CONTROL LOCOMOTIVES BY WIFI WITH LOCOFI

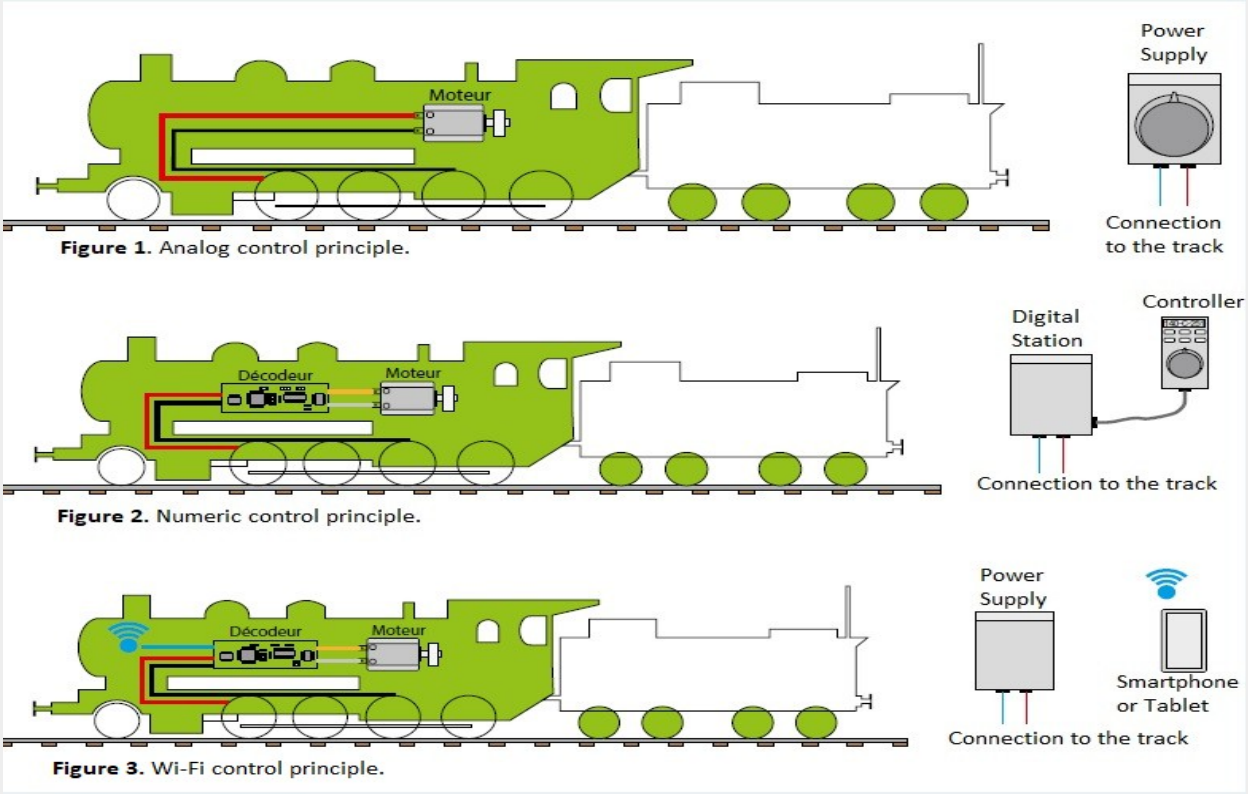
Direct motor control of devices via Wi-Fi is growing in the United States. Very promising, it already has advantages, as explained by Daniel Aurilio, who tested the LocoFi.

Illustrations: **Daniel Aurilio**
Text: Translated from the French text of **Daniel Aurilio**

LocoFi is a direct control system for your locomotive over Wi-Fi. Very promising, the system is based on a decoder with sound controlled by your smartphone, without the need for a digital control unit. It comes from the United States and deserves careful consideration.

