

## Changing Drop-In Decoder Address & Resetting To Defaults

The original factory setting for the decoder address is 3. You can change the address to any number from 1 to 9999. We recommend using the locomotive cab number. If you don't have a lot of locomotives, perhaps the last digit of the cab number's is sufficient. What ever is used, make sure it is unique. Keystroke examples are shown for both of CVP's AirWire T9000 throttles.

Resetting the decoder to the original factory settings is easily done with just a few keystrokes. Don't forget that the Drop-In decoder frequency and the locomotive frequency must match for all programming actions. A reset decoder's original factory setting for the address is 3. The reset function has no affect on the P8 sound decoder.

### Using The T9000 Throttle

The left column lists the keystroke sequence to change the decoder's address. The right column has the key sequence to reset the decoder to the original factory settings. The middle column explains what is happening for each step. For this example, the address will be changed from 3 to 9812. In either case, press SPR to exit the service mode, or, simply turn the throttle power switch off then back on. Verify that the new address is on the decoder or that the decoder has been reset. .

<u>Change Address</u>	<u>Result</u>	<u>Reset Decoder</u>
SPR	Selects service mode	SPR
SEL	Confirms that service mode is wanted	SEL
*,1,*	The CV to be changed	*, 8, *
#,9,8,1,2,#	The new value for the selected CV	#, 1, 3, 5, #
SPR	Exits service mode	SPR

### Using The RF1300 Throttle

To put the throttle into programming mode, first, turn off the throttle's power switch. Next, push **and** hold the 9 key. This is shown in the sequence as P&H. Then, while holding the 9 key down, turn on the power switch. Now you can release the 9 key. Notice the direction indicators are alternately flashing signifying the throttle is in the programming mode. Now you can use the left column key sequence to change the address or the right column key sequence to reset the decoder. Turn the throttle power switch off to exit the programming mode.

<u>Change Address</u>	<u>Result</u>	<u>Reset Decoder</u>
Pwr Switch OFF	Shuts off power to the throttle	Pwr Switch OFF
P&H 9, Pwr Switch On	Puts throttle into programming mode	P&H 9, Pwr Switch On
*,1,*	The CV to be changed	*, 8, *
#,9,8,1,2,#	The new value for the selected CV	#, 1, 3, 5, #
Pwr Switch OFF	Exits service mode	Pwr Switch OFF

See the Drop-In Decoder Users Guide for much more information regarding all the ways to setup your new decoder and locomotive for optimum performance.

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AirWire900®

# SD70 Drop-In™ Decoder

## Installation Guide

### Battery And Smart Charger Preparation

### USA-Trains SD70MAC Disassembly

### SD70 Drop-In™ Decoder Installation

### Quick Start Guide

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**AIRWIRE**®  
**900**

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SD70 Drop-In Decoder  
Battery Pigtail  
Charger Pigtail  
This Manual

## How To Use This Booklet

The booklet has 2 major sections.

### Locomotive Unpacking, 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 unpack and disassemble the USA-Trains SD70MAC 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 SD70 locomotive 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

Some useful items related to changing the Drop-In decoder address and how to reset the Drop-In decoder to its original factory settings finish out this book.

### See The Drop-In Users Guide For Applications Tips

Since this manual is used during installation only, and it is specific to the USA-Trains SD70MAC locomotive, there is a second users guide. This second users guide will have all of the items related to fine tuning and performance optimization as well as some interesting application tips.

### Recommended Optional Items - Phoenix P8 Sound Module & Interface Adapter

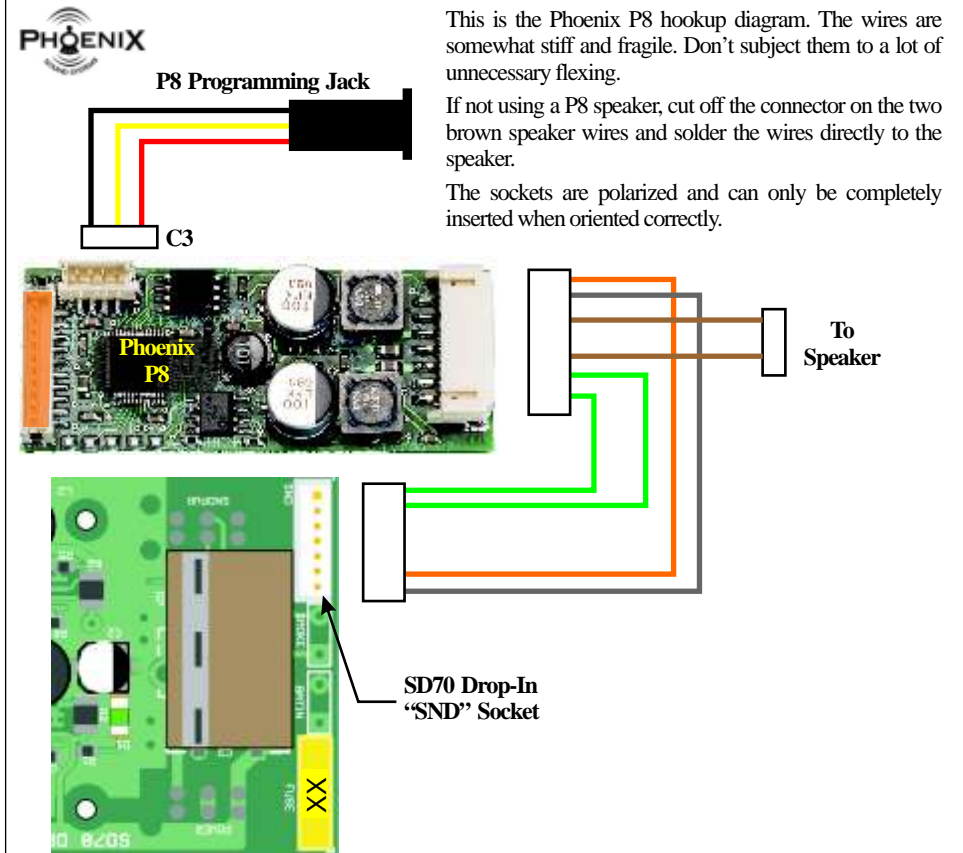
The Drop-In Decoder is designed to work with the Phoenix P8 sound module. The P8 module requires their interface adapter to setup the P8 functions. If your installation will not have sound, then you may ignore all references to the P8 sound module

**Throughout this manual, all references to the battery charger and battery are referring to the CVP Products' 14.8V Lithium battery pack and the Tenergy brand smart battery charger.**

**A smart person reads instructions.**

**A genius follows instructions.**

## 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.

The Drop-In decoder has a dedicated power switch for the P8. The P8 power switch is independent of the Drop-In decoder power switch. When turned on, the P8 is connected directly to the battery. The P8 can be powered while the Drop-In decoder is not.

Don't forget this fact when you turn the sound volume down low or off. Even if off, the P8 draws power from the battery and it will not automatically turn off.

Always use the power switch to shut off the P8.

### P8 Address Setup

The Drop-In decoder sends DCC commands to the P8 on address 3. There is no need to change the P8 address from the factory setting of 3.

### Phoenix P8 Sound Decoder Setup - See The 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 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.

## SD70 Quick-Start - continued

**Grade crossing horn** is triggered by F4. This is a 15 second recording of a complete grade crossing horn sequence. Push and release F4 to start the grade crossing horn sequence. If you want to cancel the horn before it finishes, just push F2.

“**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.

