

STANDALONE DCC/LOCONET COMMAND STATION

I had a need for an inexpensive DCC command station to support a small demonstration model railroad controlled by a Loconet based throttle. Several older, now discontinued, Digitrax command stations, or the Digitrax Zephyr would provide the support I needed but the price point for this dedicated DCC command station application was more than I wanted to meet. Street prices for these devices range from \$100 to \$200.

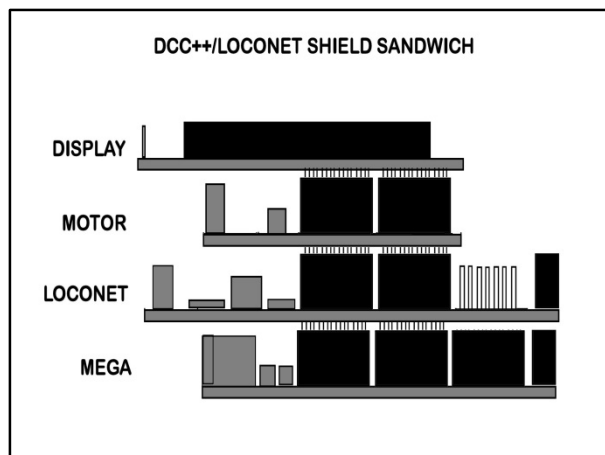
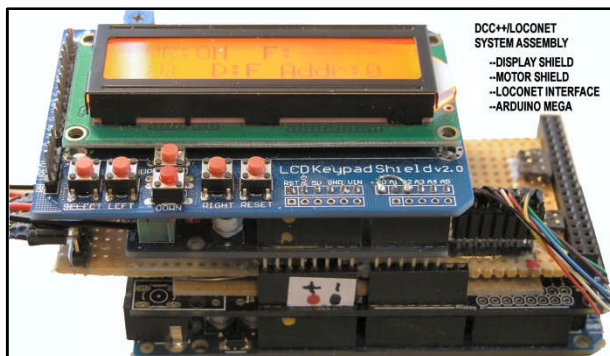


With the introduction of Arduino micro-controllers into the model railroading community, a number of standalone possibilities are available. One project called DCC++ BASE STATION was developed by Gregg E. Berman and augmented with Loconet support by Dani Guisado. This project makes use of an Arduino Mega microcontroller and various other plug-in Arduino “shields.” The

software is readily available on the Internet. See References at the end of this article.

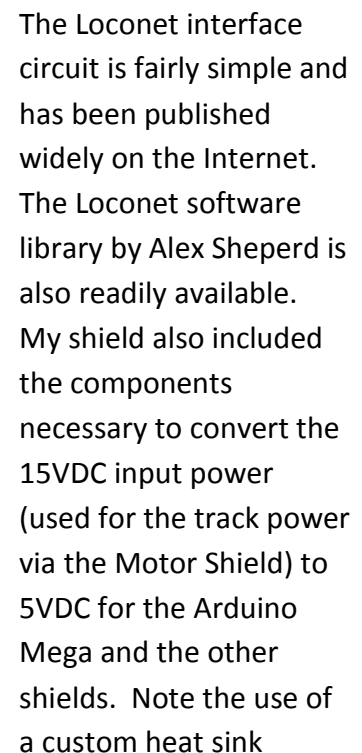
I chose to implement the DCC++/Loconet project with some minor software changes. The total price of the components ranges from \$30 to \$90, depending upon one’s willingness to use off-shore components.

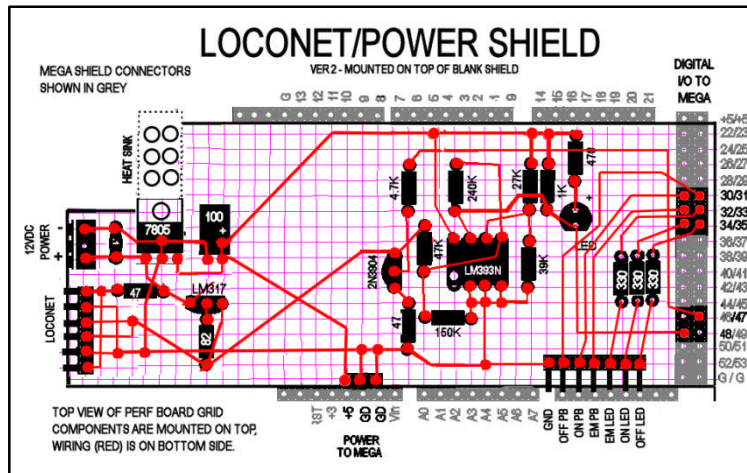
As noted, the project makes use Arduino Shields, which plug into each other over the Arduino Mega. All but one of the “shields” is



