MRC™
TECHNOLOGY, PERFECTED
MODEL RECTIFIER CORPORATION

N Dual (DC/DCC) Steam Sound Decoder with 20 different chuff sounds

Item #0001961 (8/15)

Thank you for purchasing our most advanced 16 bit dual-mode DC/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.

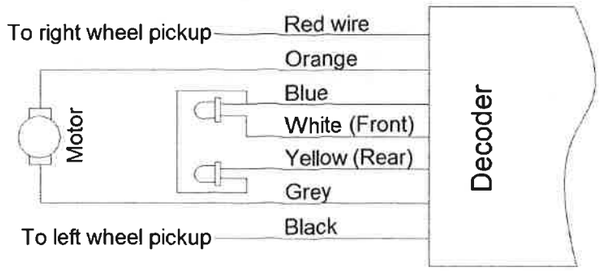
- 20 types of synchronized chuff sounds
- 1.0 amp capacity
- 17 different types of horns and 8 different types of bells
- Adjustable Master & 10 individual sound volumes (64 levels)
- Programmable either 2-digit or 4-digit addresses
- Programmable starting voltage and top-end voltage
- Programmable acceleration and deceleration rates
- Programmable 14, 28, 128 speed steps
- Back EMF load control w/adaptive PID control.
- User controlled service brake and dynamic brake with sound
- Supports read back address and CV values
- Advanced speed table control CV67-CV94
- Kick start voltage control CV65
- 17 light effects: ditch lights, mars light, prime strobe...
- 28 accessory functions (F1-F28)
- Supports advanced consisting (CV19)
- Supports programming on the main (OPS mode)
- Compatible with NMRA DCC standards
- Complies with Part 15 of FCC Rules
- 15 mm speaker included
- Dimensions: 25.0mm x 9.6mm x 5.0mm

WARNING

Do not use G scale power packs to operate this decoder. The maximum track voltage is 14 Volts.

INSTALLATION

If your loco has a NMRA 8 pin socket, you can simply unplug the original connector and plug in the decoder. If not, you have to hard wire in the decoder. 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 orange wire, then connect the left motor terminal to the grey wire. The motor will no longer receive power from the electrical pick-ups directly. The motor will be controlled by the decoder. **The motor terminals must be isolated from the wheel pickups. Failing to do so will destroy the decoder.** The white wire is for the front headlight and the yellow wire is for the rear light. The blue wire is the common wire for lighting. If you use an LED or 1.5V bulb, you must use a series 750 Ohm resistor to limit the current. The decoder can't touch any metal parts or bare wires. Do not wrap the decoder, as this will increase heat and potentially harm the decoder. Instead use tape to cover all the metal parts and weight that the decoder may touch. The 15 mm speaker should have a baffle enclosure made for a better sound quality. If you can fit a 17mm speaker in your loco we recommend you use it. The larger speaker the better sound quality. For Model Power N scale steam model, MRC has an installation video, showing how to install the decoder. Please visit our web site for more information.



OPERATION

The decoder has a default address of #3. Select address #3 on your DCC system. Release service brake (F5). You will hear the brake release sound when you turn off (F5). Move up the throttle and the loco should start to move. If the loco does not move at speed 1 you can add more starting voltage by programming CV2 with a larger number. You can program the acceleration momentum with CV3 and deceleration momentum with CV4, in order to simulate a real train. This 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, CV122, you can also have 10 articulated chuff sounds. You can use (F19) or program CV50 to select 1 of 17 different whistles. You can also use (F18) or program CV52 to select 1 of 7 different bells. With an MRC Prodigy Advance^2 DCC system, you can easily setup and access all the decoder's 28 functions. With all other DCC systems you have to use CV programming to setup the decoder. To synchronize the chuff, you need to program CV120 to adjust the chuff rate. You may also need to adjust the start chuff rate, CV121 to get a perfect match at all speeds.

LIGHT EFFECT PROGRAMMING CHART FOR CV#117

The decoder has 17 different lights effects. CV117 controls both front and rear headlight effects. Use (F0) to turn on/off the Headlights. If you use a value inconsistent with the actual headlights for the locomotive, the headlights will default to normal on/off. For example, trying to use a value of "6" in CV117 for the ditch lights, the headlights will default to normal on/off. You can program CV115 to adjust the brightness.

