Du Mont Telesets*

SERVICE MANUAL *for*

Model RA-102

THE DU MONT CLIFTON

ELECTRICAL CHARACTERISTICS

AVERAGE POWER RATINGS:
(Line Voltage......117 Volts AC)
Tele: *420 Watts*
FM and AM: *295 Watts*

CURRENT RATINGS:
Tele: *3.87 Amperes*
FM and AM: *2.67 Amperes*

AUDIO POWER OUTPUT:
2.5 Watts Undistorted

RF FREQUENCY RANGE:
44 to 216 MC Covering the 13 Television Channels and the FM Band.
Input Impedance: *72 Ohms.*

INTERMEDIATE FREQUENCIES:
Television Video *26.4 MC*
Television Audio *21.9 MC*
AM Tuner *456 KC*

DUMONT

First with the Finest in Television

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Printed in USA

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Passaic, N. J.

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1.0 INTRODUCTION

1.1 DESCRIPTION OF SET

The Model RA-102 receiver is a complete home entertainment unit featuring television, FM and AM reception. The set is housed in either the Clifton style cabinet, employing a 12-inch diameter cathode-ray tube (12JP4), or the Club style cabinet, employing a 15-inch diameter cathode-ray tube (15AP4). Other than the difference in the size of the cathode-ray tube the circuits are identical. The receiver incorporates 34 vacuum tubes mounted on two chassis, the main and the power supply chassis. Many features are included in the model. Such circuits as flywheel sync and the Inputuner are indicative of advance design. Continuous wide range tuning (44-216 mc) is used for both television and FM, while a separate AM channel is utilized for AM.

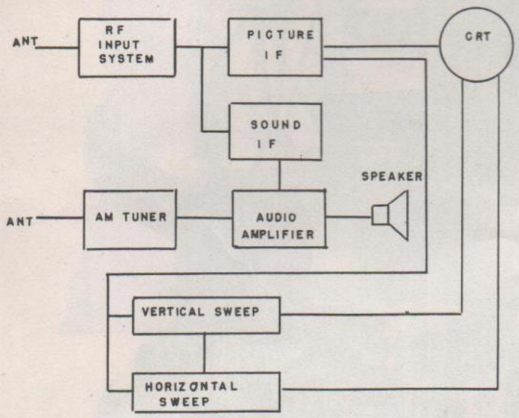


Figure 1A. Block Diagram of Main Chassis

The circuits of the RA-102 are contained on two separate chassis connected by cable. All the power supplies are contained on one chassis, while the other circuits are on the main chassis. Block diagrams of the separate chassis are shown in Figures 1a and 1b. The following tubes are used in the chassis indicated:

TABLE OF TUBE FUNCTIONS

MAIN CHASSIS

Tube Symbol	*Tube Type*	*Tube Function*
V1	6AU6	Video IF
V2	6AU6	Video IF
V3	6AU6	Video IF
V4	6AC7	Video Amplifier
V5	6AL5	D.C. restorer, time delay relay tube
V6	12JP4	Picture tube
V7	6BA6	FM Sound IF
V8	6BA6	FM Sound IF
V9	6AU6	Limiter
V10	6H6	Sound discriminator
V11	6BE6	AM converter
V12	6BA6	AM sound IF
V13	6AT6	AM detector-amplifier
V14	6V6	Audio amplifier
V15	6SN7	Sync amplifier-Sync separator
V16	6SN7	Sync clipper-Vert saw generator
V17	6SN7	Vert deflection amplifier
V18	6SN7	Sync clipper-Hor. saw generator
V19	807	Hor. deflection amplifier
V20	807	Hor. deflection amplifier
V21	6AS7	Horizontal damping
V22	6H6	Phase discriminator
V23	6K6	Oscillator
V24	6AC7	Reactance tube
V101	6J6	RF stage
V102	6AK5	Converter
V103	6J6	Oscillator
POWER SUPPLY CHASSIS		
V1	6SN7	Oscillator-H.V. regulator
V2	VR105	Regulator
V3	807	Amplifier
V4	8016	H.V. Rectifier
V5	5U4G	Rectifier
V6	5U4G	Rectifier
V7	5U4G	Rectifier

2.0 DESCRIPTION OF CIRCUITS

2.1 RF AND IF CIRCUITS

The RF stages are contained in a separate unit. Three stages are used, namely, an r-f amplifier, a mixer and an oscillator. The Inputuner continuously tunes the unit from 44 to 216 mc by inductive tuning. The r-f stage is a grounded grid, cathode-driven r-f amplifier used for matching purposes. The oscillator is a Colpitts type circuit. The coupling circuit (plate of mixer to IF stages) is designed to pass frequencies from 21.5 to 26.5 mc.

The sound IF signal is taken from the plate circuit of the mixer and impressed on the grid of V7 which is the first sound IF amplifier stage. In all, the sound IF amplifier consists of two stages, V7 and V8 both using 6BA6 tubes. After being amplified by the two stages, the modulated IF signal is fed to a single limiter stage (V9). Any amplitude modulation that might be present in the frequency modulated signal is removed by the limiting action of this tube. The signal is coupled to the discriminator by means of the discriminator transformer. The discriminator circuit is of conventional design and uses a type 6H6 tube. The plate-supply power is obtained from the 300 volt source on the power supply chassis.

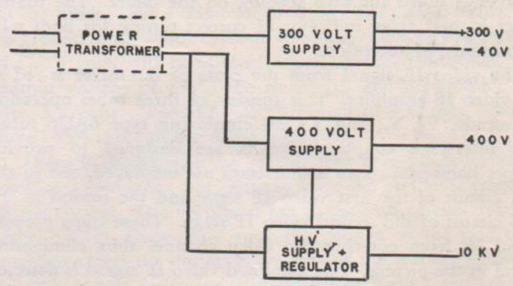


Figure 1B. Block Diagram of Power Supply Chassis

A tuning meter is connected across the discriminator load

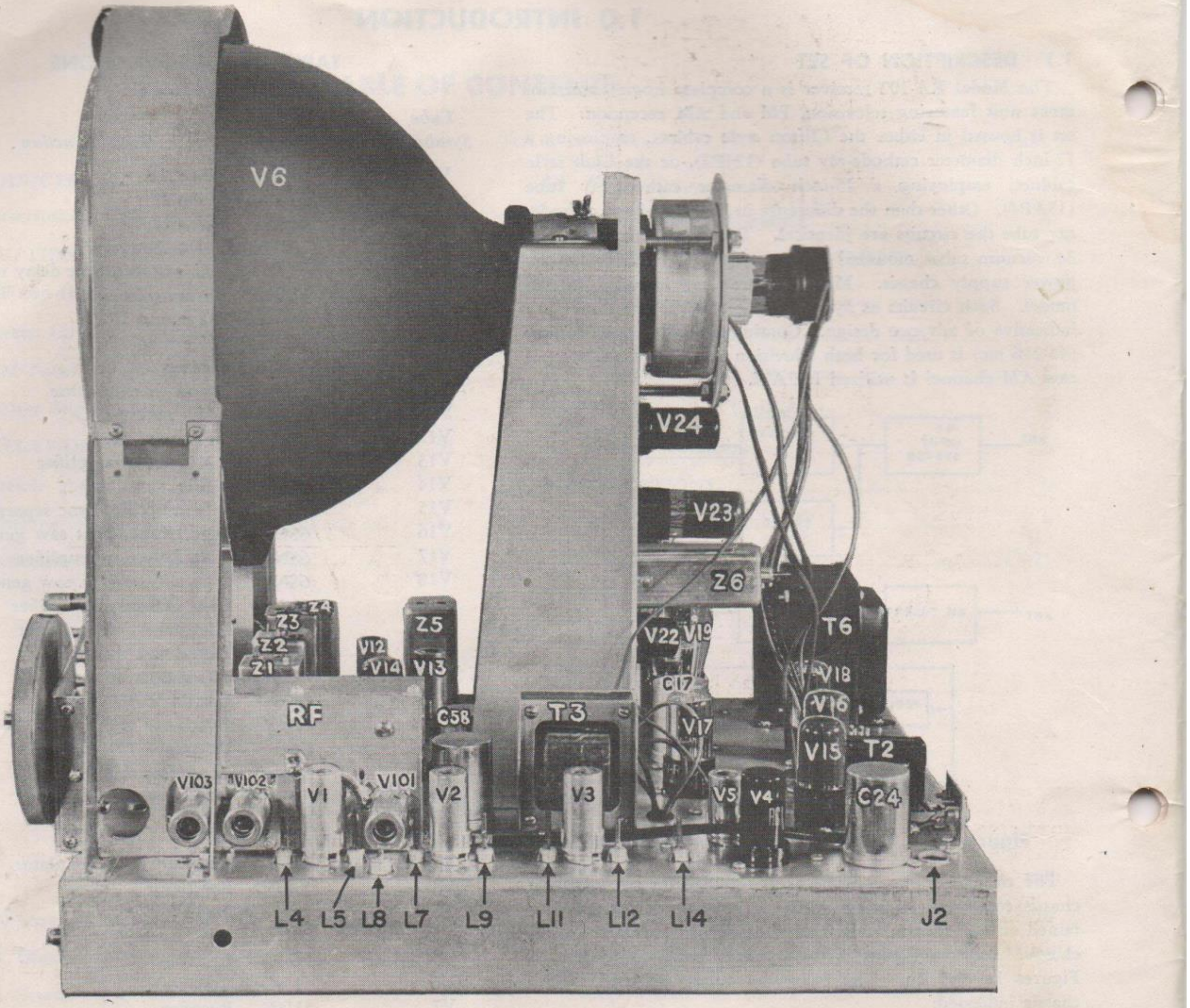


Figure 2. Main Chassis Layout (RA-102)

resistor. When a television station is being received, the receiver is tuned for zero reading on the meter. The tuning meter is used as an indicator of correct tuning for both television and FM reception.

The video IF signal from the plate of the mixer is fed to the video IF amplifier. This consists of three tubes operating in cascade, VI, V2 and V3, all employing type 6AU6 tubes. The interstage coupling circuits are designed to provide proper band-pass. Two sound traps are employed, one in the grid circuit of the first video IF stage and the second in the grid circuit of the second video IF stage. These traps prevent sound IF from entering the video channel thus eliminating sound in the picture. The amplified video IF signal is detected by a crystal rectifier circuit. The detector output, a pure video signal drives the video amplifier, a wide band amplifier using a type 6AC7 tube.

The amplified video signal is impressed on the grid of the cathode-ray tube with a d-c restoring circuit across it. The d-c restoring circuit is used to reinsert the d-c component of the video signal. It is necessary to do this, or else the video signal will not reproduce the average value of illumination on the cathode-ray tube screen. The d-c restorer uses one-half of a type 6AL5 tube designated as V5.

The gain of the video channel is controlled by varying bias on the first two video IF stages. This is accomplished by means of a potentiometer across the –40 volt d-c supply and is called the "Contrast Control." The d-c power for the video channel is supplied by the 300 volt power supply on the power supply chassis.

2.2 SWEEP CIRCUITS

The sweep circuits are used to generate deflection voltages which when applied to the cathode-ray tube will cause the electron beam to scan across the face of the tube. The sweeps must be synchronized to those at the transmitter, and for that purpose, synchronizing pulses transmitted with the video signal are used. The sync pulses are obtained from the video channel (tube V4) and are fed to the sync amplifier (V15). The second half of V15 is used as a sync separator used to separate the sync pulses from the video signal. The

Figure 3. Power Supply Chassis Layout (RA-102)

stage operates with low plate voltage and develops grid-leak bias. The bias is of sufficient amplitude to keep the tube cut-off except when sync pulses occur. The sync pulses are greater in magnitude than the video signal and cause conduction. Thus the video signal is eliminated. The pulses are passed to a clipper stage (V16) and then to an integrating circuit which is used to separate the vertical and horizontal sync pulses. The vertical pulses, being of a lower frequency, develop more voltage across the capacitors C66 and C67 than the horizontal sync pulses. A saw generator and deflection amplifier complete the vertical sweep circuit.

The horizontal sync pulses are taken from the sync separator plate, clipped by V18, and then fed to the "automatic frequency control" circuit. The object of the "AFC" circuit is to obtain pulses for synchronization that are stable in frequency and phase and not affected by extraneous disturbances. The principle used is to originate the pulses by a local oscillator, whose frequency and phase are controlled by the incoming sync pulses. The oscillator output will then be used to pulse the sweep circuits.

The oscillator used is an electron-coupled oscillator employing a 6K6 tube (V23). The oscillator is coupled to the phase discriminator (V22) by means of the discriminator transformer (Z6). The sync pulses are fed to the center tap of the phase discriminator transformer from the clipper stage (V18). With respect to the center tap, the sinusoidal oscillator output on the discriminator plates are 180 degrees out of phase. The pulse, being center fed, adds to both plates with the same polarity. When the oscillator frequency is in adjustment, the pulse rides the sine wave at the 180 degree point in its cycle. See Figure 4. During one-half of the cycle, one section of the dual diode will conduct, and during the second half of the cycle, the other section of the diode will conduct. The output voltage across the diode load will be the same in magnitude throughout the cycle, since the magnitude of the voltage on each plate is equal during each diode's conduction period. If the oscillator frequency changes, the pulse will no longer ride the mid-point of the sine wave. See Figure 4. Now the pulse voltage adds to the sine wave voltage on one plate, while it subtracts from the sine wave voltage on the other plate. Thus, during the cycle, the output d-c voltage will change. A bias of –1.5 volts is applied to the cathode circuit of the diode. Since this voltage supply has no d-c return path to ground in the diode cathode circuit, no current will flow and the –1.5 volts will be applied equally to both cathodes. The output voltage of the diode stage will add or subtract from the –1.5 volts. The –1.5 volts are used to bias the "reactance tube" V24 through the diode lead.

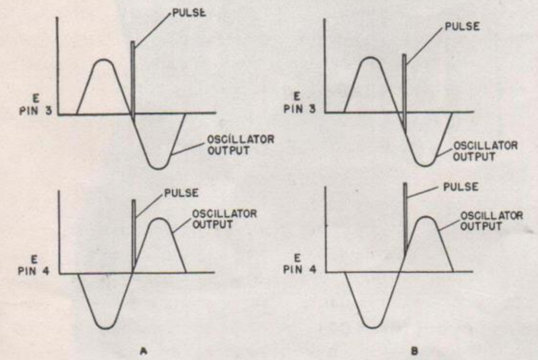
There is therefore, a d-c voltage that is constant for proper oscillator frequency, but changes when the oscillator frequency is not correct. The voltage is fed to the grid of the "reactance tube" (V24). Depending upon the voltage on the grid of the reactance tube, the output impedance of the reactance tube will be of a certain inductive value. Changes in the oscillator frequency or phase with respect to the pulse frequency will cause different values of voltage on the reactance tube grid and therefore vary the inductive output impedance of the tube.

By coupling the reactance tube across the oscillator coil, the oscillator frequency will vary in such a manner as to correct its deviation from the proper value. The oscillator is thus synchronized to the pulse frequency.

There is a filter circuit between the discriminator and the reactance tube (R128, C84 and C85). Any erratic pulses or disturbances are by-passed to ground by the filter; and therefore, will not affect the operation of the sweeps.

The oscillator output is a distorted sine wave which, when differentiated will give a pulse output. The differentiating circuit used is C91, C92, R138, R139.

The oscillator output is fed to the sawtooth generator stage, one-half of a 6SN7. It is amplified by two 807 tube amplifiers operating in parallel. (V19, V20). The horizontal damping tube, V21, is a 6AS7. It is a dual triode used to eliminate oscillations which occur from overshoot on the sawtooth voltage. The stage is connected across the output of the horizontal output transformer.



4(a) Oscillator Synchronized to Pulse Frequency — ***4(b) Oscillator Not Synchronized to Pulse Frequency***

Figure 4. Simplified AFC Diagram

2.3 AM TUNER AND AUDIO CIRCUIT

The AM tuner contains its own loop antenna. A converter, one IF stage and a detector comprise the circuit. The detector and the first or driver stage of the audio are combined in a dual purpose tube (V13). A 6V6 is then used as a power audio amplifier stage. The two audio stages may be driven from either the AM tuner or the FM sound channel. This is accomplished by means of the service selector switch.

