Operator's Manual

Paragon 2
Steam Locomotives

Important Notice:
This product is not recommended for children under 14 years of age.

06/23/14

Broadway Limited locomotives manufactured under US Patent No. 7,749,040 and RE38,660 under license from Real Rails, Inc. Other

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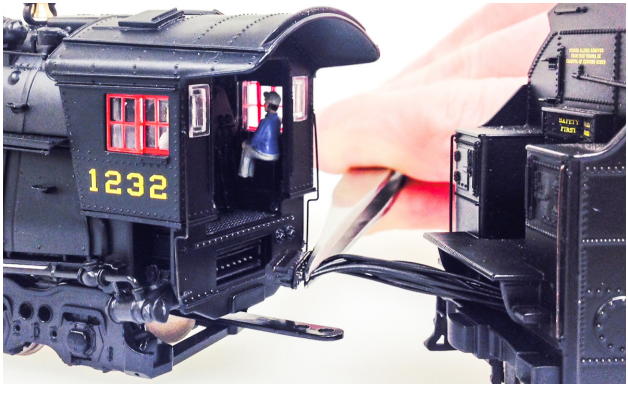
Throughout the manual we will use “DC” to refer to operation using a traditional DC power supply and “DCC” to refer to operation with a NMRA compliant Digital Command Control system. Almost every operational feature of this locomotive can be configured to suit your personal taste by setting configuration variables (CV’s). Many of these apply to DC and to DCC operation. See the list of configuration variables in this manual and the Paragon 2 Technical Reference Manual available at www.broadway-limited.com for more information.

Connecting Locomotive and Tender

Before you can operate your new steam engine, you must connect the locomotive and tender. First, locate the short “tether” cable protruding from the front of the tender. Next, locate the matching socket located under the cab on the rear of your locomotive. Notice whether the pins are located at the top or bottom of the socket. Also notice the location of the holes on the end of the tether cable. Using your finger, small pliers, or tweezers, firmly insert the tether cable into the socket on the rear of your locomotive. If you do not insert this completely, you will have continuous problems with intermittent power pick-up. If your locomotive is making sound, but is not moving, your tether cable is not firmly seated in the socket.



Smoke

If your engine is equipped with a smoke generator, DO NOT OPERATE THE SMOKE UNIT WITHOUT SMOKE FLUID. Doing so will damage the engine. The smoke unit heater can be physically turned off using the switch located beneath the cab (or behind the smokebox door on some models). If the switch is on, the smoke can be turned on and off using the AUX button on the DC Master or F7 on your DCC controller. Before using, add 6-8 drops of fluid to the smoke unit using the small plastic funnel that came with your locomotive. Drop the fluid directly into the locomotive's smokestack. If the smoke unit is hot, do not lower the funnel too far into the smokestack as you could accidentally contact the heating element. If you melt plastic onto the heating element, your locomotive will not be able to produce smoke. Whenever the smoke starts to look thin, add another 3-4 drops (enough for 15-20 minutes run time). There are 2 CV's used to adjust the smoke output by controlling the heat. CV236 controls the level while moving, and CV 237 controls the level at idle.

Operation with a DC Power Pack

Your Paragon 2 Steam locomotive is ready-to-run. Simply place the locomotive on a track powered by any DC power pack with a variable output up to 16 volts DC. As you increase the track voltage, the sound system will begin functioning at around 7 volts DC. If you increase track power slowly, you will hear the sound of a steam locomotive starting. As you slowly increase track voltage, the engine will start to move. There are a number of sounds the locomotive will produce automatically to simulate the sound of a full-size steam locomotive.

If you do not use DCC, the DC Master Analog Control Module (BLI stk# 1011 or PCM stk# 1001), is required for activation of the whistle, bell and some other sounds, and to control the volume. It can also program CV's without a DCC system. The DC Master is shown in figure 1, connected between the power pack and the track.

Figure 1 on following page.

