Fountain Controls using GilderGear

Gilderfluke & Co. Show Control systems have been used to control fountains all over the world. These include fountains ranging in size from a simple backyard splash pad to multimedia extravaganzas with over 10,000 synchronized jets with sound, video and pyrotechnics.

Fountains typically need a mix of:
- Digital (on/off) outputs, for controlling fairly large solenoid valves
- Analog outputs, for controlling analog water valves and/or pump speeds through Variable Speed Drives (VFDs)
- DMX-512, for controlling lighting and other effects

Gilderfluke & Co. has controllers that feature a mix of outputs (Br-MiniBrick4, Sd-50/8, 8DMX-512, etc.), and other controllers that have only one type of outputs (PB-DMX/xx). A typical fountain control system is made up of one of more of these different controllers, networked together using DMX-512 (see sidebar at right for an explanation of DMX-512 networking).

All of our controllers will allow you to program and download up to 256 different ‘shows’. These can be set to be played when triggered by a switch, a serial command (from a touch screen, PLC or iPad/iPhone), whenever the controller is powered up, or using the 365 day scheduler and clock available on several of our controllers (Sd-50/8, Sd-50/40, Br-Brand).

The length of the shows that a controller will hold is only limited by the size of the flash memory available on the controller. In most of our controllers, this is a standard Sd/Sc flash card, which gives the controller a virtually unlimited show length capacity.

The [proper software] and the ‘programming tools’ shown in the following block diagrams are used only during the initial programming and setup of the fountain. Once the fountain is choreographed, the shows are stored on the ‘Master’ (usually in an Sd or Sc flash card), and the ‘programming tools’ are removed from the system to be used to program your next fountain.

No PC is ever needed by the permanent control system after the fountain has been programmed. PCs aren’t reliable enough for use in permanent installations.

A simple eight jet splash pad or LeapFrog installation might have only a single PB-DMX/08 controller.

DMX-512 is the standard networking signal that is used to control all theatrical lighting equipment, as well as to network all Gilderfluke & Co. systems together.

By networking, you can make a show controller of any size with any mix of any types of outputs.

With the exception of the Br-MiniBrick4, all Gilderfluke & Co. controllers have DMX-512 inputs and/or outputs.

The DMX-512 network allows you to easily attach any type of DMX-512-compatible equipment (light dimmers, moving head lights, strobes, fans, etc.) to your fountain. The most commonly attached DMX-512 controlled device you will be using are Red/Green/Blue (RGB) LED light fixtures, which are often built-into the fountain jets.

At least one manufacturer makes submersible fountain pumps that are controlled directly by DMX-512, which eliminates the need for all the manifolds and plumbing normally required by an animated fountain.

In a DMX-512 network, there is one ‘Master’, sending data to all the ‘Slaves’. The ‘Master’ tells the ‘Slaves’ what to do, and the ‘Slaves’ have no choice but to do what the ‘Master’ has told them.

The DMX-512 network should be wired point-to-point from the Master to the first ‘Slave’, then from the first ‘Slave’ to the second ‘Slave’, and so on to the end of the network. Each DMX-512 ‘slave’ is individually addressed, and can be attached anywhere on the network.

The programmer you choose to use with your fountain should control all the equipment needed to control your fountain:

If you need to control more solenoid valves, you add in more PB-DMX/xxx.

If you need some analog outputs to control VFDs or analog jets, you just add in the appropriate number of Br-ANAS or DAC-QUADS.

Controlling PEM Jump Jets? You’ll need a DRV-05 for each eight of them.

DMX-512 network, independent of their DMX-512 addresses.

At each end of the DMX-512 network, you normally attach a 120Ω ‘terminating’ resistor. These 120Ω ‘terminating’ resistors snub out electrical echoes that might otherwise bounce back and forth at just under the speed of light in the DMX-512 network.

The maximum wire length for a DMX-512 network is nearly a mile (1.5 km).

In the block diagrams, there is a DMX-512 isolator/splitter shown on the wire heading out of the control room to the DMX-512 controlled lights in the fountain basin.

Isolators are available with anywhere from one to eight DMX-512 outputs on them. If you need more than eight DMX-512 outputs, then multiple isolator/splitters can be used.

It is recommended to isolate the DMX-512 line anywhere it leaves the control room. This protects the control system from lightning hits or other catastrophes.

If your wiring precludes connecting the DMX-512 network in a single linear DMX-512 string, then you can use a DMX-512 isolator/splitter to split the DMX-512 network into multiple DMX-512 sub-networks. Each of these can be treated as its own independent network for connecting the lights and other equipment in the fountain basin.

