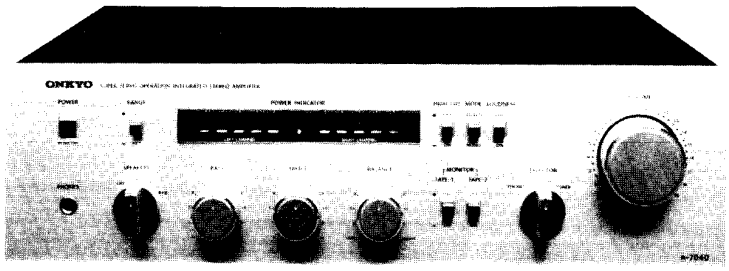
SERIAL NO. 30(

ONKYO® SERVICE MANUAL

SUPER SERVO OPERATION
INTEGRATED STEREO AMPLIFIER
MODEL A-7040



ONKYO® AUDIO COMPONENTS

SPECIFICATIONS

Power Output:	50 watts per channel, min. RMS, at 8 ohms both channels driven, from 20 Hz to 20 kHz, with no more than 0.026% total harmonic distorition.
Total Harmonic Distortion:	0.026% at rated power 0.02% at 1 watt output
IM Distortion: (60Hz: 7kHz=4:1)	0.026% at rated power 0.02% at 1 watt output
Frequency Response:	15 ~ 50,000 Hz (±1 dB)
RIAA Deviation:	20 ~ 20,000 Hz (±0.5 dB)
Damping Factor:	45 at 8 ohms
Input Sensitivity and Impedance:	PHONE 1 & 2: 2.5mV, 50 kohms TUNER: 150mV, 50 kohms TAPE PLAY 1 & 2: 150mV, 50 kohms
Phono Overload:	170mV RMS. at 1kHz, 0.026% THD
Tone Control	
BASS:	±10 dB at 100 Hz
TREBLE:	±10 dB at 10 kHz
High Cut Filter	6 kHz (6 dB/oct.)
Signal to noise ratio:	PHONO: 80 dB (IHF A Network) TUNER: 90 dB (IHF A Network)
Loudness: (–40 dB)	+5 dB at 100 Hz +5 dB at 10 kHz
Range (Ind. switch)	x 1, x 0.1

GENERAL

Power Supply Rating:	AC 120 volts, 60 Hz (120V model) AC 110, 120, 220 or 240V 50/60Hz (Universal model)
Outputs:	SPEAKER A & B, PHONES TAPE REC 1 & 2
Inputs:	PHONO 1 & 2 TUNER TAPE PLAY 1 & 2
Semiconductors:	22 Transistors, 10 ICs, 19 Diodes
Dimensions:	418(W) x 124(H) x 396(D) mm 16-1/2" x 4-15/16" x 15-5/8"
Weight:	9.4 kg (20.7 lbs)

Sepecifications and features are subject to change without notice for improvement.

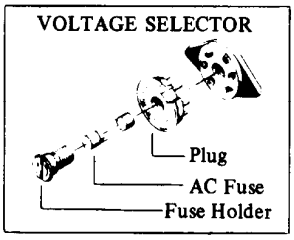
SERVICE PROCEDURES

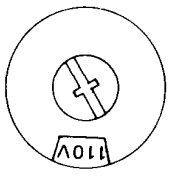
1. VOLTAGE CONVERSION (Universal model)

This model is equipped with a universal power transformer to permit operation at either power source of 110, 120, 220 or 240V AC 50/60Hz.

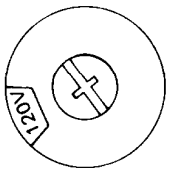
To convert the unit to a different power source voltage, change the plug as illustrated in the drawing below.

CAUTION: DISCONNECT POWER SUPPLY CORD FROM AC OUTLET BEFORE CONVERTING VOLTAGE.

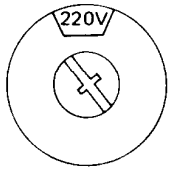




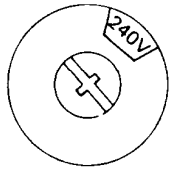
For 110V Operation



For 120V Operation



For 220V Operation

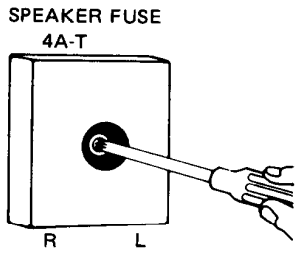


For 240V Operation

2. REPLACING THE SPEAKER PROTECTION FUSE

1) Remove a screw holding the cover and back panel.

2) Replace the fuse with same type and same rating fuse.



