



Digitrax Command Control  
Run Your Trains, Not Your Track!

# DH165K1A

HO Scale

Board Replacement Decoder Fits  
Kato SD40-2, AC4400 Locos

Mobile Decoder  
Plug 'N Play  
SFX SoundBug™ compatible  
1.25 Amp/2 Amp Peak  
6 FX3 Functions, 0.5 Amp

## Features:

- **Accepts Plug-in SFX SoundBug™ sound modules**
- **Onboard White LEDs for Headlights and Ditch lights.**
- **Digitrax LocoMotion® System**-Your locomotives look like the real thing. The Digitrax LocoMotion System makes them run like the real thing, too!
  - Torque Compensation** for smooth as silk silent operation.
  - 128 Speed Step** operation (14 or 28 steps can also be used).
  - Momentum** with acceleration and deceleration.
  - Normal Direction of Travel** is user selectable.
  - Switching Speed** feature for easier and faster access to yard speeds.
  - 3 Step Speed Tables** set start, mid and max voltage for custom control.
  - 28 Step Speed Tables** with 256 level resolution for precise control.
- **Scalable Speed Stabilization** with simple setup & 1024 level resolution.
- **SuperSonic** motor drive for silent operation.
- **FX<sup>3</sup> Functions** for prototypical lighting effects:
  - Constant Brightness Lighting** directional or independent control.
  - Realistic Effects** like Ditch lights, Mars lights, strobes, and many more.
  - Dynamic and Static Qualifiers** operate functions based on direction, F0 on or off, loco direction and F0, and whether loco is moving.
  - Function Remapping** for custom function setup.
  - Master Light Switch** turns off all lights & functions with one keystroke.
  - Advanced Consist Function Controls**
- **Plug 'N Play** design makes installation quick and easy.
- **Transponder equipped** ready for transponding on your layout.
  - Compatible with digital surround sound systems
- **All Mode Programming with Operations Mode Read Back**-read back CV values right on the mainline.
- **Decoder Factory CV Reset** with or without speed table initialize.
- **Motor Isolation Detection** prevents damage to your decoder.
- **Basic, Advanced & UniVersal Consisting**
- **2 Digit and 4 Digit Addressing**
- **DCC Compatible**

## Parts List

1 DH165K1A Decoder

1 Instruction sheet

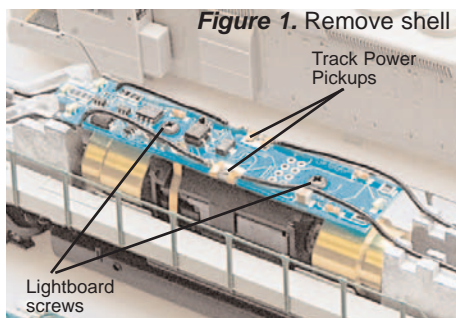
## Installation Information

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.

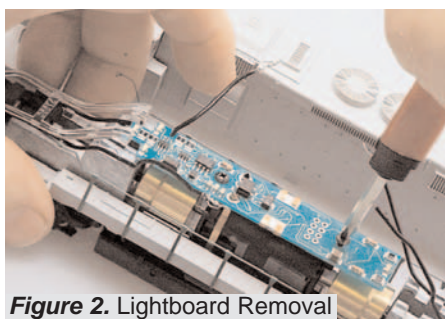
## Installation Instructions - Kato HO Scale EMD SD-40

1. Carefully remove the locomotive's shell from the frame. Note the orientation for proper reinstallation. (**Figure 1**)

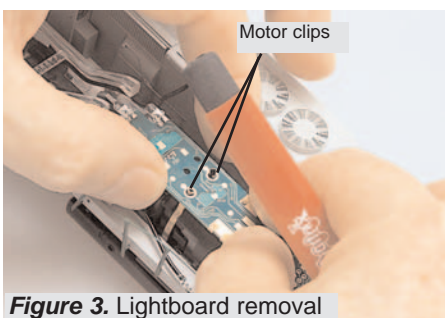
2. Remove the four track power pickup wires clipped to the lightboard at mid point (**Figure 1**)



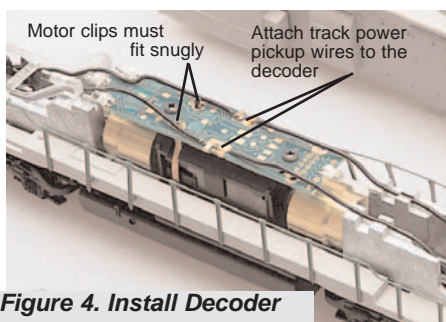
3. Unscrew the two screws securing the lightboard and lift it from the frame. (**Figure 2**)



