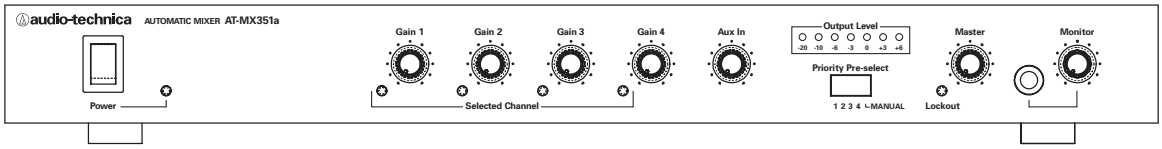
AT-MX351a SmartMixer®
Automatic Mixer



Installation and Operation

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Contents

Warning

To prevent fire or shock hazard, do not expose the unit to rain or moisture.
To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

Caution

CAUTION RISK OF ELECTRIC SHOCK DO NOT OPEN	AVIS RISQUE DE CHOC ÉLECTRIQUE NE PAS OUVRIR

To prevent electric shock, do not remove the cover. There are no user-serviceable parts inside. Internal adjustments are for qualified professionals only. Refer all servicing to qualified service personnel.

Pour prévenir un choc électrique, ne pas ouvrir le couvercle. Il n'y aucune pièces de rechanges à l'intérieur. Tout ajustement interne doit être fait par une personne qualifié seulement. Référez tout réparation au personnel qualifié.

Safety Cautions

Prior to use of this product, review all safety markings and instructions.

Warning: This apparatus must be grounded.

This product is a safety class 1 product. There must be an uninterruptible safety earth ground from the main power source to the product's AC input.
Whenever it is likely that the protection has been impaired, disconnect the power cord until the ground has been restored. An apparatus with class 1 construction shall be connected to an AC outlet with a protective grounding connection.
This apparatus is not disconnected from the mains as long as it is connected to the AC outlet, even if the unit itself has been turned off.
In case of emergency, disconnect the power cord plug of this apparatus quickly.

Installation place

Do not install this apparatus in a confined space such as a bookcase or similar unit. Please install this model in the place where ventilation is good. The apparatus should be located close enough to the AC outlet so that you can easily grasp the power cord plug at anytime. In case of emergency, disconnect the power cord plug of the apparatus quickly.

Caution for FCC

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

Warning for FCC

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

— Reorient or relocate the receiving antenna.

— Increase the separation between the equipment and receiver.

— Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

— Consult the dealer or an experienced radio/TV technician for help.

IC statement

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme á la norme NMB-003 du Canada.

Important Safety Instructions

1) Read these instructions.
2) Keep these instructions.
3) Heed all warnings.
4) Follow all instructions.
5) Do not use this apparatus near water.
6) Clean only with dry cloth.
7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8) Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10) Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11) Only use attachments/accessories specified by the manufacturer.
12) Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.

13) Unplug this apparatus during lightning storms or when unused for long periods of time.
14) Refer all servicing to qualified service personnel.
Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

Notice

The apparatus shall not be exposed to dripping or splashing. No object filled with liquids, such as vases, shall be placed on the apparatus.

Use with Rack Mounting

If you install the unit into a rack, select a rack having an all-pole mains switch (with a contact separation of at least 3mm in each pole) in its front.
In case of emergency, turn off the mains switch on the rack, or disconnect the plug of the rack quickly.

Introduction

Please Note!

This manual assumes use of microphone-level inputs and line-level output, the most typical SmartMixer application. However, all inputs and the output may be individually switched internally to achieve any combination of mic- and line-level input/output. See page 10 for details.

About internal adjustment

Operating personnel must not remove equipment covers. Only qualified, experienced, authorized service personnel may remove equipment covers for any internal adjustments.

Important caution for service personnel making internal adjustments

High voltages are present when the unit's power cord is plugged into an electrical outlet. Service personnel should not make any internal adjustments with power cable connected. Disconnect the power cord from its source before removing equipment cover, because of the danger of touching an internal high voltage part. Also, to avoid injury, take care not to touch any sharp edges within the unit, its top panel or interior sections.

What is a SmartMixer®?

The AT-MX351a SmartMixer® is a microprocessor controlled, automatic switching, five-channel mixer.

