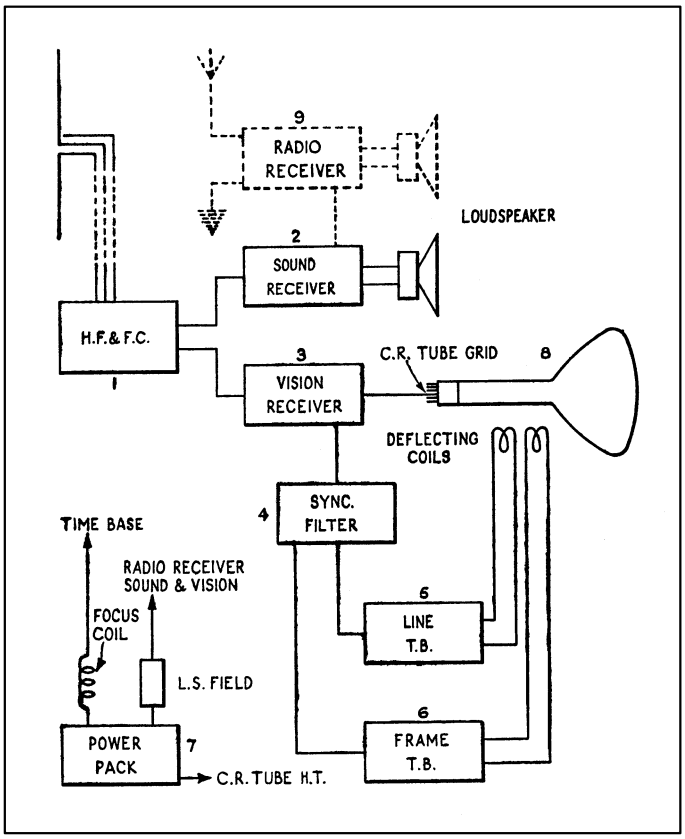
SPECIFICATION

A56V A58V

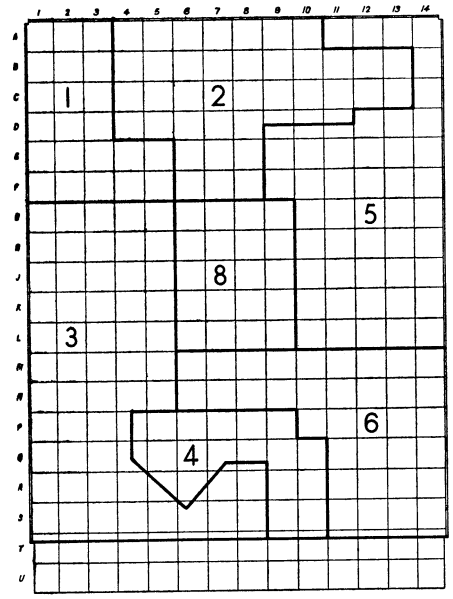
BASIC DESIGN:	A56V	15-valve (+3 rectifiers) superhet receiver. 9-inch C.R. tube scanned and focused magnetically.
	A58V	A56V and modified A46.
INTERMEDIATE FREQUENCY:		Sound 750 Kc/s. Vision 4·25 Mc/s.
WAVE RANGES:	A56V	Television sound and vision only. Sound 41·5 Mc/s (7·23 metres) Vision 45 Mc/s (6·67 metres)
	A58V	Television sound and vision, and radio. 16·7 to 50 metres (18 Mc/s to 6 Mc/s) 200 to 550 metres (1500 Kc/s to 545 Kc/s) 950 to 2000 metres (316 Kc/s to 150 Kc/s)
MAINS SUPPLY:		200-250 volts, 50-100 cycles A.C.
VALVES:	A56V	Common Sound and Vision: SP 41, AC/TH1. Vision Receiver: 4SP41, 1D1. Sync. Filter: DD41. Sound Receiver: VP41, HL/41/DD, AC/5 Pen. Frame Time Base: T41, AC/5 Pen. Line Time Base: T41, AC/6 Pen. Rectifiers: 2UU4, 1U21.
	A58V	As above, less AC/5 Pen+ radio chassis: AC/TH1, AC/VP2, HL41DD, AC/5 Pen., UU4.
PILOT LAMPS:	A58V	6·2v 0·3 amp, Globular Frosted.
CATHODE RAY TUBE:		CRM91.
SPEECH COIL IMPEDANCE:		2 ohms.
TOTAL WEIGHT:	A56V	119 lb.
	A58V	173 lb.
OVERALL DIMENSIONS :	A56V	18 × 18 × 34½ inches.
	A58V	32½ × 17½ × 34½ inches.
CONSUMPTION:	A56V	245 watts (approx.).
	A58V	290 watts (approx.). 65 watts (approx.) on radio.



The Block Diagrams

THEORETICALLY, and to a large extent mechanically, the A56V and A58V receivers divide naturally into the sections indicated in the block diagram on this page, and once this is thoroughly understood, the apparent complexity of a television receiver largely disappears. In fact, it is hardly too much to say that, once a fault has been assigned to one section of the receiver—and this becomes obvious with practice—its final location is easier than in a modern radio receiver.

The section 9, shown dotted, is the radio receiver which is, of course, only included in the A58 model.



The second diagram represents the outline of the underside view of the chassis, which is drawn in detail on page 23. It will be seen that the various sections of the circuit are roughly grouped together as far as the mechanical layout of the chassis is concerned. We must point out, however, that this diagram is only intended to give a general guide to the location of the sections, and it will be found in practice that, although it is substantially correct, one or two components belonging to one section will be found in parts of the chassis, allotted (in the diagram) to another section of the circuit.

This breaking up of the circuit into sections is so important to the simplification of television servicing that we strongly recommend that these two diagrams should be studied until they are memorized.

Circuit Analysis

In this description of the A56V and A58V television circuit the sections indicated in the diagram on page 2 will be considered separately. Frequent reference to the circuit diagram will be necessary for a clear understanding of the various points dealt with, and servicemen may find it advantageous to use the preliminary circuit diagram (which was sent to all dealers) for this purpose, to avoid the necessity of continually turning to page 18 of this book.

SECTION I

H.F. AND FREQUENCY CHANGER STAGES

The H.F. and frequency changer stages of the receiver are common to the sound and vision sections, and the band width of the tuned circuits in the H.F. stage must therefore be sufficiently wide to receive both the sound (41·5 Mc/s) and the vision (45 Mc/s) signals.

The feeder from the dipole aerial is tapped directly into the aerial tuned circuit (L1, C1), and although there is no apparent damping on this circuit, the input impedance of the H.F. valve (V1) and the aerial together load it sufficiently to give the required band width.

The gain of the H.F. valve is controlled by a pre-set resistance (R2), the use of which is described on page 11. The band-pass filter (L2, C3, L3, C4) which feeds the amplified signals into the frequency changer valve (V2) is damped to maintain adequate band width—in the primary by the addition of the resistance (R3), and in the secondary by the input impedance of the frequency changer valve.

The triode section of the frequency changer valve works as a "Colpitts" oscillator. The coil (L9) and the condensers (C14 and C16) in series form the tuned circuit and tuning is effected by screwing a brass plunger into or out of the coil, thus varying its inductance over a small range. The movement of the plunger, by rotating the tuning knob, is intentionally restricted, but the range of tuning covered can be adjusted by an arrangement on the chassis which is described on page 12.

It should be clearly understood that the operation of tuning is carried out entirely by varying the oscillator frequency, the H.F. circuits being pre-set to receive the sound and vision signals. The I.F. circuits for sound and vision are tuned to 750 Kc/s and 4·25 Mc/s respectively, and to produce I.F. signals at these frequencies the oscillator circuit must be tuned to 40·75 Mc/s. The oscillator frequency will thus be 750 Kc/s (41·5 Mc/s—40·75 Mc/s) *below* the sound signal and 4·25 Mc/s (45 Mc/s—40·75 Mc/s) *below* the vision signal.

The sound and vision I.F. signals from the anode of the frequency changer valve are fed through the I.F. filters (L4, L6, and L7, L8) into the sound and vision amplifier stages.

It will be seen from the circuit diagram that the sound I.F. filter is tuned by pre-set condensers. (C8 and C9) while the vision I.F. circuits are tuned by stray capacities.

SECTION II

THE SOUND RECEIVER

The sound section of the receiver is similar to the A46 radio receiver. Rectification is provided by one of the diodes of the double diode triode valve (V9) and simple undelayed A.V.C. is applied to the I.F. amplifier valve (V8) by feeding back the D.C. voltage across the diode load (R51 and R49) through a decoupling resistance (R48).

As high selectivity is not required, the I.F. band-pass filters are designed to give a much wider response curve than is usual in a radio receiver, and this not only allows full advantage to be taken of the high quality of the transmissions but also very much reduces the effect of the small amount of oscillator drift which is unavoidable.

In the A56V negative feed-back is employed in the audio amplifier to reduce speaker and cabinet resonances.

The cathode of the L.F. valve (V9) is returned to earth through the resistances (R61 and R62). These resistances form the bias circuit for the valve, and as they form a potentiometer across the output transformer secondary, half the audio signal is fed back into the cathode circuit of the L.F. valve. Owing to the long screened leads to the volume control, there is a small loss of the higher audio frequencies, but this is compensated for by the inclusion of the small condenser (C42) which reduces the amount of feed-back at these frequencies.

In the A58V the diode circuit is the same as in the A56V but the triode grid is connected to earth. The audio output from the diode load is fed through a condenser (C41) and the radio-television change-over switch (S1C) to the volume control (R19) of the radio receiver. The radio-television switch has a double pole mains section as well as a rotary section. The latter has three functions:

1. To change over the radio receiver volume control from the diode load of the radio receiver to the television receiver (S1C).

2. To break the H.T. feed to the radio receiver oscillator on television, thus preventing interference (S4a radio circuit).

3. To switch off the radio pilot lamps on television (S4b radio circuit).

One pole of the double pole section is in series with the main on-off switch for the television power pack (the main on-off switch is operated by the volume control knob). The other pole, in series with the second pole of the main on-off switch is connected across the safety resistance (R41) in the cathode circuit of the cathode-ray tube. The function of this resistance will be explained later.

In the A58V the AC/5 Pen sound output valve (V10) is omitted and the valve holder is replaced by a piece of bakelite, though, for the sake of standardization, other components of the A56V audio amplifier circuit are included.

SECTION III
THE VISION RECEIVER

The vision I.F. amplifier has three band-pass coupled stages (V3, V4, and V5), followed by a diode detector and resistance coupled video stage. The first two stages are gain controlled by means of the cathode resistance (R21) which is operated by the contrast control knob on the front of the cabinet. The band-pass filters resemble that in the anode circuit of the frequency changer, and consist of two tightly coupled coils tuned by the valve and stray capacities, and damped by parallel resistances to increase the band width.

One further point that needs explaining is the tuned circuit (L11, C19) in the cathode circuit of V3. The band-pass circuits for sound and vision forming the frequency-changer anode load are both low in impedance compared with the valve, and they therefore work independently, but the voltage developed across the sound I.F. coil (L7) is necessarily impressed on the vision I.F. coil (L6), and although the tuning of the two circuits is widely different, some of the sound voltage is transferred by capacity to the secondary coil (L4), and so to the grid of the vision I.F. valve (V3). If a large voltage at this frequency is allowed to reach the valve, rectification will take place, and a beat frequency of 3·5 Mc/s (4·25–·75) will be produced. This beat will reach the second detector and heterodyne the vision carrier, causing a pattern of "criss-cross" lines on the picture. To prevent this, the filter circuit (L11, C19) is fixed tuned to the 750 Kc/s (the sound I.F.) to introduce negative feed-back at this frequency, and so reduce the unwanted input to a safe level.

The detector consists of a single low-impedance diode (V6) working into the load resistance (R32). To bring the video signal produced across the resistance into correct phase, the I.F. signal is fed to the cathode of the diode, and the load

resistance is in the anode circuit, instead of the reverse arrangement, which is more usual.

The diode load is directly coupled to the video amplifier valve (V7), and the anode of this valve is directly connected to the grid of the C.R. tube, so that the "D.C. component" of the video signal is retained throughout.

The D.C. voltage applied to the grid of the tube is thus equal to the anode voltage of the valve (V7), and bias for the tube is obtained from the voltage drop across the resistances (R44, R43) in the cathode circuit. The variable section (R44) forms the "brightness control."

