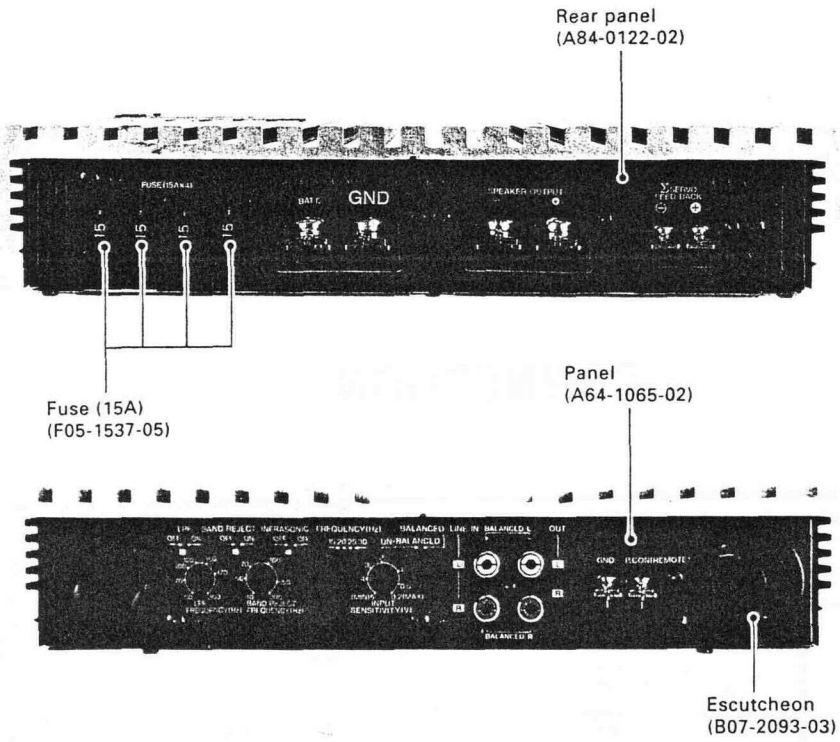
MONO POWER AMPLIFIER

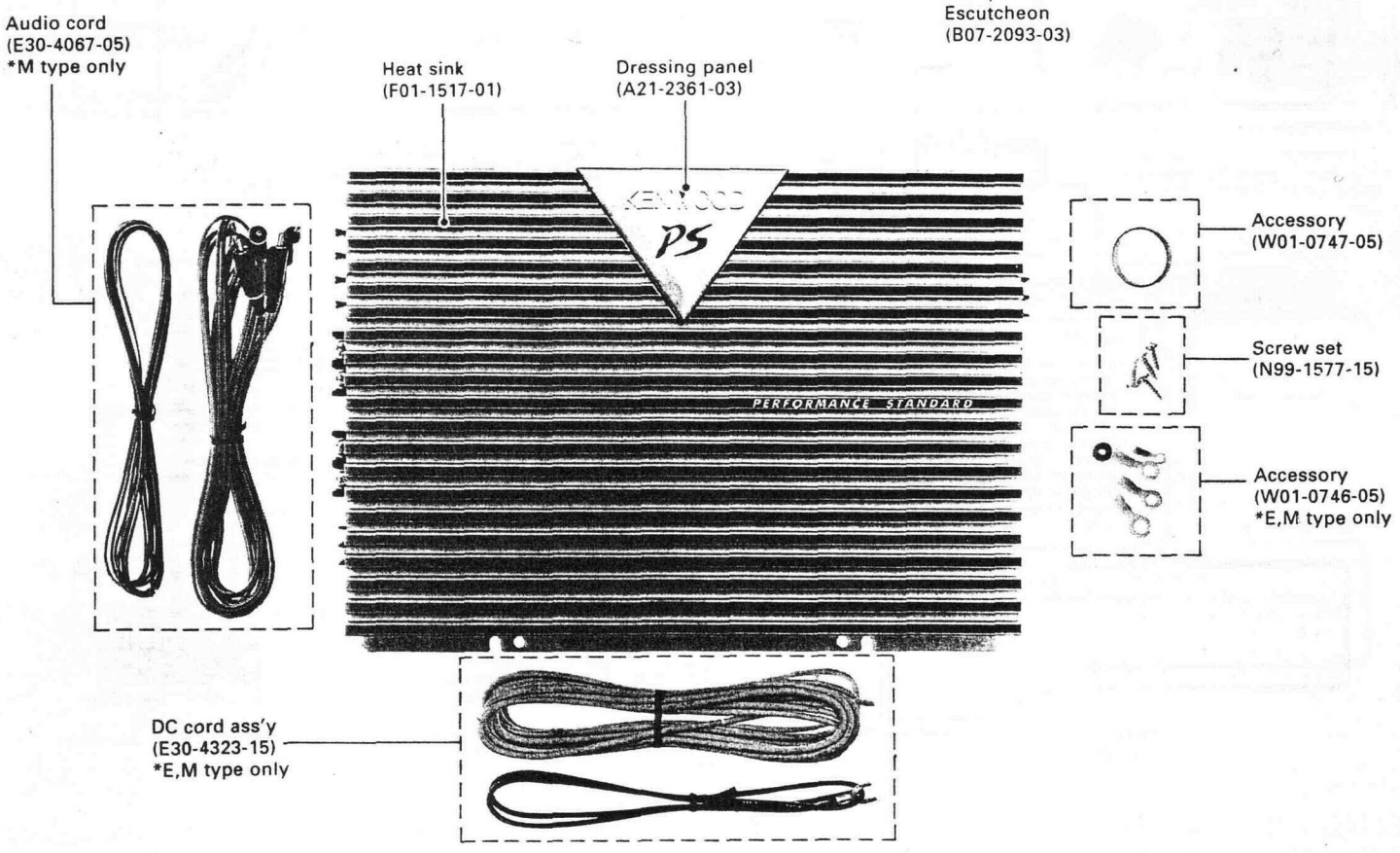
KAC-PS400M

SERVICE MANUAL

KENWOOD

B51-7157-00(MC) 3620





KAC-PS400M

CONTENTS

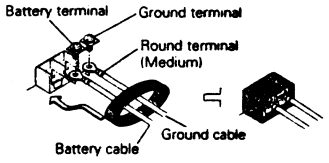
CONNECTION

Connection

■Power and Speakers cable connection

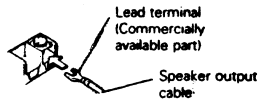
Power terminal

Pass battery and ground cables through supplied terminal cover and connect to respective terminals. After completing connections, fasten terminal cover over terminal bracket.



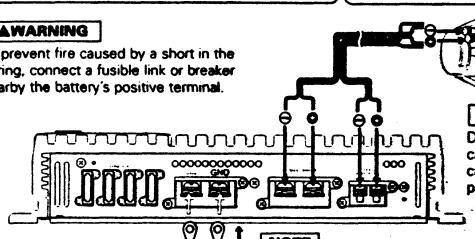
Speaker output cable terminal

Connect the speaker output cables to these terminals.



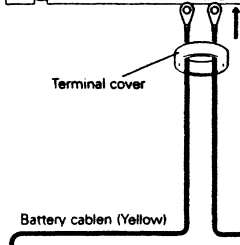
▲WARNING

To prevent fire caused by a short in the wiring, connect a fusible link or breaker nearby the battery's positive terminal.



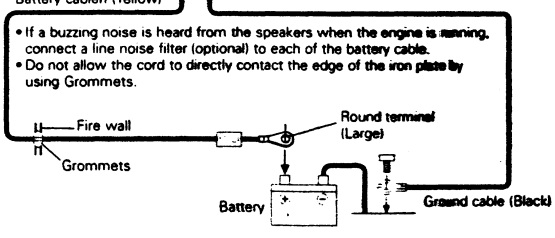
NOTE

Distribute the speaker cables and sigma servo cables along the same paths.



