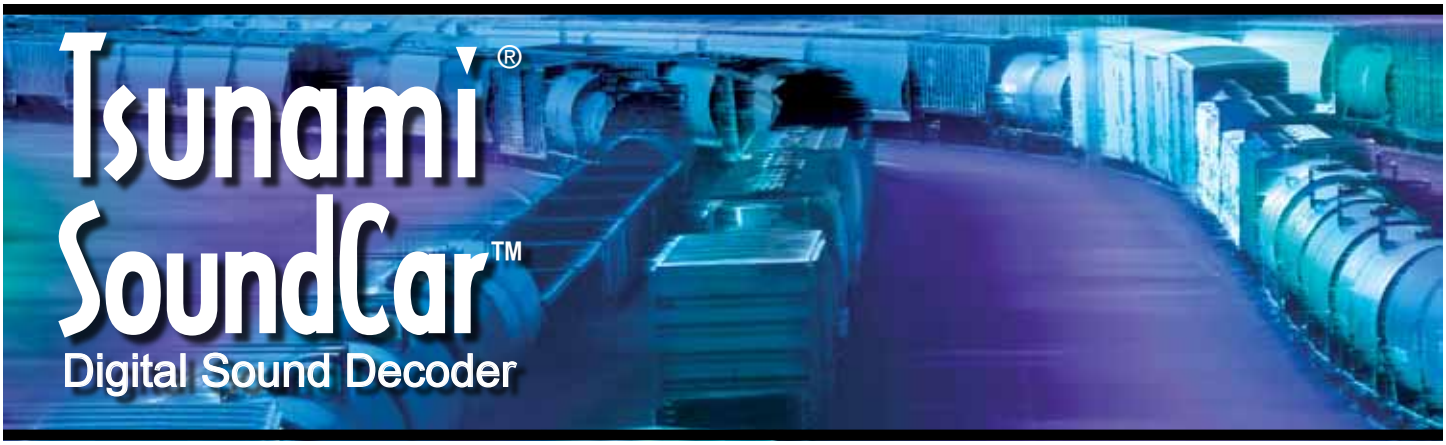

Tsunami® SoundCar™ Digital Sound Decoder™

Technical Reference

Software Release 1.01

Rev.B 9/29/14

Notice
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Primary CVs

CV 1
Primary Address Control

Description

CV 1 contains the decoder's primary address from 1 to 127.

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

A0-A6: Decoder Address
0: Not used. Must be set to 0.

Additional Information

The decoder will process all valid instruction packets containing an address that matches the value contained in this register when bit 5 (Extended Address Enable) of CV 29 (Configuration Register 1) is set to 0.

Programming this register with a new value will automatically reset CV 19 (Consist Address) to 0 and clear bit 5 of CV 29.

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

Note: *CV 1 can only be changed in Operations Mode if the extended address is enabled.*

Default Value: 3
Related CVs: CVs 17 and 18 (Extended Address)
CV 19 (Consist Address)
CV 29 (Configuration Register 1)

CV 3
Baseline Acceleration Rate

Description

CV 3 contains a value from 0 to 255 that sets the decoder's acceleration rate.

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

D0-D7: Baseline Acceleration Rate

Additional Information

The acceleration rate may be calculated as:

Seconds/Speed Step = CV 3 x 0.896 ÷ Number of Speed Steps

When CV 3 is set to 0, the speed-related sounds will respond almost instantly to increases in throttle setting, equivalent to no momentum. When set to 255, it will take the decoder sounds approximately 3.8 minutes to accelerate to full speed from a standing stop.

It is recommended that CV 3 be set to a non-zero value when operating the decoder in 14 or 28 speed-step mode, as the throttle will interpolate between speed steps during acceleration to produce a smoother overall response.

Note: *For this CV, the value in a SoundCar decoder should match the value in a Tsunami-equipped locomotive when in a consist.*

Default Value: 0
Related CVs: CV 4 (Baseline Deceleration Rate)
CV 23 (Consist Acceleration Rate)
CV 24 (Consist Deceleration Rate)

CV 4
Baseline Deceleration Rate

Description

CV 4 contains a value from 0 to 255 that sets the decoder's deceleration rate.

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

D0-D7: Baseline Deceleration Rate

Additional Information

The deceleration rate may be calculated as:

Seconds/Speed Step = CV 3 x 0.896 ÷ Number of Speed Steps

When CV 4 is set to 0, the speed-related sounds will respond almost instantly to decreases in throttle setting. When set to 255, it will take the decoder sounds approximately 3.8 minutes to come to a full stop from top speed.

It is recommended that CV 4 be set to a non-zero value when operating the decoder in 14 or 28 speed-step mode, as the throttle will interpolate between speed steps during braking to produce a smoother overall response.

Note: *For this CV, the value in a SoundCar decoder should match the value in a Tsunami-equipped locomotive when in a consist.*

Default Value: 0
Related CVs: CV 3 (Baseline Acceleration Rate)
CV 23 (Consist Acceleration Rate)
CV 24 (Consist Deceleration Rate)
CV 61 (F11 Braking Rate)

CV 7
Manufacturer Version ID (Read-Only)

Description

CV 7 contains the 8-bit software identifier.

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

D0-D7: Version Code
69 = SoundCar Digital Sound Decoder, v1.0

Note: *CV 7 is read-only and cannot be modified.*

Default Value: 69

CV 8
Manufacturer ID

Description

CV 8 contains the NMRA-issued Manufacturer ID code assigned to SoundTraxx/Throttle Up! (141).

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

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

Default Value: 141

CV 11
Packet Time-out Value

Description

CV 11 contains a value from 0 to 255 that corresponds to the time period allowed to elapse between receipts of valid packets addressed to the decoder before the speed-related sound effects stop.

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

D0-D7: Packet Time-out Value

Additional Information

The time-out period is calculated in seconds as:

Time-out Period = CV 11 x 0.25

A value of 0 disables the time-out period, causing the sounds to play indefinitely without receiving another packet.

For all other values, the decoder maintains an internal timer, which is reset every time the decoder receives a valid broadcast address packet or other valid packet with an address that matches the decoder's primary address, or if enabled, the extended address or consist address.

In the event no valid packets are received within the prescribed time period, the decoder will bring all speed-related sound effects to a stop at the rate set in CVs 4 and 24. The state of the auxiliary function outputs will remain unchanged.

Default Value: 0
Related CVs: CV 4 (Baseline Deceleration Rate)
CV 24 (Consist Deceleration Rate)

CV 12
Power Source Conversion

Description

CV 12 defines the type of power source that the decoder should switch to whenever a DCC signal is not present and bit 2 (Alternate Powers Source Enable) of CV 29 (Configuration Register 1) is set.

Bit 7							Bit 0
0	0	0	0	0	0	0	D0

D0: Alternate Power Source
0 = No alternate power source available
1 = Analog power supply

0: Not used. Must be set to 0.

