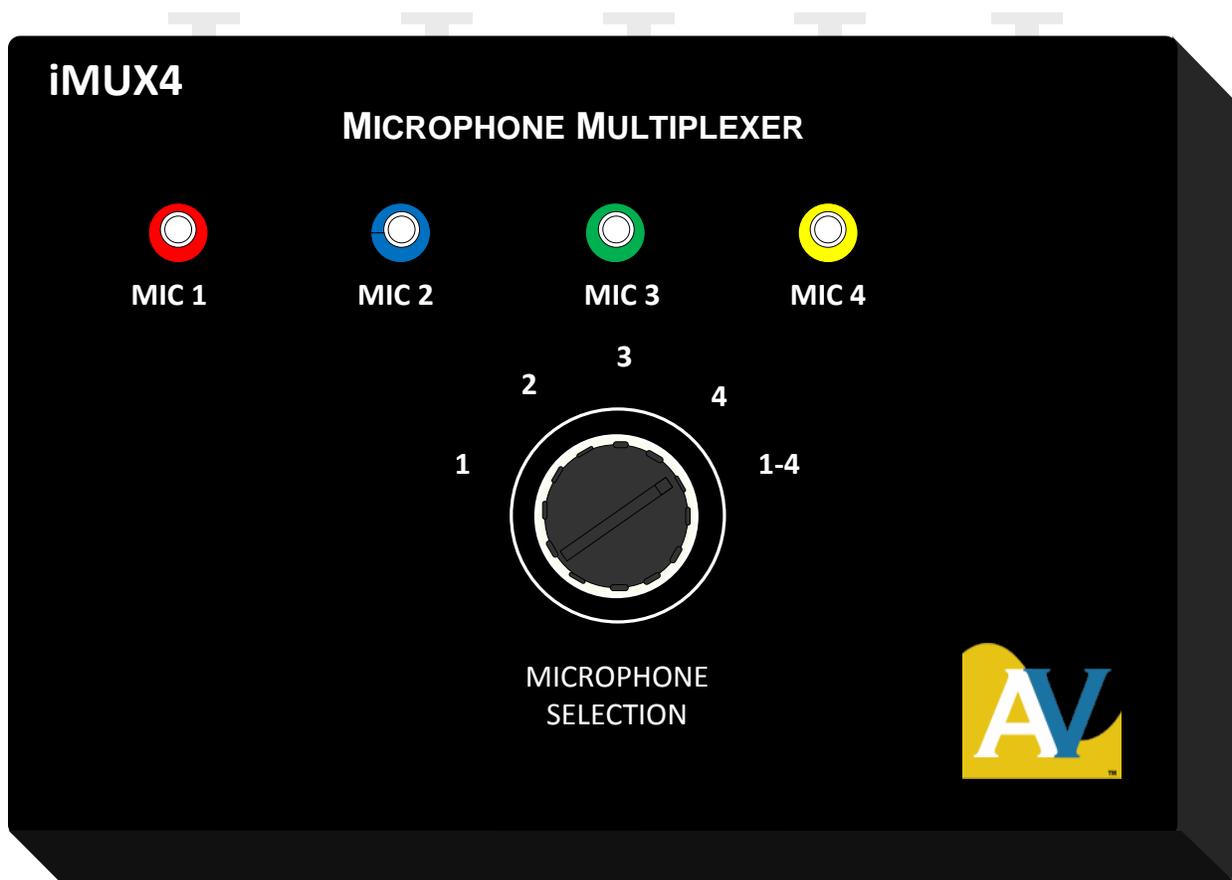


iMUX4

PROFESSIONAL MICROPHONE MULTIPLEXER

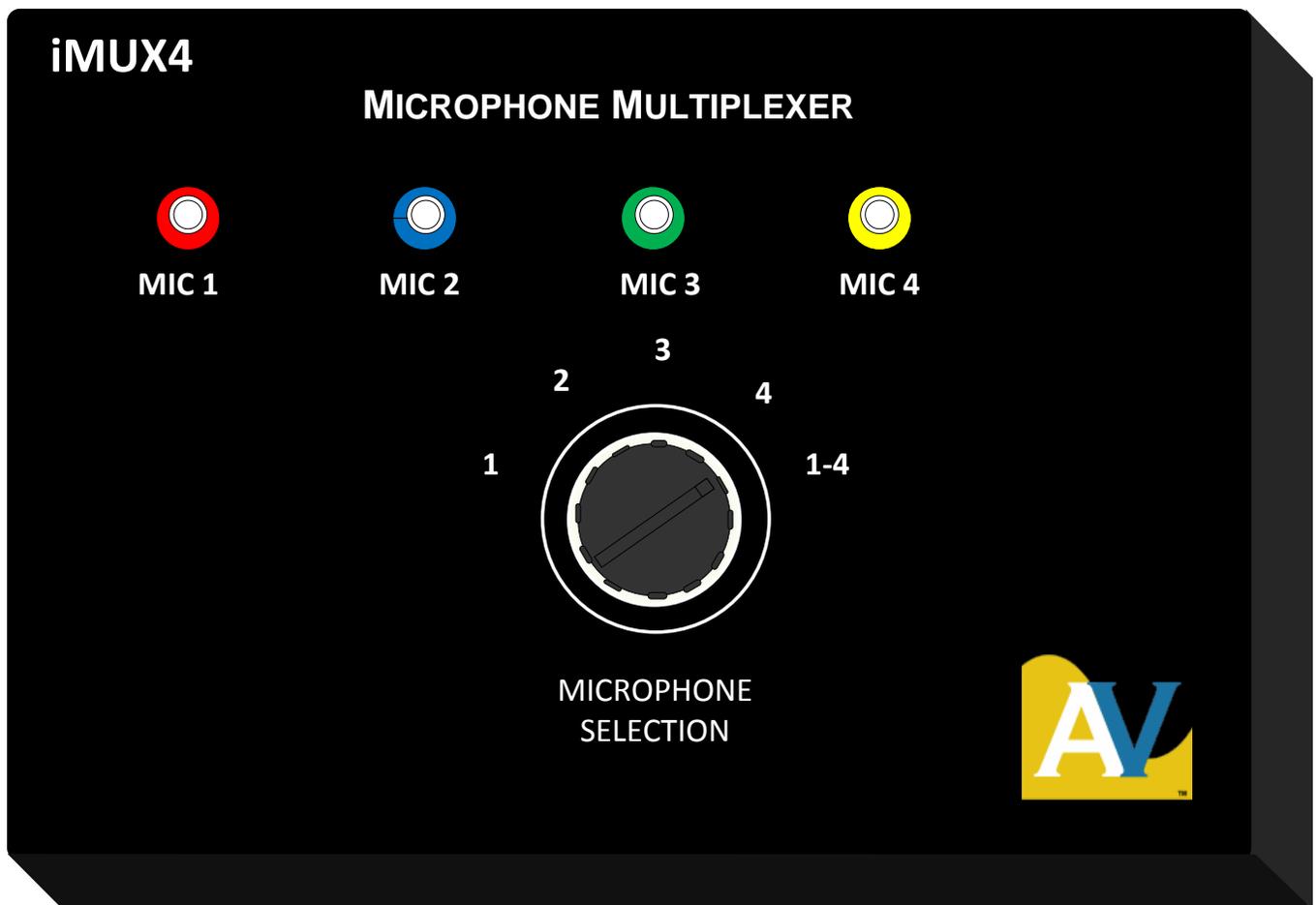
Operation and Application Manual



iMUX4

PROFESSIONAL MICROPHONE MULTIPLEXER

Operation and Application Manual



AVPROALLIANCE.COM
PO Box 90703, Sioux Falls, SD 57109

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WARNING

Please observe these Safety Precautions

There is always a danger present when using electronic test equipment. Unexpected voltages can be present at unusual locations in defective equipment and distribution systems. Become familiar with the equipment with which you are working, and observe the following safety precautions.

Every precaution has been taken in the design of the iMUX4 to insure that it is as safe as possible. However, safe operation depends on you, the operator.

1. **Never exceed the limits of the iMUX4** as given in the specification section or other special warnings in this manual.
2. **Always be sure that your equipment is in good working order.** Broken or frayed test leads or cables can be dangerous exposing you to circuit voltages.
3. **Remove test leads** immediately following measurements to reduce the possibility of shock.
4. **Do not work alone when working under hazardous conditions.** Always have another person available in case of an accident.
5. **Never assume that a cable shield is at earth ground potential.** Both static and electrical voltages can be present on a cable's sheath.
6. **Always follow standard safety procedures.**

When in doubt, be careful.

DESCRIPTION

Introduction

The iMUX4 Microphone Multiplexer is the perfect instrument to expedite the testing, adjustment, and documentation of the acoustically averaged frequency response of cinema theaters, home theaters, churches, halls, banquet rooms, meeting rooms, clubs, or any other venue in which great sound in the least amount of time is a requirement. The iMUX4 features common XLR input and output microphone connections.

Because room resonance modes cause different low frequency response in different parts of any small room, equalizing the response for multiple listening positions can be a long process of repeated measurements at multiple locations and change-and-check equalization adjustments. Adjusting for smooth response in just one or two listening positions may leave other positions with uneven, boomy, or wimpy bass response. Averaging multiple measurements manually is time-consuming and doesn't give you a

real-time display to immediately indicate results of room adjustments.

