BRC

2000 SERIES COLOUR TELEVISION MANUAL

SECTION J

WORKSHOP SERVICING

CHROMINANCE

BRITISH RADIO CORPORATION LIMITED

CONTENTS

SECTION J

WORKSHOP SERVICING

IMPORTANT NOTE

Two types of Chrominance module will be found in service, Type 131 and Type 231, employing different Delay Line and Matrix circuits. The two types are otherwise similar and are completely interchangeable. Where differences occur in the alignment procedures separate instructions are given for each. Separate circuit, alignment and component locations diagrams are provided for ease of servicing. Type 231 was introduced after board Serial No. 16000 (approximately). The identifying Type number is printed on the component side of each board adjacent to the extractor tab and is also etched on the copper side: Prefix or suffix letters can be ignored.

Interdependent adjustments may be necessary in other parts of the receiver when a module is being fitted as a replacement from stock. For details see Replacement Modules—Setting Up and Checking Procedures, Section A.

Circuit Alignment

EQUIPMENT REQUIRED

(i) Signal generator of 75Ω output impedance covering frequencies between 1 MHz and 10 MHz.

(ii) Oscilloscope or valve-voltmeter, sensitive up to 10 MHz.

(iii) Colour bar or rainbow generator.

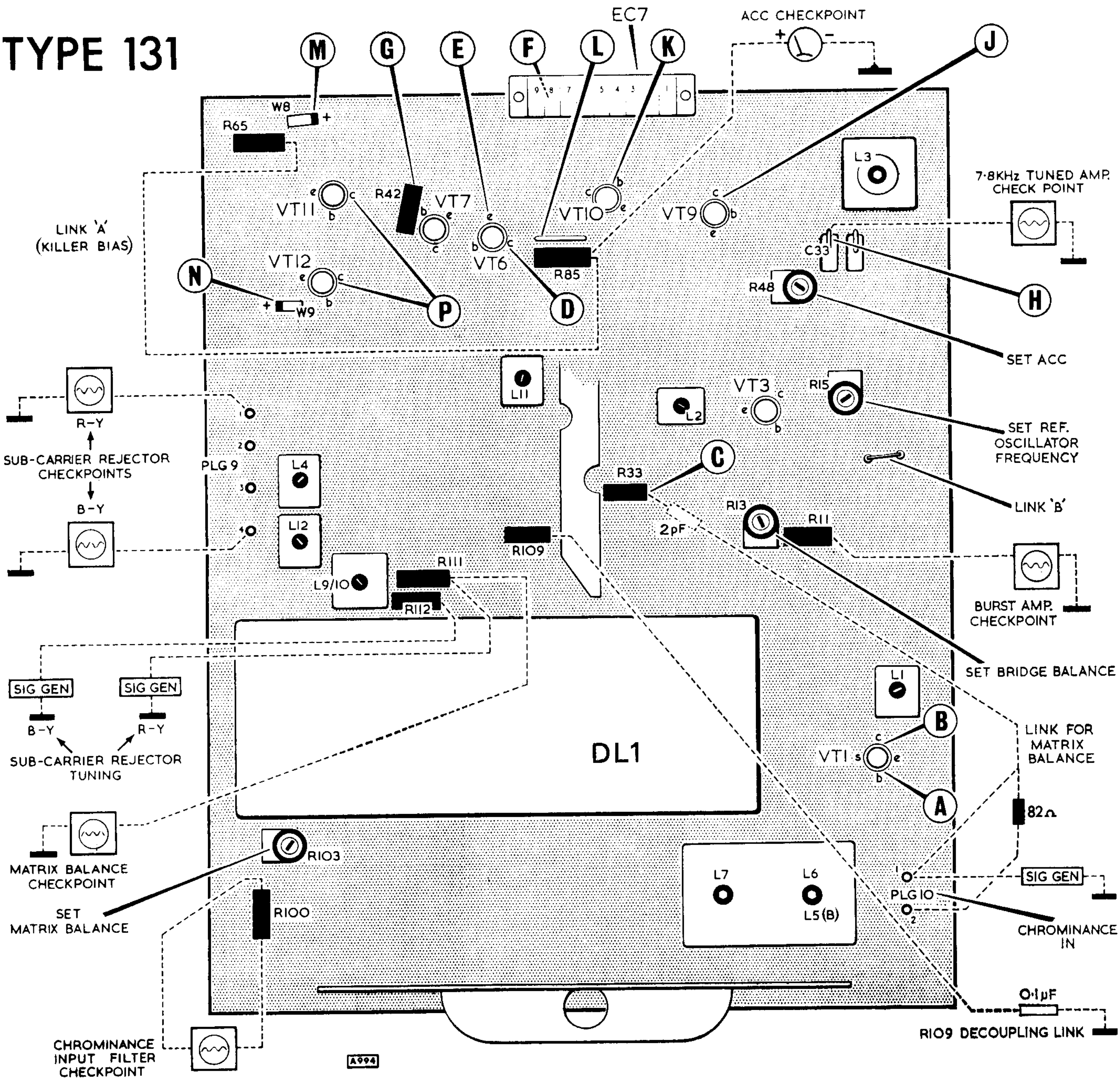
(iv) 0.1μF and 2pF capacitors and an 82 Ω resistor.

(v) A shorting link for 'Link A'—see following notes.

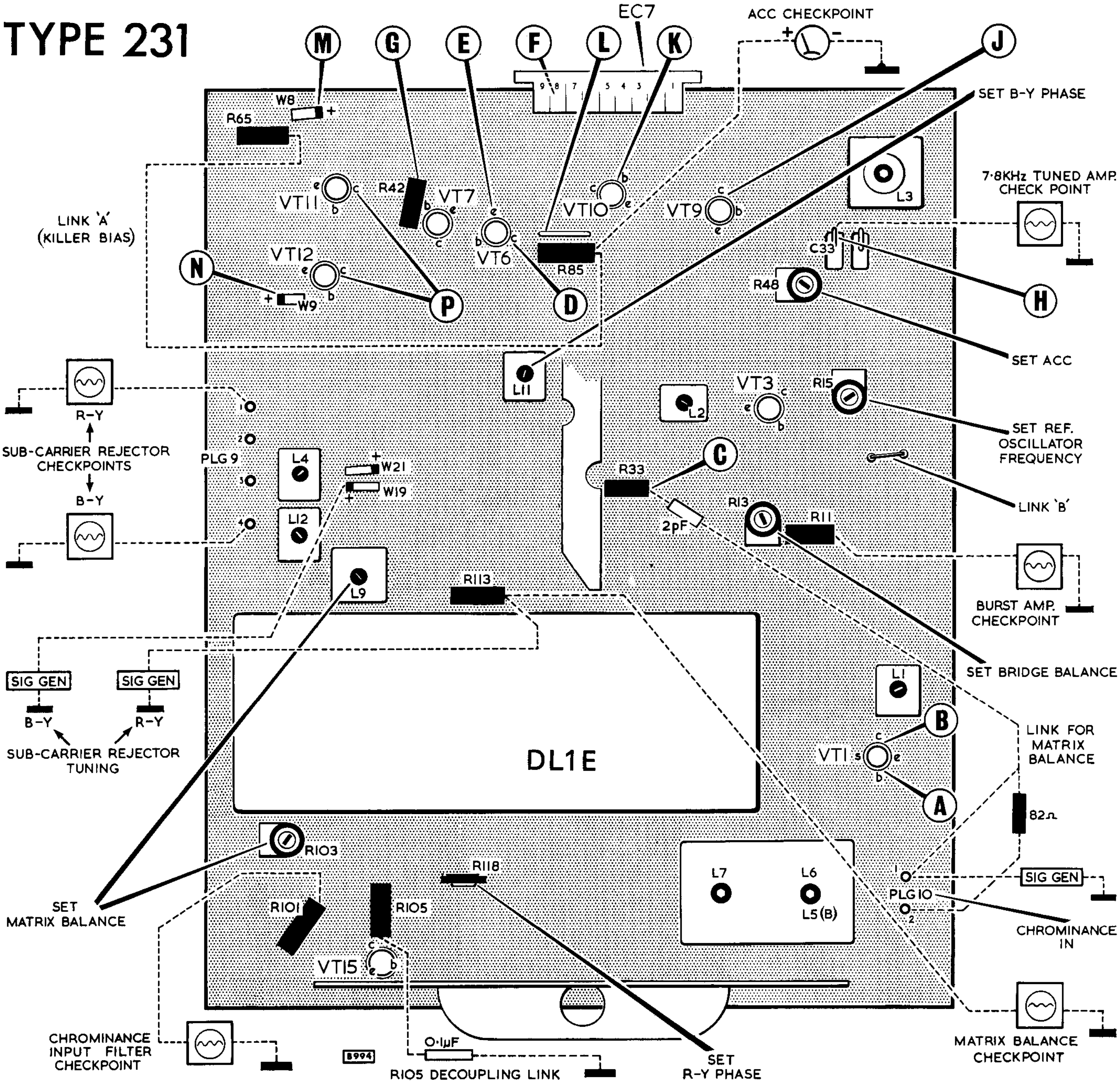
A wobbulator will only be necessary if it is required to check the chrominance response.

Unless it is known that the board has been misaligned or that tuning components have been replaced, all other possible causes for a particular fault condition should be checked before realigning the circuits. Oscillator Frequency and Ref. Bridge Balance should be checked if VT3 or VT4 are changed. Check L1 (Burst Amplifier) if VT1 is changed.

TYPE 131



TYPE 231



It will be necessary to connect a +3V source to the killer line to maintain killer bias in the absence of burst signals. A convenient method is to link the top end of R65 (Bistable emitters) to the top end of R85. The connections are shown as 'Link A' in the alignment diagrams which also show adjustments and connecting points for test equipment. (A)-(P) in the diagrams are points at which oscillograms were taken, see page 12. These are not necessarily required during alignment but are added as a servicing aid.

