JMRI Function Programming

A large part of enjoying the operation of diesel and steam locomotives is the ability to control lighting and sound. Modern sound equipped decoders are very flexible and offer realistic sounds and lighting effects to add to the realism of scale modeling. This short guide will introduce some basic concepts around programming functions and sound using JMRI. The example decoders used here are ESU but the techniques apply to any sound equipped decoder with differences only in how the manufacturer implements the features.

When programming your decoder, it is very helpful to have a manufacturers printout that outlines the various sounds programmed into your decoder and what their sound slot assignments are. Without this guide, you'll have to take some manual steps to plot the different sounds available for use.

Function Map

The function map in JMRI has 4 different sections that will receive programming input from the user: Conditions, Physical Outputs, Logical Outputs, and Sound. Each will be covered below.

Conditions

Conditions set the requirement for the function, whether logical or physical.

Options:

State:
Moving/Stopped

Direction:
Forward/Reverse/Null

Functions: On/Off/Null

Each of these settings will dictate how a given function will behave.

An example would be F8, which is usually prime mover sound effect.
Setting the sound to turn on would be:
State -
Direction -
F8 On

Physical Outputs

Controls the use of physical outputs such as LED, Speaker, Servo, etc.

To set the use, simply check the check box.

Common settings for both mobile and sound decoders are Headlight[1] and Rear Headlight [1]

Selecting a check box for one of these along with a function key will activate the output for the given *physical* wire coming from the decoder.

Remember, this may not always be a wire on pre-installed boards, but could merely be a wire trace on a PCB.

Also of note is that output wires in decoders are always charged and it is the grounding of the circuit that allows the circuit to complete.

Row 2, Physical Outputs ✕

- ☐ Headlight[1]
- ☐ Rear light[1]
- ☐ Aux 1[1]
- ☐ Aux 2[1]
- ☐ Aux 3
- ☐ Aux 4
- ☐ Aux 5
- ☐ Aux 6
- ☐ Aux 7
- ☐ Aux 8
- ☐ Aux 9
- ☐ Aux 10
- ☐ Aux 11
- ☐ Aux 12
- ☐ Aux 13
- ☐ Aux 14

OK

Logical Outputs

Controls logic with function output.

Example: F2 is horn. With Grade crossing selected, you get the grade crossing effect, which is tied to physical outputs, typically for ditch lights. So, when you activate F2 for the horn, the ditch lights light up and perform their programmed function without having to manually select the function, assuming that the grade crossing option is selected for the appropriate function output.

Logical Functions		Sounds
-	Change	-
-	Change	-
-	Change	Sound slot 4
Grade crossing	Change	Sound slot 3
-		
Brake 2 Shift	Row 4, Logical Functions ✕	

Sounds
Gives us sounds to coincide with a function. The most common is F8. This starts prime mover sound effects on most decoders. Another common use is F2, horn. However, there are a multitude of other functions that can be programmed such as sanding valves, flange squeal, blow off valves, etc.

F8	Change	Aux 1[1]	Change	-	Change	Sound slot 1

Function Outputs

Function Outputs control the physical output wiring for your decoder.
Most common uses are headlight, ditch light, rear light. Other options include smoke units, servos, power packs, couplers, etc. Mobile and Sound decoders both have function output programming. The sophistication of the functions is dependent on the features in a given decoder. More expensive decoders will naturally offer a broader set of options.

Example 1:

Ditch Light
Ditch lights can be programmed with two Aux outputs. Typically Aux1(1),Aux1(2) and Aux2(1) and Aux2(2)
Why do we have and why do we need to program each Aux more than once?
The answer is versatility. You can combine effects for a given Aux to add more realism.
For ditch lights and headlights, we prefer to have them act as dimmable lights, meaning they don't just turn on and off. They gradually turn on and off like a real light bulb. When working with LEDs this is useful. If you are using incandescent bulbs, this may not be necessary.

To get our ditch lights to function we set Aux1(1) mode to Ditch Light (type 1 or 2), set any desired delays, set brightness, then select Grade Crossing if we want them to come on automatically with the horn, and in the case of LEDs, we set LED mode.

For Aux1(2)we set dimmable if desired. The rest of the settings are left alone.

Aux2(1) gets the same setup as Aux1(1). However, to get the alternating flashing effect, we must select Phase Reverse. This tells the decoder to alternate between the two outputs.

Aux2(2) is set to dimmable headlight. The rest of the settings are left alone.

