PRELIMINARY INSTRUCTION BOOK

for

NAVY MODEL RDP
PANORAMIC RADIO ADAPTOR

RESTRICTED
(For Official Use Only)

MANUFACTURED
BY
PANORAMIC RADIO CORPORATION
NEW YORK, N. Y.
FOR

U. S. NAVY DEPT. BUREAU OF SHIPS

Contract No. NXsr-73836 *Dated: 23 August 1944*

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RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

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CONTRACTUAL GUARANTEE

The equipment including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten per cent (10%) or more of any such item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred per cent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Sercice may result in the use of the equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for affecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any such defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

REPORT OF FAILURE

"Report of failure of any part of this equipment, during its service life, shall be made to the Bureau of Ships in accordance with current instructions. The report shall cover all details of the failure and give the date of installation of the equipment. For procedure in reporting failures see Chapter 67 of the 'Bureau of Ships Manual', or superseding instructions."

INSTALLATION RECORD

(a) Contract No. NXsr-73836 Date of Contract: 23 August 1944
Serial Number of Equipment ____________________
Date of Acceptance by the Navy ____________________
Date of Delivery to Contract Destination ____________________
Date of Completion of Installation ____________________
Date Placed in Service ____________________

(b) Blank spaces in this book shall be filled in at the time of installation. Operating personnel shall also mark the "date placed in service" on the date plate located below the model nameplate on the equipment, using suitable methods and care to avoid damaging the equipment.

REPLACEMENT MATERIAL

"All requests or requisitions for replacement material should include complete descriptive data covering the part desired, in the following form:

1. Name of part desired.
2. Federal Stock number (if assigned).
3. Navy Type Number (if assigned) (including prefix and suffix as applicable).
4. Commercial Designation.
5. Model Designation (including suffix) of equipment in which used.
6. Navy Type Designation (including prefix and suffix where applicable of major unit in which part is used).
7. Contract, purchase order, requisition, etc., under which the equipment was procured.
8. Circuit symbol designation of part.
9. (a) Navy drawing and/or specification number (include part or group number.)
   (b) Manufacturer's drawing specification's number. (Include part or group number.)
10. Rating or other descriptive data.

SAFETY AND WARNING NOTICES

"OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE EQUIPMENT WITH HIGH VOLTAGE SUPPLY ON. DO NOT DEPEND UPON DOOR SWITCHES OR INTERLOCKS FOR PROTECTION BUT ALWAYS SHUT DOWN MOTOR GENERATORS OR OTHER POWER EQUIPMENT. UNDER CERTAIN CONDITIONS DANGEROUS POTENTIALS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION DUE TO CHARGES RETAINED BY CAPACITORS, ETC. TO AVOID CASUALTIES ALWAYS REMOVE POWER, DISCHARGE GROUND CIRCUITS PRIOR TO TOUCHING THEM."

ELECTRIC SHOCK
FIRST AID TREATMENT

SAFETY FIRST. Regard electrical apparatus generally, and especially all current-carrying parts as dangerous, irrespective of voltage. Exercise great care in handling and avoid broad contacts such as are made by standing on a metal deck or in water.

Dangerous contact may result through lessened resistance when the skin and clothing are wet with perspiration. Contact with damp metal surfaces -- decks, bulkheads, guns, machinery -- may allow the current to ground through the moist skin and body.

Electric shock is due to current passing through the body -- current actually passing -- irrespective of the voltage. A pressure as low as 110 volts has caused death. Current passing through the body in the region of the heart is especially dangerous. In using electric breast drills avoid the possibility of a ground.

Usually electric shock does not kill instantly. Life can often be saved even though breathing has stopped.

I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY. Use a dry non-conductor (rubber gloves, clothing, rope, board) to move either the victim or the wire. Beware of using metal or moist material. Shut off the current.

If necessary to cut a live wire, use an axe or hatchet with a dry wooden handle; turn your face away from the electrical flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING. Begin resuscitation at once on the spot. Do not stop to loosen clothing; every moment counts.

RESUSCITATION BY THE PRONE PRESSURE METHOD OF ARTIFICIAL RESPIRATION

Waste no time. When the patient is removed from the water, gas, smoke, or electric contact, get to work at once with your own hands. Send for the medical officer or nearest physician.

No reliance should be placed upon any special mechanical apparatus, as it is frequently out of order and often is not available when most needed. The patient's mouth should be cleared of any obstruction such as chewing gum or tobacco, false teeth, or mucus, so that there is no interference with the entrance and escape of air.

POSITION

1.- Lay the patient on his belly, one arm extended directly overhead, the other arm bent at elbow and with the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing.

2.- Kneel straddling the patient's thighs with your knees placed at such a distance from the hip bones as will allow you to place the palms of the hands on the small of the back with fingers resting on the ribs, the little finger just touching the lowest rib, with the thumb and fingers in a natural position, and the tips of the fingers just out of sight.

FIRST MOVEMENT

3.- With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the patient. The shoulder should be directly over the heel of the hand at the end of the forward swing. Do not bend your elbows. The operation should take about two seconds.

SECOND MOVEMENT

4.- Now immediately swing backward, so as to remove the pressure completely.

5.- After two seconds, swing forward again. Thus repeat deliberately twelve to fifteen times a minute the double movement of compression and release, a complete respiration in four or five seconds.

6.- Continue artificial respiration without interruption until natural breathing is restored. Do not get discouraged at the slow results that sometimes happen. Efforts often have to be continued a long time before signs of life are apparent. Do not discontinue the efforts until certain that all chance is lost. Sometimes, even after several hours' work, recovery takes place.

7.- As soon as this artificial respiration has been started and while it is being continued, an assistant should loosen any tight clothing about the patient's neck, chest, or waist. TO KEEP THE PATIENT WARM DURING ARTIFICIAL RESPIRATION IS MOST IMPORTANT AND IT MAY BE NECESSARY TO COVER HIM WITH BLANKETS AND WORK THROUGH THEM, AS WELL AS TO APPLY HOT-WATER BOTTLES, HOT BRICKS, ETC. Do not give any liquids whatever by mouth until the patient is fully conscious.

8.- To avoid strain on the heart when the patient revives, he should be kept lying down and not allowed to stand or sit up. If the doctor has not arrived by the time the patient has revived, he should be given some stimulant, such as one teaspoonful of aromatic spirits of ammonia in a small glass of water or a hot drink of coffee or tea, etc. Continue to keep the patient warm and at rest.

9.- Resuscitation should be carried on at the nearest possible point where the patient received his injuries. As a general rule, he should not be moved from this point until he is breathing normally of his own volition and then moved only in a lying position. Should it be necessary, due to extreme weather conditions, etc., to move the patient before he is breathing normally, resuscitation should be carried on during the time that he is being moved.

10.- A brief return of natural respiration is not a certain indication for stopping the resuscitation. Not infrequently the patient, after a temporary recovery of respiration, stops breathing again. The patient must be watched, and if natural breathing stops, artificial respiration should be resumed at once.

11.- In carrying out the resuscitation it may be necessary to change the operator. This change must be made without losing the rhythm of respiration. The relief operator should kneel behind the one giving the artificial respiration and at the end of the movement, the operator crawls forward while the relief takes his place. By this procedure no confusion results at the time of change of operator, and a regular rhythm is kept up.

"Since the use of high voltages which are dangerous to human life is necessary to the successful operation of the equipment covered by these instructions, certain reasonable precautionary measures must be carefully observed by the operating personnel during the adjustment and operation of the equipment."

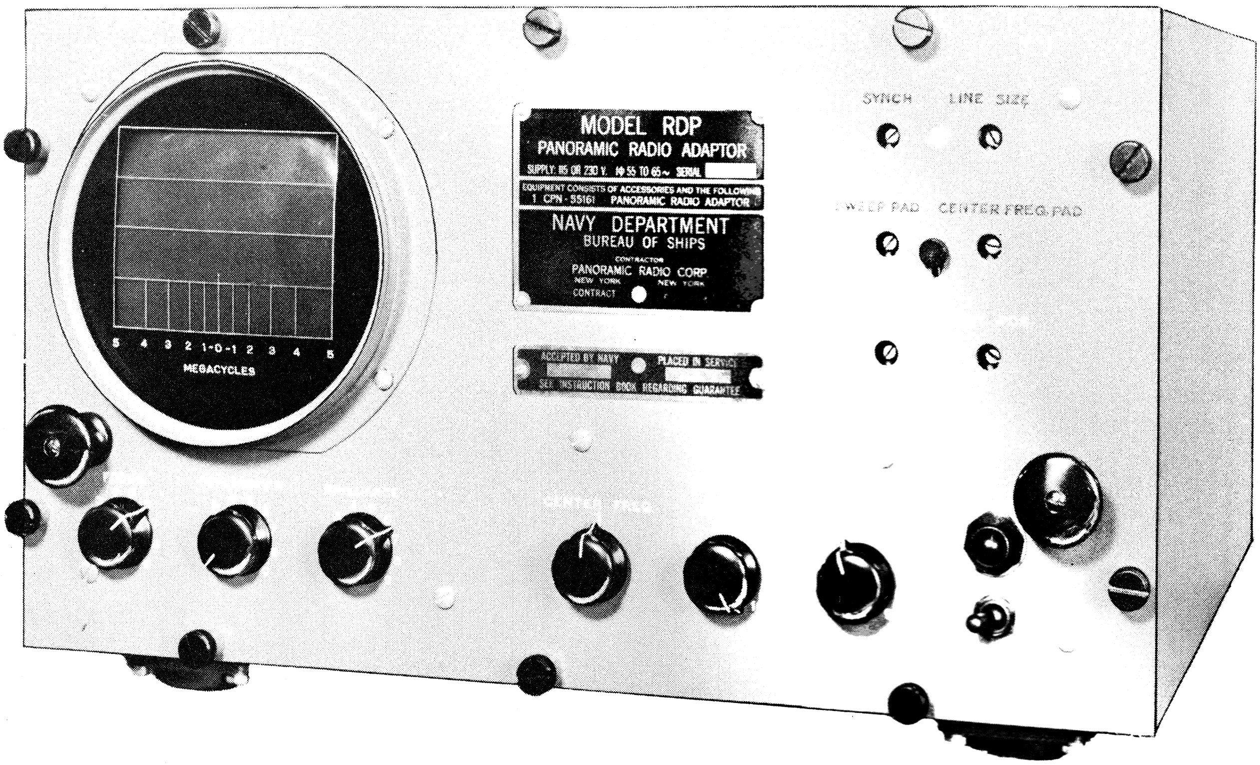
"The major portions of the equipment are within shielding enclosures. While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

"KEEP AWAY FROM LIVE CIRCUITS. Under no circumstances should any person be permitted to reach within or in any manner gain access to the enclosure with power supply line switches to the equipment closed; or to approach or handle any portion of the equipment which is supplied with power, or to connect any apparatus external to the enclosure to circuits within the equipment; or to apply voltages to the equipment for testing purposes while any portion of the shielding or enclosure is removed or open. Wherever feasible in testing circuits, check for continuity and resistance rather than directly checking voltage at various points."

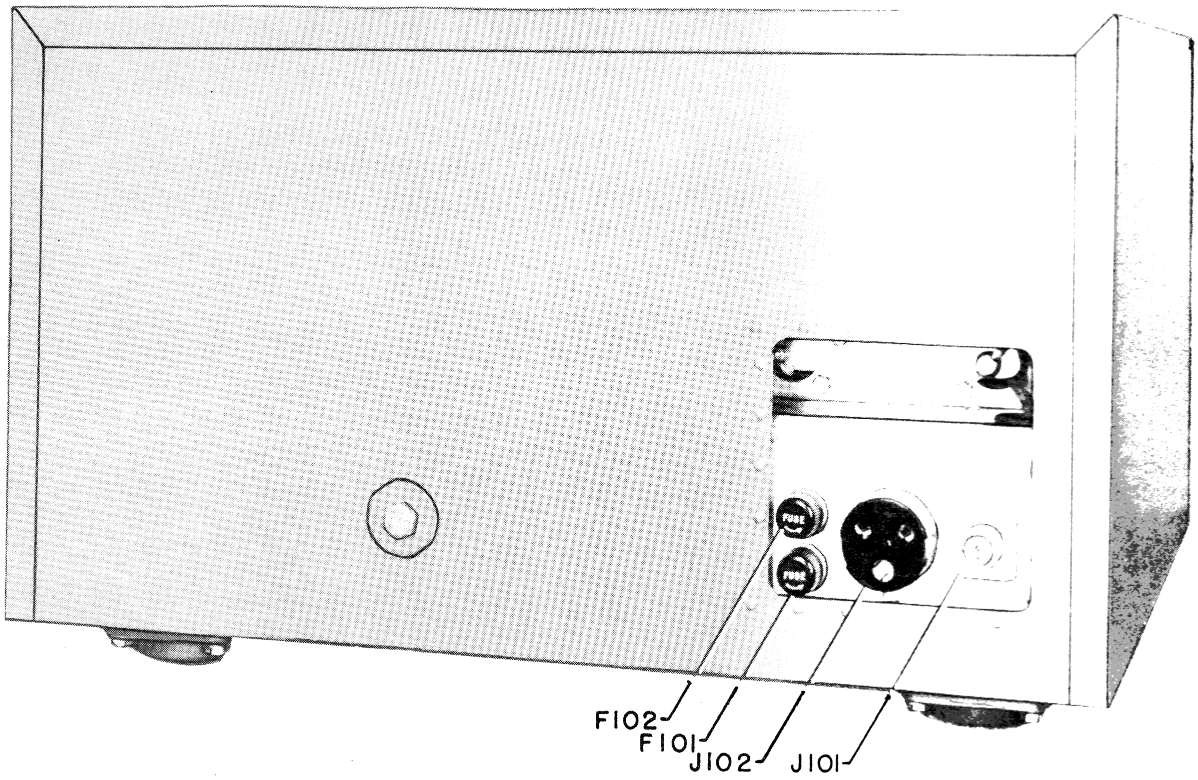
"DON'T SERVICE OR ADJUST ALONE. Under no circumstances should any person reach within the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid."

"THE ATTENTION OF OFFICERS AND OPERATING PERSONNEL IS DIRECTED TO CHAPTER 67 OF BUREAU OF SHIPS MANUAL OR SUPERSEDING INSTRUCTIONS ON THE SUBJECT OF 'RADIO-SAFETY PRECAUTIONS TO BE OBSERVED!'"

"AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY."



(A) Panoramic Adaptor, front view



(B) Panoramic Adaptor, rear view

Figure 1-1A. - Panoramic Adaptor, Navy Model RDP, Front and Rear View.

SECTION I GENERAL DESCRIPTION

1. REFERENCE DATA.

a. Contractual Data.

(1) Name and Designation of Equipment - Panoramic Adaptor, Navy Model RDP
(2) Contract Number and Date - NXsr-73836 August 1944
(3) Contractor - Panoramic Radio Corporation
242 West 55th Street
New York City, N.Y.
(4) Cognizant Naval Inspector - J. Davidson, INM, NY

b. Electrical Characteristics.

(1) Maximum sweepwidth - 10mc.
(2) Input frequency - 30mc.
(3) Method of coupling in R.F. input - Cathode follower in companion receiver.
(4) Power Source - 115/230 V. 55/65 cycles
(5) Peaking Frequencies of Bandpass Stage
R.F. input transformer – 27.5 mc. ± 500KC
32.5 mc. ± 500KC
R.F. output transformer – 25.5 mc. ± 500KC
34.5 mc. ± 500KC
(6) Sensitivity – 15μV signal of 30 mc. applied to input of adaptor directly causes a vertical deflection of more than 1/4".
(7) I.F. Transformer frequency – 7.5 mc.
(8) Oscillator mean frequency – 22.5 mc. ± 250KC
(9) Oscillator swing up to – ± 5 mc.
(10) Sweep Frequency – 30 cycles
(11) Sweep Voltage Waveform – Sawtooth linear

c. Vacuum Tube Complement

Symbol	Type Designation		Function
V101,V102	6AC7/1852		R.F. Amplifiers
V103	6SA7		Mixer
V104	6SG7		1st I.F. Amplifier
V105	6AC7/1852		2nd I.F. Amplifier
V106	6SN7GT	(A)	Detector (Diode Connection)
		(B)	Unused
V107	6SN7GT		Push-pull video amplifier

Symbol	Type Designation		Function
V108	6AC7/1852		Pulse Intensifier
V109,V110	9002		Push-pull oscillator
V111,V112	6AC7/1852		Reactors
V113	VR150/30		Voltage regulator
V114	6SN7GT	(A)	Sawtooth Generator
		(B)	Sawtooth Amplifier
V115	6SN7GT	(A)	Sawtooth Amplifier
		(b)	Sawtooth Cathode Follower
V116	5CP1		Cathode Ray Tube
V117,V118	6X5GT		Low Voltage Rectifier
V119	2X2		High Voltage Rectifier

2. GENERAL DESCRIPTION.

The Navy Model RDP Panoramic Adaptor is a modified superheterodyne receiver receiver which is tuned to a fixed band of frequencies. Unlike other superheterodyne receivers, however, the output of the adaptor is applied to the vertical deflection plates of a cathode ray tube. The front of the cathode ray tube is faced by a green plastic screen which is calibrated, on the horizontal axis, in megacycles. Upon connecting the Panoramic Adaptor to a companion receiver which has a fairly flat R.F. response of about 10mc., you may see simultaneously, as vertical deflections upon the screen, all stations receivable within a band which extends approximately 5mc. above and below the frequency to which the receiver is tuned. Therefore, while the receiver operates normally, you will not only hear and see the station or stations tuned in, but in addition you may see signals of adjacent frequencies. This is illustrated in Figure 1-1.

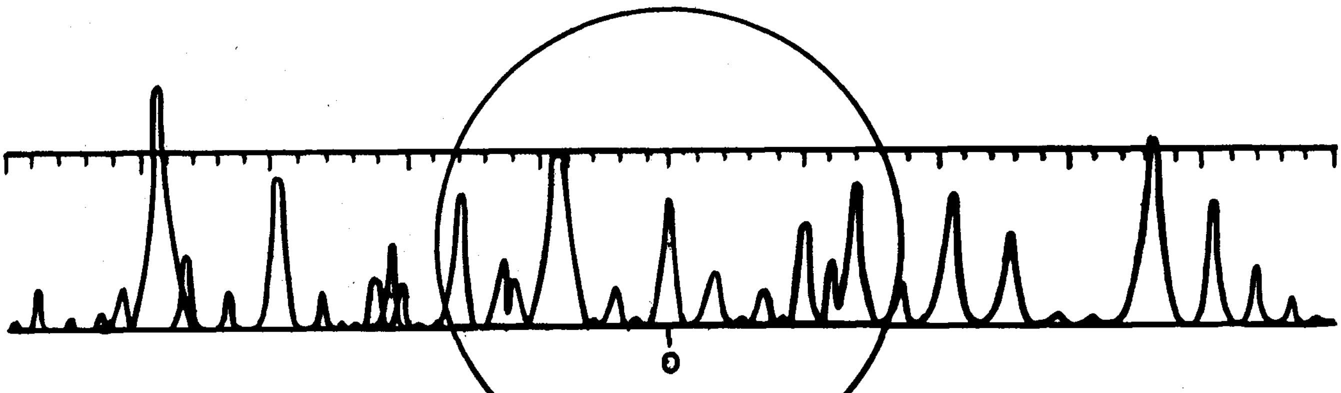


Figure 1-1. - Portion of the Radio Frequency Spectrum.

The entire strip in Figure 1-1, represents that portion of the radio frequency spectrum which is covered by the tuning range of the companion receiver. The circle represents the range visible on the screen of the adaptor. Each signal has its own peak or peaks, on the calibrated screen, from which you may secure the following information:

a. You may obtain the frequency of signals adjacent to the station to which the companion receiver is tuned; the latter appears above the zero mark on the screen. See Section III, Par. 2k.

b. You may approximate roughly the strength of signals that are shown on the screen. Strong signals will have high peaks and weak signals will have small peaks.

c. You may judge the character of the signal and the type of modulation by the shape of the deflection. See Section III, Par. 5.

d. You may monitor signals over a wide band of frequencies and quickly intercept stations which may appear on the air, even for short periods of time. Navy Model RDP offers simultaneous visual reception of stations within a bandwidth of 10 megacycles, therefore you can detect the appearance of a station within the above bandwidth.

e. You may recognize pulse signals. In addition, you may approximate roughly the pulse rate of such signals. See Section III, Par. 4. A pulse signal appears on the screen as a series of peaks or deflections as shown in Figure 1-2.

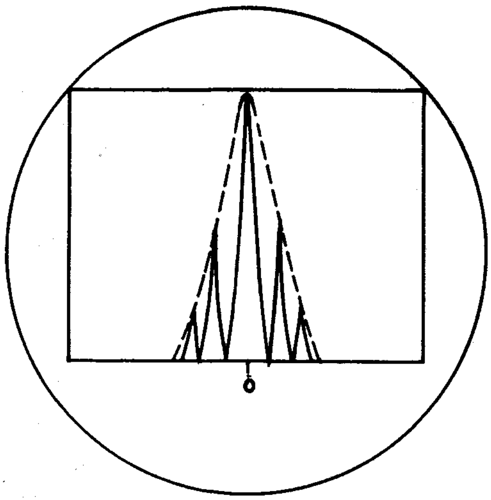


Figure 1-2. - Pulse Signal at Reduced Sweepwidth.

The envelope of these peaks, as indicated by the dotted line, will represent the station transmitting the pulses.

f. You may use the adaptor as an aid in tuning and in distinguishing between stations that are close together. If the adaptor is properly adjusted, and the SWEEP control is turned toward zero, the peak representing the station to which the receiver is tuned should broaden and remain centered over the zero mark. The peaks of the adjacent stations, however, should run off the screen. See Section III, Par. 2h.

g. You can find quickly a clear channel on which to transmit.

3. POWER SUPPLY.

The power supply of the Panoramic Adaptor is self contained. It is designed for 115v/230v. 55/65 cycle operation. However, it is wired at the factory for operation at 115v. The primaries of the power transformers can be rewired easily for 230v. operation. See Section V, Par. 8 and Figure 5-2.

The power supply contains a high voltage DC section which provides the necessary potentials for the cathode ray tube, and a low voltage DC section which provides the necessary potentials for the rest of the adaptor. The power transformers furnish all the heater voltages.

4. PHYSICAL CHARACTERISTICS.

a. Dimensions.

The dimensions of Navy Model RDP are the following:

Width	18 1/8"
Height - from the bottom edge of cabinet . .	9 13/16"
Height of Shockmounts	15/16"
Depth	17 7/16" (including panel thickness)
Distance between mounting hole centers . . .	13 5/8" x 12 23/32"
Hood Projection	1 1/8"
Weight of chassis with tubes	50 lbs.
Total weight of Navy Model RDP . . . . . . without power plug	71 lbs.

b. Cabinet.

The cabinet of the adaptor is finished in grey. The cabinet is mounted on on four shockmounts so that a minimum of vibration is transferred to the adaptor chassis. A rear view of the cabinet will reveal a cutout at the lower right hand corner. By means of this cutout, easy access is gained to the R.F. input receptacle, power receptacle, and two extractor type fuseholders. Thus, installation of the adaptor and replacement of burned out fuses are facilitated.

At approximately the lower center of the rear of the cabinet there is a guide screw which secures the rear of the chassis to the cabinet.

c. Front Panel.

On the front panel of the adaptor there are, from left to right, the following main operating controls:

(1) FOCUS. This control is used to obtain a clear sharp trace on the screen of the cathode ray tube. On the front panel, behind the knob for this control, there are engraved graduations extending from zero through nine.

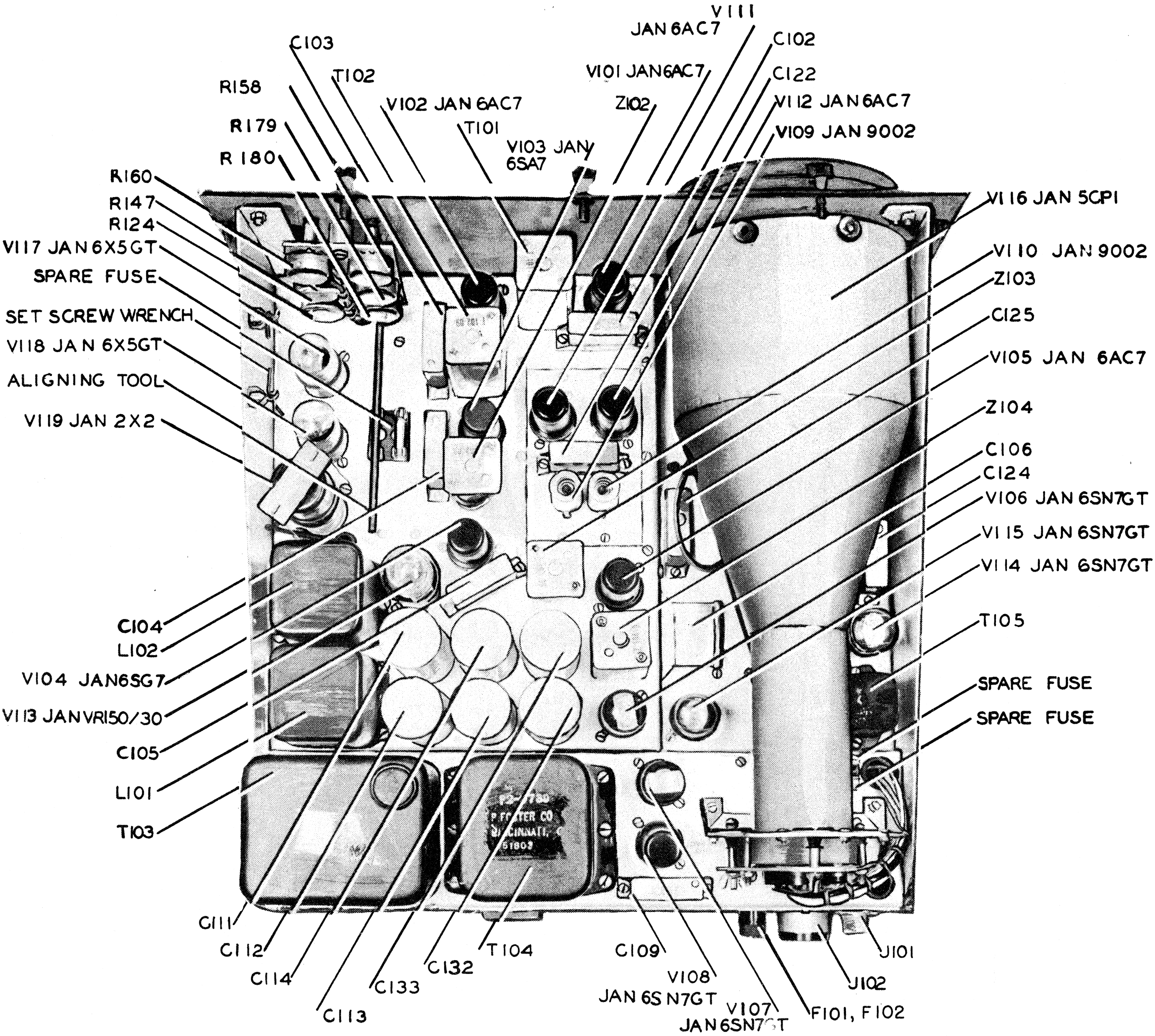


Figure 1-3.- Navy Model RDP, Top View of Chassis.

