PULSE AMPLIFIERS AM4/506 AND AM4/506A

General Description

The AM4/506 and AM4/506A are mains-operated transistor amplifiers for distributing standard 2-volt negative-going pulses. They are the same electrically but the AM4/506 is constructed on a CH1/11 chassis and the AM4/506A (which supersedes the AM4/506) on a CH1/12A chassis. In both amplifiers the components are assembled on a printed wiring board. An indexing arrangement is provided in each instance to ensure correct location when the amplifier is plugged into its associated mounting panel.

The working voltage gain is 6 dB thus allowing a margin for line losses and equalisation. A pre-set gain control provides about $\pm 0{\cdot}5$ dB adjustment. Where the combined line and equaliser insertion loss exceeds 6 dB, the amplifier is normally preceded by a 15-dB AM5/505 or 505A amplifier thereby enabling losses up to 21 dB to be covered.

The input impedance is 25 kilohms and the amplifier will accept line trigger, field trigger, mixed sync and mixed blanking pulses up to a peak input of 1·25 volts. There are four outputs with impedances of 75 ohms nominal (return loss better than 26 dB).

The power supply required is 200—250 volts a.c. at 25 mA.

Signal and mains supply connections are made via a 15-way plug at the rear of the chassis to a corresponding socket on the mounting panel.

Input and pre-amplifier output monitoring sockets and mains fuses are provided on the front of the amplifier.

Mechanical Description

The CH1/11 chassis on which the AM4/506 is constructed enables the amplifier to be mounted on a 19-in. by 5¼-in. PN3/17 bay-mounting panel which accommodates 8 units constructed on this type of chassis.

The AM4/506A amplifier is constructed on a CH1/12A chassis for mounting on a 19-in. by 5¼-in. PN3/21 bay-mounting panel which is designed to mount various combinations of units of different widths constructed on chassis CH1/12A—D.

Indexing arrangements are provided with both types of chassis to ensure that units can only be mounted in their correct positions on the mounting panel.

Circuit Description (Fig. 2)

General

The circuit shown in Fig. 1 applies to both the AM4/506 and the AM4/506A.

Four-emitter-follower output stages are driven by a common three-stage pre-amplifier which has negative feedback between the emitter of VT3 and the base of VT2. Some local feedback also is provided in the emitter circuits of VT1 and VT3.

The first stage of the pre-amplifier is stabilised by employing a potential divider R1 and R2 for bias as described in *Training Supplement No. 12*, and by employing negative feedback in the emitter circuit provided by R3 and RV1. The parallel capacitors C2 and C14 in series with R4 are virtually in parallel with R3 and RV1 and enable the fall in the frequency characteristic due to the emitter/collector capacitance of VT2 to be corrected. R4 acts as a damping resistance to prevent self-oscillation.

C2 and C14 are connected to the negative of the d.c. supply rather than to the positive because in this amplifier d.c. negative is connected to chassis. By connecting d.c. negative to chassis excessive surges through the power supply unit are avoided.

The metal rectifier MR1 is connected between the base and emitter of VT2 to avoid the risk of a reversed input which might be caused by surges from capacitors.

VT3 acts as an emitter follower with a low output impedance to feed the four output transistors with their bases connected in parallel. The use of four separate output stages ensures good separation between output circuits (in excess of 37 dB at 3 Mc/s). Delay through the amplifier is about 25 ns. Signal/hum ratio is better than 60 dB.

Power Supply

The amplifier requires a mains supply of 200—250 volts a.c. and the mains transformer has no primary tapping. The secondary windings are connected in series and feed a bridge rectifier. The d.c. output is stabilised, using a Zener diode as reference, and the stabilised output can be adjusted over a limited range by means of RV2 which is normally set to give a supply voltage of 18·5 volts; at this voltage the current drawn is 48 mA.

Ripple in the output supply is less than 2 mV for all a.c. inputs in the range 200—250 volts. Sudden mains changes of six per cent produce an output surge of less than 30 mV.

