

S4 Drop-In Configuration Variables List

This is the complete list of all CVs used in the S4 Drop-In. The factory settings are what the S4Drop-In decoder has when it is new or reset. If the CV or value is grayed out, it is not available on the S4.

Note: All CV settings are remembered without battery voltage

CV #	Factory Setting	Value Range	Description
CV1	3	0-99	1-99 Primary Address
CV2	9	0-255	Motor Starting Voltage MSV
CV3	2	0-255	Motor Acceleration Rate
CV4	2	0-255	Motor Deceleration Rate
CV5	255	0-255	Maximum Motor Voltage Vmax
CV6	128	0-255	Mid-point Motor Voltage Vmid
CV8	135	135	CVP Manufacturer ID
CV11	0	0-255	Loss of Signal Timer (seconds)
CV17	0	0-255	Loco Address Hi-Byte
CV18	0	0-255	Loco Address Lo Byte
CV29	2	0-255	Decoder configuration
CV35	0	0-99	F1 Function Key Action
CV36	0	0-99	F2 Function Key Action
CV37	9	0-99	F3 Function Key [RCOUPLR]
CV38	0	0-99	F4 Function Key Action [none]
CV39	1	0-99	F5 Function Key Action [CRUISE]
CV40	3	0-99	F6 Function Key Action
CV41	0	0-99	F7 Function Key Action
CV42	0	0-99	F8 Function Key Action
CV43	4	0-99	F9 Function Key Action [AUX]
CV44	2	0-99	F10 Function Key Action [SMOKE]
CV45	5	0-99	F11 Function Key
CV46	0	0-99	F12 Function Key Action
CV56	0	0-255	Bump Amount
CV57	0	0 - 127	Bump duration in us
CV59	3	1-15	Headlites Effect Period (x512ms)
CV60	0	0-15	Headlights Mode 0=normal/autorev
CV61	4	0-15	Headlight Front Effect
CV62	4	0-15	Headlight Rear Effect
CV63	0	0-1	Cruise Mode - 0 Norm, 1=Track
CV64	4	1-16	Cruise Track Rate (ms)
CV65	2	1-3	Cruise Track Step Size
CV200	0	0-16	RF Frequency number
CV201	3	1-15	Light Effect Period (x512ms)
CV202	4	0-15	AUX1 Light Special Effect [E1]
CV203	4	0-15	AUX Light Special Effect
CV204	4	0-15	AUX2 Special Effect [E3]
CV205	4	0-15	E4 Special Effect [not available]
CV206	0	0-255	E4 Auto-off Timer [not used]
CV207	3	0-255	DLites Flash period (x256ms)
CV208	0	0-255	DLites Mode (0=On, 1=Off)
CV209	15	0-255	DLites Flash Timeout (seconds)
CV212	3	0-255	Smoke Timeout (3 minutes)
CV213	8	0-99	Function Key 13 [FCOUPLR]
CV214	0	0-99	Function Key 14 Action
CV215	99	0-99	Function Key 15 [Cruise Off]

If the CV is grayed out, it is not available.

CV Value	Function Key Action
0	No Function
1	Activate Cruise Control
2	Smoke Enable
3	Toggle AUX Lite [ELITE1] on/off
4	Toggle AUX Lite on/off
5	Toggle AUX2 Lite [ELITE3] on/off
6	Toggle ELITE4 [not available] on/off
7	Dim Headlights on/off
8	Activate Front Coupler
9	Activate Rear Coupler
15	No Function
99	Deactivate Cruise Control
not listed	reserved

CV Value	Special Lighting Effects
0	Off 0%
1	Dim 6%
2	Dim 25%
3	Dim 50%
4	On 100%
5	Strato Light
6	Oscillating Light
7	FRED
8	Rotary Dome light 1
9	Gyra Light
10	Mars Light
11	Rotary Dome Light 2
12	Strobe Single Pulse
13	Strobe Double Pulse
14	Reserved
15	Random flicker

CV Value	Cruise Control Mode
0	Normal (cruise off with speed change)
1	Tracking mode (Cruise on with change)

CV Value	Head/Rear Lites Action
0	Normal, autoreverse
1	Normal with rule17
2	Front headlight on always
3	Front headlight on always with rule17
4	Rear headlight on always
5	Rear headlight on always with rule17
6	Front and Rear both on always
7	Front and Rear both on always with rule17
8	Reversed Auto Reverse (Front to Back)
9	Reversed Auto Reverse with rule 17
10-15	reserved

AirWire900[®] USA-Trains S4 Drop-In[™] Decoder

Installation Guide

Locomotive Disassembly

Smart Charger Preparation

Optional Sound Module Installation

Decoder Installation

Quick Start Guide

How To Use This Manual	2
S4 Drop-In Decoder Familiarization.....	3
Battery Pack and Battery Charger Preparation	4
Locomotive Disassembly	6
Installing the Optional Phoenix P8 Speaker and Sound Module	10
Mounting the S4 Drop-In Decoder	12
Initial Operation Check Before Reassembly	14
Optional Phoenix Coupler Use	16
S4 Drop-In Quick Start Guide.....	17
Changing Locomotive Decoder Number	19
Change Locomotive Decoder Frequency	19
If You Forget The Frequency - how to reset it	20
Restoring Original Factory Settings	21
AUX Lighting Connector	21
Simple Troubleshooting Tips and Warranty Information	22
Detailed P8 Hookup Diagram	23
Complete List Of All S4 Drop-In Decoder Configuration Variables	Back

AIRWIRE[®] 900

Drop-In Kit Contents

S4 Drop-In Decoder
Charger Pigtail
S4 Install Guide
Users Guide

Optional Items Not Supplied

Battery & Charger
Speaker
P8 Sound Module
P8 Programming Cable
P8 Harness

How To Use This Booklet

Locomotive Disassembly and AirWire Drop-in Decoder Installation

This section starts with the simple task of attaching the appropriate sockets and plugs to the battery and the battery charger. Step-by-step instructions then show how to disassemble the USA-Trains S4 diesel locomotive. Once the locomotive is opened up, the installation of the Phoenix P8 sound module is described followed by the rather simple task of installing the Drop-In decoder. With the installation done, a quick checkout is run and then the locomotive is reassembled.

Quick Start Instructions

This short section describes how to control the features of the S4 Drop-In decoder using the AirWire throttle. In this section you will find the “cheat sheet” listing the throttle function key assignments for both the locomotive and P8 sound effects.

Miscellaneous Items

Useful items related to changing the Drop-In decoder address, remote frequency setting and how to reset the Drop-In decoder to its original factory settings finish out this guide

See The Drop-In Users Guide For Applications Tips

Since the S4 Install Manual is used only during decoder installation, there is a second Drop-In Decoder Users guide. The users guide will have all of the items related to fine tuning and performance optimization as well as some interesting application tips.

Recommended Battery And Charger

The CVP BAT3 is a 14.8V, 3400mAh, Lithium-Ion rechargeable battery. It is an ideal battery for the S4. It is compact in size with lots of runtime capacity. The matching smart charger insures maximum lifetime for your battery. The S4 Drop-In includes a connector for use with the charger. The BAT3 can be ordered from authorized AirWire dealers or direct from CVP Products. www.cvpusa.com

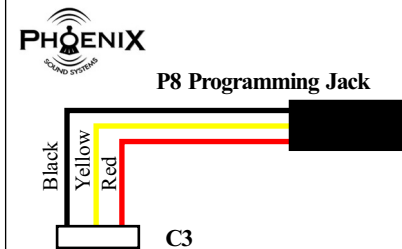
Battery 14.8V, 3400mAh	BAT3
Smart Charger	CHARGER1

Phoenix P8 Sound Module & Accessories

The Drop-In Decoder is designed to work with the Phoenix P8 sound module. In addition to the sound module, you need a speaker, a P8 Drop-In cable and the Phoenix P8 computer interface jack. If your installation will not have sound, then you may ignore all steps related to the installation of the P8 sound module. Order these items directly from Phoenix or one of their authorized dealers. www.phoenixsound.com

Oval Speaker SP-2.5OV	824-710
Drop-In Harness	6002-08
P8 Programming Jack	6000-55

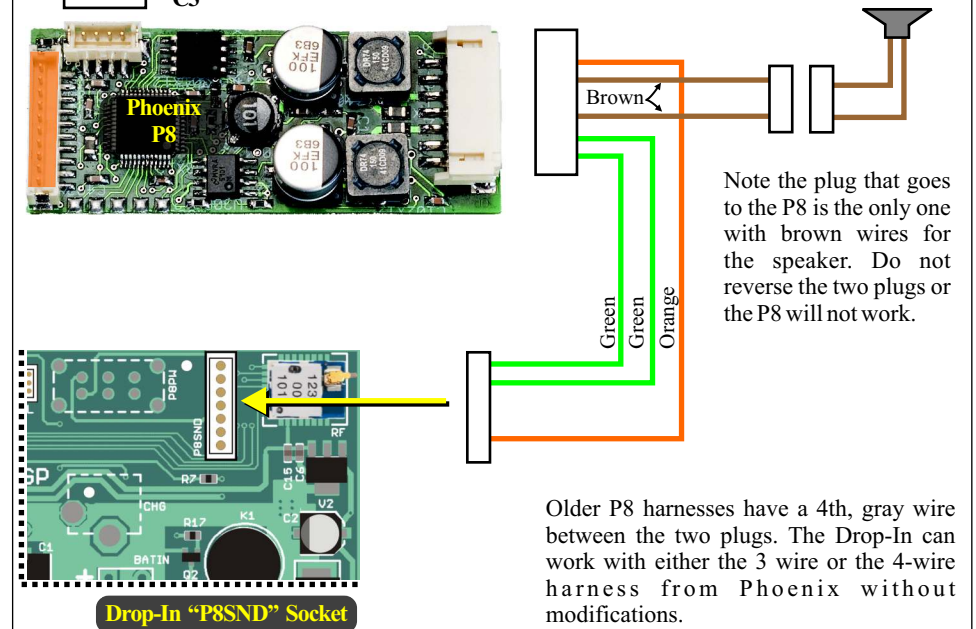
Phoenix P8 Hookup Diagram



This is the Phoenix P8 hookup diagram. The wires are somewhat stiff and fragile. Don't subject them to a lot of unnecessary flexing.

