

NIKKO PRE-AMP

BETA 20

STEREO PRE-AMPLIFIER



TYPE AND VOLTAGE

W-TYPE:	UL and CSA type	120V AC
E -TYPE:	NK-STD type	220V AC
B -TYPE:	BS type	240V AC

SERVICE MANUAL

CONTENTS

SPECIFICATIONS	1
BLOCK DIAGRAM	2
DISASSEMBLY	3
ALIGNMENT	4
PARTS LOCATION	5
SCHEMATIC DIAGRAM	6, 7
P. C. BOARD	8, 9
PARTS LIST	10~ 12
SEMICONDUCTOR DATA,	
TRANSISTORS	13
FIELD EFFECT TRANSISTORS	13
DIODES, LED'S	13
ZENER DIODES	13
INTEGRATED CIRCUITS	14

SPECIFICATIONS

Pre Amplifier Section

Total Harmonic Distortion (20 to 20,000 Hz),
 Phono (MC) to Tape Out (at 4 V output)
no more than 0.004 %
 Phono (MM) to Tape Out (at 4 V output)
no more than 0.004 %
 Aux to Pre Out (at 4 V output)
no more than 0.007 %

Input Sensitivity (1000 Hz, 1 V output),
 Phono (MC): 0.2 mV $\pm$ 2 dB
 Phono (MM): 2.0 mV $\pm$ 2 dB
 Tuner: 110 mV $\pm$ 2 dB
 Aux: 110 mV $\pm$ 2 dB
 Tape 1, 2: 110 mV $\pm$ 2 dB

Input Impedance (1000 Hz),
 Phono (MC): 100 $\pm$ 10 ohms
 Phono (MM): 47 $\pm$ 5 kohms
 Aux: 47 $\pm$ 5 kohms
 Tape 1, 2: 47 $\pm$ 5 kohms

Maximum Input Signal (1000 Hz, 0.1 % THD),
 Phono (MC): more than 25 mV
 Phono (MM): more than 250 mV

General

Power Requirement,
 U. S. A. & Canada model: AC 120V/60 Hz
 European model: AC 220V/50 Hz
 U. K. model: AC 240V/50 Hz
 Power Consumption: 18 watts

Output Level (1000 Hz),
 Tape Out: 110 mV $\pm$ 2 dB
 Pre Out: 1000 mV $\pm$ 2 dB

Signal to Noise Ratio with IHF-A Network,
 Phono (MC): more than 67 dB
 Phono (MM): more than 80 dB
 Tuner: more than 95 dB
 Aux: more than 95 dB
 Tape In 1, 2: more than 95 dB

Frequency Response (10 ~ 100,000 Hz),
 Tuner: +0, -1 dB
 Aux: +0, -1 dB
 Tape In 1, 2: +0, -1 dB

RIAA Equalization Deviation (20 ~ 20,000 Hz),
 Phono (MM) to Tape Out: $\pm$ 0.5 dB

Tone Controls,
 Bass (70 Hz): $\pm$ 8 dB
 Treble (10,000 Hz): $\pm$ 8 dB

Subsonic Filter: 15 Hz, 12 dB/oct.
 Mute Time: 7 $\pm$ 2 seconds

Dimensions,
 Width: 482 mm, 19 inches
 Height: 70 mm, 2-3/4 inches
 Depth: 330 mm, 13 inches

Weight,
 Without package: 5.2 kg, 11.4 lbs
 With package: 6.6 kg, 14.5 lbs

* Specifications are subject to change without notice.

BLOCK DIAGRAM

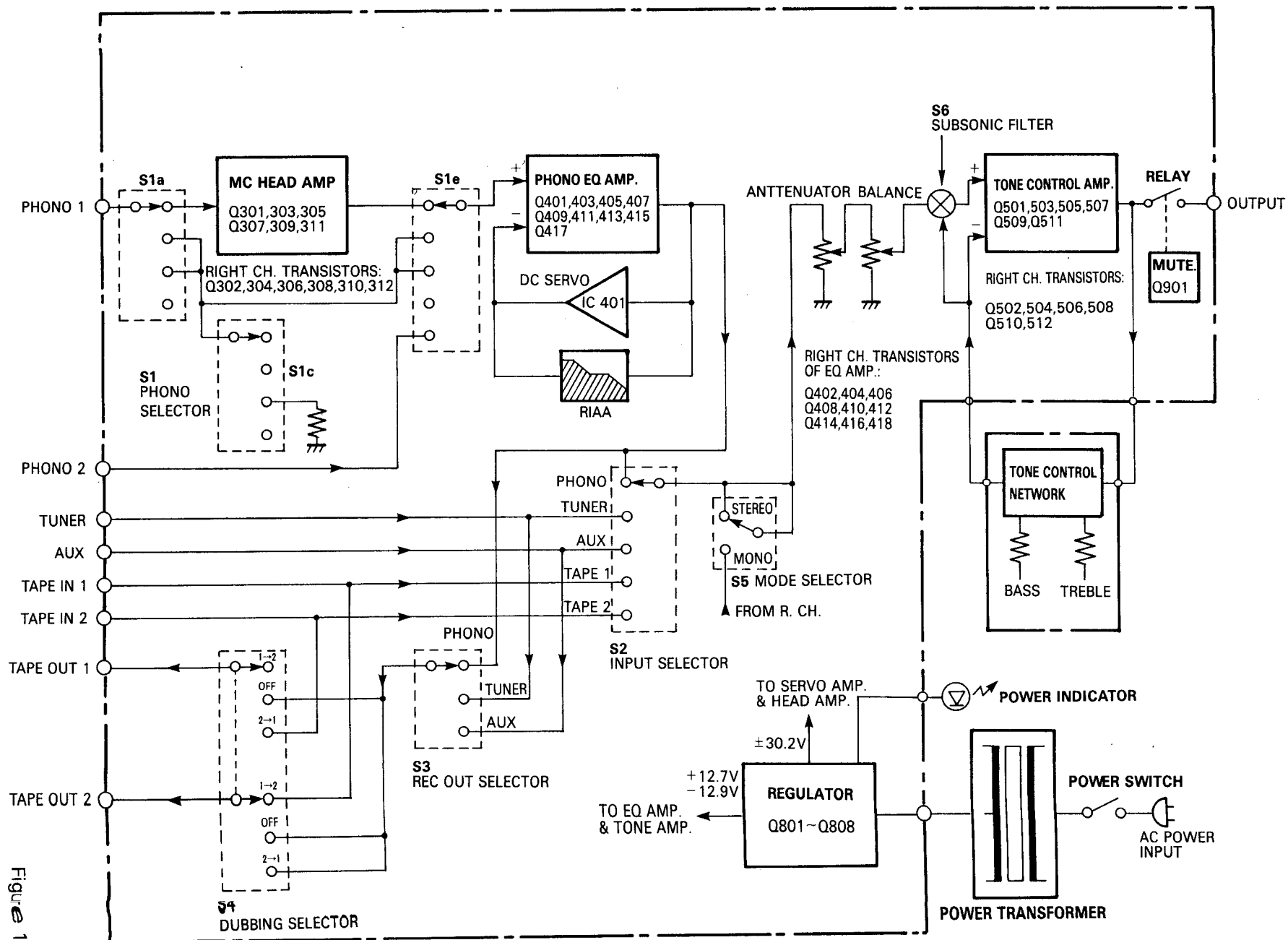


Figure 1

DISASSEMBLY

1. CABINET COVER REMOVAL

- Remove four tapping screws from the top of the metal cover.
- Remove four screws from both sides of the metal cover.
- Lift the cabinet cover away from the unit.