A small bias is applied to the valve (V7) to prevent any possibility of running into grid current. There are two resistances in the cathode circuit, and the voltage drop across one (R33) is applied as bias to the grid of the valve. A small amount of negative feed-back is introduced by this resistance. The second resistance (R33), on the other hand, which is not included in the grid circuit, does not cause feed-back, and is properly described as a cathode load. The condenser (C31) across the two resistances by-passes I.F., but is not large enough to by-pass any but the highest modulation frequencies.

This circuit will be found to be very similar to that employed in the A42V except that the latter employed a push-pull rectifier in order to double the frequency of the I.F. that appears across the diode load. As this is not done in the A56V or A58V, the 4·25 Mc/s voltage is superimposed on the signal so that the lines of the picture appear to consist of a succession of very small dots. The dots are, however, so small that they are only visible when the C.R. tube is very carefully focused, and are not considered to detract from the picture as seen from a normal viewing distance.

SECTION IV
THE SYNCHRONIZING FILTER

The filtering of the synchronizing impulses is carried out by the double diode valve (V11) fed from the cathode of the video amplifier (V7).

The synchronizing impulse is transmitted by momentarily reducing the carrier voltage to zero. This causes the voltage across the diode load (R32) to drop to zero; the current taken by the video output valve (V7) consequently increases, and maximum voltage is developed across the cathode load (R33). The synchronizing impulses thus form the most positive part of the voltage cycle across this load, and the diode valve (V11) is so biased that it only responds to this part of the cycle.

The bias is obtained from the voltage which is developed across the condenser (C48) during the impulses. During the scanning periods the condenser slowly discharges through the resistance (R63), but before the voltage is reduced sufficiently to make the valve cathodes negative to the anodes, another impulse recharges the condenser, and the cycle is repeated. The function of this condenser is similar to that of the reservoir condenser in a mains rectifier circuit. Synchronizing impulses, both line and frame, thus appear across both the load resistances (R64 and R66).

The shape of the frame impulse is such that the combined impulse may be fed straight to the line time-base, without filtering, but the synchronizing of the line time-base during the frame impulses is improved by making the feed condenser (C51) quite small, and so giving the circuit a short time-constant.

To filter the line impulses from the frame impulse for synchronizing the frame time-base circuit, an "integrating" circuit is employed (consisting of R67 and C49).

All impulses cause a current to flow down the resistance (R67) into the condenser (C49), but during the line impulse this current only flows for a very short time, and so only raises the voltage across the condenser by a small amount. The frame impulses, being much longer, develop the full impulse voltage across the condenser, to be fed to the frame thyratron (V14) through the condenser (C61).

SECTION V

THE LINE TIME-BASE

Magnetic deflection being employed in the A56V and A58V, the function of the time bases is to pass saw-tooth currents through the deflecting coils (L21 and L22) on the neck of the cathode ray tube. Each time base employs a thyratron oscillator, and a power pentode amplifier, feeding the coils through a step-down transformer.

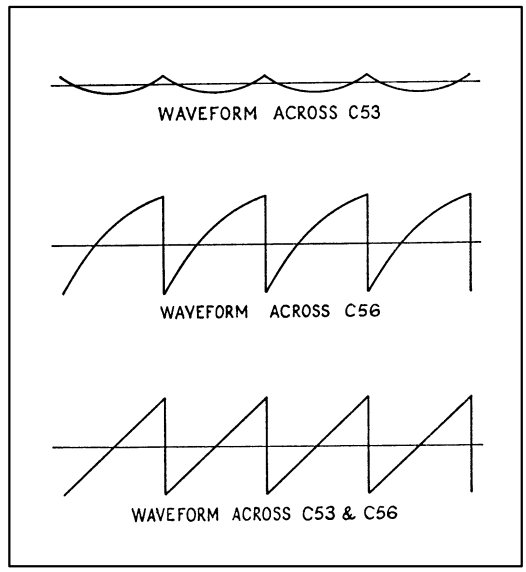
Although the line thyratron circuit is very similar to the simple arrangement used in the A42V, some special features are incorporated to permit the use of a comparatively low voltage supply. The H.T. voltage is fed through the resistances (R71 and R72) to charge up the condensers (C52 and C53), and when a critical voltage has been developed across them, the synchronizing impulse "triggers" the valve and so discharges the condensers. This causes a synchronized saw-tooth wave-form to be developed and passed on through the condenser (C57) to the amplifier valve (V13). The thyratron will, of course, operate without any synchronizing impulses being applied to the grid, and the "raster" which can be obtained while no signal is being received is quite a useful check on the time base circuits.

A comparatively large voltage swing is required to feed the amplifier valve, and since the H.T. supply is only 300 volts, the working stroke of the thyratron would be curved if a simple resistance-capacity circuit was used. The resistance and condenser (R74 and C56) are therefore introduced to add a correction voltage to the distorted saw-tooth produced across the condenser (C53), making the resultant wave-form applied to the amplifier truly saw-tooth. The separate waveforms and the resultant at this point in the circuit, are shown in the diagram.

The resistance (R73) in the thyratron circuit is included to limit the discharge current in the valve to a safe value.

Having produced the true saw-tooth waveform, it should be a simple matter to produce the required scanning current with the aid of the amplifying valve. Two additional facts, however, must be taken into consideration. Firstly, the scanning coils are inductive. Secondly, there are appreciable stray capacities across the primary of the transformer (T2).

This means that the anode load of the valve is, in effect, a tuned circuit which is set into damped oscillation at every back-stroke. To prevent this oscillation continuing into the working stroke, a damping circuit (R82, R83, and C59) is included. During the working stroke the current change in the transformer is slow and the condenser acts as a high impedance, but on the back stroke it becomes low in impedance so that the resistances (R82 and R83) are thrown across the tuned circuit and damp it so much that it is prevented from "swinging." Owing to the inclusion of the condenser (C59), unless the resistances are of suitable value, the shape of the beginning of the working stroke is spoiled, and distortion is visible at the left hand side of the picture. One of the resistances (R83) is therefore made variable, and is called the "form" control.



Three other controls are provided in the line time-base circuit. The thyratron charging re-

sistance (R71) is the synchronizing control on the side of the cabinet. The variable resistance (R78) in the cathode circuit of the amplifier valve is the pre-set amplitude control on the side of the cabinet. It works by varying the amount of negative feed-back introduced into the valve. As it only effects the operation of the amplifier valve, it does not affect frequency.

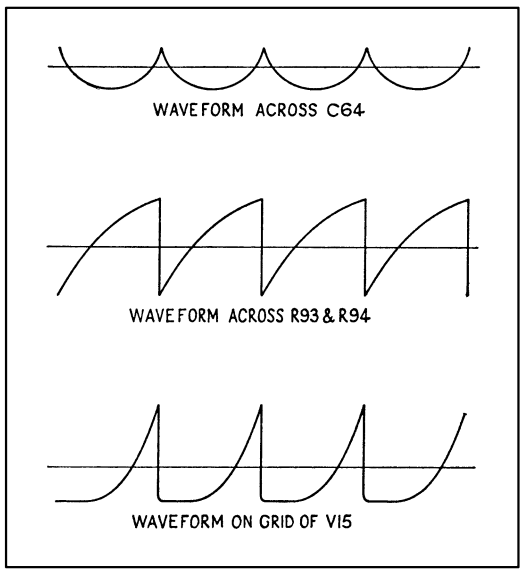
Those who are conversant with the A42V will remember that the amplitude control in this set controlled the bias on the thyratron valve. It therefore affected frequency as well as amplitude. A similar control (R106) is provided in the A56V, but it is mainly used to take up tolerances in the circuit. It should not require frequent adjustment, and is only accessible from inside the cabinet.

The loading of the amplifier valve is unusual. The transformer and coils are so designed that under normal operating conditions, the voltage swing on the anode is nearly the maximum permissible. Therefore, if the amplitude control (R75) is turned beyond the point where full scan is obtained, overloading occurs, causing distortion and decreased amplitude. Further, if the H.T. supply is unduly low, owing for instance, to the set working on the wrong mains voltage tapping, it may not be possible to obtain full scan.

A word of warning will not be out of place here. During the back stroke, the current in the anode load of the amplifier valve is suddenly decreased. The anode voltage therefore suddenly rises to a peak of about 3000 volts, which is most unpleasant to handle. Special insulation is provided on the anode lead, and care must be taken not to burn this with a hot soldering iron or damage it in any way.

SECTION VI
THE FRAME TIME-BASE

The general operation of the frame time-base circuit is very similar to that of the line time-base. The thyratron charging resistances and condenser (R87, R88, and C62) are followed by a wave-form correction circuit (R91, R92, R93, R94, and C64) which although similar in operation to the one used in the line time-base circuit, performs a different function. The impedance of the scanning coil (L21) at frame frequencies is largely resistive, and it would be very expensive to provide an output transformer to feed it without distortion. Accordingly, distortion is tolerated in the transformer, and satisfactory output is obtained by arranging the thyratron correction circuit to allow for this distortion. It will



be seen from the diagram that in this case the final wave-form appears to be over corrected, which is to allow for the transformer distortion. The chain of resistances (R91 to R94) in this circuit is to provide a certain amount of adjustment (in the factory) to allow for variations in the primary inductance of the transformer (T3). The resistance (R101) is included to limit the impedance of the scanning coil at high frequencies (when inductance becomes more important than resistance). Without it, line frequency currents may be induced in the frame coil, causing the

scanning lines to be bowed. In later sets a 500 ohms resistance is included in series with the transformer primary. This is merely to decrease the voltage on the anode of the valve.

The frame time-base, unlike the line time-base, is not critical with regard to H.T. voltage. Neither does the peak voltage on the amplifier valve (V15) exceed 500 volts. There is usually a combination of settings of the thyratron bias control (R102), and the amplitude control (R98) which gives the best wave-form, but the adjustments are not very critical.

SECTION VII

THE POWER PACK

The H.T. supply for the set needs little comment. The current required is quite large, so that two rectifiers are fitted, with two integrating condensers (C72 and C73) of a special type to carry the ripple current. After one stage of smoothing (L27, C74, and C 75) the supply is fed in two directions. In the A56V the loudspeaker field with the condenser (C28) forms a second stage of smoothing for the 250 volts supply to the sound and vision receivers, while in the A58V the loudspeaker field is replaced by a choke and resistance (L25 and R95). The second branch of the H.T. supply is fed through the focus coil (L19), where it is again split into two channels. The anode of the frame pentode (V15) is fed direct from the focus coil while a further stage of smoothing (L28, C69, and C71) is included in the feed to the other time base circuits. In tracing out the circuit it will be seen that the A.C. anode current of the frame pentode (V15) passes through the focus coil and the condensers (C74, C75). To prevent this affecting focusing, the coil is shunted by a large condenser (C77), but the frame current flowing through the condensers (C74 and C 75) causes a ripple of a few volts in the H.T. supply. This is prevented from reaching the receiver by the loudspeaker field, and from reaching the line time-base by the choke (L28).

In a similar way the A.C. current from the line pentode (V13) flows through the condensers (C69 and C71), but suitable decoupling elsewhere in the circuit prevents the ripple doing any harm.

The 4,700 volts supply for the anode of the cathode ray tube is obtained from the rectifier (V18). This valve is so designed that its cathode heats up more slowly than the cathode of the cathode ray tube, so that the H.T. is not applied to the tube until the cathode is hot. After the set has been working, however, the cathode of the high voltage rectifier will remain hot longer than the cathodes of the low voltage ones, and if the set is switched on again after only a short interval, not only will the H.T. be applied to the tube while its cathode is warming up, but also when there is no bias on the grid, since the latter is dependent on the operation of the low voltage rectifiers. This is of course most detrimental to the life of the tube.

The H.T. current taken by the C.R. tube is so small that no smoothing beyond the integrating condenser (C78) is required in the rectifier circuit. The chain of resistances (R108, R109, R111, R112, and R113) is included to increase the load on the rectifier as, without them, small surges in the mains supply would cause the H.T. to rise quickly as the reservoir condenser was charged up through the rectifier, and only fall again very slowly as it discharged. The effect of this on the picture would be very annoying. With the resistances connected, the discharge of the condenser after a surge is so rapid that no disturbance is noticed on the picture .The resistance (R107) in series with the H.T. supply limits the current which can be drawn from the supply in case of an insulation breakdown.

Though a separate transformer is used for the high voltage supply, only the transformer which supplies current to the receiver has a mains tapping panel. The primary of the high voltage transformer is connected to the highest tapping on the primary of the other transformer which therefore serves as an auto-transformer on

mains voltages other than 250 volts. In the A58V the radio circuit has an entirely separate mains transformer, with its own mains tapping panel. Servicemen should therefore be careful to see that *both* mains plugs are adjusted to suit the mains voltage.