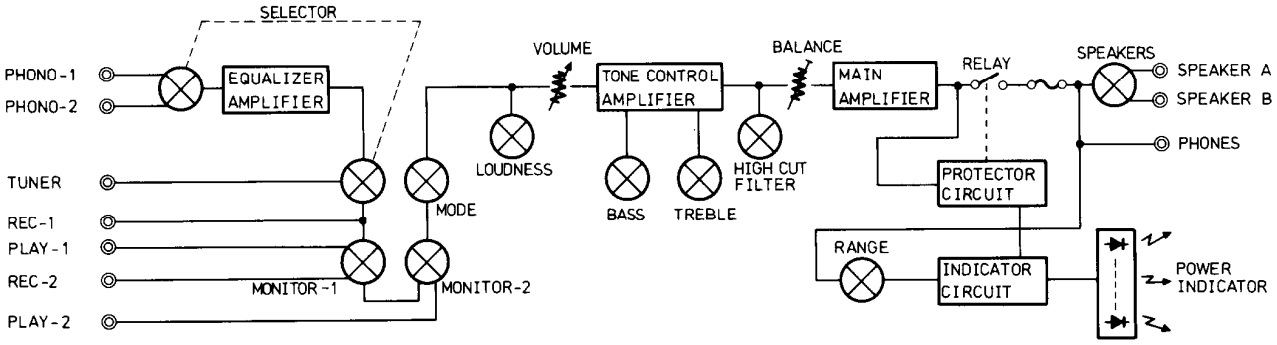
PREACAUTIONS

1. For continued protection against fire hazard, replace only with same type and same rating fuse.

		PARTS NO.
AC fuse	4A (ST-6)	252053 (110/120V model)
	3A-T	252020 (220/240V model)
Speaker protection fuse	4A-T	252014

2. Replacement for power, complementary and driver transistors, if necessary, must be made from the same beta (h_{FE}) group as the original type.
3. Always disconnect the chassis from power line when soldering.
   Turning the power switch OFF is not enough.
   Power line leakage passing through the heating element may destroy the transistors.

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

Serivo Operational Amplifier

In order to achieve a greater degree of fidelity in waveform transmission, and to remove the large capacitance capacitors (which have questionable effect on the quality of sound) from the NFB, DC amplifier designs are being more and more widely used in amplifiers today. The A-7040, however, has advanced even further by adopting the recently developed Servo Operational Amplifier which features a truly superb quality of sound, and performs considerably better than the now conventional DC amplifiers.

The major circuit feature of the Servo Operational Amplifier (see outline in Fig. 1-1) is the servo feedback loop which has no effect whatsoever on the main signal. In other words, if the signal feedback factor is β_1, and the servo feedback factor β_2, the $0 \fallingdotseq \beta_2 \ll \beta_1 \lesssim 1$ relation holds true within the signal bandwidth, while $\beta_2 \gg 1$ holds true in the subsonic region down to DC. For this purpose, a servo feedback amplifier was necessary. And since it was also necessary to include a high-cut filter, and suppress signal amplifier drift at higher DC gain plus 1/f noise and other subsonic region components, a −6dB/oct high-cut mirror integrating circuit (see Fig. 1-2) has been employed. The V_{ref} in Fig. 1-1 serves as the input voltage required to keep the system output DC voltage at 0V.

In the block diagram for the actual Servo Operational Amplifier (see Fig. 1-3), Rf and R_B constitute the signal feedback loop, while A2 and A3 form the servo feedback loop.

Assuming that A1, A2, A3 $\gg$ 1, the input/output characteristics $T(\omega)$ may be expressed as,

$$T(\omega) = \frac{R_N (Rf + R_B)}{A2 \cdot Rf \cdot R_B} \left[\frac{1 + \frac{j\omega}{\omega_1}}{1 + \frac{j\omega}{\omega_2}} \right]$$

$$\text{where } \omega_0 = \frac{1}{CR}, \ \omega_1 = \frac{\omega_0}{A2}, \ \omega_2 = \frac{R_F}{R_N}\omega_0.$$

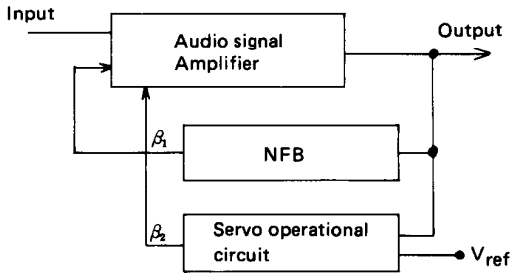


Fig. 1.1

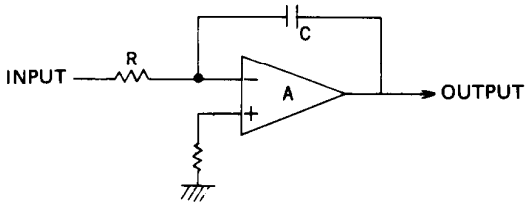


Fig. 1.2

The frequency response is as shown in Fig. 1-4, ω_2 being about 0.3Hz ~ 2Hz. A3 is phase inverted in order to prevent positive feedback in the DC region.

Hence, the subsonic frequencies are effectively cut just as if by coupling capacitor. But unlike capacitors, the output impedance of the servo operational amplifier decreases at lower frequencies (coupling capacitor impedance increases at corresponding frequencies) due to a greater amount of feedback. Since, however, in actual circuits the second stage is driven at a suitable impedance level, and the output impedance of the amplifier itself is made sufficiently large enough (to improve stability) by connecting a resistance γ_0 in series, the output impedance is kept constant at γ_0. With coupling capacitors, on the other hand, the increased impedance at lower frequencies naturally results in an increase in thermal noise (directly related to effective impedance) in the low frequency region.

Although servo feedback circuit integrating capacitors of large leakage current, or high DC resistance and inductance are undesirable, the effects are nowhere near as serious as the insertion of a capacitor in the signal path.

