



C220

TUBE PREAMPLIFIER

SERIAL NO. WS1001 And Above



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SERVICE MANUAL

Serial Number WS1001 And Above

PERFORMANCE SPECIFICATIONS

Frequency Response

+0, -0.5dB from 20Hz to 20,000Hz

Total Harmonic Distortion

0.08% from 20Hz to 20,000Hz

Main Output

2.5V for rated input

Maximum Voltage Output

8V RMS Unbalanced, 16V RMS Balanced

Sensitivity (for rated output)

High Level, 450mV unbalanced, 900mV balanced
Phono, 4.5mV

Signal To Noise Ratio (A-Weighted)

High Level, 90dB below rated output
Phono, 80dB below 10mV input

Input Impedance

High Level, 22K ohms
Phono, 47K ohms; 65pF

Maximum Input Signal

High Level, 5V Unbalanced, 10V Balanced
Phono, 50mV (@ 1,000Hz)

Output Impedance

250 ohms

Voltage Gain

High Level to Tape Output: 0dB
High Level to Main Output: 15dB
Phono to Main Output: 55dB

Headphone Output Impedance

16 ohms to 250 ohms

Tube Compliment

Phono Circuitry: 2 - 12AX7A
High Level Circuitry: 2 - 12AX7A

Power Requirements

100 Volts, 50/60Hz at 75 watts
110 Volts, 50/60Hz at 75 watts
120 Volts, 50/60Hz at 75 watts
220 Volts, 50/60Hz at 75 watts
230 Volts, 50/60Hz at 75 watts
240 Volts, 50/60Hz at 75 watts

Note: Refer to the rear panel of the C220 for the correct voltage.

Overall Dimensions

Width is 17-1/2 inches (44.45cm)
Height is 6 inches (15.24cm) including feet
Depth is 18 inches (45.72cm) including the Front Panel, Knobs and Cables


Weight

21.1 pounds (9.59 kg) net, 37.5 pounds (17.05 kg) in shipping carton

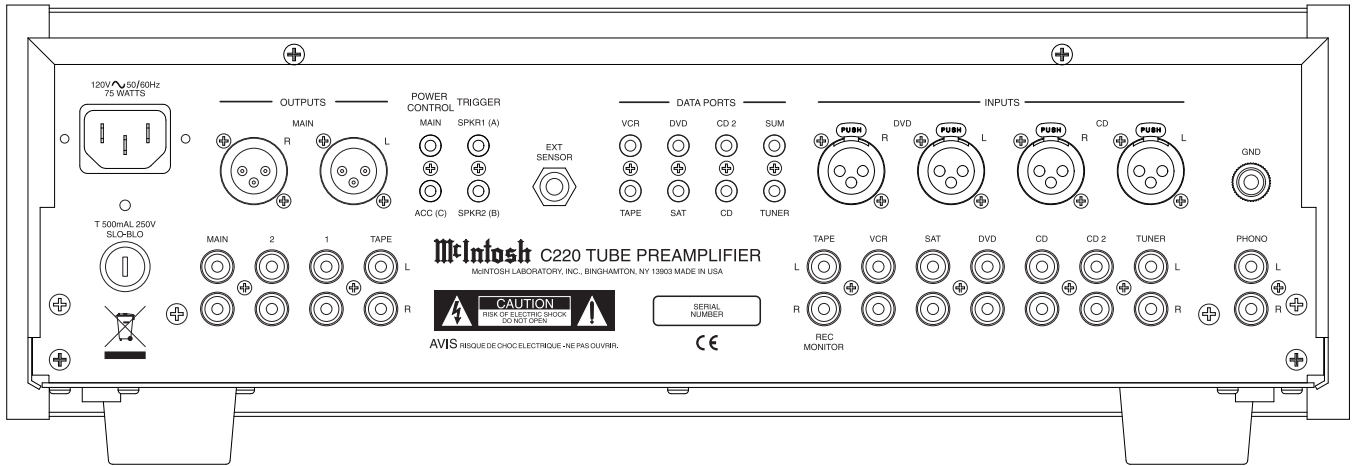
Shipping Carton Dimensions

Width is 26-1/2 inches (67.3cm)
Depth is 24-1/4 inches (62.2cm)
Height is 11-3/4 inches (29.9cm)

NOTES

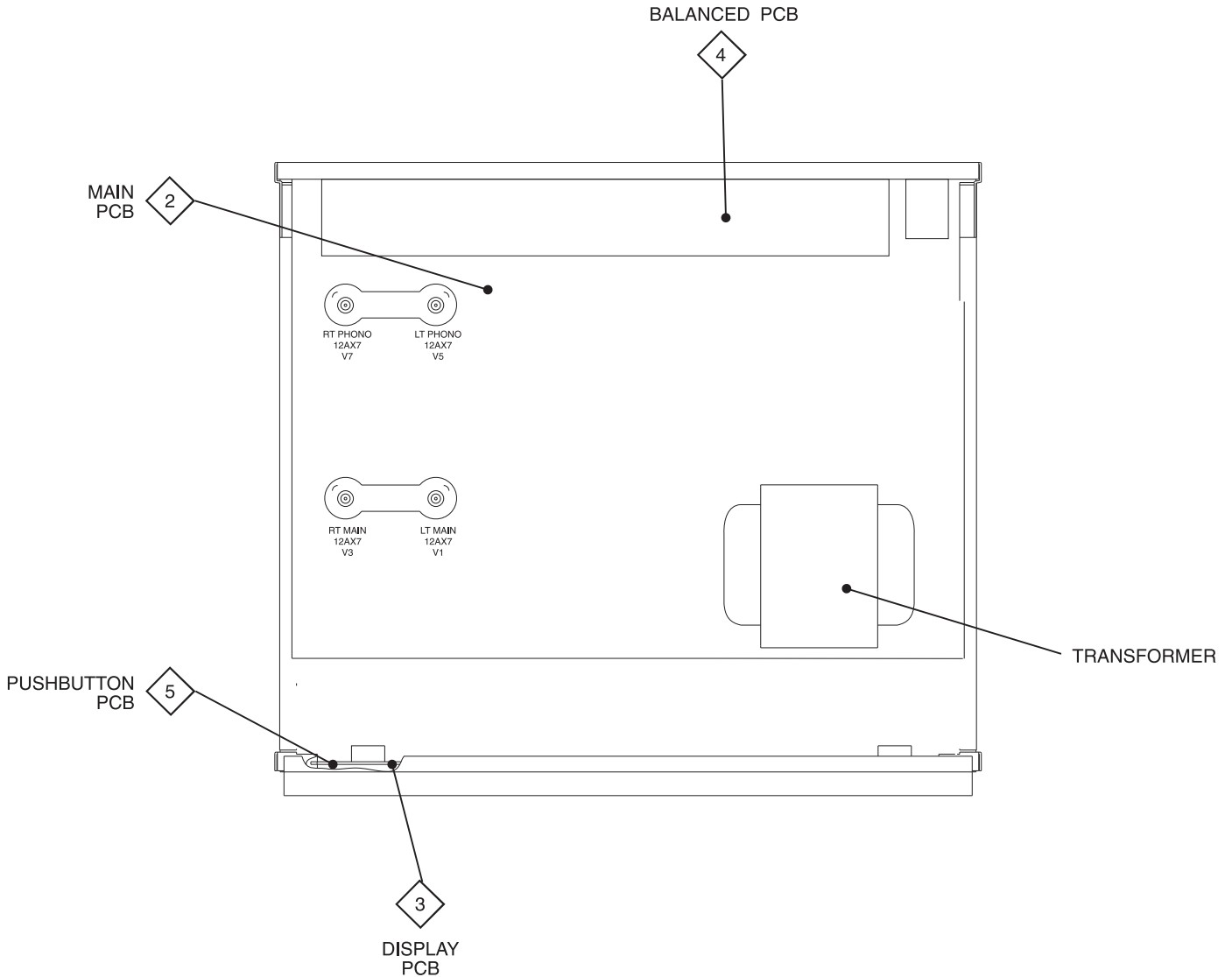
1. The heavy notes on the schematic denote the primary signal path.
2. Unless otherwise noted, all voltages indicated on the schematics are measured under the following conditions:
 - a. AC input at 120 volts, 50/60Hz.
 - b. All voltages are +/-10% with respect to ground. A high impedance (10 megaohm) voltmeter must be used.
3. Unless otherwise specified:
 - a. Resistor values are in ohms.
 - b. Capacitor values are microfarads (uF).
 - c. Inductor values are in microhenries (uH).
4. On PC board drawings, Square pad indicates:
 - a. Polarized Capacitors - Positive
 - b. Diodes - Cathode
 - c. Others - Pin 1
5. **WARNING**
Parts marked with the symbol  have critical characteristics. Use only replacement parts recommended by the manufacturer.

REAR PANEL



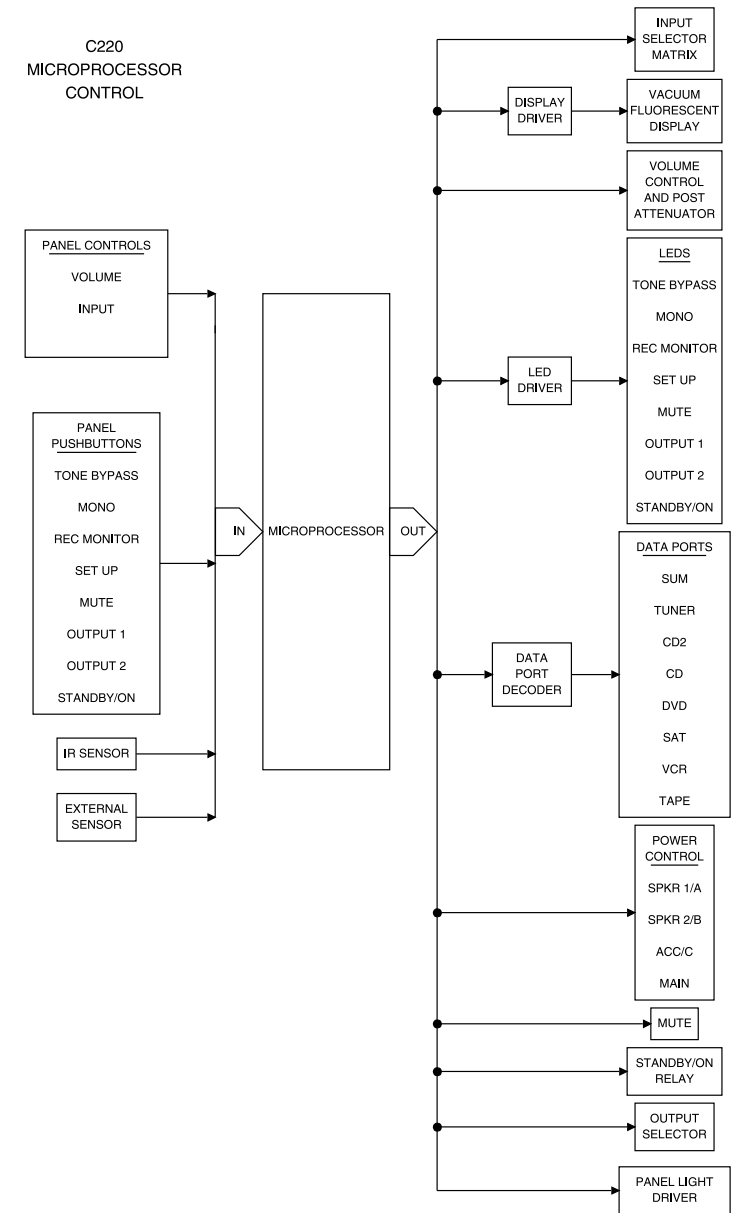
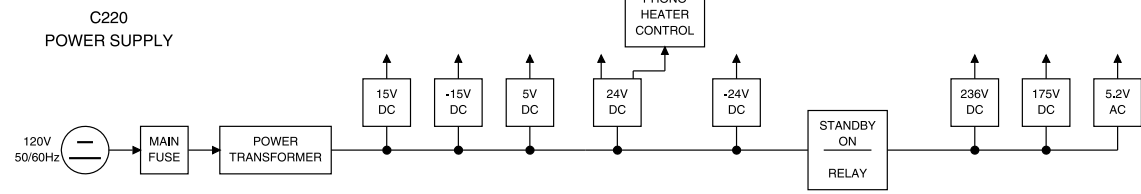
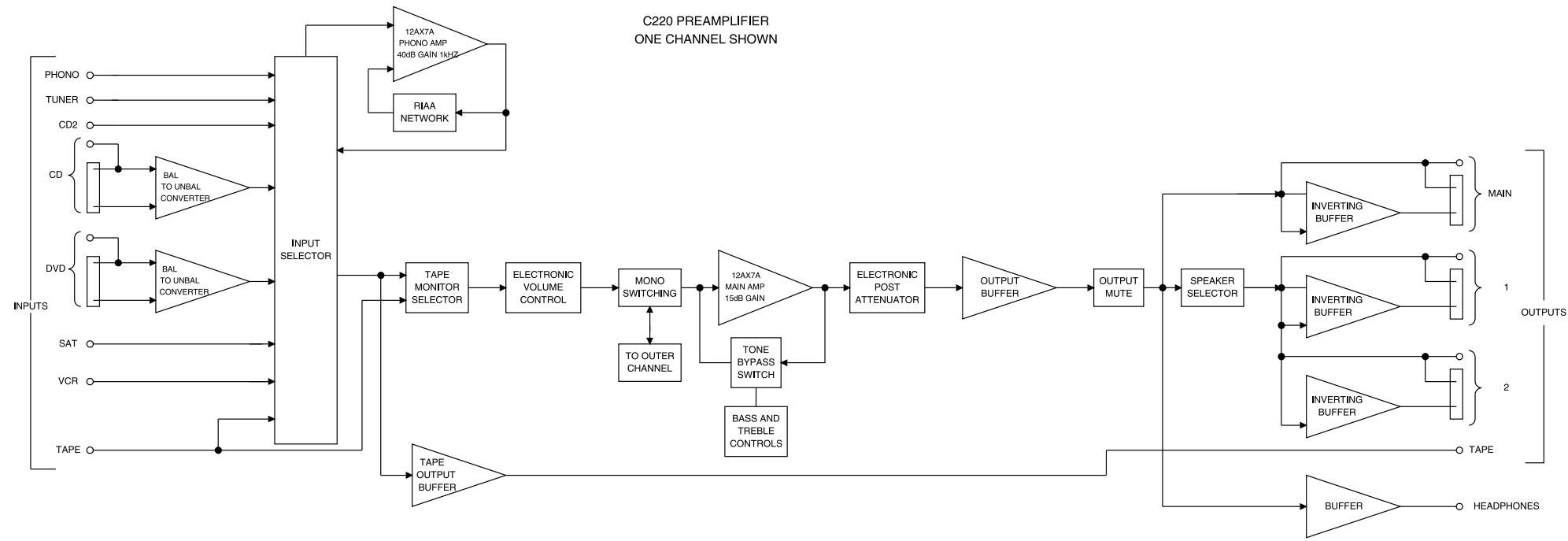
SECTION LOCATIONS

