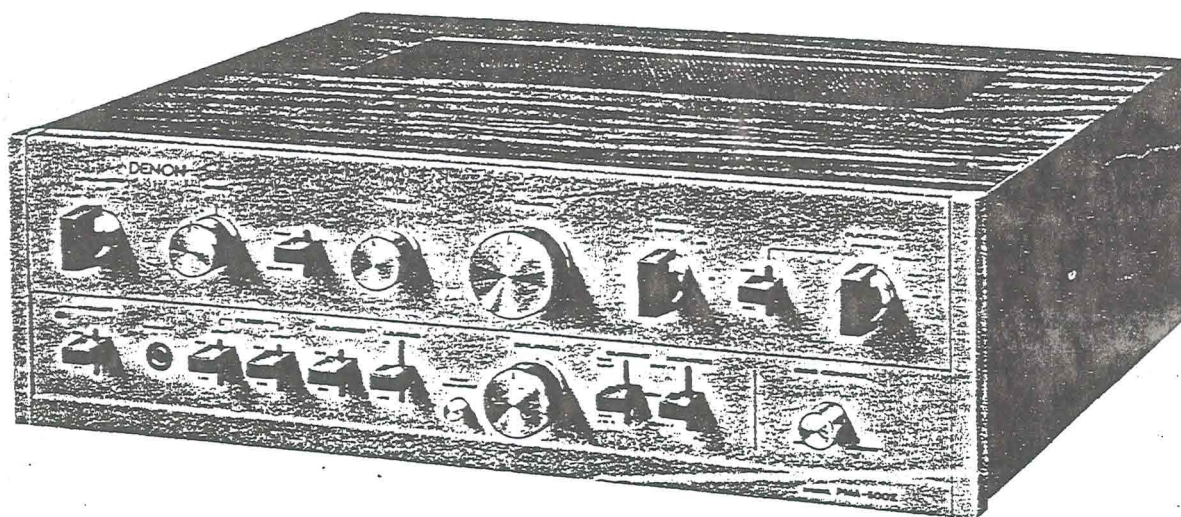


DENON

Hi-Fi Component/Amplifier

SERVICE MANUAL
MODEL PMA-500Z
SOLID STATE STEREO
INTEGRATED AMPLIFIER



NIPPON COLUMBIA CO., LTD

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Type:	All silicon transistor stereo pre-main amplifier
Semiconductors Used:	NPN transistor x 24; PNP transistor x 2; FET x 2; Darlington transistor x 4; Diode x 9; Varister x 2;

POWER AMPLIFIER SECTION

Music Power:	100W (Load, 8 ohms)
Rated Output (Both channels driven):	37W x 2 (Load, 8 ohms) at THD. less than 0.1%
Power Bandwidth (THD. 0.1%):	5Hz - 35kHz (+0, -1dB); 5Hz or lower -75kHz (+0, -3dB)
Harmonic Distortion:	Lower than THD. 0.1% (at rated output)
Cross Modulation Distortion (60Hz/7kHz 4/1):	Lower than 0.1% (at equivalent rated output)
Frequency Response (Output $P_0 = 10W$ const.):	10Hz - 100kHz (+0, -1dB)
Input Impedance:	80k Ω \pm 20% (5Hz or lower -20kHz or higher)
Input Sensitivity:	1V rms/100k
Residual Noise:	Less than 0.01 μ W (Input terminals shorted)
S/N Ratio:	Better than 95dB
Damping Factor:	Better than 50 (5Hz or lower -10kHz or higher)
Output Impedance:	Lower than 0.16 ohm in pure resistance at 1kHz or lower

PREAMPLIFIER SECTION

Rated Output:	1.0 Vrms
Maximum Output:	5.0 Vrms
Harmonic Distortion:	Lower than 0.1% (at max. output and either 100Hz, 1kHz or 10kHz) Lower than 0.05% (at rated output and either 100Hz, 1kHz or 10kHz)
Input Sensitivity/Input Impedance:	PHONO-1 2mV rms/60k Ω \pm 20% PHONO-2 2mV rms/60k Ω \pm 20% TUNER 100mV rms/60k Ω \pm 20% AUX-1 & 2 100mV rms/60k Ω \pm 20% TAPE PB 320mV rms/100k Ω \pm 20%
Cross Modulation Distortion:	Less than 0.1% (at rated output)
Frequency Response (w/Tone Defeat "ON"):	10Hz - 40kHz (+0, -1dB)
Max. Allowable Input (THD. lower than 1%):	PHONO-1 & 2 200mV rms (at 1kHz); \pm 0.5dB (at 30Hz - 15kHz)
Equalizer Characteristic, RIAA Deviation:	PHONO-1 & 2 Better than 65dB (Input terminals shorted) TUNER Better than 75dB (Input terminals shorted) AUX-1 & 2 Better than 75dB (Input terminals shorted) TAPE Better than 75dB (Input terminals shorted)
S/N Ratio:	
Audio Muting:	-10dB, -20dB
Tone Control:	BASS +10dB ~ -10.5dB (at 80Hz) TREBLE +10dB ~ -9dB (at 12kHz)
High Filter Cutoff Frequency:	9kHz (12dB/oct)
Low Filter Cutoff Frequency:	40Hz (12dB/oct)
Output/Output Impedance at Tape REC (DIN):	100mV rms/1k Ω or lower (40mV rms/80k Ω)
Terminals:	INPUT/OUTPUT PREOUT/MAIN IN; TAPE-1 & 2, Pin Jacks (REC & PB); REC/PB 1 & 2, DIN Jacks (REC & PB) TUNER; PHONO-1, PHONO-2, AUX-1, 2 OUTPUT SPEAKERS A & B; PHONES OTHERS GND & PHONO INPUT TRANS
Power Source:	AC 110/120/220/240V, 50/60Hz
Power Consumption:	Under normal usage 230W (Maximum)
Dimensions:	430 mm(W) x 140 mm(H) x 350 mm(D); 16-15/16"(W) x 5-33/64"(H) x 13-25/32"(D)
Weight:	12.5kg, 27.5Lbs.

Specifications and characteristics are subject to change without prior notice.

DISASSEMBLY INSTRUCTIONS

1. To remove the top cabinet, first remove the two screws in each side of the top cabinet, then lift up the top cabinet by its rear edge.
2. For removal of the bottom cover, a total of six screws have to be removed.
3. For removal of the shield cover, take off three screws for front cover and two screws for back cover. (Fig. 1)
4. To remove the knob, pull off all lever switch knobs and BASS, TREBLE, VOLUME, BALANCE knobs, for the other control knob (SPEAKERS, MODE and FUNCTION), first loosen the two screws using a small screw driver, then remove the knobs.