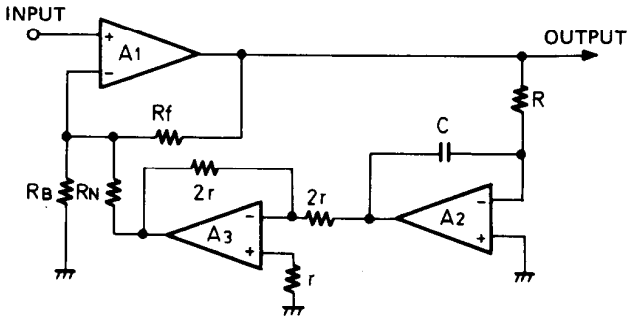


Fig 1.3

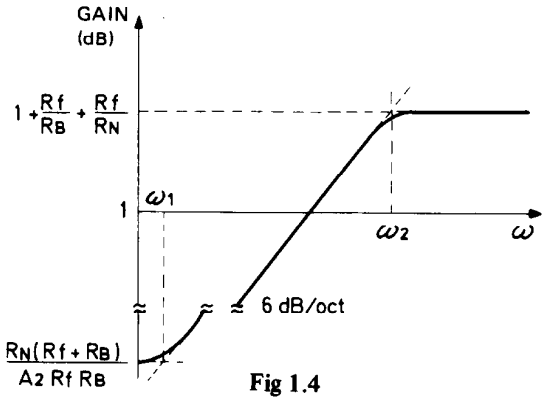
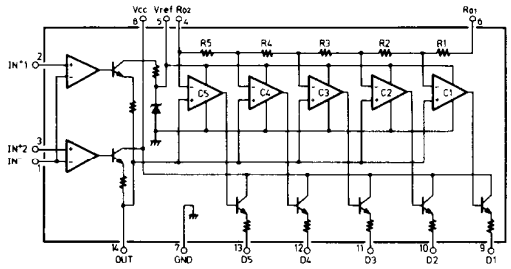


Fig 1.4

Output Indicator Driver Circuit

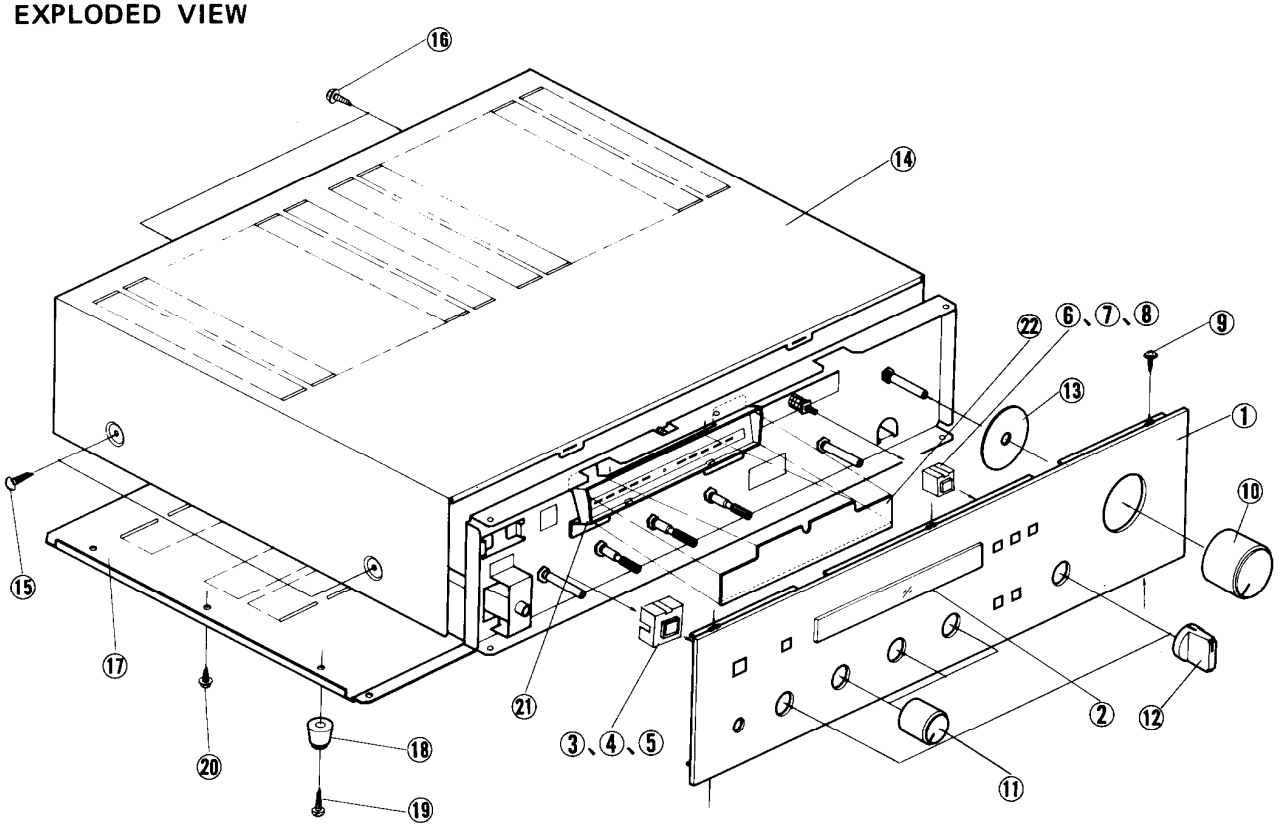
Q701 and Q702 are the power indicator drive ICs. The audio signal applied to pin no. 3 of Q701 is first amplified and then applied to the comparator. The LEDs connected to the IC output terminals pin nos. 9 ~ 13 are lit up in succession depending on the comparator level.