If not using a P8 speaker, cut off the connector on the two brown speaker wires and solder the wires directly to the speaker.

The sockets are polarized and can only be completely inserted when oriented correctly.



Note the plug that goes to the P8 is the only one with brown wires for the speaker. Do not reverse the two plugs or the P8 will not work.

Older P8 harnesses have a 4th, gray wire between the two plugs. The Drop-In can work with either the 3 wire or the 4-wire harness from Phoenix without modifications.

The Drop-In decoder has a dedicated power switch for the P8. The P8 power switch is feed by the Drop-In decoder power switch. The P8 will not turn on without having the S4 Drop-In power switch on. This will insure that there is no battery drain when the S4 Power Switch is off.

P8 Address Setup

The P8 is programmed at the same time as the S4 Drop-In decoder address is programmed. If for any reason, you think the P8 or the Drop-In might not be on the same address, just reprogram the decoder's locomotive address, CV1, from the throttle. When the address on the Drop-In is changed, the P8's address will also be changed. If the P8 doesn't respond to throttle commands, but the motion decoder does, repeat the programming of CV1 and make sure both power switches are turned on. See page 19 for step-by-step instructions for setting the loco number into the Drop-In and P8 decoders.

Phoenix P8 Sound Decoder Setup - See The S4 Drop-In Decoder Users Guide

The P8 is a versatile sound decoder with many options and selections. However, there are selections that must be made to achieve the best results with the AirWire S4 Drop-In decoder.

Detailed P8 setup instructions are contained in the Drop-In Decoder Users Guide. Also, be sure and see the P8 manual and read the help screens that are part of the Phoenix programming software.

Simple Troubleshooting Tips

These tips assume the locomotive has been operating normally for a while.

Locomotive Stops Running - But Resumes Running After A Short Rest

This is likely to be caused by overheating of the motor power drivers. If the drivers overheat, they will automatically shut down. Once they have cooled, normal operation resumes. There is no warning buzzer when this occurs. There is no harm to the decoder, but the drivers need additional ventilation.

Motor Runs For Short Period Then Stops

There are several possible reasons for this - let's start with the easy one first. Make sure the throttle is turned on, is set to the proper frequency and locomotive address. If all of these are OK, try another throttle. If it too doesn't work, then the cause is likely to be the locomotive.

Reconnect the charger and verify that the charger indicator is visible and green. If the light is red, then the battery is depleted and needs to be recharged.

Finally, it is possible that a momentary current overload tripped the battery protection circuit. Cycle the decoder power off then back on and try again. If the problem persists, there is remote possibility of a faulty battery, faulty motors or a loose wire. You will need to disassemble the locomotive to investigate these items.

Train Stops When It Is Far Away

This is an easy one. You need to set the loss of signal timer, CV11 to a value of 0. Any other value and the locomotive will come to a halt when the throttle signal is gone and the timer has expired.

Throttle Loses Control When Locomotive Is Far Away

This is just the normal limitation of the radio system. Do not expect the throttle to control the train when it is a thousand yards away. However, if your railroad is in a large loop, then leave the throttle on its original setting and let the train come back to you. Once the train is within range, the throttle will once again regain control. Be sure and set the loss of signal timer, CV11, to 0.

Horn Won't Stay On When F2 is Pushed And Held

This is usually caused by a combination of noisy motors and distant operation and is not actually a problem. Instead, it is a new automatic feature of the S4 Drop-In decoder. There is nothing more annoying than a diesel horn that is stuck on so the S4 Drop-In includes a special feature that prevents stuck horns. If for any reason, the S4 Drop-In stops receiving throttle commands, and the last command was horn ON, then it will automatically issue a horn OFF command after a preset amount of time. This will occur more frequently as the locomotive moves further and further away from the throttle.

S4 Drop-In Decoder Warranty Information

This warranty covers substantial defects in materials and workmanship in the decoder.

What This Warranty Does Not Cover

This warranty does not cover any problems which result from improper installation, modifications, battery polarity reversal, improper operation, leaking batteries, excessive battery voltages, excessive motor current draw, connections to 3rd party circuit boards, abuse, accidents, or acts of God such as excessive heat, floods, damage caused by exposure to moisture and rain, lightning, earthquakes, volcanic events, tidal waves or hurricanes.

Warranty Duration

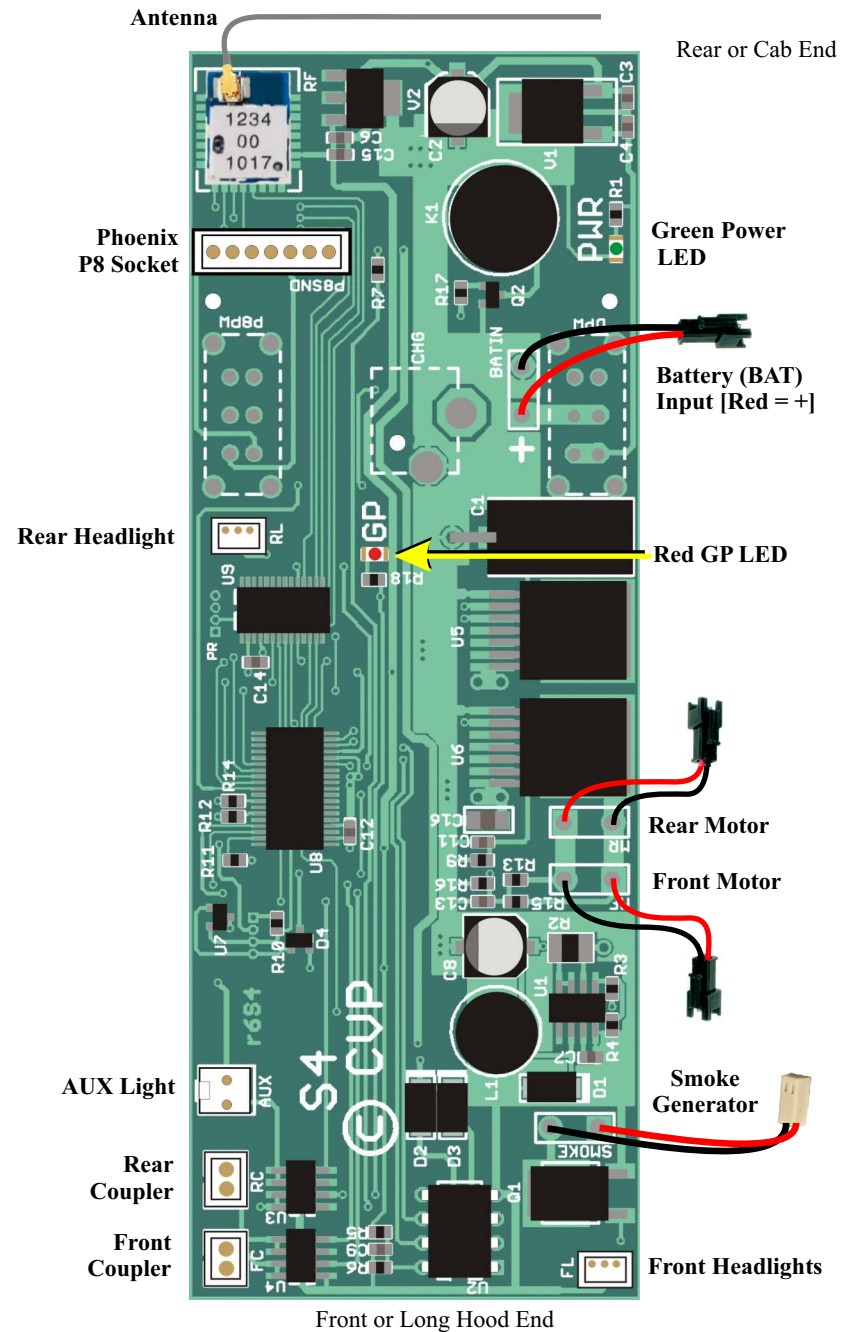
The coverage of this warranty lasts for 90 days. After this period, standard repair rates apply. Depending on the problem, CVP reserves the right to repair or replace.