REFERENCE OSCILLATOR FREQUENCY AND BRIDGE BALANCE

These two adjustments are interdependent. Select a UHF colour transmission or inject a colour signal. Open circuit 'Link B' and adjust Oscillator Frequency (R15) until the colours are almost locked. Unplug the Chrominance input (SKT10) and note voltage at VT3 collector using a valve-voltmeter or Avometer Model 8 on the 100V DC range. Connect the oscilloscope to either end of R33 and adjust L2 for maximum amplitude. Disconnect the oscilloscope. Replace 'Link B' and short the base of VT1 to chassis. Adjust Bridge Balance (R13) to obtain the previously noted reading at VT3 collector. Replace SKT10 and remove short-circuit from VT1 base.

CHROMINANCE INPUT FILTER

With the receiver switched for 625-line operation connect 'Link A'. Connect oscilloscope or valve-voltmeter to the Chrominance Input Filter Checkpoint, *see appropriate Alignment Diagram.* Unplug the Chrominance input socket (SKT10) and connect the signal generator across the input pins (PLG10). Advance the Colour control to maximum. During the procedure the signal generator output should be adjusted so that a maximum of 1V of signal is not exceeded at the Checkpoint.

Input signals unmodulated: 25 mV—30 mV p-p

Generator Freq.	Tune	Output
1.57 MHz	L5	Minimum
4.2 MHz	L6	Maximum
6 MHz	L7	Minimum

BURST AMPLIFIER

Transfer oscilloscope to either end of R11 and with a 4.4 MHz input (10 mV maximum amplitude) at PLG10 adjust L1 for maximum output. Disconnect the signal generator.

MATRIX BALANCE

TYPE 131. Link top end of R33 via a 2pF capacitor to Chrominance input terminal (PLG10) with the 2pF near the R33 end of the link and connect an 82 Ω resistor across PLG10: This provides an accurate 4.433618 MHz input. Connect an 0.1µF capacitor between junction of R108-R109 and chassis. Transfer oscilloscope to junction of R111 and R114 and turn Matrix Balance (R103) to mid position. Adjust L9/10 for maximum output.

Remove the 0.1µF from R109 and adjust Matrix Balance for minimum output. Adjust L9/10 to obtain a more satisfactory minimum.

Remove the 2pF link and 82 Ω resistor.

TYPE 231. *Fit the 2pF link and 82 Ω resistor as described for Typc 131. Transfer the oscilloscope to the demodulator end of R113. Adjust R103 and L9 in that order for minimum display.*

Repeat the two adjustments to obtain a more satisfactory minimum.

Remove the 2pF link and 82 Ω resistor.

DEMODULATOR SUB-CARRIER REJECTORS

TYPE 131. Connect oscilloscope to PLG9/1 (R-Y out). Inject 4.4 MHz at junction of R111/R114 and tune L4 for minimum. Transfer oscilloscope to PLG9/4 (B-Y out). Inject 4.4 MHz at junction of R112 and R113 and tune L12 for minimum. Disconnect the signal generator and replace SKT10.

TYPE 231. *Connect oscilloscope to PLG9/1 (R-Y out). Inject 4.4 MHz at the demodulator end of R113 and tune L4 for minimum. Transfer oscilloscope to PLG9/4 (B-Y out). Inject 4.4 MHz at junction of W19 and W21, and tune L12 for minimum. Disconnect the signal generator and replace SKT10.*

7.8 KHz TUNED AMPLIFIER

Connect oscilloscope to top wire of C33 (VT8 collector). Select a UHF colour transmission or inject a colour signal, and adjust L3 for maximum sine wave amplitude. Check for correct waveforms at Bistable switch, see oscillograms (M) and (N) page 12. Alternatively check at either VT11 collector or VT12 collector for oscillogram (P).

PHASE ADJUSTMENTS

TYPE 131

B-Y. Connect an 0.1µF capacitor across R109 (VT16 emitter) and with a static colour display observe the area where the 'venetian blind' effect is most obvious (usually areas with blue content, i.e. magenta or cyan). Adjust L11 for minimum 'venetian blind' effect.

Remove decoupling capacitor from R109 and remove 'Link A'.

TYPE 231

Please note: R118 is referred to as SET R-Y PHASE for alignment purposes although it also affects the phase of the B-Y signal which is subsequently corrected by adjustment of L11.

R-Y. *Connect an 0.1µF capacitor between collector end of R105 and chassis. With a static colour display on the screen, observe the red area ONLY whilst adjusting R118 for minimum 'venetian blind' effect in this area.*

B-Y. *Examine a static colour display for 'venetian blind' effect in the areas with blue content, i.e. magenta or cyan. Adjust L11 for minimum 'venetian blind' effect.*

Remove the 0.1µF capacitor and remove 'Link A'.

AUTOMATIC CHROMINANCE (ACC)

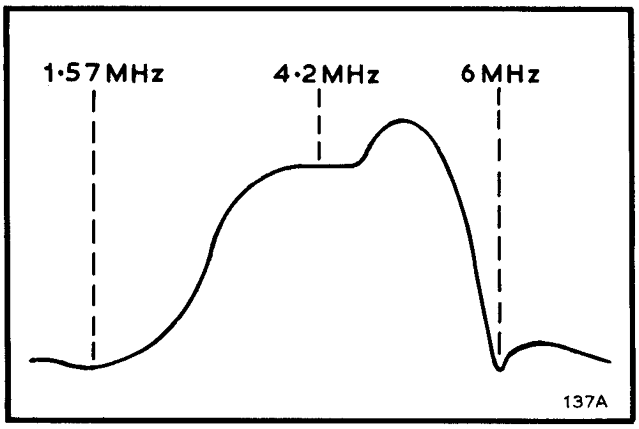
Select a colour transmission, turn Colour control to minimum (no colour) and adjust the Brightness and Contrast controls for a satisfactory black and white picture.

Connect an Avometer Model 8, on 10V DC range, to the Luminance Out terminal on the IF board and readjust the Contrast control for a reading of 6.5V.

Now transfer the Avometer (10V DC range) to top end of R85 (Killer line) and adjust SET ACC delay (R48) for a reading of 3.3V.

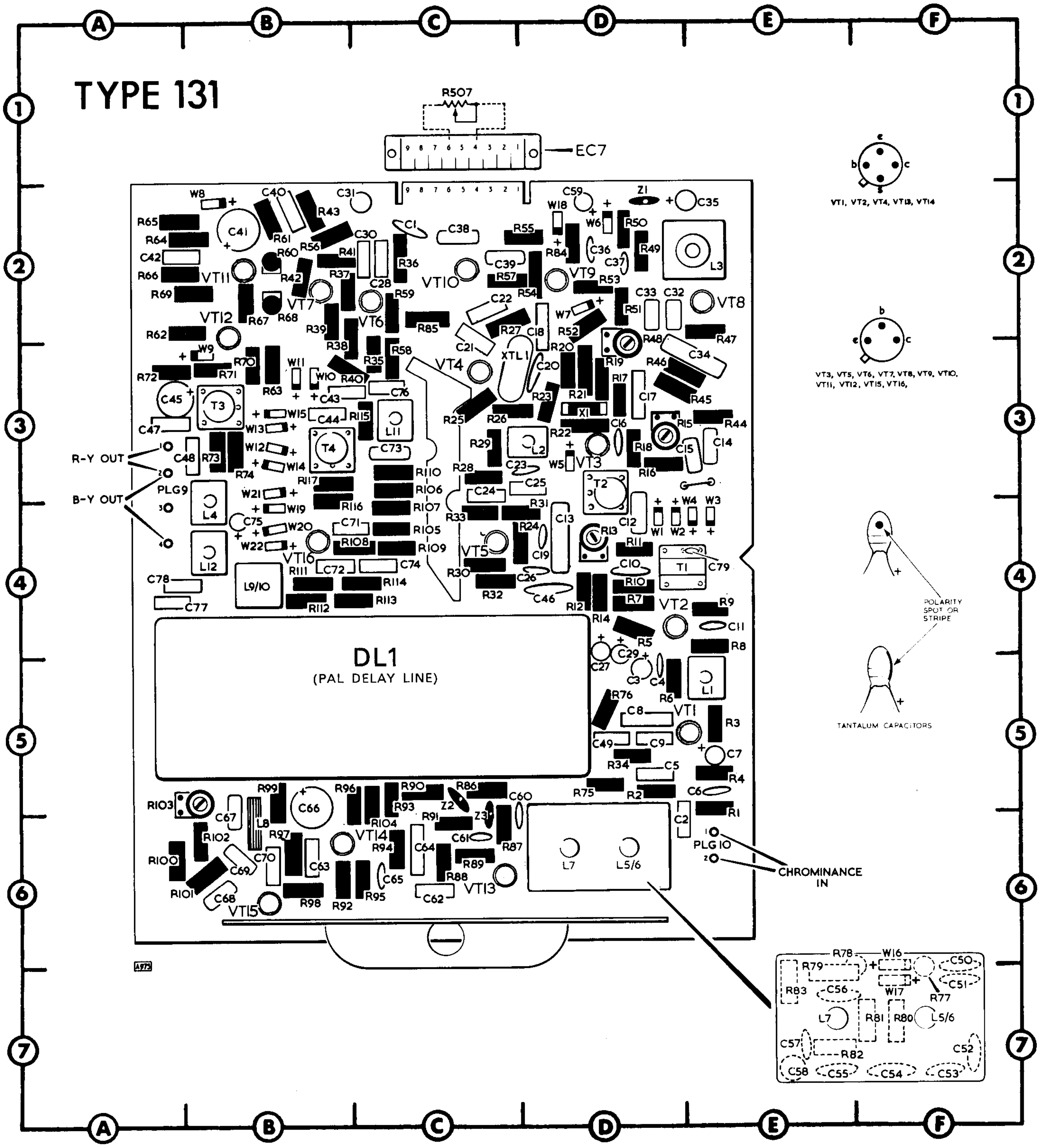
CHROMINANCE CHANNEL RESPONSE CHECK

Although a wobbulator is not required for alignment adjustments, examination of the response provides a useful indication of overall performance. Fit 'Link A' to maintain killer bias and remove Chrominance input (SKT10). Set the wobbulator for 1 MHz—7 MHz sweep at 25mV—30mV and connect across PLG10. Connect the display unit to the Chrominance Input Filter Checkpoint, *see appropriate Alignment Diagram*, to show response shape illustrated below.



