

TRACE ELLIOT

SERVICE MANUAL NO. SM00053

ISSUE 1

Date: April 9th 1998
Product Code : T3490 / T3480
Model No : SPEED TWIN H50 / C50
Technical File No : TE000053

Issued by:

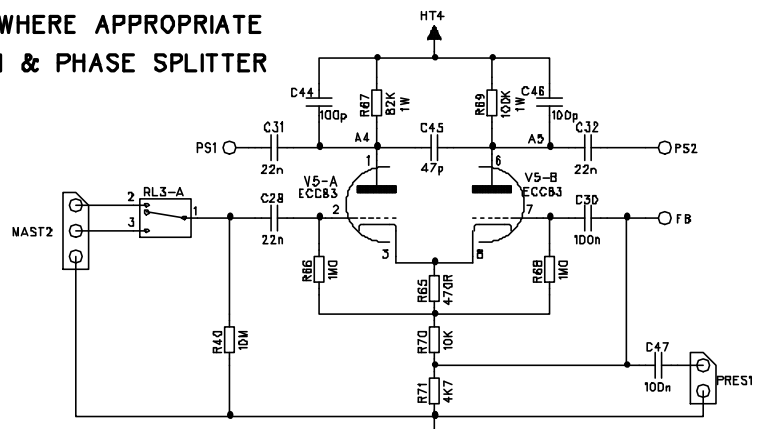
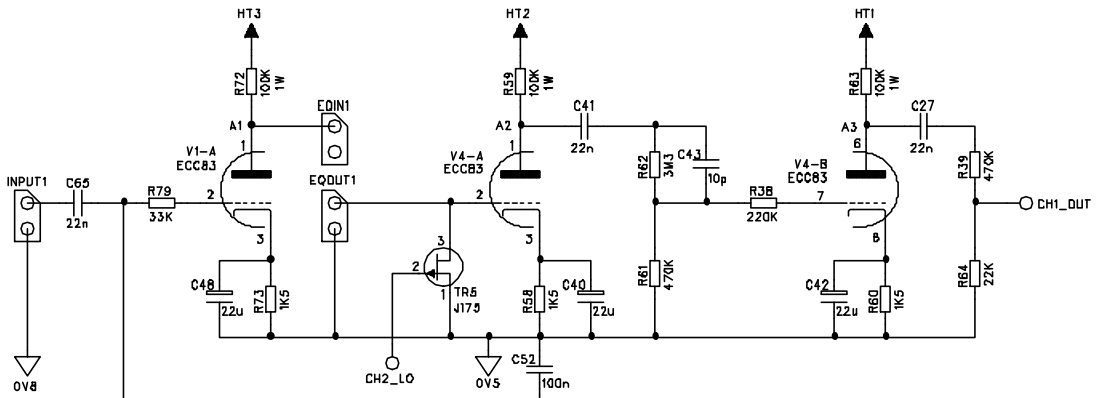
**Trace Elliot Limited.
Blackwater Trading Estate
The Causeway, Maldon
Essex CM9 4GG.**

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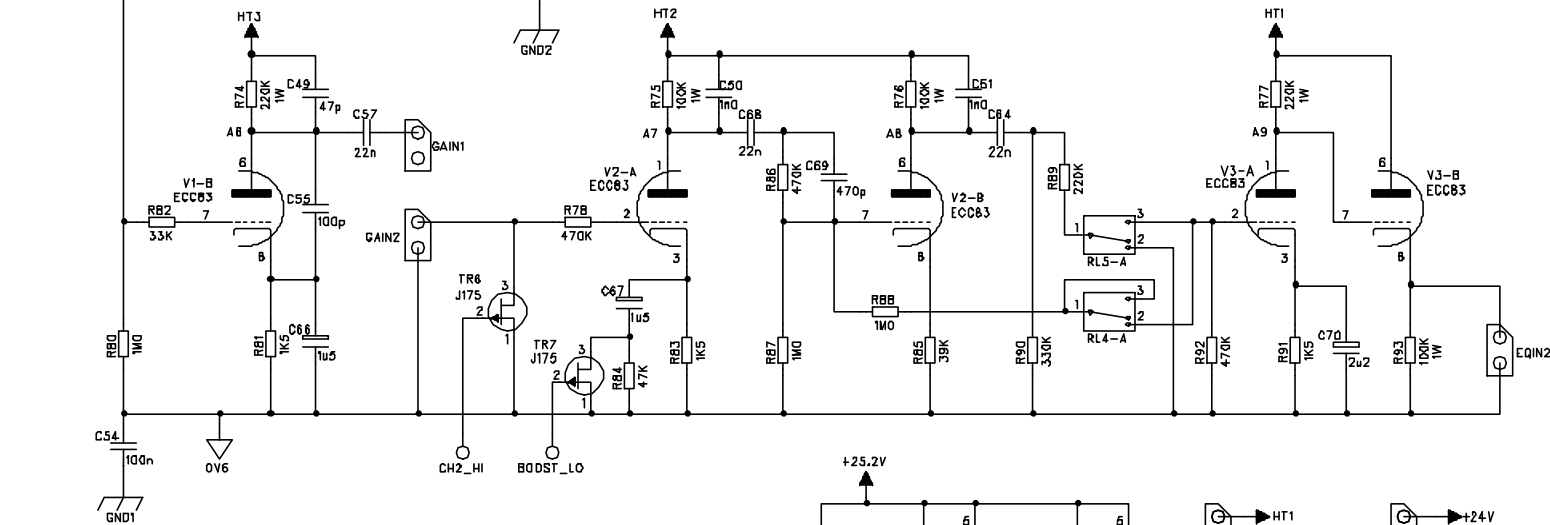
SPEED TWIN '98 GUITAR AMPLIFIERS – MAIN PREAMP PCB

FOR USE ON ALL MODELS, C30 DIFFERENCES SHOWN WHERE APPROPRIATE

CHANNEL 1 & CHANNEL 2 OF VALVE PREAMP SECTION & PHASE SPLITTER



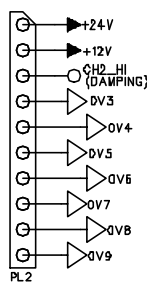
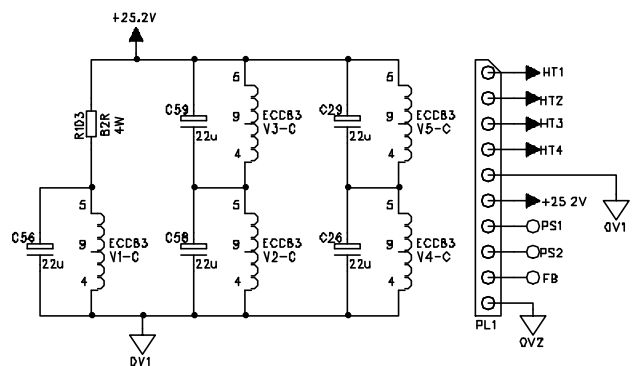
SPEED TWIN C30 MODEL CHANGES:-
 R65 – 1K2
 R70 – 47K
 R71 – LINK
 C47 – NOT FITTED



TEST VOLTAGES

| | HT1 | HT2 | HT3 | HT4 | V1p1 | V1p6 | V2p1 | V2p6 | V3p1 | V3p6 | V4p1 | V4p6 | V5p1 | V5p6 |
|-----------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|
| C30 | 315 | 325 | 330 | 333 | 224 | 151 | 210 | 305 | 135 | 138 | 210 | 200 | 255 | 250 |
| C50/H50 | 335 | 345 | 350 | 315 | 225 | 170 | 225 | 330 | 150 | 152 | 215 | 215 | 206 | 204 |
| C100/H100 | 340 | 350 | 380 | 320 | 235 | 170 | 230 | 330 | 150 | 152 | 230 | 225 | 200 | 190 |

TOLERANCE +/- 5%



SEE ALSO:-

- CD00093 – MAIN FRONT BOARD ALL MODELS
- CD00094 – MASTER SECTION C50, C100, H50 & H100
- CD00095 – MASTER SECTION C30
- CD00091 – 100 WATT VALVE OUTPUT STAGE & DC SUPPLY
- CD00085 – 50 WATT VALVE OUTPUT STAGE & DC SUPPLY
- CD00096 – 30 WATT VALVE OUTPUT STAGE & DC SUPPLY
- CD00097 – 5 FUNCTION FOOTSWITCH



