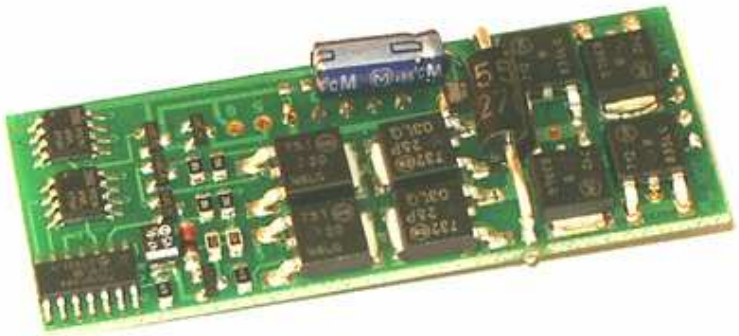
ATLO Decoder



$49.95

Simple plug-in for most Atlas-O locomotives plus locomotives from Weaver and others with the 'dog bone' shaped circuit board

This is an EPF (extended packet format) decoder supporting:

- ✓ Silent Running ™ High frequency motor drive eliminates motor hum or buzz
- ✓ Torque Compensation for ultra smooth low speed performance
- ✓ Programmable Start, Mid and Maximum speed works for all speed modes
- ✓ 6 lighting “function” outputs - each rated at ½ Amp.
- ✓ Select from 15 different lighting effects (Mars, strobes, beacons, flicker, etc)
- ✓ New decoder programming ‘lock’ mechanism

05240141

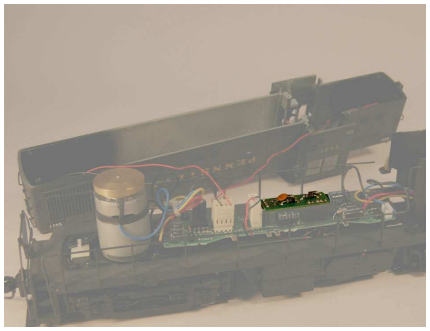
Age **14+**

Warning: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

Decoder Installation Notes**:**

1. The first task is to remove the body shell of the diesel or open the tender if you are installing in a steam locomotive. Most body shells are secured to the frame by multiple screws. Finding ALL of these screws is not always easy. The Atlas RS1 that we used for the photos below had 6 screws, 2 at each end and two under the cab.

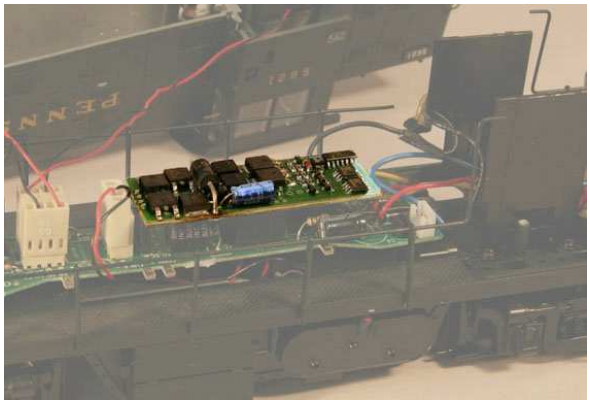
2. Locate the small (1-1/2" x 5/8" - it is highlighted in the photo below) diode circuit board plugged into the main locomotive circuit board. This circuit board unplugs by lifting it straight up from the main board.



Diode board location

3. The ATLO decoder plugs in where you removed the diode circuit board.

4. This completes the installation of the ATLO. We suggest just placing the body shell back on the frame without installing the screws until you test the installation. When you are satisfied that the lights work and the locomotive runs then replace the screws.

