BRC

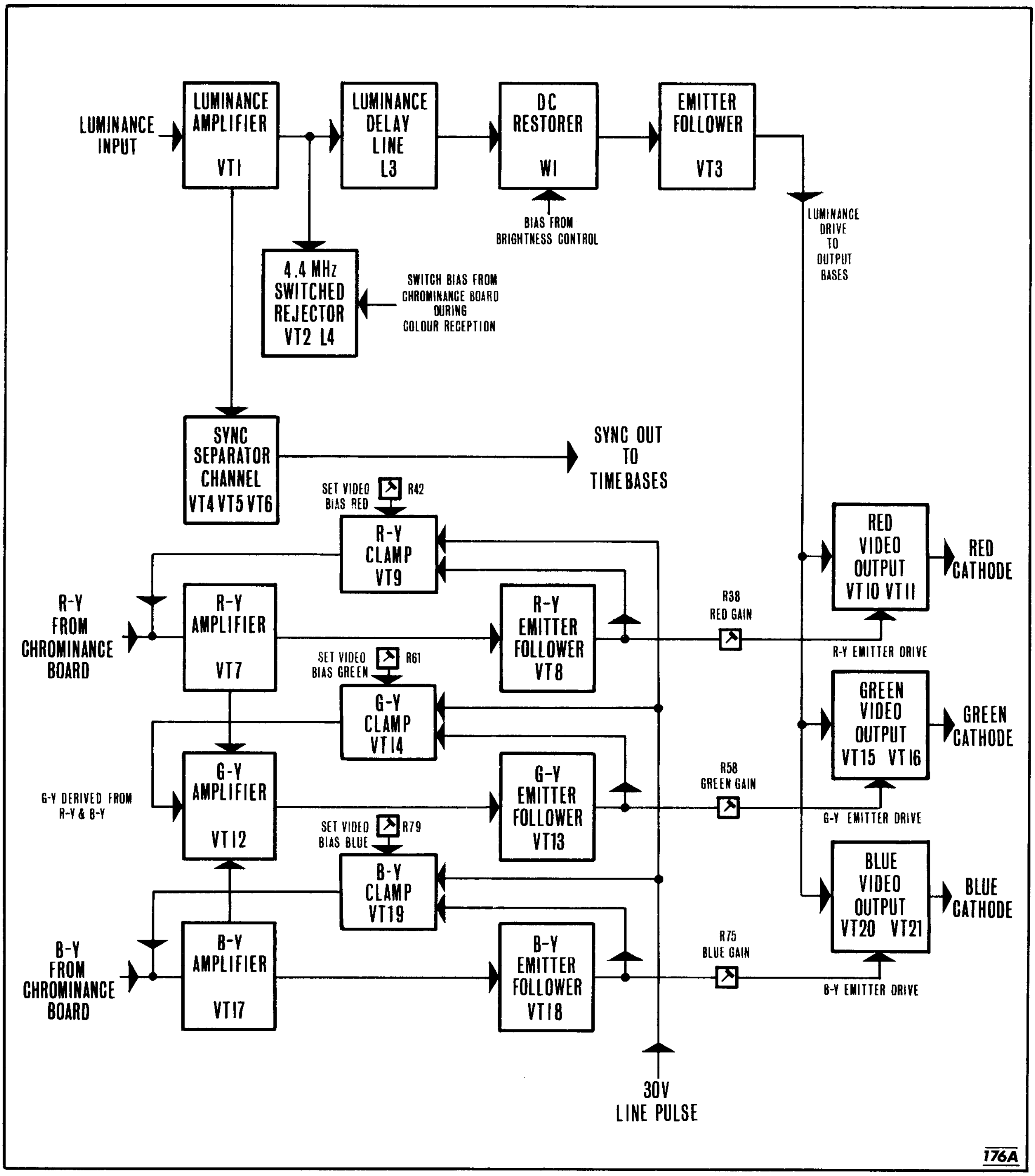
2000 SERIES COLOUR TELEVISION MANUAL

SECTION D

WORKSHOP SERVICING

VIDEO

BRITISH RADIO CORPORATION LIMITED



Simplified Block Schematic showing signal paths and transistor functions.

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Circuit Diagram & Interconnection Details Type 235

SECTION **D**

WORKSHOP SERVICING

Circuit Description

In simplified summary, the Video board has three signal inputs: The detected Luminance signal (Y) from the IF board, and the demodulated R-Y and B-Y colour difference signals from the Chrominance board. The R-Y and B-Y signals are matrixed to produce G-Y. The colour difference signals are then amplified in three indentical channels and finally added to the Luminance signal in the three video output stages to produce the RED, GREEN and BLUE drives for the CRT cathodes. VT4, VT5 and VT6 comprise the channel in which the synchronizing pulses are separated from the Luminance signal.

LUMINANCE CHANNEL

The low-level Luminance (Video) with positive-going sync is amplified in VT1 and passes along the 0.65µS Delay Line L3 which is terminated at both ends by its characteristic impedance.

At the Luminance Delay Line input L4 and C4 form a subcarrier rejector, switched by VT2, which is driven by the killer voltage derived from the Chrominance board via R8. This rejector minimizes patterning during colour reception but it is switched out during black-and-white reception to utilize the full video bandwidth. L2–C3 is the unswitched 6 MHz intercarrier sound rejector fitted to some boards only.

Following the Delay Line the Luminance signal is DC restored, the reference level being set by the potential from the Brightness control which is fed in at contact 9 of the edge-connector. The operation of the Brightness control circuit (Beam Current Limiter) is described in Section H.

After passing through Emitter Follower VT3 the Luminance signal is applied simultaneously at the bases of the Red, Blue and Green video output stages. During black-and-white reception all three CRT cathodes are driven by the same waveform but at different amplitudes to compensate for phosphor efficiency variations. The appropriate gains are set by the Video Gain presets (R38, R58 and R75) which are variable emitter loads.

SYNC CHANNEL

The Pre-Sync Amplifier VT4 is emitter driven from the emitter of Luminance Amplifier VT1 and a Luminance signal with positive-going sync pulses is developed at VT4 collector. VT5 operates as a conventional Sync Separator with reverse base-emitter voltage limiting provided by W2. The Sync Emitter Follower VT6 converts the sync output to low impedance to avoid capacitive loading effects due to the cableform between video and timebase circuits.

IMPORTANT NOTE

Two types of board may be found in service: Type 135 and Type 235. The identifying number is printed on the component side of the board adjacent to the extractor tab and is also etched on the copper side.

Basically the two types are similar but separate circuit diagrams and component locations are provided for ease of servicing.

Although generally all modules are fully interchangeable, Video boards of the 235 type (i.e. above serial number 13,000) cannot be used with Line Timebase boards below serial number 12,000 unless a small modification is made to the Line Timebase board, see Section F.

Should any doubt exist regarding compatibility when dispatching a Video Board Type 235 as a replacement it is advisable to provide also a 150K Ω 10% ¼W resistor for fitting across C18 on the Line Timebase board in case this should be required. The need for fitting the resistor will be seen as a loss of colour on the extreme right-hand side of the picture.

COLOUR DIFFERENCE CHANNELS

During colour reception the R-Y and B-Y signals from the demodulators (Chrominance board) are applied at the bases of VT7 and VT17 respectively.

The first stage of the Green channel VT12 is a common base amplifier the emitter drive signal being developed via the network R34-C16 and R54-C24 from the R-Y and B-Y amplifier emitters.

The emitter and base circuits of VT7, VT12 and VT17 derive the G-Y signal from the R-Y and B-Y inputs to the video board and also compensate for the transmitter colour difference weighting factors.

