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DMX Commander

PN: ece-C-18-001, REv 3-4

Figure 1

Overview:

Would you like an economical way to incorporate DMX control into small, standalone museum exhibits? The DMX Commander is a device that will set up six operational DMX controlled devices in a 6 to 24 DMX universe that can be configured to trigger in one of two modes. The first is contact closure/open collector outputs, which would be used with such devices as switches, relays and motion detectors. The second method would be with TTL triggers from devices like most micro-controllers and BrightSigns with GPIOs. In this mode, any voltage greater than 2.5vdc (but less than 5.1vdc) will be seen as a high and below 1vdc seen as a low.

Please specify the mode you wish as the IOs are physically configured differently for each of those operations and cannot be changed by the user in the field.

The first four addresses can have their brightness levels set from 0 to 100 percent (0 - 255 count) and can have their fade time set from under 0.3 of a second to approximately 12 seconds. The brightness level adjustment can be used in one of two ways. Using off (zero percent) as the low level, the highest brightness level can be limited to any value from zero to 100 percent. One occasion this would be applicable is when the museum curator wants to limit the light level on an artifact. Another would be when a video producer/director wants an artistic light level for a specific fixture. The other mode is when the high level is always 100 percent and the intent is to keep some minimum light level operating all the time, like house lights in a theater. Through hard coded modifications, we could change the fixed higher or lower limits to other values. Please inquire with your particular requirement to see if we can accommodate with custom firmware.

The last two of the DMX addresses, on the other hand, are on/off only (Addresses 5 and 6). They are triggered like the first four addresses but users cannot adjust their brightness levels and fade times. If it were known ahead of time, we could hard code their brightness levels and fade times in customized firmware. Please call to discuss.

Another feature that the DMX Commander can implement is skipping one to three DMX channels between the operational DMX channels. For example, some DMX devices may require more than one DMX channel. In those cases where their first channel is the brightness level and the other levels are to be ignored, you can configure the Commander so that each of its operational channels are separated by from one to three channels and those channels will be a DMX value of zero. This is accomplished with dipswitches on the front of the unit.
We could change the values for these skipped channels to some other fixed value with custom firmware, if that were known before delivery or even skipping a larger number of channels than three. Please call us to discuss.

Finally, you can also change the logic for triggering. One mode is where a high triggers the DMX level to go high and where a low triggers it to go low. Or, you can flip all the triggers so that a high sets the DMX level to its lowest value and a low sends it to its highest. This is also accomplished with a dipswitch on the front of the unit.

This unit can be purchased with or without the extruded aluminum case. In those instances when the Commander will be buried deep in the recesses of the exhibit, why add the expense of the stylish enclosure. You can place the printed circuit board (PCB) on standoffs within the exhibit. If you deem you want the electronics to have a greater level of protection, then the cost of the compact case might be warranted.

ECE sees one of the greatest applications for our DMX Commander are those situations where you would like to add active lighting to a Brightsign exhibit. Using BrightAuthor, you can now program the GPIOs to toggle on and off during the BrightSign's timeline controlling the DMX devices as the video is playing. How many light addresses can be controlled … however many GPIOs your BrightSign device can have. To calculate how many Commanders you would need,

divide the total number of channels needed by four, if all your DMX addresses need brightness and fade time control, or divide by six if you can also use the on/off channels as well. Just remember that each DMX Commander will be a unique universe of 6-24, meaning each one will have an address starting at one and going to 6 with no skipped addresses, to 11 for skipping one address, to 16 for skipping two addresses and to 21 for skipping three addresses. Said another way, each DMX Commander would have its own DMX bus with only its devices to control on its bus. So now, if you wanted a small, economical video exhibit that controls the house lights, the expense has been greatly reduced. You could even do a simple object theater where, during the video, specific artifacts have synchronized timed illuminations at a fairly economical cost. ECE thinks this would take these exhibits to the next level without breaking the bank.

DMX Commander Feedback, Configuration and Connections:

1. **Feedback:** There are seven LEDs on the front of the unit: six yellow and one green. The green LED indicates the power status of the device. Each of the yellow LEDs is an indicator for one of the operational DMX addresses. When that address is at least four percent "on" (10 out of 255 count), the LED will be illuminated. When the DMX value goes below this amount, the LED will be extinguished.