General Data

Gain	6 dB
Number of outputs	4
Input impedance	25 kilohms
Output impedance	75—80 ohms up to 3 Mc/s
Input level	1·25 volts max. p-p mixed sync signal
Output level	2·5 volts max. p-p mixed sync signal
Frequency response	0 ±0·1 dB up to 3 Mc/s 0 —0·5 dB at 5 Mc/s
Separation between outputs	Better than 37 dB at 3 Mc/s
Delay through amplifier	25 millimicroseconds
Signal/hum ratio	Better than 60 dB
Field tilt in mixed blanking waveform	Less than 20 mV
Power requirements	200—250 V, 50 c/s, 25 mA
Mains voltage surge	Output surge less than 30 mV for sudden mains changes of 6%
D.C. consumption	48 mA at 18·5 V
Transistor types	3 OC171 or OC170 (VT1, VT2, VT3) 4 2G103 or 2N711 (VT4, VT5, VT6, VT7) 1 OC28 (VT8) 1 OC71 (VT9) 1 OC42 (VT10)
Dimensions	2 in. wide by 4¾ in. high by 12 in. deep (AM4/506) 2⅛ in. wide by 5 in. high by 10 in. deep (AM4/506A)

Test Procedure

D.C. Voltages

Switch on and set RV2 so that the stabilised voltage is 18·5 V. Check that the voltages at the points given in the table below are obtained.

Measuring Point	*Volts*
VT1 Emitter to + 18 V	4·7 ±0·5
VT2 Emitter to +18 V	5·5 ±0·2
VT3 Emitter to +18 V	11·4 ±0·2
VT4, 5, 6, 7 Emitters to +18 V	11·2 ±0·3
Bridge Rectifier Output	32 ±2 for 225 V a.c. supply

Gain and Frequency Response

1. Set up a test circuit for measuring gain, using a video-frequency oscillator for the input signal and a crystal meter for measuring the input and output levels.
2. Apply 10 kc/s input signal at 1 V p-p. Check gain at each output in turn, and adjust RV1 so that the overall gain is 6 ±0·2 dB to all outputs when terminated with 75 ohms.
3. Set oscillator frequency to 3 Mc/s. Adjust C2 so that the gains at 10 kc/s and 3 Mc/s are equal.
4. Check frequency responses of all outputs at 10 kc/s, 1 Mc/s, 3 Mc/s and 5 Mc/s. The responses should be 0 ±0·1 dB in the range up to 3 Mc/s and +0 —0·5 dB at 5 Mc/s.

Mixed Sync Signal Gain

Replace the input signal from the oscillator by a mixed sync signal at 1 V p-p. Measure the gain to each output and set RV1 so that all outputs fall within the range 2 V ±40 mV. Vary the input signal amplitude and check that compression at 2·5 V output is less than 20 mV.

Hum

Measure hum component at each output. This should be less than 2 mV.

Output Separation

Apply a signal of 1 V p-p from the oscillator to each output in turn, and measure leakage output

at the other outputs. This should be less than 15 mV at all frequencies up to 3 Mc/s.

Field Tilt

Measure field tilt in mixed blanking waveform. This should be less than 20 mV.

General Maintenance

Similar precautions to those described for amplifier AM4/505 should be taken if it becomes necessary to replace a transistor or any other component.

