

Interfacing the Shure® MX395 Microphone with Polycom® SoundStructure®

Engineering Advisory 1021

Introduction

The [MX395 Specification Sheet](#) lists the following microphone options:

Available Models

The polar pattern of the cartridge is indicated by the model number suffix: C = Cardioid, O = Omnidirectional, BI = Bidirectional

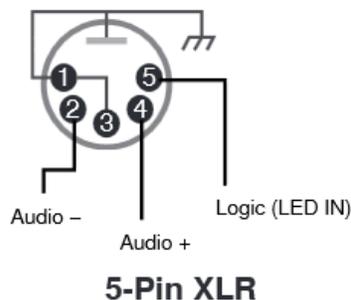
MX395B/C, MX395B/BI, MX395B/O	Black, 3-pin XLR
MX395AL/C, MX395AL/BI, MX395AL/O	Aluminum, 3-pin XLR
MX395W/O	White, 3-pin XLR
MX395B/C-LED, MX395B/BI-LED, MX395B/O-LED	Black, 5-pin XLR, logic-controlled muting functions, Bi-color Status Indicator Ring

This engineering advisory provides information on using the LED microphones MX395B/C-LED, MX395B/BI-LED, and MX395B/O-LED.

Pinout

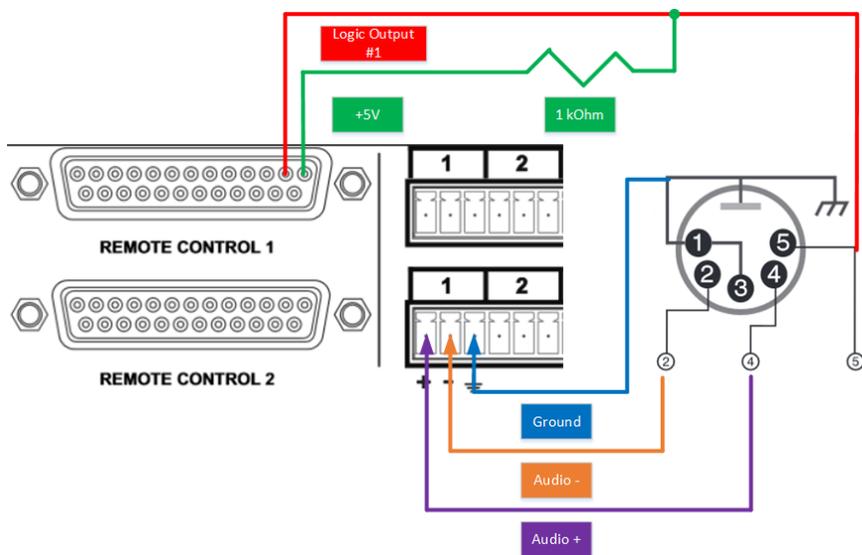
The following figure shows the pinout of the MX395 microphone from the [Shure MX395 User Guide](#).

MX395 pinout

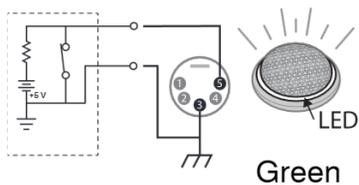


Wiring to SoundStructure

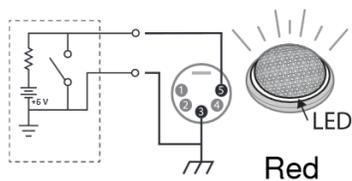
Each microphone needs to connect to a separate Analog channel and a separate Logic channel. In the following figure, the purple and orange signals represent the analog signals from the microphone. The ground signal in blue represents ground for both the Analog and the Logic signals. The Logic Output LED In signal is red and the +5V 1 kOhm pull-up resistor is shown in green.



The connection to the +5V Logic Output pin through the pull up resistor is needed due to the design of the microphone. When the LED In is shorted to ground, the MX395 microphone LED is Green. When the LED In is tied to +5V, then the MX395 microphone LED is Red, as shown in the following figure from the [Shure MX395 User Guide](#).



