

## PROGRAMMING

This decoder supports all program modes and read back features.

CV	Description	Range	Default
CV1	Short address	1-127	3
CV2	Start voltage	0-32	10
CV3	Acceleration	0-32	0
CV4	Deceleration	0-32	0
CV5	Top voltage	0-32	32
CV29	Basic configuration	---	2
CV7	Manufacturer version number	---	19
CV8	Manufacturer ID	---	143
CV17	Long address upper byte	192-231	192
CV18	Long address lower byte	0-255	3
CV19	Advanced consist address	0-127	0
CV21	CV21=0, all accessory function will follow its own address. CV21=1, all functions will follow the consist address	0-1	0
CV49	Sound on/off (1=on, 0=off, Whistle always on)	0-1	1
CV50	Whistle type	0-13	4
CV51	Whistle volume	0-3	3
CV52	Bell type	0-3	4
CV53	Bell volume	0-3	3
CV54	Bell ring rate	0-50	10
CV55	Chuff type (6 types)	0-5	0
CV56	Chuff volume	0-3	3
CV57	Brake squeal volume	0-3	1
CV58	Air release volume	0-3	3
CV59	Blower hiss volume	0-3	3
CV60	Fire box door volume	0-3	3
CV61	Water injector volume	0-3	3
CV62	Coupling volume	0-3	3
CV63	Air pump volume	0-3	0
CV64	Rail clack volume	0-3	3
CV65	Kick start voltage	0-63	63
CV67-94	28 speed steps table while CV29.4=1	1-255	linear
CV112	Conductor volume	0-3	3
CV113	Back EMF Load control proportional gain Kp	0-31	20
CV114	Back EMF Load control integral gain Ki	0-31	10
CV115	Auto brake squeal enable/disable	0-1	1(enable)
CV116	sand drop volume	0-3	3
CV117	coal volume	0-3	3
CV118	Shoveling volume	0-3	3
CV119	Coupling fire volume	0-3	3
CV120	Chuff rate	0-60	30
CV121	Chuff start point	0-10	3

## 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 CV67-CV94 to control speed (motor voltage). It allows you to setup each speed for all 28 speed steps. First, program CV29 to 18 for short addresses (1-127) or program CV29 to 50 for long addresses (128-9999) to enable speed table control. Then select 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 speed step changes from 0 to 1. You should switch between 0 to 1 many times to check step 1's speed. When done with CV67, select speed step 2 and program CV68. CV68's value must be greater than CV67's. When done with CV67-CV94, 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 reprogram CV67-CV94 to a default linear speed setting.

## TROUBLE SHOOTING

**Loco runing without chuff sound click F12. Whenever the decoder doesn't work please use the program track to program CV #125 with value 1 to restore the decoder to factory settings. This should bring the decoder to life with address #3.** This decoder should perform well with all DCC systems. The maximum DCC output should be less than 18 V. If the locomotive does not respond to commands, it may have lost its address. Please reprogram the address and program CV19 to 0 (disable consist). If it responds slowly, you should clear its momentum by reprogramming CV3 and CV4 to 0. If step 1's speed is too high, you should program start voltage, CV2 to 0. If its top speed is too slow, program top voltage CV5 to 31. You should also clean the track to improve electrical pickup. Read your DCC system manual to learn how to program and operate the decoder. For more information about registers/CVs and their functions, please refer to the NMRA DCC Standard & Recommended Practices, RP-9.2.2. This is available directly from the NMRA or their website at [www.nmra.org](http://www.nmra.org).

## FCC COMPLIANCE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions. (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

## RETURN PROCEDURE

This decoder carries a 6 month warranty against factory defects. This warranty **does not** include abuse, misuse, neglect, improper installation, or any modifications made to this decoder, including but not limited to the removal of the NMRA plug if applicable. If it should become necessary to return the decoder for warranty repair/replacement, **please include a copy of the original sales receipt.** Please include a letter (printed clearly) with your name, address, daytime phone number, and a detailed description of the problem you are experiencing. Please also include a check or a money order for \$10.00 to cover return shipping and handling. If the decoder is no longer considered under warranty, then please include a check or a money order for \$35.00 to cover the cost of repair or replacement and return shipping and handling. **Be certain to return the decoder only.**

