

TRACE ELLIOT

SERVICE MANUAL NO. SM00047

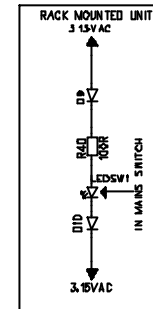
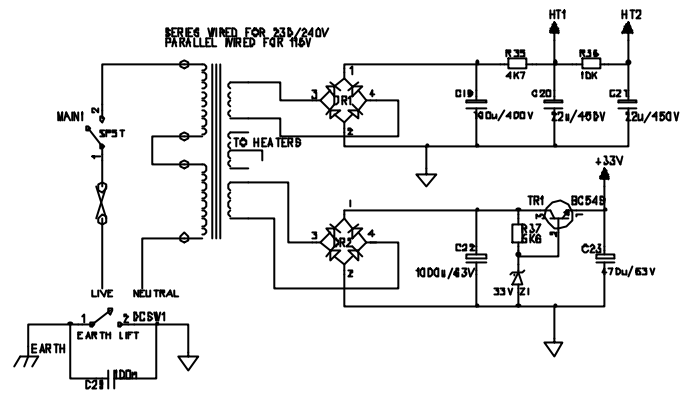
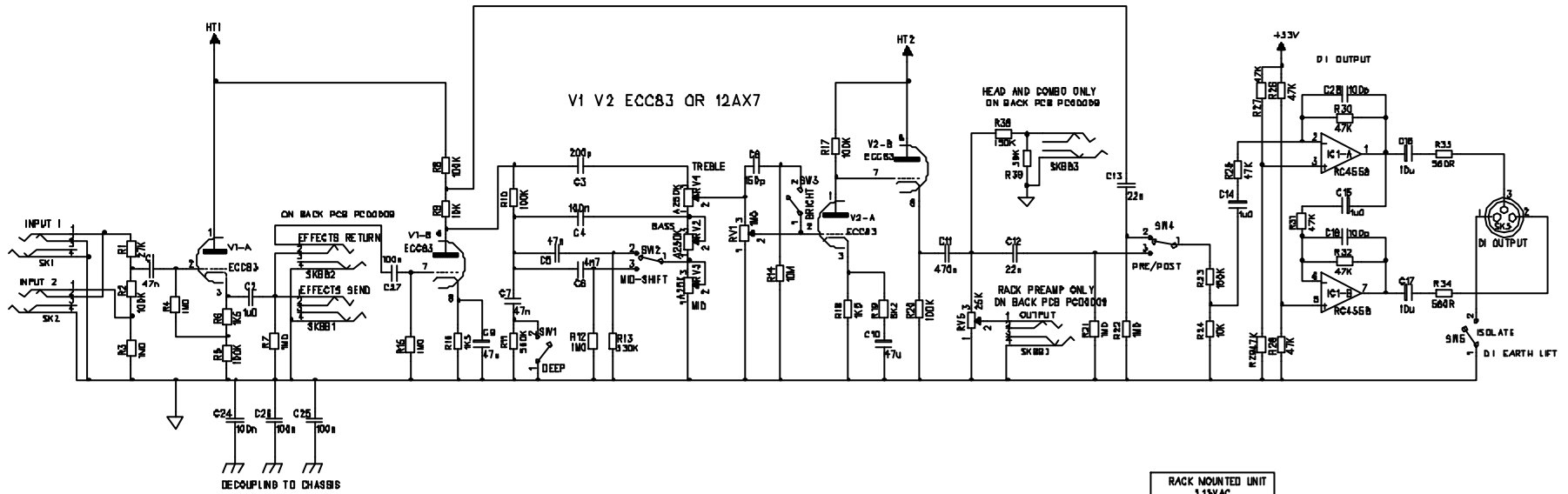
ISSUE 1

Date: JULY 31, 1997
Product Code: T0129
Model No : V-TYPE 600 HEAD
Technical File No : TE00047

Issued by:

**Trace Elliot Limited.
Blackwater Trading Estate
The Causeway, Maldon
Essex CM9 4GG.**

CHANGE NOTE DATE	CHANGE NOTE DATE	CHANGE NOTE DATE



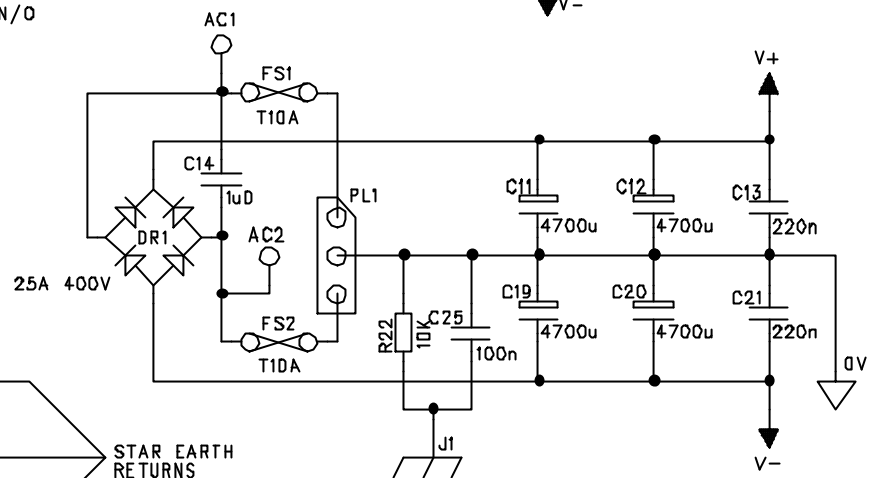
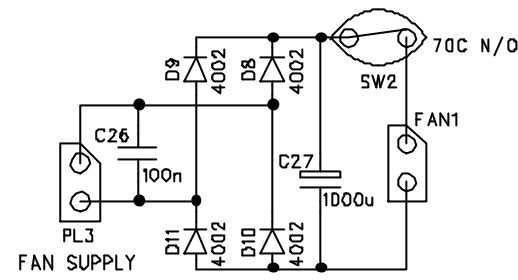
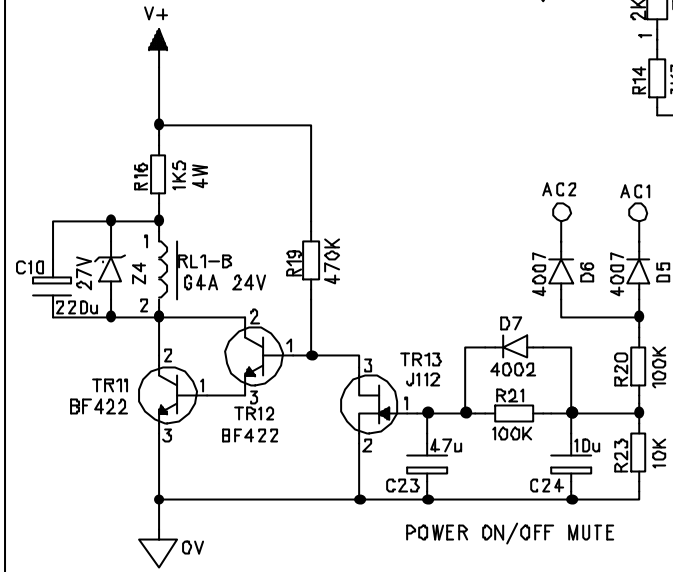
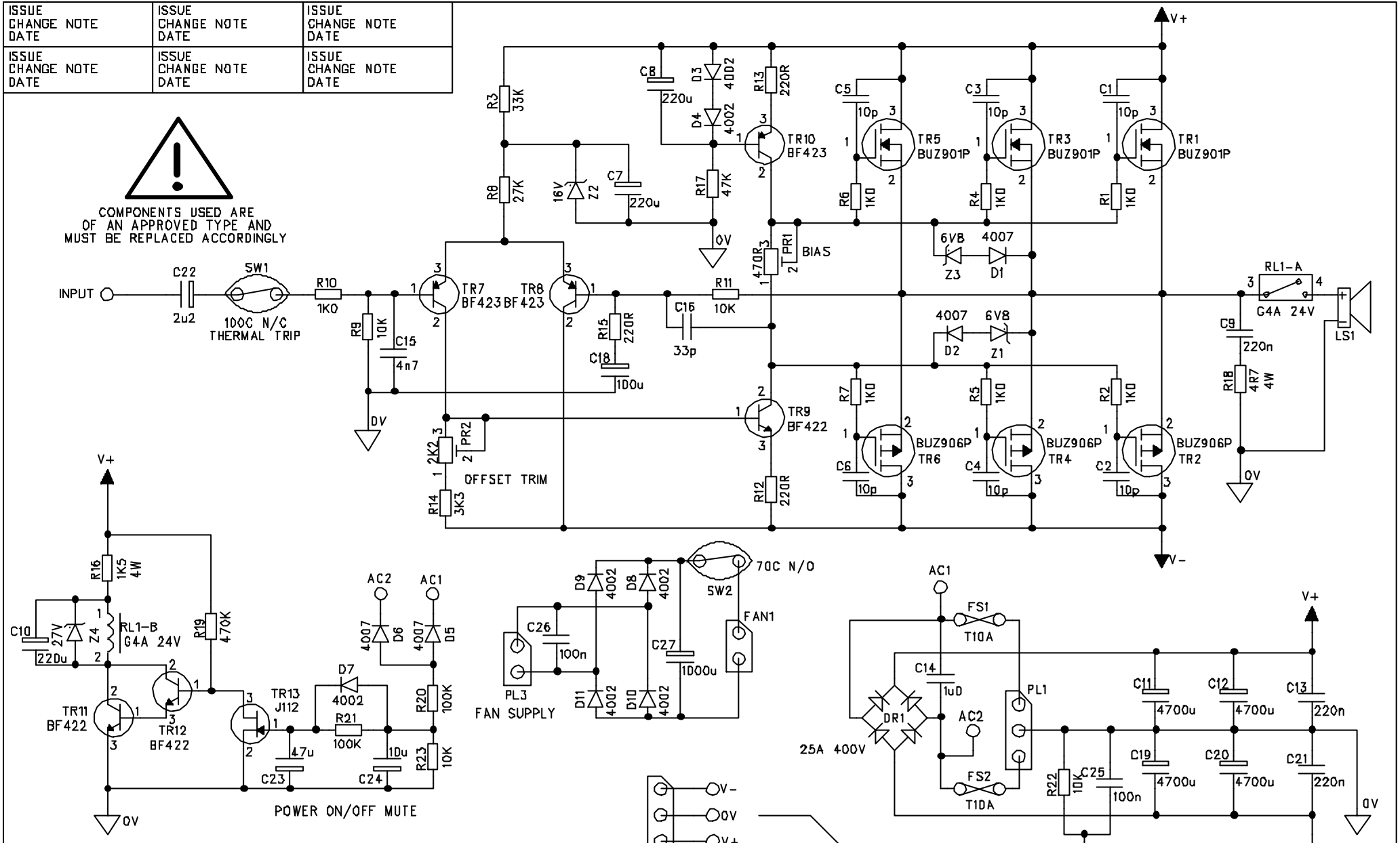
CIRCUIT DESIGN BY A. EWEN