DMX-512 is normally run through a single shielded twisted pair cable (much like a microphone cable). Unless your wire runs are especially long, just about any shielded twisted pair or Sd-25 w/DMX.

Need some lower current (150 ma continuous, 500 ma peak) digital outputs? Use Br-MiniBrick8s, Z-Bricks, or spare digital outputs from the Sd-50/78 or Sd-50/40s.

Need Video? Use one or more v-Hd120 (for 1080p resolution) or v-4K (for 4K resolution) with v-Hd-to-DMXs to trigger them via the DMX-512 network.

This is how you build a Gilderfluke & Co. fountain control system.

Where a small fountain may have just a single controller, a larger fountain may have dozens of controllers. A gigantic fountain might have hundreds of controllers spread across multiple locations around the fountain basin, all networked together via DMX-512.

In each of the following block diagrams, more controllers are shown than you will ever need in a typical fountain installation. Once you determine the number and types of outputs your fountain will need, you can redraw these block diagrams with the appropriate numbers and types of controllers.

The controller that you have chosen to use as the ‘Master’ is moved to the ‘first’ position in the diagram, as it will be what the programming system will be attaching to, and will be sending its commands to the rest of the system.

The Br-Brain4 is used as the DMX-512 ‘Master’ if you need to control a lot of output channels, or if you have particularly long shows. Its 5d flash card for storing shows means it has just about unlimited capacity. Each Br-Brain4 can support up to four full DMX-512 universes (2048 analog dimmers, or 16,384 on/off functions). The Br-Brain4 also has a built in clock and 365 day scheduler, so it can control when and what shows play automatically. In the unlikely event that 2048 channels are not sufficient, Br-Brain4s can be linked together for controlling any number of outputs. The Br-Brain4 will also support a GPS clock option, to keep its internal clock accurate to within 1/1000 of a second of (Zulu) Universal Standard Time. If the fountain is part of a larger ‘water spectacular’, the Br-Brain4 can also lock to some timecode to keep in sync with any other third party controllers used in the installation.

If you don’t need the capacity of the Br-Brain4 offers, then the next controller on the block diagrams can be used as the DMX-512 ‘Master’ to run the fountain. In the first block diagram, this is the Br-ANA or DAC-QUAD.

The Br-ANA or DAC-QUAD are used in a fountain control system to provide 0 to 10 volt signals that typically control Variable Frequency Drives (VFDs) to control the speed of the pump motors. In some fountains, they are used to control analog fountain jets through Voltage-to-Pressure (V-to-P) transducers.

The Br-ANA has sixteen 0 to 10 volt analog outputs. The DAC-QUAD has four 0 to 10 volt analog outputs. The 0 to 10 volt outputs can be adjusted electronically, which means that you can adjust the height of a line of fountain jets while sitting in the shade next to the fountain, instead of climbing in and out of the control room with a little screwdriver thousands of times. If you need more analog control signals than either of these provide, then you just use more of them. They both use an Sd flash card (micro Sd for the DAC-QUAD) for storing shows when they are used as a DMX-512 ‘Master’, so they have unlimited show length capacity. Both of these controllers can control one full DMX-512 universe (512 analog dimmers, or 4096 on/off functions).

If your fountain needs to lower the height of the water jets during high wind conditions, an anemometer is typically attached to the DAC-QUAD or Br-ANA trigger inputs. At the
tripping points set in the anemometer, the **BrANA** or **DAC-QUAD** can be configured to scale its analog output to lower the height of the water. Neither the **BrANA** or **DAC-QUAD** have a clock or any 365 day scheduling features.

If your fountain doesn’t need any 0 to 10 vdc control signals, the **BrANA** or **DAC-QUAD** can be omitted from the control system design.

The second controller shown in the second block diagram ‘With Music’ is the **Sd-50**.

The **Sd-50** has a .Mp3/.WAV audio player, along with an amplifier that is equivalent to a 400 to 500 Watt linear amplifier. The **Sd-50** has the same clock and scheduling features as the **Br-Brain4**, but lacks its ‘unlimited show’ capacity. An **Sd-50** is limited to its 4 or 8 MByte show memory. There is a chart in the **Sd-50 Manual** that shows what the time capacity is for the number of channels you need to control. The maximum DMX-512 capacity of an **Sd-50** is one DMX-512 universe [512 analog dimmers, or 4096 on/off functions].

