



Tsunami™ Digital Sound Decoder

Quick Start Guide

for the Experienced User

Software Release 1.00

Notice

The information in this document is subject to change without notice.

SoundTraxx (Throttle Up!) shall not be liable for technical or editorial errors or omissions contained herein; nor for incidental or consequential damages resulting from the furnishing, performance or use of this material.

This document contains information protected by copyright. No part of this document may be photocopied or reproduced in any form without the prior written consent of Throttle Up! Corp.

Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies.

SoundTraxx, Tsunami, SoundTraxx DCC, Digital Sound Decoder, Dynamic Digital Exhaust, Auto-Exhaust and Hyperlight are trademarks of Throttle Up! Corp.

Table of Contents

All Aboard!	1
Overview.....	1
Features	2
Reminder: Some Do's and Don'ts	4
 Installation	 5
Basic Installation Guidelines	5
Installing the Digital Sound Decoder	6
Wiring the Decoder.....	7
Installing Tsunami in a DCC-ready Model	9
 Operation	 10
Quick Start.....	10
 Programming	 11
Programming and Reading CVs.....	11
Diagnostic Lamps	12
List of Configuration Variables.....	13
 Support.....	 14
Service and Warranty Policy	14



All Aboard!

Overview

Congratulations on the purchase of your SoundTraxx™ Tsunami™ Digital Sound Decoder™. Properly installed, your Digital Sound Decoder (DSD) will provide all the pleasures of high quality, digital onboard sound and the benefits of today's DCC (Digital Command Control) technology. With the proper tools, basic modeling skills and common sense, equipping a locomotive with sound is not difficult. It may, however, be a new experience for you, and you will find that successive installations will go more quickly than the first. Please note that while each decoder is tested thoroughly before it is shipped, we cannot control the correctness or quality of the installation. It is imperative that you follow the directions, and never remove the protective heat shrink from the decoder; there are no adjustments or user serviceable parts and this will void your warranty.

This **Quick Start Guide** assumes that you have some understanding of or experience with other SoundTraxx Digital Sound Decoders. It covers the differences you may need to know between these decoders and any you may have previously used.

*If you are new to SoundTraxx Digital Sound Decoders, you should start with the **Installation Guide**, which will give you step-by-step instructions for a successful first installation. The **User's Guide** will walk you through the various aspects of programming your Tsunami decoder, as well as some tips on troubleshooting. For the power user, the Tsunami **Technical Reference** will provide a list of all the CVs available for use with Tsunami decoders and their exact function and make-up for those who wish to have a complete reference for advanced programming techniques.*

Technical Bulletins and Application Notes covering various topics are also published from time to time, and these may be downloaded free of charge from our website at www.soundtraxx.com.



All Aboard!

Tsunami Features

Tsunami Digital Sound Decoders have a great number of new features designed to enhance your operating experience. Many features operate similarly to previous SoundTraxx decoders, but some features will require a little explanation.

Some of the enhancements include:

Decoder Features

- Supports extended address mode for assigning any locomotive number up to 9,999.
- Supports advanced consist addressing.
- Supports 'Operation Mode Programming', allowing CVs to be changed on the mainline without using a programming track.

Sound Features

There are many new sound effects (now over 20 sound effects!) and the ability to adjust the sounds to suit your ear (and model) has been greatly expanded and improved. You can now adjust the volume of each sound effect individually with Tsunami's built-in mixer!

The addition of a short whistle/horn effect will allow you to more easily incorporate signaling practices into your operations. There is also the option of replacing the short whistle function with an alternate whistle or horn for the engine which carried two whistles or occasionally, a horn and a whistle.

For those with limited function keys, you may wish to enable the automatic signal feature, which will activate Stop, Forward, Reverse and Grade Crossing whistle signals automatically in response to train motion.

More Sound Features

- Adjustable Volume Controls
- Seven-Band Equalizer
- Auto-Exhaust™ allows chuff to be synchronized to the locomotive speed without a synchronizing exhaust cam (steam); cam is optional.
- 1-Watt Audio Amplifier
- Adjustable Reverb

Steam Sound Effects

- Steam Exhaust Chuff
- Whistle
- Airpump
- Water Stop
- Brake Release
- Snifter Valve
- Johnson Bar/Power Reverser
- Steam Release
- Fireman Fred's tool box (5 effects)
- Dynamic Digital Exhaust™ modifies exhaust volume, cutoff and timbre as locomotive load changes.
- Bell
- Short Whistle
- Dynamo
- Brake Squeal
- Side Rod Clank
- Injectors
- Firebox Blower
- Boiler Pop Valve
- Coupler Clank



All Aboard!