NOTE

- Connect the ground cable to a metal part of the car chassis that acts as an electrical ground passing electricity to the battery's negative – terminal. Do not turn the power on if the ground cable is not connected.
- When installing two amplifiers, connect a power tune-up cable to each of them while taking care not to exceed the cable capacity.
- The power cable should be thick enough to supply the required current and connected directly from the battery.

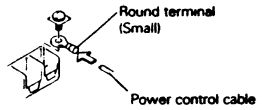


- If a buzzing noise is heard from the speakers when the engine is running, connect a line noise filter (optional) to each of the battery cable.
- Do not allow the cord to directly contact the edge of the iron plate by using Grommets.

■RCA cable connection

Power control lead terminal

Connect the Center units's power control lead from the center unit.

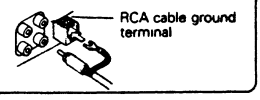


RCA cable ground lead terminal

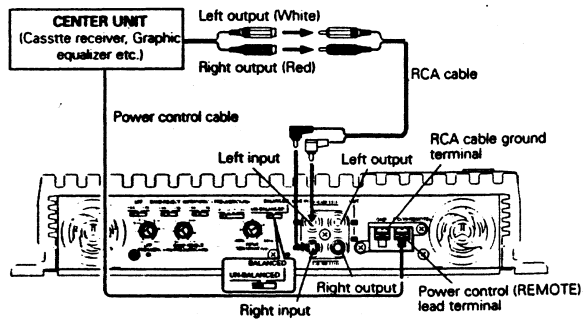
When using an RCA cable with a ground lead attached, connect the ground lead to this terminal.

▲CAUTION

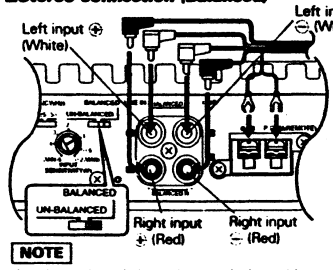
Do not use this terminal for power source grounding. This unit will be damaged if the power source grounding wire is connected to this terminal.



■Stereo connection (Unbalanced)



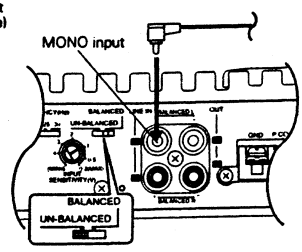
■Stereo connection (Balanced)



NOTE

Use the optional balanced transmission cable (KBC-600) when balanced signal connection is required.

■Monaural connection



Sigma servo feed back

The sound reproduced through conventional amplifiers is distorted due to the counterelectromotive force produced in the oscillating system of the speaker. The counterelectromotive force is particularly high with the woofer which requires a large drive mass.The sigma servo connection reduces distortion caused by the counterelectromotive force by including the circuit up to the speaker terminals in the negative feedback loop. This makes it possible to drive speakers with more fidelity to the input signals and create a sharp bass sound image with few feeling of noise interference.

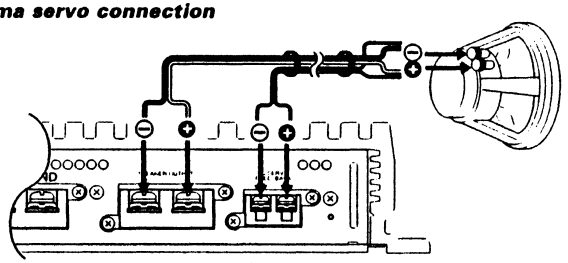
NOTE

The speaker cables and sigma servo cables should be distributed along the same paths.

▲CAUTION

- The extension of the negative feedback loop to include the speaker terminals makes it necessary to connect the sigma servo terminals correctly. Incorrect connection may result in sound degradation or other malfunction. If sound is not reproduced normally, check the connection of the sigma servo terminals, etc.
- If the Sigma servo terminals are not connected, the sound may fluctuate or noise may occur. Be sure to connect the Sigma servo terminals correctly.
- When connecting speakers in a parallel configuration, use speakers with an impedance of 4 ohms or more. Connecting speakers with smaller impedance than 4 ohms will cause malfunction.
- The rated input of the speakers connected to this unit should be no less than the maximum output of the amplifier. Otherwise malfunction may result.
  Be specially careful in this when connecting speakers in a parallel configuration.

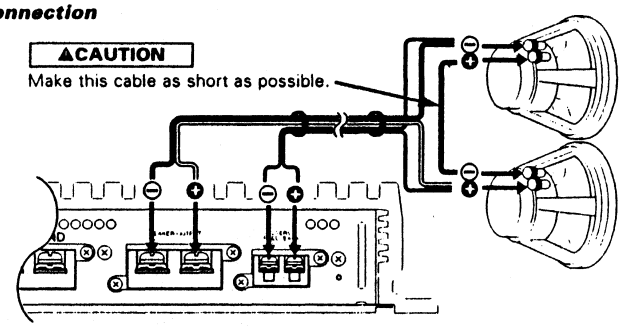
■ *Basic sigma servo connection*



■ *Series connection*

▲CAUTION

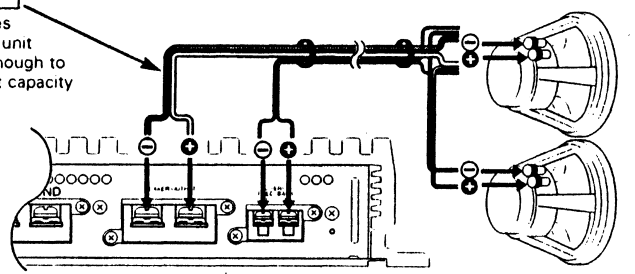
Make this cable as short as possible.



■ *Parallel connection (1)*

▲CAUTION

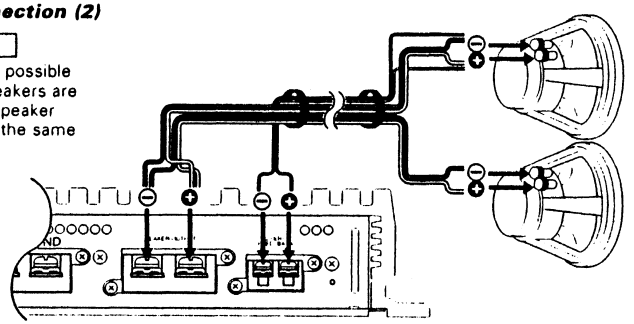
The speaker cables connected to this unit should be thick enough to supply the current capacity of two speakers.



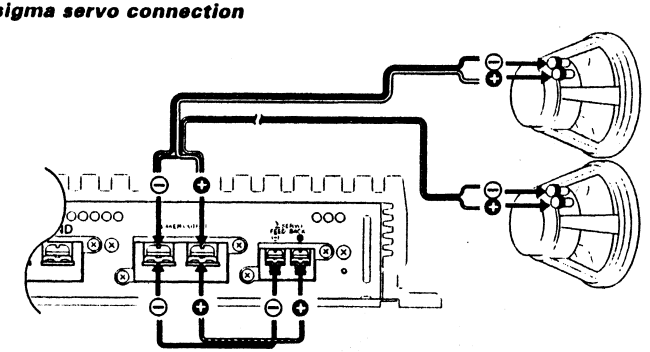
■ *Parallel connection (2)*

▲CAUTION

This connection is possible only when the speakers are identical and the speaker cables are also of the same type and length.

