PAL 625-LINE COLOUR-SIGNAL DECODER GE1L/528

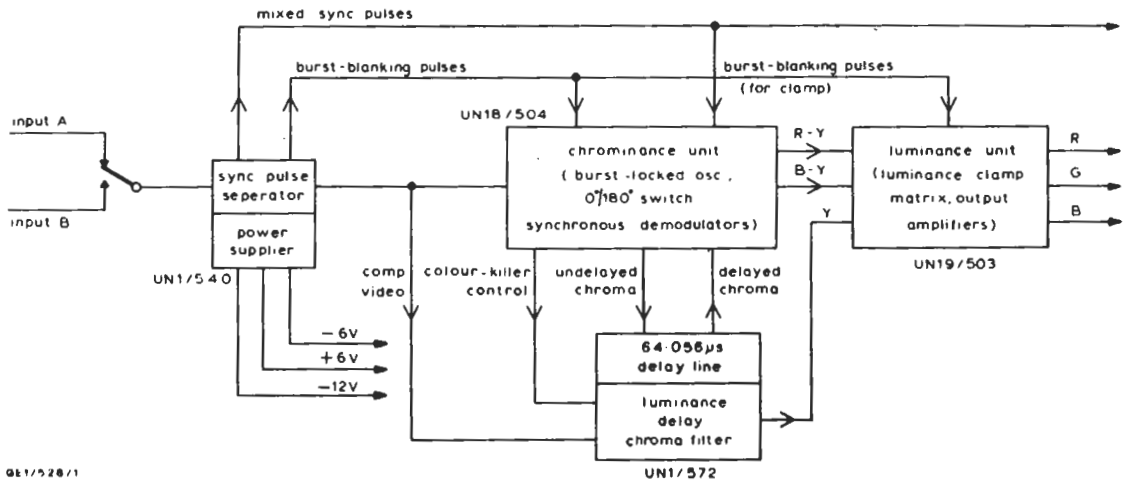

Fig. 1 Block Diagram of the Colour-signal Decoder GE1/528

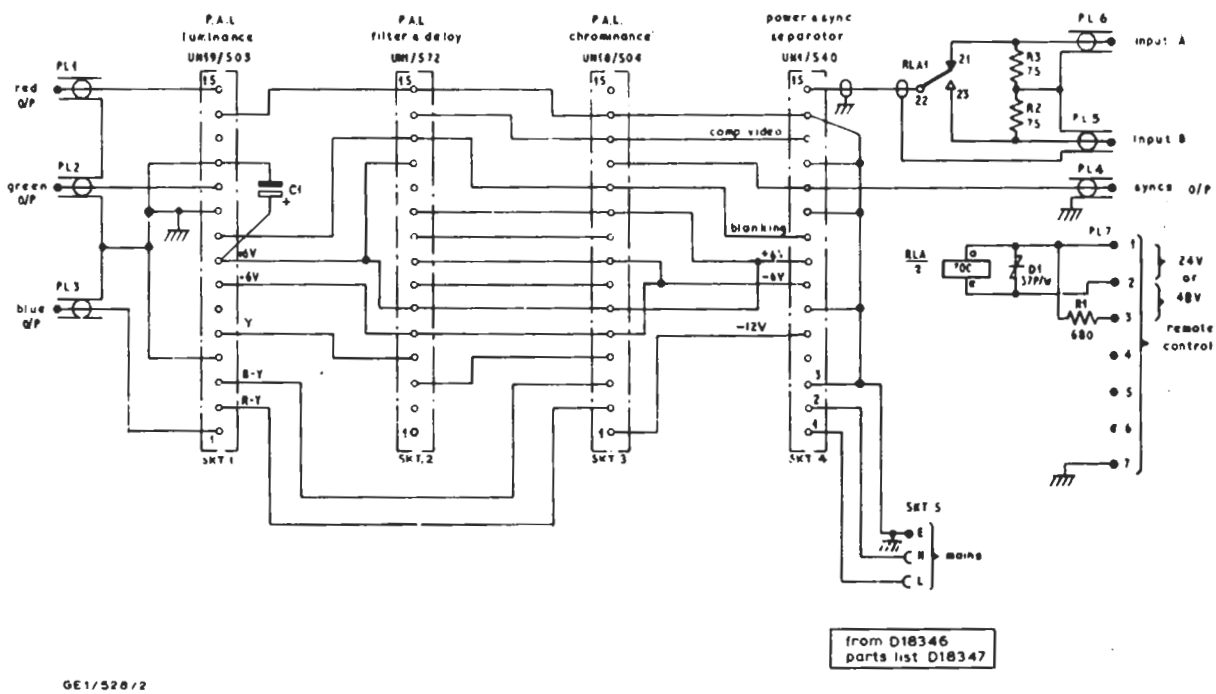

Fig. 2 *Circuit of the Colour-signal Decoder GE1/528 (Latest models have 100Ω in series with R-Y, B-Y and luminance inputs to UN19/503; see E.D. change form 7319)*

Introduction

The GE1L/528 accepts a standard-level 625-line PAL colour-coded video signal and produces three colour-separation video signals (R, G and B) also at standard level. The complete decoder comprises the four units listed below, and a back panel which can be fitted to a PN3/23 or CH1/33 chassis; it requires a power supply of 210 to 260 volts, 50 Hz.

The four component units are:

UN1/540 Power Supplier and Sync Separator Unit
UN1/572 PAL Decoder Chrominance Filter and Delay Unit
UN18/504 PAL Decoder Chrominance Unit
UN19/503 Colour-signal Decoder Luminance Unit

At the input to the decoder, either of two incoming video signals (termed the A and B signals) can be selected by means of a remotely-operated change-over relay contained in the GE1L/528 unit.

General Specification

Input Level (A or B)	
Composite colour-coded video (for 100 percent bars)	1·3 volts p-p
Input Impedance	75 ohms
Output Levels (R, G and B)	
Normal level	1 volt p-p
Maximum level	2 volts p-p
Output Impedances	75 ohms
Luminance Channel Pulse and Bar Response	
Subcarrier notch filter inoperative	
2T response	100% ±2%
1T response	100% ±5%
Subcarrier notch filter operative	
2T response	94% ±2%
Amplitude/Frequency Responses	
Subcarrier Notch Filter	−20 dB at 4·43 MHz
Chrominance Signal	−2 dB at 1 MHz
Burst Rejection	−40 dB at 4·5 MHz
Mixed-sync Pulse	
Output Level	2 volts p-p (terminated)
Input-signal	
Selector Relay Supply	24 or 48 volts (d.c.)
Power Supply	210 to 260 volts, 50 Hz.
Power Consumption	12 watts

General Description

Fig.1 is a block diagram showing the main signal paths between the four units which together comprise the complete decoder. A full circuit diagram of the GE1L/528 is given in Fig.2.

