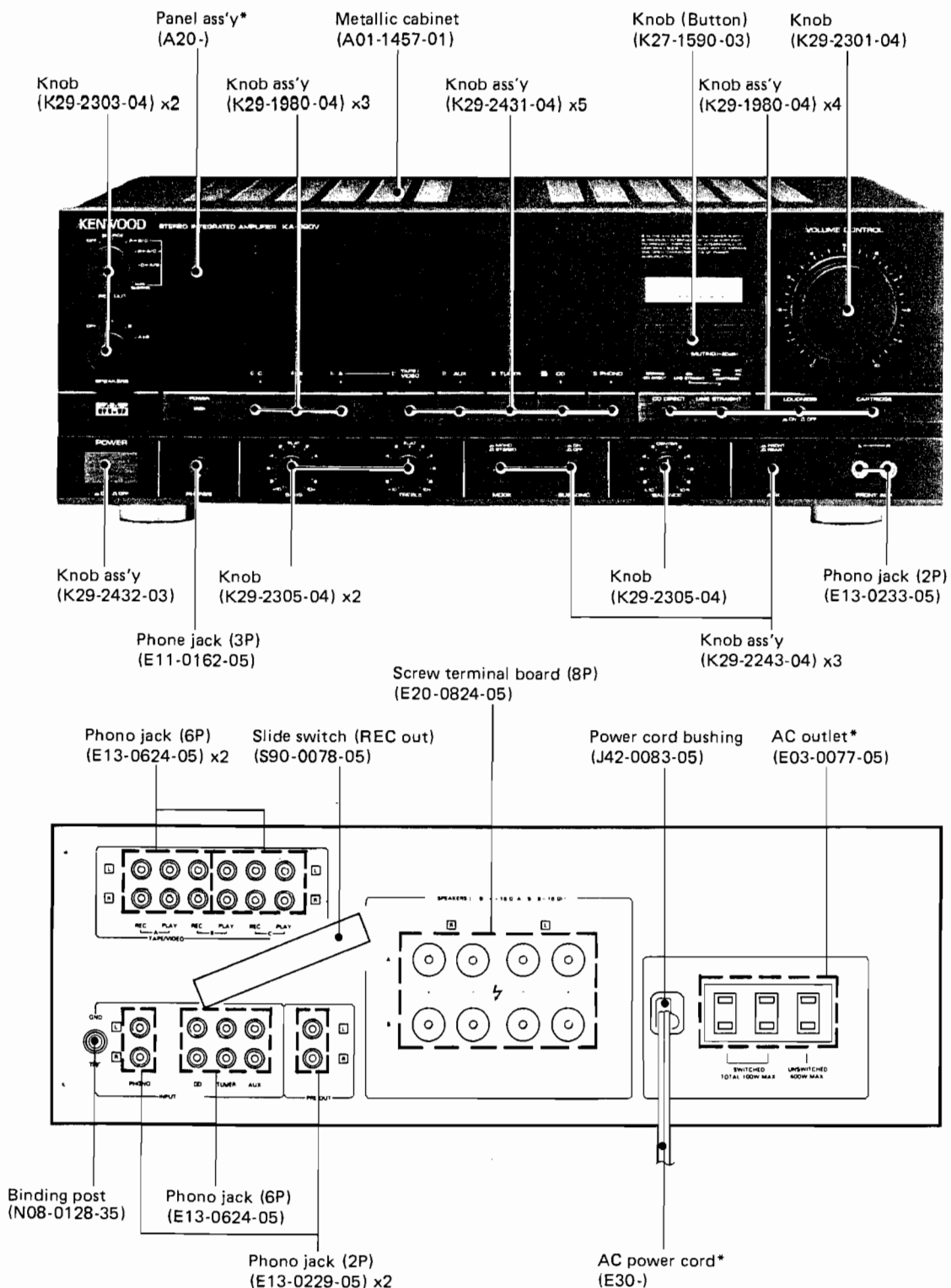


KENWOOD

KA-990V

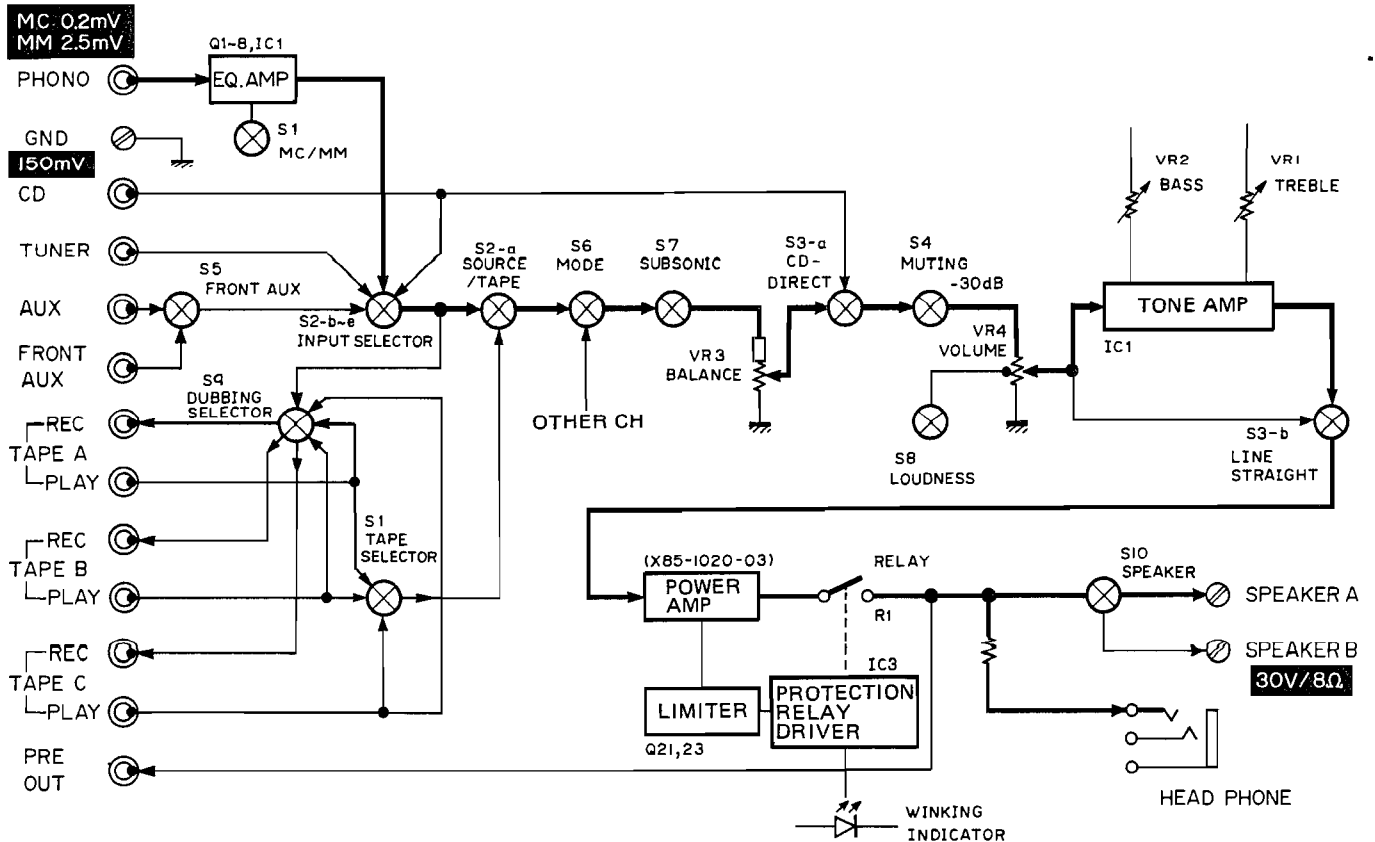
STEREO INTEGRATED AMPLIFIER



*Refer to parts list 10.

BLOCK LEVEL DIAGRAM/DISASSEMBLY FOR REPAIR

BLOCK LEVEL DIAGRAM

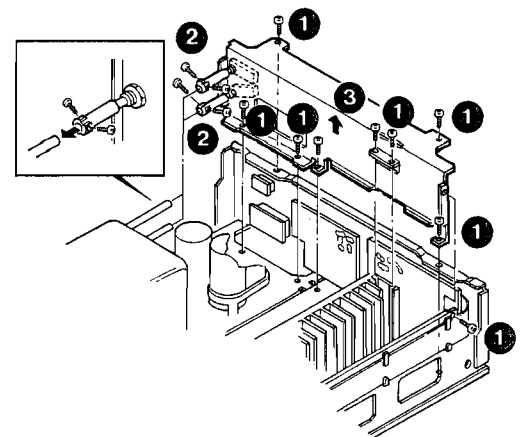


DISASSEMBLY FOR REPAIR

REPAIR ON THE REAR SIDE

For repair to the printed circuit board, etc. on the rear panel side, remove the shield plate in the following sequence.

1. Remove nine shield plate fitting screws. (①)
2. Loosen four screws of the remote switch shaft coupling (②) and remove the coupling from the extension shaft.
3. Extract the shield plate upward (③).



CIRCUIT DESCRIPTION

AUDIO (X09-2250-81)

Components	Use/Function	Operation/Condition/Interchangeability
Q1,Q2	Constant current circuit	Constant current circuit of main class A initial stage differential circuit which increases CMRR.
Q3,Q4	Bias circuit	Makes temperature compensation of the final transistor.
Q5~Q8	Predriver	
Q9~Q12	Driver	
Q13~Q16	Low side power	Final transistor on the low output side
Q17~Q20	Hi side power	Final transistor on the high output side
Q21~Q24	Current limiter	Limits current of the final transistor during overloaded drive. (Q21, Q22 are high voltage resistant transistors.)
Q25~Q32	Cascade boot strap circuit	Constitutes the VIG* circuit. Q25~Q28 constitute the constant current circuit and Q29~Q32 constitute cascade connection with base grounding.
Q33,Q34	Constant current circuit	Constant current circuit of equalizer, initial stage FET differential circuit that increases CMRR.
Q35~Q40	Constant voltage circuit	Constant voltage power supply circuit for main class A stage. Q35~Q38 constitute the control transistor and Q39 Q40 constitute the error amplifier.
Q41~Q44	Constant voltage circuit	Constant voltage power supply circuit for equalizer amplifier. Q41, Q42 constitute the control transistor and Q43, Q44 constitute the error amplifier.
Q45	Protection driver	Transmits the operation signals of current limiters Q21, Q22 to the protection IC (IC3).
Q46, Q47	Constant current circuit	Ripple removing circuit inserted into line B to class A initial stage.
IC1, IC2	DLD switching IC	DLD's Low-High switching circuit.
IC3	Protection IC	Makes output relay control due to muting at the time of power ON/OFF, DC leakage to SP terminal, overload, etc.

* VIG : See page 4.

CONTROL (X11-2200-81)

Components	Use/Function	Operation/Condition/Interchangeability
Q2,Q3	Winking circuit	The LED is lit at the time of power display or while the set is normally operating. The LED flickers until the amplifier is stabilized (around 5 seconds) after power ON and also when the protection circuit is actuated on occurrence of a fault to the power amplifier.
IC1	Tone circuit IC	

POWER AMPLIFIER (X85-1020-13)

Components	Use/Function
Q1,Q2	Class A initial stage differential amplifier
Q3~Q6	Class A initial stage cascade circuit
Q7~Q10	2nd stage differential amplifier
Q11~Q14	3rd stage differential amplifier
Q15,Q16	Current mirror circuit

PREAMPLIFIER (X85-1060-00)

Components	Use/Function
IC1	OP amplifier for EQ amplifier
Q1~Q4	Initial stage cascade circuit
Q5~Q8	Initial stage differential circuit

CIRCUIT DESCRIPTION

Outline of VIG (Voltage Interface Gate) circuit (X09-2250-81)

When the power supply voltage of an amplifier varies, its varying component will appear in the output of the amplifier to a minor extent. It is a large cause for deterioration in the reproduced tone quality.

