Complete Train Control
Run Your Trains, Not Your Track!

SFX0416

SoundFX™ Decoder

Preloaded with selectable Steam and Diesel Sound Schemes

HO and N Scale

SFX0416: Wired Function Decoder with SoundFX™
4 Function FX³ 200ma outputs
Includes 28mm 8 Ohm Speaker & 330uF Capacitor

Features:

- **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 and SoundLoader software
  16 Megabit Sound Memory
  Playable F2/Whistle option with DT400 Throttle
  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
- **Digitrax FX³ Functions-**Control lights and functions
- **Program using any Digitrax Compatible Control system** without having to buy any extra equipment
- **Direct mode programming**
- **Operations Mode Programming**
- **DCC Compatible**

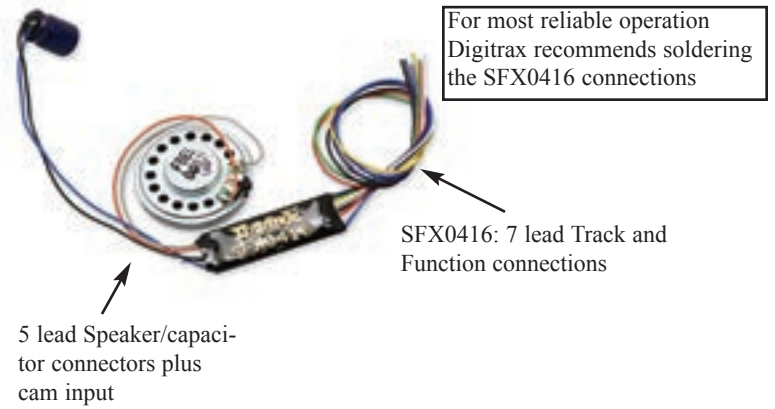
Parts List

1 SFX0416 Function Decoder with Sound FX™ 1 Instruction sheet
1 Wireset with 28mm 8 Ohm speaker and 330 uF capacitor/clip

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 for the latest versions, technical updates and additional locomotive-specific installation instructions.

Figure 1: SFX0416 Decoder



SFX0416 with Speaker and 330uF Capacitor

Installation Instructions

1) Connect the Red and Black track wires from the 7 connector Track and Function leads to the locomotive track power connections.
2) Connect the function leads that are to be used from the 7 conductor Track and Function wire set. Note that to be able to readback Sound FX CV's a combination of function lead loads of at least 60mA at 12volts should be connected to these function leads. Insulate the unused function leads so they cannot short to the locomotive frame or track power
3) Mount the 28mm speaker attached to the 5 conductor sound feature wire set in an appropriate sound enclosure. Be sure to inspect the speaker diaphram for magnetic debris or damage, which will affect sound quality. Other speakers may be subsitituted in combinations as long as the total impedance

on the Orange/Gray wires of the 5 conductor sound wire set is 8 ohms or greater.

4) Mount the 330uF/25V electrolytic energy storage capacitor from the 5 conductor sound wire set. Be sure not to short the capacitor case or leads to the track leads or locomotive frame or damage to the decoder may result.
5) For Steam units with a synchronization cam capability, connect the White CAM lead of the 5 conductor sound wire set to the cam output connection.
6) Inspect the installation before testing the sounds and replacing the shell.
7) Connect DCC track power from a compatible DCC system and select the factory default address 03 to enable sounds for testing
8) Be sure F8 is OFF, and then press F1(bell) or F2 (whistle/horn) ON to hear these associated sounds.
9) Customize sounds by programming Sound CV's to adjust the desired configurations, 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 Sound FX Programmer.

