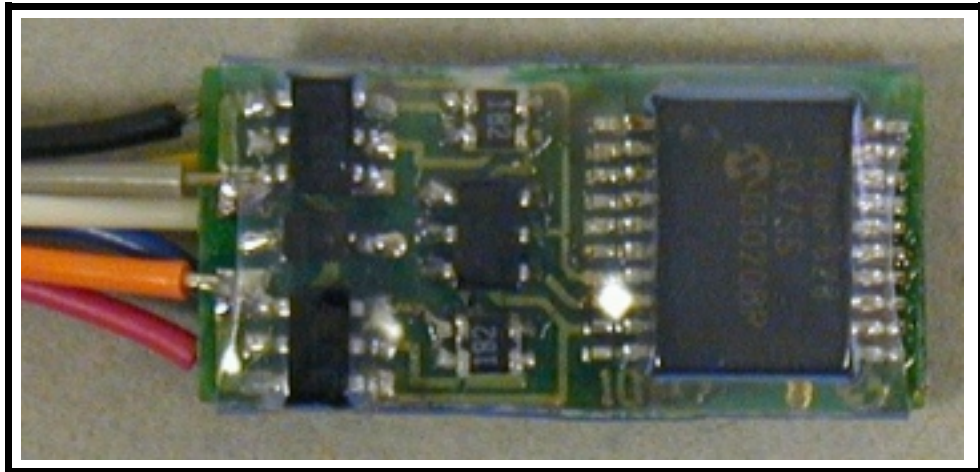


NCE N12SRP

Decoder

The Power of DCC



\$29.95

Decoder version 3.3

Dimensions: 0.34 x 0.70 x .12 inches - 8.6 x 18 x 3.2 mm

Plug and Play decoder with NMRA standard 8 pin plug

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

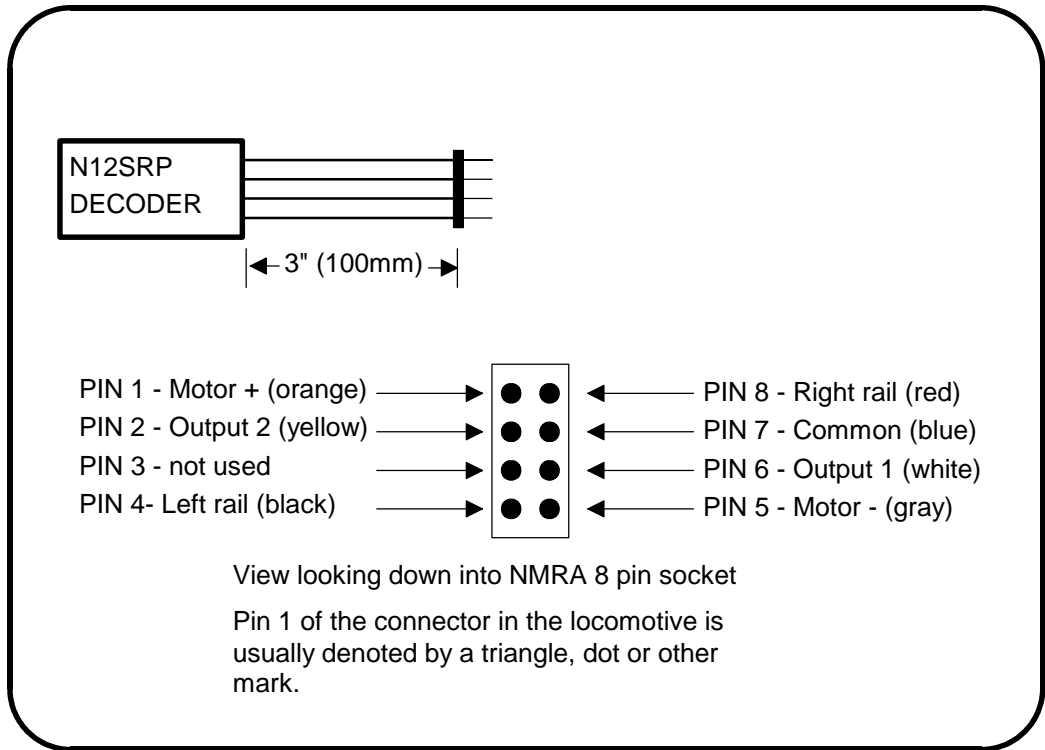
- , Silent Running™ motor drive eliminates annoying motor hum or buzz
- , Programmable Start, Mid and Maximum speed works in all speed modes
- , Motor rating 1.0 Amp continuous, 1.25 Amp peak (stall)
- , Both function outputs have effects generators
- , Select from 14 different lighting effects (Mars, strobes, beacons, etc)
- , Function outputs can be mapped to different functions (highly compatible with Soundtraxx™ DSX decoders)
- , Two or Four digit addressing
- , Uploadable speed table interpolated to 128 speed steps
- , 28 and 128 Speed mode operation (always works internally at 256 steps)
- , Decoder assisted consisting
- , All forms of operations mode programming (programming on the mainline)
- , All forms of service mode programming (programming track)