In the Class A (voltage amplification) stage it is more sensitive to voltage variation when it is closer to the initial stage, and consequently, strengthening of ripple filter and constant power supply, etc. were used. In the past, however, importance was not attached to the measures against voltage fluctuation because class B (power amplification) stage did not involve voltage gain. When an investigation was made, however, it was found out that class B stage is also considerably weak against voltage fluctuation and that major improvement can be obtained in the reproduced tone quality when this point is improved.

What improved the degree of influence of this Class B stage against fluctuations of the voltage fluctuation is the VIG circuit.

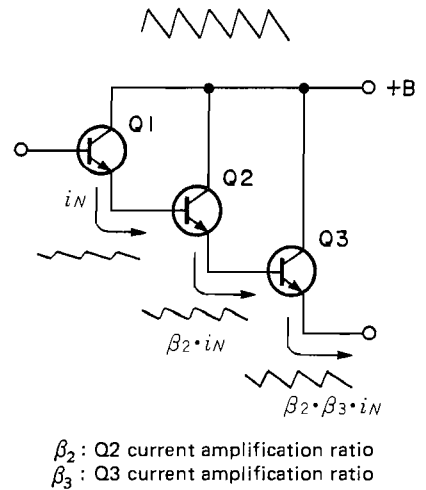


Fig. 1

1. Darlington connection circuit

The class B stage is of 3-stage Darlington connection. But the power variation component leaked from the power supply at Q1 as shown in Fig. 1 is multiplied by β_2 (current amplification ratio) times and is further multiplied by β_3 times by Q3. Therefore, the leakage of the power supply variation component from Q1, 2 becomes large, and countermeasures against it become necessary. As the collector resistance of a transistor and this leakage are inversely proportioning to each other, it becomes possible to take countermeasures by increasing the collector resistances of Q1, 2.

As the cascade connection circuit is a base grounded circuit, there is such a feature that the collector resistance is extremely high, and the objective can be accomplished by making cascade connecting through connection of base grounding transistor Q4 to Q1, 2 as shown in Fig. 2. This is the principle of VIG (Voltage Interface Gate).

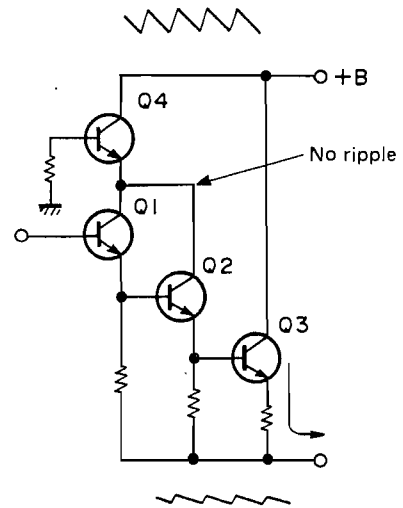


Fig. 2 Principle of VIG circuit

ADJUSTMENT/REGLAGE/ABGLEICH

ADJUSTMENT

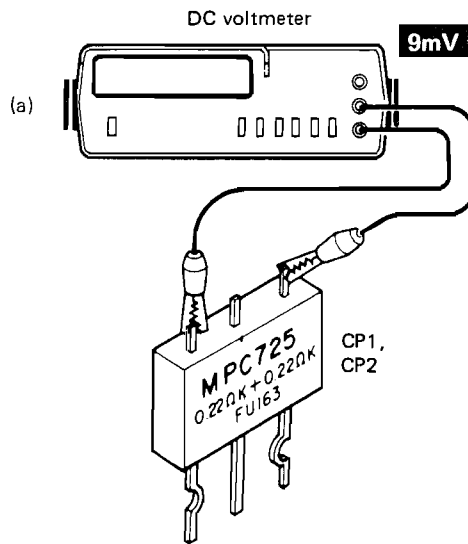
No.	ITEM	INPUT SETTINGS	OUTPUT SETTINGS	AMPLIFIER SETTINGS	ALIGNMENT POINTS	ALIGN FOR	FIG.
1	IDLE CURRENT.	-	Connect a DC voltmeter across CP1 (L) CP2 (R)	VOLUME: 0	VR1 (L) VR2 (R)	9mV	(a)

REGLAGE

N°	ITEM	REGLAGE DE L'ENTREE	REGLAGE DE LA SORTIE	REGLAGE DE L'AMPLIFICATEUR	POINS L'ALIGNEMENT	ALIGNER POUR	FIG.
1	COURANT DE POLARISATION	-	Connecter un voltmètre de CC sur CP1 (G) CP2 (D)	VOLUME: 0	VR1 (G) VR2 (D)	9mV	(a)

ABGLEICH

NR.	GEGENSTAND	EINGANGS-EINSTELLUNG	AUSGANGS-EINSTELLUNG	VORSTÄRKER EINSTELLUNG	ABGLEICH-PUNKTE	ABGLEICHEN FÜR	ABB.
1	LEERLAUFSTROM	-	Einen Gleichspannungsmesser über CP1 (L) CP2 (R) anschließen.	VOLUME: 0	VR1 (L) VR2 (R)	9mV	(a)



CIRCUIT DESCRIPTION

2. Practical circuit

It is not convenient for DC operation in the state where the base of Q4 is grounded. With KA-990V, therefore, bootstrap is made so that follow-up with the signal is made at KA-990V. Fig. 3 indicates its concrete example. Bootstrap is applied to the emitter of transistor Q3 through R1, D1. The collector voltage required for operation of Q1, 2 is produced by voltage drop of R1 and D1. Constant current circuit CC1 supplies current required for bootstrap to R1, D1, and at the same time, also supplies the base current of Q4, and thus it prevents inflow to the base of Q4 the power supply fluctuation component into the base of Q4 by the high internal resistance of CC1 itself.

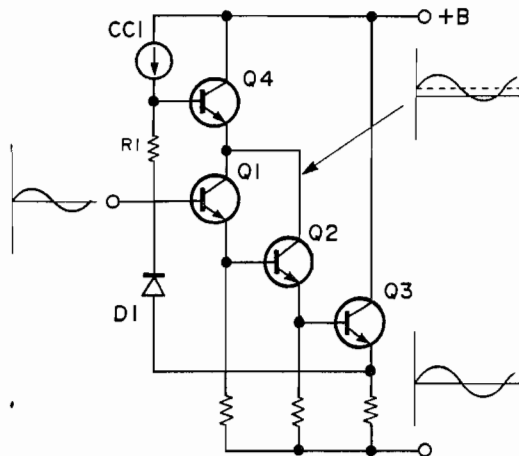


Fig. 3

A practical circuit of CC1 is shown in Fig. 4. Both bases of transistors Q5, 6 which constitute the constant current circuit are connected with constant current diodes D2 and R2, in order to increase the constant current property of Q5, 6.

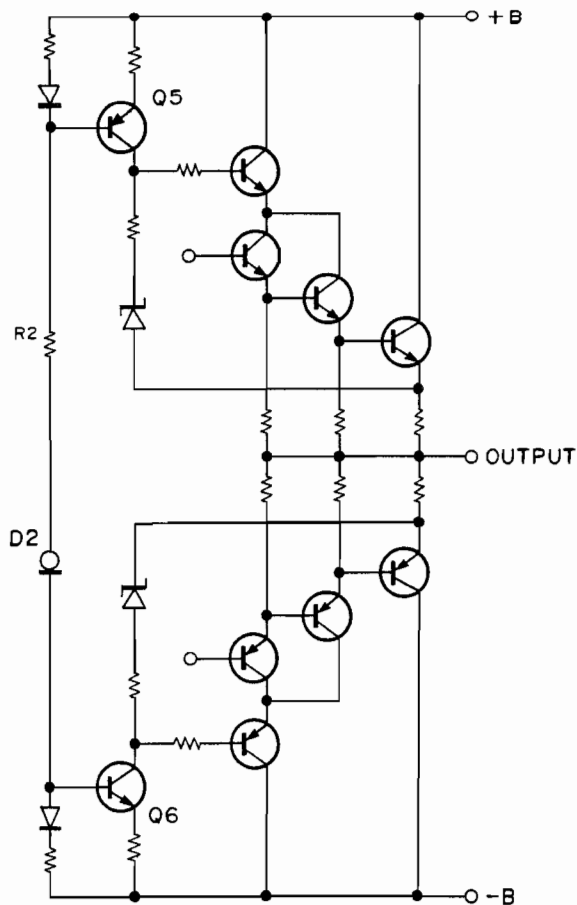
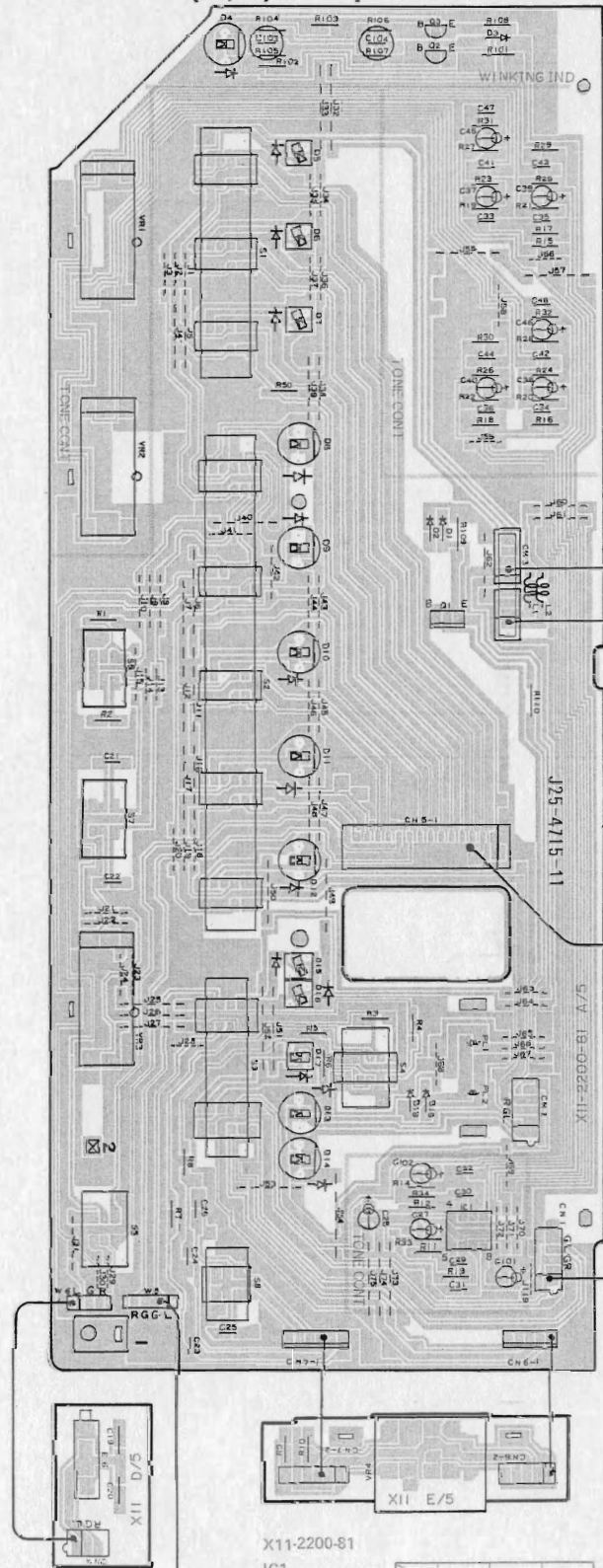


