Digitrax®
Complete Train Control
Run Your Trains, Not Your Track!

SDH164K1B

HO Scale

Plug 'N Play for Kato SD38-2 HO Locomotives. Light Board replacement decoder for motor, lights and sound. Preloaded with SD38-2 Sound Scheme (*Does Not* include or use FN04 Function/Light Decoder)

SDH164K1B: Drop in Mobile Decoder with SoundFX™ Includes 28mm 32 Ohm Speaker & 330uF Capacitor 1.0 Amp/1.3 Amps Peak

Features:

- **Digitrax SoundFX™ Sound System -**Your locomotives will sound in scale like the real thing with SoundFX™

  Customizable 8 Bit Sound
  3 simultaneous voices
  Downloadable Sound with Digitrax PR2/3 and SoundLoader software
  4 Megabit Onboard Sound Memory
  1 Watt Sound Output
  4 CV-selectable Horn choices in factory preloaded scheme
  Cam input-synchronized steam-chuff option for steam loco use

- **Drop in Light board replacement** for easy install.

- **Factory 28mm round 32 ohm speaker**

- **Smart Power Management**-no more booster or programmer shutdowns! No extra equipment needed to program or run

- **SoundFX™** does not require an external rate sensor to vary workload.

- **Digitrax LocoMotion® System-**Your locomotives look like the real thing. The Digitrax LocoMotion® System makes them run like the real thing, too!

- **SuperSonic** motor drive for silent operation.

- **Digitrax FX³ Functions-**Control lights and functions for prototypical lighting effects and on/off control:

- **Transponder ID Equipped** ready for transponding on your Layout

- **Program CV's using any Digitrax Compatible Control system** without having to buy any extra equipment

- **Direct mode programming**

- **Operations Mode Programming**

- **Decoder Reset CV** with or without speed table reset.

- **Motor Isolation Protection** helps prevent damage to your decoder.

- **Basic, Advanced & UniVersal Consisting**

- **2 Digit and 4 Digit Addressing**

- **DCC Compatible**

- **Digitrax "no worries" warranty**

- **FCC Part 15, Class B RFI compliant**

Complete Train Control
Run Your Trains, Not Your Track!

Parts List

1 SDH164K1B Mobile with Sound FX™   1 Instruction sheet
1 Speaker harness with 28mm 32 Ohm speaker and 330 uF capacitor/clip

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 for the latest versions, technical updates and additional locomotive-specific installation instructions.
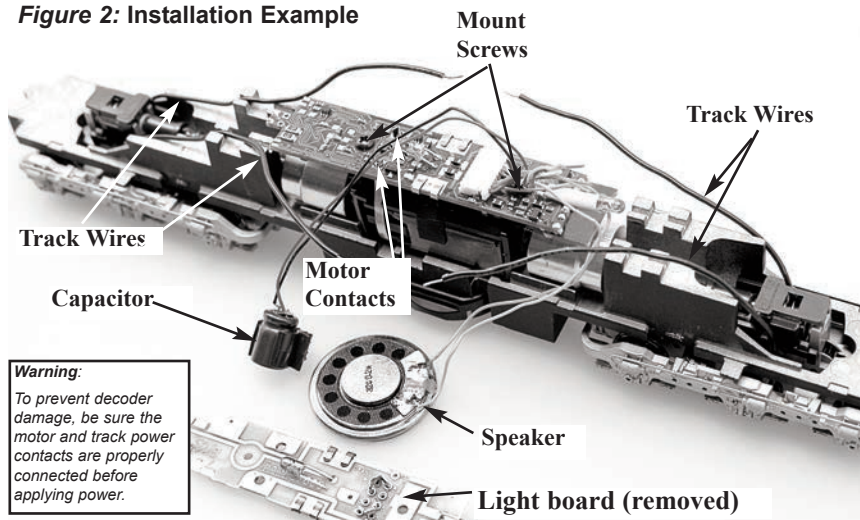
Figure 1: SDH164K1B Decoder
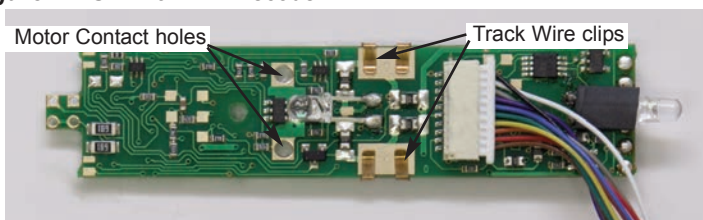
Installation Instructions

1) Carefully remove the SD38-2 couplers, shell, and platform/walkway as indicated on manufacturer's model assembly diagram.
2) Disconnect 4 track wires from the track power clips on the light board. Unscrew and remove light board. Retain the two screws.

