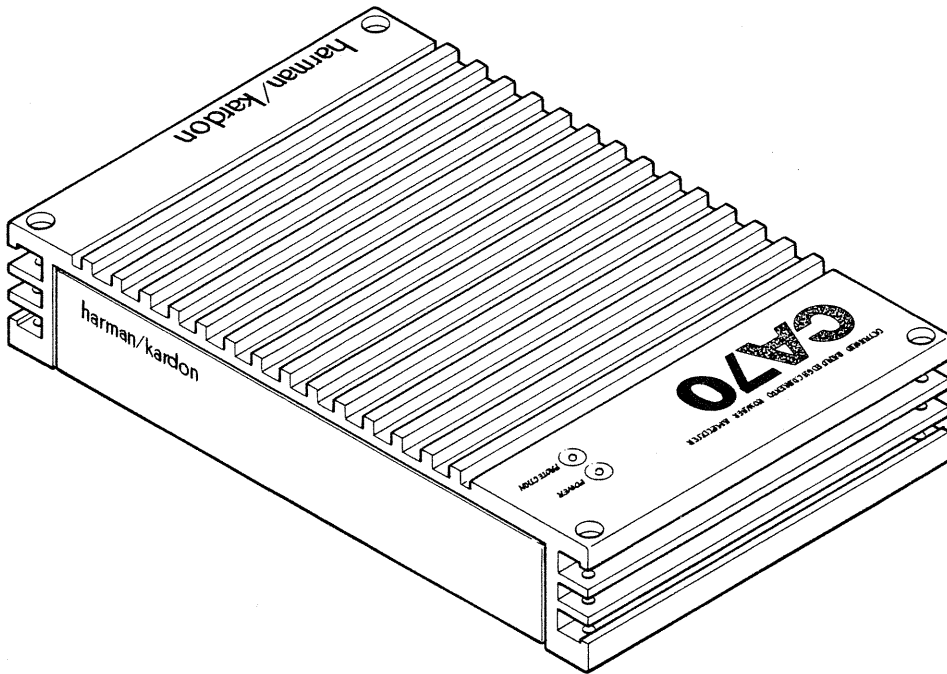


# The Harman Kardon Model CA70 HIGH FIDELITY CAR AMPLIFIER

Manual 176A

## Technical Manual



The following marks found in the parts list of this manual identify the models as follows.

- **UA** : North America area model
- **I** : International model
- **N** : Japan mode

**harman/kardon**

Parts and Service Office  
240 Crossways Park West, Woodbury, N.Y. 11797  
1112-3152176A9 P-129108 1200 Printed in Japan

## SPECIFICATIONS

Number of Channels :	2
Continuous Average :	35 Watts @ < 0.1% THD into 4 Ohms
Power per Channel, All Channels Driven	35 Watts @ < 0.3% THD into 2 Ohms
from 20 Hz – 20 kHz	70 Watts @ < 0.3% THD bridged into 4 Ohms
HCC :	±30 Amps
Frequency Response :	5 Hz – 100 kHz (+0, -3dB)
Signal-to-Noise Ratio :	100 dB
Input Sensitivity/Impedance :	250 mV/22 kΩ (variable)
Power Supply :	DC +14.4 V (11 – 16 V usable), negative ground
Dimensions (H × W × D) :	2.05" × 10.6" × 6.7" (52 × 270 × 170 mm)
Weight :	5 lbs. 1 oz (2.3 kg)
Accessories	
Power Cord with Fuse and Holder (Res) :	1 pc.
Ground Cord (Black) :	1 pc.
Connector with Tube :	1 set
Mounting Screw :	1 set

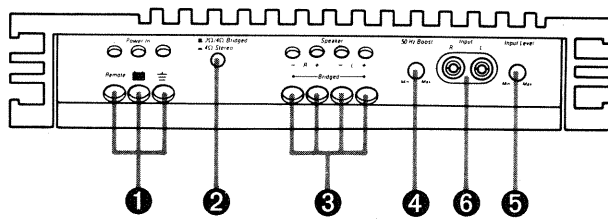
## FEATURES

- 30 Amperes of HCC (High Instantaneous Current Capability) maintains a wide dynamic range and low distortion when driving low impedance or reactive loads.
- High Power Output of 35 watts per channel into 4 Ohms, 35 watts per channel into 2 Ohms and 70 watts bridged into 4 Ohms.
- Ultrawide Bandwidth is achieved by the use of inherently fast open-loop circuitry. This improves transient accuracy and phase linearity.
- Low Negative Feedback  
Highly linear circuitry produces low distortion with only 25dB of negative feedback. This further improves dynamic accuracy.
- Discrete Component Audio Circuitry is used because it was found to be the only way to provide HCC, Ultrawide Bandwidth and Low Negative Feedback.
- A High Capacity Power Supply enables stable operating voltages even under high power conditions. This results in improved low frequency sound quality.
- High Heat Dissipation Capability is provided by a large heatsink, efficient circuitry and rugged circuit components.
- Protection Circuitry assures reliability under high temperature, reverse-voltage and short-circuit conditions, without degrading the sound quality during normal high power operation.
- Simultaneous Stereo/Bridged Operation provides operating flexibility, system simplicity and added value.

## GENERAL INSTRUCTIONS

- Be sure that metal objects or other foreign materials do not enter the unit. This can cause immediate trouble or reduce the unit's long-term reliability.
- It is natural for this unit to become warm while operating. It incorporates thermal protection circuitry to shut off the unit when operating abnormally.
- It is recommended that this unit be operated in a vehicle only while the engine (and electrical charging system) is running. At high power output, it typically draws about as much current as an automobile's headlights, and therefore can eventually discharge the battery.
- The speaker output terminals are protected from damage due to short-circuited speakers or speaker wires. When this protection circuitry is momentarily activated, the power output is muted for several seconds and is then restored. When the terminals are continuously short-circuited, the power output will remain muted. Should the latter occur, shut off the unit and check the speakers and speaker wires.
- The heat generated by this amplifier is dissipated into the air by the entire chassis. If it is covered, or becomes dirty so that the circulation of the air around it is reduced, the unit's ability to dissipate heat will also be reduced. Under most conditions, the heat dissipating capability of this unit is more than enough to provide uninterrupted operation. However, when full power is drawn in an already hot environment, any loss in heat dissipating capability is likely to result in activating the thermal protection circuits.
- When replacing the fuse, be sure to use an identical value (15 ampere) auto fuse.
- If your unit behaves abnormally, turn it off immediately and consult an authorized Harman Kardon Service Station.

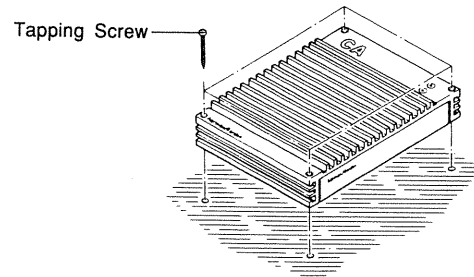
## JACKS, TERMINALS AND CONTROLS



- ① Power input terminals
- ② 2Ω/4Ω switch
- ③ Speaker terminals
- ④ 50 Hz boost control
- ⑤ Input level control
- ⑥ Input jacks

## INSTALLATION INSTRUCTIONS

Locate and drill 4 holes corresponding to those in the chassis. Securely mount the amplifier to the surface with the four 5 mm tapping screws. Drill undersized holes in the car chassis so that the 5 mm tapping screws fit tightly. We recommend 3.5 mm or 1/8 inch diameter holes.



## CONNECTIONS

### General

- Caution 1:** The ignition key switch should be turned off before any connections are made to the car electrical system.
- Caution 2:** Use a flat-bladed screwdriver with a blade width of less than 5 mm to connect the cables. Using a screwdriver with a blade width of more than 5 mm can damage the screw slot.
- Caution 3:** The last connection to be made should be to the positive terminal of the car battery.
- Caution 4:** Do not connect any of the speaker terminals to the car chassis or to a common ground. Also, do not connect the speaker terminals of the CA70 to the input terminals of another amplifier or signal processor.

Connect the CA70 to the car electrical system and to the other components in the audio system as per the following instructions:

### Remote

This terminal enables the power switch of the car tuner/CD or tuner/deck to also turn on the CA70. Connect one end of the accessory yellow cord to the appropriate lead (power amplifier remote) on the car tuner/CD or tuner/deck and the other end to the remote terminal on the CA70.

If a specific wire for this purpose is not provided on the tuner/ deck, use the wire for controlling the power antenna. If that wire is already connected to the power antenna, the CA70 can be connected in addition.

### +B

The +B terminal is the positive power input terminal. It should be connected to the positive (+) terminal of the car battery using the accessory red cord. The cord should be installed such that the attached fuse holder is located near the car battery.

### GND

This is the negative power input terminal. It should be connected directly to the car chassis using the accessory black cord. It is not necessary to connect this terminal to the negative battery terminal.

### Input Jacks

These input jacks are for connection to the line (preamplifier) output jacks on the car stereo or tuner/deck. It is recommended that high quality shielded coaxial cables with tightfitting RCA plugs be used for this connection.

