AT-MX351 SmartMixer®
Automatic Mixer

Installation and Operation
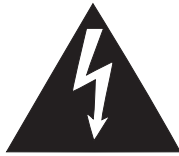
audio-technica®

Contents

Safety Cautions

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

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. Refer all servicing to qualified service personnel.

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.

Caution:

To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

Note: Line Voltage Selector Switch

You will find the line voltage selector switch on the bottom panel. Before your model is shipped from the factory, the switch is set to the power requirements of the destination. Nevertheless, you should check that it is set properly before plugging the power cord into the wall outlet. If the voltage requirements differ, adjust the selector switch as follows. Before adjusting, disconnect the power cord.

1. Provide yourself with a medium size screwdriver.

2. Change the position of switch to the proper voltage for your area.

Caution:

For continued protection against fire hazard, replace only with same type/rating of fuse.

Warning:

There are some sharp edges inside. To reduce the risk of injury, do not remove cover.

4

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.

What is a SmartMixer?

The AT-MX351 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 sources such as tape decks and VCRs. There is no signal processing of the Aux input. The mixer output is XLRM-type balanced, non-inverting.

All AT-MX351 and AT-MX341a 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-MX351 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-MX351'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-MX351 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-MX351 is shipped with the NOMA function switched off.

5

AT-MX351 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 11).

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.

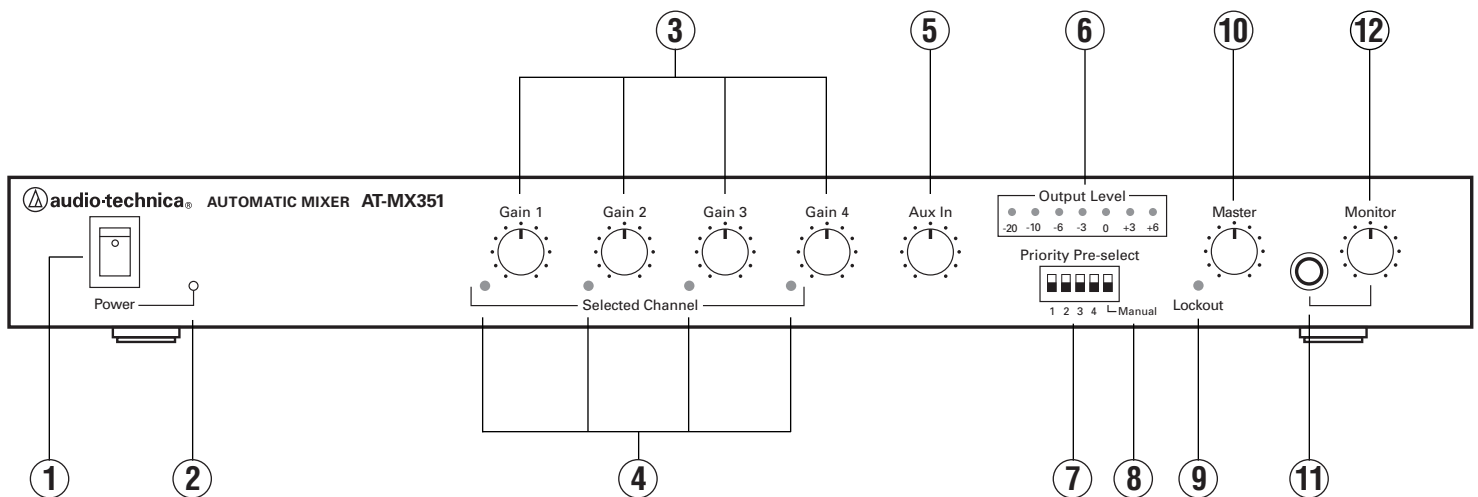12. **Monitor headphone level control.**

Figure 1. Front panel

6

AT-MX351 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 11). 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 11). XLRF-type connectors. Can supply 48V phantom power via internal switches.