TITLE	VALVE PREAMP CIRCUIT	TRACE ELLIOT LTD
PROJECT No	V-TYPE BASE SERIES	BLAKWATER TRADING ESTATE
DATE	02/08/08	BLAKWATER, WINDYBUSH
DRAWN BY	J B REYNOLDS	GLASGOW G3 7JH
		TEL: 01273 831831
		FAX: 01273 831875

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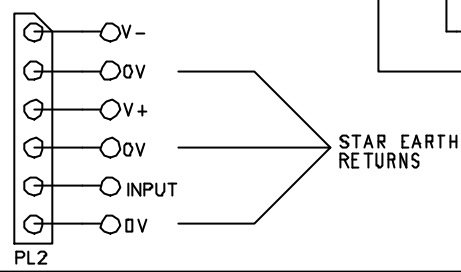


COMPONENTS USED ARE OF AN APPROVED TYPE AND MUST BE REPLACED ACCORDINGLY



TITLE PROJECT THE MOBY DICK POWER AMP
 DRAWING No V-TYPE 600H
 ISSUE CDD0051
 DATE 5/2/1997
 DRAWN BY J B RECKLESS

TRACE ELLIOT LTD
 BLACKWATER TRADING ESTATE
 MALDON ESSEX CM9 4GG
 GREAT BRITAIN
 TEL (01621) 851851
 FAX (01621) 851975



THE MOBY DICK

V-Type

V TYPE PREAMPLIFIER

V Type preamplifier is used in the following units:-

V-type head - 220 watt all valve amp. head.