Fig. 4

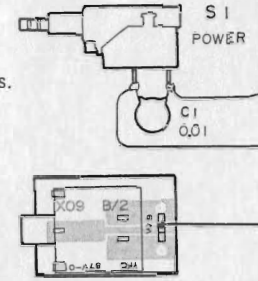
PC BOARD

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

CONTROL (X11-2200-81)
(A/5) Component side view



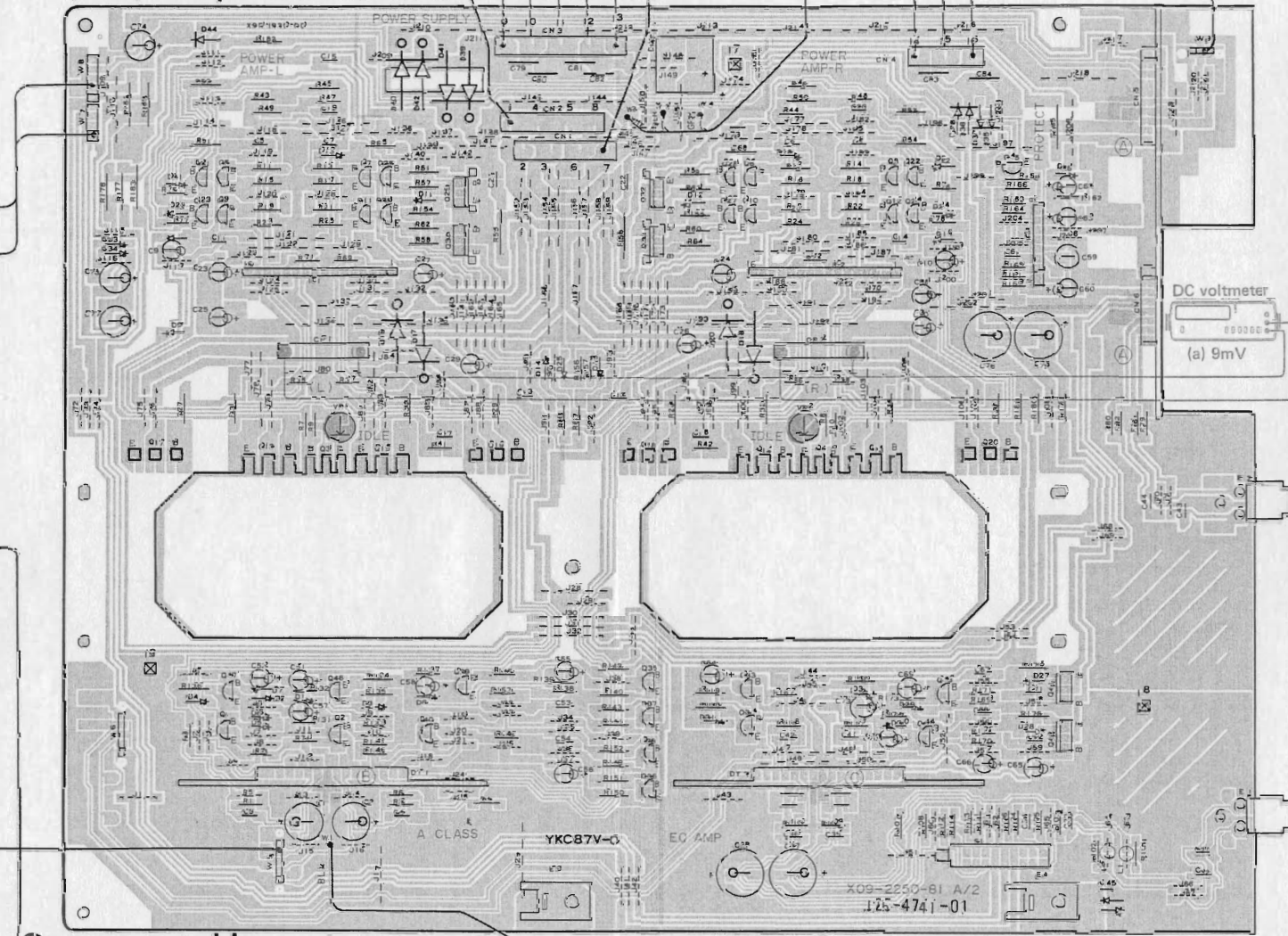
Q1	E	C	B
Q1	-29V	-26V	-
Q3	2.2V	-	2.7V



POWER TRANSFORMER

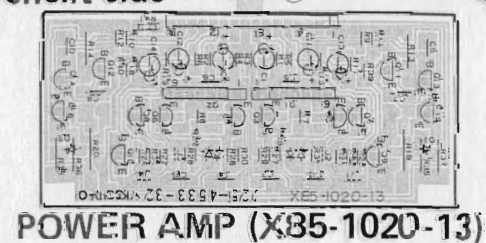
Q1	E	C	B
Q1	-	-7.6V	-
Q2	-20.0V	-7.7V	-
Q6, Q6	-	-	1.8V
Q7, Q8	-	-	-1.8V

AUDIO (X09-2250-81)
(A/2) Component side view

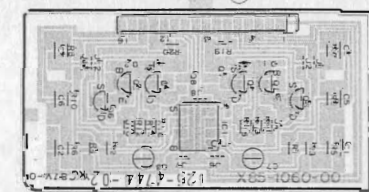


IC3	E	C	B
2	0V		
6	0.7V		

Component side view



POWER AMP (X85-1020-13)

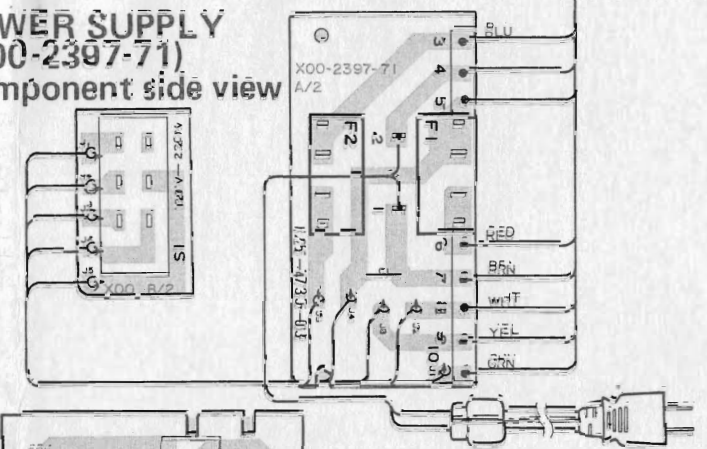


Component side view

PRE AMP (X85-1060-00)

IC1	E	C	B
1	0V		
3	7.8V		
7	0V		
8	19.7V		

POWER SUPPLY (X00-2397-71)
Component side view



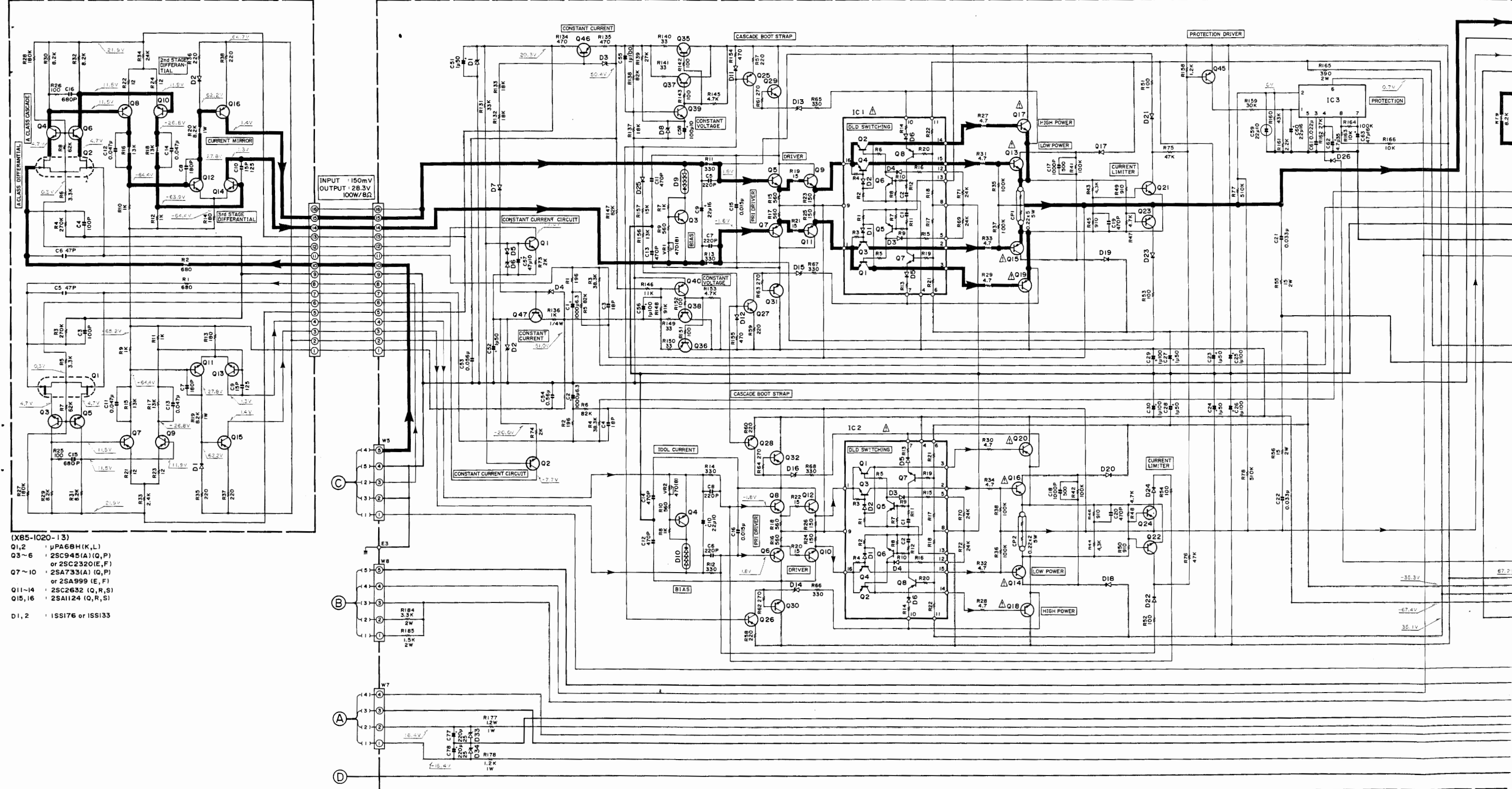
X85-1020-13

Q1, Q2	G1	G2	E	C	B
	D1	D2			
	4.7V	4.7V			
	S1, S2				
	0.3V				

Q9, Q10	E	C	B
Q9, Q10	-	-26.8V	11.9V
Q13, Q14	-	27.8V	-
Q15, Q16	-	1.3V	-
	-	1.4V	62.2V

MAIN AMP UNIT (X85-1020-13)

AUDIUNIT (X09-2250-81) (A/2)