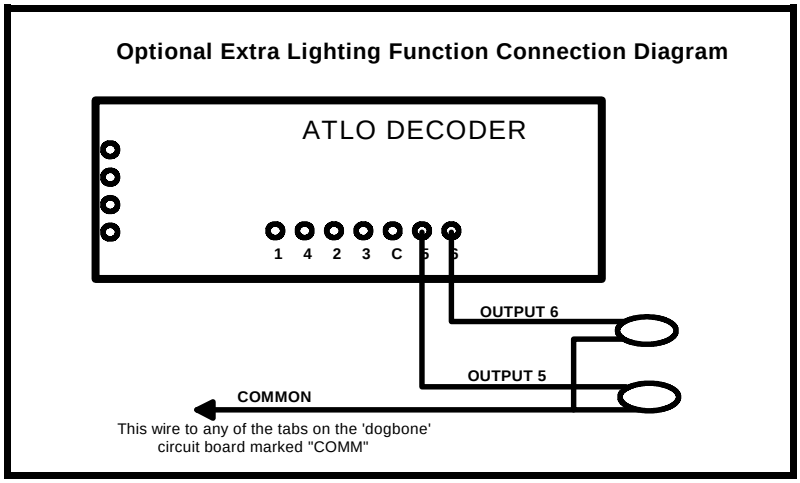


Decoder installed

Before test running your newly converted locomotive on full power double check your wiring to make sure there are no pinched or broken wires. We see many decoders returned due to wires getting pinched between the body shell and frame causing shorts.

Always test your decoder installation on a current limited programming track before trying it on full track power.

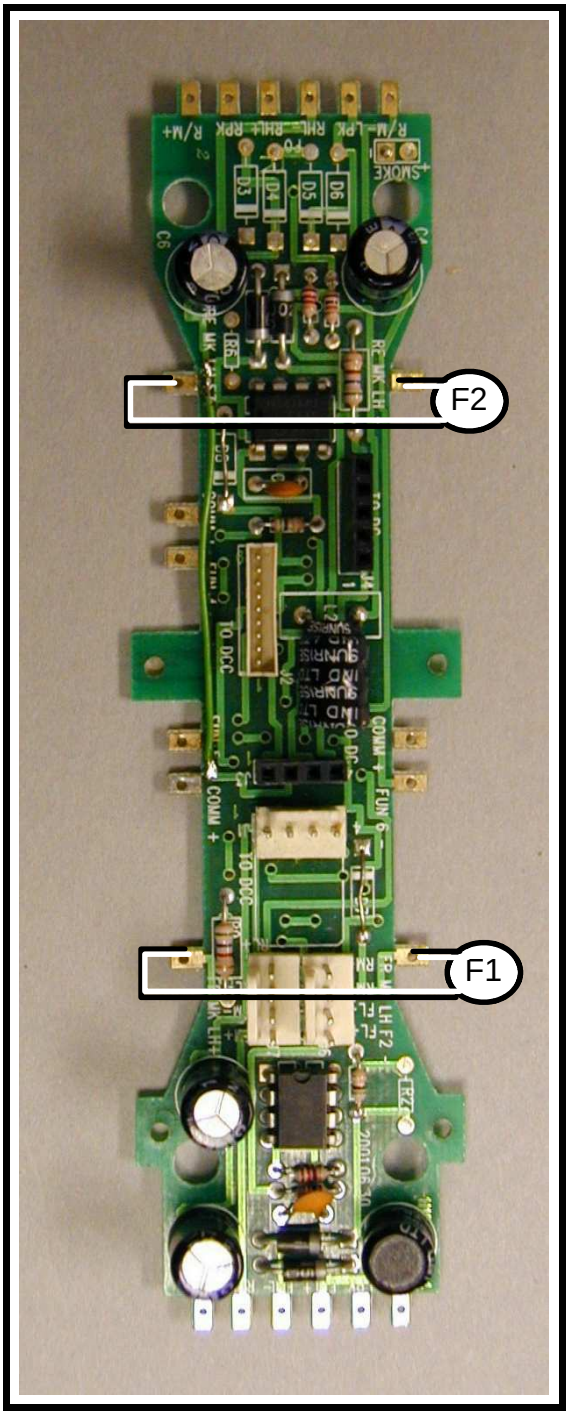
Analog operation is included in NCE decoders so you will be able to run on conventional DC layouts without having to remove the decoder or rewire your locomotive. The decoders should be driven by a good quality smooth DC power unit. Power packs with pulse power systems such as "tracking control", etc. may give unpredictable operation.



