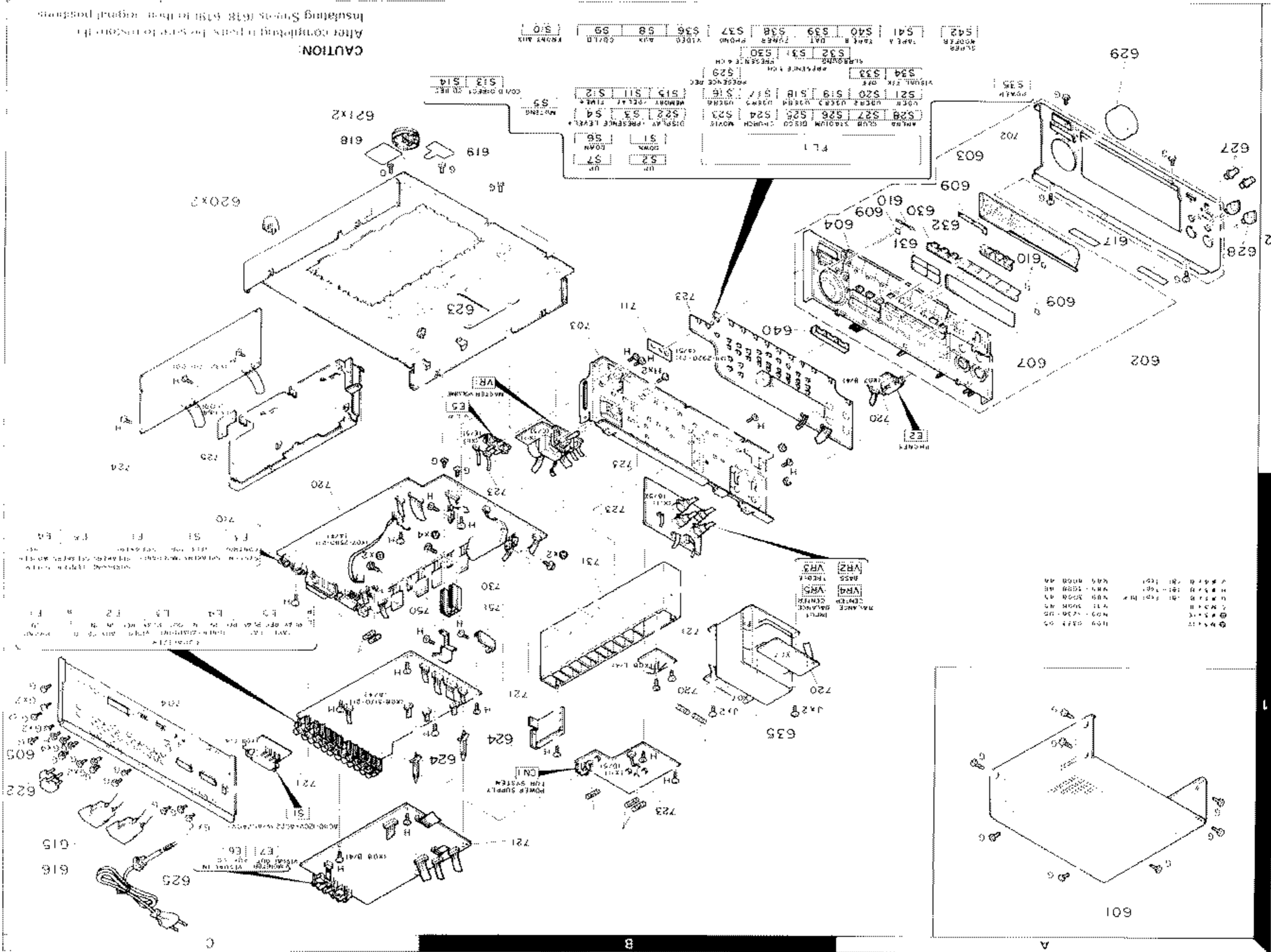
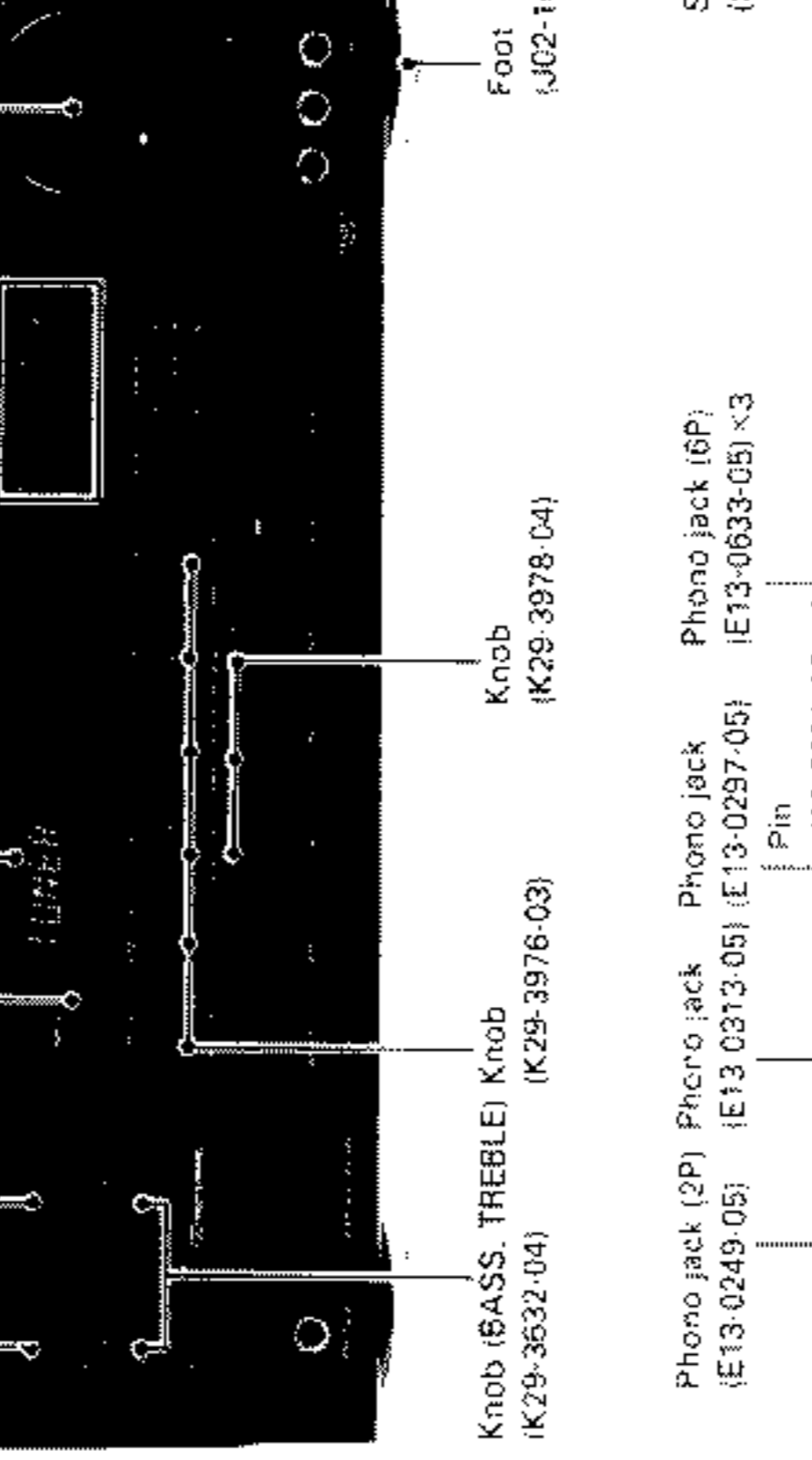
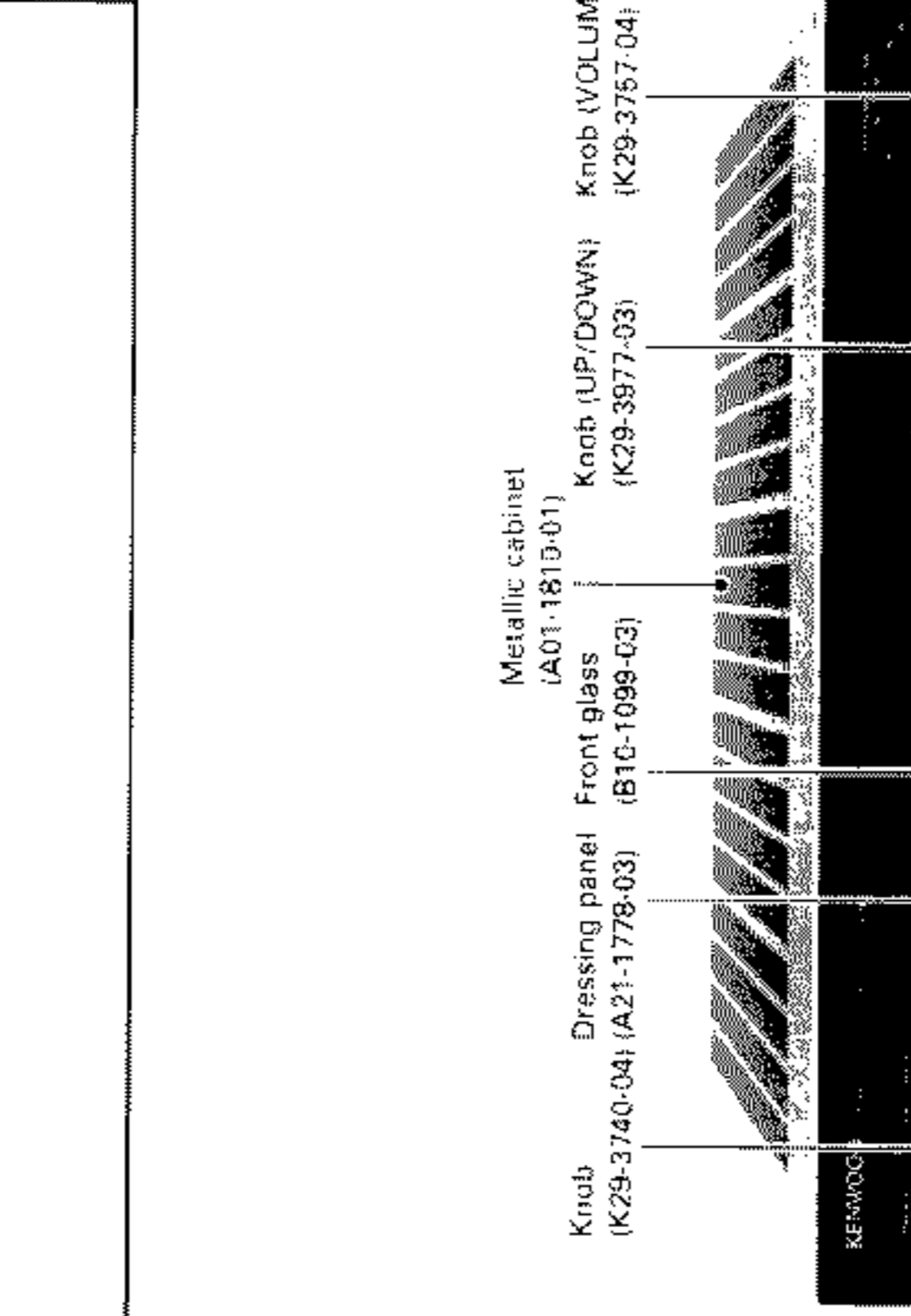


**EXPLODED VIEW**



**STEREO INTEGRATED AMPLIFIER**  
**A-94**  
**SERVICE MANUAL**

© 1990-7 PRINTED IN JAPAN  
B51-4187-00(S)1953



**CAUTION:**  
After completing repairs, be sure to restore the Insulating Sheets to their original positions.

\*Refer to parts list on page 42.

Parts with the exploded numbers larger than 700 are not supplied.

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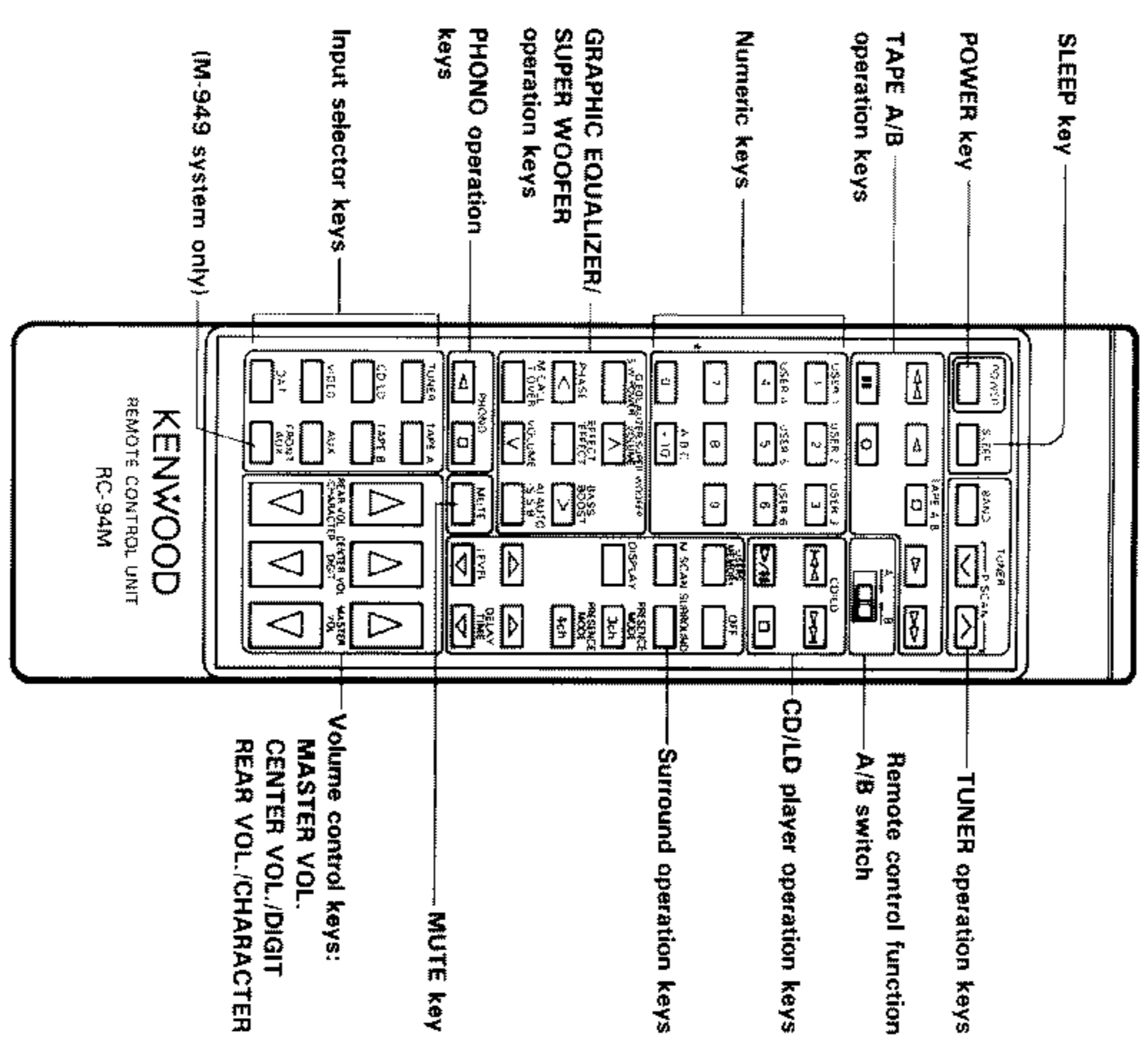
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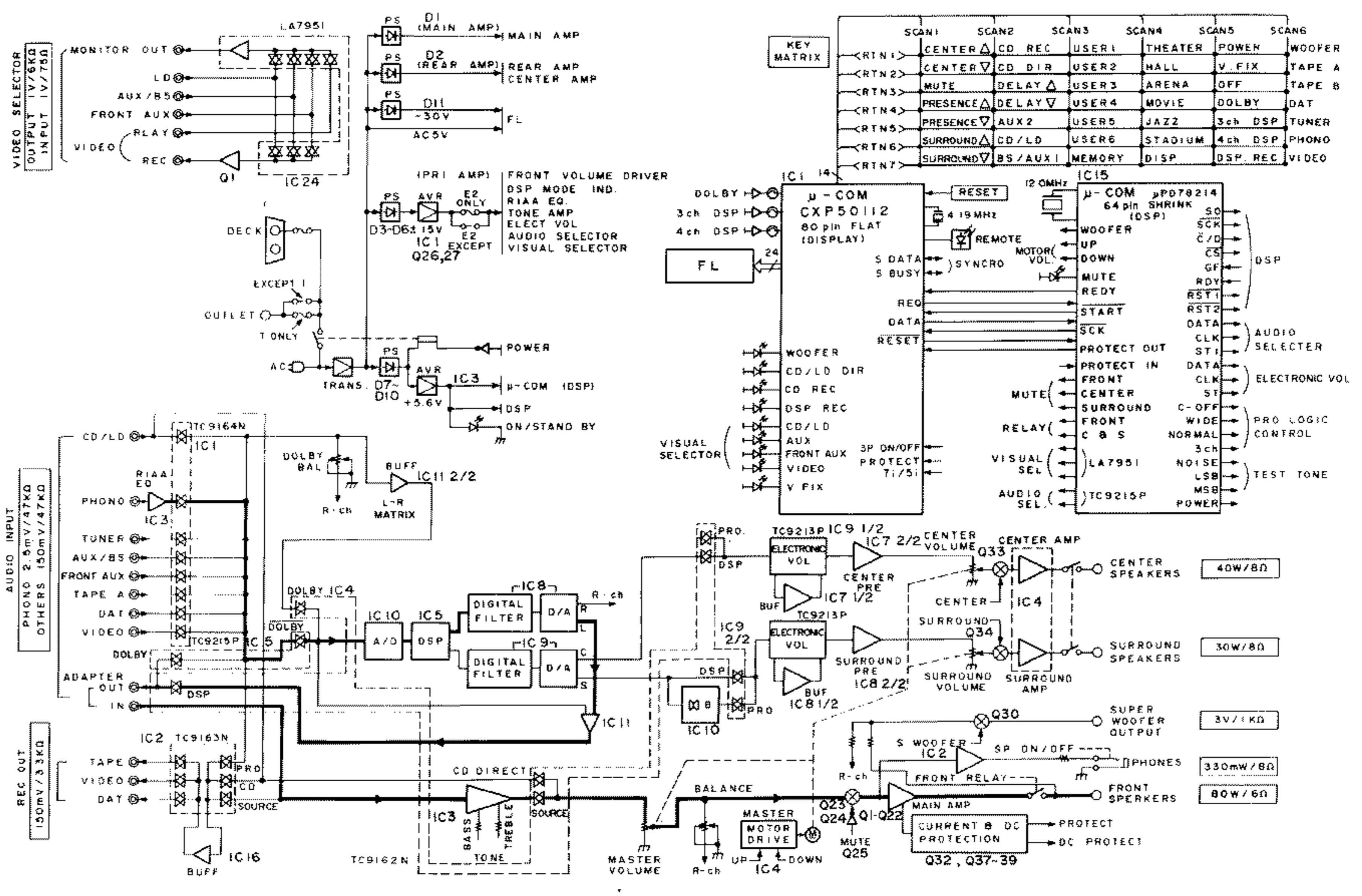
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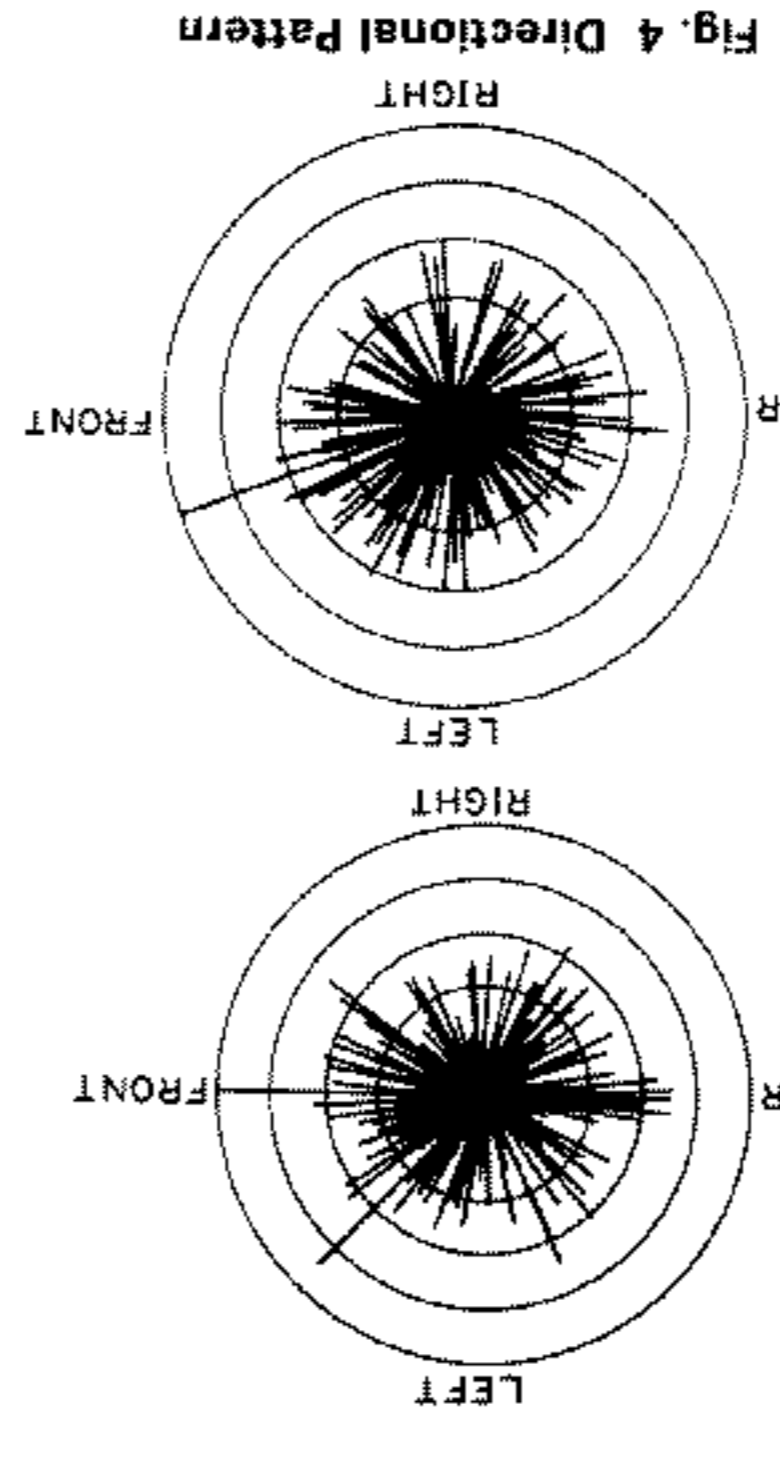
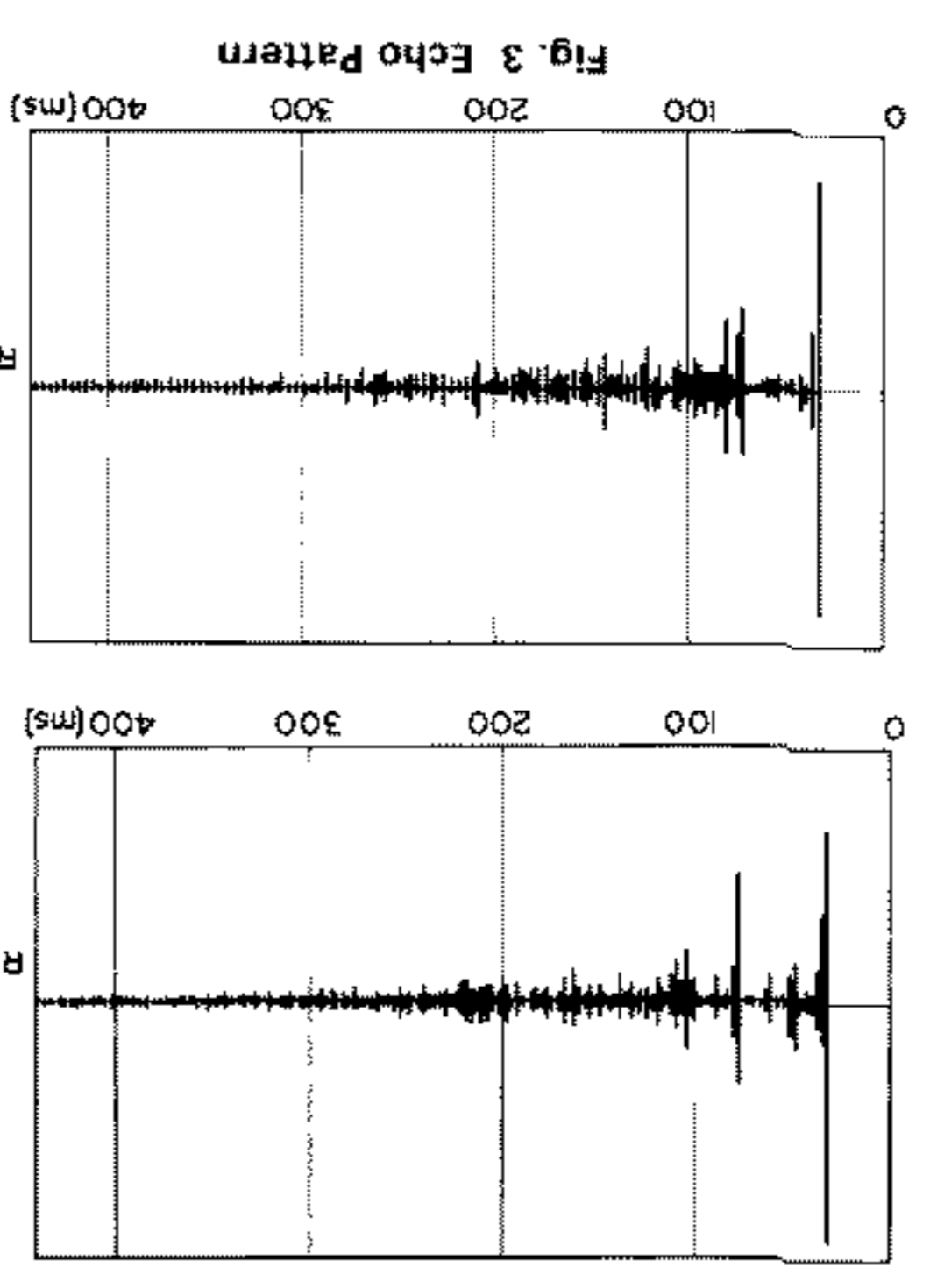
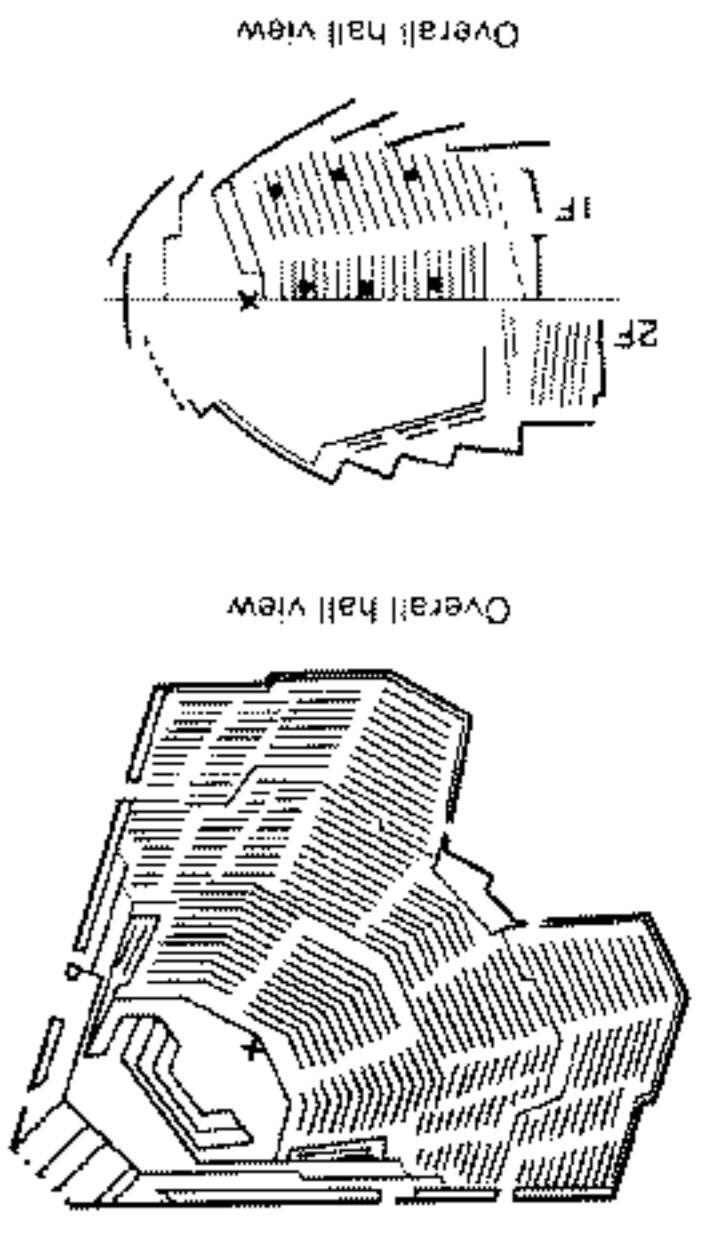
SPECIFICATIONS..... Back cover

