A.G.C. DETECTOR AM3/505

Introduction

The AM3/505 accepts composite or non-composite video signals on either the 405-line or the 625-line standard. It compares the peak amplitude of the input signal with a d.c. reference voltage which may be varied to provide a gain control. Difference signals are amplified and limited before appearing at the output as a d.c. error voltage which can be used for controlling an associated video attenuator[1]. The circuit reacts very quickly to an increase of signal but more slowly to a decrease.

The unit is mounted on a CH1/12A chassis and requires an external power supply.

Specification[2]

Video Input	
Composite	1 V p-p
Non-composite	0·7 V p-p
Input Impedance	greater than 5 kilohms
Mixed Sync Input	2 V ±0·5 V p-p
Sync Input Impedance	greater than 10 kilohms
Reference Voltage Input	0 to −12 V
Output Control Voltage (with increasing video input)	−12 to 0 V into more than 5 kilohms
Frequency Response (*video section*)	−3 dB at 1·5 MHz
Reaction Time (*when used with AT3M/506*)	
Input 3 dB high	5 ms approx
Input 3 dB low	3 s approx
Integration	
(Response in closed loop system with AT3M/506 as peak signal is varied from 2·5% to 100% of picture area)	constant to within 1%
Temperature Stability.	
Change of gain of closed loop system with AT3M/506 over temperature range of 25-50°C	negligible
Weight	1 lb
Power consumption	85mA at −24 V
Index pegs	3 and 21

Description

The circuit diagram of the AM3/505 is given in Fig. 1 on page 3. The input signal is amplified and band-restricted by C2,L1,C3 to be 3 dB down at 1·5 MHz with respect to 50 kHz. This is to prevent response to signals from very small picture areas.

The signal is then clamped by pulses derived from an input of mixed syncs. The clamping pulses and the clamped signal may be monitored at the test points provided.

After clamping, a voltage, proportional to the peak of the video signal, is developed across C9 by TR10. The integration is repeated by TR12 and TR14 to equalise the response to small and large area picture signals; the final voltage appears across C11, which is charged negatively with increasing signal. The forward time constant of the integrators is short, thus the voltage on C11 changes rapidly with increasing signal. With decreasing signal the change of voltage on C11 is slower because D3 becomes non-conductive and C11 discharges through the 8·2 megohm resistor R31.

The voltage across C11 is passed via two emitter followers (to maintain a high impedance across C11) to a long-tailed pair comparator stage, where it is compared with the reference voltage.

The output signal from the comparator stage, the level of which depends on the potential on C11 and on the reference voltage as set by R42, is amplified and then limited by the diode D10. It finally appears at the emitter of TR28 as an error signal which increases positively with increase of input signal. The diode D10 prevents the base of TR27 from being driven more negative than the voltage of the tapping on R70. R70 is set so that the circuit is insensitive to any reduction of input signal beyond 3 dB. Thus any reduction of picture amplitude because of cross-fading between picture sources or to any special effects, will not cause large increases of system gain and therefore of system noise.

The gain of the circuit from the base of TR15 to the emitter of TR28 is high (about 100) to give efficient a.g.c. C12/R32 provide a feedback path to maintain stability. If a sudden overload occurs, C11 is charged rapidly negative to the peak value of the signal and consequently a large positive error signal appears at the output and therefore, also across C12 and R32 in series. The input to the unit falls (because of increased attenuation[1]), C11 discharges through R31 and the error signal drops. The input to the unit now rises again and the system would become unstable but for the feedback loop.

When the potential on C11 rises due to the initial disturbance, C12 starts to charge through R32 and the potential across it eventually reaches the mean potential of C11. The charge on C12 stabilises the potential on the base of TR15 and thus prevents any swinging of the output error signal. This condition persists until the overload is removed. When this happens the input signal drops to an abnormally low level because the high output error signal maintains a high loss in the associated attenuator[1]. D3 is now reverse-biased and the potential of the base of TR15 falls at a rate determined primarily by C12 and R31. Thus the error signal reduces slowly and the system stabilises at the normal working point. If R32 is too large, the system oscillates, if it is too small the time taken to return to normal working is too long and becomes very obvious at the output of the system[1] of which the AM3/505 forms a part.

