Battery Powered Wireless Train Control System

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RM 27981

Ever wished you could run your trains completely free of track power? Well, as it turns out, you can. What you need is a small battery that can run a train for a reasonable amount of time and a simple remote control system that doesn't demand too much from the battery.

First, the new nickel metal hydride (NiMH) rechargeable batteries are compact and provide enough capacity to run a moderate size O gauge loco for about 1-2 hours before requiring a recharge. An alternative battery would be the lithium polymer (LiPo) type that's even better.

Second, coupling the battery with a simple two function wireless R/C system that can control loco speed and direction will give us what is needed to get up and running.

The first step for this project was to build a simple remote control module using inexpensive off-the-shelf components. **Chart 1** shows the basic elements of the system. An adjustable voltage regulator (LM317) has its DC output voltage adjusted by a 5K potentiometer that is rotated by a miniature gearbox. Since most modern locos use DC can motors, this is a simple and effective speed control/direction approach. The gearbox is driven by a polarity reversible DC signal from a two channel R/C receiver in the module. I can provide a detailed schematic diagram to anyone who would like it.

Next step was to choose a suitable battery that turned out to be a 9.6 volt 2000 mah from Tenergy (#11401 or #91102 with charger). This is a compact battery that measures only 4"x2"x.5". According to my measurements, this battery should provide about 2 hours of operation and will last almost indefinitely in standby, although I did include an on-off switch.

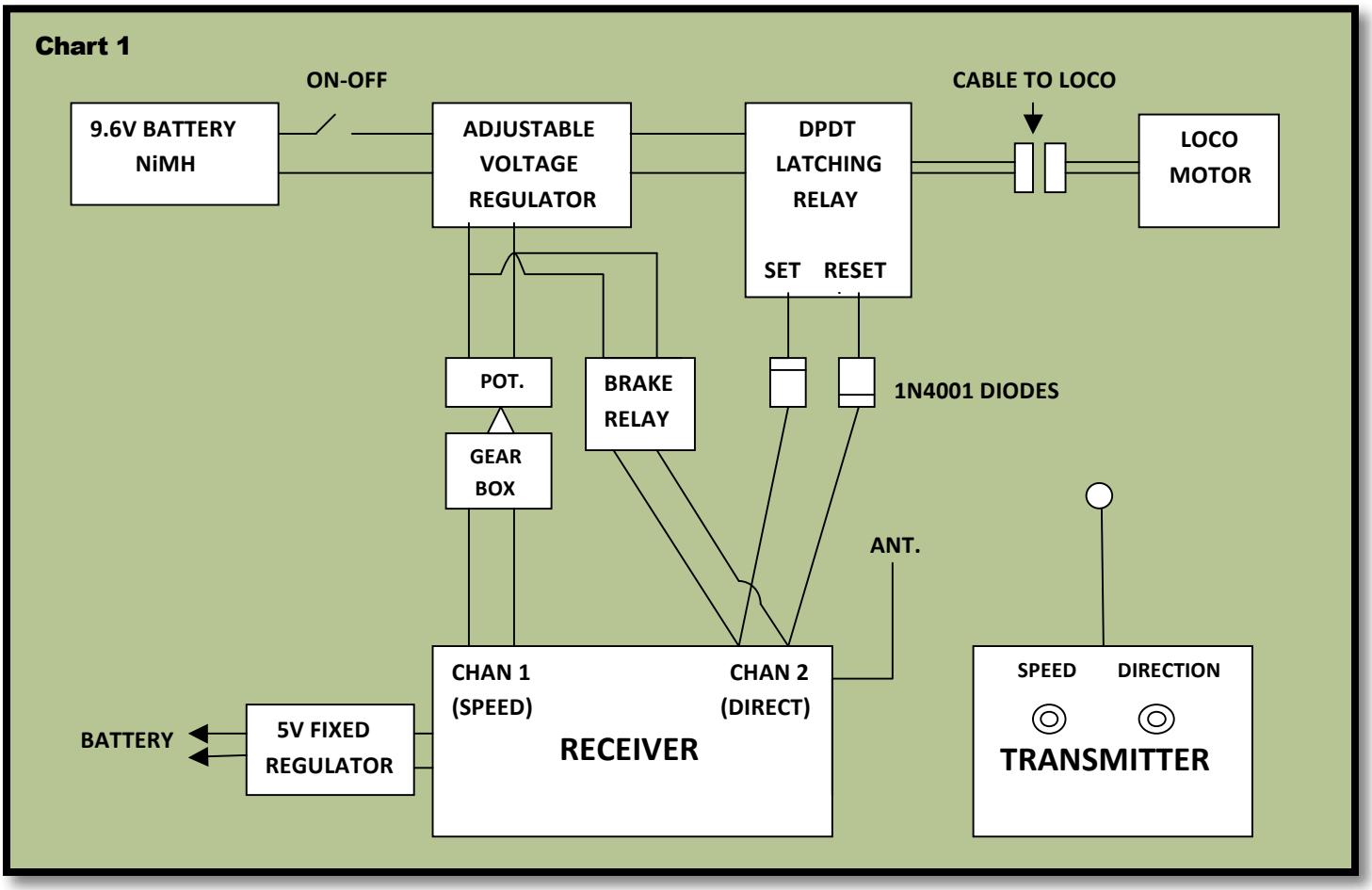
In the control module a DPDT latching relay is configured so that when activated it will reverse and maintain the polarity of the DC output voltage which provides for the control of loco motor rotation and the direction of the loco. Again, with the DC can motor, reversing the voltage polarity will reverse the direction of the locomotive.

