STABILISING AMPLIFIERS AM18/509 A—E

Introduction

The AM18/509 accepts composite video signals at a level of 1 V p-p and, after clamping the back porch at earth potential, gives out the same signal but with a 3-dB loss. It is suitable for use on any standard, monochrome or colour, and is intended to reduce spurious l.f. variations in d.c. level. It will not deal with badly distorted signals. There are no active elements in the signal path and so the linearity is good.

The AM18/509 consists of the following units mounted in half the width of a PN3/21 panel:

Error-signal Amplifier AM3/501
Shunt-clamp Amplifier and Power Supplier AM18/508
Sampling-pulse Generator GE2/502

The differences between the AM18/509 and the A—E variants are listed below:

AM18/509A	Comprises two completely separate AM18/509's and occupies the full width of the PN3/21 panel.
AM18/509B	As AM18/509 except that a PN3/23 flush mounting panel is used.
AM18/509C	As AM18/509A except that a PN3/23 flush mounting panel is used.
AM18/509D	Identical with C except that a make-before-break relay switching circuit is included to change over between the outputs of the two clamps.
AM18/509E	As AM18/509B but with the addition of a UN3/507 Gain Control Unit and either an AM5/507 or an AM5/513 Video Amplifier to provide a continuously variable gain control over the range ±3 dB. This variant will accept a non-composite signal and, with an external supply of syncs, will give out a correctly proportioned composite signal.

General Specification

AM18/509

Signal Input (composite video)	1 V p-p
Signal Output (composite video)	−3 dB relative to input
Input and Output Impedances	
Video Signals	75 ohms ±5%
Error Signals	greater than 13 ohms
Allowable Deviation of Input Back-porch Voltage from Earth (clamp off)	±2 volts
Allowable 50-Hz Interference at Input (clamp off)	0·7 volts p-p
Error-signal Reduction	see Fig. 2
Allowable Variation of Input Sync Pulses	±6 dB
k-rating on 625-line 2T Pulse and Bar	less than 5%
Non-linearity Distortion	less than 1%
Differential Gain Distortion at 4·43 MHz	less than 1%
Differential Phase Distortion at 4·43 MHz	less than 0·25 degrees
Bump at Output for Mains Input Voltage Step of 6%	less than ±8 mV
Hum Produced by Clamp (relative to output picture signal)	more than 54 dB down
Interference Produced by Clamp on Back Porch (relative to output picture signal)	more than 46 dB down
Maximum Ambient Temperature	40°C
Mains Input Voltage	200 to 250 volts, 50 Hz
Mains Input Power	14 watts
Signal Connectors	Musa
Mains Connector	Cannon EP-4-14S

Weight	13½ lb
AM18/509A and C Specification as above except:	
Weight	21 lb
Mains Input Power	28 watts
AM18/509B Specification as for AM18/509	
AM18/509D Specification as for AM18/509 except:	
Mains Input Power	28 watts
Power Input to Relay Circuit	50 V d.c.
Weight	22 lb
AM18/509E Specification as AM18/509 except:	
Signal Input	
Composite Video	1 V p-p ±3 dB
Non-composite Video	0·7 V p-p ±3 dB 2 V p-p mixed syncs
Differential Phase Distortion	less than 0·4 degree at 4·43 MHz
Mains Power Input	21 watts
Weight	16 lb

General Description

The shunt clamp is fundamentally a two terminal device which, when connected across a video circuit, re-establishes any d.c. component lost in the preceeding parts of the transmission circuit and removes hum and other interfering l.f. signals.

The principle underlying the operation of the AM18/509 is that a video signal, which has suffered envelope distortion in transmission through a linear system, may be considered as the original signal with an added error signal. The clamp abstracts the error signal by sampling the video signal during the back-porch period, integrates the resulting pulse train, inverts the correction signal thus produced and feeds it back into the original signal.

Circuit Description

A block diagram is given in Fig. 1. To prevent a mismatch at the point of connection, the clamp forms the shunt arm of a T-pad configuration which has a characteristic impedance equal to that of the circuit; i.e., 75 ohms. The series arms of the T are formed by two 13 ohm resistors in the associated AM18/508.

