ACCESS Musical Fountain Control Software Overview

Revised: June 13, 2009

The Electric Fountain is controlled by a PC running the ACCESS musical fountain control software from Atlantic Fountains. This software has been highly customized for the Electric Fountain. The screen has a simple graphic representation of the fountain layout (rotated so that left is north) to assist with the programming.

The PC outputs data to the fountain vault where it is translated to commands to open and close the valves for the various water features, control the dimmers for the incandescent lights and control the red/green/blue LED fixtures.

The ACCESS screen has four major areas:

- The main fountain programming area.
- A scheduler that runs fountain shows.
- The fountain show cue sheets.
- The fountain status boxes (which influence the control outputs of the software).

As long as the software is in AUTO mode, it will continue to run the schedule of fountain shows indefinitely. Normally the fountain runs the same schedule each day of the week.

The software is capable of synchronizing fountain shows with music. The addition of an FM transmitter in the future will allow the broadcast of music to be picked up by Walkman and boombox devices with FM radio receivers.

Programming fountain shows take planning, lots of patience, a knowledge of the fountain water features, awareness of the limits of the plumbing and a sense of artistry and showmanship! Since the new control room looks down the long axis of the fountain, it is difficult to see a lot of the effects unless you walk towards the overlook and bandstand to see the fountain from the west. A camera is planned for the bandstand to make it easier to see the water and lighting effects on a screen in the control room.

There is a standard base “look” for the fountain (the center geyser and the hourglass displays) that provides a uniform transition between fountain shows. At night that transition may include the famous “prismatic” lighting effect.

Currently the fountain is programmed to hold a spray pattern overnight to maximize the aeration of the water in the lake. Starting at 7AM the fountain changes the water display every 5 minutes. At 7PM the fountain shows start and at dusk the lights turn on. The fountain shows and lights stop at 11PM when the park closes.

Automation Valves

The original 1908 Electric Fountain had 12 water features controlled through 12 automated valves. The new Electric Fountain will have 12 water features when it is completed (feature 11 has not yet been constructed due to a lack of money) supplied through 37 valves. The increase in the number of valves
was made primarily to add more variety to the water displays but also to accommodate the change in the distribution plumbing from on the fountain deck to inside the fountain vault.

In some cases there are multiple valves feeding a single feature because of the layout of the plumbing. These valves are controlled together as a single channel on the screen. In other cases a feature that has multiple copies over the area of the fountain will be divided into sections, each controlled by its own valve. In general, valves should not be opened and closed faster than with a 3 second interval to prevent water hammer in the plumbing.

The valves are assigned as follows:
- Center geyser: 1 valve
- Beehive: 2 valves controlled together
- Peacock: east bar - 2 valves controlled together; west bar - 2 valves controlled together
- Middle spray ring: 2 valves controlled together
- Outer spray ring: 2 valves controlled together
- Radial spray bars: 2 valves controlled together
- East/west spray bars: north 3 bars - 1 valve; south 3 bars - 1 valve
- Ribbons (north/south spray bars): north bars 1 valve; south bars 1 valve
- Ring of Six: north nozzle - 1 valve; south nozzle - 1 valve; east 2 nozzles - 1 valve; west 2 nozzles - 1 valve
- Great Arch nozzles: north 3 nozzles - 1 valve; south 3 nozzles - 1 valve; east 2 nozzles - 1 valve; west 2 nozzles - 1 valve
- Hourglass rings: north 3 - 1 valve; south 3 - 1 valve; center 5 - two valves controlled together
- Pods: north 3 - 1 valve; south 3 - 1 valve; east 2 - 1 valve; west 2 - 1 valve
- Light cluster arches: north 3 - 1 valve; south 3 - 1 valve; east 2 - 1 valve; west 2 - 1 valve

Incandescent Lights

High power incandescent lights are used to illuminate the taller water displays created by single nozzles. The center geyser has two 1000-Watt fixtures. Each of the nozzles in the "ring of six" nozzles in the center of the fountain and the ten "great arch" nozzles has an individual 500-Watt fixture. Each of the pod nozzles has a 250-Watt fixture to illuminate the hollow column of water created by the pods.

The incandescent lights are controlled individually to provide maximum flexibility in programming fountain shows. While there is a limit on how fast you should operate the water valves, there is no limit in the speed of operating the fountain lighting and interesting effects can be achieved by turning lights on and off at a rapid pace. It does take a fraction of a second for incandescent lamp filaments to respond to on and off changes.

Because of the high algae content of the water in Ferril Lake, the "white" incandescent lights will produce an illumination effect that is slightly green.
LED Lights

There are three groups of LED lights on the fountain. The proportion of red, green and blue light determines the resulting color seen from the LED fixtures. The first group emulates the original 1908 lighting effects created by Frederic W. Darlington. Clusters of LED fixtures are inside each of the eleven hourglass spray rings, giving the same effect that the arc lights with colored glass slides did on the original fountain.

The second group of LED fixtures illuminates the peacock display, allowing a rainbow of colors to be projected onto the fan-shaped water display. The third group of LED fixtures illuminates the ribbon effect, which is created by the north/south spray bars. These additional fixtures also provide supplemental illumination for the middle and outer spray rings and the beehive.

The red/green/blue LED light fixtures have a very fast response time compared to an incandescent lamp filament and can be programmed to make very rapid changes. The ACCESS software provides several methods of determining the mix of intensities for the three primary colors to produce a wide range of colors. The “white” created by turning on red, green and blue LEDs simultaneously does have a slight blue cast, which is further corrupted by the green tint of the water.
Darlington's Electric Fountain No. 33  Denver CO
IMPORTANT SAFETY NOTE – Access can instantly switch hundreds of Amps with a single mouse click. Devices that appear to be off may be idling at a lower level or waiting for timed activation. DO NOT depend on the program to shut the system off for servicing. Follow a proper lock out and tag procedure for ALL circuit breaker panels servicing the fountain before servicing equipment or entering the fountain pool.

GFCI breakers in accordance with NEC Article 680 must supply all system dimmers and fountain circuits. GFCI breakers should be tested periodically in accordance with product specifications.

This manual describes the Access hardware system. It is descriptive and not a substitute for electrical training and installation experience. If you lack these then please pass this information along to a qualified individual.
Introduction

The Access system can be compared to a human body:

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Brain    >>    Nervous System    >>    Muscles
Computer >>    DMX Data        >>    Fountain Devices
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Understanding each area will help you assemble and diagnose your system. We will take each of these areas and expand upon them.

Computer

The use of a PC allows people the ability to enjoy the use of their fountain and modify its operation without having to parachute an engineer out of the sky every time a change is desired.

The job of the PC is to generate the control data that operates the fountain. It not only can playback a selection, but can schedule it as well. It turns the lights off during the day and can modify spray heights in real time according to wind speed, or other external inputs such as level sensors or push buttons.

The Access program delivers its data to a USB port. This is connected by a (typically short) cable to the DMX interface which reconstitutes the data and drives it down a cable for up to 1500'.

In most installations this allows the PC to be located where it is warm, safe and cozy and lets the other equipment sit out in a rain-tight panel near the fountain. Your installation may vary, but it is desirable to locate the PC where you can see the fountain or at least be able to move the PC to accomplish this. Often a 50' DMX cable can let you move the PC to a better location.

Many Access installations use a laptop computer because they are small, portable and their battery gives them the ability to ride out a power failure for a few hours.

You will need to set up the power management features of your computer appropriately. This includes telling it to “do nothing” if the laptop lid is closed and to use an “always on” power scheme so it does not enter standby. In some cases it is also necessary to tell the USB controller in the PC that it cannot power down for energy savings.

The USB to DMX adapter is logically attached to serial port COM7: This is manually done via the Control Panel after the driver software is installed. DO NOT move the USB cable to another port or the PC may reassign it and the software will not find it.
DMX

Entire books have been written about these three letters, but we will cover the basics.