The four microphone inputs are XLRF-type balanced, with 48-volt phantom power available on pins 2 and 3. The Aux input is an RCA jack accepting auxiliary-level input from external audio devices. There is no signal processing of the Aux input. The mixer output is XLRM-type balanced, non-inverting.

All AT-MX351-model SmartMixers and AT-MX341-model SmartMixers can be daisy-chained via the included AT8325/1.0 Link Cable and special connectors on the rear panel. The control bus and the audio are carried between mixers by the link cable. The result is that all microphones on a multi-mixer system can be controlled by one microphone connected to any mixer. Since all of the mixers are independently powered, there is no practical limit to the number of SmartMixers that can be daisy-chained.

Features

The AT-MX351a provides an independent gain control on the front panel for each input channel. Substantial gain reserve and adjustment range permit microphones of widely differing sensitivities to be used together successfully. Automatic threshold setting on all mic/line channels ensures proper gating levels for existing ambient sound conditions.

Priority Pre-select

To custom-tailor conferencing needs, the mode of each microphone channel can be independently switched via the front panel "Priority Pre-select" DIP switches. The combination of switch settings results in three different modes of priority selection/operation.

In any of the three modes of operation, when everyone stops talking, the last microphone "on" will remain "on." In a teleconferencing, recording, or broadcast application, this feature will provide continuous room ambience. This feature is cascaded throughout all linked mixers so that only one microphone in the entire system will remain on.

When a microphone is "off," its input is only attenuated. This attenuation is factory set at 8 dB. The amount of "off" attenuation can be internally adjusted between 6 dB and 40 dB if desired. (See page 12, "Adjusting 'Off' Attenuation.")

If automatic switching is not desired, a "manual" DIP-switch setting on the front panel bypasses the AT-MX351a's automatic switching and attenuation functions, causing the unit to behave like a conventional mixer. In this mode, the relative level of each microphone is strictly a function of the position of its respective front-panel gain control.

NOMA (Number of Open Microphones Attenuated)

The NOMA system helps control feedback by allowing for the increase in system gain that occurs when the number of open microphones increases. A built-in matrix in the AT-MX351a recognizes exactly how many microphones are on and automatically adjusts the gain accordingly. Because use of NOMA is not always appropriate or desired, the AT-MX351a is shipped with the NOMA function switched off.

AT-MX351a Front Panel

1. **Power switch.**
2. **Power "on" indicator.**
3. **Input Gain controls.** Adjust inputs for microphone sensitivities and/or operating conditions.
4. **Selected Channel LED indicators.** Indicate which channels are "on" or "active."
5. **Aux In control.** Adjusts input for source output level and/or operating conditions.
6. **Output Level LED meter.** Indicates RMS output level of the mixer. "Zero" (0) level is factory calibrated for an output of +4 dBm into 600 ohms (Master level control fully clockwise). Can be set for peak output level indication via internal switch (see page 10).
7. **Priority Pre-select switches (1-4).** A switch in the "up" position assigns the respective channel priority over the other channels. A priority channel can not be locked out by other channels. Any combination of priority/non-priority selections is allowed.
8. **Manual mode switch.** Setting this switch in the "up" position bypasses all of the SmartMixer's automatic functions, except limiting and NOMA if selected.
9. **Lockout LED indicator.** Shows when lockout bus is active.
10. **Master level control.** Adjusts mixer output level for operating conditions.
11. **Headphone output.** 1/4" TRS jack.
12. **Monitor headphone level control.**