Reminder of network control principles

Let's start with a quick reminder of the three control modes of our locomotives. The **analog control** (in the case of a two-rail DC power supply: see **Figure 1, page 72**) is one of the oldest: a transformer connected to the rails supplies the traction current. A potentiometer adjusts the voltage from 0 V (the locomotive is off) to 14 V (usually), which is the maximum speed. An inverter controls the direction of the current, to move the locomotive forward or backward. The engine of the locomotive picks up the current through the wheels, in contact with the rails. The entire network is impacted by the transformer settings. It is up to the model maker to create isolated zones, connected to a switch, to stop a locomotive here and there, which complicates the cabling of the network. The **numerical control (figure 2)** brings more flexibility. The rails are



FIGURES 1, 2 AND 3. PRINCIPLE OF THE THREE ORDERS.

permanently powered by a station. Each locomotive is equipped with a decoder that controls the engine and features (lighting, sound, etc.). The station sends the commands of the command only to the selected decoder (via a digital signal conveyed by the rails). The wiring is simplified because no cutting of the rails is necessary [except in the case of complex network with detections, Ed]. When several locomotives are on the same track, only the one to whom the order is addressed will react.

The **Wi-Fi command (Figure 3)** uses the same principle as the numerical control. Only changes the way of dialogue with the decoder since it relies on the Wi-Fi protocol (the information is no longer conveyed by the rail). This makes it easy to switch off the power of the track with, for example, a motor power supply with a battery. The plant is replaced by a basic power supply of the track, from 9 to 24 V, but it is also possible to do without this power supply of the track with a power supply of the motor by an on-board battery. The digital control is replaced by a free application, downloaded on a smartphone (or tablet). It will then add a Wi-Fi router independent of the network to only manage the Wi-Fi protocol. It can be the router of the Internet connection of the home or a device dedicated to the miniature network.

Presentation of the LocoFi module

The US company WiFi Model Railroad offers a decoder for rolling stock, so Wi-Fi, from a smartphone or tablet, without a digital power station. The management of the locomotives, the setting up of the decoders or the updates are carried out in a simple way, directly from a free software available on the site of the manufacturer. The operating principle of the LocoFi decoder is very similar to that of a DCC decoder, except management by the Wi-Fi protocol that provides great flexibility.

For example, the dissociation between the "supply voltage" part and the "decoder control" part makes it possible to add a battery for Dead Rail management: it is no longer necessary to feed the rails to advance locomotives. This protocol is from the beginning "bidirectional": there is a constant dialogue between the command and the machine controlled. So no CV to program to detect a locomotive on the network: the present decoders are all related to the command. It is also possible to use several commands (smartphone or tablet).

After the theory, practice

After placing an order directly on the LocoFi website (https://www.wifimodelrailroad.com/), the decoder and its accessories are delivered well protected in a cardboard box with the company colors. At the opening, we see that each item

