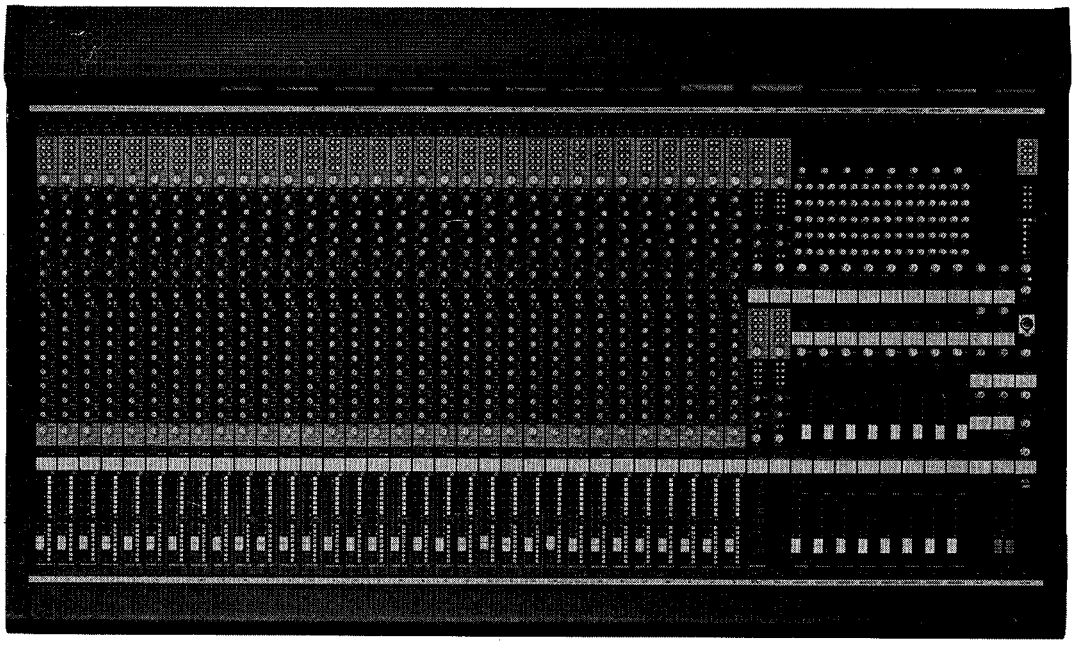
MIXING CONSOLE

PM3000/PW3000

SERVICE MANUAL



PM3000-32

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SINCE 1887 YAMAHA
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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 capabilities, or establish a principle-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.

CONTENTS

SECTION 1

Specifications

1.1 GENERAL SPECIFICATIONS

Total Harmonic Distortion
Less than 0.1%, 20 Hz–20 kHz, at +14 dBm output into 600 ohms.

Frequency Response
+1, −3 dB, 20 Hz–20 kHz, at +4 dBm output into 600 ohms.

Hum & Noise
(20 Hz–20 kHz, R_S = 150 ohms, Input Gain @ maximum, Input Pad @ 20 dB, except as noted)

−128 dBm equivalent input noise.

−95 dBu residual output noise (balanced outputs).

−88 dBu (92 dB S/N) at GROUP OUT with Master fader at nominal level and all channel assign switches off.

−74 dBu (78 dB S/N) at GROUP OUT with Master fader and one channel fader at nominal level, and channel assigned to the group bus.

−54 dBu (48 dB S/N) at GROUP OUT with Master fader and one channel fader at nominal level, and channel assigned to the group bus, WITH INPUT SENSITIVITY AT MAXIMUM AND PAD AT 0 dB.

−88 dBu (92 dB S/N) at STEREO OUT with Stereo Master fader at nominal level and all channel assign switches off.

−74 dBu (78 dB S/N) at STEREO OUT with Stereo Master fader and one channel fader at nominal level.

−90 dBu (94 dB S/N) at MTRX OUT with MTRX Master and all matrix mix controls at maximum level, all GROUP-TO-MTRX switches off.

−74 dBu (78 dB S/N) at MTRX OUT with MTRX Master and one Matrix Mix control at maximum level, one channel fader at nominal level (assigned to a group that is assigned to that matrix control).

−75 dBu (79 dB S/N) at AUX OUT with Aux Master level control at nominal, all channel AUX mix controls at minimum level.

−73 dBu (77 dB S/N) at AUX OUT with Aux Master level and one channel AUX mix control at nominal level.

Maximum Voltage Gain

94 dB	CH IN to GROUP OUT
94 dB	CH IN to STEREO OUT
94 dB	CH IN to MTRX OUT
104 dB	CH IN to AUX OUT
94 dB	CH IN to CUE OUT
20 dB	AUX RTN to GROUP OUT
10 dB	SUB IN to GROUP OUT
10 dB	SUB IN to STEREO OUT
10 dB	SUB IN to AUX OUT
0 dB	SUB IN to MTRX OUT

Input Channel Gain Control
34 dB variation in gain stop-to-stop.

Input Channel Pad Switch
0, 10, 20, 30 or 40 dB of attenuation.

Input Channel Equalization
15 dB maximum boost or cut in the each of four bands.
HIGH: 1.6 kHz ~ 16 kHz (peaking or shelving).
HI-MID: 800 Hz ~ 8 kHz (peaking, variable Q from about 0.5 to 3.0).
LO-MID: 160 Hz ~ 1.6 kHz (peaking, variable Q from about 0.5 to 3.0).
LOW: 40 Hz ~ 400 Hz (peakng or shelving)

Input Channel High Pass Filter
12 dB/octave roll off below 20 Hz to 400 Hz (adjustable −3 dB point).

AUX RTN Equalization
15 dB maximum boost or cut, shelving curve, in two bands.
HIGH: 1 kHz ~ 10 kHz.
LOW: 100 Hz ~ 1 kHz.

Crosstalk
−60 dB at 1 kHz, adjacent input channels.
−60 dB at 1 kHz, input to output.

Oscillator/Noise Generator
Switchable sine wave at 100 Hz, 1 kHz, or 10 kHz (less than 0.1% T.H.D. at +4 dBu output level), or pink noise.

VU Meters (0 VU = +4 dBu, or 1.23 V RMS output level)
STEREO L & R: 2 large, illuminated meters. 12 smaller, illuminated meters, each switchable to monitor multiple circuits:

Meters 1–8	GROUP OUT/GROUP>MTRX/MTRX
Meter 9	AUX1/AUX5/CUE L
Meter 10	AUX2/AUX6/CUE R
Meter 11	AUX3/AUX7/OSC
Meter 12	AUX4/AUX8

Peak Indicators
LED (red) built into each VU meter turns on when post-Master fader level reaches 10 dB below clipping.

Signal/Clip Indicators
3 LEDs built into each input module monitor levels in the module: SIGNAL (green) turns on when pre-EQ signal is 10 dB below nominal level. CLIP (red) turns on when pre-EQ signal is 3 dB below clipping. EQ CLIP (red) turns on when post-EQ level is 3 dB below clipping.

Phantom Power
48 V DC is applied to electronically balanced inputs or optional transformer-isolated inputs (via 6.8 kohm current limiting/isolation resistors) for powering condenser microphones. May be turned on or off via rear-panel phantom master switch; when on, individual channels may be turned off via +48 V switch on each input module.

Options
IT3000 Input Transformers; may be installed in individual input modules. Changes actual input impedance from 3K ohms to 1k ohm.

OT3000 Output Transformer Set; a rack-mountable, external chassis containing 8 output transformers, with male and female XLR connectors on the front panel. Occupies 2 rack spaces (3½" or 88 mm) in a 19 inch (480 mm) wide rack; 3½" (88 mm) depth. May be used to isolate any PM3000 XLR outputs.

Power Requirements
Requires Yamaha PW3000 power supply; see specifications for that unit.

Console Dimensions

HEIGHT	12-1/8 inches (309 mm)
DEPTH	37-3/4 inches (960 mm)
WIDTH:	24 channel, 53-3/4 inches (1367 mm)
	32 channel, 64-5/8 inches (1643 mm)
	40 channel, 75-1/2 inches (1919 mm)

Net Weight (excluding power supply)

24 CH	32 CH	40 CH
201 lbs	247 lbs	302 lbs
91 kg	112 kg	137 kg

NOTE: Specifications are subject to change without notice or obligation.