TOP VIEW WITH COVER REMOVED

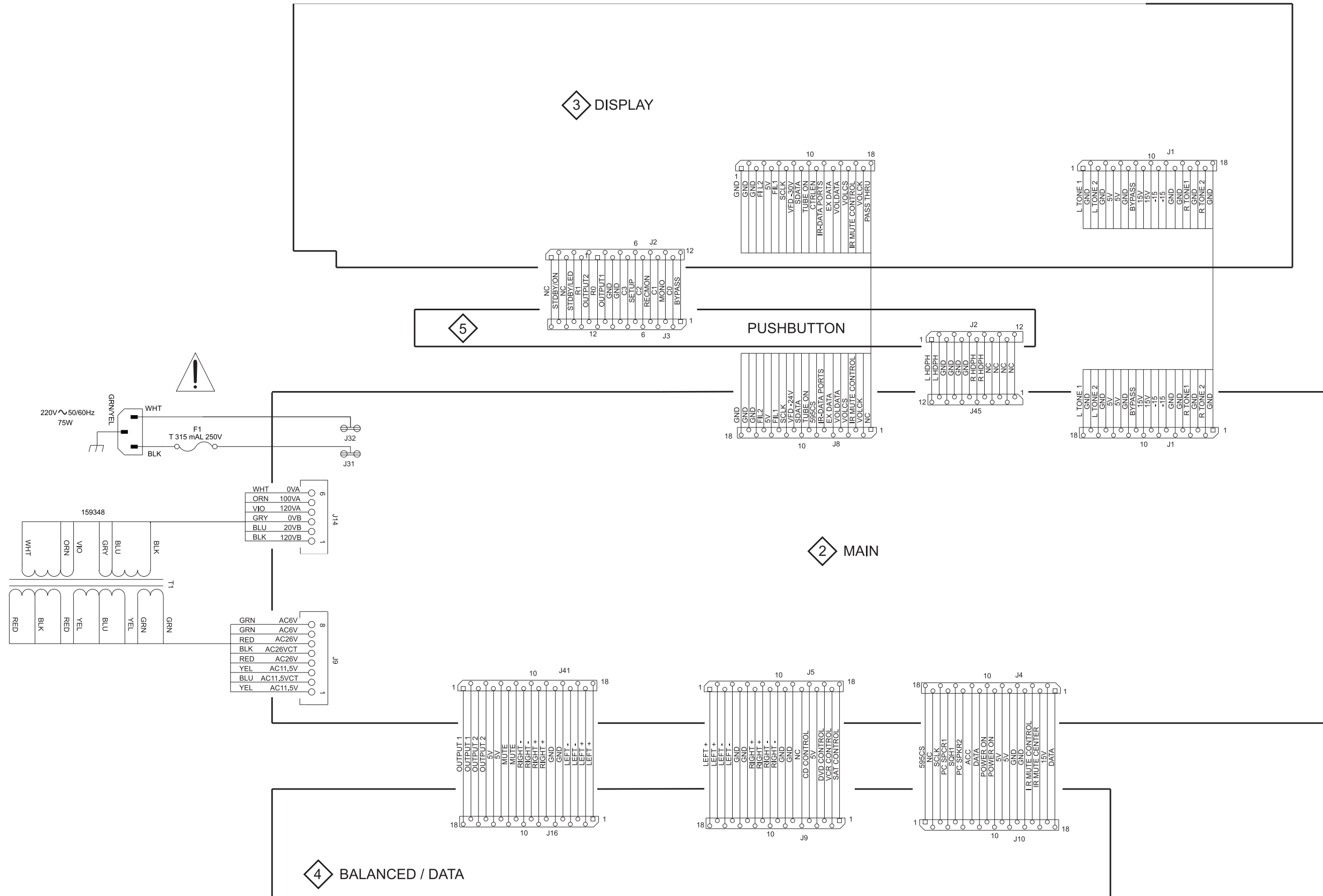


NOTES

BLOCK DIAGRAM

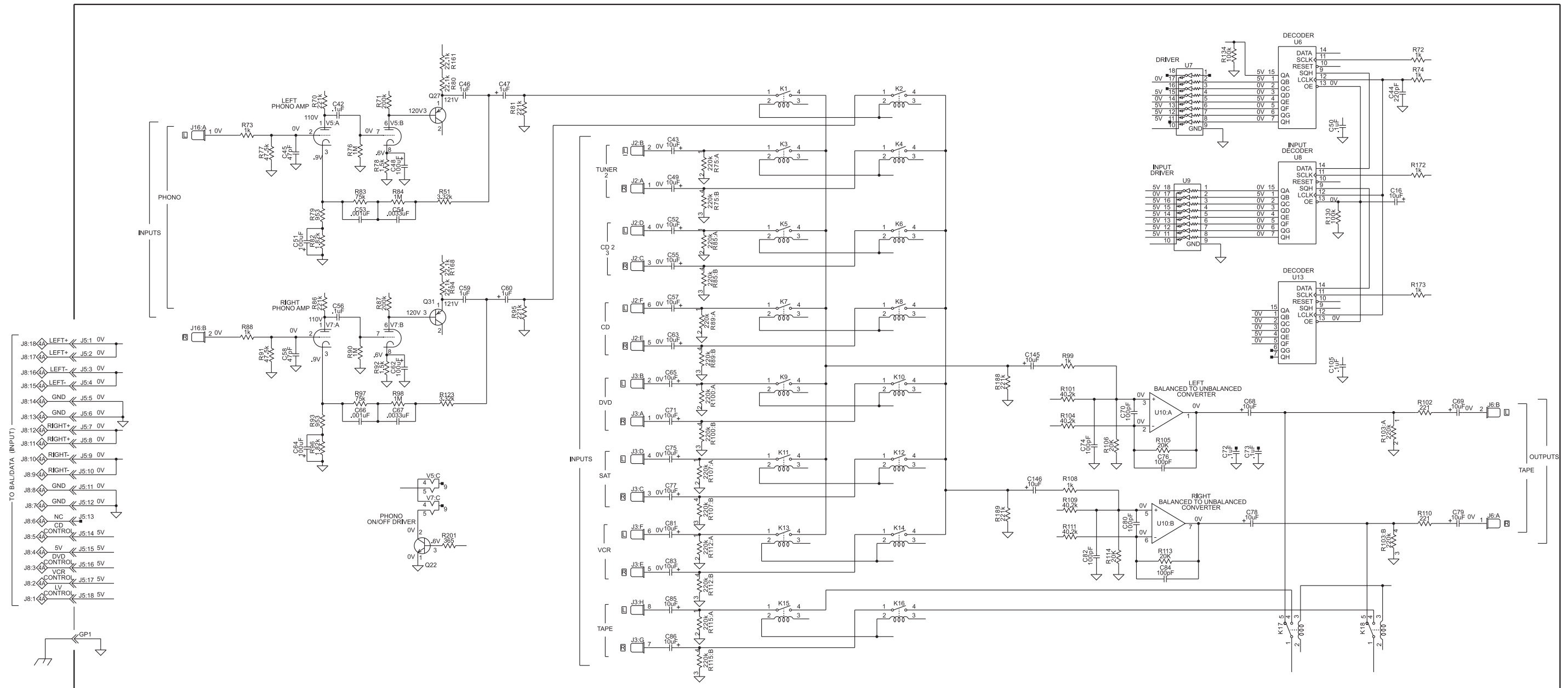


! WARNING Parts located in the shaded area have critical characteristics. Use only replacement parts recommended by the manufacturer.



2 MAIN 050329 SCH 1 OF 4

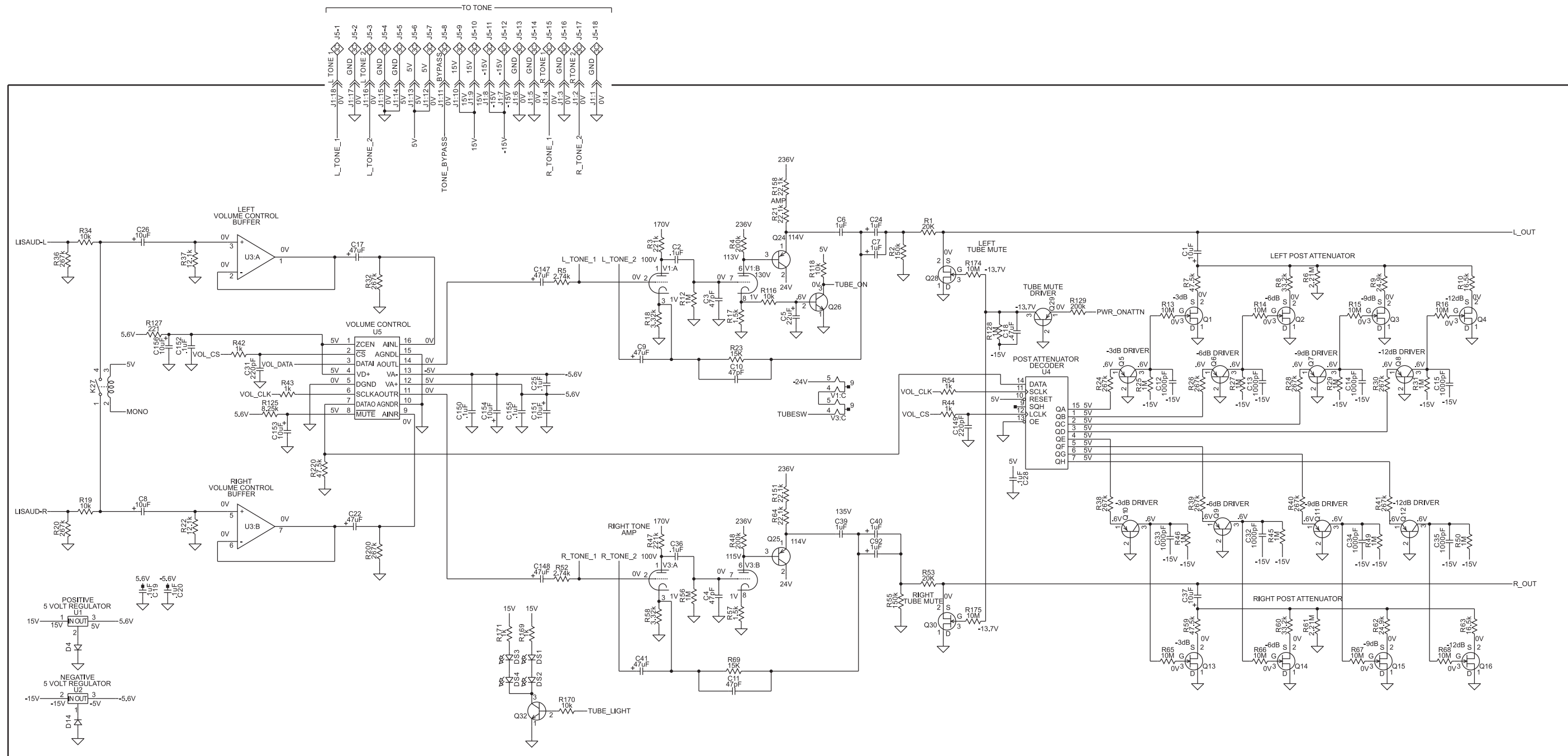
! WARNING Parts located in the shaded area have critical characteristics. Use only replacement parts recommended by the manufacturer.



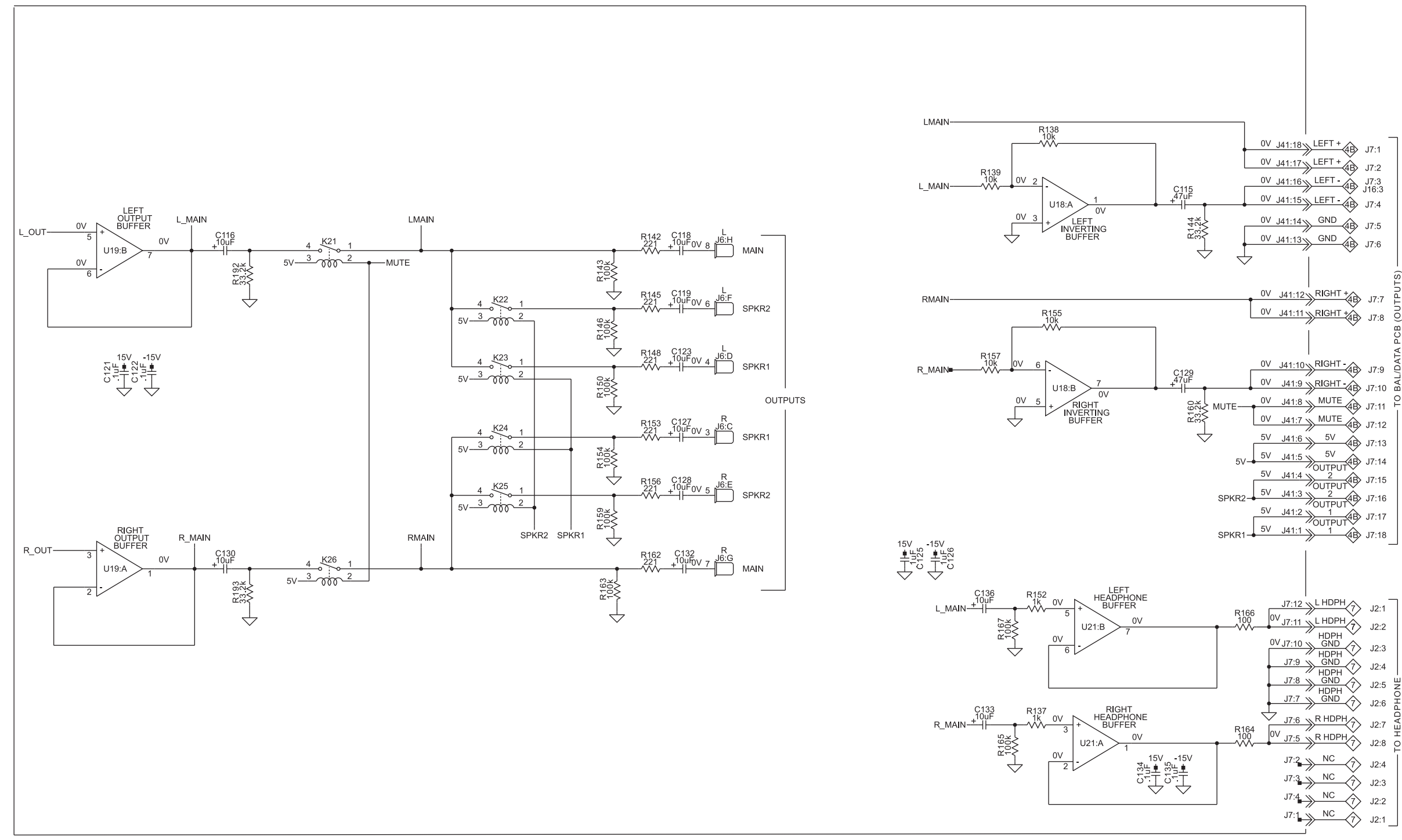
TO BAL/DATA (INPUT)

| | | | |
|-------|---------|-------|----|
| J8.16 | LEFT+ | J5.1 | 0V |
| J8.17 | LEFT- | J5.2 | 0V |
| J8.16 | LEFT+ | J5.3 | 0V |
| J8.15 | LEFT- | J5.4 | 0V |
| J8.14 | GND | J5.5 | 0V |
| J8.13 | GND | J5.6 | 0V |
| J8.12 | RIGHT+ | J5.7 | 0V |
| J8.11 | RIGHT- | J5.8 | 0V |
| J8.10 | RIGHT+ | J5.9 | 0V |
| J8.9 | RIGHT- | J5.10 | 0V |
| J8.8 | GND | J5.11 | 0V |
| J8.7 | GND | J5.12 | 0V |
| J8.6 | NC | J5.13 | |
| J8.5 | CONTROL | J5.14 | 5V |
| J8.4 | 5V | J5.15 | 5V |
| J8.3 | CONTROL | J5.16 | 5V |
| J8.2 | CONTROL | J5.17 | 5V |
| J8.1 | CONTROL | J5.18 | 5V |

