HauntMaven.com - Wolfstone's Haunted Halloween Site

DMX Control

DMX-512 is an industrial-strength protocol originally intended to control lighting fixtures. Since then, it has been pressed into service to control lasers, fog machines, and other effects.

How does DMX work?

Think of DMX as working this way...

Let's say that you have three lighting fixtures. You assign each fixture a unique identification number, 1-3, and then wire them with DMX. Through DMX, you can then say "1:50%", and lighting fixture #1 recognizes his ID number and responds by dimming to 50% brightness. If you say "1:50%, 2:100%, 3:0%", the fixture with ID 1 goes to half-bright, ID 2 turns on full, and ID 3 turns off.

The ID number of a fixture doesn't necessarily have any relationship with its physical position. Fixtures 1 and 4 could be close together, and number two would be *way* far away.

There isn't necessarily a one-to-one relationship between ID numbers and lighting fixtures. You might have a dozen fixtures that are set to ID 3, all coming on, turning off, and dimming together. And you might have no fixtures at all set to ID 2. The control console doesn't care. It happily calls out "If there is anybody listening to ID 2, go to 75%!"

Now let's go a bit further with that.... Let's say that you have a lighting fixture that is not capable of dimming; it can't even turn on and off. But it can change color. This clever fixture might still be usable via DMX. All it needs to do is use the number that it is given and *interpret it,* not as a

dimmer value, but as the color. Perhaps 0-33% means red, 34-66% means green, and 67-100% means blue.

So, what if you had a fixture capable of both dimming and changing color? Perhaps it listens for *two* ID numbers. ID 1 might indicate the intensity, and ID 2 tell the color. Thus the command "1:25%, 2:75%" means quarter-bright blue. And from a distance, you can send "1:50%, 2:50%", and the fixture cheerfully goes to half-bright green!

You can even get "intelligent" lighting fixtures that dim, change color, move around, and project gobo shapes - all under DMX control.

That's the power of DMX - since the lighting fixture gets to decide what to do with the number that it is given, you can control almost anything - laser scanners, fog machines, mirror balls - just name it, and somebody probably has it running on DMX.

There are things that you shouldn't use DMX for. DMX has no error detection or correction, so it is possible that a glitch in the transmission might accidentally turn on something when it isn't yet ready. This isn't a big deal if the ID is assigned to a light, which might flicker, and probably won't even be noticed. But if the ID is being used to control pyrotechnic special effects or something else potentially life-threatening, a glitch in the line is potentially disasterous. **DMX should never be used to control dangerous things.**

More details, please.

- What we have called an ID number is officially known as a "channel".
- The current incarnation of DMX is capable of addressing 512 channels.
- DMX signals are sent over a differential digital line using RS485 serial. This electical interface is *not compatible with PC serial ports*. If you attempt to hook a DMX cable to your personal computer, you are going to fry something - something expensive.
- The transmission rate is 250k bits-per-second. When using all 512 channels, each channel gets its value refreshed about 40 times per second.
- A numeric value is sent to each channel, but it isn't really a percentage. It is an eight-bit binary number between 0 and 255. The person operating the control console probably sees this as just the position of a sliding control. And the fixture can interpret it any way it wants to.

How do you hook up DMX?

Keep in mind that DMX only conveys the control information, not power. Every DMX fixture will also need a source of 110 VAC power.

DMX is designed to be easily hooked up as a "daisy chain". Each box that is capable of sending a DMX signal has a female socket. Each box capable of receiving a DMX signal has a male plug.

Each cable has a plug on one end and a socket on the other. In order to hook things up, you need merely string cables from each box to the next box.

Here is the output of the Sunn PLC 3200 control console. It sends exactly the same information in three different formats (it also speaks MIDI). We are interested in the DMX output to the right.

This device came with a 5-pin connector for DMX, which has been replaced with the more common 3-pin connector. The DMX output is always female.

Here is the connecting cable. It is male on one end and female on the other.

You will need one for each device you put in the chain.

Here are the connectors on the back of an ADJ X-Cess fixture. Note that it is equipped with both a DMX input and output.

Just take a cable and use it to wire the input of each device to the output of the previous device.