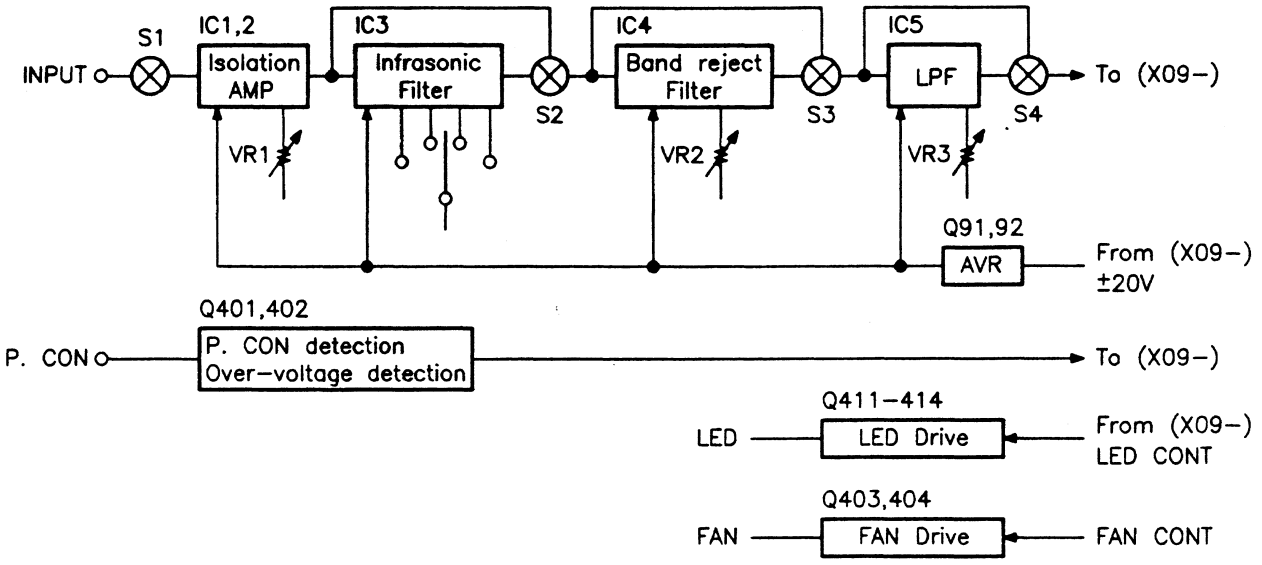


■ *Simplified sigma servo connection*

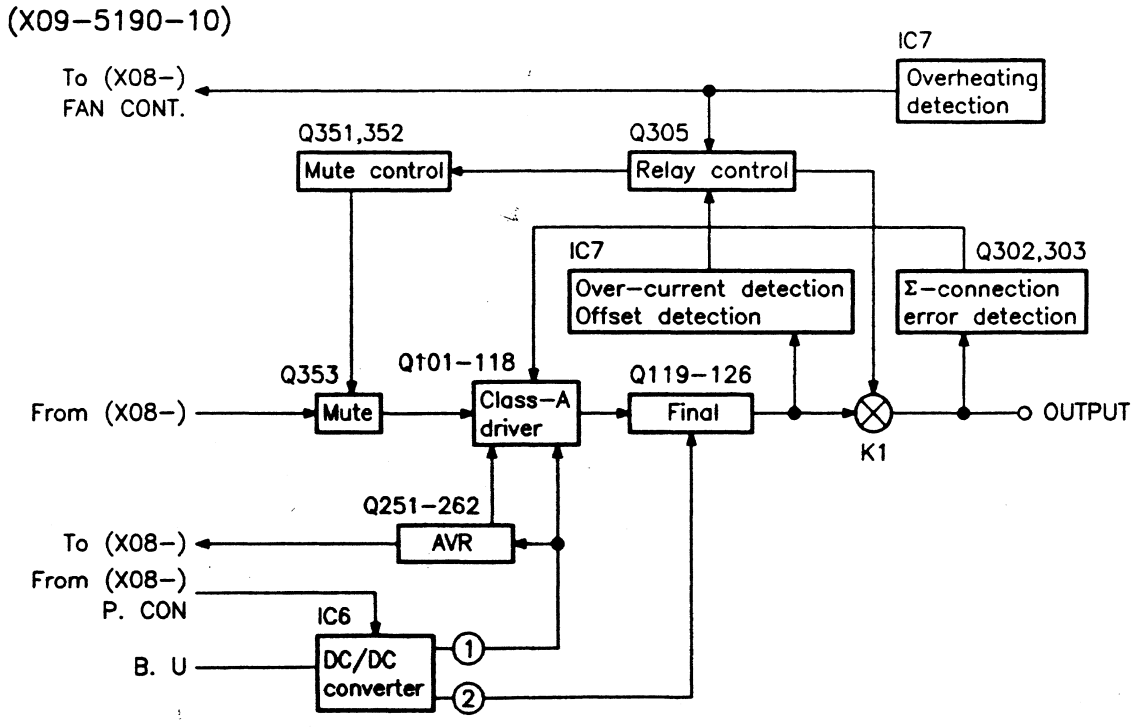


BLOCK DIAGRAM

(X08-4030-10)



(X09-5190-10)



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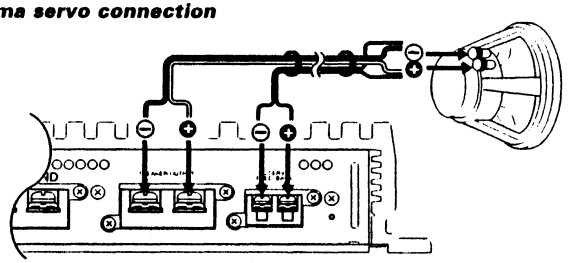
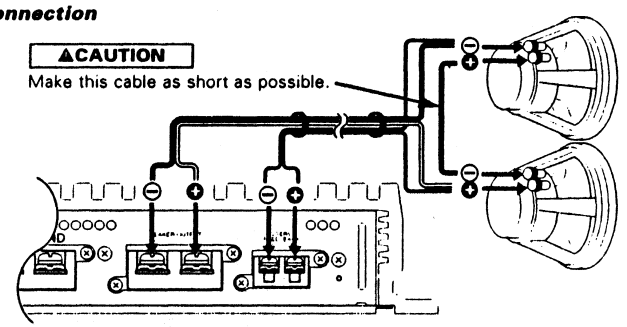
■ *Basic sigma servo connection*



■ *Series connection*

▲CAUTION

Make this cable as short as possible.



■ *Parallel connection (1)*

▲CAUTION

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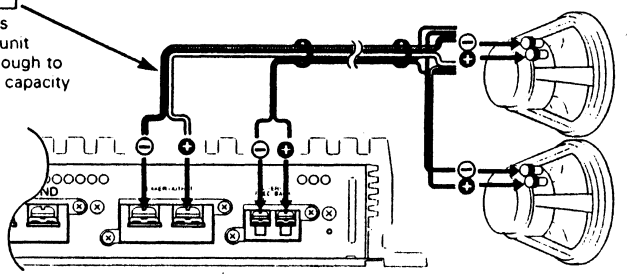
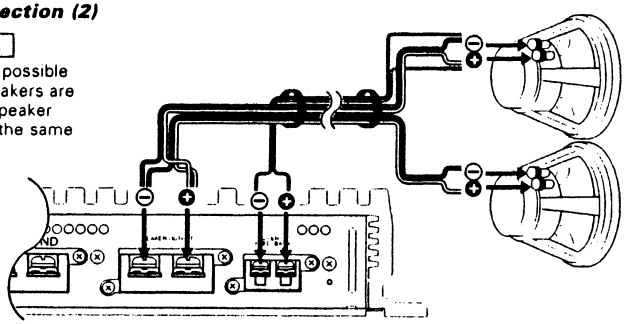


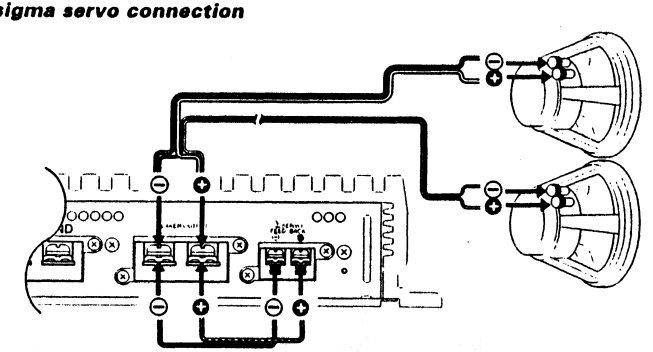
■ *Parallel connection (2)*

▲CAUTION

This connection is possible only when the speakers are identical and the speaker cables are also of the same type and length.