SECTION VIII
THE CATHODE RAY TUBE

Although this part of the set is important from the point of view of servicing, it needs little explanation. It has been explained in section seven how the slow heating rectifier (V18) protects the cathode ray tube when switching on. Protection, however, is also necessary when switching off. Owing to the small current drain the 4,700 volts H.T. supply will disappear quite slowly, so that some H.T. will remain on the tube for a short time after the bias is removed and the scanning circuits cease to operate. To prevent this damaging the cathode and screen of the tube, one half of the mains switch is arranged to remove the short circuit from the resistance (R41) in the cathode circuit of the tube. It will be seen that when this resistance is in circuit, any current passing through it from the tube puts a positive potential on the cathode, which acts as bias and limits the current. Owing to stray capacities from the cathode to earth, however, the tube current cannot develop this bias immediately. The condenser (C32) is therefore included. At the instant of switching off, while the grid potential falls rapidly, the cathode potential cannot fall until the condenser discharges through the resistances (R42 and R43). Hence the condenser holds the cathode potential positive until the tube current has developed a further positive potential across the resistance (R41).

In the A58V the television circuit can be switched off either by the mains on-off switch on the volume control, or by the television to radio change-over switch. By connecting one side of each of these switches in series across the resistance (R41) it is ensured that the protective bias is applied to the tube whichever switch is operated.

It should be noted that if either the A56V or A58V is switched off at the mains plug, the safety resistance will not be put into circuit, and damage to the tube will result.

SECTION IX
A58V RADIO CHASSIS

The radio receiver in the A58V is perfectly standard except for the arrangements for feeding television sound into it, which were dealt with in section two. A full analysis of the radio circuit is given in the "46" Service Instructions.

Adjustments

WHEN a set is received from the factory, and when it is installed in a customer's home several adjustments must be made before a satisfactory picture can be obtained.

For transport purposes the cathode ray tube is packed separately. In fitting the tube, see that it is seated properly in its socket, otherwise it may press against the plate glass viewing window when the chassis is secured. The deflecting coil assembly should press firmly against the bulb of the tube. In transit it is possible for this assembly to be pressed down against the magnetic lens, in which case it must be lifted to stretch the springs.

If the receiver is run with the coils away from the bulb the electron beam will be cut off by the neck of the tube at the extremities of the scan. When this happens the neck casts a circular shadow on the screen which may cut off the corners of the picture, or may form a complete circle cutting off all but the centre of the picture.

The receiver must be adjusted for the correct

mains voltage, before it is connected to the supply. In the A56V there is only one mains tapping plug, located on the power pack, but in the A58V there is an additional plug on the mains transformer of the radio chassis which must be adjusted.

All the valves and plugs should be checked to see that they are fitted firmly in the sockets.

The preliminary adjustments given below can be made without the aid of a signal.

TO OBTAIN A RASTER

Switch on. Turn the brightness control to zero, and wait until the high voltage rectifier (V18) has warmed up. This takes about one and a half minutes. Turn up the brightness control until the raster is easily seen.

TO ADJUST THE RASTER

Adjust the size of the raster by means of the two amplitude controls (R78 and R98) until it is about one inch smaller in each direction than the mask on the tube. If the receiver is so badly out of adjustment that this cannot be done, adjust the thyratron bias resistances (R102 and R106). If the raster is not square with the cabinet, turn the cathode ray tube until the mask is square with the cabinet. If the raster is still not square, slacken off the two screws holding the deflecting coil assembly and turn the coils bodily until they are in the correct position. Then tighten the screws.

Connect the aerial and tune-in the sound signal before making any further adjustments.

TO OBTAIN A SYNCHRONIZED PICTURE

Turn down the brightness control until the raster has just disappeared and turn up the contrast control until modulation is seen on the screen. Adjust the line and frame synchronizing controls until the picture is steady. Rotate the line amplitude control (R78) about a quarter of a turn, and adjust the pre-set resistance (R106) and the line synchronizing control concurrently until the picture is again about one inch narrower than the mask. Increase the line amplitude by turning up R78. Notice that the amplitude does not increase indefinitely with continued turning of this control, but after a certain point, the picture seems to fold up down the left hand side and gets badly distorted. If, after making these adjustments it is found that the line synchronizing control has to be set at the end of its travel, repeat the procedure, but with the amplitude control (R78) set at half instead of quarter rotation.

TO ADJUST PICTURE SIZE

With the frame synchronizing control set at maximum, adjust the pre-set resistance (R102) until the picture runs downwards fairly quickly. Reduce the frame synchronizing control until the picture is synchronized. Adjust the picture size by the frame amplitude control (R98).

The two thyratron biasing resistances (R102 and R106) are adjusted in the factory and should normally require very little readjustment, but as there is a possibility of the setting being altered in packing, it has been assumed in the above description that some adjustment will be necessary. The effect of severe maladjustment is to prevent the picture from being synchronized and sometimes causes two pictures to be received side by side.

TO CENTRALIZE THE PICTURE

If the picture is over to one side of the mask, or is too high or too low it can be corrected by adjusting the three brass nuts holding the magnetic lens assembly.

TO FOCUS THE PICTURE

Adjust the focus control until the picture is clearly defined. If the control is rotated fully

clockwise before the picture is focused it indicates that the magnetic lens is too far down the tube, and the three adjusting nuts must be slackened by an equal amount. This will bring the control adjustment away from the end of the control range.

Adjust the brightness and contrast controls until a clear picture is obtained.

TO ADJUST SIGNAL STRENGTH

In areas of medium signal strength, a fine pattern of dark, more or less vertical, lines may be seen over the screen. Assuming that the aerial is properly connected to the receiver, this indicates that the R.F. gain is too high and the preset control (square 2R) should be reduced. This control is set at maximum in the factory and if lines appear on the picture it should be reduced until they disappear.

In areas of great signal strength this control may be ineffective. In this case reset it to maximum, and fit an attenuator, as suggested in the chapter on aerials (page 14).

Trimming

RETRIMMING the tuned circuits in a television receiver is a little more difficult than retrimming a radio receiver, because of the tendecy to tuning drift in service oscillators at very high frequencies.

Due to the simpler coil assemblies and the wider band widths involved, however, there are likely to be less faults in a television receiver which will necessitate retrimming.

To simplify the instructions given below, as far as possible, we have assumed the use of the Murphy Type M1 Service Oscillator, but dealers who do not posses this equipment should have no difficulty in following them, using any other type of oscillator.

THE TELEVISION CIRCUIT

As some of the frequencies required are beyond the range of the signal generator, recourse has to be made to harmonics of the 30-10 Mc/s range. To ensure that the calibration is accurate, it is a good plan to check up the signal generator against the Alexandra Palace Sound Transmission.

To do this, connect the receiver to the aerial during transmission hours, and connect the screened lead from the service oscillator to chassis and the aerial lead (point 1). Set the range switch to 30-10 Mc/s and the attenuator to about 1 millivolt. Tune in the sound transmission and rotate the scale of the service oscillator until a whistle is heard. There will be two beat points very close together at the bottom end of the scale (round about twenty divisions) and the correct one is the lower of the two. If this reading is different from that given on the 30-10 Mc/s calibration chart, the difference must be taken into account when locating other frequencies that are used in later operations.

In addition to the signal generator, two meters will be necessary when lining up the sound and vision circuits. These are a 0-3 volt rectifier type A.C. voltmeter, and a 0-50 volt 1,000 ohms per volt D.C. meter.

SOUND I.F. TRIMMING

Connect the 0-3 volt meter across the speech coil, and connect the service oscillator between the top cap of V2 (square 17M) and chassis (on the actual screen round F.C. valve). Adjust the service oscillator to 400 metres, and set the attenuator to about 2 millivolts. Tune C38 (Square 6A), C37 (Square 5B), C9 (Square 6N), and C8 (Square 6D) in turn to maximum output Reduce the signal input and retune the trimmers

to give a final adjustment. It must be understood that this method does not give an exact result, but owing to the wide response of the circuits, and the fact that great selectivity is not necessary, the results are satisfactory.

TUNING ADJUSTMENT

With the range switch on 30-10 Mc/s, set the scale to 41·5 Mc/s, i.e. the second harmonic of 14·45 metres, and the attenuator to approximately 1 mv. Slacken the locking screw on the tuning spindle, and rotate the tuning knob until the signal is heard. Place the stop in the centre of its slot, and tighten the locking screw. Without any further rotation of the tuner, now proceed to align the R.F. circuits. Note here that it is possible to adjust the oscillator to the wrong frequency, corresponding to the image, and that this causes the vision I.F. produced to be 2·75 M.C. This can be detected, however, as the low I.F. causes the picture to be coarse grained in texture, while the correct I.F. gives a fine grain picture.

R.F. TRIMMING

Connect the 0-50 voltmeter across the cathode load of V7 (point 46 square 7R) and chassis.

Remove the screened signal generator lead from V2, and connect it between the grid of V1 (square 15R) and chassis. Set the scale to 43 Mc/s (second harmonic of 14 metres), taking into consideration any correction factor obtained when checking the oscillator on 41·5 Mc/s, and tune C4 (Square 3E) to maximum dip on the meter. Set the scale to 46·5 Mc/s (2nd harmonic of 12·9 metres), and tune C3 (square 3D) to max dip on the meter. Return to 43 Mc/s and readjust C4.

Remove the lead from the grid of V1, connect the aerial, and on the vision signal tune C1 (square 3B) to maximum brightness of picture.

THE A58V RADIO CIRCUIT

Trimming on this circuit is very critical, and must be carried out carefully, as small inaccuracies may completely spoil the performance of the receiver.

The correct sequence for completely retrimming is I.F.'s (465 Kc/s) S.W., M.W., and L.W., but small errors in calibration occurring at the lower end of the bands may be corrected by adjusting the oscillator trimmers only, and on this receiver any of these can be adjusted without affecting the calibration of the other bands.

I.F. TRIMMING

The characteristics of the I.F. transformers make it essential to damp one of each pair of coupled circuits as the other is trimmed, and a unit for this purpose should be made up with a 20,000 ohms (quarter watt) resistance and a 0·1 mfd. condenser. Attach a crocodile clip to one end of the resistance and connect the other end to the condenser. Then attach a short flexible lead terminated with a crocodile clip to the free end of the condenser.

1. Connect the 0—3v meter across L.S. terminals
2. Clip the flexible lead of the damping unit to chassis, and the resistance end to the signal diode anode of V3 (square 6C, test point 53).
3. Tune the receiver to the top end of the long wave scale.
4. Connect the service oscillator between the control grid of V2 (square 20O, test point 42) and chassis, through a fixed condenser of 0·1 mfd.
5. Tune the service oscillator to exactly 465 Kc/s, and switch on the internal modulation.
6. Adjust C31 (square 21L) for maximum reading on the output meter.
7. Remove the damping unit from V3 diode anode, and clip it to anode of V2 (square 8E, test point 44). Adjust C34 (square 21L).
8. Connect the service oscillator between the control grid of V1 (square 17O, test point 12) and chassis via the dummy aerial, switch the receiver to medium waves.
9. Remove the damping from V2 anode and apply it to V2 control grid (square 20O, test point 42). Adjust C24 (square 21P).

10. Remove the damping from V2 grid and apply to V1 hexode anode (square 10G test point 19). Adjust C28 (square 21P).

If the trimmers are found to require only a very small adjustment, the I.F. trimming may now be regarded as complete, but if large adjustments have been made, it is advisable to repeat the whole procedure as a final adjustment.

It is always advisable to check the R.F. circuits after I.F. adjustments.

The accuracy of long wave calibration depends upon the accuracy of the I.F. trimming.

S.W. TRIMMING

Connect the service oscillator between the aerial and earth sockets of the receiver and the output meter across the L.S. terminals. Tune both the oscillator and the receiver to 21metres Adjust C16 (square 16P). It will be found that the signal can be received at two settings of this condenser. The correct adjustment is the one with the highest capacity, that is, the second point when screwing in the trimmer screw. The other is the "image."

When the oscillator trimmer has been adjusted, set the trimmer on the centre section of the gang condenser C7 (square 18L) to give maximum gain. A fairly accurate adjustment of the short wave trimmers can be made by tuning to a known station on about twenty metres and trimming for the best results judged by ear, but care should be taken to tune to the highest capacity setting on the oscillator trimmer.

After adjustment check that the 16 metre band still registers correctly at the bottom of the scale as too much trimmer capacity may throw it out.

M.W. TRIMMING

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.

