



## SDH167D SoundFX®v3

### Fits many HO locomotives

2 CV Selectable Steam & Diesel Sound Schemes Included

### HO Scale

Mobile Decoder with SoundFX v3  
Digitrax 9-Pin Harness Socket  
1.0 Amp/2 Amps Peak  
6 FX<sup>3</sup> Functions, 200ma Output  
8 Ohm 16 x 26 x 9mm Box Speaker  
330uF Capacitor

### Features:

- **Digitrax SoundFX®v3 Sound System**  
Your locomotives will sound “in scale” like the real thing with SoundFX v3 Customizable with 16, 12 or 8 bit .wav file sounds  
Works with all SoundFX 8 and 16 bit sound projects  
Up to 4 simultaneous voices  
Download sounds with a Digitrax Sound Programmer and SoundLoader II  
4 megabit On Board Sound Memory  
Cam input-synchronized steam-chuff option for steam locos  
Scalable Speed Stabilization configured for sound operation
- SoundFX v3 does not require an external rate sensor to vary workload.
- Factory 8 Ohm 16 x 26 x 9 mm box speaker on 10-pin plug design makes installation quick and easy.
- Smart Power Management- no more booster or programmer shutdowns!
- Program CVs using any Digitrax Compatible Control system without having to buy any extra equipment.
- Digitrax Easy Connect 9-Pin Socket for track, motor and function control, allows decoder to be moved between different locomotive interfaces.
- Series 7 Enhanced Decoder Features.
- Works with PX112-10 Power Extender, up to 15V maximum on track.
- Digitrax FX<sup>3</sup> Functions-Control lights and functions for prototypical lighting effects and on/off control.
- Configurable FX<sup>3</sup> Pulse Function available on all function outputs.
- Digitrax LocoMotion® System – Lets your trains run like the real thing!
- 2 Digit and 4 Digit Addressing.
- Basic, Advanced & UniVersal Consisting.
- SuperSonic motor drive for silent operation.
- Direct and Operations Mode programming.
- Decoder Reset by CV8, with or without speed table reset.
- Transponder Equipped ready for transponding ID on your layout.
- Power-on Motor Isolation Protection, helps prevent damage to your decoder.
- DCC Compatible.
- FCC Part 15, Class B RFI compliant.
- Operates on DCC track voltage 9V minimum. to 18V maximum.

## Parts List:

1 SDH167D Function Decoder with SoundFX® v3

1 Instruction Sheet

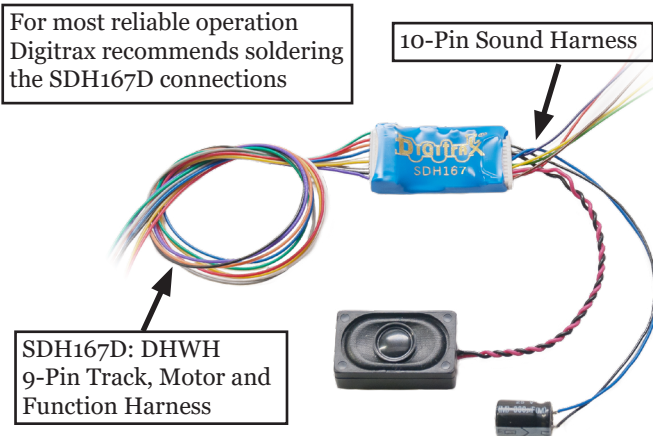
1 10-Pin Sound Harness - 8 Ω 16 x 26 x 9 mm box speaker and 330uF cap

1 9-Pin DHWH Digitrax Track, Motor, and Function Harness

Visit [www.digitrax.com](http://www.digitrax.com) for the latest information, technical updates and additional locomotive-specific installation instructions. **CAUTION: Programming or layout track voltages should not exceed 18V when using this decoder, or non-warranty damage may occur.**

