Battery Power

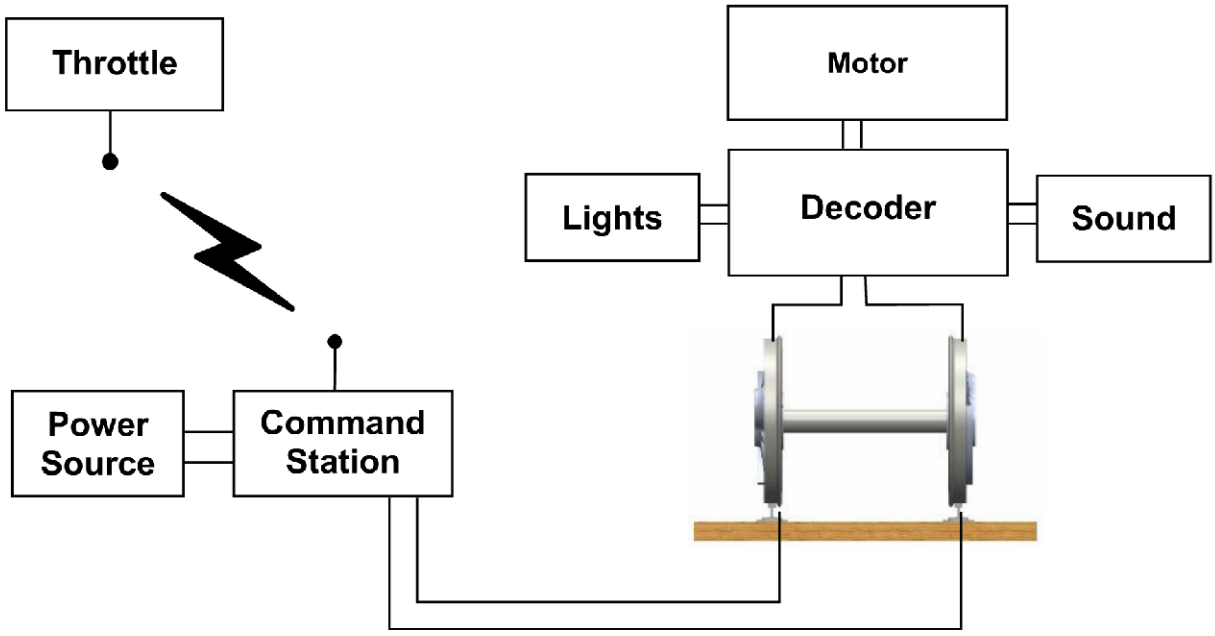
Bill Pistello converted this Atlas O Scale GP-15 to battery power. The green block is the battery.

By Glenn Guerra

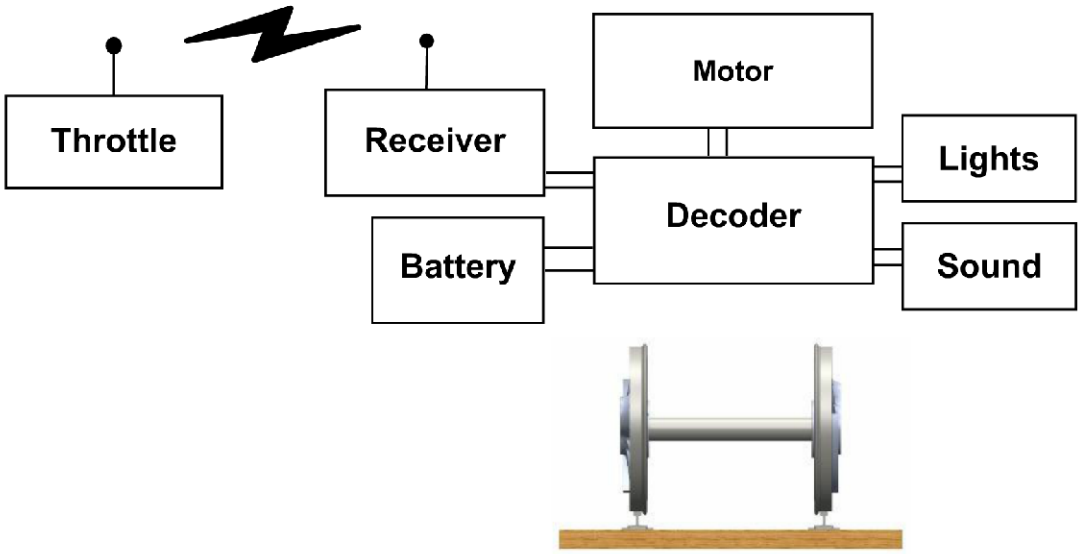
Electronics in model hobbies is an area of almost daily change. Remote control in the model airplane hobby started with simple on-off servos for control. These servos put your control surfaces either full on or full off. With the advent of digital signals, the on-off servos now became infinitely variable and the control of model airplanes took a big step. The size and weight of the servos also started to get smaller and weigh less. Model airplanes, cars, and boats now had very good and very reliable control. The digital signal idea was adapted to model trains in the form of DCC control. We now had all the advantages of the digital signal control on our model trains, opening the door to better sound systems and many other functions. The next big improvements for the model airplane people were the continued miniaturization of the servos, the advancements in batteries, and the increased torque and efficiency of electric motors. Now it was possible to have an electric powered airplane that would fly. Ultra light and small model airplanes and helicopters are flown indoors. The model car people were not as concerned with weight, but the high torque motors gave them speed without the smell of gas engines. They, too, were able to move some of the hobby indoors. The garden railroad people started looking real hard at this, and adopted battery power for their trains. The larger size of the models allowed for larger batteries. Cleaning track is a pain in the behind when our railroads are indoors and easy to reach. It's even less fun crawling around the garden cleaning the track.

