



Complete Train Control  
Run Your Trains, Not Your Track!

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## SDXH186MT SoundFX®

### Fits many HO locomotives

8 Selectable Steam & Diesel Sound  
Schemes Included

1.15" x .64" x .21"

29.28mm x 16.26mm x 5.34mm

### HO Scale

Mobile Decoder with SoundFX  
21MTC interface

1.0 Amp/2 Amps Peak

8 FX<sup>3</sup> Functions, 200ma output

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## Features:

- **Digitrax SoundFX® Sound System**  
Your locomotives will sound in scale like the real thing with SoundFX  
Customizable 16, 12 or 8 Bit Sound  
Works with SoundFX 8 and 16 Bit sound projects  
4 Simultaneous voices  
Downloadable Sound with Digitrax PR3 and SoundLoader 2.0 software  
16 Megabit On board Sound Memory  
1 Watt Sound Output  
Cam input-synchronized steam-chuff option for steam locos  
Scaleable Speed Stabilization(BEMF) optimized for sound operation
- Configurable Logic Level or 12v F3-6 function outputs.
- SoundFX does not require an external rate sensor to vary workload.
- Smart Power Management-no more booster or programmer shutdowns!
- Program CVs using any Digitrax Compatible Control system without having to buy any extra equipment.
- Compatible with Locomotives using the 21MTC Interface
- Series 6 Decoder Features.
- Works with PX112-2 Power Extender
- 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 mode programming.
- Decoder Reset CV with or without speed table reset.
- Transponder Equipped ready for transponding on your Layout.
- Motor Isolation Protection helps prevent damage to your decoder.
- DCC Compatible.
- FCC Part 15, Class B RFI compliant.
- Digitrax "No Worries" Warranty.

## Parts List

1 SDXH186MT Function Decoder with SoundFX®

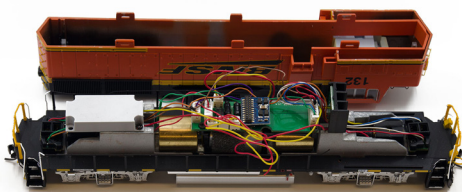
1 Instruction Sheet

## Installation Information

See the Digitrax Decoder Manual for complete decoder test procedures, installation instructions, programming and 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. **CAUTION: Programming and layout track must not exceed 16V when using this decoder.**

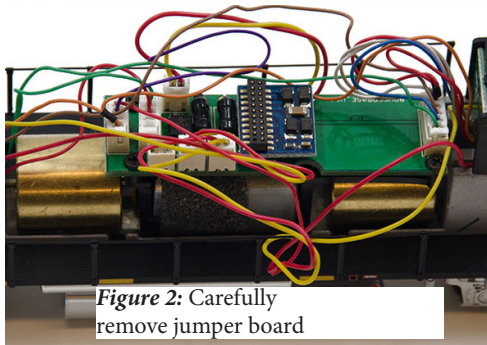
## Installation Instructions

1. Carefully remove the locomotive shell. (**Figure 1**) Note the orientation to the frame for correct re-installation. Arrange internal wires to expose the jumper board in the locomotive.



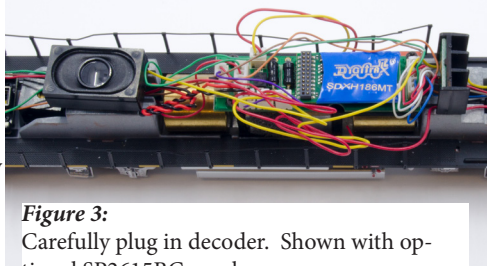
**Figure 1:** Remove loco shell

2. Remove the jumper board from the locomotive's 21MTC pins. (**Figure 2**) The jumper board allows the loco to operate on a standard DC track or in analog mode on a DCC track. **If the loco also has a 8pin NMRA socket, any jumpers should also be removed.**



**Figure 2:** Carefully remove jumper board

3. Insert the 21MTC socket onto the exposed pins. The black socket and the decoder text should be facing up. The socket is indexed so it will only fit on in one configuration. (**Figure 3**) Seat the decoder firmly on the pins.