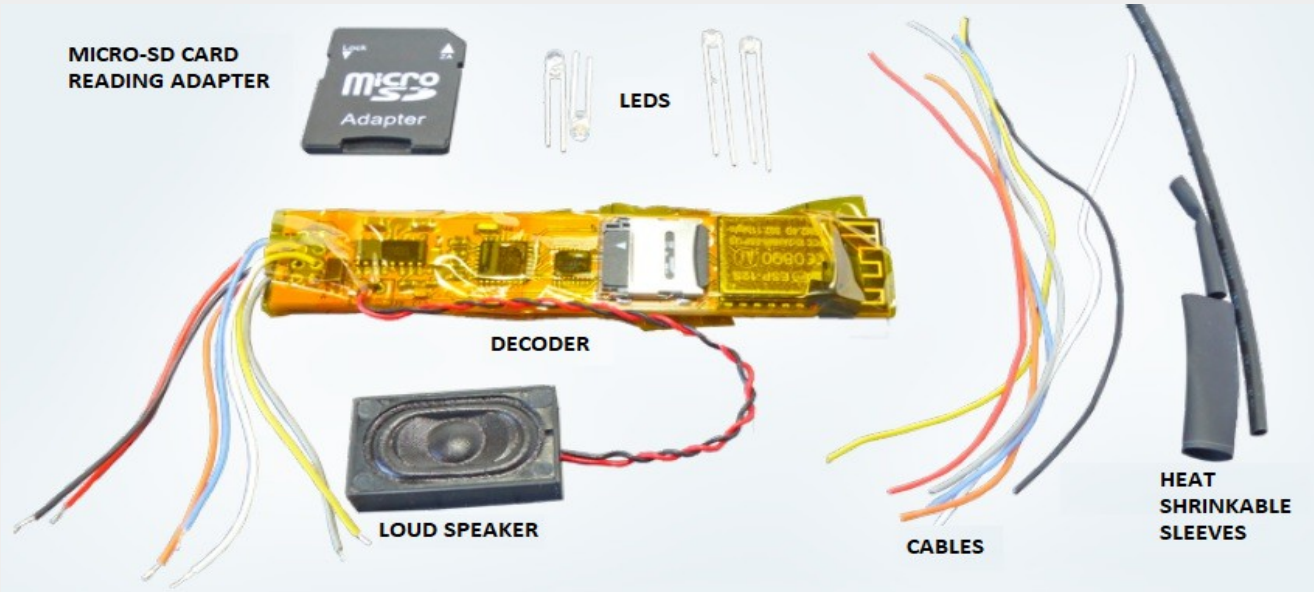


Photo 1. A very complete "package" with LED, decoder, speaker, micro-SD card reading adapter and this one which contains the soundtrack.

is very cleanly packaged separately. The package is very complete **(photo 1)**. It consists of the decoder equipped with a micro SD card (with the soundtrack), the speaker (already soldered), an adapter to read the micro SD card on a computer, four LEDs, cables and heat shrink sleeves for a clean fitting (nice attention). To this is added the documentation (in American English). Due to its dimensions (87.4 x 17.1 mm), this decoder is primarily intended for the American market and its locomotives which have a large free internal volume, especially since the components are arranged on both sides. of the decoder **(photo 2)**. Note the presence of a protective film around the decoder.

Photo 2. The LocoFi decoder is quite large: it will not fit in this 050 Fleischmann.

First, install the decoder

The installation of the decoder requires the removal of the electronic board originally installed on the machine to be equipped. The function outputs of the LocoFi decoder are not compatible with the DCC power supply. Therefore, unless it is able to isolate the circuit board in the appropriate places, it is necessary to remove it (which frees valuable space for the installation of the decoder). The wires are welded according to the information in the manual **(Figure 4, page 74)**.
The color code follows the standard NMRA standard. The output leads of the lighting (maximum current 10 mA per output) require LEDs with their resistors. The ideal is to use those provided in the package, which will be tinted if necessary to comply with French rail regulations. The decoder is compatible with a 9-24V analog or digital (DCC) channel power supply.

Download the application

The application, free, can be downloaded from the Google Play Store (only in Android version at the moment). The version for Apple iOS is under development and should be available soon.

All screens are in English but it is very understandable. During the execution of the software, a screen makes it possible to inform the name of the user so as to save the personalized settings of each user. At launch, the program performs a search for decoders present on the network. There is nothing to set, the detection is automatic. Detected locomotives are displayed on the screen. The software allows you to customize the settings of each machine (photo 3). It is possible to specify