A brake relay, which momentarily drops the output voltage to near zero whenever the direction relay is activated, mimics conventional control (forward-stop-reverse-stop) and offers realistic and familiar E-unit style direction control of the locomotive. It also provides an emergency stop.

The R/C receiver is a small two-channel unit commonly found in remote controlled toy cars. Each channel of the receiver provides either a positive or negative 5 volts DC depending on which way the transmit-

What a pleasure to not have to find an AC outlet in order to demonstrate the trains in operation when I'm on the road!

Chart 1



ter keys are pressed. **Photo 1** shows the companion R/C transmitter with the two function keys. The left hand key increases or decreases the loco speed by signaling the receiver and rotating the voltage regulator potentiometer either up or down. The right hand key controls loco direction by activating the direction relay which reverses the polarity of the output voltage to the loco motor.

A fixed 5VDC voltage regulator provides the necessary operating voltage for the receiver. The transmitter/receiver pairs operate on either 27 or 49 MHZ, so two trains can run on the same track at the same time.

Photo 1

I added a protective device in the output line that is a polyswitch resettable fuse that trips at 1.3 amps. These can be paralleled for higher current if necessary. If more than 2 amps of current to the motors are required, it would be best to use a suitably heat sunk LM338K voltage regulator which is the larger case (TO-3) version of the LM317 (TO-220) and is electrically equivalent.

I built the control module on a perforated phenolic board with the components mounted on small terminal strips. I then installed the module in a Lionel® tool car as shown in **photo 2**. The tool car is ideal for the control module as the top comes off vertically. The voltage regulators

