

KENWOOD
HI/FI STEREO COMPONENTS

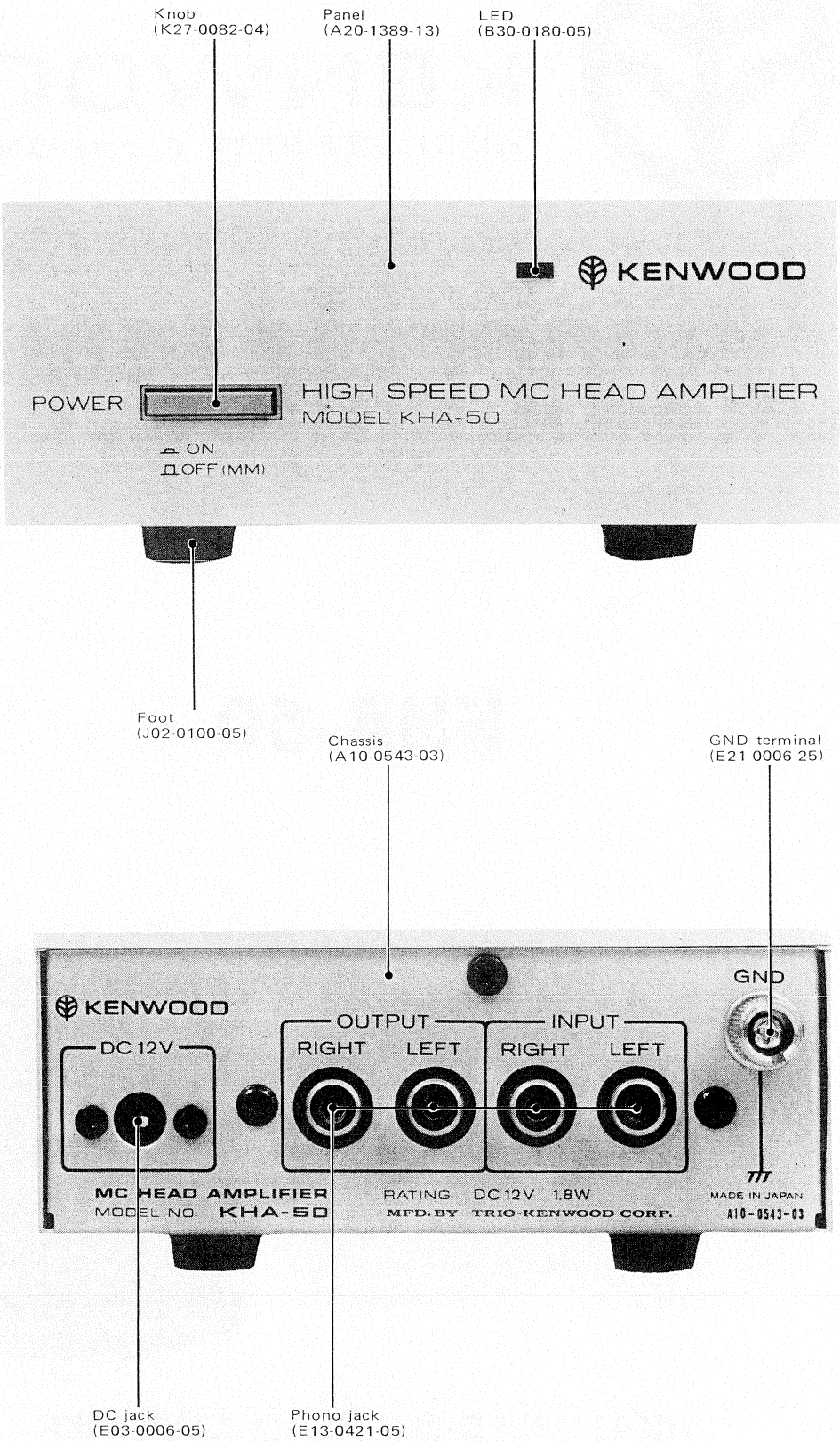
SERVICE MANUAL

KHA-50

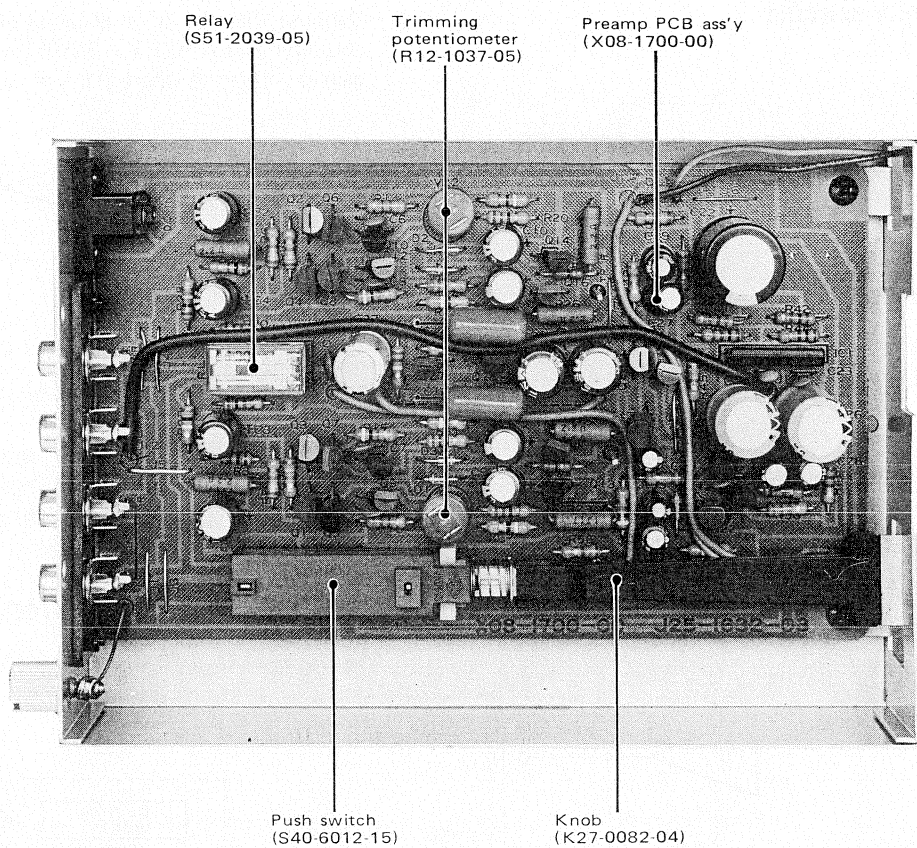


HIGH SPEED MC HEAD AMPLIFIER

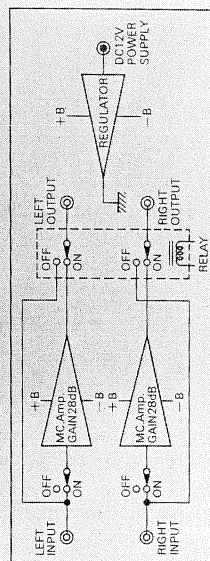
EXTERNAL VIEW



INTERNAL VIEW

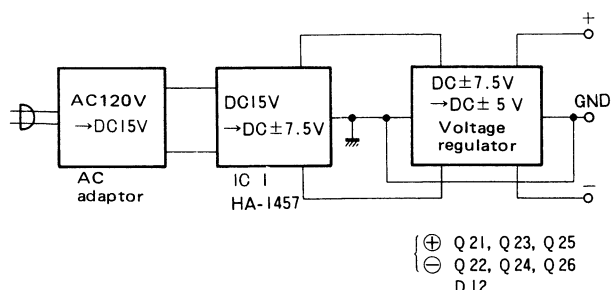


SPECIFICATION
 Frequency Response 5 to 5MHz ± 0 , -3dB
 Input Noise Level -155dBV
 Total Harmonic Distortion 0.005%/20 to 20kHz
 Rise Time 0.07 μ sec, Slew Rate 80V/ μ sec.