0 V c.c.



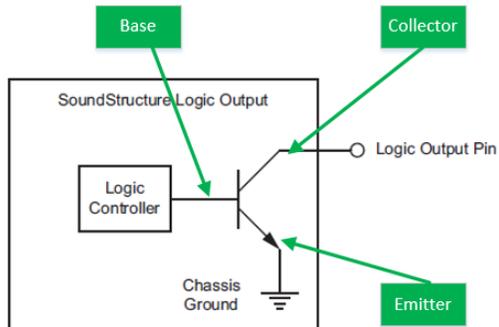
5 V c.c.

The pull-up resistor is needed for the following reasons:

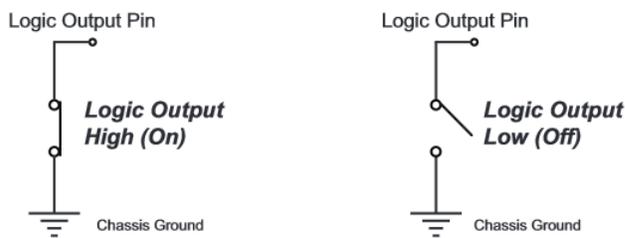
- To bias the Logic Output to +5V when the Logic Output is off.
- To limit the +5V supply from the SoundStructure when the +5V pin on the logic port is shorted to ground to prevent excessive loading of the +5V supply and possible damage to the Logic Output.

SoundStructure uses an Open-Collector Logic Output so that the collector pin of the bi-polar junction transistor is open and not actively connected when there is no active connection on the Logic Output. The

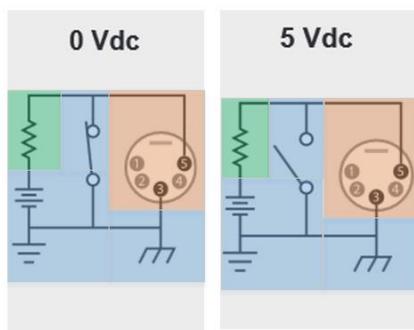
pull-up resistor is needed to create a voltage that is compatible with the MX395 microphone in order to change the internal LED to red, as shown in the following figure from the [Hardware Installation Guide for the Polycom SoundStructure](#).



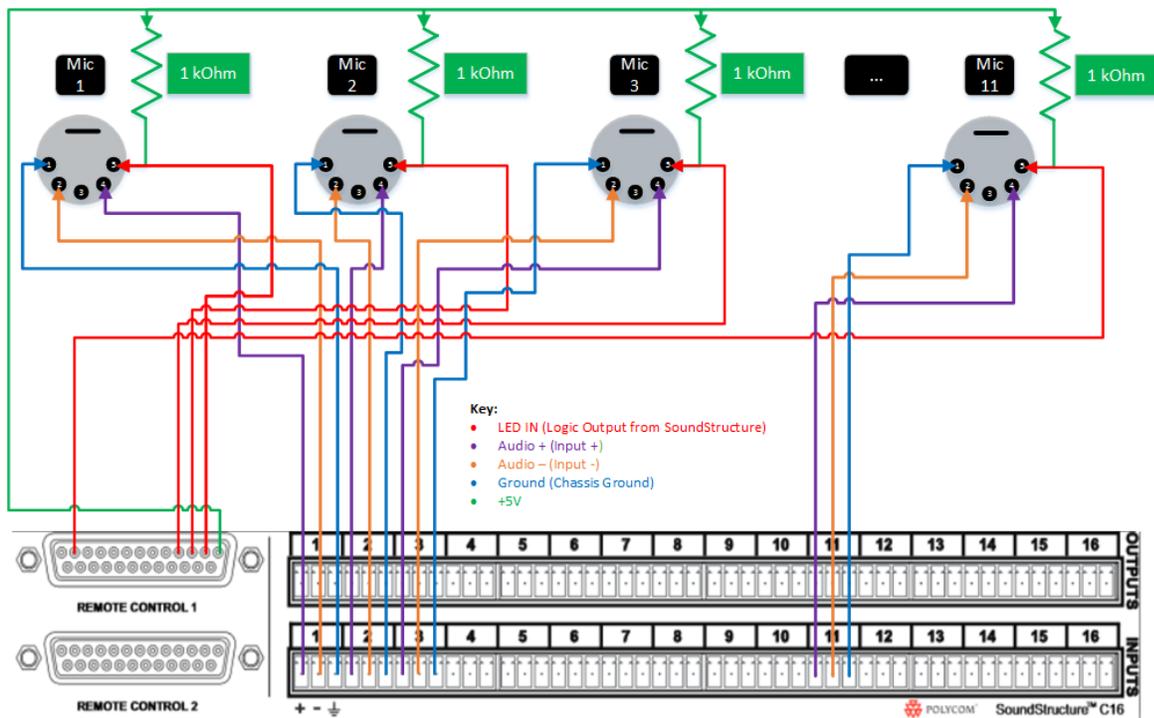
Based on the Logic Controller voltage, the transistor is either on or off, as shown in the following figure from the [Hardware Installation Guide for the Polycom SoundStructure](#).