The iMUX4 Microphone Multiplexer, with a high resolution RTA, provides measurements of the average response of a listening room or multiple listening positions. This allows you to position subwoofers or adjust equalizers as you immediately see the measured results of your adjustments. When you complete your adjustments, you can store one RTA measurement to document the average response of the room.

Features

- Provides a single, spatially-averaged acoustic input from up to four microphone positions for Real Time Analyzer measurements.
- Provides a continuously updated average measurement of the overall response of the listening area to allow easy equalization adjustments and average response documentation.
- Avoids the problem of making room adjustments based on the acoustic response of just a single point in a room or of manually averaging measurements to determine needed adjustments.
- Performs four microphone multiplexed sampling, as used by all major cinema/home theater organizations, for a good average of overall room response.
- Measure the averaged output of two, three, or four attached microphones, or monitor individual microphones for gain equalization.
- Internal microphone supply voltages and preamps eliminate the need for extra boxes and simplify setup.
- Portable, battery-operated design eliminates the need for AC power connections.
- Unit power is controlled by phantom voltage from the connected RTA.

Specifications

Frequency Response: 20Hz-20kHz +/- 2 dB
Dynamic Range: 30 dB to + 120 dB (SPL) input

Inputs

Microphone Inputs: Four
Type: Balanced
Connector: XLR Female
Input Impedance: 40 kohms nominal
Frequency Response: 20Hz – 20kHz +/-2 dB
Dynamic Range: 25dB to = 120dB SPL
Maximum Input Level: 135 dB SPL
Gain Adjustment: ±4 dB
Phantom Mic Power: 48 volts

Output

Output: One
Type: Balanced
Connector: XLR Male (Pins 2 & 3 signal, pin 1 ground)
Output Impedance: 110 ohms +/- 20%

Microphone Selection: Manual selection of Mic 1, Mic 2, Mic3, or Mic 4.
Automatic alternating switched selection of attached microphones.

Microphone Switching: Approximately one second dwell time per microphone
Mic. Dwell Time Range: 0.5 sec to 1.5 sec. (Factory adjusted to approx. 1 sec.)

Power

Power: Internal 9 V battery Pack (6 AA cells)
Power Switching: Controlled from RTA (Phantom voltage on/off)

General

Case: Metal
Size: (3.25" x 7.5" x 4.25") HWD
Weight: 1 lb. 5 oz. w/supplied battery installed