**Any questions regarding Warranty Policy can be directed to our Customer Service Department by calling 732-225-6360 between the hours of 8:30am and 6:00pm EST, or by emailing: [rrtech@modelrectifier.com](mailto:rrtech@modelrectifier.com)**

Send the decoder to: Model Rectifier Corporation  
Attn: Parts & Service  
80 Newfield Avenue  
Edison, NJ 08837-3817 U.S.A

Printed in USA



# HO Gauge Steam Sound Decoder with 12 different chuff sounds

with NMRA 8 pin and 9 pin JST connector

Item #0001869

Thank you for purchasing our most advanced DCC locomotive sound decoder. Combined with any DCC System or Tech 6 Sound Controller, our true live capture digital sound decoder will make your model railroad come to life.

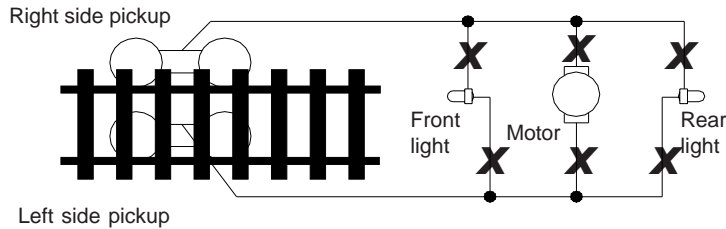
- Adjustable back EMF load control with ultra slow speed control
- 12 types of synchronized chuff sounds
- Double chuff enabling
- 1.5 amp capacity
- 14 different types of whistles
- Programmable individual sound volumes
- Programmable either 2-digit or 4-digit addresses
- Programmable start voltage and top voltage
- Programmable acceleration and deceleration rates
- Programmable 14, 28, 128 speed steps
- Supports full read back of address and CV values
- Selectable factory default speed curve
- Advanced speed table control CV67-CV94
- Kick start voltage control CV65
- Directional Head lights
- Mars light and firebox flicker
- 28 accessory functions (F1-F28)
- Supports full read back of CV's
- Supports advanced consisting (CV19)
- Supports programming on the main (OPS mode)
- Compatible with NMRA DCC standards
- Complies with Part 15 of FCC Rules
- Dimensions: 28.0mm x 17.0mm x 6.5mm

## INSTALLATION

It is quite a challenge to install the decoder in your loco. You should have some basic electrical knowledge. If you do not have, please ask the dealer for help in installation.

Figure 1 shows the electrical circuit of most standard locos. The terminals of the motor and lights are directly connected to the wheel pickup. Each type of loco has its own method of electrical pickup and distribution. There is no standard rule for installing decoders. It is always better to consult the loco manufacturer on how to install a decoder in your particular loco. First, figure out your loco's electrical wiring and how to disconnect (isolate) the motor and light(s). Label all wires before you disconnect them.

Figure 1. Connection of standard locomotive. *Note: The 'X' marks indicate where to disconnect (isolate).*



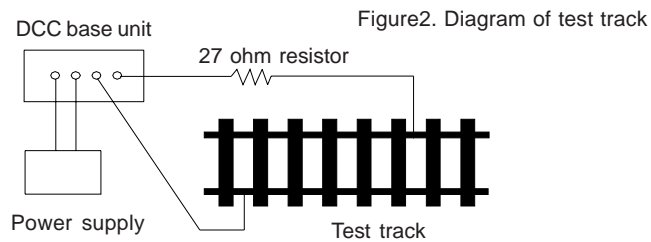
## HOW TO WIRE THE DECODER

This decoder is equipped with a wire harness that has an N.M.R.A. 8 pin medium plug on one end that simply plugs into a dcc ready loco, if you locomotive has a 9 pin JST decoder plug, simply unplug the wire harness of the decoder at the end of the board and plug the decoder into the 9 pin receptacle. If your locomotive is not dcc ready and does not have a decoder plug, use the following directions: The decoder will be inserted between the wheel pickup and the motor. After disconnecting the motor terminals from the pickup, connect the right side pickup wires to the red decoder wire, and connect the left side pickup wires to the black decoder wire. Connect the right motor terminal to the orange decoder wire, then connect the left motor terminal to the grey decoder wire. Always use good soldering techniques, and use shrink wrap to isolate the connections. The white decoder wire is for the front headlight and the yellow decoder wire is for the rear light. The blue decoder wire is the light common. The pink and green decoder wires are for your accessory lights, use the blue decoder wire as the common for these extra lights. Use double-sided sticky tape to place the decoder in a safe place. The decoder can't touch any metal part or bare wires. The 28 mm speaker should have an enclosure made for a better sound quality.