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

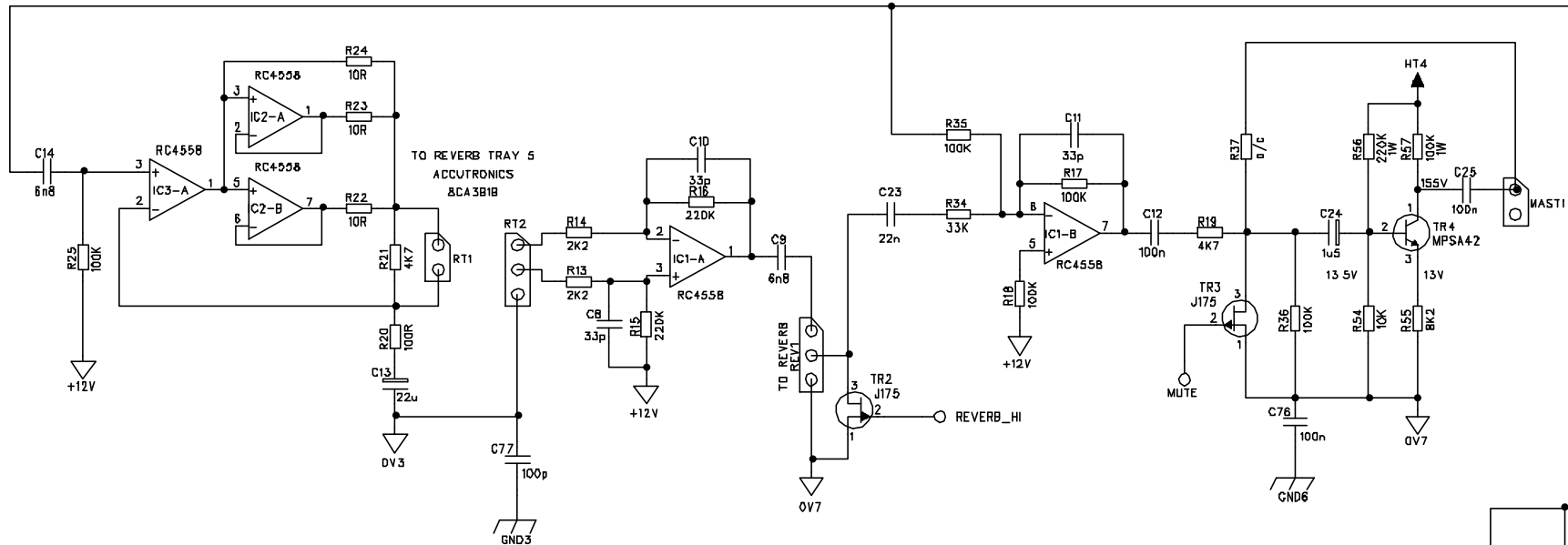
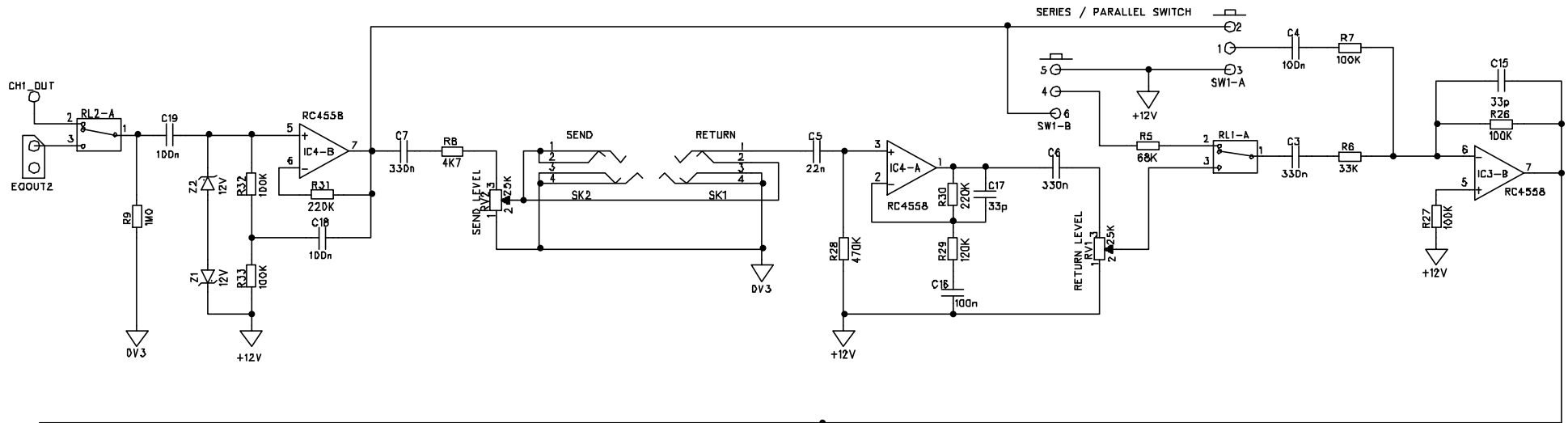
SHEET 1/3

| | | |
|------------|--------------------------------|---|
| TITLE | CH1 & CH2 VALVE PREAMP SECTION | TRACE ELLIOT LTD BLACKWATER TRADING ESTATE WALDON ESSEX CM9 4GG GREAT BRITAIN TEL (01621) 851851 FAX (01621) 851875 |
| PROJECT | SPEED TWIN '98 GUITAR AMPS | |
| DRAWING No | CD00092 | |
| ISSUE | 4 | |
| DATE | 28 MAY 1998 | |
| DRAWN BY | PAUL STEVENS | |

FOR USE WITH PC00088

| | | |
|------------------------|------------------------|------------------------|
| ISSUE CHANGE NOTE DATE | ISSUE CHANGE NOTE DATE | ISSUE CHANGE NOTE DATE |
| ISSUE CHANGE NOTE DATE | ISSUE CHANGE NOTE DATE | ISSUE CHANGE NOTE DATE |

EFFECTS LOOP AND REVERB CIRCUITRY



- SPEED TWIN C30 MODEL CHANGES -
- R37 - LINK
 - R36 - NOT FITTED
 - R54 - NOT FITTED
 - R55 - NOT FITTED
 - R56 - NOT FITTED
 - R57 - NOT FITTED
 - C24 - NOT FITTED
 - C25 - NOT FITTED
 - TR4 - NOT FITTED

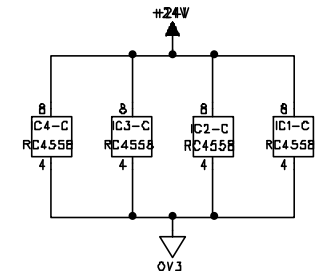
SHEET 2/3

TITLE REVERB & EFFECTS LOOP CIRCUIT
 PROJECT SPEED TWIN '98 GUITAR AMPS
 DRAWING No CD00092
 ISSUE 4
 DATE 28 MAY 1998
 DRAWN BY PAUL STEVENS

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



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

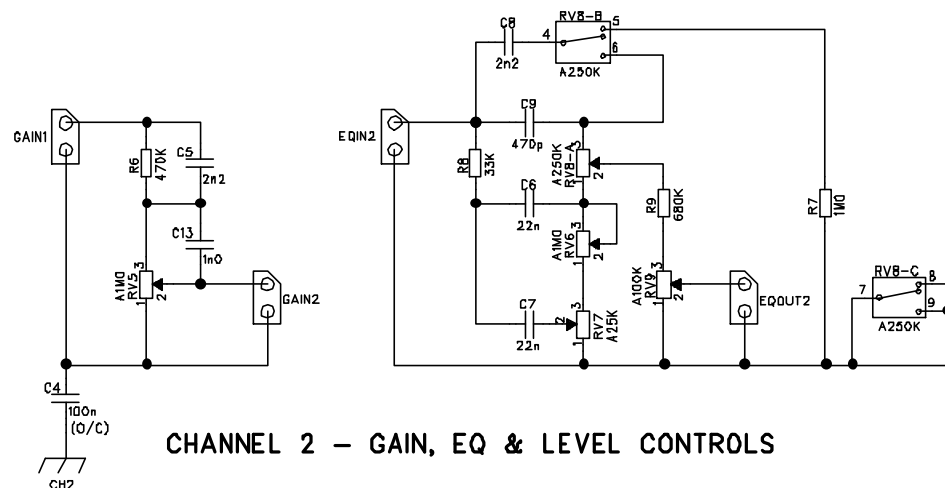
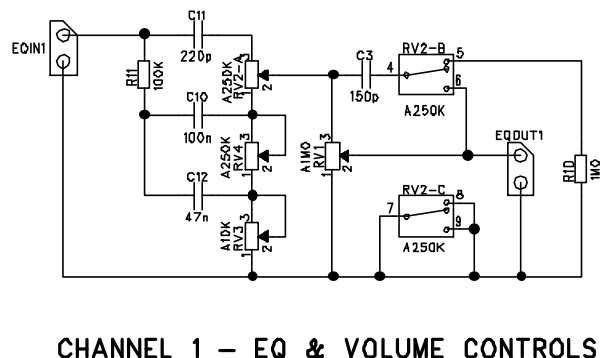
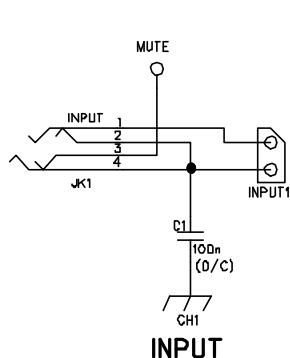