Example 2:

Beacons.
If we want a beacon effect for our locomotives, we can set the output to any one of a number of effects simulating Mars light, Strato light, rotating beacon, flashers, etc.
Select your Aux output tied to your light and set the Mode as appropriate. Set LED for LED lights.
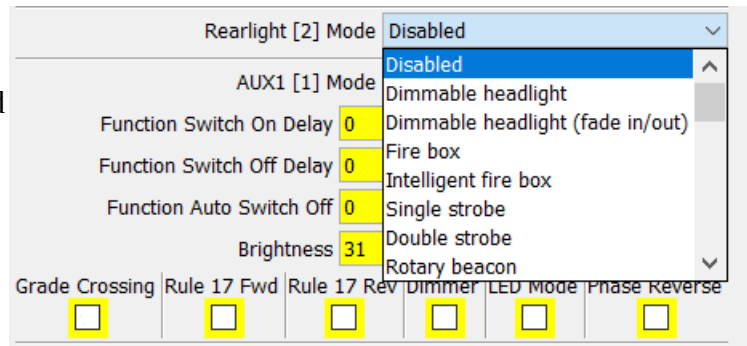
Example 3:

Firebox.
A steam locomotive can have that extra realism by adding a fire box.
Set the appropriate AUX output for your wired effect. Select Fire Box.
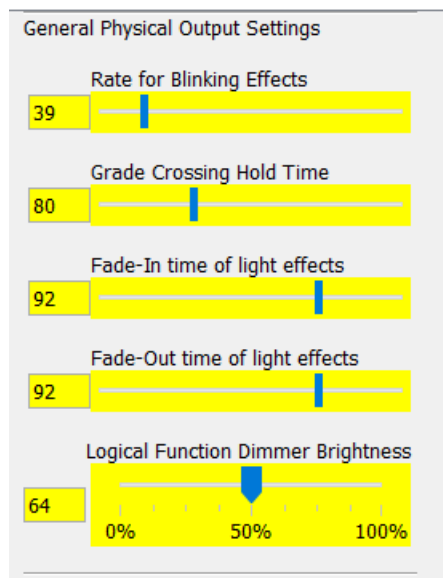If you are using an LED for the light source, be sure to check LED Mode.

Function Settings

General Physical Output Settings
Here we can set params for functions that we are using such as
Blink Rate, Grade Crossing Hold Time, Fade effects, etc.
The lower the number, the faster the setting.
Hover over each setting to get the default value and multiply as
desired.

Random Functions

Randomly executes functions based on
programmed criteria.

Examples of this could be wheel flange
effect, radio chatter, sanding valves, fans,
etc.

In the example to the right, Random 1 is
set to F11, moving, and requiring drive
sound. Looking at the sound matrix for
this decoder, this is fan sound. So,
randomly, at the intervals set, the fan will
blow on this unit as long as the unit is on,
with drive sound.
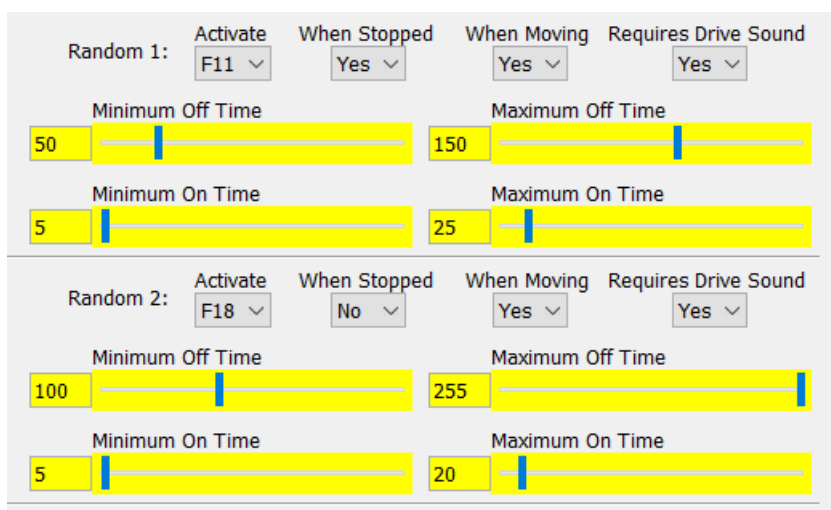
Random 2 is set to activate F18, but only when moving and with drive sound. F18 is mapped to sound
slot 13, which is sanding valve on the decoder.