V-type combo - 250 watt hybrid 15" combo.

V-type rack mount 1u all valve preamplifier.

TECHNICAL SPECIFICATIONS

Inputs	Passive bass	Impedance 1M OHM Input range 25mV to 1.5V (peak-peak)
	Active bass	Impedance 100K OHMS Input range 25mV to 6.0V (peak-peak)
	Effects return	Impedance greater than 1M OHM Nominal input level 0dBu (0.775VRMS)
Outputs	Effects send	Impedance less than 1K OHM Nominal level 0dBu
	Line output (Head and combo)	Impedance 8K OHMS Nominal level 0dBu (0.775VRMS) Maximum level +4dBu (3V RMS)
	Line output (Rack mount)	Impedance 25K OHMS Nominal level 0dBu (0.775V RMS) Maximum level + 20dBu (14VRMS)
	DI output	600ohms balanced Nominal level 0dBu (pins 2 and 3)
Frequency response		-3dB at 22Hz and 25kHz
Sensitivity	Passive input	13mV
	Active input	56mV

FACTORY DIRECT TECHNICAL HOTLINE TEL: (44) 621 840959 FAX: (44) 621 851932

V-Type

V TYPE CIRCUIT DESCRIPTION

Input SK1/SK2

SK1 and SK2 are the instrument inputs to the V type pre-amplifier. A signal entering SK1 is passed to the first stage via R1 with R2 in parallel. Resistor R3 is to decouple any D.C. appearing on the input to ground.

A signal entering SK2 is passed to the first stage via R2, again with R3 as a D.C. path to ground. This time, however, R1 has one end connected to ground via the switched contact on SK1. This provides a high degree of attenuation to input 2 for use with active or high output basses, with the combination of R2 and R1 acting as a potential divider across the input.

First stage (effects loop).

The first stage consists of one half of V1 which is a "cathode follower" stage to provide a low impedance output to feed the effects loop. R7 is there to decouple any D.C. to ground. SKBB1 and SKBB2 form a serial effects loop with the switching contacts on SKBB2 (effects return) providing the "break" into the circuit. Therefore SKBB2 can also be used as a "line in".

The signal from the effects return is passed via C27 (D.C. blocking) to the second half of V1.

Second stage (Tone network).

The tone circuit forms the anode load for the second half of V1. C3 and RV4 form the treble circuit, C4 and RV2 form the bass circuit and C5 and RV3 form the mid range circuit. RV3 incorporates a pull switch which switches C6 into the mid circuit and C5 out. This alters the point at which the mid range circuit works, upwards to about 2kHz. R12 and R13 provide D.C. paths to ground from the mid-shift contacts to reduce switching noise.

V-Type

Deep and bright switches.

The deep switch (SW1) provides a MID and TREBLE cut to accentuate the bass response by shorting out R11 and bringing C7 into the tone network.

The bright switch (SW3) brings C8 into circuit placing it in parallel with the top half of the gain control RV1. This creates a high-pass filter with a shallow roll off to accentuate the high frequency response. This function is disabled when the gain control is at a maximum as the capacitor is then by-passed. R14 is used to decouple any D.C. on the switch to ground.

Third stage.

The output from the tone network is fed from RV4 to RV1 (gain control) and then directly into the first half of V2. This is a gain stage to bring the signal up to a suitable level to drive a power amplifier.

