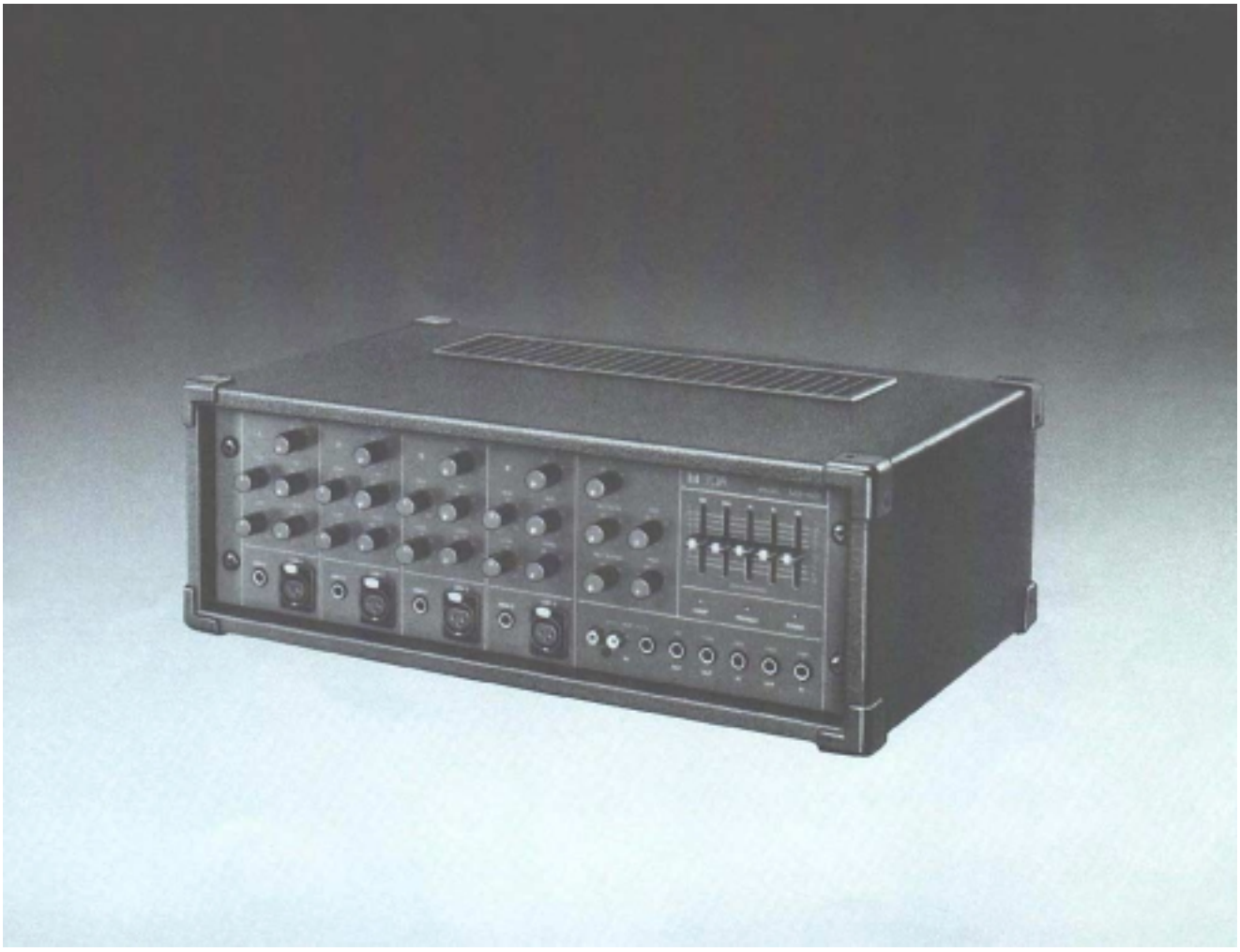
Operating Instruction Manual

TOA

POWERED MIXER

Model MX-401



TOA Toa Electric Co., Ltd.
KOBE, JAPAN

Contents

Precautions

1. XLR Type Audio Connector
The connectors are wired as follows.
The pin 1 is ground (shield), the pin 2 cold (low, minus), the pin 3 hot (high, plus).

2. Description of components and functions on the MX-401.
Various descriptions are applied, depending on each manufacturer. In our Operating and Instruction Manual explanation of components and functions is made according to our usage for them.

