

PROGRAMMING CV CHART

| CV | Register | Description | Range | Default |
|---------|----------|--|---------|-----------|
| CV1 | R1 | Short address | 1-127 | 3 |
| CV2 | R2 | Start voltage | 0-63 | 10 |
| CV3 | R3 | Acceleration, 1=1 sec, max is 63 sec to reach top speed | 0-63 | 0 |
| CV4 | R4 | 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 |
| --- | R6 | Page number | --- | --- |
| CV29 | R5 | Basic configuration | --- | 2 |
| CV7 | R7 | Manufacturer version number | --- | 2 |
| CV8 | R8 | 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 |
| CV49 | --- | Sound on/off - horn always on | 0-1 | 1 |
| CV50 | --- | Horn type | 0-22 | 13 |
| CV51 | --- | Horn volume | 0-15 | 12 |
| CV52 | --- | Bell type | 0-8 | 3 |
| CV53 | --- | Bell volume | 0-15 | 12 |
| CV54 | --- | Bell ring rate | 0-50 | 3 |
| CV55 | --- | Prime mover volume (0=diesel off) | 0-13 | 12 |
| CV56 | --- | Brake squeal volume | 0-15 | 7 |
| 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 |
| 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 | --- | Brightness of dim light | 0-255 | 255 |
| CV120 | --- | Light brightness | 0-255 | 255 |
| CV121 | --- | Ditch lights flash (=1) or stay on (=0) | 0-1 | 0 |
| CV122 | --- | Diesel notch mode, 0=auto-notch 3>manual notch | 0-3 | 3 |
| CV123 | --- | prime mover type | 0-2 | 0 |
| CV124 | --- | Back EMF Load control intensity (0=off) | 0-255 | 160 |
| CV125 | --- | Program it to 1 will restore some the CV to factory default setting | --- | 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 sound click F12 or use CV 49 to turn on/off sound. 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 21 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 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.

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 \$35.00 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



HO DC/DCC Diesel Sound Decoder

**Drop in for Atlas Genset Locomotives
Item #0001916**

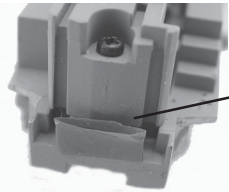
Thank you for purchasing our most advanced DC/DCC locomotive sound decoder. Combined with any DCC System, MRC Blackbox or Tech 6, our true live capture digital sound decoder will make your model railroad come to life.

- Triple core processor generating three independent diesel genset prime mover sounds
- 1.5 amp capacity
- 22 different types of horns and 8 types of bells
- Programmable 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
- Back EMF load control
- Supports read back address and CV value
- Selectable factory default speed curve
- Advanced speed table control CV67-CV94
- Kick start voltage control CV65
- 17 light effects: ditch lights, mars light, gyra light, strobe light, prime strobe...
- Replacement ditch light boards supplied for flashing front and rear ditch lights
- 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
- 16x35 mm speaker included
- Dimensions: 73.0mm x 17.6mm x 8.4mm

INSTALLATION

This decoder board completely replaces the PC Board in the Atlas Trainman GenSet Locomotive. Following the Atlas directions, slowly remove the body shell from the chassis of the locomotive. Be careful as the supplied headlight wires are very short and may break off from the LED's when you remove the body shell. We recommend using a dab of hot glue to secure the headlight wires close to the headlight location inside the long hood of the body shell, to avoid them breaking off. Use a 1" to 2" thin wire to connect ("T" connection) the two black wires from the headlights. Tape the joint to avoid short circuit. This thin wire will be connected to the tab marked "headlight com". Remove the original board with two Atlas ditch light boards.