Diesel Sound Effects

- Engine Exhaust (8 notches)
- Engine Shutdown
- Airhorn
- Compressor Pop-off
- Brake Squeal
- Radiator Fans
- Turbo Whine (some models)
- Engine Startup
- Bell
- Short Airhorn
- Dynamic Brakes
- Brake Release
- Coupler Clank
- Fireman Ed's tool box

Throttle Features

Tsunami Digital Sound Decoders have greatly improved throttle features built into our Hyperdrive system. With the addition of these features, you will be able to better eliminate motor noise, better control your locomotive speed under varying conditions and adjust for differences between various manufacturers' models.

- Supports 14, 28 and 128 speed step modes.
- Programmable acceleration, deceleration and starting voltage for prototypical starting and stopping.
- Use of standard and alternate speed tables.
- Load Compensation
- Silent High Frequency Motor Drive

Lighting Features

All of our Hyperlight effects are available in our Tsunami decoders. One new addition, the Dyno-Light, provides the missing element in the operation of the Dynamo, or steam generator. This mimics the effect of the gradual increase in brightness as the generator spools up and supplies power to the headlight.

The new LED Compensation will adjust the lighting output level to account for the visual differences in your lighting effects when using an LED rather than an incandescent bulb.

- Four function outputs for headlight and backup light or other effects
- Supports "Rule 17" operation or automatic direction control
- 100mA Current Sink Capacity
- Each output may be programmed with our Hyperlight™ Lighting effects:

Lighting Effects

- Simple On/Off Lamp
- Oscillating headlight
- Pyle-Gyalite
- Western-Cullen Rotary Beacon
- Type I and II ditch lights
- FRED (Flashing Rear End Device)
- Firebox Flicker
- Smart Firebox Flicker – synchronizes with sound of the firebox door opening and closing
- Dimmable light
- Mars Light
- Prime Stratolite
- Single strobe
- Double strobe
- Engine Exhaust Flicker
- Dyno-Light



All Aboard!

Reminder: Some Do's and Don'ts

It will be a great temptation to begin connecting wires immediately. Before you install your Tsunami Digital Sound Decoder, there are some simple precautions you should take.

- The DSD should be handled carefully in a static-free environment. To discharge static electricity, touch a water pipe or grounded metal surface before handling the decoder.
- Never remove the decoder's protective shrink tubing. First, you will void your warranty and second, you will compromise the decoder's built in thermal management system.
- Never make connections to the decoder while it is powered. Doing so makes for an accident waiting to happen.
- Make sure all electrical connections are insulated. Avoid using electrical tape, as it tends to unwrap over time. We recommend using heat shrinkable tubing instead.
- Never allow the decoder leads to come in contact with any DCC track wiring except those specifically designed for that purpose.
- Never allow speaker outputs to become shorted together.
- Never allow motor outputs to become shorted together.
- Do not exceed the output ratings for which the decoder is designed.



Installation

Basic Installation Guidelines

As a reminder for any installation:

- Don't pick a locomotive whose stall current exceeds the rating of the decoder. Always test the stall current of your locomotive before your installation.
- Do pick a smooth running locomotive that runs well on straight DC power. A smooth running mechanism is vital for good throttle control and enhances the realism of the sound. Dirty, worn out or binding mechanisms not only overload the decoder, but also will have trouble starting smoothly and will destroy the illusion created by the Auto-Exhaust feature if they barely lurch along at half throttle.
- Do start with an engine that is 'sound-ready' if possible, such as an engine with predrilled speaker holes, or a diesel with a roomy 'B' unit.
- Don't pick a noisy engine, or one, which experiences some arcing or sparking when in operation. The best sound will come from locomotives powered with can motors. Older, open-frame motors may produce an offensive, interference sound.
- Provide ventilation for the decoder; try to mount the decoder so that some airflow can occur.
- Mount the decoder away from other heat sources, such as the motor or lamps to reduce the possibility of overheating.
- If you can, mount the decoder so that the 'flat' side is against a metal chassis or weight. This will further help to dissipate heat.
- Always provide a proper baffle (enclosure) for the speaker and choose the largest speaker possible.



