

# EMX860<sup>ST</sup>

POWERED MIXER

## SERVICE MANUAL



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### IMPORTANT NOTICE

This manual has been provided for the use of authorized Yamaha Retailers and their service personnel. It has been assumed that basic service procedures inherent to the industry, and more specifically Yamaha Products, are already known and understood by the users, and have therefore not been restated.

**WARNING :** Failure to follow appropriate service and safety procedures when servicing this product may result in personal injury, destruction of expensive components and failure of the product to perform as specified. For these reasons, we advise all Yamaha product owners that all service required should be performed by an authorized Yamaha Retailer or the appointed service representative.

**IMPORTANT :** This presentation or sale of this manual to any individual or firm does not constitute authorization certification, recognition of any applicable technical capabilities, or establish a principal-agent relationship of any form.

The data provided is believed to be accurate and applicable to the unit(s) indicated on the cover. The research engineering, and service departments of Yamaha are continually striving to improve Yamaha products. Modifications are, therefore, inevitable and changes in specification are subject to change without notice or obligation to retrofit. Should any discrepancy appear to exist, please contact the distributor's Service Division.

**WARNING :** Static discharges can destroy expensive components. Discharge any static electricity your body may have accumulated by grounding yourself to the ground buss in the unit (heavy gauge black wires connect to this buss.)

**IMPORTANT :** Turn the unit OFF during disassembly and parts replacement. Recheck all work before you apply power to the unit.

### LITHIUM BATTERY HANDLING

This product uses a lithium battery for memory back-up.

**WARNING :** Lithium batteries are dangerous because they can be exploded by improper handling. Observe the following precautions when handling or replacing lithium batteries.

- Leave lithium battery replacement to qualified service personnel.
- Always replace with batteries of the same type.
- When installing on the PC board by soldering, solder using the connection terminals provided on the battery cells.
- Never solder directly to the cells. Perform the soldering as quickly as possible.
- Never reverse the battery polarities when installing.
- Do not short the batteries.
- Do not attempt to recharge these batteries.
- Do not disassemble the batteries.
- Never heat batteries or throw them into fire.

#### ADVARSEL!

Lithiumbatteri-Eksplosionsfare ved fejlagtig handling. Udskiftning ma kun ske med batteri af samme fabrikat og type. lever det brugte batteri tilbage til leverandren.

#### VAROITUS

Explosionsfara vid felaktigt batteribyte.

Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparatillverkaren.

Kassera anvant batteri enligt fabrikantens instruktion.

#### VAROITUS

Paristo voi rajahtaa, jos se on virheellisesti asennettu.

Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin.

Havita kaytetty paristo valmistajan ohjeiden mukaisesti.

The following information complies with Dutch official Gazette 1995. 45; ESSENTIALS OF ORDER ON THE COLLECTION OF BATTERIES.

- Please refer to the disassembly procedure for the removal of Back-up Battery.
- Leest u voor het verwijderen van de backup batterij deze beschrijving.

### WARNING: CHEMICAL CONTENT NOTICE!

The solder used in the production of this product contains LEAD. In addition, other electrical/electronic and/or plastic (Where applicable) components may also contain traces of chemicals found by the California Health and Welfare Agency (and possibly other entities) to cause cancer and/or birth defects or other reproductive harm.

**DO NOT PLACE SOLDER, ELECTRICAL/ELECTRONIC OR PLASTIC COMPONENTS IN YOUR MOUTH FOR ANY REASON WHATSOEVER EVER!**

Avoid prolonged, unprotected contact between solder and your skin! When soldering, do not inhale solder fumes or expose eyes to solder/flux vapor!

If you come in contact with solder or components located inside the enclosure of this product, wash your hands before handling food.

## WARNING

Components having special characteristics are marked  and must be replaced with parts having specification equal to those originally installed.

## SPECIFICATIONS

### ● General specifications

Maximum output power	MAIN STEREO: 135 W+135 W/8Ω @0.5% THD at 1 kHz, 200 W+200 W/4Ω @0.5% THD at 1 kHz MAIN BRIDGE: 400 W/8Ω @0.5% THD at 1 kHz MONITOR: 135 W/8Ω @0.5% THD at 1 kHz, 200 W/4Ω @0.5% THD at 1 kHz	
Frequency response	20 Hz–20 kHz +1 dB, –3 dB @1 W output into 8Ω (POWER AMP OUT) 20 Hz–20 kHz +1 dB, –3 dB @+4 dB output into 10 kΩ (MAIN OUT, MONITOR OUT, EFFECT OUT)	
Total harmonic distortion	Less than 0.5% @20 Hz–20 kHz, 100 W output into 4Ω (POWER AMP OUT) Less than 0.3% @20 Hz–20 kHz, +14 dB output into 10 kΩ (MAIN OUT, MONITOR OUT, EFFECT OUT)	
Hum & noise (Average, Rs=150Ω) (with 20 Hz–20 kHz BPF)	–125 dB equivalent input noise, –68 dB residual output noise (POWER AMP OUT)	
	–95 dB residual output noise (MAIN OUT, MONITOR OUT, EFFECT OUT)	
	–80 dB (MAIN OUT)	Master level control: nominal level, All channel level controls: minimum
	–75 dB (MONITOR OUT)	Master level control: nominal level, All channel level controls: minimum
	–71 dB (MAIN OUT)	Master level control: nominal level, 1 channel level control: nominal level
	–84 dB (EFFECT OUT)	Master level control: nominal level, All channel level controls: minimum
Maximum voltage gain (PAD: OFF)	86 dB CH IN (Lo-Z) to POWER AMP OUT (CH1–6)	
	66 dB CH IN (Lo-Z) to MAIN OUT, MONITOR OUT (CH1–6)	
	72 dB CH IN (Lo-Z) to EFFECT OUT (CH1–6)	
	48 dB CH IN (Lo-Z) to REC OUT (CH1–6)	
	56 dB CH IN (Hi-Z) to MAIN OUT, MONITOR OUT (CH1–6)	
	26 dB AUX IN to MAIN OUT	
Crosstalk at 1 kHz	24 dB TAPE IN to MAIN OUT	
	66 dB MIC IN to MAIN OUT (CH7–8)	
	26 dB LINE IN to MAIN OUT (CH7–8)	
	–65 dB adjacent input, –65 dB input to output	
Input channel equalization	±15 dB Maximum	
	HIGH	10 kHz shelving
	MID	2.5 kHz peaking
	LOW	100 Hz shelving
	* Turn over/roll-off frequency of shelving: 3 dB below maximum variable level.	
Meters	5 POINTS LED METER (MAIN OUT L/R, MONITOR OUT)	
Graphic equalizer	7 bands (125, 250, 500, 1k, 2k, 4k, 8k Hz) ±12 dB Maximum (MAIN OUT, MONITOR OUT)	
Internal digital effect	3 types (Vocal, L Hall, S Hall)	
Phantom power	+48 V is supplied to electrically balanced inputs for powering condenser microphones via 6.8 kΩ current limiting/isolation resistors.	
Limiter	Comp. : THD ≥ 0.5% (MAIN, MONITOR)	
LIMIT indicators	Turns on. : THD ≥ 0.5% (MAIN, MONITOR)	
Foot switch	DIGITAL EFFECT MUTE : on/off	
Optional accessories	FC5 Foot switch	
Power requirement	USA and Canada	120 V AC 60 Hz
	Europe	230 V AC 50 Hz
	Other	240 V AC 50 Hz
Power consumption	300 W	
Dimensions (WxHxD)	497x324x275 mm	
Weight	17 kg	

