



## Understanding DMX and Your DMX CONTROLLER

DMX stands for *Digital Multiplex* and is a serial communications protocol capable of managing up to 512 discreet channels of control over a single branch using one 3 or 5 pin cable. This is important with modern intelligent light fixtures since a single robotic instrument may require more than 24 individual control channels! Multiplexing allows each fixture to have its own *address* (like a unique telephone number) so that each fixture can be *called up* and sent instructions using a single set of control faders to talk to each fixture or group. A *group* is any set of fixtures sharing the same address. These fixtures would then all respond to the same instructions simultaneously. This makes it possible to create very large shows with many fixtures while keeping the lighting control board to a reasonable size. There are software/computer solutions as well.

Many portable controllers designed for DJs and smaller light shows might not be capable of addressing all 512 possible DMX channels but, will instead have a capacity set somewhat lower such as: 96, 128, or 256 channels. Consider the total number of channels you may need when buying a controller.

The most important thing is to match the controller to your fixtures. To do this you must know how many channels are required to operate your fixture and then select a controller that *banks* fixture channels in an equivalent or greater number. Hardware controllers have a fixed number of control faders and typically assume that each fixture or group will require the same "space" on the board. Thus, a simple controller with 8 faders will assume that each fixture needs no more than 8 channels of communication. Thus a 96 channel controller using an 8 channel bank will often be described as capable of 12 fixtures or groups. (8 channels x 12 groups = 96 total channels.)

In order for your controller to operate each fixture or group independently you must assign each group or fixture a unique *starting address*. A fixture whose *start address* is **001** and that requires 8 channels to operate will be controlled using DMX channels **1 through 9**. To add another fixture or group with independent control the start address chosen must be *greater than 9*. Ideally the next address should be the start of your controller's next *bank*. Let's see how this works graphically:

<b>DMX Channel (trunk)</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
<b>Controller Channel</b>	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2
<b>Fixture Group &amp; Address</b>	Fixtures 1 & 4 start address = 001								Fixtures 2 & 3 start address = 009								CC = 017				(unused)				CP = 025	
<b>Fixture/Group assigns</b>	Group 1								Group 2								Group 3				Group 4					

Setup includes:

8 channel controller (6 sliders + joystick)

4 pc - 8 channel scanners grouped as inside/outside pairs

4 pc - 2 channel color changers all grouped together

1 pc - 2 channel centerpiece effect

start addresses 1 and 9

start addresses 17

start address 19

Note that because we have an 8 channel controller - the controller assumes each group or fixture uses 8 channels. But the color changers only require 2 channels - therefore on that fixture assign six channels will be left unused. That means when we select the color changers, only the first two sliders will effect the fixtures, the remaining 4 and joystick will do nothing.

Tips and tricks:

A single DMX line controls a mximum of 512 channels - but a given controller may only provide access to 96 or less.

One way to save space is to make use of unused channels.

Since the color changers and centerpiece are both only 2 channel fuxtures, we could give the centerpiece a start address which places it in the unused channel section of our color changers.

Now, when we select Group 3 the first 2 channels contol the color changers, and the next 2 operate the centerpiece.

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<b>Fixture Group &amp; Address</b>	Fixtures 1 & 4 start address = 001								Fixtures 2 & 3 start address = 009								CC =017		CP =019							
<b>Fixture/Group assigns</b>	Group 1								Group 2								Group 3						Group 4			

There is no standard among fixtures for the operational order of channels. For example our scanners might work like this:

<u>Channel</u>	<u>Function</u>	
1	Color	So, controllers with a joystick typically have a built in fixture library and you must tell the controller what make and model of fixture has been assigned to each group. (Group 1 = American DJ Scan250 - for example.)
2	Gobo	
3	Shutter/strobe	
4	Dimming	
5	Motor speed	This way the controller will assign the joystick X/Y movements to the correct channel of your fixture. If there is a mismatch - you would end up with pan and tilt on your sliders, and something else like color/gobo on the stick.
6	Lamp Function	
7	Pan	
8	Tilt	

When you have an 8 channel controller, and a 12 channel fixture you will need to break control of that fixture across two adjacent groups. Fixture #2 on the controller would just be the last 4 channels of fixture #1 plus 4 more unused. This requirement bumps your second group up to controller group #3 and a start address of 17 because your first fixture overlaps into channel space of what the controller thinks is group #2.

Some controllers approach the above problem using "pages." This is essentially a controller that banks in 16 channel groups - but has only 8 sliders. There is a button that flips between "page 1" and "page 2" and toggles the 8 sliders between channels 1-8 and 9-16. It's still easier to use a controller with enough controls to match your fixture.

Knowing how your controller banks its fixture groups is your clue to setting the correct start address. In order to match discreet fixtures/groups to the fixture select buttons your starting address needs one number higher than the next multiple of the controllers channel bank.

**For 8 channel controllers:**      1    9   17   25   33   41   49   57 ...