REMOTE CONTROL UNIT



BLOCK DIAGRAM





**2-2 Actual Hall Sound**  
The actual sound characteristics of a concert hall are represented by an echo pattern (short-sound response) and directional pattern. The characteristic examples are shown in Figures 3 and 4.

**2-1 Sound Field Component**  
The sound field peculiar to a concert hall consists of 1) a direct sound, 2) an initial reflected sound, and 3) a reverberated sound. The direct sound reaches the listening point directly from the sound source. The initial reflected sound reaches the listening point after being reflected off a wall or the ceiling several times. The reverberated sound is a high-order reflected sound that is heard as a continuous sound without a sense of direction. Figure 1 shows the conduction status of a reflected sound. Figure 2 shows the response at the listening point when a short sound is used as the sound source.

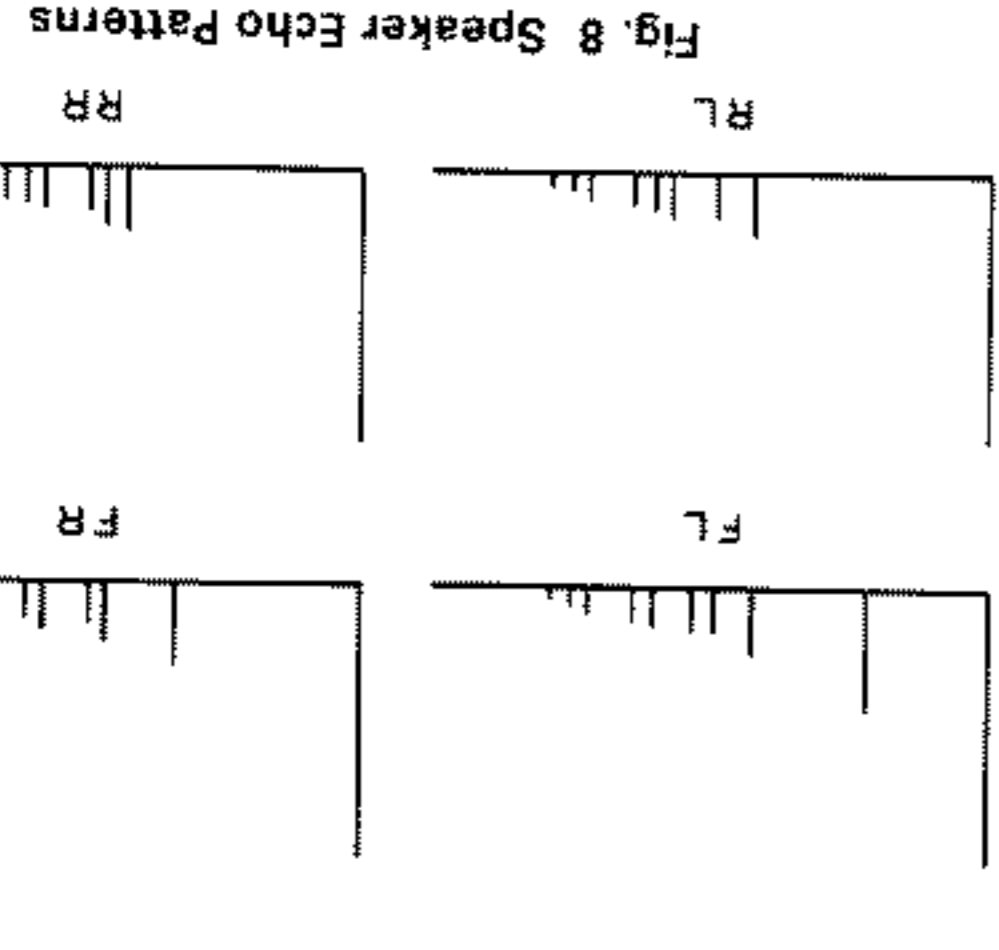
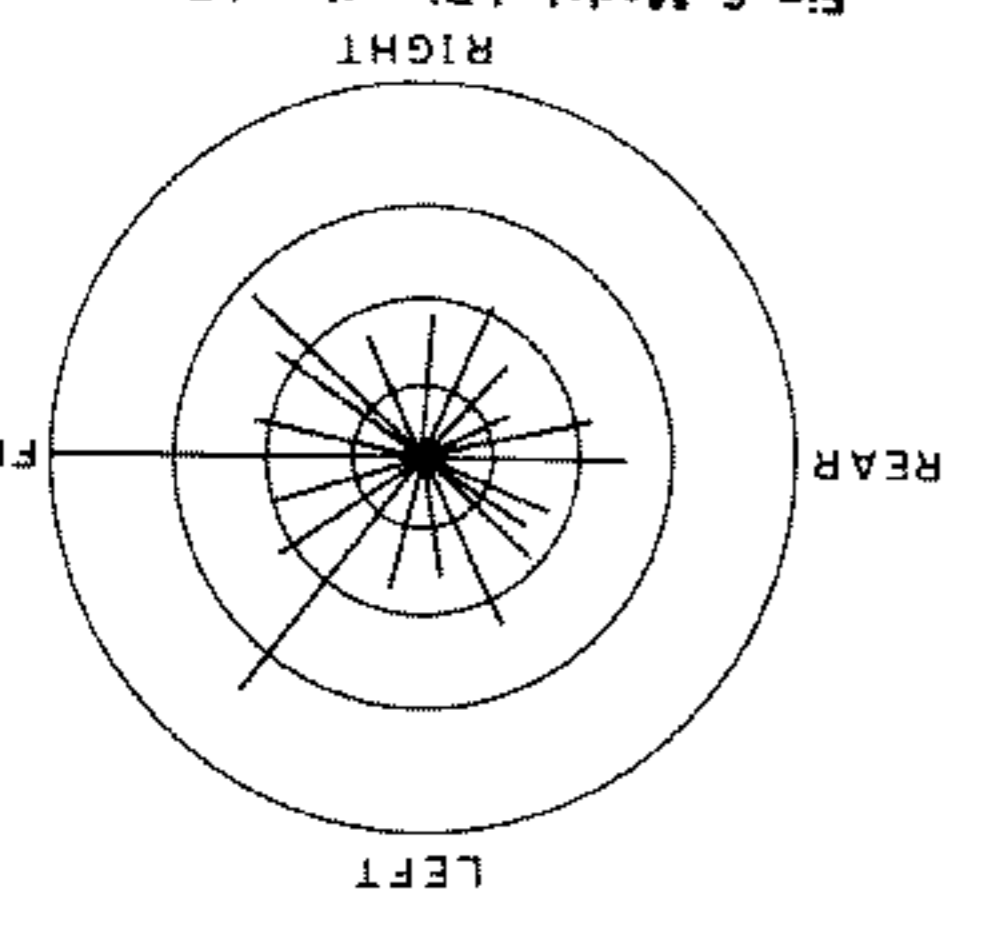
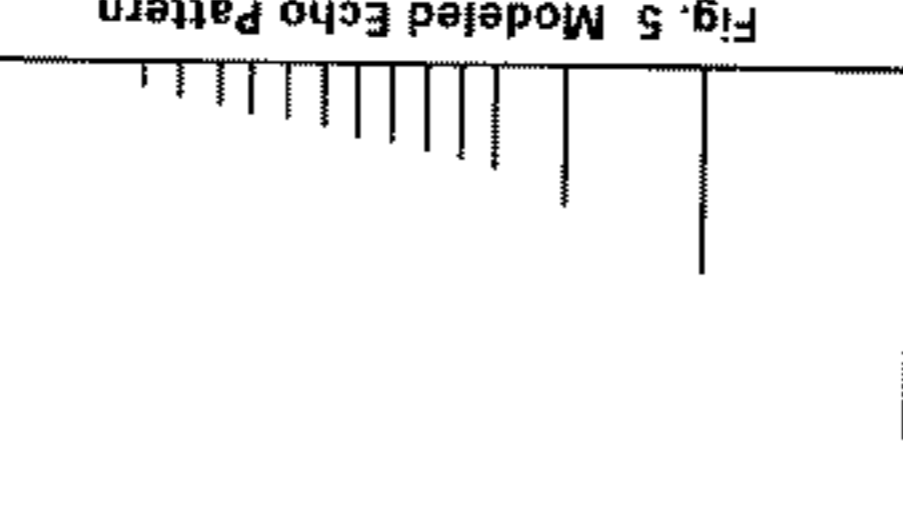
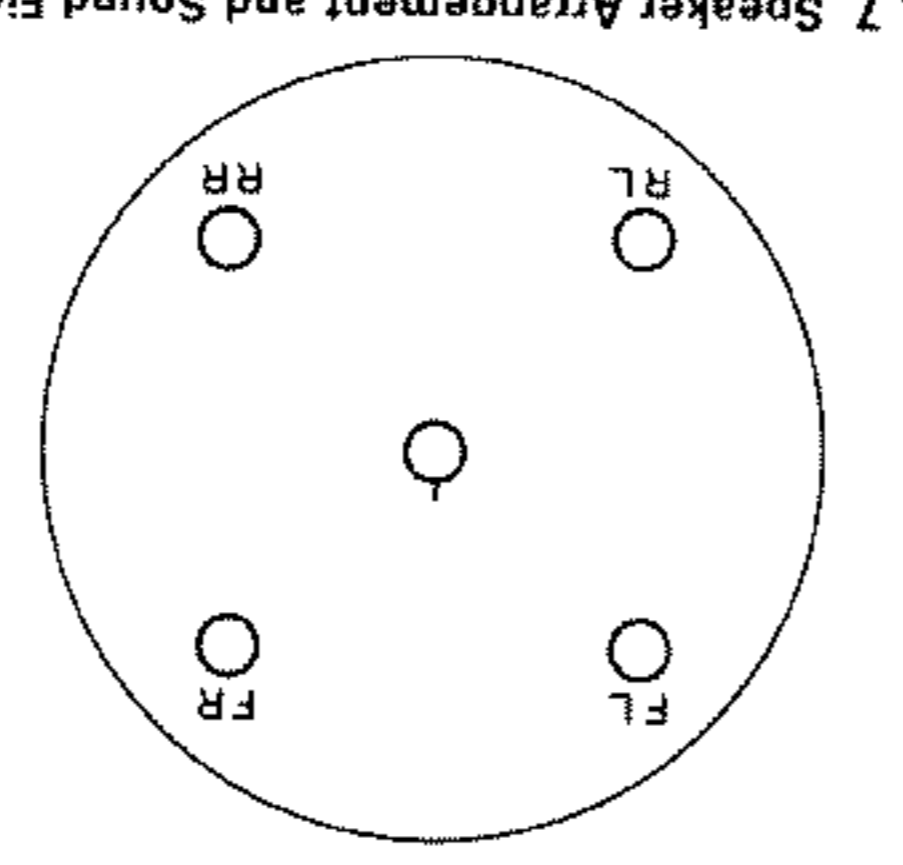
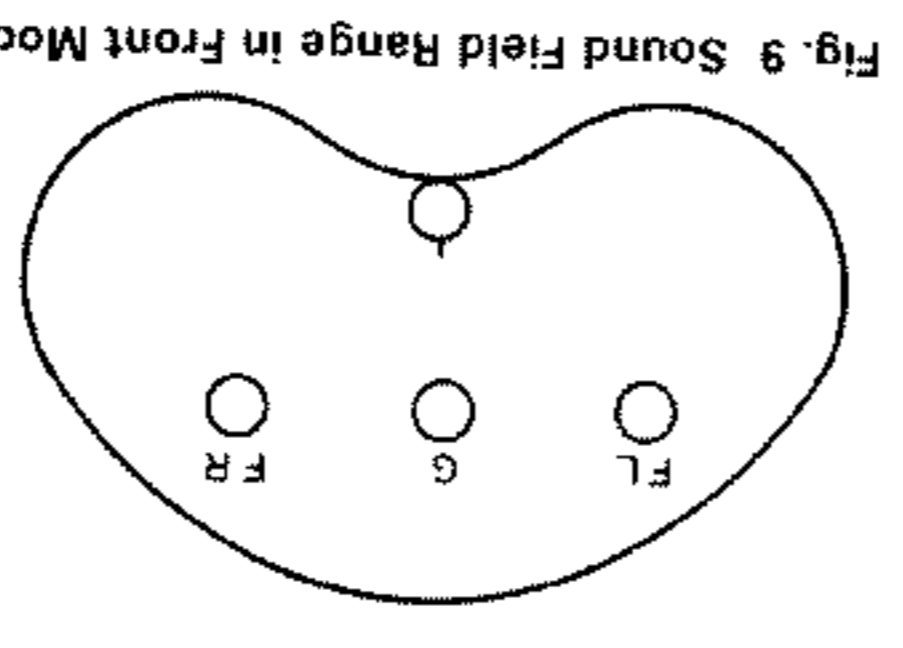
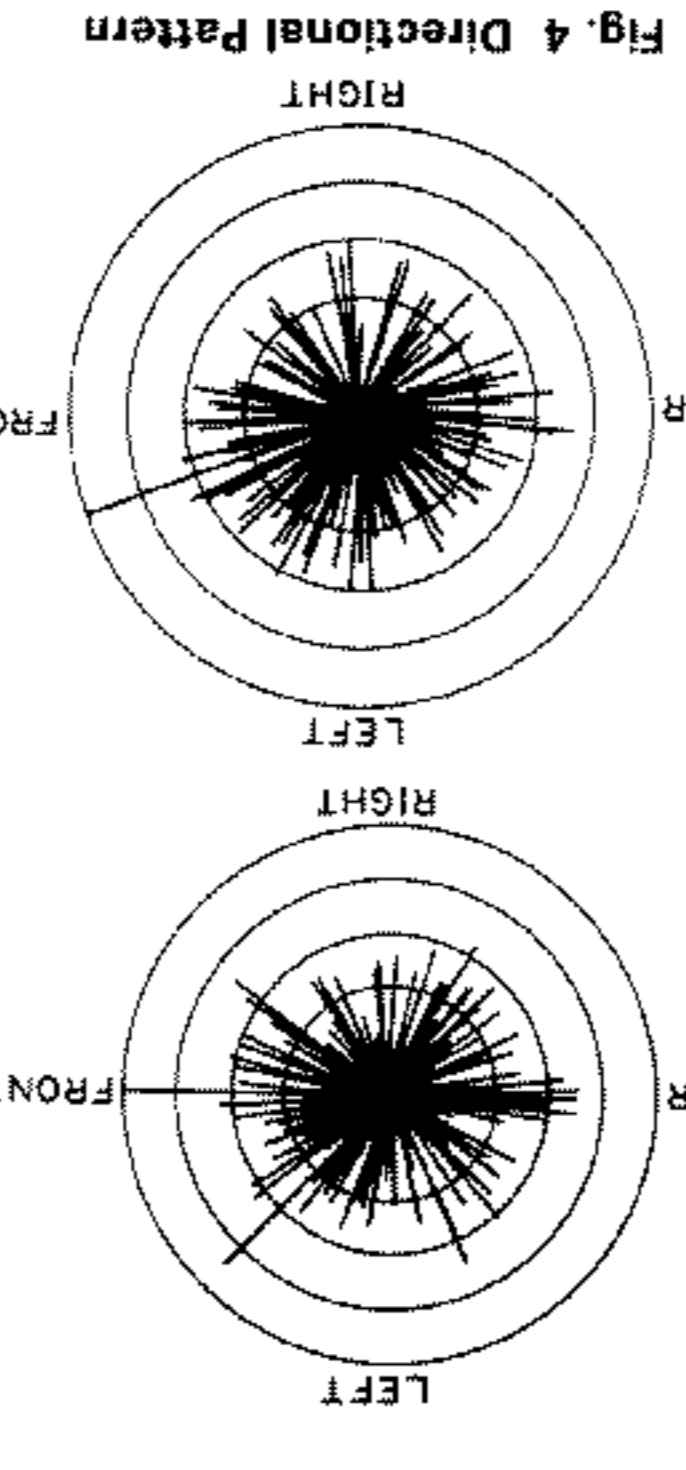
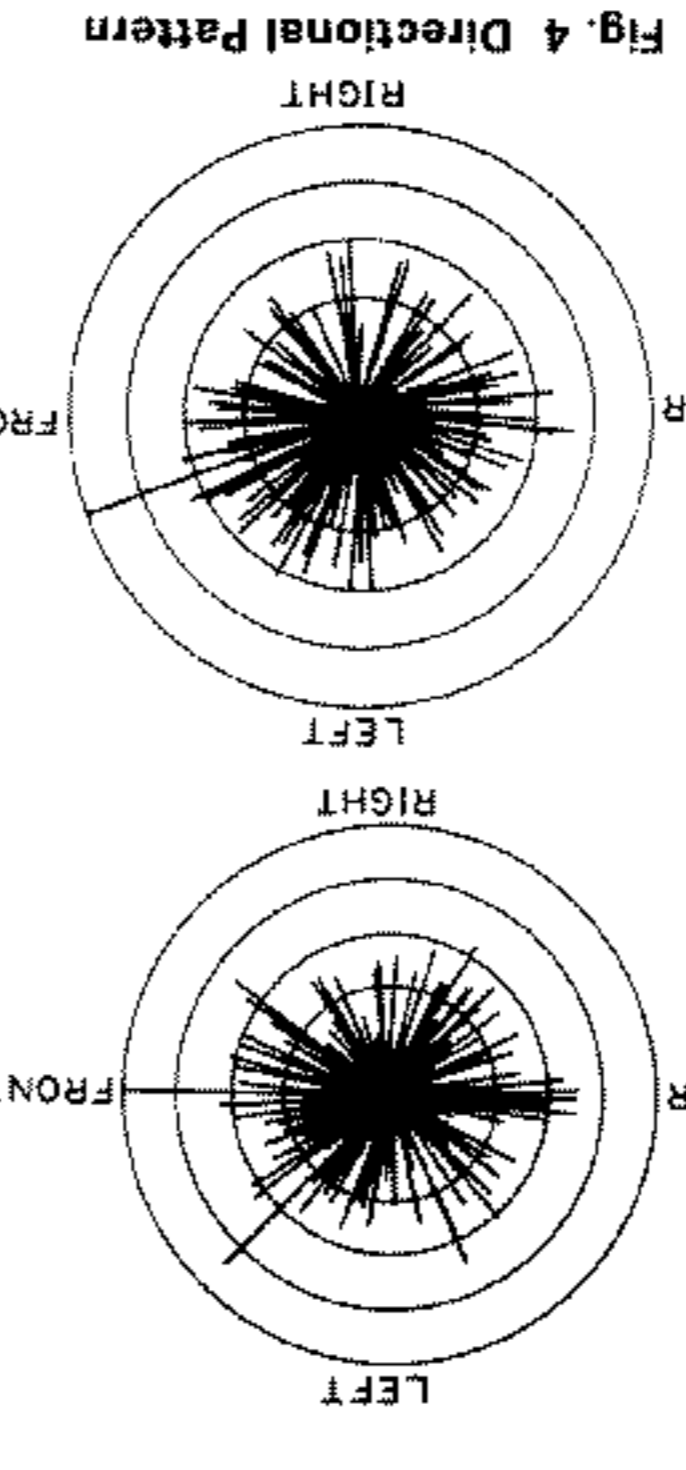
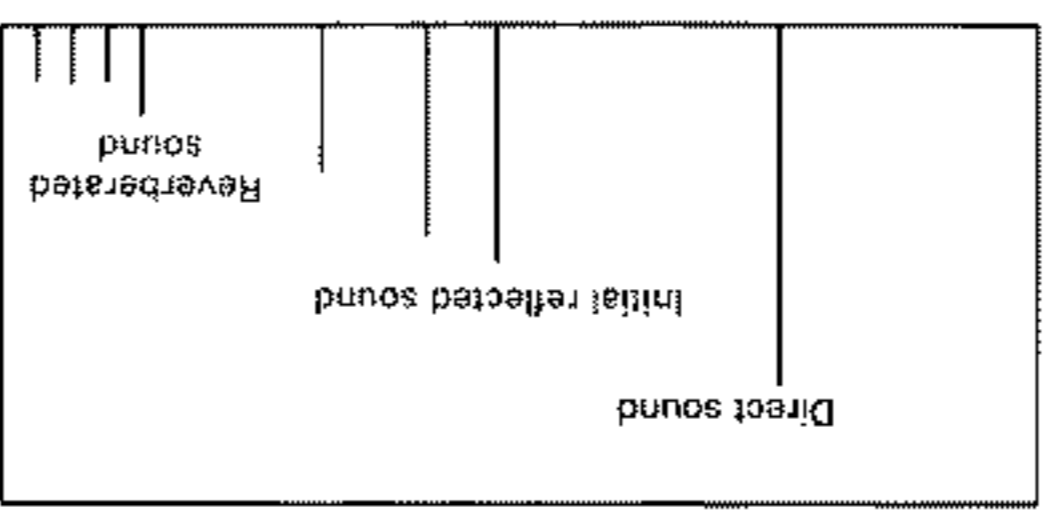
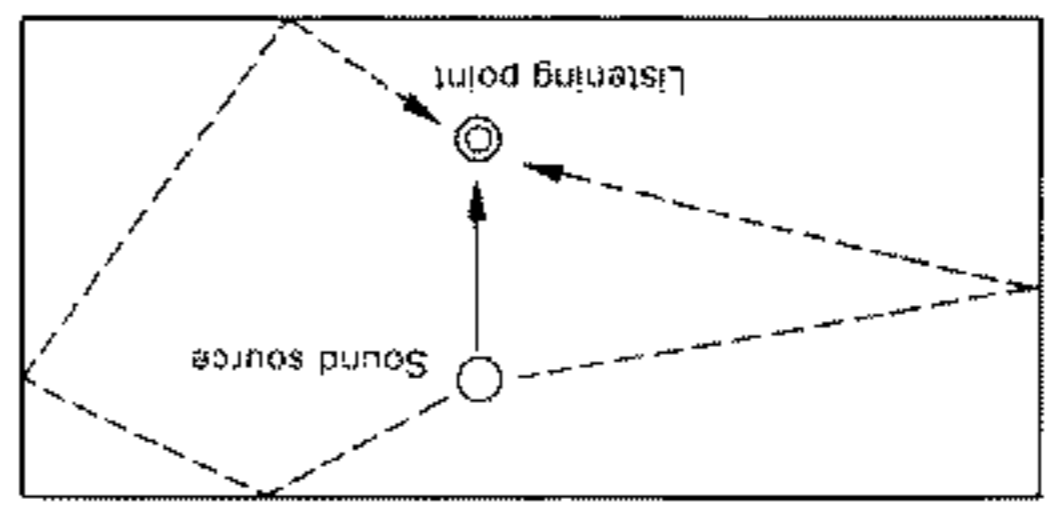
**2. ACTUAL SOUND FIELD PROPERTY AND ITS MODELING**

The digital signal processor (DSP) processes a digitized signal digitally to realize the desired functions. With the spread of digital audio, many audio digital signal processors have been developed recently. At present, the audio digital signal processor is primarily used for the following:  
1) Digital filter (graphic equalizer and tone control)  
2) Sound field control (hall sound creation)  
The outline of the digital signal processor used for the sound field control in step 2 is described below.

