



## **MIDI PWM Servo Board Instructions** **February 20, 1997**

**THESE INSTRUCTIONS COVER THE BASIC OPERATION OF MEDIAMATION INC. MIDI PWM SERVO DRIVER BOARD. THEY ARE TEMPORARY INSTRUCTIONS UNTIL THE FULL MANUAL CAN BE PRINTED. WE RESERVE THE RIGHT TO MAKE CHANGES WITHOUT NOTIFICATION OF THESE INSTRUCTIONS, AND WE CANNOT BE HELD RESPONSIBLE FOR ERRORS OR OMISSIONS CONTAINED IN THESE INSTRUCTIONS.**

The Midi PWM board is designed to drive up to 8 "Futaba" type standard electric servo motor. It has the capability of supplying 5 volt power to small servos, but its on board 5 volt supply will quickly be overdriven by larger servos or multiple servos, so the first step in hooking up the board is to design and wire your power supply for your servos.

### **POWER**

By installing JMP70 on the board, the 5 volt supply of the Midi PWM board is connected to the Power pin on a standard 3 wire servo plug. This allows you two options:

- a) Power the servo from the Midi PWM boards supply (not recommended)
- b) Power the Midi PWM board from your 5 volt feed for your servos.

Option "b" is the usual operating mode. If your servos are not 5 Volt DC, you will want to remove JMP70 and power the Midi PWM board from an external AC or DC 9-12 volt supply via the power plug on the unit.

### **MIDI**

The MIDI PWM board has a Midi In and a Midi Thru jack on it. Connect your Midi source to the In jack, and connect other Midi boards or devices that you want the signal to daisy chain to in the Thru jack. The In (J50) jack is located near the power plug connector, the Midi Thru jack is on the side with the header for the servos.

The unit in its default state responds to the following Midi commands:

#### **CONTROLLERS:**

Controllers #0-7 on Midi Ch #1 set the Minimum for servo outputs 1-8 respectively.

Controllers #8-15 on Midi Ch #1 set the Maximum for servo outputs 1-8 respectively.

Controllers #16-23 on Midi Ch #1 operate the position for servo outputs 1-8 respectively.

#### **PITCHBEND:**

Pitchbend on Midi CH# 1-8 operate the position for servos 1-8 respectively in high resolution (up to 13 bit).

Controllers and pitchbend do not operate simultaneously. If you need High Resolution (over 8000 discreet steps), use Pitchbend, if you need only Low Resolution, use controllers. Alternate Midi channel offsets can be stored in the units EEPROM utilizing the Macintosh software that comes with the unit. Controllers 0-15 and 16-23 always operate the unit the same, so all you have to do is change Midi Channels to access another board on the same cable.

**NOTE: WHENEVER YOU ADJUST THE MINIMUM OR MAXIMUM YOU ARE WRITING TO THE EEPROM MEMORY CHIP. THIS CHIP HAS A LIFECYCLE OF ABOUT 100,000 WRITES. DO**

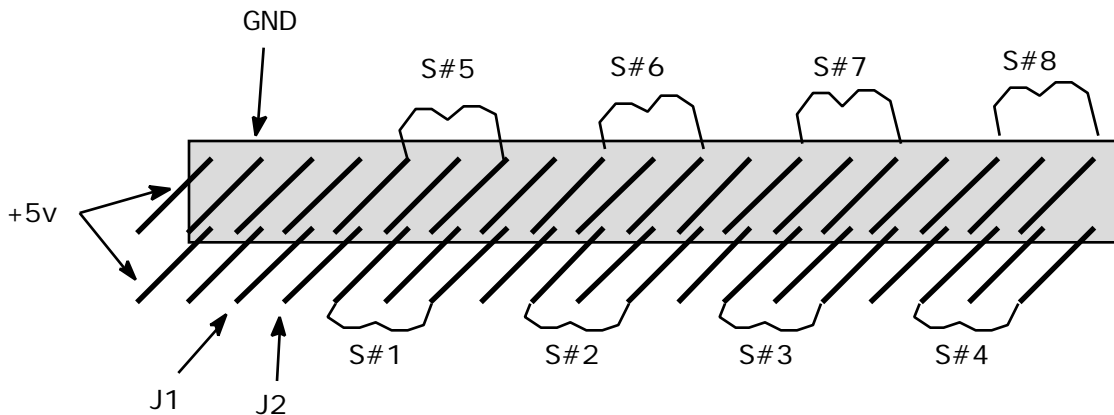
**NOT USE UP THIS LIFECYCLE WITH EXCESS OPERATION OF THE SERVOS BY ADJUSTING THE MINIMUMS AND MAXIMUMS. AS THESE ADJUSTMENTS COVER THE ENTIRE RANGE OF THE SERVO, IT IS POSSIBLE TO OPERATE THE SERVO BY CONTINUALLY ADJUSTING THESE PARAMETERS. DO NOT DO THIS!!**