8. **Power input.** 120V/230V AC, 50/60 Hz. Select input voltage via switch on bottom panel.
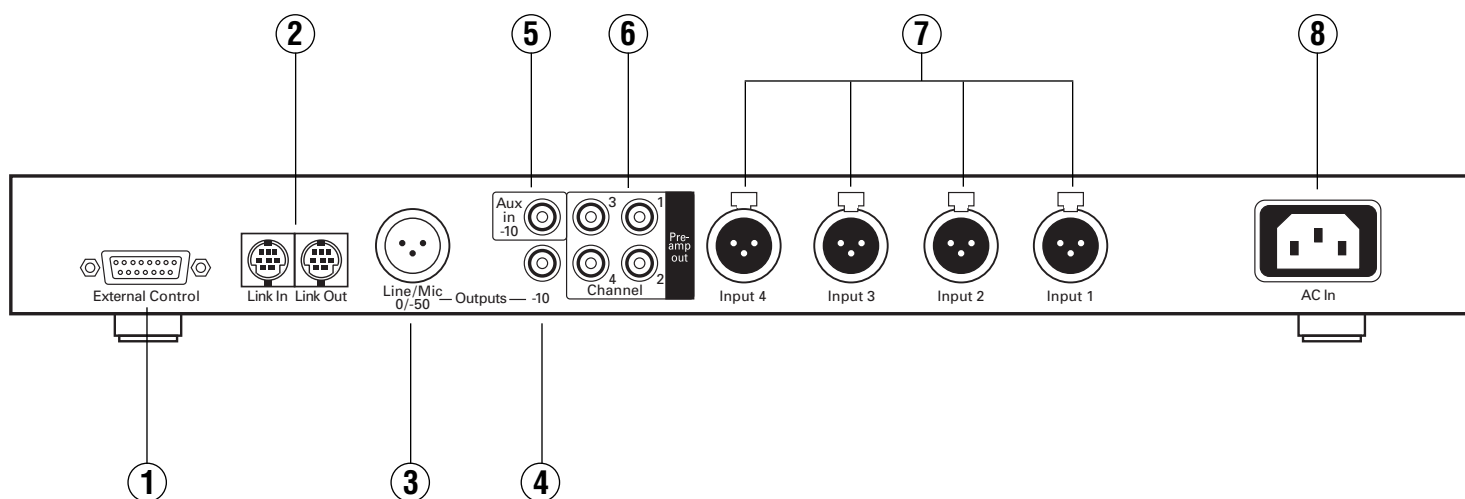
Figure 2. Rear panel

7

Installation and Setup

AT-MX351 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. Be certain the voltage switch on bottom of unit is set for the voltage of the outlet you are using.

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 override 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 override 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.

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 "SW25" (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 (–10 dBV) input from sources such as tape decks and VCRs. There is no signal processing of the Aux input.

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 "SW2," "SW8," "SW14" and "SW20" (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 "SW3," "SW9," "SW15" and "SW21" 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 "SW26" (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 "SW1," "SW7," "SW13" and "SW19" (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 "SW27" (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	SW1	SW7	SW13	SW19	
10 dB Input Atten.	SW2	SW8	SW14	SW20	
50 dB Mic/Line Atten.	SW3	SW9	SW15	SW21	SW26
Limiters (on/off)	SW4	SW10	SW16	SW22	
"Off" Atten. Range	SW5	SW11	SW17	SW23	
Preamp Output Gating	SW6	SW12	SW18	SW24	
Limiter Thresholds	VR2	VR5	VR8	VR11	
"Off" Atten. Adjustment	VR3	VR6	VR9	VR12	
NOMA	--	--	--	--	SW25
Meter RMS/Peak	--	--	--	--	SW27

Figure 3. Summary of internal controls

Rear Panel

SW26

SW25   SW27

Front Panel
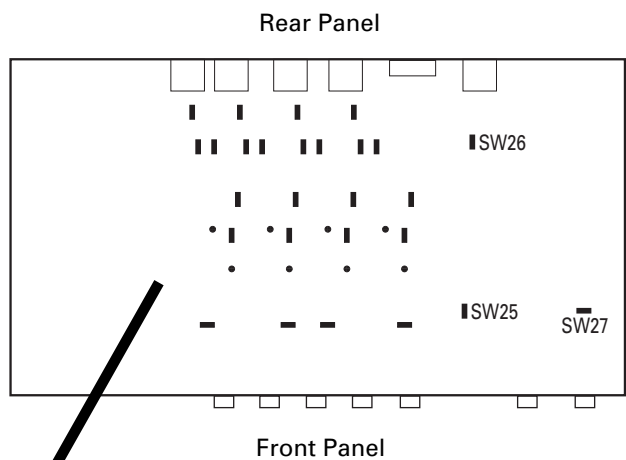
Figure 4. Internal view of mixer.