Repairs and Returns

If you purchased your decoder from one of our AirWire900 dealers, please call them first. They are your best and quickest for answers to questions about the decoder. They are also experts in installation and offer such services should it be required. If you purchased your decoder *directly* from CVP Products, call us first.

If you are asked to return an item to CVP for service, you must follow the instructions on the website link labeled [Repair Service](#) and you must obtain an RMA. At this link will find the street address plus other helpful tips about sending packages to CVP Products. **Do not send items to us for repair without first obtaining authorization.**

S4 Drop-In Decoder Familiarization



Verify Battery Pack Connector Polarity

Proper Battery Polarity Is Mandatory

Incorrect polarity will damage the decoder. This is not covered by the decoder warranty. The CVP color convention is red for positive or plus and black for negative or minus.

Locate The Drop-In Battery Input Socket

The motor connector and the battery connectors are the same. **DO NOT** accidentally plug the battery into the motor connector. This will damage the Drop-In board.

Check The Battery Pack For Proper Polarization

The CVP BAT3 battery pack has a mating plug that is properly polarized for the Drop-In BAT input socket. The drawing shows the red and black wire orientation for both the plug and the socket.

Visually Confirm Wire Color And Polarization

Orient the battery plug and the Drop-In socket as if they were to be inserted. Confirm the wire colors match up when the connectors are oriented as shown in the picture. Notice that the socket release lever is pointing away from you.

From BATT3 Battery

Black Negative Minus
Red Positive Plus, +



Locking Tab Faces Away

Lock Release Lever Faces Away



Red Positive Plus, +

Drop-In BATIN Socket

If you are using a different battery, you must properly identify the PLUS wire. If you get the polarity wrong, you will damage the Drop-In decoder and the warranty does not cover this. If you are not sure, seek help - don't guess.



CVP'S BAT3 Battery Pack

Battery Safety

Charging Precautions

- Use only a battery charger designed for 14.8V Lithium-Ion packs.
- Li-ion battery packs must be charged correctly and with the correct charger.
- Improper charging will shorten the pack's lifetime.
- Improper charging may cause overheating, fire or explosion.
- We strongly suggest the use of the matching CVP Smart Charger.
- Never use a conventional DC adapter to charge the battery module.

Battery Protection

- Never drill, puncture or open a lithium battery pack.

Battery Storage

- Store in a cool, dry and well-ventilated area. Best temperature range is between 32F and 80F.
- Keep away from fire and other sources of very high temperatures.
- Avoid storing a completely discharged battery. To avoid over-discharge, charge the batteries every three months.

Restoring The S4 To Original Factory CV Values

There may come a time when the decoder no longer responds to what you believe is the correct frequency, or you don't know its address. **The assumption for this procedure is that you DON'T know the S4 Drop-In decoder frequency nor its loco number.** This procedure will first reset the frequency as well as restore the original factory settings and address of the Drop-In decoder.

This procedure will not reset the P8 decoder.

1. Turn off all AirWire throttles. This is very important since it is the absence of a throttle signal, plus turning the power off and then back on (a power cycle), that allows the S4 decoder to temporarily jump to a specific known frequency, which is frequency 0.
2. Turn off the S4 Drop-In decoder if it was powered on.
3. Turn on the S4 Drop-In decoder and **wait** at least one minute. At the end of the one minute, the S4 Drop-In decoder will chirp 5 times. At the end of the chirps, the decoder will be temporarily receiving on frequency 0.
4. Turn on your throttle, and set it to frequency 0. The address doesn't matter.
5. Push MENU twice and then push 4 for SVC PROGRAM.
6. Push 8 and ENT for CV8.
7. Push 1, 3, 5 and push ENT to issue the factory reset. The decoder will chirp when the command is accepted.
8. Turn off, and then turn back on the S4 Drop-In. The motion decoder is now set to address 3 and frequency 0. It is now exactly the same as when it left the factory.

Note: The P8 sound decoder has not been changed and will still be on the unknown loco number.

To restore the P8 to the desired loco number, you must program the decoder with the desired loco number using SVC PROGRAM mode. See the top of page 19 for how to do this.

Using The AUX Light Connector

The S4 Drop-In decoder has one auxiliary light driver labeled AUX. It is designed to drive LEDs and must use a current limit resistor in series with the LED. The AUX driver is independent of all other lights and allows any of the 15 lighting effects to be assigned to it. It can be assigned to any throttle function key from 1 to 28. Its most common use is to drive a locomotive dome flasher. The AUX light drivers are for white LED use which look best for all lighting effects.

Making Connections

We offer a 2-wire plug with 12 inches of wire that matches the S4 decoder's AUX connector. The part number is KK2 and can be purchased directly from CVP Products. The AUX connector and plug are polarized. The black wire is at battery plus voltage. The red wire is at battery minus when the AUX light is turned on.

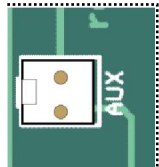
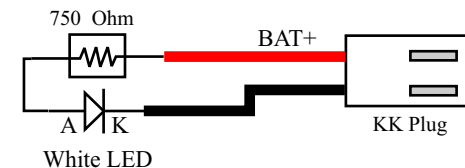
LED Requires Limit Resistor

The source voltage for the AUX output is the battery voltage. For a 20mA white LED, a limit resistor of 750 ohms is recommended. This resistor value is more than enough for the LED to glow very brightly. A higher resistance value will result in a dimmer LED.

Controlling The AUX Driver and Lighting Effect.

The factory setting for toggling the AUX driver is throttle function 11. This is done by programming the CV43 [F11] to a value of 4 [Toggle AUX ON/Off]. The lighting effect applied to the AUX driver is defined by the value in CV203. For example, if a rotary dome flasher is wanted, program CV203 To a value of 8. The factory setting is a value of 4 for 100% brightness.

White LEDs Work Best



If You Forget The S4 Frequency

There may come a time when you do not remember the S4 Drop-In decoder's assigned frequency and address. If this happens, use the following technique to reset the Drop-In frequency without changing anything else and without changing the address. If you have forgotten the decoder address as well, you must first set the frequency and then reprogram the decoder with the desired address.

To Reset The Drop-In Decoder's Frequency

Step 1: Turn off **all** AirWire throttles. This is very important since it is the absence of any throttle signal that forces the S4 Drop-In to temporarily jump to frequency 0. **Make sure there are no lurking locomotives, powered up and set to frequency 0. If so, their frequencies will be changed too.**

Step 2: Turn off the S4 Drop-In if it was powered and then turn it back on.

Step 3: Wait a minimum of one minute. Listen for the 5 second count down chirp. When the chirps stop, the S4 Drop-In has temporarily switched itself to frequency 0. You must wait the full minute before moving to step 4.

Step 4: Turn on your throttle. Set it to frequency 0.

Step 5: Push MENU twice and then push 4 to select SVC PROGRAM mode.

Step 6: Enter 200 followed by ENT.

Step 7: Enter the desired frequency number and push ENT. The decoder chirps once to indicate receipt of the new frequency. The frequency number range is 0 to 16.

Note: If you enter a frequency value larger than 16, the decoder will not accept it and, instead, will reset the frequency to 0. It still chirps even if this occurs.

Step 8: Push ESC to cancel SVC PROGRAM mode.

Step 9: Turn off the Drop-In decoder power switches, then back on. The S4 Drop-In decoder is now on the new frequency.

Be sure to change the throttle to the new frequency by pushing MENU, then 3, then enter the decoder's new frequency number and then press ENT. Set the throttle to the decoder address and drive away.

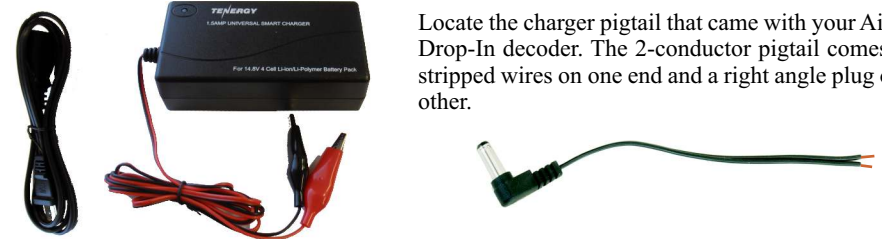
Notes About The Forgotten Frequency Setting Technique

- The temporary jump to frequency 0 is canceled and normal operation on the original frequency resumes if a throttle is turned on that matches the present S4 Drop-In frequency setting **within one minute** of the decoder power being turned on (before the count down chirps stop).
- If the S4 Drop-In jumps to frequency 0 because you waited too long to turn on the throttle, just cycle the decoder power and make sure the throttle is turned on within one minute.
- The jump to frequency 0 is temporary and **nothing is changed** in the decoder. However the S4 Drop-In will stay on frequency 0, until power is cycled or you change the frequency by setting CV58 to a new value. If you did not change the frequency, the S4 Drop-In will revert back to its previously stored frequency when its power switch is turned off then back on.
- The S4 Drop-In decoder will not jump to frequency 0 if a throttle having a frequency that matches the decoder is turned on within one minute of turning on the decoder even if the address is different.
- If a frequency number higher than 16 is selected, it is ignored and the decoder uses frequency 0.