The control console, being only a transmitter of data has a female socket. The terminator at the end, being the ultimate recipient of data, has only a male plug. All of the fixtures, packs, and other gadgets in between are equipped with both female and male connectors, because they take DMX in on one side and pass it out the other side.

DMX signals must travel in a straight line, from the control console on one end, to one unit, then another, to the end. You must not attempt to split the DMX into two directions with a "Y" cable.

Note:

- Every DMX line must be "terminated". This is done by plugging a special terminating plug into the output of the last DMX unit in the chain. You can easily make a terminator by taking a male XLR plug and soldering a 110 ohm 0.5W resistor across pins 2 and 3.
- The official DMX standard calls for a 5-pin XLR connector. Three of the pins have well-defined functions, but the other two are often used for nonstandard, incompatible purposes. As a result, it is common practice in the U.S. to use 3-pin XLR connectors. It's nonstandard, but it is common.
- The electrical standard specifies that not more than 32 devices can be placed on a single DMX chain. It doesn't matter how many channel numbers these devices use, but it matters how many devices you have. In order to work around this limitation, you need a special DMX splitter or signal booster for each additional segment of 32 units.
- For short runs, microphone cable can be used for DMX; you probably even have some sitting around with XLR connectors on it. But DMX is a high-speed digital signal - it works better and more reliably, with proper digital cables.

What is a DMX "pack"?

Let's say that you wanted a DMX-controlled lighting fixture, specifically a PAR can. While an ordinary PAR can might cost $20, adding the DMX circuitry to it would probably boost the cost to $80. And your DMX PAR can would stay a PAR can forever - not a scoop, elipsoidal, or whatever.

A "dimmer pack" is a *generic* DMX target device. It understands DMX, and is capable of dimming. But it isn't a fixture. Instead, you plug the fixture of your choice into it. When you get tired of the controlling the PAR can via DMX, you unplug it and plug a different fixture into the dimmer pack. This adds flexibility and preserves your investment.

Dimmer packs often take advantage of economy of scale by monitoring more than one DMX channel and controlling more than one fixture. Four seems to be a common number - lots of companies make four-channel DMX dimmer packs. Such a unit performs like four generic DMX dimmers, but can be built and sold for a lot less, because all four dimmers share the same case, controls, DMX connectors, and controlling microcomputer.

Dimmer packs are really only suitable for running various kinds of lights. They'll blow out if you attempt to switch heavy loads, motors, or other inductive loads. For control of things other than lamps, you can get a "relay pack", which does not dim, but switches on and off heavy loads.

DMX Rogues Gallery

This is the ADJ DP-DMX20, an older model four-channel DMX dimmer pack.

I think it looks a bit like a shoe box. The very similar-looking PP-DMX20 is a relay pack. It doesn't dim, but can switch heavy loads.

This unit also features an automatic "chase" feature, sequentially lighting each of the four fixtures plugged in to it.

This unit listens to four consecutive channel numbers, starting with a number that is set on DIP switches on the unit.

This is the ADJ DP-DMX20L, a newer model four-channel DMX dimmer pack.

The DP-DMX20L looks flatter than the shoebox-like DP-DMX20, but appears to take up about the same volume.

This unit also features an automatic "chase" feature, sequentially lighting each of the four fixtures plugged in to it.

This unit listens to four consecutive channel numbers, starting with a number that is set via a menu shown on a small digital display.

This is the ADJ PP-DMX20L, a newer model four-channel DMX relay pack.

Compare the appearance with the DP-DMX20L and you'll see what I mean about dimmer packs and relay packs looking similar.

This unit also features an automatic "chase" feature, sequentially lighting each of the four fixtures plugged in to it.

This unit listens to four consecutive channel numbers, starting with a number that is set via a menu shown on a small digital display.

This is the ADJ Color 150 DMX, a DMX-controlled color-changing fixture.

This unit has a 150W lamp. It doesn't dim, but it can remotely turn on and off, and change to any of seven different colors.

The Color 150 DMX also has a sound-activated mode, reacting to the music around it. In this mode, a single Color 150 DMX can control other units to put on a synchronized light show.

This unit listens to one channel number, set on DIP switches on the unit.

This is the ADJ X-Cess, a DMX-controlled color-changing fixture.

This unit has a 250W lamp. By sending DMX commands, you can cause it to dim or change to any of ten different colors plus white.

