

Installation Guide For Large Scale, Battery Powered Locomotives using RCS “Autobind” Radio Control and MyLocoSound

1. The RCS Instructions

The RCS radio control can be used with all kinds of vehicles including live steam locos, planes, boats, etc. Each RCS component comes with its own instructions which, by necessity, have to cover all these applications and use with other devices. Therefore they become very technical. The purpose of this document is to provide a simple guide for one application only; the installation of radio control, with or without sound, in a large scale battery locomotive.

2. What you need

Batteries

Your locomotive will need a battery pack made up of rechargeable batteries. For a locomotive with a single motor, a battery pack containing 8 to 10 AA or AAA cells is recommended giving a nominal voltage of 9.6v to 12.2v. When fully charged the actual voltage will be about 10% higher. Large diesel locomotives with two motors will require 12 cells giving a voltage of 14.4v or 16v when fully charged. NiMh batteries are recommended. LiPo batteries must not be used. Li-Ion batteries can be used but only when fitted with a built in protection circuit.

Batteryworld and other suppliers will make up battery packs to order and you will need to decide the arrangement and size (AA or AAA or C cells) based on the space you have in your locomotive. Battery packs can have a fuse built in but this is not necessary because the BIK-U component below contains a fuse.



On/Off/Charging Switch and Socket

You will need to switch off the batteries when the locomotive is not in use and will also need a socket to recharge the batteries from time to time. The BIK-U kit from RCS handles both jobs. It is a compact unit which is normally installed out of sight underneath the locomotive. The BIK-U can be supplied with a terminals above or below the circuit board. The charging socket must be isolated from both the motor and the track.



Transmitter

The RCS EVO-BATT handheld transmitter is recommended for battery powered locomotives. It is a “centre off” device meaning that control is by means of a single knob which sends the locomotive forward when turned one way and in reverse the other. The transmitter has three function buttons which can be used to trigger sounds.

To prepare your EVO-BATT for use, open the rear compartment, insert a 9v PP3 three battery and replace the cover. Also check that the control knob is in the centre position. The on/off switch is in the top left hand corner which also contains a red LED. This LED will blink when the battery is low.

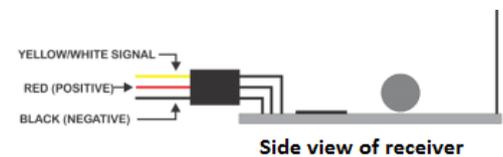
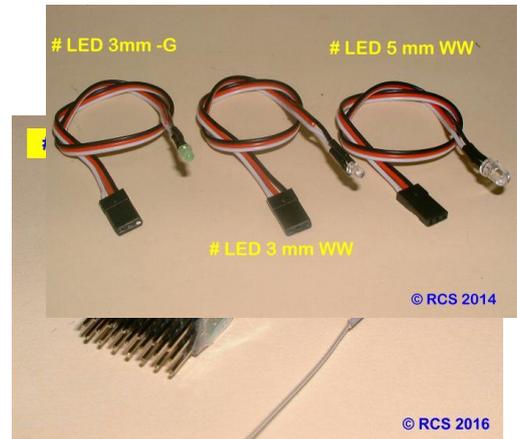


Receiver

The receiver lives in the locomotive and is a device which receives signals from the transmitter and translates them into electrical commands. For this purpose the RCS Rx102-1(AB)LR receiver is recommended. The transmitter and receiver communicate on a one-to-one basis and are connected by a process called “binding” which will be covered later. One transmitter can control multiple locomotives one at a time without the need for “re-binding”. However you will need to “re-bind” if the locomotive is changed over from one transmitter to another.

The recommended RCS Rx102-1(AB)LR receiver has automatic “binding”. Receivers with only manual “binding” are cheaper but require access to the receiver and are not worth the trouble.

The receiver has seven connecting terminals, each with three pins. Note that these pins are numbered as shown in the photo and not in numeric order as one would expect. The remaining components, covered below, have standard plugs which connect to these terminals. Note that the black wire in these plugs is at the bottom and the white or yellow wire at the top as shown in the diagram.



Speed Control

The speed control is a device which takes commands from the receiver and translates into the polarity and voltage which is sent to the motor. For single motor locomotives with 8 to 10 the Viper-10-12 speed control is recommended. For batteries with a higher number of cells the Viper-10HV speed control will be necessary.