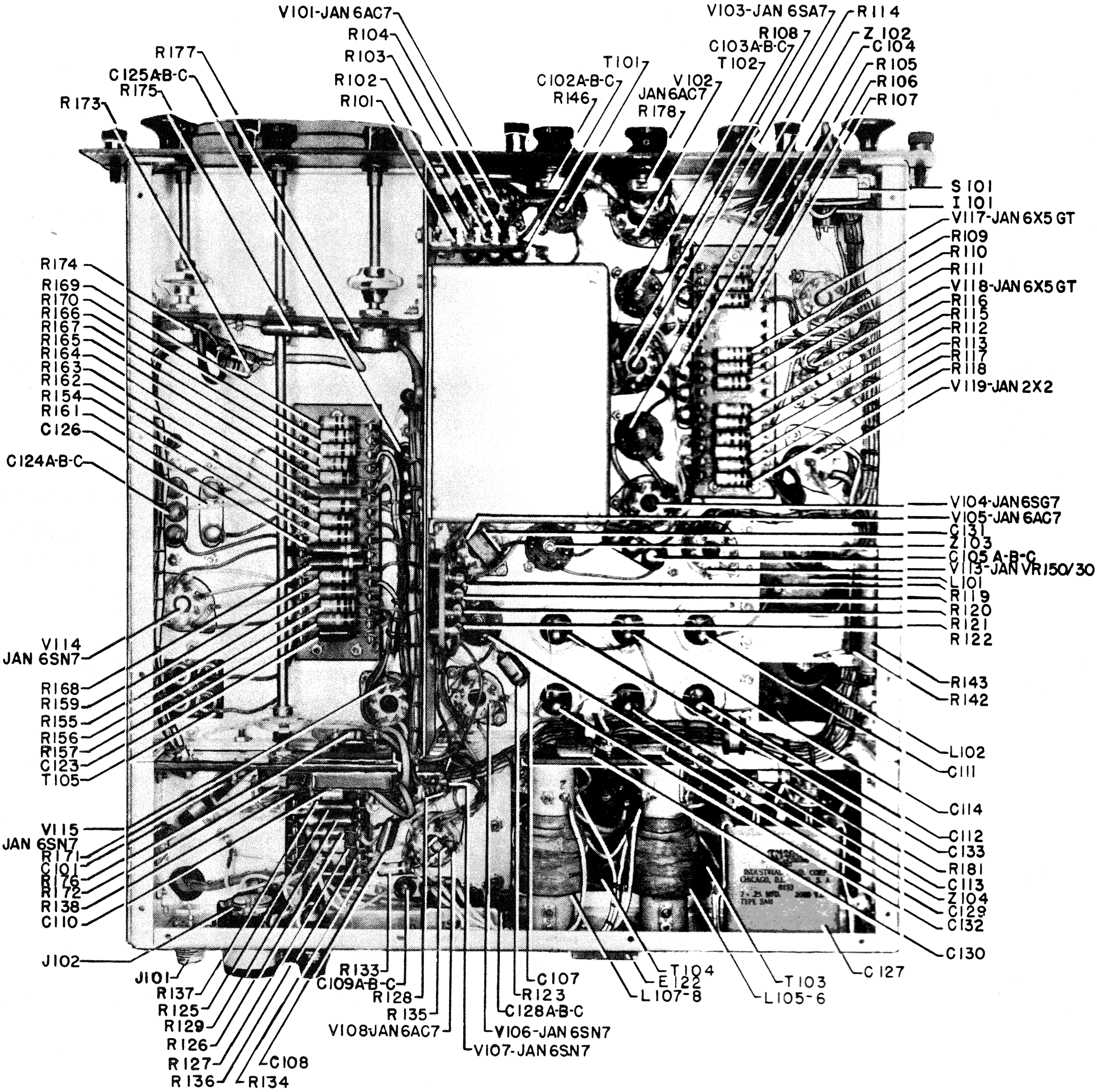


Figure 1-4.- Navy Model RDP, Bottom View of Chassis.

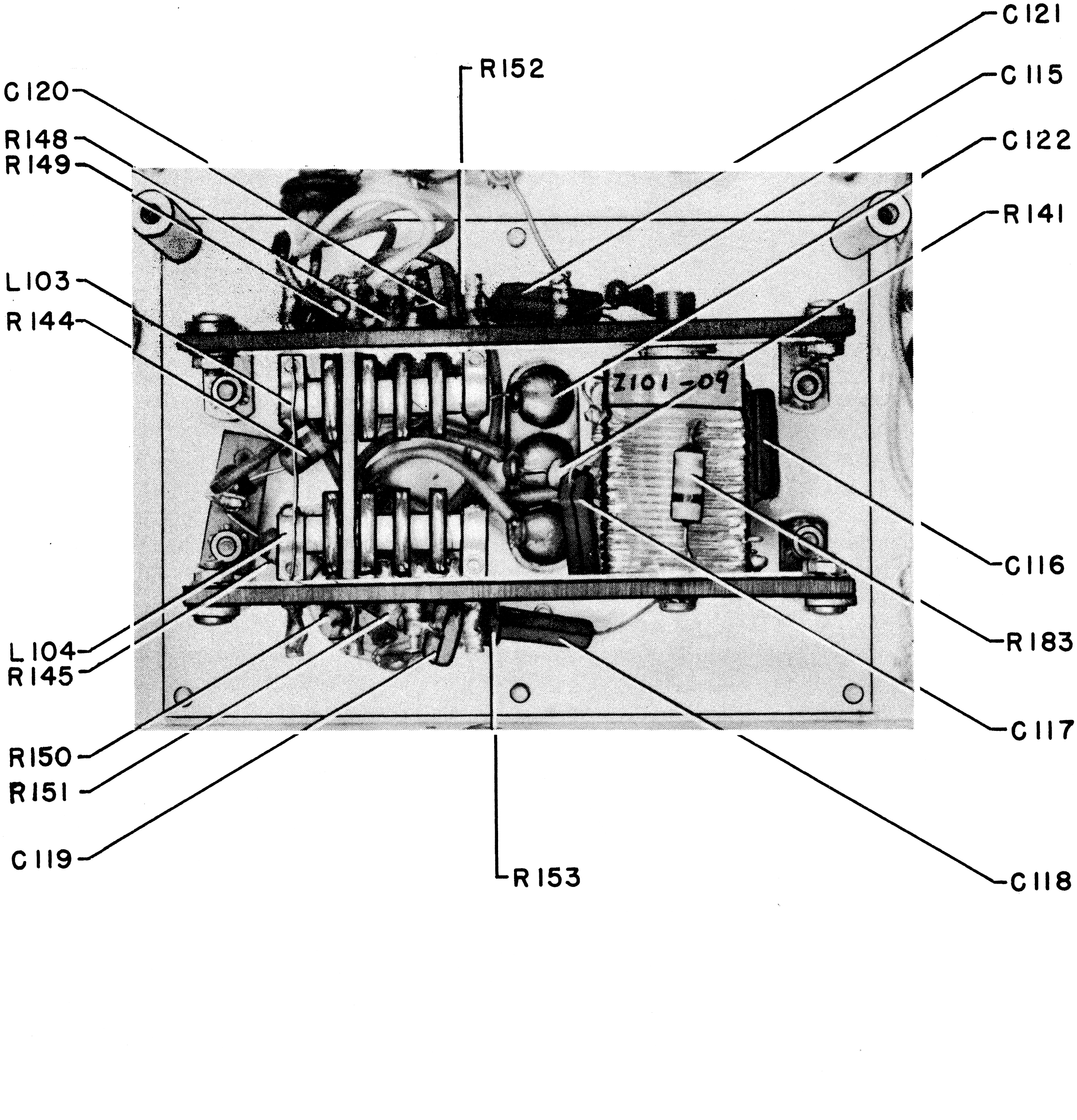


Figure 1-5.- Navy Model RDP, Bottom View of FM Oscillator and Reactor Chassis.

(2) INTENSIFIER. To obtain distinct traces for pulse signals, adjust this control. This control also has graduations, on the front panel, extending from zero through nine. Except for pulse reception, the INTENSIFIER control knob is set at zero when observing signals.

(3) BRILLIANCE. This control is used to adjust the brightness of the trace. This control also has graduations, on the front panel, extending from zero through nine.

(4) CENTER FREQ(uency). To center the deflection on the screen produced by the signal to which the receiver is tuned at the time, rotate this knob.

(5) SWEEP. This control permits the operator to vary the size or extent of the visible band of frequencies which he sees simultaneously.

(6) GAIN. The amplitude of the deflection may be varied by means of the gain control. The graduations on the panel behind this control are similar to those used for FOCUS.

At the right of the front panel, there are six holes under each of which there is a semi-adjustable control. Four of these controls are marked in red: SYNCH(ronization), LINE SIZE, SWEEP PAD, and CENTER FREQ(uency) PAD. Two are marked in white: HOR(izontal) POS(ition), VERT(ical) POS(ition). The red controls are to be serviced by experienced personnel only. The white controls may be adjusted as an integral part of the operating procedure. To adjust these controls, a front slide panel (behind the holes) must be raised to gain access to them. The slide panel is loosened by releasing a knurled slide panel locking screw. The controls can be adjusted by means of a screw-driver.

At the lower right of the front panel there is the power ON-OFF toggle switch above which there is a green pilot light to indicate whether the power is on or off.

The cathode ray tube is located at the left of the adaptor. A transparent green plastic screen is placed over the viewing end of the tube. The screen protects the tube from damage and it also protects the operator from shattered glass should the tube break. The screen is green to make the trace outstanding. A scope hood shields the screen from bright light to lend greater contrast to the trace and to allow a low setting of the BRILLIANCE control. The life of the cathode ray tube is lengthened by using a low setting of this control. Calibration lines, in megacycles are marked on the plastic screen.

Around the edges of the front panel there are ten panel locking screws which secure the front panel and chassis to the cabinet. On each side of the panel is a pull knob to facilitate removal of the chassis from the cabinet.

Upon removing the chassis from the cabinet, you will find a total of three spare 2A fuses, a tuning rod of bakelite which has a screwdriver tip at one end and a pin passing at right angles through the other end, and two Allen wrenches, sizes #6 and #8. Two of the spare fuses will be found in a dual fuse holder at the rear left of the chassis. In another dual fuse holder at the front right of the chassis you will find another spare fuse and the tuning rod. On the right side bracket, there are two Fahnstock clips, one holding a #6 Allen wrench and the other holding a #8 Allen wrench.

5. TECHNICAL SUMMARY.

Maximum sweepwidth	–	10mc.
Input frequency	–	30mc.
Sensitivity at input to adaptor	–	15µV/1/4" deflection at 30mc.
I.F. Transformer frequency	–	7.5mc.
Power Source	–	115/230 V. 55/65 cycles A.C.

SECTION II - INSTALLATION AND ADJUSTMENT

1. SPECIAL INSTRUCTIONS FOR UNPACKING EQUIPMENT.

When the crate is disassembled, place the carton on a clean working surface with its top up.

Open the top with the hands, a knife, or any other instrument, by pulling up each of the four flanges which form the top of the carton. Immediately under the top is an air cushion, marked INSTRUCTION BOOK and CABLES. Lift up this cushion, take it out of the carton, and remove books and cable.

The next "skin" is a butyral, cloth-backed moisture-vapor barrier which has been heat sealed. Carefully open the barrier by removing the heat sealed portion with a scissor or sharp knife. This will preserve the pouch for possible future use.

Remove the equipment from the open pouch with caution to avoid damage to either the equipment or the barrier. The dehydrating agent (dessicant) found inside the carton may not be reused and hence may be disposed of. Fold the bag along its natural fold lines, and store for future use. It might be found advisable to preserve the carton in its folded form, if its condition warrants it.

In removing the waterproof paper around the equipment, be careful to avoid scratching the cabinet with sharp pointed instruments.

2. PRE-INSTALLATION TESTS.

a. Test Equipment.

Signal generator	- range 5mc. to 40mc.
Voltmeter	- 0-3000V. D.C., 0-2500V. A.C. Sensitivity 1000 ohms/volt min.
Oscilloscope	- Optional

b. Test Procedure.

The Navy Model RDP is factory wired for a 115V, 55/65 cycles single phase A.C. power source. For 230V., 55/65 cycles operation, see Section V, Par. 8 and Fig. 5-2. BE SURE THAT YOU HAVE THE PROPER POWER SOURCE AVAILABLE.

Plug the power cable into the receptacle on the back of the adaptor chassis. The plug is polarized. Insert the plug into the receptacle. A spring lock will lock the plug to the receptacle. Now attach the other end of the power cable to the power source.

"Warning" - Do not tamper with any semi-adjustable control behind the slide panel.

Turn on the power switch which is at the lower right hand corner of the front panel. The pilot light should go on at once. Turn the BRILLIANCE control to approximately its #6 position. In half a minute the baseline should appear on the Panoramic screen as either a blurred or a sharp line.

NOTE: DO NOT ALLOW THE TRACE ON THE SCREEN TO COMPETE WITH SUNLIGHT OR BRIGHT LIGHT.

Now perform the following tests which cover operation of main controls, the R.F. Bandpass characteristics, and the sensitivity of the adaptor.

(1) FOCUS - Turn the FOCUS control from zero through nine. (The GAIN control should be near Zero). You will notice that the baseline will become sharp or blurred. At some setting of the FOCUS control the baseline will be sharp. Find this setting and leave the control there. This control will be used to focus screen traces so that they are clear and sharply defined.

(2) INTENSIFIER - Set the INTENSIFIER control at Zero. Set the GAIN control near eight or nine for almost maximum gain. The baseline will break up into vertical deflections representing noise. Now turn the BRILLIANCE control counterclockwise until the noise deflections almost fade out. Turn up the INTENSIFIER control. The noise lines will become brighter. In duration, noise deflections are somewhat similar to pulse deflections. This control, therefore, is used to intensify pulse signals. During the reception of other types of signals, it should be set at Zero.

(3) BRILLIANCE control can be checked quickly by turning the BRILLIANCE knob from Zero to nine. The baseline or noise deflections should vary in brilliance. Possibly the focus of the trace may be affected as the BRILLIANCE control is varied. Readjustment of the FOCUS control will compensate for such change.

(4) CENTER FREQ(uency) - Connect the output of the signal generator to the R.F. input connector which is at the rear of the chassis of the adaptor. After the signal generator and adaptor have warmed up, apply a 30mc. signal. Set the FOCUS and BRILLIANCE controls for a clear, sharp trace. Set the SWEEP control at nine. Reduce the GAIN so that a minimum of noise shows on the screen. If the signal generator, adaptor, and CENTER FREQ control are adjusted properly, there should be a peak, representing the signal, exactly over the Zero mark on the screen. Turn the SWEEP control counterclockwise. The peak will broaden but it should remain centered. Turn the SWEEP control fully clockwise.

Turn the CENTER FREQ control back and forth. The deflection should shift back and forth across the screen as you turn the control. This CENTER FREQ control is used to maintain or restore the centered condition in a properly aligned adaptor.

(5) GAIN - Turn the GAIN control from Zero to nine. Noise lines should appear and increase in size as you turn the knob clockwise.

(6) SWEEP - Use the same set up as in the CENTER FREQ test. Be sure that the CENTER FREQ control is properly set so that the 30mc. signal appears

directly over the Zero on the screen. Gradually increase the frequency of the signal generator. You will notice that the peak will move over to the left of the screen. As the frequency of the signal generator approximates 35mc., the peak will be at the extreme left side of the calibrated screen.

Now gradually decrease the frequency of the signal generator. The peak will move over toward the right of the screen. When the peak is at the extreme right side of the screen, note the signal generator frequency. It should be approximately 25mc. This indicates a full sweep of approximately 10mc.

"NOTE": Normally, when the heterodyne frequency oscillator of the companion receiver tracks above the incoming signal, those peaks appearing to the right of the zero mark on the screen are higher in frequency than the station to which the receiver is tuned. Conversely, those peaks appearing to the left of the zero mark are lower in frequency than the station to which the receiver is tuned. However, these signs are reversed when the heterodyne frequency oscillator of the companion receiver tracks below the incoming signal or when the output of a signal generator is fed directly to the adaptor.

(7) R.F. BANDPASS CHARACTERISTICS.- For this test use the same setup as that for the SWEEP test. As you vary the frequency of the signal generator from approximately 25mc. to 35mc., you will notice that the height of the moving peak will vary. The wavy line in Fig. 2-1 indicates this variation in height as the peak moves across the screen. Figure 2-1 represents the idealized bandpass characteristics of the R.F. section of the adaptor.

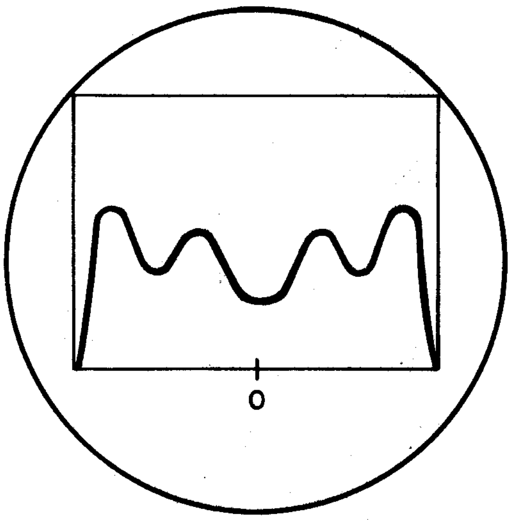


Figure 2-1. - Navy Model RDP, Bandpass Characteristics of the R.F. Section.

A quick method by which you can check the Bandpass Characteristics of the adaptor is to turn the GAIN up to maximum. Disconnect the signal generator. You will notice that the noise peaks will approximate the pattern in Fig. 2-2. This pattern will show four peaks.

(8) SENSITIVITY - With the GAIN control turned up to maximum, apply a signal of 15µV at 30mc. to the R.F. Input receptacle of the adaptor. The vertical deflection on the screen should be more than 1/4".

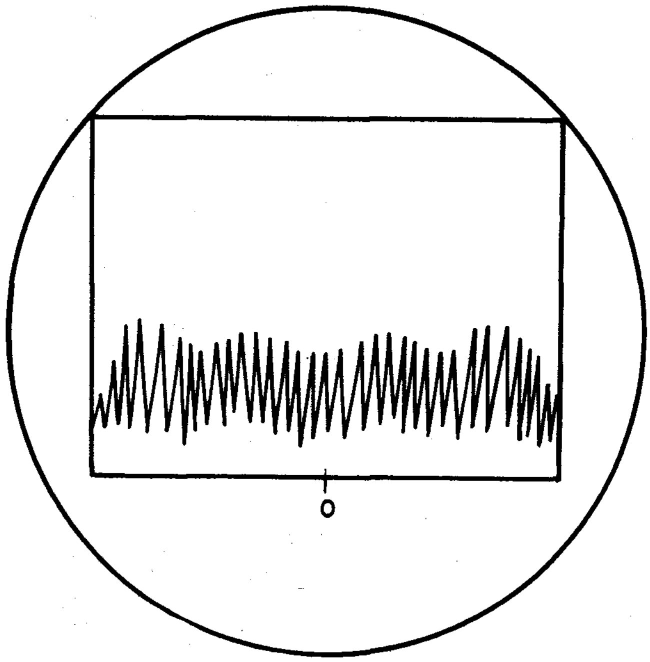


Figure 2-2. - Navy Model RDP,
Bandpass Characteristics of R.F. Section as Indicated by Noise Deflections.

3. INSTALLATION.

"Warning" - Remove the power lines from the Panoramic Adaptor and companion receiver.

a. Make sure that the companion receiver has an I.F. of 30mc. ±250KC, which will correspond to the input frequency of the Adaptor.

b. Check the companion receiver to see whether it is provided with a receptacle for operation with the Panoramic Adaptor. If there is one, go on to step c.

"NOTE": If the companion receiver is not provided with a receptacle which is connected to a cathode follower in the output of the mixer, for operation with a Panoramic Adaptor, proceed as follows:

The adaptor is to be connected to the output of the mixer of the receiver through a cathode follower circuit. Check the receiver to see whether such a circuit is present. If there is none, install a circuit like the one in Figure 2-3. In either case, determine where a hole can be drilled in the receiver chassis so that the shortest connecting cable can be used between the receiver and the adaptor. Drill a hole in which you should fit a standard Navy #CPH-49194 female connector (as in the adaptor). Now connect the inside conductor of a shielded cable to the cathode pin of the cathode follower socket. Connect the other end of the inside conductor to the center pin of the female connector. Ground the shield of the cable.

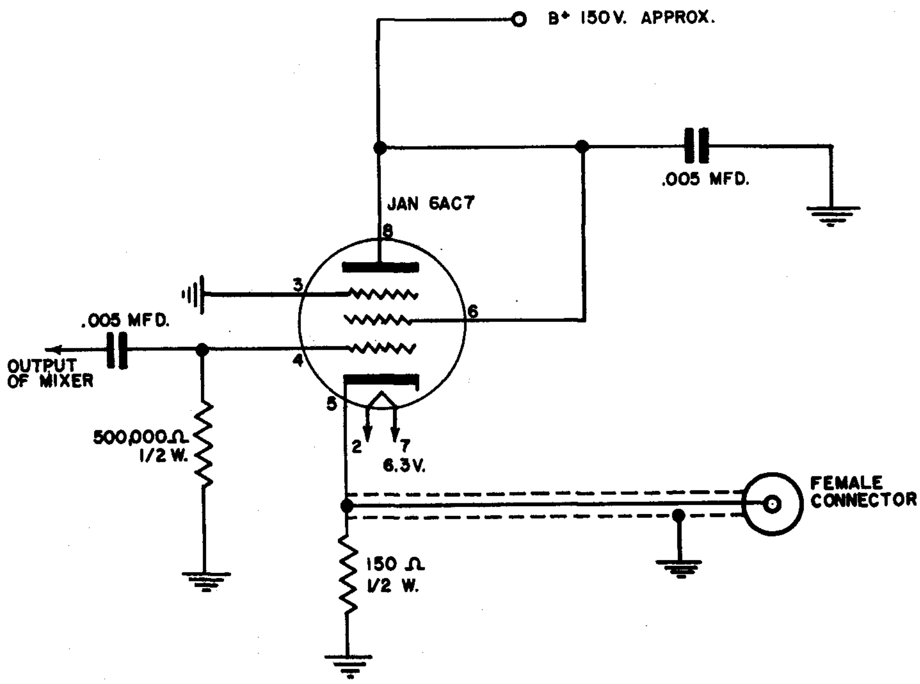


Figure 2-3. - Cathode Follower Circuit.

c. Find a proper place for the adaptor. The adaptor may be mounted over the companion receiver or it may be set in a rack. However, if possible, do not mount the adaptor over ventilation holes of the companion receiver. To prevent a decrease in the strength of the signal applied to the input of the adaptor, the cable connection between the adaptor and receiver should be as short as possible.

d. Reference can be made to the Installation Drawing (see Section II, Figure 2-4) for all necessary mounting dimensions.

e. Insert the male plug at one end of the connecting coaxial cable into the receiver receptacle. Insert the male plug at the other end of the cable into the adaptor input receptacle. Fasten both plugs to their respective connectors.

f. Now you can reconnect the power lines to both the receiver and adaptor.

4. POST-INSTALLATION OPERATING TESTS.

"Warning" - Do not tamper with the controls behind the front slide panel. The operation of the adaptor will be affected seriously if these controls are upset. See Section V, Par. 7.

a. Turn on the receiver and check its operation. The antenna should remain connected to the receiver in the normal manner.

b. Turn on the adaptor by snapping the "OFF-ON" switch to the "ON" position.

c. Turn the GAIN down to Zero.

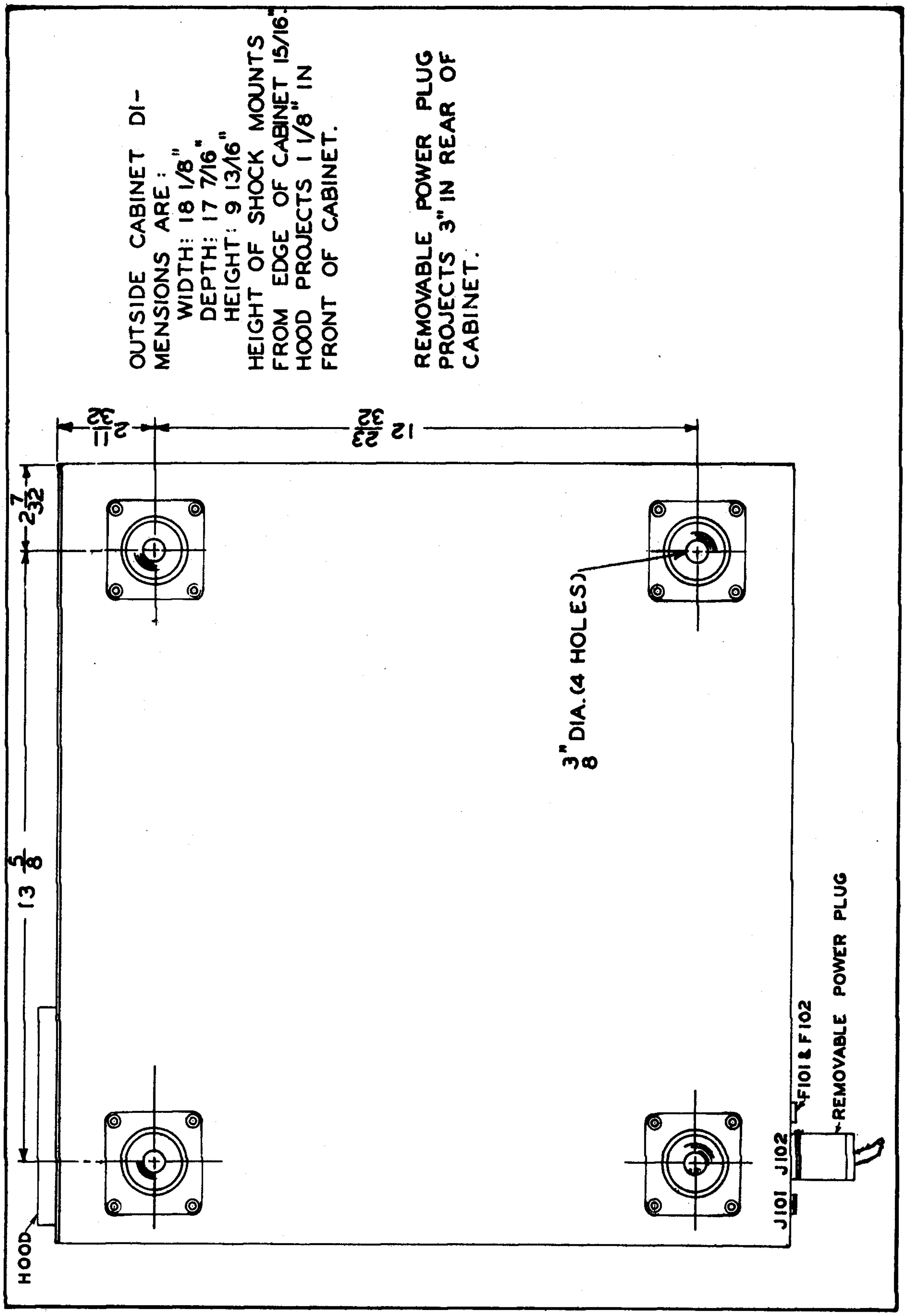


FIGURE 2-4 - Navy Model RDP, Mounting Dimensions

d. Turn the INTENSIFIER control to Zero.

e. Turn the BRILLIANCE control to about 6. Wait for the baseline to appear. This should take about 1/2 minute.

f. Adjust the FOCUS control for a clear, sharp baseline. Use the BRILLIANCE control to vary the brightness of the baseline.

g. Set the SWEEP control to 10 or maximum sweepwidth.

h. Turn the GAIN control up about halfway.

i. Slowly tune the receiver, and soon one or more signals will appear on the panoramic screen and they will move across it as you tune the receiver. If no signals appear, look under Maintenance, Section V, Par. 4.

j. Tune in a single station on the receiver, using phones or speaker. The signal should appear directly over the Zero mark on the screen. If it does not, reduce the SWEEP so that the signal deflection broadens to a base of about one inch to one and a half inches. Turn the CENTER FREQ(uency) control so that the peak of the deflection is directly over the Zero mark. Return the SWEEP to maximum. The peak should remain centered. If it does not, the front slide panel must be raised and the HOR. POS(ition) control must be adjusted, by using a screwdriver, to center the peak. "NOTE" – Do not make any adjustments until the adaptor has had a warm-up period of at least 15 minutes.

The CENTER FREQ(uency) control is used to adjust the mean frequency of the Panoramic Adaptor oscillator so that the signal will remain approximately centered no matter what the position of the SWEEP control may be. If the peak is centered incorrectly, it will run off the screen as the SWEEP is turned toward Zero.

SECTION III - OPERATION

1. DEFINITIONS APPLYING TO PANORAMIC UNITS.

Since the Panoramic Adaptor fulfills certain particular functions which are not found in ordinary radio receivers, it becomes necessary to establish certain terms and definitions which apply particularly to this type of radio equipment.

a. Panoramic Unit shall be a device which utilizes intermediate frequency output from a companion receiver to present visually a limited continuous frequency spectrum indication which includes the desired signal to which the receiver is tuned.

b. Panoramic Reception is the simultaneous visual reception of one or several radio signals whose frequencies are distributed over a portion of the radio frequency spectrum.

c. Input Coupling Device shall be a device inserted between the output of the signal source and the input terminals of the Panoramic Unit. Its electrical constants shall be such as to simulate the impedance characteristics at the panoramic output terminal of the receiver with which the unit is designed to operate.

d. Base Line shall be the trace produced by the horizontal sweep amplifier along which the signal deflections are produced. The baseline shall be visible throughout its entire length which shall be 1-3/4 times the "minimum useful cathode ray tube radius" as defined in the latest revision of the JAN-1 Vacuum Tube Specifications.

e. Standard Signal Deflection shall be the signal deflection above the baseline which is equal to 1/2 the minimum useful cathode ray tube radius of the particular type of cathode ray tube involved.

