

REMOTE COLOUR SUBCARRIER PULSE UNIT GE2/550

Introduction

The GE2/550 produces a ternary-coded (three-state) d.c. output signal which describes the phase error between a subcarrier input signal and a reference subcarrier<sup>1,2</sup> as shown in Table 1.

TABLE 1

Subcarrier Phase Error	Error Control Signal Output (volts)
between $\begin{cases} 1^\circ \text{ early} \\ 1\frac{1}{2}^\circ \text{ late} \end{cases}$	0
earlier than $1^\circ$	-3
later than $1\frac{1}{2}^\circ$	-6

- (b) *reference sinewave*<sup>2</sup> at a frequency approximately 7 kHz lower than the input subcarrier frequency and with an amplitude 6 V p-p.
- (c) *reference squarewave*<sup>2</sup> at 7 kHz derived from input (b) and the reference subcarrier; the amplitude of this input is 5 V p-p.
- (d) *delayed squarewave*<sup>2</sup> which is input (c) delayed by 0.6  $\mu$ s.
- (e) *reset pulses*<sup>2</sup> negative-going picture-frequency pulses 9 ms in duration derived from the mixed syncs of the reference system and with an amplitude of 5 V p-p.
- (f) *sample pulses*<sup>2</sup> negative-going pulses 0.5  $\mu$ s duration starting 500  $\mu$ s after the Reset pulses and with an amplitude 12 V p-p.

The unit is constructed on a CH1/26A chassis with index-peg positions 4 and 34.

There is also a 7-kHz square-wave monitoring output which is derived from the input subcarrier signal.

The unit accepts the following inputs:

- (a) *subcarrier signal* which is to be compared for phase error with the reference subcarrier signal; the amplitude of this input is 2 V p-p.

General Description

A block diagram of the GE2/550 is given in Fig. 1. The subcarrier and reference sinewave inputs are mixed in a long-tailed-pair frequency changer to produce a 7-kHz sinewave which is converted to a square wave by a Schmitt trigger circuit. The 7-kHz squarewave which results is fed to an inverter

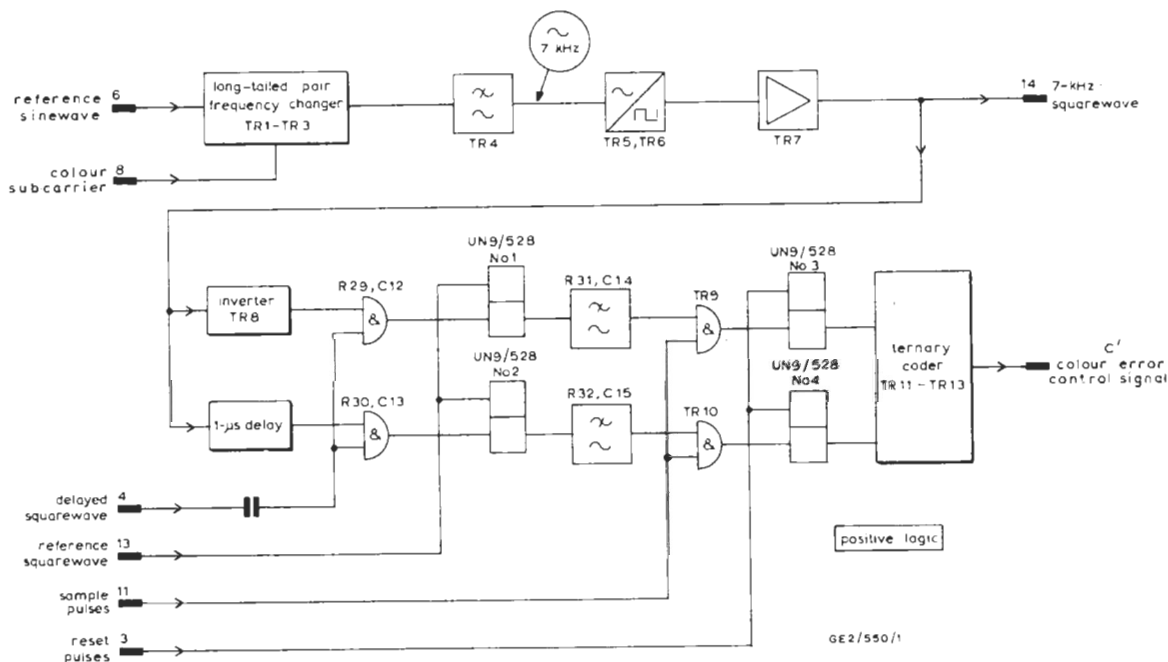


Fig. 1 Block Diagram of the Remote CSC Pulse Unit GE2/550

stage and to a 1- $\mu$ s delay stage. The output waveforms of both these stages, shown in Fig. 2, are at their negative value for 1  $\mu$ s after the positive-going transition of the derived square wave. This value is sufficient to keep the resistor-capacitor AND gates closed and so prevent the delayed square wave from reaching bistable multivibrators 1 and 2 during this period.