The battery power systems for garden railways worked well, and battery power is very common for garden railways. I saw my first battery power O Scale layout in 2002 in Madison, Wisconsin. At that time, the battery pack was large enough that it needed to be in a box car behind the locomotive. This layout was also not DCC controlled, and as such, had only speed control. Even with this, the other advantages made the system viable. There were no wires to any of the tracks, and No dirty track or short circuits.

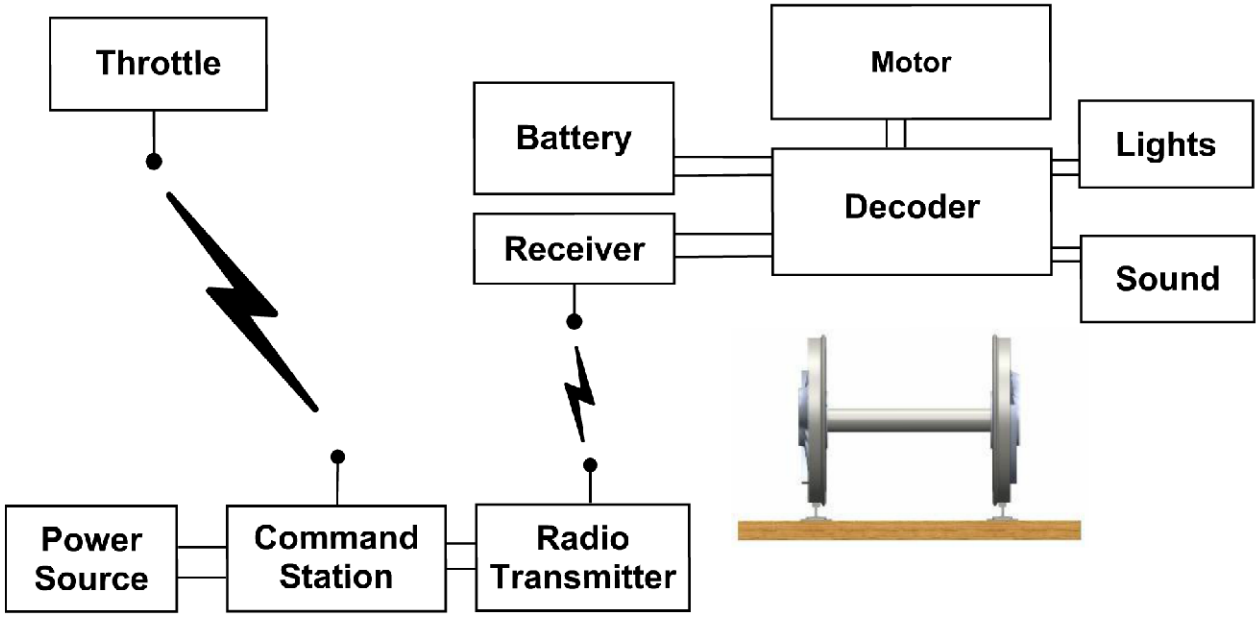
This is an HO Scale switch engine that Bill Pistello converted to battery power. This was one of his first conversions. The system Bill used communicates with the locomotive using infra red light like your TV remote. The system requires the "eye" in the side of the tender which must be able to receive the light signal. This location was rather unsightly and since this locomotive was converted Bill has had some good results mounting the "eye" in the cab window or a tender dog house window where it does not show as much.