Default Value: 1
Related CV: CV 29 (Configuration Register 1)

CV 13
Analog Function Enable 1

Description

CV 13 defines whether functions 1-8 are active during analog mode operation. If a bit is set to 1, the corresponding function will be mapped to the output defined in CVs 33-46.

Bit 7							Bit 0
F8	F7	F6	F5	F4	F3	F2	F1

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

Note: *This CV is most useful for turning on lighting effects when running on a DC-powered layout. Sound functions may be turned on in analog mode, but this is less useful as they will either run continuously or sound just once when the decoder is powered up. Instead, use the automatic sound functions (CV 197) to generate sound effects in analog mode.*

Default Value: 0
Related CVs: CVs 33-46 (Function Outputs)
CV 197 (Analog Mode Auto Sound Configuration)

CV 14
Analog Function Enable 2

Description

CV 14 defines whether functions 9-12 are active during analog mode operation. If a bit is set to 1, the corresponding function will be mapped to the output defined in CVs 33-46.

Bit 7							Bit 0
0	**0**	**F12**	**F11**	**F10**	**F9**	**F0(r)**	**F0(f)**

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

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

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

0: Not used. Must be set to 0.

Note: *This CV is most useful for turning on lighting effects when running on a DC-powered layout. Sound functions may be turned on in analog mode, but this is less useful because they will either run continuously or sound only once when the decoder powers up. Instead, use the automatic sound functions (CV 197) to generate sound effects in analog mode.*

Default Value: 3
Related CVs: CVs 33-46 (Function Output Maps)
CV 197 (Analog Mode Automatic Sound Configuration)

CV 15
CV Unlock Register

Description

CV 15 contains a value from 0 to 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. However, an acknowledgment will only be generated when the decoder is unlocked.

Bit 7							Bit 0
0	0	0	0	0	D2	D1	D0

D0-D2: CV Unlock Code

0: Not used. Must be set to 0.

Additional Information

Locked State

If CV 15 does not match CV 16 (CV Lock ID Code), all read and write operations to the decoder will be ignored and no acknowledgment will be generated.

Unlocked State

Access to the decoder's CVs will only be possible when CV 15 = CV 16.

Note: *Bit 0 (CV Lock Enable) in CV 30 (Error Information/Alternate Mode Selection) must be set to enable the lock feature in CVs 15 and 16.*

Default Value: 0
Related CVs: CV 16 (CV Lock ID Code)
CV 30 (Error Information/Alternate Mode Selection)

CV 16
CV Lock ID Code

Description

CV 16 contains a value from 0 to 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. However, an acknowledgment will only be generated when the decoder is unlocked.

Bit 7							Bit 0
0	0	0	0	0	ID2	ID1	ID0

ID0-ID2: CV Lock Code

0: Not used. Must be set to 0.

Note: *Bit 0 (CV Lock Enable) in CV 30 (Error Information/Alternate Mode Selection) must be set to enable the lock feature in CVs 15 and 16.*

Default Value: 0
Related CVs: CV 15 (CV Unlock Register)
CV 30 (Error Information/Alternate Mode Selection)

CVs 17, 18
Extended Address

Description

CVs 17 and 18 comprise a “paired” CV, meaning that the two CV registers hold one piece of data. In this case, the CV pair holds 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

Additional Information

The extended address allows the decoder to be assigned to one of 10,179 addresses ranging from 0xC000 to 0xE7FF. **Note:** *Most command stations will only recognize addresses 0001 to 9999.* The extended address will only be recognized by the decoder when bit 5 (Extended Address Mode Enable) of CV 29 (Configuration Register 1) is set to 1. Once this bit is set, the decoder will not 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 extended address to the number 49152. Divide the sum by 256. Program CV 17 with the quotient value and CV 18 with the remainder value.

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

1. 7152 + 49152 = 56304
2. 56304 ÷ 256 = 219 Quotient; 240 Remainder
3. Program 219 into CV 17
4. Program 240 into CV 18

Note: *Most command stations will perform these calculations automatically when setting the extended address. However, it’s helpful to know how to derive the appropriate register values.*

Primary CVs

Because CVs 17 and 18 are a paired CV, programming order is important. Always write to CV 17 first, and then write to CV 18. The decoder will ignore commands that attempt to program these registers out of order or with values outside of the allowable range of 0xC000 to 0xE7FF.

These CVs may be changed in Service Mode at any time, but may only be changed in Operations Mode if CV 29, bit 5, is cleared (i.e., CV 1, Primary Address, is enabled).

Default Value: CV 17 = 192
CV 18 = 3 (Long Address 0003)

Related CVs: CV 1 (Primary Address)
CV 19 (Consist Address)
CV 29 (Configuration Register 1)

CV 19
Consist Address

Description

CV 19 contains address and direction data for consist operation.

Bit 7							Bit 0
CDIR	**A6**	**A5**	**A4**	**A3**	**A2**	**A1**	**A0**

A0-A6: Consist Address Value

CDIR: Consist Direction
0 = Normal direction
1 = Reverse direction

Additional Information

A0-A6 (bits 0-6) assign the consist address from 1 to 127. If A0-A6 = 0, consist commands will be ignored. Otherwise, when the decoder receives a valid command packet with an address that matches the consist, that packet will be processed just as any other packet would be, with the following exceptions:

- Long form CV access instructions will be ignored.
- The direction within a speed/direction or advanced operation packet is inverted if CDIR (bit 7) = 1.
- Only the auxiliary functions enabled in CVs 21 and 22 are allowed to change.

CDIR (bit 7) defines the orientation of the model within a consist and specifies whether the direction bit in a speed/direction data packet should be inverted.

When the consist address is active, speed/direction and 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 be processed as normal.

To summarize, setting CV 19 to 0 or 128 disables consist addressing. Setting CV 19 to a value from 1 to 127 enables consist addresses 1-127 with the model oriented forward in the consist. Setting CV 19 to a value from 129 to 255 enables consist addresses 1-127 with the model oriented backward in the consist.

Default Value: 0
Related CVs: CV 1 (Primary Address)
CVs 17 and 18 (Extended Address)
CV 21 (Consist Function Group 1)
CV 22 (Consist Function Group 2)

CV 21
Consist Function Group 1

Description

CV 21 defines the Group 1 functions that may be controlled by packets sent to the decoder's consist address, which is useful for differentiating the various engines and cars in a consist. Disabled functions may be controlled only from the decoder's primary or extended address.

Bit 7							Bit 0
F8	F7	F6	F5	F4	F3	F2	F1

F1-F8: Consist Functions 1-8 Enable
0 = Function disabled in consist operation
1 = Function enabled in consist operation

Default Value: 128
Related CVs: CV 19 (Consist Address)
CV 22 (Consist Function Group 2)

CV 22
Consist Function Group 2

Description

This CV defines the Group 2 functions that may be controlled by packets sent to the decoder's consist address. Disabled functions may be controlled only from the decoder's primary or extended address.