The signal is then fed directly into the second half of V2 which is a "cathode follower" stage. This provides slightly less than unity gain but is designed to give a low impedance output to drive a power amplifier. The output signal is passed via C11 to the volume control RV5 and then onto the output jack socket SKBB3. This is only true for the rack mount version. In the head and combo the signal from RV5 pin 2 is passed directly to the power-amp. section, and a fixed level signal is taken from RV5 pin 3 to the line out socket. This is attenuated by a potential divider network of R38 and R39 to give a line level signal output.

D.I. output

A pre-eq D.I. signal is taken from the junction of R8 and R9 in the anode circuit of the second half of V1 before the signal is passed through the tone network, via C13.

The post-eq D.I. signal is passed via C12 from the output (cathode) of V2.

SW4 selects each of these signals with R21 and R22 providing a D.C. path to ground. The signal is then attenuated by the potential divider of R23 and R24 to provide a suitable level for the I.C.. The signal enters the inverting input of I.C. 1 via C14 and R25. The output on pin 1 of this half of the I.C. is passed via C16 and R33 to provide the negative or anti-phase D.I. signal on pin 3 of the XLR (SK5). The signal from pin 1 also enters the inverting input of the second half of I.C. 1 which re-inverts it to give the inphase (positive) D.I. signal on pin 2 of SK5. C18 is present for high frequency stability.

D.C. biasing for I.C. 1 comes from the potential dividers of R29 and R27 and R8 with R26 which halve the +33V supply to provide the reference points for the signals. SW5 isolates the ground connection pin 1 on SK5 to eliminate earth loops when connected to external equipment.

FACTORY DIRECT TECHNICAL HOTLINE TEL: (44) 621 840959 FAX: (44) 621 851932

V-Type

Pre-amp power supply.

In the rack mount version all supplies are derived from a single torroidal transformer. This provides 250V A.C. for the HT lines, bridge rectified and smoothed by C19, C20 and C21. R36 is present to stop any signal from HT2 getting onto HT1 which could cause feedback problems. It also provides 6.3V AC for the valve heaters and 40V A.C rectified and smoothed by C22 for the I.C. supply. This is regulated by a BC549 transistor, a 33v zener diode and a 5K6 resistor with C23 for smoothing purposes.

The same transformer is used in the combo version in conjunction with a larger torroidal to supply power to the output stage.

In the Head version the large mains transformer used for the phase splitter and output valves is also used for all the pre-amp. supplies.

Mains on indication

For the head and combo versions a 6.5V A.C. lamp is used for "mains on" indication. Power for this is derived directly from the 6.3V heater supply.

For the rack mount version, the 6.3V heater supply is rectified by D9 and D10 to supply a D.C. voltage to the LED built into the mains on switch. R40 is used as the current limiting resistor.

THE MOBY DICK - PC00056

CIRCUIT DESCRIPTION

Introduction

The Moby Dick is a MOSFET 600 watt power output PCB with secondary fusing, integrated bridge rectifier, power supply and fan drive circuit. It uses a single aluminium extruded heatsink with twin cooling fans. The heatsink is 'live' - i.e. there are no insulating washers between the output MOSFETs and the heatsink, thereby improving thermal efficiency and allowing high power output in a compact unit.

Design Philosophy

- The output devices are Semelab TO3P plastic package lateral MOSFETs, used in a complementary source follower configuration. The basic circuit is fully discrete and uses only a small amount of negative feedback (around 20dB) to help improve transient response and stability into reactive loads.
- Silent power up and power down is achieved using a relay in series with the speaker output.
- The fan drive supply is derived using a separate winding on the mains transformer, eliminating the need for a fan drive transistor.

Input Stage

- Transistors TR7 and TR8 form a differential long tail pair, comparing the input signal with a fraction of the output signal and producing an 'error' voltage which drives the subsequent stage (TR9).
- R3, Z2 and C7 provide a steady decoupled 16 volt DC supply to the emitters of TR7 and TR8 to eliminate power supply ripple and hum on the output.
- R8 feeds approximately 570 μ A into the emitters of TR7 and TR8 which is split evenly between the two transistors.
- PR2 in series with R14 is to adjust the voltage 'seen' by the base of TR9 to trim out any small DC offsets caused by slightly different h_{FE} of TR7 and TR8.