The connection from pin no. 14 to pin no. 1 in Q701 is part of a feedback loop where the feedback resistor R721 (82kΩ) determines the gain of the amplifier, and is consequently used in the adjustment of indicator level.

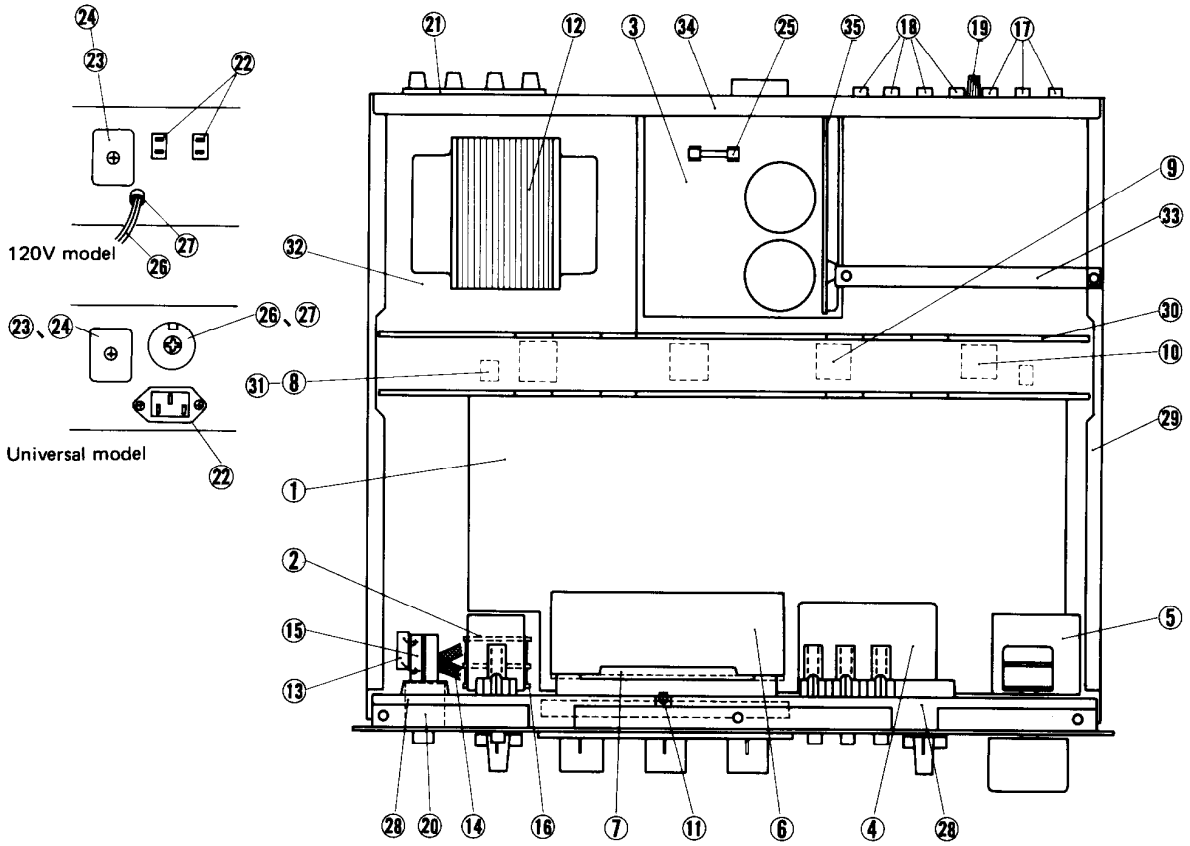


LB1416 EQUIVALENT DIAGRAM

EXPLODED VIEW



COMPONENT LOCATION



EXPLODED VIEW – PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
	12669121	Front panel ass'y (1, 2)
1	27210122	Front panel
2	28191037	Glass for indicator
	13639126	Power switch knob ass'y (3–5)
3	27267048A	Power switch guide
4	27180038	Spring
5	28320319	Power switch knob
	13639125	Push switch knob ass'y (6–8)
6	27267049A	Push switch guide
7	27180037	Spring
8	28320318	Push switch knob
9	834130062	3STS+6BQ, Tapping screw
10	28320308	Volume control knob
11	28320312	Tone control knob
12	28320314	Selector knob
13	28140126	Cushion
14	28184051	Top cover
	28140020	Cushion
15	838440109	4TTB+10C(BC), Tap screw
16	834430062	3STS+6BQ(BC), Tapping screw
17	27170054	Bottom board
18	27175009	Leg
19	831130162	3STW+16BQ, Tapping screw
20	831130082	3STW+8BQ, Tapping screw
21	27190044A	Holder
22	28130073	Plate, indicator