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SPEED TWIN MAIN FRONT PANEL

FOR USE ON ALL MODELS

(FIGURES IN BRACKETS VALUES FOR COMBO VERSIONS)

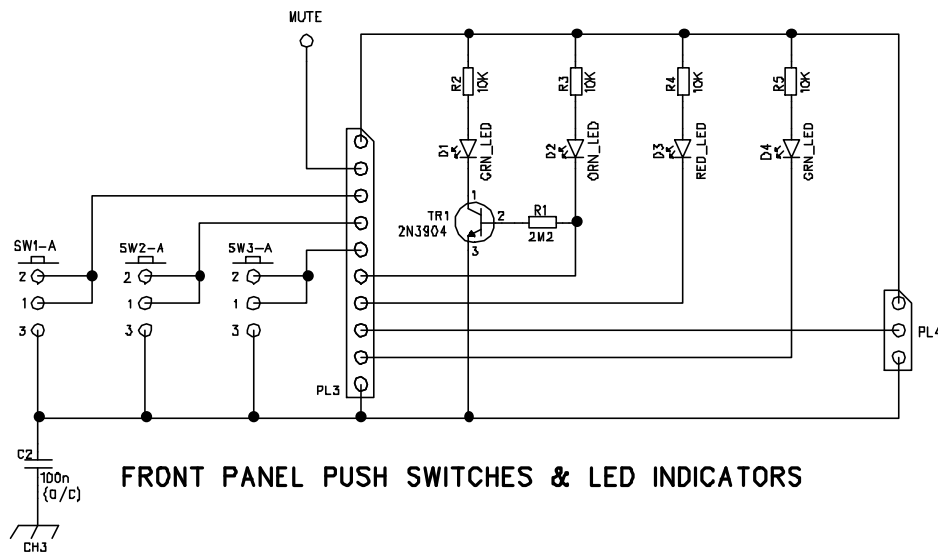


COMPONENTS USED ARE OF AN APPROVED TYPE AND MUST BE REPLACED ACCORDINGLY

FOR USE WITH PC00089 & PC00090

CONNECTS TO:-

- PC00088 CD00092 MAIN PREAMP ON ALL MODELS
- PC00093 CD00094 MASTER SECTION ON H50 & H100
- PC00094 CD00094 MASTER SECTION ON C50 & C100
- PC00091 CD00098 MASTER SECTION ON C30

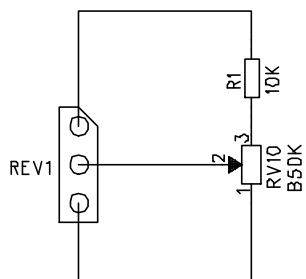


| | | |
|------------|----------------------------|---|
| TITLE | MAIN FRONT PANEL PCB | TRACE ELLIOT LTD BLACKWATER TRADING ESTATE MALDON ESSEX CM9 4GG GREAT BRITAIN TEL (01621) 851851 FAX (01621) 851975 |
| PROJECT | SPEED TWIN '98 GUITAR AMPS | |
| DRAWING No | CD00093 | |
| ISSUE | 2 | |
| DATE | 21 APRIL 1998 | |
| DRAWN BY | PAUL STEVENS | |

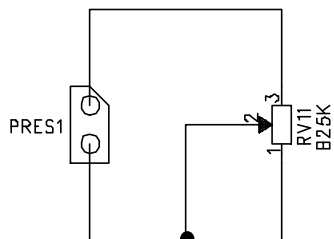
SPEED TWIN FRONT PANEL MASTER SECTION

FOR USE ON H100, H50, C100 & C50

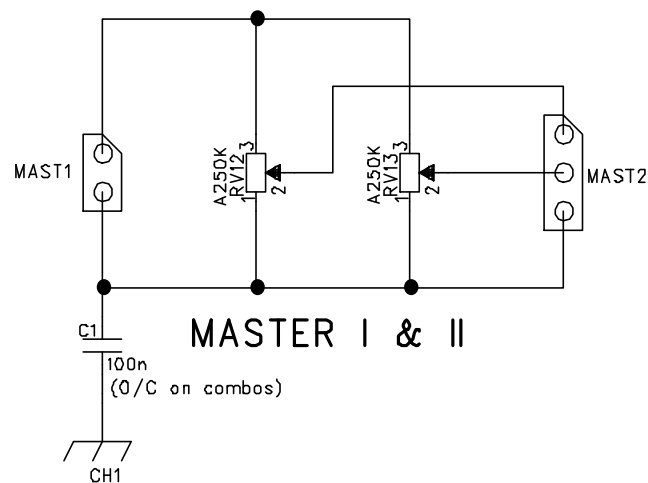
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REVERB