Bit 7							Bit 0
0	0	F12	F11	F10	F9	F0(r)	F0(f)

F0(f): Consist Function 0, Forward Enable
0 = Function disabled in consist operation
1 = Function enabled in consist operation

F0(r): Consist Function 0, Reverse Enable
0 = Function disabled in consist operation
1 = Function enabled in consist operation

F9-F12: Consist Functions 9-12 Enable
0 = Function disabled in consist operation
1 = Function enabled in consist operation

0: Not used. Must be set to 0.

Additional Information
Among other things, this register allows you to differentiate headlight and backup light functions for the lead engine and other units in the consist.

Default Value: 16
Related CVs: CV 19 (Consist Address)
CV 21 (Consist Function Group 1)

CV 23
Consist Acceleration Rate

Description

CV 23 contains a value from -127 to +127 that corresponds to the decoder's consist acceleration offset.

Bit 7							Bit 0
SIGN	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**

D0-D6: Consist Acceleration Value

SIGN: Sign
0 = Positive value
1 = Negative value

Additional Information

When the consist address is active, the consist acceleration rate is added to or subtracted from the decoder's base acceleration rate (CV 3) depending on the Sign bit (bit 7). The acceleration is then calculated as:

Seconds/Speed Step = (CV 3 + CV 23) x 0.896 ÷ Number of Speed Steps

If the sum of CVs 3 and 23 is a negative value, then the acceleration rate is set to 0 (i.e., acceleration is instant). If the sum of CVs 3 and 23 exceeds 255, then the acceleration rate is set to the maximum value of 255.

CV 23 has no effect when the consist address (CV 19) is set to 0.

To summarize, a CV 23 value from 0 to 127 will increase the decoder's base acceleration rate. Conversely, values from 129 to 255 will decrease the decoder's base acceleration rate. A value of 128 is equivalent to a setting of 0 and will have no effect.

Note: *When operating Intelligent Consisting, it is best to leave this value at 0 unless all of the locomotives pulling the cars are set up using advanced consisting.*

Default Value: 0
Related CVs: CV 3 (Baseline Acceleration Rate)
CV 4 (Baseline Deceleration Rate)
CV 19 (Consist Address)
CV 24 (Consist Deceleration Rate)

CV 24
Consist Deceleration Rate

Description

CV 24 contains a value from -127 to +127, which corresponds to the decoder's consist deceleration offset.

Bit 7							Bit 0
SIGN	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**

D0-D6: Consist Deceleration Value

SIGN: Sign
0 = Positive value
1 = Negative value

Additional Information

When the consist address is active, the consist deceleration rate is added to or subtracted from the decoder's baseline deceleration rate (CV 4) depending on the Sign bit (bit 7). The deceleration rate is then calculated as:

Seconds/Speed Step = (CV 4 + CV 24) x 0.896 ÷ Number of Speed Steps

If the sum of CVs 4 and 24 is negative, then the deceleration rate is set to 0 (i.e., braking is instant). If the sum of CVs 4 and 24 exceeds 255, then the deceleration rate is set to the maximum value of 255.

CV 24 has no effect when the consist address (CV 19) is set to 0.

To summarize, a CV 24 value from 0 to 127 will increase the decoder's baseline deceleration rate. Conversely, values from 129 to 255 will decrease the decoder's baseline deceleration rate. A value of 128 is equivalent to a setting of 0 and will have no effect.

Note: *When operating Intelligent Consisting, it is best to leave this value at 0 unless all of the locomotives pulling the cars are set up using advanced consisting.*

Default Value: 0
Related CVs: CV 3 (Baseline Acceleration Rate)
CV 4 (Baseline Deceleration Rate)
CV 19 (Consist Address)
CV 23 (Consist Acceleration Rate)

CV 29
Configuration Register 1

Description

CV 29 contains miscellaneous decoder configuration bits.

Bit 7							Bit 0
MD	**0**	**EAM**	**0**	**ACK**	**APS**	**F0**	**DIR**

DIR: Direction
0 = Normal operation
1 = Direction bit in speed/direction instruction is inverted before processing

F0: 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 (28 and 128 speed-step modes)

APS: Alternate Power Source Enable
0 = NMRA digital only
1 = Alternate power source enabled as set by CV 12

ACK: Advanced Acknowledgment Mode Enable (not used)

EAM: Extended Address Mode Enable
0 = Decoder responds to primary address in CV 1
1 = Decoder responds to extended address in CVs 17 and 18

MD: Multifunction Decoder (always reads as 0)

0: Not used. Must be set to 0.

F0 (bit 1) should be cleared to 0 if you are using 14 speed-step mode. For 28 or 128 speed-step mode, bit 1 should be set to 1.

APS (bit 2) must be set to 1 in order to activate an alternate power mode as programmed into CV 12 (Power Source Conversion). To activate analog mode, CV 12 must be set to 1.

ACK (bit 3) will always read as 0 because the decoder does not support advanced acknowledgment.

Primary CVs

EAM (bit 5) must be set to 1 in order to activate extended address capability. Note that once bit 5 is set, the decoder will respond to commands sent to the extended address only; commands 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 bit 5 is accidentally programmed. In such a scenario, connect the decoder to a programming track to access CV 29 and clear bit 5.

Default Value: 2
Related CVs: CV 12 (Alternate Power Source)
CVs 17 and 18 (Extended Address)

CV 30
Error Information/Alternate Mode Selection

Description

This CV contains manufacturer-defined error codes and provides feedback in the event an operational failure occurs within the decoder. It is also used to reconfigure the decoder for non-NMRA compliant options.

Bit 7							Bit 0
0	0	0	0	0	GRP23	CVCLR	CVLCKE

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

CVCLR: CV Clear
0 = Normal operation
1 = All CVs will be reset to default values at next power cycle, regardless of other active bits

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 Group 3 (F9-F12) assignments

0: Not used. Must be set to 0.

Default Value: 0
Related CVs: CV 15 (CV Unlock Register)
CV 16 (CV Lock ID Code)

CVs 33-46
Function Output Map

CVs 33-46 allow you to customize the function key assignments that control the decoder's outputs, sound effects, and lighting effects. Each function input, F0 through F12, is assigned a unique CV that allows the corresponding function control to be redirected to up to 15 different decoder function outputs, sound effects, or lighting effects. 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 SoundCar Function Mapping Table graphically indicates the inputs that can control each output.

SoundCar Function Mapping Table

Function Key	Control CV	Headlight	Backup Light	Horn/Whistle	Bell	FX5	FX6	Reserved	Short Horn/ Whistle	Generator	Reserved	Dimmer	Mute	Uncoupling	Brakes	Coupler
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 values indicate default settings.

