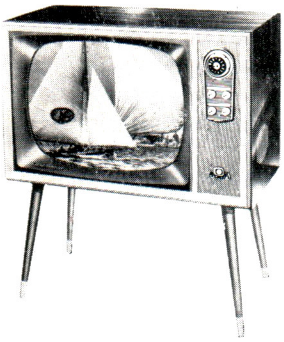
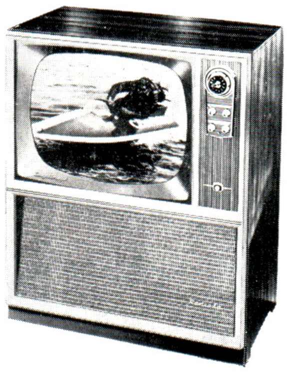
MANUFACTURERS AWA SUPERVISED SERVICE

TECHNICAL INFORMATION AND SERVICE DATA



220-L
220-Z



221-C
221-Z

A.W.A. RADIOLA TELEVISION RECEIVER

Models 220-L, 221-C 220-Z, 221-Z

21 inch, 20 valves, A.C. operated

Issued by Amalgamated Wireless (Australasia) Ltd.

GENERAL DESCRIPTION

These models are 21-inch, 20-valve, A.C.-operated Television Receivers.

Features of design include: Cascode tuner; 3-stage video I.F. amplifier; Peak-level A.G.C.; Stabilised vertical hold; A.F.C. horizontal hold; 110° deflection; Electrostatic focus; Aluminised kinescope; Intercarrier F.M. system; Ratio detector; Twin loudspeakers; Tone control.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

PICTURE SIZE: Approximately 261 sq. ins. on a 21CEP4 Kinescope.

TELEVISION CHANNELS: All 10 V.H.F. channels. (Refer Alignment Procedure)

INTERMEDIATE FREQUENCIES

Video I.F. Carrier Frequency .... 36.0 Mc/s

Sound I.F. Carrier Frequency .... 30.5 Mc/s

POWER CONSUMPTION: 200 watts max.

UNDISTORTED AUDIO POWER OUTPUT: 3 watts max.

VALVE COMPLEMENT:

1 (V1) Radiotron 6BQ7-A .... R.F. Amplifier
2 (V2) Radiotron 6CQ8 ...... R.F. Oscillator and Converter
3 (V101) Radiotron 6AU6 .... Sound I.F.
4 (V102) Radiotron 6AL5 .... Ratio Detector
5 (V103) Radiotron 6AV6 .... Audio Amp.

VALVE COMPLEMENT (continued)

6 (V104) Radiotron 6AQ5 .... Audio Output
7 (V201) Radiotron 6BZ6 .... 1st Video I.F.
8 (V202) Radiotron 6BZ6 .... 2nd Video I.F.
9 (V203) Radiotron 6BZ6 .... 3rd Video I.F.
10 (V204) Radiotron 6AW8-A ...... Video Amp. and Noise Cancellation
11 (V205) Radiotron 6AQ5 .... Video Output
12 (V206) Radiotron 21CEP4 .... Kinescope
13 (V301) Radiotron 6U8 .. A.G.C. and Sync. Separator
14 (V302) Radiotron 6CG7 ...... Sync. Amplifier and Vertical Oscillator
15 (V303) Radiotron 6CZ5 .... Vertical Output
16 (V401) Radiotron 6CG7 .... Horizontal Control and Oscillator
17 (V402) Radiotron 6DQ6-A ..... Horizontal Output
18 (V403) Radiotron 6AU4-GTA .... Damper
19 (V404) Radiotron 1B3-GT .. High Voltage Rectifier
20 (V405) Radiotron 5AS4 .... Rectifier

AERIAL INPUT IMPEDANCE 300 ohms balanced

VIDEO RESPONSE .... To 4.25 Mc/s

FOCUS .... Electrostatic (Low Voltage)

DEFLECTION .... 110° Magnetic

SCANNING .... Interlaced, 625 lines

HORIZONTAL SCANNING FREQUENCY ...... 15,625 c/s

VERTICAL SCANNING FREQUENCY .... 50 c/s

PICTURE REPETITION RATE .... 25 per second

LOUDSPEAKERS—

Models 220-L, 220-Z
7″ x 5″ Permanent Magnet No. 21540 and
4″ Permanent Magnet No. 21541.

Models 221-C, 221-Z
12″ Permanent Magnet No. 21542 and
4″ Permanent Magnet No. 21543.

OPERATING CONTROLS:

Channel Selector, Fine Tuning — Concentric.

Power/Tone, Volume, Contrast, Brightness — Single Controls on Front Panel.

NON-OPERATING CONTROLS (not including R.F. and I.F. adjustments)

Vertical Hold .... Control knob at rear of cabinet

Height .... rear cabinet adjustment

Vertical Linearity .... rear cabinet adjustment

Horizontal Hold .... rear cabinet adjustment

Width .... rear cabinet adjustment

A.G.C. Control .... rear cabinet adjustment

Focus .... rear cabinet adjustment

Horizontal Drive .... chassis adjustment

Horizontal Sine Wave .... chassis adjustment

Horizontal Linearity .... chassis adjustment

Noise Cancel .... chassis adjustment

I.F. A.G.C. .... chassis adjustment

Picture Centring .... above chassis adjustment

Deflection Yoke .... above chassis adjustment

HIGH VOLTAGE WARNING

OPERATION OF THIS RECEIVER OUTSIDE THE CABINET INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIES. WORK ON THE RECEIVER SHOULD NOT BE ATTEMPTED BY ANYONE WHO IS NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COMPARTMENT SHIELD REMOVED. MAKE SURE THAT THE EARTH STRAP BETWEEN THE CHASSIS AND THE KINESCOPE ASSEMBLY IS SECURELY FASTENED BEFORE TURNING THE RECEIVER ON.

KINESCOPE HANDLING PRECAUTIONS

DO NOT INSTALL, REMOVE OR HANDLE THE KINESCOPE IN ANY MANNER UNLESS SHATTER-PROOF GOGGLES ARE WORN. PEOPLE NOT SO EQUIPPED SHOULD BE KEPT AWAY WHILE HANDLING KINESCOPES. KEEP THE KINESCOPE AWAY FROM THE BODY WHILE HANDLING.

When the receiver has been switched off after operating for a time, the kinescope will retain a certain charge. Therefore it is advisable to discharge it before handling.

The kinescope bulb encloses a high vacuum and, due to its large surface area, is subjected to considerable air pressure. Therefore, kinescopes must be handled with more care than ordinary receiving valves.

The large end of the kinescope bulb, particularly that part at the rim of the viewing surface, must not be struck, scratched or subjected to more than moderate pressure at any time. When installing, if the valve sticks or fails to slip smoothly into its socket or deflecting yoke, do not force it, but investigate and remove the cause of the trouble. All Radiotron replacement kinescopes are packed in special cartons and should be left in the cartons until required for installation.

OPERATING INSTRUCTIONS.

The following adjustments are necessary when turning the receiver on for the first time:

1. Pull the POWER/TONE control outwards to switch the receiver "ON" and set the control near the middle of its range. An interval of about one minute is necessary for the valves to heat before satisfactory operation is obtained.

2. Set the CHANNEL SELECTOR to the desired channel.

3. Turn the FINE TUNING control fully anti-clockwise.

4. Adjust the VOLUME control, until the desired volume is obtained.

5. Turn the BRIGHTNESS control to the extreme anti-clockwise position and then clockwise until a pattern appears on the screen.

6. Adjust the VERTICAL hold control until there is no vertical movement of the pattern.

7. Adjust the HORIZONTAL hold control until a picture is obtained.

8. Adjust the FINE TUNING, CONTRAST and BRIGHTNESS controls until the picture contrast and brightness is satisfactory.

9. After switching from one channel to another, it may be necessary to repeat adjustments 4 and 8.

10. When the set is switched on again after an idle period, it should not be necessary to repeat the adjustments unless the positions of the controls have been altered. If any adjustment is necessary, adjustment No. 8 is generally sufficient. However, if the controls have been altered it may be necessary to repeat adjustments 1 to 8.

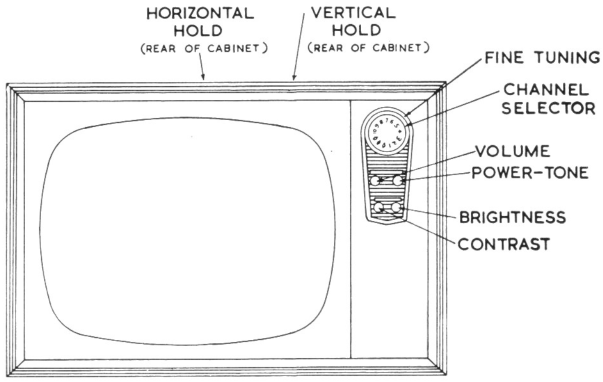


FIG I -RECEIVER OPERATING CONTROLS

INSTALLATION INSTRUCTIONS

RECEIVER LOCATION

The owner should be advised of the importance of placing the receiver in the proper location in the room.

The location should be chosen to agree with the following—

Away from windows so that bright light will not shine directly on the screen or in the viewer's eyes. However, some illumination in the room is desirable.

To give easy access for operation and comfortable viewing.

To permit convenient connection of the external aerial.

Convenient to a power point.

To allow adequate ventilation.

UNPACKING

These receivers, complete with valves, are packed in cardboard cartons.

Take the receiver from the carton and remove the wooden packing block from the base of the cabinet.

Refer to the label inside the cabinet and make sure that the valves are in their correct sockets and pressed firmly down.

Check to see that the kinescope high voltage lead clip is in place.

Plug the power cable into a 200-240 volt A.C. Power Point after making sure that the mains adjustment is set at the correct voltage tap.

The receiver is supplied ready for operation on 240 volts. In districts where the average power supply voltage during viewing times is consistently below this value adjust the tap to the correct setting.

Connect the aerial to be used to the terminals at the rear of the cabinet.

AERIAL INPUT

A 300 ohm aerial input is provided.

In locations where a very strong signal is likely to cause overloading of the receiver, an attenuator of the type shown in Fig. 5 should be used.

INITIAL OPERATION CHECK

Pull the Power/Tone control outwards to switch the receiver "ON" and check all operations.

This instrument has been accurately aligned by the manufacturer with precision instruments and should require no further adjustments. However, a check should be made of all the various functions and if further adjustments are found necessary the following should be carried out.

DEFLECTION YOKE ADJUSTMENT (Fig. 2)

If the lines of the raster are not horizontal or squared with the kinescope, rotate the deflection yoke until this condition is obtained. Tighten the yoke clamp.

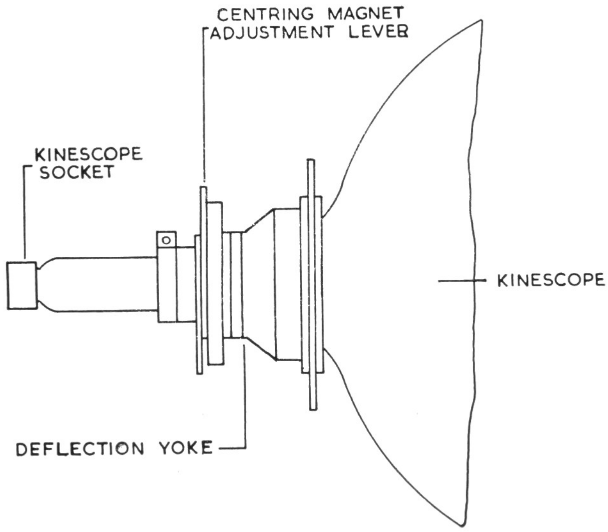


FIG. 2

NOTE: Rotational directions specified are viewed from the spindle end or, when no spindle is visible, from the rear cabinet end.

FOCUS ADJUSTMENT

This adjustment has been made at the factory and it should only be necessary to re-adjust if the kinescope is replaced. In this case, adjust the focus control (R240) on the rear of the chassis until maximum definition of the line structure of the raster is obtained.

CHECK OF HORIZONTAL OSCILLATOR ADJUSTMENT

Turn the horizontal hold control to the extreme clockwise position. The picture will be out of synchronisation with a minimum of 12 bars slanting downwards towards the left. Turn the control slowly anti-clockwise. The number of diagonal black bars will gradually reduce and when only 1½ to 3 bars remain, the picture will synchronise with further slight anti-clockwise rotation of the control. The picture should remain synchronised for approximately two full turns of additional anti-clockwise rotation of the control. Continue to turn the control anti-clockwise until the picture falls out of synchronisation. Turning the control beyond the fall-out position should produce between 2 and 3 bars before motorboating occurs. Motorboating should occur before the extreme anti-clockwise position is reached.

When the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is correctly aligned. Therefore, the "Horizontal Oscillator Adjustment" may be by-passed.

HORIZONTAL OSCILLATOR ADJUSTMENT

If during the above check the receiver failed to hold synchronisation over two full anti-clockwise turns of the control from the pull-in point, the following adjustments are necessary.

Turning the horizontal hold control anti-clockwise will produce a number of bars before motorboating occurs. Adjust the horizontal sine wave coil (L401) until 3 or 4 bars are present before motorboating occurs, when the horizontal hold control is turned anti-clockwise from the fall-out point.

If it is impossible to synchronise the picture and the A.G.C. system is correctly adjusted, it will be necessary to align the Horizontal Oscillator by the method laid down in the Alignment Procedure.