### ● Input specifications

Input connectors	PAD	Actual load impedance	Nominal impedance	Input level			Connector type
				Sensitivity*1	Nominal level	Max. before clipping	
CH INPUT (Lo-Z) (CH1–6)	OFF	3 kΩ	50–600Ω Mics	–62 dB (616 μV)	–50 dB (2.45 mV)	–20 dB (77.5 mV)	XLR-3-31 type
	ON			–32 dB (19.5 mV)	–20 dB (77.5 mV)	+10 dB (2.45 V)	
CH INPUT (Hi-Z) (CH1–6)	OFF	10 kΩ	50–600Ω Mics	–52 dB (1.95 mV)	–40 dB (7.75 mV)	–10 dB (245 mV)	Phone jack (TRS)*2
	ON			–22 dB (61.6 mV)	–10 dB (245 mV)	+20 dB (7.75 V)	
MIC INPUT (CH7, 8)		3 kΩ	50–600Ω Mics	–62 dB (616 μV)	–50 dB (2.45 mV)	–20 dB (77.5 mV)	XLR-3-31 type*2
LINE INPUT (CH7, 8) (L, R)		10 kΩ	600Ω Line	–22 dB (61.6 mV)	–10 dB (245 mV)	+20 dB (7.75 V)	Phone jack
TAPE IN (L, R)		10 kΩ	600Ω Line	–22 dBV (79.4 mV)	–10 dBV (316 mV)	+17.8 dBV (7 V)	Phono jack
AUX IN (L, R)		10 kΩ	600Ω Line	–22 dB (61.6 mV)	–10 dB (245 mV)	+20 dB (7.75 V)	Phone jack*3

\*1. Sensitivity is the lowest level that can produce an output of +4 db (1.23 V) or the nominal output level when the unit is set at maximum gain.

\*2. Balanced.

\*3. Unbalanced.

• 0 dB=0.775 Vrms, 0 dBV=1 Vrms.

### ● Output specifications

Output connectors	Actual source impedance	Nominal impedance	Output level		Connector type
			Nominal	Max. before clipping	
MAIN AMP OUT (L, R) (A, B)	0.1Ω	4/8Ω Speaker	37.7 W/4Ω	(200 W/4Ω)	Phone jack
MAIN BTL OUT	0.1Ω	8Ω Speaker	75.4 W/8Ω	(400 W/8Ω)	Phone jack
MONITOR AMP OUT (A, B)	0.1Ω	8Ω Speaker	37.7 W/4Ω	(200 W/4Ω)	Phone jack
MAIN OUT (L, R)	600Ω	10 kΩ Lines	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone jack
MONITOR OUT	600Ω	10 kΩ Lines	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone jack
EFFECT OUT	600Ω	10 kΩ Lines	+4 dB (1.23 V)	+20 dB (7.75 V)	Phone jack
REC OUT (1, 2)	600Ω	10 kΩ Lines	–10 dBV (316 mV)	+10 dBV (3.16 V)	Phono jack

• All output jacks are unbalanced.

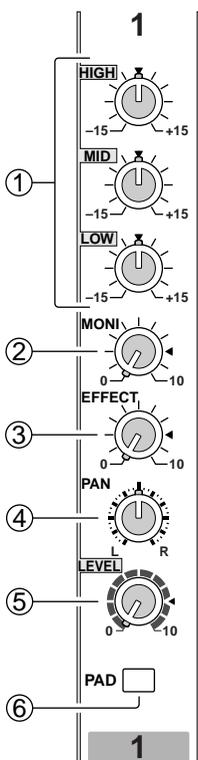
• 0 dB=0.775 Vrms, 0 dBV=1 Vrms.

Specifications are subject to change without prior notice.



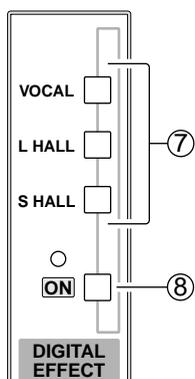
# ■ PANEL LAYOUT

## • Channel section



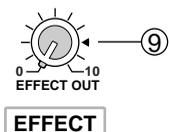
- ① Equalizer controls (HIGH, MID, LOW)
- ② Monitor controls (MONI)
- ③ Effect control (EFFECT)
- ④ PAN control (BAL/PAN control for CH7/8)
- ⑤ Level control (LEVEL)
- ⑥ Pad switch (PAD) (1-6 only)

## • DIGITAL EFFECT section



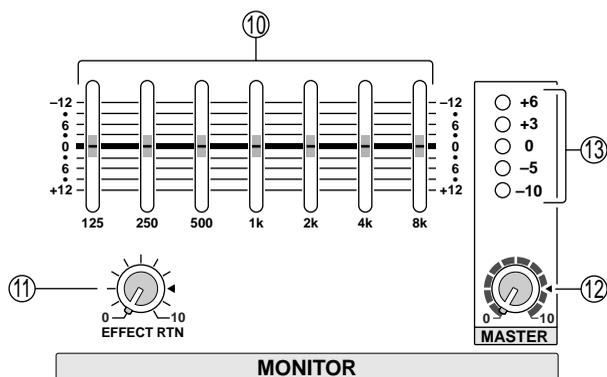
- ⑦ Effect select switch
- ⑧ DIGITAL EFFECT ON switch