## Quick Start Installation Instructions:

### Figure 1: SDH167D Decoder Components



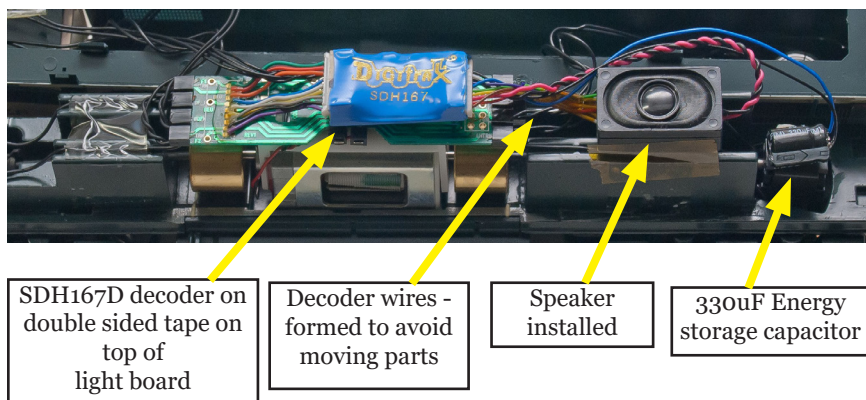
*SDH167D showing 10-Pin Sound Harness with 8 Ohm 16 x 26 x 9mm box speaker and 330uF capacitor*

Figure 2 shows plug-in connection in an Athearn 9-pin plug locomotive. For an 8-pin locomotive socket, use a Digitrax DHWHP version of 9-pin harness.

Using this DHWH harness version for a soldered install, follow these steps:

1. On the 9-pin track, motor and function harness: connect the red and black track leads to the locomotive track power connections. Connect the orange and gray motor leads to the **isolated** motor connections. *Motor connections must be isolated from the track feed or other voltages.*
2. On the 9-pin harness connect the function leads that are to be used for e.g. lights. Insulate any unused wires so they cannot short to the locomotive frame or track power. Be sure to use current setting

**Figure 2: SDH167D: Install in an Athearn 9-Pin plug locomotive.**



resistors with LED lamps. Refer to locomotive documentation for any lamp requirements.

3. Mount the factory 8 ohm box 16 x 26 x 9mm speaker attached to the 10-pin sound harness in a suitable location (refer **Figure 2**). Be sure to inspect the speaker diaphragm for magnetic debris or damage, which will affect sound quality. Ensure diaphragm does not touch anything. Other 8-ohm speaker(s) may be substituted. *Note: Depending on the locomotive model and construction it may be necessary to modify the frame or parts of the internal shell to make room for one or more speakers and enclosures.*
4. Mount the 330uF electrolytic energy storage capacitor from the 10-pin sound harness. Be sure not to short the capacitor case or leads to the track leads or locomotive frame, damage to the decoder may result.
5. For steam units using external synchronization cam capability, connect the white CAM wire of the 10-pin sound harness to the output connection of your cam, and configure CV133 to a value of 128 to synchronize the steam chuff with this external cam input.
6. Inspect the installation before testing the sounds and replacing the shell. In particular be sure that wires are correctly connected and routed and that no wires are shorted to the frame or track, or will be pinched at re-assembly.
7. Place the loco on an active DCC track powered by a compatible DCC system and select the factory default address 03 to enable sounds for testing.
8. Be sure F8 (mute) is OFF to allow full sound output, and then press F1 (bell) or F2 (whistle/horn) ON to hear the associated sounds.
9. Customize sounds by programming sound CVs to adjust the desired configurations. Sound Projects other than the factory loaded default can be loaded by using a USB Digitrax SoundFX Programmer (DCS52, DCS210+, PR4 etc.) and using the free SoundLoaderII or later PC software from the Digitrax web site at <https://www.digitrax.com/sound-depot/>.

## **Speaker Mounting and Baffle or Enclosures:**

The sound performance, volume and efficiency of any attached speaker(s) is *greatly affected* by the mounting system and required baffle or enclosure. The included 8 ohm box speaker is pre-mounted in a baffle for your convenience. Additional baffles or other mounting systems may need to be taken into consideration when installing. Baffles are used to isolate the speaker diaphragm front sound waves from the “out of phase” rear sound waves to minimize sound cancellation, particularly at lower frequencies. For the most efficient sound generation, the cubic volume of the baffle should be as large as practically possible, and the baffle walls should be acoustically rigid so not to allow acoustic interference.

## **Digitrax SoundFX<sup>®</sup> v3 System:**

For a more prototypical railroading experience, your decoder can be customized for your specific locomotive by programming some of the Configuration Variables, or CVs, available.

Digitrax SoundFX v3 lets you make your locos sound “in scale” like the real thing! The SoundFX v3 sound CVs used in the range of CV140 to CV240 let you customize your decoder without having to reload a new sound project. Digitrax sound decoder CVs can be programmed using either a programming track or with the operations mode using the main line. See the Digitrax web site for more information on programming CVs.