2. BOTTOM PLATE REMOVAL

- Remove eight tapping screws (#1 ~ #8) as shown in Photo 1.

3. FRONT PANEL REMOVAL

- Remove two knobs (#1 and #2) (Photo 2) from the front panel by pulling them forward.
- Using a hexagonal wrench, remove five knobs (#3 ~ #7) as shown in Photo 2.
- Remove two nuts (#8 and #9) (Photo 2) and lift out the front panel.

4. POWER TRANSFORMER REMOVAL

- Disconnect all wires from the power transformer.
- Remove two screws (#10 and #11) (photo 2) and lift the power transformer up and out of chassis.

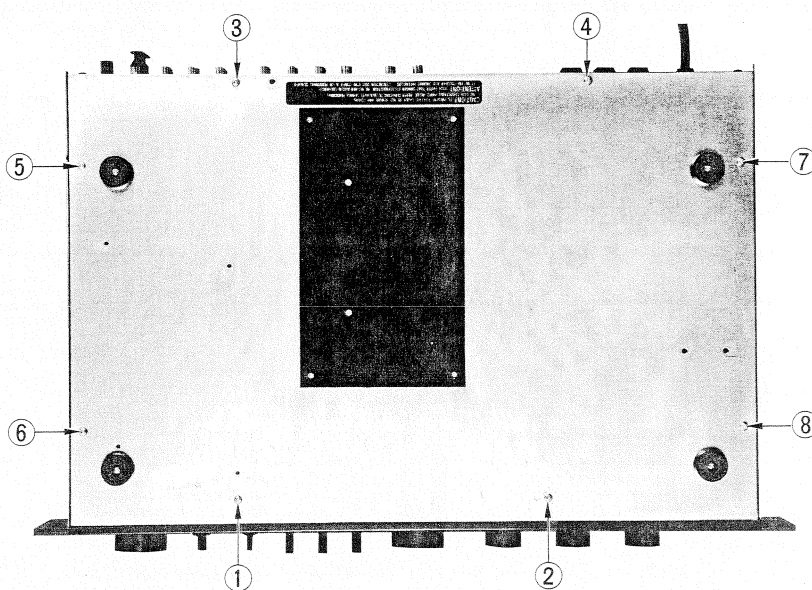


Photo 1

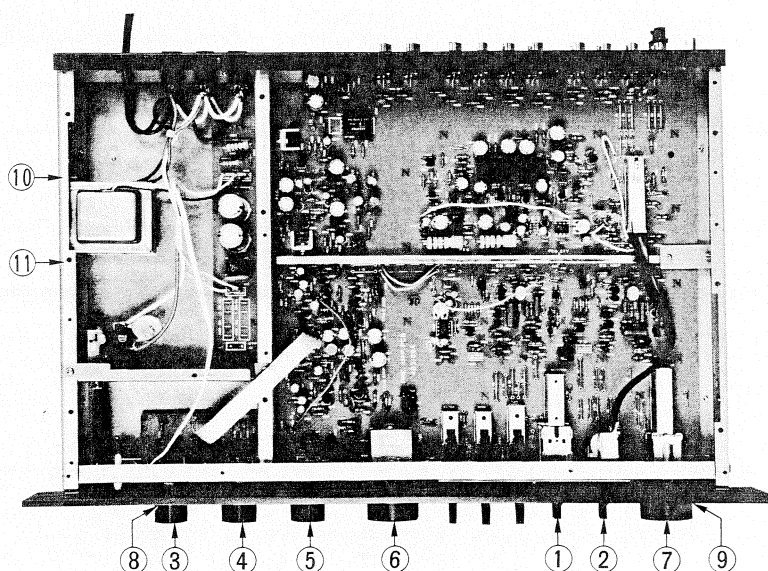


Photo 2

ALIGNMENT

GENERAL ALIGNMENT INSTRUCTIONS

- 1. Allow a minimum of 10 minutes warm-up for the unit.
- 2. When adjusting, voltmeter's needle may swing backward. In this case, simply reverse the voltmeter connection.

DC BALANCE ADJUSTMENT (EQ AMP SECTION)

- 1. Set the Phono Selector Switch to "PHONO 1 47 kohm" position.
- 2. Insert short-pin-plugs to the PHONO 1 input terminals on the rear panel.
- 3. Connect a DC voltmeter to the test points marked "TP" on the Pre Amp PC Board. (refer to Photo 3)
- 4. Adjust the potentiometer R455 (left channel) or R456 (right channel) so that the DC voltmeter indicates 0 ± 1 mV.

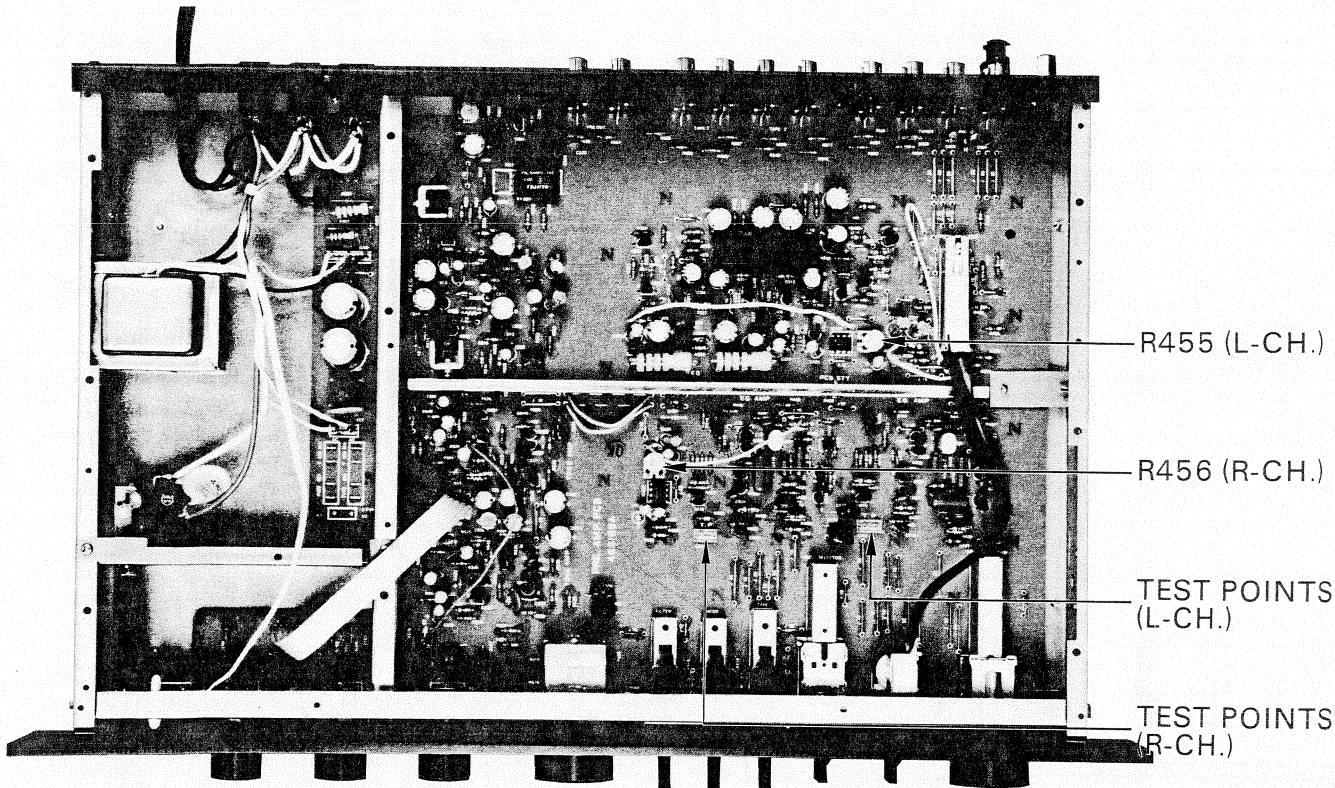


Photo 3

PARTS LOCATION

NOTE: Numbers of three digits with a  are related to the KEY NUMBER on parts list.