CV 33
F0(f) Output Location

Description

CV 33 maps the F0(f) function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
SHH	**0**	**FX6**	**FX5**	**BELL**	**HORN**	**BL**	**HL**

HL: Headlight Output
0 = Output is unaffected by F0(f)
1 = Output is activated when F0(f) is on

BL: Backup Light Output
0 = Output is unaffected by F0(f)
1 = Output is activated when F0(f) is on

HORN: Airhorn/Whistle Sound Effect
0 = Sound is unaffected by F0(f)
1 = Sound is activated when F0(f) is on

BELL: Bell Sound Effect
0 = Sound is unaffected by F0(f)
1 = Sound is activated when F0(f) is on

FX5: Effect 1 Output
0 = Output is unaffected by F0(f)
1 = Output is activated when F0(f) is on

FX6: Effect 2 Output
0 = Output is unaffected by F0(f)
1 = Output is activated when F0(f) is on

SHH: SHH, Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F0(f)
1 = Sound is activated when F0(f) is on

0: Not used. Must be set to 0.

Default Value: 1
Related CVs: CVs 34-46 (Function Output Map)

CV 34
F0(r) Output Location

Description

CV 34 maps the F0(r) function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
SHH	**0**	**FX6**	**FX5**	**BELL**	**HORN**	**BL**	**HL**

HL: Headlight Output
0 = Output is unaffected by F0(r)
1 = Output is activated when F0(r) is on

BL: Backup Light Output
0 = Output is unaffected by F0(r)
1 = Output is activated when F0(r) is on

HORN: Airhorn/Whistle Sound Effect
0 = Sound is unaffected by F0(r)
1 = Sound is activated when F0(r) is on

BELL: Bell Sound Effect
0 = Sound is unaffected by F0(r)
1 = Sound is activated when F0(r) is on

FX5: Effect 1 Output
0 = Output is unaffected by F0(r)
1 = Output is activated when F0(r) is on

FX6: Effect 2 Output
0 = Output is unaffected by F0(r)
1 = Output is activated when F0(r) is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F0(r)
1 = Sound is activated when F0(r) is on

0: Not used. Must be set to 0.

Default Value: 2
Related CVs: CV 33, CVs 35-46 (Function Output Map)

CV 35

F1 Output Location

Description

CV 35 maps the F1 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
SHH	**0**	**FX6**	**FX5**	**BELL**	**HORN**	**BL**	**HL**

HL: Headlight Output
0 = Output is unaffected by F1
1 = Output is activated when F1 is on

BL: Backup Light Output
0 = Output is unaffected by F1
1 = Output is activated when F1 is on

HORN: Airhorn/Whistle Sound Effect
0 = Sound is unaffected by F1
1 = Sound is activated when F1 is on

BELL: Bell Sound Effect
0 = Sound is unaffected by F1
1 = Sound is activated when F1 is on

FX5: Effect 1 Output
0 = Output is unaffected by F1
1 = Output is activated when F1 is on

FX6: Effect 2 Output
0 = Output is unaffected by F1
1 = Output is activated when F1 is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F1
1 = Sound is activated when F1 is on

0: Not used. Must be set to 0.

Default Value: 8
Related CVs: CVs 33-34, 36-46 (Function Output Map)

CV 36
F2 Output Location

Description

CV 36 maps the F2 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
SHH	**0**	**FX6**	**FX5**	**BELL**	**HORN**	**BL**	**HL**

HL: Headlight Output
0 = Output is unaffected by F2
1 = Output is activated when F2 is on

BL: Backup Light Output
0 = Output is unaffected by F2
1 = Output is activated when F2 is on

HORN: Airhorn/Whistle Sound Effect
0 = Sound is unaffected by F2
1 = Sound is activated when F2 is on

BELL: Bell Sound Effect
0 = Sound is unaffected by F2
1 = Sound is activated when F2 is on

FX5: Effect 1 Output
0 = Output is unaffected by F2
1 = Output is activated when F2 is on

FX6: Effect 2 Output
0 = Output is unaffected by F2
1 = Output is activated when F2 is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F2
1 = Sound is activated when F2 is on

0: Not used. Must be set to 0.

Default Value: 4
Related CVs: CVs 33-35, 37-46 (Function Output Map)

CV 37
F3 Output Location

Description

CV 37 maps the F3 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
DIM	**0**	**GEN**	**SHH**	**0**	**FX6**	**FX5**	**BELL**

BELL: Bell Sound Effect
0 = Sound is unaffected by F3
1 = Sound is activated when F3 is on

FX5: Effect 1 Output
0 = Output is unaffected by F3
1 = Output is activated when F3 is on

FX6: Effect 2 Output
0 = Output is unaffected by F3
1 = Output is activated when F3 is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F3
1 = Sound is activated when F3 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F3
1 = Sound is activated when F3 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F3
1 = Output is activated when F3 is on

0: Not used. Must be set to 0.

Default Value: 16
Related CVs: CVs 33-36, 38-46 (Function Output Map)

CV 38
F4 Output Location

Description

CV 38 maps the F4 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
DIM	0	GEN	SHH	0	FX6	FX5	BELL

BELL: Bell Sound Effect
0 = Sound is unaffected by F4
1 = Sound is activated when F4 is on

FX5: Effect 1 Output
0 = Output is unaffected by F4
1 = Output is activated when F4 is on

FX6: Effect 2 Output
0 = Output is unaffected by F4
1 = Output is activated when F4 is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F4
1 = Sound is activated when F4 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F4
1 = Sound is activated when F4 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F4
1 = Output is activated when F4 is on

0: Not used. Must be set to 0.

Default Value: 0
Related CVs: CVs 33-37, 39-46 (Function Output Map)

CV 39
F5 Output Location

Description

CV 39 maps the F5 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
DIM	**0**	**GEN**	**SHH**	**0**	**FX6**	**FX5**	**BELL**

BELL: Bell Sound Effect
0 = Sound is unaffected by F5
1 = Sound is activated when F5 is on

FX5: Effect 1 Output
0 = Output is unaffected by F5
1 = Output is activated when F5 is on

FX6: Effect 2 Output
0 = Output is unaffected by F5
1 = Output is activated when F5 is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F5
1 = Sound is activated when F5 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F5
1 = Sound is activated when F5 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F5
1 = Output is activated when F5 is on

0: Not used. Must be set to 0.

Default Value: 2
Related CVs: CVs 33-38, 40-46 (Function Output Map)

CV 40
F6 Output Location

Description

CV 40 maps the F6 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
DIM	**0**	**GEN**	**SHH**	**0**	**FX6**	**FX5**	**BELL**

BELL: Bell Sound Effect
0 = Sound is unaffected by F6
1 = Sound is activated when F6 is on

FX5: Effect 1 Output
0 = Output is unaffected by F6
1 = Output is activated when F6 is on

FX6: Effect 2 Output
0 = Output is unaffected by F6
1 = Output is activated when F6 is on

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F6
1 = Sound is activated when F6 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F6
1 = Sound is activated when F6 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F6
1 = Output is activated when F6 is on

0: Not used. Must be set to 0.