**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.

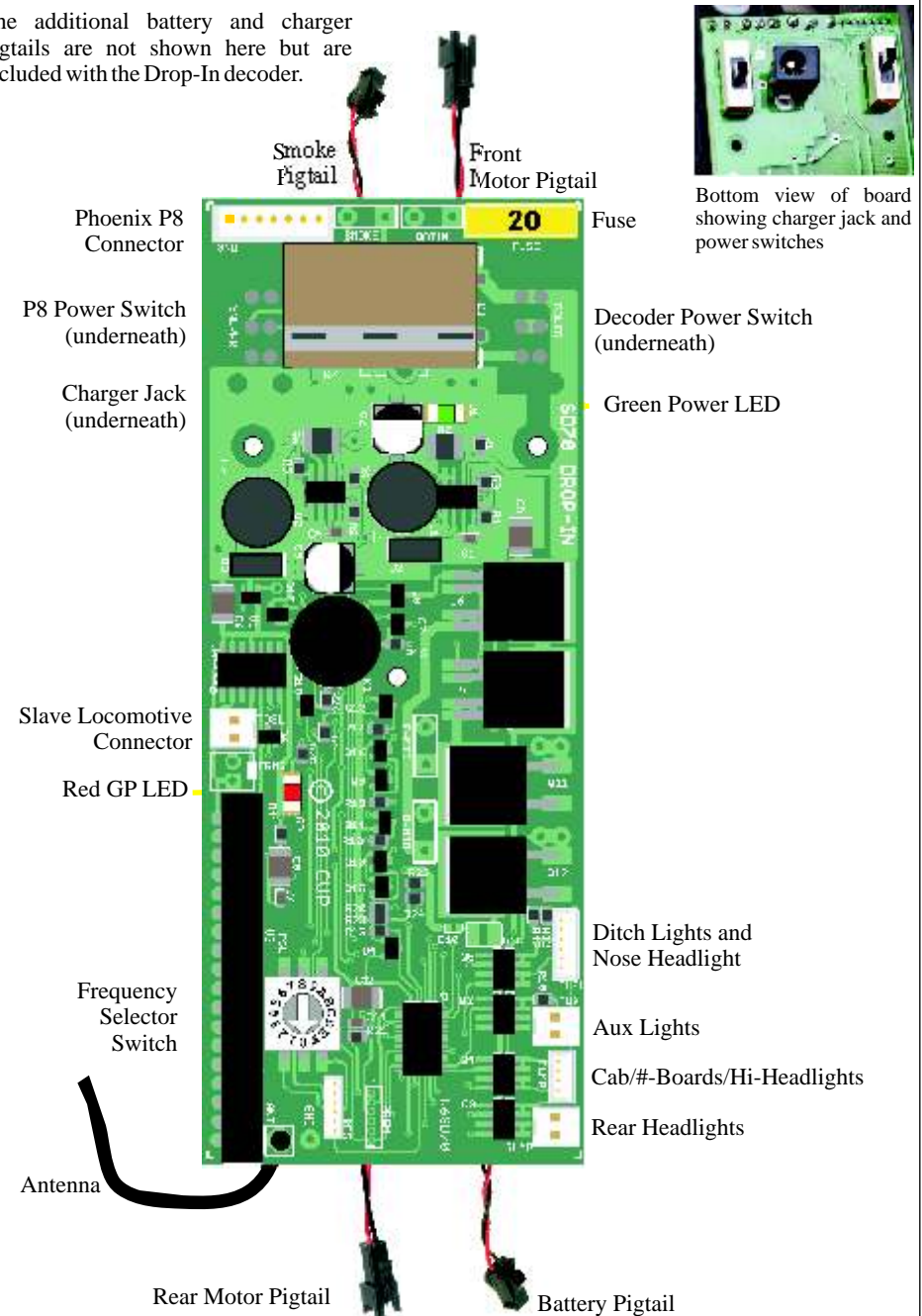
**Diesel Engine Shutdown** is triggered with F12. This will initiate the shut down sequence for the diesel engine. You can manually restart the engine by simply pushing F12 again. Note that if the throttle speed setting is not idle, the diesel automatically restart. This applies when the locomotive is standing still too. Any change of the speed control will automatically restart the diesel engine.

This table shows the combined list of recommended function key assignments for the Drop-In decoder (black) and the P8 sound module (red).

Throttle Key	Loco Effect -- Sound Effect
0	Toggle Headlights On/Off
1	Toggle Bell On/Off
2	Manual Horn Activation
3	Trigger Coupler Clank Sound
4	Trigger Grade Crossing Horn Sequence
	Trigger Ditch Lights Flash [auto stop]
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 [2 minute max time on]
	Trigger Brake Release Sound
*1	Toggle Cab Interior and Number Board Lights On/Off
	Trigger Air Pop valve
*2	Toggle Diesel Motor Shutdown or Startup Sound Effect

## SD70MAC Drop-In Decoder Familiarization

The additional battery and charger pigtails are not shown here but are included with the Drop-In decoder.



Actual pigtail lengths are longer than shown to insure easy reach of various connectors and sockets. The rear motor pigtail and the battery pigtail emerge from under the Drop-In circuit board to keep them away from the radio receiver antenna.

## Attaching Battery Pack Pigtail



**WARNING:** The CVP battery pack wire ends are insulated with heatshrink tubing. Remove only one piece of tubing at a time and then, only when ready to make the connection to the power plug, NEVER allow the two bare battery wires to touch.

The Lithium battery pack comes with wires that must be connected to the power plug pigtail. The pigtail is included with each Drop-In decoder. This is not difficult and no special tools are needed.

*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.*

**Battery polarity is very important.** Incorrect polarity will damage the decoder. This is not covered by the decoder warranty. For the Lithium battery, the plus wire is red. The black wire is minus. For the power plug, the plus wire is also red and the minus wire is black.

**Twist the Power Plug Wires Together** so they look like the picture. This helps minimize radiated noise. Once twisted together, trim both power plug wires to about 4 inches long. Next, trim the red power plug wire so it is about 1 inch shorter than the black wire.

Remove about 1/2 inch of the insulation from the black wire. Twist the strands together and touch a tiny bit of solder to the twisted wire. This is called tinning and keeps the twisted wires from unraveling.

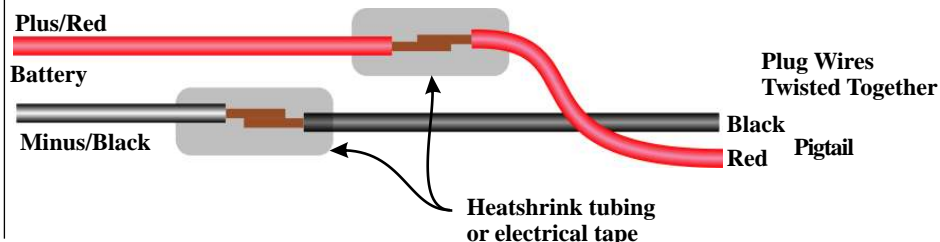
Remove about 1/2 inch of the insulation from the red wire. Twist the strands together and touch a tiny bit of solder to the twisted wire. This is called tinning and keeps the twisted wires from unraveling.

**On the battery**, start by trimming the black wire so it is one inch shorter than the red wire. Do not remove the heatshrink tubing on the red wire.

Remove about 1/2 inch of the insulation from the battery's black wire. Twist and tin the wire.

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

Remove the heatshrink tubing from the red wire. Don't forget to slide on a fresh piece of heatshrink for use later. Now 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 it around the connection. Make sure no bare wires are visible. This completes the wiring.