Controls

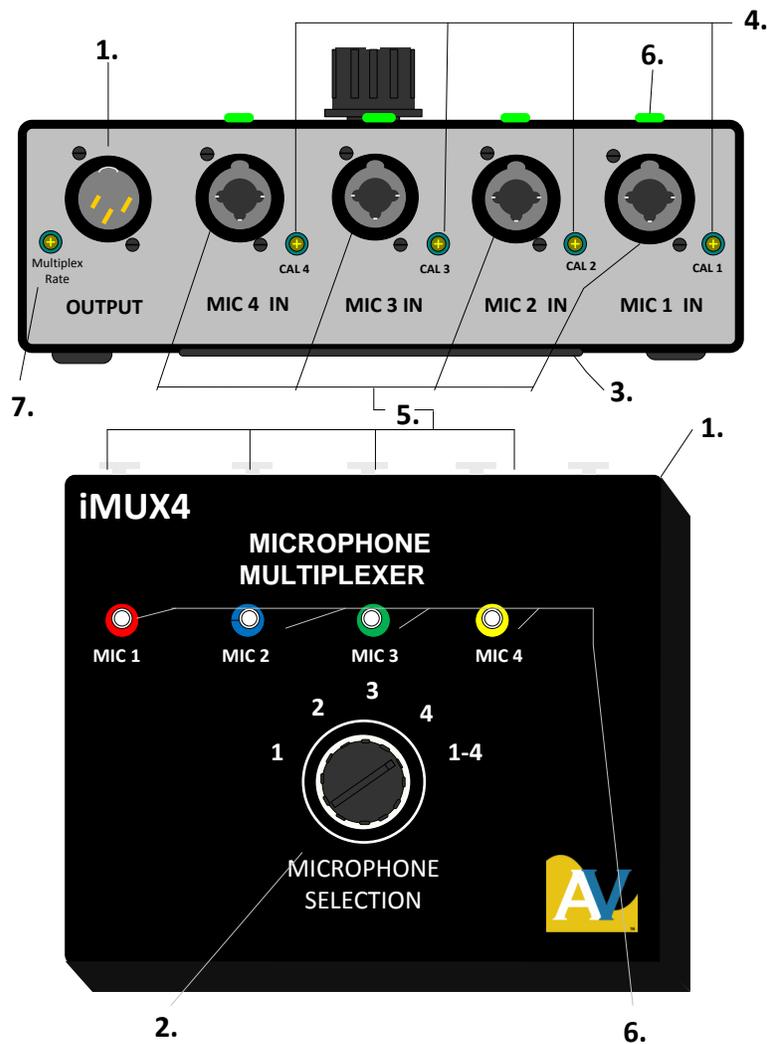


Figure 1. iMUX4 Controls

1. **MIC OUTPUT CONNECTOR:** Connects output of iMUX4 to the MIC INPUT jack of the RTA for sound measurements.
2. **MICROPHONE SELECTION SWITCH:** Switches the microphone inputs (5) to the MIC INPUT Connector (1).
3. **BATTERY COMPARTMENT:** Contains AA batteries used to power the iMUX4 and provide phantom power to microphones.
4. **CAL 1, 2, 3, 4 MIC LEVEL CALIBRATE ADJUSTMENTS:** Variable gain controls to adjust the microphone input levels for proper calibration of the individual microphones.
5. **MIC 1, MIC 2, MIC 3, MIC 4 INPUT CONNECTORS:** Connects the external individual microphones to the inputs of the iMUX4.

6. **LED(s) TEST CONDITION INDICATORS:** A LED indicates the RTA is connected and turned on to activate the iMUX4. Constant LED illumination indicates that microphone input is selected and a microphone is connected and powered. Flashing LEDs indicate low batteries which can produce erroneous measurements.
7. **MULTIPLEX RATE CONTROL:** Adjusts dwell time or the time each microphone is sampled.