Component Loc

Transistor connections shown

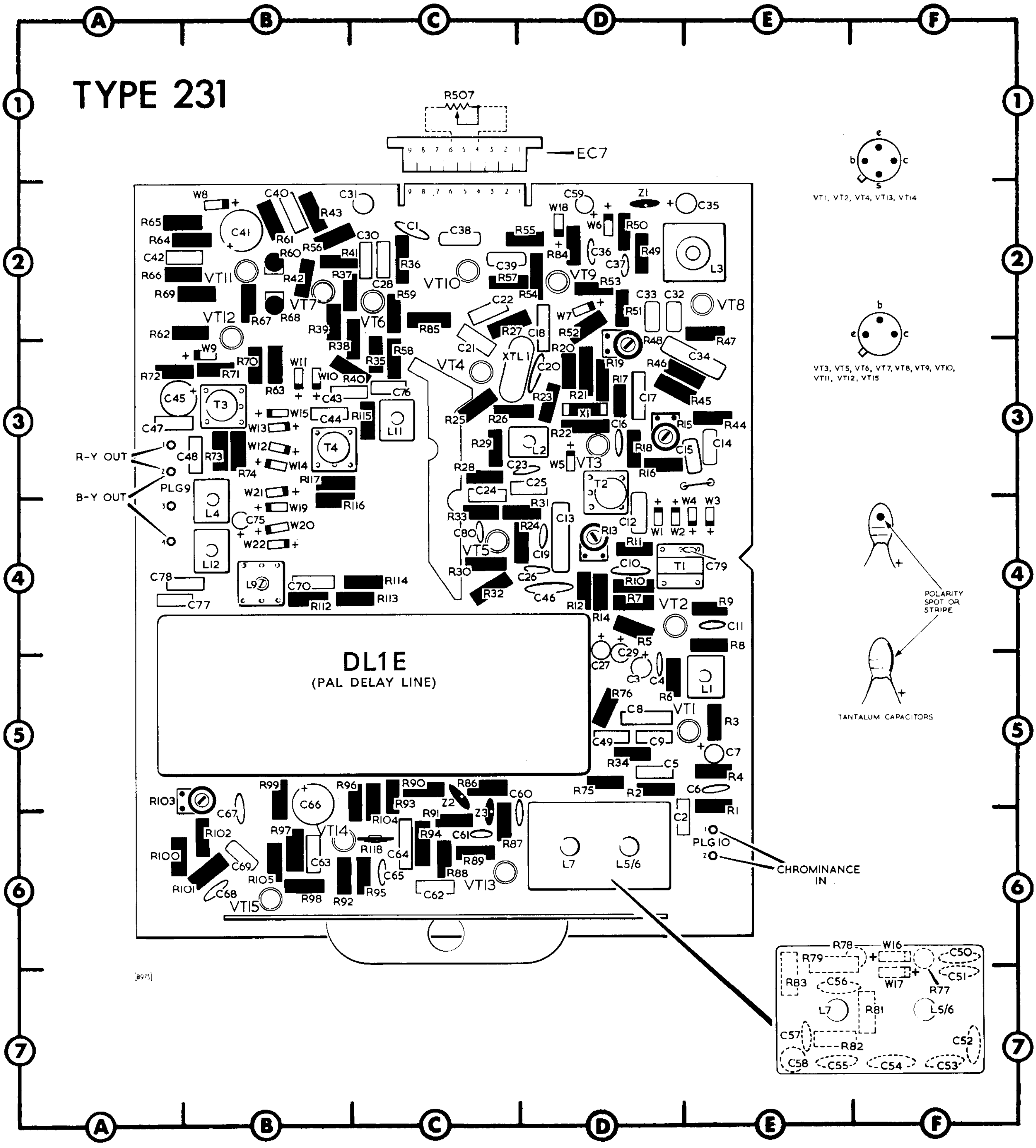


Ensure that the receiver is switched of

Board removal techniqu

tions and Details

as viewed from transistor base.



ɔre removing or inserting a printed board.

re described in Section A.

CAPACITORS

REF.	DESCRIPTION AND PART No.	LOC.
C1	0.05µF, —20 + 80%, 50V, Ceramic, 1034	C2
C2	200pF, 10%, 500V, Ceramic, 9M70	DE6
C3	4µF, 35V, Tantalum Electrolytic, 0E0–221/04	D5
C4	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	D5
C5	200pF, 10%, 500V, Ceramic, 9M70	D5
C6	5000pF, —20 + 80%, 500V, Ceramic, 9M72	E5
C7	4µF, 35V, Tantalum Electrolytic, 0E0–221/04	E5
C8	82pF, 10%, 750V, Ceramic, 9M73...	D5
C9	680pF, 20%, 500V, Ceramic, 9M74	D5
C10	0.05µF, —20 + 80%, 50V, Ceramic, 1034	D4
C11	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	E4
C12	0.22µF, 20%, 250V, Polyester, 9M75	D4
C13	0.47µF, 20%, 250V, Polyester, 6M54	D4
C14	0.1µF, 20% 250V, Polyester, 8M63	E3
C15	0.01µF, 20%, 50V, Ceramic, 9M76	E3
C16	0.01µF, 20%, 50V, Ceramic, 1060	D3
C17	5000pF, 20%, 750V, Ceramic, 9M77	D3
C18	0.01µF, 20%, 250V, Polyester, 8M57	D2
C19	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	D4
C20	79pF, 5%, 350V, Ceramic, 9M78	D3
C21	500pF, 10%, 500V, Ceramic, 9M79	C3
C22	500pF, 10%, 500V, Ceramic, 9M79	C2
C23	0.01µF, —20 + 50%, 100V, Ceramic, 9M71	CD3
C24	220pF, 10%, 500V, Ceramic, 9M80	C3
C25	390pF, 10%, 500V, Ceramic, 9M81	D3
C26	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	D4
C27	0.5µF, 35V, Tantalum Electrolytic, 0E0–220/15	D5
C28	150pF, 10%, 500V, Ceramic, 9M58	C2
C29	0.5µF, 35V, Tantalum Electrolytic, 0E0–220/15	D4,5
C30	47pF, 10%, 500V, Ceramic, 9M82...	C2
C31	2200pF, 10%, 125V, Polystyrene, 9M83	BC2
C32	0.047µF, 10%, 250V, Polyester, 6M47	D2
C33	0.047µF, 10%, 250V, Polyester, 6M47	D2
C34	0.47µF, 10%, 250V, Polyester, 9M84	E3
C35	1µF, 35V, Tantalum Electrolytic, 0E0-220/17	E2
C36	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	D2
C37	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	D2
C38	0.1µF, 20%, 250V, Polyester, 8M63	C2
C39	0.1µF, 20%, 250V, Polyester, 8M63	C2
C40	1000pF, 20%, 500V, Ceramic, 9M85	B2
C41	50µF, 25V, Electrolytic, 0E0–228/01	B2
C42	1000pF, 20%, 500V, Ceramic, 9M85	A2
C43	470pF, 10%, 500V, Ceramic, 9M86	B3
C44	470pF, 10%, 500V, Ceramic, 9M86	B3
C45	25µF, 25V, Electrolytic, 0E0–225/01	AB3
C46	0.05µF, —20 + 80%, 50V, Ceramic, 1034	D4
C47	50pF, 10%, 500V, Ceramic, 9M87...	A3
C48	8.2pF, 10%, 500V, Ceramic, 9M88	B3
C49	150pF, 10%, 500V, Ceramic, 9M58	D5
C50	62pF, 10%, 500V, Ceramic, 1010	F6
C51	62pF, 10%, 500V, Ceramic, 1010	F7
C52	75pF, 10%, 500V, Ceramic, 1009	F7
C53	75pF, 10%, 500V, Ceramic, 1009	F7
C54	120pF, 10%, 500V, Ceramic, 1N19	F7
C55	50pF, 10%, 500V, Ceramic, 1N29	E7
C56	100pF, 10%, 500V, Ceramic, 1008...	E7
C57	100pF, 10%, 500V, Ceramic, 1008...	E7
C58	50pF, 10%, 125V, Polystyrene, 1007	E7
C59	10µF, 15V, Tantalum Electrolytic, 0E0–222/06	D2
C60	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	CD6
C61	0.01µF, —20 + 80%, 100V, Ceramic, 9M71	C6
C62	300pF, 10%, 500V, Ceramic, 9M89	C6
C63	300pF, 10%, 500V, Ceramic, 9M89	B6
C64	470pF, 10%, 750V, Ceramic, 9M90	C6
C65	0.01µF, —20 + 80%, 50V, Ceramic, 9M91	C6
C66	100µF, 32V, Electrolytic, 0E0–229/03	B5
C67	Type 131: 0.1µF, 20%, 250V, Polyester, 8M63 *Type 231: 0.05µF, —20 + 80%, 50V, Ceramic, 1034*	B5,6 *B5,6*
C68	Type 131: 0.1µF, 20%, 250V, Polyester, 8M63 *Type 231: 0.05µF, —20 + 80%, 50V, Ceramic, 1034*	B6 *B6*
C69	0.1µF, 20%, 250V, Polyester, 8M63	B6
C70	Type 131: 3pF, 10%, 500V, Ceramic, 9M92 *Type 231: 1000pF, 10%, 500V, Ceramic, 1037*	B6 *B4*
C71*	1000pF, —20 + 80%, 500V, Ceramic, 9M85	BC4
C72*	120pF, 10%, 500V, Ceramic, 9M93	B4
C73*	0.1µF, 20%, 250V, Polyester, 8M63	C3
C74*	200pF, 10%, 500V, Ceramic, 9M70	C4
C75	4µF, 35V, Tantalum Electrolytic, 0E0–221/04	B4
C76	25pF, 10%, 500V, Ceramic, 9M94...	C3
C77	50pF, 10%, 500V, Ceramic, 9M87...	B4
C78	8.2pF, 10%, 500V, Ceramic, 9M88	A4
C79	Type 131: 2pF, ±0.25pF, 500V, Ceramic, 1038 *Type 231: 8pF, ±0.25pF, 500V, Ceramic, 1037*	E4 *E4*
C80†	120pF, 10%, 500V, Ceramic, 1N19	C4

