

ARCAM

DELTA 110 PREAMP SERVICE MANUAL

DELTA 110 PREAMPLIFIER SERVICE MANUAL

ISSUE 1 Serial No. 0001 -

(Paul Newton December 90)

Arcam Drawing No. H04/0010

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CIRCUIT DESCRIPTION (mother PCB)**Disc Stage** (circuit diagram sheet 1)

The Delta 110 disc stage consists of a two stage amplifier providing the RIAA equalization and amplification for both moving coil and moving magnet cartridges, and a plug-in board giving 21dB boost for moving coil cartridges. The MC/MM selection is by a rear panel switch.

IC Z1 is a low noise low offset op amp which provides gain of 19dB. The RC network R5 and C2 forms a low pass filter to form the passive high frequency part of the RIAA deemphasis. The negative feedback loop around IC Z2 provides the active low frequency correction of the de-emphasis. The CR network of C4, C5 and R11 provides a 12Hz high pass filter to remove turntable rumble.

Input/output selection (circuit diagram sheet 3 & 4)

The selected listen input is passed via a relay to the line amplifier Z5 and then onto the volume control. The required source to be recorded is selected by an 8 input multiplexer, Z3 (74HC4051) and then passed on to the record amplifier Z4 and finally to the tape out sockets of the preamplifier.

The multiplexer is powered from the +/- 15V rails via 4V7 zeners to provide the correct voltage for the TTL circuit. Selection of the source to be recorded is done by taking the select inputs S0, S1, S2 high, to give the required binary input, and by holding the enable pin (pin 6) low.

The line amplifier is powered from the +/- 16V rails and the record amplifier from +/- 15V rails (see circuit sheet 2) and decoupled by capacitors C257-264 inc.

Volume Pot Drive (circuit diagram sheet 4).

The motor drive circuit works by turning on either Q335 for volume up or Q332 for volume down and so causing a positive or negative voltage of around 7V across the pot motor. Zeners D338 and D339 prevent excessive voltages appearing across the motor. The control signal of 5V to turn on the appropriate transistor comes from the microcontroller Z301 (PCB 80439) via inverters of Z309 (74HCU04)(sheet 6).

Output and Headphone amplifier (circuit diagram sheet 5)

The listen signal from the line amplifier reaches the output amplifier via the volume control RV1.

The output amplifier is Z41 and has a dc servo across it to maintain a low dc offset on the preamp outputs. The balance control is connected across the feedback of the output amplifier and can produce only about 10dB change in the left or right image - it cannot

mute 1 channel totally. The signal then passes onto the output sockets.

The signal from the wiper of the volume control also goes to the headphone amplifier Z43 (4560). Inserting a stereo jack in the headphone socket mutes the main outputs of the preamp by the action of the mute circuit (circuit diagram sheet 4) switching relay RLG on.

Pressing the mono button causes pin 2 of Z341A, which is used as a voltage comparator, to go low so that the output swings from -15V to +15V and turns fets Q342, Q343 off and so connects the left and right inputs together.

Pressing the mute button on the remote control causes the output of Z341B to change in the same way as the mono above and so turns fet Q341 off pulling the input to the line amplifier down and reducing the output by about 40dB. The control signal comes from pin 34 of the microcontroller Z301 (sheet 6).

Power Supplies (circuit diagram sheet 2)

The Delta 110 has two toroidal transformers - one to provide the supplies to the analogue stages and one for the digital.

The ac output of the digital transformer is full wave rectified to provide a +12V smoothed but unregulated dc rail.

The analogue transformer output is rectified and smoothed by D201-204 and C201, 202, 221, 222, 228, 229. The positive and negative 15V rails are formed from the rectified dc via 15V fixed regulators Z201 and 202.

The +/- 16V rails are regulated by Q201-204 and Q205-208 respectively. Zeners D205 and D206 with the V_{be} of Q203, Q207 provide the appropriate reference voltages.

The power on led is powered from a +5V rail, derived from the +12V digital supply via regulator Z310 (sheet 6). Resistor R209 limits the current through the led.

This +5V rail also powers all of the microcontroller circuitry (sheet 6) and is used for the mono and mute circuitry (sheet 5).

The unregulated +12V is used to power the relays, volume pot and mute relay driver IC, Z342 (sheet 4).

BITSTREAM PCB CIRCUIT DESCRIPTION (See digital audio board circuits)

Note: On the D110S the digital board is not fitted, although it can be at a later stage if required. Instead an extra line level input is available using the phono sockets fitted in place of the digital board and is selected by pressing either the digital or optical buttons on the front panel.

Data (circuit diagram sheet 1)

An input signal to the bitstream pcb can be either from the coaxial or optical input. The coaxial input is amplified by Z201A and is selected when DIG1 is high. An optical input signal is selected when DIG2 is high. Data from the selected input passes through Z202C.

A data output buffered by Z201C,D is sent via isolating transformer L201 to the digital output. The data also passes via Z201E,F to the custom IC Z211.

Muting (circuit diagram sheet 1)

Z202A and the associated components detect the presence of data and cause MUTE to go low to disable an external mute circuit.

Clock extraction (circuit diagram sheet 1)

Pulses on each data transition are produced on the ex-or gate Z205A output by a combination of data and delayed data through Z204A-D. The pulses excite resonance in either L203 or L204 depending on whether the signal sampling frequency is 44.1 or 48kHz. This resonance generates a clock waveform at TP1 or TP2. Level detection circuitry based on Q201 and Q202 determines which coil is in resonance and comparator Z209 selects the correct clock signal via Z208A or B.

The clock frequency produced is 5.6448MHz for a 44.1kHz sampled input (CD) or 6.144MHz for 48kHz (DAT) sampling.

Custom IC/VCO (circuit diagram sheet 2)

The custom ic, Z211, takes the incoming data and reformats it for the DAC inputs. To do so requires a system clock of twice the detected clock e.g. 11.2896MHz for CD. This system clock is generated by the VCO, Z212. Control of the VCO frequency is via a phase detector within the custom IC and VCO loop filter C215, C235 and associated components.

Data Polarity (circuit diagram sheet 2)

The custom ic can only recognize the incoming data in one form. Depending on the unit connected to the bitstream board input, the data stream can either be of this "normal" form or inverted. If the data stream is inverted, a detection circuit connected to WSAB (pin 27) of the custom IC recognises this state and sets the D type flip-flop Z206A.

The output from Z206A will then give a second inversion in ex-or gate Z205B and so the incoming data to the custom ic becomes "normal".

Bitstream DACs (circuit diagram sheet 3)

There are 2 bitstream DACs. One receives Left+ and Left- data, the other Right+ and Right- data for a differential mode (push-pull) output. They are powered by separate digital and analogue 5V supplies regulated by Z3,103 and Z4,104. There is also a 2.5V voltage reference Z5,105.

The differential audio outputs appear on INTL (pin 10) and INTR (pin 44) on the bitstream IC.

Because of the nature of the bitstream conversion process there is a lot of above audio band noise present. This is filtered by C6,7,10,11 and 12. The audio outputs feed a differential amplifier Z2 which converts the audio signal to a single ended signal.

De-emphasis (circuit diagram sheet 3)

When the custom IC detects a de-emphasis flag on the incoming data FET Q1 is switched on via Q203. De-emphasis network C13,C14 and R14 then provide the necessary additional filtering.

DISASSEMBLY OF DELTA 110 FOR SERVICING

Access to mother PCB

1. Remove volume knob and balance knob with 1.5 A/F allen key.
2. Remove the 5 screws marked with from the rear panel and base plate.
3. Remove the 5 M4 screws from inside the unit.
4. Remove the 2 screws holding the power led pcb in place or unsolder the two led wires from the main pcb.
5. Unclip the display board ribbon cable from the main pcb.

The rear panel, with the main pcb attached will now slide out of the front and side panel framework.

Refitting is a reversal of the above procedure.