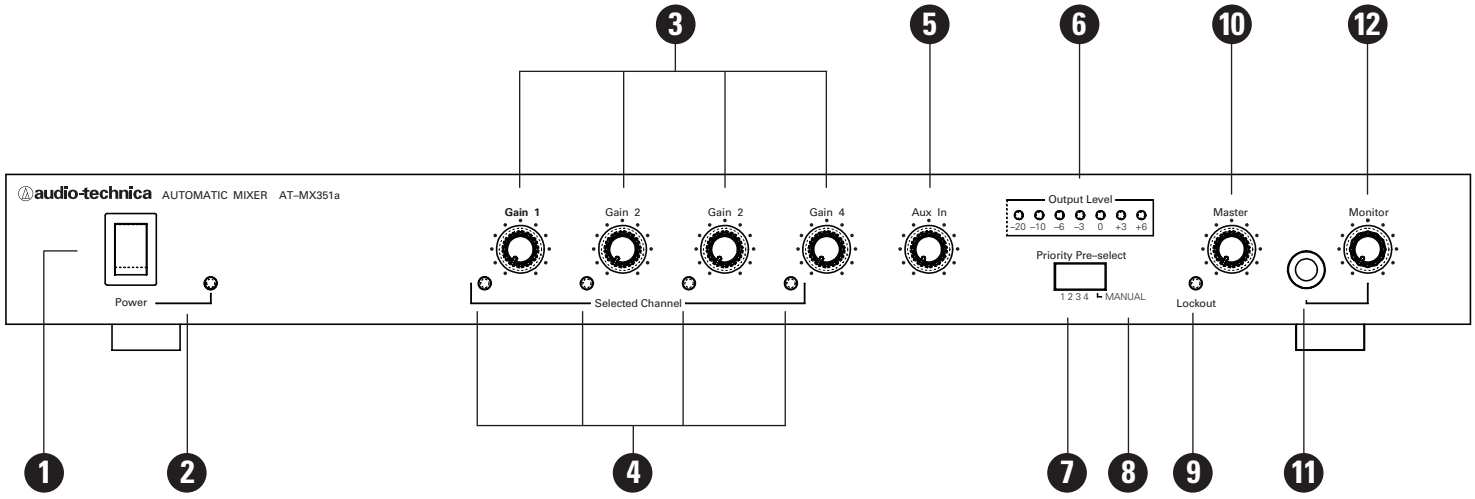


Figure 1. Front panel

AT-MX351a Rear Panel

1. **External Control connector.** For TTL output, plus closure-control input for external control of each channel.
2. **Link In/Link Out.** Provides for daisy-chaining of multiple mixers when more than four microphones are used.
3. **Line/Mic balanced output.** Level can be changed via internal switch (see page 10). XLRM-type connector.
4. **Unbalanced line-level (–10 dBV) output.** RCA jack.
5. **Aux In.** Unbalanced, line-level (–10 dBV), auxiliary input.
6. **Preamp Outputs.** Independent, unbalanced (–10 dBV), switchable pre/post-controller outputs from mic channels.
7. **Inputs.** Balanced microphone inputs for low-impedance dynamic or condenser mics. Can be changed to line-level inputs via internal switches (see page 10). XLRF-type connectors. Can supply 48V phantom power via internal switches.
8. **Power input.** 100V-240V AC, 50-60 Hz

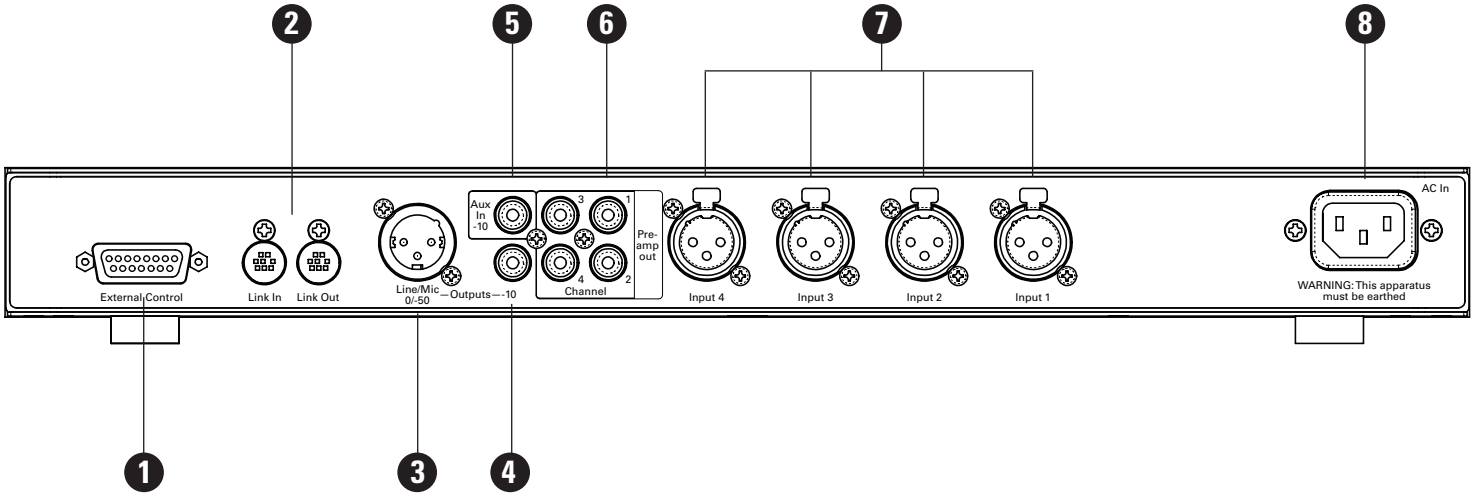


Figure 2. Rear panel

Installation and Setup

AT-MX351a SmartMixer setup tips:

1. Turn the Master level control to the minimum position. Proceed with steps 2-9.
2. Set all Priority DIP switches and Manual mode switch to “down” position.
3. Turn all four microphone Gain controls fully counterclockwise.
4. Connect the power cord to the mixer and plug into AC outlet.
5. Turn Power switch “on.” The mixer will perform a self-test and turn each microphone “on” and “off” consecutively.
6. Connect a microphone to Input 1 and turn the Gain 1 control to the “nine o’clock” position. The channel 1 LED will light if the microphone is operational.
7. Adjust the Gain 1 control for proper meter indication when speaking into microphone (peaks at 0).
8. Plug in up to three other microphones and adjust each respective Gain control for proper meter indication.
9. Priority can be assigned to one or more microphones by moving the appropriate DIP switch(es) to the “up” position. Any microphone(s) assigned in this manner cannot be locked out by any other microphone.
10. “Manual” mode can be selected at any time by moving the right-hand DIP switch to the “up” position. In this mode, the unit will behave like a conventional mixer (all automatic functions are bypassed except for limiting and NOMA if selected).
11. Adjust the Master level control for desired output level. This control is at the last stage in the mixer, and does not affect microphone gain, threshold setting, meter indication, monitor or preamp outputs.

Priority Microphones and the Lockout Bus (Channels 1-4)

Once the Gain controls have been properly adjusted, an audio signal appearing in *any* channel causes the lockout control bus to activate and the Lockout LED indicator to light. The Priority Pre-select switches then determine whether or not a particular mic is affected by lockouts caused by other mics: a channel Priority switch in the “down” position *will allow* lockout* of its mic; the same switch “up” *will not allow* lockout of its mic.

* *Note that any mic which is described as “locked out” or “off” is really just being attenuated by between 6 dB and 40 dB from the level otherwise determined by its Gain control setting, sensitivity and placement.* *See the “Daisy-chaining Mixers” section on page 14 for further details.*

There are basically three “modes” of priority pre-select automatic operation:

Mode 1... Priority Pre-select switches (1-4) *Up*

The Lockout indicator will come on with any audio input, but no mic will be locked out… because none are connected to the lockout bus. (This mode is often called “Free-for-all”…or sometimes “City Council”!)

Mode 2…Priority Pre-select switches (1-4) *Down*

In this mode, only one mic at a time can be "on." The lockout bus shuts down all other mics until the first speaker pauses. As soon as the controlling microphone goes silent, the lockout bus goes inactive and any other mic can come on. This switching takes place without any syllable-grabbing delay, or pops or clicks. (This mode is known as "First-come-first-served" or "Filibuster.")

This mode is very useful when the gain setting of the overall sound system must be close to the threshold of feedback, and additional microphones coming on could throw the system into feedback. The SmartMixer will not allow multiple microphones to be on at the same time in this mode. The switching is so fast and silent that the meeting can still be completely interactive.

Mode 3…*One* Priority Pre-select switch *Up*

The selected priority microphone can come on at any time and can mute any other mic that is on (popularly called "The Chairperson" mode).

(Note that there may be special circumstances where two or three mics could be set to priority, so those speakers could talk whenever desired, but still mute one or two non-priority mics.)

If multiple SmartMixers are used with AT8325/1.0 Link Cables, Priority Pre-select switches on all channels in use will have the control effects described above.

The selected priority microphone(s) will mute only those non-priority microphones within the same unit.

NOMA

The NOMA is factory set in the "off" position. To turn on the NOMA function, unplug the unit, remove the top cover and change the setting of the switch designated on the circuit board by "S601" (Figs. 4 and 5, page 11).