Connection of the speed control and the purpose of the pushbutton on top will be covered later.



Function Switches

The function switches also take commands from the receiver and translate them into simple switches. They can be purchased with either two or four switches built in. However the RCS transmitter has only three function buttons so the four switch device is needed with one being unused. Function switches are commonly used to trigger sounds such as a horn, whistle, bell, etc. If you are not planning to use a soundcard then you probably don't need function switches.

Each pair of function switches has a button on top which switches between momentary and latching operation. In momentary operation the switch is on for as long as you press the button on the transmitter and goes off as soon as you release a button. In latching operation, the switch goes on when you press and release the transmitter button and then stays on until you press and release the button again.



Directional Lights

Many large-scale locomotives are fitted or have provision for forward and reversing lights. These can be controlled automatically so that the headlights switches on when the locomotive is going forwards in the rear light when going backwards. LEDs which are wired and ready to plug into the receiver can be purchased from RCS.

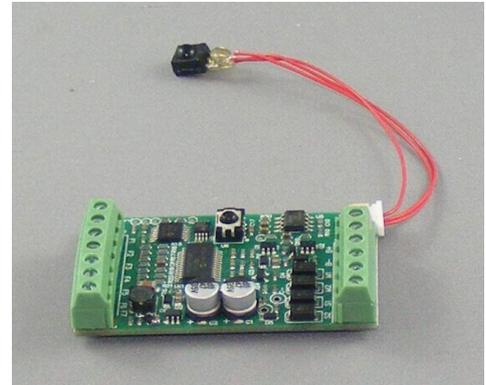
The MyLocoSound Soundcard

The soundcard can be supplied by RCS in three versions; steam, universal diesel and light diesel. All three versions connect to the speed control to sense the chuff or engine rate and to the function switches to trigger the whistle, horn, bell and other sounds.

The soundcard is very adaptable to suit the locomotive in which it is installed. The type of engine, whistle, horn and many other options are selected by using a TV remote control. In many locomotives the remote control will work if pointed through a front radiator grill, a cab window etc.

However, if the soundcard in the locomotive is completely enclosed then it will be necessary to use a tiny receiver on a small flying lead and to mount that receiver on the exterior of the loco motive in a position where it is hard to see, such as under the footplate.

Some battery powered steam locomotives contain a device called a chuff trigger. This ensures that the soundcard produces an exact four chuffs per wheel revolution at all speeds and loads. This will require an extra soundcard connection which varies according to the brand of locomotive. However it is not necessary to use this chuff trigger. The soundcard will sense the speed by feedback from the motor and the chuff rate can be adjusted to achieve the same result without the extra wiring.



The Speaker

An 8 ohm speaker is needed to output the sound and can be supplied by RCS. Your choice of speaker is highly important because it determines the quality of the sound produced. You need to consider the following:

1. To get maximum volume, the rated (or RMS) power should be 2 watts. A 1 watt or lower speaker will fall short on volume. Speakers exceeding 2 watts can be used but will not produce any more volume due to the limited output of the soundcard amplifier.
2. The resonant frequency should ideally be below 350 Hz but certainly below 500 Hz. The lower the resonant frequency, the deeper the diesel engine, horn, etc.
3. Use the largest diameter which you can fit in your loco. 50mm is the most popular.

For a better quality sound and more volume, the speaker needs to be baffled. That means that it needs to be built into the front face of an airtight box so that sound is heard only from the front of the speaker and none from the back. The plastic top of a spray paint can is good for making a baffle as shown in the diagram.