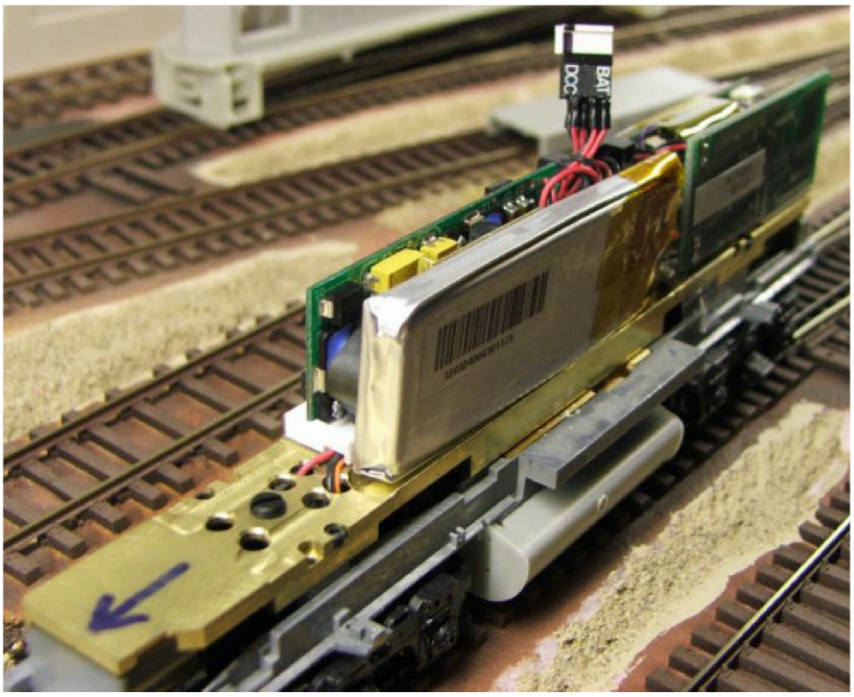
The basic DCC system looks like this. Your handheld throttle communicates with your command station by radio wave. The command station converts the direct current from the power source into a digital signal and sends it to the track through wires connected to the track. The wheels on your locomotive pick up the signal and send it through wires to the decoder mounted in your locomotive. The decoder converts the signal into power for the motor, sound, and lights on your locomotive.



The basic battery DCC system looks like this. Your handheld throttle communicates with a receiver on your locomotive by radio wave or infrared light. The receiver converts the signal into something the decoder can understand. On some systems, the radio receiver is part of the decoder. The decoder then converts the power from the battery to drive the motor, sound, and lights on your locomotive.

