MANUFACTURERS AWA SUPERVISED SERVICE

A.W.A. RADIOLA
Television Receiver Chassis
40-00 Series

ISSUED BY AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

GENERAL DESCRIPTION

The 40-00 series chassis are 20 valves, A.C.-operated Television Receivers.

Features of design include: Neutrode tuner; hinge-down chassis; three-stage I.F. amplifier; gated a.g.c.; phase discriminator a.f.c. horizontal system; frequency selective noise detector; horizontal and vertical sweep stabilisation; 110° deflection; electrostatic dynamic focus; aluminised picture tube; ratio detector; separate sound detector.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

INTERMEDIATE FREQUENCIES

Video I.F. Carrier Frequency .... 36.875 Mc/s

Sound I.F. Carrier Frequency .... 31.375 Mc/s

POWER CONSUMPTION: 170 watts maximum.

UNDISTORTED AUDIO POWER OUTPUT: 2.5 watts max.

VIDEO RESPONSE .... To 4.5 Mc/s

FOCUS .... Electrostatic (Low Voltage)

DEFLECTION .... 110° Magnetic

VALVE COMPLEMENT:

V1	6GK5	R.F. Amplifier (In tuner)
V2	6HG8	Oscillator Mixer (In tuner)
V101	6AU6	2nd Sound I.F.
V102	6AL5	Ratio Detector
V103	6AV6	Audio Amp. and A.G.C. Clamp
V104	6HG5	Audio Output
V201	6BZ6	1st Video I.F.
V202	6EW6	2nd Video I.F.
V203	6EJ7	3rd Video I.F.
V204	6EB8	Video Amp. and Sync. Amp.
V205	6CG7	Video Control and Vert. Osc.
V206		Picture Tube (Varies with models)
V207	6EA8	1st Sound I.F. and Noise Detector
V301	6HS8	Noise Gated A.G.C. and Sync. Sep.
V302	6EM5	Vertical Output
V401	6AL5	Phase Discriminator
V402	6CG7	Buffer and Hor. Osc.
V403	6CM5	Horizontal Output
V404	6AU4-GTA	Damper
V405	1B3-GT	H.V. Rectifier

DIODES:

MR201	IN87A	Sound Detector
MR202	IN87A	Video Detector
MR401	IN3194	Rectifier
MR402	IN3194	Rectifier

FEB., 1966

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 picture tube assembly is securely fastened before turning the receiver on.

PICTURE TUBE HANDLING PRECAUTIONS

Do not install, remove or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away from the area where the picture tube is being handled. Keep the picture tube away from the body while handling.

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

OPERATING TESTS

DEFLECTION YOKE ADJUSTMENT (Fig. 1)

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

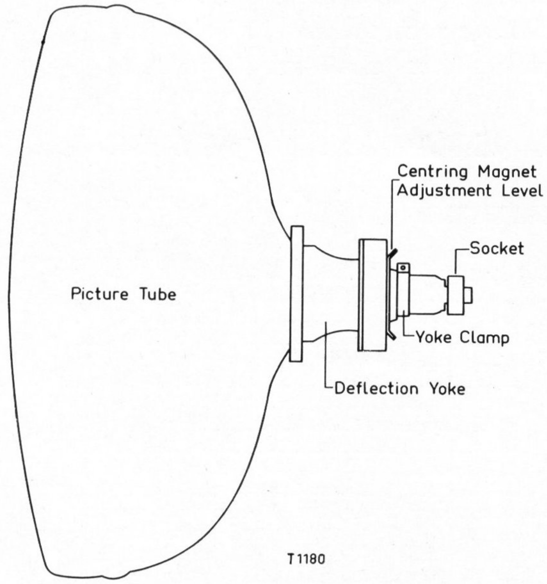


FIG. 1

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 picture tube is replaced. In this case adjust the focus control, RV402, until maximum definition of the line structure of the raster is obtained.

HORIZONTAL OSCILLATOR ADJUSTMENT

The adjustment of the horizontal oscillator is not considered to be part of the alignment procedure. The adjustment is made at the factory and should not require readjustment in the field. However, the adjustment should be carried out whenever components in the horizontal oscillator circuit are changed. The width should be correctly set before adjustments are carried out.

The horizontal oscillator may be adjusted by the following method:—

NOTE: Under normal circumstances, unless C408, C409 or L401 are replaced, no sine wave coil adjustment will be required, and the correct horizontal oscillator conditions will be obtained by following step 5 below.

1. Short circuit the sine wave coil, L401, and short circuit the phase discriminator test point to ground.
2. Adjust the horizontal hold control, RV403, until the picture is synchronised with the signal, i.e., picture sides are straight.
3. Remove short circuit from sine wave coil.
4. Adjust the sine wave coil until the picture is synchronised with the signal.
5. Remove the short circuit from the phase discriminator test point.
6. Set the horizontal hold control, RV403, for 0 volts d.c. at the phase discriminator test point.

OPERATING TESTS

CENTRING ADJUSTMENT

As the majority of test patterns transmitted contain horizontal and vertical bars, the correct procedure for centring adjustment horizontally or vertically is that the corresponding bars progressing outwards from the centre should have the same amount of pin-cushion distortion (if any).

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 AND HORIZONTAL LINEARITY ADJUSTMENTS

The width and horizontal linearity controls, RV401 and L403, in conjunction with the vertical adjustments, are adjusted to produce best linearity for a picture of the correct aspect ratio with normal picture brightness.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

Adjust the height control, RV307, for a picture of approximately $\frac{3}{4}$ of the normal size.

Adjust the vertical linearity control, RV305, to give a small amount of cramp at the top of the picture.

Adjust the height and top linearity controls, RV307 and RV306, to obtain a picture of normal height (approximately $\frac{1}{2}$" of picture extending beyond the top and bottom of the picture tube mask).

Finally adjust the height, top linearity and vertical linearity controls for best linearity and correct height.

A.G.C. ADJUSTMENT

Set the min. contrast and I.F. A.G.C. controls at their mid positions.

Set the contrast control fully clockwise.

Tune the receiver to the channel on which the received signal is strongest.

Set the fine tuning and adjust the A.G.C. control (RV302) for sync. clipping in the video amplifier. Back off five degrees (5°) further than the point at which clipping stops. If stronger signals are anticipated in the near future, back off a further ten degrees (10°).

Set the contrast control for minimum contrast and adjust the min. contrast control to give 20 volts p-p at the picture tube cathode. Adjust the brightness control for normal brightness and the I.F. A.G.C. control for snow threshold.

REPLACEMENT OF FUSES

Two 1.5 amp. fuses are provided for mains and high tension protection. The location and function of these fuses are indicated on the layout diagram.

CHASSIS REMOVAL

The method of mounting used on this chassis adds to its ease of servicing. Two wing nuts secure the top of the chassis to the cabinet while the chassis base rests in special hinge brackets.

When access is required to the wiring side of the chassis, loosen the wing nuts and swing the chassis down to its horizontal rest. This can be done without interfering with the receiver operation.

Caution! Before and during this swing down operation, make sure that the picture tube and yoke leads do not foul on the picture tube neck or chassis components.

Should the complete chassis need removing, only the following additional steps are necessary:

Remove the tuner and control panel assembly from the cabinet and attach it to the chassis (retaining screws and anchor points are provided along the i.f. side of the chassis for this purpose).

Unplug the yoke, picture tube socket, audio and ultor leads and disconnect the tuner earth strap.

Where a remote control unit is fitted, disconnect the interconnecting cables.

If the cabinet is fitted with castors remove the rear ones.

Lift the chassis to a position slightly above the horizontal and the chassis assembly will be free to slide out of its hinge brackets.

Reassembly is the reverse of the above procedure.

ALIGNMENT PROCEDURE

TESTING INSTRUMENTS

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

(1) Television Sweep Generator.

(2) A.W.A. Cathode Ray Oscilloscope (C.R.O.), type 1A56069.

(3) A.W.A. Television Calibrator, type A56057.

(4) A.W.A. Voltohmyst, type 1A56074.

(5) A.W.A. Universal Measuring Bridge, type A56048.

TESTING PADS AND CIRCUITS

(Referred to in Alignment Procedure.)

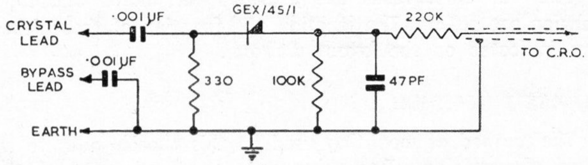


FIG. 2—CRYSTAL DETECTOR PROBE

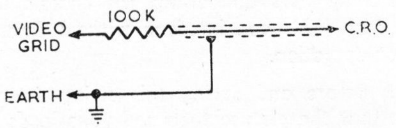


FIG. 3

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

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 adjustments, the following apply:—

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

Make sure that bias voltages are correct, as incorrect voltages will lead to wrong adjustment.

When applying markers, use smallest marker visible, otherwise response could be incorrectly displayed, i.e., removal of the marker generator should not change viewed shape of response.

Make sure that responses are viewed at correct output level as incorrect level will result in wrong adjustment. At lower levels detector non-linearity affects the shape, and at higher levels overload will alter the shape of the response.

SOUND I.F. ALIGNMENT

Connect the output of the television calibrator to pin 2 of V203 (3rd video I.F.) and set the frequency to 5.5 Mc/s.

Connect the Voltohmyst d.c. probe to the sound peak test point and set the range switch to + 5 volts d.c.

Short circuit pins 5 and 6 of V201 (1st video I.F.).

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

TR101 secondary (ratio detector bottom core)*.

TR101 primary (top core)†.

L102 2nd sound I.F.*

L101 1st sound I.F.*

Repeat this sequence once.

Transfer the Voltohmyst probe to the sound zero test point.

Re-adjust TR101 secondary (bottom core)* for zero reading on the Voltohmyst.

Set the calibrator modulation switch to 600 c/s.

Connect the output of the television calibrator to the video detector test point.

Connect the c.r.o. to the video out test point through a crystal probe (Voltohmyst probe 2R56075 is suitable).

Adjust L207 (sound trap)* for minimum 600 c/s on the c.r.o.

Remove television calibrator, Voltohmyst and short circuit.

VIDEO I.F. ALIGNMENT

Connect the junction of R301 and R303 to earth.

