

**ARC**

**DELTA B  
BITSTF  
SERVIC**

**DELTA BLACK BOX 3 SERVICE MANUAL ISSUE 1**

(Paul Newton January 91)

Arcam Drawing No. H04/0014

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The +/- 16V rails are regulated by D205 and D206 with the feedback network consisting of resistors and also the multiplier resistors. The +5V regulated supply is derived from the unregulated 12V line through a network of resistors and also the multiplier resistors. The 12V line also goes to the unregulated 12V line.

### **Filters and output stage**

The audio output from the op amp is filtered by a network of capacitors and RC networks R1, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100. Low offset op amp Z2 for the audio output. Two audio outputs are provided for connection to a speaker or headphones. The output is around 0.8V for connection to a speaker. A volume control divider formed by R9 and R10.

The output relay mutes the audio output when the system is being transmitted to other systems. The relay is controlled by the components around Z1.

### **Bitstream Board**

#### **Data**

An input signal to the bitstream board is amplified by Z201. The signal is selected when Z202C is high.

A data output buffered by Z202B. The data also passes through Z202A.

#### **Muting**

Z202A and the associated components go low to disable an external input.

#### **Clock extraction**

Pulses on each data line are used to extract a clock signal. The combination of data and clock signals is used to generate a 48kHz clock signal in either L203 or L204 dependent on the system. This resonance is generated by the combination of the data and clock signals.

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 5.6448 MHz for a 44.1 KHz sampled input (CD) or 6.144 MHz for 48 KHz (DAT) sampling.

### **Custom IC/VCO**

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. 11.2896 MHz 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**

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 flipflop 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**

There are 2 bitstream DACs. One receives Left+ and Left- data, the other Right+ and Right- data for a differential mode (push-pull) output. There are 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.