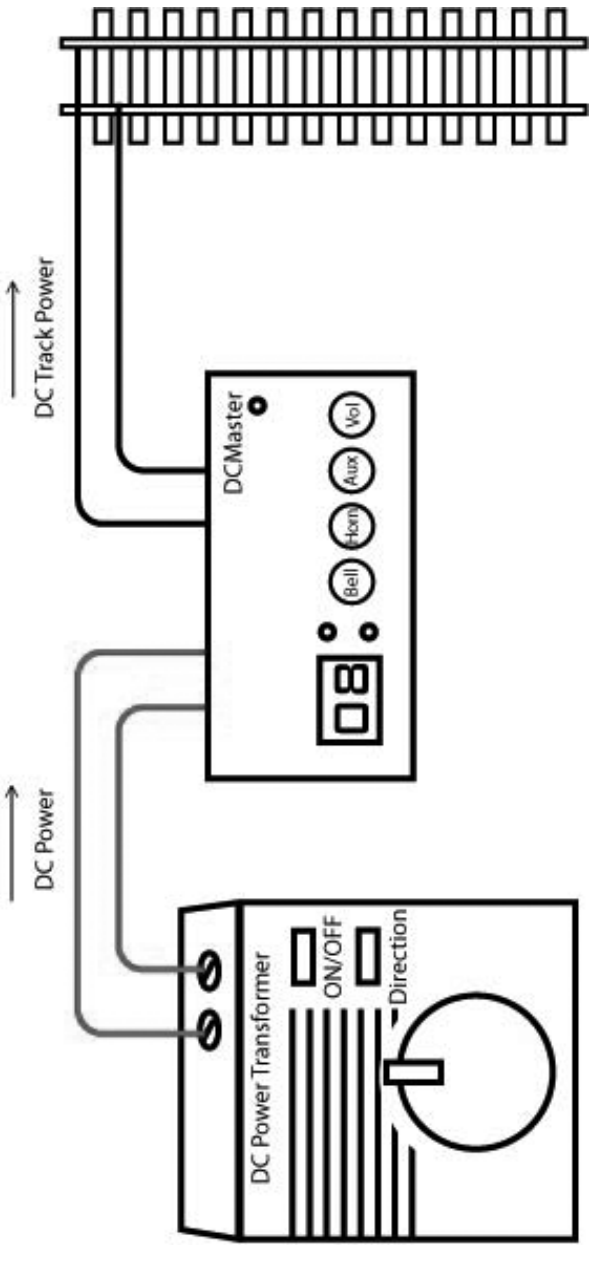

DC Track Power
DCMaster
Bell
Horn
Aux
Vol
DC Power
DC Power Transformer
ON/OFF
Direction

Figure 1.

Manually Activated Sounds

Whistle	Plays when the "horn" button on the DC Master is pressed. The Paragon 2 whistle is highly playable. A quick press and release plays a short whistle blast. Holding down longer and releasing produces a long whistle blast. Holding the horn active for a long blast, releasing quickly and pressing again, then releasing, plays an alternative whistle ending. This ending is unique for each locomotive. There are 3 whistles, selected by setting CV224 to 0, 1, or 2. The whistle can be set to automatically play warning blasts when the loco starts and stops by setting CV 227 to 6. Set CV 227 back to 2 to turn off.
Bell	The bell turns on when the "bell" button on the DC Master is pressed. It turns off when the "bell" button on the DC Master is pressed a second time. The interval between bell rings can be adjusted by setting CV180. A lower number is faster.
Air Pump	Press the "AUX" button on the DCMaster while the locomotive is stopped.
Smoke	If your model is equipped with a smoke unit, it can be turned on/off using a manual toggle switch that is located either inside the smoke box door on the boiler front or on the underside of the locomotive body. ***Important: Do not operate the smoke unit without smoke fluid, or it will be damaged.***

Automatically Activated Sounds

Startup	The sound of a steam locomotive starting is heard when the track power is turned on.
Shutdown	The sound of a steam locomotive being turned off is heard when track power is lowered to about 5 volts.
Brake Set	Plays automatically when the locomotive shuts down.
Brake Release	Plays automatically when the locomotive starts up.
Brake Squeal	Plays automatically when the locomotive is slowed quickly.
Steam Chuff	The sound of steam chuffs is automatically played when the engine moves. The intensity of the steam chuff is related to how hard the engine is working. When the engine is under a heavy load, the chuff sound will be much sharper, and the smoke output will increase. When the load is reduced, the chuff sound will be softer and the smoke output reduced.

Randomly Activated Sounds

The following sounds will be heard when the locomotive is running or sitting at idle. Various other random sounds may play if appropriate for each locomotive.

Air Pump
Blower
Coal shovel or auger
Injector
Steam Cock
Blow Down
Pop-off Valve

Volume/Mute

To mute the sounds, press the "Vol" button once. To turn the sounds back on, press the "Vol" button once. Horn and bell still work when the other sounds are muted.

Your Paragon 2 locomotive's sound system has 8 volume levels that can be set from the DCMaster. At startup, it is at the loudest setting. To lower the volume, press the "Vol" button on the DCMaster two times quickly (like double-clicking a mouse button on a PC). The volume will decrease 1 level each time you do this. When the lowest level is reached the volume will start to increase with subsequent double-clicks of the button until the highest volume level is reached, at which point the locomotive brake sound will play to signal maximum volume.

Tip: To make the locomotive always start at a lower volume, set CV 133 to some number lower than 128. 0 is off, 128 is max.

Tip: The volume of many sound features can be set independent of the overall volume by setting CV's 135 through 158 with the DC Master. See the next section.

Setting Configuration Variables (CV's) without DCC

Your Paragon 2 locomotive's sound system is highly configurable even without DCC by using the DCMaster. Most of the locomotive's functions are controlled by setting Configuration Variables (CV's). To change a CV:

1. Place the locomotive on the track with track power off. Hold down both the "Aux" and Vol" buttons on the DCMaster while turning track power on to maximum voltage. The locomotive will not move. The display on the DCMaster will read "E01."

2. Press the bell(-) button or horn(+) button to scroll past E15, then to the CV numbers which range from 1-255 (There is no 'E' in front of the CV numbers.) Stop at the one you want to change and press the "Vol" button.