- The feedback network comprising R11, R15 and C18 determines the closed loop gain and low frequency roll-off of the amplifier.
- C22, R10, R9 and C15 form a first order bandpass filter with 3dB frequencies of approx 7Hz and 30KHz. This is to prevent any DC or high frequency instability from entering the amplifier.

Voltage Gain Stage

- TR9 is the main voltage amplifying transistor. It is driven from the collector of TR7 and has an active 'constant current source' collector load consisting of TR10, R13, D3, D4, C8 and R17. This supplies approx 2.7mA into the collector of TR9 irrespective of the voltage swing.
- R12 provides localised feedback to TR9 to improve its linearity and reduce distortion.
- Preset PR1 sets the output bias voltage - its purpose is to bias the (enhancement mode) output MOSFETs just into conduction to prevent crossover distortion from appearing in the output.

Output Stage

- The output MOSFETs are complementary lateral enhancement mode FETs in a TO3P plastic package. They are configured in a push-pull source follower arrangement, with three pairs used in parallel to supply sufficient current and power dissipation for 600 watts rms of output.
- The gate stopper resistors (R1, R2, R4, R5, R6, R7) are to prevent high frequency instability by forming a low pass filter in conjunction with the gate input capacitance of the MOSFET.
- The compensation capacitors (C1 to C6) are also to prevent instability caused by parasitic inter-electrode capacitance in the output stage.
- In addition, capacitor C16 provides localised high frequency feedback from the collector of TR9 to the long tail pair to further improve output stability (closed loop compensation).
- Diodes Z1, D2, Z3 and D1 are to prevent the V_{GS} voltage of the output MOSFETs from exceeding their maximum ratings and thus damaging the devices under extreme load conditions.

Power on and off Muting

- The relay RL1 is connected in series with the loudspeaker output and is used to prevent 'thumps' during power up and power down.
- The AC voltage from the secondary of the mains transformer is rectified via D5, D6, C24, R20 and R23 to provide a small negative DC voltage when mains power is applied to the unit. This charges C23 via R21 until J112 turns off, allowing TR11 and TR12 to turn on and apply power to the relay coil.
- When mains power is turned off, C23 rapidly discharges via D7 and turns the relay off, resetting the circuit at the same time.

Zobel Network

- C9 and R18 form a zobel network which ensures the amplifier sees a suitable high frequency load at all times (loudspeakers do not provide a suitable high frequency load as they are inductive in nature).

Fan supply and thermal control

- The fan supply is derived from a separate winding on the mains transformer. This is rectified via D8, D9, D10 and D11 and smoothed by C27.
- When the temperature of the heatsink reaches 70 degrees Celsius, bimetallic trip SW2 closes and allows the cooling fans to start up.
- Should the temperature of the heatsink fall below 50 degrees Celsius, trip SW2 will open and turn the cooling fans off.
- Should the heatsink temperature exceed 100 degrees Celsius, bimetallic trip SW1 will open and disconnect the input from the amplifier, allowing it to cool with no signal going through it. This should only occur in a fault condition, if the cooling fans fail, if the vents are obstructed or in a high ambient environment and heavy load.
- SW1 will reset itself once the heatsink temperature has reached about 70 degrees Celsius.

Jonny Reckless 5 February 1997.

C12-PCB-VTYP-C/Hx1.

V-TYPE COMBO/HEAD PREAMP MAIN BOARD.
ISSUE 1 INSERTION LIST. ANDY EWEN 11/8/98.