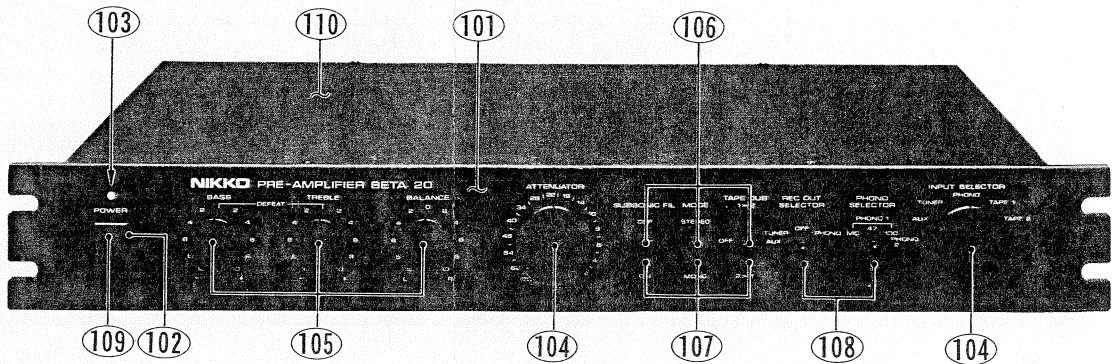


Photo 4

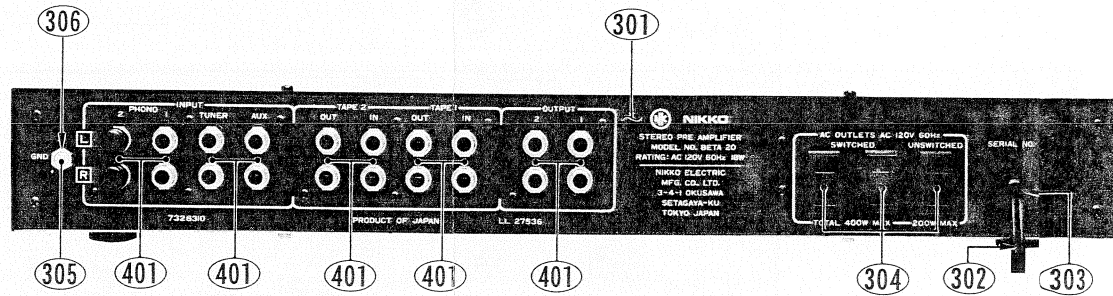


Photo 5

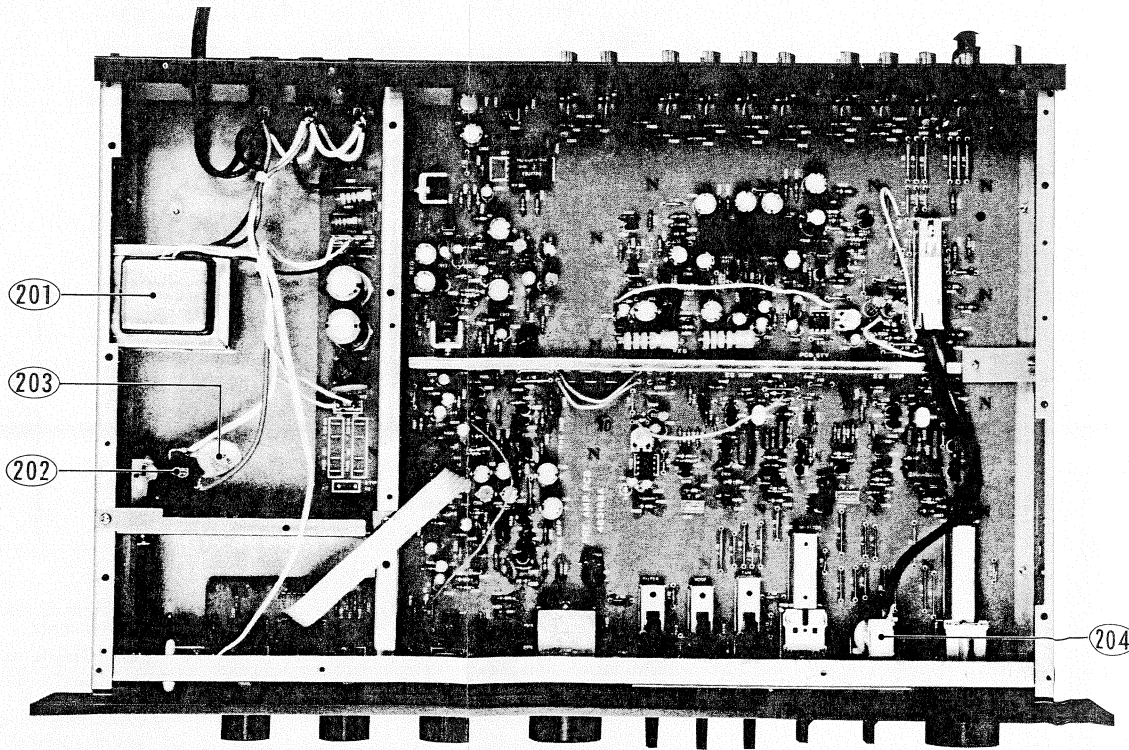
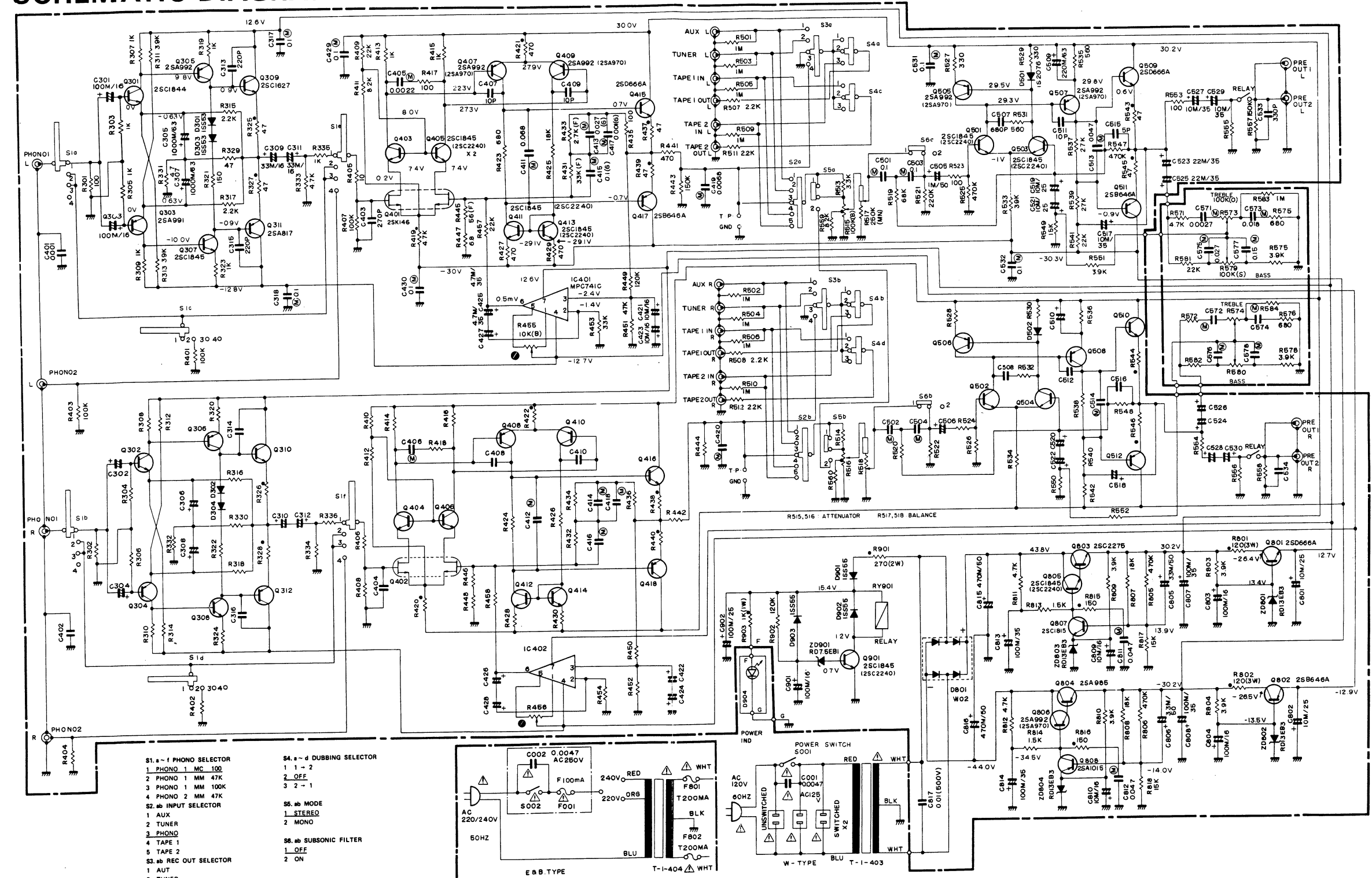


