BURST LOCKED OSCILLATOR OS1/513

Introduction

The OS1/513 accepts a colour video signal and burst-gating pulses: it produces an output of colour subcarrier signal locked in frequency to the frequency of the colour burst of the video signal and locked in phase to the mean phase of the colour burst. It also produces a 7·8-kHz pulse waveform related to the PAL squarewave. Without colour burst on the video input, the output frequency of the oscillator is approximately that of colour subcarrier.

The OS1/513 is constructed on a CH1/12A chassis with index-peg positions 9 and 25. It is a direct replacement for the OS1/502, some of which bear a yellow label and have been modified to the OS1/513 circuit.

Circuit Description

The circuit diagram of the OS1/513 is given in Fig. 4 on page 5. The high-pass filter inductor L1 is adjusted during manufacture to adjust the phase of the colour bursts and is then locked in position.

Burst-gating pulses at the base of transistor TR2 are d.c.-restored via the base-emitter junction diode so that this transistor is cut off except during the pulses.

The 6-volt p-p colour bursts at the collector of transistor TR2 are auto-transformed into a signal 20 volts p-p across inductor L2. Capacitor C10 provides neutralisation for transistor TR2.

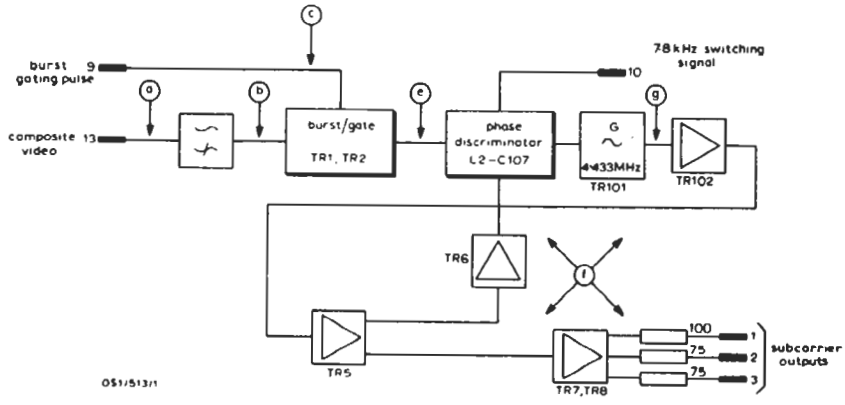

Fig. 1 Block Diagram of the Burst-locked Oscillator OS1/513

General Description

A block diagram of the OS1/513 is given in Fig. 1 and some of the waveforms to be found are given in Fig. 2. The colour video signal is fed to a burst-gating circuit via a high-pass filter which removes the luminance component. The output of this gate comprises amplified colour bursts which are fed to a phase discriminator. The discriminator, also fed with the output of a reactance-controlled crystal oscillator, produces a d.c. output related to the difference between the phase of the oscillator output and the mean phase of the colour bursts.

A simplified circuit of the phase discriminator is given in Fig. 3. The signal voltages in approximate phase quadrature v_a and v_b are added vectorially to produce voltages $(v_a - v_b)$ and $-(v_a + v_b)$ which are applied to the two diode-capacitor combinations. The rectified voltages V_d and V_e are proportional to the amplitudes of the signal voltages $(v_a - v_b)$ and $(v_a + v_b)$. The difference voltage $V_d - V_e$ is approximately proportional to the sine of the quadrature phase-error angle a.