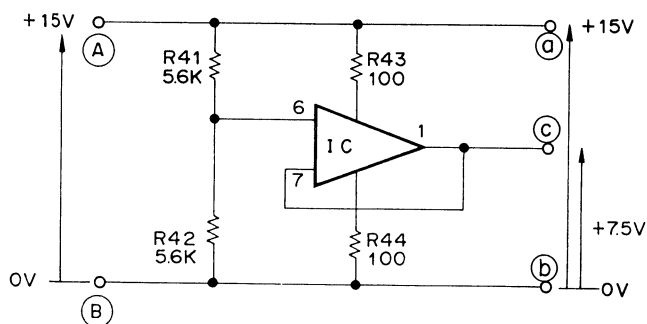
CIRCUIT DESCRIPTION

POWER SUPPLY CIRCUIT

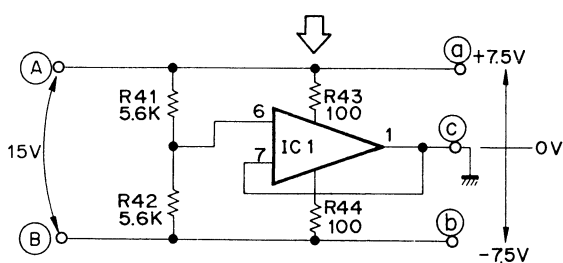


< Fig. 1 Power Supply Circuit >

The IC (HA-1457) is a low noise differential amplifier to make positive and negative power voltages. This IC is normally used in equalizer circuits.



< Fig. 2-a >

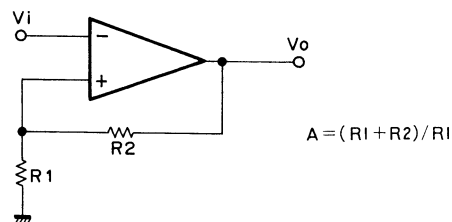


< Fig. 2-b >

Referring to Fig. 2-a, when the point **B** is grounded, a voltage of +15 V is fed at the point **A** and a voltage of +7.5V, a half of 15 V, at the pin 6. Being of a differential type, this IC provides the same voltage to the pin 6 and pin 7. Since the pin 7 is directly connected to the pin 1, the voltage at the pin 1 is also the same.

Consequently, the output voltage at the pin 1 is the same as the voltage (7.5 V) at the pin 6. When the point (b) on the output side is grounded, the point (a) is given +15 V and the point (c) +7.5 V.

Suppose that the IC is an amplifier having a gain of "1", then the gain $A = (R_1 + R_2)/R_1$ as shown in Fig. 3. This gain is 1 ($A = 1$) where $R_1 = \infty$ and $R_2 = 0$.

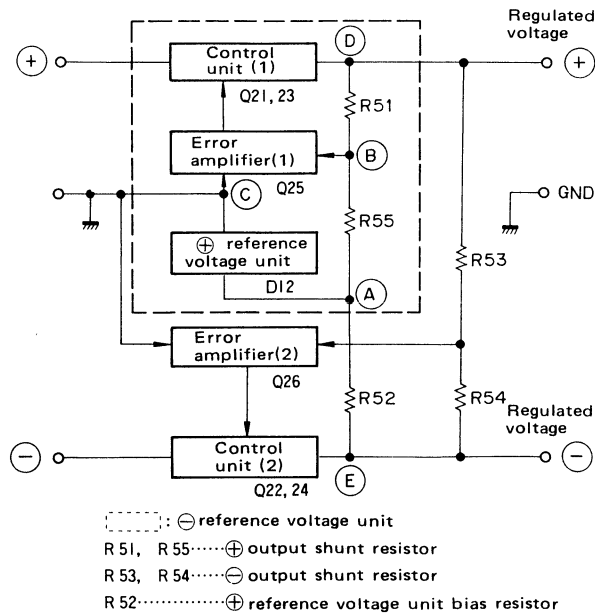


< Fig. 3 >

The outputs at the point (a) and point (b) are +7.5 V and -7.5 V respectively with regard to the point (c) as shown in Fig. 2-b. Note that the point (B) on the input side is not grounded.

POWER VOLTAGE REGULATOR

The power voltage regulator used in the KHA-50 is composed of a reference voltage unit, error amplifier and control unit.



< Fig. 4 >

As will be understood from Fig. 4, the $\oplus$ voltage is first regulated, then the $\ominus$ voltage using the regulated $\oplus$ voltage as a reference. The $\oplus$ reference voltage (5 V) is applied to between the points $\textcircled{A}$ and $\textcircled{C}$ through the zener diode, D12. The error amplifier (1) is of NPN type, so a voltage (0.6 V) is present between the points $\textcircled{C}$ and $\textcircled{B}$, thereby applying the voltage (about 5.6 V) to between the

CIRCUIT DESCRIPTION

points ① and ②.

