SoundTraxx Mobile Decoders

Blackstone Models Open Platform Passenger Coach and Long Caboose Lighting Decoder Technical Reference

Software Release 1.00

Primary CVs

CV 1
Primary Address Control

Description
Contains the decoder's primary address between 1 and 127:

Bit 7   **Bit 0**

0	A6	A5	A4	A3	A2	A1	A0

Bit 0-6:   A0-A6, Decoder Address
Bit 7:   Not used. Must be set to 0!

The decoder will process all valid instruction packets containing an address that matches the value contained in this register when CV 29, bit 5 is set to 0.

Programming this register with a new value will automatically clear the Consist Address (CV 19) to 0 and clear the Extended Address Enable bit in CV 29 (bit 5).

The decoder will ignore commands that attempt to program this register with values outside the range of 1 to 127.

Note that CV 1 can only be changed in operations mode if the extended address is enabled.

Default Value: 3
Related CVs: See also CV 29, Consist Address, Extended Address

CV 7
Manufacturer Version ID (Read Only)

Description
Contains 8-bit software version identifier.

Bit 7							Bit 0
D7	D6	D5	D4	D3	D2	D1	D0

D0-D7: Version Code

68 = SoundTraxx Lighting Decoder

This CV is read only and cannot be modified.

CV 8
Manufacturer ID

Description

Contains the NMRA issued Manufacturer ID code assignment for SoundTraxx/Throttle Up! (141):

Bit 7							Bit 0
1	0	0	0	1	1	0	1

Writing a value of 8 to this CV will reset all CVs to their default value. All other write operations will be ignored.

CV 12
Power Source Conversion

Description
Defines the type of power source the decoder should switch to whenever a DCC signal is not present and the APS bit of CV 29 (bit 2) is set.

Bit 7   **Bit 0**

D7	D6	D5	D4	D3	D2	D1	D0

D0-D7:   Alternate Power Source
                           0 = No Alternate Power Source Available
                           1 = Analog Power Supply

Default value: 1

CV 13
Analog Function Enable 1

Description
Defines whether functions 1-8 are active during analog mode operation. If the bit is set, the corresponding function will be mapped to the output as defined by CVs 33-46.

Bit 7   **Bit 0**

F8	F7	F6	F5	F4	F3	F2	F1

F1-F8: Analog Function Enable Bit
0 = Function is disabled for analog operation
1 = Function is enabled for analog operation

Default value: 48

CV 14
Analog Function Enable 2

Description

Defines whether functions 9-12 are active during analog mode operation. If the bit is set, the corresponding function will be mapped to the output as defined by CVs 33-46.

Bit 7   **Bit 0**

		F12	F11	F10	F9	F0 (r)	F0 (f)

F0 (f):   F0 Forward Enable Bit
- 0 = Function is disabled for analog operation
- 1 = Function is enabled for analog operation

F0 (r):   F0 Reverse Enable Bit
- 0 = Function is disabled for analog operation
- 1 = Function is enabled for analog operation

F9-F12:   Analog Function Enable Bit
- 0 = Function is disabled for analog operation
- 1 = Function is enabled for analog operation

Default value: 3

CV 15
CV Unlock Register

Description
Contains a value from 0-7 that is used to unlock access to the decoder's CVs in a multi-decoder installation.

CV 15 may always be written or verified regardless of the decoder's lock status. An acknowledgment will only be generated, however, when the decoder is unlocked.

Bit 7   **Bit 0**

0	0	0	0	0	D2	D1	D0

D0-D2: Unlock Code

Locked State
If CV 15 does not match CV 16, all read and write operations to the decoder will be ignored and no acknowledgment is generated.

Unlocked State
Access to the decoder's CVs occurs only when CV 15 = CV 16.

Note: CVLCKE Bit in CV 30 must be set to enable the lock feature in CVs 15 and 16.

Default value: 0
Related CVs: See also Error Information/Alternate Mode Selection.

CV 16
CV Lock ID Code

Description

Contains a value from 0-7 that sets the unlock code that must be programmed into CV 15 in order to access the decoder's CVs in a multi-decoder installation.