(1) Standard Signal Deflection Output Voltage shall be the deflection voltage superimposed upon the centering voltage applied to the vertical deflection plates of the cathode ray tube, corresponding to Standard Signal Deflection on the cathode ray tube screen.

f. Standard Gain shall be the gain at which Standard Noise Deflection is obtained.

g. Static Center Frequency shall be the input frequency to the unit at which maximum screen deflection is obtained when the sweepwidth is zero and the unit is adjusted for Standard Gain.

h. Dynamic Center Frequency shall be the input frequency to the unit which produces a deflection peak at the zero sweep calibration mark on the baseline with the unit adjusted for maximum sweep control setting the Standard Gain.

i. Resolution shall be the extent to which the Panoramic Unit is capable of differentiating between two separate signals.

j. Standard Resolution shall be the frequency difference between two signals of Standard Signal Deflection amplitude which intersect at 50% of the distance between the baseline and the standard deflection peak, at Standard Gain and maximum sweep-width.

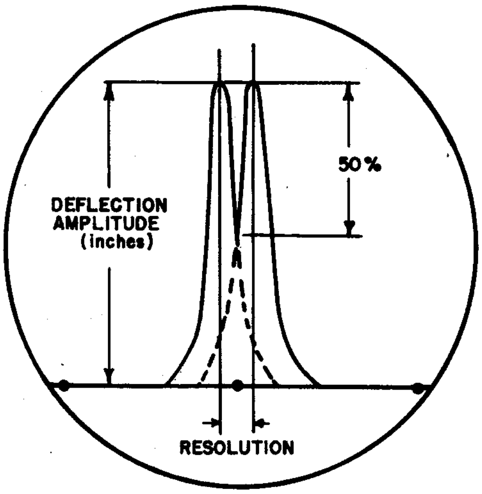


Figure 3-1. - Navy Model RDP, Standard Resolution.

k. Pre-Amplifier (Band-Pass Amplifier) and/or Circuits shall consist of all circuits between the input coupling device and the panoramic first frequency converter.

l. Spurious Modulation Response shall be the degree to which the panoramic unit responds to undesired frequencies, such as the power-line frequency, or undesired audio ripple in the power supply, as regards distortion or aberration of the normal response pattern obtained on the cathode-ray tube screen without such spurious modulation effects.

m. Heterodyne Oscillator Mean Frequency shall be the frequency of the heterodyne or conversion oscillator at zero sweep.

n. Sweep-Frequency (scanning rate) shall be the modulation rate of the heterodyne oscillator.

o. Visual Response Frequency Limits shall be the maximum difference in input frequencies applied to the Panoramic Unit which produces deflection peaks at the extremities of the baseline with the unit adjusted for maximum sweep control setting and Standard Sensitivity.

2. OPERATING PROCEDURE, GENERAL.

"WARNING" - Avoid touching any of the controls behind the front slide panel. Adjustment of these controls should be made by experienced personnel only. See Section V, Par. 7.

a. Turn on the receiver and check its operation.

b. Snap "ON" the "ON - OFF" switch which is at the lower right hand corner of the adaptor. Immediately, the pilot light, above the switch, should glow.

c. Turn the INTENSIFIER control down to Zero. This control should be used only when receiving pulse signals.

d. Turn the GAIN control down to Zero.

e. Rotate the BRILLIANCE control to about 6. This control should be used to vary the brightness of the trace on the Panoramic screen. Wait for the baseline to appear. This should take about one-half a minute.

f. Adjust the FOCUS control until the baseline is clear and sharp.

g. Readjust the BRILLIANCE control to make the baseline as bright as you wish, as long as it can be focused. It is advisable to avoid excessive brilliance in order to prevent injury of the fluorescent coating in the cathode ray tube.

NOTE - DO NOT ALLOW THE TRACE ON THE SCREEN TO COMPETE WITH BRIGHT LIGHT OR SUNLIGHT.

h. Set the SWEEP control at maximum by turning the knob fully clockwise, thus insuring that a signal which appears at either extreme edge of the calibrated screen is approximately 5 mc. away from the frequency to which the receiver is tuned.

Should the SWEEP control be turned counterclockwise to the left, the visible bandwidth on the screen will be made narrower and you will see fewer stations. However, those stations that are seen will be magnified. Therefore, this control is useful when two or more signals are so close that they almost merge into one another. By reducing the SWEEP, these close signals will seem to separate, and you can tune the receiver more accurately.

i. Turn the GAIN control up about halfway. Noise lines will appear along the baseline. If you turn the knob further clockwise, the noise lines will increase in amplitude.

It is best to keep the gain as low as possible, while still being able to see a peak on the screen for the weakest signal that you can hear through the receiver. A low gain keeps the noise level of the spurious signal level down, and makes it easier to compare weak signals that are close to strong ones.

j. Tune in a single station on the receiver using phones or speaker. A peak representing the station should appear directly over the zero mark on the screen. If the peak appears on either side of the zero mark, however, merely reduce the SWEEP so that the peak broadens. Now adjust the CENTER FREQ(uency) control so that the signal deflection is centered. Return the SWEEP to maximum, and if this causes a horizontal shift of the peak, re-center the peak by adjusting the HOR. POS. control. The signal should remain centered regardless of the position of the SWEEP control.

Should more than one signal appear on the screen, one of them appearing over the zero mark, and you are not sure that the one over the zero mark is actually the station to which you are tuned and which you hear, make the following quick check. Turn the SWEEP control almost to zero. The signals will tend to run off the screen. If the signal originally over the zero mark remains over zero, then it is the one to which the receiver is tuned. However, if this signal runs off the screen as you vary the SWEEP, the CENTER FREQ control is not properly adjusted.

k. From the location of signals on the calibrated screen, you can determine the frequencies of these signals provided that the CENTER FREQ control is properly adjusted and the SWEEP CONTROL is set at maximum.

Each division on the calibrated scale represents one megacycle. To determine the frequency of a peak under observation, note the frequency of the station to which the receiver is tuned (as indicated by the receiver dial) and to this frequency add or subtract the calibration on the screen scale corresponding to the signal peak under observation. Whether the calibration is to be added to or subtracted from the frequency to which the receiver is tuned may be determined from the following: If the heterodyne frequency oscillator of the companion receiver tracks above the frequency to which the receiver is tuned, those signals which appear on the right side of the screen are higher in frequency than the one to which the receiver is tuned, whereas those on the left side of the screen are lower in frequency. However, if the heterodyne frequency oscillator of the companion receiver tracks below the frequency to which the receiver is tuned, the reverse is true.

l. To stop operation of the adaptor alone, push the "OFF-ON" switch to the "OFF" position.

3. OPERATING PROCEDURE FOR PULSE SIGNALS.

Pulse signals are composed of a series of pulses which are of extremely short duration. Therefore, a peak produced by one of these pulses traverses the screen vertically for so short a period of time that the excitation of the fluorescent coating of the cathode ray tube may be insufficient to produce a visible trace. Merely turning up the BRILLIANCE control does not help because the baseline becomes so bright that it "washes out" the pulse pattern. Therefore, use the following procedure:

a. Follow the regular operating procedure, but upon reception of pulse signals,

b. Reduce the brightness of the baseline, by varying the BRILLIANCE control, so that the baseline is barely visible.

c. Turn the INTENSIFIER control clockwise. The pulse peaks should be fairly clear and sharp while the baseline is not equally apparent. If not, use FOCUS control.

4. OPERATING PROCEDURE FOR ESTIMATING PULSE RATE OF PULSE SIGNALS.

In case you want to estimate roughly the number of pulses per second, follow the procedure below:

a. Follow the Operating Procedure for Pulse Signals.

b. Turn the SWEEP control to Zero. The pulse peaks should spread across the entire screen. The peaks may appear to move across the screen, but at any one moment the number of peaks on the screen will not vary.

c. Multiply the number of peaks by 30. This will give you a rough estimate of the number of pulses per second.

"NOTE" - The multiplier is 30 only when the line frequency is 60 cycles per second. The multiplier should equal half the line frequency.

5. INTERPRETATION OF SIGNALS.

With a little experience, you will be able to recognize visually the character of various types of signals, without the need of listening to them. Remember that the Panoramic Adaptor can show only what the companion receiver is able to receive. Therefore, for proper all-around service, the companion receiver must be perfectly adjusted.

You will find that many different signals will appear around the signal to which the receiver is tuned. The information below will help you in determining the types of signals under observation.

a. Constant Carrier.- A constant carrier appears as a deflection of fixed height. See Figure 3-2 (A).

b. Amplitude Modulated Carrier.- An amplitude modulated carrier takes on different appearances according to the position of the SWEEP control.

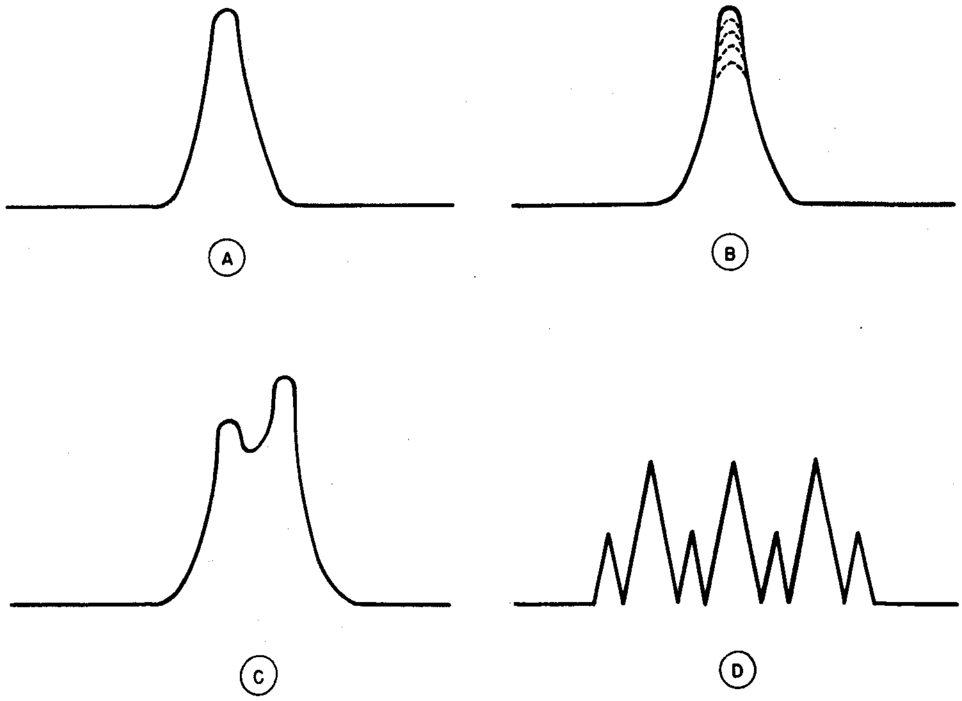
When the SWEEP control is set at maximum, the height of the deflection varies with the percentage of modulation. See Figure 3-2 (B). Possibly you may see irregularities, representing sidebands, at the base of the deflection. As the modulating frequency is increased these irregularities will tend to move away from the center of the deflection.

When the SWEEP control is turned gradually so that the sweepwidth of the adaptor is reduced, convolutions will appear along the sides of the deflection. The number of convolutions is determined by the modulating frequency. In the meantime, the width of the deflection increases more and more as the sweepwidth is reduced and the convolutions become more and more apparent.

Finally, when the SWEEP is brought to Zero, the adaptor becomes an oscilloscope and you will see a pattern of the modulating frequency.

If a constant tone modulation is used, two distinct sidebands will appear if the modulating frequency is sufficiently high. The sidebands will move away from the carrier deflection as the modulating frequency is increased.

You may find that as you tune the receiver, the relative heights of the two sidebands and the carrier will vary as they move across the screen. This is due to the fact that the overall response of the receiver and the adaptor is not perfectly flat. Therefore, the two sidebands may appear unequal in height even though, actually, they are of equal strength.



(A) Constant Carrier
(B) Amplitude Modulated Carrier
(C) Single Side-band Modulation
(D) Frequency Modulated Carrier

Figure 3-2. - Typical Signal Traces.

c. Single Side-band Modulation.- Single sideband modulation will appear as two carriers of slightly different frequency provided that the modulating frequency is high. If the modulating frequency is not high, the sideband and carrier run together and only one deflection will be apparent. See Fig. 3-2 (C).

d. Frequency Modulated Carrier.- A frequency modulated carrier appears as a carrier whose baseline width varies. As the carrier is modulated by voice or musio, deflection peaks appear on both sides of the carrier. As the percentage of modulation is increased, the deflection peaks appear farther away from the center carrier deflection. This is due to the fact that modulation of the carrier causes the carrier to shift in frequency. The magnitude of the shift is determined by the amplitude of the modulating frequency. See Figure 3-2 (D).

e. CW Signals.- A CW signal appears and disappears in step with the keying of the transmitter. If the BRILLIANCE control is turned down, and the INTENSIFIER control is turned up, CW signals will appear as flashing peaks. The base line will be rather dim.

f. MCW Signals.- An MCW signal will appear and disappear like a CW signal if the R.F. section of the transmitter is keyed. If the audio section only of the transmitter is keyed, the signal will appear as a deflection which increases in height as a code character is transmitted. If the modulation frequency is high, sidebands may appear.

g. Transient Disturbances.- Transient disturbances are either periodic or aperiodic.

Aperiodic transients, such as static, appear as irregular deflections and flashes along the whole frequency sweep axis.

Period transients, such as ignition or vibrator disturbances appear as deflections which may move along the baseline in one direction or another. This is caused by the fact that the oscillator sweep is of a definite rate while the transient occurs at a variable rate. However, should the transient be synchronized with the line frequency then the deflection of the transient will remain fixed.

h. Tube Noises.- Tube noises appear as varying irregularities along the frequency sweep axis. The high gain of the receiver or adaptor causes these noise deflections. Adjust the gain controls to reduce such disturbances.

i. Images.- Images will move on the screen in an opposite direction with respect to normal signals as the companion receiver is tuned. See Section III, Par. 1h. Images are most likely to appear on higher frequency ranges of the receiver.

j. Harmonics.- Harmonics, which are produced in the receiver by the beat of very strong signals with harmonics of the oscillator, will be distinguishable from other signals by the fact that they move more rapidly across the screen as you tune. Generally, a reduction in gain of the receiver will eliminate this type of spurious signal.

k. Diathermy apparatus.- Diathermy apparatus, which uses an unfiltered or A.C. power supply, will produce periodic disturbances that appear as deflection on certain parts of the screen and disappear on other parts of the screen. This is due to the fact that such equipment emits a pulsating signal in synchronism with the power line. The adaptor, too, sweeps the spectrum in synchronism with the line, but at half the line frequency and only when a certain phase relationship exists, is it possible for the adaptor to receive these periodic pulses.

l. Spurious Signals.- If the signal strength exceeds a certain value, the deflection caused by any signal breaks up into a series of parallel deflections, somewhat similar to sidebands. These spurious signals can take place in either the receiver or adaptor on extremely strong signals. A slight reduction in the gain of the adaptor will eliminate this type of distortion.

m. Use of AVC of the Receiver.- If the AVC circuit of the receiver affects the mixer or any stages before the mixer, the signal at the center of the screen will affect the neight of other signals. If the screen is tuned to a strong signal, AVC will act on the adjacent signals and other deflections may be reduced in height or they may not appear at all. Therefore, it will be found expedient in most applications, to operate the receiver with AVC cut off.

6. SUMMARY OF OPERATING PROCEDURE, GENERAL.

a. Turn on receiver.

b. Turn on the "ON-OFF" switch of the adaptor.

c. Turn the INTENSIFIER control to Zero.

d. Turn the GAIN down to Zero.

e. Turn BRILLIANCE control to about 6. Baseline should appear in about one half minute.

f. Adjust the FOCUS for a clear, sharp baseline.

g. Adjust the BRILLIANCE for desired brightness of the baseline.

h. Set the SWEEP control to maximum.

i. Turn the GAIN control up about half way.

j. Tune the receiver slowly. Signals should appear and move across the screen. Readjust the GAIN control for satisfactory deflection amplitude.

k. If necessary, use the CENTER FREQ. control to center, on the screen, the station which you hear.

l. To stop operation of the Adaptor push "ON-OFF" switch to "OFF".

7. SUMMARY OF OPERATING PROCEDURE OF PULSE SIGNALS.

a. Follow the regular operating procedure. Upon reception of a pulse signal,

b. Reduce the BRILLIANCE control so that baseline is barely visible.

c. Turn the INTENSIFIER control clockwise until the pulse signal is clear.

8. SUMMARY OF PROCEDURE FOR ESTIMATING PULSE RATE.

a. Turn SWEEP control to Zero, after following the procedure under Par. 7.

b. Multiply the number of peaks on the screen by 30 or one half of the line frequency. The product equals the approximate pulse rate.

SECTION IV - THEORY OF OPERATION

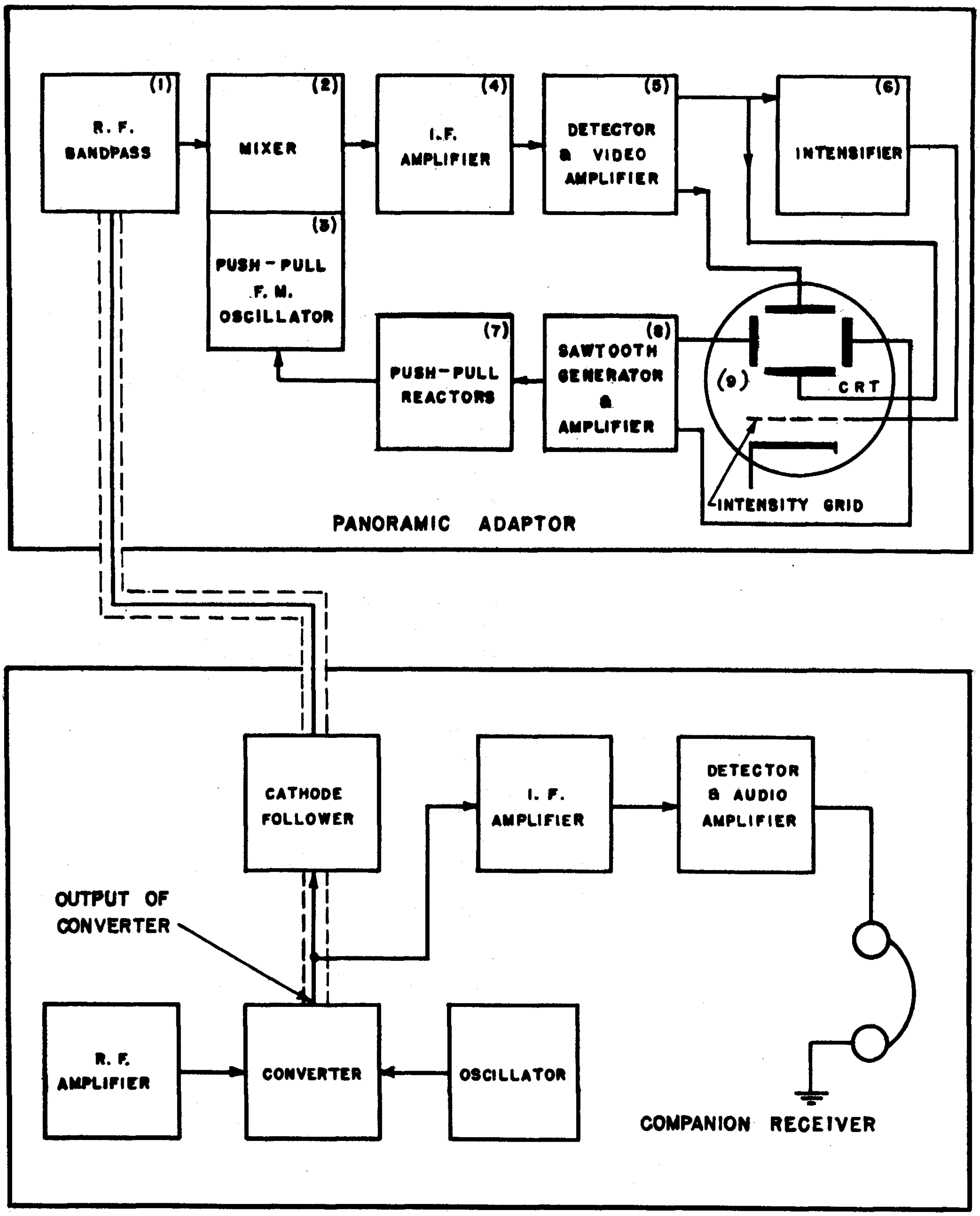


Figure 4-1. - Navy Model RDP, Block Diagram.

1. THEORY OF OPERATION .

The companion receiver must be a superheterodyne receiver having an intermediate frequency of 30mc. ±250KC. In the output of the mixer of the companion receiver there may be signals of many frequencies. The bandpass characteristics of the I.F. Amplifier section determine to a great extent which of these output signals will be amplified and subsequently heard.

The Panoramic Adaptor RDP is a complete superheterodyne receiver in itself. The input of the Adaptor is connected, through a cathode follower circuit, to the output of the mixer of the companion receiver. The frequencies which are fed to the input of the adaptor are determined, for all practical purposes, by the selectivity characteristics of the R.F. section of the companion receiver. If, merely for the sake of analysis, it is assumed that all the signals received by the companion receiver are of equal strength, then the relative strength of these signals, in the output of the mixer, will be determined by the selectivity characteristics of the R.F. section of the receiver. See Figure 4-3. From that drawing it is seen that in the output of the mixer, those frequencies near and corresponding to the I.F. of the receiver will be greater in strength than those frequencies on either side of the receiver's I.F.

The Panoramic Adaptor, on the other hand, has an input amplifying stage with a bandpass characteristic which is inverse to that of the receiver. (Figure 4-2 and Figure 4-3). That is, the input amplifier will amplify the frequencies on the fringe of the receiver's I.F., and vice-versa. Thus, when the two units are used together, the overall bandpass characteristic tends to be more or less uniform over the band for which the adaptor is designed, namely 10mc. The heavy line in Figure 4-3 illustrates the additive effects of the receiver and adaptor responses. The heavy line indicates also the approximate variation in deflection amplitude of a signal of constant strength as it moves across the adaptor screen when the receiver is tuned. "NOTE" - It is seldom that all four peaks are of equal amplitude. As the receiver is tuned to higher and higher frequencies, the side peaks will tend to increase with respect to the center peak. The reason for this is that the selectivity peak of the receiver diminishes as the frequency increases.

Therefore, due to the overall selectivity characteristics of the R.F. section of the receiver and the special input bandpass amplifier (Fig. 4-1 block (1)) of the adaptor, signal voltages within a band of 10 mc. can be fed to the mixer (Fig. 4-1, block (2)) of the adaptor. The mixer also receiver, from an FM oscillator (block (3)), a voltage which sweeps through a bandwidth of 10mc. As the oscillator sweeps through the band of 10mc., it beats progressively and periodically with one signal after another to produce an I.F. of 7.5mc. Thus, one signal after the other is periodically amplified by the I.F. Amplifiers (block (4)) which are tuned to 7.5mc.

Each signal (as an I.F.), in its own order, is subsequently rectified by the Detector (block(5)). The output voltage of the Detector is applied directly to

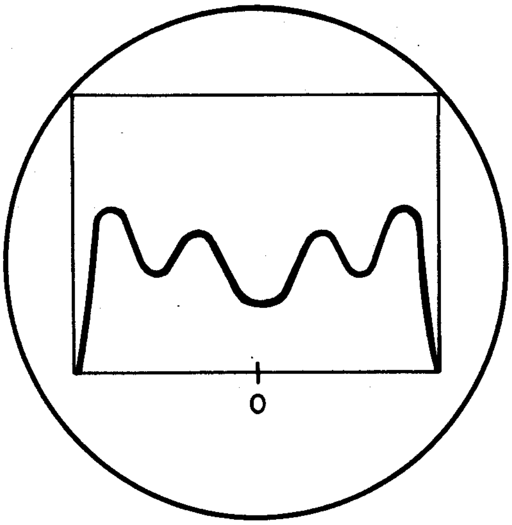


Figure 4-2. - Navy Model RDP, Bandpass Characteristics

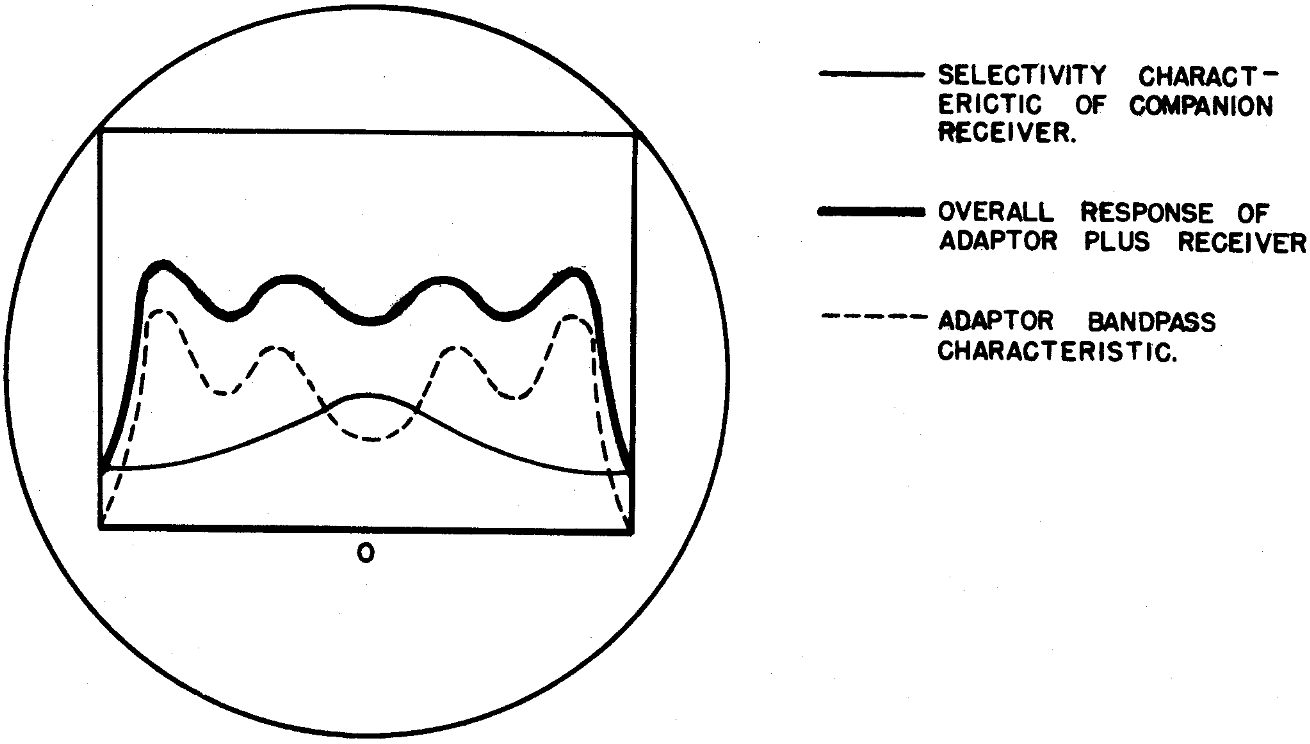


Figure 4-3. - Overall Bandpass Characteristics

The Video Amplifiers (block(5)), and the output of the Video Amplifiers is impressed on the vertical deflection plates of the cathode ray tube (block(9)). Each signal, then, produces a vertical deflection on the CRT screen.

Furthermore, each signal, according to its frequency, will produce a vertical deflection at a definite place along the horizontal axis of the CRT. The Sawtooth Generator (block(8)) produces a sawtooth voltage which is amplified and fed to the horizontal deflection plates of the cathode ray tube. This application of sawtooth voltage causes the electron beam in the CRT to bend periodically along the horizontal axis so that a horizontal trace is produced on the CRT screen. The magnitude of the instantaneous value of the sawtooth voltage determines the magnitude of instantaneous deflection of the electron beam. The sawtooth voltage is also fed to the Reactors (block(7)), which are used to vary electronically the frequency of the oscillator. The magnitude of the instantaneous value of the sawtooth voltage determines, partially, the frequency of the oscillator; and thus as the sawtooth voltage sweeps through all its instantaneous values, the oscillator sweeps through a particular bandwidth. The extent of the oscillator sweep depends upon the value of sawtooth voltage applied to the Reactors. Consequently, since both the degree of horizontal deflection of the electron beam and the oscillator frequency depend upon the same instantaneous value of sawtooth voltage, each vertical signal deflection will appear in a position along the horizontal axis of the screen according to the frequency of the signal. See Section IV, Par. 2g.

2. CIRCUIT ANALYSIS[1].

a. Bandpass Amplifying Section.- Refer to the block marked (1) in Figure 4-1 This section uses, in cascade, two JAN-6AC7 tubes, V101 and V102, which are high gain pentodes. The first stage of this two-stage section is connected to the output of the mixer of the companion receiver through a cathode follower circuit. The stage is an R.F. amplifier whose output is fed into a specially designed R.F. input transformer, T101-09, which couples the first and second stages. The primary and secondary of this transformer are tuned by distributed circuit capacitances. The coupling between the primary and secondary is such that it produces a double humped bandpass characteristic as shown in Figure 4-4. The humps appear at approximately 27.5mc. and 32.5mc.