Installation

Installing the Digital Sound Decoder

Isolating the Motor

If your model is not DCC-ready, make sure you isolate the motor first. The two motor brush connections must be electrically isolated so they are driven exclusively by the DSD motor outputs.

Failure to properly isolate the motor will damage your decoder and turn it into an effective, but short-lived smoke generator!

Disconnect all wires leading to both motor terminals. Note that some motor brush connections are made using a spring contact to the chassis. In such cases, it will be necessary to remove or modify the spring contact as well.

Next, verify that each motor terminal is electrically isolated from the left and right rail pickups using an ohmmeter or continuity tester. If all tests indicate an open circuit, the motor is properly isolated. Do not proceed further until this is done.

You will also need to disconnect the wires leading to any lights you wish to use. Using an ohmmeter, check that each lamp lead is electrically isolated from the frame as well as the left and right rail pickups.

If you don't know how to perform the above tests, see the **Installation Guide** for more detailed instructions.



Installation

Wiring the Decoder

Begin by mounting the speaker and securing the decoder in place using double-sided foam tape. Temporarily refit the body shell to ensure that adequate clearance still exists.

When wiring the decoder, trim all wires to reduce unnecessary lead length. This will not only give your installation a neater appearance but also prevent wires from interfering with the drive mechanism and getting pinched when closing up the boiler, tender or body shell.

Track Connections

Connect the RED wire to the right (engineer's side) track power pickup and the BLACK wire to the left track power pickup. If your model is DCC-ready, i.e. there is an eight-pin DCC socket already wired to the motor, follow the instructions on page 9 for your track and motor connections.

Motor Connections

Connect the ORANGE wire to the motor's (+) terminal and the GRAY wire to the motor's (-) terminal.

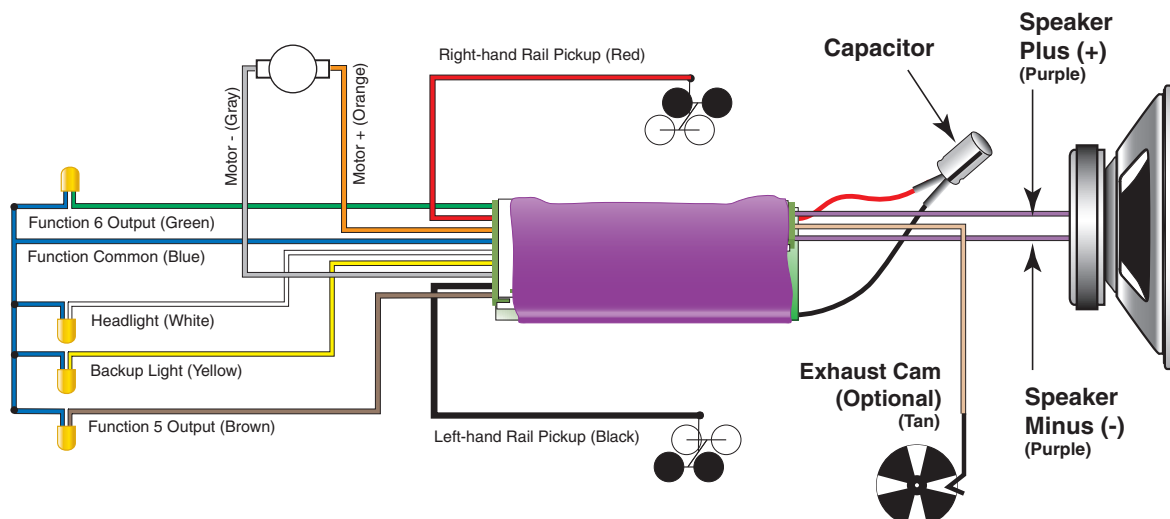


Figure 1 - Wiring Diagram

Speaker Connections

Note: *Tsunami is designed to operate with speakers having an impedance of 8 ohms or higher. Using a speaker impedance less than 8 ohms may result in erratic operation or even component failure!*

Connect the decoder's PURPLE speaker (+) wire (pin 12) to one of the speaker terminals. Connect the other PURPLE speaker (-) wire (pin 10) to the other speaker terminal.