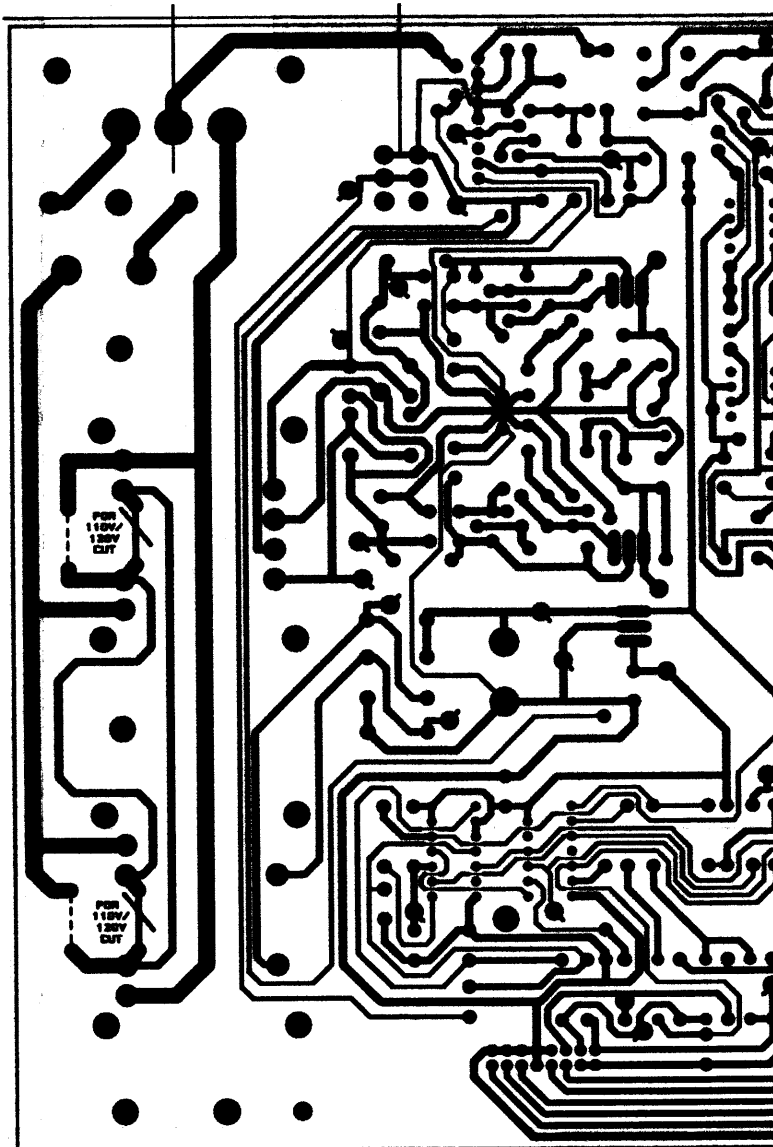
### **De-emphasis**

When the custom IC detects a deemphasis 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.

### CHANGE OF MAINS VOLTAGE

**WARNING** - The unit must be unplugged from the mains wiring or the mains fuse since the fuse is at mains potential when off.

To convert the Black Box 3 to work at a different mains voltage under the main pcb and adding 2 links (marked ----) (See diagram) links **must** be fitted to the underside of the pcb as they will be energized when unit is plugged in. The mains fuse value remains the same (



