GP7/9-PA/B Drop-In Decoder Configuration List

This page lists all of the configuration variables in one convenient location. The column labeled factory settings is how the decoder is setup at the factory. These settings can be restored by issuing a "factory reset" command. See page 39.

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 [CAB] [E1]
CV41	0	0-99	F7 Function Key Action
CV42	0	0-99	F8 Function Key Action
CV43	4	0-99	F9 Function Key Action [AUX1] [E2]
CV44	2	0-99	F10 Function Key Action [SMOKE]
CV45	5	0-99	F11 Function Key [AUX2] [E3]
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	Cuise 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	CAB Special Effect [E1]
CV203	4	0-15	AUX1 Special Effect [E2]
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 Timout (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]

Light gray italics means the feature is not available in this decoder.

CV Value	Function Key Action
0	No Function
1	Activate Cruise Control
2	Smoke Enable
3	Toggle CAB Lite [ELITE1] on/off
4	Toggle AUX1 Lite [ELITE2] on/off
5	Toggle AUX2 Lite [ELITE3] on/off
6	*Toggle ELITE4 [not available] on/off*
7	Dim Headlighs 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

P.O. Box 835772 Richardson, TX 75083-5772 www.cvpusa.com

Feb 2020 r23

AIRWIRE900®

Drop-In Decoder Installation Manual

USA-Trains GP7/9
USA-Trains Alco PA
USA-Trains Alco PB

Table Of Contents

AIRWIRE® 900

Contents

GP7/9 or PA/B Drop-In Decoder
Charger Pigtail
Cab Extension Cable (PA only)
Installation Guide [This Booklet]
Users Manual [Separate Booklet]

How To Use This Booklet - Additional Items Needed

This Guide Has 3 Installation Guides: USAT GP7/9, USAT PA and the USAT PB Locos.

The same Drop-In decoder is used on both. If you ordered the PA/B Drop-In decoder, make sure you received two extra header cables. These are used to create an extension cable for the PA cab light wires.

Battery precautions and charger cable pigtail attachment are the same.

For the GP7/9, the disassembly instructions start on page 6.

For the PA locomotive, the disassembly instructions start on page 23.

For the PB locomotive, the disassembly instructions start on page 31.

The P8 Hookup diagram is on page 38.

The back page lists all of the Drop-In decoder CV's.

Each locomotive installation section has the same format. Step-by-step instructions show how to disassemble the locomotive. Once the locomotive is opened up, the installation of the Phoenix P8 sound module is described followed by the 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 some of the features of the Drop-In decoder using the AirWire throttle.

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, there is a second users guide. This second users guide will have all of the items related to fine tuning and performance optimization. It also includes information regarding the extra lighting features available, using Phoenix couplers as well as some interesting application tips.

Find the appropriate section for your locomotive and lets get started.

Additional Items Needed [Some Are Optional]

14.8V 6800mAh rechargeable battery: The BATT2 from CVP is recommended.

Battery Charger: The Tenergy Smart Charger, from CVP Products is recommended.

Heatshrink Tubing: See box on bottom of page 5.

Long Shank #1 Philips Screwdriver: See page 6.

Phoenix P8 Sound Module, Speaker and Matching Cable: The locomotive does not have a speaker so one will be needed in addition to the P8 and cables. Phoenix sells all of these items. Contact Phoenix or one of their dealers to purchase the needed items. Be sure and tell the vendor you will be using the items in a Drop-In decoder installation in a GP7/9 or PA-B .

Phoenix P8 Programming Cable: The programming cable is required if you wish to modify the stock P8 sound effects, function key assignments or other sound related options. Setup and customization of the P8 is only possible via the programming cable.

Resetting Drop-In Decoder To Original Factory Settings

CV8 is very special. When this CV is used, ***all*** of your changes to the decoder are erased and the original factory settings are restored.

This reset procedure applies only to the AirWire Drop-In decoder. The reset command will not be understood by the attached P8 sound module in any way. The P8 address will be unchanged.

Step-by-Step Key Sequence To Reset Decoder Using CV8 Using The T5000 Throttle

Follow these steps to reset your AirWire Decoder to its original factory settings. Remember that any Drop-In decoder sharing the frequency will also be reset. Turn off all other nearby decoders to avoid this problem. Turn on the decoder to be programmed.

- Turn on the T5000 by pushing MENU. Verify it is set to the same frequency as the decoder.

- Push MENU twice and then push 4 to select Service Programming.

- Enter the CV number by pushing, one at a time, the following keys: * , 8, *

- Enter the value by pushing, one at a time, the following keys: # , 1, 3, 5, #.

- Listen for the decoder to beep or chirp signifying the command has been sent.

- Push ESC to exit programming mode.

At this time, the decoder has been reset to factory defaults. It will be on address 3 and frequency 0. Set your throttle to address 3 and frequency 0 to verify reset of the decoder.

The Drop-In decoder and the Phoenix P8 must be set to the same locomotive address. It is best to have the P8 powered on when setting the Drop-In Decoder to a new locomotive address. That way, they are both programmed at the same time.