Note: *Tsunami does not need a capacitor to be wired in series with the speaker as required by some other SoundTraxx decoders.*



Installation

The polarity of the speaker terminals is only important when using multiple speakers. If you have installed multiple speakers, make sure they are phased properly, i.e., positive lead to positive lead and minus lead to minus lead of each speaker (see the Installation Guide for more information).

Lighting Connections

Each DSD is equipped with four function outputs that are intended to drive headlight, backup light and special effect lights. Each output is rated for 100mA. **Do not exceed this rating!** Be sure that the combined current of all lights as well as the motor stall current measured does not exceed the decoder rating.

12-16V lamps can be directly wired to the function outputs as shown in Figure 1. Connect the WHITE wire to one of the Headlight leads. Connect the other bulb lead to the BLUE wire. Connect the YELLOW wire to one of the Backup Light leads. Connect the other bulb lead to the BLUE wire.

To connect the Function 5 lamp, connect the BROWN wire to one lead and connect the other lead to the BLUE wire. To connect the Function 6 lamp, connect the GREEN wire to one lead and connect the other lead to the BLUE wire.

Tsunami decoders may also be used with 1.5 Volt bulbs or LEDs, which require the use of a resistor. See the **Installation Guide** if you need more information.

Exhaust Cam Connections *(steam only)*

Connect the TAN wire from the 3-pin Speaker/Cam harness of the DSD to the exhaust cam wiper switch. The decoder is factory-programmed to operate using the Auto-Exhaust feature. If you wish to use an exhaust cam, you must enable the cam-synchronized exhaust by setting CV 112 to 128.



Installation

Installing Tsunami in a DCC-ready Model

If your locomotive is wired with an NMRA-compatible 8-pin socket, you may solder a mating connector to the DSD's wire harness, which will allow you to easily install the decoder by simply plugging the connector into the socket, with the exception of the connections for Functions 5 and 6, the speaker and the exhaust cam. SoundTraxx offers P.N. 810123, which is a package of four connectors that meet NMRA specifications.

1. Remove the 'dummy' plug from the NMRA socket.
2. We highly recommend you test the socket itself to ensure it is properly wired. Assuming the locomotive manufacturer wired the socket correctly can be dangerous! If you don't know how to do this, see the **Installation Guide**.
3. Wire the connector to the decoder's wire harness according to the illustration. Solder the wires from the sound decoder to the cup side of the connector as shown in the Figure 2.

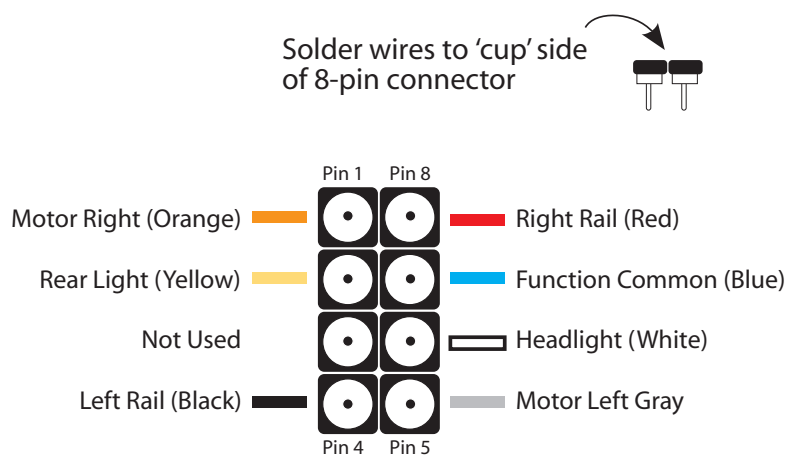


Figure 2 - NMRA 8-Pin Connector Wiring Code

4. Plug the newly wired connector into the socket with the orange wire at pin 1 on the manufacturers circuit board. Most manufacturers have labeled the sockets with pin 1 or pin 8 (at a minimum). Once you have plugged in the 8-pin connector, you will still need to wire the speaker and cam according to the instructions for a non DCC-ready model.



