# Digitrax Sound Decoder Specification Sheet

## SDH164K1A
## 1 Amp HO Scale Mobile Decoder with SoundFX
## for Kato AC4400 Locos



| Physical Size | 2.877" x .667" x .173" (73.07mm x 16.93mm x 4.4mm | Current Rating | 1.0/1.3 Amps |
|---|---|---|---|
| Speaker Rating | 32 Ohm | Speaker Size | 28mm Round |
| Capacitor | 330uF (9.96mm round with clip x 13.43mm high) | Factory Sound Scheme | AC4400 |
| Simultaneous Voices | 3 | Onboard Sound Memory | 4 Megabit |

| Interface | Decoder End | Wires | | Locomotive End/Plug |
|---|---|---|---|---|
| Board Repl | Board Replacement | | | Board Replacement |

| # Functions | 6 | Function Current Rating | 500 mA | Function Type | FX3 |
|---|---|---|---|---|---|
| Prod Date | 04-15-2010 | Discontinued | Current | Replaced By | Current |
| MSRP | US$59.95 | Feature Set | Series 3 | UPC | 652667-20008-0 |

**FX³ decoders** have motor isolation protection. If the decoder senses that the motor is not isolated, it will not run the motor. In this case, you will be able to control the loco's functions but the motor will not work.

**CVs used for this decoder**

| CV# | Feature | Default | Range | Notes |
|---|---|---|---|---|
| **Locomotive Address CVs** | | | | |
| 01 | 2 Digit Decoder Address | 03 | 001-127 | |
| 17 | 4 Digit Address (High Byte) | 00 | 0128-9983 | CV17 & 18 are used |

| | | | | |
|---|---|---|---|---|
| 18 | 4 Digit Address (Low Byte) | 00 | 0128-9983 | Together to program the 4 digit address. Current production Digitrax throttles handle this automatically. See calculator below if separate values are needed by your system for programming 4 digit address |
| 29 | Configuration Register Controls Multiple Features | 06 | See CV29 Value Table Below | Must be set to a value that allows either 2 digit or 4 digit addressing |

| **Configuration Register CV** | | | | |
|---|---|---|---|---|
| 29 | Configuration Register | 06 | | |
| | Address Selection, 2 or 4 digit | 2 Digit | 2 or 4 Digit | |
| | Normal Direction of Travel (NDOT) | Fwd | Fwd/Rev | |
| | Speed Step Control | 28/128 | 14 or 28/128 | |
| | Speed Table On/Off | Off | Speed Table On or Off | |
| | Analog Mode Conversion On/Off | On | On or Off | |

| **Locomotion CVs-Control Locomotive Motion Characteristics** | | | | |
|---|---|---|---|---|
| **Acceleration and Deceleration** | | | | |
| 03 | Acceleration Rate | 00 | 00 to 31 | 128 Steps |
| 04 | Deceleration Rate | 00 | 00 to 31 | 128 Steps |
| **Three Step Simple Speed Table & Start Voltage** | | | | |
| 02 | Start Voltage | 00 | 00 to 255 | 128 Steps |
| 05 | Maximum Voltage | 00 | 00 to 255 | 128 Steps 00, 01 & 255= max voltage at step 28 |
| 06 | Mid Point Voltage | 00 | 00 to 255 | 128 Steps 00 & 01= straight line curve |
| **28 Step Speed Tables with 256 Step Resolution** | | | | |
| 65 | Kick Start value | 00 | | 128 Step Interpolated |
| 66 | Forward Trim | 00 | | 128 Step Interpolated |
| 67 | First Speed Table Entry | 00 | | 128 Step Interpolated |
| 68-93 | 28 Step Speed Table Entries | 00 | | 128 Step Interpolated |
| 94 | Maximum Speed Table Step | 00 | | 128 Step Interpolated |
| 95 | Reverse Trim | 00 | | 128 Step Interpolated |
| 29 | Configuration Register | 06 Speed Tables are | See Above CV29 | Must be set to a value that enables speed tables |

