POWERED MIXERS

EM1400
EM1600
EM1800

SERVICE MANUAL

EM1400/EM1600
EM1800

■ CONTENTS

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YAMAHA CORP.
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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 inherant 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: The presentation or sale of this manual to any individual or firm does not constitute authorization, certification, recognition of any applicable technical capabilitites, or establish a principleagent 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.

■ SPECIFICATIONS

● GENERAL SPECIFICATIONS

Maximum Output Power	150W @ 4ohms 0.5% (THD) @ 1 kHz 100W @ 8ohms 0.3% (THD) @ 1 kHz
Maximum Output Level (LINE OUT)	+20dB @ 10kohms 0.5% 20Hz~20kHz
Total Harmonic Distortion (Power Amp. Section) (Mixer Section)	Less than 0.1% 20Hz~20kHz @ 75W/4ohms (POWER AMP IN to SPEAKER OUT) Less than 0.2% 20Hz~20kHz @ +4dB/10kohms (CH IN to LINE OUT)
Frequency Response (SPEAKER OUT) (LINE OUT)	+1, −3dB 20Hz~20kHz @ 1W/8ohms +1, −3dB 20Hz~20kHz @ +4dB/10kohms
Hum & Noise (20Hz~20kHz) Rs = 150ohms Input Gain = Max. Input Pad = 0dB ‖ Input sensitivity = −60dB	−126dB Equivalent Input Noise −64dB residual output noise (SPEAKER OUT) −88dB residual output noise (LINE OUT) −73dB (77dB S/N) LINE OUT Master fader at maximum level and all CH fader at minimum level. −62dB (66dB S/N) LINE OUT Master fader and one CH fader at maximum level. −73dB (77dB S/N) AUX OUT Master fader at maximum and all CH mix level control at minimum level. −62dB (66dB S/N) AUX OUT Master fader and one CH mix level control at maximum level.
Maximum Voltage Gain	90dB CH IN to SPEAKER OUT 64dB CH IN to LINE OUT 64dB CH IN to AUX SEND 1, 2 (+4dB) 50dB CH IN to AUX SEND 2 (−10dB) 24dB AUX RETURN to LINE OUT 26dB POWER AMP IN to SPEAKER OUT
Crosstalk (@ 1 kHz)	60dB adjacent input channels 60dB input to output
Input channel gain control	40dB (−60dB~−20dB) variation in gain stop to stop
Input channel pad switch	0/20dB of attenuation
Input channel equalization	±15dB maximum boost or cut in each of three bands. HIGH : 8kHz shelving MIDDLE : 2kHz peaking LOW : 100Hz shelving
Master equalization (GEQ)	250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz ±12dB
Level Meter	Illuminated meter (+5VU = 150W/4ohms)
Clip indicators	RED LED built into each input channel. In turns on when post-EQ signal is 3dB below clipping.
Power Requirements U.S. & Canadian models West Germany model	120V AC, 60Hz 220V AC, 50Hz
Power Consumption U.S. & Canadian models	EM1400 330W EM1600 330W EM1800 330W
West Germany model	EM1400 330W EM1600 330W EM1800 330W
Dimensions	Height 6-1/8" (155 mm) Depth 20-5/8" (525 mm) Width EM1400 14-1/8" (360 mm) EM1600 16-7/8" (430 mm) EM1800 19-5/8" (500 mm)
Weight	EM1400 28 lbs. 11 ozs. (13 kg) EM1600 33 lbs. 1 ozs. (15 kg) EM1800 35 lbs. 4 ozs. (16 kg)

* 0dB = 0.775 Vr.m.s.

● INPUT CHARACTERISTICS

Input Terminals	PAD	Gain Trim	Actual Load Impedance	For Use With Nominal	Input Level			Connector In Mixer
					Sensitivity	Nominal	Max. before clip	
CH Input *	0	−60	4k ohms	50 ~ 600 ohm Mics	−60dB (0.8mV)	−60dB (0.8mV)	−34dB (15.5mV)	XLR-3-31 type
		−20		&	−20dB (77.5mV)	−20dB (77.5mV)	+ 6dB (1.55V)	& Phone Jack
	20			600 ohm Lines	0dB (775mV)	0dB (775mV)	+26dB (15.5V)	(TRS)
AUX RETURN (1, 2)			10k ohms	600 ohm Lines	−20dB (77.5mV)	−20dB (77.5mV)	——	Phone Jack
GEQ IN			10k ohms	600 ohm Lines	+ 4dB (1.23V)	+ 4dB (1.23V)	+20dB (7.75V)	Phone Jack
POWER AMP IN			10k ohms	600 ohm Lines	+ 4dB (1.23V)	+ 4dB (1.23V)	+ 4dB (1.23V)	Phone Jack