Changing Decoder Address

The original factory setting for the decoder address is 3. The original factory setting for the Phoenix P8 is also address 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 is sufficient. What ever is used, make sure it is unique.

Do not use OPS mode programming to change the decoder address.

T5000 Step-By-Step Key Sequence To Change Drop-In and P8 Locomotive Address - CV1

For this example, the address will be changed from 3 to 9812. First turn on the Drop-In and the Sound power switches. Make sure both the throttle and the decoder are on the same frequency. Using the T5000 throttle, enter the following keystrokes to set the new address:

MENU, MENU 4	Sselects service programming
,1,	Enters the CV number to be programmed
9,8,1,2,#	Enters the value of 9812 to be programmed into CV1
*	Exits programming mode

When the final # is pressed, the locomotive decoder and the P8 sound module are sent the new address. The decoder acknowledges this with both a momentary pulse of the motor along with the several beeps. Press * to exit programming mode.

Enter the new loco number into the throttle, # 9,8,1,2,# and verify the motor operates along with the P8 sound system if it is installed.

More details about address and frequency setting are in the companion Drop-In User Guide.

Using A Remote Charger Jack - PA or PB Locomotive

There is very little space between the fuel tank and the truck. You will have to rotate the truck out of the way to gain access to the charging jack. The supplied charger plug is a right angle plug. Some users have swapped this for a straight plug to make connection a bit easier. Other users have moved the charging jack to a more accessible location. The choice is yours.

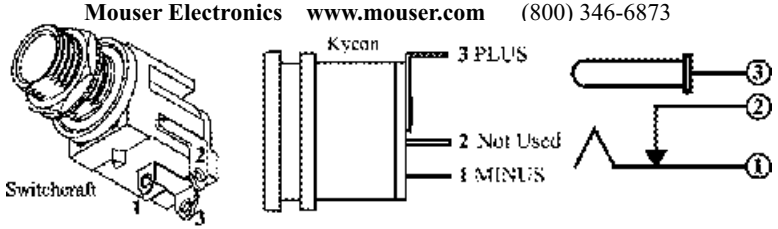
What You Need To Obtain And Where To Get It

To fit the supplied charger pigtail, the jack's outside diameter must be 6.4mm and the inside diameter must be 2.0mm. There are two different suitable jacks. One is from Switchcraft and sells for about $6. It mounts in a round hole with a washer and nut. The other is from Kycon that needs to be glued into a square hole so its a bit more of a chore to mount. However, the Kycon jack costs about a dollar. Heatshrink tubing can also be ordered from Mouser.

Mouser Catalog Number for the Kycon jack 806-KLDPX-0207-A

Mouser Catalog Number for the Switchcraft jack 502-RASH10P

Mouser Electronics www.mouser.com (800) 346-6873

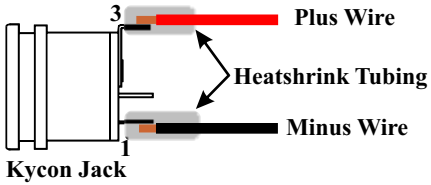


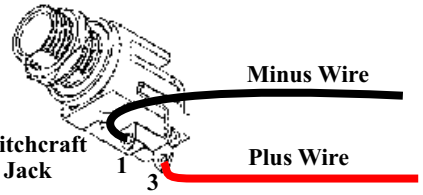
The plus wire connects to pin 3 of either jack which is the center pin. The minus wire connects to pin 1 of either jack which is called the sleeve.

To connect the jack to the Drop-In decoder board, use #24 AWG stranded wire. Large wire is not necessary because the charging current is relatively low. Use two different colors of wire cut to them desired length. Strip back about a quarter inch of insulation on each end. Tin both ends and trim the stripped ends to about 1/8 inch in length.

Connecting Wires to Jack - Kycon Example

This is will be easier to do on the bench before mounting it in the locomotive. The center lug, #2 can be cut off since it is not used. Solder the wires to the jack and then slide on heatshrink tubing to insulate the connections. For easier fishing of wires through the locomotive, twist them together.





Connecting Wires To Jack - Switchcraft Example

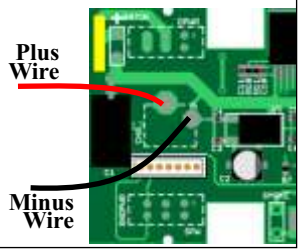
It is OK to cut off lug #2 since it isn't used. Using small heatshrink is not practical given the lug locations. Instead, wrap some electrical tape around the jack. The purpose is to make sure the lugs and solder joints do not accidentally short out against metal, wiring or other circuitry.