Every attempt has been made to ensure this decoder complies with all applicable NMRA Standards and Recommended Practices. NMRA Conformance test results on this decoder are available on our website at www.ncedcc.com

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NCE Corporation Webster, NY 14580

Decoder Installation Notes:

Plug the decoder in to the socket on the locomotive noting the pin 1 location. If you plug it in backwards no harm will be done but the locomotive will run backwards. Before test running your newly converted locomotive on full power double check your wiring to make sure the motor is fully isolated and that 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.



Before test running your newly converted locomotive on full power, double check your wiring to make sure the motor is fully isolated and that 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.

Also inspect the 8 pin socket in the locomotive to make sure there are no solder "bridges" between pins on the lighting board. If there is a short between pins 1 and 8 or pins 4 and 5 the decoder will be damaged. **Locomotive manufacturers normally do NOT test their products for this type of short.**

Always test your decoder installation on an current limited programming track before trying it on full track power. If you have a Digitrax Big Boy, EBII or MRC system that does not provide a current limited programming use a 100 Ohm resistor in series with one of the track leads and listen for the "click" that verifies correct operation as you program the decoder .

We recommend that the first "full power" testing be done on regular DC. If the pickup polarity is reversed you will want to correct this for proper analog mode operation. The decoders should be driven by 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.

Head and Rear Lights

For lighting we recommend:

- Miniaturics #18-712-10 (12v) or #18-014-10 (14v) incandescent bulbs
- Chicago Miniature white LEDs part number CMD204UWC available from Digikey, 1-800-DIGIKEY. Use a 1K 1/4 Watt series resistor with each LED.

Fine tuning locomotive operation

The factory settings of the D13SR 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 five CVs that define:

- The voltage at which the motor starts
- How much 'kick' the motor gets to start it turning
- The maximum speed
- The response characteristics or 'speed curve'.
- The frequency of the drive pulses to the motor

Start Voltage - CV2 (Vstart): Before programming the start voltage we recommend programming CV65 (Kick Start) to zero. Kick start is used to overcome the 'stiction' of the motor by giving it a voltage 'kick' when starting from a stop. We don't want it getting in the way of setting Vstart. We prefer using Operations Mode Programming (Program on the Main) to set CV2 so the locomotive is **just able** to maintain movement at speed step 1. You can also use the programming track... it just takes a bit longer to find the right setting for CV2.

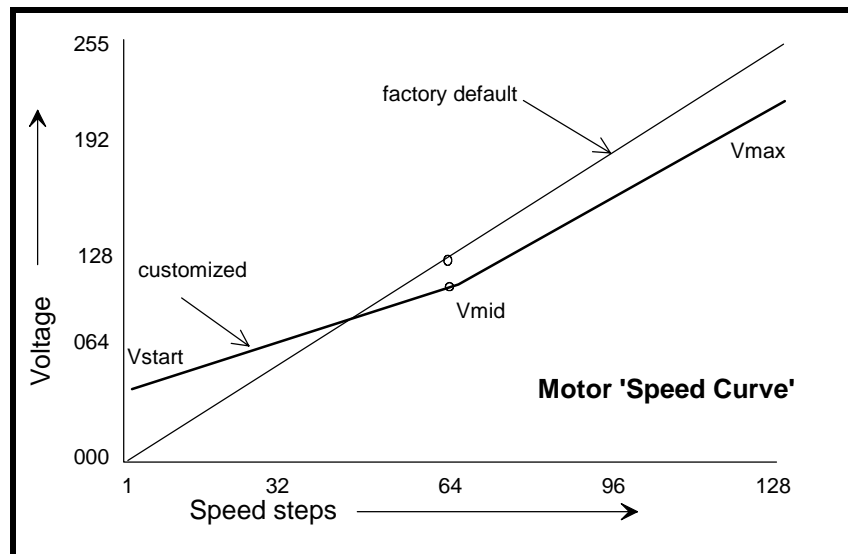
Kick Start - CV65 After the start voltage is set . Program CV65 to provide a smooth and reliable start when you advance the throttle from stop. The high frequency drive pulses of the D408SR act more like smooth DC voltage than the low frequency pulses of a standard decoder making it harder for the decoder to overcome that starting 'stiction' of the motor. This is why the Kick start CV is needed.

If the value is too low the motor will not start moving reliably, too high and the locomotive will lurch or leap as it starts.

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.