Connect a source of —3 volts bias to the junction of L209 and C301.

Connect a source of —2.5 volts bias to tuner A.G.C. terminal.

Connect the sweep generator to pin 2 of V203 (3rd video I.F.) and set the generator to I.F. sweep.

Connect the c.r.o. to the video detector test point using the network shown in figure 3.

Adjust TR204 trap (top)†, TR203* and L204 to produce the response on the c.r.o. shown in figure 4.

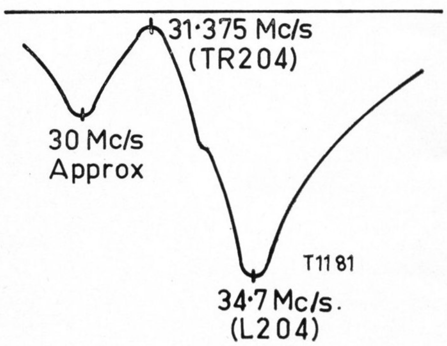


FIG. 4

Connect the c.r.o. to the junction of R214 and L203 (sound detector) using the network shown in figure 3.

VIDEO I.F. ALIGNMENT (continued)

Adjust TR203* to produce the response on the c.r.o. shown in figure 5.

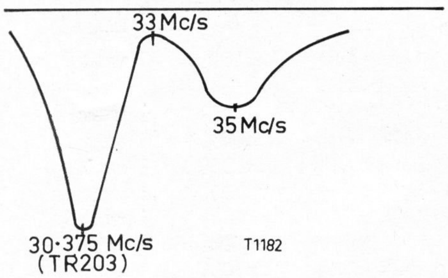


FIG. 5

Re-check the video detector response and if necessary re-adjust L204.

Connect the sweep generator to the aerial input terminals on the tuner and set both sweep generator and tuner to channel 6.

Connect the crystal detector probe (figure 2) to pin 5 of V201 (1st video I.F. plate) and also by-pass pin 5 of V202 using the by-pass lead provided.

Set the tuner oscillator frequency to 212.125 Mc/s ± 0.5 Mc/s using the fine tuning control. Set the sweep generator output to give maximum deflection on the c.r.o. of 0.3 volts p-p. It is suggested that the marker generator be connected to the centre spigot on the socket of V201 and the earth lead connected to the chassis.

Set the marker generator to 38.375 Mc/s and adjust L201 (top core)† so that the marker appears in the dip of the response produced by the trap, i.e., tune the trap to 38.375 Mc/s.

Adjust L2*, L202 (bottom core)* and C204 to produce the response on the c.r.o. shown in figure 6.

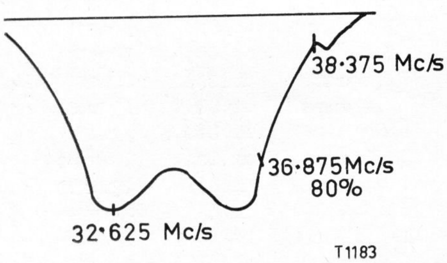


FIG. 6

L2* mainly affects the 36.875 marker position.

L202* mainly affects tilt.

C204 mainly affects the band width.

Remove the crystal probe and connect the c.r.o. to the video detector test point using the network shown in figure 3. It is suggested that the marker generator remain connected to the centre spigot of the V201 socket.

View the overall response with approximately 3 volts p-p output and adjust the accompanying sound trap, TR201 (top core)† for minimum response at 31.375 Mc/s increasing the c.r.o. gain if necessary for easier adjustment of the trap.

Re-set the c.r.o. gain to give 3 volts p-p and adjust for a response as shown in figure 7.

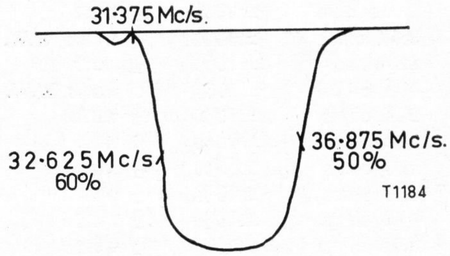


FIG. 7

Marker 36.875 Mc/s at 50% TR202*.

Marker 32.625 Mc/s at 60% TR201 (bottom core)*.

No tilt L204.

Connect the c.r.o. vertical input to pin 7 of V301 (6HS8) using the network shown in figure 3 and remove the 6HS8 valve.

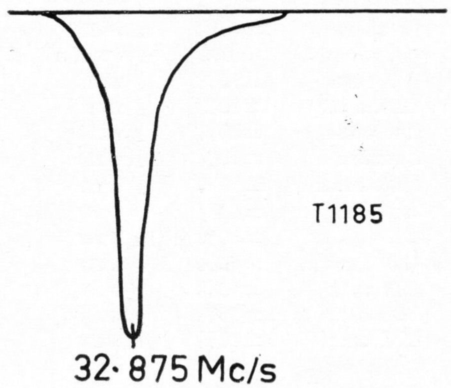


FIG. 8

Adjust the bottom core of TR204* to bring the 32.875 Mc/s marker to the top of the response curve as shown in figure 8.

With 3 volts p-p at the video detector and without adjustment of the sweep generator or bias, the p-p voltage from the noise detector should not be less than 15 volts.

CIRCUIT CODE

RESISTORS

All Resistors composition type unless otherwise stated.

Code No.	DESCRIPTION			Part No.
R1	5.6K ohms	±20%	½ watt	611288
R2	1K ohms	±20%	½ watt	608030
R3	33K ohms	±20%	½ watt	614463
R4	2.2K ohms	±10%	1 watt	609446
R5	2.2K ohms	±20%	½ watt	609445
R6	4.7K ohms	±10%	1 watt	610966
R7	10K ohms	±20%	½ watt	612032
R8	Not used			
R9	2.2K ohms	±20%	½ watt	609445
R10	1 Megohm	±20%	½ watt	618020
R90	1 Megohm	±20%	½ watt	618020
R91	3.9K ohms	±10%	7 watts W.W.	610569
R101	82 ohms	±10%	½ watt	603810
R102	10K ohms	±10%	6 watts W.W.	612058
R103	56K ohms	±10%	½ watt	615161
R104	15K ohms	±10%	1 watt	612928
R105	100 ohms	±10%	½ watt	604031
R106	330 ohms	±10%	½ watt	605962
R107	47K ohms	±10%	½ watt	614961
R108	4.7K ohms	±5%	½ watt	610964
R109	4.7K ohms	±5%	½ watt	610964
R110	10 Megohms	±10%	½ watt	619406
R111	56K ohms	±10%	½ watt	615161
R112	100K ohms	±10%	½ watt	616017
R113	47K ohms	±20%	½ watt	614968
R114	1.5 Megohms	±10%	1 watt	618263
R115	270 ohms	±10%	1 watt	605645
R116	680 ohms	±10%	5 watts W.W.	607290
R117	1.5K ohms	±20%	½ watt (in L102)	608709
R201	Not used			
R202	2.2K ohms	±10%	½ watt	609442
R203	47 ohms	±10%	½ watt	603091
R204	15K ohms	±10%	½ watt (in TR201)	612922
R205	470 ohms	±10%	½ watt	606588
R206	120K ohms	±10%	½ watt	616261
R207	15K ohms	±10%	½ watt	612922
R208	27 ohms	±10%	½ watt	602593
R209	150K ohms	±10%	½ watt	616426
R210	8.2K ohms	±5%	½ watt	611847
R211	8.2K ohms	±10%	½ watt	611846
R212	470 ohms	±10%	½ watt	606588
R213	220 ohms	±10%	½ watt	605253
R214	33K ohms	±10%	½ watt	614460
R215	2.7K ohms	±10%	1 watt	609869
R216	12K ohms	±10%	½ watt	612507
R217	1K ohms	±20%	½ watt	608030
R218	33K ohms	±10%	½ watt	614460
R219	2.7K ohms	±5%	½ watt	609867
R220	68 ohms	±10%	½ watt	603560
R221	22K ohms	±10%	½ watt	613653
R222	47K ohms	±10%	1 watt	614969
R223	470 ohms	±10%	½ watt	606588
R224	5.6K ohms	±5%	7 watts W.W.	611300
R225	6.8K ohms	±10%	½ watt	611526
R226	390K ohms	±10%	½ watt	617204
R227	180K ohms	±10%	1 watt	616568
R228	150K ohms	±10%	1 watt	616430
R229	3.3 Megohms	±10%	½ watt	618712
R230	120K ohms	±10%	½ watt	616261
R231	22 ohms	±10%	½ watt	602320
R301	470K ohms	±10%	½ watt	617356
R302	10 Megohms	±10%	1 watt	619410
R303	680K ohms	±10%	½ watt	617666
R304	33K ohms	±10%	½ watt	614460
R305	150K ohms	±10%	1 watt	616430

RESISTORS (Continued)