**DSP CIRCUIT**

**1. INTRODUCTION**

The digital signal processor (DSP) processes a digitized signal digitally to realize the desired functions.

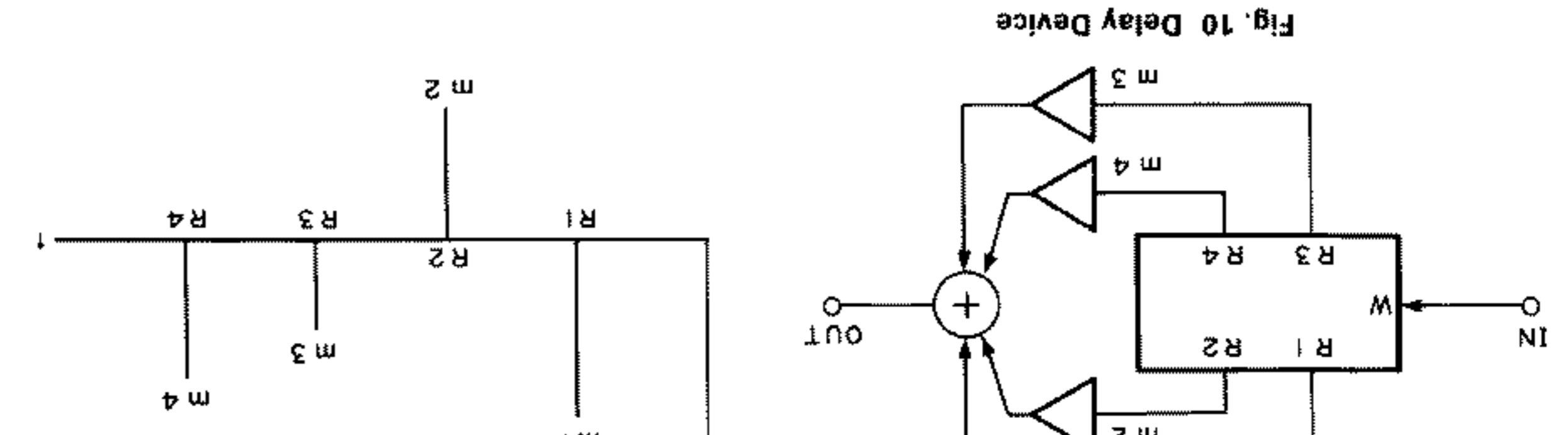
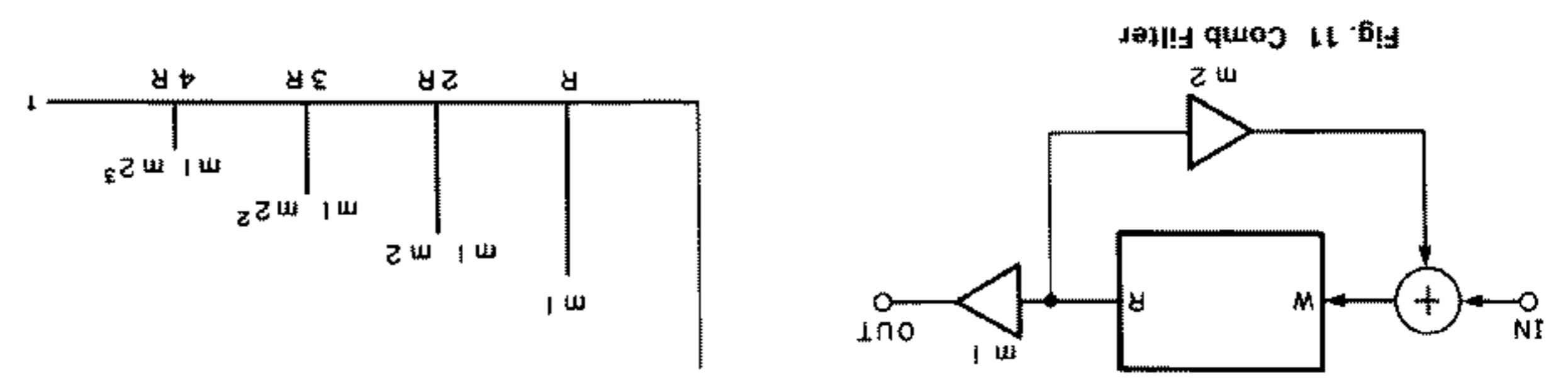
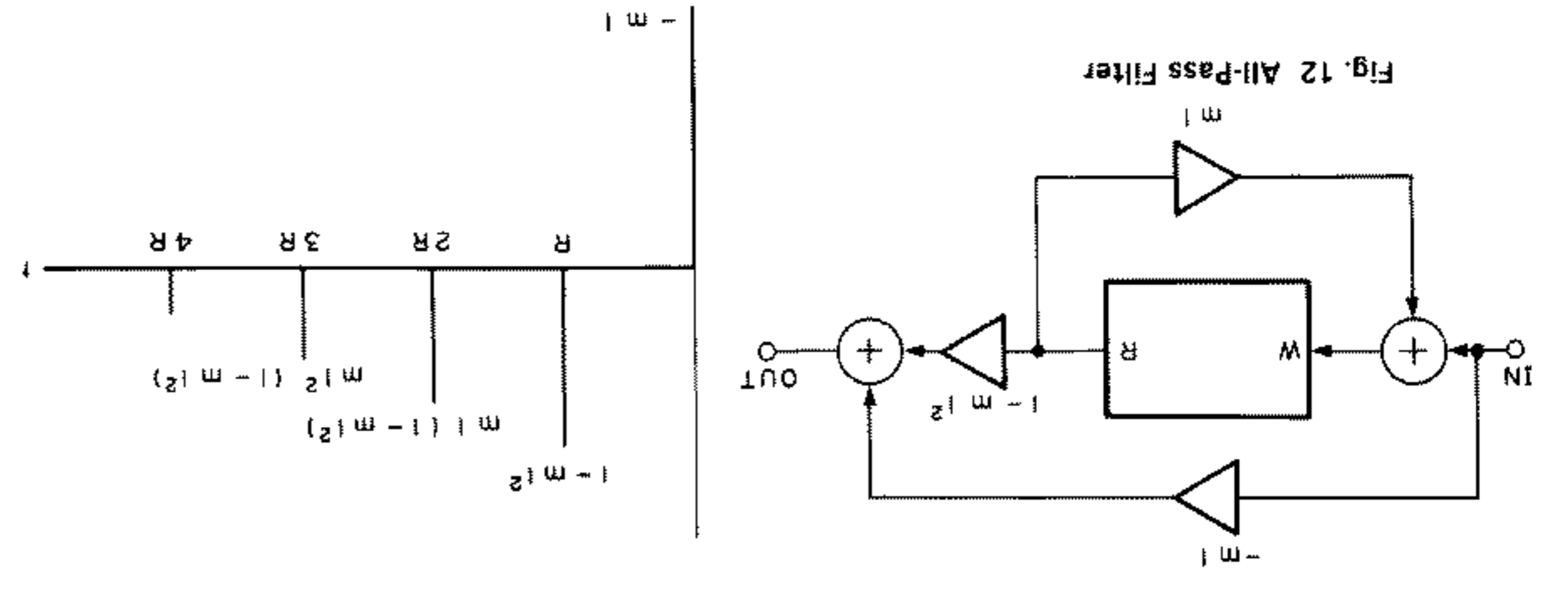


**2-3 Sound Field Characteristic Modeling**  
To reproduce a hall sound with a digital signal processor, the sound field characteristics are modeled according to the functions of the digital signal processor, as described below.  
1) Extract pulses characterizing the hall from the echo pattern shown in Figure 3.  
2) Distribute the speakers used in accordance with the directional pattern shown in Figure 4.  
Figures 5 and 6 show the modeled echo pattern and directional pattern shown in Figure 4.

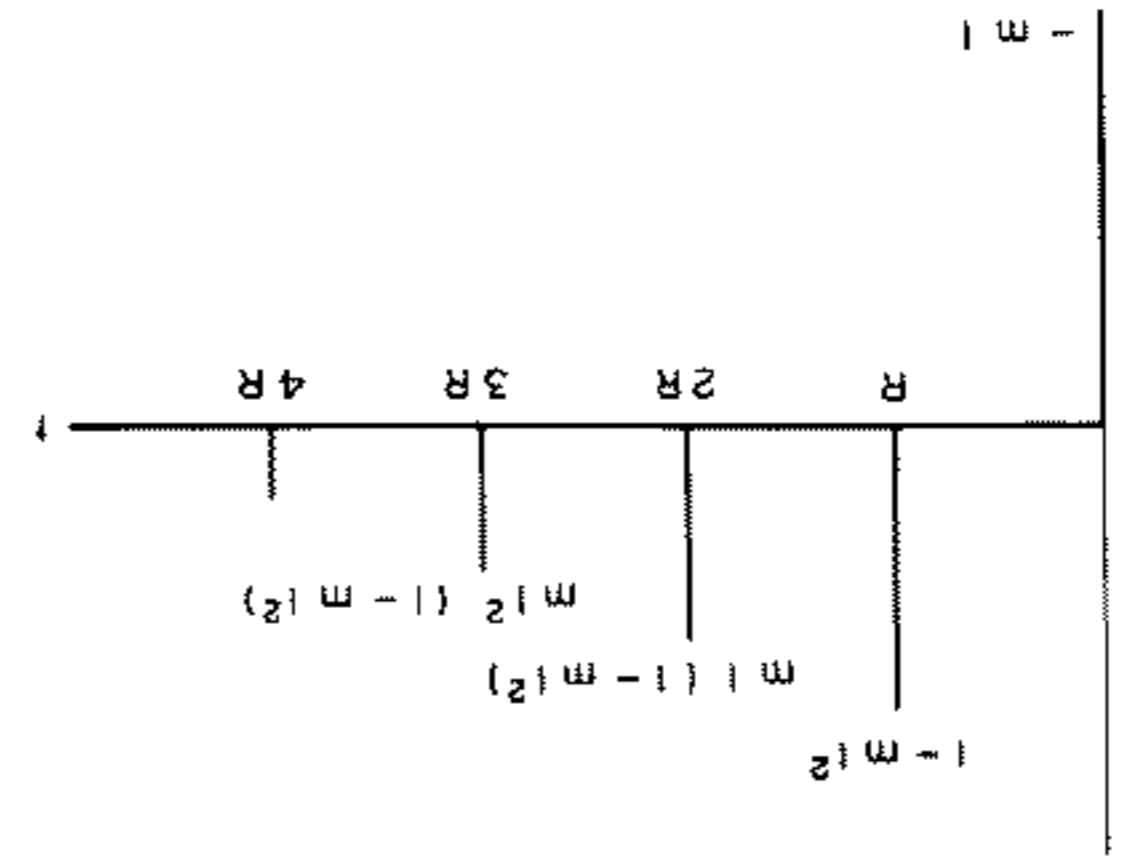
**2-2 Sound Field Characteristic Modeling**  
To reproduce a hall sound with a digital signal processor, the speaker arrangement when four channels are used and the echo patterns reproduced by each speaker are shown in Figures 7 and 8. Only two or three front speakers may be used to control the sound field more easily. As a result, a wider sound field can be obtained by filtering a reverberated signal at the back and out-putting the signal from the front. Figure 9 shows the sound field range in this case.

**CIRCUIT DESCRIPTION**

**CIRCUIT DESCRIPTION**



**3. PROCESSING USING DIGITAL SIGNAL PROCESSOR**  
The sound field characteristics of the hall described in the preceding section are realized with a digital signal processor as explained below.  
The sound field of a hall are shown in Figures 10 through 12. Figure 10 shows the delay device that reproduces the initial reflected sound. A reverberated signal is reproduced using the reverberation system of a shredder. The reverberation system consists of a comb filter, shown in Figure 11, and an all-pass filter, shown in Figure 12.



During the above signal processing, various coefficients are used in each block in the course of signal flow. Various parameters such as reverberation time, low-pass filter cut-off frequency, and direct sound-to-indirect sound ratio, as well as initial reflected sound and reverberated sound can be adjusted by altering these coefficients. These parameters can correspond to the environment used or the reproduced software information.

**3-2 Signal Processing Based on Signal Flow**  
Figure 13 shows a signal flow example when the sound field in a concert hall is reproduced with two front channels and two rear channels (4 channels in total) and four speakers based on the components in the preceding section.  
The input signal for the left and right channels branches into two paths. One is output to the front left and right channels as a direct sound. The other path is used to reproduce an indirect sound. The signal path in which the indirect sound is reproduced produces an L + R mono signal to simplify the processing. The indirect sound can also produce an attenuated high-frequency component characteristic by repeating the reflecting component. Two initial reflected sounds are output to the front left and right channels. One initial reflected sound is input to block 3 to reproduce a reverberated sound. Block 3 uses the partially changed reverberation system of the shredder described in section 3-1. The reverberated sound is reproduced in block 3. The output signal of block 3 is input to block 4 and delayed relative to the front and rear left and right channels. The resultant signal is output to each channel.

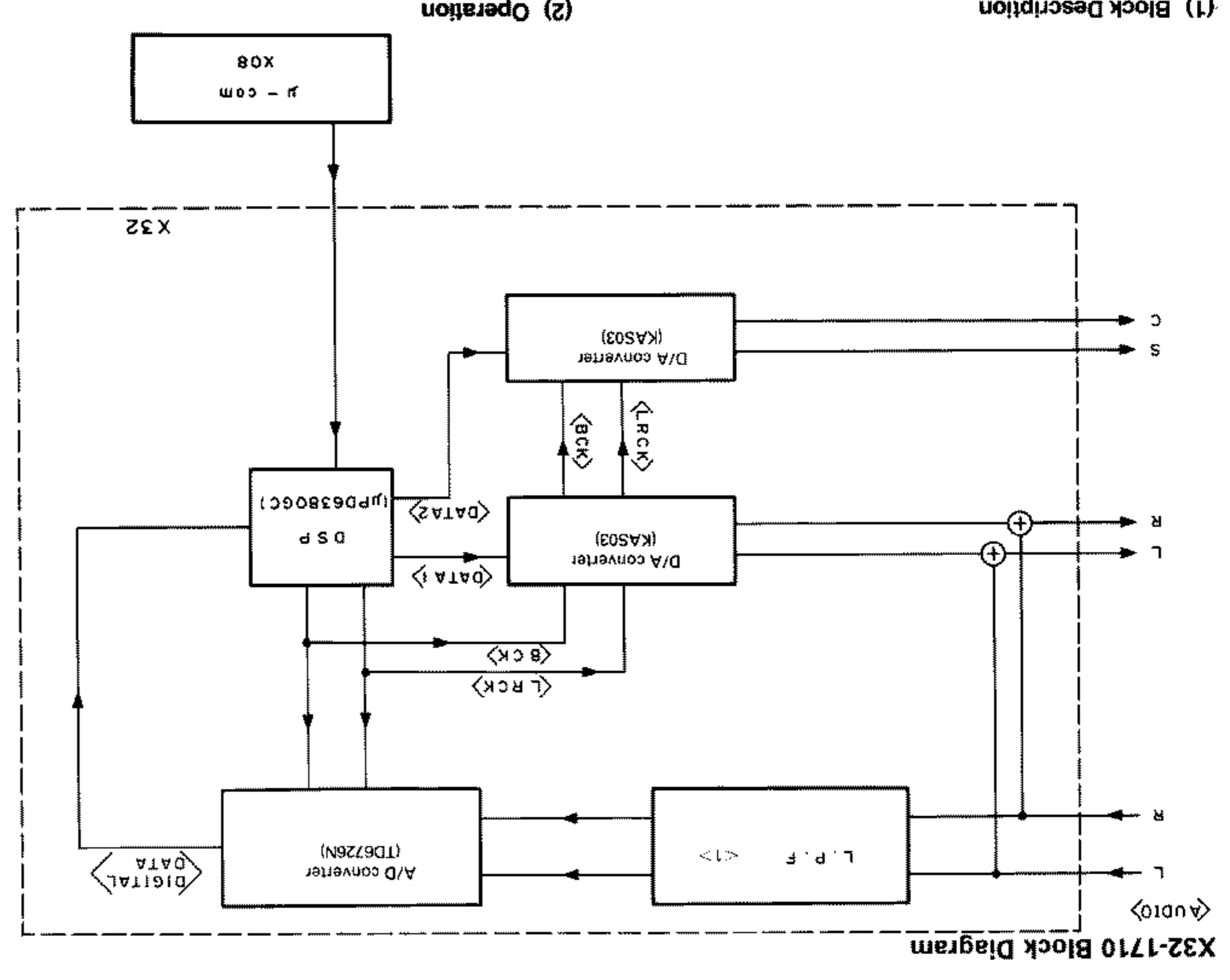
**CIRCUIT DESCRIPTION**

(i) **Low-pass filter (LPF) <1>**  
 Cut-off frequency  $f_c$  is 15 kHz. The voltage levels are -70 dB or more at 32 kHz to prevent cyclical noise in a 7-degree Chebyshev low-pass filter and analog-to-digital converter.

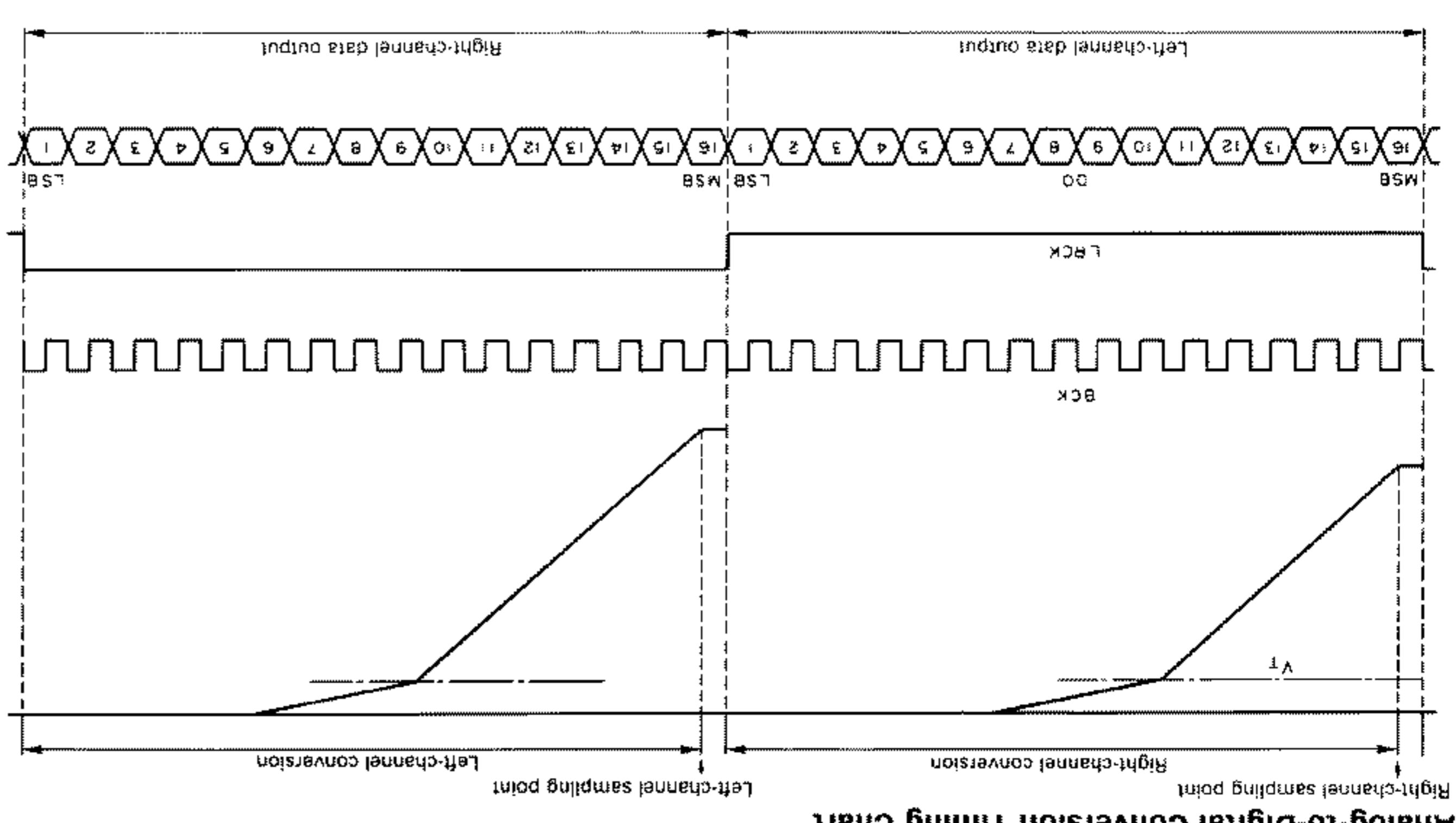
(ii) **A/D converter (TD6726N)**  
 Sixteen-bit integrating analog-to-digital converter. This converter has an internal sample and hold circuit. The output is a 2's complement.

(iii) **D/A converter**  
 The digital-to-analog converter uses two KAS03s consisting of a hybrid integrated circuit (HIC), and has a 4-channel output.

The KAS03 includes a digital filter and 16-bit SH5807 The digital-to-analog converter includes a  $\mu$ PD6376, and an +8 dB amplifier and low-pass filter (3-degree) that adjust the input and output gains of the X32-1710.



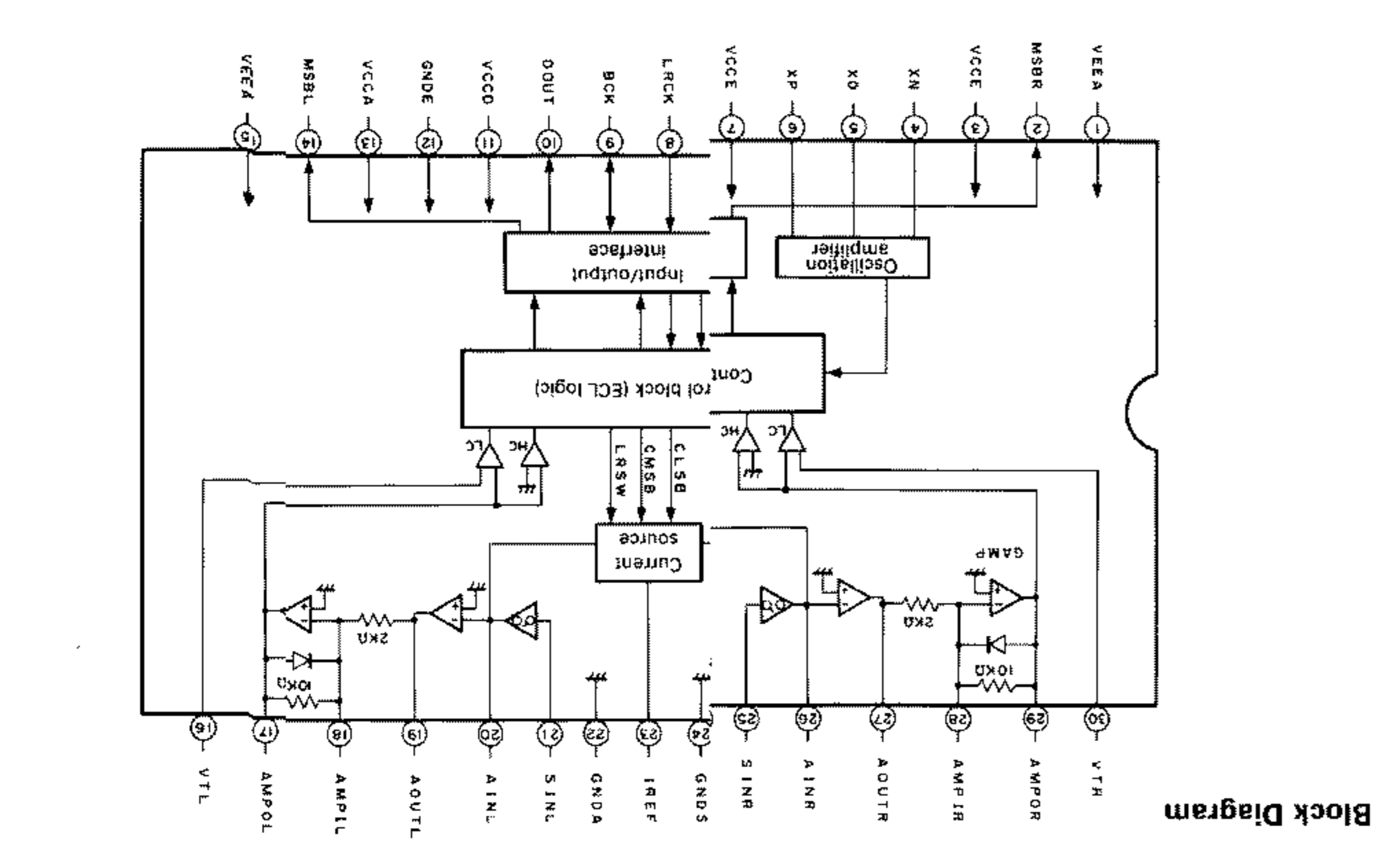
### CIRCUIT DESCRIPTION



Pin No.	Symbol I/O	Description
13	VCCA	Analog positive supply voltage (+5 V)
14	MSBL	Left-channel MSB signal output (Output in offset binary codes.)
15	VEEA	Analog negative supply voltage (-5 V)
16	VTL	Left-channel comparator reference voltage
17	AMPOL	Left-channel DC gain amplifier output
18	AMPL	Left-channel DC gain amplifier input
19	AOUTL	Left-channel integrating amplifier output
20	AINL	Left-channel integrating amplifier input
26	AINR	Right-channel integrating amplifier input
27	AOUTR	Right-channel integrating amplifier output
28	AMP1R	Right-channel DC gain amplifier input
29	AMPOR	Right-channel DC gain amplifier output
30	VTR	Right-channel comparator reference voltage
24	GNDS	Analog signal ground
25	SINR	Right-channel audio signal input
23	IREF	Integrating reference current input
22	GNDA	Analog ground
21	SINL	Left-channel audio signal input
20	AINL	Left-channel integrating amplifier input
19	AOUTL	Left-channel integrating amplifier output
18	AMPL	Left-channel DC gain amplifier input
17	AMPOL	Left-channel DC gain amplifier output
16	VTL	Left-channel comparator reference voltage
15	VEEA	Analog negative supply voltage (-5 V)
14	MSBL	Left-channel MSB signal output (Output in offset binary codes.)
13	VCCA	Analog positive supply voltage (+5 V)