General Description

The TOA MX-401 is a very compact, four channel self-powered mixer. It was designed to deliver maximum features and performance in a cost-effective portable PA package.
The MX-401 features four input channels, one program output, and one Foldback output. The internal amplifier is rated at 100 watts into an 8 ohm load, and 150 watts into 4 ohms.
Each input channel has an electronically balanced XLR connector, and a high-impedance unbalanced 1/4" phone jack. In addition, each channel features two-band EQ, a pre-EQ Foldback send, and post-EQ reverb send.
The master control section features a patchable 5-band graphic equalizer, a quality 3-spring reverb, a full patch bay with 1/4" phone auxiliary and RCA tape inputs, and master volume controls for Program, Foldback, and Reverb return to both. The power amp protection circuitry and autocomp compressor, both with LED's, are also located in this section.

Features

1. Four input channels
2. 100 watts into 8 ohms, 150 watts into 4 ohms
3. Patchable 5-band graphic EQ
4. Auto Comp compression unit w/LED
5. Built-in spring reverb
6. Power amp protection circuitry w/LED
7. Full patch bay
8. Aux input w/level control, RCA jacks and parallel phone 1/4" jacks.
9. Reverb level to PGM and FB
10. Independent Foldback mix.

Each Channel

1. Input level control
2. Two band EQ
3. Pre-EQ Foldback send
4. Post-EQ Reverb send
5. Low-Z electronically balanced XLR input
6. Hi-Z unbalanced 1/4" input

Front Panel

High Equalizer Control (HIGH)
The high EQ control alters the high frequency response of the input channel, providing ±13dB at 10kHz, and ±15dB at 20kHz of continuously variable active shelving equalization. The "0" detented position provides flat audio response.

Low Equalizer Control (LOW)
The low EQ control provides ±13dB at 100Hz and ±15dB at 50Hz of continuously variable active shelving equalization. The "0" detented position provides flat audio response.

Input Level Control (LEVEL)
The level control provides continuously variable adjustment of the channel output to the program mixing buss, thus determining the level of that channel in the main sound system mix. Since the reverb signal is "post" this control, an increase in the level of the channel's output will also result in a corresponding increase in the reverb effect of that channel. The nominal level of the input level control is at the "10" position.

High Impedance Connectors (HIGH Z)
These connectors are unbalanced, standard 1/4" phone jacks with an input impedance of 27k ohms, and an input level of —35dB. When a plug is inserted into the high -Z input, the corresponding XLR connector is automatically switched out of the input circuitry.

Low Impedance Connectors (LOW Z)
The XLR connectors are low impedance, electronically balanced inputs with an input impedance of 1k ohms.

Reverb to Foldback Control (REV TO FB)
This control adjusts the amount of reverb signal that is returned to the foldback buss and thus the level of reverb contained in the on-stage monitor mix.

Reverb/Control (REV)
This control determines the level of signal assigned to the reverb mixing buss. Rotating the control clockwise increases the amount of reverb in that channel.

Foldback Control (FB)
The Foldback control determines the level of signal assigned to the foldback mixing buss, thus setting the level of that channel in the on-stage monitor mix.

Reverb to Program Control (REV TO PGM)
This control adjusts the amount of reverb signal that is returned to the program buss and thus the level of reverb contained in the main sound system.

Program Master Control (PGM)
The PGM control adjusts the overall combined signal level of the four independent channel level controls, and thus the level of the main sound system.

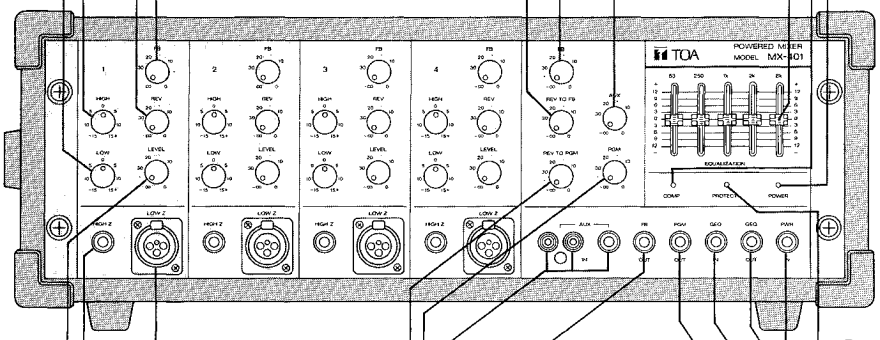
Aux Input Jacks (AUX IN)
The phone jack and RCA pin jacks are wired in parallel, with an input level of —20dB. When a plug is inserted into the phone jack, the RCA pin jacks are automatically switched out of the AUX circuitry.

Foldback Output Jack (FB OUT)
This jack is for connection to external power amplifiers and/or equalizers for the on-stage monitoring system. Nominal output level is +4dB with an impedance of 600 ohms. If the internal power amp and equalizer are to be used for the on-stage monitor system, the FB output should be connected to the GEQ input jack.