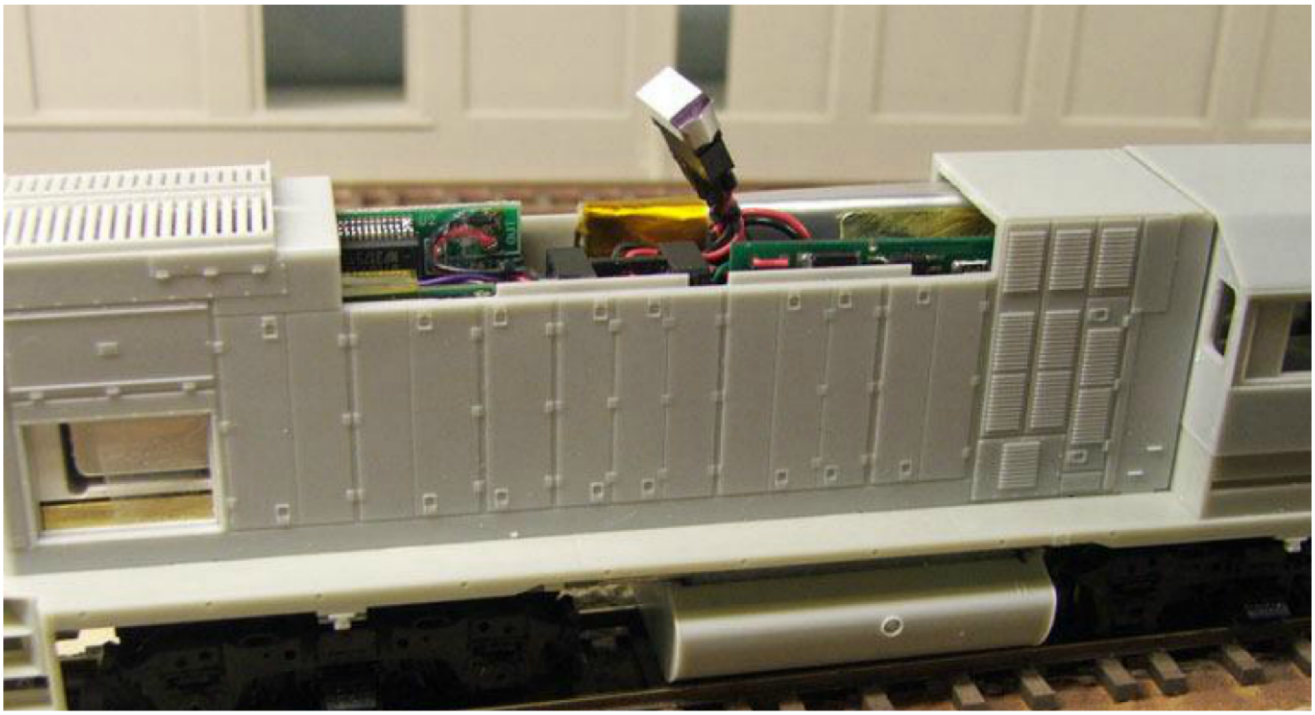


The basic modified DCC system looks like this. Your handheld throttle communicates with your command station by radio waves. The output from the command station goes to a radio transmitter instead of the track. The radio transmitter communicates with a receiver in your locomotive. The receiver in the locomotive communicates with your decoder, and the decoder receives power from the battery to drive the motor, lights, and sound.

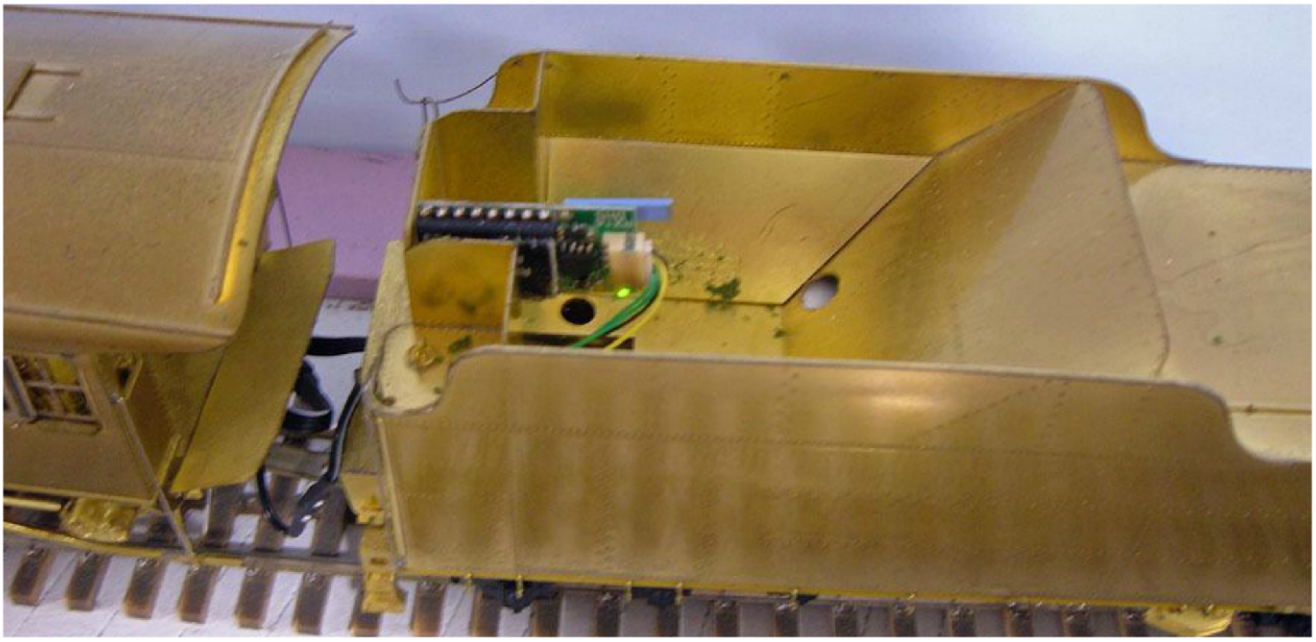


Bill Pistello and his friend, Larry Naus, like to convert models to battery power. Larry converted this HO Scale GP-15 to battery power with this set up. The battery is on the near side wrapped in the silver color.

