SDYH167IP SoundFX®v3+

Fits many HO locomotives
8 CV60-Selectable factory Steam
& Diesel Sound Projects [SPJs] Included

HO Scale
Mobile Decoder with SoundFX v3+
Fits Medium 8-pin Socket
1.0 Amp/2 Amps Peak
6 FX7 Functions, 200ma Output
8 Ohm 16 x 26 x 9mm Speaker
330uF Capacitor

Features:

- **Digitrax SoundFX®v3+ Sound System**
  128Mbit "Y"size Sound Memory allows all "high definition" SFX projects
  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 SoundFX 8 and 16 bit sound projects
  Up to 8 simultaneous voices/channels
  Download sounds with a Digitrax Sound Programmer and SoundLoader
  Cam input-synchronized steam-chuff exhaust option for steam locos
  Scalable Speed Stabilization configured for sound operation
  SFX3+ allows selection of a specific sound project, if multiple are are loaded
- Factory 8 Ohm 16 x 26 x 9 mm box speaker 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.
- Integrated DCC Medium Plug for track, motor and function control, allows decoder to be moved between different locomotive interfaces.
- Series 7 XF Enhanced Decoder Features.
- Digitrax FX7 Functions-Control lights and functions for prototypical lighting effects and on/off control.
- 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 22V maximum.

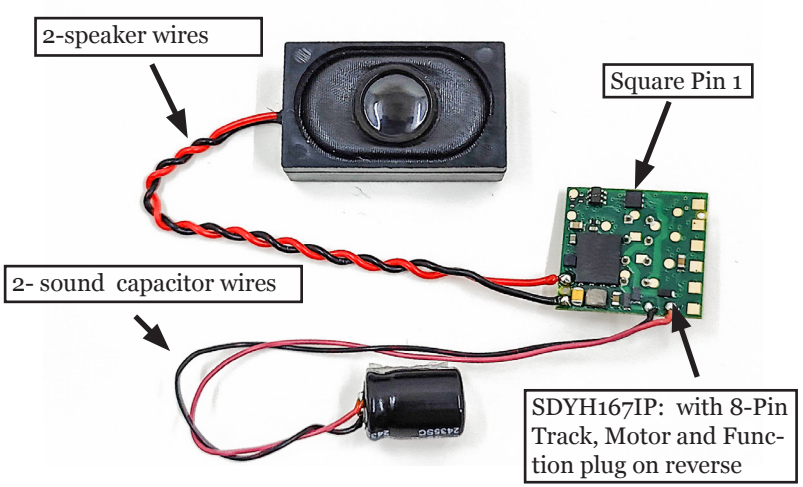
Parts List

1 SDYH167IP Function Decoder with SoundFX® v3+ with 8 Ω 16 x 26 x 9 mm box speaker and 330uF cap
1 Instruction Sheet

Visit www.digitrax.com for the latest information.

Quick Start Installation Instructions:

Figure 1: SDYH167IP Decoder Components



1. Remove locomotive shell and DC dummy plug or jumpers from the DCC medium socket.
2. Plug the SDYH167IP decoder into the socket making sure that pin one is plugged into the socket marked 1. Pin 1 on the decoder has a square pad. Seat the decoder firmly in the socket.
3. If required, additional functions can be accessed by using the solder pads indicated in Figure 3. Be sure to use current setting resistors with LED lamps. Refer to locomotive documentation for any lamp requirements.

4. Mount the factory 8 ohm box 16 x 26 x 9mm speaker attached to the decoder in suitable locations (refer Figure 2). Ensure the speaker 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 the speaker and enclosures.
5. Mount the 330uF electrolytic energy storage capacitor. Be sure not to short the capacitor case or leads to the track leads or locomotive frame.
6. For steam units using external synchronization cam capability, connect the solder pad specified in Figure 3 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.
7. Inspect the installation before testing the sounds and replacing the shell. In particular be sure that any wires are correctly connected and routed and that no wires are shorted to the frame or track, or will be pinched at re-assembly.
8. Place the loco on an active DCC track powered by a compatible DCC system and select the factory default address 03 and CV60=00 to ensure sounds for testing.
9. 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.
10. Customize sounds by programming sound CVs to adjust the desired configurations. Sound Projects other than the factory loaded default can be overwritten by using a USB Digitrax SoundFX Programmer (DCS52, DCS210+, PR4 etc.) and using the free SoundLoader PC software from the Digitrax web site at https://www.digitrax.com/sound-depot/.