CV 15 may always be written or verified regardless of the decoder's lock status. An acknowledgment will only be generated, however, when the decoder is unlocked.

Bit 7   **Bit 0**

0	0	0	0	0	ID2	ID1	ID0

ID0-ID2:   CV Lock Code

Note: CVLCKE Bit in CV 30 must be set to enable the lock feature in CVs 15 and 16.

Default Value: 0
Related CVs: See also Error Information/Alternate Mode Selection.

CV 17,18
Extended Address

Description

CV 17 and 18 make up a 'paired' CV, meaning that the two CV registers taken together hold one piece of data; in this case, the 14-bit extended decoder address:

CV 17 Extended Address MSB

Bit 7							Bit 0
A15	A14	A13	A12	A11	A10	A9	A8

CV 18 Extended Address LSB

Bit 7							Bit 0
A7	A6	A5	A4	A3	A2	A1	A0

A0-A15:   Extended Address Value

The extended address allows the decoder to be assigned one of 10,179 addresses ranging from 0xC000 to 0xE7FF (Note however, that most command stations will only recognize addresses 0000 through 9999.). The extended address will only be recognized by the decoder when CV 29, bit 5 is set to 1. Once this bit is set, the decoder will no longer recognize its primary address until CV 29, bit 5 is cleared.

CV 17 contains the most significant byte and must be loaded with values within the range of 0xC0 and 0xE7. CV 18 contains the least significant byte and may contain any value.

To determine the extended address value, add the desired four-digit address to the number 49152. Divide this number by 256 and record the quotient and the remainder. CV 17 is then programmed with the quotient value and CV 18 is programmed with the remainder value.

Example: Compute CV 17 and 18 register values for extended address 7152.

  1. Add 7152 to 49152:   *Sum = 56304.*
  2. Divide 56304 by 256:   *Quotient = 219 Remainder = 240*
  3. Program CV 17 to 219
  4. Program CV 18 to 240

Primary CVs

Note: Most command stations will handle these computations automatically when setting the extended address. However, it's still nice to know how to derive them.

Because CV 17 and 18 make up a paired CV, programming order is important. CV 17 must be written to first, followed by a write to CV 18. The decoder will ignore commands that attempt to program these registers out of order or with values outside the allowed range of 0xC000 to 0xE7FF.

These CVs may be changed in service mode at any time, but in operations mode only when CV 29, bit 5 is cleared (i.e., CV 1, Primary Address is enabled).

Default Value: CV 17 = 192, CV 18 = 03 (Long Address 0003)
Related CVs: See also Primary Address, CV 29, Consist Address.

CV 19
Consist Address

Description
Contains address and direction data for consist operation:

Bit 7   **Bit 0**

CDIR	A6	A5	A4	A3	A2	A1	A0

Bit 0-6:   A0-A6, Consist Address Value
Bit 7:   CDIR, Consist Direction
                    0 = Normal Direction
                    1 = Reverse Direction

The CDIR bit defines orientation of the car within a consist and specifies whether the direction bit in a speed/direction data packet should be inverted.

Bits A0-A6 assigns the consist address from 0 to 127. If A0-A6 = 00, consist commands are ignored. Otherwise, if the decoder receives a valid command packet whose address matches the consist address, the packet will be processed as any other packet with the following exceptions:

Long Form CV Access instructions will be ignored.

The direction bit in a speed/direction or advanced operation packet is inverted if CDIR = 1.

Only the auxiliary functions enabled in CV 21 and CV 22 are allowed to change.

When the consist address is active, advanced operations packets sent to the decoder's primary address (or extended address, if enabled) will be ignored. All other instruction packets sent to the decoder's primary (or extended) address, including CV access and function control, will continue to be processed as normal.

In summary, setting CV 19 to 0 or 128 disables consist addressing. Setting CV to a value between 1 and 127 enables consist addresses 1 to 127 with the car oriented facing forward in the consist. Setting CV to a value between 129 and 255 enables consist addresses 1 to 127 with the car oriented facing backwards in the consist.

Default Value: 0
Related CVs: See also Primary Address, Consist Function Active, Consist F0 Function Active.

