Technical Reference

for the

POWERHOUSE™
Digital Command Control

D104KRS Decoder

REVERSING HEADLIGHTS PLUS F1-F2

Dimensions:
1.9 x .65 x .125 inches
49 x 16.5 x 3.2 mm

Decoder version 2.3

$29.95

**Fits Kato RS-2, RSC-2, C44-9W,
Atlas U23B,and others**

Easy installation... just plug it in!

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

- Four digit address (long)
- Uploadable speed table with programmable motor drive frequency
- 128 Speed mode operation
- Decoder assisted consisting
- All forms of operations mode programming (programming on the mainline)
- Programmable Start Voltage works for all speed modes
- Motor rating 1.3 Amp continuous, 2 Amp peak (stall)
- Four function outputs rated for up to 40mA incandescent bulbs (150mA when used with LEDs or optional series resistor)
- Auto-reversing headlights plus F1-F2.

Every attempt has been made to ensure this decoder complies with all applicable NMRA Standards and Recommended Practices

Last revised: 27 January 2000

Configuration Variables used by D104 Decoders

CV1 normal 7 bit loco (short) address; 1-127 valid

CV2 vstart, value added to all speed steps of "standard speed table", 1 count = .89% of full voltage when using the normal speed table. If uploadable speed table is used the percentage varies with the frequency of PWM motor control in CV9.

CV3 acceleration rate (each unit = 32mS between speed steps) 254 max. CV23 is added to this value on power up]

CV4 deceleration rate (each unit = 32mS between speed steps) 254 max. CV23 is added to this value on power up

CV7 Manufactuer ID. North Coast = 11

CV8 Decoder version number. This decoder is 16 which means ver. 1.6

CV9 PWM frequency. This CV determinesthe total PWM period for the uploadable speed table. Each unit = 128uS this allows a frequency of 30hz to 279hz. 279hz comes from using each speed = 1 count this yields: max speed = 28*128us for a 3.58mS period which equals 279hz.

CV17 high byte of 14 bit address
- bit 6,7 always= 1
- bits 0-5 are upper 6 bits of 14 bit address

CV18 low byte of 14 bit address (lower 8 bits)

CV19 8 bit address for consist, when active the consist responds to all commands addressed to it the same as it would to it's normal 8 or 14 bit address. Note: the normal 8/14 bit address is still active for all non-speed/direction commands (especially useful for headlight and other function controls of individual locomotives while in consist). If the consist address is set to 0 then the consist is inactive.
- bits 0-6 7 bit consist address (1-127)
- bit 7 0= direction is normal, 1= direction is reversed

CV23 acceleration rate adjust (each unit = 32mS between speed steps) this value is added to the value in CV3 at power up or when reprogrammed

CV24 deceleration rate adjust (each unit = 32mS between speed steps) this value is added to the value in CV4 at power up or when reprogrammed

CV29
- bit 0 1= direction of operation is reversed, 0= direction is normal
- bit 1 1= use 28 speeds mode, 0= 14 speed mode
- bit 2 1= DC conversion enabled. 0 = disable DC mode
- bit 3 not used
- bit 4 1= use alternate (uploadable) speed table, 0= use normal speed table
- bit 5 1= use 14 bit address in CV17,18 (do not use CV1), 0= use CV1 not CV17,18
- bit 6 not used
- bit 7 not used

UPLOADABLE SPEED TABLE VARIABLES

CV66 Speed step 0 of uploadable table (Must be 0 for proper operation

CV67-CV94 Speed step 1 to 28 of uploadable speed table

PROGRAMMING TRACK INFORMATION: This decoder complies with NMRA RP-9.2.3 for both paged mode and register mode programming.

Ops mode programming (Programming on the Mainline): Decoders do not respond to the long form ops mode programming instructions at their consist address (per RP-9.2.1). This is to avoid setting CV29 while in a consist then later wondering why the decoder now only responds to it's long address rather than the short or vice-versa.

Tip for using consists and extended addresses: leave CV1 set to 3, or some other conveniently remembered address and only use the extended address (CV17, CV18) set to your desired value. This avoids mixing up normal 'short' addresses with consist addresses.

Factory default values for decoder Configuration Variables (CVs)

Digitrax users: Use hex values all other systems use normal decimal numbers

CV	Default value in decimal	hex	Description
1	3	3	short address
2	4	4	start voltage
3	0	0	acceleration
4	0	0	deceleration
9	195	C3	PWM frequency
17	192	C0	long address high byte
18	0	0	long address low byte
19	0	0	consist address
23	0	0	acceleration adjust
24	0	0	deceleration adjust
29	6	6	decoder configuration
30	0	0	error register
66	0	0	alt spd table step 0
67	2	2	alt spd table step 1
68	4	4	alt spd table step 2
69	5	5	alt spd table step 3
70	9	9	alt spd table step 4
71	12	0C	alt spd table step 5
72	16	10	alt spd table step 6
73	20	14	alt spd table step 7

CV	Default value in decimal	hex	Description
74	23	17	alt spd table step 8
75	27	1B	alt spd table step 9
76	31	1F	alt spd table step 10
77	36	24	alt spd table step 11
78	39	27	alt spd table step 12
79	44	2C	alt spd table step 13
80	50	32	alt spd table step 14
81	55	37	alt spd table step 15
82	60	3C	alt spd table step 16
83	64	40	alt spd table step 17
84	71	47	alt spd table step 18
85	77	4D	alt spd table step 19
86	86	56	alt spd table step 20
87	93	5D	alt spd table step 21
88	103	67	alt spd table step 22
89	112	70	alt spd table step 23
90	123	7B	alt spd table step 24
91	135	87	alt spd table step 25
92	150	96	alt spd table step 26
93	168	A8	alt spd table step 27
94	195	C3	alt spd table step 28