Photo 6

SCHEMATIC DIAGRAM



SEMICONDUCTORS	
	2SA817 2SA970 2SA991 2SA992 2SA1015 2SB46A 2SC1627 2SC1815 2SC1844 2SC1845 2SC2240 2SD666A
	2SA985 2SD275
	2K145
	1S53 1S55 1N274 R13E83

P.C. BOARD (BOTTOM VIEW)

PRE-AMP PCB

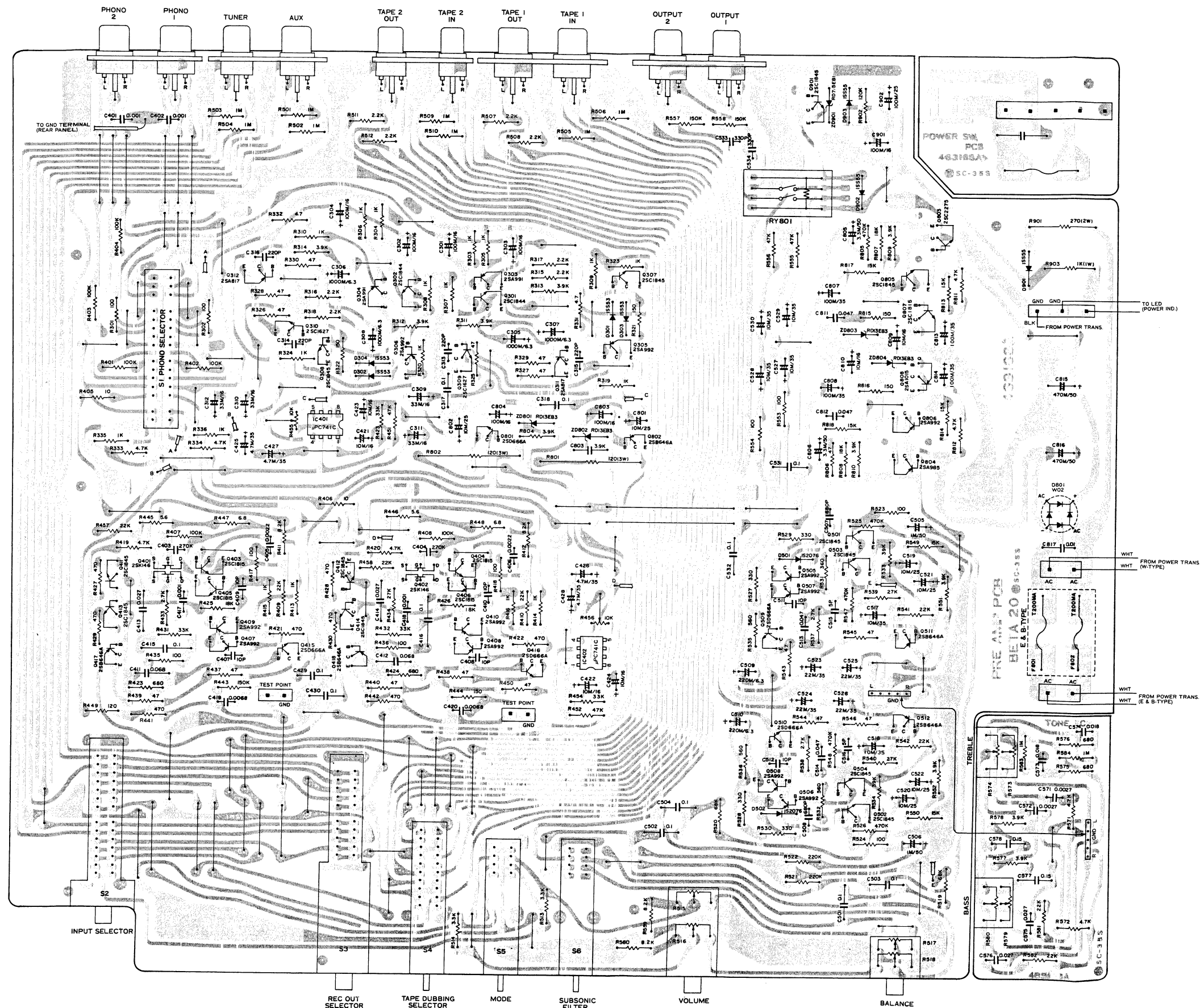


Figure 3

PARTS LIST

NOTES:

- ★ The KEY NUMBER (#) marked with a (★) on parts list relate to number of three digits with a (○). (Photo 4-6)
- + Numerals in file indicate the quantity of parts used in one type.
- ++ TR : Transistor
FET : Field effect transistor
VR : Volume control (Variable resistor)
RES : Carbon film fixed resistor
MO-RES : Metal oxide film fixed resistor
CEM-RES : Cemented wirewound fixed resistor
FP : Flame proof
C-CAP : Ceramic capacitor
E-CAP : Aluminum electrolytic capacitor
M-CAP : Polyester film capacitor
S-CAP : Polystyrene film capacitor
T-CAP : Tantalum electrolytic capacitor
BP-CAP : Bipolar electrolytic capacitor
LC-CAP : Low current leakage electrolytic capacitor.

- Assemblies and parts are subject to change without notice.

5. Parts ordering procedure:

- DO NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only)
- Include in any order
 - Part number.
 - Part description.
 - Model number.
 (any of the above lacking from an order may delay shipment of that order.)