* Fitted to Type 131 only

† *Fitted to Type 231 only*

DIODES

REF.	DESCRIPTION AND PART No.	LOC.
W1	0A91 Germanium, 0V4–616	D4
W2	0A91 Germanium, 0V4–616	D4
W3	0A91 Germanium, 0V4–616	E4
W4	0A91 Germanium, 0V4–616	E4
W5	BA102 Vari-cap Silicon, 0V4–121	D3
W6	0A91 Germanium, 0V4–616	D2
W7	0A91 Germanium, 0V4–616	D2
W8	0A91 Germanium, 0V4–616	B2
W9	0A91 Germanium, 0V4–616	B3
W10	0A47 Germanium, 0V4–617	B3
W11	0A47 Germanium, 0V4–617	B3
W12	0A90 Germanium, 0V4–610	B3
W13	0A90 Germanium, 0V4–610	B3
W14	0A90 Germanium, 0V4–610	B3
W15	0A90 Germanium, 0V4–610	B3
W16	Type 131: 0A91 Germanium, 0V4–616 *Type 231: 0A47 Germanium, 0V4–617*	F6,7 *F6,7*
W17	Type 131: 0A91 Germanium, 0V4–616 *Type 231: 0A47 Germanium, 0V4–617*	F7 *F7*
W18	0A91 Germanium, 0V4–616	D2
W19	0A90 Germanium, 0V4–610	B4
W20	0A90 Germanium, 0V4–610	B4
W21	0A90 Germanium, 0V4–610	B3
W22	0A90 Germanium, 0V4–610	B4

TRANSISTORS

REF.	DESCRIPTION AND PART No.	LOC.
VT1	BF115 Mullard, 0V1–310	DE5
VT2	BF115 Mullard, 0V1–310	D4
VT3	BC107 Mullard, 0V1–314	D3
VT4	BF115 Mullard, 0V1–310	C3
VT5	BC107 Mullard, 0V1–314	C4
VT6	BC107 Mullard, 0V1–314	C2
VT7	BC107 Mullard, 0V1–314	B2
VT8	BC107 Mullard, 0V1–314	E2
VT9	BC107 Mullard, 0V1–314	D2
VT10	BC107 Mullard, 0V1–314	C2
VT11	BC107 Mullard, 0V1–314	B2
VT12	BC107 Mullard, 0V1–314	B2
VT13	BF115 Mullard, 0V1–310	C6
VT14	BF115 Mullard, 0V1–310	BC6
VT15	BC107 Mullard, 0V1–314	B6
VT16*	BC107 Mullard, 0V1–314	B4

* Fitted to Type 131 only

MISCELLANEOUS

REF.	DESCRIPTION AND PART No.	LOC.
DL1*	Chrominance delay line, 0E5–999	C4,5
DL1E†	Chrominance delay line, 0E5–997	C4,5
EC7	9-way edge-connector	**
SKT10	2-way non-reversible connector	**
X1	Thermistor, 0E5–109/01	D3
XTL1	Crystal 4.433618 MHz, 0E5–998	CD3
Z1	Assymetrical VDR, 0E5–108/02	D2
Z2	Assymetrical VDR, 0E5–108/01	C5
Z3	Assymetrical VDR, 0E5–108/01	C5,6

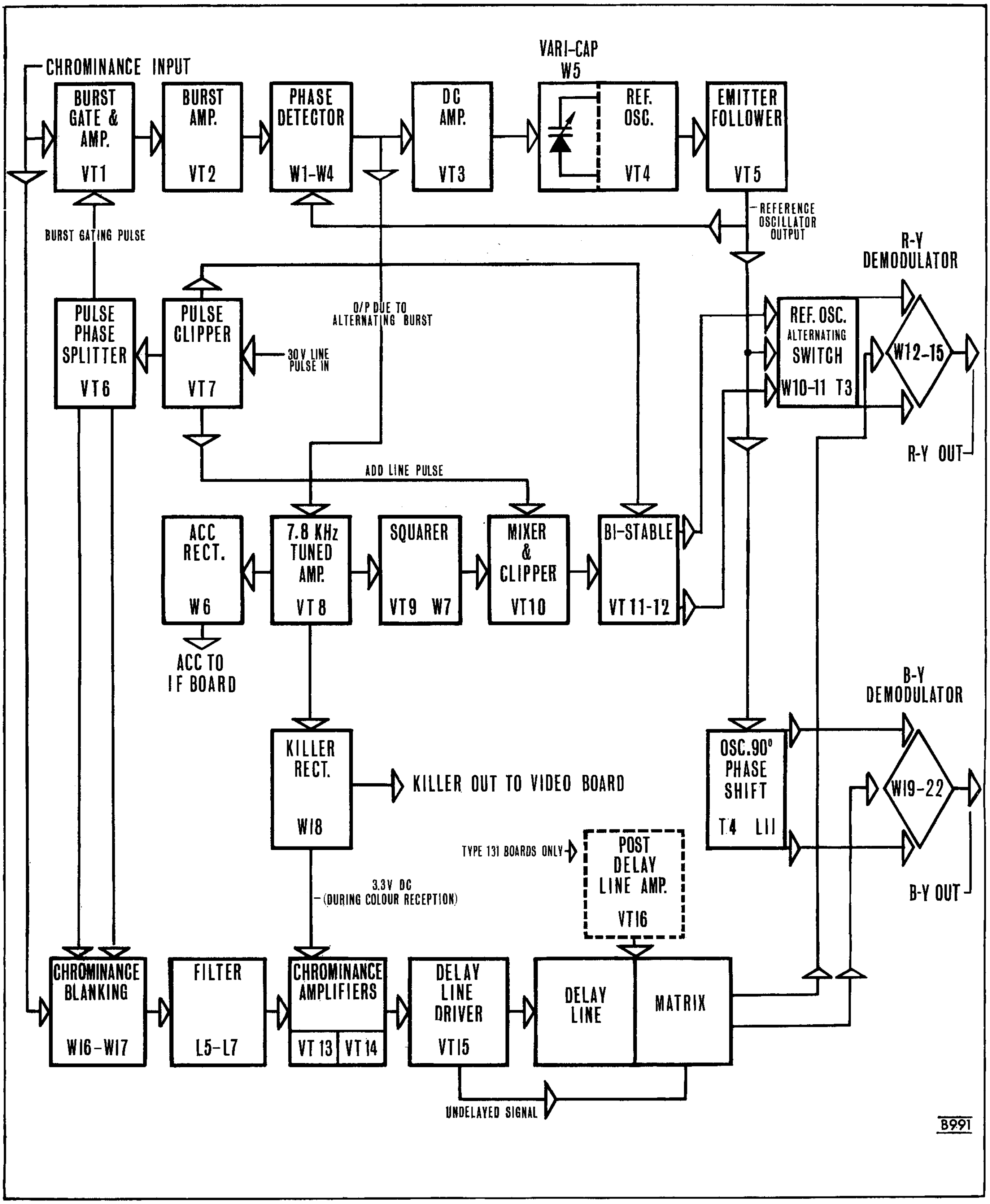
* Fitted to Type 131 only

** See Chassis Frame, Section L

† *Fitted to Type 231 only*

Continued on page 11

Circuit Description



Simplified Block Schematic of Chrominance Circuit Types 131 and 231

CHROMINANCE INPUT

The chrominance signal (from the IF board) is split between the Burst Reference channel and the Chrominance channel at the common input terminal PLG10/1.

PULSE CIRCUIT (VT6 & VT7)

Half-sine pulses, derived from the line timebase, are coupled via C31 to the base of pulse clipper VT7. A proportion of the pulse appearing at the collector is used as a triggering pulse for the bistable. The collector is DC coupled into the base of VT6 which functions as a pulse phase splitter, i.e. positive- and negative-going pulses appear at the collector and emitter respectively. These pulses drive the double diode Chrominance Blanker (W16 and W17) which is balanced to exclude the ring which would be produced at the start of picture by single-ended blanking. Additionally the positive pulses via the integrator R34, C5 and R2, gate the first Burst amplifier on.

BURST REFERENCE CHANNEL

VT1 is gated on only during the Burst periods. The collector of VT1 is tuned to the subcarrier frequency (4.43 MHz) and is followed by an untuned amplifier VT2 which is coupled via T1 into two of the bridge terminals of the Phase Detector W1-W4. The Phase Detector functions to correct the frequency and phase of the Reference Oscillator VT4. The output from the Reference Oscillator is injected via T2 into the other bridge terminals and its phase and frequency are compared with those of the Burst pulses. Any resultant DC output drives the DC amplifier VT3, which in turn controls the Reference Oscillator frequency and phase via vari-cap diode W5. The crystal controlled Reference Oscillator VT4 drives the emitter follower VT5 via the tuned circuit L2 to eliminate harmonics of 4.43 MHz.

