VIDEO DISTRIBUTION AMPLIFIERS AM4/517 AND AM4/518

Introduction

The AM4/517 and AM4/518 are 6-output amplifiers with 0-dB gain which are intended for the distribution of 625-line signals either monochrome or colour. The AM4/517 is used for coded colour signals and the AM4/518 for colour signals in R.G.B. form where closer tolerances on output levels are required. Apart from this the amplifiers are identical.

Both amplifiers are constructed on CH1/12A chassis with internal power suppliers. Index-peg positions are:

AM4/517	5 and 31
AM4/518	6 and 31

General Specification

Input Impedance	
100 kHz	11 kilohms, 30 pF, in parallel (approximately).
5mHz	9 kilohms, 30 pF, in parallel (approximately).
Voltage Gain	0 dB, adjustable ±0·2 dB.
Nominal Output Level	1 volt p-p.
Output at Overload Point	
10 kHz sinewave	greater than 3·5 volts p-p.
5 MHz sinewave	greater than 2·9 volts p-p.
Differential Phase Distortion at 4·43 MHz	less than 0·1 degree.
Differential Gain Distortion at 4·43 MHz	less than 0·3 per cent.
Picture Distortion Factor	less than 0·2 per cent.
Amplitude-frequency Response (2 Hz to 7 MHz)	± 0·1 dB.
1T Pulse and Bar Response	
k_{pb}	less than 0·25 per cent.
k_{1T}	less than 0·25 per cent.
Square Wave Response (k_{50})	less than 0·2 per cent.
Step Response	less than 14 per cent overshoot with d.c.-step signal fed through a single *CR* circuit. No overshoot for d.c.-step signal fed directly to the input.
Number of Outputs	6.
Separation between Outputs	
100 kHz	greater than 70 dB.
5 MHz	greater than 46 dB.
Difference in Gain between Outputs with Matched Terminations	
AM4/517	±0·1 dB maximum.
AM4/518	±0·01 dB maximum.
Maximum d.c. Component of Input Signal	± 6 volts.
Maximum d.c. Output with No Input	± 100 millivolts.
Propagation Time (Typical)	10·5 ns.
Operating Temperature Range	10 to 45 degrees C.
Power Input	210-260 V r.m.s., 50 Hz. 40 mA.
Weight	2 lbs.

General Description

The amplifiers are designed to work from a source impedance of 75 ohms when terminated at their inputs with 75 ohms (i.e. an effective source impedance of 37·5 ohms). Because the input impedance is high it is possible to operate amplifiers in parallel with the termination on the amplifier which is farthest from the source. However, if more than 12 outputs are required, it is preferable to operate amplifiers in tandem. All outputs must be terminated with 75 ohms at all times.

All outputs are separated by earth screens on the output plugs to minimise cross-talk at high frequencies. This necessitates the use of a PN3A/18 termination block.

Circuit Description

A circuit diagram is given in Fig. 1 on page 3 and this and the following description apply to both the AM4/517 and the AM4/518.

The input signal passes via C1 to the base of TR1; C1 is a reversible electrolytic capacitor and the specified d.c. component of the input signal must not be exceeded. TR1 and TR2 together form a feedback pair with high input impedance and low output impedance. C2 modifies the frequency and phase response to maintain stability.

TR3, a common base amplifier, provides the main gain of the amplifier. The gain of such a stage varies inversely with source impedance and, using L1, C4 and R11, advantage is taken of this to control the response at high frequencies. The complex collector circuit also serves the same function and the complete stage gives control of the amplitude-frequency response up to 80 MHz. TR4 is an emitter-follower buffer stage for driving the output transistors.

TR5 and TR6 are connected as a push-pull emitter-follower output stage. The transistors are complementary and are therefore fed in phase, the necessary d.c. shift between them being provided by the zener diode D2. Both transistors drive each output via a 150-ohm resistor, thus providing a 75-ohm output impedance. This arrangement reduces the effect of removing the output terminations and stabilises the operating point. Resistors R25 to R36 have a tolerance of 1 per cent on the AM4/517 and of 0·1 per cent on the AM4/518; this is the only difference between the two amplifiers.

The gain of the amplifier from input to loaded output is 0 dB and this is achieved by feedback to the base of TR3 via R23 and R24. R17 allows a small adjustment of $\pm 0{\cdot}2$ dB. Capacitors C7 and C8 introduce a phase lead which, together with the frequency shaping mentioned above, maintains stability under all load conditions likely to be met in operation.

The d.c. output voltage is stabilised by feedback from the decoupled resistors R21 and R39 and is set to zero by adjustment of R3. Adjustment of the gain by R17 does not shift the d.c. output voltage as both ends of the control are nominally at earth potential.

The power supply consists of two identical circuits providing independently adjustable positive and negative supply rails. Both halves are stabilised and R50 and R53 allow adjustment of the output voltage.

Maintenance

The amplifier does not require regular maintenance but the d.c. output level and the gain should both be checked occasionally; if necessary they can be adjusted as described below.

Apparatus Required

Wayne Kerr Video Oscillator type 022B.
Tektronix 515 oscilloscope or equivalent.
Avometer model 8.
75-ohm wide band Decibel Meter type E3233.

Test Procedure

1. Measure the voltages across C17 and C18 using the Avometer. Set these to 12 volts by adjustment of R50 and R53.
2. Connect the apparatus as shown in Fig. 17.2 using the oscilloscope, on a convenient d.c. range, as an indicator and the video oscillator, switched to *Off*, as a zero reference. Adjust R3 to obtain zero d.c. at the output.