■ *Simplified sigma servo connection*



CIRCUIT DESCRIPTION

●PREAMPLIFIER UNIT (X08-4030-10)

Component	Component Name	Application / Functions	Operation/Condition/Compatibility
IC1 , 2	NJM5532D	Isolation AMP	Cancels common mode noise in amplifier input
IC3	NJM4565D	Infrasonic filter	Cuts low frequencies below audible band
IC4	NJM4565D	Band reject filter	Cuts off specific frequencies
IC5	NJM4565D	L.P.F	Low pass filtering, gain boosting
Q91	2SC3940A(R,S)	AVR	+15.4V
Q92	2SA1534A(R,S)	AVR	-15.4V
Q401	2SC945(A)(Q,P)	P-CON detection	Goes ON when P-con is detected
Q402	2SC945(A)(Q,P)	Over-voltage detection	Goes ON when back-up voltage is 16.7V or more (→ P-con OFF)
Q403	2SC945(A)(Q,P)	Fan control	Goes OFF when amplifier's internal temperature rises (→ Fan ON)
Q404	2SC3940A(R,S)	Fan ON/OFF SW	Goes ON when Q403 goes OFF(=Fan ON)
Q411	DTA124ESA	LED drive	GOes ON when LED CONT = L. At this time, Q412 goes OFF (Red)
Q412	DTA124ESA	LED drive	Goes ON when SW 14V is ON (Green)
Q413 , 414	DTC124ESA	Voltage drop detection	Q413 goes OFF when B.U is 11.5V or less. → Q414 ON = Green ON(Amber)
D1 - 8	1SS131	Static electricity protection	Protects the input of isolation Op-Amp
D91 , 92	RD16JS(B2)	AVR reference voltage	D91 is maintained at +16V and D92 at -16V
D401	RD7.5JS(B)	P-CON	P-con reference voltage
D402	RD16JS(B2)	Over-voltage detection	Reference voltage for over-voltage detection
D403 ,404	1SS131	Surge absorber	Absorbs surge while relay is OFF
D411	1SS131	LED CONT	LED CONT muting, prevention of mutual interference between relay drives
D412	RD10JS(B2)	Voltage drop detection	Reference voltage for voltage for voltage drop

●AUDIO UNIT(X09-5190-10)

Component	Component Name	Application / Functions	Operation/Condition/Compatibility
IC6	UPC494C	DC/DC converter	Oscillator for use in DC/DC conversion
IC7	UPC1237HA	Protection	Turns relay OFF in case of over-current, DC offset and overheating
Q101	2SK389	Differential AMP	Class A 1st-stage amplifier
Q102	2SC945(A)(Q,P)	Constant current circuit	Bias current regulator for Class A 1st-stage amplifier
Q103 , 104	2SC945(A)(Q,P)	Cascode circuit	Cascode circuit for Class A 1st-stage amplifier
Q105 , 106	2SA1123(Q,R)	Differential AMP	Class A 2nd-stage amplifier
Q107 - 110	2SC2631(Q,R)	Differential AMP	Class A 3rd-stage amplifier
Q111 ,112	2SC2631(Q,R)	Cascode circuit	Cascode circuit for Class A 3rd-stage amplifier
Q113 ,114	2SA1123(Q,R)	Current mirror circuit	Current mirror for Class A 3rd-stage amplifier
Q115	2SC2590(Q,R)	Bias voltage circuit	Temperature compensation of Class B amplifier
Q116	2SA1110(Q,R)		

CIRCUIT DESCRIPTION

Component	Component Name	Application / Functions	Operation/Condition/Compatibility
Q117	2SC4883A	Driver	Driver stage of Class B amplifier
Q118	2SA1859A		
Q119,121,123,125	2SC4886*5	Final	Final stage of Class B amplifier
Q120,122,124,126	2SA1860*5		
Q201 , 202	2SC945(A)(Q,P)	Switching drive	Drives DC/DC switching FET
Q203 , 204	2SA733(A)(Q,P)		
Q205 - 216	IRFIZ48N	Switching FET	DC/DC switching element
Q217	2SA817A	SW 14V	14V line switch
Q218	2SA733(A)(Q,P)	Muting drive	Muting ON/OFF switch
Q219	2SC945(A)(Q,P)	Fuse blow	
Q251 - 256	2SC1627A	AVR	AVR transistor, +20V
Q257 - 262	2SA817A	AVR	AVR transistor, -20V
Q263 , 264	2SC1845(F,E)	AVR control	Differential AMP for AVR error amplification
Q265 , 266	2SA992(F,E)		
Q301	2SC1845(F,E)	Over-current detection	ON in case of over-current
Q302 , 303	2SC1845(F,E)	Σ-connection error detection	ON in case of Σ-connection error
Q304	2SA992(F,E)	Over-current protection	Turns pin 1 of UPD1237 ON and OFF
Q305	2SA1123(Q,R)	Relay drive	Relay ON/OFF switch
Q306	2SC945(A)(Q,P)	Posistor voltage buffer	Emitter-follower of posistor voltage
Q307	2SA733(A)(Q,P)	Σ-connection error protection	In case of Σ-connection error, shuts down the constant-current circuit of Class A 1st-stage AMP and turns LED CONT OFF(Green)
Q308 - 310	2SC945(A)(Q,P)		
Q351 , 353	2SC945(A)(Q,P)	Muting & muting drive	
Q352	2SA733(A)(Q,P)		
D101 , 102	1SS131	Constant-current circuit	Reference voltage for constant-current circuit
D103	1SS131	Current mirror	Bias voltage for current mirror
D105 , 106	1N4935	Excessive signal protection	Goes on when signal voltage > final supply voltage
D201 , 202	D10LC20U	DC/DC regulator	Power supply for final stage
D203 , 204	D10LC20UR		
D205 - 212	1N4935	DC/DC regulator	Power supply for other circuitry than final stage
D213 - 216	1SS131	DC/DC FET gate control	Diode for pulling charge from FET gate
D217 , 218	1N5406-M	Inverse-connection diode	
D219 , 220	1SS131	P-CON, 1st-stage bias	Prevention of mutual interference between P-con and 1st-stage bias control
D221	1SS131	Fuse blow detection	Detection of fuse below on one side
D251	RD10JS(B2)	AVR	AVR reference voltage
D301 - 303	1SS131	Current protection	D301 increases the voltage across emitter resistor
D304-310,314-316	1SS131	Σ-connection error protection	Shuts off constant-current circuit upon detection
D317	1SS131	Σ-connection error protection	Illumination : Red → Green
D351 , 352	1SS131	Muting drive	

KAC-PS400M

SPECIFICATIONS

Specifications subject to change without notice.