CENTRING ADJUSTMENT

Centring of the electron beam is important for good linearity, horizontally and vertically. When the linearity has been adjusted as per following instructions, if the horizontal linearity is poor this indicates that the centring magnets require adjustment for horizontal centring. Similarly, if the vertical linearity is poor after adjusting the height and vertical linearity controls, this indicates the need for vertical centring.

Note: The centre of test patterns as transmitted on various channels may vary and should not be relied upon for centring purposes.

The centring magnets are in the form of two discs mounted on the rear of the deflection yoke cap. When the magnets are rotated around the tube neck so that the levers are opposite, minimum centring effect with either lever is produced. To obtain correct centring of the picture the magnets are alternatively rotated with respect to each other.

CAUTION

Under no circumstances should the receiver be switched on with the deflection yoke removed from the picture tube. This may produce an undeflected spot which may damage the screen.

WIDTH, DRIVE AND HORIZONTAL LINEARITY ADJUSTMENTS

Adjustment of the horizontal drive control affects the high voltage applied to the kinescope as well as the width of the picture. In order to obtain the highest possible voltage and hence the brightest and best focussed picture the drive trimmer C408 is adjusted in the following manner:

Turn the drive control anti-clockwise until either one of the following effects take place:

(a) there is no variation in picture width

(b) a bright white line appears in approximately the centre of the raster.

If condition (b) exists turn the control clockwise until the line disappears.

Adjust the width control T404 to obtain approximately correct picture width. This is with the picture extending ¾" on either side of the kinescope mask with normal picture brightness.

Connect a voltmeter between 6DQ6-A cathode and chassis.

NOTE: For this purpose a test point is situated near the 6DQ6-A socket.

Adjust the linearity control until minimum voltage is obtained across the cathode resistor. This minimum voltage should be coincident with obtaining best linearity, maximum E.H.T. voltage and maximum width. However, in some cases this may not be correct and a slight readjustment of the linearity control to obtain maximum width may be required. If this is necessary then UNDER NO CIRCUMSTANCES MUST THE VOLTAGE ACROSS THE CATHODE BE ALLOWED TO BE EXCEEDED BY 1.0V ABOVE THE MINIMUM VALUE.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

The height control (R325) has more effect on the bottom of the picture than the top, tending to give bottom stretch or cramp, depending on the setting of the control. The opposite effect is noticeable with variation of the vertical linearity control (R333) in that it tends to give top stretch or cramp depending on its position. Therefore, to adjust for height and linearity, the two controls should be adjusted in conjunction, so that approximately ½" of the picture extends beyond the top and bottom of the kinescope mask while maintaining the best linearity from top to bottom.

A.G.C. CONTROL

Both A.G.C. controls have been set at the factory to cover a very wide range of signal levels and should not require attention in the field. Should the settings ever have been shifted, however, remember that clockwise rotation of the A.G.C. control increases the level at the detector and anti-clockwise rotation of the I.F. A.G.C. decreases the amount of snow.

NOISE CANCEL ADJUSTMENT

Rotate the "Noise Cancel" control clockwise until a horizontal bend or shift in position is visible in the picture, then anti-clockwise about 30° past the point where the bend just disappears.

CHASSIS REMOVAL

To remove the chassis from the cabinet for repairs proceed as follows:—

Remove all the control knobs by pulling them straight off their spindles.

Disconnect aerial lead-in wires.

Remove the cabinet back.

Remove the tuner earth braid from the main chassis.

Free the tuner and control panel from the front panel by removing two bolts, one at bottom of the control panel and one at the rear of tuner.

Attach the tuner to the main chassis, using the screw that held the tuner earth braid as an anchor point for the upper side lug on the control panel, the lower lug fitting under a raised portion of the chassis.

Disconnect the speaker, kinescope, yoke and Ultor leads.

The chassis is held in the cabinet by three (four)* bolts, one at the top of cabinet, one on each side at the bottom support brackets. Removal of these bolts will allow the chassis to slide free after the bottom support brackets have been forced inwards to allow their tongues to clear their captive slots.

Installing the chassis is the reversal of the above procedure taking care that when tightening up the top mounting bolt that the dust sealing rubber is correctly located around the mask. Also check that the cables going to the Control Panel are dressed behind the lug on the kinescope cradle base.

KINESCOPE HANDLING PRECAUTIONS

Do not install, remove or handle the kinescope in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away while handling kinescopes.

Keep the kinescope away from the body while handling.

REMOVAL AND INSTALLATION OF KINESCOPE

Attach the tuner to the main chassis as above.

Disconnect the speaker cable.

The chassis and cradle assembly are attached to the cabinet by five (six)* bolts, the removal of which allows the complete assembly to be withdrawn.

Remove kinescope and yoke sockets and the Ultor lead.

Remove earthing sling.

Loosen kinescope clamp strap and ease the kinescope out of its cradle.

Loosen yoke cap clamp and slide the yoke assembly off the neck of the kinescope.

Replacing the kinescope is by reversing the above procedure, making sure that the dust seal is in its correct position.

When viewed from the rear of the cabinet the high-voltage contact on the kinescope should be on the left hand side.

SAFETY GLASS REMOVAL

Remove chassis and kinescope assembly as in kinescope removal.

Remove the centre vertical trim.

The mask and safety glass are retained by a wooden bar at the base of the mask. Remove the Philips-head screws securing this bar. Holding the mask and glass assembly in one hand, remove the bar by sliding it to the left until the right hand end is free from its recess and the bar may then be lifted out.

Remove the mask.

Sliding the glass to the left then downwards and back, steadying it from the front at the same time, will allow the glass to be removed. Necessary care should be taken that the glass does not become scratched.

Replacing the glass is the reversal of the above procedure. When the glass is in position make sure that the inside surface is free from finger marks and the like.

*Note. Some chassis had an extra support bracket on the power transformer.

REPLACEMENT OF FUSES

Fuses are provided for power mains and high tension protection. Both are accessible on removing the cabinet back, the function of each being indicated on the label attached to the lid of the high voltage box.

ALIGNMENT PROCEDURE

AUSTRALIAN TELEVISION CHANNELS

Channel No.	Picture Carrier Freq. Mc/s	Sound Carrier Freq. Mc/s	Receiver R.F. Osc. Freq. Mc/s
1	50.25	55.75	86.25
2	64.25	69.75	100.25
3	86.25	91.75	122.25
4	133.25	138.75	169.25
5	140.25	145.75	176.25
6	175.25	180.75	211.25
7	182.25	187.75	218.25
8	189.25	194.75	225.25
9	196.25	201.75	232.25
10	210.25	215.75	246.25

TESTING INSTRUMENTS

To properly service the television receiver, it is recommended that the following testing equipment be available—

(1) A.W.A. Television Sweep Generator, type A56036.
(2) A.W.A. Cathode Ray Oscilloscope (C.R.O.), type A56031.
(3) A.W.A. Television Calibrator, type A56057.
(4) A.W.A. Voltohmyst, type A56010.
(5) A.W.A. Universal Measuring Bridge, type A56048.

TESTING PADS AND CIRCUITS

(Referred to in Alignment Procedure.)

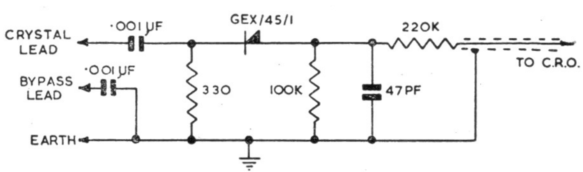


FIG. 3 — CRYSTAL DETECTOR PROBE.

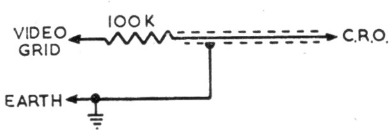


FIG. 4

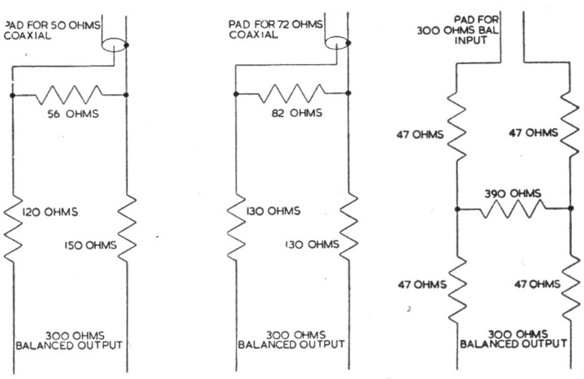


FIG. 5—SWEEP ATTENUATOR PADS

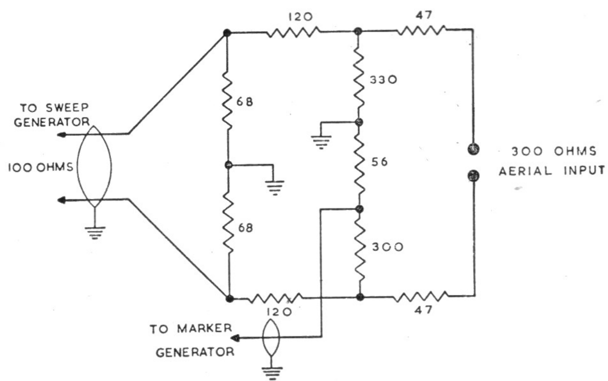


FIG. 6—INPUT PAD

RESPONSE CURVES

The response curves referred to throughout the alignment procedure were taken from a production set, but some variations can be expected.

CRITICAL LEAD DRESS

The cables from the receiver to the tuner must be positioned behind the lance on the kinescope cradle with the slackness of the cable between the lance and the tuner.

All leads in the I.F. section, particularly those on by-pass capacitors, must be kept as short as possible.

Wire wound resistors should be dressed away from neighbouring components.

NOTE: When two positions of the core appear to give the correct adjustment, the following apply:—

* coil tuned with core close to chassis.

† coil tuned with core close to can top, i.e., remote from chassis.

SOUND I.F. ALIGNMENT

Connect the output of the television calibrator to pin 7 of V204 (video amplifier).

Set the calibrator frequency at 5.5 Mc/s.

Set the contrast control maximum clockwise.

Short circuit pin 1 of V203 (3rd video I.F.) to ground.

Connect the Voltohmyst D.C. probe to pin 1 of V102 (ratio detector) and set the range switch to +5 volts D.C.

Adjust the following transformers for peak output, varying the input to maintain a reading of about +3 volts.

T101 (ratio detector transformer) secondary (bottom core)*.

T101 primary (top core)†.

L101 (sound take off)*.

‡L205 (sound trap)†.

Repeat this sequence once.

Transfer the Voltohmyst probe to the junction of R104 and C108.

Re-adjust T101 secondary (bottom core)* for zero reading on the Voltohmyst.

Set the calibrator modulation switch to 600 c.p.s.

Connect the C.R.O. to the kinescope grid (test point "video out") through a crystal probe. (Voltohmyst probe 2R56020 is suitable.)

Re-adjust ‡L205 (sound trap)† for minimum 600 c.p.s. on the C.R.O.

‡ **NOTE:** On Z model L205 is tuned with core close to chassis.

VIDEO I.F. ALIGNMENT

Turn R301 and R218 to their extreme clockwise position when viewed from the wiring side.

Connect a source of —3V bias to the video I.F. at the junction of R201 and C301 (test point "I.F. A.G.C.").

Connect the Voltohymst D.C. probe to pin 7 of V204 (video amplifier) and set the range switch at —5V D.C.

Set the channel selector on channel 6 and the fine tuning control at its mechanical centre. Check that the oscillator frequency is 211.25 Mc/s ±0.5 Mc/s.

Connect the calibrator output to TP2 on the tuner through 1,000 pf capacitor using short leads.

Set the calibrator to the frequencies shown and adjust the following transformers for a peak output, reducing the input to maintain a reading of about —3 volts.

31.6 Mc/s T201*
34.0 Mc/s T203*
35.25 Mc/s .... T202 (bottom core)*

Set the calibrator to the frequencies shown and adjust the following traps for a minimum output increasing the input to maintain an output of —1V D.C.

37.5 Mc/s L201*
30.0 Mc/s .... T202 (top core)†

Remove Voltohmyst and calibrator.

Connect a source of —2.5 volts bias to the tuner A.G.C. terminal. The I.F. bias remains at —3 volts.

Connect the sweep generator to the aerial input terminals on the tuner. Set the sweep to channel 6. Connect the C.R.O. vertical input to TP1 on the tuner through a shielded lead.

Check that the R.F. response viewed on the C.R.O. conforms with that shown in Fig. 11.

Connect the crystal detector probe (Fig. 3) to pin 5 of V201 (1st video I.F.) and the bypass lead to pin 5 of V202 (2nd video I.F.).

Set the sweep generator output to give 0.3V p/p on the C.R.O.

Adjust T2 (tuner)† and L202* to give 36 Mc/s at 80% with symmetrical peaks.

Adjust trimmer C204 and L202 to give 31.75 Mc/s at 80%.

T2 mainly affects 36 Mc/s position.

L202 mainly affects tilt.

C204 mainly affects bandwidth.

Required response is shown in Fig. 7.

Remove the crystal detector probe and connect the C.R.O. to pin 7 of V204 (video amplifier) using the network shown in Fig. 4.

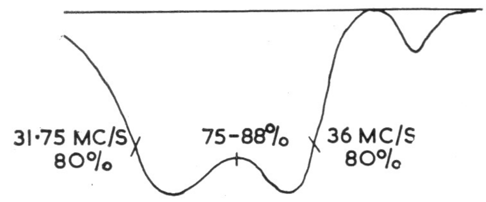


FIG. 7

View the overall response with 3V p/p output and adjust, if necessary, the following coils to give the required response of

36 Mc/s at 50% T202*
30.5 Mc/s at 5% T201*
No tilt T203*

The required response is shown in Fig 8.