Supplied Accessories

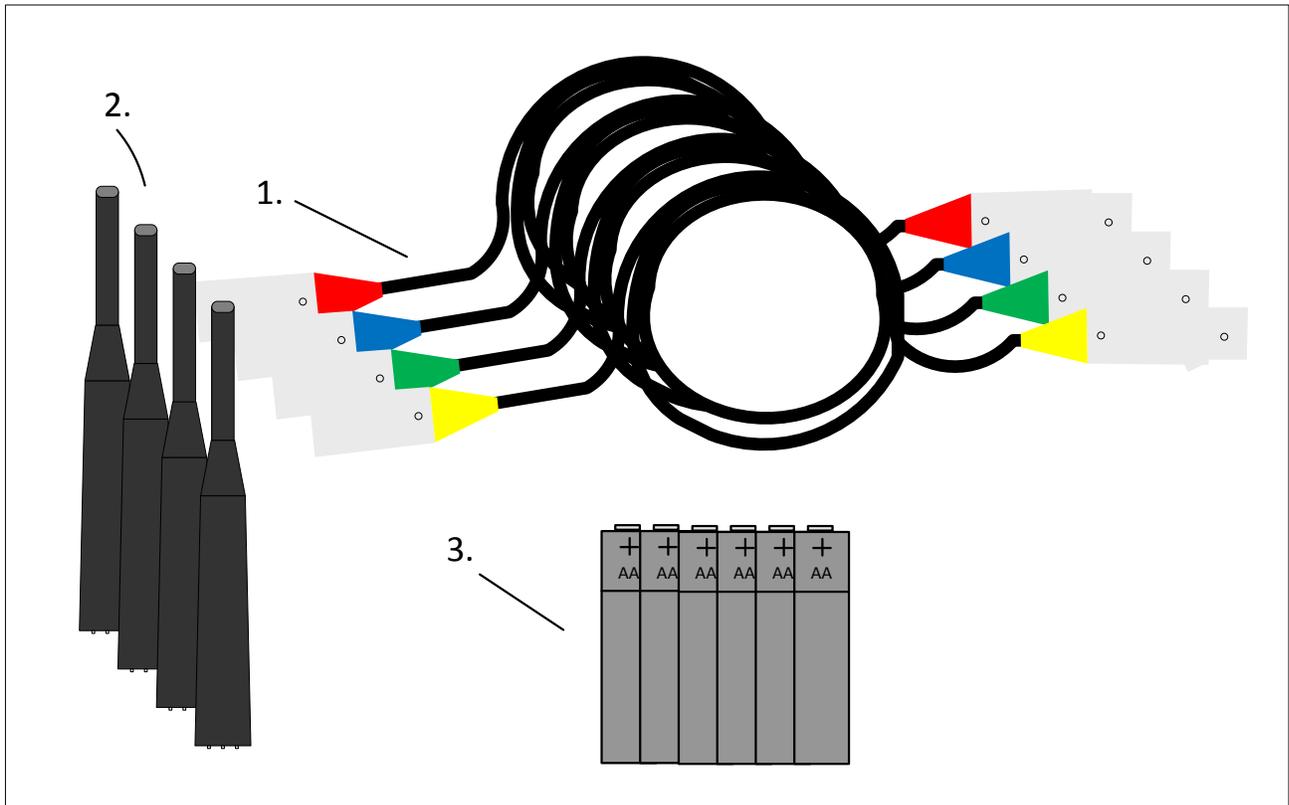


Figure 2. Accessories

1. (4) color coded 20 foot microphone extension cables, XLR male to XLR female (13G122): Connects the individual microphones to the MIC INPUTS of the iMUX4. Five cables are supplied with the iMUX4 including the jumper to the RTA
2. Microphone (39G1156): Meets or exceeds ANSI S1.4 Type 2 specifications. Measurement microphones that connect to the MIC Inputs of the iMUX4. Four microphones are supplied with the iMUX4.
3. AA Batteries: Comprise nine volt battery pack to power the iMUX4. Six batteries are supplied with the iMUX4 to be installed into the battery compartment.
4. Case (not shown): Your iMUX4 is installed in an intuitively designed case designed for rapid deployment and secure storage of cables, microphones, and accessories ready for use.

Kit Accessories (Kit Only)



Figure 3. Studio Six Digital iAudioInterface2 (iAI2) (available from AVProAlliance.com)



Figure 4. Reed SC-05 microphone calibrator (available from AVProAlliance.com)



Figure 5. Microphone with 9/32" grommet sound seal used to seal microphone inlet while using Reed SC-05 calibrator

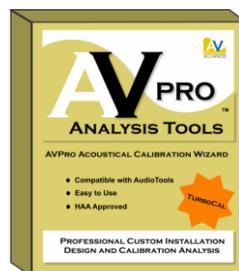


Figure 6. AVPro 2.0 Software; Home Theater acoustical analysis, design and calibration wizard (available from AVProAlliance.com)

OPERATION

Introduction

The iMUX4 Microphone Multiplexer connects to a variety of XLR based RTA's to provide acoustic analysis of rooms using multiple microphones. Be aware that the microphones use inverse polarity and a 48v phantom voltage when setting up your RTA. The iMUX4 provides accurate sound speaker equalization by enabling the simultaneous use of up to four microphones placed throughout the room. Due to the inherent signal to noise ratio of Type 2 microphones and the switching circuit of the iMUX4, it is recommend to drive your test tone to a level of at least 70 dB SPL for best results. Care should be taken to periodically calibrate your iMUX4 with your RTA. This includes alignment of microphone #1 with the RTA and then each remaining microphone with the first. AVProAlliance.com recommends the Reed SC-05 for this function.

Power – On/Off Switching

The iMUX4 contains no on/off switch. The iMUX4 circuitry is powered by a 9 volt battery pack consisting of 6 AA batteries mounted inside the battery compartment of the iMUX4. Phantom microphone voltage supplied to the unit from the RTA switches on the iMUX4. The phantom microphone voltage is supplied from the RTA ANALOG INPUT jack to the "OUTPUT" jack on the iMUX4.

The RTA (or iAI2) must be connected, powered on, and the phantom voltage of 48V selected in the top tool bar before microphone voltage is output to the iMUX4 and its internal circuits are powered on.

LEDs on the iMUX4 provide an indication when the unit is powered on and ready for operation. When any LED is blinking or illuminated, the iMUX4 is powered on and ready for use. Erratic LED blinking indicates new batteries are required.

Battery Installation/Replacement

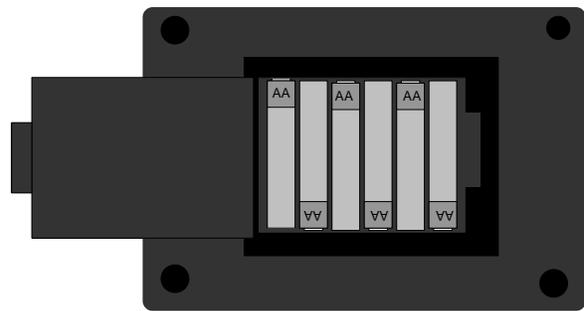


Figure. 7 The iMUX4 battery compartment

The AVPro iMUX4 requires six AA batteries for proper operation. The iMUX4 draws very little current from the batteries, so the battery lifetime will be close to 24 hours. The batteries are replaceable.

To install or replace the AA batteries:

1. Remove the battery compartment on the iMUX4 by gently releasing the tab holding the battery compartment door.
2. The battery compartment door releases and may be lifted away. Lift gently and remove the cover.
3. Pull each of the batteries out of the battery compartment.
4. Install AA batteries into the battery compartment observing proper polarity.
5. Reinstall the battery compartment door.

Microphone Selection Switching

The iMUX4 has four separate microphone inputs. These inputs are switched to the RTA or iAI2 ANALOG INPUT jack by the five-position MICROPHONE SELECTION switch on the iMUX4. The first four positions are labeled 1, 2, 3, and 4. These positions switch only the respective single microphone input to the RTA. These positions are used to calibrate the individual mic inputs or to monitor the response of only one location in a multiple microphone setup.