Comparing the MX395 microphone recommendations to the SoundStructure implementation of the Logic Output where the SoundStructure internal components are shaded in blue, the external resistor is shaded green, and the external microphone is shaded orange:



The following figure shows all required connections for up to 11 microphones connected to one logic port. The ground from the logic port is unnecessary, as explained in section [Explanation of the Invert Check Box and Negative Logic Output](#).



SoundStructure Configuration

After the microphones are wired to the chassis, use SoundStructure Studio to configure the chassis. Note that the process is the same regardless of the number of microphones or the number of chassis linked via One Big Audio Matrix (OBAM).

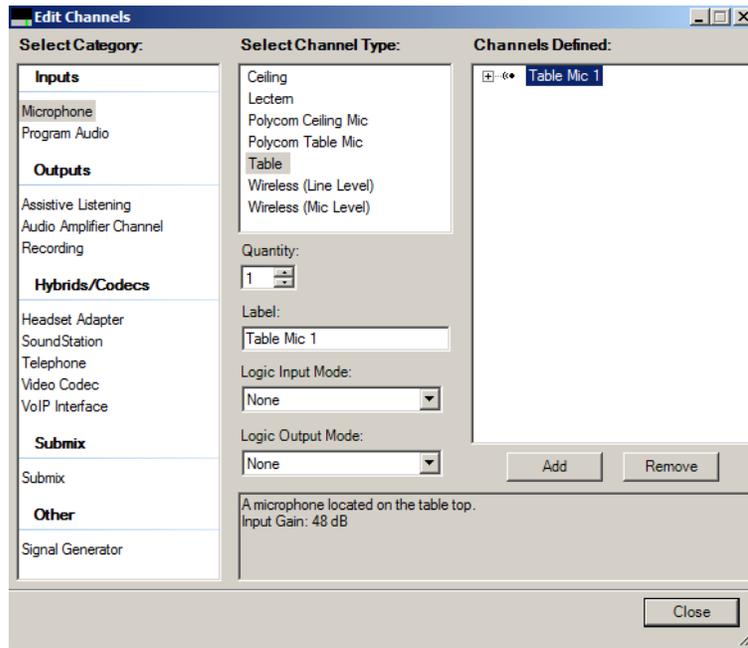
Example SoundStructure Microphone Configuration

In this example configuration, we are adding a Table Mic. Optionally, you could change the Logic Output Mode from None to either Activate on Mute, Activate on Unmute, or Activate on Gate, and that quickly populates the Logic and Events. In this engineering advisory, these steps are done manually so as to better explain what is needed to make the design work.

To configure microphones for SoundStructure:

- 1 Select a **Channel Type** and click **Add**.

