DIGITAL PHASE SHIFT UNIT CO2/522

Introduction

The CO2/522 accepts a signal at 15/16 of colour subcarrier frequency from an associated CO2/521, a d.c. error control signal and a video signal: it produces an output signal at colour subcarrier frequency whose phase is dependent upon the error control signal. The phase of the output signal is digitally controlled in steps of 1·5 degrees. The CO2/522 contains two Modulators MD2/504 and eleven bistable units UN9/528.

The CO2/522 is constructed on a B-sized CH1/38 chassis with index-peg positions 7 and 36.

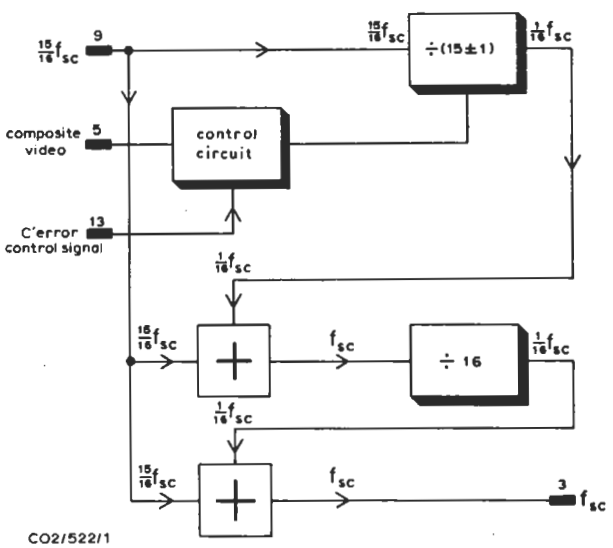

Fig. 1 Simplified Block Diagram of the CO2/522

General Description

A simplified block diagram of the CO2/522 is shown in Fig. 1. The input signal at 15/16 of subcarrier frequency is fed to two modulators and a counter which is used as a frequency divider. This counter has a normal division ratio of fifteen which can be made fourteen or sixteen for one of the 166,261 (approx.) counts in each picture period. The change in the counter ratio is produced by a control circuit which is fed with the error control signal.

The output of the divide-by-fifteen counter is fed to an input of the first modulator whose output circuit is tuned to the sum of the input frequencies. This sum is subcarrier frequency. This subcarrier signal is fed to a divide-by-sixteen counter whose output is fed to an input of the second modulator. The output circuit of the second modulator is tuned to the sum of the input frequencies. This sum is also subcarrier frequency.

A change of one in the ratio of the divide-by-fifteen counter produces a 1·5 degree phase shift in the final output subcarrier signal with respect to the input subcarrier signal of the associated CO2/521.

Text continued overleaf

A more detailed block diagram is shown in Fig. 2. The input signal is fed to three input amplifiers which feed a squaring circuit and two modulators. The squaring circuit feeds a four-stage counter with feedback switchable to the first two stages. This gives a count of 14, 15 or 16. The output of the counter is fed via a low-pass filter and emitter follower to an input of the first modulator. The output of this modulator is fed via a tuned amplifier, a squaring circuit, a divide-by-sixteen counter, a low-pass filter and an emitter follower to an input of the second modulator. The output of the second modulator is fed via a tuned amplifier to an output amplifier.

The CO2/522 accepts either a video signal or a feed of mixed sync pulses as an input on pin 5. The picture information of a video signal is removed by a sync separator which feeds inverted sync pulses to a monostable multivibrator and a field-sync separator. The output pulse duration of the monostable circuit is 45 μs to avoid double triggering during the field sync period. The output of the field-sync separator triggers a monostable multivibrator with an output pulse duration of 4 ms. The output pulses of the two monostable circuits are differentiated to obtain shorter pulses (20 μs and 2 μs respectively). These shortened pulses are fed to an AND gate whose output is a positive-going pulse once a picture. This pulse triggers a monostable multivibrator with an output pulse duration of 8 μs.

The 8-μs picture pulse switches bistable unit No. 9 into the Reset condition. The unit is switched into the Set condition at the end of every count of the divide-by-fifteen counter by the output pulse of bistable unit No. 8. The behaviour of the remainder of the control circuit is given in Table 1. For the remaining counts in each picture period the normal ratio of divide-by-fifteen is maintained.

Circuit Description

The circuit of the CO2/522 is given in Fig. 3. The picture-pulse circuit on card C is similar to that of the UN17/503. The remainder of the sub-circuits are similar to those of the CO2/521.