3. Use the bell(-) button or horn(+) button to scroll to the new value, then press “Vol” to accept. The locomotive will make a ‘beep’ sound to acknowledge. It will not beep if the CV was already set to the number entered.

4. Turn off track power to finish programming.

Tip: The locomotive you are setting should be the only DC Master compatible locomotive on the track. Otherwise all locomotives on the track will have their CV’s reset.

Changing the function of the AUX button.

The AUX button can be made to do other functions by changing CV222 with the DC Master. Select the desired function from the table on pages 17-18 and enter it into CV222. See page 11 for a listing of the functions and their descriptions.

Commonly used DC settings are shown below:

#	*Name*	*Description*	*Usual values*	*Factory Setting*
CV8	Master Reset	Setting CV8 to 8 resets everything to factory settings.	8	38
CV131	Sound Unit Startup voltage	A lower number causes the sounds to start at a lower track voltage.	0-255	178
CV132	Sound Unit Shutdown voltage	A lower number causes the sounds to shut down at a lower track voltage.	0-255	62
CV135	Whistle Volume	higher number is louder.	0-255	128
CV136	Bell Volume	higher number is louder.	0-255	128
CV137	Steam Background Volume	higher number is louder.	0-255	128
CV138	Whistle 2 Volume	higher number is louder.	0-255	128
CV139	Coupler Slack Volume	higher number is louder.	0-255	128
CV140	Coupler Volume	higher number is louder.	0-255	128
CV141	Uncouple Volume	higher number is louder.	0-255	128
CV142	Wheel Flange Volume	higher number is louder.	0-255	128
CV143	Air Pump Volume	higher number is louder.	0-255	128
CV144	Blow Down Volume	higher number is louder.	0-255	128
CV145	Steam Cock Volume	higher number is louder.	0-255	128
CV146	Brake Set Volume	higher number is louder.	0-255	128
CV147	Brake Release Volume	higher number is louder.	0-255	128
CV148	Pop Off Valve Volume	higher number is louder.	0-255	128
CV149	Blower Volume	higher number is louder.	0-255	128
CV150	Dynamo Volume	higher number is louder.	0-255	128

CV151	Brake Squeal Volume	higher number is louder.	0-255	128
CV152	Coal Auger/ Shovel Volume	higher number is louder.	0-255	128
CV153	Water Fill Volume	higher number is louder.	0-255	128
CV154	Water Injector Volume	higher number is louder.	0-255	128
CV155	Chuff Volume	higher number is louder.	0-255	128
CV156	Passenger /Freight Volume	higher number is louder.	0-255	128
CV157	Maintenance/ Radio comm. volume	higher number is louder.	0-255	128
CV158	City/Farm/ Industrial/ Lumber Volume	higher number is louder.	0-255	128
CV180	Bell Ring Interval	Increasing increases the time between bell rings	0-255	40 (varies)
CV184	DC Brake Control	Increase to play the brake sound more frequently	0-255	20
CV188	Pitch Shift	Change to alter pitch of all sounds. Makes 2 locomotives sound different	0-255	128
CV222	Analog AUX Select for DCMaster	Selects which function is controlled by the Aux button.	see p. 23	5
CV 224	Horn Select	Selects one of 3 horns	0,1,2	0
CV 227	Forward/ Reverse Warning	Set to 6 to turn on automatic horn toot when starting. Set to 2 to turn off.	2,6	2
CV230	DC Easy Consist	Set consist position as front, middle or rear locomotive. Rear locomotive is facing rear. 0=single locomotive 1=front locomotive 2=middle eng. 3=rear locomotive	0-3	0
CV236	Smoke unit heat level when moving	Set to higher level to increase smoke while moving.	0-90	80
Cv237	Smoke unit heat level when stopped	Set to higher level to increase smoke while stopped.	0-50	50
CV245	Enable Alternate Horn Ending	16=disable 17=enable	16,17	17
CV248	Start Up Delay	Delays motor start to let engine start up sounds finish before moving. Each number is 0.1 seconds.	0-255	20
CV251	Enhanced DC Motor Control Vmax	Voltage at which 100% of track power is sent to motor. (Must be greater than Vmin)	0-255	120
CV252	Enhanced DC Motor Control Vmin	Track voltage at which motor will start moving. A Lower Value = Lower Start Voltage	0-255	92

Consists

Paragon 2 locomotives can be set to run in a DC consist with each other by setting CV 230 to 1,2, or 3, which designates the locomotive as front, middle or rear facing rear locomotive, respectively. The rear loco facing backwards since railroads commonly run the rear loco in reverse. This automatically sets the lights, bell and horn to respond appropriately. To break the consist, simply program zero into CV230. (To make the rear facing loco forward facing, Set CV230 to 3, then change CV229 to 1 to enable the rear light.)

BLI's Paragon 2 Locomotives are programmed from the factory to start-up just like the prototype, utilizing a realistic motor start-up delay that lets the steam engine starting sounds finish before the train moves. To minimize this delay and allow the locomotive to start moving instantly, decrease CV 248 to a value of 0 using the DC Master (See Page 6 of this manual).