2. Tune the receiver and oscillator to 220 metres.

3. Adjust the oscillator trimmer C17 (square 16O), the grid trimmer C2 (square 16K), and the aerial trimmer C6 (square 18K) in that order. Repeat for final adjustment.

4. If possible, check the calibration on the local broadcast station.

L.W. TRIMMING

1. Connect the service oscillator to the aerial and earth terminals and the output meter to the L.S. terminals.

2. Tune receiver and oscillator to 1000 metres.

3. Adjust the oscillator trimmer C19 (square 16J).

Mechanical Details

Most service work can be carried out without removing the television chassis from the cabinet. The components on underside are accessible when the chassis is in its normal position, and by removing the two back fixing bolts and the extension spindle for the tuning control, the chassis can be lowered to make the valves and cathode ray tube accessible.

If the chassis has to be removed from the cabinet, the control panel assemblies should be released by removing the securing wood-screws. Take out the loudspeaker and power pack plugs and in the case of the A58V, the plug in the change-over switch assembly. In withdrawing the chassis be careful to avoid the leads to the panels fouling the cabinet fittings.

Removal of the radio chassis in the A58V is simplified by first removing the power pack, but this is not essential, provided reasonable

care is taken. The television chassis should be lowered and the plug withdrawn from the socket on the change-over switch assembly. The switch assembly can then be released from the cabinet and removed with the radio chassis.

THE A56V FRONT PANEL

The front panel of the A56V is secured by bushes behind the control knobs. The bushes are pushed through the holes in the panel and secured with spring clips inside the cabinet. The clips can be removed with a screwdriver. If they are difficult to remove the pressure on them may be reduced by pressing the bushes.

THE SERIAL NUMBERS

The serial number of the receiver, which should be used in connection with correspondence and telephone inquiries relating to the set, is marked on a small plate on the cathode ray tube assembly. The power-pack also has a serial number, but this should not be quoted in cases relating to the complete receiver.

Aerial Equipment

THE A56V and A58V are designed for use with a half-wave dipole aerial, using co-axial cable for connecting the aerial to the receiver. It is very desirable to take the cable straight to the aerial socket provided with each set, and to avoid joining up two or more lengths of cable. In no circumstances should the cable be terminated by a two pin socket on the wall, and the set coupled to the plug with twin flex. This practice leads to serious mismatching between the aerial and the input circuits and may cause the formation of patterns on the screen.

AERIAL TYPES

The type of aerial most commonly used consists of a conductor, a half wavelength long, mounted vertically and divided at the centre (having a gap of an inch or so) for the connection of the co-axial cable. The cable should be soldered to the aerial and the joints weather proofed. It should be taken horizontally to about one foot from the aerial and brought down so that it is kept at least this distance from the bottom half of the aerial. Free lengths of cable should be avoided and precautions should be taken to prevent it rubbing against gutters. **The outer casing should be earthed, preferably at the point where the cable enters the house.**

The addition of a reflector gives the aerial directional properties, by increasing the signal pick-up in one direction and decreasing it in the other. The reflector can therefore be used to increase signal voltage to the set, and to reduce interference.

Interference arising from a source which is not directly in line with the transmitting station in the "forward" direction can usually be reduced if not practically eliminated by rotating the aerial so that the reflector points towards the source of interference. When, however, the source of interference is not clearly defined, such for example as that due to cars passing along a road, it will be found better to use the reflector to give the maximum amount of signal pick-up rather than attempt to use it to suppress interference.

This applies, even in cases where the signal strength is so great that an attenuator has to be used in the set, as increasing the signal strength as far as possible and subsequently attenuating, will obviously increase the signal to noise ratio.

An aerial may be be "loaded" to reduce the length and consequently make erection simpler.

The efficiency of this type of aerial is less than that of a standard half-wave aerial, and great care must be taken in the design to keep the band-width sufficiently wide to avoid reducing the picture quality. Dealers are therefore not recommended to make up this type of aerial for themselves.

FEEDER CABLE

The impedance of feeder cable of the co-axial type is not affected by length, and consequently any convenient length may be used. To avoid losses, however, the lead to the set should be taken by the most direct route to avoid unnecessary length.

With the cheaper varieties of cable, the losses amount to as much as 7 db per 100 foot. This means that one millivolt at the aerial is reduced to rather less than half millivolt at the end of 100 ft. of cable. Where these losses are important, low loss cables should always be used.

In general, twin feeder should not be used with the A56V and A58V receivers.

ATTENUATORS

In localities where the signal strength is high, an attenuator must be fitted in the aerial circuit to prevent the receiver overloading and the consequent formation of patterns on the screen due to cross modulation between the sound and vision signals.

A "T" type attenuator should be used, consisting of two non-inductive resistances in series in one lead from the aerial, with a third resistance taken from the junction point of the two resistances, to the other aerial lead. The unit should be screened, and should be mounted as close as possible to the aerial terminal on the receiver.

The value of the resistances will depend on the amount of attenuation required and must be determined by experiment, but the table below indicates suitable values for various degrees of attenuation.

SERIES RESISTANCES	PARALLEL RESISTANCES	APPROX. VOLTAGE ATTENUATION
50 + 50	30	5 : 1
70 + 70	15	10 : 1
70 + 70	10	20 : 1
80 + 80	3	50 : 1

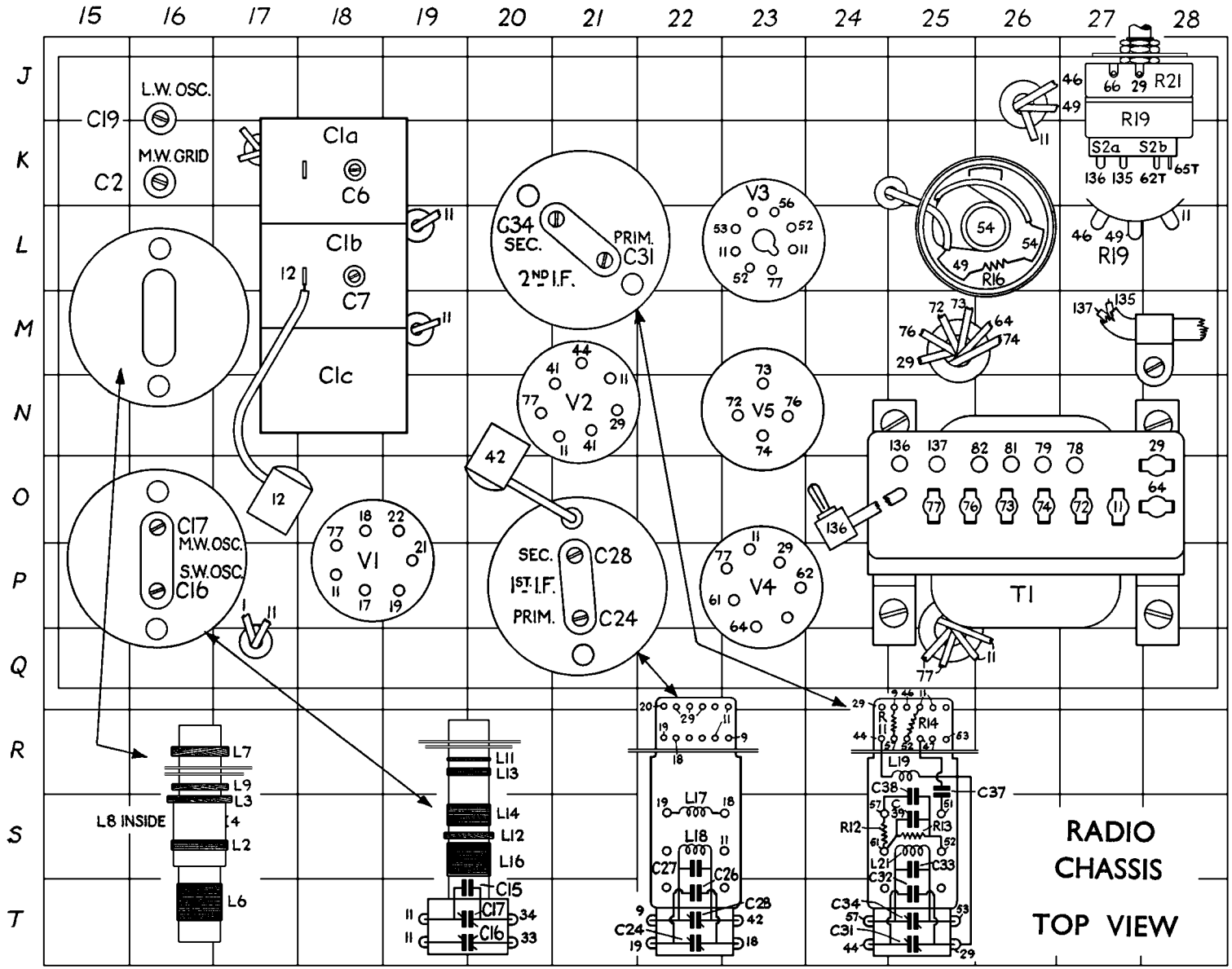
The Diagrams

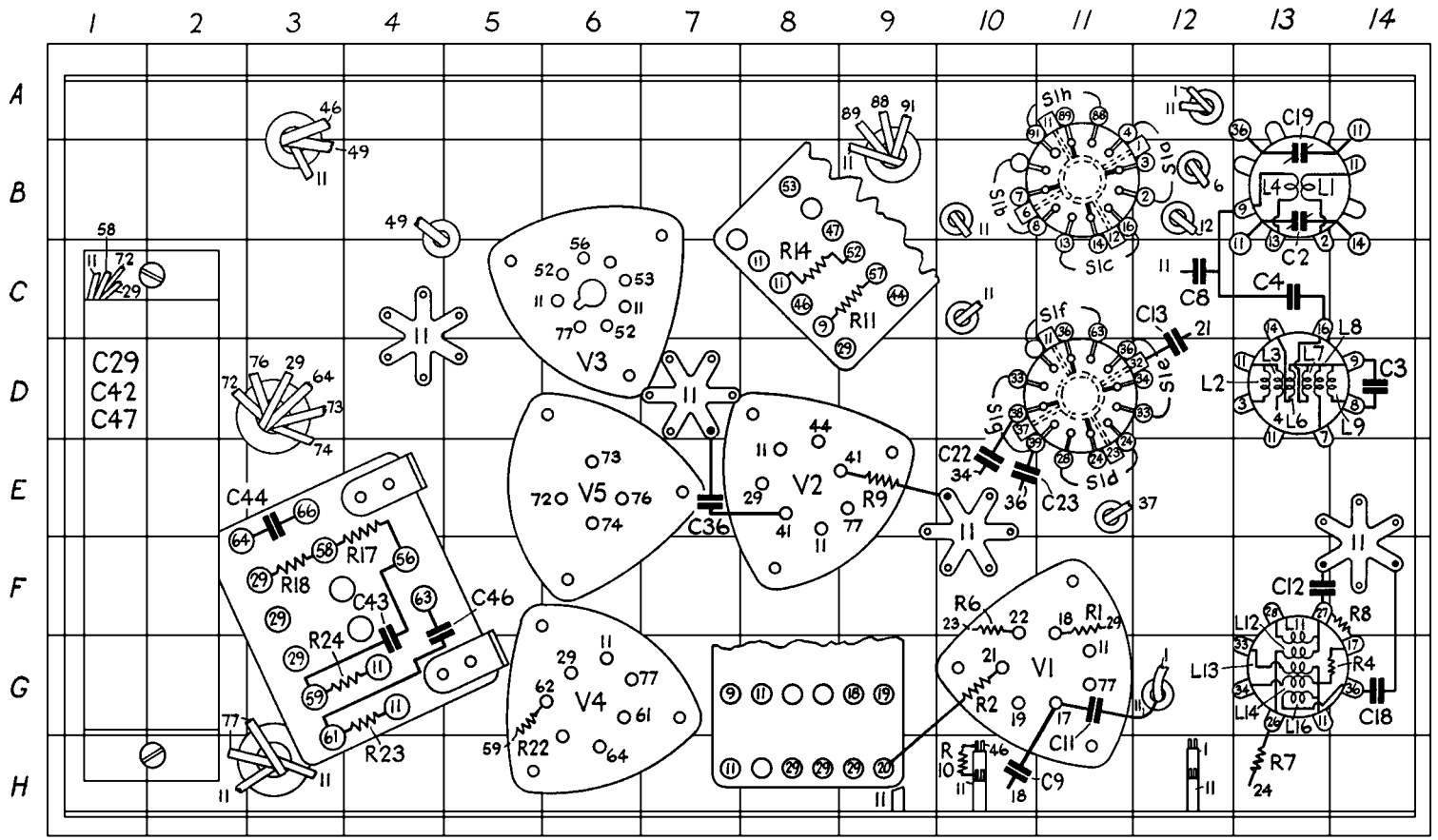
In numbering the circuit and other diagrams the radio receiver in the A58V has been treated as an entirely separate unit, and the numbers used are the same as those used for the "A46" receiver in the "46" Service Instructions. Actually the top and bottom chassis views on pages 16 and 17 are taken from the "46" Service Instructions, so that the modifications for adapting the circuit for use with the television receiver are not shown. They are so simple, however, that the modified parts of the chassis should not cause servicemen any difficulty.