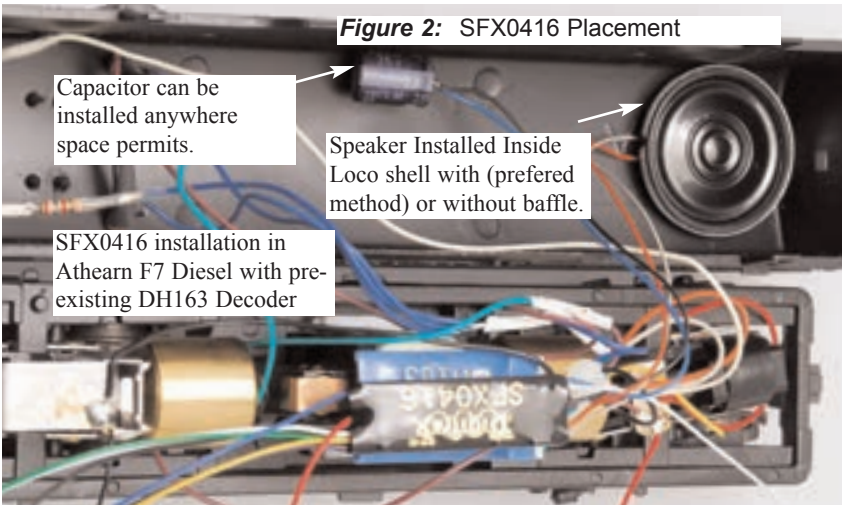


Figure 2: SFX0416 Placement

Using the SFX0416 with other DCC decoders

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 SFX0416 Sound CV's and PR2 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 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.

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. Commercial baffles are also available in many sizes to match many types of speakers, such as a “TDS Enclosure 1.10” diameter” from Tony’s Train Exchange [1-800-978-3472] unit that will match the 28mm factory speaker of the SFX0416

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

Your Digitrax SFX0416 Sound FX decoder 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.

Intial 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

Changing the Decoder Address

The first CV most people change is the decoders address. This lets you independently control each loco with its own 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 or on the main line.
2. Enter the programming mode using your DCC system/throttle. On DT400 press **PROG** until you see "Pd" if using a programming track or "Po" if using the main line.
3. Use your throttle to choose the address you want to set up for the decoder. On the DT400 use the left knob to dial AD2 for two digit programming, use the right knob to dial up the address, click the right knob to change to AD4 for programming 4 digit addresses.

4. Complete address programming. On DT400 press **ENTER**. **Note:** CV29 must also be programmed to enable 4 digit addressing, this is done automatically by the DT300 & DT400 but not on earlier throttles.

Using this decoder in other locomotives

The factory supplied sound project loaded into the SFX0416 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 SFX0416 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 DCC decoder operation. Acceleration is controlled by CV03 and deceleration by CV04. Both come from the factory set to 000/x00. A range of 000/x00 to 031/x1F is available for both accel and decel. We recommend that you try CV03:003/x03 and CV04:000/x00 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 Digitrax 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/x00 at the factory. All have a range of values from 000/x00 to 255/xFF. We recommend the following CV values as a starting point for experimenting with speed tables.

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

Switching speed is controlled by CV54. The factory setting is 000/x00 for OFF. To turn on the switching speed feature, program CV54 to a value of 001/x01. When this feature is on, use F6 to activate and deactivate switching speed. When switching speed is ON and F6 is ON, the switching speed feature is on. 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

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/x08. 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/x09.

Digitrax SoundFX™ System

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 FX3 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 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
F0	Lights	
F1	Bell	
F2	Horn/Whistle	CV150 sets mode
F3	Coupler crash	Auto coupler/brake set by CV151 max speed
F4	Air feature disable	F4 off enables pop-off, drier and starts compressor/airpump
F5	Diesel= Dynamic brake Fans Steam=Waterpump turbine	
F6	Diesel=Notch UP Steam=Blowdown	Notch UP if CV155=01 or 02
F7	Crossing Gate Airhorn or; Diesel=Notch DOWN Steam=Wheelslip	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 Airhorn Sequence	
F11	Steam=Greaser	
F12	Steam=Safety Blowoff	

Sound FX DC Operation Mode

Digitrax SoundFX deccoders 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.”

SFX0416 Troubleshooting

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 on the SFX0416 function leads. 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 was not designed for multiple decoder readback.

The SFX0416 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.

