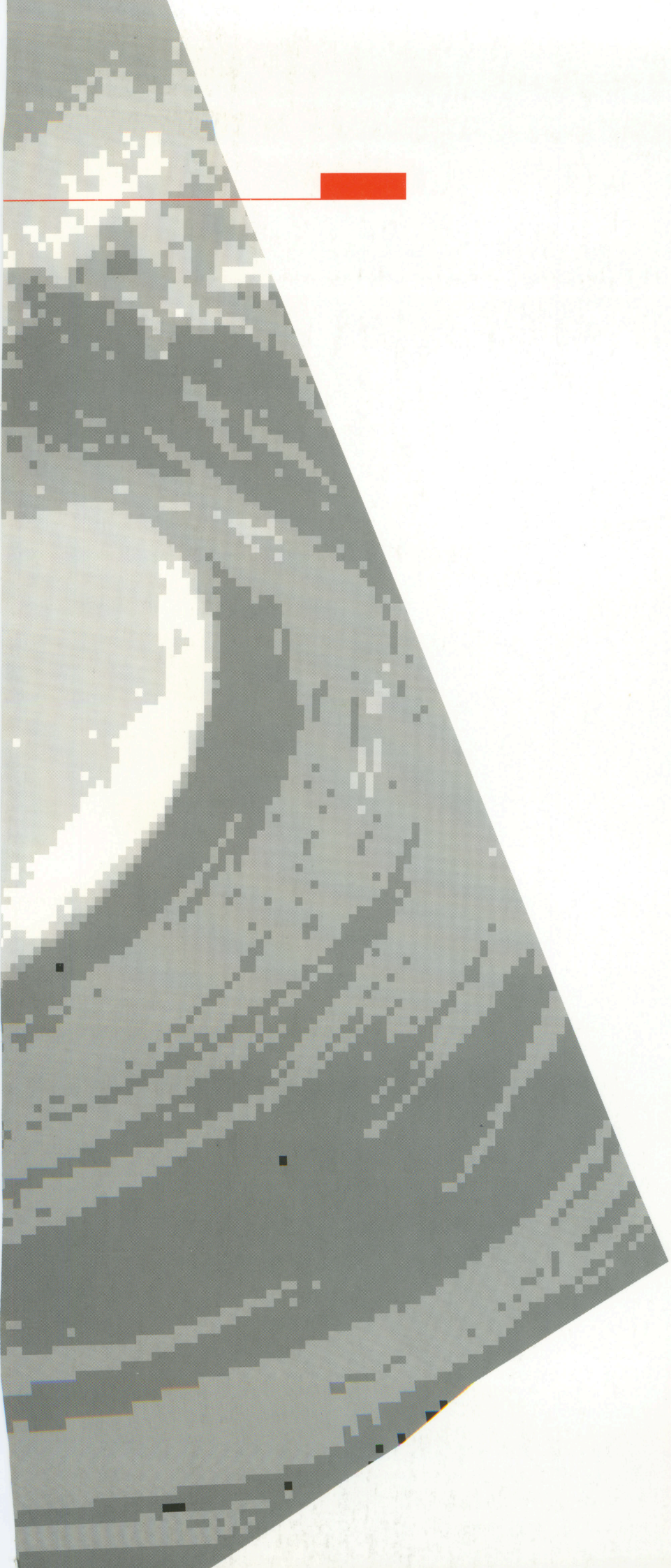


RE 204
Audio Analyzer
Service Manual

Volume II

re

11. A/D CONVERTER BOARD

11.1 Circuit Description

Fig. 11.1 shows the block diagram.

The A/D Converter Board comprises various subsections:

* Main Signal Conversion (16-bit A/D Converter)
* DC Input
* Peak Detector Conversion (8-bit, 4 Channel A/D Converter)
* Offset Calibration (Dual 8-bit D/A Converter)
* General Serial Bus Interface

11.1.1 Main Signal Conversion

Sheet 4 of the schematic diagram shows the circuitry of this section.

The A/D conversion of the outputs from the two frontends is done here. Both channels are routed to the same 16-bit converter, a PCM78P from Burr-Brown. By operating the converter at a sampling rate of 128 kHz, each channel (left/right) is sampled at 64 kHz.

The analog switch QA400 constitutes a multiplexer between the two outputs, Out and Peak, from each frontend board. Normally, Out is selected for signal analysis; Peak is only enabled when making the Peak measurement. QA402 and QA404 buffer the two outputs from the multiplexer, for right and left respectively. In these buffer circuits, the final hardware offset is calibrated to compensate for the offset generated in the sampling and A/D conversion process. Note that the DC at the output of the buffers should not be zero.

Following the buffers, the FET switches Q400 and Q401, which operate at 128 kHz, provide the multiplexing between left and right. The control signals for this multiplexing originate from the timing PLD QD401 and is level-translated from +5/0 V to ±15 V using QA405.

The timing of the various control signals is shown in Fig. 11.2.

The integrated crystal oscillator QD404, operating at 12.8 MHz, clocks the timing PLD QD401. The PLD divides this by 4 to provide the 3.2 MHz External Clock to the A/D converter. A conversion cycle is started by S/H going high (HOLD mode), followed by a conversion command pulse to the A/D converter. When receiving this, the converter asserts Status (HIGH) and enables the gated clock output Clk Out. The last 16 (out of 17) clock pulses of Clk Out clock the 16 data bits from the conversion (Serial Out from the converter). The data stream is routed to the PLD (pin 11), which inserts a bit to indicate which channel is being converted, ahead of the 16 data bits.

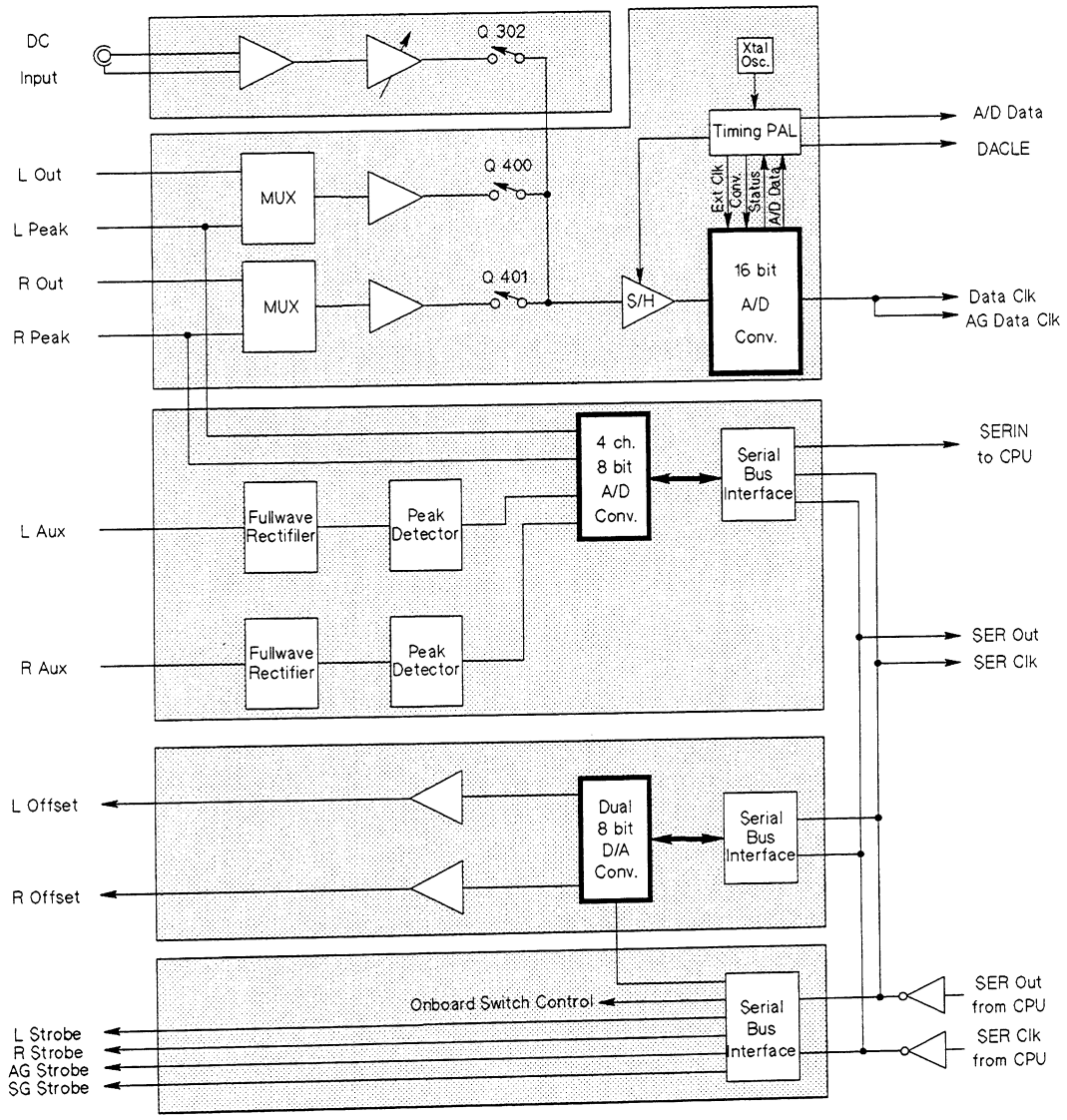


Fig. 11.1 - A/D Converter Block Diagram

This bit, appearing at the first of the 17 clock pulses, allows the Signal Analyzing Processor to distinguish between left and right channel data samples (see section 9).

The 17 data bits thus coming out from the PLD (pin 18) are buffered and inverted by QD403A, which drives a coaxial cable on the Analog Motherboard. The inversion compensates for the inherent inversion in the optocoupler interfacing the signal to the Digital Section. An identical construction (QD403B) processes the Data Clk (Clk Out from the converter).

The Data Clk is also used as master clock for the Audio Generator. The latch pulse for the D/A converters on the Audio Generator Analog Board (see section 12) is created by the PLD QD401 (DAC LE).

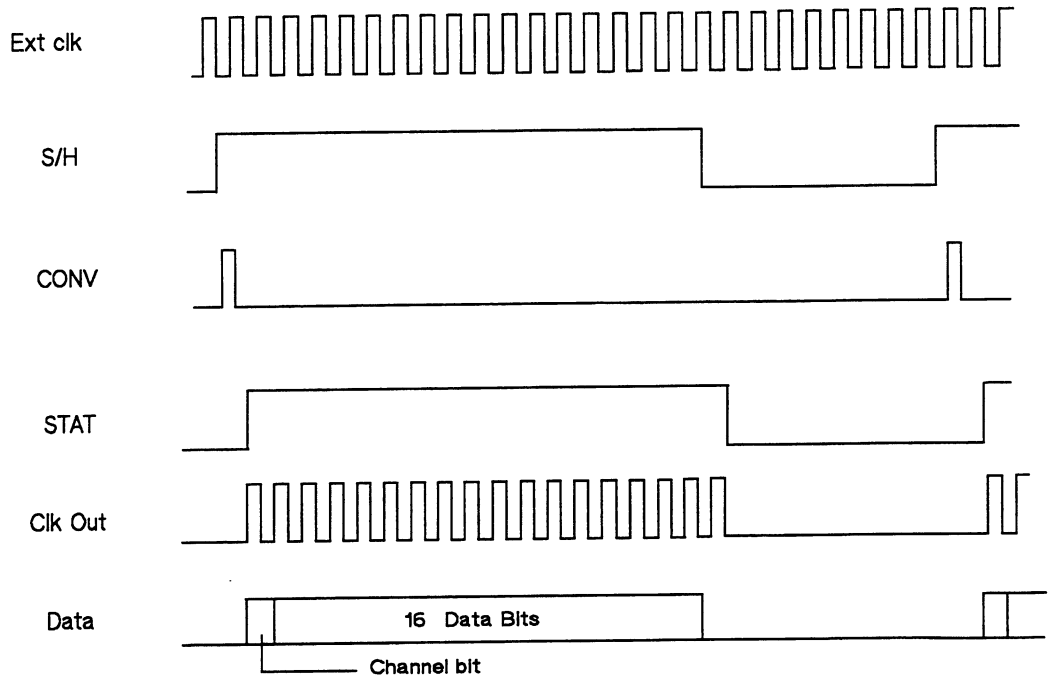


Fig. 11.2 - A/D Converter Timing

The L On and R On inputs to the PLD, which come from the control circuit QD203, are used to permit measurements in only one channel, and to enable DC measurements.

11.1.2 DC Input

Sheet 3 of the schematic diagram shows the DC input.

A differential amplifier having a gain of 0.324 is built around QA300A, while QA300B is used as a programmable amplifier. When FET switch Q301 is deselected, the amplifier has a gain of 1/3.24 (total gain thus being 1/10, establishing the HIGH range). When the switch is closed, the formula for the total gain is:

$$\text{gain}_{\text{LOW}} = \frac{(R305 + R303) \| (R302 + R301)}{R308 \| R311 \| (R343 + R310)}$$

For the standard values of the resistors (assuming midrange position of the potentiometers), this establishes a LOW range gain of 3.

The signal is, via FET switch Q302, routed to the 16-bit A/D converter QA401, which has a full scale range of ± 3 V. Thus, the standard HIGH range corresponds to ± 30 V and the standard LOW range to ± 1 V.

11.1.3 Peak Detector Conversion

Sheet 2 of the schematic diagram shows the circuitry of the section.

The 8-bit, 4-channel A/D converter is used to convert the outputs from the four peak detectors (one for each input channel). These detectors serve three purposes:

* Supervision of the input level(s) during measurements
* Input auto ranging (when enabled)
* Updating of the meters.

The peak detectors on the A/D converter board are only used for the latter task. The AUX outputs from the frontend boards provide the input to these detectors via the fullwave rectifiers. For a description of the meter updating procedure see section 2.9.

The converter is controlled by the PLD QD101 which interfaces to the Serial Bus. When the 80C186 Main Computer wants to read one of the peak detectors, a standard read procedure, as described in section 8, is used. As seen from the computer, the four detectors are simply read on four different I/O addresses. All of these addresses are recognized by the PLD, which in turn presents a two-bit address and an RD pulse to the converter. The RD pulse initiates a conversion cycle, and at the trailing edge of the pulse, the result present on DB0-DB7 is latched into the parallel-in-serial-out register QD100. The serial output from this register is then, via the PLD, sent to the SER IN line to the CPU.

The 3 V reference voltage is derived from the -9 V reference voltage described in the following section.

11.1.4 Offset Calibration

Sheet 3 of the schematic diagram shows the circuitry providing the DC voltages used for offset calibration of the Analog Frontend Boards.

The two voltages, spanning the range ± 1.2 V, are routed one to each of the frontend boards. On the Analog Frontend Boards, the voltages are divided to obtain approx. 40 μV per step. The 80C186 Main Computer programs the D/A converter, via the Serial Bus, to provide the correct offset compensation voltage each time gain and/or channel (front/rear) is changed. QD200 holds the value written via the bus strobed from the PLD QD202. As the converter number format is binary offset, the two's complement word, written by the computer, is converted using the inverter QD201C.

QA200A establishes the -9 V reference voltage for the converter. For a further description of the calibration procedure see section 2.10.

Select Out/Peak	Peak/AC		
	0		Out selected
	1		Peak selected
Dicharge Peak Detectors	Discharge Peak		
	0		Peak discharge
	1		Peak enable
L on, R on	L On	R On	
	0	0	DC input enable
	0	1	R only @128 kHz
	1	0	L only @128 kHz
	1	1	Normal measurement
DC enable	DC On		
	0		Normal measurement
	1		DC measurement
DC gain	DC Gain		
	0		HI range
	1		LO range

Table 11.1 - A/D Converter Board Setup

11.1.5 General Serial Bus Interface

As the Serial Bus from the 80C186 is routed via a filtered connector, the signals (SER CLK CPU, SER OUT CPU) need reshaping before being presented to standard HCMOS circuits. The Schmitt trigger inverters QD201A,B,D,E reshape the signals. The outputs are then routed back to the Analog Motherboard for distribution to other boards in the Analog Section (SER CLK, SER OUT).

The PLD, QD202, provides strobe pulses for all the receiving devices on the Serial Interface Bus in the Analog Section, that is:

* Strobe A Left frontend.
* Strobe B Right frontend.
* Strobe C Audio Generator Analog Board.
* Strobe D Stereo Generator.
* Strobe E A/D Converter Board (pin 18).
* Strobe F Offset Calibration D/A (pin 17).

See section 8 for a further description of the Serial Bus Interface.

11.2 Adjustments

On the A/D Converter Board, adjustment of the following items are described:

* Reference voltage for 8-bit A/D converter and offset calibration D/A.
* Peak detectors for AUX channels.
* Zero for calibration voltages.
* 16-bit A/D converter MSB (*).
* Offset for left and right channel (*).
* DC input, offset (*).
* DC input, gain at high range.
* DC input, CMRR.
* DC input, gain at low range.

All adjustments require the 48-pole DIN Extender Board (901-864), apart from the adjustments marked with (*) which must be performed with the board mounted directly in the instrument. The potentiometers used are accessible either from the top or the from the bottom.

When making any adjustment on the DC input, we recommend that you make all the adjustments, and in the order stated.

11.2.1 Reference Voltage

Connect a 0.1 % DC voltmeter to TP7.

Adjust using R205 to -9.00 V ± 0.01 V.

11.2.2 Peak Detectors for AUX Channels

Apply a 2.00 V_{rms} (2.82 Vpeak), 1 kHz test signal to left and right rear input. Send the command "**RE,A,3 METER,ON**". Wait for the bargraph meters to update (approximately 1 second) and send the string "**METER,OFF ZZ,1**".

Adjust the DC voltage at TP1 to 2.82 V ±0.01 V using R104.

Adjust the DC voltage at TP2 to 2.82 V ±0.01 V using R120.

11.2.3 Zero for Calibration Voltages

Send the command "**CAL,CLR CAL,OFF**".

Adjust the DC voltage at TP5 to 0.0 mV ±0.1 mV using R200.

Adjust the DC voltage at TP6 to 0.0 mV ±0.1 mV using R211.

11.2.4 16-bit A/D Converter MSB

NOTE When you make this adjustment, you must also make offset adjustments for the left and right channels as well as for the DC input.

Apply a 1 kHz, 2 V_{rms} test signal to, for example left front input. Send the command "`CAL,OFF CAL,CLR RE,LF,3 CH,LF FR,HP,100 ZZ,10`". Measure "SD,200" continuously.

Turn R407 fully counterclockwise and then clockwise until the first minimum SINAD reading is obtained (<1.7E-2%).

Send the command "`ZZ,11 CAL,ON`".

11.2.5 Left and Right Channel Offset

Short-circuit left and right front inputs. Send the command "`CAL,OFF CAL,CLR ZZ,8`". Measure "`ZZ,2`" continuously.

Adjust the two readings to a minimum (<2.00E-05 V) using R425 for left channel and R423 for right channel. As the two channels influence each other, it is advantageous always to adjust the one returning the greatest reading. This should be done very carefully and may need to be repeated.

Send the command "`ZZ,9`".

11.2.6 DC Input, Offset

Short-circuit the DC input. Measure "`DL,HI,30V`". Measure "`DC,HI`" continuously.

Adjust the reading to a minimum (<0.5 mV) using R313.

11.2.7 DC Input, Gain at High Range

Test equipment: DC source, 15 V

Connect the outer conductor of the DC input connector to ground (chassis). Apply a 15.0 V DC test signal to the inner conductor of the DC input. Measure "DC,HI" continuously.

Adjust using R301 until the measurement results are accurate within ±15 mV.

11.2.8 DC Input, CMRR

Test equipment: DC source, 15 V

Short-circuit the DC input and apply a 15 V DC test signal between the short and ground (chassis). Measure "DC,HI" continuously.

Adjust to a minimum (<4 mV) using R319.

11.2.9 DC Input, Gain at Low Range

Connect a 900 mV test signal to the DC input. Measure "DC,LO" continuously.

Adjust using R310 until the measurement results are accurate to within 1 mV.

Send the command "`CAL,ON CAL`".

11.3 Schematic Diagrams

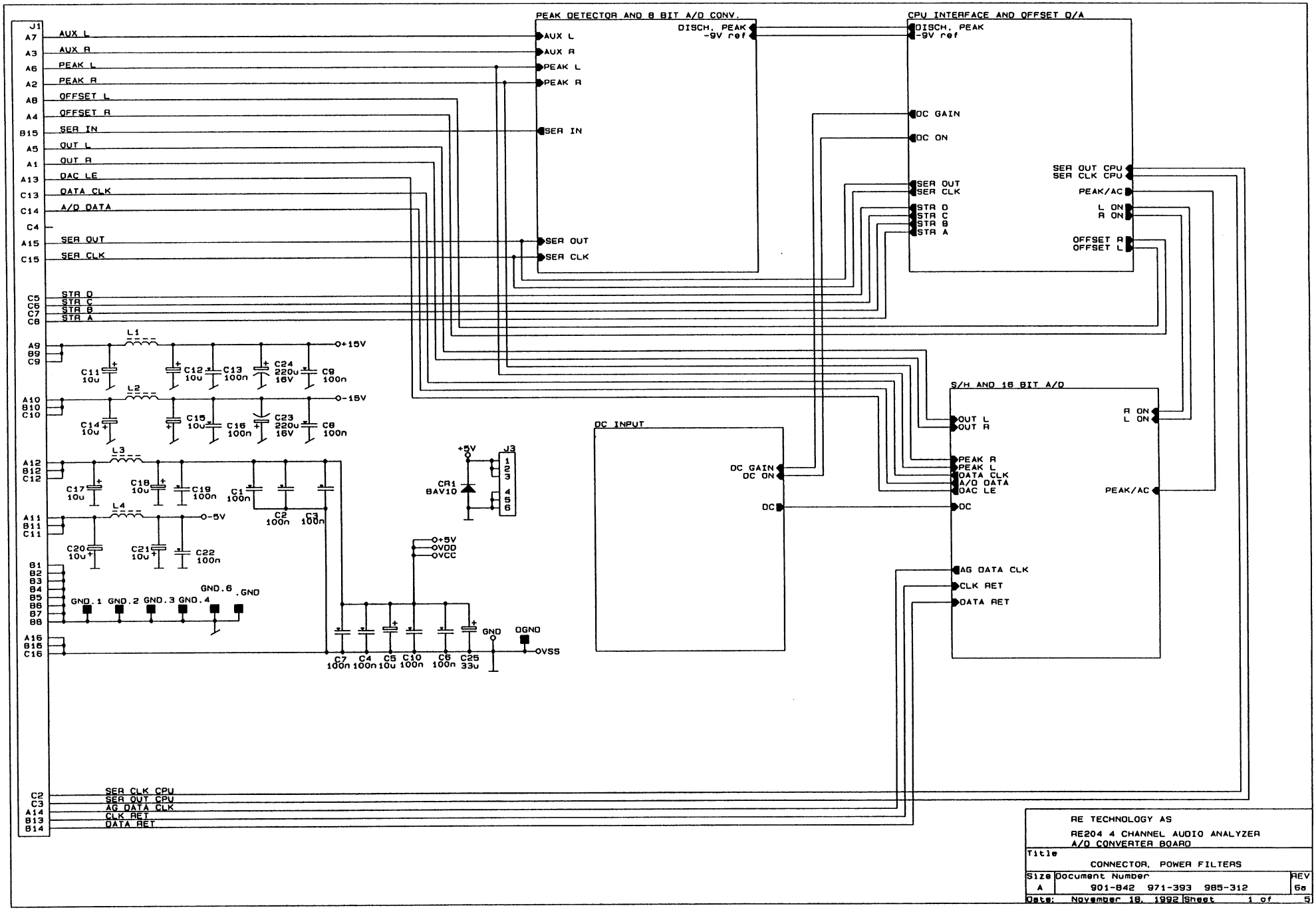
The schematic diagram for the A/D Converter Board is shown in diagram number 985-312.

11.4 Component Locations

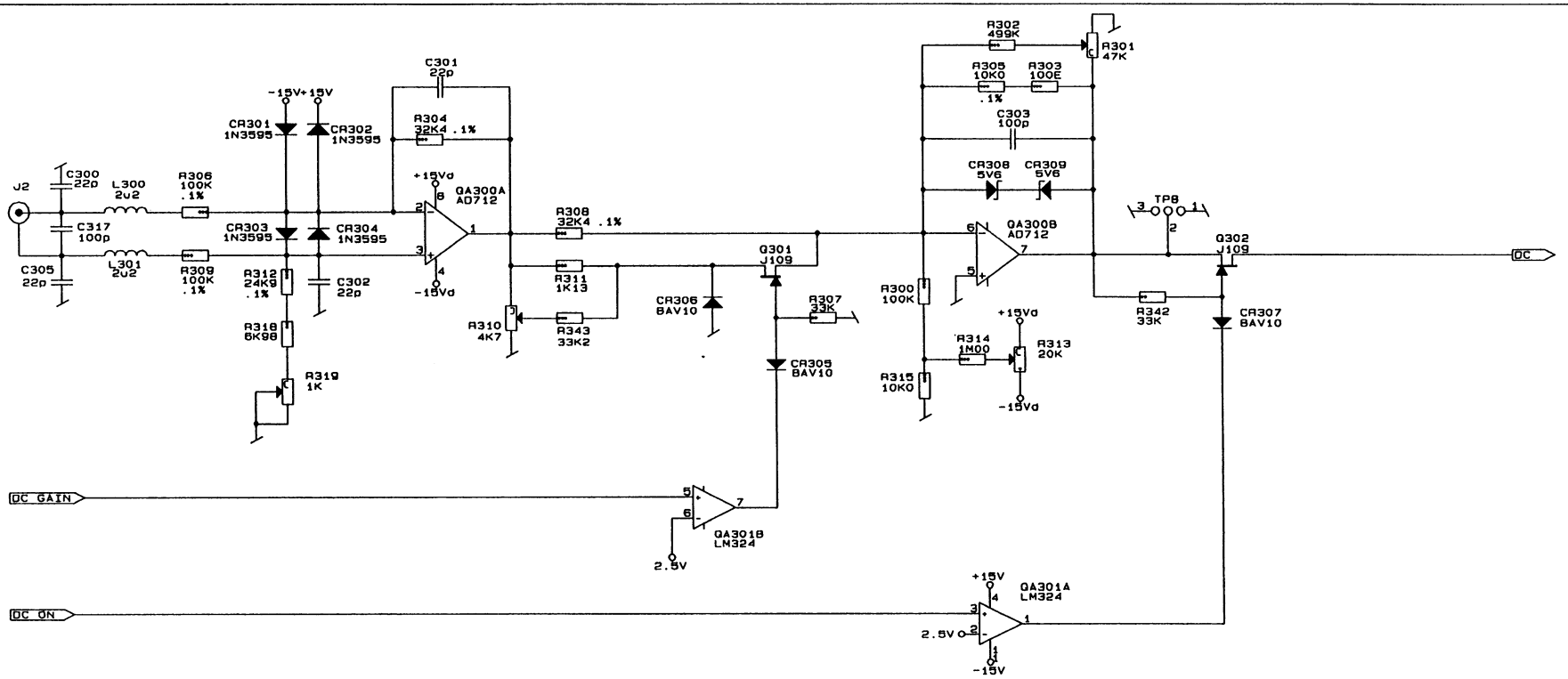
The component locations on the A/D Converter Board are shown in the following diagram.

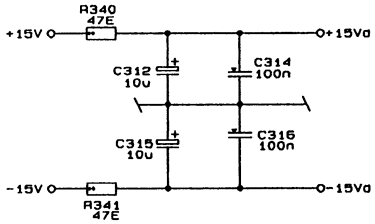
11.5 Parts List

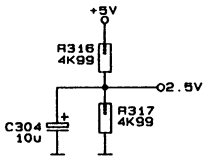
A copy of the parts lists from the production documentation is shown in the following. The code number of the assembled PCB is 901-842.