**Figure 3:** Carefully plug in decoder. Shown with optional SP2615BC speaker.

**Note:** The SDH186MT does not include a speaker. This install is shown with an optional SP26158BC. Please refer to you locomotive manufacturer for the best way to attach a speaker to you locomotive motherboard.

4. Inspect the installation before testing the sounds and replacing the shell. In particular be sure that wires are correctly routed and not pinched between the shell and frame.
5. 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.
6. Be sure F8 (mute) is OFF to allow sound output, and then press F1 (bell) or F2 (whistle/horn) ON to hear the associated sounds.
7. Customize sounds by programming Sound CVs to adjust the desired configurations, as shown in the following tables of SoundFX CVs. Sound schemes other than the 8 factory preloaded can be loaded by using a Digitrax PR3 SoundFX Programmer or DCS240.

## **Speaker Mounting and baffle or 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 included 8ohm box speaker is pre-mounted in a baffle for your convenience, however additional baffles or other mounting systems may need to be taken into consideration when installing. The baffle is used to isolate the speaker diaphragm front sound waves from the “out of phase” rear sound waves. This minimizes sound cancellation, particularly at lower frequencies. For 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.

Practical baffle materials are plastic, cardboard and even sheet metal. Common items such as cardboard tubes, soda caps, or 35mm film canisters may be modified and trimmed to create reasonable baffles in the available space. Most HO or O scale or similar locomotives have limited internal volume within the shell, so the choice of speaker mounting benefits from some ingenuity to get best sound performance and space. Of course, you can substitute an alternate after market speaker of the maximum size for the locomotive you have.

## Customizing Your Decoder

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Your Digitrax SDXH186MT SoundFX decoder is ready to run and will operate and generate sound (with an installed speaker) 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.

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 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.

**CAUTION: Programming track must not exceed 16V when programming this decoder.**

**Initial Test and Programming:** This decoder is preprogrammed and tested with a diesel 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 general decoder installation and programming techniques and examples visit [www.digitrax.com](http://www.digitrax.com)

## 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 DT4XX series throttle. See your Starter Set Manual for complete programming instructions.

1. Place the loco on the **programming track not to exceed 16V**. Go into Program Mode on your system. On DT4XX throttle press **PROG**.

2. Choose AD2 for 2 digit addressing or AD4 for 4 digit addressing.
3. Choose the address you want to set up for the decoder.
4. Complete address programming by pressing **ENTER**.

**Note:** CV29 must also be programmed to enable 4 digit addressing, this is done automatically by the DT4XX throttles. See your Digitrax Decoder Manual or the Digitrax Toolbox App for how to set up CV29.

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

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The factory supplied sound project loaded into the SDXH186MT is for a GP38 diesel locomotive, other preloaded projects are 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 on pin 1 for Steam installations where supported by the locomotive.

## **Digitrax LocoMotion® System**

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Your locomotives look like the real thing, now you can make them run like the real thing, too. Digitrax decoders incorporate torque compensation for smooth as silk operation. You can also program CVs that control momentum, 3 step and 128 step speed tables, switching speed, normal direction of travel, scalable speed stabilization and more to take full advantage of the Digitrax LocoMotion System.

## **Momentum-CV03 & CV04**

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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.

<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

### **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. 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.

### **Other LocoMotion® Features: Switching Speed, Normal Direction of Travel & Scalable Speed Stabilization (Back EMF) Features**

**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 or the Digitrax Toolbox App for additional information on the settings for CV29.