Operation

Quick Start

Your SoundTraxx Tsunami has been shipped with all CVs pre-programmed so you can begin using your locomotive immediately without having to worry about what adjustments to make. All Tsunami Digital Sound Decoders are shipped with the address set to 3. Function Assignments are as follows:

Steam Decoders

<i>Function Key</i>	<i>Effect</i>
F0	Headlight/Backup Light/Dynamo
F1	Bell
F2	Whistle
F3	Short Whistle
F4	Steam Release
F5	FX5 Output
F6	FX6 Output
F7	Light Dimmer
F8	Mute the Sound
F9	Water Stop
F10	Injectors
F11	Brake Squeal/Release
F12	Coupler Clank

Diesel Decoders

<i>Function Key</i>	<i>Effect</i>
F0	Headlight/Backup Light
F1	Bell
F2	Airhorn
F3	Short Horn
F4	Dynamic Brake On/Off
F5	FX5 Output
F6	FX6 Output
F7	Light Dimmer
F8	Mute the Sound
F9	RPM+
F10	RPM-
F11	Brake Squeal/Release
F12	Coupler Clank



Programming

Programming and Reading CVs

Certain command stations allow you to read a CV during Service Mode Programming, which is useful to verify its current setting. If you have trouble reading or verifying CVs, the problem may be due to the design of your command station and not the DSD itself. Tsunami and all other decoders communicate back to the command station using what's called an acknowledgment pulse, which is defined in NMRA RP-9.2.3 as "an increased load on the programming track of at least 60mA for at least 5ms." Like most decoders, the DSD generates the acknowledgment pulse by momentarily applying power to the motor.

If your DSD is otherwise working properly (i.e., responds properly on the mainline to speed and direction commands) but your command station is having troubles reading CV data from the DSD, it may be due to incompatibilities between the electrical requirements of the DSD (which are different from conventional decoders due to the added audio circuitry) and the electrical characteristics of your programming track. In such an event, you will need to use a Programming Track Booster, such as SoundTraxx PTB-100 (P.N. 829002). The PTB-100 amplifies the programming track signals to levels that work best with Tsunami. It is easy to install (see below) and inexpensive. An advantage to using the PTB-100 is that it also provides short circuit detection and some helpful diagnostics. It works well for all other SoundTraxx decoders, too.

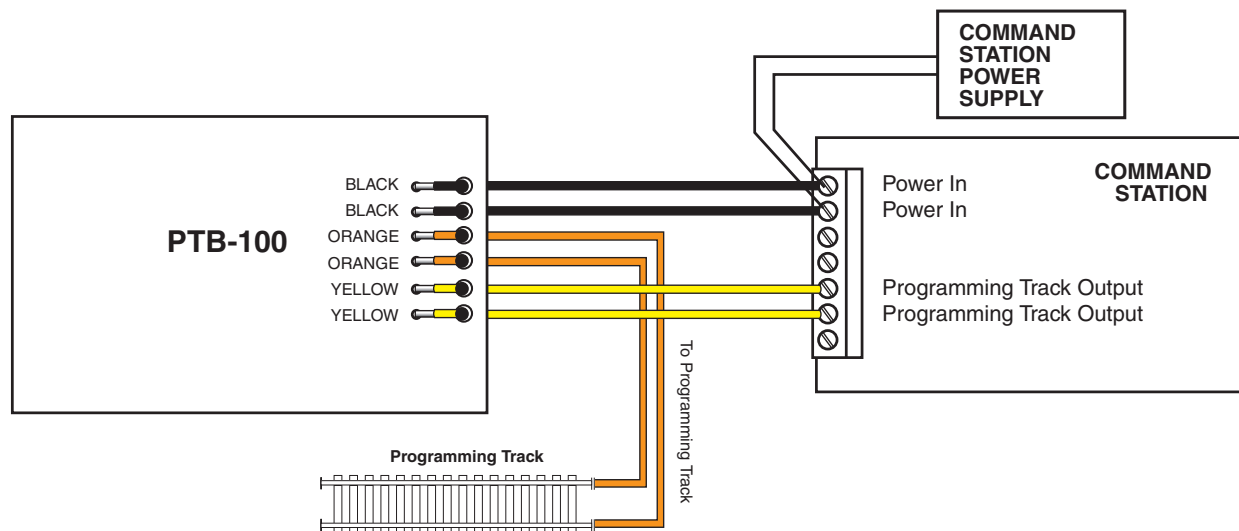


Figure 3 - General Wiring Diagram for the SoundTraxx PTB-100



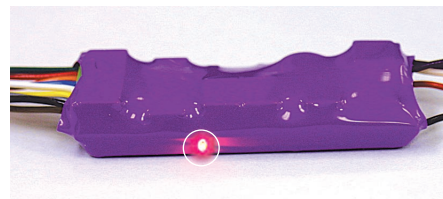
Programming

Diagnostic Lamps

Tsunami has two red LEDs on the circuit board which may be helpful for resolving potential difficulties.