NOMA serves to maintain overall system gain by proportionately reducing amplifier gain as the number of open microphones increases. In a sound reinforcement system, this can tend to preserve the feedback margin and system stability. However, this action necessarily reduces the sound level of *each individual* person speaking, which may not be desired. In the end, use of NOMA often comes down to the preferences of the system's designer and/or operator. Generally speaking, use of NOMA is *not* desirable in applications such as teleconferencing, recording or broadcasting.

Auxiliary Input

The Aux input is an RCA jack accepting auxiliary-level (-10dBV) input from external audio devices. There is no signal processing of the Aux input (not gated).

Preamplifier Gain

The SmartMixer has a substantial gain range, allowing it to accept a wide variety of microphones. However, if in some instances higher-output microphones are used for close talking, it may be necessary to reduce the preamplifier gain. This can be done by changing switch settings inside the unit. With the unit unplugged from its AC source, remove the two screws on each side of the unit and carefully lift off the top cover. Locate the internal switches designated on the circuit board by "S103," "S203," "S303" and "S403" (Figs. 4 and 5, page 11). A "control map" drawing will be found on the inside of the top cover. Changing the settings of these internal switches will cause a gain reduction of 10 dB for channels 1, 2, 3 and 4 respectively.

The preamplifier gain may be reduced further, allowing the SmartMixer to accept line-level sources. Changing the settings of the internal switches designated by "S101," "S201," "S301" and "S401" will cause an input reduction of 50 dB for channels 1, 2, 3 and 4 respectively. Note that the appropriate internal switches can be used in combination for a total sensitivity reduction of up to 60 dB for each channel.

Output Level

The SmartMixer's output is factory set at line level. Should mic-level output be desired, simply unplug the unit, remove the top cover and locate the switch on the circuit board marked "S602" (Figs. 4 and 5, page 11). Changing the setting of this switch will cause a 50 dB reduction in output.

Phantom Power

Each of the SmartMixer's inputs supplies +48V DC phantom power. Should it be required to disable the phantom power, simply unplug the unit, remove the top cover and locate the switches designated on the circuit board by "S102," "S202," "S302" and "S402" (Figs. 4 and 5, page 11). Changing the settings of these switches will disable phantom power on channels 1, 2, 3 and 4, respectively. Note that, although they do not require phantom power for operation, most balanced-output dynamic microphones can be used without disabling the SmartMixer's phantom power.

Output Level LED Meter

The Output Level LED meter is factory set to indicate RMS output. Should peak output indication be desired, simply unplug the unit, remove the top cover and change the setting of the switch designated on the circuit board by "S603" (Figs. 4 and 5, page 11). "Zero" (0) level is factory-calibrated at +4 dBm into 600 ohms.

Summary of Internal Controls

Function	Ch 1	Ch 2	Ch 3	Ch 4	Output
48V Phantom Power	S102	S202	S302	S402	
10 dB Input Atten.	S103	S203	S303	S403	
50 dB Mic/Line Atten.	S101	S201	S301	S401	S602
Limiters (on/off)	S106	S206	S306	S406	
"Off" Atten. Range	S105	S205	S305	S405	
Preamp Output Gating	S104	S204	S304	S404	
Limiter Thresholds	VOL103	VOL203	VOL303	VOL403	
"Off" Atten. Adjustment	VOL102	VOL202	VOL302	VOL402	
NOMA	--	--	--	--	S601
Meter RMS/Peak	--	--	--	--	S603

Figure 3. Summary of internal controls

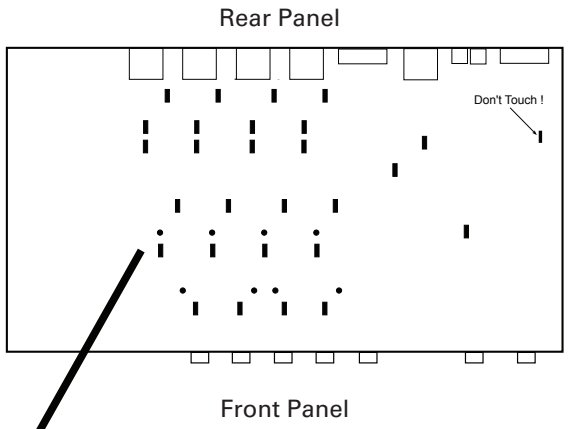


Figure 4. Internal view of mixer.