W.G. 2/62

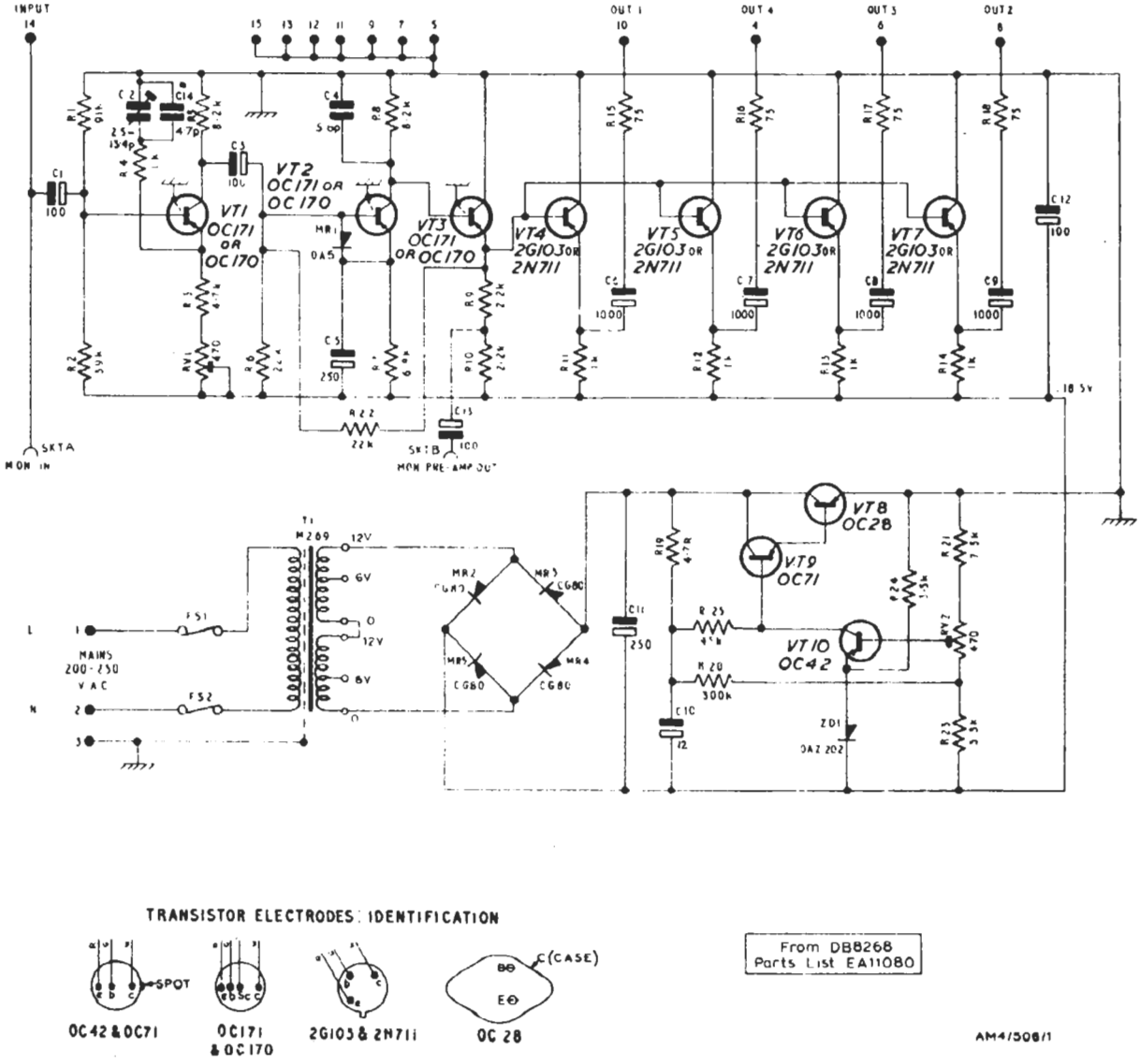


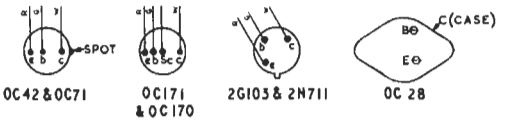
Fig. 1 Circuit of the AM4/506

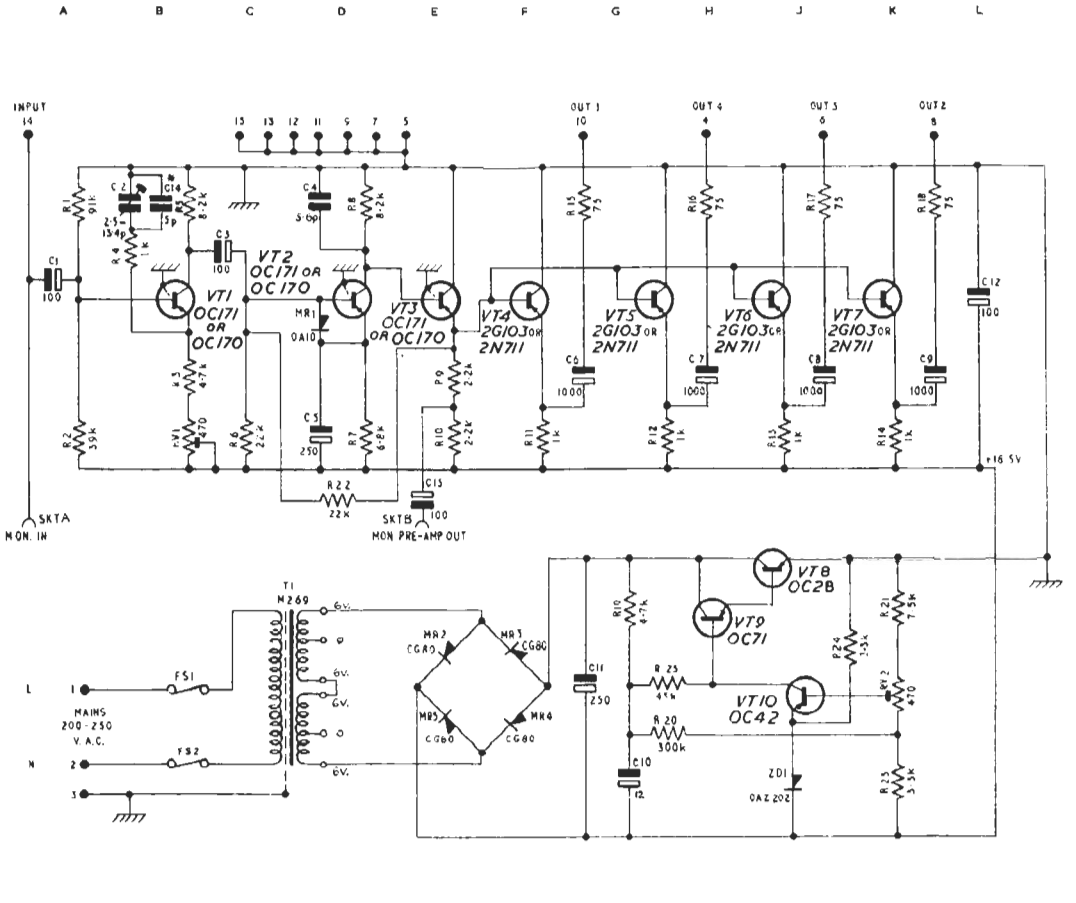
COMPONENT TABLE: FIG. 2

Comp.	Loc.	Type	Tolerance per cent	Comp.	Loc.	Type	Tolerance per cent
C1	A2	Plessey 50V		R10	E4	Erie 109 ¼W	2
C2	B1	Oxley SMT9/10·9 variable		R11	F4	Erie 109 ¼W	2
C3	B1	Plessey 6V		R12	G4	Erie 109 ¼W	2
C4	C1	Erie 30AD	0·5	R13	H4	Erie 109 ¼W	2
C5	C4	Plessey 6V		R14	K4	Erie 109 ¼W	2
C6	F3	Plessey 12V		R15	F1	Erie 109 ¼W	1
C7	H3	Plessey 12V		R16	H1	Erie 109 ¼W	1
C8	J3	Plessey 12V		R17	J1	Erie 109 ¼W	1
C9	K3	Plessey 12V		R18	K1	Erie 109 ¼W	1
