

# Academy Audio Inc.

discovering the soul of music®

## MCU\_M Mini Control Board for Hi-End MUSES® Electronic Volume Controls

Ver. 01

## User Manual

Rev. 02



Shown with optional Remote Control and Connector Kits installed, and assembled with a VCM Volume Control board.

VCM board not included.

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## 1. Introduction

Thank you for purchasing the MCU-M Mini Control Board for Hi-End MUSES® Electronic Volume Control products from Academy Audio Inc.

The MCU\_M Board was designed to provide a quick and efficient way to integrate the Hi-End MUSES® Electronic Volume Control board or VCM Mini Hi-End MUSES® Volume Control board into an existing or a newly built Hi- End audio system.

The MCU-M Board features a rotary encoder, and a dual color LED for mode indication provides a complete Volume and Balance control solution for a stereo preamp or an integrated audio amplifier.

An IR Remote control option enhances control functionality, and also adds a Mute mode. An assembly kit is available to build a compact volume control unit with the VCM board.

Designed and built in the United States.

## 2. What's Inside the Box

The MCU Board package includes the following items:

- MCU-M Board
- Volume Control 6-pos flat cable
- Credit Card style Remote Control unit and a matching remote control sensor. (If a Remote Control option ordered.)
- Connector Kit: 4 nylon stand-offs, 6-pos pin header, 6-pos receptacle header. (If a Connector Kit option ordered.)

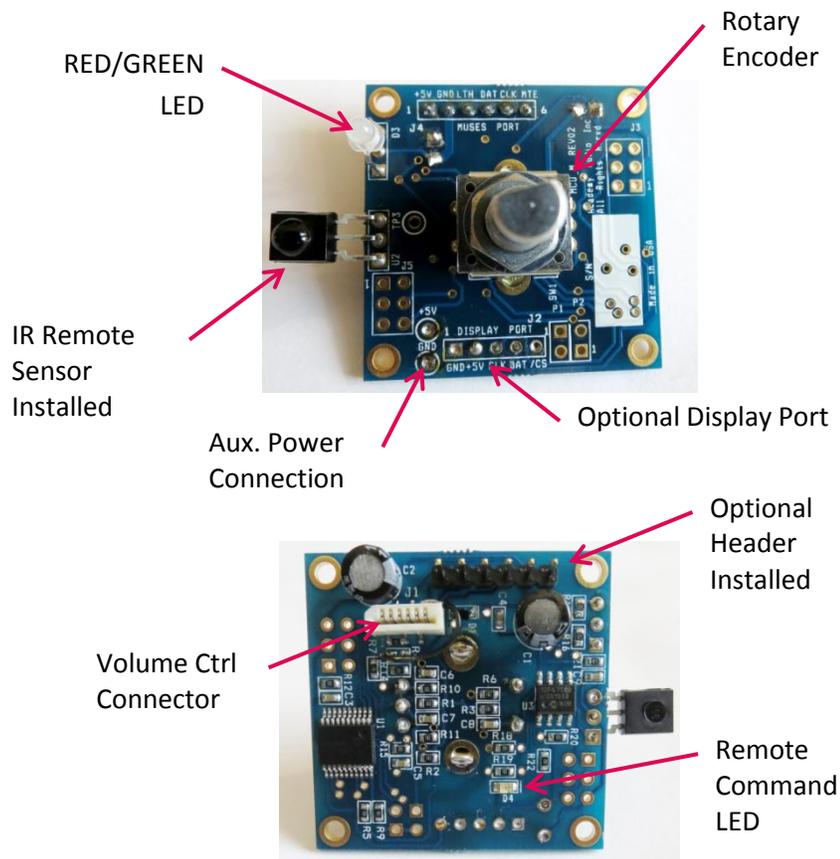
## 3. Specifications

The following specifications refer to the MCU-M board connected to a MUSES® application board.

