PROGRAMMING

This decoder supports all programming modes and supports read back of all CV's with most dcc systems.

CV	Description	Range	Default
CV1	Short address	1-127	3
CV2	Start voltage	0-32	0
CV3	Acceleration	0-32	0
CV4	Deceleration	0-32	0
CV5	Top voltage	0-32	32
CV29	Basic configuration	---	2
CV7	Manufacturer version number	---	32
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 volume control	1-16	16
CV50	Horn type	0-3	0
CV51	Horn volume	0-15	12
CV52	Bell type	0-1	0
CV53	Bell volume	0-15	12
CV54	Bell ring rate	0-50	3
CV55	Diesel rumble volume	0-15	12
CV56	Brake squeal volume	0-15	7
CV57	Dynamic brake volume	0-15	12
CV58	Air release volume	0-15	12
CV59	Air pump volume	0-15	12
CV60	Safety pop valve volume	0-15	12
CV61	Engine cooling fan volume	0-15	12
CV62	Coupling volume	0-15	12
CV63	Auto ditch lights flash with horn enable	0-1	1(enable)
CV64	Rail wheel clack volume	0-15	12
CV65	Kick start voltage	0-63	63
CV67-94	28 speed steps table while CV29.4=1	1-255	linear
CV105	User identification number	0-255	0
CV106	User identification number	0-255	0
CV112	Air Compressor volume	0-15	12
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	Flange squeal volume	0-15	12
CV117	Light mode (0=normal, 1=rule 17)	0-1	0
CV118/119	Accessory light configuration detail see table 2	0-6	0
CV120	Sand dropping volume	0-15	12
CV121	Ditch lights flash (=1) or steady on (=0)	0-1	0
CV122	Diesel notch mode, 0=auto-notch, 3=manual notch	0-3	3
CV124	Back EMF Load control intensity (0=off)	0-255	0
CV125	Set it to1 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 then 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

This decoder should perform well with all DCC systems. The maximum DCC output should be less than 15 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 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**. 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.

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 $11.00 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 $30.00 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
Send the decoder to:

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

MRC™ TECHNOLOGY. PERFECTED.
MODEL RECTIFIER CORPORATION

HO Diesel Sound Decoder

Built-in NMRA DCC 8 pin and 9 pin JST connector

Item #'s 0001611/1612/1613/1614/1615/1616

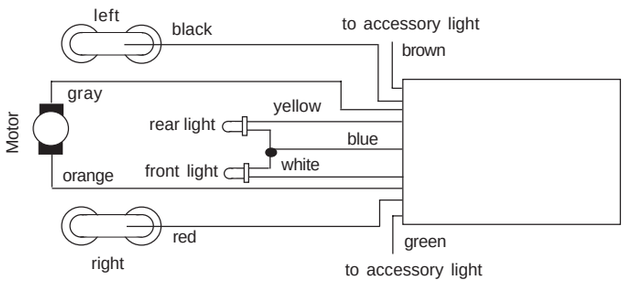
Thank you for purchasing our highly advanced DCC 16 bit locomotive sound decoder. Combined with any DCC System, our new decoder with authentic diesel sounds will bring your locomotives to life.

- Synchronized diesel prime mover with random associated locomotive sounds
- Adjustable back EMF load control with ultra slow speed control
- 1.5 amp capacity. Small size for tight installations. Comes with NMRA 8 pin plug and 9 pin JST Connector
- Programmable for either 2-digit (1-127) or 4-digit (1-9999) addresses
- Programmable start voltage and top voltage
- Programmable acceleration and deceleration rates
- Programmable 14, 28 / 128 speed steps
- Programmable user selectable 4 horns and 2 bells
- Programmable individual sound volumes (16-levels)
- Programmable master sound volumes (16-levels)
- 2 accessory functions (ACC1 & ACC2), at 0.1 amp rate
- 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 regulations
- Speaker included

INSTALLATION

If your loco has an NMRA DCC 8 pin or 9 pin JST socket, all you need to do is remove the dummy plug and plug in the decoder. If the loco travels in wrong direction you should change the 8 pin plug orientation. 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 pickups and the motor as shown in Figure1. Cut off the 8 pin plug on 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. Always use good soldering techniques, and use shrink wrap to isolate the connections. The white wire is for the front headlight and the yellow wire is for the rear light. The brown and green wires are for your accessory lights. The blue wire is the common wire for all four lights.

Figure 1. Decoder wiring diagram



DCC OPERATION ONLY

The decoder has been factory programmed with address #3, 28/128 speed steps and maximum top voltage. Select the “Run” mode of your DCC system and select or acquire address #3. Move up the throttle and the loco should move.