Connnecting the extra lighting functions to the light board:

Below is a photo of the lighting outputs of the “dog-bone” light board in your locomotive. If extra lights are not already connected in the loco then you can add additional lighting features. We have brought out F1 and F2 of the decoder to the terminals indicated below. These terminals are where the factory connects marker/classification lights if the locomotive is so equipped.

The white “bulbs” in the photo below illustrate the connections for wiring the additional lights.



Fine tuning locomotive operation

The factory settings normally provide good performance for most locomotives in HO-Scale. You may want to improve or fine tune performance by adjust the starting characteristics or top speed .

There are 6 CVs that define:

- The voltage at which the motor starts.
- How often and how hard the motor gets kicked a slow speeds to keep it turning smoothly.
- The maximum motor speed.
- The mid speed range response characteristics or 'speed curve'.
- Compensation for a motor that runs faster in one direction.

Start Voltage - CV2 (Vstart):
This is the amount of voltage sent to the motor when first starting up. We set CV2 so the locomotive is ***almost*** able to maintain movement at speed step 1. We then use CV116 and 117 to apply enough torque compensation to keep it turning on speed step 1. Typical values for CV2 are in the range of 0-35. For the Atlas RS1 we used 0.

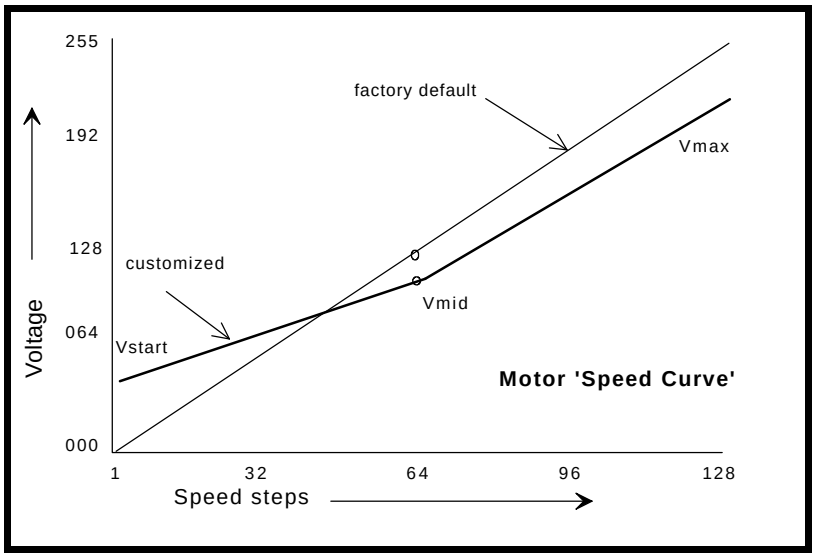
Torque compensation kick rate - CV116:
How *frequently* the motor is 'kicked' at slow speed. Typical adjustment is 2 to 4. The smaller the number the more often the motor gets a brief voltage 'kick'. Factory default is 0 (off). A value of 1 applies kicks continuously. The maximum practical value is about 6. For the Atlas RS1 we used 3.

Torque compensation kick strength - CV117:
How *hard* the motor is 'kicked' at slow speed. Typical adjustment is 4 to 25 The larger the number the more voltage is applied in each 'kick'. The strength of these kicks fade out ratio metrically as speed is increased providing a smooth transition to normal motor operation. Factory default is 0 (off), usable range 0-50. For the Atlas RS1 we used 50.

Vmax - CV5: If your locomotive runs too fast you can use CV5 to lower its maximum speed. Setting CV5 to 255 uses the maximum possible voltage to run the motor when full speed is requested. Set CV5 to a smaller value to reduce the top speed. A value of 128 will yield approximately ½ full voltage to the motor at top speed. 192 will provide about ¾ full voltage. All speeds from the middle speed step to the maximum will be proportionally reduced (see diagram). If CV5 is set to 0 the decoder will use 255 for maximum speed. Always make sure CV5 is greater than CV6 to avoid erratic operation. For the Atlas RS1 we used 180.