On the A58V front panel assembly (page 24) the sections of the changeover switch are marked (T) or (R) to denote whether they belong to the television or radio circuit.

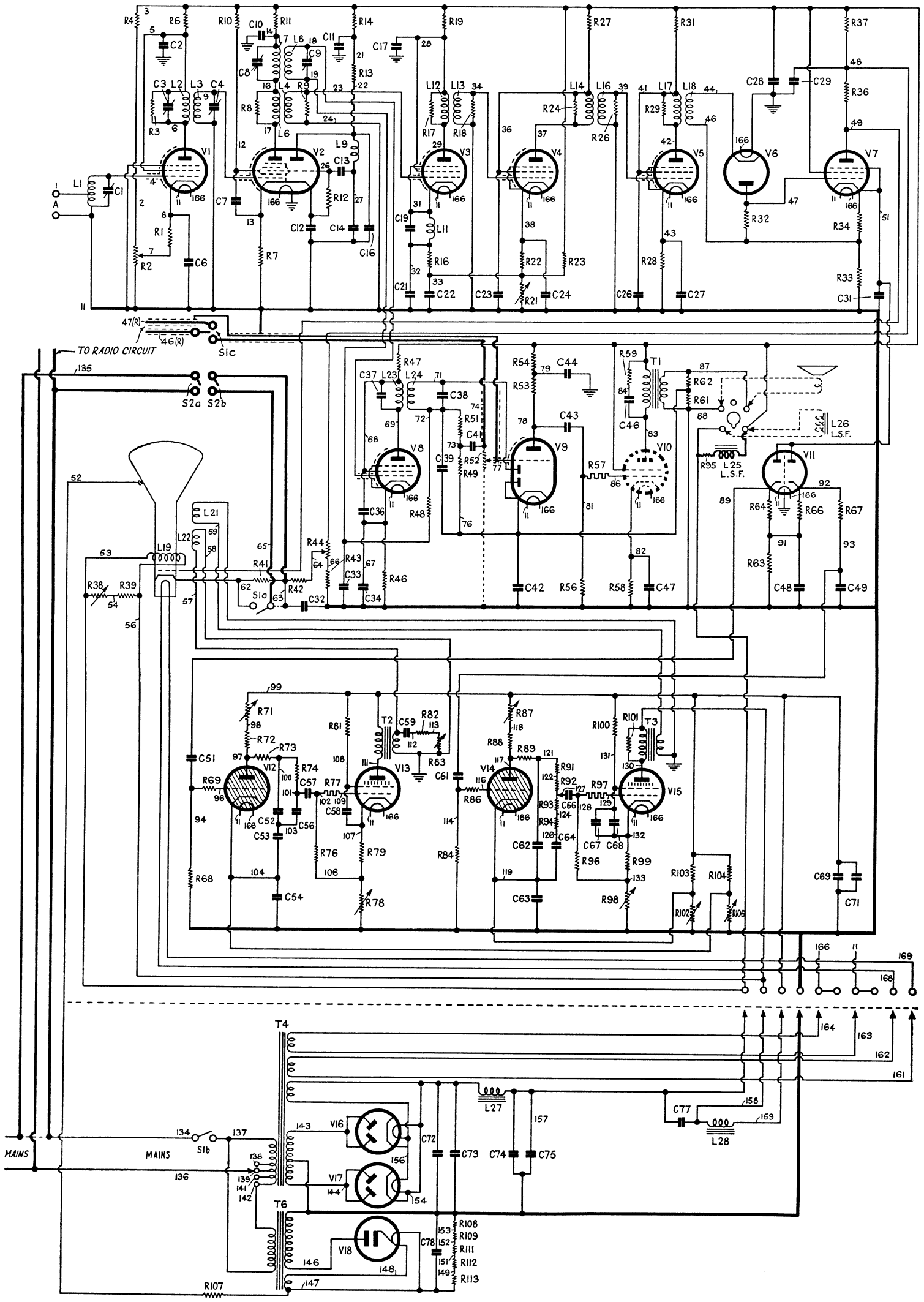
A composite circuit diagram is used for the two receivers. For the A56V, the heavy lines should be ignored and the dotted lines treated as full. For the A58V, ignore the dotted lines and include the parts shown in heavy lines.

In the component tables, all resistances are given in ohms, and capacities in microfarads, unless otherwise stated. The D.C. resistance of coils is quoted in ohms in all cases, except where the reading would be too small to be of use, when they are omitted altogether.





RADIO CHASSIS UNDERSIDE



This circuit has been modified in certain details, particulars of which are given on page 36.

FOLLOW THE DOTTED LINES FOR THE A56 AND THE HEAVY LINES FOR THE A58

TABLE OF COMPONENTS

TELEVISION CIRCUIT

Code	Value	Test	Pts.	Square
C1	Trimmer	4	11	3 A
C2	·002	5	11	2 C
C3	Trimmer	5	6	3 D
C4	,,	9	11	3 E
C6	·002	8	11	2 C
C7	·002	12	13	5 F
C8	Trimmer	14	16	6 D
C9	,,	18	19	6 D
C10	·05	11	14	7 E
C11	·002	11	21	1 F
C12	·002	11	13	5 G
C13	50 pf.	26	27	1 E
C14	25 ,,	11	27	2 E
C16	25 ,,	11	22	4 F
C17	·002	11	28	2 H
C19	·002	31	32	2 H
C21	·002	11	32	1 G
C22	·05	11	33	2 K
C23	·002	11	36	2 L
C24	·002	11	38	1 L
C26	·002	11	41	2 P
C27	·002	11	43	2 N
C28	16	3	11	7 L
C29	16	11	48	7 M
C30	·05	3	11	5 R
C31	·0003	11	51	8 S
C32	·05	11	63	11 K
C33	·05	11	19	7 C
C34	·05	11	67	4 D
C36	·05	67	68	4 D
C37	Trimmer	68	69	5 B
C38	,,	71	72	6 A
C39	50 pf.	72	76	7 C
C41	·01	73	74	8 C
C42	·025	76	11	7 C
C43	·05	78	81	9 C
C44	3	11	79	9 D
C46	·04	83	84	10 C
C47	75 12v.	11	82	11 A
C48	2	11	91	2 S
C49	·0015	11	93	5 Q
C51	50 pf.	89	94	7 Q
C52	·002	100	103	13 F
C53	·005	103	104	14 G
C54	·2	11	104	13 D
C56	·0015	101	103	12 G
C57	·01	101	102	12 F
C58	·1	107	108	10 E
C59	·02	57	112	12 L
C61	·01	93	114	5 Q
C62	·5	119	121	12 S
C63	75 12v.	11	119	14 M
C64	·1	119	126	11 S
C66	·2	127	128	11 N
C67	8	131	132	8 L
C68	4	131	132	8 M
C69	16	99	11	8 G
C71	16	99	11	8 G
C72	8	11	154	34 E
C73	8	11	154	34 D
C74	16	11	157	31 B
C75	16	11	157	31 B
C77	100 40v.	157	158	38 A
C78	·1	11	147	36 E
R1	140	7	8	1 C
R2	1,000	2	11	1 B
R3	3,200	5	6	16 P
R4	70,000 1w.	2	3	1 C
R6	2,000 ½w.	3	5	2 C
R7	200	11	13	2 F
R8	3,200	16	17	3 F
R9	3,200	23	11	3 H
R10	15,000 1 w.	3	12	5 E
R11	5,000	3	14	20 P
R10	15,000 1w.	3	12	5 E
R11	5,000	3	14	20 P
R12	50,000	13	26	1 E
R13	33,000 ½w.	21	22	1 F
R14	5,000	3	21	1 F
R16	140	32	33	1 G
R17	3,200	28	29	3 J
R18	3,200	11	34	3 L
R19	2,000 ½w.	3	28	4 K
R21	2,000	11	33	73 B
R22	140	33	38	1 L
R23	70,000 1w.	3	33	4 N
R24	3,200	36	37	3 M
R26	3,200	39	11	3 N
R27	2,000 ½w.	3	36	4 M
R28	140	11	43	1 P
R29	3,200	41	42	3 Q
R31	2,000 ½w.	3	41	3 Q
R32	3,200	46	47	19 D
R33	2,000 1w.	11	46	7 R
R34	50	46	51	6 R
R36	5,200 2w.	48	49	5 S
R37	1,000 ½w.	3	48	8 R
R38	1,000	53	54	70 D
R39	500 2w.	54	56	11 K
R41	5 MΩ	62	63	12 J
R42	10,000	63	64	11 K
R43	25,000 1w.	11	66	13 K
R44	10,000	48	66	70 B
R46	400	11	67	4 C
R47	2,000 ½w.	3	68	4 C
R48	2 MΩ	19	72	8 D
R49	250,000	73	76	8 C
R51	9,000	72	73	8 C
*R52	500,000	11	74	73 D
R53	33,000 ½w.	78	79	9 C
R54	9,000	3	79	9 C
R56	500,000	11	81	9 D
R57	500	81	86	10 A
R58	180 ½w.	11	82	11 C
R59	4,000 1w.	3	84	11 C
R61	2,000	11	76	10 C
R62	2,000	76	87	10 C
R63	1 MΩ	11	91	6 R
R64	20,000	89	91	6 Q
R66	20,000	91	92	6 Q
R67	20,000	92	93	5 Q
R68	20,000	11	94	6 R
R69	50,000	94	96	13 E
R71	100,000	98	99	67 D
R72	70,000 1w.	97	98	13 F
R73	250	97	100	13 H
R74	250,000	101	100	12 H
R76	500,000	102	106	11 F
R77	500	102	109	10 E
R78	200	11	106	66 B
R79	114 1w.	106	107	11 G
R81	10,000 1w.	99	108	11 F
R82	500 2w.	112	113	13 K
R83	500	11	113	67 B
R84	150,000	11	114	5 P
R86	20,000	114	116	14 Q
R87	100,000	99	118	66 D
R88	70,000 1w.	117	118	12 P
R89	200	117	121	11 P
R91	150,000	121	122	11 P
R92	5,000	122	127	11 N
R93	5,000	124	127	11 N
R94	40,000	124	126	11 P
†R95	725	90	53	8 P
R96	1 MΩ	128	133	10 P
R97	500	128	129	12 Q
R98	500	11	133	64 B
R99	210 ½w.	132	133	10 P
R100	25,000 1w.	99	131	12 R
R101	15,000	130	56	26 G
R102	1,000	11	119	12 A
R103	35,000 3w.	119	99	13 P
R104	35,000 3w.	99	104	13 N
R106	1,000	11	104	13 A
R107	25,000	147	52	45 C
R108	5 MΩ	11	153	42 D
R109	5 MΩ	153	152	43 D
R111	5 MΩ	152	151	43 D
R112	5 MΩ	151	149	44 D
R113	5 MΩ	149	147	44 D
L1	——	4	11	17 S
L2	——	5	6	17 P
L3	——	9	11	17 P
L4	5	11	23	3 G
L6	6·5	16	17	3 G
L7	7·5	14	16	20 P
L8	6·5	18	19	20 P
L7	7·5	14	16	20 P
L8	6·5	18	19	20 P
L9	——	22	27	2 E
L11	1	31	32	2 G
L12	6·5	28	29	3 K
L13	5	11	34	3 K
L14	6·5	36	37	3 N
L16	5	11	39	3 N
L17	6·5	41	42	3 Q
L18	7	44	46	3 R
L19	200	53	56	20 K
L21	6·5	11	59	22 J
L22	5·5	11	57	22 J
L23	7·5	68	69	20 R
L24	7·5	71	72	20 S
†L25	500	3	90	——
*L26	950	3	53	L.S.F.
L27	40	154	157	38 D
L28	100	158	159	40 D
T1 Prim.	160	3	83	27 S
Sec.	——	11	87	
T2 Prim.	52	99	111	13 G
Sec.	——	11	57	
T3 Prim.	400	56	130	27 G
Sec.	——	11	59	
T4 Prim.				
200-213v.	4·5	137	138	49 D
214-228v.	4·75	137	139	
229-244v.	5·0	137	141	
245-260v.	5·25	137	142	
H.T. Sec.	35	11	143	
	+37	11	144	
T6 Prim.				
240v.	42	137	142	56 D
H.T. Sec.	2,300	11	146	