### CIRCUIT DESCRIPTION

Pin No.	Symbol I/O	Description	Remarks
1	$\Delta$ VEEA	Analog negative supply voltage (-5 V)	
2	MSBR	Right-channel MSB signal output (Output in offset binary codes.)	
3	VCCCE	ECL logic positive supply voltage (+5 V)	
4	XN	Oscillation amplifier input/output	
5	XO	Oscillation amplifier output	A Colpitts oscillator can be easily configured by connecting a coil, capacitor, and resistor to the crystal oscillator.
6	XP		
7	VCCCE	ECL logic positive supply voltage (+5 V)	
8	LRCK	LR clock input	
9	BRCK	Bit clock input	
10	DOUT	Digital audio data output (Synchronized on the falling edge of the BCK signal for MSB data first-out operation.)	
11	VCCD	Digital positive supply voltage (+5 V)	
12	GNDE	ECL logic ground	

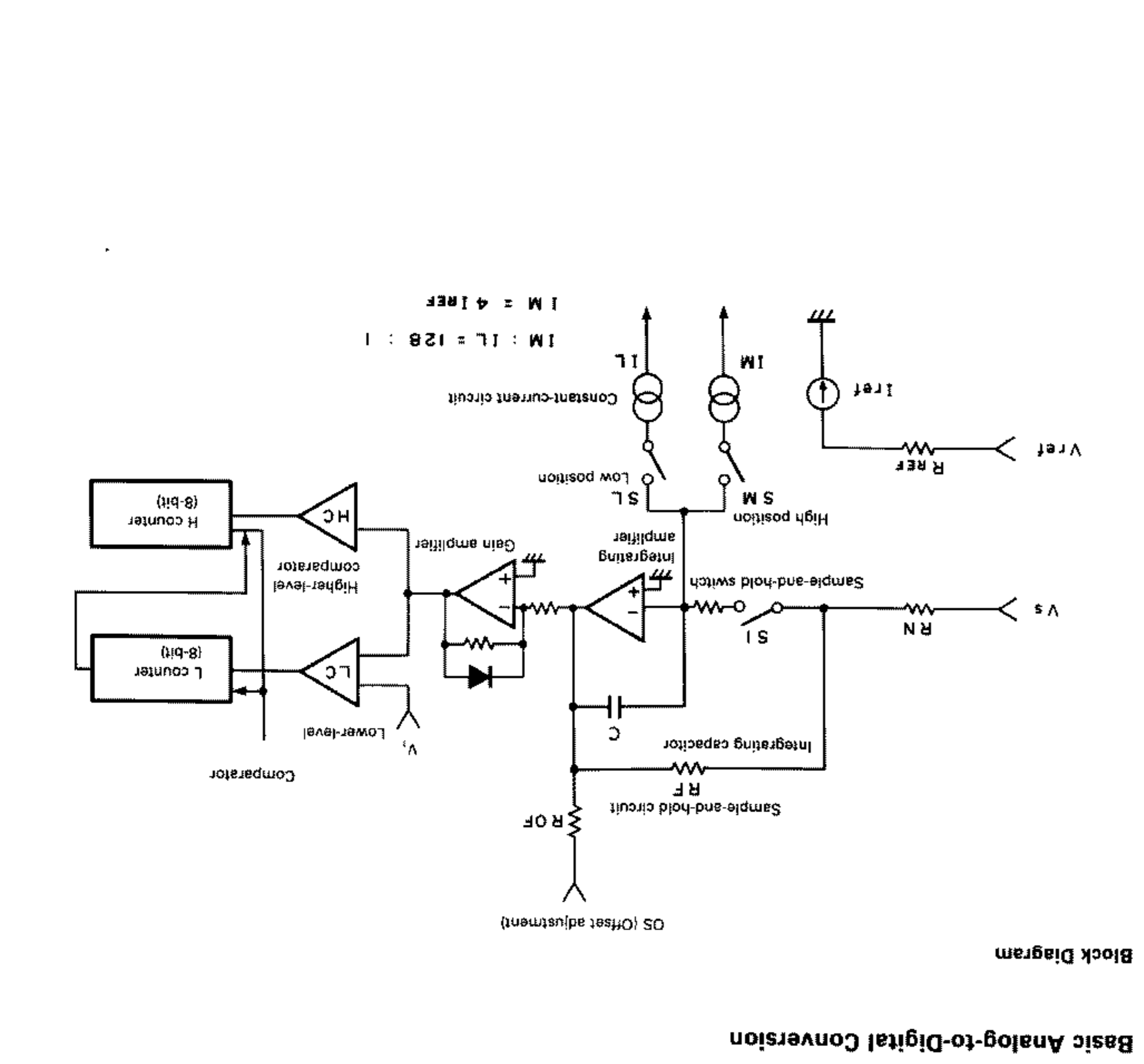


### CIRCUIT DESCRIPTION

Pin No.	Symbol I/O	Description
1	SM	Sample-and-hold switch
3	SL	Sample-and-hold switch
4	SM	Sample-and-hold switch
5	SL	Sample-and-hold switch

**Basic Operation**

(Sample) Holds the analog voltage applied to the Vs signal in a capacitor.  
 (Hold) Turns off sample-and-hold switch S1 and holds the voltage just before the switch is turned off in a capacitor.  
 (Conversion-1) Turns on the SM signal and discharges the capacitor with constant-current source IM. Turns off the SM signal when the capacitor voltage (V0) becomes zero. The higher-level M counter then counts the fck frequency.  
 (Conversion-2) Turns on the SL signal when the SL signal becomes zero. Then discharges the capacitor with constant-current source IL. Turns off the SL signal when the V0 voltage becomes zero. The lower-level L counter then counts the fck frequency. The L counter is carried to the M counter when a carry is produced by the L counter.  
 (Conversion completion) An A/D-converted digital data when the L and M counter information is concatenated is produced after all operations above are completed.



### CIRCUIT DESCRIPTION

CIRCUIT DESCRIPTION

Master Microcomputer

Outline (CXP50112-154Q)

The main features of the A-94 display microcomputer are as follows:

- 1) 9-channel audio input and 4-channel video input
- 2) Digital signal processor (DSP)
- 3) Digital signal processor (DSP) recording

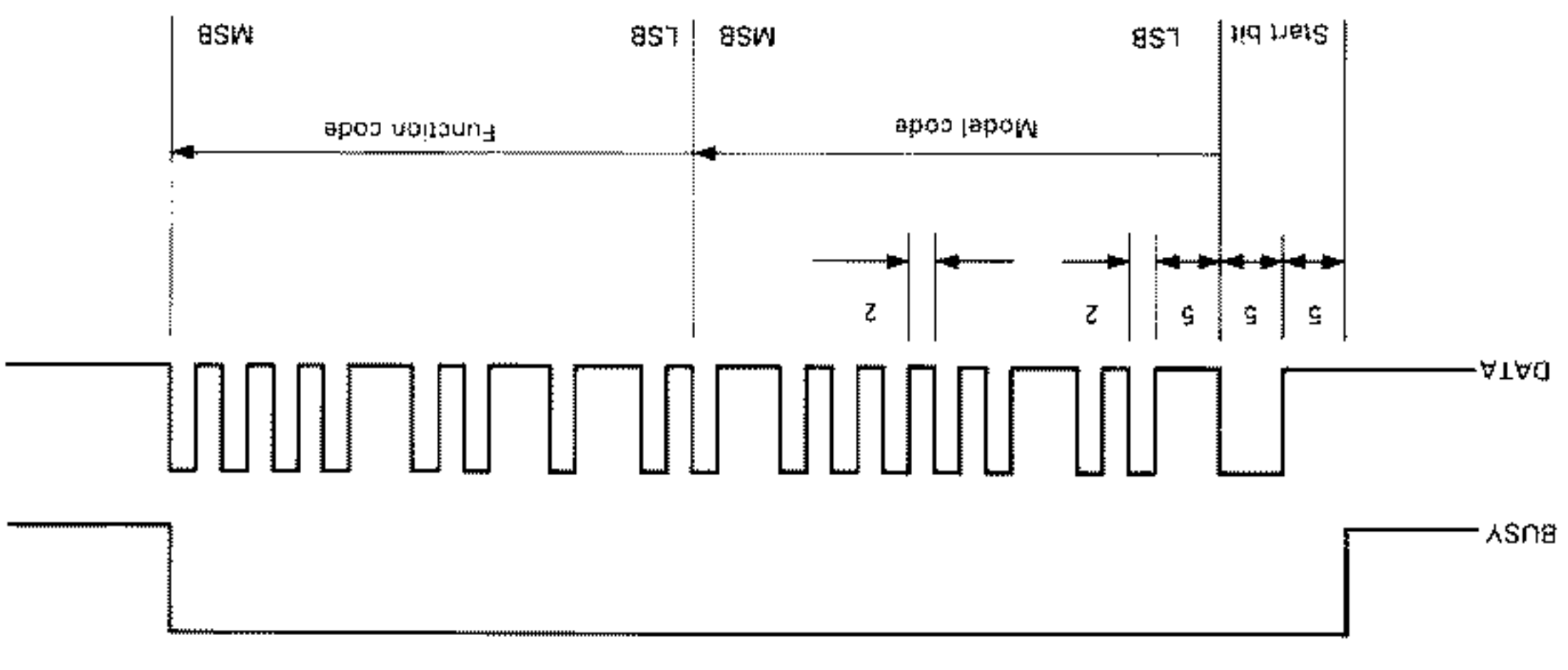
Initial Setting

Item	Setting	Item	Setting
POWER	OFF	Surround mode	OFF
Selector (audio)	TUNER	MEMORY	OFF
Selector (video)	VIDEO	VISUAL FIX	OFF
CD DIRECT	OFF	DOLBY	-25 dB
CENTER	OFF	DSP	-15 dB
MUTE	OFF	DOLBY	-15 dB
REAR	OFF	DSP	-15 dB
DELAY TIME	OFF	DOLBY	20 ms
DSP REC	OFF	DSP	35 ms
DSP REC LEVEL	OFF	DSP only	-8 dB
DISPLAY	Selector mode	ARENA	3 CH
SUPER WOOFER	OFF	4 CH	ARENA

Memory Clear

Switch on while holding down the TUNER key.

Timing Chart



16-Bit Communication Format

PPM two-wire bidirectional serial communication system  
 The data configuration consists of 16 bits below.  
 Model code 8 bits  
 Function code 8 bits

1. System

● Start bit  
 Low: 5 ms, High: 5 ms  
 ● Data  
 The binary value depends on the length of the space, which is delimited by 2-ms marks.  
 Model code 0: 2 ms, 1: 5 ms  
 In the example above, the model code is 85h and the function code is 16h

CAUTION:

When Test Mode is used, the memory will be cleared completely.

Test mode

1. The amplifier test mode includes the two tests below  
 Test 1: Fluorescent display, LED, and lamp lighting test  
 Test 2: Surround test

- 1) The fluorescent display and LED indicators light when the amplifier is switched on while the CD key is being held down. Lamps then light in the order of DOLBY, DSP3CH, and DSP4CH. Test 1 mode is entered.
- 2) The amplifier enters test 2 mode when the keys below are pressed in test 1 mode. (Test 1 mode is canceled.)

- a) CENTER UP KEY
- b) REAR UP KEY
- c) PRESENCE UP KEY
- d) DELAY UP KEY

CAUTION:

When Test Mode is used, the memory will be cleared completely.

CIRCUIT DESCRIPTION

CIRCUIT DESCRIPTION

3-3 Internal Configuration and Operation of Digital Signal Processor

Figure 14 shows the internal block diagram of a digital signal processor (NEC μP D6380). Each block operation is explained below.

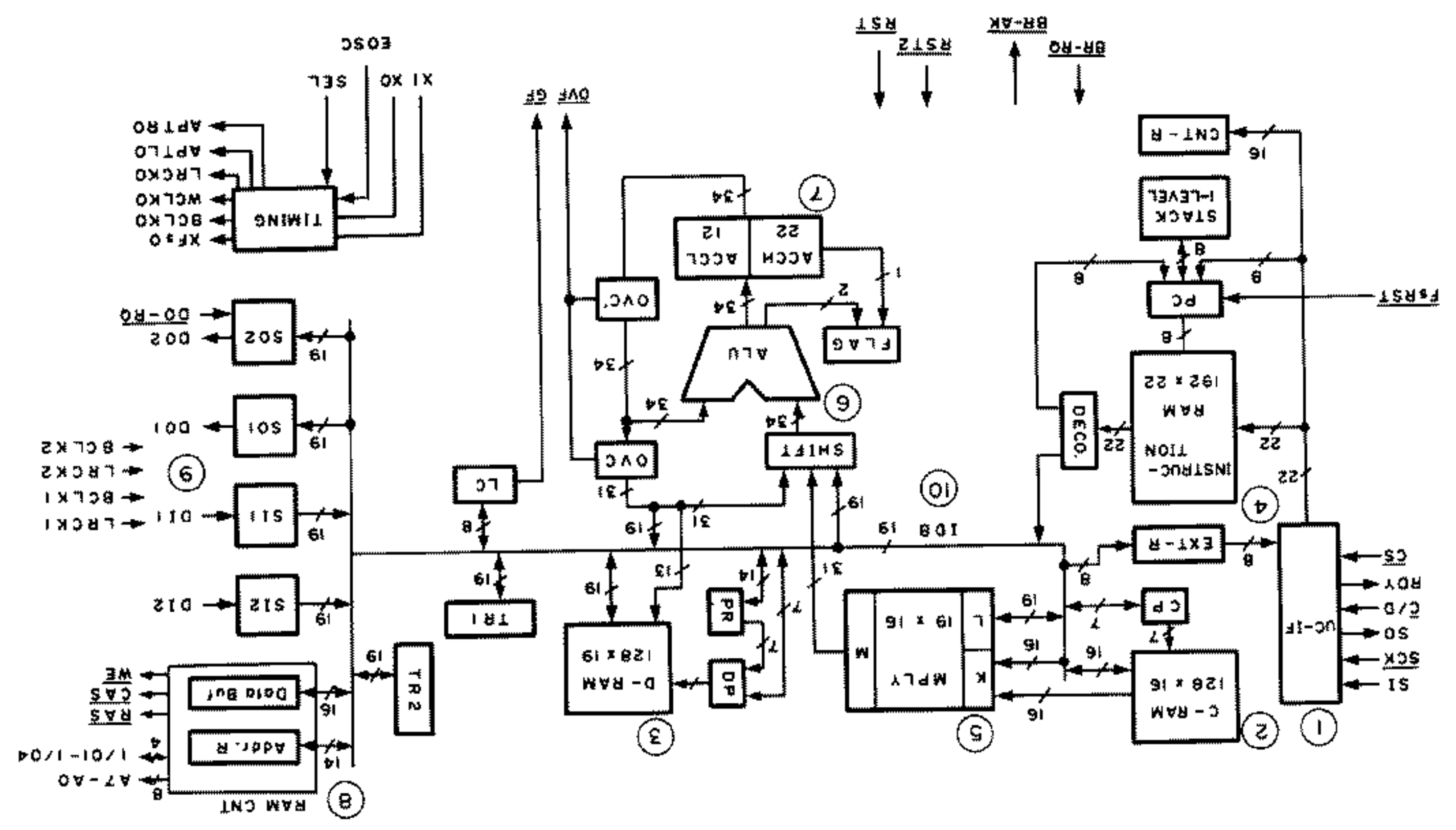
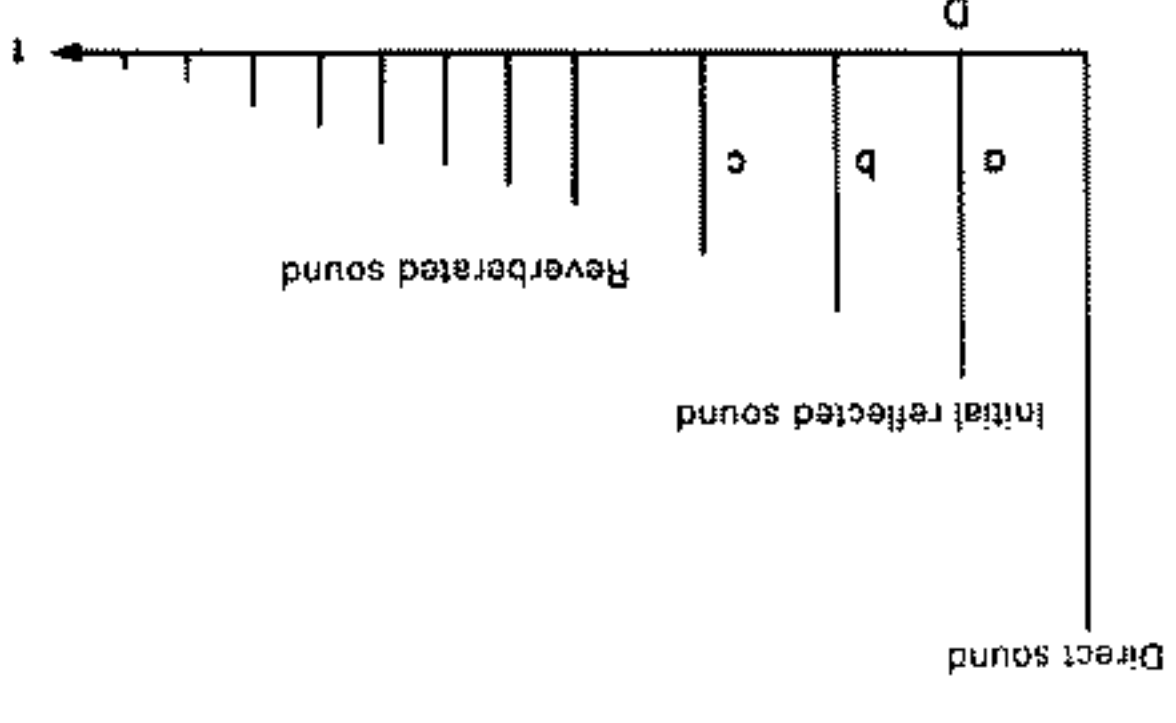


Fig. 14 Internal Block Diagram of Digital Signal Processor

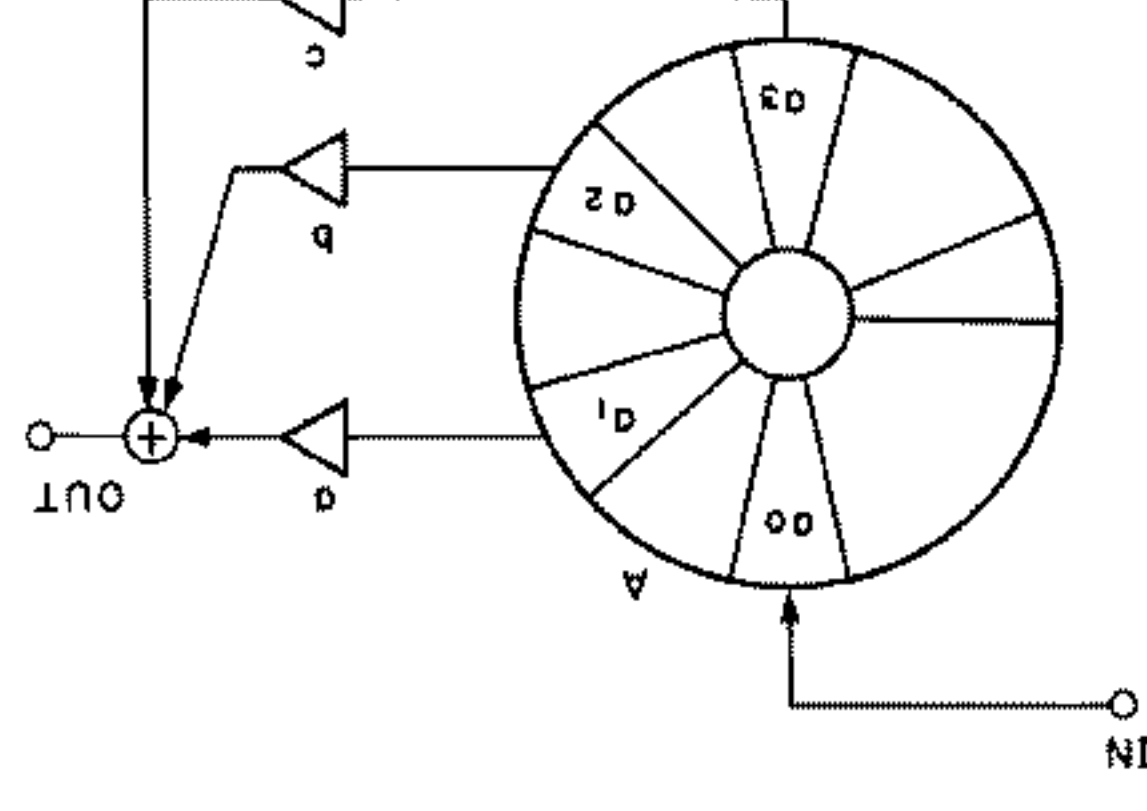
The process when the echo pattern shown in Figure 15 is reproduced by a digital signal processor is described below with the initial reflected sound as an example. See Figure 14, "Internal Block Diagram".

Fig. 15 Reproduced Echo Pattern



CIRCUIT DESCRIPTION

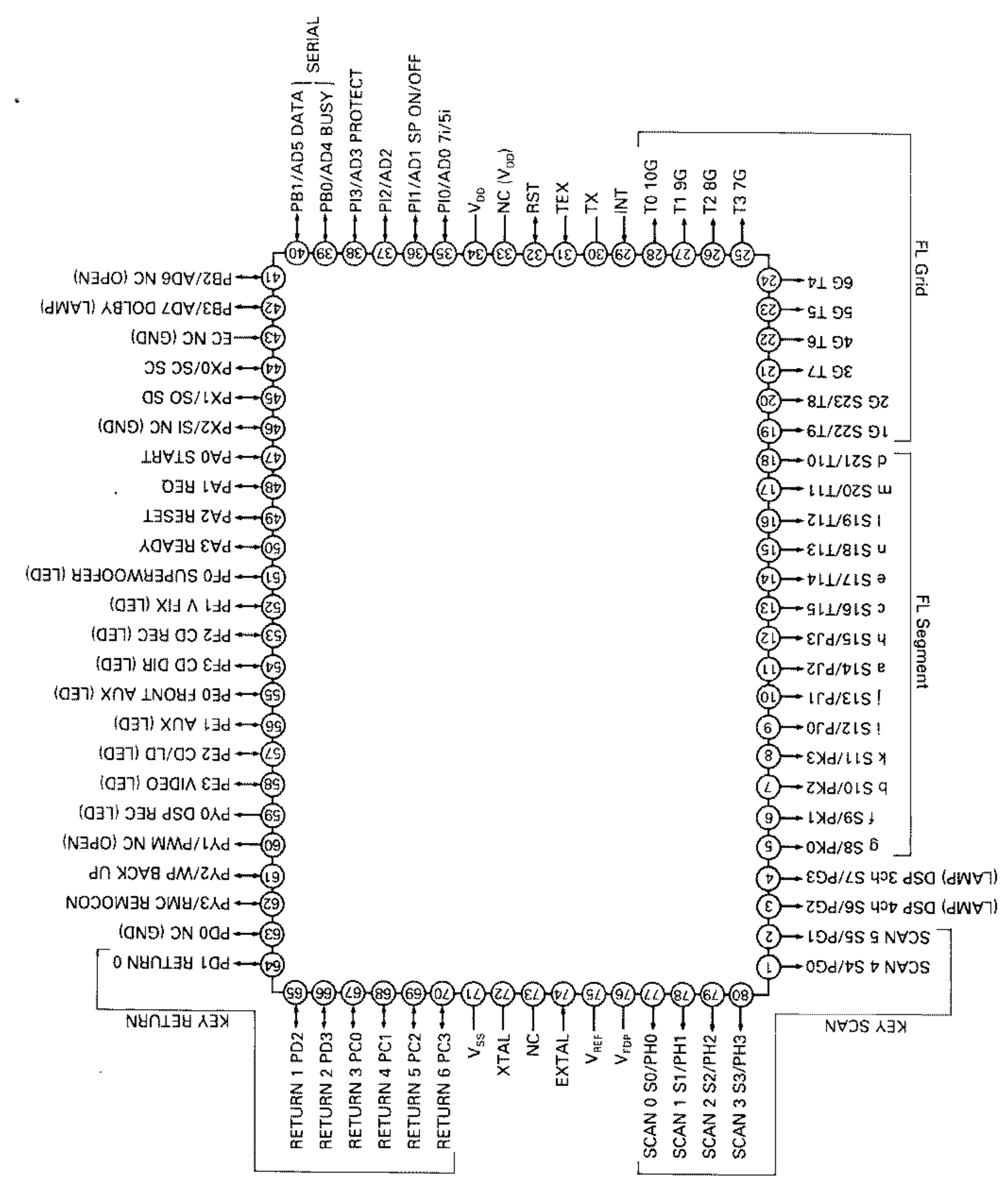
Fig. 16 Ring Buffer Model



The process when an initial reflected sound that is a times as high as the direct sound is reproduced after D seconds with the digital signal processor is as follows:  
 Audio signals is fetched from audio interface block 9 for every sampling period of T seconds and sent to external RAM control block 8. Data is then written in the ring buffer example. An address is offset by  $A = D/T$  relative to the currently written address and the address is read to obtain the delay time corresponding to D seconds. The read data is sent to the L register of multiplier 5. To make the data size a times the normal, coefficient a is sent from coefficient RAM 2 to the K register of the

multiplier. The multiplier performs a K<sub>L</sub> operation in one instruction cycle. The result data is obtained using the M register. The signal that is delayed D seconds and made a times the normal size is sent from the M register to the arithmetic and logic unit (ALU) 6 and added to accumulator 7. The resultant signal is sent again from the accumulator to audio interface block 9. The signal is then output for every sampling period of T seconds. A subsequent initial reflected sound is also reproduced in the same way as above.  
 The digital signal processor performs the above signal processing at high speeds according to a horizontal instruction format. ALU operation, data transfer, and memory address updating are executed at the same time in one instruction cycle.

