



Plymouth Switcher

Operator's Manual

Introduction

Congratulations! You have just purchased a premium grade model railroading product by Broadway Limited Imports. Your new Plymouth Switcher is designed to exacting specifications and will provide you with many years of reliable service on your layout. Please take a moment to read over this Operator's Manual to familiarize yourself with the features and operation of your new model.

Note: This model is equipped with a dual-mode DC & DCC decoder. You can operate the model on both DC analog layouts and digital DCC layouts.

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Features

Your new switcher is made of die cast metal for optimal performance and durability. In addition, it features the following:

- Precision Paint and Decoration
- Decorated Cab Interior
- Powerful 3-pole Can Motor
- Low Gear-Ratio for precision switching
- 2-Metal Kadee #58 "Scale Couplers"
- A custom-designed NCE DCC decoder

DC Operation

Operating your Plymouth Switcher in traditional DC is simple. Just place the model on the track and increase throttle to the desired speed. To change directions, toggle the direction switch on your power pack.

DCC Operation

Your new switcher is equipped with a custom-designed DCC decoder by NCE. It is already installed and ready to use out-of-the-box. The default address is 3. Once your throttle is set to 3, the model will respond to standard DCC throttle commands.

Basic Maintenance

Your switcher will perform best when it is properly maintained. Primary maintenance concerns include:

- Wheel Cleaning
- Gear Lubrication

Wheel Cleaning:

The wheels on your model should be periodically checked for debris and patina. Should the wheels become dirty, clean them by wiping them with an alcohol swab. Gentle scraping with a small implement may also remove most types of patina. Clean wheels contribute to reliable performance.

Gear Lubrication:

The gears in your switcher come lubricated from the factory. We recommend lubricating the gears only if performance deteriorates or becomes excessively noisy. To do this, remove the bottom plate from the switcher to expose the gears. The exploded view diagram (included with the model) will be helpful during this procedure. Place a drop of plastic compatible light oil on each gear and carefully replace the bottom plate.

Lighting

Your new Plymouth Switcher has an operating headlight and an operating rear light. When operating in DC mode, the headlight will be on in forward, and the back-up light will be on in reverse. When operating in DCC mode with default settings, the headlight will be on when you travel in forward. The rear light will be on when you travel in reverse. Use F0 to toggle both lights on and off.

NCE DCC Decoder Details

Decoder version 3.6

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

- Silent Running™ motor drive
- Torque Compensation for ultra smooth low speed performance
- Programmable Start, Mid and Maximum speed works for all speed modes
- Motor rating 1.3 Amp continuous, 2 Amp peak (stall)
- All three function outputs have lighting effects generators

- Select from 15 different lighting effects (Mars, strobes, beacons, flicker, etc)
- Function outputs can be mapped to different functions
- 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)
- Support for all forms of DCC programming
- Decoder programming lock mechanism
- Brake on DC feature assists automatic train control

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

Fine tuning locomotive operation

You may want to fine tune performance by adjusting 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 at 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):

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.

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 8.

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 fades out ratiometrically as speed is increased providing a smooth transition to normal motor operation. Factory default is 0 (off), usable range 0-50.

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 $\frac{1}{2}$ full voltage to the motor at top speed. 192 will provide about $\frac{3}{4}$ 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.

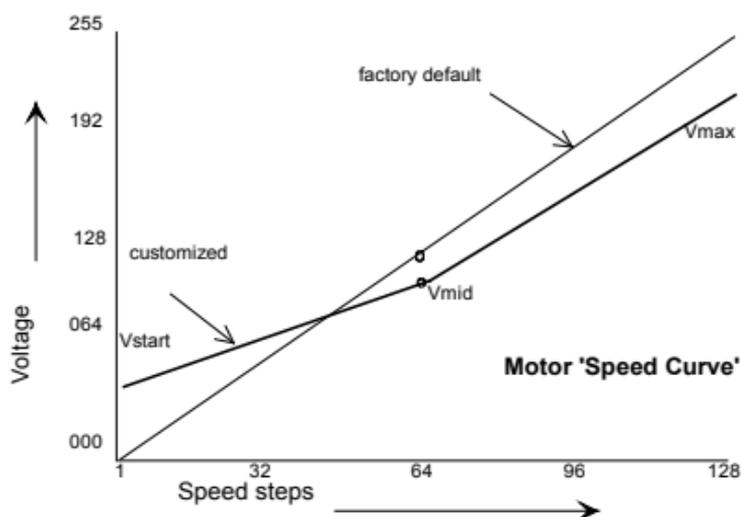
Vmid - CV6: CV6 determines how the motor responds through its middle speed ranges to advancement of the throttle. If you set CV6 lower than half the maximum speed you'll have smaller increases in motor speed through the lower speed ranges. Then, as you hit the upper speed ranges there will be larger increases between speed steps. In