You must use the Drop-In's "motor" power switch (see picture on page 16) when turning the S4 decoder on and off for a "power cycle." If you forget and just turn off the sound decoder's power switch, the Drop-In decoder will not be reset. Best practice is to always turn on and off both power switches.

Attaching Charger Plug Pigtail To Charger

First, open up the charger box. Inside will be the charger with alligator clips and the AC power cord.



Locate the charger pigtail that came with your AirWire Drop-In decoder. The 2-conductor pigtail comes with stripped wires on one end and a right angle plug on the other.

The pigtail needs to be permanently attached to the charger output wires. This is not difficult and no special tools are needed.

Wire polarity is very important and reversing the polarity could damage the charger or the battery or both. On the pigtail, the plus wire is the wire with the white stripe. The minus wire is the solid black wire. The charger uses the conventional red wire for plus and black for the minus wire.

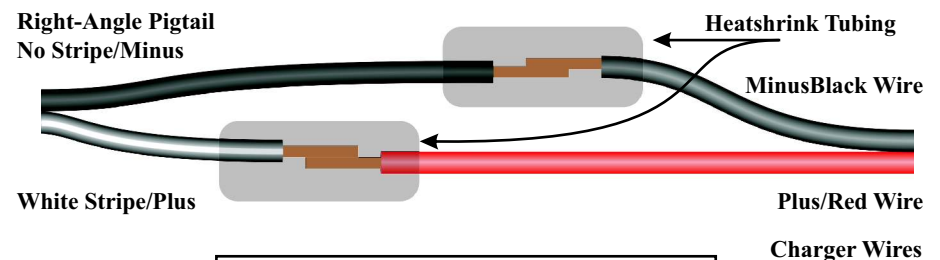
Take the pigtail and separate the 2 wires for about 2 inches. Cut the plus wire so it is 1 inch shorter than the minus wire. Remove about 1/2 inch of insulation from the plus wire. Twist and apply solder to the twist end of the plus wire. This is called tinning and keeps the twisted wires from unraveling. Next, remove about 1/2 inch of the insulation from the minus wire. Twist the strands together and touch a tiny bit of solder to the twisted wire.

Take the charger wires and split the red and black wires apart for about 3 inches. Cut off the alligator clips and cut the minus (black) wire so it is shorter than the plus (red) wire. Remove about 1/2 inch of the insulation from both the black and red ends of the wires. Twist and tin the wires.

If you are using heatshrink tubing to insulate the solder joints, now is the time to slide a piece over the minus wire. Otherwise, use electrical tape to insulate each connection. Overlap or twist together the two minus wires and solder them together. Once the solder joint has cooled, slide the heatshrink over the connection and heat it up to shrink the tubing around the connection. Make sure no wire is visible.

Slide a piece of heatshrink over the plus wire. Overlap or twist together the two plus wires and solder them together. Once the solder joint has cooled, slide the heatshrink over the connection and heat it up to shrink the tubing around the connection. Make sure no wire is visible.

Inspect for proper polarity matching and that no bare wire is visible outside the heatshrink tubing. This completes the wiring.



Heatshrink tubing may be ordered from Mouser Electronics. Use 0.25 inch diameter tubing with part number 5174-1141. It sells for about \$2 and comes in a 4 foot length. www.mouser.com

USA-Trains S4 Disassembly

Warning: Many parts of the hood, cab and chassis are fragile and break easily. Especially vulnerable are the moving doors, side-frame assemblies, horn, bell window and roof detail. Take care not to break them. On our unit, one of the cab windows popped out. We stopped and glued it back into place.



You Must Have The Proper Screwdriver

You must have a thin-shafted, #1 phillips-head screwdriver that is at least 4 inches long to reach the screws. The thin shaft is necessary to fit between the wheel and side frame. This one is from General and has a 4 inch long, narrow shaft with a #1 Philips tip. It is also magnetized which comes in handy for pulling the screws from deep recesses.



A Soft Work Surface Pays Big Dividends

When working on the bottom of the loco, use several towels or a thick foam cushion to serve as a pad to protect roof detail and walkways. The top of the locomotive is uneven and is unstable when upside down. The padding will help prevent damage should it fall over.

Use a Foam Block To Hold Screws

Take a rectangular sheet of foam and label it F and B to represent the loco's front (long hood) and back end (cab). As each screw is removed, position it in the foam in about the same location as found on the locomotive.

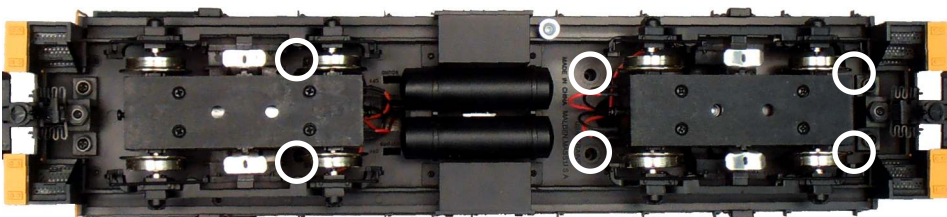


Total Chassis Mounting Screw Count is 6

When all the screws are removed, there will be a total of 6 screws. When you are done, If your count doesn't match, go back and check to see which ones you missed. The next series of illustrations shows the location of the screws.

All of the screws are deep inside hollow tubes. Also, a few the screw holes are obscured by the trucks. But with the long thin screwdriver shank, these can be easily reached. Take your time and be sure to locate and remove all screws.

The photo below uses white circles to show the location of the holes where the screws are located. The next page has closeups of these three areas.



Cab

Changing The S4 Drop-In Decoder Address

Address changing is simple and straight forward using the T5000 throttle. Always use Service Programming mode when setting the decoder address. As long as both power switches are turned on, the P8 sound decoder will be programmed to the motion decoder address at the same time.

The decoder address and the P8 sound decoder addresses must match. Make sure both power switches on the S4 decoder are in the on position before starting.

1. Turn on both power switches on the S4 decoder.
2. Turn on the T5000 throttle.
3. Set the throttle frequency to match the decoder frequency [new decoders are on frequency 0].
4. Push MENU key twice. "Push" means to push and release the key.
5. Push 4 to select SVC PROGRAM.
6. Push 1 to select configuration variable (CV) number 1 and ENT.
7. Enter the desired decoder address and push ENT. The address range is 1 to 9999. Address 0 is not allowed. The address must be unique and we recommend using the locomotive cab number.
8. Upon pressing ENT, the decoder chirps 2 times for an address from 1 to 99 or 3 times for an address from 100 to 9999. Push ESC to exit the programming mode.
9. Set your throttle to the new decoder address. Set the direction and turn up the speed knob and you are in control.
10. Push the LOCO MEM key twice to store the frequency and decoder address in throttle memory. This is not mandatory but does make it easier to recall the address and automatically set the proper frequency.

Changing The S4 Drop-In Decoder Frequency

The S4 decoder features remote frequency selection directly from the throttle. The decoder frequency is remembered even if the Drop-In battery is disconnected.

17 Unique Frequencies Are Available - The frequencies are numbered from 0 to 16 for a total of 17.

Setting The Frequency - The desired frequency is stored inside the decoder in configuration variable number 200 which is abbreviated CV200. Service programming is recommended because you don't need to use or remember the locomotive address. Changing the frequency has no affect on the attached P8 decoder.

1. Set throttle to decoder's present frequency [for a new decoder, this is frequency 0].
 2. Push MENU twice and then push 4 to select SVC PROGRAM mode..
 3. Enter 200 followed by ENT.
 4. Enter the frequency number and push ENT. The decoder chirps once to indicate receipt of the new frequency. The frequency number range is 0 to 16 (a total of 17 frequencies)
- Note: If you enter a frequency value larger than 16, the decoder will not accept it and, instead, will reset the frequency to 0. It still chirps even if this occurs.*
5. Push ESC to cancel SVC PROGRAM mode.
 6. Change the throttle to the new frequency. Push MENU, then 3, then enter the new frequency number, then press ENT.
 7. Set the throttle to the loco number and the new decoder frequency and drive away.
 8. Write the frequency and address on a sticky label and attach it to the locomotive. While you may remember the frequency next week; how about in 6 months? This record will help you remember.

Optional: push LOCO MEM key twice to store locomotive address and its new frequency in your T5000 throttle.

S4 Quick-Start - *continued*

Volume Up is triggered with F7. To use this feature, push F7 to begin increasing the overall Phonenix sound volume. When the volume reaches the desired level, push F7 to stop and hold the volume setting.

Volume Down is triggered with F8. This works the same as F7 except the volume will begin to decrease when F8 is pushed. Push F8 again to stop and hold the volume setting.

Caution: if the volume is allowed to decrease to 0 or off, the volume will remain at 0 when the power is turned off. When turned back on, you may think there is a problem with the sound when in fact you simply have to push F7 to raise the volume.