Paragon 2 locomotives start moving at a higher track voltage than non-sound locomotives. This is done to allow the sound system to start working before the locomotives moves. As a result, it is difficult to consist a sound locomotive with a non sound locomotive in DC operation.

DCC Operation

Paragon 2 Locomotives come equipped with an integral DCC decoder. It automatically detects if you are using a DCC system and responds appropriately.

FACTORY DEFAULT ADDRESS = 3.
To Reset, set CV8 = 8.

When programming on the main line in Operations Mode, the locomotive will beep to indicate when a CV is changed. It will not beep if the same number is programmed into a CV. It will not beep on the program track.

DCC Programming

To change the engine ID, first, make sure you can run the locomotive as engine #3 and blow the horn. Then, reprogram the engine ID on the main track or the program track following the procedure for your DCC system. (Note: Lenz systems do not allow changing address on the main line. Use the program track. See page 24.)

Steam Engine Function Key Definitions

Paragon 2 locomotives have the ability to use dozens of functions. If your DCC system does not support this many functions, the function you want to use can be assigned

to the function keys available on your DCC system. The default function keys are listed below. To change the assignments, see page 16.

Function Key	Description
F0	Front Light/Rear Light
F1	Bell
F2	Whistle
F3	Coupler Slack/Couple
F4	Air Pump
F5	When stopped: Blow Down When Moving: Increase Chuff Intensity
F6	When stopped: Water Fill When Moving: Decrease Chuff Intensity
F7	Smoke On/Off (if equipped)
F8	Volume/Mute
F9	Startup / Shutdown Engine
F10	Coal Shovel or Auger
F11	Water Injectors
F12	Brake Set/ Brake Release When Moving: Brake Squeal
F13	Grade Crossing Horn
F14	Passenger Announcements
F15	Freight Announcements
F16	Maintenance Sounds
F17	Radio Sounds
F18	City background sounds
F19	Farm background sounds
F20	Industrial Background Sounds
F21	Lumber Background Sounds
F22	Toggle to second horn
F23	Mars Light on/off
F24	
F25	
F26	Play recorded macro
F27	Record Start/Stop
F28	Brake Squeal

Front and Rear Light (F0)

Pressing F0 turns the front and rear light on and off. The light intensity can be adjusted with CV 231.

Bell (F1)

Pressing F1 turns on the bell. Most controllers allow the bell to stay on until the F1 is pressed a second time. Lower CV 180 to speed up the bell.

Whistle (F2)

Pressing F2 activates the Whistle. The Paragon 2 whistle is highly playable. A quick press and release plays a short whistle blast while holding down and releasing produces a long whistle blast. Holding the whistle button for a long blast, releasing quickly and pressing again, then releasing, plays an alternative whistle ending. This ending is unique for each locomotive.

There are 3 whistles, selected by setting CV 224 to 0,1, or 2. There is an alternate whistle, which can be toggled in place of the main horn by pressing F22.

Some DCC controllers, including Digitrax DT400 and NCE Procab, have the ability to "quill" the whistle. This model is equipped with a variable "analog" whistle function that will operate if your system is capable of sending the signal. See P. 22.

The whistle can be set to automatically play warning blasts when the loco starts and stops by setting CV 227 to 6. Set CV 227 back to 2 to turn off.

Coupler (F3)

Pressing F3 when the locomotive is moving causes a coupling sound effect to play. The effect simulates two cars coupling. The sound of the slack between the cars being removed may be simulated by pressing F3 when the locomotive is stopped. This action arms the sound, making it ready to play. The actual slack sound effect plays when the engine starts moving.

Air Pump (F4)

Pressing F4 activates the air pump. Pressing F4 once the air pump is active shuts the air pump off.

Blow Down/Increase Chuff Magnitude (F5)

The blow down sound effect may be activated by pressing F5 when the engine is stopped. Pressing F5 when the engine is moving increases the chuff volume with each press. CV204 (Chuff Magnitude Increment) dictates the magnitude of change per F5 press.

Water Fill/Decrease Chuff Magnitude (F6)

The water fill sound effect may be activated when the engine is stopped. See Water Fill. Pressing F6 when the engine is moving decreases the chuff volume with each press. CV205 (Chuff Magnitude Decrement) dictates the magnitude of change per F6 press.

Smoke (F7)

Pressing F7 will turn on the smoke unit. Pressing F7 again will turn off the smoke unit. The smoke unit output can be adjusted using CV's 236 and 237. The smoke unit should never be operated without fluid or it will be damaged. It can be disabled by turning off the switch behind the smoke box door.

Master Volume and Mute (F8)

To mute the sounds, press the F8 button once. To turn the sounds back on, press the F8 button once. Whistle and bell still work when the other sounds are muted.

There are 8 volume levels that can be set from the DCC handheld controller. At startup, it is at the loudest setting. To lower the volume, press the F8 button two times quickly (like double-clicking a mouse button on your PC). The volume will decrease one level each time you do this. When the lowest level is reached the volume will start to increase with subsequent double-clicks of the button until the highest volume level is reached, at which point the locomotive brake sound will play to signal maximum volume. Tip: To make the locomotive always start at a lower volume, set CV 133 to some number lower than 128. 0 is off, 128 is max.