CAUTION:

The Δ mark, the KEY NO. and the SYMBOL NO. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

KEY NO.	SYMBOL NO.	TYPE ⁺ WEB	DESCRIPTION	PART NO.
PACKING MATERIALS & ACCESSORIES				
001	1 1 1		Carton box	9825710
002	2 2 2		Pad	9840930
003	1 1 1		Sack, polyethylene cloth	9640720
004	1 1 1		Sack, polyethylene cloth — #13	9640320
005a	1 —		Manual, instructions — in English and French	960338E
005b	— 1 1		Manual, instructions — in five different languages	960337K
006	1 —		Card, warranty	967010A
007	1 —		Manual, safety instructions	9670410
008	1 —		List, service stations	9690210
009	1 1 1		Cord, RCA phono pin plug — 2T-1 (NK)	962014A
010	2 2 2		Short pin plug	4440180
CABINET ASSEMBLY				
*101a	1 1 1		Panel, front — SILVER	7884980
*101b	1 1 1		Panel, front — BLACK	7884990
*102	1 1 1		Guide, button — P15SQ-BK — power switch	7402680
*103	1 1 1		Globe, LED — power indicator	7402120
*104a	2 2 2		Knob — 2GL-34D — attenuator/input selector, SILVER	7851460
*104b	2 2 2		Knob — 2BK-34D — attenuator/input selector, BLACK	7851740
*105a	3 3 3		Knob — 2GL-23D — bass/treble/balance, SILVER	7851670
*105b	3 3 3		Knob — 2BK-23D — bass/treble/balance, BLACK	7851770
*106a	3 3 3		Knob, lever — P4525SGL — SILVER	7852580
*106b	3 3 3		Knob, lever — P4525BLK — BLACK	7852370
*107a	3 3 3		Blind, lever knob — SILVER	7002480
*107b	3 3 3		Blind, lever knob — BLACK	7002490
*108	2 2 2		Knob, — P2BK-1613-DL — rec out/phono selector	7852350
*109a	1 1 1		Button, push — M15SQ-GL — power, SILVER	7852380
*109b	1 1 1		Button, push — M15SQ-BK — power, BLACK	7852390
*110a	1 —		Cover, top	7820870
*110b	— 1 1		Cover, top — (D)	7820880
111	1 1 1		Plate, bottom	7326410
112	4 4 4		Foot, polyethylene — 22 ϕ x 10	7401350
CHASSIS ASSEMBLY				
*201a	1 —		Transformer, power — T-1-403 — AC120V	1104030
*201b	— 1 1		Transformer, power — T-1-404 — AC220 or 240V	1104040
*202	1 —		Switch, push — U62S-TV-5 — power	4041480
*203	1 —		C-CAP 0.0047 μ f AC125V	239472C
*204	1 1 1		Switch, rotary — ESA-333033B — phono selector	4051130

KEY NO.	SYMBOL NO.	TYPE ⁺ WEB	DESCRIPTION	PART NO.
BACK PLATE ASSEMBLY				
*301a	1 —		Plate, back — (W)	7326310
*301b	— 1 1		Plate, back — (E)	7326320
*302a	1 —		Cord, AC line — DP-70	606007A
*302b	— 1 —		Cord, AC line — CEE-2T	600510A
*302c	— 1 —		Cord, AC line — BS	600514A
*303a	1 —		Bush, power cord — SR3P-4	7400620
*303b	— 1 1		Bush, power cord — SR4N-4	7400690
*304	3 —		Socket — AC outlets	4500190
*305	1 1 1		Shaft, GND terminal — MK-3	7152050
*306	1 1 1		Nut, GND terminal — MK-2	7152060
PRE AMPLIFIER PC BOARD ASSEMBLY				
*401	5 5 5		Terminal, RCA phono pin jack — 2P x 2	4444070
(MC HEAD AMP SECTION)				
Q301,302	2 2 2		TR 2SC1844 (E or F)	512106S
Q303,304	2 2 2		TR 2SA991 (E or F)	510104S
Q305,306	2 2 2		TR 2SA992 (E or F)	510110S
Q307,308	2 2 2		TR 2SC1845 (E or F)	512115S
Q309,310	2 2 2		TR 2SC1627 (Y)	511017S
Q311,312	2 2 2		TR 2SA817 (Y)	510047S
D301~304	4 4 4		Diode 1SS53	501023S
C301~304	4 4 4		E-CAP 100 μ f 16V	211230Q
C305~308	4 4 4		E-CAP 1000 μ f 6.3V	211040S
C309~312	4 4 4		E-CAP 33 μ f 16V	211223Q
C313~316	4 4 4		C-CAP 220pf 50V SL	232221K
C317,318	2 2 2		M-CAP 0.1 μ f 10% 50V	222104K
R301,302	2 2 2		RES 100ohm 5% $\frac{1}{4}$ W	328101J
R303~310	8 8 8		RES 1kohm 5% $\frac{1}{4}$ W	328102J
R311~314	4 4 4		RES 3.9kohm 5% $\frac{1}{4}$ W	328392J
R315~318	4 4 4		RES 2.2kohm 5% $\frac{1}{4}$ W	328222J
R319,320	2 2 2		RES 1kohm 5% $\frac{1}{4}$ W	328102J
R321,322	2 2 2		RES 150ohm 5% $\frac{1}{4}$ W	328151J
R323,324	2 2 2		RES 1kohm 5% $\frac{1}{4}$ W	328102J
R325~328	4 4 4		FP-RES 47ohm 5% $\frac{1}{4}$ W	328470L
R329,330	2 2 2		RES 47ohm 5% $\frac{1}{4}$ W	328470J
R331,332	2 2 2		RES 4.7ohm 5% $\frac{1}{4}$ W	328478J
R333,334	2 2 2		RES 4.7kohm 5% $\frac{1}{4}$ W	328472J
R335,336	2 2 2		RES 1kohm 5% $\frac{1}{4}$ W	328102J
(EQUALIZER AMP SECTION)				
S1	1 1 1		Switch, rotary slide — ESA-2643 — phono selector	4020670
Q401,402	2 2 2		FET 2SK146 (GR)	516036S
Q403~406	4 4 4		TR 2SC1815 (Y or GR)	512107S
Q407~410	4 4 4		TR 2SA992 (E or F)	510110S
Q407~410	4 4 4		TR 2SA970 (GR or BL)	510116S
Q411~414	4 4 4		TR 2SC1845 (E or F)	512115S
Q411~414	4 4 4		TR 2SC2240 (GR or BL)	512102S

PART ORDERING PROCEDURE ----- DO NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) Include in any order: a. Part number, b. Part description, c. Model number. (any of the above lacking from an order may delay shipment of the order.)