Audio Section

Max Power Output (2 Ω)	1200 W × 1
Rated Power Output (+B = 12.0 V)	
(4 Ω)	200 W × 1 (20 Hz ~ 20 kHz, 0.05 % THD)
(2 Ω)	400 W × 1 (1 kHz, 0.5 % THD)
Rated Power Output (+B = 14.4 V)	
(4 Ω)	300 W × 1 (20 Hz ~ 20 kHz, 0.05 % THD)
(2 Ω)	600 W × 1 (1 kHz, 0.5 % THD)
Frequency Response (+ 0 , – 3 dB)	5 Hz ~ 50 kHz
Total Harmonic Distortion (Rated power)*	0.002 % (1 kHz)
Sensitivity (rated output) (MAX.)	0.2 V
(MIN.)	5.0 V
Signal to Noise Ratio	105 dB
Input Impedance	10 kΩ
Damping Factor	More than 9900 (at Σ connect)
Low Pass Filter Frequency (24 dB/oct.)	50 ~ 200 Hz (variable)
Infrasonic Filter Frequency (24 dB/oct.)	15 / 20 / 25 / 30 Hz
Band Reject Filter Frequency	40 ~ 200 Hz

* Sensitivity + Min. Through LPF (30 kHz)

General

Operating Voltage	12.0 V (11 ~ 16 V allowable)
Current Consumption (4 Ω, +B = 12.0 V, 10 % THD)	36 A
Dimensions (W × H × D)	272 × 58 × 400 mm
	10-11/16 × 2-5/16 × 15-3/4 inch
Weight	6.5 kg
	14.3 lbs

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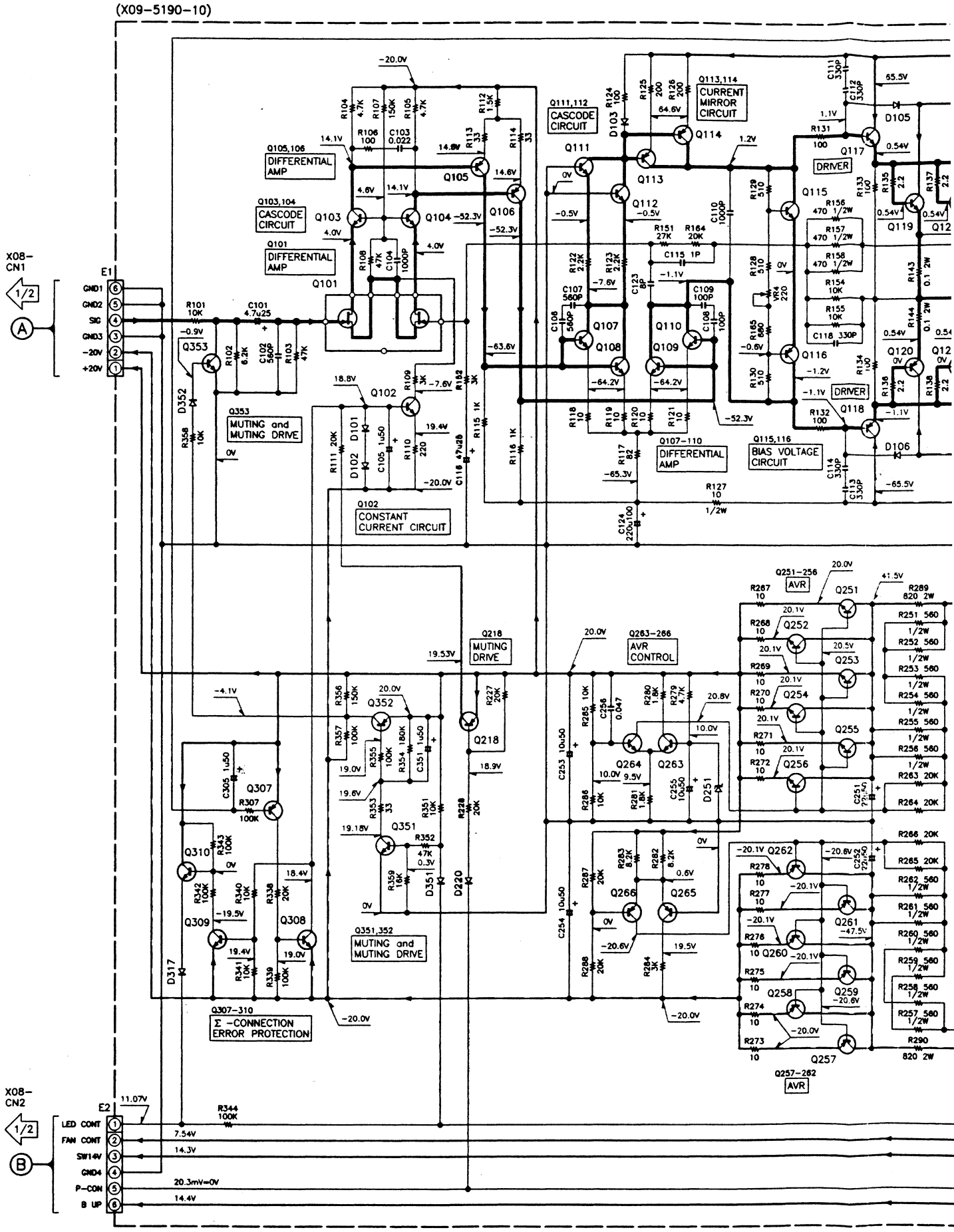


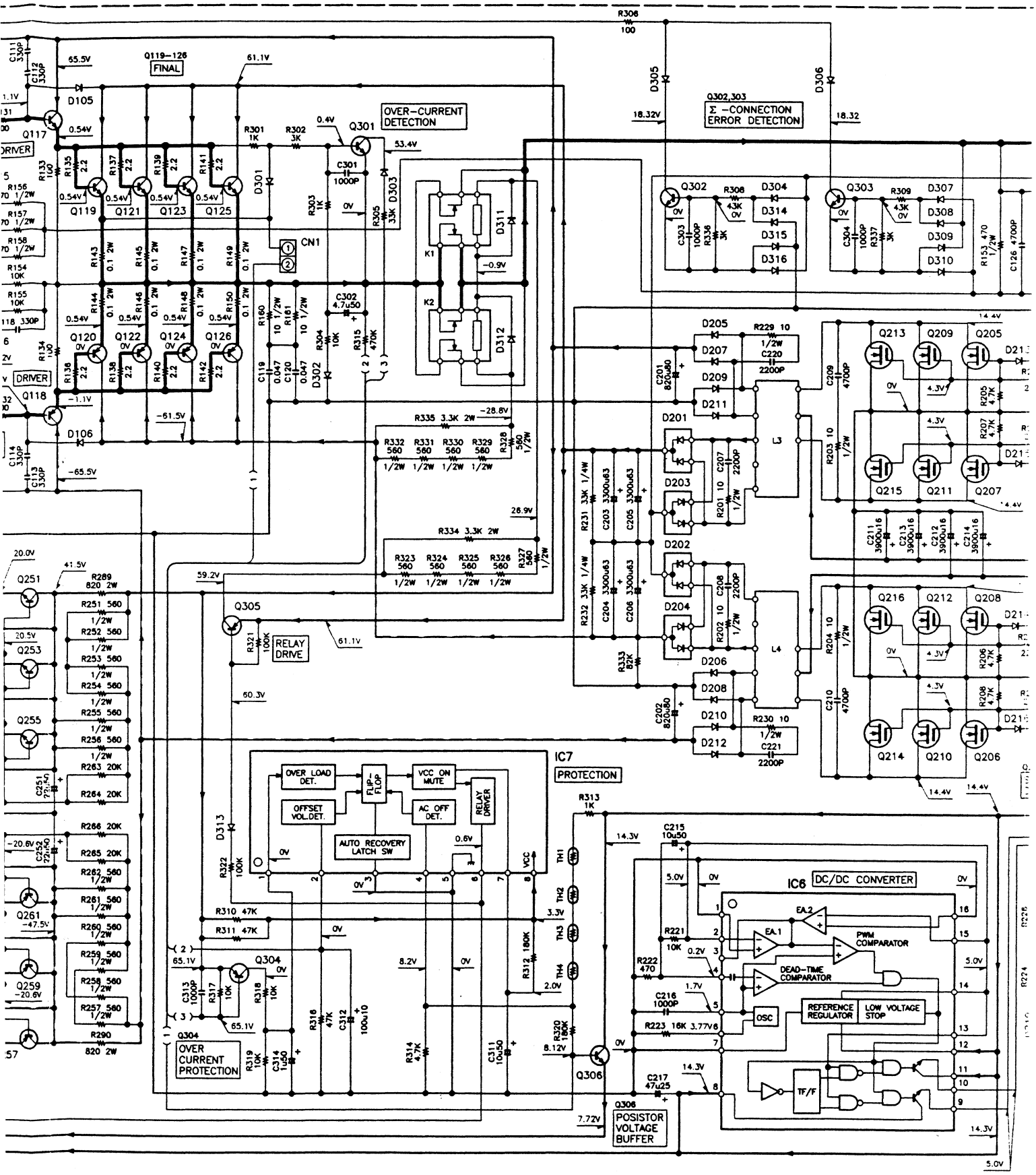
IC6 : UPC494C
IC7 : UPC1237HA

Q101 : 2SK389
Q102-104,201,202,219 306,308-310,351,353 : 2SC945(A)(Q,P)
Q105,106,113,114,305 : 2SA1123(Q,R)
Q107-112 : 2SC2631(Q,R)

