SDXH187K1A

Fits Kato AC4400 or compatible HO locomotives
8 CV Selectable sound Schemes

HO Scale
Mobile Decoder with SoundFX v3
Drop-in light board replacement
1.0 Amp/2 Amps Peak
8 FX³ Functions, 200ma Output
8 Ohm 28 mm round 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 6 simultaneous voices
  Download sounds with a Digitrax Sound Programmer and SoundLoader II
  16 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 28mm round speaker .
- Smart Power Management- no more booster or programmer shutdowns!
- Program CVs with Digitrax Command Control, or compatible DCC system.
- Series 7 Enhanced Decoder Features.
- XF expanded function capability, allows user remap of function keys to sounds and function output leads.
- Works with PX112-2 Power Extender, up to 15V maximum on track.
- Digitrax FX3 Functions-Control lights and functions for prototypical lighting effects and on/off control.
- Onboard leds.
- Configured for 8 function output leads for leds.
- Configurable FX3 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 SDXH187K1A Function Decoder with SoundFX® v3, with 8 Ω 28 mm round speaker and 330uF cap.
1 Instruction Sheet

Visit 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.**

Installation Suggestions

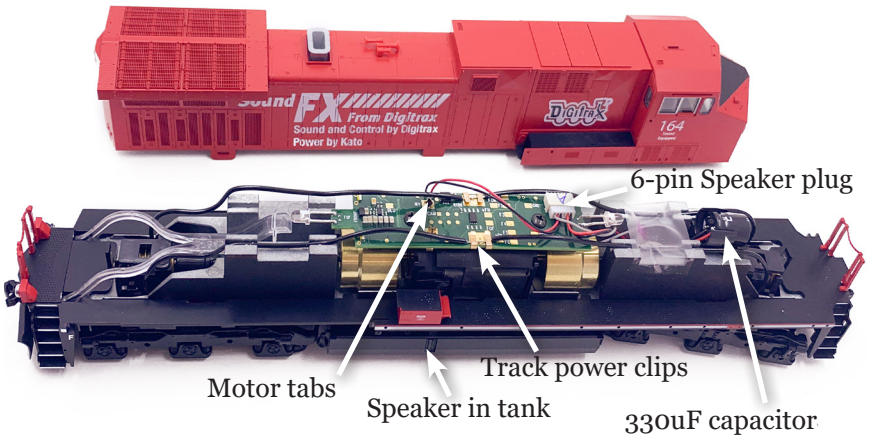

Figure 1: SDXH187K1A: Locomotive with decoder installed

1. Carefully remove the Locomotive shell.
2. Detach the track feed wires from the light board middle. Remove the 2 retain screws. Press out the two motor tabs and lift off the factory Light board.
3. Align the decoder on top of the motor bracket with the 6-pin speaker socket upwards and connection text visible. Press gently and support the two motor tabs to engage through the motor holes in the decoder. Replace the 2 mount screws.
4. Attach the track power wires from; the trucks at both ends of the decoder, under the brass retain clips and hold securely in place. Make sure not to short any parts of the wires outside of the allocated connection pads as this may cause non-warranty damage.
5. Place the capacitor in the space at the rear of the motor, and the 28mm speaker into the circular baffle in the fuel tank.
6. Be sure the location of these parts do not interfere with the shell replacement, otherwise you may need to modify parts of the locomotive to accom-

modate the installation. Insulate the capacitor and ensure its lead wires do not short to the frame metal . Mount the speaker so the diaphragm is pointed downwards in the fuel tank.

7. Dress excess speaker wire to be clear of the shell and moving parts.
8. Place the loco on an active DCC test track powered by a compatible DCC system and select the factory default address 03 to enable sounds for testing.
9. 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.
10. Once the sound and motor function OK, replace the locomotive shell, taking care to dress the light wires so they are not damaged.

Note: These instructions show an example light board replacement installation, for a Kato AC4400 HO locomotive.
For an AC4400, set CV60= 1 to change from factory default SD40-2 to the AC4400 scheme for that model.

Other model installs may require modification of the specific locomotive to make space for the speaker, capacitor etc., and selection of a different sound scheme. If desired you can load a different sound project from the Digitrax or other web site.

Function lead voltages:
The SDXH187K1A decoder has the positive function power return or +FN pads configured for lower voltage white leds at ~8mA, or 20mA micro-bulbs, and each function line does not require additional current setting resistors. Decoder connection pads are shown in Figure 2. Be careful if you solder to these decoder pads not to damage them, or short to adjacent circuitry that may cause non-warranty damage.

Functions 1 to 6 are available at the marked pads, and any of the +FN pads may be used to support leds driven by these functions.
To use 12V lights; you can return these lights/function circuits to the marked BLU [+12V] pad instead of the +FN lower voltage used for leds.

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. 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®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 SDXH187K1A sets CV60 to 00 for a SD40-2 diesel locomotive scheme. The other 7 preloaded schemes are selectable with the value 1 to 7 in CV60. If the locomotive you're installing in is not one of the 8 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.

