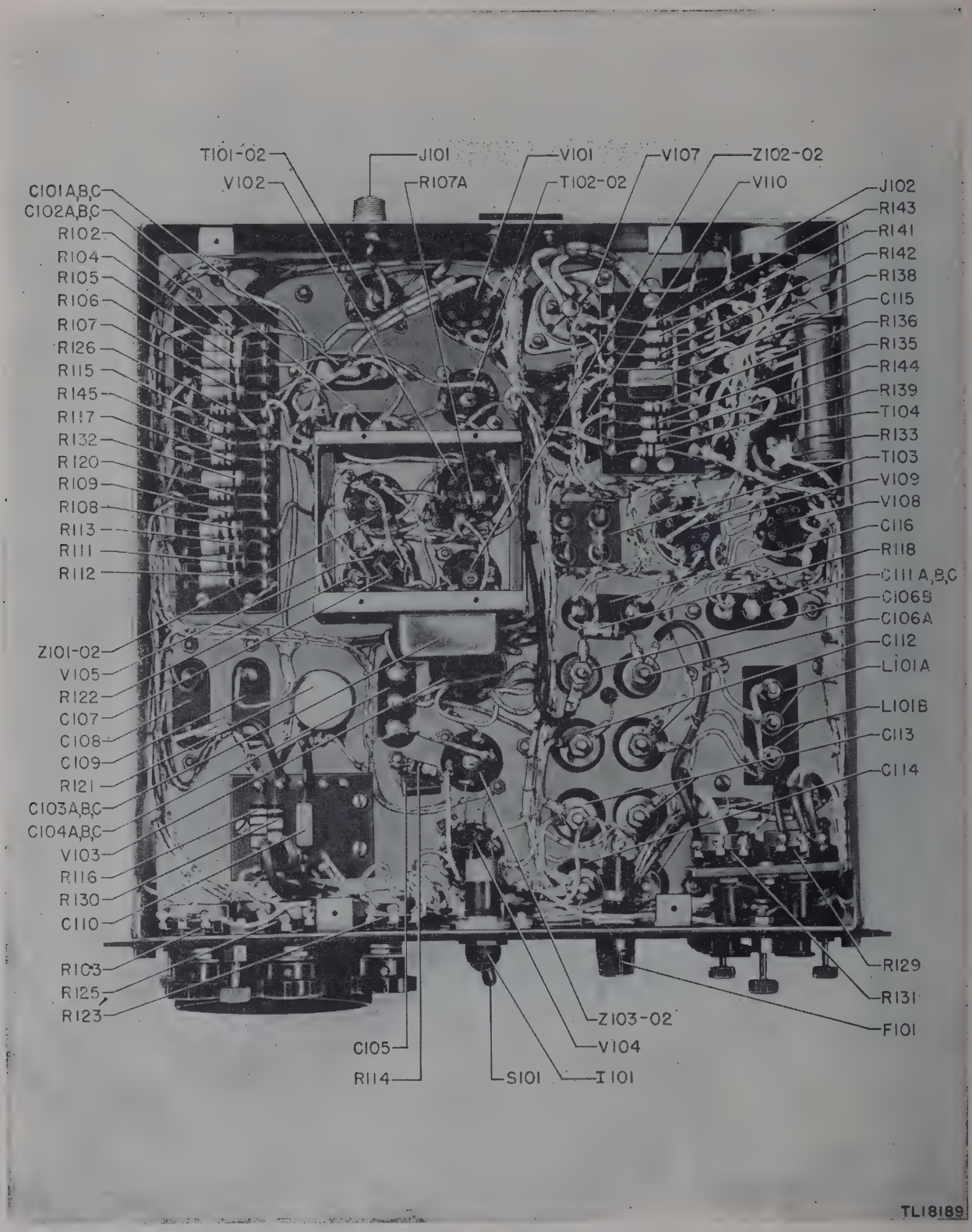


Figure 39. Panoramic Adaptor BC–1032–A, bottom view with reference symbols.