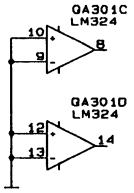


RE TECHNOLOGY AS		
RE204 4 CHANNEL AUDIO ANALYZER A/D CONVERTER BOARD		
Title: CONNECTOR, POWER FILTERS		
Size: A	Document Number: 901-842 971-393 985-312	REV: 6a
Date: November 18, 1992	Sheet 1 of 5	

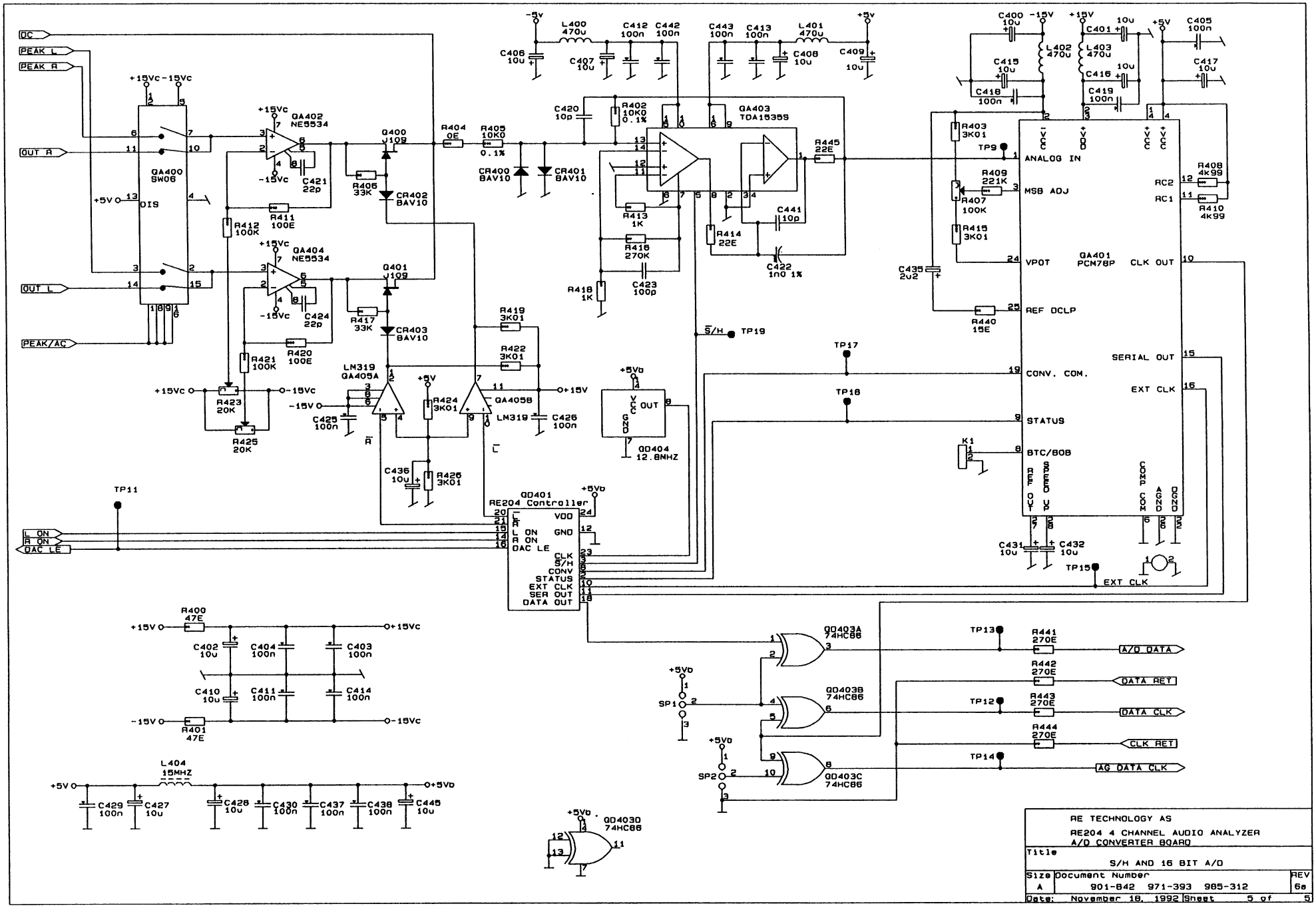








RE TECHNOLOGY AS		
RE204 4 CHANNEL AUDIO ANALYZER A/D CONVERTER BOARD		
Title: DC INPUT		
Size: A	Document Number: 901-842 971-393 985-312	REV: 6a
Date: November 18, 1992	Sheet 4 of 5	



RE TECHNOLOGY AS

RE204 4 CHANNEL AUDIO ANALYZER
A/D CONVERTER BOARD

Title	S/H AND 16 BIT A/D	
Size A	Document Number 901-842 971-393 985-312	REV 6a
Date: November 18, 1992	Sheet 5 of 5	

PCB Assy A/D Converter Board (901-842)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Ceramic 100n 20% 50V	213-401
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 100n 20% 50V	213-401
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 12	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 15	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 18	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 21	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 22	C Ceramic 100n 20% 50V	213-401
C 23	Electrolytic 220/35, 2000h/105°, R:10*12,5, RM2	261-092
C 24	Electrolytic 220/35, 2000h/105°, R:10*12,5, RM2	261-092
C 25	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 100	C Ceramic 100n 20% 50V	213-401
C 101	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 102	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 103	C Ceramic 470p 20% 100V	213-014
C 104	C Solid Aluminium 4u7 20% 25V Short Type	265-100
C 105	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 106	C Ceramic 470p 20% 100V	213-014
C 107	C Solid Aluminium 4u7 20% 25V Short Type	265-100
C 108	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 109	C Ceramic 100n 20% 50V	213-401
C 110	C Ceramic 100n 20% 50V	213-401
C 111	C Ceramic 100n 20% 50V	213-401
C 112	C Ceramic 100n 20% 50V	213-401
C 113	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 114	C Ceramic 100n 20% 50V	213-401
C 115	C Ceramic 100n 20% 50V	213-401
C 116	C Ceramic 100n 20% 50V	213-401
C 117	C Ceramic 100n 20% 50V	213-401
C 118	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 119	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 120	C Ceramic 100n 20% 50V	213-401
C 121	C Ceramic 100n 20% 50V	213-401
C 122	C Ceramic 100p 2% 100V NP0	213-211
C 123	C Ceramic 100n 20% 50V	213-401
C 200	C Solid Aluminium 10u 20% 16V Short Type	265-108

C 201	C Ceramic 100p 2% 100V NP0	213-211
C 202	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 203	C Ceramic 100p 2% 100V NP0	213-211
C 204	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 205	C Ceramic 100n 20% 50V	213-401
C 206	C Ceramic 100n 20% 50V	213-401
C 207	C Ceramic 100n 20% 50V	213-401
C 208	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 209	C Ceramic 100n 20% 50V	213-401
C 210	C Ceramic 100n 20% 50V	213-401
C 211	C Ceramic 100n 20% 50V	213-401
C 300	C Ceramic 22p0 2% 100V NP0	213-206
C 301	C Ceramic 22p0 2% 100V NP0	213-206
C 302	C Ceramic 22p0 2% 100V NP0	213-206
C 303	C Ceramic 100p 2% 100V NP0	213-211
C 304	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 305	C Ceramic 22p0 2% 100V NP0	213-206
C 312	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 314	C Ceramic 100n 20% 50V	213-401
C 315	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 316	C Ceramic 100n 20% 50V	213-401
C 317	C Ceramic 100p 2% 100V NP0	213-211
C 400	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 401	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 402	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 403	C Ceramic 100n 20% 50V	213-401
C 404	C Ceramic 100n 20% 50V	213-401
C 405	C Ceramic 100n 20% 50V	213-401
C 406	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 407	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 408	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 409	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 410	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 411	C Ceramic 100n 20% 50V	213-401
C 412	C Ceramic 100n 20% 50V	213-401
C 413	C Ceramic 100n 20% 50V	213-401
C 414	C Ceramic 100n 20% 50V	213-401
C 415	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 416	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 417	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 418	C Ceramic 100n 20% 50V	213-401
C 419	C Ceramic 100n 20% 50V	213-401
C 420	C Ceramic 10p0 2% 100V NP0	213-205
C 421	C Ceramic 22p0 2% 100V NP0	213-206
C 422	C Polystyrene 1n 1% 63V	243-320
C 423	C Ceramic 100p 2% 100V NP0	213-211
C 424	C Ceramic 22p0 2% 100V NP0	213-206
C 425	C Ceramic 100n 20% 50V	213-401
C 426	C Ceramic 100n 20% 50V	213-401
C 427	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 428	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 429	C Ceramic 100n 20% 50V	213-401
C 430	C Ceramic 100n 20% 50V	213-401
C 431	C Solid Aluminium 10u 20% 16V Short Type	265-108

C 432	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 435	C Solid Aluminium 2u2 20% 25V Short Type	265-102
C 436	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 437	C Ceramic 100n 20% 50V	213-401
C 438	C Ceramic 100n 20% 50V	213-401
C 441	C Ceramic 10p0 2% 100V NP0	213-205
C 442	C Ceramic 100n 20% 50V	213-401
C 443	C Ceramic 100n 20% 50V	213-401
C 444	C Ceramic 100n 20% 50V	213-401
C 445	C Solid Aluminium 10u 20% 16V Short Type	265-108

DIODES

CR 1	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 100	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 101	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 102	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 103	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 104	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 105	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 106	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 107	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 108	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 109	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 110	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 111	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 112	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 113	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 200	Diode zener 1N825 C6V2 0.4W	350-637
CR 301	Diode 1N3595 SI 100V 100mA	350-415
CR 302	Diode 1N3595 SI 100V 100mA	350-415
CR 303	Diode 1N3595 SI 100V 100mA	350-415
CR 304	Diode 1N3595 SI 100V 100mA	350-415
CR 305	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 306	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 307	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 308	Diode zener BZX79-C5V6 0.4W	350-629
CR 309	Diode zener BZX79-C5V6 0.4W	350-629
CR 400	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 401	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 402	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 403	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958
J 2	Angle Bnc Jack For Printed Circuin Board 50E	800-524
J 3	2x3 Pol Dubox Right Angle Pcb Male	806-053

CHOKES

L 1	RF-choke six-hole core green	731-204
L 2	RF-choke six-hole core green	731-204
L 3	RF-choke six-hole core green	731-204
L 4	RF-choke six-hole core green	731-204
L 300	Choke HF Mini 2u2 10% 1A 0. 25ohm	703-011
L 301	Choke HF Mini 2u2 10% 1A 0. 25ohm	703-011
L 400	Choke HF Mini 470uH 10% 124MA	703-014
L 401	Choke HF Mini 470uH 10% 124MA	703-014
L 402	Choke HF Mini 470uH 10% 124MA	703-014
L 403	Choke HF Mini 470uH 10% 124MA	703-014
L 404	RF-choke six-hole core green	731-204

TRANSISTORS

Q 100	Transistor J175-18 p jfet	360-252
Q 101	Transistor J175-18 p jfet	360-252
Q 102	Transistor BC547B npn	360-159
Q 103	Transistor BC547B npn	360-159
Q 104	Transistor BC547B npn	360-159
Q 301	Transistor J109-18 n Fet	360-188
Q 302	Transistor J109-18 n Fet	360-188
Q 400	Transistor J109-18 n Fet	360-188
Q 401	Transistor J109-18 n Fet	360-188

INTEGRATED ANALOG CIRCUITS

QA 101	IC NJM2068D op-amp	364-889
QA 102	IC AD7824 4-Channal 8Bit ADC.	364-874
QA 103	IC LM311N comparator	364-024
QA 104	IC AD713JN Quad Precisin High Speed OP-amp	365-004
QA 105	IC NJM2068D op-amp	364-889
QA 106	IC LM311N comparator	364-024
QA 200	IC NJM2068D op-amp	364-889
QA 201	IC 7528 Dual 8-Bit Dac.	364-870
QA 202	IC AD712J Dual OP-amp	365-005
QA 203	IC AD712J Dual OP-amp	365-005
QA 300	IC AD712K Dual OP.AMP.	364-791
QA 301	IC LM324N Quad OP-Amp	364-176
QA 400	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 401	IC PCM78P 16 Bit A/D Converter 5uS	364-871
QA 402	IC 5534A op amp	364-639
QA 403	IC TDA1535 Sample/Hold Amplifier	364-869
QA 404	IC 5534A op amp	364-639
QA 405	IC LM319N high speed comp	364-750

INTEGRATED DIGITAL CIRCUITS

QD 100	IC 74HCT165 8-bit PISO	364-695
QD 101	IC pal EP610PC-35	364-876
QD 200	IC 74HCT164 8b shift reg.	364-676
QD 201	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 202	IC pal EP610PC-35	364-876

QD 203	IC 74HC4094 8 stage shift REG.	364-811
QD 204	IC 74HC4094 8 stage shift REG.	364-811
QD 401	RE204 Controller For 16-Bit A/D Conn Iss.2	369-395
QD 403	IC 74HC86 Quad 2-Input EX OR Gate	364-804
QD 404	Hybrid Clock Oscillator TTL 12.8MHz 25ppm	910-215

RESISTORS

R 100	R Metal Film 4K99 1% 0.5W TC50	114-499
R 101	R Metal Film 75K0 0.1% 0.25W TC25	141-300
R 102	R Metal Film 24K9 0.1% 0.25W TC25	141-293
R 103	R Metal Film 4K99 1% 0.5W TC50	114-499
R 104	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 105	R Metal film 820K 5% 0.2W TC250	107-682
R 106	R Metal Film 2K49 1% 0.5W TC50	114-249
R 107	R Metal film 100E 5% 0.2W TC250	107-310
R 108	R Metal film 100K 5% 0.2W TC250	107-610
R 109	R Metal film 1K00 5% 0.2W TC250	107-410
R 110	R Metal film 33E0 5% 0.2W TC250	107-233
R 111	R Metal film 1K00 5% 0.2W TC250	107-410
R 112	R Metal Film 2K49 1% 0.5W TC50	114-249
R 113	R Metal film 1M00 5% 0.2W TC250	107-710
R 117	R Metal Film 2K49 1% 0.5W TC50	114-249
R 118	R Metal Film 4K99 1% 0.5W TC50	114-499
R 119	R Metal Film 4K99 1% 0.5W TC50	114-499
R 120	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 121	R Metal film 820K 5% 0.2W TC250	107-682
R 122	R Metal Film 2K49 1% 0.5W TC50	114-249
R 123	R Metal film 100E 5% 0.2W TC250	107-310
R 124	R Metal film 100K 5% 0.2W TC250	107-610
R 125	R Metal film 1K00 5% 0.2W TC250	107-410
R 126	R Metal film 33E0 5% 0.2W TC250	107-233
R 127	R Metal film 1K00 5% 0.2W TC250	107-410
R 128	R Metal film 22E0 5% 0.2W TC250	107-222
R 129	R Metal Film 2K49 1% 0.5W TC50	114-249
R 130	R Metal film 1M00 5% 0.2W TC250	107-710
R 134	R Metal Film 2K49 1% 0.5W TC50	114-249
R 135	R Metal film 10K0 5% 0.2W TC250	107-510
R 136	R Metal film 10K0 5% 0.2W TC250	107-510
R 137	R Metal film 4K70 5% 0.2W TC250	107-447
R 138	R Metal film 47E0 5% 0.2W TC250	107-247
R 139	R Metal film 47E0 5% 0.2W TC250	107-247
R 140	R Metal film 22E0 5% 0.2W TC250	107-222
R 141	R Metal film 22E0 5% 0.2W TC250	107-222
R 142	R Metal film 1K00 5% 0.2W TC250	107-410
R 143	R Metal film 1K00 5% 0.2W TC250	107-410
R 200	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 201	R Metal film 1K13 1% 0.5W TC50	114-113
R 202	R Metal film 1M00 5% 0.2W TC250	107-710
R 203	R Metal Film 20K0 0.1% 0.25W TC25	141-294
R 204	R Metal Film 2K77 0.1% 0.25W TC15	141-314
R 205	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 207	R Metal Film 1K27 1% 0.5W TC50	114-127
R 208	R Metal Film 10K 0.1% 0.1W TC25	141-010

connected to the SO (Shift Out) signal of the FIFO. The Data Clk clocks the registers as well as data from the A/D converter to the Signal Analyzing board (see section 11). Fig. 12.1 also shows the signal DAC LE, which latches data into the D/A converters; this signal is generated on the A/D Converter Board and transferred to the Audio Generator Analog Board only (see section 3.8).

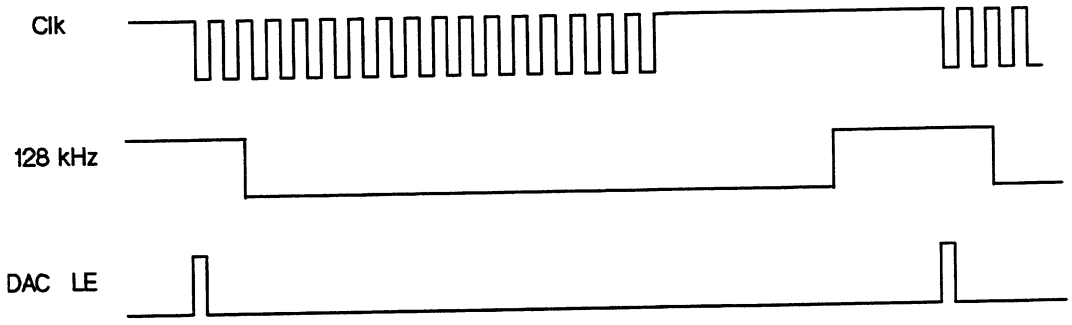


Fig. 12.1 - A/D Converter and Audio Generator Timing

12.1.2 Audio Generator Analog Board

We recommend that you read section 12.1.1, **Audio Generator Signal Processor**, first.

The data generated by the Audio Generator Signal Processor is routed, via optocouplers and coaxial wires W11 and W12 on the Analog Motherboard, to the Audio Generator Analog Board. The left and right channels have separate signal paths, each transferring a 16-bit sample at a sampling rate of 128 kHz, with a bit rate of 3.2 MHz. The clock used for the transfer is the Data Clk which also clocks the samples from the A/D converter. This clock signal is routed to both the Digital Section and the Analog Board.

The Analog Board consists of two quite identical channels, one for the left and one for the right. The description given below is for the left channel.

Refer to sheet 2 of the schematic diagram.

A 16-bit converter from Burr-Brown, PCM56P (QD4), D/A-converts the calculated data samples. As the output from this device is 0 to 6 Vpeak, R186-R188 converts it to a ± 3 Vpeak signal.

The output from the converter is buffered (QA2) and followed by an antialiasing filter, a 5-poled elliptical filter (QA3, QA4).

Refer to sheet 3 of the schematic diagram.

The output from the filter is routed to a programmable amplifier in two sections (QA11,QA12) having 3 dB gain steps in the range -48 dB to +9 dB, thus covering the full scale range 11 mVpeak to 8.5 Vpeak (0 dB corresponding to 3 Vpeak). The level adjustments inside each range is handled digitally, thus achieving a very fine resolution.

The gain is programmed from the 80C186 Main Computer via the Serial Bus Interface. The actual gain/attenuation is written to QD1 (QD2 for the right channel). The STR C pulse used to latch data in these registers originates from the A/D Converter Board (see section 11).

Note that attenuation is set in last section (QA12) first.

The outputs from the gain section are routed to both the Analog Motherboard for use in the (optional) Stereo Generator, and the balanced output stage.

Refer to sheet 4 of the schematic diagram.

The output stage is composed of an active balanced amplifier (QA20,QA21).

QA11	Q1		
	0		0 dB
	1		+3 dB
QA12	Q2		
	0		0 dB
	1		+6 dB
QA12	Q4	Q3	
	0	0	0 dB
	0	1	-12 dB
	1	1	-24 dB
QA11	Q6	Q5	
	0	0	0 dB
	0	1	-12 dB
	1	1	-24 dB

Table 12.1 - Audio Generator Setup

12.2 Adjustments

The adjustments outlined below are all performed on the Analog Board of the Audio Generator (901-868). We recommend that you make all the adjustments and exactly in the order as described below, as most of the adjustments influence each other (for example, both adjustment for CMRR and for distortion influence the absolute level).

The description given applies to left channel. Test pins, resistors etc. belonging to the right channel are mentioned in brackets.

Adjustment of the following items are described:

* Offset
* Output amplifiers, DC zero
* Output amplifiers, CMRR
* Distortion
* Level.

12.2.1 Offset

Send the command "`AL,B,3 AF,B,1000`". Connect a DC voltmeter to TP1 (TP2).

Use R1 (R20) to adjust to 0 mV ±1 mV.

Move the voltmeter to TP3 (TP4). Use R65 (R90) to adjust to 0 mV ±1 mV.
Move the voltmeter to K1, pin 1-3 (K2, pin 1-3). Use R73 (R111) to adjust to 0 mV ±1 mV.

12.2.2 Output Amplifiers, DC Zero

Reposition jumper K1 (K2) to connect pins 2-3 instead of 1-2. Short-circuit the outer conductor of the output to circuit ground (chassis). Connect a DC voltmeter to the inner conductor and ground.

Use R134 (R167) to adjust to 0 mV ±0.1 mV.

Short-circuit the inner conductor to ground and measure between the outer conductor and ground.

Use R153 (R178) to adjust to 0 mV ±0.1 mV.

Repeat both adjustments.

Remount K1 (K2) in position 1-2.

12.2.3 Output Amplifiers, CMRR

NOTE This adjustment requires the use of a high-precision summing amplifier. If such a device is not available, the adjustment should be handled by the factory.

Send the command "**AL,B,3 AF,B,1KHZ**". Connect a voltmeter to K1, pin 1-3, and measure the exact voltage V_0.

Connect the outer conductor of J2 (J3) to ground (chassis). Use R133 (R157) to adjust the voltage measured at J2 (J3) to V_0 - 0.3 %.

Connect the inner conductor instead of the outer conductor to ground. Use R149 (R176) to adjust the voltage measured as above.

Connect the summing amplifier to J2 (J3) as shown:

J2, inner conductor	Amplifier	+
J2, outer conductor	Amplifier	-
Chassis	Amplifier	GND

Use R133 (R157)to adjust the voltage at the output of the summing amplifier to minimum.

12.2.4 Distortion

Test equipment — Distortion analyzer having better specifications than the RE 204 (approximately 100 dB THD). If such an instrument is not available, the adjustment should be made by the factory.

Send the command "**AL,B,3 AF,B,1KHZ**".

Connect the distortion analyzer to J2 (J3).

Use R190 (R196) to adjust the THD to a minimum (<90 dB).

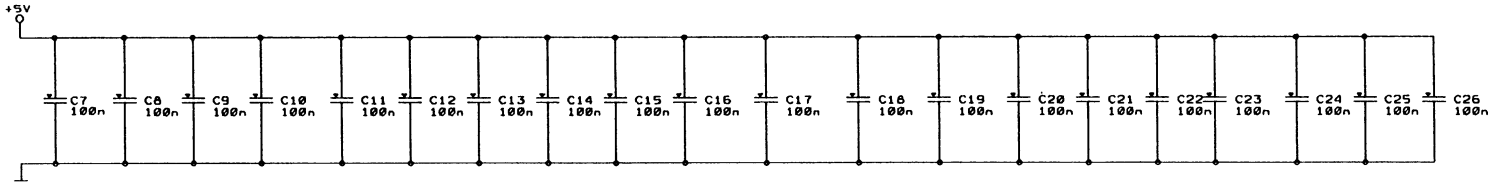
12.2.5 Level

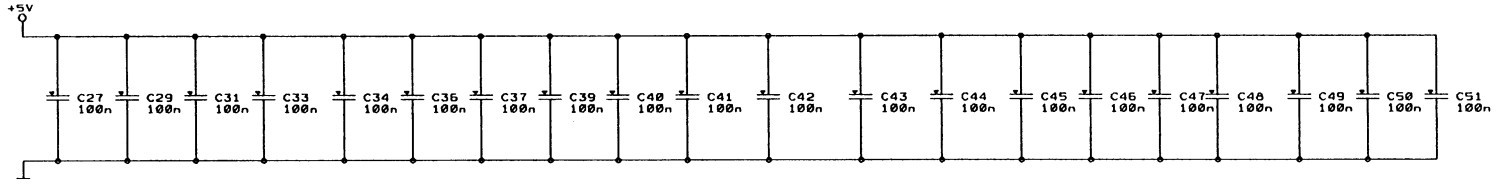
Send the command "**AL,B,3 AF,B,1KHZ**".

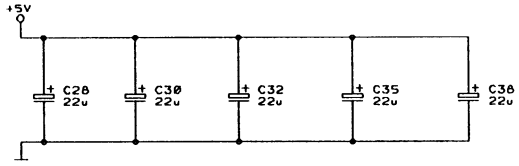
Use R18 (R43) to adjust the voltage measured at J2 (J3) to 2.1213 V_{rms} ±0.1 %.

Change the frequency to 20 Hz ("**AF,B,20**").

Use R15 (R40) to adjust the voltage measured at J2 (J3) to 2.1213 V_{rms} ±0.1 %.



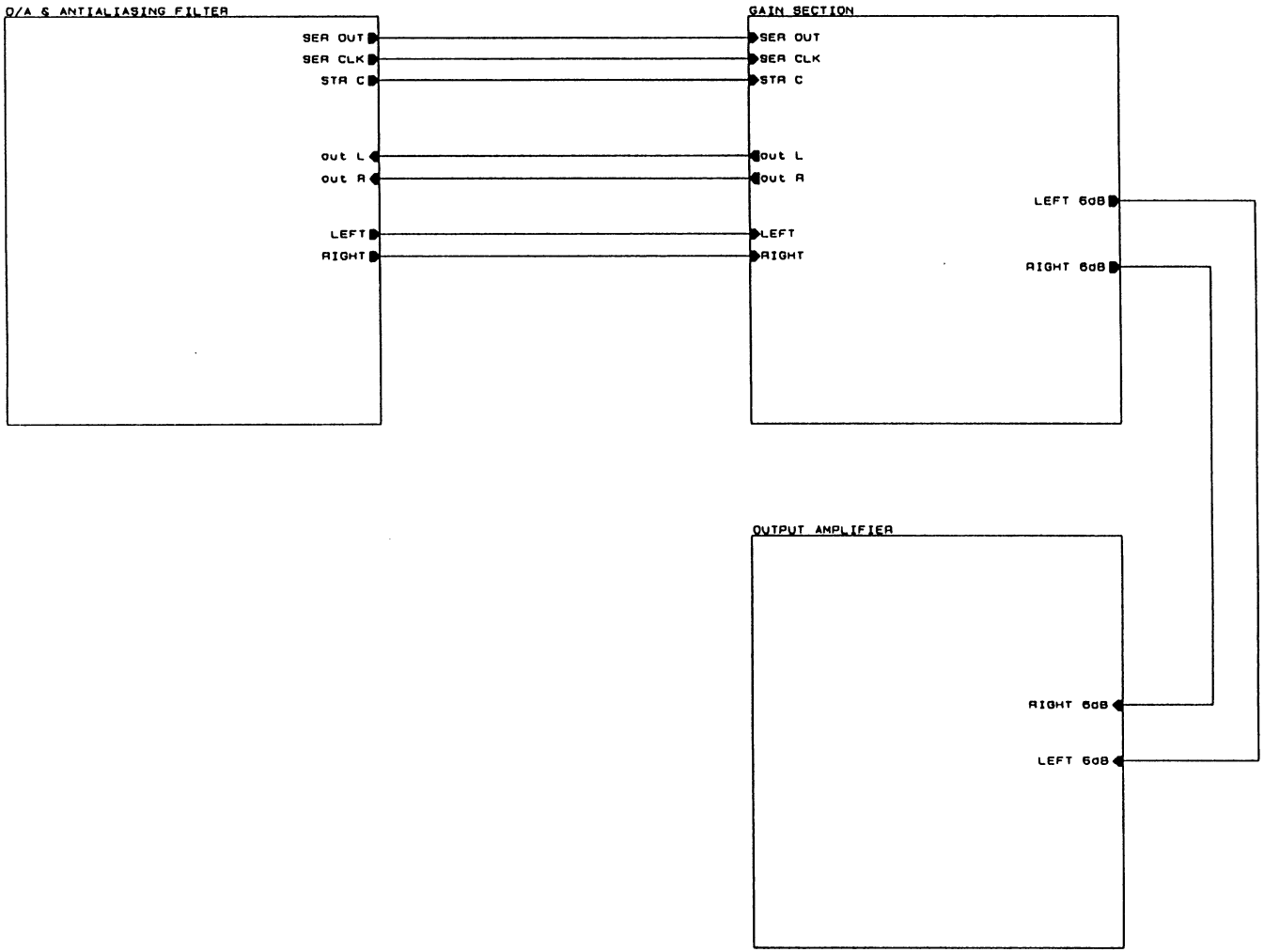




RE TECHNOLOGY AS		
RE204 4 CHANNEL AUDIO ANALYZER		
Title: AUDIO GENERATOR CAP		
Size: A	Document Number: 901-867 971-413 985-316	REV: 4A
Date: September 18, 1992	Sheet 4 of 4	

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
C1	E8	QD20	H8																				
C2	E7	QD21	G5																				
C3	D3	QD22	H3																				
C4	D3	QD23	D11																				
C5	D4	QD24	H11																				
C6	D4	QD25	F11																				
C7	G3	QD26	G9																				
C8	E15	QD27	G11																				
C9	F15	QD28	E13																				
C10	G15	QD29	J13																				
C11	H15	QD30	E13																				
C12	H15	QD31	F13																				
C13	H3	QD32	G13																				
C14	D13	QD33	D9																				
C15	E14	QD34	E11																				
C16	F14	QD35	E11																				
C17	G14	QD36	D13																				
C18	H14	QD37	H13																				
C19	H14	QD38	G15																				
C20	J13	QD39	J11																				
C21	D11	QD40	E15																				
C22	E12	QD41	D15																				
C23	F12	QD42	D7																				
C24	G12	QD43	J15																				
C25	H12	QD44	F15																				
C26	H12	QD45	E15																				
C27	J11	R1	D2																				
C28	D16	R2	H2																				
C29	D9	R3	E6																				
C30	J8	R4	F6																				
C31	H9	R5	D12																				
C32	D8	R6	D8																				
C33	J10	R7	E5																				
C34	H10	R8	D5																				
C35	J2	R9	D6																				
C36	J8	R10	H5																				
C37	G8	R11	D3																				
C38	J16	R12	H5																				
C39	D7	R13	H8																				
C40	E9	R14	D14																				
C41	H7	R15	D14																				
C42	H7	R16	H15																				
C43	J7	SP1	E15																				
C44	J5	SP2	E16																				
C45	H5	Y1	E7																				
C46	D4																						
C47	G5																						
C48	F5																						
C49	E4																						
C50	D5																						
C51	F3																						
GND	D8																						
GND	J8																						
J1	D2																						
K1	E8																						
L1	D3																						
QD1	E5																						
QD2	E3																						
QD3	E5																						
QD4	E3																						
QD5	E7																						
QD6	F5																						
QD7	F3																						
QD8	J5																						
QD9	H5																						
QD10	J3																						
QD11	G3																						
QD12	J7																						
QD13	G7																						
QD14	J8																						
QD15	D5																						
QD16	H7																						
QD17	H15																						
QD18	J10																						
QD19	H10																						