Connecting To Drop-In Decoder

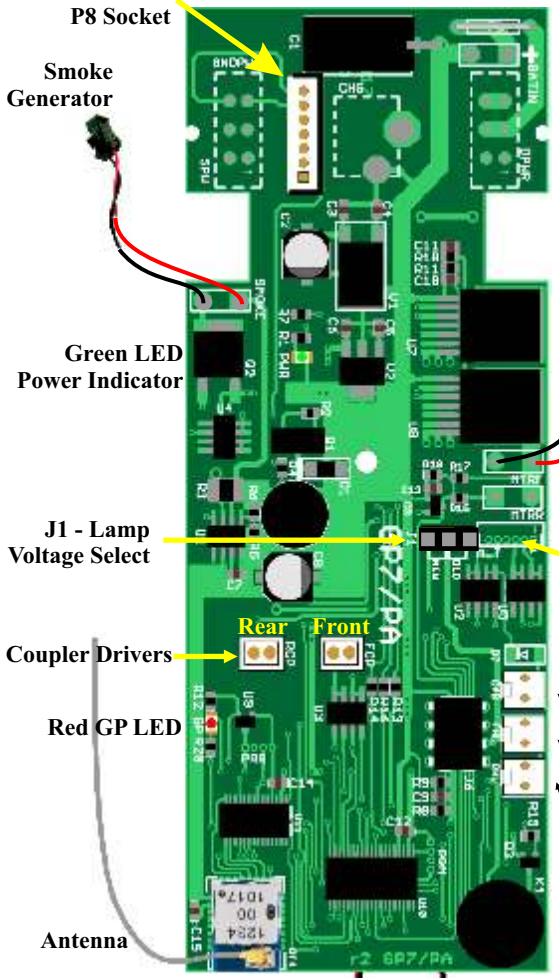
There is no need to remove the original jack. Proper polarity is mandatory or you risk damaging the charger.

To attach a wire, first heat the solder joint on the decoder until it is molten. There is usually plenty of solder so you won't need to add any. Insert the wires vertically into the solder joint while it is molten. Check for proper polarity.

After both wires are soldered, bend them flat to the board. Check that no bare wire is touching anything on the decoder.

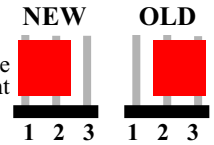


GP7/9-PA/B Drop-In Decoder Familiarization



Bottom view of board showing charger jack and power switches

J1- Lamp Select
NEW = 2nd Generation GP7
OLD = 1st Generation GP7
Factory Set For New



See page 17 for precautions if moving the shunt.

AUX Lite Output Jack [ALT]

[CAB] Cab light

[FHL] Front headlight, markers and number boards

[RHL] Rear headlights, markers and number boards

An optional antenna extension cable is available to allow the whip antenna to be moved 14 inches away from the RF module. This typically improves distant reception.

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.

J1 Warning!

If unsure about 1st or 2nd generation loco, leave J1 jumper in NEW position. See page 17 before changing the jumper.

Warning!

Do not plug battery into motor connector. It will damage the Drop-In board.

Verify Battery Pack Connector Polarity

Proper Battery Polarity Is Mandatory

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.

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 BATT2 battery pack has a mating plug that is properly polarized for the Drop-In power 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 and connector orientation match the picture to the right. Notice that the socket release lever is pointing away from you.

From BATT2 Battery

From Drop-In Power Input

CVP'S BATT2 Battery Pack

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 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 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 the fire and sources of high temperatures.
- Avoid storing a discharged battery. To avoid over-discharge, charge the batteries every three months.

Quick-Start Instructions - *Continued*

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.

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 and the P8 sound module. Black is the effect for the Drop-In decoder and red is the effect for the P8.

Throttle Key	Loco Effect -- Sound Effect
0	Toggle Headlights On/Off and Auto-Dim at Idle
1	Toggle Bell On/Off
2	Manual Horn Activation
3	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 [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 Engine Shutdown or Startup Sound Effect

Quick-Start Instructions - *Continued*

Locomotive Motion Control

Now that the locomotive is reassembled, its time to begin exploring some of its new features and capabilities. These two pages show all of the features using the original factory settings.

As you become familiar with your locomotive performance, you will undoubtably want to make changes as well as fine tune its operation. Detailed instructions for fine tuning are contained in the accompanying Drop-In User Guide. For now, lets concentrate on basic operation.

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 too slow for reliable cruise control so you need to increase the speed slightly and push F5 again.

Locomotive Lighting and Smoke Generator Control

Headlights, number boards and marker 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.

The Cab interior light is toggled on and off with F6.

Smoke generator is toggled on and off with F10. Once turned on, the smoke generator has an automatic 3 minute timeout. The timeout period can be changed and is discussed in the Drop-In User Manual. Note, 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. But the circuit is unreliable so don't depend on it.

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 (see page 21). 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 sound module 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.

continued on the next page

Don't forget to reattach the exterior details such as the horn assembly.

Attaching Charger Plug Pigtail To Charger

Power cord not shown

First, open up the charger box. The only items kept are the charger and the power cord. 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.