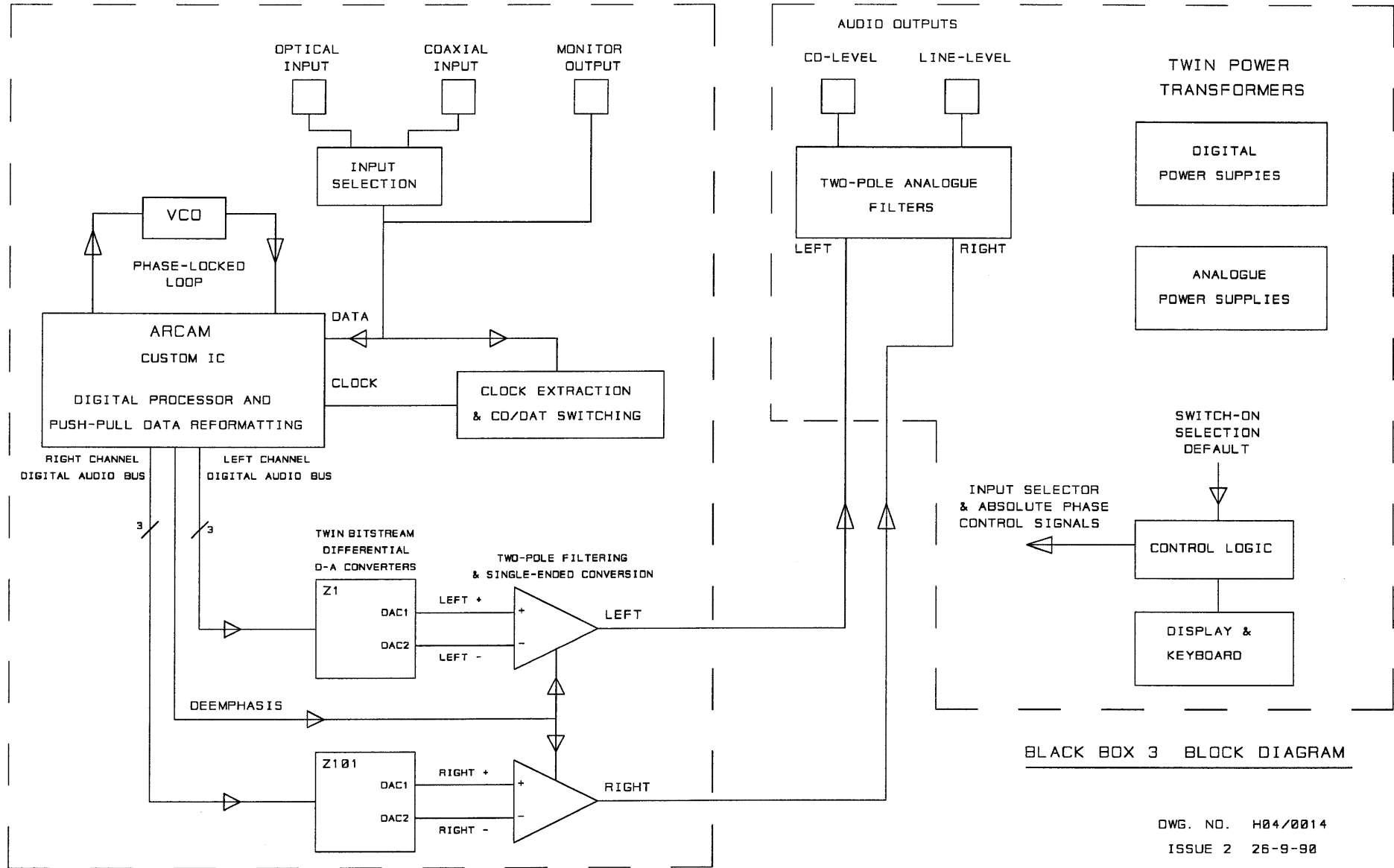
BLACK BOX 3 SE

CIRCUIT D

No.	TI
	Black Bo
1	Bitstream
2	Bitstream PC
3	Bitstream PCB
4	Mother F
5	Mother P
6	Mother F