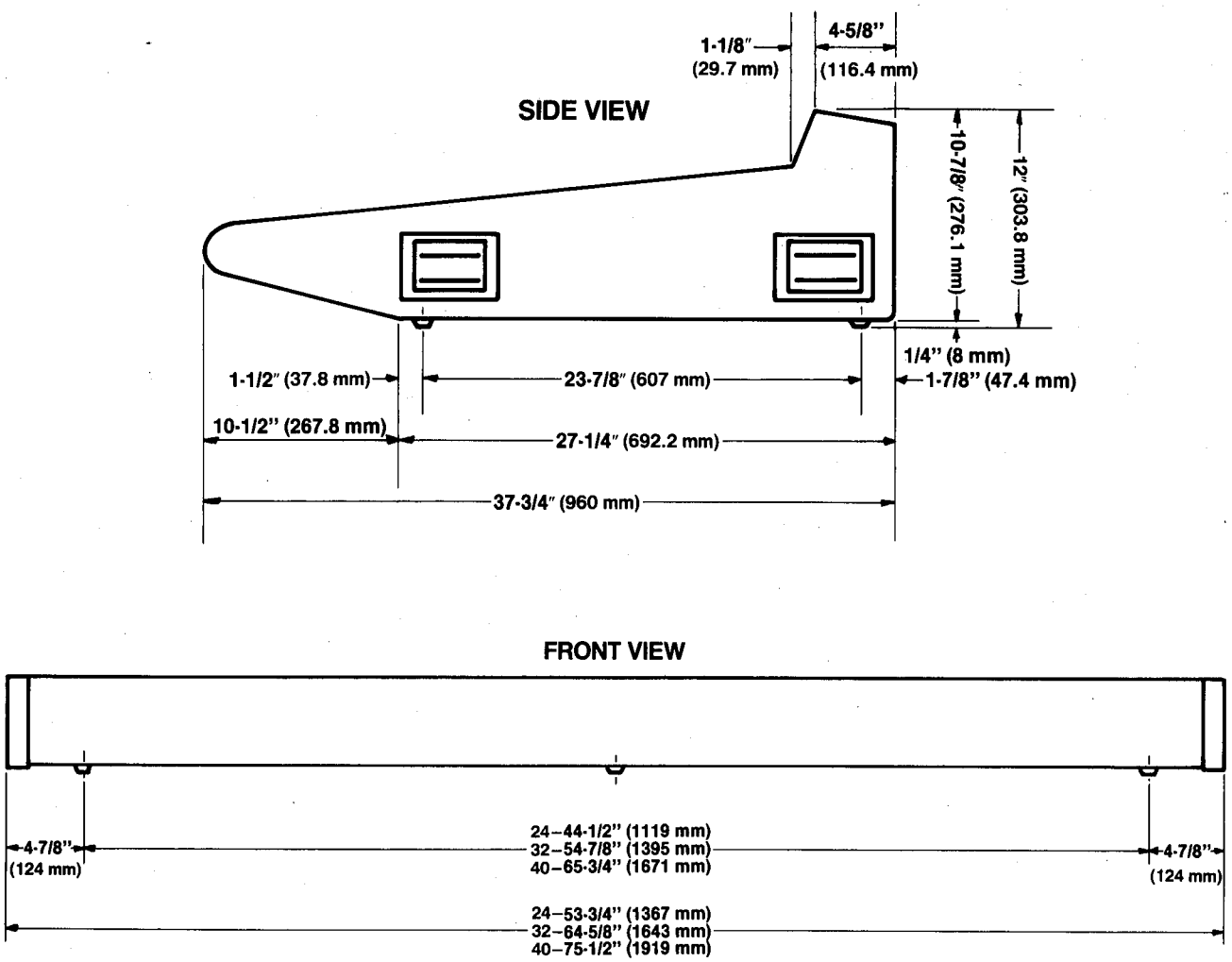


FIGURE 1-1 PM3000 DIMENSIONS

1.2 POWER SUPPLY (PW3000) SPECIFICATIONS

Dimensions:

HEIGHT 6-7/8 inches (176 mm) (excluding rubber feet; add 3/8" for feet).

DEPTH Overall, 18 inches (457 mm); Behind panel, 16-1/2 inches (418 mm).

WIDTH 18-7/8 inches (480 mm); for standard rack mounting.

Fuses

Primary fuses for each of 3 transformers, 250 Watts, 6 amperes, slo-blow.

Additionally, the DC supplies each have secondary fuses as follows:

+ 20 volt supply: 10 A, 250 V slo-blow
− 20 volt supply: 10 A, 250 V slo-blow
+ 12 volt supply: 10 A, 250 V slo-blow
+ 48 volt supply: 2 A, 250 V slo-blow

Outputs

+ 20 VDC @ 8 Amps
− 20 VDC @ 8 Amps
Ground (common) for 20 V
+ 12 VDC @ 6.1 Amps
+ 48 VDC @ 0.3 Amps
Ground (common) for 12 V
Chassis ground
Detector A & B

AC Requirements

U.S.A./Canada models: 105 to 130 V, 50/60 Hz.
General Export models: 220 or 240 V, ± 10%, 50/60 Hz.

Umbilical Cables

Two multi-conductor cables with locking, multi-pin connectors convey power to the PM3000 console. Each cable is approximately 10 feet (3.6 meters) long. Protected against inadvertent A/B misconnection.

Cooling

Internal fan, pulls air through foam grille on front panel, exhausts via top and side vents.