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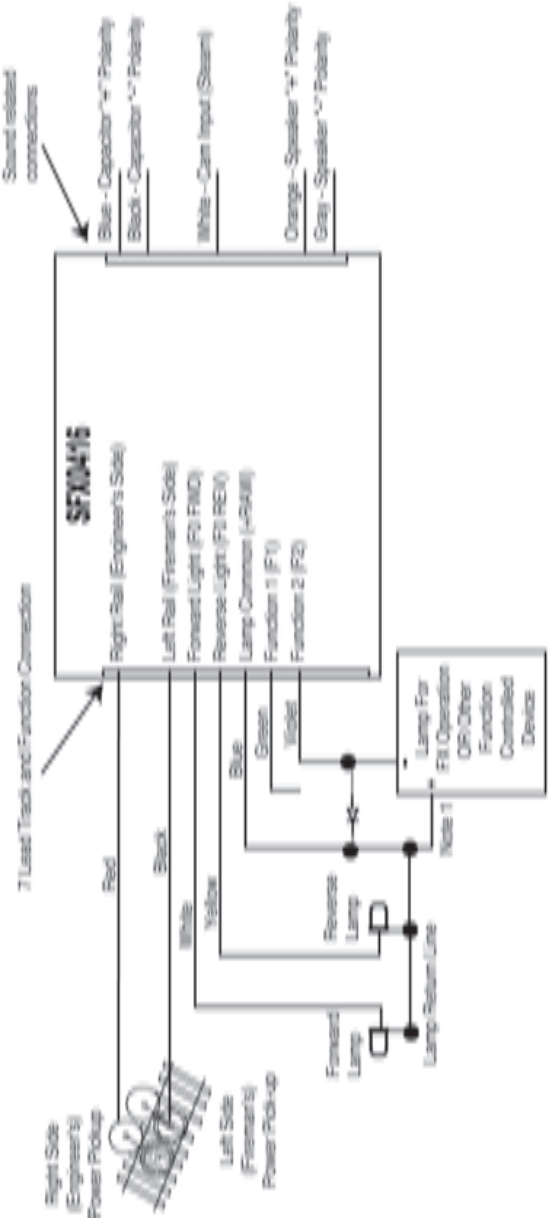
Function Outputs on the SFX0416



A Note about Steam Chuff/Cam configuration: CV133 and CV134 work together to control chuff timing:

CV133 Steam Chuff/CAM config, 128=>EXT cam, 1-127=>DRIVER dia in inches[63] CV134 Steam gear ratio trim, 32=100% ratio, [32]

Setting CV133's value from 1-127, puts the SFX0416 into 'Autochuff' mode. Autochuff mode tells the decoder to simulate driver chuff timing in software. The CV133 default value is 63, approximating a real-world loco driver diameter of 63 inches. If you halve this figure you will effectively double the chuff rate for a given loco speed.

CV134 (gear ratio) also effects the Autochuff rate. The CV134 default value of 32 assumes no gear reduction. Doubling this value to 64 tells the decoder to simulate a 2:1 gear reduction thereby doubling the chuff rate. CV134 and CV133 work together to create the desired chuff rate in your locomotive.

A final note on Chuff support - Setting CV133 to a value of 128 tells the SFX0416 that you want to configure an actual cam input on your locomotive. CV134-->128 tells the decoder to activate the white cam input wire on the 5 lead sound wire set of the SFX0416 (see diagram below)

A chuff will be triggered when a pulse of over 6 volts or DCC track voltage is seen on the white CAM input lead. This voltage has to go off (0 volts) before the next chuff can be triggered.

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Damaged decoders should be returned directly to Digitrax for repair.

Incorporates elements of US Patents 6220552, 6545886, 6729584, 6747579, other patents pending.

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SFX0416 Sound and Function Decoder

Wired Sound+Function Decoder

for N, HO and Large scale locomotives

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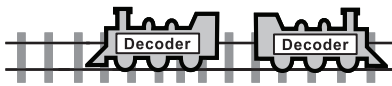

More Fun For Everyone

Add More Boosters,
Advanced & Simple Throttles,
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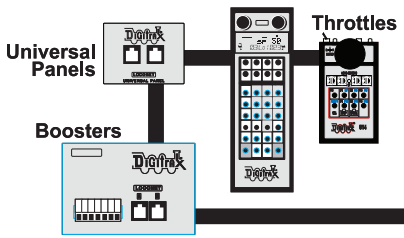
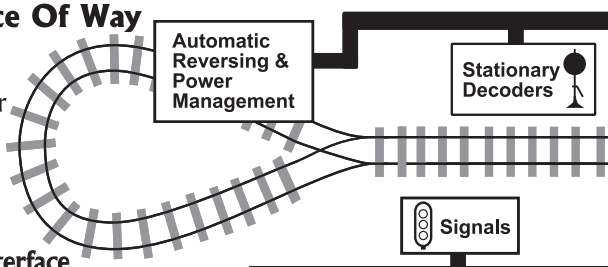


Maintenance Of Way

Make your layout more fun & simpler to operate!



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