Dynamic Brake is toggled with F9.

Brake release sound is triggered with F10.

Air Pop Valve sound effect is triggered with F11.

Diesel Engine Shutdown is triggered with F12. This will initiate the shut down sequence for the diesel engine. You can manually restart the engine by simply pushing F12 again. Note that if the throttle speed setting is not 0, the diesel automatically restarts. Any change of the speed control will automatically restart the diesel engine.

The table below the combined list of recommended function key assignments for the Drop-In decoder and the P8 sound module. Black is the effect for the Drop-In decoder and red is the effect for the P8.

Please review your P8 manual for detailed information on its features and settings.

Throttle Key	Loco Effect -- Sound Effect
0	Toggle Headlights On/Off
1	Toggle Bell On/Off
2	Manual Horn Activation
3	Activate Rear Coupler Trigger Coupler Clank Sound
4	Trigger Grade Crossing Horn effect
5	Enable Cruise Control [change speed to disable]
	Trigger Station Announcement
6	Trigger Compressor Sound Effect
7	Volume Up (push to begin increasing, push to stop)
8	Volume Down (push to begin decreasing, push to stop)
9	Toggle Dynamic Brake Sound Effect
*0	Toggle Smoke Generator [3 minutes default on-time]
	Trigger Brake Release Sound
*1	Trigger Air Pop valve
*2	Toggle Engine Shutdown or Startup Sound Effect
*3	Activate Front Coupler

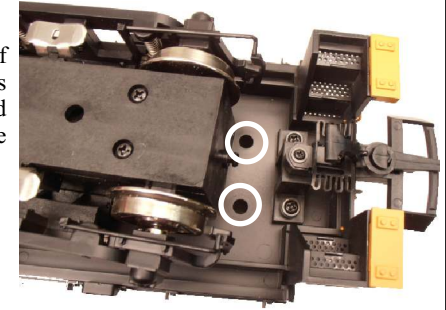
Power Must Be On When Reprogramming Sound Module

Both Drop-In power switches must be ON before plugging in the programming plug.

S4 Disassembly

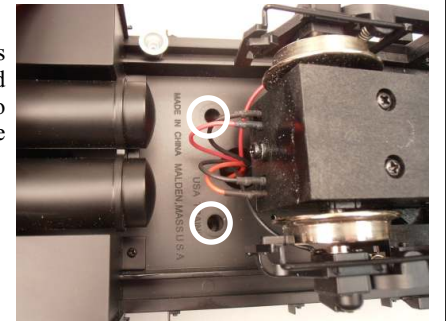
Starting At The Front - Long End [2 Screws]

These are easy to see and get to if you tilt the back of the truck closest to the cab down. Both of these screws are located in the deep hollow tubes and you will need the long, thin-shafted screw driver. As the screws are removed, place them into the foam block.



Middle Chassis [2 Screws]

These two screws are easy to see. Both of these screws are located in the deep hollow tubes and you will need the long, thin-shafted screw driver. Take care not to nick or break the small wires. As the screws are removed, place them into the foam block.



Cab End [2 screws]

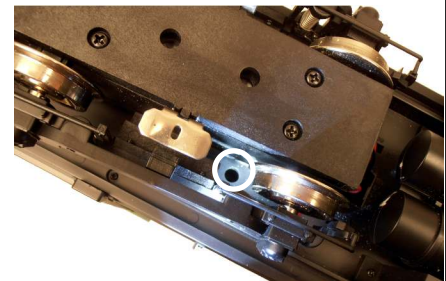
The 2 screws are under the truck. Rotate the truck left and right and you will see the holes where the screws are located.

A bright LED flashlight was used to make the hole visible. The white circle shows the hole location.

Use the long shank screwdriver to extract the screw from the hole. Don't worry if the screw doesn't come out of the tube. Instead, just rotate it several more times to insure it has released from the chassis.

Once the first screw is removed, rotate the truck and find the second hole. It too is illuminated to make it visible in the picture. The white circle shows the hole location.

These are the last two screws. If the hood doesn't release when you attempt separation, rotate the screws that didn't come out a few more times.



USA-Trains S4 Disassembly

Separating the Hood From The Chassis

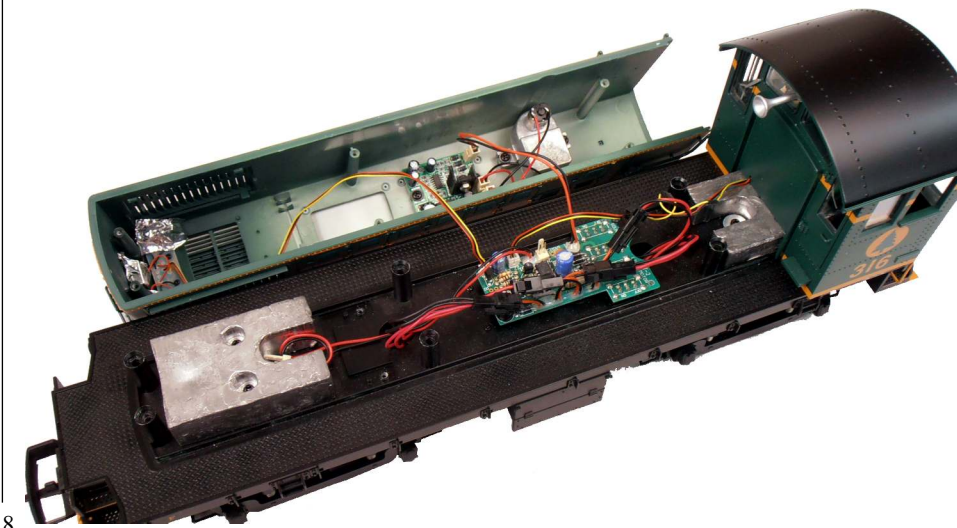
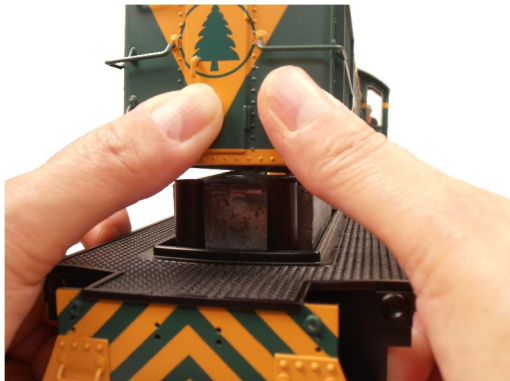
Besides the 6 screws you have already removed, the hood is held in place to the chassis by friction as well as being wedged into a molded ridge around the chassis and on the front of the cab.

Use two hands. Place your thumbs on the front of the hood in the center and to the right of center. This placement insures that the grab iron under your left thumb is not accidentally broken off.

With both thumbs push towards the cab and slightly upward. The hood will separate from the chassis.

Once the front is free of the chassis, gently pull the hood towards the front to disengage it from the cab.

Rotate the hood and lay it on its side next to the chassis.



S4 Drop-In Decoder Quick-Start Guide

The quick-start page assumes the locomotive decoder is on the original factory setting of address 3 and frequency 0. If you have changed either of these, then be sure and use your settings on the throttle. This page also assumes you have used the recommended settings for the P8 sound module. See the Drop-In users manual for details.

Now that the locomotive is reassembled, its time to begin exploring some of its new features and capabilities.

As you become familiar with your locomotive performance, you will undoubtedly want to make changes as well as fine tune its operation. For complete details about all the options available, see the Drop-In Users Guide that covers the S4.

Locomotive Motion Control

Speed and direction are controlled from the throttle. Use the throttle's knob to change speed. To change direction, push down on the speed knob. "Forward" direction is defined as if you were sitting in the locomotive cab.

Cruise control activation is easy. Once the locomotive is running at the desired speed, push the 5 key on the throttle - abbreviated as F5 - to activate cruise control. A beep will be heard when cruise control is activated. To deactivate cruise control simply change the speed or direction. A beep will be heard when cruise control is deactivated. At very slow speeds, you may hear a double beep. This means that the locomotive is going too slow for reliable cruise control so you need to increase the speed slightly and push F5 again.

Locomotive Lighting and Smoke Generator Control

Front and rear headlights, the cab light and the front number board lights are toggled on and off with the throttle's 0 key. This is "Function 0" which we shorten to F0. The headlights automatically switch between front and rear when direction key is pushed. This can be changed to nearly any type of display. See the Drop-In users manual for the options and how to set this up.

Smoke generator is turned on and off with F10. To activate F10, first push the * key followed by the 0 key on the T5000. Once turned on, the smoke generator has an automatic timeout. However, if the smoke fluid has run out, the locomotive's own smoke generator controller will turn off even if the decoder's timer has not run out.

Phoenix P8 Sound Effects Control

The table on the next page assumes you have used the recommended configuration file or have set up the P8 to match our recommended settings. These settings are described in the Drop-In decoder operation manual. If you have not yet configured the P8, the sound effects and throttle activation keys will not match and the sound may shut off after only a few minutes of operation. This is normal if the configuration has not been changed - it is not a problem of either the Drop-In or the P8 sound module.