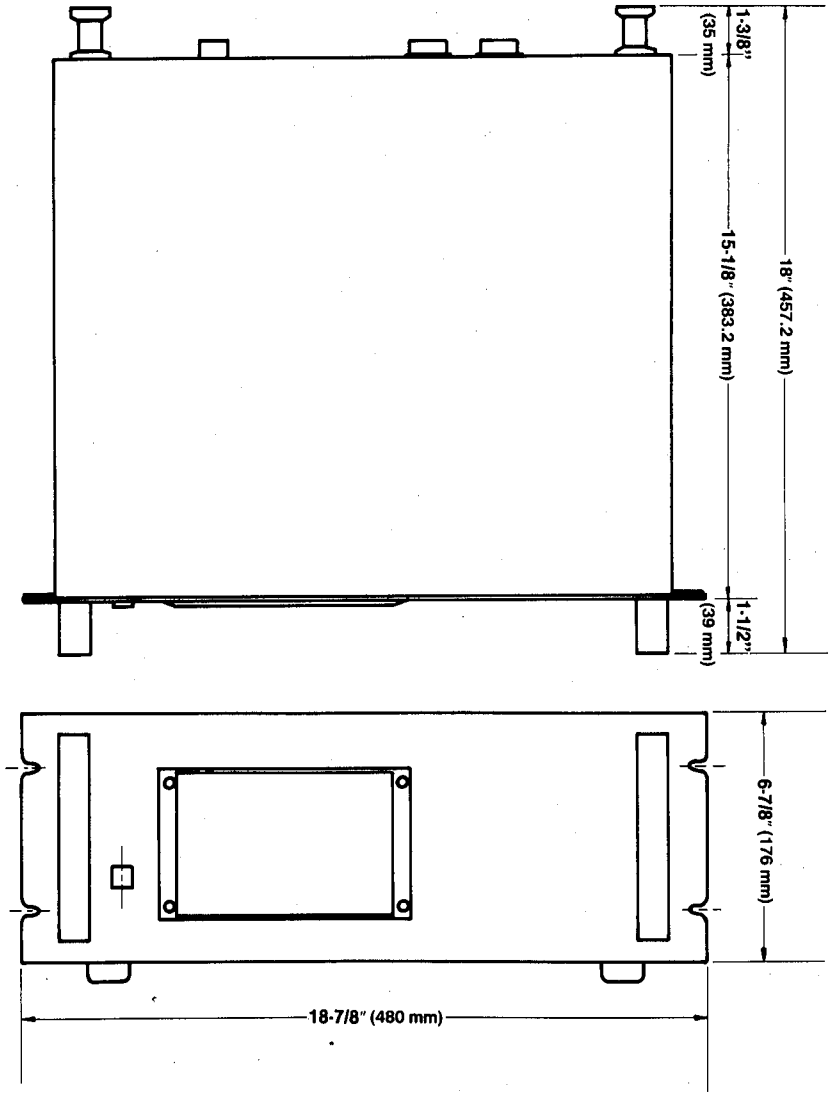


FIGURE 1-2 PW3000 DIMENSIONS

1.3 INPUT CHARACTERISTICS

CONNECTION	PAD	GAIN TRIM	ACTUAL LOAD IMPEDANCE	FOR USE WITH NOMINAL	INPUT LEVEL			CONNECTOR IN CONSOLE
					SENSITIVITY	NOMINAL	MAX BEFORE CLIP	
CH INPUT, 1–24;	0	–70	3K ohms if electronic balanced; 1K ohms if transformer balanced	50 ohm to 200 ohm mics and 600 ohm lines	–90 dBu (0.025 mV)	–70 dBu (0.25 mV)	–40 dBu (7.75 mV)	XLR-3-31
1–32	0	–36			–56 dBu (1.23 mV)	–36 dBu (12.3 mV)	–16 dBu (123 mV)	
or 1–40	10	–36			–46 dBu (3.88 mV)	–26 dBu (38.8 mV)	–6 dBu (388 mV)	
	20	–36			–36 dBu (12.3 mV)	–16 dBu (123 mV)	+4 dBu (1.23 V)	
	30	–36			–26 dBu (38.8 mV)	–6 dBu (388 mV)	+14 dBu (3.88 V)	
	40	–36			–16 dBu (123 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	
AUX RETURN, 1–4 (stereo)			10K ohms	600 ohm lines	–16 dBu (123 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
PGM SUB IN, 1–8			10K ohms	600 ohm lines	–6 dBu (388 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
STEREO SUB IN, L–R			10K ohms	600 ohm lines	–6 dBu (388 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
AUX SUB IN, 1–8			10K ohms	600 ohm lines	–6 dBu (388 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
MTRX SUB IN, 1–8			10K ohms	600 ohm lines	+4 dBu (1.23 V)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
TALKBACK IN	–50		3K ohms	50–250 ohm mics	–70 dBu (0.25 mV)	–50 dBu (2.45 mV)	–30 dBu (24.5 mV)	XLR-3-31
	+4		3K ohms	600 ohm lines	–16 dBu (123 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
COMM IN	–50		3K ohms	50–250 ohm mics	–70 dBu (0.25 mV)	–50 dBu (2.45 mV)	–30 dBu (24.5 mV)	XLR-3-31
	+4		3K ohms	600 ohm lines	–16 dBu (123 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-31
CH INSERT IN, 1–24, 1–32, or 1–40			10K ohms	600 ohm lines	–16 dBu (123 mV)	+4 dBu (1.23 V)	+24 dBu (12.3 V)	Phone Jack (¼" TRS)
INSERT IN: PGM, 1–8 STEREO, L–R AUX, 1–8			10K ohms	600 ohm lines	–16 dBu (123 mV)	–6 dBu (388 mV)	+24 dBu (12.3 V)	Phone Jack (¼"TRS)

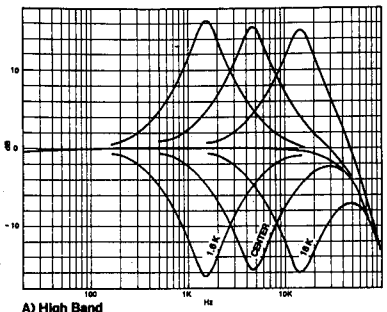
NOTES: (1) Sensitivity is the lowest level that will produce an output of +4 dBu (1.23V), or the nominal output level, when the circuit is set to maximum gain.
(2) All XLR connectors are electronically balanced. Phone jacks are balanced with Tip = signal high (+), Ring = signal low (–), and Sleeve = ground.
(3) 0 dBu is referenced to 0.775 V RMS. Where the circuit is capable of 600 ohm termination, this would be equivalent to 0 dBm.

1.4 OUTPUT CHARACTERISTICS

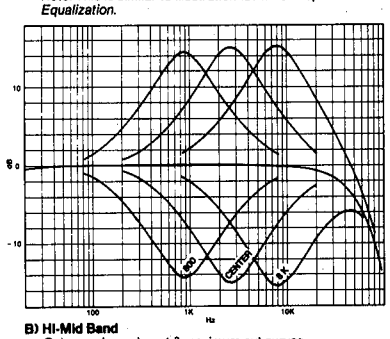
CONNECTION	ACTUAL SOURCE IMPEDANCE	FOR USE WITH NOMINAL	OUTPUT LEVEL		CONNECTOR IN CONSOLE
			NOMINAL	MAX. BEFORE CLIP	
GROUP OUT, 1–8	150 ohms	600 ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-32
STEREO OUT, L–R	150 ohms	600 ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-32
MATRIX OUT, 1–8	150 ohms	600 ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-32
AUX OUT, 1–8	150 ohms	600 ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-32
CUE OUT, L–R	150 ohms	600 ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-32
TALKBACK OUT,	150 ohms	600 ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	XLR-3-32
CH INSERT OUT (1–24, 1–32 or 1–40)	600 ohms	10K ohm lines	+4 dBu (1.23 V)	+24 dBu (12.3 V)	Phone Jack (¼" TRS)
OSCILLATOR OUT			+4 dBu (1.23 V)		XLR-3-32
AUX. INSERT OUT, 1–8	600 ohms	10K ohm lines	–6 dBu (388 mV)	+24 dBu (12.3 V)	Phone Jack (¼" TRS)
GROUP INSERT OUT, 1–8	600 ohms	10K ohm lines	–6 dBu (388 mV)	+24 dBu (12.3 V)	
STEREO INSERT OUT, L–R	600 ohms	10K ohm lines	–6 dBu (388 mV)	+24 dBu (12.3 V)	
PHONES OUT, 1–2	15 ohms	8 ohm phones	75 mW	150 mW	Phone Jack (¼" TRS)
		40 ohm phones	65 mW	130 mW	

NOTES: (1) All XLR connectors are electronically balanced. Phone jacks are unbalanced, with Tip = signal, Ring = common, Sleeve = ground. PHONES out phone jacks are wired standard stereo with Tip = Left, Ring = Right, Sleeve = ground.
(2) 0 dBu is referenced to 0.775 V RMS. Where the circuit is capable of 600 ohm termination, this would be equivalent to 0 dBm.

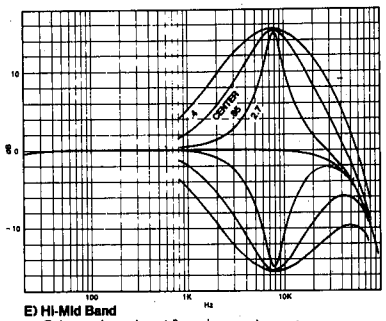
1.5 PERFORMANCE GRAPHS



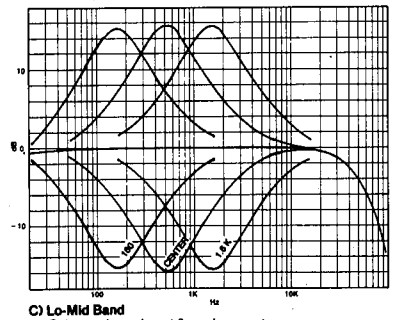
A) High Band
Peaking/Shelving: peaking
Gain: maximum boost & maximum cut curves
Frequency: swept from minimum (1.6 kHz), through center (approx. 4.6 kHz), to maximum (16 kHz)
Q: Non-Adjustable (fixed at 1.5)
Note: This is similar to illustration (D) which depicts Low Band Equalization.



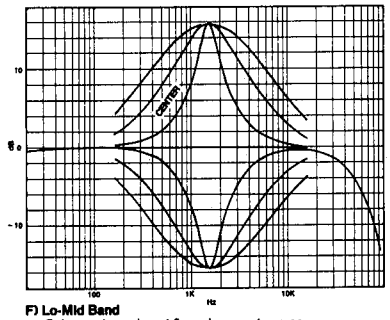
B) HI-Mid Band
Gain: maximum boost & maximum cut curves
Frequency: swept from minimum (800 Hz), through center (approx. 2.6 kHz), to maximum (8 kHz)
Q: centered (approx. 1.2)
Note: This is similar to illustration (C) which depicts Lo-Mid Band Equalization.



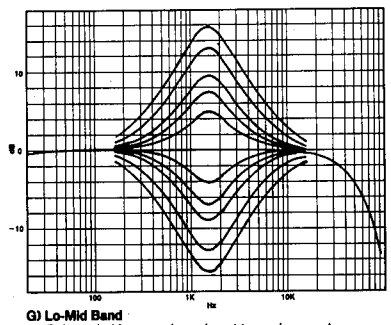
E) HI-Mid Band
Gain: maximum boost & maximum cut curves
Frequency: set at 8 kHz
Q: swept from minimum (approx. 0.5), through center (approx. 1.2), to maximum (approx. 3)
Note: The middle curves here (Q = 0.85) are the same as the right-most curves in illustration (B).