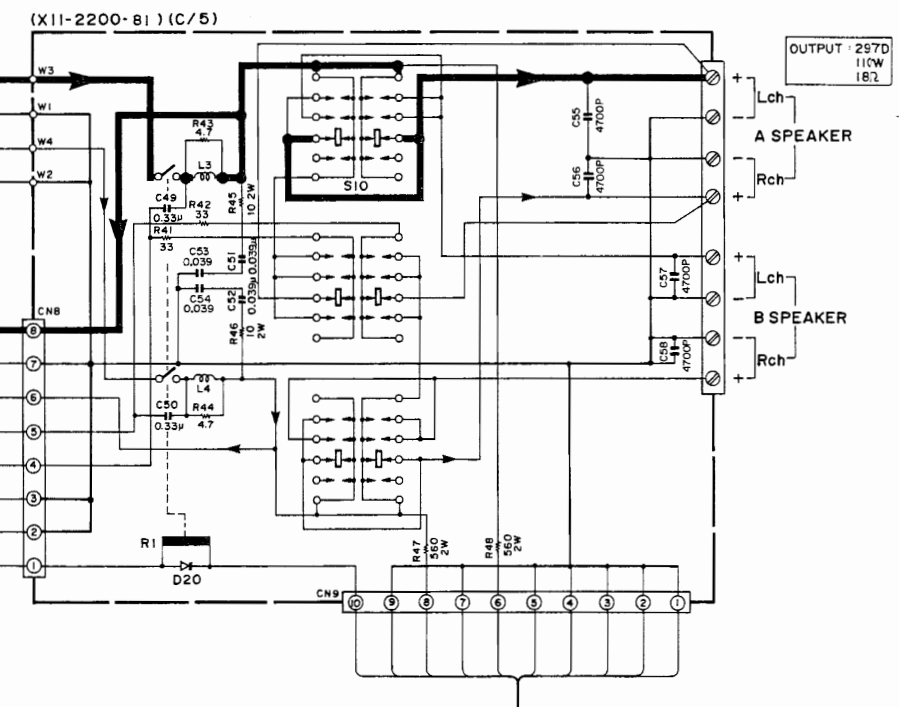
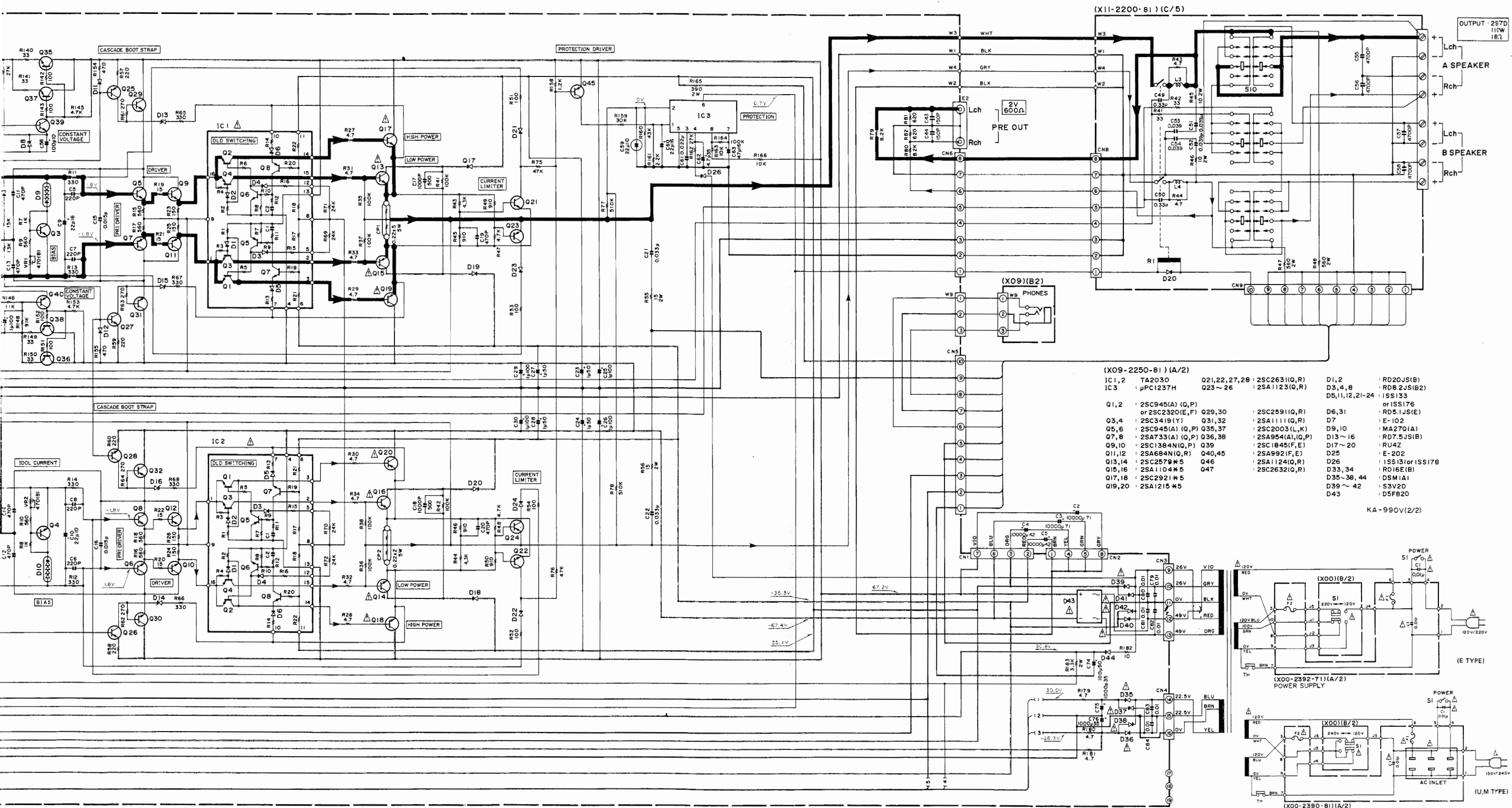


- (X85-1020-13)
 Q1,2 μPA68H(K,L)
 Q3~6 2SC945(A)(Q,P)
 or 2SC2320(E,F)
 Q7~10 2SA733(A)(Q,P)
 or 2SA999(E,F)
 Q11~14 2SC2632(Q,R,S)
 Q15,16 2SA1124(Q,R,S)
 D1,2 1SS176 or 1SS133

- | | | | | | | | | | | | | |
|----------|-----------|--------|---------|---------|-----------|-----------|---------|--------|--------|------------|----------|--------|
| 2SA1123 | 2SC1384NC | 2SB772 | 2SA1111 | 2SC2167 | 2SA1104*5 | 2SA1215*5 | 2SC3419 | μPA68H | 2SK371 | NJM4560D-N | μPC1237H | TA2030 |
| 2SA1124 | 2SC1845 | 2SD882 | 2SC2591 | | 2SC2579*5 | 2SC2921*5 | | | | NJM55232D | | |
| 2SA684NC | 2SC2003 | | | | | | | | | | | |
| 2SA733 | 2SC2320 | | | | | | | | | | | |
| 2SA954 | 2SC2631 | | | | | | | | | | | |
| 2SA992 | 2SC2632 | | | | | | | | | | | |
| 2SA999 | 2SC945 | | | | | | | | | | | |

CAUTION: For continued safety, replace safety critical components only with manufacturer's recommended parts (refer to parts list). Δ 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.

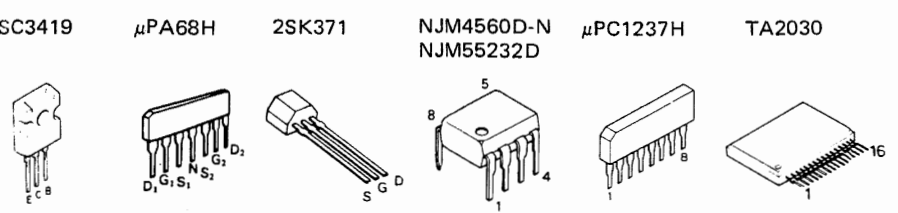
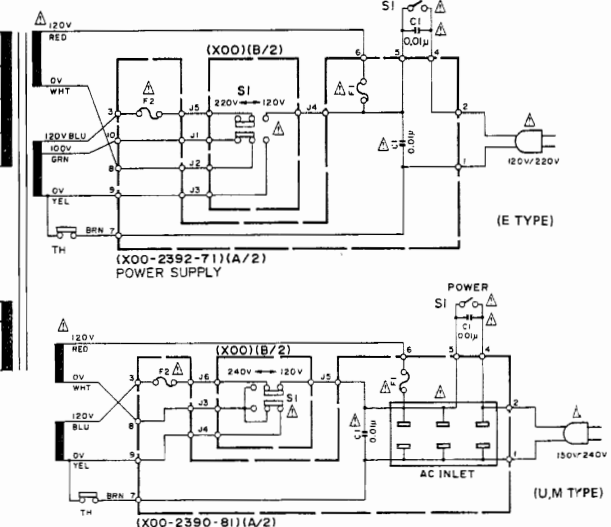
DC voltages are as indicated on the schematic diagram with the voltmeter with the red lead connected to the positive terminal and the black lead to the negative terminal. Slight variations may occur due to component tolerances and/or measurement errors. Les tensions c.c. indiquées sont des valeurs moyennes. Les tensions c.c. indiquées peuvent varier légèrement en raison des tolérances inhérentes aux composants et/ou des erreurs de mesure individuelles.



(X09-2250-81) (A/2)

IC 1,2	TA2030	Q21,22,27,28	2SC2631(Q,R)	D1,2	RD20J(SB)
IC 3	μPC1237H	Q23~26	2SA1123(Q,R)	D3,4,8	RD8.2J(SB2)
				D5,11,12,21-24	ISS133
Q1,2	2SC945(A) (Q,P)	Q29,30	2SC2591(Q,R)	D6,31	RD5.1J(S1E)
	or 2SC2320(E,F)		2SA1111(Q,R)	D7	E-102
Q3,4	2SC3419(Y)	Q31,32	2SC2003(L,K)	D9,10	MA27Q(A)
Q5,6	2SC945(A) (Q,P)	Q35,37	2SA954(A1,Q,P)	D13~16	RD7.5J(SB)
Q7,8	2SA733(A) (Q,P)	Q36,38	2SC1845(F,E)	D17~20	RU4Z
Q9,10	2SC1384N(Q,P)	Q39	2SA684N(Q,R)	Q40,45	E-202
Q11,12	2SA684N(Q,R)	Q40,45	2SA1124(Q,R)	Q46	ISS133 or ISS178
Q13,14	2SC2579*5	Q46	2SA1104*5	Q47	RD16E(B)
Q15,16	2SA1104*5	Q47	2SC2632(Q,R)	D25	DSM1A1
Q17,18	2SC2921*5			D26	D35~38,44
Q19,20	2SA1215*5			D27	D39~42
				D28	S3V20
				D29	D5FB20
				D30	
				D31	
				D32	
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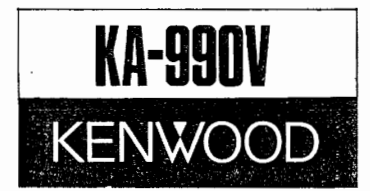
KA-990V(2/2)



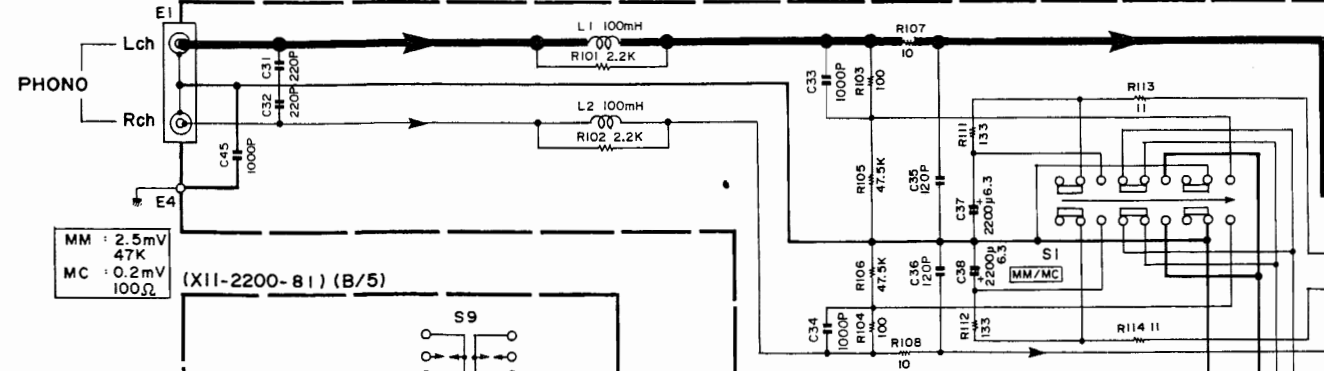
CAUTION: For continued safety, replace safety critical components only with manufacturer's recommended parts (refer to parts list). Δ Indicates safety critical components. To reduce the risk of electric shock, leakage-current or resistance measurements shall be carried out (exposed parts are acceptably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

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

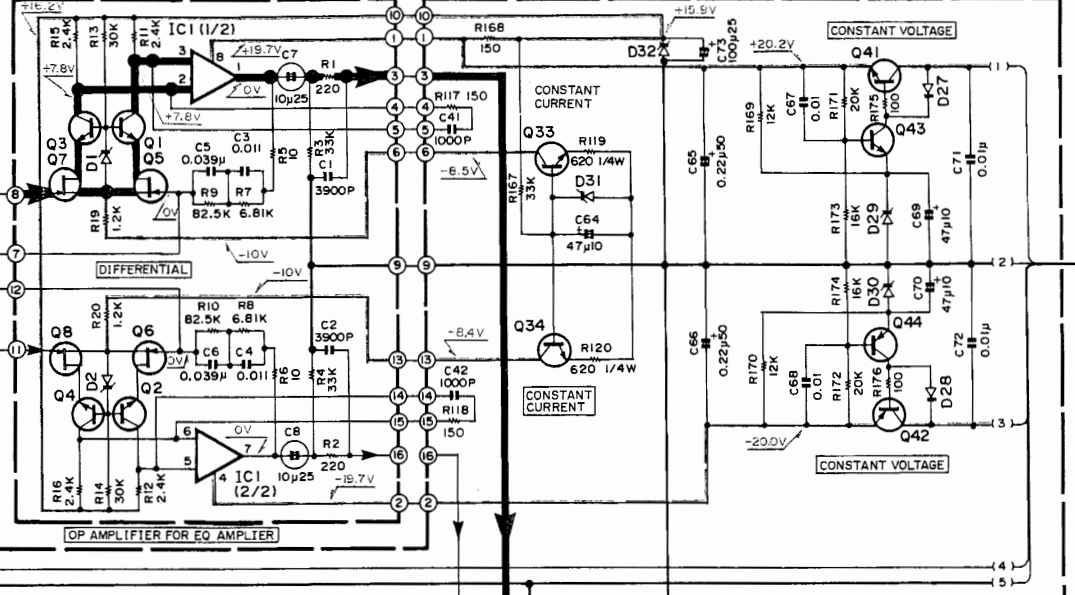
• Die angegebenen Gleichspannungswerte wurden mit einem hochohmigen Voltmeter ohne Eingangssignal gemessen. Dabei schwanken die Maßwerte aufgrund von Unterschieden zwischen einzelnen Instrumenten oder Geräten u.U. geringfügig.