COMPONENT SIDE



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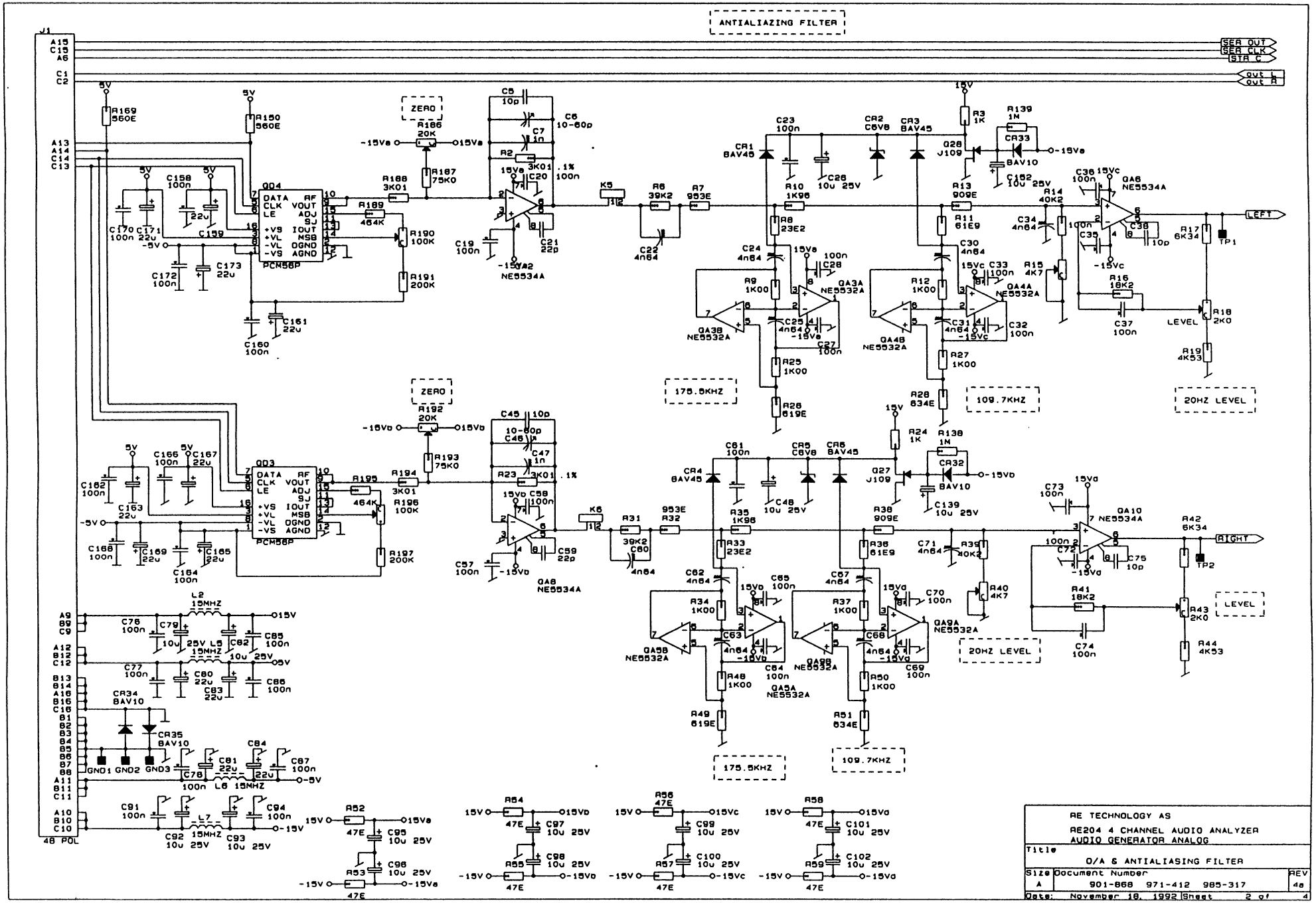
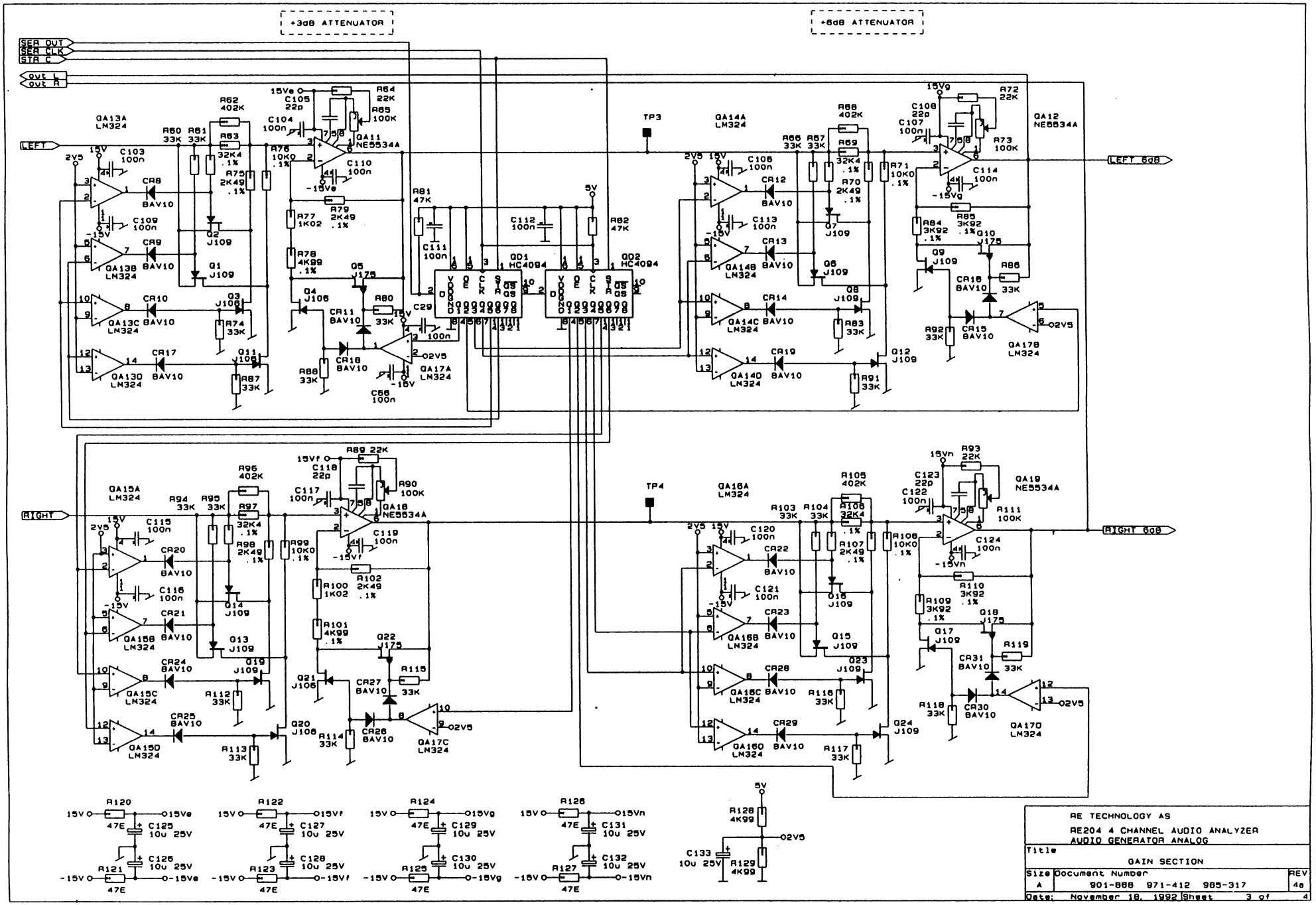
Title: ROOT SHEET		
Size: A	Document Number: 901-868 971-412 985-317	REV: 4a
Date: November 18, 1992	Sheet 1 of 4	


ANTIALIAZING FILTER
SER OUT
SER CLK
STA C
out L
out R
ZERO
PCM56P
NE5534A
NE5532A
LEFT
RIGHT
LEVEL
175.5KHZ
109.7KHZ
20HZ LEVEL
48 POL
RE TECHNOLOGY AS
RE204 4 CHANNEL AUDIO ANALYZER
AUDIO GENERATOR ANALOG
Title
O/A & ANTIALIASING FILTER
Size A
Document Number
901-868 971-412 985-317
REV 4a
Date: November 18, 1992
Sheet 2 of 4



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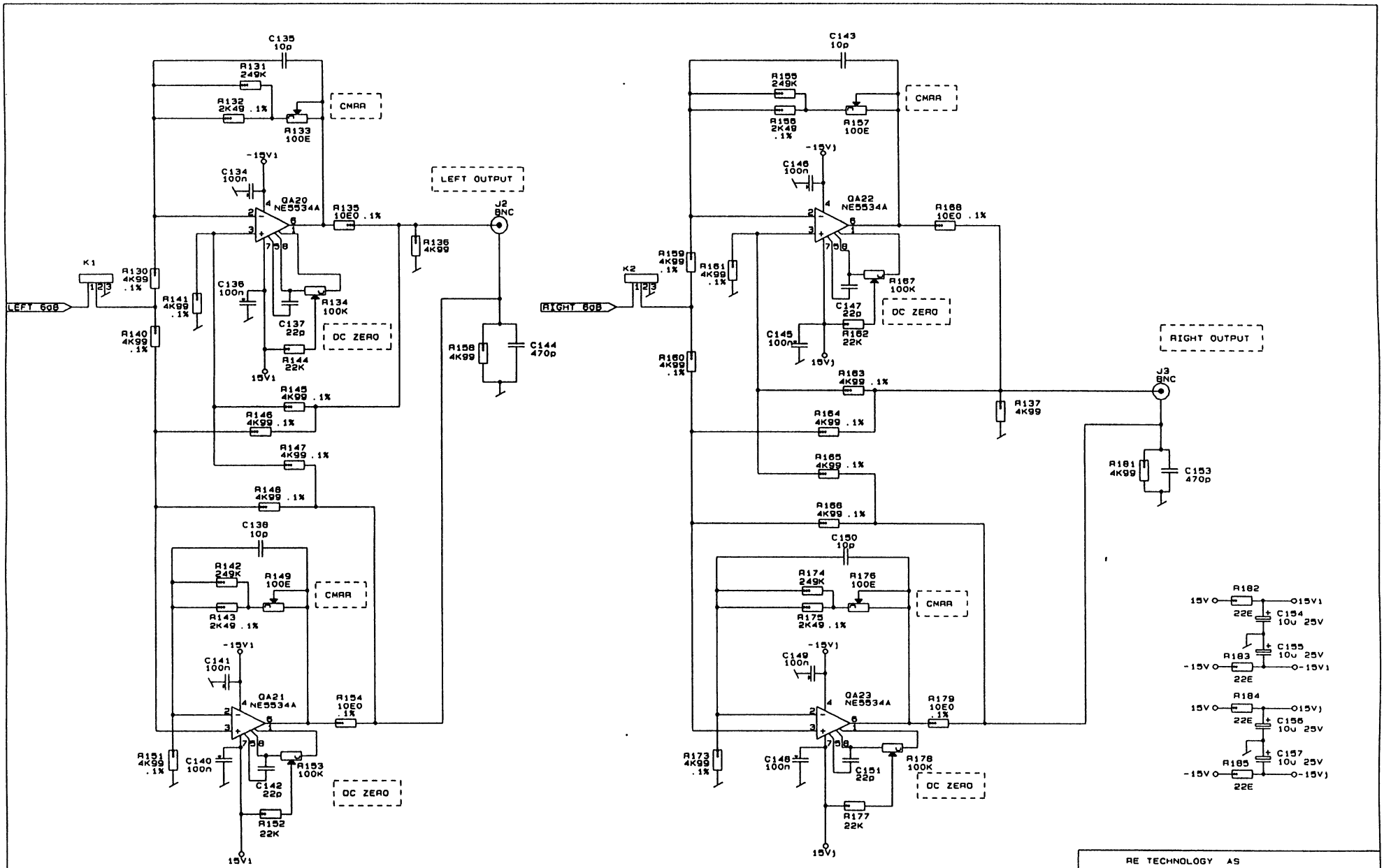
Title: GAIN SECTION		
Size: A	Document Number: 901-868 971-412 985-317	REV: 4a
Date: November 18, 1992	Sheet 3 of 4	



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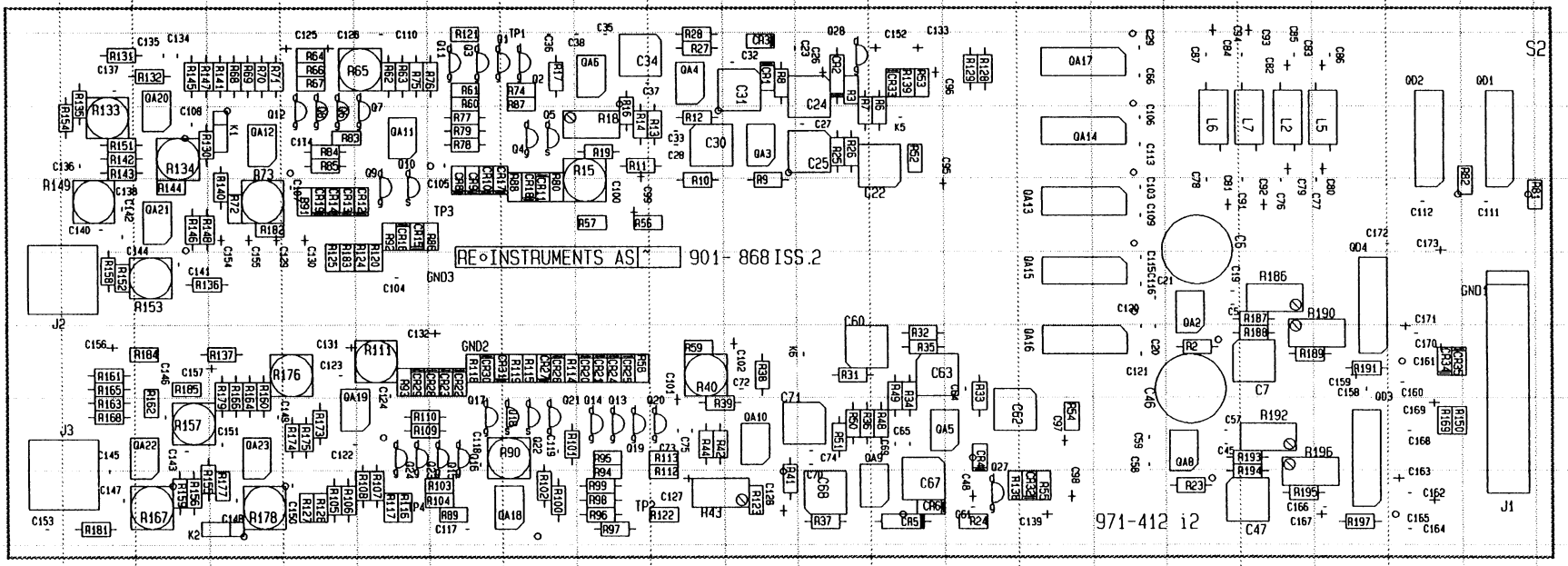


901-868
RE204 AUDIO GENERATOR ANALOG BOARD

CR1	M5	C71	N9	C149	F10	Q12	E6	R72	E7	R147	E5												
CR2	N5	C72	M9	C150	F11	Q13	K9	R73	E6	R148	D7												
CR3	M5	C73	L10	C151	E10	Q14	K9	R74	J5	R149	C7												
CR4	R10	C74	N10	C152	P5	Q15	H10	R75	G5	R150	X10												
CR5	P11	C75	L10	C153	B11	Q16	H10	R76	H5	R151	C6												
CR6	P11	C76	V7	C154	E7	Q17	H9	R77	H6	R152	C8												
CR8	H7	C77	W7	C155	E7	Q18	J10	R78	H6	R153	D8												
CR9	H7	C78	U7	C156	C9	Q19	K10	R79	H6	R154	C6												
CR10	H7	C79	V7	C157	D9	Q20	L9	R80	J6	R155	E11												
CR11	J7	C80	W7	C158	W9	Q21	K9	R81	Z7	R156	D11												
CR12	G7	C81	U7	C159	W9	Q22	J10	R82	Y7	R157	D10												
CR13	F7	C82	V5	C160	X9	Q23	G10	R83	F6	R158	C8												
CR14	F7	C83	W5	C161	X9	Q24	G10	R84	F6	R159	D11												
CR15	G7	C84	U5	C162	X11	Q27	R10	R85	F6	R160	E9												
CR16	G7	C85	V5	C163	X11	Q28	N4	R86	H7	R161	C9												
CR17	J7	C86	W5	C164	X11	R2	U9	R87	J6	R162	D9												
CR18	J7	C87	U5	C165	X11	R3	N5	R88	J6	R163	C10												
CR19	F7	C91	V7	C166	V11	R6	P5	R89	H11	R164	E10												
CR20	K9	C92	V7	C167	V11	R7	P6	R90	J10	R165	C9												
CR21	K9	C93	V4	C168	X10	R8	M5	R91	F7	R166	E10												
CR22	H9	C94	U4	C169	X10	R9	M7	R92	G7	R167	D11												
CR23	H9	C95	R6	C170	X9	R10	L6	R93	G9	R168	C10												
CR24	K9	C96	R5	C171	X8	R11	K6	R94	K11	R169	X10												
CR25	K9	C97	S10	C172	X7	R12	L6	R95	K10	R173	F10												
CR26	J9	C98	S11	C173	X7	R13	L6	R96	K11	R174	F10												
CR27	J9	C99	K7	GND1	Y8	R14	K6	R97	K11	R175	F10												
CR28	G9	C100	K7	GND2	H9	R15	K6	R98	K11	R176	E9												
CR29	G9	C101	L9	GND3	G8	R16	K5	R99	K11	R177	E11												
CR30	H9	C102	M9	J1	Y11	R17	J5	R100	J11	R178	E11												
CR31	H9	C103	T7	J2	B9	R18	K6	R101	J10	R179	E10												
CR32	S11	C104	G8	J3	B10	R19	K6	R102	J11	R181	C11												
CR33	P5	C105	H7	K1	E6	R23	U11	R103	G11	R182	F7												
CR34	X9	C106	T6	K2	D11	R24	R11	R104	H11	R183	F7												
CR35	X9	C107	F7	K5	P6	R25	N6	R105	F11	R184	D9												
C5	U8	C108	D6	K6	M9	R26	N6	R106	F11	R185	D9												
C6	U7	C109	T7	L2	V6	R27	L5	R107	G11	R186	V8												
C7	V9	C110	G4	L5	W6	R28	L5	R108	G11	R187	V8												
C19	V8	C111	Y7	L6	U6	R31	N9	R109	G10	R188	V9												
C20	T9	C112	X7	L7	V6	R32	P9	R110	G10	R189	W9												
C21	U8	C113	T6	QA2	U8	R33	R9	R111	G9	R190	W8												
C22	N7	C114	F6	QA3	M6	R34	P10	R112	L10	R191	W9												
C23	N5	C115	T8	QA4	L5	R35	P9	R113	L10	R192	V10												
C24	N5	C116	T8	QA5	R10	R36	N10	R114	J9	R193	V10												
C25	N6	C117	H11	QA6	K5	R37	N11	R115	J9	R194	V10												
C26	N5	C118	H10	QA8	U10	R38	M9	R116	G11	R195	W11												
C27	N6	C119	J10	QA9	P10	R39	M10	R117	G11	R196	W10												
C28	L6	C120	T8	QA10	M10	R40	L9	R118	H9	R197	W11												
C29	T5	C121	T9	QA11	G6	R41	M10	R119	J9	TP1	J5												
C30	M6	C122	F10	QA12	E6	R42	L10	R120	G7	TP2	K11												
C31	M5	C123	F9	QA13	S7	R43	L11	R121	H4	TP3	H7												
C32	M5	C124	G10	QA14	T6	R44	L10	R122	L11	TP4	G11												
C33	L6	C125	F5	QA15	S8	R48	P10	R123	M11	868	2M8												
C34	L5	C126	F5	QA16	S9	R49	P9	R124	G7														
C35	K4	C127	L11	QA17	T5	R50	N10	R125	F7														
C36	J5	C128	M11	QA18	J11	R51	N10	R126	F11														
C37	K5	C129	E7	QA19	G9	R52	P6	R127	F11														
C38	K5	C130	F7	QA20	D5	R53	P5	R128	R5														
C45	U10	C131	F9	QA21	D7	R54	S10	R129	R5														
C46	T9	C132	G9	QA22	D10	R55	S11	R130	D6														
C47	V11	C133	P5	QA23	E10	R56	K7	R131	C5														
C48	R11	C134	D5	QD1	Y5	R57	K7	R132	D5														
C57	U10	C135	D5	QD2	X5	R58	K9	R133	C6														
C58	T10	C136	C6	QD3	X9	R59	L9	R134	D6														
C59	T10	C137	C5	QD4	W7	R60	H5	R135	C6														
C60	N9	C138	D7	Q1	J5	R61	H5	R136	D8														
C61	R11	C139	S11	Q2	J5	R62	G5	R137	E9														
C62	S10	C140	C7	Q3	H5	R63	G5	R138	S11														
C63	R9	C141	D8	Q4	J6	R64	F5	R139	P5														
C64	R10	C142	C7	Q5	J6	R65	G5	R140	E6														
C65	P10	C143	D10	Q6	F6	R66	F5	R141	E5														
C66	T5	C144	D7	Q7	G6	R67	F5	R142	C6														
C67	P11	C145	C10	Q8	F6	R68	E5	R143	C6														
C68	N11	C146	D9	Q9	G6	R69	E5	R144	D7														
C69	P10	C147	C11	Q10	G6	R70	E5	R145	D5														
C70	N11	C148	E11	Q11	H5	R71	E5	R146	D7														

C 51	C Ceramic 100n 20% 50V	213-401
CONNECTORS		
J 1	DIN 41612 96 pol male 90°, C class II	805-923
RELAYS & JUMPERS		
K 1	2-pol amp connector	805-951
CHOKES		
L 1	RF-choke six-hole core green	731-204
INTEGRATED DIGITAL CIRCUITS		
QD 1	IC 74HC541 Octal buffer/line driver	364-781
QD 2	IC 74HC541 Octal buffer/line driver	364-781
QD 3	IC 74AC541 Octal Buffer/Line Driver	364-818
QD 4	IC 74AC541 Octal Buffer/Line Driver	364-818
QD 5	IC DSP320c10-32 Digital Signal Processor 32MHz	364-890
QD 6	IC Cmos Static Ram 2Kx8 30nsec.	364-868
QD 7	IC Cmos Static Ram 2Kx8 30nsec.	364-868
QD 8	IC 74HC273 Octal D-FF.	364-574
QD 9	IC 74HCT245 oct bus tx/rx	364-667
QD 10	IC 74HCT245 oct bus tx/rx	364-667
QD 11	IC 74AC374 OCT D-FF 3-State	364-754
QD 12	IC 74HC04 HEX INV	364-757
QD 13	IC 74HC32 Quad 2-Input OR Gate	364-756
QD 14	IC 74HC08 Quad 2-Input And Gate	364-808
QD 15	IC 74HC139 Decoder-Multiplex	364-771
QD 16	IC 74HC32 Quad 2-Input OR Gate	364-756
QD 17	IC 74HC00 quad 2-input NAND gate	364-807
QD 18	IC 74AC74 dual D ff	364-795
QD 19	IC 74AC139 Dual 1-OF-4 Decoder/Demultiplexer	364-805
QD 20	IC 74HC04 HEX INV	364-757
QD 21	IC 74AC374 OCT D-FF 3-State	364-754
QD 22	IC 74AC374 OCT D-FF 3-State	364-754
QD 23	IC 74HC273 Octal D-FF.	364-574
QD 24	IC 74HC273 Octal D-FF.	364-574
QD 25	IC 74HC273 Octal D-FF.	364-574
QD 26	RE204 Aud.Gen Digital Board 901-867 QD26 27C512	368-377
QD 27	IC 74AC541 Octal Buffer/Line Driver	364-818
QD 28	IC 74HC40105 4-BitsX16 Words FiFo Register	364-802
QD 29	IC 74HC74P dual d ff	364-755
QD 30	IC 74HC40105 4-BitsX16 Words FiFo Register	364-802
QD 31	IC 74HC40105 4-BitsX16 Words FiFo Register	364-802
QD 32	IC 74HC40105 4-BitsX16 Words FiFo Register	364-802
QD 33	RE204 Aud.Gen Digital Board 901-867 QD33 27C512	368-378
QD 34	IC 74AC541 Octal Buffer/Line Driver	364-818
QD 35	IC 74HC273 Octal D-FF.	364-574
QD 36	IC 74HC21 and gate	364-812
QD 37	IC 74HC175 Quad D-type FF W.Reset	364-829
QD 38	IC 74HCT165 8-bit PISO	364-695

QD 39	IC 74HC74P dual d ff	364-755
QD 40	IC 74HCT165 8-bit PISO	364-695
QD 41	IC 74HC74P dual d ff	364-755
QD 42	IC 74HC32 Quad 2-Input OR Gate	364-756
QD 43	IC 74HC04 HEX INV	364-757
QD 44	IC 74HCT165 8-bit PISO	364-695
QD 45	IC 74HCT165 8-bit PISO	364-695

RESISTORS

R 1	R Thick film Sil 8*47K	146-005
R 2	R Thick film Sil 8*47K	146-005
R 3	R Metal film 47K0 5% 0.2W TC250	107-547
R 4	R Metal film 47K0 5% 0.2W TC250	107-547
R 5	R Metal film 47K0 5% 0.2W TC250	107-547
R 6	R Metal film 47K0 5% 0.2W TC250	107-547
R 7	R Metal film 47K0 5% 0.2W TC250	107-547
R 8	R Metal film 47K0 5% 0.2W TC250	107-547
R 9	R Metal film 47K0 5% 0.2W TC250	107-547
R 10	R Thick film Sil 8*47K	146-005
R 11	R Metal film 47K0 5% 0.2W TC250	107-547
R 12	R Thick film Sil 8*47K	146-005
R 13	R Metal film 47K0 5% 0.2W TC250	107-547
R 14	R Metal film 560E 5% 0.2W TC250	107-356
R 15	R Metal film 560E 5% 0.2W TC250	107-356
R 16	R Metal film 47K0 5% 0.2W TC250	107-547

CRYSTALS

Y 1	Quarts Crystal 32MHz 100ppm	910-216

MISCELLANEOUS

	40 pin DIL Socket	816-179
	28 Pin DIL Socket	816-251
	24 Pin DIL Socket w. 3 modul spacing	816-274
	PCB For RE204 Audio Generator Digital	971-413
GND1	Term. strip 50pol mod 2	806-072
GND2	Term. strip 50pol mod 2	806-072
QDS5	40 pin DIL Socket	816-179
QDS6	24 Pin DIL Socket w. 3 modul spacing	816-274
QDS7	24 Pin DIL Socket w. 3 modul spacing	816-274
QDS26	28 Pin DIL Socket	816-251
QDS33	28 Pin DIL Socket	816-251

PCB Assy Audio Generator Analog Board (901-868)

CAPACITORS

C 5	C Ceramic 10p0 2% 100V NP0	213-205
C 6	C Var. 10-60p hor	286-007
C 7	C Polyst 1n00 1% 63V	243-304
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Ceramic 100n 20% 50V	213-401
C 21	C Ceramic 22p0 2% 100V NP0	213-206
C 22	C Polyst 4n64 1% 63V	243-301
C 23	C Ceramic 100n 20% 50V	213-401
C 24	C Polyst 4n64 1% 63V	243-301
C 25	C Polyst 4n64 1% 63V	243-301
C 26	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 27	C Ceramic 100n 20% 50V	213-401
C 28	C Ceramic 100n 20% 50V	213-401
C 29	C Ceramic 100n 20% 50V	213-401
C 30	C Polyst 4n64 1% 63V	243-301
C 31	C Polyst 4n64 1% 63V	243-301
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Ceramic 100n 20% 50V	213-401
C 34	C Polyst 4n64 1% 63V	243-301
C 35	C Ceramic 100n 20% 50V	213-401
C 36	C Ceramic 100n 20% 50V	213-401
C 37	C Ceramic 100n 20% 50V	213-401
C 38	C Ceramic 10p0 2% 100V NP0	213-205
C 45	C Ceramic 10p0 2% 100V NP0	213-205
C 46	C Var. 10-60p hor	286-007
C 47	C Polyst 1n00 1% 63V	243-304
C 48	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 57	C Ceramic 100n 20% 50V	213-401
C 58	C Ceramic 100n 20% 50V	213-401
C 59	C Ceramic 22p0 2% 100V NP0	213-206
C 60	C Polyst 4n64 1% 63V	243-301
C 61	C Ceramic 100n 20% 50V	213-401
C 62	C Polyst 4n64 1% 63V	243-301
C 63	C Polyst 4n64 1% 63V	243-301
C 64	C Ceramic 100n 20% 50V	213-401
C 65	C Ceramic 100n 20% 50V	213-401
C 66	C Ceramic 100n 20% 50V	213-401
C 67	C Polyst 4n64 1% 63V	243-301
C 68	C Polyst 4n64 1% 63V	243-301
C 69	C Ceramic 100n 20% 50V	213-401
C 70	C Ceramic 100n 20% 50V	213-401
C 71	C Polyst 4n64 1% 63V	243-301
C 72	C Ceramic 100n 20% 50V	213-401
C 73	C Ceramic 100n 20% 50V	213-401
C 74	C Ceramic 100n 20% 50V	213-401
C 75	C Ceramic 10p0 2% 100V NP0	213-205
C 76	C Ceramic 100n 20% 50V	213-401
C 77	C Ceramic 100n 20% 50V	213-401
C 78	C Ceramic 100n 20% 50V	213-401
C 79	C Solid Aluminium 10u 20% 25V Short Type	265-110

C 80	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 81	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 82	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 83	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 84	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 85	C Ceramic 100n 20% 50V	213-401
C 86	C Ceramic 100n 20% 50V	213-401
C 87	C Ceramic 100n 20% 50V	213-401
C 91	C Ceramic 100n 20% 50V	213-401
C 92	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 93	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 94	C Ceramic 100n 20% 50V	213-401
C 95	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 96	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 97	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 98	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 99	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 100	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 101	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 102	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 103	C Ceramic 100n 20% 50V	213-401
C 104	C Ceramic 100n 20% 50V	213-401
C 105	C Ceramic 22p0 2% 100V NP0	213-206
C 106	C Ceramic 100n 20% 50V	213-401
C 107	C Ceramic 100n 20% 50V	213-401
C 108	C Ceramic 22p0 2% 100V NP0	213-206
C 109	C Ceramic 100n 20% 50V	213-401
C 110	C Ceramic 100n 20% 50V	213-401
C 111	C Ceramic 100n 20% 50V	213-401
C 112	C Ceramic 100n 20% 50V	213-401
C 113	C Ceramic 100n 20% 50V	213-401
C 114	C Ceramic 100n 20% 50V	213-401
C 115	C Ceramic 100n 20% 50V	213-401
C 116	C Ceramic 100n 20% 50V	213-401
C 117	C Ceramic 100n 20% 50V	213-401
C 118	C Ceramic 22p0 2% 100V NP0	213-206
C 119	C Ceramic 100n 20% 50V	213-401
C 120	C Ceramic 100n 20% 50V	213-401
C 121	C Ceramic 100n 20% 50V	213-401
C 122	C Ceramic 100n 20% 50V	213-401
C 123	C Ceramic 22p0 2% 100V NP0	213-206
C 124	C Ceramic 100n 20% 50V	213-401
C 125	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 126	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 127	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 128	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 129	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 130	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 131	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 132	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 133	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 134	C Ceramic 100n 20% 50V	213-401
C 135	C Ceramic 10p0 2% 100V NP0	213-205
C 136	C Ceramic 100n 20% 50V	213-401