The second stage also is a bandpass amplifier. The R.F. output transformer, T102-09, is also tuned by distributed circuit capacitances. However, this transformer is so coupled that double peaks appear at approximately 25.5mc. and 34.5mc. See Figure 4-5. The overall bandpass characteristic of this section, therefore, is a four-peak arrangement as shown in Figure 4-2. Thus, the combination of adaptor and receiver has a fairly flat response for 5mc. below and above the frequency to which the companion receiver is tuned. Each of the transformers is permeability tuned.

Condenser C101 is a DC blocking condenser which prevents DC interaction between the adaptor and the companion receiver. Resistor R101 is used to terminate the R.F. input line.

The plate and screen grid currents of V101, which flow through the cathode resistor, R102, develop cathode bias for tube V101. Condenser C102-A is an R.F. bypass condenser which filters the bias voltage developed across R102, thus preventing degeneration. R103 is a series screen dropping resistor for tube V102. Condenser C102-B is an R.F. bypass condenser which places the screen grid of V102 at R.F. ground potential. Resistor R104 and condenser C102-C constitute a decoupling filter

[1]Refer to Circuit Diagram attached to inside back cover of this instruction book.

for the plate circuit of the first stage thus preventing interstage reactions and hum modulation.

R105 is a cathode bias resistor. The plate and screen currents of V102 which flow through R105 develop bias voltage for V102. Condenser C103-A is an R.F. bypass condenser which filters the bias voltage. R106 is a series screen dropping resistor, C103-B, an R.F. bypass condenser, places the screen grid of V102 at R.F. ground potential. Thus the screen becomes an effective shield between the plate and control grid. R107 and C103-C constitute a plate decoupling filter for V102.

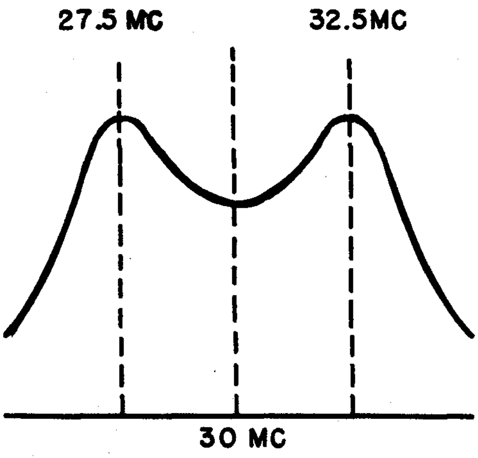


Figure 4-4. - Navy Model RDP, Bandpass Characteristic of Input Transformer.

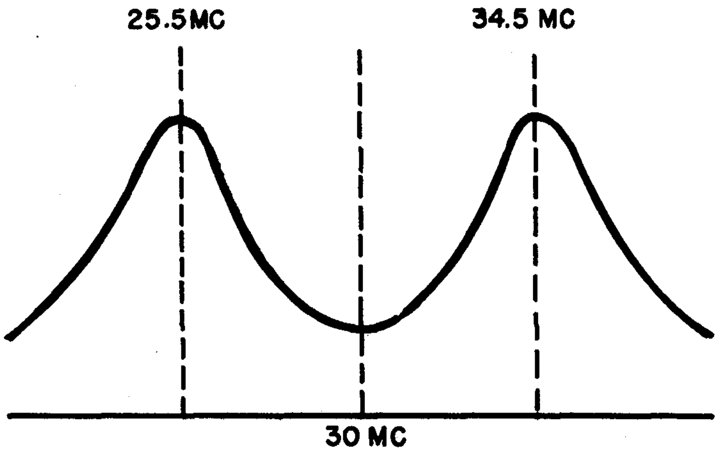


Figure 4-5. - Navy Model RDP, Bandpass Characteristic of Output Transformer.

b. Mixer Stage. - The mixer, marked block (2), is not only fed a series of signals which are within the range of the adaptor but also a signal of varying frequency, which is produced by a frequency modulated oscillator (block marked 3)). The mixer is so operated that beat frequencies are present in its plate circuit. A 6SA7 tube, V103, is used as a mixer.

R108 is the grid return and bias resistor for grid one, the injection grid, of V103. The plate and screen grid currents, which flow through R109, develop, across R109, bias voltage for grid three of V103. C104-A is an R.F. bypass condenser which smooths this bias voltage. R110 is a series screen dropping resistor for V103. C104-B is an R.F. bypass condenser which places the screen grids at R.F. ground potential. R111 and C104-C constitute a plate decoupling filter for the mixer stage.

c. FM Push-pull Oscillator. - The FM oscillator, marked block (3), is a permeability tuned push-pull type using a pair of JAN 9002 triode tubes, V109 and V110. Its frequency varies periodically by 5mc. above and below a mean frequency which is adjusted to represent the difference between the receiver's I.F. of 30mc. and the adaptor's I.F. of 7.5mc. Therefore, the oscillator mean frequency is approximately 22.5mc.

Condenser C115 couples the F.M. oscillator to the mixer stage. R139 and R140 are grid bias resistors for tubes V109 and V110, respectively. C116 and C117 are D.C. blocking condensers which keep from the control grids of V109 and V110 the B+ plate voltage. Resistor R141 is used so that the oscillator coil finds its own electrical center. The tuned circuit of the oscillator consists of the oscillator coil, Z101-09, the distributed capacities across the oscillator coil, and the inductance of the reactor circuit.

d. Reactor.- The block marked (7) is the reactor. The reactor stages, which use a pair of 6AC7 tubes, V112 and V111. form a part of the tuned circuit of the oscillator, and they vary the frequency of the oscillator in step with an amplified sawtooth voltage. The sawtooth voltage is applied to the control grids of the two reactor tubes. "NOTE" - The development of the sawtooth voltage will be treated under the B.T.O. oscillator.

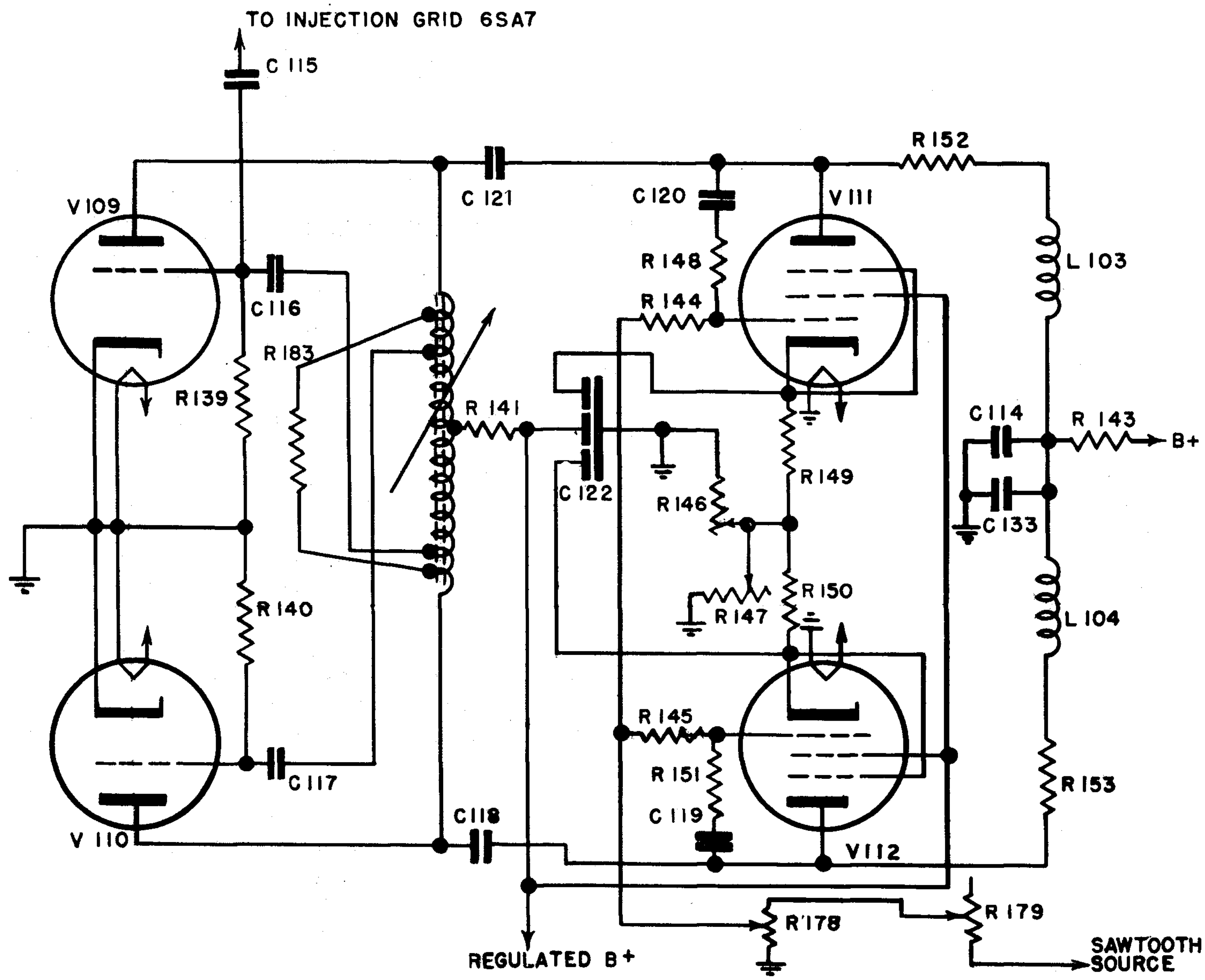


Figure 4-6. - Navy Model RDP, Circuit Diagram of Push-pull Oscillator and Reactor.

The schematic of the reactor and oscillator circuits, which are shown in Figure 4-6, can be represented by the block diagram in Figure 4-7.

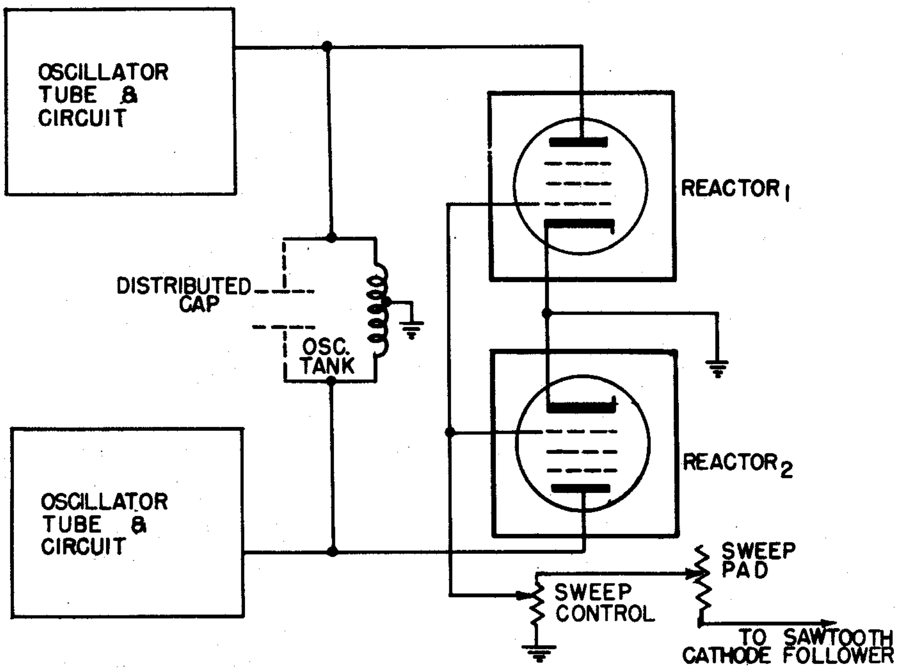
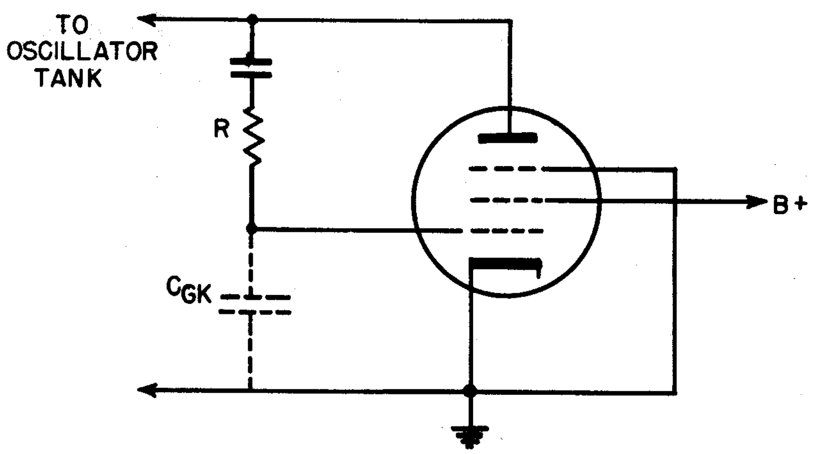


Figure 4-7. - Navy Model RDP, Block Diagram of Push-pull Oscillator and Reactor.

Thus it can be seen that the two reactors are so connected that effectively they are in series; and this series circuit, in turn, is in parallel with the oscillator tank.

A rigorous analysis of either reactor circuit would reveal that due to a phase shift in the reactor tube and in the phasing network between the plate and cathode of the tube, the reactor acts inductively. Figure 4-8 shows a simplified equivalent circuit of either reactors one or two.



(1) R is R148 or R151 in Fig. 4-6

(2) R and Cgk make up the phasing network

Figure 4-8. - Simplified Equivalent Circuit of Reactor.

The approximate value of this inductance may be calculated from the simplified formula below. The derivation of this formula is rather intricate and it is beyond the scope of this instruction book.

$$L = \frac{RCgk}{Gm}$$

where R = ohms
C = μμfd
L = μh
Gm = μmhos

Gm is a tube constant whose value may be changed by varying the voltage between the control grid and cathode. However, from the formula it may be seen that any variation of Gm affects the value of L. Therefore, any change of grid bias will affect the inductive value of the reactor. Hence, in Figure 4-6, R146 and R147, the CENTER FREQ control and the CENTER FREQ. PAD respectively, are used to vary the bias or operating points of the reactor tubes, thus affecting the average inductance of the oscillator tank and, consequently, the oscillator mean frequency. Adjustment of R178 and R179, the SWEEP control and SWEEP PAD respectively, determines the amplitude of the sawtooth voltage applied between the control grids and cathodes of the two reactor tubes and consequently the magnitude of the swing in inductance of the reactor. The magnitude of this inductance swing, in turn, determines the magnitude of the oscillator swing.

When the SWEEP control is set at Zero, the sawtooth voltage applied to the control grids of the reactor tube is Zero. The reactor tubes will no longer vary in inductance, and, therefore, the oscillator will operate only at its mean frequency. "NOTE" - The SWEEP PAD and CENTER FREQ PAD are semi-adjustable controls that should be set by experienced personnel only.

It may be seen then that actually the reactors are variable inductances, in series, connected across the oscillator tank as shown in Figure 4-9.

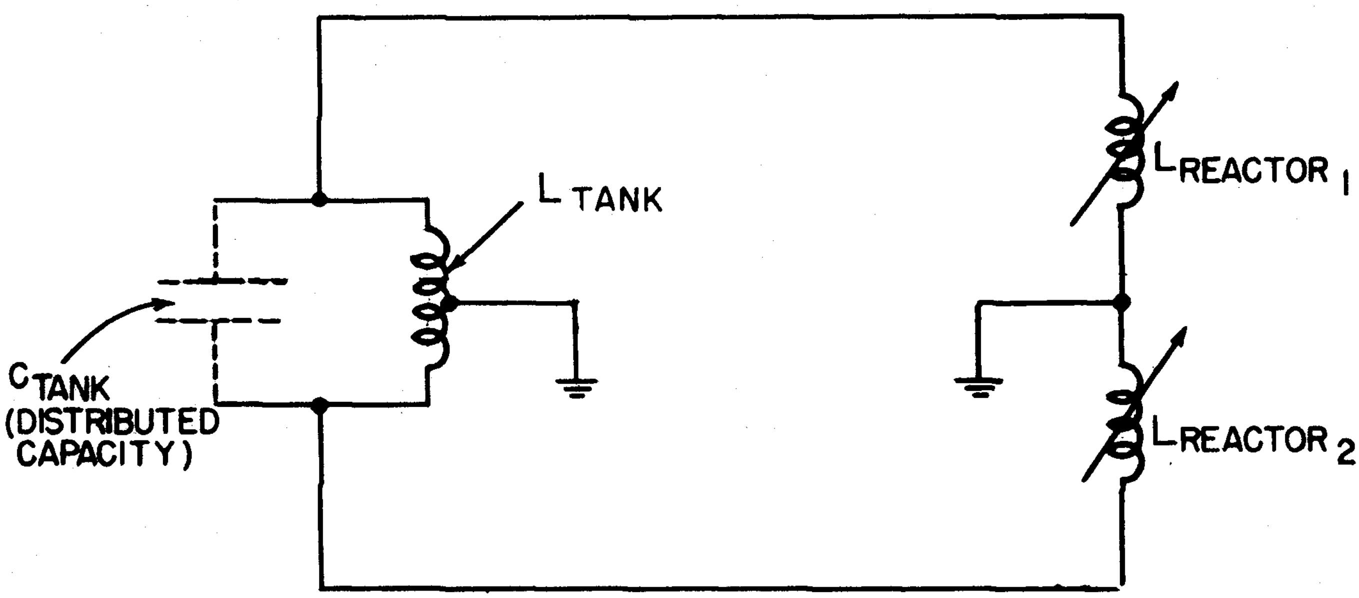


Figure 4-9. - Equivalent Circuit of Reactor and Oscillator Tank.

The two reactors are used effectively in series so that an oscillator swing up to 10mc. is obtained. The oscillator and reactor circuits are highly critical. Therefore, they are shielded.

Function of Parts:

C118, C119, C120, C121	- D.C. Blocking Condenser
C114, C133	- Plate Bypass Condenser
C122	- Cathode Bypass Condenser and R.F. Bypass Condenser
R148, R151	- Phasing Network Resistors
R149, R150	- Bias Resistors
R146, R147	- Center Frequency Network
R152, R153, L103, L104	- High Impedance Shunt Feed for B+
R143	- Decoupling Resistor
R144, R145	- Isolating Resistors to Prevent Interaction between Reactor and Sawtooth Amplifier
R178, R179	- Sweep Controls
R183	- Oscillator Loading Resistor

It must be borne in mind that as the oscillator frequency changes, different signals that are passed by the bandpass amplifier periodically beat one after the other, with the oscillator frequency to produce an I.F. of 7.5mc. (See Section IV, Par. 2j).

e. I.F. Amplifier Section. The block marked (4) is the I.F. Amplifier which is composed of two stages. The overall response of this amplifier is such that it has a fairly flat top. The first stage uses a 6SG7 tube, V104, and the second stage uses a 6AC7 tube, V105.

The first stage is coupled to the plate of the mixer by means of the permeability tuned transformer, Z102-09, which is tuned to approximately 7.5mc.

A GAIN control, variable resistor R114, is present in this stage. The total grid bias on V104 consists of the minimum bias developed across R112 and the voltage developed across R114. Now, the voltage across R114 is dependent upon several currents which flow through it. First, there is the bleeder current through R114, R112, R113, R117 and R118. Second, there is another bleeder current through R114, R115 and R116. Finally, there are the plate and screen currents of V104 which flow through R114. As R114 is changed in value, the voltage drop across it is varied, and thus the total grid bias is altered. Since V104 is a semi-remote cutoff type of tube, a change in grid bias affects the sensitivity of the stage. Condenser C105A is used to filter the total bias voltage.

The screen bleeder network R113 and R117 furnishes the proper operating potential for the screen grid of V104. C105-B is used to place this grid at R.F. ground potential. R118 and C105-C act as the plate decoupling filter for V104.

The first and second stages are coupled by the transformer Z103-09, which is permeability tuned to approximately 7.5mc. The second stage is a straight I.F. amplifier. It is coupled to the next stage, the detector, by Z104-09, another permeability tuned transformer.

R119 is a cathode resistor across which is developed, due mainly to plate and screen currents, the bias voltage for V105. C106-A and C131, an auxiliary condenser, smooth the bias voltage to prevent degeneration. By means of the resistor network R120 and R121, the proper operating potential for the screen grid is obtained. C106-B is used to place the screen grid at R.F. ground potential. R122 and C106-C are used as a plate decoupling filter to prevent interaction between stages.

f. Detector Stage.- The block marked (5) contains the detector stage. The detector stage uses a half section, (A), of a 6SN7GT twin-triode tube, V106, while the other half section (B) is left unused. However, the plate and control grid of the used half section are tied together so that the tube operates as a diode.

When a signal voltage which appears across the secondary of Z104-09, is applied between the plate and cathode of the diode, it is rectified. The rectified voltage appears across R123, the diode load resistor.

C107 is an R.F. bypass condenser which offers a low impedance path, around R123, for R.F. Thus a maximum R.F. voltage is made to appear between the plate and cathode of the diode and hence a maximum rectified voltage appears across R123.

The detector stage is directly coupled to the next section, a video amplifier. The elimination of a coupling capacitor by the use of direct coupling prevents loss of gain at low modulation frequencies.

g. Video Amplifier.- The Video Amplifier is also contained in the block marked (5). This amplifier is essentially a push-pull circuit using a 6SN7GT, V107, which is a twin triode tube.

The output voltage of the detector is fed directly to and amplified by the half section (A) of the twin triode tube. This amplified voltage is fed directly to one of the vertical deflection plates of the cathode ray tube. Also, a portion of the amplified voltage, (an amount approximately equal to the voltage taken from the detector circuit), is directly coupled to the grid of the half section (B) of the twin triode tube.

A 180^{o} phase shift will take place in the tube of this half section, and therefore, its output voltage will be 180^{o} out of phase with the output voltage of the (A) half section. The half section (B) of the twin triode, then, actually, is a phase inverter whose output is coupled to the remaining vertical deflection plate of the cathode ray tube. By this arrangement one vertical deflection plate is driven positive while the other vertical deflection plate is driven relatively negative. The magnitude of the voltage applied to the vertical deflection plates govern the amplitude of the vertical deflection of the trace on the adaptor screen. R124 serves as the VERT(ical) POS(ition) control which determines the vertical position of the baseline. If equal and similar potentials are applied to the vertical deflection plates, the baseline will appear across the center of the face of the C.R.T. Should the potentials be unequal, the baseline will be deflected toward the more positive vertical deflection plate. Thus, by varying the relative DC potentials on the vertical deflection plates, the position of the baseline is shifted. This may be accomplished by changing the potential on one vertical deflection plate.

Now R124, R125 and R127 make up a bleeder network across the low voltage B supply. Any variation in the value of R124 affects the voltage across R127, and this voltage acts as grid bias for the (B) section of the video amplifier tube. Any change of this bias affects the plate current of the (B) section. However, any change of plate current affects the voltage drop across R132. As this voltage drop across R132 increases, the plate voltage of the (B) section decreases and vice-versa. Now the plate of the (B) section is directly coupled to one of the vertical deflection plates. Therefore, any change of plate voltage of the (B) section affects one deflection plate. Thus, the voltage between the two vertical deflection plates can be varied and the vertical position of the baseline shifted.

h. Intensifier Circuit.- The Intensifier circuit, block marked (6), uses a 6AC7 tube, V108. By means of the voltage divider network R133 and R135, a portion of the output voltage of the phase inverter stage of the video amplifier is fed through C108 to the grid of the intensifier tube. The output voltage of the intensifier tube is fed, in proper phase, to the intensity grid of the cathode ray tube. The magnitude of the voltage fed from the intensifier tube to the intensity grid is readily varied by adjusting the potentiometer, R138, which is the INTENSIFIER control.

The intensifier tube will be excited by pulse signals, among others. As a result, the potential on the intensity grid of the C.R.T. will be so changed with each pulse that the electron stream is intensified as each pulse comes through. If the bias on the intensity grid is increased, by turning down the BRILLIANCE control, the baseline fades out. However, the pulse voltages from the intensifier tube will overcome this bias. Thus a trace will be produced on the C.R.T. screen only when pulses come through. Normally, when pulse signals are not received, the INTENSIFIER control is adjusted so that no intensifier voltage is applied to the intensity grid.

R136 is a cathode bias resistor. C109-A is a bypass condenser which smoothes the bias developed across R136. R137 is a series screen dropping resistor. C109-B places the screen at ground potential. Resistor R182 and condenser C132 constitute a decoupling filter which prevents oscillation of the INTENSIFIER stage. C110 is a D.C. blocking condenser which prevents interaction between the high voltage and low voltage supplies.

i. Sweep Voltage Generator.- The block marked (8) contains the sawtooth generator. The (A) half of V114, a 6SN7GT tube, is used for the sawtooth voltage generator which is of the B.T.O. (blocking tube oscillator) type.

The circuit is capable of generating a sawtooth voltage of any frequency between 20 and 40 cycles. A certain amount of alternating voltage is fed to the control grid of the oscillator tube from a filament winding, which supplies the heater voltage of the oscillator tube, in order to "lock" the sweep frequency to a submultiple of the line frequency. If the line frequency is 60 cycles, the sweep frequency is locked at 30 cycles. The submultiple is usually half the line frequency.

The operation of the blocking tube oscillator may be understood upon analysis of the B.T.O. schematic in Figure 4-10.

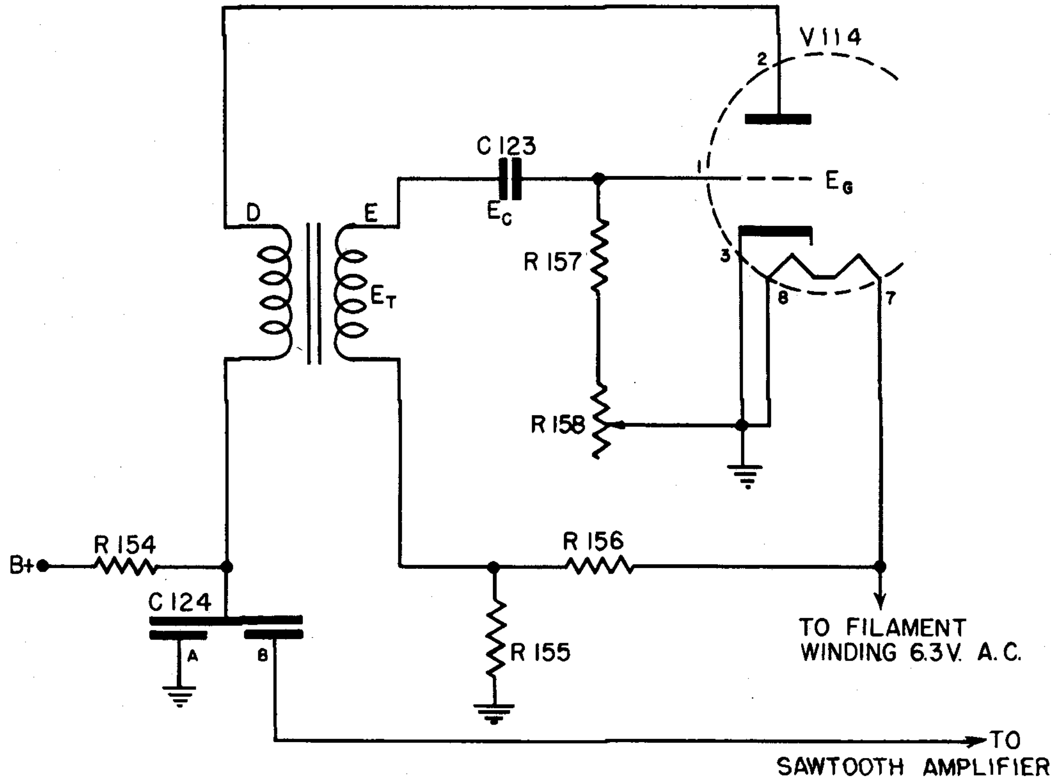


Figure 4-10. - Navy Model RDP, Circuit Diagram of B.T.O.

To analyze the operation of the BTO several voltages should be examined. First, if R155 is ignored due to its small value of resistance, the voltage between the grid and cathode of V114, Eg, will be approximately the vector difference between the voltage across C123, Ec, and the voltage across the transformer winding E, E_T. Second, the waveform of the voltage across C124-A is dependent primarily upon the rate of charge and discharge of C124-A.

Merely for the ease of analysis, it is assumed that when the adaptor is turned on, the low voltage power supply furnishes its output voltage before V114, in Figure 4-10, can conduct. (If the opposite condition were considered, the ultimate analysis would not be different from the one to be followed). Now before V114 can conduct, the low voltage supply, through the large resistor R154, slowly charges up condenser C124-A from point 1 to point 2, as shown in Figure 4-11. But the voltage across C124-A is applied between the plate and cathode of V114, and by the time C124-A is charged up to point 2, V114 can conduct. Therefore, C124-A discharges through V114 and winding D of the transformer. The rate of discharge of C124-A is far more rapid than the rate of charge since the discharge path offers a lower impedance than the charging path, R154.