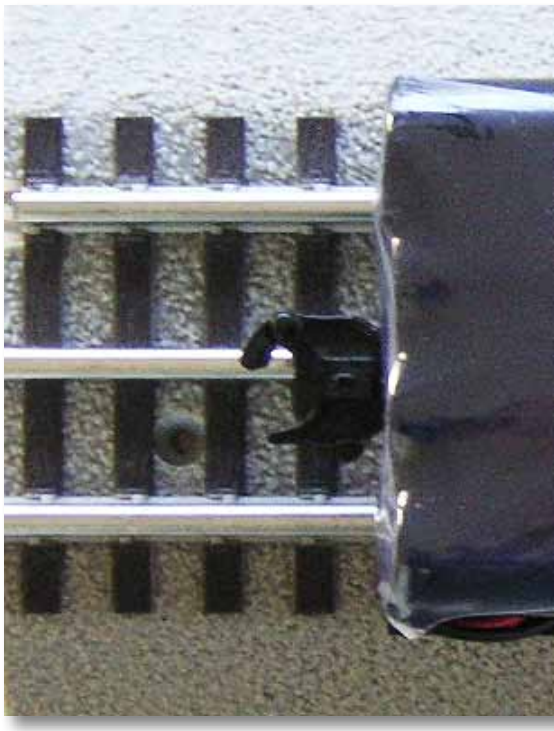
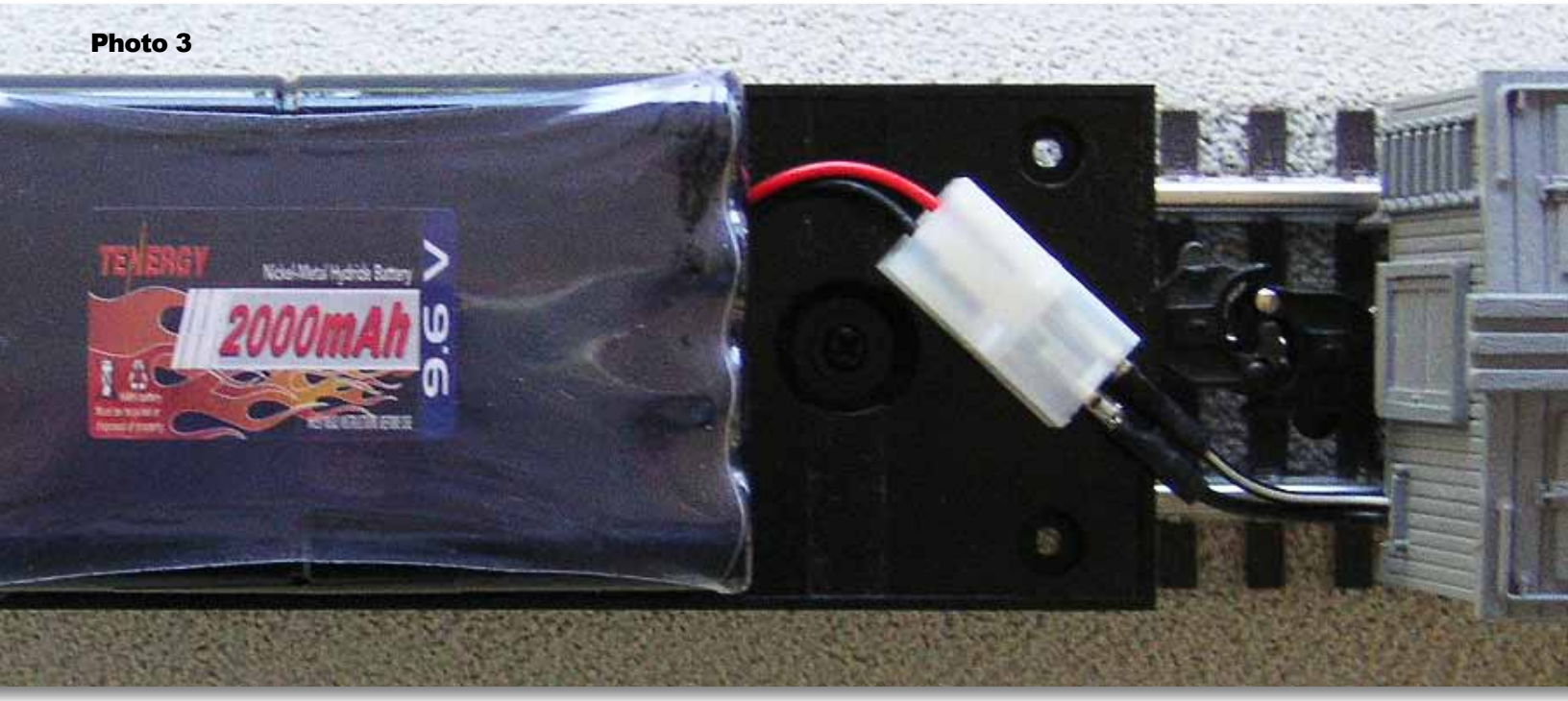


Photo 2

Photo 3



are at the left end of the module, the gearbox/potentiometer is near the center and the receiver is at the right end. The horizontal white wire is the receiver antenna that's suspended above the module to keep it away from other components.

A small plug and two conductor cable interconnects the control unit in the tool car with the motor(s) in the loco. The cable goes directly to the terminals of the DC can motor (or motors) in the loco. The can motor(s) must first be disconnected from any internal control boards and/or pickup rollers so that power is received only from the control module in the tool cart. Once installed and hooked up, operation of this setup proved to be quite simple and very smooth.

There were two choices for mounting the battery. The first was to mount it under the tool car between the trucks. This would have required shaving off some of the plastic undercarriage components so that the battery would clear the track. To avoid this, I elected to mount the battery on a small flat car trailing the tool car and connect it with a small plug and cable as shown in **photo 3** where the tool car is to the immediate right of the flatcar.

Finally, I got the whole setup running nicely on my portable demo layout that's shown in **photo 4**, out in my backyard. I tried out this setup with a number of medium sized locos including the Lionel Docksider and two K-Line diesels. They all reacted very nicely and low speed operation was quite smooth. What a pleasure to not have to find an AC outlet in order to demonstrate the trains in operation when I'm on the road!

One more thing: the cost of the components for this setup, including the battery was under $80.00.

Photographs by Robert H. Walker

Photo 4