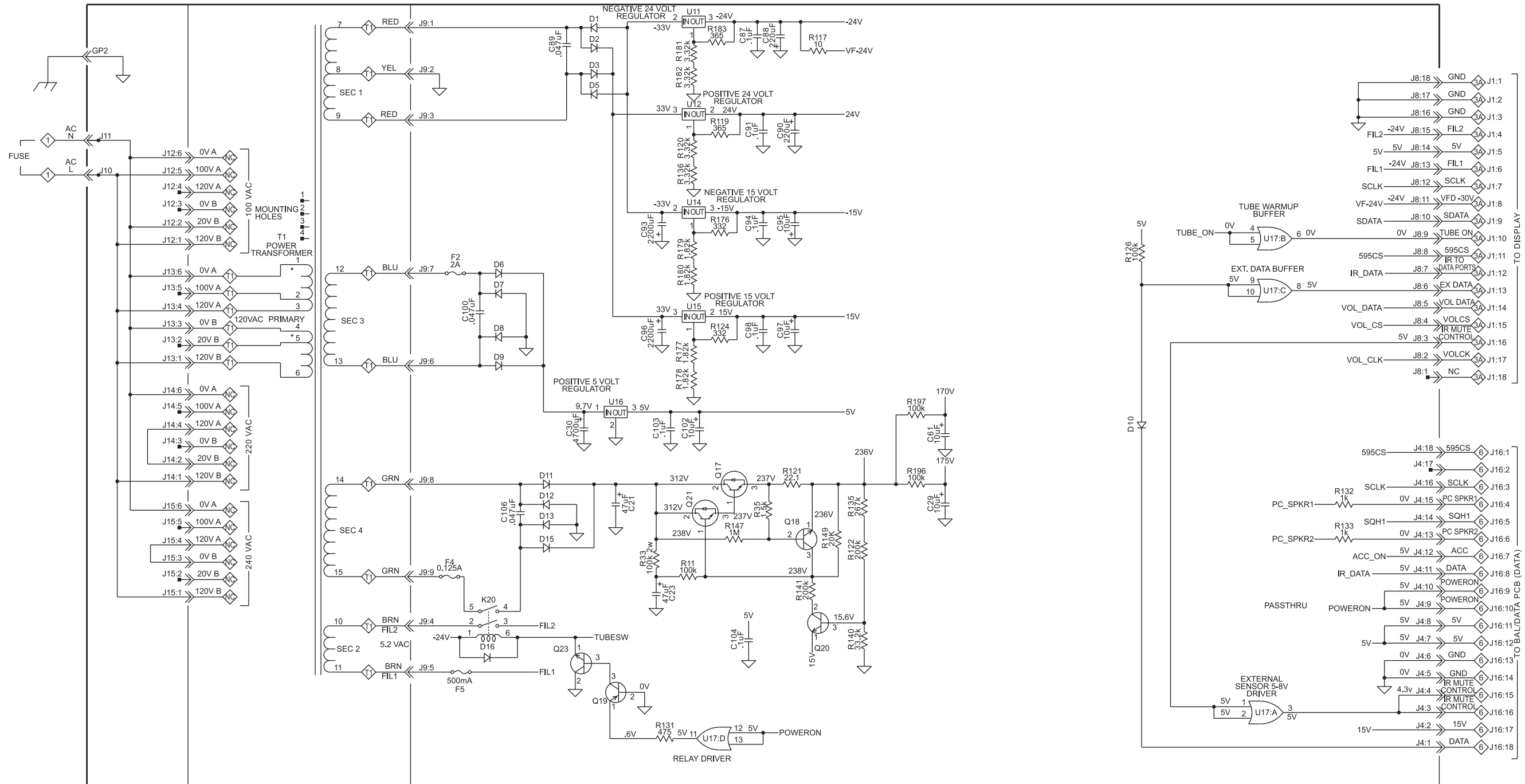
2 MAIN 050329 SCH 2 OF 4



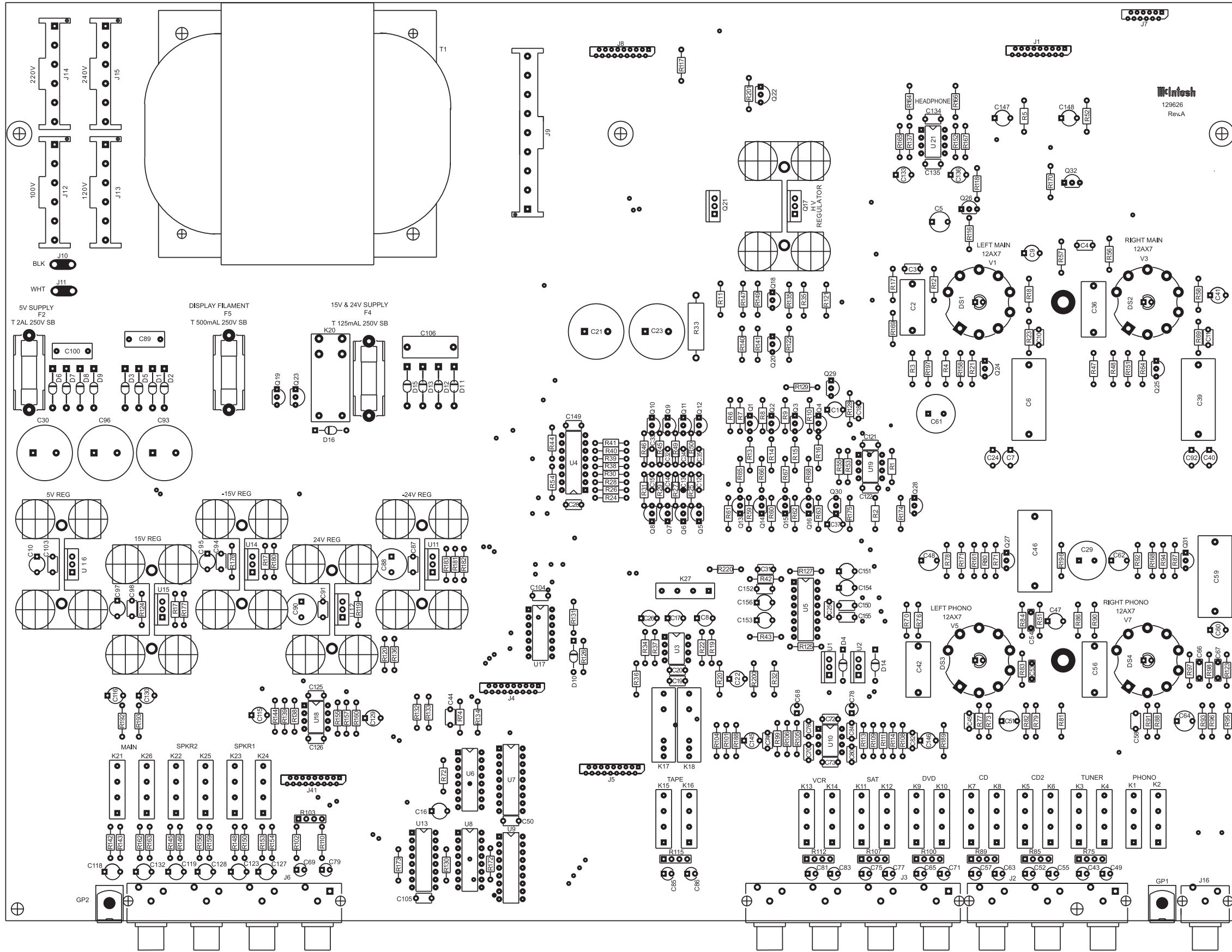
2 MAIN 050329 SCH 3 OF 4



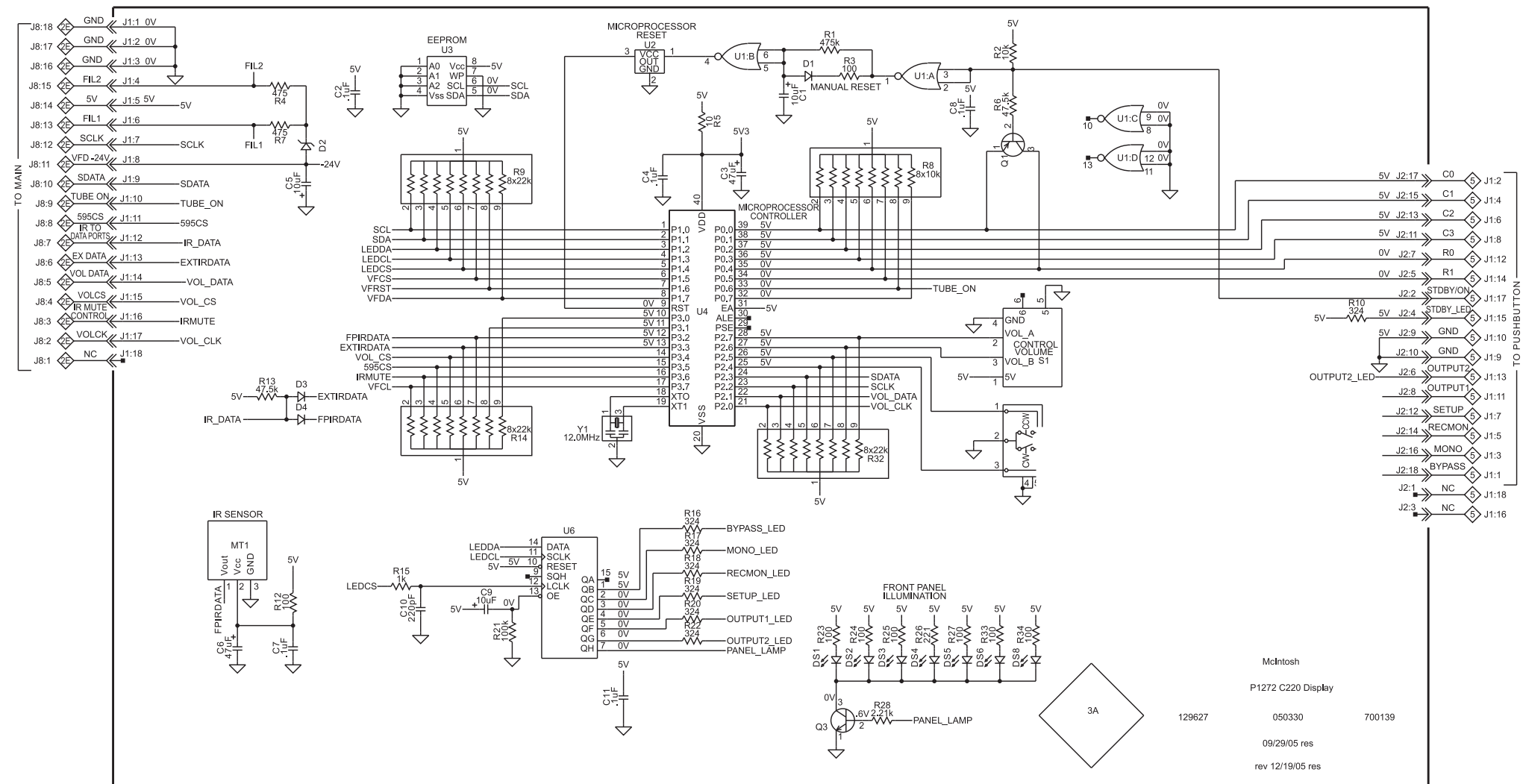
2 MAIN 050329 SCH 4 OF 4



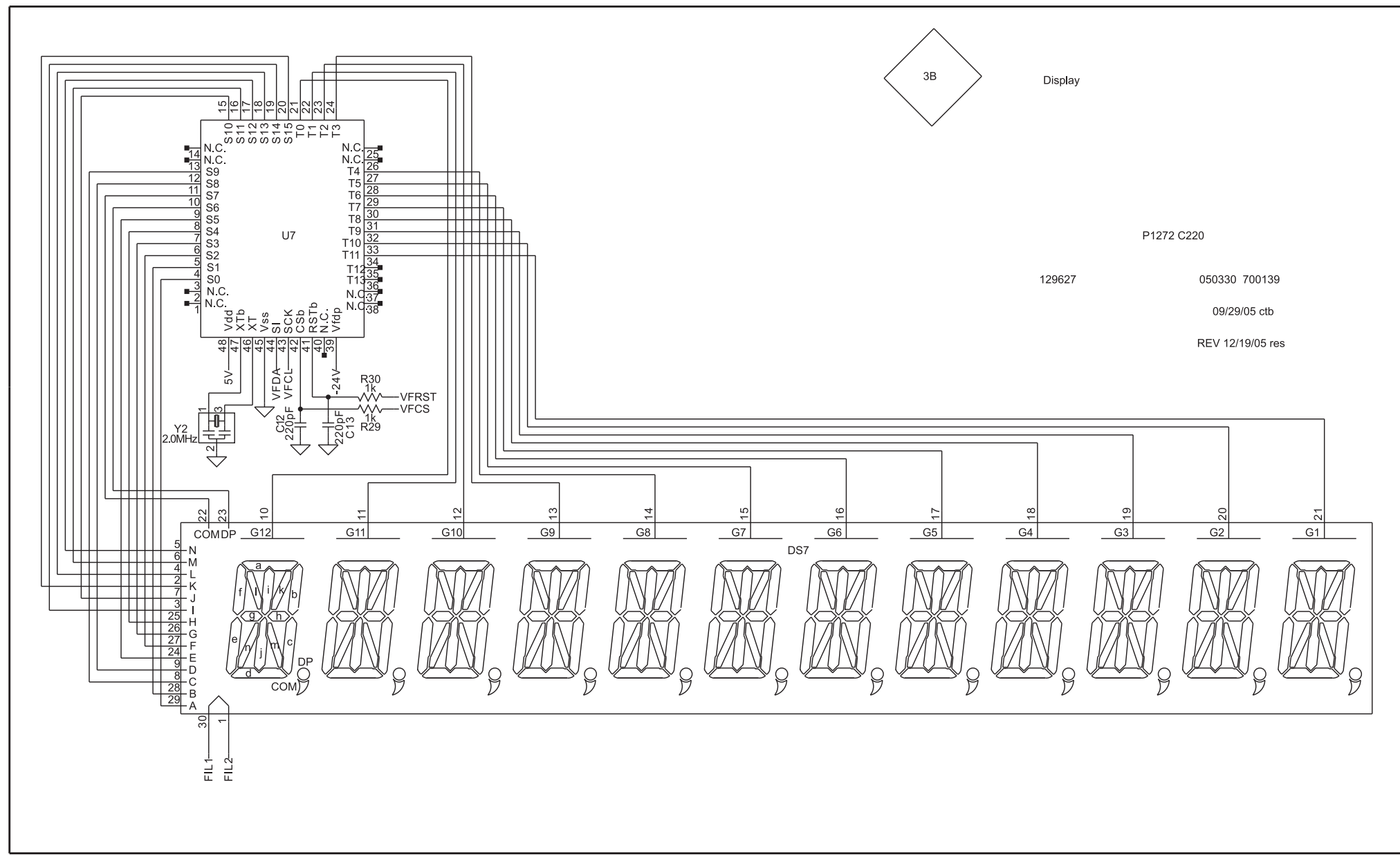
2 MAIN 050329 PCB



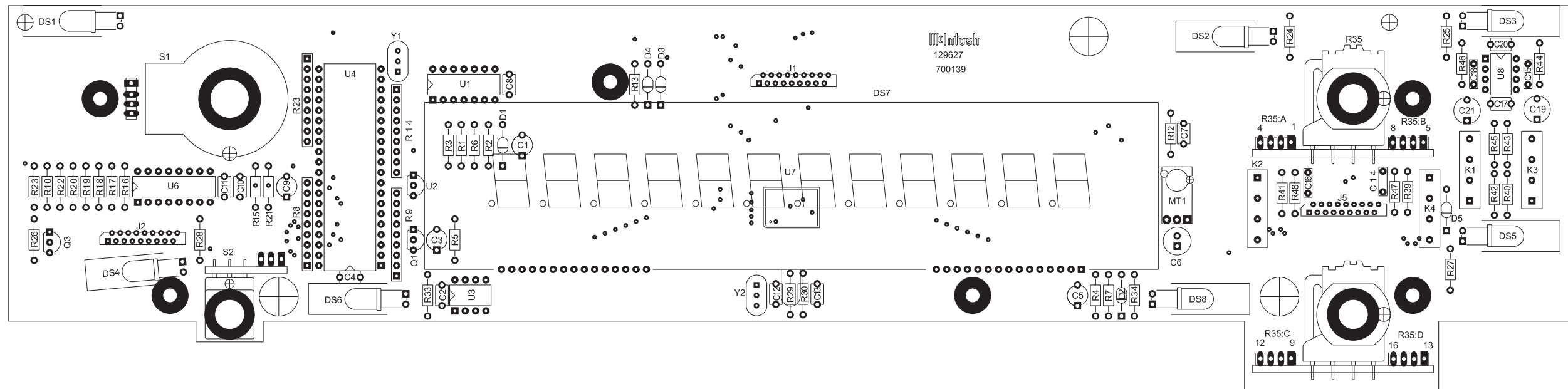
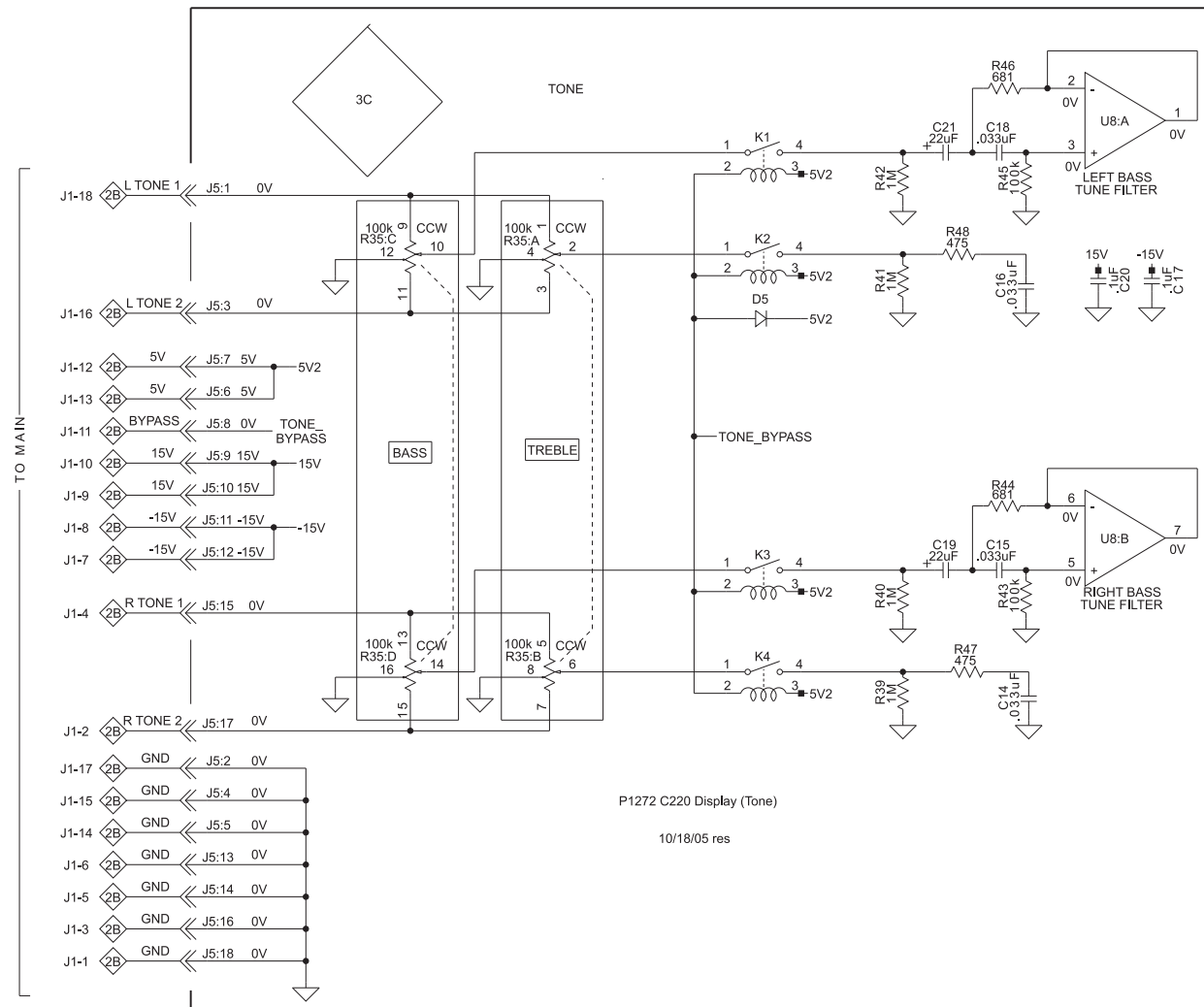
3 DISPLAY 050330 SCH 1 of 3