(1) Sensitivity is the lowest level that will produce an output of full power or the nominal output level when the unit is set to maximum gain.
(2) XLR type connectors are balanced, CH Phone Jacks are balanced (T = +, R = −, S = GND) and another Phone Jacks are unbalanced.
(3) In these specifications, when dB represents a specific voltage, 0dB is referenced to 0.775V RMS.
(4) * CH No EM1400 = 4CH EM1600 = 6 CH EM1800 = 8CH

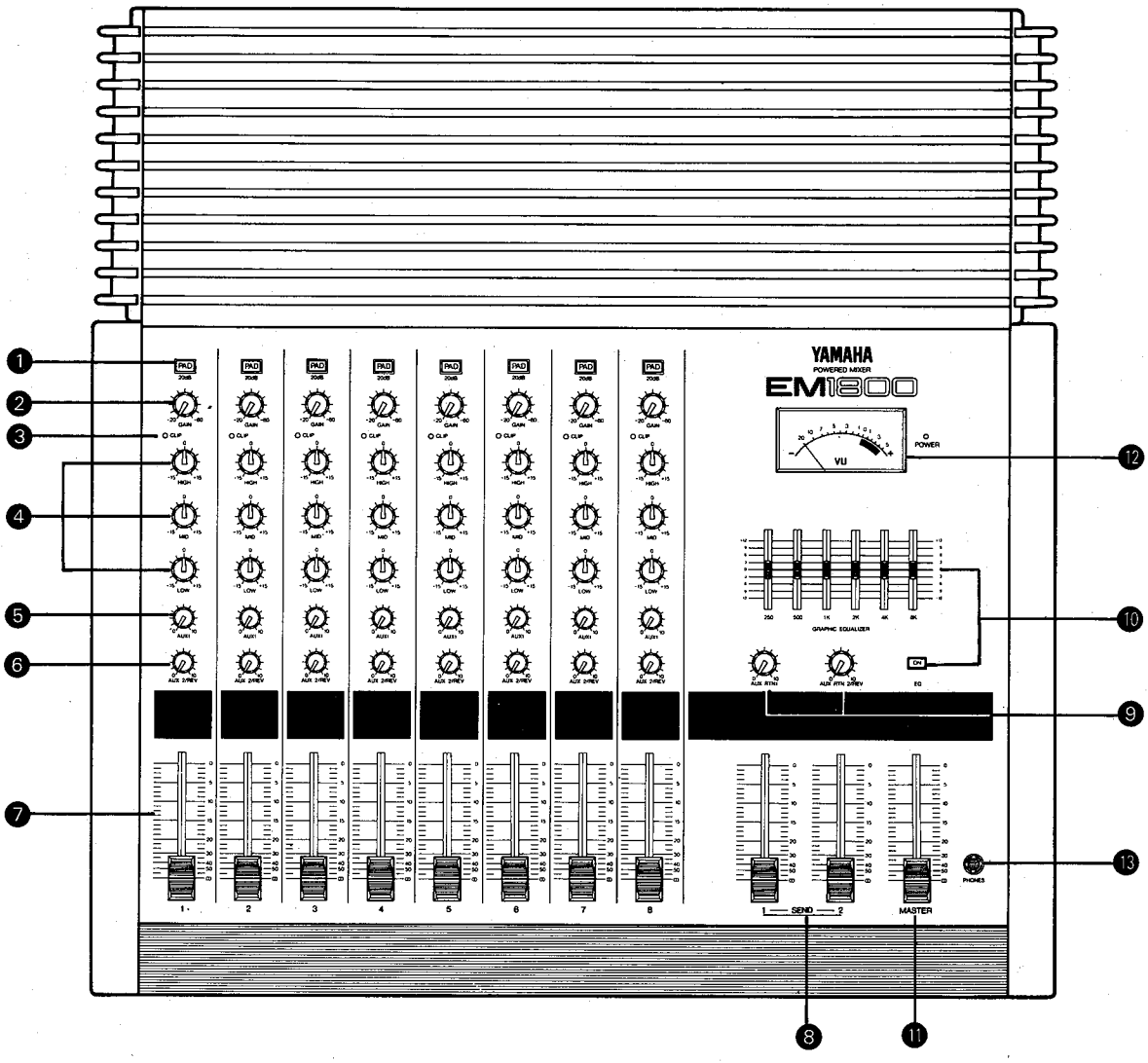
● OUTPUT CHARACTERISTICS

Output Terminals		Actual Source Impedance	For Use With Nominal	Output Level		Connector In Mixer
				Nominal	Max. before clip	
SPEAKER OUT		0.08 ohms	8 ohm speakers	100 W	100 W	Phone Jack
			4 ohm speakers	150 W	150 W	
LINE OUT		600 ohms	10k ohm lines	+ 4dB (1.23V)	+20dB (7.75V)	Phone Jack
GEQ OUT		600 ohms	10k ohm lines	+ 4dB (1.23V)	+20dB (7.75V)	Phone Jack
AUX SEND 1		150 ohms	600 ohm lines	+ 4dB (1.23V)	+20dB (7.75V)	Phone Jack
AUX SEND 2	+ 4dB	150 ohms	600 ohm lines	+ 4dB (1.23V)	+20dB (7.75V)	Phone Jack
	−10dB	600 ohms	10k ohm lines	−10dB (245mV)	+ 6dB (1.55V)	Phone Jack
PHONES		150 ohms	8 ohm phones	75mW	75mW	Stereo Phone Jack