3. Installation

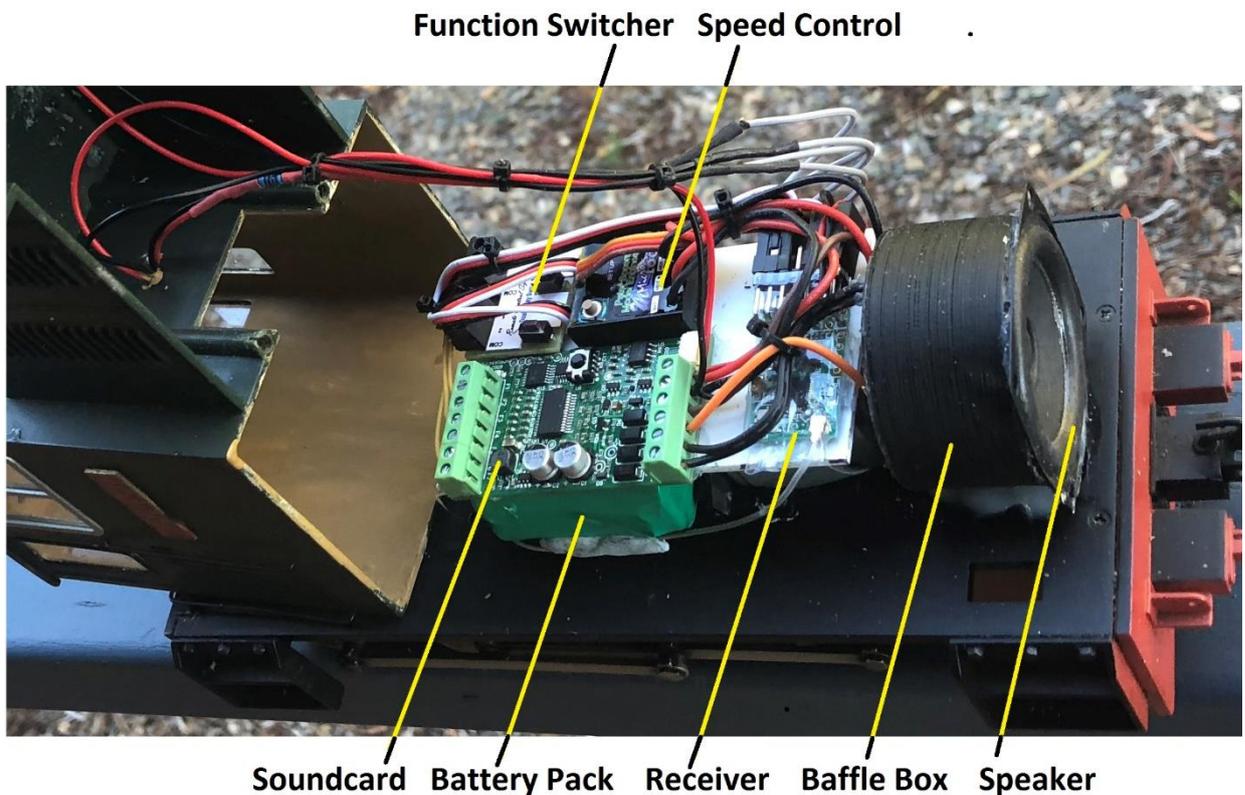
The usual procedure is to decide where the batteries are to be located first and install them in that position. They should be positioned as low as possible to improve the stability of the locomotive and can be fixed in position using blobs of bathroom silicon.

The next step is to install the on off switch and charging socket. This may require drilling a couple of holes in the locomotive floor or mounting them on a piece of plastic which can be glued or screwed underneath the locomotive.

The receiver, speak control, function switch, soundcard and speaker can then be fixed in place and again blobs of silicon are a common way of doing this. Once a silicon has set then the components are ready to be connected.