PRESENCE



MASTER I & II



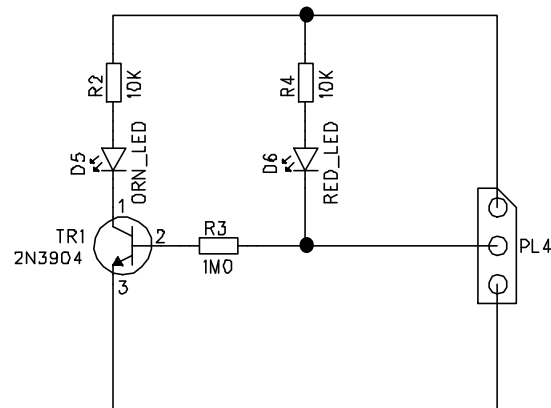
COMPONENTS USED ARE OF AN APPROVED TYPE AND MUST BE REPLACED ACCORDINGLY

FOR USE WITH PC00093 & PC00094

CONNECTS TO:-

PC00089 CD00093 MAIN FRONT PANEL ON H50 & H100

PC00090 CD00093 MAIN FRONT PANEL ON C50 & C100



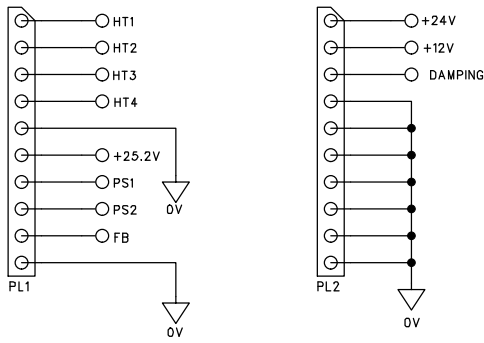
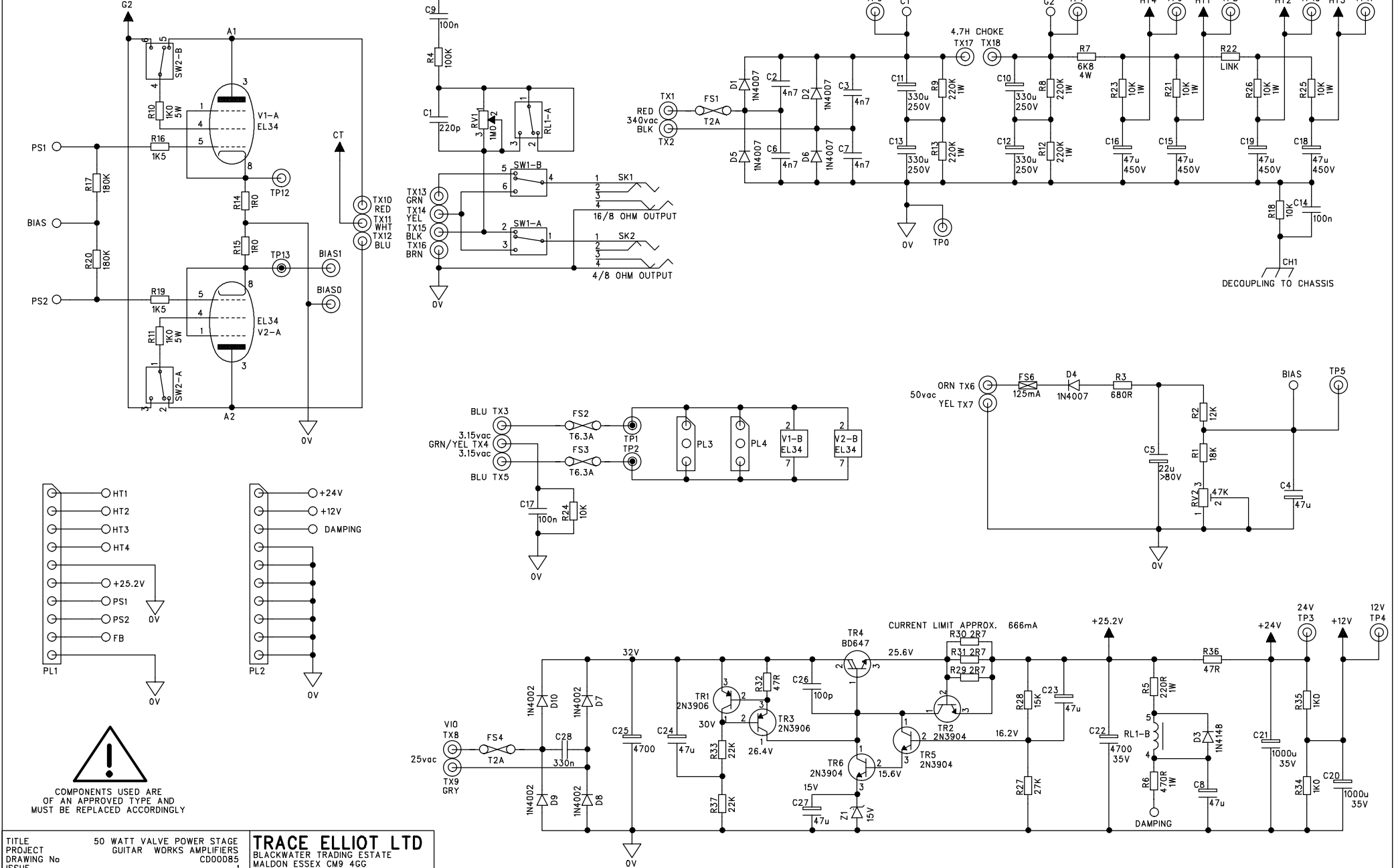
LED INDICATORS

TITLE 50/100W FRONT PANEL MASTER SECTION
 PROJECT SPEED TWIN '98 GUITAR AMPS
 DRAWING No CD00094
 ISSUE 1
 DATE 6 MARCH 1998
 DRAWN BY PAUL STEVENS

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

| | | | |
|-------------------|------|-------------------|------|
| ISSUE CHANGE DATE | NOTE | ISSUE CHANGE DATE | NOTE |
| ISSUE CHANGE DATE | NOTE | ISSUE CHANGE DATE | NOTE |

50 WATT VALVE OUTPUT STAGE AND DC SUPPLY



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

TITLE: 50 WATT VALVE POWER STAGE
 PROJECT: GUITAR WORKS AMPLIFIERS
 DRAWING No: CD00085
 ISSUE: 1
 DATE: 6 MARCH 1998
 DRAWN BY: PAUL STEVENS

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

FOR USE WITH PC00085

PARTS LIST FOR SPEED TWIN '98 MAIN PRE AMP PCB FOR 50W & 100W MODELS

C32-PCB-SP2-M

ISSUE 2 9/4/98 PS

| Description | Part Code | Qty | Where Used |
|-------------------|-----------------|-----|--|
| PCB | PC00088 issue 2 | 1 | |
| RESISTORS | | | |
| 0 ohm link | 72-RCZERO | 2 | R1 R100 |
| 10R 1/4W | 72-RM10R | 3 | R22 R23 R24 |
| 100R 1/4W | 72-RM100R | 1 | R20 |
| 220R 1W | 72-RM220R-1WATT | 5 | R4 R11 R42 R105 R107 |
| 470R 1/4W | 72-RM470R | 1 | R65 |
| 470R 1W | 72-RM470R-1WATT | 5 | R3 R10 R41 R104 R106 |
| 1K5 1/4W | 72-RM1K5 | 6 | R58 R60 R73 R81 R83 R91 |
| 2K2 1/4W | 72-RM2K2 | 2 | R13 R14 |
| 4K7 1/4W | 72-RM4K7 | 4 | R8 R19 R21 R71 |
| 8K2 1/4W | 72-RM8K2 | 1 | R55 |
| 10K 1/4W | 72-RM10K | 7 | R43 R45 R47 R50 R52 R54 R70 |
| 22K 1/4W | 72-RM22K | 1 | R64 |
| 33K 1/4W | 72-RM33K | 4 | R6 R34 R79 R82 |
| 39K 1/4W | 72-RM39K | 1 | R85 |
| 47K 1/4W | 72-RM47K | 1 | R84 |
| 68K 1/4W | 72-RM68K | 1 | R5 |
| 82K 1W | 72-RM82K-1WATT | 1 | R67 |
| 100K 1/4W | 72-RM100K | 23 | R2 R7 R17 R18 R25 R26 R27 R32 R33 R35 R36 R44 R46 R48 R51 R53 R94 R95 R96 R97 R99 R101 R102 |
| 100K 1W | 72-RM100K-1WATT | 8 | R57 R59 R63 R69 R72 R75 R76 R93 |
| 120K 1/4W | 72-RM120K | 1 | R29 |
| 220K 1/4W | 72-RM220K | 7 | R15 R16 R30 R31 R38 R56 R89 |
| 220K 1W | 72-RM220K-1WATT | 2 | R74 R77 |
| 330K 1/4W | 72-RM330K | 1 | R90 |
| 470K 1/4W | 72-RM470K | 7 | R28 R39 R49 R61 R78 R86 R92 |
| 1M0 1/4W | 72-RM1M | 6 | R9 R66 R68 R80 R87 R88 |
| 3M3 1/4W | 72-RM3M3 | 1 | R62 |
| 10M 1/4W | 72-RM10M | 2 | R12 R40 |
| 82R 4W | 72-RWW82R-4W | 1 | R103 |
| NOT FITTED | | | R37 R98 |
| CAPACITORS | | | |
| 33p 100V axial | 72-C33P-100VCA | 5 | C8 C10 C11 C15 C17 |
| 100p 100V axial | 72-C100P-100VCA | 1 | C77 |
| 6n8 100V axial | 72-C6N8-100VCA | 2 | C9 C14 |
| 22n 100V axial | 72-C22N-100VCA | 4 | C5 C23 C28 C65 |
| 100n 100V axial | 72-C100N-100VCA | 16 | C4 C12 C16 C18 C19 C30 C33 C47 C52 C53 C54 C60 C61 C62 C63 C76 |
| 220n 100V axial | 72-C220N-50VCA | 6 | C34 C35 C36 C38 C39 C73 |