As the current in R55 is equal to that in R51, the voltage between the points ① and ② is:

$$V_{①②} = V_{③④} \times (R51 + R55)/R55 \\ \approx 10.7 \text{ V}$$

Therefore, the output voltage $V_{⑤⑥}$ is:

$$V_{⑤⑥} = V_{①②} - V_{③④} \approx 5.1 \text{ V}$$

The $\ominus$ voltage can be obtained in the same manner (reference voltage: $V_{⑤⑥}$). The output voltage $V_{⑦⑧}$ is:

$$V_{⑦⑧} \approx -5.0 \text{ V}$$

The control units (1 and 2) are of the Darlington connection. The ripple filter composed of C25-30, C33 and C34 is used to minimize the noise in the circuit.

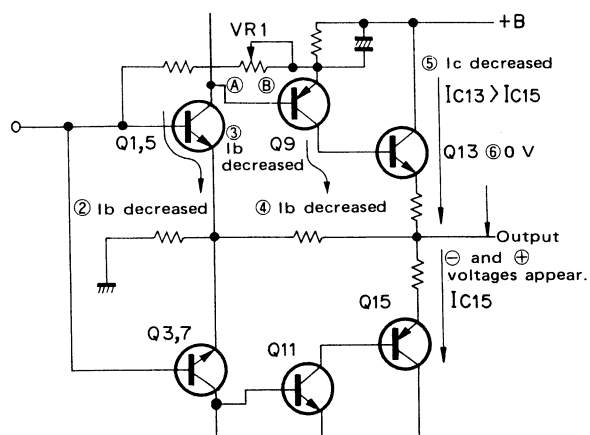
Although the variation in the $\ominus$ power supply voltage has no effects on the $\oplus$ voltage, the variation in the $\oplus$ voltage affects the $\ominus$ output voltage.

ADJUSTMENT

OFFSET ADJUSTMENT AND FUNCTIONS

To adjust the offset, connect a voltmeter to the test point, TP on the preamplifier circuit board, then adjust the trimming potentiometers VR1 and 2 ($3.3 \text{ k}\Omega$) for DC 0 V (see the diagram on printed circuit board).

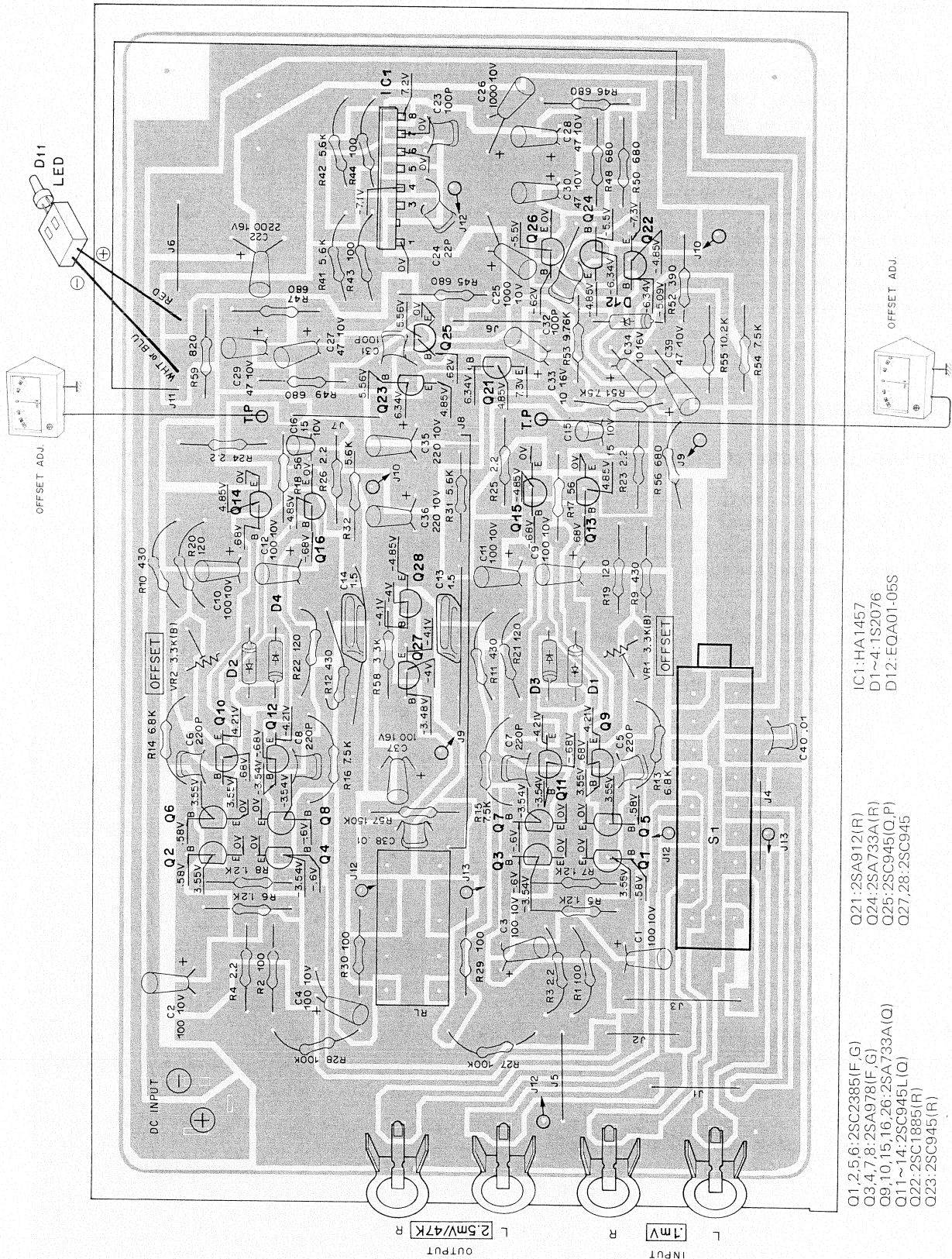
When a positive voltage is present on TP, I_{C13} is greater than I_{C15} . To reduce I_{C13} , turn VR1 in the ② direction. This increases the bias resistances of Q1 and Q5 which, in turn, reduces the base current to a large extent. In contrast with this, when a negative voltage is present, turn VR1 in the ① direction