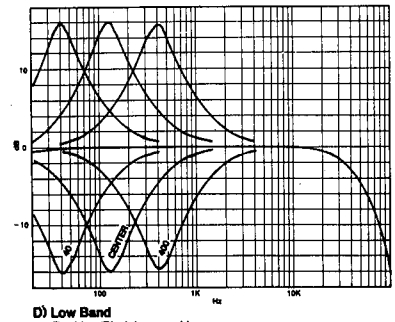
C) Lo-Mid Band
Gain: maximum boost & maximum cut curves
Frequency: swept from minimum (160 Hz), through center (approx. 500 Hz), to maximum (1.6 kHz)
Q: centered (approx. 1.2)



F) Lo-Mid Band
Gain: maximum boost & maximum cut curves
Frequency: set at 1.6 kHz
Q: swept from minimum (approx. 0.5), through center (approx. 1.2), to maximum (approx. 3)
Note: The middle curves here (Q 1.2) are the same as the right-most curves in illustration (C).



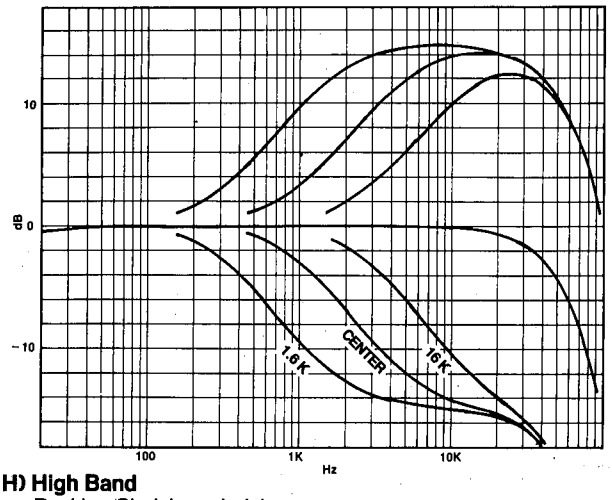
G) Lo-Mid Band
Gain: varied from maximum boost to maximum cut
Frequency: set at 1.6 kHz
Q: centered (approx. 1.2)
Note: The outer curves here (maximum boost and cut) are the same as the middle curves (Q centered) in illustration (F).



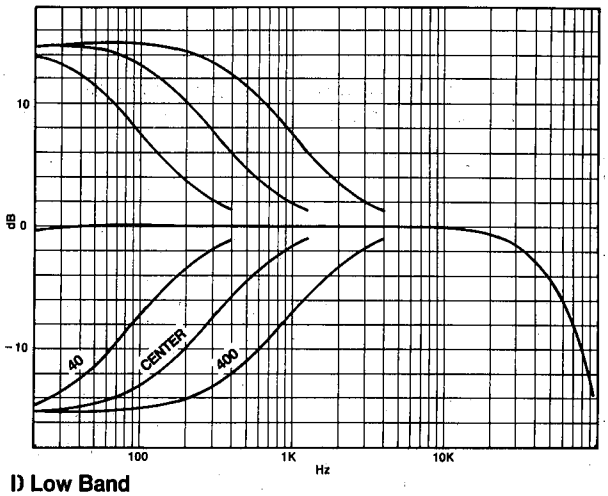
D) Low Band
Peaking/Shelving: peaking
Gain: maximum boost & maximum cut curves
Frequency: swept from minimum (40 Hz), through center (approx. 125 Hz), to maximum (400 Hz)
Q: Non-Adjustable (fixed at 1.5)

FIGURE 1-3 INPUT CHANNEL EQUALIZER CHARACTERISTICS

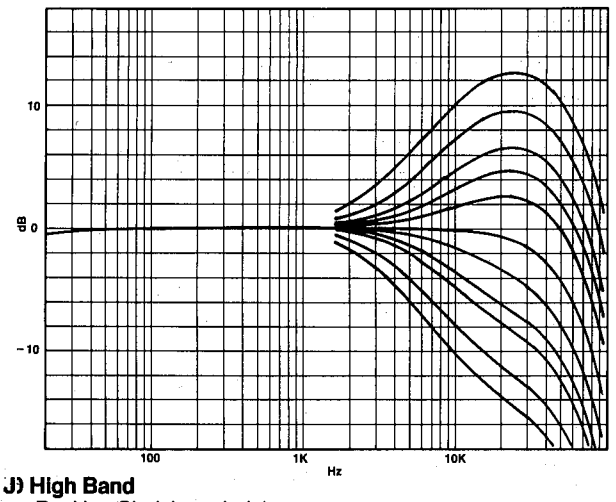
FIGURE 1-3 INPUT CHANNEL EQUALIZER CHARACTERISTICS (continued)



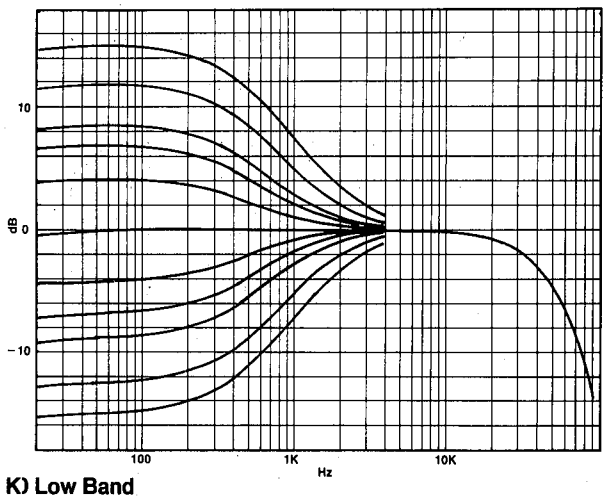
H) High Band
Peaking/Shelving: shelving
Gain: maximum boost & maximum cut curves
Frequency: swept from minimum (1.6 kHz), through center (approx. 4.6 kHz), to maximum (16 kHz)
Q: Non-Adjustable (fixed at 1.5)
Note: This is similar to illustration (I) which depicts Low Band qualization.



I) Low Band
Peaking/Shelving: shelving
Gain: maximum boost & maximum cut curves
Frequency: swept from minimum (40 Hz), through center approx. 125 Hz), to maximum (400 Hz)
Q: Non-Adjustable (fixed at 1.50)



J) High Band
Peaking/Shelving: shelving
Gain: varied from maximum boost to maximum cut
Frequency: set at 1.6 kHz
Q: Non-Adjustable (fixed at 1.5)
Note: The outer curves here (maximum boost and cut) are the same as the right-most curves (1.6 kHz) in illustration (H).



K) Low Band
Peaking/Shelving: shelving
Gain: varied from maximum boost to maximum cut
Frequency: set at 400 Hz
Q: Non-Adjustable (fixed at 1.5)
Note: The outer curves here (maximum boost and cut) are the same as the right-most curves (400 Hz) in illustration (I).