| | | | | |
|------------------------|---------------|------------------|----|--|
| 330n | 50V axial | 72-C330N-50VCA | 7 | C2 C3 C6 C7 C22 C37 C72 |
| 10p | 500V ceramic | 72-C10P-500VCD | 1 | C43 |
| 47p | 500V ceramic | 72-C47P-500VCD | 2 | C45 C49 |
| 100p | 1KV ceramic | 72-C100P-1KVCD | 3 | C44 C46 C55 |
| 470p | 1KV ceramic | 72-C470P-1KVCD | 1 | C69 |
| 1n0 | 1KV ceramic | 72-C1000P-1KVCD | 2 | C50 C51 |
| 22n | 400V poly box | 72-C22N-400VP | 7 | C27 C31 C32 C41 C57 C64 C68 |
| 100n | 250V poly box | 72-C100N-250VP | 1 | C25 |
| 1u5 | 35V tant | 72-C1.5-35VT | 3 | C24 C66 C67 |
| 2u2 | 35V tant | 72-C2.2-35VT | 1 | C70 |
| 22u | 63V elect rad | 72-C22-63VER | 15 | C1 C13 C20 C21 C26 C29 C40 C42 C48 C56 C58 C59 C71 C74 C75 |
| SEMICONDUCTORS | | | | |
| 1N4148 | | 72-D-IN4148 | 6 | D1 D2 D3 D4 D5 D6 |
| 12V ZENER | | 72-D-BZX55C12V | 2 | Z1 Z2 |
| ZTX614 Darlington | | 72-TZTX614 | 5 | TR8 TR9 TR10 TR11 TR12 |
| J175 | | 72-FET-J-175 | 6 | TR1 TR2 TR3 TR5 TR6 TR7 |
| MPSA42 | | 72-TMPSA42 | 1 | TR4 |
| RC4558 | | 72-IC-RC4558P | 4 | IC1 IC2 IC3 IC4 |
| 4049B -Hex Inverter | | 72-IC-4049B | 1 | IC5 |
| 4013B -Dual D Type | | 72-IC-4013B | 3 | IC6 IC7 IC8 |
| CONNECTORS | | | | |
| 10 way 0.1" | | 72-HEAD-10W | 3 | PL1 PL2 PL3 |
| 12 way 0.1" | | 72-HEAD-12W | 0 | PL5 NOT FITTED YET |
| SOCKETS | | | | |
| ¼" Mono Jack SKT | | 72-SKT-JCKBNBG | 2 | SK1 SK2 |
| ¼" Stereo Jack SKT | | 72-SKT-JCKBBBG | 1 | FS1 |
| 8 pin DIN SKT PCB | | 73-SKT-DIN-8PIN | 2 | FS2 FS3 |
| SWITCH | | 73-SWT-F2UEE | 1 | SW1 |
| POTENTIOMETERS | | 73-POT-A25K | 2 | RV1 RV2 |
| RELAY Omron G5V-1 | | 73-RELAY-5V-SPCO | 5 | RL1 RL2 RL3 RL4 RL5 |
| B9A PCB valve base | | 73-VAL-SOCKET | 5 | V1 - V5 (on underside of PCB) |
| MODIFICATION | | | | |
| 22u 63V elect rad | | 72-C22-63VER | 1 | ACROSS C63 |
| 7805 voltage regulator | | 72-IC-7805-REG | 1 | AS SHOWN ON SAMPLE |

PARTS LIST FOR SPEED TWIN '98 MAIN FRONT PCB

C32-PCB-SP2-FC & C32-PCB-SP2-FH

ISSUE 2 27/4/98 PS

| Description | Part Code | Qty | Where Used |
|-----------------------|------------------|-----|-----------------------|
| PCB | PC00089x2 or... | 1 | For H100 and H50 |
| | PC00090x2 | 1 | For C100, C50 and C30 |
| RESISTORS | | | |
| 10K 1/4W | 72-RM10K | 4 | R2 R3 R4 R5 |
| 33K 1/4W | 72-RM33K | 1 | R8 |
| 100K 1/4W | 72-RM100K | 1 | R11 |
| 470K 1/4W | 72-RM470K | 1 | R6 |
| 680K 1/4W | 72-RM680K | 1 | R9 |
| 1M0 1/4W | 72-RM1M | 2 | R7 R10 |
| 2M2 1/4W | 72-RM2M2 | 1 | R1 |
| CAPACITORS | | | |
| 100n 100V axial | 72-C100N-100VCA | 3 | C1 C2 C4 |
| 150p 100V ceramic | 72-C150P-100VCD | 1 | C3 |
| 220p 1KV ceramic | 72-C220P-1KVCD | 1 | C11 |
| 470p 1KV ceramic | 72-C470P-1KVCD | 1 | C9 |
| 1n0 1KV ceramic | 72-C1000P-1KVCD | 1 | C13 |
| 2n2 1KV ceramic | 72-C2200P-1KVCD | 2 | C5 C8 |
| 22n 400V poly box | 72-C22N-400VP | 2 | C6 C7 |
| 47n 400V poly box | 72-C47N-400VP | 1 | C12 |
| 100n 250V poly box | 72-C100N-250VP | 1 | C10 |
| SEMICONDUCTORS | | | |
| 2N3904 | 72-T2N3904 | 1 | TR1 |
| 3mm GRN LED | 72-LED-GRN-3mm | 2 | D1 D4 |
| 3mm YEL LED | 72-LED-YEL-3mm | 1 | D2 |
| 3mm RED LED | 72-LED-RED-3mm | 1 | D3 |
| CONNECTORS | | | |
| 3 way 0.1" | 72-HEAD-3W-2 | 1 | PL4 |
| 10 way 0.1" | 72-HEAD-10W | 1 | PL3 |
| 1/4" MONO JACK SKT | 72-SKT-JCKBNBG | 1 | JK1 |
| PUSH SWITCH | 73-SWT-F2UEE-MOM | 3 | SW1 SW2 SW3 |
| POTENTIOMETERS | | | |
| 10K | 73-POT-A10K | 1 | RV3 |
| 25K | 73-POT-A25K | 1 | RV7 |
| 100K | 73-POT-A100K | 1 | RV9 |
| 250K | 73-POT-A250K | 1 | RV4 |
| 250K with Pull Switch | 73-POT-A250K-PS | 2 | RV2 RV8 |
| 1M0 | 73-POT-A1M | 3 | RV1 RV5 RV6 |

PARTS LIST FOR SPEED TWIN '98
MASTER SECTION PCB FOR 50W & 100W MODELS

C32-PCB-SP2-FMC & C32-PCB-SP2-FMH

ISSUE 2 27/4/98 PS

| Description | Part Code | Qty | Where Used |
|-----------------------|-----------------|-----|---------------------|
| PCB | PC00093x2 or... | 1 | For H100 and H50 |
| | PC00094x2 | 1 | For C100 and C50 |
| RESISTORS | | | |
| 0 ohm link | 72-RCZERO | 3 | PC00093 where shown |
| 0 ohm link | 72-RCZERO | 4 | PC00094 where shown |
| 10K 1/4W | 72-RM10K | 3 | R1 R2 R4 |
| 1M0 1/4W | 72-RM1M | 1 | R3 |
| CAPACITOR | | | |
| 100n 100V axial | 72-C100N-100VCA | 1 | C1 |
| SEMICONDUCTORS | | | |
| 2N3904 | 72-T2N3904 | 1 | TR1 |
| 3mm YEL LED | 72-LED-YEL-3mm | 1 | D5 |
| 3mm RED LED | 72-LED-RED-3mm | 1 | D6 |
| POTENTIOMETERS | | | |
| 50KB | 73-POT-B50K | 1 | RV10 |
| 25KB | 73-POT-B25K | 1 | RV11 |
| 250K | 73-POT-A250K | 2 | RV12 RV13 |
| CONNECTOR | | | |
| 3 way 0.1" | 72-HEAD-3W-2 | 1 | PL4 |

PARTS LIST FOR SPEED TWIN '98
MASTER SECTION PCB FOR C30 MODEL

C32-PCB-SP2-FM30

ISSUE 1 6/3/98 PS

| Description | Part Code | Qty | Where Used |
|-----------------------|-----------------|-----|------------|
| PCB | PC00091x1 | 1 | C30 |
| RESISTOR | | | |
| 10K 1/4W | 72-RM10K | 1 | R1 |
| CAPACITOR | | | |
| 100n 100V axial | 72-C100N-100VCA | 1 | C1 |
| POTENTIOMETERS | | | |
| 50KB | 73-POT-B50K | 1 | RV10 |
| 250K | 73-POT-A250K | 1 | RV11 |

