COLOUR BLACK LEVEL GENERATOR GE6/504

Introduction

The GE6/504 accepts a colour subcarrier signal and feeds of burst-gate pulses, mixed synchronising pulses and PAL square wave; it provides a composite output signal which consists of blanking level, mixed synchronising pulses and a subcarrier colour-burst signal[1].

When supplied with the appropriate input signals the unit will operate on either the 625-line PAL standard or the 525-line NTSC standard. Power at +12 volts is provided by a mains-fed integral stabilised power supplier.

The unit is constructed on a CH1/12A plug-in chassis with index-peg positions 6 and 37. Mains fuses and an *Output* monitor socket are provided on the front panel of the unit.

General Specification

Inputs for 625-line working

Mixed Syncs	2 V p-p
Burst Gate Pulses	2 V p-p
PAL Square Wave (colour axis switch)	1 V p-p
Colour Subcarrier (at 4·43361875 MHz)	1 V p-p

Inputs for 525-line working

Mixed syncs	2 V p-p
Burst Gate Pulses	2 V p-p
Colour Subcarrier (at 3·579545 MHz)	1 V p-p

Outputs

625-line	0·3 V mixed syncs with 0·3 V subcarrier colour burst (combined amplitude 0·45 V p-p) phase-switched by ±45° on alternate lines.
525-line	0·3 V mixed syncs with 0·3 V constant-phase subcarrier colour burst (combined amplitude 0·45 V)

Input Impedances

Mixed Syncs	more than 2 kilohms
Burst Gate	more than 2 kilohms
PAL Square Wave	about 1·5 kilohms
Subcarrier	75 ohms

Output Impedance	75 ohms
Delay (sync input to output)	380 ns ±25 ns
Mains Input	220–260 volts, 50 Hz
Power Consumption	3·6 watts
Operating Temperature	15°C to 45°C

Circuit Description

A block diagram is shown in Fig. 1 and the circuit diagram in Fig. 2 on page 3. The following description is for 625-line working. Differences for 525-line working are given at the end of this subsection.

Subcarrier and Modulator Stages

The subcarrier input signal is applied, via emitter-follower TR1 and a 90-degree phase-shift network, to emitter-follower TR2. The output of TR2 drives current through the secondary winding of transformer T1.

A 7·8-kHz PAL square wave (colour-axis switching) signal is fed to the base of TR3A. The two halves of transistor TR3 form a long-tailed pair and the base bias of TR3B is adjusted so that, in the quiescent condition, the two transistors take equal currents. The positive-going portions of the applied switching signal drive TR3A into conduction and cut TR3B off; the negative going portions of the signal reverse this process. Thus diodes D1 and D2 in the collector circuits of the two transistors conduct alternately and the upper and lower ends of the primary winding of T1 are alternately decoupled to earth. This results in the subcarrier signal induced into the secondary of T1 being inverted on alternate lines.

From the secondary of T1 the switched subcarrier is fed to the base of TR4 where it is mixed with a feed of unmodified subcarrier, taken from the emitter of transistor TR1, to produce a signal which changes phase by 90 degrees on alternate lines. Transistor TR4 increases the amplitude of this signal to about 2·5 volts peak-to-peak and the amplified signal is then fed, via emitter-follower TR5, to the subcarrier input of the MD2/504 modulator[2].

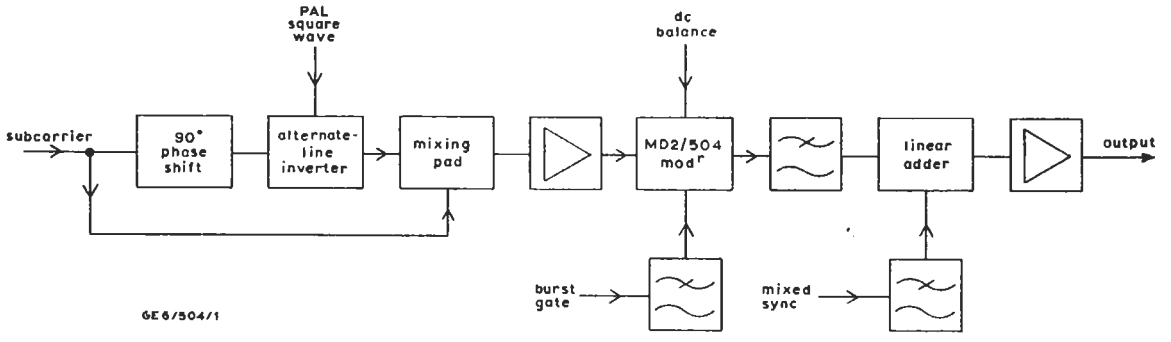

Fig. 1 Block Diagram of GE6/504

The modulator output consists of a burst of subcarrier the phase of which changes by 90 degrees (± 45 degrees with respect to the switching axis) on alternate lines. This signal is fed, via amplifier stage TR6 and a filter which removes the second harmonic of the subcarrier frequency, to the mixer stage TR14. Preset resistor R27 is adjusted in conjunction with the balance controls inside the modulator for minimum residual subcarrier.