CV 21
Consist Function Group 1

Description
Defines which Group 1 functions may be controlled by packets sent to the decoder's consist address. Disabled functions may be controlled only from decoder's primary or extended address:

Bit 7   **Bit 0**

F7	F6	F5	F4	F3	F2	F1	F0

Bit 0:   F1, Consist Function 1 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 1:   F2, Consist Function 2 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 2:   F3, Consist Function 3 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 3:   F4, Consist Function 4 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 4:   F5, Consist Function 5 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 5:   F6, Consist Function 6 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 6:   F7, Consist Function 7 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

Bit 7:   F8, Consist Function 8 Enable Bit
  0 = function is disabled for consist operation.
  1 = function is enabled for consist operation.

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Default Value: 0
Related CVs: See also Consist Address, Consist F0 Function Active.
  Consist F0 Function Active.

CV 22
Consist Function Group 2

Description

Defines which Group 2 functions may be controlled by packets sent to the decoder's consist address. Disabled functions may be controlled only from decoder's primary or extended address:

Bit 7   **Bit 0**

		F12	F11	F10	F9	F0 (r)	F0 (f)

Bit 0:	F0(f), Function 0, Forward enable Bit
	0 = function is disabled for consist operation.
	1 = function is enabled for consist operation.

Bit 1:	F0(r), Function 0, Reverse enable Bit
	0 = function is disabled for consist operation.
	1 = function is enabled for consist operation.

Bit 2:	F9, Consist Function 9 Enable Bit
	0 = function is disabled for consist operation.
	1 = function is enabled for consist operation.

Bit 3:	F10, Consist Function 10 Enable Bit
	0 = function is disabled for consist operation.
	1 = function is enabled for consist operation.

Bit 4:	F11, Consist Function 11 Enable Bit
	0 = function is disabled for consist operation.
	1 = function is enabled for consist operation.

Bit 5:	F12, Consist Function 12 Enable Bit
	0 = function is disabled for consist operation.
	1 = function is enabled for consist operation.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

This register is useful for turning on the marker lights on only the last car.

Default Value: 0
Related CVs: See also Consist Address, Consist Function Active.

CV 29
Configuration Register 1

Description

CV 29 contains miscellaneous decoder configuration bits:

Bit 7   **Bit 0**

0	0	EAM	STE	RES	APS	F0	DIR

Bit 0:   DIR, Direction Bit
0 = normal operation
1 = direction bit in Direction instruction is inverted before processing.

Bit 1:   F0 Location
0 = F0 state is controlled by bit 4 of Speed/Direction Instruction (14 Speed Step Mode)
1 = F0 state is controlled by bit 4 of Function Group 1 Instruction (28 and 128 Speed Step Modes)

Bit 2:   APS, Alternate Power Source enable
0 = NMRA Digital Only
1 = Alternate Power Source enabled as set by CV 12

Bit 3:   ACK, Advanced Acknowledge Mode enable (not used)
0 = Advanced Acknowledge mode disabled.
1 = Advanced Acknowledge mode enabled.

Bit 4:   STE, Speed Table Enable (not used)
0 = Speed Table set by CV 2, 4 and 6.
1 = Use custom speed table selected by CV 25.

Bit 5:   EAM, Extended Address Mode enable
0 = Decoder responds to Primary Address in CV 1
1 = Decoder responds to Extended Address in CV 17-18

Bit 6:   Reserved for future use.

Bit 7:   Multifunction Decoder - Always reads as 0.

When the DIR bit is set, the car and lights mapped to F0 will run in a direction opposite to the speed/direction instruction received.

The F0 bit should be cleared to 0 if you are using the decoder in 14 speed step mode. If you are using 28 or 128 speed step modes, this bit should be set to 1.

Primary CVs

The EAM bit must be set to 1 in order to activate extended address capability. Note that once this bit is set, the decoder will respond to commands sent to the extended address only and commands sent to the primary address will be ignored. This can be a problem if you are using a command station that does not support extended addressing and the bit gets accidentally set. In such a case, you must connect the decoder to a programming track to gain access to the CV and clear the bit.

The APS bit must be set to 1 in order to activate an alternate power mode as set in CV 12. To activate Analog Mode Operation, you must also set CV 12 to 1. Note: this feature is not contained in all versions.