(1) All Phone Jacks are unbalanced.
(2) In these specifications, when dB represents aspecific voltage, 0dB is referenced to 0.775V RMS.

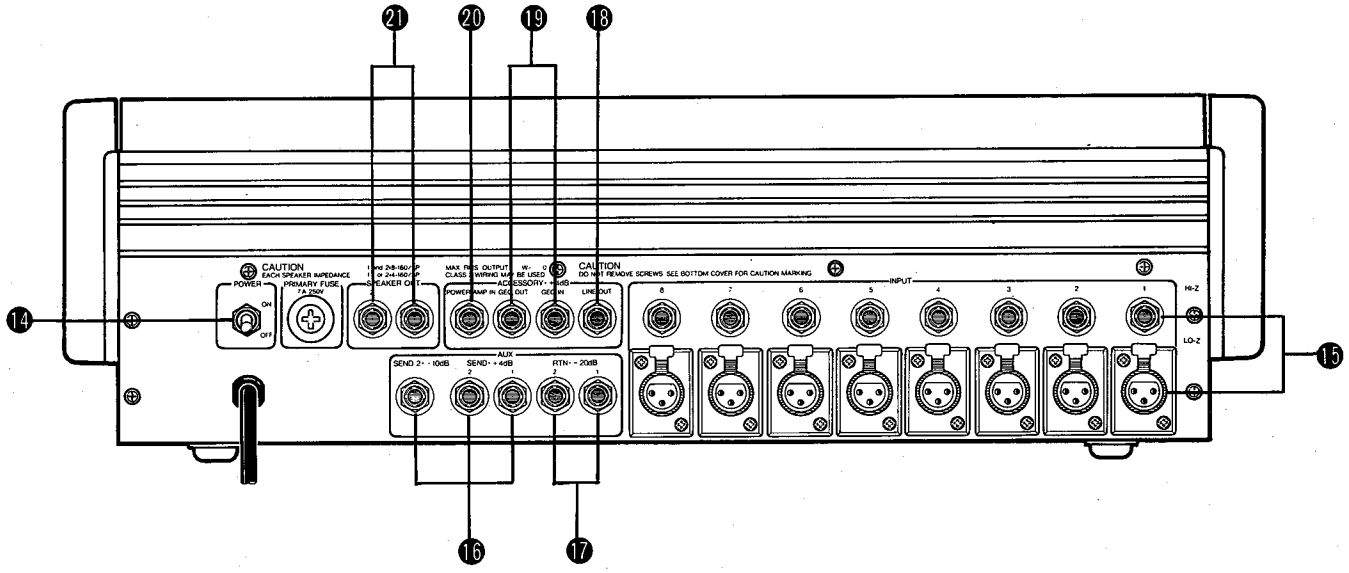
■ PANEL LAYOUT

● Front Panel



❶ PAD Switch
❷ GAIN Control
❸ CLIP LED indicator
❹ 3-band Equalizer
❺ AUX1 Control
❻ AUX2/REV Control
❼ Channel Fader
❽ SEND1 & SEND2 Faders
❾ AUX RTN1 & AUX RTN2/REV Controls
❿ Graphic Equalizer & EQ Switch
⓫ Master Fader
⓬ VU Meter
⓭ PHONES Jack