**Scaleable Speed Stabilization (Back EMF)** intensity, or droop, is controlled by CV57. The factory setting for this feature is 006 which is suitable for most locos. You can adjust this value in the range of 000 for OFF to 015 for the maximum effect. Consult your Digitrax Decoder Manual for info about CVs 55 & 56 and their effects on scaleable speed stabilization. The factory setting for both CV55 & CV56 is 000.

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### **Logic Level or 12v 21 pin function outputs CV64**

The DH166MT can be configured via CV64 for compatibility with either Logic Level or 12 Volt function formats for outputs F3,F4,F5, and F6. By default CV64 is set to a value of 0 for Logic Level compatibility. This is the most common configuration for locomotives using the 21MTC interface. Setting CV64 to a value of 64 will set a bit for function compatibility to 12v format comparable to that of F0, F1, and F2 .

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

Digitrax SoundFX lets you make your locos sound in scale 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.

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### **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 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.

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### **Steam Chuff / Cam Configuration and Gear Rotation Trim CV133 and 134**

CV133 controls the Steam Chuff / Cam configuration in the decoder it allows you to get the value of the CV equal to the diameter of the driver in inches from 1-27 or to set the CV to 128 to enable the external cam lead. CV134 controls the gear rotation trim where a value of 32 equals a 100% ratio.

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

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CV146 controls the bell rate or time between ring 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 locomotive direction is changed and function 3 is enabled. CV151 has a range of 0-60.

## **Changing the Sound Scheme on your SDHX166D CV60, 150, 157**

The SDHX166D comes preloaded with 8 different sound schemes, 6 diesel and 2 Steam. These schemes can be selected using CV60. Each diesel scheme can be configured with one of 8 different horns using CV150 and one of 4 different bells using CV157. Each Steam scheme can be configured with one of 3 whistles using CV150 and one of 4 bells using CV157. To enable playable volume for your selected horn or whistle add 128 to the selected value (ex. Playable volume on horn 2 is enabled with a value of 130,  $02+128=130$ )



CV60 set to	Sound Scheme	CV150 set to	CV157 set to
0	GP38 Diesel	0= default 1-7= alt horns 128-135 = Playable horns	0=default 1-3 = alt bells
1	GE Evolution Diesel	1= default 0-7= alt horns 128-135 = Playable horns	0=default 1-3 = alt bells
2	SD70 Diesel	2= default 0-7= alt horns 128-135 = Playable horns	0=default 1-3 = alt bells
3	GP10 Diesel	3= default 0-7= alt horns 128-135 = Playable horns	0=default 1-3 = alt bells
4	RS1 Diesel	4= default 0-7= alt horns 128-135 = Playable horns	0=default 1-3 = alt bells
5	C420 Diesel	5= default 0-7= alt horns 128-135 = Playable horns	0=default 1-3 = alt bells
6	Steam type 1 (based on 3985)	0= default 0-2= alt whistles 128-130 = Playable whistles	0=default 1-3 = alt bells
7	Steam type 2 (based on K27)	1= default 0-2= alt whistles 128-130 = Playable whistles	0=default 1-3 = alt bells

## **Loading Other Sound Schemes in your SDHX166D**

The decoder's sound scheme can be changed using a Digitrax PR3 programmer and your computer with the SoundLoader 2.0 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 sound to your decoder. 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. **(Table on next page.)**