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 factory default line. If you set Vstart larger than 0 you'll 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. Setting CV6 to a value of 70 will approximate the speed curve of older NCE (and Soundtraxx) decoders

Motor Drive Frequency - CV9: When CV9 is set to 0 the Silent Running™ motor drive frequency of 15,625 Hz is used. If a value of 1-255 is programmed into CV9 the motor drive frequency will be calculated by the formula: $\text{Frequency} = 1/(\text{CV9} * .000128)$.



Function mapping and effects programming examples

Mars Light:

What we want to do:

- Use output 2 (Yellow wire) for a Mars light.
- It is to be on in the forward direction only
- Mars light is to be activated by F1

How to do it:

- ✓ Set Output 2 to be activated by F1 (CV35=2). Disable FLR operation of Output 2 (CV34=0)
- ✓ Configure output 2 as a forward only Mars light. Set CV121 to 9. We get the value of 9 by using 8 (Mars Light) plus 1 (output operates only in forward direction)

Rule 17 lighting:

Rule 17 refers to how the locomotive engineer operates the locomotive headlights during the running of the train. The rule varies from road to road but generally requires the dimming of the headlight(s) when in a siding waiting to meet another train, passing through passenger stations or moving within yard limits.

What we want to do:

- Use output 1 for the Headlight
- The headlight is to be on bright in both directions of locomotive travel
- We also want to be able to dim the headlight

How to do it:

- ✓ Output 1 is already activated by F0 (factory default setting of CV33 =1).
- ✓ Configure output 1 as a standard output, on in both directions, yet dimmable when F4 is activated. Set CV120 to 32 (20 hex). You can optionally set CV120 to 36 if you want F8 to control the dimming instead of F4.
- ✓ Configure

Switcher:

What we want:

- Headlights that dim in the opposite direction that the locomotive is travelling
- Use output 1 as Headlight and output 2 as Rearlight

How to do it:

- ✓ Outputs 1 and 2 are already activated by F0 due to the factory default settings.
- ✓ Configure output 1 as bright in forward dim in reverse. Set CV120 to 44 (2C hex)
- ✓ Configure output 2 as bright in reverse dim in forward. Set CV121 to 40 (28 hex)

Description of EFX configuration CVs

CV120 - Lighting effect configuration for output 1 (white wire).

CV121 - Lighting effect configuration for output 2 (yellow wire).

Each output wire can select from 15 different lighting effects by using its associated EFX configuration CV. Pick the value for the CV from the table below, add 1 or 2 if you want the effect to be directional (footnotes 2 and 3), then add 128 if you are using a white LED for the effect. Ditch lights should not be made directional, they're not directional in real life.

bit weight	128	64	32	16	8	4	2	1
bit name	LED ¹	---	Effect configuration				REV ²	FWD ³

Value for CV	Description of lighting effect	Hex (for Digitrax users)
0	Standard on/off function output	0
4	reserved	4
8	Mars light	8
12	Rotary Beacon	0C
16	Gyralight	10
20	Double Strobe	14
24	Strobe A	18
28	Strobe B (alternates with Strobe A)	1C
32	Dim when F0 and F4 on, otherwise bright	20
36	Dim when F0 and F8 on, otherwise bright	24
40	Dim in reverse, bright in forward	28
44	Dim in forward, bright in reverse	2C
48	Type 2 Right Ditch light, effect on if F2 on, output off otherwise	30
52	Type 2 Left Ditch light, effect on if F2 on, output off otherwise	34
56	Type 1 Right Ditch light, effect on if F0 <i>and</i> F2 on, bright if F0 on <i>and</i> F2 off, off if F0 off	38
60	Type 1 Left Ditch light, effect if F2 <i>and</i> F0 on, bright if F0 on <i>and</i> F2 off, off if F0 off	3C

1 - Functions are designed to use 12-16 volt 30-40ma incandescent lamps. If you are using a white LED (with 1K limiting resistor) add 128 to the CV value.

2 - If you want the function to be active only in the reverse direction add 2 to the CV value

3 - If you want the function to be active only in the forward direction add 1 to the CV value

Description of function mapping CVs:

Function mapping can change which output wire(s) are controlled by a function command from your handheld cab. It is possible to have one command control several outputs. In the tables below each row corresponds to a function mapping CV and each column indicates an output number. A '1' under an output number means that output will be controlled by the function corresponding to the row. In the table below the factory value of CV33 is 1 which means F0 will control Output #1.

Example:

To change output 2 to be controlled by F3 you would put a "1" in the F3 row under the output #2 column. You would then program CV37 to 2. You will also want to program CV34 to 0 (the factory setting is 2) to avoid having this output also controlled by the reverse light (F0 rev).

