Mini HO Universal Diesel DCC Sound Decoder

**WARNING**

Do not use G scale power packs to operate this decoder. The maximum track voltage cannot exceed 16 Volts.

**INSTALLATION**

If your loco has a MINA 8 pin socket, you can simply unplug the original connector and plug in the decoder. If not, you will have to hard wire the decoder. The decoder will be connected between the two pickups and the motor. After disconnecting the motor terminals from the pickups, connect the right side pickup wires to the red decoder wire, and connect the left side pickup wires to the black wire. Connect the right motor terminal to the front wire, then connect the left motor terminal to the grey wire. The motor terminals must be isolated from the wheel pickups. The white wire is for the front headlight and the yellow wire is for the rear light. The white wire is the light common. If you use an LED or 1.0V bulb, you have to use a series 750 Ohm resistor to limit the current. Otherwise it will burn your light out. Remember to use good soldering techniques, and shrink wrap to isolate the connections. The decoder cannot touch any metal part or bare wires. The decoder has a two pin 1.5mm pitch speaker connector. You can use 8 to 32 Ohm speaker sizes from 10mm to 22mm. Typically, larger speakers provide better sound quality. MRC speakers come with the two pin plug which can be directly plug into the decoder.

**OPERATION**

Do not use a G scale power pack to operate the decoder. The maximum track voltage is 16 Volts. The decoder has a default address of #3. Select address #4 on your DCC system. Release service brake (F5) and dynamic brake (F6). You will hear the brake release sound and the decoder will start to move. Move up the throttle and the loco should start to move. If the loco does not move on speed 1 you can add more starting voltage by programming CV32 with a large value. You can program the acceleration maximum with CV3 and deceleration to simulate the throttle. The decoder has start up and shut down features. If the loco was previously shut down, you must start up the engine first. Press any function key to start up the engine. To shut down the engine, you must press and hold function key until it sounds. The decoder has six prime movers. You can program CV123 (see the CV123 chart) to match your model. It also has 22 different horns and 8 different bell sizes. You can use (F18) or program CV28 to select bell. You can use (F18) or program CV27 to select bell.

The decoder has an easy function exchange feature (re-mapping), which allows changing the function key features. For example, program CV07 with a value of 1, will make (F3) and (F4) exchanged. For more information on 'function re-mapping' please visit our website www.modelrectifier.com

The decoder default is set to automatic notch mode. You can program CV122 to "3" for automatic notch mode, allowing more realistic operation. In the manual notch operation, the notch level, is not controlled by loco speed. It is controlled by (F9) (notch up) and (F8) (notch down).

To make the air compressor's speed synchronized to the prime mover, program CV21 with a value of 2. For a constant speed, program CV212 with a value of 0.

**LIGHT EFFECT PROGRAMMING CHART FOR CV1017**

The decoder has 17 different lights effects. CV117 controls both front and rear headlight effects. Use (F6) to turn on or off the Headlights. If you use a value inconsistent with actual headlight, (CV117), the headlights will default to normal on/off. For those trying to use a value of "14" in CV117 for the firebox flicker, the headlights will default to normal on/off.

**SERVICE BRAKING**

To apply the service brake (requires CV4 set to almost maximum) set the throttle to zero and press (F5). The loco will slow down fast and you will hear the brake squeal. You can stop the braking by turning (F5) on and off to stop the loco at a desired location. The brake rate is proportional to deceleration rate that you program in CV4.

If you forget to turn off (F5) and move the throttle up, the loco will move. However, when you release the throttle the brake will stop at the last position.

The service brake can only operate when throttle is set at "0". If you don't want to hear the brake sound program CV115 with a value of "2".

**DYNAMIC BRAKING**

You can use the dynamic brake (F6) in order to reduce the speed of the loco, to half of the full braking speed. When you turn on (F6) the prime mover will notch down to 1. You will hear the dynamic brake sound and the loco will reduce its speed. When you release (F6), the loco will speed up to the original speed. If you forget to turn off (F6) and move throttle up, it will automatically disable the dynamic brake and loco will start to move. To apply the dynamic brake again you have to cycle (F6) on and off.

**BACK EMF LOAD CONTROL (PID CONTROLLER)**

This decoder is equipped with a adjustable back EMF load control feature. It is a closed loop speed control. With back EMF load control, the locomotive will maintain its speed regardless of pulling up hill or downhill. You can program the back EMF load control intensity with CV24, at a lower value. This lowers the amount of back EMF load control. This will enable the locomotive to slow down uphill at a real locomotive. The PID controller consists of three components: proportional gain (CV113); the integral gain (CV114); and derivative gain (CV115). Designing (tuning) a PID controller is a kind of "rocket science". So we optimized these gains at the factory, but still give the customer final adjustments. We recommend that you do not change those settings. Too much gain may cause the motor to oscillate (become unstable). Too low a gain may cause a slow response. Additional knowledge of PID feedback control is required before attempting to adjust CV113 and CV114. If CV113 and CV114 are programmed incorrectly, the locomotive will not operate smoothly. Program CV23 to "1" will automatically render the default controller settings. If you cannot get the PID controller to work properly or you do not know how to tune it, you should program CV6 to enable adaptive PID control. This will have the decoder select the best back EMF control for your loco. You can also turn off the Back EMF load control, by programming CV24 with a value of "0" – the adaptive control will fail.

**SPEED TABLE CV67-CV94 FOR 28 SPEED STEPS**

When CV29's bit 4 is set to "1" it will use the speed table formed by CV76-CV94 to control speed (motor voltage). It allows you to setup each speed step for all 28 speed steps. First, program CV29 to "18" for short addresses (1-127) or program CV29 to 50 for long addresses (128-255) to enable speed table control. Then set throttle to 28 speed steps and run your loco at speed step "1". Use program CV on the main to change CV67's value (1-255) to adjust step 1's speed. The kick voltage, CV65 is only applied when the step speed changes from "0" to "1". You should switch between "0" to "1" 3 times to check how it works. When done with CV67, select speed step "2" and program CV68. CV68's value must be greater than CV67's. When done with CV67-CV69, use read back CV to make sure their values are in increasing order.

Note: When using MRC Prodigy DCC to program addresses it will automatically disable the speed table (set CV29's bit 4 to "0"). Programming CV125 to 1 will also disable the speed table and re-program CV67-CV94 to a default linear speed setting.