DISTRIBUTION AMPLIFIERS AM4/519 AND AM4/520

Introduction

The AM4/519 and AM4/520 are 6-output video distribution amplifiers with a gain of 6 dB. They are intended for distributing 625-line monochrome or colour signals. The AM4/519 was designed for coded colour signals and the AM4/520 for R.G.B colour signals which require closer tolerances on output levels. Later models of the AM4/519 (from 1/1/72) are uprated and the AM4/520 rendered obsolete.

Both amplifiers are constructed on CH1/12A chassis and have internal power supplies. Index-peg positions are:

AM4/519	17 and 37
AM4/520	18 and 37

General Specification

Input Return Loss (when input terminated in 75 ohms ±1%)	
10 kHz	greater than 40 dB
4·5 MHz	greater than 30 dB
Output Return Loss 50 Hz to 5 MHz	greater than 40 dB
Nominal Output Level	1 V p-p across 75 ohms
Overload Point	
10 kHz sinewave	greater than 3·5 V p-p
6 MHz sinewave	greater than 2·9 V p-p
Differential Phase Distortion at 4·43 MHz	less than 0·1°
Differential Gain Distortion at 4·43 MHz	less than 0·1%
Picture Distortion Factor	less than 0·2%
Amplitude-frequency Response (2 Hz to 7 MHz)	±0·1 dB
IT Pulse and Bar Response	
k_{pb}	less than 0·5%
k_{1T}	less than 0·25%
L.F. Tilt (50 Hz square wave)	less than 0·1% per ms
Step Response	
d.c. step fed through single CR circuit	less than 14% overshoot
d.c. step fed direct	No overshoot
Isolation Between Outputs	
100 kHz	greater than 70 dB
5 MHz	greater than 46 dB
Difference in Gain between Outputs with Matched Terminations	
AM4/519	±0·1 dB maximum
AM4/520	±0·01 dB maximum
Maximum d.c. Component of Input Signal	±10 volts
Maximum d.c. Output with Zero Input	±100 millivolts
Propagation Time	13 ±2 ns
Operating Temperature Range	0°C to 45°C
Weight	2 lbs
Power Requirements	40 mA at 210-260 V, 50 Hz

General Description

The AM4/519 and the AM4/520 have almost identical circuit arrangements to the AM4/517 and the AM4/518 but the gain is 6 dB instead of zero. They are intended 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). The input impedance is high and the amplifiers may be operated in parallel. 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 earthed screens on the output plugs to minimise high frequency cross talk. This necessitates the use of a PN3A/18 termination block.

Circuit Description

The circuit diagram, given in Fig. 1 on page 3, and the following description applies to both amplifiers.

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

The main gain of the amplifier is provided by TR3 connected in the common base mode. 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 inductive collector circuit assists this action 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. bias between them is provided by the zener diode D2. Both transistors drive each output via a 150-ohm resistor, thus producing a 75-ohm output impedance. This arrangement reduces the effect of removing the output terminations and stabilises the operating point. Resistors R24 to R37 have a tolerance of 1 per cent on the AM4/519 and of 0·1 per cent on the AM4/520; this is the only difference between them. (But see introduction.)

The gain from input to loaded output is 6 dB and this is controlled by feedback through R22 and R23 to the base of TR3; the preset resistor R16 provides a setting-up adjustment. Capacitors C6 and C7 introduce a phase lead which, together with the frequency shaping already mentioned, maintains stability under all load conditions likely to be met in operation.

The d.c. conditions at the output are stabilised by feedback from the decoupled resistors R20 and R39; the actual voltage is set to zero by adjustment of R3. Adjustment of the gain by R16 does not affect this as both ends of R16 are nominally at earth potential.

The power supplier consists of two identical circuits which provide independently adjustable positive and negative supply rails. Both supplies are stabilised and the output voltages are set by R49 and R52.

Maintenance

The amplifiers do 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.
Tektronic 515 oscilloscope or equivalent.
Avometer model 8.
75-ohm wide band Decibel meter type E3233.
75-ohm 6-dB attenuator.
Double pole changeover box.