2.4 POWER SUPPLY CIRCUITS

All the power supply circuits are contained on one chassis. Three different supplies are used, namely a 300 volt supply, a 400 volt supply and a 10 kv power supply.

The 300 and 400 volt supplies are conventional full wave supplies. The 300 volt supply develops a negative voltage of 40 volts by inserting a resistor in the load return circuit across which the negative voltage is developed.

A pulse type power supply is utilized to obtain intensifier voltages. One-half of V1 is used as a blocking oscillator. This stage is triggered by the "BTO sync" signal that is obtained from the horizontal sweep. Failure of the horizontal sweep, therefore, causes failure of the high voltage power supply. The pulses obtained from the blocking oscillator are amplified by V3 and then fed to an auto transformer. Amplification is again accomplished by transformer action (T2). Rectification is afforded by V4, a diode. Filter action is accomplished by an RC filter (R13, C8, R12 and the capacity of the high tension lead).

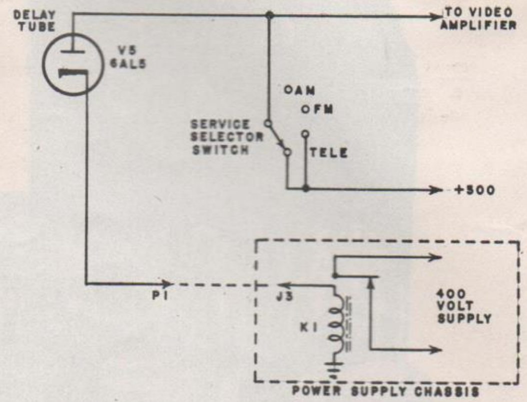


Figure 5. Simplified Delay Tube Circuit

A part of the output is obtained by voltage divider action for use in the regulator circuit. Changes in magnitude of the high voltage cause voltage changes across the regulator tube. This in turn affects the pulse amplifier, thus controlling the size of the pulses. All changes are in such a direction so as to correct the original deficiency.

Tube V5 on the main chassis, is used in conjunction with the 300 volt source. This tube, the supply delay tube serves three purposes, namely:

1. Automatic cathode-ray tube cut-off when television is not used.
2. Cathode-ray tube screen protection.
3. Prevents excessive voltage being applied to capacitors before set warms up.

The first purpose is to turn off the high voltage source when television is not used, thus inactivating the cathode-ray tube. When the service selector switch is thrown to the "Tele" position, 300 volts is applied to the diode circuit in which there is a relay K1. See Figure 5. The relay, located on the power supply chassis, must be energized to allow operation of the 400 volt source. When the selector switch is in the AM or FM position, no voltage is applied to the diode circuit, and the relay will not be energized. The 400 volt supply will not work and consequently there will be no high voltage as well as no d-c voltage for the sweep circuits. Tubes V16, V17, V18, V19 and V20 will have no d-c plate voltage, since all use the 400 volt supply, and the cathode-ray tube will have no intensifier voltage. Incidental to this is the fact that the video amplifier will not work on FM or AM because it receives its *300* volt power through the service selector switch.

The second purpose of the delay tube is screen protection. In the above discussion it was noted that relay K1 must be energized in order to have the sweep circuit and the high voltage source operate. When the set is turned on, there will be a time period before the delay tube warms up. There will be, therefore, no high voltage or d-c sweep voltage until the end of this time delay. This delay in time gives the sweep circuit tubes a chance to warm up. When the d-c voltage is applied to the sweep circuits, sweep voltage will be immediately applied to the cathode-ray tube. Simultaneously, high voltage will also be applied to the cathode-ray tube, and no spot but a raster will immediately appear. If the spot did occur for any length of time, it might damage the tube screen.

The sequence of operation is:

1. Tele switch on, diode delay tube and sweep circuit tubes heat up.
2. Diode is warm, passes current which energizes relay K1.
3. K1 allows 400 volt supply to operate.
4. 400 volts is applied to high voltage source and sweep circuits.
5. Sweep and high voltage simultaneously applied to cathode-ray tube.

No spot, but a raster appears, thus protecting tube screen from being damaged.

The delay in time serves to accomplish the third purpose of the circuit. No excessive voltages will be applied to capacitors before the tubes in the set are warmed up. The 10 kv and 400 volt supplies will be inoperative until the delay time is over as explained above.

3.0 INSTALLATION

Installations, at the present state of the television art, are of the utmost importance. Customer satisfaction will depend entirely upon a well made installation. The best teleset manufactured is not capable of improving upon the signal presented to it by its antenna. The consumer is not technically educated enough to appreciate the difficulties involved in obtaining a clean picture in our urban areas. He will judge the television industry by the picture presented to him in his home. No amount of explanations or apologies will offset the unfavorable impression created by a noisy, blurry, jumpy picture.

Remember also, that a teleset purchaser will remain a teleset owner, only as long as he is able to enjoy the entertainment provided by the art. A rejected and returned teleset will not improve a dealer's net profit. It, therefore, is important for the service or installation man to bend every effort to make a good installation when a teleset is sold, not only for his own immediate profit, but also for the good of the art as a whole. The mortality will be high among servicemen attempting to profit from television installations. The field is complex and demanding of perfection. Only those who have firmly grasped and assimilated the necessary techniques and principles, will survive the competitive era now approaching. The following installation data is not complete. To be of value to a practicing serviceman it should be amplified by study and experimentation on his part.

3.1 THE PRESALE SURVEY

When an installation is contemplated, make a complete survey before starting any permanent work. This will assure the prospective teleset owner of good reception before he buys. It will also enable the dealer to avoid a great deal of expense and trouble if conditions prove impossible at the proposed location.

To make a survey the following equipment is required.

1. A portable, sturdy television receiver.
2. A sectional mast or pole, which can be extended to 20 or 25 feet.
3. A portable antenna kit, which can be easily assembled into several simple directive arrays.
4. A set of tuned dipoles to receive each station and reject all others.
5. Lengths of co-axial and/or parallel lead-in equipped with connectors.
6. Lengths of A.C. power line, equipped with connectors.

Select a temporary position for the antenna, bearing in mind the requirements for a clean signal. Connect the antenna to the receiver and examine the resulting picture.

If the picture is satisfactory on all stations available, orient the antenna for maximum signal strength, and note the location so determined. A permanent installation may then be made.

Should the location prove to be poor, one or more picture defects will be evident. Various remedies should be applied until a clean picture results. A permanent installation can then be made. The advantages of the survey method should be self evident. Trying out different antennas and antenna positions in permanent form is not only difficult but almost impossible.

3.2 ANTENNA AND LEAD-IN

The antenna which is recommended for use with a Du Mont teleset is known as the Cosgrove Antenna. This antenna has been designed for Du Mont telesets in accordance with Du Mont specifications. It is a wide band antenna so that it picks up almost equally well all signals between 44 and 216 megacycles. The impedance of the antenna is 72 ohms and the lead-in from this antenna to the set, therefore, must be made with 72 ohm cable. Thus the antenna and lead-in system is matched to the input impedance of the receiver which is also 72 ohms. Since the input system of the Du Mont teleset is unbalanced, the inner conductor of the 72 ohm co-axial cable is connected to the input terminal and the shield is connected to ground.

3.3 REFLECTIONS

Reflections are exactly what their name implies. Any surface which is at the correct angle to the transmitting and receiving points, will provide an additional, reflected, signal path.

This reflected signal will be accepted by the receiver, and will be presented on the viewing screen, along with the direct signal. However, there will be an appreciable time and phase difference between the two signals and they will not coincide on the viewing screen.

If the reflected signal is of equal or approximately equal amplitude to the direct signal, it will affect the synchronization stability (horizontal line displacement) of the receiver and may make it impossible to attain correct sweep synchronization. If the time difference is negligible or very small, no obvious ghost will be seen. However, it will be present, and will evidence itself by blurring the outlines of whatever picture is presented on the screen. Remember also that reflection conditions may change with every change in atmospheric humidity, so that an erratic and unstable picture may result as the reflection strength changes. The usual reflection will appear on the screen as an offset, duplicate of the pattern being viewed. The amount of offset is proportional to the difference in signal path lengths.

The reflection problem can only be solved by proper selection of antennas and their orientation and directivity. The antenna must be directive enough to accept the direct signal from the desired transmitter. It must also discriminate against reflections received from different directions. It is frequently possible to achieve this result by rotating a single dipole. Usually, however, more antenna directivity must be used. This is accomplished by adding reflectors to the dipole or using a directive antenna such as the "V" or rhombic.

On occasion a complex type of ghost will be encountered due to multiple reflections. This may result in a reflection being received from the same direction as the direct signal, in which case, antenna directivity will not reduce the reflection.

The only recourse for this condition is to attenuate the composite signal, until the reflection is below the noise level. The direct signal will probably still be strong enough to be usable. If not, nothing else can be done, except to tolerate it or to add a special antenna. If it is impossible to eliminate ghosts on all stations with a single antenna, multiple antennas with a switching arrangement or a matching amplifier can be used. Each antenna should be adjusted for best response on a single station.

3.4 NOISE

Signal to noise ratio, is dependent upon both the strength of the received signal and upon the level of the local noise. If the ratio is too low the picture will be unusable. High peak pulse noise also may trigger the sweep circuits and make the picture unusable.

If the signal is weak, normal atmospheric and set noise, will be high enough in comparison to the signal, to have the same effect as a high level of local noise.

If the local noise level is high, only an extremely strong signal will overcome it. In this type of situation only by removing the source of local noise, will an acceptable picture result. Many types of apparatus will cause appreciable noise in a given locality. Electric motors, neon signs, automobiles, household appliances will all radiate interfering noises if too near the teleset antenna.

Random noise, atmospheric or set, will evidence itself as light and dark spots in the picture. From a distance, the effect resembles a snow storm.

Pulse type noises, from motors, automobiles, etc., will create streaks or "tear out" across the picture. This type of noise may also trigger the vertical sync circuits and cause the picture to skip a frame or so (roll up or down).

The noise problem may be attacked from two angles. One is to endeavor to increase the signal pickup while attenuating noise. Often this can be accomplished by using a high gain, directive antenna. Anything done to increase signal strength will raise the signal to noise ratio: shortening the lead-in, using lower loss lead-in, or elevating the antenna, are effective.

Moving the antenna out of direct noise field, even at the expense of increasing lead-in length, is often beneficial. If the signal strength is extremely low, recourse might be had to a long wire "V" or rhombic antenna.

In regard to signal strength level, remember; that beyond approximately 50 miles from the transmitter, receiving conditions will be very poor. If beyond "line of sight" from the transmitter, usually nothing much can be done to secure reliable reception, although many sets have been known to work satisfactorily with special antenna installations.

The second method of attack on the poor signal to noise ratio problem, is to eliminate noise at its source. The source of local noise should be determined and remedies applied to reduce or eliminate it. Electric motors, diathermy, neon signs, elevators, household appliances are all susceptible to proper filtering, bonding or shielding.

3.5 INTERFERENCE AND FADING

A variety of different types of signals will create visual interference on the viewing screen. Ultra short wave diathermy or harmonics of short wave diathermy apparatus will seriously interfere with good reception of the picture. The interference will appear as one or two dark bands moving slowly up or down the screen, if the signal is strong. A weak diathermy signal will appear as bands of cross hatch or herring bones, moving up and down the screen. If the diathermy is extremely strong, the sweeps will lock in on it instead of the picture. In this case a stationary type of interference will result, while the picture will move through the background.

Harmonic or image signals of different services will also affect the picture. The type of interference seen will vary as the modulation on the interfering signal varies. Usually it will consist of alternate dark and light lines, moving vertically or horizontally, changing in width, number, and speed, as the audio modulation on the interfering signal changes. An unmodulated carrier will cause a herring bone or spotty type of interference all over the screen area.

Interference caused by signals from other television and FM stations at the image frequency of the teleset, can be eliminated with wave traps. A tuned circuit, resonating to the image frequency of the interfered with television station, will usually eliminate this type of interference. The trap can be a parallel circuit placed in series with the ungrounded side of the lead-in. Or, it can be a series circuit placed across the lead-in. All traps should be located as close as possible to the antenna terminals of the teleset. Traps will not be effective, if interference is being received at the desired tele-station's frequency. In such a case, the antenna if directive, can be oriented to discriminate against the interference. Or, the combined interfering and desired signal can be attenuated until the interfering signal is too weak to cause trouble. This will, of course, be ineffective if the interference is as strong as, or stronger than the desired signal. Harmonics of lower frequency services, diathermy, and other teleset local oscillators, will cause the types of interference mentioned above.

Fading will cause the picture to become alternately stronger and weaker. As the signal becomes stronger, the picture will lose detail and contrast, and become "soft," or "mushy." When the picture signal becomes weak, the picture seen will fade into the background noise. It will also lose synchronism and either skip a vertical frame or tear out horizontally.

Fading is normally the result of wave addition and subtraction between reflections and direct signals, or, of varying propagation conditions due to reception beyond the reliable service area of a given transmitter. Nothing much can be done to eliminate this condition. Antenna gain and directivity will help. But if conditions at the receiving location are such that severe fading occurs, it usually must be tolerated.

4.0 MAINTENANCE AND ADJUSTMENTS

4.1 SAFETY PRECAUTIONS

Before attempting any sort of servicing or adjustment it is imperative that the serviceman bear in mind certain safety precautions.

HIGH VOLTAGE PRECAUTIONS

1. The high voltage applied to the accelerating electrode is *10,000* volts.
2. Always turn off the power and remove the power plug from wall receptacle before removing chassis from cabinet.
3. Always make adjustments with one hand.
4. Always turn off all power before soldering or making connections.

CATHODE-RAY TUBE PRECAUTIONS

1. Do not bump tube against hard objects.
2. Do not use tools near tube.
3. Always wear safety goggles and gloves when handling the tube.
4. Always stand the tube on its face on a thick piece of felt in a protected place if it is removed from the cabinet.
5. Always replace a tube if it becomes scratched and return it to the factory for a pressure test.

4.2 ADJUSTMENT OF CONTROLS

Normal operating procedure should be followed. See Operating Instruction Manual. If satisfactory results are not acquired, then further adjustments should be made as outlined below. If required results are still not obtained, a diagnosis should be made to locate the trouble.

A. LOCATION OF SCREWDRIVER ADJUSTMENTS

Control	*Chassis*	*Desig-nation*	*Location on Chassis*
C.R.T. Bias	Main	R35	Top—under main bracket
Vert hold	"	R91	Front—below control panel
Vert size	"	R93	Front—below control panel
Vert position	"	R98	Front—below control panel
Vert linearity	"	R97	Front—below control panel
Hor peaking	"	R107	Top—between two 807 tubes — right center from rear
Hor linearity	"	R116	Front—below control panel
Hor size	"	R106	Front—below control panel
Hor positioning	"	R121	Front—below control panel
Hor frequency	"	Z6	Top, on upright, adjustment on phase discriminator transformer
Hor phase	"	Z6	Top, on bottom of phase discriminator transformer
Voltage	Power Supply	R8	Power supply chassis — right end rear
Regulator	" "	R9	Right end forward

B. ADJUSTMENT OF CONTROLS

1. Sensitivity Control Adjustment (should not be touched except when cathode-ray tube is changed).
   a. Turn selector service knob to tele position, first position from left.
   b. Increase brightness for raster appearance.
   c. Decrease brightness until raster just fades out.
   d. Turn contrast control counterclockwise.
   e. Measure voltage on cathode of cathode-ray tube. vary brightness until 45 volts are obtained, and vary sensitivity control until raster just fades out.
2. Turn up contrast control for image and adjust focus for a clear picture.
3. If the picture it tilted, adjust the yoke on the neck of the cathode-ray tube.
4. Adjust vertical hold if necessary.
5. If horizontal frequency adjustment is necessary, the following procedure should be followed.
   a. Turn the screwdriver adjustment (horizontal frequency adjustment on phase discriminator transformer) until the test pattern comes into sync.
   b. Turn clockwise until the test pattern falls out of sync, then back off until it pulls in again. Note the position where "pull in" occurs.
   c. Continue rotating counterclockwise until the test pattern falls out of sync again. Then turn clockwise until it pulls in. Note the position of the control for this second pull in point.
   d. Set the adjustment half-way between the two "pull in" points.
6. Adjust phase control if necessary for proper blanking and sync pulse. Readjust horizontal frequency setting as described above.
7. Set the vertical linearity size and positioning controls for a good pattern.
8. Adjustment of peaking control.
   a. Set the horizontal linearity control clockwise, the horizontal size control counterclockwise and the damping control in the mid-position.
   b. Adjust the peaking control for about 5 inches on the screen. Then operate horizontal size for proper size pattern.
9. Adjust horizontal linearity and horizontal damping for a good linear pattern. The following table is given for guidance.