Vmid - CV6: CV6 determines how the motor responds through its middle speed ranges to advancement of the throttle. If you set CV6 lower than half the maximum speed you'll have smaller increases in motor speed through the lower speed ranges. Then, as you hit the upper speed ranges there will be larger increases between speed steps. In the diagram below you can see this best illustrated by the 'customized' line. If you set Vstart larger than 0 you'll will most likely want to raise Vmid so a reasonable slope is maintained in the 'speed curve'. If CV6 is set to 0 the decoder will use 127 as the value. If you use high values in CV117 you will want to increase CV6 by a proportional amount to keep a smooth acceleration curve. For the Atlas RS1 we used 100.

Reverse trim (also forward trim) - CV95:
Values from 1-127 make decoder run **faster in reverse** than forward. 1 is one speed step faster in reverse, 2 is two steps faster, etc.
Values from 129-255 make decoder run **faster in forward** than reverse. 129 is one speed step faster in forward, 130 is 2 speed steps faster, etc. 0 and 128 add nothing to either direction.



Factory default values for decoder Configuration Variables (CVs)

CV	Default value		Description
	decimal	hex	
1	**3**	03	short address
2	**0**	00	start voltage
3	**0**	00	acceleration
4	**0**	00	deceleration
5	**0**	00	Maximum speed
6	**0**	00	Mid speed
17	**192**	C0	long address high byte
18	**0**	00	long address low byte
19	**0**	00	consist address
21	**255**	FF	consist functions F1-F8
22	**63**	3F	consist function FLF,FLR
23	**0**	00	acceleration adjust
24	**0**	00	deceleration adjust
29	**2**	02	decoder configuration
30	**0**	00	reset register
33	**1**	01	Output(s) controlled by F0
34	**64**	20	Output(s) controlled by F0
35	**2**	02	Output(s) controlled by F1
36	**4**	04	Output(s) controlled by F2
37	**8**	8	Output(s) controlled by F3
38	**2**	02	Output(s) controlled by F4
39	**4**	04	Output(s) controlled by F5
40	**16**	10	Output(s) controlled by F6
41	**4**	04	Output(s) controlled by F7
42	**0**	0	Output(s) controlled by F8
43	**0**	0	Output(s) controlled by F9
44	**0**	0	Output(s) controlled by F10
45	**0**	0	Output(s) controlled by F11
46	**0**	0	Output(s) controlled by F12
67	**0**	0	alt spd table step 1
68	**0**	0	alt spd table step 2
69	**0**	0	alt spd table step 3
70	**0**	0	alt spd table step 4
71	**0**	0	alt spd table step 5
72	**0**	0	alt spd table step 6
73	**0**	0	alt spd table step 7

CV	Default value		Description
	decimal	hex	
74	**0**	0	alt spd table step 8
75	**0**	0	alt spd table step 9
76	**0**	0	alt spd table step 10
77	**0**	0	alt spd table step 11
78	**0**	0	alt spd table step 12
79	**0**	0	alt spd table step 13
80	**0**	0	alt spd table step 14
81	**0**	0	alt spd table step 15
82	**0**	0	alt spd table step 16
83	**0**	0	alt spd table step 17
84	**0**	0	alt spd table step 18
85	**0**	0	alt spd table step 19
86	**0**	0	alt spd table step 20
87	**0**	0	alt spd table step 21
88	**0**	0	alt spd table step 22
89	**0**	0	alt spd table step 23
90	**0**	0	alt spd table step 24
91	**0**	0	alt spd table step 25
92	**0**	0	alt spd table step 26
93	**0**	0	alt spd table step 27
94	**0**	0	alt spd table step 28
95	**0**	0	Reverse trim
116	**0**	0	Kick rate
117	**0**	0	Kick strength
118	**20**	14	Ditch light hold time
119	**255**	FF	EFX page access
120	**1**	01	Output 1 EFX generator
121	**0**	02	Output 2 EFX generator
122	**0**	00	Output 3 EFX generator
123	**0**	00	Output 4 EFX generator
124	**0**	00	Output 5 EFX generator
125	**0**	00	Output 6 EFX generator
126	**64**	40	Output 7 EFX generator
127	**0**	00	Output 8 EFX generator

Table of commonly used values for CV29

Value for CV29	Long/Short Address	Uploadable/Factory Speed table	Analog (DC) operation	Speed mode
0	Short	Factory	no	28/128
6	Short	Factory	yes	28/128
18	Short	Uploadable	no	28/128
22	Short	Uploadable	yes	28/128
34	Long	Factory	no	28/128
38	Long	Factory	yes	28/128
50	Long	Uploadable	no	28/128
54	Long	Uploadable	yes	28/128

Notes:
If you want to reverse the direction of travel on DCC increase the value for CV29 by one (this also reverses all directional lighting).
If you want to reverse the DC direction reverse the track pickup wires.