commercially available. The Motor Shield is cleverly used to develop the DCC track power while the Display Shield provides useful (but not

The Loconet interface shield is one which must be custom developed. I used a blank Arduino Mega shield to house the circuitry. (Although that circuit could be directly installed on the blank shield, I found it easier to follow my previous experience and assemble it on a perf board and then fasten that to the Mega Shield.



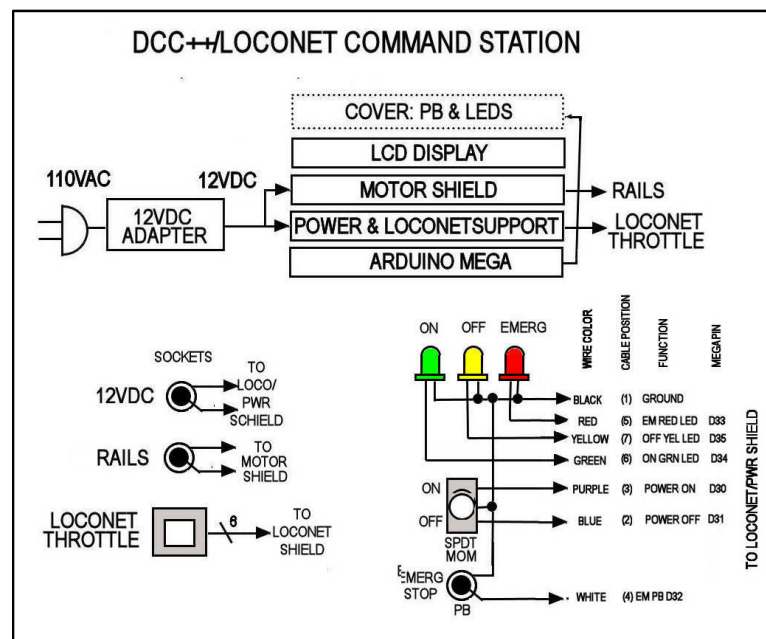


Provision is also included to develop the necessary power to run the standalone Loconet network (pins 1 and 6) as well as the necessary Loconet termination (pins 3 and 4). Access to the system controls and LED indicators from the MEGA digital ports is also included on my Loconet interface board. The LED dropping resistors are connected to a small plug-in cable which goes to

