

# Digitrax Sound Decoder Specification Sheet

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## SDH164D

### 1 Amp HO Scale Mobile Decoder with SoundFX



|                            |  |                             |                                |
|----------------------------|--|-----------------------------|--------------------------------|
| <b>Physical Size</b>       | 1.273" x .67" x .25"<br>32.33mm x 17.02mm x 6.35mm | <b>Current Rating</b>       | 1.0/2.0 Amps                   |
| <b>Speaker Rating</b>      | 32 Ohm   | <b>Speaker Size</b>         | 28mm Round                     |
| <b>Capacitor</b>           | 330uF (8.17mm round x 13.43mm tall)                | <b>Factory Sound Scheme</b> | Generic Steam & Generic Diesel |
| <b>Simultaneous Voices</b> | 3  | <b>Onboard Sound Memory</b> | 4 Megabit                      |

|                  |                    |              |                            |
|------------------|--------------------|--------------|----------------------------|
| <b>Interface</b> | <b>Decoder End</b> | <b>Wires</b> | <b>Locomotive End/Plug</b> |
| Wired            | Digitrax Plug      |              | Wires                      |

|                    |            |                                |         |                      |                 |
|--------------------|------------|--------------------------------|---------|----------------------|-----------------|
| <b># Functions</b> | 6          | <b>Function Current Rating</b> | 200mA   | <b>Function Type</b> | FX <sup>3</sup> |
| <b>Prod Date</b>   | 04/05/2010 | <b>Discontinued</b>            | Current | <b>Replaced By</b>   | Current         |
| <b>MSRP</b>        | US\$49.95  | <b>Feature Set</b>             |         | <b>UPC</b>           | 652667-20014-1  |

**FX<sup>3</sup> 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.

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#### CVs used

| CV#                           | Feature                     | Default | Range     | Notes   |
|-------------------------------|-----------------------------|---------|-----------|---|
| <b>Locomotive Address CVs</b> |                             |         |           |   |
| 01                            | 2 Digit Decoder Address     | 03      | 001-127   |   |
| 17                            | 4 Digit Address (High Byte) | 00      | 0128-9983 | CV17 & 18 are used Together to program the 4 digit address. Current production Digitrax |
| 18                            | 4 Digit Address (Low Byte)  | 00      | 0128-9983 |   |

|   |   |                                 |                            |  |
|---|---|---------------------------------|----------------------------|--|
|   |   |                                 |                            | 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  |
| <b>Configuration Register CV</b>                                |   |                                 |                            |  |
| 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                  |  |
| <b>Locomotion CVs-Control Locomotive Motion Characteristics</b> |   |                                 |                            |  |
| <b>Acceleration and Deceleration</b>                            |   |                                 |                            |  |
| 03  | Acceleration Rate                                 | 00                              | 00 to 31                   | 128 Steps  |
| 04  | Deceleration Rate                                 | 00                              | 00 to 31                   | 128 Steps  |
| <b>Three Step Simple Speed Table &amp; Start Voltage</b>        |   |                                 |                            |  |
| 02  | Start Voltage                                     | 00                              | 00 to 255                  | 128 Steps  |
| 05  | Maximum Voltage                                   | 00                              | 00 to 255                  | 128 Steps<br>00, 01 & 255= max voltage at step 28  |
| 06  | Mid Point Voltage                                 | 00                              | 00 to 255                  | 128 Steps<br>00 & 01= straight line curve  |
| <b>28 Step Speed Tables with 256 Step Resolution</b>            |   |                                 |                            |  |
| 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<br>Speed Tables are disabled | See Above CV29             | Must be set to a value that enables speed tables   |
| <b>Torque Compensation and</b>                                  |   |                                 |                            |  |