DMX stands for “Digital Multiplex” and is the language of theatre lighting. It is an asynchronous 200kHz serial data stream that uses a shielded twisted pair for its physical connection. Technically, DMX is RS-485 standard serial data, but what it means to you is that it can be run long distances typically without issue.

DMX is like a party line. Everyone on the line can listen in. DMX sends a start sequence followed by a packet for each device, for up to 512 devices. This is why you may see it referred to as DMX-512, even though it is still perfectly fine if it only sends information for a handful of devices each refresh. On faster systems where the “pipeline” can be kept full, DMX can refresh all 512 devices 44 times per second. This is fast enough to control any fountain device without flicker.

The RS-485 data format is very robust. The shielded twisted pair is very immune to interference, although it is still a good idea to run it a foot or so away from power conductors, in other words, not just a separate conduit, but one that is spaced apart from others. Double shielded DMX lines are also available, but rarely required.

You will also see “5-pin DMX” and “3-pin DMX.” This is simply the connector used on the cable. Genuine international spec DMX cables are 5-pin, but some Asian and European suppliers use a 3-pin XLR type microphone connector because they are less expensive and easier to find. In any event the first three pins are the same:

- Pin 1 Shield
- Pin 2 Data –
- Pin 3 Data +

An easy way to remember which connector sends DMX is to remember that “females are in control.”

A DMX data line is daisy-chained through multiple devices. Although devices may have varying actual loads on the data line, standard practice is to keep the devices to a dozen or so.

Note that this is physical devices, not channels. The 144 channels on the 24 channel dimmers shown only take six loads as there are only six physical devices.
The DMX standard is a cable run of up to 1,000 meters, although most professionals only go 1,500 feet before going to fiber optic. If you are running that far you probably are a commercial installation that has some trained A/V and IT support available.

The end of the DMX cable must be terminated to prevent data reflections. Think of this as having a 200 kHz fast ball being caught in a catcher's mitt instead of bouncing off the backstop and rolling back out on the field where it will confuse other devices on the line. Termination is a 120 Ohm resistor across pins 2&3. Most DMX devices have a terminate switch or jumper built in, so that an extra connector and resistor does not need to be obtained. Only terminate the last physical device on the line.

DMX is a serial bus, not a branch. The data line must be looped from device to device (and terminated at the end) NOT branched out from a single point with a separate line to each device. In cases where this is desirable, a DMX isolation/distribution box may be used to fan the data out to two, four or more locations. The device also provides data isolation by lifting pin 1. This can be useful where the fountain is run off of one transformer and the PC sits in another building off of a different transformer. This prevents ground loops where "ground" is not really at the same potential at two different points on the line. In some cases with dozens of LED fixtures this can also be a good idea as pin 1 may be attached to the fixture body and a path exists from the conductive water, down pin 1, through the DMX adapter, out the ground of the USB cable across the frame of the PC and finally out the ground wire of the PC power plug, or attached audio amplifier. (whew)

Most DMX devices supplied by Atlantic Fountains have an indicator that shows when a DMX signal is present. This is not the ultimate in DMX diagnostic tools, but can go a long way in helping you diagnose a problem. The fastest way to test is by substitution. If your system is working fine and a new device crashes the signal, take it off! Try disconnecting the in and out connectors on a device and then plug the cable ends together to bypass it and see if other devices on the system still work correctly.

As mentioned earlier, DMX devices are all on the same party line. They have an addressing mechanism that tells them their starting address so they know when their name is being called. A four channel dimmer set to 005 will occupy addresses 5,6,7 & 8. This does not mean that another dimmer could not listen to the same addresses and in some cases this may be used for high wattage requirements or where mirror images of devices exist on either side of a fountain and you wish them to operate together (this can of course also be done in software). In addition many dimmers have a "non-dim" setting where the output switches on/off at the 50% point instead of dimming. Make sure you have the correct setting for your equipment.

DMX delivers an 8-bit value to a device. This is 0-255 or steps of 0.4%, sufficient to control almost any device smoothly. An RGB fixture therefore has a color selection of 256x256x256 or 16 million colors.
DMX Devices

Atlantic Fountains uses a variety of DMX devices in its systems. These can be dimmers, interface devices such as relays or voltage boards, or directly controlled DMX devices such as LED fixtures, smart pumps and DMX laminar nozzles.

Atlantic Fountains has probably already devised a device layout and data assignment scheme for your system. This is described on a spreadsheet, much like the following:

### DMX Device Assignments

<table>
<thead>
<tr>
<th>Location</th>
<th>Dimmer &amp; GFCI</th>
<th>Dimmer Position</th>
<th>DMX Chan Description</th>
<th>Watts</th>
<th>Total</th>
<th>Amps (120V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 (15A GFCI)</td>
<td>1</td>
<td>Center Nozzle</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>Frothy</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>Frothy</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4</td>
<td>Filter Pump</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>805</td>
<td>6.7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2 (15A GFCI)</td>
<td>1</td>
<td>Ring 1</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Ring 2</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Ring 3</td>
<td>215</td>
<td>215</td>
<td></td>
</tr>
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<td></td>
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<td>4</td>
<td>Ring 4</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>860</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3 (15A GFCI)</td>
<td>1</td>
<td>3-Tier 1</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3-Tier 2</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>3-Tier 3</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>4</td>
<td>3-Tier 4</td>
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<td>160</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>640</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4 (15A GFCI)</td>
<td>1</td>
<td>Laminar 1</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Laminar 2</td>
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<td>160</td>
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</tr>
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<td>Laminar 3</td>
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<tr>
<td></td>
<td></td>
<td>4</td>
<td>Laminar 4</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>640</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>LED Power</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TOTAL</td>
<td>25.0</td>
<td></td>
</tr>
</tbody>
</table>

### DMX Neo

<table>
<thead>
<tr>
<th>Location</th>
<th>DMX</th>
<th>Neo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Center</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>Ring 1</td>
<td>22</td>
<td>8</td>
</tr>
<tr>
<td>Ring 2</td>
<td>25</td>
<td>9</td>
</tr>
<tr>
<td>Ring 3</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>Ring 4</td>
<td>31</td>
<td>11</td>
</tr>
</tbody>
</table>
This chart provides you with a lot of information and in the hands of a knowledgeable fountaineer, is actually more useful than a schematic.

Things we know from above are that there are four dimmers driving a total of sixteen pump motors. The chart shows which of the four channels is used on the dimmer, but also how those channels are addressed in the grand scheme of things. The second, third and fourth dimmers are set to starting addresses of 005, 009 and 013.

Other things we can see are the GFCI circuit breaker requirements for each dimmer. These typically range from 15 to 30 Amps depending on the dimmer. Dimmers are rated on output wattage as well. The dimmers used on this project have a 600 Watt per channel capacity, although 1,200 and 2,400 Watt dimmers are also frequently used on some projects.

Pump loads are listed and as we see, neither exceed the maximum value for that channel or the maximum total for the dimmer. Wattage is divided by 120 Volts to give an approximate value of the amperage required for the specific dimmer as well as the total project.

One of the reasons for using multiple small dimmers instead of a large dimmer is to keep the total loads under 30A which is a practical limit for a single phase GFCI protected circuit. Many residential systems use dimmers which are fine on 15 or 20A GFCI circuits.

Another thing that this allows in commercial systems is to keep all of the devices on a dimmer to share the same single junction box and conduit. This prevents or reduces cross-talk from other dimmers from upsetting the sensitive nature of GFCI breakers and reduce nuisance tripping as a result.

With LED fixtures the R,G & B values typically take sequential addresses although once in a while a manufacturer will make an RBG fixture or some other arrangement. At the bottom of the chart we list both the starting DMX address as well as the fixture number, which is used by some manufacturers when programming their fixture addresses. In these cases the starting address is held in non-volatile memory not by switches.