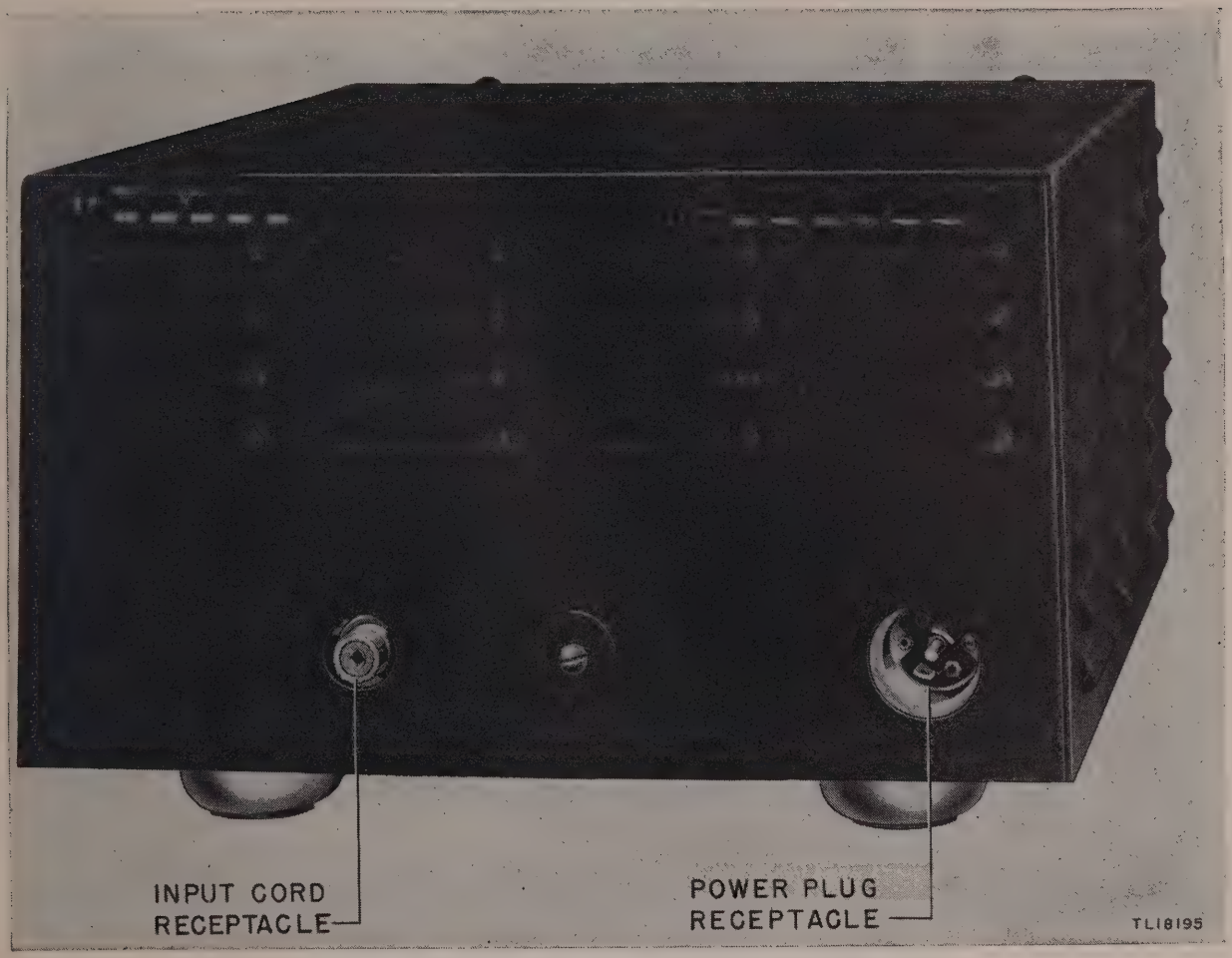
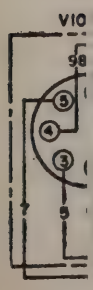


Figure 40. Panoramic Adaptor BC–1032–A, rear view.