CHROMINANCE CHANNEL

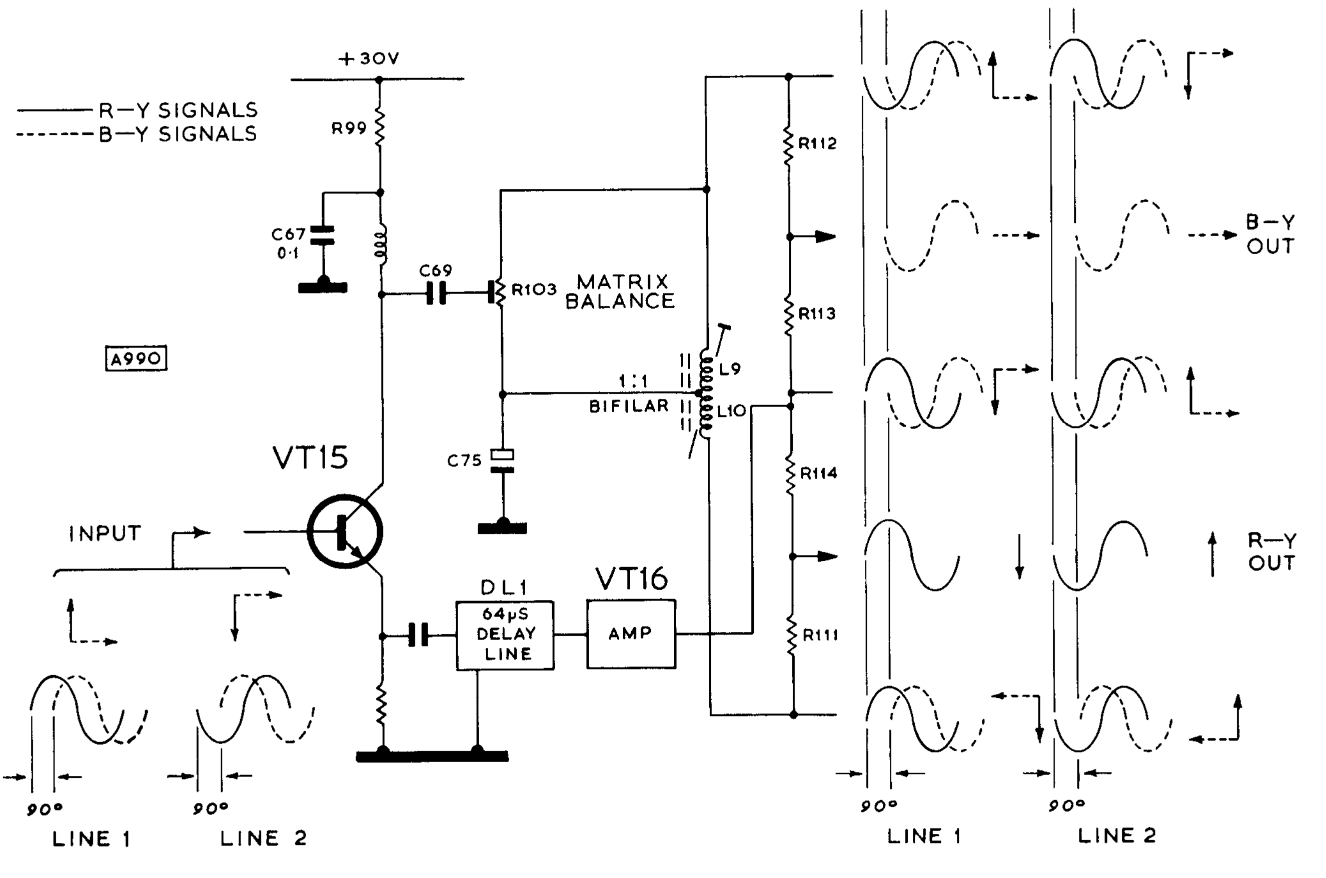
The Chrominance signal is taken from the common input (PLG10) to a balanced double diode blanking circuit (W16 and W17) which operates to blank off the Chrominance channel during each line flyback period.

The blanking circuit is followed by a subcarrier sound beat rejector L5, bandpass filter L6 and intercarrier sound rejector L7.

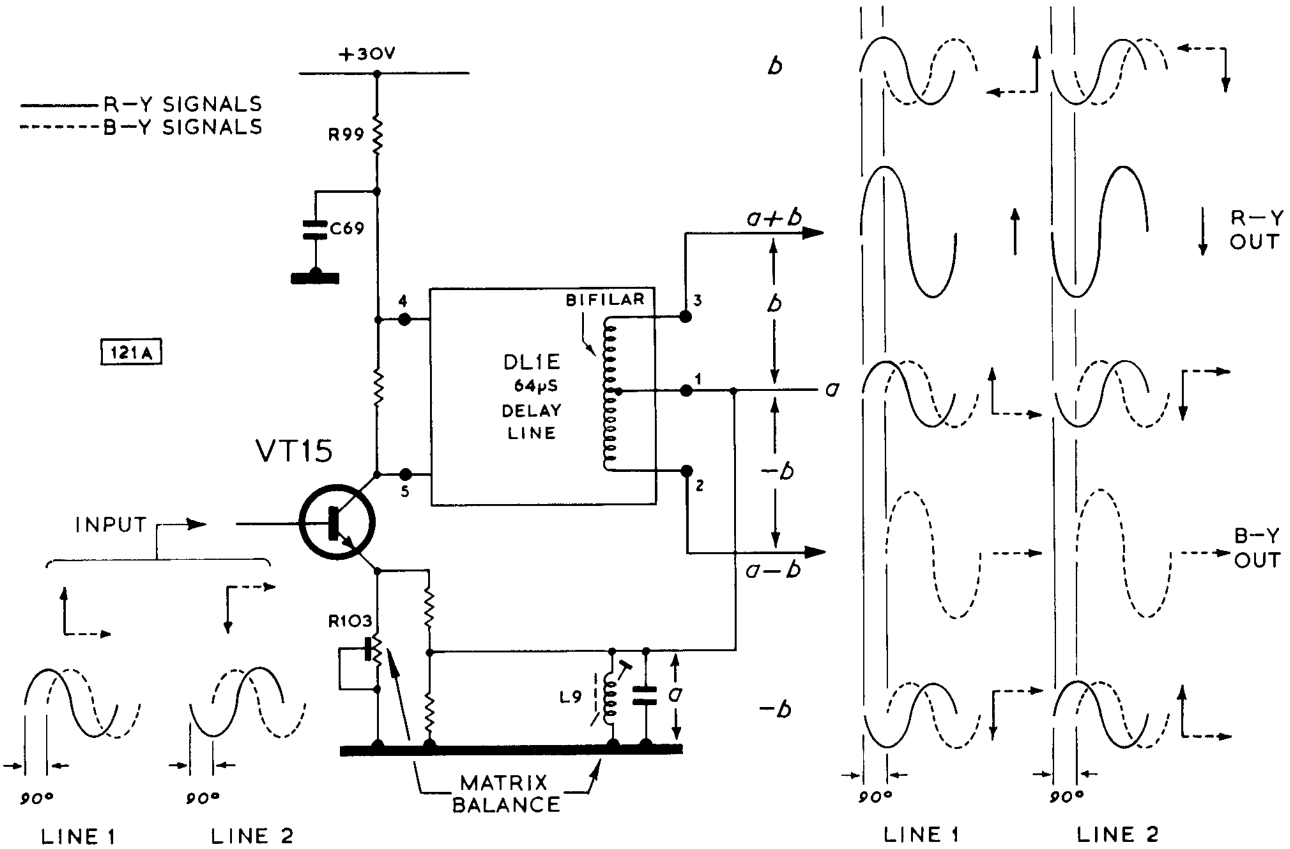
Two RC coupled transistors, VT13 and VT14 operate as the chrominance amplifiers with phase shift correction applied at the emitter of the second stage VT14. The Colour control R507 adjusts the gain of VT13 by varying its emitter bias. This stage is turned on at the base by the Killer bias only when the Burst is present.

DELAY LINE & MATRIX

TYPE 131. The delay line and the bifilar coils L9 and L10 are respectively driven from the emitter and the collector of Delay Line Driver VT15. A post-delay line amplifier VT16 makes up for the attenuation in the line and is phase corrected in its emitter. The amplitude of the bifilar coils output is adjustable by R103 (Matrix Balance) in order to match that of the delay line path. The output from the delay line path is applied to the common end of the two matrix networks (junction of R113 and R114). The other ends of the matrices are supplied from tags 1 and 5 of the bifilar with opposite phases of the undelayed signal. As there is no effective phase shift in the stored signal and the B-Y signal is not alternated, one of the matrices connected to the correct end of the bifilar will always have at its centre (output) the B-Y signal (see Simplified Circuit Type 131). This is taken to the B-Y demodulator. The other matrix which is also driven from the delay line and from the reverse end of the bifilar will then always have its centre (output) the R-Y signal. Since the R-Y signal is alternated 180° line by line, this matrix will have at its



Simplified Circuit Diagram of Delay Line and Matrix Type 131



Simplified Circuit Diagram of Delay Line and Matrix Type 231

ends R-Y voltages of similar phase but the pair will alternate together just as the R-Y component of the transmission. The centre of this matrix (output) will do the same and the signal at this point is fed to the R-Y demodulator.