Removal of Digital Audio PCB

1. Unplug the 6 and 14 way connectors from the audio board.
2. Unscrew the earth wire and the 2 screws from the rear panel holding the board in place.
3. Release the 2 pcb clips at the front edge of the audio pcb.

The board is now free.

To work on the underside of the board requires removal of the copper clad shield. This is held by 3 screws and is spaced off the pcb with 3 washers.

CHANGE OF MAINS VOLTAGE

WARNING - the unit **must** be unplugged from the mains when replacing the fuse or rewiring the transformer wires as the mains inlet and fuse are at mains potential even with the unit switched off.

To rewire the D110 for use at a different voltage rewire the primary of the transformers as shown below. The fuse rating is unchanged.

240V/220V WIRING

| | | |
|--------|-------------|-------|
| 0 | 0 | 0 |
| ORANGE | BROWN & RED | BLACK |
| 0 | 0 | 0 |

120V/110V WIRING

| | | |
|----------------|--|-------------|
| 0 | | 0 |
| ORANGE & BROWN | | BLACK & RED |
| 0 | | 0 |

BOARD MODIFICATIONS 06/11/91

MOTHER PCB

Aug 90

R4,104 changed from 470R to 220R to reduce the gain of the disc stage.

Nov/Dec 90

Some D110's have OP27 or LT1028 ic's in place of LM627 due to a difficulty in obtaining LM627.

Jan 91

Disc input earth terminal connected to chassis via 22nF capacitor to improve RF rejection of moving coil stage.

Oct 91

R46, 146 changed from 22R to 180R because LM627 ic was susceptible to instability under certain conditions. R42, 142 changed from 2K4 to 4K7 to make the volume control less sensitive.

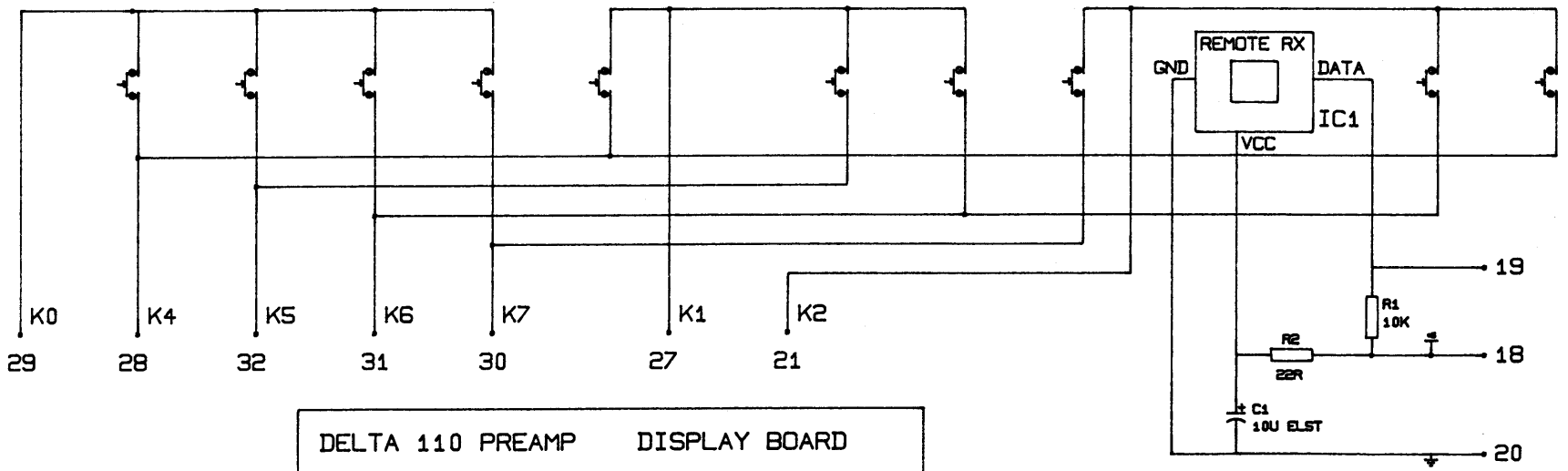
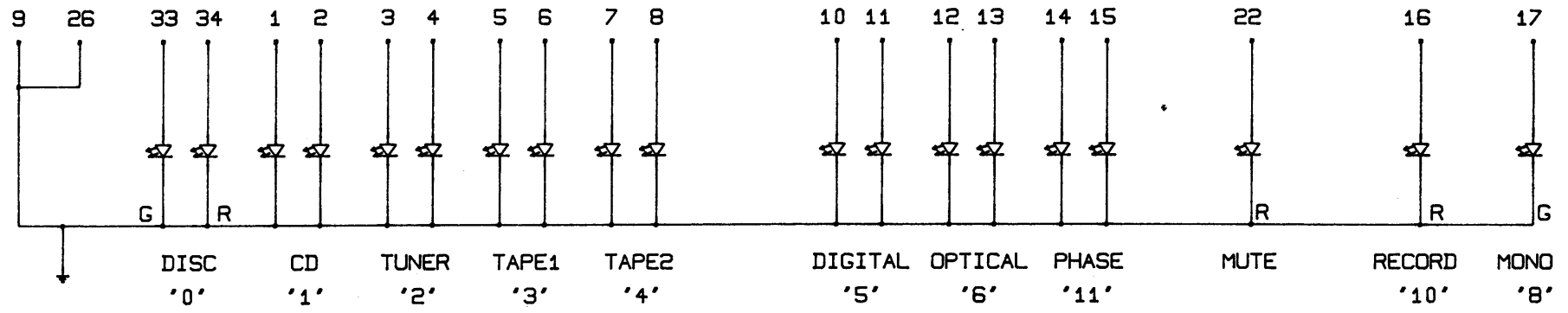
BITSTREAM PCB

Sept 90

R241,218 changed from 470K to 220K to prevent crackling on the co-axial input.

CIRCUIT DIAGRAMS

| No. | Title of Circuit |
|------------|--|
| | D110 Overall Block Diagram |
| 1 | Mother Board Disc Stage |
| 2 | Mother Board Power Supplies |
| 3 | Mother Board I/O & Control |
| 4 | Mother Board Relay Control & Mute |
| 5 | Mother Board Output Stage |
| 6 | Mother Board Microcontroller |
| 7 | Moving Coil Preamp (MCA) |
| 8 | Bitstream Board Input Circuit |
| 9 | Bitstream Board VCO & Arcam Chip |
| 10 | Bitstream Board DAC & Output Amplifier |
| 11 | Display Board |