## • EFFECT section



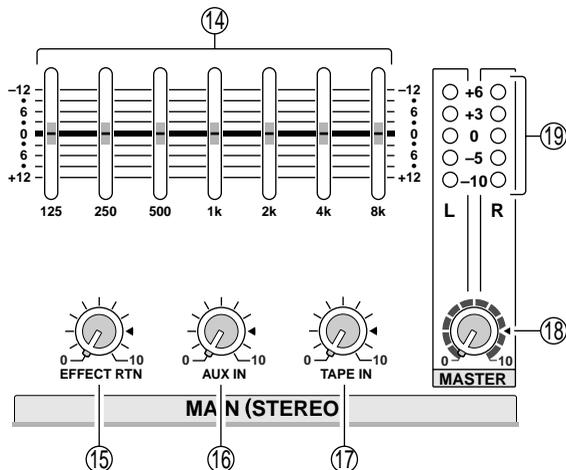
- ⑨ EFFECT OUT control

• MONITOR section



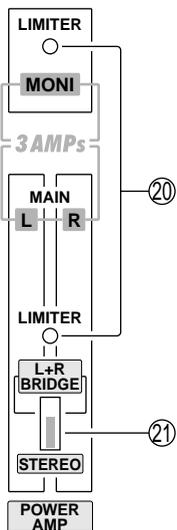
- ⑩ Graphic equalizer
- ⑪ EFFECT RTN control
- ⑫ MASTER control
- ⑬ Peak level indicator

• MAIN section



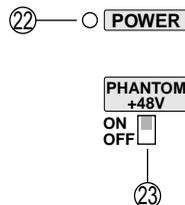
- ⑭ Graphic equalizer
- ⑮ EFFECT RTN control
- ⑯ AUX IN control
- ⑰ TAPE IN
- ⑱ MASTER control
- ⑲ Peak level indicator

• POWER AMP section



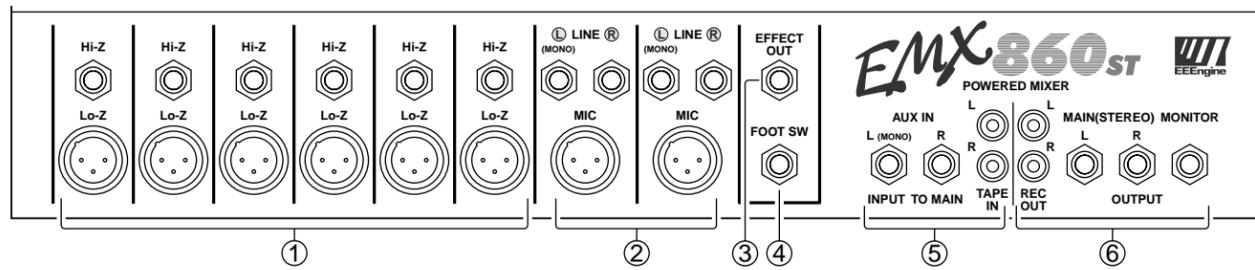
- ⑳ LIMITER indicator
- ㉑ Stereo/Bridge select switch

• POWER indicator & PHANTOM switch



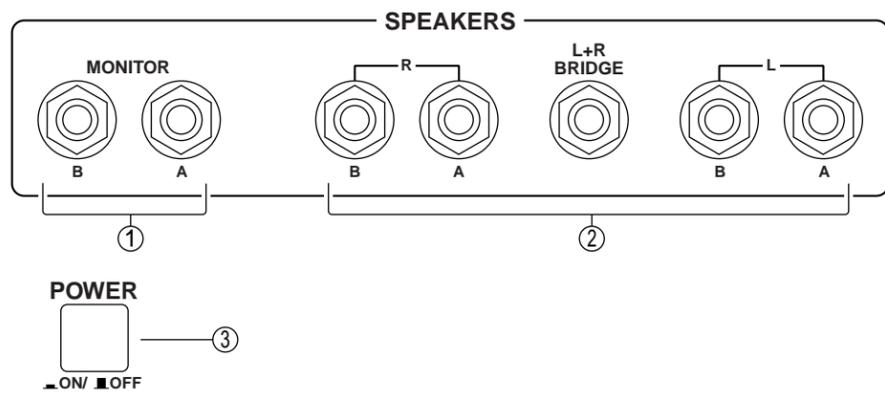
- ㉒ POWER indicator
- ㉓ PHANTOM +48 V switch

• Input/output panel



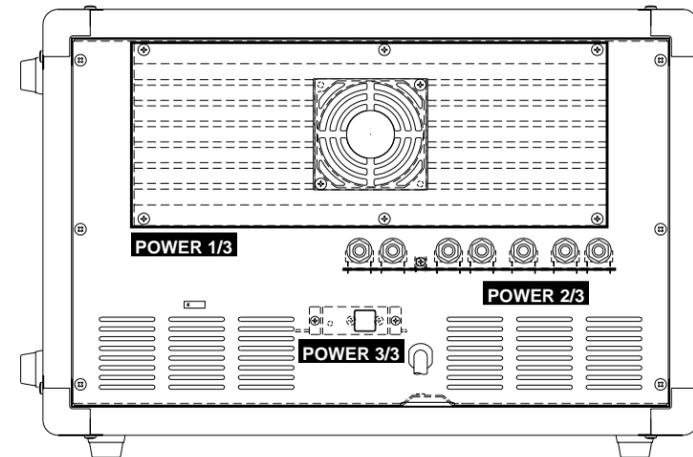
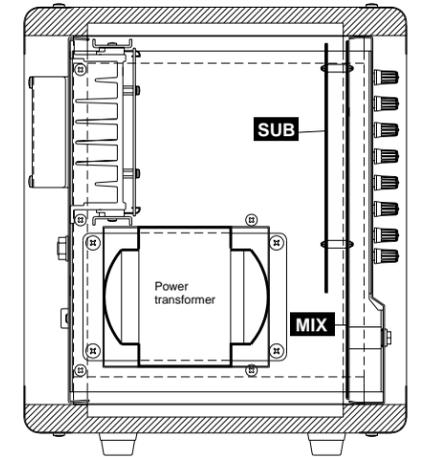
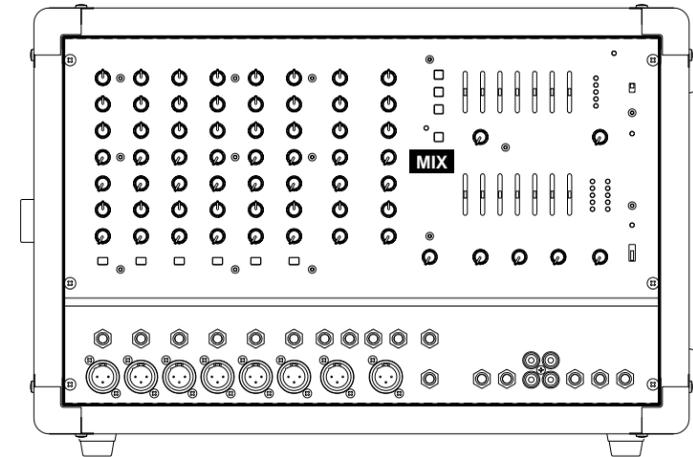
- ① Channel input jacks (Hi-Z, Lo-Z) 1-6
- ② Channel input jacks (MIC/LINE) 7-8
- ③ Effect output jack (EFFECT OUT)
- ④ Foot switch jack (FOOT SW)
- ⑤ AUX IN/TAPE IN jacks
- ⑥ REC OUT/MONITOR/MAIN (STEREO) jacks