PLUG-IN BITSTREAM DIGITAL TO ANALOGUE CONVERTER CARD

MOTHER BOARD



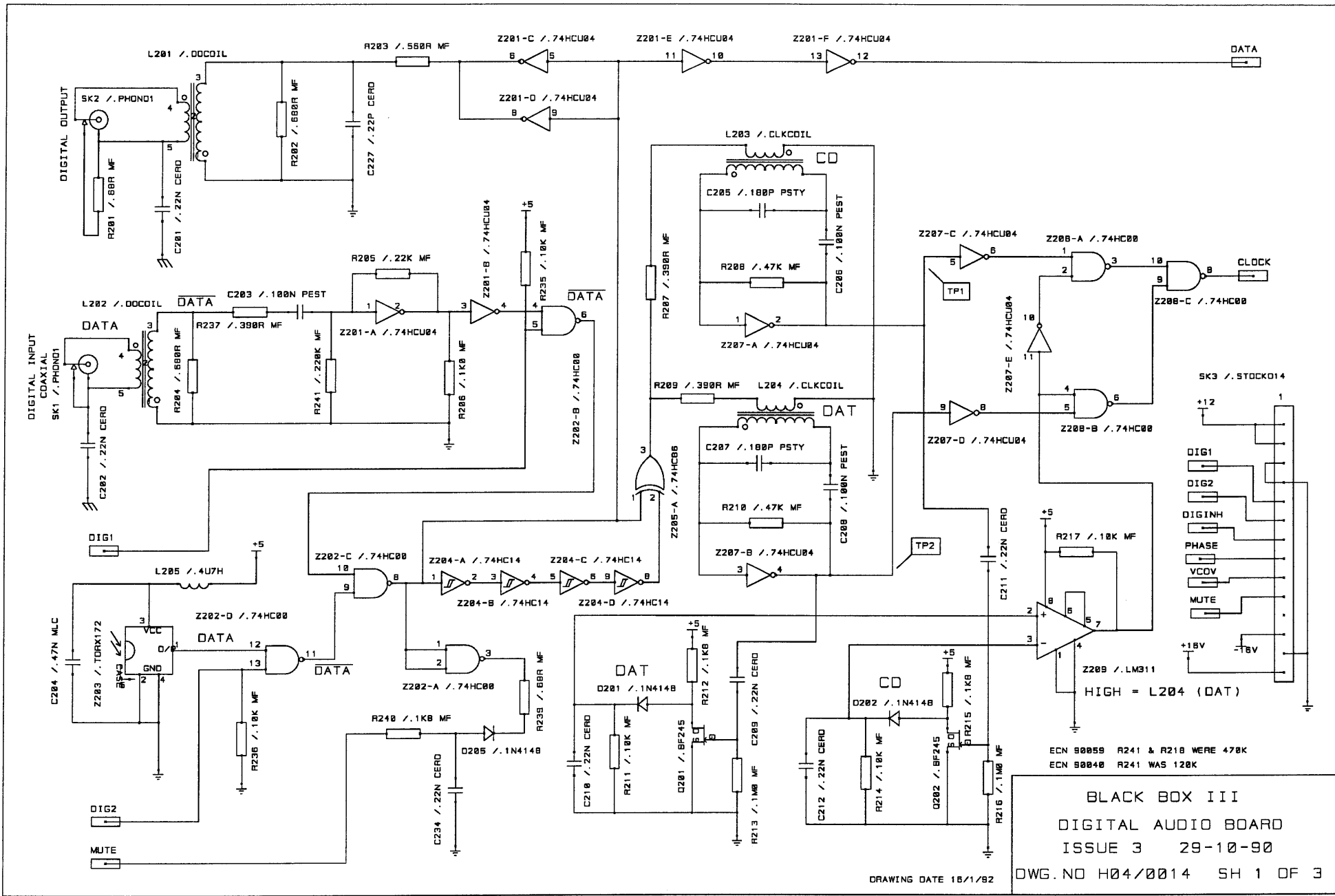
BLACK BOX 3 BLOCK DIAGRAM

DWG. NO. H04/0014

ISSUE 2 26-9-90

DRAWING DATE 16/1/92



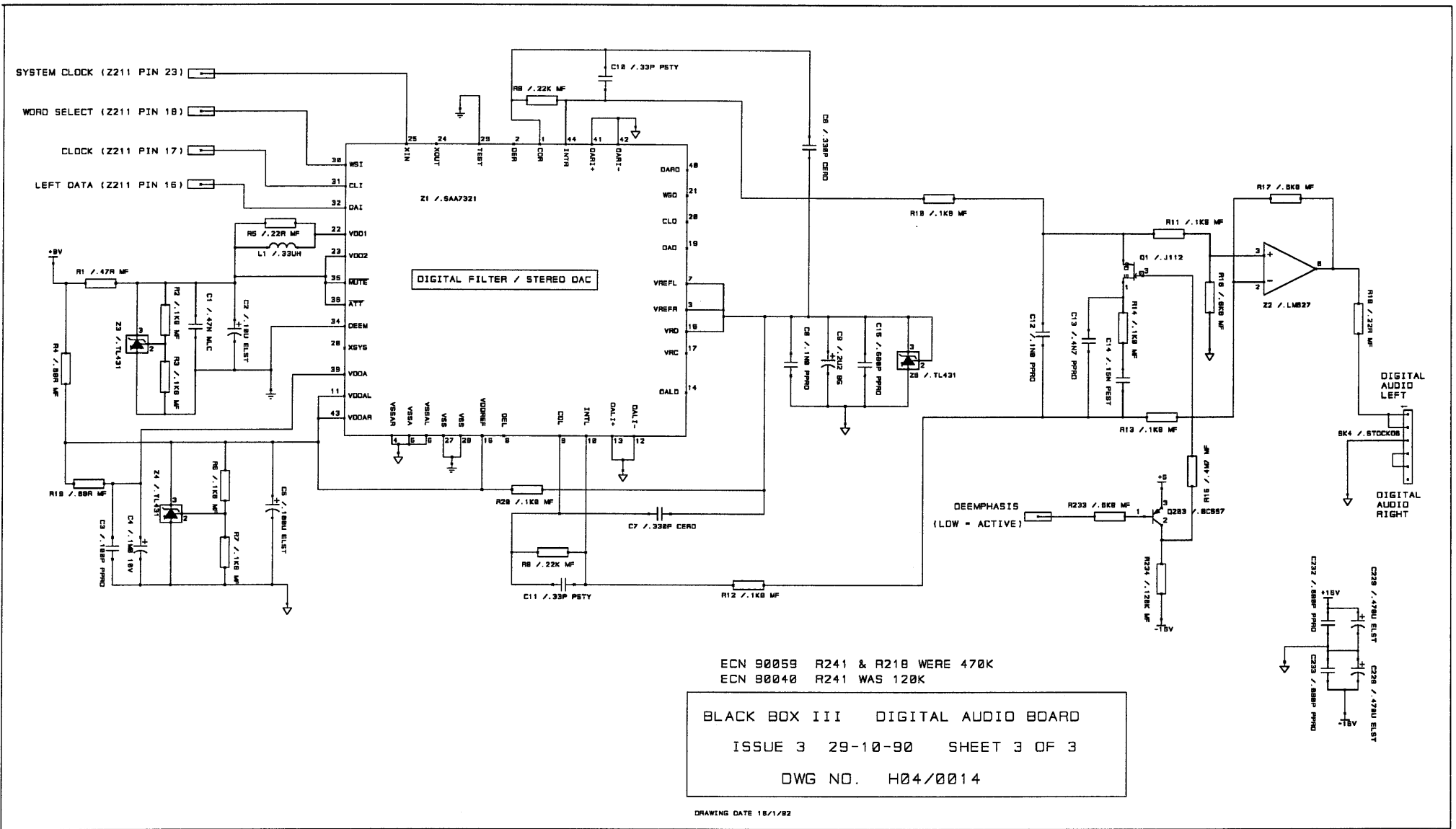


ECN 90059 R241 & R218 WERE 470K  
 ECN 90040 R241 WAS 120K