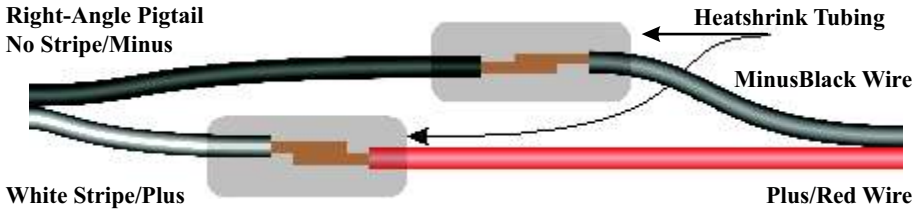
Take the charger pigtail and separate the 2 wires for about 2 inches. Cut the plus wire so it is 1 inch shorter than the minus wire. Remove about ½ inch of the insulation from the minus wire. Twist the strands together and touch a tiny bit of solder to the twisted wire. This is called tinning and keeps the twisted wires from unraveling.

Take the charger output wires and first remove and discard the alligator clips. Next, 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 ½ 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.



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 GP7/9 Drop-In Installation

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 both of the horn assemblies. The cab sun-shades ares especially vulnerable. Take care not to break them.

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 18

When all the screws are removed, there will be a total of 18 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 and have been numbered for easy reference.

Remove Fuel Tank - 2 Screws

The 2 screws are number below and the red circles are where you will find the screws. Remove the 2 screws, lift off the tank and set it aside for now.

Quick Start - Setting Address and Frequency

The "Quick Start" section assumes you have already installed your Drop-In. As delivered from the factory, the Drop-In's frequency is set for 0 and the locomotive address is 3. It is also assumed that the shell has not been reattached to the chassis allowing you to see the Drop-In LED indicators.

Step 1: Turn Power on to the Drop-In and Turn on Throttle

- The Drop-In's power green LED will glow brightly indicating power is connected.
- If you have not done so, set the throttle to frequency 0. Assuming your Drop-In still has the factory default address setting, also set the throttle's locomotive address to 3.
- When the throttle is turned on to the proper frequency, the red GP LED will be on. If the red LED is not on, then your throttle is not on the proper frequency. Do not proceed to step 2 until both red LEDs and both green LEDs are on.

Step 2: Set the Drop-In Decoder Address

- Select SERVICE PROGRAM mode. Press the green menu key twice and then push the number 4.
- Now push 1 and push ENT which selects CV1 for changing the address.
- Enter the decoder address that you want to use. The address must be unique. The loco's cab number is always a good idea. Once you have entered the numbers, push ENT. [Address 0 is not allowed].

Step 3: Set the Throttle To The New Address And Verify That The Loco Runs

Step 4: Changing The Drop-In Frequency

- Select SERVICE PROGRAM mode on the throttle.
- Enter 200 followed by ENT. CV200 is where the desired frequency (from 0 to 16) is stored in the Drop-In decoder.
- Enter the desired frequency number and push ENT. Your Drop-In is now on the new frequency. Verify the red GP LED is on when you set the throttle to the new frequency.
- Push ESC to cancel SERVICE PROGRAM mode.

Quick-Start - Resetting The Drop-In Frequency

There may come a time when your locomotive no longer responds to what you believe is the correct frequency, or you can not remember the correct frequency. Here's how to reset the frequency

Step 1 Turn off all AirWire throttles. This is very important since it is the of the absence of a throttle signal, plus a decoder power-cycle (turning the decoder's power off and then back) that allows the decoder to temporarily jump to frequency 0 where you can set a new frequency.

Step 2 Turn off the Drop-In decoder if it was powered on.

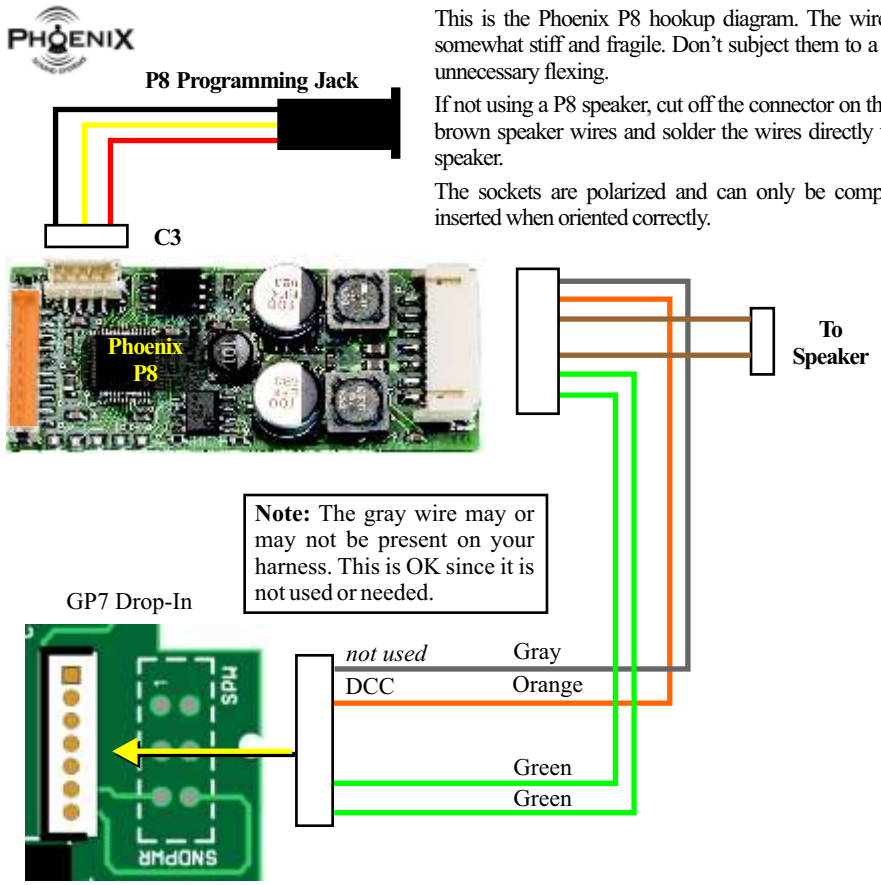
Step 3 Turn on the Drop-In decoder and wait at least one minute. Do not turn on any throttles during this time. At the end of one minute, the Drop-In beeps 5 times and jumps, temporarily, to frequency 0.