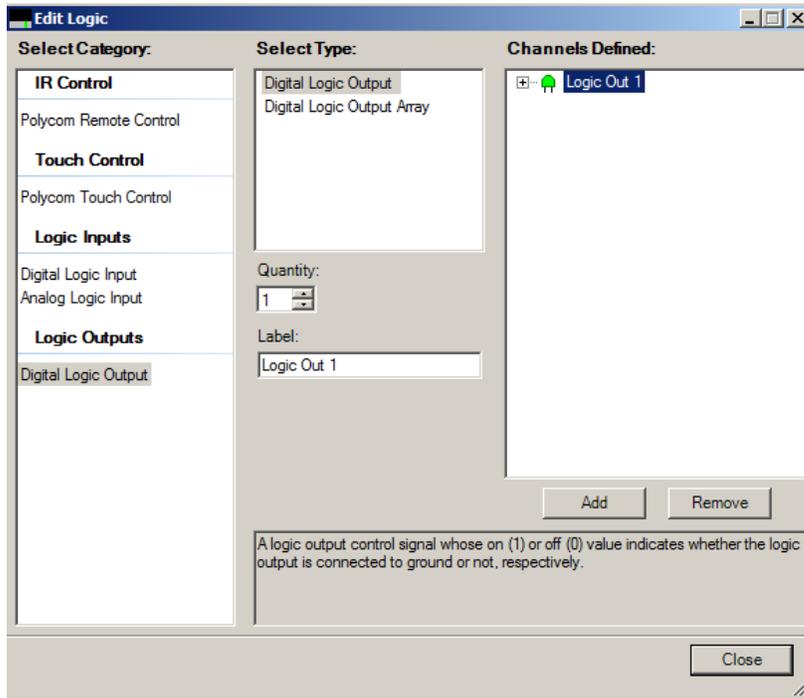
The microphone is displayed in the **Channels Defined** box, as shown next.



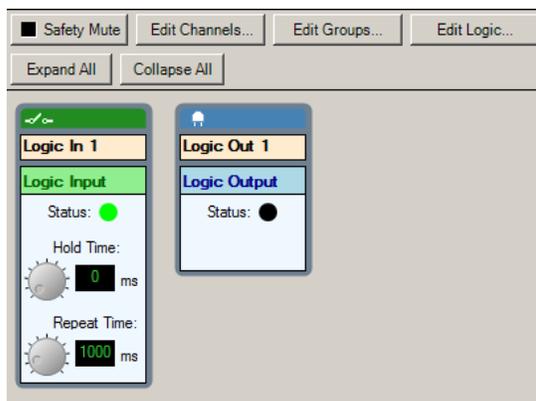
- 2 Navigate to the **Channels** page and verify that *Table Mic 1* was added.



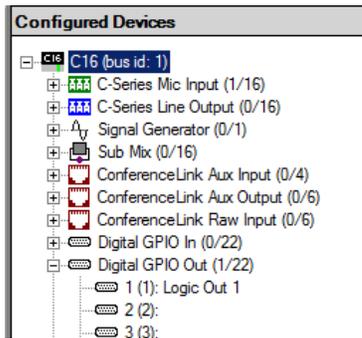
- 3 Click the **Edit Logic** button at the top of the page, and add a **Digital Logic Output** into the system. In the following figure, the label is changed to *Logic Out 1*.



- 4 Navigate to the **Logic** page and verify that the Digital Logic Output was added, as shown next.



- 5 Navigate to the **Wiring** page and verify that *Logic Output 1* is on the correct Logic Output pin. If not, drag *Logic Out 1* to another pin.



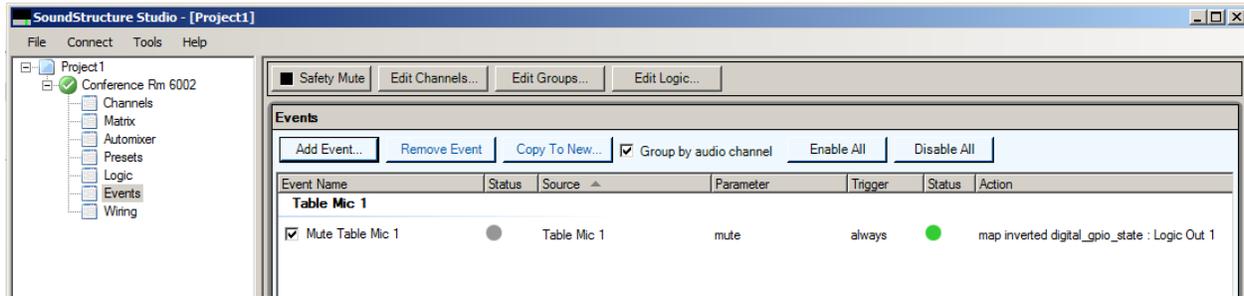
- 6 Navigate to the **Events** page and click the **Add Event** button.