- Power supply voltage 4.5Vdc – 5.2Vdc
- Power supply current  $\leq 7\text{mA}$
- Volume Control Range -120dB(Mute); -112dB to 0dB
- Volume Control Step Size 0.5dB
- Balance Control Range  $\pm 12\text{dB}$
- Balance Control Step Size 0.5dB
- Dimensions 1.500" L x 1.500" W x 1.500" H (including encoder))

## 4. Description

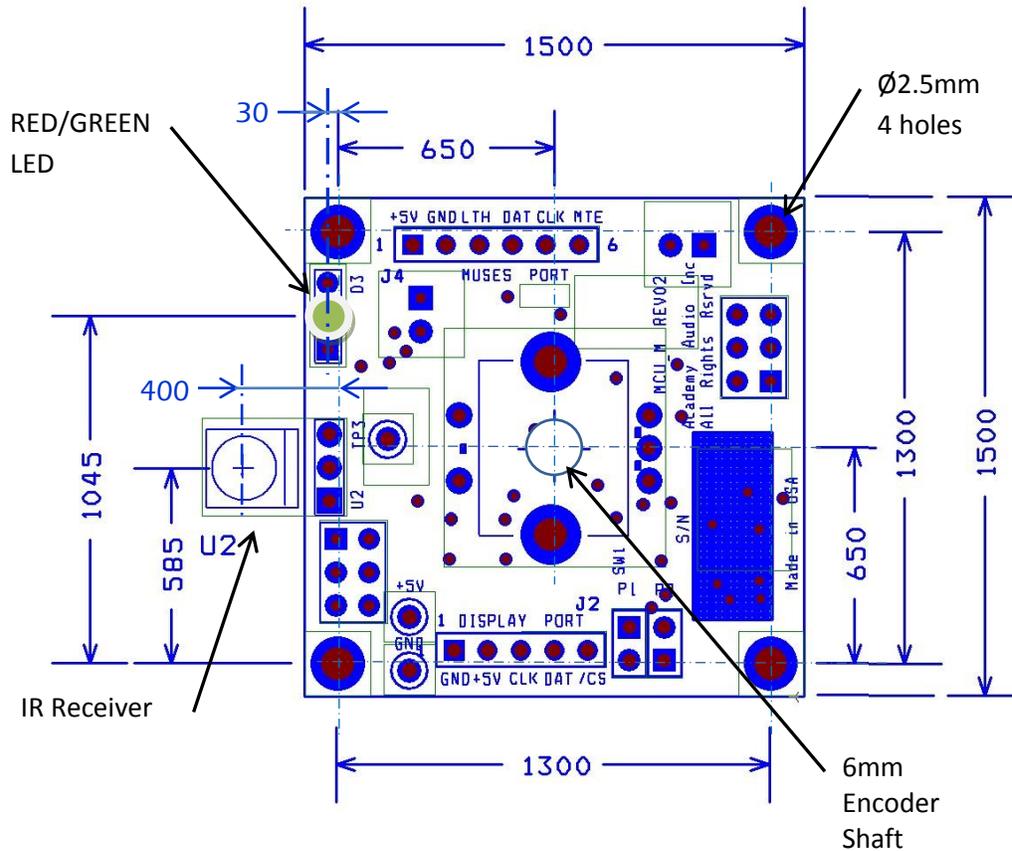
Referring to Figure 1, the front of the MCU-M board features a rotary encoder with a push switch function located at the center, and a dual color multifunctional LED indicator. An optional IR remote control sensor may be installed into a U2 footprint. There are also optional Display Port and Auxiliary power connection, reserved for future extensions.



**Figure 1.** MCU-M Board Front View (top) and Rear View (bottom).

The back of the board features a Volume Control connector J1 for a 6-pos flat MUSES control cable. An optional header may be installed into a J4 position as shown at Figure 1 for installation on top of the VCM board for a compact volume control unit. An LED D4 serves as a remote command indicator when a remote control option is selected.

## 5. Mechanical



All dimensions in 0.001".