Q115 : 2SC2590(Q,R)
Q116 : 2SA1110(Q,R)
Q117 : 2SC4883A
Q118 : 2SA1859A
Q119,121,123,125 : 2SC4886#5
Q120,122,124,126 : 2SA1860#5

Q203,204,218,307,352 : 2SA733(A)(Q,P)
Q205-216 : IRFIZ48N
Q217,257-262 : 2SA817A
Q251-256 : 2SC1627A
Q263,264,301-303 : 2SC1845(F,E)
Q265,266,304 : 2SA992(F,E)

D101-103,213 301-317,351
D105,106,205-
D201,202

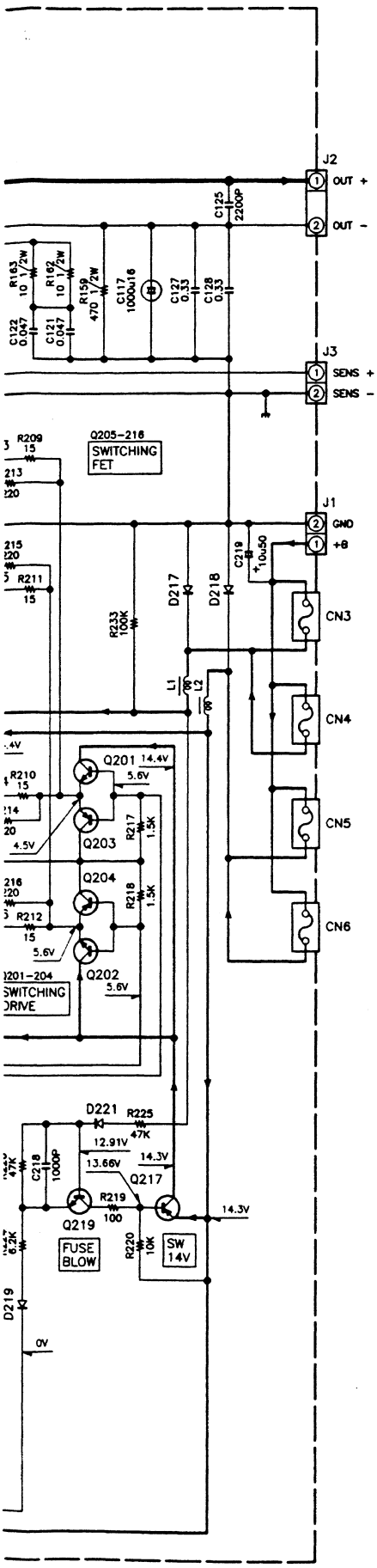


P)

D101–103,213–216,219–221, 301–317,351,352 : 1SS131
D105,106,205–212 : 1N4935
D201,202 : D10LC20U
D203,204 : D10LC20UR
D217,218 : 1N5406–M
D251 : RD10JS(B2)

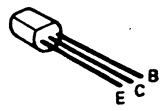
TH1,3 : PTH9M04BD222T
TH2,4 : PTH59F04BD222T

SIGNAL LINE
GND LINE
+B LINE
–B LINE

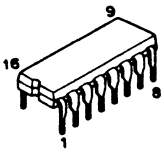


KAC-PS400M(K) (2/2)

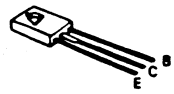
2SA1123
2SA1534A
2SA733(A)
2SA817A
2SA992
2SC1627A
2SC1845
2SC2631
2SC3940A
2SC945(A)



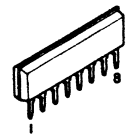
UPC494C



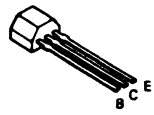
2SA1110
2SC2590



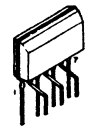
UPC1237HA



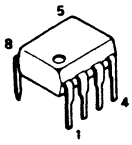
DTA124ESA
DTC124ESA
2SA933(A)



2SK389



NJM4565D
NJM5532D

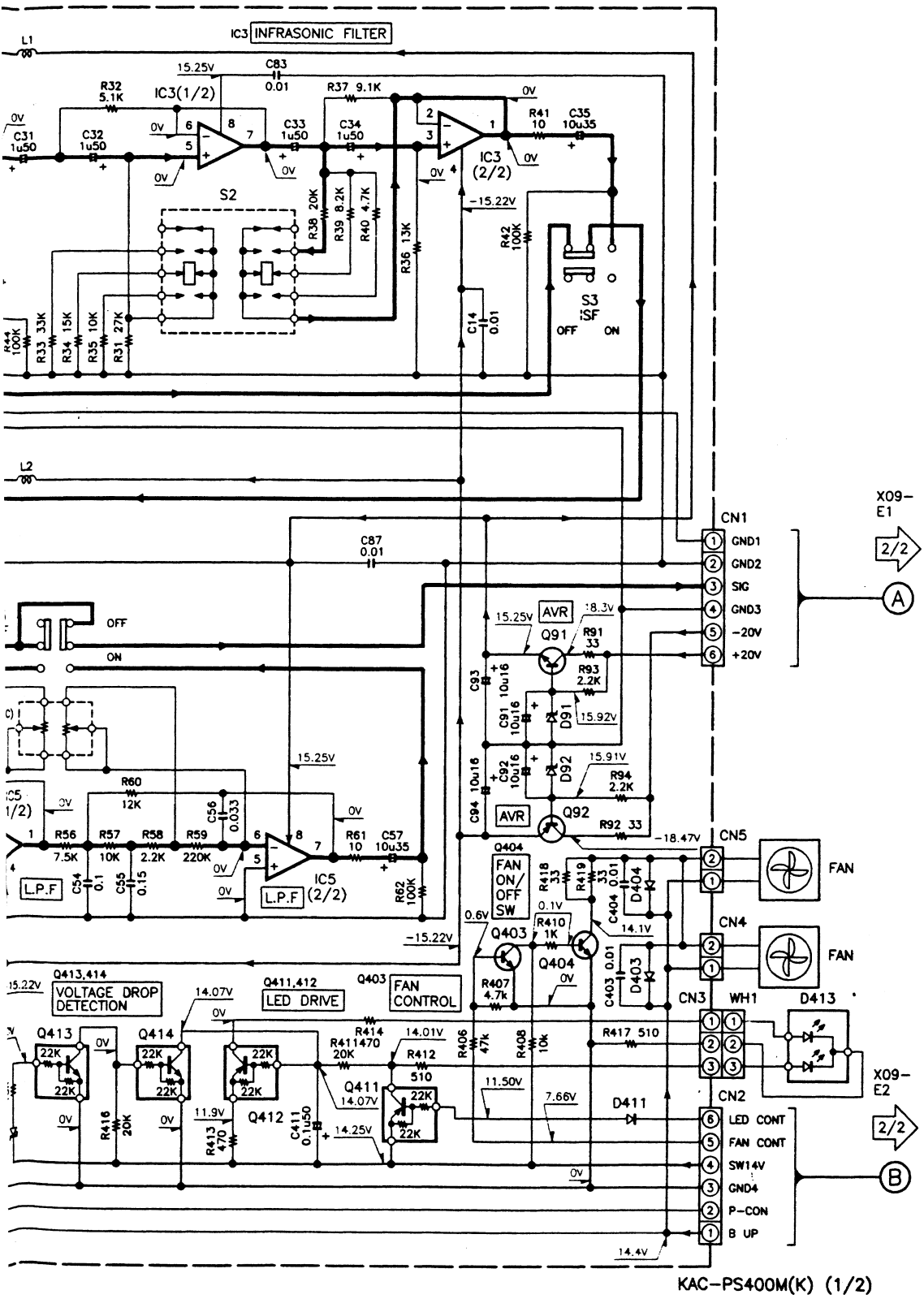


DC voltages are as measured with a high impedance voltmeter. Values may vary slightly due to variations between individual instruments or/and units.