TYPE 231. *The Delay Line and L9 are respectively driven from the collector and emitter of Delay Line Driver VT15. The amplitude of the signal applied to the Delay Line is adjusted by R103 in order to match that appearing across L9. The output from the Delay Line is applied to a bifilar coil assembly, contained within the Delay Line housing (see Type 231 Simplified Circuit). At the output terminals (3 and 2) signals with a 180° phase relationship appear (b and -b). To the centre point of the bifilar (terminal 1) is added the signal from VT15 emitter, i.e. signal (a). As there is no effective phase shift in the delayed signal and B-Y signal is not alternated, at one output of the bifilar (terminal 2) there will appear the B-Y signal only. This is taken to the B-Y demodulator.*

At the other output of the bifilar (terminal 3) there will then appear the R-Y signal. Since the R-Y signal is alternated 180° line by line, this bifilar output will also alternate. This signal is applied to the R-Y demodulator.

DEMODULATORS

The R-Y and B-Y demodulators comprise two phase detector bridges which are driven by the chrominance signals and the Reference Oscillator. The B-Y bridge is supplied with the 4.43 MHz reference waveform which is 90° phase shifted by C76 and L11 to bring it round to the B-Y axis.

Since the R-Y component of the chrominance signal is inverted every line, the Reference Oscillator output is also inverted every line before application to the R-Y demodulator, to maintain a similar output on every line. Alternation of the Reference Oscillator output is achieved by push-pull transformer T3 and diode switches W10 and W11. Any residual 4.43 MHz component in the demodulated signals is trapped out by the tuned circuits L4-C48 and L12-C78 in each output.

BISTABLE SWITCH

The switching drive for the alternating oscillator input circuit (W10, W11 and T3) is supplied by the Bistable circuit VT11 and VT12 the latter transistor being locked to the line timebase. To identify which state corresponds to which line, one half of the Bistable (VT11) is synchronized by a pulse which is fed in on every other line. This identification pulse is derived as follows: A half line-frequency component from the Phase Detector reference bridge output is fed via C14 into the tuned amplifier VT8 to produce a sine wave. The sine wave is squared in the following stage VT9, line pulses are added and the result sliced near the top (in VT10) thus giving out a line pulse only on every other line.

The other half of the Bistable (VT12) is driven by line pulses from the junction of R39 and R40. W8 and W9 are steering diodes, i.e. they arrange for the other half of the Bistable to be open to the next switching pulse.

KILLER AND ACC BIAS

Half the sine wave amplitude in VT8 collector circuit is tapped off from capacitive divider C32-C33 and rectified by W18 to provide Killer bias for the first Chrominance amplifier—if the Burst is missing the Killer bias disappears and the first Chrominance amplifier is switched off. This bias is also fed to a 4.43 MHz trap circuit on the Video board. ACC voltage is also developed from the 7.8 KHz sine wave. The sine wave is rectified by W6 and applied via a delay circuit (with adjustable element R48) to the Chrominance emitter follower on the IF board.

Component Locations and Details—continued from page 7

RESISTORS

REF.	DESCRIPTION AND PART No.	LOC
R1	15K Ω, 20%, 0.2W, 1A70	E5,6
R2	12K Ω, 20%, 0.2W, 3B71	D5
R3	22 Ω, 10%, 0.2W, 3B72	E5
R4	470 Ω, 20%, 0.2W, 3B40	E5
R5	1.8K Ω, 10%, 0.2W, 8A07	D4
R6	2.7K Ω, 10%, 0.2W, 7A38	D5
R7	39K Ω, 10%, 0.2W, 2B01	D4
R8	2.2K Ω, 10%, 0.2W, 6A89	E4
R9	220 Ω, 20%, 0.2W, 3B73	E4
R10	1.8K Ω, 10%, 0.2W, 8A07	D4
R11	33K Ω, 10%, 0.2W, 8A33	D4
R12	22K Ω, 20%, 0.2W, 4A93	D4
R13	2.2K Ω, Preset, 0E1–002/06	D4
R14	820 Ω, 10%, 0.2W, 8A27	D4
R15	100K Ω, Preset, 0E1–002/07	DE3
R16	3.3M Ω, 10%, 0.2W, 8A29	D3
R17	47K Ω, 10%, 0.2W, 7A56	D3
R18	47K Ω, 10%, 0.2W, 7A56	D3
R19	56K Ω, 10%, 0.2W, 1B60	D3
R20	68K Ω, 10%, 0.2W, 1A30	D3
R21	1.5K Ω, 10%, 0.2W, 8A06	D3
R22	12K Ω, 10%, 0.2W, 1A89	D3
R23	33K Ω, 10%, 0.2W, 8A22	D3
R24	470 Ω, 10%, 0.2W, 7A37	D4
R25	120K Ω, 10%, 0.2W, 8A14	C3
R26	82K Ω, 10%, 0.2W, 3B74	C3
R27	8.2K Ω, 10%, 0.2W, 8A50	CD2
R28	6.8K Ω, 10%, 0.2W, 8A08	C3
R29	6.8K Ω, 10%, 0.2W, 8A08	C3
R30	15K Ω, 10%, 0.2W, 1A18	C4
R31	4.7K Ω, 10%, 0.2W, 2A27	D4
R32	1K Ω, 10%, 0.2W, 1A52	C4
R33	120 Ω, 10%, 0.2W, 1B98	C4
R34	12K Ω, 20%, 0.2W, 3B71	D5
R35	1.5K Ω, 10%, 0.2W, 8A06	C3
R36	1.5K Ω, 10%, 0.2W, 8A06	C2
R37	6.8K Ω, 10%, 0.2W, 8A08	BC2
R38	22K Ω, 10%, 0.2W, 4A92	B3
R39	1.2K Ω, 10%, 0.2W, 7A44	B2
R40	270 Ω, 10%, 0.2W, 3B75	BC3
R41	100 Ω, 10%, 0.2W, 1A28	BC2
R42	6.8K Ω, 10%, 0.2W, 8A08	B2
R43	33K Ω, 10%, 0.2W, 8A22	B2
R44	22K Ω, 10%, 0.2W, 4A92	E3
R45	270K Ω, 10%, 0.2W, 9A95	E3
R46	1.5K Ω, 10%, 0.2W, 8A06	D3
R47	330 Ω, 10%, 0.2W, 7A41	E2,3
R48	100K Ω, Preset, 0E1–002/07	D2,3
R49	180K Ω, 10%, 0.2W, 5A01	D2
R50	82K Ω, 10%, 0.2W, 3B76	D2
R51	47K Ω, 10%, 0.2W, 7A85	D2
R52	33K Ω, 10%, 0.2W, 8A22	D2
R53	39K Ω, 10%, 0.2W, 2B43	D2
R54	6.8K Ω, 10%, 0.2W, 6A90	D2
R55	39K Ω, 20%, 0.2W, 3B77	D2
R56	4.7K Ω, 10%, 0.2W, 1A32	B2
R57	47K Ω, 10%, 0.2W, 7A56	C2
R58	1.5K Ω, 10%, 0.2W, 1B14	C3
R59	5.6K Ω, 5%, 0.2W, 3B78	C2
R60	1K Ω, 10%, 0.5W, 3B79	B2
R61	22K Ω, 10%, 0.2W, 7A74	B2
R62	15K Ω, 10%, 0.2W, 7A55	A2
R63	560 Ω, 10%, 0.2W, 2A33	B3
R64	12K Ω, 10%, 0.2W, 1A89	A2
R65	150 Ω, 10%, 0.2W, 2A94	A2
R66	12K Ω, 10%, 0.2W, 1A89	A2
R67	15K Ω, 10%, 0.2W, 7A55	B2
R68	1K Ω, 10%, 0.5W, 3B79	B2
R69	22K Ω, 20%, 0.2W, 3B80	A2
R70	560 Ω, 10%, 0.2W, 2A33	B3
R71	18K Ω, 10%, 0.2W, 3B81	B3
R72	6.8K Ω, 10%, 0.2W, 8A08	A3
R73	470 Ω, 10%, 0.2W, 7A37	B3
R74	470 Ω, 10%, 0.2W, 7A37	B3
R75	12K Ω, 20%, 0.2W, 3B71	D5
R76	12K Ω, 20%, 0.2W, 3B71	D5
R77	6.8K Ω, 10%, 0.1W, 1A39	F7
R78	6.8K Ω, 10%, 0.1W, 1A39	E6
R79	6.8K Ω, 10%, 0.1W, 5B17	E6
R80*	390 Ω, 10%, 0.1W, 5B14	F7
R81	150 Ω, 10%, 0.1W, 5B15	F7
R82	2.2K Ω, 10%, 0.1W, 9A30	EF7