EFFECTS OF CONTROLS ON LINEARITY

Control	*Effect on Pattern*
Horizontal linearity:	Flattens and expands pattern on the right side
Horizontal peaking:	Flattens and expands pattern on both sides, but affects left side more
Horizontal damping:	Flattens and expands left side of pattern
Vertical linearity:	Flattens and expands top side of pattern

POWER SUPPLY ADJUSTMENTS

Normally it will not be necessary to adjust the control on the power supply chassis. If the controls are not properly set, the following symptoms will be noted. When the brightness control is turned slowly clockwise, the image will be clear until full brightness is approached, and then blurring will occur, provided the focus control has been set properly. To eliminate this effect, set the voltage control for maximum brilliance, and then set the regulator control for 10 kv output. If no meter is available, set the regulator control at its mid-point, and test again to see if the effect takes place. If it does, try another position for the regulator control. Continue this procedure until optimum results are acquired. If a meter is available for reading high voltage, be extremely careful, for the magnitude of the voltage is dangerous.

4.3 TROUBLESHOOTING PROCEDURE

Although much information can be given for diagnosing trouble in the Telesets, the information is of a general nature. The nature, location and repair of troubles must be analyzed by the repairman. This necessitates a good working knowledge of the circuits of the sets, as well as an understanding of television principles. It behooves the repairman to study Teleset circuits as well as outside information on television.

Before attempting to repair a set, a diagnosis should be made to determine in what channel or circuit there is trouble. Remember that in 99% of cases only one trouble develops at a time. It is only a waste of time and effort to indiscriminately test circuits of a set when trouble occurs. The method to follow is by use of logic and symptoms to localize the trouble before testing. When the troublesome circuit has been localized, a tube check should be made for faulty tubes. A few examples of proper reasoning are presented below.

Assume that the following trouble is evident: no picture can be obtained but sound is operating. First of all, it can be assumed that the Inputuner is operating correctly. If it weren't, the sound channel would not be operating. Turn the brightness control clockwise. If a raster appears, the sweep circuits must be working correctly. The trouble has now been localized to the video channel. Now the repairman is in a position to test the video channel.

If, when the brightness control is advanced, no raster appears, the difficulty can be in either the sweep circuits or the high voltage power supply. A failure of the horizontal sweep will cause a failure of the high voltage power supply. A failure in the vertical sweep circuit will cause a horizontal line to appear on the screen. The sweep output may be checked by means of an oscillograph. If the sweep output is correct, the trouble has been localized to the high voltage source and vice versa. Be extremely careful in making measurements on the cathode-ray tube because of the high accelerating potential. Remember, the high voltage is dangerous.

Another condition is that there is picture, but no sound. Check the action of the tuning meter. If it is operating correctly, chances are that the trouble is in the audio amplifier. If it is not, the trouble is in the sound IF channel. This assumption comes from the fact that the tuning meter operates off the sound discriminator. Again it can be assumed that the Inputuner is operating correctly since the picture is being received.

If the receiver is completely dead, (no picture, no sound) check the input power, input power cords and interlock (safety) switches. The antenna lead in cable or the Inputuner may be bad. If these checks do not reveal the trouble, the low voltage power supply outputs should be checked. In case of Inputuner difficulties (aside from bad tubes) the entire unit should be removed and sent back to the factory.

If the sound channel is operating correctly, and the picture alone is distorted, an analysis can be made by merely viewing the screen of the cathode-ray tube. Such faults as too strong a signal, too weak a signal, outside interfering signals, excessive ripple, distortion and phase shift, can all be viewed on the screen. Once recognized as specific faults, corrections can be made.

The procedure to follow then is:

1. Analyze symptoms
2. By reasoning, localize trouble to possible channels
3. By tests, locate actual channel
4. By further tests, find and correct troubles

Normal signal tracing methods of testing is recommended for the audio amplifier and the sound channel. For the video channel response curves can be checked by using a wobbulator and an oscillograph. For the sweep channel, waveforms can be viewed and checked against those given in section 4.5.

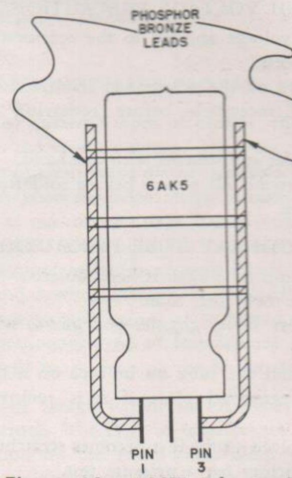


Figure 6A. 6AK5 Adapter Tube

4.4 REQUIRED TEST EQUIPMENT

VACUUM TUBE VOLTMETER—Voltmeter with ranges approximately 0 to 5 V, 0 to 10 V, 0 to 100 V, 0 to 500 V.

CATHODE-RAY OSCILLOGRAPH—Du Mont Type 208-B recommended for RF-IF alignment, and audio amplifier servicing. Du Mont Type 224-A or Type 241 for trouble-shooting sweep chassis.

SIGNAL GENERATORS

(1) FM signal Generator—This is a wobbulator-type signal generator whose center frequency ranges from 20 to 30 megacycles with a sweep width of ± 5 megacycles (adjustable). The voltage output of this generator should be 0.1 volts.

(2) RF Signal Generator—With amplitude modulation available. RF range from 20 megacycles to a minimum of 60 megacycles. The RF signal must be adjustable to within 10 kc with a calibrated attenuator on the output.

(3) Audio Signal Generator—Used for checking amplifiers.

TRAVELING DETECTOR—This is a crystal detector mounted in a probe assembly to enable IF stages to be aligned stage-by-stage. (See Figure 6b.)

6AK5 ADAPTER TUBE—See Figure 6a.

OPTIONAL TEST EQUIPMENT

VIDEO SWEEP GENERATOR—Output varies from 0 to 6 megacycles.

VOLTAGE CALIBRATOR—Du Mont Type 264-A recommended for use in measuring peak-to-peak voltages.

SQUARE WAVE GENERATOR—For servicing audio and video amplifiers.

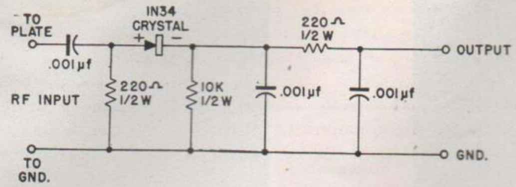


Figure 6B. Probe Detector Circuit

4.5 SWEEP WAVEFORMS

Waveforms taken at various points are given in Figure 9. All waveforms were taken with the following control settings:

Line voltage	— 115 volts a-c
Horizontal linearity	— full counterclockwise
Horizontal damping	— full clockwise
Horizontal peaking	— full clockwise
Vertical linearity	— full counterclockwise
Vertical size	— full clockwise
Horizontal size	— full counterclockwise
Vertical hold	— set to lock picture
Positioning controls	— Normal setting

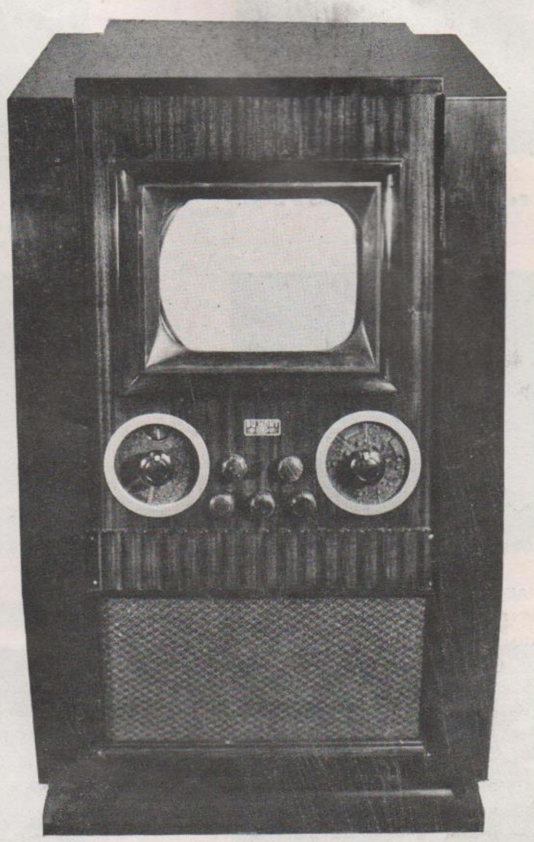
5.0 MODIFICATIONS

Changes in design have resulted in a B2 model of the RA-102. The focus control is mounted on the control panel, instead of under the panel. Listed below are the changes and their effects. See Figure 13 for the revised diagram.

Changes	*Effect*
Focus control on the front panel, additional resistor in circuit	Changes in focusing, effect contrast
300 volt supply fed directly to first video IF instead of through two resistors	Higher voltage on first IF stage
300 volts to AM tuner fed through service selector switch	AM tuner stages inoperative when FM and television used.
300 volts fed directly to video amplifier	Video amplifier stage operative at all times

6.0 CLUB MODEL

The club model circuits (RA102-B3) are identical to those of the RA102-B2 model. (Refer to Figure 13.) As in the 102 models, the set incorporates television, FM and AM reception.



Photograph of the Earlier RA-102-B1 Model (No Focus Control on Front Panel)

A 15AP4 tube is used, giving a picture of approximately 9-1/2 inches by 12-3/4 inches. A 10-inch permanent magnet type speaker is used. See back cover for photograph of Club model.

The power supply chassis is held in place by four bolts. The main chassis is bolted in place from the bottom face of the cabinet shelf. Both chassis slide out of the cabinet when the bolts are removed.

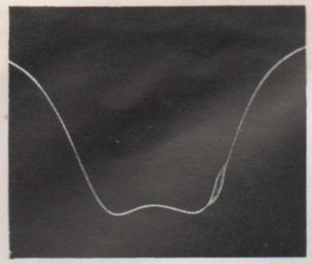


Figure 7-A
Response curve of 3rd video IF stage. Birdie at 26.4 mc.

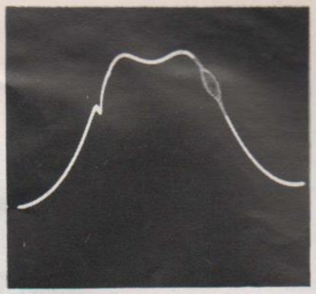


Figure 7-B
Response curve at 2nd video IF stage. Birdie at 26.4 mc.

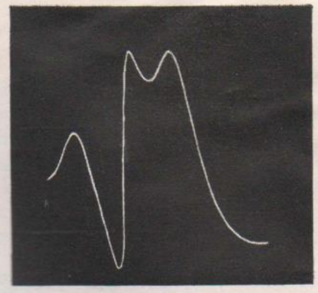


Figure 7-C
Alignment of 2nd sound trap. C11 in adjustment.

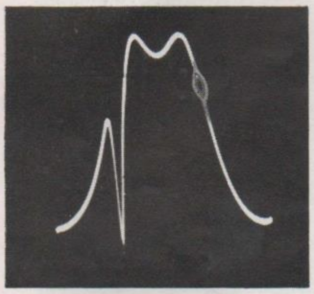


Figure 7-D
Alignment of 2nd sound trap. C11 adjusted for insufficient capacity. Birdie at 26.4 mc.

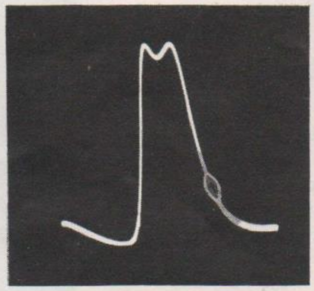


Figure 7-E
Alignment of 2nd sound trap. C11 adjusted for too much capacity.

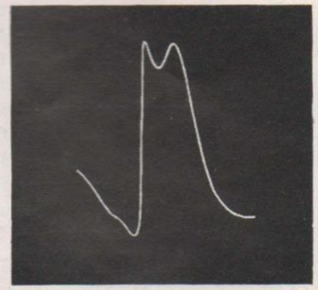


Figure 7-F
Alignment of 1st sound trap. C2 in adjustment.

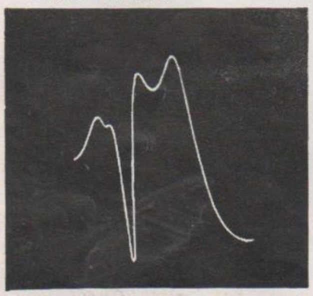


Figure 7-G
Alignment of 1st sound trap. C2 adjusted for insufficient capacity.

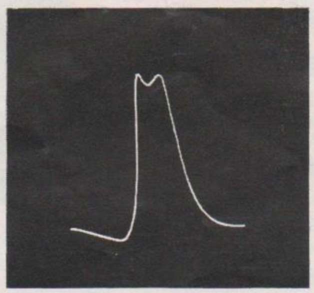


Figure 7-H
Alignment of 1st sound trap. C2 adjusted for too much capacity.

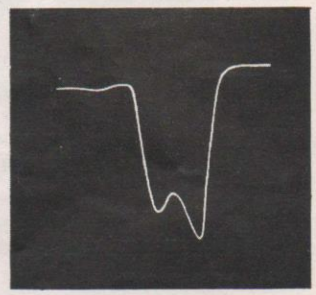


Figure 7-I
Overall video IF response curve.

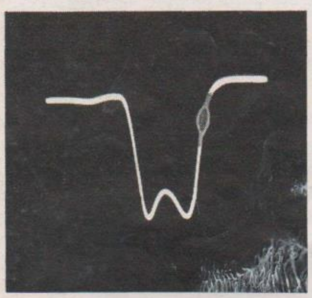


Figure 7-J
Overall video IF response curve corrected by retuning last stage. Birdie at 26.4 mc.

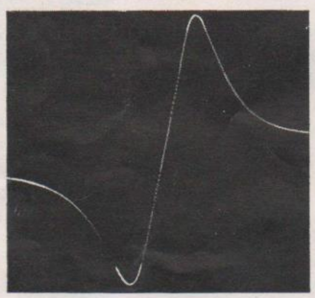


Figure 7-K
Properly aligned discriminator curve.

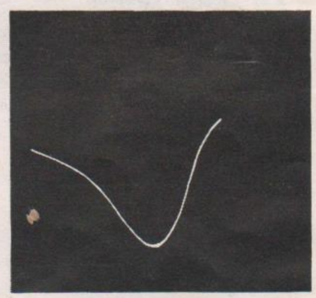


Figure 7-L
Properly aligned limiter curve.