R 71	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 72	R Metal film 22K0 5% 0.2W TC250	107-522
R 73	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 74	R Metal film 33K0 5% 0.2W TC250	107-533
R 75	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 76	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 77	R Metal Film 1K02 1% 0.5W TC50	114-102
R 78	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 79	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 80	R Metal film 33K0 5% 0.2W TC250	107-533
R 81	R Metal film 47K0 5% 0.2W TC250	107-547
R 82	R Metal film 47K0 5% 0.2W TC250	107-547
R 83	R Metal film 33K0 5% 0.2W TC250	107-533
R 84	R Metal film 3K92 0.1% 0.25w TC25	141-004
R 85	R Metal film 3K92 0.1% 0.25w TC25	141-004
R 86	R Metal film 33K0 5% 0.2W TC250	107-533
R 87	R Metal film 33K0 5% 0.2W TC250	107-533
R 88	R Metal film 33K0 5% 0.2W TC250	107-533
R 89	R Metal film 22K0 5% 0.2W TC250	107-522
R 90	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 91	R Metal film 33K0 5% 0.2W TC250	107-533
R 92	R Metal film 33K0 5% 0.2W TC250	107-533
R 93	R Metal film 22K0 5% 0.2W TC250	107-522
R 94	R Metal film 33K0 5% 0.2W TC250	107-533
R 95	R Metal film 33K0 5% 0.2W TC250	107-533
R 96	R Metal Film 402K 1% 0.5W TC50	116-402
R 97	R Metal Film 32K4 0.1% 0.2W TC25	141-005
R 98	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 99	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 100	R Metal Film 1K02 1% 0.5W TC50	114-102
R 101	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 102	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 103	R Metal film 33K0 5% 0.2W TC250	107-533
R 104	R Metal film 33K0 5% 0.2W TC250	107-533
R 105	R Metal Film 402K 1% 0.5W TC50	116-402
R 106	R Metal Film 32K4 0.1% 0.2W TC25	141-005
R 107	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 108	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 109	R Metal film 3K92 0.1% 0.25w TC25	141-004
R 110	R Metal film 3K92 0.1% 0.25w TC25	141-004
R 111	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 112	R Metal film 33K0 5% 0.2W TC250	107-533
R 113	R Metal film 33K0 5% 0.2W TC250	107-533
R 114	R Metal film 33K0 5% 0.2W TC250	107-533
R 115	R Metal film 33K0 5% 0.2W TC250	107-533
R 116	R Metal film 33K0 5% 0.2W TC250	107-533
R 117	R Metal film 33K0 5% 0.2W TC250	107-533
R 118	R Metal film 33K0 5% 0.2W TC250	107-533
R 119	R Metal film 33K0 5% 0.2W TC250	107-533
R 120	R Metal film 47E0 5% 0.2W TC250	107-247
R 121	R Metal film 47E0 5% 0.2W TC250	107-247
R 122	R Metal film 47E0 5% 0.2W TC250	107-247
R 123	R Metal film 47E0 5% 0.2W TC250	107-247
R 124	R Metal film 47E0 5% 0.2W TC250	107-247

R 125	R Metal film 47E0 5% 0.2W TC250	107-247
R 126	R Metal film 47E0 5% 0.2W TC250	107-247
R 127	R Metal film 47E0 5% 0.2W TC250	107-247
R 128	R Metal Film 4K99 1% 0.5W TC50	114-499
R 129	R Metal Film 4K99 1% 0.5W TC50	114-499
R 130	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 131	R Metal Film 249K 1% 0.5W TC50	116-249
R 132	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 133	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 134	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 135	R Metal film 10E0 0.1% 0.25w TC25	140-478
R 136	R Metal Film 4K99 1% 0.5W TC50	114-499
R 137	R Metal Film 4K99 1% 0.5W TC50	114-499
R 138	R Metal film 1M00 5% 0.2W TC250	107-710
R 139	R Metal film 1M00 5% 0.2W TC250	107-710
R 140	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 141	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 142	R Metal Film 249K 1% 0.5W TC50	116-249
R 143	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 144	R Metal film 22K0 5% 0.2W TC250	107-522
R 145	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 146	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 147	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 148	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 149	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 150	R Metal film 560E 5% 0.2W TC250	107-356
R 151	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 152	R Metal film 22K0 5% 0.2W TC250	107-522
R 153	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 154	R Metal film 10E0 0.1% 0.25w TC25	140-478
R 155	R Metal Film 249K 1% 0.5W TC50	116-249
R 156	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 157	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 158	R Metal Film 4K99 1% 0.5W TC50	114-499
R 159	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 160	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 161	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 162	R Metal film 22K0 5% 0.2W TC250	107-522
R 163	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 164	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 165	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 166	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 167	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 168	R Metal film 10E0 0.1% 0.25w TC25	140-478
R 169	R Metal film 560E 5% 0.2W TC250	107-356
R 173	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 174	R Metal Film 249K 1% 0.5W TC50	116-249
R 175	R Metal film 2K49 0.1% 0.25w TC25	141-297
R 176	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 177	R Metal film 22K0 5% 0.2W TC250	107-522
R 178	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 179	R Metal film 10E0 0.1% 0.25w TC25	140-478
R 181	R Metal Film 4K99 1% 0.5W TC50	114-499
R 182	R Metal film 22E0 5% 0.2W TC250	107-222

R 183	R Metal film 22E0 5% 0.2W TC250	107-222
R 184	R Metal film 22E0 5% 0.2W TC250	107-222
R 185	R Metal film 22E0 5% 0.2W TC250	107-222
R 186	R Cermet Trimpot 20K 10% 0.5W TC100	182-414
R 187	R Metal Film 75K0 0.1% 0.25W TC25	141-300
R 188	R Metal Film 3K01 1% 0.5W TC50	114-301
R 189	R Metal Film 464K 1% 0.5W TC50	116-464
R 190	R Cermet Trimpot 100K 20% 0.5W TC100	182-409
R 191	R Metal Film 200K 0.1% 0.1W TC15	141-059
R 192	R Cermet Trimpot 20K 10% 0.5W TC100	182-414
R 193	R Metal Film 75K0 0.1% 0.25W TC25	141-300
R 194	R Metal Film 3K01 1% 0.5W TC50	114-301
R 195	R Metal Film 464K 1% 0.5W TC50	116-464
R 196	R Cermet Trimpot 100K 20% 0.5W TC100	182-409
R 197	R Metal Film 200K 0.1% 0.1W TC15	141-059

TESTPOINTS

TP 1	Term. strip 50pol mod 2	806-072
TP 2	Term. strip 50pol mod 2	806-072
TP 3	Term. strip 50pol mod 2	806-072
TP 4	Term. strip 50pol mod 2	806-072

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Lock washer D2,7/4,8x0,45	046-404
	Tubular Rivet 2.5X10	060-310
	Female Plug	805-718
	L-piece for PCB	857-041
	PCB For RE204 Audio Generator Analog	971-412
GND1	Solder Terminal 0.1 O2	823-303
GND2	Solder Terminal 0.1 O2	823-303
GND3	Solder Terminal 0.1 O2	823-303
QDS3	16 Pin Dil Socket	816-133
QDS4	16 Pin Dil Socket	816-133

13. STEREO GENERATOR OPTION

13.1 Circuit Description

Fig. 13.1 shows a block diagram of the Stereo Generator.

13.1.1 Input Buffers and Function Control

Refer to sheet 1 of the schematic diagram.

The R Input and L Input are fed by the Audio Generator. The pre-emphasis weighting is made by modifying the Audio Generator levels according to the frequency, see section 2.13.

The input buffers QA1A and QA3A provide an amplification of 1.33 This means that the 100 % composite level is changed from 3 Vpeak to 4 Vpeak.

The Main Computer controls the function selector using the control signals R, L=R, L, and L=-R. Fig. 13.1 and Table 13.1 show the use of these control signals.

The L and R signals are then fed to the L-δR and R-δL amplifiers, QA1B and QA3B. These amplifiers provide adjustment for LR crosstalk.

The LR crosstalk present in modulators of the switching type, and the LR crosstalk caused by attenuating the composite filter in the frequency range of the subchannel, are compensated for by feeding the output signal of the L-δR amplifier to the input of the R-δL amplifier via R34/R39, and feeding the output signal of the R-δL amplifier to the input of the L-δR amplifier via R33/R38.

The MS separation may be adjusted to minimum using R30 and R32.

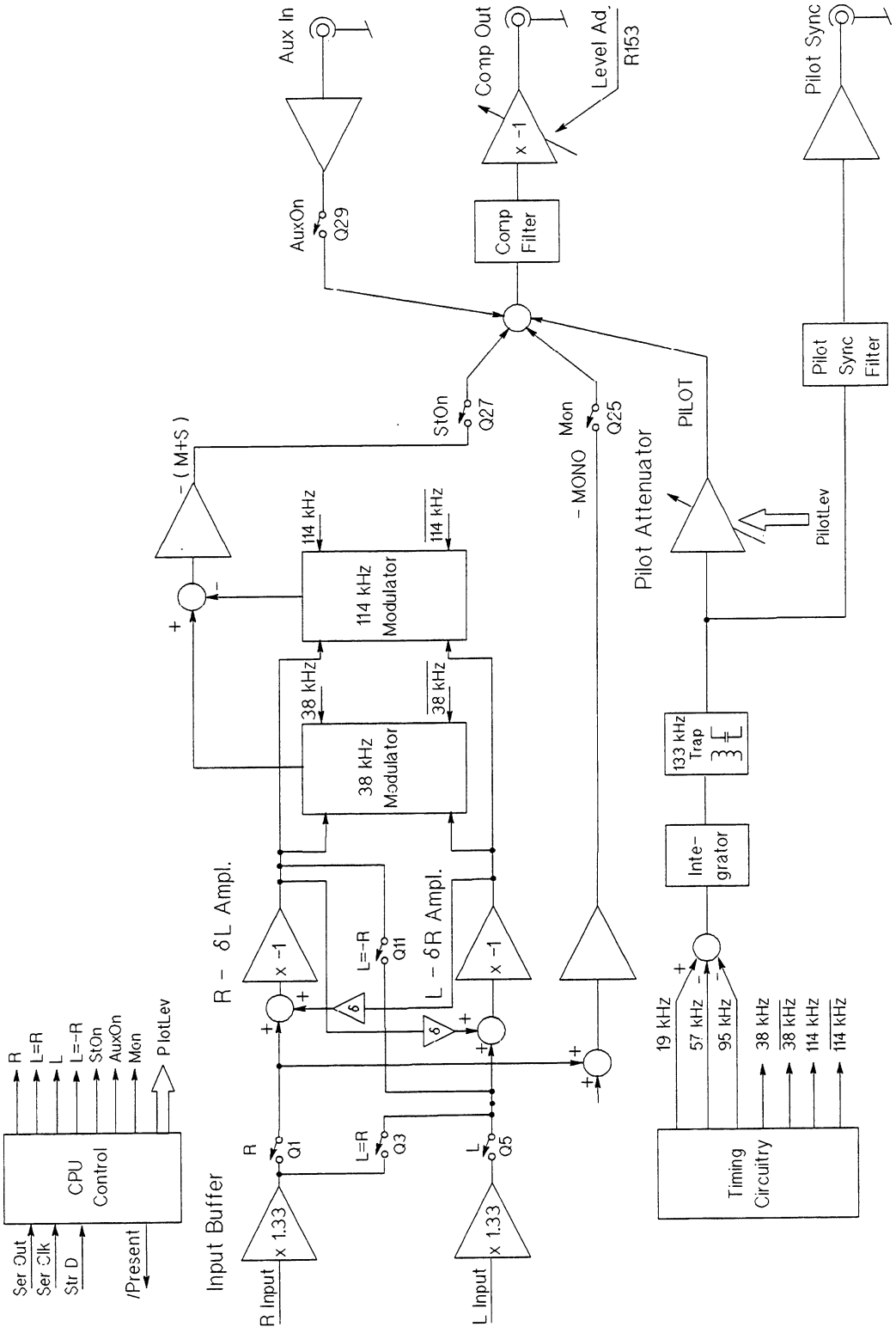


Fig. 13.1 - Stereo Generator Block Diagram

Function		Mon Q25	StOn Q27	L=-R Q11	L Q5	L=R Q3	R Q1
Stereo	L & R	0	1	0	1	0	1
Mono	L = R	1	0	0	0	1	1
Subchannel only	L = -R	0	1	1	0	0	1
L only		0	1	0	1	0	0
R only		0	1	0	0	0	1
Off		0	0	0	0	0	0

Table 13.1 - Stereo Generator Setup

13.1.2 Modulators

The composite signal is generated by an integrated balanced switch modulator, operating at 38 kHz (QA4). The sidebands at the third harmonic of 38 kHz, that is 114 kHz, are balanced out by a signal from a 114 kHz modulator (QA5) similar to and synchronized to the 38 kHz modulator. Both modulators consist of two dual-transistors having individual current sources.

The L and R signals are connected to each half of the modulators. The current from each current source alternately passes through the first and the second half of that dual-transistor to which it is connected, as the bases of the two dual-transistors are fed with complementary square wave voltages with an amplitude of approximately 500 mV.

Due to this, the current through R41 (the output of the 38 kHz modulator QA4) in the first half period of the 38 kHz equals the current of the current generator connected to the L signal, while the current in the second half period of the 38 kHz equals the current from the current generator connected to the R signal. As the DC current from the two current generators are equal (adjusted by R68) the DC current through R41 is constant, thus suppressing the 38 kHz signal from the modulator.

The 114 kHz modulator operates in a similar way.

The currents from the two modulators are fed to the summing amplifier QA2. Because the current from the 114 kHz modulator is 3 times less than the current from the 38 kHz modulator, the sidebands in the vicinity of 114 kHz are compensated.

Use R53 to adjust the L signal current, and R77 for the R signal current. C16/C17 provide the correct phasing of the current from the 114 kHz modulator.

13.1.3 Clock Generator and Pilot Generator

Refer to sheet 2 of the schematic diagram.

The digital circuitry generating the driver signals for the modulators and the pilot generator consists of an X-tal oscillator (f = 4.56 MHz), a counter (QD4/QD8), counting a cycle of 240 (4.56 MHz÷240 = 19 kHz), a PROM (QD9) which outputs the actual signals with the correct phase relationship, and buffers (QD5/QD10).

The QD10 outputs are used for the generation of the pilot signal. A 19 kHz signal from the clock generator (QD9, pin 9), is fed to the pilot integrator, QA9A, together with a 57 kHz signal (QD9, pin 8) and a 95 kHz signal (QD9, pin 7). The phase relationship and the current level, set by R109/R110/R111, are such, that the 3rd and 5th harmonics of the 19 kHz square wave are compensated (eliminated). Only 7th and 9th order harmonics and upwards are present in the output of the pilot integrator.

The 7th harmonic, 133 kHz, is eliminated by a 133 kHz trap, which is a parallel resonance circuit. The 7th harmonic is thus attenuated by approximately 20 dB. The remaining harmonic components are attenuated either by the composite filter used in the composite signal, or by a dedicated pilot sync filter used at the Pilot Sync output. The resulting pilot at the composite output has a THD of approximately 0.1 %.

The phase of the pilot signal relative to the 38 kHz subcarrier can be adjusted by changing the time constant of the pilot integrator (R127).

Following the pilot integrator and the 133 kHz trap, the signal is routed to the pilot attenuator for use in the composite output signal, as well as to the pilot sync filter for use at the Pilot Sync output.

The pilot attenuator is programmable in steps of 0.5 % composite level, from 0 % (pilot off) to 15.5 %.

The pilot sync filter built around QA18B reduces the THD of the Pilot Sync output to approximately 0.01 %.

The circuitry QD7/QD3D is not used in the RE 204.

13.1.4 Composite Filter, Aux Input, and Outputs

Refer to sheet 3 of the schematic diagram.

The switches Q25, controlled by the signal Mon, and Q27, controlled by the signal StOn, select between mono mode and stereo mode. When mono is selected, the signal bypasses the modulators, thus obtaining optimum noise performance.

De-selection of the pilot signal is obtained by selecting a level of 0 %.

Q29 selects/deselects the Aux Input. R175 adjusts the Aux level.

All signal components are added in the summing amplifier QA14 and then fed to the composite filter.

The composite filter is a 6-link low-pass filter with the following characteristics:

* Linear phase characteristic up to 53 kHz
* Flat amplitude response up to 15 kHz and a maximum attenuation of approximately 0.3 % at 53 kHz.
* Fine cut-off characteristics.

The filter output is buffered by QA12, level adjusted by R153 (the potentiometer accessible from the rear panel), and then finally buffered by QA13.

13.1.5 Main Computer Interface

The 80C186 Main Computer controls all Stereo Generator settings via the Serial Interface described in section 8. The STR D pulse used to latch data into the registers QD1/QD2 originates from the A/D Converter Board (see section 11). Table 13.1 shows the control bit settings of L, L=R, R, L=-R, StOn and Mon.

The /Present signal is used to detect the Stereo Generator. During the initialization procedure at power-up, the Main Computer writes a "1" to QD1, pin 4. J1 c4 is then asserted (low), and this is detected by the CPU. If no Stereo Generator is installed, the line remains high.

13.2 Adjustments

You can optimize the adjustment of the Stereo Generator in two ways: for a specific RE 204, or as a board which may be swapped between different instruments. The reason for this is, that the remaining output offsets and level errors in the Audio Generator of the relevant RE 204 may be compensated for in the Stereo Generator. Therefore, before adjusting the Stereo Generator, we recommend that you first check these two parameters of the Audio Generator.

Adjustment of the following items are described:

* DC offset
* Gain, input
* 38 kHz residual and 114 kHz spurious
* Sidebands
* L/R separation
* Mono/subchannel separation

* Gain, output and mono
* 133 kHz trap for pilot generator
* Pilot phase
* Pilot gain
* AUX gain
* Re-adjustment of 38 kHz residual and 114 kHz spurious.

We recommend that all the adjustments are made, and strictly in the order stated.

During calibration, the Stereo Generator Board may be mounted on an Extender Board (901-864), except for the final re-adjustment of 38 kHz and 114 kHz residuals.

NOTE Turn the Comp Output level potentiometer fully clockwise until the maximum output signal is reached during adjustments.

Before starting any test, send the command "**GE,FM PE,0 AN,OFF**".

13.2.1 DC Offset

Send the command "**AL,B,0% FC,ST PT,OFF CT,ON**".

Use R26 to adjust TP1 to <1 mV.

Use R57 to adjust TP3 to <1 mV.

Use R6 to adjust TP2 to <1 mV.

Use R40 to adjust TP4 to <1 mV.

Use R170 to adjust J2 to <1 mV.

Send the command "**FC,MN**".

Use R97 to adjust TP5 to <1 mV.

13.2.2 Gain, Input

Send the command "**AL,B,100% AF,B,1000HZ FC,ST**".

Use R3 to adjust TP1 to 4 Vpeak ± 0.1 % (2.8284 V_{rms} ± 2.8 mV).

Use R25 to adjust TP3 to 4 Vpeak ± 0.1 % (2.8284 V_{rms} ± 2.8 mV).

13.2.3 38 kHz Residual and 114 kHz Spurious

Test equipment: Wave analyzer or spectrum analyzer, 10 kHz to 150 kHz, bandwidth <10 Hz, sensitivity >80 dB below 1.5 V_{rms}.

Send the command "**FC,ST AL,B,0% PT,ON PV,10% CT,ON**".

Use R66 to adjust J2 to a minimum 38 kHz (<0.28 mV_{rms}, that is <-74 dB relative to 100 % composite level (2 Vpeak) or <-54 dB relative to pilot level (0.2 Vpeak)).

Use R77 to adjust to a minimum 114 kHz (<0.56 mV, that is <-68 dB relative to 100 % composite level or <-48 dB relative to pilot level).

NOTE After the Stereo Generator has been inserted into the RE 204 and warmed up, additional adjustments of the 38 kHz and 114 kHz residuals have to be made (the potentiometers may be reached from the top when the board is installed).

13.2.4 Sidebands

Test equipment: Wave analyzer or spectrum analyzer, 10 kHz to 150 kHz, bandwidth <10 Hz, sensitivity >80 dB below 1.5 V_{rms}.

Make the following measurements at J2:

Send the command "**AL,B,100% AF,B,10KHZ FC,L**".

Use R53 to adjust the sidebands at 104 kHz and 124 kHz to a minimum (<0.25 mVrms, that is <-72 dB relative to 100 % composite level (2 Vpeak)).

Send the command "**FC,R**".

Use R73 to adjust the sidebands at 104 kHz and 124 kHz to a minimum.

13.2.5 L/R Separation

Test equipment: For this test, an oscilloscope with the capability of 40 dB overdrive without distortion of zero line and a sensitivity of 5 mV/div must be used.

NOTE If such an instrument is not available, the adjustment should be made by the factory.

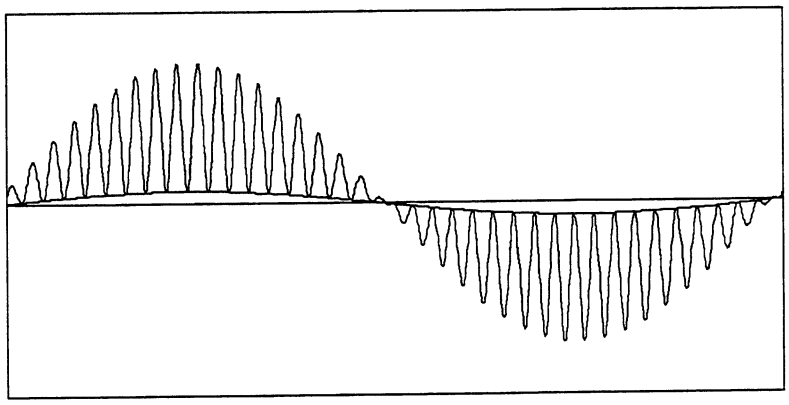


Fig. 13.2 - Adjustment of LR Separation

Send the command "**AL,B,100% AF,B,1000HZ FC,R**". Connect Comp Out to the oscilloscope and right Out of the audio generator to the external trigger input.

Use R38 to adjust until maximum channel separation is reached, that is until the "bottom line" of the signal is horizontal (see Fig. 13.2).

Send the command "**FC,L**".

Use R39 to adjust until maximum channel separation is reached.

13.2.6 M/S Separation

Test equipment: Wave analyzer or spectrum analyzer, 10 kHz to 150 kHz, bandwidth < 10 Hz, sensitivity > 80 dB below 1.5 V_{rms}.

Make the following measurements at J2:

Send the command "**AL,B,100% AF,B,1000HZ FC,MN ZZ,SG,#2030**".

Use R30 to adjust the sidebands at 37 kHz and 39 kHz to a minimum (< 0.22 mVrms, that is < -76 dB relative to 100 % composite level (2 Vpeak)).

Send the command "**FC,SB**".

Use R32 to adjust the 1 kHz component to a minimum value (< 0.45 mVrms, that is < -70 dB relative to 100 % composite level (2 Vpeak)). The voltage must be measured selectively, either using the wave analyzer/spectrum analyzer or by measuring RMS with the RE 204, using the 1 kHz band-pass filter.

13.2.7 Gain, Output and Mono

Send the command "**AL,B,100% AF,B,1000HZ FC,ST**".

Use R152 to adjust TP8 to 2 Vpeak ±0.1 % (1.4142 V_{rms} ±1.4 mV).

Send the command "**FC,MN**".

Use R91 to adjust TP8 to 2 Vpeak (1.4141 V_{rms} ±1.4 mV).

13.2.8 133 kHz Spurious

Test equipment: Wave analyzer or spectrum analyzer, 10 kHz to 150 kHz, bandwidth <10 Hz, sensitivity >80 dB below 1.5 V_{rms}.

Send the command "**FC,OFF PT,ON PV,10%**".

Use L108 to adjust J2 to a minimum 133 kHz (<0.25 mV_{rms}, that is <-72 dB relative to 100 % composite level (2 Vpeak) *or* <-52 dB relative to pilot level (0.2 Vpeak)).

13.2.9 Pilot Phase

Test equipment: Oscilloscope.

Send the command "**AL,B,9% AF,B,400HZ PT,ON PV,15.5% FC,SB**". Connect right Out of the audio generator to the external trigger input of the oscilloscope and Comp. Out to the input. Set the oscilloscope to 10 mV/div.

Use R127 to adjust the difference between the zero passages to minimum (see Fig. 13.3).

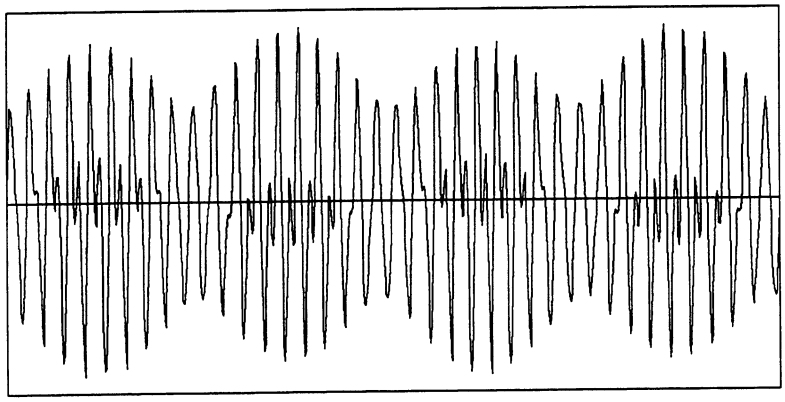


Fig. 13.3 - Pilot phase adjustment

13.2.10 Pilot Gain

Send the command "**PT,ON PV,8% FC,OFF**".

Use R123 to adjust J2 to 160 mVpeak (113.1 mV_{rms} ±0.1 mV).

Send the command "**PV,4%**".

Use R144 to adjust J2 to 80 mVpeak (56.56 mV_{rms} ±0.05 mV). Check that 0.5 %, 1 % and 2 % are correct.

Use R134 to adjust J4 to 775.0 mV_{rms} ±0.8 mV.

13.2.11 Aux Gain

Test equipment: LF generator, 57.000 kHz, 1 Vpeak (0.707 V_{rms} ±0.7 mV) output.

Send the command "**AN,ON PT,OFF**". Connect the generator output to AUX input.

Use R175 to adjust J2 to 200 mVpeak (141.42 mV_{rms} ±0.14 mV).

13.2.12 Re-adjustment of 38 kHz and 114 kHz

After re-installing the board in the RE 204, and after a warm-up period of at least 15 minutes, the 38 kHz residual and the 114 kHz spurious *must* be re-adjusted while the board is operating at the correct temperature. You can do this by removing the top plate, which provides access to the two potentiometers in question.

Re-adjust the Comp Output level by using the procedure described in section 4.4.6.

13.3 Schematic Diagrams

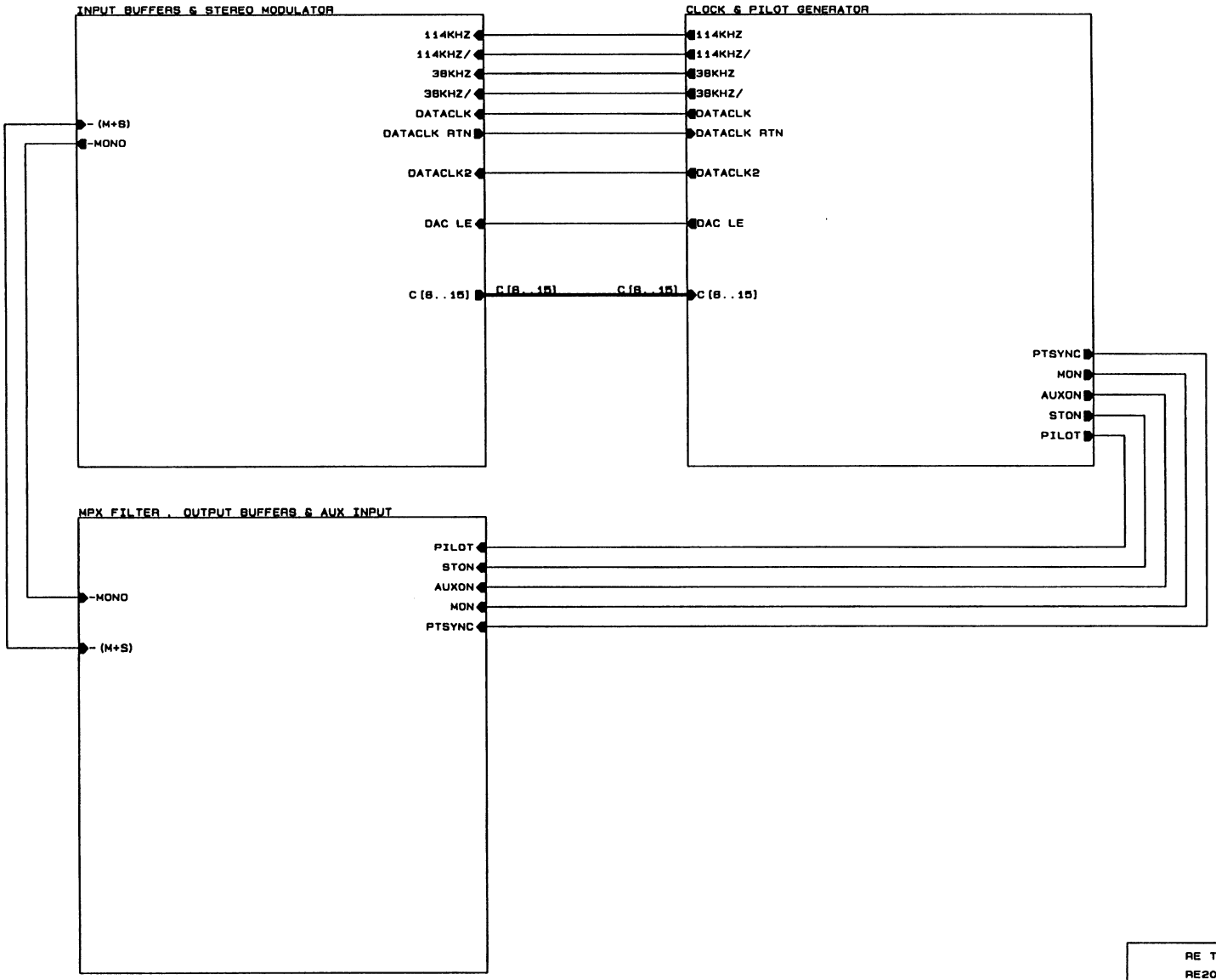
The schematic diagram for the stereo generator option is shown in diagram number 985-318.