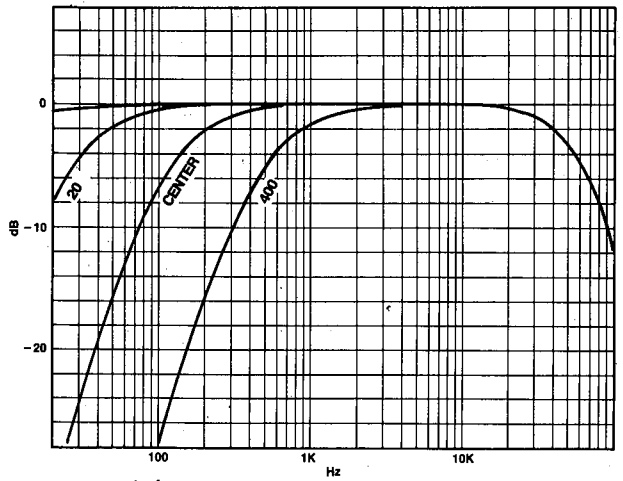


FIGURE 1-4 INPUT CHANNEL HIGH PASS FILTER CHARACTERISTICS

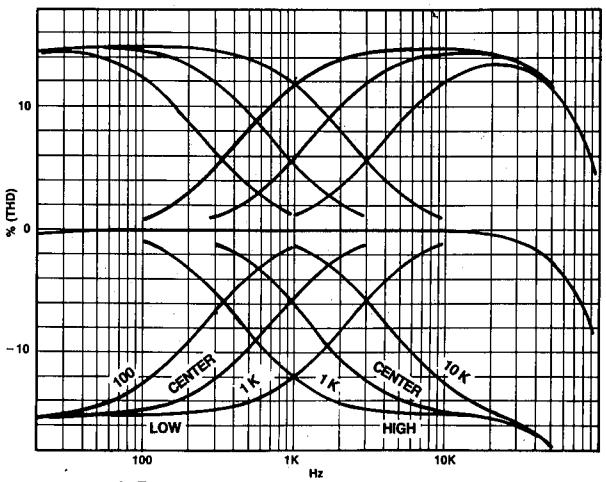


FIGURE 1-5 AUX RETURN EQUALIZER CHARACTERISTICS

1.5.1 Input Channel 1 to Group Output 1 Performance Graphs with Input Gain Control @ Max

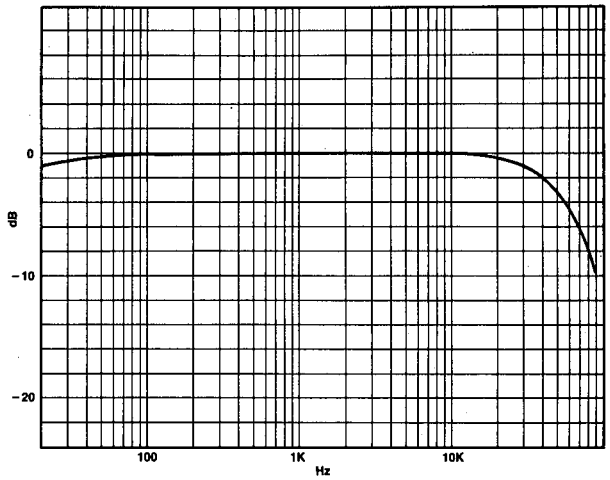
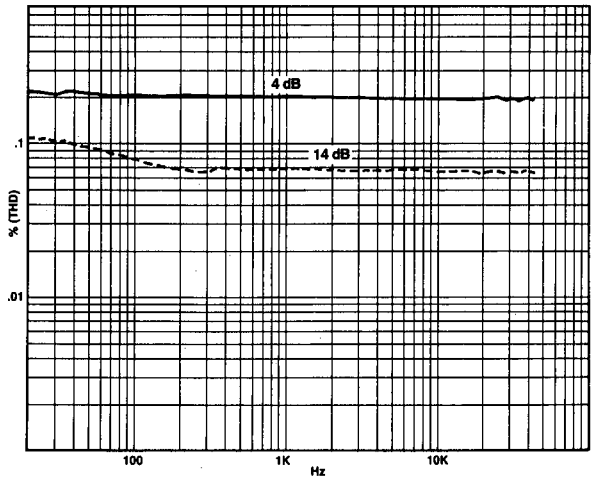
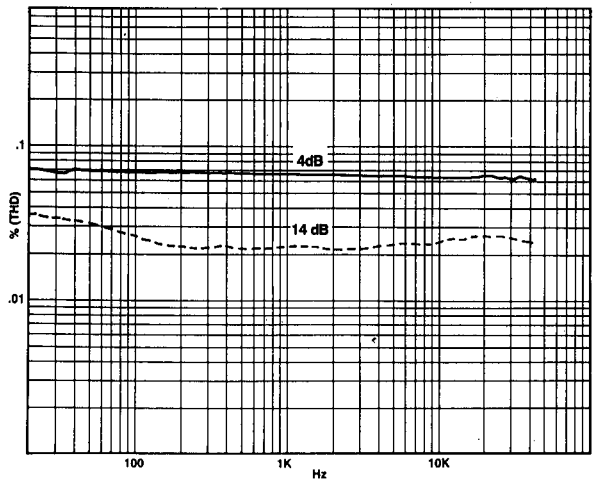


FIGURE 1-6 FREQUENCY RESPONSE
At +4 dBu output level, PAD at 0 dB.
(Curves would be identical with PAD at 10, 20, 30 or 40 dB).

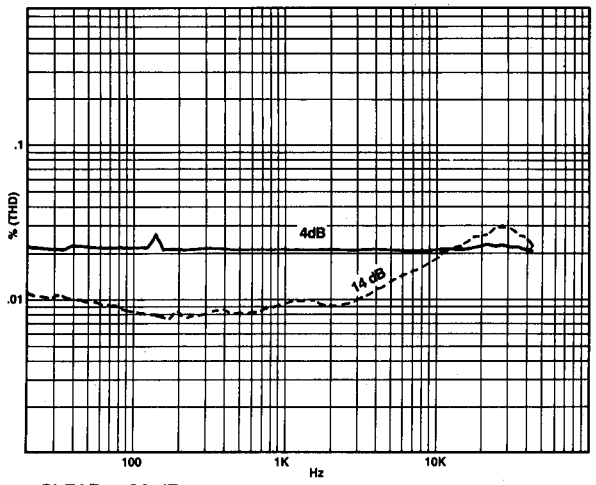
FIGURE 1-7 FREQUENCY vs. T.H.D. CURVES
At +4 dBu & +14 dBu output levels.