Code No.	DESCRIPTION			Part No.
R306	Not used			
R307	10K ohms	±10%	1 watt	612033
R308	2 x 47K ohms (22K)	±10%	1 watt	614969
R309	8.2K ohms	±10%	1 watt	611849
R310	470K ohms	±10%	1 watt	617359
R311	Not used			
R312	1 Megohm	±10%	½ watt	618016
R313	680K ohms	±10%	1 watt	617669
R314	1.8 Megohms	±10%	½ watt	618362
R315	1 Megohm	±10%	1 watt	618021
R316	100K ohms	±10%	½ watt	616017
R317	1 Megohm	±10%	1 watt	618021
R318	120K ohms	±10%	½ watt	616261
R319	Not used			
R320	10K ohms	±10%	2 watts	612022
R321	Not used			
R322	10K ohms	±10%	2 watts	612022
R323	27K ohms	±10%	1 watt	614142
R324	6.8K ohms	±10%	½ watt	611526
R325	1.2 Megohms	±10%	1 watt	618146
R326	100K ohms	±10%	1 watt	616020
R327	3.3 Megohms	±20%	1 watt	618716
R328	Not used			
R329	1 Megohm	±10%	1 watt	618021
R330	4.7K ohms	±10%	1 watt	610966
R331	Not used			
R332	1 Megohm	±10%	½ watt	618016
R333	330K ohms	±10%	1 watt	617111
R334	47K ohms	±10%	1 watt (BTAV)	614974
R335	820K ohms	±10%	1 watt (BTAV)	617848
R336	820K ohms	±10%	1 watt (BTAV)	617848
R337	1.5 Megohms	±10%	1 watt	618263
R338	1.2 Megohms	±10%	½ watt	618141
R339	47K ohms	±10%	½ watt	614961
R340	1 Megohm	±10%	1 watt	618021
R341	Not used			
R342	680 ohms	±10%	5 watts W.W.	607290
R343	10K ohms	±10%	2 watts	612022
R344	12K ohms	±10%	½ watt	612507
R345	220K ohms	±10%	1 watt	616726
R346	100K ohms	±10%	½ watt	616017
R347	1.2 Megohms	±10%	1 watt	618146
R348	1 Megohm	±10%	1 watt (BTAV)	618026
R349	100K ohms	±10%	1 watt	616020
R401	1 Megohm	±10%	½ watt	618016
R402	33K ohms	±10%	2 watts	614465
R403	1 Megohm	±10%	½ watt	618016
R404	82K ohms	±10%	½ watt	615795
R405	27K ohms	±10%	½ watt	614137
R406	2.2K ohms	±10%	½ watt	609442
R407	100K ohms	±5%	1 watt	616034
R408	39K ohms	±10%	½ watt	614684
R409	100K ohms	±10%	1 watt	616020
R410	47 ohms	±10%	½ watt	603091
R411	Not used			
R412	680K ohms	±10%	1 watt	617669
R413	68K ohms	±10%	1 watt	615500
R414	820K ohms	±10%	1 watt (BTAV)	617848
R415	3.9K ohms	±10%	5 watts W.W.	610567
R416	1 Megohm	±10%	1 watt (BTAV)	618026
R417	22K ohms	±10%	1 watt	613658
R418	1.5 ohms	±10%	½ watt W.W.	600416
R419	470K ohms	±10%	1 watt	617359
R420	330K ohms	±10%	1 watt	617111
R421	Not used			
R422	68K ohms	±20%	½ watt	615499

CIRCUIT CODE

Code No.	DESCRIPTION	Part No.
	RESISTORS (Continued)	
R423	1K ohms ±20% ½ watt	608030
R424	47K ohms ±10% 1 watt (BTAV)	614974
R425	150 ohms ±10% ½ watt } in	601082
R426	150 ohms ±10% ½ watt } yoke	601082
R427	150 ohms ±10% 1 watt	604681
RV101	500K ohms Curve "C" Carbon, Tone	*
RV102	500K ohms Curve "C" Carbon, Volume (Sound)	*
RV201	500K ohms Curve "A" Carbon, Contrast	*
RV202	100K ohms Curve "A" Carbon, Min. Contrast	620322
RV301	1 Megohm Curve "A" Carbon, I.F. A.G.C.	620760
RV302	20K ohms Curve "A" Carbon, A.G.C.	620262
RV303	Not used	
RV304	1 Megohm Curve "A" Carbon, Vert. Hold	620793
RV305	50K ohms Curve "A" Carbon, Vert. Linearity	620293
RV306	1 Megohm Curve "A" Carbon, Top Linearity	620760
RV307	1 Megohm Curve "A" Carbon, Height	620760
RV308	500K ohms Curve "A" Carbon, Brightness (Picture)	*
RV401	1 Megohm Curve "A" Carbon, Width	620769
RV402	2.5 Megohms Curve "A" Carbon, Focus	620781
RV403	50K ohms Curve "A" Carbon, Hor. Hold	620327
	*Varies with models	
	CAPACITORS	
C1	3.3pf ±10% NPO disc	220164
C2	2.2pf ±5% NPO disc	221494
C3	18pf ±5% NPO feed thru	220776
C4	3.3pf ±10% NPO disc	220164
C5	15pf ±5% NPO disc	220710
C6	0.001μf +100% —0% Hi-K feed thru	225011
C7	1-5pf trimmer	231144
C8	0.5-3pf trimmer	231122
C9	100pf ±7½% N3300 feed thru	222246
C10	27pf ±5% NPO disc	221071
C11	0.001μf +100% —0% Hi-K feed thru	225011
C12	0.5-3pf trimmer	231122
C13	0.001μf +100% —0% Hi-K feed thru	225011
C14	0.68pf ±20% NPO disc	220068
C15	470pf ±20% K2000 tubular	221972
C16	39pf ±10% N750 tubular	221294
C17	5.6pf +5% —0% N150 disc	220274
C18	5.6pf ±2½% N150 disc	220276
C19	5.6pf +0% —5% N150 disc	220275
C20	0.001μf +100% —0% Hi-K feed thru	225011
C21	0.01μf ±10% 125VW polyester	226378
C22	220pf ±20% Hi-K disc	223205
CN	Neutralising capacitance	
C90	0.01μf ±10% 125VW polyester	226378
C91	0.0047μf +100% —0% K5000 disc	225980
C101	6.8pf ±5% NPO tubular	220378
C102	39pf ±5% N220 disc (in L101)	221292
C103	0.01μf ±20% 200VW AEE W99	228609
C104	0.0027μf ±10% 400VW polyester	225746
C105	39pf ±5% N220 disc (in L102)	221292
C106	39pf ±5% N220 disc (in L102)	221292
C107	0.0033μf ±10% 400VW polyester	225793
C108	100pf ±5% 630VW polystyrene (in TR101)	222222
C109	470pf ±5% 630VW polystyrene	224212
C110	470pf ±5% 630VW polystyrene	224212
C111	0.001μf ±10% 400VW polyester	225060
C112	10μf 25VW Electrolytic	228771
C113	0.0047μf ±10% 400VW polyester	225953
C114	0.0039μf ±10% 160VW polyester	226775
C115	0.01μf ±10% 160VW polyester	226378
C116	0.047μf ±10% 400 VW polyester	226802

Code No.	DESCRIPTION	Part No.
	CAPACITORS (Continued)	
C117	40μf 16VW Electrolytic	229552
C118A	10μf 450VW } Electrolytic	229612
C118B	50μf 350VW }	
C119	0.0022μf ±10% 400VW polyester	225636
C120	270pf ±5% 630VW polystyrene	223561
C201	5.6pf ±5% NPO disc	220269
C202	12pf ±5% NPO tubular	220556
C203	0.0047μf +100% —0% K5000 disc	225980
C204	4—10pf trimmer	231123
C205	0.0047μf +100% —0% K5000 disc	225980
C206	270pf ±5% 630VW polystyrene	223561
C207	0.001μf ±10% 400VW polystyrene	225062
C208	0.0047μf +100% —0% K5000 disc	225980
C209	470pf ±5% 630VW polystyrene	224212
C210	0.0047μf +100% —0% K5000 disc	225980
C211	33pf ±10% N750 tubular	220552
C212	0.0047μf +100% —0% K5000 disc	225980
C213	18pf ±5% NPO tubular (in TR201)	220775
C214	0.0047μf +100% —0% K5000 disc	225980
C215	0.001μf +80% —20% K2000 feed thru	225011
C216	680pf ±10% 630VW polystyrene	224777
C217	4.7pf ±10% NPO disc	220220
C218	33pf ±5% NPO tubular (in TR204)	221161
C219	12pf ±5% NPO tubular (in TR204)	220556
C220	0.1μf ±10% 400VW polyester	227085
C221	10μf 50VW Electrolytic	228751
C222	0.0047μf +100% —0% K5000 disc	225980
C223	33pf ±5% NPO tubular	221161
C224	5.6pf ±5% NPO disc	220269
C225	0.0033μf ±10% 400VW polyester	225793
C226	39pf ±10% N220 disc	221292
C227	0.1μf ±10% 400VW polyester	227085
C228	0.47μf ±10% 160VW polyester	227495
C229	0.01μf ±10% 160VW polyester	226378
C230	2.2pf ±20% NPO disc	221494
C231	33pf ±10% N750 tubular	220552
C232	2.2pf ±20% NPO disc	221494
C301	0.1μf ±10% 160VW polyester	227086
C302	Not used	
C303	0.022μf ±10% 400VW polyester	226636
C304	0.0039μf ±10% 400VW polyester	225863
C305	0.1μf ±10% 400VW polyester	227085
C306	24μf 80VW Electrolytic	229319
C307	330pf ±10% 630VW polystyrene	223716
C308	0.033μf ±10% 400VW polyester	226739
C309	0.001μf ±10% 400VW polyester	225060
C310	Not used	
C311	Not used	
C312	0.01μf ±10% 400VW polyester	226365
C313	0.027μf ±10% 400VW polyester	226689
C314	0.0068μf ±5% 400VW polyester	226236
C315	Not used	
C316	2μf 500VW Electrolytic	227922
C317	4μf 450VW Electrolytic	228188
C318	0.012μf ±10% 400VW polyester	226526
C319	0.1μf ±10% 400VW polyester	227085
C320	0.0068μf ±10% 400VW polyester	226234
C321	330pf ±20% K1000 disc	223724
C322	0.1μf ±10% 400VW polyester	227085
C323	0.1μf ±10% 160VW polyester	227086
C324	0.0068μf ±10% 400VW polyester	226234
C325	0.047μf ±10% 400VW polyester	226802
C326A	10μf 450VW } Electrolytic	229612
G326B	50μf 350VW }	
C327	0.01μf ±10% 400VW polyester	226365

CAPACITORS (Continued)

Code No.	DESCRIPTION	Part No.
C328	0.022μf ±10% 400VW polyester	226636
C329	0.1μf ±10% 400VW polyester	227085
C330	Not used	
C331	0.1μf ±20% 600VW paper	227011
C401	150pf ±10% 630VW polystyrene	222698
C402	150pf ±10% 630VW polystyrene	222698
C403	0.0015μf ±10% 400VW polyester	225390
C404	390pf ±5% 630VW polystyrene	223885
C405	0.15μf ±10% 160VW polyester	227294
C406	0.0015μf ±10% 400VW polyester	225390
C407	270pf ±5% 1000VW mica	223553
C408	0.0068μf ±5% 630VW polystyrene	226231
C409	0.0033μf ±10% 400VW polyester	225793
C410	680pf ±10% 630VW polystyrene	224777
C411	Not used	
C412	2.2pf ±20% NPO disc	221494
C413	680pf ±10% 630VW polystyrene	224777
C414	0.01μf +100% —0% K5000 disc	226307
C415	2μf 300VW Electrolytic	227923
C416	0.047μf ±10% 1000VW paper	226831
C417	0.047μf ±10% 1000VW paper	226831
C418	68pf ±10% 4000VW N750 disc	221965
C419	560pf ±10% 2500VW N1500 tubular	224484
C420	270pf ±10% 2500VW N750 disc	223554
C421	0.27μf ±10% 400VW paper	227428
C422	0.5μf ±20% 200VW AEE W48	229116
C423	0.001μf +100% —0% K5000 tubular	225010
C424	0.0047μf ±10% 400VW polyester	225953
C425	270pf ±10% 2500VW N750 disc	223554
C426	200μf 200VW Electrolytic	229751
C427	200μf 200VW Electrolytic	229751
C428	150μf 350VW Electrolytic	229748
C429	Not used	
C430	15pf ±20% 3000VW N750 disc	220711