## SD70 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.*

Now that the locomotive is reassembled, its time to begin exploring some of its new features and capabilities. This one page shows all of the features using the original factory settings.

As you become familiar with your locomotive performance, you will undoubtedly want to make changes as well as fine tune its operation. Detailed instructions for fine tuning and changes are covered in the next section.

### Locomotive Motion Control

**Speed and direction** are controlled from the throttle. Use the throttle's knob to change speed. To change direction, push the direction key. "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 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 to slow for reliable cruise control so you need to increase the speed slightly and push F5 again.

### Locomotive Lighting and Smoke Generator Control

**Headlights** 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.

**Ditch/Safety lights** are also toggled on and off with F0. Pushing F4 initiates the alternate flashing of these lights. The flashing continues for about 15 seconds and then the lights turn on solid. The flashing time period is timed to match the Phoenix P8 grade crossing horn duration which is also about 15 seconds.

**Cab interior and number boards** are toggled on and off with F11. As a reminder F11 is the \* key followed by the 1 key on the T9000 throttle. For the RF1300 throttle, F11 requires you to push the # key, then the \* key followed by the 1 key.

**Smoke generator** is toggled on and off with F10. Once turned on, the smoke generator has an automatic 2 minute timeout. However, if the smoke fluid has run out, the locomotive's own smoke generator controller will turn off even if the 2 minute timer has not run out. As a reminder F10 is the \* key followed by the 0 key on the T9000 throttle. For the RF1300 throttle, F10 requires you to push the # key, then the \* key followed by the 0 key.

### 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 Drop-In or P8 problem.

**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.

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

## SD70 Drop-In Installation

### Common Errors and Fixes

**Green Power LED doesn't turn on:** Make sure the Drop-In decoder power switch is on. The power LED does not turn on even though the sound module is operating OK.

**Red GP LED only has a very slow flash rate:** This is your indication that either the radio frequency or the locomotive address is set incorrectly. The small frequency selector could also be off by one click. First, verify the throttle address matches the decoder. If you are not sure, change the address again (see the back cover page). Then, with the power is on, use a small screwdriver to rotate the frequency selector left or right. If the red GP light turns on steady, then you are on correct frequency and address. Make sure everything checks - you don't want to have to take the locomotive apart more than once.

### Mount the Fuel Tank

Place the fuel tank near its mounting location on the locomotive. Fish the programming jack and the speaker plug up through the hole in the floor. Plug in the connectors. Orient the black radio antenna straight up.

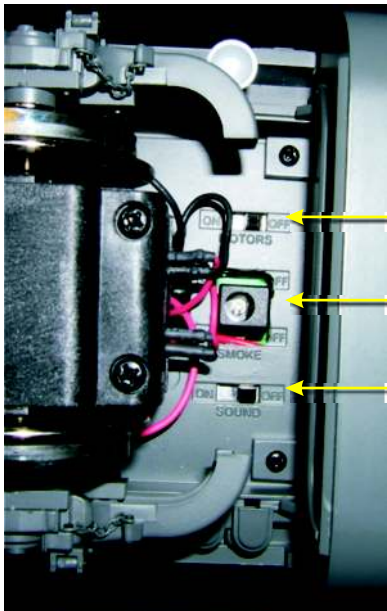
Use twist ties or tie wraps to keep wiring in place and out of the way of all mounting holes. Neatness really counts and will prevent troubles and broken wires during locomotive reassembly.

### Closing Up The Locomotive

This will take a few minutes so don't rush - take your time. Bring the top half down onto the chassis slowly and carefully. Make sure the wires are **INSIDE** the mounting posts. Don't allow a wire to fall on the outside or you risk pinching it when the top half is mated to the bottom half. Look on both sides of the locomotive. Make sure you can't see any wires.

The top half will seat itself correctly and easily when everything is aligned. It is easy to be off by a small amount which will prevent the two halves from mating. Inspect all around. If resistance is encountered, check for wires that may not be inside the mounting posts. The rear headlight wires are usually the ones that slip outside the mounting posts.

Once the two halves are together, turn the locomotive upside down. Once again check for alignment of the two halves. Install the two chassis screws that are hidden by the fuel tank. Then attach the fuel tank. Finish the reassembly by installing the remaining screws.



### Power Switches And Charger Jack

Drop-In Power Switch [shown in OFF position]

Battery Charger Jack

Phoenix P8 Module Power Switch [also shown OFF]

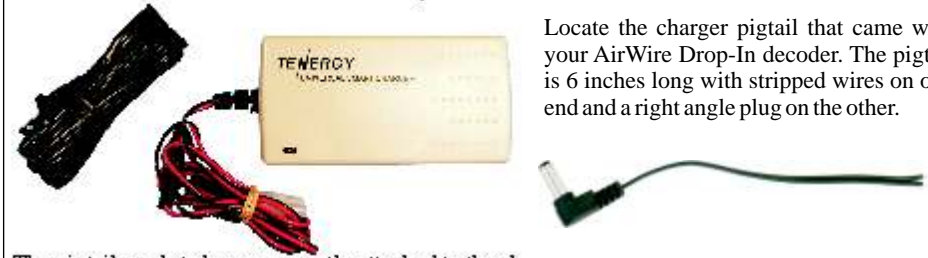
Slide Switch Actuator  
Towards Cab = ON

Slide Switch Actuator  
Towards Fuel Tank = OFF



## Attaching Charger Plug Pigtail To Charger

First, open up the charger box. The only items kept are the charger, the power cord, and the spare fuses. All other items are not needed and may be discarded.



Locate the charger pigtail that came with your AirWire Drop-In decoder. The pigtail is 6 inches long 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 the insulation from the minus wire. Twist the strands together and touch a tiny bit of solder to the twisted wire. This is called tinning and keeps the twisted wires from unraveling.

**Take the charger** wires and split the red and black wires apart for about 3 inches. Cut the minus wire so it is shorter than the plus 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 - either side will work. 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.

Right-Angle Pigtail  
No Stripe/Minus

Heatshrink Tubing

Minus/Black Wire

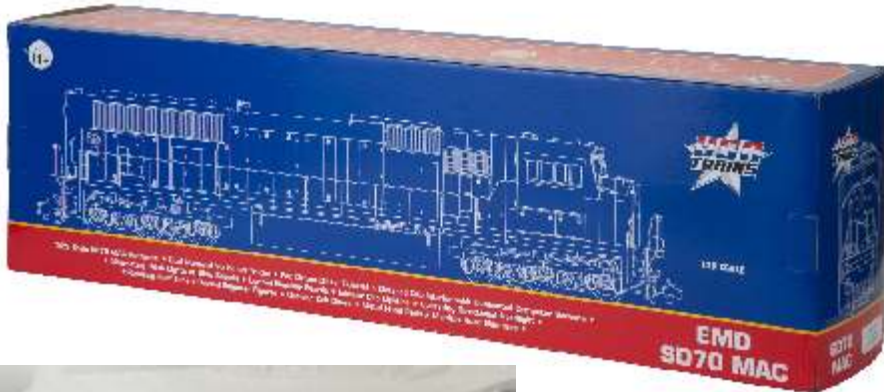
White Stripe/Plus

Plus/Red Wire

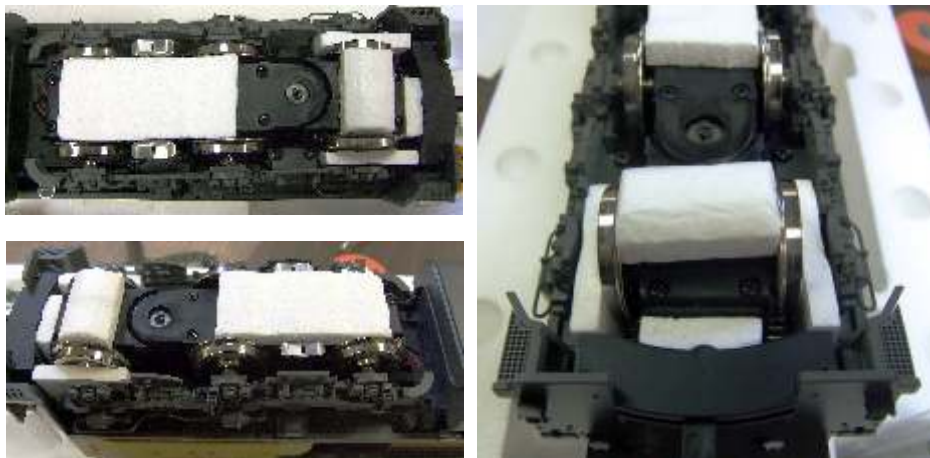
Charger Wires

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](http://www.mouser.com)