Step 4 Turn on your throttle, and set the throttle for frequency 0. You will notice the Drop-In's red GP LED is on. The locomotive address does not matter when using SERVICE PROGRAM mode.

Step 5 - Push the green MENU key twice and select 4 for SVC PROGRAM.

Step 6. Enter 200 followed by ENT for CV200 which is used set the decoder's frequency. Enter a valid frequency number from 0 to 16 followed by ENT. Be sure and make a note of the new frequency. When done, power-cycle the decoder to accept the new frequency. The frequency is stored even without battery power forever or until you change it.

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.

Drop-In "SND" Socket

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.

USA-Trains GP7/9 Drop-In Installation

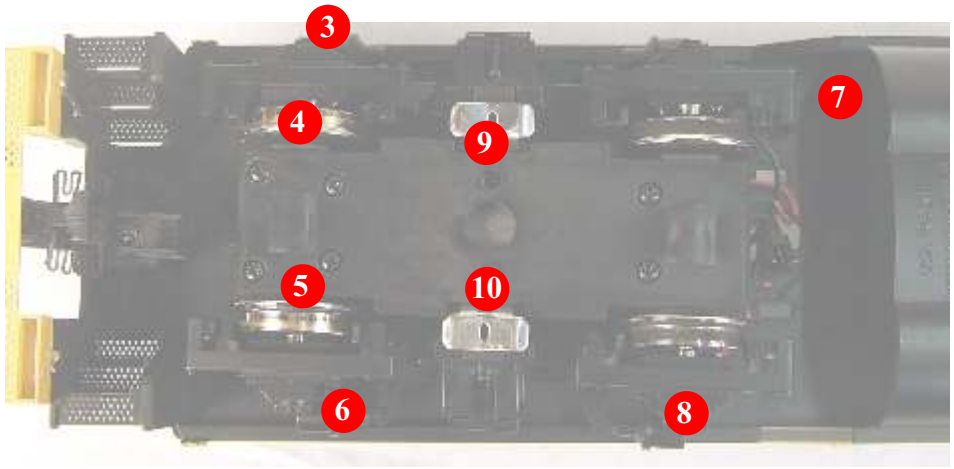
Front End and Cab Mounting Screws - 8 Screws

Except for number 9 and number 10, the screws are visible without removing the truck. Rotate the truck to expose the screw heads and/or the hollow tubes. The screws located in the deep hollow tubes will require the long, thin-shafted screw driver. As each screw is removed, place it into the foam block.

Once the first 6 screws are removed, the truck side frames will be temporarily removed to gain access to screws number 9 and number 10.

The front truck is easily rotated to expose the hollow tubes. Take care not to damage the truck wiring. Be careful and do not damage the side frame's delicate detail.

If the screw does not come out of the hole, give it several more turns to insure it has released from the

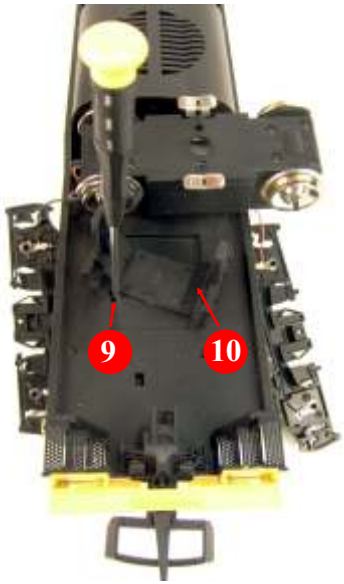


Temporarily Remove Front Truck Side Frames

Three small screws hold the side frame to the truck mounting bracket. Remove the screws and allow the side frame to fall away from the truck. The pickup wire will make sure it doesn't wander off. Remove both side frames. These are not counted in the total screw count.

The motor assembly is now free to be rotated away from the mounting bracket. The two holes are now visible by rotating the bracket. Remove the final two screws from their hollow tubes.