*Delete in A58

†Delete in A56V

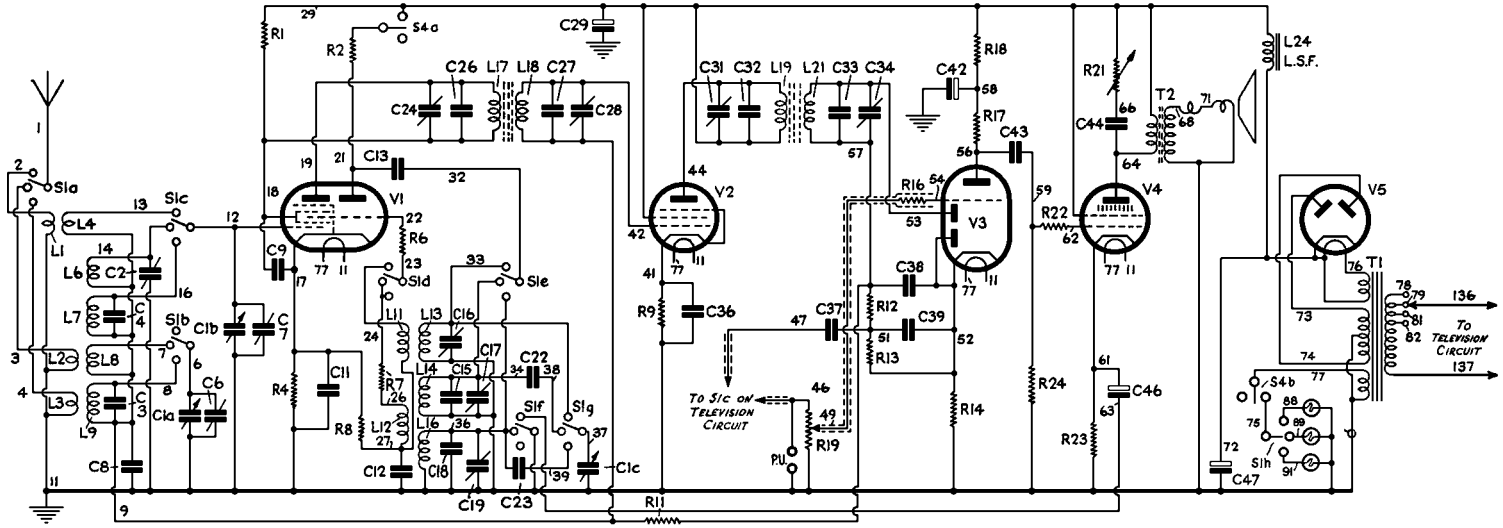
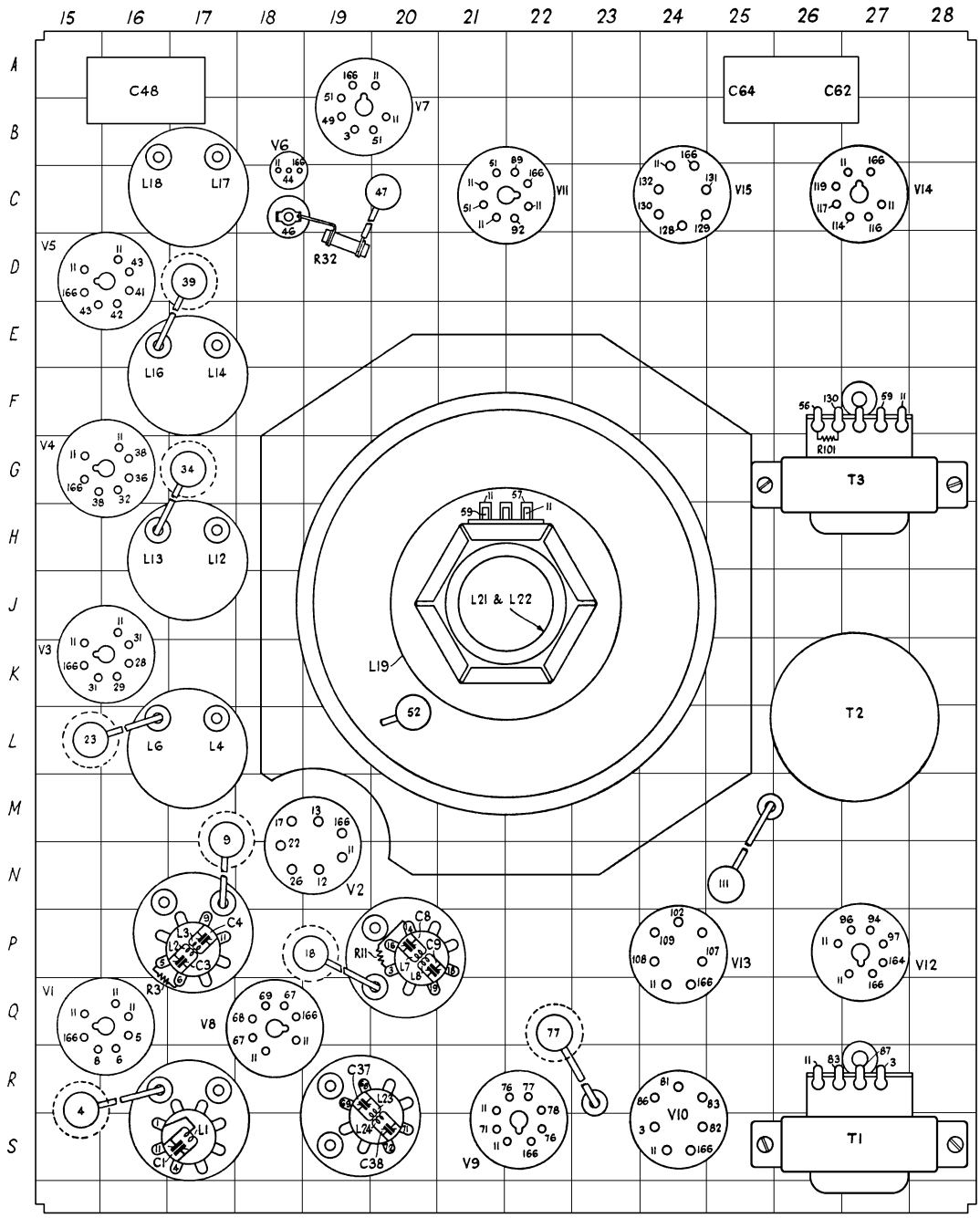