The next controller shown in these drawings are the **PB-DMX**. These are the relay output cards that directly control the larger sized solenoid valves typically found on fountains. They are available with 8, 16, 24 or 32 relays on each. Each relay is rated for 3.5 amps of continuous current, and are fused for five optional larger memory. The maximum DMX-512 capacity of a **PB-DMX** is a bit more than one half of a DMX512 universe (300 analog dimmers, or 2400 on/off functions). The **PB-DMX** does not have a clock or any scheduling features. The number of **PB-DMX**s that are needed (and the number of relays on each **PB-DMX**) for a given project is determined by the number of solenoid valves (and other devices) that need to be controlled.

Solenoid valves just require an on/off control signal. We only recommend solid state relays for this. Electromechanical relays should not be used in fountain applications, as they will wear out far too quickly.

The **PEM LeapFrog** jets need a controller that reverses the polarity of the voltage sent to them, but never turns it off. The **DRV-05** has been designed specifically for controlling up to eight **PEM LeapFrog** jets. The **DRV-05** does not accept DMX-512 directly. The input to the **DRV-05** must come from the digital outputs of a **Br-MiniBrick**, **Z-Brick**, **Sd-50/8**, **Sd-50/40**, etc. that receives the DMX-512 from the network and turns it back into the individual on/off digital control signals the **DRV-05** wants to see. Any of these can be used as the **DMX-512 ‘Master’** for fountains with just the **LeapFrog** jets (and optionally some **DMX-512 controlled lights**).

If you need video output for your fountain, you can use a **vHD-120** (for 1080p resolution) or **v-4K** (for 4K resolution). They attach anywhere along the **DMX-512** network as ‘Slaves’ using the **vHD-to-DMX** to trigger them via the **DMX-512** network. Each video player cable will work. There are specific cables that are best for use with **DMX-512**:

- **Belden 3106A**
- **Belden 9841**
- **Belden 7200A**
- **Proplex PC222A**
- **Dataplex WDP222TBK**

You can also use standard CAT-5 (or better) cables for **DMX-512**.

There are also many options for running **DMX-512** through wireless links, fiberoptic cables, or other media. ☏

### Sample Fountains

Here are links to just a few of the thousands of fountains that have been built and programmed using GilderGear:

A small musical fountain in Southern California, using 13 Oase Varionauts (DMX-512 controlled submersible pumps) for 13 jets. No additional plumbing or modifications are needed for retrofitting existing ponds or in shallow-pond applications.

This is a live camera feed of a fountain that was completed in early 2014 near USC in Los Angeles, California. It has 109 jets, each with a **DMX-512-Controlled RGB LED** lights. The fountain runs a random sequence made up of almost 200 different short shows between the ‘main’ musical shows.

Here is a mid-sized fountain in Memphis, Tennessee using our software, augmented by a...
More Fountains

A world record-breaking series of fountains in Avaza Beach, Turkmenistan. These fountains were built by a first-time user in 2010.

Click some of the related Avaza Beach videos to see the other Fountains. The big one in the Caspian Sea has a central jet that reaches about 500 feet (150 meters), a world record for an animated fountain. The builder had a pretty good budget and a big yard to play in.

There are dozens of videos of the Ferris World Abu Dhabi Musical Fountain performing different musical numbers. It uses one DMX-512 universe for jets, and seven for lights.

This is one of hundreds of YouTube videos of the Disney Seas Symphony from Tokyo, which used our controls for all the water features.

You can also find thousands of videos on YouTube for the Fantasmic dragons at Disneyland and Walt Disney World and 'The Legend of Mythica' at Tokyo Disney Seass.

You will find that choreographing a fountain using PC MACs is not anything like programming a computer. After you have named your show, you can almost throw away your keyboard. Everything is done graphically or just by doing it. PC MACs will remember what you did and how you did it. You can then edit your show graphically until it is perfect. Once you have all of your shows as you like them, you download them to whichever controller is serving as your DMX-512 ‘Master’, and your PC and programming tools can be removed from the system to be used on your next project.

Once you can program a small show on a Br-MiniBrick8, you can program a show of any size. The only difference is the number of channels you need to wrangle.

Third party pre-visualization and simulation program for programming.

The MACsLicense and USB DMX-512 Adapter are only necessary if your show is larger than the equivalent of sixteen analog and/or 128 digital on/off functions. If your show is smaller than this you can use PC MACs gratis. You will use your serial port for connecting to the Control System during programming.

We have training videos on GilderYouTube that will walk you through programming your first show.

PC MACs for FREE from our web page. The web page makes it look like you are buying something when all you need to do is download. Just set the ‘shipping’ to download when you are checking out, and the web page will send it to you gratis.

Once you download and run the installer, you should be all set.

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