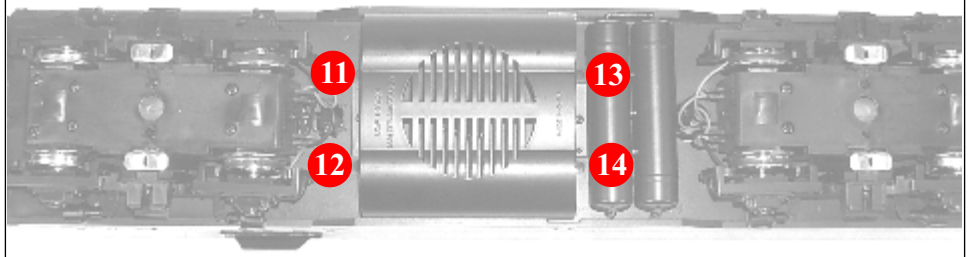
Reassemble the side frames once the chassis screws are removed.



USA-Trains GP7/9 Drop-In Installation

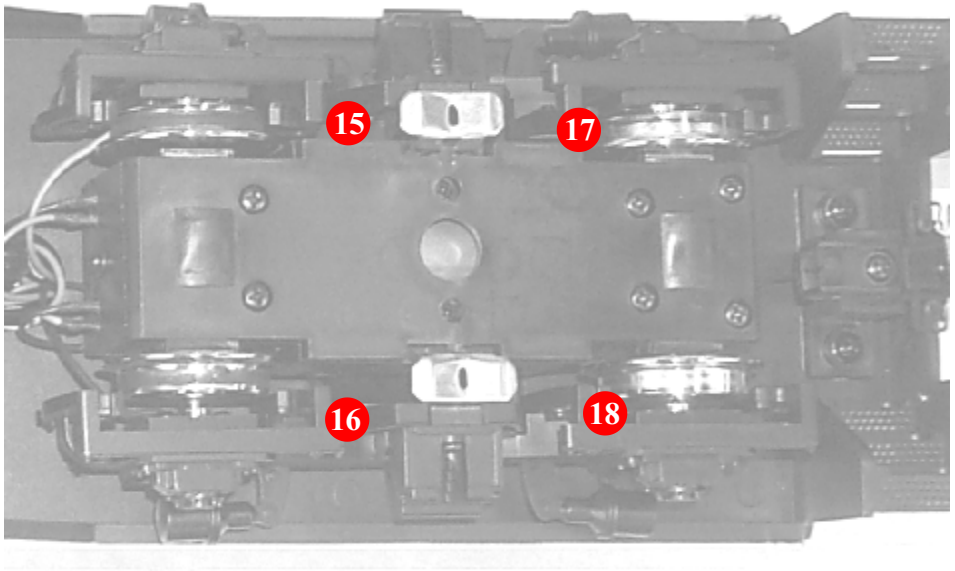
Middle Mounting Screws - 4 Screws

Use the long shafted driver to remove these screws, number 11 through number 14.



Rear Mounting Screws - 4 Screws

The last 4 screws are easy to see but are near the frame of the truck that obstructs their holes. It is the long shaft screwdriver that does the trick. Rotate the truck to expose the holes and remove the last four screws.



You can remove and discard the track sliders since they are no longer required

USA-Trains Alco PB Drop-In Installation

Alco B-Unit Operating Considerations

This section is written with the assumption that the A and B units are operating together as a pair.

Use the same frequency on both A and B units. Also, use the same locomotive address on both A and B units. Keeping the two units together like this allows them to respond to the same throttle commands without having to build a consist.

When sending programming commands to the Drop-In, both the A and B units will be programmed at the same time. If this is not wanted, set the power switch to off on the unit that is not to be programmed.

Shared Battery?

Although we do not recommend it, a single battery can provide power for both the A and B units. However, you will need to decide how to connect the battery power between the two units. Be sure to use heavy duty wiring since high currents will be flowing from the battery, through the connecting wire, and to the decoder.

The battery lifetime will be reduced by about half since both decoders and 4 motors are now being driven.

A Larger Single Shared Battery?

Again, yes, this is certainly an option. You will have to decide how to connect the battery power between the two units. Be sure to use heavy duty wiring since high currents will be flowing from the battery, through the connecting wire, and to the decoder. Finally, you will need to locate the battery and a matching charger. Go to **www.all-battery.com** and look at the options available.

USA-Trains Alco PB Drop-In Installation

Unscrew Transistors From Front and Rear Weights

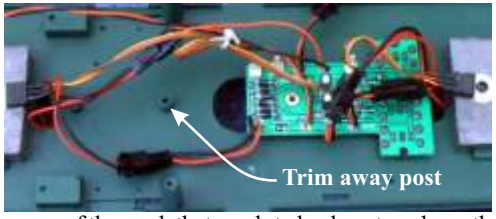
There are two transistors each mounted to one of the lead weights. Remove the screws and the washers to separate these devices from the weights. Reinstall the screw and washers after removing the transistors.

Unplug All Connectors and Remove The Main Board

Unplug all the connectors from the main board. Unplug the smoke generator, motor and pickup wires from the main board. The connections are made with a large black plugs and sockets. Press down on the tab to release it. Don't pull on the wires.

There are no lighting circuits in the B-unit.

Remove the 3 screws holding the main circuit board and remove it. The board is no longer needed but be sure and save the screws to mount the Drop-In decoder. Set the top shell aside. It won't be needed until it is time to reassemble the locomotive.