The collector signals of VT7, VT12 and VT17 are the three colour difference signals -(R-Y), -(G-Y) and -(B-Y) of correct relative amplitudes and of the same polarity. From these points onwards the signal paths in the three channels are similar.

In the Red channel, for example, -(R-Y) at VT7 collector is passed via Emitter Follower VT8 and gain preset R38 to the emitter of the Red output stage. The output stage is formed by VT11 and VT12 which are connected in cascade to operate from the high voltage supply (270V DC). Since Luminance +Y is applied at the base, the net drive to this stage is +R which provides the negative-going Red component -R at the final collector. This is taken to the CRT Red cathode.

After amplification and polarity reversal the signal at each of the CRT cathodes is up to 150V (p-p) picture plus sync together with DC shift on all three signals for brightness control.

CLAMP CIRCUITS (VT9, VT14 & VT19)

These circuits eliminate DC drifts in the colour difference channels and AC couplings which might otherwise cause tint changes in the picture. The clamp transistors are gated on during each line flyback period by a line pulse fed in at contact 4 of the edge-connector. During the line sync interval, when the colour difference signals are zero, the emitters of VT8, VT13 and VT18 are clamped to reference levels derived from three potential dividers. The three reference levels are separately adjustable by means of the Video Bias presets (R42, R61 and R79). The Tint control (R508) provides limited adjustment of the reference levels for the Red and Blue channels.

OUTPUT STAGES

The clamp circuits and Tint control are operative on 405 and 625 during both black-and-white and colour transmissions. The output emitters are stabilized by the clamp circuits whilst the DC potential at the bases, which is adjusted by the Brightness control, is derived from a stabilized supply via the Luminance Emitter Follower. The collectors are driven from the unstabilized 270V DC supply which also drives the collector of the CRT grid potential control transistor (Brilliance Stabilizer VT7 on Frame Timebase and Sound board).

The constant current characteristics of the transistors ensure that the collector potentials and consequently the CRT cathode potentials vary directly in sympathy with changes in the 270V DC supply. Since the CRT grid potential behaves in a similar manner the CRT grid-to-cathode potential remains constant irrespective of mains fluctuations thus ensuring that the brightness and tint of the picture are not affected.

Grey-Scale performance near zero beam current is set by the A1 tube voltages which control the cut-off of the three guns. The Video Bias presets, which set the clamp reference levels, are adjusted near zero beam current for equal CRT cathode potentials to avoid relative drifts which would otherwise be evident at low beam currents as a change of tint. At high beam currents the white quality is adjusted by the Video Gain presets.