Since that time, the systems are now DCC compatible and getting much smaller. How small, you ask. Bill Pistello has successfully installed DCC battery power control systems in N Scale locomotives. It's here for O Scale and ready to use. That's the good news. Now for the rest of the story. There are a few different ways the systems work and there are advantages and disadvantages to each way. I will try to explain the basics of some of the systems, and show what can be done when installing them in your locomotives.



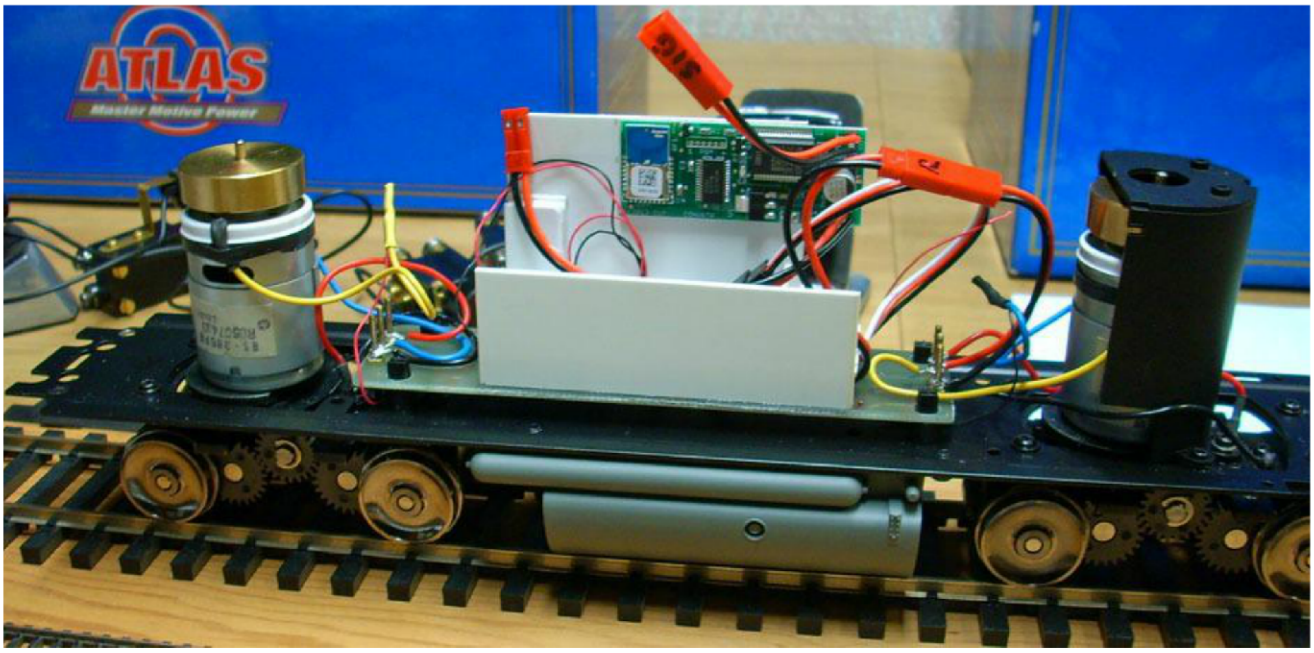
This is the HO Scale GP-15 that Larry Naus converted to battery power. Even a narrow hood GP type of locomotive can accommodate the battery and the decoder. The model already had a removable hood which makes access to the battery easy.



If you use the radio signal to communicate with your locomotive, you will need to mount the receiving antenna outside of a brass shell. The radio signal will penetrate a plastic shell, but not a metal one. Pat Mitchell mounts the receiving antenna in the coal pile of his tenders. When the tender is full of coal and painted, the receiver does not show. You could also make a hollow coal pile out of plastic and mount the antenna below it. This locomotive is a consolidation that Pat is working on. He has already done the challenger that runs on his layout. The battery is in the water compartment of the tender, and by lifting the hatch for the tender tank, Pat gets access to an off-on switch and a place to plug the charger into the battery.