## **Customizing Your Decoder:**

This decoder will initially operate and generate sound using address 03. On your Digitrax system, simply select the decoder’s address and the sounds will start. [On some DCC systems, it is necessary to select the decoder address AND send a command to start the sounds].

The factory supplied sound project loaded into the SDH167D sets CV60 to 00 for a SD38 diesel locomotive scheme. The other preloaded scheme is selectable with the value 1 in CV60. If the locomotive you’re installing in is not one of the preloaded schemes you can download the appropriate project from the Digitrax website.

**Sound Control Functions:** The following table shows how each decoder function controls sounds for the factory sound project.

Function#	Function Controls	Notes
F0	Lights	F0 controls directional white/yellow wires
F1	Bell	CV146 controls rate, CV157 selects bell type
F2	Horn/Whistle	CV150 selects horn choices
F3	Coupler crash	Auto coupler/brake set by CV151 max speed
F4	Air feature disable	F4 <b>OFF</b> enables pop-off, drier and starts compressor/air pump
F5	Diesel = Dynamic brake Fans Steam = Water Pump turbine	
F6	Diesel = Notch Up Steam = Blow-down	Notch UP if CV155=01 or 02
F7	Crossing Gate Air horn or; Diesel = Notch DOWN Steam = Wheel slip	Notch DOWN, if CV155 = 01 or 02 (Crossing Gate active if in Diesel mode and CV155=0)
F8	Mute Control	F8 ON is mute
F9	Brake squeal	
F10	Crossing Gate Air horn Sequence	
F11	Steam = Greaser	
F12	Steam = Safety Blow-off	

**Configuration CV setup:** The following tables show the CVs used in this decoder sound project and how it is set up at the factory to operate various sounds using your throttle. SFXv3 CV assignments are generally consistent with earlier Digitrax decoders.

**Motor Drive Frequency: CV9:** CV9 value sets motor frequency in KHz, range 4 to 50KHz for CV values 01-50. 00 sets a supersonic 16KHz default.

**Motor Back EMF (BEMF) Trim: CV10:** Value 64 and up to 127 slows down step1 BEMF motor speed. 00 default also sets this to 64.

**Motor Control: CV55/CV56/CV57:** CV55 sets BEMF static gain, CV56 controls dynamic gain, CV57 sets BEMF Intensity. This is same as prior Digitrax decoders.

**Master Volume: CV58:** The value in CV58 sets the master sound volume, and CV140 to CV145 trim volumes for specific sound types. If you download a new .wav sound file for any of the sounds in the schemes, be careful to set a volume level that does not overdrive the speakers, which may cause distortion or damage.

CV#	Sound Control Usage	Range	Default Value
01	2 Digit Address	1-127	03
11	Sound Time Out, 06 = Sound ends when loco address is unselected, 00=Sound stays on after loco is unselected		06
29	Configuration Register - Speed steps, 2 /4 digit addressing, Analog Mode, Normal direction of travel, speed tables		06
49	FX effect: Forward Light (FOF) - Headlight		00
50	FX effect: Reverse Light (FOR) - Reverse Light		00
51	FX effect: Function 1 lead		00
52	FX effect: Function 2 lead		00
58	Master Volume (F8 used for Mute) 1=min 00=max	00-15	09
60	Sound Scheme Select	00-01	00
132	Notch Rate	00-255	127
133	Steam CAM config, 128=>EXT cam, 1-127=>DRIVER dia”	01-128	63
134	Steam Gear Ratio Trim, 32 = 100% Ratio	00-255	32
135	Mute Volume	00-64	00
140	Prime Mover / Chuff Volume	00-64	60
141	Bell Volume	00-64	25
142	Horn/Whistle Volume	00-64	60
143	Time-Scattered Air Effects Volume	00-64	30
145	Miscellaneous Volumes	00-64	40
146	Bell Ring Rate (1= 24 milliseconds delay)	01-100	07
147	Air Drier Rate (1= about 2 seconds delay)	01-64	02
148	Compressor Run Rate (seconds delay)	00-255	30
149	Air Compressor On Time	00-255	20
150	Horn Setup .	00-01	00
151	Auto Coupler Sequence Threshold Value-Peak speed for coupler/brake when direction change occurs and F3 is ON	00-64	48
152	Project Author ID, Digitrax=221		221
153	Project ID		6
154	Steam Blow down / Safety Volume	0-64	60
155	Notching/Slip Mode: 00=Automatic,		00
157	Bell Selector	00-00	00

## Selecting the Sound Scheme on Your SDH167D: CV60

The SDH167D comes preloaded with 2 different sound schemes, 1 diesel and 1 Steam. The active scheme is selected by the value in CV60, as shown in following table.