2. **Configuration:**

    a. Dip Switch Configurations. There is a five-count dipswitch on the front of the unit.

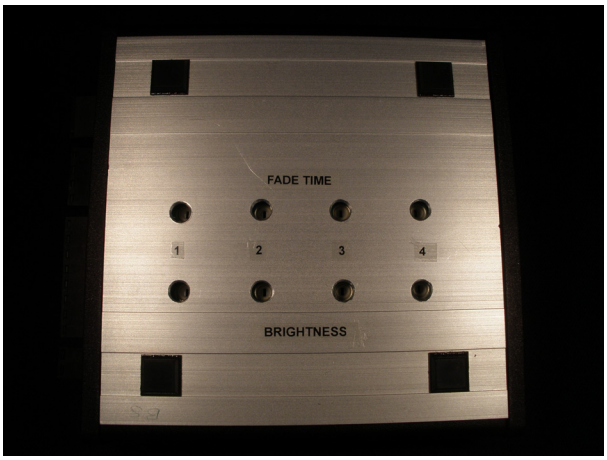
        i. Dip Switch #1. This switch controls whether the brightness controls the highest level of brightness or limits the lowest level of brightness. All of the first four DMX addresses' operations are controlled by this switch. In the down or "off" position, the brightness controls are for the brightest allowable. If the switch is up or "on", the brightness controls are for the minimum brightness allowed.

        ii. Dip Switch #2. This dipswitch controls the logic level effect. When down or "off", a high on the input extinguishes the DMX level (lowest level) and a ground sends the DMX channel to its highest level. Toggling this switch to the up or "on" position reverses this logic action: a high turns the DMX channel on and a low turns it off (or lowest level set).

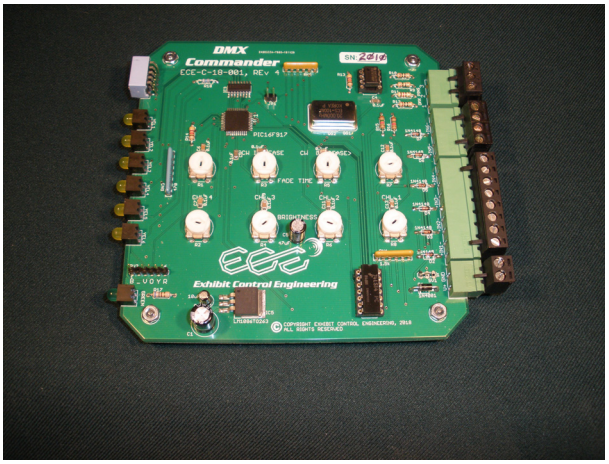
        iii. Dip Switches 3-5. These dip switches are used to designate the number of DMX channels that are in between the operational channels. All of these switches in the down or "off" position results in no extra DMX channels being generated. Switch #3, up or "on", puts one channel in between the operational channels for a total universe of 12. Switch #4, up or "on", puts two channels in between the operational channels for a universe of 18. And, Switch #5, up or "on", puts three channels between the operational addresses for a universe of 24. If more than one of these switches is in the "on" position, the lowest switch position number will be the one implemented. So, if all

three were “on”, Switch #3 would take precedence and the number of channels between operational channels would be one.

b. Adjusting brightness and fade time is accomplished by adjusting one of eight potentiometers. These potentiometers can be accessed through the bottom of the extruded aluminum case, if that option has been selected. If the naked PCB on standoffs configuration was selected, the potentiometers can be accessed from the topside of the PCB. See Figure 2.



Bottom of Extruded Enclosure



Top of PCB

Figure 2.

i. Let us identify a few points on these adjustments. First, the pots are single turn pots (~340°). Trying to force these adjustments past their limits will damage the pot. Second, your position relative to the adjustment will change the operation. When you are adjusting through the case with the LEDs to your right, the channel number increases from left to right and clockwise (CW) pot adjustments increases brightness levels and fade times while counterclockwise (CCW) degreases both. Making the adjustment from the top of the PCB with the LEDs on your left means the channel numbers decrease from four to one going left to right and the adjustment rotations are reversed.

ii. If you need to demonstrate the brightness level to a curator or a media producer, you can do this easily by controlling inputs and flipping Dip Switch #2 appropriately. First remove any inputs by unplugging the 8-pin and the 4-pin Phoenix connectors from the back of the unit. Another tip is to turn all the fade time pots to the minimum fade time to have the channels respond instantaneously to your brightness adjustment. Otherwise, the fade time will delay your adjustments to the brightness level.