Graphic Equalizer (EQUALIZATION)
The graphic equalizer is 5 independent active bands (filters), providing 12dB of boost or cut at each center frequency. The "0" detented position provides flat audio response.

Foldback Master Control (FB)
The FB master control adjusts the overall combined signal level of the four independent channel foldback sends, and thus the level of the entire on-stage monitor mix.

Aux Level Control (AUX)
This control sets the overall level of the Aux input signal.



Program Output Jack (PGM OUT)
The PGM Out jack is provided for connection to external equalizers and/or power amps, deriving its signal prior to the internal GEQ and power amp. Nominal output level is +4dB with an impedance of 600 ohms.

Graphic Equalizer Input Jack (GEQ IN)
The GEQ input jack allows the graphic equalizer to be used independently of the **MX-401** with other external equipment, or the internal power amplifier and the graphic equalizer with external equipment. When a plug is inserted, the main mix from the program buss is disconnected from the graphic equalizer and the power amplifier. The nominal input level is +4dB with an input impedance of 50k ohms.

Graphic Equalizer Output Jack (GEQ OUT)
This jack allows the **MX-401** and the internal graphic equalizer to be used with an external power amplifier, or in conjunction with the GEQ in jack, to be used independently of all other **MX-401** circuitry. Nominal output level is +4dB with an impedance of 600 ohms.

Power Amp Compression Indicator (COMP)
The Comp LED lights when the internal compressor is activated. The compressor is provided to protect speaker systems by compressing the input signal level of the power amplifier when clipping occurs in the output stage. Frequent flashing of the LED is not reason for alarm. However, a constant or steady light indicates that the MX-401 is being overdriven and that the internal power amplifier is possibly "under powered" for that application. The output level of the MX-401 should be decreased until the LED only flashes intermittently.

Power Indicator LED (POWER)
The indicator LED lights when the power switch is "on".

Power Amp Protection Indicator (PROTECT)
The indicator LED lights if the power amplifier output is shorted, if the temperature of the unit rises above acceptable levels, or if DC is drifted to the speaker outputs. If the LED should light, speaker wiring and ambient temperature of the **MX-401** should be checked. If the LED remains lighted, the unit should be referred to qualified service personnel for repair.
Note:
The **MX-401** protection circuitry will (1) detect 'faulty conditions' within the power amplifier, (2) give a visual indication, and (3) automatically shut down until the fault condition is alleviated. This special circuitry ensures maximum reliability and virtually eliminates equipment damage due to unsafe or fault conditions. Please refer to fault protection table on page 4 for full explanation of this important feature.

Power Amplifier Input Jack (PWR IN)
The PWR Amp input jack allows the internal power amplifier to be used with external equipment. When a plug is inserted, the power amp is automatically disconnected from the **MX-401** mixer section. The nominal input level is +4dB with an input impedance of 10k ohms.

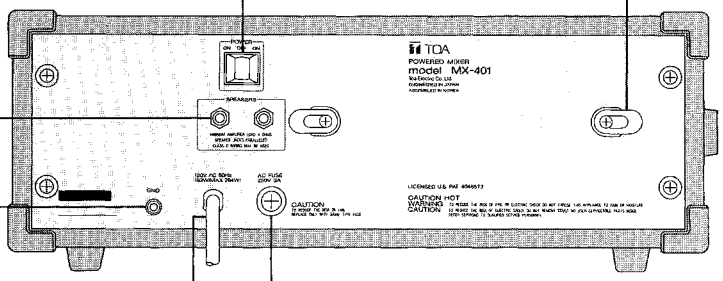
Rear Panel

Power Switch (POWER)
The power switch is a three-position type with the middle position being the "off position. The **MX-401** should be operated in the switch position which produces the lowest amount of system hum.

Speaker Jacks (SPEAKERS)
The speaker outputs are standard 1/4" phone jacks wired in parallel. Speaker cables (recommend at least #18 gauge wire) should be connected between the **MX-401** and the speaker systems prior to applying power to the unit.
Caution - The **MX-401** should never be operated into less than a 4 ohm speaker load.

Earth Terminal (GND)

AC Power Cord
The power cord is the three-wire type with proper grounding facilities.
Caution - The ground pin should not be removed under any circumstances. If the **MX-401** must be used without proper grounding facilities, a suitable grounding adapter should be utilized.



Operation of the **MX-401** with proper grounding techniques will result in less system noise and greatly reduced shock hazard.

Cord Wrap
The cord wrap is provided for convenient storage of the power cord when the **MX-401** is not in use.
Caution - The power cord should always be completely removed from the cord wrap prior to operation of the unit. This will insure maximum cooling of the **MX-401** For the same reason, adequate clearance should be maintained between the rear panel and any other surface (4-6 inches should do). The vents on the bottom and top of the **MX-401** are also provided for convection cooling. These vents should be kept clear and open. Failure to do so may cause thermal shutdown of the unit.