INDUCTORS

Code No.	DESCRIPTION	Part No.
L1	36.875 Mc/s Trap	41859
L2	Converter I.F. Coil	41859
L3	Not used	
L4	Oscillator Filament Choke	41866
L5	Screen Inductor Coil	45017
La-Lh	Tuning Coil Assembly	
	Channel 0	45055
	Channel 1	45056
	Channel 2	45057
	Channel 3	45058
	Channel 4	45059
	Channel 5	45060
	Channel 5A	45061
	Channel 6	45062
	Channel 7	45063
	Channel 8	45064
	Channel 9	45065
	Channel 10	45066
	Channel 11	45067
L101	1st Sound I.F.	40903
L102	2nd Sound I.F.	52793
L103	Ratio Detector Choke	52771
L201	38.375 Mc/s Trap }	43580
L202	I.F. Input }	43580
L203	Detector Filter	52770
L204	Video I.F. Inductor	53250
L205	Detector Filter	40323
L206	Detector Peaking Coil (250μH)	40117
L207	5.5 Mc/s Trap	43593
L208	Video Ampl. Series Peaking Coil	41423
L209	Link Choke	52738
L210	Video Peaking	51693
L211	Detector Filter	49671
L401	Sine Wave	52150
L402	H.F. Choke (1.5μH)	214516
L403	Horizontal Linearity	43264
L404-L407	Yoke (23" Picture Tube)	43660
	(25" Picture Tube)	43665
L408	H.T. Filter Choke	40113C

TRANSFORMERS

Code No.	DESCRIPTION	Part No.
TR1	Balun Assembly	44009
TR101	Ratio Detector	40077
TR102	Speaker Transformer	*
TR201	1st Video I.F.	52780
TR202	2nd Video I.F.	52782
TR203	3rd Video I.F.	52784
TR204	Noise Detector	52786
TR301	Vertical Blocking Oscillator	43643A
TR302	Vertical Output	43340A
TR401	Horizontal Oscillator	53237
TR402	Horizontal Output	43646
TR403	Horizontal Feedback	43344A
TR404	Power Transformer	51839A
	*Varies with models	

VALVES AND DIODES

Code No.	DESCRIPTION	Part No.
V1	Radiotron 6GK5	
V2	Radiotron 6HG8	
V101	Radiotron 6AU6	
V102	Radiotron 6AL5	
V103	Radiotron 6AV6	
V104	Radiotron 6HG5	
V201	Radiotron 6BZ6	
V202	Radiotron 6EW6	
V203	Radiotron 6ES7	
V204	Radiotron 6EB8	
V205	Radiotron 6CG7	
V206	Radiotron 23CP4	
	25LP4	
	25QP4 as required	
V207	Radiotron 6EA8	
V301	Radiotron 6HS8	
V302	Radiotron 6EM5	
V401	Radiotron 6AL5	
V402	Radiotron 6CG7	
V403	Radiotron 6CM5	
V404	Radiotron 6AU4-GTA	
V405	Radiotron 1B3-GT	
MR201	AWV IN87A	
MR202	AWV IN87A	
MR401	AWV IN3194	
MR402	AWV IN3194	

MISCELLANEOUS

Code No.	DESCRIPTION	Part No.
SG401	Spark Gap (BTS Blank)	600000
VDR301	Voltage Dependent Resistor E298ED/A260	619561
VDR302	Voltage Dependent Resistor E298ED/A260	619561
VDR303	Voltage Dependent Resistor E299DE/P238	619563
VDR401	Voltage Dependent Resistor E298ZZ/06	619562
TH401	1 ohm at 25°C NTC Thermistor	893707
FS401	1.5 Amp. Fuse	370023
FS402	1.5 Amp. Fuse	370023

MECHANICAL REPLACEMENTS

DESCRIPTION	Part No.
Anode Cap and Lead, Hor. Output	40044
Cap Ass'y, Yoke	41185
Clamp, Body, Power Cable	208056
Clamp, Lock, Power Cable	208057
Clamp, Yoke Cap	41186
E.H.T. Box Lid	41310
E.H.T. Box Side	41309
Fuse Holder, H.T.	49075
Fuse Holder, Mains	40845
Fuse Holder, Pilot Lamp, Tuner	43566
Lead Ass'y, Ultor	49545
Lid, I.F. Shield	42426
Screen, Valve (4)	653013
Screen, Valve (1)	653014
Shield Ass'y, Corona	41062
Shield Ass'y, Video Det.	42378
Shield, Tunnel	42429
Socket, 4 Pin, Wafer	793287
Socket, 7 Pin with Saddle	794615
Socket, 7 Pin with Skirt	794569
Socket, 7 Pin, Push-in	794579
Socket, 8 Pin, Wafer	793033
Socket, 8 Pin, Moulded Mica	794582
Socket, 9 Pin	793058
Socket, 9 Pin, Mica Filled	794640
Socket, 9 Pin, Moulded	794599
Test Point Assembly	41085

D.C. RESISTANCE OF WINDINGS

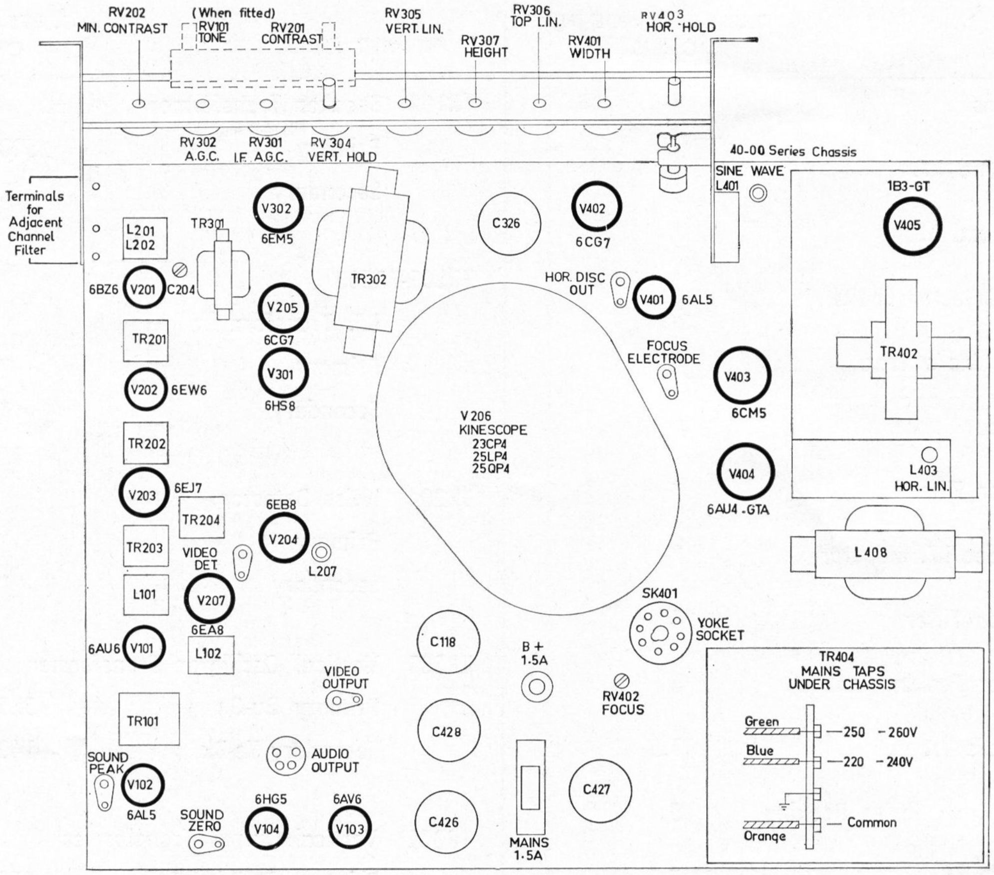
WINDING		D.C. RESISTANCE IN OHMS
Tuner Windings		*
L101	1st Sound I.F.	*
L102	2nd Sound I.F.	*
L103	Ratio Detector Choke	*
L201	38.375 Mc/s Trap	*
L202	I.F. Input	*
L203	Detector Filter	*
L204	3rd Video I.F. Inductor	*
L205	Detector Filter	4
L206	Detector Peaking Coil	6
L207	5.5 Mc/s Trap	1.5
L208	Video Amp. Series Peaking	5
L209	Link Choke	*
L210	Video Peaking Coil	5
L211	Detector Filter Choke	*
L401	Sine Wave Coil	55
L402	H.F. Choke	*
L403	Horizontal Linearity Coil	7
L404	Vertical Deflection	2.5
L405	Vertical Deflection	2.5
L406	Horizontal Deflection	17
L407	Horizontal Deflection	17
L408	H.T. Filter Choke	40
TR101	Ratio Detector	
	1-6	9.5
	5-4, 5-3, 5-2	*

WINDING		D.C. RESISTANCE IN OHMS
TR102	Speaker Transformer	
	Primary	500
	Secondary	2
TR201-TR203		
	I.F. Transformers	
	Primary	*
	Secondary	*
TR204	Noise Detector	
	Primary	*
	Secondary	*
TR301	Vertical Oscillator Transformer	
	Primary Bu-Gn	525
	Secondary Ye-Bk	140
TR302	Vertical Output Transformer	
	Primary Bu-Rd	350
	Secondary Rd-Ye	1
TR401	Horizontal Oscillator	
	Transformer	85
TR402	Horizontal Output Transformer	
	Primary 3-5	23
	Secondary 4-7	7
	Tertiary 5-Top Cap	415
	Tertiary 1-2	1.5
TR403	Horizontal Feedback Transformer	
	Primary Ye-Rd	1.8
	Secondary Wh-Bk	450
TR404	Power Transformer	
	Primary Gn-Or	10
	Secondary Rd-Rd	4