PARTS LIST FOR PC00085 - 50W VALVE POWER BOARD

C32-PCB-50W-VP

ISSUE 1 6/3/98 PS

| Description | Part Code | Qty | Where Used |
|-----------------------|-----------------|-----|-------------------|
| PCB | PC00085 issue 1 | 1 | |
| RESISTORS | | | |
| 0 Ohm Link | 72-RCZERO | 1 | R22 |
| 2R7 1/4W | 72-RM2R7 | 3 | R29 R30 R31 |
| 47R 1/4W | 72-RM47R | 2 | R32 R36 |
| 220R 1W | 72-RM220R-1WATT | 1 | R5 |
| 470R 1W | 72-RM470R-1WATT | 1 | R6 |
| 680R 1/4W | 72-RM680R | 1 | R3 |
| 1K0 1/4W | 72-RM1K | 2 | R34 R35 |
| 1K5 1/4W | 72-RM1K5 | 2 | R16 R19 |
| 10K 1/4W | 72-RM10K | 2 | R18 R24 |
| 12K 1/4W | 72-RM12K | 1 | R2 |
| 15K 1/4W | 72-RM15K | 1 | R28 |
| 18K 1/4W | 72-RM18K | 1 | R1 |
| 22K 1/4W | 72-RM22K | 2 | R33 R37 |
| 27K 1/4W | 72-RM27K | 1 | R27 |
| 100K 1/4W | 72-RM100K | 1 | R4 |
| 180K 1/4W | 72-RM180K | 2 | R17 R20 |
| 10K 1W | 72-RM10K-1WATT | 4 | R21 R23 R25 R26 |
| 220K 1W | 72-RM220K-1WATT | 4 | R8 R9 R12 R13 |
| 1R0 4W | 72-RWW1R-4W | 2 | R14 R15 |
| 1K0 4W | 72-RWW1K-6W | 2 | R10 R11 |
| 6K8 4W | 72-RWW6K8-4W | 1 | R7 |
| PCB MOUNT FUSE | 72-FUS-125MA-F | 1 | FS6 |
| DIODES | | | |
| 1N4002 | 72-D-IN4002 | 4 | D7 D8 D9 D10 |
| 1N4007 | 72-D-IN4007 | 5 | D1 D2 D4 D5 D6 |
| 1N4148 | 72-D-IN4148 | 1 | D3 |
| 15V ZENER | 72-D-BZX55C15V | 1 | Z1 |
| CAPACITORS | | | |
| 220p 100V axial | 72-C220P-100VCA | 1 | C1 |
| 100n 100V axial | 72-C100N-100VCA | 3 | C9 C14 C17 |
| 330n 50V axial | 72-C330N-50VCA | 1 | C28 |
| 100p 1KV ceramic | 72-C100P-1KVCD | 1 | C26 |
| 4n7 1KV ceramic | 72-C4700P-1KVCD | 4 | C2 C3 C6 C7 |
| 22u 160V elect radial | 72-C22-160VER | 1 | C5 |
| 47u 63V elect radial | 72-C47-63VER | 5 | C4 C8 C23 C24 C27 |

| | | | |
|------------------------|------------------|----|--------------------------------------|
| 1000u 35V elect radial | 72-C1000-35VER | 2 | C20 C21 |
| 4700u 35V elect radial | 72-CAP-470035V | 2 | C22 C25 |
| 47u 450V elect radial | 73-CAP47450V | 4 | C15 C16 C18 C19 |
| 330u 250V elect radial | 73-CAP-330250V | 4 | C10 C11 C12 C13 |
| SEMICONDUCTORS | | | |
| 2N3904 | 72-T2N3904 | 3 | TR2 TR5 TR6 |
| 2N3906 | 72-T2N3906 | 2 | TR1 TR3 |
| BD647 | 72-TBD647 | 1 | TR4 |
| RELAY Omron G5V-1 | 73-RELAY-5V-SPCO | 1 | RL1 |
| CONNECTORS | | | |
| 3 way 0.1" | 72-HEAD-3W-2 | 2 | PL3 PL4 |
| 10 way 0.1" | 72-HEAD-10W | 2 | PL1 PL2 |
| JACK SOCKETS | 73-SKT-JCKBNBG | 2 | SK1 SK2 |
| SLIDER SWITCHES | 73-SWT-SLIDER-DP | 2 | SW1 SW2 |
| POTENTIOMETERS | | | |
| 47K vertical trimmer | 72-PRESET-47K-V | 1 | RV2 |
| 1M0 | 73-POT-A1M | 1 | RV1 |
| OCTAL VALVE BASES | 73-VAL-SOCKET-2 | 2 | V1 V2 |
| FUSE HOLDERS | 72-FUS-HLD-PCB-4 | 4 | FS1-FS4 (check insertion) |
| CRIMP CONNECTORS | 72-CRIMP-PCB-TAB | 18 | TX1 -18 |
| 0V TEST POINT PIN | 73-TERM-PIN | 1 | TP0 |
| BIAS TEST POINTS | 73-TERM-SCREW-M3 | 2 | BIAS0 BIAS1 |
| TR4 HEATSINK | | | |
| TO220 HEATSINK | G13-HS-ST | 1 | TR4 |
| M3 SCREW | 71-SCR-M3X12PPB | 1 | Part of heat sink assembly |
| M3 WASHER | 71-WAS-M3INTSP | 1 | similar to as on Velocette Twin |
| M3 NUT | 71-NUT-M3ZINC | 1 | " |
| INSULATING KIT | 72-MOS-PAD-TO220 | 1 | " |
| Heat sink compound | | | Put between TR4, heat sink & chassis |

SPEED TWIN '98 CIRCUIT DESCRIPTION

Please refer to the following circuit diagrams:-

| | |
|----------------|---|
| CD00092 | MAIN PREAMP PCB |
| CD00093 | MAIN FRONT PANEL PCB |
| CD00094 | 50W/100W FRONT PANEL MASTER SECTION |
| CD00098 | C30 FRONT PANEL MASTER SECTION |
| CD00096 | 30 WATT VALVE POWER STAGE & DC SUPPLY |
| CD00085 | 50 WATT VALVE POWER STAGE & DC SUPPLY |
| CD00091 | 100 WATT VALVE POWER STAGE & DC SUPPLY |

Where necessary, where particular components are referred to, to avoid confusion due to component numbers being repeated on other PCBs, the CD000?? number will be shortened to the last two figures and shown in brackets following the component number, with, where necessary the sheet number; i.e. TR4 (92/2) is referring to Transistor 4 on Sheet 2 of CD00092 (Main Preamp PCB).

For more information it may be useful to refer to the Test Procedure and Operating Instructions.

1) SIGNAL FLOW

VALVE PREAMP

INPUT

The instrument is connected to the INPUT JK1 (93) which is connected to INPUT 1 on the main preamp board.

The MUTE control line will be at either 0V or 25.2V depending on whether a jack is inserted, this controls the MUTE function described later.

C65 (92/1) blocks any DC from the input that may unintentionally be present, this would otherwise change the bias point of the first valve stage and affect the sound.

The signal is now split for the input sections of each channel with R79 and R82 (both 92/1) feeding Channels 1 and 2 respectively, R80 (92/1) sets the input impedance.

CHANNEL 1

V1A is the input stage of this channel and is configured as a cathode bias, common cathode, voltage amplifier with a high value capacitor bypassing the cathode resistor for increased gain and extended lower frequency response.

The anode is connected to the tone controls on the front board which all work in the traditional passive manner.

The frequency of the BRIGHT effect is set by C3 (93), which, when switched in, is connected across pins 2 and 3 of RV1 (93) VOLUME. Obviously connected like this the amount of brightness added will decrease as RV1 is turned up.

The signal then returns to the main board where it is either muted or un-muted by TR5 (92/1) depending on the state of the CH2_LO control line.

V4A is the next gain stage configured the same as before. R62, C43, and R61 (all 92/1) form a high pass filter which gives a considerable presence lift at around 4.8KHz.

V4B is the final gain stage in Channel 1 again configured and biased as before.

R39 and R64 (both 92/1) form a potential divider which reduces the signal level before the solid state section.

CHANNEL 2

V1B is the input stage of this channel and again is configured as a cathode bias, common cathode, voltage amplifier. However due to the values chosen it has increased gain at a selective frequency range. C55 (92/1) helps to keep the circuit stable.

The signal is then sent to the front board. R6 and C5 give a slight upper frequency boost, RV5 sets the GAIN and C13 increases the brightness depending on the setting of RV5.

The signal then returns to the main board where it is either muted or un-muted by TR6 depending on the state of the CH2_HI control line.

V2A is the next gain stage, the amount of gain depends on the state of the BOOST_LO control line and consequently the condition of TR7. Without the boost selected BOOST_LO will be high and the source and drain pins of TR7 will be open circuit resulting in normal gain. Pulling BOOST_LO down will bring the resistance between the source and drain down to around 50 ohms effectively shorting out R84 and letting C67 almost completely bypass R83. This will result in increased gain.

R86, C69 and R87 (all 92/1) give a slight presence lift before the third gain stage.