Still other DMX devices use multiple channels for control. These can include DMX laminar nozzles and multiple axis devices such as programmable moving spot lights and moving nozzles. Some devices are programmed by serial number—so try not to lose the serial number printed on the device!

Although we try and match the closest pump size for your spray size, you will often need to valve down the pump or manifold to get the desired spray height. This should be done (safely) while using the software to set the pump to 100%. On some systems this may require turning off the breakers and making incremental adjustments to valves until all are at the same display height.
Dove Systems DM-406, DM-410, WM-410 Shoebox Dimmers

The Dove Shoebox is a 1.2kW (1,200 Watt) per channel dimmer. It is available with 3-prong Edison or 30A twist lock power inputs.

Front

Line input, 10A per channel circuit breakers, 3-prong outlets

Rear

5-pin DMX in, DMX out, DMX address thumbwheel, DIP switches, DMX signal LED

Notes:

The Dove needs a minimum of 8” front to back panel space unless right angle DMX connectors are used.

The DIP switches allow setting DMX terminate, Emergency ON (good for testing loads without a signal) and non-dim settings.

Choosing DMX addresses in the 900’s will put the dimmer in various self test modes. Consult the Dove manual for details.

The DMX indicator LED will glow red if the pack has power, green with a DMX signal.

Must be installed in a suitable enclosure for outdoor use.
Cyberpak Dimmer

The Cyberpak is a 600 Watt per channel dimmer. It has dual 3-prong Edison outlets and a 20A (side prong) power cord for input power.

Front - Channel indicator lights, dual 3-prong outlets, DMX signal LED, control buttons and readout.

End - 3-pin DMX in/out, MIDI in/out, fuses, power switch

Notes: Requires external termination, 20A side prong outlet for power. Must be in a suitable enclosure for outdoor use. See manual for available settings and modes.
DMX Interfaces

These interface boards allow Access to provide dry contact relay closures or 0-10VDC analog output to drive variable frequency drives or E to P pressure transducers.

Boards require 12VDC for operation and include LED indicators for DMX activity.
LED Fixtures

Each LED fixture must be programmed with a starting address before use. On smaller projects this is typically done by Atlantic Fountains in advance. On larger projects this is actually less desirable as it is easier to place the fixtures as needed and then program them in the field, a process that takes only a few seconds per fixture.

Fixtures have a five wire cord ending in a terminal block. This block must be removed in order to pass the cord through a cordseal in a junction box or to its 12VDC power supply. **BE SURE** not only to restore the wires to their proper location, but **BE SURE** not to have wayward strands short together adjacent terminals!

The LED power supplies are provided in rain-tight outdoor enclosures. These supplies, while low voltage should be GFCI protected.

Fixtures may be mounted with the lenses at or just above water level for maximum brightness.
DMX Laminar

The DMX laminar nozzle has two sets of underwater connectors, the 2-pin connectors are for the 12V AC power and the 5-pin for DMX data. The cables are daisy chained from one nozzle to the next.

The nozzles require about 32 Watts of power. A 300W pool listed transformer is appropriate for running chains of up to six nozzles on a string. This is a limitation of the 16 Amp rating of the jumper cable. The DMX data can be extended through more devices but ideally should be terminated at the end of its run.

Starting addresses for the nozzles are programmed by Atlantic Fountains. On the side of the nozzle stand is a serial number for the nozzle used in the addressing process. It is recommended that this number be written down elsewhere or etched into the nozzle stand for safe-keeping.

Notes:

Additional information about the nozzle is in its manual. Water must be maintained over the LED fixture to keep it cool, or water must be flowing through the unit. The water level however must be below the middle of the nozzle.

<table>
<thead>
<tr>
<th>DMX Addr</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
</tr>
<tr>
<td>2</td>
<td>Green</td>
</tr>
<tr>
<td>3</td>
<td>Blue</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>LED master (must be 255 for full)</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Strobe (pulses water stream)</td>
</tr>
<tr>
<td>8</td>
<td>Shutter (cutter for leaping effects)</td>
</tr>
</tbody>
</table>

250 to 300 mm (9-3/4 to 11-3/4 inches) operating depth.
Audio

Depending on the installation a variety of outdoor speakers may be used including direct burial and wall mount types. Electrically however the speakers divide themselves into 8 Ohm and 70V line types.

The speakers supplied by Atlantic Fountains can be operated in either 8 Ohm or 70V line mode by changing the switch on the back or under the lid.

8 Ohms is typically the resistance (impedance) of a single speaker. When two speakers are wired in parallel, their collective value is now 4 Ohms, which is generally the lowest impedance that most amplifier channels will drive. Putting a 4 Ohm load on the end of a long wire run however is not always a great idea, because if the wire measures 4 Ohms, you will lose half of your power just heating the wire (not to mention a loss of damping factor and other things that an audio purist just ain't gonna hear from outdoor speakers anyway).

A solution to this is a 70V line system which allows the amplifier to drive the wiring at a high voltage and then have it stepped down at the speaker. These speakers have a rotary switch that selects the internal transformer wattage "tap" for the speaker. For instance, a speaker may have 2, 5, 10, 15 and 20 Watt taps. While this sounds like quite a range, 20 Watts is only twice as loud as 2 Watts. In selecting speakers for a 70V line, the sum of wattages should only total 70% of the total amplifier rating.

The advantages of a 70V line system are cost and convenience. However the transformers included with most speakers (yes even ours) are subject to saturation at higher volumes. The bottom line is that if you are looking for general purpose background audio for your fountain the 70V line technique may be fine, but if you want the best fidelity run larger #12 or #10 conductors and wire the speakers in series/parallel as needed by your amplifier (Atlantic Fountains is happy to help you figure this out).

In all cases, the polarity (phasing) of the speakers is important so that the woofers all woof in the same direction. Unphased speakers fight each other and reduce bass response. This is true for both 8 Ohm and 70V line systems.

Speaker lines should be run in their own conduits. Line currents can easily approach 10 Amps and the high frequency content can radiate into other wiring causing GFCI trips.
Animation Control and Choreography System Software
(ACCESS)

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Animation Control and Choreography System Software
(ACCESS)

Introduction

Access provides both manual and automatic control of the fountain, permitting on/off and proportional control of fountain resources such as pumps, lights, and valves. Depending on your implementation, Access can also respond to external information such as a photocell, wind sensor, or external switch.

The control program is operated from a primary main screen:

The left side of the screen shows the current state of every device in the fountain. It allows these settings to be easily changed and a snapshot or "state" of the fountain to be crafted accordingly. Each state may then be stored as a cue for later playback using the selection editor on the right side of the screen. Those familiar with lighting may prefer the word "scene" to describe the recording of individual fountain states.

The ability to store successive scenes as events and retrieve them on cue forms the heart of choreography. We will explore this process later in detail, but will first examine the operation of the individual fountain controls.
Display Screen and Device Control

Your version of Access will be different from the example shown, with different devices available. Unused controls are "grayed out" to make them invisible. Access stores data for all colors, so you can add pumps and light fixtures at a later date without sacrificing your existing choreography.

Up/Down controls

Pumps and lights are arranged and labeled in multiple groups. Each has a matching color text window (pumps are black), and an up/down scroll bar to alter its value by 2%. The displayed number is repeatable, but may not reflect exactly what you expect to see:

**Lights** – Between the response curve of your eye, the "square-law" effect of the dimmers, and the particular wattage of the lamp filaments, you will not get a perfect "linear" response, but it will be repeatable and that is what is important. In similar fashion, LED fixtures from various manufacturers may vary in their brightness curves and ability to mix "16 million" colors, but will also be repeatable.

**Pumps** – Unlike the nearly resistive load of the lights, pumps have moving parts with friction and backpressure. Pump flow increases linearly with speed as pressure goes up by the square. This means that you will not see significant output below 20% on most pumps.