**Figure 2.** MCU-M Board Dimensions.

Refer to Figure 2 for mechanical dimensions and mounting holes location. The MCU-M board may be installed on a faceplate as a regular potentiometer into a 0.300" hole, and secured with a provided 7mm nut. Alternatively, the board may be secured through the 2.5mm mounting holes to standoffs of the appropriate size. In either case, make sure the knob can be pushed in to enable Balance adjustment. Provide a hole in the panel for the dual color LED indicator. Make sure the IR Remote control receiver is not blocked from receiving the IR commands. A piece of infra-red transparent plastic may be used as a window for the IR receiver.

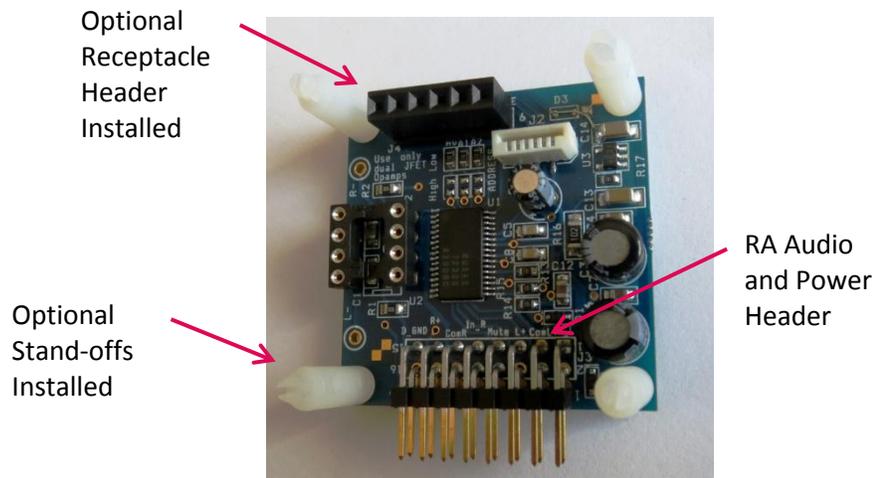
A MUSES Volume control board may be installed as far as 6" away from the MCU-M board, in close proximity to the audio circuits to ensure the lowest noise. Use a provided 6-pos flat cable to connect

the MCU-M board with the MUSES Volume control board. Make sure the exposed conductors of the flat cable are facing the conductors of the flat cable connectors on both boards.

An optional Connector Kit is available for installation of the MCU-M board on top of the VCM board to provide a compact Volume/Balance control unit to replace a potentiometer based Volume control.

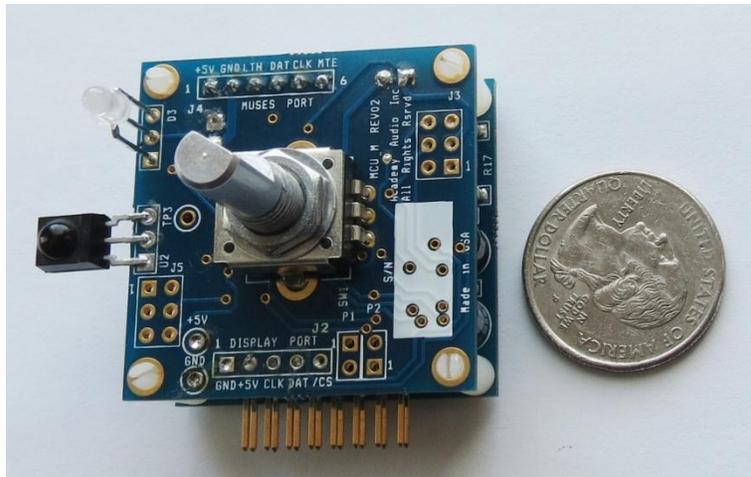
Using the kit requires basic soldering skills. The kit provides four nylon stand-offs and two mating 6-pin connectors to assemble the MCU-M and VCM boards as a stack on top of each other. A right angle (RA) header for the audio and power connections is mounted to the VCM board. The connector may be used with a mating female connector, or soldered into the application PCB directly.

Refer to Figure 1 and Figure 3 for the kit components installation.



**Figure 3.** VCM Board with Optional Connectors and Stand-offs Installed.  
(DIP socket not provided.)

Once the connectors and stand-offs are installed, align the 6-pin header on the MCU-M board with the 6-pin receptacle on the VCM board, and snap the boards together. A complete combo unit is shown at Figure 4. The 6-pos flat cable is **not used** in this configuration.