Default Value: 4
Related CVs: CVs 33-39, 41-46 (Function Output Map)

CV 41
F7 Output Location

Description

CV 41 maps the F7 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
BRK	**UNCPL**	**MUT**	**DIM**	**0**	**GEN**	**SHH**	**0**

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F7
1 = Sound is activated when F7 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F7
1 = Sound is activated when F7 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F7
1 = Output is activated when F7 is on

MUT: Audio Mute
0 = Output is unaffected by F7
1 = Output is activated when F7 is on

UNCPL: Uncoupling Sound Effects
0 = Sound is unaffected by F7
1 = Sound is activated when F7 is on

BRK: Brake Squeal/Brake Release Sound Effects
0 = Sound is unaffected by F7
1 = Sound is activated when F7 is on

0: Not used. Must be set to 0.

Default Value: 16
Related CVs: CVs 33-40, 42-46 (Function Output Map)

CV 42
F8 Output Location

Description

CV 42 maps the F8 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
BRK	**UNCPL**	**MUT**	**DIM**	**0**	**GEN**	**SHH**	**0**

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F8
1 = Sound is activated when F8 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F8
1 = Sound is activated when F8 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F8
1 = Output is activated when F8 is on

MUT: Audio Mute
0 = Output is unaffected by F8
1 = Output is activated when F8 is on

UNCPL: Uncoupling Sound Effects
0 = Sound is unaffected by F8
1 = Sound is activated when F8 is on

BRK: Brake Squeal/Brake Release Sound Effects
0 = Sound is unaffected by F8
1 = Sound is activated when F8 is on

0: Not used. Must be set to 0.

Default Value: 32
Related CVs: CVs 33-41, 43-46 (Function Output Map)

CV 43
F9 Output Location

Description

CV 43 maps the F9 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
BRK	**UNCPL**	**MUT**	**DIM**	**0**	**GEN**	**SHH**	**0**

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F9
1 = Sound is activated when F9 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F9
1 = Sound is activated when F9 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F9
1 = Output is activated when F9 is on

MUT: Audio Mute
0 = Output is unaffected by F9
1 = Output is activated when F9 is on

UNCPL: Uncoupling Sound Effects
0 = Sound is unaffected by F9
1 = Sound is activated when F9 is on

BRK: Brake Squeal/Brake Release Sound Effects
0 = Sound is unaffected by F9
1 = Sound is activated when F9 is on

0: Not used. Must be set to 0.

Default Value: 4
Related CVs: CVs 33-42, 44-46 (Function Output Map)

CV 44
F10 Output Location

Description

CV 44 maps the F10 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
CPL	BRK	UNCPL	MUT	DIM	0	GEN	SHH

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F10
1 = Sound is activated when F10 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F10
1 = Sound is activated when F10 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F10
1 = Output is activated when F10 is on

MUT: Audio Mute
0 = Output is unaffected by F10
1 = Output is activated when F10 is on

UNCPL: Uncoupling Sound Effects
0 = Sound is unaffected by F10
1 = Sound is activated when F10 is on

BRK: Brake Squeal/Brake Release Sound Effects
0 = Sound is unaffected by F10
1 = Sound is activated when F10 is on

CPL: Coupler Sound Effect
0 = Sound is unaffected by F10
1 = Sound is activated when F10 is on

0: Not used. Must be set to 0.

Default Value: 32
Related CVs: CVs 33-43, 45-46 (Function Output Map)

CV 45
F11 Output Location

Description

CV 45 maps the F11 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
CPL	**BRK**	**UNCPL**	**MUT**	**DIM**	**0**	**GEN**	**SHH**

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F11
1 = Sound is activated when F11 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F11
1 = Sound is activated when F11 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F11
1 = Output is activated when F11 is on

MUT: Audio Mute
0 = Output is unaffected by F11
1 = Output is activated when F11 is on

UNCPL: Uncoupling Sound Effects
0 = Sound is unaffected by F11
1 = Sound is activated when F11 is on

BRK: Brake Squeal/Brake Release Sound Effects
0 = Sound is unaffected by F11
1 = Sound is activated when F11 is on

CPL: Coupler Sound Effect
0 = Sound is unaffected by F11
1 = Sound is activated when F11 is on

0: Not used. Must be set to 0.

Default Value: 64
Related CVs: CVs 33-44, 46 (Function Output Map)

CV 46
F12 Output Location

Description

CV 46 maps the F12 function to any of eight auxiliary decoder outputs as defined by a 1 in the corresponding bit position.

Bit 7							Bit 0
CPL	BRK	UNCPL	MUT	DIM	0	GEN	SHH

SHH: Short Horn/Whistle Sound Effect
0 = Sound is unaffected by F12
1 = Sound is activated when F12 is on

GEN: Generator Sound Effect
0 = Sound is unaffected by F12
1 = Sound is activated when F12 is on

DIM: Headlight Dimmer Function
0 = Output is unaffected by F12
1 = Output is activated when F12 is on

MUT: Audio Mute
0 = Output is unaffected by F12
1 = Output is activated when F12 is on

UNCPL: Uncoupling Sound Effects
0 = Sound is unaffected by F12
1 = Sound is activated when F12 is on

BRK: Brake Squeal/Brake Release Sound Effects
0 = Sound is unaffected by F12
1 = Sound is activated when F12 is on

CPL: Coupler Sound Effect
0 = Sound is unaffected by F12
1 = Sound is activated when F12 is on

0: Not used. Must be set to 0.

Default Value: 128
Related CVs: CVs 33-45 (Function Output Map)

Lighting Effect CVs

CVs 49-52
Hyperlight Effect Select

Description

CVs 49-52 are used to set Hyperlight lighting effects and associated control modes for their respective outputs.

CV 49, Headlight Effect Select
CV 50, Backup Light Effect Select
CV 51, FX5 Effect Select
CV 52, FX6 Effect Select

Bit 7 **Bit 0**

LED	R17	XING	PHSE	EF3	EF2	EF1	EF0

EF0-EF3: Effect Type Select

0 = On/off output
1 = Rule 17 dimmable headlight
2 = Mars Light
3 = Pyle-National 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 = Flashing rear-end device (FRED)
12 = Engine exhaust flicker
13 = Firebox flicker
14 = Reserved
15 = Dyno-light

Rule 17 dimmable headlight – This function output is normally an on/off output. When it is on, the output level will be reduced by approximately 60% when the dimmer function is activated.

Mars Light – This effect simulates the sweeping figure-8 pattern of this popular warning beacon.

Pyle-National Gyralite – The Gyralite is similar to the Mars Light, but generates a slow, wide-sweeping elliptical headlight pattern.

Oscillating headlights – Similar in appearance to the common twin-sealed-beam headlight, the oscillating headlight uses a moving reflector to sweep the headlight beam in a tight circular motion.