# USA-Trains SD70 Unpacking



If this is your first SD70 locomotive, you may be tempted to remove it from the box like you have all others. **DO NOT DO THAT!** You risk breaking delicate details located in the front and rear of the locomotive. Pay attention to the orange placards. Find the unpacking instruction sheet. Follow the instructions and carefully remove the foam inserts from the front and back. Once those are out, tilt the box on its side and remove the locomotive. Turn the locomotive upside down on your lap, or other soft surface and remove the packing from the trucks. Make sure you find and remove all of the small blocks of foam from in and around the trucks. If these are not removed, the mechanism will bind and or derail. Save the packing material and box.



# Set Drop-In Decoder Frequency Selector Switch

Before closing up the locomotive, now is the time to set the decoder's frequency selector. You can always change the frequency at any time but since the locomotive is already open, now is a good time to set it.

The Drop-In Decoder offers the original 8 frequencies plus an additional 8 frequencies making a total of 16 available frequencies. Either the RF1300 or the T9000 throttle can use the original 8 frequencies, numbered from 0 thru 7. **Only** the T9000 throttle can use the 8 new frequencies available on the Drop-In Decoder.

## Setting RF1300 To One Of The Original 8 Frequencies - 0 to 7

Use the illustrations to ensure that the throttle/decoder pair have matching frequencies. Notice that the small arrow on the decoder's selector switch points at the frequency number. In the picture to the right, it is pointing at 0. The frequency can be changed at any time and the new setting takes affect immediately. In the drawings below, the white square is the slider portion of the switch.



Note, if using a remote frequency selector, set the selector switch to 0.

## Setting T9000 To One Of The Original 8 Frequencies - 0 to 7

Push SEL 1 and enter the numeric number from 0 thru 7 to match the number dialed in at the Drop-In decoder. Push ENT after the number has been entered.

## Change Frequencies Carefully - Watch And Count

When changing the decoder's frequency, each click of the switch is followed by a chirp. This tells you that the decoder's frequency has been changed. The little switch's arrow is small so use a bright light, good reading glasses, a jewelers screwdriver and count the chirps as the arrow is moved. Use the red GP light as your final check that the frequency and address match before closing up the shell.

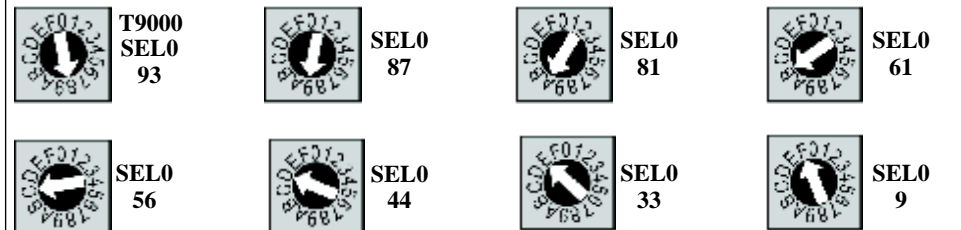
### Decoder RF1300



## Setting T9000 To One Of The New Drop-In Decoder Frequencies - 8 to F

You will be delighted to know that your T9000 is already capable of accessing the new frequencies. The T9000 has an undocumented command that is used to set it to the new frequencies. Note that there is no direct match between the T9000's new frequencies and the Drop-In decoder's switch setting. Be sure to set the decoder first and then enter the frequency on the T9000 throttle. Push SEL 0, enter the numeric number shown below and then push #. Verify that the decoder's GP light turns on.

### Decoder



## SD70 Drop-In Installation

### Tidy Up The Wiring

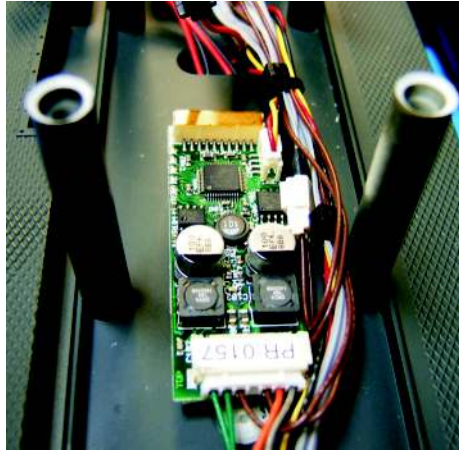
Use the left over twist-ties or miniature wire ties (available from hardware stores) to bundle all wires together. Try to keep the wires away from the antenna which is the 3 inch length of wire near the receiver module.

Some parts of the P8 become hot when operating so don't let the wires lie on top of the P8.

### Temporarily Plug In Speaker

Before checking the installation, plug the speaker connector into the P8. Don't bother with the programming jack connector at this time, just the speaker.

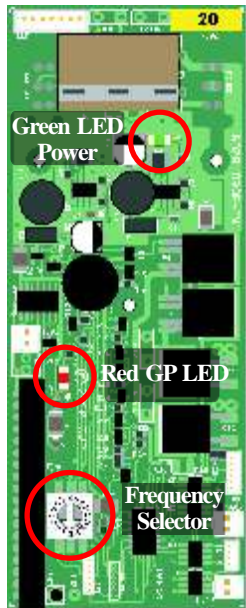
The next step will be to check the installation and verify correct operation. A throttle will be required for the next set of steps.



### Preliminary Checkout

As delivered from the factory, the Drop-In decoder is set to locomotive address 3. Also, the frequency selector will be set for frequency 0. For this initial test, verify that frequency selector rotary switch's little pointer is pointing at the number 0, and if not, set it to 0.

1. Turn on both power switches on the drop-in. The ON position is with the slide switches towards the cab. The green LED will turn on indicating that battery power is present.
2. You will hear the Phoenix P8 module turn on. Don't be alarmed if the sound turns off in a minute or so - that is normal and can be changed. Changing this feature will be discussed later.
3. Turn on the throttle and set it for address 3. Also set the throttle to frequency 0. See your throttle manual for how to do this. Now look at the red GP LED - it will be on. It may appear to flicker a bit which is normal. This tells you that the address and frequency are set to match the throttle.



4. Turn on the front headlight by pushing the 0 key on the throttle. Change directions and confirm the rear headlight turns on.
  5. Slowly turn up the throttle until you see the motor attempt to move. Verify that both motors turn in the same direction. You will also notice that the headlights brighten once the throttle is turn up. This is normal. The headlights automatically dim when the speed is 0. This can be changed and will be discussed later. Push 0 to turn off the headlights.
  6. Push the \* key followed by the 1 key. This will turn on the cab interior and the number boards. Push \* and 1 again to turn them off.
  7. Push the \* key followed by the 0 key. Listen carefully for the small fan to start running in the smoke generator. Push \* and 0 again to turn it off. Since there is no fluid in the generator, be sure and turn it off.
  8. Push the 2 key and the P8 horn will sound.
- This concludes the preliminary checkout.