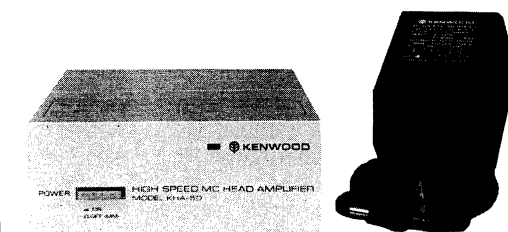
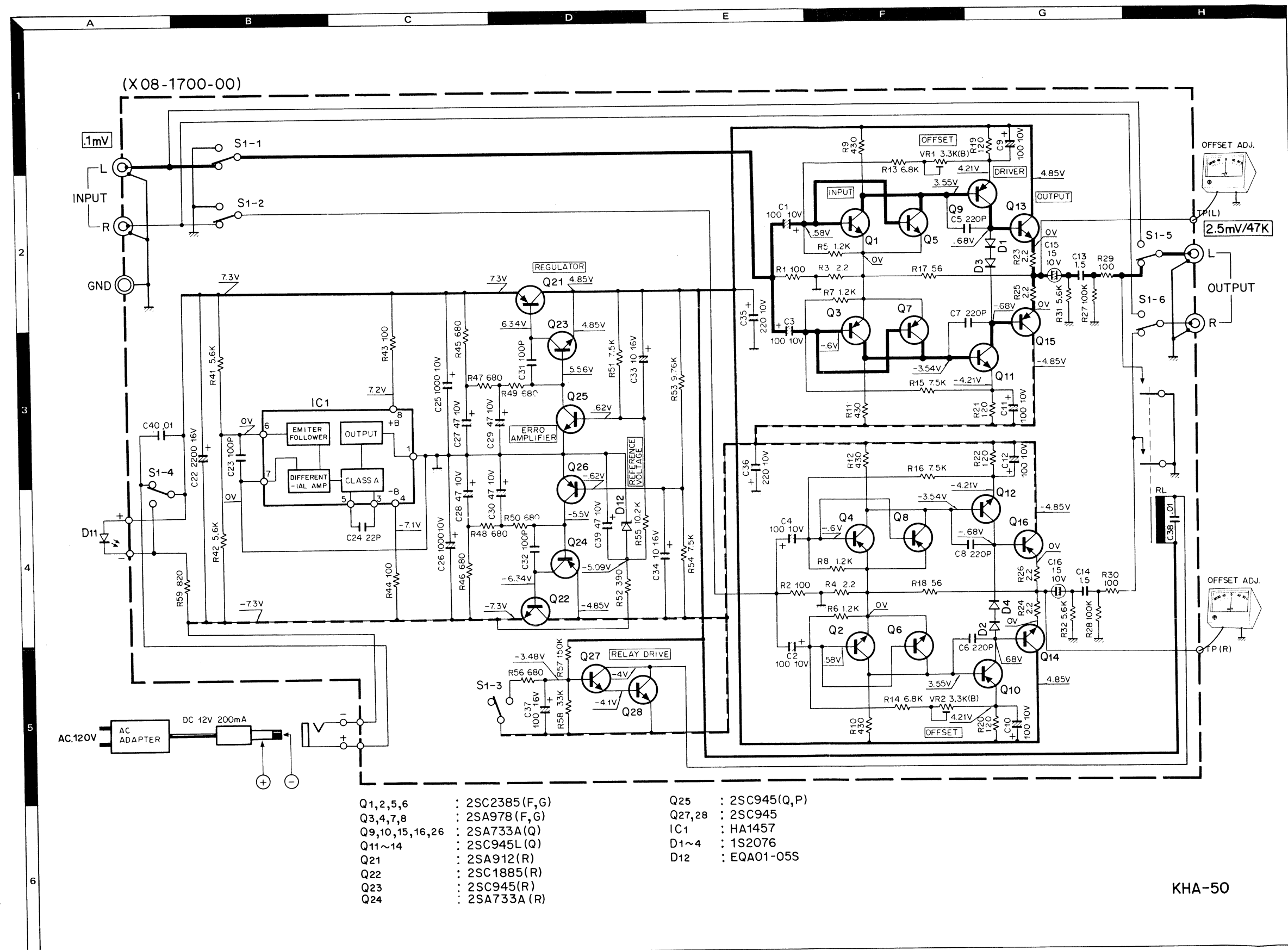


