THREE-CHANNEL SWITCH UNIT UN9/510

Introduction

The UN9/510 contains three solid-state switch circuits; the unit accepts three video signals and selects one of these inputs as an output[1,2]. The switches are operated by means of positive-going trigger pulses; a separate trigger input is provided to turn each switch on and this pulse is also used, via the switch-latch circuit, to turn off any switch which previously was on.

The unit is constructed on a CH1/12A chassis with index-peg positions 2 and 6. Each switch is mounted on a separate printed-wiring card. Power supplies at +12 volts are required[3,4].

General Specification

See parent unit.

Circuit Description

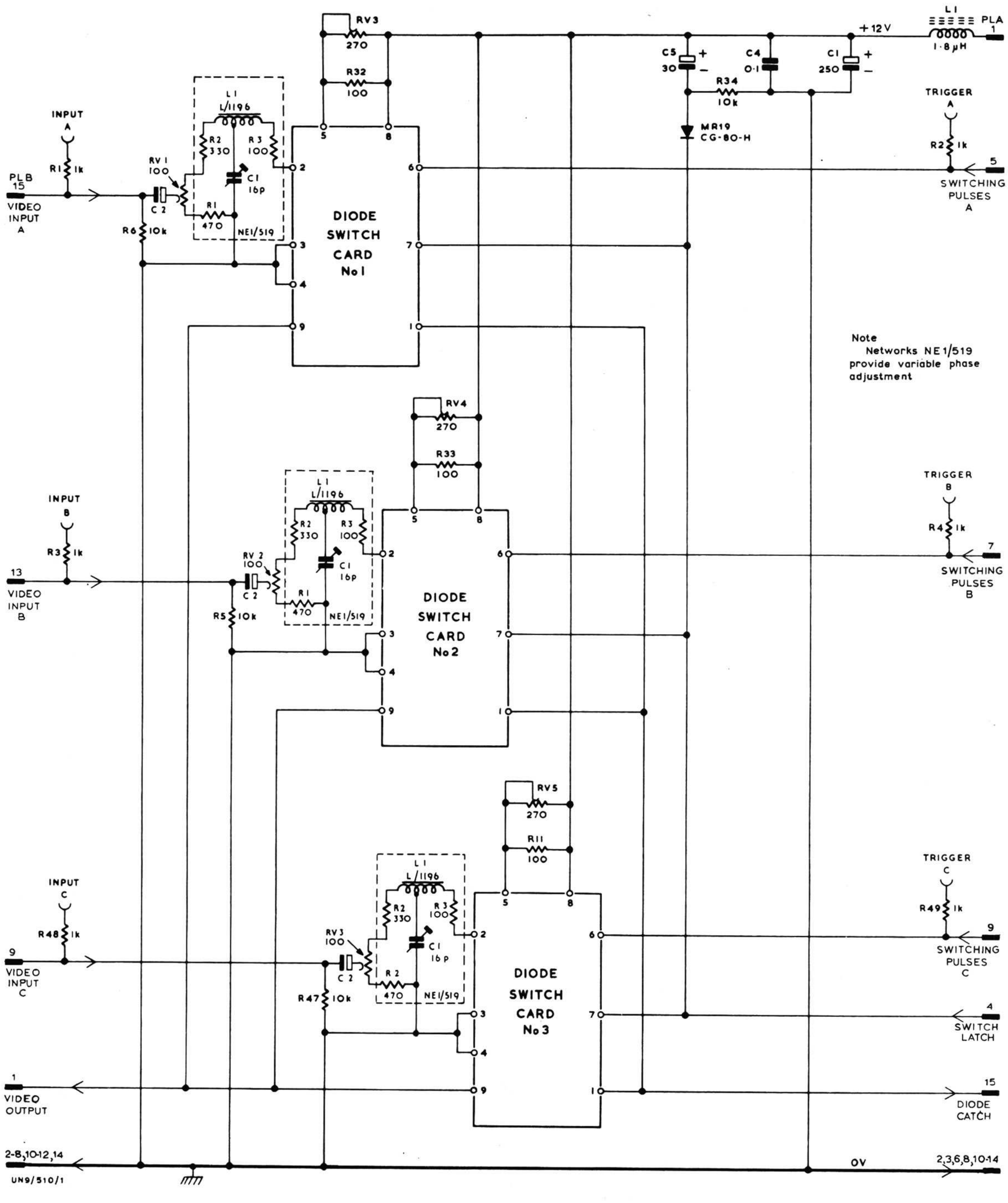
The circuit diagram of a complete UN9/510 unit is shown in Fig. 1 and a circuit of one of the switch cards (Card 1) is shown in Fig. 2. The component numbers for cards 2 and 3 are given in Table 1.