When a dramatic high-speed change is desired with minimal lag-time, a trick is to bring the pumps to a slow speed (where they are barely gurgling) before making the final increase to full. This allows quick acceleration to the desired speed without spinning the pumps up from a dead stop.

In writing choreography it is desirable to have the visual effect come in at the same time as the audio (or even a bit earlier). Access allows the release of cues to the tenth of a second, so it is easy to slide a cue up a few tenths to meet a special need for a particular device.

Changes in a control are instantly reflected in the fountain and are displayed as a percentage, such as the "amber at 32%" at right. 100% is shown as "FL" (Full), while a 0% setting is blanked out for clarity. A small toggle button to the right of the up/down "spinner" control may also be used to switch the device fully on or off. The combination of a letter and number is an effect (discussed later).

Tapping the color readout brings up a monitor bar for that control. This is in the same color as the control it is monitoring. NOTE: The monitor bar may also be used as an input slider by clicking and dragging it with the mouse. Monitors may also be turned on or off as a group.
Master and submasters

At the top of the screen are controls to allow the easy manipulation of your fountain devices in groups. These produce sweeping changes that would be tedious to perform by setting individual controls. The “Pmp” and “Lgt” check boxes allow their effect to be isolated to just the pump or light channels if desired.

- **Clear**
  - Sets devices to zero, clears effects
- **Full**
  - Sets devices to 100%
- **Invert**
  - Subtracts the current value from 100% to “flip” the intensity. This might be used to scintillate a scene by toggling it between 40% and 60%. Devices that are currently set to zero are excluded so that only active devices are affected.
- **Random**
  - Sets a device to a random setting between 0 and 100%. (Useful for clearing “writer’s block”)
- **Bump**
  - Takes non-zero devices and bumps them up 5%. This has the effect of saturating the current settings.
- **Cut**
  - As above except cut by 5%
- **CW**
  - Rotate the values in the current submaster clockwise
- **CCW**
  - Rotate the values in the current submaster counterclockwise

To make adjusting large groups easier, a grand master and submasters are provided for the pump and light channels. These may be used to bring a group of devices to a desired intensity, with individual controls used to finesse the final setting. The “M” selects the master while the “ABCDE” selects a submaster group. Submasters are preprogrammed by Atlantic Fountains as permitted by your particular layout.

The master is not stored or updated by the program. Only the individual values for the devices are stored. Also, a master does not affect devices with an effect checked.

Other Controls

Access can respond to inputs from a MIDI device (Musical Instrument Digital Interface) or wireless remote control. The top displays at right are used to select the MIDI input port and display the action of the remote control.

With the addition of the USB input module, Access can respond to external inputs such as wind speed. Access interrogates and displays these inputs every ten seconds. You may set the percentages to be applied against the pumps at each stage. Set the wind control from Auto to Off to disable it. When a wind trip occurs its display window will turn red to notify you. Wind trips include a one minute time delay to prevent the rapid cycling of the fountain.

At the very bottom, the outgoing DMX data (0-255) is displayed for your reference.
Effects

Up until now, we have used the up/down (or monitor bar) controls to set a level. This is a static value that will be sent to your fountain device for as long as you are on that cue.

Effects allow you to take a fountain device and map it (or "strap it" if you prefer) to a dynamic or real time event. This may be a waveform generated internally by Access or can be completely external such as the closing of a switch or the pressing of a key on a MIDI keyboard. Effects can automate what might otherwise take hundreds of cues.

Effects include:

- **Wave**: Uses a waveform you draw. It can be repeating or a "single shot" trigger.
- **Audio**: Maps pre-processed audio effect streams to your device.
- **MIDI**: Maps MIDI data to your device, or uses it to trigger a Wave effect.
- **Real**: Passes contact closures into the program in real time.

The check boxes next to each up/down control are used to put the device under control by an effect. The text window responds by putting a letter prefix in front of the numbered effect you have selected: Wave (E), Trigger (T), MIDI (M), Audio (A), and Real-time (R) may be selected. The up/down control may then be used to select the effect number.

NOTE: Once the effect box is checked on a control, its toggle button is clicked to cycle through the available effect types.

Wave and Trigger effects are always available. To save you time, you can uncheck the other effect types so they are not present in the rotation when you click a control's toggle button. When an effect type is not selected its button will also be "grayed out." Clicking the effect button itself opens the control panel for that type of effect.

When a control has its effect box checked it is not affected by the quick set buttons, grand master or fades in process. An effect is active only while the cue it is stored in is active. If you move to a different cue, device control passes to whatever now defines it in the new cue. All effects (except Triggers) may be used seamlessly from cue to cue by simply repeating the effect in the next cue. Triggers restart or "fire" the instant a cue is selected. There is no point using 20 second long triggers in cues spaced a second apart (unless you just want to see the first second). This is not as much of a limitation as it sounds, as the alternative would be constantly remembering to turn the trigger off. Longer changes are better handled by using a fade.

Although you can select 100 different effects of each type, this does not mean they are all actually available to the program. Presently Access provides the following maximums: E50, T50, M99, A60, R9. Effect numbers above these are simply ignored.
Wave Effects

Effects allow programming repetitive operations without the tedious setting of individual cues in the selection editor. Effects allow pulses and waveforms to be custom crafted and then run as a background process.

Up to fifty loop and fifty trigger effects may be set. These are unique to each performance and are stored and loaded with your .FXF selection file.

The exact intensity of a pump or light is defined over the length of the effect. This period is looped indefinitely as long as the effect is active on the main control screen. Because the main screen is still active underneath the effect window, when you save a new effect it is immediately used out in the fountain.

Each point on the graph may be moved by clicking and dragging with the mouse, or by using the preset buttons. These buttons allow pulses and waveforms to be added and shifted. The save buttons store to memory and the load buttons retrieve it for further editing. All of the effects are written to disk only when your selection is saved.

Looping effects “wrap” from the end of the effect length back to the start, so usually you would set the beginning and end values so the head and tail wrap smoothly. Triggers are a “one shot” event that make only a single pass through the wave form at the beginning of a cue.

A major difference is that the loop effect is free running and is NOT synchronized to start with the release of cued event. On the plus side, all loops (of the same length) are synchronized to each other, allowing you to build combined patterns (such as a rolling coin pattern) by shifting a loop effect and assigning it to another effect number.
Triggers, again, are a one shot. If you wanted a unique portrayal of the cannon flash during the 1812 Overture, you could draw the Trigger effect and use it in successive cues. Every time that cue is loaded you will get your custom flash.

The speed of the waveform is altered by changing its timebase. The duration of each of the sliders is also displayed for your convenience. The reason for different timebases is resolution. If you only want a two second effect, use the 2.5 Sec timebase. This will give you 40 steps instead of the five you would have with a 20 second timebase.

The length, or period, of a wave effect is set by adjusting the horizontal slider. A setting other than full is indicated with a red background, as a reminder that your effect will not remain synchronized with other effects of the full length. This can also be used to your advantage if you purposely want your effects to drift out of phase with each other, perhaps to add a look of randomness to groups of jets or colors.

The Sync button resets all wave effects to their starting point so you can test how they will all interact after you are done constructing them.

