



**HO, N, O and Stationary**  
**SFX004: Plug N' Play SoundFX® Decoder**  
With 28mm Speaker & 330uF Capacitor

## **SFX004 Soundbug™ Decoder**

**Plug N' Play Sound module for HO, N, O Locomotives**  
**Preloaded with selectable Steam and Diesel Sound Schemes**

### **Features:**

- **Plug N' Play sound module for Digitrax DH165 series decoders**  
DH165A0, DH165K0, DH165K1A, DH165L0 and DH165Q1.
- **Stationary and under-layout sound**
- **Digitrax SoundFX® Sound System**-Your locomotives will sound like the real thing with **SoundFX™**
  - Customizable 8 Bit Sound**
  - 3 simultaneous voices**
  - Downloadable Sound** with Digitrax PR2 or PR3 and SoundLoader software
  - 4 Megabit Sound Memory**
  - Playable F2/Whistle** option with DT400 and DT402 Throttles
  - 1 Watt Sound Output**
  - Cam input**-synchronized steam-chuff option for steam locos
- **Smart Power Management**-no more booster or programmer shutdowns! No extra equipment needed to program or run
- **Program CVs using any Digitrax Compatible decoder programmer** without having to buy any extra equipment
- **Direct Mode Programming**
- **Operations Mode Programming**
- **DCC Compatible**
- **Runs on up to 20V track voltage**
- **Download sounds using Digitrax PR2/PR3 sound programmer**

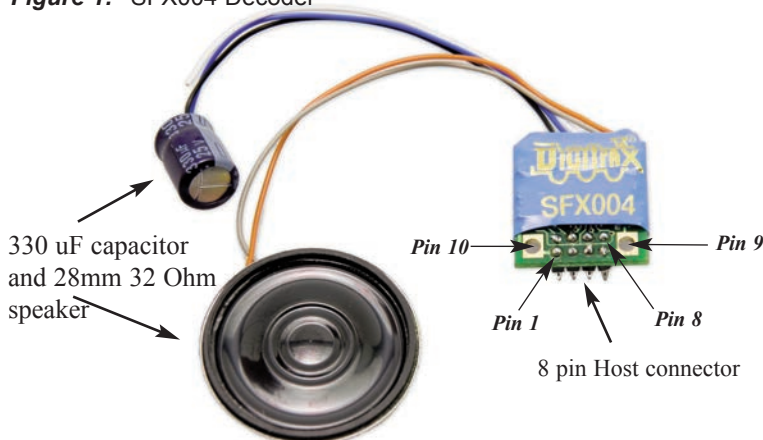
## Parts List

- 1 SFX004 Decoder with SoundFX®
- 1 Instruction sheet
- 2 2/56 x 1/4" mounting screws
- Attached 28mm 32 Ohm speaker and 330 uF capacitor

## Installation Information

For additional resources see Digitrax Decoder Manuals for test procedures, installation instructions, programming and other technical information. Digitrax manuals and instructions are updated periodically. Please visit [www.digitrax.com](http://www.digitrax.com) for the latest versions, technical updates and additional locomotive-specific installation instructions.