If you have a 1.5V bulb or LED, you should connect a 2k ohm resistor in series to one of the leads to limit current.

## MAKING A TEST TRACK

We strongly recommend building a test track with a 27 ohm resistor to limit current. Only test your installed decoder on the test track. The test track will reduce the chance of damaging your decoder due to an incorrectly installed decoder. Note: The test track is not your program track.



## TESTING

The decoder has been programmed to address #3, 28/128 speed steps. To test, place the loco on the test track. Select address #3 and 28 speed step. Move up the throttle and the loco should move. Push the light button [F0] and headlight should come on. Change the direction of the loco and the loco should change direction. The loco cannot reach full speed, due to the resistor. If all the above occurs, you passed the test. Congratulations! Do not run the loco for an extended period of time on the test track or the resistor will overheat. If your installed decoder does not pass the test, find the problem, correct it and test it again. As long as you test the decoder on the test track there is little chance of damaging the decoder. This is why the test track is so important.

## OPERATION

The decoder has 12 types of chuff sounds (6 single and 6 double). You can use F24 to select them or F12 to turn the chuff off. With our unique double chuff enable, (CV 122), you can also have 6 articulated chuff sounds. You can use F19 to select 14 different whistles. With MRC Prodigy Advance<sup>2</sup> DCC which has 28 functions, you can easily setup and access all the decoder's functions. With all other DCC systems you have to use CV programming to setup the decoder.

If your locomotive has a Mars Light, use acc1 light for hook up. The Mars Light flash rate can not be changed. If you want your locomotive to have a firebox flicker, use acc 2 light for hook up. The firebox flicker rate can not be changed.

This decoder should work with a DC power pack. However, its performance is good as good as in DCC and you can only have the default prime mover sounds. If you want full control of all sounds on DC, please use the MRC Tech6 (item0001200) to operate the decoder.

## BACK EMF LOAD CONTROL (PID CONTROLLER)

This decoder is equipped with adjustable back EMF load control feature. It is a PID closed loop feedback speed control. With back EMF load control the locomotive will maintain its speed regardless of pulling up hill or driving down hill. You may program the back EMF load control intensity, CV124, to a lower value to get less back EMF load control. This will enable the locomotive to slow down during uphill travel like real locomotive.

The PID controller contains three components: proportional gain (CV113); the integral gain (CV114); and derivative gain (fixed). Designing (tuning) a PID controller is a kind of "rocket science". So optimized these gains at the factory but still give the customer final adjustments. We recommend that you do not change these settings. Too much gain may cause the motor to oscillate (become unstable). Too little gain may cause 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 run smoothly. Program CV125 to "1" will automatically restore the default PID controller settings. If the loco does not run smoothly after program CV125=1, program CV124=0 to minimize the back EMF control.

Function	Idle/Moving
F0	Headlight on/off
F1	Bell on/off
F2	Whistle
F3	Mars light on/off (accy 1)
F4	Coupling 1
F5	Brake squeal (moving)
F6	Firebox flicker on/off (accy 2)
F7	Fire box open/close
F8	Sound on/off
F9	Air hose firing/uncoupling lever
F10	Water injector
F11	Blower hiss
F12	Chuff sound on/off with whistle always on
F13	Short air release
F14	Coupling 2
F15	Flange noise
F16	Shoveling
F17	Coal auger
F18	Safety valve air release
F19	Whistle type select (total 14 different ones)
F20	Bell rate change (use F1 to turn off bell after adjustment)
F21	Change bell volume (use F1 to turn off bell after adjustment)
F22	Change whistle volume
F23	Change chuff volume
F24	Chuff type select (total 6 types)
F25	Long air release
F26	Sand dropping
F27	Associated loco sound
F28	Conductor