COMPONENT LOCATION – PARTS LIST

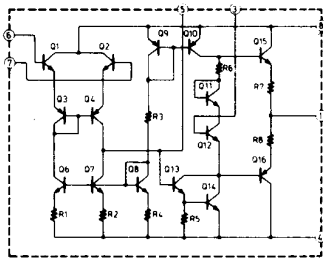
120V model

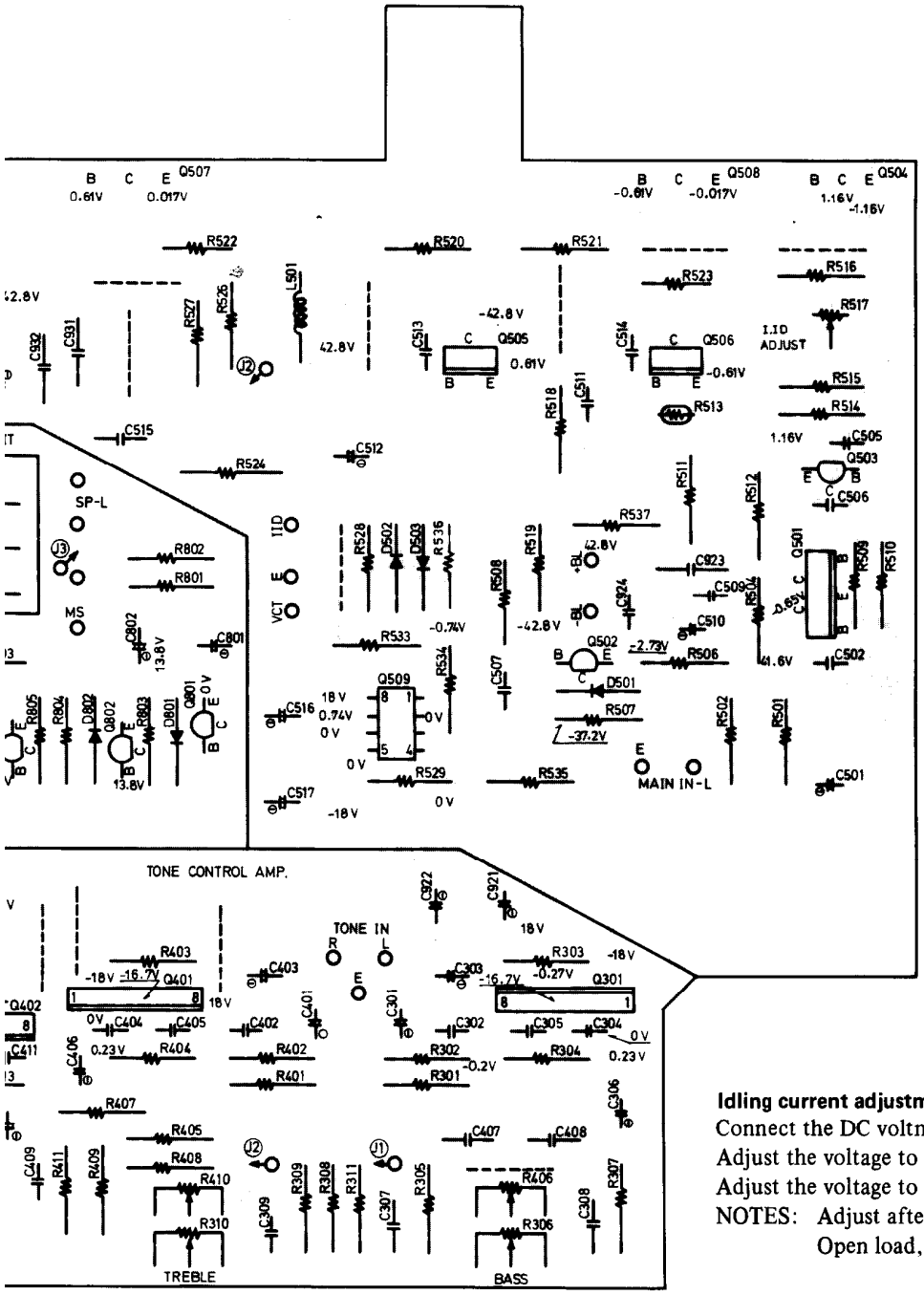
REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1		12669540	NAAF-640, Pre., and main ampli. p.c.b.
2		12669541	NASW-641, Switch p.c.b.
3		12669542	NAPS-642, Power supply p.c.b.
4		12669543	NASW-643, Switch p.c.b.
5		12669544	NAVR-644, Volume control p.c.b.
6		12669545	NAME-645, Output indicator driver p.c.b.
7		12669546	NADIS-646, Output indicator p.c.b.
8	Q504, Q604	2211255 or 2211256	2SC1815(GR) or 2SC1815(BL) Thermo ampli. transistor
9	Q507, Q607	2200993 or 2200994	2SC2580(O) or 2SC2580(Y) Power ampli. transistor
10	Q508, Q608	2201003 or 2201004	2SA1105(O) or 2SA1105(Y) Power ampli. transistor
11	PL001	210057	PL6.3V 0.15AW1.5, Power indicator lamp
12	T001	230286	NPT-668D, Power transformer
13	C001	3504012	UL125V103M, UL capacitor
14	R001, R002	441723314	330Ω, 2W, Metal oxide film resistor
15	S001	25035135 or 24035138	NPS-111-L100P or NPS-111-L103P Power switch
16	S002	25030124	NRSM-244-35Y, Speaker selector switch
17	P001	25045056	NPJ-6PRBL29, Tuner, Phono 1 and Phono 2 input terminal
18	P002, P003	25045025	NPJ-4PRBL03, Tape input/ output terminal
19	P004	25060008	Ground terminal
20	P005	25045018	LT-100H, Headphone jack
21	P006, P007	25060029	NTM-4PRMN05, Speaker terminal
22	P008, P009	25050032	S-I6444-01, AC outlet
23	P010, P011	25050004	Fuseholder
24	P010a, P011a	252014	4A-T, Speaker fuse
25	F901b	252049	4A (ST-6), AC fuse
26	W001	253099	AS-VC-3, Power supply cord
27	W001a	270025	SR-3P-4, Strainrelief
28	A001	27110079	Front bracket
29	A014	27115043A	Side bracket
30	A015	27160052	Radiator
31	A016	223012	RH-14, Bracket
32	A017	27130148	Bracket for power transformer
33	A027	27140285	Bracket
34	A032	27120157	Back panel
35	A033	27150096B	Shielded plate for equalizer

