

# XL SYSTEM INC

## HO Universal DCC Diesel Sound Decoder

### Item #0001910

- Six types of synchronized prime mover sounds:
- 1.0 amp capacity
- 22 different types of horns and 8 types of bells
- Adjustable individual sound volumes (16 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 with Back EMF load control
- Advanced speed table control CV67-CV94
- 17 accessory light effects: ditch lights, mars light, gyra light, strobe light, prime strobe
- 28 accessory functions (F1-F28)
- Compatible with NMRA DCC standards
- Complies with Part 15 of FCC Rules
- 18 mm speaker included
- Dimensions: 25.2mm x 17.2mm x 5.0mm

### INSTALLATION:

Simply unplug the original 8 pin plug and plug in the decoder, If the loco travels in wrong direction you should the the orientation of the decoder. If you can not change the decoder's orientation due to the space limitation, you have to program CV29's bit 0 to 1. This will reverse the loco's direction. If the loco has accessory lights solder their wires to the solder pads labeled as ACC1 and ACC2. Use good soldering techniques, and use shrink wrap to isolate the connections. The decoder can't touch any metal part or bare wires.

### OPERATION:

The decoder has a default address #3. Select address #3 on your DCC. Release service brake (F5) and dynamic brake (F6). 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 on speed 1 you can add more start voltage by programming CV2 with a large number. You can program the acceleration momentum CV3 and deceleration momentum CV4 to simulate a real train. The decoder has start up and shut down features. If the loco was previously shut down you have to start up the engine. 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. The decoder has 6 types of prime mover sound effects. You can program CV 123 to select the desired prime mover sound or turn them off. Set CV123 to 0 for EMD645E, to 1 for EMD645, to 2 for EMD710, to 3 for ALCO244, to 4 for ALCO539T and to 5 for EMD567 prime mover sound. You can use F19 to select 22 different horns and use F18 to select 8 different bells. The decoder default is set to automatic notch. You can program CV122 to 3 for manual notch for realistic operation. And then use F9 to notch up and use F8 to notch down. To make air compressor's speed synchronized to the prime mover, program CV121 with a value of 1. For a constant speed program CV121 with a value of 0. F12 will toggle between max master volume and sound off. F13 will reduce the master volume reduce by 1. F14 will increase the master volume by 1

### LIGHT EFFECT:

The decoder has 17 different lights effects. CV 117 controls both front and rear headlight effect. Use F0 to turn on or off the Headlights. CV118/CV119 control ACC1/ACC2 light effect. Use F3 to turn on or off ACC1 and ACC2. For ditch light operation you must program Cv118 and CV119 to the same ditch light type. In type A the ditch lights will flash when F2 (horn) or F3 is on. In type B the ditch lights will flash when F2 is on and stay on when F3 is on. If you use a value inconsistent with actual headlights, ( CV117), the headlights will default to normal on/off. For example trying to use a value of 14 in CV117 for firebox flicker, the headlights will default to normal on/off.

**SERVICE BRAKING:** To apply service brake 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 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. If you don't hear the brake sound program CV115 with a value of 2.

**DYNAMIC BRAKING:** You can use dynamic brake F6 to reduce the speed. When you turn on F6 the prime mover will notch down to 1 and you will hear the dynamic brake sound and the loco will reduce its speed. When you release F6 the loco will speed up to the original speed. If you forget to turn off F6 and move throttle up it will automatically disable the dynamic brake and loco will start to move. To apply the dynamic brake again you have to cycle F6 off and on.

### 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.

### 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). 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. If this happens just program CV124 to 0.

### 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 re-program the address and program CV19 to 0 (disable consist). 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 its 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 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).

### About US

XL Systems Inc has designed and manufactured model rail road products for MRC for more than 20 years. All MRC DCC products are made by XL Systems Inc. All our DCC products are compatible MRC DCC products. We will introduce more new products to meet customer's beget. We also provide installation and special programming and modification for customer. If you have special needs please contact to us at: [linzping@gmail.com](mailto:linzping@gmail.com) or [maxiulandcc@gmail.com](mailto:maxiulandcc@gmail.com).

**RETURN PROCEDURE**

This decoder carries a 6 month warranty against factory defects. This warranty does not include abuse, misuse, neglect, improper installation, If it should become necessary to return the decoder for warranty repair / replacement, Please also include a check or a money order for \$9.00 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 \$25.00 to cover the cost of repair or replacement and return shipping and handling. Before sending in the decoder please email us at linzping@gmail.com for service support. We may solve your program through email.