The decoder does not support advanced acknowledgment and the ACK bit will always read as 0.

Default value: 6
Related CVs: See also Extended Address, Loadable Speed Table.

CV 30
Error Information/Alternate Mode Selection

Description

Contains manufacturer defined error codes and provides feedback in the event an operational failure occurred within the decoder. It is also used to re-configure the decoder for non-NMRA compliant options:

Bit 7   **Bit 0**

					GRP23	CVCLR	CVLCKE

Bit 0: CVLCKE, CV Lock Enable
0 = Normal operation.
1 = Enables CV Lock as set in CVs 15 and 16.

Bit 1: CVCLR, CV Clear
0 = Normal operation.
1 = All CVs will be reset to default values at next power cycle.

Bit 2: GRP23, Function Group 2 and 3 Exchange
0 = System Normal, Decoder processes group 2 and 3 function commands according to the NMRA standard.
1 = Function Group 2 (F5-F8) assignments are swapped with Function Group 3 (F9-F12)

Bits 3-7: Reserved for future use.

Default value: 0
Related CVs: See also CV Unlock Register, CV Lock ID Code.

CV 33-46
Function Output Map

CVs 33-46 allow the user to customize which decoder outputs are controlled by which function keys. Each function input, F0 through F12, is assigned a unique CV that allows the corresponding function control to be redirected to up to fifteen different decoder function outputs. This allows a single function key to control more than one output if desired.

The F0 function has two CVs - one for forward direction and one for reverse. Function outputs mapped to these registers will be directional unless the same output is mapped to both CVs.

Note that all function inputs cannot be mapped to all outputs. The matrix below graphically indicates which inputs can control which outputs:

Function Mapping Table

Function Key	Control CV	FX 0F	FX 0R	Xing Logic	RESERVED	FX5	FX6	RESERVED	RESERVED	RESERVED	RESERVED	Dimmer	RESERVED	RESERVED	RESERVED	RESERVED
F0 (f)	33	**1**	2	4	8	16	32	64	128							
F0 (r)	34	1	**2**	4	8	16	32	64	128							
F1	35	1	2	4	8	16	32	64	128							
F2	36	1	2	**4**	8	16	32	64	128							
F3	37				1	2	4	8	16	32	64	128				
F4	38				1	2	4	8	16	32	64	128				
F5	39				1	**2**	4	8	16	32	64	128				
F6	40				1	2	**4**	8	16	32	64	128				
F7	41							1	2	4	8	**16**	32	64	128	
F8	42							1	2	4	8	16	32	64	128	
F9	43							1	2	4	8	16	32	64	128	
F10	44								1	2	4	8	16	32	64	128
F11	45								1	2	4	8	16	32	64	128
F12	46								1	2	4	8	16	32	64	128

Bold Numbers indicate default settings.

Function Output CVs

CV 33
F0(f) Output Location

Description
Maps the F0(fwd) function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	FX6	FX5	RES	Xing	BL	HL

Bit 0:   HL, Head light output
0 = Output is unaffected by F0(fwd).
1 = Output is activated when F0(fwd) is on.

Bit 1:   BL, Backup light output
0 = Output is unaffected by F0(fwd).
1 = Output is activated when F0(fwd) is on.

Bit 2:   Xing: Crossing Logic
0 = Output is unaffected by F0(fwd).
1 = Output is activated when F0(fwd) is on.

Bit 3:   Reserved for future use.

Bit 4:   FX5, Effect 1 output
0 = Output is unaffected by F0(fwd).
1 = Output is activated when F0(fwd) is on.

Bit 5:   FX6, Effect 2 output
0 = Output is unaffected by F0(fwd).
1 = Output is activated when F0(fwd) is on.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 1
Related CVs: See also CVs 34-46

CV 34
F0(r) Output Location

Description
Maps the F0(rev) function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	FX6	FX5	RES	Xing	BL	HL

Bit 0:   HL, Head light output
0 = Output is unaffected by F0(rev).
1 = Output is activated when F0(rev) is on.