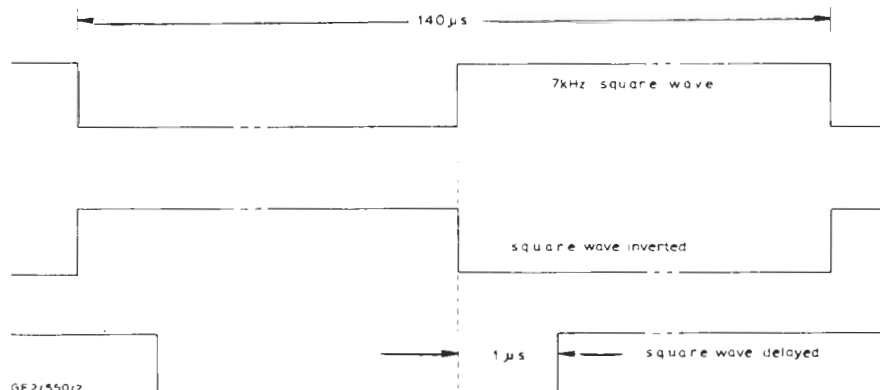


Fig. 2 Waveforms in the GE2/550

Multivibrators 1 and 2 are switched to their *Set* state (see Instruction UN9/528) by the reference square wave. The delayed square wave 0.6  $\mu$ s later passes through the AND gates depending on the phase relation between this delayed square wave and the waveforms derived from the colour sub-carrier input signal; one of these multivibrators may be triggered into the *Reset* state as shown in Table 2. The outputs of these multivibrators are fed to transistor AND gates via resistor-capacitor low-pass filters which remove the 7-kHz pulse components.

TABLE 2

Timing Error	Bistable Multivibrator Switched to Reset State
early by more than 0.4 $\mu$ s	no. 2
early by less than 0.4 $\mu$ s late by less than 0.6 $\mu$ s	neither
late by more than 0.6 $\mu$ s	no. 1

Reset pulses at picture frequency are used to hold bistable multivibrators 3 and 4 in the *Set* state for 9 ms after the start of each picture period. This 9-ms period allows time for a burst-locked oscillator to settle down if corrected at the start of a picture period. The input 0.5  $\mu$ s *sample* pulses occur 500  $\mu$ s after the end of the Reset pulses and these switch multivibrators 3 and 4 according to the condition of multivibrators 1 and 2 at the moment the transistor AND gates are opened; these last two multi-

vibrators thus store the sampled information for about a picture period until the next *Reset* pulse occurs. The outputs from these multivibrators drive the ternary coder to give the outputs described in Table 1.

#### Circuit Description

The circuit of the GE2/550, given in Fig. 3 on

page 3, comprises conventional stages but the following points should be noted:

- The frequency-changer circuit is an over-driven long-tailed pair. Overdriving the stage causes distortion of what would otherwise be an algebraic difference signal. This distortion produces modulation products and the 7-kHz frequency-difference signal is selected using resistor-capacitor filtering.
- The AND gates feeding multivibrators 1 and 2 are the resistor-capacitor type described in Instruction UN9/528.
- In the ternary coder circuit the voltage at the emitters of transistors TR11 and TR12 is about -7 volts. The outputs of the preceding multivibrators are attenuated to ensure that the transistors are cut-off if the multivibrators are in the *Set* state. If either of the multivibrators is in the *Reset* state the corresponding coder transistor is bottomed.

#### Test Procedure

The GE2/550 is tested as part of its parent unit.

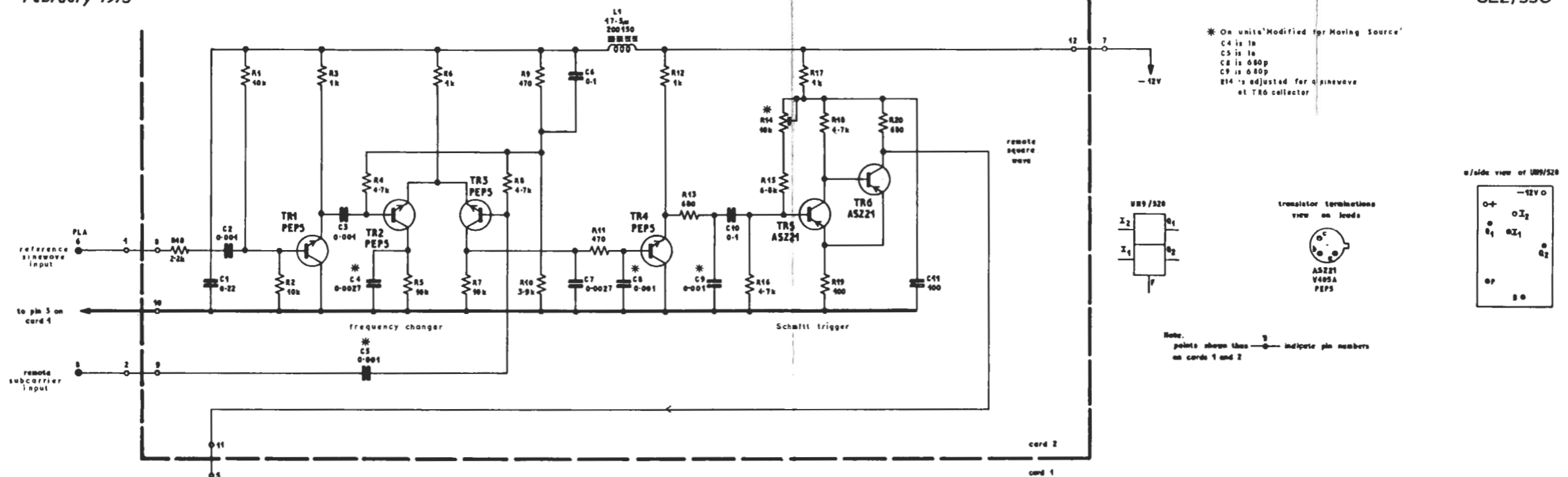
#### Modification for Use with a Moving Source