**Figure 4.** Complete Volume/Balance Control Combo.  
(Shown with a Remote control option installed.)

## 6. Power Supply

The MCU-M board derives power from an application board it is connected to. No separate power supply is needed. The optional power connection points are currently used as test points, and are reserved to connect to an external +5Vdc power source for the future enhancement options.

## 7. MCU-M Board Operation

### Definitions:

**Volume Control** adjusts an application board volume setting up or down. After each adjustment the volume setting is stored in a non-volatile memory, and is retained at power down.

**Balance Control** adjusts the balance of the volume control to move a perceivable sound source to the Left or to the Right. After each adjustment the volume setting is stored in a non-volatile memory, and is retained at power down.

**Mute Control** sets the volume to -120dB attenuation. The Muting relay status does not change.

### Controls Functionality:

- Turn the **Encoder** to set a **Volume** value.
- Press the **Encoder Knob** to enable **Balance** control. The LED glows GREEN if the balance is set left from the center, and RED if the balance is set right from the center. In the center position of the balance control the LED glows RED and GREEN at the same time. Turn the encoder to the desired balance position. The unit returns to **Volume** control on the next push on the Encoder Knob, or after a time-out.

- Mute Control.** The Remote Control enabled units provide a **MUTE** function in response to the MUTE button of the remote control activation. The LED glows steady RED, and the audio signal is blocked. Press the MUTE button on the remote control again to disable the MUTE mode. The LED goes off, and the control returns to the previously set Volume and Balance position. The MUTE mode is disabled also at any activation of the encoder or any remote control button. (The Mute Control function is unavailable without the remote control.)

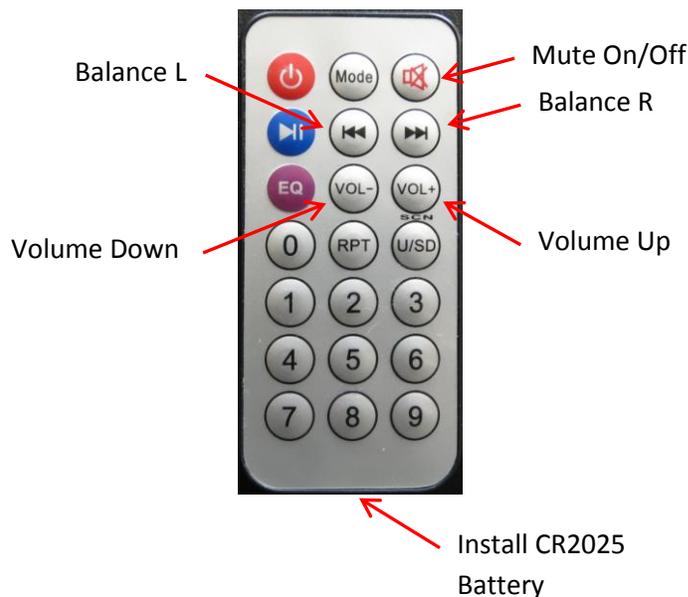
On power down, the MCU-M retains the Volume and Balance controls position, and restores them at power-up.

Upon power up there is a delay of about 1 second before the Muting relay control signal is generated to prevent any pops and clicks. Refer to the corresponding MUSES Volume Control board manual for the Muting relay connection description.

## 8. Remote Control Unit

A dedicated credit card style IR remote control unit is provided with each IR enabled MCU-M Board. Due to shipping regulations, the remote control unit is shipped without the battery. **Install a CR2025 lithium coin battery before operating the remote control unit.**

The remote control unit buttons functionality is illustrated at Figure 5. Unused buttons are reserved for future enhancements. The MCU-M LED indicator blinks GREEN when a remote command is received.



**Figure 5.** Remote Control Unit.

## 9. Technical Support

For any questions regarding operation of the MCU Control board and for the latest documentation please visit us at [www.academyaudio.com](http://www.academyaudio.com).

**Happy listening!**