KEY NO.	SYMBOL NO.	TYPE ⁺ WEB	DESCRIPTION ⁺⁺	PART NO.
C401,402	2 2 2		C-CAP 0.001 μ f +80, -20% 50V YG	231102Z
C403,404	2 2 2		C-CAP 220pf 10% 50V SL	232221K
C405,406	2 2 2		M-CAP 0.0022 μ f 10% 50V	222222K
C407~410	4 4 4		C-CAP 10pf 10% 50V SL	232100K
C411,412	2 2 2		M-CAP 0.068 μ f 10% 50V	222683K
C413,414	2 2 2		M-CAP 0.022 μ f 2% 50V	228273G
C415,416	2 2 2		M-CAP 0.1 μ f 2% 50V	228104G
C417,418	2 2 2		M-CAP 0.001 μ f 2% 50V	228102G
C419,420	2 2 2		M-CAP 0.0068 μ f 10% 50V	222682K
C429,430	2 2 2		M-CAP 0.1 μ f 10% 50V	222104K
R401~404	4 4 4		RES 100kohm 5% $\frac{1}{4}$ W	328104J
R405,406	2 2 2		RES 10ohm 5% $\frac{1}{4}$ W	328100J
R407,408	2 2 2		RES 100kohm 5% $\frac{1}{4}$ W	328104J
R409,410	2 2 2		RES 22kohm 5% $\frac{1}{4}$ W	328223J
R411,412	2 2 2		RES 8.2kohm 5% $\frac{1}{4}$ W	328822J
R413~416	4 4 4		RES 1kohm 5% $\frac{1}{4}$ W	328102J
R417,418	2 2 2		RES 100ohm 5% $\frac{1}{4}$ W	328101J
R419,420	2 2 2		FP-RES 4.7kohm 5% $\frac{1}{4}$ W	328472L
R421,422	2 2 2		FP-RES 470ohm 5% $\frac{1}{4}$ W	328471L
R423,424	2 2 2		RES 680ohm 5% $\frac{1}{4}$ W	328681J
R425,426	2 2 2		RES 18kohm 5% $\frac{1}{4}$ W	328183J
R427~430	4 4 4		RES 470ohm 5% $\frac{1}{4}$ W	328471J
R431,432	2 2 2		RES, metal film 33kohm 1% $\frac{1}{4}$ W	304333F
R433,434	2 2 2		RES, metal film 2.7kohm 1% $\frac{1}{4}$ W	304272F
R435,436	2 2 2		RES 100ohm 5% $\frac{1}{4}$ W	328101J
R437~440	4 4 4		FP-RES 47ohm 5% $\frac{1}{4}$ W	328470L
R441,442	2 2 2		RES 470ohm 5% $\frac{1}{4}$ W	328471J
R443,444	2 2 2		RES 150kohm 5% $\frac{1}{4}$ W	328154J
R445,446	2 2 2		RES, metal film 56ohm 1% $\frac{1}{4}$ W	304560F
(SERVO AMP SECTION)				
IC401,402	2 2 2		IC μ PC741C	518088S
C421~428	8 8 8		E-CAP 10 μ f 16V	211220Q
C449,450	2 2 2		RES 120kohm 5% $\frac{1}{4}$ W	328124J
R451,452	2 2 2		RES 47kohm 5% $\frac{1}{4}$ W	328473J
R453,454	2 2 2		RES 33kohm 5% $\frac{1}{4}$ W	328333J
R455,456	2 2 2		Potentiometer — 10kohm (B)	4301280
R457,458	2 2 2		RES 22kohm 5% $\frac{1}{4}$ W	328223J
S2	1 1 1		Switch, rotary-slide — SRZ-W 45S — input selector	4055200
S3	1 1 1		Switch, rotary-slide — SRZ-W 44N — rec out selector	4055210
S4	1 1 1		Switch, lever — SLR-843 — tape dubbing selector	4025510
S5, 6	1 1 1		Switch, lever — SLR-822 — subsonic filter/mode	4025550
R515,516	2 2 2		VR AP25GPHAN — 100kohm (B) x 2 — attenuator	4390170
R517,518	2 2 2		VR GM70E745C — 250kohm (M, N) — balance	4321130
Q501~504	4 4 4		TR 2SC1845 (E or F)	512115S
Q501~504	4 4 4		TR 2SC2240 (GR or BL)	512102S
Q505~508	4 4 4		TR 2SA992 (E or F)	510110S
Q505~508	4 4 4		TR 2SA970 (GR or BL)	510116S
Q509,510	2 2 2		TR 2SD666A (B or C)	511025S
Q511,512	2 2 2		TR 2SB646A (B or C)	510052S
D501,502	2 2 2		Diode 1S2076	501019S
C505,506	2 2 2		E-CAP 1 μ f 50V	211510Q
C507,508	2 2 2		C-CAP 680pf 10% 50V SL	232681K
C509,510	2 2 2		E-CAP 220 μ f 6.3V	211032Q
C511,512	2 2 2		C-CAP 10pf 10% 50V SL	232100K
C513,514	2 2 2		M-CAP 0.047 μ f 10% 50V	222473K
C515,516	2 2 2		C-CAP 5pf 10% 50V SL	232509D
C517,518	2 2 2		E-CAP 10 μ f 35V	211420Q
C519~522	4 4 4		E-CAP 10 μ f 25V	211320Q
C523~526	4 4 4		E-CAP 22 μ f 35V	211422Q
C527~530	4 4 4		E-CAP 10 μ f 35V	211420Q
C531,532	2 2 2		M-CAP 0.1 μ f 10% 50V	222104K

KEY	SYMBOL	TYPE ⁺	DESCRIPTION ⁺⁺					PART
NO.	NO.	WEB						NO.
	C533,534	2 2 2	C-CAP	330pf	10%	50V	SL	232331K
	R501~506	6 6 6	RES	1meg-ohm	5%	¼W		328105J
	R507,508	2 2 2	RES	2.2kohm	5%	¼W		328222J
	R509,510	2 2 2	RES	1meg-ohm	5%	¼W		328105J
	R511,512	2 2 2	RES	2.2kohm	5%	¼W		328222J
	R513,514	2 2 2	RES	3.3kohm	5%	¼W		328332J
	R523,524	2 2 2	RES	100ohm	5%	¼W		328101J
	R525,526	2 2 2	RES	470kohm	5%	¼W		328474J
	R527~530	4 4 4	RES	330ohm	5%	¼W		328331J
	R531,532	2 2 2	RES	560ohm	5%	¼W		328561J
	R533,534	2 2 2	RES	39kohm	5%	¼W		328393J
	R535,536	2 2 2	RES	560ohm	5%	¼W		328561J
	R537,538	2 2 2	RES	2.7kohm	5%	¼W		328272J
	R539,540	2 2 2	RES	27kohm	5%	¼W		328273J
	R541,542	2 2 2	RES	22kohm	5%	¼W		328223J
	R543~546	4 4 4	FP-RES	47ohm	5%	¼W		328470L
	R547,548	2 2 2	RES	470kohm	5%	¼W		328474J
	R549,550	2 2 2	RES	15kohm	5%	¼W		328153J
	R551,552	2 2 2	RES	3.9kohm	5%	¼W		328392J
	R553,554	2 2 2	RES	100ohm	5%	¼W		328101J
	R555,556	2 2 2	RES	47kohm	5%	¼W		328473J
	R557,558	2 2 2	RES	150kohm	5%	¼W		328154J
	R559,560	2 2 2	RES	8.2kohm	5%	¼W		328822J
(REGULATOR SECTION)								
	F801,802	— 2 2	Midget fuse	— T200MA 250V				4720440
	Q801	1 1 1	TR	2SD666A	(B or C)			511025S
	Q802	1 1 1	TR	2SB646A	(B or C)			510052S
	Q803	1 1 1	TR	2SC2275	(L or M)			512120S
	Q804	1 1 1	TR	2SA985	(L or M)			510118S
	Q805	1 1 1	TR	2SC1845	(E or F)			512115S
	(Q805)	1 1 1	TR	2SC2240	(GR or BL)			512102S
	Q806	1 1 1	TR	2SA992	(E or F)			510110S
	(Q806)	1 1 1	TR	2SA970	(GR or BL)			510116S
	Q807	1 1 1	TR	2SC1815	(Y or GR)			512107S
	Q808	1 1 1	TR	2SA1015	(Y or GR)			510102S
	D801	1 1 1	Diode	W02				560061S
	ZD801~804	4 4 4	Zener diode	RD13EB3				502063S
	C801,802	2 2 2	E-CAP	10µf	25V			211320Q
	C803,804	2 2 2	E-CAP	100µf	16V			211230Q
	C805,806	2 2 2	E-CAP	3.3µf	50V			211513Q
	C807,808	2 2 2	E-CAP	100µf	35V			211430Q
	C809,810	2 2 2	E-CAP	10µf	16V			211220Q
	C811,812	2 2 2	M-CAP	0.047µf	10%	50V		222473K
	C813,814	2 2 2	E-CAP	100µf	35V			211430Q
	C815,816	2 2 2	E-CAP	470µf	50V			211535Q
	C817	1 1 1	C-CAP	0.01µf	500V			238103P
	R801,802	2 2 2	FP-MO-RES	120ohm	5%	3W		363121L
	R803,804	2 2 2	RES	3.9kohm	5%	¼W		328392J
	R805,806	2 2 2	RES	470kohm	5%	¼W		328474J
	R807,808	2 2 2	RES	18kohm	5%	¼W		328183J
	R809,810	2 2 2	RES	3.9kohm	5%	¼W		328392J
	R811,812	2 2 2	FP-RES	4.7kohm	5%	¼W		328472L
	R813,814	2 2 2	FP-RES	1.5kohm	5%	¼W		328152L
	R815,816	2 2 2	FP-RES	150ohm	5%	¼W		328151L
	R817,818	2 2 2	RES	15kohm	5%	¼W		328153J
(MUTING SECTION)								
	RY901	1 1 1	Reed relay	— FRL644D				1700140
	Q901	1 1 1	TR	2SC1845	(E or F)			512115S
	(Q901)	1 1 1	TR	2SC2240	(GR or BL)			512102S
	D901~903	3 3 3	Diode	1SS55				501024S
	ZD901	1 1 1	Zened diode	RD7. 5EB1				502062S
	C901	1 1 1	E-CAP	100µf	16V			211230Q
	C902	1 1 1	E-CAP	100µf	25V			211330Q
	R901	1 1 1	FP-MO-RES	270ohm	5%	2W		362271L
	R902	1 1 1	RES	120kohm	5%	¼W		328124J
	R903	1 1 1	FP-MO-RES	1kohm	5%	1W		361102L