- 1) Microcomputer interface  
 Interfaces between a microcomputer and the digital signal processor in series.
- 2) Coefficient RAM (C-RAM)  
 Stores the coefficient for a filter. The address is specified by the D-RAM pointer (DP).
- 3) Data RAM (D-RAM)  
 The data RAM is a work area that stores data during operation. The address is specified by the D-RAM pointer (DP).
- 4) Instruction RAM  
 Stores a program. The address is specified using a program counter (PC).
- 5) Multiplier (MPLY)  
 The result data is sent to the M register in one instruction cycle when a multiplier and multiplier are transferred to the K and L registers.
- 6) Arithmetic and logic unit (ALU)  
 Performs arithmetic and logic operations.
- 7) Accumulator (ACCL)  
 The accumulator is a register that stores the result data of an ALU operation.
- 8) External RAM control  
 Controls the external RAM in which delay data is written.
- 9) Audio interface  
 Inputs or outputs an audio signal in series.
- 10) Internal data bus (DB)  
 The internal data bus is an internal data transfer path between the memory and registers.



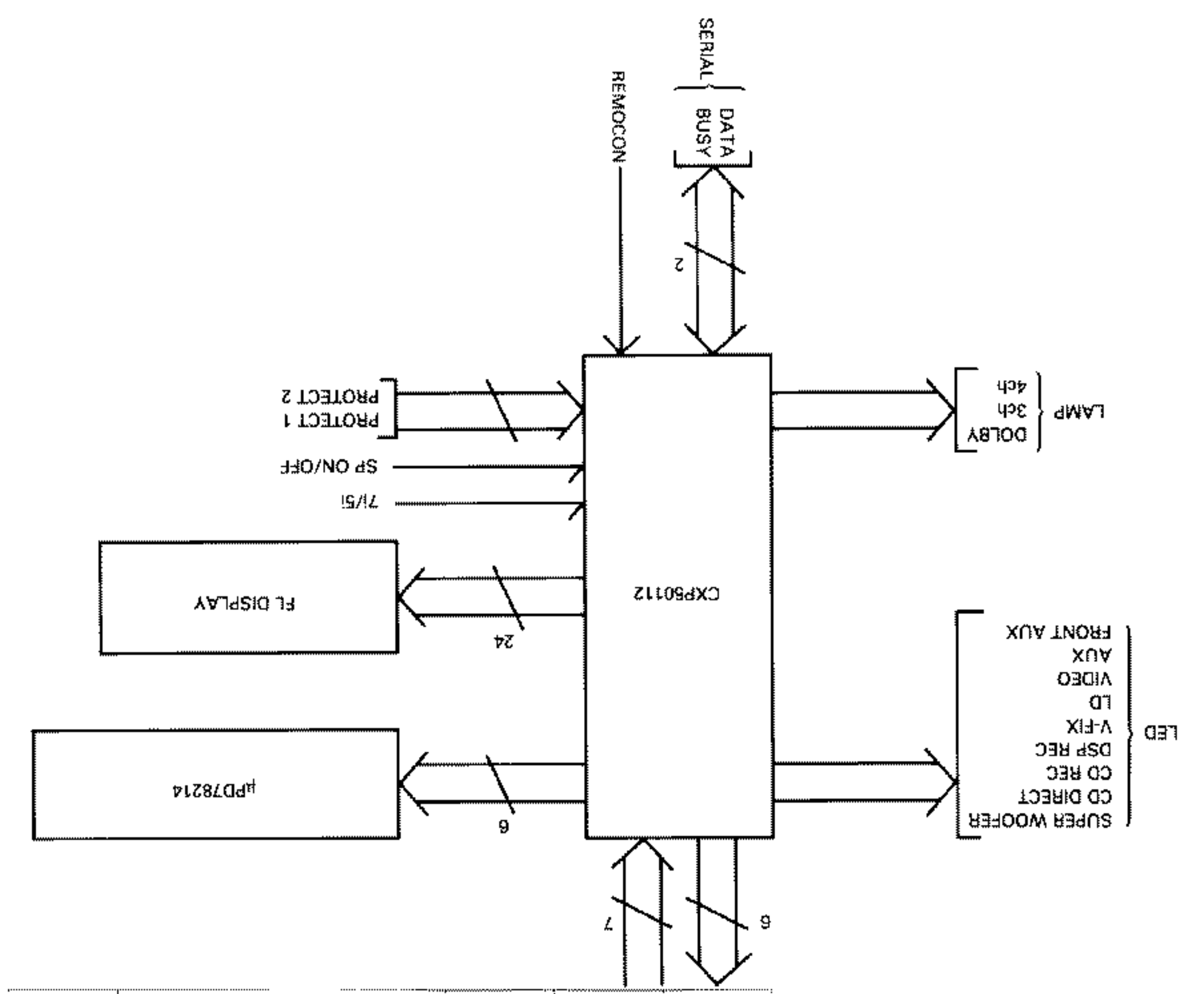
### CIRCUIT DESCRIPTION

A-94

Pin No.	Pin name	I/O	Name	Description
45	PX1/SD	O	SD	S - O data (for communication)
46	PX2/SI	NC	NC	NC (GND)
47	PA0	O	START	Start (for communication)
48	PA1	O	REQ	Request (for communication)
49	PA2	O	RESET	Reset (for communication)
50	PA3	I	READY	Ready (for communication)
51	PF0	O	SPERWOOFFER	LED
52	PF1	O	V-FIX	LED
53	PF2	O	CD-REC	LED
54	PF3	O	CD DIR	LED
55	PE0	O	F-RONT AUX	LED
56	PE1	O	AUX	LED
57	PE2	O	CD/LD	LED
58	PE3	O	VDECO	LED
59	PV0	O	DSP REC	LED
60	PY1/DWM	O	NC	NC (OPEN)
61	PY2/WP	I	BACK UP	Backup input
62	PY3/RMC	I	REMOCON	Remote control input
63	PD0	NC	NC	NC (GND)
64	PD1	I	RETURN 0	Auto-return 0
65	PD2	I	RETURN 1	Auto-return 1
66	PD3	I	RETURN 2	Auto-return 2
67	PD0	I	RETURN 3	Auto-return 3
68	PC1	I	RETURN 4	Auto-return 4
69	PC2	I	RETURN 5	Auto-return 5
70	PC3	I	RETURN 6	Auto-return 6
71	V <sub>SS</sub>	NC	NC	GND
72	XTAL	NC	NC	Crystal
73	NC	NC	NC	Crystal
74	EXTAL	I	EXTAL	Oscillation pin
75	V <sub>CC</sub> F	NC	NC	Reference voltage for voltage detection (unused)
76	V <sub>CC</sub> P	NC	NC	Fluorescent display power supply
77	PH0	O	SCAN 0	Key scan 0
78	PH1	O	SCAN 1	Key scan 1
79	PH2	O	SCAN 2	Key scan 2
80	PH3	O	SCAN 3	Key scan 3

### CIRCUIT DESCRIPTION

A-94



### CIRCUIT DESCRIPTION

A-94

Pin No.	Pin name	I/O	Name	Description
1	S4/DG0	O	SCAN4	Key scan 4
2	S5/DG1	O	SCAN5	Key scan 5
3	S6/DG2	O	DSPACH	LAMP
4	S7/DG3	O	DSP3CH	LAMP
5	S8/DK0	O	LAMP	LAMP
6	S9/DK1	O	SEGMENT 1	FL segment g
7	S10/DK2	O	SEGMENT 2	FL segment f
8	S11/DK3	O	SEGMENT 3	FL segment b
9	S12/PJ0	O	SEGMENT 4	FL segment k
10	S13/PJ1	O	SEGMENT 5	FL segment i
11	S14/PJ2	O	SEGMENT 6	FL segment a
12	S15/PJ3	O	SEGMENT 7	FL segment j
13	S16/T14	O	SEGMENT 8	FL segment h
14	S17/T13	O	SEGMENT 9	FL segment e
15	S18/T13	O	SEGMENT 10	FL segment n
16	S19/T12	O	SEGMENT 11	FL segment m
17	S20/T11	O	SEGMENT 12	FL segment l
18	S21/T10	O	SEGMENT 13	FL segment o
19	S22/T9	O	SEGMENT 14	FL segment d
20	S23/T8	O	GRID 1	Fluorescent display grid 1
21	3G/T7	O	GRID 2	Fluorescent display grid 2
22	4G/T6	O	GRID 3	Fluorescent display grid 3
23	5G/T5	O	GRID 4	Fluorescent display grid 4
24	6G/T4	O	GRID 5	Fluorescent display grid 5
25	7G	O	GRID 6	Fluorescent display grid 6
26	T2 8G	O	GRID 7	Fluorescent display grid 7
27	T1 9G	O	GRID 8	Fluorescent display grid 8
28	T0 10G	O	GRID 9	Fluorescent display grid 9
29	INT	I	INT	Interrupt (unused)
30	TX	NC	TX	32-kHz oscillator
31	TEX	I	TEX	32-kHz oscillator
32	RST	I/O	RST	Microcomputer reset
33	NC	NC	NC	NC
34	V <sub>CC</sub>	NC	NC	Power supply
35	PI0/AD0	I	7/SI	Model discrimination
36	PI1/AD1	I	SP ON/OFF	Speaker on/off input
37	PI2/AD2	NC	NC	NC use
38	PI3/AD3	I	PROTECT	Protection input
39	PB0/AD4	I/O	DATA	Serial data line
40	PB1/AD5	I/O	BUSY	Serial busy
41	PB2/AD6	NC	NC	NC (OPEN)
42	PB3/AD7	O	DOLBY	LAMP
43	EC	NC	NC	NC (GND)
44	PX0/SC	O	PX0/SC	SC

### CIRCUIT DESCRIPTION

A-94

## CIRCUIT DESCRIPTION

### Slave Microcomputer ( $\mu$ PD78214CW-668)

#### Outline

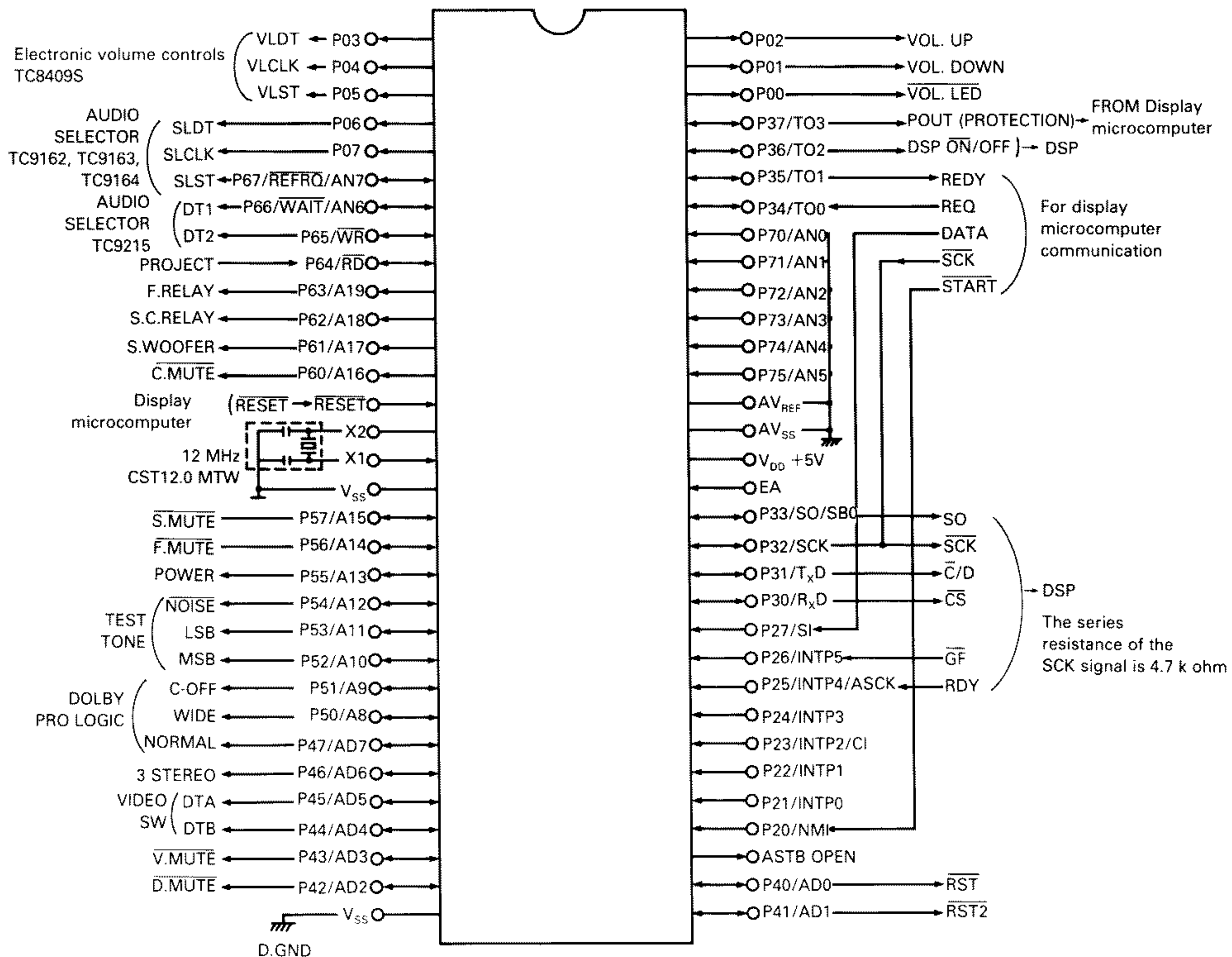
The slave microcomputer is used for DSP amplifiers. This microcomputer provides the following amplifier control functions through data communications with the display microcomputer (CXP50112-154Q):

- Selector selection (muting control) TC9162N, etc.
- Electronic volume control TC9213P

- Speaker relay control
- Surround control (DSP IC  $\mu$ PD6380)
  - Dolby surround, Dolby Prologic, and DSP
  - Rear and Center levels (TC9213P)
  - Delay time (DSP IC  $\mu$ PD6380)
  - Presence level (DSP IC  $\mu$ PD6380)
- Video selection

### 2.3 Pin Connection (Top View)

64-pin plastic shrink DIP and 64-pin plastic QUIP



Note: Pin compatible with  $\mu$ PD78210CW/GQ.

### CIRCUIT DESCRIPTION

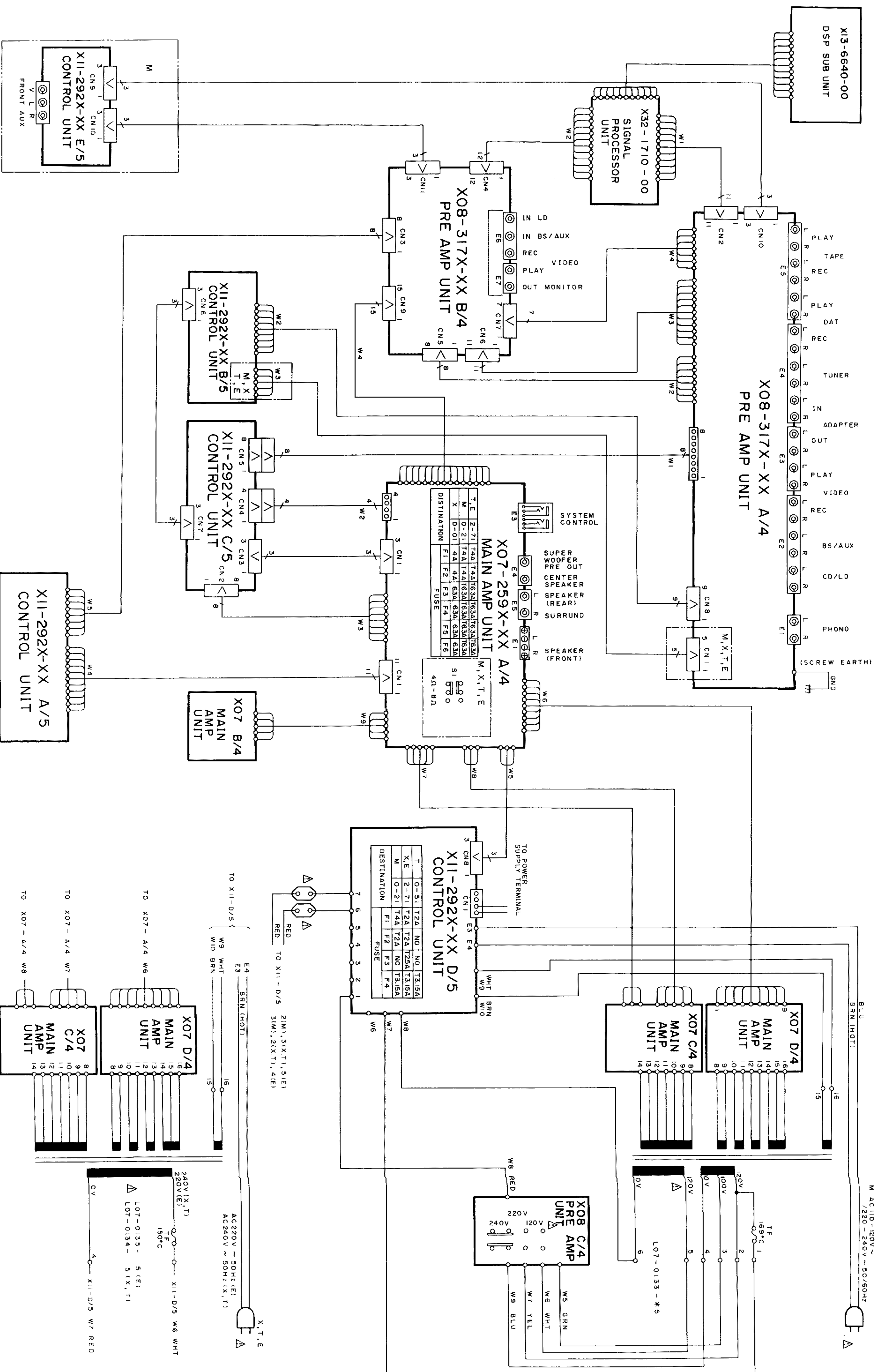
Pin No.	Pin name	I/O	Name	Description
1	P03	O	VLDI	Electronic volume control IC (TC9213P) data output REAR = LEFT CENTER =
2	P04	O	VCLK	Electronic volume control IC (TC9213P) clock output
3	P05	O	VLST	Electronic volume control IC (TC9213P) strobe output RIGET =
4	P06	O	SLDT	Switch array IC (TC9162N, TC9163N, and TC9164N) data output
5	P07	O	SLCLK	Switch array IC (TC9162N, TC9163N, and TC9164N) clock output
6	P67	O	SLST	Switch array IC (TC9162N, TC9163N, and TC9164N) strobe output
7	P66	O	DT1	TC9215 DT1 signal output
				PROLOGIC DOL SUR
				MODE DT1 DT2 DT1 DT2
				OFF 0 1 0 1
8	P65	O	DT2	TC9215 DT2 signal output
				DOLBY 0 0 0 0 1
				DSP 1 0 1 0
9	P64	I	PROTECT	Protection signal input Low: Normal High: Protected
10	P63	O	F.RELAY	Front speaker relay control Low: Speaker off High: Speaker on
11	P62	O	S.C.RELAY	Rear center speaker relay control Low: Speaker off High: Speaker on
*12	P61	O	S.WOOFER	Super-woofer output control Low: No output High: Output
13	P60	O	CMUTE	Center output mute Low: Mute on High: Mute off
14	RESET	I		Reset High: Normal Low: Reset
15	X2			System clock oscillator connection (12 MHz)
16	X1	I		System clock oscillator connection (12 MHz)
17	V <sub>SS</sub>			Ground
18	P57	O	S.MUTE	Rear output mute Low: Mute on High: Mute off
19	P56	O	F.MUTE	Front output mute Low: Mute on High: Mute off
20	P55	O	POWER	Power supply control pin Low: Power off High: Power on
21	P54	O	NOISE	Dolby Prologic test tone output control Low: Test tone off High: Test tone on
22	P53	O	LSB	Test tone output position specification
23	P52	O	MSB	Test tone output position specification
				LSB 0 1 0 1
				MSB 0 0 1 1
24	P51	O	C-OFF	Dolby Prologic center mode setting (center off)
25	P50	O	WIDE	NORMAL WIDE PHANTOM
26	P47	O	NORMAL	WIDE 0 1 0
27	P46	O	3 STEREO	NORMAL 1 0 0
28	P45	O	DTA	Video selection control
29	P44	O	DTB	Video selection control
30	P43	O	V.MUTE	Video output muting

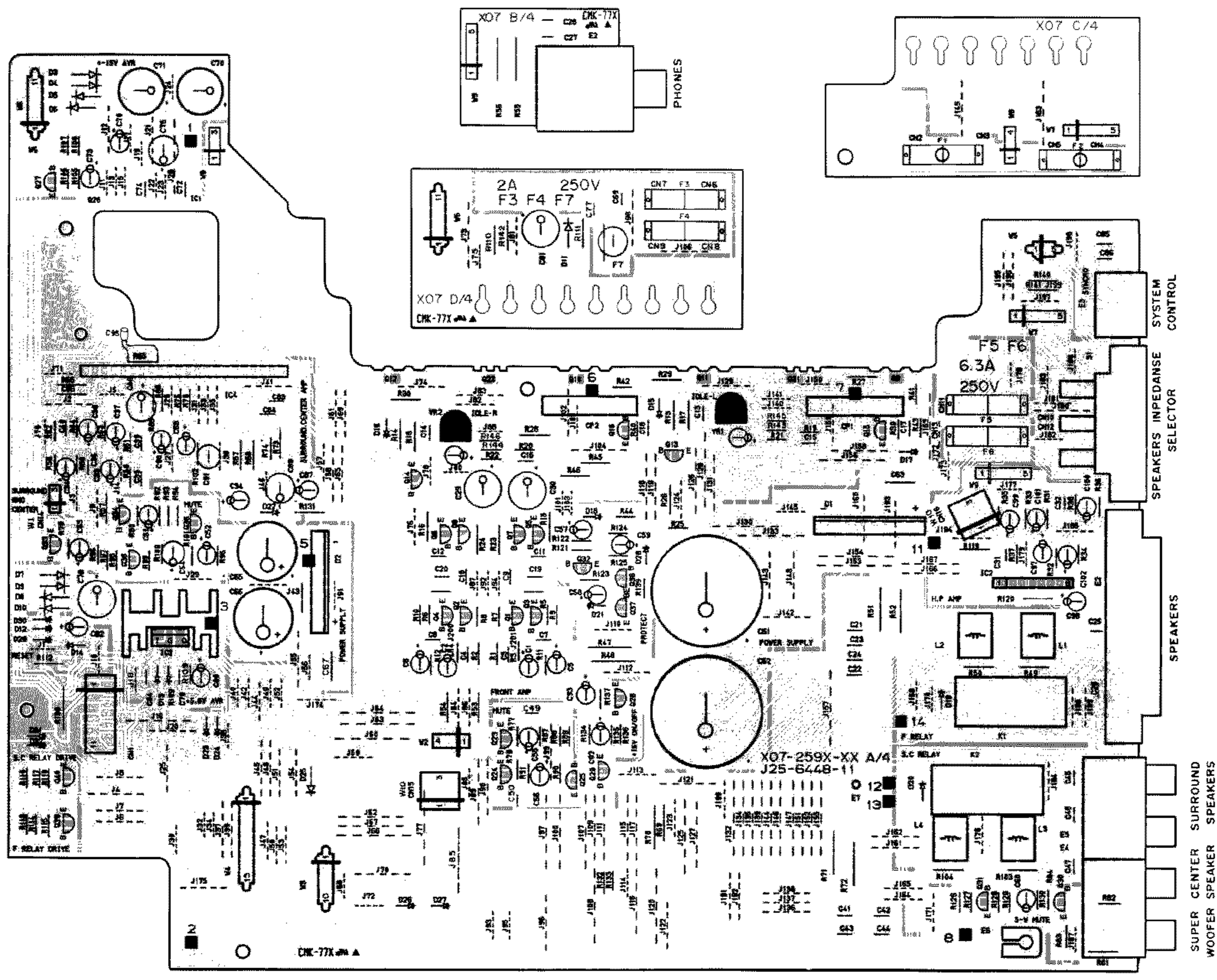
### CIRCUIT DESCRIPTION

Pin No.	Pin name	I/O	Name	Description
31	P42	O	D.MUTE	DSP board output muting
32	V <sub>SS</sub>			Ground
33	P41	O	RST2	DSP IC (μPD6380) RST2 signal output
34	P40	O	RST	DSP IC (μPD6380) RST signal output
35	ASTB	O		Unused (opened, pulled up, and pulled down)
36	P20/NMIT	I		START signal input for communications with display microcomputer
37	P21	I		Unused (pulled up and pulled down)
~	~			Unused (pulled up and pulled down)
40	P24	I		Unused (pulled up and pulled down)
41	P25	I	RDY	DSP IC (μPD6380) RDY signal input
42	P26	I	GF	DSP IC (μPD6380) GF signal input
43	P27/SI	I	DATA	Data signal input for communications with display microcomputer
44	P30	O	CS	DSP IC (μPD6380) CS signal output
45	P31	O	C/D	DSP IC (μPD6380) C/D signal output
46	P32	I/O	SCK	SCK signal input during communications with display microcomputer SCK signal output during DSP IC (μPD6380) data output
47	P33/SO	O	SO	DSP IC (μPD6380) SO (data) signal output
48	EA	I		Unused (ROMless operation instruction) Pulled up or pulled down.
49	V <sub>DD</sub>			Microcomputer power supply
50	AV <sub>SS</sub>			Unused (ground for analog-to-digital converter) Ground
51	AV <sub>REF</sub>			Unused (Reference voltage for analog-to-digital converter is applied) Ground
52	P75/AN5	I		Unused Ground GND
~	~			~
57	P70/AN0	I		Unused Ground GND
58	P34/TO0	I	REQ	REQ signal input for communications with display microcomputer
59	P35/TO1	I	REDY	REDY signal output for communications with display microcomputer
60	P36/TO2	O	DSP ON/OFF	DSP oscillator stop control on DSP board High: Stop Low: Oscillate
61	P37/TO3	O	POUT	Protection status report signal to display microcomputer High: Protected Low: Normal
62	P00	O	VOL.LED	Electronic volume control LED drive Low: Lights High: Goes off
63	P01	O	VOL.DOWN	Electronic volume control down signal output
64	P02	O	VOL.UP	Electronic volume control up signal output