Bit 1:   BL, Backup light output
0 = Output is unaffected by F0(rev).
1 = Output is activated when F0(rev) is on.

Bit 2:   Xing: Crossing Logic
0 = Output is unaffected by F0(rev).
1 = Output is activated when F0(rev) is on.

Bit 3:   Reserved for future use.

Bit 4:   FX5, Effect 1 output
0 = Output is unaffected by F0(rev).
1 = Output is activated when F0(rev) is on.

Bit 5:   FX6, Effect 2 output
0 = Output is unaffected by F0(rev).
1 = Output is activated when F0(rev) is on.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 2
Related CVs: See also CVs 33, 35-46

CV 35
F1 Output Location

Description
Maps the F1 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	FX6	FX5	RES	Xing	BL	HL

Bit 0:   HL, Head light output
0 = Output is unaffected by F1.
1 = Output is activated when F1 is on.

Bit 1:   BL, Backup light output
0 = Output is unaffected by F1.
1 = Output is activated when F1 is on.

Bit 2:   Xing: Crossing Logic
0 = Output is unaffected by F1.
1 = Output is activated when F1 is on.

Bit 3:   Reserved for future use.

Bit 4:   FX5, Effect 1 output
0 = Output is unaffected by F1.
1 = Output is activated when F1 is on.

Bit 5:   FX6, Effect 2 output
0 = Output is unaffected by F1.
1 = Output is activated when F1 is on.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 0
Related CVs: See also CVs 33-34, 36-46

CV 36
F2 Output Location

Description
Maps the F2 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	FX6	FX5	RES	Xing	BL	HL

Bit 0:   HL, Head light output
0 = Output is unaffected by F2.
1 = Output is activated when F2 is on.

Bit 1:   BL, Backup light output
0 = Output is unaffected by F2.
1 = Output is activated when F2 is on.

Bit 2:   Xing: Crossing Logic
0 = Output is unaffected by F2.
1 = Output is activated when F2 is on.

Bit 3:   Reserved for future use.

Bit 4:   FX5, Effect 1 output
0 = Output is unaffected by F2.
1 = Output is activated when F2 is on.

Bit 5:   FX6, Effect 2 output
0 = Output is unaffected by F2.
1 = Output is activated when F2 is on.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 4
Related CVs: See also CVs 33-35, 37-46

CV 37
F3 Output Location

Description

Maps the F3 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

DIM	RES	RES	RES	RES	FX6	FX5	RES

Bit 0:   Reserved for future use.

Bit 1:   FX5, Effect 1 output
                  0 = Output is unaffected by F3.
                  1 = Output is activated when F3 is on.

Bit 2:   FX6, Effect 2 output
                  0 = Output is unaffected by F3.
                  1 = Output is activated when F3 is on.

Bit 3:   Reserved for future use.

Bit 4:   Reserved for future use.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   DIM, Headlight Dimmer Function
                  0 = Lighting outputs are unaffected by F3.
                  1 = Lighting outputs set up as "Dimmable Headlights"
                  are dimmed when F3 is on.

Default Value: 0
Related CVs: See also CVs 33-36, 38-46

CV 38
F4 Output Location

Description
Maps the F4 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

DIM	RES	RES	RES	RES	FX6	FX5	RES

Bit 0:   Reserved for future use.

Bit 1:   FX5, Effect 1 output
0 = Output is unaffected by F4.
1 = Output is activated when F4 is on.

Bit 2:   FX6, Effect 2 output
0 = Output is unaffected by F4.
1 = Output is activated when F4 is on.

Bit 3:   Reserved for future use.

Bit 4:   Reserved for future use.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   DIM, Headlight Dimmer Function
0 = Lighting outputs are unaffected by F4.
1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F4 is on.

Default Value: 0
Related CVs: See also CVs 33-37, 39-46

CV 39
F5 Output Location

Description

Maps the F5 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

DIM	RES	RES	RES	RES	FX6	FX5	RES

Bit 0:	Reserved for future use.
Bit 1:	FX5, Effect 1 output 0 = Output is unaffected by F5. 1 = Output is activated when F5 is on.
Bit 2:	FX6, Effect 2 output 0 = Output is unaffected by F5. 1 = Output is activated when F5 is on.
Bit 3:	Reserved for future use.
Bit 4:	Reserved for future use.
Bit 5:	Reserved for future use.
Bit 6:	Reserved for future use.
Bit 7:	DIM, Headlight Dimmer Function 0 = Lighting outputs are unaffected by F5. 1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F5 is on.