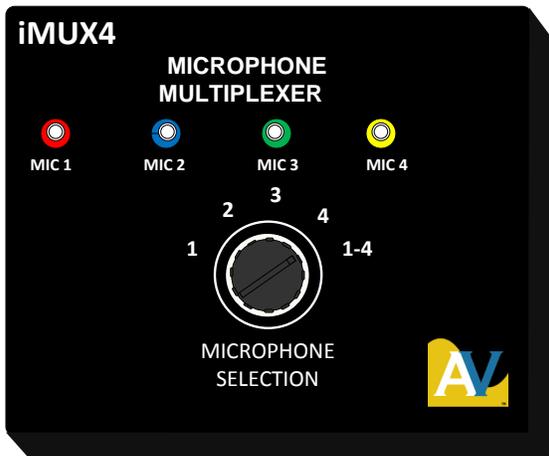


Figure 8. Microphones are selected or multiplexed to the RTA with the MICROPHONE SELECTION switch. LEDs indicate which microphone(s) are selected or active.

The fifth position of the MICROPHONE SELECTION switch is labeled “1-4.” This position electronically selects each of the iMUX4’s MIC IN jacks momentarily. The iMUX4 alternately switches to each of the active microphone inputs, providing a path from these inputs to the OUTPUT jack.

To multiplex between microphones to analyze with the iAI2 connected to AudioTools iPad App:

1. Connect a cable from the iAI2 Microphone jack to the iMUX4’s OUTPUT jack. Power up the iAI2 and open AudioTools. Once the iAI2 is connected to the iPad there should be an indication that the audio interface is connected. In AudioTools select Settings then Microphone Setup. Select the iAI2 microphone input and confirm calibration. Select position “1-4” on the iMUX4 MICROPHONE SELECTION switch.
2. Connect desired microphones to iMUX4 MIC IN jacks.
3. LED indicators indicate the MIC Inputs that are being alternately selected by the iMUX4.

The dwell time, or time each MIC Input is selected, is factory set by the iMUX4 internal circuits to about one second. This time has been optimized for Real Time Analyzing (RTA) when using AudioTools. This time can be made longer or shorter for special applications by changing the Multiplex Rate control located near the OUTPUT jack of the iMUX4.

The multiplex switching action is done only between active MIC Inputs. An iMUX4 MIC Input jack is active if a microphone is connected to the jack. MIC IN jacks that do not have a microphone connected to them will be omitted from the multiplex switching sequence.

Each active microphone input is selected for approximately one second. The MIC input selected is indicated by an illuminated LED. As different inputs are alternately selected, the different LEDs light, indicating multiplex switching.

NOTE: MIC Inputs are active only when a microphone is connected and drawing current from the iMUX4. If a microphone is not connected to a particular input, the iMUX4 will not switch to that MIC In jack. This permits the iMUX4 to multiplex switch to only the active inputs. In this manner, the iMUX4 can multiplex switch between 2, 3 or 4 active microphones.

Microphone Input Calibration Controls

The calibration control for each microphone input is located beside each of the MIC IN jacks. The CAL controls are multi-turn pots, adjustable with a miniature screw driver (not provided).

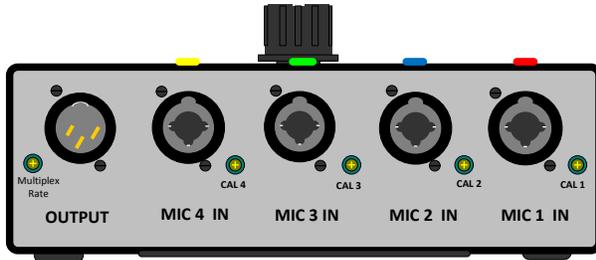


Figure 9. Calibration controls on each microphone input provides level adjustment for accurate measurements

The calibration controls are used to adjust the level from each microphone input to the iMUX4. Each microphone and its respective input should be calibrated to a reference level before using the iMUX4. This insures that each microphone and its respective input of the iMUX4 is providing a proper level to the RTA.

The microphones supplied with the iMUX4 are labeled as MIC 1, MIC 2, MIC 3, and MIC 4. Your iMUX4 comes pre-connected to the proper cables and microphones; observe the color coding when reconnecting; Mic 1: Red, Mic 2: Blue, Mic 3: Green, and Mic 4: Yellow. You should periodically verify proper calibration using the procedures below. Microphones can change over time and use so it's essential to check it for best accuracy of your *measurements*.

iAI2 Microphone Calibration

The microphone calibration controls in Studio Six Digital AudioTools App are located in the "Settings" menu under "Microphone Setup". Once you have your system properly connected and powered up you should see the iAI2 microphone indicated as an input source option. Select it by touch indicated by the field becoming

yellow. Select the blue arrow on the right for the calibration menu.