The decoder has a start up and shut down feature. If the loco has been previously shut down, you have to start up the engine by simply pressing any numbered function button. To shut down the engine you must bring the loco to idle and then press F8 three times.

This decoder has 4 different horns. You can use F19 or program CV50 to select these 4 horns. You can also use F18 or program CV52 to select different 2 bell sounds.

Most of the sounds have their own volume control CV. There is also a master sound volume control CV49. Also F13 will reduce the master volume by 1 (you will hear an air release when you reach CV49=1). Pressing F14 will increase volume by 1 (you will hear an air release when you reach CV49=16).

You can use F12 to turn on or turn off the sound.

The decoder is default to automatic notching. You can program CV122 to 3 to set manual notching for realistic operation. Then use F9 to notch up and use F8 to notch down. This simulates the way a real locomotive operates.

This decoder is equipped with adjustable back EMF closed loop speed control. Its proportional gain (CV113), integral gain (CV114) and derivative gain (fixed) are pre-tuned for most locomotives. We recommend that you do not change these settings. Too much gain may cause the motor to oscilate (become unstable). Too little gain may cause slow response. Please get some basic knowledge of PID feedback control before trying to adjust CV113/114. To turn off Back EMF control program CV124 to 0, [factory default].

There are many more program features available with this decoder. Please refer to the CV Chart to explore other features of the decoder.

Note: Bell, Dynamic Brake and Rail Wheel Clack cannot play at the same time. If you activate the Bell sound [F1], while either the Dynamic Brake or Rail Wheel Clack sounds are activated, the Bell sound will override the other 2 sounds. Rail Wheel Clack cannot play while the loco is in idle. When you turn off Dynamic Brake and Rail Wheel Clack sound there will be one second delay.

LIGHT EFFECT PROGRAMMING CHART FOR CV # 118/119

You would program CV #118/119 to choose the desired light effect. CV118 for ACC1 and CV119 for ACC2. For ditch light both CV118 and CV119 must to 0. F3 controls both ACC1 and ACC2. Use the brown and green wires for the accessory light functions, along with the blue, (common), wire.
Use DCC rated bulbs for both the directional headlights and accessory lights.
If using 1.5 volt bulbs or LED’s use a 1K to 3K ohm resistor in series with one of the leads.

CV118/119 value	ACC#1/ACC#2 Light effect
0	Ditch light
1	Gyra light
2	Marslight
3	Prime strato light
4	Single strobe light
5	Double strobe light
6	on/off

Function	Idle/Moving
F1	Bell on/off
F2	Horn
F3	Accessory light on/off, air release
F4	Coupling 1
F5	Brake release (idle) / brake squeal (moving)
F6	Dynamic brake on/off
F7	Air hose firing/uncoupling lever
F8	3 times will shut down when in idle / Manual notch down
F9	Engine cooling fan / Manual notch up
F10	Rail wheel clack (only moving)
F11	Traction air compressor
F12	Sound on / off
F13	Master volume reduce by 1 / air release when reach minimal
F14	Master volume increase by 1/ air release when reach maximum
F15	Air compressor
F16	Flange squeal
F17	Air release
F18	Change bell type
F19	Horn type select
F20	Associated loco sound
F21	Change bell volume and turn on the bell
F22	Change horn volume
F23	Change diesel rumble volume
F24	Safety valve pop
F25	Air release
F26	Flange noise
F27	Sand drop
F28	Air release

Prime movers and their application		
Decoder	Prime mover	Suitable for the locomotive
0001611	EMD645E	SD39, SD40, SD40A, SD40-2, SD40T-2, SD45. SDP45, SD45X, SD45-2, SD45T-2, F45, FP45, DDA40X, GP15T, GP39, GP39-2, GP40, GP40-2
0001612	EMD645	SW1000, SW1001, SW1500, SW1504, MP15DC, MP15AC, MP15T, GP38, GP38-2, SD38, SD38-2, GP15AC, GP15-1
0001613	EMD710	SD70AC, SD70M-2
0001614	ALCO 244	RS-3, PA1, PB1
0001615	ALCO 539T	S-2, S-4, RS-1, RSC-1, RSD-1, DL-105, DL107, DL-108, DL-109, DL-110
0001616	EMD567	F2A/B, F3A/B, F7A/B, F9A/B, BL1, BL2, FP7, FL9, FT, GP7, GP9, GP18, GP28, E6, E7, E8, E9, NW2, NW3, NW4, SW1, SW7, SW8, SW9, SW600, SW900, SW1200