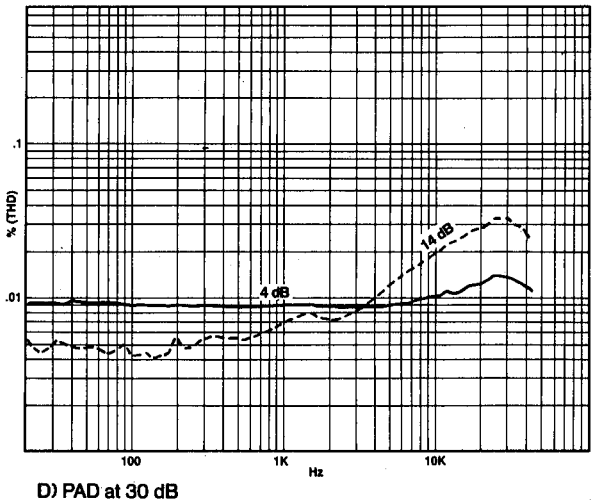
A) PAD at 0 dB



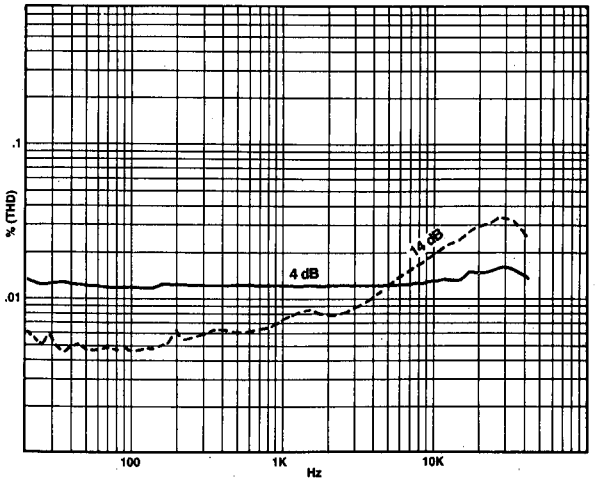
B) PAD at 10 dB



C) PAD at 20 dB

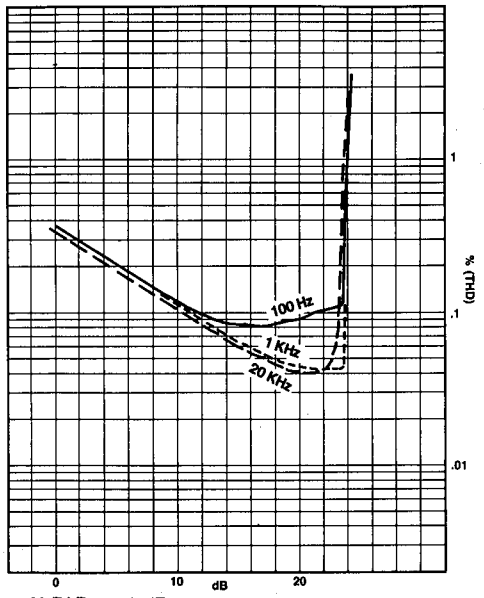


D) PAD at 30 dB

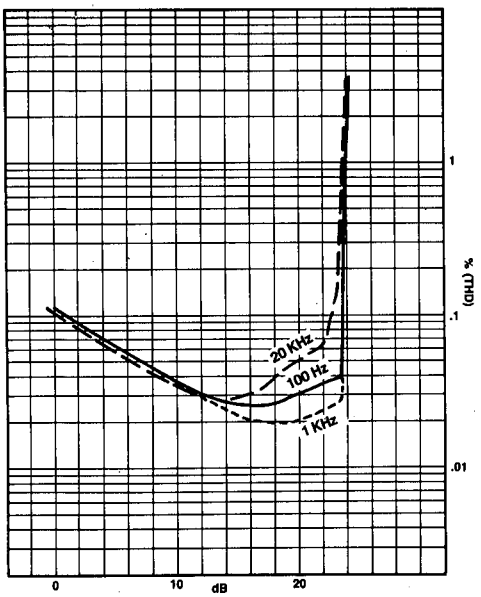


E) PAD at 40 dB

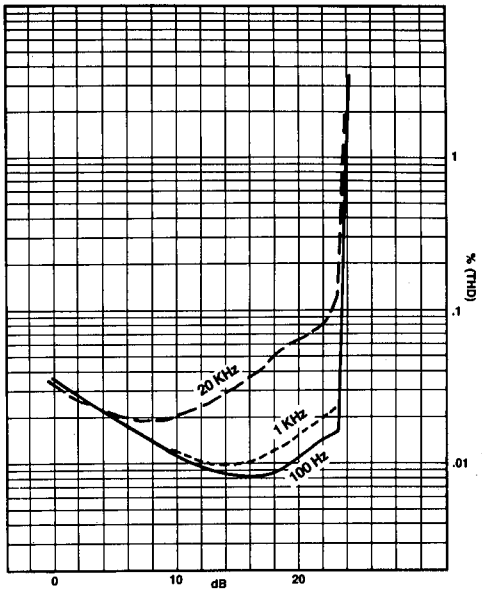
FIGURE 1-8 OUTPUT LEVEL vs T.H.D.
At 100 Hz, 1 kHz & 20 kHz.



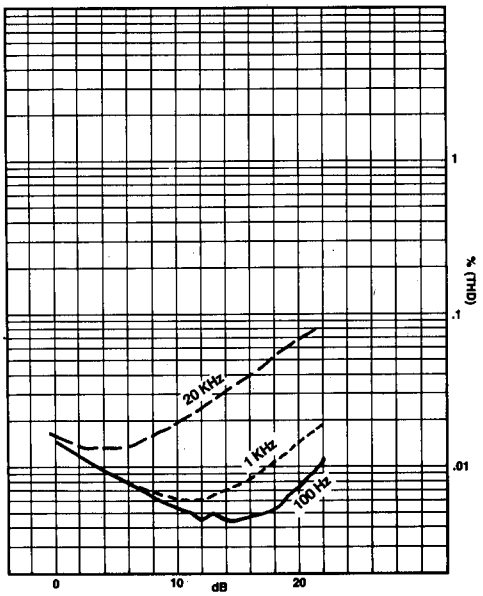
A) PAD at 0 dB



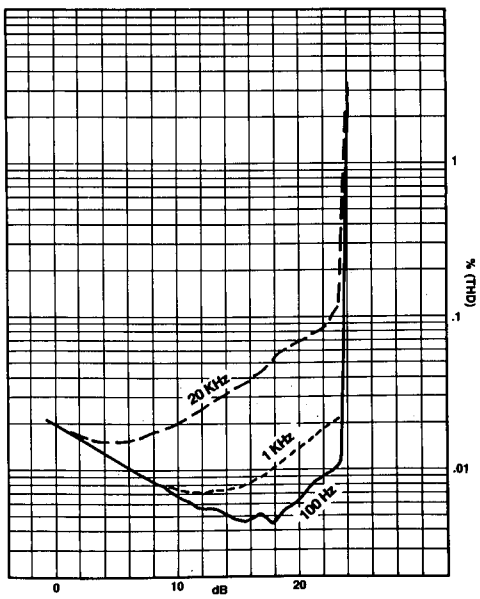
B) PAD at 10 dB



C) PAD at 20 dB



D) PAD at 30 dB



E) PAD at 40 dB

1.5.2 Input Channel 1 to Group Output 1 Performance Graphs with Input Gain Control @ Min

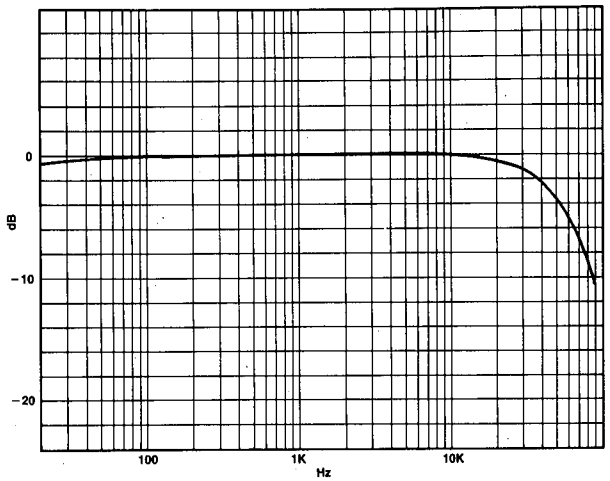


FIGURE 1-9 FREQUENCY RESPONSE
At +4 dBu output level. PAD at 40 dB.
(Curves would be identical with PAD at 0, 10, 20, or 30 dB).

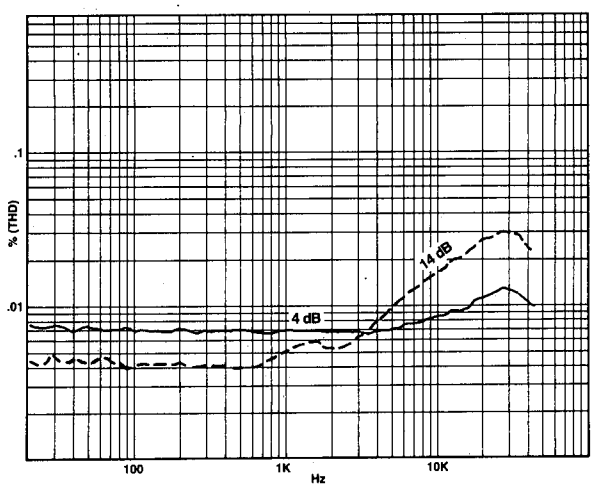


FIGURE 1-10 FREQUENCY vs. T.H.D. CURVES
At +4 dBu & +14 dBu output levels, PAD at 40 dB.
(Curves would be identical with PAD at 0, 10, 20, or 30 dB).

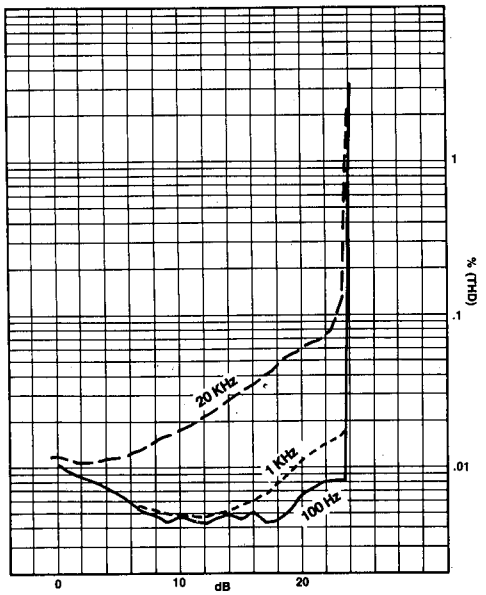


FIGURE 1-11 OUTPUT LEVEL vs T.H.D.
At 100 Hz, 1 kHz & 20 kHz, PAD at 40 dB.

1.5.3 Aux Return 4 (L) to Group Output 1 Performance Graphs

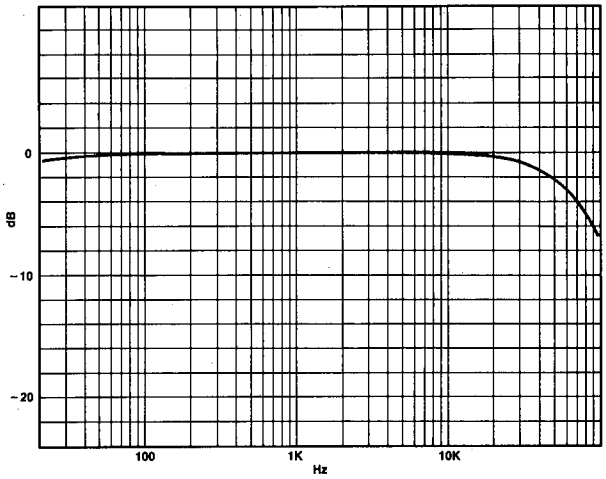


FIGURE 1-12 FREQUENCY RESPONSE
(At +4 dBu output level.)