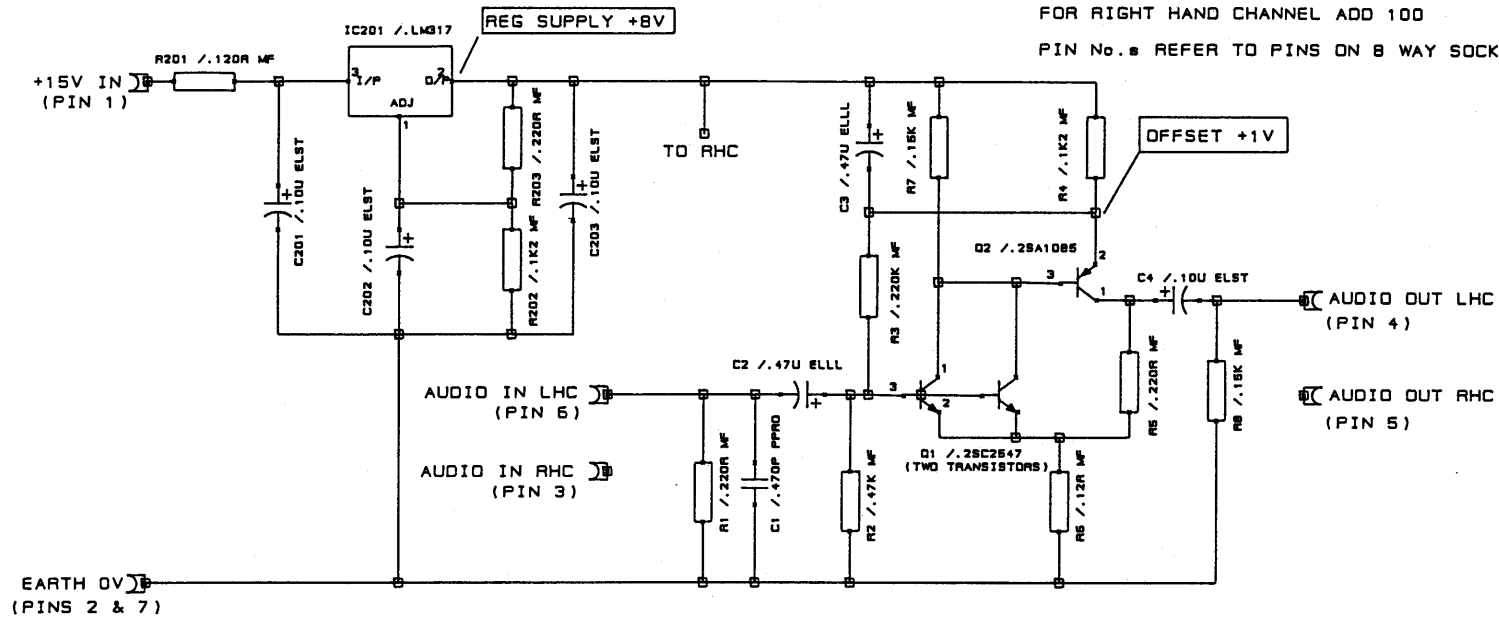
DELTA 110 PREAMP DISPLAY BOARD
 ISSUE 3 2-3-90 DWG. NO. C02/0013

MCA MOVING COIL BOARD

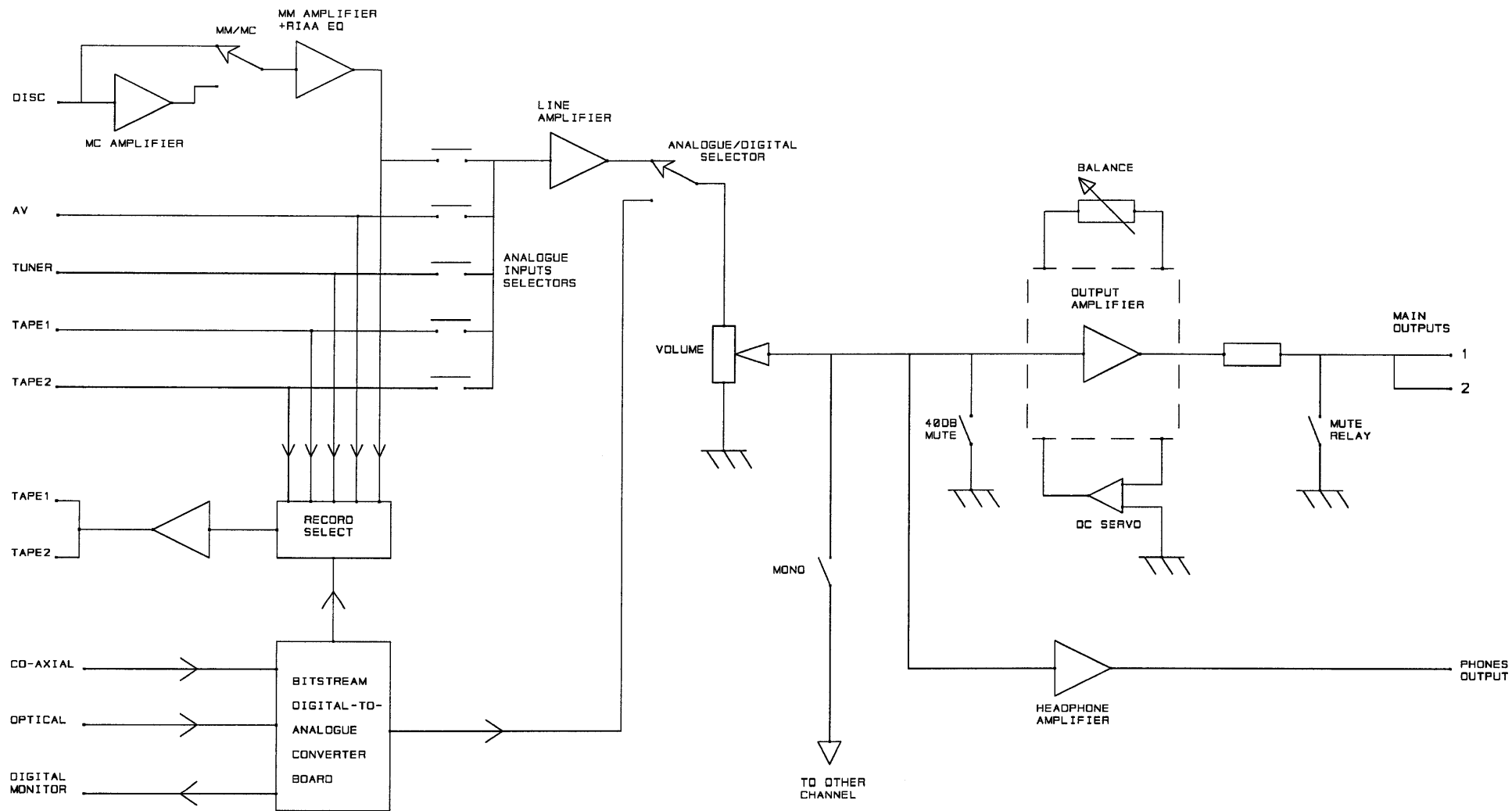
LEFT HAND CHANNEL ONLY SHOWN

FOR RIGHT HAND CHANNEL ADD 100

PIN No. s REFER TO PINS ON 8 WAY SOCKET



| | | | | |
|-------------------------------------|--------------|---------|----------------------|---------|
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| DRAWN BY | JMG/PN | ISS | DATE | ECN NO. |
| DATE DRAWN | 05/05/92 | TITLE | D110/ALPHA II MC PCB | |
| SHT. 1 | OF. 1 | DRG NO. | C02/0058 | |
| SERVICE MANUAL DRW NO. H04/ | | SHT. | OF | |
| ARCAM. A & R CAMBRIDGE LTD, CB5 9PB | | | | |