**BLACK BOX III**  
 DIGITAL AUDIO BOARD  
 ISSUE 3 29-10-90  
 DWG. NO H04/0014 SH 1 OF 3

DRAWING DATE 18/1/82

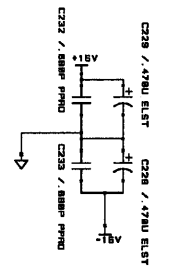


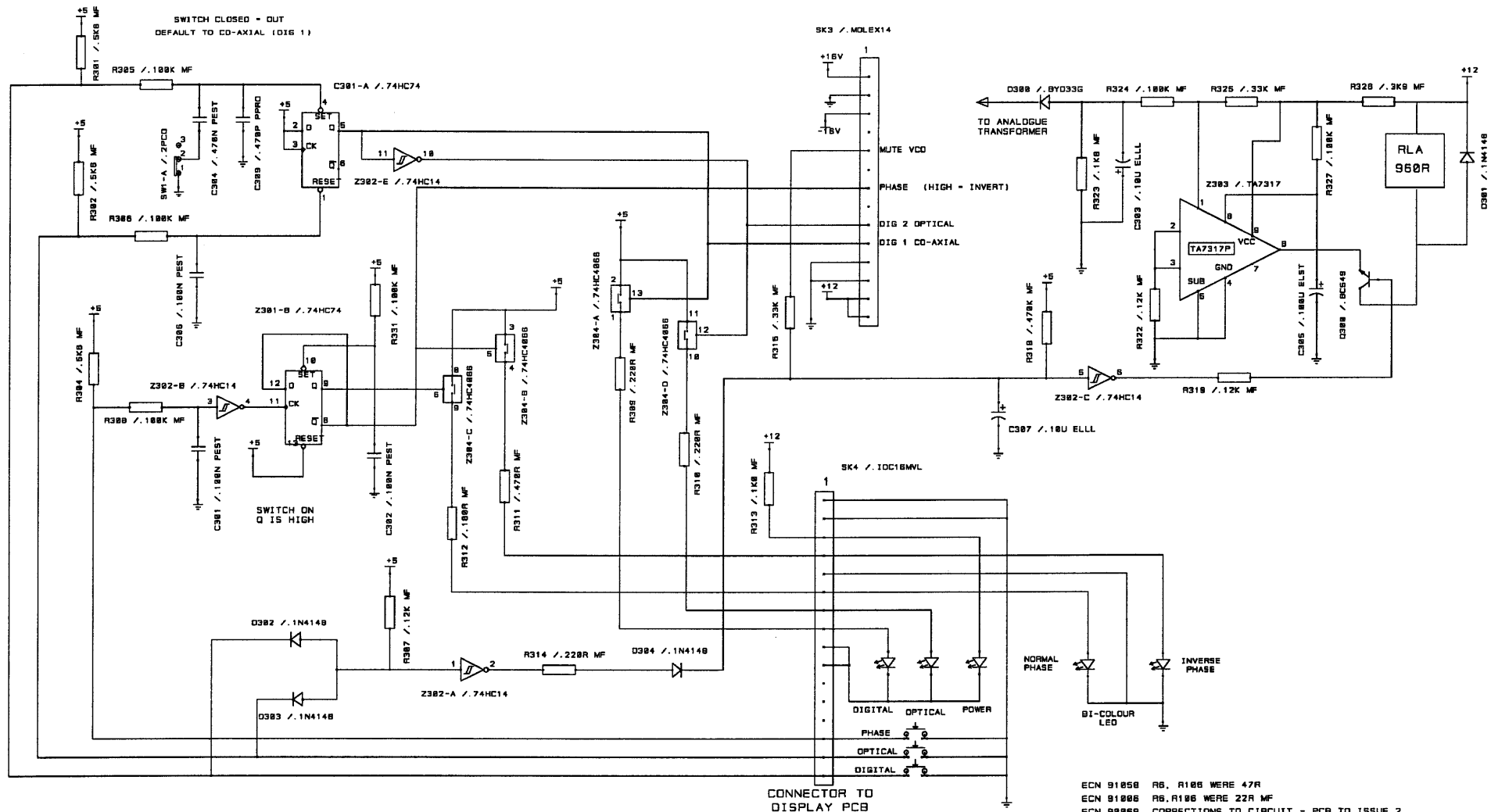


ECN 90059 R241 & R218 WERE 470K  
 ECN 90040 R241 WAS 120K

BLACK BOX III DIGITAL AUDIO BOARD  
