VIDEO DIFFERENCE AMPLIFIER AM1/567

Introduction

The AM1/567 accepts two video signals and provides a range of facilities for use with waveform monitors[1]. The facilities provided consist of:

(a) A variable-gain difference amplifier.
(b) A calibrating square-waveform (not available externally in calibrated form).
(c) An auxiliary *Clean Feed* output which is derived from the A-input signal and is used for triggering purposes[2].

The gain of the difference amplifier is continuously-variable between −5 dB and +3 dB, but the *Gain* control is calibrated only over the most accurate portion of this range, between −2 dB and +2 dB. The calibration waveform is applied to the difference amplifier in place of the B-input video signal when a *Mode Selection* switch is set to *Measure A*. The amplitude of the calibration waveform can be set to 1 volt p-p, 0·7 volt p-p or 0·3 volt p-p, for measuring composite video, picture or sync amplitudes respectively. Additional switches are provided by means of which the amplitude of the calibration signal can be increased or reduced by 0·5 dB and/or 0·2 dB.

The *Gain* setting of the difference amplifier does not affect the accuracy of the calibration signal.

Power supplies at +8·2 volts and −11·2 volts are provided by an integral power supplier.

The unit is constructed on a double-module CH1/46 chassis with index-peg positions 25 and 44. The A and B input connectors are mounted on the front panel of the unit, together with the following controls:

(a) A *Mode* switch (SD), labelled *A/A−B/−B/Measure A*.
(b) A *Gain* control calibrated from −2 dB to +2 dB.
(c) A calibration-waveform amplitude switch (SC), labelled *1V/0·7V/0·3V*.
(d) Two subsidiary calibration switches (SA and SB), labelled *+0·5 dB/−0·5 dB* and *+0·2 dB/−0·2 dB* respectively. These two switches are spring-loaded devices and return to the out-of-circuit central position when released.
(e) An input-termination switch (SE), labelled *75Ω/10 kΩ*.

General Specification

Gain	−5 dB to +3 dB
Inputs	two
Input Impedance	switchable: 10 kilohms (± 5%) or 75 ohms (± 1%)
Max. Output Level (main output)	2·8 volts p-p with a 10-kHz sine wave input
Main Output Impedance	75 ohms
Auxiliary Output Load	not less than 1 kilohm
Amplitude/Frequency Response from A input to Main Output (relative to response at 10 kHz)	±0·1 dB at 4·43 MHz ±3 dB up to 15 MHz
Pulse to Bar Ratio (625-line)	within ±1%
L.F. Time Constant (capacitance coupled)	0·1 second (±50%)
Common Signal Rejection	greater than 54 dB at 10 kHz greater than 26 dB at 5 MHz
Calibrator Accuracy (relative to A-input)	±0·05 dB for 1 volt ±0·15 dB for 0·7 volt or 0·3 volt ±0·03 dB for the 0·2 dB and 0·5 dB variations
Power Requirements	240 V, 50 Hz, about 7 watts

Circuit Description

The circuit diagram is given in Fig. 1 on page 3.

Square Wave Generator and Calibrator

Integrated circuit IC1 functions as an astable multivibrator, at a frequency of about 8·7 kHz, and drives in push-pull the long-tailed pair formed by transistors TR10 and TR11. The common emitter connection of this long-tailed pair is returned to the −11·2 volt line via the constant-current source TR13. Transistors TR12 and TR13 are of the same type and share a common bias supply; thus the emitter current of TR13 is controlled by the voltage drop across zener diode D7 and an extremely stable square-wave is developed between the collectors of transistors TR10 and TR11. Variable resistor R71 functions as a preset frequency control.

The output of the square-wave generator is applied to a ladder attenuator (labelled calibrator in the circuit diagram); tappings are taken at points along this attenuator and applied to switch SC. The calibration voltages that can be selected by SC (with switches SA and SB in the unoperated condition) are 1 volt peak-to-peak, 0·7 volt peak-to-peak, 0·3 volt peak-to-peak. Switches SA and SB modify the attenuation provided by the ladder network; SA provides +0·5 dB when connected across R3 and −0·5 dB when connected to R4; SB provides +0·2 dB when connected across R6 and −0·2 dB when connected to R5.

Difference and Output Amplifiers

The difference amplifier consists of two cascaded emitter-follower stages, TR1–TR2 and TR5–TR4, and a constant-current source TR3 which feeds the emitters of transistors TR2 and TR4. Zener diode D2 stabilises the base potential of TR3. Diodes D1 and D3 are overload protection devices. The output from the difference amplifier is applied to the output amplifier via *Gain* control R21. The gain control is shunted by resistors R18 and R22, and the wiper of the control is returned to the junction of these resistors in order to expand the calibration scale on either side of the 0-dB point.

The A and B input signals are applied to the associated inputs of the difference amplifier via the SD1 and SD2 banks of the *Mode* switch. With this switch in the *A* position the *B* input of the amplifier is terminated in 36 ohms, in the *−B* position the A input is terminated in 36 ohms and in the *Measure A* position the B input is fed, via switch SC, with the selected calibration signal.