4. Remove the lightboard by pulling gently straight up, off the motor clips. (**Figure 3**)

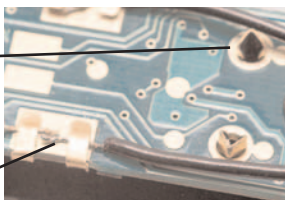


5. Decoder installation is the reverse of what we've done so far. Snap the decoder into place over the motor clips. Be sure motor clips are spread enough to engage snugly in decoder holes. Secure the decoder with screws. **(Figure 4)** Re-attach Track Power Pickup wires **(Figure 5)** and check Light Pipe alignment **(Figure 6)** .



Spread Motor clip pins if necessary. Motor Clip pins must fit snugly into decoder PCB!

Track Pickup wires must fully engage clips. Insulation should meet clip, but not be underneath it.



**Figure 5. Install Decoder**



**Figure 6. Install Decoder**

5. Replace the locomotive shell.
6. Digitrax decoders are set up with configuration variable (CV) factory settings so you can run your locomotive using address 03. This installation will allow the loco to run short hood forward. To setup ditch lights to operate on F2/Horn key, program CV51=106 and CV52=107

## Customizing Your Decoder

All Digitrax decoders can be customized for realistic operation. The most commonly used CVs, their default values and uses are listed below. The Digitrax Decoder Manual, available on line at [www.digitrax.com](http://www.digitrax.com), contains complete information on these and other CVs and CV values available.

## Changing the Decoder Address

The first CV most people change is the decoder address so that the loco can be independently controlled with it's own unique address. All Digitrax decoders are shipped with CV01 (AD2), the two digit address, set to 03. See your Starter Set Manual for complete programming instructions. Following is a brief description of how to change the decoder address with a DT series throttles.

1. Place the loco on the programming track. Go into Program Mode on your system. On DT400 press PROG. On DT300, DT100 & DT200 press



RUN/STOP & FN/F0.

2. Choose AD2 for 2 digit addressing or AD4 for 4 digit addressing (DT300 & DT400). (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 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 DT300 & DT400 but not on earlier throttles.

## **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**

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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**

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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/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.



Loco Type	V Start CV02	V Mid CV06	V Max CV05
<b>Switcher</b> Concentrated low speed. Limited top speed	002/x02	038/x26	064/x50
<b>Road Switcher</b> Prototypical top speed w/evenly distributed curve from 0 to top speed	002/x02	048/x30	098/x62
<b>Mainline Loco</b> Quick increase to cruising speed then levels off to prototypical top speed.	002/x02	128/x80	154/x9A

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## Other Locomotion® Features: Switching Speed, Normal Direction of Travel & Scaleable Speed Stabilization (Back EMF) Features

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**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 bit 0.

The intensity of **Scaleable Speed Stabilization (Back EMF)** is controlled by CV57. The default value for this feature is 006/x06 which is suitable for most locos. You can adjust this value in the range of 000/x00 for OFF to 015/x0F for the maximum effect. Consult your Decoder Manual for info about CVs 55 & 56 and their effects on scaleable speed stabilization.

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## SuperSonic Silent Operation and Torque Compensation

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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 web site.

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## Digitrax Transponding CV61

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**Digitrax Transponding** is controlled by CV61. The initial factory set value is 000/x00 for OFF. To turn ON transponding, program CV61 to a value of 002/x02. This allows you to use Digitrax transponding to keep track of your rolling stock. When transponding is enabled, the front light of the locomotive will flicker slightly to indicate transponding signal is being communicated. For

optimal transponding operation, we recommend that you hook up the forward and rear lights using the standard installation instructions.

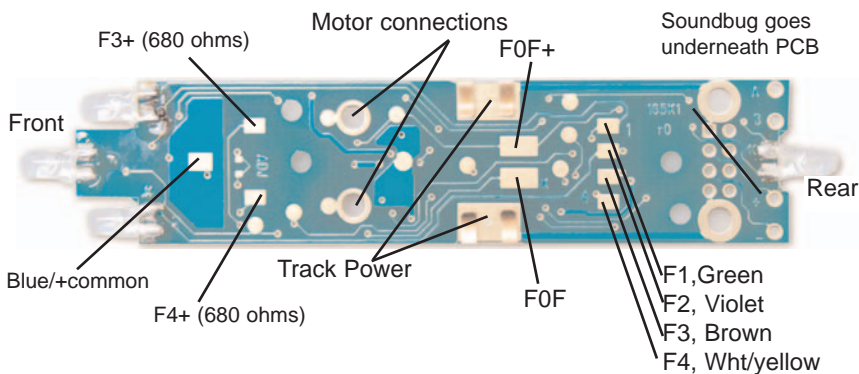
## Decoder Reset CV08

**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.

## Functions on the DH165K1A

The DH165K1 is set up at the factory to control six function outputs, with white factory LEDs on the; F0F-forward/white lead, F0R-reverse/Yellow lead (for directional lighting), F1/Green lead and F2/Violet leads (for Ditch lights).