1. Select Mic 1 on the iMUX4.
2. Insert the microphone into the microphone calibrator with sound seal grommet ~.75 inch from end (see picture pg. 7) and select the 94 dB test tone on the calibrator.
3. In the AudioTools Microphone Calibration menu:
 - a. Switch the 48v phantom power to on and select reverse polarity. Confirm the LED is lit for Mic 1.
 - b. Select Low Range and set the Gain Setting to 35 dB for starters.
 - c. Now touch the dB level box. This will reveal the iPad keyboard. Enter 94 dB and touch "Done". This will change the trim box to the required trim.
 - d. If the trim is between -2 and -7 dB you've got it. If not, try a different Gain Setting and repeat the procedure.
4. Now, move the microphone calibrator to Mic 2 and select Mic 2 on the iMUX4.
5. Adjust the trim screw near the input on the iMUX4 until this Mic also reads 94 dB in AudioTools. Don't change the trim in AudioTools.
6. Repeat for all microphones.

You may find that you'll need to readjust Mic 1's trim control up or down if you do not have enough adjustment available on the other trim screws. **NOTE:** Add a new input source in AudioTools and calibrate this for Mic 1 connected directly to the iAI2 (bypassing the iMUX4) for low noise requirements. This is desired for ambient noise or ETC measurements.

APPLICATION

Introduction

The AVProAlliance.com iMUX4 allows an analyzer to average sound from multiple microphones in a room, providing a single RTA or FFT test display. When sound is time averaged from multiple microphones, measuring different positions in the room, the resulting test display is called “spatially averaged.” Spatial averaging indicates the average response of the room across the entire seating or listening area rather than from a single point in the room. This is ideal for low frequency measurements where point to point variability introduces a high degree of uncertainty. A spatially averaged measurement is considered the most accurate representation of the true low frequency response of a room and is essential for accurate calibration.

Measurement Setup

To use the iMUX4 and SSD AudioTools to measure a room's spatially-averaged frequency response, use the setup illustrated in Figure 5. Run cables from the microphones to the respective MIC IN jacks of the iMUX4. Connect the cable from the iAI2 to the iMUX4 and connect the iPad connector from the iAI2 to the iPad as shown below. The iMUX4 case facilitates these connections for maximum efficiency on the jobsite.

The iMUX4 case allows for the deployment and storage of microphones fully connected. This means that the process of setting up is greatly expedited and simplified. The only connection necessary will be attaching the iPad to the iAI2 using its connector. Due to the short length of the iAI2 connector it's recommended that you place the iPad on top of the iMUX4 case for use. The long high quality microphone cables allow easy reach of most locations in the room.