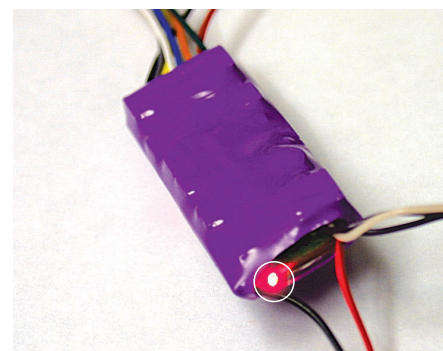
Pilot Light

The pilot light indicates that the decoder is receiving power. If this light does not come on, it may indicate an improperly wired decoder. It could also indicate a loose wire, poor track pickups, no output from the command station or other problem with your layout wiring.



Fault Light

During normal operation, the fault light will turn on and off with the headlight, and is useful for establishing basic control of the decoder. Additionally, Tsunami monitors a number of its input signals and if a fault is found, reports an error code by flashing the fault light as well as the headlight and backup light (if connected). The number of times the light flashes corresponds to the number of the error code. Error codes whose conditions can usually be solved by the user are as follows:



- Error 9: Over-temperature Fault
- Error 10: Over-voltage Fault
- Error 11: Motor Connection Fault
- Error 12: Motor Over-current Fault
- Error 16: CV Reset has occurred and CVs have been set to default values



Programming

List of Configuration Variables (CVs)

The following is a quick reference list of CVs used by Tsunami. See the Tsunami Technical Reference for detailed information about their uses.