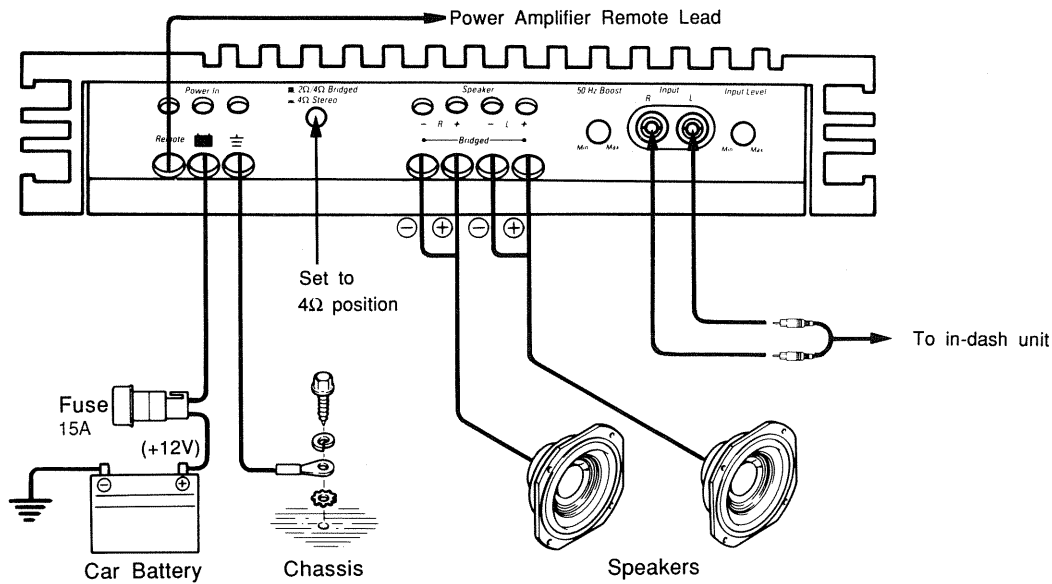
If the car in-dash unit has a built-in power amplifier and does not have line (preamplifier) output jacks, connect the speaker wires to these input jacks. Male phono plugs (not provided) are required. If the built-in amplifier is the "High Power" type (rated 12 watts per channel or more), a power-line adaptor (not provided) must be used.

### Adjusting Input Level and 50 Hz Boost Controls

**Input level** - This continuously variable control allows the amplifier's sensitivity to be matched to the output level of the in-dash unit. Initially, set this control to a low position. Turn on the car audio system and attempt to play it at a comfortable listening level. If the volume control on the in-dash unit cannot increase the level sufficiently, increase the input level control setting accordingly.

**50 Hz boost** - This continuously variable control can add up to 12 dB of boost to low frequencies in the 50 Hz range. This can be used to compensate for the poor low frequency response from some car speaker systems. Set the bass and treble controls on the in-dash unit to their center positions. Defeat or bypass an equalizer, if used. While the car audio system is playing at a comfortable listening level, increase the setting of the 50 Hz boost control until the desired low frequency effect is achieved.

## Stereo Systems

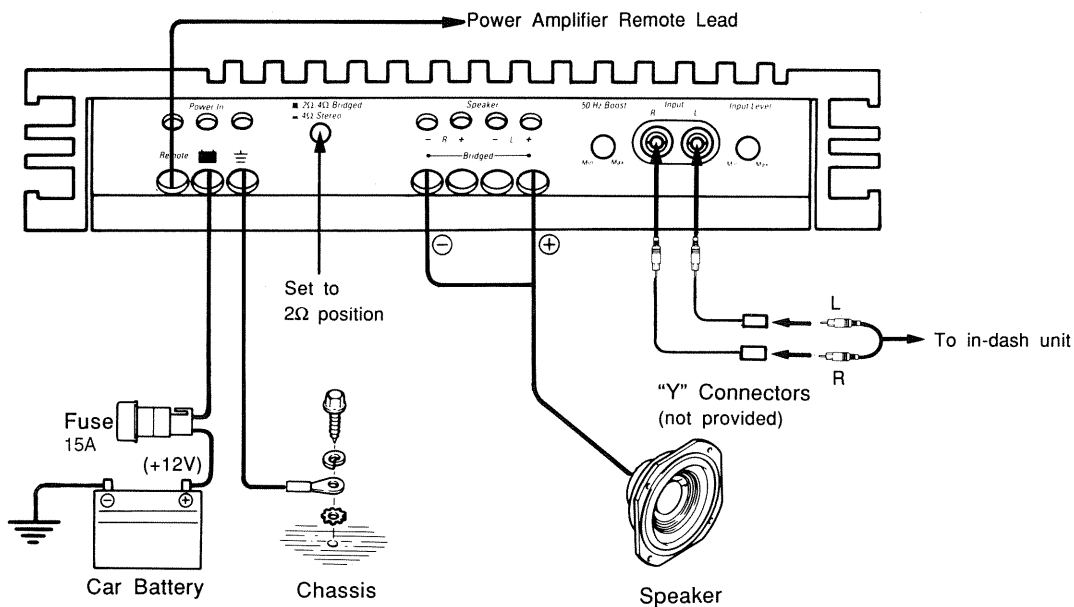


The following instructions and illustration as shown left apply to typical 2 and 4 channel systems, where one 4 Ohm speaker system is used per channel, and 2 or 4 line output connectors are provided by the in-dash unit.

Connect one pair of signal leads from the in-dash unit to the input jacks. Connect one pair of speaker systems to the left and right speaker terminals. Set the 2Ω/4Ω switch to the 4Ω position.

- If two 4 Ohm speaker systems are to be connected to each channel, set the 2Ω/4Ω switch to the 2Ω position.

## Bridged Operation - Mono

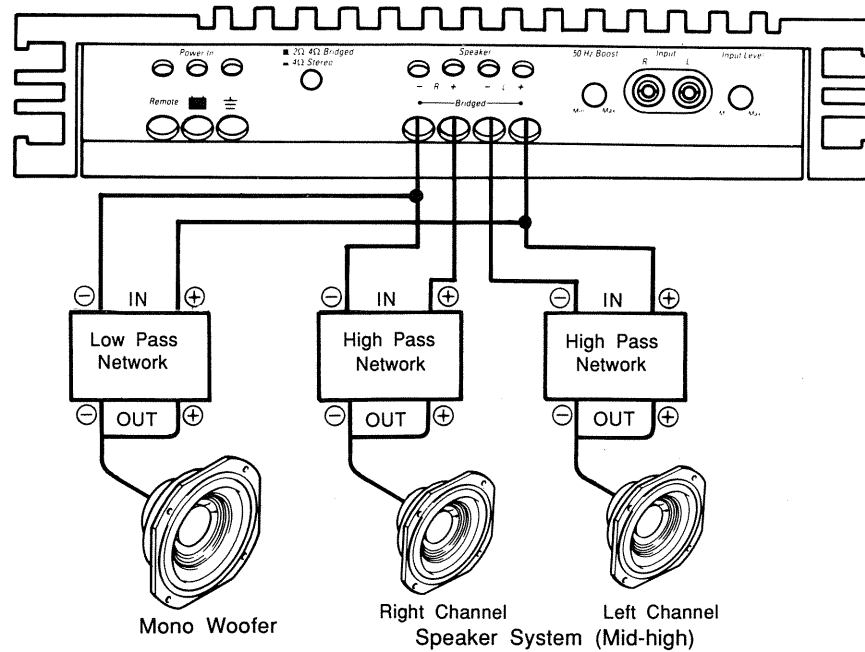


In this mode of operation, two channels work together so that their combined power can be driven into one speaker system. Only 4 Ohm speaker systems can be used in this way.

The same input signal must be fed to each channel. This can be done by connecting a "Y" connector (not provided). One 4 Ohm speaker system should be connected with its positive terminal connected to the left "+" terminal, and its negative terminal connected to the right "-" terminal.

- The 2Ω/4Ω switch should be set in the 2Ω position;

## Simultaneous Stereo - Bridged Operation



When passive crossover networks are available, both mid-high speaker systems and woofers can be connected to the same terminals.

First, connect the mid-high speaker systems and their high-pass networks to the left and right speaker terminals. Be sure to maintain the correct polarities. Also, be sure to connect the amplifier's speaker terminals to the network inputs and the speaker systems to the network outputs.

Next, connect the low-pass network and woofer from the left "+" to the right "-" terminals, with the network's "+" input connected to the left "+".

## CIRCUIT DESCRIPTION

### Operation of Switching Power Supply:

IC1 generates a Pulse Width Modulated signal at a frequency of 50 kHz. The square wave output signals of IC1 (Pin 9 and Pin 10) are sent to transistors Q18/Q20 and Q19/Q21. These transistors control FET Q22 and Q23. Q22 and Q23 alternately ground the windings of T1. The center tap of T1 is connected to the car battery thru noise suppressor coil L1.