C10	G7	Plessey 50V		R19	G5	Erie 109 ¼W	2
C11	F6	Plessey 50V		R20	G7	Erie 109 ¼W	2
C12	L2	Plessey 25V		R21	K5	Erie 109 ¼W	2
C13	E4	Plessey 25V		R22	D4	Erie 109 ¼W	2
C14	B1	G.E.C. polystyrene		R23	K7	Erie 109 ¼W	2
				R24	J6	Erie 109 ¼W	2
				R25	G6	Erie 109 ¼W	2
R1	A1	Erie 109 ¼W	2				
R2	A4	Erie 109 ¼W	2				
R3	B3	Erie 109 ¼W	2	RV1	B4	Plessey 404/1/00142/471 linear	
R4	A2	Erie 109 ¼W	2				
R5	B1	Erie 109 ¼W	2	RV2	K6	Plessey 404/1/00142/471 linear	
R6	C4	Erie 109 ¼W	2				
R7	D4	Erie 109 ¼W	2				
R8	D1	Erie 109 ¼W	2				
R9	E3	Erie 109 ¼W	2	T1	C6	M269	

FIG 2

TRANSISTOR ELECTRODES: IDENTIFICATION





PULSE DISTRIBUTION AMPLIFIERS AM4/506 & AM4/506A : CIRCUIT