RESISTORS-*continued*

REF.	DESCRIPTION AND PART No.	LOC.
R83	10K Ω, 10%, 0.1W, 7A34	E7
R84	12K Ω, 10%, 0.2W, 1A89	D2
R85	12K Ω, 10%, 0.2W, 1A89	C2
R86	22K Ω, 10%, 0.2W, 7A74	C5
R87	15K Ω, 10%, 0.2W, 1A18	C6
R88	1.2K Ω, 10%, 0.2W, 7A54	C6
R89	Type 131: 100 Ω, 10%, 0.2W, 1A28 *Type 231: 39 Ω, 10%, 0.2W, 2B04*	C6 *C6*
R90	150 Ω, 10%, 0.2W, 6A93	C5
R91	150K Ω, 10%, 0.2W, 5A49	C6
R92	Type 131: 3.9K Ω, 10%, 0.2W, 6A88 *Type 231: 10K Ω, 10%, 0.2W, 2A34*	B6 *B6*
R93	Type 131: 10K Ω, 10%, 0.2W, 2A34 *Type 231: 27K Ω, 10%, 0.2W, 2A24*	C5 *C5*
R94	Type 131: 68 Ω, 10%, 0.2W, 7A75 *Type 231: 33 Ω, 10%, 0.2W, 5B54*	C6 *C6*
R95	1K Ω, 10%, 0.2W, 1A52	C6
R96	1.2K Ω, 10%, 0.2W, 7A54	BC5
R97	Type 131: 27K Ω, 10%, 0.2W, 4A98 *Type 231: 15K Ω, 10%, 0.2W, 1A18*	B6 *B6*
R98	Type 131: 12K Ω, 10%, 0.2W, 1A94 *Type 231: 6.8K Ω, 10%, 0.2W, 1A08*	B6 *B6*
R99	Type 131: 100 Ω, 10%, 0.2W, 8A36 *Type 231: 560 Ω, 10%, 0.2W, 2A33*	B5 *B5*
R100	Type 131: 680 Ω, 10%, 0.2W, 1B49 *Type 231: 330 Ω, 10%, 0.2W, 8A49*	A6 *A6*
R101	Type 131: 220 Ω, 10%, 0.2W, 7A43 *Type 231: 120 Ω, 10%, 0.2W, 1B98*	AB6 *AB6*
R102	Type 131: 22 Ω, 10%, 0.2W, 3B72 *Type 231: 39 Ω, 10%, 0.2W, 2B04*	B6 *B6*
R103	Type 131: 500 Ω, Preset, 0E1–002/11 *Type 231, 300 Ω, Preset, 0E1–002/12*	A5 *A5*
R104	100 Ω, 10%, 0.2W, 8A77	C6
R105	Type 131: 150 Ω, 10%, 0.2W, 6A93 *Type 231: 390 Ω, 5%, 0.2W, 7A84*	C4 *B6*
R106*	39K Ω, 10%, 0.2W, 2B01	C3
R107*	10K Ω, 10%, 0.2W, 2A34	C4
R108*	39 Ω, 10%, 0.2W, 2B04	BC4
R109*	470 Ω, 10%, 0.2W, 7A37	C4
R110*	470 Ω, 20%, 0.2W, 9A45	C3
R111*	1.5K Ω, 5%, 0.2W, 3B81	B4
R112	Type 131: 1.5K Ω, 5%, 0.2W, 3B82 *Type 231: 47 Ω, 10%, 0.2W. 5B51*	B4 *B4*
R113	Type 131: 1.5K Ω, 5%, 0.2W, 3B81 *Type 231: 100 Ω, 5%, 0.2W, 1B85*	C4 *C4*
R114	Type 131: 1.5K Ω, 5%, 0.2W, 3B81 *Type 231: 47 Ω, 10%, 0.2W, 1B79*	C4 *C4*
R115	3.3K Ω, 10%, 0.2W, 1B50	C3
R116	470 Ω, 10%, 0.2W, 7A37	BC4
R117	470 Ω, 10%, 0.2W, 7A37	B3
R118†	200 Ω, Preset, 0E1–027/05	C6
R507††	10K Ω, Reverse semi-log Pot. (Colour control), 0E1–015/07	**

* Fitted to Type 131 only

† *Fitted to Type 231 only*

**See Chassis Frame, Section L

†† Twist-tab type, 0E1–041/09

INDUCTORS AND TRANSFORMERS

REF.	DESCRIPTION AND PART No.	LOC.
L1	VT1 collector coil, 0D0–160	E5
L2	VT4 collector coil, 0D0–159	D3
L3	VT8 collector coil, 0D0–157	E2
L4	4.43MHz rejector coil, 0D0–158	B4
L5	Chrominance-Sound beat rejector	
L6	1st Chrominance Amplifier base coil } Type 131, 0D0 161 / *Type 231, 0D0-238*	D6 *D6*
L7	6 MHz sound rejector	
L8*	Delay line driver collector coil, 0D0–164	B6
L9†	Matrix coil, 0D0–237	B4
L9-10*	Matrix bifilar winding, 0D0–163	B4

Continued on page 12

Circuit Diagram Notes

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 input; all controls set for normal operation under colour reception conditions. A tolerance of ±5% should be allowed for the 30V board supply, but variations of up to 20% in other figures do not necessarily indicate fault conditions.

Component Locations and Details—continued from page 11

INDUCTORS AND TRANSFORMERS-*cont.*

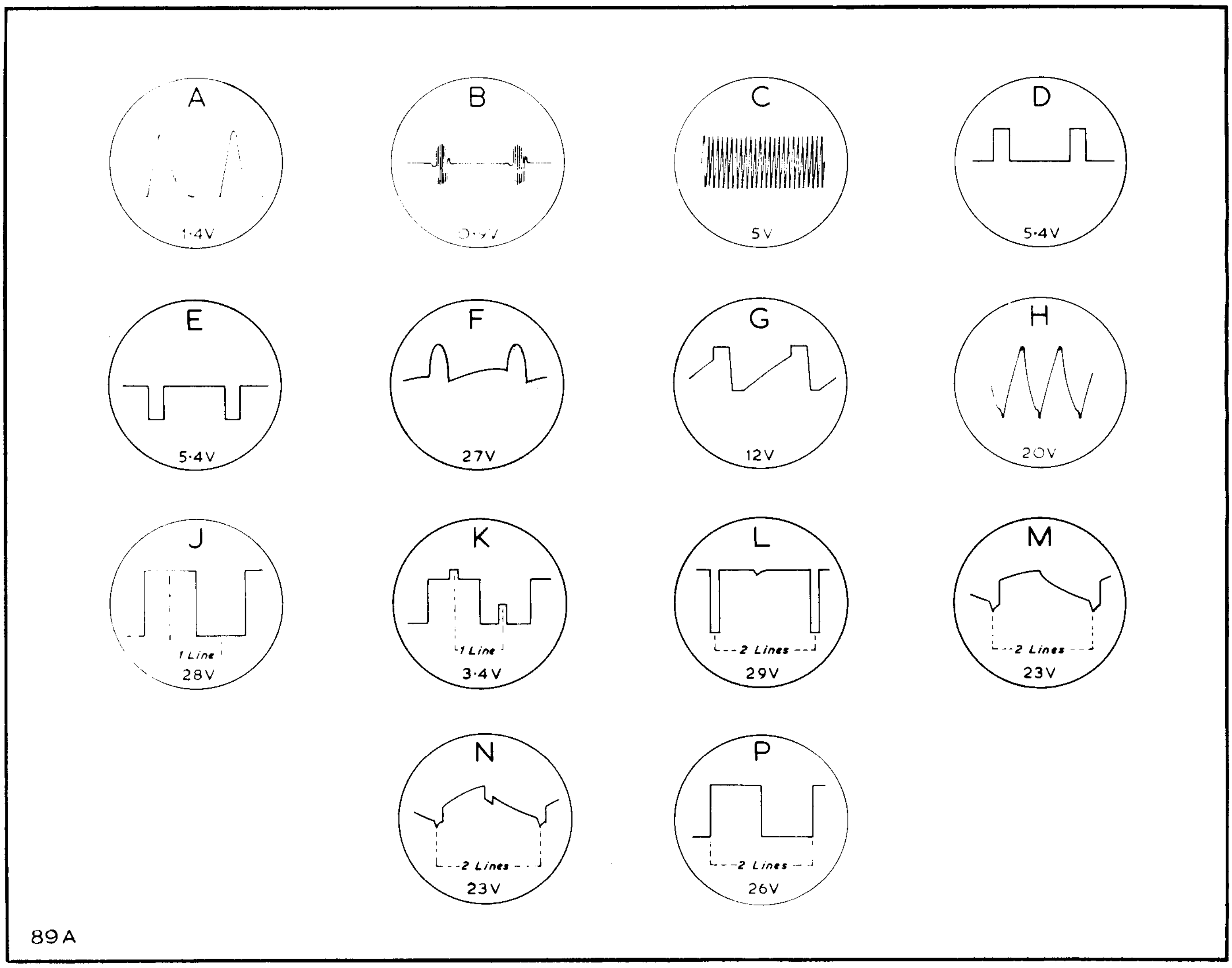
REF.	DESCRIPTION AND PART No.	LOC.
L11	B-Y phase adjustment, 0D0–162	C3
L12	4.4MHz rejector coil, 0D0–158	B4
T1	Burst transformer (including C79) { Type 131, 0D4–051 / *Type 231, 0D4–067*	DE4 / *DE4*
T2	Burst reference bridge oscillator transformer, 0D4-050 ...	D3
T3	R-Y reference oscillator transformer, 0D4–048	B3
T4	B-Y reference oscillator transformer { Type 131, 0D4–049 / *Type 231, 0D4–066*	B3 / *B3*
	* Fitted to Type 131 only	
	† *Fitted to Type 231 only*	