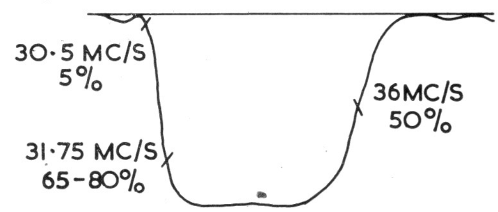


FIG.8

Additionally on Z models:

Re-adjust T202* to give 36 Mc/s at 30%. This should require the bottom core to be turned through approximately half a turn clockwise (as viewed from the wiring side of chassis.) Remove any tilt by adjusting T203.

The final response is shown in Fig. 9.

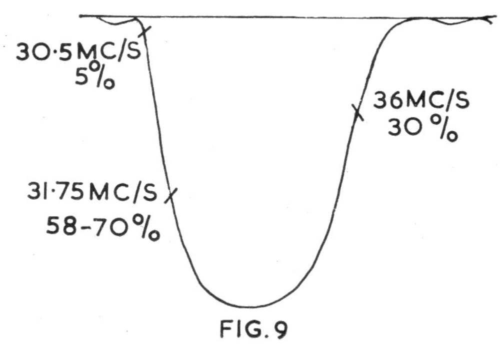


FIG.9

ALIGNMENT PROCEDURE

TUNER ALIGNMENT

A tuner unit which is completely out of alignment, due to most unusual circumstances, should be re-aligned by carrying out the procedure listed below in correct order. In cases where only slight re-adjustment is necessary, due to component or valve failure, the tuned circuits associated with them need only be re-adjusted. In such cases, follow the appropriate procedure.

The tuner is normally aligned in three steps.

(1) Aerial filter panel is separately adjusted as a sub-assembly.

(2) Tuner with its cover removed is adjusted with respect to correct bandpass characteristics and approximately correct oscillator frequencies.

(3) Tuner, with cover in place, is accurately aligned with respect to oscillator frequencies.

Step (1) should not normally be necessary in the field. Components which may cause trouble, i.e., broken windings on T1, may be replaced without re-adjustment. Capacitors C1, C2 and C3 may be replaced without danger of serious malalignment on all channels except channel 1.

For the sake of completeness the factory method of adjustment of the filter panel is included below:

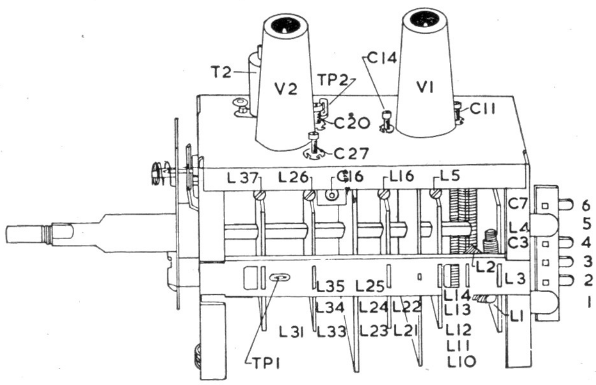


FIG. 9A. TUNER ADJUSTMENTS

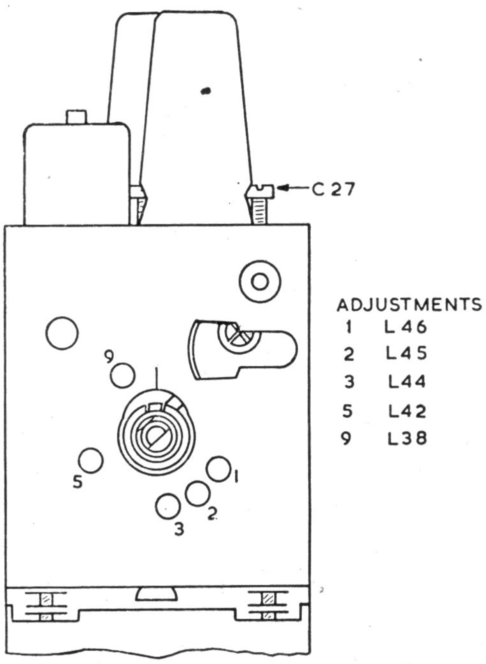


FIG. 9B. OSCILLATOR ADJUSTMENTS

AERIAL FILTER ADJUSTMENT

Connect the A.W.A. Television Calibrator (36 Mc/s C.W. source) to the 300 ohm aerial terminals on the panel via a 72 ohm to 300 ohm balanced pad (Fig. 5). Disconnect C7 from the junction of L4 and C3; connect this junction via a screened cable to the input of a 36 Mc/s high gain amplifier.

Adjust L1 and L4 for maximum attenuation of the 36 Mc/s signal as observed at the output of the amplifier.

Connect the sweep generator to the 300 ohm aerial terminations. To prevent coupling reactance from the sweep generator into the filter unit, it is advisable to again use a resistance pad. Connect the A.W.A. Television Calibrator loosely to the matching unit terminals. For this purpose it will be found convenient to use the pad shown in Fig. 6.

Disconnect C7 again and connect a crystal detector probe to the junction of L4 and C3. A probe such as that shown in Fig. 3 constructed with very short leads will be most useful.

Adjust the sweep generator to sweep from 42 to 52 Mc/s. This may be achieved on the A.W.A. Sweep Generator Type A56036 by switching to channel 1 and screwing the core in several turns.

Adjust L2 and L3 to obtain the response shown in Fig. 10. Note that the adjustment of L3 affects the shoulder of the response curve, while L2 affects the position of the 46.5 Mc/s point.

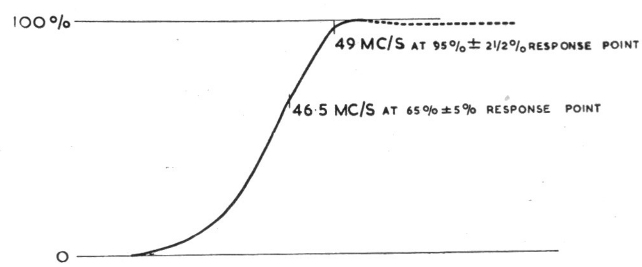


FIG. 10—AERIAL MATCHING UNIT RESPONSE

Remove the crystal probe connections and re-connect C7 to junction of C3 and L4.

COMPLETE R.F. ALIGNMENT

For complete tuner alignment the tuner must be removed from the receiver. Disconnect the co-axial lead from the I.F. input and connect up extension leads for B+, Filament and Earth. Remove the tuner from the chassis and remove its cover.

Connect the sweep generator to the aerial input terminals of the matching unit. It is advisable to have on hand a special cable for connection from tuner to sweep generator with a resistive pad (Fig. 6) having balanced connections going directly to the aerial input terminals.

Connect a bias source to the A.G.C. terminal of the tuner and set the bias to —2.5 volts while making all adjustments for correct responses. Connect the vertical input of the C.R.O. direct to TP1 on the tuner with a shielded lead. Earth the shield at the tuner.

Switch on the receiver or power supply to the tuner and carry out the following adjustments with the correct voltages: **265V H.T., 6.3V Filament and —2.5V Bias.**

Loop an insulated wire from the R.F. input terminal of the calibrator around the 6CQ8 valve with its cover removed.

Switch to channel 10 and adjust L37 to give oscillator frequency of 246.25 Mc/s.

Switch to channel 9 and adjust L38 to give oscillator frequency of 232.25 Mc/s.

Switch to channel 6 and re-adjust C27, if necessary, to 211.25 Mc/s.

Repeat the above procedure until no adjustment is necessary for correct oscillator frequencies on channels 10, 9 and 6 within ± 0.3 Mc/s. Channel 8 and 7 have no separate frequency adjustment, but the frequency will be found to be 225.25 Mc/s and 218.25 Mc/s ± .3 Mc/s respectively, if adjustments of 10, 9 and 6 frequency are carried out correctly.

Connect the calibrator to the input pad from the sweep generator as shown in Fig. 6.

Switch the tuner and sweep generator to channel 6 and adjust the output to give a response pattern on the C.R.O. Detune the core of T2 (convertor I.F. transformer) when adjusting response curves until no variation of curve is observed on the C.R.O. Adjust C11, C14, C16 and C20 for correct response shape, with markers, from calibrator at video and sound carrier frequencies, correctly placed on the response curve. Be sure that the pattern shown on the C.R.O. is not disturbed by a 50 c/s pick-up. A direct earth strap between tuner, C.R.O. and power supply will eliminate this interference.

The correct adjustment of C11 is indicated by maximum amplitude at a frequency midway between video and sound markers. C16 is adjusted for the required bandwidth on top of the response curve. C20 affects the frequency of the response mainly and C14 the symmetry. C11 also affects symmetry and tilt but should always be adjusted for the maximum output in the centre.

Switch the tuner and sweep generator to channel 10 and adjust the calibrator to give video and sound markers. Adjust L5 for maximum output between video and sound markers and L26, L16 for correct curve. L16 affects mainly the frequency of the response and L26 the symmetry.

Return to channel 6 and observe the response curve. If re-adjustment is necessary, repeat the procedure contained in the previous three paragraphs, until correct response is obtained on channels 6 and 10 without recourse to adjustment. Observe the responses on channels 9, 8 and 7 which should be within the tolerances shown in Fig. 11.

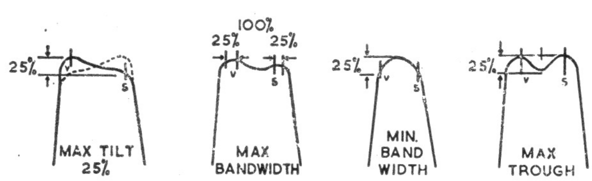


FIG. 11 — RESPONSE CURVE TOLERANCES ALL CHANNELS

Re-check the oscillator frequency adjustment as in the first paragraph of this section. If re-adjustment is necessary, check the response curves of channels 10 and 6. Re-adjust if necessary.

Then proceed as follows:

Switch to channel 5 and adjust screw in L42 to give oscillator frequency of 176.25 Mc/s.

Switch to channel 3 and adjust screw in L44 to give oscillator frequency of 122.25 Mc/s.

Switch to channel 2 and adjust screw in L45 to give oscillator frequency of 100.25 Mc/s.

Switch to channel 1 and adjust screw in L46 to give oscillator frequency of 86.25 Mc/s.

Switch tuner and sweep generator to channel 5 and spread or close turns of L21 and L31 to give correct curve. Adjust L10, in the R.F. amplifier grid circuit, for maximum response in the centre of the channel. L21 affects the frequency of the response mainly and L31 the symmetry.

Switch to channel 4 and if necessary adjust L22 and L11 for correct response.

Switch to channel 3 and spread or close the turns of L23 and L33 to give approximately the correct response. Spread or close the turns of L12, in grid circuit, for maximum response at the centre frequency which corresponds to the minimum hollow in the top of the curve.

Switch to channels 2 and 1 in turn and adjust—

L24, L34, L13 on channel 2
L25, L35, L12 on channel 1
for correct response curve.

Re-check response curves of channels 10 and 6, and re-adjust C14, C20, L16, L26 if necessary. Then re-check response curves of channels 5, 4, 3, 2 and 1.

FINAL OSCILLATOR ADJUSTMENT

This adjustment may be carried out with the tuner mounted in its normal manner on the chassis.

Replace the cover on the tuner unit and with the calibrator R.F. input lead looped around the 6CQ8 valve, re-adjust C27 on channel 6, L37 on channel 10, L38 on channel 9 for the correct frequency when the fine tuning control is in its central position. Then re-adjust screws through the front of the tuner for correct frequencies on channels 5, 3, 2 and 1.

Check that the correct frequency on all channels is obtained without adjustments when the fine tuning control is rotated ± 45° from its centre position. Check that the oscillator injection voltage, measured with the Voltohmyst D.C. probe at TP1, is between 2.0 and 5.0 volts.

Make sure that the screws retaining the covers are firmly in position and that the covers are well fitted to maintain a low oscillator radiation.

SPECIAL NOTES

1. Always align with the correct bias of —2.5 volts, which is an average figure of the A.G.C. potential.

2. The cover of the tuner must be in position when making final adjustment to frequency of local oscillator.

3. Detune the core of T2 (converter I.F. transformer) when adjusting response curves until no variation of the curve is observed on the C.R.O.

HORIZONTAL OSCILLATOR ALIGNMENT

Normally the adjustment of the horizontal oscillator is not considered to be a part of the alignment procedure, but since the oscillator waveform adjustment may require the use of an oscilloscope, it usually can not be done conveniently in the field. The waveform adjustment is made at the factory and normally should not require re-adjustment in the field. However, the waveform adjustment should be checked whenever the receiver is aligned or whenever the horizontal oscillator operation is incorrect.

When no C.R.O. is available the horizontal oscillator may be aligned and checked as follows:

Tune in a station, if available, or, using a generator to provide the appropriate synchronising signals, synchronise the picture by adjusting the horizontal and vertical hold controls respectively. If the picture cannot be synchronised, short circuit the sine wave stabilising coil (L401) and then adjust the horizontal hold control until synchronisation is obtained. Remove the short circuit and adjust the core in L401 until the picture is again synchronised. If synchronisation is still unobtainable, adjust the horizontal hold control slowly, in conjunction with the core in L401, until the picture is synchronised.

Check for over-drive and make any necessary re-adjustments to the horizontal hold control or to the core in the sine wave stabilising coil.