AUDIO UNIT (X09-2250-81) (A/2)

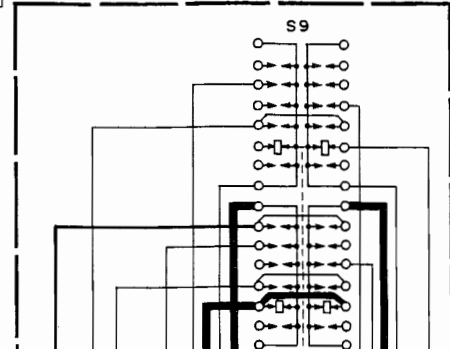


PRE AMP UNIT (X85-1060-00)



- (X09-2250-81) (A/2)
 Q33,34,43 : 2SC945 (A) (Q,P) or 2SC2320 (E,F)
 Q41 : 2SD882 (Q,P)
 Q42 : 2SB772 (Q,P)
 Q44 : 2SA733 (A) (Q,P) or 2SA999 (E,F)
 D27,28 : E-102
 D29,30 : RD8.2JS (B2)
 D31 : RD5.1JS (E)
 D32 : RD16E (B)

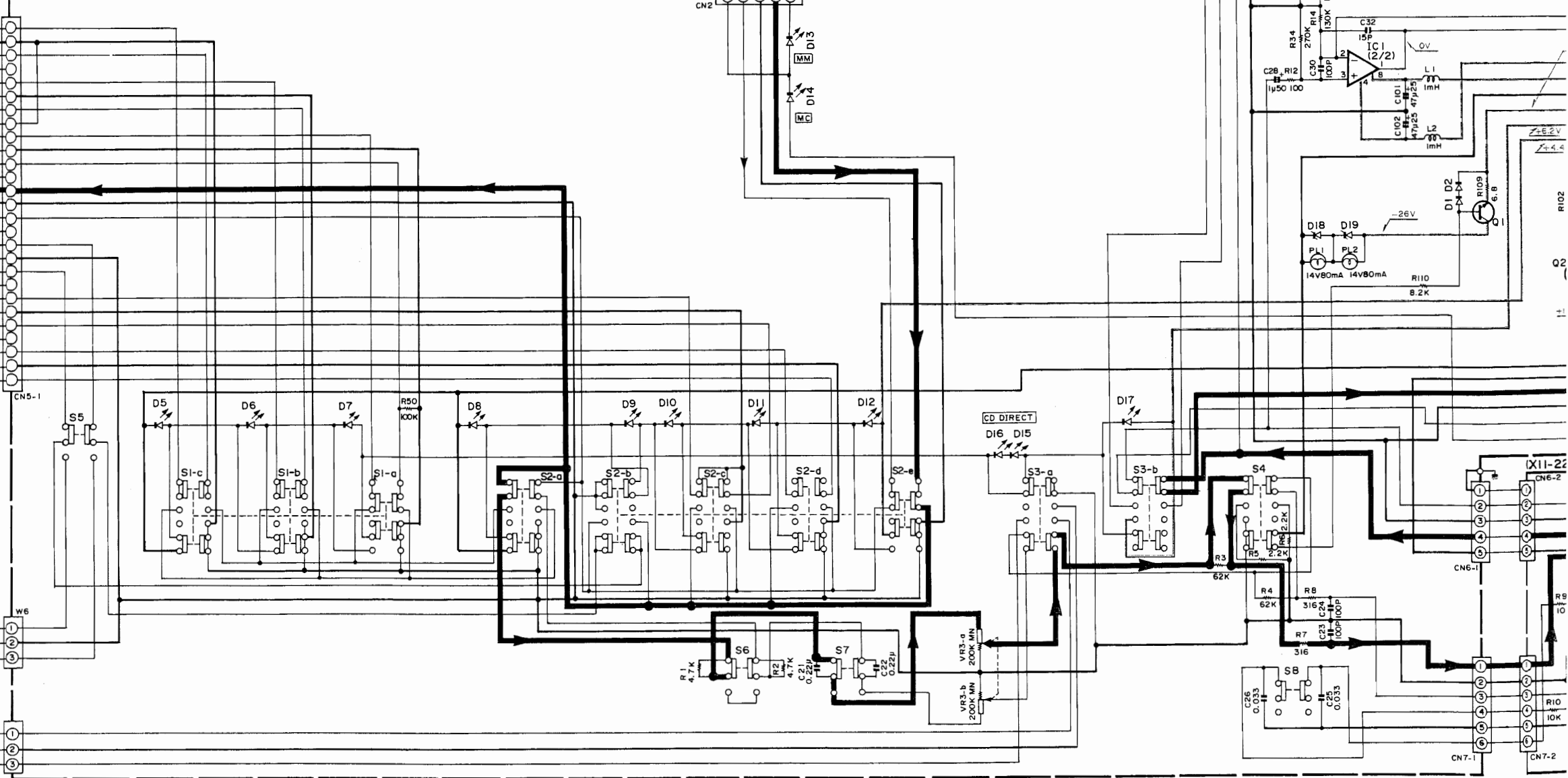
(X11-2200-81) (B/5)



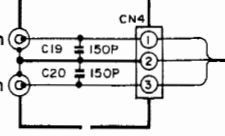
(X85-1060-00)

- IC1 : NJM5532D
 Q1~4 : 2SC945 (A) (Q,P) or 2SC2320 (E,F)
 Q5~8 : 2SK371 (BL) or 2SK371 (V)
 D1,2 : RD5.1JS (B)

CONTROL UNIT (X11-2200-81) (A/5)



(X11-2200-81) (D/5)

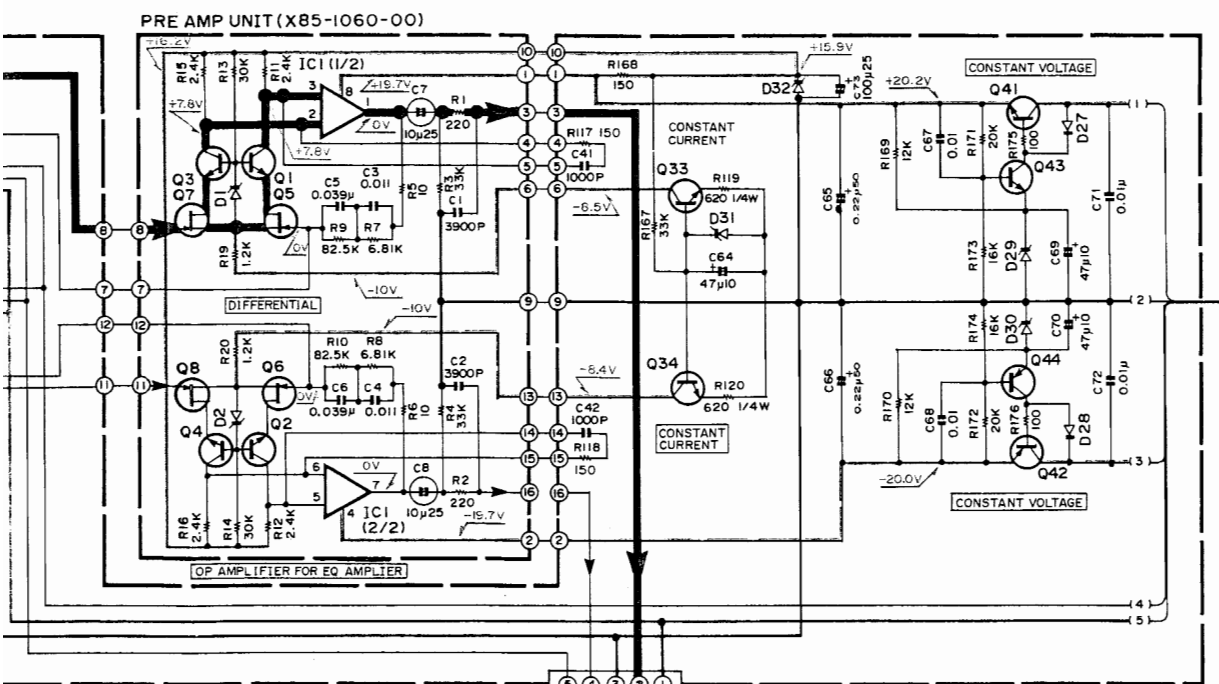


- (X11-2200-81) (B/5)
 IC1
 Q1
 Q2,3
 D1,2
 D3,20
 D4,8-1
 D5-7,15
 D16,19

- (X11-2200-81) (A/5)
 Q1
 Q2

(X11-2200-81) (D/5)