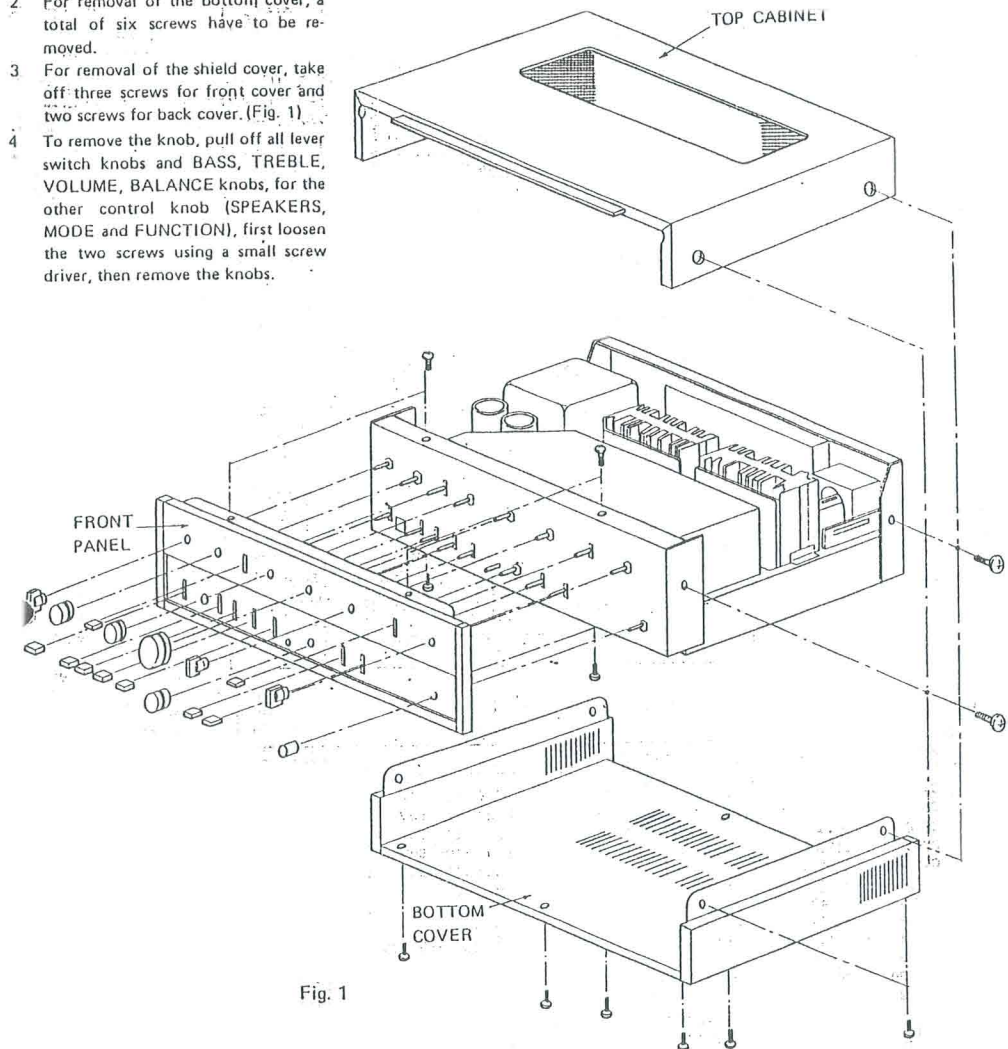
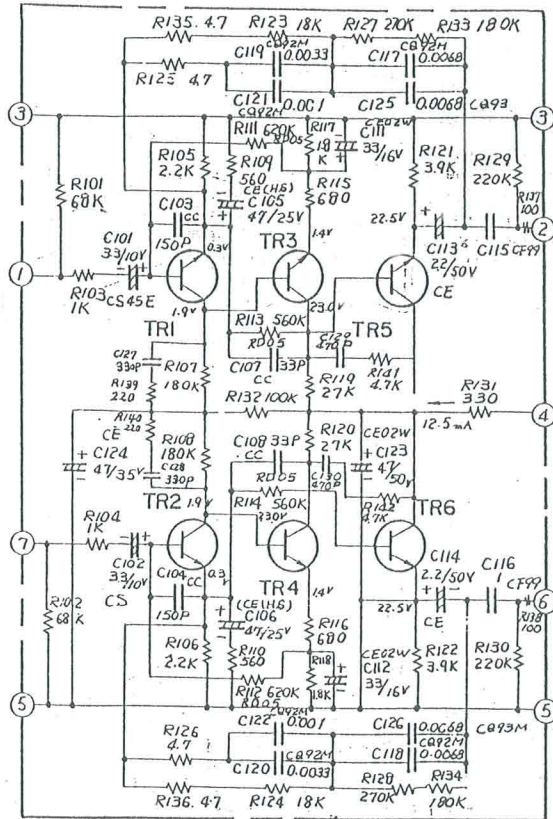


Fig. 1

CIRCUIT DIAGRAMS, PRINTED CIRCUIT BOARD PATTERNS AND PARTS LIST (The board diagram represents the view from the copper foil side)

ETC-21B EQUALIZER AMP. UNIT



ETC-24 TONE AMP. UNIT

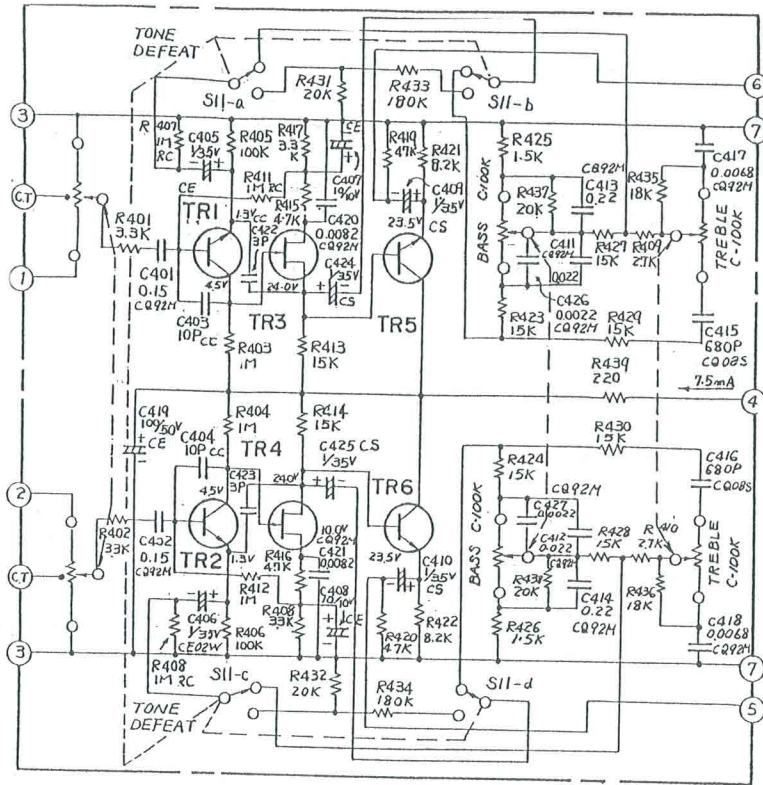
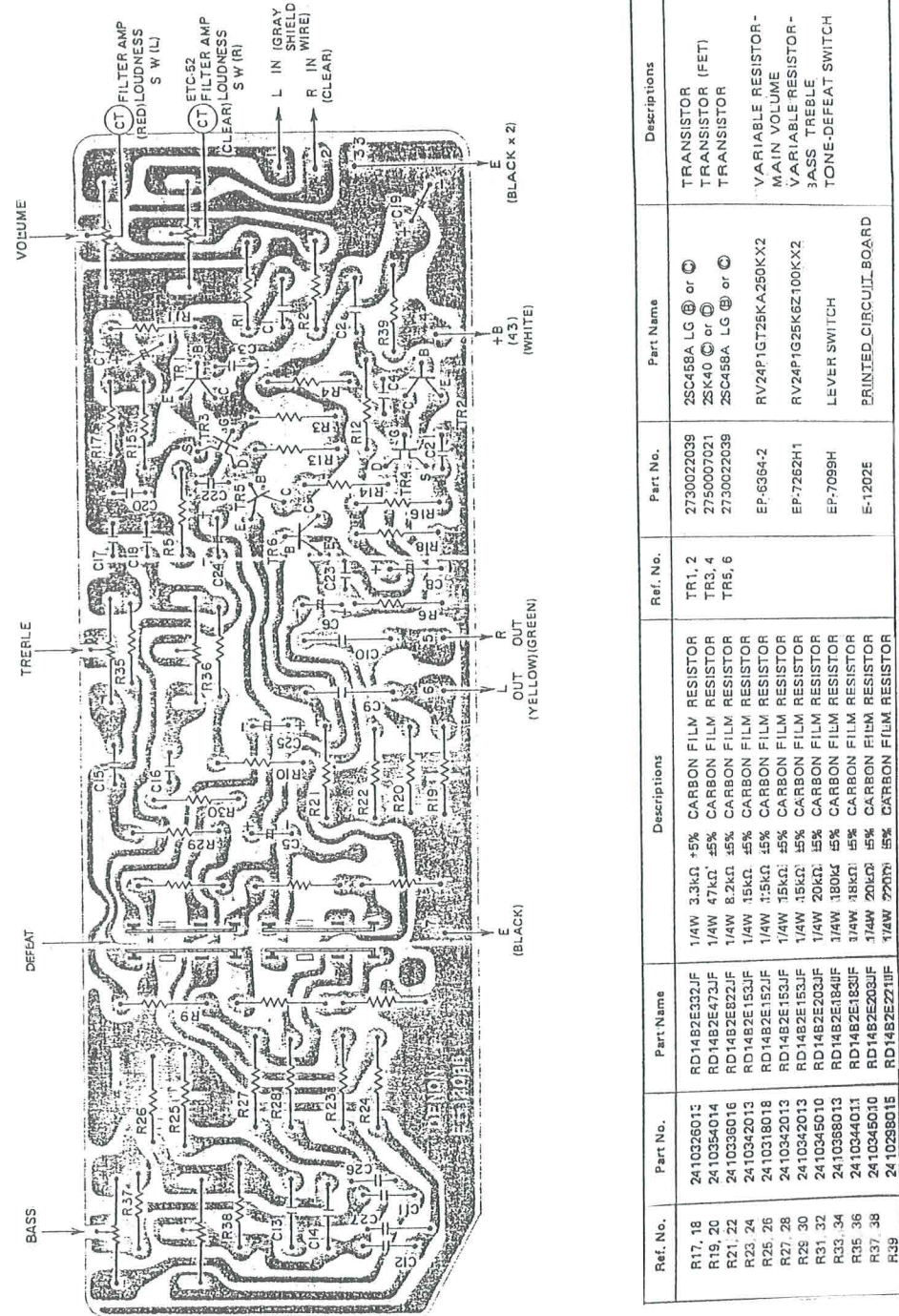