PART ORDERING PROCEDURE ----- DO NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER: (these are control # for the factory only.) Include in any order: a. Part number, b. Part description, c. Model number. (any of the above lacking from an order may delay shipment of the order.)

KEY	SYMBOL	TYPE ⁺	DESCRIPTION ⁺⁺	PART
NO.	NO.	W E B		NO.
(TONE CONTROL SECTION)				
R573,574	1 1 1	VR	GM70EE71C - 100kohm x 2 - treble	4321140
R579,580	1 1 1	VR	GM70EE72C - 100kohm x 2 - bass	4321150
C571,572	2 2 2	M-CAP	0.0027 μ f 10% 50V	222272K
C573,574	2 2 2	M-CAP	0.018 μ f 10% 50V	222183K
C574,576	2 2 2	M-CAP	0.027 μ f 10% 50V	222273K
C577,578	2 2 2	M-CAP	0.15 μ f 10% 50V	222154K
R571,572	2 2 2	RES	4.7kohm 5% $\frac{1}{4}$ W	328472J
R575,576	2 2 2	RES	680ohm 5% $\frac{1}{4}$ W	328681J
R577,578	2 2 2	RES	3.9kohm 5% $\frac{1}{4}$ W	328392J
R581,582	2 2 2	RES	22kohm 5% $\frac{1}{4}$ W	328223J
R583,584	2 2 2	RES	1 meg.ohm 5% $\frac{1}{4}$ W	328105J

KEY	SYMBOL	TYPE ⁺	DESCRIPTION ⁺⁺	PART
NO.	NO.	W E B		NO.
(POWER SWITCH SECTION)				
SW2	- 1 1	Switch, push	ESB-70823S - power	4041600
C002	- 1 1	M-CAP	0.0047 μ f AC250V	283472M
F001	- 1 1	Midget fuse	T100MA 250V	4720430
(POWER INDICATOR SECTION)				
D904	1 1 1	LED	BR5504S	5060300
	1 1 1	Spacer, LED		7903110

SEMICONDUCTOR DATA

TRANSISTORS

† NOTES Ge: Germanium A : Alloy Df: Drift-field M : Mesa
 Si: Silicon B : Base E : Epitaxial P : Planer
 D : Diffused G : Grown Pc : Point-contact
 Dd: Double-diffused J : Junction Td : Triple-diffused

DEVICE TYPE	APPLICATIONS	STRUC- TURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T _A = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (T _A = 25°C unless otherwise specified)															MANU- FACTURER
			Collector- to-Base Voltage V _{CB0} (V)	Emitter- to-Base Voltage V _{EB0} (V)	Collector Current I _C (mA)	Collector Dissipa- tion P _C (mW)	Junction Tempera- ture T _J (°C)	Collector Cutoff Current		Static Forward-Current Transfer Ratio			Collector-Emitter Saturation Voltage			Gain-Bandwidth Product			Output Capaci- tance C _{ob} (pF)	Others			
								I _{CBO} (μA)	V _{CB} (V)	h _{FE}	V _{CE} (V)	I _C (mA)	V _{CE(sat)} (V)	I _C (mA)	I _B (mA)	f _T (MHz)	V _{CE} * (V)	I _E * (mA)					
2SA817 (Y)	AF, Driver	PNP Si-E	-80	-5	-300	600	150	-0.1 max.	-50	120 ~ 240	-2	50	-0.4 max.	-200	-20	100	-10	-10*	14	Complementary to 2SC1627	TOSHIBA		
2SA991 (E, F)	AF, Low noise	PNP Si-E	-80	-5	-100	500	125	-0.05 max.	-60	300 ~ 800	-6	-0.1	-0.5 max.	-100	-10	90	-6	1	10 max.	Complementary to 2SC1844	N E C		
2SA992 (E, F)	AF, Low noise	PNP Si-E	-120	-5	-50	500	125	-0.05 max.	-120	300 ~ 800	-6	-0.1	-0.3 max.	-10	-1	100	-6	1	3 max.	Complementary to 2SC1845	N E C		
2SA985 (P, Q)	AF, Power amp	PNP Si-E	-120	-5	-1.5A	25W (T _C = 25°C)	150	-1 max.	-120	100 ~ 320	-5	-300	-2 max.	-1A	-100	180	-5	-200*	29	Complementary to 2SC2275	N E C		
2SA1015 (Y, GR)	AF, General	PNP Si-E	-50	-5	-150	400	125	-0.1 max.	-50	120 ~ 400	-6	-2	-0.3 max.	-100	-10	80 min.	-10	-1*	7 max.	Complementary to 2SC1815	TOSHIBA		
2SB646A (B, C)	AF, Driver	PNP Si-E	-120	-5	-50	900	150	-10 max.	-100	60 ~ 200	-5	-10	-2 max.	-30	-3	140	-5	-10*	4	Complementary to 2SD666A	HITACHI		
2SC1627 (Y)	AF, Driver	NPN Si-E	80	5	300	600	150	0.1 max.	50	120 ~ 240	2	50	0.5 max.	200	10	100	10	10*	10	Complementary to 2SA817	TOSHIBA		
2SC1815 (Y, GR)	AF, General	NPN Si-E	60	5	150	400	125	0.1 max.	60	120 ~ 400	6	2	0.25 max.	100	10	80 min.	10	1*	3 max.	Complementary to 2SA1015	TOSHIBA		
2SC1844 (E, F)	AF, Low noise	NPN Si-E	60	5	100	500	125	0.05 max.	60	300 ~ 800	6	1	0.3 max.	100	10	100	6	-1	8 max.	Complementary to 2SA991	N E C		
2SC1845 (E, F)	AF, Low noise	NPN Si-E	120	5	50	500	125	0.05 max.	120	300 ~ 800	6	1	0.3 max.	10	1	110	6	-1	2.5 max.	Complementary to 2SA992	N E C		
2SC2275 (P, Q)	AF, Power amp	NPN Si-E	120	5	1.5A	25W (T _C = 25°C)	150	1 max.	120	100 ~ 320	5	300	2 max.	1A	100	200	5	200*	19	Complementary to 2SA985	N E C		
2SD666A (B, C)	AF, Driver	NPN Si-E	120	5	50	900	150	10 max.	100	60 ~ 200	5	10	2 max.	30	3	140	5	10*	3	Complementary to 2SB646A	HITACHI		