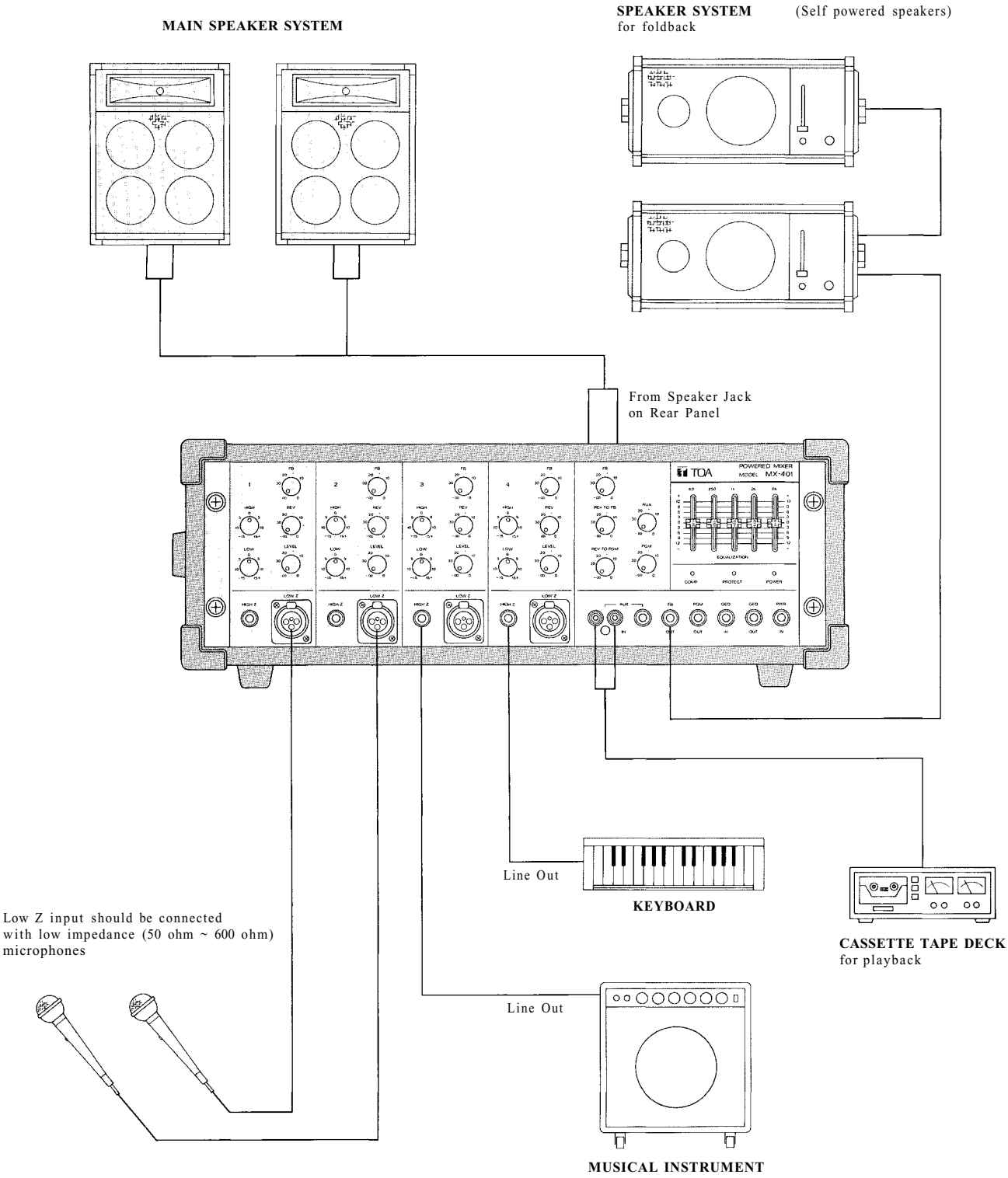
AC Fuse

Warning - To avoid possible equipment damage and/or personnel injury, the fuse should always be replaced with same type and rating. Using improper fuses will also void the warranty. The **MX-401** should always be disconnected from AC outlet prior to changing fuses. If fuse repeatedly fails, the unit should be referred to qualified service personnel for repair.

