PROGRAMMING

This decoder supports all program modes and read back features. With MRC Prodigy Advance² DCC you can read its address and CV values.

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	0-22	13
CV51	Horn volume	0-15	12
CV52	Bell type	0-6	3
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	Sand dropping 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 brightness	0-255	200
CV118	ACC1 light mode	0-6	0
CV119	ACC2 light mode	0-6	0
CV120	out sync time	0-255	150
CV121	Mars light flashing on/off (F28)	0-1	1
CV122	Diesel notch mode, 0=auto-notch, 3=manual notch	0-3	3
CV123	prime mover type, 4 types, 4=sound off	0-4	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

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.

BACK EMF LOAD CONTROL (PID CONTROLLER)

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 recommendend that you do not change these settings. Too much gain may cause the motor to oscilate (become unstable). Too little gain may cause slow reponse. Please get some basic knowledge of PID feedback control before trying to adjust CV113/114.

TROUBLE SHOOTING

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 $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 $55.00 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

MRC
TECHNOLOGY. PERFECTED.
MODEL RECTIFIER CORPORATION

HO 16 Bit Stereo Sound Decoder for E8/9 or PA Locomotives (DC/DCC)
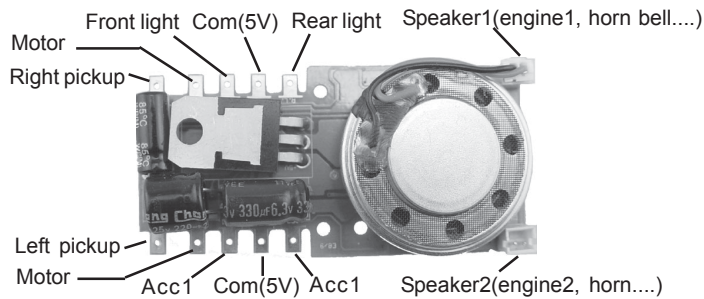
Item #0001902 for Proto 2000 Locos

Thank you for purchasing our most advanced triple core stereo sound decoder available. Combined with any DCC System or the MRC Tech 6, our true live capture digital diesel sound decoder will bring your Proto 2000 locos to life.

- Adjustable back EMF load control with utlra slow speed control
- 16 bit sound control with 16 levels of sound volume
- Dual out of synch EMD 567B prime movers for realistic operation
- 1.5 amp capacity
- 2 different prime mover sounds- EMD 567B/Alco 539T
- 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 22 types of horns and 6 types of bells
- Supports full read back
- 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 regulations
- Programmable individual sound volumes
- True stereo sound comes with two 28mm speakers

INSTALLATION

Refer to the instructions that came with your E8/E9 locomotive for removal of the body shell. Remove the screws that hold down the original circuit board. Gently lift the original circuit board and note the locomotives wire colors and locations from where they originate inside the chassis. Before remove the wires from the circuit board study all wires and identify the four wheel pickup wires (each side has two wires connnected together) and two motor wires. Lights wiring may have different versions dependent on road name. For example, the sample we have has yellow and black wire for headlight, and red, blue(common wire) and white for mars light. Remove the plastic clips that hold these wires to the original circuit board, and carefully remove the wires from the circuit board. You can use the clips to attach the wires to the decoder, although we do recommend you solder the wires to the decoder.

The decoder is set up to use the bulbs that came with the locomotive. Install the wires to the decoder as noted in the following diagram. Make sure to twist the wire leads tightly as not to have any stray strands, as they could cause a short circuit on the decoder. Use the plastic clips to attach the wires to the decoder. The speaker side is the top of the decoder. The common wire is set to 5V for low voltage bulbs or LED's. If the light is not bright enough you can use any wheel pickup tab as common tab. You may need series a 1k resistor if the light is bright. This stereo decoder comes with two speakers for the E8/9 which has two diesel engines. Speaker # 2 should be placed in the front. If you use the decoder for single engine locomotives, or if there is no room for 2 speakers, you do not have to install speaker # 2. Use of this decoder in older Proto 2000 Locomotives may necessitate changing the light bulbs.