Trim The Unneeded Mounting Post

Use a pair of wire cutters to cut and remove the mounting post shown in the picture. It is not needed and interferes with the mounting of the Drop-In decoder which will be done later.

Remove The Rear Truck Assembly

The rear truck and the connecting wires are in the way of the work that needs to be done to enlarge the switch holes in the bottom of the chassis.

This is a 6 wheel truck with the back wheel set attached to a metal guide frame. The 4 screws holding the frame to the chassis must be removed first before removing the truck mounting screw. Rotate the wheels to expose the frame's screws and remove them.

Turn the locomotive right side up. Remove the screw and washer holding the truck to the chassis. Gently pull the truck wire through the chassis hole and set the truck aside.

Enlarge Switch Opening For Charger Jack

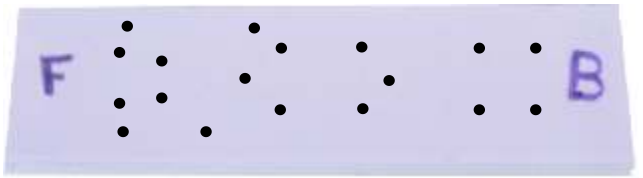
This is exactly like the A unit. For a detailed explanation of the procedure, see page **XX.** Enlarge the opening as shown. Reattach the truck to the chassis and attach the wheel frame.

The remaining steps are exactly like the A unit installation. The various steps are listed here but the details are omitted. See the page number shown in brackets for the details.

USA-Trains GP7/9 Drop-In Installation

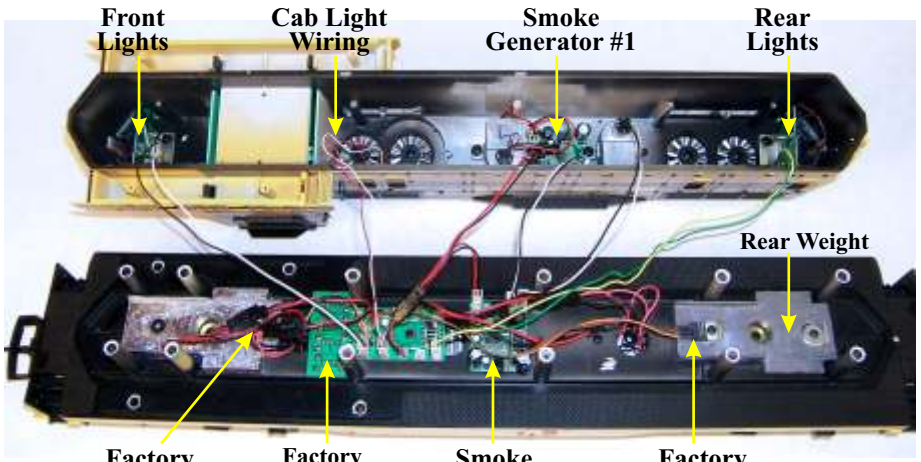
Check Your Screw Count

With all screws now removed, take a moment and compare your count and foam board holder to the one below. Not counting the side frame screws, which you should have already reassembled, the total count is 18. If your count is different, you've missed one. Go back and find the missing screw and remove it. If all screws are not removed, the top shell and bottom chassis can not be separated.



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.

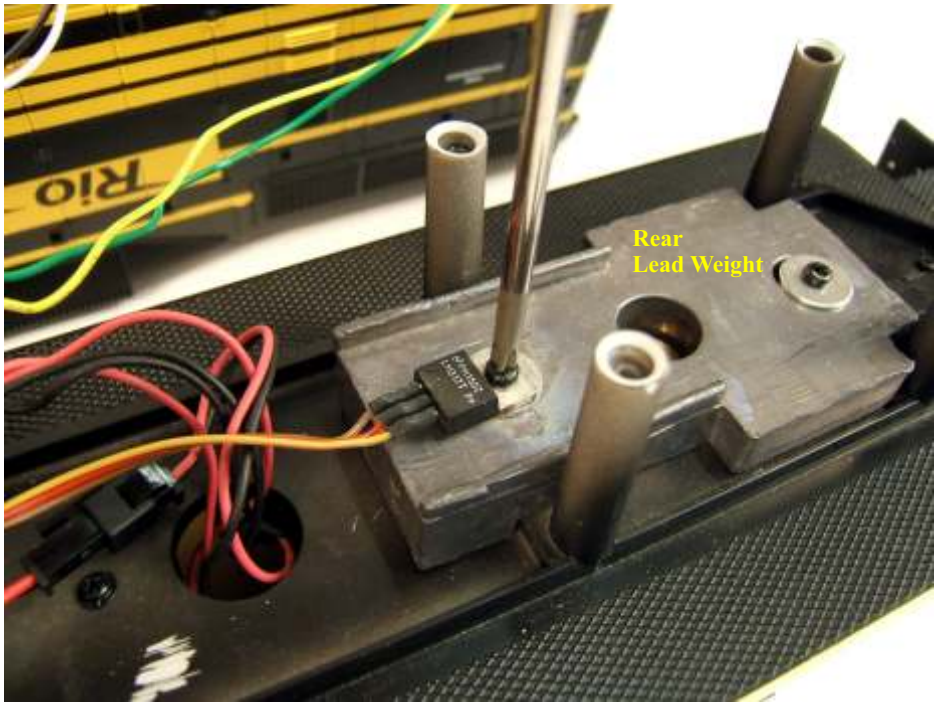


USA-Trains GP7/9 Drop-In Installation

Unscrew Factory Transistors From Front and Rear Weights

There are two transistors, each one mounted to one of the lead weights. They are attached to the original circuit board and which will eventually be discarded. Remove the screws and the washers to separate these devices from the weights. Do not lose the screws and washers from the front weight as they will be used again.