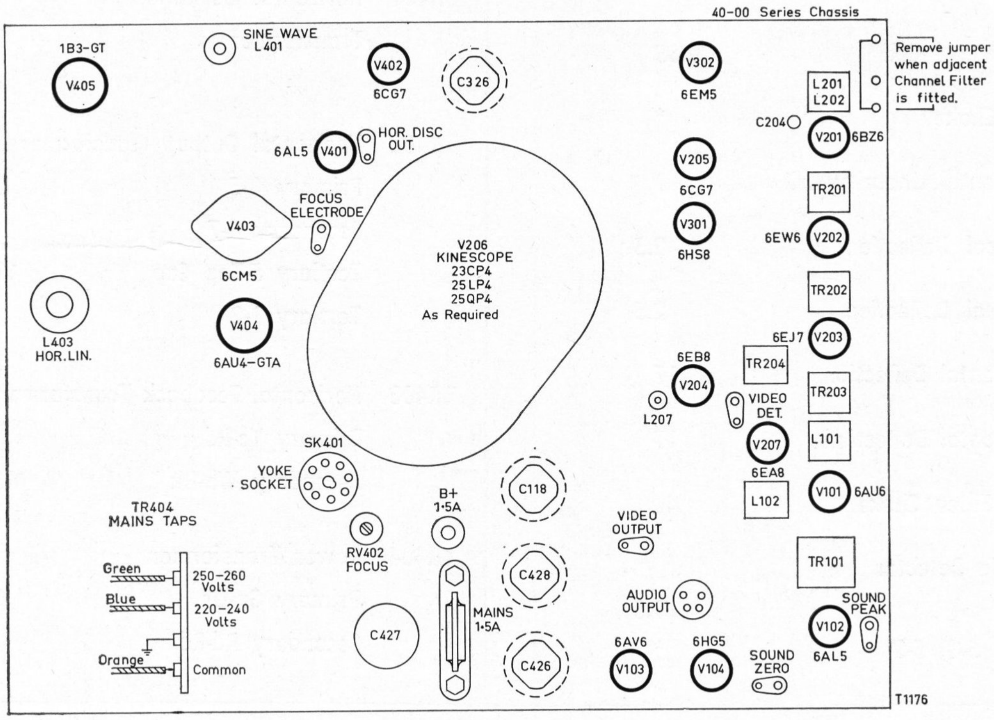
*Less than I ohm.

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.

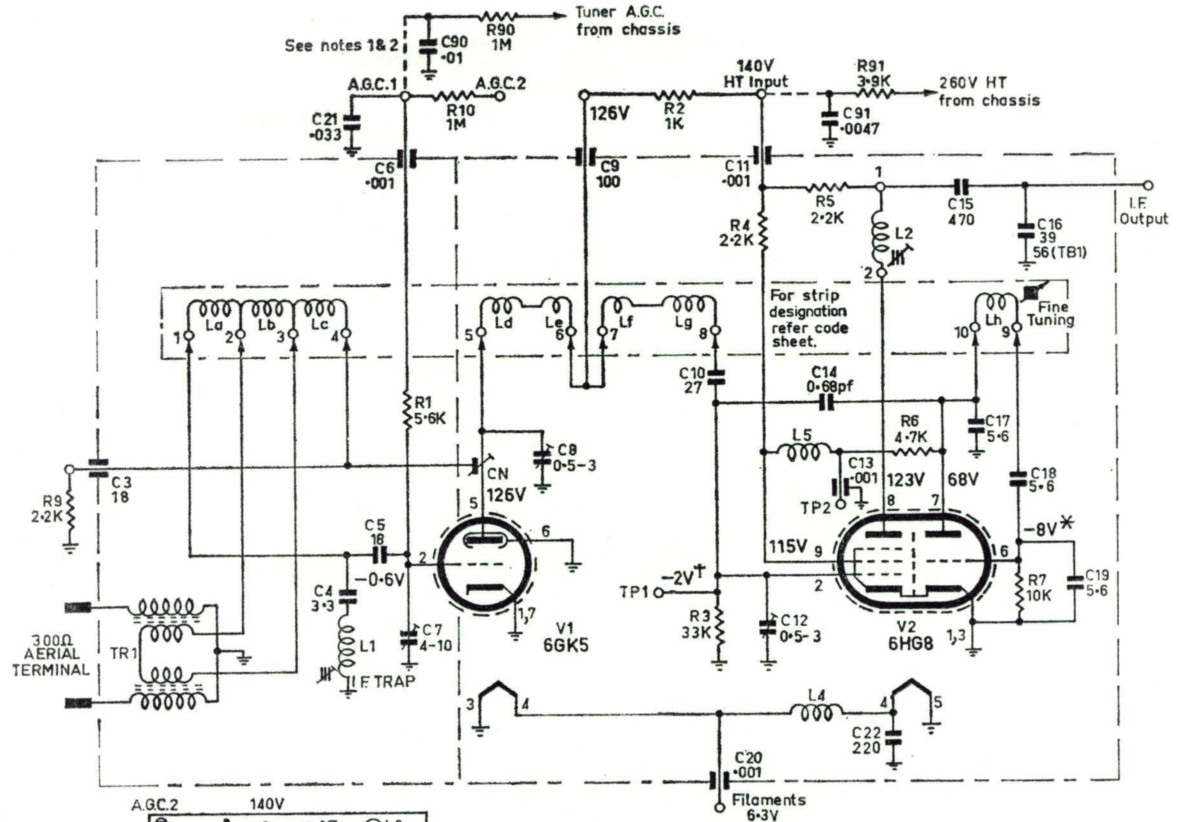
TOP CHASSIS VIEW

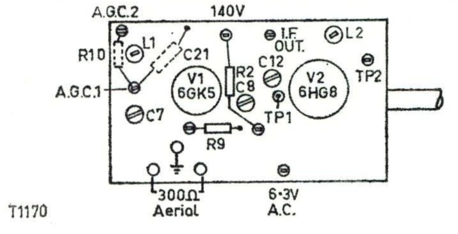


UNDER CHASSIS VIEW



TB4(45054) NEUTRODE TURRET TUNER





NOTES:– † Voltage at TP1 measured with 100K resistor, with short leads, in series with VTVM. This voltage may vary between −5V and −1·4V without loss of gain.

* Oscillator plate and grid voltages measured as above. Grid voltage varies from −6V (Ch.11) to −12V (Ch.0)

N.B. TP2 used for Tuner Sweep Alignment.

(1.) C21 and R10 are on TB1 Series Tuner only.

(2.) C90, C91, R90 and R91 are used with TB4 Series Tuner only but are not mounted on the tuner chassis and are not supplied with a replacement tuner.

CIRCUIT VARIATIONS

To improve horizontal oscillator drift with time the present oscillator circuit was adopted. Some early chassis had the oscillator circuit as in the 34-50 chassis. The components affected are TR401, RV403, R405, R407, R413, C405, C406, C410 and C413.

To reduce variations in height with leakage current of C317 the present VDR303 was substituted for a 220K ohms ± 20% ½ watt resistor.

To reduce Channel 7 herringbone pattern:
R214 was changed from 3.9K ohms to present 33K ohms.
R211 was added.
C216 was changed from 0.001µf to present 680pf ± 10% 630 VW polystyrene capacitor.
C230 a 2.2pf ± 20% NPO disc capacitor was added.
L205 was changed from 52770 to 40323 detector filter.
L211 detector filter 49671 was added.

Changes since circuit was drawn:

To improve Horizontal Hold Control operation:
RV403 is now a 50K ohms curve A carbon control 620327.
R407 is now a 100K ohms ± 5% 1 watt 616034 Morganite resistor.

To reduce Channel 7 radiation:
C224 is now 5.6pf ± 5% NPO disc, 220269, capacitor.
C231 a 33pf ± 10% N750 tubular, 220552, capacitor has been added across pins 2 and 4 of TR203.
C232 a 2.2pf ± 20% NPO disc, 221494, capacitor has been added from pin 2 TR204 to centre tap of L204.

To reduce hum, mains and picture buzz in the sound:
C111 is now a 0.0047µf ± 10% 400VW polyester, 225953, capacitor.
C113 (when used) is now a 0.033µf ± 10% 400VW polyester, 226739, capacitor.
C115 is now mounted on the control panel.
R107 is now a 4.7K ohms ± 10% ½ watt, 610932, resistor.
RV101 when used and RV102 are now 100K ohms controls.