Composite video signals (either monochrome or PAL colour-coded) enter the unit through two coaxial sockets mounted on a panel at the rear of the chassis. Either or both sockets may be fed with video signals, one of which can then be passed through relay contacts to the input circuit of a UN1/540 Sync-pulse Separator Unit. Selection of the required input signal is achieved by operation of the relay as necessary; the relay-energising voltage can be 24 volts or 48 volts depending on which pair of remote-control plug contacts is used.

The UN1/540 comprises two separate circuits one of which produces outputs of composite video, mixed-sync pulses and burst-blanking pulses; these signals are fed to the remaining three decoder units as shown in Figs. 1 and 2. The other part of the UN1/540 provides d.c. power supplies (regulated, at +6 volts and −6 volts; unregulated at −12 volts) for all four GE1L/528 units.

The UN18/504 chrominance unit accepts composite video signals, mixed-sync and burst-blanking pulses from the UN1/540, and extracts from the video input the (R-Y) and (B-Y) colour-difference signals by means of synchronous demodulation. When the delay-line method of chrominance-signal interpolation is selected (by a switch on the front of the UN18/504) a 64·056-μs delay line (part of the UN1/572 unit) is associated with the chrominance unit in the decoding process.

A 0·44-μs luminance delay circuit and 4·43-MHz (PAL colour subcarrier) rejection filter form a second section of the UN1/572 unit. The luminance delay is necessary because of a similar delay suffered by chrominance signals passing through the chrominance unit. The rejection filter attenuates chrominance information present in the luminance signal when a colour-coded video signal is applied to the decoder. When a monochrome signal is applied, however, it is desirable to inhibit the filter action; a control voltage known as the colour-killer signal (generated in the UN18/504 unit) is therefore fed to a gate circuit in the UN1/572 so that the luminance signal is re-routed through circuits which by-pass the rejection filter.