**Figure 5.** DH165K1A Decoder Function Outputs (front of loco to the right)



Functions F3 (Brown) and F4 (White/Yellow) can be used by soldering a wire from the pad for the function you wish to use to the lamp (or other function) you wish to control. The wire colors indicated are the standard color code used in the industry (you can use any color you like). These colors are important if you plan to use function remapping. **CAUTION:** When adding function wires, be very careful that the wires you add do not come into contact with any other pads or components on the board where they might create a short circuit.



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## Function Mapping

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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 web site for information on function remapping.

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## Digitrax Transponding CV61

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## Warranty & Repair

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All warranties on Digitrax products are limited to refund of purchase price, repair or replacement at Digitrax's sole discretion. Except as expressly stated in the full warranty statement, there are no warranties, express or implied, including but not limited to any warranties of merchantability or fitness for a particular purpose. For complete warranty details see [www.digitrax.com](http://www.digitrax.com).

**Damaged decoders should be returned directly to Digitrax for repair.**

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



# DH165K1A

Board Replacement Decoder Fits Kato SD40-2, AC4400 H0 Scale Locomotives

## Go Beyond DCC With **Digitrax** 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!



**LocoNet®**  
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.

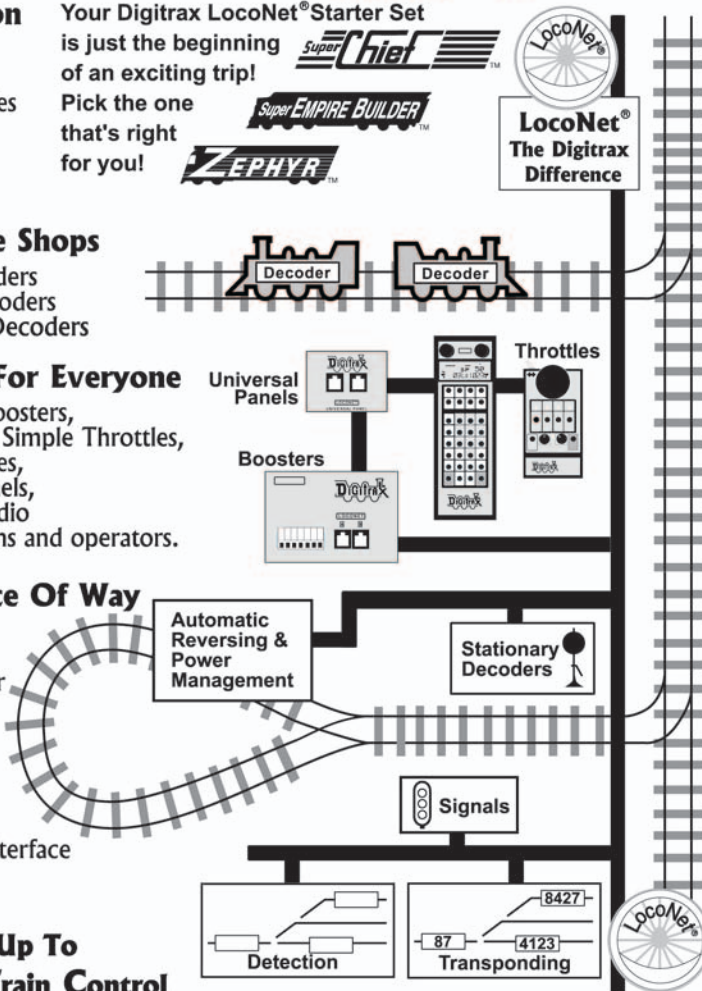
### Maintenance Of Way

Make your layout more fun & simpler to operate!

### Computer Controls

Computer Interface Programmer

### It All Adds Up To Complete Train Control

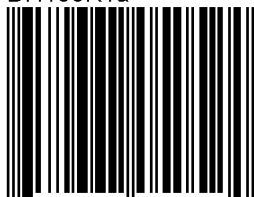


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