CAUTION : For continued safety, replace safety critical components only with manufacturer's recommended parts (refer to parts list). ⚠ indicates safety critical components. For continued protection against risk of fire, replace only with same type and rating fuse(s). 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.

KAC-PS400M

KENWOOD

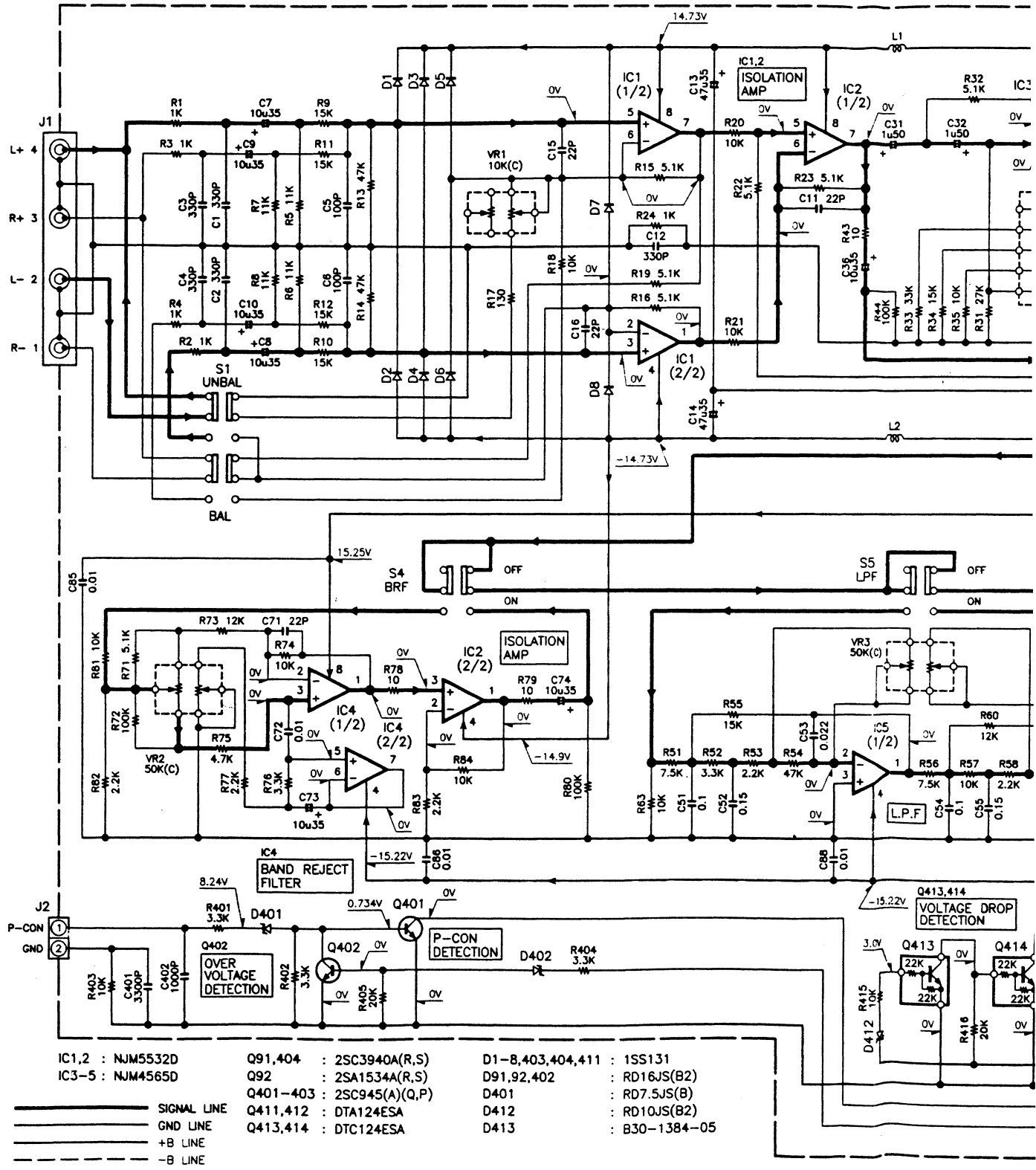


KAC-PS400M(K) (1/2)

KAC-PS400M

KENWOOD

(X08-4030-10)



IC1,2 : NJM5532D
IC3-5 : NJM4565D

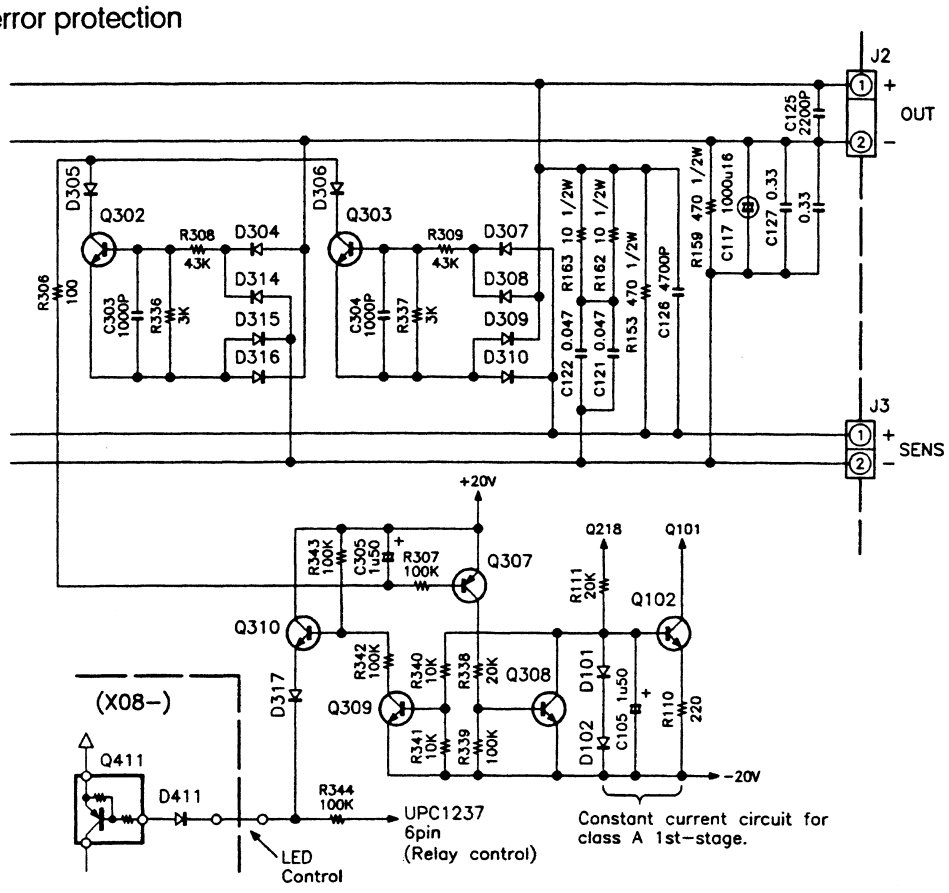
Q91,404 : 2SC3940A(R,S)
Q92 : 2SA1534A(R,S)
Q401-403 : 2SC945(A)(Q,P)
Q411,412 : DTA124ESA
Q413,414 : DTC124ESA