| <b>Switching Speed</b>   |  |             |  |  |
|--|--|-------------|--|--|
| 53<br>FX <sup>3</sup>  | FX <sup>3</sup> Decoders do not use CV53   | NA          | NA   | Not Available  |
| 53<br>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<br>FX <sup>3</sup>  | FX <sup>3</sup> Decoders use CV54 to control Switching Speed & Torque Compensation | 00          | 00=SS Off, TC On<br>01=SS On, TC On<br>16=SS Off, TC Off<br>17=SS On, TC Off |  |
| 53<br>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 |
| <b>Functions</b>   |  |             |  |  |
| 13   | DC Functions ON Not Used in FX <sup>3</sup>  |             | Automatic  | Not Used FX <sup>3</sup>                               |
| <b>FX<sup>3</sup> Functions</b>                                |  |             |  |  |
| 49   | F0F, forward light effect white  | 00          | See FX <sup>3</sup> section  |  |
| 50   | F0R, reverse light effect yellow   | 00          | See FX <sup>3</sup> section  |  |
| 51   | F1, Function 1 green   | 00          | See FX <sup>3</sup> section  |  |
| 52   | F2, Function 2 violet  | 00          | See FX <sup>3</sup> 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 <sup>3</sup> section                            |
| <b>Directional Headlights, Transponding, Split Field Motor</b> |  |             |  |  |
| 61   | Directional Headlight  | Directional | Map F0 Forward & Reverse<br>See CV61 Section                                 | Not controlled by CV61 in FX <sup>3</sup> Decoders     |
|  | Transponding   | Off         | Off or On<br>See CV61 Section  |  |
|  | Split Field Motor  | Off         | Off or On<br>See CV61 Section  | For AC Motors  |

| <b>Scaleable Speed Stabilization (Back EMF)</b> |  |     |                                   |  |
|---|--|-----|-----------------------------------|--|
| 55  | Static Compensation  | 128 | 00 to 255                         |  |
| 56  | Dynamic Compensation                                       | 048 | 00 to 255                         |  |
| 57  | Speed Stabilizer-Droop                                     | 006 | 00 to 15                          |  |
| <b>SuperSonic (Quiet Operation)</b>             |  |     |                                   |  |
| 09  | Motor Frequency SuperSonic                                 | 00  | 00 to 255                         | Default is MAX   |
| <b>Advanced Consisting</b>                      |  |     |                                   |  |
| 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               |  |
| <b>Function Mapping</b>                         |  |     |                                   |  |
| 33-46   | Function Mapping CVs                                       | 00  | See Function Mapping Section      |  |
| <b>Decoder Reset to Default Values</b>          |  |     |                                   |  |
| 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. |
| <b>Decoder IDs</b>                              |  |     |                                   |  |
| 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  |

## Sound CVs

### Generic Steam or Diesel Sound Scheme

Steam is based on recordings made by AJ & Zana Ireland on UP3985.

|                            |                |             |                             |
|----------------------------|----------------|-------------|-----------------------------|
| <b>Copyright</b>           | Digitrax, Inc. | <b>Date</b> | 11-6-2007                   |
| <b>Project</b>             | steam_38a.jpg  | <b>SDF</b>  | Generic steam/diesel Scheme |
| <b>Author</b>              | AJ Ireland     | <b>Type</b> | Steam/Diesel                |
| <b>Simultaneous Voices</b> | 3              |             |                             |

**Function Key Usage:**

| Function Key                  | Feature   | Notes  |
|-------------------------------|---|--|
| <b>Locomotive Address CVs</b> |   |  |
| F0                            | Lights  |  |
| F1                            | Bell  |  |
| F2                            | Horn/Whistle  | CV150 Selects Horn/Whistle 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                            | Diesel=Dynamic<br>Brake Fans<br>Steam=Water<br>Pump Turbine                       |  |
| F6                            | Diesel=Manual<br>Notch Up<br>Steam=Blowdown                                       | If CV155 is NOT 00                                       |
| F7                            | Crossing Gate Air<br>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<br>Horn Sequence or<br>Diesel=Notch<br>Down<br>Steam=Wheel Slip | If CV155 is not 0 See CV155 below for how to set this up |
| F11                           | Diesel=Engine<br>Hand Brake<br>Steam=Greaser                                      |  |
| F12                           | Diesel= Available<br>for user sounds<br>Steam=Safety<br>Blow off                  |  |
| F13-F19                       |   | Available for user added sounds                          |