Startup/Shutdown Steam Engine (F9)

The sound system powers up with all sound effects off. The startup sound effect is played by throttling up or by pressing F9. If the locomotive is already playing sound effects, pressing F9 initiates the shutdown locomotive sound effect. If the engine is not idling, F9 is ignored.

Shovel Coal (F10)

Pressing F10 activates shovel coal sound effect. Once this effect is active, pressing F10 turns the effect off. This button should not be pressed on oil burning models.

Injector (F11)

Pressing F11 activates the water injector sound. Once this effect is active, pressing F11 turns the effect off.

Brake Set and Brake Release (F12)

When the locomotive is at speed step zero, pressing F12 activates the brake set sound effect. When the locomotive is above speed step zero, pressing F12 activates the brake release sound effect.

Above speed step 5, F12 plays the brake squeal.

Brake Squeal

A sudden decrease in throttle activates the brake squeal sound effect. DCC Brake Control (CV185) controls how sensitive the brakes are to changes in throttle. The factory value is 20. Increasing this value decreases the brake sensitivity while decreasing this value increases the sensitivity. Set to 5 for 28 speed step operation.

Grade Crossing Whistle (F13)

Pressing F13 automatically plays a long-long-short-long whistle sequence as a warning at grade crossings.

Passenger Sounds (F14)

When stopped, press F14 to play a passenger train departing message. Do not press this button if you do not have a passenger train, as this will cause unprototypical operation. After pressing, other passenger departure sounds will be heard when the train starts to move. If the train has been moving for over 30 seconds, pressing F14 will play station arrival messages.

Freight Sounds (F15)

When stopped, press F15 to play a Freight train departing message. Do not press this button if you do not have a Freight train, as this will cause unprototypical operation. After pressing, other Freight departure sounds will be heard when the train starts to move. If the train has been moving for over 30 seconds, pressing F15 will play freight yard arrival messages.

F16 - F21 play one of 4 messages in random order.

F16 is Maintenance Facility Sounds.
F17 is Crew Radio Messages
F18 is radio chatter heard in a city.
F19 is radio chatter heard on a farm.
F20 is industrial sounds.
F21 is lumber mill sounds.

Caution: Do not press these buttons if the corresponding background sound is not appropriate for your layout.

Whistle Toggle (F22)

Whistle Toggles (F22) between the main and an alternate whistle. This is useful for locomotives equipped with more than one whistle/horn.

Mars Light (F23)

Turns on/off the MARS light if the model is so equipped.

Macro Recording (F26 and F27)

When operating in DCC, the operation of the locomotive

can be recorded and later played back. To use this function, press F27. (If your DCC system does not have an F27 key, assign that function to a key you do have using the directions on page 15.) The front light will flash and the sound will momentarily stop. Once the sound starts again, every keystroke will be recorded. Operate the train as you normally would, being careful not to adjust the throttle too much, as this uses recording space quickly. When finished recording, press F27 again to stop recording. The rear light will flash indicating the recording has been saved. Be careful not to accidentally hit F27 again, as this will start recording over your previous recording. If this happens, interrupt track power before hitting F27 again.

Press F26 to replay. During replay, the DCC controller cannot control the engine. To interrupt the playback, either interrupt track power, or press the emergency stop button.

CV 238 controls the number of times the recording will repeat, between 1-14 times by setting the value to 64 plus the number of repeats. Setting CV 238 to 79 makes the recording repeat indefinitely. The timing of the loop can be shortened by setting CV239. Its range is from 0-255. Each number shortens the loop by 0.1 seconds.

The engine contains a pre-recorded sequence. To load it, set CV8 to a value of 10. Then press F26 to play. This works well for demonstrations and will repeat indefinitely if CV238 = 79.

NOTE: There is a limited amount of recording space available. If the space is used up, the engine will repeatedly make a coupler clanking sound to indicate the memory is full. The engine can run for a long time without using more space, but changing the throttle uses space quickly. 28 speed step mode is best for recording, since it uses less space.

Function Key Mapping

Most DCC systems have between 8 and 28 function buttons. Since the Paragon 2 sound system has more than 28 functions, the functions can be made to work on any function button. This is done by entering the value of the function into the CV associated with the button.

Button	*CV*
F0	CV 33
F1	CV 34
F2	CV 35
F3	CV 36
F4	CV 37
F5	CV 38
F6	CV 39
F7	CV 40
F8	CV 41
F9	CV 42
F10	CV 43
F11	CV 44
F12	CV 45
F13	CV 46
F14	CV 47
F15	CV 48
F16	CV 49
F17	CV 50
F18	CV 51
F19	CV 52
F20	CV 53
F21	CV 54
F22	CV 55
F23	CV 56
F24	CV 57
F25	CV 58
F26	CV 59
F27	CV 60
F28	CV 61

The table below shows the available functions. To assign one of these functions to a function button, enter the value into the CV for the desired function button. For Example, to assign Grade Crossing to Function 7, enter 30 into CV40.