D11 and D12 rectify the secondary voltage of T1. This voltage is sent to photocoupler PH1. When the secondary voltage from T1 increases, the voltage at Pin 4 of PH1 increases. This voltage is sent to Pin 16 of IC1 thru R49, R61 and VR1. The voltage at Pin 16 is compared against the reference voltage at Pin 15. The voltage differential between these two Pins controls the Pulse Width Modulation Circuit. When the voltage at Pin 16 is larger than the voltage at Pin 15, the Pulse Width is reduced and the secondary voltage is reduced. As result the secondary voltage is stabilized.

### Secondary Voltage in 4-ohm and 2-ohm modes:

SW1 controls Q12. When Q12 is Off (4 Ohm mode), the secondary voltage of T1 is stabilized at approximately 26 Volts.

When Q12 is switched on (2 Ohm mode) Q12 shorts R49. As result, the impedance of the feedback path is reduced and the voltage at Pin 16 of IC1 is increased. IC1 will now reduce the Pulse Width until the voltage at

Pin 16 of IC1 is again 2.2 Volts. At that moment, the secondary voltage of T1 is 18 Volts.

### Thermal protection circuits:

Temperature sensors PT1 and PT2 measure the temperature of the amplifier heatsink. When this temperature exceeds 85 degrees Celsius Pin 1 of IC2 goes high and LED D5 (Thermal Protect Indicator) goes ON. At the same time, Q14 and Q13 switch ON and the impedance of the voltage feedback circuit is reduced to zero. IC1 will now reduce the Pulse Width until the secondary voltage of T1 is 15 Volts. Since the amplifier now operates at a reduced voltage, the heat sink will cool down.

Temperature sensor PT3 measures the temperature of switching transformer T1. When the temperature of T1 exceeds 105 degrees Celsius Pin 13 of IC1 goes high and Q15 and Q16 switch ON. When Q16 switches ON, Pin 4 of IC1 becomes 5 Volts and IC1 stops oscillating. When transformer T1 cools down below 105 degrees Celsius IC1 will start oscillating again.

**DISASSEMBLY PROCEDURES (REFER TO PAGE 7)****1 CABINET BOTTOM (AA) REMOVAL**

Remove 4 screws (A), screw (B) and then remove the Cabinet Bottom (AA).

**2 FRONT PANEL (134) REMOVAL**

1. Remove the Cabinet Bottom (AA), referring to the previous step **1**.
2. Remove 2 screws (C) and then remove the Front Panel (134).

**3 REAR PANEL (133) REMOVAL**

1. Remove the Cabinet Bottom (AA), referring to the previous step **1**.
2. Remove 3 screws (D), disengage the 3 hooks and then remove the Rear Panel (133).

**4 INPUT P.C. BOARD (PCB-2) REMOVAL**

1. Remove the Rear Panel (133), referring to the previous step **3**.
2. Remove 3 screws (E) and 3 screws (F) and then remove the Input P.C. Board (PCB-2).

**5 POWER P.C. BOARD (PCB-3) REMOVAL**

1. Remove the Rear Panel (133), referring to the previous step **3**.
2. Remove 2 screws (G), 2 screws (H), 4 screws (I) and 2 screws (J) and then remove the Power P.C. Board (PCB-3).

**6 MAIN P.C. BOARD (PCB-1) REMOVAL**

1. Remove the Rear Panel (133), referring to the previous step **3**.
2. Remove 4 screws (K) and then remove the Main P.C. Board (PCB-1) with heat sink.

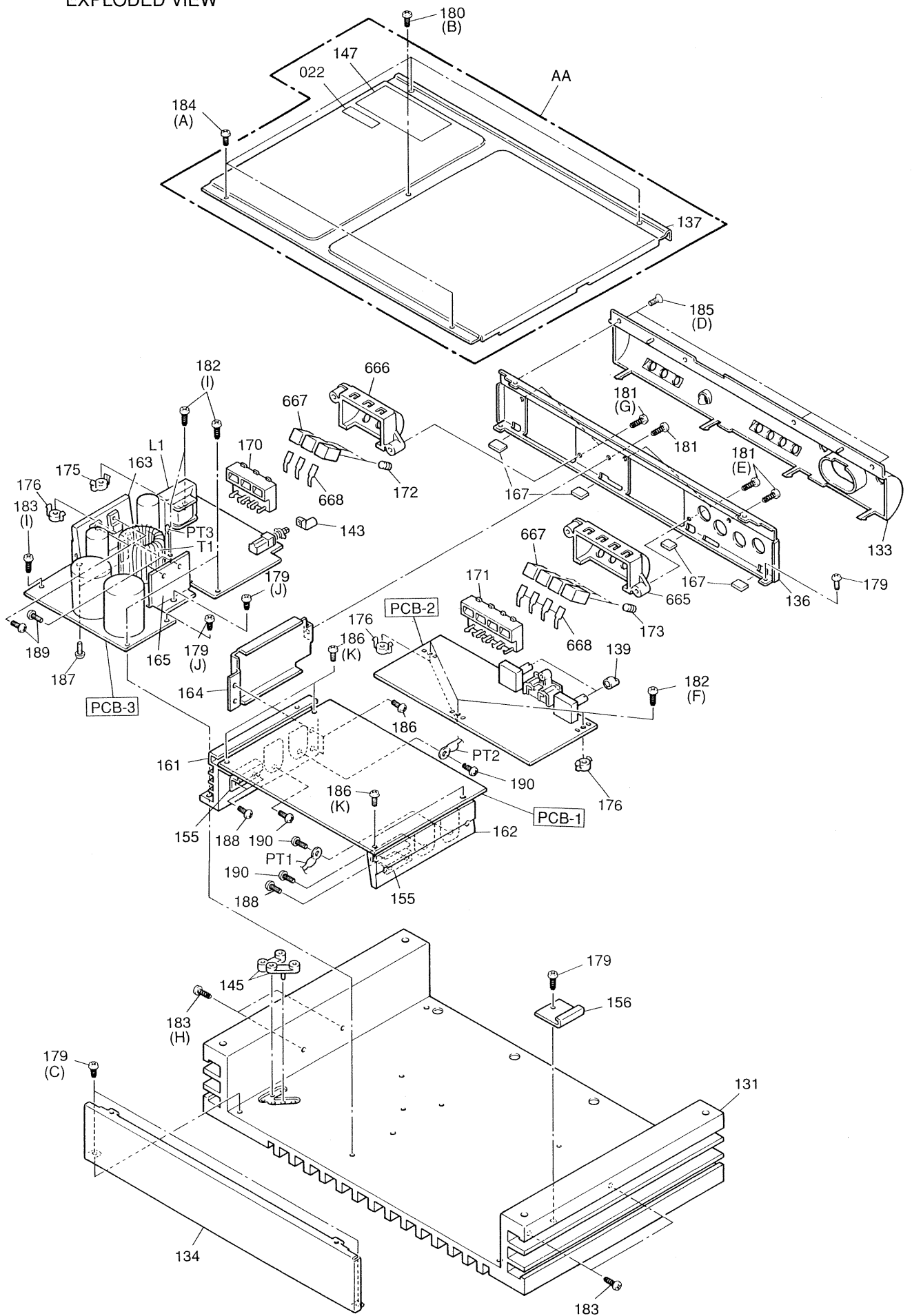
**GENERAL UNIT PARTS LIST**

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
AA	A424-HC393A	CABI BOTTOM ASS'Y	171	2240-7389	HOLDER, 4P TERMINAL
022	1756-19317	LABEL, DBP NO. ①	172	2310-7039	SCREW, SPE (×3)
131	1413-00301	CABINET, MAIN HEAT SINK	173	2310-7039	SCREW, SPE (×4)
133	1442-27001	PANEL, REAR	175	2360-7025	BOSS, SPE
134	1444-05701	PANEL, FRONT	176	2360-7026	BOSS, SPE (×4)
136	1424-34801	CABI BACK, REAR	179	2347-R0130062	SCREW, BND T+ (3×6mm)(×6)
137	1424-34901	CABI BACK, BOTTOM	180	2347-R0126054	SCREW, BND T+ (2.6×5mm)
139	1632-21201	ROTARY KNOB, INPUT, BASS BOOST	181	2347-R0130084	SCREW, BND T+ (3×8mm)(×6)
143	1662-66101	PUSH BUTTON, 2/4	182	2347-R0130102	SCREW, BND T+ (3×10mm)(×7)
145	1732-08401	INDICATOR (×2)	183	2347-R0130124	SCREW, BND T+ (3×12mm)(×5)
147	1751-10016	LABEL	184	2347-260547	SCREW, BND T+ (2.6×5mm)(×4)
155	2219-8333	METAL FITTG DRIVER (×2)	185	2343-260527	SCREW, CSK T+ (2.6×5mm)(×3)
156	2219-8334	METAL FITTG, MAIN HEAT	186	2347-R0130062	SCREW, BND T+ (3×6mm)
161	2222-7290	HEAT SINK, SUB	187	2347-R0130062	SCREW, BND T+ (3×6mm)
162	2222-7291	HEAT SINK, SUB	188	2557-300629	SCREW, B SPW+ (3×6mm)
163	2222-7292	HEAT SINK, SUB	189	2557-300829	SCREW, B SPW+ (3×8mm)
164	2222-7301	HEAT SINK, HOLD	190	2557-301029	SCREW, B SPW+ (3×10mm)
165	2222-7296	HEAT SINK, DIODE	665	4215-09701	TERMINAL BRD
167	2112-11804	SPONGE (×4)	666	4215-09801	TERMINAL BRD
168	2240-R0101	HOLDER (×5)	667	4214-237	TERMINAL
170	2240-7388	HOLDER, 3P TERMINAL	668	4214-236	TERMINAL