**Sound CVs Used for this .spj**

| CV#   | Feature                | Default Value | Value Range   | Notes  |
|-------|------------------------|---------------|---|--|
| CV58  | Master Volume          | 09            | 00-15   | 0 = Maximum volume<br>F8 used to mute sound                |
| CV60  | Sound Scheme Selection | 00            | 00=Steam<br>scheme<br>01=SD38-2<br>Diesel<br>Scheme |  |
| CV120 | Read Only              |               | Read Only   | Manufacturer defined<br>Not User Configurable<br>Read Only |
| CV121 | Software Version       | 03            | 2 or higher   |  |
| CV122 | Product Type           | 12            | Read Only   |  |
| CV123 | Hardware Version       | 17            | 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  |  |
| CV129           | Mode Control  | 0                |  | 0=standard DC mode<br>1=use relay in DC mode   |
| CV130<br>to 139 | Manufacturer defined in<br>sound definition file<br>(SDF)                       | Unique to<br>Mfg | Unique to<br>Manufacturer  | Global Configuration<br>Flags                  |
| CV132           | Diesel Notch Rate   | 127              |  | Notch 8 @ 44%                                  |
| CV133*          | Steam Chuff/CAM<br>Configuration  | 63               | 1-127=driver<br>diameter in<br>inches<br>128=external<br>cam input |  |
| CV134*          | Steam Gear Ratio Trim   | 32               | 1-32   | 32=100%  |
| CV135           | Volume When Muted   | 00               | 00-64  | 00=mute, 64=full volume                        |
| CV140<br>to 240 | User defined in sound<br>definition file (SDF)                                  | Unique to<br>SDF | Unique to<br>SDF   | CV# & CV value range<br>are unique to each SDF |
| CV140           | Prime Mover/Diesel<br>Chuff Volume  | 60               | 00-64  |  |
| CV141           | Bell Volume   | 25               | 00-64  |  |
| CV142           | Horn/Whistle Volume   | 60               | 00-64  |  |
| CV143           | Air Features Volume<br>(Pop off, Drier,<br>Compressor sounds)                   | 30               | 00-64  |  |
| CV145           | Misc Sounds Volume  | 40               | 00-64  |  |
| CV146           | Bell Delay (24mS<br>intervals)  | 7                | 01-100   |  |
| CV147           | Drier Rate  | 2                | 01-64  | 1=approx. 2 seconds                            |
| CV148           | Compressor/Air Pump<br>Start Rate   | 30               |  |  |
| CV149           | Compressor/Air pump<br>run time   | 20               |  |  |
| CV150           | Horn/Whistle Selector   | 00               | 00 = Standard<br>01 = Playable<br>Volume<br>02 = Alternate         |  |
| CV151           | Peak Speed To Allow<br>Auto Coupler / Brake On<br>Direction Change and F3<br>On | 48               | 00-60  |  |
| CV152           | Author ID<br>Digitrax=0xDD/221  | 221              | 221  | Not User Configurable                          |
| CV153           | Project ID<br>Steam/SD38_2a   | 5                |  | Not User Configurable                          |
| CV154           | Steam Blow  | 60               | 0-64   |  |

|       |                      |    |   |                       |
|-------|----------------------|----|---|-----------------------|
|       | Down/Safety Volume   |    |   |                       |
| CV155 | Notching/Slip Mode   | 00 | 00 = Automatic<br>01 = Semi-auto<br>02 = Manual |                       |
| CV156 | Horn delay threshold | 10 |   |                       |
| CV160 | Variant ID           | 4  |   | Not User Configurable |

Notes:

\*CV134 and CV133 work together to control the loco's chuff rate.

Programming CV133 to a value between 1 and 127, initiates auto chuff. Auto chuff uses internal software to simulate driver chuff timing.

CV133's default value of 63, simulates a loco driver diameter of 63 inches. If you program the value to 32, you will double the chuff rate.

CV134 (gear ratio) also affects the auto chuff rate. CV134's default value of 32 assumes no gear reduction. Doubling this value to 64 simulates a 2:1 gear reduction (doubling the chuff rate).

Setting CV133 to a value of 128 activates the white cam input lead on the 10 pin sound harness. This lets you use a physical cam input installed in your locomotive to control chuffing. A chuff is triggered when a pulse greater than 6 volts or DCC track voltage is seen on the white cam input lead. This voltage must go off (to 0 volts) before the next chuff is triggered.

For CV155=01 semiautomatic notching, the prime mover lowest notch setting is set by the throttle speed setting. F6 (ON) can increase the notch and F7 (ON) will decrease the prime mover to the minimum notch set by current throttle setting.

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