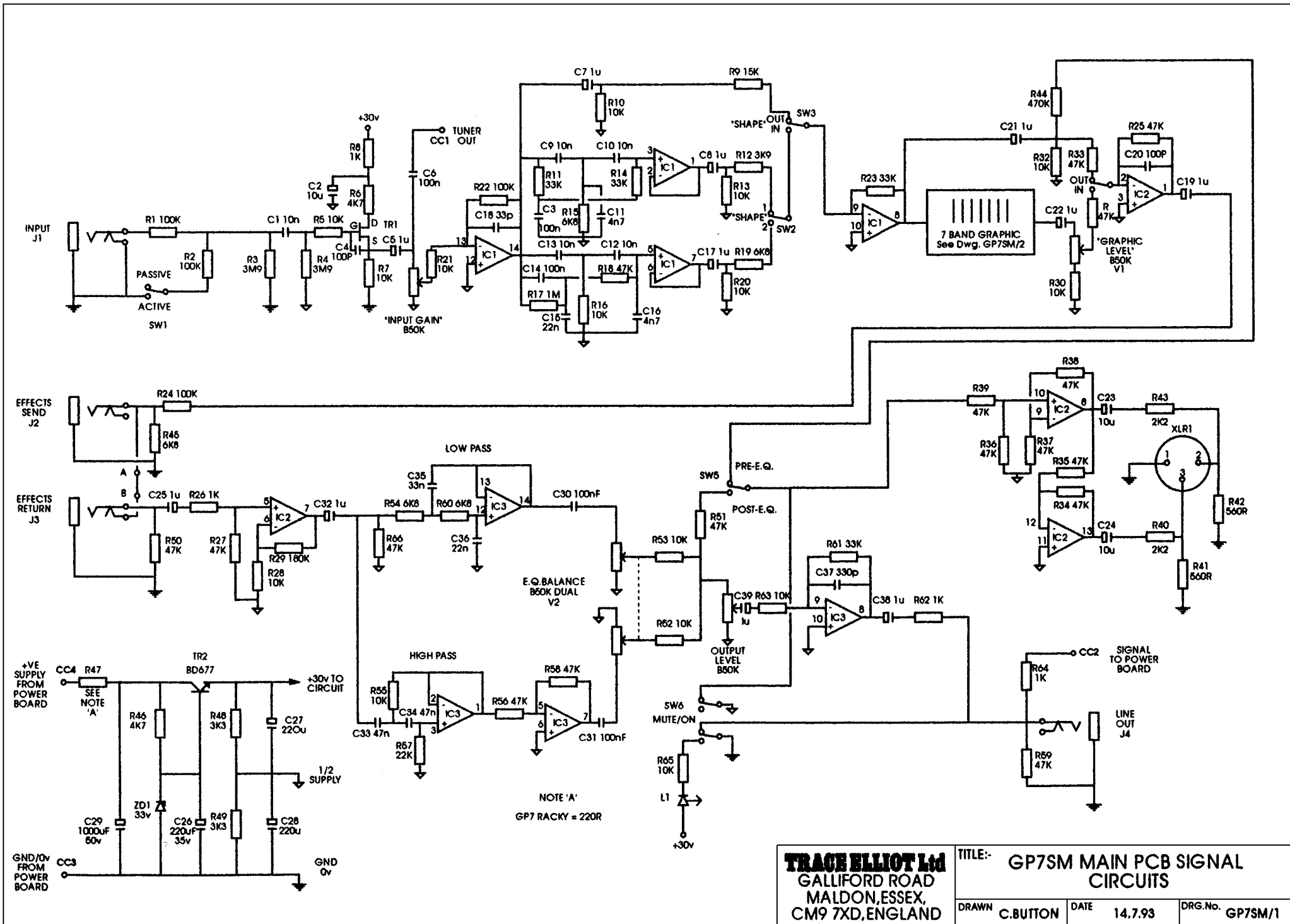


# **TRACE ELLIOT**

## **SERVICE MANUAL**

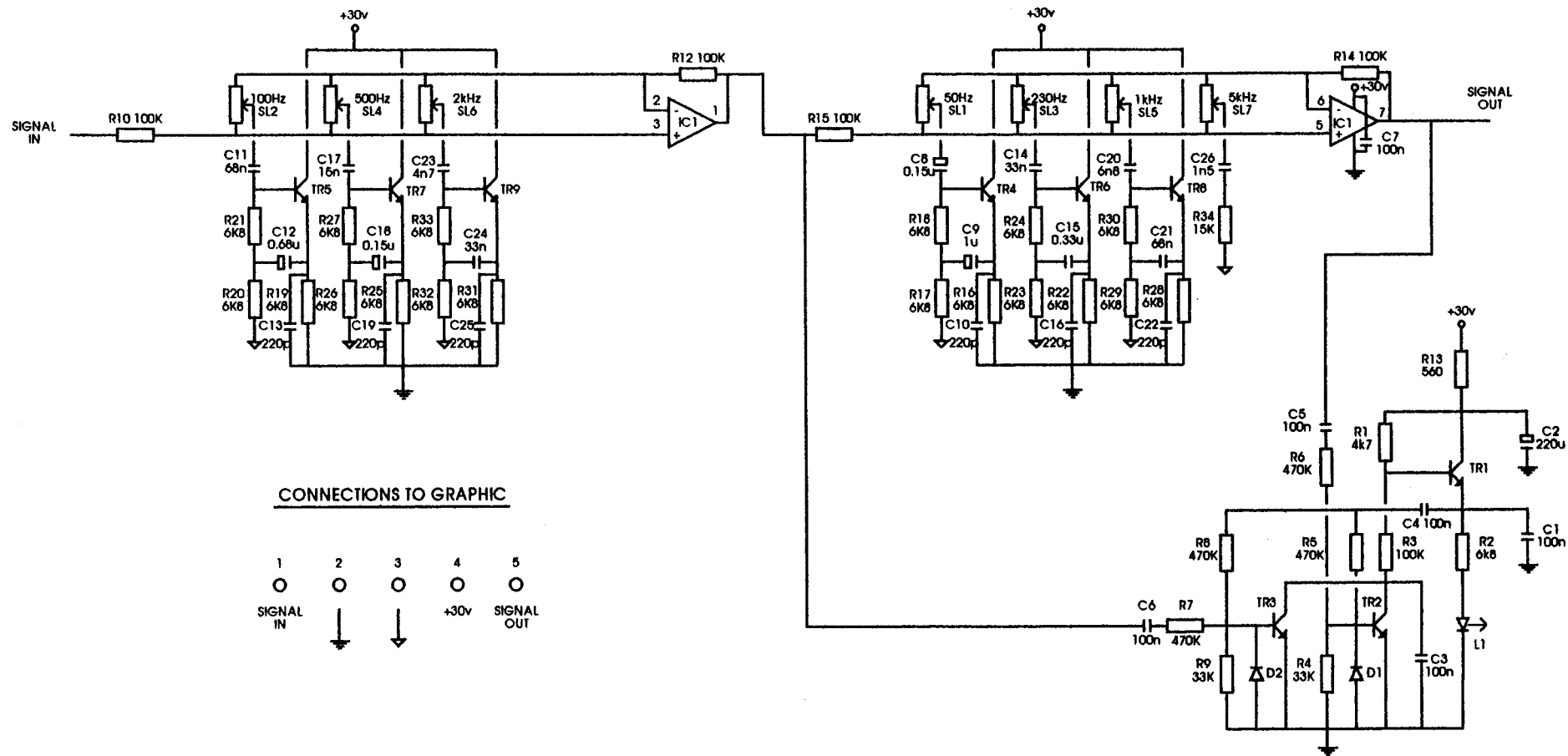
**DATE :** December 29, 1999  
**Product Code:** N/A  
**Model Number :** GP7 350.400 WATT SM SERIES