Default Value:	2
Related CVs:	See also CVs 33-38, 40-46

CV 40
F6 Output Location

Description

Maps the F6 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

DIM	RES	RES	RES	RES	FX6	FX5	RES

Bit 0:   Reserved for future use.

Bit 1:   FX5, Effect 1 output
                             0 = Output is unaffected by F6.
                             1 = Output is activated when F6 is on.

Bit 2:   FX6, Effect 2 output
                             0 = Output is unaffected by F6.
                             1 = Output is activated when F6 is on.

Bit 3:   Reserved for future use.

Bit 4:   Reserved for future use.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   DIM, Headlight Dimmer Function
                             0 = Lighting outputs are unaffected by F6.
                             1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F6 is on.

Default Value: 4
Related CVs: See also CVs 33-39, 41-46

CV 41
F7 Output Location

Description

Maps the F7 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	RES	DIM	RES	RES	RES	RES

Bit 0:   Reserved for future use.

Bit 1:   Reserved for future use.

Bit 2:   Reserved for future use.

Bit 3:   Reserved for future use.

Bit 4:   DIM, Headlight Dimmer Function
                    0 = Lighting outputs are unaffected by F7.
                    1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F7 is on.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 16
Related CVs: See also CVs 33-40, 42-46

CV 42
F8 Output Location

Description

Maps the F8 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	RES	DIM	RES	RES	RES	RES

Bit 0:	Reserved for future use.
Bit 1:	Reserved for future use.
Bit 2:	Reserved for future use.
Bit 3:	Reserved for future use.
Bit 4:	DIM, Headlight Dimmer Function 0 = Lighting outputs are unaffected by F8. 1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F8 is on.
Bit 5:	Reserved for future use.
Bit 6:	Reserved for future use.
Bit 7:	Reserved for future use.

Default Value:	0
Related CVs:	See also CVs 33-41, 43-46

CV 43
F9 Output Location

Description

Maps the F9 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	RES	DIM	RES	RES	RES	RES

Bit 0:	Reserved for future use.
Bit 1:	Reserved for future use.
Bit 2:	Reserved for future use.
Bit 3:	Reserved for future use.
Bit 4:	DIM, Headlight Dimmer Function 0 = Lighting outputs are unaffected by F9. 1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F9 is on.
Bit 5:	Reserved for future use.
Bit 6:	Reserved for future use.
Bit 7:	Reserved for future use.

Default Value:	0
Related CVs:	See also CVs 33-42, 44-46

CV 44
F10 Output Location

Description

Maps the F10 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	RES	RES	DIM	RES	RES	RES

Bit 0:   Reserved for future use.

Bit 1:   Reserved for future use.

Bit 2:   Reserved for future use.

Bit 3:   DIM, Headlight Dimmer Function
0 = Lighting outputs are unaffected by F10.
1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F10 is on.

Bit 4:   Reserved for future use.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 0
Related CVs: See also CVs 33-43, 45-46

CV 45
F11 Output Location

Description
Maps the F11 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	RES	RES	DIM	RES	RES	RES

Bit 0:   Reserved for future use.

Bit 1:   Reserved for future use.

Bit 2:   Reserved for future use.

Bit 3:   DIM, Headlight Dimmer Function
0 = Lighting outputs are unaffected by F11.
1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F11 is on.

Bit 4:   Reserved for future use.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 64
Related CVs: See also CVs 33-44, 46

CV 46
F12 Output Location

Description
Maps the F12 function to any of eight decoder auxiliary function outputs as defined by a 1 in the corresponding bit position:

Bit 7   **Bit 0**

RES	RES	RES	RES	DIM	RES	RES	RES

Bit 0:   Reserved for future use.

Bit 1:   Reserved for future use.

Bit 2:   Reserved for future use.