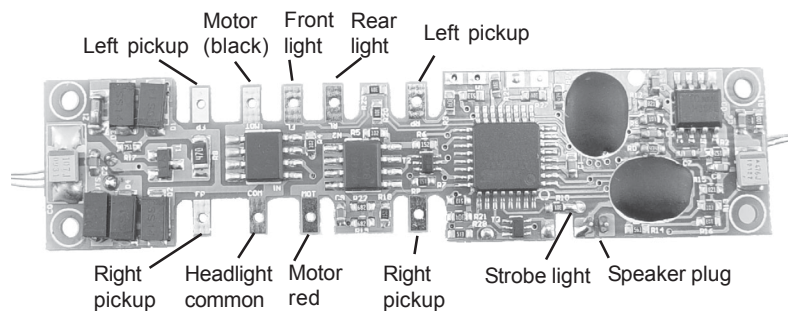
Remove the weight from the rear part of the chassis. Remove two capacitors hidden under the weight. They will not be used. The speaker supplied with your decoder fits snugly in place where you removed the two capacitors. We recommend using a small bead of glue to fully secure the speaker to its location. Before installing the ditch light boards please use tape to completely wrap both front and rear ditch light board holders/slots to prevent the LEDs from touching the chassis, and shorting out. See the picture below.



Use tape to completely wrap both front and rear ditch light board holders to prevent LEDs from touching the chassis

The ditch light boards are already soldered to the decoder for your convenience. Be very careful with these wires as they are very fragile. The 4 ditch lights are tiny SMD led's. Do not put force on them during install or when removing the ditch light boards. You may need to remove some of the tape from the board to ease the fit. However, you must make sure the rear board be covered with tape, or insulated from the frame.

Using the supplied wiring diagram, attach the four pickup, two motor and three headlight wires to the decoder board and secure using the plastic clips or by soldering the wires to the tabs on the decoder. The black motor wire may need to be extended. Use all the wire channels in the chassis to route the wires going to the decoder and use scotch tape in these locations to keep the wires from moving. If you wish to add a roof top strobe light to your loco, use the tab marked for strobe light and the headlight common tab on the decoder.



OPERATION

The decoder has a default address #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. 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. This decoder is default to manual notch setting (CV122=3). F9 will notch up and F8 will notch down. If you want automatic notching enabled set CV 122 = 0. It has three independent diesel genset prime mover sounds. The second engine will turn on at notch 4 and turn off below notch 4. The third will turn on at notch 6 and turn off below notch 6. This decoder also mimics the real GenSet, and if left idling for a long period of time will shut down and restart automatically at specific intervals to conserve fuel.

Shutting off the sound in CV49 will not disable the horn. The decoder has two types of diesel prime movers. You can use F12 or CV 123 to select the desired prime mover sound. You can use F19 to select 34 different horn sounds and use F18 to select 8 different bell sounds. With MRC Prodigy Advance² DCC which has 28 functions, you can easily setup and access all the decoder's functions. If not, you may not be able to access all the features of the decoder. And you have to use the CV program to setup the decoder.

SERVICE BRAKING

To apply service brake (needs CV #4 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 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.

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 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 run smoothly. Program CV125 to "1" will automatically restore the default PID controller settings. **If you can not get the PID controller work properly or you don't know to tune it, you should program CV6 to enable adaptive PID control to let the decoder to select the best back EMF control for your loco.** You can also turn off the Back EMF load control by program CV124 with a value of 0 if the adaptive control fails.

| Function | Idle/Moving |
|----------|---|
| F1 | Bell on/off |
| F2 | Horn |
| F3 | Ditch Lights on/off |
| F4 | Coupling 1 |
| F5 | Brake release (idle) / brake squeal (moving) |
| F6 | Strobe Light 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 mover type, (2 types and off) |
| F13 | Short air release |
| F14 | Coupler crash |
| 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 prime mover volume |
| F24 | Safety valve pop |
| F25 | Air release |
| F26 | Flange noise |
| F27 | Sand drop |
| F28 | Ditch Lights flash when F3 is activated |

LIGHT EFFECT PROGRAMMING CHART FOR CV#117

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. If you use 1.5V bulbs or LED's, you should connect a 1k ohm resistor in series to one of the leads to reduce the voltage. You may need to program brightness CV120 to adjust the LED light effect for perfect ditch, gya and mars light. If you use Rule17 or dim-bright-off light effect you may also need to program CV116 to adjust the brightness of the dim light.

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