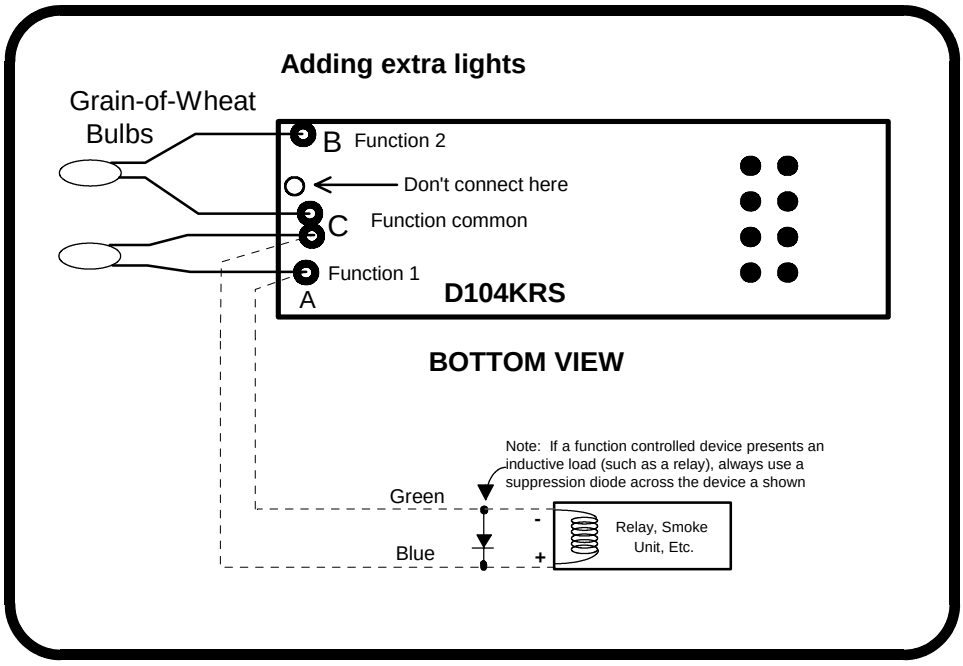
Installation Notes:

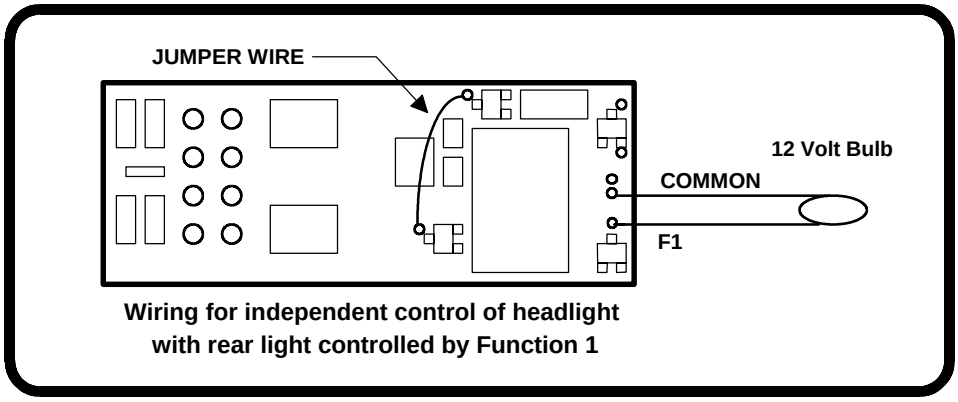
This decoder is designed to plug straight in to locomotives with an NMRA 8 pin medium DCC socket.

If you are installing this decoder into a LifeLike SD7 or SD9 attach the included extender plug to the bottom of the decoder to raise the decoder above the electronic components on the locomotive circuit board.

If you are installing the decoder in a Kato RSC-2 you will find the locomotive runs long hood forward like the protoytpe. If you wish to have the locomotive run short hood forward add 1 to whatever value is in CV29 (read CV29 on the programming track and put the same value, plus one, back in to CV29).

DC "Analog" operation
These decoders come from the factory with analog mode enabled. If you run your locomotive on a regular DC layout the power pack should be a good quality smooth DC power unit. Power packs with pulse power systems such as "tracking control", etc. will give unpredictable operation. Analog operation is included in your NCE decoders so you will be able to run on conventional layouts without having to remove the decoder or rewire your locomotive.





Wiring for independent control of headlight with rear light controlled by Function 1

Wiring for "US" style lighting
The diagram above shows where to solder a short jumper wire on the decoder that will keep the headlight lit in both directions of loc travel. By installing a bulb wired to F1 for the rear light you will have independent control of lights regardless of loco direction

About the extra function outputs:
Due to the high in-rush current of incandescent grain-of-wheat type bulbs (about 10 times the normal operating current) function outputs are rated at 40mA each. We recommend Miniatronics part number 18-014-10 (2.4mm diameter 14 volt/30mA) or number 18-712-10 (1.7mm diameter 12 volt/30mA) bulbs for good results. If you wish to use 50-150mA rated lamps use a 22 ohm 1/4 Watt resistor in series with each bulb (this will also greatly extend bulb life). The function outputs are rated at 150mA continuous if used with LEDs other low in-rush devices.

Get our product catalog from your dealer or by writing to NCE Corp at 1260 Creek Street Suite 105 , Webster, NY 14580.