Fig. 4

Ref. No.	Part No.	Part Name	Descriptions
C1, 2	2551137006	CQ92M1H154J	0.15µF ±5% 50V PLASTIC FILM CAPACITOR
C7, 8	2544015009	CE04W1C100-	10µF 16V ELECTROLYTIC CAPACITOR
C5, 6, 9, 10	2541035008	CS45E 1V010M	1µF ±20% 35V SOLID TANTALUM CAPACITOR
C11, 12	2551134038	CQ92M1H223J	0.022µF ±5% 50V PLASTIC FILM CAPACITOR
C13, 14	2551134070	CQ92M1H224J	0.22µF ±5% 50V PLASTIC FILM CAPACITOR
C15, 16	2556021007	C008S1H681J	0.00068µF ±5% 50V PLASTIC FILM CAPACITOR
C17, 18	2551135066	CQ92M1H682J	0.0068µF ±5% 50V PLASTIC FILM CAPACITOR
C19	2544050006	CE04W1H101-	10µF 50V ELECTROLYTIC CAPACITOR
C20, 21	2551135008	CQ92M1H822J	0.0082µF ±5% 50V PLASTIC FILM CAPACITOR
C22, 23	2533596005	CC45SL1H030C	30pF ±0.25pF 50V CERAMIC CAPACITOR
C24, 25	2541035008	CS45E 1V010M	1µF ±20% 35V SOLID TANTALUM CAPACITOR
C26, 27	2551134009	CQ92M1H222J	0.0022µF ±5% 50V PLASTIC FILM CAPACITOR
R1, 2	2410326013	RD1482E332JF	1/4W 3.3kΩ ±5% CARBON FILM RESISTOR
R3, 4	2410257001	RD1482H105J	1/2W 1MΩ ±5% CARBON FILM RESISTOR
R5, 6	2410362019	RD1482E104JF	1/4W 100kΩ ±5% CARBON FILM RESISTOR
R7, 8	2420191018	RC05GF2E105KF	1/4W 1MΩ ±10% CARBON COMPOSITE RESISTOR
R9, 10	2410324015	RD1482E272JF	1/4W 2.7kΩ ±5% CARBON FILM RESISTOR
R11, 12	2420191018	RC05GF2E105KF	1/4W 1MΩ ±10% CARBON COMPOSITE RESISTOR
R13, 14	2410342013	RD1482E153JF	1/4W 15kΩ ±5% CARBON FILM RESISTOR
R15, 16	2410330012	RD1482E472JF	1/4W 4.7kΩ ±5% CARBON FILM RESISTOR



Ref. No.	Part No.	Part Name	Descriptions
TR1, 2	2750022039	2SC458A LG @ or Ⓞ	TRANSISTOR (FET)
TR3, 4	2750007021	2SK40 Ⓞ or Ⓞ	TRANSISTOR
TR5, 6	2730002039	2SC458A LG @ or Ⓞ	TRANSISTOR
	EP-6364-2	RV24P1GT25KA250KX2	VARIABLE RESISTOR - MAIN VOLUME
	EP-7262H1	RV24P1G25KZ100KX2	VARIABLE RESISTOR - BASS TREBLE
	EP-7099H		LEVER SWITCH
	E-1202E		TONE-DEFEAT SWITCH
			PRINTED_CIRCUIT_BOARD
R17, 18	2410326013	RD1482E332JF	1/4W 3.3kΩ ±5% CARBON FILM RESISTOR
R19, 20	2410354014	RD1482E472JF	1/4W 47kΩ ±5% CARBON FILM RESISTOR
R21, 22	2410360016	RD1482E822JF	1/4W 8.2kΩ ±5% CARBON FILM RESISTOR
R23, 24	2410342013	RD1482E153JF	1/4W 15kΩ ±5% CARBON FILM RESISTOR
R25, 26	2410318018	RD1482E152JF	1/4W 15kΩ ±5% CARBON FILM RESISTOR
R27, 28	2410342013	RD1482E153JF	1/4W 15kΩ ±5% CARBON FILM RESISTOR
R29, 30	2410342013	RD1482E153JF	1/4W 15kΩ ±5% CARBON FILM RESISTOR
R31, 32	2410345010	RD1482E203JF	1/4W 20kΩ ±5% CARBON FILM RESISTOR
R33, 34	2410368013	RD1482E194JF	1/4W 18kΩ ±5% CARBON FILM RESISTOR
R35, 36	2410344011	RD1482E183JF	1/4W 18kΩ ±5% CARBON FILM RESISTOR
R37, 38	2410346010	RD1482E203JF	1/4W 20kΩ ±5% CARBON FILM RESISTOR
R39	2410298015	RD1482E221JF	1/4W 22kΩ ±5% CARBON FILM RESISTOR