Send the decoder to: XL Systems Inc 14 Dora Ln Holmdel NJ 07733

**FUNCTION CHARTER**

Function	Idle / Moving
F1	Bell on/off
F2	Horn
F3	Accessory lights on off, Air release
F4	Coupling 1
F5	Brake release / brake squeal
F6	Dynamic brake on/off
F7	Air hose firing/uncoupling lever
F8	Click 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	Toggle between max master volume and sound off
F13	Master volume reduce (CV49) by 1 / air release
F14	Master volume increase (CV49) by 1 / air release
F15	Air compressor
F16	flange squeal
F17	Air release
F18	Change bell type (CV52 , 8 types plus off)
F19	Horn type select (CV50, total 22 different horns plus off)
F20	Associated loco sound
F21	Change bell volume (go up by 1 and back 0 when reach top)
F22	Change horn volume(go up by 1 and back 0 when reach top)
F23	Change diesel rumble volume (go up by 1 and back 0 when reach top)
F24	Safety valve pop
F25	Air release
F26	Flange noise
F27	Sand drop
F28	Air release change air compressor speed mode CV121

**LIGHT EFFECT PROGRAMMING CHART FOR CV#117/118/119**

The decoder has 17 different lights effects. CV 117 controls both front and rear headlight effect. Use F0 to turn on or off the Headlights. CV118/CV119 control ACC1/ACC2 light effect. Use F3 to turn on or off ACC1 and ACC2. For ditch light operation you must program Cv118 and CV119 to the same ditch light type. In type A the ditch lights will flash when F2 (horn) or F3 is on. In type B the ditch lights will flash when F2 is on and stay on when F3 is on. If you use a value inconsistent with actual headlights, ( CV117), the headlights will default to normal on/off. For example trying to use a value of 14 in CV117 for firebox flicker, the headlights will default to normal on/off.

CV= Light effect	CV= Light effect
0 Normal on/off	9 Prime strato light
1 Dyno effect (fading)	10 Single strobe light
2 Cim, bright, off cycle	11 Double strobe light
3 Rule 17	12 Rotating beacon
4 Both healights 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 Gyra light	16 Engine exhaust flicker
8 Marslight	

**CV CHARTER**

CV	Description	Range	Default
CV1	Short address	1-127	3
CV2	Start voltage	0-63	10
CV3	Acceleration	0-63	0
CV4	Deceleration	0-63	0
CV5	Top voltage	0-63	63
CV29	Basic configuration	---	2
CV7	Manufacturer version number	---	0
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	When CV21=0, all accessory functions will follow its own address. When CV21=1, all functions will follow the consist address	---	0
CV37	0=normal, 1=F3 and F=4 exchange	0-1	0
CV39	0=normal, 1=F5 and F=6 exchange	0-1	0
CV42	0=normal, 1=F8 and F=12 exchange	0-1	0
CV49	Master volume control 16=max volume, 0=sound off	0-16	16
CV50	Horn type (22 types plus off, 22=off)	0-22	13
CV51	Horn volume	0-15	15
CV52	Bell type (8 types plus off, 8=off)	0-7	5
CV53	Bell volume	0-15	15
CV54	Bell ring rate	0-50	3
CV55	Diesel rumble volume	0-15	12
CV56	Brake squeal volume	0-15	12
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
CV64	Rail wheel clack	0-15	12
CV65	Kick start voltage	0-63	63
CV67-94	28 speed steps table while CV29.4=1	1-255	linear
CV112	Back EMF start speed adjustment	0-7	0
CV113	Back EMF load control proportional gain kp	0-31	20
CV114	Back EMF load control integral gain ki	0-31	10
CV115	Brake sound type: 2=breke sound off	0-2	0
CV117	Light brightness	0-15	0
CV118-119	Accessory light mode	0-16	0
CV120	Light brightness	0-255	255
CV121	Air compressor mode (1=change with engine rpm)	0-1	0
CV122	Diesel notch mode, 0=auto notch 3=manual notch	0-3	0
CV124	Back EMF load control intensity (0=off)	0-255	0
CV125	Programming to "1" will restore some CV's to factory settngs	....	0

**CV123 PRIME MOVER CHARTER**

CV123 Prime mover	Suitable for the locomotive
0 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
1 EMD645	SW 1000, SW1001, SW1500, SW1500, SW1504, MP15DC, MP15AC,MP15T, GP38, GP38-2, SD38, SD38-2, GP15AC, GP15-1
2 EMD710	SD70AC, SD70M-2
3 ALCO244	RS-3, PA1, PB1
4 ALCO539T	S-2, S-4, RS-1, RSC-1, RSD-1, DL-105, DL-107, DL-108, DL-109, DL-110
5 EMD567	F2A/B, F3A/B, F7A/B, F9A/B, BL1, BL2, FP7, FL9, FT, GP7, GP9 ,GP,GP28 E6, E7, E8, E9, NW2, NW3, NW4, SW1, SW7, SW8, SW9, SW600, SW900