The UN19/503 unit comprises a luminance-signal amplifier with associated clamp, and the three colour-separation signal output amplifiers. It also includes a matrix and associated amplifier for deriving the G-Y colour-difference signal (from the R-Y and B-Y inputs) and a second matrix which is used to combine the colour-difference and luminance (Y) signals to produce the decoder output signals (i.e. the three colour-separation signals R, G and B).

Maintenance

Each of the four units forming the GE1L/528 is originally tested and aligned as part of a complete equipment, and it is not practicable to exchange these sub-units between different decoders without some re-alignment.

A basic alignment procedure for the GE1L/528 is given below, together with a fault-location guide.

Fig. 3 shows oscillograms of important signal waveforms at various points in the decoder circuit.

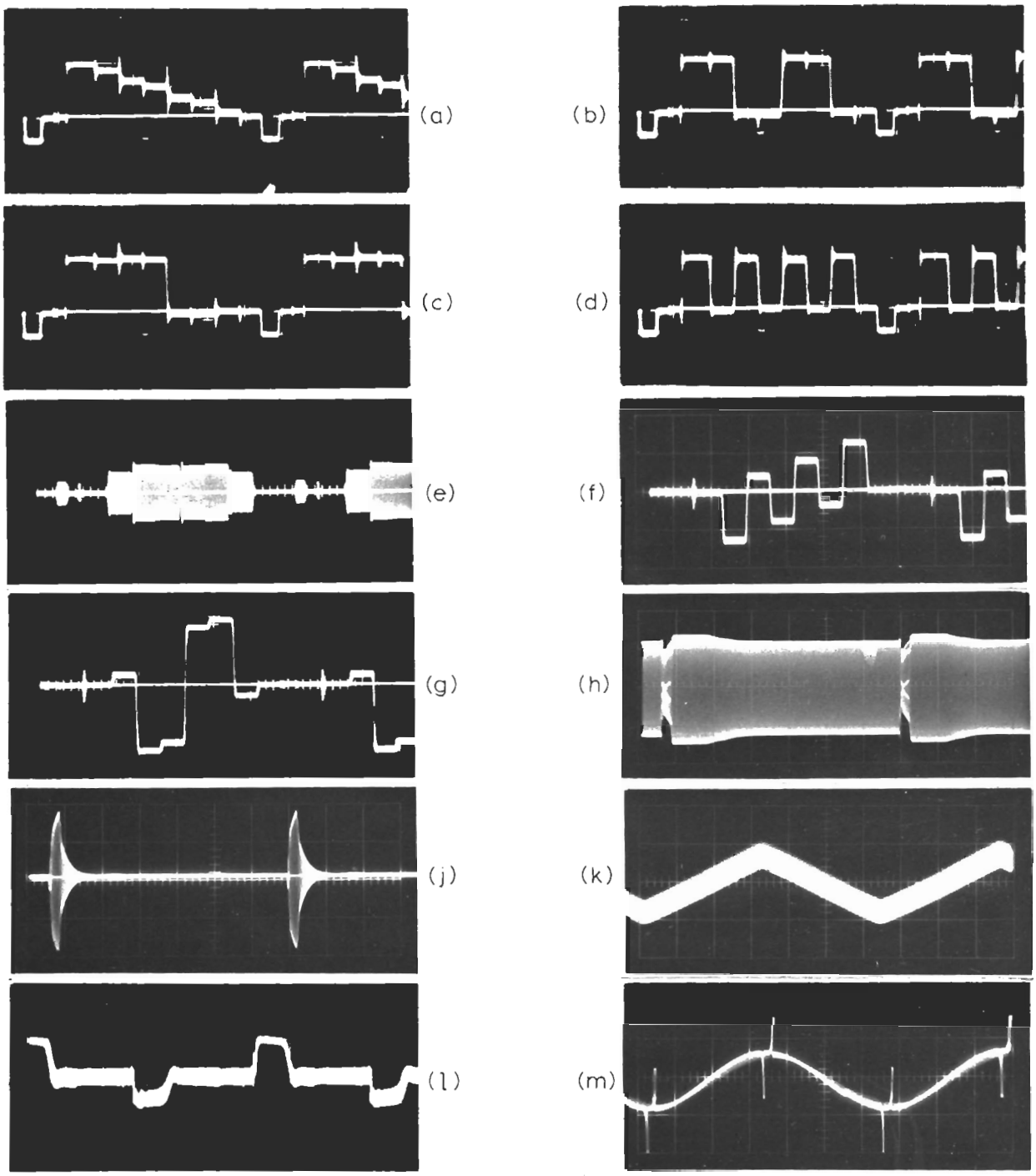

Fig.3 Waveforms in the GE1/528

(a) Y test Socket
(b) R Test Socket
(c) G Test Socket
(d) B Test Socket

UN18/504

(e) E_c Test Socket (0·5, 10μs/sq)
(f) B-Y Test Socket (0·5V, 10μs/sq)
(g) R-Y Test Socket (0·5V, 10μs/sq)
(h) Junct D3,D4 (5V, 10μs/sq)
(j) Collector TR3 (5V, 10μs/sq)
(k) Collector TR19 (0·5V, 20μs/sq)
(l) Junct R16,R17 (0·5V, 20μs/sq)
(m) Junct C41,D12 (1V, 20μs/sq)

(In waveforms (1) & (m) the trace-length is 2 lines; for (1) the collector of TR11 is decoupled to chassis with 0·1 F)

Test Apparatus Required

An oscilloscope with high-impedance probe and frequency response flat from 0 to 6 MHz (e.g. Tektronix Type 535 with Type H plug-in pre-amplifier).
Avometer
Musa 75-ohm terminations (4 required)
CH1A/3A chassis extender
A d.c. supply of 50 or 24 volts.

Basic Alignment

1. Terminate all four decoder outputs (R, G, B and SYNCS) with 75 ohms.
   Apply a 100-percent saturated, standard-level PAL colour-bar signal to input A; apply a standard-level, 625-line monochrome video signal to input B.
2. Apply mains power to the decoder. Measure the voltage of the positive supply (e.g. by attaching the appropriate meter leads between the case of TR4 in the UN1/540 and any convenient chassis point). This voltage should be between 5·5 volts and 9 volts depending on the position of the *Set D.C.* controls in the UN19/503 (see UN1/540 fault-location guide).
3. Connect the oscilloscope to *Sync Mon* test socket (UN1/540), and check that the level of mixed-sync pulses is 2 volts p-p ±0·2 volts. (This point can be used as a source of triggering pulses for all other oscilloscope measurements described below.)
4. Select *Simple* decoder operation, and check that a chrominance signal appears at the E_C test socket (UN18/504; see Fig.3, waveform e), and a luminance signal is present at the Y test socket (UN19/503; see Fig.3, waveform a).