ETC-25 FILTER AMP. UNIT

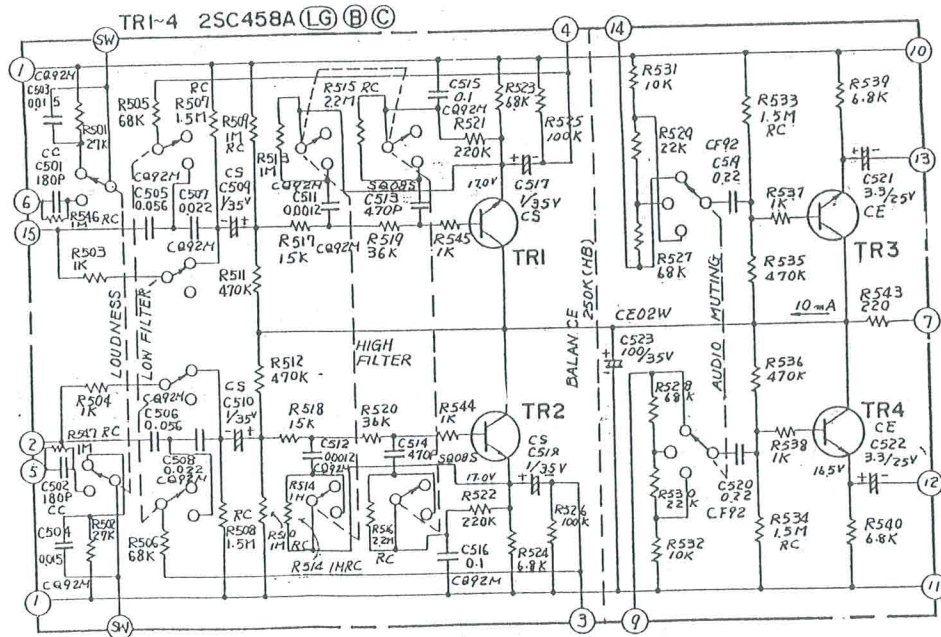


Fig. 6

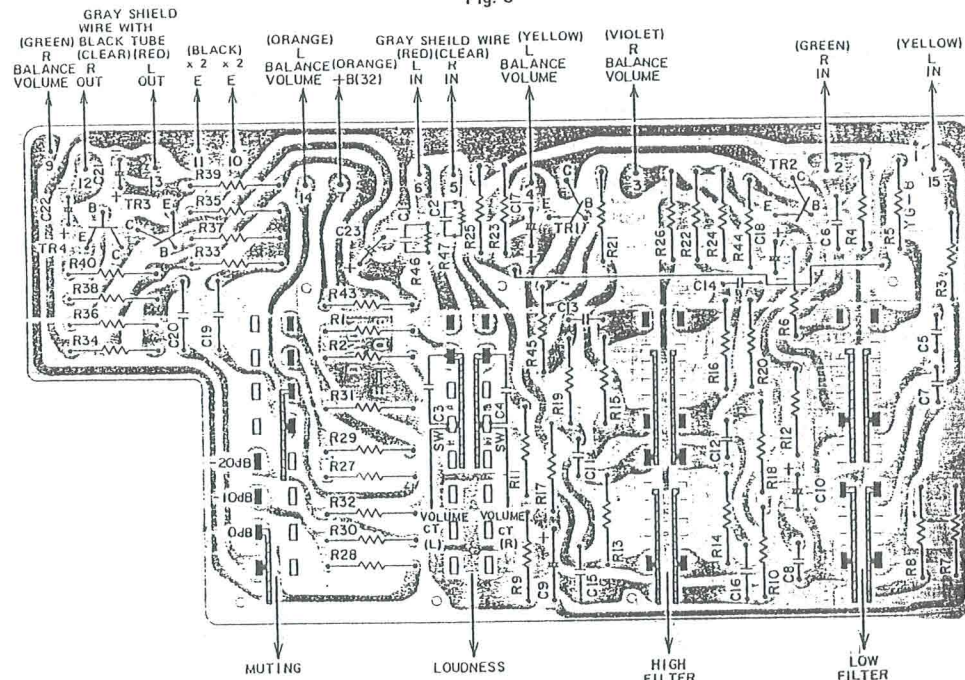


Fig. 7

Ref. No.	Part No.	Part Name	Descriptions
C1, 2	2533660009	CC45SL1H181K	180pF ±10% 50V CERAMIC CAPACITOR
C3, 4	2551135011	C092M1H153J	0.015µF ±5% 50V PLASTIC FILM CAPACITOR
C5, 6	2551135095	C092M1H563J	0.056µF ±5% 50V PLASTIC FILM CAPACITOR
C7, 8	2551134038	C092M1H223J	0.022µF ±5% 50V PLASTIC FILM CAPACITOR
C9, 10	2541035008	CS45E1V010M	1µF ±20% 35V SOLID TANTALUM CAPACITOR
C11, 12	2551135037	C092M1H122J	0.0012µF ±5% 50V PLASTIC FILM CAPACITOR
C13, 14	2556017008	CO08S1H471J	0.00047µF ±5% 50V PLASTIC FILM CAPACITOR
C15, 16	2551025008	C092M1H104K	0.1µF ±10% 50V PLASTIC FILM CAPACITOR
C17, 18	2541035008	CS45E1V010M	1µF ±20% 35V SOLID TANTALUM CAPACITOR
C19, 20	2545016007	CA92F1ER22M	0.22µF ±20% 25V SOLID ALUMINUM CAPACITOR
C21, 22	2544023004	CE04W1E3R3-	3.3µF 25V ELECTROLYTIC CAPACITOR
C23	2544038002	CE04W1V101-	10µF .35V ELECTROLYTIC CAPACITOR
R1, 2	2410348011	RD14B2E273JF	1/4W 27kΩ ±5% CARBON FILM RESISTOR
R3, 4	2410314012	RD14B2E102JF	1/4W 1kΩ ±5% CARBON FILM RESISTOR
R5, 6	2410358010	RD14B2E683JF	1/4W 68kΩ ±5% CARBON FILM RESISTOR
R7, 8	2420193016	RC05GF2E155KF	1/4W 1.5MΩ ±10% CARBON COMPOSITE RESISTOR
R9, 10	2420191018	RC05GF2E105KF	1/4W 1MΩ ±10% CARBON COMPOSITE RESISTOR
R11, 12	2410378016	RD14B2E474JF	1/4W 470kΩ ±5% CARBON FILM RESISTOR
R13, 14	2420191018	RC05GF2E105KF	1/4W 1MΩ ±10% CARBON COMPOSITE RESISTOR
R15, 16	2420195014	RC05GF2E225KF	1/4W 2.2MΩ ±10% CARBON COMPOSITE RESISTOR
R17, 18	2410342013	RD14B2E153JF	1/4W 15kΩ ±5% CARBON FILM RESISTOR
R19, 20	2410351017	RD14B2E363JF	1/4W 36kΩ ±5% CARBON FILM RESISTOR
R21, 22	2410370014	RD14B2E224JF	1/4W 220kΩ ±5% CARBON FILM RESISTOR
R23, 24	2410334018	RD14B2E682JF	1/4W 6.8kΩ ±5% CARBON FILM RESISTOR
R25, 26	2410362019	RD14B2E104JF	1/4W 100kΩ ±5% CARBON FILM RESISTOR
R27, 28	2410358010	RD14B2E683JF	1/4W 68kΩ ±5% CARBON FILM RESISTOR
R29, 30	2410346019	RD14B2E223JF	1/4W 22kΩ ±5% CARBON FILM RESISTOR
R31, 32	2410338014	RD14B2E103JF	1/4W 10kΩ ±5% CARBON FILM RESISTOR
R33, 34	2420193016	RC05GF2E155KF	1/4W 1.5MΩ ±10% CARBON COMPOSITE RESISTOR
R35, 36	2410378016	RD14B2E474JF	1/4W 470kΩ ±5% CARBON FILM RESISTOR
R37, 38	2410314012	RD14B2E102JF	1/4W 1kΩ ±5% CARBON FILM RESISTOR
R39, 40	2410334018	RD14B2E682JF	1/4W 6.8kΩ ±5% CARBON FILM RESISTOR
R41, 42			MISSING RESISTOR
R43	2410298015	RD14B2E221JF	1/4W 220Ω ±5% CARBON FILM RESISTOR
R44, 45	2410314012	RD14B2E102JF	1/4W 1kΩ ±5% CARBON FILM RESISTOR
R46, 47	2420191005	RC05GF2E105K	1/4W 1MΩ ±10% CARBON COMPOSITE RESISTOR
TR1, 2	2730022039	2SC458ALG (L) or (C)	TRANSISTOR
TR3, 4	2730022039	2SC458ALG (L) or (C)	TRANSISTOR
EP-7099H		LEVER SWITCH	HIGH, & LOW FILTER, LOUDNESS SWITCH
EP-7101H		LEVER SWITCH	MUTING SWITCH
E-12026		PRINTED CIRCUIT BOARD	

MEMO:

ETC-26B POWER AMP. UNIT

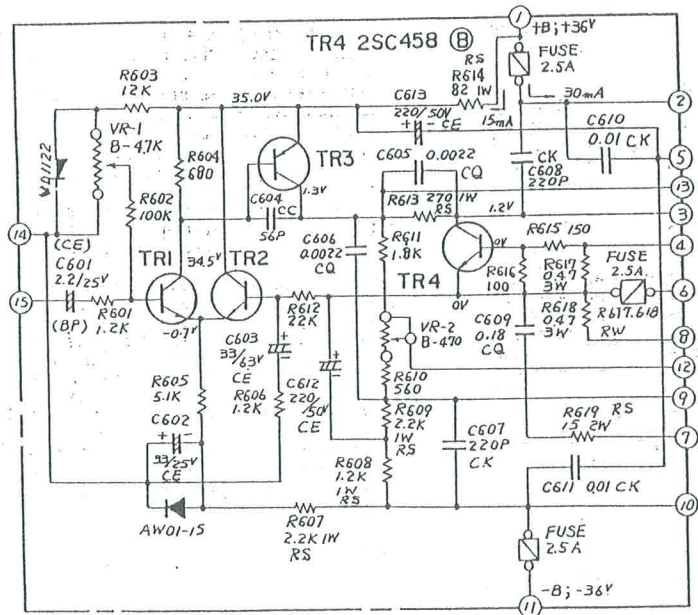


Fig. 8

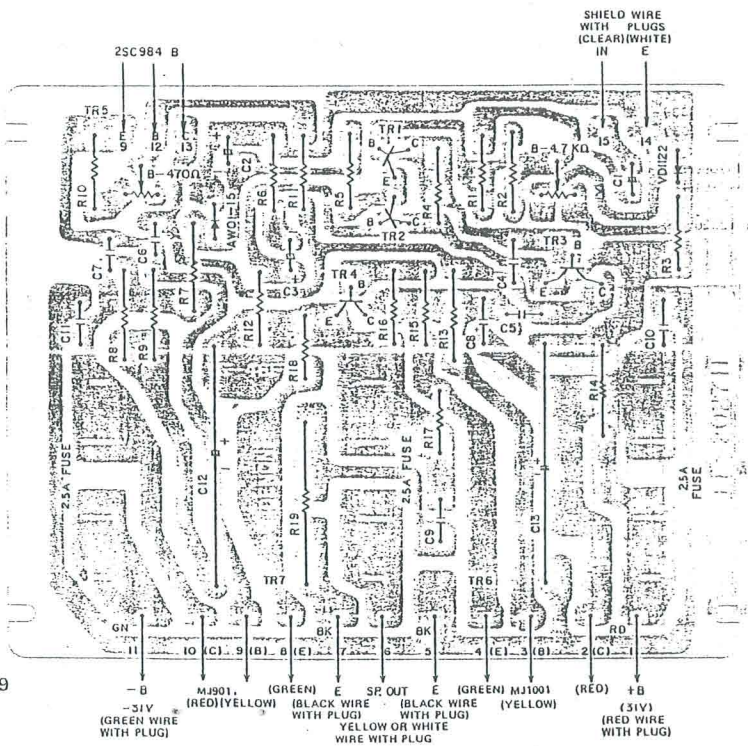


Fig. 9

Ref. No.	Part No.	Part Name	Descriptions
C1	2543015000	CE04D1E2R2MBP	2.2μF ±20% 25V
C2	2544026001	CE04W1E330-	33μF 25V
C3	2544001000	CE04W0J330-	33μF 6.3V
C4	2533654002	CC45SL1H560K	56pF ±10% 50V
C5, 6	2551032004	CQ92M1H222M	0.0022μF ±20% 50V
C7, 8	2531028009	CK45B2H221K	220pF ±10% 500V
C9	2551028005	CQ92M1H184K	0.18μF ±10% 50V
C10, 11	2531010004	CK45B1H103K	0.01μF ±10% 50V
C12, 13	2542056002	CE02W1H221-	220μF 50V
R1	2410316010	RD14B2E122JF	1/4W 1.2kΩ ±5%
R2	2410362019	RD14B2E104JF	1/4W 100kΩ ±5%
R3	2410340015	RD14B2E123JF	1/4W 12kΩ ±5%
R4	2410310016	RD14B2E681JF	1/4W 680Ω ±5%
R5	2410331011	RD14B2E512JF	1/4W 5.1kΩ ±5%
R6	2410316010	RD14B2E122JF	1/4W 1.2kΩ ±5%
R7	2440045005	RS14B3A222JNB	1W 2.2kΩ ±5%
R8	2440042008	RS14B3A122JNB	1W 1.2kΩ ±5%
R9	2440045005	RS14B3A222JNB	1W 2.2kΩ ±5%
R10	2410308015	RD14B2E561JF	1/4W 560Ω ±5%
R11	2410320019	RD14B2E182JF	1/4W 1.8kΩ ±5%
R12	2410346019	RD14B2E223JF	1/4W 22kΩ ±5%
R13	2440034003	RS14B3A271JNB	1W 270Ω ±5%
R14	2440028006	RS14B3A820JNB	1W 82Ω ±5%
R15	2410294019	RD14B2E151JF	1/4W 150Ω ±5%
R16	2410290013	RD14B2E101JF	1/4W 100Ω ±5%
R17, 18	2430032002	RW99-3FR47K	3.15W 0.47Ω ±10%
R19	2440076003	RS14B3D150JNB	2W 15Ω ±5%
VR1	EP-546211	SOLID VOLUME	B-4.7kΩ VARIABLE RESISTOR
VR2	EP-54625	SOLID VOLUME	B-470Ω VARIABLE RESISTOR
TR1, 2	2730116013	2SC1345 Ⓞ	TRANSISTOR
TR3	2710050018	2SA537 ⓐ	TRANSISTOR
TR4	2730021027	2SC458 ⓑ	TRANSISTOR
TR5	2730096010	2SC984 ⓑ	TRANSISTOR
TR6	2730123006	MJ3001	TRANSISTOR
TR7	2730047005	MJ2501	TRANSISTOR
	2760155028	VD1122	VARISTOR
	2760067006	AW01-15	ZENER DIODE
	EP-71327	FUSE (2.5A)	FOR "+B", "-B" "OUTPUT"
	EP-5870	FUSE HOLDER	
	E-12105	RADIATOR	HEAT SINK FOR TR3
	EP-6733	INSULATING SHEET	FOR TR6, 7
	EE-2027H	PRINTED CIRCUIT BOARD	

MEMO:

TAPE DUBBING/MONITOR SWITCH UNIT

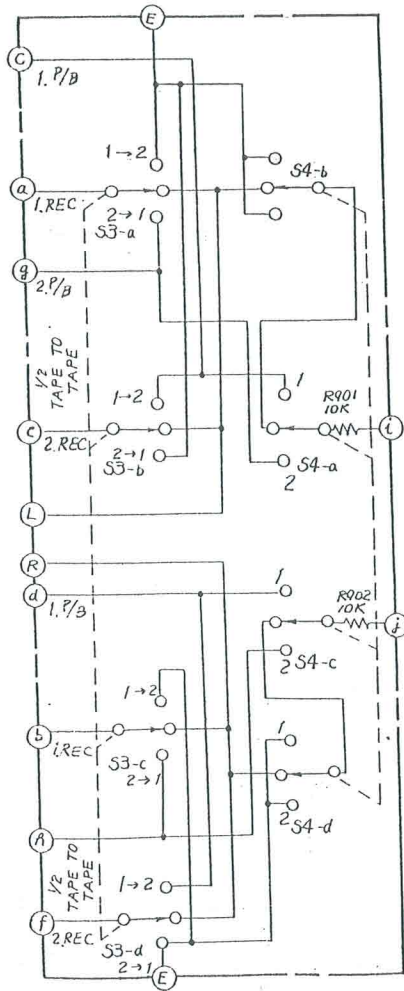


Fig. 14

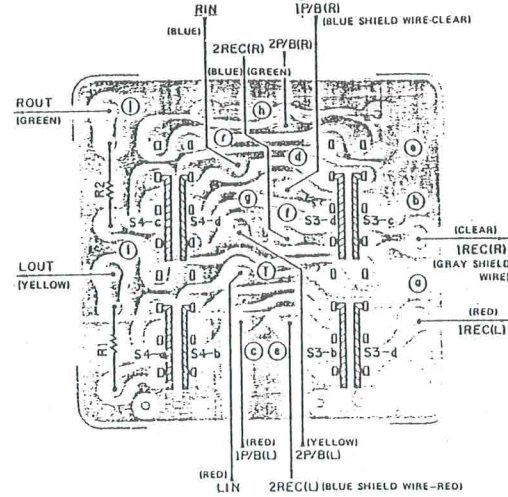


Fig. 15

ETC-60 MUTING UNIT

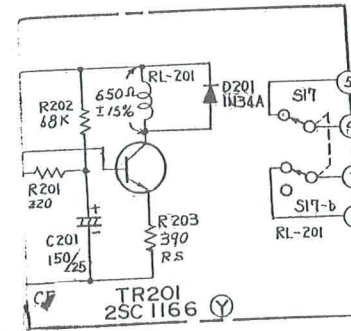


Fig. 16

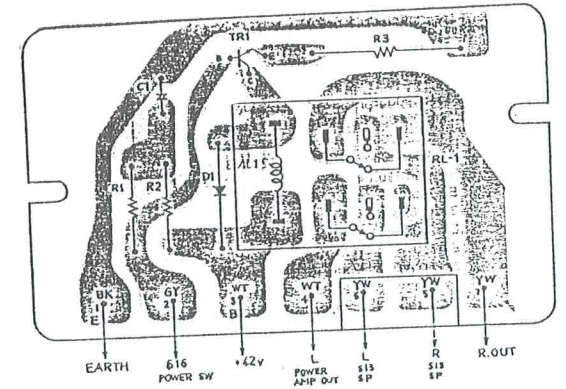


Fig. 17

Ref. No.	Part No.	Part Name	Descriptions
C1	2549005014	CE04=1E151MHS	150μF 25V ELECTROLYTIC CAPACITOR
R1	2410298015	RD14B2E221JF	1/4W 220Ω ±5% CARBON FILM RESISTOR
R2	2410358010	RD14B2E683JF	1/4W 68kΩ ±5% CARBON FILM RESISTOR
R3	2440093015	RS14B3D391JNBF	2W 390Ω ±5% METAL OXIDE FILM RESISTOR
TR1	2730141004	2SC1166 Y	TRANSISTOR
D1	2760001004	1N34A	DIODE
	2140016004	RELAY	
	2220103109	PRINTED CIRCUIT BOARD	

