

Random Thunder Storm (Lightning & Thunder)

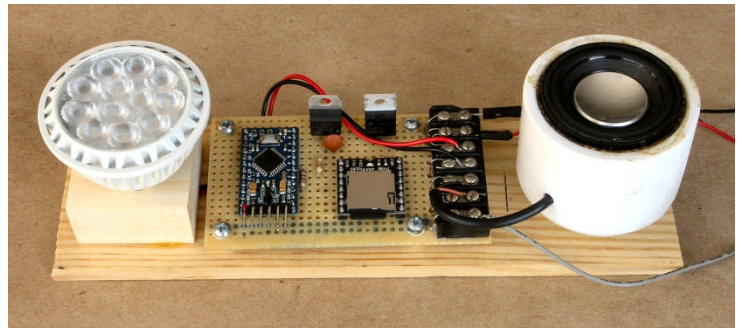
By Fred Miller, MMR

“Into each (model railroad) a little rain must fall.” Well maybe we shouldn’t dump water on our layouts but how about the lightning and thunder? In fact that has been a recurring topic in the Yahoo Layout Sounds discussion group. My growing interest in applying micro-controllers to facilitate animation of my layout prompted me to try my hand at a simple lightning and thunder project controlled by an Arduino Mini Pro micro-controller. Actually this is a second and simpler implementation of the storm effects. See previous article *Thunder Storms for Model Railroads*.

Of course the three main components of a Thunder Storm project would be (1) the sound, (2) the lightning, and (3) some means of controlling and sequencing these components. Let me say at the outset my compulsion to do things “on the cheap” prompted my selection of the electronics to meet the needs of the three basic components. For example, there are several very versatile “sound player” boards available for the model railroader. Pricom and Iowa Scaled Engineering offer quality sound boards. However the best sounds (CD quality stereo wave files) are only available on boards priced at \$40 or more. Many of those also require additional circuitry to amplify the sounds suitable for a speaker. For my “tin ears” and limited budget approach I chose to use an inexpensive MP3 player module. Further since I wanted to develop a single spot sound project, a mono player seemed OK with me.

The lightning:

The actual lightning flashes could be accomplished in a number of ways with multiple light sources and even behind the backdrop implementations. I chose to use a simple 50 watt equivalent small LED flood bulb aimed at the sky above my layout and behind the front top valence strip. By appropriately flashing the flood with random length on and off periods, somewhat sequenced to the thunder sounds, a rather convincing thunder storm effect can be created



LED Flood Lamp, Speaker and Electronics

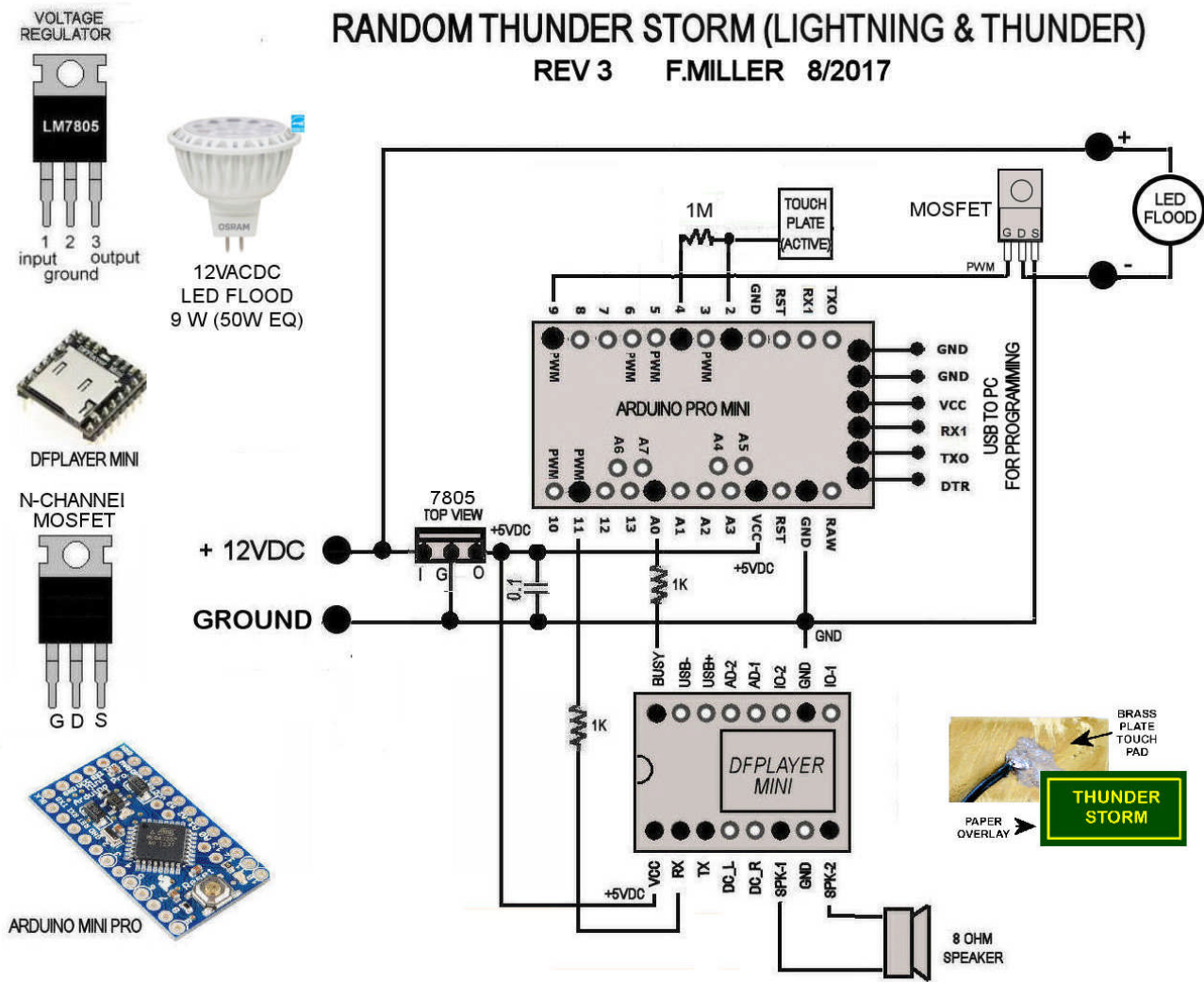
The thunder:

Jim Wells of Fantasonics was kind enough to provide the sounds for a few thunder crashes and rumbles. I was able to assemble a few sequences, each with different and multiple crashes, followed by some rumbles and even some rain. (The thunder clashes and rumbles are not a current product offering from Fantasonics, but Jim does have a great selection of background sounds for model railroads.) My sound player is a DFPlayer Mini which plays MP3 files from a micro SD memory card. Selection of sound files from multiple tracks and volume settings can be accomplished with commands transmitted from a micro-controller. Many different controls are accessible but I found all I needed were those to set the volume and select and play sound tracks. The player includes an amplifier but only for mono sounds out to an 8 ohm speaker. Stereo output is available but a separate amplifier circuit would be required.

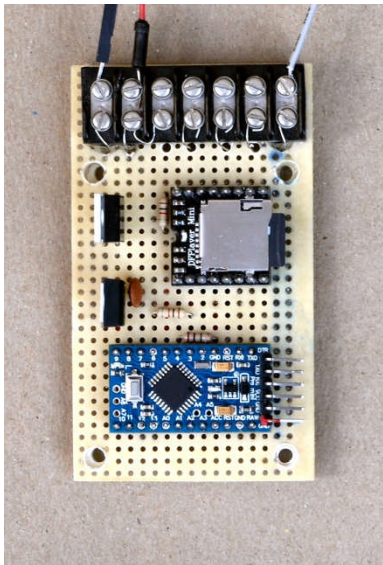
The controls:

I just love working with the Arduino micro-controller boards. I typically develop the software using the standard Arduino UNO with a breadboard shield, and then transfer the software over to the very inexpensive Arduino Pro Mini. The software for this project cycles through several thunder-lightning sequences when a “touch plate” on my layout fascia strip is touched. In general each sequence plays a different thunder/rumble and the lightning flashes consist of random ON and random OFF periods. The “random” times vary from 10 milliseconds to 100 milliseconds. About a quarter of the way through any sequence of lightning flashes, the thunder sounds are initiated. The lightning flashes terminate but the thunder claps and subsequent rumbles continue on to the end of the current sound file. At that point the next sequence is initiated. These multiple sequences with different sound files and random flashes create, I think, a realistic display.

The Electronics:

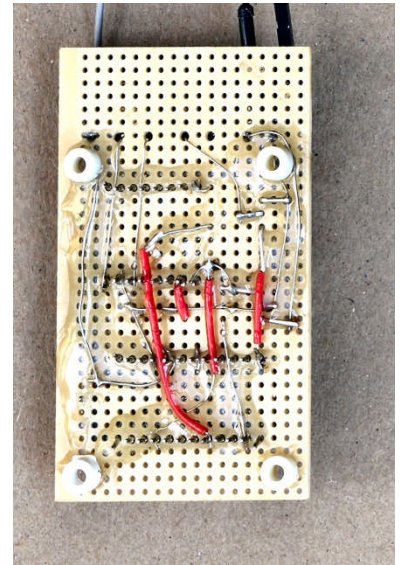


Construction Hints:



Assembled project board

I always like to use my PC to graphically lay out the circuit components on a perf board template, then graphically “wire” the components printing out both a front and back view. The components are then placed on an actual perf board, connecting with wire and soldering on the bottom side. I thoroughly clean the board of soldering flux and then inspect all soldered connections (with a magnifying glass). When the visual check looks good I apply power and check voltages. I then check out the circuit performance. (Sometimes I find adjustments are necessary.) I coat the bottom of the perf board with 5-minute epoxy to keep all wires in place when everything is working as desired.



Bottom side sealed in Epoxy

The table below itemizes the parts, sources and approximate costs for the project.

RANDOM THUNDER STORM PARTS LIST				
Q	DESCRIPTION	PRICE	SOURCE *	SOURCE PART NO.
1	7805 5V REGULATOR	\$ 0.55	JAMECO	51262
1	N-CHANNEL MOSFET	\$ 0.69	JAMECO	2001373
2	1K OHM 1/4 W RESISTOR	\$ 0.20	JAMECO	690865
1	1.0M OHM 1/4 W RESISTOR	\$ 0.10	JAMECO	691585
1	ARDUINO MINI-PRO	\$ 1.50	VARIOUS	NOTE 1
1	DFPLAYER	\$ 1.34	ALIEXPRESS	
1	6W MR16 12V LED FLOOD	\$ 4.90	1000BULBS	IRT-10056
1	8 OHM SPEAKER	-	VARIOUS	-
1	PERF BOARD, MISC HARDWARE	-	VARIOUS	-
TOTAL		\$ 9.28		
* WHEN ORDERED IN MULTIPLES OF 10				
NOTE 1: MINI-PRO MICROCONTROLLERS AVAILABLE FROM CHINEESE SOURCES				
SUCH AS ALIEXPRESS OR BANGGOOD FOR ~\$1.50				

REFERENCES:

Fantasonic website:	www.fantasonic.com
Author's email:	tractionfan@aol.com
Arduino website:	www.arduino.cc
1000Bulbs website:	www.1000bulbs.com
Jameco website:	www.jameco.com