If you intend to change the frequency, do so now before the chassis is reassembled. See the next page for how to do this. And if the frequency is changed, set the throttle to the new frequency and verify the red GP LED turns on before closing up the shell.

## USA-Trains SD70 Disassembly

**Warning:** Many parts of the shell and chassis are fragile and easily break. Especially vulnerable are the steps, doors, side-frame assemblies, and cab awnings. Gently pull up and remove the horn assembly if it has been installed.



### 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

Spread a couple layers of thick towels on your work surface to serve as a cushion for the locomotive. The top of the locomotive is uneven and is unstable when upside down. The towel will help prevent damage should it fall over.

### Use a Foam Block To Hold Screws

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



### Total Mounting Screw Count is 16

When all the screws are removed, there will be a total of 16 screws. 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 and have been numbered for easy reference.

### Remove Fuel Tank - 4 Screws

Remove the 4 screws and set the tank aside for now.

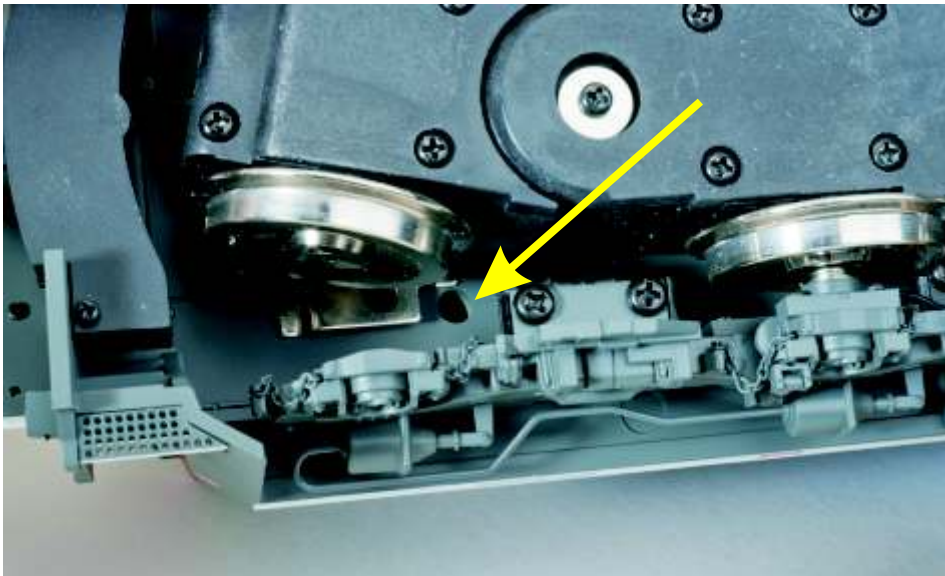
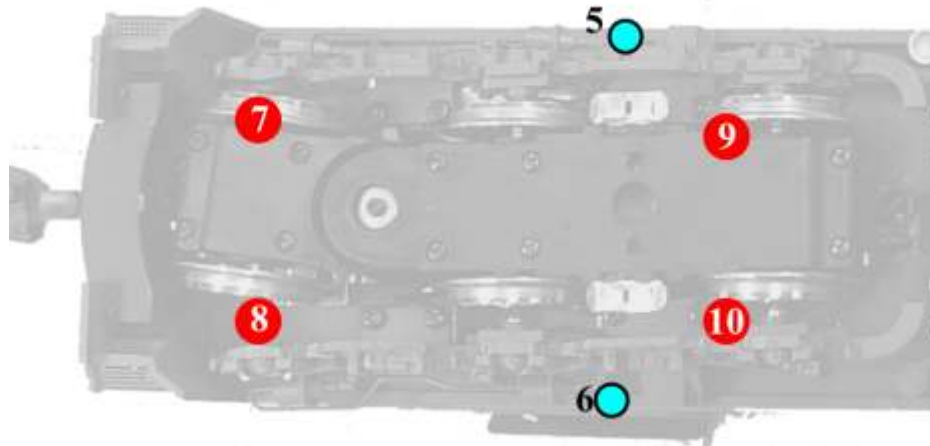


## USA-Trains SD70 Disassembly

### Front Mounting Screws - 6 Screws

There are two types of screws in this area. Numbers 5 and 6 in blue will need a small jeweler's type Philips screwdriver. These two are small and short - don't lose them. The red circled screws are deep inside hollow columns. The 4 inch long screwdriver must be used to get these out. Once again, as each screw is removed, place it into the foam block.

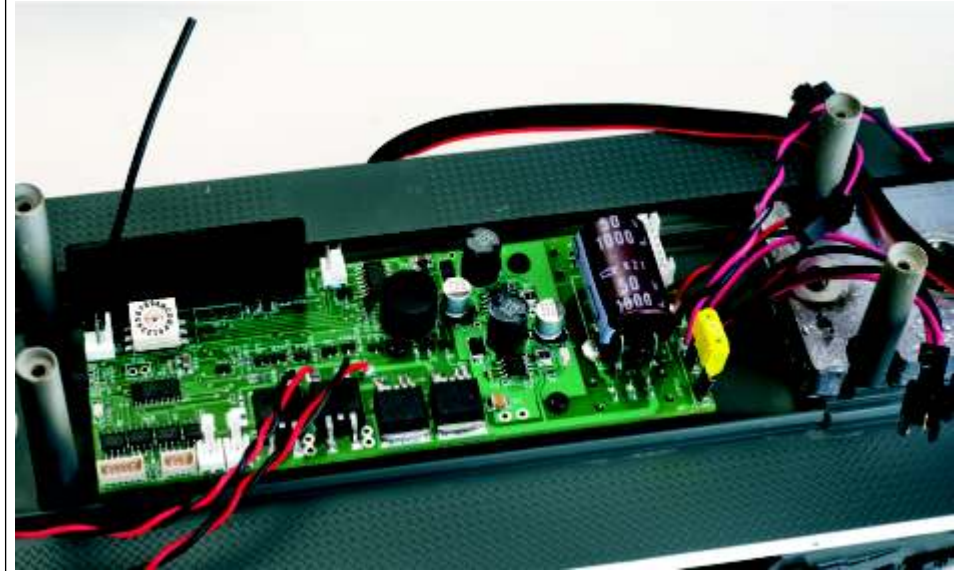
The number 7 and number 8 holes are well hidden. The yellow arrow points to the hole in which the #8 screw is located. The number 7 screw is on the other side of the truck. Rotate the front set of wheels out of the way to expose the screw hole. Be careful and do not damage the side frame's delicate detail.



## SD70 Drop-In Installation

### Mount SD70 Drop-In

Place the decoder onto the mounting posts. Make sure the jack and switches fit through the holes and the board is flush to the mounting posts. Verify that any wire under the board is clear of the posts. Use the original 3 screws to mount the board. The picture below might not exactly match your board with regards to the location of all the wires and plugs.