- 7 There are several things to note on this page:

- Rename the **Event Name** to something that is descriptive. In this example, the event is named *Mute Table Mic 1*.
- Make sure the source event is correct. For this microphone, **muting (mute)**, **gating (am_gate)**, or **camera gating (am_camera_gate)** are the most ideal sources to use.
- Verify that the channel assigned to the source is correct. In this example, Table Mic 1 is the channel we want to use.
- Confirm the trigger is set to **Always**.
- Confirm the action is set as **Map Parameter**.
- Confirm the **Invert** check box is checked. This is explained further in the section [Explanation of the Invert Check Box and Negative Logic Output](#).
- Set the parameter to **digital_gpio_state** in order to route the source event to the correct output. The resulting action should be tied to the Logic Out 1 logic event previously defined.



Your event should be similar to the following figure.



To verify that the SoundStructure logic is working correctly, note the Status indicators. Since the source was the mute command, we can easily toggle the mute to verify that the state is changing. Note that when the Source status is off, it displays as gray and when the Action status is on, it displays as green.

Event Name	Status	Source	Parameter	Trigger	Status	Action
Table Mic 1						
<input checked="" type="checkbox"/> Mute Table Mic 1	●	Table Mic 1	mute	always	●	map inverted digital_gpio_state : Logic Out 1

When the mute is on, this is the expected result. Note that the Source status is on (green) and the Action status is off (gray).

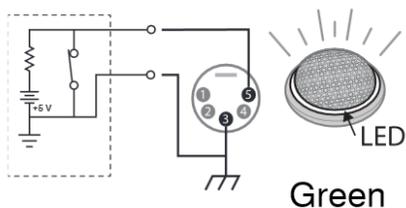
Event Name	Status	Source	Parameter	Trigger	Status	Action
Table Mic 1						
<input checked="" type="checkbox"/> Mute Table Mic 1	●	Table Mic 1	mute	always	●	map inverted digital_gpio_state : Logic Out 1

If the function of the Status indicators is unclear, see the section [Explanation of the Invert Check Box and Negative Logic Output](#).

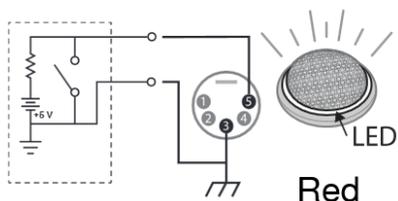
After you finish making your logic and event changes, save the changes to a full preset.

Explanation of the Invert Check Box and Negative Logic Output

To summarize, 0V = Green and 5V = Red, as shown in the following figure from the [Shure MX395 User Guide](#).

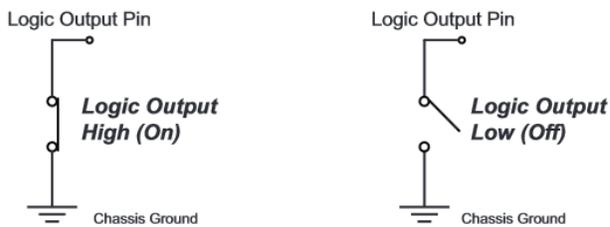


0 V c.c.



5 V c.c.

So, when the Logic Output is On, then the Logic Output pin is shorted to ground, as shown in the following figure from the [Hardware Installation Guide for the Polycom SoundStructure](#). Conversely, when the Logic Output is Off, then the Logic Output pin is open with respect to ground.



One of the functions of the 1 kOhm resistor, as shown in the section [Wiring to SoundStructure](#), is to act as a pull-up resistor to +5V such that when the Logic Output is off, the LED In wire to the microphone remains at +5V. The other function of the resistor is to limit the current when the Logic Output is on and shorted to ground from the +5V supply.

The Logic Output operates via negative logic. When the Logic Output is off, the voltage on the LED In wire equals +5V, and when the Logic Output is on, the voltage on the LED In wire equals 0V.

Using the previous example where the Source command was mute, when the mute is off, the Source status is off and displays gray and the Action status is on and displays green. Note that the Action status represents the state of the Logic Output pin, which in this case is on and shorted to ground, as shown next.