Configuration Variables used by V3.5 Decoders

CV1 Short decoder address; 1-127 valid
CV2 Start Voltage (useful range 0-100)
CV3 Acceleration rate (each unit = 7mS between speed steps) 255 max.
CV4 Deceleration rate (each unit = 7mS between speed steps) 255 max.
CV5 Vmax, speed at highest speed step. 0=use factory default of 255
CV6 Vmid, speed (on a scale of 1-255) at speed step 7,14,or 63. 0=use default of 127
CV7 Decoder version number. This decoder is 35 which means version 3.5
CV8 Manufacturer ID. NCE = 11 (0B hex)
CV11 Packet time-out value (in ½ second increments) Time the decoder will wait before braking to a stop after running into a section of track with DC power. 0=Don't brake
CV15 Decoder programming lock "KEY". This CV is always programmable even when "locked"
CV16 Decoder programming lock ID. When CV15=CV16, programming is unlocked and the decoder will respond to programming commands. If CV15 is not equal to CV16 then decoder programming is locked and it will not program (except CV15) or read.
CV17 High byte of long (4 digit) address
- bit 6,7 always= 1
- bits 0-5 are upper 6 bits of address

CV18 Low byte of long (4 digit) address
CV19 Consist address. (0 or 128 = no consist active)
- bits 0-6 short consist address (1-127 valid)
- bit 7 0= direction is normal, 1= direction is reversed

CV21 Functions active in consist mode. Bit 0 controls F1,bit 1=F2, bit 2=F3, etc.
- bit 0 - 1=function can be controlled at consist address, 0 = no consist control

CV22 Functions active in consist mode. Bits 0,1 control FLF and FLR respectively
each bit 1=function can be controlled at consist address, 0 = no consist control
CV29
- bit 0 1= direction of operation is reversed, 0= direction is normal
- bit 1 1=28 speed mode (always enabled)
- bit 2 1= analog operation mode enabled, 0 = disabled
- bit 4 1= alternate speed table active, 0= use table defined by CV2,5,6
- bit 5 1= use long address in CV17/18, 0= use short address CV1
- bits 3,6,7 are ignored by the decoder

CV30 Set this CV to 2 **on the programming track** and the decoder will reset to factory settings.
CV33-CV46 function mapping CVs for F0-F12
CV67-CV94 Uploadable speed table steps 1-28 (128 speed mode calculates intermediate steps)
CV95 Reverse trim, values 1-127 add to reverse speed, values 129-255 add to forward speed
CV116 Torque kick rate - number of 16 ms periods in a row that motor is 'kicked' with voltage pulse
CV117 Torque kick strength - how much voltage is used to kick the motor at slow speeds. Reduces to 0 as speed is increased.
CV118 Ditch light hold time (in ¼ second increments) after F2 goes off.
CV120-CV128 Effects configuration registers for outputs 1-8

CV NOTES: All CV numbers not listed above are ignored.
This decoder supports all DCC programming methods.

Decoder Warranty
This decoder is fully factory tested and warranted against manufacturing defects for a period of 1 year. As the circumstances under which this decoder is installed can not be controlled, failure of the decoder due to installation problems can not be warranted. This includes misuse, miswiring, operation under loads beyond the design range of the decoder or short ciruits in the locomotive manufacturer's factory wiring. If the decoder fails for non-warranted reasons NCE will replace the decoder, no questions asked, for $10 U.S. plus $2 shipping. For warranty or non-warranty replacement send the decoder (and any payment, if required) to:

NCE Warranty Center
82 Main Street
Webster, New York 14580

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