Bell is toggled on and off by F1. Toggle means push and release the F1 key to turn on the bell. To turn off the bell, push F1 again.

Horn is activated by F2. This is a momentary activation which means push to turn on and release to turn off. There is an automatic timer tied to the horn activation. Sometimes, when the horn is activated, it does not receive the turn off command. This can be caused by motor noise, distance from the throttle or momentary jamming. To prevent the horn from being stuck on, the Drop-In decoder will automatically shut off the horn.

Engine rev up and down is controlled by the speed knob.

Coupler clang is triggered by F3. Trigger means the sound effect is transitory and sounds each time the key is pressed.

Grade crossing horn is triggered by F4. This is a 15 second recording of a complete grade crossing horn sequence.

"All Aboard" station announcement is triggered by F5.

Compressor start up is triggered by F6. The sound effects runs for a few seconds and then shuts off.

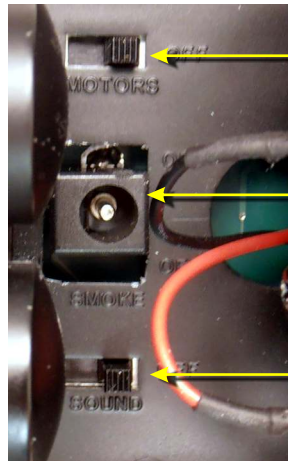
Charge The Battery

The battery is charged only when both power switches are in the off position.

Once the locomotive is back together, turn off the power switches, plug in the charger and let the battery charge for about 4 hours. If using the CVP smart charger, the charger will shut off automatically when the battery is fully charged.

Always store the locomotive with the battery fully charged. This will prolong its life and provide years of enjoyment.

S4 Drop-In Power Switches And Charger Jack



Drop-In Power Switch [shown OFF]

Battery Charger Jack

Sound Decoder Power Switch [shown OFF]

Phoenix Coupler Connectors *[optional]*

The S4 Drop-In series decoder includes built-in drivers and matching sockets for two Phoenix “solenoid” style couplers. These are labeled FC for the front coupler and RC for the rear coupler. Function key F3 has the factory setting of activating the rear coupler. Function key F13 has the factory setting to activate the front coupler. Coupler activation can be reassigned to other throttle function keys, especially if your AirWire throttle doesn't support more than 12 functions.

Battery Voltage Range is 8 to 24 volts. However, at lower voltages, the coupler “snap” will be somewhat weaker and might not release if there is any tension present. The snap time is optimized for the CVP 14.8V battery. However, the coupler will reliably operate from 8 to 24 volt batteries.

Coupler Operation

The Phoenix coupler must not have tension on the knuckle or it will not release. Thus it is called a slack-type coupler. There must be slack in the coupler so the knuckle releases when activated. So back up a bit to release the tension and then activate the coupler.

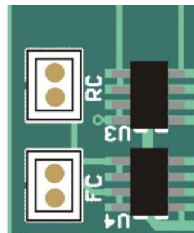
To re-couple, make sure the knuckle is open and firmly back into the car to be coupled. The knuckle will close and lock upon contact.

Coupler Mounting

Coupler mounting is your biggest challenge. Although originally designed for truck mounting, the coupler should be body mounted for better operation. If you find a good way to mount the coupler on the body, be sure and take pictures and share with us and Phoenix.

Couplers, connecting cables and usage guidelines can be found and ordered on the Phoenix Sound Website. Contact them with questions about their couplers.

www.phoenixsound.com



USA-Trains S4 Disassembly

Unplug All Connectors

Unplug all the connectors from the main board. Unplug the smoke generator, motor and pickup wires from the main board. The motor and pickup connections are made with a large black plugs and sockets. Press down on the large socket's tab to release the plug. Don't pull on the wires. The unused speaker wire is also untaped from the chassis and will be discarded.

Unplug the two tiny lighting plugs that go from the main board to the cab and to the rear of the locomotive. These small plugs are a tight fit into the socket on the main board. Do not jerk the plug from the socket or you risk breaking the wire or damaging the plug. Pull on all 3 wires together and gently rock the plug side to side to loosen it. Slow and steady force works best as you rock the plug back and forth. Once the plugs are all removed, set the hood aside.

Remove The Old Main Circuit Board

Remove the 3 tiny screws holding the main circuit board. Save the screws in your foam block. These small screws will be used to mount the new Drop-In decoder. The old main board is no longer needed and may be discarded.

Remove Rear Truck And Remove Pickup Wires

Remove the rear truck mounting screw to separate the truck from the chassis. Pull the wires and connectors through the round hole in the chassis. Put the screw and washer back onto the truck for now.

The large black socket has 4 wires for wheel and slider pickup. The socket and the pickup wires are no longer needed. Pull off the two inside wires going to pins at the end of the truck (white arrows). Cut or unsolder the other two pickup wires from the side frame pickup wipers (white arrows). The socket and wires can be discarded.

The track sliders can also be removed. However, this requires the truck to be disassembled which could be intimidating. It is OK to leave the sliders on the truck.

When finished, there will only be the small black plug with the two motor wires attached at the end of the truck (yellow arrows).

Enlarge Switch Opening In Chassis Floor For Charging Jack

Look at the bottom of the Drop-In board. Note the two switches and charging jack. The switches fit the outside switch holes in the locomotive floor. However, the area for the charging jack needs to be enlarged.

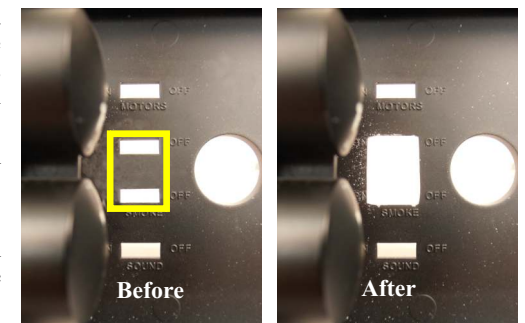
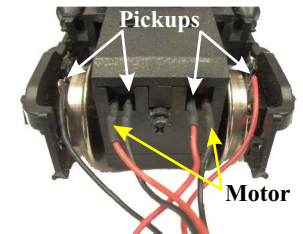
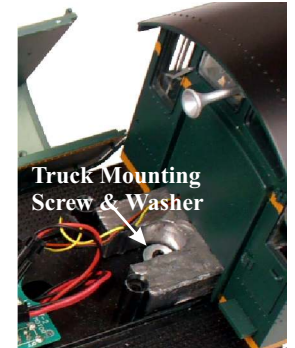
In the before picture, the area to be enlarged is outlined by the yellow box. Working from the bottom side of the chassis, use a motor tool with an abrasive or routing bit to enlarge this area so the jack drops through without binding. The switches must also drop freely into the outside slots.

Turn the chassis right side up and temporarily mount the Drop-In board. The board must fit flush to the mounting posts and the jack and switches must not bind in their openings.

When you get a good fit, remove the Drop-In board and clean away the debris.

Reattach The Truck To The Chassis

With the hole enlarged and the Drop-In board fitting neatly into the locomotive, the rear truck can be reattached to the chassis. Push the motor wire and plug through the round hole and use the washer and screw to mount the truck.



Remove Pickup Wires From Front Truck

The front truck is built exactly like the rear truck so use the pictures on page 9 for reference. Remove the front truck mounting screw to allow the front truck to be separated from the chassis. Pull the wires through the round hole in the chassis. Put the screw back onto the truck for now.

The large black socket has 4 wires for wheel and slider pickup. The socket and the wires are no longer needed. Pull off the two inside wires going to pins at the end of the truck (white arrows). Cut or unsolder the other two pickup wires from the side frame pickup wipers (white arrows). The socket can be discarded.

The track sliders can also be removed. However, this requires the truck to be disassembled which could be intimidating. It is OK to leave the sliders on the truck.

When finished, there will only be the small black plug with the two motor wires attached at the end of the truck (yellow arrows).

Reattach the front truck to the chassis. The washer is between the screw and the mounting hole.

P8 Computer Interface Jack Mounting *[optional]*

Phoenix P8 Programming Jack Installation

The Phoenix P8 sound module uses a programming interface jack to connect it to a PC. The PC is how the P8 settings are changed or to change the selected sound effects.

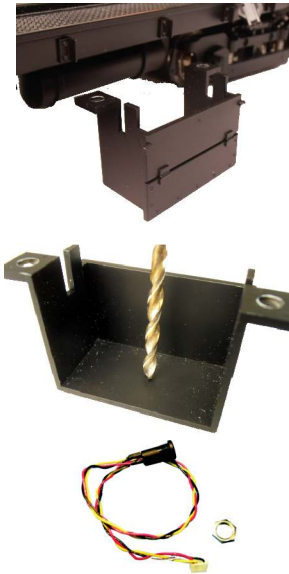
The programming jack is installed inside the tool box at the center of the locomotive. It is very easy to use since the tool box is just a two sided piece of plastic. The floor of the tool box is thin and the jack is easily mounted using the nut that comes with the programming jack.

First remove the tool box. Turn the loco onto its back. Remove the two small screws holding the tool box casting to the chassis. Either box will work. For this example, the box on the opposite side of the bell was used.