Ref. No.	Part No.	Part Name	Descriptions
R1	2410338014	RD14B2E103JF	1/4W 10kΩ ± 5% CARBON FILM RESISTOR
R2	2410338014	RD14B2E103JF	1/4W 10kΩ ± 5% CARBON FILM RESISTOR
S-3	EP-7101H2	LEVER SWITCH	TAPE DUBBING SWITCH
S-4	EP-7101H2	LEVER SWITCH	TAPE MONITOR SWITCH
	EE-2089	PRINTED CIRCUIT BOARD	

GE-4002-1, GX-4002-1 CHASSIS & CABINET GROUP

Ref. No.	Part No.	Part Name	Descriptions
C902	2518001023	CP05C--AC473MC	0.047μF ±20% AC450V OIL CAPACITOR
C903	EP-7131	CEL4700μF 50V	4700μF 50V ELECTROLYTIC CAPACITOR
C904	EP-7131	CEL4700μF 50V	4700μF 50V ELECTROLYTIC CAPACITOR
C905	251088003	CQ93M1H224K	0.22μF ±10% 50V PLASTIC FILM CAPACITOR
C906	2551088003	CQ93M1H224K	0.22μF ±10% 50V PLASTIC FILM CAPACITOR
C907	2551088003	CQ93M1H224K	0.22μF ±10% 50V PLASTIC FILM CAPACITOR
R903	2440090005	RS14B3D221JNB	2W 220Ω ±5% METAL OXIDE FILM RESISTOR
R904	2440090005	RS14B3D221JNB	2W 220Ω ±5% METAL OXIDE FILM RESISTOR
R905	2440090005	RS14B3D221JNB	2W 220Ω ±5% METAL OXIDE FILM RESISTOR
R906	2440090005	RS14B3D221JNB	2W 220Ω ±5% METAL OXIDE FILM RESISTOR
S1a~d	EP-7099H	LEVER SWITCH	MM-MC SELECTOR SWITCH
S16	2124058004	LEVER SWITCH	POWER ON-OFF SWITCH
S2a~d	EP-7108H	FUNCTION SWITCH	FUNCTION SELECTOR SWITCH
S6a~c	EP-7107H	MODE SWITCH	MODE SELECTOR SWITCH
S13a~d	EP-7106J	SPEAKER SWITCH	SPEAKER SELECTOR SWITCH
S14a~b	EP-7102	PUSH SWITCH	NULL BALANCE SWITCH
	EP-7112	RV24G25KHB250KX2	VARIABLE RESISTOR - BALANCE
	EP-7109	RV16N15AD100K	VARIABLE RESISTOR - DSC
	EP-7110	RV16N15KA100K	VARIABLE RESISTOR - MIC GAIN
	3930904005	LAMP ASS'Y	PILOT LAMP
	4150042008	TERMINAL COVER	FOR VOLTAGE CHANGEOVER TERMINAL
	EP-5941	HEADPHONE JACK	
	EP-7114-1	4P PUSH TERMINAL	SPEAKER CONNECTING TERMINAL
	EP-6762	4P CONNECTOR BASE	PHONO 1-2, AUX 1-2, PRE OUT-MAIN IN, JACK
	EP-6764	8P CONNECTOR BASE	TAPE-1, TAPE-2 JACK
	EP-7174	PIN PLUG	PHONO 1-2 SHORT PLUG
	EP-6759	2P CONNECTOR BASE	TUNNER INPUT JACK
	415006600	INSULATING CAP	INSULATION FOR POWER SWITCH
S12a~b	2120017007	6P SLIDE SWITCH	PRE-MAIN COUPLER
	CF-8576	SWITCH STOPPER	FOR PRE-MAIN SELECT SWITCH
	2020012005	FUSE HOLDER	
	2006034007	AC CORD WITH PLUG	FOR EUROPE
	200601005	AC CORD WITH PLUG	FOR AUSTRALIA
	EP-7129	8P SOCKET	FOR PHONO STEP-UP TRANS
	EP-7130	TERMINAL	GND TERMINAL
	2300013009	POWER TRANS ASS'Y	
	2061015016	FUSE (1.25A)	
	EE-2036N	FRONT CHASSIS	
	EE-2035S	CHASSIS FRAME	
	1050101000	BACK PANEL	
	4120190100	BRACKET	FOR VOLTAGE CHANGEOVER TERMINAL
	2050011005	TERMINAL	FOR VOLTAGE CHANGEOVER
	E-12051H	SHIELD COVER (B)	FOR BACK PANEL
	4100010006	SHIELD COVER (F)	FOR FRONT CHASSIS
	EE-2043L	RADIATOR	HEAT SINK FOR POWER TRANSISTOR (TR6, 7 ON ETC-26B)
	EP-7127	TR SOCKET	FOR POWER TRANSISTOR (TR6, 7 ON ETC-26B)
	DL-7253M	FRONT PANEL ASS'Y	
	DL-7281J	VOLUME KNOB ASS'Y	MAIN VOLUME
	DL-7282K2	KNOB ASS'Y	BALANCE
	DL-7282K1	KNOB ASS'Y	BASS, TREBLE
	DL-7284J	FUNCTION KNOB ASS'Y	FUNCTION, MODE, SPEAKER
	DL-7301	KNOB	
	MD-5169	PUSH KNOB	NULL BALANCE
	MD-5167H	LEVER KNOB (A)	POWER, HIGH, LOW, LOUDNESS, TONE DEFEAT, MM-MC.
	MD-5221	LEVER KNOB (B)	MUTING, DUBBING, MONITOR
	EE-2061K	BOTTOM COVER ASS'Y	
	CT-2531M	TOP CABINET ASS'Y	
	SC-1162	SPECIAL SCREW	FIXING SCREW FOR TOP CABINET
	2090006009	WIRE ASS'Y (A)	FOR VOLTAGE CHANGEOVER
	2090007008	WIRE ASS'Y (B)	FOR VOLTAGE CHANGEOVER

ADJUSTMENTS AND MEASUREMENTS PROCEDURES

INSTRUCTIONS FOR ADJUSTING MIDPOINT ELECTRIC POTENTIAL AND IDLING ELECTRIC CURRENT OF POWER AMPLIFIER UNIT.

To ensure accurate adjustment of the midpoint electric potential and idling electric current of the PMA-500Z Power Amplifier Unit (ETC-26B), and adjustment should be performed in the manner indicated below:

1. MEASURING INSTRUMENTS

- A. DC Voltmeter (200mV)
- B. DC Ammeter (100mA)

Note: One each of the above mentioned instruments will suffice if a test is conducted on only one channel at a time.

2. CONNECTION

- A. Connect one DC voltmeter to the left and one to the right channel of the SPEAKER terminals. (See Fig. 18)
- B. Remove the plug (red wire) from the No. 1 terminal (+B) of the Power Amplifier Unit (ETC-26B) and connect the DC ammeter to each channel. (See Fig. 19)

3. PROCEDURES

- A. Set the power supply at pre-set voltages of the PMA-500Z (AC 110, 120, 220, 240 volts)
- B. Wait three minutes after Power switch is ON.

- C. For adjusting midpoint voltage, turn the VR-1 (4.7 Kohm) so that voltage reading on the DC voltmeter (V) becomes 0 (zero): V=0. The condition is abnormal if the value exceeds 100 mV.
- D. Following adjustment of the midpoint voltage potential, adjust the idling electric current to 45 mA on the DC ammeter by rotating the VR-2 (470 ohm). I=45mA. Lock it with paint after adjustment is completed.