Let's start with the two basic ways your locomotive can be controlled with a wireless signal. Your locomotive will need a receiver that can receive a wireless signal and convert it into something that can control your locomotive. One way of doing this is using an infrared signal like the remote control on most TV sets. The remote in your hand sends out an infrared light signal that the receiver on the TV picks up. For this system to work, you need to be in the same room as the TV, and the light signal needs to hit the receptor on the TV. I'm sure that many of you have played around by bouncing the signal off of a wall and getting it to hit the TV. The receptor on your TV is a small "eye" somewhere on the front where the light can get to it. Some model control systems use this technology. The advantages are that they are simple and talk directly to your locomotive. One of the disadvantages is that you need to be in visual contact with the locomotive for it to receive your signal.

Pat Mitchell uses the modified DCC system. On the output from the command station, he inserts this radio transmitter which is commercially available. This transmitter replaces the wires that go to the track. The signal is now transmitted via radio to Pat's locomotives.

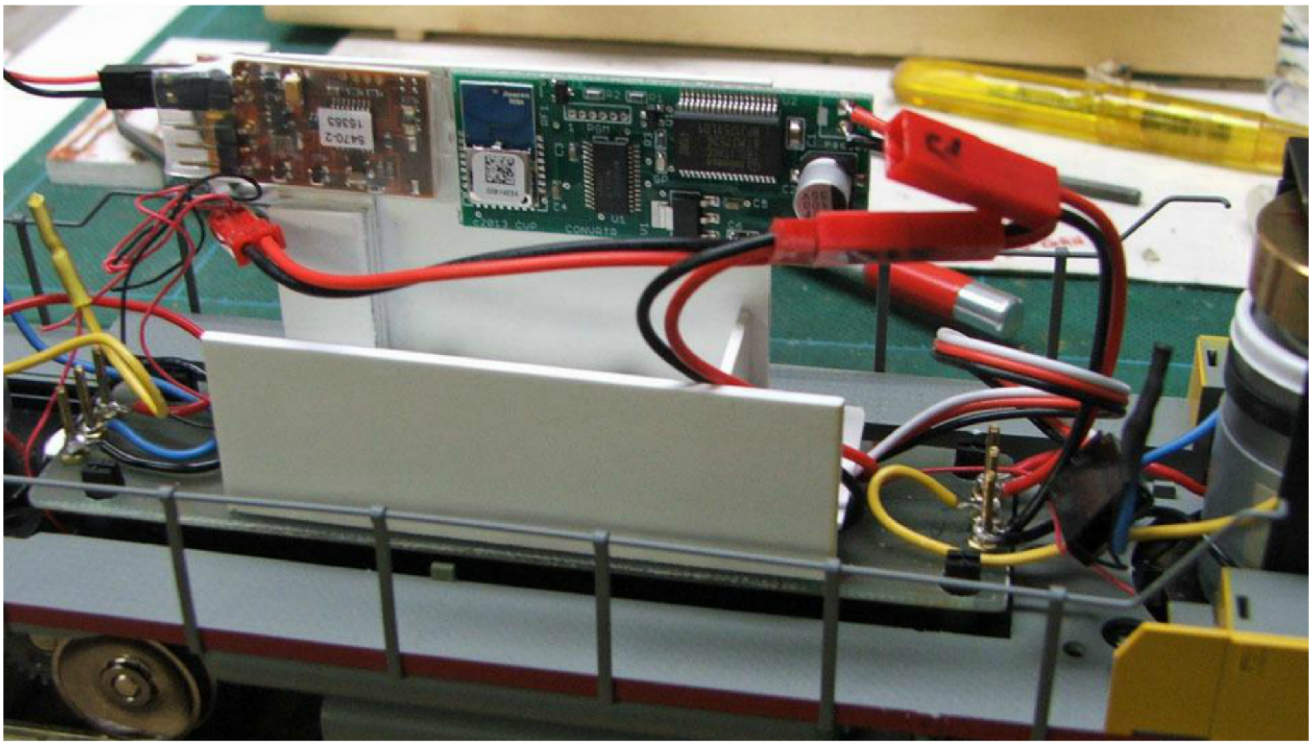


This is Bill Pistello's O Scale Atlas GP-15 conversion. Bill used a printed circuit board as a base and a way of getting wires from the front to the back of the locomotive. The circuit board is the light green piece. Bill milled slots in the board to cut the copper cladding and make the electrical connections. The board has small screws and nuts at each end for a place to screw the motor leads to. This eliminates a lot of excess loose wire in the model. Next, he built the white styrene cradle to hold all the components and the battery. The component circuit boards are held in place with double sided tape.