Drill a 5/16 inch hole into the center of the floor of the tool box. To avoid splitting or twisting the plastic, start with a small drill and work up to the larger size. Or use a tapered reamer to enlarge a smaller hole.

Remove the nut from the jack. Insert the plug first into the hole from the outside of the tool box. Pull the wire so the jack is flush to the outside floor. Screw the nut onto the jack.

Reinstall the tool box. Feed the programming jack's plug into the chassis hole where the front motor wires also go (long hood is forward).



Speaker Mounting *[optional]*

For this simple installation, the speaker will face the front weight using the supplied mounting brackets. Later the battery will be fastened on top of the weight with double sided tape.

The USA-Trains S4 comes with a pair of brackets onto which a the specified Phoenix speaker mounts. It is not an ideal location and no rear baffling will be used, but it does make installation much easier. The other reason this isn't an ideal location is because the speaker will face the battery which sits on top of the weight. Again, it isn't ideal but the goal for this installation is simplicity. It will be easier to make your own personal modifications to suit your wishes as your skills and experience grow.

Initial Checkout *continued*

If something doesn't work correctly, usually the cause is easy to find while the locomotive is apart. Here are some common problems found at this stage that are easy to fix.

Green Power LED doesn't turn on: Make sure the Drop-In decoder power switch is on. Your battery may need to be charged. A discharged Lithium-Ion battery will read 0 volts. Plug the charger into the bottom of the locomotive and set the Drop-In power switch to the off position. When charging, the charger's indicator will be red. Wait about 30 minutes and retry the initial check.

Red GP LED flashes slowly: This is your indication that the throttle's frequency doesn't match the decoder's frequency. Set the throttle's frequency to 0.

Locomotive moves backwards instead of forwards: *for the S4 locomotive, the long hood is considered the front of the locomotive and the cab is the rear of the locomotive.* Swap the two motor connections to fix the direction problem.

Sound decoder makes no sound: First confirm that the plug having the brown, green and orange wires is firmly plugged into the P8 sound decoder. Make sure the plug having only green and an orange wire on its connector is plugged into the S4 Drop-In. Next check that the speaker is plugged in. Next confirm the S4 Drop-In sound power switch is on. Push and release F7 on the throttle to set maximum volume. If the sound module remains silent, it may need to be reprogrammed via the programming cable. Wait until the locomotive is fully assembled before doing this.

One or more lights don't work: Usually, this is because of the plug is not seated all the way into the socket on the Drop-In. Push the plug firmly into the socket and test the light again. The other possibility is a broken wire. Carefully inspect the light cables and look for pierced or cut insulation. Our locomotive had a broken yellow wire going into the cab. It was cut during assembly at the factory.

If You Find A Broken Wire

If you accidentally break the wire, splice it back together. Twist and tin the two wire ends and then lay them on top of each other. Solder the joint and then cover it with tape or heat-shrink tubing. Never leave wires uninsulated. You risk damaging the decoder and locomotive.

Reassembly And Final Notes

Carefully pickup the hood, flip it right side up and bring it over the top of the chassis. Use your other hand to sweep the light and smoke unit wires into the area between the mounting posts. Bend the wires towards the front of the locomotive.

Make sure all wires are INSIDE and BETWEEN the mounting posts. Don't allow a wire to fall on the outside of the post or you risk pinching it during reassembly. The front headlight wires are especially vulnerable because of their length. Look on both sides of the locomotive. Make sure you can't see any wires. If you did a good job of tidying the wires, they will be clear of all the mounting posts and you will not break a wire when installing the screws. Double check the radio antenna is vertical.

Push the hood towards the cab and under the horn. Tilt the front portion down and push it into the chassis until it seats itself. If resistance is encountered, check for wires, plugs or sockets that may not be between the mounting posts. Watch for wires that lie on top of the screw mounting tubes. These are difficult to spot and if missed, the screw will pierce the wire and most likely break it.

Once the two halves are together, reinstall all the 6 screws. To start the screw, first turn it slightly counter-clockwise to get it seated in the threads, then turn it clockwise to tighten. Do not over tighten. Take care because this is where most of the damage to plastic detail takes place. The rough handling and rushing to finish spells disaster for the tiny details. The most common items to pop off or break at this stage are window shades, steps and window detail.

Connect The Smoke Unit and Front Headlights

The last connections are for the smoke unit and the front headlights located in the hood.

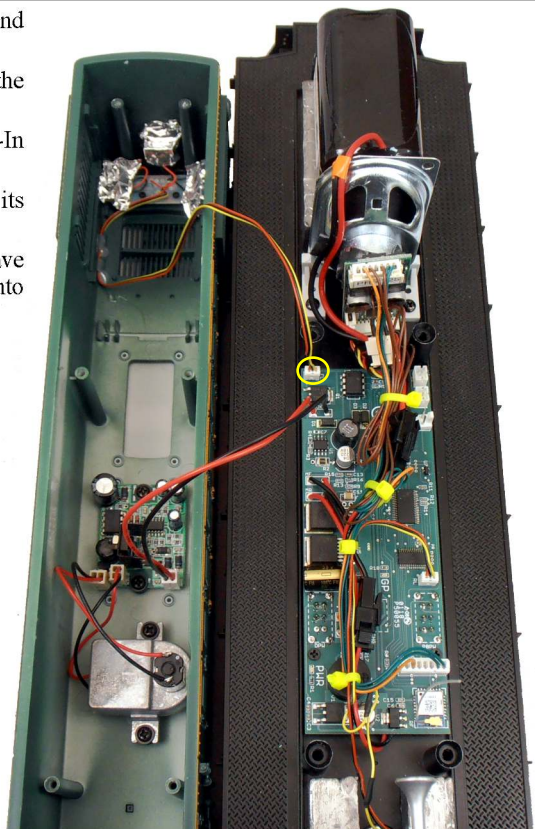
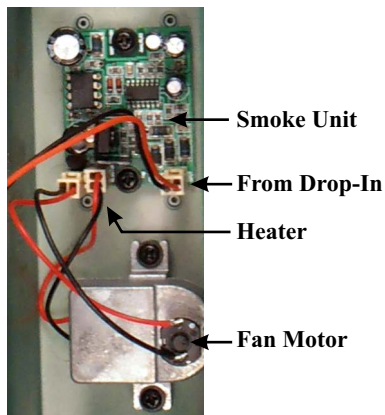
Place the hood, upside down, next to the chassis.

Plug the front headlight cable into the Drop-In socket labeled FL (circled in yellow).

Plug the cable from the smoke output into its matching connector the smoke unit.

If any of the other plugs on the smoke unit have popped off, use these pictures to put them into their correct connectors.

Double check all connections.



Initial Checkout

As delivered from the factory, the S4 Drop-In decoder is set to locomotive address 3 and frequency 0. Also, if your P8 is new and unused it will be on address 3.

1. Turn on your T5000 throttle. Set it to loco number 3 and frequency 0. Set the speed to 0.
2. Turn on both Drop-In power switches. The ON position is when the slide switch is towards the long hood. With both switches on, the Drop-In decoder's green PWR LED will be on. With the throttle turned on, the red GP LED will also be on.
3. You will hear the Phoenix P8 module turn on (if installed).
4. Slowly turn up the speed knob on the throttle until you see the motor attempt to move. Verify that both motors turn in the same direction and that forward (right arrow on throttle) corresponds to forward motion relative to the locomotive's long hood. The S4 convention is long hood is forward.
5. Push the throttle's 0 key to turn on the front headlight and the number boards. Change throttle direction to reverse and confirm that the rear headlight turns on. and the front headlight turns off. The number boards will always be on whenever the headlights are on. Push 0 to turn off the headlights.
6. Push the * key followed by the 0 key which is function 10. Listen carefully for the smoke generator small fan to start running. Push * and 0 again to turn it off. Since there is no fluid in the generator, be sure and turn it off.
7. If you have installed the Phoenix sound decoder, push the 2 key and the P8 horn will sound.

continued on next page

Phoenix P8 Speaker Mounting *continued*

Remove the two mounting brackets located near the front weight. Don't lose the screws. On the side of the brackets facing the weight are two additional screws. These are used to mount the speaker to the bracket.

Prepare the speaker to provide an escape for the battery wires to reach around the top right corner of the speaker. Cut off the top right mounting speaker mounting ear. This area is shown in yellow. Take care not to damage the speaker cone. File the cut edge smooth. It must be smooth to prevent it from slicing into the battery wires. Slide your finger on the edge to insure it is smooth.

Mount the speaker to the two mounting brackets. Note that there is a left and right mounting bracket. The bracket's rounded side is towards the middle of the chassis as can be seen in the photo. Screw the speaker mounting brackets to the bottom of the speaker. Be sure to tighten the screws.

Reinstall the speaker brackets into the chassis. Tighten the screws to prevent the brackets from rattling.