# WIRING DIAGRAM

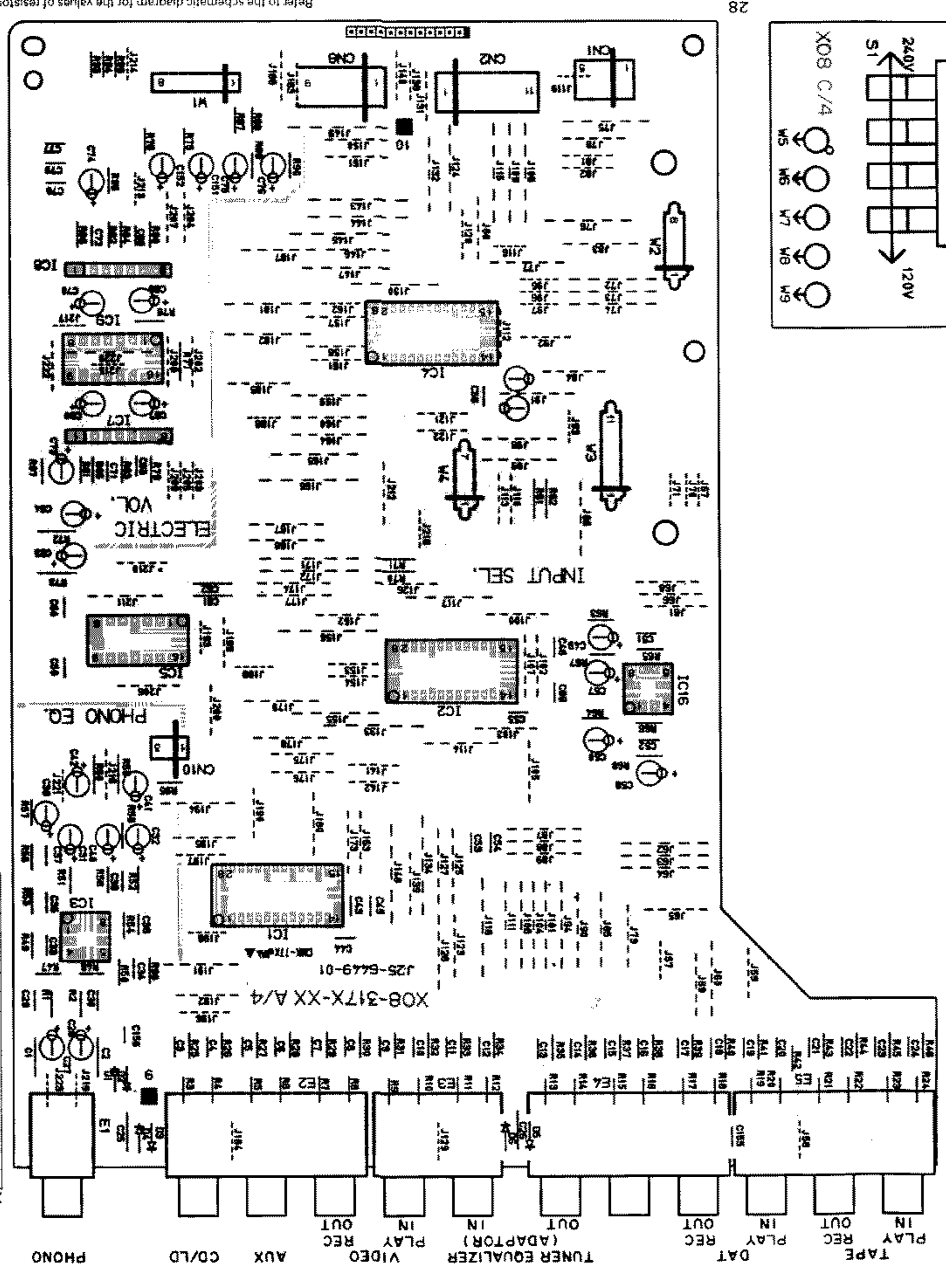




X07-2592-XX

Ref. No.	Q	Address
1		5E
2		5D
3		5E
4		5D
5		4E
6		4D
7		4E
8		4D
9		4G
10		4E
11		4F
12		4D
13		4F
14		4D
15		4G
16		4E
21		4F
22		4E
23		6E
24		6E
25		6E
26		2B
27		2B
28		5E
29		6E
30		6H
31		6H
32		4E
33		4B
34		4B
35		4B
36		4C
37		5E
38		5E
39		6B
40		6B
1		2C
2		5H
3		5C

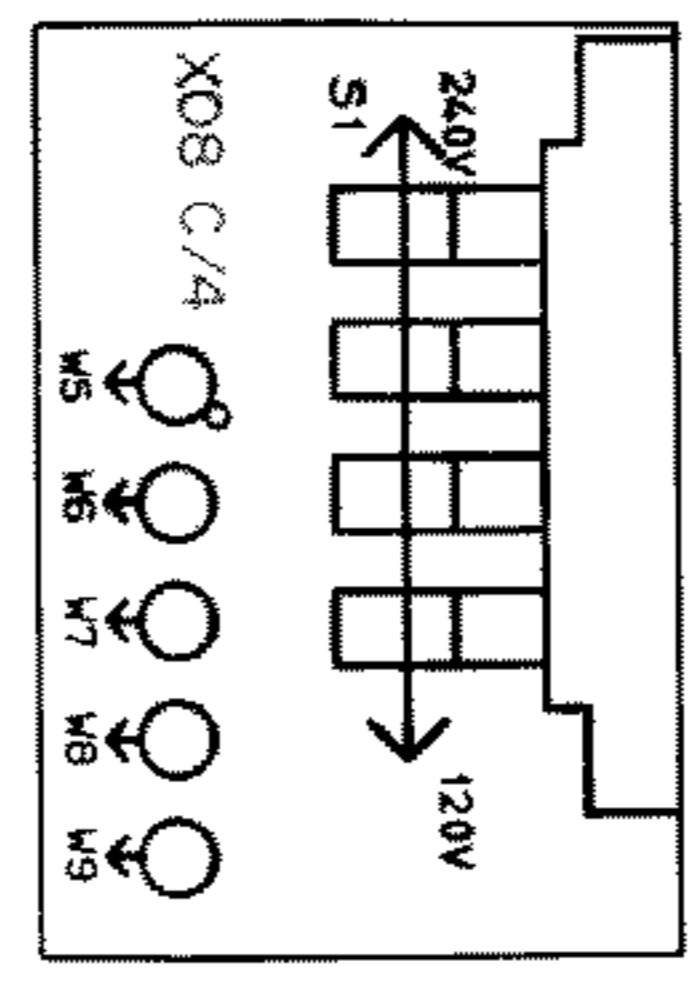
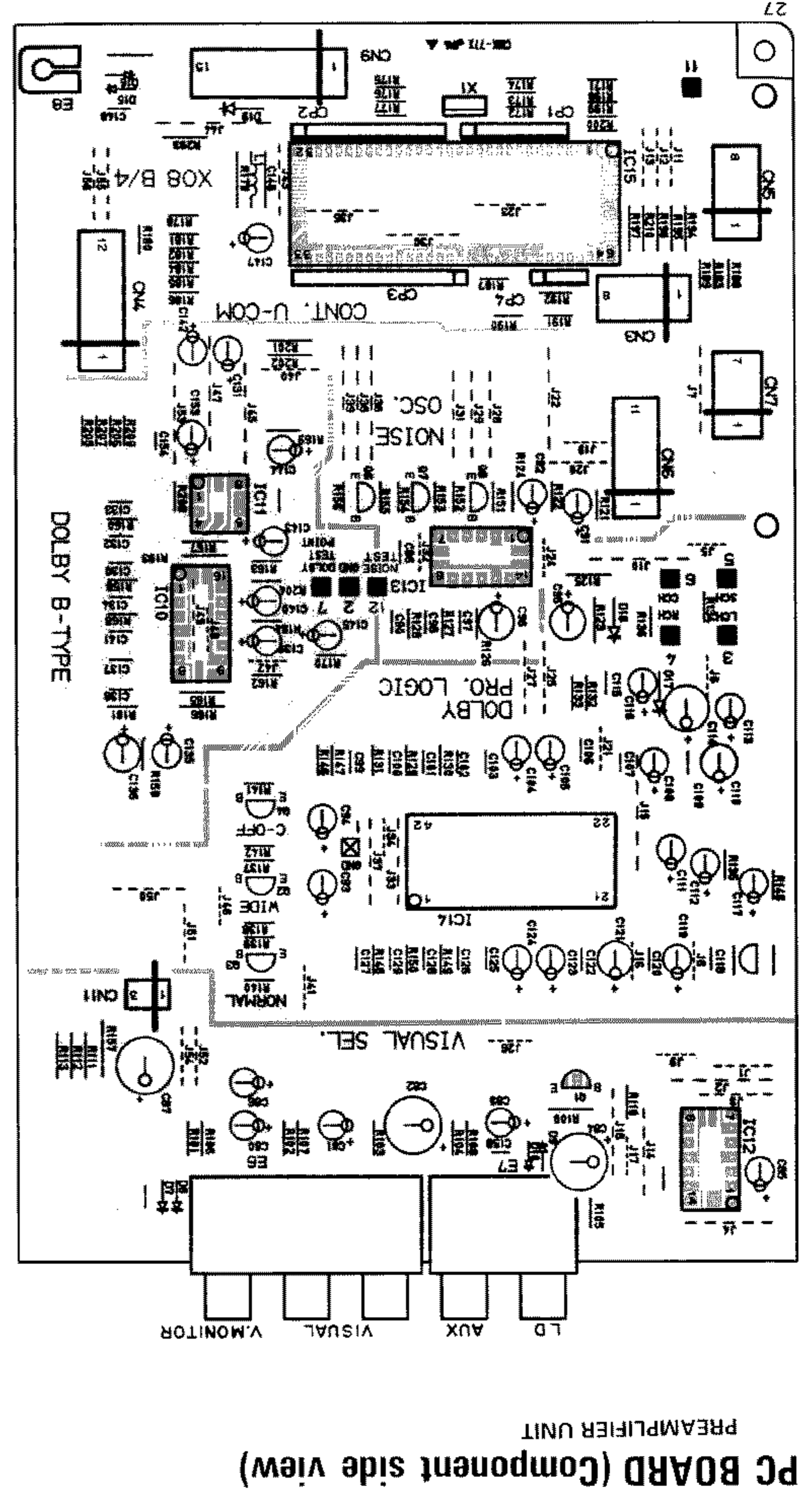
Refer to the schematic diagram for the values of resistors and capacitors



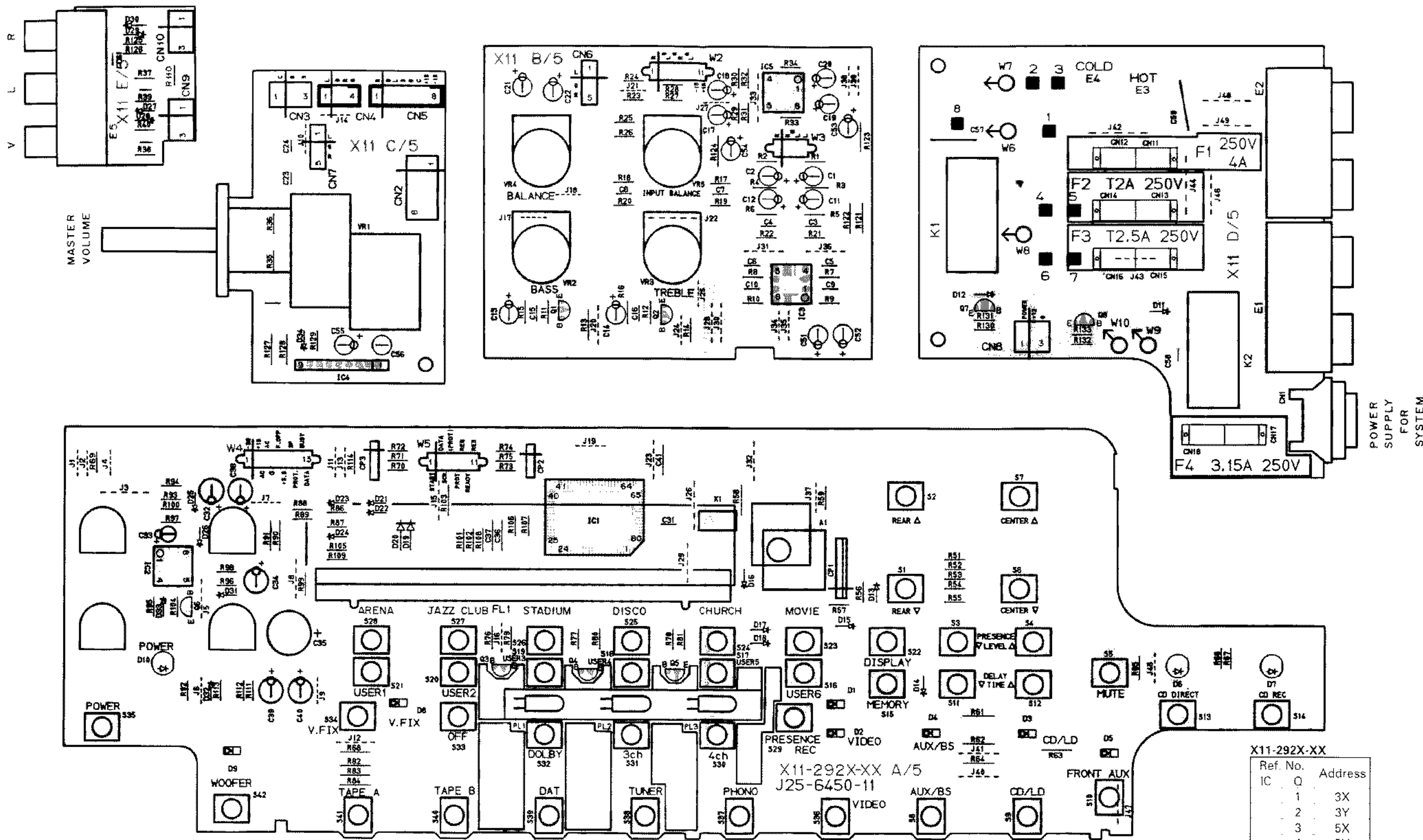
X08-317X-XX

Ref. No.	Q	Address
16		4P
15		6L
12		2K
11		5M
10		4M
9		6S
8		6S
7		5S
5		4S
4		5O
3		3S
2		4Q
1		3R
2L		
IC		0
IC		1

Refer to the schematic diagram for the values of resistors and capacitors



PC BOARD (Component side view) CONTROL UNIT



X11-292X-XX

Ref. No.	IC	Address
1	3X	
2	3Y	
3	5X	
4	5Y	
5	5Y	
6	5V	
7	3AA	
8	3AB	
1	4Y	
2	5V	
3	3Z	
4	3W	
5	1Z	

Refer to the schematic diagram for the values of resistors and capacitors.

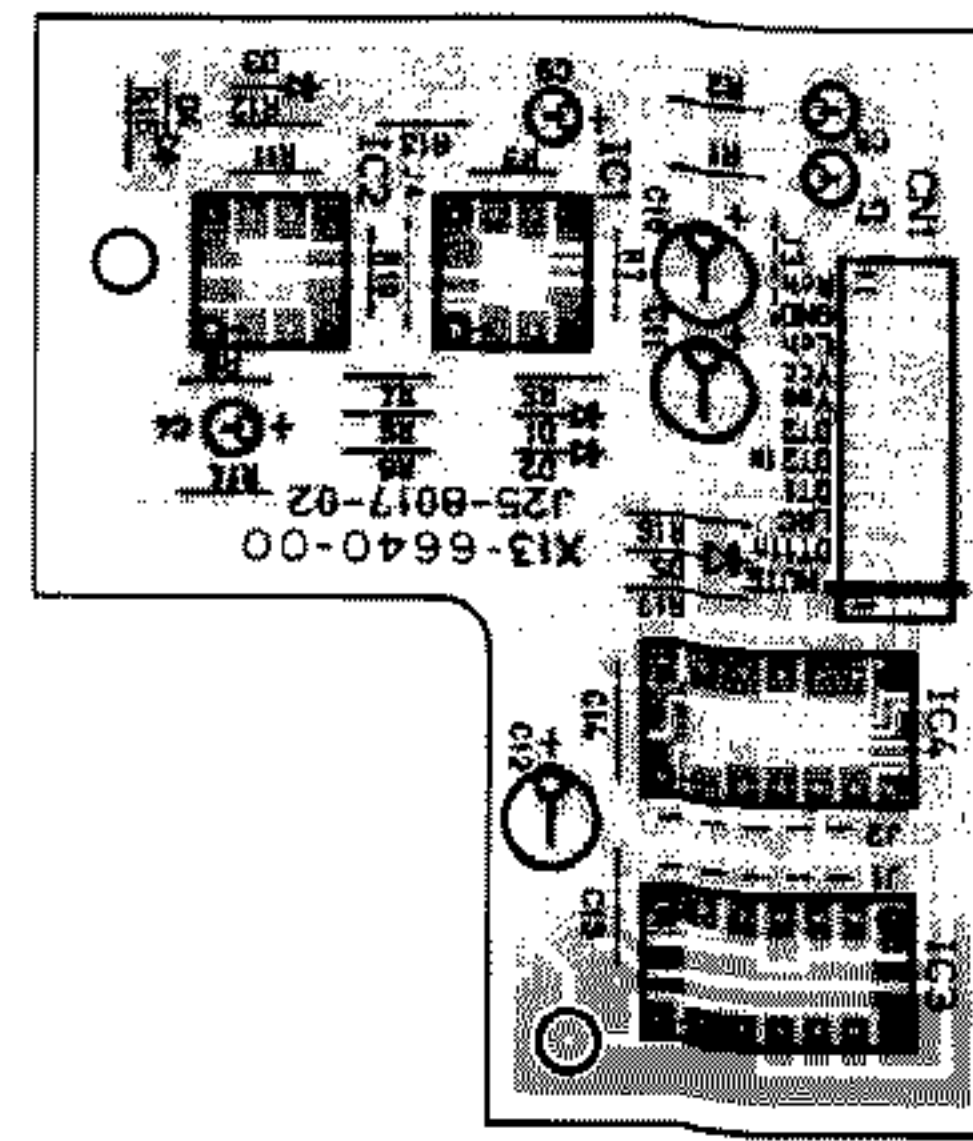
29

30

Refer to the schematic diagram for the values of resistors and capacitors.

32

31



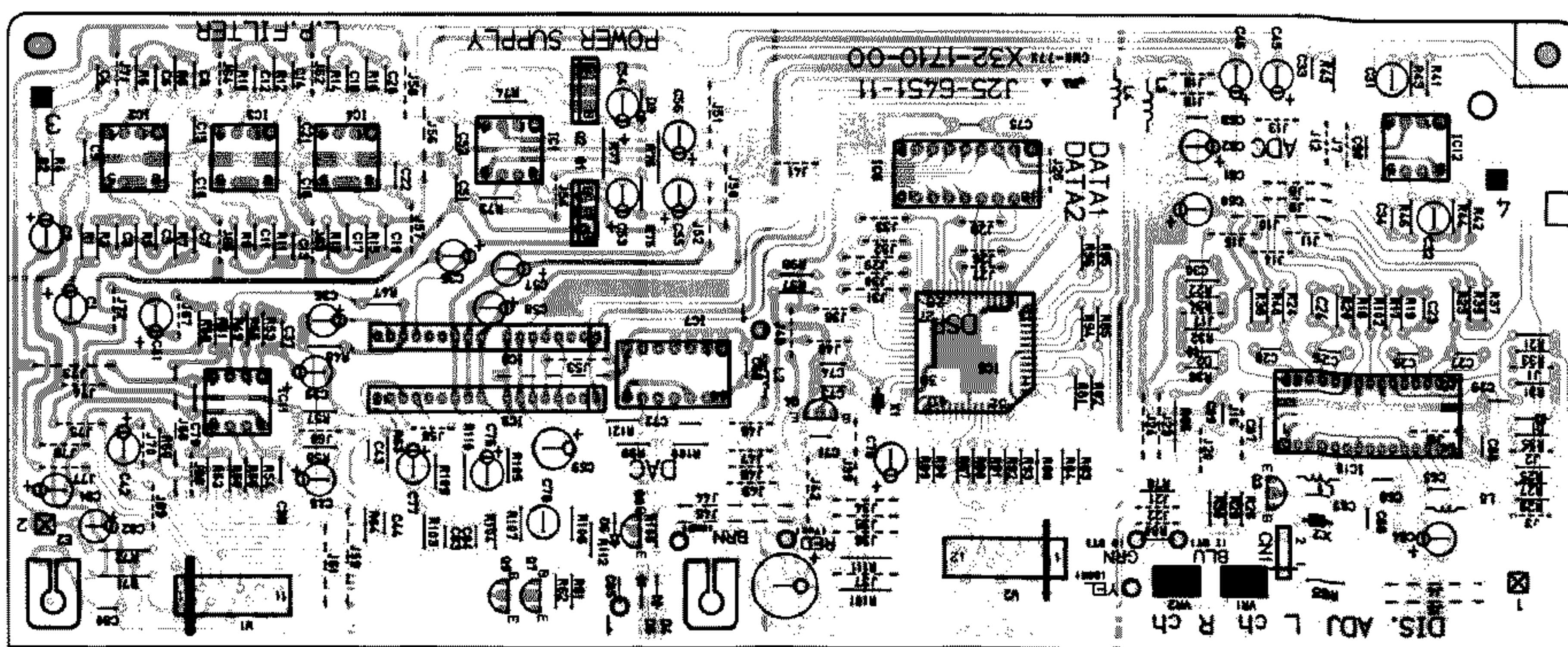
DSP SUB UNIT

X32-1710-00

Ref. No.	IC	Address
1	3A1	
2	3A1	
3	2AG	
4	2A1	
7	2A1	
8	2A1	
9	1AJ	
1	3AJ	
2	2AK	
3	2AK	
4	3AJ	
5	2AH	
6	3AH	
7	2AI	
8	2AJ	
9	2AJ	
10	2AF	
11	2AK	
12	3AF	

