TEST WAVEFORM DISTRIBUTION AMPLIFIER AM4/515

General

The Test-waveform Distribution Amplifier type AM4/515 is intended primarily for the distribution of video test signals where a large number of outputs are required. The unit, which has a gain of 3 dB, accepts an input of 1 volt p-p and provides 20 outputs with more than 40 dB isolation (at 4·43 MHz) between them. Input and output impedances are 75 ohms.

The amplifier is constructed on a CH1/12B chassis. Power supply and input-signal connections to the unit are via a 15-way connector and the 20 coaxial output plugs are mounted on the unit back-plate. Input and output monitor sockets are provided on the front panel.

Circuit Description (Fig. 25)

Amplifier

The input signal is fed via emitter-followers TR1 and TR2 to the emitter of the amplifying stage, TR3. Voltage amplification is controlled in this stage by using RV2 to adjust the negative feedback to the base of TR3. The signal developed at the collector of TR3 is applied to the base of TR5 which drives the complementary emitter-follower output stage TR6 and TR7. This circuit provides a very low output impedance and also provides short rise times for both negative-going and positive-going edges.

The purpose of TR4 is to stabilise the d.c. conditions of the output stage by controlling the current through the output transistors. Any change in the current taken by TR6 will result in a change of voltage across R12 and will thus alter the current flowing through TR4. This change of current is applied as negative feedback to the base circuit of transistors TR6 and TR7 to maintain equilibrium. Diodes D1 and D2, in conjunction with RV3, adjust the d.c. conditions on the bases of the two output transistors.

Power Supplies

Power supplies at −12 volts and +11 volts are obtained from two conventional bridge-rectifier circuits. A series stabiliser circuit is associated with each of the power supplies.

General Specification

Voltage gain	3 dB ± 0·2 dB
Number of outputs	20
Maximum difference in gain between any two outputs terminated in matched resistors	0·1 dB
Output level	1·414 V p-p across 75 ohms
Overload point (all outputs terminated)	4V p-p sine wave at 10 kHz 2V p-p sine wave at 5·5 MHz
50-Hz square wave response	less than 0·5% sag
Luminance to chrominance ratio	less than ± 0·3 dB with any number of outputs terminated
Pulse-and-bar response (625 lines)	K factor less than 0·5%
Low-frequency bump	No overshoot for a d.c. step signal at the input
Input impedance	75 ohms (nominal) Return loss greater than 40 dB (50 Hz to 5·5 MHz)
Output impedance	75 ohms (nominal) Return loss greater than 40 dB (50 Hz to 5·5 MHz)
Separation between outputs	
At 10 kHz	More than 60 dB
At 4·43 MHz	More than 40 dB (adjacent outputs; average value for all outputs 45 dB)
Permitted d.c. at input	Must not exceed ± 3 V
Thermal Stability (20—40 degrees C)	±0·1V at output
Non-linearity	less than 1%
Differential phase	less than 0·5 degrees at 4·43 MHz
Power consumption	Approximately 75 mA at 240V
Mains supply voltage	210—250V at 50 Hz
Weight	5 lbs.

Test Procedure

Apparatus Required

Wayne Kerr Video Oscillator 022B or equivalent
Tektronix Oscilloscope 515A (or similar)
Pulse and Bar Generator GE4/504B or C
H.F. Double-pole Changeover Box
Avometer Model 8
Decibelmeter type E 3233
Variable Attenuator, e.g. S.T. and C.
Voltage Calibrator, Colour, type UN2/503
Accurate 3-dB Attenuator

Alignment

1. Switch on and allow five minutes to warm up.
2. Set the negative power supply to −12 volts by adjusting RV4.
   Set the positive power supply to +11 volts by adjusting RV5.
3. Feed a 625-line pulse-and-bar signal into the input of the video changeover box. Connect one output of the changeover box to the oscilloscope via the 3-dB attenuator and the unit under test; connect the other output direct to the oscilloscope.
4. Using the changeover facility, adjust RV2 until the signal amplitude is the same through each path.
5. Remove the input signal and, with the oscilloscope set for d.c. measurement, adjust RV1 to obtain zero d.c. at the amplifier output.
6. Terminate ten outputs of the unit in 75 ohms (the same effect can be achieved by short-circuiting five outputs); connect the eleventh output to the oscilloscope and terminate in 75 ohms.
   Apply the output of the chrominance voltage calibrator to the input of the changeover box and use the changeover facility to compare the chrominance to luminance ratio through the direct and indirect signal paths. Adjust trimming capacitor C7 in the amplifier until the signals through the two paths appear the same. When the correct setting for C7 has been obtained seal the trimmer with melted wax or a similar fixative.
7. Disconnect the changeover box.
   Connect the output of the video oscillator to the input of the amplifier and connect one output of the amplifier to the decibel meter via a variable attenuator. Terminate the decibel meter and the remaining outputs of the amplifier (eighteen outputs are effectively terminated if nine are short-circuited, the nineteenth can be ignored). Set the video oscillator output to 1 volt p-p at a frequency of 10 kHz.
   Insert 3 dB of attenuation in the signal path and observe the reading on the decibel meter. This should be 1 volt p-p; if it is not adjust the output of the video oscillator until this figure is obtained.
   Increase the input to the amplifier in 2-dB steps and increase the attenuator setting by the same amount. The meter reading should not change by more than 0·1 dB for an increase in input level of 10 dB.
8. Repeat step 7 at a frequency of 5·5 MHz. The meter reading should not change by more than 0·1 dB for an increase in input level of 4 dB.