< Fig. 5 $\oplus$ Voltage on Output Terminal >

PC BOARD

Components Side





SPECIFICATIONS

Input Sensitivity and Impedance	
PHONO (MC)	0.1 mV, 100 ohms
Output Level and Impedance	
Rated Output	2.5 mV at 100 ohms
Maximum Output	1.5 V
Frequency Response	 From 5 Hz to 2 MHz, +0 dB, -3 dB
Total Harmonic Distortion	 0.005% at Maximum Output
	 from 20 Hz to 20 kHz
Signal to Noise Ratio (IHF-A)	75 dB at rated output
Equivalent Input Noise Level (IHF-A)	 -155 dBV
Maximum Input Level for PHONO (MC)	 60 mV (RMS), T.H.D. 0.005% at 1 kHz
Transient Response	
Rise Time	0.12 μ s (less than 2 V peak to peak)
Slew Rate	± 40 V/ μ s
Power Supply (AC Adaptor)	
(For U.S.A.)	
Model	28A-4105
Input	AC 120 V, 60 Hz 5 W
Output	DC 12 V, 200 mA
(For Europe)	
Model	KHA-50PS
Input	AC 220 V~, 50/60 Hz 6 VA
Output	DC 12 V $\pm$ 200 mA
Protector	T500 mA
Supplied Accessory	1 Connecting Cord

Note:
 Kenwood follows a policy of continuous advancements in development. For this reason specifications may be changed without notice.

DC voltage measured with 20 k Ω /V VOM under no signal.