Speaker Mounting and Enclosures:

The sound performance, volume and efficiency of speakers are *greatly affected* by the mounting system and required baffle or enclosure. The included 8 ohm box speaker is pre-mounted in baffle. Alternate 8 or 4ohm speakers, baffles or other mounting systems may be used.

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.

The CVs used in the range of CV140 to CV240 let you customize your decoder without needing to reload a new SPJ. 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 information on programming decoder CVs.

Customizing Your Decoder:

This decoder will initially operate and generate sound using address 03. On a 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].

Customizing Your Sounds:

CV60 selects the active SPJ. The SDYH167IP CV60 default of 00 is a GP38-2 diesel Compact Hi-Definition factory SPJ. Seven other preloaded SPJ's are selectable with CV60 values 10 to 70. If the locomotive you're using is not close to one of the factory projects, you can erase the factory SPJ's and download your new SPJ choice or sounds from the Digitrax, or other website.

The CV60 control of the SDYH167IP differs from previous SFX decoders: The high decimal digit selects a sound **project#**, from 0 to 7, and the lower digit will select **scheme** 0 to 9 *within* that sound project (*if implemented, default 0*). You can view the expanded intents and capability of any .spj sound project file in SoundLoader, with *view>view project description* command. All factory spjs for this decoder use scheme digit# 0.

Sound Control Functions: The following function key table shows how each controls sounds for a factory SPJ.

Function#	Function Controls	Notes
F0	Lights/Steam-Dynamo	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 Steam- Blowdown	F4 **OFF** enables pop-off, drier and starts compressor/air pump
F5	Diesel - Dynamic Fans Steam- Open cylinder cocks	Cylinder cocks off when stopped.
F6	Diesel - Notch Up Steam - bump up chuffs	Notch UP if CV155=01 or 02
F7	Diesel - Notch DOWN Steam - bump down chuffs	Notch DOWN, if CV155 = 01 or 02
F8	Mute Control	F8 ON is muted at volume in CV135
F9	Uncoupler	
F10	Brake to stop	Stops motor, resume speed F10 off
F11	Hand Brake set	When stopped
F12	Emergency Stop	Sounds resume after F12 released

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	08
60	Sound Scheme Select	00-70	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/Air pump Run Rate (seconds delay)	00-255	25
149	Air Compressor On Time	00-255	36
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	28
152	Project Author ID, 222, =Digitrax Compact HiDef SPJ		222
153	Project ID [= Hi decimal digit of CV60 value]	0-7	0
154	Steam Blow down / Safety Volume	0-64	20
155	Notching/Slip Mode: 00=Automatic,		00
157	Bell Selector	00-03	00

Selecting a Sound Project on Your SDYH167IP: CV60

The SDYH167IP comes with 8 different single-scheme SPJ's loaded in sound flash , 6 diesel and 2 Steam. The active SPJ is selected by the value in CV60 [in steps of 10], as shown in following table. Low digit always 0.

CV60 decimal value	Factory SPJ
00	GP38-2 diesel
10	AC4400CW diesel
20	GP7 diesel
30	SD70MAC diesel
40	SD40-2 diesel
50	C420 diesel
60	ATSF 3751 Heavy Mountain Steam
70	UP3985 4-6-6-4 Challenger Steam

Selecting Horns/Whistles/Bells: CV150, CV157: CV150 can select between *available* horns, and CV157 choses between *available* bells. To allow using Compact Hi-Definition SPJ's in older "X"/16Mbit SFX decoders, the horn/bell choices are fewer, but you can use Sound-Loader to download the exact Horns or bells you choose. To enable playable volume for your selected horn or whistle add +128 to the selected value (i.e. Playable volume on horn 00 is enabled with a value of 128, i.e. 00+128=128).

Notching: CV132 and 155:

CV155 is provided to select Diesel engine "notching" modes, or Steam project slip. The default of CV155= 00 provides "automatic notching" that changes the diesel RPM/Chuff 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. For Steam, a F6 notch-up while stopped will generate chuffs as if wheel slip is occurring. A F7-notch down will return to stopped/no chuffs.