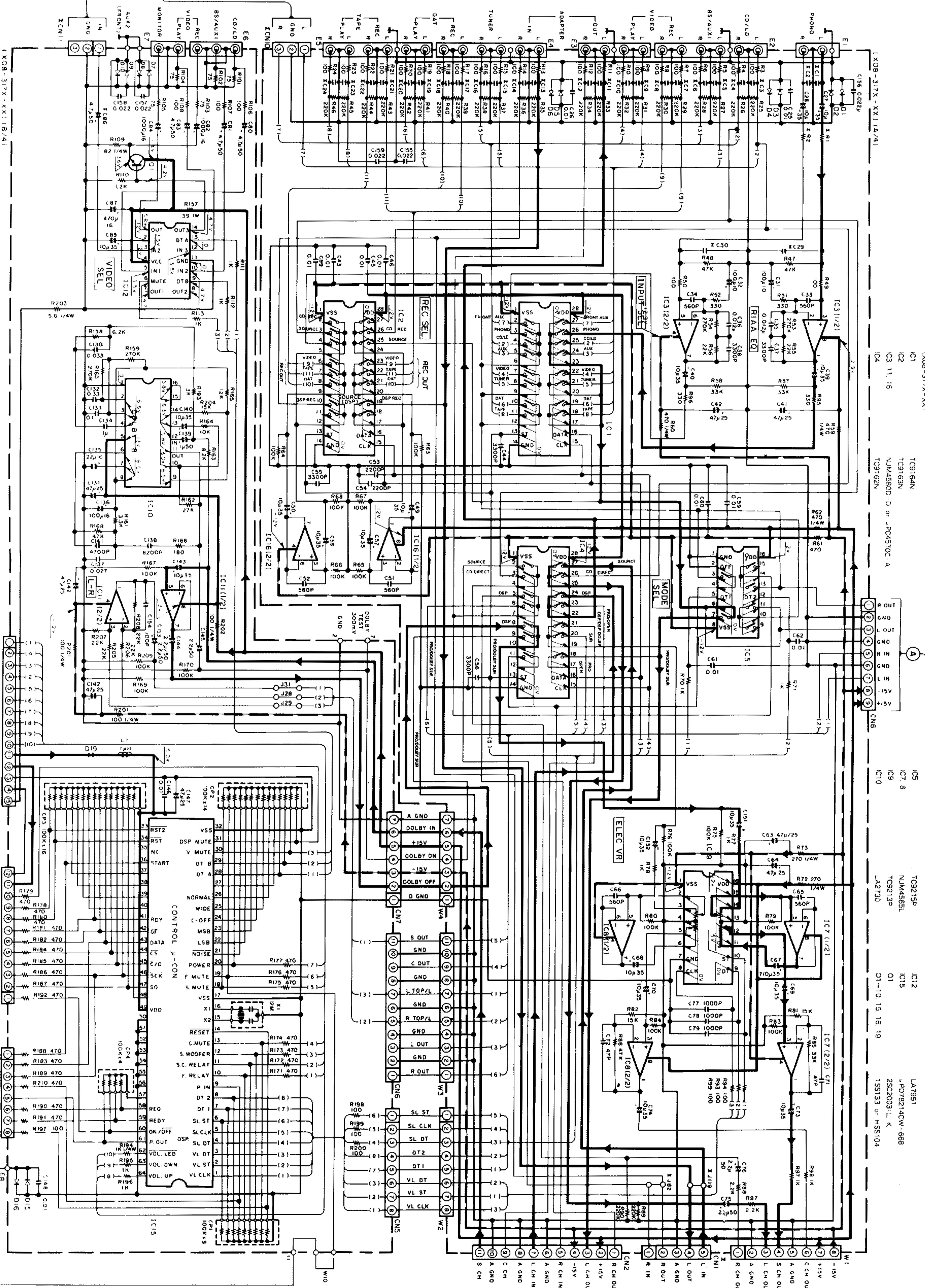
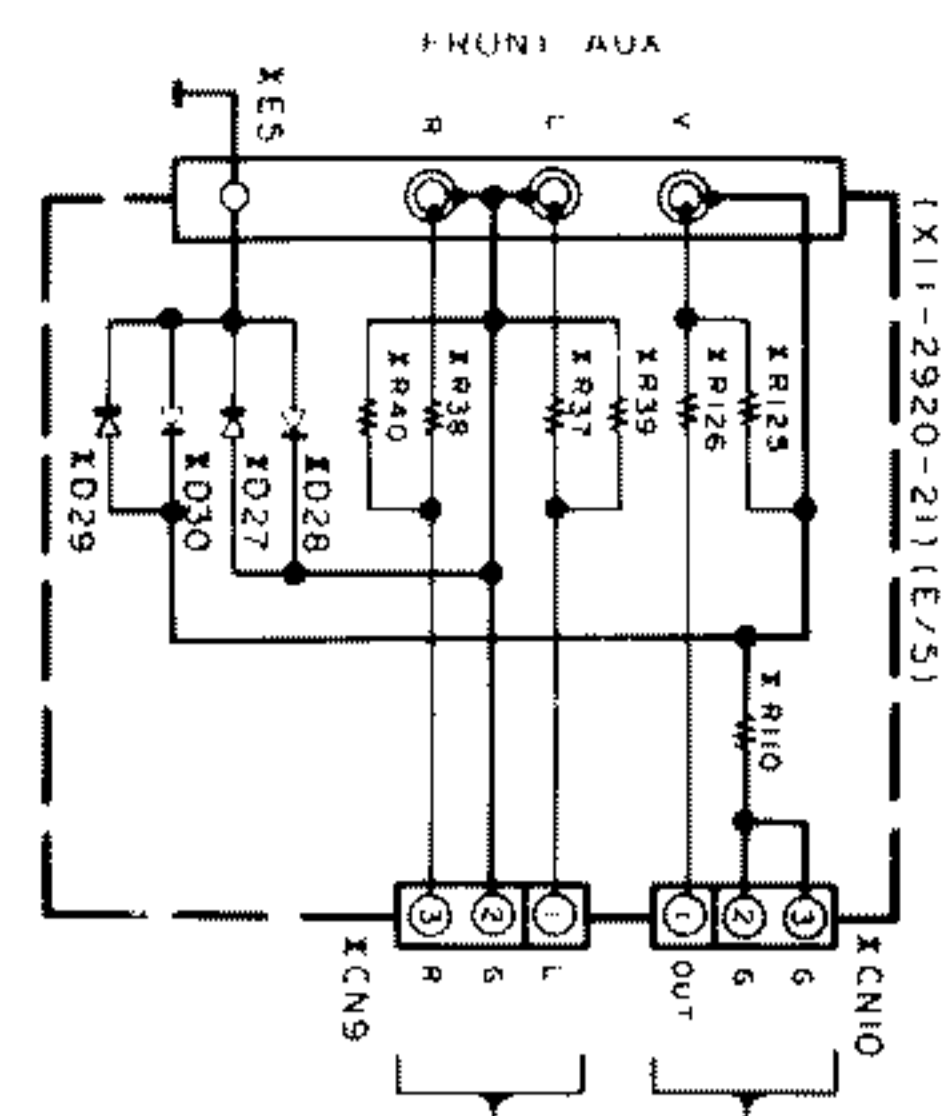
X13-6640-XX

Ref. No.	IC	Address
1	6AG	
2	6AG	
3	5AF	
4	5AF	



SIGNAL PROCESSOR UNIT

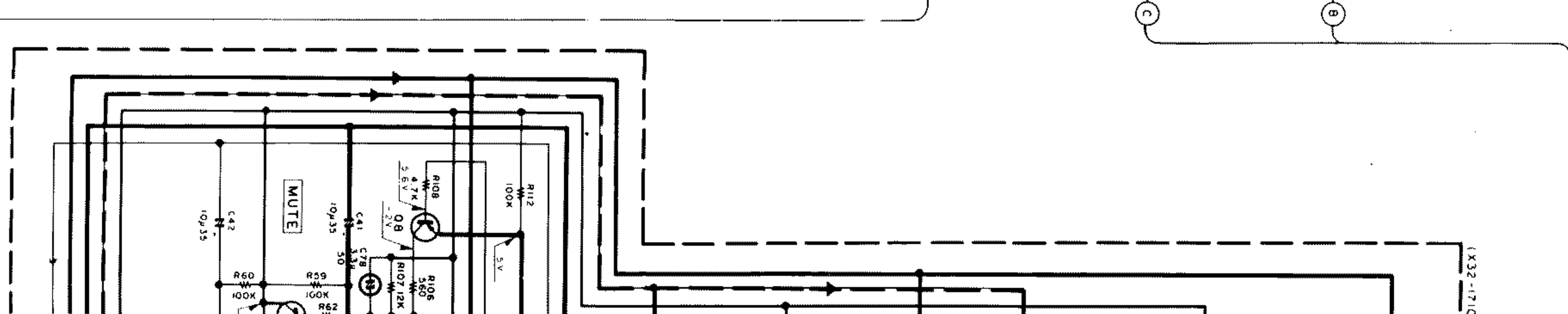
PC BOARD (Component side view)

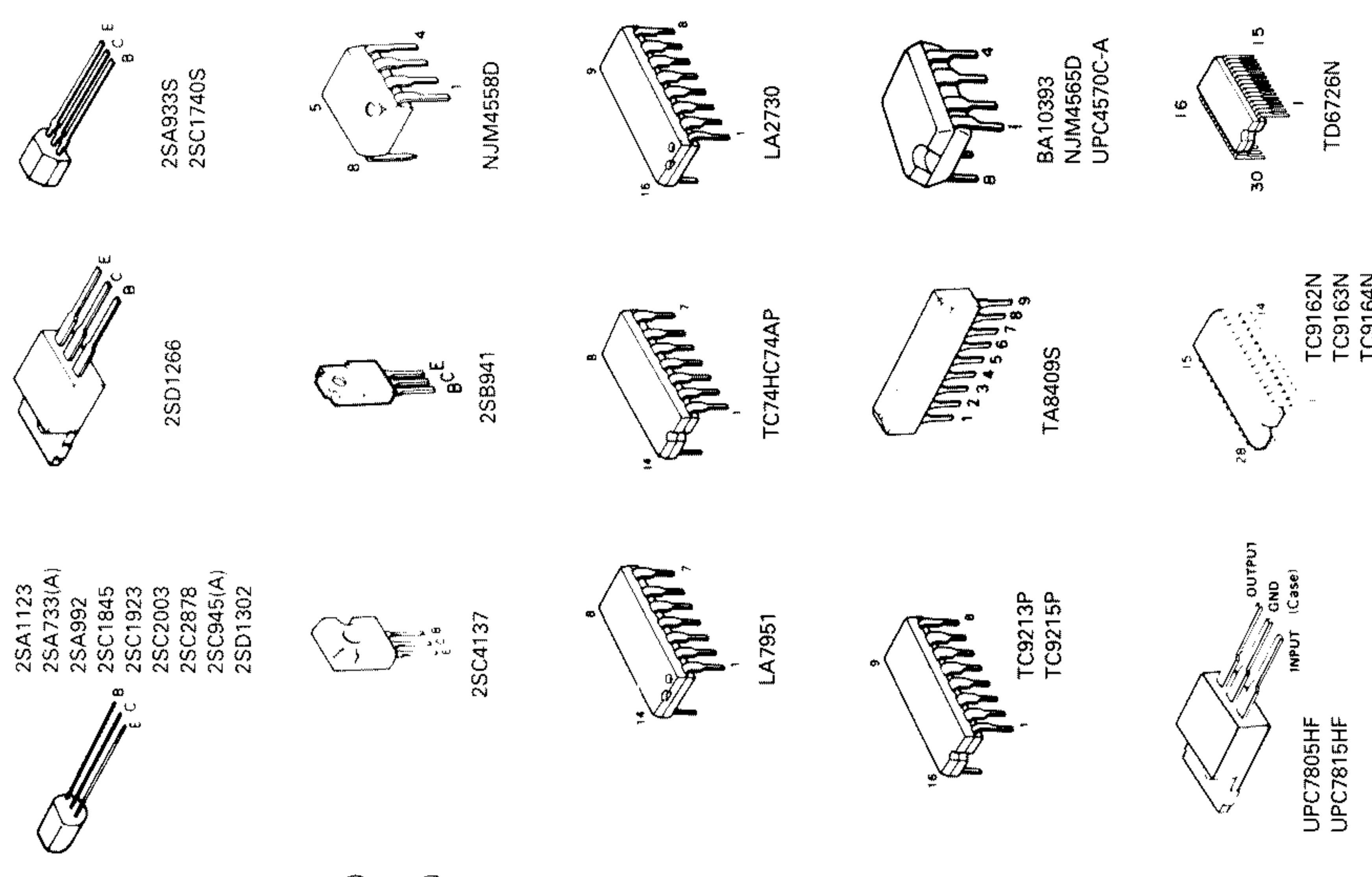


X08-317X-XX Part No. CI-24 C29 30 C28 CN1 CN10 11 R1 2 S1 WS-9

DESTINATION	NO	NO	4750	NO	YES	100	NO	NO
M	0	21	NO	NO	4750	YES	100	YES
T.E	2	71	220P	NO	NO	NO	1K	NO

- X08-317X-XX (A/B/4)
- X08-317X-XX (C)
- X08-317X-XX (D)
- X08-317X-XX (E)
- X08-317X-XX (F)
- X08-317X-XX (G)
- X08-317X-XX (H)
- X08-317X-XX (I)
- X08-317X-XX (J)
- X08-317X-XX (K)
- X08-317X-XX (L)
- X08-317X-XX (M)
- X08-317X-XX (N)
- X08-317X-XX (O)
- X08-317X-XX (P)
- X08-317X-XX (Q)
- X08-317X-XX (R)
- X08-317X-XX (S)
- X08-317X-XX (T)
- X08-317X-XX (U)
- X08-317X-XX (V)
- X08-317X-XX (W)
- X08-317X-XX (X)
- X08-317X-XX (Y)
- X08-317X-XX (Z)



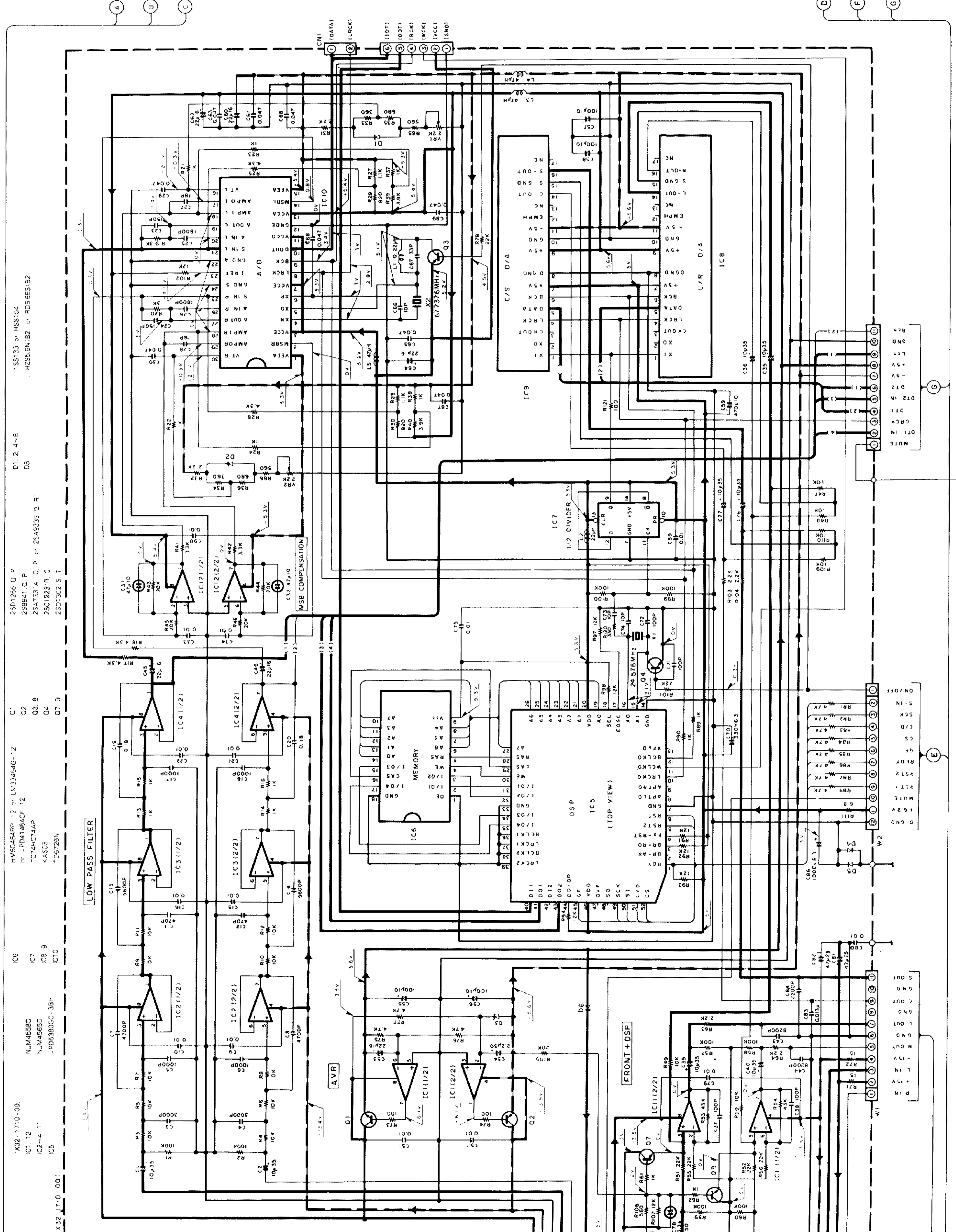


**CAUTION:** For continued safety, replace safety critical components only with manufacturer's recommended parts (refer to parts list). **⚠** Indicates safety critical components. To reduce the risk of electric shock, leakage-current or resistance measurements shall be carried out (exposed parts are acceptably insulated from the supply circuit) before the appliance is returned to the customer.

**▲ Others**  
 DC voltages are as measured with a high impedance voltmeter. Values may vary slightly due to variations between individual instruments or/and units.

Les tensions c.c. doivent être mesurées avec un voltmètre à haute impédance. Les valeurs peuvent différer légèrement du fait des variations inhérentes aux appareils et aux instruments de mesure individuels.

Die angegebenen Gleichspannungswerte wurden mit einem hochohmigen Spannungsmesser gemessen. Dabei schwanken die Maßwerte aufgrund von Unterschieden zwischen einzelnen Instrumenten oder Geräten u. U. geringfügig.