V10
98
5
4
3
7
5

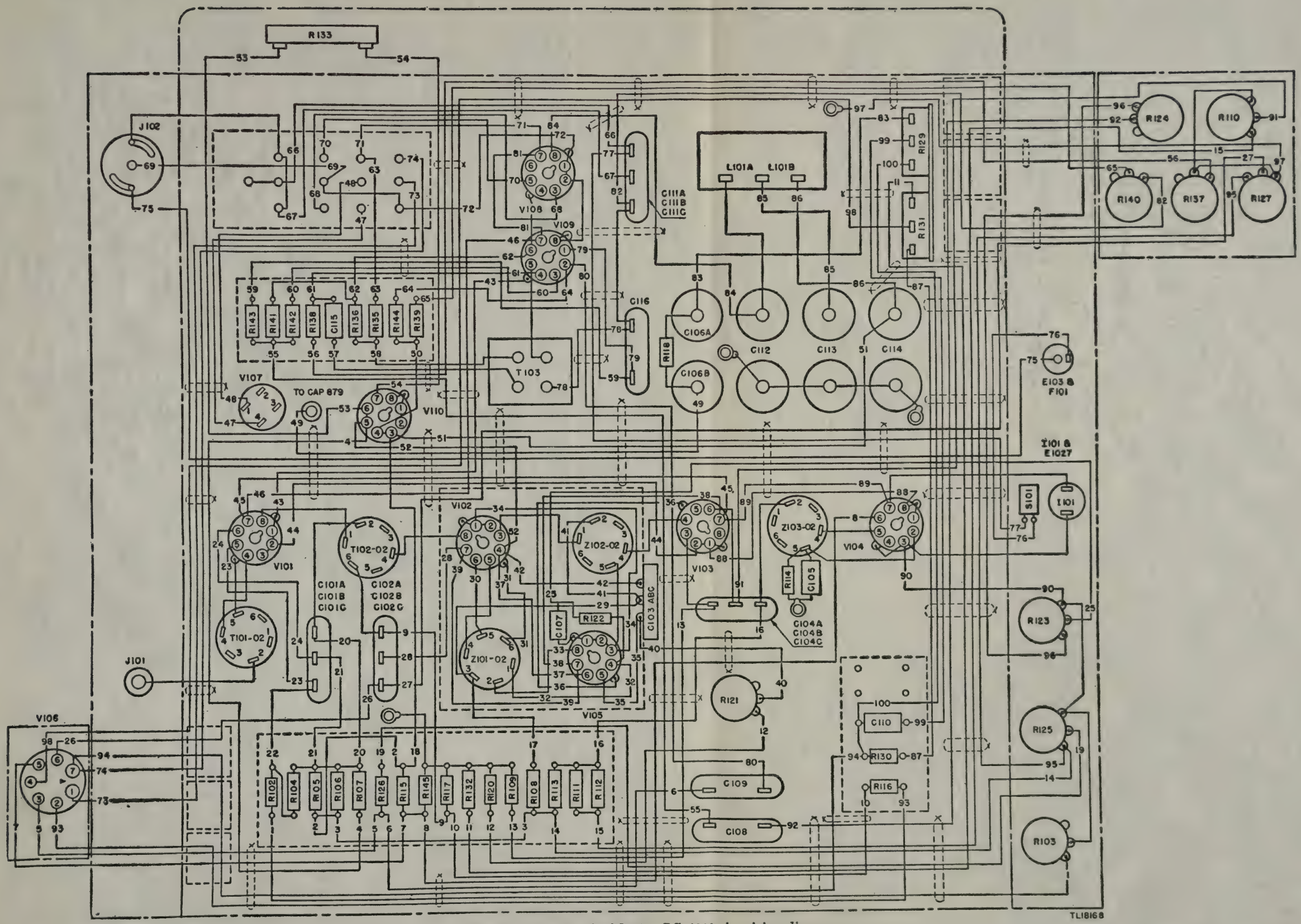


Figure 41. Panoramic Adaptor BC–1032–A, wiring diagram.

