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Using Sliders with the 4201-B Lighting Controller Application Note

June 26, 2008

This application note will discuss ways of using potentiometers (sliders or normal rotary volume control type) with the “B” version of the 4201 lighting controller. Earlier versions of the 4201 do not have analog inputs so this won’t work with them.

Feel free to contact us for assistance with any use of our products. We can also quote cables and/or custom assemblies for your specific application.

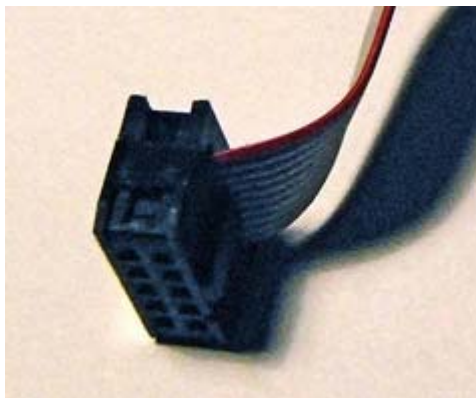
The connector

The external input connector is located next to the power jack and labeled "0-5V INPUTS". Looking at the edge of the 4201 with the power connector on the left and the RS-232 connector on the right, pin 1 of the input connector is in the upper right. The top row of pins is all the odd numbers, from the left that would be 9, 7, 5, 3, 1. The bottom row is all the even numbers; 10, 8, 6, 4, 2. When you plug in a ribbon wire, from left to right the wires will be 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. Wire #1 normally has either a stripe on it or is colored brown in multi-colored cables. Note that most, but not all, ribbon cables are keyed so they can only be inserted one way. 10-Pin ribbon cables may be purchased at most electronic suppliers such as Mouser and Digi-Key. They are also commonly used for RS-232 connections in PCs, so you may have spare cables lying around (cut off the RS-232 connector).

Pins 1-8 correspond to Analog Inputs 0-7. Each of these inputs is high impedance (200K ohms) and will drift towards ground if left open. The operating range of these inputs is 0-5VDC, but the inputs will not be damaged by reverse polarity and reasonable over voltage accidents. You can drive these pins with a wide range of voltage sources so don't think you're limited to just potentiometers, you could even use solar cells so a person waving their hand over it will change the lighting.

Analog inputs 2 & 4-7 (pins 3 & 5-8) may also be read by the 4201 as digital inputs. Any time the input is over 2.5V, the input is considered to be a "1", otherwise it's "0".

Pin 9 is connected to the 5VDC internal power supply and pin 10 is ground. The 5V power is intended for running small loads such as in the examples below. Drawing excessive current from this pin will cause the power supply to shut down. This shouldn't hurt anything, but the 4201 will not work or will be erratic until the overload is removed.



Typical 10 pin ribbon cable showing polarity key and pin 1 stripe.

Simple 8 Channel Control

The first example will be simple while still being useful, 8 sliders controlling the first 8 DMX channels on a one to one basis (8 channel light dimmer). Things will be explained in more detail in this example than in the others.

Aside from the ribbon cable from above, you'll need 8 slide (or rotary if you prefer) potentiometers in the range of 1K to 10K ohms, LINEAR taper. You should also have a volt/ohm meter, any inexpensive multimeter will do.

If you don't know which pins are which on your sliders/potentiometers, set one of them all the way OFF (down or CCW). Measure the resistance between any two pins and find the combination that gives you the lowest reading (should be close to zero). The unconnected pin is the CW pin. Now set the control to full ON and move the RED lead to the CW pin. If the meter reads near zero, the BLACK lead is on the WIPER. Otherwise the BLACK lead is on the CCW pin.

You are now ready to connect everything. Connect all of the CCW pins together and tie them to wire #10 (ground). Connect all of the CW pins together and tie them to wire #9 (5VDC). Pause at this point and measure the resistance between wires 9 & 10, it should be close to the resistance of your potentiometers divided by eight and in any case should always be over 100 ohms. Moving any of the controls should not change this.

Assuming this worked, now connect wires 1-8 to the WIPER pins. The order isn't important to the hardware, but since you will need to know it later, it's probably best to keep them in some sort of logical order.

Plug the cable into the 4201 and apply power. You do not need to be connected to a computer at this point.

Connect the BLACK lead of your meter to wire #10 (ground). Connect the RED lead to one of the WIPER terminals. Move the slider and note the voltage changes from zero when the slider is down to 5V when it is full on.

You're now ready to test the actual dimming. Connect a computer with a terminal program so you can talk to the 4201 (refer to the 4201-B Instruction Manual if you haven't done this before). Make sure you have a prompt by pressing the RETURN/ENTER key and verifying that you receive a ">" character back. We will now do a quick test of the first channel only. This test will erase Preset #77, most people probably don't have anything in it. You can use any other Preset, but you'll need to change the examples below. Type the following line in (copy & paste sometimes works, feel free to try):

```
XW77 :0; ^A0; O"v#r\n"; TD0 0 0 5; J0
```

Note that there are three zeros and one "oh" in the line above. Don't forget the RETURN/ENTER at the end. You have now saved a macro in Preset #77. Start the macro by typing

```
XE77
```

Followed by RETURN/ENTER. Every ½ second you should see a hex number appear. Move the slider connected to wire #1 up and down noting that the numbers track. Full off should be 00, full on should be FF.