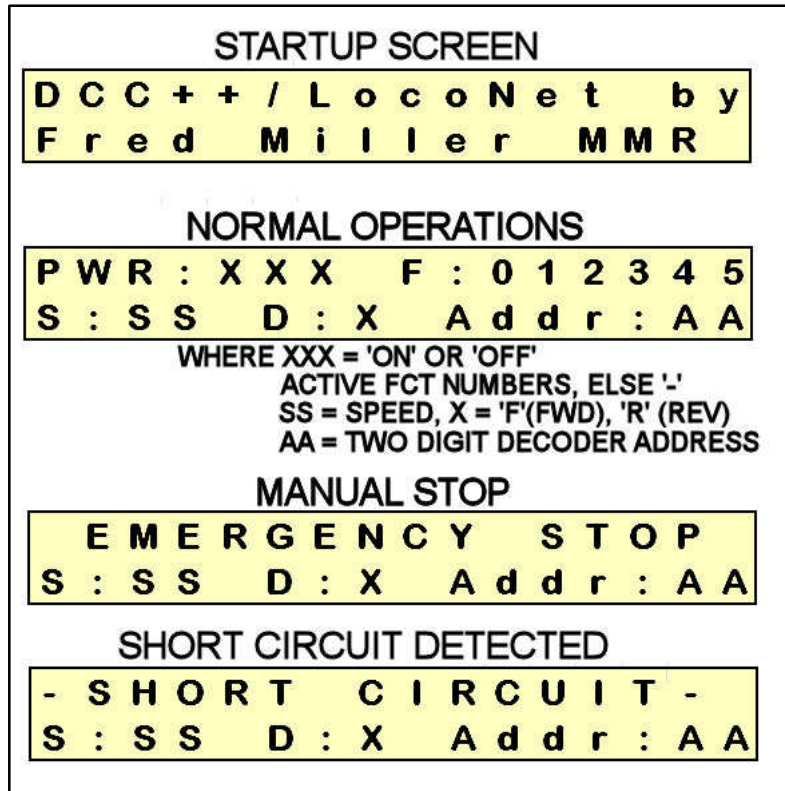
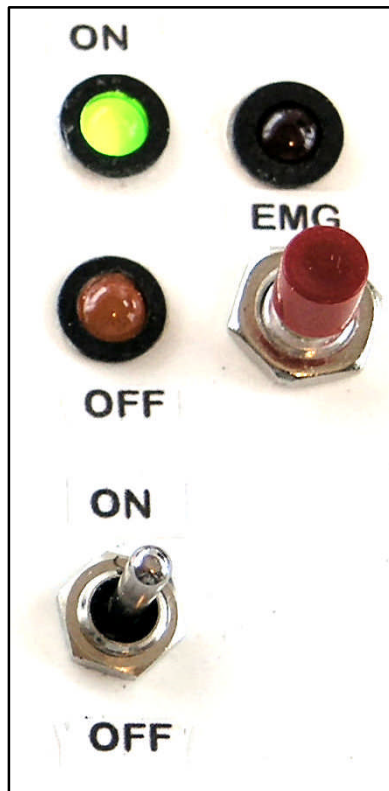
the top of the system enclosure, as well as to the Digital Pins of the Arduino MEGA through the shield plugs.

Since my project was specifically developed to support only one Loconet throttle running a small demonstration model railroad, I modified the software running the LCD display to show the currently acquired motor decoder address and the direction and Function settings (F0-F5) for that acquired Decoder. The command station could, however, support multiple LocoNet throttles but the display would show only the decoder status of the last activated throttle, i.e. showing the last Loconet messages sent from a throttle to a decoder.

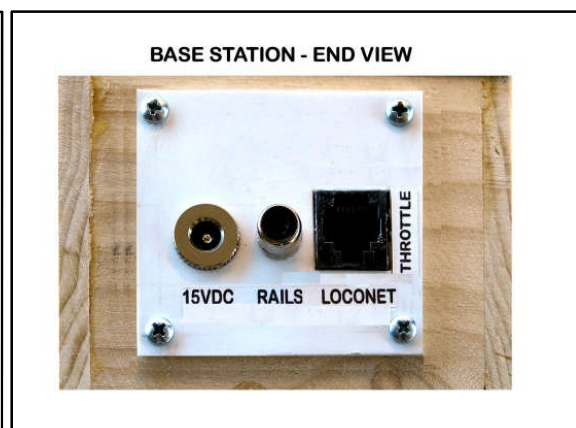
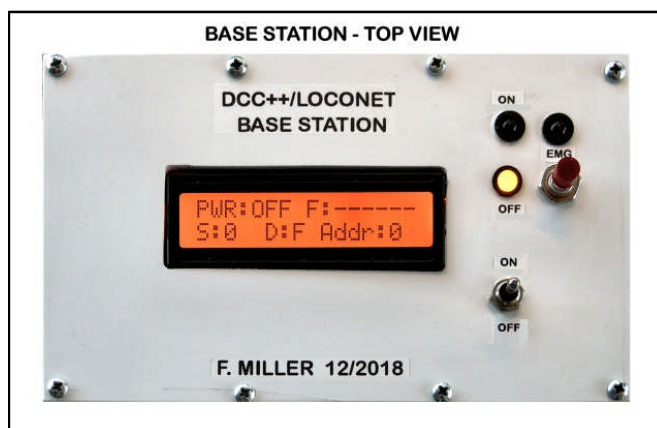
Depending upon the Display Shield chosen, the software and driving digital and analog pins may need to be adjusted so as to not conflict with the Motor Shield. Note that my implementation also removes the logic and circuitry for the Decoder programming track output. I also avoided the use of the push-buttons on the LCD Display Shield. Instead I use a toggle switch on the top panel of the enclosure to turn the track power ON or OFF. The GREEN LED and the AMBER LED shows the state of the track power. In addition, I have a push-button and RED LED for an EMERGENCY stop provision which immediately removes power to the track.