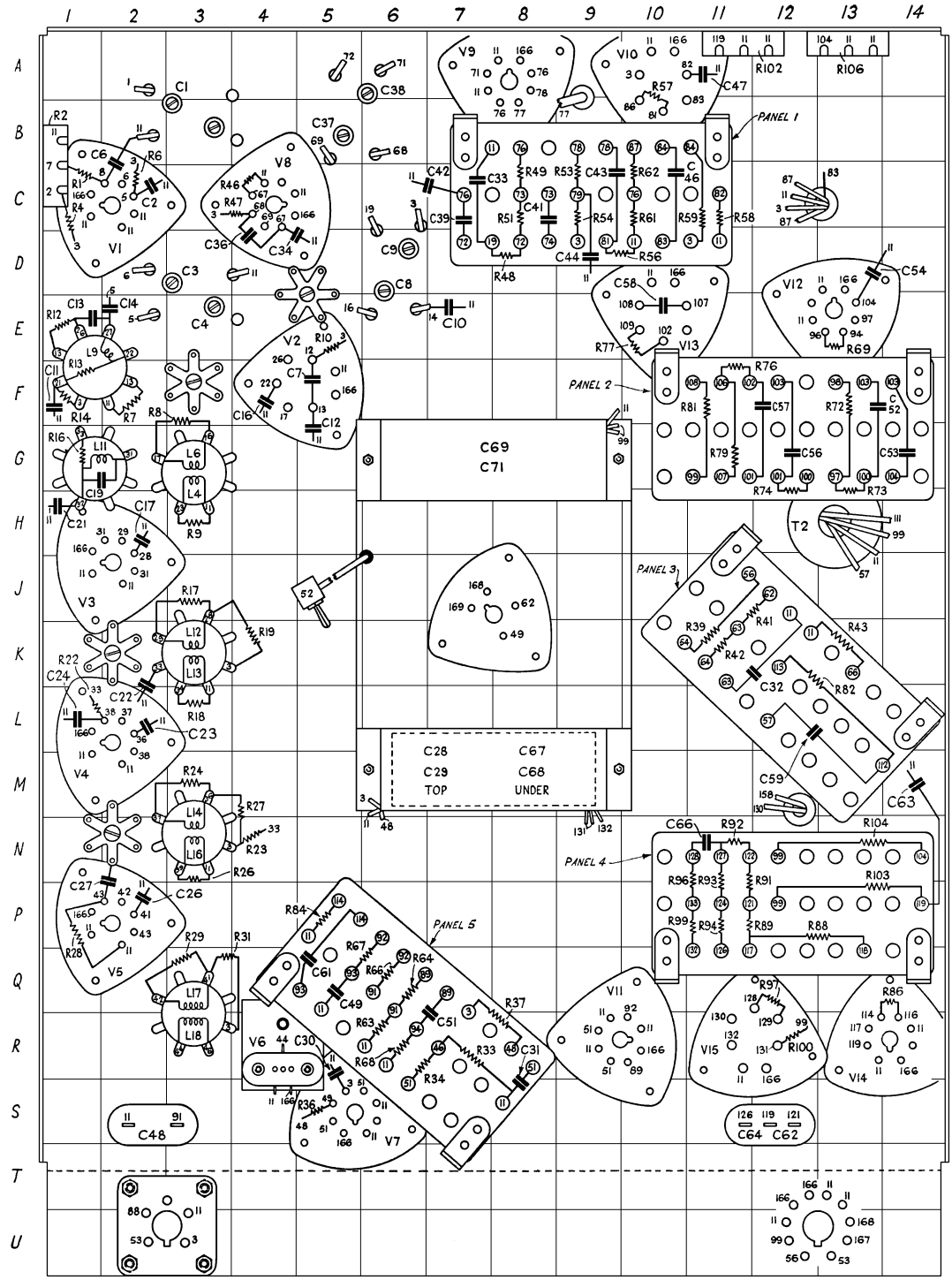
TABLE OF COMPONENTS

RADIO CIRCUIT

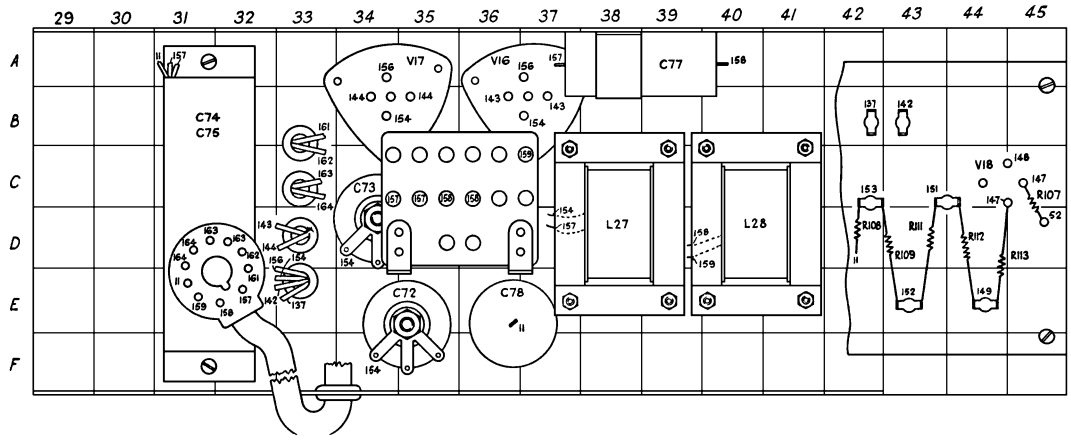
Code	Value	Test	Pts.	Square	Code	Value	Test	Pts.	Square	Code	Value	Test	Pts.	Square	Code	Value	Test	Pts.	Square
C1a	Variable	6	11	18 K	C28	Trimmer	9	42	21 P	R10	100,000	11	43		L12	1·5	26	27	13 G
C1b	,,	11	12	18 L	C29	8 (400v.)	11	29	1 D	R11	2 MΩ	9	57	9 C	L13	—	11	33	13 G
C1c	,,	11	37	18 N	C31	Trimmer	29	44	21 L	R12	100,000	51	57	25 S	L14	2·5	11	34	13 G
C2	Trimmer	11	14	16 K	C32	125 mmf.	29	44	25 T	R13	500,000	51	52	25 S	L16	4	11	36	13 G
C3	50 mmf.	8	9	14 D	C33	125 ,,	53	57	25 S	R14	500	11	52	8 C	L17	6	18	19	22 S
C4	62 ,,	9	16	13 C	C34	Trimmer	53	57	20 L	R16	50,000	49	54	26 L	L18	6	9	42	22 S
C6	Trimmer	6	11	18 K	C36	·025	11	41	8 E	R17	50,000	56	58	4 F	L19	6	29	44	25 R
C7	,,	11	12	18 L	C37	·01	47	51	25 R	R18	15,000	29	58	3 F	L21	6	53	57	25 S
C8	0·1	9	11	12 C	C38	100 mmf.	52	57	25 R	R19	1 MΩ	11	46	27 L	L24	1400	29	72	LSF
C9	·025	17	18	10 H	C39	100 mmf.	51	52	25 S	R21	25,000	29	66	27 L					
C11	·05	11	17	11 G	C42	4 (400v.)	11	58	1 D	R22	50,000	59	62	5 G	T1 prim				
C12	200 mmf.	11	27	13 F	C43	·025	56	59	4 G	R23	210	11	61	4 G	200–213v	26	78	84	
C13	100 ,,	21	32	12 D	C44	·04	64	66	3 E	R24	500,000	11	59	4 G	214–228v	28	79	84	
C15	35 ,,	11	34	20 T	C46	50 (12v.)	61	63	5 F						229–244v	31	81	84	
C16	Trimmer	11	33	16 P	C47	16	11	72	1 D	L1	—	2	11	13 B	245–260v	33	82	84	26 O
C17	,,	11	34	16 O						L2	1·25	3	11	13 D	H.T. sec.				
C18	245 mmf.	11	36	14 G	R1	15,000	18	29	11 F	L3	10	4	11	13 D		210	11	73	
C19	Trimmer	11	36	16 J	R2	33,000	20	21	10 G	L4	—	9	13	13 B		+240	11	74	
C22	703 mmf.	34	38	10 E	R4	300	11	17	14 G	L6	4	9	14	13 D	T2 prim	140	29	64	ON
C23	386 ,,	36	39	10 F	R6	100	22	23	10 F	L7	12	9	16	13 D	T2 sec	—	11	68	L.S.
C24	Trimmer	18	19	21 P	R7	1,000	24	26	13 H	L8	4	7	9	13 D					
C26	125 mmf.	18	19	22 T	R8	20,000	17	27	14 F	L9	12	8	9	14 D	L.S.	2	11	71	
C27	134 ,,	9	42	22 S	R9	450	11	41	9 E	L11	—	27	28	13 G	Sp. coil				



TOP OF TELEVISION CHASSIS

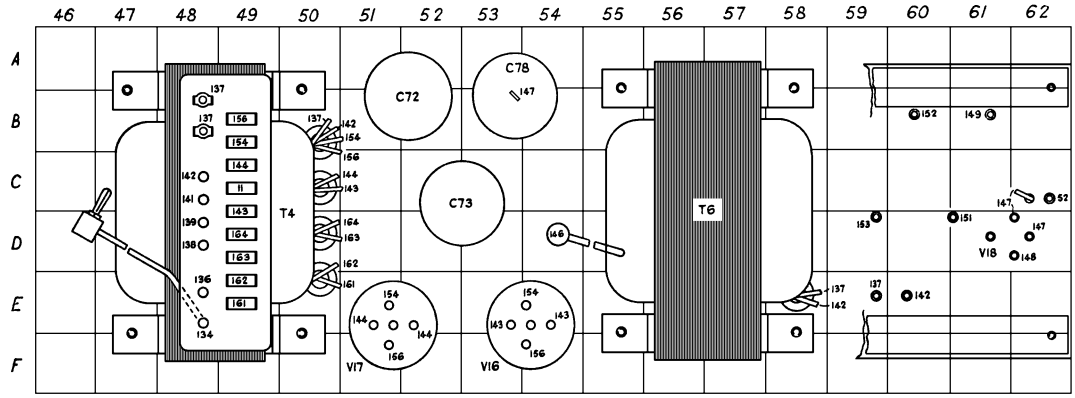


UNDERSIDE OF TELEVISION CHASSIS



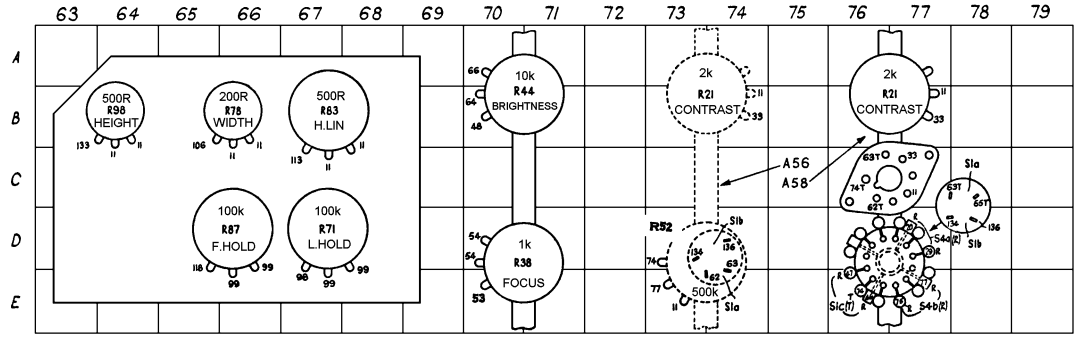
UNDERSIDE OF POWER PACK

TOP SIDE OF POWER PACK



SIDE CONTROL PANEL

FRONT CONTROL PANELS



The Voltage Tables

THE table of voltages below was taken with the receiver working on 230 volt A.C. mains. A voltmeter with 0—50 and 0—500 volt ranges, with an internal resistance of 1,000 ohms-per-volt was used except where otherwise stated.

With the exception of V13, where the voltages are fairly critical, considerable variations in the voltage may occur without affecting the performance of receivers, and some variation is to be expected between different receivers.

Mazda valves and cathode ray tubes are used throughout, and the maker has not therefore been quoted in the table.

Two sets of figures are given against certain valves. The second set is for receivers above serial numbers 184316. These receivers incorporate some minor modifications which are given in detail on page 36.

TABLE OF VOLTAGES — TELEVISION CIRCUIT

Valve	Type	Electrode	Test Point	Square	Voltage
V1	SP41	Anode	6	2 C	**200**
		Screen	5	2 C	**200**
		Cathode Max. bias	8	2 C	**4**
		,, Min. bias	8	2 C	**1·5**
V2	ACTH1	Hexode Anode	17	4 F	**210**
		Hexode Screen	12	5 E	**105**
		Triode Anode	22	4 F	**40**
		Cathode	13	5 F	**3**
V3	SP41	Anode	29	2 H	**200**
		Screen	28	2 H	**200**
		Cathode	31	2 J	**1·5**
		,, Min. contrast	31	2 J	**7**
V4	SP41	Anode	37	2 L	**200**
		Screen	36	2 L	**200**
		Cathode	38	2 M	**1·5**
		,, Min. contrast	38	2 M	**7**
V5	SP41	Anode	42	2 P	**200**
		Screen	41	2 P	**200**
		Cathode	43	2 P	**1·5**
V7	SP41	Anode	49	5 S	**140**
		Screen	3	5 S	**220**
		Cathode	51	6 S	**34**

TABLE OF VOLTAGES (Cont.) TELEVISION CIRCUIT

Valve	Type	Electrode	Test Points	Square	Voltage
V8	VP41	Anode Screen Cathode	69 68 67	4 C 4 C 4 C	**200** **200** **4·5**
V9	HL41DD	Anode Cathode	78 76	8 A 8 B	**110** **2·5**
V10	AC5PEN	Anode Screen Cathode	83 3 82	11 B 10 A 10 A	**210** **220** **6·5**
V11	DD41	Anodes Cathode 1 Cathode 2	51 89 92	9 R 10 R 10 R	**34** **33·5** **33·5**
All the above voltages are measured with the contrast control at maximum and aerial disconnected except where stated.					
V12	T41	Anode Max. bias ,, Min. bias Cathode Max. bias ,, Min. bias	97 97 104 104	13 E 13 E 13 E 13 E	**140** **30** **10** **0**
V13	AC6PEN	Anode (See Note *) Screen Cathode Max. amplitude ,, Min. amplitude	111 108 107 107	10 D 10 E 11 E 11 E	— **190 or 210** **4·5 or 6** **20 or 22**
* Owing to the high peak volts (2000–3000) on the anode of V13 the voltage cannot be easily measured unless the bias on V12 is reduced to zero. The voltage on the anode of V13 will then be about 320-330.					
V14	T41	Anode Max. bias Anode Min. bias Cathode Max. bias ,, Min. bias	117 117 119 119	13 R 13 R 13 R 13 R	**140** **30** **10** **0**
V15	AC5PEN	Anode Screen Cathode Max. amplitude ,, Min. amplitude	130 131 132 132	11 R 12 R 11 R 11 R	**300** **250 or 190** **9 or 8** **32 or 25**
V16	UU4	Cathode	156	37 A	**345 or 370**
V17	UU4	Cathode	156	37 A	**345 or 370**

TABLE OF VOLTAGES (Cont.) TELEVISION CIRCUIT

Valve	Type	Electrode	Test Points	Square	Voltage
V18	U21	Cathode	148	45 E	**4700**
This voltage can only be measured accurately with an electrostatic voltmeter or a 20,000 ohms-per-volt meter.					
CR Tube	CRM91	Cathode Max. brightness ,, Min. brightness Grid	62 62 49		**150** **205** **140**
Measured under no signal conditions, with the U21 (V18) removed to prevent damage to tube when on Max. brightness.					
L.S. field Magnetic Lens			140		**125** **23 to 31**

TABLE OF VOLTAGES RADIO CIRCUIT

Valve	Type	Electrode	Test Point	Square	Voltage
V1	AC/TH1	Hexode Anode Hexode Screen Triode Anode Cathode	19 18 21 17	10 G 11 F 10 G 11 G	**110** **90** S.W. **60** M.W.**70** L.W. **80** **3·5**
V2	AC/VP2	Anode Screen Cathode	44 29 41	8 E 8 E 8 E	**230** **230** **4**
V3	HL41DD	Anode Cathode	56 62	6 C 6 C	**85** **1**
V4	AC5PEN	Anode Screen Cathode	64 29 61	6 H 6 G 6 G	**220** **230** **7**
V5	UU4	Cathode	72	6 E	**315**
L.S. Field			29—72	27 O	**90**

Fault Finding

THE block diagram on page 2 shows how the circuit of the A56V and A58V receivers can be divided into sections, and as any failure gives, by its symptoms, an indication of the section in which the fault lies, the location of the trouble should, in most cases, be quite a simple matter.

The general symptoms, which point to a fault being in any particular section, are given at the top of each division of the Fault Finding Table. Diagnosis up to this point should therefore result automatically by reference to the main headings of the table.

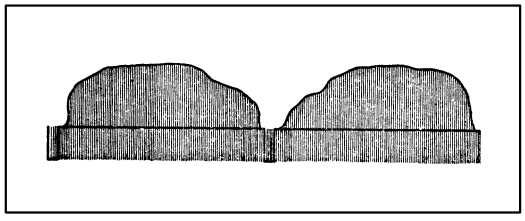
The symptoms are localized further in the sub-sections of the table and the final diagnosis should be carried out on similar lines to those adopted for a radio receiver.

Generally, this will amount to systematic voltage and continuity testing and for this purpose the service man should have a high grade multi range meter with a D.C. resistance on the voltage ranges of at least 1000 ohms-per-volt. An electrostatic voltmeter for the H.T. voltages is an advantage and a high voltage continuity tester for insulation tests is also desirable.

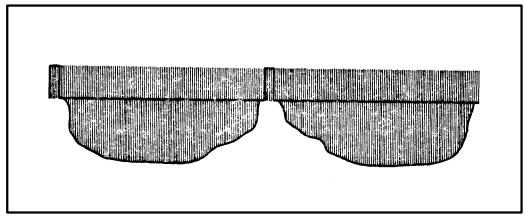
We need hardly warn servicemen that extreme care should be taken in making tests in the H.T. circuits to avoid the risk of electric shock.