Component Locations

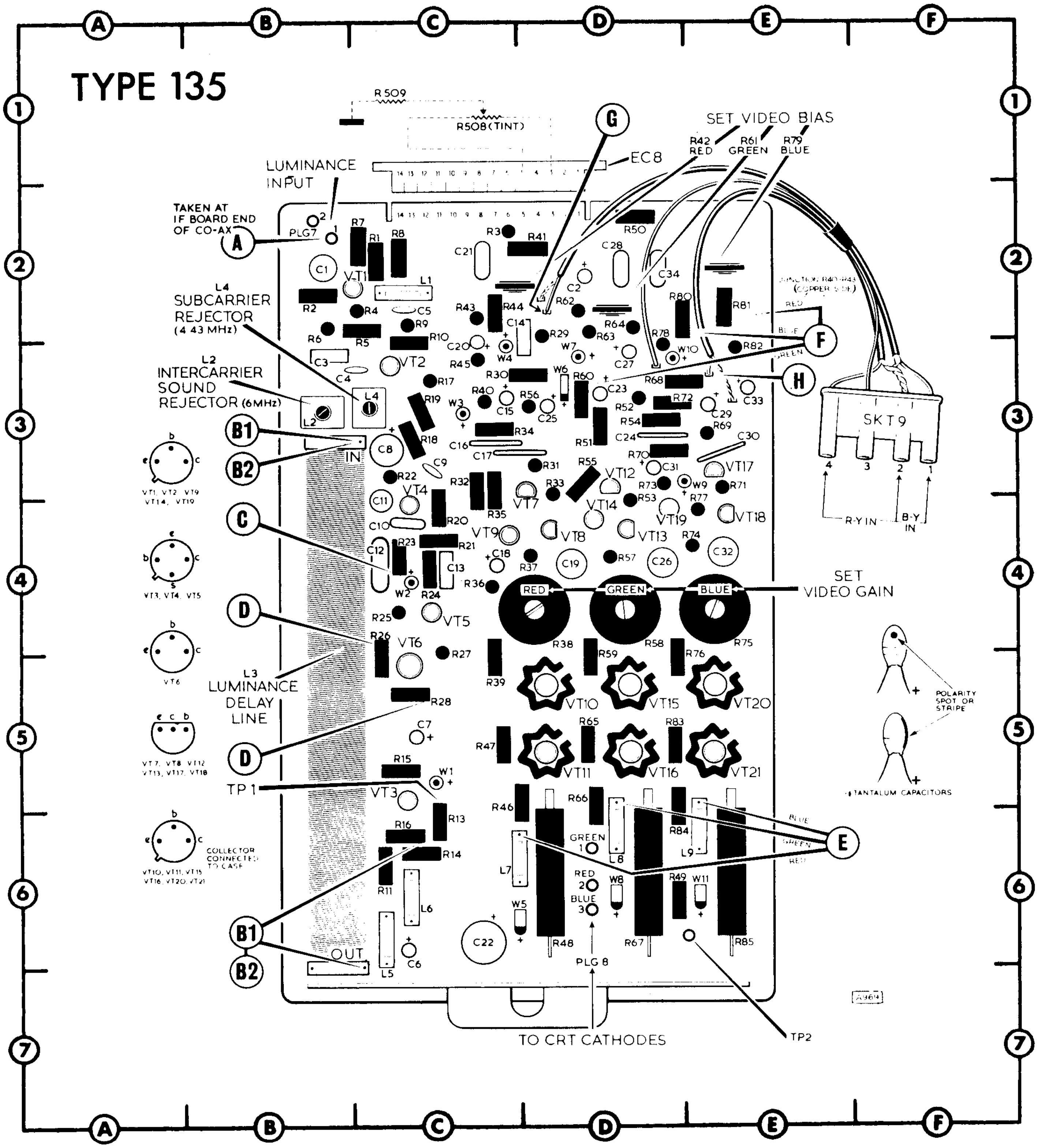
RESISTORS

REF.	DESCRIPTION AND PART No.	LOC.
R1	360K Ω, 5%, 0.2W, 4B64	C2
R2	56K Ω, 5%, 0.2W, 4B63	B2
R3	12 Ω, 10%, 0.2W, 4B70	C2
R4	1.5K Ω, 10%, 0.2W, 4B17	C2
R5	8.2K Ω, 10%, 0.2W, 8A50	C2
R6	820 Ω, 10%, 0.2W, 4B73	B2
R7	1K Ω, 5%, 0.2W, 4B62	C2
R8	100K Ω, 10%, 0.2W, 1A68	C2
R9	100K Ω, 10%, 0.2W, 4B81	C2
R10	22K Ω, 10%, 0.2W, 4B92	C2,3
R11	Type 135—1.8K Ω, 10%, 0.2W, 1B94	C6
	Type 235—2K Ω, 10%, 0.2W, 5B52	*C6*
R13	22K Ω, 10%, 0.2W, 7A74	C6
R14	Type 135—1.8K Ω, 10%, 0.2W, 1B94	C6
	Type 235—2K Ω, 10%, 0.2W, 5B22	*C6*
R15	470 Ω, 10%, 0.2W, 7A37	C5
R16	1.2K Ω, 10%, 0.2W, 7A44	C6
R17	5.6K Ω, 10%, 0.2W, 4B24	C3
R18	5.6K Ω, 10%, 0.2W, 1A49	C3
R19	750 Ω, 5%, 0.2W, 4B61	C3
R20	390K Ω, 10%, 0.2W, 4B65	C4
R21	8.2K Ω, 10%, 0.2W, 3B15	C4
R22	1.5K Ω, 5%, 0.2W, 4B14	C3
R23	560K Ω, 10%, 0.2W, 4B66	C4
R24	33K Ω, 10%, 0.2W, 8A22	C4
R25	3.3M Ω, 10%, 0.2W, 4B82	C4
R26	22K Ω, 10%, 0.2W, 4A92	C4
R27	5.6K Ω, 10%, 0.2W, 4B24	C4
R28	1.2K Ω, 10%, 0.2W, 7A44	C5
R29	5.6K Ω, 5%, 0.2W, 4B75	D2
R30	3K Ω, 5%, 0.2W, 4B69	CD3
R31	680 Ω, 20%, 0.2W, 4B72	CD3
R32	220 Ω, 5%, 0.2W, 4B67	C3
R33	1.5K Ω, 5%, 0.2W, 4B74	D3,4
R34	160 Ω, 5%, 0.2W, 4B60	CD3
R35	22K Ω, 10%, 0.2W, 1A56	C4
R36	56K Ω, 10%, 0.2W, 4B80	C4
R37	1K Ω, 10%, 0.2W, 4B16	D4
R38	Type 135—50 Ω, Preset, 0E1–001/04	D4
	Type 235—80 Ω, Preset, 0E1–001/08	*D4*
R39	Type 135—82 Ω, 10%, 0.2W, 1A16	C5
	Type 235—120 Ω, 10%, 0.2W, 8A24	*C5*
R40	Type 135—33K Ω, 20%, 0.2W, 4B79	C3
	Type 235—150K Ω, 10%, 0.2W, 5B53	*C3*
R41	2.2K Ω, 10%, 0.2W, 7A51	D2
R42	Type 135—25K Ω, Preset, 0E1–027/02	E1
	Type 235—10K Ω, Preset, 0E1–027/04	*E1*
R43	5.6K Ω, 20%, 0.2W, 4B76	C2
R44	10K %, 20%, 0.2W, 7A26	C2
R45	7.5K Ω, 10%, 0.2W, 4B77	C3
R46	Type 135—68K Ω, 10%, 0.2W, 1A30	C5,6
	Type 235—43K Ω, 10%, 0.5W, 5B54	*C5,6*
R47	Type 135—68K Ω, 10%, 0.2W, 1A13	C5
	Type 235—43K Ω, 10%, 0.5W, 5B54	*C5*
R48	Type 135—6K Ω, 5%, 9W, Wirewound, 4B83	D6
	Type 235—9K Ω, 5%, 9W, Wirewound, 5B56	*D6*
R49	12 Ω, 10%, 0.2W, 4B59	D6
R50	120K Ω, 10%, 0.5W, 8A12	D2
R51	680 Ω, 20%, 0.2W, 2A30	D3
R52	220 Ω, 5%, 0.2W, 4B71	D3
R53	1.5K Ω, 5%, 0.2W, 4B74	D3,4
R54	750 Ω, 5%, 0.2W, 4B68	D3
R55	22K Ω, 10%, 0.2W, 1A56	D3
R56	56K Ω, 10%, 0.2W, 4B80	D3
R57	1K Ω, 10%, 0.2W, 4B16	D4
R58	Type 135—50 Ω, Preset, 0E1–001/04	D4
	Type 235—80 Ω, Preset, 0E1–001/08	*D4*
R59	Type 135—82 Ω, 10%, 0.2W, 1A16	D4
	Type 235—120 Ω, 10%, 0.2W, 8A24	*D4*
R60	Type 135—33K Ω, 20%, 0.2W, 1A88	D3
	Type 235—150K Ω, 10%, 0.2W, 5B53	*D3*
R61	Type 135—25K Ω, Preset, 0E1–027/02	DE1
	Type 235—10K Ω, Preset, 0E1–027/04	*DE1*
R62	5.6K Ω, 20%, 0.2W, 4B76	D2
R63	12K Ω, 20%, 0.2W, 4B78	D2

Continued on page 6

Locations and Details

A, B1, B2, C, D, E, F, G, H in both illustrations indicate points at which oscillograms were taken, see page 11.
Transistor connections shown are as viewed from transistor base.



Ensure that the receiver is switched off before removing or inserting a printed board.

Board removal techniques are described in Section A.

RESISTORS-*continued from page 4*

REF.	DESCRIPTION AND PART No.	LOC.
R64	7.5K Ω, 10%, 0.2W, 4B77	E2,3
R65 {	Type 135—68K Ω, 10%, 0.2W, 1A13	D5
	Type 235—43K Ω, 10%, 0.5W, 5B54	*D5*
R66 {	Type 135—68K Ω, 10%, 0.2W, 1A13	D5
	Type 235—43K Ω, 10%, 0.5W, 5B54	*D5*
R67 {	Type 135—6K Ω, 5%, 9W Wirewound, 4B83	D6
	Type 235—9K Ω, 5%, 9W Wirewound, 5B56	*D6*
R68	8.2K Ω, 10%, 0.2W, 3B15	DE3
R69	680 Ω, 20%, 0.2W, 4B72	E3
R70	220 Ω, 5%, 0.2W, 4B67	D3
R71	1.5K Ω, 5%, 0.2W, 4B74	E3,4
R72	22K Ω, 10%, 0.2W, 4A92	DE3
R73	56K Ω, 10%, 0.2W, 4B80	D3
R74	1K Ω, 10%, 0.2W, 4B16	DE4
R75 {	Type 135—50 Ω, Preset, 0E1-001/04	E4
	Type 235—80 Ω, Preset, 0E1-001/08	*E4*
R76 {	Type 135—82 Ω, 10%, 0.2W, 1A16	DE4
	Type 235—120 Ω, 10%, 0.2W, 8A24	*DE4*
R77 {	Type 135—33K Ω, 20%, 0.2W, 4B79	DE4
	Type 235—150K Ω, 10%, 0.2W, 5B53	*DE4*
R78	2.2K Ω, 10%, 0.2W, 4B18	D2
R79 {	Type 135—25K Ω, Preset, 0E1-027/02	E1
	Type 235—10K Ω, Preset, 0E1-027/04	*E1*
R80	5.6K Ω, 20%, 0.2W, 3B51	DE2
R81	10K Ω, 20%, 0.2W, 7A26	E2
R82	7.5K Ω, 10%, 0.2W, 4B77	E2,3
R83 {	Type 135—68K Ω, 10%, 0.2W, 1A13	DE5
	Type 235—43K Ω, 10%, 0.5W, 5B54	*DE5*
R84 {	Type 135—68K Ω, 10%, 0.2W, 1A13	DE6
	Type 235—43K Ω, 10%, 0.5W, 5B54	*DE6*
R85 {	Type 135—6K Ω, 5%, 9W Wirewound, 4B83	E6
	Type 235—9K Ω, 5%, 9W Wirewound, 5B56	*E6*
R86*	33K Ω, 10%, 0.2W, 8A22	E2
R87*	33K Ω, 10%, 0.2W, 8A22	C3
R88*	33K Ω, 10%, 0.2W, 8A22	D3
R89*	6.8K Ω, 10%, 0.2W, 2B88	D2
R90*	6.8K Ω, 10%, 0.2W, 2B88	D2
R91*	6.8K Ω, 10%, 0.2W, 2B88	E2
R93*	10K Ω, 10%, 0.2W, 7A26	C6
R508	100K Ω, Lin. Pot. (Tint control), 0E1-015/02†	**
R509	68K Ω, 10%, 0.25W, 8A82	††