| | | | disabled | |
|---|---|---|---|---|
| **Torque Compensation and Switching Speed** | | | | |
| 53 FX$^3$ | FX$^3$ Decoders do not use CV53 | NA | NA | Not Available |
| 53 FX | FX Decoders used CV53 to designate FX effect generated on F3-Brown Wire | | | See instruction sheet for the FX decoder you are using |
| 54 FX$^3$ | FX$^3$ Decoders use CV54 to control Switching Speed & Torque Compensation | 00 | 00=SS Off, TC On 01=SS On, TC On 16=SS Off, TC Off 17=SS On, TC Off | |
| 53 FX | FX Decoders used CV54 to designate FX effect generated on F4-White/Yellow Wire | | | See instruction sheet for the FX decoder you are using |
| **Functions** | | | | |
| 13 | DC Functions ON Not Used in FX$^3$ | | Automatic | Not Used FX$^3$ |
| **FX$^3$ Functions** | | | | |
| 49 | F0F, forward light effect white | 00 | See FX$^3$ section | |
| 50 | F0R, reverse light effect yellow | 00 | See FX$^3$ section | |
| 51 | F1, Function 1 green | 00 | See FX$^3$ section | |
| 52 | F2, Function 2 violet | 00 | See FX$^3$ section | |
| 113 | F3, Function 3 brown | 00 | | Not Available |
| 114 | F4, function 4 white/yellow | 00 | | Not Available |
| 115 | F5, Function F5 white/green | 00 | | Not Available |
| 116 | F6, Function F6 white/blue | 00 | | Not Available |
| 62 | FX Rate and Keep alive adjust | 00 | 00 to 255 | |
| 63 | Ditch Light Blink hold time | 00 | 00 to 255 | |
| | Master Light Switch | | | See FX$^3$ section |
| **Directional Headlights, Transponding, Split Field Motor** | | | | |
| 61 | Directional Headlight | Directional | Map F0 Forward & Reverse See CV61 Section | Not controlled by CV61 in FX$^3$ Decoders |
| | Transponding | Off | Off or On See CV61 Section | |

| | Split Field Motor | Off | Off or On See CV61 Section | For AC Motors |
|---|---|---|---|---|
| **Scaleable Speed Stabilization (Back EMF)** | | | | |
| 55 | Static Compensation | 128 | 00 to 255 | |
| 56 | Dynamic Compensation | 048 | 00 to 255 | |
| 57 | Speed Stabilizer-Droop | 006 | 00 to 15 | |
| **SuperSonic (Quiet Operation)** | | | | |
| 09 | Motor Frequency SuperSonic | 00 | 00 to 255 | Default is MAX |
| **Advanced Consisting** | | | | |
| 19 | Advanced Consist Address | 00 | 00 to 255 | Default is OFF |
| 21 | Advanced Consist Function Control Override for F1-F8 | 00 | See CV21-22 Section | |
| 22 | Advanced Consist Function Control Override for F0 & F9-F12 | 00 | See CV21-22 Section | |
| **Function Mapping** | | | | |
| 33-46 | Function Mapping CVs | 00 | See Function Mapping Section | |
| **Decoder Reset to Default Values** | | | | |
| 08 | Reset Decoder to Factory Default CV Values | 129 | Set to 08 to reset all CV Values. | Set to 09 to reset all CV Values except 28 step speed table. |
| **Decoder IDs** | | | | |
| 105 | User Private ID #1 | 00 | | User Defined |
| 106 | User Private ID #2 | 00 | | User Defined |
| 07 | Version ID | 64 | Digitrax Version ID | Read Only |
| 08 | Manufacturer ID | 129 | Digitrax | Not affected by reset |

## AC4400 Diesel Scheme included with this decoder

Sound Scheme based on recordings provided courtesy of Paul Knowles, AJ Ireland, and Charlie Brown

| **Copyright** | Digitrax, Inc. | **Date** | 10/9/2007 |
|---|---|---|---|
| **Project** | Ac_4400_4.spj | **SDF** | EVO AC4400 |
| **Author** | AJ Ireland | **Type** | Diesel |
| **Simultaneous Voices** | 3 | | |