1. This procedure is for DMX Commanders that are configured for contact closure. If Dip Switch #1 is in the “off” position and you set Dip Switch #2 to “on”, all six of the DMX channels will go to their brightest levels and you can watch

them change to the desired level while you adjust their brightness potentiometers. Conversely, if Dip Switch #1 is "on", flip Dip Switch #2 to "off" and this will make all six of the DMX channels advance to their lowest value and you can observe them as you adjust their lowest brightness level using the brightness pots.

2. If the DMX Commander is configured for TTL signals use this process. If Dip Switch #1 is in the "off" position and you set Dip Switch #2 to "off" as well, all six of the DMX channels will go to their brightest levels and you can watch them change to the desired level while you adjust their brightness potentiometers. Conversely, if Dip Switch #1 is "on", flip Dip Switch #2 to "on" and this will make all six of the DMX channels decrease to their lowest value and you can observe them as you adjust their lowest brightness level using the brightness pots.

iii. An alternative approach is to disconnect the inputs from back of the unit and activate by applying a trigger signal to each input. On the DMX Commanders that are configured for contact closure, all you need to do is short each signal on each input to its ground and then use the potentiometer to adjust its brightness level. For Commanders configured for TTL signals, it will be a little harder, because now you will need to apply a dc voltage (between 2.5-5.0vdc) to toggle the trigger. One way to do this is by using a pair of fresh AA batteries, in series with one another, and connecting the battery negative to the ground pin on the Commander and the battery positive to the signal input. ***Warning: Never apply a voltage greater than 5.0vdc to these inputs. See para 3.b.***

iv. Adjusting the fade time is more of a trial and error process. Assume the maximum time for fade is 12 seconds. Divide the desired fade time by 12 and apply that percentage to the total travel of the appropriate fade potentiometer. So if you wanted a fade time of three seconds, twist the potentiometer 25 percent (3/12 = 25%) of its travel from its minimum position and then test to see if the effect is correct. Use small incremental adjustments from there on to approach the targeted effect.

3. **Wiring Connections:** The wiring connections are fairly straightforward. See Figure 3 for the back of the device for to see the wiring interface. It uses screw terminal Phoenix connectors for interfacing wiring to the unit.

Figure 3

a. Power: Any DC power supply between 9-12vdc that can supply at least 300ma can be used. Although the power connection is polarity sensitive (indicated by the markings on the back of the Commander for power), reversing their connections will not harm the unit, it will just keep it form working. The green LED on the front indicates the powered condition.

b. IO Connections: Each channel trigger (or IO) has a ground pin and a signal pin. Connect the ground pin to the ground of the trigger (control) source and the signal pin to the signal of the control source. DMX Commanders that are configured for contact closure have all their IOs diode protected for voltages up to 70vdc. They are fairly robust. ***However, units that are configured for TTL inputs must never have a voltage greater than 5vdc applied to them or you will catastrophically damage the input IO.***

c. DMX Connections. There is a three-pin Phoenix connector for interfacing with a suitable DMX cable. This cable should be specifically designed for DMX. Some of the specifications are 120Ω twisted pair with low capacitance and a double shield (foil and braid). Microphone cable and unshielded Ethernet cable should be avoided. The Phoenix connection has numerical designations of 1,2 and 3. They represent the pin number on a female XLR connector (three or five pin as appropriate for the DMX device being controlled). Remember if the last DMX device to be controlled on the bus has a through output for the DMX bus, it should have a DMX terminator on it (120Ω).

Conclusion: You should be ready to operate your DMX Commander in whatever venue you have selected to apply it. We believe it will work flawlessly for you within the constraints discussed. Please contact us (see the header) for any issues or questions, or for our assessment on creating a custom firmware for your particular application. Sincere thanks for selecting our DMX Commander for your application.

Exhibit Control Engineering