Factory default function mapping values

		OUTPUT NUMBER	
		2	1
Bit weight CV33-CV37		2	1
CV33 F0 Fwd	0	0	1
CV34 F0 Rev	1	0	0
CV35 F1	0	0	0
CV36 F2	0	0	0
CV37 F3	0	0	0

About the function outputs:

The rating of each function output on this decoder is 100mA continuous with a non-incandescent lamp (such as an LED) and 40mA with an incandescent lamp. The total allowable current that can be drawn by all functions is 300mA. We recommend Miniaturics part number 18-014-10 (2.4mm diameter 14 volt/30mA) or number 18-016-10 (2.4mm diameter 16 volt/30mA) bulbs for good results. If you wish to use 50-80mA rated lamps we suggest using a 22 ohm 1 Watt resistor in series with each bulb to greatly extend bulb life, especially if any lighting effects are used.

Recommend dropping resistors if using 1.5 volt bulbs

Bulb Current	Track Voltage								Wattage
	12.5	13	13.5	14	14.5	15	15.5	16	
15ma	680	680	720	750	820	820	910	910	¼ watt
30ma	330	360	360	390	390	430	430	470	½ watt
40ma	240	270	270	300	300	300	330	330	1 watt
50ma	200	200	220	220	240	240	270	270	1 watt
60ma	160	180	180	200	200	200	220	220	1 watt
80ma	120	130	130	150	150	160	160	160	2 watt

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
9	0	00	PWM frequency
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/error register
33	1	01	Output(s) controlled by F0
34	2	02	Output(s) controlled by F0
35	0	04	Output(s) controlled by F1
36	0	0	Not used
37	0	0	Not used
38	0	0	Not used
39	0	0	Not used
40	0	0	Not used
41	0	0	Not used
42	0	0	Not used
65	0	00	Kick start
67	2	02	alt spd table step 1
68	5	05	alt spd table step 2
69	7	07	alt spd table step 3

CV	Default value		Description
	decimal	hex	
70	12	0C	alt spd table step 4
71	16	10	alt spd table step 5
72	21	15	alt spd table step 6
73	26	1A	alt spd table step 7
74	30	1E	alt spd table step 8
75	35	23	alt spd table step 9
76	40	28	alt spd table step 10
77	47	2F	alt spd table step 11
78	51	33	alt spd table step 12
79	58	3B	alt spd table step 13
80	65	41	alt spd table step 14
81	72	48	alt spd table step 15
82	79	1F	alt spd table step 16
83	84	54	alt spd table step 17
84	93	5D	alt spd table step 18
85	100	64	alt spd table step 19
86	112	70	alt spd table step 20
87	121	79	alt spd table step 21
88	135	87	alt spd table step 22
89	147	93	alt spd table step 23
90	161	A1	alt spd table step 24
91	177	B1	alt spd table step 25
92	196	C4	alt spd table step 26
93	219	DB	alt spd table step 27
94	255	FF	alt spd table step 28
118	20	14	Ditch light hold time
119	255	FF	EFX page access
120	1	01	Output 1 EFX generator
121	2	02	Output 2 EFX generator
122	0	00	Output 3 EFX generator

Configuration Variables used by NCE version 3.3 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 128
CV7 Manufactuer ID. NCE = 11 (0B hex)
CV8 Decoder version number. This decoder is 33 which means version 3.3
CV9 Motor drive frequency
- 1-255 = PWM drive frequency period in 128uS increments,
- 0 = PWM frequency is 15,625 Hz
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 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
CV23 acceleration rate adjust (in 7mS increments) this value is added to CV3
CV24 deceleration rate adjust (in 7mS increments) this value is added to CV4
CV29 - bit 0 1= direction of operation is reversed, 0= direction is normal
- 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 1,3,6,7 are ignored by the decoder
CV33-CV35 function mapping CVs for F0-F1
CV65 Kick start - number of 1/1000s of a second to 'kick' motor when starting
CV67-CV94 Uploadable speed table steps 1-28 (128 speed mode calculates intermediate steps)
CV118 Ditch light hold time (in ¼ second increments) after F2 goes off.
CV119 Lighting effects page. Must be set to 255 for access to CVs120-127
CV120-CV122 Effects configuration registers for outputs 1-3

CV NOTES: All CV numbers not listed above are ignored.

PROGRAMMING TRACK INFORMATION: This decoder complies with NMRA RP-9.2.3 for all forms of paged, direct (bit and byte) and register mode programming. If using a Lenz SET01 or SET02 use the paged programming mode and see the note below if using long addresses.

Formula for computing the long address if using a Lenz SET01 or SET02:

CV17 = 192 + (the whole number portion of the long address divided by 256)

CV18 = the remainder of the long address divided by 256

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.

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 circuits 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 (an any payment, if required) to:

NCE Warranty Center

899 Ridge Road

Webster, New York 14580

Bar Code

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