• Rear panel

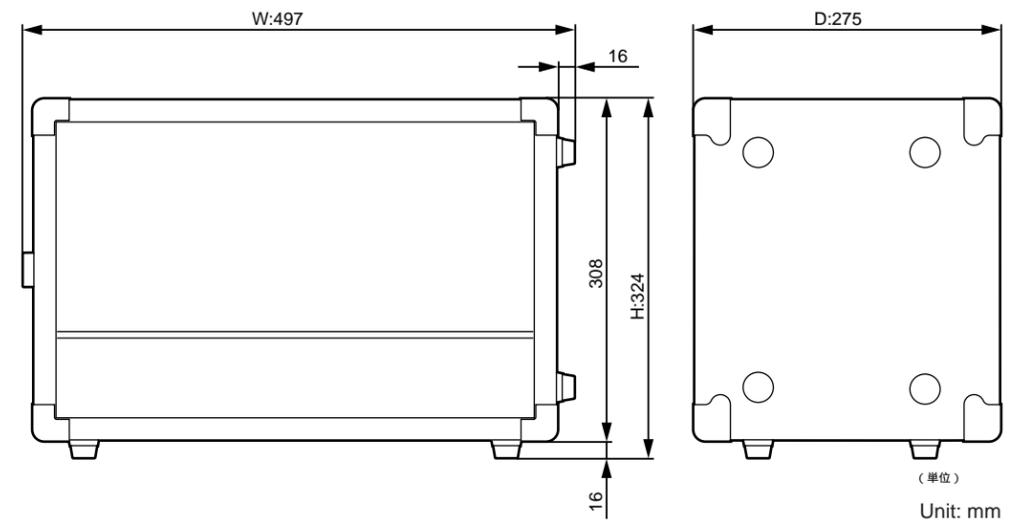


- ① SPEAKERS MONITOR jacks
- ② SPEAKERS L/R/L+R BRIDGE jacks
- ③ Power switch

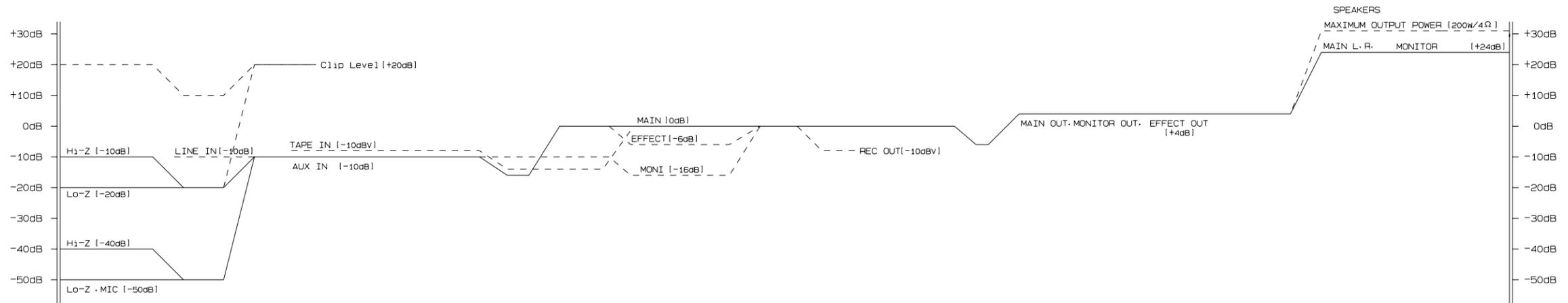
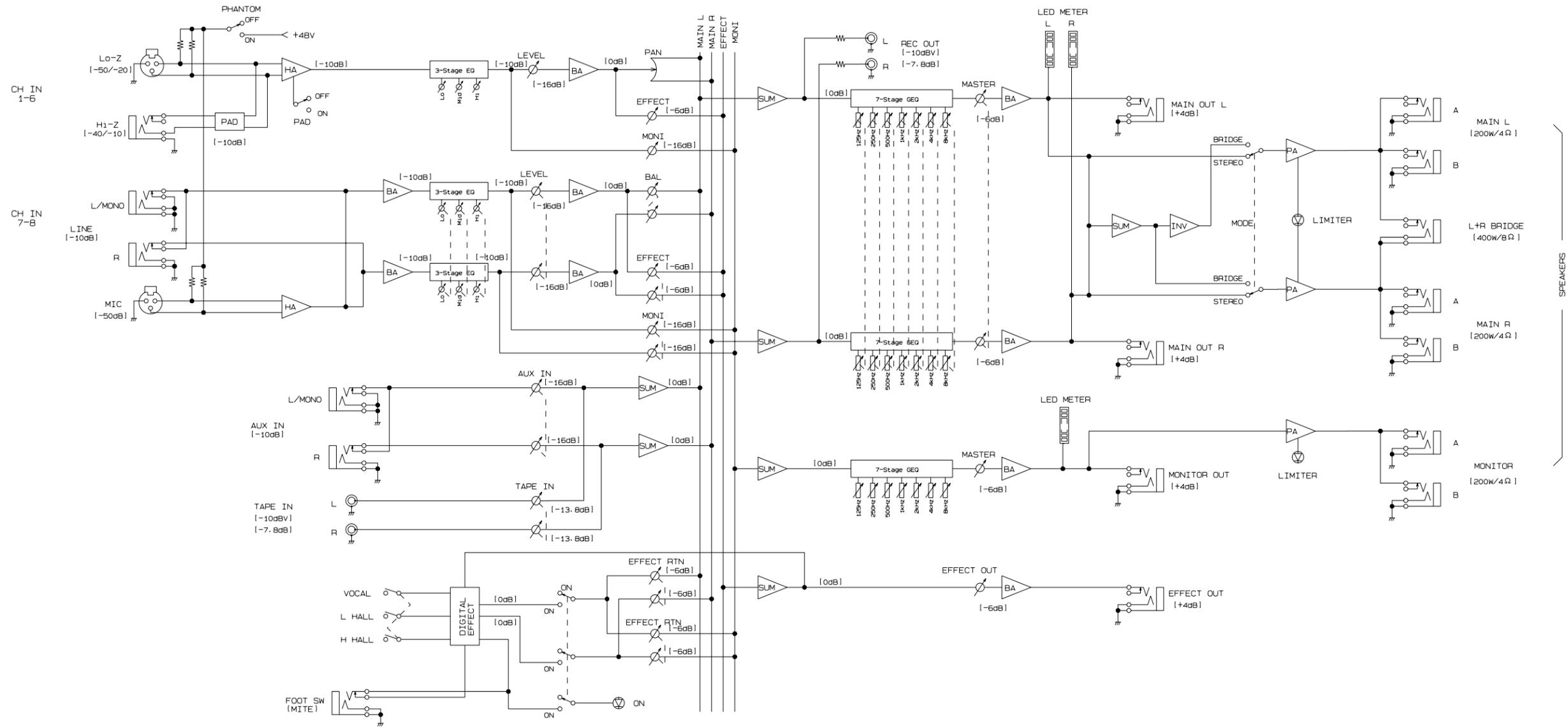
■ CIRCUIT BOARD LAYOUT