CV 1	Primary Address Control	CV 138	Reserved
CV 2	Vstart	CV 139	Brake Squeal Volume
CV 3	Baseline Acceleration Rate	CV 140	Brake Release Volume
CV 4	Baseline Braking Rate	CV 141	Snifter Valve Volume
CV 7	Manufacturer Version ID (Read Only)	CV 142	Johnson Bar/Power Reverse Volume
CV 8	Manufacturer ID	CV 143	Pop Valve Volume
CV 10	BEMF Cutout	CV 145	Blower Draft Volume
CV 11	Packet Time Out Value	CV 146	Water Stop Volume
CV 12	Power Source Conversion	CV 147	Injector Volume
CV 13	Analog Function Enable 1	CV 148	Fireman Fred's Shovel Volume
CV 14	Analog Function Enable 2	CV 149	Fireman Fred's Wrench Volume
CV 15	CV Unlock Register	CV 150	Fireman Fred's Oil Can Volume
CV 16	CV Lock ID Code	CV 151	Fireman Fred's Grease Gun Volume
CV 17,18	Extended Address	CV 153	Equalizer Control
CV 19	Consist Address	CV 154	62 Hz Equalizer Cut/Boost
CV 21	Consist Function Group 1	CV 155	125 Hz Equalizer Cut/Boost
CV 22	Consist Function Group 2	CV 156	250 Hz Equalizer Cut/Boost
CV 23	Consist Acceleration Rate	CV 157	500 Hz Equalizer Cut/Boost
CV 24	Consist Braking Rate	CV 158	1K Hz Equalizer Cut/Boost
CV 25	Speed Table Select Register	CV 159	2K Hz Equalizer Cut/Boost
CV 29	Configuration Register 1	CV 160	4K Hz Equalizer Cut/Boost
CV 30	Error Information/Alternate Mode Selection	CV 161	Reverb Control
CV 33	FL(f) Output Location	CV 162	Reverb Output Level
CV 34	FL(r) Output Location	CV 163	Reverb Delay
CV 35	F1 Output Location	CV 164	Reverb Gain
CV 36	F2 Output Location	CV 169	Whistle Reverb Effect Send Level
CV 37	F3 Output Location	CV 170	Bell Reverb Effect Send Level
CV 38	F4 Output Location	CV 171	Exhaust Reverb Effect Send Level
CV 39	F5 Output Location	CV 172	Air Pump Reverb Effect Send Level
CV 40	F6 Output Location	CV 173	Reserved
CV 41	F7 Output Location	CV 174	Reserved
CV 42	F8 Output Location	CV 175	Reserved
CV 43	F9 Output Location	CV 176	Reserved
CV 44	F10 Output Location	CV 177	DDE Throttle Gain
CV 45	F11 Output Location	CV 178	DDE Motor Load Gain
CV 46	F12 Output Location	CV 179	DDE Attack Time Constant
CV 47	Analog Whistle Control	CV 180	DDE Release Time Constant
CV 49-52	Hyperlight Effect Select (for FL(f), FL(r), Function 5, 6)	CV 181	Exhaust Low Volume Limit
CV 59	Flash Rate	CV 182	Exhaust High Volume Limit
CV 60	Crossing Hold Time	CV 183	Side Rod Clank Low Volume Limit
CV 61	F11 Braking Rate	CV 184	Side Rod Clank High Volume Limit
CV 62	Transponding Control	CV 185	DDE Filter Initial Frequency
CV 66	Forward Trim	CV 186	DDE Filter Control Gain
CV 67-94	Loadable Speed Table	CV 187	DDE Filter Initial Frequency
CV 95	Reverse Trim	CV 188	DDE Tracking Coefficient
CV 105	User Identifier #1	CV 193	Automatic Bell-On Set Point
CV 106	User Identifier #2	CV 194	Automatic Bell-Off Set Point
CV 112	Sound Configuration 1	CV 195	Grade Crossing Whistle Sensitivity
CV 113	Quiet Mode Timeout Period	CV 196	Brake Squeal Sensitivity
CV 114	Bell Ring Rate	CV 197	Analog Mode Automatic Sound Configuration
CV 115	Whistle Select	CV 198	Digital Mode Automatic Sound Configuration
CV 116	Engine Exhaust Control	CV 201	Event Probability: Fireman Fred Shovels Coal
CV 119	Effect Processor Select	CV 202	Event Probability: Fireman Fred Fills the Tender
CV 128	Master Volume Control	CV 203	Event Probability: Fireman Fred Turns His Wrench
CV 129	Whistle Volume	CV 204	Event Probability: Fireman Fred Uses His Grease Gun
CV 130	Bell Volume	CV 205	Event Probability: Fireman Fred Uses His Oil Can
CV 131	Exhaust Volume	CV 206	Event Probability: Fireman Fred Uses the Injectors
CV 132	Air Pump Volume	CV 207	Event Probability: Fireman Fred Uses the Firebox Blower
CV 133	Dynamo Volume	CV 208	Event Probability: Pop Valve Blow Off
CV 134	Blower Volume	CV 209	Kp Coefficient
CV 135	Rod Clank Volume	CV 210	Ki Coefficient
CV 136	Steam Release Volume	CV 212	Motor Control Intensity
CV 137	Coupler Volume	CV 213	Motor Control Sample Period
		CV 214	Motor Control Sample Aperture Time



Support

Service and Warranty Policy

Each SoundTraxx Digital Sound Decoder is tested thoroughly before it is shipped and warranted to be in good working order and free of manufacturing defects. However, in the event that a mistake does occur during installation, SoundTraxx will cover the repair under our 'Safety-Net' Service Warranty. See the full warranty statement in the the **User's Manual**, along with tips for troubleshooting common problems.

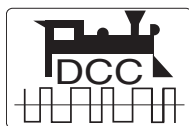
Our service department is available to help you Monday through Friday, 9:00am to 5:30pm Mountain Time .

Contact us either by phone, our 24-hour fax or by email:

SoundTraxx Service Department
210 Rock Point Drive
Durango, CO 81301
Telephone (970) 259-0690
Fax (970) 259-0691
Email: support@soundtraxx.com



©2005 Throttle Up! Corp.
All Rights Reserved.



COMPATIBLE WITH
THE NMRA DCC STANDARDS
AND RECOMMENDED
PRACTICES

SOUNDTRAXX™
New Dimensions in Digital Sound Technology

141 Burnett Drive • Durango, CO 81301
(970) 259-0690 • Fax: (970) 259-0691 • Email: Sales@soundtraxx.com