The signal from the junction of the two resistors is fed to the GE2/502 Sampling Pulse Generator and, via the clamp in-out switch, to the AM3/501 Error Signal Amplifier. The GE2/502 produces two sampling pulses at line frequency for driving the back porch sampling and demodulating bridges in the AM3/501. The output of the sampling bridge is a train of pulses modulated by the error signal. These pulses, after amplification and inversion, are passed to the demodulating bridge which acts as a switch; this allows the pulses from the sampling bridge to charge or to discharge an integrating capacitor. The potential across the integrating capacitor thus varies with the amplitude of the sampling pulses; this variation of potential is the error correction signal which is passed back to the AM18/508 to be mixed with the original signal.

The time constant of the integrating circuit can be altered in three steps, see Fig. 2.

The power supplies for the three sub-units form part of the AM18/508.

Maintenance

Routine maintenance is not required but the following tests, which apply to all versions of the AM18/509, may be made occasionally or if the performance becomes suspect (see item 7).

1. To check the tuning of the subcarrier rejector circuit on the AM3/501:
   (a) Feed a 1 V p-p subcarrier signal to M1 on the AM3/501.
   (b) Connect an oscilloscope via a probe to the junction of R4, C1.
   (c) Tune L1 for minimum displayed signal.
2. To check the tuning of the subcarrier rejector circuit on the GE2/502:
   (a) Feed a 0·5 V p-p subcarrier signal to the input of the AM18/509.
   (b) Set the clamp switch on the AM18/508 to the *Out* position.
   (c) Connect an oscilloscope via a probe to the emitter of TR1.
   (d) Tune L1 for minimum display.