V2B is configured to give more gain with an extended lower frequency response, this is effectively switched in or out of the circuit by RL4A and RL5A which are both controlled by the BOOST_LO control line.

V3A is the final gain stage, configured for high gain, the signal is then fed into V3B configured as a cathode follower. This reduces the impedance to drive the tone network.

The tone network on the front board is passive and works in the manner traditional to guitar amplifiers. The PULL SHIFT function, controlled by RV8B, lowers the operating frequency of the TREBLE control by switching in C8 in parallel with C9 (both 93).

RV9 sets the signal level of Channel 2 sent into the solid state section and is restricted by R9 to prevent unwanted distortion.

EFFECTS LOOP AND REVERB SECTIONS

RL2 (92) selects which of the two channels is fed into the solid state section which is buffered by IC4B, configured as a boot strapped voltage follower. Z1 and Z2 have been added to prevent spikes from damaging the opamp, this should in practise never happen.

The signal from the output of IC4B is split two ways for the effects loop. One goes to the series/parallel switch, SW1, the other goes to the SEND socket SK2 via R8 and RV2 (both 92/2). These reduce the nominal send level to between -20 and 0dBu.

SK1 is the RETURN socket which feeds the effect loop signal into IC4A which is configured as a non-inverting voltage amplifier. RV1 sets the level of the effects loop signal sent to RL1. This relay basically turns the effects loop on or off depending on the state of the EFFECTS_LO control line.

Depending on the setting of the series/parallel switch , the dry and effects loop signals are mixed together by IC3B configured as a standard virtual earth mixer, then the signal is split again to drive the reverb section.

C14 and R25 roll off a lot of the lower frequencies before the signal gets sent to IC3A, IC2A and IC2B. These opamps are configured for current gain, the actual gain being dependant on the impedance/frequency curve of the reverb tray. Because of this it is crucial to the correct operation of the reverb that the right reverb tray is used. This should be an Accutronics 8CA3B1B.

The output of the reverb tray goes into IC1A. This is configured as a differential amplifier as a way of reducing any hum that may be picked up by the sensitive reverb return leads.

RV10 (94 or 98 depending on model) controls the level of the reverb. Across pins 1 and 2 is TR2 (92/2), a J175 FET which mutes or un-mutes the reverb signal depending on the state of the REVERB_HI control line.

IC1B is configured as a standard virtual earth mixer section which mixes in the reverb with, the already mixed, dry and effects loop signals.

TR3 (92/2) mutes or un-mutes the overall signal depending on the state of the MUTE control line. Without a jack plugged into the INPUT socket the MUTE control line will be at 0V which will virtually short out pins 1 and 3 of TR3 and mute the signal. Inserting a jack plug will allow the MUTE control line to rise up to +25.2V, changing the state of the FET and consequently un-mute the signal.

TR4 (92/2) is an MPSA42, a high voltage transistor. This, along with its associated components, is used to amplify the signal up to levels required to drive the valve output stage. Due to its very high head room and the way in which it is being used in the circuit, this stage will be totally transparent and have no effect on the audio signal apart from increasing the amplitude.

This section is not fitted to the SPEED TWIN C30 model due to the difference in sensitivity between the EL34 and EL84 power stages.

The signal is now sent to the Front Panel Master Section board (see either CD00094 or CD00098 depending on model) where the Master Volume is set by either RV11 (98) or RV12/RV13 (94).

PHASE SPLITTER

The signal is returned to the main preamp board where RL3 (92/1) selects whether MASTER I or MASTER II is used. On the C30 model the relay switches between the MASTER setting and MUTE. The relay is set by the MASTERII_LO control line.

The phase splitter (V5) is a standard differential input splitter which produces the anti-phase signals necessary to drive the push pull output stages.

The 50 and 100 watt models have a connection to the Front Master Board for the PRESENCE control, this is basically an overall tone control working in the negative feedback loop of the power stage. The C30 model does not have a PRESENCE control due to its traditional open loop design not having a negative feedback loop.

POWER STAGES

Within the SPEED TWIN range three different power amplifier sections are used.

The C30 is powered by four EL84's configured in CATHODE BIASED CLASS A, WITHOUT any NEGATIVE FEEDBACK. This is the traditional arrangement for a guitar amplifier of this type and will produce at least 30 watts RMS with the valves supplied.

The C50/H50 and C100/H100 are each powered by two or four EL34's respectively. These are configured for GRID BIASED CLASS A/B. This is the traditional arrangement for a guitar amplifier of this type and will produce at least 50 or 100 watts RMS respectively with the valves supplied.

Other differences are explained below.

OUTPUT BIASING (C50, C100, H50 & H100)

The holes in the chassis marked BIAS MEASUREMENT and BIAS ADJUST allow the biasing of the output valves to be checked or reset easily and safely if necessary. It also allows the use of several different types of output valve including EL34, 6L6, 6550 and 5881.

On a new unit the biasing will be factory set for the particular set of EL34's supplied with the amplifier. Although this should not need to be adjusted unless a new set of output valves is fitted, on all amplifiers as valves age their bias requirements may change.

There are several methods that are used to bias valve amplifiers, the following is one of the easiest, safest and ensures that the output valves do not draw too much current which can result in thermal run away and damaged valves.

To check or reset bias on currently installed valves:-

- 1) Ensure unit is correctly loaded. Connect to mains, switch to STANDBY and allow to warm up for at least one minute.
- 2) Ensure that MASTER controls are turned to zero and switch from STANDBY to ON.
- 3) Set volt meter to 200mV range and insert probes into BIAS MEASUREMENT holes.
- 4) There should now be a reading of 33mV (+/-3mV) on the volt meter. If yes amplifier is correctly biased, if not follow point 5.
- 5) Using a trimmer tool or small flat bladed screwdriver carefully rotate the BIAS ADJUST control to give the correct reading in the volt meter. Turning clockwise will increase the value and vice versa.

To install new valves and bias amplifier:-

- 1) Ensure unit is disconnected from mains supply and that valves have had time to cool down.
- 2) Remove rear grille and carefully remove old valves.
- 3) Install new valves making sure that they are inserted correctly.
N.B. Only use matched sets of output valves.
- 4) Using trimmer tool turn BIAS ADJUST control fully anti-clockwise.
- 5) Ensure unit is correctly loaded. Connect to mains, switch to STANDBY and allow to warm up for at least one minute.
- 6) Ensure that any MASTER controls are turned to zero and switch from STANDBY to ON.
- 7) Set volt meter to 200mV range and insert probes into BIAS MEASUREMENT holes.
- 8) Using trimmer tool carefully rotate the BIAS ADJUST control to give the correct reading on the volt meter as shown below:-

| | | |
|------|---------------|---|
| EL34 | 33mV (+/-3mV) | |
| 6L6 | 27mV (+/-3mV) | |
| 6550 | 37mV (+/-3mV) | |
| 5881 | 27mV (+/-3mV) | |
| KT88 | 37mV (+/-3mV) | 50 watt models only - due to wider glass envelope |

The above values are a guide line but should be OK for most brands of valves, although the bias point for any amplifier is somewhat subjective. Increasing the values shown may improve the tone but will make the valves run hotter reducing their life, whereas lower values will run valves cooler, increasing life and reliability at the sacrifice of increasing cross over distortion.

The individual quiescent current for each valve can be measured if desired, to make sure the set is matched, at TP12, 13, 14 and 15 (inside the unit on the power board).

The output valves on the C30 do not require biasing to be manually set due to the CATHODE SELF BIAS design of the output stage which is set by R9 and R19 (96). Therefore to change valves simply follow points 1, 2 and 3 immediately above.

OUTPUT POWER SWITCH - FULL/HALF (100 watt models only)

The power stage on the 100 watt board can be set to either FULL or HALF power.

With the switch in the FULL power setting all four power output valves are in operation. When switched to the HALF power setting two of the output valves (V1 & V2) are turned off obviously leaving just two in operation (V3 & V4) resulting in a reduction in output power.

The actual available output power will depend on the setting of the OUTPUT STYLE switch explained below.

OUTPUT STYLE SWITCH - PENTODE/TRIODE (50 and 100 watt models only)

This switch works slightly differently depending in the model.

On the 50 watt board both the valves in the output stage can be set to either PENTODE or TRIODE operation. PENTODE operation produces full power from the valves, whereas in TRIODE operation the output is reduced to about half. This enables the user to switch from 50 watts down to about 25 watts.