Universal model

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1		12669540	NAAF-640, Pre., and main ampli. p.c.b.
2		12669541	NASW-641, Switch p.c.b.
3		12670542A	NAPS-642a, Power supply p.c.b.
4		12669543	NASW-643, Switch p.c.b.
5		12669544	NAVR-644, Volume control p.c.b.
6		12669545	NAME-645, Output indicator driver p.c.b.
7		12669546	NADIS-646, Output indicator p.c.b.
8	Q504, Q604	2211255 or 2211256	2SC1815(GR) or 2SC1815(BL) Thermo ampli. transistor
9	Q507, Q607	2200993 or 2200994	2SC2580(O) or 2SC2580(Y) Power ampli. transistor
10	Q508, Q608	2201003 or 2201004	2SA1105(O) or 2SA1105(Y) Power ampli. transistor
11	PL001	210057	PL6.3V 0.15AW1.5, Power indicator lamp
12	T001	230287	NPT-668ADGQ, Power transformer
13	C001, C002	3500052	PME271Y510CEE, IS capacitor
14	R001, R002	441723314	330Ω, 2W, Metal oxide film resistor
15	S001	25035051	NPS-121-L26P Power switch
16	S002	25030124	NRSM-244-35Y, Speaker selector switch
17	P001	25045056	NPJ-6PRBL29, Tuner, Phono 1 and Phono 2 input terminal
18	P002, P003	25045025	NPJ-4PRBL03, Tape input/ output terminal
19	P004	25060008	Ground terminal
20	P005	25045018	LT-100H, Headphone jack
21	P006, P007	25060029	NTM-4PRMN05, Speaker terminal
22		25050018	PA-125, 3P inlet
23	P010a, P011a	25050004	Fuseholder
24	P010, P011	252014	4A-T, Speaker fuse
25	F901b	252049	4A (ST-6), AC
26	F001a	252003	3A-T, AC fuse
27	F001b	25050021	X-I7240, VS socket
28	A001	27110079	Front bracket
29	A014	27115043A	Side bracket
30	A015	27160052	Radiator
31	A016	223012	RH-14, Bracket
32	A017	27130148	Bracket for power transformer
33	A027	27140285	Bracket
34	A032	27120158	Back panel
35	A033	27150096B	Shielded plate for equalizer