 ISSUE 3 29-10-90 SHEET 3 OF 3  
 DWG NO. H04/0014

DRAWING DATE 15/1/92

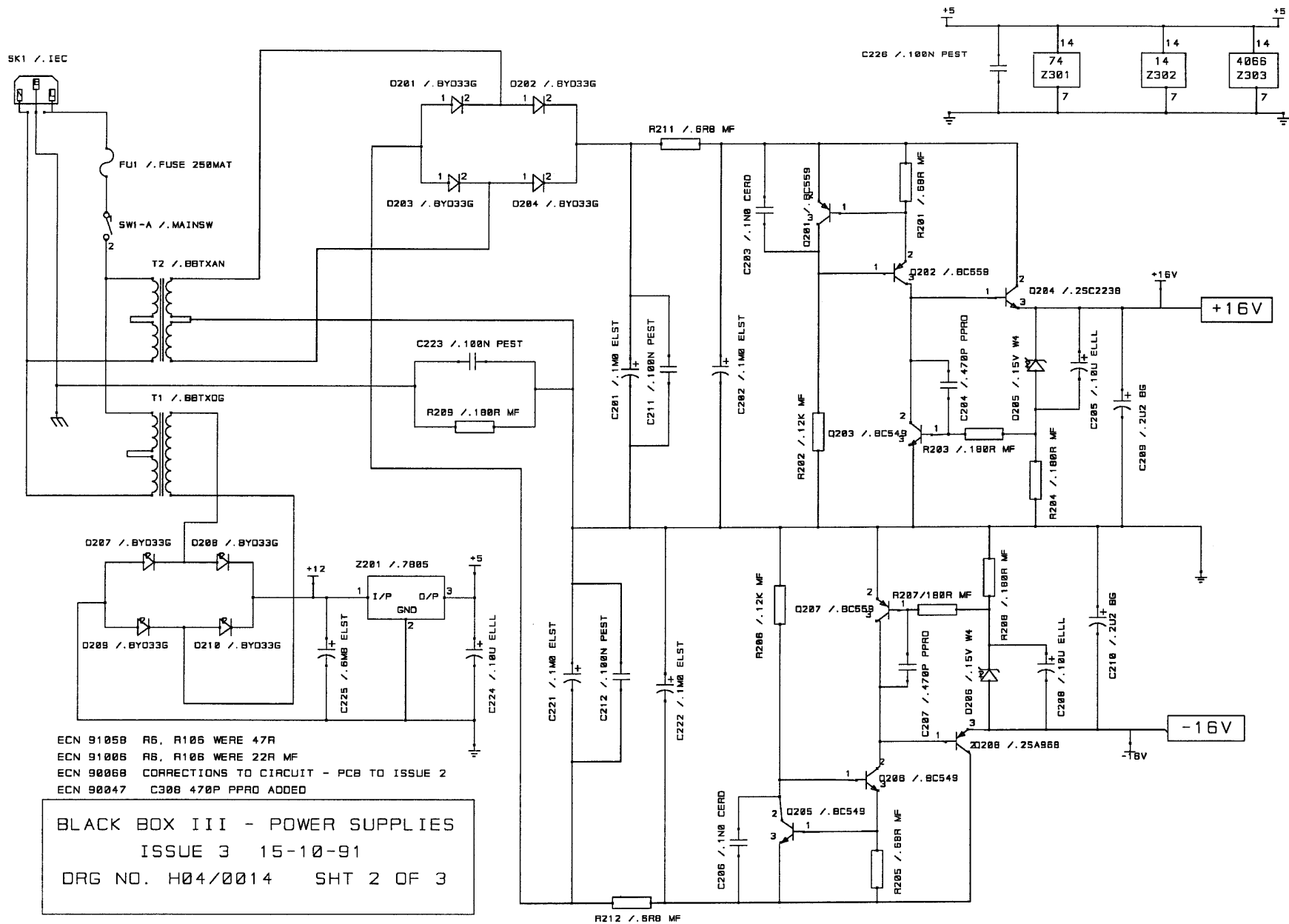




ECN 91058 R6, R106 WERE 47R  
 ECN 91006 R6, R106 WERE 22R MF  
 ECN 90068 CORRECTIONS TO CIRCUIT - PCB TO ISSUE 2  
 ECN 90047 C308 470P PPRQ ADDED

BLACK BOX III (BITSTREAM)  
 MOTHER BOARD - CONTROL  
 ISSUE 3 15-10-91  
 DWG. NO. H04/0014 SH 1 OF 3

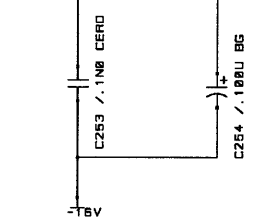
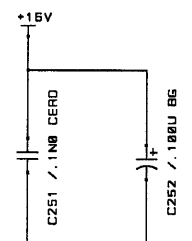
DRAWING DATE 18/1/92



ECN 91059 R6, R106 WERE 47R  
 ECN 91006 R6, R106 WERE 22R MF  
 ECN 90068 CORRECTIONS TO CIRCUIT - PCB TO ISSUE 2  
 ECN 90047 C308 470P PPRD ADDED

