VERTICAL APERTURE CORRECTOR PROCESSING UNIT UN3/519

Introduction

The UN3/519 forms part of the EP1/516 Vertical Aperture Corrector. It accepts the following signals:

(a) The video signal to be corrected (designated OH)
(b) OH delayed by one line period (designated 1H)
(c) OH delayed by two line periods (designated 2H)

The unit processes these signals and combines them in the correct proportions to form a vertical-aperture-corrected video signal[1,2,3].

The unit is constructed on a double-sided printed board in a CH1/12A chassis with index-peg positions 16 and 35. It requires 105 mA d.c. at +12 volts and 95 mA d.c. at −12 volts.

General Description

The Vertical-Aperture-Corrected output of the unit is formed by adding to the 1H signal a correction signal derived from the 0H, 1H and 2H signals. The required correction signal[2,3] is [1H − 0·5 (0H + 2H)] and an inverted version of this is derived as shown in Fig. 1. The inverted signal is filtered to remove high-frequency noise and re-inverted by TR8 to produce the [1H − 0·5 (0H + 2H)] correction signal.

Before addition to the 1H signal the correction signal passes through a *coring circuit*. The purpose of this circuit is to prevent noise from the correction signal circuits reaching the output of the unit on parts of the picture where no correction signal is present.

A 140-ns delay is necessary in the 1H path to obtain the correct timing between the 1H signal and the correction signal before they are added together. A gain control at the output of the coring circuit varies the level of the correction signal added to the 1H-signal. This has the effect of varying the amount of aperture correction provided.

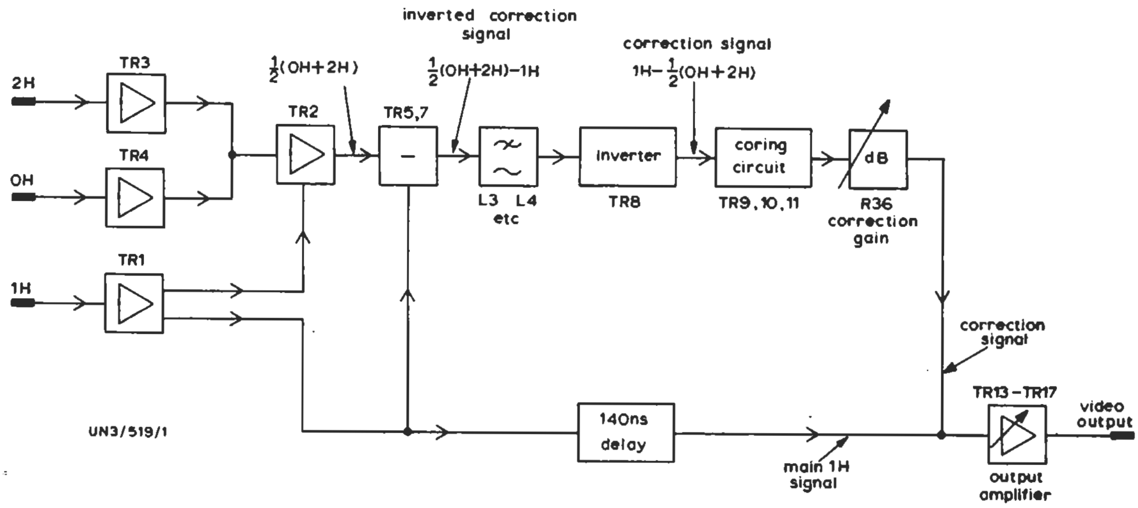

Fig. 1. UN3/519: Block Diagram

General Specification

Inputs	0H, 1H and 2H signals, as defined above
Input Level	1-volt p-p (composite)
Input Impedance	Greater than 3 kilohms
Output	Aperture-corrected video signal
Output Level	As 1H input signal
Output Impedance	75 ohms
Amount of correction[3]	Continuously variable up to 6 dB

Continued overleaf

Circuit Description

The circuit of the unit is shown in Fig. 2.