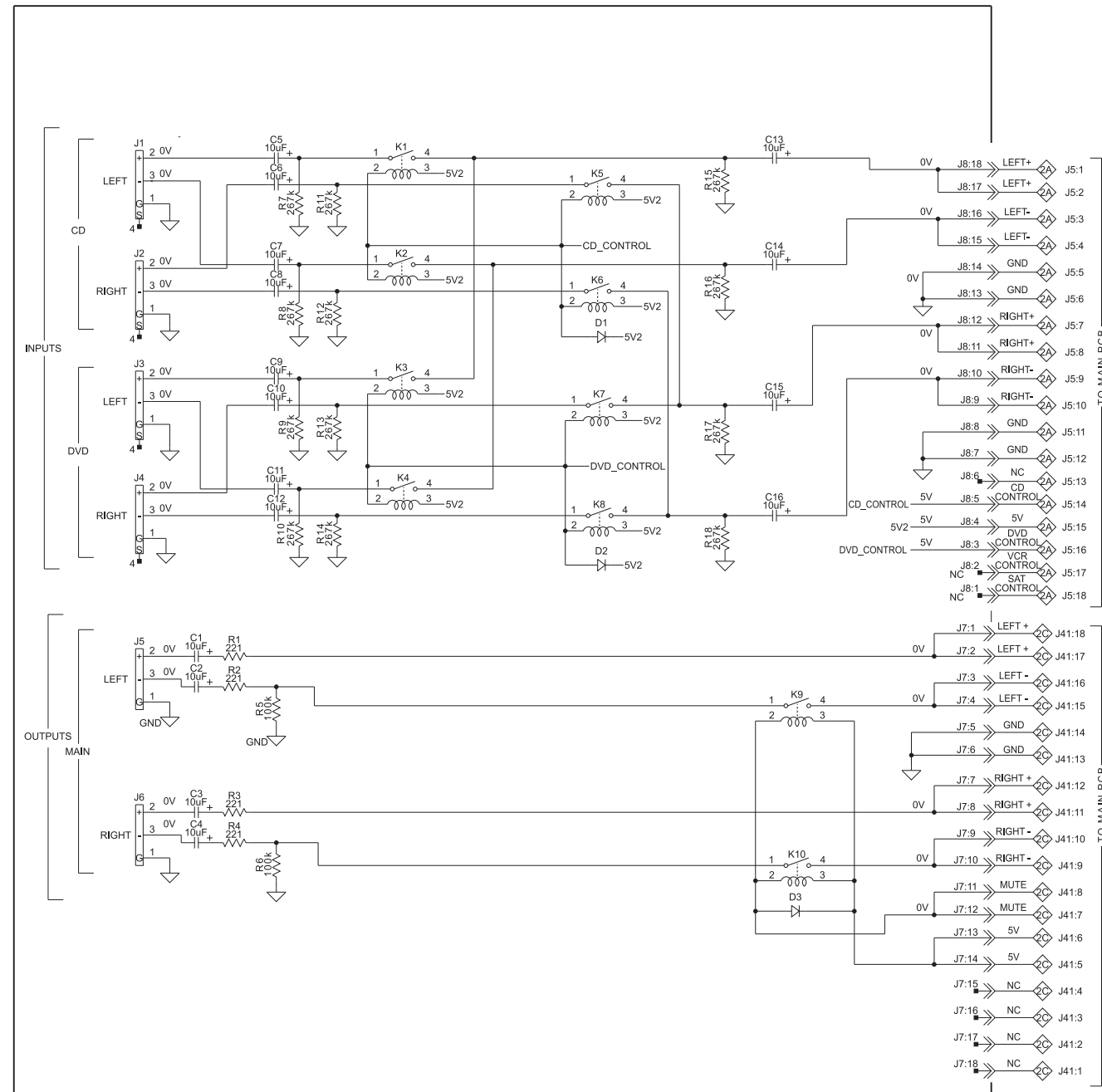
3 *DISPLAY 050330 SCH 2 of 3*



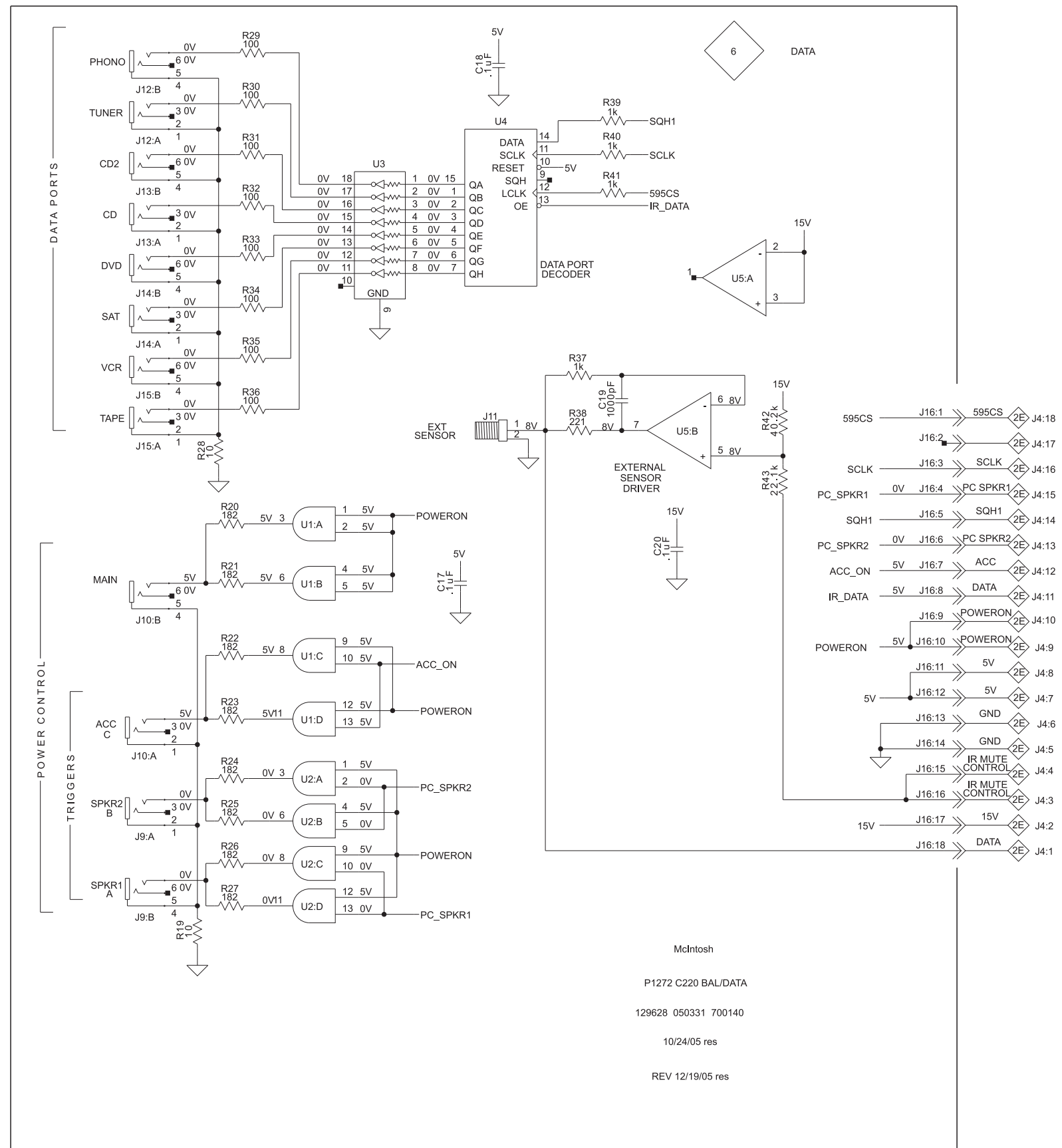
3 *DISPLAY 050330 SCH 3 of 3 and PCB*



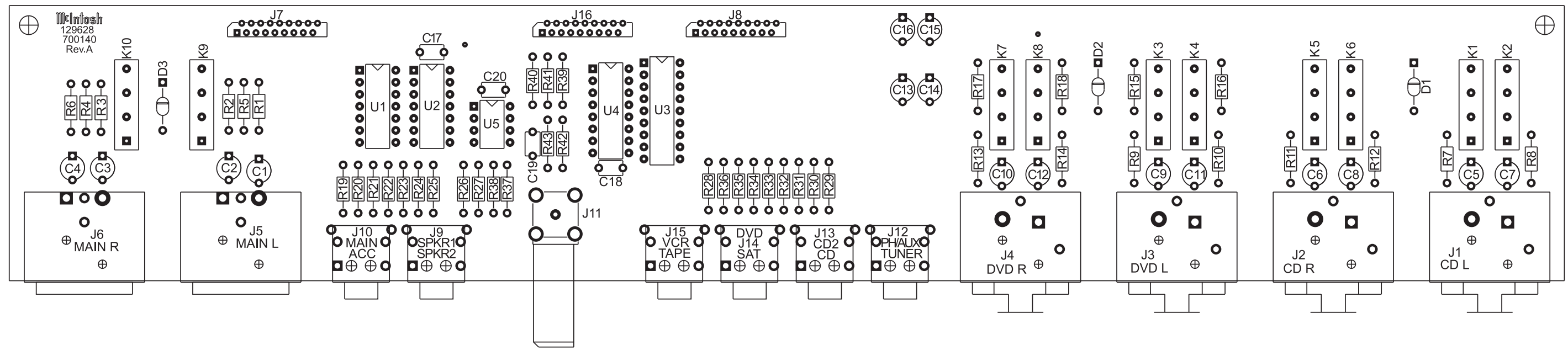
4 *BALANCED / DATA* 051331 SCH 1 of 2



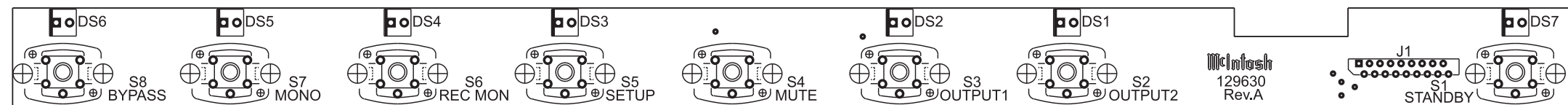
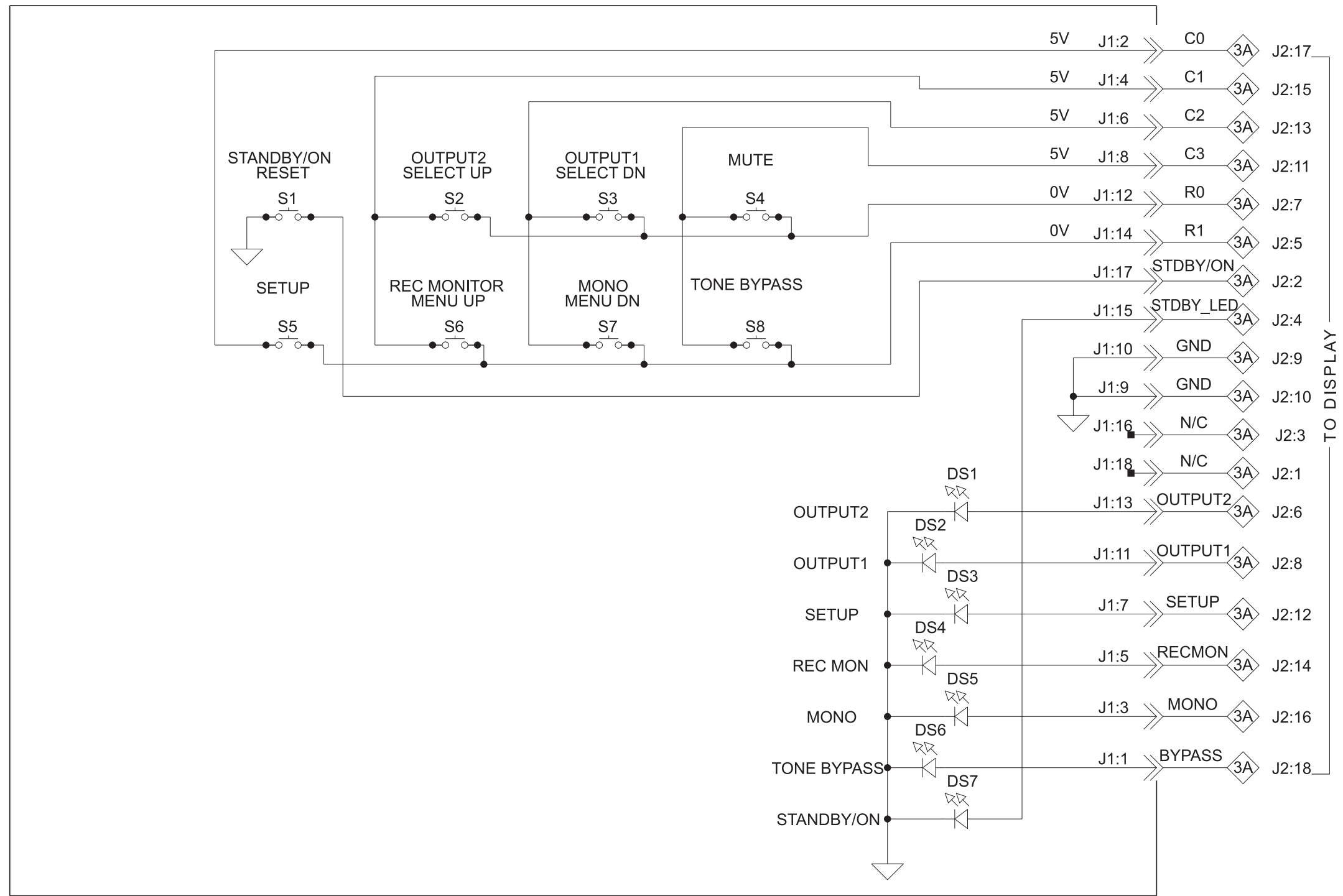
4 *BALANCED / DATA* 050331 SCH 2 of 2



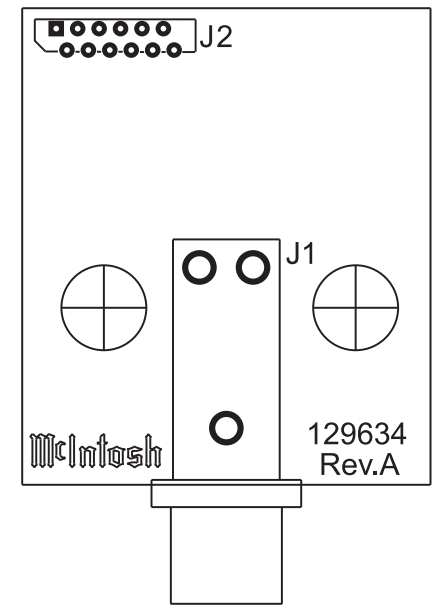
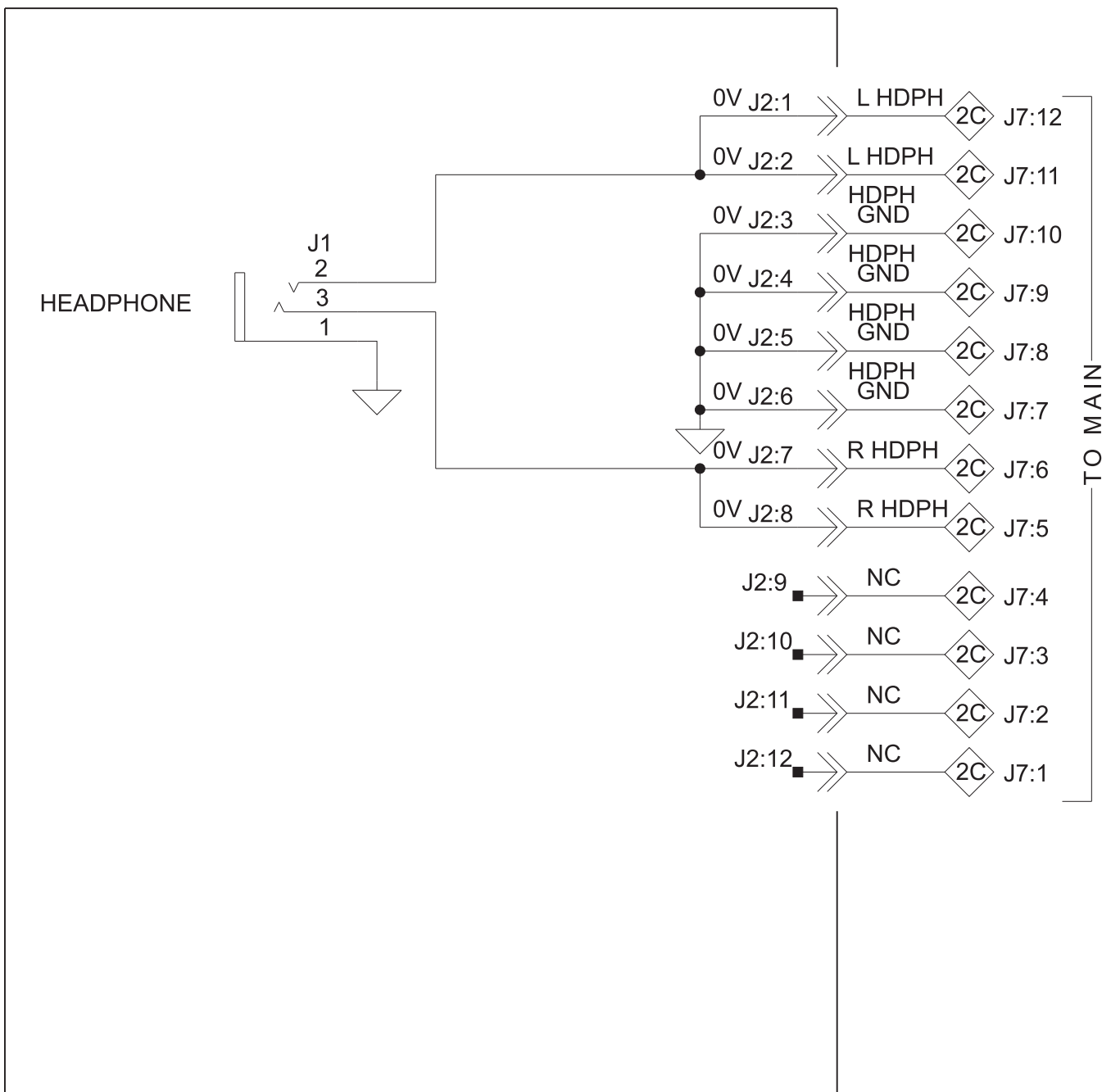
4 *BALANCED / DATA* 050331 PCB



5 *PUSHBUTTON* 051332 SCH and PCB



6 HEADPHONE 051333 SCH and PCB



NOTES

PARTS LIST

◆ MAIN PCB 050329

| Ref No. | Description | Part No. | Ref No. | Description | Part No. |
|---------|-----------------------------|----------|---------|-------------------------------|----------|
| C1 | CAPELECT 10UF 50V | 066445 | C57 | CAPELECT 10UF 16V | 066580 |
| C2 | CAPMPF 0.1UF 630VDC | 064431 | C58 | CAP MONO 47PF 200V 10% NPO | 061340 |
| C3 | CAP MONO 47PF 200V 10% NPO | 061340 | C59 | CAPPOLYPROP 1UF 20% 250VDC | 064433 |
| C4 | CAP MONO 47PF 200V 10% NPO | 061340 | C60 | CAPELECT 1UF 50V | 066510 |
| C5 | CAPELECT 22UF 100V | 066574 | C61 | CAPELECT 10UF 250V | 066493 |
| C6 | CAPPOLYPROP 1UF 20% 250VDC | 064433 | C62 | CAPELECT 100UF 25V | 066573 |
| C8 | CAPELECT 10UF 50V | 066445 | C63 | CAPELECT 10UF 16V | 066580 |
| C7 | CAPELECT 1UF 50V | 066510 | C64 | CAPELECT 100UF 25V | 066573 |
| C9 | CAPELECT 47UF 35V | 066446 | C65 | CAPELECT 10UF 16V | 066580 |
| C10 | CAP MONO 47PF 200V 10% NPO | 061340 | C66 | CAP PF 0.001UF 5% 63VDC | 064453 |
| C11 | CAP MONO 47PF 200V 10% NPO | 061340 | C67 | CAPMPF 0.0033UF 5% 63VDC | 064306 |
| C12 | CAP MONO 1000PF 50V 10% NPO | 061344 | C68 | CAPELECT 10UF 16V | 066580 |
| C13 | CAP MONO 1000PF 50V 10% NPO | 061344 | C69 | CAPELECT 10UF 16V | 066580 |
| C14 | CAP MONO 1000PF 50V 10% NPO | 061344 | C70 | CAP MONO 100PF 100V 10% NPO | 061341 |
| C15 | CAP MONO 1000PF 50V 10% NPO | 061344 | C71 | CAPELECT 10UF 16V | 066580 |
| C16 | CAPELECT 10UF 50V | 066445 | C72 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C17 | CAPELECT 47UF 35V | 066446 | C73 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C18 | CAP DISC MONO .47UF 50V | 061320 | C74 | CAP MONO 100PF 100V 10% NPO | 061341 |
| C19 | CAP MONO .1UF 50V 20% Z5U | 061346 | C75 | CAPELECT 10UF 16V | 066580 |
| C20 | CAP MONO .1UF 50V 20% Z5U | 061346 | C76 | CAP MONO 100PF 100V 10% NPO | 061341 |
| C21 | CAPELECT 47UF 450V | 066497 | C77 | CAPELECT 10UF 16V | 066580 |
| C22 | CAPELECT 47UF 35V | 066446 | C78 | CAPELECT 10UF 16V | 066580 |
| C23 | CAPELECT 47UF 450V | 066497 | C79 | CAPELECT 10UF 16V | 066580 |