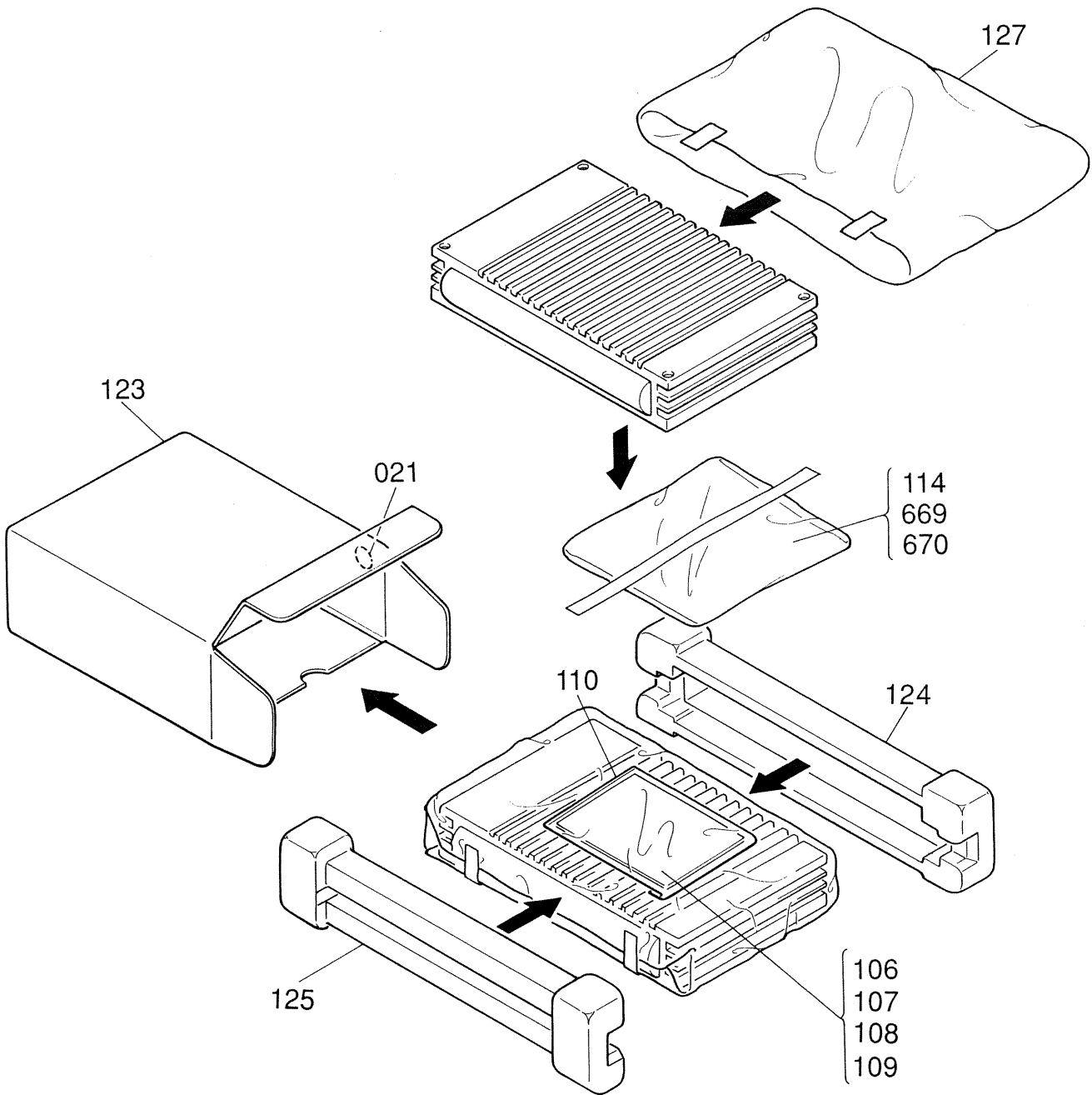
**GENERAL UNIT**  
EXPLODED VIEW

1  
2  
3  
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A B C D E



PACKAGE



PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
021	1756-03108	LABEL <b>F</b>	110	1241-R0118250	POLYETHY BAG
021	1756-03113	LABEL <b>N</b>	114	2310-7041	SCREW,SPE
106	1111-J30349	OWNER GUIDE <b>UA</b>	123	1221-29601	CARTON BOX
106	1111-J30350	OWNER GUIDE <b>I</b>	124	1222-7374	CUSHION
106	1111-J2057	OWNER GUIDE <b>N</b>	125	1222-7375	CUSHION
107	1113-02501	OWNER CARD <b>UA</b>	127	1241-R0140350	POLYETHY BAG
107	1113-0C	OWNER CARD <b>N</b>	669	<b>▲</b> 4472-7636	HOLDER, FUSE W/FUSE (P/N5732-01401153)
108	1116-03901	GUARANT CARD <b>UA</b>	670	4171-01201	WIRING KIT
108	1116-GC	GUARANT CARD <b>N</b>			
109	1119-04601	ATTACH SHEET <b>UA</b>			



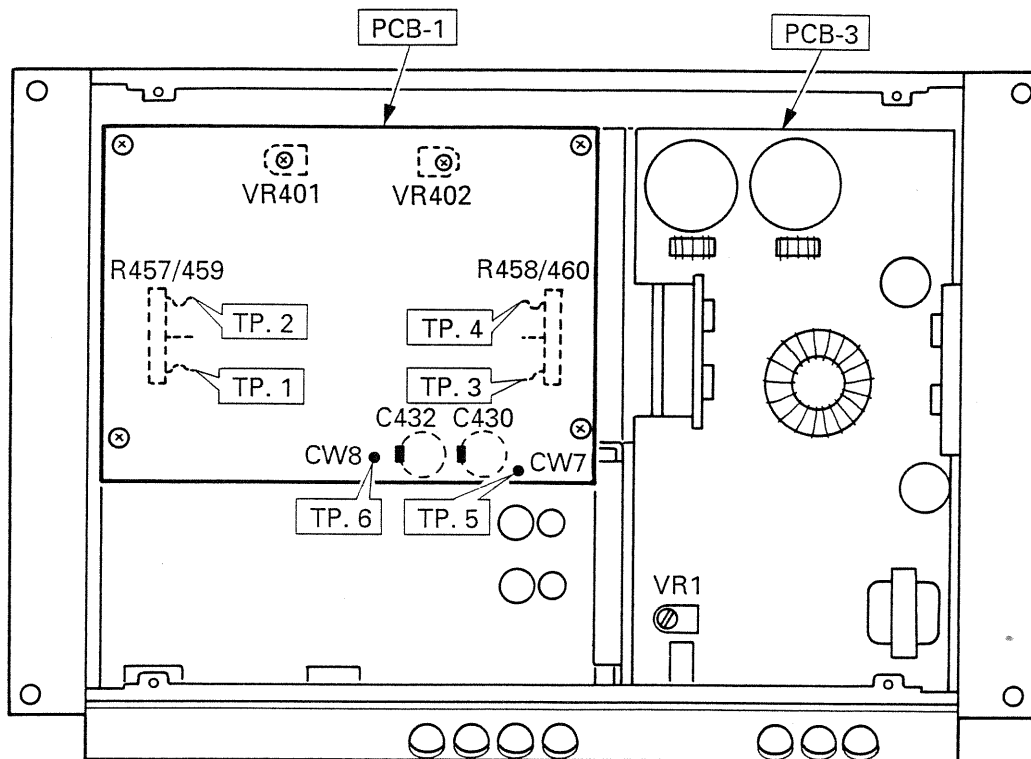
## ALIGNMENT PROCEDURES (REFER TO PAGE 13,14 AND 15)

### ■ IDLING CURRENT ADJUSTMENT

Conditions :

- Connect a 14.4V power supply to the 12V BATTERY POWER IN terminal.
- After the power on, wait for 10 minutes before measuring to be sure of the most stable operation.
- Set the Speaker Operating Mode Switch to "4Ω Stereo" position.
- Set the Boost and Input Level Volume to minimum position.

Step	Connections Equipments	Adjustment	For
1	Connect the Digital Voltmeter to TP1 and TP2 (across the terminals of R457/459)	VR401 (L ch )	22 mV
2	Connect the Digital Voltmeter to TP3 and TP4 (across the terminals of R458/460)	VR402 (R ch )	22 mV



### ■ VOLTAGE REGULATOR ADJUSTMENT

Conditions :

- Connect a 14.4V power supply to the 12V BATTERY POWER IN terminal.
- After the power on, wait for 10 minutes before measuring to be sure of the most stable operation.
- Set the Boost Volume to minimum position.
- Set the Speaker Operating Mode Switch to "2Ω" position.