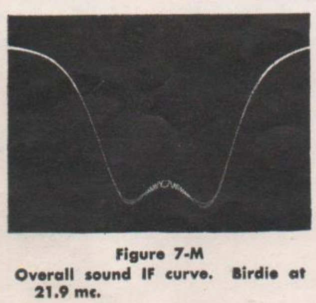


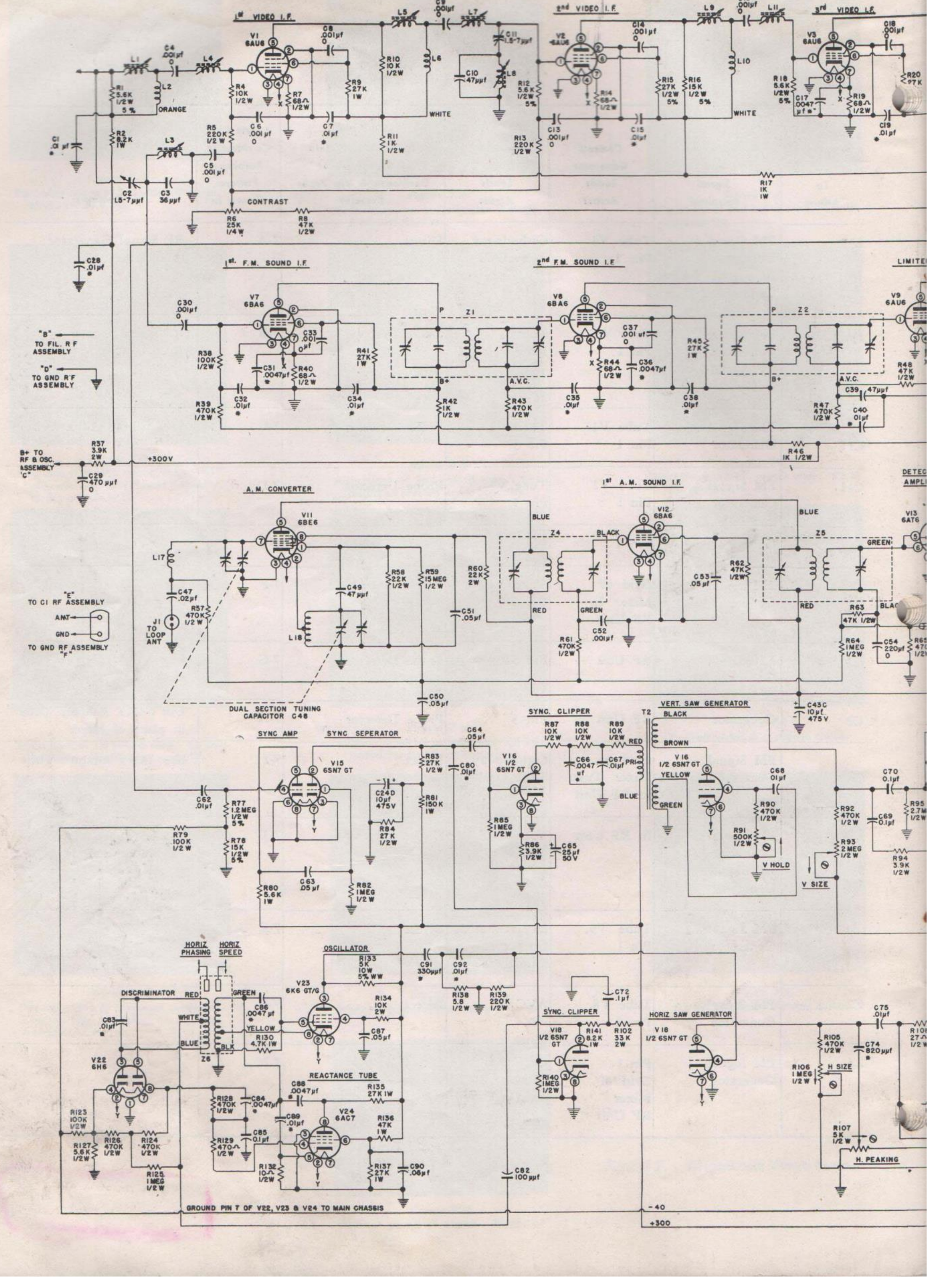
Figure 7-M
Overall sound IF curve. Birdie at 21.9 mc.

Figure 7. Alignment Wave Forms

TABLE 1

DATA FOR ALIGNMENT

To Adjust	Type of Input Signal Required	Connect Generator Leads Across	Connect Output Leads Across	Leads Directly Into Oscillograph or Oscillograph Via Probe Detector	Adjust Coils Conform to Response Pattern Shown In	Remarks
L12	FM Signal Generator RF Signal Generator	Tube V3 Pin 1	Cathode-ray Tube Grid	Direct	7-A	RF Signal Generator at 26.4 mc
L9. L11	FM Signal Generator, RF Signal Generator	Tube V2 Pin 1	Tube V3, Pin 5	Probe Detector	7-B	RF Signal Generator at 26.4 mc
L5, L7, C11	FM Signal Generator	Tube V1 Pin 1	Tube V2, Pin 5	Probe Detector	7-C	Sound Trap Adjustment
C11	FM Signal Generator	Tube V1 Pin 1	Tube V2, Pin 5	Probe Detector	7-D	
C11	Generator	Pin 1	Pin 5	Probe Detector	7-E	
C2	FM Signal Generator	Grid of Mixer In RF Unit	Tube V1 Pin 5	Probe Detector	7-F	Use 6AK5 Adapter Tube in place of Mixer
C2	FM Signal Generator	RF Unit	Pin 5	Probe Detector	7-G	Use 6AK5 Adapter Tube in place of Mixer
C2	Generator	RF Unit	Pin 5	Probe Detector	7-H	Use 6AK5 Adapter Tube in place of Mixer
	FM Signal Generator	Grid of Mixer Tube In RF Unit	Cathode-ray Tube Grid	Direct	7-I	Use 6AK5 Adapter Tube
L12 retuned	FM Signal Generator RF Signal Generator	In RF Unit	Tube Grid	Direct	7-J	Use 6AK5 Adapter Tube RF Signal Generator at 26.4 mc.
Z3	FM Signal Generator	Tube V9, Pin 1	Discriminator Output at Tele Switch	Direct	7-K	
Z2	FM Signal Generator	Tube V8, Pin 1	AVC Off Z2	Direct	7-L	
Z1	FM Signal Generator	Pin 1 Grid of Mixer RF Unit	Output at Junction R-47 and C-39	Direct	7-M	


1st VIDEO I.F.
2nd VIDEO I.F.
3rd VIDEO I.F.
V1 6AU6
V2 6AU6
V3 6AU6
CONTRAST
R6 25K 1/4 W
R8 47K 1/2W
ORANGE
WHITE
R17 1K 1W
1st F.M. SOUND I.F.
2nd F.M. SOUND I.F.
LIMITER
V7 6BA6
V8 6BA6
V9 6AU6
Z1
Z2
A.V.C.
"B" TO FIL. R F ASSEMBLY
"D" TO GND R F ASSEMBLY
B+ TO RF & OSC. ASSEMBLY "C"
R37 3.9K 2W
C29 470 μμf
+300V
R46 1K 1/2 W
A. M. CONVERTER
V11 6BE6
1st A. M. SOUND I.F.
V12 6BA6
DETECTOR AMPLIFIER
V13 6AT6
BLUE
BLACK
RED
GREEN
Z4
Z5
"E" TO C1 RF ASSEMBLY
ANT
GND
TO GND RF ASSEMBLY "F"
J1 TO LOOP ANT
L17
L18
DUAL SECTION TUNING CAPACITOR C48
C43C 10μf 475 V
SYNC AMP
SYNC SEPERATOR
V15 6SN7 GT
SYNC. CLIPPER
V16 1/2 6SN7 GT
T2
VERT. SAW GENERATOR
BROWN
YELLOW
PRI
V HOLD
V SIZE
HORIZ PHASING
HORIZ SPEED
OSCILLATOR
V23 6K6 GT/G
DISCRIMINATOR
V22 6H6
Z6
BLK
REACTANCE TUBE
V24 6AC7
SYNC. CLIPPER
V18 1/2 6SN7 GT
HORIZ SAW GENERATOR
V18 1/2 6SN7 GT
H SIZE
H. PEAKING
GROUND PIN 7 OF V22, V23 & V24 TO MAIN CHASSIS
-40
+300

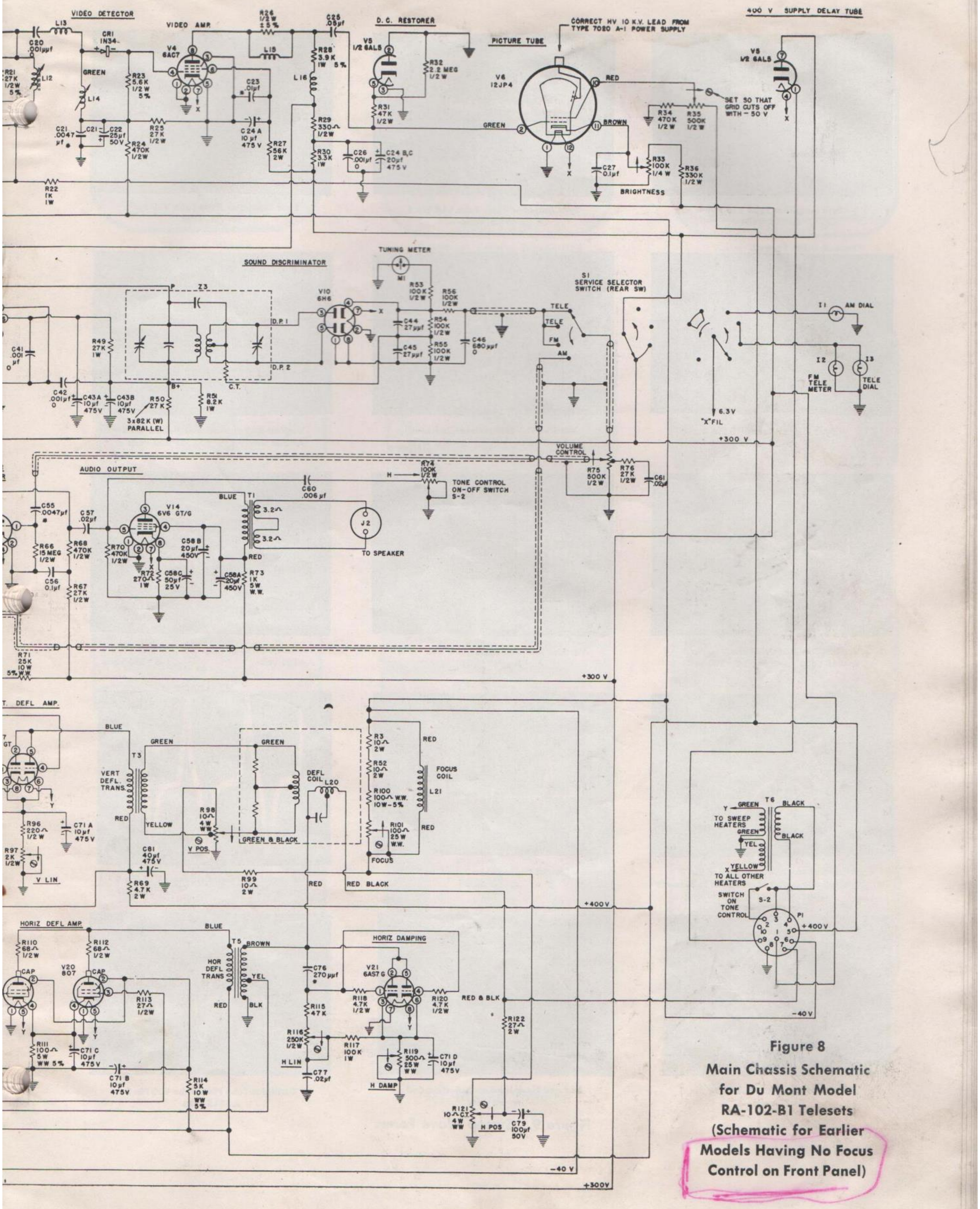
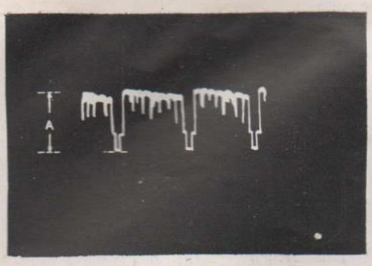
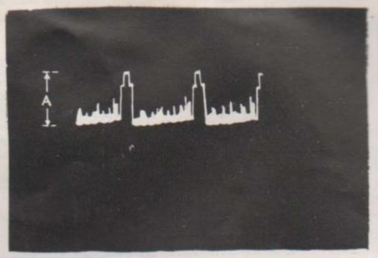


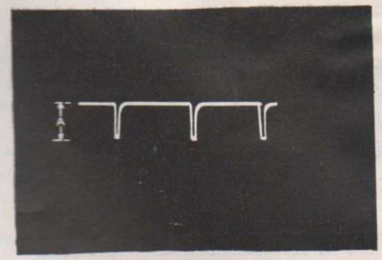
Figure 8
Main Chassis Schematic for Du Mont Model RA-102-B1 Telesets (Schematic for Earlier Models Having No Focus Control on Front Panel)



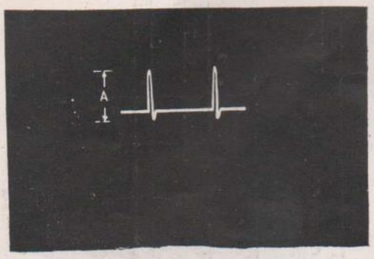
Sync Amplifier Tube V15 Pin 4
A=2.5 volts



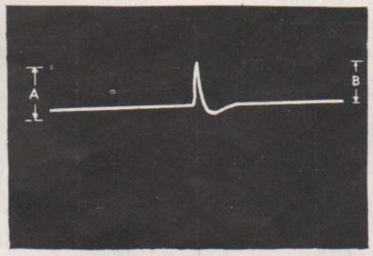
Sync Amplifier Plate Tube V15 Pin 5
A=12.5 volts



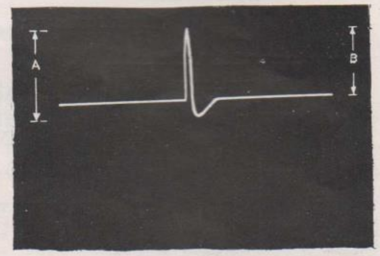
Sync Separator Plate Tube V15 Pin 2
A=7.5 volts



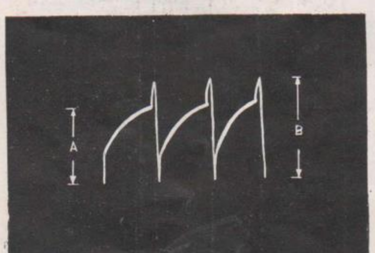
Sync Clipper Tube V16 Pin 2
A=85 volts



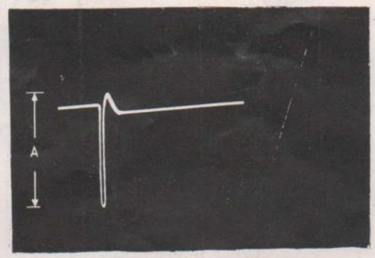
Vertical BTO Transformer Red Lead
A=140 volts B=120 volts



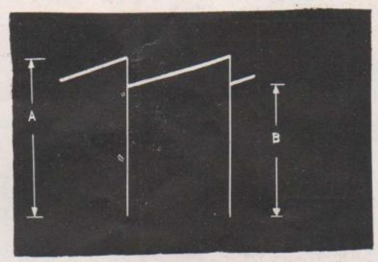
Vertical BTO Transformer Yellow Lead
A=300 volts B=260 volts



Vertical Saw Gen Grid Tube V16 Pin 4
A=245 volts B=290 volts

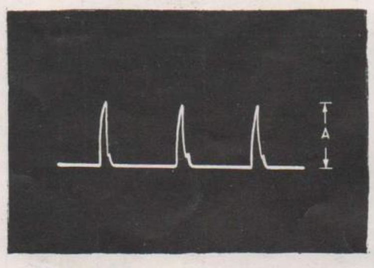


Vertical Saw Gen Plate Tube V16 Pin 5
A=325 volts

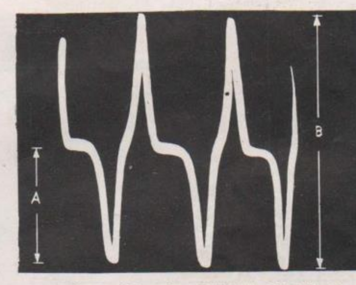


Vertical Deflection Amp Grid Tube V17 Pin 4
A=160 volts B=130 volts

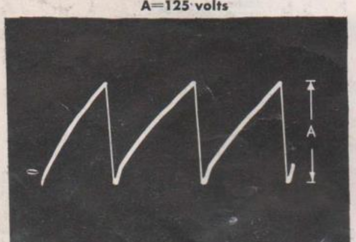
Vertical Deflection Amp Tube V17 Pin 2
Flat portion on upper part of curve due to extreme position of linearity control
A=125 volts