Issued by:  
**Trace Elliot Limited**  
**Blackwater Trading Estate**  
**The Causeway**  
**Maldon**  
**Essex**  
**England**  
**CM4 4GG**

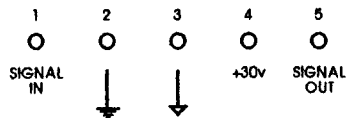


**TRACHELLIOT Ltd**  
 GALLIFORD ROAD  
 MALDON, ESSEX,  
 CM9 7XD, ENGLAND

TITLE:- GP7SM MAIN PCB SIGNAL CIRCUITS	
DRAWN C.BUTTON	DATE 14.7.93
DRG.No. GP7SM/1	



**CONNECTIONS TO GRAPHIC**



**TRACE ELLIOT Ltd**  
 GALLIFORD ROAD  
 MALDON, ESSEX,  
 CM9 7XD, ENGLAND

TITLE:- **GP7SM GRAPHIC E.Q. &  
 OVERLOAD DISPLAY**

DRAWN **C.BUTTON**

DATE **16.7.93**

DRG.No. **GP7SM/2**

## PARTS LIST FOR GP7 SM MAIN PCB

Description	Part Code	Qty	Where Used
<b>RESISTORS</b>			
ZERO OHM LINK	72-RC-ZERO	17	
100K ¼ WATT	72-RM100K	4	R1 R2 R22 R24
3.9M ¼ WATT	72-RM3M9	2	R3 R4
10K ¼ WATT	72-RM10K	15	R5 R7 R10 R13 R16 R20 R21 R28 R30 R32 R52 R53 R55 R63 R65
4.7K ¼ WATT	72-RM4K7	1	R46
1K ¼ WATT	72-RM1K	4	R8 R26 R62 R64
15K ¼ WATT	72-RM15K	1	R9
33K ¼ WATT	72-RM33K	4	R11 R14 R23 R61
3.9K ¼ WATT	72-RM3K9	2	R12 R6
6.8K ¼ WATT	72-RM6K8	5	R15 R19 R45 R54 R60
1M ¼ WATT	72-RM1M	1	R17
47K ¼ WATT	72-RM47K	17	R18 R25 R27 R31 R33 R35-39 R50 R51 R56 R58 R59 R66 R34
180K ¼ WATT	72-RM180K	1	R29
2.2K ¼ WATT	72-RM2K2	2	R40 R43
560R ¼ WATT	72-RM560R	2	R41 R42
470K ¼ WATT	72-RM470K	1	R44
22K ¼ WATT	72-RM22K	1	R57
3K3 ¼ WATT	72-RM3K3	2	R48 R49
330R 4 WATT	72-RWW330R-4W	1	R47
<b>CAPACITORS</b>			
4.7nF 100V POLY	72-C4N7-100VP	2	C11 C16
10nF 100V POLY	72-C10N-100VP	5	C1 C9 C10 C12 C13
22nF 100V POLY	72-C22N-100VP	2	C15 C36
33nF 100V POLY	72-C33N-100VP	1	C35
47nF 100V POLY	72-C47N-100VP	2	C33 C34
100nF 100V POLY	72-C100N-100VP	5	C3 C6 C14 C30 C31
33pF 100V CER/DISC	72-C33P-100VCD	1	C18
100pF 100V CER/DISC	72-C100P-VCD2	2	C4 C20
330pF 100V CER/DISC	72-C330P-100VCD2	1	C37
1µF 35V TANT	72-C1-35VT	11	C5 C7 C8 C17 C19 C21 C22 C25 C32 C38 C39
10µF 63V RADIAL	72-C10-63VER	3	C2 C23 C24