Description	***Value***
Nothing	0
Headlight & Rear Light on/off	1
Bell on/off	2
Whistle	3
Couple/Uncouple	4
Air Pump	5
Blow Down/Chuff Increase	6
Water Fill/ Chuff Decrease	7
Mars Lights	8
Volume/Mute	9
Startup/Shutdown	10
Coal Auger or Shovel	11
Water Injector	12
Brake	13
Steam Cock	14
Pop Off	15
Wheel Flange	16
Coupler Slack	17
Brake Squeal	18
Horn 2 Toggle	19
Smoke Control	21
Grade Crossing Horn	30
Play Macro	40
Record Macro	41
Passenger Sounds	50
Freight Sounds	51
Maintenance Sounds	52
Radio Chatter	53
City Sounds	54
Farm Sounds	55
Industrial Sounds	56
Lumber Sounds	57

Cab Light on/off	60
Rule 17 dimming	61

The function keys can be mapped to closely match the functions of several other sound systems by setting CV8 to the manufacturers code for the engine you want to match.

CV8 = 38 matches F0 - 12 with BLI Blueline Engine
CV8 = 113 matches most QSI equipped engines.
CV8 = 141 matches Sound Traxx Tsunami equipped engines.

CV Programming

The sound and operation of Paragon 2 locomotives can be customized by setting a number of configuration variables (CV's). A list of DCC settings is shown on page 20. Broadway Limited Imports recommends programming your Paragon 2 locomotives on the main track using Operations Mode programming or using Direct mode or Paged mode on the programming track.

Reading CV's

Digitrax and Lenz systems can read Paragon 2 CV's in any mode. Most MRC and NCE systems require a programming track booster to read CV's, such as the Power Pax by DCC Specialties. A booster is not required to operate the train or to program CV's.

Resetting to Factory Default

The Paragon 2 sound system can be reset to the factory default by setting CV8 to a value of 8. If this cannot be accomplished, the system can be manually reset by holding down the tiny reset button on the sound circuit board while turning on track power.

DCC Easy Consist

Start with each engine having a unique address.

You can create a consist by designating each engine as front, middle, or rear, then setting the consist address.

CV230 designates the position in the consist as follows:

CV230 = 1 for the Front Engine
CV230 = 2 for all Middle Engines
CV230 = 3 for the Rear Engine

Front Engine: Set CV230 = 1. Pick a consist address between 1 and 127 (10 for example) and program it into CV19.

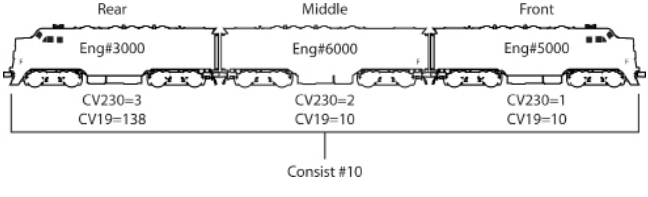
Middle Engines: Set CV230 = 2. Set CV19 = consist address (10 for example). (For a rear facing engine, Set CV 19 = the consist address plus 128. (138 for example if the consist address is 10).

Rear Facing Rear Engine: Set CV230 = 3. Set CV 19 = the consist address plus 128. (138 for example if the consist address is 10).

Front Facing Rear Engine: Set CV230 = 3. Set CV19 = Consist Address, then set CV 229=1 to set the lights.

Operate the consist by selecting its address as if it were a locomotive (Select loco #10 for example).

Note: Setting CV19 to zero removes the engine from the consist.



Motor Control

The Paragon 2 system features outstanding back EMF speed control for both DC and DCC use. The back EMF feature can be turned off by changing CV10 to 0. Change to 1 to turn back EMF on again.

The motor movement can be delayed after turning the throttle to allow the engine sound to rev up before movement. To enable this feature, set CV 245 to 18 or 19. Set back to 16 or 17 to disable. Once enabled, the delay can be adjusted by setting CV 248.

CV2, 6 and 5 control the motor start, mid range and maximum voltages. The possible values are from 0 to 255. 0 would cause the motor voltage to be 0 and 255 would cause it to be 100 % on. These can be used to adjust 2 different locomotives to start and run at the same speeds. Usually the back EMF must be turned off on one or all of the engines to enable different types of engines to run together smoothly.

CV95 is the Forward/Reverse Trim, used to make the forward and reverse speed match if they are different. Setting the value from 1-127 makes the engine run slower in reverse. 1 is the slowest. Setting CV95 from 129 to 255 makes it run faster in reverse. 255 is the fastest. A value of 0 or 128 disables the feature.

CV2 is the start voltage, and determines the motor voltage at speed step 1. If back EMF is disabled, this value must be high enough to get the engine moving.
CV6 is the motor voltage at the middle speed step. It must be greater than CV2 and less than CV5.

CV5 is the motor voltage at the highest speed step.

CV3 sets the acceleration rate. Its range is from 0 to 255. Setting to 20 makes the engine take an additional 20 seconds to accelerate from stopped to full speed.
CV4 sets the deceleration rate. Its range is from 0 to 255. Setting to 20 makes the engine take an additional 20 seconds to decelerate from full speed to stopped.