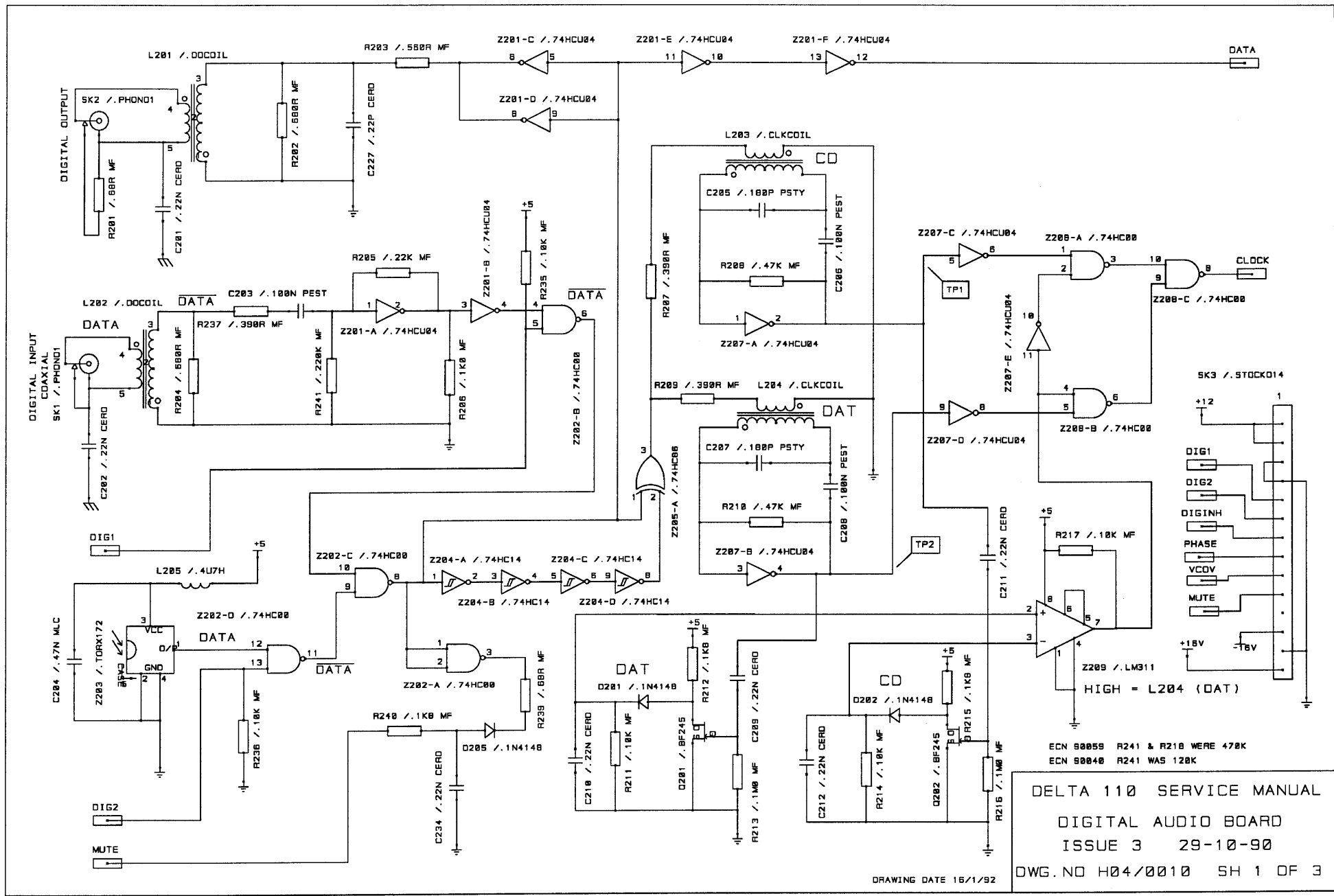


DELTA D110 PREAMP

BLOCK DIAGRAM - ANALOGUE SIGNAL PROCESSING

25-4-90

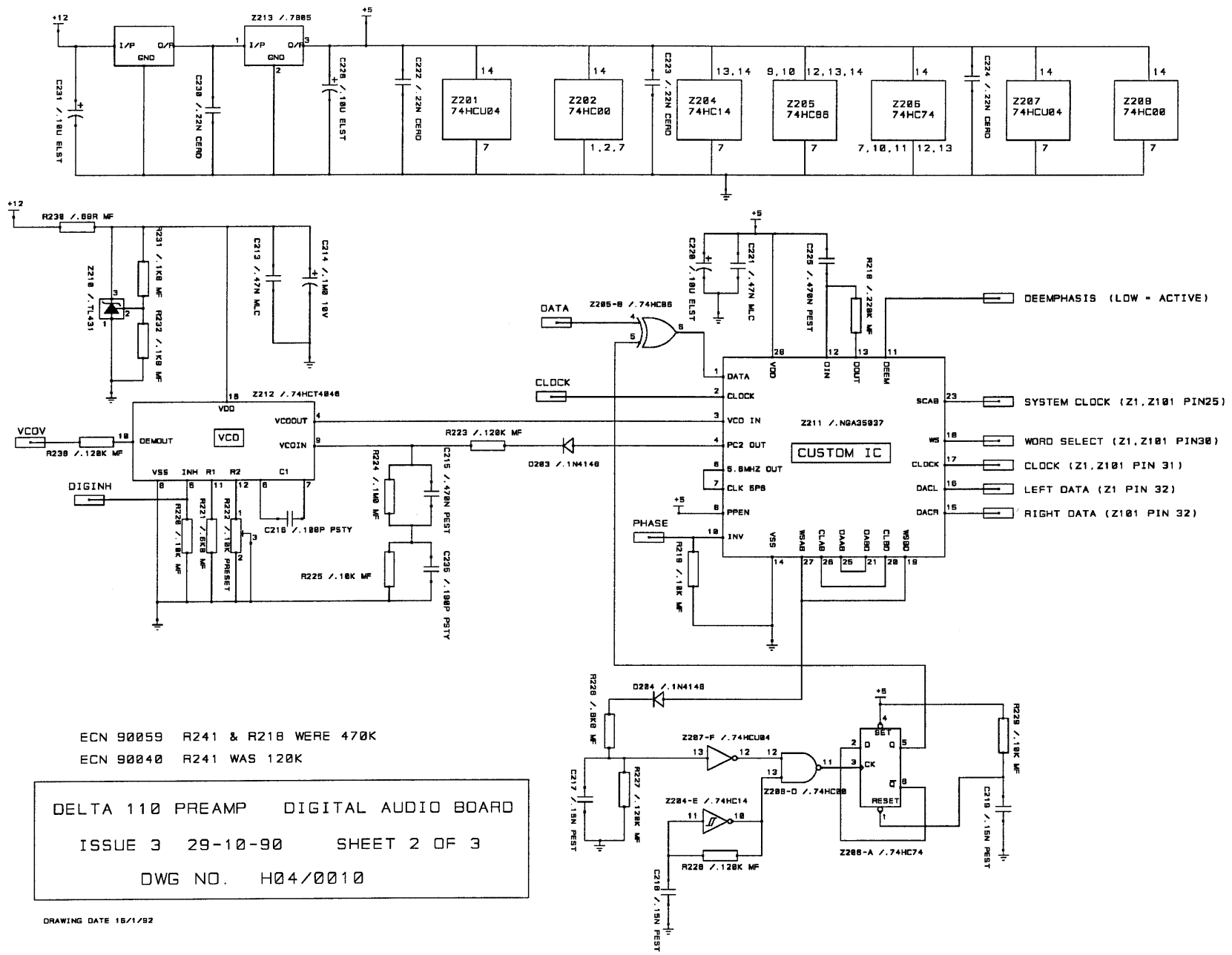
DRAWING DATE 18/1/92



ECN 90059 R241 & R218 WERE 470K
 ECN 90040 R241 WAS 120K

DELTA 110 SERVICE MANUAL