Event Name	Status	Source	Parameter	Trigger	Status	Action
Table Mic 1						
<input checked="" type="checkbox"/> Mute Table Mic 1	●	Table Mic 1	mute	always	●	map inverted digital_gpio_state : Logic Out 1

From a voltage perspective on the LED In wire, the on state of the SoundStructure Logic Output means that the +5V pull-up resistor is grounded so the LED In wire equals to +0V, which makes the LED in the MX395 microphone turn green. The green colored LED represents the state of the microphone when it is unmuted and live.



Note that the Source status is on and displays green, and the Action status is on and displays green.

Event Name	Status	Source	Parameter	Trigger	Status	Action
Table Mic 1						
<input checked="" type="checkbox"/> Mute Table Mic 1	●	Table Mic 1	mute	always	●	map inverted digital_gpio_state : Logic Out 1

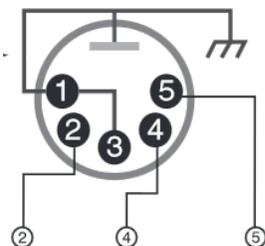
From a voltage perspective on the LED In wire, the off state of the SoundStructure Logic Output means that the +5V pull-up resistor forces the LED In wire to equal +5V, which makes the LED in the MX395 microphone turn red. The red LED represents the state of the microphone when it is muted.



Additional Notes

Grounding

The following figure from the [Shure MX395 User Guide](#) shows a pinout with pins 1 and 3 shorted together.



As a result, only one ground connection is needed from SoundStructure to the microphone. The easiest way to ground the microphone is via the chassis ground connection on each analog input of the SoundStructure. Inside the SoundStructure, the chassis ground and the logic ground are tied together.

LED In

Shure designed the MX395 microphone to power the LED from the Phantom Power, as shown in the following figure from the [MX395-LED and MX400SMP](#) page.

Based on development research for the MX395-LED and MX400SMP, RFI immunity improved when XLR pin 4 and pin 2 were used for the audio signal.

Pin 1: cable shield

Pin 2: Audio -

Pin 3: Logic Ground for the LED

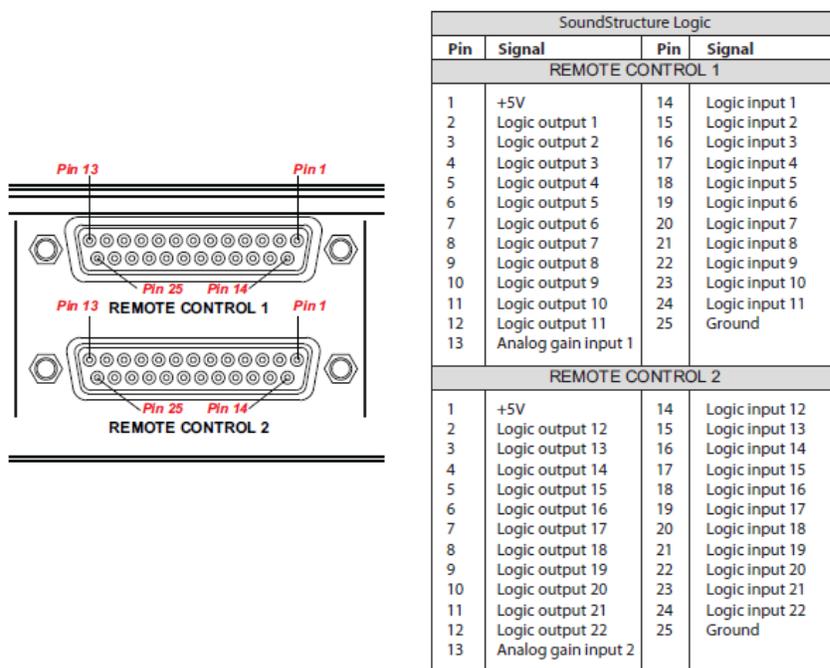
Pin 4: Audio +

Pin 5: Logic Input Control for the LED

Note 1: The LED operating voltage and current is provided by the phantom power. A dim LED indicates insufficient current provided to pin 2 and pin 4.

Reference Drawings

The following figure shows the logic port on SoundStructure.



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