SERVICE BRAKING

To apply the service brake (needs CV4 set to almost maximum) set throttle to zero and press (F5). The loco will slow down fast and you will hear the brake squeal. You can pump the brake 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 service brake will apply again. The service brake can only operate when throttle is at "0".

BACK EMF LOAD CONTROL (PID CONTROLLER)

This decoder is equipped with an 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 CV124, to a lower value. This lowers the amount of back EMF load control. This will enable the locomotive to slow down during uphill travel like a 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 we 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 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 CV125 to "1" will automatically restore the default PID 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 CV124 with a value of "0" – if the adaptive control fails.

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 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 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

When you hear "off" it indicates overload or over voltage. Correct problem it will operate normally. ***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. If it responds to 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 it's top speed is too slow, program top voltage CV5 to 63. 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**.

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***. 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 $11.00 to cover return shipping and handling. If the decoder is no longer considered under warranty, then please contact Model Rectifier Corp. for a price quote to cover the cost of repair or replacement of the decoder, and return shipping and handling. ***Customers outside the continental United States, including; Hawaii, Alaska, Canada and Mexico, have to contact MRC for exact return shipping rates for both warranty and non-warranty repairs. Contact rrtech@modelrectifier.com***. 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
Send the decoder to:

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

LIGHT EFFECT CHART

Light effect CV117, CV118, CV119			
Value	Light effect	Value	Light effect
0	Normal on/off	9	Prime strato light
1	Dynamo effect (fading)	10	Single strobe light
2	Dim, bright, off cycle	11	Double strobe light
3	Rule 17	12	Rotating beacon
4	Both headlights on	13	Fred Rear End Flashing
5	Ditch Light type A	14	Firebox Flicker A
6	Ditch Light type B	15	Firebox Flicker B
7	Gyralite	16	Engine Exhaust Flicker
8	Mars Light		

FUNCTION CHART

Function	Idle/Moving
F0	Headlight on/off
F1	Bell on/off
F2	Whistle
F3	Accessory lights on/off, Long air release
F4	Coupling 1
F5	Brake squeal (moving) and brake release (idle)
F6	Chuff sound on/off (Drifting) -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	Blower 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 selection
F25	Long air release
F26	Sand dropping
F27	Associated loco sound
F28	Associated loco sound

For the latest information on DCC, DCC Systems, Decoders, Installation, and Manuals - visit us at www.modelrectifier.com

CV PROGRAMMING CHART

CV	Description	Range	Default
CV1	Short address	1-127	3
CV2	Start voltage	0-63	10
CV3	Acceleration, 1=1 sec, max is 63 sec to reach top speed	0-63	0
CV4	Deceleration, 1=1 sec, max is 63 sec to stop at top speed	0-63	0
CV5	Top voltage, 63=full speed, 0=half of the top speed	0-63	63
CV6	Adaptive back EMF control enable, 1=enable, 0=disable	0-1	1
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	63
CV52	Bell type	0-7	0
CV53	Bell volume	0-63	63
CV54	Bell ring rate	0-50	10
CV55	Chuff type (10 types) + 10 Double Chuff	0-9	0
CV56	Chuff volume	0-63	63
CV57	Brake squeal volume	0-63	40
CV58	Air release volume	0-63	63
CV59	Blower hiss volume	0-63	63
CV60	Fire box door volume	0-63	63
CV61	Water injector volume	0-63	63
CV62	Coupling volume	0-63	63
CV63	Water filling volume	0-63	63
CV64	Coal auger volume	0-63	63
CV65	Kick start voltage	0-63	63
CV67-94	28 speed steps table while CV29.4=1	1-255	linear
CV112	Metal crank, [side rod], volume	0-63	63
CV113	Back EMF Load control proportional gain Kp	0-31	20
CV114	Back EMF Load control integral gain Ki	0-31	10
CV115	Light brightness	0-255	255
CV116	Brightness of dim light, [dim, bright, off feature]	0-255	120
CV117	Headlight light effect	0-16	0
CV120	Chuff rate	0-100	75
CV121	Chuff start point	0-10	3
CV122	Double chuff enable (when applicable)	0-1	1 (enable)
CV123	Safety valve type	0-2	0
CV124	Back EMF Load control intensity (0=off)	0-255	160
CV125	Set it to1 to restore some factory default CV settings	0-1	0