Lighting Effect CVs

Single- and double-flash strobes – The strobe effect simulates the white-hot burst of light associated with a xenon strobe.

Western-Cullen D312 rotary beacon – This effect provides a spectacular rendition of the revolving reflector and bulb assembly found atop many diesels from the 60s and 70s.

Prime Stratolite – The Stratolite is a new version of the rotary beacon, with the prototype consisting of four individual lamps arranged in a circular pattern, which electronically flash in a clockwise direction. The Stratolite flashes in a mechanical “stepped” fashion, opposed to the smooth motion of the rotary beacon.

Type I and Type II ditch lights – These operate identically; however, if 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.

Flashing rear-end device (FRED) – Also known as an end-of-train device, this red flashing marker light is mounted on the coupler of the rear car or on the back of the caboose to warn following trains.

Exhaust flicker – This effect produces a random flicker with an intensity that increases with the throttle speed. The most realistic effect can be achieved by placing a red or orange lamp under the model’s exhaust port, and out of direct view. As the speed steps ramp up, the effect will glow brighter, imitating unmuffled exhaust gases and sparks. Use this effect in power generator cars.

Firebox flicker – This effect produces a random flicker that resembles a burning fire and can be used by placing a lamp in the caboose to simulate a wood-burning stove. The effect is improved when two bulbs are used (one yellow, the other red or orange), each connected to a separate function output.

Dyno-light – This effect for steam locomotives synchronizes the lamp brightness to the “output” of the dynamo so that the lamp brightness gradually increases as the dynamo builds up speed. For diesel locomotives, the lights will fade on and off to simulate the heating and cooling of the bulb filaments.

PHSE: Phase Select
0 = Phase A
1 = Phase B

Phase Select (bit 4) – This bit alters the timing of the lighting effect so that it is 180 degrees out-of-phase with other lighting effects. This allows you to have two lighting effects blinking back and forth. Set one effect to Phase A and the other to Phase B.

Lighting Effect CVs

XING: Grade Crossing Logic Enable
0 = Grade Crossing Logic disabled
1 = Grade Crossing Logic enabled when horn function is on

Grade Crossing Logic (bit 5) – This bit causes the lighting effect to activate only when the horn/whistle is sounded (and the corresponding lighting function key is on). This can be used to create prototypical scenarios such as causing the ditch lights to flash at a grade crossing. Grade Crossing Logic can be used with nearly all of the Hyperlight effects without affecting the on/off, dimmable headlight, Dyno-light, FRED, engine exhaust, or firebox flicker effects. Other effects will either turn off (e.g., strobes and beacons) or revert to a steady "on" state (e.g., Mars Light, ditch lights, etc.) as appropriate to prototypical practice.

R17: Rule 17 Mode
0 = Rule 17 Mode disabled
1 = Rule 17 Mode enabled

Rule 17 Mode (bit 6) – This bit converts the headlight and backup light into independent, non-directional lights. When Rule 17 Mode is active, the headlight is controlled as if it is FX5 and the backup light is controlled as if it is FX6.

LED: LED Compensation Mode Enable
0 = Incandescent-compatible lighting outputs enabled
1 = LED-compatible lighting outputs enabled

LED Compensation Mode (bit 7) – This bit improves the contrast of the lighting effects to compensate for the brightness of LEDs.

Default Value: 0
Related CVs: CV 57 (FX5, FX6 Directional Control Enable)
CV 58 (FX5, FX6 Lighting Override Enable)
CV 59 (Flash Rate)
CV 60 (Crossing Hold Time)

CV 57
FX5, FX6 Directional Control Enable

Description

CV 57 is used to configure the directionality of FX5 and FX6 function outputs. Setting a bit to 1 enables the corresponding function in the indicated direction. A function can be made bi-directional by setting both the forward and reverse bits to 1.

Bit 7							Bit 0
0	0	FX6(r)	FX6(f)	0	0	FX5(r)	FX5(f)

FX5(f): FX5 Forward
0 = FX5 function output disabled in forward
1 = FX5 function output enabled in forward

FX5(r): FX5 Reverse
0 = FX5 function output disabled in reverse
1 = FX5 function output enabled in reverse

FX6(f): FX6 Forward
0 = FX6 function output disabled in forward
1 = FX6 function output enabled in forward

FX6(r): FX6 Reverse
0 = FX6 function output disabled in reverse
1 = FX6 function output enabled in reverse

0: Not used. Must be set to 0.

Default Value: 51
Related CVs: CVs 51-52 (FX5, FX6 Select)
CV 58 (FX5, FX6 Lighting Override Enable)
CV 60 (Crossing Hold Time)

CV 58
FX5, FX6 Lighting Override Enable

Description

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

Bit 7							Bit 0
0	0	0	0	0	0	FX6OVR	FX5OVR

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

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

0: Not used. Must be set to 0.

Note: *If both FX5OVR and FX6OVR are set to 1, FX5 will have precedence.*

Default Value: 0
Related CVs: CVs 51-52 (FX5, FX6 Select)
CV 57 (FX5, FX6 Directional Control Enable)
CV 60 (Crossing Hold Time)

CV 59
Flash Rate

Description

CV 59 is used to adjust the overall flash rate of Hyperlight effects.

Bit 7							Bit 0
0	0	0	0	FR3	FR2	FR1	FR0

FR0-FR3: Flash Rate Select
0 = Maximum flash rate
.
.
.
15 = Minimum flash rate

0: Not used. Must be set to 0.

Default Value: 4
Related CVs: CVs 49-52 (Hyperlight Effect Select)
CV 60 (Crossing Hold Time)

CV 60
Crossing Hold Time

Description

When Grade Crossing Logic is enabled (CVs 49-52, bit 5), CV 60 sets the time (range of 0 to 15 seconds) that an effect will stay on after the horn button is released.

Bit 7							Bit 0
0	0	0	0	HT3	HT2	HT1	HT0

HT0-HT3: Hold Time Select
0 = Minimum hold time (0 seconds)
.
.
.
15 = Maximum hold time (15 seconds)

0: Not used. Must be set to 0.

Default Value: 4
Related CVs: CVs 49-52 (Hyperlight Effect Select)
CV 59 (Flash Rate)

Misc. Control CVs

CV 61
F11 Braking Rate

Description

This CV contains a value from -127 to +127 that corresponds to the decoder's baseline deceleration offset.

Bit 7							Bit 0
SIGN	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**

D0-D6: F11 Braking Rate

SIGN: Sign
0 = Positive value
1 = Negative value

Additional Information
The F11 braking rate is added to or subtracted from the decoder's base braking rate (CV 4) when the F11 button is pressed. Set this CV to the same value in your Tsunami-equipped locomotive to synchronize the F11 braking effect.