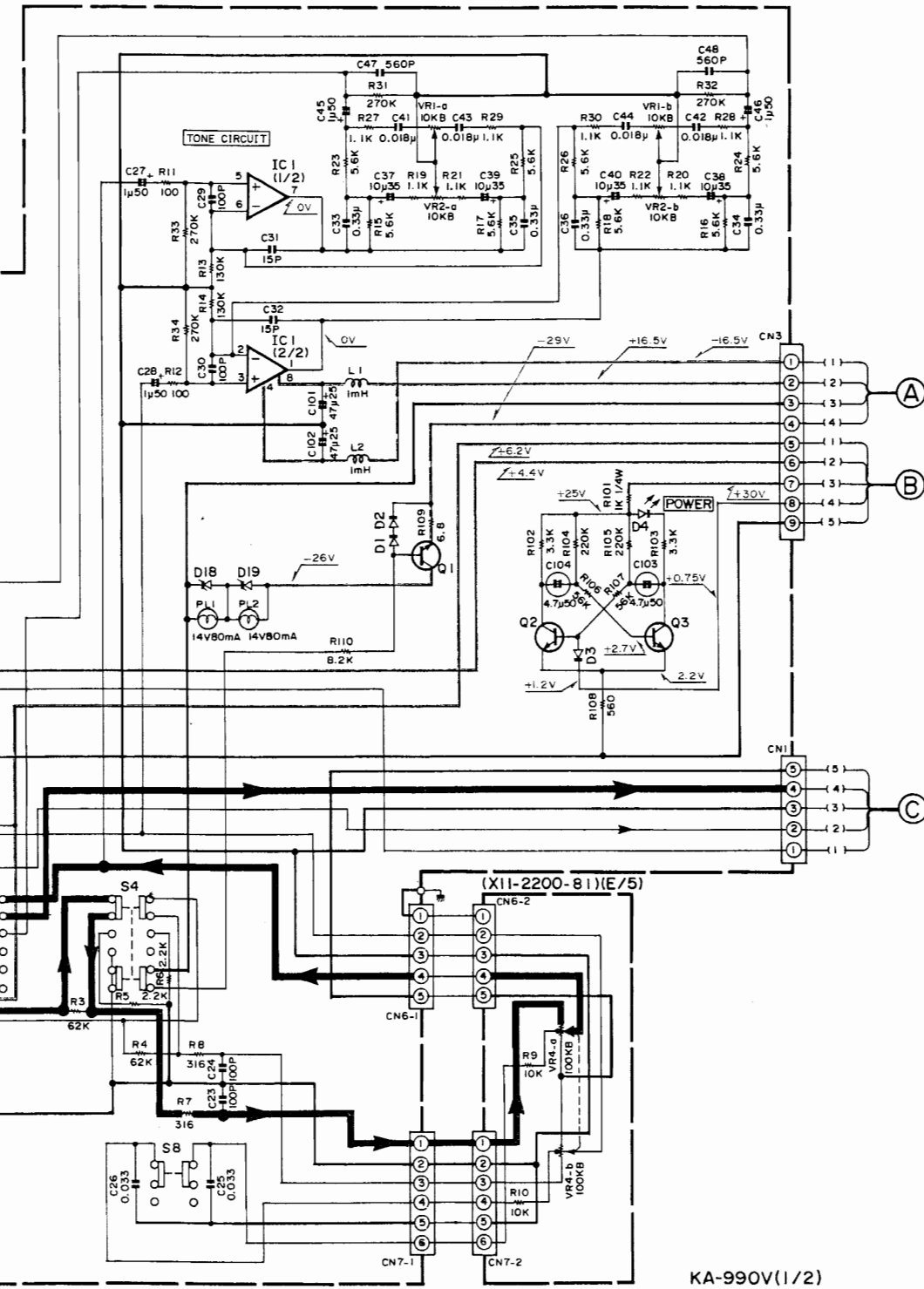
- (X11-2200-81) (D/5)
 CN6-1
 CN6-2
 CN7-1
 CN7-2



- (X09-2250-81) (A/2)
 Q33,34,43 : 2SC945 (A) (Q,P) or 2SC2320 (E,F)
 Q41 : 2SD882 (O,P)
 Q42 : 2SB772 (O,P)
 Q44 : 2SA733 (A) (Q,P) or 2SA999 (E,F)
 D27,28 : E-102
 D29,30 : RD8.2JS (B2)
 D31 : RD5.1JS (E)
 D32 : RD16E (B)

- (X85-1060-00)
 IC1 : NJM5532D
 Q1~4 : 2SC945 (A) (Q,P) or 2SC2320 (E,F)
 Q5~8 : 2SK371 (BL) or 2SK371 (V)
 D1,2 : RD5.1JS (B)

- (X11-2200-81) (A/5)
 IC1 : NJM4560D-N
 Q1 : 2SC2167 (O,Y)
 Q2,3 : 2SC945 (A) (Q,P) or 2SC2320 (E,F)
 D1,2 : ISSI33 or ISSI76
 D3,20 : ISSI31 or ISSI78
 D4,8~14 : B30-0431-05
 D5-7,15-17 : B30-1010-05
 D18,19 : RD13E (B2)



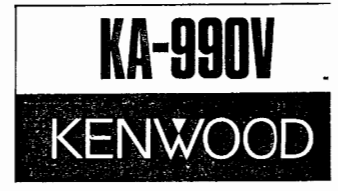
- (X11-2200-81) (E/5)

- | | | | |
|-----------|-----------|------------|--|
| 2SA1123 | 2SA1384NC | 2SC3419 | |
| 2SA1124 | 2SC1845 | | |
| 2SA684NC | 2SC2003 | | |
| 2SA773 | 2SC2320 | | |
| 2SA954 | 2SC2631 | | |
| 2SA992 | 2SC2632 | | |
| 2SA999 | 2SC945 | | |
| | | μPA68H | |
| 2SB772 | | | |
| 2SD882 | | | |
| | | 2SK371 | |
| 2SA1111 | | | |
| 2SC2591 | | | |
| | | NJM4560D-N | |
| | | NJM5532D | |
| 2SC2167 | | | |
| | | μPC1237H | |
| 2SA1104*5 | | | |
| 2SC2579*5 | | | |
| | | TA2030 | |
| 2SA1215*5 | | | |
| 2SC2921*5 | | | |

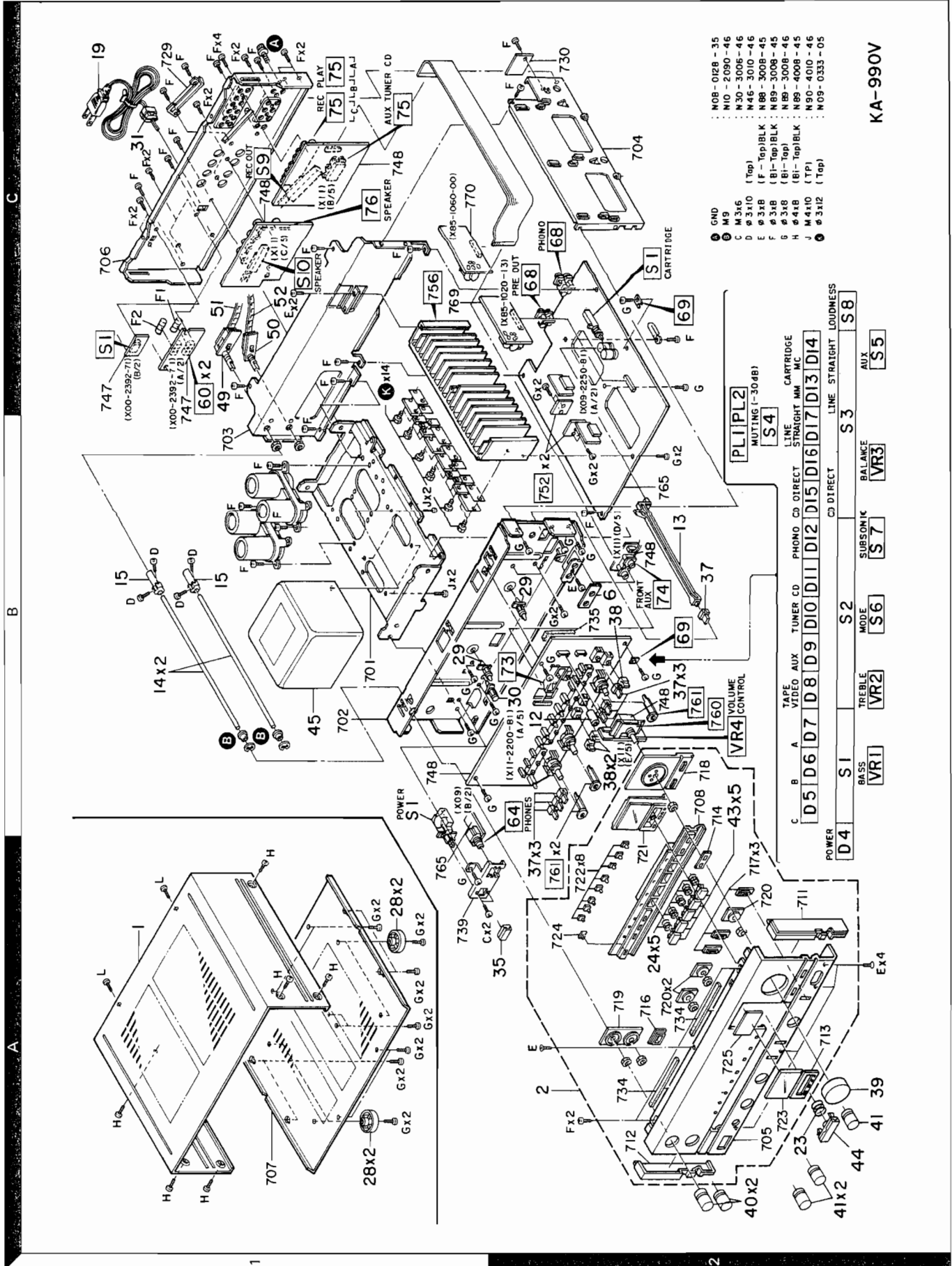
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- DC voltages are as measured with a high impedance voltmeter with no signal input. Values may vary slightly due to variations between individual instruments or/and units.
- Les tensions c.c. doivent être mesurées avec un voltmètre à haute impédance sans signal d'entrée. 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 Voltmeter ohne Eingangssignal gemessen. Dabei schwanken die Meßwerte aufgrund von Unterschieden zwischen einzelnen Instrumenten oder Geräten u.U. geringfügig.

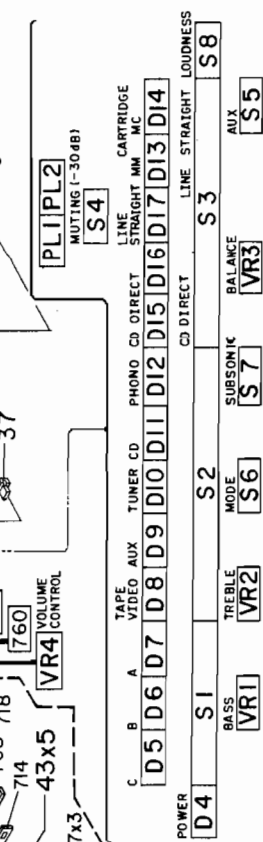
KA-990V(1/2)



EXPLODED VIEW



- GND
- M9
- M3x6
- D # 3x10 (Top)
- E # 3x8 (F - Top)BLK
- F # 3x8 (B1 - Top)BLK
- G # 3x8 (B1 - Top)
- H # 4x8 (B1 - Top)BLK
- J M 4x10 (TP)
- # 3x12 (Top)
- N08 - 0128 - 35
- N10 - 2090 - 46
- N30 - 3006 - 46
- N46 - 3010 - 46
- N88 - 3008 - 45
- N89 - 3008 - 45
- N89 - 3008 - 46
- N89 - 4008 - 45
- N90 - 4010 - 46
- N09 - 0333 - 05