| C24 | CAPELECT 1UF 50V | 066510 | C80 | CAP MONO 100PF 100V 10% NPO | 061341 |
| C25 | CAP MONO .1UF 50V 20% Z5U | 061346 | C81 | CAPELECT 10UF 16V | 066580 |
| C26 | CAPELECT 10UF 50V | 066445 | C82 | CAP MONO 100PF 100V 10% NPO | 061341 |
| C28 | CAP MONO .1UF 50V 20% Z5U | 061346 | C83 | CAPELECT 10UF 16V | 066580 |
| C29 | CAPELECT 10UF 250V | 066493 | C84 | CAP MONO 100PF 100V 10% NPO | 061341 |
| C30 | CAPELECT 4700UF | 066443 | C85 | CAPELECT 10UF 16V | 066580 |
| C31 | CAP MONO 220PF 200V 10% NPO | 061342 | C86 | CAPELECT 10UF 16V | 066580 |
| C32 | CAP MONO 1000PF 50V 10% NPO | 061344 | C87 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C33 | CAP MONO 1000PF 50V 10% NPO | 061344 | C88 | CAPELECT 220UF 50V 20% | 066254 |
| C34 | CAP MONO 1000PF 50V 10% NPO | 061344 | C89 | CAPPOLYPROP .047UF 10% 250VDC | 064364 |
| C35 | CAP MONO 1000PF 50V 10% NPO | 061344 | C90 | CAPELECT 220UF 50V 20% | 066254 |
| C36 | CAPMPF 0.1UF 630VDC | 064431 | C91 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C37 | CAPELECT 10UF 50V | 066445 | C92 | CAPELECT 1UF 50V | 066510 |
| C39 | CAPPOLYPROP 1UF 20% 250VDC | 064433 | C93 | CAPELECT 2200UF 50V 20% | 066440 |
| C40 | CAPELECT 1UF 50V | 066510 | C94 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C41 | CAPELECT 47UF 35V | 066446 | C95 | CAPELECT 10UF 50V | 066445 |
| C42 | CAPMPF 0.1UF 630VDC | 064431 | C96 | CAPELECT 2200UF 50V 20% | 066440 |
| C43 | CAPELECT 10UF 16V | 066580 | C97 | CAPELECT 10UF 50V | 066445 |
| C44 | CAP MONO 220PF 200V 10% NPO | 061342 | C98 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C45 | CAP MONO 47PF 200V 10% NPO | 061340 | C100 | CAPPOLYPROP .047UF 10% 250VDC | 064364 |
| C46 | CAPPOLYPROP 1UF 20% 250VDC | 064433 | C102 | CAPELECT 10UF 50V | 066445 |
| C47 | CAPELECT 1UF 50V | 066510 | C103 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C48 | CAPELECT 100UF 25V | 066573 | C104 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C49 | CAPELECT 10UF 16V | 066580 | C105 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C50 | CAP MONO .1UF 50V 20% Z5U | 061346 | C106 | CAPPOLY .047UF 10% 1000VDC | 064434 |
| C51 | CAPELECT 100UF 25V | 066573 | C115 | CAPELECT 47UF 35V | 066446 |
| C52 | CAPELECT 10UF 16V | 066580 | C116 | CAPELECT 10UF 50V | 066445 |
| C53 | CAP PF 0.001UF 5% 63VDC | 064453 | C118 | CAPELECT 10UF 50V | 066445 |
| C54 | CAPMPF 0.0033UF 5% 63VDC | 064306 | C119 | CAPELECT 10UF 50V | 066445 |
| C55 | CAPELECT 10UF 16V | 066580 | C121 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C56 | CAPMPF 0.1UF 630VDC | 064431 | C122 | CAP MONO .1UF 50V 20% Z5U | 061346 |