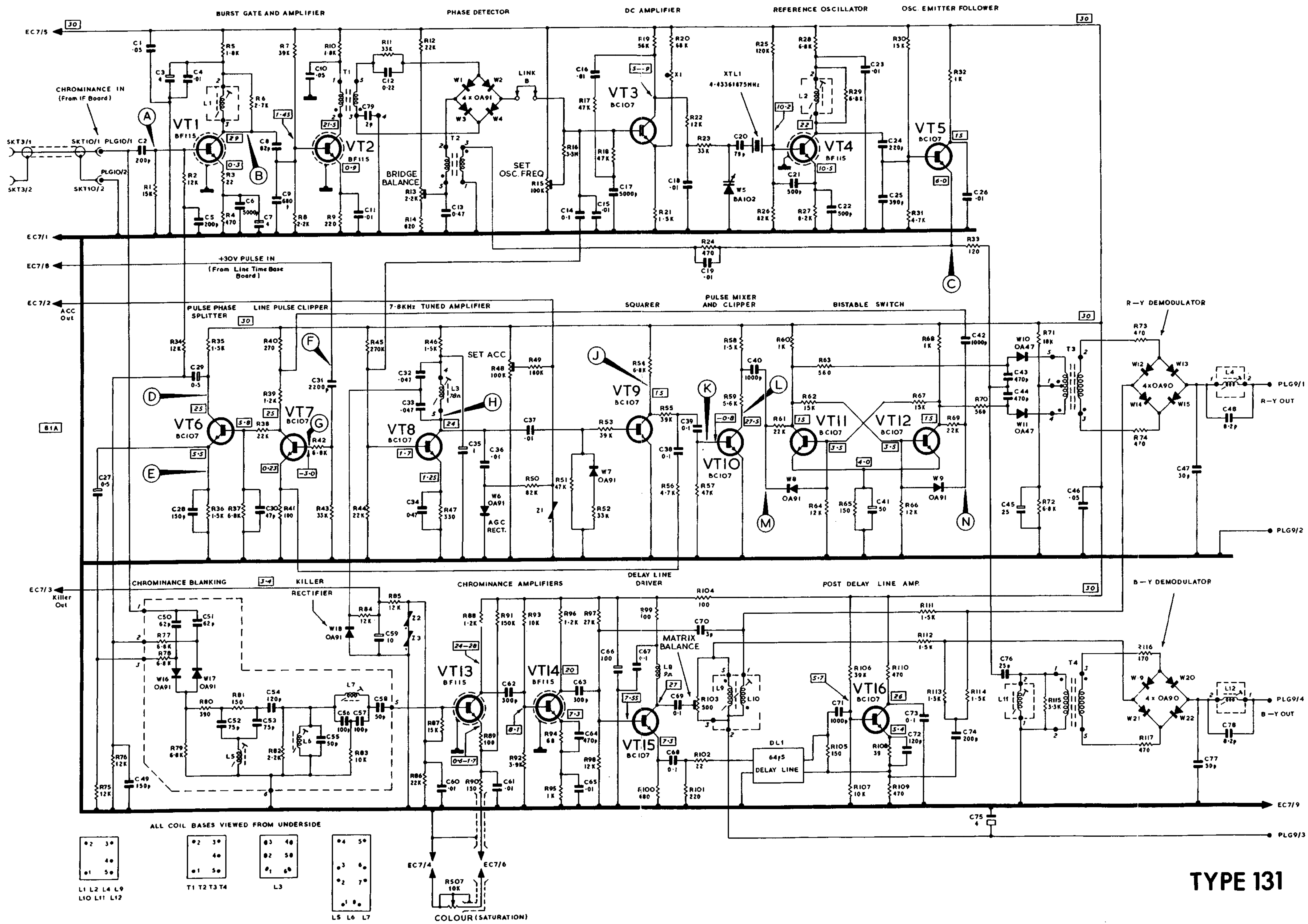
OSCILLOGRAMS. These were taken at line frequency and are referred to by corresponding letters at the appropriate points in both circuit diagrams. Oscillogram (P) not shown in the circuit diagrams was taken at VT11 or VT12 collector. The voltage figures given with the oscillograms represent peak-to-peak amplitudes measured via a probe having an input capacitance of 8pF in parallel with 10M Ω.

PLEASE NOTE (231 Circuit only)

L11 should be designated SET B-Y PHASE and not L9 as shown in the circuit diagram. L9 with R103 is a Matrix Balance adjustment. Also R80 (Chrominance input filter) is replaced by a shorting link.

MODIFICATIONS SUMMARY (*Type 131 ONLY*). The following differences from the circuit diagram may be found on some boards: C11—5000pF; C64—220pF; C72—500pF or 250pF; C79—not fitted; R23—120K Ω; R94—39K Ω.





BURST GATE AND AMPLIFIER
PHASE DETECTOR
DC AMPLIFIER
REFERENCE OSCILLATOR
OSC. EMITTER FOLLOWER
CHROMINANCE IN
(From IF Board)
+30V PULSE IN
(From Line Time Base Board)
PULSE PHASE SPLITTER
LINE PULSE CLIPPER
7·8KHz TUNED AMPLIFIER
SQUARER
PULSE MIXER AND CLIPPER
BISTABLE SWITCH
R–Y DEMODULATOR
R–Y OUT
B–Y DEMODULATOR
B–Y OUT
CHROMINANCE BLANKING
KILLER RECTIFIER
CHROMINANCE AMPLIFIERS
DELAY LINE DRIVER
MATRIX BALANCE
POST DELAY LINE AMP.
BRIDGE BALANCE
SET OSC. FREQ
SET ACC
AGC RECT.
DELAY LINE
ALL COIL BASES VIEWED FROM UNDERSIDE
L1 L2 L4 L9 L10 L11 L12
T1 T2 T3 T4
L3
L5 L6 L7
COLOUR (SATURATION)
EC7/5
EC7/1
EC7/8
EC7/2 ACC Out
EC7/3 Killer Out
EC7/4
EC7/6
EC7/9
PLG9/1
PLG9/2
PLG9/3
PLG9/4

TYPE 131

Interconnection Details

EC7

1 To chassis
2 ACC to IF board EC9/9
3 Bias to Video EC8/13
4 Earth return for Colour control
5 30V from Power Supply EC10/14
6 To Colour control, live end
7 not used
8 30V pulse in from Line Timebase EC5/11
9 To chassis

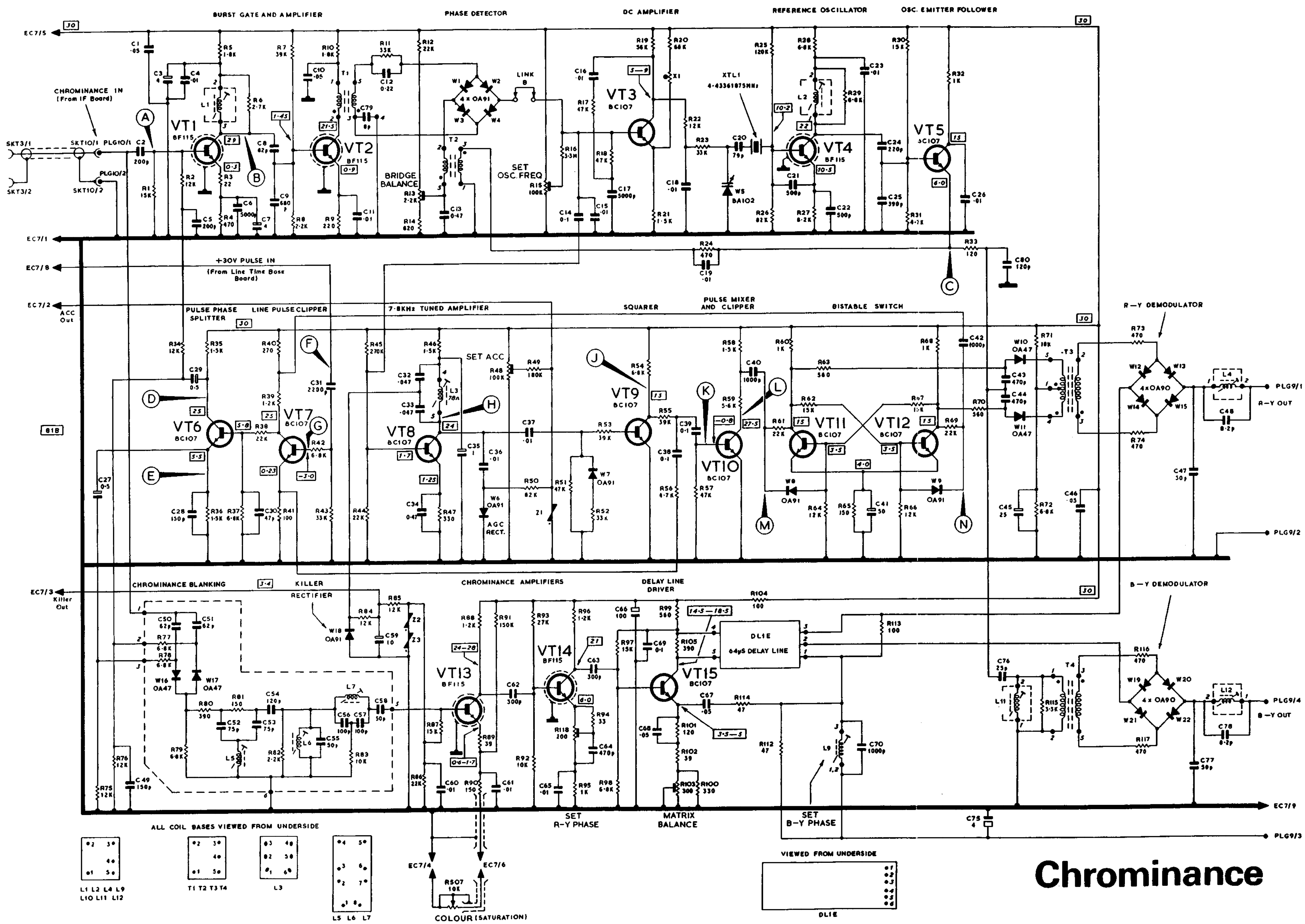
PLG9—pins on board

1 R-Y to Video
2 Screens joined for R-Y and B-Y to Video
3 AC return for colour difference outputs
4 B-Y to Video

PLG10—pins on board

1	inner	Chrominance in on SKT10 through main cableform and SKT3 on IF board
2	screen	

Chrominance



Chrominance

Interconnection Details

EC7

1 To chassis
2 ACC to IF board EC9/9
3 Bias to Video EC8/13
4 Earth return for Colour control
5 30V from Power Supply EC10/14
6 To Colour control, live end
7 not used
8 30V pulse in from Line Timebase EC5/11
9 To chassis

PLG9—pins on board

1 R-Y to Video
2 Screens joined for R-Y and B-Y to Video
3 AC return for colour difference outputs
4 B-Y to Video

PLG10—pins on board

1 inner } Chrominance in on SKT10 through main
2 screen } cableform and SKT3 on IF board