 DIGITAL AUDIO BOARD
 ISSUE 3 29-10-90
 DWG.NO H04/0010 SH 1 OF 3

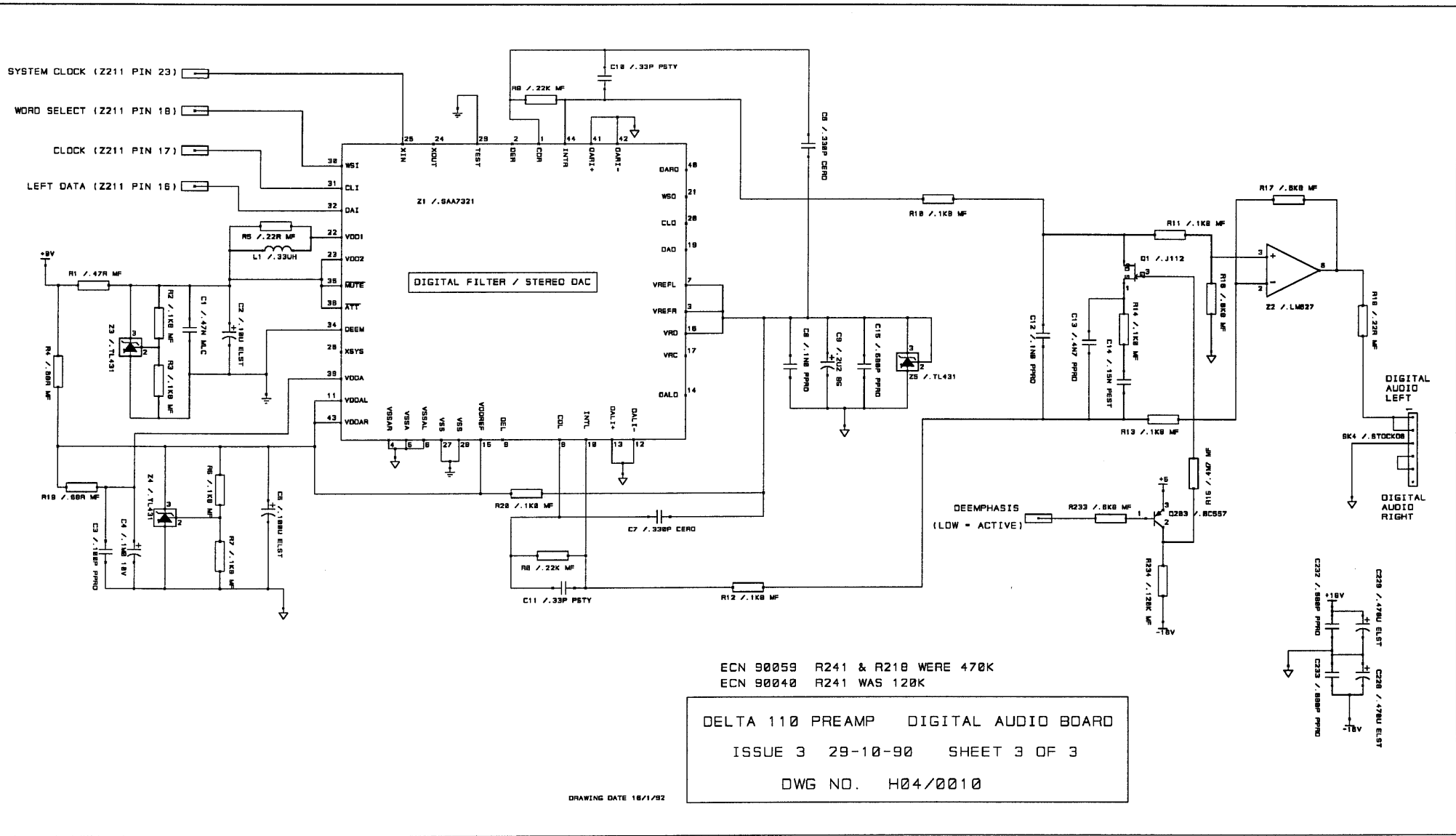
DRAWING DATE 16/1/92

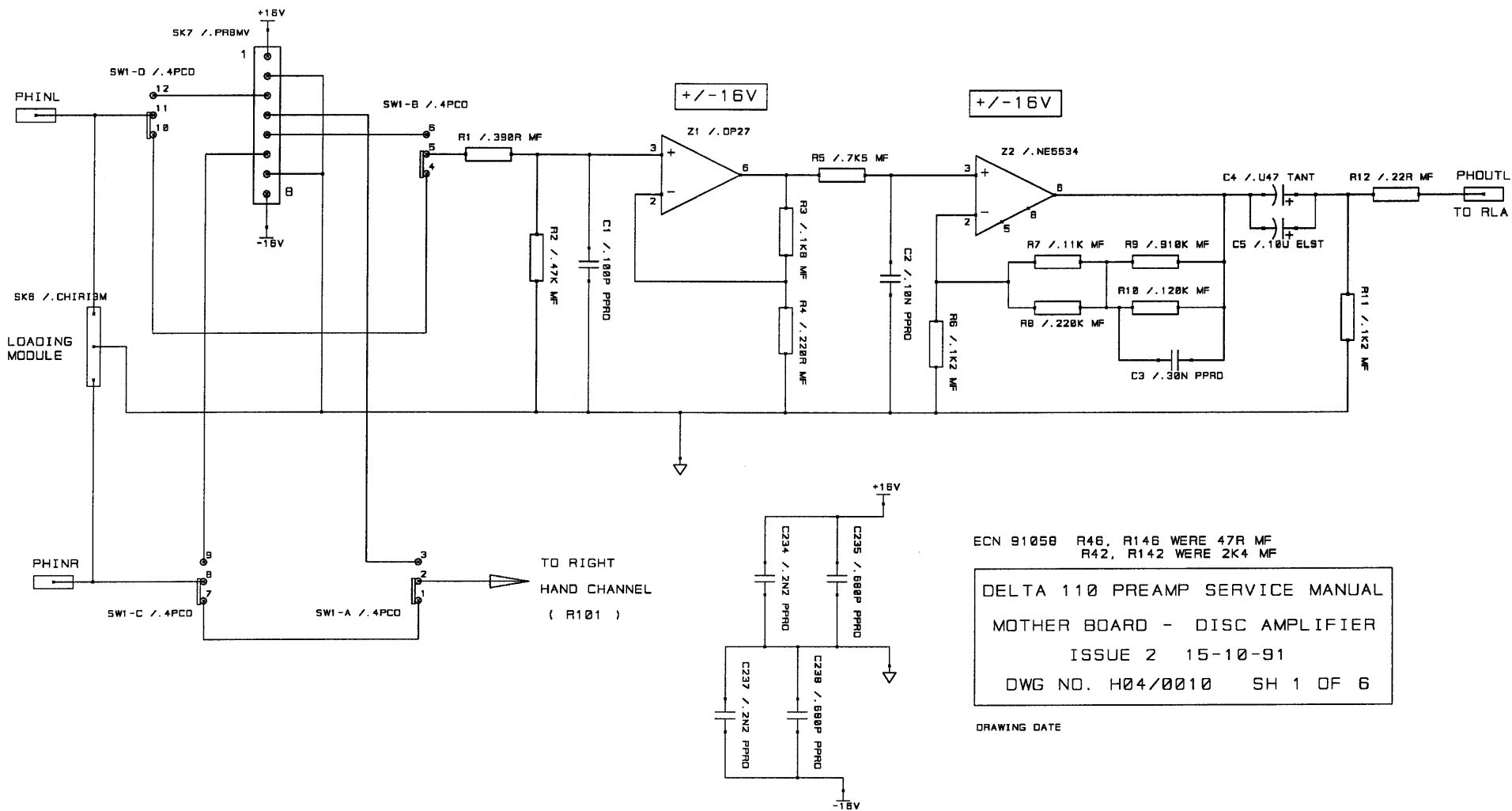


ECN 90059 R241 & R218 WERE 470K
 ECN 90040 R241 WAS 120K

DELTA 110 PREAMP DIGITAL AUDIO BOARD