DESCRIPTION	PART CODE	QTY	WHERE USED
PCB PC00008 ISSUE 2	73-PCB-PC00008	1	
ZENER DIODE 27V	72-D-BZX55C27V	1	ZD1
DIODE	72-D-IN4007	10	D1-D10
RES 2.5W 4K7	72-RWW4K7-2.5W	1	R35
RES 2W 100K	72-RC100K-2W	4	R8 R10 R17 R20
RES 1/2W 10K	72-RC10K-.5W	2	R9 R36
ZERO OHM LINK	72-RCZERO	28	AS MARKED
RES 1/4W 100K	72-RM100K	2	R2 R5
RES 1/4W 100R	72-RM100R	1	R40
RES 1/4W 10K	72-RM10K	1	R24
RES 1/4W 10M	72-RM10M	1	R14
RES 1/4W 150K	72-RM150K	1	R23
RES 1/4W 1K5	72-RM1K5	3	R6 R16 R18
RES 1/4W 1M	72-RM1M	7	R3 R4 R7 R12 R15 R21 R22
RES 1/4W 27K	72-RM27K	1	R1
RES 1/4W 330K	72-RM330K	1	R13
RES 1/4W 47K	72-RM47K	8	R25-R32
RES 1/4W 560K	72-RM560K	1	R11
RES 1/4W 560R	72-RM560R	2	R33 R34
RES 1/4W 5K6	72-RM5K6	1	R37
RES 1/4W 8K2	72-RM8K2	1	R19
CAP 1uF POLY BOX	72-C1-250VP	1	C2
CAP 1uF ELEC RADIAL	72-C1-63VER	2	C14 C15
CAP 10uF ELEC RADIAL	72-C10-35VER	2	MOD ACROSS R28 & R29 +ve legs nearest IC1.
CAP 10uF ELEC RADIAL	72-C10-63VER	2	C16 C17
CAP 1000uF ELEC RAD.	72-C1000-63VER	1	C22
CAP 100N POLY BOX	72-C100N-250VP	5	C4 C24 C25 C26 C27
CAP 100P CER DISC	72-C100P-100VCD2	2	C18 C28
CAP 150P CER DISC	72-C150P-50VCD	1	C8
CAP 200P Polystyrene	72-C200P-630VPA	1	C3
CAP 22uF ELEC AXIAL	72-C22-450VEA	2	C20 C21
CAP 22N POLY BOX	72-C22N-400VP	2	C12 C13
CAP 47uF ELEC RADIAL	72-C47-63VER	2	C9 C10
CAP 470uF ELEC RAD.	72-C470-63VER	1	C23
CAP 470N POLY BOX	72-C470N-250VP	1	C11
CAP 47N POLY BOX	72-C47N-100VP	1	C1
CAP 47N POLY BOX	72-C47N-400VP	2	C5 C7
CAP 4N7 POLY BOX	72-C4N7-400VP	1	C6
CAP 100uF ELEC RAD.	72-CAP-100400V	1	C19

TRANSISTOR BC549C	72-TBC549C	1	TR1
8-WAY SOCKET	72-SOCKET-8W	1	FOR IC1
IC RC4558P	72-IC-RC4558P	1	IC1
POT A 1MEG	73-POT-A1M	1	P1
POT A 250K	73-POT-A250K	2	P2 P4
POT A 25K	73-POT-A25K	1	P5
POT A25K PULL SWITCH	73-POT-A25K-PS	1	P3
MINI TOGGLE SWITCH	73-SWT-M-TGL-PCB	4	SW1 SW3 SW4 SW5
2-WAY HEADER 0.1"	72-HEAD-2W	4	HP1-HP4 (SEE NB1)
8-WAY HEADER 0.2"	72-HEAD-8W	1	PL1
VALVE BASE 9-WAY	73-VAL-SOCKET	2	VT1 VT2
XLR PLUG NEUTRIK	73-XLR-PCB-M-N	1	XLR1
JACK SOCKETS	72-SKT-JCKBNBG	2	SK1 SK2
FLYLEAD	C00-FLY-HEATER	1	ACROSS HP1-HP4
SIGNAL LEAD	LOOM-00275	1	From L/0(F) to PC00009
SIGNAL LEAD	LOOM-00276	1	From send/return to PC00009
LEAD FOR LAMP	LOOM-00277	1	From PL3 to 6.3V lamp

N.B.1 The four 2-way headers are fitted with their small face to the left. This is with the pots facing you.

C11-PC00056x1.