**Figure 1:** SFX004 Decoder

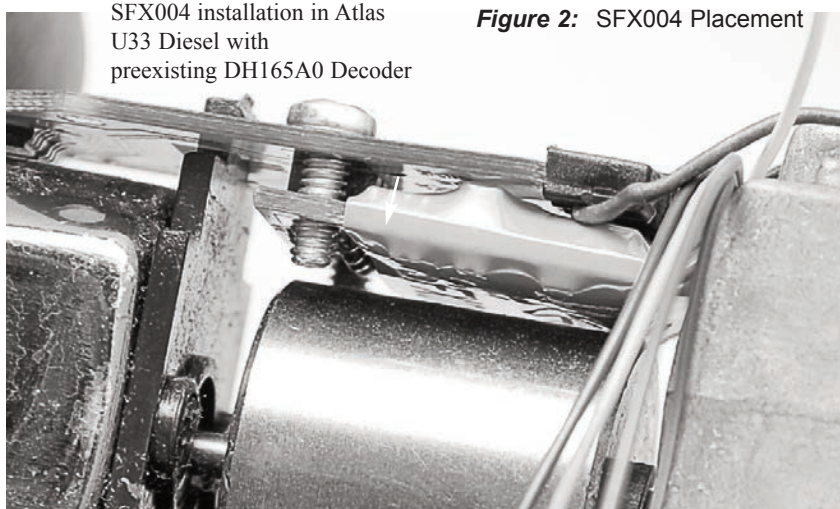


SFX004 8pin Host connector, also showing Speaker and 330uF Capacitor

## Installation Instructions

- 1) Identify the correct orientation and mounting side and of the DH165 series decoder to plug this sound module into. There is text saying “SFX here” etc,. The SFX004 must only be mounted from the correct side and orientation, for each of the DH165 host decoders. **For convenience, current photographs of DH165 series decoders and attached SFX sound Bug units are shown at the following address: [www.digitrax.com/soundbuginstall](http://www.digitrax.com/soundbuginstall)**
- 2) With correct orientation noted from step 1, align the dual row of SFX004 connector pins to the matching holes in the DH165 host PCB. Apply gentle and firm pressure behind the SFX004 connector to engage the pins until the black plastic connector base almost touches the DH165 host PCB. (The first pin insertion may take slightly more force to engage).
- 3) Screw in the two 2/56 screws from the DH165 host PCB down through the SFX004 to ensure the module is retained and parallel to the DH165 host.

- 4) Mount the attached 28mm speaker in an appropriate sound enclosure. Be sure to inspect the speaker diaphragm for magnetic debris or damage, which will affect sound quality. Other speakers may be substituted in combinations as long as the total impedance on the Orange/Gray wires is 8 ohms or greater.
- 5) Mount the 330uF/25V electrolytic energy-storage capacitor. It is often easiest to use double-sided tape to locate and secure this capacitor. Be sure not to short the capacitor case or leads to the track leads or locomotive frame, or damage to the decoder may result.
- 6) For Steam units with a synchronization cam capability, connect the White CAM lead to the cam output connection, and program CV133 to 128 for external CAM operation.
- 7) Inspect the installation before testing the sounds and replacing the shell. Take extra care to inspect that the SFX/SoundBug is clear of any moving parts such as e.g. flywheels in many of the possible locomotive installations. In most older units tested, using the DH165A0 and SFX004 combina-



tion, there is typically 1 to 2mm of flywheel clearance, if the Soundbug is correctly mounted flush and parallel to the host DH165 decoder. Space up or shim the DH165 series decoder to ensure an adequate separation with no binding.

- 8) Connect DCC track power from a compatible DCC system and select the factory default address 03 to enable SFX sounds for testing
- 9) Be sure F8 is OFF, and then press F1(bell) or F2 (whistle/horn) ON to hear these associated sounds.
- 10) Customize sounds by programming Sound CV's to adjust the desired con-



## Complete Train Control Run Your Trains, Not Your Track!

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figurations, as shown in the following tables of Sound FX CVs. Sound schemes other than the default Steam (CV60=0) or Diesel (CV60=1) schemes may be loaded by using a Digitrax PR2/PR3 Sound FX Programmer.

**Note:** For standalone operation without a DH165 series host decoder, DCC track power may be connected to the two gold ringed pads (see page 10) with holes that the two 2/56 screws engage on the Soundbug. Do not short or connect to any other of the 8 pin connector pins.

### Using the SFX004 with other DCC decoders

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The sound project loaded into this decoder may be operated independently of any other DCC motor or function decoder. If another non-Sound FX compatible DCC decoder is connected to the track leads then CV readback of SFX004 Sound CV's and PR2/PR3 SoundTest modes may not be possible. Note that it is always possible to Write CV values using Operations mode or a Service Mode programming track, even if CV Read is inoperative.

If the connected function loads are insufficient for CV readback with a PR2/PR3 or an incompatible DCC decoder is also connected, it is still possible to download a complete sound project by using the large green "program project" icon. in the SoundLoader program.

### Speaker Mounting and Baffle/Enclosures.

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The sound performance of any attached speaker(s) is greatly affected by the mounting system and required baffle or rear enclosure.

The baffle is used to isolate to speaker diaphragm front sound waves from the out of phase rear sound waves. This minimises sound cancellation, particularly at lower frequencies. For most efficient sound generation, the 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.

Practical baffle materials are plastic, cardboard and even sheetmetal. Common items such as cardboard tubes or 35mm film canisters may be modified and trimmed to create reasonable baffles.

Most HO or O scale or similar locomotives have limited internal volume within the shell, so the choice of speaker mounting requires some ingenuity for good sound performance and volume. An example of a commercial molded baffle in a ready-to-run locomotive is the Kato HO F40-PH, where the 28mm speaker clips into an enclosure at the upper rear of the locomotive shell.