 ISSUE 3 29-10-90 SHEET 2 OF 3
 DWG NO. H04/0010

DRAWING DATE 18/1/92





ECN 91050 R46, R146 WERE 47R MF
 R42, R142 WERE 2K4 MF

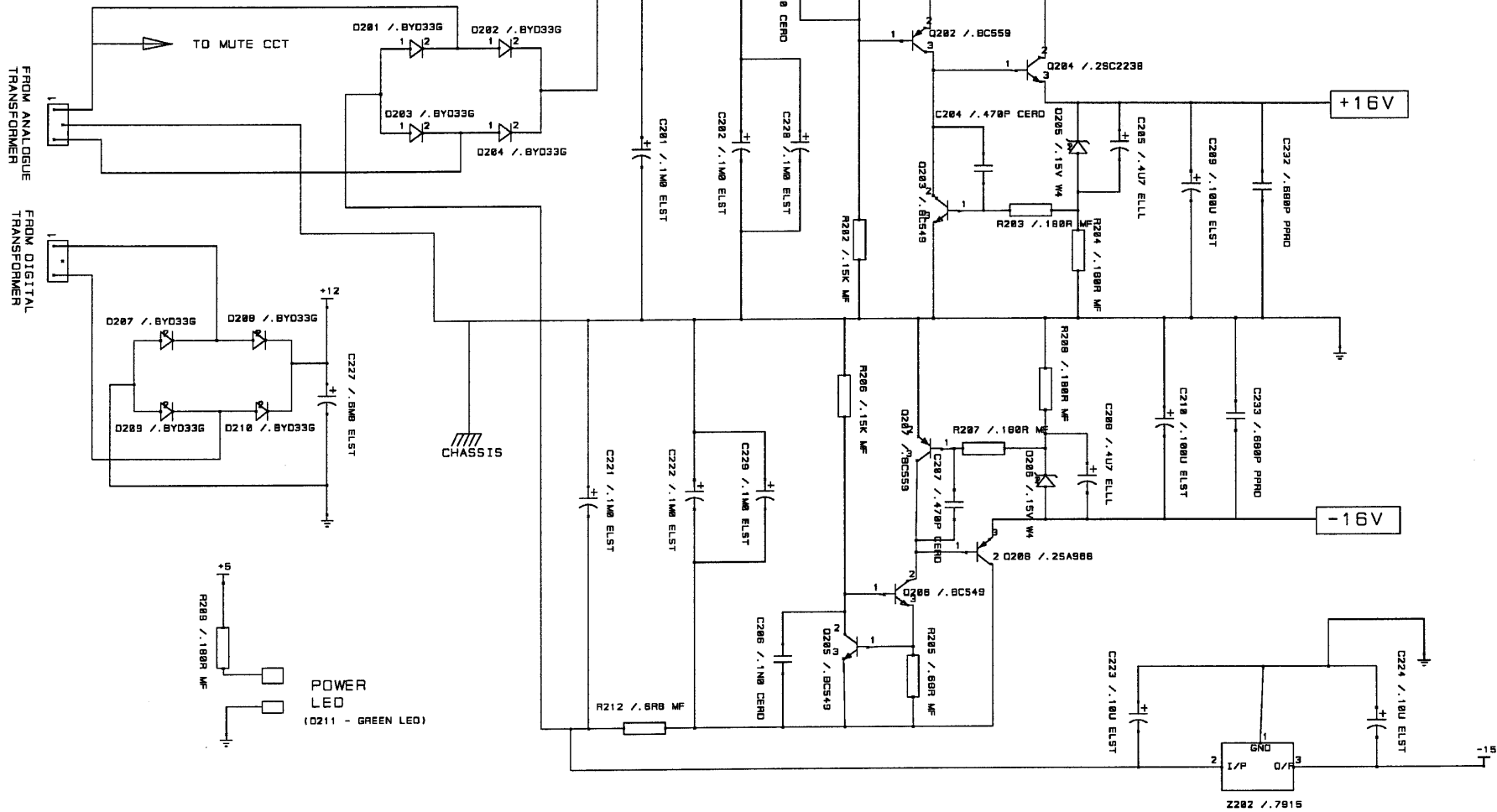
DELTA 110 PREAMP SERVICE MANUAL
 MOTHER BOARD - DISC AMPLIFIER
 ISSUE 2 15-10-91
 DWG NO. H04/0010 SH 1 OF 6