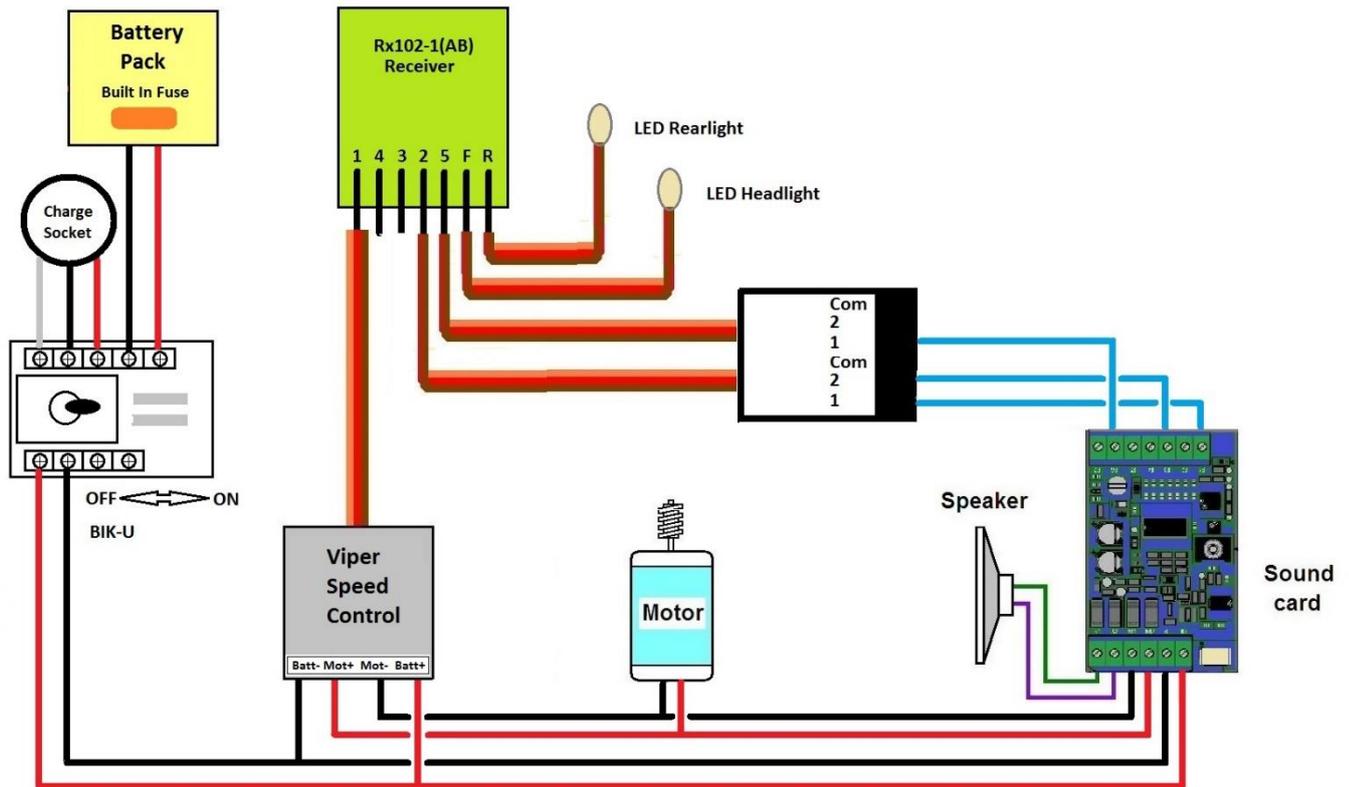
If your locomotive has metal bodywork then the exposed end of the aerial should be outside the bodywork.

The photo below shows an installation in a small diesel shunting locomotive.



4. Connecting up

The diagram below shows how the components are interconnected.



5. Getting it going

Step 1 – Centring the transmitter

Check that the locomotive is off. Turn on the transmitter and the LED will come on. Press and hold down the bind (top right) button for 20 seconds. The LED should then go off. Release the bind button and the LED should come on again. The centre reset is complete. If your transmitter battery ever runs flat then you should repeat this procedure.

Step 2 – Binding

Check that the locomotive is off and that the transmitter knob is in its central position. Place the locomotive on blocks so that the driving wheels are clear. This is because the locomotive may take off at speed when binding is complete (and yes, one of my locos ended up on the floor!). Switch on the locomotive and wait 20 seconds. The LED on the receiver will then start blinking rapidly. Move at least one metre away from the locomotive. Press and hold down the bind (top right) button on the transmitter and then press on the power (top left) button. The transmitter LED will start to flash slowly and you can let go of both buttons. When binding is complete both the transmitter and receiver LEDs will stop blinking. Switch off the locomotive and transmitter.

Step 3 – Setting forward and reverse speeds

Turn on the transmitter and then the receiver. For two seconds the red and green LEDs on the Viper speed controller will blink rapidly. While they are blinking press the button on the Viper once. The LED will turn to steady green. Rotate the transmitter knob fully clockwise and then back to the centre. The LED will change to a steady red. Rotate the transmitter knob fully anti-clockwise and then back to the centre. Both the red and green LEDs will come back on and remain on.

Step 4 – Your radio control is ready to run

When running the locomotive, always power on the transmitter first and then the receiver.

To set up the soundcard for your locomotive, please refer to Section 8 of the MyLocoSound instructions.