To check if the correct adjustment has been made, turn the horizontal hold control to the extreme clockwise position. The picture should be out of synchronisation, with a minimum of twelve bars slanting downwards to the left. Turn the control slowly anti-clockwise. The number of diagonal black bars will be gradually reduced and when only 1½ to 3 bars sloping downward to the left are obtained, the picture will synchronise upon slight additional anti-clockwise rotation of the control. The picture should remain in synchronisation for approximately two full turns of additional anti-clockwise rotation of the control. Continue turning the control anti-clockwise until the picture falls out of synchronisation. Rotation beyond the "fall-out" position should produce between 2 and 5 bars before motorboating occurs. Motorboating should be reached before the control reaches the extreme anti-clockwise position.

If an oscilloscope is available, the procedure is as follows:

Connect the low capacity probe of the C.R.O. to the terminal of L401 which is connected to C406 and R407. Dress the probe at least one inch away from the sine wave coil (L401). Turn the horizontal hold control so that the picture is in synchronisation. The pattern on the C.R.O. should be as shown in Fig. 12A. If not, adjust the sine wave coil until nominal wave form, as shown, is obtained. Remove the C.R.O. on completion of this adjustment.

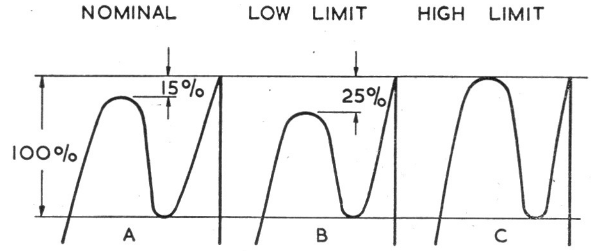


FIG. 12 — HORIZONTAL OSCILLATOR WAVE FORMS

When the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned.

SENSITIVITY CHECK

A comparative sensitivity check can be made by operating the receiver on a weak signal from a television station and comparing the picture and sound obtained to that obtained on other receivers under the same conditions.

This weak signal can be obtained by connecting the service department aerial to the receiver through a ladder type attenuator pad. The number of stages in the pad depends upon the signal strength available at the aerial. A sufficient number of stages should be inserted so that a somewhat less than normal contrast picture is obtained when the contrast control is in the extreme clockwise position. Only carbon type resistors should be used to construct the pad.

A.G.C. CONTROL ADJUSTMENT

Both A.G.C. controls have been set at the factory to cover a very wide range of signal levels and should not require attention in the field. Should the settings ever have been shifted, however, remember that clockwise rotation of the A.G.C. control increases the level at the detector and anti-clockwise rotation of the I.F. A.G.C. decreases the amount of snow.

The factory procedure for adjustment is as follows:

Set the "Noise Cancel" control fully anti-clockwise. Set the A.G.C. and I.F. A.G.C. control midway. Apply a 100mV fully modulated TV signal to the aerial terminals and set the A.G.C. control for 2.5 volts peak to peak at the detector. Reduce the signal to 1mV and adjust the I.F. A.G.C. for a reading of —1.7 volts at the Tuner A.G.C. tag. (Fine tuning control to be set at correct frequency.)

NOISE CANCEL ADJUSTMENT

Rotate the "Noise Cancel" control clockwise until a horizontal bend or shift in position is visible in the picture, then anti-clockwise about 30° past the point where the bend just disappears.

D.C. RESISTANCE OF WINDINGS

WINDING		D.C. RESISTANCE IN OHMS	WINDING		D.C. RESISTANCE IN OHMS
Tuner Windings		*	T202	2nd Video I.F.	
L101	Sound I.F.	1.3		Primary 1-4	*
L201	37.5 Mc/s Trap	*		Secondary 2-3	*
L202	Video I.F. Input	*	T203	3rd Video I.F.	
L203	Detector Filter Choke	4		Primary 1-4	*
L204	Detector Peaking Coil Rd	6		Secondary	*
L205	5.5 Mc/s Trap	1.5	T301	Vertical Oscillator Transformer	
L206	Video Amp. Shunt Peaking Wh	5		Primary Bu-Gr	450
L207	Video Output Shunt Peaking Bk	6.5		Secondary Ye-Bk	130
L208	Video Output Series Peaking Bu	4	T302	Vertical Output Transformer	
L401	Hor. Sine Wave Coil	55		Bu-Rd	400
L402	H.F. Choke	*		Rd-Ye	2.7
L403	Hor. Linearity Coil	7.7	T401	Horizontal Blocking Oscillator Transformer	
L405	Deflection Yoke	8.9		Ye-Anode	24
L406	Deflection Yoke	8.9		Ye-C405	64
L407	Deflection Yoke	18	T402	Horizontal Output Transformer	
L408	Deflection Yoke	18		2-3	3.5
L409	Filter Choke	40		3-4	11
T101	Ratio Detector			4-8	13
	Primary 1-6	9.5		8-7	9
	Secondary 3-4	1		7-6, 5	10
T102	Audio Output			6, 5-Anode	380
	Primary	340-400	T403	Power Transformer	
	Secondary	*		Primary Gr-Wh	7
T201	1st Video I.F.			Secondary Rd-Rd	62
	Primary 1-2	*	T404	Width Coil	
	Secondary 3-4	*		Primary	*
				Secondary	12.5

* Less than 1 ohm.

The above readings were taken on a standard chassis, but substitution of materials during manufacture may cause variations, and it should not be assumed that a component is faulty if a slightly different reading is obtained.

MECHANICAL REPLACEMENT PARTS

Description	Part No.	Code No.
MAIN CHASSIS:		
Anode Cap, H.V. Rectifier		188011
Anode Cap and Lead, Horizontal Output	40044	
Bracket, Chassis Mtg. L.H.	41304	
Bracket, Chassis Mtg. R.H.	41305	
Bracket, Chassis Top Corner L.H.	41307	
Bracket, Chassis Top Corner R.H.	41306	
Cable, Power	49743	
Cap Assembly, Yoke	41185	
Clamp Assembly, Yoke Cap	41186	
Clamp Body, Power Cable	41397	
Clamp Lock, Power Cable	41398	
Clamp, Yoke	41174	
Clamp, Ultor Lead	41330	
Dial Lamp Holder	4195	
Earthing Lead Frame	49788	
E.H.T. Box Assy.	41412	
E.H.T. Box Lid	41310	
E.H.T. Box Side	41309	
Fuse Holder	40845	
Insulator, Preset Panel	41470	
Lead, Ultor	49782	
Panel Assembly, Mains		551500
Panel, Preset Controls	41381	
Plug Assembly, Mains		581235
Shield, Corona	41064	
Socket and Cable Assembly Kinescope	49780	
Socket, 8 Pin Mica Filled		794582
Socket, 8 Pin Wafer		793033
Socket, 9 Pin Moulded Mica		794599
Socket, 7 Pin less Mount Flange		794579
Socket, 7 Pin with Register, Mica Filled		794569

Description	Part No.	Code No.
TUNER UNIT:		
Tuner	41441	
Bracket Rear Support	41317	
Cover Front	41384	
Cover Main Body	40152	
Pin Jack Assembly	40373	
Screen, Valve	40164	
Terminal Panel Assembly	40612	
FINE TUNING ASSEMBLY:		
Detent Mech. Assembly	41414	
Guide, Fine Tuning Spring	40140	
Lever Assembly	40165	
Retainer Spring, Fine Tuning	40502	
Spring, Lever	40500	
Spring, Wiper	40507	
MISCELLANEOUS:		
Baffle, 7" x 5" Speaker Mtg.	40737	
Bracket, Chassis Mtg.	41318	
Cabinet, Lowboy	37761	
Cabinet, Console	37762	
Clamp Baffle	40728	
Dust Seal 21" Kinescope	40731	
Escutcheon	41371	
Legs, Lowboy Cabinet	41466	
Kine Mount Rivet Assembly 21"	41331	
Kine Strap Assy. L.H. 21"	41327	
Kine Strap Assembly R.H. 21"	41325	
Knob Assembly Channel Selector	41337	
Knob Assembly Fine Tuning	41369	
Knob Assembly Front Controls	41370	
Knob Assembly Power/Tone	41586	
Plate Centre Trim Mtg.	41374	
Safety Glass	40701	
Sling Earthing	41324	
Spring, Kine Earth	40515	
Spring, Frame Earth	40242	

SOCKET VOLTAGES

Conditions of measurement unless otherwise specified:

(1) 30 mv Signal: Contrast, Brightness, A.G.C., I.F. A.G.C., Noise Cancel., Vert. Hold, Height and Linearity, Hor. Hold Width and Linearity and Focus all adjusted for correct normal picture. Tone and Volume maximum anti-clockwise.

(2) No Signal—Channel 1, Input S/C. Contrast, Brightness, A.G.C., I.F. A.G.C., Noise Cancel, Focus, Tone and Volume all maximum anti-clockwise, Vert. Hold, Height and Linearity, Hor. Hold, Width and Linearity, adjusted for correct normal picture. (Controls viewed from spindle end or from valved side of chassis for presets.) For all measurements Mains Input = 240V A.C. Signal Input as indicated. All D.C. voltages measured with a Voltohmyst.

NOTE: These voltages are the average of a number of chassis. Therefore variations should be expected on individual chassis.

CAUTION: Do not measure mains voltage with Voltohmyst unless earth lead from Voltohmyst is connected to chassis.

Valve No.	Type	Function	Operating Condition	Anode to Chassis		Screen to Chassis		Cathode to Chassis		Grid to Chassis		Remarks
				Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	
V1	6BQ7A	R.F. Amp.	30 mV	6	250	—	—	8	148	7	140	Voltage difference from 30 mV to No Signal is less on Channels 10 to 4.
			No Signal	6	230	—	—	8	112	7	110	
V1	6BQ7A	R.F. Amp.	30 mV	1	148	—	—	3	0	2	—4.5	
			No Signal	1	112	—	—	3	0	2	—0.25	
V2	6CQ8	Converter	30 mV	6	90	3	100	7	0	2	3.0	Measure Oscillator and Converter voltages with 0.1 meg resistor in series with D.C. probe to avoid upsetting conditions.
			No Signal	6	100	3	110	7	0	2	3.1	
V2	6CQ8	R.F. Oscillator	30 mV	1	210	—	—	8	100	9	90	
			No Signal	1	220	—	—	8	110	9	96	
V101	6AU6	1st Sound I.F.	30 mV	5	70	6	70	7	0.75	1	0	
			No Signal	5	80	6	80	7	0.7	1	0	
V102	6AL5	Ratio Detector	30 mV	2	—5.1	—	—	5	1.5	—	—	*Varies with noise.
				7	1.45	—	—	1	5.1	—	—	
			No Signal	2	—7.5	—	—	5	*0 to —3	—	—	
				7	*0 to —3	—	—	1	7.3	—	—	
V103	6AV6	Audio Amp.	30 mV	7	100	—	—	2	0	1	—.90	
			No Signal	7	100	—	—	2	0	1	—.90	
V104	6AQ5	Audio Output	30 mV	5	250	6	260	2	15.1	1	0	
			No Signal	5	245	6	255	2	14.8	1	0	
V201	6BZ6	1st Video I.F.	30 mV	5	140	6	140	2	.17	1	—4.8	
			No Signal	5	120	6	120	2	.90	1	0	
V202	6BZ6	2nd Video I.F.	30 mV	5	260	6	260	2	143	1	139	
			No Signal	5	240	6	240	2	125	1	123	
V203	6BZ6	3rd Video I.F.	30 mV	5	235	6	135	2	1.77	1	0	
			No Signal	5	230	6	130	2	1.7	1	0	
V204A	6AW8A	Noise Cancel	30 mV	3	265	—	—	1	—.85	2	—13	*Varies with noise.
			No Signal	3	255	—	—	1	*0 to —.8	2	—20	
V204B	6AW8A	Video Amp.	30 mV	9	140	8	155	6	2.1	7	—1.55	
			No Signal	9	110	8	150	6	*2 to 3	7	*—.1 to —.5	
V205	6AQ5	Video Output	30 mV	5	225	6	265	2	22	1	0	
			No Signal	5	225	6	260	2	22	1	0	
V206	21CEP4	□ Kinescope	30 mV	Side Contact	‡16.1KV	3	400	7	[65 to 130	2	36	[Varies with Brightness control setting.
			No Signal		‡16KV	3	390	7	[60 to 115	2	35.5	

□ Pin 4: 0 to 620 volts with Focus control setting.

SOCKET VOLTAGES (continued)

Conditions of measurement unless otherwise specified:

(1) 30 mv Signal: Contrast, Brightness, A.G.C., I.F. A.G.C., Noise Cancel., Vert. Hold, Height and Linearity, Hor. Hold Width and Linearity and Focus all adjusted for correct normal picture. Tone and Volume maximum anti-clockwise.

(2) No Signal—Channel I, Input S/C. Contrast, Brightness, A.G.C., I.F. A.G.C., Noise Cancel, Focus, Tone and Volume all maximum anti-clockwise, Vert. Hold, Height and Linearity, Hor. Hold, Width and Linearity, adjusted for correct normal picture. (Controls viewed from spindle end or from valved side of chassis for preset.) For all measurements Mains Input = 240V A.C. Signal Input as indicated. All D.C. voltages measured with a Voltohmyst.

NOTE: These voltages are the average of a number of chassis. Therefore variations should be expected on individual chassis.

CAUTION: Do not measure mains voltage with Voltohmyst unless earth lead from Voltohmyst is connected to chassis.