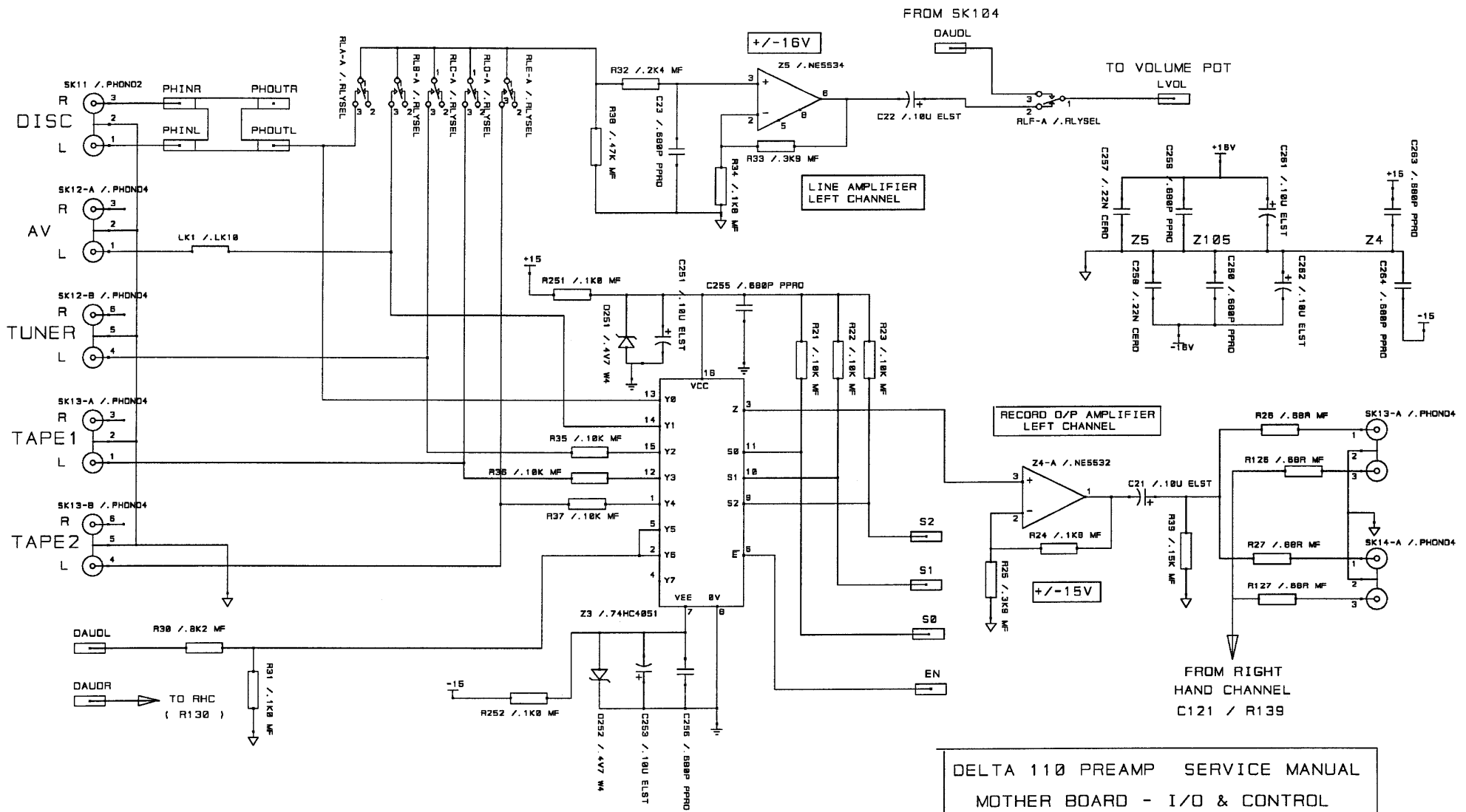
DRAWING DATE

DELTA 110 PREAMP SERVICE MANUAL
 MOTHER BOARD - POWER SUPPLIES
 ISSUE 2 15-10-91
 DWG NO. H04/0010 SHEET 2 OF 6

DRAWING DATE 15/1/92

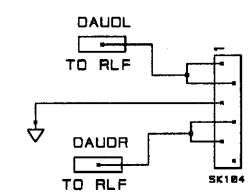
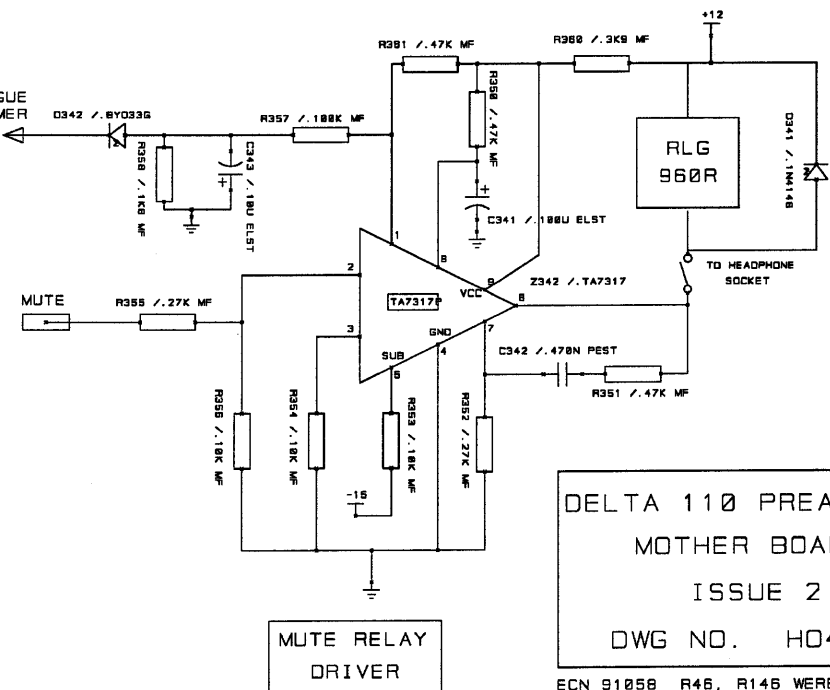
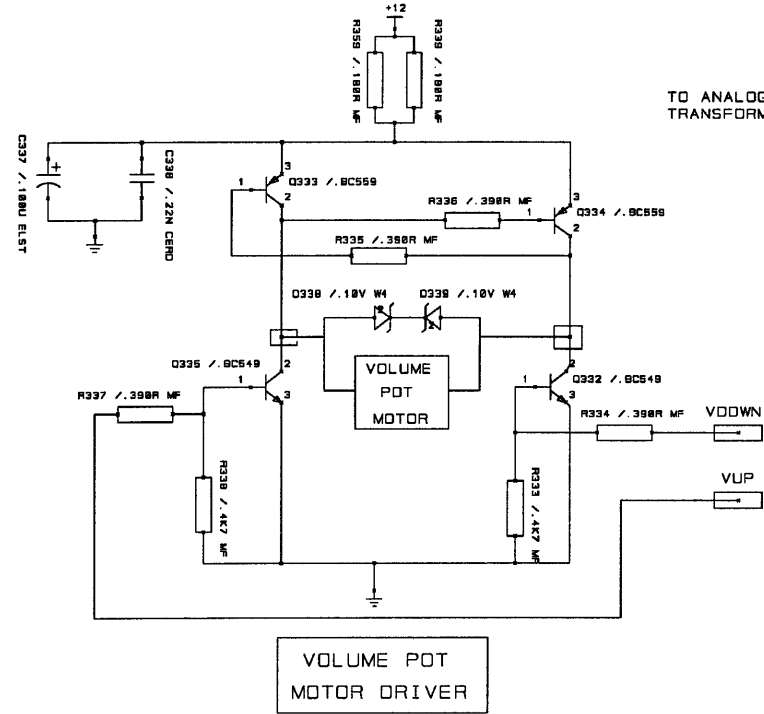
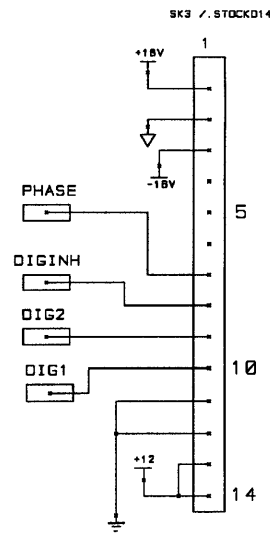
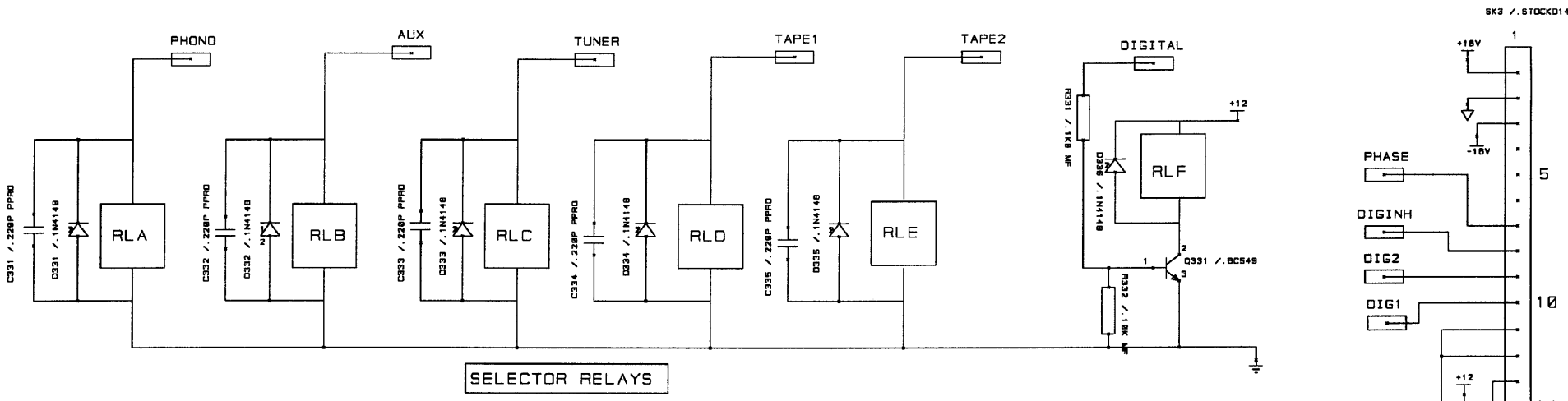
ECN 91058 R46, R146 WERE 47R
 R42, R142 WERE 2K4