In the I.F. circuits of the sound and vision receivers, stage by stage tests can be made with a reliable service oscillator such as the type M.I.

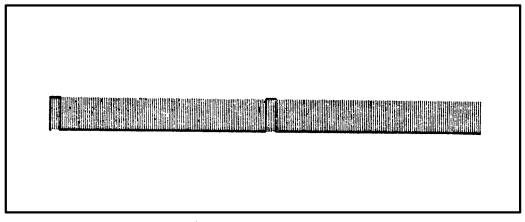
An oscilloscope, to observe the waveform in various sections of the receivers, is a great help in locating the less obvious faults, but we cannot give detailed information on the use of this equipment, because there are considerable differences in the design of the various oscilloscopes available. The manufacturers do, in most cases, however, give comprehensive instructions and the sketches below, indicating the curves which should be obtainable by connecting the 'scope to various points in the circuit, will probably be useful to servicemen possessing this equipment.



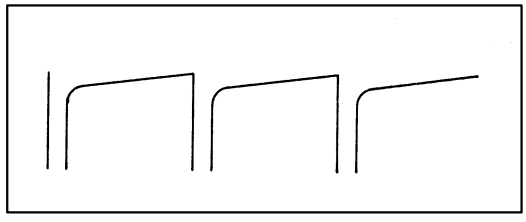
(1) *Peak volts 20-25. Measured between V6 anode and chassis.*



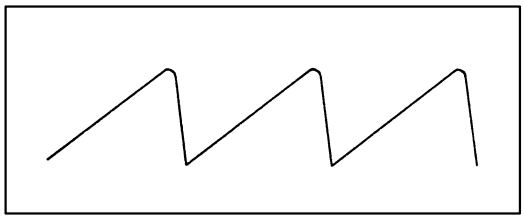
(2) *Peak volts 13. Measured between V6 grid and chassis.*



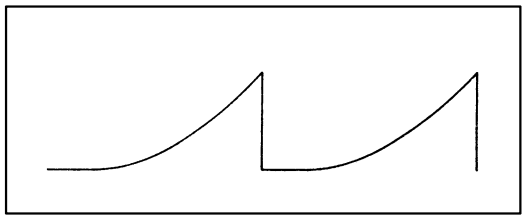
(3) *Peak volts 6. Measured between V11 cathode and chassis.*



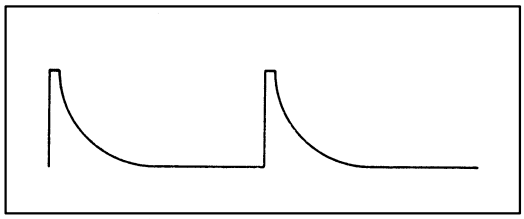
(4) *Peak volts 200. Measured across T2 secondary. This curve may be inverted on the screen.*



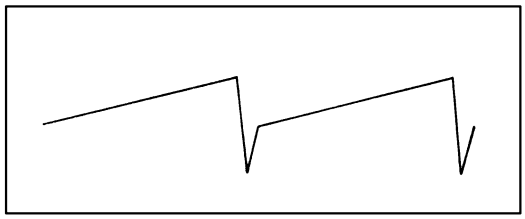
(5) *Peak volts* 40. *Measured from V13 grid to chassis.*



(6) *Peak volts* 30. *Measured from V15 grid to chassis.*



(7) *Peak volts* 10. *Measured across C49. This waveform is mainly due to thyratron grid current, but with small synchronizing impulses superposed.*



(8) *Peak volts* 10. *Measured across T3 secondary.*

The voltages quoted are only approximate and are intended to give an indication of the size of picture to be expected.

A word of warning is necessary with regard to the handling of the cathode ray tubes. Although they are fairly robust in construction there is always the possibility of an implosion which could result in damage to one's eyesight. It is therefore strongly recommended that goggles should be worn whenever tests are made with the cathode ray tube unprotected by the plate glass viewing window.

Another point of importance with regard to the tube is that certain faults in the receiver will cause a part or the whole of the screen to become intensely brilliant. If the set is allowed to run in this condition for any length of time the screen of the tube will be damaged. It is therefore important in this case to adjust the controls to reduce the brilliance, or if this is not possible, to switch the set off and locate the fault by continuity tests. The faults which cause these symptoms are starred (*) in the fault finding table.

Occasional reference has been made in the table to hum bands and heterodyne patterns on the picture, and it is felt that a brief description of their appearance would not be out of place.

Hum, unless severe, is not readily apparent when a picture is being received, except when particular O.B.'s are taking place. This arises from the fact that normally the transmitter is locked to the mains, and hum, being derived in some fashion from the mains, gives rise to a stationary pattern. If, however, the contrast is turned to zero, and the brightness adjusted to give a dim raster, any hum present will be seen as darker bands floating upwards or downwards, according to the setting of the frame hold control.

Heterodyne patterns take various forms, the most common of which are an appearance rather like open grained wood over the picture, or a series of light and dark bars, whose spacing and angle of inclination is constantly changing.

Fault Finding Table

THIS table, although fairly comprehensive, does not cover obvious faults such as mains breakdowns, nor does it include straightforward valve failures which should be easily located without the aid of a table.

A small space is left at the bottom of each section so that servicemen can add any unusual faults which develop in the field, and which are not already included in the table.

Section 1. H.F. Stage and Frequency Changer
FAULTS AFFECTING BOTH SOUND AND VISION

SYMPTOMS	FAULTS
Neither sound nor vision	R2 o/c. C1 or C4 leads s/c. to can. V1 screening cap s/c to grid lead. S/c in aerial socket
Weak sound and vision. Crackles on sound, flashes on picture	V2. Metallizing s/c to additional screen
Hiss on sound, heterodyne pattern swamping picture	C1 unscrewed too far causing R.F. stage to oscillate
NOTE—*Also see faults in Section 7.*	

Section 2. Sound Receiver
FAULTS AFFECTING SOUND ONLY

SYMPTOMS	FAULTS
Whistles on sound	V8 screening cap missing
No Sound: V10 screen red hot	T1 Prim.: o/c

Section 3. Vision Receiver

FAULTS AFFECTING PICTURE MODULATION ONLY

SYMPTOMS	FAULTS
No modulation; raster normal; brightness control normal in operation	R21 o/c; leads dis.: between control panel and chassis. V3, V4, or V5 screening caps s/c to grid leads. V3, V4, or V5 loose in socket
*No modulation; raster intensely bright; no control with brightness control	V7 faulty or loose in socket. C.R. tube grid lead o/c. R44 o/c or wire dis.
Weak modulation with contrast control at maximum	L8, L12, L14, L16, or L18 o/c
Weak modulation with contrast control in normal position and no increase by turning up control	V6 Faulty
Weak modulation with contrast control in normal position, but screen going evenly white with increase in control	V7 low emission
Contrast normal, but more or less steady pattern of close vertical bars	Signal too strong. Reduce R2. If incurable by this means, fit attenuator (see notes on aerials)
Flashes on picture	Bad contacts in I.F. chain; loose valves

Section 4. Synchronizing Impulse Filter

FAULTS AFFECTING THE HOLD OF THE PICTURE IN EITHER OR BOTH LINE AND FRAME DIRECTIONS

SYMPTOMS	FAULTS
No hold in line or frame directions	S/c between resistors on panel 5
No hold in either direction; size of picture changing with setting of contrast control	C48 s/c or o/c R63 s/c to R68 R63 low resistance
Line hold normal; frame hold weak or non-existent; size of picture in frame direction dependent on setting of contrast control	R66 s/c to R67 C49 o/c
No line hold	R68 s/c to R34 or R33 C51 o/c
NOTE—*The two diodes in V11 are separate and failures of one will not affect the other.*	

Section 5. Line Time Base

FAULTS AFFECTING THE SHAPE OF THE PICTURE HORIZONTALLY

SYMPTOMS	FAULTS
*No Line scan; picture contracted to vertical Line	Leads dis. to R71 or R78 R71, R78, R68, R69, R106, C52, or C53 o/c T2 Prim. or Sec. o/c (where sec. is o/c a scan of $\frac{1}{2}$" or so is often obtained) L22 o/c V12 loose in socket

Section 5 (Cont.) Line Time Base

SYMPTOMS	FAULTS
Picture contracted on left hand side and expanded on right	L22 s/c turns C56 Low capacity
Picture expanded left hand side, normal on right	R83 o/c or leads dis.
Picture insufficient amplitude in line direction even with control (R78) at optimum	V13 failing H.T. too low on Time base line

Section 6. Frame Time Base

FAULTS AFFECTING THE SHAPE OF THE PICTURE VERTICALLY

SYMPTOMS	FAULTS
*No Frame Scan; picture contracted to horizontal line	R84, R86, R87, R98 or R102 o/c C63 s/c T3 Prim. or Sec. o/c Leads to L21 broken L21 o/c V14 loose in socket
Small amplitude and badly contracted toward bottom	L21 s/c turns L21 s/c to earth
Frame amplitude control affects line amplitude and vice versa	R103 s/c to R104
NOTE—Also see faults in section 7.	

Section 7. Power Pack

FAULTS AFFECTING THE GENERAL PERFORMANCE OF THE RECEIVER

SYMPTOMS	FAULTS
No Volts delivered to receiver; V16 and V17 glow blue and arc over	Lead 163 or 164 s/c to leads 157 or 158 in cable plug L27 or L28 s/c to earth (note that if leads 163 and 164 s/c to 157 or 158, this will only be apparent if the cable is connected to the receiver chassis)
Picture focuses only in a narrow horizontal band which moves up or down according to the setting of the focus control	C77 o/c
Unfocused picture	L19 o/c
H.T. volts low; hum on sound	V16 or V17 low emission
Picture dim and grey pronounced hum bands; but brightness control operative	†Switch S1a not closing thus leaving R41 in cathode circuit of tube: leads to S1a dis.
Picture has hum bands	One or more of the resistances R108 to R113 s/c
Picture has continual rain of white specks, with roar in loudspeaker	Arcing between R108 and R109 etc.
*Picture confined to one bright band	C78 o/c or lead dis.
No high voltage, but rectifier V18 heats up	T6 Sec. o/c
*Brilliant raster. Neither sound nor vision	No H.T. to receiver L25 or L26 o/c.

† *If switch S1a does not open when set is switched off, there will be an intensely bright circle of light on the screen at the instant of switching off.*

Section 8. The Cathode Ray Tube

FAULTS AFFECTING THE GEOMETRICAL FORM OF THE PICTURE, ITS FOCUS, AND THE OPERATION OF THE BRIGHTNESS CONTROL

SYMPTOMS	FAULTS
Picture dim; pronounced hum bands; no control with brightness control	Cathode pin not making contact in holder
*Raster white, no control with brightness control	Grid pin not making contact in socket
No picture or raster	Heater pins not making contact in holder Tube faulty Anode lead o/c
Picture does not focus within range of control	Adjusting nuts for focus coil assembly screwed up too tightly R38 o/c or leads dis.
Picture cut off at corners	Scanning coil assembly too far down tube. Coils should be as near the screen as possible.
Picture has the form of a parallelogram	Coils not mutually at right angles
Picture not square with mask	Coil assembly not correctly adjusted in slots

Section 9. Radio Circuit

FAULTS AFFECTING THE RADIO PERFORMANCE ONLY, OR IN SOME CASES AFFECTING BOTH RADIO AND TELEVISION SOUND

SYMPTOMS	FAULTS
Instability	C8 s/c or o/c
Distortion	T2 s/c turns
Low gain	I.F. coils s/c turns

NOTE—Any fault in the L.F. section will affect television sound. It should also be remembered that broken leads to the change over switch on the front panel assembly may affect the performance of either or both television and radio sound.

Modifications

SERIAL NUMBER OF 1st RECEIVER MODIFIED	MODIFICATION
All Sets	·05 mfd. condenser (C30) added between V7 cathode and chassis.
184046	R41 increased from 500,000 ohms to 5MΩ.
184327	R94 increased from 35,000 ohms to 40,000 ohms. (In very early receivers the value was 30,000 ohms, and in these cases the resistance should be changed if the top of the picture is contracted.)
184316	R99 increased from 180 ohms to 210 ohms. R100 increased from 10,000 ohms to 25,000 ohms. R105: 500 ohms 2w, added between V15 anode and T3. T4 modified to give higher H.T. (This modification allows a larger tolerance on the anode voltage of V13.)