Fault Protection Table

Fault	Protection	Indication	Action	Restoration
Excessive current due to overloads.	Current limiter activates at less than 2 ohm.	Compressor LED illuminates.	Remove excessive loads. Minimum speaker loads 4 ohm.	Automatic restoration after normal loads are obtained.
Short circuits (less than 0.4-ohm)	Current limiter activates, input signal is lowered, unit shuts down.	Amp protection LED illuminates.	Check speaker lines/systems for shorts.	Turn off power switch. Turn on into operational loads.
Temperature rise of heat sink (more than 105°C)	Input signal is lowered. Unit shuts down.	Amp protection LED illuminates.	Check for adequate ventilation.	Automatic restoration after temperature lowers (to 75° - 95° C)
DC drift	Input signal is lowered. Unit shuts down.	Amp protection LED illuminates.	Refer to qualified service personnel.	Automatic restoration after normal bias is regained.

● Connection Examples



Input Connections

Generally speaking, there are two rules to follow when connecting equipment outputs to the inputs of other equipment.

1. Properly match the impedances of the outputs and inputs.

2. Connect low impedance outputs to high impedance inputs.

It goes without saying that not only input and output impedance matching, but also level matching should be taken into consideration. Each input channel of the **MX-401** is provided with an Input Level Control that includes a negative feedback (NF) circuitry, so the usable signal level range is wide. Input impedances and levels are shown in the following table.

INPUT SPECIFICATIONS

CONNECTION	INPUT	ACTUAL LOAD IMPEDANCE	FOR USE WITH NOMINAL	SENSITIVITY* (PGM OUTPUT LEVEL +4dB)	CONNECTOR
CH1	LOW Z	OPEN	50Ω TO 250Ω MICRO-PHONES	-60dB (0.78mV)	XLR TYPE NC3F
CH4	HIGH Z	27kΩ	27kΩ OR LOWER IMP LINES	-35dB (13.8mV)	PHONE JACK
AUX		30kΩ	30kΩ OR LOWER IMP, LINES	-20dB (77.5mV)	RCA PIN JACK PHONE JACK
GEQ		50kΩ	50kΩ OR LOWER IMP, LINES	+4dB (1.23V)	PHONE JACK
PWR/AMP		10kΩ	10kΩ OR LOWER IMP, LINES	+4dB (1.23V)	PHONE JACK

*Sensitivity is the level required to produce a program out level of +4dB.
*0dB is referenced to 0.775V RMS.

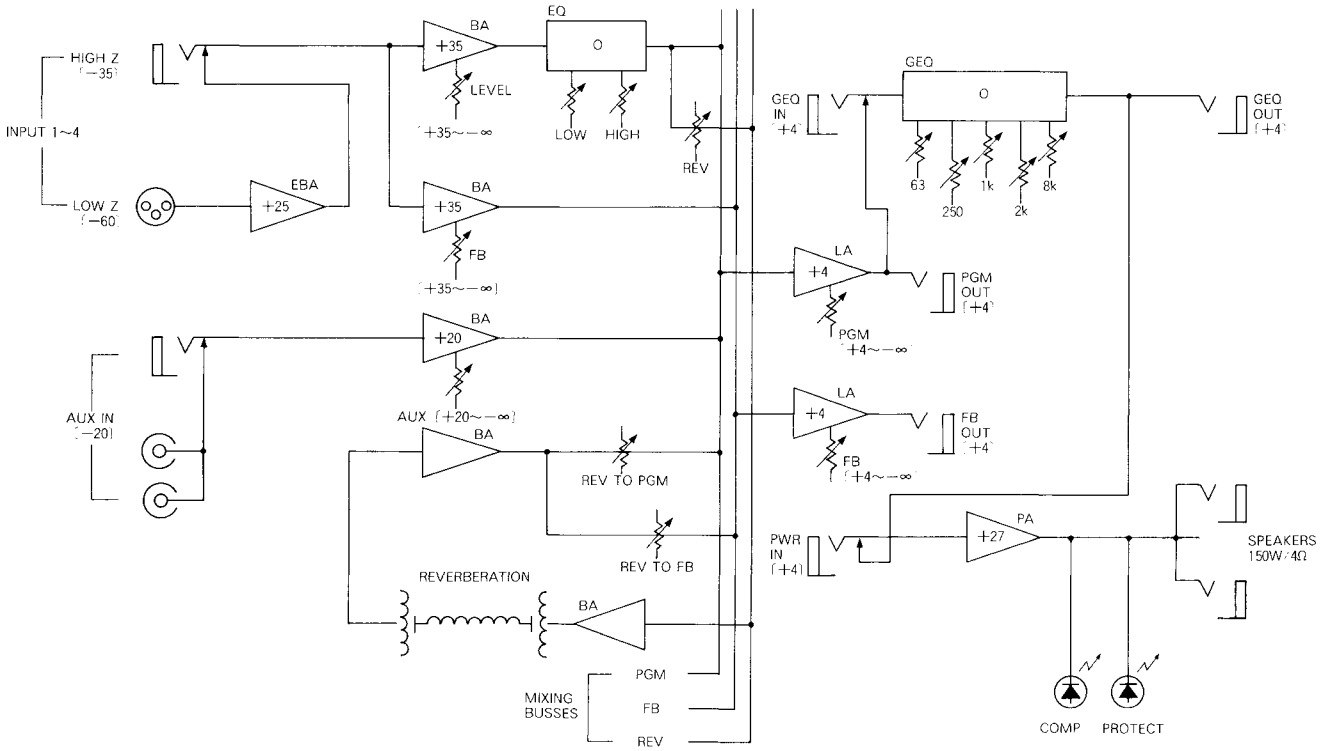
All XLR Type connectors are electronic balanced. Phone jack is unbalanced.