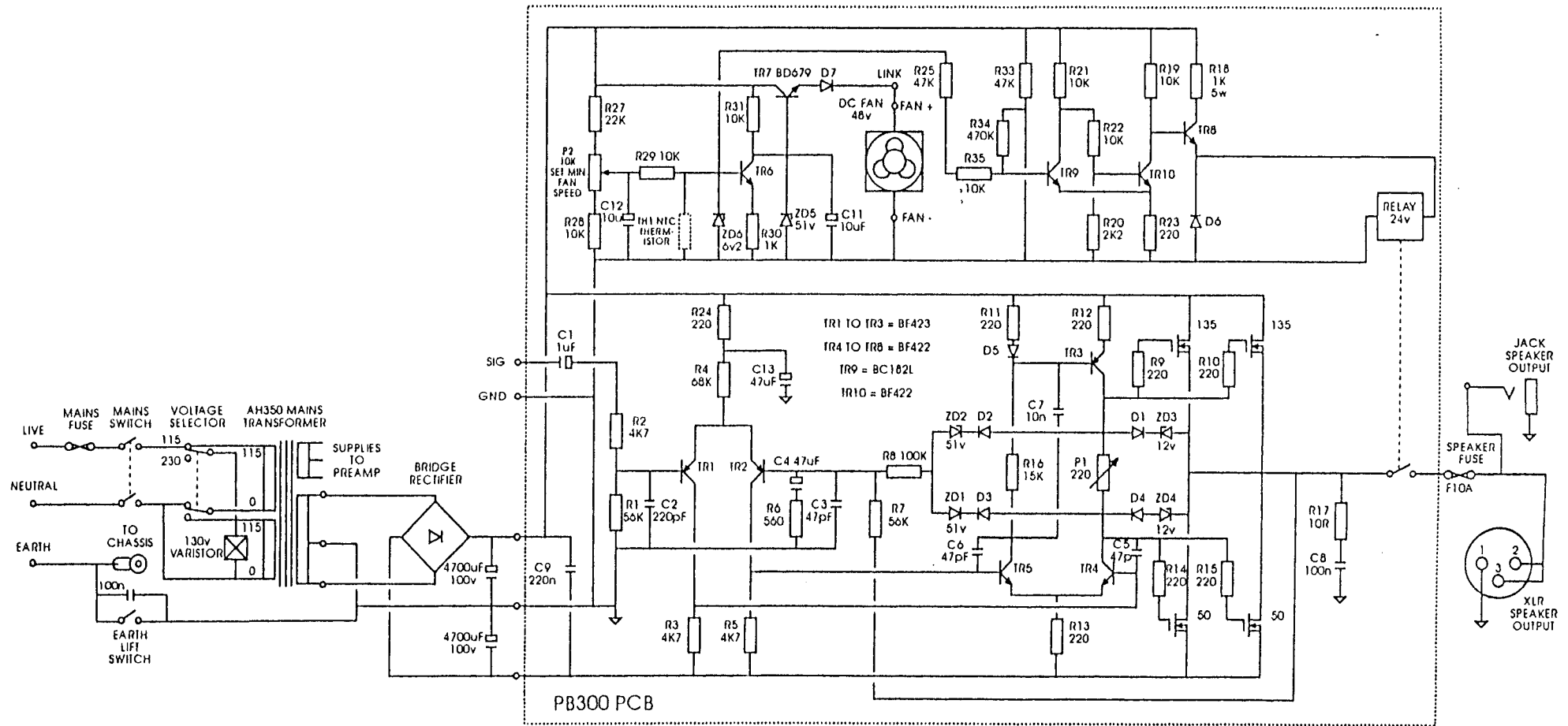
220 $\mu$ F 25V RADIAL	72-C220-35VER	2	C26 C28
10 $\mu$ F 35V AXIAL	72-C10-35VEA	1	This is to be fitted in place of the link above C15 and C16. Fitted the same way round as the rest of the radials, + at the top.
<b>SEMI-CONDUCTORS</b>			
TL074 OP-AMP	72-IC-TL074	3	IC1,2,3
J112 FET	72-FET-J-112	1	TR1
33V ZENER DIODE	72-D-BZX55C33V	1	ZD1
BD677	72-TBD677	1	TR2
HEATSINK FOR BD677	71-HS-TEG	1	TR2
<b>SOCKETS</b>			
3 WAY HEADER	72-HEAD-3W-2	1	CB
4 WAY HEADER	72-HEAD-4W	1	CC
5 WAY HEADER	72-HEAD-5W	1	CA
JACK SOCKETS	72-SKT-JCKBNBG	4	J1 J2 J3 J4
<b>POTS / SWITCHES</b>			
50K DUAL GANG PCB	73-POT-50K-DG	1	V2
50K PCB MOUNT POT	73-POT-50KB	1	V1
50K POTS FLYING	C00-POT-50KB	2	INPUT / OUTPUT
LATCHING PUSH SWITCH	73-SW-F2UEE	6	SW1-6
<b>OTHERS</b>			
RED LED	72-LED-RED-TEG	1	LED 1