As a result of this surge of plate current (actually the discharge current of C124-A), a voltage, E_T is developed, by transformer action, across winding E. The polarity of E_T is such that the grid is driven positive with respect to cathode. The positive grid draws current which charges up C123. Thus, at the grid side of the condenser, C123, becomes negative with respect to the other side of the condenser. Furthermore, C123 will charge up to a voltage somewhat smaller than the voltage across winding E since the tube acts almost as a short for grid current.

But as the grid goes in a positive direction with respect to cathode, the plate current rises more and more rapidly until a point is reached where the transconductance of the tube effectively falls off. At that point the rate of increase of plate current falls off rapidly. Consequently, the voltage, E_T, falls off rapidly since the magnitude of E_T is dependent upon the rate of change of plate current.

However, this decrease of E_T allows condenser C123 to discharge through R157 and R158. As C123 discharges, the voltage E_c across C123 decreases. E_c decreases SLOWLY since the charge on C123 must leak off through the high resistance network R157 and R158. It is seen, then, that if E_T, which originally was greater than E_c, drops rapidly while E_c drops slowly, E_T will eventually equal E_c. Furthermore, E_T subsequently will fall rapidly to Zero while E_c will merely diminish slowly in magnitude.

Now, the voltage between grid and cathode, Eg, is the vector difference between E_T and E_c, and when E_T equals E_c, Eg equals Zero. But as E_T rapidly becomes less than E_c, Eg becomes greater than Zero and Eg is such that the grid becomes negative with respect to the cathode. This is so since the grid side of C123 was charged negative with respect to the opposite side of C123. Finally, E_T will fall to such a value that Eg is sufficiently negative to cut off plate current (the discharge current of C124-A).

This whole process is so rapid and plate current flows for so short a time, that C124-A discharges only to point 3 in Figure 4-11. However, Eg goes far beyond the cut-off point, for E_T, finally, falls to Zero and hence Eg equals E_c. That is, the full voltage E_c is applied between grid and cathode of V114. Plate current will not flow until Eg returns in a positive direction to and beyond the cut-off point. Eg will reach this value only when C123 has leaked off sufficiently.

In the meantime, however, while the grid blocks the tube, condenser C124-A once again charges up slowly to point 4, at which time Eg is of such value as to allow C124-A to discharge through V114. Thus the whole process or cycle is repeated again and again producing a sawtooth voltage across C124-A as shown in Figure 4-11.

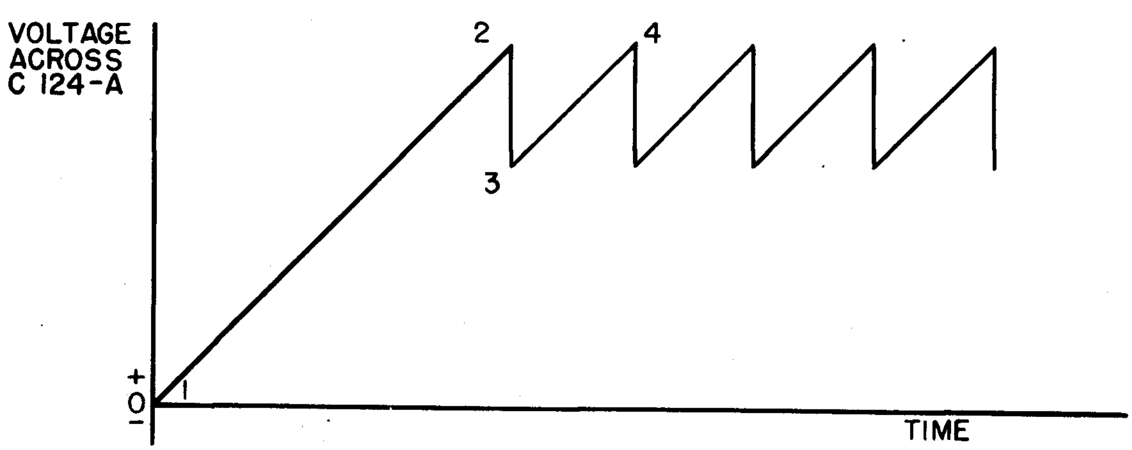


Figure 4-11. - Generation of a Sawtooth Voltage.

The time constant of the combination C123 and the bias resistors, mainly, determines how long the tube is blocked, and hence it determines the frequency of the sawtooth voltage.

The size of R154, mainly, determines the amplitude of the sawtooth voltage (if C124-A is kept the same size). As R154 is decreased in size, C124-A will charge up to a greater voltage in a given time thereby increasing the amplitude of the sawtooth voltage. It is also true that the peak plate voltage will rise as R154 is decreased and one might expect that the frequency of the oscillator should be affected materially. However, it must be borne in mind that the grid rather than the plate has greater control over plate current.

The AC voltage developed across R155 is used to "lock" the oscillator to a submultiple usually half of the line frequency. The SYNCH control, R158, is used toward this end also since an adjustment of this potentiometer affects the time constant of the grid resistor condenser combination.

j. Sawtooth Voltage Amplifier. - The block marked (8) also contains the Sawtooth Voltage Amplifier which is used to drive the horizontal deflection plates of the cathode ray tube and to supply, through a cathode follower circuit, the sawtooth voltage for the reactor circuit. The amplifier, essentially, is made up of two stages in push-pull.

The output of the sawtooth generator, the (A) half of V114, is fed through a coupling capacitor, C124, to a potentiometer, R160. The movable arm of the potentiometer, in turn, is connected to the control grid of the (B) section of V114. This half section of V114 amplifies the sawtooth voltage and the output of this amplifier is fed to three different circuits.

First, it is coupled directly to one of the horizontal deflection plates of the cathode ray tube.

Second, it is capacitively coupled, through an attenuation network, to the grid of the second stage of the amplifier so that the output voltages of the first and second stages are approximately equal. However, a 180° phase shift will take place in the tube of the second stage, and therefore its output voltage will be 180° out of phase with the output voltage of the first stage. The second stage, then, is actually a phase inverter whose output is coupled directly to the remaining horizontal deflection plate. Thus one horizontal deflection plate is driven positive while the other horizontal deflection plate is driven relatively negative, and vice-versa.

Potentiometer, R180, serves as the HOR(izontal) POS(ition) control. R180, R165 and R164 constitute a bleeder network across the low voltage B supply. Any variation in the value of R180 affects the voltage across R164. This voltage is used as bias for the (A) section of V115 and any change of this bias voltage affects the plate current of this half of the tube. Consequently, the voltage across R168 is affected and the plate voltage on V115 (A) is subsequently changed. However, this plate voltage is applied directly to one of the horizontal deflection plate of the C.R.T.

Now the horizontal position of the baseline is governed by the relative potential difference between the horizontal deflection plates. The baseline will be shifted toward the more positive horizontal deflection plate. By varying the potential on one plate, the potential difference between the horizontal deflection plates is varied and thus the baseline is shifted in a horizontal direction.

The potentiometer, R160, is used to vary the magnitude of the sawtooth voltage applied to the grid of the first stage of the amplifier. However, the output of the first stage is coupled to the grid of the second stage. Hence, any variation of R160 affects the magnitude of the output voltages of both stages, and these output voltages are applied to the horizontal deflection plates. The magnitude of the voltage applied to these plates determines the degree of horizontal deflection of the electron beam. Therefore, adjustment of R160 affects the horizontal size or the baseline size. R160 is the LINE SIZE semi-adjustable control.

Third, it is coupled capacitively through an attenuation network to the grid of a cathode follower circuit which uses the remaining half section of V115. V115 is a 6SN7GT tube. The output of the cathode follower is capacitively coupled, by C126, to the SWEEP PAD.

It must be borne in mind that both the reactor and the horizontal deflection plates of the cathode ray tube are affected simultaneously by the sawtooth voltage. Therefore, for a given instantaneous value of sawtooth voltage the horizontal deflection of the electron beam will be of a definite magnitude and the FM oscillator will produce a particular frequency. See Section IV, Par. 2d. Only one R.F. input frequency, excluding images, can beat with this particular oscillator frequency to produce an I.F. of 7.5mc. which ultimately affects the vertical deflection plates. Hence, for this one input frequency the electron beam will strike the face of the cathode ray tube above a particular position on the baseline. For a different given instantaneous value of sawtooth voltage, there will be a different oscillator frequency, hence a different signal frequency to produce an I.F. of 7.5mc. and a different magnitude of horizontal deflection, and hence a different position on the baseline for this signal frequency.

Although each signal actually appears on the screen at a different time, due to retentivity of vision, persistence of the screen, and the rapidity with which the signal deflections appear, all the signals on the screen seem to appear simultaneously.

k. <u>The Cathode Ray Tube.</u> - The block marked (9) represents the cathode ray tube V116 (5CP1). Basically, the tube consists of the following elements contained within an evacuated glass envelope:

(1) An indirectly heated cathode for emitting electrons.

(2) Immediately beyond the cathode there is a grid, which is composed of a metal sleeve with a metal disc at one end. The disc itself has a small aperture which concentrates the electrons, from the cathode, into a narrow beam. The grid is operated at a negative potential with respect to cathode. The magnitude of this potential determines the intensity or concentration of the electron

beam, which strikes a fluorescent screen on the face of the tube. Hence, it controls the brilliance of the trace on the cathode ray screen. The potentiometer R177 serves as a bias control which governs the intensity of the electron beam. R177 is part of the high voltage bleeder network which is composed of R173, R174, R175 and R177, and as R177 is varied, the voltage across it is altered. Thus, R177 is used as a BRILLIANCE control.

(3) The first anode follows the grid. It is operated at a potential which is fairly positive with respect to cathode, and hence it accelerates the electrons which pass through the grid aperture. The first anode is constructed somewhat similar to the grid, that is, it is made up of a metal sleeve with discs which have a small aperture. The first anode forms the electron stream into a beam. Beyond the first anode, the electron stream comes under the influence of a second anode which further accelerates the electron stream.

(4) The second anode operates at a potential which is highly positive with respect to the first anode and consequently a field exists between the first and second anodes. This field acts very much like a lens which can be used to focus the electron beam. By securing the proper ratio of potentials between the first and second anodes, the beam will be so focused that a clear, sharp trace can be produced on the screen of the tube. Potentiometer R174, which is part of the high voltage bleeder network, is used to secure the proper ratio of potentials by controlling the potential on the first anode. Hence, it is called the FOCUS control. The cathode, grid, first anode, and second anode make up the electron gun.

(5) Along the path of the electron beam there are two sets of parallel plates, one set being perpendicular to the other. When there is a difference of potential between the plates of one of the sets, the electron beam bends in a horizontal direction and hence this set is called the horizontal deflection plates. On the other hand the application of a difference of potential upon the remaining set of plates produces a vertical deflection of the electron beam. Therefore this set of plates is called the vertical deflection plates.

Now where the electron beam strikes the viewing end of the cathode ray tube a dot of light is produced. The exact position of the dot of light in both the horizontal or vertical planes can be controlled by adjusting the magnitude of the difference of potential applied to both sets of plates. In the adaptor, adjustment of the HOR. POS. and VERT. POS. controls affects the respective positions of the dot of light by altering the magnitude of D.C. positioning voltages applied to the deflection plates.

In addition to the positioning voltage, a sawtooth voltage is fed to the horizontal deflection plates and this sawtooth voltage causes the electron beam to shift back and forth along the horizontal axis. As a result of this sweeping action a horizontal line of light is produced on the cathode ray tube screen.

If now a varying voltage is applied to the vertical deflection plates, the electron beam is influenced by both a varying horizontal voltage (the sawtooth voltage) and a varying vertical voltage. Consequently, the resultant trace on the screen becomes two dimensional.

(6) The viewing end of the cathode ray tube is coated with a fluorescent material which emits light when it is energized as the electron beam impinges upon it. This material has the property of persistence, that is, it will continue to emit light for a short period of time, even after the electron beam no longer strikes it. It is possible to burn out the screen by setting the BRILLIANCE control for excessive brightness. Therefore, it is advisable to set this control for the minimum brilliance practicable.

(7) Around the inner portion of the glass envelope, near the face of the tube, there is a ring which is used to collect the electrons which strike the screen. The ring operates at the same potential as the second anode.

1. The Power Supply.- The power supply is composed of a high voltage D.C. section and a low voltage D.C. section. The power transformers of both sections provide all the heater voltages. The high voltage D.C. section, which uses a 2x2 half wave rectifier, V119, supplies the anode and grid voltages of the cathode ray tube. Since the current drain on this section is relatively small, a resistance capacity filter is used to smooth the output voltage of the rectifier.

The low voltage D.C. section, which uses two 6x5 tubes, V117 and V118, furnishes the necessary D.C. potentials for the rest of the adaptor. The two plates of each 6x5 tube are tied together externally so that the tube is converted to a single diode. Each tube is connected to opposite ends of the high voltage winding of the low voltage transformer. Thus, although the 6x5 tubes are converted into single diodes, they are so connected in the circuit that full wave rectification is accomplished. Part of the output voltage of the low voltage section is regulated by a VR150/30 tube, V113. The regulated output supplies a number of critical circuits, namely the plates of the oscillators, V109 and V110, and the screens of the reactors, V111 and V112.

A line filter is connected to the primaries of the power transformers to to prevent radiation of energy from the adaptor through the power line. The line filter also prevents disturbances on the line from entering the adaptor.

SECTION V - MAINTENANCE

1. SAFETY NOTICE.

"CAUTION" - OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE. OPERATING PERSONNEL MUST AT ALL TIMES OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE TUBES OR MAKE ADJUSTMENTS INSIDE EQUIPMENT WITH HIGH VOLTAGE ON. UNDER CERTAIN CONDITIONS DANGEROUS POTENTIALS MAY EXIST IN CIRCUITS WITH POWER CONTROLS IN THE OFF POSITION. DUE TO CHARGES RETAINED BY CAPACITORS, ETC. TO AVOID CASUALTIES ALWAYS REMOVE POWER, DISCHARGE AND GROUND CIRCUITS PRIOR TO TOUCHING THEM.

2. EQUIPMENT FOR SERVICING.

a. Signal generator - range 5mc. to 40mc.

b. Voltohmmeter (1000 ohms per volt minimum) 0-3000V DC, 0-2500V AC

c. An oscilloscope is optional, but it will be needed if it is desired to examine any waveforms.

3. ALIGNMENT PROCEDURE.

Allow the equipment to warm up for half an hour. If the Panoramic Adaptor is used with a receiver whose local oscillator is higher in frequency than the resonance frequency of the receiver's input circuit, the right side[1] of the adaptor screen indicates high frequency and the left side[1] low frequency. If the local oscillator of the receiver is lower in frequency than the input circuit, right means low frequency and left means high frequency. The same reversal of sign is also applicable when signals are fed directly from a signal generator into the adaptor. The following adjustments are made with a signal generator of 5mc. to 40mc.

a. General Instructions.- Transformers T101-09, T102-09, Z102-09, Z103-09 and Z104-09 are tuned by means of movable powdered iron cores. All coils but Z101-09 have windings marked either "T" or "B". The "T" windings can be tuned at the top of the coil by means of the tuning tool which is provided with the equipment. Use the end of the rod which has the short metal pin. Windings "B" can be tuned either from the bottom or top of the transformer by using the screwdriver tip at the other end of the tuning rod. When windings "B" are tuned from the top, push open the dust cover and insert the screwdriver end of the tool through the opening in the top of the shield can. The screwdriver tip will fit into the slot of the iron slug which tunes windings "B". Z101-09 is a coil wound on a polystyrene form under the chassis and it has only one movable core which is adjusted with the pin end of the aligning tool.

"NOTE" - Read Section V, Par. 7 before making any adjustments.

[1]In the alignment procedure the right side will be considered as + and the left side as -.

b. I.F. Amplifier Alignment Procedure.

Sig. Gen. Output	Signal Freq.	SWEEP Control	GAIN Control	Signal Fed to	Procedure
(1) audio modulated 30%	7.5mc.		maximum	pin #4 V105	Step 1. Using the screwdriver tip of the tuning tool through the top of the transformer, Z104-09, rotate the bottom core in a clockwise direction until it is well down in the coil. The core screw will then protrude 7/8" under the bottom of the chassis. Step 2. Adjust the position of the top core until maximum deflection of the signal is seen on the screen. Step 3. Retract the bottom core and adjust for maximum deflection on the screen.
(2) audio modulated 30%	7.5mc.		maximum	pin #4 V104	Adjust transformer Z103-09 by following the procedure above. It may be necessary to reduce the output voltage of the signal generator to keep the entire trace on the screen.
(3) audio modulated 30%			maximum	pin #8 V103	Adjust transformer Z102-09 by following the procedure above.
(4) no modulation. Adjust output to produce a deflection about three divisions in amplitude	30mc.	maximum	maximum	input connector of the adaptor	Trim the frequency of the signal generator to center the signal of the screen. Reduce the Sweepwidth (SWEEP) of the adaptor until the deflection basewidth is 1/2 inch. Trim the bottom "B" core of Z104-09 so that the deflection approximates a flat top response. Slowly reduce the gain of the adaptor and simultaneously increase the output of the generator so that the screen trace is always of about the same amplitude. Continue this adjustment until the maximum output of the generator is used. If the trace does not change essentially (no pronounced double peaks), no further adjustment is necessary. If double peaks appear, adjust the top core of Z102-09 slightly to eliminate them.

The first three steps are performed to peak all three I.F. transformers. The last step is performed to avoid either double peak response curves or too narrow a bandpass.

c. F.M. Oscillator Alignment.

Adjustment For	Sig. Gen. Output and Freq.	SWEEP control	CENTER FREQ. Control	Signal Fed to	Procedure
(1) CENTER FREQUENCY	30mc. unmodulated	maximum	At panel marker	INPUT Connector of the adaptor	Adjust the Zero on Z101-09 to center the deflection on the screen approximately. As a last resort only, it may be necessary to adjust the CENTER FREQ. PAD to center the deflection on the screen. Some adjustment of the SWEEP PAD may be necessary. Gradually rotate the SWEEP control counter-clockwise toward its minimum position and simultaneously readjust the Zero control for a centered deflection. The adaptor is properly adjusted for center frequency when a symmetrically centered curve appears on the screen while the SWEEP control is near its minimum position. See Figure 5-1. Return the SWEEP control to maximum. If the deflection does not remain centered, adjust the HOR. POS. control to center the deflection.
(2) HIGH FREQUENCY	35mc. unmodulated	maximum	same as (1).	same as (1)	Adjust the CENTER FREQ PAD until the deflection appears on the screen at -5mc. Some adjustment of the SWEEP PAD may be necessary. Repeat the CENTER FREQUENCY procedure (1) above.
(3) LOW FREQUENCY	25mc. unmodulated	maximum	same as (1).	same as (1).	Adjust the SWEEP PAD until the deflection appears at +5mc.
(4) OVERALL REPETITION OF CENTER FREQUENCY ALIGNMENT	According to the particular procedure to be followed	maximum	same as (1).	same as (1).	Repeat the procedures above in the following order: Center Freq. Alignment (1), High Freq. Alignment (2), Center Freq. (1), High Freq. (2), Low Freq. (3), finally, Center Freq. (1)

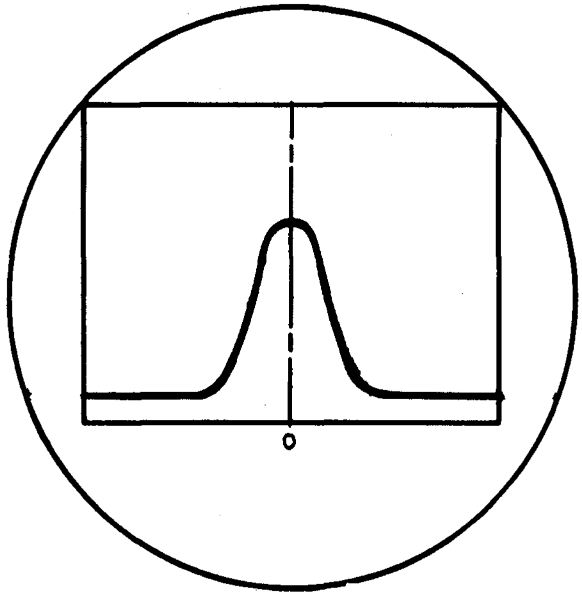


Figure 5-1. - Symmetrically Centered Curve

All the adjustments above are a series of approximations which are generally narrowed down until the desired results are obtained.

d. R.F. Alignment.

For this alignment, an approximation method is employed. Figure 2-1 illustrates an idealized bandpass characteristic. It is possible to align the R.F. amplifier stage using only a signal generator. In order to obtain the trace in Figure 2-1, the frequency of the signal generator is varied so that the peak of the deflection on the screen moves from one end to the other to produce this trace. See Section II, Par. 2b (7).

"NOTE" - Tests of Panoramic Equipment have definitely indicated that, with regard to R.F. Alignment, it is more important to establish the peaks at the correct positions above the calibrated baseline than it is to strive for equal amplitudes of corresponding peaks on each side of the center. Therefore, if alignment difficulties are encountered, stress peak locations. Do not forget that the amplitudes of the 2.5mc. peaks will be less than the amplitudes of the 4.5mc. peaks.

Transformer Aligned	Sig. Gen. Output & Freq.	SWEEP Control	Signal Fed to	Procedure
T102-09	30mc. un-modulated	maximum	Plate Pin 8 of V102 thru a .01 mfd condenser	Adjust the secondary, "T", for peak deflection at the center of the screen.
	34.5mc. un-modulated	maximum	Grid pin 4 of V102	Adjust the primary "B" for peak deflection at the minus side of the screen.

Transformer Aligned	Sig. Gen. Output & Freq.	SWEEP Control	Signal Fed to	Procedure
				This peak should appear approximately above the marker indicating -4.5 divisions on the calibrated screen.
	25.5mc. un-modulated	maximum	Grid pin 4 of V102	A peak should appear +4.5 on the calibrated screen and its amplitude should approximate the amplitude of the peak which appeared at -4.5.
T101-09	30mc. un-modulated	maximum	Plate pin 8 of V101 thru a .01 mfd. condenser	Adjust the primary "T" for peak deflection at the center of the screen.
	32.5mc. un-modulated	maximum	Input cable of the adaptor.	Adjust the primary "B" for peak deflection at the -2.5 division from the center. This peak probably will not be as high as the peak which appeared at -4.5 when T102-09 was adjusted.
	27.5mc. un-modulated	maximum	Input cable of the	A peak should appear above +2.5 on the calibrated screen. The amplitude of this peak should approximate the amplitude of the peak which appeared at -2.5.
T101-09 T102-09	None	maximum	Cable (noise pick-up)	Set the GAIN control sufficiently high so that the noise deflections indicate the R.F. response of the adaptor. If necessary, tune the primaries "B" of T101-09 and T102-09 so that the peaks are so positioned that the response is either similar to that shown in Figure 4-2 or as flat as possible.

4. POSSIBLE OPERATION FAILURES AND THEIR LOCATION.

The servicing procedure generally applied to the repair of other types of radio equipment, such as receivers, applies in general to the repair of the Panoramic Adaptor.

The regular routine procedure for repair work may follow such lines as indicated below.

a. Perform a visual check on the adaptor unit. Look for damaged resistors, broken components and possible broken wires or insulation. Make all proper replacements if any are necessary.

b. Check all tubes to see whether they are in their proper sockets. Check the quality of all tubes. Replace tubes of doubtful condition.

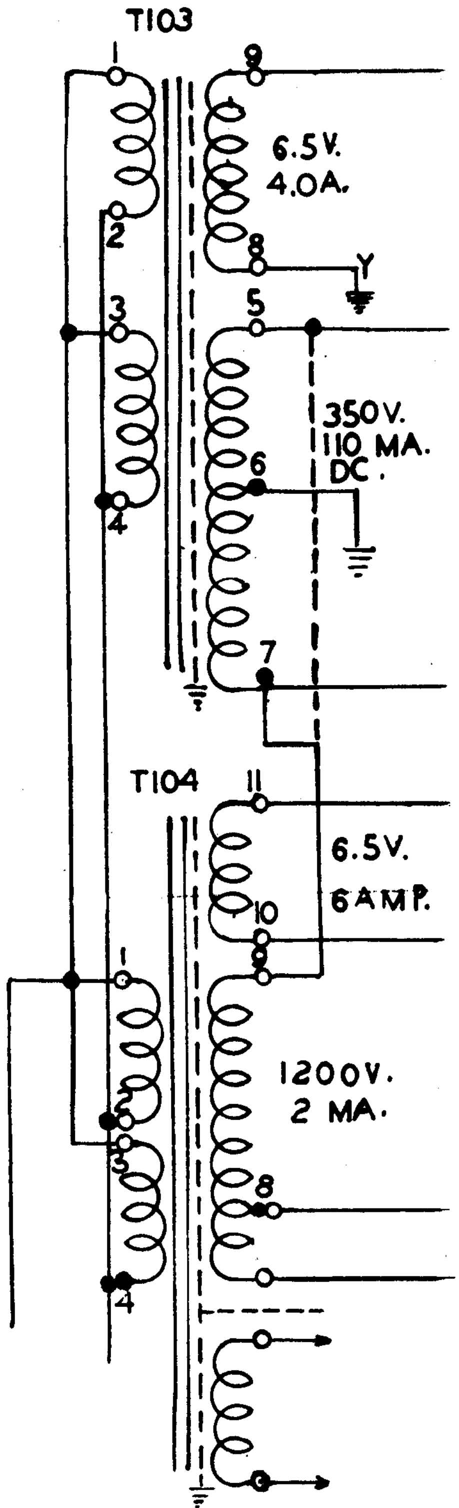
c. Measure voltages at tube socket terminals and compare with charts supplied in this instruction book. This will help isolate the stage in which the defect exists.

d. Make resistance measurements in those stages where there are voltage discrepancies. Use the resistance chart supplied in this instruction book. Make all necessary replacements.

Make free use of the table below to locate defective wiring or components.

Failure	Look for the Following:
Set inoperative, pilot light and tubes fail to go on.	Check the two fuses at the rear of the chassis. Check AC voltages according to the voltage chart. Check the "ON - OFF" switch. Check all connections to the power receptacles.
No trace on the screen. Pilot light on.	Check the connection between the second anode lead and the contact at the side of the 5CP1. Check socket voltages of the 5CP1. CAUTION! - HIGH VOLTAGE
Horizontal line fails to appear on the screen, but a dot shows on the screen.	Check tubes V114 and V115 and their associated circuits. Check voltages and resistances. Check C124 and R154.
Horizontal line short in length or blinks	Check the frequency of the sawtooth generator. See Section V, Par. 7.
Horizontal line normal but signals produce no vertical deflections on the screen.	This effect may be produced by any defect in the Video, Det., I.F., mixer, oscillator, or R.F. sections of the adaptor. To locate the trouble, the following steps are suggested, and if in the step by step check, the expected results are not obtained, then the trouble lies in the stage immediately following the point where the signal is applied. Check voltages, resistances, and continuity on the suspected stage. Make all necessary repairs. (a) To check the video amplifiers, feed the AC voltage from pin #7 of V106, through a .01 mfd., 500V condenser to grid pin #1 of V107. This should produce a wavy line well up on the screen. (b) Feed a 7.5mc. audio modulated signal to pin #4 of V105. A wavy line should appear well upon the screen. (c) Again feed a 7.5 mc. audio modulated signal to pin #4 of V104. The results of step (b) should be present in greater amplitude. Possibly the output of the signal generator will have to be attenuated.

Failure	Look for the Following:
	(d) Now, feed the 7.5mc. audio modulated signal to pin #8 of V103, the mixer. A wavy line should appear on the screen. (e) Now, feed a 30mc. unmodulated signal of about 10μV to pin #8 of V103. This should produce a normal signal deflection near the center of the screen, with the SWEEP control set at maximum. If no signal appears check the FM oscillator. (f) Using a high resistance voltmeter in series with a 50,000 ohm resistor which is to be tied to pin #6 of V109 and V110, alternately, ascertain whether there is a negative grid voltage. This voltage indicates operation of the oscillator. (g) Now, apply a 30mc. signal to grid pin #4 of V102. The results should be similar to that of step (e). (h) Repeat with a 30mc. signal applied to the input connector of the adaptor. The results should be similar to that of step (e).
With the SWEEP control set at maximum the vertical deflection does not appear as a peak but rather as a shift in the baseline.	The reactor tube is not modulating the FM oscillator. Check the tubes V111 and V112 and their associated circuits.
When GAIN control is rotated frequency shift takes place.	Check V113 and the gain control itself together with its associated circuit.
Curved overload line on the cathode ray tube.	Gassy detector V106
If pulse reception yields peaks which are dim in comparison with the baseline.	Use the Intensifier control. If no change is noted, check V108 and its associated circuit.
Either V117 or V118 runs excessively hot.	This probably results from the burnout of either V117 or V118. The one which runs cool is the burnout.
Receiver operates normally but no signal reaches the adaptor.	Check the coaxial cable which connects the adaptor and receiver. Check the connections. Check the cathode follower tube and its associated circuit in the companion receiver.