Note: *A setting of +0 or -0 (CV 61 = 0 or 128) disables this feature.*

Default Value: 0
Related CV: CV 4 (Base Deceleration Rate)

User ID CVs

CV 105
User Identifier #1

Description

CV 105 provides storage for user-supplied data such as purchase date, serial numbers, spouse's birthday, etc. Otherwise, this CV has no effect on decoder operation.

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

D0-D7: User Identifier Data

Additional Information

This CV may be programmed with any value from 0 to 255.

When the decoder is reset to default values, CV 105 is reset to the software's minor revision code.

Default Value: Varies by software revision
Related CV: CV 106 (User Identifier #2)

CV 106
User Identifier #2

Description

CV 106 provides storage for user-supplied data such as purchase date, serial numbers, spouse's birthday, etc. Otherwise, this CV has no effect on decoder operation.

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

D0-D7: User Identifier Data

Additional Information

This CV may be programmed with any value from 0 to 255.

When the decoder is reset to default values, CV 106 is reset to the software's default CV value configuration.

Default Value: Varies by software revision
Related CV: CV 105 (User Identifier #1)

Sound Control CVs

CV 112
Sound Configuration 1

Description

CV 112 allows you to configure the generator and clickety-clack sound effects. A setting of 1 in the corresponding bit position enables the selected sound effect.

Bit 7							Bit 0
0	0	0	0	0	TPC	APT	GEN

GEN: Generator Control
0 = Generator sound effect controlled by F9
1 = Generator sound effect always on

APT: Axles per Truck
0 = Two axles per truck
1 = Three axles per truck

TPC: Trucks per Car
0 = Two trucks per car
1 = One truck per car

0: Not used. Must be set to 0.

Additional Information

APT (bit 2) sets the number of axles per truck used to determine the clickety-clack rate.

TPC (bit 3) sets the number of trucks per car used to determine the clickety-clack rate.

Default Value: 0
Related CVs: CV 116 (Moving Sound Scalar)
CV 117 (Rolling Stock Type Select)
CV 202 (Generator Probability)

CV 113
Quiet Mode Time-out Period

Description

When CV 113 is set to a non-zero value, sound effects are only activated when the decoder is addressed. When the model is stopped and all functions have been turned off, sound effects will turn off automatically after the quiet mode time-out period has elapsed.

Bit 7							Bit 0
Q7	Q6	Q5	Q4	Q3	Q2	Q1	Q0

Q0-Q7: Quiet Mode Time-out Period
0 = Sound effects turn on a few seconds after power is turned on
1 = Minimum time-out period (0.25 seconds)
.
.
.
255 = Maximum time-out period (63.75 seconds)

Additional Information
The time-out period is calculated in seconds as:

Time-out Period (seconds) = CV 113 x 0.25

Default Value: 0

CV 114
Bell Ring Rate

Description

CV 114 contains a value from 0 to 15 and is used to control the speed at which the bell rings.

Bit 7							Bit 0
0	0	0	0	BR3	BR2	BR1	BR0

BR0-BR3: Bell Ring Rate
0 = Fastest ring rate
.
.
.
15 = Slowest ring rate

0: Not used. Must be set to 0.

Default Value: 3
Related CVs: CV 130 (Bell Volume)
CV 227 (Bell Select)

CV 115
Airhorn/Whistle Select

Description

CV 115 is used to select from the available airhorns and whistle.

Bit 7							Bit 0
0	0	0	0	0	0	AH1	AH0

AH0-AH1: Airhorn/Whistle Selection
0 = Wabco E2
1 = Nathan K5LA
2 = Hancock air whistle

0: Not used. Must be set to 0.

Default Value: 0
Related CVs: CV 129 (Airhorn/Whistle Volume)

CV 116
Moving Sound Scalar

Description

CV 116 is used to set the proportion between the speed step and the scale speed in feet per second (ft/s). The decoder uses the scale speed to determine the frequency of the clickety-clack and flat spot sound effects.

Bit 7							Bit 0
MS7	**MS6**	**MS5**	**MS4**	**MS3**	**MS2**	**MS1**	**MS0**

MS0-MS7: Moving Sound Scalar

Additional Information

This CV can be programmed with any value from 0 to 255. A value of 1 corresponds to 0.01ft/s. Higher values correspond to faster scale speeds. For example, cars with a shorter wheelbase may need a higher value in CV 116.

Scale Speed (feet/second) = (Speed Step × CV 116) ÷ 100

Note: *Entering a value of 0 will disable the clickety-clack and flat spot sound effects.*

Default Value: 100
Related CVs: CV 112 (Sound Configuration 1)
CV 117 (Rolling Stock Type Select)

CV 117
Rolling Stock Type Select

Description

CV 117 can be programmed with a value from 0 to 255 to select sound effects appropriate to the type of car you are operating.

Bit 7							Bit 0
BSE	WNE	FSE	CCE	HBE	CPE	GE	FE

FE: Flat Spot Enable
- 0 = Flat spot sound effect off
- 1 = Flat spot sound effect on

GE: Generator Enable
- 0 = Generator sound effect off
- 1 = Generator sound effect on

CPE: Coupler Enable
- 0 = Coupler sound effects off
- 1 = Coupler sound effects on

HBE: Horn and Bell Enable
- 0 = Airhorns and bells off
- 1 = Airhorns and bells on

CCE: Clickety-Clack Enable
- 0 = Clickety-clack sound effect off
- 1 = Clickety-clack sound effect on

FSE: Flange Squeal Enable
- 0 = Flange squeal off
- 1 = Flange squeal on

WNE: Wheel Noise Enable
- 0 = Wheel noise off
- 1 = Wheel noise on

BSE: Brake Sounds Enable
- 0 = Brake sounds off
- 1 = Brake sounds on

Default Value: 254
Related CVs: CV 112 (Sound Configuration 1)
CV 116 (Moving Sound Scalar)
CV 128 (Master Volume Control)
CVs 129-143 (Sound Mixer)

Misc. Control CVs

CV 118
Recovery Speed

Description

CV 118 adjusts the recovery speed for momentary interruptions in power during operation.

Bit 7							Bit 0
RS7	RS6	RS5	RS4	RS3	RS2	RS1	RS0

RS0-RS7: Recovery Speed

0 = Disabled

1-127 = Absolute limiting: When set from 1 to 127, the decoder will limit the recovery speed to the corresponding speed step.

128 = Disabled

129-255 = Proportional limiting: When set from 129 to 255, the decoder will limit its power after a power loss to a specific percentage as calculated below:

Percentage = (CV 118 - 128) ÷ 127

Default Value: 204 (60%)

Sound Control CVs

CV 128
Master Volume Control

Description

CV 128 sets the overall volume of all sound channels.