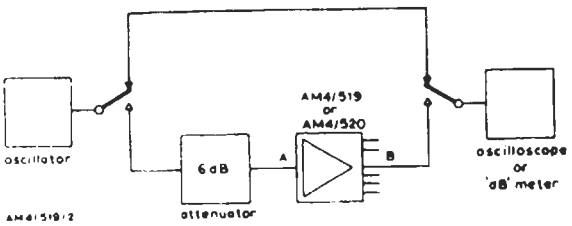


Fig. 2 Test Arrangement for the AM4/519 and AM4/520

Test Procedure

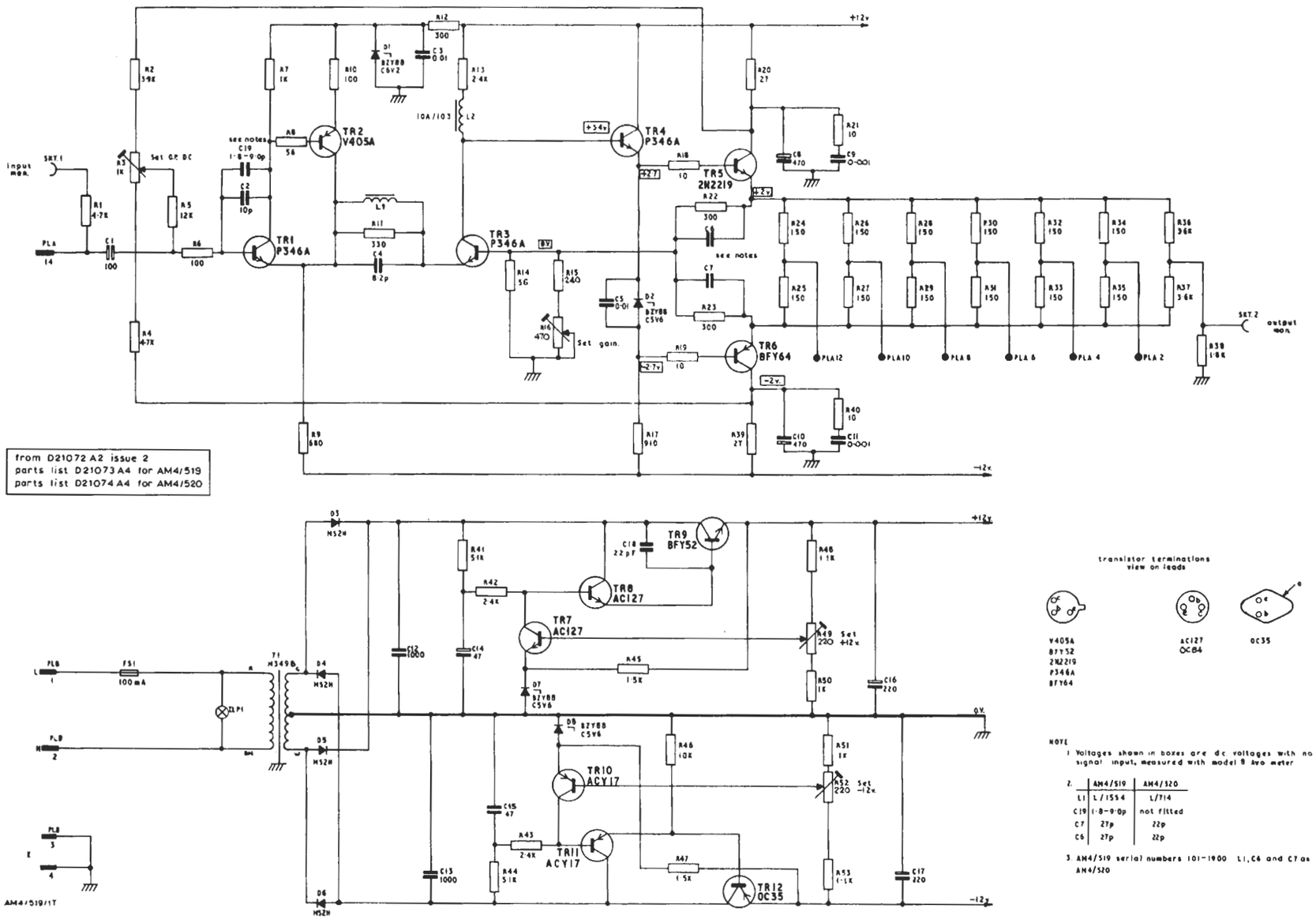
1. Connect the apparatus as shown in Fig. 2 and ensure that all outputs of the amplifier are terminated with 75 ohms.
2. With the Avometer measure the voltages across C16 and C17. Set both to 12 volts by adjustment of R49 and R52.
3. With the oscilloscope as an indicator and the video oscillator, switched to *Off*, as a zero reference adjust R3 to give zero d.c. at the output.
4. 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 R16 and, using the changeover technique, bring the output of the amplifier to 0 dB and hence the gain to 6 dB.
5. Set the frequency of the oscillator to 5 MHz and check that the gain is 6 dB ±0·1 dB; if necessary adjust the values of C6 and C7. (These two capacitors should have the same nominal value which should not exceed 33 pF. If the choice lies between two values, select the lower.)
6. Check that the gain of the amplifier at 10 MHz lies between 6·0 dB and 6·4 dB. (See note.)
7. Check the d.c. output level as in (3) above and readjust as necessary.
8. 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. Limiting should not occur.

Note: For tests 5 and 6 it is essential to check the zero of the test circuit by comparing the two branches when the amplifier under test is replaced by a short link between the points A and B (Fig. 2).

If the amplifier fails tests 5 and 6, a possible cause is TR4 which should be replaced. If it fails test 8, transistors TR5, TR6 and diode D2 should be checked.

Reference

1. Designs Department Specification 8.270(67)



NOTE

1 Voltages shown in boxes are dc voltages with no signal input, measured with model 8 Avo meter

2.

	AM4/519	AM4/520
L1	L/1554	L/714
C19	1·8–9·0p	not fitted
C7	27p	22p
C6	27p	22p

3 AM4/519 serial numbers 101–1900 L1, C6 and C7 as AM4/520

Fig. 1 Circuit of the AM4/519 and AM4/520