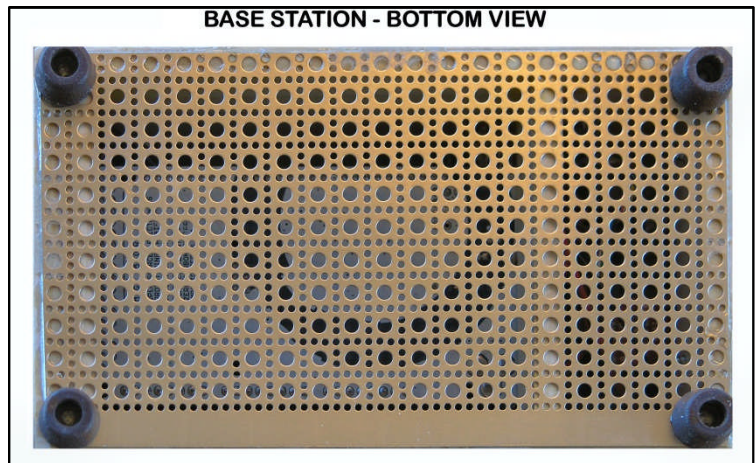


As noted above, my implementation modified the software driving the LCD display to show additional information beyond that provided in the original DCC++ project. The startup and subsequent operational screen layouts are shown below:



I assembled the project in a simple wood and plastic enclosure. Note the screening to allow for heat dissipation on the bottom side of the enclosure. Provision is made for the 15VDC power input (from a wall wart) as well as outputs for the Rail Power and LoCoNet (for the throttle). I also provided USB access to the Arduino Mega for potential software changes. An external push-button is also included for resetting the Mega back to startup (power on) state.





Operations

When the 15VDC power is plugged into the Base Station, the unit will momentarily display the 'startup screen' and turn on all three indicator LEDs. When the system has initialized the 'normal operations' screen will be displayed and the Amber LED (Track Power Off) will be illuminated. When the Power ON toggle is thrown, the Green LED (Track Power On) will be illuminated and the track power will be sent to the DCC rails.

When a Loconet Throttle is plugged in and a Decoder is acquired, the associated Address, speed, direction and applicable FCTs will be displayed. These will be changed as the throttle/decoder is used. If a short circuit is detected, the display screen will indicate that state and also turn the track power off, showing the Red LED. Pressing the Emergency Push Button at any time will also turn the track power off, the Red LED on and a display message.

As noted above, the cost of the DCC++/Loconet Base Station components will vary considerably, depending upon their sourcing. The chart shows some typical lower prices, but these could easily be doubled or tripled if using other sources.

| Typical Pricing | | |
|--|----------|-------------|
| Principle Boards | Amazon | Ali-Express |
| Arduino Mega 2560 | \$ 14.99 | \$ 5.95 |
| Mega Prototyping Shield | \$ 7.99 | \$ 1.99 |
| LCD Keypad shield | \$ 6.49 | \$ 2.50 |
| Motor Shield | \$ 8.99 | \$ 1.10 |
| | \$ 38.46 | \$ 11.54 |
| Plus ~\$10 of additional electronic components | | |

References

- Description of the original DCC++/Loconet project:
<http://www.clubncaldes.com/2017/04/cheapest-dcc-command-station-with.html>
- Loconet Arduino Library: <https://www.arduino-libraries.info/libraries/loco-net>, or
<https://mrrwa.org/loconet-interface/>
- My email address for a copy of the Arduino software (sketch) and other information:
tractionfan@aol.com