CV60 value	Factory Sound scheme
0	SD38 diesel
1	Steam type 1 (based on 3985)

**Selecting Horns: CV150:** The Diesel Scheme can be configured with one of 2 different horns using CV150.

### Diesel Notching: CV132 and 155:

Sound CV155 is provided to select Diesel engine “notching” modes. The default of CV155= 00 provides “automatic notching” that changes the diesel RPM settings at 8 distinct throttle speeds that are configured by Sound CV132 and follow speed directly.

Sound CV155=01 selects “semi-automatic notching” mode that allows F6 ON to increase the notch up from the current throttle setting and F7 ON to decrease back down towards the lowest current throttle notch setting.

Sound CV155=02 selects “manual notching” mode that allows F6 ON to increase the notch setting and F7 ON to decrease the notch sound setting, irrespective of the throttle speed, which then controls just the motor speed.

### Steam Exhaust Chuff / Cam Configuration and Gear Ratio Trim: CV133 and 134:

CV133 controls the Steam Chuff / Cam configuration in the decoder. It allows you to set the value of the CV equal to the diameter of the driver in inches from 1-127. Set CV133 to 128 to enable the external cam lead controlling steam exhaust chuffs. CV134 controls the gear ratio trim, where a value of 32 equals a 100% ratio.

### Bell and Air Effect Rates: CV146-149:

CV146 controls the bell rate or time between rings of the bell, it has a range from 1-100 with each increment adding 24ms of delay. CV147 controls the drier rate, it has a range from 1-64 with each increment adding about 2 seconds. CV148 controls the Compressor/ Air pump start rate

and CV149 controls how long the Compressor/ Air Pump runs.

### **Auto Coupler Sequence Threshold Value: CV151:**

CV151 controls the threshold at which coupler and brake sounds are automatically played *when* the locomotive direction changes and function 3 is enabled. CV151 has a range of 0-60.

### **Loading Other Sound Projects in your SDH167D:**

Decoder sounds can be re-loaded or customized using a Digitrax SFX programmer and your computer with the SoundLoader II software. Both the software and a number of alternate Sound Project files are available from the Digitrax Sound Depot web site. It takes only a few minutes to download the new sounds to your decoder.

Prior SFXv1 and v2 Sound Projects can be loaded into SFXv3 decoders if sized to fit in sound memory. SFXv3 projects may run on older SFXv1/v2 decoders with decreased functionality.

For example, earlier v1/2 decoders may be limited to 3 sound channels, whereas SDH167D decoders can run new SFXv3 sound projects with up to 4 simultaneous channels in the scheme.

The additional channels allow e.g. V3 steam sound schemes to overlap near and far-side steam sounds for more realistic steam scheme operations.

### **SoundFXv3 DC Operation Mode:**

1. Digitrax SoundFX v3 decoders will operate on smooth DC power if CV29 is default value 06, allowing Analog Mode conversion.
2. Sound/motor will not start until about 6VDC on the track.
3. It is not practical to Consist/MU decoder equipped locomotives with non-decoder equipped locomotives, since they will not operate at same speed on shared track DC power.

### **SDH167D Troubleshooting:**

#### **If sound does not start in the decoder when on powered track:**

1. Make sure you have selected the locomotive address on a throttle. The sound will not startup and run unless the locomotive is addressed by the system.

Check your installation to make sure the decoder is installed properly.



### **If the sound output seems distorted:**

1. Check the speaker cone for magnetic debris that may have collected there. Debris on the speaker must be removed and this, or damage will cause a loss of sound quality.
2. Be sure that the CV58 volume is not set at a level that sets sound power too high for the track power and speaker being used.

### **If motor does not run:**

1. Check the motor is properly connected.
2. Make sure locomotive address is correct and selected. Activate Fo/ lights to see if decoder is powered and addressed properly.
3. If Front and Rear lights come uncontrollably solid ON and wink off once every 4 secs, the motor is not properly isolated from stray voltages. Check wiring.