WHEN TRANSFORMERS ARE REPLACED, IT MAY BE FOUND THAT IMPROPER PHASING OF THE TRANSFORMERS RESULT IN LOWERED C.R.T. INTENSITY. IF SUCH BE THE CASE, REMOVE CONNECTION TO PIN 5 SHOWN BY THE DOTTED LINE AND CONNECT TO PIN 7 AS SHOWN BY THE SOLID LINE.

5. REMOVAL OF CHASSIS FROM CABINET.

Disconnect the power cable from the AC line. Then, at the chassis end of the cable, rotate the plug to the left and disengage.

Disconnect the RF input cable by unscrewing the connector at the chassis end of the cable.

Unfasten the ten panel thumbscrews.

Grasp the two pull knobs on the panel and carefully pull the chassis out of the cabinet.

6. REMOVAL OF THE CATHODE RAY TUBE.

"WARNING" - BE SURE THAT ALL POWER IS REMOVED FROM THE ADAPTOR.

Carefully snap off the high voltage lead which passes through the side of the cathode ray tube shield to the tube. Remove the three wing nuts at the rear of the shock mount back plate. This back plate holds the cathode ray tube socket. Next remove the two nuts and lockwashers which hold the cathode ray tube shield to the shock mount back plate. Hold the tube shield in place and carefully pull away the shock mount back plate from the tube shield so that the socket is separated from the tube. Push the socket and back plate to the side. Now ease the shield off the back of the scope hood (the back of the shield will pass through the front shock mount plate) and swing upward the front end of the shield. Carefully remove the front end of the shield.

7. SEMI-ADJUSTABLE CONTROLS.

On the right side of the panel there are six holes under which there is a slide panel. If the slide panel locking screw is loosened, the slide panel can be raised and behind each hole you can see a control which can be adjusted with a screwdriver.

Do not touch these controls unless you are familiar with the correct servicing procedure.

a. SYNCH(ronization). - This governs the sub-multiple of the line frequency to which the sweep oscillator (sawtooth generator) is locked. See Section IV, Par. 21. Normally, the SYNCH control is set for a sweep voltage of one half the line frequency.

In order to check this adjustment, the AC line frequency can be obtained from pin #7 of tube V106 and fed through a .01 mfd coupling condenser to either pin #1 or #2 of tube V106. Two peaks will appear on the screen if the sweep frequency is one half of the line frequency. The sweep frequency is incorrect if any number but two peaks appear. You may also note that the baseline oscillates in a horizontal direction or the peaks move, when the SYNCH control is improperly adjusted.

Should any of these faulty conditions exist, adjust the SYNCH control until two stationary peaks appear on the screen and then remove the coupling condenser.

b. LINE SIZE.- This controls the length of the baseline on the screen. The baseline should be slightly longer than the calibrated scale. If this control is turned completely in a counterclockwise direction, the size of the baseline is diminished. Hence, the line size is increased by turning this control in a clockwise direction. This control is used to determine the magnitude of the sawtooth voltage applied to the horizontal deflection plates.

c. CENTER FREQ. PAD.- This control is used to adjust the proper mean frequency of the FM oscillator. The control should be adjusted only as a last resort to secure proper centering of a deflection which represents the signal to which the receiver is tuned.

d. SWEEP PAD. - This control is used to adjust the sweepwidth of the adaptor. As this control is turned in a clockwise direction, the sweepwidth is increased. This control may have to be adjusted in aligning the FM oscillator.

e. HOR(izontal) POS(ition). - This control governs the horizontal position of the baseline. It controls the amount of D.C. deflection voltage applied to one of the horizontal deflection plates. As it is turned in a clockwise direction the baseline shifts to the right. At times it is necessary to use this control in order to achieve proper centering, on the screen, of the deflection representing the signal to which the receiver is tuned. See Section III, Par. 2j.

f. VERT(ical) POS(ition). - This control governs the vertical position of the baseline which should be very close to the calibration line of the screen scale. When it is turned in a clockwise direction, the baseline goes up. It controls the amount of D.C. deflection voltage applied to one of the vertical deflection plates.

8. POWER TRANSFORMER CONNECTIONS.

The power transformers may be connected for 115 or 230 volt, 55-65 cycle operation. The adaptor is factory wired for 115 volt operation. For 230 volt operation make the following changes:

T103

(a) Disconnect terminal three from terminal one. The line connection on terminal one should be left intact.
(b) Disconnect the remaining wire on terminal three. (The other end of this wire is attached to terminal 3 of T104.) Connect and solder this wire to terminal one (T103).
(c) Disconnect terminal two from terminal four.
(d) Disconnect the line from terminal two. Connect and solder this line to terminal four.
(e) Connect and solder terminals two and three.

T104

(a) Remove the jumper between terminals three and one.
(b) Remove the jumper between terminals two and four.
(c) Transfer the line from terminal three to terminal one.
(d) Connect and solder terminal two to terminal three. See Fig. 5-2 for power transformer connections.

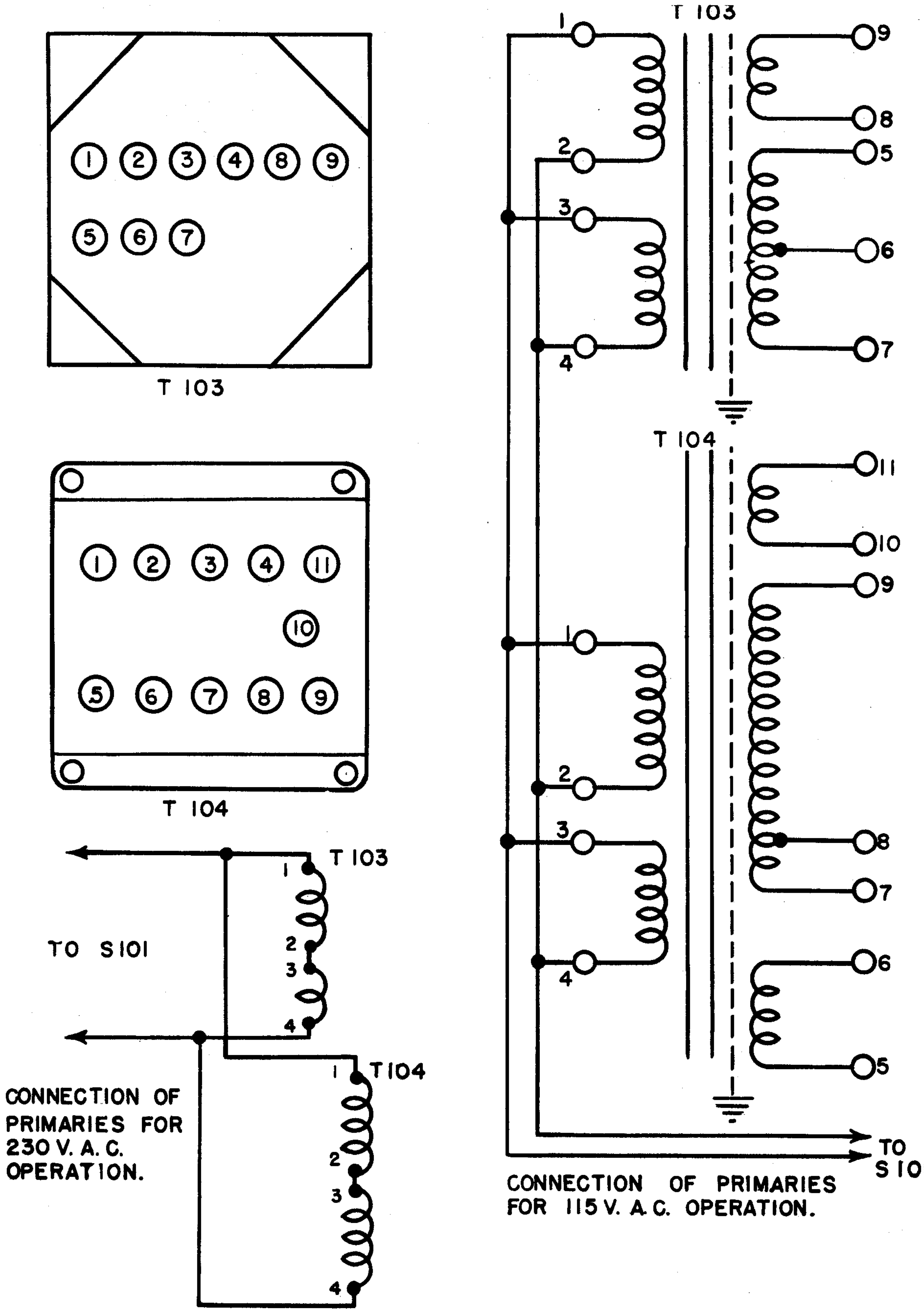


Figure 5-2.- Power Transformer Connections.

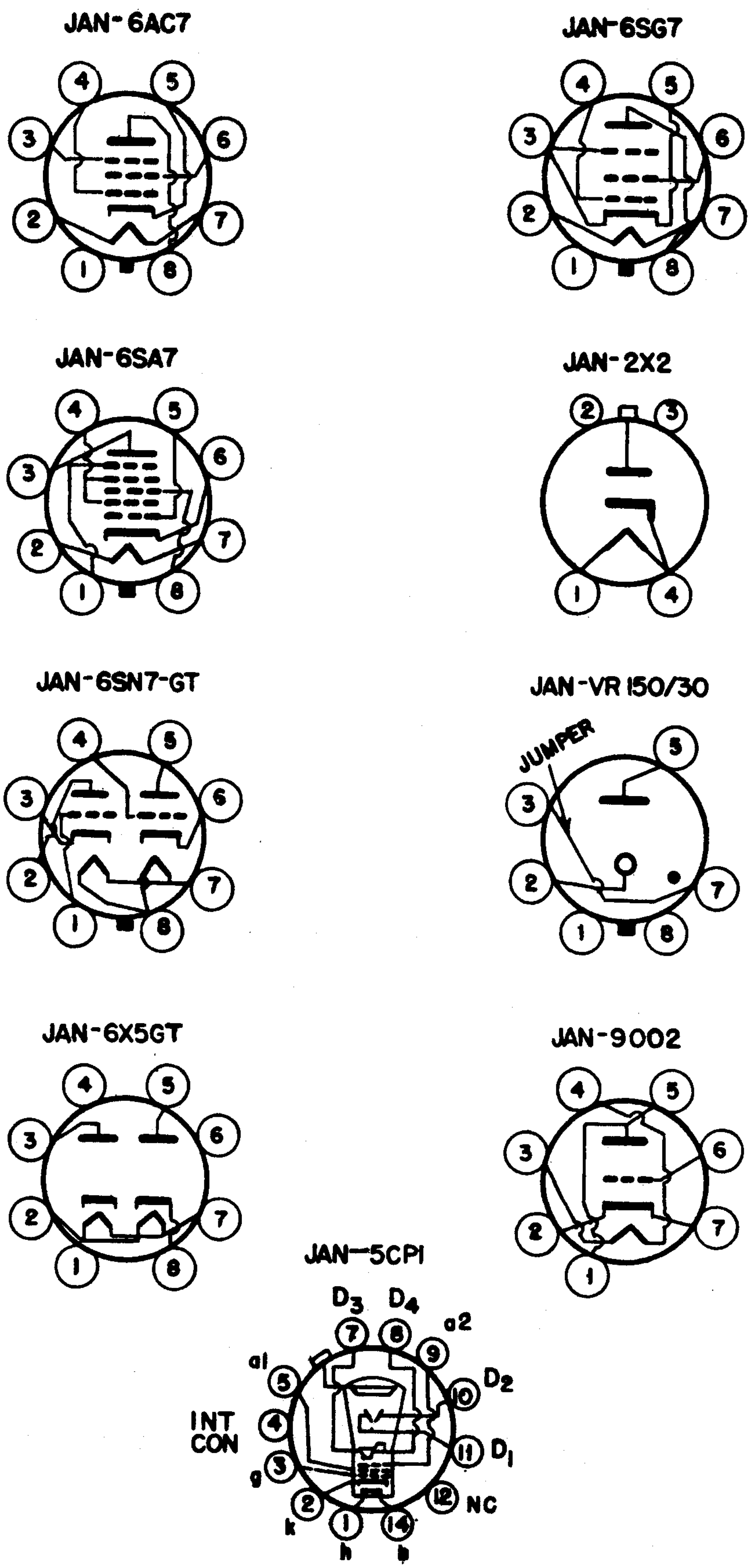


Figure 5-3. - Navy Model RDP, Schematic Diagram of Tubes, Bottom View.

3S TAKEN WITH VOLTMETER (5000 OHMS
LT).
ND SWEEP CONTROLS SET AT MAX;
BRILLIANCE, LINE SIZE, HOR. POS., AND
FREQ. CONTROLS ARE SET FOR
. OPERATION. INTENSIFIER CONTROL AT

ADINGS TAKEN FROM INDICATED PIN
UND (CHASSIS)
LTAGES ARE +DC. UNLESS OTHERWISE
ED.
OLTAGE EQUALS 115 VOLTS A.C.

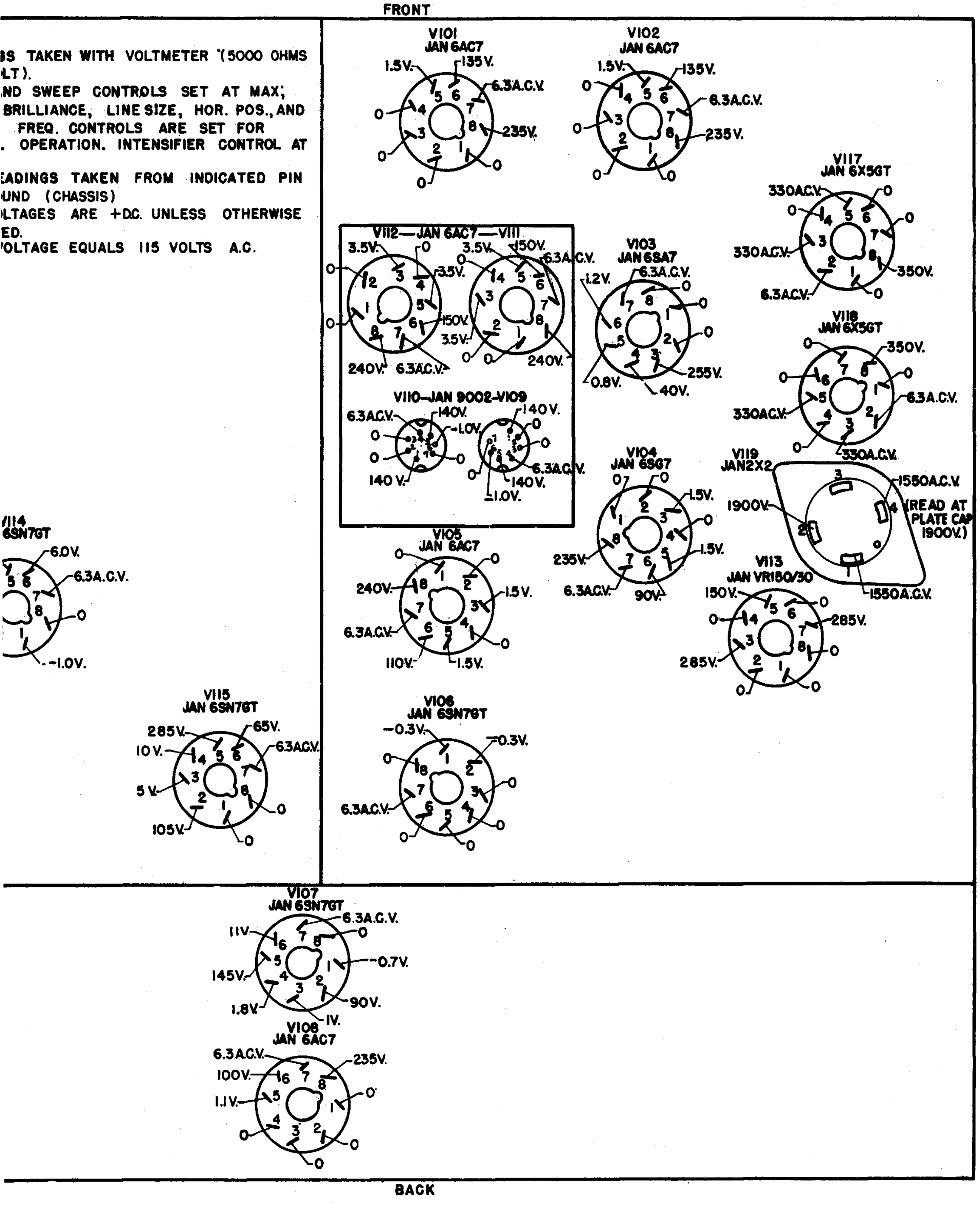


Figure 5-4. - Navy Model RDP, Tube Socket Voltage Diagram, Bottom View.

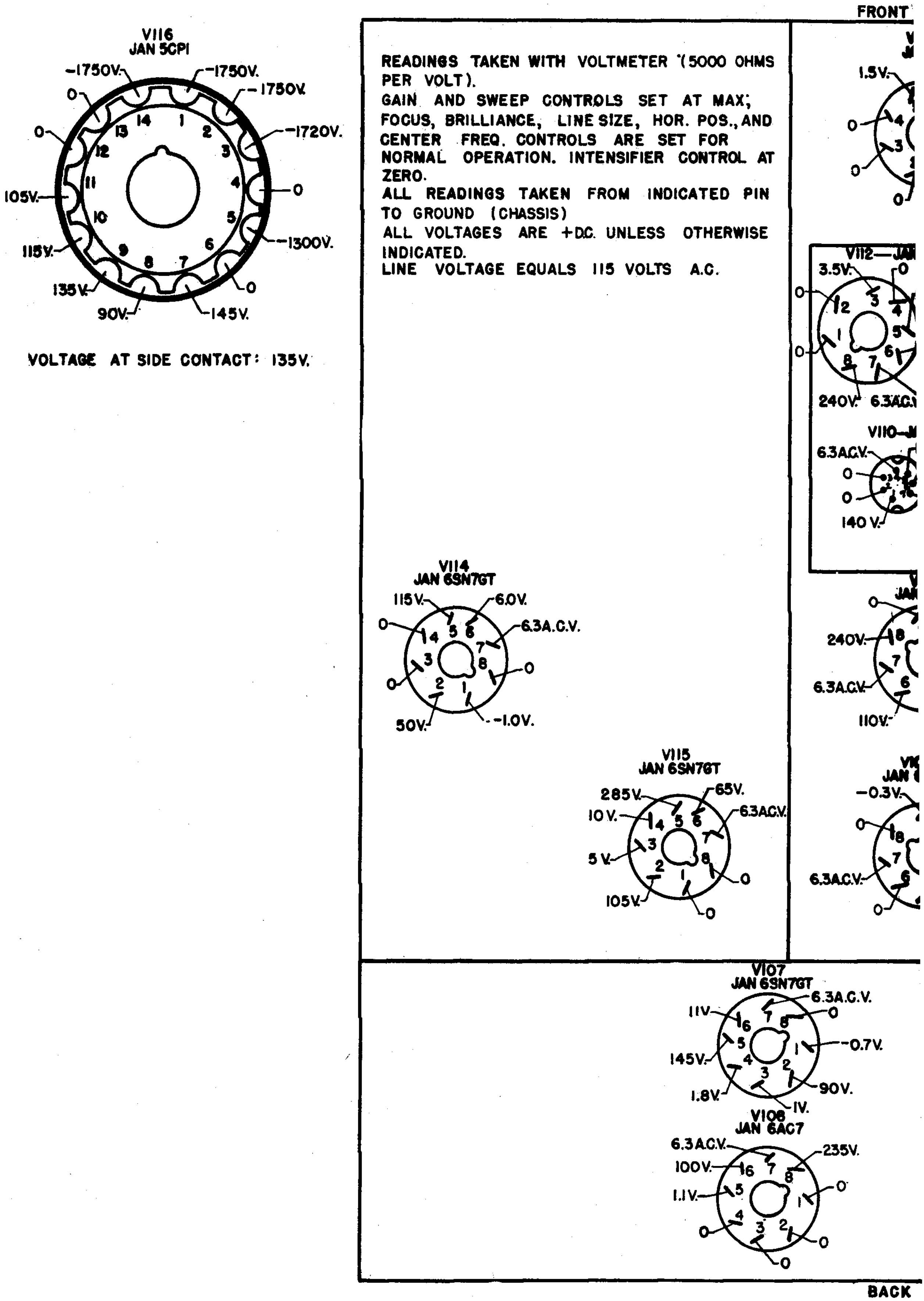


Figure 5-4. - Navy

NGS TAKEN WITH AN OHMMETER.
AND SWEEP SET AT MAX.. ALL OTHER
OLS SET FOR NORMAL OPERATION.
EADINGS TAKEN FROM INDICATED PIN
OUND. (CHASSIS).
EADINGS TAKEN WITH TUBES IN SOCKETS
POWER DISCONNECTED.
NGS MAY VARY BY ±20%
000 OHMS
LOW RESISTANCE (LESS THAN .5Ω)
NGS DEPEND UPON SETTING OF INDICATED POTS..

PIN	RESISTANCE	CONTROL
3	150Ω - 5KΩ	GAIN
5	150Ω - 5KΩ	GAIN
3	100Ω - 400Ω	C.F. PAD, C.F.
5	100Ω - 400Ω	C.F. PAD, C.F.
4	200KΩ - 450KΩ	SWEEP
3	100Ω - 400Ω	C.F. PAD, C.F.
5	100Ω - 400Ω	C.F. PAD, C.F.
4	200KΩ - 450KΩ	SWEEP
1	500KΩ - 1.5 MEG.	SYNCH
4	2 MEG. - 0Ω	HOR. SIZE
5	1.45MEG. - 1.2 MEG.	FOCUS

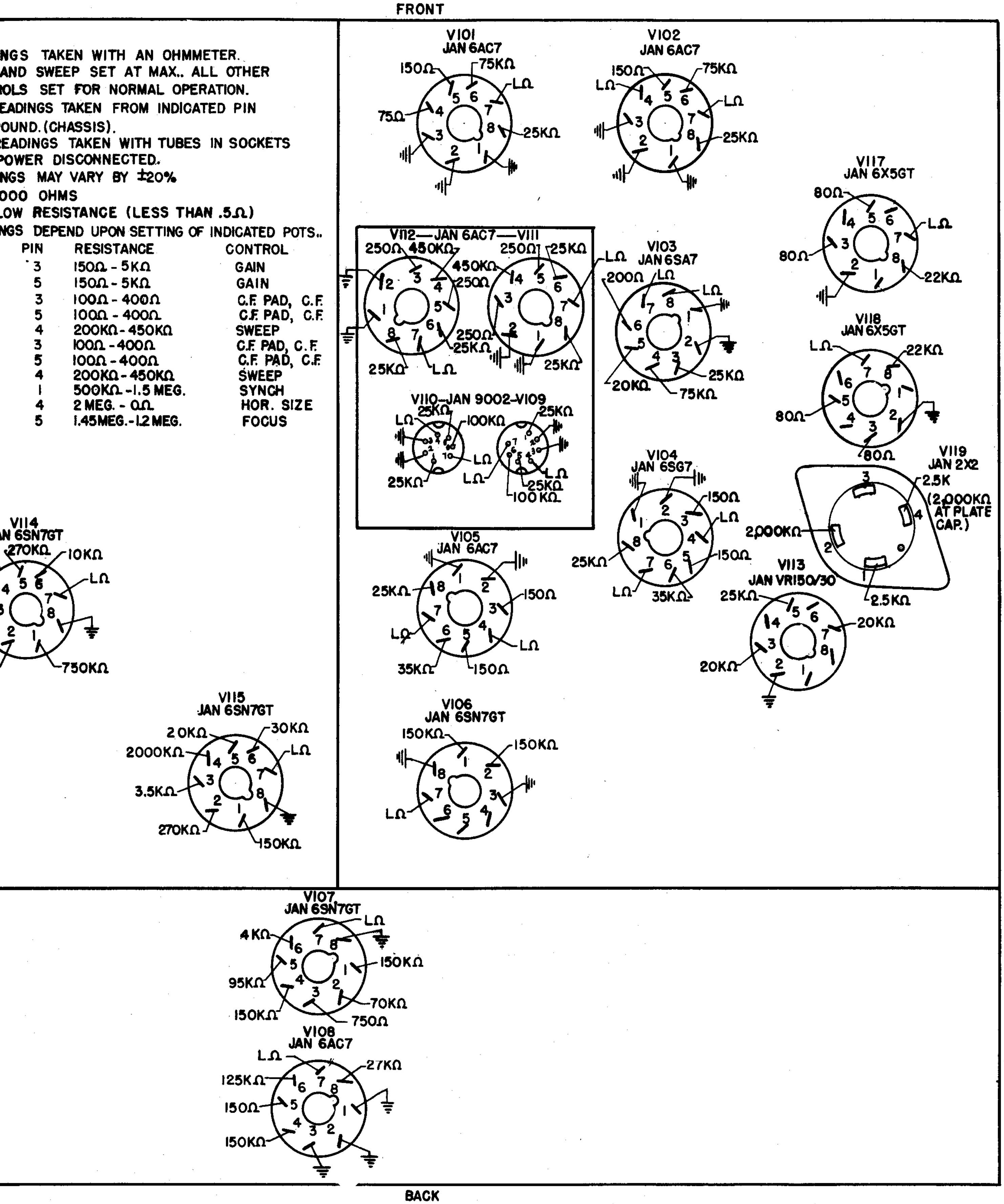
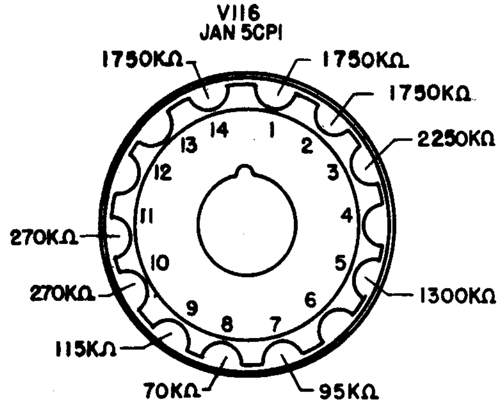


Figure 5-5. - Navy Model RDP, Tube Chassis Socket Resistance Diagram, Bottom View.

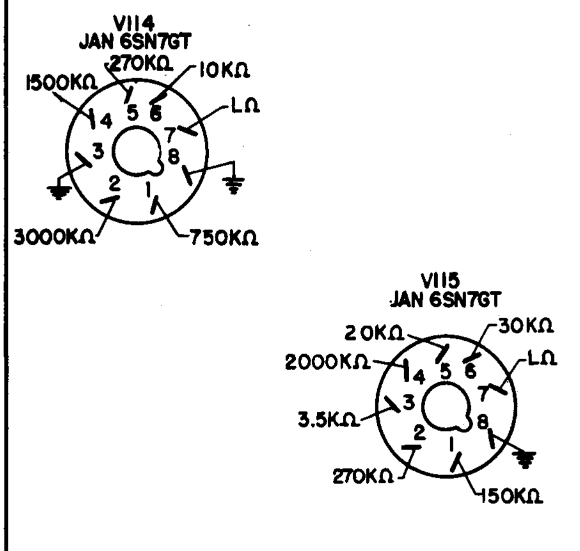


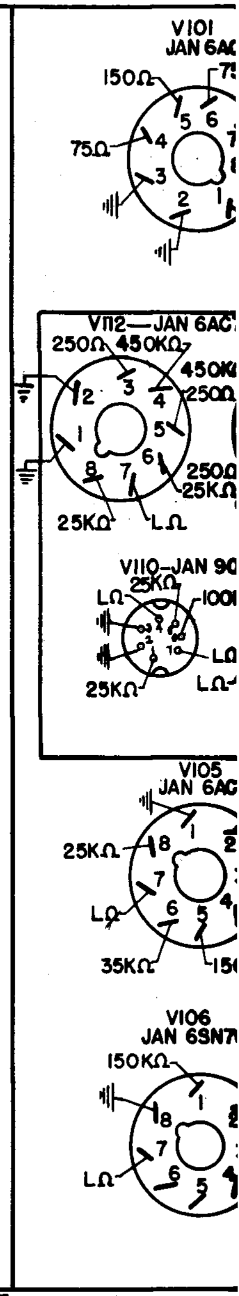
RESISTANCE AT SIDE CONTACT: 115KΩ

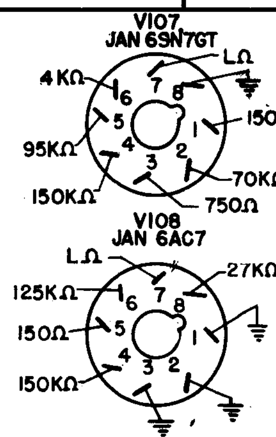
FRONT

READINGS TAKEN WITH AN OHMMETER.
GAIN AND SWEEP SET AT MAX.. ALL OTHER CONTROLS SET FOR NORMAL OPERATION.
ALL READINGS TAKEN FROM INDICATED PIN TO GROUND. (CHASSIS).
ALL READINGS TAKEN WITH TUBES IN SOCKETS AND POWER DISCONNECTED.
READINGS MAY VARY BY ±20%
KΩ = 1000 OHMS
LΩ = LOW RESISTANCE (LESS THAN .5Ω)
READINGS DEPEND UPON SETTING OF INDICATED POTS..