■ DIMENSIONS



# BLOCK & LEVEL DIAGRAM



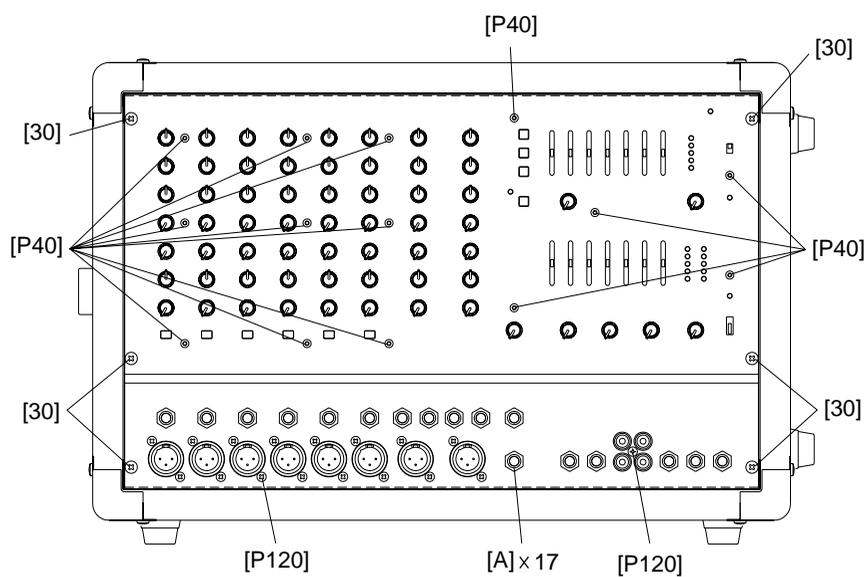
## ■ DISASSEMBLY PROCEDURE

### 1. MIX Circuit Board

- 1-1 Remove the six (6) screws marked [30]. The panel assembly can then be removed. (Fig. 1)
- 1-2 Remove the sixty-three (63) knobs, the seventeen (17) hexagonal nuts marked [A] and the seventeen (17) screws marked [P120]. (Fig. 1)
- 1-3 Remove the fourteen (14) screws marked [P40]. The MIX circuit board can then be removed. (Fig. 1)

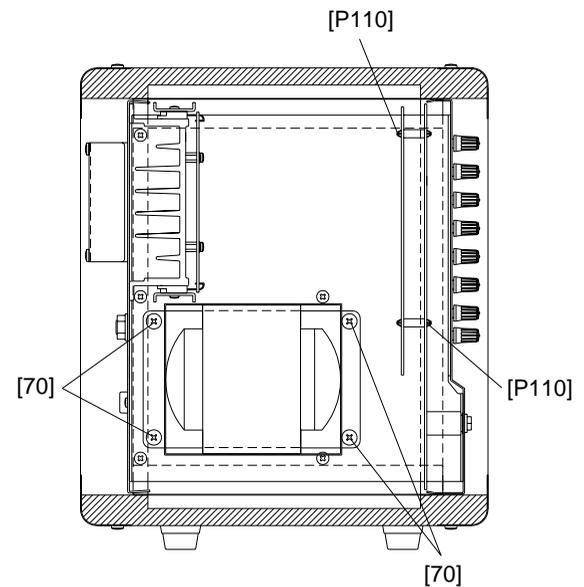
### 2. SUB Circuit Board

- 2-1 Remove the panel assembly. (See Procedure 1.)
- 2-2 Remove the SUB circuit board from the spacer port marked [P110]. (Fig. 2)



- [30]: Bonding B-Tyte Screw 4.0X8 MFZN2BL (VR779900)
- [P40]: Hexagonal Socket Screw-P 3X25 MFZNBL (V3289800)
- [P120]: Bonding Tapping Screw-P 3.0X8 MFZN2BL (VN413300)

Fig.1



- [70]: Bind Head Screw SP 5.0X10 MFZN2BL (VU688100)

Fig.2

**3. PWR 1/3, 2/3, 3/3 Circuit Boards**

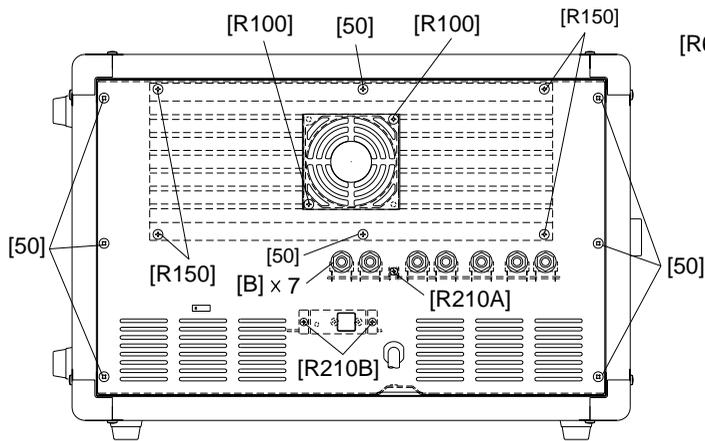
- 3-1 Remove the panel assembly. (See Procedure 1.)
- 3-2 Remove the two (2) connectors from the power transformer and the six (6) screws marked [50]. The rear assembly can then be removed. (Fig. 3)
- 3-3 Remove the six (6) screws marked [R150]. The radiating plate with the PWR 1/3 circuit board can then be removed. (Fig. 3)  
Remove the fourteen (14) screws marked [R80], the six (6) screws marked [R40] and the TR holder marked [R60]. The PWR 1/3 circuit board can then be removed. (Fig. 4)
- 3-4 Remove the seven (7) hexagonal nuts marked [B] and the screw marked [R210A]. The PWR 2/3 circuit board can then be removed.
- 3-5 Remove two (2) screws marked [R210B]. The PWR 3/3 circuit board can then be removed. (Fig. 3)

**4. Motor fan**

- 4-1 Remove the panel assembly. (See Procedure 1-1.)
- 4-2 Remove the rear assembly. (See Procedure 3-2.)
- 4-3 Remove the PWS 1/3 circuit board. (See Procedure 3-3.)
- 4-4 Remove the two (2) screws marked [R100]. The motor fan can then be removed.