### Plug-In All Lighting and Motor Connectors

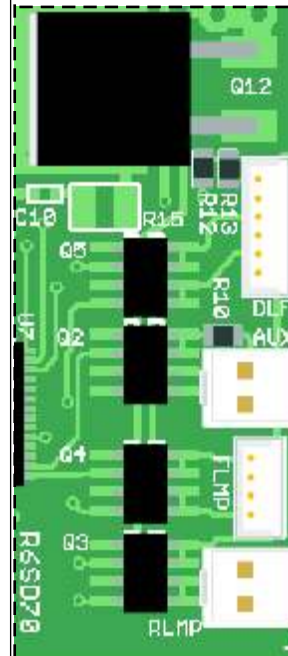
You are nearing the end. In this step, all connectors are plugged into their matching socket on the Drop-In board. Make sure both power switches are in the off position.

Start with the white connector from the P8 board. It goes into the matching white socket on the Drop-In board.

Plug in the front and rear motor connectors. The wires exiting out the bottom of the board are for the rear motor connector. The wires exiting the top of the Drop-In board are for the front motor. The pickup connectors are not used and may be taped down to get them out of the way.

Finally, plug in all the lamp connectors. Do not bend the board when pushing in connectors. The SD70 lamp connector area is shown below for convenience.

Plug in smoke generator connector and finally plug in the battery connectors.



6-wire ribbon cable to front ditch light board

Auxiliary lamp connection (not used)

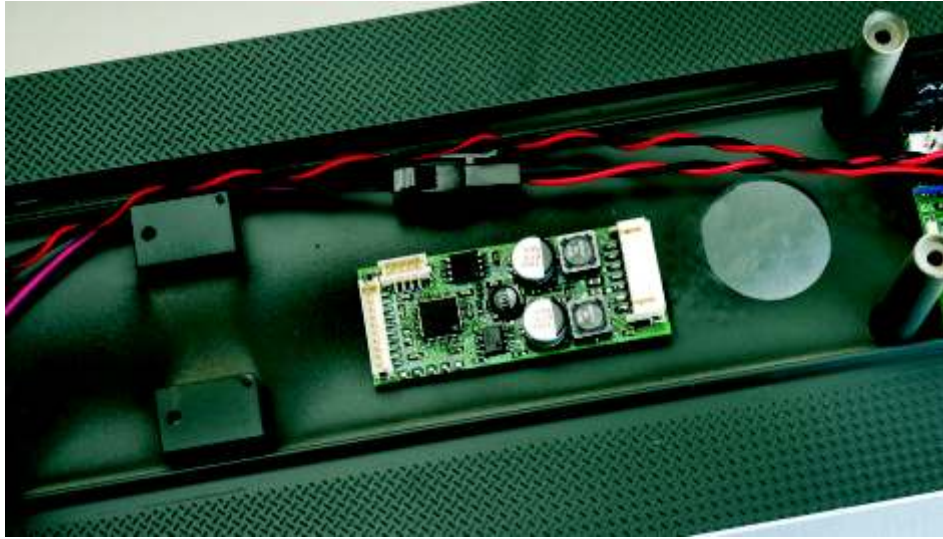
4-wire ribbon cable to cab and front headlight

2-wire connector to rear headlight

## Mounting Phoenix P8 Sound Module

### Mount The P8 Sound Module

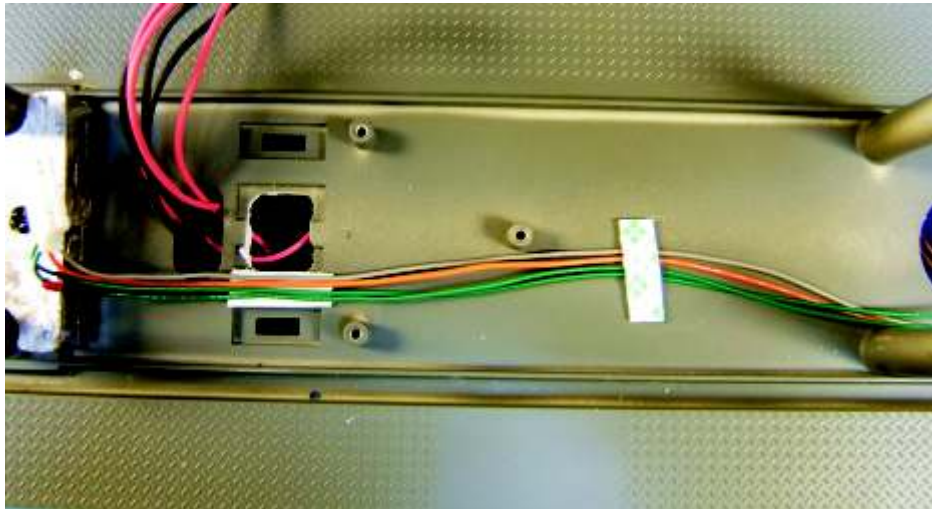
The P8 is small and is placed in the free area between the Drop-In and the battery pack. Use double-stick tape to hold it in place. Orient the module as shown below. The white, right angle connector on the end of the P8 needs to face towards the large hole in the floor.



### Plug in the 6-wire P8 Cable To The Right Angle Connector

This cable connects the P8 to the SD70 Drop-In decoder and two other wires from the connector go to the speaker. The cable is stiff and will not stay put. Use a couple of small pieces of foam tape, between the power switch and the charger jack holes, will insure the wires are not pinched when the Drop-In is mounted.

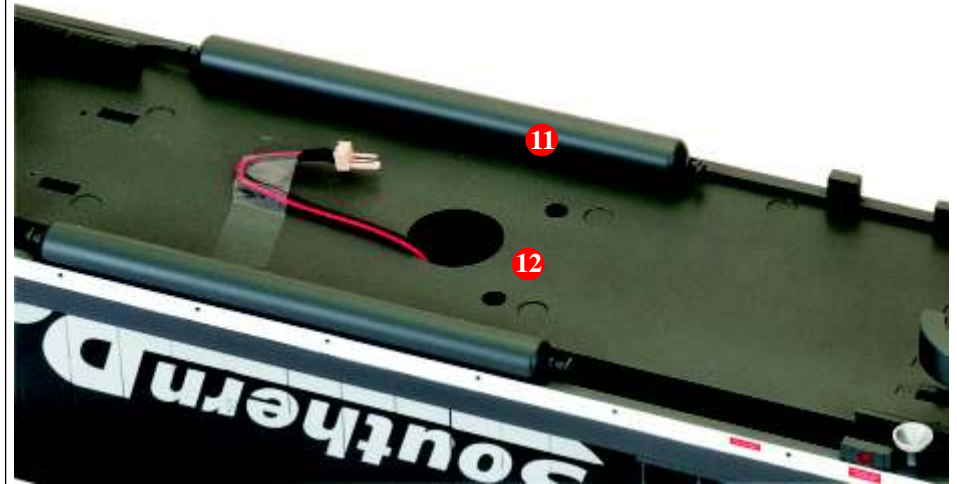
The 4 wire larger connector goes to the Drop-In. The smaller connector with the two brown wires goes to the speaker socket and are not shown in this image.