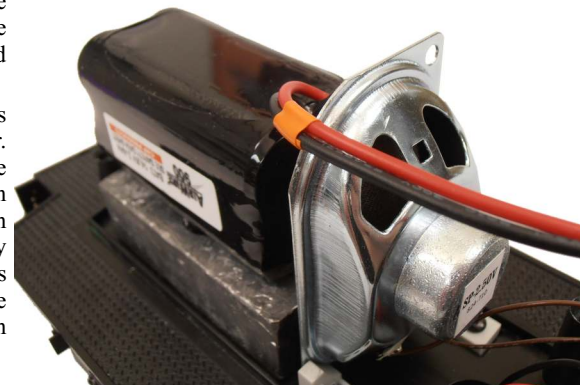
Battery Mounting

The battery mounts on top of the front weight. We recommend using 3M Brand "Extremely Strong" double-sided tape. It can be purchased at office supply stores. Don't use foam tape. Over time foam tape disintegrates and the battery will move and possibly damage the speaker.

Cut two strips of tape the width of the battery. Attach them to the front of the weight and near the front of the slot for the truck mounting screw. Don't remove the top protective layer yet.

The battery is placed flush to the two mounting posts at the front of the chassis. This provides some space between the battery and the speaker. Center the battery on the weight. Once you see how the battery fits, remove the protective layer from the tape and permanently mount the battery.

Form and bend the battery wires around the top right of the speaker. Note where the wires pass by the trimmed speaker edge. Take a 1 inch piece of electrical tape and split it in half. Wrap the tape around the battery wires in the area where the wires pass over the speaker edge. The tape provides additional abrasion protection.

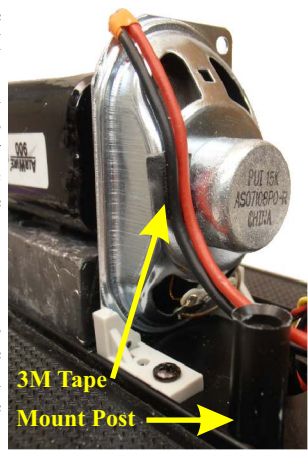


Battery Mounting *continued*

Once the speaker is mounted, the wires are wrapped with some protective tape, there is one more task. A small piece of the 3M double sided tape is used to stick the battery wires to the speaker. This makes the hood reinstallation much easier since the wires will not get in the way of the hood or its mounting screws. The tape is very sticky and will hold the wires for a long time. But, don't worry about the tape releasing the batteries. It is only needed during the hood reinstallation. Once the hood is in place, it will keep the battery wires in the proper position.

Attach a piece of 3M tape in approximately the position shown. Remove the red backing.

The battery wires are rather stiff and can be bent and formed. As shown in the picture, bend the wires to go around the edge of the speaker. Then bend them downwards towards the frame. Position the battery plug on the inside of the mounting post. Hold the speaker when pushing the wires firmly onto the tape.



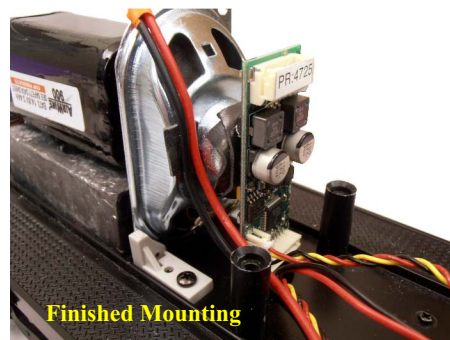
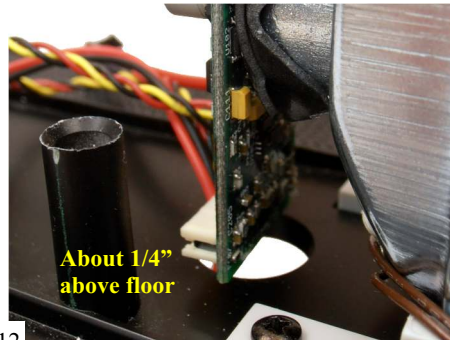
P8 Module Mounting *[optional]*

There are two possible locations to mount the P8 module. One location is underneath the hollow cab stand. However this requires removing the cab and sawing holes in both the cab and the cab stand. This is not a trivial task so another location is recommended because it is very simple and there is plenty of space. The other location is to mount the P8 directly to the back of the speaker.

The P8 module has electronic components on both sides. Neither side must be allowed to touch anything metal. First, use two thicknesses of 3M tape that are one inch by one inch square. Stick one to the back of the speaker. Remove the red liner from the tape. Press the loose edges around the speaker. Place the second piece of 3M tape directly on top of the first piece. Remove the red liner from the tape and press the loose edges around the speaker.

Insert the the programming jack plug into the P8 module. Orient the P8 so the programming jack's plug is facing the battery wires.

Don't press the module into the 3M tape until the module is above the floor of the frame by about a quarter inch. This provides room for the truck wires to move. Position the module squarely on the 3M tape and firmly press it into place. Rock the module while pressing. Stop rocking and hold the pressure for about 30 seconds. The 3M tape is very strong and unlikely to deteriorate over time.



Mount The S4 Drop-In Decoder

You are almost done. However, don't rush. Take your time. Neatness counts.

Before mounting the Drop-In decoder, slide both switches towards the radio module. This is the off position. The switch levers will be towards the cab of the locomotive when off. Move all of the wires out the way and place the decoder onto the mounting posts. Make sure the jack and switches fit through the holes and the decoder is flush to the mounting posts. Attach the 3 screws to their mounting posts.

Rotate the gold connector of the snap on whip antenna towards the center of the board. Bend the antenna vertical to provide optimum range.

Plug in the connectors starting with the rear motor. Start by connecting the rear motor plug to the socket labeled MR. Next connect the rear headlight plug to the socket labeled RL.

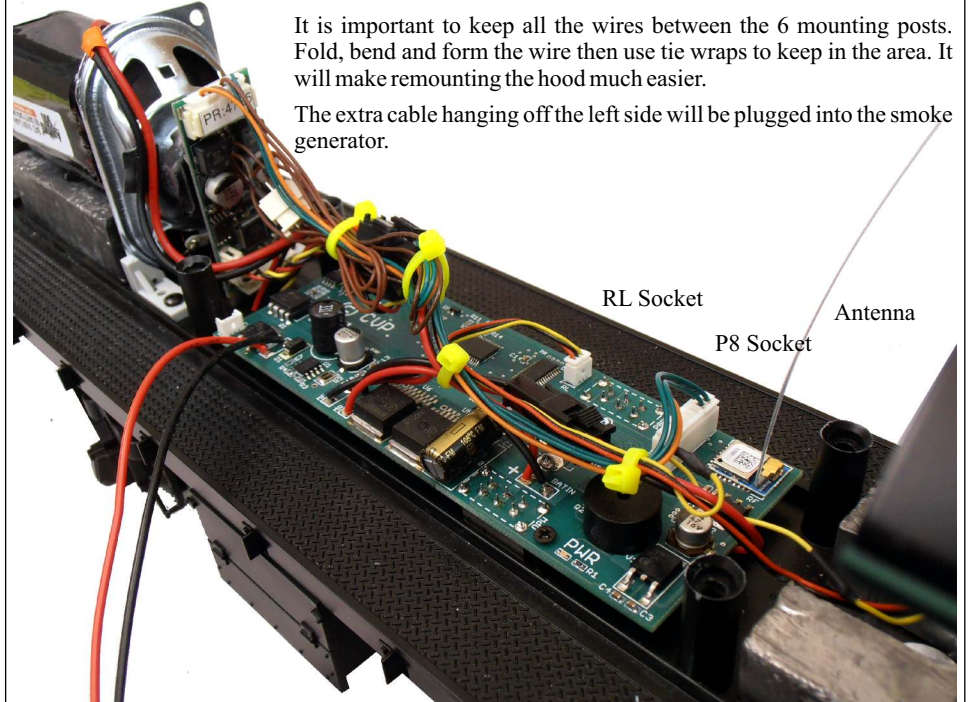
Next connect the P8 wiring harness to the P8 module and the Drop-In. The connector having two brown wires plugs directly into the P8 module. Plug the brown wire's plug into socket coming from the speaker. Finally, connect the remaining plug into the Drop-In decoder at the socket labeled P8. Double check that you have the P8 harness plugged in to the correct sockets or you risk damaging the P8 or the Drop-In. A detailed drawing of the P8 hookup is on page 23.

Now connect the battery plug to the battery socket labeled BATIN. **DO NOT CONFUSE BATIN WITH FRONT MOTOR [MF] SOCKET or you will damage the decoder.** Next, connect the front motor plug to the socket labeled MF.

Tidy up the wires using small tie-wraps. These can be obtained from the electrical department at hardware stores such as Home Depot. The bright yellow color is used to make them very visible in the photos.

It is very important to keep the rear motor wires and the P8 wires as far away from the radio antenna as possible. Careful use of the tie-wraps helps maintain the wires away from the antenna.

There is a lot of extra wire on the P8 harness. Fold up this wire and tie wrap it to the battery and front motor wires.



It is important to keep all the wires between the 6 mounting posts. Fold, bend and form the wire then use tie wraps to keep in the area. It will make remounting the hood much easier.

The extra cable hanging off the left side will be plugged into the smoke generator.