CIRCUIT A.W.A. TELEVISION RECEIVER CHASSIS — 40-00 SERIES

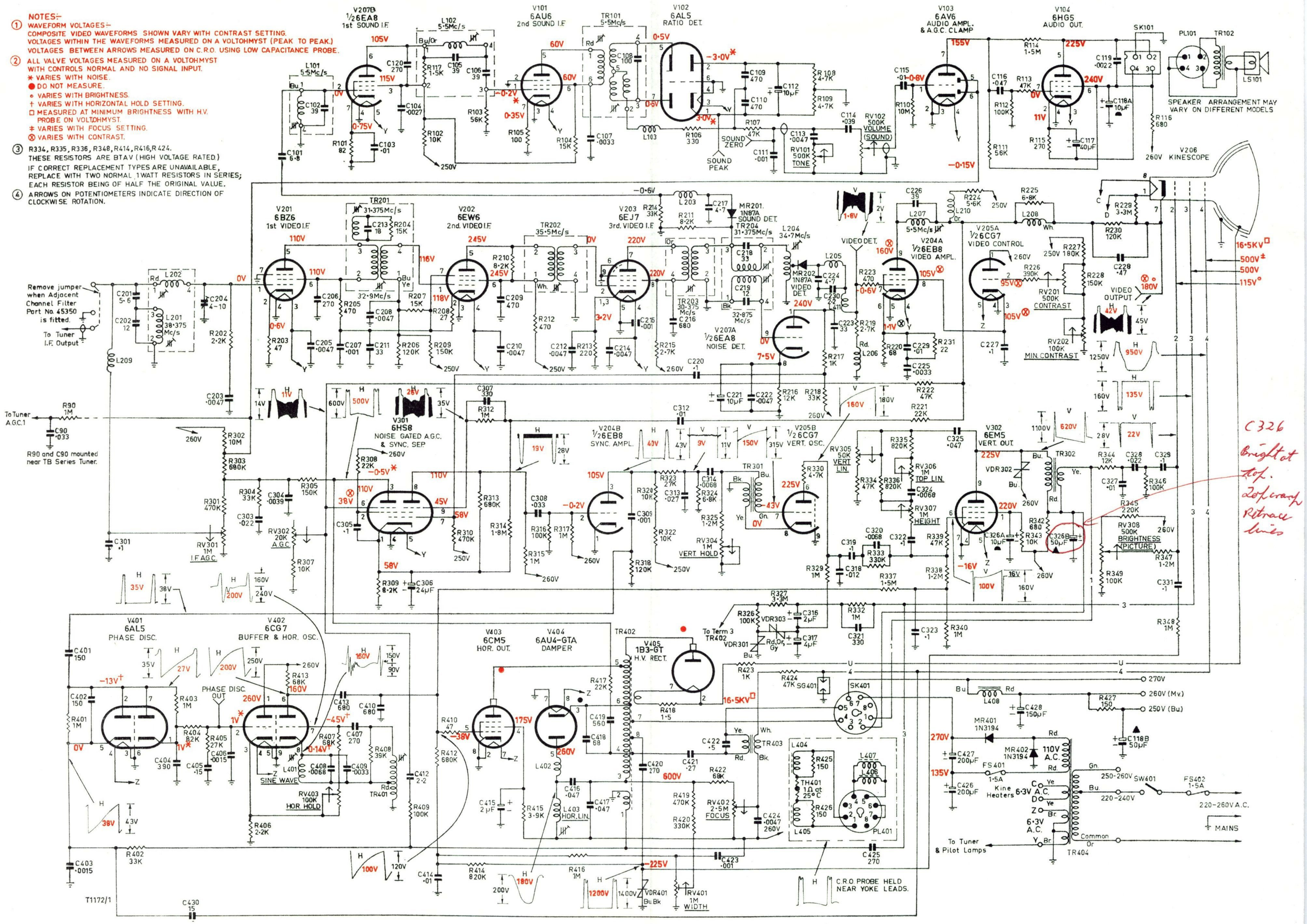
NOTES:–

① WAVEFORM VOLTAGES:–
COMPOSITE VIDEO WAVEFORMS SHOWN VARY WITH CONTRAST SETTING.
VOLTAGES WITHIN THE WAVEFORMS MEASURED ON A VOLTOHMYST (PEAK TO PEAK.)
VOLTAGES BETWEEN ARROWS MEASURED ON C.R.O. USING LOW CAPACITANCE PROBE.

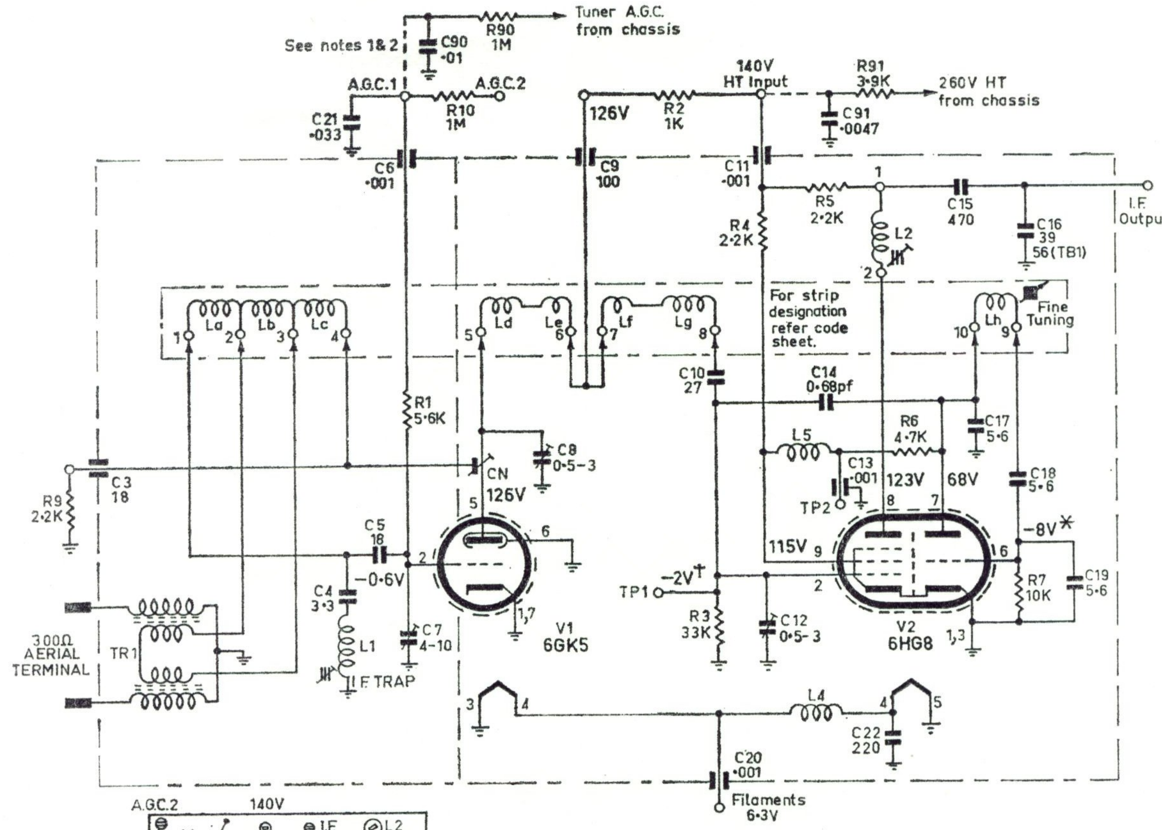
② ALL VALVE VOLTAGES MEASURED ON A VOLTOHMYST WITH CONTROLS NORMAL AND NO SIGNAL INPUT.
* VARIES WITH NOISE.
● DO NOT MEASURE.
∘ VARIES WITH BRIGHTNESS.
† VARIES WITH HORIZONTAL HOLD SETTING.
□ MEASURED AT MINIMUM BRIGHTNESS WITH H.V. PROBE ON VOLTOHMYST.
‡ VARIES WITH FOCUS SETTING.
⊗ VARIES WITH CONTRAST.

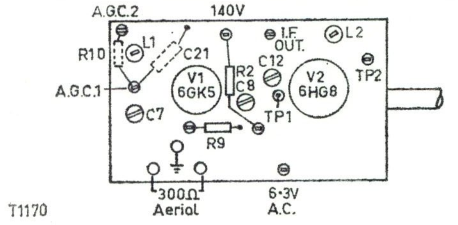
③ R334, R335, R336, R348, R414, R416, R424.
THESE RESISTORS ARE BTAV (HIGH VOLTAGE RATED)
IF CORRECT REPLACEMENT TYPES ARE UNAVAILABLE, REPLACE WITH TWO NORMAL 1WATT RESISTORS IN SERIES; EACH RESISTOR BEING OF HALF THE ORIGINAL VALUE.

④ ARROWS ON POTENTIOMETERS INDICATE DIRECTION OF CLOCKWISE ROTATION.



TB4(45054) NEUTRODE TURRET TUNER





T1170

NOTES:— † Voltage at TP1 measured with 100K resistor, with short leads, in series with VTVM. This voltage may vary between −5V and −1·4V without loss of gain.

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C232 a 2.2pf ± 20% NPO disc, 221494, capacitor has been added from pin 2 TR204 to centre tap of L204.

To reduce hum, mains and picture buzz in the sound:
C111 is now a 0.0047µf ± 10% 400VW polyester, 225953, capacitor.
C113 (when used) is now a 0.033µf ± 10% 400VW polyester, 226739, capacitor.
C115 is now mounted on the control panel.
R107 is now a 4.7K ohms ± 10% ½ watt, 610932, resistor.
RV101 when used and RV102 are now 100K ohms controls.

CIRCUIT A.W.A. TELEVISION RECEIVER CHASSIS — 40-00 SERIES

NOTES:—

① WAVEFORM VOLTAGES:—
COMPOSITE VIDEO WAVEFORMS SHOWN VARY WITH CONTRAST SETTING.
VOLTAGES WITHIN THE WAVEFORMS MEASURED ON A VOLTOHMYST (PEAK TO PEAK.)
VOLTAGES BETWEEN ARROWS MEASURED ON C.R.O. USING LOW CAPACITANCE PROBE.