The clamping pulses are formed from mixed syncs. After amplification and differentiation the leading edge is used to trigger an L/C circuit, tuned to a few hundred kHz, into oscillation. A diode across the tuned circuit limits the oscillation to one half cycle per trigger pulse. Thus one positive pulse per line appears on the base of TR21 and the resulting pulse via T1 switches on the clamping transistors, TR23 and TR24. The zenor diode D7, provides the clamping potential.

Maintenance

Routine maintenance is not required, but if necessary the performance of the unit may be checked as detailed below. Note that the AM3/505 has a high gain and it must be tested in the feed-back loop for which it was designed. A suitable test circuit is given in Fig. 2.

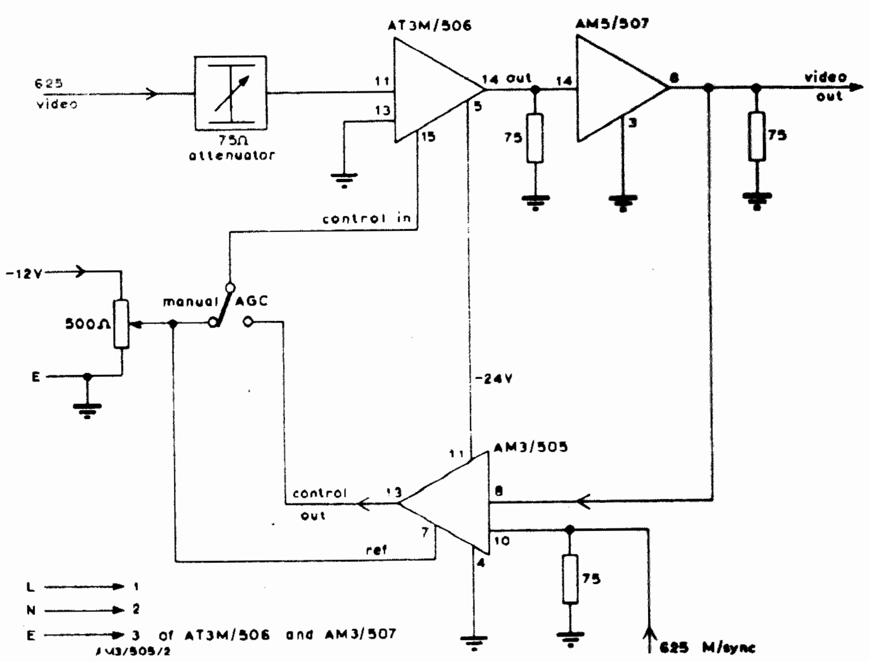

Fig. 2. Test Arrangement for the AM3/505

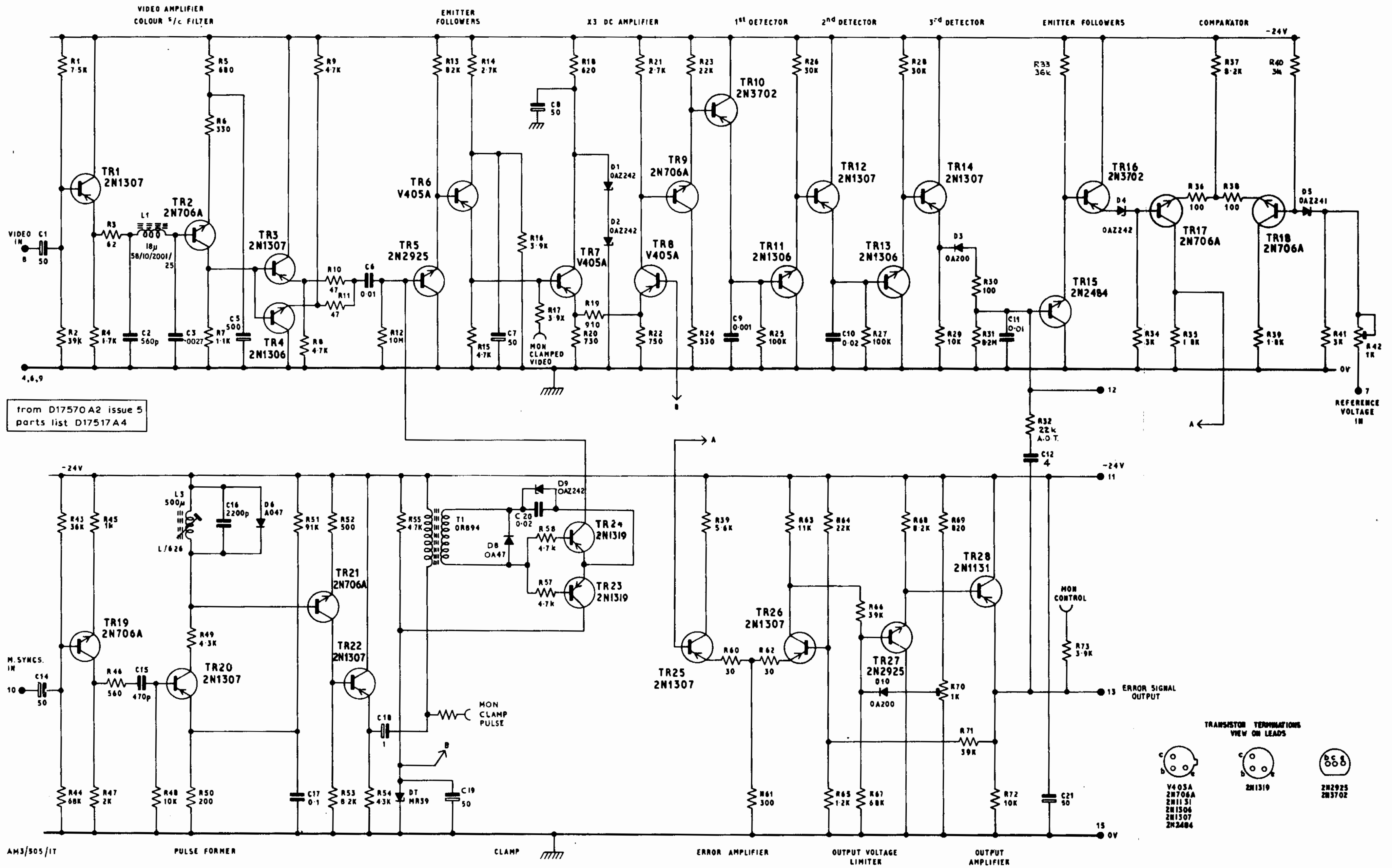

Fig.1 Circuit of the AGC Detector AM3/505

Apparatus required.

Oscilloscope
15-dB video amplifier (AM5/507 or similar)
Attenuator AT3M/506
Avometer 8
12 V, 1A power supplier (PS2/503A)
500-ohm 3-watt wirewound potentiometer
Single pole change-over switch
75-ohm switched video attenuator
Video oscillator
625-line mixed sync pulses
625-line video signal (such as grey scale)
625-line colour sub-carrier signal

Procedure

1. Connect up the apparatus as shown in Fig. 2. Put the change-over switch to manual and the input attenuator to 0 dB.
2. To check the frequency response of the video stage, supply an input signal to the test circuit from the video oscillator and connect the oscilloscope to the emitter of TR2. The response of the stage should be 1 dB down at 1 MHz with respect to 50 kHz.