Also, these systems may not be adaptable to other functions you may want in your locomotive. An example would be the sound system. You may only have a choice of the manufacturer's system and not any of the other systems. This is a good point to consider when looking at a system. The other disadvantage is the "eye" that needs to be on your locomotive somewhere. The first HO Scale locomotive Bill Pistello did had an "eye" on each side of the tender. Visually, this did not work, and Bill experimented with other locations. Having the "eye" in the cab looked better, but required additional wires between the locomotive and tender. On a diesel or an electric locomotive, the cab windows would work fine. Bill also experimented with putting the "eye" in the dog house on the back of a tender. This worked as long as the "eye" was near the window.

The other way of contacting your locomotive is by radio. The radio signal will penetrate walls and plastic shells on locomotives. With this system, you can be in constant communication with your locomotive. This has some advantages. One small disadvantage is that the receiver on your locomotive cannot be inside a brass shell because the radio signal cannot get to it. Pat Mitchell, who has an O Scale layout with battery power, has overcome this by mounting the receiver in the coal on his steam engines. On diesel or electric models, you will need to make some provision for a plastic panel or some other way to hide the receiver behind a non metallic part of your model. This covers the two basic ways your locomotive can receive a wireless signal.

The next thing we should consider are the basics of how the different systems work, and their compatibility with each other. In the basic system, you would have a handheld throttle and a receiver in your locomotive. This is simple and relatively inexpensive. The drawback may be that you are limited to the manufacturer's sound system and other accessories. If the system allows you to install a decoder between the radio receiver on the locomotive and the motor, then you will have more options. Bill Pistello favors these types of systems because the initial cost of the system is less. Another way is to use a standard DCC system with a radio output added to the command station. On the typical DCC system, the command station has a two wire output that is connected to the track. These wires carry the digital signal to your track and then through the locomotive wheels to the decoder in the locomotive.



In this photo, Bill Pistello has installed the walkways on his O Scale Atlas GP-15 and finished installing the components, with the exception of the battery which will drop into the white styrene cradle.

The decoder is receiving the digital signal and converting it to power for the motor. There are companies that sell a radio transmitter that converts the signal on the two wire output from the command station into a radio signal. By putting a wireless radio receiver from the same company in your locomotive, you can now convert your locomotive to battery power with the addition of a battery. Pat Mitchell likes the radio transmitter fitted to the standard DCC system. Pat was showing me the system on his layout. He still runs the two wire buss around the layout for control of accessories like turnout controls. While operating his locomotive with his handheld cab, he can call up a turnout and throw it from the handheld cab while his locomotive is running. Pat felt that having this type of control justified the expense of the regular DCC system. Pat also felt that he had more options for sound systems and other things on his locomotive. There are no wires to the track on Pat's layout, and the buss wire is only there to control accessories. Pat was telling me that the radio transmitter attached to his output from the DCC command station is portable. He put two wires on it with alligator clips and took it to a friend's house. He was able to clip the wires to the output from the friend's DCC command station, and now runs his battery power locomotive on the friend's layout.

Since we mentioned the battery, let's talk a little about the batteries. There are many choices, and the best place to look is the remote control airplane and car hobby. Let's start with the basic types of batteries available. Since we want a rechargeable battery, we have a choice between Nickel Cadmium (NiCD), Nickel Metal Hydride (NiMH), Lithium Ion (Li-Ion), Lithium Polymer (Li-Polymer), and Lithium Iron (LiFePO4). Probably your two biggest concerns with a battery selection are the space you have available, and the power draw you expect to have. To start with, you want the most efficient motor. Most new locomotives come with efficient motors, but older models may require fitting newer motors to them. When shopping for a battery or battery pack, you want to start by looking in the 12-14 volt range for an O Scale model. The next consideration is the power output. That will be expressed as the milliamps it will put out. The more it will put out, the longer it will run your locomotive between charging. There is a trade off between size and power output and this will be something you need to consider. Some have higher outputs for the same size than others. Most are relatively easy to use, but I would caution you about the Lithium Ion batteries.