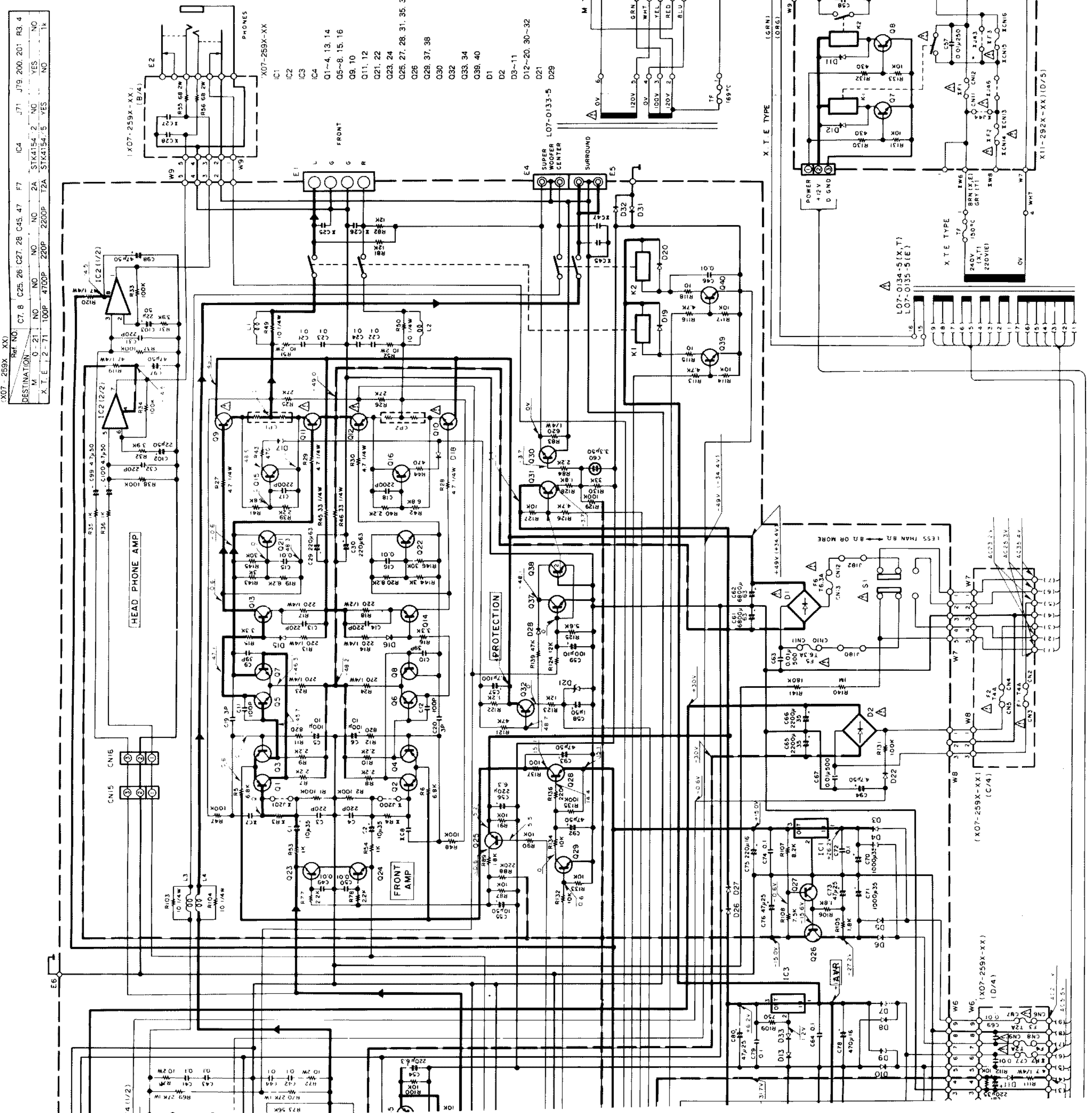


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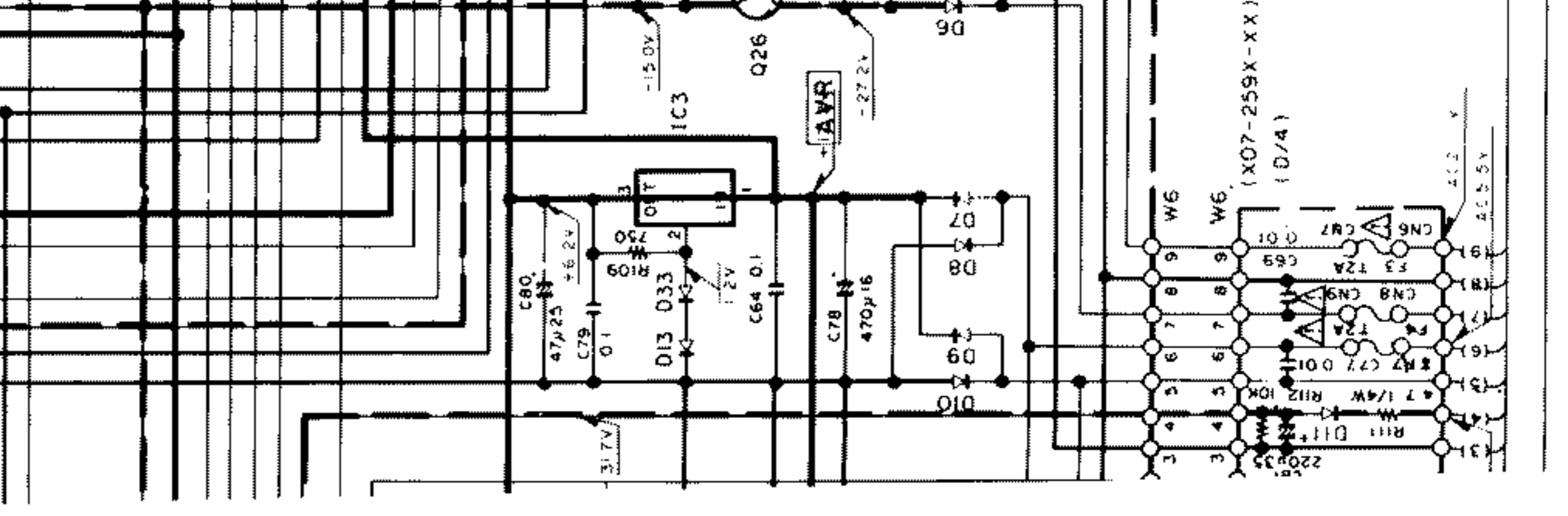
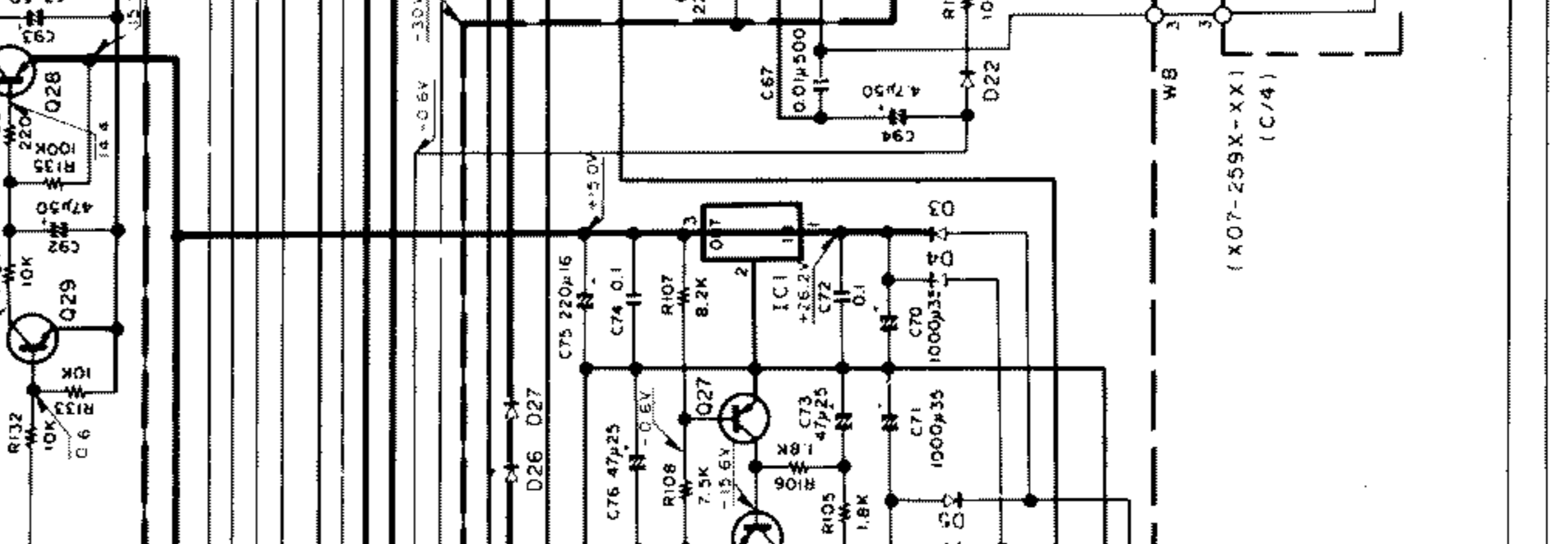
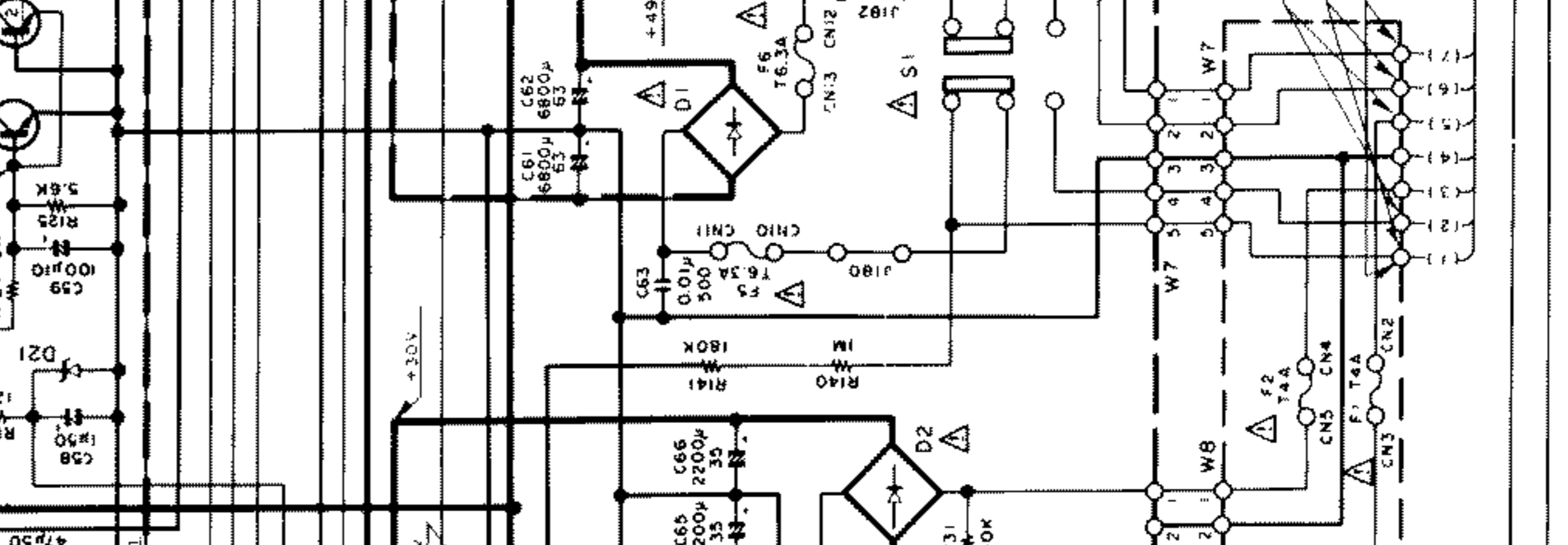
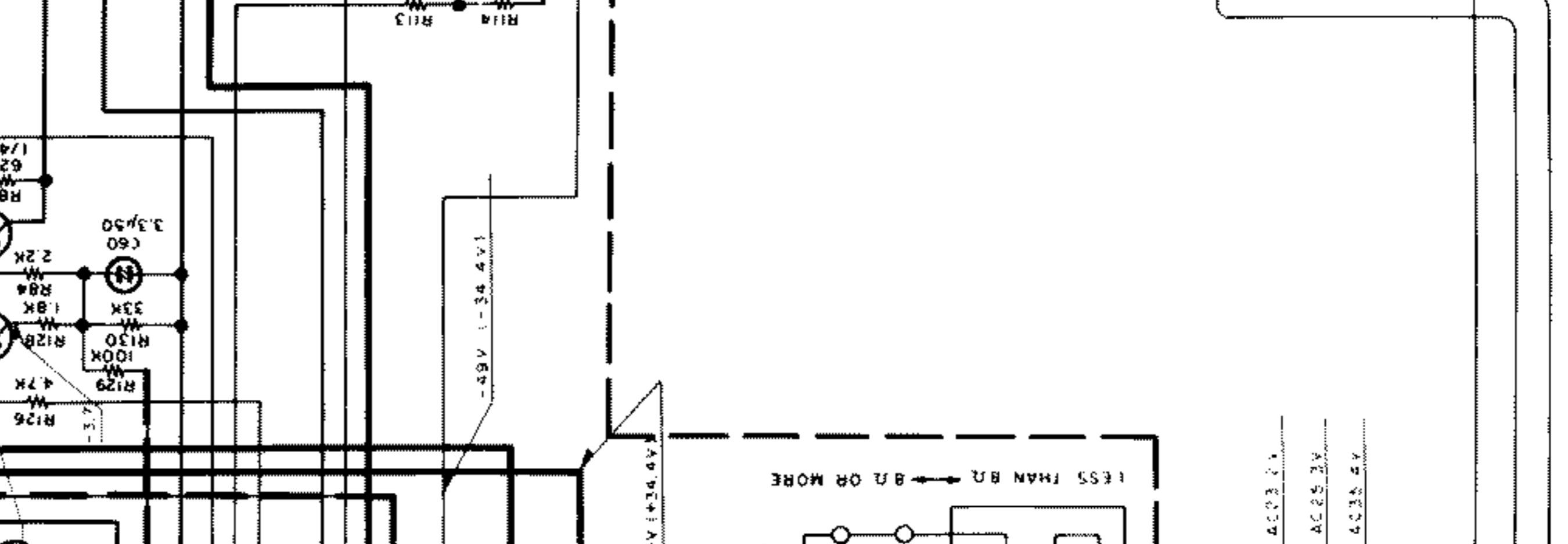
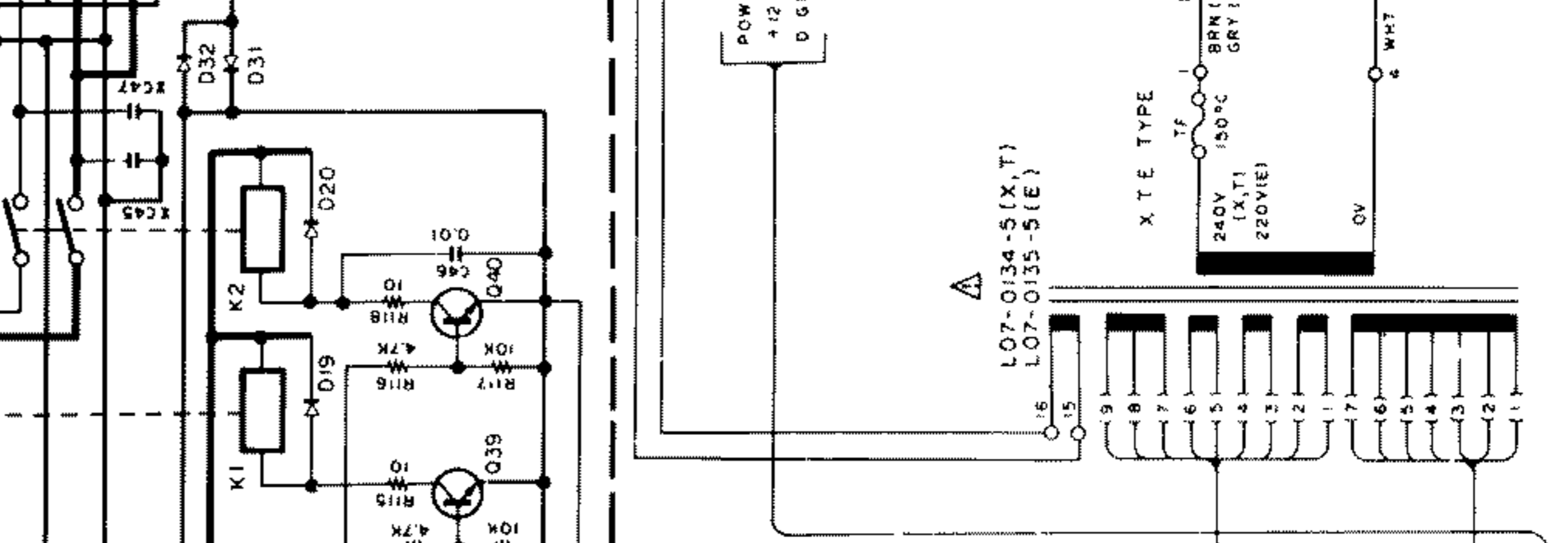
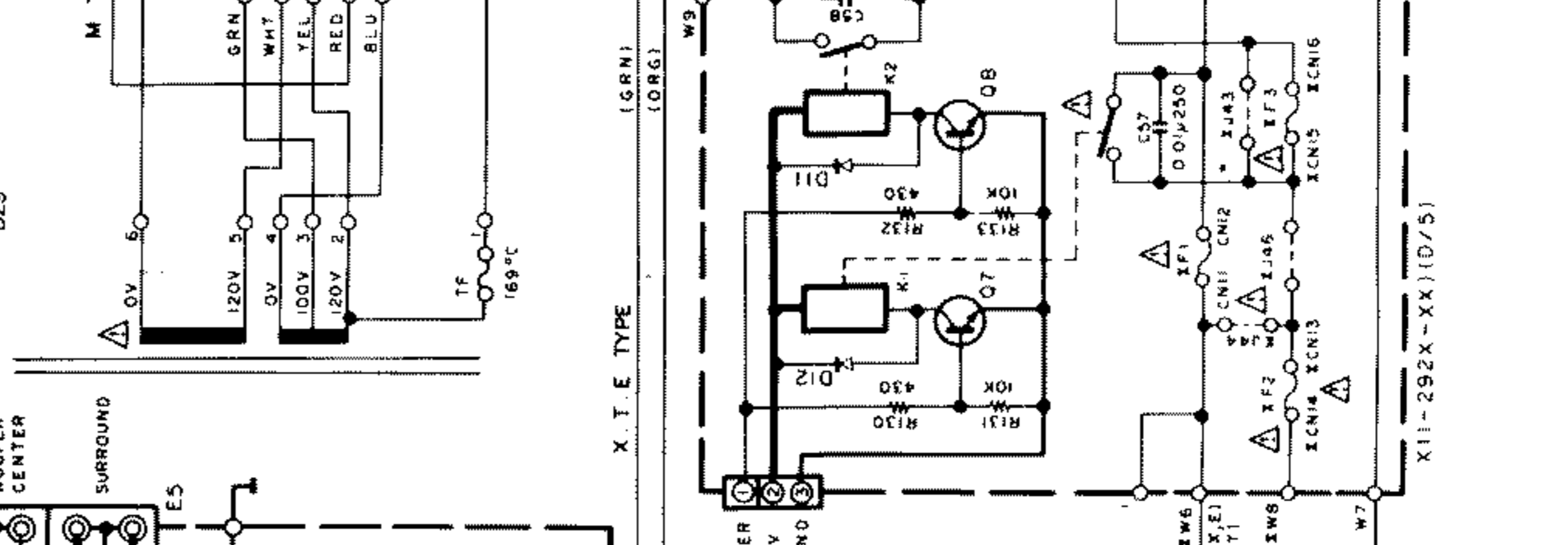
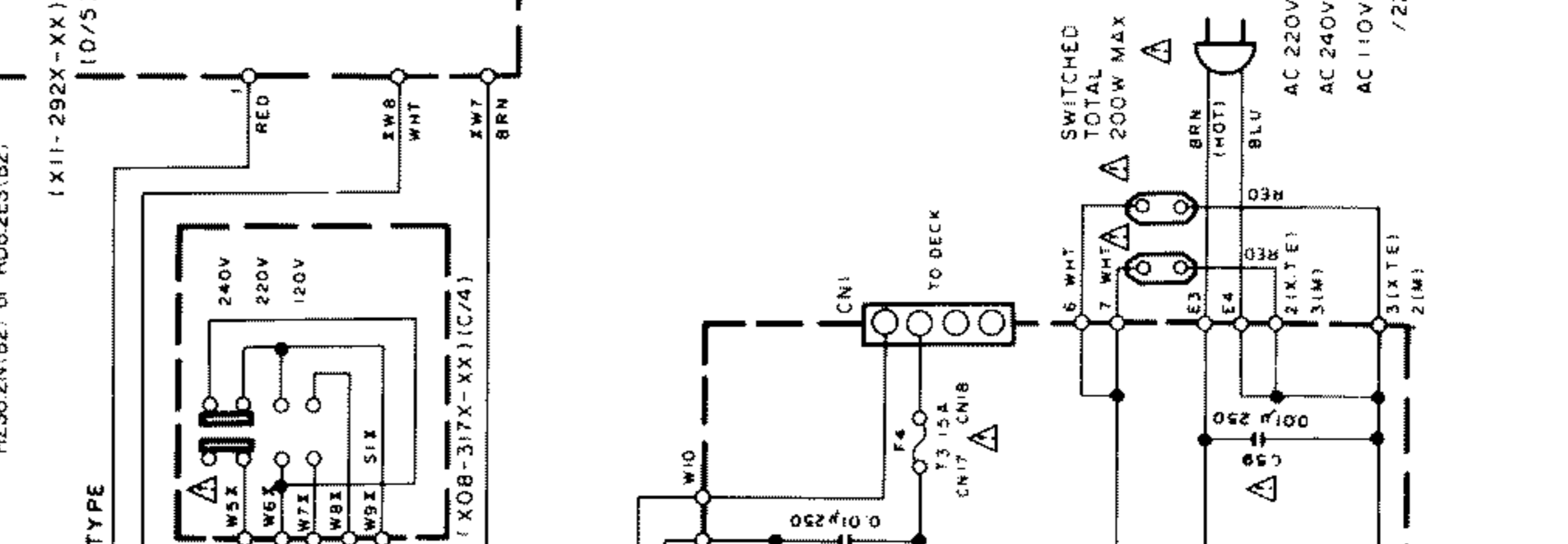
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X07-259X-XX		C7, B		C25, 26, C27, 28		C45, 47		F7		IC4		J71		J79		200, 201		R3, 4	
DESTINATION		NO		NO		NO		NO		NO		NO		NO		NO		NO	
M		0		1		2		3		4		5		6		7		8	
X, T, E		1, 2, 7, 1		100P		4700P		220P		220P		220P		220P		220P		220P	
		YES		NO		YES		NO		YES		NO		YES		NO		YES	

PC7B15HF	X07-259X-XX
NJM4580L-D	(B/A)
L-PC7805HF	(B/A)
STK4154-2	(B/A)
2SA92(F, E)	01-4, 13, 14
2SC1845(F, E)	05-8, 15, 16
2SB1503	09, 10
2SD2276	011, 12
2SC4137(V, W)	021, 22
2SC2878(B)	023, 24
2SA733(A)(Q, P) or 2SA935(Q, R)	025, 27, 28, 31, 35, 36
2SB941	026
2SC1740S(Q, R) or 2SC945(A)(Q, P)	029, 37, 38
2SD1302(S, T)	030
2SA1123(R, S)	032
2SC2878(B)	033, 34
2SC2003(L, K)	038, 40
RBV-602LFA	D1
RBV-402LFA	D2
SS5668	D3-11
1SS131 or HSS104A	D12-20, 30-32
HZ54-7N(B) or RDA-7ES(B)	D21
HZ56-2N(B2) or RD6-2ES(B2)	D29





**PARTS LIST**

\* New Parts  
Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Teile ohne Parts No. werden nicht geliefert.

Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 向	Re- marks 備考
IC1		*	CXP50112-154Q	IC		
IC2		*	AN5914	IC		
IC3			BA10393	IC(DUAL COMPALATOR)		
IC3			NJM4580D-D	IC		
IC3			UPC4570C-A	IC		
IC4			TA8409S	IC(MOTOR CONTROL)		
IC5			NJM4580D-D	IC		
IC5			UPC4570C-A	IC		
Q1 -6			2SC1740S(Q,R)	TRANSISTOR		
Q1 -6			2SC945(A)(Q,P)	TRANSISTOR		
Q7 ,8			2SC2003(L,K)	TRANSISTOR		
A1			W02-0776-05	ELECTRIC CIRCUIT MODULE		
A1		*	W02-1046-05	ELECTRIC CIRCUIT MODULE		
<b>DSP SUB UNIT (X13-6640-00)</b>						
C4			CE04JW1C47M	ELECTRO 4.7UF	16WV	
C7 -9			CE04JW1C100M	ELECTRO 10UF	16WV	
C10 -12			CE04JW1C470M	ELECTRO 47UF	16WV	
C13 ,14			C91-0769-05	CERAMIC 0.01UF	K	
C15 ,16			CC45FSL1H221J	CERAMIC 220PF	J	
D1 -5			HSS104	DIODE		
D1 -5			1SS133	DIODE		
IC1 ,2			NJM4580D-D	IC		
IC1 ,2			UPC4570C-A	IC		
IC3			TC74HC74AP	IC(DUAL D-TYPE FLIP FLOP)		
IC4			TC74HC08AP	IC		

**SIGNAL PROCESSOR UNIT (X32-1710-00)**

C1 ,2			CE04KW1V100M	ELECTRO 10UF	35WV	
C3 ,4			CF92FV1H302J	MF 3000PF	J	
C5 ,6			CF92FV1H102J	MF 1000PF	J	
C7 ,8			CF92FV1H472J	MF 4700PF	J	
C9 ,10			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C11 ,12			CF92FV1H471J	MF 470PF	J	
C13 ,14			CF92FV1H562J	MF 5600PF	J	
C15 ,16			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C17 ,18			CF92FV1H102J	MF 1000PF	J	
C19 ,20			CF92FV1H184J	MF 0.18UF	J	
C21 ,22			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C23 ,24			CC45FSL1H151J	CERAMIC 150PF	J	
C25 ,26			CQ09FS1H182J	POLYSTY 1800PF	J	
C27 ,28			CC45FSL1H180J	CERAMIC 18PF	J	
C29 ,30			CK45FF1H473Z	CERAMIC 0.047UF	Z	
C31 ,32			C90-1334-05	NP-ELEC	10WV	
C33 ,34			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C35 ,36			CE04KW1V100M	ELECTRO 10UF	35WV	
C37 ,38			CC45FSL1H101J	CERAMIC 100PF	J	
C39 -42			CE04KW1V100M	ELECTRO 10UF	35WV	
C43 ,44			CF92FV1H822J	MF 8200PF	J	
C45 ,46			CE04KW1C220M	ELECTRO 22UF	16WV	
C51 ,52			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C53			CE04KW1C220M	ELECTRO 22UF	16WV	
C54			CE04KW1H2R2M	ELECTRO 2.2UF	50WV	
C55 -58			CE04KW1A101H	ELECTRO 100UF	10WV	
C59			CE04KW1A471M	ELECTRO 470UF	10WV	

E: Scandinavia & Europe K: USA P: Canada  
Y: PX(Far East, Hawaii) T: England M: Other Areas  
X: AAFES(Europe) X: Australia

△ indicates safety critical components.

**PARTS LIST**

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Ref. No. 参照番号	Address 位置	New Parts 新	Parts No. 部品番号	Description 部品名 / 規格	Desti- nation 向	Re- marks 備考
C60			CE04KW1C220M	ELECTRO 22UF	16WV	
C61			CK45FF1H473Z	CERAMIC 0.047UF	Z	
C62			CE04KW1C220M	ELECTRO 22UF	16WV	
C63			CK45FF1H473Z	CERAMIC 0.047UF	Z	
C64			CE04KW1C220M	ELECTRO 22UF	16WV	
C65			CK45FF1H473Z	CERAMIC 0.047UF	Z	
C66			CC45FCH1H100D	CERAMIC 10PF	D	
C67			CC45FCH1H330J	CERAMIC 33PF	J	
C68			CK45FF1H473Z	CERAMIC 0.047UF	Z	
C69			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C70			CE04KW0J331M	ELECTRO 330UF	6.3WV	
C71 ,72			CC45FSL1H101J	CERAMIC 100PF	J	
C73 ,74			CC45FCH1H100D	CERAMIC 10PF	D	
C75			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C76 ,77			CE04KW1V100M	ELECTRO 10UF	35WV	
C78			C90-1351-05	NP-ELEC	50WV	
C79 ,80			CK45FF1H103Z	CERAMIC 0.010UF	Z	
C81 ,82			CE04KW1E470M	ELECTRO 47UF	25WV	
C83			CF92FV1H133J	MF 0.013UF	J	
C84			CF92FV1H222J	MF 2200PF	J	
C86			CE04DWOJ102M	ELECTRO 1000UF	6.3WV	
C87 -89			CK45FF1H473Z	CERAMIC 0.047UF	Z	
C90			CK45FF1H103Z	CERAMIC 0.010UF	Z	
L1			L40-2281-17	SMALL FIXED INDUCTOR		
L2 -5			L40-3301-17	SMALL FIXED INDUCTOR(33UH,K)		
X1			L77-1125-05	CRYSTAL RESONATOR 24.576MHZ		
X2			L77-1128-05	CRYSTAL RESONATOR 67.7376MHZ		
R71 ,72			RD14GB2E150J	FL-PROOF RD 15	J 1/4W	
R111			RD14GB2E6R8J	FL-PROOF RD 6.8	J 1/4W	
VR1 ,2			R12-1086-05	TRIM POT. 1K		
D1 ,2			HSS104	DIODE		
D1 ,2			1SS133	DIODE		
D3			HZS5.6N(B2)	ZENER DIODE		
D4 -6			RD5.6ES(B2)	ZENER DIODE		
D4 -6			HSS104	DIODE		
D4 -6			1SS133	DIODE		
IC1			NJM4558D	IC(OP AMP X2)		
IC2 -4			NJM4565D	IC(OP AMP X2)		
IC5		*	UPD63806C-3BH	IC(DIGITAL SIGNAL PROCESSOR)		
IC6		*	HMS0464RP-12	IC		
IC6		*	LM33464C-12	IC		
IC6		*	UPD41464CF-12	IC		
IC7		*	TC74HC74AP	IC(DUAL D-TYPE FLIP FLOP)		
IC8 ,9		*	KAS03	IC		
IC10		*	TD6726N	IC(16BIT A/D CONVERTER)		
IC11			NJM4565D	IC(OP AMP X2)		
IC12			NJM4558D	IC(OP AMP X2)		
Q1			2SD1266(Q,P)	TRANSISTOR		
Q2			2SB941(Q,P)	TRANSISTOR		
Q3			2SA733(A)(Q,P)	TRANSISTOR		
Q3			2SA933S(Q,R)	TRANSISTOR		
Q4			2SC1923(R,Ø)	TRANSISTOR		
Q7			2SD1302(S,T)	TRANSISTOR		
Q8			2SA733(A)(Q,P)	TRANSISTOR		

E: Scandinavia & Europe K: USA P: Canada  
Y: PX(Far East, Hawaii) T: England M: Other Areas  
X: AAFES(Europe) X: Australia

△ indicates safety critical components.



E: Scandinavia & Europe K: USA P: Canada  
Y: Pacific East Hawaii T: England M: Other Areas  
X: Australia V: AAFES(Europe)

Table with columns: Ref. No., Address, Parts No., Description, Dest. Nation marks. Includes sub-section 'MAIN AMPLIFIER UNIT (X07-2590-21 : M, 2-71 : X, T, E)' and 'A-94'.

PARTS LIST

A-94

Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Telle ohne Parts No. werden nicht geliefert.

E: Scandinavia & Europe K: USA P: Canada  
Y: Pacific East Hawaii T: England M: Other Areas  
X: Australia V: AAFES(Europe)

Table with columns: Ref. No., Address, Parts No., Description, Dest. Nation marks. Includes sub-section 'PREAMPLIFIER UNIT (X08-3170-21 : M, 0-01 : X, 2-71 : T, E)' and 'A-94'.

PARTS LIST

A-94

Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Telle ohne Parts No. werden nicht geliefert.

E: Scandinavia & Europe K: USA P: Canada  
Y: Pacific East Hawaii T: England M: Other Areas  
X: Australia V: AAFES(Europe)

Table with columns: Ref. No., Address, Parts No., Description, Dest. Nation marks. Includes sub-section 'PREAMPLIFIER UNIT (X08-3170-21 : M, 0-01 : X, 2-71 : T, E)' and 'A-94'.

PARTS LIST

A-94

Parts without Parts No. are not supplied.  
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Telle ohne Parts No. werden nicht geliefert.

E: Scandinavia & Europe K: USA P: Canada  
Y: Pacific East Hawaii T: England M: Other Areas  
X: Australia V: AAFES(Europe)

Table with columns: Ref. No., Address, Parts No., Description, Dest. Nation marks. Includes sub-section 'PREAMPLIFIER UNIT (X08-3170-21 : M, 0-01 : X, 2-71 : T, E)' and 'A-94'.

PARTS LIST

A-94

Parts without Parts No. are not supplied.  
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Telle ohne Parts No. werden nicht geliefert.

E: Scandinavia & Europe K: USA P: Canada  
Y: Pacific East Hawaii T: England M: Other Areas  
X: Australia V: AAFES(Europe)

E: Scandinavia & Europe K: USA P: Canada  
Y: Africa (Europe) X: Australia  
T: England M: Other Areas

Table with columns: Ref. No., Address, Parts No., Description, Dest. Re- (national marks). Contains various electronic components like resistors, capacitors, and relays.

\* New Parts  
Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Teil ohne Parts No. werden nicht geliefert.

PARTS LIST

A-94

E: Scandinavia & Europe K: USA P: Canada  
Y: Africa (Europe) X: Australia  
T: England M: Other Areas

Table with columns: Ref. No., Address, Parts No., Description, Dest. Re- (national marks). Contains various electronic components like diodes, relays, and resistors.

\* New Parts  
Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Teil ohne Parts No. werden nicht geliefert.

PARTS LIST

A-94

E: Scandinavia & Europe K: USA P: Canada  
Y: Africa (Europe) X: Australia  
T: England M: Other Areas

Table with columns: Ref. No., Address, Parts No., Description, Dest. Re- (national marks). Contains various electronic components like lamps, relays, and resistors.

\* New Parts  
Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Teil ohne Parts No. werden nicht geliefert.

PARTS LIST

A-94

E: Scandinavia & Europe K: USA P: Canada  
Y: Africa (Europe) X: Australia  
T: England M: Other Areas

Table with columns: Ref. No., Address, Parts No., Description, Dest. Re- (national marks). Contains various electronic components like relays, resistors, and lamps.

\* New Parts  
Parts without Parts No. are not supplied.  
Les articles non mentionnés dans le Parts No. ne sont pas fournis.  
Teil ohne Parts No. werden nicht geliefert.

PARTS LIST

A-94