5. Connect the oscilloscope to the (B-Y) test socket (UN18/504; see Fig.3, waveform f). Adjust the *Bal* control for minimum alternate-line amplitude change (Hanover-bar effect). The total signal amplitude should be about 1·3 volts p-p. With the UN18/504 on an extender, adjust R26 (upper centre of board) for minimum observed burst-blank switching transients. Replace the UN18/504 directly into the main chassis.
6. Connect the oscilloscope to the (R-Y) test socket (see Fig.3, waveform g), and check that the signal amplitude is about 1·6 volts p-p. Hanover-bar amplitude variation may be evident on this signal, but should not exceed 0·16 volts p-p (i.e. 10 percent). In the event of variations greater than this, they may be reduced by adjustment of R52 (situated at the lower side of the UN18/504, near L10). For this adjustment, which is performed with the unit on an extender, it is first necessary to temporarily re-adjust the *Bal* control for minimum (B-Y) amplitude variation (as in 5, above). (Remember to return the *Bal* control to its normal position when adjustment of R52 is complete and the unit is returned to the main chassis.)
7. Connect the oscilloscope to the Y test socket (UN19/503; see Fig.3, waveform a), and set the luminance signal amplitude to 1 volt p-p by means of RV1 (*Y Gain*) on the UN1/572 unit. Residual chrominance signal at this point should not exceed 80 mV p-p.
8. Connect the oscilloscope to the B test socket (UN19/503; see Fig.3, waveform d), and adjust the *Sat* control to equalise the levels of the blue and white bar components. Set the signal d.c. component (black level) to 0 volts ±250 mV with respect to chassis by means of RV7 (*Set D.C.*). Set the signal amplitude to 1 volt p-p by means of RV8 (*Set Blue*).
9. Connect the oscilloscope to the R test socket (UN19/504; see Fig.3, waveform b). Adjust for correct d.c. component and signal amplitude (as in 8, above) by means of RV3 (*Set D.C.*) and RV4 (*Set Red*), respectively. The *Gain R-Y* control (R82) in the UN18/504 should be adjusted for level red and white bar components.
10. Connect the oscilloscope to the G test socket (UN19/503; see Fig.3, waveform c), and adjust for minimum slope of the green bar by means of RV2 (*Set G-Y*). Adjust for correct d.c. component and signal amplitude by means of RV5 (*Set D.C.*) and RV6 (*Set Green*), respectively.
11. Connect the oscilloscope to the B-Y test socket (UN18/504; see Fig.3, waveform f), and operate the decoder mode switch between *Simple* and *Delay*. Adjust R8 (situated immediately below L1 in the UN18/504) to obtain equal signal amplitude for both modes of operation. Check that the R, G and B decoder output signals (from the UN19/503) are as shown by waveforms b, c and d (Fig.3), respectively.
12. Connect a 50-volt d.c. supply between pins 2 and 3 (or a 24 volt supply between pins 1 and 2) of the 7-pin Painton plug on the GE1L/528 rear panel to select the monochrome signal (input B). Check that this signal appears at each of the three decoder outputs (R, G and B). Check also that signals are not present at the B-Y and R-Y test sockets (UN18/504).