Speed Table: If setting CV2, 5, and 6 is not sufficient to make 2 engines run together through the entire speed range, the speed at each step can be set using CV's 67 through 94. To use these values, CV29, bit 4 must equal 1. See Paragon 2 Technical Reference Manual for specifics. This should only be attempted by experienced users.

DCC CV's, descriptions, and default settings:

#	Name	Description	Usual values	Factory Setting
CV1	Primary Address	DCC address	1-127	3
CV2	V START	motor voltage at step 1	0-255	1
CV3	Acceleration delay	Simulates heavy train	0-255	5
CV4	Deceleration delay	Simulates heavy train	0-255	5
CV5	V MAX	Motor Voltage at top speed step	0-255	250
CV6	V MID	Motor voltage at middle speed step	0-255	50
CV7	Manufacturer Version	Read only software version		Varies
CV8	Manufacturer ID	NMRA manufacturers ID number	38	38
CV10	Back EMF on/off	Set to 0 to turn off back EMF speed control. Set to 1 to turn on.	0, 1	1
CV15	Unlock ID Code	Unlocked when CV15=CV16	0,1,2,3	0
CV16	Lock ID Number	Lock	0,1,2,3	0
CV17	Extended Address MSB	Valid when CV29 bit 5 =1, see tech manual	0-10239	Engine 128
CV18	Extended Address LSB	Valid when CV29 bit 5 =1	0-10239	Engine 128
CV19	Consist Address	See page 16	0-255	0
CV21	Consist Address Functions Type 0	see tech manual	0-255	255
CV22	Consist Address Functions Type 1	see tech manual		
CV29	Configuration Bits	see tech manual		
CV33-61	Function Key assignment	selects which function is activated by keys F0-F28	See P 22	
CV67-94	Speed Table Entries	See Tech Manual		
CV95	Reverse Trim	Values less than 128 make engine run slower in reverse. Values over 128 make engine faster in reverse.	0-255	0
CV133	Sound Unit Master Volume	Volume at start up. Higher number is louder.	0-128	128
CV135	Whistle Volume	higher number is louder.	0-255	128
CV136	Bell Volume	higher number is louder.	0-255	128
CV137	Steam Background Volume	higher number is louder.	0-255	128
CV138	Whistle 2 Volume	higher number is louder.	0-255	128
CV139	Coupler Slack Volume	higher number is louder.	0-255	128
CV140	Coupler Volume	higher number is louder.	0-255	128
CV141	Uncouple Volume	higher number is louder.	0-255	128
CV142	Wheel Flange Volume	higher number is louder.	0-255	128
CV143	Air Pump Volume	higher number is louder.	0-255	128
CV144	Blow Down Volume	higher number is louder.	0-255	128
CV145	Steam Cock Volume	higher number is louder.	0-255	128
CV146	Brake Set Volume	higher number is louder.	0-255	128
CV147	Brake Release Volume	higher number is louder.	0-255	128
CV148	Pop Off Valve Volume	higher number is louder.	0-255	128
CV149	Blower Volume	higher number is louder.	0-255	128
CV150	Dynamo Volume	higher number is louder.	0-255	128
CV151	Brake Squeal Volume	higher number is louder.	0-255	128
CV152	Coal Auger/Shovel Volume	higher number is louder.	0-255	128
CV153	Water Fill Volume	higher number is louder.	0-255	128
CV154	Water Injector Volume	higher number is louder.	0-255	128
CV155	Chuff Volume	higher number is louder.	0-255	128
CV156	Passenger /Freight Volume	higher number is louder.	0-255	128
CV157	Maintenance/Radio comm. volume	higher number is louder.	0-255	128
CV158	City/Farm/Industrial/ Lumber Volume	higher number is louder.	0-255	128
CV180	Bell Ring Interval	Increasing increases the time between bell rings	0-120	Varies
CV185	DCC Brake Control	increasing decreases brake sensitivity	0-255	20

CV188	Pitch Shift	Change to alter pitch of all sounds. Makes 2 locomotives sound different	0-255	128
CV194	Articulated Chuff Offset	Initial angular offset between front and rear drivers set in articulated engine.	0-25	17
CV195	Slip Timer	Time in seconds for articulated drivers to slip one increment.	0-255	20
CV196	Steam Cocks	Number of wheel rotations for which open steam cocks are heard.	0-255	2
CV197	Rod Knock	Number of wheel rotations for which open steam cocks are heard.	0-255	2
CV208	DCC Cab Light Throttle Stop (if equ ipped)	If equipped, cab light is turned on below this speed step. 0 is always on. 255 is always off.	0-255	3
CV209	DCC Brake Set Throttle Stop	Brake is set below this throttle level.	0-128	0
CV210	DCC Brake Release Throttle Stop	Brake is released when speed exceeds this throttle level.	0-128	1
CV 224	Horn Select	Selects one of 3 main horns.	0,1,2	0
CV225	DCC Control One	see tech manual		
CV226	DCC Control Two	see tech manual		
CV227	FWD/Reverse Warning	2 turns off horn toots to ward when starting. 6 turns on.	2 or 6	2
CV229	DCC Extended Consist Lighting	see tech manual		
CV230	DCC Easy Consist	0=single locomotive, 1=front, 2=middle, 3-rear locomotive in consist.	0,1,2,3	0
CV 231	Headlight brightness	Decrease to dim headlight and rear light.	4-100	100
CV236	Smoke unit heat level when moving	Set to higher level to increase smoke while moving.	0-90	80
Cv237	Smoke unit heat level when stopped	Set to higher level to increase smoke while stopped.	0-50	50
CV238	Loop Repeat	Set to 64 plus the number of repeats, up to 14. 65= 1 repeat, 66=2 repeat, etc. Set to 79 to repeat indefinitely.	65-79	79
CV239	Macro Loop Adjust	Increasing by 1 shortens the playback loop by 0.1 second.	0-255	0
CV240	Random Sound Generator Occurrence	Increasing decreases how often random sounds occur.	1-20	4
CV245	Enable Alternate Horn Ending and start delay	16=both disabled 17= horn ending enabled 18=Start Delay enabled. 19=Both enabled.	16,17,18,19	17
CV248	Motor Start Delay	sets start delay in 0.1 second increments.	0-255	20