Maintenance

A suspect amplifier can be checked by removing the input signal, terminating input and outputs in 75 ohms and checking potentials throughout the unit with an oscilloscope or an Avo Model 8 on a d.c. range. Any significant departure from the values shown in the table below should provide an indication of the faulty stage.

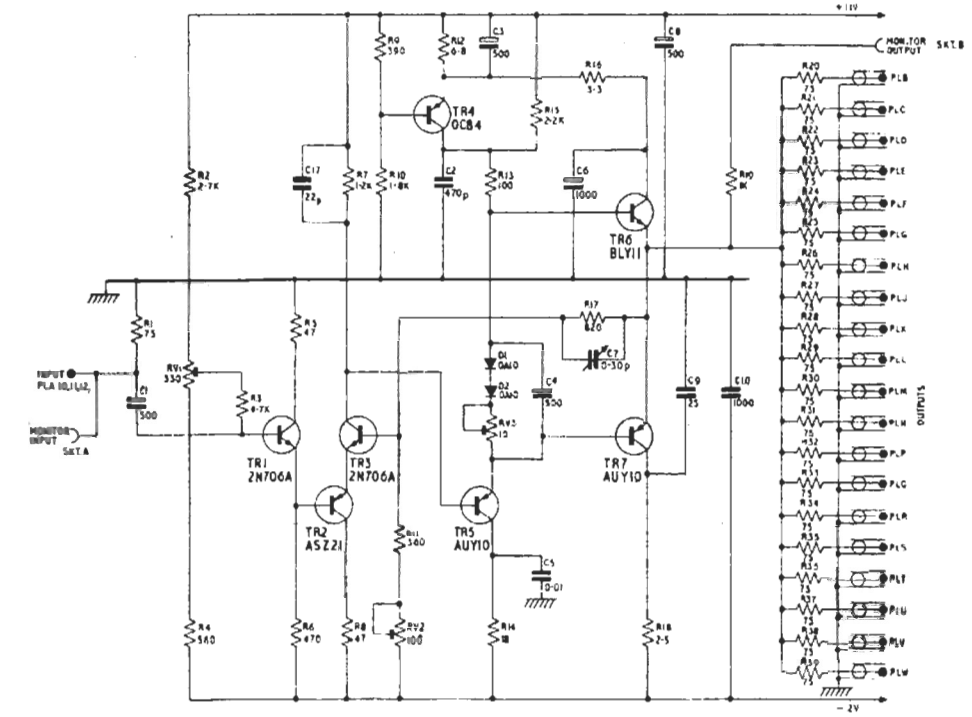
Point of measurement	*Voltage*
TR1 Base	−8·4
TR1 Collector	−0·25
TR1 Emitter	−9·6
TR2 Collector	−11·5
TR2 Emitter	−8·9
TR3 Collector	−0·5
TR3 Base	−8·1
TR4 Base	+9·2
TR4 Collector	+7·6
TR4 Emitter	+9·5
TR5 Collector	−1·2
TR5 Emitter	−0·26
TR6 Base	+0·74
TR6 Collector	+8·9
TR6 Emitter	zero ±0·1
TR7 Collector	−11·6

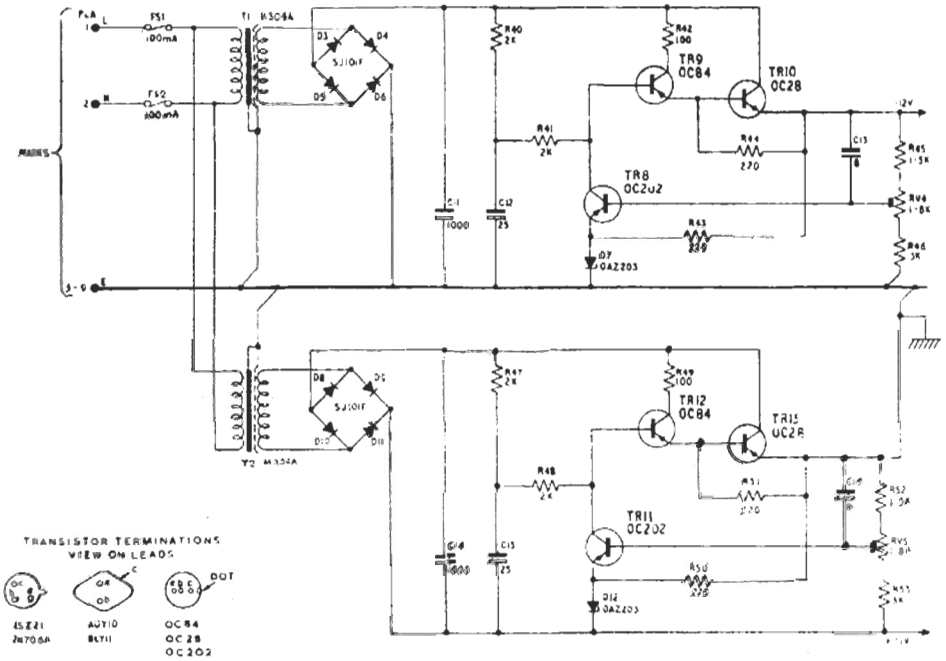
If it becomes necessary to replace a transistor, or any other component mounted on the printed wiring boards, the precautions described in Section 4 for amplifier type AM4/505 should be observed. After component changes is it advisable to check the alignment.

DT/TES 10/66

V7
FIG 25
SECTION 4

DA 11369





TRANSISTOR TERMINATIONS
VIEW ON LEADS

TEST WAVEFORM DISTRIBUTION AMPLIFIER AM4/515: CIRCUIT