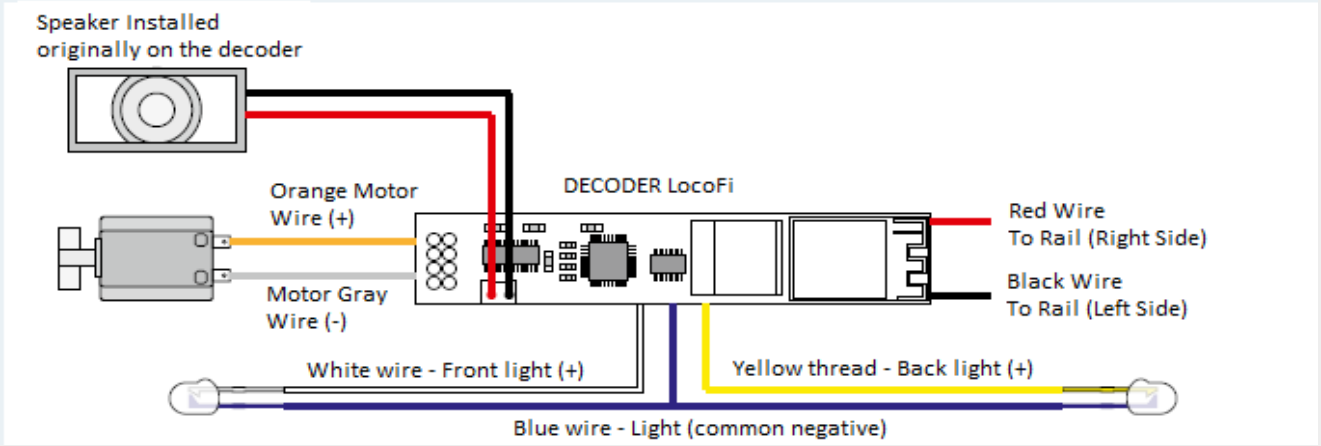


Figure 4. Installation diagram of the LocoFi decoder.

the name of the machine, the lighting management mode, but also to update the firmware of the decoder (which makes it possible to add new functionalities very easily). This function is important because it represents LocoFi's philosophy of offering new functionalities as the development progresses, such as an operating system or software that is updated. This makes it possible to change the possibilities of the decoder.
It is thus possible to manage the front and rear lights independently, by clicking on the buttons on the screen. But it is also possible to automatically turn off the taillights if the front lights are on. A planned feature will make it possible to reverse the front / rear lights (to compensate for a connection error, thus avoiding opening the machine and resoldering the wires). All these settings are made very simply, with sliders to move on the smartphone or tablet.

Control, easily

The control screen of a machine is very visual **(photo 4)**. Pressing the big red button starts the machine. The associated sound sequence is executed. A central slider increases or decreases the speed, while a horizontal slider with the indication "FWD" or "RWD" changes the direction of travel. The "Front" and "Rear" indicators light the lights on the front and rear of the locomotive (independently and manually or automatically depending on the setting). The buzzer icon performs the sound session of ... the buzzer, that of the bell does the same for the bell (we are in the United States). Note that for use on French equipment, it is possible to reassign sounds. The bell will be able to play the sounds of a second horn (or whistle).

To switch from one locomotive to another, simply slide to the right or left with your finger, as smartphone / tablet owners are used to. I advise you to visit the website of the manufacturer (wifimodelrailroad.com) to view the many videos of demonstration.

Sound management made easier

The decoder is supplied with a speaker (dimensions 26 x 15 x 7 mm) installed as standard. In order to achieve optimum quality, sound management is assigned to a specific polyphonic digital processor (independent of motor / lighting management) that handles 16 kHz - 8 bit files on three channels. The sound sessions:

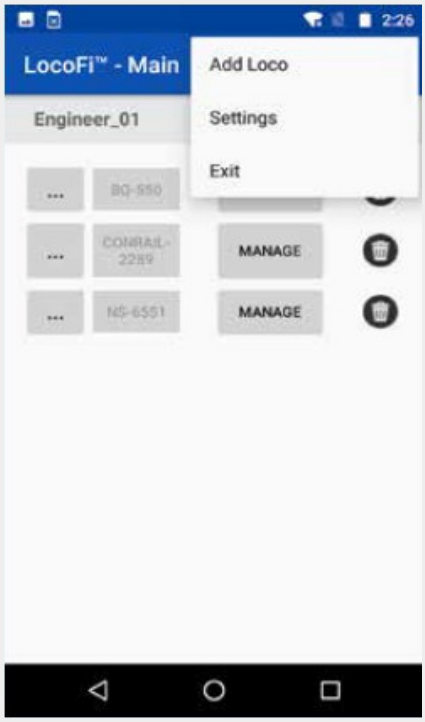


Photo 3. Setting screen.