Step	Connections Equipments	Adjustment	For
1	Connect the Digital Voltmeter to TP5 and TP6	VR1	35.5V



Ser. No.	Ref. No.	Part No.	Description	Ser. No.	Ref. No.	Part No.	Description
406	Q417	5613-945(K)	XISTOR,NPN R	505	R513	5232-101J16P	RES,CBN 1/6P 100
406	Q418	5613-945(K)	XISTOR,NPN R	505	R514	5232-101J16P	RES,CBN 1/6P 100
407	Q419	5613-3247(H)	XISTOR,NPN R	508	R515	5232-103J16P	RES,CBN 1/6P 10K
407	Q420	5613-3247(H)	XISTOR,NPN R	508	R516	5232-103J16P	RES,CBN 1/6P 10K
408	Q421	5611-1287(G)	XISTOR,PNP R	509	R517	5232-332J16P	RES,CBN 1/6P 3.3K
408	Q422	5611-1287(G)	XISTOR,PNP R	509	R518	5232-332J16P	RES,CBN 1/6P 3.3K
409	△ Q423	5613-3181(O)	XISTOR,NPN R	510	R519	5232-122J16P	RES,CBN 1/6P 1.2K
409	△ Q424	5613-3181(O)	XISTOR,NPN R	510	R520	5232-122J16P	RES,CBN 1/6P 1.2K
411	△ Q425	5611-1264(O)	XISTOR,PNP R	513	R521	5232-681J16P	RES,CBN 1/6P 680
411	△ Q426	5611-1264(O)	XISTOR,PNP R	513	R522	5232-681J16P	RES,CBN 1/6P 680
<b>COILS</b>				511	R523	5232-473J16P	RES,CBN 1/6P 47K
427	L401	5991-7165	SPRING COIL	511	R524	5232-473J16P	RES,CBN 1/6P 47K
427	L402	5991-7165	SPRING COIL	512	R525	5232-222J16P	RES,CBN 1/6P 2.2K
<b>CONTROLS</b>				503	R526	5232-102J16P	RES,CBN 1/6P 1K
449	VR401	5101-50101930	RES,SEMI FIX 500	515	R527	5232-184J16P	RES,CBN 1/6P 180K
449	VR402	5101-50101930	RES,SEMI FIX 500	504	R531	5232-331J16P	RES,CBN 1/6P 330
<b>MISCELLANEOUS</b>				504	R532	5232-331J16P	RES,CBN 1/6P 330
557	CW1	4163-0116024	CONNECTOR W/W	504	R533	5232-331J16P	RES,CBN 1/6P 330
558	CW2	4163-0116025	CONNECTOR W/W	504	R534	5232-331J16P	RES,CBN 1/6P 330
559	CW3	4163-0116026	CONNECTOR W/W	503	R535	5232-102J16P	RES,CBN 1/6P 1K
560	CW4	4163-0116027	CONNECTOR W/W	518	R537	5232-331J16P	RES,CBN 1/6P 330
561	CW5	4163-0125025	CONNECTOR W/W	<b>INTEGRATED CIRCUIT</b>			
562	CW6	4163-0125027	CONNECTOR W/W	517	IC501	5652-M5218L	IC,MONO
561	CW7	4163-0125025	CONNECTOR W/W	<b>TRANSISTORS</b>			
562	CW8	4163-0125027	CONNECTOR W/W	521	Q101	5614-667A(C)	XISTOR,NPN A
563	CW9	4163-0130024	CONNECTOR W/W	522	Q102	5612-647A(C)	XISTOR,PNP A
<b>PCB-2 INPUT P.C.BOARD</b>				491	Q501	5613-2240(BL)	XISTOR,NPN R
<b>CAPACITORS</b>				491	Q502	5613-2240(BL)	XISTOR,NPN R
527	C101	5345-227D045	CAP,MINI ELE 220μ/25V	491	Q503	5613-2240(BL)	XISTOR,NPN R
527	C102	5345-227D045	CAP,MINI ELE 220μ/25V	491	Q504	5613-2240(BL)	XISTOR,NPN R
527	C103	5345-227D045	CAP,MINI ELE 220μ/25V	491	Q505	5613-2240(BL)	XISTOR,NPN R
527	C104	5345-227D045	CAP,MINI ELE 220μ/25V	492	Q505	5611-970(BL)	XISTOR,PNP R
528	C105	5345-108C045	CAP,MINI ELE 1000μ/16V	492	Q506	5611-970(BL)	XISTOR,PNP R
528	C106	5345-108C045	CAP,MINI ELE 1000μ/16V	493	Q507	5611-999L(F)	XISTOR,PNP R
500	C501	5353-680534	CAP,MCA 68P	<b>DIODES</b>			
500	C502	5353-680534	CAP,MCA 68P	525	D101	5635-HZ12B2L	DIODE,ZENER
495	C503	5345-106C0951	CAP,MINI ELE 10μ/16V	525	D102	5635-HZ12B2L	DIODE,ZENER
495	C504	5345-106C0951	CAP,MINI ELE 10μ/16V	<b>CONTROLS</b>			
499	C505	5353-050934	CAP,MCA 5P	553	VR501/ 502	5109-S0701303	RES,V CBN 30K,INPUT
499	C506	5353-050934	CAP,MCA 5P	554	VR503/ 504	5109-S0702503	RES,V CBN 50K,BASS BOOST
497	C507	5345-106C0951	CAP,MINI ELE 10μ/16V	<b>MISCELLANEOUS</b>			
497	C508	5345-106C0951	CAP,MINI ELE 10μ/16V	551	J1	4489-04101002	PIN JACK, MLT
496	C509	5345-105F0951	CAP,MINI ELE 1μ/50V	<b>PCB-3 POWER P.C.BOARD</b>			
496	C510	5345-105F0951	CAP,MINI ELE 1μ/50V	<b>CAPACITORS</b>			
498	C511	5354-334593	CAP,MYL .33μ	641	C1	5345-104F0951	CAP,MINI ELE .1μ/50V
498	C512	5354-334593	CAP,MYL .33μ	642	C7	5345-S14DM226	CAP,MINI ELE 22μ/25V
502	C513	5345-106C041	CAP,MINI ELE 10μ/16V	643	C9	5359-S010J103	CAP,PPP .01μ
502	C514	5345-106C041	CAP,MINI ELE 10μ/16V	653	C10	5345-106C0951	CAP,MINI ELE 10μ/16V
502	C515	5345-106C041	CAP,MINI ELE 10μ/16V	644	C11	5345-S15CM108	CAP,MINI ELE 1000μ/16V
502	C516	5345-106C041	CAP,MINI ELE 10μ/16V	644	C12	5345-S15CM108	CAP,MINI ELE 1000μ/16V
502	C517	5345-106C041	CAP,MINI ELE 10μ/16V	645	C13	5361-102ZF	CAP,CER 1000P
502	C518	5345-106C041	CAP,MINI ELE 10μ/16V	646	C14	5345-S14FM475	CAP,MINI ELE 4.7μ/50V
<b>RESISTORS</b>				647	C15	5359-S010J102	CAP,PPP 1000P
533	△ R101	5102-6805116	RES,FUSE 68	648	C16	5345-S14CM337	CAP,MINI ELE 330μ/16V
533	△ R102	5102-6805116	RES,FUSE 68	649	C17	5345-S14CM107	CAP,MINI ELE 100μ/16V
531	R103	5135-472522	RES,CBN 1/2P 4.7K	650	C18	5359-S010J123	CAP,PPP .012μ
531	R104	5135-472522	RES,CBN 1/2P 4.7K	650	C19	5359-S010J123	CAP,PPP .012μ
535	R105	5135-470522	RES,CBN 1/2P 47	651	C20	5359-S010J332	CAP,PPP 3300P
535	R106	5135-470522	RES,CBN 1/2P 47	651	C21	5359-S010J332	CAP,PPP 3300P
514	R501	5232-821J16P	RES,CBN 1/6P 820	652	C22	5341-S22EM478	CAP,ELE 4700μ/35V
514	R502	5232-821J16P	RES,CBN 1/6P 820	652	C23	5341-S22EM478	CAP,ELE 4700μ/35V
505	R505	5232-101J16P	RES,CBN 1/6P 100	<b>RESISTORS</b>			
505	R506	5232-101J16P	RES,CBN 1/6P 100	615	R1	5135-332522	RES,CBN 1/2P 3.3K
507	R507	5232-823J16P	RES,CBN 1/6P 82K	616	R2	5232-472J16P	RES,CBN 1/6P 4.7K
507	R508	5232-823J16P	RES,CBN 1/6P 82K	619	R27	5232-333J16P	RES,CBN 1/6P 33K
503	R509	5232-102J16P	RES,CBN 1/6P 1K	616	R28	5232-472J16P	RES,CBN 1/6P 4.7K
503	R510	5232-102J16P	RES,CBN 1/6P 1K				
506	R511	5232-682J16P	RES,CBN 1/6P 6.8K				
506	R512	5232-682J16P	RES,CBN 1/6P 6.8K				