3. Connect the video signal to the test circuit input. Connect the oscilloscope to the *Clamped Video* test point and display the broad pulses. If there is any distortion of the pulses, adjust L3.
4. With conditions as in paragraph 4, but with the input to the test circuit adjusted to give a 1 volt p-p signal at the output of the AM5/507, the amplitude of the signal at the *clamped video* test point should be about 3 volts p-p inverted.
5. Put the change over switch to its *A.G.C.* position. Apply a 1 volt p-p video signal to the input of the test circuit and adjust the reference voltage (by means of the 500-ohm potentiometer) to be −6·0 volts ±0·1 volt. With the oscilloscope connected to the output of the AM5/507, adjust R42 so that the output signal is 1 volt p-p.
6. With conditions as in paragraph 6 but with the input attenuator set to give a 3 dB loss, rotate R70 fully anticlockwise and then clockwise until the output from the AM5/507 is 1 volt p-p. If the input attenuator setting is now reduced to 2·9 dB loss, the output should not change.
7. With conditions as in paragraph 7 but with the oscilloscope connected to the *Clamped Video* test point, set the input attenuator to 0 dB. Now rapidly switch the attenuator back to the 3-dB setting. The amplitude of the signal at the test point should drop but be restored after about 3 seconds. If the attenuation is now removed again, the amplitude of the signal at the test point should be restored almost instantaneously (5 ms).

References

1. Video Attenuator Assembly AT3M/506
2. Designs Department Specification No. 7.127. (67)

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