13.4 Component Locations

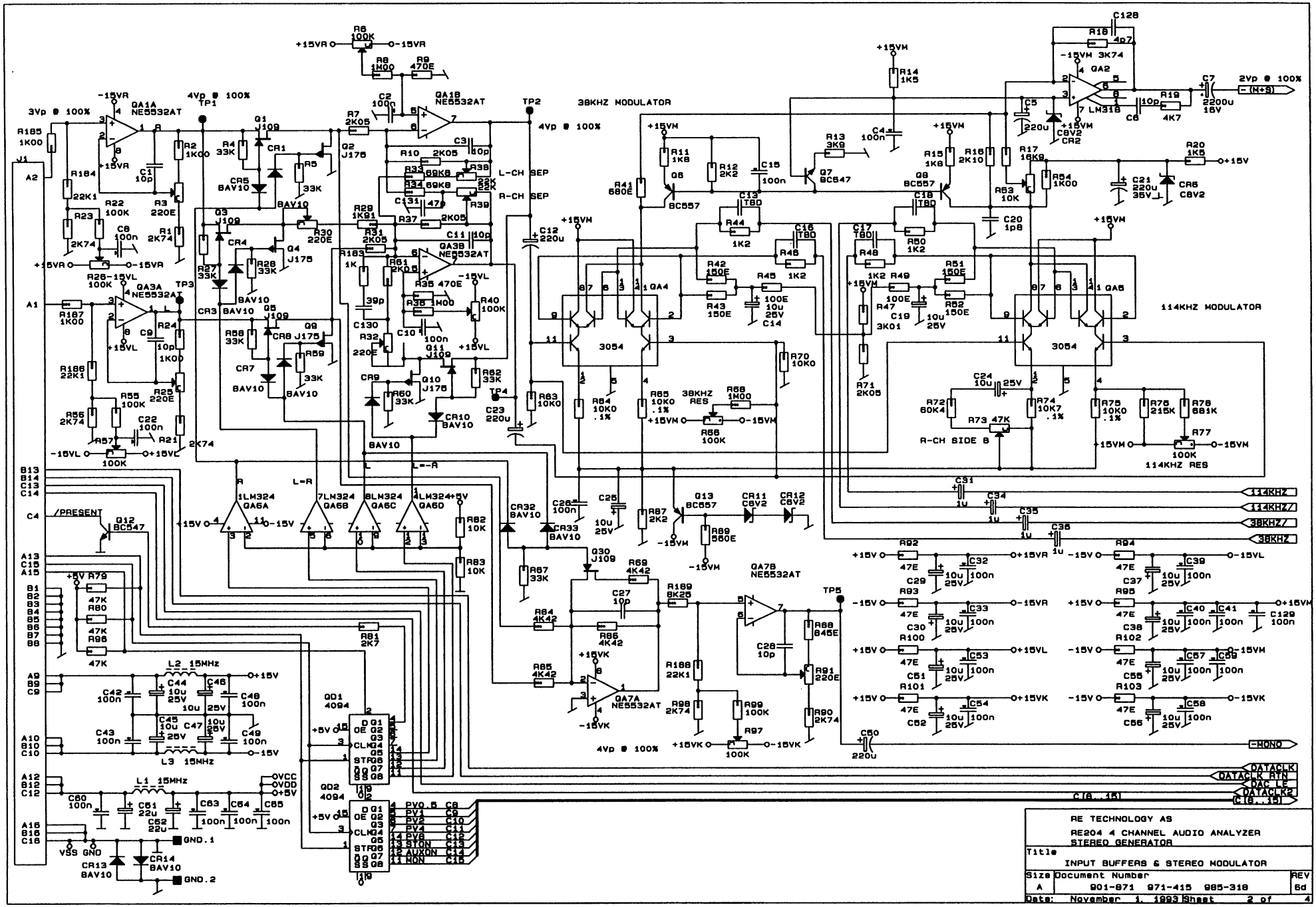
The component locations on the stereo generator option are shown in the following diagram.

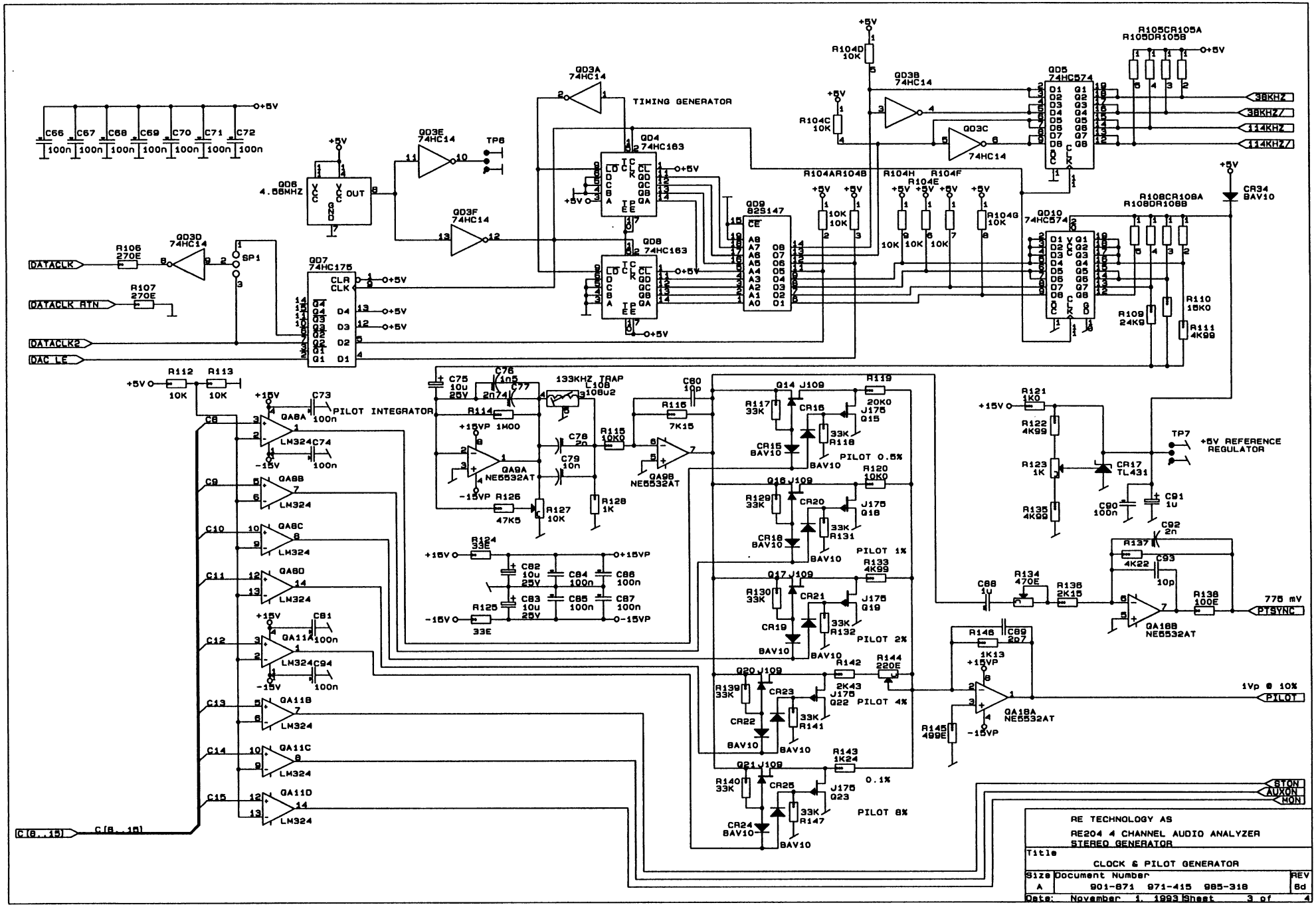
13.5 Parts List

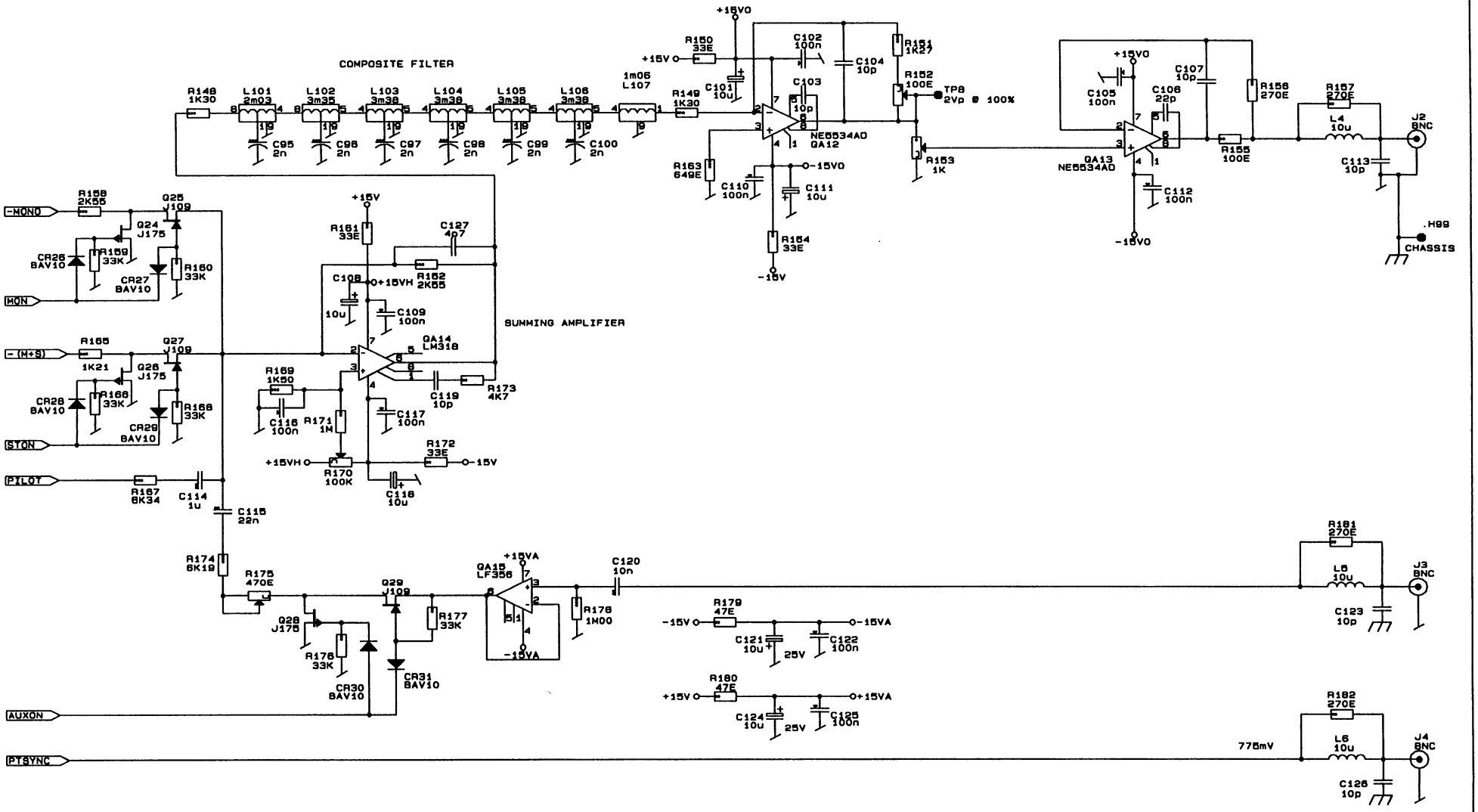
A copy of the parts lists from the production documentation is shown in the following. The code number of the assembled PCB is 901-871.

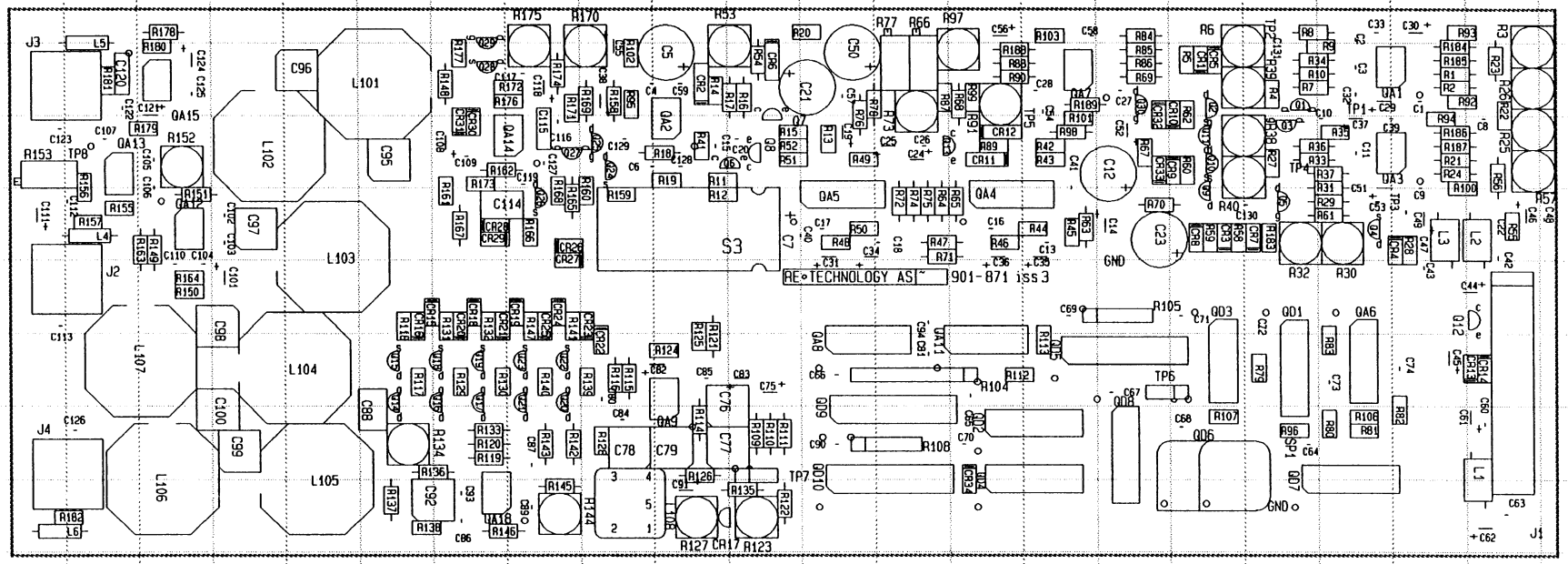


RE TECHNOLOGY AS		
RE204 4 CHANNEL AUDIO ANALYZER STEREO GENERATOR		
Title: ROOT SHEET		
Size: A	Document Number: 901-871 971-415 985-318	REV: 8d
Date: November 1, 1993	Sheet 1 of 4	


38KHZ MODULATOR
114KHZ MODULATOR
A-CH SIDE B
114KHZ RES
38KHZ RES
L-CH SEP
R-CH SEP
3054
QA1A NE5532AT
QA1B NE5532AT
QA3A NE5532AT
QA3B NE5532AT
QA4
QA5
QA6A LM324
QA6B LM324
QA6C LM324
QA6D LM324
QA7A NE5532AT
QA7B NE5532AT
QA8 NE5532AT
QD1 4094
QD2 4094
L1 15MHz
L2 15MHz
L3 15MHz
/PRESENT
GND.1
GND.2
DATACLK
DATACLK RTN
DAC LE
DATACLK2
C(0..15)
-MONO
RE TECHNOLOGY AS
RE204 4 CHANNEL AUDIO ANALYZER STEREO GENERATOR
Title
INPUT BUFFERS & STEREO MODULATOR
Size A
Document Number 901-871 971-415 985-318
REV 6d
Date: November 1, 1993 Sheet 2 of 4


TIMING GENERATOR
PILOT INTEGRATOR
133KHZ TRAP
+5V REFERENCE REGULATOR
PILOT 0.5%
PILOT 1%
PILOT 2%
PILOT 4%
0.1%
PILOT 8%
38KHZ
38KHZ/
114KHZ
114KHZ/
775 mV
PTSYNC
1Vp @ 10%
PILOT
STON
AUXON
MON
DATACLK
DATACLK RTN
DATACLK2
DAC LE
C[8..15]
RE TECHNOLOGY AS
RE204 4 CHANNEL AUDIO ANALYZER
STEREO GENERATOR
CLOCK & PILOT GENERATOR
Document Number 901-871 971-415 985-318
Size A
REV 8d
Date: November 1, 1993 Sheet 3 of 4


COMPOSITE FILTER
SUMMING AMPLIFIER
-MONO
MON
-(M+S)
STON
PILOT
AUXON
PTSYNC
+15V0
-15V0
+15V
-15V
+15VH
+15VA
-15VA
NE5534AD QA12
QA13 NE5534AD
QA14 LM318
QA15 LF356
TP8 2Vp @ 100%
775mV
CHASSIS
J2 BNC
J3 BNC
J4 BNC
RE TECHNOLOGY AS
RE204 4 CHANNEL AUDIO ANALYZER STEREO GENERATOR
Title
MPX FILTER , OUTPUT BUFFER & AUX INPUT
Size A
Document Number 901-871 971-415 985-318
REV 6d
Date: November 1, 1993 Sheet 4 of 4



971-415iss.3

901-871
RE240 STEREO GENERATOR BOARD

CR1	U5	C42	Y8	C117	J5	Q16	H10	R61	W7	R136	G10
CR2	L5	C43	X8	C118	J5	Q17	H10	R62	U6	R137	G11
CR3	U7	C44	Y8	C119	J6	Q18	H9	R63	S7	R138	H11
CR4	W7	C45	X9	C120	C5	Q19	H9	R64	P7	R139	K9
CR5	U5	C46	Y7	C121	D5	Q20	J10	R65	R7	R140	J9
CR6	W5	C47	X7	C122	C5	Q21	J10	R66	P4	R141	J9
CR7	V7	C48	Z7	C123	C6	Q22	J9	R67	T6	R142	J10
CR8	U7	C49	X7	C124	D5	Q23	J9	R68	R5	R143	J10
CR9	T6	C50	N4	C125	D5	Q24	K6	R69	T5	R144	K11
CR10	U6	C51	W7	C126	B10	Q25	K6	R70	T7	R145	J11
CR11	R6	C52	T6	C127	J6	Q26	J7	R71	R7	R146	J11
CR12	R6	C53	W7	C128	L6	Q27	J6	R72	P7	R147	J9
CR13	Y9	C54	S5	C129	K6	Q28	H5	R73	P5	R148	H5
CR14	Y9	C55	K4	C130	V7	Q29	H4	R74	P7	R149	D7
CR15	G8	C56	R4	C131	V5	Q30	T5	R75	P7	R150	D8
CR16	G9	C57	N5	GND	V11	R1	X5	R76	N6	R151	D7
CR17	M11	C58	T4	GND	T8	R2	X5	R77	P4	R152	D6
CR18	H8	C59	L5	J1	Y11	R3	Y4	R78	P5	R153	B6
CR19	J8	C60	Y10	J2	C8	R4	V5	R79	V9	R155	C7
CR20	H9	C61	Y10	J3	B5	R5	U5	R80	W10	R156	C6
CR21	J9	C62	Y11	J4	B10	R6	U4	R81	W10	R157	C7
CR22	K8	C63	Y11	L1	Y10	R7	V5	R82	X10	R158	K5
CR23	K9	C64	V10	L2	Y7	R8	V4	R83	W9	R159	K7
CR24	J8	C65	R10	L3	X7	R9	W4	R84	T4	R160	K6
CR25	J9	C66	N9	L4	C7	R10	W5	R85	T5	R161	H7
CR26	J7	C67	T9	L5	C4	R11	L6	R86	T5	R162	J6
CR27	J7	C68	U10	L6	C11	R12	L7	R87	R5	R163	C7
CR28	H7	C69	S8	L101	F5	R13	N6	R88	S5	R164	D8
CR29	H7	C70	R10	L102	E6	R14	L5	R89	R6	R165	J7
CR30	H5	C71	U8	L103	F7	R15	M6	R90	S5	R166	J7
CR31	H6	C72	V8	L104	F9	R16	M5	R91	R6	R167	H7
CR32	T5	C73	W9	L105	F10	R17	M5	R92	Y5	R168	J6
CR33	T6	C74	X9	L106	D11	R18	L6	R93	Y4	R169	K5
CR34	R10	C75	M9	L107	D9	R19	L6	R94	X5	R170	K4
C1	X5	C76	L9	L108	L11	R20	M4	R95	K5	R171	J6
C2	W4	C77	L10	QA1	X5	R21	X6	R96	V10	R172	J5
C3	W5	C78	K10	QA2	L5	R22	Y5	R97	P4	R173	H6
C4	L5	C79	L10	QA3	X6	R23	Y5	R98	S6	R174	J5
C5	L5	C80	K9	QA4	R7	R24	X6	R99	R5	R175	J4
C6	K6	C81	P9	QA5	N7	R25	Y6	R100	Y6	R176	H5
C7	M7	C82	K9	QA6	W8	R26	Y5	R101	S5	R177	H4
C8	Y6	C83	M9	QA7	S5	R27	V6	R102	K4	R178	D4
C9	X7	C84	K10	QA8	N9	R28	X7	R103	S4	R179	D6
C10	W5	C85	L9	QA9	L10	R29	W7	R104	R9	R180	D5
C11	W6	C86	H11	QA11	P9	R30	W8	R105	T8	R181	C5
C12	T6	C87	J10	QA12	D7	R31	W7	R106	W10	R182	C11
C13	S7	C88	G9	QA13	C6	R32	V8	R107	U10	R183	V7
C14	T7	C89	J11	QA14	H6	R33	W6	R108	P10	R184	X5
C15	L6	C90	N10	QA15	D6	R34	W5	R109	M10	R185	Y5
C16	R7	C91	L11	QA18	J11	R35	W6	R110	M10	R186	X6
C17	N7	C92	G11	QD1	V8	R36	W6	R111	M10	R187	Y6
C18	P7	C93	H11	QD2	R10	R37	W6	R112	R9	R188	S5
C19	N6	C94	P8	QD3	U8	R38	V6	R113	S9	R189	T5
C20	M6	C95	G6	QD4	R11	R39	V5	R114	L10	SP1	V10
C21	N5	C96	F5	QD5	S9	R40	U7	R115	K9	TP1	W5
C22	Y7	C97	E7	QD6	U10	R41	L6	R116	K9	TP2	V4
C23	T7	C98	E9	QD7	V11	R42	S6	R117	G9	TP3	X7
C24	P6	C99	E10	QD8	T9	R43	S6	R118	G9	TP4	V6
C25	P6	C100	E10	QD9	N10	R44	S7	R119	H10	TP5	S6
C26	P6	C101	E8	QD10	N11	R45	S7	R120	H10	TP6	U9
C27	T5	C102	E7	Q1	V5	R46	R7	R121	L8	TP7	M11
C28	S5	C103	E7	Q2	U5	R47	P7	R122	M11	TP8	C6
C29	W5	C104	D7	Q3	V6	R48	N7	R123	M11	871	3P8
C30	X4	C105	D6	Q4	W7	R49	N6	R124	L9		
C31	N8	C106	D7	Q5	V7	R50	N7	R125	L8		
C32	W5	C107	C6	Q6	M6	R51	M6	R126	L10		
C33	W4	C108	H6	Q7	N6	R52	M6	R127	L11		
C34	N7	C109	H6	Q8	M6	R53	L4	R128	K10		
C35	S8	C110	D7	Q9	U7	R54	M5	R129	H9		
C36	R8	C111	B7	Q10	U6	R55	Y7	R130	J9		
C37	W6	C112	C7	Q11	U6	R56	Y6	R131	H9		
C38	K5	C113	C8	Q12	X8	R57	Y7	R132	H9		
C39	X6	C114	H7	Q13	R6	R58	U7	R133	H10		
C40	N7	C115	J6	Q14	G10	R59	U7	R134	H10		
C41	S6	C116	J6	Q15	G9	R60	U6	R135	M11		

PCB Assy Stereo Generator Option (901-871)

CAPACITORS

C 1	C Ceramic 10p0 2% 100V NP0	213-205
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Ceramic 10p0 2% 100V NP0	213-205
C 4	C Ceramic 100n 20% 50V	213-401
C 5	Elct 220u 35V Radial Mini	261-103
C 6	C Ceramic 10p0 2% 100V NP0	213-205
C 7	Electrolytic 2000/16, 2000h/85°, A:12.5*30, RM14	260-063
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 10p0 2% 100V NP0	213-205
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Ceramic 10p0 2% 100V NP0	213-205
C 12	Elct 220u 35V Radial Mini	261-103
C 14	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 15	C Ceramic 100n 20% 50V	213-401
C 19	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 20	C Ceramic 1p80 p25 100V NP0	213-219
C 21	Elct 220u 35V Radial Mini	261-103
C 22	C Ceramic 100n 20% 50V	213-401
C 23	Elct 220u 35V Radial Mini	261-103
C 24	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 25	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 26	C Ceramic 100n 20% 50V	213-401
C 27	C Ceramic 10p0 2% 100V NP0	213-205
C 28	C Ceramic 10p0 2% 100V NP0	213-205
C 29	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 30	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 31	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Ceramic 100n 20% 50V	213-401
C 34	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 35	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 36	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 37	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 38	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 39	C Ceramic 100n 20% 50V	213-401
C 40	C Ceramic 100n 20% 50V	213-401
C 41	C Ceramic 100n 20% 50V	213-401
C 42	C Ceramic 100n 20% 50V	213-401
C 43	C Ceramic 100n 20% 50V	213-401
C 44	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 45	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 46	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 47	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 48	C Ceramic 100n 20% 50V	213-401
C 49	C Ceramic 100n 20% 50V	213-401
C 50	Elct 220u 35V Radial Mini	261-103
C 51	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 52	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 53	C Ceramic 100n 20% 50V	213-401
C 54	C Ceramic 100n 20% 50V	213-401

C 55	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 56	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 57	C Ceramic 100n 20% 50V	213-401
C 58	C Ceramic 100n 20% 50V	213-401
C 59	C Ceramic 100n 20% 50V	213-401
C 60	C Ceramic 100n 20% 50V	213-401
C 61	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 62	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 63	C Ceramic 100n 20% 50V	213-401
C 64	C Ceramic 100n 20% 50V	213-401
C 65	C Ceramic 100n 20% 50V	213-401
C 66	C Ceramic 100n 20% 50V	213-401
C 67	C Ceramic 100n 20% 50V	213-401
C 68	C Ceramic 100n 20% 50V	213-401
C 69	C Ceramic 100n 20% 50V	213-401
C 70	C Ceramic 100n 20% 50V	213-401
C 71	C Ceramic 100n 20% 50V	213-401
C 72	C Ceramic 100n 20% 50V	213-401
C 73	C Ceramic 100n 20% 50V	213-401
C 74	C Ceramic 100n 20% 50V	213-401
C 75	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 76	C Polystyrene 1n5 1% 63V	243-312
C 77	C Polystyrene 2n74 1% 63V	243-318
C 78	C Polyst 2n00 1% 63V	243-305
C 79	C Polyst 10n0 1% 63V	243-302
C 80	C Ceramic 10p0 2% 100V NP0	213-205
C 81	C Ceramic 100n 20% 50V	213-401
C 82	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 83	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 84	C Ceramic 100n 20% 50V	213-401
C 85	C Ceramic 100n 20% 50V	213-401
C 86	C Ceramic 100n 20% 50V	213-401
C 87	C Ceramic 100n 20% 50V	213-401
C 88	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 89	C Ceramic 2p70 p25 100V NPO	213-201
C 90	C Ceramic 100n 20% 50V	213-401
C 91	C Solid Aluminium 1u0 20% 25V Short Type	265-101
C 92	C Polyst 2n00 1% 63V	243-305
C 93	C Ceramic 10p0 2% 100V NP0	213-205
C 94	C Ceramic 100n 20% 50V	213-401
C 95	C Polyst 2n00 1% 63V	243-305
C 96	C Polyst 2n00 1% 63V	243-305
C 97	C Polyst 2n00 1% 63V	243-305
C 98	C Polyst 2n00 1% 63V	243-305
C 99	C Polyst 2n00 1% 63V	243-305
C 100	C Polyst 2n00 1% 63V	243-305
C 101	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 102	C Ceramic 100n 20% 50V	213-401
C 103	C Ceramic 10p0 2% 100V NP0	213-205
C 104	C Ceramic 10p0 2% 100V NP0	213-205
C 105	C Ceramic 100n 20% 50V	213-401
C 106	C Ceramic 22p0 2% 100V NP0	213-206
C 107	C Ceramic 10p0 2% 100V NP0	213-205
C 108	C Solid Aluminium 10u 20% 16V Short Type	265-108

C 109	C Ceramic 100n 20% 50V	213-401
C 110	C Ceramic 100n 20% 50V	213-401
C 111	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 112	C Ceramic 100n 20% 50V	213-401
C 113	C Ceramic 10p0 2% 100V NP0	213-205
C 114	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 115	MKT, 0.022/63/10, R:2.5*6.5*7.2, RM2	241-082
C 116	C Ceramic 100n 20% 50V	213-401
C 117	C Ceramic 100n 20% 50V	213-401
C 118	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 119	C Ceramic 10p0 2% 100V NP0	213-205
C 120	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 121	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 122	C Ceramic 100n 20% 50V	213-401
C 123	C Ceramic 10p0 2% 100V NP0	213-205
C 124	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 125	C Ceramic 100n 20% 50V	213-401
C 126	C Ceramic 10p0 2% 100V NP0	213-205
C 127	C Ceramic 4p70 p25 100V p100	213-203
C 128	C Ceramic 4p70 p25 100V p100	213-203
C 129	C Ceramic 100n 20% 50V	213-401
C 130	C Ceramic 39p0 2% 100V NP0	213-232
C 131	C Ceramic 47p0 2% 100V NP0	213-209

DIODES

CR 1	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 2	Diode zener BZX79-C8V2 0.4W	350-607
CR 3	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 4	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 5	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 6	Diode zener BZX79-C8V2 0.4W	350-607
CR 7	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 8	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 9	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 10	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 11	Diode zener BZX79-C6V2 0.4W	350-604
CR 12	Diode zener BZX79-C6V2 0.4W	350-604
CR 13	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 14	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 15	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 16	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 17	IC TL431 ADJ. Precision Shunt Regulators	364-849
CR 18	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 19	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 20	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 21	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 22	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 23	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 24	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 25	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 26	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 27	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 28	Diode BAV10 Si Vr-60V If-600mA	350-022

CR 29	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 30	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 31	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 32	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 33	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958
J 2	Angle Bnc Jack For Printed Circuin Board 50E	800-524
J 3	Angle Bnc Jack For Printed Circuin Board 50E	800-524
J 4	Angle Bnc Jack For Printed Circuin Board 50E	800-524

CHOKES

L 1	RF-choke six-hole core green	731-204
L 2	RF-choke six-hole core green	731-204
L 3	RF-choke six-hole core green	731-204
L 4	Choke HF 10uH 20% 0.3A	703-019
L 5	Choke HF 10uH 20% 0.3A	703-019
L 6	Choke HF 10uH 20% 0.3A	703-019
L 101	*Potcore Coil	740-012
L 102	*Potcore Coil	740-013
L 103	*Potcore Coil	740-014
L 104	*Potcore Coil	740-014
L 105	*Potcore Coil	740-014
L 106	*Potcore Coil	740-014
L 107	*Potcore Coil	740-015
L 108	*Potcore Coil	740-016