**Fitted to Type 235 only*
***See Chassis Frame, Section L*
†Twist tab tape, 0E1-041/02
††Mounted on Tint control

TRANSISTORS

REF.	DESCRIPTION AND PART No.	LOC.
VT1	BC107B Mullard, 0V1-330	C2
VT2	BC107A Mullard, 0V1-328	C3
VT3	BF115 Mullard, 0V1-310	C5
VT4	BF115 Mullard, 0V1-310	C3,4
VT5	BF115 Mullard, 0V1-310	C4
VT6	BC116 Fairchild, 0V1-321	C4,5
VT7	E5024* Texas, 0V2-001	D3
VT8	E5036* Texas, 0V2-002, (Heat sink, 0B1-133/002†) ...	CD4
VT9	BC107 Mullard, 0V1-314	C4
VT10	BF178 Mullard, 0V1-325, (Heat sink, 0C2-013/6) ...	D5
VT11	BF178 Mullard, 0V1-325 (Heat sink, 0C2-013/6) ...	D5
VT12	E5024* Texas, 0V2-001	D3
VT13	E5036* Texas, 0V2-002, (Heat sink, 0B1-133/002†) ...	D4
VT14	BC107 Mullard, 0V1-314	D4
VT15	BF178 Mullard, 0V1-325, (Heat sink, 0C2-013/6) ...	D5
VT16	BF178 Mullard, 0V1-325, (Heat sink, 0C2-013/6) ...	D5
VT17	E5024* Texas, 0V2-001	E3
VT18	E5036* Texas, 0V2-002, (Heat sink, 0B1-133/002†) ...	E4
VT19	BC107 Mullard, 0V1-314	D4
VT20	BF178 Mullard, 0V1-325, (Heat sink, 0C2-013/6) ...	E5
VT21	BF178 Mullard, 0V1-325 (Heat sink, 0C2-013/6) ...	E5

**VT7, VT12, VT17 (E5024) and VT8, VT13, VT18 (E5036) must be used in triplets of the same colour code to ensure correct gain matching*
†Heat sink compound, 0N6-013

Continued overleaf

CAPACITORS

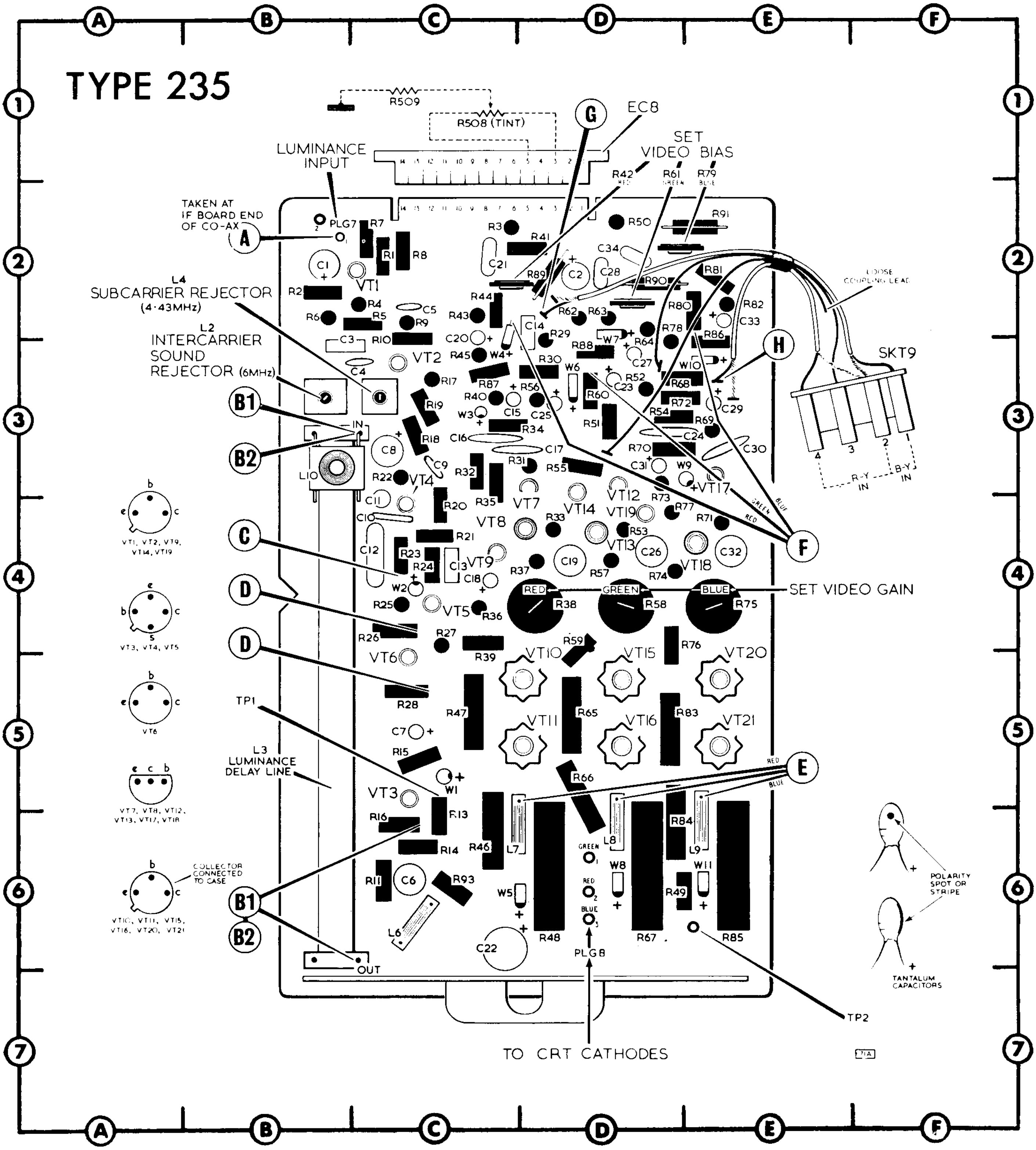
REF.	DESCRIPTION AND PART No.	LOC.
C1	15μF, Reversible, Electrolytic, 25V, 0E0–222/09	B2
C2	4μF, 50V, Tantalum Electrolytic, 0E0–221/04	D2
C3	8.2pF, 10%, 500V, Ceramic, 1N64	B3
C4	6.8pF, 10%, 500V, Ceramic, 1N65	BC3
C5	0.01μF, −20+80%, 100V, Ceramic, 9M71	C2
C6	4μF, 50V, Tantalum Electrolytic, 0E0–221/04	C6
C7	2μF, 35V, Tantalum Electrolytic, 0E0–220/16	C5
C8	50μF, Electrolytic, 12V, 0E0–228/08	C3
C9	200pF, 20%, 500V, Ceramic, 1N66	C3
C10	0.022μF, 10%, 250V, Polyester, 1N67	C4
C11	2000pF, 10%, 125V, Polyester, 1N68	C3,4
C12	0.22μF, 20%, 250V, Polyester, 9M63	C4
C13	30pF, 10%, 500V, Ceramic, 1N44	C4
C14	68pF, 10%, 500V, Ceramic, 1N13	CD2
C15	0.5μF, 35V, Tantalum Electrolytic, 0E0–220/15	C3
C16	430pF, 10%, 350V, Mica, 1N28	C3
C17	430pF, 10%, 350V, Mica, 1N28	CD3
C18	0.5μF, 35V, Tantalum Electrolytic, 0E0–220/15	C4
C19	860pF, 10%, 125V, Polystyrene, 1N69	D4
C20	2μF, 35V, Tantalum Electrolytic, 0E0–220/16	C2,3
C21	0.1μF, 20%, 250V, Polyester, 8M63	C2
C22	1μF, Electrolytic, 350V, 0E0–220/04	C6
C23	0.5μF, 35V, Tantalum Electrolytic, 0E0–220/15	D3
C24	180pF, 10%, 200V, Mica, 1N70	DE3
C25	0.5μF, 35V, Tantalum Electrolytic, 0E0–220/15	D3
C26	860pF, 10%, 125V, Polystyrene, 1N69	D4
C27	2μF, 35V, Tantalum Electrolytic, 0E0–220/16	D3
C28	0.1μF, 20%, 250V, Polyester, 8M63	D2
C29	0.5μF, 35V, Tantalum Electrolytic, 0E0–220/15	E3
C30	750pF, 10%, 200V, Mica, 1N71	E3
C31	0.5μF, 35V, Tantalum Electrolytic, 0E0–220/15	D3
C32	860pF, 10%, 125V, Polystyrene, 1N69	E4
C33	2μF, 35V, Tantalum Electrolytic, 0E0–220/16	E2,3
C34	0.1μF, 20%, 250V, Polyester, 8M63	D2