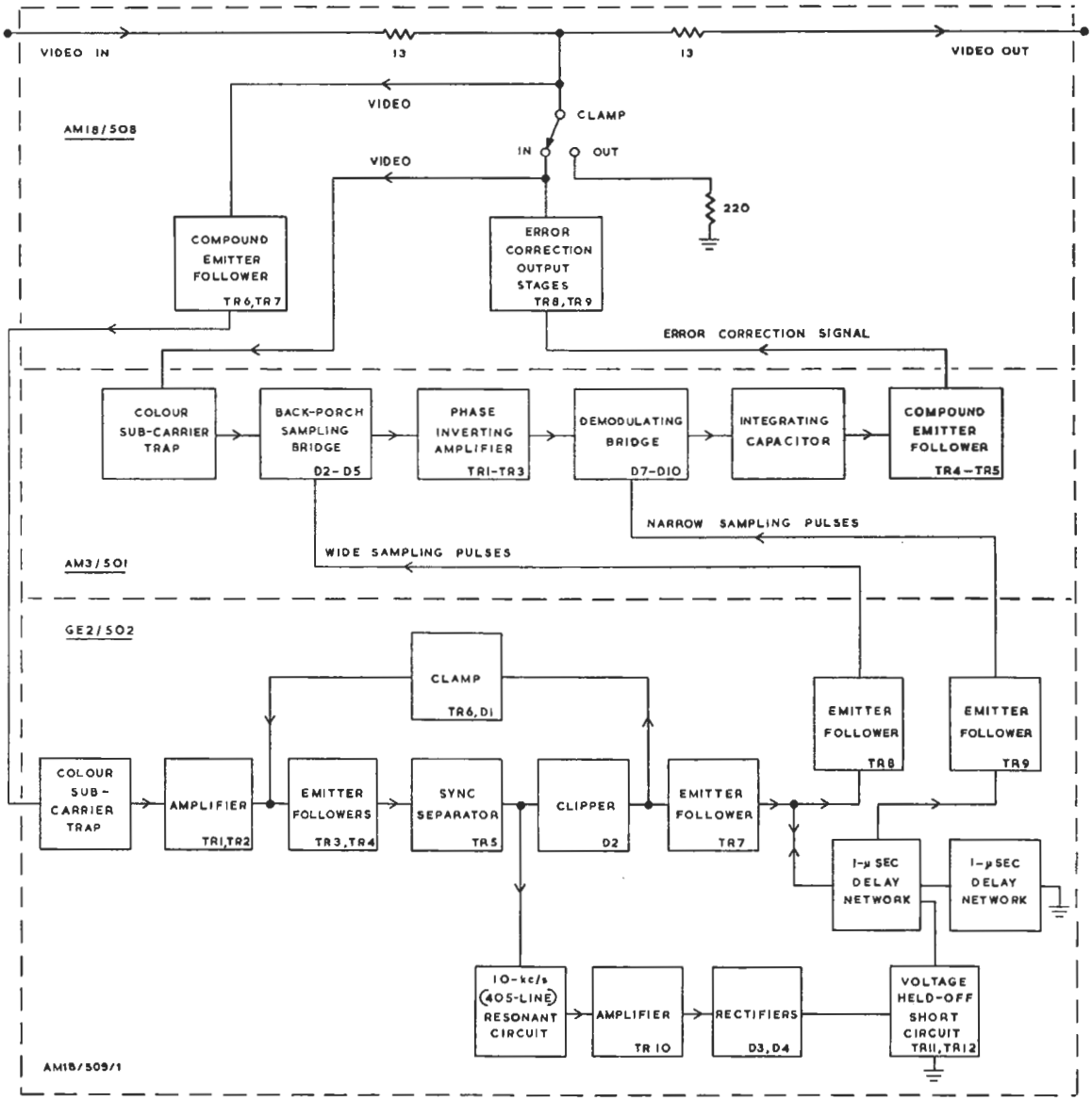

Fig. 1 Block Diagram of the Stabilising Amplifier AM18/509

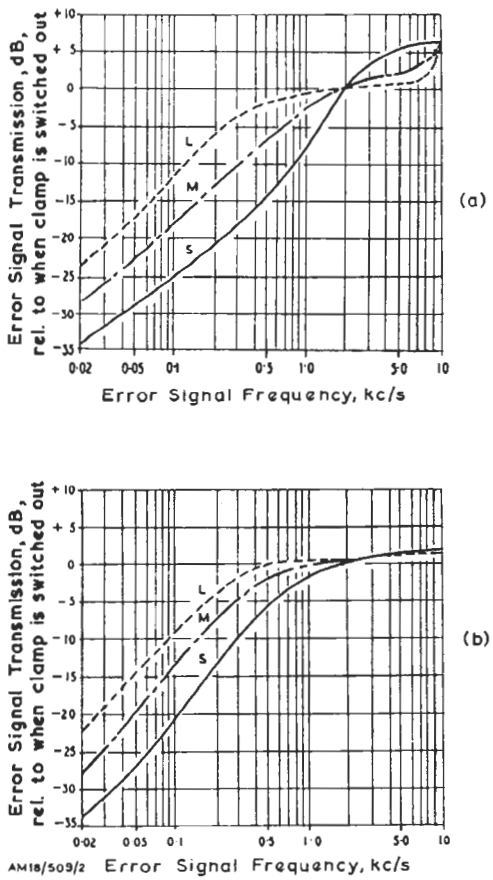

Fig. 2 Typical Error-signal Reduction with AM18/509 Switched to Long(L), Medium(M) Short(S) Time Constant

(a) 405-line pulse and bar (b) 625-line pulse and bar

3. To check the tuning of L2 in the automatic pulse-duration control circuit in the GE2/502:
   (a) Feed a 1 V p-p 405-line pulse-and-bar signal to the input of the AM18/509 and terminate the output.
   (b) Connect an oscilloscope via a probe to the base of TR10 in the GE2/502.
   (c) Tune L2 for maximum display; this should be not less than 1·6 V p-p.
   (d) Substitute a 625-line input signal; the displayed amplitude should be 0·2 V p-p.
4. With the same conditions as in (3) above, but with the oscilloscope connected in turn to M2 and M3, check that the displayed waveforms are as in Fig. 3a and 3b for a 405-line input signal and as in Figs. 3c and 3d for 625-lines. If the input signal is reduced by 6 dB there should not be any appreciable change in output pulses.
5. To check the clamping action:
   (a) Feed in a video signal which is free of superimposed d.c.
   (b) Connect an oscilloscope to M2 on the AM18/508.
   (c) Set the *Time Constant* switch to *Short*.
   (d) Press the *Test* switch; the amplitude of the 50-Hz signal added to the video signal should not exceed 30 mV p-p.
6. To check the operation of the error signal feedback path, proceed as follows referring to the waveforms shown on the circuit diagram of the AM3/501:
   (a) Connect a video signal to the input of the AM18/509.
   (b) Open the feedback path and connect its input to earth by operating switch S1 in the AM3/501 to the *0V* position.
   (c) Inspect the pulses at each end of the secondary of T1 relative to earth, using an oscilloscope with a high impedance probe. If the pulses are satisfactory examine the waveform at M2 (AM3/502); the signal amplitude should be less than 0·3 V p-p.
   (d) Operate S1 to the *−10 mV* position; the pulses at M2 should increase to about 1V p-p.
   (e) Examine the pulses from T3 which drive the second diode bridge; M2 should be temporarily earthed.
   (f) There should be a steady potential of about +7 volts at M3 with S1 in the *−10mV* position. This should decrease to about +6 volts with the switch in the *0V* position.