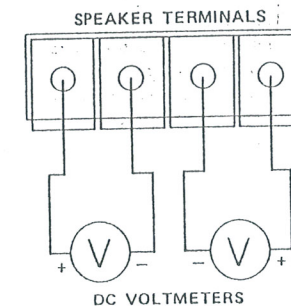


Fig. 18

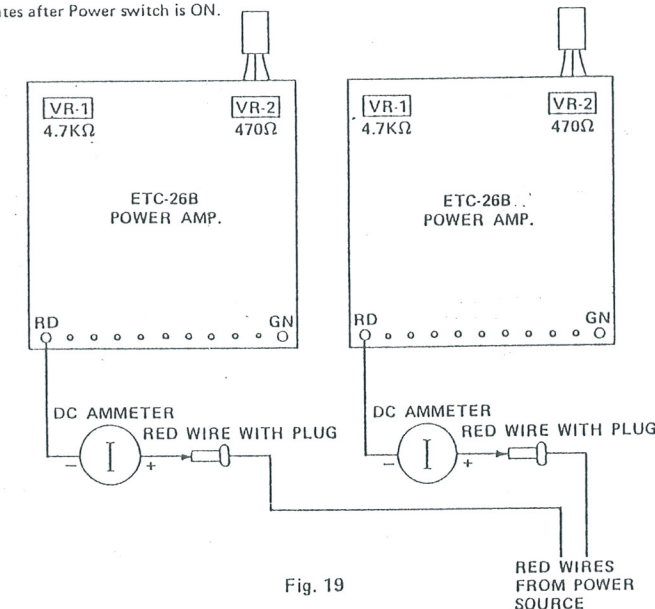


Fig. 19

INSTRUCTIONS FOR TESTING THE POWER AMPLIFIER UNIT

To ensure accurate testing of the PMA-500Z power amplifier, a test should be conducted in the manner indicated below:

1. MEASURING INSTRUMENTS

- A. Low-distortion audio frequency oscillator 1 set
- B. High-performance distortion meter 1 set
- C. AC Voltmeter (V.T.V.M.) 2 sets
- D. Oscilloscope 1 set
- E. 8 ohms noninductive resistor 2 pcs.
- F. Variable transformer 1 set

2. CONNECTION (SEE FIG. 20)

- A. Connect one 8 ohms noninductive resistor to the left and one to the right channel of the SPEAKER terminals, using a separate ground lead.
- B. Set the NORMAL-SEPARATE selector switch to the "SEPARATE" position and apply input signal to the MAIN-IN jack.

3. PROCEDURES

- A. Set the power supply at pre-set voltages of the PMA-500Z (AC 110, 120, 220, 240 volts)
- B. Supply the power only upon completion of connection.
- C. Gradually increase the 1 KHz. input signal level until the distortion meter registers 0.1% distortion. Voltage of the SPEAKER terminals then becomes the output voltage (V2) and the read-off from V1 becomes the input voltage. Be sure to apply input signal one channel at a time.

4. STANDARD VALUES

- A. Input Voltage (V1) 0.89 volts - 1.19 volts
- B. Output Voltage (V2)
PMA-500Z: 38 watts (17.4 volts) or more.

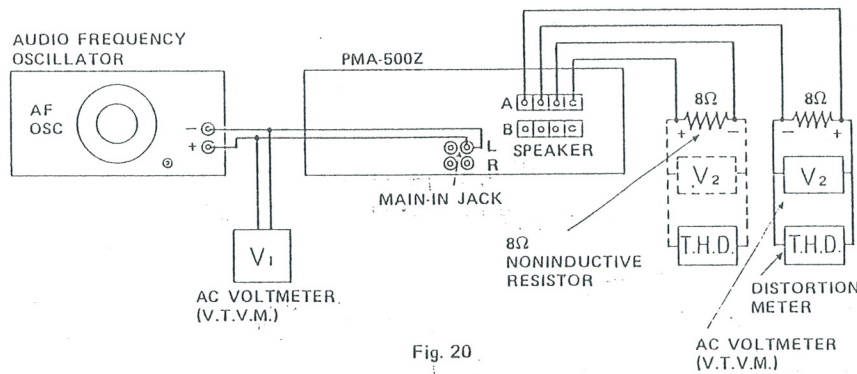


Fig. 20

INSTRUCTION FOR TESTING THE SENSITIVITY OF EACH INPUT JACK

To ensure accurate testing of the sensitivity of each input jack, a test should be conducted in the manner indicated below:

1. MEASURING INSTRUMENTS

- A. Low-distortion Audio frequency oscillator 1 set
- B. High-performance distortion meter 1 set
- C. Oscilloscope 1 set
- D. 8 ohms noninductive resistor 2 pcs.
- E. AC voltmeter (V.T.V.M.) 2 sets

2. CONNECTION

- A. Connect one 8 ohms noninductive resistor to the left and one to the right channel of the SPEAKER terminals, using a separate ground lead. Connection of other instrument refer Fig. 21.

3. PROCEDURES

- A. Set the power supply at pre-set voltages of the PMA-500Z (AC 110, 120, 220, 240 volts)
- B. Apply 1 KHz. input signal to AUX-1 jack so that output of the SPEAKER terminals becomes THD = 0.1%. The input voltage (V1) then becomes the input sensitivity of the AUX-1. Note the output voltage (V2).

- C. Change over to another input jack and adjust the input voltage so that it becomes equal to the output voltage (V2) of AUX-1. The input voltage then becomes the input sensitivity of the each jack.

4. STANDARD VALUES

- 4-1 For PMA-500
 - A. PHONO-1,2 2 mV ± 1.5 dB
 - B. TUNER 100 mV ± 1.5 dB
 - C. AUX-1,2 100 mV ± 1.5 dB
 - D. TAPE P.B. (DIN) 500 mV ± 1.5 dB
 - E. TAPE P.B. (RCA PIN) 500 mV ± 1.5 dB

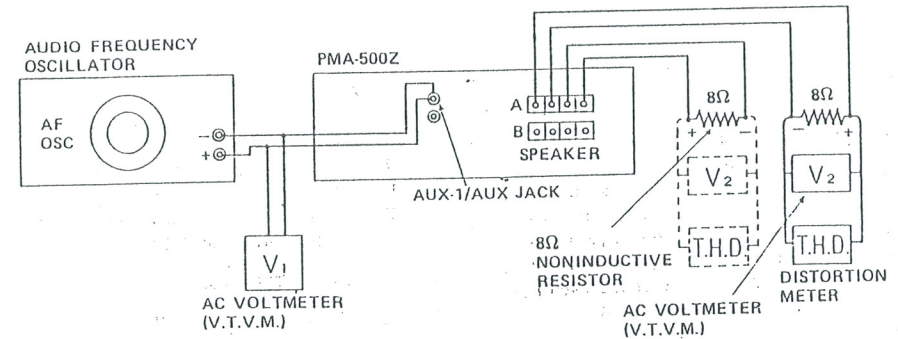


Fig. 21

INSTRUCTIONS FOR TESTING FREQUENCY CHARACTERISTIC OUTPUT FOR MONITOR

To ensure accurate testing of the PMA-500Z frequency characteristic, a test should be conducted in the manner indicated below:

1. MEASURING INSTRUMENTS

- A. AC voltmeter (V.T.V.M.) 2 sets
- B. Oscilloscope 1 set
- C. CR oscillator 1 set
- D. 8 ohms noninductive resistor 2 pcs
- E. Variable transformer 1 set
- F. Low frequency direct-viewing apparatus 1 set
- G. Audio frequency sweep generator 1 set

2. CONNECTION

- A. Connect one 8 ohms noninductive resistor to the left and one to the right channel of the SPEAKER terminals, using a separate ground lead.
- B. Figure 22 shows for testing AUX-1 frequency characteristic.
- C. Figure 23 shows for testing PHONO-1 frequency characteristic.

3. PROCEDURES

3-1. FREQUENCY CHARACTERISTIC FROM AUX INPUT JACK

- A. Set the power supply at pre-set voltages of the PMA-500Z (AC 110, 120, 220, 240 volts).
- B. Supply power upon completion of wiring.
- C. Set the TONE DEFEAT switch to "TONE" position.
- D. Set the MAIN VOLUME control to the maximum and BASS and TREBLE controls to it's center (Flat) position.
- E. Apply 1 KHz. input signal from the audio frequency sweep generator (or CR oscillator) and adjust the output level of the generator so that the power output (V) becomes 5 watts (6.3 volts). The level of the low frequency direct-viewing apparatus must be adjusted to 20 dB (When using V.T.V.M., 0 dB is set at 6.3 volts). Then set the sweep generator to AUTO. Be sure that level variation while sweeping at 30Hz. - 15KHz. is within ± 1 dB.
- F. Set the TONE DEFEAT switch to "DEFEAT" position.
- G. The same procedure used for item "E" applies. Variation of the level while sweeping at 25Hz. - 20KHz. should be within ± 1 dB.
- H. Set the TONE DEFEAT switch to "TONE" position and BASS control at the maximum position.