HA-1457



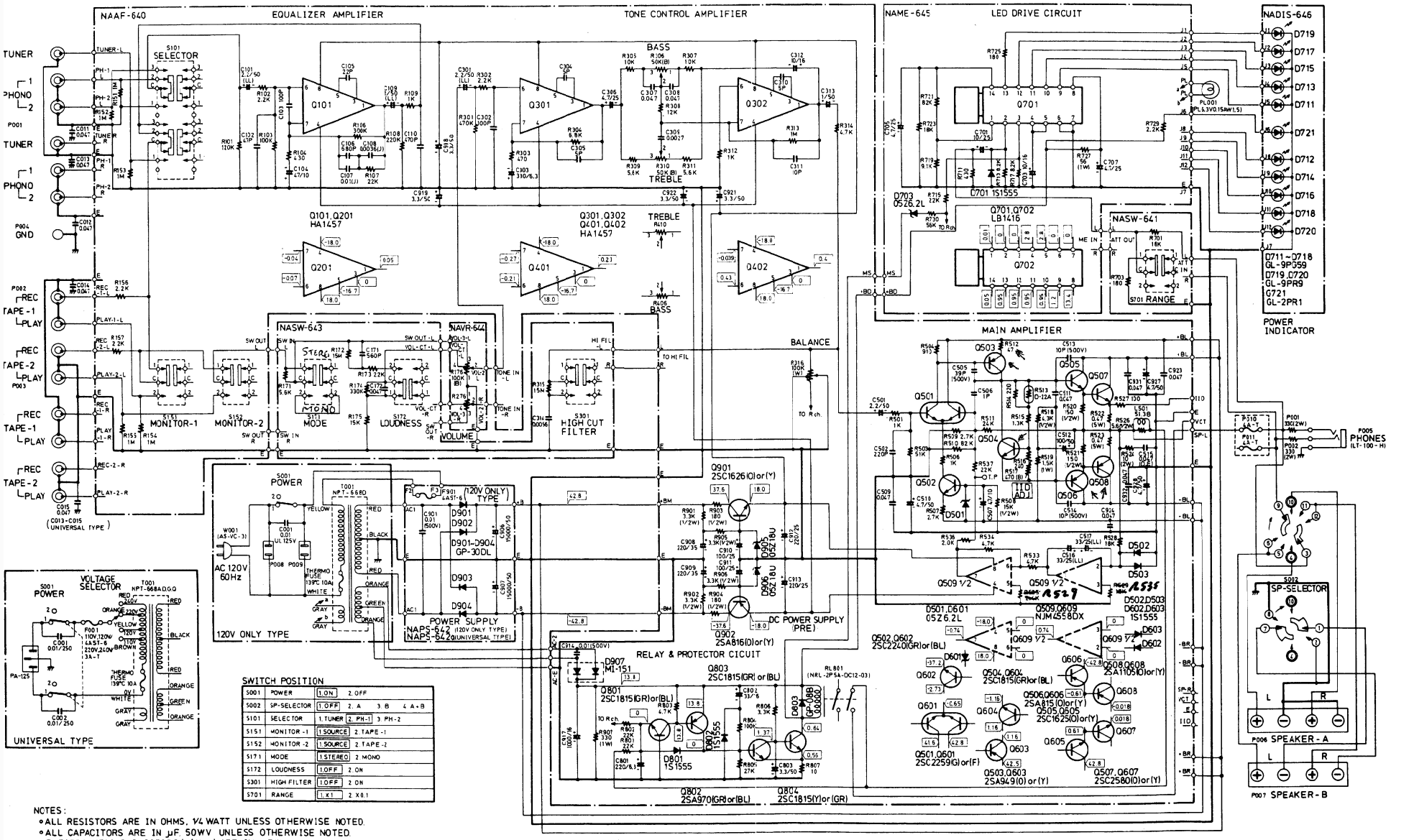


Idling current adjustment

Connect the DC voltmeter between I_{ID} and V_{CT} terminal.
Adjust the voltage to 18mV with R517. (Lch)
Adjust the voltage to 18mV with R617. (Rch)
NOTES: Adjust after switching on for 5 minutes.
Open load, Volume. . . . . Minimum.

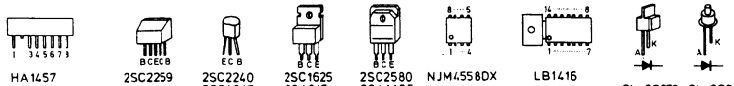
:HEMATIC DIAGRAM

odel A-7040



SWITCH POSITION			
S001	POWER	1. ON	2. OFF
S002	SP-SELECTOR	1. OFF	2. A 3. B 4. A+B
S101	SELECTOR	1. TUNER	2. PH-1 3. PH-2
S151	MONITOR-1	1. SOURCE	2. TAPE-1
S152	MONITOR-2	1. SOURCE	2. TAPE-2
S171	MODE	1. STEREO	2. MONO
S172	LOUDNESS	1. OFF	2. ON
S301	HIGH FILTER	1. OFF	2. ON
S701	RANGE	1. X1	2. X0.1

NOTES:
- ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF, 50WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (-⊕|⊖-) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M.)(NO INPUT SIGNAL).
- CIRCUIT IS SUBJECT TO CHANGE FOR INPROVEMENT.



ONKYO CORPORATION

PRINTED CIRCUIT BOARD – PARTS LIST

PRE., AND POWER AMPLI. PC BOARD (NAAF-640) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q101,Q201,Q301, Q302,Q401,Q402	222471	HA-1457
Q509,Q609	222502	NJM-4558DX
	Transistors	
Q501,Q601	2211372 or 2211371	2SC2259(G) or 2SC2259(F)
Q502,Q602	2211405 or 2211406	2SC2240(GR) or 2SC2240(BL)
Q503,Q603	2211353 or 2211354	2SA949(O) or 2SA949(Y)
Q504,Q604	2211255 or 2211256	2SC1815(GR) or 2SC1815(BL)
Q505,Q605	2200393 or 2200394	2SC1625(O) or 2SC1625(Y)
Q506,Q606	2200403 or 2200404	2SA815(O) or 2SA815(Y)
Q507,Q607	2200993 or 2200994	2SC2580(O) or 2SC2580(Y)
Q508,Q608	2201003 or 2201004	2SA1105(O) or 2SA1105(Y)
Q801,Q803	2211255 or 2211256	2SC1815(GR) or 2SC1815(BL)
Q802	2211395 or 2211396	2SA970(GR) or 2SA970(BL)
Q804	2211254 or 2211255	2SC1815(Y) or 2SC1815(GR)
Q901	2200663 or 2200664	2SC1626(O) or 2SC1626(Y)
Q902	2200673 or 2200674	2SA816(O) or 2SA816(Y)
	Diodes	
D501,D601	224042	05Z6.2L
D502,D503,D602 D603,D801,D802	223105	1S1555
D803	223848	GP-08B
D905,D906	224065	05Z18U
D907	223853	MI-151
	Coils	
L501,L601	231001	S-1.3B
	Capacitors	
C101,C201	392880227	2.2μF, 50V, LL
C104,C204	352734701	47μF, 10V, Elect.
C109,C209	392880107	1μF, 50V, LL
C301,C401	392880227	2.2μF, 50V, LL
C303,C403	352723311	330μF, 6.3V, Elect.
C306,C406	352750471	4.7μF, 25V, Elect.
C312,C412	352741001	10μF, 16V, Elect.
C313,C413	357280101	1μF, 50V, Elect.
C501,C601	352780221	2.2μF, 50V, Elect.
C507,C607	352734701	47μF, 10V, Elect.
C510,C610	352780471	4.7μF, 50V, Elect.
C512,C612	352781011	100μF, 50V, Elect.
C513,C514 C613,C614	345071002	10pF±2%, 500V, Ceramic
C515,C615	374124735	0.047μF±10%, 50V, DE
C516,C517 C616,C617	392853307	33μF, 25V, LL
C801	352722211	220μF, 6.3V, Elect.
C802	322743301	33μF, 16V, Elect.
C803	352780331	3.3μF, 50V, Elect.
C908,C909	352762211	220μF, 35V, Elect.
C910,C911	352751011	100μF, 25V, Elect.
C912,C913	352752211	220μF, 25V, Elect.
C917	352741021	1,000μF, 16V, Elect.
C918–C922	352780331	3.3μF, 50V, Elect.
C927–C930	352780471	4.7μF, 50V, Elect.
	Resistors	
R306,R406	5148035	N16RGM11C50KBS35
R310,R410	5148034	N16RGM11C50KBO35
R316	5104079	N16RLC100KWTP35
R508,R608	441521534	15kΩ, 1/2W, M.O.F.
R513,R613	4000003	D-22A, Themistor
R517,R617	5225026	N10HR470BD,
R158,R618	441524324	4.3kΩ, 1/2W, M.O.F.
R519,R619	441621524	1.5kΩ, 1W, M.O.F.
R520,R521 R620,R621	441521514	150Ω, 1/2W, M.O.F.
R522,R523 R622,R623	4000047	0.47Ω, 5W, Metal plate
R524,R624	451731004	10Ω, 2W, Metal
R526,R626	451630564	5.6Ω, 1W, Metal
R903,R904	441521814	180Ω, 1/2W, M.O.F.
R907	441623314	330Ω, 1W, M.O.F.
	Switches	
S101	25030127	NRSM-143-35ZR
S151,S152	25035115	NPS-222-L80
	Relay	
RL801	25065085A	NRL-2P-5A-DC12-03