The signal path from input to output of the switch (see Fig. 2) is through diodes MR6 and MR1. When the potential at the junction of these diodes is higher than the potentials at the input and output terminals of the card, the diodes conduct and the switch is closed. When the potential at the junction of the diodes is lower than that at the input and output terminals the diodes are reverse-biased and the switch is open. The state of the diode switch is determined by the condition of transistor TR1. When TR1 is cut off, diode MR5 in its collector circuit conducts, the junction of the switch diodes is connected to a potential divider consisting of R12 and R15 and the switch is open. When TR1 conducts, MR5 is reverse-biased and the switch is closed.

Transistors TR1 and TR2 form a bistable multivibrator (see Television Engineering, Vol. 3). If, initially, TR1 is cut off and TR2 is conducting then a positive-going trigger pulse applied to the switching-pulse input passes through diode MR9, cuts off transistor TR2 and drives TR1 into conduction,

TABLE 1

Card 1	*Card* 2	*Card* 3
R12	R22	R35
R13	R23	R36
R14	R24	R37
R15	R25	R38
R16	R26	R39
R17	R27	R40
R18	R29	R41
R19	R29	R42
R20	R30	R43
MR1	MR10	MR20
MR2	MR11	MR21
MR3	MR12	MR22
MR4	MR13	MR23
MR5	MR14	MR24
MR6	MR15	MR25
MR7	MR16	MR26
MR8	MR17	MR27
MR9	MR18	MR28
TR1	TR3	TR5
TR2	TR4	TR6