MOBY DICK 600W OUTPUT STAGE V-TYPE 600H PC00056 ISSUE 1

Description	Part Code	Qty	Where Used			
DIODE 1N4002	72-D-1N4002	7	D3 D9	D4 D10	D7 D11	D8
DIODE 1N4007	72-D-1N4007	4	D1	D2	D5	D6
ZENER DIODE 16V	72-D-BZX55C16V	1	Z2			
ZENER DIODE 27V	72-D-BZX55C27V	1	Z4			
ZENER DIODE 6V8	72-D-BZX55C6V8	2	Z1	Z3		
100K 1/4W RES	72-RM100K	2	R20	R21		
10K 1/4W RES	72-RM10K	4	R9	R11	R22	R23
1K0 1/4W RES	72-RM1K	7	R1 R6	R2 R7	R4 R10	R5
220R 1/4W RES	72-RM220R	3	R12	R13	R15	
27K 1/4W RES	72-RM27K	1	R8			
3K3 1/4W RES	72-RM3K3	1	R14			
33K 1/4W RES	72-RM33K	1	R3			
470K 1/4W RES	72-RM470K	1	R19			
47K 1/4W RES	72-RM47K	1	R17			
CAP RADIAL 1000u 63V	72-C1000-63VER	1	C27			
CAP RADIAL 100u 16V	72-C100-16VER	1	C18			
CAP RADIAL 47u 63V	72-C47-63VER	1	C23			
CAP BOX POLY 100n 100V	72-C100N-100VP	2	C25	C26		
CAP RADIAL 10u 63V	72-C10-63VER	1	C24			
CAP CERAMIC DISC 10p 500V	72-C10P-500VCD	6	C1 C5	C2 C6	C3	C4
CAP BOX POLY 1uF 250V	72-C1-250VP	1	C14			
CAP TANT 2u2 35V	72-C2.2-35VT	1	C22			
CAP RADIAL 220u 25V	72-C220-25VER	3	C7	C8	C10	
CAP BOX POLY 220n 250V	72-C220N-250VP	3	C9	C13	C21	
CAP CERAMIC 33p 100V	72-C33P-100VCD2	1	C16			
CAP BOX POLY 4n7 100V	72-C4N7-100VP	1	C15			
JFET J112	72-FET-J-112	1	TR13			
RES W/W 1K5 4W	72-RWW1K5-4W	1	R16			
RES W/W 4R7 4W	72-RWW4R7-4W	1	R18			
TRANSISTOR BF422	72-TBF422	3	TR9	TR11	TR12	

TRANSISTOR BF423	72-TBF423	3	TR7 TR8 TR10
FUSE T10A 1.25"	72-FUS-10AT-2	2	FS1 FS2
PCB FUSEHOLDER 1.25"	72-FUS-HLD-PCB-2	2	FS1 FS2
HEADER 2 WAY 0.2"	72-HEAD-2W-2	2	LS1 PL3
HEADER 3 WAY 0.2"	72-HEAD-3W-3	1	PL1
HEADER 6 WAY 0.1"	72-HEAD-6W-2	1	PL2
TREMINAL 2 WAY 0.2"	73-TERM-PCB-2WAY	1	FAN
PRESET 2K2	72-PRESET-2K2	1	PR2
PRESET 470R	72-PRESET-470R	1	PR1
BRIDGE RECTIFIER	73-BRIDGE-A	1	DR1
CAP RADIAL 4700u 100V	72-CAP-4700100V	4	C11 C12 C19 C20
MOSFET BUZ901P	73-MOS-BUZ901P	3	TR1 TR3 TR5
MOSFET BUZ906P	73-MOS-BUZ906P	3	TR2 TR4 TR6
RELAY OMRON G4A 24V	73-RELAY-24V-G4A	1	RL1
THERMAL SWITCH 70C	73-SWT-THERM-6	1	SW2
PCB CRIMP TAB	72-CRIMP-PCB-TAB	3	SW1A SW1B GND2
THERMAL SWITCH 100C	73-SWT-THERM-2	1	wire into SW1
TRANSISTOR CLIP	74-HS-KR70-CLIP1	6	for fastening output devices
TRANSISTOR CLIP	74-HS-KR70-CLIP2	1	FOR SW2
HEATSINK MOBY 200mm	71-HS-KR200-2	1	fit output devices with compound and no insulating washers
SCREW M3 TAPTITE	71-SCR-M3X8PP/TT	9	
PCB PC00056 ISSUE 1	73-PCB-PC00056	1	