TUBE	PIN	RESISTANCE	CONTROL
V104	3	150Ω - 5KΩ	GAIN
	5	150Ω - 5KΩ	GAIN
V111	3	100Ω - 400Ω	C.F. PAD, C.F.
	5	100Ω - 400Ω	C.F. PAD, C.F.
	4	200KΩ - 450KΩ	SWEEP
V112	3	100Ω - 400Ω	C.F. PAD, C.F.
	5	100Ω - 400Ω	C.F. PAD, C.F.
	4	200KΩ - 450KΩ	SWEEP
V114	1	500KΩ - 1.5 MEG.	SYNCH
	4	2 MEG. - 0Ω	HOR. SIZE
V116	5	1.45MEG. - 1.2 MEG.	FOCUS







BACK

Figure 5-5. - Navy Model RDP, Tu

SECTION VI - PARTS AND SPARE PARTS LISTS

TABLE I

PARTS LIST BY SYMBOL DESIGNATION
NAVY MODEL RDP, PANORAMIC ADAPTOR

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
		Structural Parts, Panels, Frames, etc.				
A101	Support chassis; indicators, nameplate, etc.	panel	1	A4450		P3-1049d
A102	Cover semi-adjustable controls	Slide plate, front panel	1	A1045		P1-1273b P1-1529
A103	Shield base section of reactor and oscillator	FM oscillator shield	1	A1115		P2-1225c P1-1082
A104	Cover and shield for adaptor	Cabinet	1	A1418		P3-1308 P3-1309e P3-1298c
A105	Cover and shield for chassis	Bottom Plate	1	A2450		P3-1310
A106	Mount components	Chassis	1	A3450		P3-1009b P4-1008b P3_1000c P4-999f P1-1071a
A107	Brace front panel, mount tools	Side bracket, right	1	A1075		P3-1243c
A108	Brace front panel	Side bracket, left	1	A1093		P3-1244b
A109	Mount Potentiometer	Pot bracket	1	A1154		P1-1001

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
A110	To anchor H.V. pot mount	Pot bracket left, H.V.	1	A1153L		P1-1077a
A111	To anchor H.V. pot mount	Pot bracket right, H.V.	1	A1153R		P1-1078a
A112	To anchor H.V. pot mount	Pot bracket center, H.V.	1	A1153C		P1-1079
A114A	To mount rubber snubbers	CRT Shock Mount, Part A	1	A1134		P2-1066b
A114B	To mount CRT Socket and CRT magnetic shield	CRT Shock Mount, Part B	1	A1135		P1-1067
A115	To lock CRT socket in position	Franklin ring for diheptal socket	1	X1066M		P1-1250
A122	To hold CRT magnetic shield, to shield CRT screen from light	Scope hood	1	A1183		P2-1069b
A123A	Bond between panel and cabinet	Grounding Strip A	1	A1164		P2-1306
A123B	Same as A123A	Grounding Strip B	1	A1165		P2-1307
A124	To shield CRT from stray magnetic fields	CRT magnetic shield	1	A1146		P3-1087a
A126A-J	To hold captive nut	Bracket for captive nut	1	A1180		P1-1303
A127A-D	To hold cabinet shock-mounts	Shockmount base, 2-3/4" sq. 2-1/8" dia. of hole	1	A1162		P1-1315b
A131A-B	Bond between cabinet and chassis	Contact Spring A, cabinet	1	A1166		P1-1304a
*A135A-C	Absorb vibration	Shockmount, CRT	4	100PDLN-1		G1010
*A137A-C	Same as A135	Shockmount, Cabinet	4	200P25		G1026

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
		Capacitors				
*C101	Blocking condenser	Capacitor, .01 mfd., fixed mica, lugs and mounting holes	28	Type B	± 10%, 300V.	C1200
*C102A-C	R.F. bypass	Capacitor, 3x.01 mfd., fixed paper, oil impregnated, flat type, metal case. Same as C103, C104, C105, C106, C109, and C122	29	Type 7710	± 20%, 600V.	C1060
*C103A-C	R.F. bypass	Same as C102A-C				
*C104A-C	R.F. bypass	Same as C102A-C				
*C105A-C	R.F. bypass	Same as C102A-C				
*C106A-C	R.F. bypass	Same as C102A-C				
*C107	Diode load resistor bypass	Capacitor, 250 mmfd., fixed mica, low loss	3	1468	± 10%, 500V.	C1058
*C108	D.C. blocking cond.	Capacitor, .001 mfd., fixed mica, commercial	31	502L"A"	± 10%, 300V.	C1061
*C109A-C	Bypass condenser	Same as C102A-C				
*C110	D.C. blocking condenser	Capacitor, .005 mfd., fixed mica, low loss, silver mica	28	Type 6-19	± 10%, 2500V.	C1195
*C111	Low voltage power supply filter cond.	Capacitor, 4mfd., tubular, fixed paper oil impregnated, metal case. Same as C112, C113, C114, C132, C133	30	CAAI 481080-10	± 10%, 600V.	C1180

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*C112	Same as C111	Same as C111				
*C113	Same as C111	Same as C111				
*C114	Same as C111	Same as C111				
*C115	Oscillator injection	Capacitor, fixed, 5 mmfd. silver mica	31	603J	± 5%, 500V.	C1067
*C116	D.C. blocking cond.	Capacitor, 500 mmfd., fixed mica, low loss. Same as C117, C118, C119, C120, C121, and C131	3	1408	± 10%, 500V.	C1060
*C117	Same as C116	Same as C116				
*C118	Same as C116	Same as C116				
*C119	Same as C116	Same as C116				
*C120	Same as C116	Same as C116				
*C121	Same as C116	Same as C116				
*C122	R.F. Bypass Condenser	Same as C102				
*C123	D.C. blocking Cond.	Capacitor, .01 mfd., fixed mica, Same as C129, C130	3	1407	± 10%, 300V.	C1202
*C124	Coupling condenser	Capacitor, 2x.01 mfd., fixed paper, oil impregnated, metal case, flat type.	29	7706-R	± 15%, 600V.	C1175
*C125	D.C. blocking Cond.	Capacitor, 2x.25 mfd., fixed paper, oil impregnated, flat type metal case	29	7707	± 15%, 600V.	G1189

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*C126	Coupling condenser	Capacitor, .25 mfd., fixed paper, oil impregnated, bathtub, bottom mounting, metal case.	2	6BAB25	± 10%, 600V.	C1015
*C127	H.V. Supply Filter	Capacitor, 2x.25 mfd., fixed paper, oil impregnated, metal case.	29	7071	± 15%, 2000V.	G1007
*C128	Line filter	Capacitor, 3x.1 mfd., fixed paper, oil impregnated, bathtub, top mtg, metal case	2	6BAT111	± 20%, 600V.	C1010
*C129	Line filter	Same as C123				
*C130	Same as C129	Same as C123				
*C131	R.F. bypass, cathode V105	Same as C116				
*C132	Plate decoupling filter (V108)	Same as C111				
*C133	L.V. Filter cond.	Same as C111				
		CONNECTORS				
*J101	Connect adaptor to companion receiver	Connector, single, coaxial, Navy Type No. CPH 49194	11	83-1R		J1004
*J102	Connect adaptor to A.C. power source	Connector, Female 3 pole, A.C. 10A., 250V.; CRS 49126	34	F7079		J1003

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
		MISCELLANEOUS ELECTRICAL PARTS				
E101A-F	To adjust FOCUS, INTENSIFIER, BRILLIANCE, CENTER FREQ., SWEEP, and GAIN controls	Knobs, black bakelite, curved octoganal shape 1-1/8" dia., Allen head set screws set at right angles.	10			E1018
*E102	Hold I101	Assembly, pilot light, bayonet type	13	BV805		B1014
*E103A-B	Hold fuse F101A-B	Fuse holder, molded bakelite	21	HKM		F1001
*E104A-B	Mount tuning rod and spare fuses	Dual fuse holder	15			P1-230c F1009
E106	Contact for second anode lead.	Contact, second anode lead.	10	K-870326-1		P1-1115 X1068
*E107	Shield contact for second anode lead	Cover, second anode lead	10	M-426889-1		W1578
E109	Mount resistors for wiring	Standoff, resistor, R.F., 8 terminal lugs, 3/32" xxx paper base bakelite	1	K1056p		P1-1085e
E111	Same as E109	Standoff, resistor, I.F., 8 terminal lugs, xxx paper base bakelite	1	K1057p		P1-1097c
E115	Same as E109	Standoff, resistor, 18 terminal lugs, xxx paper base bakelite	1	K1016p		P1-305d
E116A-B	Same as E109	Standoff, resistor, 32 terminal lugs, xxx paper base bakelite	1	K1015p		P1-304d

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
E117	To mount H.V. pot	Pot mount, H.V., Mykroy	1	K1051		P1-1068b
E118	To mount Intensifier pot and condenser	Pot Mount, Intensifier, 1/8" xxx paper base bakelite	1	K1062p		P1-1316b
E119	To mount oscillator components	Terminal strip "A", oscillator, xxx paper base bakelite	1	K1059p		P1-1072c
E120	Same as E119	Terminal strip "B", oscillator, xxx paper base bakelite	1	K1060p		P1-1073d
E121	Hold line filter assembly components	Terminal strip, Line filter, xxx paper base bakelite	1	K1061p		P1-1471a
E122	Mount chassis to cabinet	Anchor plate, bakelite	1	K1021		P1-1220
*E123	Clamp down V119	Tube clamp, top piece, bakelite, and accessories	18			P1-168a K1002
*E124	Contact plate of V119	Plate cap, plastic	5	91-T-INL WRB-165		K1001
*E125	To align coils and adjust slotted pots	Aligning tool, bakelite	1	E1010		P1-170b
E126A-B	Slide chassis into cabinet	Cabinet Runner "A", Phenol fibre FBM	1	A1184		P1-1312
E127A-B	Same as E126	Cabinet Runner "B" Same as E126	1	A1185		P1-1311b
*E146	To fit Allenhead set screws on knobs	Allen wrench	13	#8		E1009

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*E147	To fit Allen head set screws on couplers	Allen wrench	13	#8		E1021
E148A-B	Mount Allen wrenches to chassis	Allen wrench clip	20	#45		X1038
		FUSES				
*F101	Prevent damage due to overload	Fuse, 2A., 250V. non-renewable	15	#3AG/2A		F1003
*F102	Same as F101	Same as F101				
		HARDWARE				
H101A-B	To pull Chassis out of cabinet	Pull-knob	1	E1020		P1-1301a
H105	To lock front slide panel	Screw, knurled, slide panel	1	H1247		P1-1300
H106A-J	To lock panel and chassis to cabinet	Panel locking stud	1	H1319		P1-1406b
H109A-J	To hold panel thumbscrew	Captive nut, mounted on edge of front cabinet	1	H1288		P1-1302
H110A-B	Hold harness assembly to chassis	Clamp, cabling	26	#755 10-2-6		X1059
H115A-C	Hold CRT socket plate to shockmount	Nut, wing 8:32	1			H1259
H116A-B	Mount pot bracket to front panel	Spacer, pot bracket	1	H1331		P1-1275
H118A-B	Support swept oscillator shield	Spacer swept osc. shield	1	H1327		P1-1082

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
H120A-L	Secure flexible coupling	Screw, Allen head 6:32 x 1/8	1	H1183		
H121A-L	Secure control knobs	Screw, Allen head 8:32 x 1/8	1	H1052		
H122A-J	Lock panel to chassis	Screw, Panel locking	1	H1339		P1-1484
H123A-C	Separate CRT shockmount part "A" from part "B"	Spacer, shockmount	1	H1147		P1-1549
		INDICATING DEVICES				
I101	OFF-ON indicator	Lamp, pilot light, bayonet base, 6V./8v., 150 ma.	16	#47		B1007
I126	Calibration screen	Lumarith screen, green	1	Green .050" B1025		P1-1007
I127	Back up calibration screen	Lumarith screen, colorless, clear	1	B1024		
		INDUCTORS, R.F. AND A.F.				
*L101	L.V. Filter Choke	Choke, filter 10-20 H. at 100 ma. D.C., 5V. 60 cycles, same as L102	1	T4450		P1-924f
*L102	L.V. Filter Coke	Same as L101				
*L103	Shunt feed reactor (VIII)	Choke, RF, 4 pie type, 2.5 mh. Same as L104	32	4537		L1001
*L104	Shunt feed reactor (V112)	Same as L103				

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*L105-6	Line Filter Choke	Choke, line filter, 3 pie, 1 solenoid L_1 = 400 mh at 1000 cps L_2 = 20 mh at 1000 cps Total resistance less than .55 ohms Same as L107-8	1	L1103	±10%	P2-1366
*L107-8	Line Filter Choke	Same as L105-6				
		MECHANICAL PARTS				
0101	To rotate INTENSIFIER potentiometer	Shaft, extension "A"	1	H1326		P1-1108c
0103A-B	To rotate FOCUS and BRILLIANCE potentiometers	Shaft, extension "B"	1	H1325		P1-1109c
*0105A-C	Couple extension shafts to pots	Coupling, flexible	33	Type A		G1020
0107A-D	Bearing for Pot extension shafts	Bearing, panel	1	H1251		
		PLUGS				
*P101	Connect RF input to chassis connector	Plug, straight, 1 pole, male, HF input, cable coupling to plug, polystyrene insulation CPH 49195	11	83-1SPN		P1010
*P101A	Same as P101	RF input angle plug CPH 49192	11	83-1AP		P1011
*P102	Connect AC source to adaptor	Plug, AC, 3 pole, 10A, 250V DC, 440V AC, 20A 125V DC CRS 49125	34	F-7078		P1004

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*P201	Connect Adaptor to companion receiver	Same as P101				
		RESISTORS				
*R101	Grid return	Resistor, fixed carbon, 75 ohms, 1W. ceramic insulated	7	518	±10%	R1145
*R102	Grid bias (V101)	Resistor, fixed carbon, 150 ohms, 1W, ceramic insulated. Same as R119, R136, R112, R105	7	518	±10%	R1150
*R103	Screen dropping resistor (V101)	Resistor, fixed carbon, 50,000 ohms, 1W, ceramic insulated. Same as R106, R110, R117, R121	7	518	±10%	R1055
*R104	Plate resistor (V101)	Resistor, fixed carbon, 5,000 ohms, 1W, ceramic insulated. Same as R107, R111, R118, R122, R167	7	518	±10%	R1048
*R105	Grid bias (V102)	Same as R102				
*R106	Screen dropping resistor (V102)	Same as R103				
*R107	Plate isolation (V102)	Same as R104				
*R108	Grid bias resistor (INJECTION GRID V103)	Resistor, fixed carbon, 20,000 ohms, 1/2W, ceramic insulated	7	504	±10%	R1026
*R109	Grid bias (V103)	Resistor, fixed carbon, 200 ohms 1W, ceramic insulated, same as R155	7	518	±10%	R1151
*R110	Screen dropping resistor (V103)	Same as R103				
*R111	Plate isolation (V103)	Same as R104				
*R112	Grid bias (V104)	Same as R102				

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*R113	Screen bleeder (V104)	Resistor, fixed carbon, 75,000 ohms, 1W, ceramic insulated. Same as R120, R131, R132	7	518	±10%	R1058
*R114	Gain Control (V104)	Potentiometer, carbon, 5,000 ohms, 1W, linear taper, screwdriver slot. Same as R138	8		±20%	R1509
*R115	Bleeder resistor (V104)	Resistor, fixed carbon, 25,000 ohms, 1W, ceramic insulated. Same as R116, R166	7	518	±10%	R1053
*R116	Bleeder resistor (V104)	Same as R115				
*R117	Screen bleeder (V104)	Same as R103				
*R118	Plate isolation (V104)	Same as R104				
*R119	Grid bias (V105)	Same as R102				
*R120	Screen bleeder (V105)	Same as R113				
*R121	Screen bleeder (V105)	Same as R103				
*R122	Plate isolation (V105)	Same as R104				
*R123	Diode load resistor (V106)	Resistor, fixed carbon, 150,000 ohms, 1W, ceramic insulated, same as R125, R129,R134,R163,R171,R165	7	518	±10%	R1060
*R124	Vertical positioning control (V107B)	Potentiometer carbon, 500,000 ohms, 1W, linear taper, screwdriver slot. Same as R180	8	W37	±20%	R1524
*R125	Bleeder resistor (V107B)	Same as R123				
*R126	Grid bias (V107A)	Resistor, fixed carbon, 750 ohms, 1W, ceramic insulated	7	518	±10%	R1158

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*R127	Grid bias (V107B)	Resistor, fixed carbon, 4,000 ohms, 1W, ceramic insulated Same as R164	7	518	±10%	R1161
*R128	Coupling (V107)	Resistor, fixed carbon, 2 meg. 1/2W, ceramic insulated	7	504	±10%	R1038
*R129	Grid return (V107B)	Same as R123				
*R130	Bleeder resistor (V107A)	Resistor, fixed carbon, 250,000 ohms, 1/2W, ceramic insulated	7	504	±10%	R1033
*R131	Plate load resistor (V107A)	Same as R113				
*R132	Plate load resistor (V107B)	Same as R113				
*R133	Coupling (V108)	Resistor, fixed carbon, 250,000 ohms, 1W, ceramic insulated, same as R135, R161, R168, R181	7	518	±10%	R1062
*R134	Grid load resistor (V108)	Same as R123				
*R135	Grid return (V108)	Same as R130				
*R136	Grid bias (V108)	Same as R102				
*R137	Screen dropping resistor (V108)	Resistor, fixed carbon, 100,000 ohms, 1W, ceramic insulated	7	518	±10%	R1059
*R138	Intensifier control (V108)	Same as R114				
*R139	Grid bias (V109)	Resistor, fixed carbon, 100,000 ohms, 1/2W, ceramic insulated Same as R140	7	504	±10%	R1030
*R140	Grid bias (V110)	Same as R139				

*Spare Parts Furnished Refer to Table II for Quantities

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*R141	Oscillator plate resistor (V109, V110)	Resistor, fixed carbon, 100 ohms, 1/2W, ceramic insulated, same as R149, R150	7	504	±10%	R1007
*R142	Regulator, dropping resistor	Resistor, wire wound, 5,000 ohms, 10W, cement coated and insulated	27	DH or Brown Devil	±10%	R1082
*R143	Regulator, dropping resistor	Resistor, wire wound, 3,000 ohms, 10W, cement coated and insulated	27	DH or Brown Devil	±10%	R1155
*R144	Isolating resistor (V111)	Resistor, fixed carbon, 200,000 ohms, 1/2W, ceramic insulated, same as R145	7	504	±10%	R1032
*R145	Isolating resistor (V112)	Same as R144				
*R146	CENTER FREQ(uency) Control (V111-V112)	Potentiometer, carbon, 500 ohms, 1W, linear taper, screwdriver slot	8	W37	+20%-10%	R1502
*R147	CENTER FREQ PAD (V111-V112)	Potentiometer, carbon, 1000 ohms 1W, linear taper, screwdriver slot	8	W37	±20%	R1505
*R148	Phasing network resistor (V111)	Resistor, fixed carbon, 1000 ohms, 1/2W, ceramic insulated, same as R151	7	504	±10%	R1014
*R149	Grid bias V111	Same as R141				
*R151	Phasing network resistor (V112)	Same as R148				
*R152	Reactor plate resistor (V111)	Resistor, fixed carbon, 2000 ohms, 1/2W, ceramic insulated, same as R153, R182	7	504	±10%	R1016

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*R153	Reactor plate resistor (V112)	Same as R152				
*R154	Sawtooth Gen. Plate resistor (V114A)	Resistor, fixed carbon, 3meg, 1W, ceramic insulated	7	518	±10%	R1154
*R155	Synch net (V114A)	Same as R109				
*R156	Synch net (V114A)	Resistor, fixed carbon, 500 ohms 1W, ceramic insulated	7	518	±10%	R1152
*R157	Grid bias (V114A)	Resistor, fixed carbon, 500,000 ohms 1W, ceramic insulated, same as R172	7	518	±10%	R1063
*R158	SYNCH control (V114A)	Potentiometer, carbon, 1 meg, 1W, linear taper screwdriver slot	8	W37	±20%	R1525
*R159	Bias resistor (V114B)	Resistor, fixed carbon 10,000 ohms, 1W, ceramic insulated	7	518	±10%	R1050
*R160	Horizontal size control (Line size) (V114B)	Potentiometer, carbon, 2 meg, 1W, linear taper, screwdriver slot, same as R179	8	W37	±20%	R1527
*R161	Plate resistor (V114)	Same as R133				
*R162	Coupling resistor (V115A)	Resistor, fixed carbon, 2 meg, 1W, ceramic insulated, same as R169, R170	7	518	±10%	R1065
*R163	Grid return resistor (V115A)	Same as R123				
*R164	Grid bias (V115A)	Resistor, fixed carbon, 3,500 ohms, 1W, ceramic insulated	7	518	±10%	R1047
*R165	Bleeder resistor (V115A)	Same as R123				

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*R166	Sawtooth output of cathode follower (V115B)	Same as R115				
*R167	Grid bias (V115B)	Same as R104				
*R168	Plate load resistor (V115A)	Same as R133				
*R169	Coupling resistor (V115B)	Same as R162				
*R170	Grid resistor (V115B)	Same as R162				
*R171	Bleeder resistor (V116)	Same as R123				
*R172	Bleeder resistor (V116)	Same as R157				
*R173	Bleeder network (V116)	Resistors, fixed carbon, 1.2 meg, 2W, (3 meg and 2 meg, 1W in parallel) ceramic insulated	7	518	±10%	R1065 2 meg R1154 3 meg
*R174	Focus Control (V116)	Potentiometer, carbon, 250,000 ohms, 1W, linear taper, screwdriver slot, same as R178	8	W37	±20%	R1522
*R175	Bleeder network (V116)	Resistor, fixed carbon, 1 Watt, 300,000 ohms, ceramic insulated	7	518	±10%	R1156
*R176	Grid resistor (V116)	Resistor, fixed carbon, 500,000 ohms, 1/2W, ceramic insulated	7	504	±10%	R1036
*R177	BRILLIANCE control (V116)	Potentiometer, carbon, 100,000 ohms, 1W, linear taper, screwdriver slot	8	W37	±20%	R1520
*R178	SWEEP Control	Same as R174				
*R179	SWEEP PAD	Same as R160				
*R180	HORizontal POSition Control	Same as R124				

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*R181	H.V. Filter Resistor (V119)	Same as R133				
*R182	Plate decoupling resistor (V108)	Same as R152				
*R183	Oscillator loading resistor	Resistor, 5,000 ohm, 1/2W, fixed carbon, ceramic insulated	7	504	±10%	R1021
		SWITCHES				
*S101	Switch power on and off	Switch, toggle double pole, single throw, 3A, 250V molded bakelite "baseball bat" handle, CHH24003	25			S1026
		TRANSFORMERS AND INTEGRAL COMPONENTS				
*T101-09	Couple input stage with bandpass amplifier stage (V102)	Trans. bandpass input, permeability tuned. Frequency is 30mc ± 250KC	1	L1097		P2-1365b P2-1248a
C1	Coupling	Capacitor, 5mmfd. ceramicon, same as C2	28 or 3		±10%	C1084
C2	Coupling	Same as C1				
*T102-09	Couple bandpass amplifier with mixer (V103)	Transformer, bandpass interstage, permeability tuned. Frequency is 30mc ± 250KC	1	L1098		P2-1364b P2-1248a
C3	Coupling	Capacitor, 5mmfd. ceramicon	28 or 3		±10%	C1084
R1	Loading Resistor	Resistor, fixed carbon, 10,000 ohms, 1/2W, ceramic insulated	7	504	±10%	R1024

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*T103	Power transformer supply low voltage operating potentials	Transformer, power primary 115/230V 55-65 cycles. Two secondary windings 6.5V at 4.0 Amp. 700V tapped at 350V at 110 ma.	1	T1450 L.V.		P2-974e
*T104	Power transformer, supply high voltage operating potentials	Transformer, power Primary 115/230V 55-65 cycles. Secondary four windings. 6.5V at 6A, 6.4V at .6A, 2.5V at 1.75A, 1200V at 2 ma.	1	T1450 H.V.		P2-973e
*T105	Blocking tube oscillator transformer (sawtooth generator)	Transformer, BTO 2:1 ratio, secondary to primary	1	T2418		P1-554b
*Z101-09	FM oscillator coil	Coil, oscillator composite, permeability tuned 22.5 mc. ±5mc.	1	L1099		P2-1367
*Z102-09	I.F. input transformer	Transformer I.F. input, permeability tuned. Frequency is 7.5 mc. Same as Z103-09, Z104-09	1	L1100		P2-1363a P2-1248a
C4	Tune primary	Capacitor, fixed 50mmfd., silver mica	3		±10%	C1071
C5	Tune secondary	Same as C4				
R2	Loading resistor	Resistor, fixed carbon, 25,000 ohms, 1/2W, ceramic insulated	7	504	±10%	R1027
*Z103-09	I.F. interstage transformer	Same as Z102-09				
C6	Same as C4	Same as C4				
C7	Same as C4	Same as C4				
R3	Same as R2	Same as R2				

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR. DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
*Z104-09	I.F. output transformer	**Same as Z102-09**				
C8	Same as C4	**Same as C4**				
C9	Same as C4	**Same as C4**				
R4	Same as R2	**Same as R2**				
		TUBES				
*V101	1st R.F. Amplifier	6AC7/1852	10	6AC7/1852		6AC7
*V102	2nd Bandpass Amplifier	6AC7/1852	10	6AC7/1852		6AC7
*V103	Mixer	6SA7	10	6SA7		6SA7
*V104	1st I.F.	6SG7	10	6SG7		6SG7
*V105	2nd I.F.	6AC7/1852	10	6AC7/1852		6AC7
*V106	Detector (diode)	6SN7GT	10	6SN7GT		6SN7GT
*V107	Push-pull video amplifier	6SN7GT	10	6SN7GT		6SN7GT
*V108	Pulse Intensifier	6AC7/1852	10	6AC7/1852		6AC7
*V109	Push-pull osc.	9002	10	9002		9002
*V110	Push-pull osc.	9002	10	9002		9002
*V111	Reactor	6AC7/1852	10	6AC7/1852		6AC7
*V112	Reactor	6AC7/1852	10	6AC7/1852		6AC7
*V113	Voltage Regulator	VR150/30	10	VR150/30		VR150/30
*V114	Sawtooth generator, Sawtooth amplifier	6SN7GT	10	6SN7GT		6SN7GT
*V115	Sawtooth amplifier, Sawtooth cathode follower	6SN7GT	10	6SN7GT		6SN7GT
*V116	Cathode Ray Tube	5CP1	10	5CP1		5CP1
*V117	L.V. rectifier	6X5GT same as V118	10	6X5GT		6X5
*V118	L.V. rectifier	Same as V117				
*V119	H.V. rectifier	2X2	10	2X2		2X2

*Spare Parts Furnished Refer to Table II for Quantities.

SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAME OF MFR.	MFR.DESIG.	TOLERANCE RATING OR MODIFICATION	CONTRACTOR'S DWG. AND PART NUMBER
		CABLES				
*W103	Connect adaptor to companion receiver	Cable, interconnecting, prefabricated, copoline, single coaxial, connected to P201	1			
		TUBE SOCKETS				
*X101	Mount V101	Socket, octal, mica filled or ceramic	18	KS100 67		X1028
*X102	Mount V102	Same as X101				
*X103	Mount V103	Same as X101				
*X105	Mount V105	Same as X101				
*X106	Mount V106	Same as X101				
*X107	Mount V107	Same as X101				
*X108	Mount V108	Same as X101				
*X109	Mount V109	Socket, midget 7 prong ceramic wafer				X1009
*X110	Mount V110	Same as X109				
*X111	Mount V111	Same as X101				
*X112	Mount V112	Same as X101				
*X113	Mount V113	Same as X101				
*X114	Mount V114	Same as X101				
*X115	Mount V115	Same as X101				
*X116	Mount V116	Socket, 14 prong, moulded bakelite	18	#40-1 #40-3		X1026
*X117	Mount V117	Same as X101				
*X118	Mount V118	Same as X101				
*X119	Mount V119	Socket, 4 prong, ceramic wafer	11	RSS4		X1004

*Spare Parts Furnished Refer to Table II for Quantities.