If the line going from one piece of equipment to another is long (more than 5m), we recommend that balanced outputs be connected to balanced inputs.

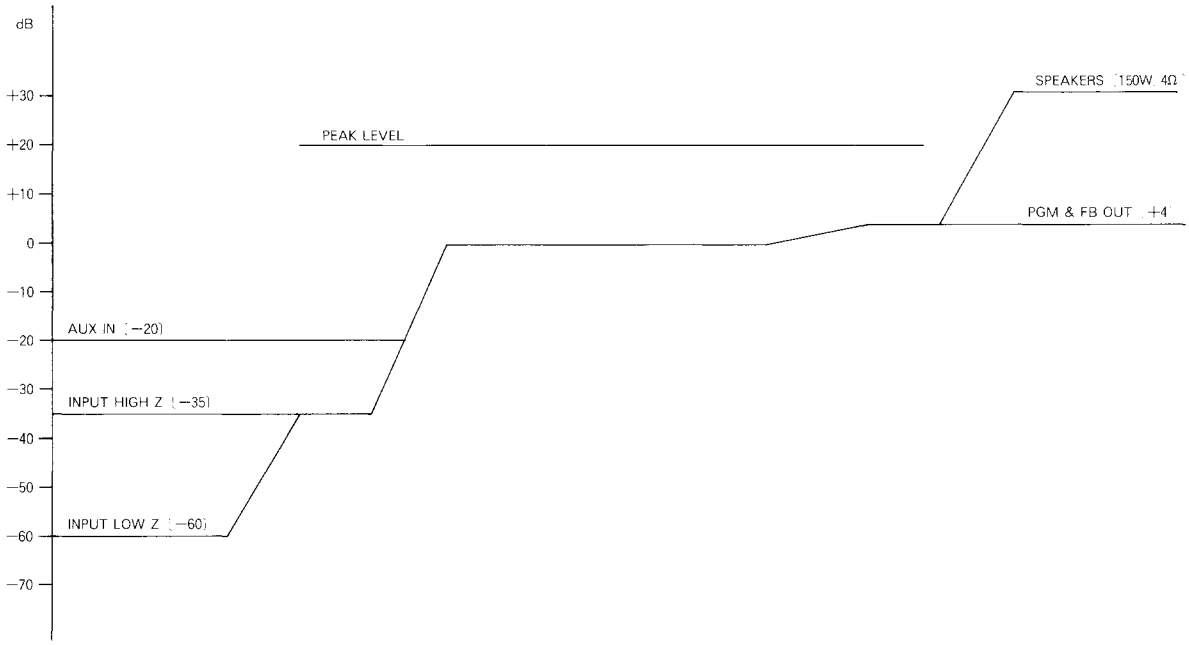
As is described in the beginning of the Operating Instructions Manual, the connectors of the **MX-401** are wired as follows: Pin 1 is ground (shield). Pin 2 is cold (low, minus). Pin 3 is hot (high, plus).

Block and Level Diagrams

BLOCK DIAGRAMS



LEVEL DIAGRAM



Specifications

MIXER SECTION

Frequency Response
+0, -3dB 60Hz~20kHz (input LEVEL at "5" position)

Total Harmonic Distortion
0.05% +4dB* at 1kHz.