**Controls**

**Timing**
- >, >>>>>  Rotate the waveform forward one or five steps
- <, <<<<<  Rotate the waveform back one or five steps
- Timebase  Sets the underlying clock speed for the effect
- Horz slider  Sets the length of the loop

**Presets**
- PulseX  Overlays a pulse of 2, 5 or 10 units long. For a single pulse drag the slider
- Sine  Draws a sine wave
- P train  Draws various pulse trains. Remember you can stretch or invert these
- Ramps  up, down, and a log-like decay

**Modifiers**
- Full/Clear  Sets every slider to 100% or 0%
- Shift  Moves the entire wave. Useful for setting an offset for pumps
- Amplify  Increase or decrease the size of the wave
- Invert  Inverts the wave vertically
- Smooth  Performs a running average to smooth out bumps. Wraps head and tail.
- Random  Loads each slider with a random value. Can be stretched and smoothed
- Flip  Flips the wave horizontally
- Damp  Gradually decreases the wave. (Flip the wave to make one that expands)

**Stretch**
- x,/  Stretches or shrinks the waveform

**Snapshot**  Used like a calculator memory to save and recall your experiments
In this example, a waveform has been made that produces mid-air bursts for (fast) pumps attached to vertical smoothbore jets. The pump speed is held low at 40% for 0.6 seconds and then set to full for 0.4 seconds. As the water starts to fall, the rising column hits it and causes a burst. Changing the pulse "floor" changes where the bursts appear on the column.

Making the waveform is easy. Use one of the predefined pulse trains, or:

1. Set a 0.4 second pulse
2. Shift it three spaces to the right
3. Repeat steps 1&2 until you fill out 10 seconds
4. Click the Bump button to raise the waveform until the bottom is at 40%
5. Save the waveform to an open effect channel.

Let's say you want to make a light chase, like the lights on a marquee sign:

1. Take the waveform above (or one with pulses that start at zero)
2. Save it in effect channel 0 (click the red 0)
3. Shift it right and save it in channel 1
4. Shift it right again and save it in channel 2
5. Exit the effect editor back to the main screen

Using the check boxes and spinner, take three lights and make them E0, E1, E2. The lights will now flash in one direction.

Now change the assignment to E2, E1, E0 and the direction will reverse.

In similar fashion, a sine wave can be used to make a traveling wave. Just shift and save the waveform to successive effect channels. If your pumps are in a circle, this can be used to make a "rolling coin" pattern (helix). Reversing the assignments of the effects will make the direction of the spin reverse.

Effects will run continuously until changed by another choreography cue. They may be mixed with fades and other effects. For example, a slow fade or slow sine wave effect might be used on a pump, while a fast series of pulses in an effect make the lights on that nozzle sparkle. The ability to assign a set of effects in a single choreography cue and then change it completely in the next cue allows very intricate performances to be made using an economy of individual cues.
Suggested uses for looping and trigger effects:

- Light chases, water chases, see-saw effects (odds and evens in a group)
- Setting the on/off duty cycle (slug length) for leapfrog effects
- Ramping and stalling pumps to produce mid-air bursts
- Alternating lights to scintillate/dither a particular color
- Use a trigger as one time "exclamation points" for cannon bursts etc.
- Use triggers to "fatten" up MIDI notes by adding a decay envelope.
- Generate a helix (rolling coin) pattern by strapping successive pumps to time shifted sine waves. Use one effect channel for each pump. Reassign the same effects in reverse order on another cue to reverse the direction of the roll.
- As above, but use triggers. This can be used to construct complex sequences that can fire whenever a cue starts.
- Set loops that run at different speeds (such as light chases). Use successively stored cues to select the appropriate speed as the music progresses.
- By using slightly different length loops it is possible to make waves that stay out of phase for surprisingly long times. This can be used to great advantage to pack a lot of variety into a single Access cue by using multiple effects. A loop of 20 seconds and 19.6 seconds comes into phase every 392 seconds, over six minutes! The "least common multiple" of several waves can be huge. As an example, make a pulse, but save it in loop effects with slightly different lengths. During playback the pulses will drift out of phase, first appearing sequential, but after a while appearing pseudo-random. This is ideal for laminar leaping effects and for play areas where you want to keep kids guessing what is coming next.
- LED fixtures have nearly instantaneous response. Effects can be used to set up high speed color strobes by turning the fixture completely on and off as fast as ten times a second.
- Use the random control to preset a waveform with lots of variety. By adjusting the loop length and time base, this can be used to produce a sparkle effect.
- This is more for purists, but at rare times you will need to come out of a loop effect particularly gracefully at the transition point when the following cue loads. This is because loop effects are free running and you are not guaranteed where you might be in the loop. In the past the best that could be done would be to use a cue with a fade to fade from 50% to where you want to be. Use a trigger in a cue to finish out the last several cycles of your effect. This can be damped to smooth the effect out to a desired transition level.
Audio Effects

Audio effects allow direct control of your fountain by building effects from selected frequencies. Just like a looping effect, pumps and lights may be strapped to that effect stream in a cue for device control. The audio effect editor appears as follows:

Wave Inspector

At the upper left is the wave inspector. This lets you set a range of all or part of a wave file, in this case an eight second clip of Hawaii-Five-O. The audio is displayed in the top large window, both left and right tracks. Just the top half of the wave is shown to better show its amplitude (volume).

The blue line is the amplitude of the waveform. It is scaled to fit the window.
The green line is the average of amplitude and is displayed for reference.
The red line is the effect stream and will be discussed in a moment.
The vertical white bars show the 0.1 sec clip viewed by the Frequency Inspector.

Moving the scroll bars changes the start and stop points of the clip and will let you magnify an area of interest. The play and stop buttons let you listen to the selected clip. The progress bar below the window tracks with the position in the file during playback.
Frequency Inspector

At the bottom of the screen is the frequency inspector window. You may pick any 0.1 second clip of the music and run a spectrum analysis to see what content is present.

The selected 0.1s clip is at upper left and a shaped version (used for cleaner analysis) is directly below it. The clip position and peak value is displayed at lower left and the graphical result to the right. Use "F" or "F" to magnify the graph if desired.  The frequency labels on the graph will change accordingly.

The control buttons allow you to select the left or right channel and adjust position and gain. Press "A" to sync the audio clip to the beginning of the wave inspector audio.

Only a sine wave would appear as a single frequency spike. Most instrument notes are actually composed of a series of frequency harmonics that give the instrument its unique voice. Some instruments can be very rich in harmonics, with content extending beyond the range of hearing.

Early music synthesizers constructed their voices by combining multiple waveforms. As an example, a square wave (a bit like a clarinet) can be constructed from sine waves:

\[ y = \sin(t) + \sin(3t)/3 + \sin(5t)/5 + \sin(7t)/7 + \sin(9t)/9 \ldots \]

The reverse is also true. We would expect that if we feed ACCESS a square wave, we should see its components. Here is the display we get from a 1kHz square wave:

We see the fundamental at 1kHz plus 1/3 the third harmonic at 3k, plus 1/5 the fifth harmonic at 5k and so forth as we would expect.

This information can now be used to control fountain devices.
Process

When this is clicked a 29 channel (1/3 octave) analysis is run for every .1 sec clip of both channels of your audio wave file. A progress bar shows the processing, which will take from several seconds to over a minute depending on the length of the audio and the speed of your PC. Once this is done you do not need to run it again unless you exit the program or change to a different audio file. Only the channel settings and streams are saved to disk.

Controls

At top center are the effects controls. Any change to these controls instantly updates the red lines on the graph in the Wave Inspector window.

The red line is the effect stream generated for your control settings. This varies between 0 and 100% and can be saved for later use in your choreography.

Slider Bar  Lets you pick the 1/3 octave frequency as shown on the preceding page
Bandpass   How many frequency channels are grouped together: 1, 3, 5 or 7 wide.
Gain       Boost or attenuate the effect—it will simply clip at 100%.
Offset     Allows the base line to be boosted. This is great for pumps that start at 24% or to keep lights from going black during soft passages.
Smooth     Performs a running average, adjustable from 0 to 2 seconds. This lets you put a shock absorber on the audio data to smooth the effect stream.
Look+      This control sets how many tenths of a second to look ahead in the music. Pumps and non LED lights take time to respond. Look ahead gives your fountain the gift of foreknowledge. If you have a small pump that takes a 1/2 second to respond or a big pump that shoots water 40 feet in the air this lets you compensate for it. This does NOT shift the red line on the graph, but is used later at "run time" when your music plays.
Compress  Your ear has a logarithmic response. It is more sensitive to a change in low volumes than to the same change in at higher volumes. Values are continuously adjustable from 0.4 (expansion) to 3 (compression) with 1 being linear. This is great for lifting the signals you want out of the mud.