Valve No.	Type	Function	Operating Condition	Anode to Chassis		Screen to Chassis		Cathode to Chassis		Grid to Chassis		Remarks
				Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	
V301A	6U8	A.G.C. Amp.	30 mV	6	—53	3	270	7	155	2	130	
			No Signal	6	*+.1 to —6	3	260	7	150	2	120	*Varies with noise.
V301B	6U8	Sync. Sep.	30 mV	1	40	—	—	8	0	9	—27	
			No Signal	1	*50 to 90	—	—	8	0	9	*—4 to —10	
V302A	6CG7	Sync. Amp.	30 mV	1	68	—	—	3	0	2	—3.2	
			No Signal	1	66.5	—	—	3	0	2	*—1.6	
V302B	6CG7	Vert. Osc.	30 mV	6	110	—	—	8	.02	7	—26	Depends on positions of Vert. Height and Linearity controls Figures given for correct settings of Vert. Height and Lin. Control.
			No Signal	6	105	—	—	8	.02	7	—25	
V303	6CZ5	Vert. Output	30 mV	9	245	1	260	7	22.5	3	2	
			No Signal	9	235	1	250	7	22	3	5	
V401	6CG7	Hor. Control	30 mV	1	270	—	—	3	°0 to 20	2	—18.5	°Depends on Hor. Hold Setting.
			No Signal	1	265	—	—	3	°—4 to +6	2	—21	
		Hor. Osc.	30 mV	6	195	—	—	8	0	7	—84.5	
			No Signal	6	190	—	—	8	0	7	—90	
V402	6DQ6A	Hor. Output	No Signal	Top Cap	†5.2KV Peak	4	160	8	(11.5	5	—25	(For optimum Hor. Linearity but must not exceed 12.0V. †Do not measure. ‡Measured with Voltohmyst fitted with high-voltage probe and at minimum Brightness.
V403	6AU4GTA	Hor. Damper	No Signal	5	260	—	—	3	†4.3KV Peak	—	—	
V404	1B3GT	H.V. Rect.	No Signal	Top Cap	†16KV Peak	—	—	2,7	‡16KV			
V405	5AS4	Rectifier	30 mV	4,6	286A.C.	—	—	2,8	287	—	—	
			No Signal	4,6	286A.C.	—	—	2,8	284	—	—	

H.T. Voltages	Across	C116C	C317C	C423	At junction of C413 & C414
Operating Condition	30 mV	275	155	265	745
	No Signal	270	150	260	730

Filament Voltages: Between pins 2 and 8 V405: 4.85V A.C. (Do not use Voltohmyst.)

Between pin 8 V403 and chassis: 6.15V A.C.

CHANGES ON Z MODELS

COMPONENTS ADDED:

R118, R241, R242, C118, C228 and C327.

COMPONENTS CHANGED:

R203 was 22 ohms ± 10% ½ watt.

R222 was 180 ohms ± 10% ½ watt.

R236 was 4.7 K ohms ± 10% ½ watt in L208.

C207 was 470 pf ± 10% 500V working Mica.

C211 was 220 pf ± 10% 500V working Mica.

C221 was 0.0033 μf ± 10% 600V working Paper.

C223 was 22 pf ± 10% N750 Tubular.

COMPONENTS DELETED:

L207 Video Output Shunt Peaking Coil 41424 was in series with R235.

A parallel circuit of R204 a 47 ohms ± 10% ½ watt resistor and C205 a 0.0047 μf + 100% − 0% K5000 disc capacitor was in series with cathode resistor R203.

ADDITIONAL CHANGES SINCE CIRCUIT WAS DRAWN

R238 is now a 1.2M ohm ± 10% 1 watt.

R339 is now 150K ohm ± 10% ½ watt.

R108 with SPST switch 37206, is now a D.P.S.T. type 37233, the additional switching arm being used to break the earth lead of R237 on switching off.

Lead from pin 3 of Kinescope socket now goes to junction of R240 and R238.

CHANGES PRIOR TO THE Z MODELS

In some chassis C202 was mounted in L201.

In some chassis the voltage rating on C418 was 600. These should be changed to a 1,600-volt rated capacitor.

In some chassis R345 and R346 were omitted.

The height-control circuit has been changed in the following stages:—

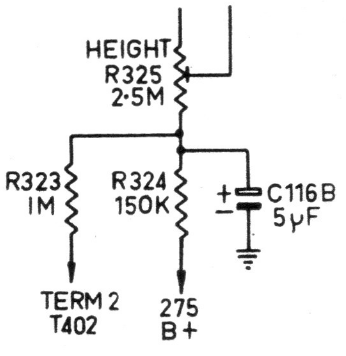


FIG A

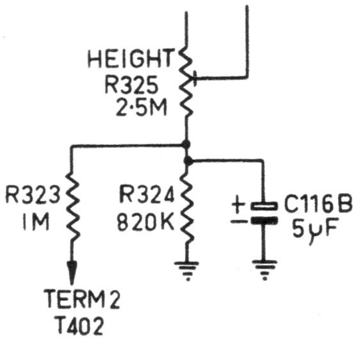


FIG B

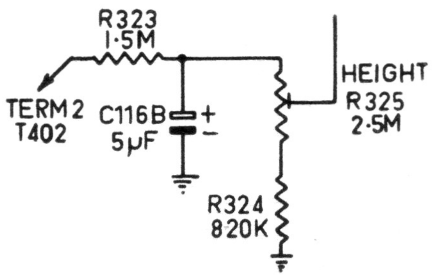
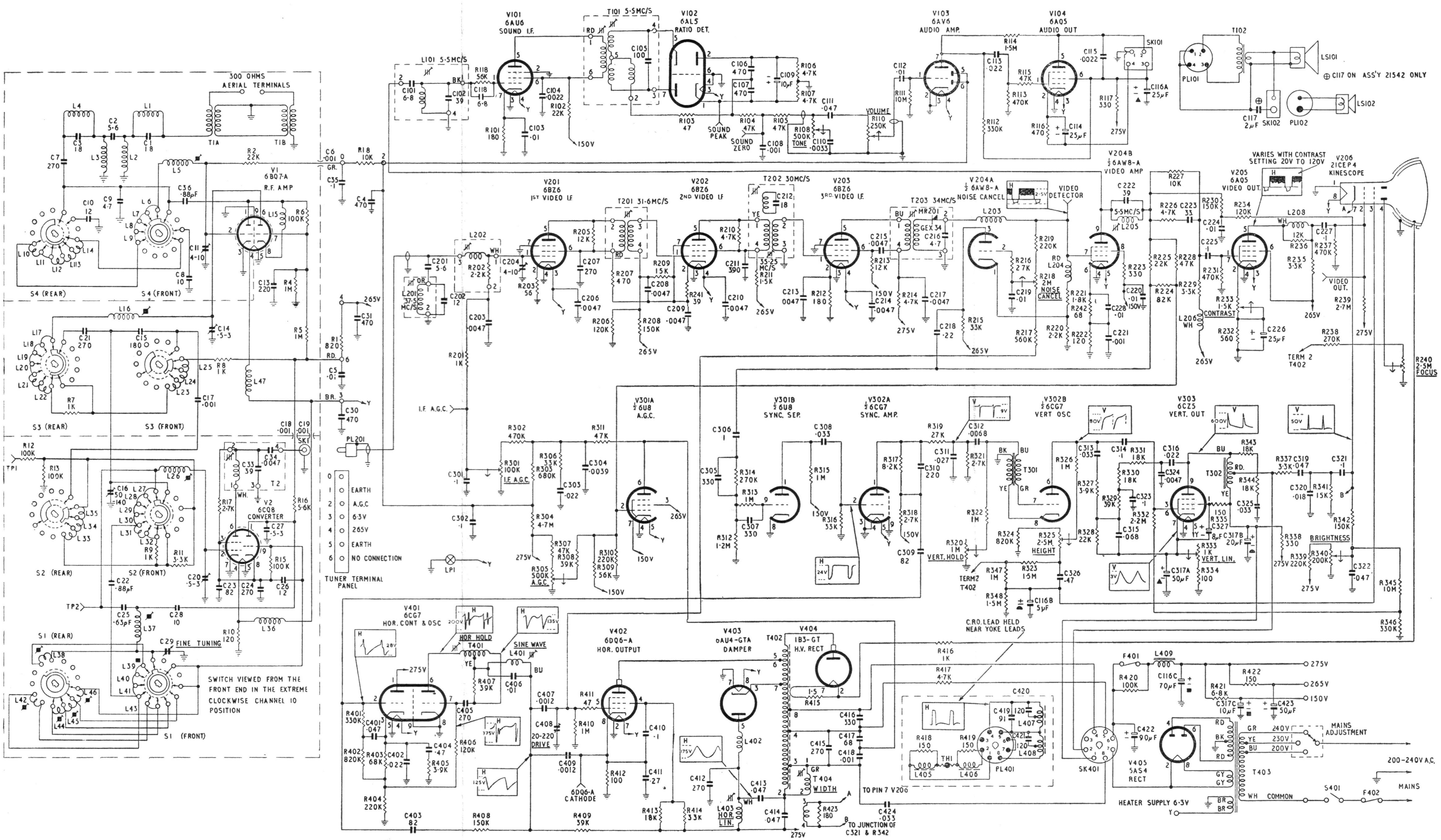
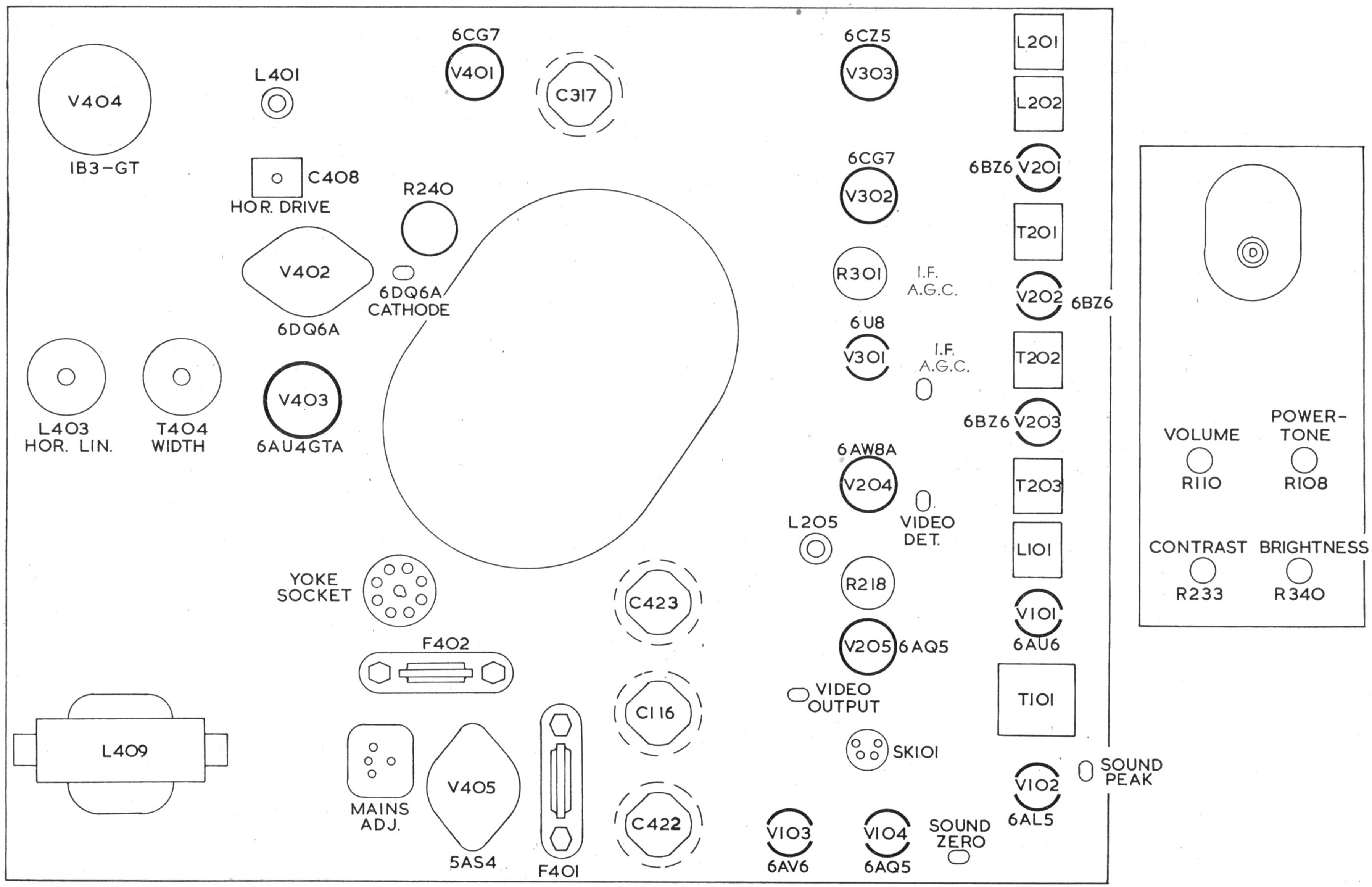