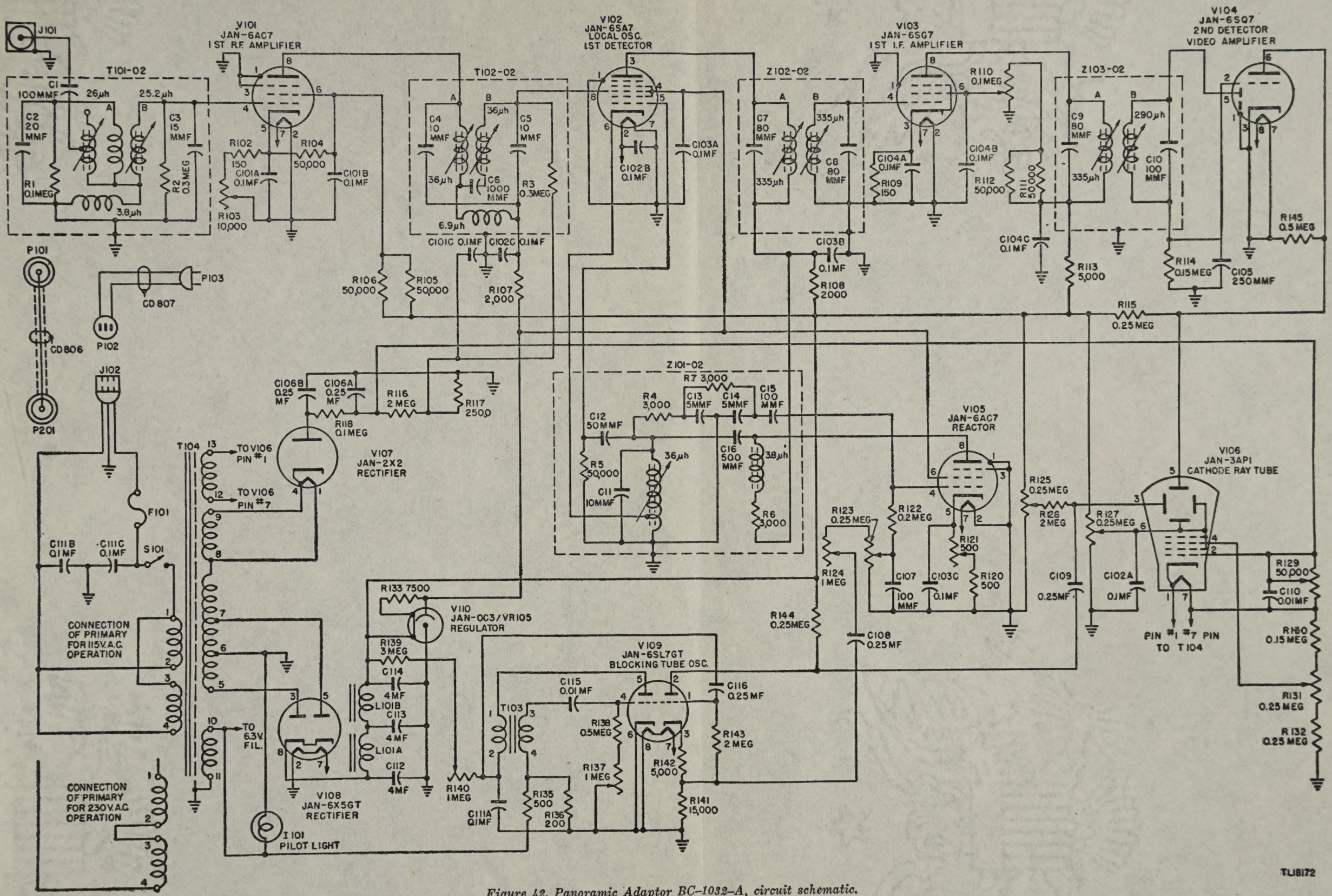


Figure 42. Panoramic Adaptor BC-1032-A, circuit schematic.