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● DO NOT MEASURE.
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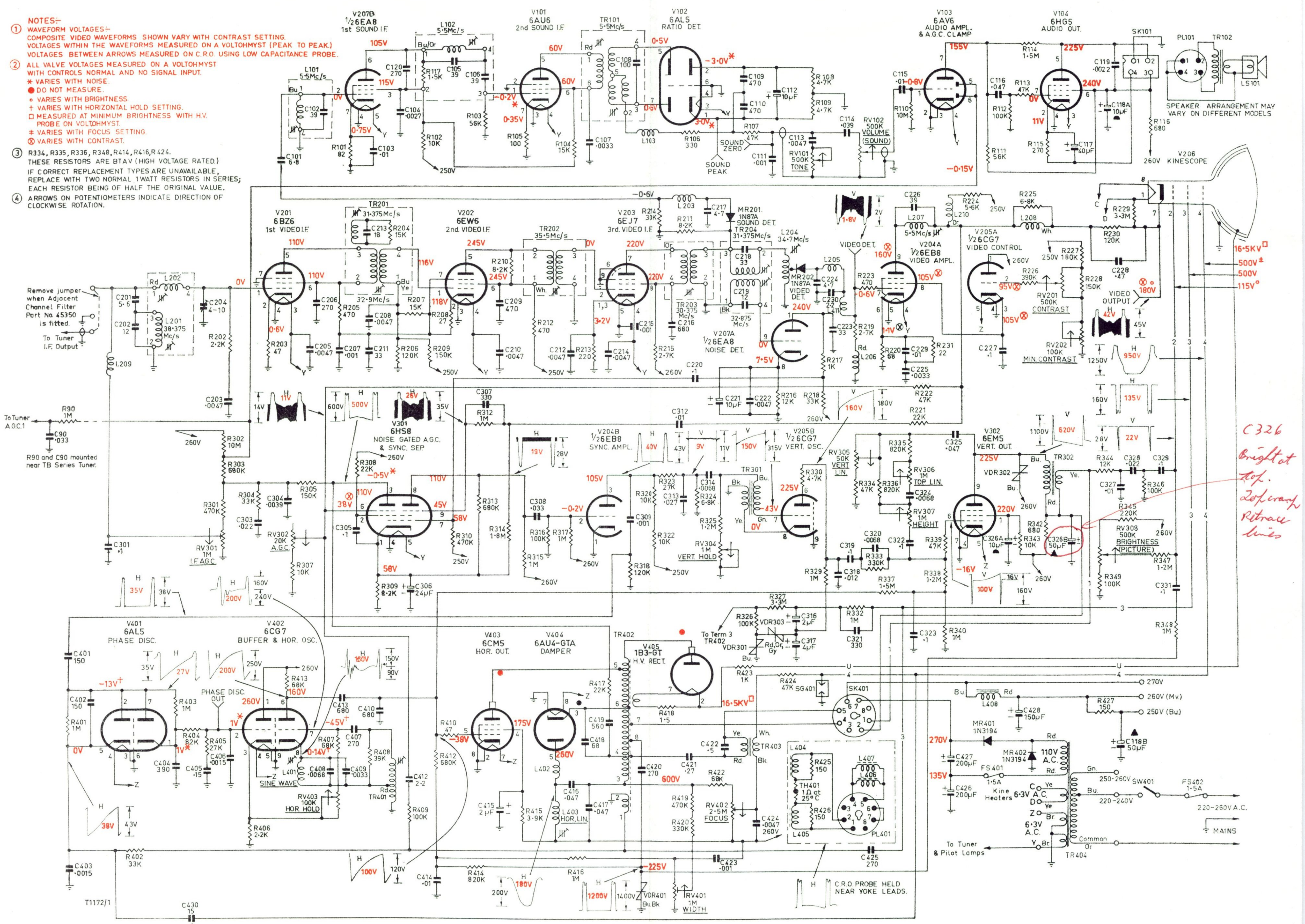


Printed by A. W. Bounds Pty. Ltd., 11 Arundel Street, Glebe, Sydney

TECHNICAL DATA - 4000 Series T.V. Chassis

(For AWA Service Dept Use)

Iss'd By: C. P. Eng. Lab.
Eng: Refer Mr. R.Elvery

Date Iss'd: 30.6.65

Issued By : F. A. Long

A.W.A. 4000 SERIES T.V. CHASSIS

1. GENERAL DESCRIPTION

The 4000 series T.V. chassis is a modification of the 34-50 series.

It is designed to give improved sound signal to noise ratio in areas where signals are very weak (i.e. below 10µV).

The improvement is such that on a "side by side" test, the 3450 chassis would require approximately twice the signal of the 4000 series to produce the same sound signal to noise ratio.

2. NEW DESIGN FEATURES

(a) Use of a separate sound detector

(b) A modified picture I.F. alignment procedure

(c) Use of two stages of sound IF amplification

(d) Use of a framed grid 3rd picture IF amplifier.

(e) Deletion of AGC compensator triode

(f) Retention of noise detector circuit with modified coupling.

3. DESCRIPTION OF CIRCUIT CHANGES

3.1 SEPARATE SOUND DETECTOR

The level of sound carrier which can be applied to a video detector in a T.V. receiver, to give an inter-carrier

(Cont'd on page 2

5.5 Mc/s output, is limited because of the unwanted signals which are added to the demodulated video information and cause interference. These unwanted signals are:-

(a) 5.5 Mc/s

(b) edge agitation which is a beat between 5.5 Mc/s and high frequency video components

(c) sound bars which are caused by amplitude modulation of the frequency modulated sound carrier, due to the slope of the picture IF amplifier response curve.

The unwanted 5.5 Mc/s signal may be trapped out in the video amplifier circuit, but no method can remove the effects of (b) and (c) once they have been produced in the video detector.

If a second detector can be connected into the picture IF amp. at a point where the sound carrier level is high, and its function is to provide 5.5 Mc/s sound carrier only, then the levels into this detector can be set to give optimum sound performance. The picture IF circuit can then be designed so that the video detector can be connected at a point which has the desired response curve shape and a low level of sound carrier input.

By separating the detector functions, the circuit can be designed for best performance of each of the vision and sound channels with little need for compromise.

The circuit of the two detector system as used in the 4000 chassis is shown in Fig. 1.

The mechanical layout is such that neither detector diode is mounted within an IF can but both are located within the detector shield box.

(Cont'd on page 3

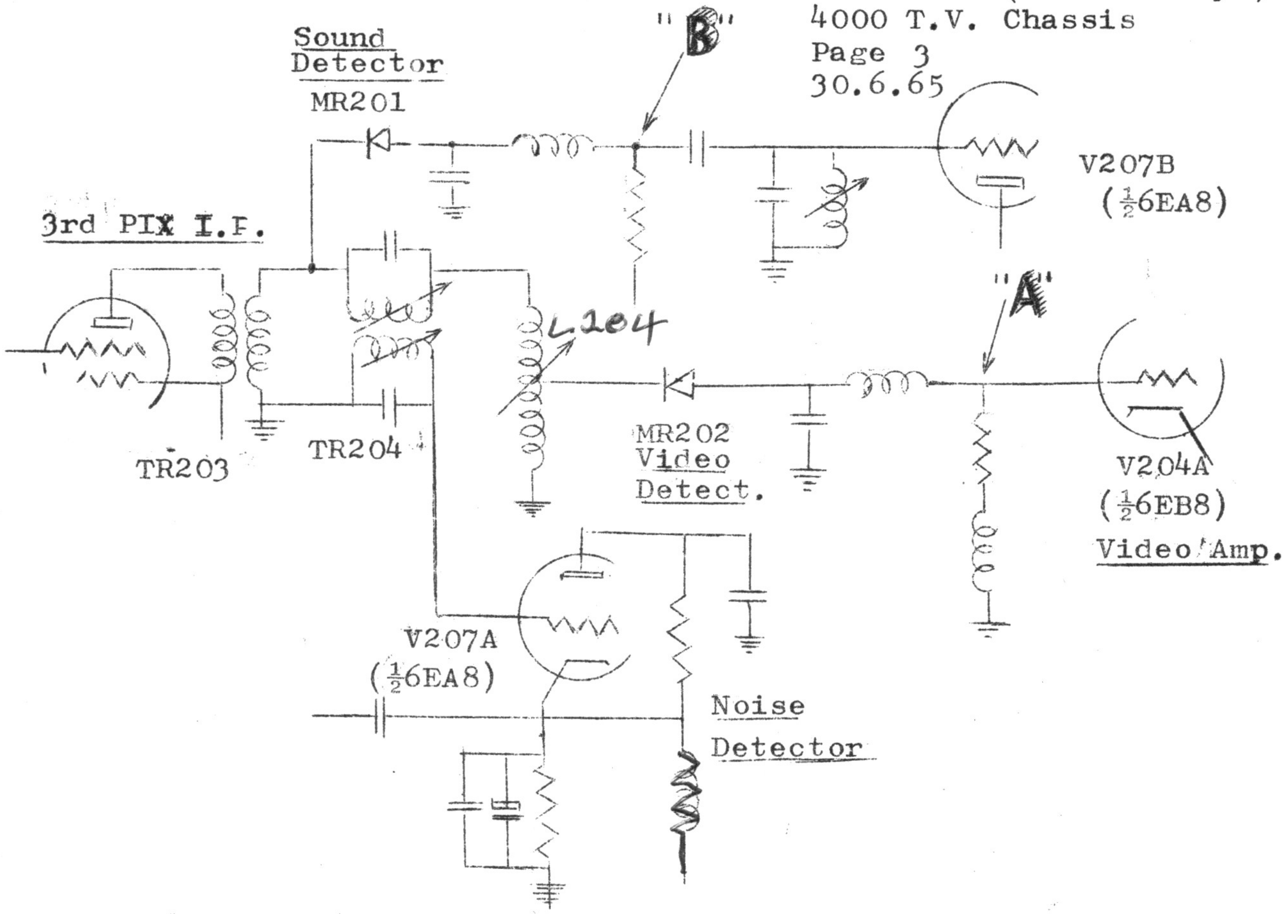
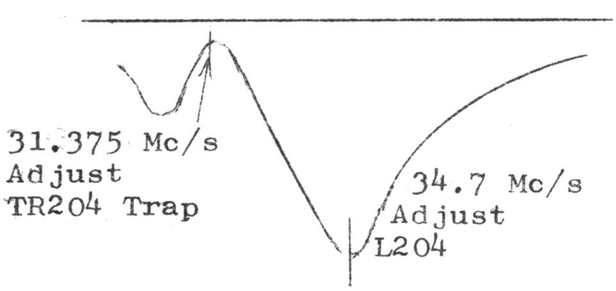


FIG. 1. - Two Detector system in 40-00 Series Chassis

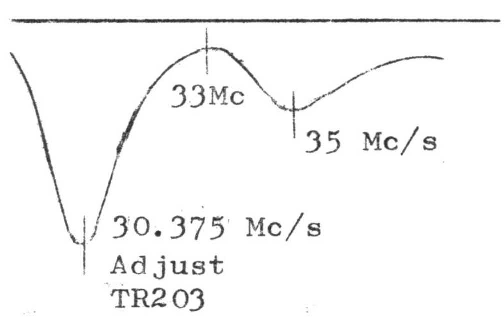
3.2 PICTURE I.F. ALIGNMENT

(a) The alignment of picture IF is modified because of above circuit (Fig. 1) and brief procedure and curves are given.

Picture IF sweep signal into 3rd Pix IF grid. CRO connected to video detector output (point A) or to sound detector output (point B).