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## Customizing Your Decoder

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Your Digitrax SFX004 Soundbug™ is ready to run and will operate and generate sound using address 03 with no additional programming. On your Digitrax system, simply select the locomotive's address and the sound will start. On some DCC systems, it is necessary to select the locomotive address AND send a command to start the sounds.

When used in conjunction with a separate DCC motor decoder in a single locomotive it is most practical to program both decoders to the same address and operating modes.

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 Sound decoders can be programmed using either the direct method on a programming track or with the operations mode using the main line. See the Digitrax Decoder Manual or the Digitrax web site for more information.

**Initial Test and Programming:** This decoder is preprogrammed and tested with a Steam locomotive sound scheme, and is ready to operate on factory default address 03. Before customizing the decoder it is useful to run it on the factory default address 03 to check the installation. The following sections show how to change the locomotive address and customize the decoder

For more information on decoder installation and programming techniques and examples visit the [www.digitrax.com](http://www.digitrax.com)

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## Changing the Decoder Address

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The first CV most people change is the decoder address. This allows you to independently control each loco with a unique address. Digitrax decoders are shipped with CV01 (AD2), the two digit address, set to 03. Following is a brief description of how to change the decoder address with a Digitrax DT series throttle. See your Starter Set Manual for complete programming instructions.

1. Place the loco on the programming track. Go into Program Mode on your system. On DT400/DT402 press **PROG**. On DT300, DT100 & DT200 press **RUN/STOP & FN/F0**.
2. Choose AD2 for 2 digit addressing or AD4 for 4 digit addressing (DT400/DT402 and DT300). (Ad for DT100 & DT200, see set manual for 4 digit instructions).
3. Choose the address you want to set up for the decoder.
4. Complete address programming. On DT400/DT402 press **ENTER**. On DT300, DT100 & DT200 press **SEL**.



**Note:** CV29 must also be programmed to enable 4 digit addressing, this is done automatically by the DT400/DT402 & DT300 but not on earlier throttles.

### **Using this decoder in other locomotives**

The factory supplied sound project loaded into the SFX004 is for a Steam (default) or SD38-2 diesel locomotive, selectable with the value in CV60. If you want to install it in a different locomotive, you can simply load a different sound project for that type of locomotive. The cam input is available for steam installations where you want to synchronize chuffing.

### **Digitrax LocoMotion® System**

The SFX004 does not have a motor drive capability but uses the DCC CV's associated with motor drive to synchronize the generation of prime move sounds.

### **Momentum-CV03 & CV04**

Momentum is part of the LocoMotion System. Acceleration is controlled by CV03 and deceleration by CV04. Both come from the factory set to 000. A range of 000 to 031 is available for both accel and decel. Try CV03:003 and CV04:000 as a starting point for experimenting with momentum.

### **Speed Tables-How the Loco Responds to the Throttle**

With Digitrax LocoMotion, there are two types of speed tables: 3 Step Tables and High Resolution 28 Step Tables. Please see your Decoder Manual for a discussion of the 28 Step Tables. The 3 Step Tables are set up by programming 3 CVs: Start Voltage (CV02), Mid point Voltage (CV06) and Max Voltage (CV05). These values are set at 000 at the factory. All have a range of values from 000 to 255. We recommend the following CV values as a starting point for experimenting with speed tables.

### **Other LocoMotion® Features: Switching Speed, Normal Direction of Travel**

<b>Loco Type</b>	<b>V Start CV02</b>	<b>V Mid CV06</b>	<b>V Max CV05</b>
<b>Switcher</b> Concentrated low speed. Limited top speed	002	038	064
<b>Road Switcher</b> Prototypical top speed w/evenly distributed curve from 0 to top speed	002	048	098
<b>Mainline Loco</b> Quick increase to cruising speed then levels off to prototypical top speed.	002	128	154



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**Switching speed** is controlled by CV54. The factory setting is 000 for OFF. To turn on the switching speed feature, program CV54 to a value of 001. When this feature is on, use F6 to activate and deactivate switching speed. With the feature on the throttle's target speed is effectively reduced by about 50% and the effects of accel and decel programmed into the decoder are reduced by 1/4. This is useful for yard switching operations.

**Normal Direction of Travel** is controlled by CV29. See your decoder manual for additional information on the settings for CV29.