Save and Load

Finally you can click on a red button and save the stereo effect pair. The left channel effect stream is saved on the even number and the right on the odd. There are 30 effect pairs available. If you store an effect using button 52, then on the main screen you would use "E52" to use the left channel stream and "E53" the right.
Audio effect notes

- There is a 15 minute maximum length for WAV files and effects.
- 512 Mb of RAM is greatly recommended for ease of development. Over 20Mb is used internally for the higher resolution processing of effect streams.
- The presence of a stereo pair allows you to get a bit of display variety without having to think through build an additional effect. If a pan takes place in the recording it will take place in your fountain.
- Increasing audio compression makes “soft sounds louder.” The larger the number you pick the greater the compression. The actual transfer is as follows:

![Audio Compression Graph]

Compression can lift low signals “out of the mud” and let you use them productively. At higher levels of compression even a little bit of low level noise or content can be significant and will raise the “floor” of the effect stream. This side effect is similar to raising the offset. In the opposite direction, compression values less than 1.0 cause expansion. Expansion with high gain can be used to cause a strobe-like effect.

- The look-ahead value is stored with each effect stream, so it is possible to use nearly duplicate effect streams to meet the needs of different devices. LED fixtures are instantaneous, while 500 Watt PAR 56 lamps can take almost a second to react (slower than some pumps!). Water in flight obeys the laws of physics as does the spinning mass of the pump motor. You will need some experimentation to find what works the best for your particular device.
- The effect streams and their settings are saved when you save your cue list in the selection editor. As such, they are available for use by your choreography when the selection is loaded manually or in automatic mode by the scheduler. However, in order to view or alter the effect streams, the process button must be pressed and the analysis re-run whenever you exit the program or change audio files. Even though their settings were saved, the green load buttons will not respond until the analysis has been processed. This was a design decision to prevent saving 12Mb intermediate disk files that are not needed for general use.
Real time Effects

Real time effects allow the pass-through of external switch closures into the program. This feature uses the USB input module available from Atlantic Fountains. This is the same adapter used with our USB proportional wind control, so if you have the wind control you already have this ability.

Full technical detail concerning the electronic interface of the USB adapter may be found in the product manual shipped with the adapter. This section describes how these inputs may be used as effects.

The USB adapter has three eight bit ports available for input. These inputs are available as eight individual contact closures (Port A), a proportional control input (Port B), and as a means for starting an album (Port C).

Port A — The individual bits of ports A are mapped out to effect channels R0 to R7. A switch closure on any of these inputs causes that effect to be 100%.

Port B — Effect R8 can acquire any 8 bit value between 0 and 100% (0 to 255).

Port C — This is used to put the program into automatic mode or start an album. The eight bits are used in the same way as the wireless remote control available for Access.

Suggested uses for Real Time Effects:

Port A
• Set up a motion sensor to fire a nozzle when someone walks by.
• Set push buttons to fire leaping nozzles in a play area or children’s museum
• Use a float sensor for low water cut-off (requires custom programming by AF)
• Build a water game: Record a wave audio file that directs the game or flashes lights. Set cues to enable and remap different switch inputs at different times.

Port B
• Use weighted combinations of switch closures to set a pump or light brightness to a particular level. This could be used to set a spray height to a desired real world scalar data value such as temperature, applause sound level, the present tide level or total dollars in a fund raiser.

Port C
• Use a contact closure to start an album. This could be to start “Happy Birthday” or some other special occasion presentation in a restaurant.
The USB adapter has TTL level inputs which means that 3 to 5 Volts is considered high (active) and 0.7V or less is considered low (inactive). An input that is not connected will float high. Most of our users will want to use dry contact closures, so we have inverted the logic to make it active low. This means that a switch closure to ground is considered “on.” This is easier than wiring dozens of pull-up or pull-down resistors.

Other types of input devices such as analog input converters or custom programming of logic inputs can be obtained from Atlantic Fountains.

**Da Disclaimer:**

We have all read about people that attempted to use a rotary lawn mower as a hedge trimmer or tried walking a snow blower around on a pitched roof. If you ever wondered why the National Electric Code handbook is so thick, it is because people can do amazingly dumb things. We cannot reproduce that entire book here, ensure your compliance nor speculate on the pages you might try to add to it. If you do not know that you know what you are doing please stop and get professional assistance.

The operating voltage of the USB adapter is 5 Volts DC. It is pretty hard to get in trouble with 5 Volts. …But consider that the ground on the USB adapter comes from the ground on the PC. All branch circuits that feed a fountain must be GFCI protected and cannot share a conduit with non-GFCI wiring. This includes your PC and connections to it such as an anemometer if present. If you are using the system in some sort of water play situation you may need or desire optical isolation or a means of using isolated radio controlled push buttons instead of direct wiring. THINK where every single wire radiates to and what it is near.

Some states limit water velocity in play areas to 20 feet per second. That is a vertical stream about six feet high. A 60° laminar arch eight feet high at its peak exceeds this by a factor of two. Other requirements for water treatment, protection against toe or suction entrapment, anti-skid surfacing etc. are also your responsibility for compliance.

Just because Access can turn things on and off ten times a second does not mean that that is a good idea with a 30hp pump motor! A Variable Frequency Drive (VFD) typically has an acceleration/deacceleration parameter. This should be set appropriately for the motor being controlled. Motors consume more power (i.e. heat to be dissipated) during starts and may have water cooled bearings that require an average amount of water passing by them. Where larger motors are concerned it may be perfectly fine to rapidly cycle them for a few minutes, but not leave them like that or set to 10% for hours. We use continuous duty pumps in our designs, but we do not restrict the internal speed of Access to accommodate or protect what is attached to it.

You assume all direct and indirect liability for the use of this equipment and software.
Selection Editor

All of the above controls are manual in nature. They are used to set up the fountain to a predefined state (even if that state includes animated effects). The selection editor allows a series of these states to be recorded as cues and played back automatically.

A selection needs timing information so that it knows when to execute a cue. This "time base" can be provided by:

- The Access internal timer
- Position information from a MIDI or .WAV audio file.

These latter sources form the basis for choreography, where changes can be synchronized to a musical source.

The editor sets the execution or "release" time for each cue. These must be sequential, beginning with 00:00.0 ranging through the end of the selection. A total of 400 such cues may be entered for each selection. The program does not check to see if these times are sequential, or even reasonable. (If you put a 59 minute value in a cue, the program will dutifully wait almost an hour to release it!)

In the example at right, note that the times are all based from the start of the selection and are not incremental times from the previous cue. The ability to set cue times to a tenth of a second allows changes in the fountain to be very precise. Selections proceed until they reach a time of zero or run out of music.

Command buttons

| Enter   | Write the state of the devices into the highlighted cue |
| Copy    | Copy the highlighted cue into a paste buffer           |
| Paste   | Write the paste buffer into the highlighted cue        |
| PFix    | Paste only channels with their monitor bars on. This can easily "repair" a device setting that you forgot to include in a series of cues. |
| Over    | Overlay the paste buffer without changing the time. This is useful in reusing cues later in your selection on entries made with the Tap button. |
| Insert  | Insert the buffer above the present cue and shift down. Cue #399 is lost |
| Delete  | Remove the present cue and shift up (cue #399 is duplicated) |
| Tap     | Insert the paste buffer and exact time while a selection is running. |
| Run     | Start the selection (and audio) at the highlighted cue |
| Stop    | Stop the selection                                     |
| Reset   | Set the cue list and timebase (clock or music source) to zero |
| Step    | Execute cue list only. You can also just use down arrow. |
Selection boxes

Source - Selects Time, Wave, or MIDI as the selection timebase
Time - Used to set the minutes, seconds, and tenths of a cue
Fade - If "F" the computer will compute a cross fade from the previous cue state.
IMPORTANT: Fades under 1 sec. or over 5 min. are ignored.