Figure 2: Installation Example

**Warning**:
To prevent decoder damage, be sure the motor and track power contacts are properly connected before applying power.

Digitrax®

2443 Transmitter RD
Panama City, FL 32404
www.digitrax.com

T 850-872-9890
F 850-872-9557

3) Place SDH164K1B decoder in position and use small pliers to press in 2 motor contacts into the motor contact holes. Using 2 light board screws removed earlier, secure the decoder in position.

4) Install the speaker by removing the 2 piece diesel tank surround as show in figure 3. From the engineer/right hand side of the locomotive place the 28mm speaker attached to the wire harness in the speaker enclosure with the cone facing outward. Remove any magnetic debris from the speaker. Replace diesel tank surround.

5) Replace platform/walkway and couplers.

Figure 3: **Speaker Installation Diagram**

Diesel Tank Surround

Speaker Installed Inside Speaker Enclosure
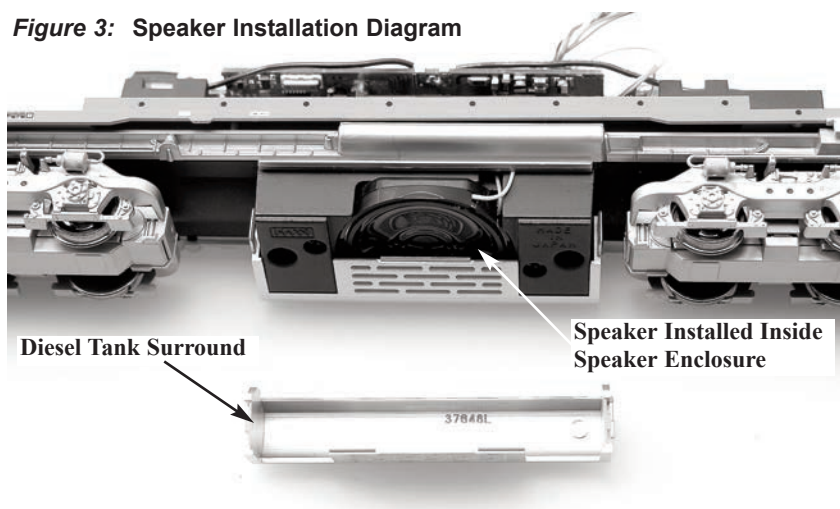
6) Re-connect the 4 track wires by inserting them under the track power clips on the SDH164K1B. Be sure that the wires are retained and *do not touch anything but the clips and pads.* Run the track wires in the track lead slots in the casting so they do not interfere with the shell.

7) Install the capacitor attached to the wire harness at the rear of the casting using the plastic clip provided as shown in Figure 4. Be sure no wires short to the casting. Trim back and secure any unused wires so they do not short to the decoder or frame or bind the drive shafts.

8) Inspect and test the installation before replacing the shell.