Notes

The use of a chassis extender for connection of the UN18/504 and UN1/572 should be avoided if possible because the increase of path length results in phase changes affecting the chrominance signal. If connection through an extender is necessary, partial compensation (for the phase change) can be effected by adjustment of the *Bal* control. An extender is required for adjustment of internally-mounted controls in the UN19/503 as in 8, 9 and 10, above.

If the UN19/503 unit is fitted with a variable resistor designated RV1 (in the circuit position occupied by R74 in later models of this unit; see Fig.1 of UN19/503 Instruction), this should be set fully clockwise.

In the UN1/572 unit, RV2 is normally set for unity gain through the chrominance delay circuits. For this condition, the signals at pins 7 and 9 of the UN18/504 should be equal in (envelope) amplitude

with the mode switch set at *Delay*. (Access to the GE1L/528 rear panel is required for connection to these pins.) In addition to adjustment of RV2 for signal equality, R8 in the UN18/504 will also require re-adjustment as in item 11 of the basic alignment.

R72 in the UN18/504 (situated immediately below a point midway between L2 and L3) should be set for equal-amplitude positive and negative 7·8 kHz (PAL Ident) pulses at the junction of R16 and R17 as shown in Fig.3 waveform 1 (with TR11 temporarily disabled by decoupling the collector to chassis through a 0·1μF capacitor). The *Bal* and *Sat* controls should be at the normal setting for adjustment of R72.

Fault Location Guide

Fault-location details are given for the four component decoder units; the following notes apply to each set of details.

(a) All potentials are measured with respect to chassis except where otherwise indicated.
(b) Signal levels are expressed as peak-to-peak amplitudes for an input of 100-percent colour bars at standard level (1·3 volts p-p).
(c) All outputs are to be terminated with 75 ohms.

UNI/540

Typical Voltages at Rear Connector

Pin Number	*Signal*	*Level*
7	d.c. (w.r.t pin 8)	−12 colts
8	d.c.	+5·5 to +9 volts
5	d.c. (w.r.t. pin 8)	−1·5 to −20 volts
15	video	1 volt p-p (sync to white bar)
13	video	as for pin 15
11	sync output (negative going)	2 volts p-p±0·2 volts
9	blanking output (positive going)	6 volts p-p ±1 volt

Possible Faults

(a) If pin 7 is at chassis potential and pin 8 is at +12 volts, then a short circuit exists between the negative 6-volt rail and chassis.
(b) If pin 8 is at chassis potential and pin 7 is at −12 volts, then D3 (zener) is probably open circuit; this is usually caused by temporary short-circuit between the negative 6-volt rail and chassis.
(c) If a potential difference does not exist between pins 7 and 8, then check the (unregulated) voltage at pin 5 and mains-supply fuses if necessary.