Displays

Cue# - The position in the selection file
Pos - Current position in the timebase
Tot - Total length of the audio file if applicable
Play Status - The state of the selection file

Audio File Used

Lists the name of the audio file to be used (if applicable). Use the pick button to select from a list. Error checking is not performed on broken files.

Selection Name

Retains the selection name after a load or save.

Selection Description

Allows the entry of a forty character description.

Cue Notes

Allows the entry of a forty character comment

Pull down menu

The more permanent actions such as File: New|Load|Save or Exit are placed on a pull down menu in the upper left of the screen. The program does not provide an "Undo" function, so take your time before blowing away an hour or so of work.

These commands allow you to clear the selection, or save or load the selection as an .FXF file (Fountain Effects File). You can alternately save to two or three different file names while developing a selection to keep a rolling backup of your work.

ACCESS only saves a 40 character file name including the path. Therefore:
C:\Fount\Strauss\BlueDanube.FXF —is good, but:
C:\Fount\Classical\Waltzes\ThatStraussDude\BlueDanube.FXF —will get truncated to:
C:\Fount\Classical\Waltzes\ThatStraussDu

Once upon a time hard disk space cost money and this is just one of the little quirks that live on from earlier versions of the program.
Scheduler

Once a selection has been built and saved, it may be scheduled for playback. The daily schedule file (called DAYx.FSF) is loaded on program startup. This file holds up to 400 selections that may be scheduled as needed throughout the day.

- **Pick**: Allows the selection of a .FXF or .FEA Album file
- **Clear**: Clears the current selection entry to make it blank
- **Enter**: Writes changes to memory
- **Ins**: Insert above the current entry
- **Del**: Delete the current entry
- **Exec**: Immediately execute the current entry. This is used to start a selection or album running without waiting for a particular time of day. This is useful when starting a live performance.

The pull down box is used to select the day that will be loaded or saved when the Load or Save button is clicked. There are entries for each day of the week, as well as five “special days.” These special days can be used to park a regular day of the week file and insert a custom day schedule in its place. For example, if you made a Thanksgiving day schedule in SP1, you could then take the regular Thu file and save it to SP2, Then load SP1 and save it to Thu. If you did this earlier in the week you could enjoy your holiday on Thursday and then copy SP2 back to Thu when you get back the next Monday. This also makes running shows for visitors easier.

Light Inhibit

Your implementation of Access may include a “Light Inhibit” control. In Automatic mode only, this forces the light fixtures off between the hours selected without the need to write special “water only” choreography. Be sure your Windows system clock is set correctly. This setting is restored after a restart.

Auto / Manual Operation

This pull down selection box puts the program in Automatic mode under control of the scheduler. Beginning at the current position, the program will seek out the next start time, and if a selection is entered there, will load it and enter a hold.

The program will sit in a hold until the exact time called out, and then release the selection for execution. Whenever a selection completes, control is returned to the scheduler and it falls through to the next time greater than the current time of day.

The “R” checkbox tells the program to enter automatic after a restart. This allows a full restart after a power failure if you put the program in the Windows startup folder.
Scheduling Considerations

The schedule file was pre-initialized with entries every five minutes. It is suggested that this be left alone, although the time entries may be adjusted as required. It is the user's responsibility to make sure that the time entries are sequential. This will get you thinking in terms of sub-five minute selections —probably a good discipline, as it will make your selections more interchangeable later on.

People sitting around the fountain are not using a stopwatch. The release of a three or four minute selection every five minutes is less noticeable than the time between the end of one selection and the start of the next. It is advisable to practice some showmanship and not saturate people with too much material. Remember that the fountain is inherently beautiful and relaxing in itself. Let the water do the work.

It is important to remember that because the first cue of a selection is highlighted when that selection loads, the fountain will assume that state the instant the file loads. This means that the first cue (typically at 00:00.0) should be thought of as a "setup" that will be used to prep the look of the fountain before the selection runs. Practical examples of this would be putting the fountain in a "low profile" mode (soft lighting, modest water) until the selection starts and the cue at 00:00.1 gets released —see the example in the selection editor screen shot above. You may wish to decide on a few predetermined "looks" that you want to have between your selections.

DO NOT schedule selections or albums so they run past midnight, or within ten seconds after midnight. ACCESS will not be able to properly load the schedule for the next day.

You must save any schedule changes by selecting the desired day and clicking save. (Otherwise, the changes would be lost when the next day is loaded.)

Make a selection with nothing turned on and save that as Shutdown.FEF. Place this after your last selection to be sure the fountain turns off at the end of the day.

Album Editor

In order to simplify scheduling and to allow for "live" presentations, the album editor allows multiple selections to be grouped into an album. This album file, with a .FEA extension, may then be placed in the scheduler. It is up to you to keep track of the length of your album, so you may schedule it. If you have a 32 minute album and you schedule it to play at 10:00 and 10:30, the entry at 10:30 will be skipped when program control is returned to the scheduler.
Choreography

Because the program stores the entire state of the fountain with each cue it would be rather bulky to show the state of the fountain with each entry. For this reason a few screen snapshots are used with the narration. Your particular screen will look different.

For starters, we will make our "setup" cue that will be executed when the selection is loaded by the scheduler. The fountain will "sit" at this setting until it is started by the scheduler.

The controls were used to set the lights as shown, the result being a "fire" red/amber in the center, a magenta red/blue in the middle, and a blue/green on the outside.

The text "Setup Cue" was entered into the cue notes and Store clicked. We have written our first cue!

To make the second cue we will clone the first. (This makes progressive changes easy)

1. Click in the large cue window to select the first cue.
2. Click Copy
3. Click on the second cue
4. Click Paste.
5. Use the masters to set the ambers to zero and whites to 16%
6. Type "Begin — Cut amber, add white" into the note window
7. Use the up/down control on the tenths to set the time to 0.2
8. Click store

The screen will look as follows:

Please note that the Store button updates memory, but does not save your work to disk. We will do that in a moment with File | Save from the pull down menu at the top. As you write increasingly larger selections you will want to develop a habit of saving your work to disk on a regular basis.

Our next cue will perform a slow 30 second fade to magenta and eight Aerator nozzles.

1. Click on the third cue (everything will clear as the cue is empty)
2. Set the reds, blues, center, spray ring & Aerator pumps to FL
3. Type "Fade to magenta" into the note window
4. Use the up/down control on the tenths to set the time to 0.30.0
5. Use the pull down control to change Fade to "Y"
6. Click store
Make sure the Source selection remains set to "Time." Type "My First" in the Selection Description field. Click Store.

Using the pull down menu in the upper left of the screen, select File | Save, and save the file as "MyFirst." Congratulations! You are now a fledgling choreography whiz!

Testing and adjusting your selection

Now that you have a selection written, you can pull it up for special presentations, or for inclusion in the daily schedule.

To test your selection, either click on the first cue, or on Reset. Now click on Run. The program will now begin stepping through your cues until it encounters a 00:00.0 for a time, and will then stop.

If you feel that the fade is too slow for your tastes click on the 30 second cue and edit the time to, say, 00:20.0 and click Store. Click Reset and Run to test the change.
Fades

When the Fade is set to "=", your selection will change between cues like successive snapshots. When it is set to "F," the fountain will fade up to that cue. Fades under one second or over five minutes are ignored and are treated as a regular cue change.

Often you will want the fountain to sit unchanged before making using a faster fade for emphasis. In the example of Stars and Stripes Forever at right, this is done by duplicating a cue to use it as an "anchor point". The cues at :27 and :35 have the exact same state of the fountain stored in them. This holds the fountain until :35 when a faster, more dramatic fade begins. Otherwise the fade would begin at :27 and progress to :50. Think of the extra cue as a thumbtack that pins down a rubber band in the place that you want.