Figure 4: **Installation Diagram**

Track Power Clips

Capacitor with
Clip Installed

Track Lead Slots

Track Power Clip Detail
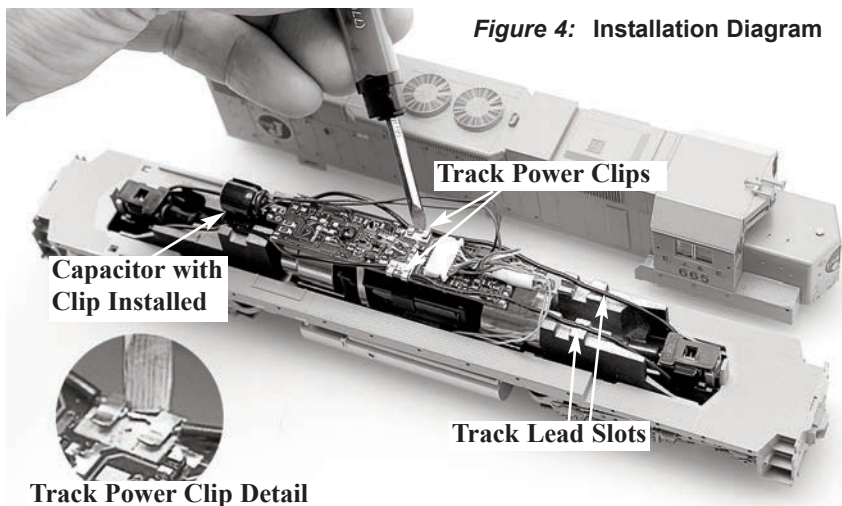
Customizing Your Decoder

Your Digitrax decoder is ready to run and will operate 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 sound.

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 SD 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 an SD38-2 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 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 sound project loaded into this decoder is for an SD38-2 diesel locomotive. 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

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, scaleable speed stabilization and more to take full advantage of the Digitrax LocoMotion System.

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. We recommend that you 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 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 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.

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

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

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.

SuperSonic Silent Operation and Torque Compensation

The factory settings in the decoder provide silent, smooth operation of your locomotive under most conditions. For more information about these settings, please see the Digitrax Decoder Manual or our website.

Digitrax Transponding CV61

Digitrax Transponding is controlled by CV61. The initial factory set value is 000 for OFF. To turn on transponding, program CV61 to a value of 002. This allows you to use Digitrax transponding to keep track of your rolling stock. When transponding is enabled, the front light of the locomotive may flicker slightly to indicate transponding signal is being communicated. For optimal transponding operation, we recommend that you hook up the forward and rear lights as shown above.

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.

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 FX^3 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 SD38_2.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**	[06]
49	**Forward Light (FOF) -Headlight - FX configuration**	[0]
50	**Reverse Light (FOR) -Rev Light - FX configuration**	[0]
51	**Function 1 - FX configuration**	[0]
52	**Function 2 - FX configuration**	[0]
58	**Master Volume (F8 ON used for Muting)**	0-15 [9]
60	**Factory Scheme Select: 0=SD38-2**	[0]
132	**Notch Rate**	[127]
135	**Mute Volume**	[0]
140	**Prime Mover Volume**	0-64 [60]
141	**Bell Volume (Min=0, Max=64)**	[25]
142	**Horn 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 Setup. Default=0, Alternate Horns= 1, 2, 3 Playable Horn versions =128, 129, 130, 131**	[0]
151	**Auto Coupler Sequence Threshold Value-Peak speed to allow auto coupler/brake when direction change occurs and F3 is ON**	0-64 [48]
152	**Project Author ID, Digitrax=221**	[221]
153	**Project ID, SD38-2 scheme**	[3]
155	**Notching/Slip Mode: 00=Automatic, 01=Semi-Automatic, 02=Manual**	[00]

2443 Transmitter RD   T 850-872-9890
Panama City, FL 32404   F 850-872-9557
www.digitrax.com

Function #	Used For	Notes
F0	Lights	
F1	Bell	
F2	Horn/Whistle	CV150 selects horn
F3	Coupler crash	Auto coupler/brake set by CV151 max speed
F4	Air feature disable	F4 off enables pop-off, drier and starts compressor
F5	Diesel = Dynamic brake Fans	
F6	Diesel = Notch Up	Notch UP if CV155=01 or 02
F7	Crossing Gate Airhorn or; Diesel = Notch DOWN	Notch DOWN, if CV155 = 01 or 02 (Crossing Gate Horn active if CV155=0)
F8	Mute Control	F8 ON is muted
F9	Brake squeal	
F10	Crossing Gate Airhorn Sequence	
F11	Handbrake	
F12		

Function Remapping

Function remapping allows you to program the function outputs of your decoder to be controlled by selected function keys on your throttle. Please consult the Digitrax Decoder Manual or website for information on function remapping.