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

PARTS LIST

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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 仕 向	Re- marks 備考
KA-990V						
1	1A	*	A01-1457-01	METALLIC CABINET		
2	2A	*	A20-4684-02	PANEL ASSY	UMUE	XTE
2	2A	*	A20-4686-02	PANEL ASSY	T	
6	2B		B03-1956-04	DRESSING PLATE (FRONT AUX)		
-			B46-0074-03	WARRANTY CARD	UUE	
-			B46-0075-03	WARRANTY CARD	UUE	
-			B46-0076-13	WARRANTY CARD	X	
-			B46-0122-13	WARRANTY CARD	E	
-			B46-0123-03	WARRANTY CARD	T	
-		*	B50-5984-00	INSTRUCTION MANUAL (ENGLISH)	UMUE	XTE
-		*	B50-5985-00	INSTRUCTION MANUAL (FRENCH)	MXE	
-		*	B50-5986-00	INSTRUCTION MANUAL (SPANISH)	M	
-		*	B50-5987-00	INSTRUCTION MANUAL (ENGLISH)	T	
-		*	B50-5988-00	INSTRUCTION MANUAL (G,D,I)	E	
-			B58-0222-14	CAUTION CARD (PRE-SET 220V)	UE	
-			B58-0223-04	CAUTION CARD (PRE-SET 120V)	U	
-			B58-0245-33	CAUTION CARD (FTZ)	E	
-			B59-0072-00	SERVICE DIRECTORY	UUE	
△ C1			C91-0023-05	CERAMIC 0.01UF AC250V	UMUE	
△ C1			C91-0647-05	CERAMIC 0.01UF P	XTE	
C2 .3		*	C90-1329-05	ELECTRO 1000UF 71WV		
C4 .5		*	C90-1336-05	ELECTRO 1000UF 56WV		
12	2B		D21-1102-04	EXTENSION SHAFT (MUTING)		
13	2B		D21-1103-03	EXTENSION SHAFT (CARTRIDGE)		
14	1B	*	D21-1107-14	EXTENSION SHAFT (REC OUT, SP)		
15	1B		D22-0047-04	SHAFT COUPLING		
△ 19	1C		E30-0459-05	AC POWER CORD	E	
△ 19	1C		E30-0812-05	AC POWER CORD	UMUE	
△ 19	1C		E30-1341-05	AC POWER CORD	X	
△ 19	1C		E30-1416-05	AC POWER CORD	T	
△ F1	1C		F05-3121-05	FUSE (SEMKO) (250V T3.15A)	XTE	
△ F1 .2	1C		F05-3022-05	FUSE (250V 3A)	UMUE	
23	2A		G01-0489-04	COMPRESSION SPRING		
24	2A		G01-1751-04	COMPRESSION SPRING		
-		*	H01-7009-04	ITEM CARTON CASE	UMUE	XTE
-		*	H01-7011-04	ITEM CARTON CASE	T	
-		*	H10-1838-02	POLYSTYRENE FOAMED FIXTURE		
-			H25-0225-04	PROTECTION BAG (850X450)		
-			H25-0232-04	PROTECTION BAG (235X350)		
28	1A	*	J02-0171-05	FOOT		
29	1B, 2B		J19-0515-05	UNIT HOLDER		
30	2B		J19-2536-05	UNIT HOLDER		
△ 31	1C		J42-0083-05	POWER CORD BUSHING		
-			J61-0307-05	WIRE BAND		
35	2A		K29-2432-03	KNØB ASSY (POWER)		
37	2A, 2B		K29-1980-04	KNØB ASSY (TAPE)		
38	2B		K29-2243-04	KNØB ASSY (AUX)		
39	2A	*	K29-2301-04	KNØB (VOLUME)		
40	2A	*	K29-2303-04	KNØB (REC OUT, SP)		
41	2A	*	K29-2305-04	KNØB (TONE BALANCE)		
43	2B	*	K29-2431-04	KNØB ASSY		

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44	2A		K27-1590-03	KN0B (BUTTON) (MUTING)		
△ 45	1B	*	L01-6952-05	POWER TRANSFORMER	XT UMUE E	
△ 45	1B	*	L01-6955-05	POWER TRANSFORMER		
△ 45	1B	*	L01-6956-05	POWER TRANSFORMER		
A	1C		N08-0128-35	BINDING POST (GND)		
B	1B		N10-2090-46	HEXAGON NUT (M9)		
49	1C	*	S90-0092-05	REMOTE SWITCH SHAFT		
50	1C	*	S90-0093-05	REMOTE SWITCH SHAFT		
51	1C	*	S90-0094-05	REMOTE WIRE		
52	1C	*	S90-0095-05	REMOTE WIRE		
△ -			S59-1055-05	THERMAL SWITCH		
△ S1	1B		S40-1073-05	PUSH SWITCH (POWER)		
POWER SUPPLY (X00-2397-71)						
△ C1			C91-0023-05	CERAMIC 0.01UF AC250V	UMUE XTE	
△ C1			C91-0647-05	CERAMIC 0.01UF P		
△ 56		*	E03-0077-05	AC OUTLET	UMUE	
60	1C		J13-0041-05	FUSE CLIP	UMUE XTE	
60	1C		J13-0054-05	FUSE CLIP		
△ S1	1C		S31-2083-05	SLIDE SWITCH (POWER TYPE)	UMUEE	
AUDIO (X09-2250-81)						
C1 ,2			CE04KW0J102M	ELECTRO 1000UF 6.3WV		
C3 ,4			C91-0169-05	POLYSTY 18PF K		
C5 -8			CC45FSL1H221J	CERAMIC 220PF J		
C9 ,10			CE04KW1C220M	ELECTRO 22UF 16WV		
C11 -14			CK45FB1H471K	CERAMIC 470PF K		
C15 ,16			CF92FV1H153J	MF 0.015UF J		
C17 ,18			CK45FB2H102K	CERAMIC 1000PF K		
C19 ,20			CK45FB1H471K	CERAMIC 470PF K		
C21 ,22			CF92FV1H333J	MF 0.033UF J		
C23 ,24			CE04KW1H010M	ELECTRO 1.0UF 50WV		
C25 ,26			CE04KW2A010M	ELECTRO 1.0UF 100WV		
C27 ,28			CE04KW1H010M	ELECTRO 1.0UF 50WV		
C29 ,30			CE04KW2A010M	ELECTRO 1.0UF 100WV		
C31 ,32			CC45FSL1H221J	CERAMIC 220PF J		
C33 ,34			CK45FB1H102K	CERAMIC 1000PF K		
C35 ,36			CC45FSL1H121J	CERAMIC 120PF J		
C37 ,38			CE04KW0J222M	ELECTRO 2200UF 6.3WV		
C41 ,42			CK45FB1H102K	CERAMIC 1000PF K		
C43 ,44			CC45FSL1H151J	CERAMIC 150PF J		
C45			CK45FB1H102K	CERAMIC 1000PF K		
C51 ,52			CE04KW1H010M	ELECTRO 1.0UF 50WV		
C53 ,54			CF92FV1H564J	MF 0.56UF J		
C55 ,56			CE04KW2A010M	ELECTRO 1.0UF 100WV		
C57			CE04KW1A470M	ELECTRO 47UF 10WV		
C58			CE04KW1A101M	ELECTRO 100UF 10WV		
C59			C90-1333-05	NP-ELEC 10UF 25WV		
C60			CE04KW1C220M	ELECTRO 22UF 16WV		
C61			CF92FV1H223J	MF 0.022UF J		
C62			CE04KW1V4R7M	ELECTRO 4.7UF 35WV		
C63			CE04KW1C470M	ELECTRO 47UF 16WV		

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C64			CE04KW1A470M	ELECTRO 47UF 10WV		
C65 ,66			CE04KW1HR22M	ELECTRO 0.22UF 50WV		
C67 ,68			CF92FV1H103J	MF 0.010UF J		
C69 ,70			CE04KW1A470M	ELECTRO 47UF 10WV		
C71 ,72			CF92FV1H103J	MF 0.010UF J		
C73			CE04KW1E101M	ELECTRO 100UF 25WV		
C74			CE04KW1H101M	ELECTRO 100UF 50WV		
C75 ,76		*	CE04KW1V102M	ELECTRO 1000UF 35WV		
C77 ,78			CE04KW1E221M	ELECTRO 220UF 25WV		
C79 -84			CK45FE2H103P	CERAMIC 0.010UF P		
64	2B	*	E11-0162-05	PHONE JACK (3P)		
68	2C		E13-0229-05	PHONE JACK (2P)PHONE,PRE		
69	2C		E23-0125-05	TERMINAL		
L1 ,2			L40-1011-47	SMALL FIXED INDUCTOR(100UH,K)		
K	1C		N09-0333-05	TAPPING SCREW (3X12)		
CP1 ,2			R90-0187-05	MULTI-COMP 0.22X2 K 5W		
R1 ,2			RN14BK2C1960F5	RN 196.0 F 1/6W		
R3 ,4		*	RN14BK2C3032F5	RN 30.3K F 1/6W		
R11 -14			RD14AB2E331J	FL-PROOF RD 330 J 1/4W		
R15 -18			RD14AB2E561J	FL-PROOF RD 560 J 1/4W		
R19 -22		*	RD14AB2E150J	FL-PROOF RD 15 J 1/4W		
R23 -26			RD14AB2E151J	FL-PROOF RD 150 J 1/4W		
R27 -34			RD14AB2E4R7J	FL-PROOF RD 4.7 J 1/4W		
R45 ,46		*	RD14AB2E911J	FL-PROOF RD 910 J 1/4W		
R49 ,50		*	RD14AB2E911J	FL-PROOF RD 910 J 1/4W		
R51 -54			RD14AB2E101J	FL-PROOF RD 100 J 1/4W		
R55 ,56		*	RS14DB3D150JTE	FL-PROOF RS 15 J 2W		
R57 -60			RD14AB2E221J	FL-PROOF RD 220 J 1/4W		
R61 -64			RD14AB2E271J	FL-PROOF RD 270 J 1/4W		
R65 -68			RD14AB2E331J	FL-PROOF RD 330 J 1/4W		
R103,104		*	RN14BK2C100DFTS	RN 100.0 F 1/6W		
R105,106			RN14BK2C4752F5	RN 47.5K F 1/6W		
R111,112			RN14BK2C1330F5	RN 133.0 F 1/6W		
R113,114			RN14BK2C110R0F5	RN 11.0 F 1/6W		
R119			RD14GB2E621J	FL-PROOF RD 620 J 1/4W		
R120			RD14AB2E621J	FL-PROOF RD 620 J 1/4W		
R134,135		*	RD14AB2E471J	FL-PROOF RD 470 J 1/4W		
R136			RD14AB2E102J	FL-PROOF RD 1.0K J 1/4W		
R140,141			RD14AB2E330J	FL-PROOF RD 33 J 1/4W		
R142,143			RD14AB2E101J	FL-PROOF RD 100 J 1/4W		
R149,150			RD14AB2E330J	FL-PROOF RD 33 J 1/4W		
R151,152			RD14AB2E101J	FL-PROOF RD 100 J 1/4W		
R154,155		*	RD14AB2E471J	FL-PROOF RD 470 J 1/4W		
R165		*	RS14DB3D391JTE	FL-PROOF RS 390 J 2W		
R168			RD14AB2E151J	FL-PROOF RD 150 J 1/4W		
R175,176			RD14AB2E101J	FL-PROOF RD 100 J 1/4W		
R177,178			RS14DB3A122JTE	FL-PROOF RS 1.2K J 1W		
R179-181			RD14AB2E4R7J	FL-PROOF RD 4.7 J 1/4W		
R182			RD14AB2E100J	FL-PROOF RD 10 J 1/4W		
R183,184		*	RS14DB3D332JTE	FL-PROOF RS 3.3K J 2W		
R185		*	RS14DB3D152JTE	FL-PROOF RS 1.5K J 2W		
VR1 ,2			R12-0094-05	TRIMMING PNT. (470) BIAS		

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S1	2C		S40-6027-05	PUSH SWITCH (CARTRIDGE)		
D1 ,2			RD20JS(B)	ZENER DIODE		
D3 ,4			RD8.2JS(B2)	ZENER DIODE		
D5			1SS133	DIODE		
D5			1SS176	DIODE		
D6			RD5.1JS(B)	ZENER DIODE		
D7			E-102	CONSTANT CURRENT DIODE		
D8			RD8.2JS(B2)	ZENER DIODE		
D9 ,10		*	MA27Q(A)	VARISTOR		
D11 ,12			1SS133	DIODE		
D11 ,12			1SS176	DIODE		
D13 -16		*	RD7.5JS(B)	ZENER DIODE		
D17 -20			RU4Z	DIODE		
D21 -24			1SS133	DIODE		
D21 -24			1SS176	DIODE		
D25			E-202	CONSTANT CURRENT DIODE		
D26			1SS131	DIODE		
D26			1SS178	DIODE		
D27 ,28			E-102	CONSTANT CURRENT DIODE		
D29 ,30			RD8.2JS(B2)	ZENER DIODE		
D31			RD5.1JS(B)	ZENER DIODE		
D32 -34			RD16E(B)	ZENER DIODE		
△ D35 -38			DSM1A1	DIODE		
△ D39 -42			S3V20	DIODE		
△ D43			D5FB20	DIODE		
△ D44			DSM1A1	DIODE		
△ IC1 ,2			TA2030	IC (LO/HI SWITCHING)		
IC3			UPC1237H	IC (PROTECTION)		
Q1 ,2			2SC2320(E,F)	TRANSISTOR		
Q1 ,2			2SC945(A) (Q,P)	TRANSISTOR		
Q3 ,4			2SC3419(Y)	TRANSISTOR		
Q5 ,6			2SC945(A) (Q,P)	TRANSISTOR		
Q7 ,8			2SA733(A) (Q,P)	TRANSISTOR		
Q9 ,10			2SC1384NC (Q,R)	TRANSISTOR		
Q11 ,12			2SA684NC (Q,R)	TRANSISTOR		
△ Q13 ,14		*	2SC2579*5	TRANSISTOR		
△ Q15 ,16		*	2SA1104*5	TRANSISTOR		
△ Q17 ,18			2SC2921*5	TRANSISTOR		
△ Q19 ,20			2SA1215*5	TRANSISTOR		
Q21 ,22			2SC2631 (Q,R)	TRANSISTOR		
Q23 -26			2SA1123 (Q,R)	TRANSISTOR		
Q27 ,28			2SC2631 (Q,R)	TRANSISTOR		
Q29 ,30			2SC2591 (Q,R)	TRANSISTOR		
Q31 ,32			2SA1111 (Q,R)	TRANSISTOR		
Q33 ,34			2SC2320 (E,F)	TRANSISTOR		
Q33 ,34			2SC945 (A) (Q,P)	TRANSISTOR		
Q35			2SC2003 (L,K)	TRANSISTOR		
Q36			2SA954 (L,K)	TRANSISTOR		
Q37			2SC2003 (L,K)	TRANSISTOR		
Q38			2SA954 (L,K)	TRANSISTOR		
Q39			2SC1845 (F,E)	TRANSISTOR		
Q40			2SA992 (F,E)	TRANSISTOR		
Q41			2SD882 (Q,P)	TRANSISTOR		
Q42			2SB772 (Q,P)	TRANSISTOR		