PARTS LIST *con't*

MAIN PCB 050329 (cont'd)

| Ref No. | Description | Part No. | Ref No. | Description | Part No. |
|---------|-------------------------------|----------|---------|-------------------------------|----------|
| | DIODE SIL 400 PIV @ 1.5A | 070031 | J3 | JACK PHONO 8P GOLD PLATED | 117455 |
| D1 | DIODE SIL 400 PIV @ 1.5A | 070031 | J4 | CONN FFC 18PIN | 117765 |
| D2 | DIODE SIL 400 PIV @ 1.5A | 070031 | J5 | CONN FFC 18PIN | 117765 |
| D3 | DIODE SIL 400 PIV @ 1.5A | 070031 | J6 | JACK PHONO 8P GOLD PLATED | 117455 |
| D4 | DIODE SILICON | 070174 | J7 | CONN 12 PIN FFC | 117720 |
| D5 | DIODE SIL 400 PIV @ 1.5A | 070031 | J8 | CONN FFC 18PIN | 117765 |
| D6 | DIODE SIL 400 PIV @ 1.5A | 070031 | J9 | HEADER 9 CIRCUIT POST NATURAL | 117724 |
| D7 | DIODE SIL 400 PIV @ 1.5A | 070031 | J10 | BLADE FASTON W/FEET | 117708 |
| D8 | DIODE SIL 400 PIV @ 1.5A | 070031 | J11 | BLADE FASTON W/FEET | 117708 |
| D9 | DIODE SIL 400 PIV @ 1.5A | 070031 | J12 | CONN PCB MOUNT POWER RED | 117719 |
| D10 | DIODE SILICON | 070174 | J13 | CONN PCB MOUNT POWER RED | 117719 |
| D11 | DIODE SIL 400 PIV @ 1.5A | 070031 | J14 | CONN PCB MOUNT POWER RED | 117719 |
| D12 | DIODE SIL 400 PIV @ 1.5A | 070031 | J15 | CONN PCB MOUNT POWER RED | 117719 |
| D13 | DIODE SIL 400 PIV @ 1.5A | 070031 | J16 | JACK PHONO GOLD PJ261G | 117436 |
| D15 | DIODE SIL 400 PIV @ 1.5A | 070031 | J41 | CONN FFC 18PIN | 117765 |
| D14 | DIODE SILICON | 070174 | K1 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| D16 | DIODE SILICON | 070174 | K2 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| DS1 | LED GREEN 3MM HI INTENSITY | 058172 | K3 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| DS2 | LED GREEN 3MM HI INTENSITY | 058172 | K4 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| DS3 | LED GREEN 3MM HI INTENSITY | 058172 | K5 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| DS4 | LED GREEN 3MM HI INTENSITY | 058172 | K6 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| F2 | FUSE 2A 250V SLO-BLO 5X20 IEC | 089088 | K7 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| (F2) | HOLDER FUSE 5X20MM PCB MOUNT | 178159 | K8 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| F4 | FUSE 1/8A SLO-BLO 5X20 IEC | 089094 | K9 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| (F4) | HOLDER FUSE 5X20MM PCB MOUNT | 178159 | K10 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| F5 | FUSE 0.5A SLO-BLO 5X20 IEC | 089092 | K11 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| (F5) | HOLDER FUSE 5X20MM PCB MOUNT | 178159 | K12 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| GP1 | BRACKET PCB CARD MOUNTING | 003611 | K13 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| GP2 | BRACKET PCB CARD MOUNTING | 003611 | K14 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| J1 | CONN FFC 18PIN | 117765 | K15 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| J2 | JACK PHONO 6P GOLD PLATED | 117449 | K16 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K17 | RELAY REED FORM 1C 5V 125 OHM | 087056 |
| | | | K18 | RELAY REED FORM 1C 5V 125 OHM | 087056 |
| | | | K20 | RELAY 24VDC 5A 277VAC | 087057 |
| | | | K21 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K22 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K23 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K24 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K25 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K26 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | K27 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | | | Q1 | TRANSISTOR N JFET | 132318 |
| | | | Q2 | TRANSISTOR N JFET | 132318 |
| | | | Q3 | TRANSISTOR N JFET | 132318 |
| | | | Q4 | TRANSISTOR N JFET | 132318 |
| | | | Q5 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q6 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q7 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q8 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q9 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q10 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q11 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q12 | TRANSISTOR PNP SILICON | 132304 |
| | | | Q13 | TRANSISTOR N JFET | 132318 |

PARTS LIST *con't*

MAIN PCB 050329 (cont'd)

| Ref No. | Description | Part No. | Ref No. | Description | Part No. |
|---------|------------------------|----------|---------|--------------------------|----------|
| Q14 | TRANSISTOR N JFET | 132318 | R35 | RES MF 1.5K 1% 1/4W | 144539 |
| Q15 | TRANSISTOR N JFET | 132318 | R36 | RES MF 267K 1% 1/4W | 144532 |
| Q16 | TRANSISTOR N JFET | 132318 | R37 | RES MF 12.1K 1% 1/4W | 144550 |
| Q17 | TRANSISTOR NPN POWER | 132295 | R38 | RES MF 267K 1% 1/4W | 144532 |
| (Q17) | HEATSINK TO-220 | 080017 | R39 | RES MF 267K 1% 1/4W | 144532 |
| Q19 | TRANSISTOR PNP SILICON | 132304 | R40 | RES MF 267K 1% 1/4W | 144532 |
| Q29 | TRANSISTOR PNP SILICON | 132304 | R41 | RES MF 267K 1% 1/4W | 144532 |
| Q21 | TRANSISTOR NPN POWER | 132295 | R42 | RES MF 1K 1% 1/4W | 144513 |
| Q22 | TRANSISTOR NPN 2A 50V | 132302 | R43 | RES MF 1K 1% 1/4W | 144513 |
| Q23 | TRANSISTOR NPN 2A 50V | 132302 | R44 | RES MF 1K 1% 1/4W | 144513 |
| Q18 | TRANSISTOR NPN SILICON | 132317 | R45 | RES MF 1M 1% 1/4W | 144577 |
| Q24 | TRANSISTOR PNP | 132326 | R46 | RES MF 1M 1% 1/4W | 144577 |
| Q25 | TRANSISTOR PNP | 132326 | R47 | RES MF 221K 1% 1/4W | 144629 |
| Q26 | TRANSISTOR NPN SILICON | 132317 | R48 | RES MF 200K 1% 1/4W | 144531 |
| Q27 | TRANSISTOR PNP | 132326 | R49 | RES MF 1M 1% 1/4W | 144577 |
| Q28 | TRANSISTOR N JFET | 132318 | R50 | RES MF 1M 1% 1/4W | 144577 |
| Q30 | TRANSISTOR N JFET | 132318 | R51 | RES MF 3.32K 1% 1/4W | 144518 |
| Q31 | TRANSISTOR PNP | 132326 | R52 | RES MF 2.74K 1% 1/4W | 144587 |
| Q32 | TRANSISTOR NPN SILICON | 132317 | R53 | RES MF 20K 1% 1/4W | 144524 |
| Q20 | TRANSISTOR NPN | 132325 | R54 | RES MF 1K 1% 1/4W | 144513 |
| R1 | RES MF 20K 1% 1/4W | 144524 | R55 | RES MF 150K 1% 1/4W | 144627 |
| R2 | RES MF 150K 1% 1/4W | 144627 | R56 | RES MF 1M 1% 1/4W | 144577 |
| R3 | RES MF 221K 1% 1/4W | 144629 | R57 | RES MF 1.5K 1% 1/4W | 144539 |
| R4 | RES MF 200K 1% 1/4W | 144531 | R58 | RES MF 3.32K 1% 1/4W | 144518 |
| R5 | RES MF 2.74K 1% 1/4W | 144587 | R59 | RES MF 47.5K 1% 1/4W | 144526 |
| R6 | RES MF 2.21M 1% 1/4W | 144576 | R60 | RES MF 33.2K 1% 1/4W | 144694 |
| R7 | RES MF 47.5K 1% 1/4W | 144526 | R61 | RES MF 2.21M 1% 1/4W | 144576 |
| R8 | RES MF 33.2K 1% 1/4W | 144694 | R62 | RES MF 24.9K 1% 1/4W | 144439 |
| R9 | RES MF 24.9K 1% 1/4W | 144439 | R63 | RES 16.5K 1% 1/4W | 144103 |
| R10 | RES 16.5K 1% 1/4W | 144103 | R64 | RES MF 22.1K 1% 1/4W | 144564 |
| R11 | RES MF 100K 1% 1/4W | 144528 | R65 | RES MF 10M 1% 1/4W | 144575 |
| R12 | RES MF 1M 1% 1/4W | 144577 | R66 | RES MF 10M 1% 1/4W | 144575 |
| R13 | RES MF 10M 1% 1/4W | 144575 | R67 | RES MF 10M 1% 1/4W | 144575 |
| R14 | RES MF 10M 1% 1/4W | 144575 | R68 | RES MF 10M 1% 1/4W | 144575 |
| R15 | RES MF 10M 1% 1/4W | 144575 | R69 | RES MF 15K 1% 1/4W | 144623 |
| R16 | RES MF 10M 1% 1/4W | 144575 | R70 | RES MF 221K 1% 1/4W | 144629 |
| R17 | RES MF 1.5K 1% 1/4W | 144539 | R71 | RES MF 200K 1% 1/4W | 144531 |
| R18 | RES MF 3.32K 1% 1/4W | 144518 | R72 | RES MF 1K 1% 1/4W | 144513 |
| R19 | RES MF 10K 1% 1/4W | 144504 | R73 | RES MF 1K 1% 1/4W | 144513 |
| R20 | RES MF 267K 1% 1/4W | 144532 | R74 | RES MF 1K 1% 1/4W | 144513 |
| R21 | RES MF 22.1K 1% 1/4W | 144564 | R75 | RES NETWORK 2 X 220K ISO | 144678 |
| R22 | RES MF 12.1K 1% 1/4W | 144550 | R76 | RES MF 1M 1% 1/4W | 144577 |
| R23 | RES MF 15K 1% 1/4W | 144623 | R77 | RES MF 47.5K 1% 1/4W | 144526 |
| R24 | RES MF 267K 1% 1/4W | 144532 | R78 | RES MF 1.5K 1% 1/4W | 144539 |
| R25 | RES MF 1M 1% 1/4W | 144577 | R79 | RES MF 953 OHM 1% 1/4W | 144473 |
| R26 | RES MF 267K 1% 1/4W | 144532 | R80 | RES MF 22.1K 1% 1/4W | 144564 |
| R27 | RES MF 1M 1% 1/4W | 144577 | R81 | RES MF 221K 1% 1/4W | 144629 |
| R28 | RES MF 267K 1% 1/4W | 144532 | R82 | RES MF 1.82K 1% 1/4W | 144582 |
| R29 | RES MF 1M 1% 1/4W | 144577 | R83 | RES MF 75K 1% 1/4W | 144156 |
| R30 | RES MF 267K 1% 1/4W | 144532 | R84 | RES MF 1M 1% 1/4W | 144577 |
| R31 | RES MF 1M 1% 1/4W | 144577 | R85 | RES NETWORK 2 X 220K ISO | 144678 |
| R32 | RES MF 267K 1% 1/4W | 144532 | R86 | RES MF 221K 1% 1/4W | 144629 |
| R33 | RES MO 100K 5% 2W | 144698 | R87 | RES MF 200K 1% 1/4W | 144531 |
| R34 | RES MF 10K 1% 1/4W | 144504 | R88 | RES MF 1K 1% 1/4W | 144513 |