Bit 7							Bit 0
VOL7	VOL6	VOL5	VOL4	VOL3	VOL2	VOL1	VOL0

VOL 0-7: Master Volume Control
0 = Minimum volume
.
.
.
255 = Maximum volume

Default Value: 192 (75%)
Related CVs: CVs 129-143 (Sound Mixer)

CVs 129-143
Sound Mixer

Description

CVs 129-143 set the volume of individual sound channels as follows:

Bit 7							Bit 0
MIX7	MIX6	MIX5	MIX4	MIX3	MIX2	MIX1	MIX0

MIX 0-7: Mixer Level
0 = Minimum sound level (0%)
.
.
.
255 = Maximum sound level (100%)

CV	Mixer Channel	Sound Effect	Default Value
CV 129	Mixer Channel 0	Airhorn/Whistle	225
CV 130	Mixer Channel 1	Bell	64
CV 131	Mixer Channel 2	Clickety-Clack	64
CV 132	Mixer Channel 3	Generator	25
CV 133	Mixer Channel 4	Flange Squeal	16
CV 134	Mixer Channel 5	Flat Spot	64
CV 135	Mixer Channel 6	Wheel Noise	32
CV 136	Mixer Channel 7	Uncoupling	64
CV 137	Mixer Channel 8	Coupler	64
CV 138	Mixer Channel 9	Brake Set	32
CV 139	Mixer Channel 10	Brake Squeal	64
CV 140	Mixer Channel 11	Retainer Valve	32
CV 141	Mixer Channel 12	Emergency Brake Valve	192
CV 142	Mixer Channel 13	Hand Brake Set	128
CV 143	Mixer Channel 14	Hand Brake Release	128

Related CV: CV 128 (Master Volume Control)

Auto Sound Control

CV 193
Bell ON Set Point

Description

CV 193 contains a value from 0 to 126 that specifies the throttle speed step at which the automatic bell will turn on.

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

D0-D6: Bell ON Set Point

0: Not used. Must be set to 0.

Default Value: 15
Related CVs: CV 194 (Bell OFF Set Point)
CV 197 (Analog Mode Auto Sound Configuration)
CV 198 (DCC Mode Auto Sound Configuration)

CV 194
Bell OFF Set Point

Description

CV 194 contains a value from 0 to 126 that specifies the throttle speed step at which the automatic bell will turn off.

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

D0-D6: Bell OFF Set Point

0: Not used. Must be set to 0.

Note: *If CV 194 is set to a value equal to or less than the value of CV 193, the automatic bell will not turn on.*

Default Value: 19
Related CVs: CV 193 (Bell ON Set Point)
CV 197 (Analog Mode Auto Sound Configuration)
CV 198 (DCC Mode Auto Sound Configuration)

CV 195
Grade Crossing Airhorn/Whistle Sensitivity

Description

CV 195 contains a value from 0 to 127 that specifies the positive rate of throttle change required to activate the automatic grade crossing airhorn/whistle.

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

D0-D6: Grade Crossing Airhorn/Whistle Sensitivity

0: Not used. Must be set to 0.

Additional Information

The CV setting is calculated as:

CV 195 Value = Speed Steps/Second ÷ 10

Default Value: 4

Related CVs: CV 197 (Analog Mode Auto Sound Configuration)
CV 198 (DCC Mode Auto Sound Configuration)

CV 197
Analog Mode Automatic Sound Configuration

Description

CV 197 allows you to set parameters for automatic sound control features in analog mode.

Bit 7							Bit 0
0	0	0	0	0	BELL	AHSIG	AHXING

AHXNG: Automatic Grade Crossing Enable
0 = Effect disabled
1 = Effect enabled

AHSIG: Automatic Horn Enable
0 = Effect disabled
1 = Effect enabled

BELL: Automatic Bell Enable
0 = Effect disabled
1 = Effect enabled

0: Not used. Must be set to 0.

Default Value: 0
Related CVs: CVs 193-194 (Bell ON/OFF Set Point)
CV 195 (Grade Crossing Airhorn/Whistle Sensitivity)
CV 198 (DCC Mode Auto Sound Configuration)

CV 198
DCC Mode Automatic Sound Configuration

Description

CV 198 allows you to set parameters for automatic sound control features in DCC mode.

Bit 7							Bit 0
0	0	0	0	0	BELL	AHSIG	AHXING

AHXING: Automatic Grade Crossing Enable
0 = Effect disabled
1 = Effect enabled

AHSIG: Automatic Horn Enable
0 = Effect disabled
1 = Effect enabled

BELL: Automatic Bell Enable
0 = Effect disabled
1 = Effect enabled

0: Not used. Must be set to 0.

Default Value: 0
Related CVs: CVs 193-194 (Bell ON/OFF Set Point)
CV 195 (Grade Crossing Airhorn/Whistle Sensitivity)
CV 197 (Analog Mode Auto Sound Configuration)

CV 201
Flange Squeal Probability

Description

CV 201 allows you to set the frequency of occurrence for the flange squeal sound effect.

Bit 7							Bit 0
FS7	FS6	FS5	FS4	FS3	FS2	FS1	FS0

FS0-FS7: Flange Squeal Probability
0 = Infinite time between flange squeals (never squeals)
.
.
.
255 = Constant flange squeal

Default Value: 64
Related CVs: CV 117 (Rolling Stock Type Select)
CV 133 (Flange Squeal Volume)

CV 202
Generator Probability

Description

CV 202 allows you to set the frequency of occurrence for the generator sound effect, which enables you to re-create prototypical scenarios appropriate to your car, e.g., a generator that never runs in a non-reefer car, a generator that constantly runs in a passenger car, or one that turns on and off according to the heat of the day (or lack thereof) in a reefer car.

Bit 7							Bit 0
GP7	**GP6**	**GP5**	**GP4**	**GP3**	**GP2**	**GP1**	**GP0**

GP0-GP7: Generator Probability
0 = Generator never turns on
.
.
.
255 = Generator runs constantly

Default Value: 192
Related CVs: CV 112 (Sound Configuration 1)
CV 117 (Rolling Stock Type Select)
CV 132 (Generator Volume)

Sound Control CVs

CV 227
Bell Select

Description

CV 227 is used to select the bell sound effect.

Bit 7							Bit 0
0	0	0	0	0	0	BS1	BS0

BS0-BS1: Bell Select
0 = Cast bell
1 = Electronic bell
2 = Gong bell

0: Not used. Must be set to 0.

Default Value: 0
Related CVs: CV 114 (Bell Ring Rate)
CV 130 (Bell Volume)

Misc. Control CVs

CV 228
Intelligent Consisting Function Output Location

Description

CV 228 sets the function key assignment to activate Intelligent Consisting once the decoder has entered into “waiting mode” for a signal from the command station to add it to the consist.

Bit 7							Bit 0
0	**0**	**0**	**0**	**FOL3**	**FOL2**	**FOL1**	**FOL0**

FOL 0-3: Function Output Location
1 = F1 output location
.
.
.
12 = F12 output location

0: Not used. Must be set to 0.

Default Value: 8
Related CVs: CVs 33-46 (Function Output Map)

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