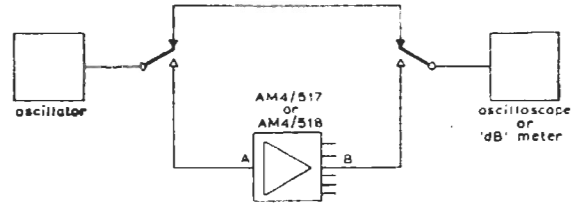

Fig. 2. Test Arrangement for the AM4/517

3. Replace the oscilloscope with the decibel meter and, using a frequency of 10 kHz and the through path of the test circuit, adjust the output of the oscillator to give a reading of 0 dB. Now adjust R17, using the change-over technique, to bring the output of the amplifier (and hence the amplifier gain) to 0 dB.
4. Set the frequency of the oscillator to 5 MHz and check that the gain is 0 dB $\pm$ 0·1 dB; if necessary adjust the values of C7 and C8. (These two capacitors should have the same nominal value which should not exceed 30 pF. If the choice of value lies between two values, select the lower value.)
5. Check that the gain of the amplifier at 10 MHz is 0 dB, + 0·3 dB, −0 dB.

Note: For tests 4 and 5 it is essential to check the zero of the test circuit by comparing the two branches when the AM4/517 is replaced by a short link between the points A and B (Fig .2).

6. Replace the decibel meter with the oscilloscope. Set the oscillator to 10 kHz and increase the input to the amplifier to 3·5 volts p-p. Check that limiting does not occur.
7. Check the d.c. output level as in (2) above and readjust R3 if necessary.

If the amplifier fails tests 4 and 5 a possible cause is TR4 which should be replaced. If the amplifier fails test 6, transistors TR5, TR6 and diode D2 should be checked.

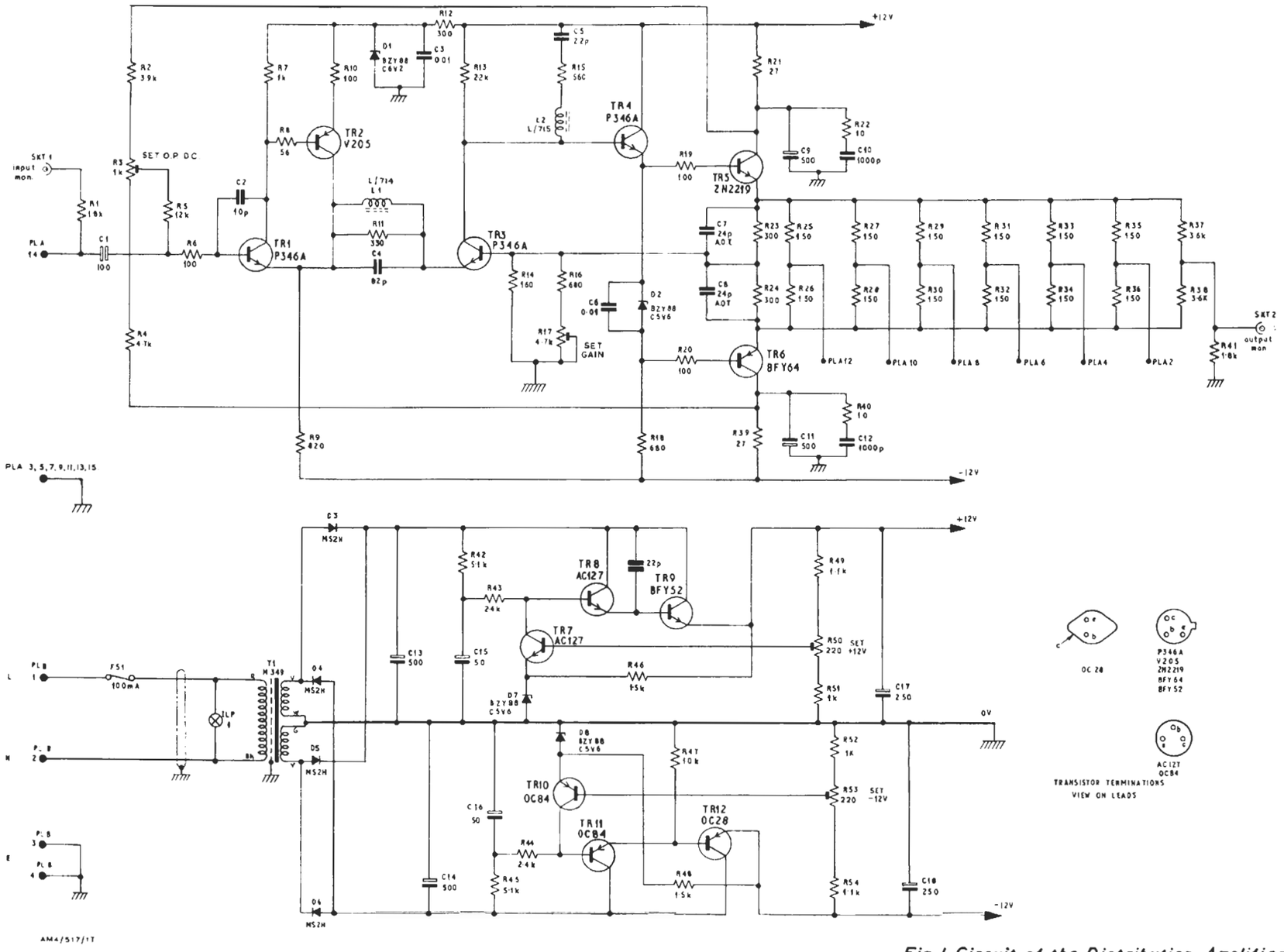

Fig.1. Circuit of the Distribution Amplifiers AM4/517 and AM4/518 (OdB)

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