PARTS LIST *con't*

MAIN PCB 050329 (cont'd)

| Ref No. | Description | Part No. | Ref No. | Description | Part No. |
|---------|--------------------------|----------|---------|-------------------------------|----------|
| R89 | RES NETWORK 2 X 220K ISO | 144678 | R143 | RES MF 100K 1% 1/4W | 144528 |
| R90 | RES MF 1M 1% 1/4W | 144577 | R144 | RES MF 33.2K 1% 1/4W | 144694 |
| R91 | RES MF 47.5K 1% 1/4W | 144526 | R145 | RES MF 221 OHM 1% 1/4W | 144559 |
| R92 | RES MF 1.5K 1% 1/4W | 144539 | R146 | RES MF 100K 1% 1/4W | 144528 |
| R93 | RES MF 953 OHM 1% 1/4W | 144473 | R147 | RES MF 1M 1% 1/4W | 144577 |
| R94 | RES MF 22.1K 1% 1/4W | 144564 | R148 | RES MF 221 OHM 1% 1/4W | 144559 |
| R95 | RES MF 221K 1% 1/4W | 144629 | R149 | RES MF 20K 1% 1/4W | 144524 |
| R96 | RES MF 1.82K 1% 1/4W | 144582 | R150 | RES MF 100K 1% 1/4W | 144528 |
| R97 | RES MF 75K 1% 1/4W | 144156 | R151 | RES MF 22.1K 1% 1/4W | 144564 |
| R98 | RES MF 1M 1% 1/4W | 144577 | R152 | RES MF 1K 1% 1/4W | 144513 |
| R99 | RES MF 1K 1% 1/4W | 144513 | R153 | RES MF 221 OHM 1% 1/4W | 144559 |
| R100 | RES NETWORK 2 X 220K ISO | 144678 | R154 | RES MF 100K 1% 1/4W | 144528 |
| R101 | RES MF 40.2K 1% 1/4W | 144525 | R155 | RES MF 10K 1% 1/4W | 144504 |
| R102 | RES MF 221 OHM 1% 1/4W | 144559 | R156 | RES MF 221 OHM 1% 1/4W | 144559 |
| R103 | RES NETWORK 2 X 220K ISO | 144678 | R157 | RES MF 10K 1% 1/4W | 144504 |
| R104 | RES MF 40.2K 1% 1/4W | 144525 | R158 | RES MF 22.1K 1% 1/4W | 144564 |
| R105 | RES MF 20K 1% 1/4W | 144524 | R159 | RES MF 100K 1% 1/4W | 144528 |
| R106 | RES MF 20K 1% 1/4W | 144524 | R160 | RES MF 33.2K 1% 1/4W | 144694 |
| R107 | RES NETWORK 2 X 220K ISO | 144678 | R161 | RES MF 22.1K 1% 1/4W | 144564 |
| R108 | RES MF 1K 1% 1/4W | 144513 | R162 | RES MF 221 OHM 1% 1/4W | 144559 |
| R109 | RES MF 40.2K 1% 1/4W | 144525 | R163 | RES MF 100K 1% 1/4W | 144528 |
| R110 | RES MF 221 OHM 1% 1/4W | 144559 | R164 | RES MF 100 OHM 1% 1/4W | 144568 |
| R111 | RES MF 40.2K 1% 1/4W | 144525 | R165 | RES MF 100K 1% 1/4W | 144528 |
| R112 | RES NETWORK 2 X 220K ISO | 144678 | R166 | RES MF 100 OHM 1% 1/4W | 144568 |
| R113 | RES MF 20K 1% 1/4W | 144524 | R167 | RES MF 100K 1% 1/4W | 144528 |
| R114 | RES MF 20K 1% 1/4W | 144524 | R168 | RES MF 22.1K 1% 1/4W | 144564 |
| R115 | RES NETWORK 2 X 220K ISO | 144678 | R169 | RES MF 1K 1% 1/4W | 144513 |
| R116 | RES MF 10K 1% 1/4W | 144504 | R170 | RES MF 10K 1% 1/4W | 144504 |
| R117 | RES MF 10 OHM 1% 1/4W | 144553 | R171 | RES MF 1K 1% 1/4W | 144513 |
| R118 | RES MF 10K 1% 1/4W | 144504 | R172 | RES MF 1K 1% 1/4W | 144513 |
| R119 | RES MF 365 OHM 1% 1/4W | 144505 | R173 | RES MF 1K 1% 1/4W | 144513 |
| R120 | RES MF 3.32K 1% 1/4W | 144518 | R174 | RES MF 10M 1% 1/4W | 144575 |
| R121 | RES MF 22.1 OHM 1% 1/4W | 144554 | R175 | RES MF 10M 1% 1/4W | 144575 |
| R122 | RES MF 200K 1% 1/4W | 144531 | R176 | RES MF 332 OHM 1% 1/4W | 144646 |
| R123 | RES MF 3.32K 1% 1/4W | 144518 | R177 | RES MF 1.82K 1% 1/4W | 144582 |
| R124 | RES MF 332 OHM 1% 1/4W | 144646 | R178 | RES MF 1.82K 1% 1/4W | 144582 |
| R125 | RES MF 8.25K 1% 1/4W | 144549 | R179 | RES MF 1.82K 1% 1/4W | 144582 |
| R126 | RES MF 100K 1% 1/4W | 144528 | R180 | RES MF 1.82K 1% 1/4W | 144582 |
| R127 | RES MF 221 OHM 1% 1/4W | 144559 | R181 | RES MF 3.32K 1% 1/4W | 144518 |
| R128 | RES MF 1M 1% 1/4W | 144577 | R182 | RES MF 3.32K 1% 1/4W | 144518 |
| R129 | RES MF 200K 1% 1/4W | 144531 | R183 | RES MF 365 OHM 1% 1/4W | 144505 |
| R130 | RES MF 100K 1% 1/4W | 144528 | R188 | RES MF 221K 1% 1/4W | 144629 |
| R131 | RES MF 475 OHM 1% 1/4W | 144509 | R189 | RES MF 221K 1% 1/4W | 144629 |
| R132 | RES MF 1K 1% 1/4W | 144513 | R192 | RES MF 33.2K 1% 1/4W | 144694 |
| R133 | RES MF 1K 1% 1/4W | 144513 | R193 | RES MF 33.2K 1% 1/4W | 144694 |
| R134 | RES MF 100K 1% 1/4W | 144528 | R196 | RES MF 100K 1% 1/4W | 144528 |
| R135 | RES MF 267K 1% 1/4W | 144532 | R197 | RES MF 100K 1% 1/4W | 144528 |
| R136 | RES MF 3.32K 1% 1/4W | 144518 | R200 | RES MF 267K 1% 1/4W | 144532 |
| R137 | RES MF 1K 1% 1/4W | 144513 | R201 | RES MF 365 OHM 1% 1/4W | 144505 |
| R138 | RES MF 10K 1% 1/4W | 144504 | R220 | RES MF 47.5K 1% 1/4W | 144526 |
| R139 | RES MF 10K 1% 1/4W | 144504 | T1 | TRANSFORMER R-CORE POWER | 159348 |
| R140 | RES MF 33.2K 1% 1/4W | 144694 | U1 | IC REGULATOR 5V | 133250 |
| R141 | RES MF 200K 1% 1/4W | 144531 | U2 | IC -5V REGULATOR | 133253 |
| R142 | RES MF 221 OHM 1% 1/4W | 144559 | U3 | IC DUAL OPERATIONAL AMPLIFIER | 133260 |

PARTS LIST *con't***MAIN PCB 050329 (cont'd)**

| Ref No. | Description | Part No. | Ref No. | Description | Part No. |
|---------|--------------------------------|----------|---------|------------------------------|----------|
| U4 | IC SHFT REG SER-PAR | 133186 | D5 | DIODE SILICON | 070174 |
| U5 | IC STEREO DGTL VOLUME CONTROL | 133331 | DS1 | LED GRN 5MM HI-INTENSITY | 058165 |
| U6 | IC SHFT REG SER-PAR | 133186 | (DS1) | SPACER LED | 112108 |
| U7 | IC OCTAL DARLNGTON TRANS ARRAY | 133258 | DS2 | LED GRN 5MM HI-INTENSITY | 058165 |
| U8 | IC SHFT REG SER-PAR | 133186 | (DS2) | SPACER LED | 112108 |
| U9 | IC OCTAL DARLNGTON TRANS ARRAY | 133258 | DS3 | LED GRN 5MM HI-INTENSITY | 058165 |
| U10 | IC DUAL OPERATIONAL AMPLIFIER | 133260 | (DS3) | SPACER LED | 112108 |
| U11 | IC VOLTAGE REGLTR VARIABLE NEG | 133334 | DS4 | LED GRN 5MM HI-INTENSITY | 058165 |
| (U11) | HEATSINK TO-220 | 080017 | (DS4) | SPACER LED | 112108 |
| U12 | IC VOLTAGE REGLTR VARIABLE POS | 133333 | DS5 | LED GRN 5MM HI-INTENSITY | 058165 |
| (U12) | HEATSINK TO-220 | 080017 | (DS5) | SPACER LED | 112108 |
| U13 | IC SHFT REG SER-PAR | 133186 | DS6 | LED GRN 5MM HI-INTENSITY | 058165 |
| U14 | IC VOLTAGE REGLTR VARIABLE NEG | 133334 | (DS6) | SPACER LED | 112108 |
| (U14) | HEATSINK TO-220 | 080017 | DS7 | DISPLAY 12 CHARACTER | 058150 |
| U15 | IC VOLTAGE REGLTR VARIABLE POS | 133333 | DS8 | LED GRN 5MM HI-INTENSITY | 058165 |
| (U15) | HEATSINK TO-220 | 080017 | (DS8) | SPACER LED | 112108 |
| U16 | IC REGULATOR +5V | 133108 | J1 | CONN FFC 18PIN | 117765 |
| (U16) | HEATSINK TO-220 | 080017 | J2 | CONN FFC 18PIN | 117765 |
| U17 | IC 2 INPUT X 4 | 133167 | J5 | CONN FFC 18PIN | 117765 |
| U18 | IC DUAL OPERATIONAL AMPLIFIER | 133260 | K1 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U19 | IC DUAL OPERATIONAL AMPLIFIER | 133260 | K2 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U21 | IC DUAL OPERATIONAL AMPLIFIER | 133260 | K3 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| V1 | SOCKET 9 PIN TUBE CERAMIC | 178170 | K4 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| V3 | SOCKET 9 PIN TUBE CERAMIC | 178170 | MTGPA1 | DBL COATED MTG-TAPE 1/16 THK | 094409 |
| V5 | SOCKET 9 PIN TUBE CERAMIC | 178170 | MTGPA2 | DBL COATED MTG-TAPE 1/16 THK | 094409 |
| V7 | SOCKET 9 PIN TUBE CERAMIC | 178170 | MTGPA3 | DBL COATED MTG-TAPE 1/16 THK | 094409 |
| 18574 | ASSEMBLY INSERTION PCB MAIN | 700138 | MT1 | SENSOR IR 38KHZ | 121046 |
| | ASSY INSERTION PCB MAIN | 701138 | Q1 | TRANSISTOR PNP | 132304 |
| | | | Q3 | TRANSISTOR NPN 2K/REEL | 132317 |
| | | | R1 | RES MF 475K 1% 1/4W | 144604 |
| | | | R2 | RES MF 10K 1% 1/4W | 144504 |
| | | | R3 | RES MF 100 OHM 1% 1/4W | 144568 |
| | | | R4 | RES MF 475 OHM 1% 1/4W | 144509 |
| | | | R5 | RES MF 10 OHM 1% 1/4W | 144553 |
| | | | R6 | RES MF 47.5K 1% 1/4W | 144526 |
| | | | R7 | RES MF 475 OHM 1% 1/4W | 144509 |
| | | | R8 | RES NET 10K X8 RES BUSSED | 144253 |
| | | | R9 | RES NETWORK 9X-1-223 | 144238 |
| | | | R10 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R12 | RES MF 100 OHM 1% 1/4W | 144568 |
| | | | R13 | RES MF 47.5K 1% 1/4W | 144526 |
| | | | R14 | RES NETWORK 9X-1-223 | 144238 |
| | | | R15 | RES MF 1K 1% 1/4W | 144513 |
| | | | R16 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R17 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R18 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R19 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R20 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R22 | RES MF 324 OHM 1% 1/4W | 144597 |
| | | | R21 | RES MF 100K 1% 1/4W | 144528 |
| | | | R23 | RES MF 100 OHM 1% 1/4W | 144568 |
| | | | R24 | RES MF 100 OHM 1% 1/4W | 144568 |
| | | | R25 | RES MF 100 OHM 1% 1/4W | 144568 |
| | | | R26 | RES MF 221 OHM 1% 1/4W | 144559 |
| | | | R27 | RES MF 100 OHM 1% 1/4W | 144568 |
| | | | | | |

3 DISPLAY PCB 050330

| | | |
|-----|-----------------------------|--------|
| C1 | CAPELECT 10UF 50V | 066445 |
| C2 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C3 | CAPELECT 47UF 35V | 066446 |
| C4 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C5 | CAPELECT 10UF 50V | 066445 |
| C6 | CAPELECT 47UF 16V | 066380 |
| C7 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C8 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C9 | CAPELECT 10UF 50V | 066445 |
| C10 | CAP MONO 220PF 200V 10% NPO | 061342 |
| C11 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C12 | CAP MONO 220PF 200V 10% NPO | 061342 |
| C13 | CAP MONO 220PF 200V 10% NPO | 061342 |
| C14 | CAP MPF 0.033UF 5% 63VDC | 064318 |
| C15 | CAP MPF 0.033UF 5% 63VDC | 064318 |
| C16 | CAP MPF 0.033UF 5% 63VDC | 064318 |
| C17 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C18 | CAP MPF 0.033UF 5% 63VDC | 064318 |
| C19 | CAPELECT 22UF 100V | 066574 |
| C20 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| C21 | CAPELECT 22UF 100V | 066574 |
| D1 | DIODE SILICON | 070174 |
| D2 | DIODE ZENER 6.2V 5% 500MW | 070085 |
| D3 | DIODE SILICON | 070174 |
| D4 | DIODE SILICON | 070174 |