On the 100 watt board, which has four output valves, the switch controls the PENTODE or TRIODE operation of just two of the four valves (V3 & V4) leaving the other two (V1 & V2) permanently configured for PENTODE operation when used.

By combining the functions of both the OUTPUT POWER and OUTPUT STYLE switches four different output powers are then possible:-

| OUTPUT POWER | OUTPUT STYLE | | |
|---------------------|---------------------|--|------------|
| FULL | PENTODE | (all four valves in pentode mode) | ~100 W RMS |
| FULL | TRIODE | (V1 & V2 pentode mode, V3 & V4 triode) | ~75 W RMS |
| HALF | PENTODE | (V1 & V2 off, V3 & V4 pentode mode) | ~50 W RMS |
| HALF | TRIODE | (V1 & V2 off, V3 & V4 triode mode) | ~25 W RMS |

OUTPUT TRANSFORMERS

The output transformers convert the high voltage low current output from the power valves into low voltage, high current for driving the speaker load.

OUTPUT DAMPING (50 and 100 watt models only)

The OUTPUT DAMPING control sets the amount of negative feedback sent back to the phase splitter when on CHANNEL 2.

When CHANNEL 1 is selected the OUTPUT DAMPING control is automatically bypassed by RL1 which is set by the DAMPING and CH2_HI control lines.

SPEAKER OUTPUTS AND IMPEDANCE SELECTOR SWITCH

The 30 watt power board has three ¼" jack sockets for connection to 8Ω or 16Ω loads. The two 8Ω sockets are in parallel.

The 50 and 100 watt power boards have connections for driving loads of 4Ω, 8Ω or 16Ω, depending upon which socket is used and how the impedance selector switch is set.

One position sets the sockets for either 4Ω or 16Ω, as indicated on the unit, only one socket should be used at a time in this mode.

The other position sets both sockets to 8Ω. In this mode either socket can be used to drive an 8Ω cabinet or both sockets can be used to drive two 16Ω cabs (in parallel), also indicated on the unit.

2) SWITCHING CIRCUITRY

The basic switching circuit architecture is based around momentary switching of CMOS electronic latches which then control relays or FET's within the audio circuitry to switch functions. This provides very low noise, discrete switching and enables the user to control the functions from different places.

Momentary shorting to 0V of any of the control lines; CH1/CH2, CH2_BOOST, MASTER_I/II, EFFECTS or REVERB; anywhere in the circuit (including externally via FS2 and FS3) will send a negative pulse to the associated 4049 gate which will then be inverted into a positive pulse. This is then sent to the clock input of a 4013 configured as a 'divide by two' electronic latch. One of the outputs of these then sets the states of the control lines; CH2_LO, CH1_HI, BOOST_LO, MASTERII_LO, EFFECTS_LO and REVERB_HI; sometimes via ZTX614 Darlington transistors (where necessary for higher current requirements) and consequently the settings of the primary functions of the amplifier via relays or FET's.

Using a footswitch in FS1 (92/3) merely shorts the CH2_LO and MASTERII_LO or BOOST_LO control lines (depending on model) to 0V to control the associated functions.

Throughout the switching circuitry additional resistors, capacitors, diodes and FET's have been used to slow down switching transients and reduce switching noise further.

Descriptive terms were used for the control lines to make fault finding easier; i.e. CH2_LO means that Channel 2 is selected when this control line is at a low state, and so on.

The 12 way IDC connector PL5 will be used in the future to connect to a MIDI interface daughter board.

The signal is now sent to the Front Panel Master Section board (see either CD00094 or CD00098 depending on model) where the Master Volume is set by either RV11 (98) or RV12/RV13 (94).

PHASE SPLITTER

The signal is returned to the main preamp board where RL3 (92/1) selects whether MASTER I or MASTER II is used. On the C30 model the relay switches between the MASTER setting and MUTE. The relay is set by the MASTERII_LO control line.

The phase splitter (V5) is a standard differential input splitter which produces the anti-phase signals necessary to drive the push pull output stages.

The 50 and 100 watt models have a connection to the Front Master Board for the PRESENCE control, this is basically an overall tone control working in the negative feedback loop of the power stage. The C30 model does not have a PRESENCE control due to its traditional open loop design not having a negative feedback loop.

POWER STAGES

Within the SPEED TWIN range three different power amplifier sections are used.

The C30 is powered by four EL84's configured in CATHODE BIASED CLASS A, WITHOUT any NEGATIVE FEEDBACK. This is the traditional arrangement for a guitar amplifier of this type and will produce at least 30 watts RMS with the valves supplied.

The C50/H50 and C100/H100 are each powered by two or four EL34's respectively. These are configured for GRID BIASED CLASS A/B. This is the traditional arrangement for a guitar amplifier of this type and will produce at least 50 or 100 watts RMS respectively with the valves supplied.

Other differences are explained below.

OUTPUT BIASING (C50, C100, H50 & H100)

The holes in the chassis marked BIAS MEASUREMENT and BIAS ADJUST allow the biasing of the output valves to be checked or reset easily and safely if necessary. It also allows the use of several different types of output valve including EL34, 6L6, 6550 and 5881.

On a new unit the biasing will be factory set for the particular set of EL34's supplied with the amplifier. Although this should not need to be adjusted unless a new set of output valves is fitted, on all amplifiers as valves age their bias requirements may change.

There are several methods that are used to bias valve amplifiers, the following is one of the easiest, safest and ensures that the output valves do not draw too much current which can result in thermal run away and damaged valves.

TECHNICAL SPECIFICATIONS

INPUT Impedance 1M Ω , CHANNEL SELECT push switch

CHANNEL 1 VOLUME, TREBLE with PULL BRIGHT switch, MIDDLE and BASS

CHANNEL 2 GAIN, PREAMP STYLE push switch, BASS, MIDDLE, TREBLE with PULL SHIFT switch, and LEVEL

MASTER CONTROL

- C50, C100, H50 & H100 EFFECTS SELECT push switch, REVERB, PRESENCE, MASTER I and MASTER II

- C30 EFFECTS SELECT switch, REVERB and MASTER

REVERB 3 Spring ACCUTRONICS

EFFECTS LOOP SEND - Impedance 25K Ω , LEVEL variable (-20 to 0dBu)
RETURN - Impedance 470K Ω , LEVEL variable (-20 to 0dBu)
SERIES/PARALLEL push switch

FOOTSWITCH CONTROL ¼" Jack socket for dual latching footswitch
2 x 8 way DIN sockets for optional 5 way non latching footswitch

SPEAKER OUTPUTS

- C30 3 x ¼" jack sockets for connection to 8 or 16 Ω loads

- C50, C100, H50 & H100 2 x ¼" jack sockets with impedance switch for connection to 4, 8 or 16 Ω loads

SPEAKER CONFIGURATION

- C30 1 x 12" CELESTION

- C50 1 x 12" CELESTION

- C100 2 x 12" CELESTION

POWER AMP CONTROL

C50 & H50 OUTPUT DAMPING control, TRIODE/PENTODE switch plus OUTPUT BIASING test points and BIAS ADJUST trimmer.

- C100 & H100 OUTPUT DAMPING control, FULL/HALF POWER switch, TRIODE/PENTODE switch plus OUTPUT BIASING test points and BIAS ADJUST trimmer.

POWER OUTPUT

- C30 ~30 watts RMS Class A

- C50 & H50 ~50 watts RMS (switchable to 25 watts with TRIODE/PENTODE switch)

- C100 & H100 ~100 watts RMS (switchable to 75, 50 and 25 with FULL/HALF POWER and TRIODE/PENTODE switches)

FACTORY FITTED VALVE COMPLIMENT

- C30 5 x 12AX7/ECC83's and 4 x EL84's

- C50 & H50 5 x 12AX7/ECC83's and 2 x EL34's

- C100 & H100 5 x 12AX7/ECC83's and 4 x EL34's

DIMENSIONS

- C30 W590mm / H480mm / D280mm
(add 30mm to height to include handle and feet)
- C50 W650mm / H480mm / D280mm
(add 30mm to height to include handle and feet)
- C100 W740mm / H480mm / D280mm
(add 30mm to height to include handle and feet,
80mm to include handle and castors)
- H50 &H100 W700mm / H235mm / D275mm
(add 50mm to height to include handle and feet)

WEIGHT

- C30 ~23Kg
- C50 ~25Kg
- C100 ~30Kg
- H50 ~20Kg
- H100 ~23Kg