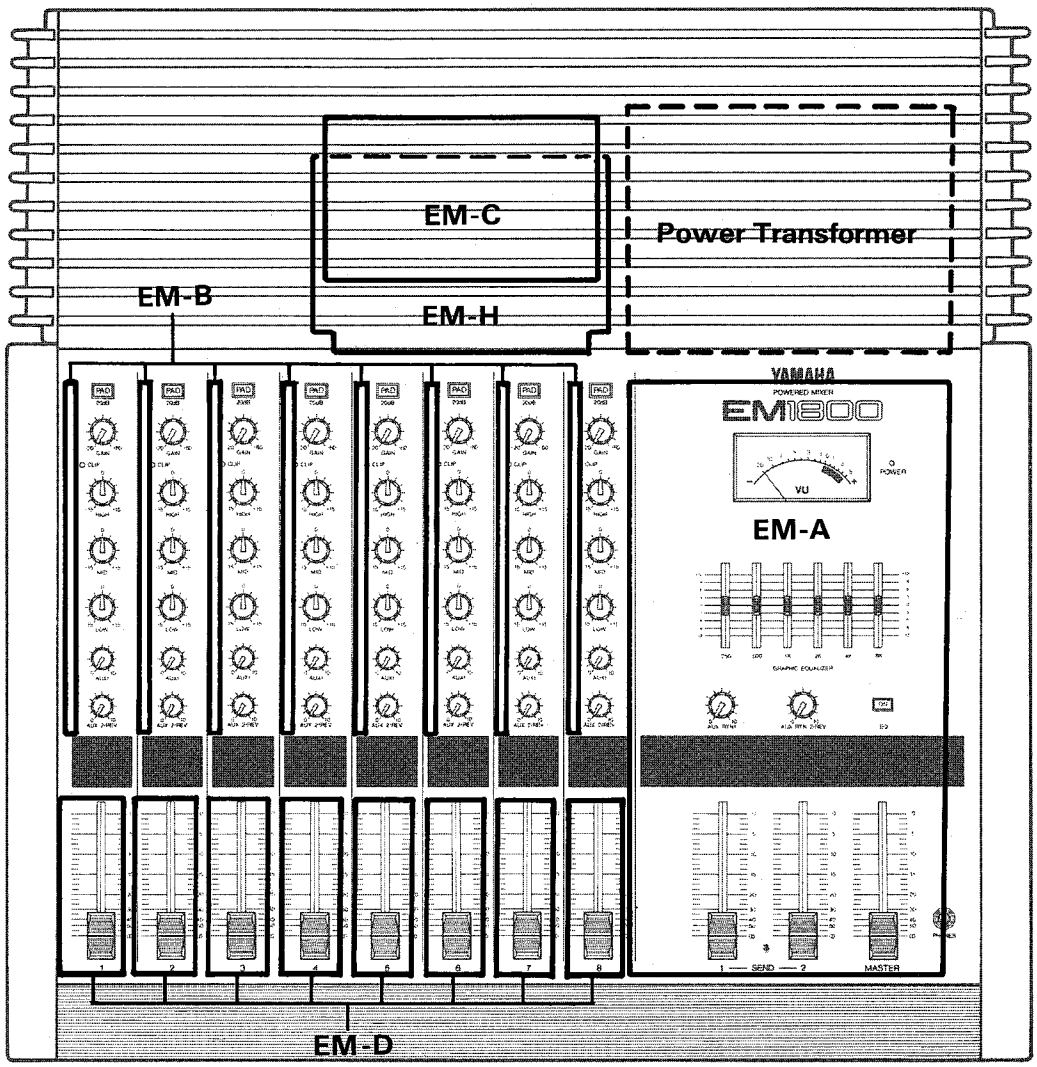
● Rear Panel



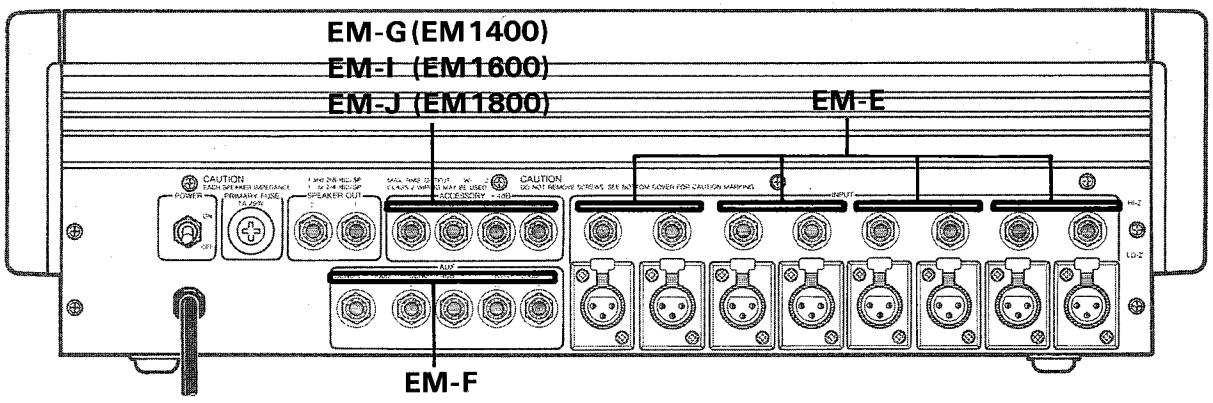
⑭ Power Switch
⑮ HI-Z and LO-Z Input Connectors
⑯ AUX SEND 1 & AUX SEND 2 Jacks
⑰ AUX RTN 1 & AUX RTN 2 Jacks
⑱ LINE OUT Jack
⑲ GEQ IN & GEQ OUT Jacks
⑳ POWER AMP IN Jack
㉑ SPEAKER OUT 1 and 2 Jacks