INDUCTORS

REF.	DESCRIPTION AND PART No.	LOC.
L1	Luminance compensating choke, 0D0–204	C2
L2	6 MHz rejector coil, 0D0–203	B2
L3	Type 135—Luminance delay line, 0D0–212	B5
	Type 235—Luminance delay line, 0D0–229	*B5*
L4	4.4MHz rejector coil, 0D0–202	A2
L5*	Delay line output series choke, 0D0–210	C7
L6	Type 135—Delay line compensating choke, 0D0–705 ...	C6
	Type 235—Delay line compensating choke, 0D0–232 ...	*C6*
L7	Video load compensating choke (red), 0D0–204	C6
L8	Video load compensating choke (green), 0D0–204 ...	D6
L9	Video load compensating choke (blue), 0D0–204	DE6
L10†	Delay line input series choke, 0D0–205	B3
	**Fitted to Type 135 only*	
	†Fitted to Type 235 only	

MISCELLANEOUS

REF.	DESCRIPTION AND PART No.	LOC.
EC8	4-way edge-connector, ...	*
SKT9	4-way connector, moulding only, 0C8-161	F3
	Socket, 0F6–017	
	**See Chassis Frame, Section L*	



DIODES

REF.	DESCRIPTION AND PART No.	LOC.
W1	0A91 Germanium, 0V4-616	C5
W2	BA115 Silicon, 0V4-125	C4
W3	0A91 Germanium, 0V4-616	C3
W4	0A91 Germanium, 0V4–616	C3
W5	BA148 Silicon, 0V4–118	C6
W6	0A91 Germanium, 0V4–616	D3
W7	0A91 Germanium, 0V4–616	D2,3
W8	BA148 Silicon, 0V4–118	D6
W9	0A91 Germanium, 0V4–616	DE3
W10	0A91 Germanium, 0V4–616	DF3
W11	BA148 Silicon, 0V4–118	E6

Setting-up Procedures

incl. General Notes

GAIN-MATCHED TRANSISTORS

VT7, VT12 and VT17 (E5024); also VT8, VT13 and VT18 (E5036) are fitted in colour-coded triplets to provide equal gain in the three colour difference channels at all Contrast and Brightness settings. An individual replacement must have the same colour marking as the other two transistors in the triplet. Early production boards were fitted with Type 2N3702 (VT7, VT12, VT17) and Type 2N4062 (VT8, VT13, VT18) in some cases without coding marks. In the event of failure of one of these non-coded types it is advisable to change the complete triplet for the later coded type.

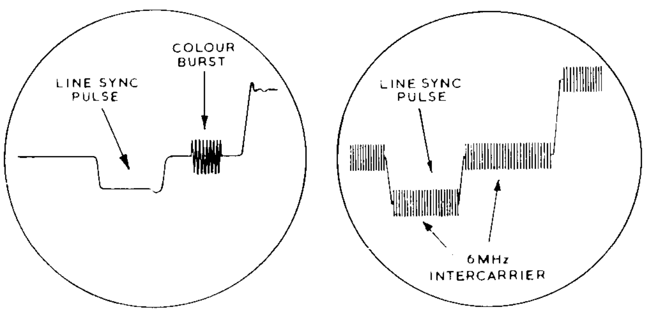
DC VOLTAGE CHECKS

It should be noted that incorrect Grey-Scale Tracking adjustments may cause considerable variations in the DC voltages in the colour difference channels and output stages, and this could lead to incorrect fault diagnosis. This particularly applies to the Video Bias adjustments which affect the output stage collector potentials. The only reliable method of checking these settings is to go through the Grey-Scale Tracking procedure.

REJECTOR ALIGNMENT

A UHF colour transmission provides accurate frequencies for optimum alignment. To ensure that the Burst signal is present, tune for a colour display.

Connect an oscilloscope capable of resolving the subcarrier to the output end of the Luminance Delay Line. Observe the burst



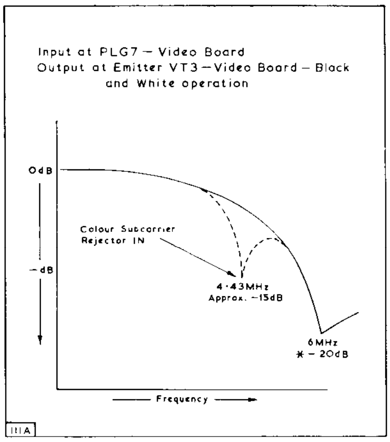
Left: Showing Burst with L4 off-tuned
Right: Showing 6 MHz Intercarrier with L2 off-tuned

signal on the back porch of the line sync pulse (see left-hand oscillogram), and tune L4 for minimum Burst.

When the Video board incorporates L2, the following 6 MHz Intercarrier Rejection check should be made: Connect an oscilloscope, capable of resolving the 6 MHz intercarrier, to the output end of the Luminance Delay Line. If the line sync pulse shows the 6 MHz signal, see right-hand oscillogram, tune L2 for minimum intercarrier. To increase the amplitude for ease of adjustment, detune receiver slightly towards sound-on-vision.

SIGNAL GENERATOR METHOD. With the receiver switched off, withdraw the Chrominance board approximately 2 inches to disengage the edge-connector. Unplug SKT7 (Luminance Input), and link TP1 to the edge-connector end of R8 (to switch on VT2); this link will cause a reduction in the brightness level which can be ignored. *Warning: adjacent resistor R1 is 55 V line.*

Connect a signal generator across the Luminance Input plug pins (PLG7). Connect an oscilloscope at the output end of the Luminance Delay Line and switch on the receiver. Set the signal generator to 4.43 MHz and tune L4 for minimum signal. If L2 is fitted, set the signal generator to 6 MHz and tune L2 for minimum. Switch off the receiver. Remove test equipment and link, and replace SKT7. Return the Chrominance board to its normal position.



Video response with rejectors L2 and L4 correctly tuned

* *Minimum rejection level*

GREY-SCALE TRACKING

Before attempting these adjustments, see Section A. The following sequence of adjustments ensures a black-and-white picture which is free from colouration. A multirange meter, such as Avometer Model 8, is required for DC voltage measurements. Locations of adjustments and meter test connections are shown. The Convergence board should be withdrawn from the chassis and mounted in the cabinet clips as shown in Section A, page 8.

The setting-up procedure should be carried out with the receiver switched to a 625-line channel.