starting the engine, running, stopping the engine, horn and bell are stored on a micro SD card **(photo 5)** inserted in the reader built into the decoder (a first to my knowledge).
It's easy to create your own soundtrack. The first step involves preparing audio sessions on a computer using specific software **(photo 6)**. The source can be a personal scan, recovery on a video or the purchase of sounds from a provider. The second step is to remove the micro SD card from the decoder, place it in the adapter (supplied) and read it on a computer. A simple copy / paste of the sounds on the card will be able to exploit them via the decoder.

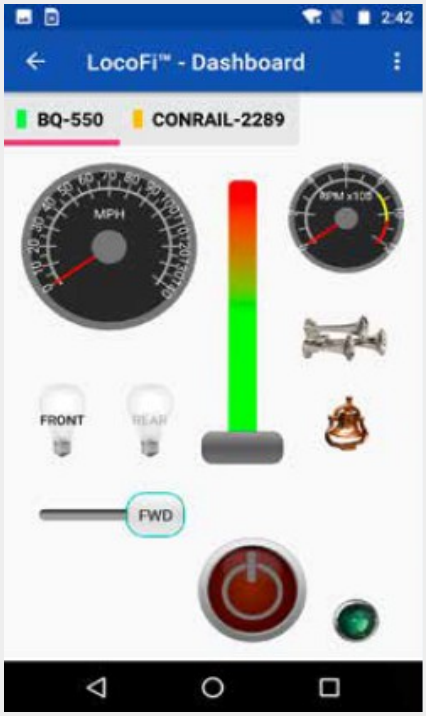


Photo 4. Control screen of a machine.

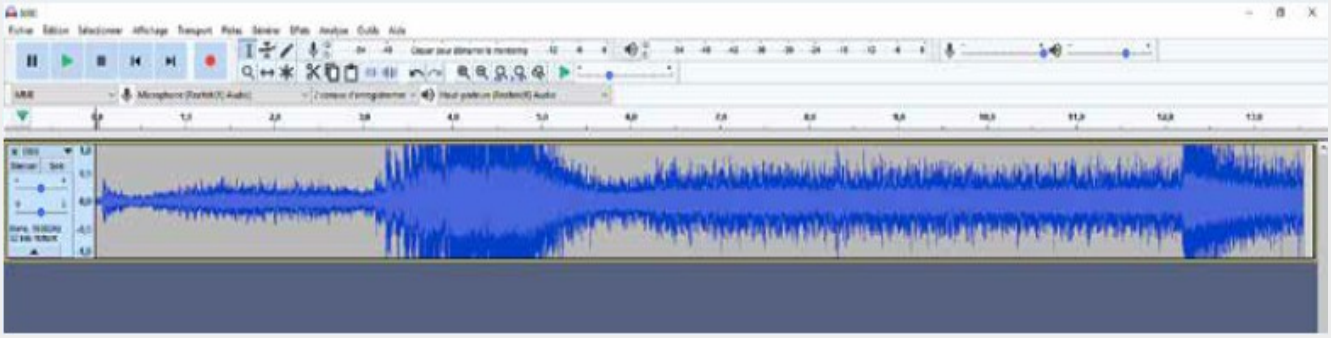


Photo 5. Example of the sound of the boot session seen by the Audacity software (available for free download from https://www.audacityteam.org/).

To date, the decoder has only a "diesel" soundtrack (recorded on a MAV Class 418 - M41 Hungarian machine). A version with "steam" sounds will be available later. The builder's philosophy is to allow everyone to implement a soundtrack of their choice, in a simple and free way. The site LocoFi offers to host free soundtracks of model makers who wish to facilitate sharing.