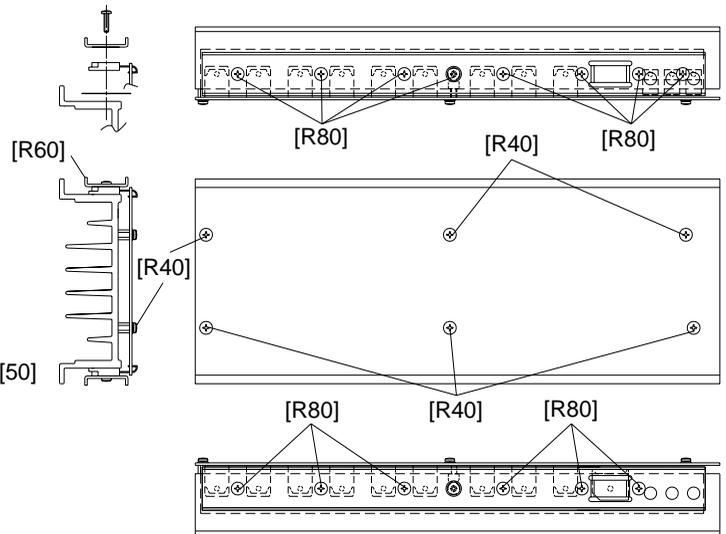
**5. Power transformer**

- 5-1 Remove the panel assembly. (See Procedure 1-1.)
- 5-2 Remove the rear assembly. (See Procedure 3-2.)
- 5-3 Remove the four (4) screws marked [70]. The power transformer can then be removed. (Fig. 2)



- [50]: Bonding B-Tyte Screw 4.0X8 MFZN2BL (VR779900)
- [R100]: Bind Head Screw 3.0X30 ZMC2BL (VT520200)
- [R150]: Bind Head Tapping Screw-B 4.0X8 MFZN2BL (EG340190)
- [R210]: Bonding Tapping Screw-B 3.0X8 MFZN2BL (VN413300)

Fig.3



- [R40]: Bind Head Screw SP 3.0X8 MFZN2Y (EG330290)
- [R80]: Bind Head Tapping Screw-B 3.0X12 MFZN2BL (VQ074600)

Fig.4

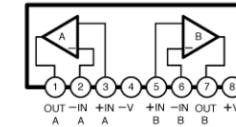
## LSI PIN DISCRPTION

### YSS234 (XN299A00) Digital Sound Processor

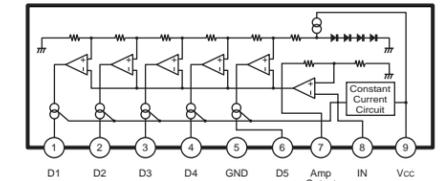
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	MD4	I/O	External RAM interface data	33	AVDD	-	DC A+5Vs bus
2	MD3	I/O		34	VDD	-	DC D+5V
3	MD0	I/O		35	TST0	-	DC D+5V
4	MD1	I/O		36	TST1	-	DC D+5V
5	MD2	I/O		37	DOEN	-	DC D+5V
6	MCKO	O	Master clock output	38	SDO1	O	N.C.
7	XO	O	Crystal oscillator connection	39	SDO0	O	N.C.
8	XI	I	Crystal oscillator connection	40	WC	O	N.C.
9	ER0	I	Eary refrection preset select	41	BCO	O	N.C.
10	ER1	I		42	MA0	O	External RAM interface address
11	ER2	I		43	MA1	O	
12	REV0	I	44	MA2	O		
13	REV1	I	45	MA3	O		
14	REV2	I	46	MA4	O		
15	MUTEN	I	DC D+5V	47	MA5	O	
16	ICN	I	Initial clear	48	MA6	O	
17	PRG	I	DC D+5V	49	MA7	O	
18	MODE	I	Preset mode (H=DC +5V)	50	MA12	O	
19	VSS	-	Ground	51	MA14	O	
20	AVSS	-	Ground	52	VSS	-	Ground
21	CVA	-	N.C.	53	MA10	O	External RAM interface address
22	AORL	O	N.C.	54	MA011	O	
23	AORR	O	N.C.	55	MA09	O	
24	CHL	I	Sample hold capacitor connection	56	MA8	O	DC D+5V
25	AIL	I	Lch ADC input	57	MA13	O	
26	VDD	-	DC D+5V	58	VDD	-	
27	AIR	I	Rch ADC input	59	WEN	I	Write enable
28	CHR	I	Sample hold capacitor connection	60	OEN	I	Output enable
29	AOFL	O	Lch DAC output	61	CEN	I	Chip select
30	AOFR	O	Rch DAC output	62	MD7	I/O	External RAM interface data
31	AVDD	-	DC A+5V	63	MD6	I/O	
32	CVB	I	Rch midpoint voltage	64	MD5	I/O	

## IC BLOCK DIAGRAM

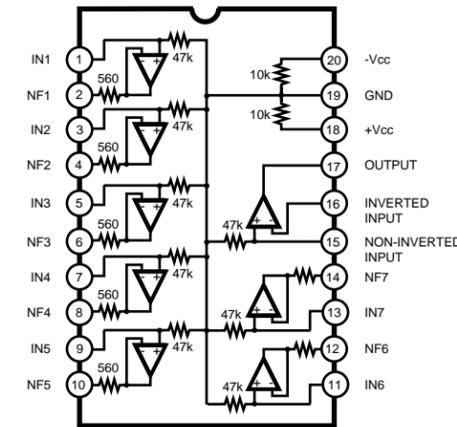
- **NJM2068L-D** (XM356A00)  
**NJM4558L** (XM922A00)  
Dual Operational Amplifier



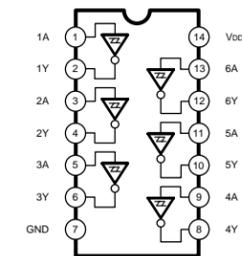
- **BA6137** (XA534A00)  
LED Driver



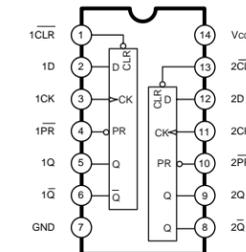
- **M5229P** (XG203A00)  
7 SEGMENTS GRAPHIC EQUALIZER



- **TC74HC14AP** (IR001400)  
Hex Inverter



- **TC74HC74AP** (IR007400)  
Dual D-Type Flip-Flop



INPUTS			OUTPUTS	
PR	CLR	CK	D	Q
L	H	X	X	H
H	L	X	X	L
L	L	X	X	H
H	H	t	H	H
H	H	t	L	L
H	H	L	X	Q <sub>0</sub>

# INSPECTIONS

## 1. Measuring Instruments

Low Frequency Oscillator:	Balance Output, Output Impedance = 150 ohms
Oscilloscope:	Input Impedance $\geq$ 100 kohms
Level Meter:	Input Impedance $\geq$ 100 kohms

Note: Use a balance input measuring instrument

## 2. Mixer Part

### 2-1 Setting Conditions

Setting conditions are as follows unless otherwise specified.