**Rik Daniels**  
**February 24, 1997**

## PARTS LIST FOR GP7SM FRONT BOARD

Description	Part Code	Qty	Where Used
<b>RESISTORS</b>			
ZERO OHM LINK	72-RCZERO	3	
100K ¼ WATT	72-RM100K	5	R3 R10 R12 R14 R15
15K ¼ WATT	72-RM15K	1	R34
33K ¼ WATT	72-RM33K	2	R4 R9
470K ¼ WATT	72-RM470K	4	R5 R6 R7 R8
4K7 ¼ WATT	72-RM4K7	1	R1
560R ¼ WATT	72-RM560R	1	R13
6K8 ¼ WATT	72-RM6K8	19	R2 R16-33
<b>CAPACITORS</b>			
0.15µF 35V TANT	72-C0.15-35VT	2	C8 C18
0.33µF 35V TANT	72-C0.33-35VT	1	C15
0.68µF 35V TANT	72-C0.68-35VT	1	C12
1µF 35V TANT	72-C1-35VT	1	C9
100nF 100V POLY	72-C100N-100VP	6	C1 C3-7
15nF 100V POLY	72-C15N-100VP	1	C17
1n5 100V POLY	72-C1N5-100VP	1	C26
220µF 35V RADIAL	72-C220-35VER	1	C2
220pF 100V POLY	72-C220P-100VCD2	6	C10 C13 C16 C19 C22 C25
33nF 100V POLY	72-C33N-100VP	2	C14 C24
4n7 100V POLY	72-C4N7-100VP	1	C23
68nF 100V POLY	72-C68N-100VP	2	C11 C21
6n8 100V POLY	72-C6N8-100VP	1	C20
<b>SEMI-CONDUCTORS</b>			
IN4148 DIODE	72-D-IN4148	2	D1 D2
TL072 OP-AMP	72-IC-TL072	1	IC1
RED LED	72-LED-RED	1	L1
BC212L TRANSISTOR	72-TBC212L	1	TR1
BC549C TRANSISTOR	72-TBC549C	8	TR2-9
<b>OTHERS</b>			
PLASTIC SPACER	71-SPA-LED-TEG2	1	L1
5 WAY JUMPER LINK	72-LK-5W100MM	1	CA
SLIDER POTS	73-SLIDER-B100KC	7	SL1-7