Bit 3:   DIM, Headlight Dimmer Function
0 = Lighting outputs are unaffected by F12.
1 = Lighting outputs set up as "Dimmable Headlights" are dimmed when F12 is on.

Bit 4:   Reserved for future use.

Bit 5:   Reserved for future use.

Bit 6:   Reserved for future use.

Bit 7:   Reserved for future use.

Default Value: 0
Related CVs: See also CVs 33-45

Lighting Effect CVs

CV 49-52
Hyperlight Effect Select

Description
Used to set the Hyperlight lighting effect and control mode for their respective output:

CV 49, F0 (f) Effect Select
CV 50, F0 (r) Effect Select
CV 51, FX5 Effect Select
CV 52, FX6 Effect Select

Bit 7   **Bit 0**

LED	R17	XING	PHSE	EF3	EF2	EF1	EF0

Bits 0-3:   EF[0..3] Effect Type Select

0	=	On/Off output
1	=	Rule 17 Dimmable headlight
2	=	Mars Light
3	=	Pyle Gyralite
4	=	Oscillating Headlight
5	=	Single Flash Strobe
6	=	Double Flash Strobe
7	=	Western Cullen D312 Rotary Beacon
8	=	Prime Stratolite
9	=	Type I Ditch Light
10	=	Type II Ditch Light
11	=	FRED (End of Train flasher)
12	=	Engine Exhaust Flicker
13	=	Firebox Flicker (coal pot belly stove flicker)
14	=	Reserved
15	=	Dyno-Light

Most of the effects are self-descriptive. However a few need some additional notes:

Dimmable Headlight - The function output is normally an on/off output. If the output is on, the output level will be reduced about 60% whenever the dimmer function is on.

Type I and Type II Ditch Lights - These are identical when operating. However, if the grade crossing logic is enabled, the Type I ditch light will revert to a steady on state when it is not flashing whereas the Type II lights will turn off.

Lighting Effect CVs

Engine Exhaust Flicker - This effect produces a random flicker whose intensity is proportional to the engine RPMs. It is best used by placing a red/orange lamp under the model's exhaust port, out of direct view. As the engine is revved up, it will glow brighter, imitating unmuffled exhaust gases and sparks.

Dyno-Light - This effect softly fades the lamp brightness on and off to simulate the heating and cooling of the bulb filament.

Bit 4:   PHSE, Phase Select Bit
                        0 = Phase A
                        1 = Phase B

Phase Select Bit - Alters the timing of the effect so that it is 180 degrees out of phase with the other effects. This allows you to have two light effects that blink back and forth if desired. Set one effect to phase A and the other to phase B.

Bit 5:   XING, Grade Crossing Logic Enable
                        0 = Crossing Logic disabled
                        1 = Crossing Logic enabled when Horn function is on.

Grade Crossing Logic Bit - Causes the lighting effect to become active only when function two has been activated (and the corresponding lighting function key is also on). A typical use would be to cause the ditch lights to flash at a grade crossing. The grade crossing logic can be used with almost all the Hyperlight effects. The on/off, dimmable headlight, FRED, engine exhaust, and firebox flicker effects will not be affected. The other effects will either turn off (strobes and beacons) or revert to a steady on state (mars light, ditch lights, etc.) as appropriate to prototype practice.

Bit 6:   R17, Rule 17 Mode
                        0 = Rule 17 Mode disabled
                        1 = Rule 17 Mode enabled

Rule 17 Mode - Converts the headlight and backup light to independent, non-directional lights. When this mode is active, the headlight is controlled as if it were FX5 and the backup light as FX6 and vice-versa.

Bit 7:   LED, LED Compensation Enable
                        0 = Incandescent Compatible Lighting Outputs enabled
                        1 = LED Compatible Lighting Outputs enabled

LED Compensation - Improves lighting effect contrast when using LEDs instead of incandescent lamps.

Default Value: 15 (CV 49, 50), 15 (CV 51, 52)
Related CVs: See also CV 59, CV 60

CV 55
F0 (f and r) LED Brightness

Description

CV 55 sets the lamp brightness for the lights that have been wired to the F0 (f) and the F0 (r) outputs on the lighting decoder. A value of 100 or higher equals 100 percent of the lamp brightness. A value between 0 and 100 will equal that percentage of brightness. For example, a value of 50 will equal 50 percent brightness. The lower the brightness level the longer the capacitor charge will last in analog operation.