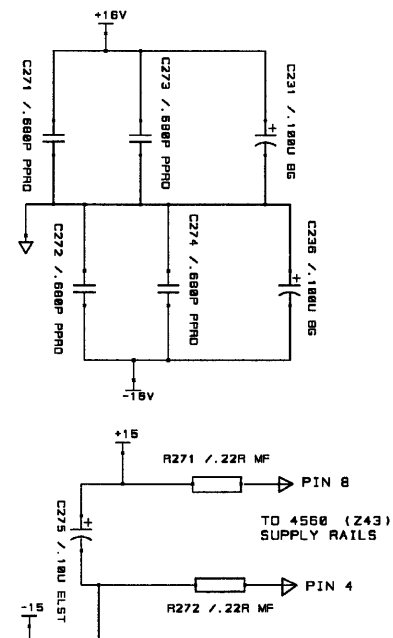
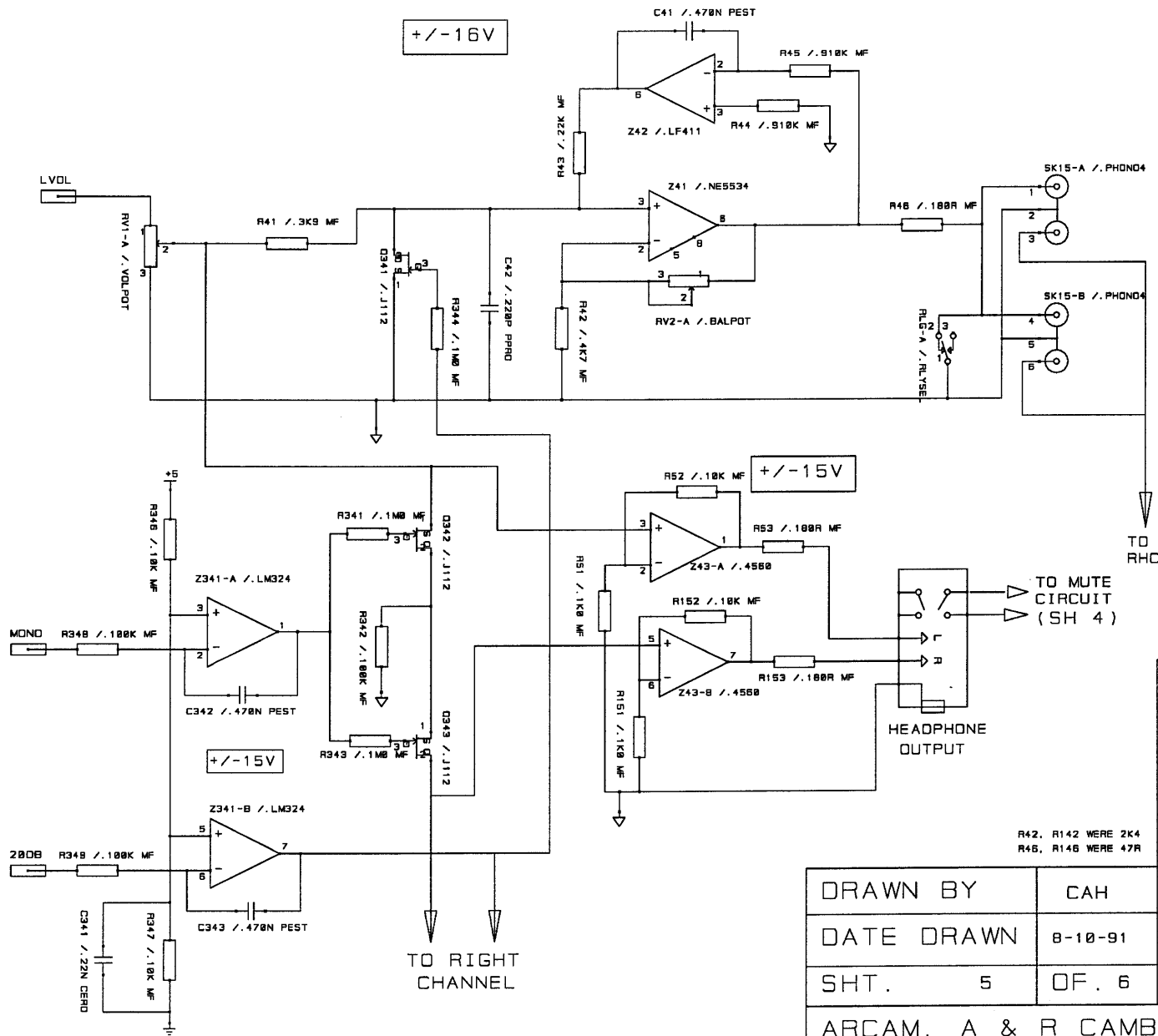
DELTA 110 PREAMP SERVICE MANUAL
 MOTHER BOARD - I/O & CONTROL
 ISSUE 2 15-10-91
 DWG NO. H04/0010 SH 3 OF 6

ECN 91058 R46, R146 WERE 47R
 R42, R142 WERE 2K4 DRAWING DATE 10/1/92



DELTA 110 PREAMP SERVICE MANUAL
MOTHER BOARD - CONTROL
ISSUE 2 15-10-91
DWG NO. HO4/0010 SH 4 OF 6

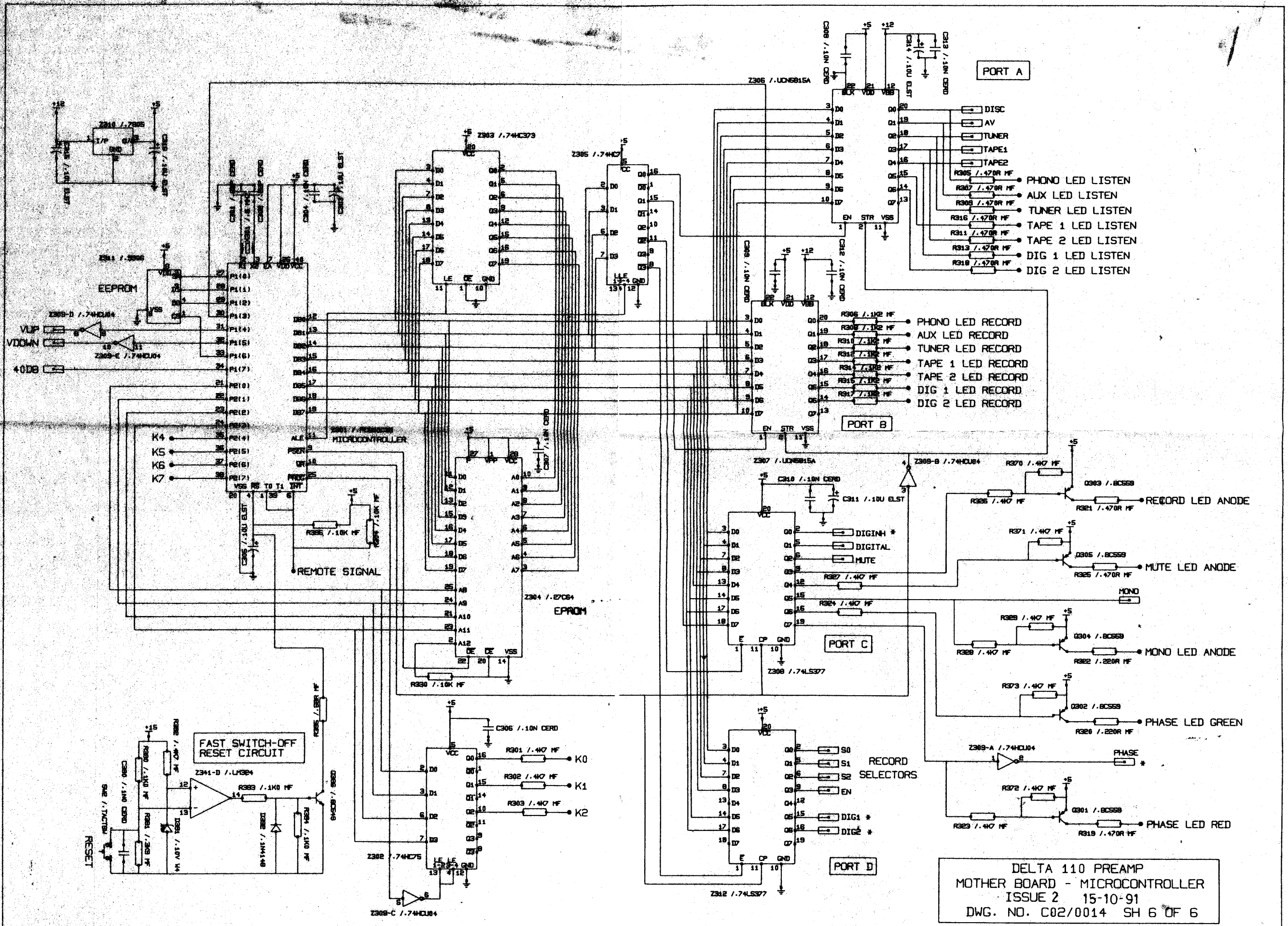
ECN 91058 R46, R146 WERE 47R R42, R142 WERE 2K4 DRAWING DATE 18/1/82



R42, R142 WERE 2K4
R45, R145 WERE 47R

| | | | | |
|-------------------------------------|----------|-----------------------------|------|------------------|
| 2 | 15-10-91 | 91058 | | |
| DRAWN BY | CAH | ISS | DATE | ECN NO. |
| DATE DRAWN | 8-10-91 | TITLE | | DELTA 110 PREAMP |
| | | MOTHER BOARD - OUTPUT STAGE | | |
| SHT. | 5 | OF. | 6 | DRG NO. |
| | | H04/0010 | | |
| ARCAM. A & R CAMBRIDGE LTD, CB5 9PB | | | | |

DRAWING DATE 16/1/92



DELTA 110 PREAMP
 MOTHER BOARD - MICROCONTROLLER
 ISSUE 2 15-10-91
 DWG. NO. C02/0014 SH 6 OF 6

* - INDICATES THAT THE SIGNAL GOES TO THE DIGITAL AUDIO BOARD