PARTS LIST

☆ : new parts

Ref. No.	Parts No.	Description	Re- marks
TOTAL			
—	A10-0543-03	Chassis	☆
—	A20-1389-13	Panel	☆
—	B07-0253-04	Escutcheon	☆
D11	B30-0180-05	LED (green)	☆
—	B42-0009-04	Passed sticker	
—	B42-0473-24	Serial No. sticker	
—	B46-0055-20	Warranty card	P
—	B46-0061-20	Warranty card	K
—	B50-1828-00	Instruction manual	K, E
—	B50-1829-00	Instruction manual	P
—	E21-0006-25	GND terminal	
—	E30-0606-05	Audio cord	☆
—	H01-1856-03	Carton box	K, E
—	H01-1900-03	Carton box	P
—	J02-0100-05	Foot	☆
—	J19-0534-04	LED holder	☆
—	K27-0082-04	Knob	
—	W09-0011-05	AC adaptor	K, P
—	W09-0012-05	AC adaptor	E
—	X08-1700-00	Preamp PCB ass'y	☆
PREAMP PCB ASS'Y (X08-1700-00)			
C1~4	C24-1010-71	Electrolytic 100μF 10WV	
C5~8	C71-1722-15	Ceramic 220pF ±5%	
C9~12	C24-1010-71	Electrolytic 100μF 10WV	
C13,14	C91-0068-05	Film 1.5μF 100WV	
C15,16	C26-1015-67	Non-pole electrolytic 15μF 10WV	
C22	C90-0390-05	Electrolytic 2200μF 16WV	☆
C23	C71-1710-15	Ceramic 100pF ±5%	
C24	C71-1722-05	Ceramic 22pF ±5%	
C25,26	C24-1010-81	Electrolytic 1000μF 10WV	
C27~30	C24-1047-61	Electrolytic 47μF 10WV	
C31,32	C71-1710-15	Ceramic 100pF ±5%	
C33,34	C24-1210-61	Electrolytic 10μF 16WV	
C35,36	C24-1022-71	Electrolytic 220μF 10WV	
C37	C25-1210-77	Electrolytic 100μF 16WV	
C38	C55-1710-38	Ceramic 0.01μF +100%,—0%	
C39	C24-1047-61	Electrolytic 47μF 10WV	
C40	C55-1710-38	Ceramic 0.01μF +100%,—0%	
—	E03-0006-05	DC jack	
—	E13-0421-05	Phono jack (gold-plated)	
VR1,2	R12-1037-05	Trimming potentiometer 3.3kΩ(B) Offset	
R17,18	R48-6256-05	RN 56Ω ±5% 1/4W	
R53	R48-2976-14	RN 9.76kΩ ±2% 1/4W	
R55	R48-2102-24	RN 10.2kΩ ±2% 1/4W	
S1	S40-6012-15	Pushbutton switch	☆
RL	S51-2039-05	Relay	☆
Q1,2	V03-2385-10	Transistor 2SC2385(F,G)	
Q3,4	V01-0978-10	Transistor 2SA978(F,G)	
Q5,6	V03-2385-10	Transistor 2SC2385(F,G)	
Q7,8	V01-0978-10	Transistor 2SA978(F,G)	
Q9,10	V01-0733-50	Transistor 2SA733A(Q)	
Q11~14	V03-0945-50	Transistor 2SC945(L)(Q)	
Q15,16	V01-0733-50	Transistor 2SA733A(Q)	
Q21	V01-0912-30	Transistor 2SA912(R)	
Q22	V03-1885-20	Transistor 2SC1885(R)	

Ref. No.	Parts No.	Description	Re- marks
Q23	V03-0316-05	Transistor 2SC945(R)	
Q24	V01-0733-70	Transistor 2SA733A(R)	
Q25	V03-0348-05	Transistor 2SC945(Q,P)	
Q26	V01-0733-50	Transistor 2SA733A(Q)	
Q27,28	V03-0297-05	Transistor 2SC945	
D1~4	V11-0271-05	Diode 1S2076	
D12	V11-0462-05	Zener diode EQA01-05(S)	
IC1	V30-0264-10	IC HA1457	

SEMICONDUCTOR SUBSTITUTIONS

Semiconductor Name	Semiconductor Substitutions
2SA733A(Q,P)	2SA872(D), 2SA899(B,G), 2SA915(K,L,M), 2SA992(P), 2SA921(R)
2SA733A(R)	2SA915(M), 2SA899(B,G)
2SA912(R)	2SA921(R), 2SA915(L,M), 2SA899(B,G)
2SA978(F,G)	—
2SC945(Q,P)	2SC1845(P), 2SC1980(R), 2SC1940(K,L,M), 2SC1904(B)
2SC945(R)	2SC1904(B,G), 2SC1940(M)
2SC1885(R)	2SC1980(R), 2SC1940(M), 2SC1904(B)
2SC2385(F,G)	—

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