Write down your favorite settings:

CV #	Name	Value

Articulated Engines

The chuff sounds on Paragon 2 articulated engines are designed to sound like the chuff sounds of a real articulated engine. For compound articulated engines, this will result in hearing 4 chuffs per revolution of the drivers. For simple articulated's, 8 chuffs are heard, 4 from the front engine and 4 from the rear. Because the wheels on real locomotives slip, the front and rear chuff sounds come in and out of phase with each other. The sound system simulates this. At start up, the sounds will be somewhat evenly spaced. Every 20 seconds of operation, the sounds can be heard to slip. This time can be changed using CV195. Setting to 0 stops the slip. CV196 can be adjusted to set the initial timing between the front and rear engines. Setting to zero will make the articulated engine sound like a traditional steam engine at start up.

DCC Programming Quick Reference Guide

FACTORY DEFAULT ADDRESS = 3
FACTORY RESET: Set CV 8 = 8

Programming Paragon 2 locomotives using locomotives using Lenz Digital Plus system.

The Lenz system does not allow programming locomotive ID on the main track. To program on the program track:

Press F, then 8.

The display should flash "PROGRAM". Press enter.

Press the "ENTER" key until the display reads "DIR".

Press enter, then press + repeatedly until the display reads "ADR" then press enter.
The display should read "A*_". Enter the address, 2477 for example, and press enter. The engine should beep several times and display the new address as A*2477

**If an error occurs, you will get a message like "ERR02". Press "ESC" and quickly re-enter the address. (You may have to do this several times. This is because the sound decoder has a capacitor that charges when the track power is turned on to begin programming. This interferes with the programming signal. Once the signal is sent quickly several times, the capacitor will be fully charged and will no longer interfere. If this is not successful, the address can be entered manually by setting CV 17, 18 and 29. Call service for assistance.

To RESET Paragon 2 locomotive to factory default using Lenz system on the Program Track: Place the locomotive on the programming track.

Press F, then 8. The display should flash PROGRAM. Press enter. Press the + key until the display reads CV.

Press 8. Press Enter.

Press 8. Press Enter. The locomotive should not beep to indicate the CV was changed.

Press ESC twice. The locomotive ID # is now 3.

To enable the quillable analog whistle function using the Digitrax DT400.

Press the "OPTN" button, then press "enter" twice. The display should read "Option 3=XXX", where xxx is a number, x01 for example. Ad d 80 to that value by spinning the right throttle, to make it x81. Press "Exit".

The horn button is now pressure sensitive and will change the horn sound depending on how hard the button is pressed. Notice that the bar graph on the display now shows how hard the button is being pressed.

To enable the quillable analog horn function using the NCE Procab system.

NOTE: The NCE system must have software dated March 2007 or later. To check, press "Prog" until "Set CMD Station" is displayed. Press "Enter". The software date will show. If you need to update, NCE will send a new chip to install in the system for a nominal fee.

To enable, press "Prog" until "SET CAB PARAMS" is displayed. Press enter repeatedly until "ANALOG HORN CHANNEL" is displayed. Press "127, then "ENTER".

Press Enter until ANALOG BIAS is shown. Press 8, then ENTER. Press ESC.

Now, while pressing the horn button, the pitch can be changed by turning the throttle.

To enable Functions F13-28 using the NCE Procab system.

NOTE: The NCE system must have software dated March 2007 or later. To check, press “Prog” until “Set CMD Station” is displayed. Press “Enter”. The software date will show. If you need to update, NCE will send a new chip to install in the system for a nominal fee.

With the system on, disconnect the plug from the handheld. Hold down the “Select Loco” key while plugging the cable back in. Press “enter” repeatedly until “Program Option Key Value” is displayed. Press 122, enter. Press Esc.

Now, pressing the option key 1 time will make keys F1-9 act as 11-19, pressing twice will make keys F1-9 act as functions 20-29.

Pressing EXPN will now show the status of all 28 functions.

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