1H-Signal Processing

The 1H-signal passes through emitter follower TR1 via C7 to one side of a long-tailed-pair difference amplifier TR5 and TR7. An output of the 1H signal is tapped off the emitter load of TR1 at the junction of R8 and R9 to feed the 140-ns delay network L1 L2 C11 C12 L5 L6 C14 C15.

Formation of the Correction Signal

The 0H and 2H signals pass through emitter followers TR3 and TR4 and are added at the emitter of TR2, a common-base amplifier. The gain of the signal paths from the 0H and 2H inputs to the collector of TR2 are arranged to be 0·5 so that the signal at the collector of TR2 is 0·5 (0H + 2H). This is applied to the other side of the difference amplifier TR5 and TR7. Transistor TR6 provides a constant current for TR5 and TR7.

TR5 is effectively an emitter follower which feeds the 0·5 (0H + 2H) signal into the emitter of TR7. Transistor TR7 accepts the 1H signal at its base and the 0·5 (0H + 2H) signal at its emitter. It is, therefore, a common-emitter amplifier, providing inversion to the 1H signal, and a common-base amplifier providing no inversion to the 0·5 (0H + 2H) signal. The output at the collector of TR7 is thus [0·5 (0H + 2H) – 1H] which is the inverted correction signal. A gaussian filter L3 L4 C10 C13 C15 reduces noise above 3 MHz and TR8, a common-emitter stage, provides amplification and inversion to give the required correction signal at the base of TR9.

Coring Circuit

This comprises TR9 and a non-linear push-pull emitter follower TR10 and TR11. With R31 set to zero resistance (fully clockwise) the base-emitter voltages of TR10 and TR11 are both zero and so neither transistor conducts. Therefore to provide an output from the coring stage the correction signal at the emitter of TR9 must be greater than the base-emitter voltage required to bring the appropriate transistor into conduction. This causes the centre of the waveform to be removed from the signal at the output of the coring stage, e.g. a sinewave applied to the coring stage would appear at the output with a step at the crossover points of the sinewave. By increasing the resistance of R31 and hence the base bias on TR10 and TR11 the amount removed from the waveform is reduced until with full forward base bias, the stage passes the whole of the input waveform. R31 is normally set to just remove noise from the centre of the correction signal.

From TR10 the cored correction signal passes via C19 and the *correction gain* control, R36, to an emitter follower TR12. The correction signal is added back to the main 1H signal at the base of TR13.

Output Amplifier

This comprises TR13 to TR17 and associated circuitry. The aperture-corrected signal passes via a long-tailed-pair amplifier TR13 and TR14 to the emitter of TR15 which is a common-base stage. The base voltage of TR15 is held constant by zener diode D1 and the output voltage of TR15, which is developed across R47, is applied to the cascaded emitter follower output stage TR16 and TR17. The output impedance of TR17 is very low and so R54 is used to increase the output impedance of the unit to 75 ohms.

Negative feedback is applied from TR17 emitter to TR14 base via R51, R49 and R50. The amount of feedback applied, and hence the gain of the output amplifier, can be controlled by adjustment of R50.

C24 tailors the open-loop frequency response of the amplifier and C23 and R46 provide some high-frequency boost to compensate for losses in the delay network.

Alignment Procedure

The UN3/519 is aligned as part of its parent unit.

Maintenance

To assist in fault finding Table 1 gives typical video signal levels through the unit for a 1-volt p-p signal at the 1H input only. These figures were obtained with the *correction gain* control set to minimum.

TABLE 1

SIGNAL LEVELS IN THE UN3/519

Location	*signal level (volts p-p)*	*positive or negative going*	*remarks*
TR1 base	1·0	+	
TR13 base	0·4	+	
TR8 base	1·2	–	
TR9 base	5·6	+	
C19	2·5	+	R31 fully anticlockwise
TR17 emitter	2·0	+	