**Function Key Usage:**

| Function Key | Feature | Notes |
|---|---|---|
| **Locomotive Address CVs** | | |
| F0 | Lights | |
| F1 | Bell | |
| F2 | Horn | CV150 Selects Horn Type |
| 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 | Dynamic Brake Fans | |
| F6 | Manual Notch Up | If CV155 is NOT 00 |
| F7 | Crossing Gate Air horn | Or Manual Notch Down, if CV155 is NOT 00 |
| F8 | Mute Control | F8 ON is muted, F8 OFF is unmuted |
| F9 | Brake Squeal | |
| F10 | Crossing Gate Air Horn Sequence | |
| F11 | Hand Brake | |

**Sound CVs Used for this .spj**

| CV# | Feature | Default Value | Value Range | Notes |
|---|---|---|---|---|
| CV58 | Master Volume | 09 | 00-15 | 0 = Maximum volume F8 used to mute sound |
| CV60 | Sound Scheme Selection | 00 | 00=diesel scheme | Only One Scheme available |
| CV120 | Read Only | | Read Only | Manufacturer defined Not User Configurable Read Only |
| CV121 | Software Version | 03 | 2 or higher | |
| CV122 | Product Type | 12 | Read Only | |
| CV123 | Hardware Version | | Read Only | |
| CV124 | Flash Signature | 2 | Read Only | |
| CV125 | 16KB free blocks | 0 | Read Only | |
| CV126 | FAT flags | 7 | Read Only | |
| CV127 | Internal Flags | 0 | Read Only | |
| CV128 | IPL Counter | 0 | Read Only | |
| CV130 to 139 | Manufacturer defined in sound definition file (SDF) | Unique to Mfg | Unique to Manufacturer | Global Configuration Flags |
| CV132 | Diesel Notch Rate | 127 | | |
| CV133 | Steam Chuff/CAM Configuration | | | Not Used in this Scheme |
| CV134 | Steam Gear Ratio Trim | | | Not Used in this Scheme |
| CV135 | Volume When Muted | 00 | 00-64 | 00=mute, 64=full volume |

| | | | | |
|---|---|---|---|---|
| CV140 to 240 | User defined in sound definition file (SDF) | Unique to SDF | Unique to SDF | CV# & CV value range are unique to each SDF |
| CV140 | Prime Mover Volume | 60 | 00-64 | |
| CV141 | BELL Volume | 25 | 00-64 | |
| CV142 | Horn Volume | 60 | 00-64 | |
| CV143 | Air Features Volume (Pop off, Drier, Compressor sounds) | 30 | 00-64 | |
| CV145 | Misc Sounds Volume | 40 | 00-64 | |
| CV146 | Bell Delay (24mS intervals) | 7 | 01-100 | |
| CV147 | Drier Rate | 2 | 01-64 | 1=approx. 2 seconds |
| CV148 | Compressor Start Rate | 30 | | |
| CV149 | Compressor On Time | 20 | | |
| CV150 | Horn Selector | 00 | 00 = Standard 01 = Playable Volume 02 = Alternate | |
| CV151 | Peak Speed To Allow Auto Coupler / Brake On Direction Change and F3 On | 48 | 00-60 | |
| CV152 | Author ID Digitrax=0xDD/221 | 221 | 221 | Not User Configurable |
| CV153 | Project ID AC4400 | 2 | | Not User Configurable |
| CV154 | | | | Not used in this scheme |
| CV155 | Notching Slip Mode | 00 | 00 = Automatic 01 = Semi-auto 02 = Manual | |
| CV160 | Variant ID | 4 | | Not User Configurable |

Notes:
Sound recordings for this sound project courtesy of Paul Knowles, AJ Ireland, and Charlie Brown.

For CV155=01 Semi-automatic notching , the prime mover's lowest notch setting is set by the throttle speed setting.

F6 ON will increase the notch and F7 ON will decrease the prime mover to the minimum notch set by current throttle setting.

Legacy note:  When SDH104K1 decoder is used in conjunction with FN04 (4 line FX3-type function decoder), SDH104K1 responds as per standard $FX^3$ decoder (e.g. DH163D) for CV1-120.  FN04 does not respond to or execute any CV programming in Sound CV (SCV) range CV121-255.  Both decoders have CV15/16 lock capability so they will work together.

Information provided here is correct to the best of our knowledge.