■ CIRCUIT BOARD LAYOUT

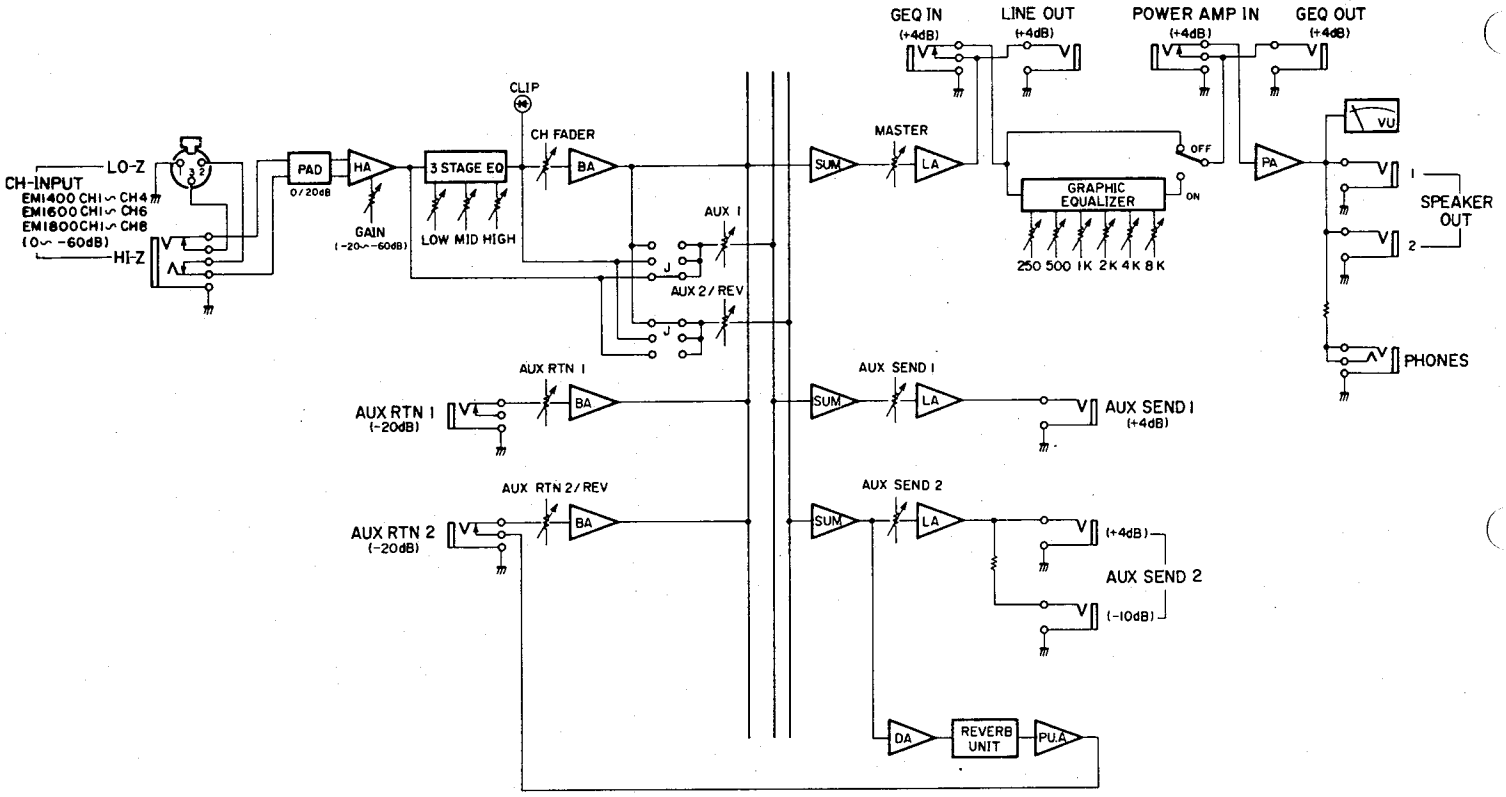
● Front Panel

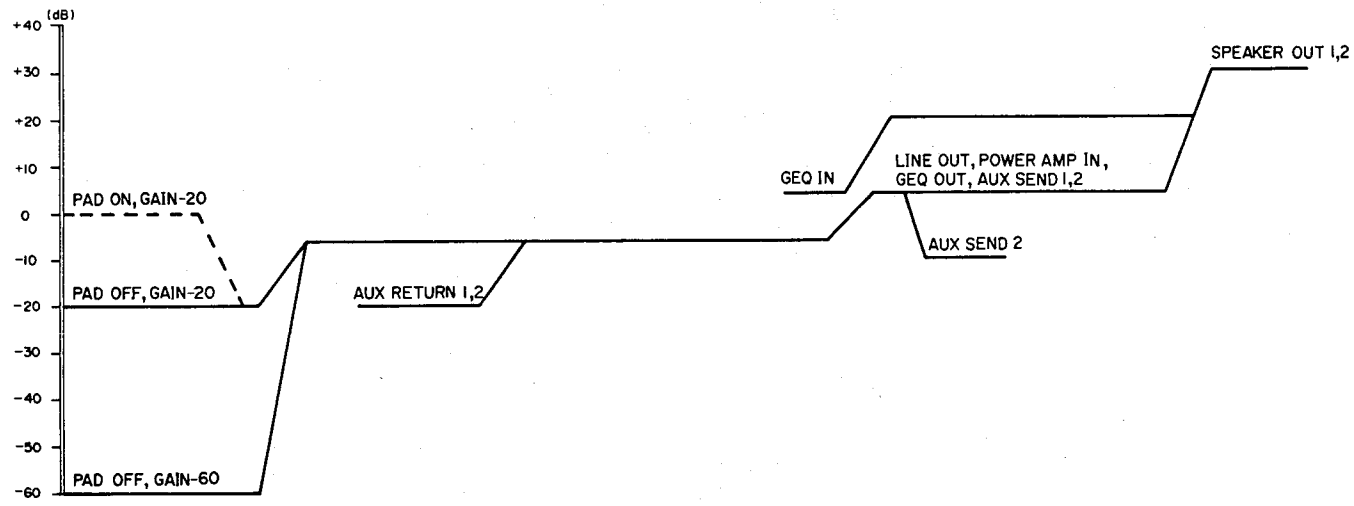


● Rear Panel



■ BLOCK & LEVEL DIAGRAM

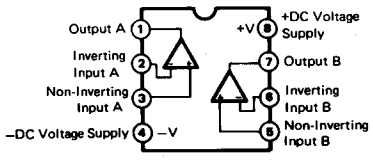




■ IC BLOCK DIAGRAM

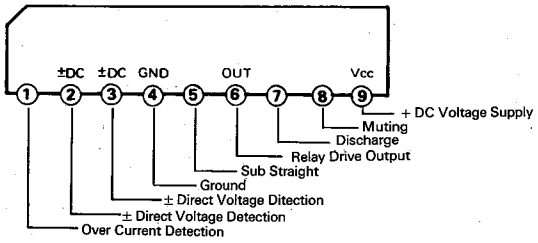
- **NJM4558DV** (IG001390)
- **NJM4556DE** (XA772001)

Dual Operational Amplifier



- **TA7317** (IG034800)

Relay Driver



■ CIRCUIT BOARDS & WIRING

Notes)

※ Circuit Board

EM-A (V0) (NX804090) MASTER
EM-B (V0) (NX804100) CHANNEL PATCH
EM-C (V0) (NX804110) POWER IC
EM-D (HB) (NX804120) LEVEL VR
EM-E (HB) (NX804130) CH JACK
EM-F (HB) (NX804140) OUT JACK
EM-G (HB) (NX804150) RTN JACK (EM1400)
EM-H (V0) (NX804160) POWER SUPPLY
EM-I (HB) (NX804190) RTN JACK (EM1600)
EM-J (HB) (NX804200) RTN JACK (EM1800)

1. IC
   - IC 101: NJM7815A (IG147400) 1A + 15V I0:1.5
   - IC 102: NJM7915A (IG147500) 1A − 15V I0:1.5
   - IC 201, 202, 501 ~ 505: NJM4558DV (IG001390) OP AMP.
   - IC 301: STK4048XI (IX803040)
   - IC 302: TA7317P (IG034800) Relay Driver
   - IC 506: NJM4556DE (XA772001) OP AMP.
   - IC 601: M5229P (IX803030)

2. Transistor
   - Q 201, 202: 2SA970-BL (IA097010)
   - Q 203: 2SC1313 (IX802930)
   - Q 204: 2SA726 (IX802920)
   - Q 301, 501: 2SC3421-Y (IX803090)
   - Q 302, 502: 2SA1358 (IX603580)

3. Diode
   - D 101 ~ 105: 1N4001 (IX803100)
   - D 301 ~ 304, 501, 502: 1N4148 (IX803110)
   - D 503, 504: 1N60P (IF000620)