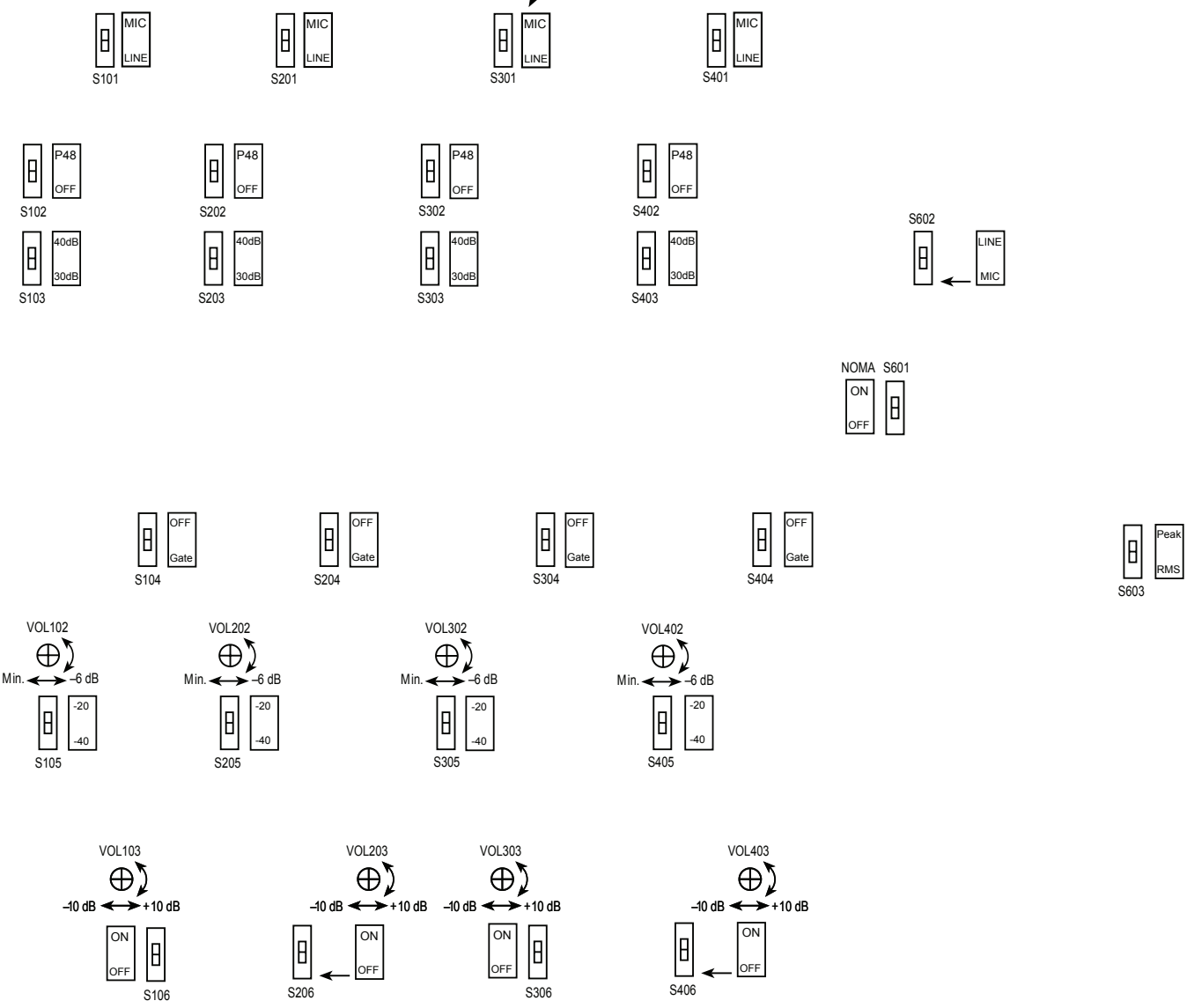


Figure 5. Detail of internal controls.

Adjusting ”Off” Attenuation

In instances when the number of microphones in use is high, it may be necessary to increase the amount of “off” attenuation per microphone to keep the total ambient noise level low. There are “off” attenuation adjustments inside the unit. To adjust the “off” attenuation of channel 1, unplug the unit, remove the top cover and locate the trimpot designated on the circuit board by “VOL102” (Figs. 4 and 5, page 11). It is factory set at approximately 8 dB, the attenuation at the middle of the control’s rotation. When the control is turned fully counter-clockwise, “off” attenuation is approximately 20 dB. Conversely, when the adjustment is turned fully clockwise, “off” attenuation is approximately 6 dB. VOL202, VOL302 and VOL402 control “off” attenuation for channels 2, 3 and 4 respectively.