- I. When sweep is performed in a manner similar to item "E", the level at 80Hz. should be $\pm 10 \pm 1.5$ dB.
- J. When the BASS control is set at the minimum position, the level must be -10.5 ± 1.5 dB at 80Hz.
- K. When the TREBLE control is set at the maximum position and sweep is performed in a manner similar to item "E", the level should be $+10 \pm 1.5$ dB at 12KHz.
- L. Likewise, when TREBLE control is set at the minimum position, the level at 12KHz. should be -9 ± 1.5 dB.
- M. Manipulate the tone controls in the order of BASS, both center and TREBLE.
- N. Set the BASS and TREBLE controls to center (Flat) position.
- O. When the HIGH FILTER switch is set at the "ON" position and sweep is performed in a manner similar to item "E", the level should be -3 ± 1.5 dB, -2.5 dB at 9KHz. and -14 ± 4 dB at 20KHz.
- P. When LOW FILTER switch is set at "ON" position, and sweep is performed in a manner similar to item "E", the level should be -3 ± 1.5 dB, -2.5 dB at 40Hz.

3-2. STANDARD VALUES FOR FREQUENCY CHARACTERISTIC FROM AUX INPUT JACK.

ITEM	CONDITION	STANDARD VALUES
A. AUX	± 1 dB.	Less than 30Hz. - more than 15,000 Hz.
B. BASS MAX	at 80Hz.	$+10 \pm 1.5$ dB.
C. BASS MIN	at 80Hz.	-10.5 ± 1.5 dB.
D. TREBLE MAX	at 12KHz.	$+10 \pm 1.5$ dB.
E. TREBLE MIN.	at 12KHz.	-9 ± 1.5 dB.
F. HIGH FILTER	at 9KHz.	$+1.5$ dB.
G. " "	at 20KHz.	$-3 -2.5$ dB.
H. LOW FILTER	at 40Hz.	-14 ± 4 dB.
I. " "	at 20Hz.	$-3 -2.5$ dB.
J. AUX (TONE DEFEAT)	± 1 dB.	Less than 25Hz. - more than 20,000 Hz.

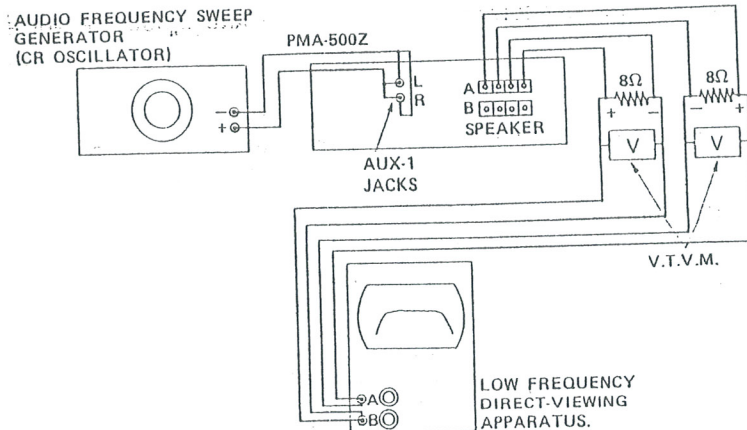


Fig. 22

3-3 FREQUENCY CHARACTERISTIC FROM PHONO-1 INPUT JACK.

- A. Apply input signal to PHONO-1 jack and obtain the output from REC-1 jack.
- B. Apply 1 KHz. input signal from the audio frequency sweep generator (or CR oscillator). 0 dB is to be set at 100 mV for REC-1 output level. The level of the low frequency direct-viewing apparatus should be set at 20 dB. On setting the sweep generator to "AUTO", the REC-1 output level of each frequency while sweeping should be as follows:

CONDITION	STANDARD VALUES
at 30Hz.	$+18.5 \pm 1.0$ dB.
at 100Hz.	$+13.1 \pm 0.5$ dB.
at 400Hz.	$+3.8 \pm 0.2$ dB.
	$+0.2$ dB.
at 5,000Hz.	$-8.5 -0.3$ dB.
at 10,000Hz.	-13.8 ± 0.5 dB.
at 15,000Hz.	-16.5 ± 1.0 dB.

NOTES:

- A. The stray capacitance of the input lead should be set at less than 100pF, and the lead length should be shortened as much as possible to minimize the effect of external hum.
- B. Frequency characteristic of the V.T.V.M. should be checked and calibrated in advance.
- C. Remember that an alteration of frequency may cause a variation of input voltage.

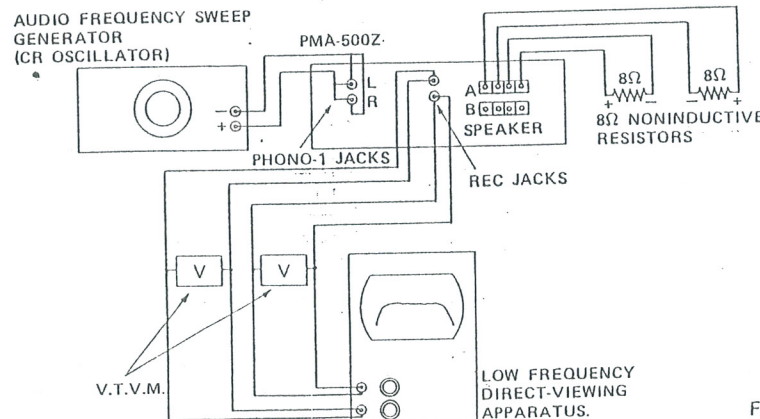


Fig. 23

INSTRUCTIONS FOR TESTING CROSSTALK, RESIDUAL NOISE AND INDUCTIVE NOISE

To ensure accurate testing of the PMA-500Z cross talk, residual noise and inductive noise, a test should be performed in the manner indicated below:

1. MEASURING INSTRUMENTS

- A. AC voltmeter (V.T.V.M.) (capable of measuring up to 3 mV at full range) 1 set
- B. Oscilloscope 1 set
- C. CR oscillator 1 set
- D. 8 ohms noninductive resistor 2 pcs.
- E. Variable transformer 1 set
- F. Input terminate resistor (4.7 Kohm); Be sure to completely shield off the resistor 14 pcs.

2. CONNECTION

- A. Connect one 8 ohms noninductive resistor to the left and one to the right channel of the SPEAKER terminals, using a separate ground lead.
- B. Connection of other instrument refer Fig. 25.

3. PROCEDURES

3-1 RESIDUAL NOISE

- A. Set the power supply at pre-set voltage of the PMA-500Z (AC 110, 120, 220, 240 volts)
- B. Supply power upon completion of wiring.
- C. Set the BASS and TREBLE controls to center (Flat) position and terminate the input jacks, both right and left channels with 4.7 Kohm resistor.
- D. Read the output voltage when the MAIN VOLUME control is at its minimum, which becomes the residual noise.
Be sure to change the power source plug and use smaller value. Use AUX-1 jack for the input.
- E. Standard values is less than 3mV.

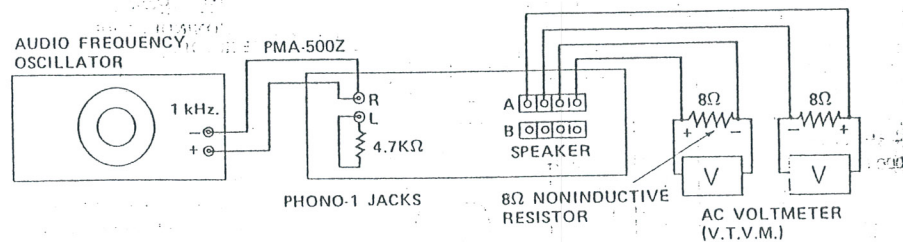


Fig. 24

3-2 INDUCTIVE NOISE

- A. Terminate each input jack (PHONO-1,2, AUX-1,2, TUNER, TAPE-1,2) with 4.7 Kohm resistor. Set the MAIN VOLUME control at the maximum.
The noise then obtained becomes the inductive noise of each terminal. Confirm that measuring is not affected by external noise.
- B. Standard values
PHONO: Less than 20mV, TUNER & TAPE: 4mV.

3-3 PHONO CROSSTALK

- A. Set the MUTING switch at -10 dB position and MAIN VOLUME control at the maximum. Apply 1 KHz. input signal to PHONO-1(R) jack from the oscillator, set the right channel of the SPEAKER terminal at 25 watts (14.1 volts), and terminate the PHONO-1(L) with 4.7 Kohm resistor. (See Fig. 24)
Then check the output leakage from the right channel to the left channel. The obtained ratio becomes crosstalk for the right channel. Perform a similar procedure for the left channel to determine its crosstalk.
- B. Standard values is more than 49 dB.

VOLTAGE CHANGEOVER

If change of voltage is necessary, as shown in figure.