4. Zener Diode
   - D 305: 47V 1W (IX803120)

5. Diode Bridge
   - B 1: 2W06 (IX802960)
   - B 2 ~ 4: KBU8D (IX803140)

6. LED
   - 103HD (IX802980) CLIP
   - SE-5013DH (IX803150) POWER

7. Variable Resistor
   - VR 201: N15KC-05C10K (HX801960) GAIN
   - VR 202, 203: N15KC-15A25K (HX801980) AUX1, AUX2/REV
   - VR 205 ~ 207: N15KC-B50K C.C. (HX801970) LOW, HIGH, MID
   - VR 501, 502: N15KC-15A20K (HX802160) AUX RTN1, 2

8. Slide Pot
   - VR 204, 503 ~ 505: RS60Y11G4023-PJ (HX802030) 10KA × 1 SEND1, 2, MASTER
   - VR 601 ~ 606: S3013K6105- (HX802170) 50KW × 1 G.EQUALIZER

9. Trimmer Pot
   - VR 506: 5KB 3P (HX802180)

10. Coil
    - L 301: 1μH (GX801200)

11. Switch
    - SW1: P-2021 L/B (KX800830) POWER
    - SW3: KPB121-SNA (KX800840) EQ
    - SW201: KPB122-SSAL (KX800730) PAN 6P

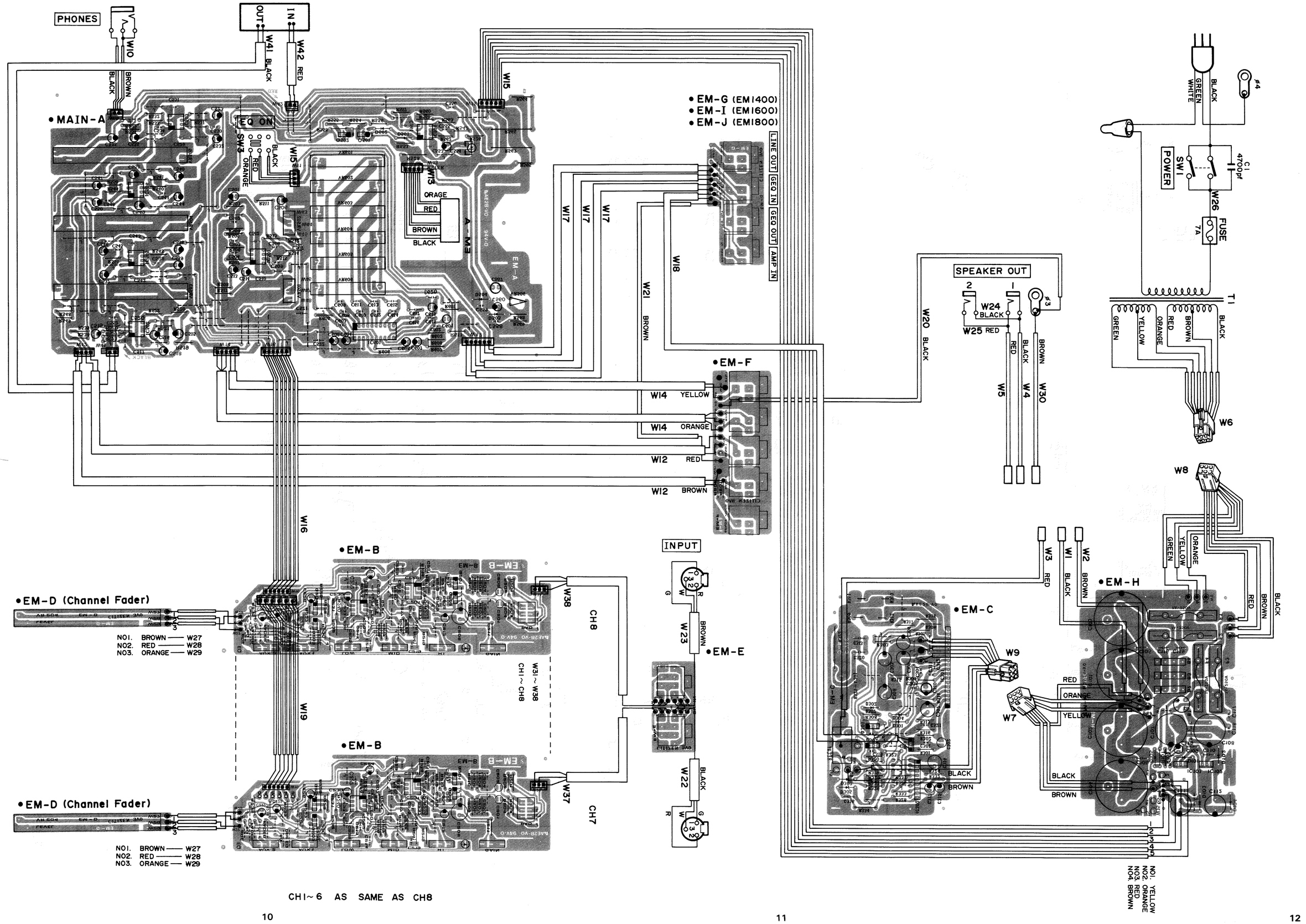
12. Relay
    - JY1J-DC48V (KX800880)