SWITCH PC BOARD (NASW-641) – PARTS LIST

S701	25035109	NPS-122-L74

POWER SUPPLY PC BOARD (NAPS-642) – PARTS LIST (120V model)

D901–D904	223863	GP-30DL, Diode
C906,C907	3504118	15,000μF, 50V, Elect. capacitor
F901a	250113	SN5051, Fuseholder

POWER SUPPLY PC BOARD (NAPS-642a) – PARTS LIST (Universal model)

D901-D904	223863	GP-30DL, Silicon diode
C906,C907	3504118	15,000μF, 50V, Elect.

SWITCH PC BOARD (NASW-643) – PARTS LIST

S171,S172,S301	25035114	NPS-322-L79

VOLUME CONTROL PC BOARD (NAVR-644) – PARTS LIST

R176,R276	5172055	N24RGL41C100KBTP35M, Volume control

METER DRIVER PC BOARD (NAME-645) – PARTS LIST

Q701, Q702	222539	LB1416, IC
D701,D702	223105	1S1555, Silicon diode
D703	224042	05Z6.2L
C701,C702	352751001	10μF, 25V, Elect.
C703,C704	352741001	10μF, 16V, Elect.
C705–C708	352750471	4.7μF, 25V, Elect.
	Resistors	
R727,R728	441625604	56Ω, 1W, M.O.F.

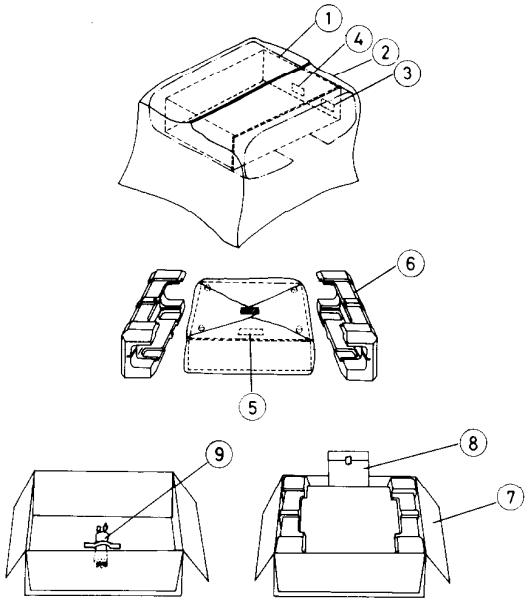
DISPLAY PC BOARD (NADIS-646) – PARTS LIST

D711–D718	225028	GL-9PG59, L.E.D.
D719,D720	225029	GL-9PR9, L.E.D.
D721	225018	GL-2PR1, L.E.D.

CAUTION: Replacement for power, complementary and driver transistors, if necessary, must be made from the same beta group (h_{FE}) as the original type.

NOTES: Capacitors: LL: Low leakage current type electrolytic capacitor
DE: Non-inductive polyester film capacitor
Resistors: MOF: Metal oxide film resistor

PACKING PROCEDURES



REF. NO.	PARTS NO.	DESCRIPTION
1	29100036	850 x 550mm, Poly bag
2	29095012	500 x 800mm, Protection sheet
3	29380040	Cabinet composite label (USA)
4	282969	Caution label (A) (USA)
5	293041	Caution label (USA)
6	29090398	Pad
7	29050269	Carton box
8		Accessary bag complete
	U.S.A. model	
	29340315	Instruction manual
	29365006	Warranty card
	29358002	S. S list
	29100006	250 x 350mm, Poly bag
	Universal model	
	29340316	Instruction manual
	25055018	Conversion plug
	252049	4A ST-6, Fuse
	29100002	150 x 80 mm , Poly bag for fuse
	29100006	250 x 350mm, Poly bag
	Germany model	
	29340316	Instruction manual
	29365005-1	Warranty card
	29100006	250 x 350mm, Poly bag
9	13710703	Power supply cord (UU)
	253089	AS-VDE-C, Power supply cord (G)
	29380038	Voltage tag (UU), (G)

NOTE: (USA): U.S.A. model
(UU): Universal model
(G): Germany model

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