FIG C

CIRCUIT A.W.A. TELEVISION RECEIVER MODELS 220-L, 221-C, 220-Z & 221-Z

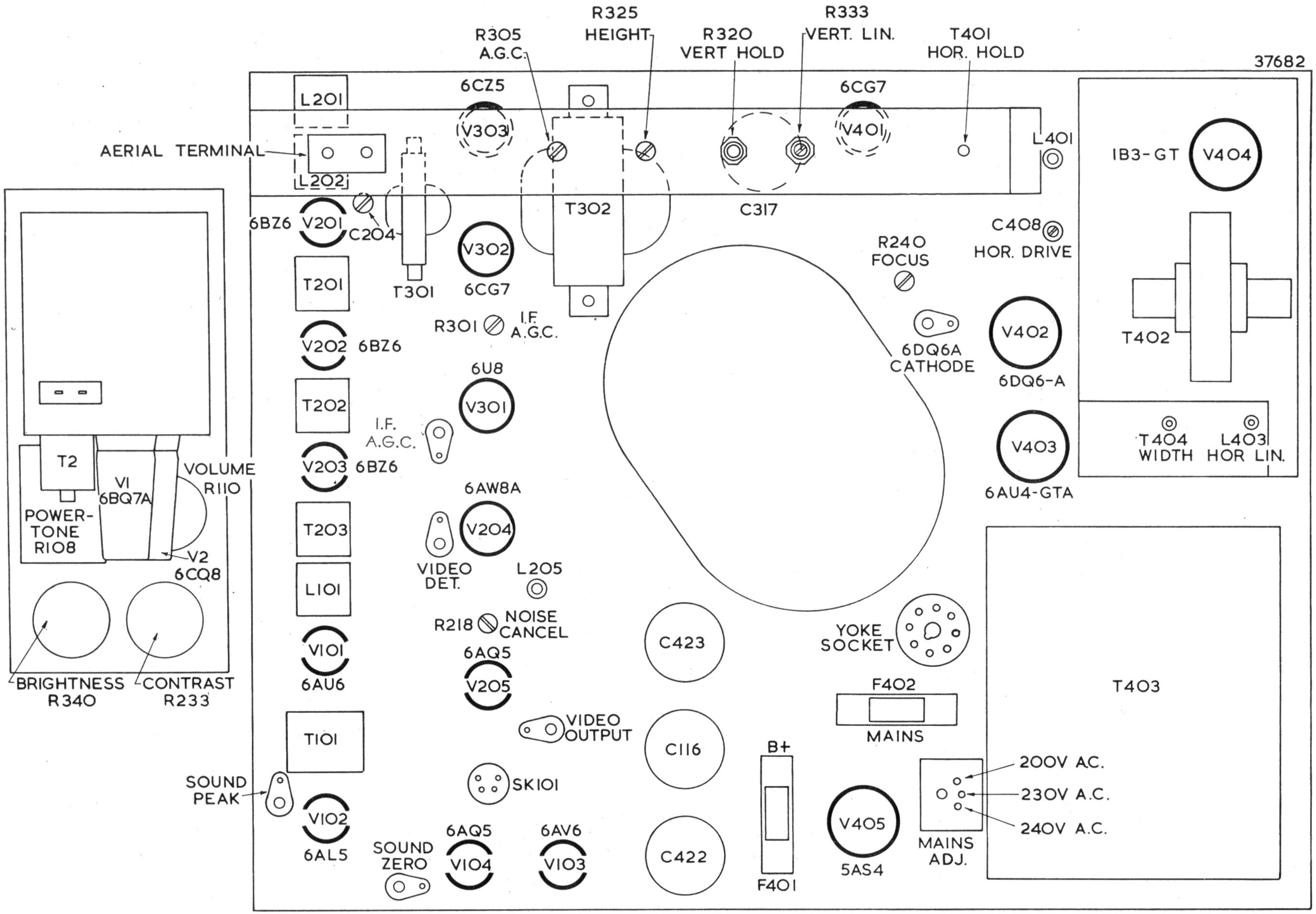


All voltages shown on waveforms measured with a Voltohmyst



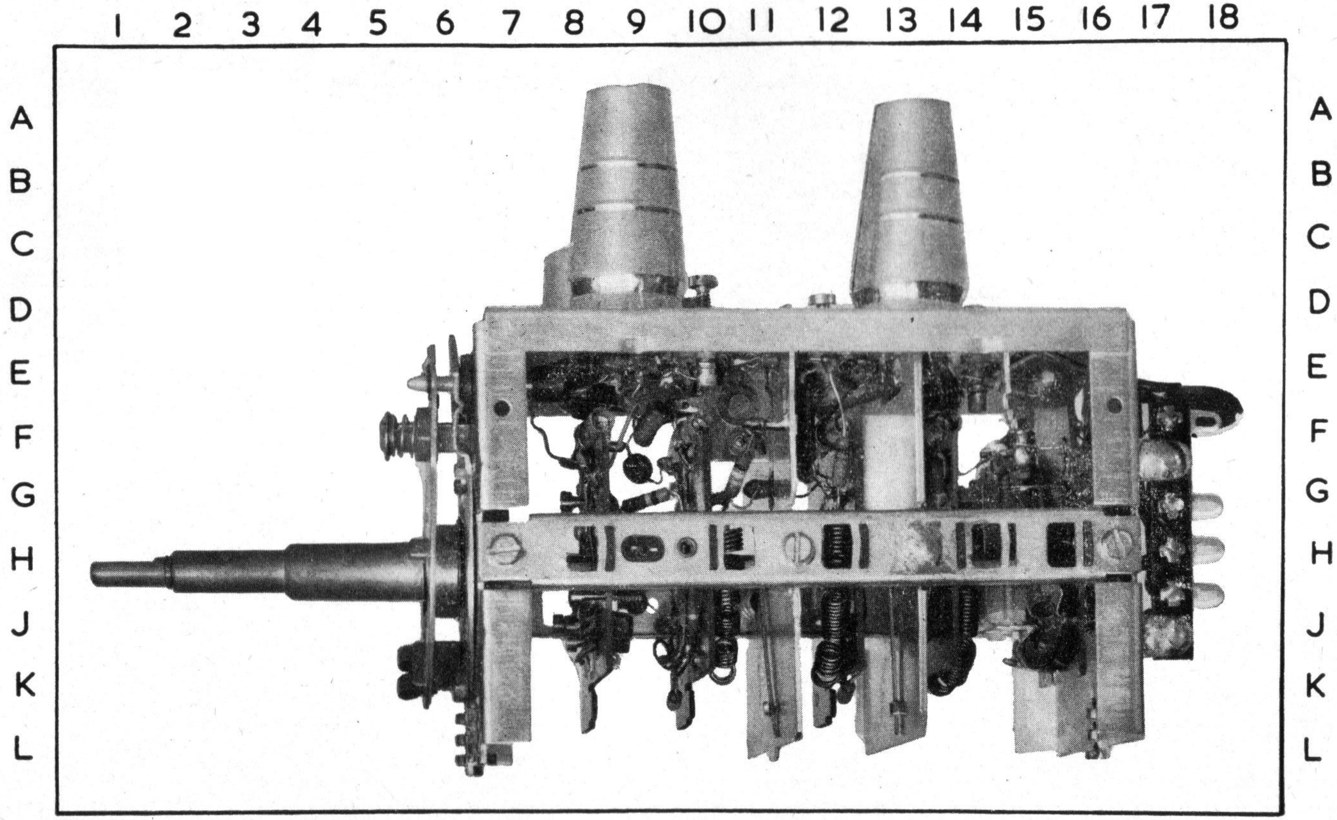
UNDER CHASSIS ALIGNMENT ADJUSTMENT.