the diagram below you can see this best illustrated by the factory default line. If you set V_{start} larger than 0 you'll most likely want to raise V_{mid} 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 CV57 you will want to increase CV6 by a proportional amount to keep a smooth acceleration curve.

Reverse trim (also forward trim) - CV95:

Values 1-127 make the decoder run faster in reverse than forward. 1 is one speed step faster in reverse, 2 is two steps faster, etc.

Values 129-255 make the 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.



Configuration of CV29 settings:

Table of commonly used values for CV29

Value for CV29		Long/ Short Address	Uploadable/ Factory Speed table	Analog Conv.	14 or 28 Speed mode
decimal	hex				
2	2	Short	Factory	no	28
6	6	Short	Factory	yes	28
18	12	Short	Uploadable	no	28
22	16	Short	Uploadable	yes	28
34	22	Long	Factory	no	28
36	24	Long	Factory	yes	14
38	26	Long	Factory	yes	28
48	30	Long	Uploadable	no	14
50	32	Long	Uploadable	no	28
52	32	Long	Uploadable	yes	14
54	36	Long	Uploadable	yes	28

Factory default values for decoder Configuration Variables (CVs)

CV	Default value	Description
1	3	short address
2	0	start voltage
3	0	acceleration
4	0	deceleration
5	0	maximum speed
6	0	mid speed
7	36	decoder version
11	0	Packet timeout value
15	0	Programming "key"
16	0	Programming "lock"
17	192	long address high byte
18	0	long address low byte
19	0	consist address
21	255	consist functions F1-F8
22	63	consist function FLF,FLR
23	0	acceleration adjust
24	0	deceleration adjust
29	2	decoder configuration

30	0	error/reset register
67	0	alt spd table step 1
68	0	alt spd table step 2
69	0	alt spd table step 3
70	0	alt spd table step 4
71	0	alt spd table step 5
72	0	alt spd table step 6

**Factory default values for decoder
Configuration Variables (CVs) continued**

CV	Default value	Description
73	0	Alt spd table step 7
74	0	Alt spd table step 8
75	0	Alt spd table step 9
76	0	Alt spd table step 10
77	0	Alt spd table step 11
78	0	Alt spd table step 12
79	0	Alt spd table step 13
80	0	Alt spd table step 14
81	0	Alt spd table step 15
82	0	Alt spd table step 16
83	0	Alt spd table step 17
84	0	Alt spd table step 18
85	0	alt spd table step 19
86	0	alt spd table step 20

87	0	alt spd table step 21
88	0	alt spd table step 22
89	0	alt spd table step 23
90	0	alt spd table step 24
91	0	alt spd table step 25
92	0	alt spd table step 26
93	0	alt spd table step 27
94	0	alt spd table step 28
95	0	reverse trim
116	0	torque kick rate
117	0	torque kick strength

Config. Variables used by V3.6 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. = 11
- CV11 Packet timeout 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.

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 16ms 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.

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

Limited 1-Year Warranty

This premium model railroading product by Broadway Limited Imports, LLC is warranted against defects in materials and workmanship for a period of One (1) Year from the date of purchase.

In the event you should require service under the terms of this warranty, please contact Broadway Limited Imports, LLC via email at:

service@broadway-limited.com

Telephone Service Inquiries:

(386) 673-8900

Proof of purchase required if purchased from a retailer other than Broadway Limited Imports, LLC.



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