Hum and Noise (Open)
Equivalent Input Noise -130dB* (20Hz ~ 20kHz)
Equivalent Input Noise -133dB* (IHF A)
All level Controls Minimum -110dB* (IHF A)
PGM Master at MAX and all input level controls minimum -90dB* (IHF A)
PGM Master at MAX and one input level control at MAX -70dB* (IHF A)

Maximum Voltage Gain
INPUT to PGM out 64dB
INPUT to FB out 64dB
INPUT to GEQ out 64dB
AUX to PGM out 24dB

Input EQ
50Hz ±15dB Shelving
20kHz ±15dB Shelving

Equalization
63Hz ±12dB Peaking
250kHz ±12dB Peaking
1kHz ±12dB Peaking
2kHz ±12dB Peaking
8kHz ±12dB Peaking

INPUT SPECIFICATIONS

CONNECTION	INPUT	ACTUAL LOAD IMPEDANCE	FOR USE WITH NOMINAL	SENSITIVITY* (PGM OUTPUT LEVEL +4dB)	CONNECTOR
CH1	LOW Z	OPEN	50Ω TO 250Ω MICRO-PHONES	-60dB(0.78mV)	XLR TYPE NC3F
CH4	HIGH Z	27kΩ	27kΩ OR LOWER IMP LINES	-35dB(13.8mV)	PHONE JACK
AUX		30kΩ	30kΩ OR LOWER IMP, LINES	-20dB(77.5mV)	RCA PIN JACK PHONE JACK
GEQ		50kΩ	50kΩ OR LOWER IMP,. LINES	+4dB (1.23V)	PHONE JACK
PWR/AMP		10kΩ	10kΩ OR LOWER IMP, LINES	+4dB (1.23V)	PHONE JACK

OUTPUT SPECIFICATIONS

CONNECTION	ACTUAL SOURCE IMPEDANCE	FOR USE WITH NOMINAL	OUTPUT LEVEL*		CONNECTOR
			NOMINAL	MAX. BEFORE CLIP	
PGM	600Ω	600Ω OR HIGHER IMP. LINES	+4dB (1.23V)	+20dB (7.75V)	PHONE JACK
GEQ	600Ω	600Ω OR HIGHER IMP. LINES	+4dB (1.23V)	+20dB (7.75V)	PHONE JACK
FB	600Ω	600Ω OR HIGHER IMP. LINES	+4dB (1.23V)	+20dB (7.75V)	PHONE JACK

POWER AMPLIFIER SECTION

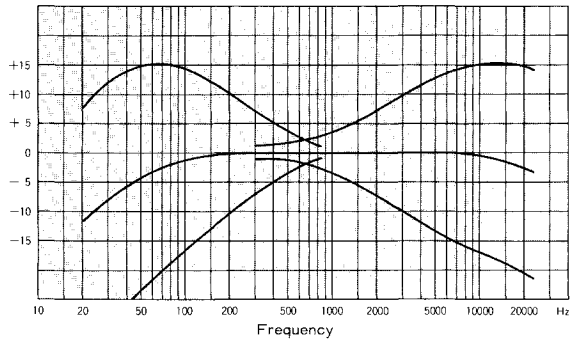
Frequency Response
+0, -1dB 15Hz to 30kHz (150W RMS 4 Ω)
Rated Power & Load
150W RMS (4Ω) 110W RMS (8Ω)
Power Output at Clipping
1% THD, 1kHz
160W RMS (4Ω) 115W RMS (8Ω)
Total Harmonic Distortion
Less than 0.1% (200mW ~150W RMS, 20Hz~20kHz, 4 Ω)
Typically below 0.05%
Compresser Dynamic Range
Greater than 26dB
Hum and Noise
At least 105dB S/N ratio, 20Hz~20kHz
At least 109dB S/N ratio IHF-A weighted
Damping Factor
Greater than 200 [1kHz 8Ω)
Input Sensitivity
+4dB* (1.23V)
Input Impedance
10kΩ
Output Connector
Phone Jack ×2
Power Requirement
300W
Dimensions
494(W) × 180(H) × 304(D) (19.44 × 7.09 × 11.97) ins.
Weight
10 kg (22 lbs)

*0dB is referenced to 0.775V RMS.

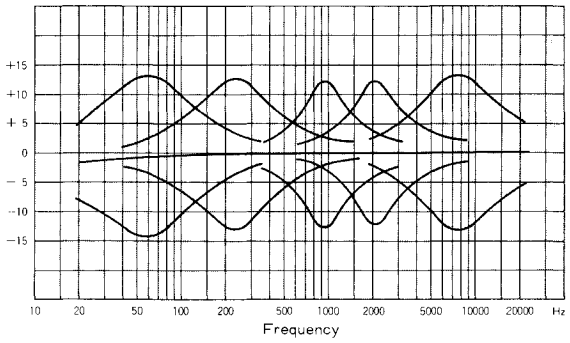
***Specifications are subject to change without notice.**