FIG. 14



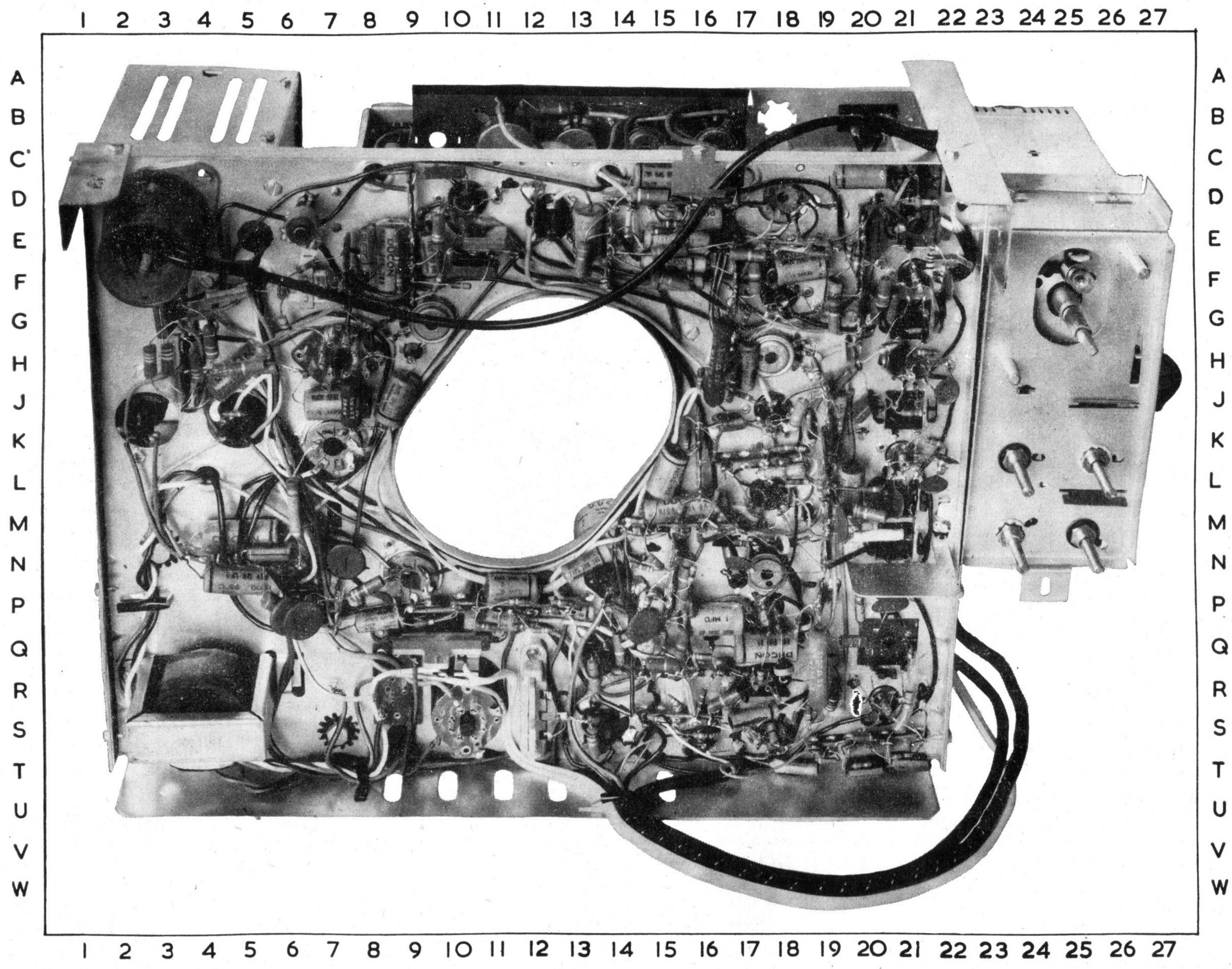
TOP CHASSIS ALIGNMENT ADJUSTMENT

FIG. 15



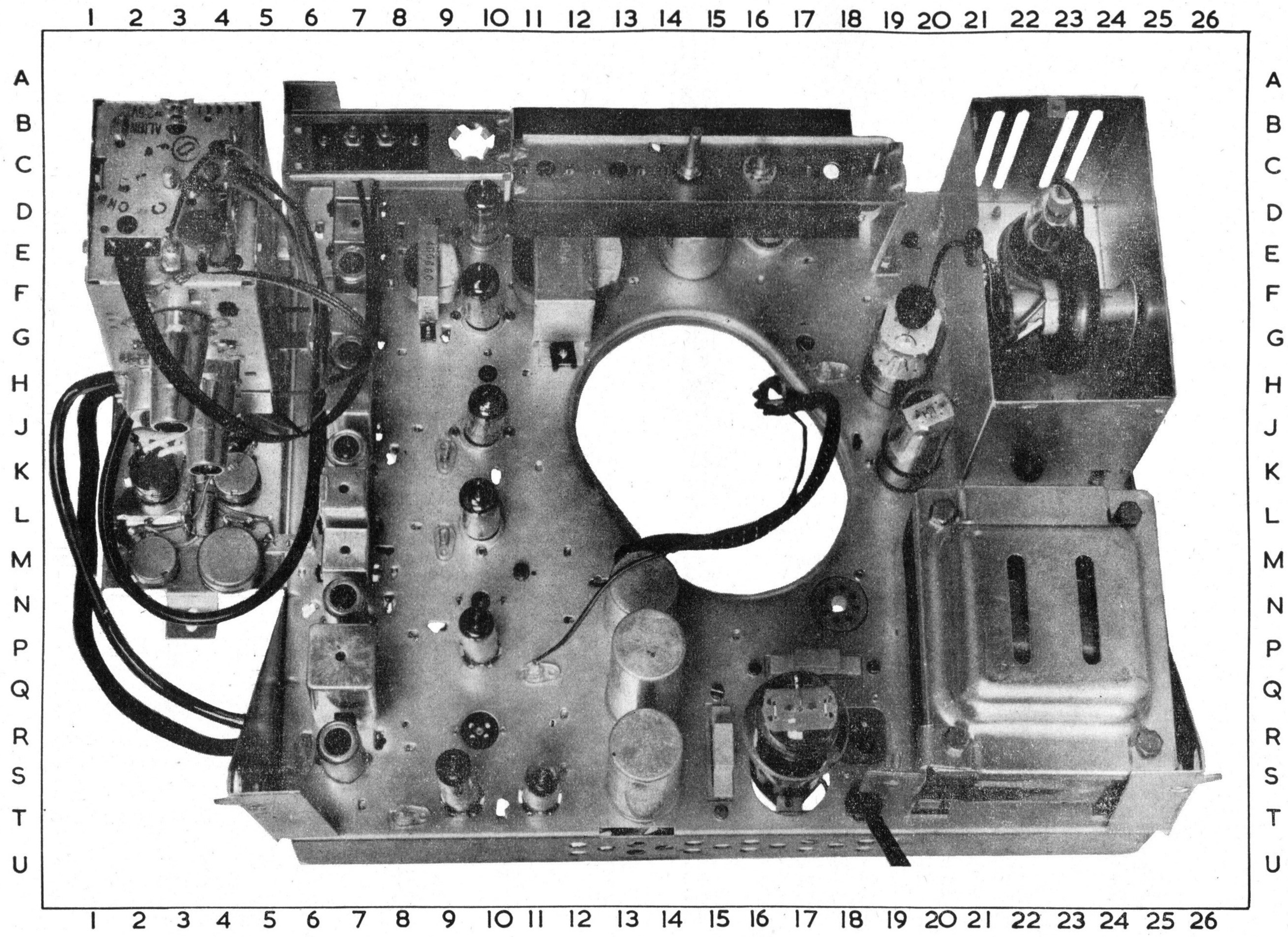
TUNER LAYOUT

FIG. 16



BOTTOM LAYOUT

FIG. 17



TOP LAYOUT

FIG. 18

CIRCUIT CODE

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	INDUCTORS			
L1		41015	16	J15
L2	Composite Filter Coils	41016	16	J15
L3		41017	16	H15
L4		41018	16	G15
L5	Aerial Section Inductor	40300	16	F14
L6			16	G13
L7	Aerial Section Segment	40169	16	H13
L8			16	H13
L9			16	J13
L10	Channel 5 Aerial Section Inductor	40304	16	J14
L11	Channel 4 Aerial Section Inductor	40305	16	J14
L12	Channel 3 Aerial Section Inductor	40314	16	K14
L13	Channel 2 Aerial Section Inductor	40315	16	K14
L14	Channel 1 Aerial Section Inductor	40316	16	J14
L15	Interstage Coupling 6BQ7-A	40108	16	E14
L16	6BQ7-A Plate Section Inductor	40312	16	F12
L17			16	G12
L18	S3 Rear		16	H12
L19	6BQ7-A Plate Section Inductor	40169	16	J12
L20			16	J12
L21	Channel 5 6BQ7-A Plate Sect. Inductor	40302	16	J13
L22	Channel 4 6BQ7-A Plate Sect. Inductor	40303	16	K13
L23	Channel 3 6BQ7-A Plate Sect. Inductor	40317	16	K12
L24	Channel 2 6BQ7-A Plate Sect. Inductor	40318	16	J12
L25	Channel 1 6BQ7-A Plate Sect. Inductor	40319	16	H12
L26	Converter Grid Section Inductor	40311	16	F10
L27			16	G10
L28	S2 Front		16	G10
L29	Converter Grid Section Segment	40168	16	H10
L30			16	J10
L31	Channel 5 Converter Grid Sect. Inductor	40301	16	K9
L32	Channel 4 Converter Grid Sect. Inductor	40170	16	K10
L33	Channel 3 Converter Grid Sect. Inductor	40320	16	K10
L34	Channel 2 Converter Grid Sect. Inductor	40321	16	J10
L35	Channel 1 Converter Grid Sect. Inductor	40322	16	H10
L36	Oscillator Filament Choke	40107	16	F9
L37	Oscillator Section Inductor	40313	16	F8
L38	Channel 9 Oscillator Section Inductor	40310	16	G8
L39			16	G8
L40	Oscillator Section Segment	40167	16	H8
L41			16	J8
L42	Channel 5 Oscillator Section Inductor	40306	16	J9
L43	Channel 4 Oscillator Section Inductor	40182	16	J8
L44	Channel 3 Oscillator Section Inductor	40307	16	J9
L45	Channel 2 Oscillator Section Inductor	40308	16	J9
L46	Channel 1 Oscillator Section Inductor	40309	16	J9
L47	6BQ7-A Filament Choke	40106	16	E13
L101	Sound I.F.	41411	17	N21
L201	37.5 Mc/s Trap	41405	17	D21
L202	Video I.F. Input	41403	17	E21
L203	Detector Filter Choke	40323	17	M20
L204	Detector Peaking Coil	40117	17	M18
L205	5.5 Mc/s Trap	40905	17	N17

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	INDUCTORS (continued)			
L206	Video Amp. Shunt Peaking	41423	17	Q14
L207	Video Output Shunt Peaking	41424	17	Q18
L208	Video Output Series Peaking	41425	17	P18
L401	Sine Wave Coil	40050	17	E6
L402	H.F. Choke	214516	17	L6
L403	Horizontal Linearity	41448	17	K2
L405				
L406	Yoke	41170		
L407				
L408				
L409	H.T. Filter Choke	40113D	17	R4
	RESISTORS			
	All Resistors carbon unless wire wound (W.W.) as stated.			
R1	820 ohms ± 10% ½ watt		16	F17
R2	22K ohms ± 10% ½ watt		16	E15
R3	Not used			
R4	1 Megohm ± 10% ½ watt		16	E13
R5	1 Megohm ± 10% ½ watt		16	E12
R6	100K ohms ± 10% ½ watt		16	E14
R7	1K ohms ± 10% ½ watt		16	K12
R8	1K ohms ± 10% ½ watt		16	F12
R9	1K ohms ± 10% ½ watt		16	K10
R10	120 ohms ± 10% ½ watt		16	E8
R11	3.3K ohms ± 10% ½ watt		16	J10
R12	100K ohms ± 10% ½ watt		16	G9
R13	100K ohms ± 10% ½ watt		16	G11
R14	Not used			
R15	100K ohms ± 10% ½ watt		16	E8
R16	5.6K ohms ± 10% ½ watt		16	E10
R17	2.7K ohms ± 10% ½ watt		16	E9
R18	10K ohms ± 10% ½ watt		16	J17
R101	180 ohms ± 10% ½ watt		17	P20
R102	22K ohms ± 10% 1 watt		17	Q20
R103	47 ohms ± 10% ½ watt		17	R21
R104	47K ohms ± 20% ½ watt		17	S20
R105	47K ohms ± 20% ½ watt		17	T19
R106	4.7K ohms ± 5% ½ watt		17	T20
R107	4.7K ohms ± 5% ½ watt		17	T21
R108	500K ohms Log. Carbon. Tone Control	37206	18	K2
R109	Not used			
R110	250K ohms Log. Carbon. Volume Control	37207	18	K4
R111	10 Megohms ± 20% ½ watt		17	S16
R112	330K ohms ± 10% ½ watt		17	S17
R113	470K ohms ± 20% ½ watt		17	S18
R114	1.5 Megohms ± 10% 1 watt		17	R16
R115	47K ohms ± 20% ½ watt		17	S18
R116	470 ohms ± 10% 1 watt		17	R19
R117	330 ohms ± 10% 1 watt		17	R13
R118	56K ohms ± 10% ½ watt		17	P20
R201	1K ohms ± 20% ½ watt		17	D21
R202	2.2K ohms ± 5% ½ watt (In L202)		17	E21
R203	56 ohms ± 10% ½ watt		17	F22

CIRCUIT CODE

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	RESISTORS (continued)			
R204	47 ohms ± 10% ½ watt		17	F22
R205	12K ohms ± 5% ½ watt		17	G21
R206	120K ohms ± 10% ½ watt		17	H21
R207	470 ohms ± 20% ½ watt		17	H20
R208	150K ohms ± 10% ½ watt		17	H20
R209	15K ohms ± 10% ½ watt		17	H20
R210	4.7K ohms ± 5% ½ watt		17	J21
R211	1.5K ohms ± 20% ½ watt		17	J20
R212	180 ohms ± 10% ½ watt		17	K22
R213	12K ohms ± 10% ½ watt		17	L20
R214	4.7K ohms ± 10% 1 watt		17	M20
R215	33K ohms ± 10% ½ watt		17	L16
R216	27K ohms ± 20% ½ watt		17	M17
R217	560K ohms ± 10% ½ watt		17	F6
R218	2 Megohms Linear Carbon. Noise Cancel	620772	17	N18
R219	220K ohms ± 10% ½ watt		17	M18
R220	2.2K ohms ± 5% ½ watt		17	M15
R221	1.8K ohms ± 5% ½ watt		17	M16
R222	120 ohms ± 10% ½ watt		17	K18
R223	330 ohms ± 10% ½ watt		17	L19
R224	82K ohms ± 10% ½ watt		17	M14
R225	22K ohms ± 10% ½ watt		17	N15
R226	4.7K ohms ± 10% ½ watt		17	N15
R227	10K ohms ± 10% 2 watts		17	N15
R228	47K ohms ± 10% ½ watt		17	N14
R229	3.3K ohms ± 10% 1 watt		17	Q15
R230	150K ohms ± 10% ½ watt		17	P15
R231	470K ohms ± 20% ½ watt		17	R17
R232	560 ohms ± 10% 1 watt		17	Q15
R233	1.5K ohms W.W. Contrast Control	41467	18	M4
R234	120K ohms ± 10% ½ watt		17	P11
R235	3.3K ohms ± 10% 5 watts W.W.		17	R19
R236	12K ohms ± 10% ½ watt		17	P18
R237	470K ohms ± 20% ½ watt		17	Q16
R238	270K ohms ± 10% ½ watt		17	G8
R239	2.7 Megohms ± 10% ½ watt		17	R16
R240	2.5 Megohms Linear Carbon. Focus	620781	17	G9
R241	39 ohms ± 10% ½ watt		17	H21
R242	68 ohms ± 20% ½ watt		17	K17
R301	100K ohms Linear Carbon I.F. A.G.C.	620322	17	H18
R302	470K ohms ± 10% ½ watt		17	H19
R303	680K ohms ± 20% ½ watt		17	K19
R304	4.7 Megohms ± 10% ½ watt		17	L19
R305	500K ohms Linear Carbon A.G.C. Control	620569	17	B16
R306	33K ohms ± 10% ½ watt		17	J18
R307	47K ohms ± 10% ½ watt		17	G17
R308	39K ohms ± 10% ½ watt		17	J17
R309	56K ohms ± 10% ½ watt		17	J17
R310	220K ohms ± 10% ½ watt		17	J16
R311	47K ohms ± 10% 1 watt		17	J18
R312	1.2 Megohms ± 10% ½ watt		17	K16
R313	1 Megohm ± 10% ½ watt		17	K17
R314	270K ohms ± 10% ½ watt		17	K16

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	RESISTORS (continued)			
R315	1 Megohm ± 10% ½ watt		17	J17
R316	33K ohms ± 10% ½ watt		17	G18
R317	8.2K ohms ± 10% 1 watt		17	G19
R318	2.7K ohms ± 5% ½ watt		17	G20
R319	27K ohms ± 10% 1 watt		17	F20
R320	1 Megohm Linear Carbon. Vertical Hold	37209	17	B13
R321	2.7K ohms ± 10% ½ watt		17	E20
R322	1 Megohm ± 10% ½ watt		17	E20
R323	1.5 Megohm ± 10% 1 watt		17	H3
R324	820K ohms ± 10% ½ watt		17	B14
R325	2.5 Megohm Linear Carbon. Height Control	620781	17	B14
R326	1 Megohm ± 10% ½ watt		17	D16
R327	3.9K ohms ± 10% ½ watt		17	E15
R328	22K ohms ± 10% ½ watt		17	E15
R329	39K ohms ± 5% 1 watt		17	D15
R330	18K ohms ± 5% 1 watt		17	E13
R331	18K ohms ± 5% 1 watt		17	E13
R332	2.2 Megohms ± 20% ½ watt		17	E19
R333	1K ohms W.W. Linear Vertical Linearity	41468	17	B11
R334	100 ohms ± 10% 1 watt		17	B12
R335	150 ohms ± 10% 1 watt		17	E17
R336	Not used			
R337	3.3K ohms ± 10% ½ watt		17	P9
R338	330 ohms ± 10% 1 watt		17	F17
R339	220K ohms ± 10% ½ watt		17	R15
R340	200K ohms Linear Carbon. Brightness	37208	18	M2
R341	15K ohms ± 10% ½ watt		17	Q12
R342	150K ohms ± 10% ½ watt		17	P12
R343	18K ohms ± 10% 1 watt		17	E15
R344	18K ohms ± 10% 1 watt		17	F15
R345	10 Megohms ± 10% ½ watt		17	P12
R346	330K ohms ± 10% ½ watt		17	Q12
R347	1 Megohm ± 10% 1 watt		17	H3
R348	1.5 Megohms ± 10% 1 watt		17	H3
R401	330K ohms ± 10% ½ watt		17	F10
R402	820K ohms ± 10% ½ watt		17	F9
R403	68K ohms ± 10% ½ watt		17	E9
R404	220K ohms ± 10% ½ watt		17	E9
R405	3.9K ohms ± 10% ½ watt		17	F7
R406	120K ohms ± 10% 1 watt		17	E10
R407	39K ohms ± 10% ½ watt		17	B9
R408	150K ohms ± 10% ½ watt		17	F10
R409	39K ohms ± 10% 1 watt		17	G4
R410	1 Megohm ± 10% ½ watt		17	F6
R411	47 ohms ± 10% ½ watt		17	G6
R412	100 ohms ± 10% 5 watts W.W.		17	J8
R413	18K ohms ± 10% 2 watts		17	H5
R414	33K ohms ± 10% 1 watt		17	H5
R415	1.5 ohms ± 10% ½ watt W.W.		17	F3
R416	1K ohms ± 10% ½ watt		17	F2
R417	4.7K ohms ± 10% 1 watt		17	P8
R418	150 ohms ± 10% ½ watt (In Yoke)			
R419	150 ohms ± 10% ½ watt (In Yoke)			