BLACK BOX III - POWER SUPPLIES  
 ISSUE 3 15-10-91  
 DRG NO. H04/0014 SHT 2 OF 3

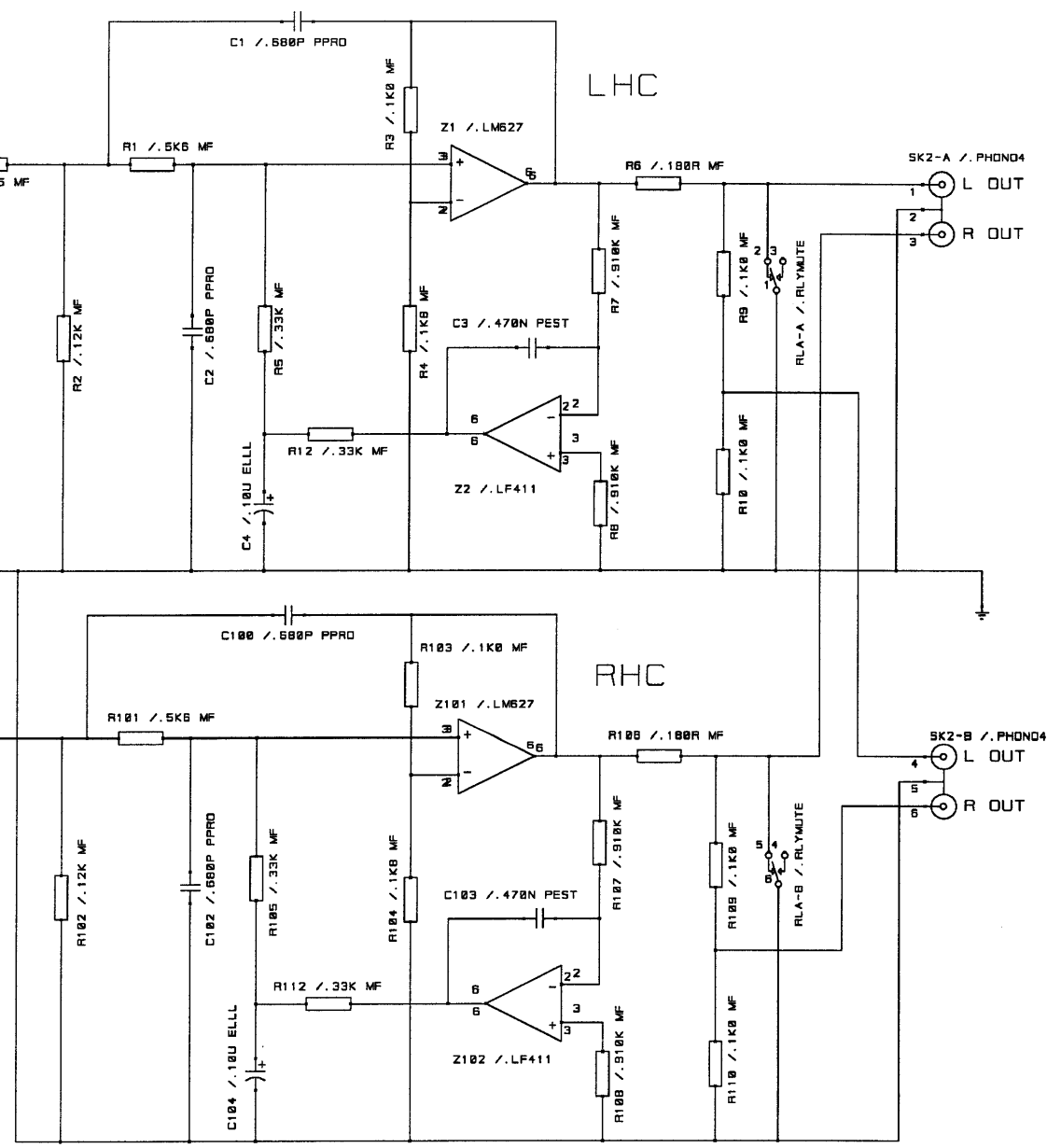
FROM DAC CARD  
LEFT CHANNEL  
RIGHT CHANNEL



ECN 91058 R6, R108 WERE 47R MF  
ECN 91008 R6, R108 WERE 22R MF  
ECN 90068 CORRECTIONS TO CIRCUIT - PCB TO ISSUE 2  
ECN 90047 C308 470P PPRD ADDED

BLACK BOX III (BITSTREAM)  
AUDIO STAGES  
ISSUE 3 15-10-91  
DRG NO. H04/0014 SH 3 OF 3

DRAWING DATE 15/1/82



LHC

RHC

SK2-A / PH0ND4  
1 L OUT  
2 R OUT  
3

SK2-B / PH0ND4  
4 L OUT  
5 R OUT  
6