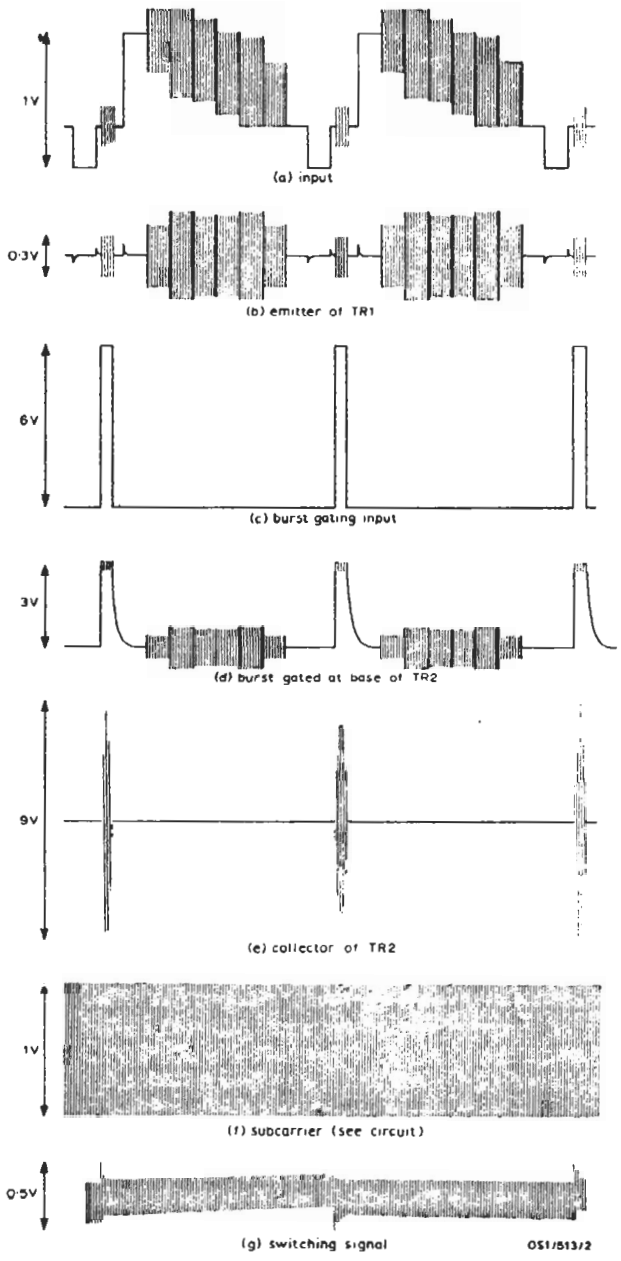

Fig. 2 Waveforms in the OS1/513

The output voltage of the discriminator V_f, which controls the frequency of the oscillator, differs from V_c by half the difference voltage $(V_d - V_e)$. When the oscillator is operating at the frequency of the colour bursts of the input signal V_f is fixed by the oscillator control-voltage/frequency characteristic. Thus potential divider R108 controls the phase of the oscillator output when the frequency is locked to the incoming bursts. In the unlocked condition without incoming bursts V_f equals V_c and R108 controls the oscillator frequency.

In the OS1/513 the control voltage is applied to the junction of two voltage-doubling rectifier circuits and is isolated from inductor L2 by capacitors C102 and C103. The phase of the colour bursts in the PAL system alternates plus and minus 45 degrees from the mean phase on successive lines. This produces an output from the discriminator in the form shown in Fig. 2(g). The d.c. component of the waveform is applied to the oscillator.

Transistor TR101 forms part of a Colpitts oscillator with a variable-capacitance diode D105 as part of the feedback circuit between the collector and emitter. Transistor TR102 is used as an emitter follower at the oscillator output frequency and as a common-emitter stage at d.c. to provide a negative-feedback loop to stabilise the operating conditions of the oscillator.

Transistor TR5 forms part of a neutralised tuned-output stage which feeds emitter follower TR6 and a direct coupled negative-feedback output amplifier.

Test Procedure

Allow a thirty-minute warm-up period before testing the OS1/513.

1. Compare the phase of the input and output signals on a vectorscope. Adjust R108 to make the phase of the output signal equal to the mean phase of the colour bursts of the input signal.
2. Check that the frequency of the unlocked oscillator is 4·43361875 MHz $\pm$ 5 Hz using an eight-figure digital frequency counter.
3. Use a remote signal analyser EP1/508 to check that phase jitter of the output signal between alternate line periods is less than 0·5 degrees.