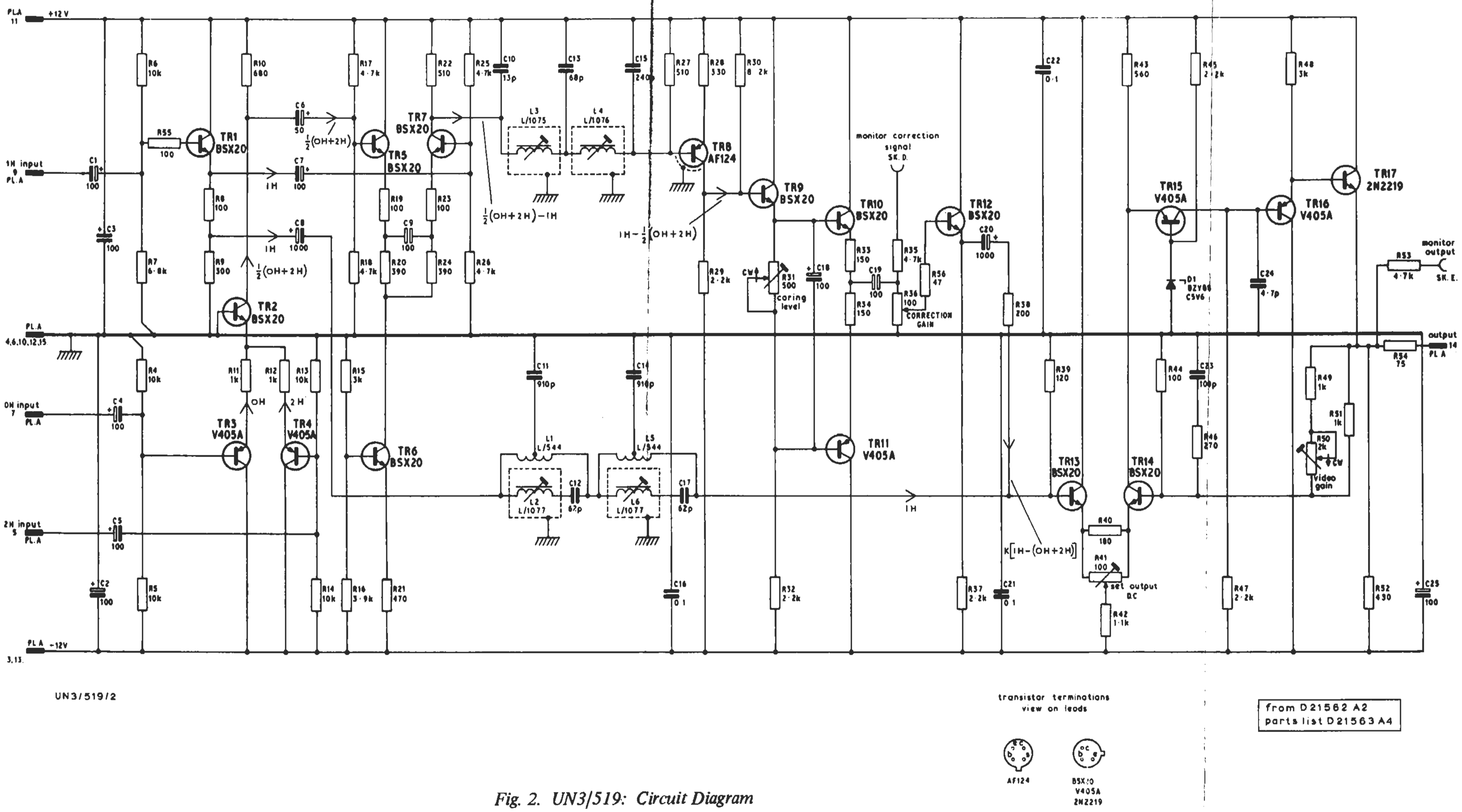

Fig. 2. UN3/519: Circuit Diagram

TABLE 2

VOLTAGES IN THE UN3/519

Location	*volts*
TR6 emitter	−6·2
TR1 emitter	+3·7
TR2 collector	+6·2
TR7 collector	+10·4
TR8 collector	−0·2
TR14 collector	+6·1
TR15 collector	−0·3

Table 2 gives various transistor terminal potentials which are typical of a correctly-operating unit. The voltages are measured with respect to the 0-volt line (chassis).

References

1. Instruction P.3, Section 1.
2. EP1/516 Vertical Aperture Corrector.
3. Engineering Training Department Information Sheet, *Vertical Aperture Correction* (J.R. Kirkus).

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