PARTS LIST *con't*

DISPLAY PCB 050330 (cont'd)

| Ref No. | Description | Part No. | Ref No. | Description | Part No. |
|---------|--------------------------------|----------|---------|-------------------------------|----------|
| R28 | RES MF 2.21K 1% 1/4W | 144584 | C13 | CAP ELECT 10UF 50V | 066445 |
| R29 | RES MF 1K 1% 1/4W | 144513 | C14 | CAP ELECT 10UF 50V | 066445 |
| R30 | RES MF 1K 1% 1/4W | 144513 | C15 | CAP ELECT 10UF 50V | 066445 |
| R32 | RES NETWORK 9X-1-223 | 144238 | C16 | CAP ELECT 10UF 50V | 066445 |
| R33 | RES MF 100 OHM 1% 1/4W | 144568 | C17 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| R34 | RES MF 100 OHM 1% 1/4W | 144568 | C18 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| R35 | PC BD TONE | 129629 | C19 | CAP MONO 1000PF 50V 10% NPO | 061344 |
| (R35) | POTEQUAL | 134509 | C20 | CAP MONO .1UF 50V 20% Z5U | 061346 |
| (R35A) | CONN 4 PIN RIGHT ANGLE | 117927 | D1 | DIODE SILICON | 070174 |
| (R35B) | CONN 4 PIN RIGHT ANGLE | 117927 | D2 | DIODE SILICON | 070174 |
| (R35C) | CONN 4 PIN RIGHT ANGLE | 117927 | D3 | DIODE SILICON | 070174 |
| (R35D) | CONN 4 PIN RIGHT ANGLE | 117927 | J1 | CONN XLR FEM HORIZ PCB LATCH | 117814 |
| R39 | RES MF 1M 1% 1/4W | 144577 | J2 | CONN XLR FEM HORIZ PCB LATCH | 117814 |
| R43 | RES MF 100K 1% 1/4W | 144528 | J3 | CONN XLR FEM HORIZ PCB LATCH | 117814 |
| R44 | RES MF 681 OHM 1% 1/4W | 144567 | J4 | CONN XLR FEM HORIZ PCB LATCH | 117814 |
| R46 | RES MF 681 OHM 1% 1/4W | 144567 | J5 | RECEPTACLE XLR MALE | 117686 |
| R45 | RES MF 100K 1% 1/4W | 144528 | J6 | RECEPTACLE XLR MALE | 117686 |
| R47 | RES MF 475 OHM 1% 1/4W | 144509 | J7 | CONN FFC 18PIN | 117765 |
| R48 | RES MF 475 OHM 1% 1/4W | 144509 | J8 | CONN FFC 18PIN | 117765 |
| R40 | RES MF 1M 1% 1/4W | 144577 | J9 | JACK HEADPHONE DUAL BLACK 1/8 | 117825 |
| R41 | RES MF 1M 1% 1/4W | 144577 | J10 | JACK HEADPHONE DUAL BLACK 1/8 | 117825 |
| R42 | RES MF 1M 1% 1/4W | 144577 | J11 | CONN GOLD F RIGHT ANGLE | 117661 |
| S1 | ENCODER OPTICAL ROTARY | 146246 | J12 | JACK HEADPHONE DUAL BLACK 1/8 | 117825 |
| S2 | SWITCH ROT PULSE | 146258 | J13 | JACK HEADPHONE DUAL BLACK 1/8 | 117825 |
| S2 | PC BD SWITCH | 129294 | J14 | JACK HEADPHONE DUAL BLACK 1/8 | 117825 |
| (S2) | CONN 3-PIN RIGHT ANGLE | 117670 | J15 | JACK HEADPHONE DUAL BLACK 1/8 | 117825 |
| U1 | IC NOR 2 INPUT X 4 | 133176 | J16 | CONN FFC 18PIN | 117765 |
| U2 | IC MICRO RESET POS | 133241 | K1 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U3 | IC CMOS EPROM | 133249 | K2 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U4 | IC PROGRAMMED V1.00 C220 | 133584 | K3 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U3 | SOCKET IC 8-POS | 178096 | K4 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U4 | SOCKET IC 40-PIN | 178133 | K5 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U6 | IC SHFT REG SER-PAR | 133186 | K6 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| U8 | IC DUAL OPERATIONAL AMPLIFIER | 133260 | K7 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| Y1 | CERAMIC RESONATOR 12MHZ | 180059 | K8 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| Y2 | RES MF 8.25K 1% 1/4W | 144549 | K9 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| Y2 | RESONATOR CERAMIC 2.00MHZ | 180064 | K10 | RELAY REED SPST-NO 5V 1.2A | 087078 |
| | ASSEMBLY INSERTION PCB DISPLAY | 700139 | PCB1 | PC BD BAL/DATA | 129628 |
| | ASSY INSERTION PCB DISPLAY | 701139 | R1 | RES MF 221 OHM 1% 1/4W | 144559 |
| | ASSY DISPLAY PCB SM PART | 750360 | R2 | RES MF 221 OHM 1% 1/4W | 144559 |
| | | | R3 | RES MF 221 OHM 1% 1/4W | 144559 |
| | | | R4 | RES MF 221 OHM 1% 1/4W | 144559 |
| | | | R5 | RES MF 100K 1% 1/4W | 144528 |
| | | | R6 | RES MF 100K 1% 1/4W | 144528 |
| | | | R7 | RES MF 267K 1% 1/4W | 144532 |
| | | | R8 | RES MF 267K 1% 1/4W | 144532 |
| | | | R9 | RES MF 267K 1% 1/4W | 144532 |
| | | | R10 | RES MF 267K 1% 1/4W | 144532 |
| | | | R11 | RES MF 267K 1% 1/4W | 144532 |
| | | | R12 | RES MF 267K 1% 1/4W | 144532 |
| | | | R13 | RES MF 267K 1% 1/4W | 144532 |
| | | | R14 | RES MF 267K 1% 1/4W | 144532 |
| | | | R15 | RES MF 267K 1% 1/4W | 144532 |
| | | | R16 | RES MF 267K 1% 1/4W | 144532 |
| | | | R17 | RES MF 267K 1% 1/4W | 144532 |

◆ BALANCED/DATA PCB 050331

| | | | | | |
|-----|-------------------|--------|-----|---------------------|--------|
| C1 | CAPELECT 10UF 50V | 066445 | R6 | RES MF 100K 1% 1/4W | 144528 |
| C2 | CAPELECT 10UF 50V | 066445 | R7 | RES MF 267K 1% 1/4W | 144532 |
| C3 | CAPELECT 10UF 50V | 066445 | R8 | RES MF 267K 1% 1/4W | 144532 |
| C4 | CAPELECT 10UF 50V | 066445 | R9 | RES MF 267K 1% 1/4W | 144532 |
| C5 | CAPELECT 10UF 50V | 066445 | R10 | RES MF 267K 1% 1/4W | 144532 |
| C6 | CAPELECT 10UF 50V | 066445 | R11 | RES MF 267K 1% 1/4W | 144532 |
| C7 | CAPELECT 10UF 50V | 066445 | R12 | RES MF 267K 1% 1/4W | 144532 |
| C8 | CAPELECT 10UF 50V | 066445 | R13 | RES MF 267K 1% 1/4W | 144532 |
| C9 | CAPELECT 10UF 50V | 066445 | R14 | RES MF 267K 1% 1/4W | 144532 |
| C10 | CAPELECT 10UF 50V | 066445 | R15 | RES MF 267K 1% 1/4W | 144532 |
| C11 | CAPELECT 10UF 50V | 066445 | R16 | RES MF 267K 1% 1/4W | 144532 |
| C12 | CAPELECT 10UF 50V | 066445 | R17 | RES MF 267K 1% 1/4W | 144532 |

PARTS LIST *con't***BALANCED/DATA PCB 050331 (cont'd)**

| Ref No. | Description | Part No. |
|---------|-----------------------------|----------|
| R18 | RES MF 267K 1% 1/4W | 144532 |
| R19 | RES MF 10 OHM 1% 1/4W | 144553 |
| R20 | RES MF 182 OHM 1% 1/4W | 144579 |
| R21 | RES MF 182 OHM 1% 1/4W | 144579 |
| R22 | RES MF 182 OHM 1% 1/4W | 144579 |
| R23 | RES MF 182 OHM 1% 1/4W | 144579 |
| R24 | RES MF 182 OHM 1% 1/4W | 144579 |
| R25 | RES MF 182 OHM 1% 1/4W | 144579 |
| R26 | RES MF 182 OHM 1% 1/4W | 144579 |
| R27 | RES MF 182 OHM 1% 1/4W | 144579 |
| R28 | RES MF 10 OHM 1% 1/4W | 144553 |
| R29 | RES MF 100 OHM 1% 1/4W | 144568 |
| R30 | RES MF 100 OHM 1% 1/4W | 144568 |
| R31 | RES MF 100 OHM 1% 1/4W | 144568 |
| R32 | RES MF 100 OHM 1% 1/4W | 144568 |
| R33 | RES MF 100 OHM 1% 1/4W | 144568 |
| R34 | RES MF 100 OHM 1% 1/4W | 144568 |
| R35 | RES MF 100 OHM 1% 1/4W | 144568 |
| R36 | RES MF 100 OHM 1% 1/4W | 144568 |
| R37 | RES MF 1K 1% 1/4W | 144513 |
| R38 | RES MF 221 OHM 1% 1/4W | 144559 |
| R39 | RES MF 1K 1% 1/4W | 144513 |
| R40 | RES MF 1K 1% 1/4W | 144513 |
| R41 | RES MF 1K 1% 1/4W | 144513 |
| R42 | RES MF 40.2K 1% 1/4W | 144525 |
| R43 | RES MF 22.1K 1% 1/4W | 144564 |
| U1 | IC AND 2 INPUT X 4 | 133175 |
| U2 | IC AND 2 INPUT X 4 | 133175 |
| U3 | IC 8 LN DRIVER ARRAY | 133180 |
| U4 | IC SHFT REG SER-PAR | 133186 |
| U5 | IC OPERATIONAL AMPLIFIER | 133189 |
| 18574 | ASSY INSERTION PCB BAL/DATA | 701140 |

◇ **TONE PCB 129629 ?????**

| Ref No. | Description | Part No. |
|---------|------------------------|----------|
| 1 | PCB Part Number | 129629 |
| 2 | LOGO | |
| J1 | CONN 4-PIN RIGHT ANGLE | 117927 |
| J2 | CONN 4-PIN RIGHT ANGLE | 117927 |
| R1 | Potentiometer | 134457 |

◇ **PUSHBUTTON PCB 050333**

| Ref No. | Description | Part No. |
|---------|----------------|----------|
| 1 | Pushbutton PCB | 129630 |
| 2 | LOGO | |
| DS1 | LED SQUARE RED | 58109 |
| DS2 | LED SQUARE RED | 58109 |
| DS3 | LED SQUARE RED | 58109 |
| DS4 | LED SQUARE RED | 58109 |
| DS5 | LED SQUARE RED | 58109 |
| DS6 | LED SQUARE RED | 58109 |
| DS7 | LED SQUARE RED | 58109 |
| J1 | CONN FFC 18PIN | 117765 |
| S1 | SWITCH PB TACT | 150058 |
| S2 | SWITCH PB TACT | 150058 |
| S3 | SWITCH PB TACT | 150058 |
| S4 | SWITCH PB TACT | 150058 |
| S5 | SWITCH PB TACT | 150058 |
| S6 | SWITCH PB TACT | 150058 |
| S7 | SWITCH PB TACT | 150058 |
| S8 | SWITCH PB TACT | 150058 |

◇ **HEADPHONE PCB 050332**

| Ref No. | Description | Part No. |
|---------|-----------------|----------|
| 1 | PCB Part Number | 129634 |
| 2 | LOGO | |
| J1 | HEADPHONE JACK | 117881 |
| J2 | CONN 12 PIN FFC | 117720 |

NOTES

REPACKING INSTRUCTIONS

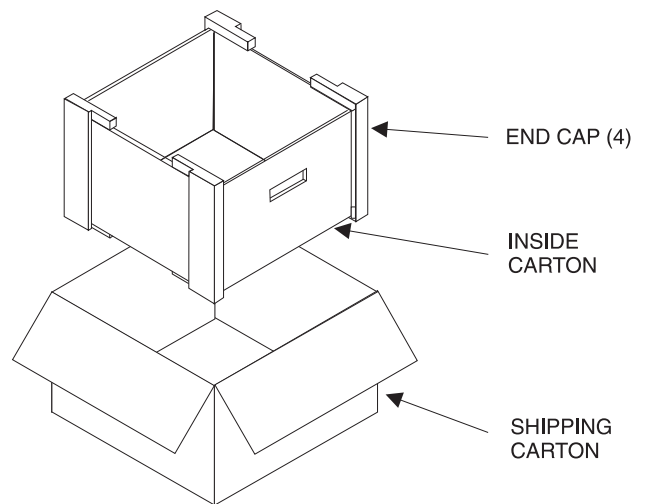
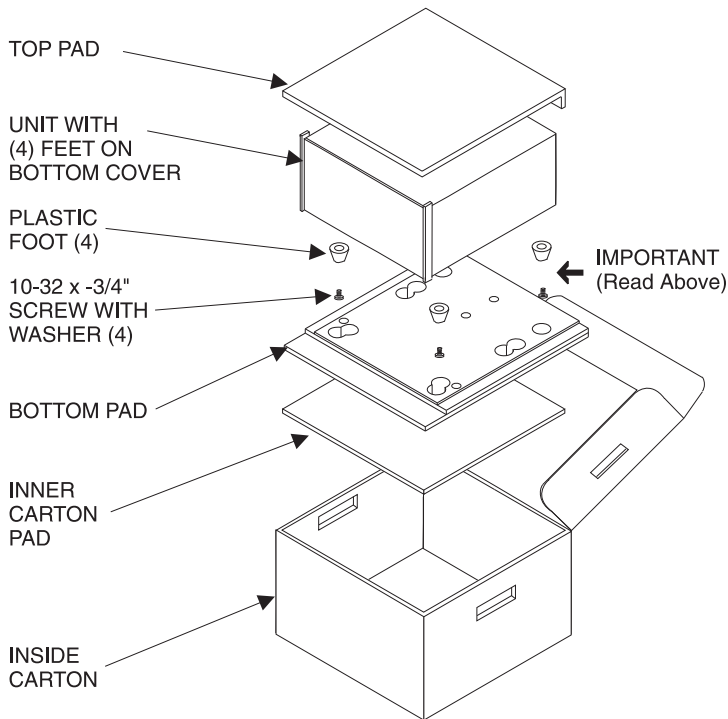
In the event it is necessary to repack the unit for shipment, the unit must be packed exactly as shown below.

IMPORTANT - The four plastic feet must be attached to the bottom of the unit so they will locate in the four holes of the bottom pad. Failure to do this will result in shipping damage.

If a shipping carton or any of the interior parts is needed, please call or write the Customer Service Department of McIntosh Laboratory. Order parts from the accompanying list by part number.

Use the original shipping carton and interior parts only if they are in good serviceable condition.

| Qty. | Part No. | Description |
|------|----------|-----------------------------|
| 1 | 033838 | Shipping carton only |
| 4 | 033837 | Foam end cap |
| 1 | 033836 | Inside carton only |
| 1 | 033725 | Top pad |
| 1 | 034301 | Bottom pad |
| 1 | 034037 | Inner carton pad |
| 4 | 017937 | Plastic foot |
| 4 | 100159 | #10-32 x 3/4" Machine screw |
| 4 | 104083 | #10 x 7/16" Flat washer |



C220

TUBE PREAMPLIFIER

SERIAL NO. WS1001 And Above



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