1 Set the Tint control to the centre of its range and turn the three A1 potentiometers (Convergence board) to minimum. Turn each of the three Video Bias presets (R42, R61 and R79) fully clockwise. Set the Red Video Gain preset (R38) a $\frac{1}{4}$-turn from its anticlockwise stop, and the Green and Blue Video Gain presets (R58 and R75) midway between stops.

2 Operate the Set White switch (Convergence board) to collapse the frame. Connect the meter positive to TP1 (end tag of R13 on Video board) and negative to chassis. Adjust Video Reference preset R14 (Convergence board) for 9.5V.

3 Connect the meter (250V DC range) positive to TP2 and negative to the Red, Green and Blue video output collectors in turn, i.e. across R48, R67 and R85 respectively. Adjust in turn the Red, Green and Blue Video Bias presets (R42, R61 and R79) as follows:

Type 135—Adjust for 90V. **Type 235**—Adjust for 80V.†

† **Note: If 80V cannot be obtained within the range of a particular preset, then the shorting link across its associated series resistor (R89, R90 or R91) may be removed or reinstated, as necessary to achieve the correct figures.**

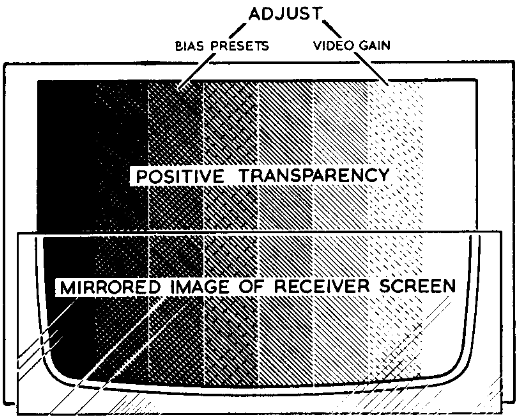
4 Connect the meter (100V DC range) positive to pin 12 on the tube base connector with negative to chassis and adjust the CRT Grid Bias preset (R30 on the Frame Timebase and Sound board) as follows:

Type 135—Adjust for 30V. **Type 235**—Adjust for 40V.

5 Slowly advance each A1 potentiometer (Convergence board) in turn until the three colours are barely visible as three equally bright horizontal lines. If any line fails to appear, leave its associated A1 potentiometer at maximum and return the others to zero. Advance the CRT Grid Bias preset until the previously absent colour is just visible; the maximum value of grid bias allowed is 60V. Then advance the remaining A1 potentiometers until the other two colours are just visible. The three A1 beam switches (Convergence board) may be operated to turn the individual beams on and off for brightness comparison.

6 If an Illuminant C Wedge is available for comparison (i.e. a black-and-white positive transparency of colour bars illuminated by a 6,500° K light source such as two Atlas Tropical Daylight 18" 15W fluorescent tubes) the final adjustment may be made as follows:

Position the illuminated transparency so that with a mirror placed across the lower half to reflect the screen, a direct comparison is possible, see illustration.



Illuminant C Comparator

Switch on all three beams and operate the Set White switch to restore normal picture. Select a colour-bar transmission or inject a colour bar signal and turn the Colour control fully anti-clockwise. Adjust Brightness and Contrast controls to obtain an even gradation from black to white.

Adjust the Video Gain presets to match the second bar from the right and trim the Video Bias presets to match the second *visible* bar from the left as viewed in the mirror.

READJUSTMENT FOR COLOUR TUBES NEARING END-OF-LIFE

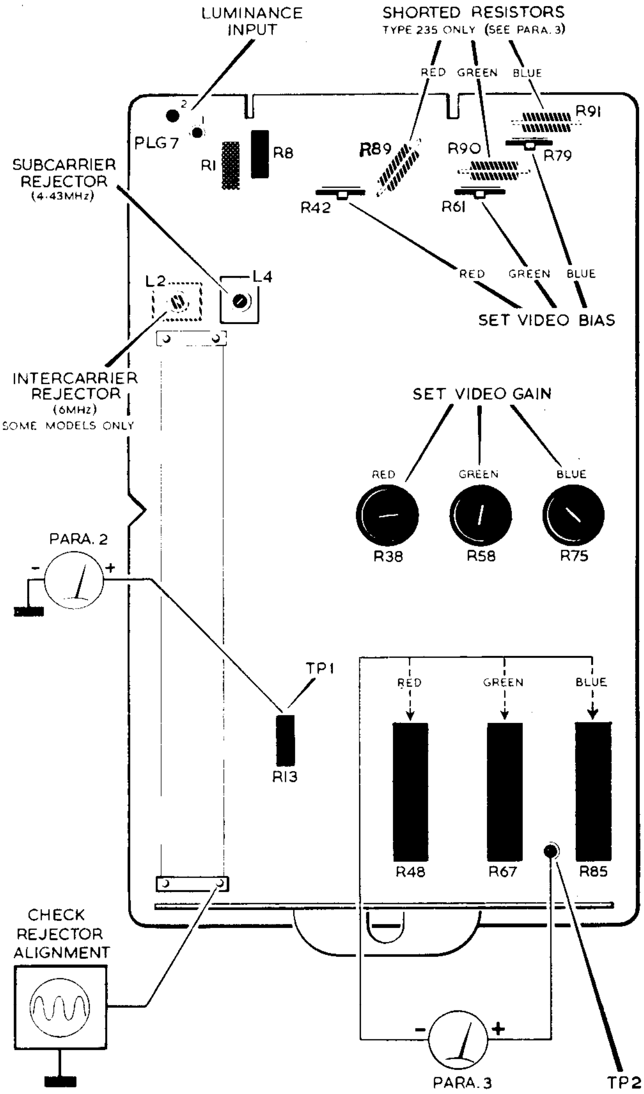
When peak brightness becomes inadequate, even with maximum picture drive, the peak beam current available may be increased by the following method:

(a) Operate the Set White switch and turn the three A1 potentiometers to minimum.

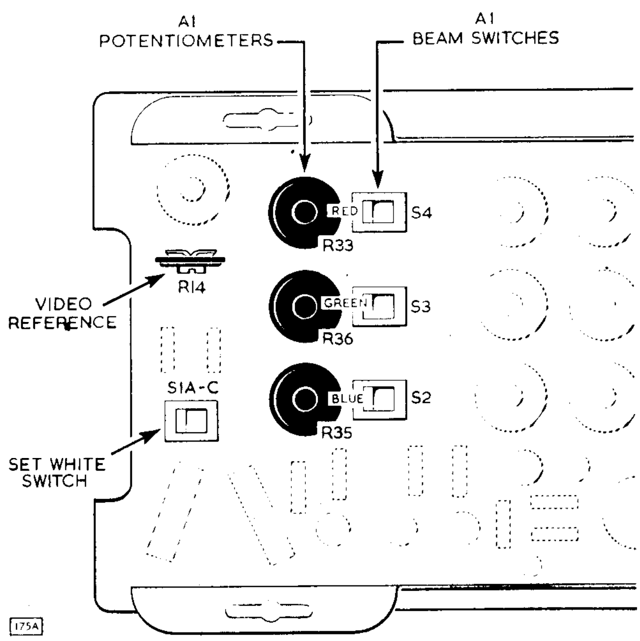
(b) Proceed as in paragraph 4 but increase the grid potential to the maximum 60V.

(c) Carry out procedures of paragraphs 5 and 6.

This adjustment shortens the grid base of the tube, with a corresponding reduction in A1 voltages. In effect, an increase of beam current on peak white can be obtained, although the spot size will be slightly larger, thereby extending the useful life of the tube.



Rejector Alignment and Grey-Scale Tracking adjustments



Part of Convergence board showing Beam Switches, etc.