Horizontal Clipper Plate Tube V18 Pin 2
A=50 volts

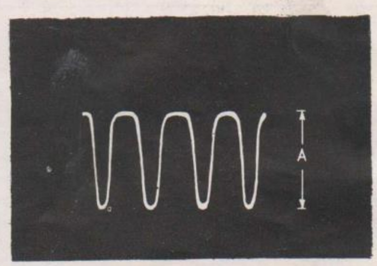


Horizontal Saw Gen Grid Tube V18 Pin 4
A=50 volts B=90 volts



Horizontal Saw Gen Plate Tube V18 Pin 5
A=50 volts

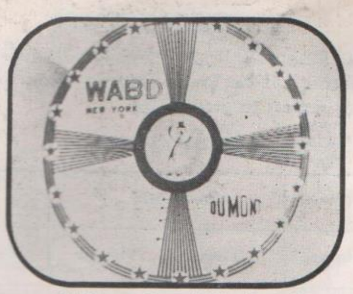
Red and Black Lead on Deflection Coil
A=25 volts



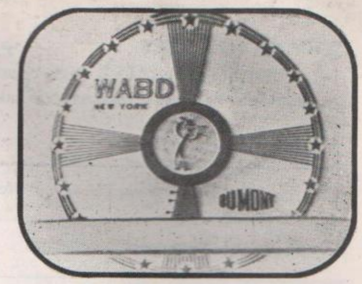
Oscillator Tube Plate Tube V23 Pin 3
A=215 volts

Figure 9. Sweep Wave Forms

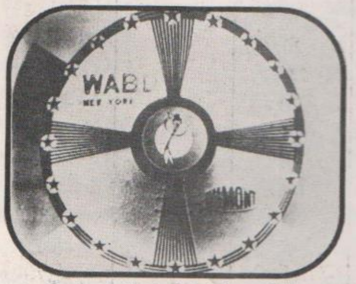
Normal Picture



Brightness Control Misadjusted



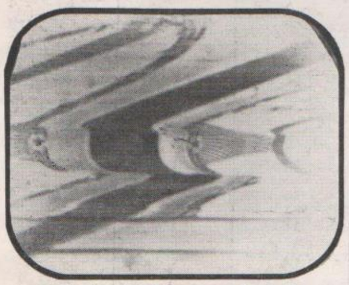
Focus Control Misadjusted*



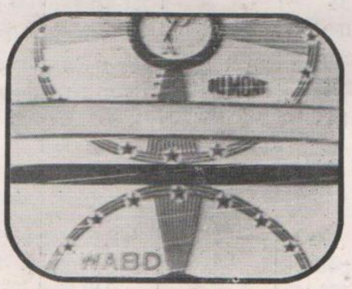
Contrast Control Set Too High

Contrast Control Set Much Too High*

Contrast Control Set Too Low

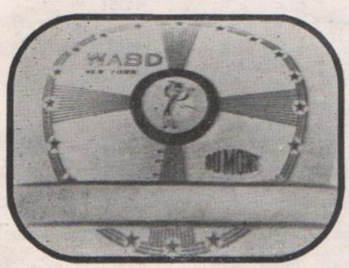


Horizontal Frequency Control Misadjusted*

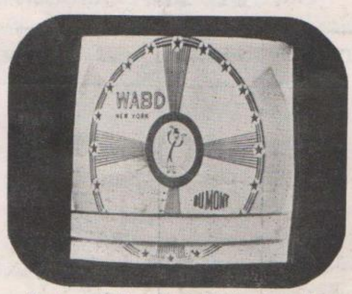


Vertical Hold Control Misadjusted*

Horizontal Linearity Control Misadjusted*



Vertical Linearity and Size Controls Misadjusted*



Horizontal Size Control Misadjusted*

Outside Interference Caused By Diathermy

* Test patterns taken with INS news tape.

Figure 10

Typical Test Patterns

TABLE 2

SOCKET VOLTAGES

All voltages are D-C with contrast control full clockwise. These voltages should be regarded as representative and not absolute. All measurements are taken with respect to ground.

MAIN CHASSIS

Stage	Tube Type	Plate		Screen Grid		Cathode		Grid	
		Pin No.	Voltage	Pin No.	Voltage	Pin No.	Voltage	Pin No.	Voltage
V1	6AU6	5	175	6	105	7	0.7	1	–1.6
V2	6AU6	5	225	6	135	7	0.7	1	–1.6
V3	6AU6	5	235	6	140	7	0.7	1	–0.2
V4	6AC7	8	250	6	160	5	0	4	–1.5
V5	6AL5	2	0			5	26		
V6	6AL5	7	280			1	250		
V7	6BA6	5	210	6	115	7	1.0	1	–0.5
V8	6BA6	5	225	6	125	7	0.9	1	–0.3
V9	6AU6	5	45	6	25	7	0	1	–1.6
V10	6H6	3	4			4	0.5		
V11	6BE6	5	100			2	0	7	–1.8
V12	6BA6	5	100	6	65	7	0	1	–3.0
V13	6AT6	7	65			2	0	1	–1.7
V14	6V6	3	250	4	250	8	5.4	5	–25.0
V15	6SN7	5	200			6	0	4	–3.4
V15	6SN7	2	33			3	0	1	–0.9
V16	6SN7	2	180			3	9.0	1	0
V16	6SN7	5	200			6	0	4	–0.7
V17	6SN7	2	265			3	14	1	–0.7
V18	6SN7	2	68			3	0	1	–1.0
V18	6SN7	5	40	2		6	0	4	–32.5
V19	807			2	270	4	14	3	–4.4
V20	807				270	4	14	3	–4.4
V21	6AS7					6	58	1	46
V22	6H6	3, 5	–24	4		4, 8	–1.4		
V23	6K6	3	190	6	220			5	–19
V24	6AC7	8	170		77	5		4	–1.2

POWER SUPPLY CHASSIS

Tube	*Pin No.*	*Voltage*
V1	1	–10 V + 23 AC
	2	250 V + 10 AC
	3	44 V + 56 AC
	4	80 V
	5	260 V
	6	100 V
V2	5	100 V
	2	0 V
V5	2	340 V
{V6, V7}	2	400 V

7.0 PARTS LIST

MAIN CHASSIS ELECTRICAL PARTS LIST DE-2183

TYPE 7019-B-1

Symbol No.	Reference Drawing or Part No.	Description
C1	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C2	3-779	Capacitor, variable; ceramic; 1.5-7 mmfd; 500 V.
C3	3-1306	Capacitor, fixed: ceramic; 36 mmfd; 300 V; ±5%
C4	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C5	3-1217	Capacitor, fixed; ceramic; .001 mfd; 300 V; ±20% Hi K
C6	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C7	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C8	3-1217	Capacitor, fixed: ceramic; .001 mfd. 300 V; ±20%; Hi K
C9	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C10	3-1312	Capacitor, fixed: ceramic; 47 mfd; 300 V; ±5%
C11	3-779	Capacitor, variable; ceramic; 1.5-7 mmfd; 500 V.
C13	3-1217	Capacitor, fixed; ceramic; .001 mfd; 300 V; ±20% Hi K
C14	3-1217	Capacitor, fixed; ceramic; .001 mfd; 300 V; ±20% Hi K
C15	CM35B103K	Capacitor,fixed: mica; .01 mfd; 300 V; ±10%
C16	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20% Hi K
C17	CM35A472K	Capacitor, fixed: mica; .0047 mfd; 500 V; ±10%
C18	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20% Hi K
C19	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C20	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20% Hi K
C21	CM35A472K	Capacitor, fixed: mica; .0047 mfd; 500 V; ±10%
C22	3-4	Capacitor, fixed: electrolytic; 25 mfd; 50 V; +150-25%
C23	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C24A	3-1164	Capacitor, fixed: electrolytic; 4 section 10+10+10+10 mfd; 475 V; +40-10%
C24B		Part of C24A
C24C		Part of C24A
C24D		Part of C24A
C25	3-151	Capacitor, fixed: paper; .05 mfd; 600 V; ±25%
C26	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C27	3-1138	Capacitor, fixed: paper; 0.1 mfd; 600 V; ±25%
C28	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C29	3-1292	Capacitor, fixed: ceramic; 470 mmfd; 300 V; ±10%; Hi K
C30	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C31	CM35A472K	Capacitor, fixed: mica; .0047 mfd; 500 V; ±10%
C32	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C33	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C34	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C35	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C36	CM35A472K	Capacitor, fixed: mica; .0047 mfd; 500 V; ±10%
C37	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20% Hi K
C38	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C39	3-1273	Capacitor, fixed: ceramic; 47 mmfd; 300 V; ±10%
C40	CM35B103K	Capacitor, fixed: mica; .01 mfd; 300 V; ±10%
C41	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C42	3-1217	Capacitor, fixed: ceramic; .001 mfd; 300 V; ±20%; Hi K
C43A	3-1164	Capacitor, fixed; electrolytic; 4 section 10+10+10+10 mfd; 475 V; +40-10%
C43B		Part of C43A
C43C		Part of C43A
C44	3-1272	Capacitor, fixed; ceramic; 27 mmfd; 300 V; ±10%
C45	3-1272	Capacitor, fixed; ceramic; 27 mmfd; 300 V; ±10%
C46	3-1275	Capacitor, fixed; ceramic; 680 mmfd; 300 V; ±10%; Hi K
C47	3-1139	Capacitor, fixed; paper; .02 mfd; 600 V; ±20%
C48	3B-11264-101	Assembly, Capacitor, Bracket, Shaft and Gear
C49	3-1273	Capacitor, fixed; ceramic; 47 mmfd; 300 V; ±10%
C50	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C51	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C52	3-1217	Capacitor, fixed; ceramic; .001 mfd; 300 V; ±20%; Hi K
C53	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C54	3-1274	Capacitor, fixed; ceramic; 220 mmfd; 300 V; ±10%; Hi K
C55	CM35A472K	Capacitor, fixed; mica; .0047 mfd; 500 V; ±10%
C56	3-1138	Capacitor, fixed; paper; 0.1 mfd; 600 V; ±25%
C57	3-1139	Capacitor, fixed; paper; .02 mfd; 600 V; ±20%
C58A	3-1204	Capacitor, fixed; electrolytic; 3 section 50+20+20 mfd; 25/450/450 V; +75-0%
C58B		Part of C58A
C58C		Part of C58A
C60	3-1322	Capacitor, fixed; paper; .006 mfd; 600 V; ±25%
C61	3-1139	Capacitor, fixed; paper; .02 mfd; 600 V; ±20%
C62	3-156	Capacitor, fixed; paper; .01 mfd; 600 V; ±25%
C63	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C64	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C65	3-4	Capacitor, fixed; electrolytic; 25 mfd; 50 V; +150-25%
C66	CM35A472K	Capacitor, fixed; mica; .0047 mfd; 500 V; ±10%
C67	3-156	Capacitor, fixed; paper; .01 mfd; 600 V; ±25%
C68	3-156	Capacitor, fixed; paper; .01 mfd; 600 V; ±25%
C69	3-1138	Capacitor, fixed; paper; 0.1 mfd; 600 V; ±25%
C70	3-1138	Capacitor, fixed; paper; 0.1 mfd; 600 V; ±25%
C71A	3-1164	Capacitor, fixed; electrolytic; 4 section 10+10+10+10 mfd; 475 V; +40-10%
C71B		Part of C71A
C71C		Part of C71A
C71D		Part of C71A
C72	3-1138	Capacitor, fixed; paper; 0.1 mfd; 600 V; ±25%
C74	CM25A821K	Capacitor, fixed; mica; 820 mmfd; 500 V; ±10%
C75	3-156	Capacitor, fixed; paper; .01 mfd; 600 V; ±25%
C76	CM20A271K	Capacitor, fixed; mica; 270 mmfd; 500 V; ±10%
C77	3-1139	Capacitor, fixed; paper; .02 mfd; 600 V; ±20%
C79	3-1156	Capacitor, fixed; electrolytic; 100 mfd; 50 V; +150-25%
C80	CM35B103K	Capacitor, fixed; mica; .01 mfd; 300 V; ±10%
C81	3-1212	Capacitor, fixed; electrolytic; 40 mfd; 475 V; +40, −10%
C82	CM20A101K	Capacitor, fixed; mica; 100 mmfd; 500 V; ±10%
C83	CM35B103K	Capacitor, fixed; mica; .01 mfd; 300 V; ±10%
C84	CM35A472K	Capacitor, fixed; mica; .0047 mfd; 500 V; ±10%
C85	3-1138	Capacitor, fixed; paper; .1 mfd; 600 V; ±25%
C86	CM35A472K	Capacitor, fixed; mica; .0047 mfd; 500 V; ±10%
C87	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C88	CM35A472K	Capacitor, fixed; mica; .0047 mfd; 500 V; ±10%
C89	CM35B103K	Capacitor, fixed; mica; .01 mfd; 300 V; ±10%
C90	3-151	Capacitor, fixed; paper; .05 mfd; 600 V; ±25%
C91	CM20B331K	Capacitor, fixed; mica; 330 mmfd; 500 V; ±10%
C92	CM35B103K	Capacitor, fixed; mica; .01 mfd; 300 V; ±10%
C93	3-4	Capacitor, fixed: electrolytic; 25 mfd; 50 V; +150%, −25%
CR1	25-1N34	Crystal Unit, rectifying