13. Fuse
    - F1, F2: 7A
    - F3, F4: 1A
    - F5: 7A (J, U, C)
      4A (E)

14. Jack
    - J 1 ~ 6, J 10 ~ 12: MIC Jack (AUX, LINE, EQ, AMP IN/OUT)
    - J 7 ~ 9: PHONE Jack (SP. OUT, PHONES)
    - J 201: XLR Connector (INPUT)
    - J 202: MIC Jack (INPUT)

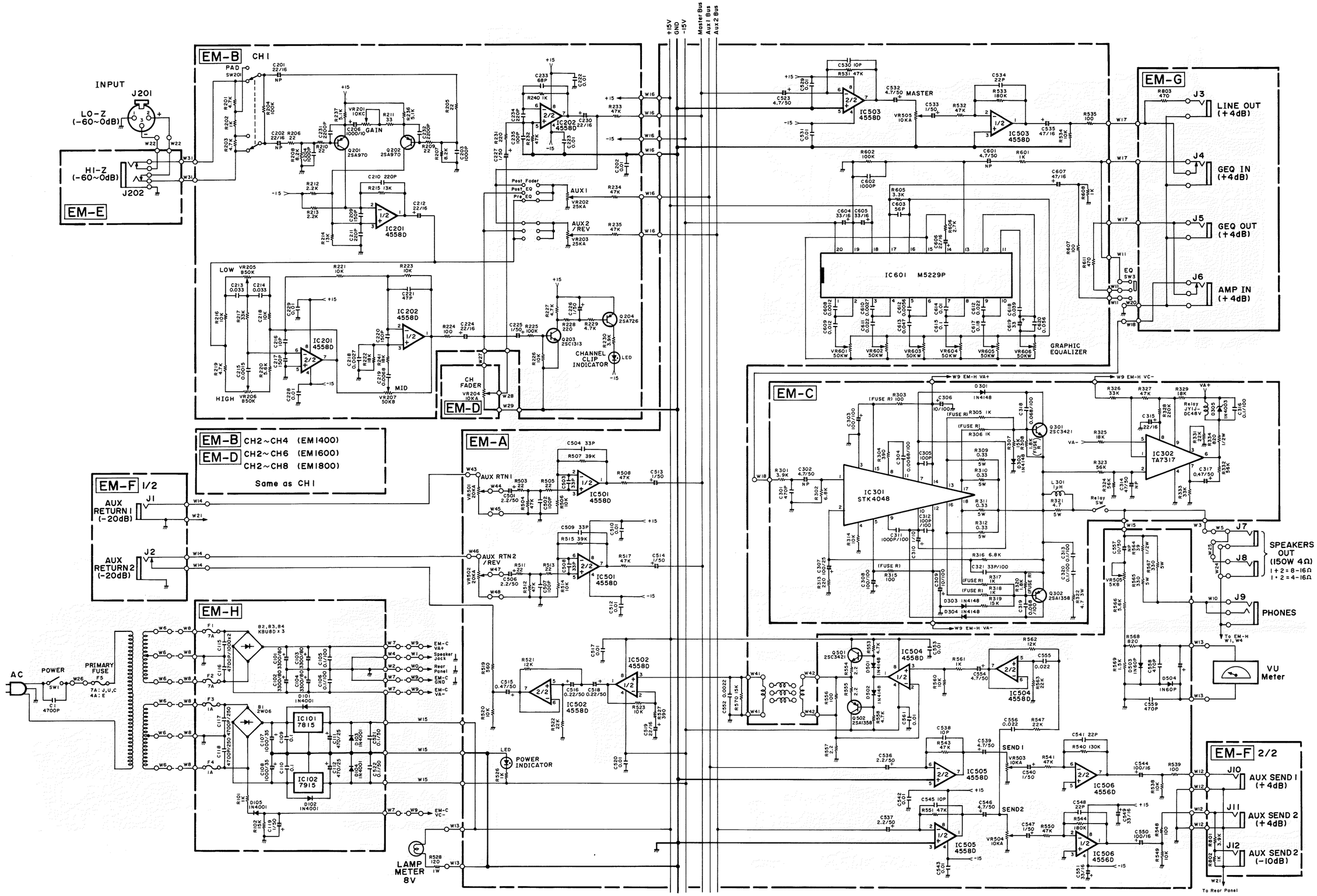
■CIRCUIT BOARDS & WIRING

EM1400/EM1600/EM1800



10 11 12

■OVERALL CIRCUIT DIAGRAM



EM1400/EM1600/EM1800