Circuit Diagram Notes

DC VOLTAGES. Figures in rectangles are DC voltages: They were taken with an Avometer Model 8 on a 240V mains input with mains tap set for this figure. Many of the readings were taken under special conditions, as indicated in the circuit; unmarked readings apply to normal reception conditions. The DC conditions in the colour difference channels and particularly in the output stages are dependent upon settings of the Grey-Scale Tracking adjustments.

OSCILLOGRAMS. These were taken at line frequency and are referred to by corresponding letters at the appropriate points in both circuit diagrams. The voltage figures given with the oscillograms represent peak-to-peak amplitudes, measured via a probe having an input capacitance of 8pF in parallel with 10M Ω.

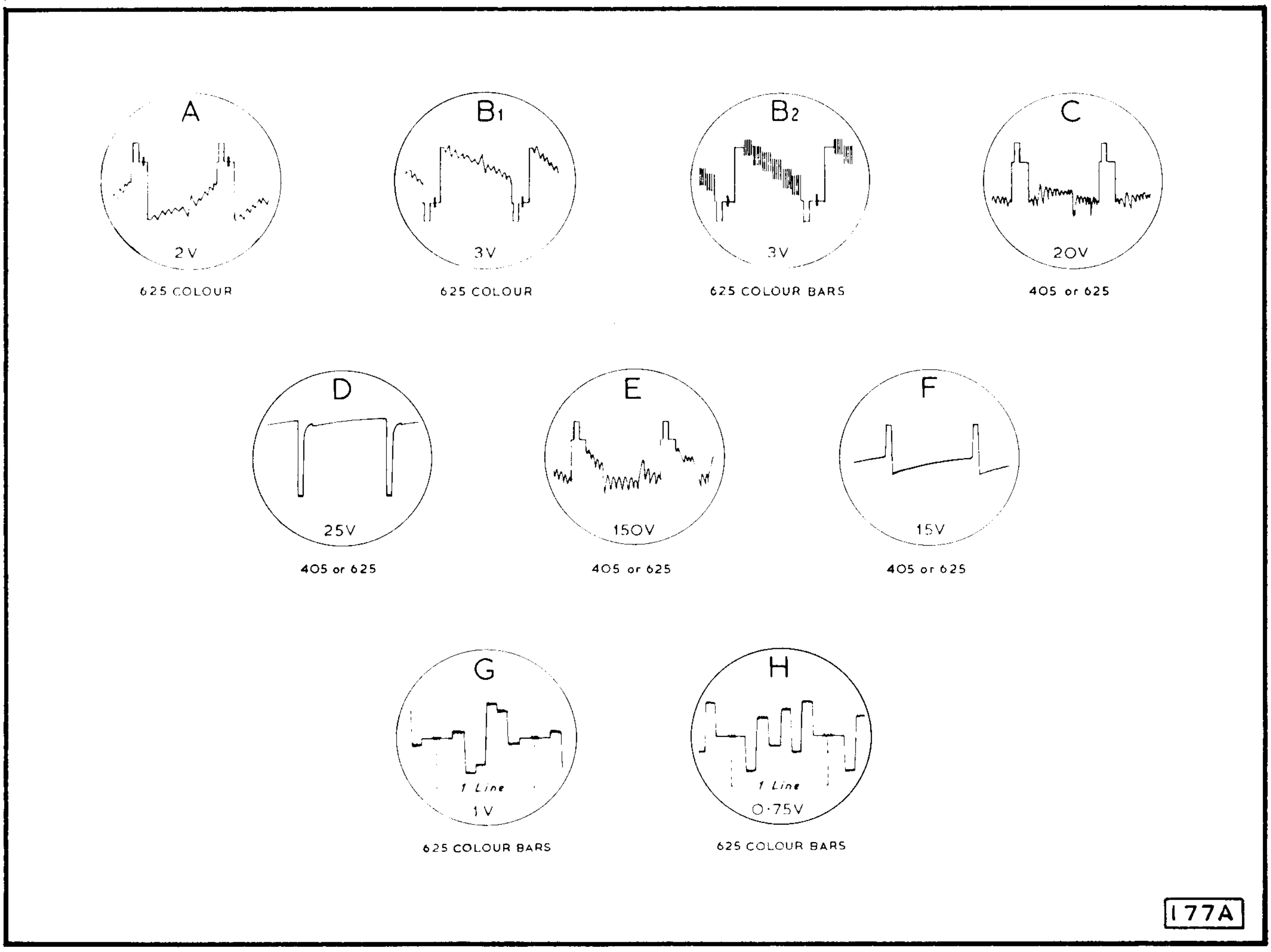
PLEASE NOTE (235 Circuit only)
R42, SET VIDEO BIAS (RED) and R89 are incorrectly shown transposed in the circuit diagram. The DC voltage at the collectors of VT11, VT16 and VT21 is typically 190V and not 180V as shown. The more significant voltage to note here would be that across each of the collector loads which is normally 80V as set by the Video Gain adjustment under SET WHITE conditions.

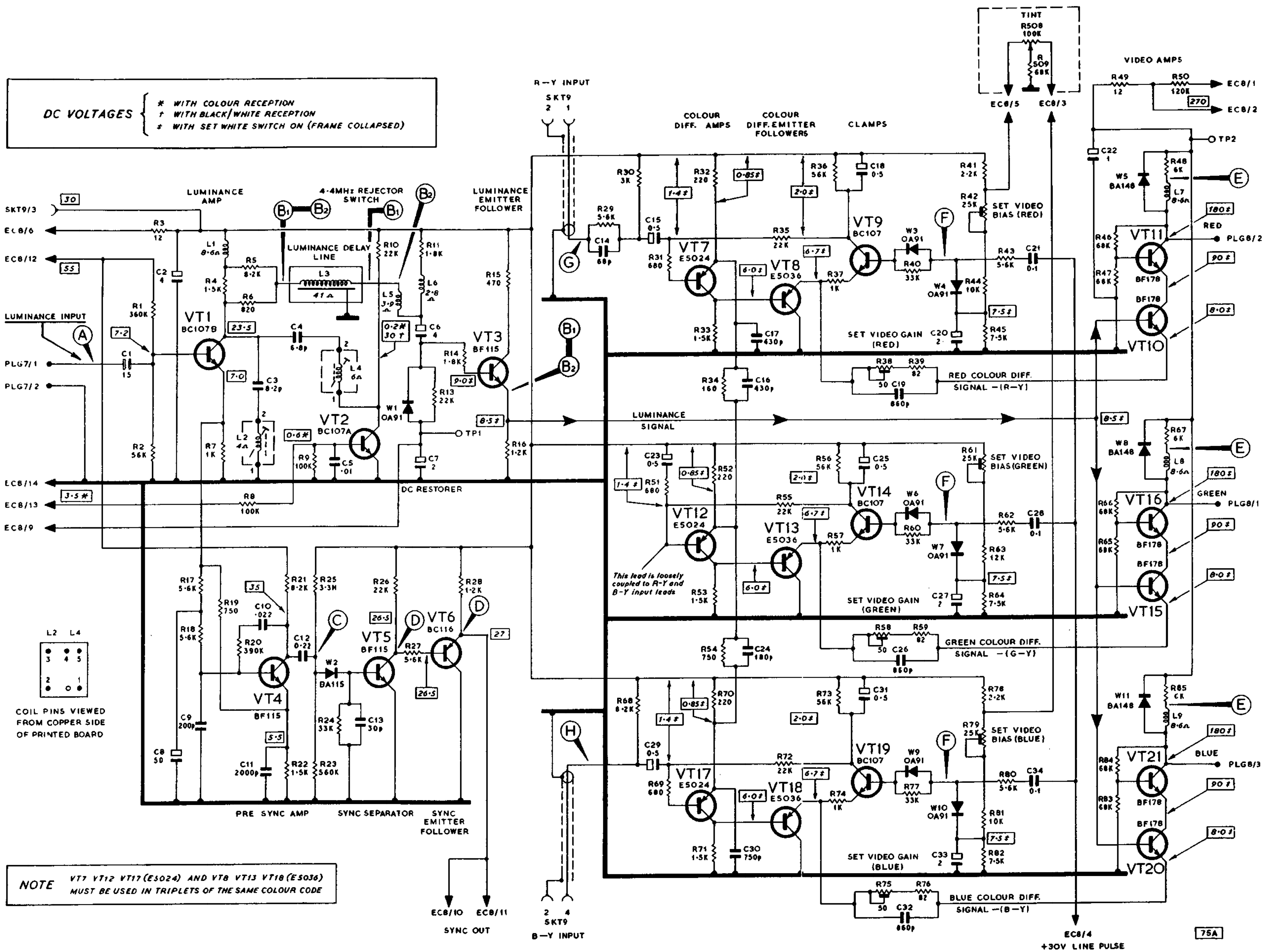
MODIFICATIONS SUMMARY. The following differences from the circuit diagrams may be found on some boards:

Type 135. C14—30pF or 68pF; R29—4.7K Ω; R34—220 Ω; R54—1K Ω.

A 1.5K Ω resistor fitted in series with W1 (DC restorer). VT2—type BC107; VT7, VT12 and VT17—Type 2N3702; VT8, VT13 and VT18—Type 2N4062; W5, W8 and W11—Type BA145.

Type 235. *C3 and L2—not fitted; C6—2.2μF; R13—39K Ω or 100KΩ; VT2—Type BC183LA; VT3—Type BC183LB; VT10, VT15 and VT20—Type BF157 or BF257; VT11, VT16 and VT21—Type BF257.*





Video

TYPE 135

Interconnection Details

EC8

1 IF board EC9/11
2 Power Regulator EC11/8
3 Tint control
4 Line Timebase EC5/10
5 Tint control
6 Junction Block EC3/4
7 & 8 not used
9 Brightness potential from Convergence EC2C/8 (Video reference line with Set White switch operated)
10 Line Timebase EC5/18 via sync switch on 625 Horizontal Hold control
11 Frame Timebase and Sound EC6/4
12 Power Regulator EC11/16
13 Chrominance EC7/3— Bias in for 4.4 MHz rejector switch
14 Chassis earth

PLG7—pins on board

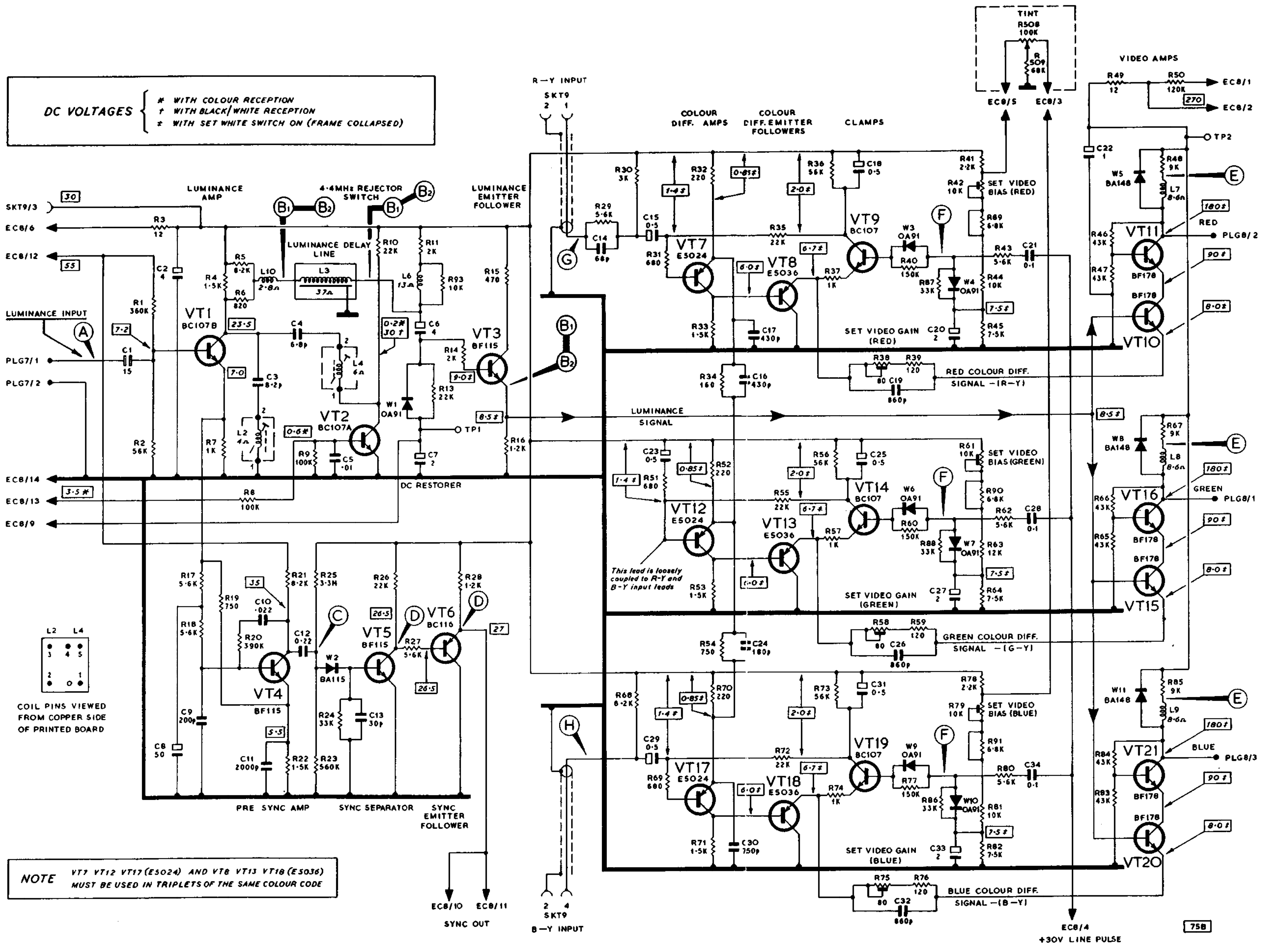
1, 2 } Luminance in from IF board SKT7

PLG8—pins on board

1 Green, 2 Red, 3 Blue } Composite signals to CRT cathodes via SKT8 and Spark Protection board

SKT9—on flying leads

1 R-Y in from Chrominance
2 Earth for R-Y and B-Y inputs
3 AC return for colour difference inputs
4 B-Y from Chrominance



Video

TYPE 235

Interconnection Details

EC8

1 IF board EC9/11
2 Power Regulator EC11/8
3 Tint control
4 Line Timebase EC5/10
5 Tint control
6 Junction Block EC3/4
7 & 8 not used
9 Brightness potential from Convergence EC2C/8 (Video reference line with Set White switch operated)
10 Line Timebase EC5/18 via sync switch on 625 Horizontal Hold control
11 Frame Timebase and Sound EC6/4
12 Power Regulator EC11/16
13 Chrominance EC7/3—
Bias in for 4.4 MHz rejector switch
14 Chassis earth

PLG7—pins on board

1, 2 } Luminance in from IF board SKT7

PLG8—pins on board

1 Green, 2 Red, 3 Blue } Composite signals to CRT cathodes via SKT8 and Spark Protection board

SKT9—on flying leads

1 R-Y in from Chrominance
2 Earth for R-Y and B-Y inputs
3 AC return for colour difference inputs
4 B-Y from Chrominance