Assuming this works you are now ready to “go live”. First, stop the macro from running by typing an asterisk “*”, you should get the “>” prompt back.

Now we’re going to save a macro as the auto-exec macro. That means it will automatically run whenever you turn on the power. If you want to stop it to do something else or change it, you will have to send an asterisk to the 4201 after the macro starts. To permanently delete the auto-exec macro, first stop it, then type:

XW0

If you stop it but don’t delete it, it WILL start up again the next time the 4201 restarts.

Time to install the auto-exec macro. Type or copy (all on one line):

XW0 :0; ^A0; MW0; ^A1; MW1; ^A2; MW2; ^A3; MW3; ^A4; MW4; ^A5; MW5; ^A6; MW6; ^A7; MW7; J0

This macro reads all eight inputs and sends the data directly out to the DMX channels (0-7 or 1-8 depending on how your dimmers number channels) in a continuous loop.

Now disconnect power from the 4201 and connect your lights, making sure that nothing will be harmed if lights unexpectedly come on. Apply power to the 4201 and the macro should start running. Try changing your sliders and they should be directly controlling the lights on the matching channel number. All other channels beyond the first 8 will be set to whatever was stored in Preset #1 (or whichever preset you have set as the startup preset) and shouldn’t change. Note that the startup preset MUST be set to something other than zero. Factory default is #1.

7 Channel Preset

This example will assume you understand the concepts presented in the previous example. What we're going to do here is make a preset board where you set levels for the first 7 channels ahead of the time you want them to change and then cause them to all change at the press of a button.

If you've built the assembly from the previous example you can use that (slide slider #8 to full on and then back to full off to "push" the button). If you're building this from scratch, follow the instructions for building the hardware for the "Simple 8 Channel Control" except only use seven sliders on wires 1-7. You will then wire a push button between wire #8 and the CW pins on the sliders. If your wires are more than a few inches long, you should add a resistor (1K to 10K ohms) between wire #8 and the CCW pins.

Before proceeding execute the following command to enable Shadow Presets:

^S1

And then type:

I

Verify that the Shadow Presets are ON and Preset Select is set to 1. If all is well, type:

Z

To save the settings as the power up default.

Now install the following auto-exec macro (should be all one line):

**XW0 :0; J0 80 00; P0; C0 7E; ^A0; MW0; ^A1; MW1; ^A2; MW2; ^A3; MW3; ^A4;
MW4; ^A5; MW5; ^A6; C0 7F; P7E; F7F A; :1; J1 80 80; J0**

You're probably wondering what all this does. Each section will be explained below:

- **XW0** tells the 4201 to store the following line in the auto-exec macro.
- **:0** is a label. The auto-exec macro always starts at label zero.
- **J0 80 0** says to test digital input #7 (the button) and if it isn't pushed, jump to label 0. When the button is pushed then the jump won't happen and the next instruction in the macro will be executed.
- **P0** stops the DMX output at the end of the current frame so we can change values without flickering lights. The lights should never notice this pause as we'll be turning it back on very shortly.
- **C0 7E** saves the current setting to Shadow Preset 7E
- The line of **^A0...** is the same as the simple demo above, the first 7 channels are updated with the slider settings (but note this is NOT being sent out to your lights).
- **C0 7F** copies the new settings from the Active Memory to Shadow Preset 7F.
- **P7E** restarts the DMX output with the values saved earlier in Shadow Preset 7E
- **F7F A** starts a one second cross fade from the current settings to the new ones saved in Shadow Preset 7F.
- **:1** another label
- **J1 80 80** tests the push button and jumps to label 1 as long as the button is still pressed (in case you're very slow releasing the button). When the button is released, the macro will continue with the next instruction.
- **J0** is an unconditional jump back to the beginning of the program where it waits for you to press the button again.

Assuming you have your lights hooked up, let's try this. Either cycle the power on the 4201 to start the auto-exec macro or type:

XEO

Set the sliders to some pattern and press the button (or run #8 full on and back to full off). The lights should fade to these new values over one second. During this time or any time after you may change the sliders for the next cue. When you press the button again the lights will change to the new cue. Repeat as desired.

More complex things

With the addition of a small IC and more sliders you can make an 8 channel two scene manual preset board (two rows of 8 sliders with two more sliders for MASTER and Cross-Fade).

You could also use photo or solar cells in place of some or all sliders to enable control based on light levels. Using thermistors you could have the lights respond to temperatures at some remote point.

Adding a small processor (PIC, BASIC Stamp, etc.) can GREATLY expand what you can do here.

Please contact us for assistance/ideas on how to adapt the 4201 to your specific application.