Bit 7   **Bit 0**

LB7	LB6	LB5	LB4	LB3	LB2	LB1	LB0

Bit 0-7: Percent of LED output brightness

Default value: 100

CV 56
FX5 and FX6 LED Brightness

Description

CV 56 sets the lamp brightness for the lights that have been wired to the FX5 (interior) and the FX6 outputs on the lighting decoder. A value of 100 or higher equals 100 percent of the lamp brightness. A value between 0 and 100 will equal that percentage of brightness. For example, a value of 50 will equal 50 percent brightness. The lower the brightness level the longer the capacitor charge will last in analog operation.

Bit 7   **Bit 0**

LB7	LB6	LB5	LB4	LB3	LB2	LB1	LB0

Bit 0-7: Percent of LED output brightness

Default value: 100

CV 58
FX5, FX6 Lighting Override Enable Bits

Description

CV 58 is used to configure FX5 or FX6 such that all other lighting function outputs automatically turn off when the corresponding function is turned on.

Bit 7							Bit 0
						FX6OVR	FX5OVR
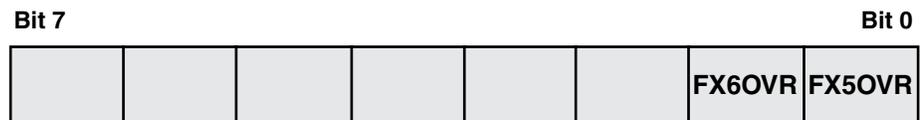
Bit 0: FX5OVR
0 = Normal FX5 operation
1 = When FX5 is on, HL, BL, and FX6 turn off

Bit 1: FX6OVR
0 = Normal FX6 operation
1 = When FX6 is on, HL, BL, and FX5 turn off

Default Value: 0
Related CVs: See also CV 49-52, CV 60

CV 59
Flash Rate

Description

CV 59 is used to adjust the Hyperlight effect's flash rate.

Bit 7   **Bit 0**

				FR3	FR2	FR1	FR0

Bit 0-3:   FR0-3, Flash Rate Select
Sets the overall flash rate of the Hyperlight effects.
0 = Maximum Flash Rate
 :
15 = Minimum Flash Rate

Default Value: 4
Related CVs: See also CVs 49-52, CV 60

Lighting Effect CVs

CV 60
Crossing Hold Time

Description
CV 60 is used to adjust the hold time for grade crossing logic.

Bit 7   **Bit 0**

				HT3	HT2	HT1	HT0

Bit 0-3:   HT0-3, Hold Time Select
Sets the time an effect will stay on after the horn button is released (if it is set up to do so) and has a range of zero to 15 seconds.

0 = Minimum Hold Time = 0
 :
15 = Maximum Hold Time = 15 Seconds

Default Value: 4
Related CVs: See also CVs 49-52.

User ID CVs

CV 105
User Identifier #1

Description
Provides storage for user supplied data such as purchase date, serial numbers, spouse's birthday, etc. This CV otherwise has no effect on the Decoder operation.

Bit 7   **Bit 0**

D7	D6	D5	D4	D3	D2	D1	D0

D0-D7:   User Identifier data

This CV may be programmed with any value between 0 and 255.

When the decoder is reset to default values, this CV is preset to the software's minor revision code.

Default Value: Varies
Related CVs: See also User Identifier #2.

CV 106
User Identifier #2

Description

Provides storage for user supplied data such as purchase date, serial numbers, spouse's birthday, etc. This CV otherwise has no effect on the decoder operation.

Bit 7   **Bit 0**

D7	D6	D5	D4	D3	D2	D1	D0

D0-D7:   User Identifier data

This CV may be programmed with any value between 0 and 255.

When the decoder is reset to default values, this CV is preset to the software's default CV value configuration.

Default Value: Varies
Related CVs: See also User Identifier #1.
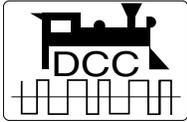
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