UN1/572

Typical Voltages at Rear Connector

Pin No.	*Signal*	*Level*
14	video (from in 13 of UN1/540)	1 volt p-p (sync to white bar)
4	luminance component output	0·18 volts p-p
3	Colour-killer control (d.c. from UN18/504)	+3 volts (color input) +4·5 volts (mono input)
9	chrominance component (from pin 9 of UN18/504)	1·5 volts p-p
7	delayed chrominance output	1·5 volts p-p
12	d.c.	+5·5 to +9 volts
12 & 10	d.c. (w.r.t. 2,5,8,11)	+12 volts

Some versions of the unit contain extra components in the luminance and chrominance signal paths. These are included to optimise the performance and should not be removed.

UN19/503

Typical Voltages at Rear Connector

Pin Number	*Signal*	*Level*
2	R-Y (from pin 2 of UN18/504)	1·8 volts p-p
3	B-Y (from pin 3 of UN18/504)	1·4 volts p-p
5	luminance component (from pin 4 of UN1/572)	0·18 volts p-p
7	d.c. (w.r.t. pin 8)	- 12 volts
8	d.c.	+5·5 to +9 volts
9	blanking (from pin 5 of UN1/540)	6 volts p-p
1	B	1 volt p-p
11	G (outputs)	1 volt p-p
15	R	1 volt p-p
		0 ±250 mV (d.c.) at blanking level

Possible Faults

(a) Low-frequency video-signal distortion (shown by slope on the white bar of input signal) may be caused by faulty electrolytic capacitors.

(b) Inability to set the d.c. levels by means of the *Set D.C.* controls (RV3, RV5 and RV7) may be caused by asymmetry of the 12-volt d.c. supply about chassis (see *UN1/540; Possible Faults*).

UN18/504

Typical Voltages at Rear Connector

Pin No.	*Signal*	*Level*
13	video (from pin 13 of UN1/540)	1 volt p-p
11	blanking (from pin 9 of UN1/540)	6 volts p-p
4	colour-killer control d.c. (w.r.t. pin 5)	+3 volts (color input) +4·5 volts (mono input)
1	d.c. from UN1/540 (w.r.t. pin 6 or 15)	−15 to −20 volts
9	chrominance component (to pin 9 of UN1/572)	1·5 volts p-p
7	delayed chrominance (from pin 7 of UN1/572)	1·5 volts p-p
5 and 8	d.c. from UN1/540 (w.r.t. pin 6 or 15)	−12 volts
12	mixed sync pulses (from pin 11 of UN1/540)	2 volts p-p
2	R-Y	1·8 volts p-p
3	B-Y	1·4 volts p-p

Possible Faults

If colour-difference signals are not available from this unit when a PAL colour signal is applied to the decoder (assuming that the other three units are operating correctly), the following procedure may help to locate the fault. Initially:

(a) Plug the unit into the main assembly through a chassis extender.

(b) Check that the d.c. supply voltages are correct, that a chrominance signal appears at the E_C test socket and that colour-difference signals are still not present at either the (R-Y) or (B-Y) test socket.

(c) Temporarily inhibit the colour-killer control signal by connecting a 100-ohm resistor between the collector of TR5 and chassis.

If now a phase-locked signal appears at the test socket, then the fault is probably associated with the colour-killer signal; if an unlocked signal is observed, the fault is in the phase-comparator/burst-locked oscillator circuit. If a signal does not appear, there is probably either a discontinuity in the signal path or the oscillator (or its associated amplifier) is inoperative.

The colour-killer circuit may be checked by observing waveforms or potentials at the following points:

(i) Junction of R16/R17 (see Fig.3 waveform l).
(ii) Junction of C41/D12 (see Fig.3 waveform m).
(iii) TR12 collector; check for 7·8-kHz square-wave signal at 8 volts p-p.
(iv) TR5 base; check for 7·8-kHz square-wave signal at 1 volt p-p.
(v) TR5 collector; check for d.c. of 0 volt ±1 volt (with inhibiting resistor removed).

Operation of the burst-locked oscillator section may be checked by inspecting the signal at the collector of TR19. If the oscillator is not locked than a low-frequency colour-difference signal will appear at this point. Under locked conditions, the collector voltage should be −3 volts ±0·5 volt (w.r.t. pin 6 or pin 15). A 7·8-kHz triangular waveform of about 1 volt p-p (see Fig.3 waveform k) should also appear at this point.