CIRCUIT CODE

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	RESISTORS (continued)			
R420	100K ohms ± 10% 2 watts		17	S13
R421	6.8K ohms ± 10% 10 watts W.W.		17	H16
R422	150 ohms ± 10% 1 watt		17	Q14
R423	180 ohms ± 10% ½ watt		17	J5
	CAPACITORS			
C1	18 pF ± 5% NPO Tubular Ceramic		16	J16
C2	5.6 pF ± 5% NPO Tubular Ceramic		16	H15
C3	18 pF ± 5% NPO Tubular Ceramic		16	G16
C4	470 pF + 100% — 0% K5000 Disc		16	J17
C5	0.01 μF + 100% — 0% K5000 Disc		16	F18
C6	0.001 μF + 100% — 0% K5000 Feed Thru		16	F16
C7	270 pF ± 20% K1200 Tubular		16	G15
C8	10 pF ± 5% NPO Tubular		16	G14
C9	4.7 pF ± 5% NPO Tubular		16	F13
C10	12 pF ± 5% NPO Tubular		16	G14
C11	4-10 pF Trimmer	231123	16	E14
C12	Not used			
C13	220 pF ± 20% K1200 Disc		16	E12
C14	0.5-3 pF Trimmer	231122	16	E12
C15	180 pF ± 5% N750 Style "B" Tubular		16	F12
C16	50-140 pF Mica Trimmer	40038	16	F10
C17	0.001 μF + 100% — 0% K5000 Tubular		16	G11
C18	0.001 μF + 100% — 0% K5000 Feed Thru		16	E11
C19	0.001 μF + 100% — 0% K5000 Feed Thru		16	F11
C20	0.5-3 pF Trimmer	231122	16	E10
C21	270 pF ± 20% K1200 Tubular		16	F12
C22	0.88 pF ± 20% NPO Bead		16	J9
C23	82pF ± 10% N750 Style "C" Disc		16	E9
C24	270 pF ± 20% K1200 Disc		16	E8
C25	0.63 pF ± 20% NPO Bead		16	G9
C26	12 pF ± 5% N750 Tubular		16	E9
C27	0.5-3 pF Trimmer	231122	16	E10
C28	10 pF ± 5% NPO Tubular		16	F9
C29	Trimmer (Fine Tuning) AWA Special	40135	16	E7
C30	470 pF + 100% — 0% K5000 Disc		16	H17
C31	470 pF + 100% — 0% K5000 Disc		16	G17
C32	Not used			
C33	39 pF ± 10% N220 Disc (In T2)		16	C8
C34	0.0047 μF + 100% — 0% K5000 Disc (In T2)		16	C8
C35	0.1 μF ± 10% 200V Working Paper		16	J17
C36	0.88 pF ± 20% NPO Bead		16	F15
C101	6.8 pF ± 5% NPO Tubular (In L101)		17	N21
C102	39 pF ± 10% N220 Disc (In L101)		17	N21
C103	0.01 μF + 100% — 0% K5000 Disc		17	P20
C104	0.0022 μF ± 10% 400V Working Paper		17	P20
C105	100 pF ± 5% 600V Working Styroseal (In T101)		17	Q21
C106	470 pF ± 5% 500V Working Silvered Mica		17	T20
C107	470 pF ± 5% 500V Working Silvered Mica		17	T21
C108	0.001 μF ± 10% 600V Working Paper		17	T18
C109	10 μF 50V Working Electrolytic		17	T20
C110	0.0033 μF ± 10% 600V Working Paper		18	K3
C111	0.047 μF ± 10% 200V Working Paper		18	L4
	CAPACITORS (continued)			
C112	0.01 μF ± 20% 200V Working Paper		17	S16
C113	0.022 μF ± 20% 400V Working Paper		17	S17
C114	25 μF 25V Working Electrolytic		17	R19
C115	0.0022 μF ± 10% 600V Working Paper		17	R17
C116A	25 μF 400V Working } Electrolytic			
C116B	5 μF 450V Working } Electrolytic	229720	17	Q14
C116C	70 μF 400V Working } Electrolytic			
C117	2 μF ± 10% 200V Working Paper (On LS101) N.B. C117 on 12" Speaker 21542 Only			
C118	6.8 pF ± .5 pF NPO Tubular		17	P20
C201	5.6 pF ± .25 pF NPO Tubular		17	E22
C202	12 pF ± 5% NPO Tubular		17	D21
C203	0.0047 μF + 100% — 0% K5000 Disc		17	D21
C204	4-10 pF Trimmer	231123	17	F20
C205	0.0047 μF + 100% — 0% K5000 Disc		17	F22
C206	0.0047 μF + 100% — 0% K5000 Disc		17	G22
C207	270 pF ± 5% 500V Working Mica		17	G21
C208	0.0047 μF + 100% — 0% K5000 Disc		17	H21
C209	0.0047 μF + 100% — 0% K5000 Disc		17	H22
C210	0.0047 μF + 100% — 0% K5000 Disc		17	J22
C211	390 pF ± 5% 500V Working Mica		17	J20
C212	18 pF ± 5% NPO Tubular (In T202)		17	J21
C213	0.0047 μF + 100% — 0% K5000 Disc		17	K22
C214	0.0047 μF + 100% — 0% K5000 Disc		17	L22
C215	0.0047 μF + 100% — 0% K5000 Disc		17	M21
C216	4.7 pF ± .5 pF N750 Bead (In T203)		17	L21
C217	0.0047 μF + 100% — 0% K5000 Disc		17	L20
C218	0.22 μF ± 20% 200V Working Paper		17	M15
C219	0.01 μF + 100% — 0% K5000 Disc		17	N18
C220	0.01 μF + 100% — 0% K5000 Disc		17	M19
C221	0.001 μF ± 10% 500V Working Mica		17	L18
C222	**39 pF ± 10% N220 Disc**		17	N17
C223	33 pF ± 10% N750 Tubular		17	P15
C224	0.01 μF + 100% — 0% K5000 Disc		17	P15
C225	0.1 μF ± 10% 600V Working Paper		17	P16
C226	25 μF 25V Working Electrolytic		17	P15
C227	0.1 μF ± 20% 600V Working Paper		17	Q17
C228	0.01 μF ± 20% 200V Working Paper		17	L17
C301	0.1 μF ± 20% 200V Working Paper		17	C20
C302	0.1 μF ± 20% 200V Working Paper		17	L19
C303	0.01 μF + 100% — 0% K5000 Disc		17	K19
C304	0.0039 μF ± 10% 400V Working Paper		17	J19
C305	330 pF ± 10% 500V Working Mica		17	K16
C306	0.1 μF ± 20% 400V Working Paper		17	L15
C307	330 pF ± 10% 500V Working Mica		17	K17
C308	0.033 μF ± 20% 400V Working Paper		17	H17
C309	82 pF ± 10% 1000V Working Silvered Mica		17	E11
C310	220 pF ± 10% 500V Working Mica		17	G21
C311	0.027 μF ± 10% 400V Working Paper		17	F19
C312	**0.0068 μF ± 5% 500V Working Silvered Mica**		17	E20
C313	0.033 μF ± 10% 600V Working Paper		17	D16
C314	0.1 μF ± 10% 400V Working Paper		17	F18
C315	0.068 μF ± 10% 400V Working Paper		17	D15

CIRCUIT CODE

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	CAPACITORS (continued)			
C316	0.022 μF ± 10% 1000V Working Paper		17	E15
C317A	50 μF 50V Working } Electrolytic			
C317B	20 μF 400V Working } Electrolytic	229680	17	E12
C317C	10 μF 400V Working } Electrolytic			
C318	Not used			
C319	0.047 μF ± 20% 600V Working Paper		17	Q11
C320	0.018 μF ± 10% 400V Working Paper		17	P13
C321	0.1 μF ± 10% 400V Working Paper		17	P11
C322	0.047 μF ± 10% 200V Working Paper		17	N13
C323	0.1 μF ± 10% 400V Working Paper		17	E13
C324	0.0047 μF ± 10% 1600V Working Paper		17	F15
C325	0.033 μF ± 10% 400V Working Paper		17	F15
C326	0.47 μF ± 10% 400V Working Paper		17	H5
C327	8 μF 525V Peak Electrolytic		17	D12
C401	0.047 μF ± 20% 400V Working Paper		17	E9
C402	0.022 μF ± 10% 200V Working Paper		17	E8
C403	82 pF ± 10% 1000V Working Silvered Mica		17	F10
C404	0.47 μF ± 20% 100V Working Paper		17	E8
C405	270 pF ± 5% 1000V Working Silvered Mica		17	C10
C406	0.01 μF ± 5% 600V Working Styroseal		17	E6
C407	0.0012 μF ± 10% 1000V Working Silvered Mica		17	F4
C408	20-220 pF Trimmer Horizontal Drive	231127	17	F6
C409	0.0012 μF ± 5% 500V Working Silvered Mica		17	G3
C410	0.1 μF ± 20% 600V Working Paper		17	J7
C411	0.27 μF ± 20% 100V Working Paper		17	J9
C412	270 pF ± 20% 1000V Working Silvered Mica		17	N5
C413	0.047 μF ± 10% 1000V Working Paper		17	N5
C414	0.047 μF ± 10% 1000V Working Paper		17	M5
C415	270 pF ± 10% N750 2500V Working Disc		17	P6
C416	330 pF ± 10% N750 2500V Working Disc		17	N7
C417	68 pF ± 10% N750 2500V Working Disc		17	P6
C418	0.001 μF ± 10% 1600V Working Paper		17	P6
C419	91 pF ± 10% N750 2500V Tubular } In Yoke			
C420	120 pF ± 10% N750 2500V Tubular } In Yoke			
C421	120 pF ± 10% N750 2500V Tubular } In Yoke			
C422	90 μF 525V Peak Electrolytic		17	S13
C423	50 μF 400V Peak Electrolytic		17	N14
C424	0.033 μF ± 10% 400V Working Paper		17	P8
	TRANSFORMERS			
T1A	Aerial Matching Transformer	40982	16	H15
T1B	Aerial Matching Transformer	40982	16	H14
T2	Converter I.F.	41401	16	D8
T101	Ratio Detector	40077	17	Q20
T102	Audio Output Transformer (On LS101)			
T201	1st Video I.F.	40902	17	G21
T202	2nd Video I.F.	41407	17	J21
T203	3rd Video I.F.	41409	17	L21
T301	Vertical Blocking Oscillator	40066C	18	E9
T302	Vertical Output	41445	18	F12
T401	Horizontal Blocking Oscillator	41579	17	C9
T402	Horizontal Output (High Volt Box)	41449		

CODE No.	DESCRIPTION	PART No.	FIG. No.	LOCATION
	TRANSFORMERS (continued)			
T403	Power Transformer	41443	18	N22
T404	Width Coil	41542	17	K5
	VALVES			
V1	Radiotron 6BQ7-A		18	H3
V2	Radiotron 6CQ8		18	J4
V101	Radiotron 6AU6		17	P20
V102	Radiotron 6AL5		17	R20
V103	Radiotron 6AV6		17	S16
V104	Radiotron 6AQ5		17	S18
V201	Radiotron 6BZ6		17	F21
V202	Radiotron 6BZ6		17	H21
V203	Radiotron 6BZ6		17	K21
V204	Radiotron 6AW8-A		17	L18
V205	Radiotron 6AQ5		17	P17
V206	Radiotron 21CEP4			
V301	Radiotron 6U8		17	J18
V302	Radiotron 6CG7		17	F18
V303	Radiotron 6CZ5		17	D18
V401	Radiotron 6CG7		17	D10
V402	Radiotron 6DQ6-A		17	H7
V403	Radiotron 6AU4-GTA		17	K7
V404	Radiotron 1B3-GT		17	E3
V405	Radiotron 5AS4		17	S10
	SWITCHES			
S1	Channel Selector		16	G8
S2	Channel Selector		16	G10
S3	Channel Selector		16	G12
S4	Channel Selector		16	G14
S401	Power ON/OFF (On R108)		18	K2
	LOUDSPEAKERS			
LS101	7" x 5" Permanent Magnet, Lowboy	21540		
LS101	12" Permanent Magnet, Console	21542		
LS102	4" Permanent Magnet, Lowboy	21541		
LS102	4" Permanent Magnet, Console	21543		
	FUSES			
F401	0.375 Amp. Cartridge		17	S12
F402	1.5 Amp. Cartridge		17	Q10
	MISCELLANEOUS			
MR201	Germanium Diode GEX 34 (In T203)			
PL101	4 Pin Plug (On LS101)	581404		
PL102	2 Pin Wafer Plug	581215		
PL201	Video Input Plug	581549		
PL401	Mica Filled Octal Plug	581380		
SK1	Video Input Socket	793249		
SK101	4 Pin Wafer Socket	793287	17	R18
SK102	2 Pin Wafer (On LS101)	793038		
SK401	Octal Socket	794582		
LP1	12V 2.2 watt M.E.S. Pilot Lamp		17	F25

AWA