

## 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	Master sound volume	0-63	63
CV50	Whistle type	0-17	4
CV51	Whistle volume	0-63	60
CV52	Bell type	0-7	60
CV53	Bell volume	0-63	3
CV54	Bell ring rate	0-50	10
CV55	Chuff type (10 types)	0-9	0
CV56	Chuff volume	0-63	60
CV57	Brake squeal volume	0-63	40
CV58	Air release volume	0-63	60
CV59	Blower hiss volume	0-63	60
CV60	Fire box door volume	0-63	60
CV61	Water injector volume	0-63	60
CV62	Coupling volume	0-63	60
CV63	Water filling volume	0-63	60
CV64	Rail clack volume	0-63	60
CV65	Kick start voltage	0-63	63
CV67-94	28 speed steps table while CV29.4=1	1-255	linear
CV112	Metal crank 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	0-63	60
CV117	Coal volume	0-63	60
CV118	Shoveling volume	0-63	60
CV120	Chuff rate	0-60	30
CV121	Chuff start point	0-10	3
CV122	Double chuff enable	0-1	1(enable)
C123	Safety valve type	0-2	0
CV124	Back EMF Load control intensity (0=off)	0-255	160
CV125	Set it to 1 to restore some factory default CV settings	0-1	0

## 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 re-program CV67-CV94 to a default linear speed setting.

## TROUBLE SHOOTING

**Loco running 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 re-program the address and program CV19 to 0 (disable consist). If it responds slowly, you should clear its momentum by reprogramming CV3 and CV4 to zero. If step 1's speed is too high, you should program start voltage, CV2 to zero. 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 \$50.00 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



## N Gauge Steam Sound Decoder with 20 different chuff sounds

Item #0001956

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.

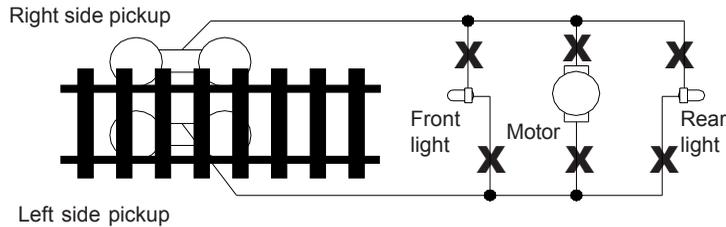
- Adjustable back EMF load control with ultra slow speed control
- 20 types of synchronized chuff sounds
- Double chuff enabling
- 1.0 amp capacity
- 17 different types of whistles
- Programmable individual sound volumes (64-levels)
- Programmable master sound volumes (64-levels)
- Programmable either 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
- Advanced speed table control CV67-CV94
- Directional Head lights
- 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
- 17 mm speaker included
- Dimensions: 29.50mm x 10.60mm x 5.0mm

## 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 the 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

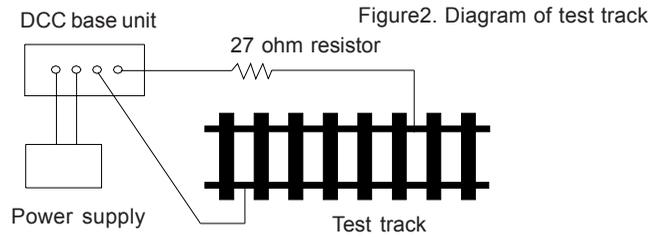
This decoder is equipped with a wire harness that has an N.M.R.A. 8 pin medium plug on one end that simply plugs into a dcc ready locomotive. If your locomotive is not dcc ready and does not have a decoder plug, use the following directions:

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. 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 17 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 20 types of chuff sounds (10 single and 10 double). You can use F24 to select them or F6 to turn the chuff off. With our unique double chuff enable, (CV 122), you can also have 10 articulated chuff sounds. You can use F19 to select 17 different whistles. You can also use F18 to select 7 different bells. 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.

## BACK EMF LOAD CONTROL (PID CONTROLLER)

This decoder is equipped with 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 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). Fine tuning a PID controller is difficult and experimental on part of the end user, so we optimized these settings at the factory, but still give the customer the ability to make 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.

Function	Idle/Moving
F0	Headlight on/off
F1	Bell on/off
F2	Whistle
F3	Long air release
F4	Coupling 1
F5	Brake squeal (moving) and brake release (idle)
F6	Chuff sound on/off -all other sounds on
F7	Fire box open/close
F8	Water injector
F9	Metal crank sound on/off (moving), steam associated sound (idle)
F10	Water filling
F11	Blow er hiss
F12	All sounds on/off
F13	Master volume reduce by 2
F14	Master volume increase by 2
F15	Flange noise
F16	Shoveling
F17	Coal auger
F18	Bell type select (total 7 different ones)
F19	Whistle type select (total 17 different ones)
F20	Air hose firing/uncoupling lever
F21	Flange noise
F22	Associated loco sound
F23	Flange noise
F24	Chuff type select
F25	Long air release
F26	Sand dropping
F27	Associated loco sound
F28	Associated loco sound