Changing the settings of the switches designated on the circuit board by “S105,” “S205,” “S305” and S405” will extend the range of “off” attenuation to –40 dB for channels 1, 2, 3 and 4 respectively.

Preamp Outputs

Each microphone channel has an independent unbalanced preamp output that is separate from the main mixer output. This is helpful when it is necessary to record the output of each channel, whether or not it is the active mixer output (as is required, for example, in some courtroom proceedings). As set at the factory, no gating is applied to these outputs. To gate these outputs, unplug the unit, remove the top cover and locate the switches designated on the circuit board by “S104,” “S204,” “S304” and S404” (Figs. 4 and 5, page 11). Change the switch position(s) to “Gating” for channels 1, 2, 3 and/or 4 respectively, as desired.

Input Limiters

Independent, adjustable limiters are available on all mic channels. To adjust the limiter threshold of channel 1, unplug the unit, remove the top cover and locate the trimpot designated on the circuit board by “VOL103” (Figs. 4 and 5, page 11). It is factory set at approximately 0 dB RMS. When the control is turned fully counter-clockwise, limiter threshold is approximately
–10 dB RMS. Conversely, when the adjustment is turned fully clockwise, limiter threshold is approximately +10 dB RMS. VOL203, VOL303 and VOL403 adjust limiter threshold for channels 2, 3 and 4 respectively.

Changing the settings of the switches designated on the circuit board by “S106,” “S206,” “S306” and S406” will turn off the threshold-limiting function on channels 1, 2, 3 and 4 respectively.

Force-on/Force-off

To activate force-on/force-off, install a closure between the appropriate pin and Ground Reference on the External Control connector on back of unit.

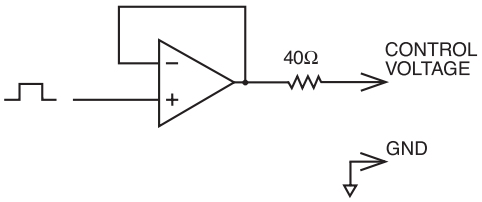
External Control Connector Pinout

Pin 1	Channel 1 force off	Pin 8	Channel 4 force on
Pin 2	Channel 2 force off	Pin 9	Channel 1 TTL out
Pin 3	Channel 3 force off	Pin 10	Channel 2 TTL out
Pin 4	Channel 4 force off	Pin 13	Ground reference
Pin 5	Channel 1 force on	Pin 14	Channel 3 TTL out
Pin 6	Channel 2 force on	Pin 15	Channel 4 TTL out
Pin 7	Channel 3 force on		

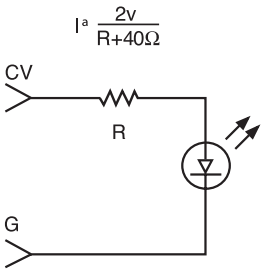
Control Voltage Out

When a microphone channel turns “on,” as indicated by a Selected Channel LED on the front panel, the channel’s associated Control Voltage Out goes “high” (+4 VDC). See chart on page 12 for pin connection. This signal can be used to light indicator lamps, switch speaker zones on and off, select video cameras, etc. *The control voltage should not be connected directly to an inductive load such as a relay coil, as damage to the mixer may result.* Several interface circuit possibilities are shown in Figure 6 below.

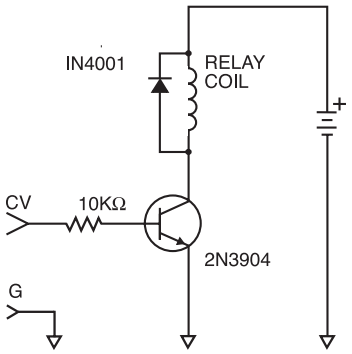
Equivalent Output Circuit for Control Voltage Out



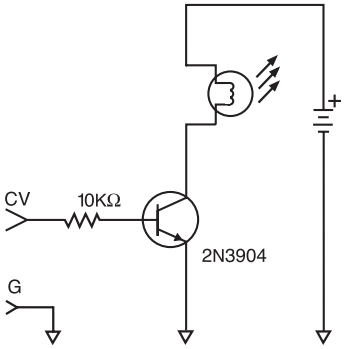
Driving One LED



Relay Driver



Driving Lamps



Driving Logic Gates

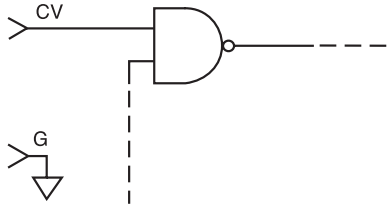


Figure 6. Control interface examples.