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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 **OFF** 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	00-07	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/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 for coupler/brake when direction change occurs and F3 is ON	00-64	48
152	Project Author ID, Digitrax=221		221
153	Project ID		16
154	Steam Blow down / Safety Volume	0-64	60
155	Notching/Slip Mode: 00=Automatic,		00
157	Bell Selector	00-03	00

Selecting the Sound Scheme on Your SDXH187K1A:
CV60 The SDXH187K1A comes preloaded with 8 different sound schemes, 7 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	SD40-2 diesel
1	AC4400 diesel
2	GE Evolution diesel
3	C44-9 diesel
4	U33 diesel
5	SD70 diesel
6	SD45
7	4-8-4 Steam

Selecting Horns/Whistles/Bells: CV150, CV157: 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)

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 rage 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 SDXH187K1A:

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 many 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.

There are other sources for SPJ sound projects, such as joining the free group: https://groups.io/g/AnPRR. Their file section has over 300 SPJ's that are super-detailed with single locomotive types, versus the factory SPJ that has multiple loco samples loaded for convenience.

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 or 4 sound channels, whereas SDXH187K1A decoders can run new SFXv3 sound projects with up to 6 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 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.

SDXH187K1A 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.
2. 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 F0/ 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 SDXH187K1A plays a Steam scheme, but I want the default Diesel scheme: If the factory sound project with the 8 schemes has not been changed, program CV60 back to a value of 00 to reselect the default SD40-2 diesel scheme. The SDXH187K1A sound project is on the web site so you can reload this if you get lost. Program CV8 to 8 to restore factory 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 the 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.

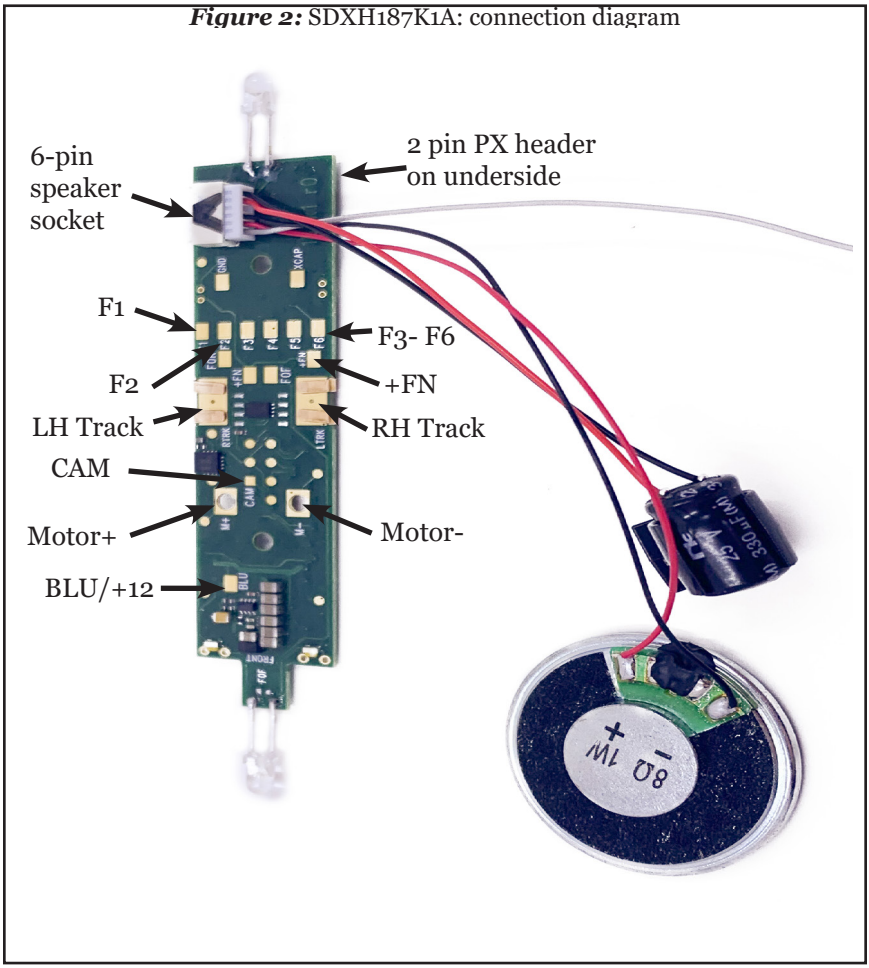
I want to load new .wav files with 12 bit resolution instead of 8 bit, but do not have enough room in the sound flash. Save your project (.spj) to a new named project: " File> Save Sound Project File As" saves the project file with a new name. Next, right click on any .wav file you do not need or use, 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 2: SDXH187K1A: connection diagram



Warranty & Repair

Digitrax gives a one year *Warranty* against manufacturing defects for this product. All decoders are 100% tested before shipping. Exercise caution during installation to avoid cost of a non-warranty return. Best practice is to bench-test a new decoder functionality *before* installation.
Visit www.digitrax.com for instructions for tech support and returning items for repair.

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

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