CV#	Used For	Range	Default Value
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 - Advanced or Standard speed steps, 2 or 4 digit addressing, Analog Mode, Normal direction of travel, speed tables		06
49	Forward Light (FOF) - Headlight		00
50	Reverse Light (FOR) - Reverse Light		00
51	Function 1		00
52	Function 2		00
58	Master Volume (F8 used for Mute) 1=min 00=max	00-15	09
60	Sound Scheme Select	00-07	00
132	Notch Rate	00-255	127
133	Steam Chuff/CAM config, 128=>EXT cam, 1-127=>DRIVER dia in inches	01-128	63
134	Steam Gear Ration 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	Misc Vols	00-64	40
146	Bell Ring Rate (1=24 milliseconds)	01-100	07
147	Air Drier Rate (1-about 2 seconds)	01-64	02
148	Compressor Run Rate	00-255	30
149	Air Compress On Time	00-255	20
150	Horn/Whistle Setup (Default=0, Playable Horn=1, Alternate Horn=2 +128 for playable volume.)	00-07 or 128-135	00
151	Auto Coupler Sequence Threshold Value-Peak speed to allow auto coupler/brake when direction change occurs and F3 is ON	00-64	48
152	Project Author ID, Digitrax=221		221
153	Project ID		168
154	Steam Blow down / Safety Volume	0-64	60
155	Notching/Slip Mode: 00=Automatic,		00
157	Bell Selector	00-03	00

Function	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 = Water Pump 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	

## **SoundFX DC Operation Mode**

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Digitrax SoundFX decoders will operate on smooth DC power. The sound will not start until approximately 7 volts is applied to the track and there will be no “start up sound.”

## SDXH186MT Troubleshooting

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

1. Make sure you have selected the locomotive address on a throttle. The sound will not run unless the locomotive is addressed in the system.
2. Check your installation to make sure the decoder is 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 being used.

**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. Of course you can always just re-program the CV value into a CV to get the desired results, even if reading CVs does not work. OPS 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 the NMRA CV read back was not designed for multiple decoder read back.

**The SDXH186MT plays a Steam scheme, but I want the default Diesel scheme.** If the factory scheme has not been erased, program CV60 to a value of 0 to reselect the default GP38 diesel scheme.

**I have loaded a new scheme but the CVs 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 CVs and functions for sound generation and configuration.

## **Warranty & Repair**

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Digitrax gives a one year “*No Worries*” *Warranty* against manufacturing defects and accidental customer damage on all Digitrax command stations, boosters, throttles, decoders, power supplies and layout control devices.

**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.

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

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# SDXH186MT

Fits Many HO Locomotives with 21MTC interface

## Go Beyond DCC With



**Complete  
Train  
Control**

### Main Station

Starter Sets  
LocoNet®  
Power Supplies



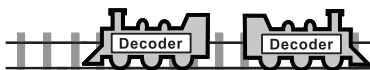
Your Digitrax LocoNet® Starter Set is just the beginning of an exciting trip! Pick the one that's right for you!



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The Digitrax  
Difference**

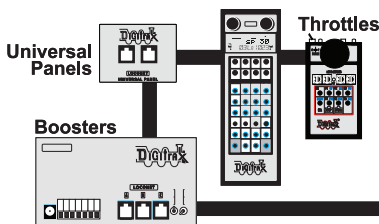
### Locomotive Shops

Mobile Decoders  
Function Decoders  
SoundFX™ Decoders



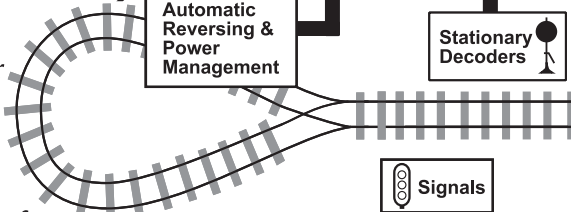
### More Fun For Everyone

Add More Boosters,  
Advanced & Simple Throttles,  
Power Supplies,  
Universal Panels,  
IR and/or Radio  
for more trains and operators.



### Maintenance Of Way

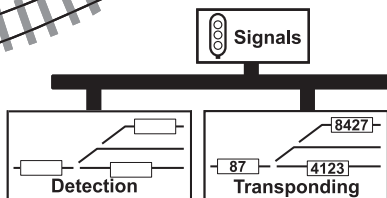
Make your  
layout more  
fun & simpler  
to operate!



### Computer Controls

Computer Interface  
Decoder Programmer  
Sound Programmer

### It All Adds Up To Complete Train Control



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SDXH186MT



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