Ser. No.	Ref. No.	Part No.	Description
620	R29	5232-103J16P	RES,CBN 1/6P 10K
621	R30	5232-332J16P	RES,CBN 1/6P 3.3K
620	R31	5232-103J16P	RES,CBN 1/6P 10K
620	R33	5232-103J16P	RES,CBN 1/6P 10K
619	R34	5232-333J16P	RES,CBN 1/6P 33K
619	R35	5232-333J16P	RES,CBN 1/6P 33K
619	R36	5232-333J16P	RES,CBN 1/6P 33K
616	R37	5232-392J16P	RES,CBN 1/6P 3.9K
616	R39	5232-122J16P	RES,CBN 1/6P 1.2K
620	R40	5232-103J16P	RES,CBN 1/6P 10K
618	R41	5232-102J16P	RES,CBN 1/6P 1K
618	R42	5232-102J16P	RES,CBN 1/6P 1K
616	R43	5232-472J16P	RES,CBN 1/6P 4.7K
616	R44	5232-472J16P	RES,CBN 1/6P 4.7K
623	R45	5232-682J16P	RES,CBN 1/6P 6.8K
624	R46	5232-183J16P	RES,CBN 1/6P 18K
625	R47	5232-271J16P	RES,CBN 1/6P 270
620	R48	5232-103J16P	RES,CBN 1/6P 10K
637	R49	5232-222J16P	RES,CBN 1/6P 2.2K
626	R50	5232-822J16P	RES,CBN 1/6P 8.2K
623	R51	5232-682J16P	RES,CBN 1/6P 6.8K
633	R52	5135-331522	RES,CBN 1/2P 330
633	R53	5135-331522	RES,CBN 1/2P 330
627	R54	5232-105J16P	RES,CBN 1/6P 1M
628	R55	5232-821J16P	RES,CBN 1/6P 820
615	R56	5135-332522	RES,CBN 1/2P 3.3K
629	R57	5171-S010J150	RES,MTL 1 15
629	R58	5171-S010J150	RES,MTL 1 15
630	R59	5135-220522	RES,CBN 1/2P 22
630	R60	5232-274J16P	RES,CBN 1/6P 270K
631	△ R61	5102-2205116	RES,FUSE 22
631	△ R62	5102-2205116	RES,FUSE 22
622	R67	5232-471J16P	RES,CBN 1/6P 470
617	R71	5135-152522	RES,CBN 1/2P 1.5K
618	R72	5232-102J16P	RES,CBN 1/6P 1K

**INTEGRATED CIRCUITS**

661	IC1	5653-UPC494C	IC,LINEAR
662	IC2	5654-TC4069UB	IC,DIGITAL

**TRANSISTORS**

581	Q9	5613-C124ES	XISTOR,NPN R
582	Q10	5611-1359(Y)	XISTOR,PNP R
583	Q11	5613-1740S(S)	XISTOR,NPN R
584	Q12	5611-A124ES	XISTOR,PNP R
584	Q13	5611-A124ES	XISTOR,PNP R
581	Q14	5613-C124ES	XISTOR,NPN R
581	Q15	5613-C124ES	XISTOR,NPN R
584	Q16	5611-A124ES	XISTOR,PNP R
583	Q17	5613-1740S(S)	XISTOR,NPN R
585	Q18	5613-2655(Y)	XISTOR,NPN R
585	Q19	5613-2655(Y)	XISTOR,NPN R
586	Q20	5611-1020(Y)	XISTOR,PNP R
586	Q21	5611-1020(Y)	XISTOR,PNP R
587	Q22	5616-2SK943	FET,N-CH
587	Q23	5616-2SK943	FET,N-CH

**DIODES**

590	D1	5631-1S2473	DIODE,DET
591	D2	5635-HZ6A-2L	DIODE,ZENER
592	D3	5635-HZ12B2L	DIODE,ZENER
593	D4	5637-SLR33VC	LED
594	D5	5637-SLR33YC	LED
595	D6	5637-SLR33MC	LED
596	D7	5636-1S2471	DIODE,SWITCH
597	D8	5632-ERC102FL	DIODE,RECT
598	D9	5631-1SS133	DIODE,DET
599	D11	5632-F10P20F	DIODE,RECT
600	D12	5632-F10P20FR	DIODE,RECT
601	D13	5635-HZ22BP	DIODE,ZENER

**COILS**

604	L1	5583-51102	COIL,AF CH
607	L2	5995-S210M300	COIL W/CORE
607	L3	5995-S210M300	COIL W/CORE

Ser. No.	Ref. No.	Part No.	Description
<b>CONTROLS</b>			
613	VR1	5101-10201930	RES,SEMI FIX 1K
<b>MISCELLANEOUS</b>			
640	LCN1	4163-02902003	CONNECTOR W/W
663	PH1	5624-TLP531	PHOTO COUPLR
657	PT1	5192-00701	POSISTOR
657	PT2	5192-00701	POSISTOR
658	PT3	5192-00601	POSISTOR
611	SW1	4431-S0601102	SWITCH,PUSH
606	T1	5591-00101	CORE,RND
664	TM1	4214-5021	TERMINAL

**ABBREVIATIONS IN PARTS LIST****CAPACITORS**

CAP, MINI ELE	: Electrolytic
CAP, CER	: Ceramic
CAP, PPP	: Polypropylene
CAP, MYL	: Mylar
CAP, MCA	: Mica
	470 $\mu$ : 470 $\mu$ F
	6800P : 6800PF
	.047 $\mu$ : 0.047 $\mu$ F

**RESISTORS**

RES, CBN 1/6P	: Carbon 1/6W
	2.2K : 2.2k $\Omega$
	220 : 220 $\Omega$
RES, FUSE	: Fuse
RES, CEM 5P	: Cement 5W
RES, MTL 1P	: Metal 1W

**TRANSISTORS**

XISTOR	: Transistor
FET	: Field Effect Transistor

**CONTROLS**

RES, V CBN	: Variable Carbon Resistor
RES, SEMI FIX	: Semi-fixed Resistor

**NOTE**

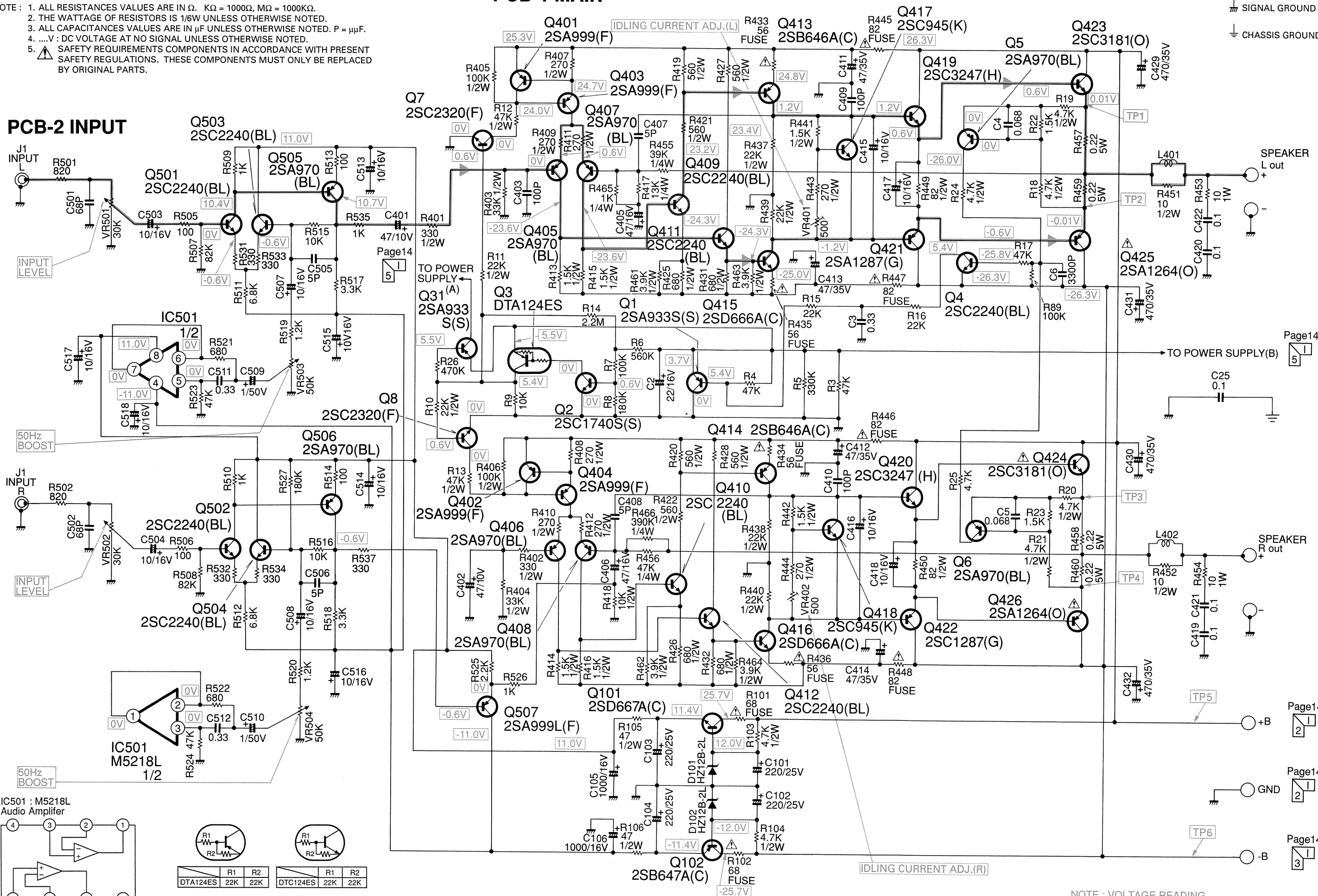
△ SAFETY RELATED COMPONENT. USE ONLY EXACT REPLACEMENT PART AS SPECIFIED.