Some units GE2/550 bear the label *Modified for Moving Source*. In this case filtering of the beat frequency<sup>2</sup> is altered. Component changes are shown only on the circuit diagram in Fig. 3.

Details of modification and operation are given in Designs Department Technical Memorandum 10.31(70).

#### References to Typical Associated Equipment

- Colour Subcarrier Phase Comparators EP5/505 and EP5/506.
- Local CSC Pulse Unit GE2/549.



from D19282 A1 parts list D19283 A4 iss. 2

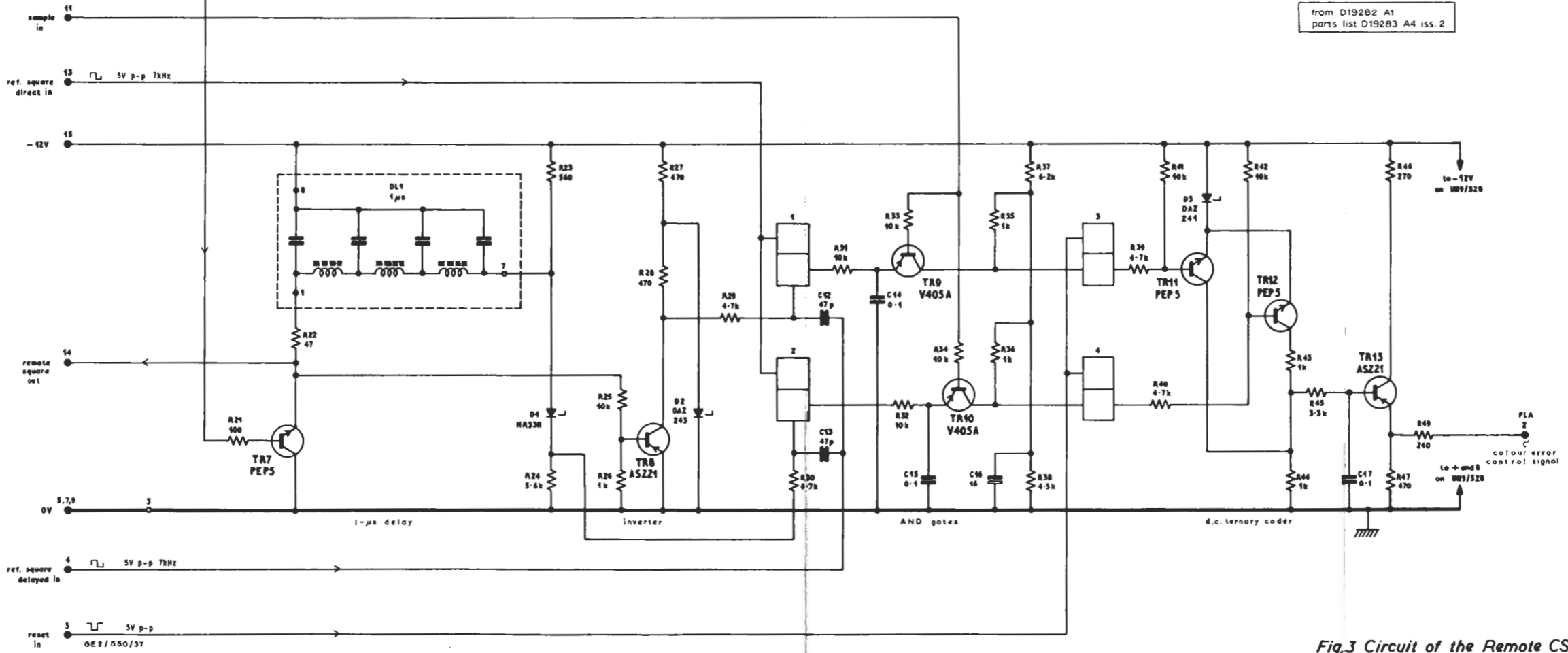


Fig.3 Circuit of the Remote CSC Pulse Unit GE2/550