**Rik Daniels**  
**February 24, 1997**



**TRACE ELLIOT Ltd**  
 GALLIFORD ROAD  
 MALDON, ESSEX,  
 CM9 7XD, ENGLAND

TITLE:- AH350 OUTPUT STAGE  
 CIRCUIT DIAGRAM  
 DRAWN C. BUTTON DATE 28.10.92 ORG No AH350/1

## PARTS LIST FOR PA300L / 500R

Description	Part Code	Qty	Where Used
RESISTORS			
100K ¼ WATT	72-RM100K	1	R8
10K ¼ WATT	72-RM10K	5	R22 R28 R29 R31 R35
15K ¼ WATT	72-RM15K	2	R33 R16
1K ¼ WATT	72-RM1K	1	R30
220R ¼ WATT	72-RM220R	9	R9-15 R23 R24
22K ¼ WATT	72-RM22K	1	R27
2K2 ¼ WATT	72-RM2K2	1	R20
33K ¼ WATT	72-RM33K	1	R32
470K ¼ WATT	72-RM470K	1	R34
47K ¼ WATT	72-RM47K	1	R25
560R ¼ WATT	72-RM560R	1	R6
56K ¼ WATT	72-RM56K	2	R7
68K ¼ WATT	72-RM68K	1	R4
10R 2.5 WATT	72-RWW10R-2.5W	1	R17
1K 6 WATT	72-RWW1K-6W	1	R18
4K7 ¼ WATT	72-RM4K7	3	R2 R3 R5
10K ½ WATT	72-RC10K-.5W	2	R19 R21
CAPACITORS			
0.22µF 250V POLY	72-C0.22-250VP	1	C9
1.5µF 35V TANT	72-C1.5-35VT	1	C1
10µF 63V RADIAL	72-C10-63VER	2	C11 C12
100nF 250V POLY	72-C100N-250VP	1	C8
220pF 100V CER/DISC	72-C220P-100VCD2	1	C2
10nF 100V MYLAR	72-C10N-100VE	1	C7
47µF 16V RADIAL	72-C47-16VER	1	C10
47µF 63V RADIAL	72-C47-63VER	2	C4 C13
47pF 100V CER/DISC	72-C47P-100VCD	3	C3 C5 C6
SEMI-CONDUCTORS			
12V ZENER DIODE	72-D-BZX55C12V	2	ZD3 ZD4
6.2V ZENER DIODE	72-D-BZX556V2	1	ZD6
51V ZENER DIODE	72-D-BZX55C51V	3	ZD5 ZD1 ZD2
IN4002 DIODE	72-D-IN4002	2	D6 D7
IN4148 DIODE	72-D-IN4148	5	D1-5
* BUZ900 MOS-FET	* 72-MOS-BUZ900	2	NEAREST RELAY
* BUZ905 MOS-FET	* 72-MOS-BUZ905	2	NEAREST D7
BC182L TRANSISTOR	72-TBC182L	1	TR9
BD679 DARLINGTON	72-TBD679	1	TR7



BF422 TRANSISTOR	72-TBF422	5	TR4-8 TR10
BF423 TRANSISTOR	72-TBF423	3	TR1-3
OTHERS			
10K PRESET POT	72-PRESET-10K	1	P2
220R PRESET POT	72-PRESET-220R	1	P1
NTC THERMISTOR	72-TH-KED472CY	1	TH1
30 AMP RELAY	73-RELAY-176590	1	RL1
MAIN HEATSINK	71-HS-300/500	1	UNDER MOS-FETS
BD679 HEATSINK	71-HS-TEG	1	TR7
MOS-FET FITTINGS	72-MOS-BUSH-WHT	8	UNDER HEATSINK
MOS-FET FITTINGS	72-MOS-KOOL-PAD	4	UNDER MOS-FETS

\* THE PPA 1200 POWER UNITS ARE FITTED WITH DOUBLE DYE MOSFETS.  
THE PART NUMBERS FOR THESE ARE THE SAME BUT HAVE THE LETTER ' D ' ON  
THE END.

**Rik Daniels**  
**February 24, 1997**

# **CIRCUIT DESCRIPTION**

## **POWER MODULE PB300/500**

**February 24, 1997**

### **FAN SPEED CONTROL**

The voltage to the 48 volt DC fan comes from the +70 volt supply to the PCB. This 70 volts is dropped to a suitable voltage for the fan by TR7 a BD679 darlington transistor working as a series regulator.

Diode D7 is included in series with the output to the fan to allow two power modules to be linked together as in the AH600SM amplifiers. Either module may take control of the fan without affecting the other.