TRANSISTORS

Q 1	Transistor J109-18 n Fet	360-188
Q 2	Transistor J175-18 p jfet	360-252
Q 3	Transistor J109-18 n Fet	360-188
Q 4	Transistor J175-18 p jfet	360-252
Q 5	Transistor J109-18 n Fet	360-188
Q 6	Transistor BC557B pnp	360-160
Q 7	Transistor BC547B npn	360-159
Q 8	Transistor BC557B pnp	360-160
Q 9	Transistor J175-18 p jfet	360-252
Q 10	Transistor J175-18 p jfet	360-252
Q 11	Transistor J109-18 n Fet	360-188
Q 12	Transistor BC547B npn	360-159
Q 13	Transistor BC557B pnp	360-160
Q 14	Transistor J109-18 n Fet	360-188
Q 15	Transistor J175-18 p jfet	360-252
Q 16	Transistor J109-18 n Fet	360-188
Q 17	Transistor J109-18 n Fet	360-188
Q 18	Transistor J175-18 p jfet	360-252
Q 19	Transistor J175-18 p jfet	360-252
Q 20	Transistor J109-18 n Fet	360-188
Q 21	Transistor J109-18 n Fet	360-188
Q 22	Transistor J175-18 p jfet	360-252

Q 23	Transistor J175-18 p jfet	360-252
Q 24	Transistor J175-18 p jfet	360-252
Q 25	Transistor J109-18 n Fet	360-188
Q 26	Transistor J175-18 p jfet	360-252
Q 27	Transistor J109-18 n Fet	360-188
Q 28	Transistor J175-18 p jfet	360-252
Q 29	Transistor J109-18 n Fet	360-188
Q 30	Transistor J109-18 n Fet	360-188

INTEGRATED ANALOG CIRCUITS

QA 1	IC NE5532A Dual OP-Amp low noise	364-640
QA 2	IC LM318N OP-Amp	364-216
QA 3	IC NE5532A Dual OP-Amp low noise	364-640
QA 4	IC 3054 transistor array	364-070
QA 5	IC 3054 transistor array	364-070
QA 6	IC LM324N Quad OP-Amp	364-176
QA 7	IC NE5532A Dual OP-Amp low noise	364-640
QA 8	IC LM324N Quad OP-Amp	364-176
QA 9	IC NE5532A Dual OP-Amp low noise	364-640
QA 11	IC LM324N Quad OP-Amp	364-176
QA 12	IC 5534A op amp	364-639
QA 13	IC 5534A op amp	364-639
QA 14	IC LM318N OP-Amp	364-216
QA 15	IC LF356 op amp	364-203
QA 18	IC NE5532A Dual OP-Amp low noise	364-640

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC4094 8 stage shift REG.	364-811
QD 2	IC 74HC4094 8 stage shift REG.	364-811
QD 3	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 4	IC 74HC163P 4-bit binary counter	364-814
QD 5	IC 74HCT574P octal d ff	364-716
QD 6	Crystal Clock Oscillator 4.56MHz 50ppm	910-223
QD 7	IC 74HC175 Quad D-type FF W.Reset	364-829
QD 8	IC 74HC163P 4-bit binary counter	364-814
QD 9	RE521 Timing QD5 901-831 82S147	368-374
QD 10	IC 74HCT574P octal d ff	364-716

RESISTORS

R 1	R Metal Film 2K74 1% 0.5W TC50	114-274
R 2	R Metal Film 1K00 1% 0.5W TC50	114-100
R 3	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 4	R Metal film 33K0 5% 0.2W TC250	107-533
R 5	R Metal film 33K0 5% 0.2W TC250	107-533
R 6	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 7	R Metal Film 2K05 0.5% 0.4W TC50	140-971
R 8	R Metal Film 1M00 1% 0.5W TC50	117-100
R 9	R Metal film 470E 5% 0.2W TC250	107-347
R 10	R Metal Film 2K05 0.5% 0.4W TC50	140-971
R 11	R Metal film 1K80 5% 0.2W TC250	107-418
R 12	R Metal film 2K20 5% 0.2W TC250	107-422

R 13	R Metal film 3K90 5% 0.2W TC250	107-439
R 14	R Metal film 1K50 5% 0.2W TC250	107-415
R 15	R Metal film 1K80 5% 0.2W TC250	107-418
R 16	R Metal Film 2K10 1% 0.5W TC50	114-210
R 17	R Metal Film 16K9 1% 0.5W TC50	115-169
R 18	R Metal Film 3K74 1% 0.5W TC50	114-374
R 19	R Metal film 4K70 5% 0.2W TC250	107-447
R 20	R Metal film 1K50 5% 0.2W TC250	107-415
R 21	R Metal Film 2K74 1% 0.5W TC50	114-274
R 22	R Metal film 100K 5% 0.2W TC250	107-610
R 23	R Metal Film 2K74 1% 0.5W TC50	114-274
R 24	R Metal Film 1K00 1% 0.5W TC50	114-100
R 25	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 26	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 27	R Metal film 33K0 5% 0.2W TC250	107-533
R 28	R Metal film 33K0 5% 0.2W TC250	107-533
R 29	R Metal Film 1K91 1% 0.5W TC50	114-191
R 30	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 31	R Metal Film 2K05 0.5% 0.4W TC50	140-971
R 32	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 33	R Metal Film 82K5 1% 0.5W TC50	115-825
R 34	R Metal Film 82K5 1% 0.5W TC50	115-825
R 35	R Metal film 470E 5% 0.2W TC250	107-347
R 36	R Metal Film 1M00 1% 0.5W TC50	117-100
R 37	R Metal Film 2K05 0.5% 0.4W TC50	140-971
R 38	R Cermet Trimpot 22K 20% 0.3W TC70	182-303
R 39	R Cermet Trimpot 22K 20% 0.3W TC70	182-303
R 40	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 41	R Metal film 680E 5% 0.2W TC250	107-368
R 42	R Metal film 150E 5% 0.2W TC250	107-315
R 43	R Metal film 150E 5% 0.2W TC250	107-315
R 44	R Metal film 1K20 5% 0.2W TC250	107-412
R 45	R Metal film 100E 5% 0.2W TC250	107-310
R 46	R Metal film 1K20 5% 0.2W TC250	107-412
R 47	R Metal Film 3K01 1% 0.5W TC50	114-301
R 48	R Metal film 1K20 5% 0.2W TC250	107-412
R 49	R Metal film 100E 5% 0.2W TC250	107-310
R 50	R Metal film 1K20 5% 0.2W TC250	107-412
R 51	R Metal film 150E 5% 0.2W TC250	107-315
R 52	R Metal film 150E 5% 0.2W TC250	107-315
R 53	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 54	R Metal Film 1K00 1% 0.5W TC50	114-100
R 55	R Metal film 100K 5% 0.2W TC250	107-610
R 56	R Metal Film 2K74 1% 0.5W TC50	114-274
R 57	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 58	R Metal film 33K0 5% 0.2W TC250	107-533
R 59	R Metal film 33K0 5% 0.2W TC250	107-533
R 60	R Metal film 33K0 5% 0.2W TC250	107-533
R 61	R Metal Film 2K00 1% 0.5W TC50	114-200
R 62	R Metal film 33K0 5% 0.2W TC250	107-533
R 63	R Metal Film 10K0 1% 0.5W TC50	115-100
R 64	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 65	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 66	R Cermet Trimpot 100K 10% 0.5W	182-429

R 67	R Metal film 33K0 5% 0.2W TC250	107-533
R 68	R Metal Film 1M00 1% 0.5W TC50	117-100
R 69	R Metal Film 4K42 1% 0.5W TC50	114-442
R 70	R Metal Film 10K0 1% 0.5W TC50	115-100
R 71	R Metal Film 2K05 0.5% 0.4W TC50	140-971
R 72	R Metal Film 60K4 1% 0.5W TC50	115-604
R 73	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 74	R Metal Film 10K7 0,5% 0,4W TC50	140-840
R 75	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 76	R Metal Film 215K 1% 0.5W TC50	116-215
R 77	R Cermet Trimpot 100K 10% 0.5W	182-429
R 78	R Metal Film 681K 1% 0.5W TC50	116-681
R 79	R Metal film 47K0 5% 0.2W TC250	107-547
R 80	R Metal film 47K0 5% 0.2W TC250	107-547
R 81	R Metal film 2K70 5% 0.2W TC250	107-427
R 82	R Metal film 10K0 5% 0.2W TC250	107-510
R 83	R Metal film 10K0 5% 0.2W TC250	107-510
R 84	R Metal Film 4K42 1% 0.5W TC50	114-442
R 85	R Metal Film 4K42 1% 0.5W TC50	114-442
R 86	R Metal Film 4K42 1% 0.5W TC50	114-442
R 87	R Metal film 2K20 5% 0.2W TC250	107-422
R 88	R Metal Film 845E 1% 0.5W TC50	113-845
R 89	R Metal film 560E 5% 0.2W TC250	107-356
R 90	R Metal Film 2K74 1% 0.5W TC50	114-274
R 91	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 92	R Metal film 47E0 5% 0.2W TC250	107-247
R 93	R Metal film 47E0 5% 0.2W TC250	107-247
R 94	R Metal film 47E0 5% 0.2W TC250	107-247
R 95	R Metal film 47E0 5% 0.2W TC250	107-247
R 96	R Metal film 47K0 5% 0.2W TC250	107-547
R 97	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 98	R Metal Film 2K74 1% 0.5W TC50	114-274
R 99	R Metal film 100K 5% 0.2W TC250	107-610
R 100	R Metal film 47E0 5% 0.2W TC250	107-247
R 101	R Metal film 47E0 5% 0.2W TC250	107-247
R 102	R Metal film 47E0 5% 0.2W TC250	107-247
R 103	R Metal film 47E0 5% 0.2W TC250	107-247
R 104	R Thick film Sil 8*10K	146-003
R 105	R Thick Film Sil 4*10K 5% 0.1W	146-017
R 106	R Metal film 270E 5% 0.2W TC250	107-327
R 107	R Metal film 270E 5% 0.2W TC250	107-327
R 108	R Thick Film Sil 4*10K 5% 0.1W	146-017
R 109	R Metal Film 24K9 1% 0.5W TC50	115-249
R 110	R Metal Film 15K0 1% 0.5W TC50	115-150
R 111	R Metal Film 4K99 1% 0.5W TC50	114-499
R 112	R Metal film 10K0 5% 0.2W TC250	107-510
R 113	R Metal film 10K0 5% 0.2W TC250	107-510
R 114	R Metal Film 1M00 1% 0.5W TC50	117-100
R 115	R Metal Film 10K0 1% 0.5W TC50	115-100
R 116	R Metal Film 7K15 1% 0.5W TC50	114-715
R 117	R Metal film 33K0 5% 0.2W TC250	107-533
R 118	R Metal film 33K0 5% 0.2W TC250	107-533
R 119	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 120	R Metal Film 10K0 1% 0.5W TC50	115-100

R 121	R Metal Film 1K00 1% 0.5W TC50	114-100
R 122	R Metal Film 4K99 1% 0.5W TC50	114-499
R 123	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 124	R Metal film 33E0 5% 0.2W TC250	107-233
R 125	R Metal film 33E0 5% 0.2W TC250	107-233
R 126	R Metal Film 47K5 1% 0.5W TC50	115-475
R 127	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 128	R Metal film 1K00 5% 0.2W TC250	107-410
R 129	R Metal film 33K0 5% 0.2W TC250	107-533
R 130	R Metal film 33K0 5% 0.2W TC250	107-533
R 131	R Metal film 33K0 5% 0.2W TC250	107-533
R 132	R Metal film 33K0 5% 0.2W TC250	107-533
R 133	R Metal Film 4K99 1% 0.5W TC50	114-499
R 134	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 135	R Metal Film 4K99 1% 0.5W TC50	114-499
R 136	R Metal Film 2K15 1% 0.5W TC50	114-215
R 137	R Metal Film 4K22 1% 0.5W TC50	114-422
R 138	R Metal film 100E 5% 0.2W TC250	107-310
R 139	R Metal film 33K0 5% 0.2W TC250	107-533
R 140	R Metal film 33K0 5% 0.2W TC250	107-533
R 141	R Metal film 33K0 5% 0.2W TC250	107-533
R 142	R Metal Film 2K43 1% 0.5W TC50	114-243
R 143	R Metal Film 1K24 0.1% 0.25W TC25	141-296
R 144	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 145	R Metal Film 499E 1% 0.5W TC50	113-499
R 146	R Metal film 1K13 1% 0.5W TC50	114-113
R 147	R Metal film 33K0 5% 0.2W TC250	107-533
R 148	R Metal Film 1K3 0.5% 0.4W TC50	140-883
R 149	R Metal Film 1K3 0.5% 0.4W TC50	140-883
R 150	R Metal film 33E0 5% 0.2W TC250	107-233
R 151	R Metal Film 1K27 1% 0.5W TC50	114-127
R 152	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 153	R Cermet Trimpot 1K 10% 0.5W TC100	182-424
R 155	R Metal film 100E 5% 0.2W TC250	107-310
R 156	R Metal film 270E 5% 0.2W TC250	107-327
R 157	R Metal film 270E 5% 0.2W TC250	107-327
R 158	R Metal Film 2K55 1% 0.5W TC50	114-255
R 159	R Metal film 33K0 5% 0.2W TC250	107-533
R 160	R Metal film 33K0 5% 0.2W TC250	107-533
R 161	R Metal film 33E0 5% 0.2W TC250	107-233
R 162	R Metal Film 2K55 1% 0.5W TC50	114-255
R 163	R Metal Film 649E 1% 0.5W TC50	113-649
R 164	R Metal film 33E0 5% 0.2W TC250	107-233
R 165	R Metal Film 1K21 1% 0.5W TC50	114-121
R 166	R Metal film 33K0 5% 0.2W TC250	107-533
R 167	R Metal Film 6K34 1% 0.5W TC50	114-634
R 168	R Metal film 33K0 5% 0.2W TC250	107-533
R 169	R Metal Film 1K50 1% 0.5W TC50	114-150
R 170	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 171	R Metal film 1M00 5% 0.2W TC250	107-710
R 172	R Metal film 33E0 5% 0.2W TC250	107-233
R 173	R Metal film 4K70 5% 0.2W TC250	107-447
R 174	R Metal Film 6K19 1% 0.5W TC50	114-619
R 175	R Cermet Trimpot 470E 20% 0.5W TC70	182-302

R 176	R Metal film 33K0 5% 0.2W TC250	107-533
R 177	R Metal film 33K0 5% 0.2W TC250	107-533
R 178	R Metal Film 1M00 1% 0.5W TC50	117-100
R 179	R Metal film 47E0 5% 0.2W TC250	107-247
R 180	R Metal film 47E0 5% 0.2W TC250	107-247
R 181	R Metal film 270E 5% 0.2W TC250	107-327
R 182	R Metal film 270E 5% 0.2W TC250	107-327
R 183	R Metal film 1K00 5% 0.2W TC250	107-410
R 184	R Metal Film 22K1 1% 0.5W TC50	115-221
R 185	R Metal Film 1K00 1% 0.5W TC50	114-100
R 186	R Metal Film 22K1 1% 0.5W TC50	115-221
R 187	R Metal Film 1K00 1% 0.5W TC50	114-100
R 188	R Metal Film 22K1 1% 0.5W TC50	115-221
R 189	R Metal Film 8K25 1% 0.5W TC50	114-825

TESTPOINTS

TP 1	Term. strip 50pol mod 2	806-072
TP 2	Term. strip 50pol mod 2	806-072
TP 3	Term. strip 50pol mod 2	806-072
TP 4	Term. strip 50pol mod 2	806-072
TP 5	Term. strip 50pol mod 2	806-072
TP 6	3 Pin AMP mod II Terminal List, Straight	805-894
TP 7	3 Pin AMP mod II Terminal List, Straight	805-894
TP 8	Term. strip 50pol mod 2	806-072

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Lock washer D2,7/4,8x0,45	046-404
	Solder Terminal 0.1 O2	823-303
	L-piece for PCB	857-041
	PCB For RE204 Stereo Generator	971-415
QDS9	20 Pin DIL Socket	816-184

14. WOW & FLUTTER OPTION

14.1 Circuit Description

The Wow & Flutter Board is mounted on top of the Analog Frontend Board for the right channels. Fig. 10.1 shows the Analog Frontend Block Diagram.

The circuitry provides a band-pass filter and a limiter, which removes any amplitude modulation which would violate the frequency demodulation performed for the wow & flutter measurement.

The remaining part of the wow & flutter detection is made digitally, see section 2.11.

14.1.1 Band-pass Filter

The 2.4 to 3.8 kHz band-pass filter rejects frequency components in the input signal (for example hum) outside the actual frequency band, which would affect the measurement due to AM to FM conversion in the limiter. The cut-off frequency of the filter has been determined by the worst-case condition in the input signal which is:

[3 kHz] - [10 % drift] - [a 300 Hz wow & flutter component] = 2.4 kHz

[3.15 kHz] + [10 % drift] + [a 300 Hz wow & flutter component] = 3.765 kHz

QA1B constitutes a 0.3 dB ripple 3-pole Chebyschev low-pass section with a cut-off frequency of 3800 Hz, while QA1C provides a similar high-pass section with a cut-off frequency of 2400 Hz.

14.1.2 Limiter

QA2 is used for a hard-limiting high-gain amplifier which shapes the sinusoidal input signal into a squarewave signal. This signal is then fed to the antialiasing filter of the Analog Frontend before being presented to the A/D converter. Further processing is done digitally.

14.2 Adjustments

Connect the Right output to the Right Front Input.

Send the command "**CAL,OFF AF,B,3000 AL,B,2.9 ZZ,12 FR,BP,6000**". Measure RMS continuously. Send the command "**CH,RF RS**".

Use R20 to adjust to the minimum RMS value.

Send the command "**ZZ,13 CAL,ON**".

14.3 Schematic Diagrams

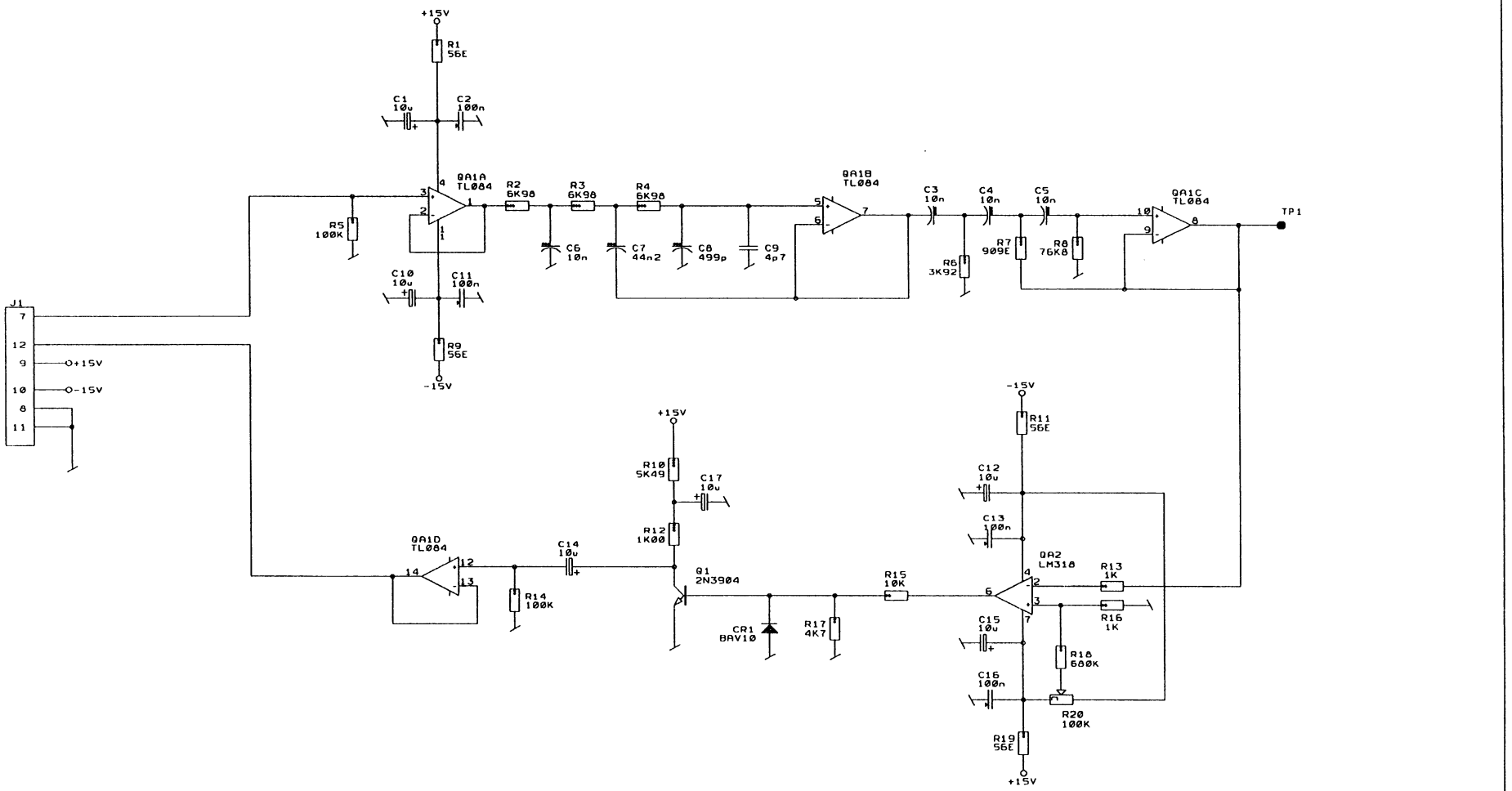
The schematic diagram for the Wow & Flutter option is shown in diagram number 985-308.

14.4 Component Locations

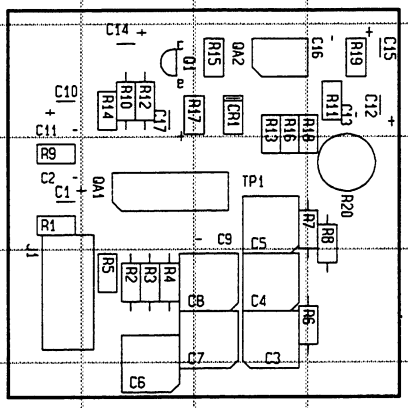
The component locations on the Wow and Flutter option are shown in the following diagram.

14.5 Parts List

A copy of the parts lists from the production documentation is shown in the following. The code number of the assembled PCB is 901-837.



RE TECHNOLOGY AS		
RE204 4 CHANNEL AUDIO ANALYZER		
Title: W&F OPTION		
Size: A	Document Number: 901-837 971-384 985-308	REV: 2A
Date: October 2, 1992	Sheet 1 of 1	



RE204 WOW & FLUTTER BOARD /0971-384iss.2

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	GB																						
C1	E9																						
C2	E9																						
C3	G11																						
C4	G10																						
C5	G10																						
C6	F11																						
C7	F11																						
C8	F10																						
C9	G9																						
C10	E8																						
C11	E8																						
C12	H8																						
C13	H8																						
C14	F8																						
C15	H8																						
C16	H8																						
C17	F8																						
J1	E9																						
QA1	F9																						
QA2	G8																						
Q1	F8																						
R1	E9																						
R2	F10																						
R3	F10																						
R4	F10																						
R5	F10																						
R6	G10																						
R7	G9																						
R8	H9																						
R9	E9																						
R10	F8																						
R11	H8																						
R12	F8																						
R13	G8																						
R14	F8																						
R15	G8																						
R16	G8																						
R17	F8																						
R18	G8																						
R19	H8																						
R20	H9																						
TP1	G9																						

COMPONENT SIDE

PCB Assy Wow & Flutter Option (901-837)

CAPACITORS

C 1	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Polyst 10n0 1% 63V	243-302
C 4	C Polyst 10n0 1% 63V	243-302
C 5	C Polyst 10n0 1% 63V	243-302
C 6	C Polyst 10n0 1% 63V	243-302
C 7	C Polystyren 44n2 1% 63V	243-337
C 8	C Polystyrene 499p 1% 63V	243-319
C 9	C Ceramic 4p70 p25 100V p100	213-203
C 10	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 15	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Solid Aluminium 10u 20% 16V Short Type	265-108

DIODES

CR 1	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	Connector 6 Pol For PC Board Bottom Entry	806-045

TRANSISTORS

Q 1	Transistor 2N3904 pnp	360-064

INTEGRATED ANALOG CIRCUITS

QA 1	IC TL084 quad op amp	364-276
QA 2	IC LM318N OP-Amp	364-216

RESISTORS

R 1	R Metal film 56E0 5% 0.2W TC250	107-256
R 2	R Metal Film 6K98 1% 0.5W TC50	114-698
R 3	R Metal Film 6K98 1% 0.5W TC50	114-698
R 4	R Metal Film 6K98 1% 0.5W TC50	114-698
R 5	R Metal film 100K 5% 0.2W TC250	107-610
R 6	R Metal Film 3K92 1% 0.5W TC50	114-392
R 7	R Metal Film 909E 1% 0.5W TC50	113-909
R 8	R Metal Film 76K8 1% 0.5W TC50	115-768
R 9	R Metal film 56E0 5% 0.2W TC250	107-256
R 10	R Metal Film 5K49 1% 0.5W TC50	114-549
R 11	R Metal film 56E0 5% 0.2W TC250	107-256
R 12	R Metal Film 576E 1% 0.5W TC50	113-576
R 13	R Metal film 1K00 5% 0.2W TC250	107-410

R 14	R Metal film 100K 5% 0.2W TC250	107-610
R 15	R Metal film 10K0 5% 0.2W TC250	107-510
R 16	R Metal film 1K00 5% 0.2W TC250	107-410
R 17	R Metal film 4K70 5% 0.2W TC250	107-447
R 18	R Metal film 680K 5% 0.2W TC250	107-668
R 19	R Metal film 56E0 5% 0.2W TC250	107-256
R 20	R Cermet Trimpot 100K 20% 0.5W TC70	182-311

TESTPOINTS

TP 1	Wire Wrap Terminal	805-727

MISCELLANEOUS

	PCB For RE204 W&F Option	971-384

15. METER BOARD

15.1 Circuit Description

The only circuitry on the Meter Board is a Serial Bus interface to the Main CPU, which loads the actual bargraph displays. Refer to section 8 for a description of the Serial Bus, and to section 2.9 for a description of the algorithm for updating of the meter values.

15.2 Schematic Diagrams

The schematic diagram for the meter board is shown in diagram number 985-315.

15.3 Component Locations

The component locations on the meter board are shown in the following diagram.

15.4 Parts List

A copy of the parts lists from the production documentation is shown in the following. The code number of the assembled PCB is 901-869.