### SCHEMATIC DIAGRAM (1)

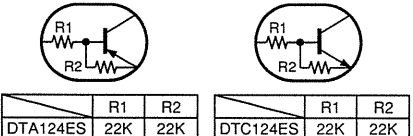
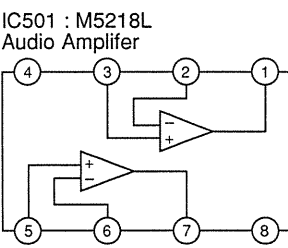
- NOTE : 1. ALL RESISTANCES VALUES ARE IN  $\Omega$ .  $K\Omega = 1000\Omega$ ,  $M\Omega = 1000K\Omega$ .  
 2. THE WATTAGE OF RESISTORS IS 1/6W UNLESS OTHERWISE NOTED.  
 3. ALL CAPACITANCES VALUES ARE IN  $\mu F$  UNLESS OTHERWISE NOTED.  $P = \mu\mu F$ .  
 4. ....V : DC VOLTAGE AT NO SIGNAL UNLESS OTHERWISE NOTED.  
 5. SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

### PCB-1 MAIN

### PCB-2 INPUT



⏏ SIGNAL GROUND  
 ⏏ CHASSIS GROUND



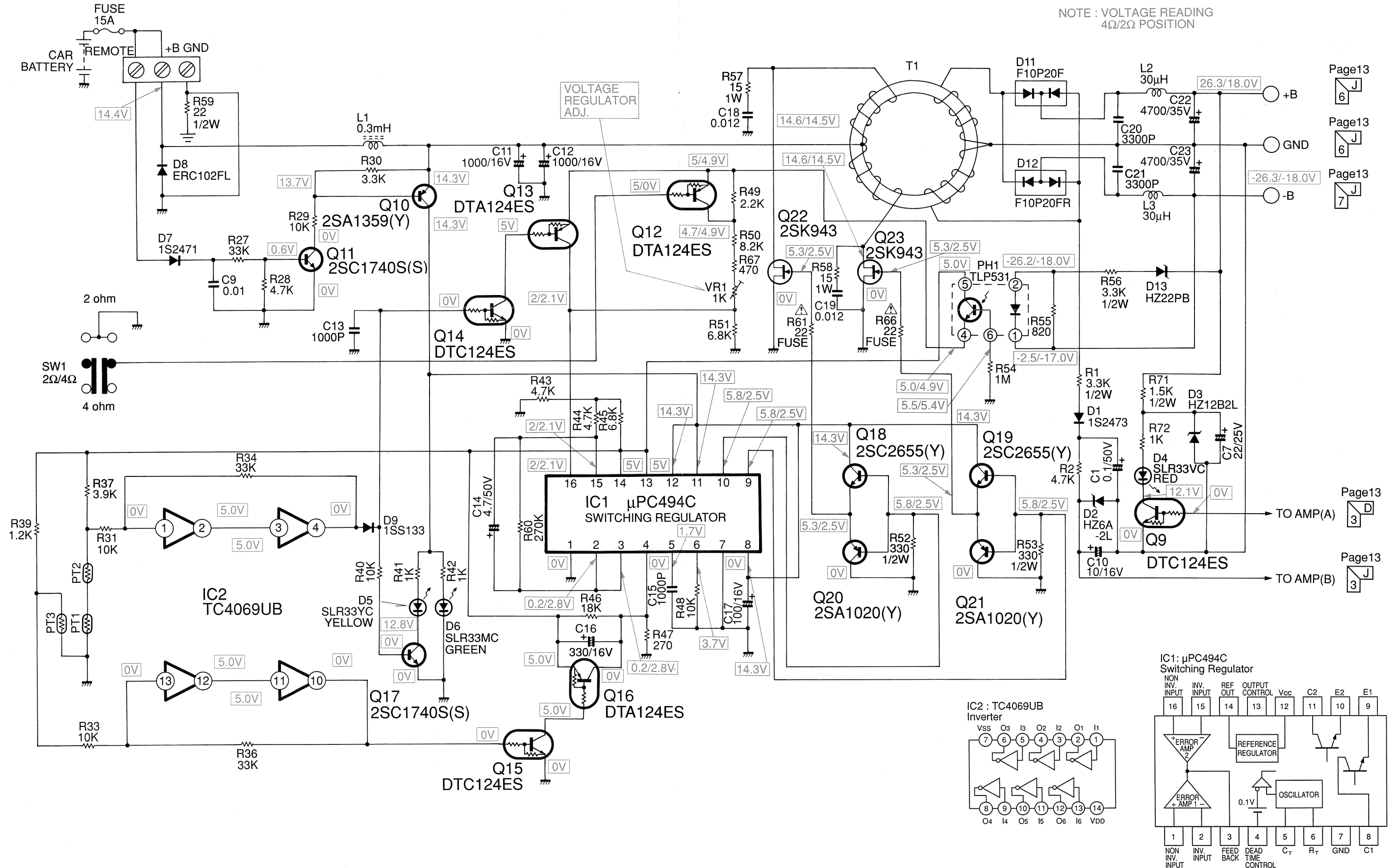
NOTE : VOLTAGE READING 4 $\Omega$  POSITION

SCHMATIC DIAGRAM (2) POWER SUPPLY

⏏ SIGNAL GROUND  
⏏ CHASSIS GROUND

PCB-3 POWER

NOTE : VOLTAGE READING  
4Ω/2Ω POSITION



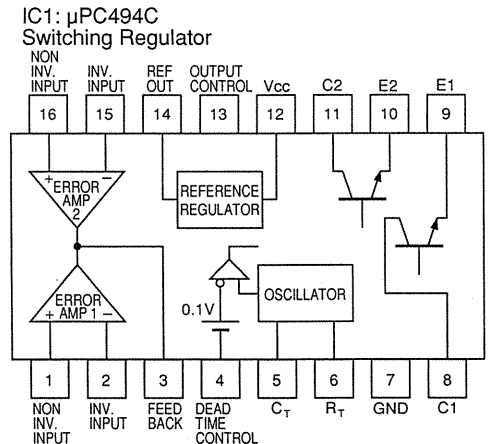
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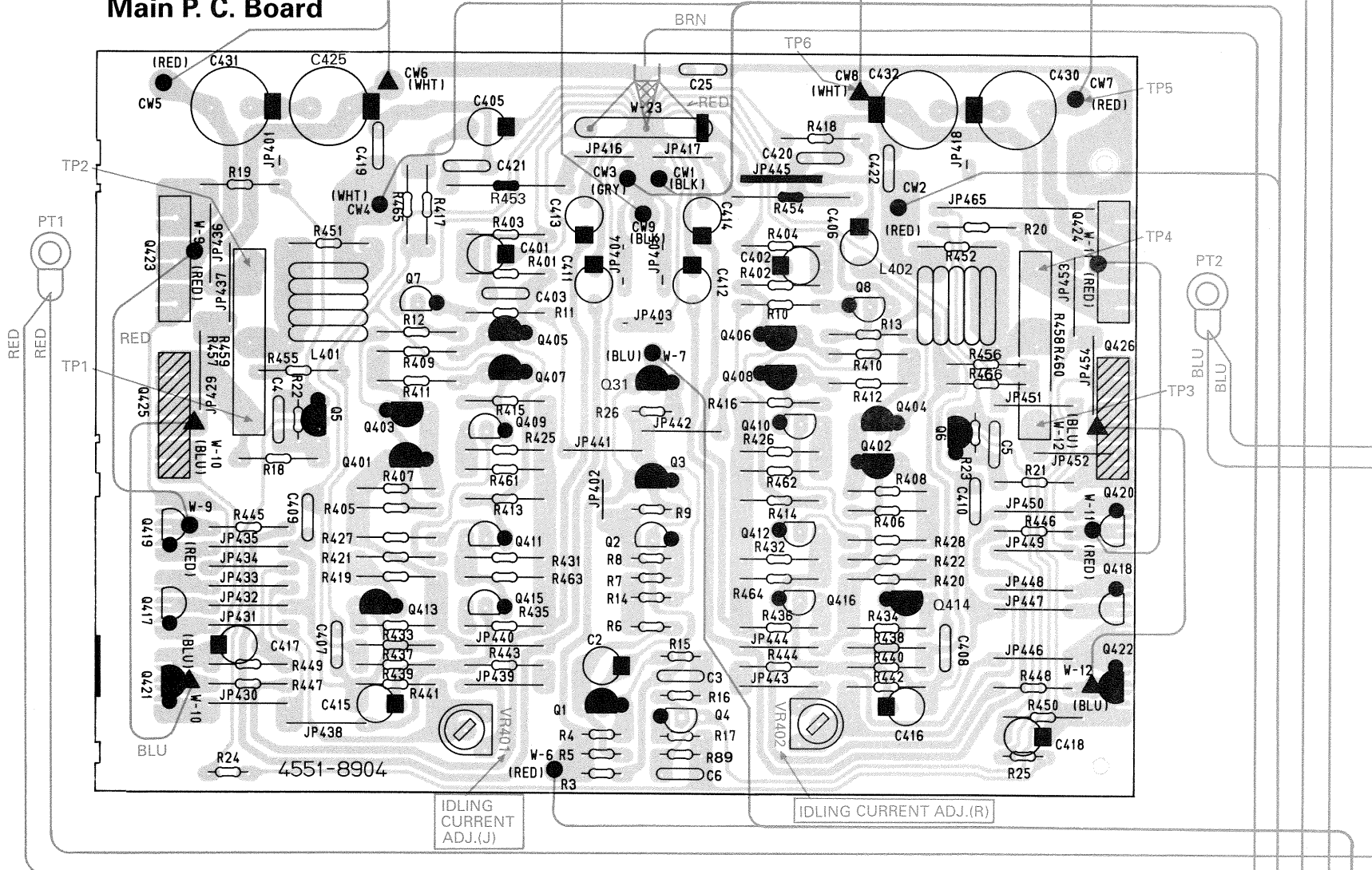
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WIRING DIAGRAM