Fig, 1 Circuit of Three-switch Switch Unit UN9/510

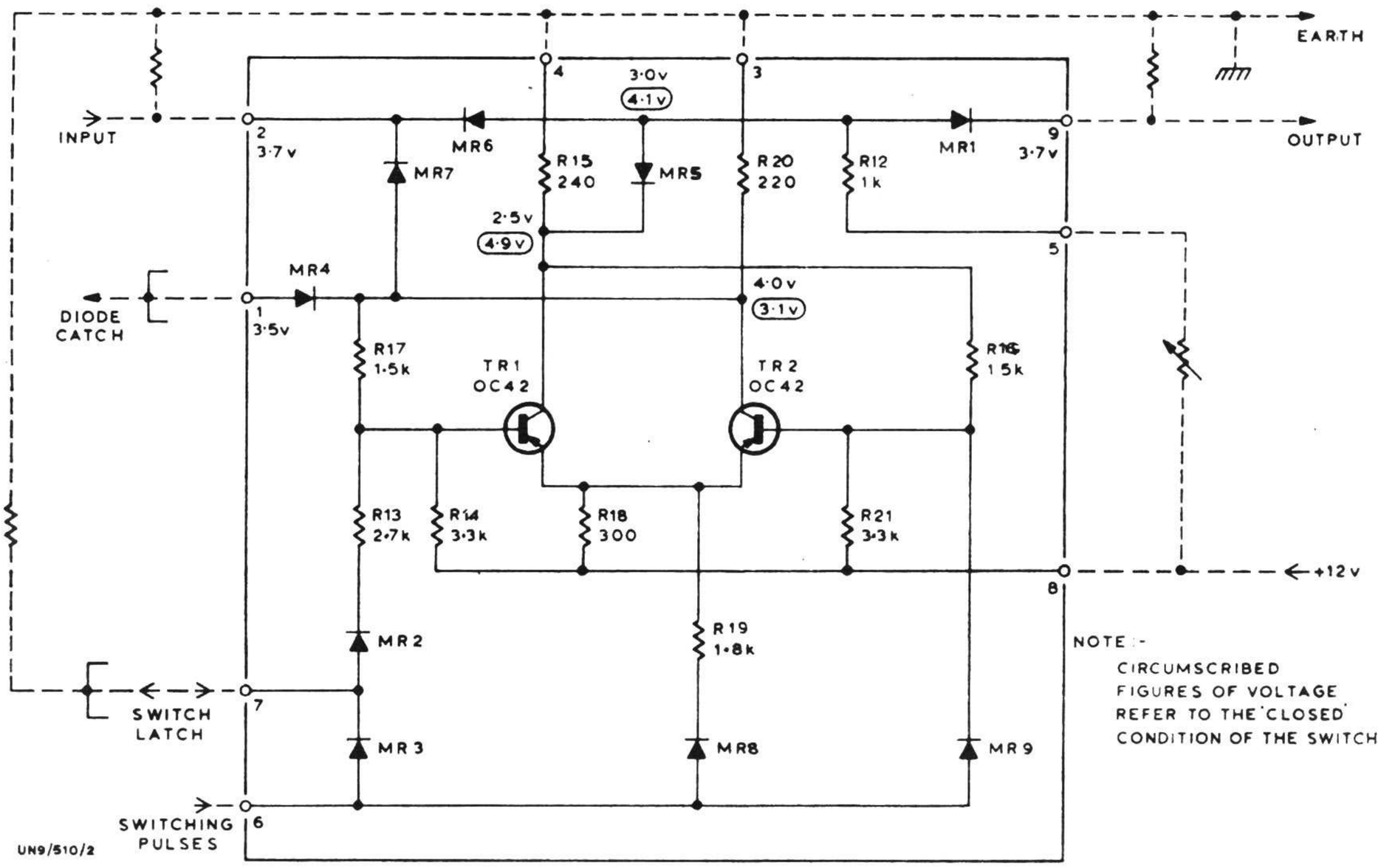


Fig. 2 Circuit of a UN9/510 Switch Card

thus closing the diode switch. The trigger pulse is applied also, via MR3 and the switch-latch line, to transistors TR3 and TR5, on cards 2 and 3 respectively, to open the switches on these cards. Additionally, this pulse is applied via MR2 and R13 to the base of TR1. When it reaches TR1 the pulse is not of sufficient amplitude to cancel the input pulse and so affect the state of the multivibrator; however, it might upset the correct functioning of the switch and so a correction circuit is provided. The correction circuit consists of MR8 and R19 connected in series between the switching-pulse input to the card and the common emitter connection of the two transistors. When a positive-going pulse is applied, via MR2 and R13, to the base of TR1 the current through R18 falls, but the current flow through R19 adds to the current flow through R18 and so maintains the current through R18, and hence the emitter potential, at the correct value.

If a switching pulse applied to the card is of low amplitude it may close the switch, but, because of the attenuation provided by the resistors equivalent to R13 on the other cards, fail to open the previously selected switch. If this happens MR4 and R20, together with the equivalent diode and resistor on the previously selected switch, are connected via the common diode-catch line to a trigger circuit on the associated AM1/551 Video Amplifier. The impedance provided by the two forward-biased diode-resistor networks in parallel is sufficiently low to actuate this trigger circuit and, as a result, a positive-going pulse is fed back from the AM1/551 to the common switch-latch line on the UN1/510. This pulse opens the previously closed switch and so rectifies the fault condition.

Diode MR7 serves as a shunt path for the video input signal when the switch is open. Under this condition TR2 is conducting heavily, thus its collector potential is high and MR7 is forward-biased. When the switch is closed and TR2 is cut off, MR7 is reverse-biased and so does not affect the video signal.

Alignment

Alignment should only be necessary following component changes.

Gain Adjustments

1. Terminate video inputs A, B and C in 100 ohms. Connect an oscilloscope terminated in 75 ohms

to the video output of the unit.

2. Apply a test signal containing a colour sub-carrier component (such as colour-burst and blanking level[5] or an augmented pulse-and-bar waveform[6]) to input A.
3. Trigger *On* switch No. 1 (by applying +12 volts to switching-pulse input A) and check that the output signal has the same amplitude as the input signal. If necessary adjust RV1 (Fig. 1) to match the output and input amplitudes.
4. Apply the test signal to input B and repeat step 3 for switch No. 2 adjusting RV2 if necessary.
5. Apply the test signal to input C and repeat step 3 for switch No. 3; adjust RV6 if necessary.

Note: If the above adjustments are carried out on a maintenance bench, +12 volts for the switching-pulse input can be obtained from the power supply to the unit. If the unit forms part of a Video Switching Panel PA18M/513 or PA18M/514 the adjustments can be carried out in position by placing the unit (or units) to be adjusted on chassis extenders. In this instance the input terminations are provided by the panel and the switching (or trigger) pulses can be derived from the control circuits of the associated video mixer.

Balance Adjustments

1. Terminate the video inputs to the unit as above.
2. Connect an oscilloscope, set to a sweep speed of 0·1 cm per sec and terminated in 75 ohms, to the output of the unit. Apply +12 volts in turn to the three switching pulse inputs of the unit and check that the pips that occur during switching do not exceed 150 μV in amplitude. If they do, adjust the appropriate balance controls; RV3 for switch No. 1, RV4 for switch No. 2 and RV5 for switch No. 3.

Note: If the unit is adjusted as part of a Video Switching Panel PA18M/513 or PA18M/514, switch No. 3 in UN9/510 No. 3 should be used as a reference channel for balance adjustments.

References to Typical Associated Equipment

1. Cut/Fade Amplifier AM1/504.
2. Video Switching Panels PA18M/513 and PA18M/514.
3. Stabilised Power Supplier PS2/503.
4. Video Amplifier AM1/551.
5. Colour Black Level Generator GE6/504.
6. Augmented Pulse and Bar Generator GE2/543.

TES 11/67