Transistors TR6 to TR9 form a feedback amplifier with a gain of 10 and a bandwith of 19 MHz. Frequency-dependent negative feedback is applied over the last two stages of the amplifier and resistor R54 is adjusted on test to give the required gain. Feedback (d.c.) is also applied from the collector of TR9 to the emitter of TR6 so that the current through the transistor is determined by the feedback signal. The bias applied to transistor TR7 is determined by the current through TR6; therefore TR6 determines the d.c. conditions at the output of the unit. Resistor R41 is adjusted on test for zero d.c. at the output.

Monitor Amplifier

This amplifier consists of transistor TR14 and provides the *Clean Feed* output of the unit. It is fed with the A-input signal at all times. When the *Mode* switch is in the *A*, *A−B* or *Measure A* positions the signal is applied to the monitor amplifier via switch SD2, transistor TR5 and switch SD3. When the *Mode* switch is in the *−B* position the signal path is via switch SD3 only.

Power Supplies

Power supplies at +8·2 volts and −11·2 volts are derived from a conventional stabilised power supplier comprising transistors TR15 to TR17. The shunt amplifier TR15 compares any load variations across the −11·2 volt supply with a reference voltage derived from zener diode D15 and applies correction signals to the base of transistor TR16. Preset resistor R82 provides a fine control of the voltage applied to the 11·2-volt line. The +8·2 volt line is separately stabilised by zener diode D18.

References to Typical Associated Equipment

1. General Purpose Waveform Monitor MN6/502.
2. Trigger Unit UN1/558.

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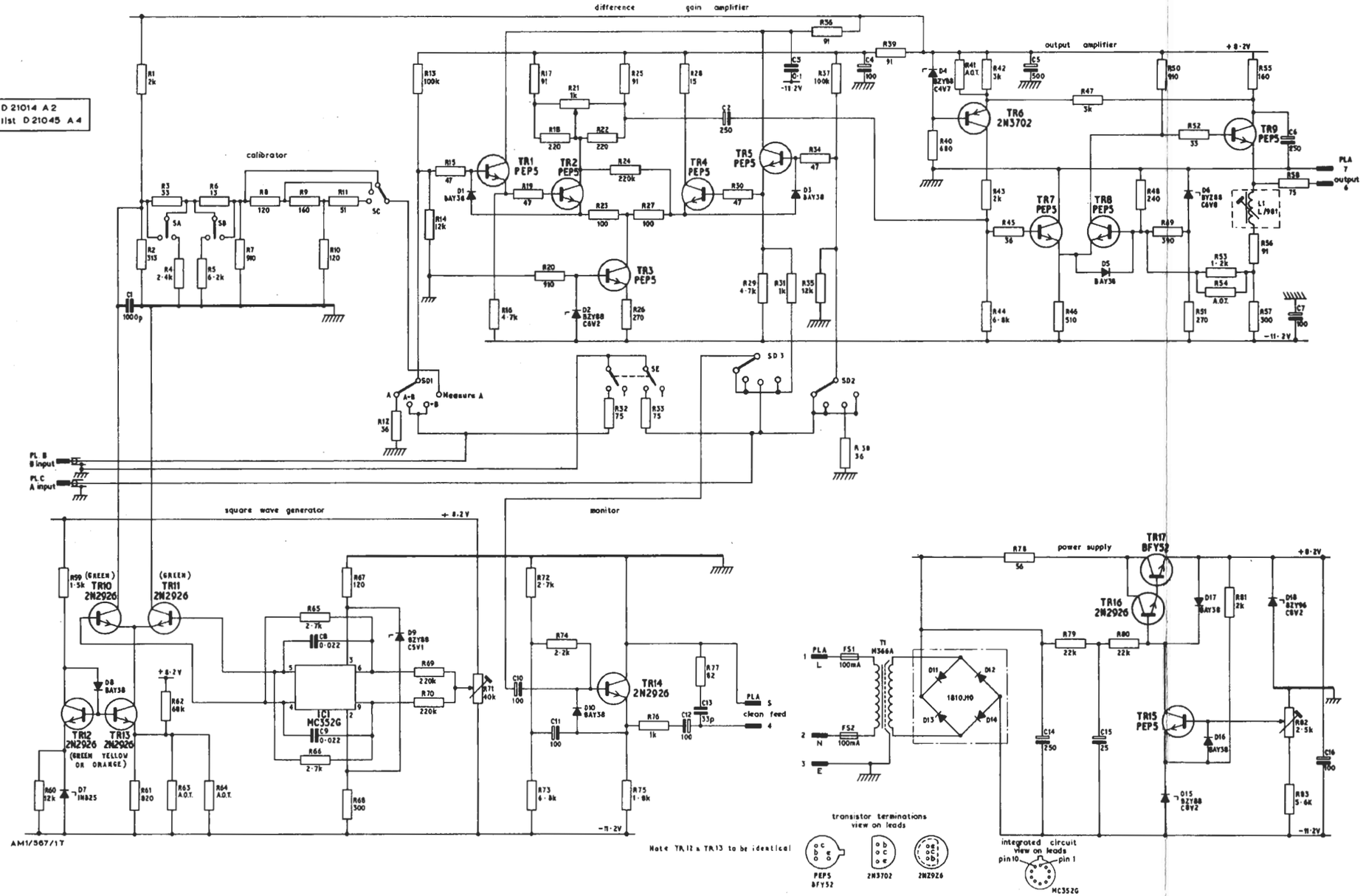

Fig. 1 Circuit of the AM1/567