Symbol No.	Reference Drawing or Part No.	Description
I1	39-4	Lamp, incandescent: 0.25 amp; 6.3 V.
I2	39-4	Lamp, incandescent: 0.25 amp; 6.3 V.
I3	39-4	Lamp, incandescent: 0.25 amp; 6.3 V.
J1	9-333	Connector, female: 2 pin
J2	9-333	Connector, female: 2 pin
L1	21B-11026	Coil, 21.9 Mc. Video I. F.
L2	21A-11021	Coil, 21.9 Mc. Video I. F. Coupling, .95 mh.±2%
L3	21B-11024	Coil, 21.9 Mc. Video I. F. sound trap
L4	21B-11026	Coil, 21.9 Mc. Video I. F.
L5	21B-11026	Coil, 21.9 Mc. Video I. F.
L6	21A-11022	Coil, 21.9 Mc. Video I. F. Coupling, .68 mh.±2%
L7	21B-11026	Coil, 21.9 Mc. Video I. F.
L8	21B-11024	Coil, 21.9 Mc. Video I. F. Sound trap
L9	21B-11026	Coil, 21.9 Mc. Video I. F.
L10	21A-11022	Coil, 21.9 Mc. Video I. F. Coupling, 68 mh.±2%
L11	21B-11026	Coil 21.9 Mc. Video I. F.
L12	21B-11026	Coil, 21.9 Mc. Video I. F.
L13	21A-11023	Coil, 21.9 Mc. Video I. F. Coupling, 20.4 mh. ±2%
L14	21B-11025	Coil, 21.9 Mc. Video I. F.
L15	21A-11064-1	Coil, Video peaking, 170 μh., ±5%
L16	21A-11064-2	Coil, Video peaking, 184 μh., ±5%
L17	21A-11016	Assembly RF coil
L18	21A-11017	Assembly Oscillator Coil
L20	21-361	Inductor, fixed; two windings; 8 mh. horizontal; 50 mh. vertical
L21	21C-4882-102	Focus coil assembly
M1	30B-11100	Meter, tuning
P1	9-335	Connector, male: 10 pin
R1	RC21BF562J	Resistor, fixed; composition; 5600 ohm; 1/2 W; ±5%
R2	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R3	RC41BF100K	Resistor, fixed; composition; 10 ohm; 2 W; ±10%
R4	RC21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
R5	RC21BF224K	Resistor, fixed; composition; 220,000 ohm; 1/2 W; ±10%
R6	1-497	Resistor, variable; composition; 25,000 ohm; 1/4 W; ±20%
R7	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R8	RC21BF272K	Resistor, fixed; composition; 2700 ohm; 1/2 W; ±10%
R9	RC31BF273K	Resistor, fixed; composition; 27,000 ohm; 1 W; ±10%
R10	RC21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
R11	RC21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
R12	RC21BF562J	Resistor, fixed; composition; 5600 ohm; 1/2 W; ±5%
R13	RC21BF224K	Resistor, fixed; composition; 220,000 ohm; 1/2 W; ±10%
R14	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R15	RC21BF273J	Resistor, fixed; composition, 27,000 ohm; 1/2 W; ±5%
R16	RC21BF153J	Resistor, fixed; composition; 15,000 ohm; 1/2 W±5%
R17	RC31BF102K	Resistor, fixed; composition; 1000 ohm; 1 W; ±10%
R18	RC21BF562J	Resistor, fixed; composition; 5600 ohm; 1/2 W; ±5%
R19	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R20	RC31BF273K	Resistor, fixed, composition; 27,000 ohm; 1 W; ±5%
R21	RC21BF273J	Resistor, fixed; composition; 27,000 ohm; 1/2 W; ±5%
R22	RC31BF102K	Resistor, fixed; composition; 1000 ohm; 1 W; ±10%
R23	RC21BF562J	Resistor, fixed; composition; 5600 ohm; 1/2 W; ±5%
R24	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R25	RC21BF273K	Resistor, fixed; composition; 27,000 ohm; 1/2 W; ±10%
R26	RC21BF153J	Resistor, fixed; composition; 15,000 ohm; 1/2 W; ±5%
R27	RC41BF563K	Resistor, fixed; composition; 56,000 ohm; 2 W; ±10%
R28	RC31BF392J	Resistor, fixed; composition; 3900 ohm; 1 W; ±5%
R29	RC21BF331K	Resistor, fixed; composition; 330 ohm; 1/2 W; ±10%
R30	RC31BF332K	Resistor, fixed; composition; 3300 ohm; 1 W; ±10%
R31	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R32	RC21BF225K	Resistor, fixed; composition; 2.2 megohm; 1/2 W; ±10%
R33	1-498	Resistor, variable; composition; 100,000 ohm; 1/4 W; ±20%
R34	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R35	1-496	Resistor, variable; composition; 500,000 ohm; 1/2 W; ±20%
R36	RC21BF224K	Resistor, fixed; composition; 220,000 ohm; 1/2 W; ±10%
R37	RC41BF392K	Resistor, fixed; composition; 3900 ohm; 2 W; ±10%
R38	RC21BF104K	Resistor, fixed; composition; 100,000 ohm; 1/2 W; ±10%
R39	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R40	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R41	RC31BF273K	Resistor, fixed; composition; 27,000 ohm; 1 W; ±10%
R42	RC21BF102K	Resistor, fixed; composition; 1000 ohm; 1/2 W; ±10%
R43	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R44	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R45	RC31BF273K	Resistor, fixed; composition; 27,000 ohm; 1 W; ±10%
R46	RC21BF102K	Resistor, fixed; composition; 1000 ohm; 1/2 W; ±10%
R47	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R48	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R49	RC31BF273K	Resistor, fixed; composition; 27,000 ohm; 1 W; ±10%
R50*	RC30BF823K	Resistor, fixed; composition; 82,000 ohm; 1 W; ±10%
R51	RC31BF822K	Resistor, fixed; composition; 8200 ohm; 1 W; ±10%
R52	RC41BF100K	Resistor, fixed; composition; 10 ohm; 2 W; ±10%
R53	RC21BF104K	Resistor, fixed; composition; 100,000 ohm; 1/2 W; ±10%
R54	RC21BF104K	Resistor, fixed; composition; 100,000 ohm; 1/2 W; ±10%
R55	RC21BF104K	Resistor, fixed; composition; 100,000 ohm; 1/2 W; ±10%
R56	RC21BF104K	Resistor, fixed; composition; 100,000 ohm; 1/2 W; ±10%
R57	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R58	RC21BF223K	Resistor, fixed; composition; 22,000 ohm; 1/2 W; ±10%
R59	RC21BF156K	Resistor, fixed; composition; 15 megohm; 1/2 W; ±10%
R60	RC41BF225K	Resistor, fixed; composition; 22,000 ohm; 2 W; ±10%
R61	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R62	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R63	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R64	RC21BF105K	Resistor, fixed; composition; 1 megohm; 1/2 W; ±10%
R65	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R66	RC21BF156K	Resistor, fixed; composition; 15 megohm; 1/2 W; ±10%
R67	RC21BF273K	Resistor, fixed; composition; 27,000 ohm; 1/2 W; ±10%
R68	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R69	RC41BF472K	Resistor, fixed; composition; 4700 ohm; 2 W; ±10%
R70	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R71	2-8	Resistor, fixed; wire wound; 25,000 ohm; 10 W; ±5%
R72	RC31BF271K	Resistor, fixed; composition; 270 ohm; 1 W; ±10%
R73	2-1713	Resistor, fixed; wire wound; 1,000 ohm; 5 W; ±10%
R74	1-499	Resistor, variable; composition; 100,000 ohm; 1/2 W; ±20%; & SPST switch
R75	1-500	Resistor, variable composition; 500,000 ohm; 1/2 W; ±20%; C. T.
R76	RC21BF273K	Resistor, fixed; composition; 27,000 ohm; 1/2 W; ±10%
R77	RC21BF125J	Resistor, fixed; composition; 1.2 megohm; 1/2 W; ±5%
R78	RC21BF153J	Resistor, fixed; composition; 15,000 ohm; 1/2 W; ±5%
R79	RC21BF104K	Resistor, fixed; composition; 100,000 ohm; 1/2 W; ±10%
R80	RC31BF562K	Resistor, fixed; composition; 5,600 ohm; 1 W; ±10%
R81	RC31BF154K	Resistor, fixed; composition; 150,000 ohm; 1 W; ±10%
R82	RC21BF105K	Resistor, fixed; composition; 1 megohm; 1/2 W; ±10%
R83	RC21BF272K	Resistor, fixed; composition; 2700 ohm; 1/2 W; ±10%
R84	RC21BF273K	Resistor, fixed; composition; 27,000 ohm; 1/2 W; ±10%
R85	RC21BF105K	Resistor, fixed; composition; 1 megahm; 1/2 W; ±10%
R86	RC21BF392K	Resistor, fixed; composition; 3900 ohm; 1/2 W; ±10%

* Three resistors in parallel to equal 27,000 ohm.

Symbol No.	Reference Drawing or Part No.	Description
R87	RC21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
R88	RC21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
R89	RC21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
R90	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R91	1-491	Resistor, variable; composition; 500,000 ohm; 1/2 W; ±20%
R92	RC21BF474K	Resistor, fixed; composition; 470,000 1/2 W; ±10%
R93	1-492	Resistor, variable; composition; 2 megohm; 1/2 W; ±20%
R94	RC21BF392K	Resistor, fixed; composition; 3900 ohm; 1/2 W; ±10%
R95	RC21BF225K	Resistor, fixed; composition; 2.2 megohm; 1/2 W; ±10%
R96	RC21BF221K	Resistor, fixed; composition; 220 ohm; 1/2 W; ±10%
R97	1-535	Resistor, variable; composition; 2000 ohm; 1/2 W; ±20%
R98	1-493	Resistor, variable; wire wound; 10 ohm; 4 W; ±10% C. T.
R99	RC41BF100K	Resistor, fixed; composition; 10 ohm; 2 W; ±10%
R100	2-244	Resistor, fixed; wire wound; 100 ohm; 10 W; ±5%
R101	1-657	Resistor, variable; wound; 100 ohm; 25 W; ±10%
R102	RC41BF333K	Resistor, fixed; composition; 33,000 ohm; 2 W; ±10%
R105	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R106	1-489	Resistor, variable; composition; 1 megohm; 1/2 W; ±20%
R107	1-474	Resistor, variable; composition; 5000 ohm; 1/2 W; ±20%
R108	RC21BF270K	Resistor, fixed; composition; 27 ohm; 1/2 W; ±10%
R109	RC21BF224K	Resistor, fixed; composition; 220,000 ohm; 1/2 W; ±10%
R110	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R111	2-944	Resistor, fixed; wire wound; 100 ohm; 5 W; ±5%
R112	RC21BF680K	Resistor, fixed; composition; 68 ohm; 1/2 W; ±10%
R113	RC21BF270K	Resistor, fixed; composition; 27 ohm; 1/2 W; ±10%
R114	2-13	Resistor, fixed; wire wound; 5000 ohm; 10 W; ±5%
R115	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R116	1-488	Resistor, variable; composition; 250,000 ohm; 1/2 W; ±20%
R117	RC31BF104K	Resistor, fixer; composition; 100,000 ohm: 1 W; ±10%
R118	RC21BF472K	Resistor, fixed; composition; 4700 ohm; 1/2 W; ±10%
R119	1-470	Resistor, variable; wire wound; 500 ohm; 25 W; ±10%
R120	RC21BF472K	Resistor, fixed; composition; 4700 ohm; 1/2 W; ±10%
R121	1-493	Resistor, variable; wire wound; 10 ohm;; 4 W; ±10%; C. T.
R122	RC41BF270K	Resistor, fixed; composition; 27 ohm; 2 W; ±10%
R123	RC21BF473K	Resistor, fixed; composition; 47,000 ohm; 1/2 W; ±10%
R124	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R125	RC21BF105K	Resistor, fixed; composition; 1 megohm; 1/2 W; ±10%
R126	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R127	RC21BF562K	Resistor, fixed; composition; 5,600 ohm; 1/2 W; ±10%
R128	RC21BF474K	Resistor, fixed; composition; 470,000 ohm; 1/2 W; ±10%
R129	RC21BF471K	Resistor, fixed; composition; 470 ohm; 1/2 W; ±10%
R130	RC31BF473K	Resistor, fixed; composition; 47,000 ohm; 1 W; ±10%
R132	RC21BF100K	Resistor, fixed; composition; 10 ohm; 1/2 W; ±10%
R133	2-13	Resistor, fixed; wire wound; 5,000 ohm; 10 W; ±5%
R134	RC41BF103K	Resistor, fixed; composition; 10,000 ohm; 2 W; ±10%
R135	RC31BF273K	Resistor, fixed; composition; 27,000 1 W; ±10%
R136	RC31BF473K	Resistor, fixed; composition; 47,000 ohm; 1 W; ±10%
R137	RC31BF273K	Resistor, fixed; composition; 27,000 ohm; 1 W; ±10%
R138	RC21BF682K	Resistor, fixed; composition; 6,800 ohm; 1/2 W; ±10%
R139	RC21BF224K	Resistor, fixed; composition; 220,000 ohm; 1/2 W; ±10%
R140	RC21BF105K	Resistor, fixed; composition; 1 megohm; 1/2 W; ±10%
R141	RC31BF822K	Resistor, fixed; composition; 8,200 ohm; 1 W; ±10%
R142	2-1741	Resistor, fixed; wire wound; 30 ohm; 10 W; ±5%
R143	1-673	Resistor, variable; composition; 50,000 ohm; 1/2 W; ±20%
S1	5-207	Service Selector Switch per dwg. BX-608
S2		Part of R74
T1	20B-11063	Transformer, speaker output
T2	20D-4901	Transformer, vertical block tube oscillator
T3	20-359	Transformer, sweep
T5	20D-4706	Transformer, horizontal sweep output (formerly 20-345)
T6	20C-4932	Transformer, filament
V1	25-6AU6	Tube, electron; type 6AU6
V2	25-6AU6	Tube, electron; type 6AU6
V3	25-6AU6	Tube, electron; type 6AU6
V4	25-6AC7	Tube, electron; type 6AC7
V5	25-6AL5	Tube, electron; type 6AL5
V6	25-12JP4	Tube, electron; type 12JP4, Cathode-ray Tube
V6	25-15AP4	Tube, electron; type 15AP4 Cathode-ray Tube
V7	25-6BA6	Tube, electron; type 6BA6
V8	25-6BA6	Tube, electron; type 6BA6
V9	25-6AU6	Tube, electron; type 6AU6
V10	25-6H6	Tube, electron; type 6H6
V11	25-6BE6	Tube, electron; type 6BE6
V12	25-6BA6	Tube, electron; type 6BA6
V13	25-6AT6	Tube, electron; type 6AT6
V14	25-6V6T/G	Tube, electron; type 6V6GT/G
V15	25-6SN7GT	Tube, electron; type 6SN7GT
V16	25-6SN7GT	Tube, electron; type 6SN7GT
V17	25-6SN7GT	Tube, electron; type 6SN7GT
V18	25-6SN7GT	Tube, electron; type 6SN7GT
V19	25-807	Tube, electron; type 807
V20	25-807	Tube, electron; type 807
V21	25-6AS7G	Tube, electron; type 6AS7G
V22	25-6H6	Tube, electron; type 6H6
V23	25-6K6GT/G	Tube, electron; type 6K6GT/G
V24	25-6AC7	Tube, electron; type 6AC7
Z1	20C-4918	Transformer, 21.9 Mc. Sound I.F.
Z2	20C-4918	Transformer, 21.9 Mc. Sound I.F.
Z3	20C-4943	Transformer, 21.9 Mc. Sound I.F. Discriminator
Z4	20-356	Transformer, I.F. 455 K.C.
Z5	20-355	Transformer, I.F. 455 K.C.
Z6	20C-12197	Transformer, Oscillator

POWER SUPPLY CHASSIS

Symbol No.	Reference Drawing or Part No.	Description
C1	CM20A101K	Capacitor, fixed: mica; 100 mmfd; 500 V; ±10%
C2	3-1217	Capacitor, fixed: ceramic; 1000 mmfd; 300 V; ±20% Hi K
C3	CM20A471K	Capacitor, fixed: mica; 470 mmfd; 500 V; ±10%
C4	3-151	Capacitor, fixed: paper; .05 mfd; 600 V; ±25%
C5		Same as C3
C6		Same as C3
C7	3-219	Capacitor, fixed; paper; 0.5 mfd; 200 V; ±25%
C8	3-1155	Capacitor, fixed; ceramic; 500 mmfd. min; 10 K. V. Hi K
C9	3-1139	Capacitor,fixed: paper; .02 mfd; 600 V; ±20%
C10	3-1139	Capacitor, fixed; paper; .02 mfd; 600 V; ±20%
C11	3-1201	Capacitor, fixed: paper; 10 mfd; 600 V; +20, −10%
C12A	3-1162	Capacitor, fixed: electrolytic; 2 section; 40+40 mfd; 475 V; +40, −10%
C12B		Part of C12A
C13	3-1166	Capacitor, fixed: electrolytic; 500 mfd; 50 V; +40, −10%
C14	3-1212	Capacitor, fixed: electrolytic; 40 mfd; 475 V; +40, −10%
F1	11-54	Fuse, cartridge; 8 amps.; 250 V
I4	39-4	Lamp, incandescent: 0.25 amp; 6.3V.
J3	51B-4957	Cable, power: 10 wire
K1	5-206	Relay, SPST
L1	21C-4990	Choke, 12 hy.; 200 ma.; 300 ohm
L2	21C-4991	Choke, 8 hy.; 275 ma; 80 ohm
P2	46-108	Power Cable Asembly
R1	RC21BF473K	Resistor, fixed: composition; 47,000 ohms; 1/2 W; ±10%
R2	RC41BF154K	Resistor, fixed; composition; 150,000 ohm; 2 W; ±10%
R3	RC21BF103K	Resistor, fixed: composition; 10,000 ohm; 1/2 W; ±10%
R4	2-150	Resistor, fixed: wire wound; 15,000 ohm; 10 W; ±5%
R5	RC41BF473K	Resistor, fixed: composition; 47,000 ohm; 2 W; ±10%
R6	RC21BF105K	Resistor, fixed: composition; 1.0 megohm; 1/2 W; ±10%
R7	RC21BF273K	Resistor, fixed: composition; 27,000 ohm; 1/2 W; ±10%
R8	1-480	Resistor, variable: composition; 200,-000 ohm; 1/2 W; ±20%

Symbol No.	Reference Drawing or Part No.	Description
R10*	RC41BF156K	Resistor; fixed: composition; 15 megohm: 2 W; ±10%
R11	RC41BF151K	Resistor, fixed: composition; 150 ohm; 2 W; ±10%
R12	RC31BF473K	Resistor, fixed: composition; 47,000 ohm; 1 W; ±10%
R13	RC31BF473K	Resistor, fixed: composition; 47,000 ohm; 1 W; ±10%
R14	RC41BF333K	Resistor, fixed: composition; 33,000 ohm; 2 W; ±10%
S3	5-51	Switch, push: SPST
T1	20-46	Transformer; Blocking Tube Oscillator per Dwg. B-11095
T2	21B-12446	Coil, Inductor, pulse type H. V. Power Supply
T3	20D-11204	Transformer, Plate and Filament
V1	25-6SN7GT	Tube, electron; type 6SN7GT
V2	25-OC3/VR105	Tube, electron; type OC3/VR105
V3	25-807	Tube, electron; type 807
V4	25-8016	Tube, electron; type 8016
V5	25-5U4G	Tube, electron; type 5U4G
V6	25-5U4G	Tube, electron; type 5U4G
V7	25-5U4G	Tube, electron; type 5U4G

*12—15 meg. 2 W resistors in series to equal total of 180 meg.