● Characteristics Diagrams

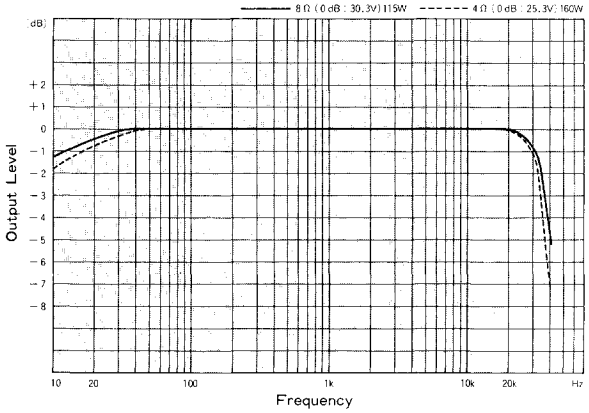
LOW Z HIGH Z IN & INPUT EQ (LEVEL Control)
HIGH Z IN. & INPUT EQ (set at "5")



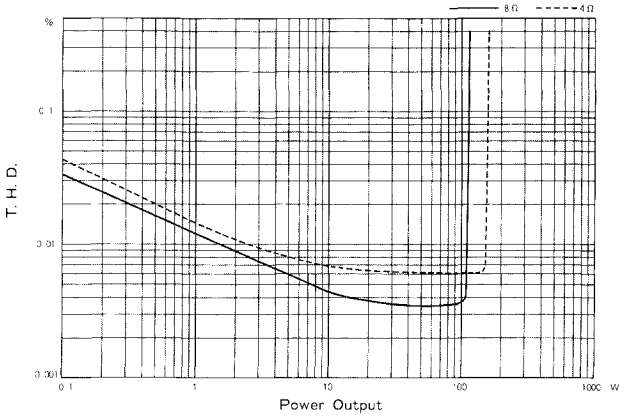
GEQ



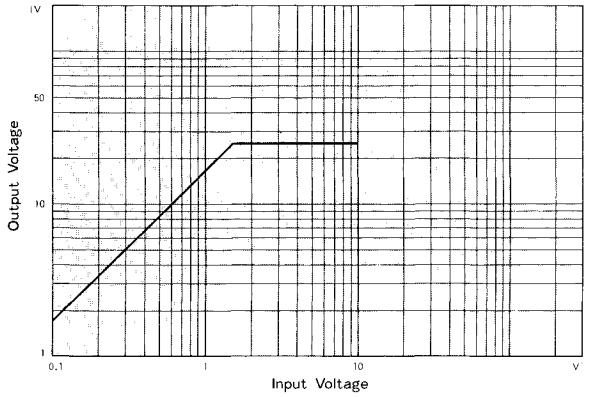
POWER AMP POWER BAND WIDTH



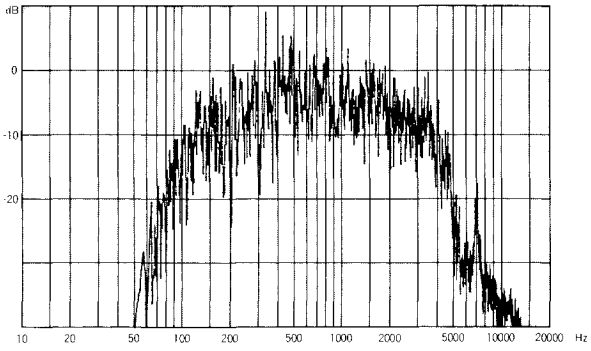
POWER AMP T.H.D. vs POWER OUTPUT



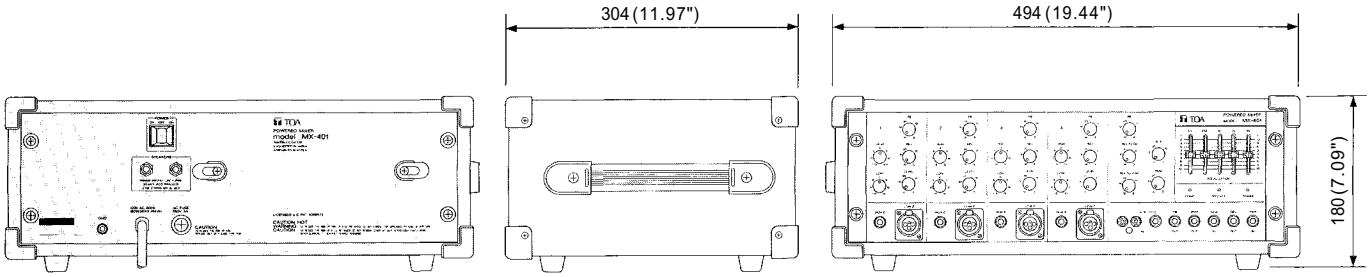
POWER AMP COMPRESSOR



REVERBERATION FREQUENCY RESPONSE



● Appearance



TOA Toa Electric Co., Ltd.
KOBE, JAPAN

Printed in Japan
133-02-873-5