Mic   Mic   Mic   Mic

SW3 Line   SW9 Line   SW15 Line   SW21 Line

Phantom 40 dB   Phantom 40 dB   Phantom 40 dB   Phantom 40 dB   Line

SW1   SW2   SW7   SW8   SW13   SW14   SW19   SW20   Output   SW26

Off   30 dB   Off   30 dB   Off   30 dB   Off   30 dB   Mic

Off   Off   Off   Off

SW6   SW12   SW18   SW24

Gating   Gating   Gating   Gating

VR3   −20 dB   VR6   −20 dB   VR9   −20 dB   VR12   −20 dB

Min. −6 dB SW5   Min. −6 dB SW11   Min. −6 dB SW17   Min. −6 dB SW23

−40 dB   −40 dB   −40 dB   −40 dB

VR2   VR5   VR8   VR11

−10 dB +10 dB   −10 dB +10 dB   −10 dB +10 dB   −10 dB +10 dB

On   Meter

NOMA   SW25   SW27

Off   Peak   RMS

SW4   SW10   SW16   SW22

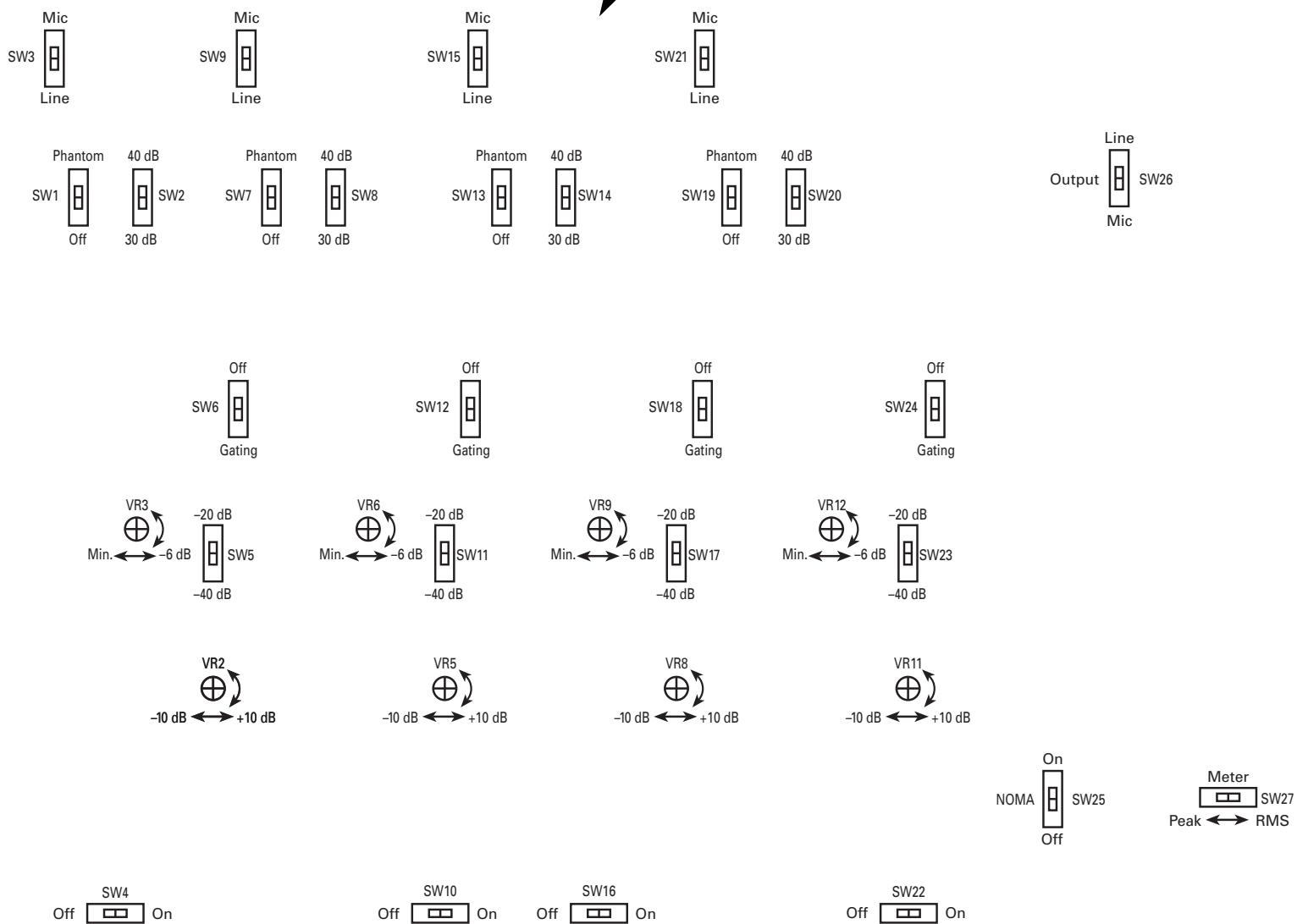Off   On   Off   On   Off   On   Off   On

Figure 5. Detail of internal controls.