## **Decoder Reset CV08**

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**Decoder reset** lets you reset all CV values to the initial factory settings. To reset all CV values, program CV08 to a value of 008. You also have the option of resetting all values except the 28 speed step tables. To do this, program CV08 to a value of 009.

## **Digitrax SoundFX™ System**

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Digitrax SoundFX™ lets you make your locos sound like the real thing!

The SoundFX™ sound CVs in the range of CV140 to CV256 let you customize your decoder without having to reprogram or change the installed sound scheme.

Standard decoder CVs in the range of CV01 to CV120 operate the same as for a non-sound FX<sup>3</sup> Digitrax decoders (they control motor and light functions etc.) CV58 is used as Master Volume, and CV60 is used to select an alternate scheme, if provided in the sound project.

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 controlled by Sound CV132.

Sound CV155=01 selects “semi-automatic notching” mode that allows F6 ON to increase the notch from the current throttle setting and F7 ON to decrease back 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 setting irrespective of the throttle setting, which controls just the motor speed.

The decoder's sound scheme can be reloaded using a Digitrax PR2/PR3 programmer and a sound project file (for example AC4400.spj) from the Digitrax Sound Depot web site. Typical sound downloads take between 50 and 100 seconds depending on the project complexity and file size.

The following tables show the CVs used in this decoder version and how it is set up at the factory to operate various sounds using your throttle.





CV#	Used For	[Range] default val
01	2 Digit Address	03
11	Sound Time Out, 06=Sound ends when loco address is de-selected, 00=Sound stays on after loco is de-selected	06
29	Configuration Register	06
49	Forward Light (F0F)-Headlight	0
50	Reverse Light (F0R)-Reverse Light	0
51	Function 1	0
52	Function 2	0
58	Master Volume (F8 used for Mute)	[0-15] 9
60	Select Sound Scheme	0
132	Notch Rate	127
135	Mute Volume	0
140	Prime Mover/Chuff Volume	[0-64] 60
141	Bell Volume (Min=0, max=64)	25
142	Horn/Whistle Volume (Min=0, max=64)	60
143	Time-Scattered Air Effects Volume	[0-64] 30
145	Misc vols	[0-64] 40
146	Bell Ring Rate (1=24 milliseconds)	[1-100] 07
147	Air Drier Rate (1=about 2 seconds)	[1-64] 02
148	Compressor Run Rate	30
149	Air Compressor On Time	20
150	Horn/Whistle Setup (Default=0, Playable Horn=1, Alternate Horn=2)	0
151	Auto Coupler Sequence Threshold Value- Peak speed to allow auto coupler/brake when direction change occurs and F3 is ON	[0-60] 48
152	Project Author ID, Digitrax=221	221
153	Project ID Steam/SD38 2	02
154	Steam Blowdown / Safety volume	[0-64] 60
155	Notching/Slip Mode: 00=Automatic, 01=Semi-Automatic, 02=Manual	00





Func	Used For	Notes
<b>F0</b>	<b>Lights</b>	
<b>F1</b>	<b>Bell</b>	
<b>F2</b>	<b>Horn/Whistle</b>	<b>CV150 sets mode</b>
<b>F3</b>	<b>Coupler crash</b>	<b>Auto coupler/brake set by CV151 max speed</b>
<b>F4</b>	<b>Air feature disable</b>	<b>F4 off enables pop-off, drier and starts compressor/airpump</b>
<b>F5</b>	<b>Diesel= Dynamic brake Fans Steam=Waterpump turbine</b>	
<b>F6</b>	<b>Diesel=Notch UP Steam=Blowdown</b>	<b>Notch UP if CV155=01 or 02</b>
<b>F7</b>	<b>Crossing Gate Airhorn or; Diesel=Notch DOWN Steam=Wheelslip</b>	<b>Notch DOWN, if CV155=01 or 02 (Crossing Gate active if in Diesel mode and CV155=0)</b>
<b>F8</b>	<b>Mute Control</b>	<b>F8 ON is mute</b>
<b>F9</b>	<b>Brake squeal</b>	
<b>F10</b>	<b>Crossing Gate Airhorn Sequence</b>	
<b>F11</b>	<b>Steam=Greaser</b>	
<b>F12</b>	<b>Steam=Safety Blowoff</b>	

## SoundFX™ DC Operation Mode

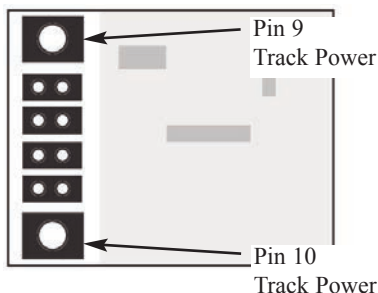
Digitrax SoundFX™ decoders will operate on smooth DC power. The sound will not start until approximately 5 volts is applied to the track and there will be no “start up sound.”