### **If the sound in your decoder shuts down after you stop it and you are not using a Digitrax system for control:**

On some DCC systems decoders are not addressed by DCC packets after the locomotive is set to 0 speed.

In this case after the CV11 timeout elapses (6 second default), sound will “shutdown.” To defeat this feature, set CV11=00 to remove the timeout and shutdown. *To make sounds, the decoder must have a command addressed to it at least once.*

**If you have trouble reading back CVs on the programming track:** This may be due to insufficient current draw for program acknowledgment. You can always just re-program or **write** the CV value into a CV to get the desired results, even if reading CVs does not work.

OPS/Mainline mode is recommended for writing to (programming) all CVs except CV01, CV17 & CV18 (2 digit and 4 digit addresses).

If a second DCC decoder is present that is not SoundFX compatible then correct read back of CV data is not possible, since CV read back was not originally designed for multiple decoder read back.

**The SDH167D plays a Steam scheme, but I want the default Diesel scheme:** If the factory sound project with the 2 schemes has not been changed, program CV60 back to a value of 00 to reselect the default SD38 diesel scheme. The SDH167 sound project is on the web site so you can reload this if you get lost. Program CV8 to 8 to restore factory CV settings.

**I have loaded a new sound project but, the CVs and Function controls are not what I expected:** In SoundLoader II, open the sound project .spj file you programmed with “File>Open Sound Project File”. Now select “View>View Project Description”, the Project description should define how the project operates and how CVs and functions are configured for sound generation.

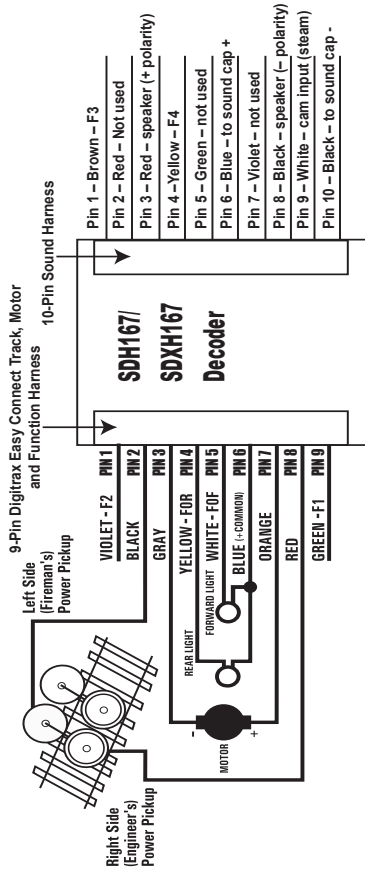
**I have loaded new .wav files for a bell in 16 bit resolution vs the 12 bit, but don’t hear much difference. Why?** With most *small speaker systems* it is tough to hear difference between a 12 and 16 bit download, or even an 8 and 16 bit download. This is particularly true if there is any noise in the layout room. In most cases the extra cost for “CD quality sound” is not justified. With a number of sound locomotives running at same time it gets quite noisy, and so many operators simply turn down the decoder volumes anyway.

**I want to load new .wav files with 12 bit resolution instead of 8 bit, but do not have enough room in the sound flash.** Save your project (.spj) to a new named project: “File> Save Sound Project File As” saves the project file with a new name. Next, right click on any .wav file you do not need or use, and select “Remove Association”. This will skip this .wav when pressing the green download “ALL”, or “Program Wavs” button, and the SFX decoder will not output this, or ignore/ skip this sound as silence. This frees up memory for you to download 12 or 16 bit .wav files that you wish to use, and be within the memory size available.

You can skip all .wav files that are not needed for the scheme you want to run, and/or can substitute any .wav versions you may prefer. Remember to save any modified project version with “File> Save Sound Project File”.

If you have free memory, you can download any single .wav by right clicking on the .wav entry and selecting “Download this Sound”.

**Figure 3:** SDH167D: connection diagram



## Warranty & Repair

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Digitrax gives a one year *Warranty* against manufacturing defects for this product.

Visit [www.digitrax.com](http://www.digitrax.com) for instructions for tech support and returning items for repair.

**Please return warranty items directly to Digitrax - DO NOT** return items to place of purchase.

errors and omissions excepted.



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