RF ASSEMBLY

Symbol No.	Reference Drawing or Part No.	Description
C101	CM20C471K	Capacitor, fixed; mica; 470 mmfd; 500 V; ±10%
C102	3-1292	Capacitor, fixed; ceramic; 470 mmfd; 350 V; ±10%
C103	3-1292	Capacitor, fixed; ceramic; 470 mmfd; 350 V; ±10%
C104	3-1205	Capacitor, fixed; ceramic; 15 mmfd; 500 V; ±10%; NPO
C105	3-307	Capacitor, variable; ceramic; 4-30 mmfd; N500*
C106	3-307	Capacitor, variable; ceramic; 4-30 mmfd; N500*
C107	3A-12739	Capacitor, variable; air; approx. 20 mmfd*
C108	3-1205	Capacitor, fixed; ceramic; 15 mmfd; 500 V; ±10%; NPO
C109	3-1292	Capacitor, fixed; ceramic; 470 mmfd; 350 V; ±10%
C110	3-1292	Capacitor, fixed; ceramic; 470 mmfd; 350 V; ±10%
C111	3-307	Capacitor, variable; ceramic; 4-30 mmfd; N500
C112	2-1215	Capacitor, fixed; ceramic; 1.0 mmfd; 500 V; ±20%

*3B-12740-101 Assembly, Capacitor Group

Symbol No.	Reference Drawing or Part No.	Description
C113	CM20C471K	Capacitor, fixed; mica; 470 mmfd; 500 V; ±10%
C114	3-1323	Capacitor, fixed; ceramic; 5 mmfd; ±0.5 mmfd; N030
C115	CM20C471K	Capacitor, fixed, mica; 470 mmfd; 500 V; ±10%
C116	3-1292	Capacitor, fixed; ceramic; 470 mmfd; 350 V; ±10%
C111	3-307A	Capacitor, variable; ceramic; 4-30 mmfd; 500 V; N500
L101	21A-12080	Inductor, End—Band Pass Filter Input
L102A	21-357	Inductor, variable; 3 gang Mallory Inductuner
L102B		Part of L102A
L102C		Part of L102A
L103	21A-11281	Coil. Shunt
L104	21A-12081	Inductor, End—Band Pass Filter Output
L105	21A-12082	Inductor, End—Oscillator
L106	21A-12453	Coil, Antenna
R101	2-957	Resistor, fixed; composition; 200 ohm; 1/2 W; ±5%
R102	2-943	Resistor, fixed; composition, 10,0000 ohm; 2 W; ±10%
R103		Omitted
R104	2-956	Resistor, fixed; composition; 12,000 ohm; 1/2 W; ±10%
R105	2-1208	Resistor, fixed; composition; 1 megohm; 1/2 W; ±10%
R106	RC21BF470 K	Resistor, fixed; composition; 47 ohm; 1/2 W; ±10%
R107	2-1202	Resistor, fixed; composition; 330,000 ohm; 1/2 W; ±10%
R108	2-943	Resistor, fixed; composition; 10,000 ohm; 2 W; ±10%
R109	2-956	Resistor, fixed; composition; 12,000 ohm; 1/2 W; ±10%
R110	2-956	Resistor, fixed; composition; 12,000 ohm; 1/2 W; ±10%
R111	2-1025	Resistor, fixed; composiiton; 110 ohm; 1/2 W; ±5%
V101	25-6J6	Tube, electron; type 6J6
V102	25-6AK5	Tube, electron; type 6AK5
V103	25-6J6	Tube, electron; type 6J6

SPEAKER ASSEMBLY

Symbol No.	Reference Drawing or Part No.	Description
P3	9-369	Connector, male; 2 pin
L51	53-8	Speaker, magnetic 10" dia. cone, per Dwg. D-11190

MECHANICAL PARTS FOR RA-102-B1, B2, B3

CLUB CABINET PARTS

Drawing or Part No.	Description
31D-12251-101	Control panel enclosure assembly (mahogany cabinet)
31D-12754-101	Control panel enclosure assembly (gray cabinet)
30D-11842	Rubber mask
29-49	1/4 x 11-1/8 x 14-3/8 safety glass
15B-1232-101	Assembly window dial
15A12331-1	Tone—off-on knob
15A12331-2	Volume knob
15A12331-3	Contrast knob
15A12331-4	Brightness knob
15A12331-5	Focus knob
15A12333	AM dial knob
15A12334	Selector knob
15B12335-101	Tele dial knob
12A11319	Pilot light lens
16-55	1/4" cable clamp
31B-11906	Bottom cover for P. S. chassis
31A-12260	CRT mask clamp
7-11	Escutcheon pin
31A-12583	Hold-down bracket for main chassis
32B11189-102	Loop antenna
31A12483	Pilot light bracket
31A11164-1	Hold-down bracket for P.S. chassis
31A12484	Wood assembly cleat to hold rear of main chassis down

INDICATOR (RECEIVER) CHASSIS PARTS

Drawing or Part No.	Description
30D-11056	12" rubber mask
31B-12300	Control pot bracket with focus pot
30D-1142	15" rubber mask for club set
31B-12312	Linearity and size pots. strip for mounting
31A-11089	Mounting bracket for above
31C-11096	Support, CRT outer vertical
31A-11112	Bracket for mounting L-1
31A-11087	Antenna bracket
16-244	Antenna terminal
31C-12275-101	Vertical chassis and support for neck of CRT
4-90	7 pin min. tube socket
26-53	7 pin min. tube base shield
26-52	7 pin min. tube shield
31C-11107	Bottom cover
4-29	5 pin tube socket
4-59	Octal tube socket
9-363	Male speaker plug
34A-4995-1	2 foot (approx.) metal extension for pot.
34A-4995-2	2 foot (approx.) Bakelite extension for pot.
30-122	Coupling for above
16-55	Cable clamp
31-296	Deflection yoke bracket
6-238	3/8 x 3/4 stand off
1-269	1 terminal dummy lug (L hand).
16-268	1 terminal dummy lug (R hand).
16-267	2 terminal dummy lug.
16-296	3 terminal dummy lug (R hand)
16-276	3 terminal dummy lug (L hand)
16-316	1 terminal dummy lug (L hand).
16-302	1 terminal dummy lug (L hand).
16-300	2 terminal dummy lug.
33C-12302-1	Pot cables for CRT controls
12-58	Dial light socket
26-54	Shield for dial light
20A-11046-3	Rubber cushion for CRT
16C-11705-101	CRT strap lower } (for 15" tube)
16C-11701	CRT strap upper } (for 15" tube)
30C11132-101	CRT strap lower } (for 12" tube)
30C-11123	CRT strap upper } (for 12" tube)

AM TUNER PARTS

(All Items Fit Both Clifton and Club Models Except Where Noted)

Drawing or Part No.	Description
3B-11264	Assembly tuning cap bracket, shaft and gear
26A-11229	•Light shield for tuning meter
26A-11699	†Light shield for tuning meter
31A-11228	•Light support for AM tuner
13-4	Bushing spacer
31B-11707	†Bracket assembly

Drawing or Part No.	*Description*
31B-11226	*Bracket assembly
30C-11178	††Assembly pan and bracket
15B-11200	Assembly dial and hub

* Clifton only.
† Club Model only.
†† This may be broken down into 30B-11073 pan and 31A-11113 bracket

RF SECTION PARTS

15B-11183	Vernier television dial
15B-11182	Main television dial
15C-11192	Pan and bracket assembly for television dial
34A-4866	Pinion gear—this gear is fastened to the tuner shaft and drives ———
34A-4884	Idler gear and bracket assembly which drives
34A-4663	Anti-back lash gear which fastens to the shaft of the slow television dial

CLIFTON CABINET PARTS

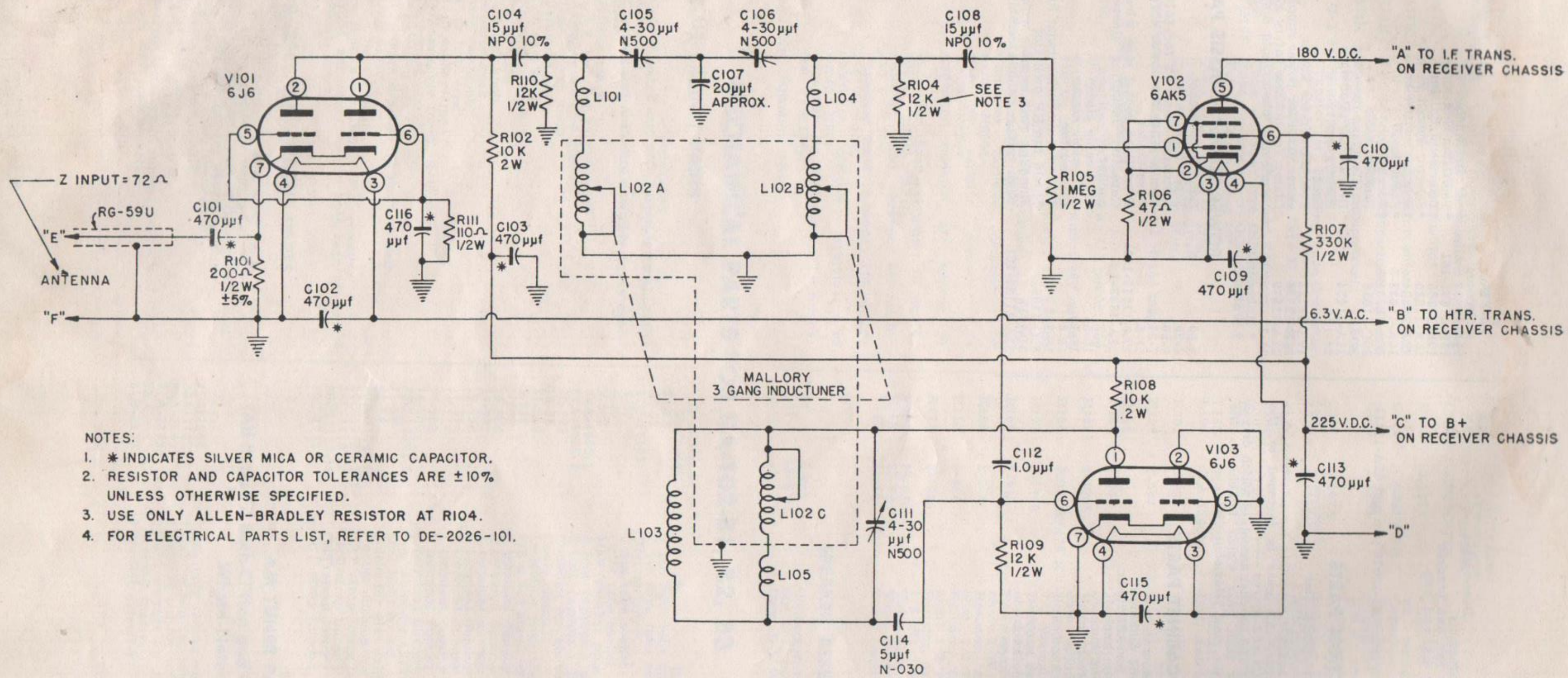
15B-11232	Dial window
12A-11319	Red plastic dial light
32B-11189-101	Antenna for AM tuner
15A-11222-1	*Tone off-on knob
15A-12331-1	†Tone off-on knob
15A-11222-2	*Volume knob
15A-12331-2	†Volume knob
15A-11222-3	*Contrast knob
15A-12331-3	†Contrast knob
15A-11222-4	*Brightness knob
15A-12331-4	†Brightness knob
15A-11218	*AM dial knob

Part No. Reference	*Description*
15A-12333	†AM dial knob
15B-11363-101	*Television dial knob
15B-12335	†Television dial knob
15A-11220	*Selector switch knob
15A-12334	†Selector switch knob
15A-11222-5	*Focus knob
15A-12331-5	†Focus knob
30C-11056	Rubber mask
29-52	Safety glass for CRT
31A-11434	Bracket for pilot light
24-124	Fiber glass tubing 3/6 I D x 2-1/4 for pilot light
10A-11122	Felt washer for knobs
31B-11906	Cover plate for power supply chassis
31A-11579	Clamp for holding safety glass in cabinet
71-11	Escutcheon pin to hold dial dindow in place

* Mahogany.
† Walnut.

POWER SUPPLY CHASSIS PARTS

5-59	Octal tube socket
4-29	5 pin tube socket
6-20	Insulated stand off for 8016
7-37	Strain relief for power cord
11-55	Fuse holder
12A-11215-101	Pilot light socket plus wires
13A-4833-1	Capacitor mounting sleeve for 10 AV capacitor
16-55	1/4" cable clamp
16-12	1/2" cable clamp
16-6	Ground lug
16-232	Plate for mounting twist lug capacitors
30C-11091	Shield for RP oscillator
31-1317	Bundling strip to cable wires
51A-11129-101	High voltage cable assembly



NOTES:

1. ✱ INDICATES SILVER MICA OR CERAMIC CAPACITOR.
2. RESISTOR AND CAPACITOR TOLERANCES ARE ±10% UNLESS OTHERWISE SPECIFIED.
3. USE ONLY ALLEN-BRADLEY RESISTOR AT R104.
4. FOR ELECTRICAL PARTS LIST, REFER TO DE-2026-101.