**SETUP:**

Each Servo should be connected to the 3 pins as outlined on the lettering on the bottom of the board. Channels 1-4 are on the BOTTOM row of pins, and 5-8 are on the TOP row of pins. There is one unused pin between each servo connection and the first 4 pins on both rows are used to supply external power and hold programming jumpers. Each group of 3 pins goes from left to right in the following order:

GROUND      MOTOR POWER (Typically 5 volts)      PWM CONTROL

If you are using a non 5 volt DC supply, you should remove JMP70 and make sure that the center pin on the servo connection header for each servo is not connected as other voltages will damage the board.



When J1 is installed, it locks the settings into the unit and you can no longer adjust the minimums, maximums, or Midi channels.

When J2 is in, the 8 servos position is controlled by 8 consecutive pitchbend commands. If the unit is configured to respond to Midi channel #1, it will respond to Pitchbends on channels 1-8. If the unit is configured to respond to Midi channel 9, it will respond to Pitchbends on channels 9-16.

When J2 is out, the 8 servos position is controlled by 8 consecutive controllers #16-23 on whatever Midi channel the unit is configured for.

After you have properly connected your servos, you can set the minimums and maximums. Follow these instructions for each of the 8 servos. For this example, we will use the controllers for servo #1:

1. SET MINIMUM POSITION COMMAND - Send the unit Controller # 16 value "0".
2. ADJUST MINIMUM POSITION THROW- Use Controller # 0 to set the minimum position.
3. SET MAXIMUM POSITION COMMAND- Send the Unit Controller #16 value 127.
4. ADJUST MAXIMUM POSITION THROW- Use Controller #8 to the maximum position.

Repeat these steps for each of the 8 servos using the next controller up sequentially for each of the commands. When done, Controllers #16-23 will now operate your servos in the range set utilizing the procedures above. The settings are retained in EEPROM memory until they are changed via Midi. **Caution : If you inadvertently send Controllers 0-15 to the unit, you will be changing the minimums and maximums of the servos, so be careful not to have these controllers sent to the unit unless you are setting the servos throw range.**

## MIDI PWM SYSTEM EXCLUSIVE COMMANDS

There are two functions on the MidiPWM board that can only be changed via Midi SysEx commands. These are Unit Number, and Midi Channel.

**Unit Number** assigns a unique number to each MidiPWM board that is connected to the same Midi cable. A MidiPWM board will only respond to a Channel Change command that has its particular unit number indicated in the SysEx string. This makes it possible to communicate with a particular board even though several other boards may be connected to the same Midi source. Typically this value is set to "0" at the factory and needs not be changed. The commands for this are listed below.

### Unit Number SysEx

<u>Hexadecimal</u>	F0 77 7F 02 xx F7
<u>Decimal Equivalents</u>	240 119 127 2 xx 247

Where "xx" is the unit number: Legal values \$00-\$7F or 0-127 Decimal

**Midi Channel** SysEx changes the Midi channel that the unit responds to. It's value is one less than the traditional Midi channel number as the SysEx command begins at "0" while the traditional nomenclature begins at "1". If the unit is assigned to any channel between 1-8, it will respond to controllers on that particular channel, and Pitchbend on channels 1-8. If the unit is assigned to any channel between 9-16, it will respond to controllers on that particular channel, and pitchbend on channels 9-16. Typically, you would set a unit to either channel #1, or channel #9 if you are using high resolution Pitchbend commands. If you are using lower resolution controllers, you can assign each unit to any of the 16 available channels and it will only respond to information on that channel regardless of how many units are connected to the same Midi source. The Channel assign SysEx must have the proper Unit Number (see above) embedded in it for a MidiPWM to act upon the data.

### Midi Channel Number SysEx

<u>Hexadecimal</u>	F0 77 7F 01 xx yy F7
<u>Decimal Equivalents</u>	240 119 127 1 xx yy 247

Where "xx" is the unit number: Legal values \$00-\$7F or 0-127 Decimal **AND**

Where "yy" is the Midi Channel: Legal values \$00-\$0F or 0-15 Decimal

(Note- What is referred to traditionally as Midi channel 1 will be indicated by a value of 0 in the "yy" field)

**WARRANTY:**

Warranty: This product is guaranteed against defects in material and workmanship for a period of one year from the date of shipment, when operated within our specifications. Defective product must be returned (RMA# required) to the factory with an explanation of the defect And with freight prepaid. We will repair, replace, exchange and/or adjust at our option. No responsibility is accepted for damages, loss or other expenses incurred through the sale or use of this product. Under no conditions will we be liable for any special, incidental or consequential damages. No warranty of merchantability is expressed or implied.

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