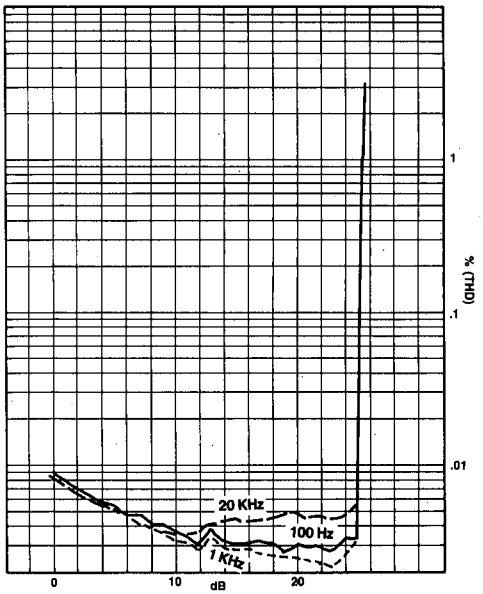


FIGURE 1-13 OUTPUT LEVEL vs T.H.D.
(At 100 Hz, 1 kHz & 20 kHz.)

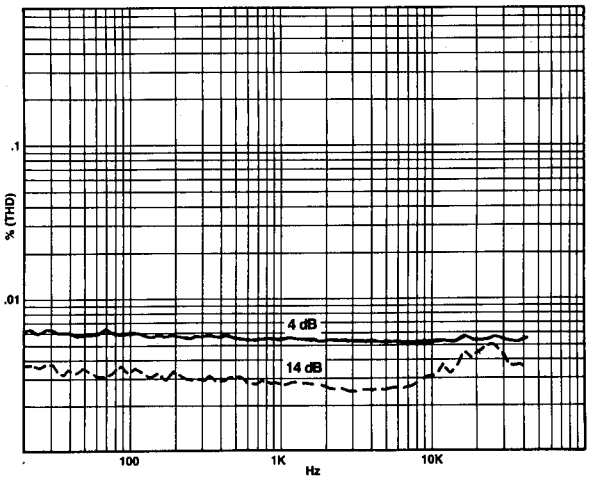


FIGURE 1-14 FREQUENCY vs. T.H.D. CURVES
(At +4 dBu & +14 dBu output levels.)

1.5.4 Channel 1 Input to Phones Output Performance Graphs with Input Pad @ 40 dB, Gain @ Min.

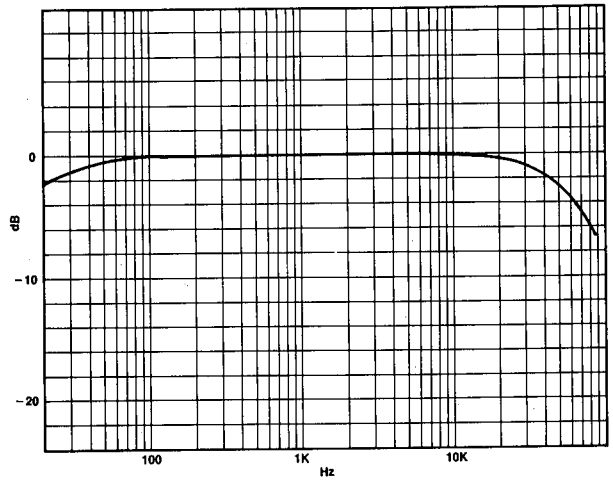


FIGURE 1-15 FREQUENCY RESPONSE

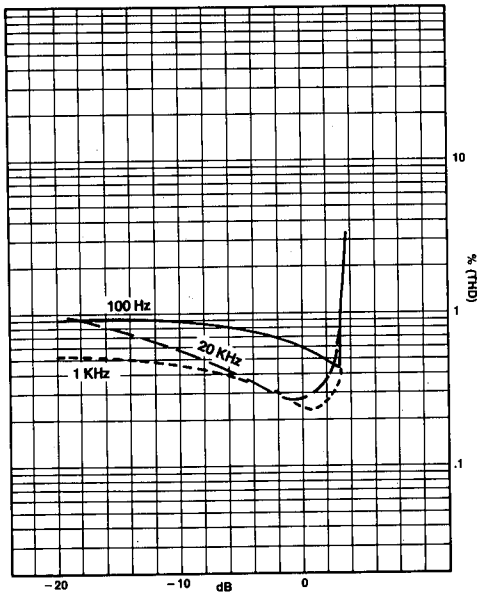


FIGURE 1-16 OUTPUT LEVEL vs T.H.D. At 100 Hz, 1 kHz & 20 kHz.