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Q43			2SC2320(E,F)	TRANSISTOR		
Q43			2SC945(A)(Q,P)	TRANSISTOR		
Q44			2SA733(A)(Q,P)	TRANSISTOR		
Q44			2SA999(E,F)	TRANSISTOR		
Q45			2SA992(F,E)	TRANSISTOR		
Q46			2SA1124(Q,R)	TRANSISTOR		
Q47			2SC2632(Q,R)	TRANSISTOR		
CONTROL (X11-2200-81)						
73	2B	*	A33-0093-04	REFLECTOR		
D4	2A		B30-0431-05	LED(LN21CPH)		
D5 -7	2B		B30-1010-05	LED(SLP-281F-50U)		
D8 -14	2B,2C		B30-0431-05	LED(LN21CPH)		
D15 -17	2B		B30-1010-05	LED(SLP-281F-50U)		
PL1 ,2	2B,2C		B30-1025-05	LAMP (14V 0.08A)		
C1 -20		*	C91-0747-05	CERAMIC 150PF K		
C21 ,22			CF92FV1H224J	MF 0.22UF J		
C23 ,24			CC45FSL1H101J	CERAMIC 100PF J		
C25 ,26			CF92FV1H333J	MF 0.033UF J		
C27 ,28			CE04KW1H010M	ELECTRO 1.0UF 50WV		
C29 ,30			CC45FSL1H101J	CERAMIC 100PF J		
C31 ,32			CC45FSL1H150J	CERAMIC 15PF J		
C33 -36			CF92FV1H334J	MF 0.33UF J		
C37 -40			CE04KW1V100M	ELECTRO 10UF 35WV		
C41 -44			CF92FV1H183J	MF 0.018UF J		
C45 ,46			CE04KW1H010M	ELECTRO 1.0UF 50WV		
C47 ,48			CK45FB1H561K	CERAMIC 560PF K		
C49 ,50			CF92FV1H334J	MF 0.33UF J		
C51 -54			CF92FV1H393J	MF 0.039UF J		
C55 -58			CK45FF1H472Z	CERAMIC 4700PF Z		
C101,102			CE04KW1E470M	ELECTRO 47UF 25WV		
C103,104			C90-1335-05	NP-ELEC 4.7UF 50WV		
69	2B		E23-0125-05	TERMINAL (GND)		
74	2B	*	E13-0233-05	PHONE JACK (2P)FRONT AUX		
75	1C		E13-0624-05	PHONE JACK (6P)REC PLAY,AUX		
76	1C	*	E20-0824-05	SCREW TERMINAL BOARD(8P) SP		
-			J61-0307-05	WIRE BAND		
L1 ,2			L40-1021-14	SMALL FIXED INDUCTOR(1.0MH,K)		
L3 ,4			L39-0080-15	PHASE-COMPENSATION COIL		
R7 ,8		*	RN14BK2C3160FTS	RN 316.0 F 1/6W		
R41 ,42			RD14AB2E330JTS	FL-PROOF RD 33 J 1/4W		
R43 ,44			RD14AB2E4R7JTS	FL-PROOF RD 4.7 J 1/4W		
R45 ,46			RS14DB3D100JTE	FL-PROOF RS 10 J 2W		
R47 ,48			RS14DB3D561JTE	FL-PROOF RS 560 J 2W		
R101			RD14AB2E102JTS	FL-PROOF RD 1.0K J 1/4W		
R109			RD14AB2E6R8JTS	FL-PROOF RD 6.8 J 1/4W		
R110		*	RD14AB2E82JTS	FL-PROOF RD 8.2K J 1/4W		
VR1 ,2	2B	*	R06-3050-05	POTENTIOMETER(10K) BASS,TREB		
VR3	2B	*	R06-5143-05	POTENTIOMETER(200K) BALANCE		
VR4	2B	*	R10-5021-05	POTENTIOMETER(100K) VOLUME		
K1			S51-2045-05	MAGNETIC RELAY		
S1	2B		S42-3093-05	MULTIPLE PUSH SWITCH(A,B,C)		

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S2	2B	*	S42-5045-05	MULTIPLE PUSH SWITCH(OPERATION)		
S3	2B	*	S42-2135-05	MULTIPLE PUSH SWITCH(CD,LINE)		
S4	2B		S40-4062-05	PUSH SWITCH (MUTING)		
S5	-8		S40-2200-05	PUSH SWITCH		
S9	1C		S90-0078-05	SLIDE SWITCH (REC OUT)		
S10	1C		S90-0062-05	SLIDE SWITCH (SPEAKER)		
D1	,2		1SS133	DIODE		
D1	,2		1SS176	DIODE		
D3			1SS131	DIODE		
D3			1SS178	DIODE		
D18	,19		RD13E(B2)	ZENER DIODE		
D20			1SS131	DIODE		
D20			1SS178	DIODE		
IC1		*	NJM4560D-A	IC		
Q1			2SC2167(O,Y)	TRANSISTOR		
Q2	,3		2SC2320(E,F)	TRANSISTOR		
Q2	,3		2SC945(A)(Q,P)	TRANSISTOR		
POWER AMP (X85-1020-13)						
C3	,4		CC45FSL1H101J	CERAMIC 100PF J		
C5	,6		CC45FSL1H47DJ	CERAMIC 47PF J		
C7	,8		CC45FSL1H181J	CERAMIC 180PF J		
C9	,10		CC45FSL1H15DJ	CERAMIC 15PF J		
C11	-14		CK45FF1H473Z	CERAMIC 0.047UF Z		
C15	,16		CK45FB1H681K	CERAMIC 680PF K		
R13	,14		RD14AB2E181JTS	FL-PROOF RD 180 J 1/4W		
R19	,20	*	RS14DB3A822JTE	FL-PROOF RS 8.2K J 1W		
R35	-38		RD14AB2E221JTS	FL-PROOF RD 220 J 1/4W		
D1	,2		1SS133	DIODE		
D1	,2		1SS176	DIODE		
Q1	,2		LPA68H(K,L)	DUAL FET		
Q3	-6		2SC2320(E,F)	TRANSISTOR		
Q3	-6		2SC945(A)(Q,P)	TRANSISTOR		
Q7	-10		2SA733(A)(Q,P)	TRANSISTOR		
Q7	-10		2SA999(E,F)	TRANSISTOR		
Q11	-14		2SC2632(Q,R,S)	TRANSISTOR		
Q15	,16		2SA1124(Q,R,S)	TRANSISTOR		
PRE AMP (X85-1060-00)						
C1	,2	*	CQ93HP2A392J	MYLAR 3900PF J		
C3	,4	*	CQ93HP2A113G	MYLAR 0.011UF G		
C5	,6	*	C91-0790-05	FILM 0.039UF J		
C7	,8	*	C90-1332-05	ELECTRO 10UF 25WV		
R5	,6	*	RN14BK2C10R0FTS	RN 10.0 F 1/6W		
R7	,8		RN14BK2C6811FTS	RN 6.81K F 1/6W		
R9	,10		RN14BK2C8252FTS	RN 82.5K F 1/6W		
D1	,2		RD5.1JS(B)	ZENER DIODE		
IC1			NJM5532D	IC(OP AMP X2)		
Q1	-4		2SC2320(E,F)	TRANSISTOR		
Q1	-4		2SC945(A)(Q,P)	TRANSISTOR		
Q5	-8	*	2SK371(BL)	FET		
Q5	-8	*	2SK371(V)	FET		

E: Scandinavia & Europe H: Audio Club K: USA

P: Canada

S: South Africa

T: England

U: PX(Far East, Hawaii)

UE: AAFES(Europe)

X: Australia

M: Other Areas

⚠ indicates safety critical components.

SPECIFICATIONS

Power Output

110 watts per channel minimum RMS, both channels driven at 8ohms from 20Hz to 20,000Hz with no more than 0.004% total harmonic distortion

Maximum Continuous Power Output (DIN) 1kHz at 4ohms	140W + 140W
Maximum Continuous Power Output (DIN) 1kHz at 8ohms	115W + 115W
Maximum Continuous Power Output (IEC/NF) from 63Hz to 12,500Hz, 0.7% Total Harmonic Distortion at 8ohms	115W + 115W
Total Harmonic Distortion	
(20Hz-20,000Hz, 8ohms)	0.004% at 110W
(1kHz, 8ohms)	0.002% at 110W
Inter Modulation Distortion	0.004% at rated power into 8 ohms
Frequency Response	1Hz to 180kHz / +0dB, -3dB
Phono Frequency Response	RIAA Standard curve ± 0.3 dB (20Hz to 20kHz)
Damping Factor (50Hz into 8ohms)	1,000
Signal to Noise Ratio (IHF-A)	
PHONO (MM)	88dB
PHONO (MC)	70dB
TUNER/CD/AUX/TAPE/VIDEO	108dB
Signal to Noise Ratio at Unweighted, 50mW Output (DIN)	
PHONO (MM)	60dB
PHONO (MC)	61dB
TUNER/CD/AUX/TAPE/VIDEO	62dB
Input Sensitivity/Impedance	
PHONO (MM)	2.5mV/ 47 kohms, 340 pF
PHONO (MC)	0.2mV/100 ohms, 560 pF
TUNER/CD/AUX/TAPE	150mV/ 47 kohms
Phono Maximum Input Level	
(MM)	200mV, 0.003% T.H.D. at 1kHz
(MC)	15mV, 0.003% T.H.D. at 1kHz
Output Level/Impedance	
TAPE REC	150mV/330 ohms
PRE OUT	2 V/600 ohms
Channel Separation (DIN) at 1,000Hz	
PHONO (Terminated with 2.2kohms)	60dB
AUX (Terminated with 47kohms + 250pF)	55dB
Tone Controls	
TREBLE	± 10 dB at 10kHz
BASS	± 10 dB at 100Hz
Subsonic Filter	6dB/oct. at 18Hz
Loudness Control (at ~ 30 dB Volume Level)	+9dB at 100Hz
Transient Response Risetime	1.7 μ s
General	
Power Requirements	120/220V, 50/60Hz
	240V, 50/60Hz
	110-120V/220-240V, 50/60Hz
	European Model
	Australia and U.K. Models
	Other Models
Power Consumption	220W
Dimensions	W 440mm (17-5/16")
	H 158mm (6-1/4")
	D 420mm (16-9/16")
Weight (Net)	13.5kg (3.0lb)
(IHF '66)	

Note:

We follow a policy of continuous advancements in development. For this reason specifications may be changed without notice.

Note:

Component and circuitry are subject to modification to insure best operation under differing local conditions. This manual is based on, the Europe (E) standard, and provides information on regional circuit modification through use of alternate schematic diagrams, and information on regional component variations through use of parts list.

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