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## SFX004 In Stationary or Under-layout Operation

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The SFX004 can be used in a stand alone configuration as well. In these situations just connect pins 9 and 10 to the track and address the device normally.



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## SFX004 Troubleshooting

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### If the sound does not start in the decoder

1. Make sure you have selected the locomotive on a throttle. The sound will not run unless the locomotive is addressed in the system.
2. Check your installation to make sure the decoders are installed properly.

### If the sound output sounds distorted

1. Check the speaker cone for magnetic debris that may have collected there. Debris on the speaker will cause a loss of sound quality and must be removed.
2. Be sure that the CV58 volume is not set at a level that is too high for the speaker. For impedances below 32ohms (e.g. 8 to 30 ohms) set the volume setting lower to ensure the 1 watt output rating is not exceeded.

**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 CV's on the programming track,** this may be due to insufficient current draw by the SFX004 for the programmer you are using. Of course you can always just re-program the CV value into a CV to get the desired results, even though reading CV's does not work. OPs mode is recommended for programming all CVs except CV01, CV17 & CV18 (2 digit and 4 digit addresses). If a second DCC decoder is present that is not Sound FX compatible, then correct readback of CV data is not possible, since the NMRA CV readback method was not originally designed for multiple decoder readback.

**The SFX004 plays a Diesel scheme, but I want the default steam scheme.** If

the factory scheme has not been erased, program CV60 to a value of 0 to reselect the Steam scheme. Alternatively set CV60 to 01 to change to the SD38-2 sound scheme.

**I have loaded a new scheme but the CV's and Functions are not what I expected.** Load the sound project you programmed and then select the "view>project description" menu and then read the text file on the screen that defines how that project in particular uses CV's and Functions for sound generation and configuration.

**I cannot run the "SoundTest" feature of the SoundLoader program used in conjunction with a PR2/PR3 Programmer.** If the Soundbug™ is combined with a DCC decoder that is not fully SFX compatible, then it may not be possible for the SoundTest feature to activate properly. Of course, it is still possible to hear and exercise the sound scheme by placing the programmed units on a regular DCC track, and operating the functions, etc. Also, it is possible to program the Soundbug with new sound projects using the PR2/PR3, and non-SFX compatible decoders should have the Analog Mode conversion capability in CV29 turned OFF.



## Warranty & Repair

Digitrax gives a one year "No Worries" Warranty against manufacturing defects and accidental customer damage on all Digitrax products.

**That's it! A simple, straightforward warranty with no tricky language!**

Visit [www.digitrax.com](http://www.digitrax.com) for complete warranty details and instructions for returning items for repair.

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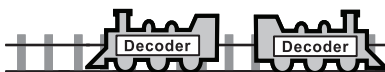


Your Digitrax LocoNet® Starter Set is just the beginning of an exciting trip! Pick the one that's right for you!



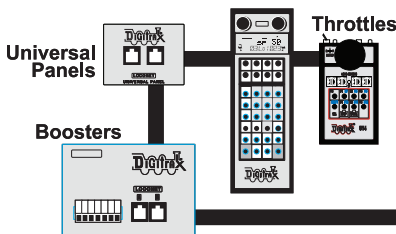
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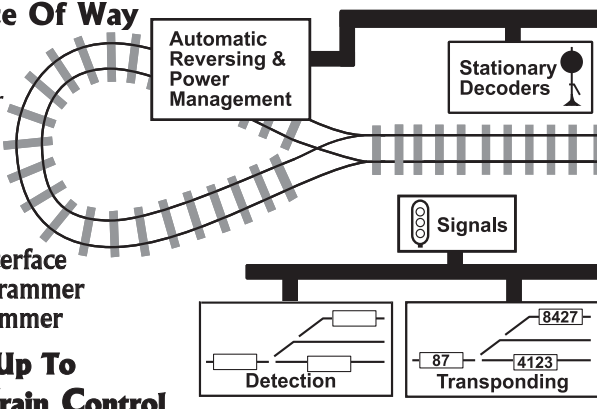
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