### 2-2 Input and Output Load

Input Signal:	1 kHz, sine wave ( $R_s = 150$ ohms)
Load:	All output terminals have a 10 k ohms load

### 2-3 Control Panel Setting

#### Channel Input (CH1-CH6) Section

EQ (HIGH, MID, LOW) level controls:	Center
MONITOR level control:	Maximum
EFFECT level control:	Maximum
PAN:	Center
LEVEL:	Maximum
PAD:	OFF

#### Stereo Channel Input (CH7-CH8) Section

EQ (HIGH, MID, LOW) level controls:	Center
MONITOR level control:	Maximum
EFFECT level control:	Maximum
PAN:	Center
LEVEL:	Maximum

#### EFFECT Section

DIGITAL EFFECT ON switch	OFF
EFFECT OUT level control	Maximum

#### MAIN Section

GRAPHIC EQUALIZER (7 band) Fader:	Center
EFFECT RTN level control:	Maximum
AUX IN:	Maximum
TAPE IN:	Maximum
MASTER (MAIN):	Maximum

#### MONITOR Section

GRAPHIC EQUALIZER (7 band) Fader:	Center
EFFECT RTN level control:	Maximum
MASTER (MAIN) level control:	Maximum

#### Others

PHANTOM +48V switch	OFF
POWER AMP switch	STEREO

## 2-4 Gain

Each output gain should be as shown in the table below.

Table 1: INPUT CH 1-CH 6

[Units: dBs]

Input Terminal	Input Level	MAIN OUT (L, R)	MONITOR OUT	EFFECT OUT	REC OUT (L, R)
Lo-Z	-62	$+1 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$	$+4 \pm 2$	$+10 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$	$-16.8 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$
	-32 (PAD ON)				
Hi-Z	-52	$+1 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$	-	-	-

Note: When the POWER AMP MODE switch is set to the BRIDGE side, confirm the gain

Table 2: INPUT CH7-CH8

[Units: dBs]

Input Terminal	Input Level	MAIN OUT	MONITOR OUT	EFFECT OUT
MIC	-62	$+1 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$	$+7 \pm 2$	$+13 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$
LINE L	-22	$+1 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$	$+7 \pm 2$	$+13 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$
LINE R	-22	$+1 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$	$+1 \pm 2$	$+7 \begin{smallmatrix} +2.5 \\ -2.0 \end{smallmatrix}$

Table 3: AUX IN and TAPE IN

[Units: dBs]

Input Terminal	Input Level	MAIN OUTPUT
AUX IN	-22	$+4 \pm 2$
TAPE IN	-22	$+1.8 \pm 2$

## 2-5 Frequency Response

When the input signal frequency is set to 20 Hz and 20 kHz for the systems shown in Tables 1, 2 and 3, the each output terminal should fall within the range of +1 and -3 dB at 20 Hz and 20 kHz, using 1 kHz as the reference.

## 2-6 Equalizer Characteristics

When the input signals shown below are applied to the channel input in the states of 2-3 and the channel EQ (HIGH,MID, LOW) level controls are changed from center position (flat), the boost/cut range at the MAIN OUT should be as follows:

Table 4

[Units: dB]

EQ Controls	GAIN	Frequency	Response
LOW	Maximum	100 Hz	$+12 \pm 2$
	Minimum		$+12 \pm 2$
MID	Maximum	2.5 kHz	$+12 \pm 2$
	Minimum		$+12 \pm 2$
HIGH	Maximum	10 kHz	$+12 \pm 2$
	Minimum		$+12 \pm 2$

If the result of the equalizer is out of the specified range, change the input signal frequency so that the output signal is at the set level. Its frequency should then be within the range of 80 - 120% of the standard frequency.

## 2-7 Graphic Equalizer Characteristics

When the input signals shown below are applied to the channel input in the states of 2-3 and graphic equalizer level controls are changed from center position (flat), the boost/cut range at the MAIN OUT and the MONITOR OUT should be as follows:

Table 5

[Units: dB]

		Input signal frequency and Fader name						
		125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Response	Maximum	$+12 \pm 2$						
	Minimum	$-12 \pm 2$						

If the result of the graphic equalizer is out of the specified range, change the input signal frequency so that the output signal is at the set level. Its frequency should then be within the range of 80 - 120% of the standard frequency.

## 2-8 Meter LED

When the MAIN OUT and MONITOR OUT output levels are as shown in the table below, the corresponding METER LED lights up.

Table 6 [Units: dBs]

LED Name	Lighting Level
+6	+10 ± 2
+3	+7 ± 2
0	+4±2
-5	-1 ± 2
-10	-6 ± 2.5

## 2-9 Distortion

Set each volume control of the INPUT section and MASTER section to nominal for the systems shown in Tables 1, 2 and 3. When each output except the REC OUT level reaches +14 dBs, the distortion ratio should be less than 0.1 % from 20 Hz to 20 kHz.

## 2-10 Maximum Output Level

In the states of 2-9, the maximum output levels of MAIN OUT, MONITOR OUT and EFFECT OUT should be +20 dBs with a distortion of less than 1%.

## 2-11 Equivalent Input Noise

The measurement CH level volume is assumed to be at maximum, and the other CH level volumes are assumed to be at minimum in the states of 2-3.

When the Lo-z and MIC input terminals are connected with a 150 ohms resistor, the MAIN OUT terminal noise level should be less than -61 dBs. If the noise level does not reach -61 dBs due to a gain variance, the converted noise level (= noise level minus the actual gain of the channel) should be less than -124 dBs. (Apply a DIN-AUDIO filter.)

## 2-12 Residual Noise

Set all the input level controls at minimum in the states of 2-3. When the MASTER and EFFECT OUT level controls in the MAIN and MONITOR section are changed to maximum or minimum, the residual noise should be as shown in the table below. (Apply a DIN-AUDIO filter.)

Table 7 [Unit: dBs]

MASTER VOLUME	MAIN OUTPUT	MONITOR OUT	EFFECT OUT
Maximum	-73	-68	-77
Minimum	-94	-94	-94

## 2-13 Phantom Power (+48 V)

Connect a load resistance of 10 K ohm (more than 1W) between pins 1 and 2 of both the Lo-z IN and the MIC IN input terminals, then short between pins 2 and 3 of the Lo-z IN and the MIC IN input terminal.