Burst Gate Amplifier

Burst-gate pulses are applied via clipper-inverter stage TR7 to the common-emitter amplifier TR8; resistor R31 functions as an amplitude control. The signal at the collector of TR8 is limited in bandwith by a Dietzold filter, consisting of L3, R34, C17, L4 and C18, which has a cut-off frequency of 1·2 MHz. The signal is then applied via emitter-follower TR9 to the video input of the modulator.

Sync Amplifier

Mixed-syncs are applied to clipper-inverter stage TR10 via an integrating network. The delay provided by the integration ensures that syncs and colour-burst bear the correct time relationship to each other at the mixing stage. The sync-pulse amplifier is similar in circuit configuration to the burst-gate amplifier described above and the pulses appearing at the emitter of TR12 are applied to the mixing stage TR14 via emitter-follower TR13.

In TR14 syncs are added to the colour-burst output from the modulator and the resulting composite signal is applied to the complementary output stage comprising transistors TR15 and TR16. The output has an impedance of 75 ohms and, when terminated in a 75-ohm load, the peak-to-peak signal amplitude is 0·45 volts.

525-line Working

For 525-line working the operation of the circuit differs in the following respects.

(a) A colour-switching signal is not provided.
(b) The subcarrier phase-shifting and axis-switching networks are inoperative. The signal applied to TR4 consists only of the direct signal taken from the emitter of TR1 via R15.
(c) Because of (a) and (b) above, the output of the modulator does not change phase on alternate lines.
(d) If the burst-phase is incorrect, fine adjustment may be made by altering the setting of R12. The phase must not be shifted by more than 5 degrees by this method.

Power Supplier

Power supplies at +12 volts are obtained from a conventional stabiliser circuit comprising transistors TR17–TR19. The regulated output is monitored by the shunt amplifier TR19 and compared with a reference voltage derived from zener diode D9. Any variations are applied as correction signals to the base of TR17. Resistor R19 provides a fine control of the regulated output.

Alignment Instructions

Apparatus Required

Low-pass Link Filter FL4/512
High-grade oscilloscope
Tektronix Vectorscope type 526
Communications Receiver (such as the CR100).

Adjustment of Modulator Balance

1. Apply burst-gate, PAL square wave and 625-line subcarrier signals to the appropriate inputs of the unit.
2. Route the output of the unit via 5·8-MHz low-