## USA-Trains SD70 Disassembly

### Under Fuel Tank Mounting Screws - 2 Screws

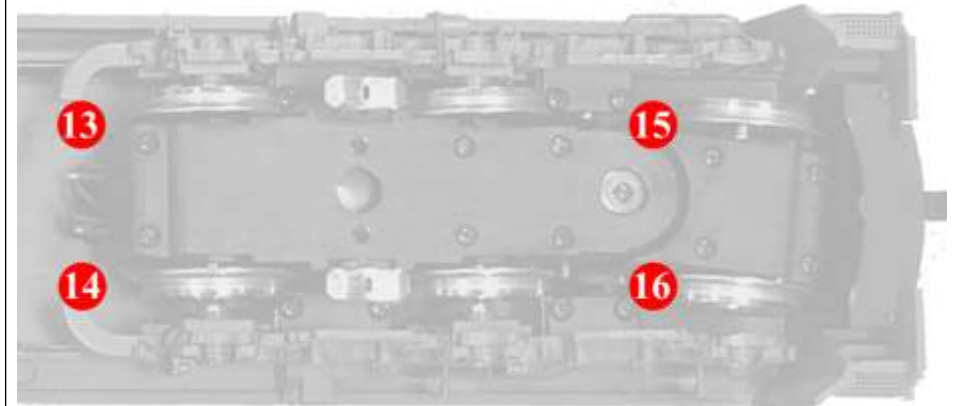
With the fuel tank removed, two additional mounting screw holes are exposed. Use the long shafted driver to remove these screws, # 11 and #12.



### Rear End Mounting Screws - 4 Screws

Two of these screws, #15 and #16 will be the most difficult to see and remove because the truck obstructs their access holes. It is the long thin shaft of the screwdriver that does the trick. These will be saved for last.

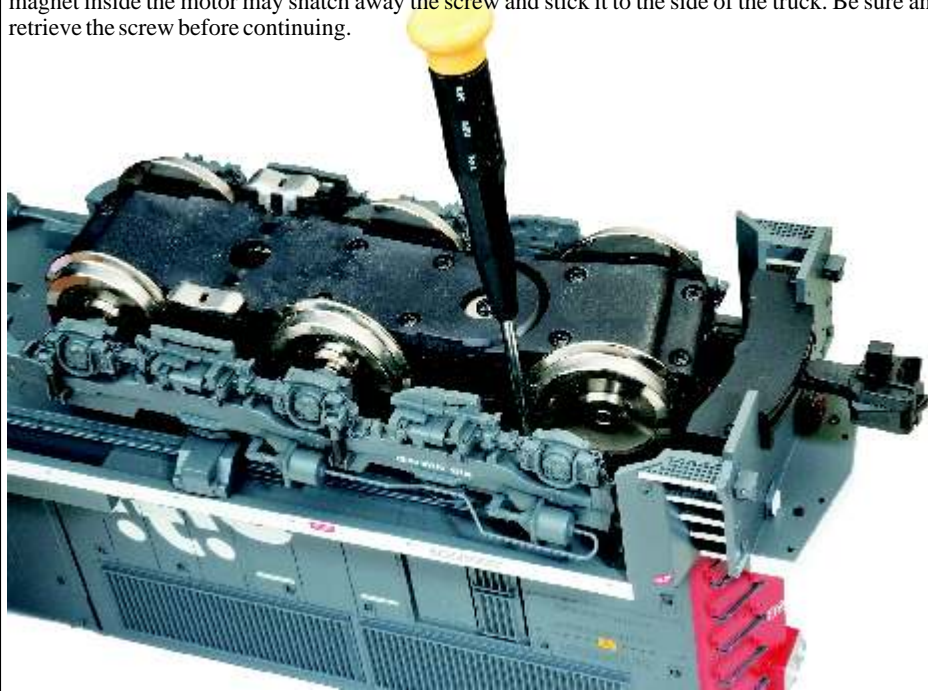
First locate screw numbers 13 and 14 - these are easy to see. Go ahead and remove them.



## USA-Trains SD70 Disassembly

### Last 2 Rear End Mounting Screws - 2 Screws

Last two screw access holes are located under the front truck. However, the truck can not be rotated out of the way. Instead, slide the screwdriver between the side frame and the wheel. You may need to put a bit of pressure on the side frame to get it into the hole. A little bit of extra pressure will allow it into the hole. Let the head of the screw center in the tool and then unscrew it. If you are using a magnetized tool, you can try and lift out the screw. However, as you get close to the wheels, the magnet inside the motor may snatch away the screw and stick it to the side of the truck. Be sure and retrieve the screw before continuing.



That concludes the screw removal. The top chassis half is now separated from the bottom chassis half. Count the screws and make sure there are a total of 16. If you don't have that many, compare your block of foam to the photo. You'll quickly see which ones you missed.



## Speaker And P8 Interface Jack Mounting

For the next step, the fuel tank is fitted with a speaker and the Phoenix P8 sound module interface jack. If you are not using a sound decoder, skip the next two pages.

### P8 Interface Jack Installation

The Phoenix P8 sound module uses a programming jack to connect it to a PC for editing and downloading of sound files. The programming jack is installed into the fuel tank for easy access. For fast mounting, use quick-set epoxy or hot-melt glue.

The end of the fuel tank facing the rear truck is where to drill the hole. Put the hole about half way up the tank and favoring one side. This makes it easier to plug in the programming jack. Drill a 5/16 inch hole for the jack. Remove any burrs from around the hole.

The fuel tank walls are too thick for the jack's threads so remove the nut from the jack and discard. Push the small plug and wire through the fuel tank hole. Use either epoxy or hot-melt glue to permanently mount the jack.



### P8 Speaker Mounting

Newer speakers from Phoenix have a two wire plug attached to the speaker. If yours is different, solder the wires to the speaker before mounting it. Hot melt glue is the quickest method to mount the speaker although some people prefer silicon adhesive which takes longer to dry. We like hot-melt glue simply because it is fast.

Center the speaker in the grill opening before gluing.

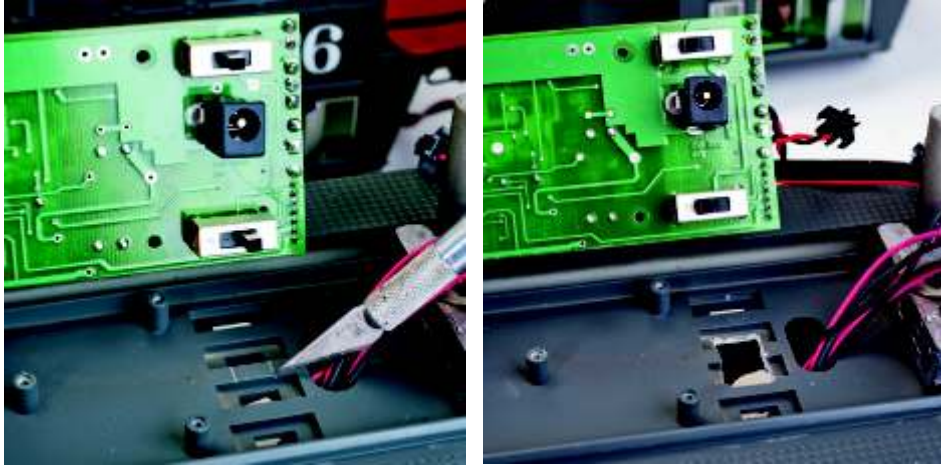
Place the hot melt glue nozzle into the speaker's corner mounting hole and squirt out a blob of glue. Slowly pull the nozzle from the hole while continuing to dispense glue. This builds up a small glue "post" that holds the speaker securely to the fuel tank. Finally, place a small amount of glue around gaps between the speaker and the mounting area for best sound reproduction.



## Enlarge Switch Hole And Mount Battery

### Enlarge Switch Opening In Chassis Floor

Take a look at the bottom of the Drop-In board. Notice the two switches and jack. The switches fit the holes in the locomotive floor exactly. However, the hole into which the jack fits needs to be enlarged. Mark the location for the jack using a sharp tool. Use a hobby knife or Dremel tool with a routing bit to enlarge the hole so the jack fits through the hole without binding.