When the PHANTOM switch is turned on, +35 ± 3 V should be obtained between the load resistance.

## 2-14 Digital Effect

When the DIGITAL EFFECT ON switch is turned on, the ON LED lights up. When the DIGITAL EFFECT ON switch is turned off, the ON LED light goes out.

When the DIGITAL EFFECT ON switch is turned on while inputting a sine wave of -60 dB to the CH1 Lo-z IN at a minimum MONITOR level control setting, the signal level of the MONITOR OUT will be more than -25 dBs. Even if the SELECT switch is changed to VOCAL, L HALL and S HALL, confirm that the output level is even.

Confirm that the output sound from the vocals music source has a digital effect, and confirm that the effect is able to be turned on and off by the FOOT SW.

## 2-15 Stability

When a capacitor of 10 FP to 0.1 F is connected in parallel to the loading resistor at each SPEAKER OUT terminal, or when all VR and EQ control volumes are set to MAX, there should be no abnormality; for example, there should be no oscillation. Especially, do not oscillate if the FREQ LEVEL is at maximum.

### 3. Power Amplifier Part

#### 3-1 Setting Conditions

Setting conditions are as follows unless otherwise specified.

Input Terminal:	INPUT CH 8 LINE L
POWER AMP switch:	STEREO
Measuring Output Terminal:	(SPEAKERS) L-A, R-A, MONITOR-A
Output Load:	4 ohm (more than 200 W)
	Connect the resistor when inspecting the power amplifier section
INPUT CH 1- CH 7	
MONITOR level control:	Minimum
EFFECT level control:	Minimum
LEVEL level control:	Minimum

Note: Other control settings are the same as the mixer part in section 2-3.

#### 3-2 Power ON Muting

The muting relay should be released 2.5 +/- 1 seconds after the power switch is turned on.

#### 3-3 Speaker Terminal DC Voltage

When input terminals are grounded, confirm that each output terminal voltage is 0 +/- 100 mV.

#### 3-4 Gain

When applying a 1 kHz -26.0 dBs sine wave to an INPUT terminal, confirm that the SPEAKERS L+R terminal output levels are +17.0  $\pm 2.5$  dBs and the SPEAKERS MONITOR terminal output levels is +23.0 dB  $\pm 2.5$  dBs. The SPEAKERS L-B, R-B and MONITOR B output terminals should also be measured.

#### 3-5 Frequency Response

Apply a 20 Hz, 1 kHz and 20 kHz = 26 dB sine wave signal separately to the input; the output level should be between -3 and +1 dB at 20 Hz and 20 kHz, when 1 kHz is set as the reference. (0 dB)

#### 3-6 Harmonic Distortion

Apply a 1 kHz sine wave signal to the input; the three output levels should be 200 W/4 ohms (31.2 dBs/ch); the distortion ratio should be less than 0.5 %.

Apply a sine wave signal of 20 Hz, 1 kHz and 20 kHz separately to the input; the three output level should be 100 W /4 ohms (28.2 dBs/ch); the distortion ratio should be less than 0.5 %.

Do this inspection within 30 seconds.

#### 3-7 Residual Noise

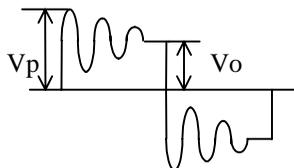
Set the MASTER level controls (MONITOR and MAIN) at minimum; the residual noise should be less than -68 dBs.

Notes: Apply a DIN-AUDIO filter.

#### 3-8 Stability

Apply a 10 kHz -26 dBs rectangular signal to the input and connect a capacitor (10 pF to 0.47 F) parallel to the 4 ohm load resistor, or connect an inductor (10 H to 0.47 H) serial to the 4 ohm load resistor. Confirm that the output signal is as illustrated below.

Overshoot:	$V_p/V_o \leq 1.8$
Ringing:	5 waves and less than 5 waves



Next, only connect a capacitor (10 pF to 0.47 $\mu$ F) to the SPEAKERS terminal as a load, and confirm that the output is as follows:

Overshoot:	$V_p/V_o \leq 2.5$
Ringing:	It should end within 7 waves; there is no oscillation.

### 3-9 Protection

Apply a 10 Hz sine wave signal to the input; increase the input signal so that the output signal is clipped. Confirm that the protection does not operate and that the speaker relay does not be open.

When applying a 1 Hz, 6 Vp-p (8.7 dBs) sine wave signal to the input, confirm that the protection operates within 2 seconds and that the speaker relay is turned off. When turning off the input signal, confirm that the protection stops the operation seconds and that the speaker relay automatically turns on within 5 seconds.

### 3-10 PC Limiter and Limiter

Apply a 1 kHz -20 dBs sine wave signal to the input and then connect a 1 ohm ( +/- 5% 100 W) resistor; confirm that the output signal is  $V_{p-p} \leq 20V$  and that the signal is not rectangular.

### 3-11 LIMITER Indicator

When applying a 1 kHz -10.8 dBs sine wave signal to the input, the LIMITER indicator should light up.

### 3-12 Efficiency

When adjusting for the output of L and R to become 10V (+2.2 dBs), confirm that the power consumption is 330 +/- 50W.

## 4. Main Bridge

### 4-1 Setting Conditions

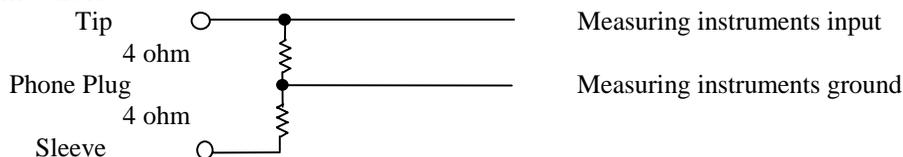
Input Terminal:	INPUT CH 8 LINE L
POWER AMP switch:	BRIDGE
Measuring Output Terminal:	SPEAKERS, L + R BRIDGE
Output Load:	8 ohm (more than 400 W)

INPUT CH 1- CH 7

MONITOR level control:	Minimum
EFFECT level control:	Minimum
LEVEL level control:	Minimum

Note: Other control settings are the same as the mixer part in section 2-3.

### 4-2 Connection



### 4-3 Gain

Apply a 1 kHz -26.0 dBs sine wave signal to the input; confirm that the output levels are +20.0 dBs  $\pm 2.5$  dB.

### 4-4 Frequency Response

Apply a sine wave signal to the input; the output level should be between -3 and +1 dB at 20 Hz and 20 kHz, when 1 kHz is set as the reference. (0 dB)

## 5. Power Supply Fluctuation

There should be no operational problems when the power supply fluctuation is within +/- 10% of the nominal voltage.