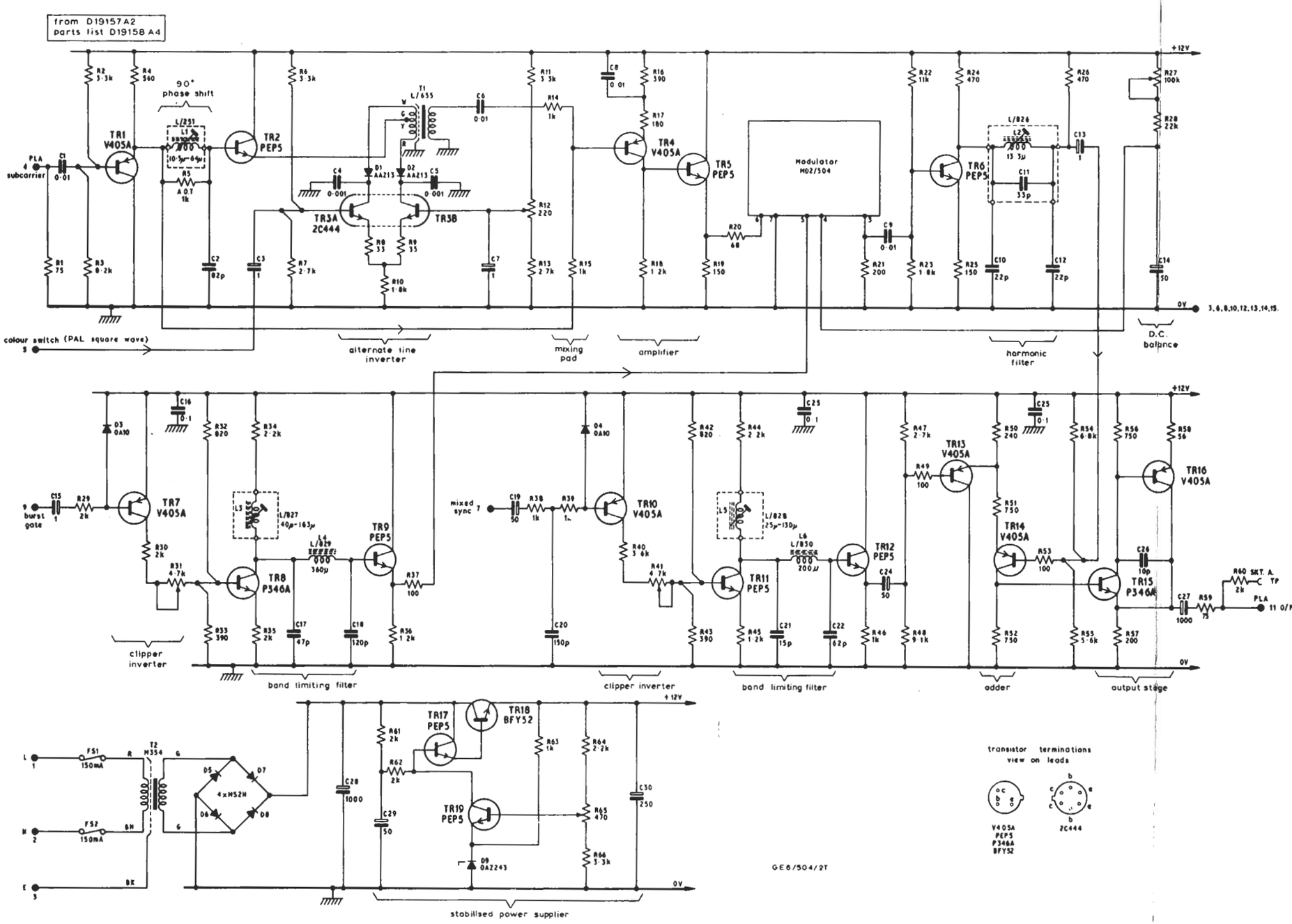

Fig. 2 Circuit of the GE6/504

pass link filter FL4/512 to an oscilloscope with a sensitivity of 5 mV/cm. Trigger the oscilloscope from mixed syncs and examine the trace in the region immediately before the colour burst.
3. Adjust R27 for minimum subcarrier. Adjust the five modulator-balance controls, in conjunction with R27, to reduce the residual subcarrier to a minimum.

Adjustment of Burst-gate and Sync-pulse Amplitudes and Overshoots
1. Monitor the output of the unit with an oscilloscope terminated in 75 ohms.
2. Adjust R31 to obtain a p-p burst amplitude of 0·3 volts.
   Adjustment of this control affects the d.c. balance of the modulator; therefore, R27 must be reset for minimum subcarrier following any adjustment of R31.
3. Adjust L3 for minimum overshoot on bursts.
4. Apply mixed sync pulses to the appropriate input of the unit. Adjust R41 for a p-p sync-pulse amplitude of 0·3 volt.
5. Adjust L5 for minimum overshoots on syncs.

Adjustment of Burst 90° Phase Difference
1. Display the output of the unit on a Tektronix vectorscope type 526. Adjust the display so that one of the bursts is coincident with a convenient datum line.
2. Note the setting of the precision delay line and then adjust the delay line control until the other burst is coincident with the same datum line.
3. Adjust L1 until the angle between the bursts is 90° ±0·5° and re-seal the core of the inductor with a suitable locking compound.
   If a suitable oscilloscope, one fitted with a delay line calibrated at the PAL subcarrier frequency, is not available the unit must be returned to Equipment Department for this adjustment to be carried out.

Adjustment of Second Harmonic Subcarrier Trap
1. Connect 525-line subcarrier and burst-gate signals only to the unit.
2. Feed the output of the unit to the communications receiver and tune it to the second harmonic of the subcarrier signal. (The second harmonic will be recognised as a strong carrier among a large number of weaker signals).
3. Adjust L2 for minimum signal.

Maintenance

Typical voltage and signal amplitudes are given in Table 1.

TABLE 1

Point of measurement	*d.c.*	*Signal (p-p)*
TR1 base	+9·3 V	1 V subcarrier
TR2 emitter	+9·3 V	1 V subcarrier
TR3A base	+5·7 V	1 V colour switch
TR3B base	+5·7 V	None
TR4 base	+10 V	0·5 V subcarrier
TR5 emitter	+2·4 V	2·5 V subcarrier
TR6 base	+1·6 V	0·6 V colour-burst
TR6 collector	+11 V	1·2 V colour-burst
TR8 base	+4 V	0·6 V burst-gate
TR9 emitter	+7·9 V	0·6 V burst-gate
TR11 base	+4 V	0·6 V mixed-syncs
TR12 emitter	+5·7 V	0·6 V mixed-syncs
TR13 base	+9·5 V	0·6 V mixed-syncs
TR14 base	+6 V	0·9 V colour-burst
TR14 collector	+3·4 V	0·6 V syncs with 0·6 V colour-burst
TR15 collector	+11 V	None

References to Typical Associated Equipment

1. Video Switching Panels PA18M/513 and PA18M/514.
2. Carrier Amplitude Modulator MD2/504.

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