TR7 has a 51 volt zener diode ZD5 in its base to limit the maximum voltage to the fan. C11 is in parallel with ZD5 for smoothing purposes.

The voltage on TR7's base is set by TR6 in series with R30 and R31. The DC conditions around TR6 are set by preset P2, in the potential divider chain of R27, P2 and R28 across the 70 volt supply.

Adjusting P2 will set the fan's minimum speed, this functions as follows:

Increasing the voltage on the wiper of P2 increases the voltage on the base of TR6, this in turn decreases the voltage on TR6's collector, and thus decreases the voltage to the fan via TR7 causing it to slow down. Zener diode ZD6 is included to prevent the base voltage on TR6 from rising too far causing the fan to completely stop.

The opposite occurs if the voltage on the base of TR6 is decreased, i.e. the fan speeds up.

Thermistor TH1 detects the temperature from the heat sink, this is a NTC ( Negative Temperature Coefficient ) device i.e. its resistance decreases as its temperature increases . This thermistor is placed directly across the base of TR6, and consequently reduces the preset base voltage supplied via R29 as its temperature increases ( and its resistance decreases ), speeding up the fan.

Capacitor C12 is included to make sure the fan always starts when the amplifier is switched on. To see how it does this, consider the conditions before switching on when C12 is fully discharged, the unit is then switched on and the 70 volt supply appears.

C12 is at this point still discharged and holds the base voltage to TR6 at or near zero volts, TR6 is not conducting and the voltage on its collector will be +51 volts, the maximum zener diode voltage. The voltage to the fan will also be maximum and the fan will start at maximum speed.

C12 gradually charges up, the base voltage increases and the fan slows down to the minimum speed set by P2.

This minimum speed will also be dependant on the ambient room temperature as this will determine the initial resistance of the thermistor.

### **SWITCH ON DELAY**

The speaker output is switched using a heavy duty 30 amp relay, this is done for two reasons:

Firstly to provide a switch on delay that will not connect the speakers to the output stage until the supplies have reached their full voltage, and become stable.

And secondly to provide a means of electronic thermal output protection. We have already seen how capacitor C12 holds down the base voltage on TR6 on initial switch on; well it is this same TR6 base voltage that is delayed further by R25 charging up capacitor C10 that provides the delay to the relay circuit.

The relay switching circuit consists of TR8, TR9 and TR10 and their associated resistors.

### **OUTPUT THERMAL PROTECTION**

The thermistor controlled voltage on the base of TR6 is also used as a means of providing output thermal protection.

R32 and R33 form a potential divider with its centre point voltage being fed via R34 to the base TR9, this sets the trip and reset voltages for the relay switching circuit to approximately 1 volt and 1.7 volt respectively. Switching off the relay itself is done by TR8, in series with a 1k Ohm dropper resistor to give the correct relay voltage.

For the relay to switch cleanly i.e. without chattering etc. TR8 has to be either turned hard on i.e. conducting fully or turned completely off.

This is done with the circuit around TR9 and TR10 with these two transistors forming a schmitt trigger.

A schmitt trigger is a circuit that has an upper and lower threshold on its input, and has an output that changes state instantly as these thresholds are passed.

As already mentioned these thresholds are 1 volt for the relay to drop out, i.e. thermal cutout, and 1.7 volts for the relay to pull in again.

These voltages equate to temperatures of approximately 80 degrees celsius for the relay to trip, and a 10 degree celsius drop in temperature before the relay resets itself again.

### **OUTPUT CIRCUIT**

The output circuit is a MOS-FET type arrangement.

This uses two BUZ900 MOS-FET transistors and two complimentary BUZ905 MOS-FETS.

The speakers are driven from the common sources of these four devices connected together, the +VE supply being connected to the drain of the

BUZ900 and the -VE supply connected to the drain of the BUZ905 device.

C8 and R17 form a Zobel network to damp out and prevent any high frequency spurious oscillation ( MHz range ).