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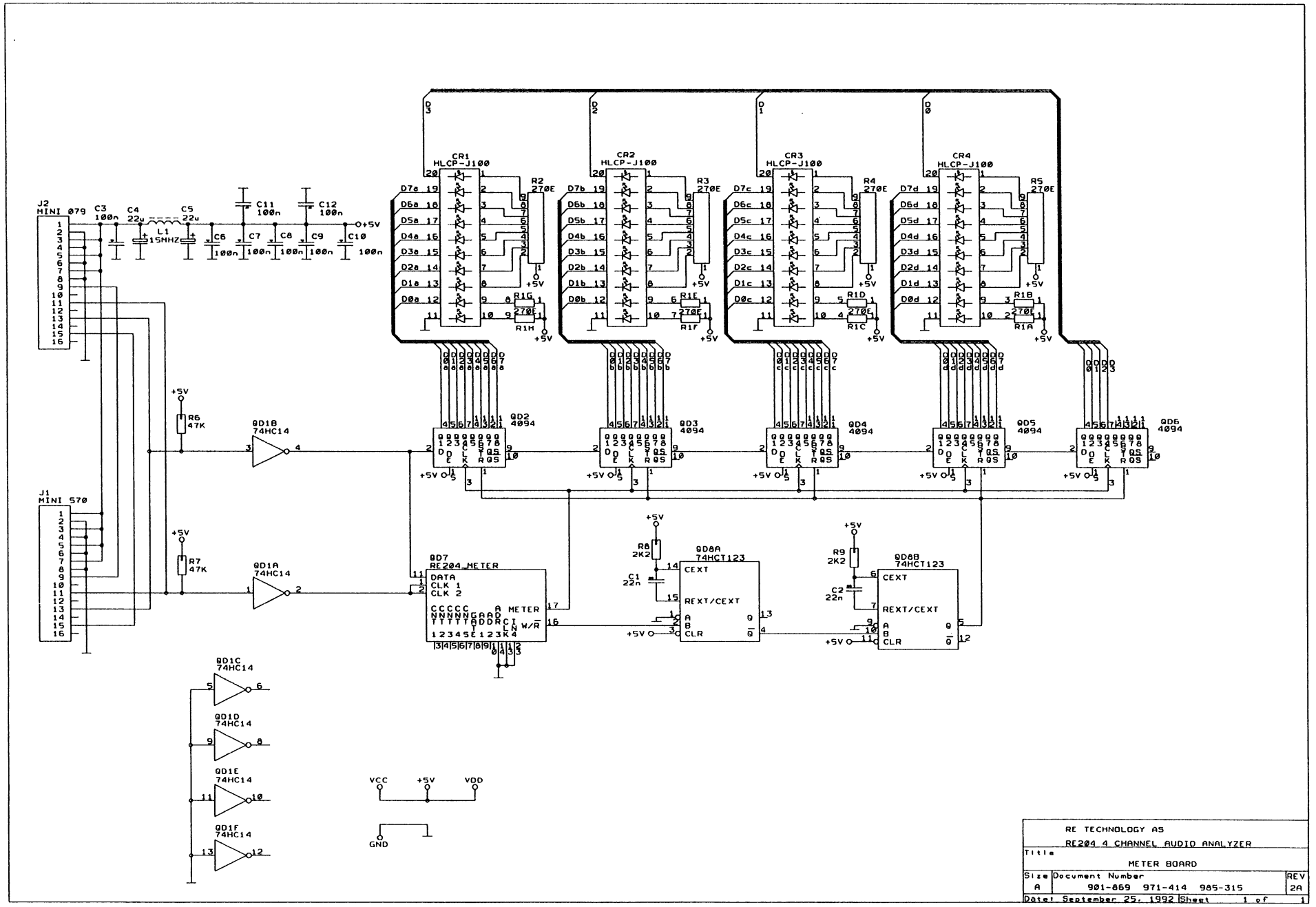
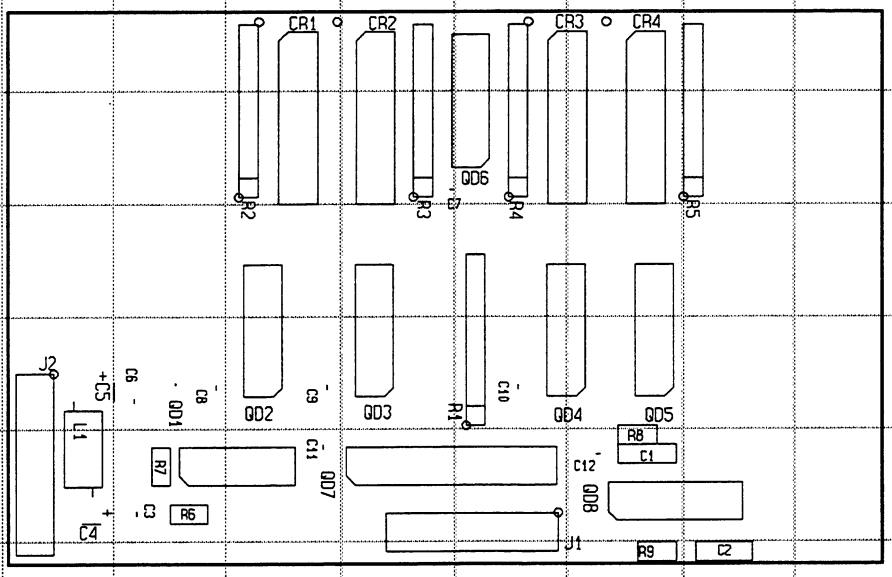

J2
MINI 079
J1
MINI 570
C3 100n
C4 22u
C5 22u
L1 15MHZ
C6 100n
C7 100n
C8 100n
C9 100n
C10 100n
C11 100n
C12 100n
+5V
CR1 HLCP-J100
CR2 HLCP-J100
CR3 HLCP-J100
CR4 HLCP-J100
R2 270E
R3 270E
R4 270E
R5 270E
R1G 270E
R1H 270E
R1E 270E
R1F 270E
R1D 270E
R1C 270E
R1B 270E
R1A 270E
D3
D2
D1
D0
QD2 4094
QD3 4094
QD4 4094
QD5 4094
QD6 4094
R6 47K
R7 47K
QD1B 74HC14
QD1A 74HC14
QD7 RE204_METER
DATA
CLK 1
CLK 2
A METER
W/R
R8 2K2
R9 2K2
C1 22n
C2 22n
QD8A 74HCT123
QD8B 74HCT123
CEXT
REXT/CEXT
CLR
QD1C 74HC14
QD1D 74HC14
QD1E 74HC14
QD1F 74HC14
VCC
+5V
VDD
GND
RE TECHNOLOGY AS
RE204 4 CHANNEL AUDIO ANALYZER
Title
METER BOARD
Size
A
Document Number
901-869 971-414 985-315
REV
2A
Date: September 25, 1992
Sheet 1 of 1



RE204 METER BOARD RE971-414iss.2

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	E7																						
CR2	F7																						
CR3	G7																						
CR4	H7																						
C1	H11																						
C2	J12																						
C3	D11																						
C4	C11																						
C5	C10																						
C6	D10																						
C7	F9																						
C8	D10																						
C9	E10																						
C10	G10																						
C11	E11																						
C12	H11																						
J1	G12																						
J2	C10																						
L1	C11																						
QD1	D10																						
QD2	E10																						
QD3	F10																						
QD4	H10																						
QD5	H10																						
QD6	G8																						
QD7	E11																						
QD8	H11																						
R1	G10																						
R2	E9																						
R3	F9																						
R4	G9																						
R5	J9																						
R6	D11																						
R7	D11																						
R8	H11																						
R9	H12																						

COMPONENT SIDE

PCB Assy Meter Board (901-869)

CAPACITORS

C 1	MKT, 0.022/63/10, R:2.5*6.5*7.2, RM2	241-082
C 2	MKT, 0.022/63/10, R:2.5*6.5*7.2, RM2	241-082
C 3	C Ceramic 100n 20% 50V	213-401
C 4	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 5	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 100n 20% 50V	213-401
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Ceramic 100n 20% 50V	213-401

DIODES

CR 1	LED Bar HLCP-J100 Display	350-810
CR 2	LED Bar HLCP-J100 Display	350-810
CR 3	LED Bar HLCP-J100 Display	350-810
CR 4	LED Bar HLCP-J100 Display	350-810

CONNECTORS

J 1	Conn Miniature Socket 16 pin For Flat Cabel PCB	806-049
J 2	Conn Miniature 16 pin Socket	806-050

CHOKES

L 1	RF-choke six-hole core green	731-204

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 2	IC 74HC4094 8 stage shift REG.	364-811
QD 3	IC 74HC4094 8 stage shift REG.	364-811
QD 4	IC 74HC4094 8 stage shift REG.	364-811
QD 5	IC 74HC4094 8 stage shift REG.	364-811
QD 6	IC 74HC4094 8 stage shift REG.	364-811
QD 7	RE204 Seriel Receiver For Display & Meter 5C060	369-332
QD 8	IC 74HCT123 dual monostab	364-731

RESISTORS

R 1	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 2	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 3	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 4	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 5	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 6	R Metal film 47K0 5% 0.2W TC250	107-547
R 7	R Metal film 47K0 5% 0.2W TC250	107-547
R 8	R Metal film 2K20 5% 0.2W TC250	107-422

R 9	R Metal film 2K20 5% 0.2W TC250	107-422

MISCELLANEOUS

120mm Flat Cable For RE2o4 Display	617-928
Socket Strip 10-pin Sil	816-298
PCB Meter Board For RE204 W/O Keyboard	971-414

16 EQUIPMENT AND ACCESSORIES

This section contains a list of the accessories supplied with the RE 204 Audio Analyzer and lists of available options and optional equipment and accessories.

16.1 Standard Equipment and Accessories

The following equipment and accessories should be found when unpacking the RE 204 Audio Analyzer:

Code	Type	Description
380-311	RE 204	Audio Analyzer
450-020	1.0 A	Fuse, slow blow
450-123	2.0 A	Fuse, slow blow
615-303	220 V	Line cord, 2.5 m
615-403	110 V	Line cord, 2.4 m
983-308		Operating Manual
983-705		Installation Instructions

Table 16.1 - Standard Equipment and Accessories

16.2 Available Options

The following options are available for the RE 204 Audio Analyzer:

Code	Description
901-837	Wow & Flutter Option
901-871	Stereo Generator Option
906-129	Audio Generator Option

Table 16.2 - Available Options

16.3 Optional Equipment and Accessories

Optional equipment and accessories to be used with the RE 204 Audio Analyzer:

Code	Description
901-805	96-pole DIN Extender Board to be used with: CPU Board, 901-870 Signal Analyzing Processor, 901-840 Audio Generator Signal Processor, 901-867
901-864	48-pole DIN Extender Board to be used with all other plug-in boards
983-402	Service Manual

Table 16.3 - Optional Equipment and Accessories

17. SPECIFICATIONS

This section contains a full specification for the instrument. The listed data is guaranteed, unless otherwise indicated.

17.1 Audio Analyzer

Audio Analyzer

Full scale range	11 mVp to 30 Vp
Range selection	Auto ranging or manual in 13 ranges, steps of 6 dB
Residual noise	
CCIR 468-3 weighted	$<15\ \mu V_{rms}$
25 kHz bandwidth	$<30\ \mu V_{rms}$
Flatness	±0.1 dB

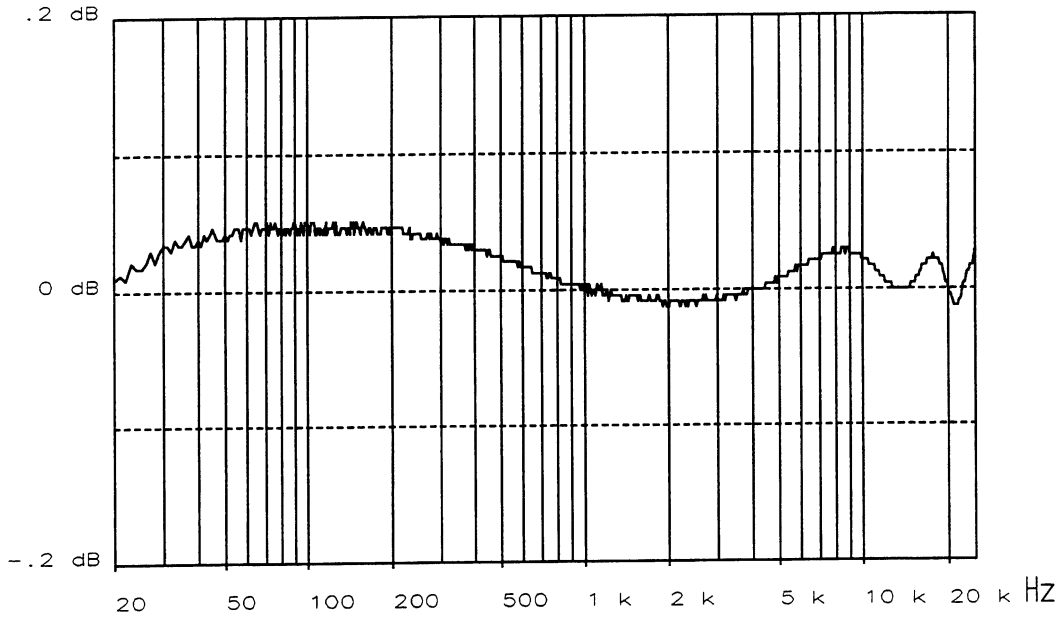


Fig. 17.1 - Flatness, Typical,
Combined Audio Analyzer and Generator

Input circuit	Balanced floating inputs, transformerless,

	overload protected to 50 Vp
Common mode rejection ratio	>70 dB at 1 kHz
Maximum common mode input	±7 V
Channel separation	>110 dB at 1 kHz, 600 Ω generator impedance
Input impedance	100 kΩ shunted by 100 pF
Type of connectors	Isolated BNC with ground plug

Filters

Noise measurements	CCIR/ARM, Dolby Labs Bulletin No. 19/4
	CCIR 468-3, DIN 45404, weighted and unweighted
	DIN 45633, IEC 651, A weighting
Bandwidth limiting	100 Hz highpass with 25 Hz notch >75 dB attenuation, 4th order elliptic with <0.2 dB ripple[1)]
	400 Hz highpass, approximated 6th order Butterworth, 36 dB/octave
	15 kHz lowpass with 19 kHz notch >50 dB attenuation, 6th order elliptic with <0.1 dB ripple[1)]
Bandpass/notch	Programmable 20 Hz to 25 kHz with 1 Hz resolution
	Bandpass, 6th order Butterworth, 3 dB points are 0.9 f_0 and 1.1 f_0
	Notch, >70 dB attenuation, <0.2 dB ripple[1)] exluding the band from 0.5 f_0 to 2 f_0
User filters	2 user specified filters may be downloaded via the IEEE 488 interface
Measurements	Average, RMS, Quasipeak, SINAD

1) Ripple specification including flatness of analyzer and generator.

Distortion and Noise - SINAD

Fundamental range	20 Hz to 23750 Hz
Noise bandwidth	25 kHz or any of the filters
Residual SINAD	<-70 dB at 1kHz, 3 Vp
Accuracy	±1 dB
Time to result[2)]	150 ms

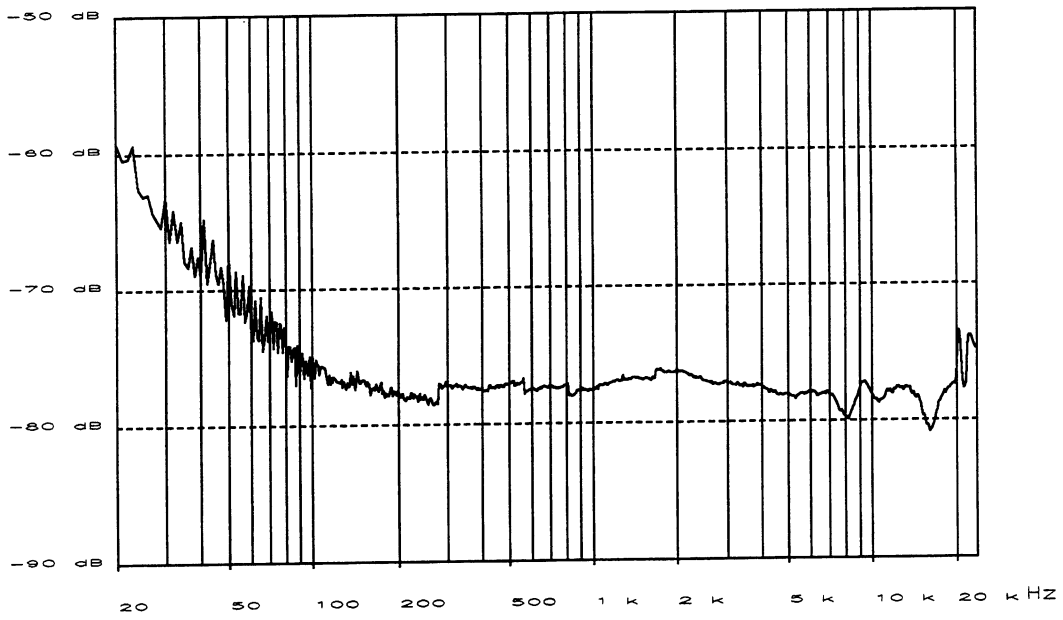


Fig. 17.2 - SINAD versus Frequency, Typical,
Level 3 Vp, 25 kHz Bandwidth
Audio Generator and Analyzer Combined

2) Typical time from command is received until results for all 4 channels are available. Measured on a 1000 Hz, 1 Vp signal with auto ranging disabled and no filtering. For average and quasi-peak, a noise measurement time of 100 ms is used. All other measurements use minimum measurement time for specified accuracy.

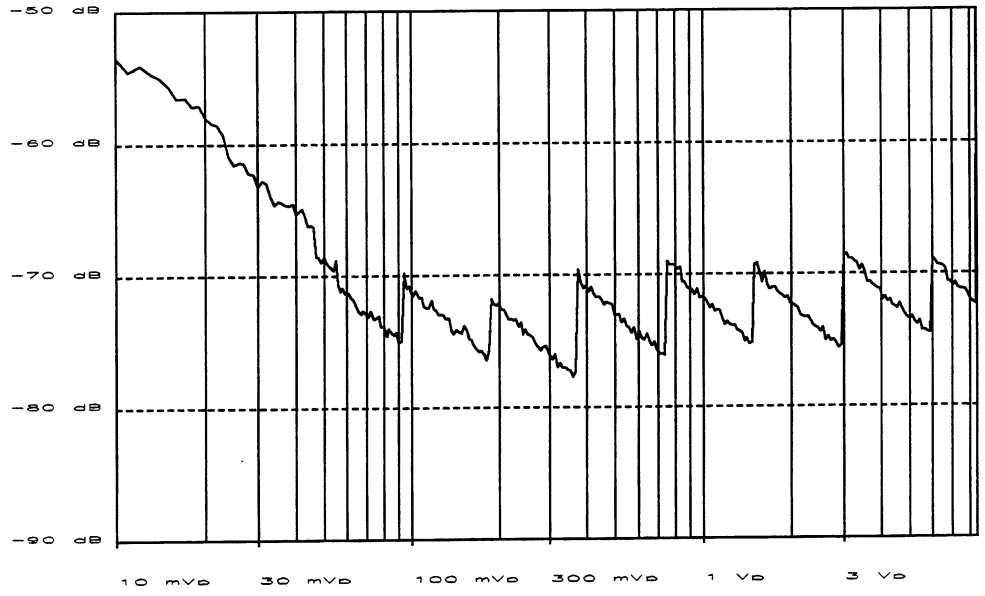


Fig. 17.3 - SINAD versus Level, Typical,
Frequency 1000 Hz, 25 kHz Bandwidth,
Audio Generator and Analyzer Combined

RMS

Frequency range	20 Hz to 25 kHz
Accuracy	±3%
Crest factor	
Without filter	8 at full scale
With filter	4 at full scale
Time to result[2)]	30 ms

Average

Calibration	RMS calibrated
Frequency range	20 Hz to 25 kHz
Accuracy	±3%
Time to result[2)]	290 ms

2) Typical time from command is received until results for all 4 channels are available. Measured on a 1000 Hz, 1 Vp signal with auto ranging disabled and no filtering. For average and quasi-peak, a noise measurement time of 100 ms is used. All other measurements use minimum measurement time for specified accuracy.

Peak

Frequency range	20 Hz to 75 kHz
Accuracy	±3%
Flatness	±0.05 dB, 20 Hz to 25 kHz
	±0.1 dB, 25 kHz to 75 kHz
Time to result[2)]	35 ms

Quasi-peak

Standard	CCIR 468-3
Calibration	RMS calibrated
Frequency range	CCIR 468 weighted
	CCIR 468 unweighted
Accuracy	±3%
Time to result[2)]	6.5 s

Level Indication Meter

Range	1 mVp to 10 Vp
Resolution	10 dB

Frequency

Range	20 Hz to 25 kHz
Resolution	1 Hz
Accuracy	±0.2 %
Time to result[2)]	55 ms

DC

Full scale ranges	1 V and 30 V, other ranges on request
Accuracy	±0.5 % to ±3 mV
Time to result	95 ms
Input circuit	Differential
Common mode rejection ratio	
30 V range	>70 dB at 1 kHz
1 V range	>50 dB at 1 kHz

2) Typical time from command is received until results for all 4 channels are available. Measured on a 1000 Hz, 1 Vp signal with auto ranging disabled and no filtering. For average and quasi-peak, a noise measurement time of 100 ms is used. All other measurements use minimum measurement time for specified accuracy.

Maximum common mode input	±30 V
Input impedance	100 kΩ
Type of connector	Isolated BNC

17.2 Wow & Flutter Option

Range	0 to 3 %
Residual Wow & Flutter	0.001 %
Accuracy	±0.5 %
Reference frequency range	2400 Hz to 3750 Hz
Detector modes	Quasi-peak, DIN 45507, IEC 386, CCIR 409-2 Average, NAB 1965 RMS, JIS C5551
Statistical detection	2 σ
Filters	Weighted, DIN 45507
	27 to 200 Hz, 6 dB/octave rolloff below 0.5 Hz, 24 dB/octave rolloff above 200 Hz
	28. Hz to 500 Hz, 6 dB/octave rolloff below 0.2 Hz, 24 dB/octave rolloff above 500 Hz
Measurement time	1 to 20 s

17.3 Audio Generator Option

Principle of operation	AF synthesizer
Number of outputs	2, independently programmable
Frequency range	1 Hz to 25 kHz
Output level	0 to 8.5 Vp
Resolution	
Frequency	1 Hz
Level	1 mV
Distortion	>80 dB, SINAD >86 dB, THD
Flatness	±0.05 dB, 20 Hz to 10 kHz ±0.1 dB, 10 to 25 kHz

Accuracy	
Frequency	±25 ppm
Level	±0.1 dB + flatness

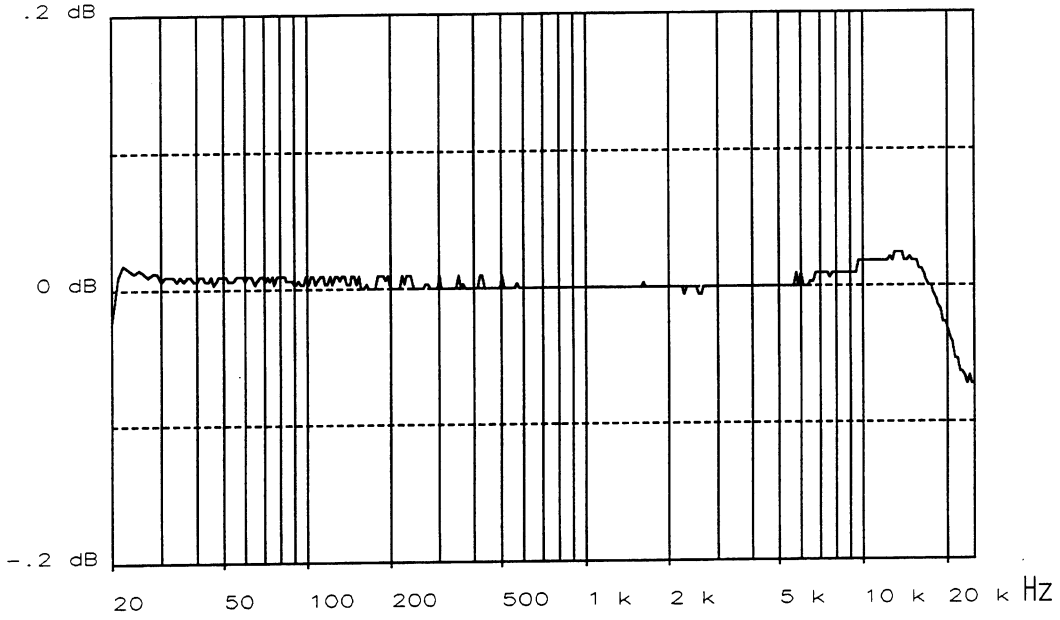


Fig. 17.4 - Audio Generator Ripple, Typical

Output circuit	2 balanced floating outputs, transformerless, shortcircuit protected
Output impedance	< 10 Ω
Type of connectors	Isolated BNC with ground plug

17.4 Stereo Generator Option

FM Stereo

General

Functions	L&R, stereo L=R, mono L= -R, subchannel L only R only
Bandwidth	20 Hz to 15 kHz, ±0.1 dB
Distortion	< 0.02 % THD, 100 % composite level

Separation

Stereo separation	>65 dB, 80 Hz to 5 kHz >60 dB, 40 Hz to 8 kHz >55 dB, 22 Hz to 15 kHz
M-S separation	
L=R, mono	>66 dB, 70 Hz to 3 kHz >61 dB, 40 Hz to 5 kHz >55 dB, 20 Hz to 10 kHz
L= -R, subchannel	>66 dB, 70 Hz to 1.5 kHz >61 dB, 40 Hz to 3 kHz >55 dB, 20 Hz to 5 kHz

Hum and Noise[3)]

Unweighted S/N ratio	
DIN 45300, bandpass	>86 dB, mono >83 dB, stereo
CCIR 468-3, bandpass	>82 dB, mono >80 dB, stereo
Weighted S/N ratio	
DIN 45300, A curve	>86 dB, mono >83 dB, stereo
CCIR 468-3	>80 dB, mono >77 dB, stereo
38 kHz suppression	<-64 dB
Spurious above 53 kHz	<-60 dB

L and R Signals

Inputs	Audio Generator
Level	0 to 150 % continuously programmable
Level accuracy	As Audio Generator
Distortion	As Audio Generator
Outputs	L and R signals available at Audio Generator connectors. Note: Pre-emphasis weighted

3) Relative to 100 % composite level.

Pilot

Frequency	19 kHz ±1 Hz
Level	0 to 15.5 % composite level
Resolution	0.5 % composite level
Level accuracy	
Level ≥ 4 %	±0.5 % of setting
Level <4 %	±1 % of setting
Phase deviation	<0.3° rel. to 38 kHz
Distortion	<-70 dB

Pre-emphasis

Standard	25 μs, FM Dolby 50 μs, European standard 75 μs, American standard
Accuracy	Digitally calculated on Audio Generator L and R signals

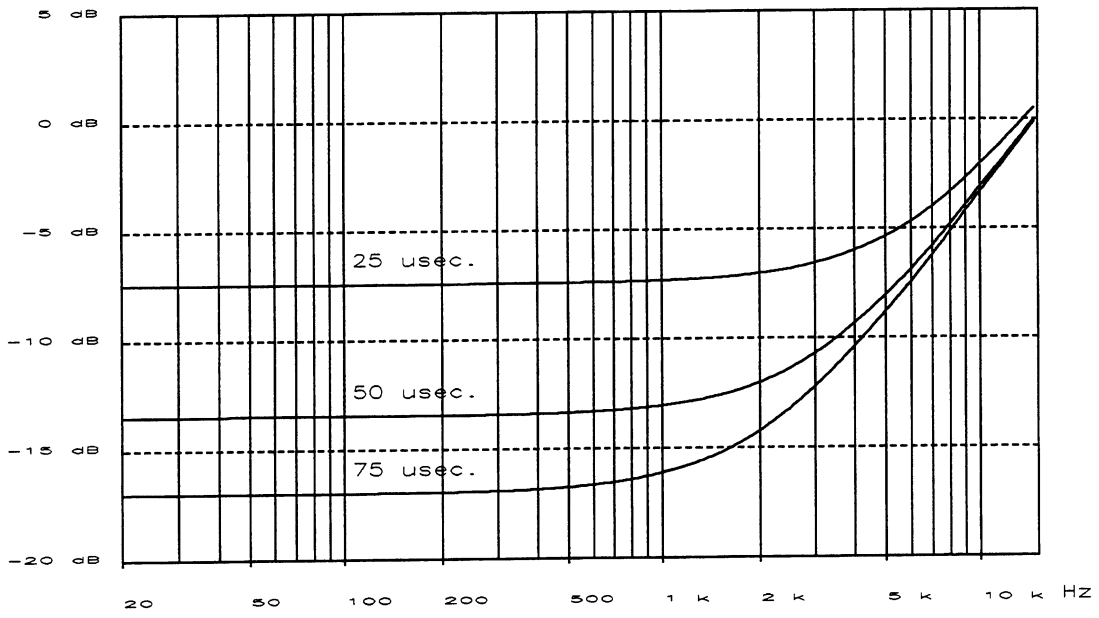


Fig. 17.5 - FM Stereo Pre-emphasis Weighting

Composite Output

Output level	0 to 2 Vpeak, adjustable for 100 % composite level
Output impedance	$<10\ \Omega$
Load	$>500\ \Omega$, <500 pF
DC level	<10 mV
Type of connector	BNC

Pilot Sync Output

Output level	775 V_{rms}
Output impedance	$<10\ \Omega$
Load	$>500\ \Omega$, <500 pF
Type of connector	BNC
Distortion	<0.1 %

AUX Input

Frequency range	10 to 100 kHz
Flatness	± 0.1 dB, 50 kHz to 75 kHz ± 0.3 dB, 50 kHz to 100 kHz
Sensitivity	100 mVp for 1 % composite level at 57 kHz
Maximum input	5 Vp
Input impedance	1 MΩ
Type of connector	BNC

AM Stereo

General

Stereo system	Motorola C-QUAM
Functions	L&R, stereo L=R, mono L= -R, subchannel L only R only
Stereo separation[4]	>55 dB, R/L level 30 %, 1 kHz >50 dB, R/L level 30 %, 20 Hz to 10 kHz

4) Audio performance only. C-QUAM modulater performance must be taken into account.

L and R Signals

Inputs	Audio Generator
Level	0 to 150 % continuously programmable
Level accuracy	As Audio Generator
Distortion	As Audio Generator
Outputs	L+R and L-R signals available at Audio Generator connectors. Note: Pre-emphasis weighted

Pilot

Frequency	25 Hz ±25 ppm
Level	0 to 15.5 %
Resolution	0.5 %
Level accuracy	1 % of setting

Pre-emphasis

Standard	NRSC Interim Voluntary National Standard, 75 μs AM Broadcast Transmission Pre-emphasis
Accuracy	Digitally calculated on Audio Generator L and R signals

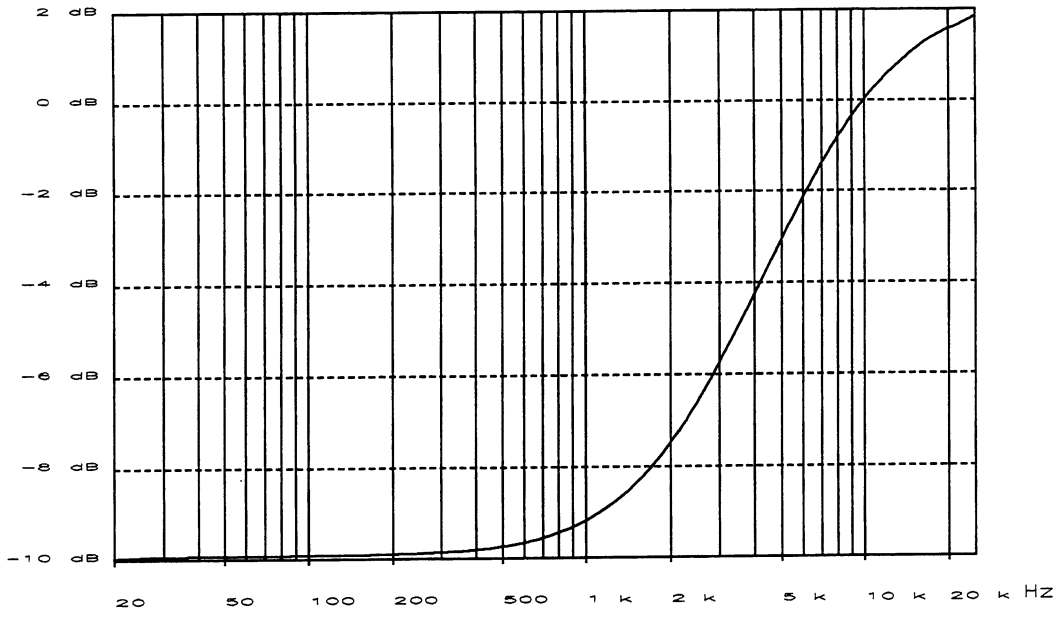


Fig. 17.6 - AM Stereo Pre-emphasis Weighting

17.5 General

Remote Programming and Operation

IEEE 488 Bus

Functions controlled	All except power on/off
Interface functions	SH1, AH1, T6, TE0, L4, LE0, SR1, RL0, PP1, DC1, DT1, C0, E2
Instrument set-ups	100 complete set-ups and 2 user-defined filters can be stored in nonvolatile memory

General

Temperature	
Operating temperature	5 to 50 °C (41 to 122 °F)
Storage temperature	-40 to 70 °C (-40 to 158 °F)
Relative humidity	20 % to 80 %, non-condensing
Line	
Voltage	100 V to 130 V AC, 190 V to 260 V AC
Frequency	47.5 Hz to 63 Hz
Power consumption	70 VA including all options
Dimensions and Weight	
Height	133 mm (5.2")
Width	440 mm (17.3")
Depth	437 mm (17.2")
Net weight	11 kg (24.3 lbs)
Shipping weight	16 kg (35.3 lbs)

17.6 Filter Characteristics

Figs 17.7 to 17.21 show the filter characteristics for the built-in filters. Please note, that all filter characteristics are typical. The ripple plots include flatness of the Audio Analyzer and Generator, and are all relative to 1 kHz.