Make a Test Track

Before you start with your decoder installation, we strongly recommend building a test track that uses a 27-ohm, 1/2 watt resistor to limit current. Only test your installed decoder on the test track. The test track will prevent any damage due to an incorrectly installed decoder.
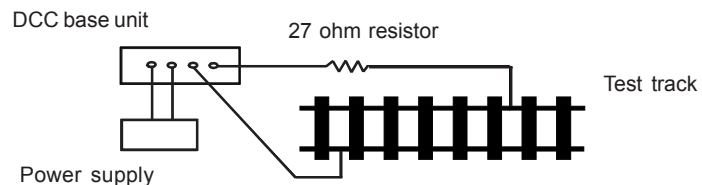

Figure 2. Diagram of test track

TEST

All MRC decoders have been factory programmed with address #3, 28/128 speed steps and maximum top voltage. After you have finished your decoder installation you are ready to test it. Never run the installed decoder on your layout without first passing the test. You may damage the decoder if it is not wired correctly or if you have not properly isolated the motor and lights.

Put the loco on the test track. Select the "Run" mode of your DCC system and select or acquire address #3. Advance the throttle and the loco should move forward. Push the light button, [F0], and the front headlight should come on. Change the direction of the loco, the loco should change direction and the rear headlight, [if equipped], should come on. The locomotive cannot get to full speed, due to the resistor. If the loco moved forwards and backwards, and the light{s} came on, you did a great job. Congratulations!

Do not run the loco for an extended period of time on the test track or the resistor will overheat.

DCC OPERATION

This decoder has diesel start up and shut down features. Press any function key to start up the engine before operating the loco. To shut down the engine you must bring the loco to idle and then press F8 three times. If the loco has been previously shut down you will have to start up the engine. You can use F19 to select one of 22 different horns and use F18 to select 1 of 8 bells. If your DCC System does not have this many functions, you will have to use CV programming to select these features.

The decoder is defaulted to **manual notching**. You can program CV122 to 0 to set automatic notch for automatic operation. You can use F9 to notch up and use F8 to notch down. Using this feature gives you the true to life feeling of operating a real locomotive. When you change diesel volume you may need to notch up or down to make the change effective.

This decoder should perform well with a DC power pack. However, you can only have the default prime mover sounds. If you want full control of all sounds on DC, please use the MRC Tech6 to operate the decoder.

CV123 DIESEL TYPE CONTROL

CV123 value	Diesel type
0	Dual EMD 567B prime mover1
1	Single EMD 567B prime mover1
2	Dual AlCo 539T prime mover2
3	Single AlCo 539T prime mover2
4	All sounds off

OUT OF SYNC TIME CV120

When you select dual primer mover the two primer mover sounds are generated by two different sound processors. These two engine sounds can be programmed to be out of sync. The amount of out of sync time is controlled by CV120's value times 8 ms. For example, if CV120=150, then the out sync time equal 1.2 seconds (150x0.008)

ADDITIONAL INFORMATION

The MRC 1902 sound decoder should perform well when used with other brand DCC systems. See your DCC Systems manual to learn how to program and operate the decoder. For more information about register/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.**

Function	Idle/Moving
F1	Bell on/off
F2	Horn
F3	Mars light (ACC1& ACC2) on/off
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	Change prime diesel mover type, (CV123, 4 types)
F13	Master volume reduce by 1
F14	Master volume increase by 1
F15	Air compressor
F16	Flange squeal
F17	Air release
F18	Change bell type (use F1 to turn off bell after adjustment)
F19	Horn type select (total 22 different horns)
F20	Associated loco sound
F21	Change bell volume (use F1 to turn off bell after adjustment)
F22	Change horn volume
F23	Change diesel rumble volume
F24	Safety valve pop
F25	Air release
F26	Flange noise
F27	Sand drop
F28	Ditch light flash enable/disable with Air release (CV 121)

LIGHT EFFECT PROGRAMMING CHART FOR CV#118/119

Use F3 to turn on/off ACC1 & ACC2. For ditch lights both CV118 and CV119 must be 0. Use F28 to enable/disable flash. When you blow the horn the ditch lights will flash. The ditch lights will remain flashing for several seconds after horn is off.

CV118/119 value	ACC#1/ACC#2 Light effect
0	Ditch light (CV118=0, CV119=0)
1	Gyra light
2	Marslight
3	Prime strato light
4	Single strobe light
5	Double strobe light
6	on/off