11

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 "VR3" (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. VR6, VR9 and VR12 control "off" attenuation for channels 2, 3 and 4 respectively.

Changing the settings of the switches designated on the circuit board by "SW5," "SW11," "SW17" and SW23" 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 "SW6," "SW12," "SW18" and SW24" (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 "VR2" (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. VR5, VR8 and VR11 adjust limiter threshold for channels 2, 3 and 4 respectively.

Changing the settings of the switches designated on the circuit board by "SW4," "SW10," "SW16" and SW22" 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			

12

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 5 below.
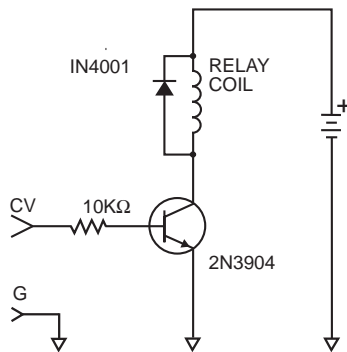
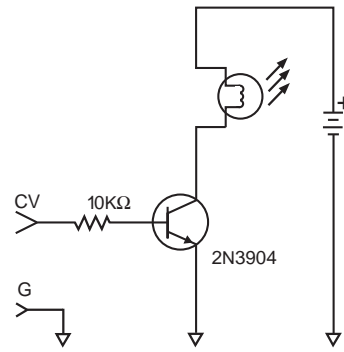**Equivalent Output Circuit for Control Voltage Out**

Driving One LED

$$I \approx \frac{2v}{R+40\Omega}$$
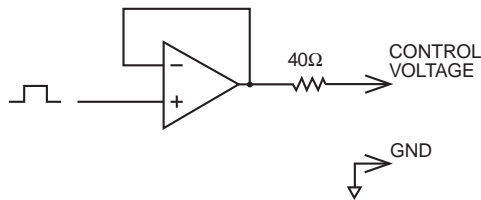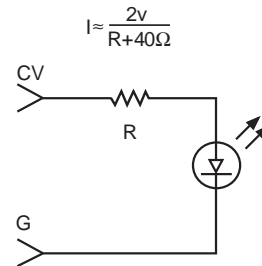
Relay Driver
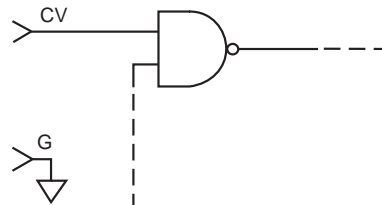
Driving Lamps

Driving Logic Gates

Figure 5. Control interface examples.

13

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-MX351 mixers through Link In/Out. If AT-MX351 mixers are linked with AT-MX341 and/or AT-MX341a mixers, the NOMA function will pass through the AT-MX341(a) 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 . . . . 300 ohms
        Mic . . . . 200 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 . . . . 120V/230V AC (switchable), 50/60 Hz, 10W

Operating Temperature . . . . 32° to 104° F (0° to 40° C)

Dimensions . . . . 16.93" (430 mm) W x 9.38" (327 mm) D x 1.75"
(44 mm) H (including feet, knobs and connectors)

Weight . . . . 6 lbs. 13 oz (3.1 kg)

Accessories Included . . . . AC power cable, AT8325/1.0 Link Cable,
rack mount adapters, security caps

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† In the interest of standards development, A.T.U.S. offers full details on its test
methods to other industry professionals on request.

* Master Level control at maximum (fully clockwise).

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

15

One-Year Limited Warranty

Audio-Technica brand products purchased in the U.S.A. are warranted for one year from date of purchase by Audio-Technica U.S., Inc. (A.T.U.S.) to be free of defects in materials and workmanship. In event of such defect, product will be repaired promptly without charge or, at our option, replaced with a new product of equal or superior value if delivered to A.T.U.S. or an authorized service center prepaid, together with the sales slip or other proof of purchase date. ***Prior approval from A.T.U.S. is required for return.*** This warranty excludes defects due to normal wear, abuse, shipping damage, or failure to use product in accordance with instructions. This warranty is void in the event of unauthorized repair or modification.

For return approval and shipping information, contact the Service Department, Audio-Technica U.S., Inc., 1221 Commerce Drive, Stow, Ohio 44224.

Except to the extent precluded by applicable state law, ***A.T.U.S. will have no liability for any consequential, incidental, or special damages; any warranty of merchantability or fitness for particular purpose expires when this warranty expires.***

This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

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