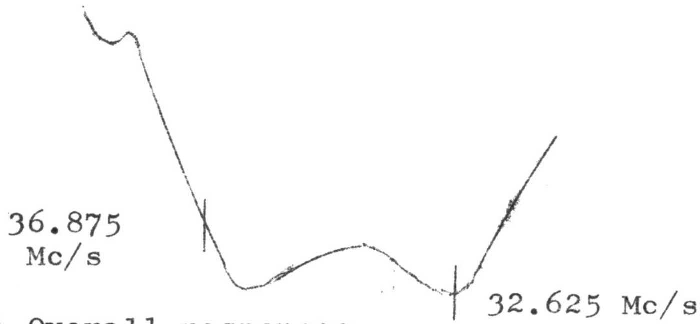
VIDEO DETECT. "A"



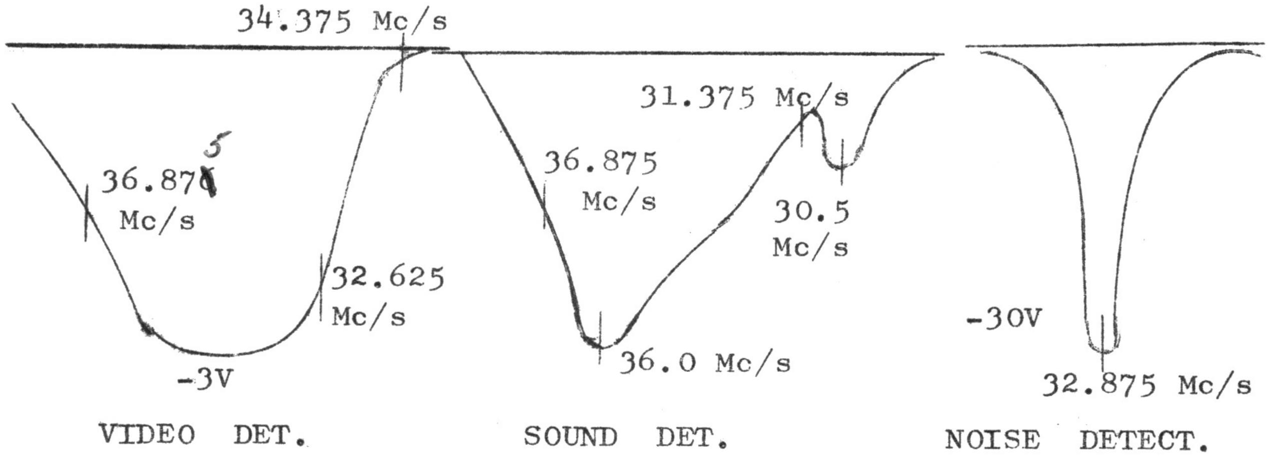
SOUND DETECTOR "B"

(Cont'd on page 4)

(b) <u>The link circuit adjustment</u> method is as for 3450 chassis, except response shape is as below.



(c) <u>Overall responses</u>



(d) <u>Accompanying Sound Trap</u>

The trap coupled to 2nd picture IF plate circuit and tuned at 30.875 Mc/s in 3450 chassis has been moved to 1st I.F. plate and tuned at 31.375 Mc/s.

3.3 <u>SOUND IF AMPLIFIER</u>

Because the video amplifier no longer amplifies the inter-carrier 5.5 Mc/s sound signal, an additional sound IF amplifier is used (pentode half of 6EA8).

To ensure that optimum performance is obtained from the receiver, the alignment of the IF system (especially of the limiter grid circuit L102) must be carefully carried out both in the factory and the field.

3.4 <u>FRAMED GRID PICTURE I.F. AMP.</u>

The third picture IF amplifier has been changed from a 6CB6 to a 6EJ7 to make up the gain lost in the detector system.

3.5 <u>DELETION OF A.G.C. COMPENSATOR</u>

It has been found necessary to delete the AGC

(Cont'd on page 5

compensator stage because space is not available for a suitable valve to be located without a high increased cost. The circuit has been redesigned to give adequate performance without this increased cost.

The tuner AGC delay resistor has been increased from 4.7 MΩ to 10MΩ and the IF AGC control increased to 1MΩ, to give a flatter AGC control characteristic.

The AGC and Minimum Contrast adjustments should be carried out as in 3450 chassis except that the input level for adjustment should be as high as possible to prevent synch. clipping at maximum signal (100mV). This method ensures that some noise pulse clipping takes place in the video amplifier.

3.6 NOISE DETECTOR

A frequency selective noise detector is again used and its coupling to the picture IF is shown in Fig. 1

Note Synch lockout can occur, due to the noise detector, when the fine tuning is set approx 2 Mc/s below nominal frequency. In this respect the performance is similar to that of the 34.50 chassis

4.0 VALVES AND FUNCTIONS

Type	Application	No of Functions	
6GK5	RF Amplifier	1	Tuner
6HG8	Oscillator & Mixer	2	Tuner
6BZ6	1st Video I.F.	1	
6EW6	2nd " "	1	
6EJ7	3rd Video I.F.	1	
6EA8	1st Sound I.F. (pentode)	1	
	Noise detector (triode)	1	
6EB8	Video Amp (pentode)	1	
	Synch Amp (triode)	1	
6AU6	2nd Sound I.F.	1	
6AL5	Ratio detector	2	
6AV6	Audio Amp (triode)	1	
	AGC Clamp (diodes)	1	
6HG5	Audio Output	1	
6HS8	AGC and Synch Sep (noise gated)	2	
6CG7	Vertical Oscill.	1	
	Video Control	1	
6EM5	Vertical Output	1	
6AL5	Phase discriminator	2	
6CG7	Buffer Amplifier	1	
	Horizontal Oscill.	1	
6CM5	Horizontal Output	1	
6AU4GT	Damper	1	
1B3GT	H. V. Rectifier	1	
	Kinescope	1	

(Cont'd on page 6

Semi-Conductors

IN87A	Video Detector	1
IN87A	Sound Detector	1
IN3194	Rectifier (B+)	1
IN3194	Rectifier (B+)	1
	Total Functions	33

5.0 APPLICATIONS

From approx. Issue 8, 1965 the 4000 series chassis replaces the 3450 in all "D" series receivers except school T.V.

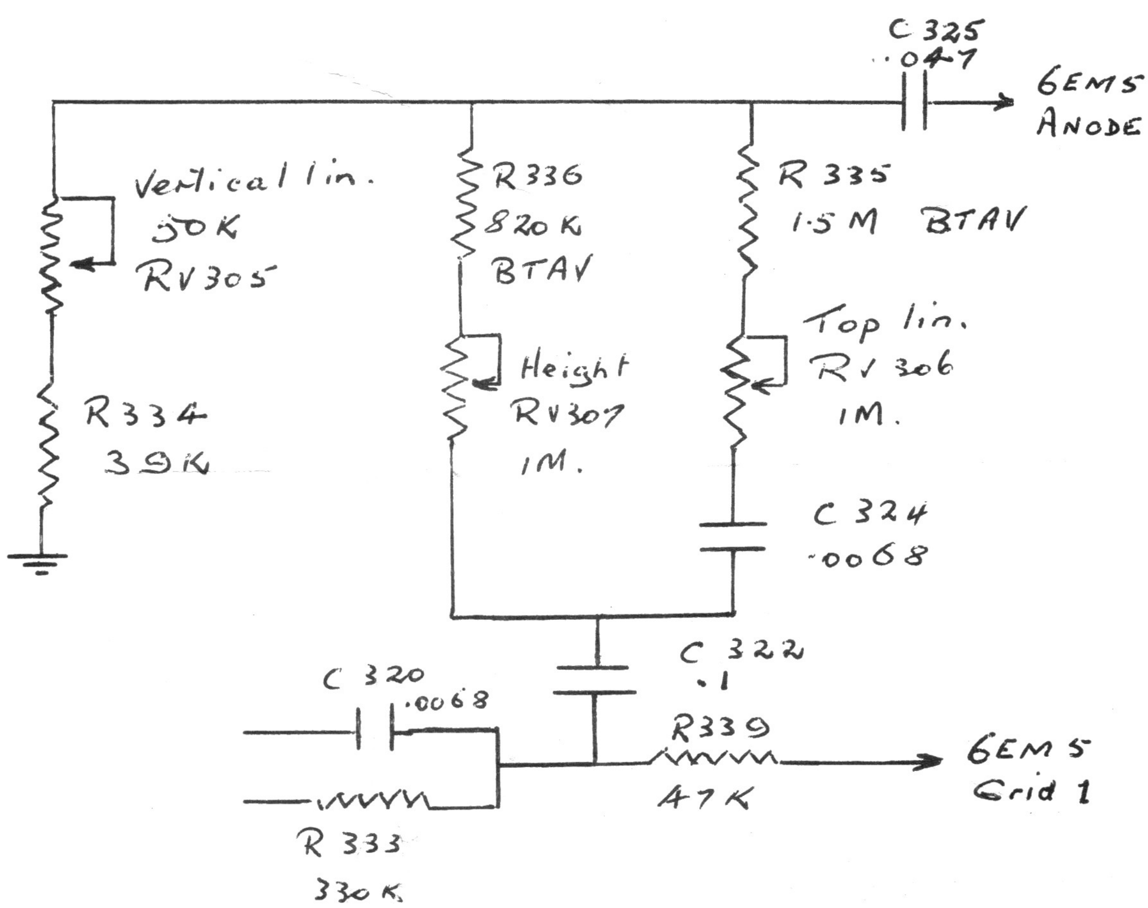
It is required that all D series receivers using the 4000 chassis pass the weak signal sensitivity test normally applied to such receivers.

June, 1966.

A.W.A. TV TECHNICAL INFORMATION

Some improvements have recently been made to the vertical scan circuits of T.V. Receiver Chassis types 36-50 and 40-00 resulting in improved vertical linearity. This has been achieved by the re-arranging of height and top linearity control circuits so that height and linearity variations are practically independent of each other. Also several resistors in the circuit have been varied in type so that some negative and some positive temperature coefficient types are used, to reduce change in height with temperature variations.

Because this type of vertical scan circuit is used in several earlier chassis types it is possible to overcome vertical linearity problems by modifying the circuit as shown in the accompanying diagram. This is possible in chassis types DX-Q, DX-QZ, 34-00, 36-00, 34-40, 34-50, 36-50, 36-70 and 40-00.



Resistor type changes are as follows:-

R326	100K	1W	IRC only	AWA Code 616036
R329	1M	1W	" "	" " 618037
R337	1M	1W	" "	" " 618037
R340	1M	1W	Morganite or Ducon only	AWA Code 618036
R412	680K	1W	IRC only	AWA Code 617676

To adjust linearity with this circuit reduc top and bottom of the picture can be seen. A linearity controls and then return height to