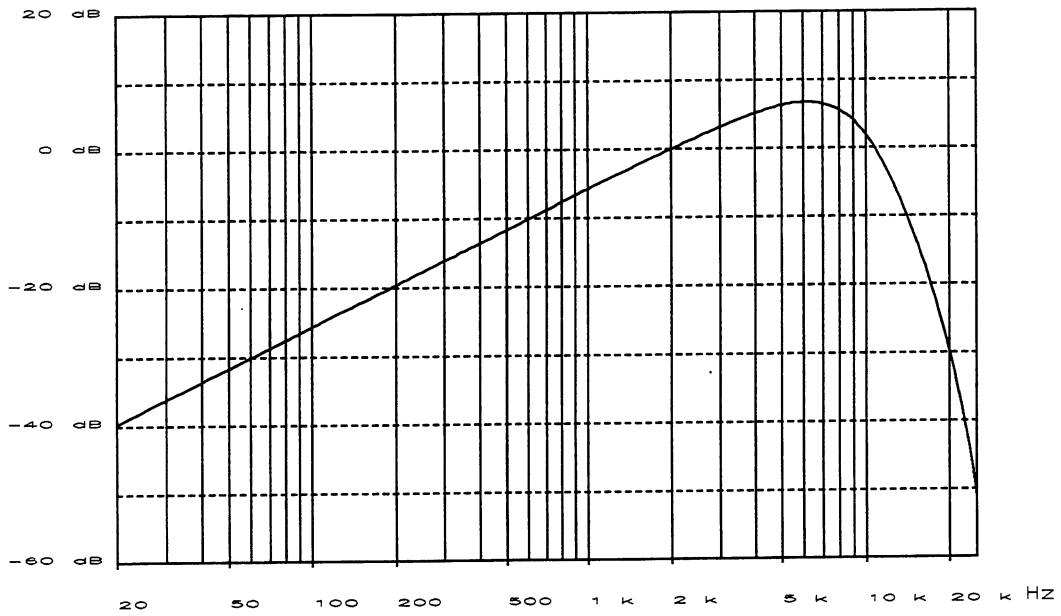


Fig. 17.7 - CCIR/ARM, Dolby Labs

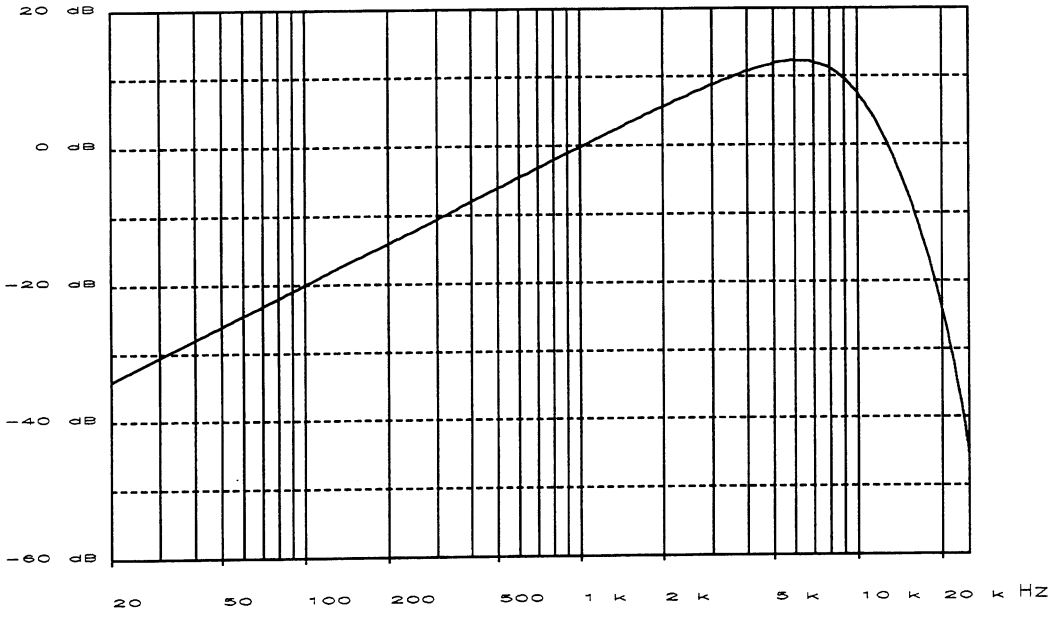


Fig. 17.8 - CCIR 468-3, Weighted

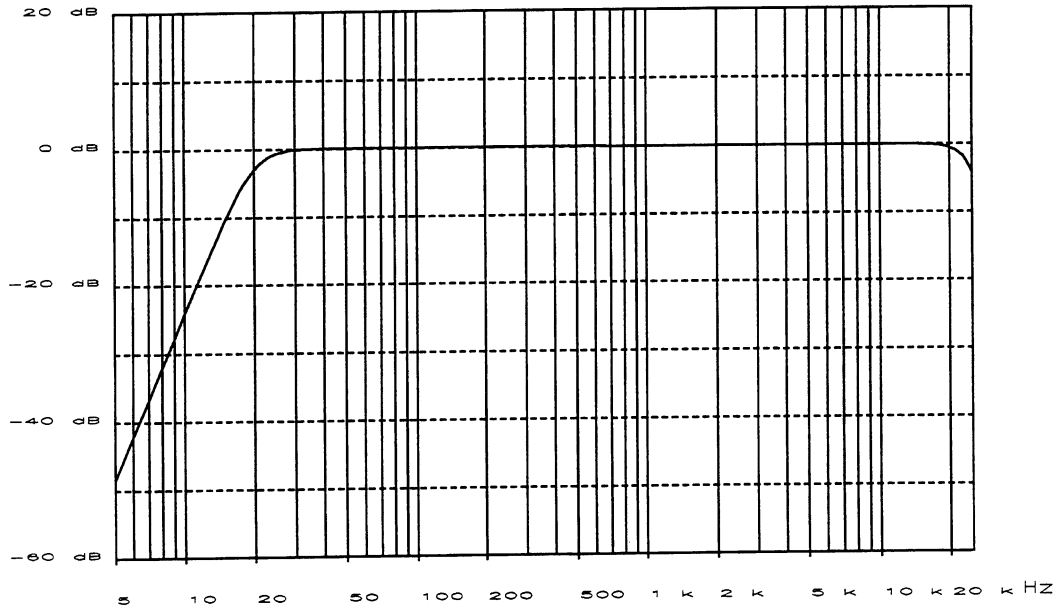


Fig. 17.9 - CCIR 468-3, Unweighted

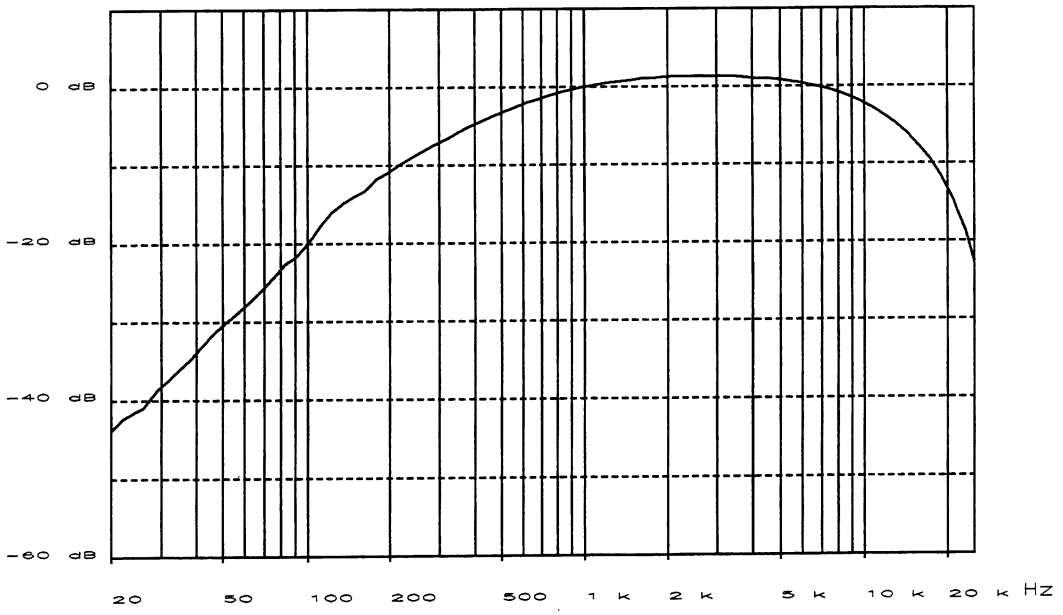


Fig. 17.10 - dB(A), DIN 45633/IEC 651

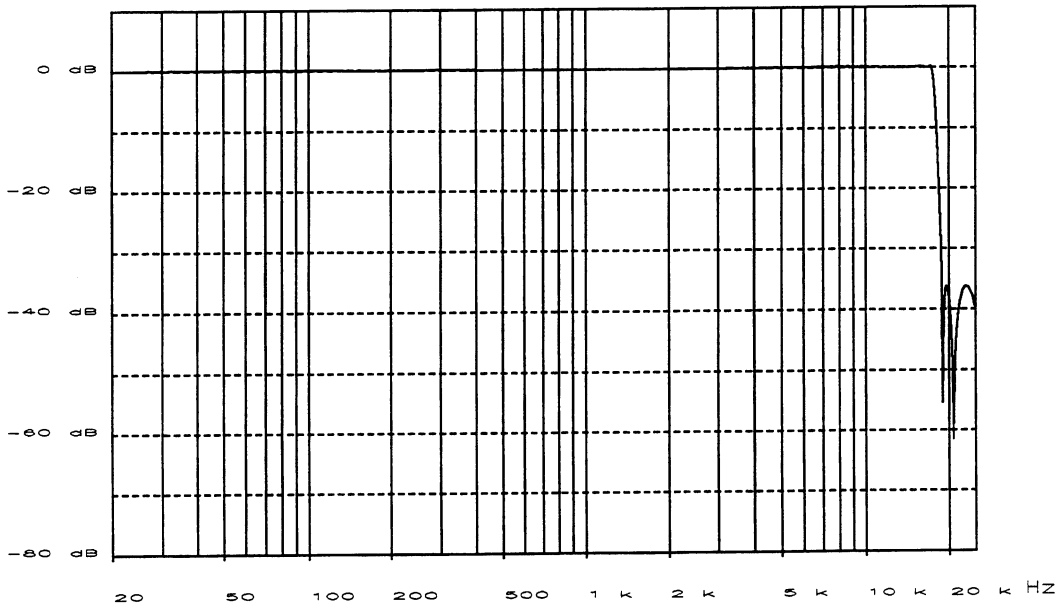


Fig. 17.11 - 15 kHz Low-pass with 19 kHz Notch

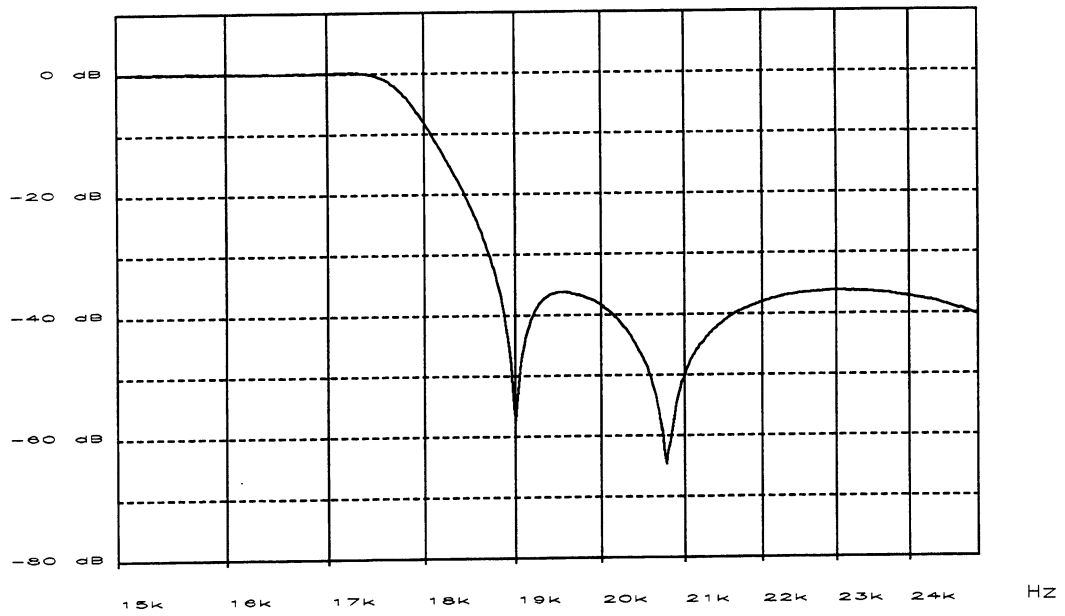


Fig. 17.12 - 15 kHz Low-pass, Stopband Characteristic

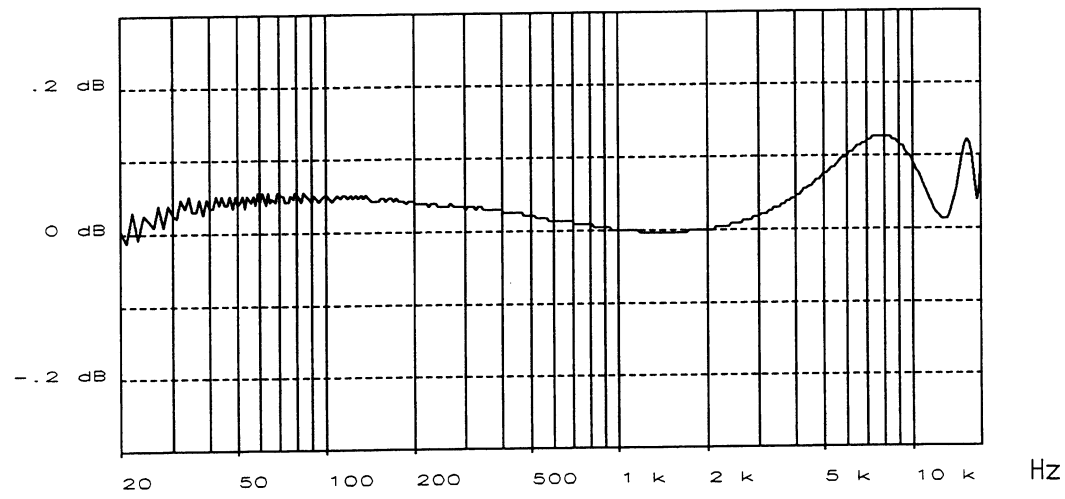


Fig. 17.13 - 15 kHz Low-pass Ripple

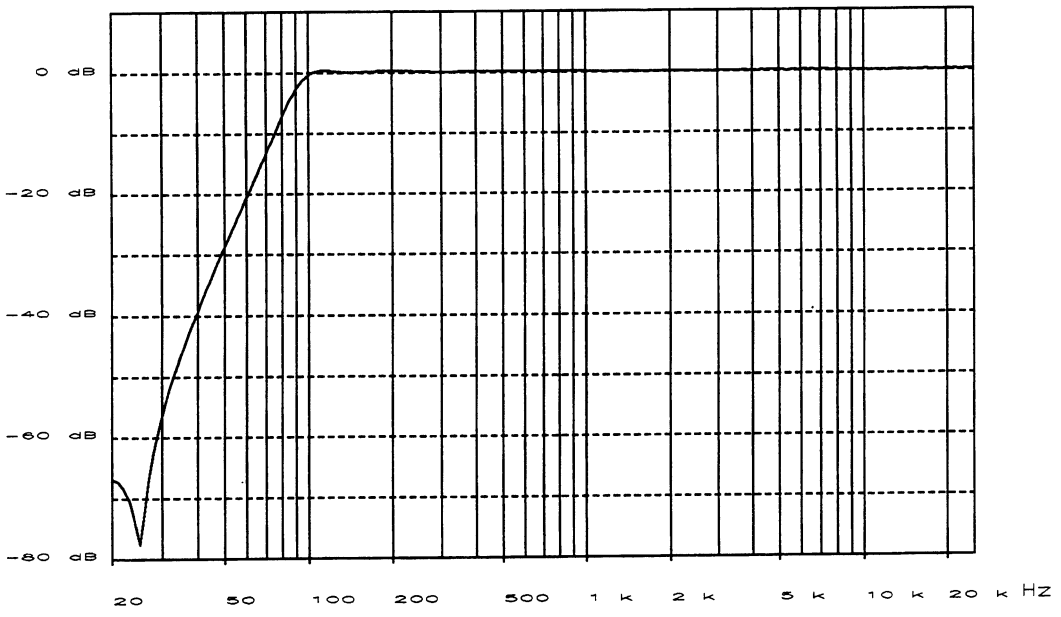


Fig. 17.14 - 100 Hz High-pass with 25 Hz Notch

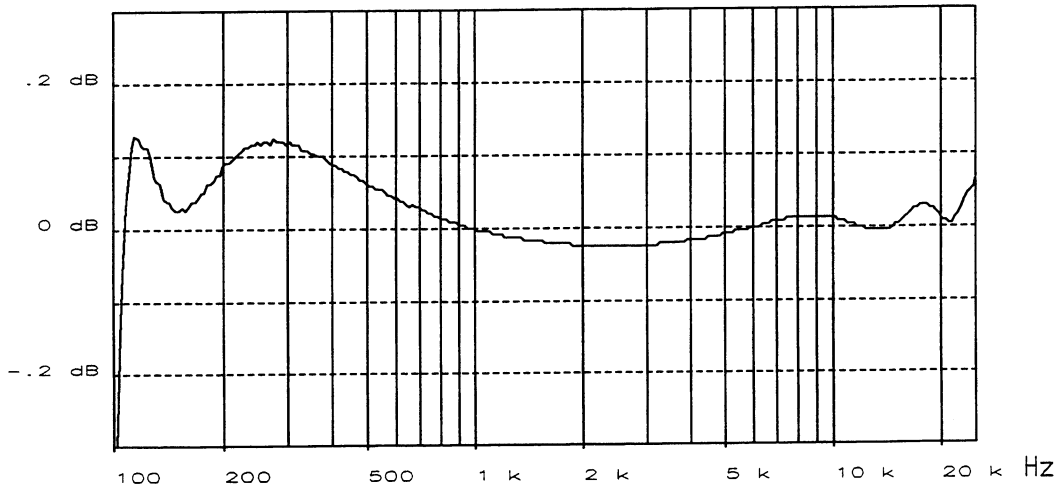


Fig. 17.15 - 100 Hz High-pass Ripple

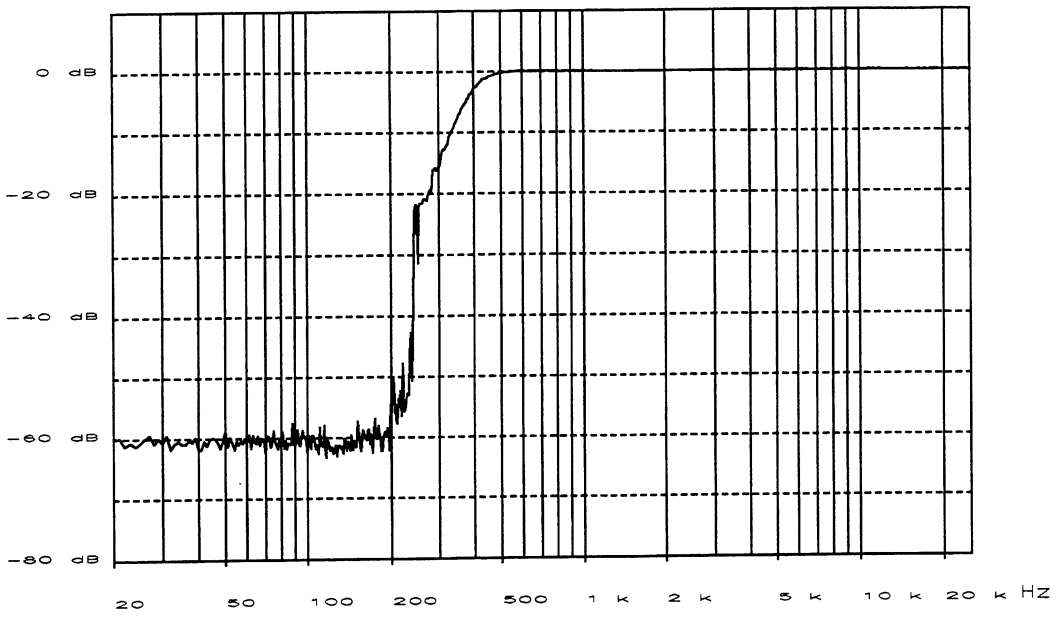


Fig. 17.16 - 400 Hz High-pass

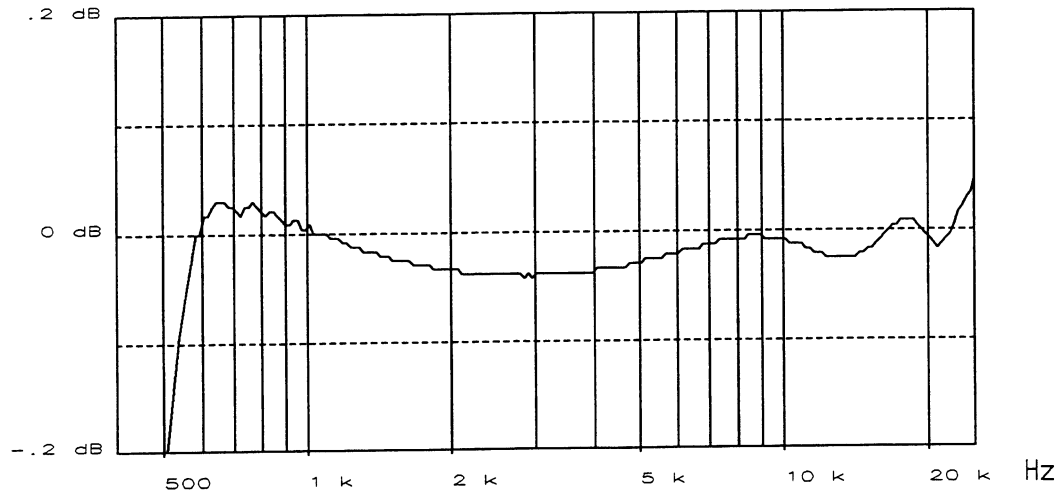


Fig. 17.17 - 400 Hz High-pass Ripple

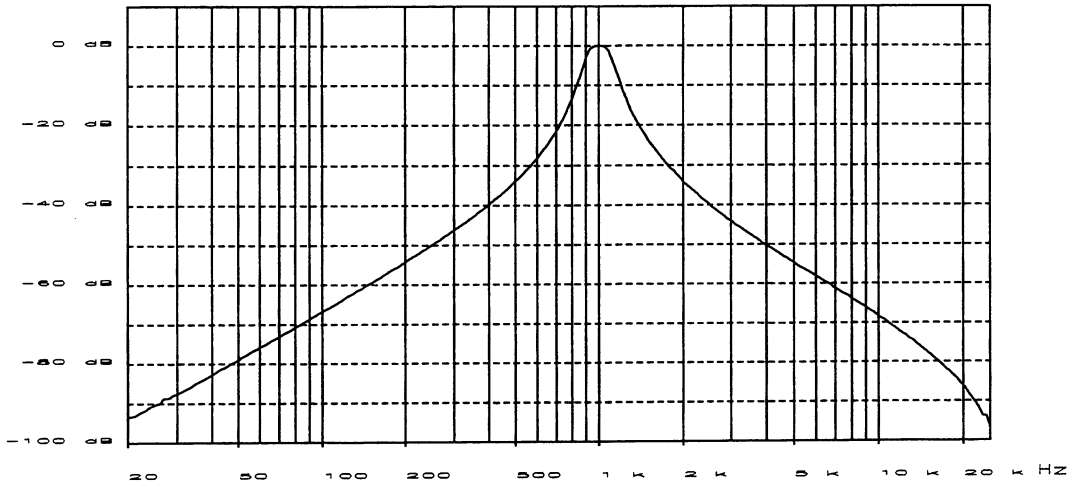


Fig. 17.18 - Double Precision Band-pass, 1 kHz

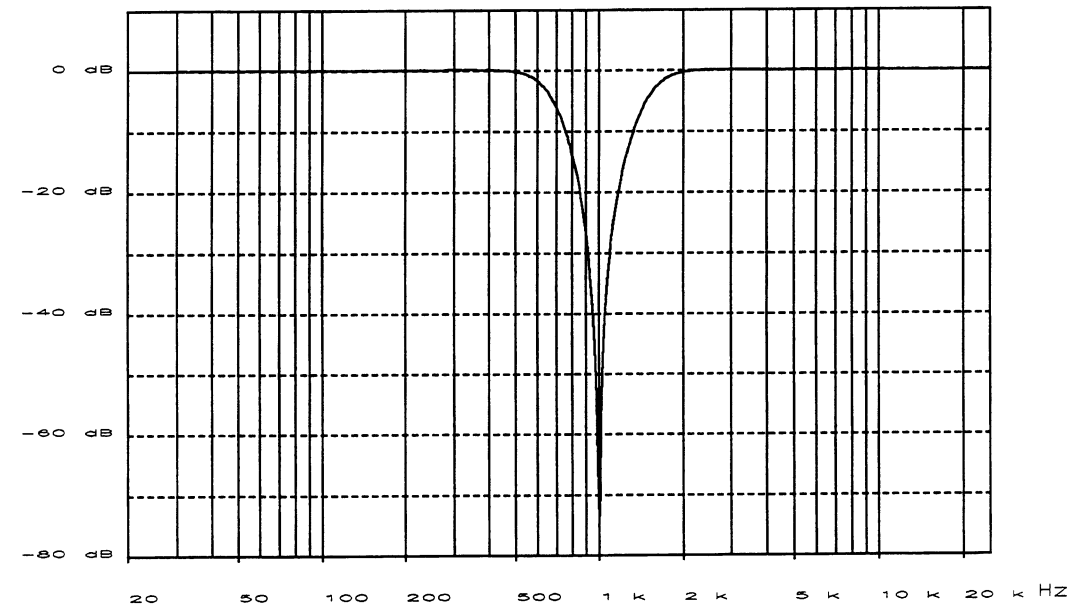


Fig. 17.19 - Notch Filter, 1 kHz

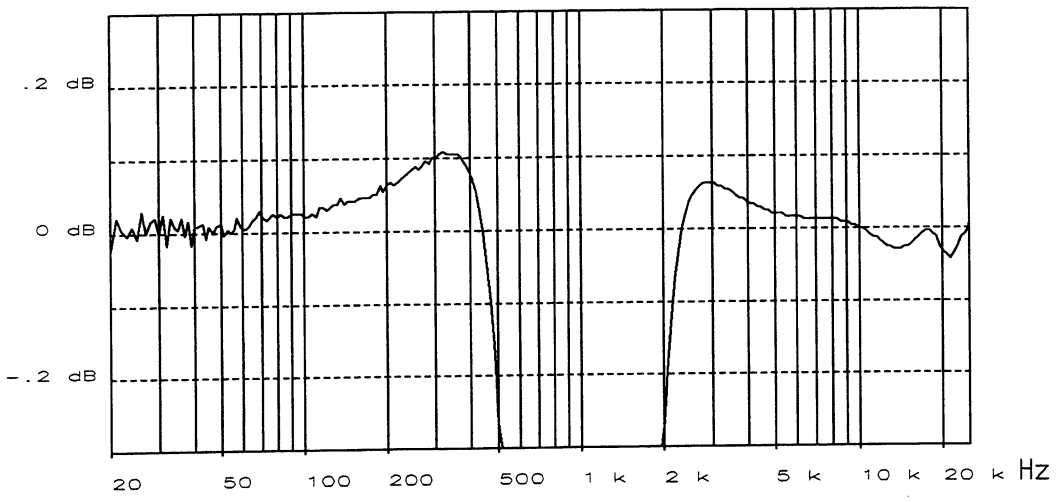


Fig. 17.20 - Notch Filter Ripple

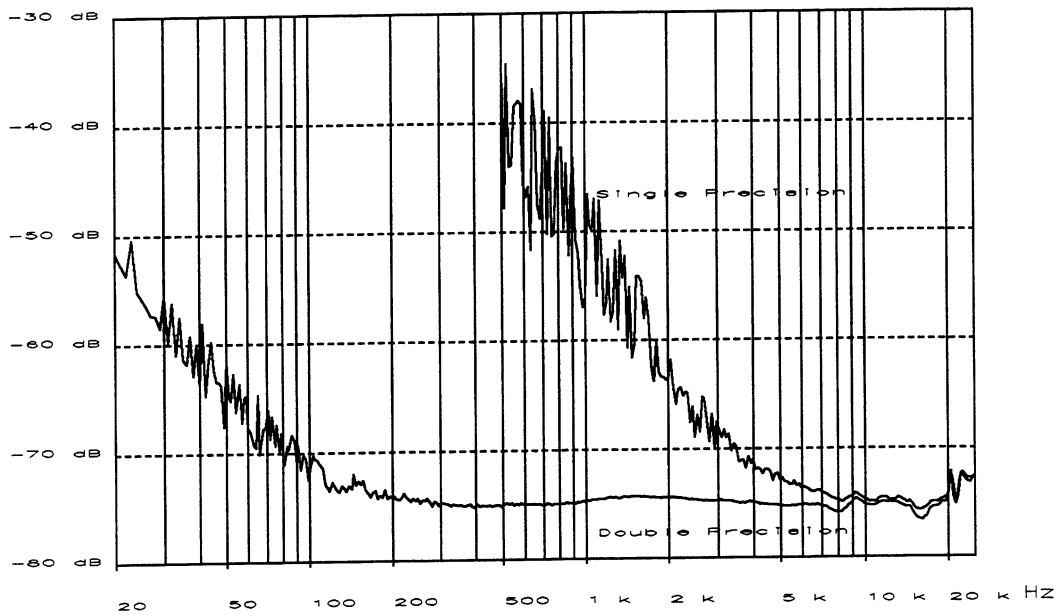


Fig. 17.21 - Notch Filter Attenuation at Notch Frequency

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