Who is the LocoFi decoder for?

It is aimed primarily at anyone who wants a very simple system and does not need the most advanced possibilities offered by the DCC. The price of the decoder ($ 120 currently) is offset by the lack of purchase of a digital power station, sound management, and the ability to use as many orders as desired (interesting for a club). Due to its imposing size, this decoder is rather ideal to equip a material in Zero (normal or narrow way) even if its implantation is possible in some machines in H0. The obligation to remove the original plate (which cancels the guarantee of the machine to equip) entails additional manipulations especially if it is necessary to rewire the fires. But the manipulation is simple. The ability to add your own sounds requires to invest a little technically. To date, no soundtrack other than that provided by default is available, but the standard format is conducive to exchanges between modellers, the LR Press forum or via the official WiFi Model Railroad website.

WiFi Model Railroad announces the upcoming availability of Amrit, the equivalent of a Powerpack ESU, which uses a battery instead of a supercapacitor. The autonomy announced with the smallest model is 5 min. This reserve of energy makes it possible to avoid stopping the locomotive on a fouled track zone. On YouTube, we can see modelers using this decoder in "Dead rail" mode, with a battery (the channel is no longer electrically powered). It becomes possible to form a train dedicated to cleaning tracks, which rolls independently and without changing the configuration of the network (which can remain analog or DCC).

THANKS

I would like to thank Garg Peeyush of the Wi-Fi Model Railroad Team for providing the LocoFi decoder for testing. The numerous e-mail exchanges prove the seriousness of the support to the users. The answer is very fast. Also on the website of the manufacturer are many very interesting videos, even for the layman in English, which can discover the possibilities of this decoder and how to exploit it.

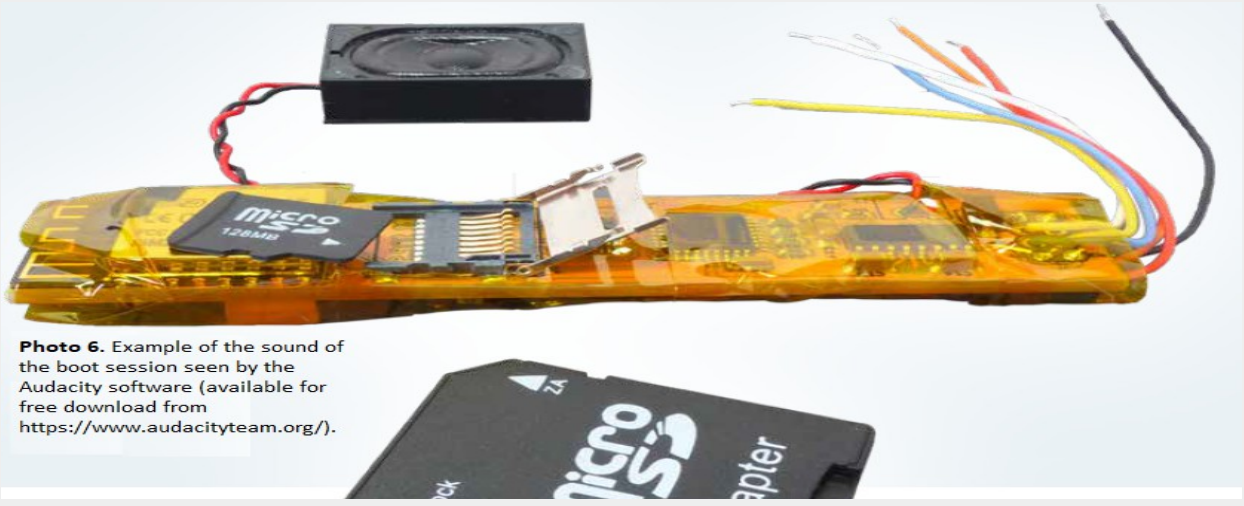


Photo 6. Example of the sound of the boot session seen by the Audacity software (available for free download from https://www.audacityteam.org/).