Figure 11

RF Tuner Schematic for Du Mont Models RA-102-B1, B2 and B3 Telesets

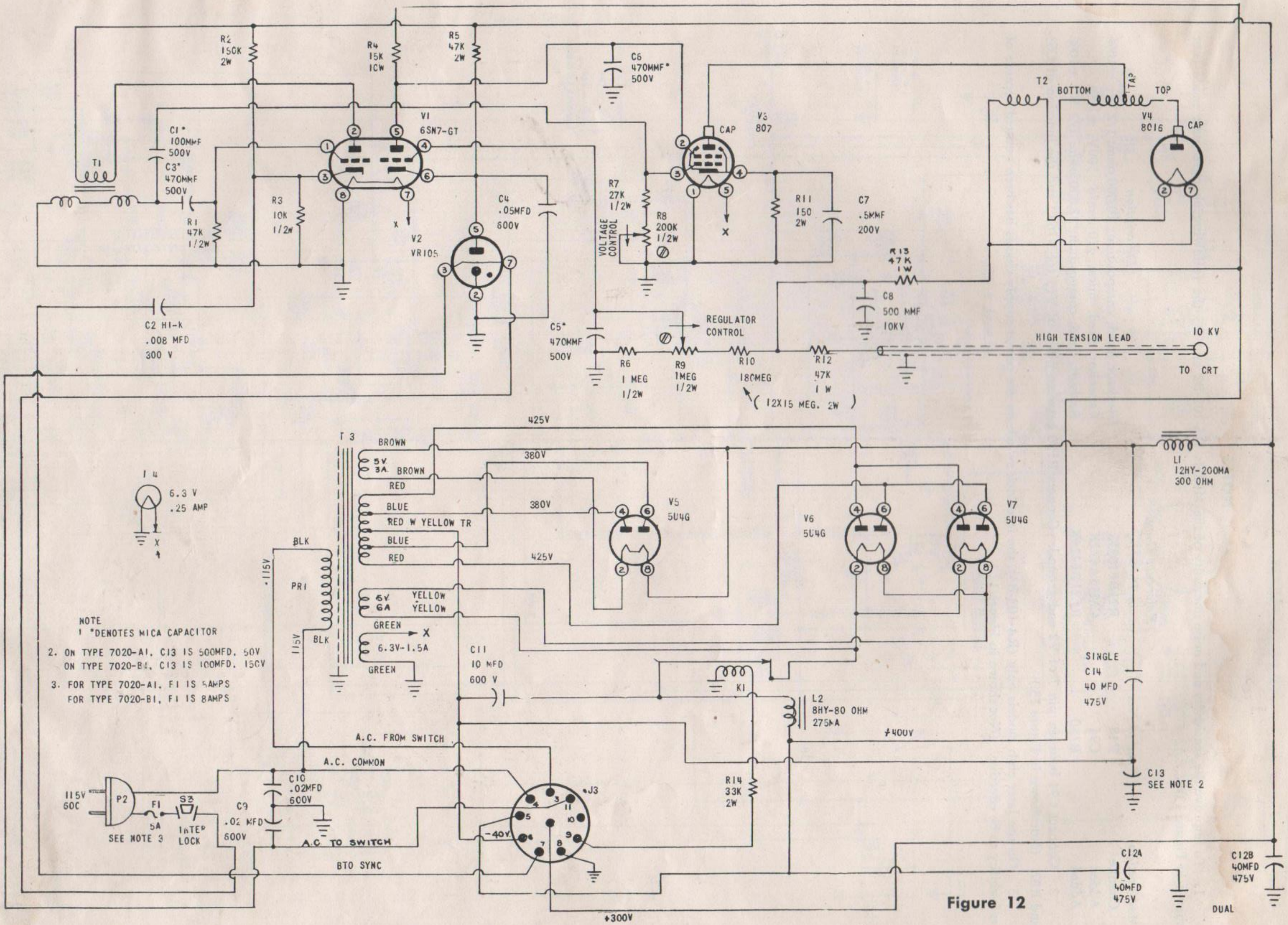


Figure 12

Power Supply Schematic for Du Mont Models RA-102-B1, B2 and B3 Telesets

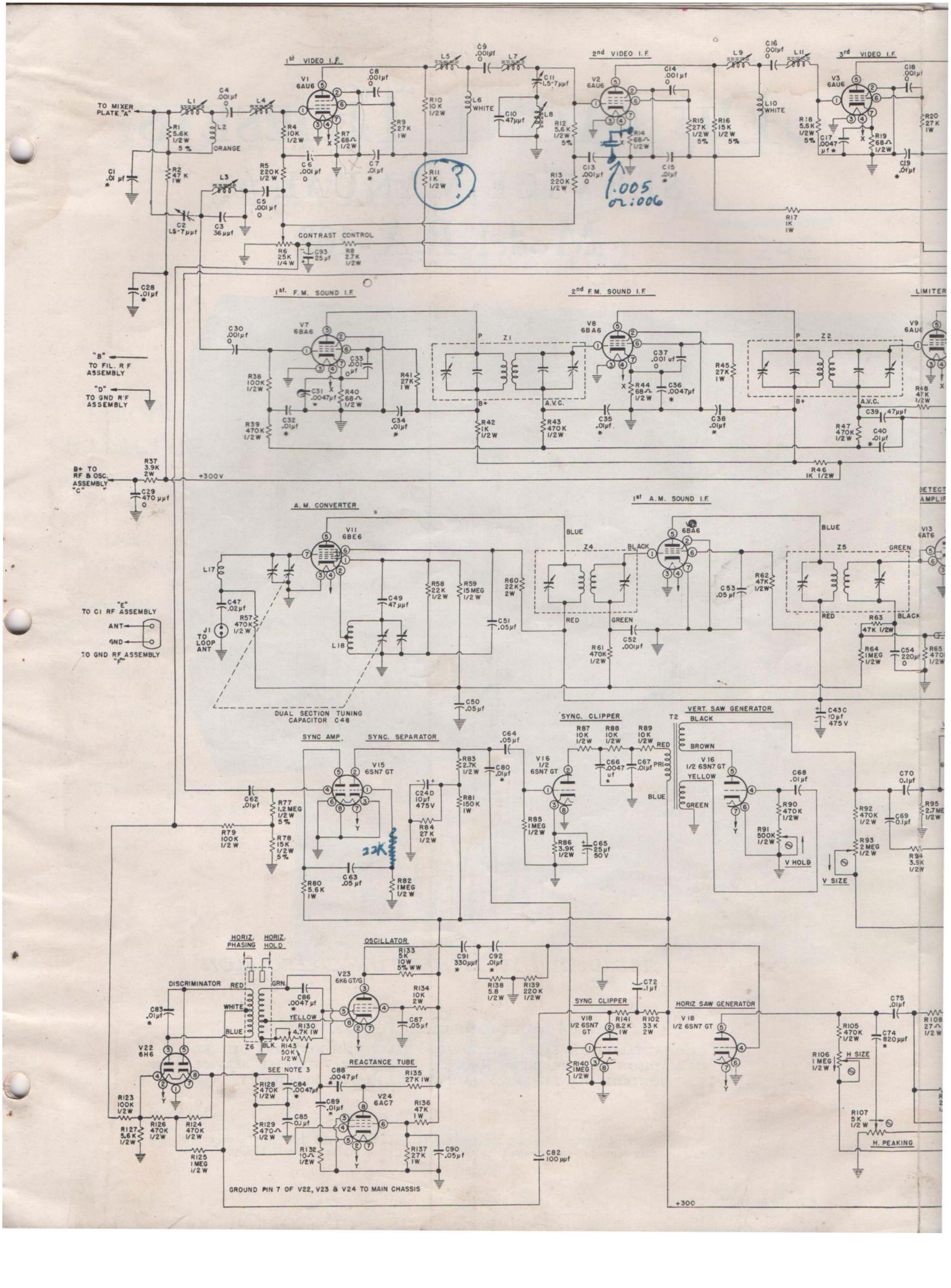
NOTES

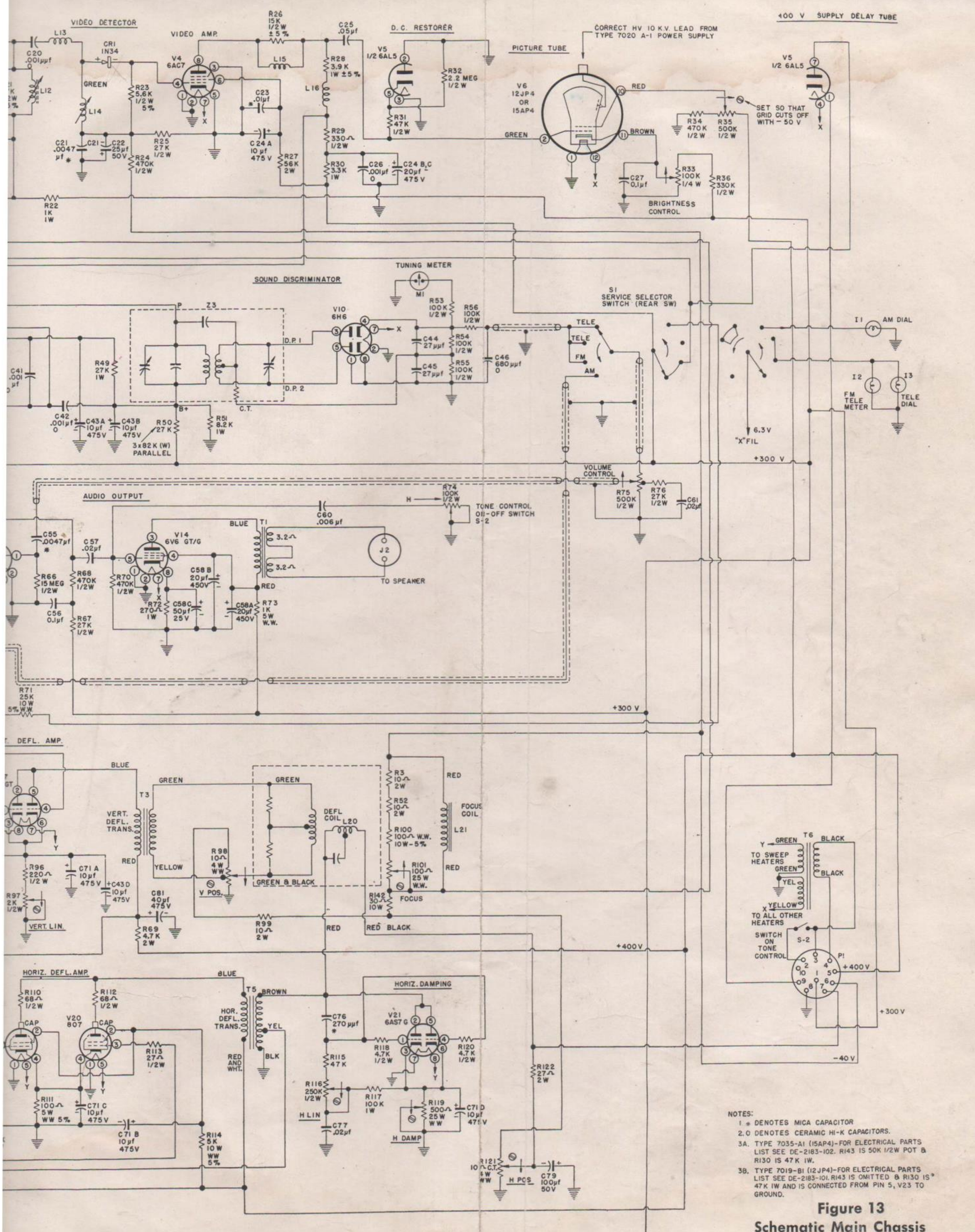
1. To improve the sensitivity and noise immunity of the Models RA-102-B2 and B3 the following changes were made (not shown in Figure 13):

Modification	*Symbol No.*	*Reference Dwg. or Part No.*	*Description*
Change	R18	R21BF103K	Resistor, fixed; composition; 10,000 ohm; 1/2 W; ±10%
Added	C94	CM35A472K	Capacitor, fixed; mica; 470 mmfd; 500V; ±10%
Added	R150	RC21BF223K	Resistor, fixed; composition; 22,000 ohm; 1/2 W; ±10%

2. Connect C94 between pin 7 of V2 and ground. Connect R150 between pin 1 of V15 (6SN76T) and the junction of C63 and R82. (Not shown in Figure 13.)

3. On the later club models only (RA-103-B3), the interlock switch on the power supply chassis has been omitted because of its inability to be effective. (Not shown in Figure 12.)


1st VIDEO I.F.
2nd VIDEO I.F.
3rd VIDEO I.F.
TO MIXER PLATE "A"
V1 6AU6
V2 6AU6
V3 6AU6
L1
L2 ORANGE
L3
L4
L5
L6 WHITE
L7
L8
L9
L10 WHITE
L11
C1 .01 µf
C2 1.5-7µµf
C3 36µµf
C4 .001µf
C5 .001µf
C6 .001µf
C7 .01µf
C8 .001µf
C9 .001µf
C10 47µµf
C11 1.5-7µµf
C13 .001µf
C14 .001µf
C15 .01µf
C16 .001µf
C17 .0047 µf
C18 .001µf
C19 .01µf
R1 5.6K 1/2W 5%
R2 47K 1W
R4 10K 1/2W
R5 220K 1/2W
R7 68Ω 1/2W
R9 27K 1W
R10 10K 1/2W
R11 1K 1/2W
R12 5.6K 1/2W 5%
R13 220K 1/2W
R14 68Ω 1/2W
R15 27K 1/2W 5%
R16 15K 1/2W 5%
R17 1K 1W
R18 5.6K 1/2W 5%
R19 68Ω 1/2W
R20 27K 1W
.005 or .006
CONTRAST CONTROL
R6 25K 1/4W
C93 25µf
R8 2.7K 1/2W
C28 .01µf
1st F.M. SOUND I.F.
2nd F.M. SOUND I.F.
LIMITER
V7 6BA6
V8 6BA6
V9 6AU6
Z1
Z2
C30 .001µf
C31 .0047µf
C32 .01µf
C33 .001µf
C34 .01µf
C35 .01µf
C36 .0047µf
C37 .001 µf
C38 .01µf
C39 47µµf
C40 .01µf
R38 100K 1/2W
R39 470K 1/2W
R40 68Ω 1/2W
R41 27K 1W
R42 1K 1/2W
R43 470K 1/2W
R44 68Ω 1/2W
R45 27K 1W
R46 1K 1/2W
R47 470K 1/2W
R48 47K 1/2W
A.V.C.
B+
"B" TO FIL. RF ASSEMBLY
"D" TO GND RF ASSEMBLY
B+ TO RF & OSC. ASSEMBLY "C"
R37 3.9K 2W
C29 470 µµf
+300V
A.M. CONVERTER
1st A.M. SOUND I.F.
DETECTOR AMPLIFIER
V11 6BE6
V12 6BA6
V13 6AT6
L17
L18
Z4
Z5
BLUE
BLACK
RED
GREEN
C47 .02µf
C49 47µµf
C50 .05µf
C51 .05µf
C52 .001µf
C53 .05µf
C54 220µµf
C43C 10µf 475V
R57 470K 1/2W
R58 22K 1/2W
R59 15MEG 1/2W
R60 22K 2W
R61 470K 1/2W
R62 47K 1/2W
R63 47K 1/2W
R64 1MEG 1/2W
R65 470K 1/2W
"E" TO CI RF ASSEMBLY
ANT
GND
TO GND RF ASSEMBLY "F"
J1 TO LOOP ANT
DUAL SECTION TUNING CAPACITOR C48
SYNC AMP.
SYNC. SEPARATOR
V15 6SN7 GT
SYNC. CLIPPER
V16 1/2 6SN7 GT
VERT. SAW GENERATOR
T2
PRI
BROWN
YELLOW
C62 .01µf
C63 .05µf
C64 .05µf
C65 25µf 50V
C66 .0047 µf
C67 .01µf
C68 .01µf
C69 0.1µf
C70 0.1µf
C80 .01µf
C24D 10µf 475V
R77 1.2MEG 1/2W 5%
R78 15K 1/2W 5%
R79 100K 1/2W
R80 5.6K 1W
R81 150K 1W
R82 1MEG 1/2W
R83 2.7K 1/2W
R84 27K 1/2W
R85 1MEG 1/2W
R86 3.9K 1/2W
R87 10K 1/2W
R88 10K 1/2W
R89 10K 1/2W
R90 470K 1/2W
R91 500K 1/2W
V HOLD
R92 470K 1/2W
R93 2MEG 1/2W
V SIZE
R94 3.9K 1/2W
R95 2.7MEG 1/2W
22K
HORIZ. PHASING
HORIZ. HOLD
DISCRIMINATOR
OSCILLATOR
V22 6H6
V23 6K6 GT/G
Z6
RED
WHITE
BLUE
GRN.
YELLOW
BLK.
C83 .01µf
C84 .0047µf
C85 .01µf
C86 .0047 µf
C87 .05µf
C88 .0047µf
C89 .01µf
C90 .05µf
C91 330µµf
C92 .01µf
C82 100 µµf
R123 100K 1/2W
R124 470K 1/2W
R125 1MEG 1/2W
R126 470K 1/2W
R127 5.6K 1/2W
R128 470K 1/2W
R129 470K 1/2W
R130 4.7K 1W
R143 50K 1/2W
R133 5K 10W 5% WW
R134 10K 2W
R135 27K 1W
R136 47K 1W
R137 27K 1W
R132 10Ω 1/2W
R138 5.8 1/2W
R139 220K 1/2W
SEE NOTE 3
REACTANCE TUBE
V24 6AC7
SYNC CLIPPER
V18 1/2 6SN7 GT
R141 8.2K 1W
R102 33K 2W
R140 1MEG 1/2W
C72 .1µf
HORIZ SAW GENERATOR
V18 1/2 6SN7 GT
C74 820µµf
C75 .01µf
R105 470K 1/2W
R106 1MEG 1/2W
H SIZE
R107 5K 1/2W
H. PEAKING
R108 27Ω 1/2W
GROUND PIN 7 OF V22, V23 & V24 TO MAIN CHASSIS
+300



NOTES:

1. ✱ DENOTES MICA CAPACITOR
2. O DENOTES CERAMIC HI-K CAPACITORS.

3A. TYPE 7035-A1 (15AP4)-FOR ELECTRICAL PARTS LIST SEE DE-2183-102. R143 IS 50K 1/2W POT & R130 IS 47K 1W.

3B. TYPE 7019-B1 (12JP4)-FOR ELECTRICAL PARTS LIST SEE DE-2183-101. R143 IS OMITTED & R130 IS 47K 1W AND IS CONNECTED FROM PIN 5, V23 TO GROUND.

Figure 13
Schematic Main Chassis for Du Mont Models RA-102-B2 and B3 Telesets

Du Mont Telesets*

SERVICE MANUAL *for* Model RA-102

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