Modifications for Use with a Moving Source

Some units CO2/522 bear the label *Modified for Moving Source.* In this case the phase-stepping rate has been doubled to field frequency (50 Hz) and the phase step has also been doubled to 3 degrees.

This is achieved by removing diode D3 and adding a bistable type UN9/528 in the reset line to bistables 9 to 11. These 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).

Test Procedure

The test procedure for the CO2/522 is given as part of the test procedure for the EP1/509.

MJR 9/67
RDH 8/72

TABLE 1

Error signal converter			*State once a picture at*		*Feedback pulses to bistable no.*	*Division ratio*	*Condition*
Input (volts)	Output A	Output B	C	D			
0	0	0	1	0	5	÷ 15	normal
−3	1	0	0	0	–	÷ 16	retard
−6	1	1	0	1	6	÷ 14	advance

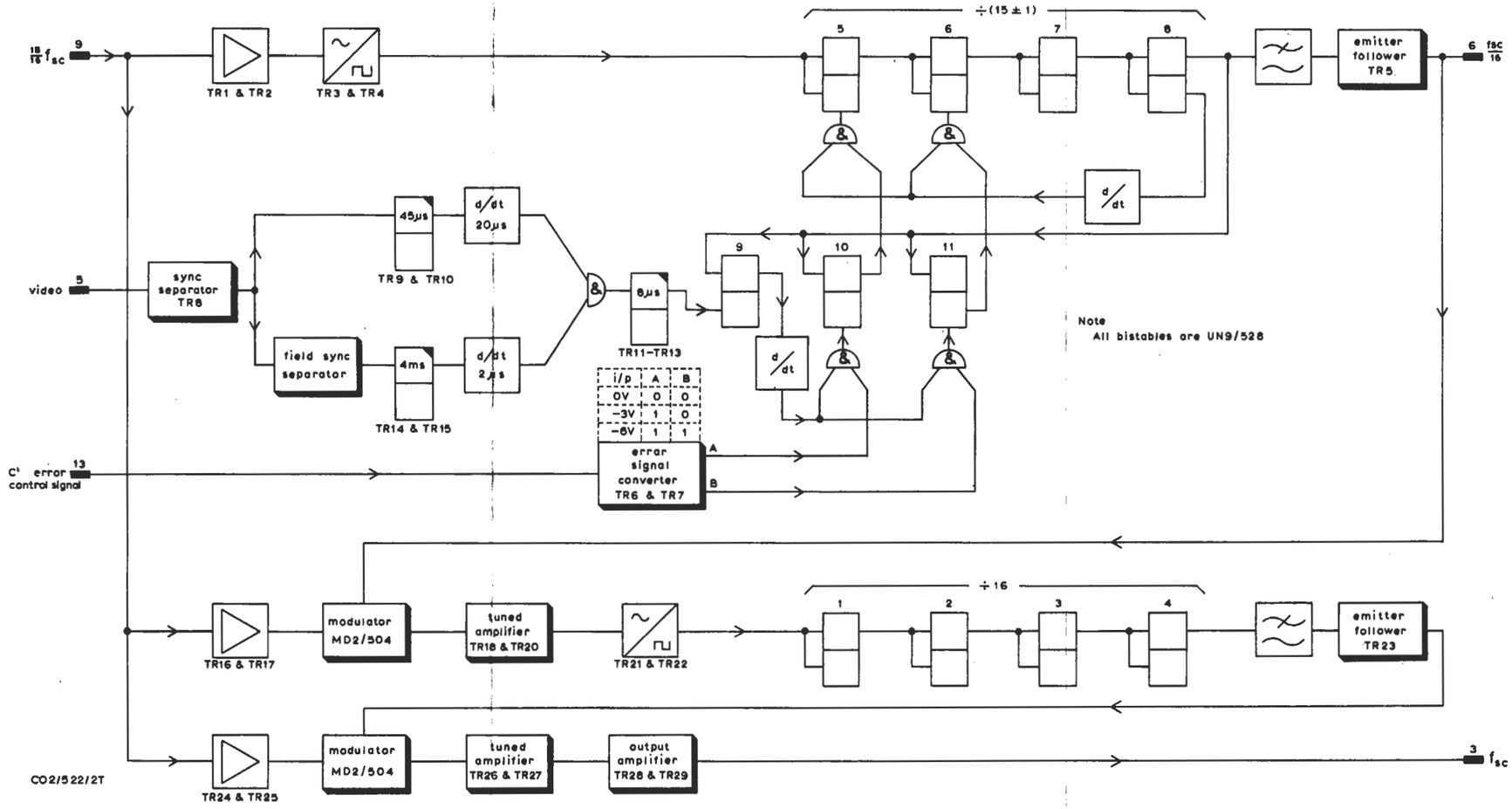

Fig. 2 Block Diagram of the CO2/522

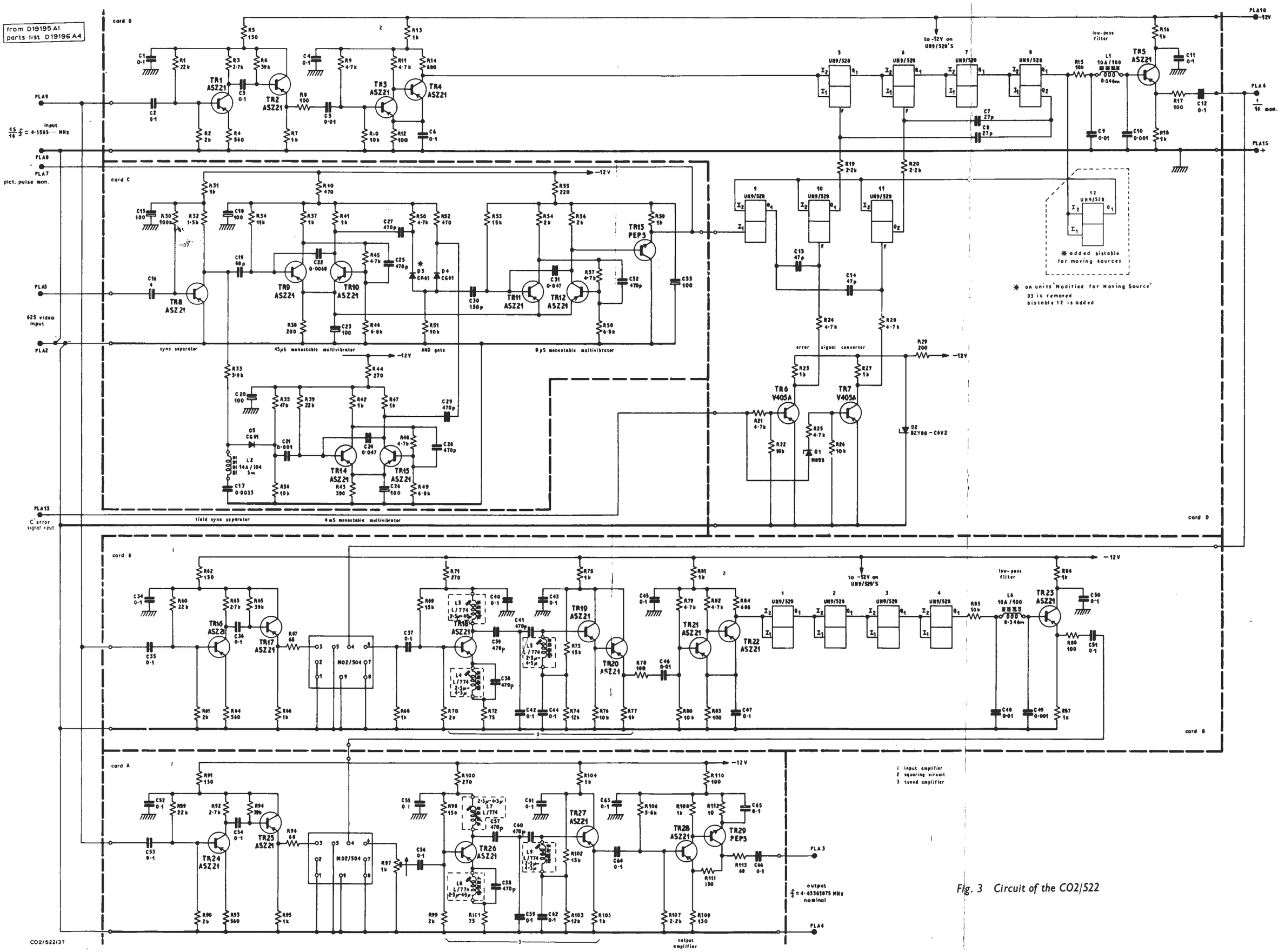

Fig. 3 Circuit of the CO2/522