The X-Cess also has a sound-activated mode, reacting to the music around it. In this mode, a single X-Cess can control other units to put on a synchronized light show.

This unit listens to two channel numbers, starting with the one set on DIP switches on the unit.

This is the ADJ DJ Scan, a DMX-controlled intelligent lighting fixture.

7 colors, plus white. 9 gobos, plus large and small spot. 90-degree pan, 90-degree tilt.

This unit listens to four consecutive channel numbers, tarting with a number that is set on DIP switches on the unit.

This is the ADJ Megastrobe DMX, a DMX-controlled strobe light.

The DMX values allow you to set the flash rate and *dim* the strobe.

This unit listens to two consecutive channel numbers, starting with a number that is set on DIP switches on the unit.

This is the ADJ Master Blaster 1500, a DMX-controlled fog machine. It is currently being manufactured under the Elation brand with a blue paint job.

This unit has lots of high-end features, including a timer that allows you to specity regular bursts of fog for a duration and volume that you set.

This machine is quite heavy, strongly built, and puts out huge volumes of fog!

In DMX mode, this unit listens to channel number, which simply specifies the amount of fog to put out. The timer is not available in DMX mode.

This is the Sunn PLC 3200 control console.

It speaks DMX512, MIDI, and some other protocols.

It can be programmed with scene settings - each one consisting of a full set of control values - then sequence through them.

Do you own stock in ADJ?

No. The rogues Gallery contains a lot of American DJ equipment, because I *own* a lot of ADJ equipment - bought and paid for.

ADJ stuff impresses me as being sturdily-built and relatively inexpensive. Yes, there is better stuff out there. You also pay a lot more for it.

The thing that bothers me about ADJ is that everything is larded up with additional features that I don't particularly want or need. For example, every relay pack and dimmer pack seems also to function as a chase controller. And almost everything comes with an option to react to sound. It's obvious why these things are included - they are simple and cheap to add, often just a couple more bytes in the microcomputer that controls the unit, but adds perceived value to the product. This allows the gadgets to command a higher price, and look like a better deal than competing equipment. But it still means that you have to read the manual and figure exactly how to turn off the features that you have no choice in buying and just don't want.

Here's a partial list of manufacturers of DMX equipment:

- American DJ
- Elation, ADJ's "high-end" line
- MBT
- Chauvet
- Martin

What are the haunt applications of DMX?

I'm not sure that it makes good economic sense to buy DMX equipment *just* for use in a haunted house. But if you already need the equipment for some other purpose, like little theatre or DJ, why not also use it in the haunt?

I should think that there would be plenty of obvious haunt applications for technology that allows you to remotely control lights, lasers, fog machines, and just about anything that runs on electricity. This is especially true if you don't need to justify the purchase of the equipment, because you *already have it on-hand for some other use,* such as theatrical productions and DJ work.

But if you haven't had your coffee yet this morning, consider what you could do with just a single intelligent lighting fixture: Set the color to green and the aperature to a small spot; use the X/Y controls to move a "Will O'Wisp" around your graveyard. The wandering point of light comes up to something interesting, and grows a bit larger, turning a golden color for a moment.

The light wanders towards a tombstone. Suddenly, there is a flash of light, burst of fog, and the tombstone is illuminated with a red light, flickering like flames. By the strange red light, you read "Count Dracula".

Or perhaps you just have some DMX color changers. By using them to illuminate the stones in your graveyard, you can change them from a cold blue to a sickly green, to a blood-red.

Or maybe you want to control the speed of a strobe, without walking up to it and twisting a knob on the back of the unit.

You just have to use your imagination.

For more information on DMX...

For more information on DMX, try the following web sites:

NAME	WEB SITE	CONTENT
United States Institute for Theatre Technology	http://www.usitt.org	sells the DMX512 specification
Rosco	http://www.rosco-et.com/dmxtour.htm	Rosco "tour of DMX"
dmx512.com	http://www.dmx512.com	DMX info, products, and projects
Ujjal Kar	http://www.dmx512-online.com	DMX info and projects
DMX-512 mini-FAQ	http://waapa.cowan.edu.au/lx/dmx-faq.htm	DMX-512 mini-FAQ