Choreography with audio

Programming cues with audio is little different from using a timer as we have been doing. Windows returns position information from running audio that is used in place of the time base. This will stay synchronized with the cues you set at various times. Your last cue entry should be the same as the length of the selection so all the music can play and all cues can be released. The selection stops executing when it either runs out of audio or runs out of cues by hitting a cue of 00.00.0. If you have music that runs 3:52.5, set your last cue entry to 3:52.5 or less. Remember to clear out any effects you do not wish to leave running after the selection ends.

You need to begin by putting the stop time (3:52.5 in the case above) in the second cue so you can use the run button and listen to the audio and watch the timer.

The best equipment is pencil and paper. Listen to the audio selection several times to get a feel for it, and where the major lulls and crescendos exist. Watch the time information on the screen and jot down the times for these points in the music. Make notes on what effects might be nice. Use the Tap button or manually enter the cues and then test and revise until done.

The Run and Step buttons make life easier on longer selections. The Run button will "sync" the audio to the time entry for the cue. This allows you to work your way through ten minute waltzes without starting over from the beginning of the piece each selection!

Philosophy of Fountains (...seeing I have the microphone)

Let the natural beauty of the water and lighting help to keep life simple. Remember that your long-term goal is to produce quality content, not to prove that you can twiddle hundreds of changes in a single selection.
Electric Fountain PC – ACCESS Software Startup

Revised: June 12, 2009

- Turn on power to UPS system if it is off.
- Turn on power to PC and display.
- At the conclusion of the boot-up process you will see a “balloon” in the lower right corner of the screen: “Your computer might be at risk.
  - Automatic Update is turned off
  - Antivirus software might not be installed
- Click on the “X” in the upper right corner of the balloon, not on the balloon itself to close this warning. This computer is not connected to the Internet and virus protection would slow down the real-time operation of the system.
- Check to be sure that the date and time are correct on the PC
- Double click on the Electric Fountain icon on the desktop
- After the ACCESS fountain control software loads put the software into AUTO mode if it is not already in that mode.

Check the 8 status interlock boxes to confirm that all necessary conditions are met to operate the fountain.
File Types:
- FAF: Fountain Audio File for spectrum analysis
- FCF: Fountain Configuration File
- FEA: Fountain Album File
- FSF: Fountain Schedule File
- FXL: Fountain Show File

Interlock Input Boxes:
- The eight interlock inputs to the ACCESS software are displayed in rectangular boxes with colored backgrounds. A green means OK, a red background is NOT OK and yellow is a warning. These inputs are tested every 10 seconds. See the chart for details about the effects that these inputs have on the operation of the program.

SCRN Box:
- When the SCRN box is checked the entire display is updated normally; when it is not checked the screen does not refresh the color bars.

Box below SCRN box:
- Typing DEF33 in this box bypasses all interlock inputs. The box will turn blue when the correct password is recognized. Clear the box to return to normal operation. This box is checked every 10 seconds like the interlock inputs.
  NOTE: Use this for emergency and testing purposes only.

Color Bars:
- Clicking on a color bar gives the custom color chart for the LED fixtures.

Number Box/Sliders:
- Clicking on a number box (valve or light percentage) will cause an analog slider to appear. These “monitor bars” may be turned on and off by using the buttons at the top of the screen in the Monitor section.

SnapSet/SnapClr:
- Normally the ACCESS screen is live; everything you do with the controls is immediately sent out to the fountain as a command signal. Clicking on the SnapSet box allows you to take a snapshot of the fountain display and freeze it in the output buffer while continuing to program the fountain blind. Use the SnapClr to clear the snapshot and return to normal live operation.
- Put the fountain in manual mode and stop the running program to use Snap.
Programming Notes:
- Sudden changes in valve positions creates a water hammer in the fountain plumbing that can be dangerous to the pipeline and pumps. The pressure relief valve cannot compensate for instantaneous changes; it takes about a second to operate. Always make valve transitions at least 3 seconds long and do not have sudden valve changes between cues.
- The last cue triggers the load of next file in the schedule; make the last cue be the standard transition cue for water (G+HG) and at least 5 seconds before you want the next show file to load. (Ending a 5 minute show with the last cue at 4:50 or 4:55 works well.)
- The first cue in a show (at 0:00.0) is a holding cue until the show is triggered; make first cue be the standard transition cue for water (G+HG). The first operating cue of a show can be at 0:00.1.

Standard Transition Cue at the beginning and end of each show:
- Geyser at Full; Hourglasses at 32

Programming Examples:

<table>
<thead>
<tr>
<th>Time</th>
<th>Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00.0</td>
<td>G+HG-no lights</td>
<td>Cue that runs and holds when show is loaded</td>
</tr>
<tr>
<td>00:00.1</td>
<td>G+HG-no lights</td>
<td>Duplicate cue that runs when the show is triggered</td>
</tr>
<tr>
<td>00:30.0</td>
<td>F G+GA-no lights</td>
<td>Fade is over at 00:30.0; this cue holds until 14:55.0</td>
</tr>
<tr>
<td>14:55.0</td>
<td>G+GA-no lights</td>
<td>This cue triggers the loading of the next file</td>
</tr>
</tbody>
</table>

Note: an "F" in the next cue causes a cross-fade between the cues at 00:00.1 and 00:30.0 over a period of 29.9 seconds

1 00:15.0 = This cue holds until 00:30.0
2 00:30.0 = This cue is a duplicate of the cue at 00:15.0 but it now has a 10 second fade to cue 3
3 00:40.0 F  Cue 3 is a new cue
Prismatic:
The “prismatic” or ROYGBIV effect (Red-Orange-Yellow-Green-Blue-Indigo-Violet) may be achieved by the use of the following ratios of red, green and blue.

Red Orange Yellow Green Blue Indigo Violet
|R100 G0 B0| R100 G40 B0 | R100 G100 B0 | R0 G100 B0 | R0 G0 B100 | R0 G38 B100 | R56 G0 B100|

Or, as a variation:
|R100 G0 B0| R100 G40 B0 | R100 G100 B0 | R0 G100 B0 | R0 B100 B100 | R0 G0 B100 | R56 G0 B100|
(RED/ORANGE/YELLOW/GREEN/CYAN/BLUE/VIOLET)

Yellow (R100+G100), magenta (R100+B100) and cyan (G100+B100) and their variations are nice pastel colors to use.

Balances between valves:
There are multiple valves for many features. Sometimes there will be an imbalance between the height of the water at the north end of the fountain and the south end of the fountain with the same value programmed for the valves. This is due to a finite supply of water to the fountain and the fact that the main fountain manifold is fed from the north end.
Adjustments will be attempted on the manual valves to see if that can help balance the flow to a given feature. However, it may be necessary to visually check a show and adjust the values of the valves for a feature if the heights are not even.
Effects Loops:
1-7: Pulses
8-10: Sine waves
11: Square wave 0-degrees
12: Square wave 120-degrees
13: Square wave 180-degrees
14: Square wave
15: Square wave
16: Square wave
17: Sine wave
18: Sine wave
19: Sine wave
20: Pulse
21: Pulse
22: Pulse
23: Pulse
24: Pulse
The Oase EasyControl software is used only to program the DMX addresses into the Oase NozzleStar LED fixtures, although it has many other features.

- Plug a USB cable into the PC and into the Oase interface
- Remove the 5-pin XLR cable plugged into the DMX-512 interface and plug it into the Oase interface.
- Launch the Oase software.
- Click on “File”, then “DMX Address Programming”
- Enter in Window:
  - Manufacturer ID: 37
  - Version #: 1
  - Mode: 1
  - Enter serial number of fixture and starting DMX address.
- Check your results to be sure that the programming worked.