Daisy-chaining Mixers

When more than four microphones are needed, it is possible to daisy-chain multiple SmartMixers together through the Link In/Out connectors on their back panels (Fig. 2). Connect Mixer #1 Link Out jack to Mixer #2 Link In jack, etc. Mixer #1 output contains only audio from the first four microphones; Mixer #2 output then contains audio from all the microphones plugged into Mixer #1 *and* the microphones plugged into Mixer #2. The last mixer in the chain contains audio from all preceding mixers. The combined output is then taken from the *last* mixer in the chain. Because lockout information is passed between mixers through Link In/Out, the last-microphone-on condition is not violated. Thus only one microphone per installation will stay on when no one is speaking.

Note that one or more mixers can be switched to "Manual" mode without affecting the automatic operation of any other mixers in the chain.

NOMA information is passed between AT-MX351a mixers through Link In/Out. If AT-MX351a mixers are linked with AT-MX341-model mixers, the NOMA function will pass through the AT-MX341 models but their mics will not be included in the NOMA calculation.

Rack Mounting

Provided with each mixer are two rack ears and six self-tapping screws to attach the ears to the unit, which allow the unit to be mounted in a 1U rack space.

Security Caps

For permanent installations where microphone selections, positions and acoustic conditions are constant, it may be advantageous to remove the front panel knobs and install security caps to prevent unauthorized adjustments. To install, simply press the caps into place, covering the desired control(s). The system should be tested carefully before installing the security caps because they are intended to be "permanent" and are very difficult to remove.

If removal of installed security caps becomes necessary, unplug the mixer, remove the two screws on each side of the unit and remove the top cover. Then remove the nine screws that attach the front panel: six on top and three underneath. Remove the front panel. With the panel removed, the two locking tabs on each security cap can be accessed. The cap can be released by carefully squeezing the two tabs together.

Specifications

Input Impedance	
Mic	8,000 ohms
Line	50,000 ohms
Aux	50,000 ohms
Link In	20,000 ohms
Output Impedance	
Balanced	
Line	200 ohms
Mic	300 ohms
Unbalanced	400 ohms
Link Out	100 ohms
Preamp Out	750 ohms
Maximum Input Level	
Mic	–24 dBV
Line	+27 dBV
Aux	+17 dBV
Maximum Output Level*	+22 dBm
Nominal Output Level (0 VU)*	
Balanced	
Line	+4 dBm (600 ohms), +4.4 dBV (open circuit)
Mic	–46 dBm (600 ohms), –44 dBV (open circuit)
Unbalanced	–10 dBV (open circuit)
Preamp Out	–10 dBV (open circuit)
Maximum Monitor Output	700 mW, 20 ohm load
Maximum Gain	73 dB
Frequency Response	40 Hz to 22 kHz
Equivalent Input Noise[1]	–128 dBV (150 ohms) at maximum gain
Input Attenuation	10 dB
Mic/Line Input Pads	50 dB
Maximum NOMA Attenuation	≈20 dB (up to 100 mics on simultaneously)
Microphone Phantom Power	+48V DC
Control Voltage Out	+4V DC
Power Supply	100V-240V AC, 50-60 Hz, 30W
Operating Temperature	32˚ to 104˚ F (0˚ to 40˚ C)
Dimensions	16.93" (430 mm) W x 9.38" (238 mm) D x 1.75" (44 mm) H (including feet, knobs and connectors)
Weight	7 lbs. 6 oz (3.35 kg)
Accessories Included	AC power cable, AT8325/1.0 Link Cable, rack mount adapters, security caps

* Master Level control at maximum (fully clockwise).

[1] Input terminated with 150 ohms, A-weighted using Audio Precision System One.

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