TABLE II - SPARE PARTS LIST

NAVY MODEL RDP, PANORAMIC ADAPTOR

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
			RESISTORS				
Resistors, fixed carbon, 1/2W, ceramic insulated	±10%						
100 ohm		R1007	R141, R149, R150	3	2	15	9
1,000 ohm		R1014	R148, R151	2	1	10	6
2,000 ohm		R1016	R152, R153, R182	3	2	15	9
3,000 ohm		R1018	R183	1	1	5	3
20,000 ohm		R1026	R108	1	1	5	3
100,000 ohm		R1030	R139, R140	2	1	10	6
200,000 ohm		R1032	R144, R145	2	1	10	6
250,000 ohm		R1033	R130, R135	2	1	10	6
500,000 ohm		R1036	R176	1	1	5	3
2 meg.		R1038	R128	1	1	5	3
Resistor, fixed carbon, 1W, ceramic insulated	±10%						
75 ohm		R1145	R101	1	1	5	3
150 ohm		R1150	R102, R112, R119, R136, R105	5	3	25	15
200 ohm		R1151	R109, R155	2	1	10	6
500 ohm		R1152	R156	1	1	5	3
750 ohm		R1158	R126	1	1	5	3
3,500 ohm		R1047	R164	1	1	5	3
4,000 ohm		R1161	R127	1	1	5	3
5,000 ohm		R1048	R104, R107, R111, R118, R122, R167	6	3	30	18
10,000 ohm		R1050	R159	1	1	5	3

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
25,000 ohm		R1053	R115 R116, R166	3	2	15	9
50,000 ohm		R1055	R103, R106, R110, R117, R121	5	3	25	15
75,000 ohm		R1058	R113,R120,R131,R132	4	2	20	12
100,000 ohm		R1059	R137	1	1	5	3
150,000 ohm		R1060	R123,R125,R129,R134 R163,R165,R171	7	4	35	21
250,000 ohm		R1062	R133, R168, R181	3	2	15	9
300,000 ohm		R1156	R175	1	1	5	3
500,000 ohm		R1063	R157, R172	2	1	10	6
2 Meg.		R1065	R162,R169,R170,R173	4	2	20	12
3 Meg.		R1154	R154, R173	2	1	10	6
Resistor, wire-wound, 10W, cement coated and insulated	±10%						
3,000 ohm		R1155	R143	1	1	5	3
5,000 ohm		R1082	R142	1	1	5	3
Potentiometers, carbon, 1W, linear taper, screw-driver slot	±20%						
500 ohm	(+20%-10%)	R1502	R146	1	1	5	3
1,000 ohm		R1505	R147	1	1	5	3
5,000 ohm		R1509	R114, R138	2	1	10	6
100,000 ohm		R1520	R177	1	1	5	3
250,000 ohm		R1522	R174, R178	2	1	10	6
500,000 ohm		R1524	R124, R180	2	1	10	6
1 Meg.		R1525	R158	1	1	5	3
2 Meg.		R1527	R160, R179	2	1	10	6

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
			CAPACITORS				
Capacitor, fixed paper, oil impreg. flat type metal case							
3X.1 mfd.	±20% 600V	C1062	C102, C103, C104, C105, C106, C109, C122	7	4	18	11
2X.1 mfd.	±15% 600V	C1175	C124	1	1	3	2
2X.25 mfd.	±15% 600V	C1189	C125	1	1	3	2
Capacitor, fixed paper, oil impreg. bathtub bottom mtg. metal case							
.25 mfd.	±10% 600V	C1015	C126	1	1	3	2
Capacitor, fixed paper, oil impreg. bathtub top mtg. metal case							
3X.1 mfd.	±20% 600V	C1010	C128	1	1	3	2
Capacitor, fixed paper, oil impreg. metal case							
2X.25 mfd.	±15% 2000V	C1007	C127	1	1	3	2
Capacitor, fixed paper, oil impreg. tubular metal case							
4 mfd.	±10% 600V	C1180	C111, C112, C113, C114, C132, C133	6	3	15	9
Capacitor, fixed mica							
.01 mfd.	±10% 300V	C1202	C123, C129, C130	3	1	3	2
.001 mfd.	±10% 300V	C1061	C108	1	1	1	1

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
Capacitor, fixed mica, with lugs							
.01 mfd.	±10% 300V	C1200	C101	1	1	1	1
Capacitor, fixed mica, low loss silver mica							
.005 mfd.	±10% 2500V	C1195	C110	1	1	1	1
5 mmfd.	± 5% 500V	C1067	C115	1	1	1	1
Capacitor, fixed mica, low loss							
250 mmfd.	±10% 500V	C1058	C107	1	1	1	1
500 mmfd.	±10% 500V	C1060	C116, C117, C118, C119, C120, C121, C122	7	2	7	5
COILS AND TRANSFORMERS							
Transformer bandpass input permeability tuned	30mc ±250KC	P2-1365 P2-1248a L1075	T101-09	1	1	3	2
Transformer bandpass output permeability tuned	30mc ±250KC	P2-1364 P2-1258a L1076	T102-09	1	1	3	2
Oscillator composite permeability tuned	22.5mc ±5mc	P2-1367 L1077	Z101-09	1	1	3	2
Transformer, IF input, permeability tuned	7.5mc	P2-1363 P2-1248a L1078	Z102-06	1	1	3	2
Transformer, IF inter-stage, permeability tuned	7.5mc	Same as Z102-06	Z103-06	1	1	3	2

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
Transformer, IF output, permeability tuned	7.5mc	Same as Z102-06	Z104-06	1	1	3	2
Chokes, line, 3 pie	±10%	P2-1366 L1103	L105-6, L107-8	2	2	3	2
Choke, RF, 4 pie 2.5 mh		L1104	L103, L104	2	2	6	4
Choke filter L.V. 10-20 H at 100 ma		P1-924e T4418	L101, L102	2	2	6	4
Transformer, BTO		P1-554b T2418	T105	1	1	3	2
Transformer, Power L.V.		P2-974e T1450 L.V.	T103	1	1	3	2
Transformer, Power H.V.		P2-973d	T104	1	1	3	2
			TUBES				
6AC7		6AC7	V101, V102, V105, V108, V111, V112	6	12		18
6SA7		6SA7	V103	1	2		3
6SN7GT		6SN7GT	V106, V107, V114, V115	4	8		12
5CP1		5CP1	V116	1	3		6
9002		9002	V109, V110	2	4		6
VR150/30		VR150/30	V113	1	2		3
6X5GT		6X5GT	V117, V118	2	4		6
2x2		2x2	V119	1	2		3
6SG7		6SG7	V104	1	2		3

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
			ELECTRICAL PARTS				
RF Connector Chassis		J1004	J101	1	1	2	1
AC Connector		J1003	J102	1	1	2	1
RF Plug Straight			P201				
RF Plug (angle)		P1011	P101A	2	1	4	2
AC Plug		P1004	P102	1	1	2	1
Cable Connected to P201			W103	1	1	2	1
SOCKETS, OCTAL mica filled or ceramic		X1028	X101, X102, X103, X104, X105, X106, X107, X108, X111, X112, X113, X114, X115, X117, X118	15	8	15	8
SOCKET, MIDGET, 7 prong, ceramic wafer		X1009	X109	2	1	2	1
SOCKET, 4 prong ceramic wafer		X1004	X119	1	1	1	1
SOCKET, 14 prong moulded bakelite		X1026	X116	1	1	1	1
PILOT light assembly		V1014	E102	1	1	1	1
Switch toggle DPST		S1004	S101	1	1	1	1
Fuseholder, dual fiber		P1-230c F1009	E104	1	1	1	1
Fuseholder, bayonet type, molded bakelite		F1001	E103	2	1	2	1
Plate Cap		K1001	E123	1		1	
Fuses 2A		V1003	F101, F102	2	20	100	40

DESCRIPTION	TOLERANCE OR RATING	CONTRACTOR'S DWG. OR PART NUMBER	CIRCUIT SYMBOL DESIG.	QUANT. IN EQUIP.	QUANT. PER EQUIP. SPARE	QUANT. PER STOCK SPARES	QUANT. PER TENDER SPARES
Pilot light 6/8v 150ma.		B1007	I 101	1	2	6	4
Contact 2nd anode lead		P1-1115 K1055	E106	1	4	10	6
Cover, 2nd anode lead		W1578	E107	1	2	10	6
		MECHANICAL PARTS					
Shock mount, cabinet		G1026	A137	4	1	4	4
Shock mount, CRT		G1010	A135	3	1	3	3
Coupling, flexible		G1020	0105	3		3	2
Wrench, Allen #8		E1009	E146	1	1	2	1
Wrench, Allen #6		E1021	E147	1	1	2	1
Clips for Allen wrench		X1038	E148	2		2	
Aligning Tool		P1-1706 E1010	E145	1	1	2	1
Clamp Top pieces for 2X2		P1-168a K1002	E139	1	1	1	1
Knob screw Allen head #8		H1052	H121	2		2	

TABLE III

Color Code Charts

CAPACITY MARKING: Invariably, capacity is expressed (for coding purposes) in terms of micromicrofarads, as .00025 = 250 mmf.

The colors employed to designate these significant digits in mmf. are listed below. Note that codes are read from left to right in the position required for reading of words molded in case, or by arrow.

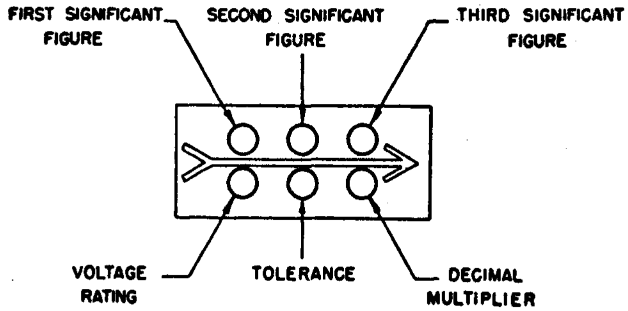
Color	Numeral	Volts	Multiplier	Tolerance
Black	0		1	
Brown	1	100	10	1%
Red	2	200	100	2%
Orange	3	300	1,000	3%
Yellow	4	400	10,000	4%
Green	5	500	100,000	5%
Blue	6	600	1,000,000	6%
Violet	7	700	10,000,000	7%
Gray	8	800	100,000,000	8%
White	9	900	1,000,000,000	9%
Gold		1000	.1	
Silver			.01	10%
No Color		500		20%

3-DOT COLOR CODE: This is used to indicate capacity (in mmf.) where the working voltage is 500 v.d.c. and the tolerance is ± 20%.

1. The first dot indicates the first significant digit of capacity.
2. The second dot indicates the second digit of capacity.
3. The third dot indicates the number of zeros which follow after the first two digits.

EXAMPLE:
Red Green Black = 25 mmf. = .000025 mfd.

6-DOT R. M. A. COLOR CODE: When it is essential to indicate three significant figures of capacity (such as 1250 mmf.), together with voltage and tolerance information, it is desirable to employ the 6-Dot Code. On units marked with six dots, the upper three dots are significant figures of capacity in mmf. multiplied by the multiplier indicated by the lower right hand dot. The remaining dots are tolerance and D.C. working voltage rating, as shown in sketch.



EXAMPLE:

Brown	Red	Green	= 1250 mmf.,
Orange	Green	Brown	300 v.d.c.w. ± 5%

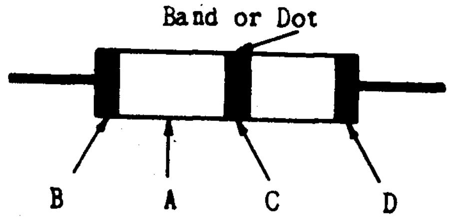
SILVER MICA IDENTIFICATION: Silver mica capacitors are molded in distinctive Red Low-loss Bakelite, precluding any possibility of confusion.

RMA COLOR CODE FOR RESISTORS

COLOR	A 1ST DIGIT	B 2ND DIGIT	C CIPHERS
Black	-	0	.0
Brown	1	1	0
Red	2	2	00
Orange	3	3	000
Yellow	4	4	0000
Green	5	5	00000
Blue	6	6	000000
Purple	7	7	0000000
Gray	8	8	00000000
White	9	9	--

D - Tolerance Code:
Gold = 5% Silver = 10% Omit = 20%

Original Color Arrangement
for
Axial Leads



New Color Arrangement
for
Axial Leads

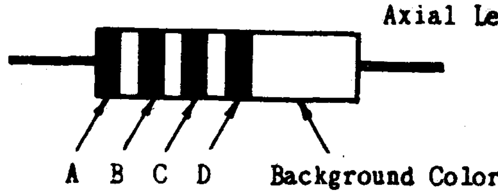


TABLE IV

Code	Key to Manufacturers Mfr. Prefix Letters	(Refer to Table I) Manufacturer	Address
1.	CPN	Panoramic Radio Corp.	242 W. 55th St., New York, N.Y.
2.	CIE	Industrial Condenser Corp.	Chicago, Ill.
3.	CAW	Aerovox Corp.	New Bedford, Mass.
4.		Lord Mfg. Co.	Erie, Pa.
5.		Alden Products Co.	Brockton, Mass.
6.		Harry Goldman	230 W. 58th St., New York, N.Y.
7.	CER	Erie Resistor Co.	Erie, Pa.
8.	CMC	Clarostat Mfg. Co.	Brooklyn, N.Y.
9.	COM	Ohmite Mfg. Co.	Chicago, Ill.
10.	CRU	R.C.A. Manufacturing Co.	Camden, N.J.
11.	CPH	American Phenolic Corp.	Chicago, Ill.
12.	CHU	Harvey Hubbell	Bridgeport, Conn.
13.		Kirz-Kasch Co.	Dayton, Ohio
14.		Dialight Corp. of America	New York, N.Y.
15.	CLF	Littlefuse Inc.	Chicago, Ill.
16.	CG	General Electric Corp.	Schenectady, N.Y.
17.		Eagle Electric Co.	Brooklyn, N.Y.
18.		A. W. Franklin Co.	New York, N.Y.
19.	CNA	National Co.	Malden, Mass.
20.		Fahnstock Electric Co.	Long Island City, N.Y.
21.	CFA	Bussman Mfg.	St. Louis, Mo.
22.	CUF	United Carr Fastener	Cambridge, Mass.
23.	CMG	Cinch Mfg. Corp.	Chicago, Ill.
24.	CEJ	E. F. Johnson Co.	Waseca, Minn.
25.	CHH	Hart & Hegeman	Bridgeport, Conn.
26.		Huntington Precision Products	Huntington, West Va.
27.	CIR	International Resistance Corp.	Philadelphia, Pa.
28.	CMR	Micamold Radio Corp.	Brooklyn, N.Y.
29.		Gudeman Co.	Chicago, Ill.
30.		Capacitrons Inc.	Chicago, Ill.
31.		Electromotive Mfg. Co.	Willimantic, Conn.
32.		J. W. Miller Products Co.	Los Angeles, Calif.
33.	CBK	Allen D. Cardwell Mfg. Co.	Brooklyn, N.Y.
34.	CSR	Russell and Stoll	125 Barclay St., New York, N.Y.

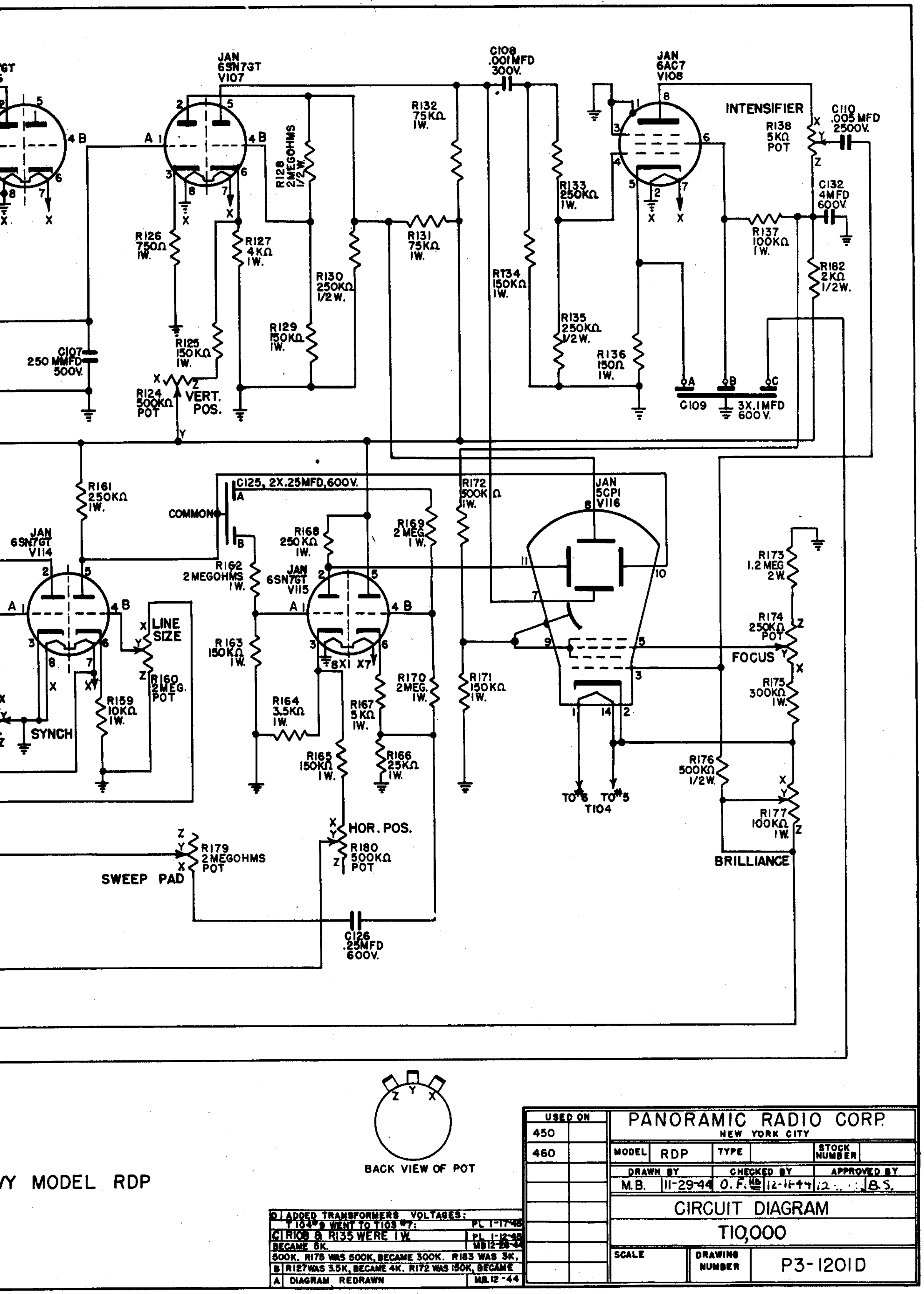
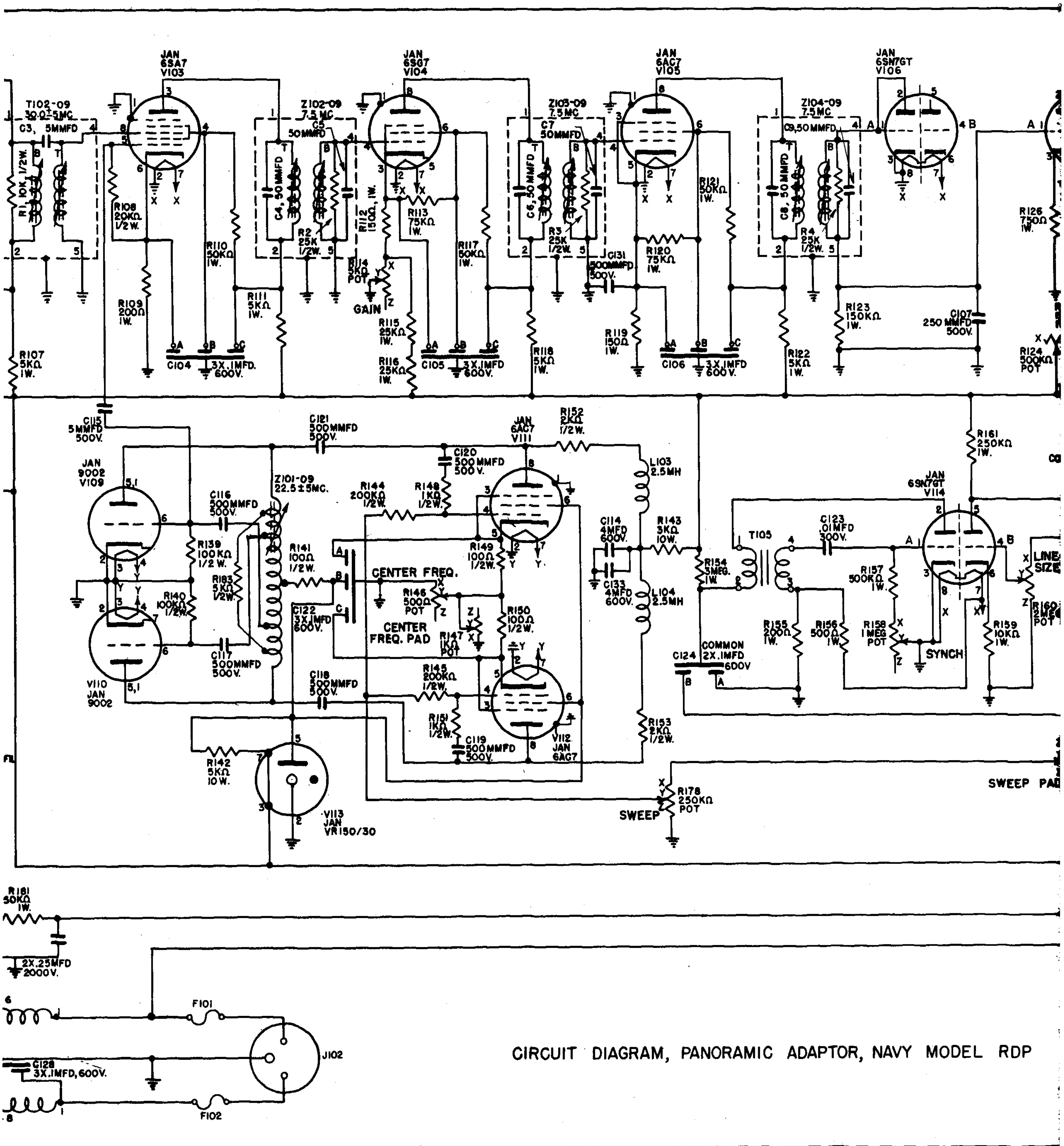
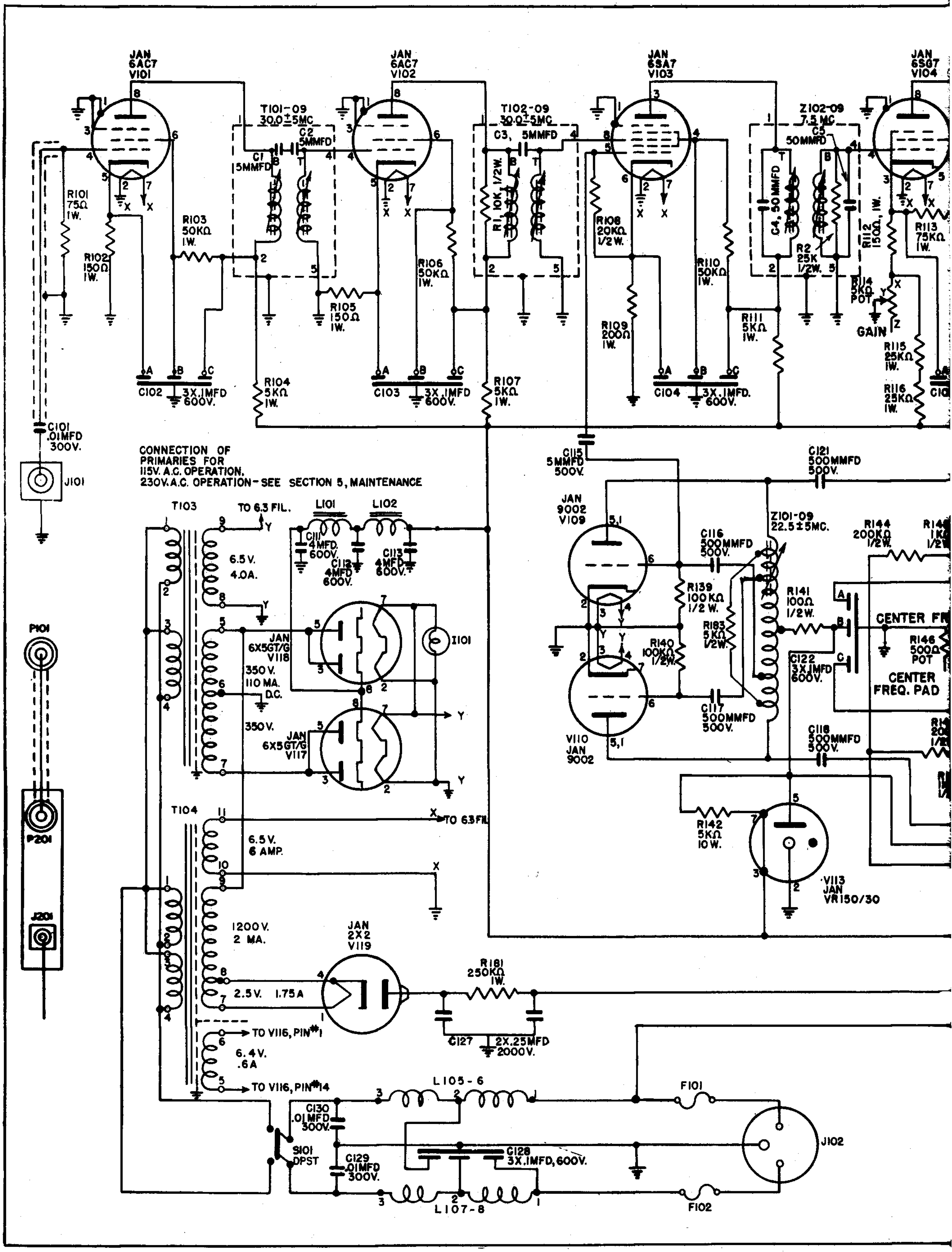


Figure 7-1. - Panoramic Adaptor, Navy Model RDP, Circuit Diagram



CIRCUIT DIAGRAM, PANORAMIC ADAPTOR, NAVY MODEL RDP


JAN 6AC7 V101
JAN 6AC7 V102
JAN 6SA7 V103
JAN 6SG7 V104
T101-09 30.0±.5MC
T102-09 30.0±.5MC
Z102-09 7.5 MC
C1 5MMFD
C2 5MMFD
C3, 5MMFD
C4, 50 MMFD
C5 50MMFD
R101 75Ω 1W.
R102 150Ω 1W.
R103 50KΩ 1W.
R104 5KΩ 1W.
R105 150Ω 1W.
R106 50KΩ 1W.
R107 5KΩ 1W.
R1, 10K, 1/2W.
R108 20KΩ 1/2W.
R109 200Ω 1W.
R110 50KΩ 1W.
R111 5KΩ 1W.
R2 25K 1/2W.
R112 150Ω, 1W.
R113 75KΩ 1W.
R114 5KΩ POT
GAIN
R115 25KΩ 1W.
R116 25KΩ 1W.
C102 3X.1MFD 600V.
C103 3X.1MFD 600V.
C104 3X.1MFD. 600V.
C101 .01MFD 300V.
J101
CONNECTION OF PRIMARIES FOR 115V. A.C. OPERATION. 230V.A.C. OPERATION-SEE SECTION 5, MAINTENANCE
T103
TO 6.3 FIL.
L101
L102
C111 4MFD. 600V.
C112 4MFD 600V.
C113 4MFD 600V.
6.5 V. 4.0A.
JAN 6X5GT/G V118
350 V. 110 MA. D.C.
350V.
JAN 6X5GT/G V117
I101
P101
P201
J201
T104
TO 6.3 FIL
6.5 V. 6 AMP.
1200 V. 2 MA.
2.5V. 1.75 A
JAN 2X2 V119
R181 250KΩ 1W.
C127 2X.25MFD 2000V.
TO V116, PIN #1
6.4 V. .6A
TO V116, PIN #14
L105-6
L107-8
C130 .01MFD 300V.
C129 .01MFD 300V.
S101 DPST
C128 3X.1MFD, 600V.
F101
F102
J102
C115 5MMFD 500V.
C121 500MMFD 500V.
JAN 9002 V109
V110 JAN 9002
C116 500MMFD 500V.
C117 500MMFD 500V.
Z101-09 22.5±.5MC.
R139 100KΩ 1/2 W.
R140 100KΩ 1/2W.
R183 5KΩ 1/2W.
R141 100Ω 1/2W.
R144 200KΩ 1/2W.
C122 3X.1MFD 600V.
CENTER FREQ. PAD
R146 500Ω POT
C118 500MMFD 500V.
R142 5KΩ 10 W.
V113 JAN VR150/30