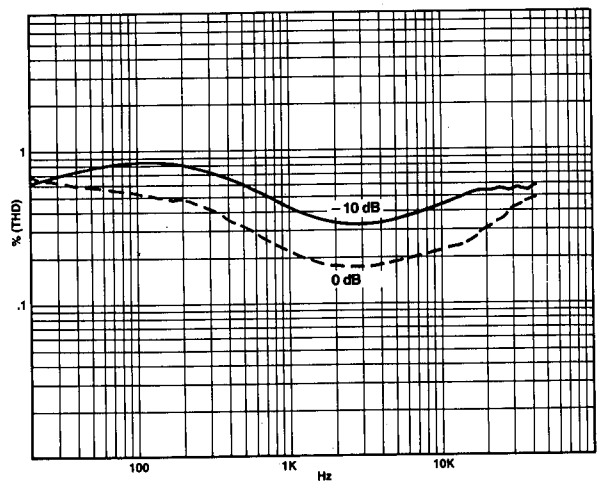


FIGURE 1-17 FREQUENCY vs. T.H.D. CURVES

1.5.5 Crosstalk Performance Graphs

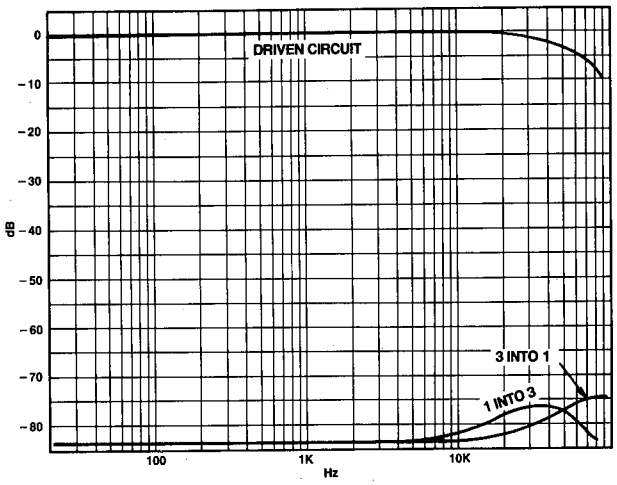


FIGURE 1-18 CROSSTALK OF GROUP 1 INTO 3 OR 3 INTO 1 WITH INPUT PAN CONTROL AT FULL CW & FULL CCW POSITIONS

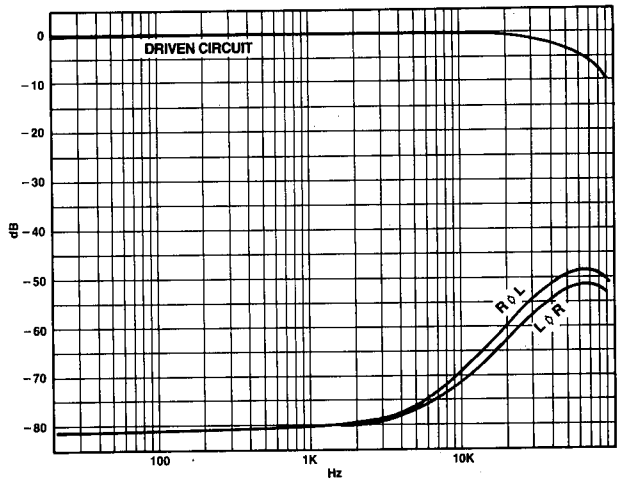


FIGURE 1-19 CROSSTALK OF STEREO L INTO R OR R INTO L WITH INPUT PAN CONTROL AT FULL CW & FULL CCW POSITIONS

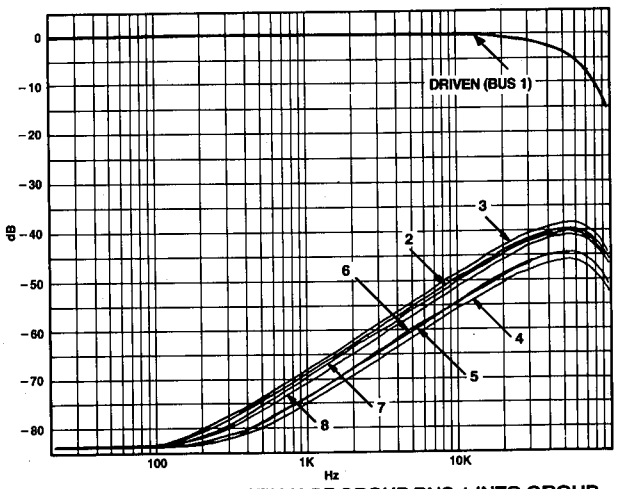


FIGURE 1-20 CROSSTALK OF GROUP BUS 1 INTO GROUP BUSSES 2 THROUGH 8

1.6 GAIN STRUCTURE & BLOCK DIAGRAM

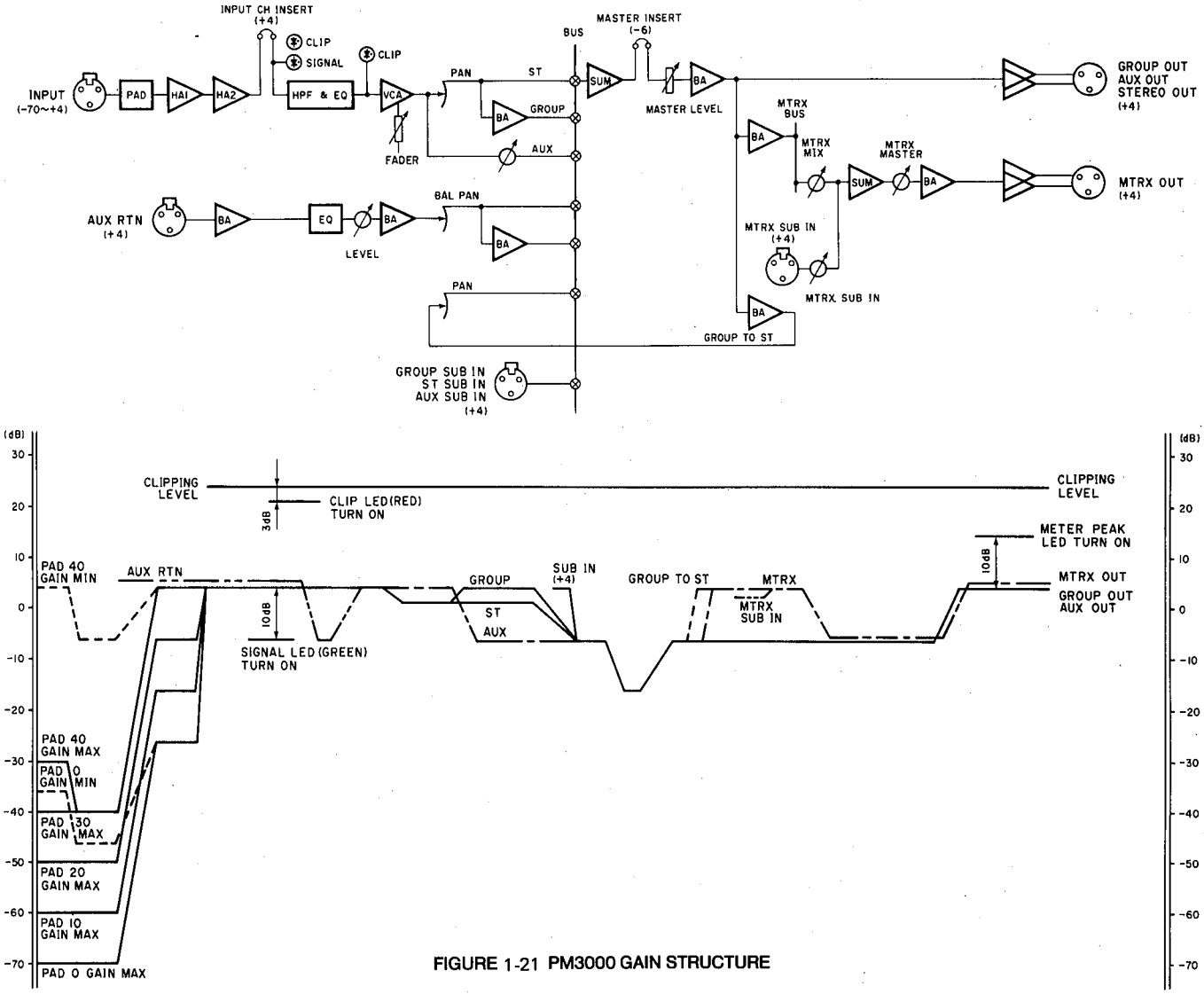


FIGURE 1-21 PM3000 GAIN STRUCTURE

PM3000/PW3000

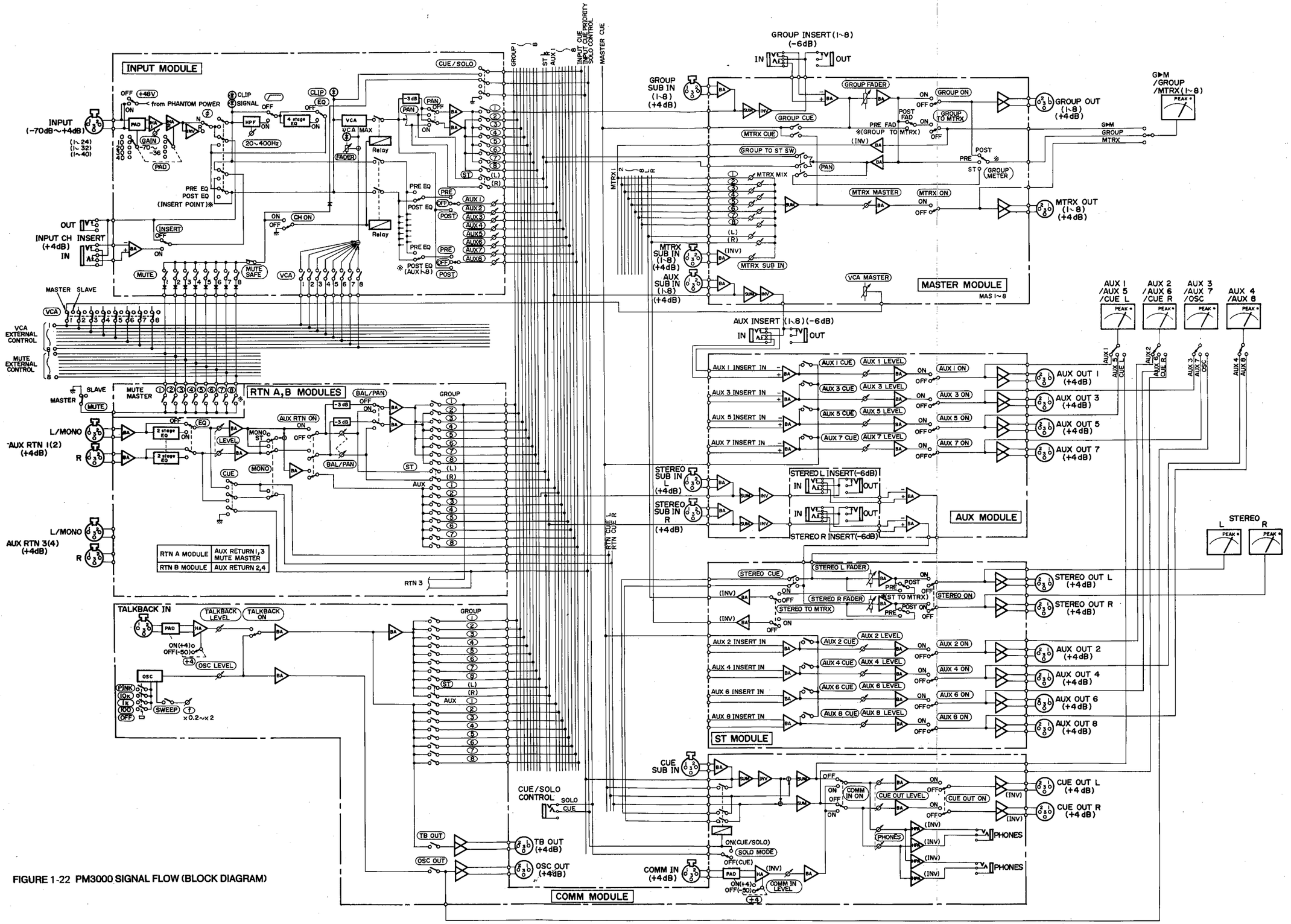


FIGURE 1-22 PM3000 SIGNAL FLOW (BLOCK DIAGRAM)