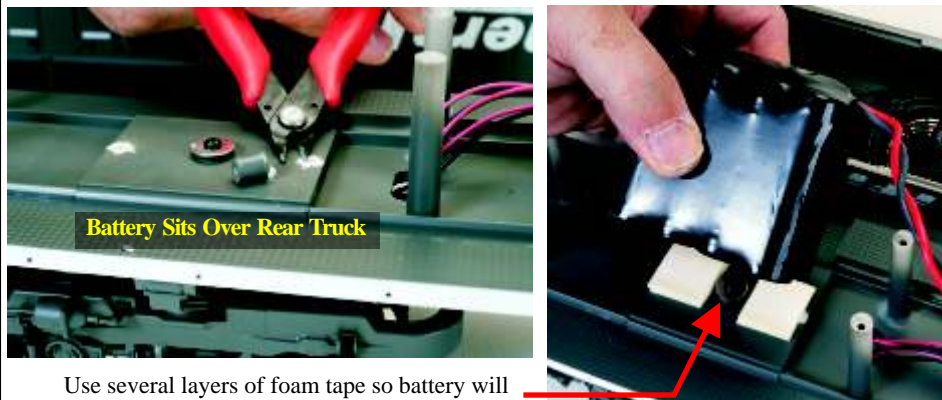


### Make Room For The Battery

This installation makes use of the standard CVPLithium battery pack. The small size yet high power capacity makes for a simple installation. After removing the weight, the battery is mounted over the rear truck on double stick foam tape.

First unscrew the two outer screws. The center screw holds the truck - do not remove it. Once the weight is removed, trim flush to the floor, the two plastic posts. Flush-cutting wire cutters make this easy.

The battery is mounted to the floor using double-stick foam tape. Be sure to apply several layers of tape so the battery does not obstruct or sit on the truck mounting screw. Mount the battery between the posts onto the tape and press down firmly. For added strength, a small dab of hot melt glue can also be used but keep the glue away from the truck mounting screw.



Use several layers of foam tape so battery will not touch truck mounting screw

## USA-Trains SD70 Disassembly

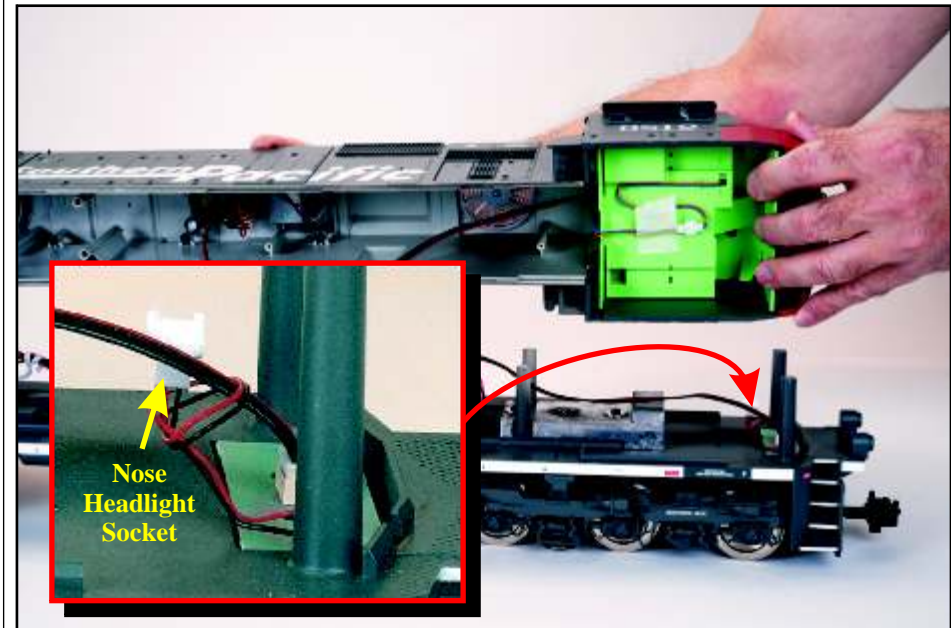
### Separating the Top and Bottom Chassis Halves

"Gently" is the key word for this task. Starting at the back end, gently lift the top half of the chassis away from the bottom. If you feel any resistance, go back and verify all screws have been removed. The two halves should come apart easily. Place the top half on its side. Be careful of the small wires that join the two halves.



### Beware Of Fragile Wiring If Your Loco Has Nose Mounted Headlight

The SP locomotive in most of these pictures has a headlight mounted above the cab windows. However, if your locomotive features a nose mounted headlight, there will be a small pair of wires going to the socket with the arrow. These wires are very short and very fragile. You will not be able to lift the top half of the chassis as high as shown. Very carefully disconnect the plug from the socket. **DO NOT PULL ON THE WIRES** - they break very easily.



## USA-Trains SD70 Disassembly

### Unplug All Connectors From Old Circuit Board and Remove The Board

This is relatively easy. Unplug all the connectors from the circuit board. Remove and save the little garbage bag twist ties. These will be used later.

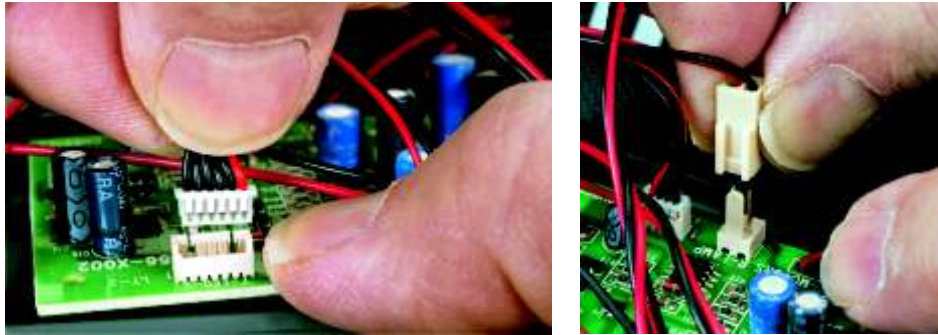
The miniature 4 and 6 wire sockets are held by friction and may seem tight. The easiest method to remove these is to grasp the group of wires near the plug. Next put your thumb on the top of the circuit board to prevent flexing. Now pull upwards while gently rocking the plug from side to side. This will release the plug from the socket.

The small 2-wire connector is easily removed. Grasp the plastic connector and pull upwards. Don't pull on the wires.

Remove the USA-Trains speaker wires (shown on page 9) that go down through the hole in the floor. The connector and wires are not needed and may be discarded.

Unplug the 2-wire plug from the smoke generator mounted to the roof.

Finally, remove the 3 screws holding the circuit board and remove the board. The board is no longer needed but be sure and save the screws to mount the Drop-In decoder.



## USA-Trains SD70 Disassembly

### Removing The Front Truck - Optional But Recommended

The front truck and the connecting wires are in the way of the work that needs to be done to enlarge the switch holes. You don't have to remove it, and in fact some of the pictures show that we did not remove the truck. However, it is real easy to nick or break the truck wires so we recommend removing it. It isn't hard.

The articulated front set of wheels on the truck are held to the chassis with a bracket. Swing the wheels towards the side to reveal the bracket screws. Remove the 4 screws holding the bracket. In the picture below, the front right screw has been removed and the rear right screw head is visible. There is another pair of screws on the other side. Leave the wheels and bracket attached. Don't lose the screws.

The lower picture shows the center screw inside the weight that holds the truck assembly to the chassis.

Once the truck wires are unplugged from the circuit board, it is OK to remove the screw and remove the truck. There will be a small metal cylinder inside the weight which serves as a spacer. Don't lose it or the screw.