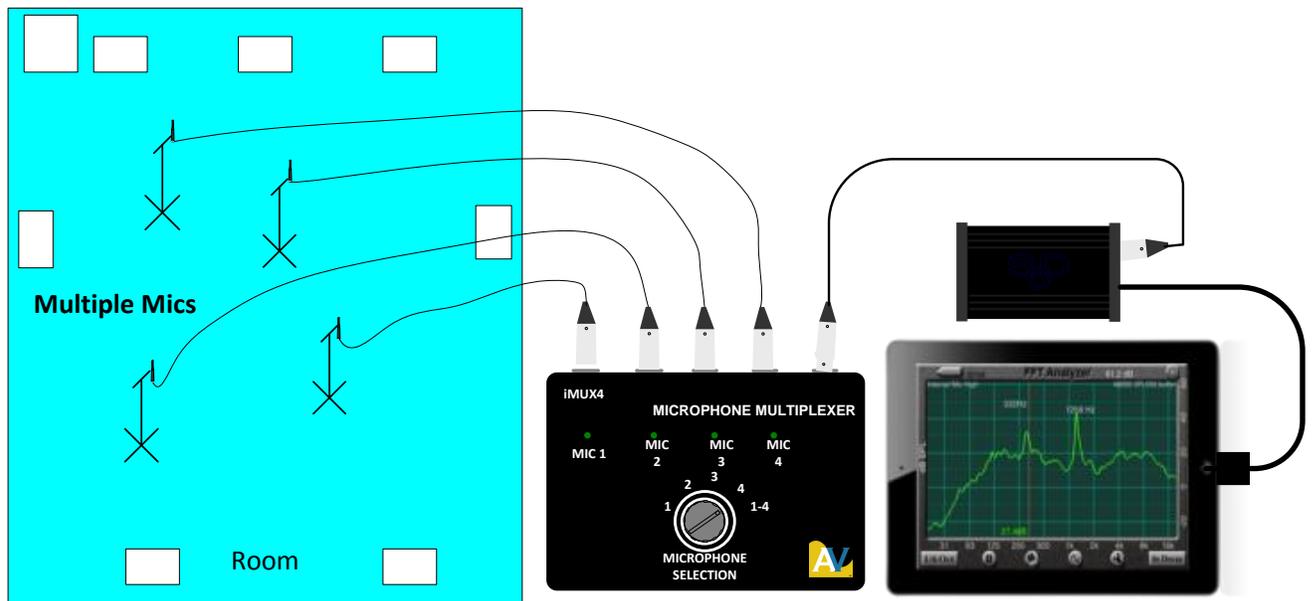


Figure 10. Typical setup for analyzing a room with the iMUX4 & iPad with iAI2

Microphone Room Placement

The microphones should be randomly placed in the room in the listening area. Avoid placing the microphones too close to any speaker, so as to avoid direct sound energy from the speaker. Also avoid the center and quarter axes of the room, as strong room mode peaks and nulls at these positions can unduly influence the measurement. Microphones should be mounted on microphone stands near the

listeners' ear height. Point the microphones straight up for the best omni-directional pickup. Use a staggered parallelogram or diagonal microphone placement formation with Mic 1 located at the central listening location or sweet spot at ear height. Each microphone should be a different distance from the side walls and a different distance from the end walls. In addition, try to avoid placing any microphones at the same height. This will provide a more uniform sampling of the sound field in the room.

Real Time Analyzing – Multiplexing Microphones for Spatial Average

Multiplexing microphones placed throughout the listening position provides a single continuous measurement of the overall response of the listening area. This permits more accurate equalization adjustments, as you can see an average of the entire listening area. Sequentially switching to each microphone briefly with the iMUX4 and accumulating a running active average on the Real Time Analyzer provides an average room response. This has the added benefit of revealing the most audible response anomalies while minimizing less audible ones.

To perform a spatially averaged RTA measurement, connect the iAI2, to the iPad, and deploy microphones from the iMUX4 case. Connect the toslink cable (from the iAI2) to the desired input on the pre-amp in use. Place the microphones in the room as described above. Set the iMUX4 Microphone Selection Switch to the “1-4” position. This position cycles through the microphone inputs, switching the sound from each mic to the RTA at approximately one second intervals. Choose a full-range pink noise signal. Access the iAI2 signal generator control by touching the “sine-wave” icon on the RTA or FFT screen.

The AudioTools RTA or FFT function averages the alternately selected microphone measurements over a period of time, creating a spatially averaged display. In most case setting the decay time in AudioTools to “Average” provides to best results. At the

onset of each measurement be sure to touch the “Reset” control to clear any previous data. The measurement is complete once the plot has stabilized. This indicates that all acoustical effects have been measured. When using a shorter decay time make sure it is at least 4 seconds long so all microphones have contributed. Any ambient noise extraneous to the test tone spoils the measurement requiring a redo.

To multiplex microphones for a spatial average RTA/FFT measurement:

1. Set up as shown in figure above.
2. Set iMUX4 Microphone Selection Switch to position “1-4”.
3. Select & perform the RTA/FFT test.
4. Set decay to averaging mode.
5. Reset averaging.
6. Adjust speaker placement, equalization, treatments for best overall room response.

WARRANTY AND SERVICE INFORMATION

WARRANTY

Your iMUX4 Microphone Multiplexer has been built to the highest quality standards in the industry. Each unit has been tested, aged under power for at least 24 hours and the every function and range was retested to insure it met all published specifications. Your instrument is fully protected with a 1-year warranty.

SERVICE

Save the original shipping carton and packing material for reuse should you ever need to ship your iMUX4, or return it to AVProAlliance.com for repair.

1. If you are returning the unit to AVProAlliance.com for service open a Support ticket on the site and enclose the following information: owner's address, billing information, purchase order (if applicable), name and phone number of contact person, description of problem and reason for return. We will contact you and issue a Return Authorization Number.
2. Completely enclose the unit inside a plastic bag to protect its finish and prevent foreign material from getting inside.
3. Cushion the unit equally on all sides with a minimum of 3 inches of padding material. Pack the padding tightly enough to prevent the unit from shifting during shipment.
4. Seal all seams on the container with strapping tape.
5. Send the packed unit to the following address (we recommend shipping via United Parcel Service):

AVPROALLIANCE.COM SERVICE

RA# _____
Sioux Falls, SD 57109
www.AVProAlliance.com

Most service repairs are completed within 72 hours. If you need to ask about your unit, use the AVProAlliance.com Support Ticket system.

Fill in for your records:

Purchase date: _____

Serial Number (on back of unit) _____



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