FIELD EFFECT TRANSISTOR

DEVICE TYPE	APPLICA- TIONS	STRUC- TURE †	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25° C unless otherwise specified)							ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25° C unless otherwise specified)													MANU- FACTURER
			Gate-to- Drain Voltage VGS0 (V)	Gate-to- Source Voltage VGS0 (V)	Gate Current IG (mA)	Drain Current ID (mA)	Total Dissipation PD (mW)	Channel Temperature Tch (°C)	Gate Leak Current IGSS (nA)	Gate to Drain Breakdown Voltage		Drain Current IDSS (mA)	Gate to Source Cutoff Voltage		Forward Transfer Admittance		Feed Back Capacitance		Power Gain (Common Source)		Noise Figure		
										Test Conditions	VDS (V)		Test Conditions	VBI0 GDO (V)	Test Conditions	IDSS (mA)	Test Conditions	VGS (off) (V)	Test Conditions	Yfe (mS)	Test Conditions	Ciss (pF)	
2SK146 (GR)	AF, Low noise Differential amp	Si N-channel junction (Dual)	-40		10	600/ unit	125	VGS = -30V VDS = 0	-1	VDS IG = -100uA	-40 min.	VDS = 10V VGS = 0	5 ~ 10	VDS = 10V ID = 8mA VGS = 0	48	VDS = 10V ID = 0 f = 1 MHz	15			VDS = 10V ID = 5mA f = 1 kHz	1	TOSHIBA	

DIODES, LED'S

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T _A = 25°C unless otherwise specified)										ELECTRICAL CHARACTERISTICS Typical Values: (T _A = 25°C unless otherwise specified)										MANU- FACTURER
			Reverse Surge Voltage V _{RSurge} (V)	Peak Reverse Voltage V _{RM} (V)	Reverse Voltage V _R (V)	Peak Forward Voltage V _{FM} (V)	Average Forward Current I _{FM} (mA)	Forward Rectified Current I _O (mA)	Forward Surge Current I _{F surge} (A)	Junction Temperature T _J (°C)	Total Power Dissipation P _D (mW)	Forward Current I _{Fmin} (mA)	Test Condition V _F (V)	Forward Voltage V _{Fmax} (V)	Test Condition I _F (mA)	Reverse Current I _{Rmax} (uA)	Test Condition V _R (V)	Others					
W02	Rectifier	Si-DJ (Bridge)			200	200	1.5A	50	125				1.0	1.0A	10		R _{th} = 50°C/W	GENERAL INSTRUMENT					
1SS53	Medium speed switching	Si-EP		35	30		300	100	2	200	500		0.8 1.0	1.0 30	0.1	30		N E C					
1SS55	Medium speed switching	Si-EP		100	75		300	100	2	200	500		0.8 1.0	1.0 30	0.1	75		N E C					
BR -5504S	Lamp (red)	GaAlAs			4		300	I _F = 50	85	100			2.0	20	100	4	I _V = 80 mcd (I _F = 20 mA)	STANLEY					

ZENER DIODES

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute - Maximum Values: (T _A = 25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Typical Values: (T _A = 25°C unless otherwise specified)												MANUFACTURER						
			Total Power Dissipation P _D (mW)	Zener Current I _Z (A)	Junction Temperature T _J (°C)	Zener Voltage V _Z			Differential Resistance r _Z			Temperature Coefficient γ _Z		Reverse Current I _Z		Others								
						MIN (V)	TYP (V)	MAX (V)	I _Z (mA)	TYP (Ω)	MAX (Ω)	I _Z (mA)	TYP (%/°C)	MAX (%/°C)	I _Z (mA)		MAX (μA)							
																			Test Conditions		Test Conditions		Test Conditions	
RD7.5 - EB1	Regulator	Si-J	400		175	6.85		7.22	20		10	20			2	4		NEC						
RD15 - EB2	Regulator	Si-J	400		175	13.89		14.62	10		30	10			2	11		NEC						

INTEGRATED CIRCUITS μ PC741C

- Manufacturer: NEC
- Applications: Operational Amplifier

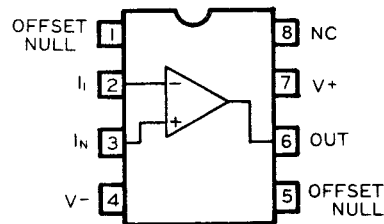
ABSOLUTE MAXIMUM RATINGS

Supply Voltage	$\pm 18\text{ V}$	Input Voltage	$\pm 15\text{ V}$
Internal Power Dissipation	350 mW	Storage Temperature Range	-40°C to $+125^{\circ}\text{C}$
Differential Input Voltage	$\pm 30\text{ V}$	Operating Temperature Range	-20°C to $+75^{\circ}\text{C}$

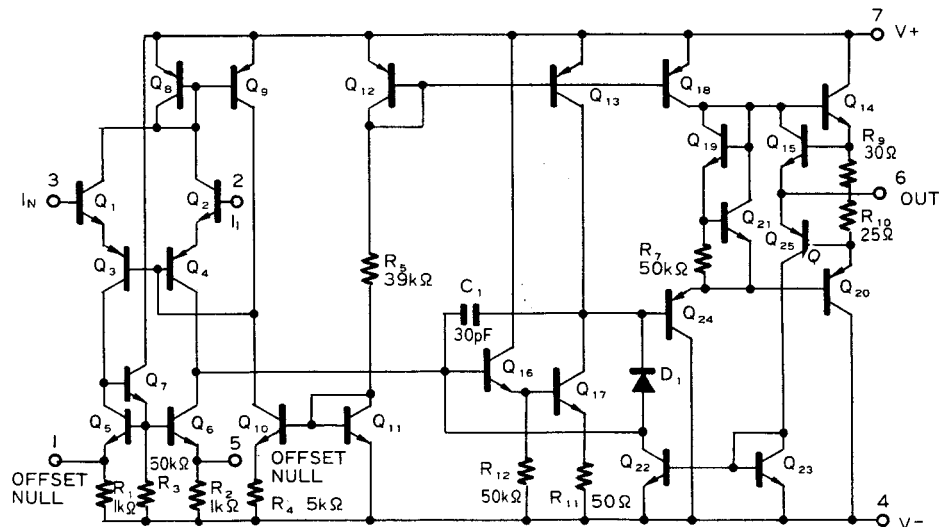
ELECTRICAL CHARACTERISTICS ($V_{CC} = \pm 15\text{ V}$, $T_A = +25^{\circ}\text{C}$ unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Offset Voltage	$R_S \leq 10\text{ k}\Omega$		1.0	6.0	mV
Input Offset Current			20	200	nA
Input Bias Current			80	500	nA
Large-Signal Voltage Gain	$R_L \geq 2\text{ k}\Omega$ $V_{out} = \pm 10\text{ V}$	106	108		dB
Output Voltage Swing	$R_L \geq 10\text{ k}\Omega$	12	± 14		V
Common Mode Rejection Ratio	$R_S \leq 10\text{ k}\Omega$	70	90		dB
Supply Voltage Rejection Ratio	$R_S \leq 10\text{ k}\Omega$		30	150	$\mu\text{V/V}$
Power Consumption			45	85	mW

TERMINAL GUIDE (TOP VIEW)



EQUIVALENT CIRCUIT



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