PCB-1

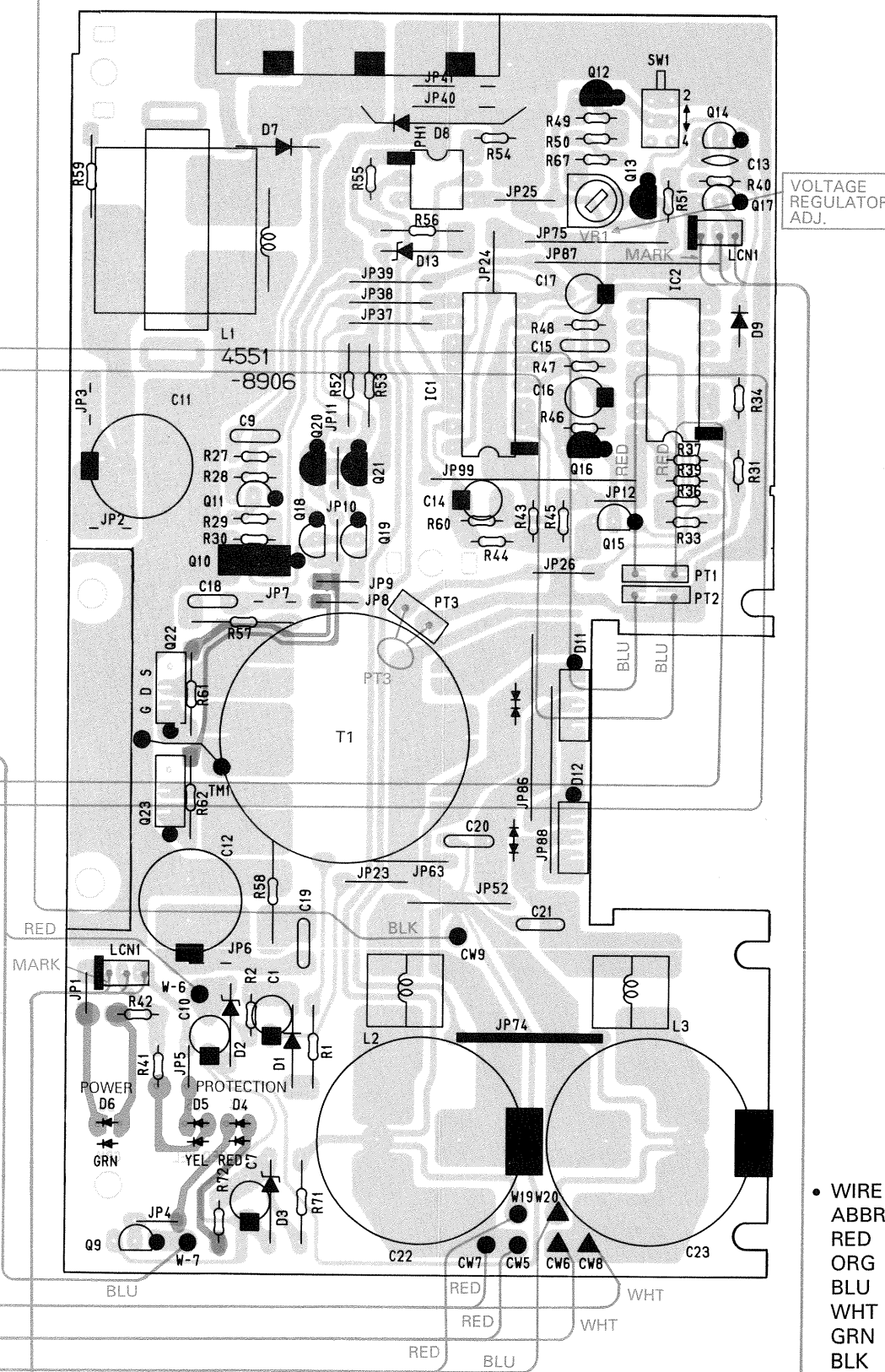
Main P. C. Board



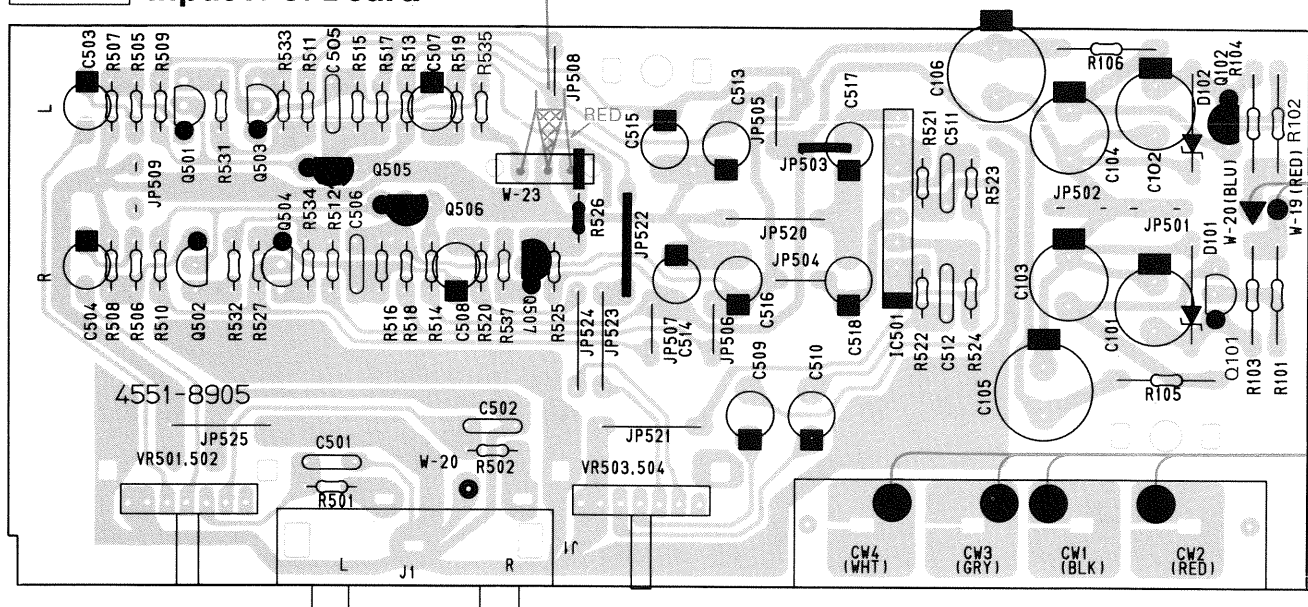
PCB-3

Power P. C. Board

Power Remote +12V  $\ominus$   $\blacksquare$  2Ω/4Ω Bridged  $\blacksquare$  4Ω Stereo



PCB-2 Input P. C. Board



Input Level L R 50 Hz Boost + L - + R -

- WIRE COLOR ABBREVIATIONS
- RED : Red
- ORG : Orange
- BLU : Blue
- WHT : White
- GRN : Green
- BLK : Black
- YEL : Yellow
- PUP : Purple
- PIK : Pink
- BRN : Brown