If inspection and these tests do not enable the source of a fault to be traced, the equipment should be returned to Equipment Department for service.

7. When testing an AM18/509E, the *Video Input* switch on the UN3/507 should be set to the *Comp* position and the gain control set to *−3 dB* before the tests detailed above are made. With the gain control set to 0 dB and the output terminated with 75 ohms, the gain should be 0 ±0·25 dB.

With a 2-volt p-p input of syncs, with both video input and output connectors terminated with 75

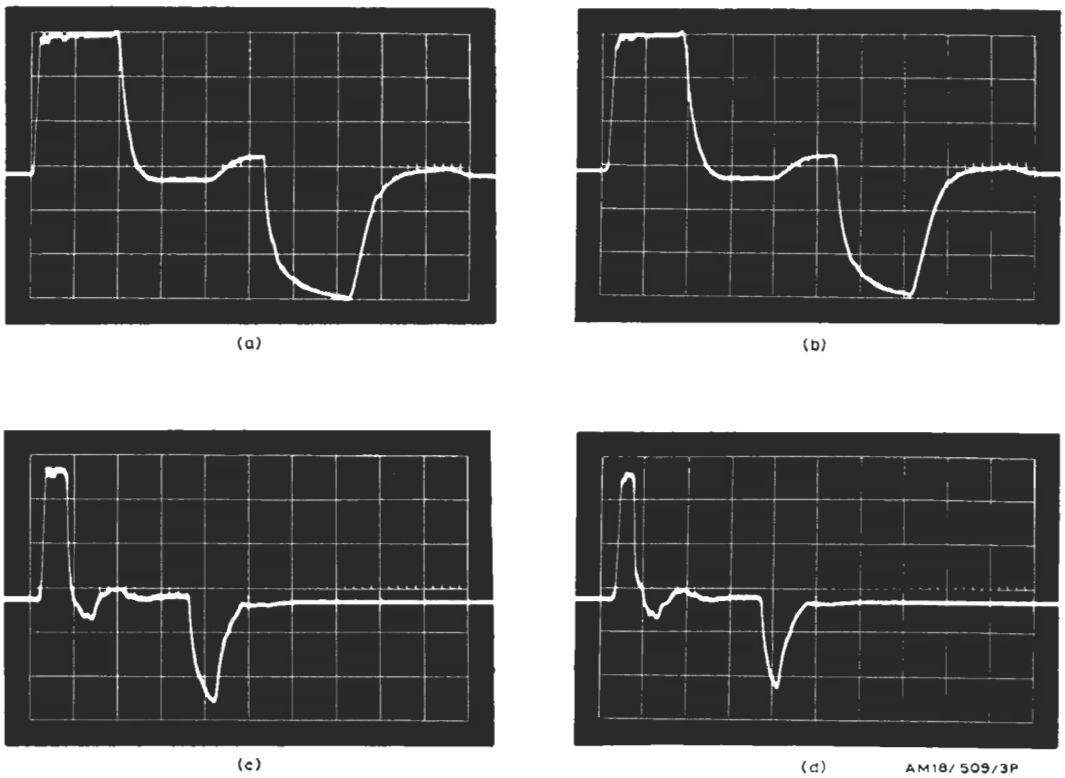

Fig. 3 Waveforms in the GE2/502

(a) monitoring point M2, 405 lines
(b) monitoring point M3, 405 lines
(c) monitoring point M2, 625 lines
(d) monitoring point M3, 625 lines

ohms and with the *Video Input* switch in the *Non Comp* position, the amplitude of the sync pulses across the output load should be between 14·5% and 15·5% of the input-sync amplitude.

References

1. Designs Department Technical Memorandum No.6.39(62).
2. I.E.E. Paper No.4027E June 1963.

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