D1-8,403,404,411 : 1SS131
D91,92,402 : RD16JS(B2)
D401 : RD7.5JS(B)
D412 : RD10JS(B2)
D413 : B30-1384-05

SIGNAL LINE
GND LINE
+B LINE
-B LINE

CIRCUIT DESCRIPTION

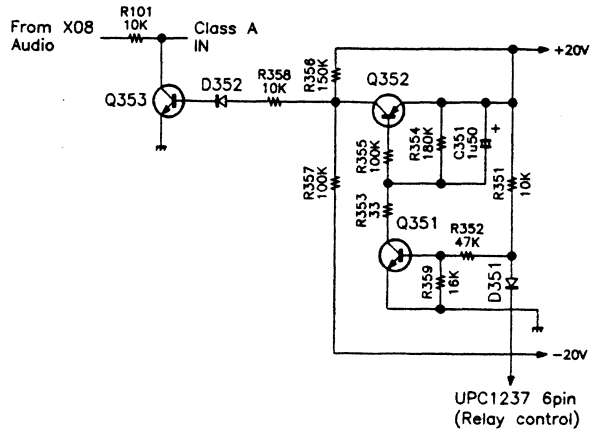
● Σ connection error protection



•Usually, a large voltage does not process in the section between OUT+ and Sens+ (OUT- and Sens-). In case an abnormal voltage is produced here, the Σ connection error protection circuit shuts off the bias current in the Class A 1st-stage amplifier to stop the amplifier operation.
•The abnormal voltage is full-wave rectified by D307 to D310 (D304 and 314 to 316) and turns Q303(Q302) ON. The bias current is switched off by short-circuiting the base and emitter of Q102 in the constant-current circuit by means of Q304 and Q308.
•Although the ON time of Q303(Q302) is very short, the ON voltage is maintained for a few hundreds of milliseconds by C305.
•The relay remains ON while this protection circuit is activated.
•The illumination is turned green by forcing LED control to "H" through Q309 and Q310.

●Muting circuit

•When the protection circuitry is activated, pin 6 (relay control) of UPD1237 goes "H". This turns Q351 while muting is ON, and by R354, R355 and C351 while muting is OFF. Muting ON occurs very quickly by muting OFF requires a few hundreds of milliseconds.
•When muting is OFF (i.e. Q352 is OFF), inverse bias(approx. -4 V) is applied by R355 and R357.
•As the input level of Class A amplifier is rather large, distortion is reduced by grounding the emitter of Q353.



CIRCUIT DESCRIPTION

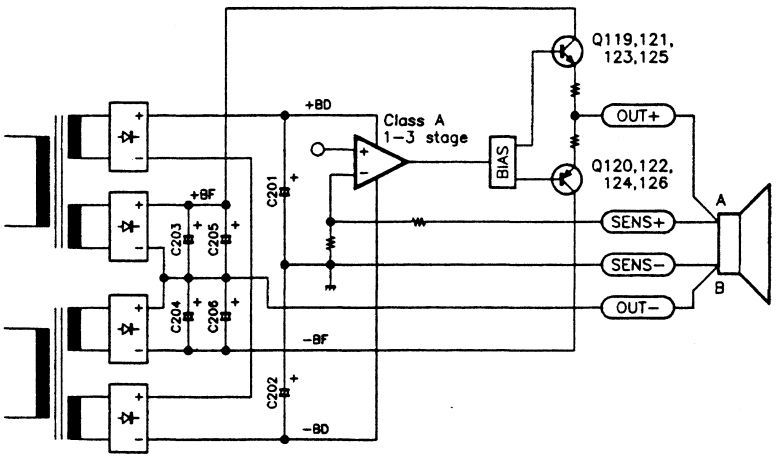
● Σ servo

[Forward]

•A load current flows between OUT+ and point A and a difference in potential produces in the speaker cable. However, the potential at point A is not affected by the load current because a negative feedback occurs from point A to Sens+.

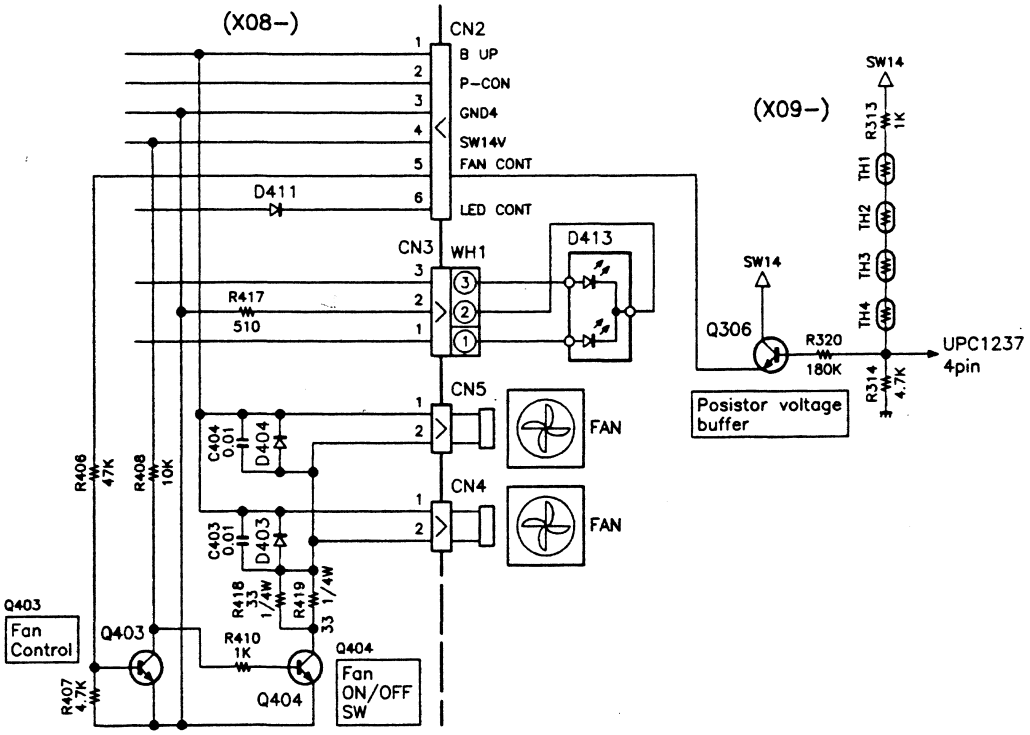
[Negative]

•A load current flows between OUT- and point B, but current hardly flows between Sens- and point B. Sens- is fixed at GND. Therefore, point B is fixed at the GND potential regardless of the load current.



This means that both of the speaker terminals can be driven ideally, without the influence of the speaker cables.

● Fan control



•The voltage at pin 4 (thermal protection detection) of UPD1237 is about 8V under normal temperatures. In this condition, Q403 OFF and Q404 ON, thereby starting to rotate the fan.

•When the temperature rises, the voltage at pin 4 of UPD1237 drops. This turns Q403 OFF and Q404 ON, thereby starting to rotate the fan.

•The fan starts rotation at fairly earlier stage than the start of the thermal protection circuitry.

ADJUSTMENT

No.	ITEM	INPUT SETTINGS	OUTPUT SETTINGS	TUNER (RECEIVER)	ALIGNMENT POINTS	ALIGN FOR	FIG.
Connect a cassette receiver or other.							
1	IDLE CURRENT	—	Connect a DC voltmeter to CN1(BIAS) and SP-OUT(+).	Volume : 0	VR4	2.5 mV	(a)