Master Light Switch

Each of the four function outputs can be programmed to turn on and off with the F0 ON/OFF key on your throttle, creating a Master Light Switch. The CV values for creating this effect are listed in the Digitrax Decoder Manual in the section: *Setting up FX & FX³ Effects On Function Outputs*.plugs into the decoder. This 9 pin connector has been adopted by other companies in the DCC industry, too.

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."

SoundFX™ Troubleshooting

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. Make sure F8 is **OFF**.

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. For impedances below 32ohms (e.g. 8 to 30 ohms) set this 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 SDH164K1B motor or function leads, particularly if it is not installed in a loco. Of course you can always just re-program the CV value into a CV to get the desired results, even though reading CV's might 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.

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. Even without a programmer you can get SoundLoader and the sound projects from the Digitrax web site and review the descriptions on your compatible PC.

My speaker does not have a polarity mark.

Speaker Polarity is simply used to ensure when more than one speaker is being used that they can be wired or "phased" so the input causes the diaphragm to move in the same direction. It can be ignored in a single speaker case.

When using my LT1 and test kit when I blow the Horn the decoder resets .

 Using the LT1 test kit and protection resistor is good to check the decoder is safely connected, but when a loud sound like a horn is activated the protection resistor limits the available track input power too much, so the decoder resets. Simply test full volume sounds on normal track power after connections check OK.

When I blow the Horn while on normal powered track the decoder slows down or resets .

1. If high volume overloads the decoder and the loco slows down, set CV57=0 to turn off BEMF.

2. Alternatively if you are using a speaker with too low an impedance, try a new speaker with the factory recommended 32 ohm impedance. It is safe to use a 4 or 8ohm speaker, as long as the volume is not set too high which may overload beyond the designed power level.

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 for complete warranty details and instructions for returning items for repair.

Digitrax, Inc. is not responsible for unintentional
errors or omissions in this document.

SDH164K1B
Plug 'N Play Sound/Mobile Decoder
for Kato HO SD38-2

Go Beyond DCC With Digitrax®
Complete **T**rain **C**ontrol

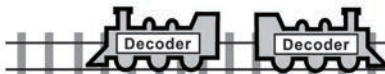### Main Station
Starter Sets
LocoNet®
Power Supplies

RADIO® EQUIPPED
Available

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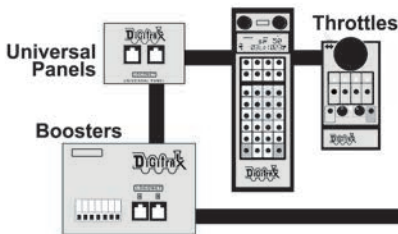
Super **Chief** ™

Super **EMPIRE BUILDER** ™

ZEPHYR ™

LocoNet®
The Digitrax Difference

Locomotive Shops
Mobile Decoders
Function Decoders
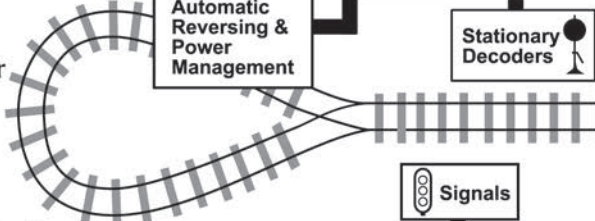SoundFX™ Decoders

Decoder   Decoder

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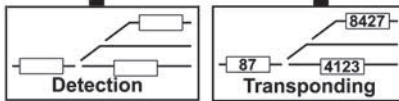IR and/or Radio
for more trains and operators.

Universal Panels

Throttles

Boosters

Maintenance Of Way
Make your layout more fun & simpler to operate!

Automatic Reversing & Power Management

Stationary Decoders

Computer Controls
Computer Interface
Programmer

Signals

It All Adds Up To Complete Train Control

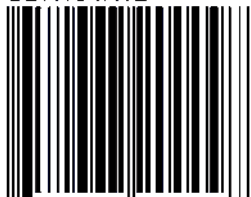Detection

Transponding
8427
87   4123

2443 Transmitter Road
Panama City, FL 32404

www.digitrax.com
T 850-872-9890
F 850-872-9557

Made in U.S.A.

CE

SDH164K1B

6 52667 20009 7

307-SDH164K1B