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 SPJ's in your SDYH167IP:

SDYH167IP decoders can run new Compact Hi-Definition SPJ's with up to 8 channels, and up to 128Mbit of SPJ downloads.
The 8 channels allow steam sound schemes to overlap near and far-side steam sounds for more realistic steam exhaust sound. The 128Mbit sound flash is big enough to use "high definition" sound projects and more complex schemes with fully expanded and longer diesel notch run and transition sound files.
Decoder sounds can be re-loaded or customized using a Digitrax SFX programmer and your computer with the SoundLoader software. Both the software and a number of alternate Sound Project files are available from the Digitrax Sound Depot, if you have erased the factory SPJ's.

Log onto and join the free web site *https://groups.io/g/AnPRR/files* as an excellent source of over 300 free SPJ's, including larger "high definition" projects that can make use of 128Mbit sound capacity. It takes about 5 minutes to download the biggest SPJ to your decoder, and you can customize any of the wave files before downloading.

SoundFXv3+ DC Operation Mode:

1. Digitrax SoundFX v3+ decoders will operate on smooth DC power if CV29 is 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.

SDYH167IP 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 SDYH167IP plays a Steam scheme, but I want the default Diesel scheme: If the factory sound project with the 8 projects has not been erased, program CV60 back to a value of 00 to reselect the default GP38-2 diesel project. The **SDYH167IP** SPJ's are on the web site so you can reload if you get lost. Program CV8 to 8 to restore factory settings and any customized CV's defined in the SPJ.

I have loaded a new sound project but, the CVs and Function controls are not what I expected: In SoundLoader, open the sound project .spj file you programmed with "*File>Open Sound Project File*". Now select "*View>View Project Description*", the Project description usually defines 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.

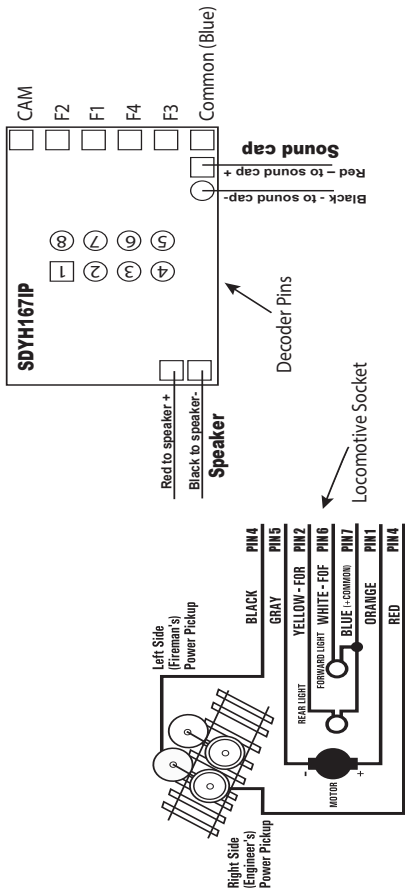
I want to load new .wav files with 12 bit resolution instead of 8 bit, but do not have room in the sound flash memory. Save your project (.spj) to a new named project: " *File> Save Sound Project File As*" saves the project file with a new name. Next, right click on any .wav file you do not need or use, 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 skip this sound as silence. This frees up sound flash memory for you to download 12 or 16 bit .wav files that you prefer, 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*".

With free memory, you can download any single .wav by selecting, then right clicking on the .wav entry and selecting "Download this Sound".

Figure 3: **SDYH167IP**: connection diagram



If you have insufficient sound flash memory to load new files, the whole flash memory and all sound project(s) will be erased before you load a new SPJ.

If you download an SPJ configured for 16 channels, the channels above the first 8 will be ignored, and in most cases will work OK, with loss of details from the higher channels.

You may change the factory box speaker to ones you prefer of different sizes for a better fit. We recommend you cut an existing speaker lead at about the mid point and solder on your new wires there, away from the plugs. Insulate these joints with e.g. small heat shrink covers. Keep the wire color polarity so the new speakers have correct phasing so as to not cancel sounds.

Best practice is to test a new decoder on the bench to confirm functionality and get acquainted with setups and sound choices.

Warranty & Repair

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