Typical Associated Equipment

1. Colour Subcarrier Phase Comparators EP5/505,6.
2. Sync Separator UN1/540.
3. Power Suppliers PS3/35A,B,C.

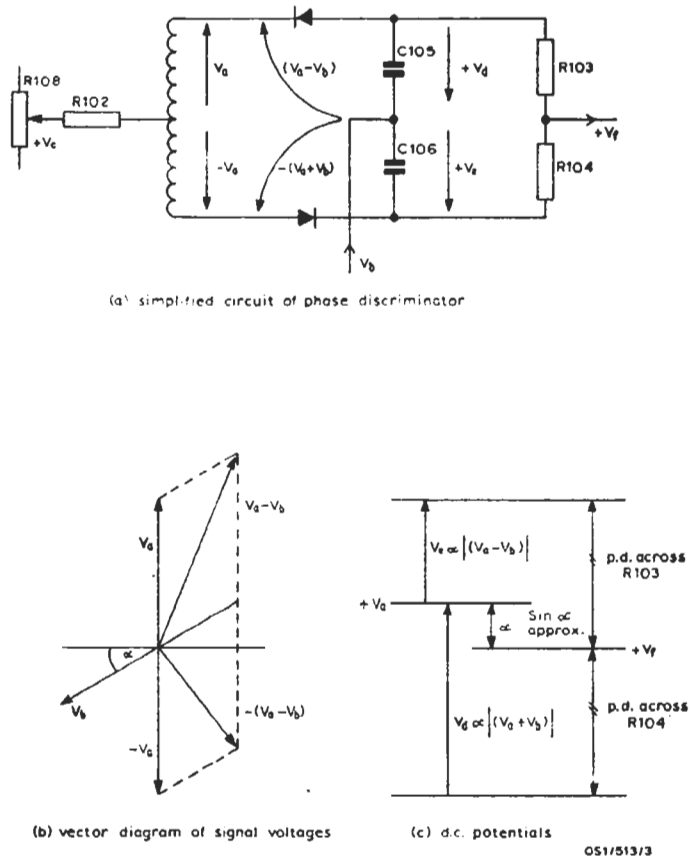

Fig. 3 Simplified Circuit of the Phase Discriminator in the OS1/513

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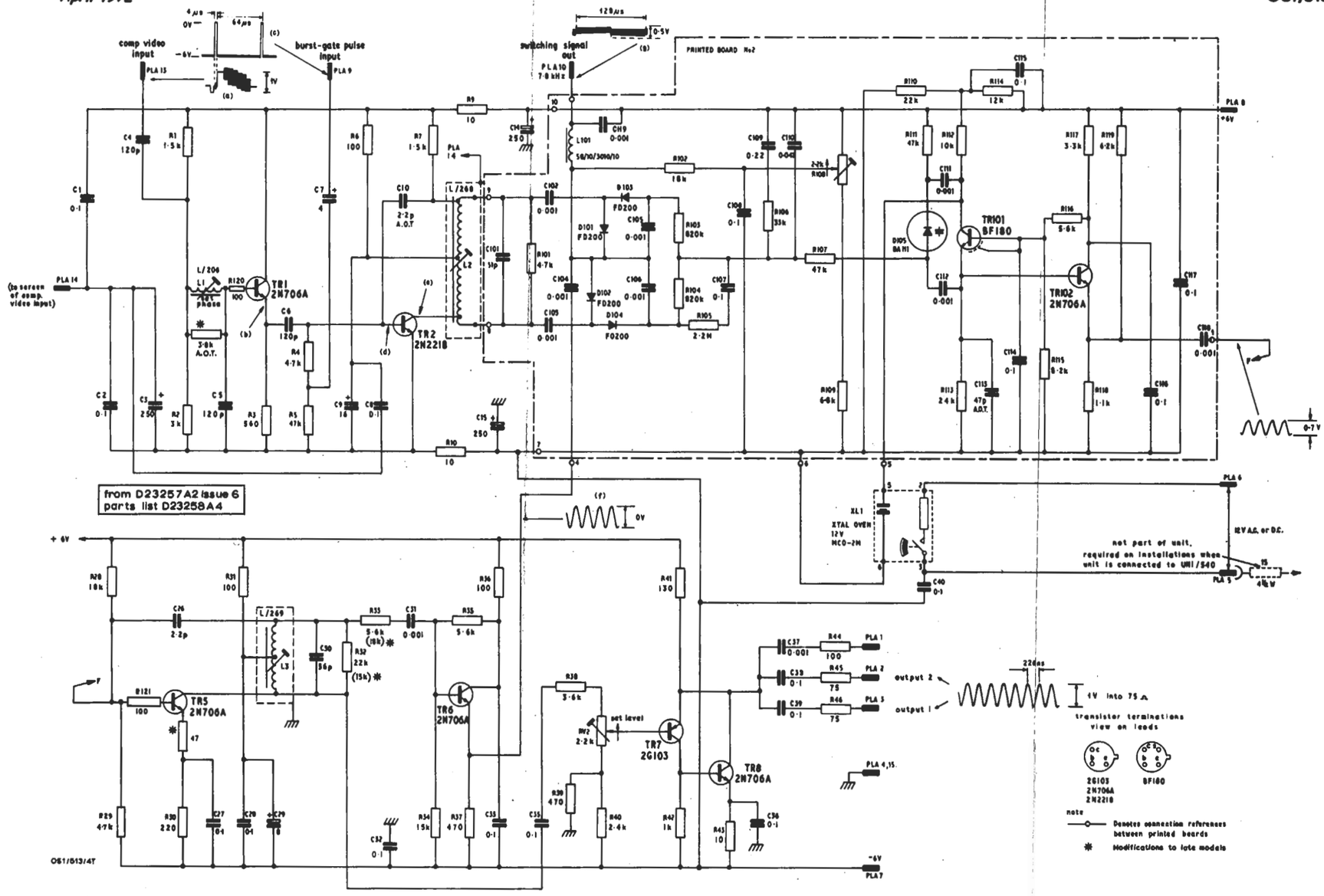

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Fig. 4. Circuit of the Burst-locked Oscillator OS1/513