The rear lead weight is shown below. Remove and discard the rear lead weight.



Rear Weight Is Discarded But Keep The Front Weight

The rear lead weight will be discarded to make room for the battery pack. Once the screws are removed, the weight and the mounting screws may be discarded.

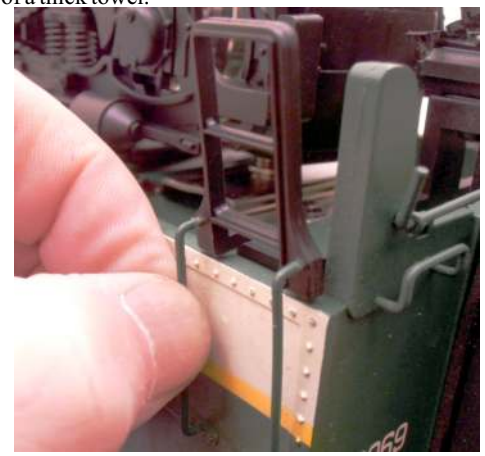
Weights Are Made From Lead

The two weight blocks are made from lead. The unused lead weight to be discarded should be done so using an environmentally friendly method. Do not allow children to play with the discarded lead weight.

USA-Trains Alco PB Drop-In Installation

The USA-Trains Alco PB powered B-unit is very similar in construction to the A unit except it has no lighting. The same Drop-In decoder is used as in the PA locomotive. This section will only highlight the differences such as screw locations and screw count. Otherwise, the same installation guidelines apply. To begin, turn the unit upside down on top of a thick towel.

As with the A unit, remove the handrails and steps from the 4 corners of the B-unit. You may use your fingers or small needle-nose pliers for stubborn rails. Rotate the rails around to rest on the top chassis. Friction will hold them in place.



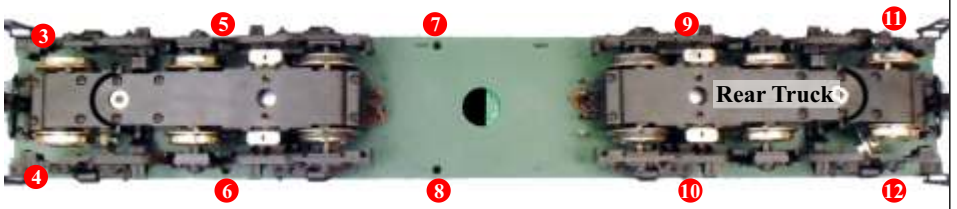
The steps are held by two small screws. Remove the screws to free the steps. The middle handrails are not attached to the chassis bottom and can remain as is.

Screw Count is 12

Remove the two screws, #1 and #2 holding the fuel tank. Remove the tank and set it aside.

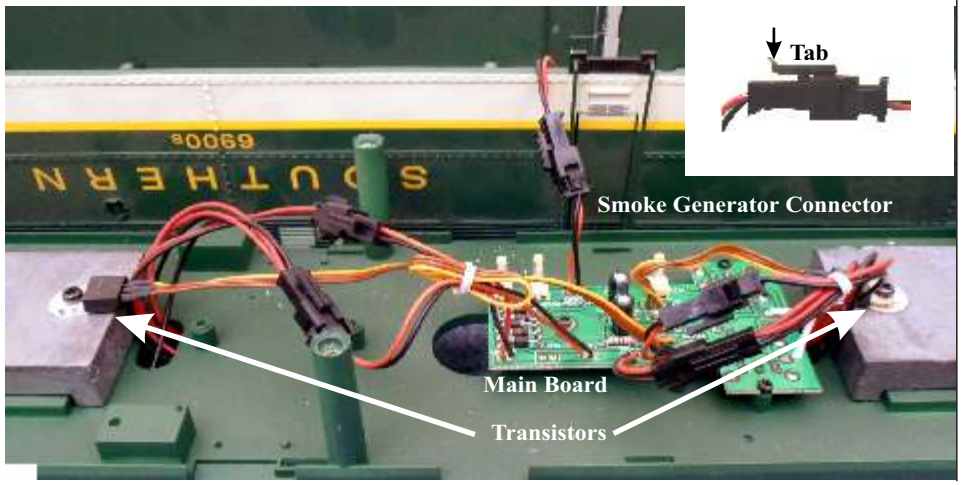
The 10 remaining screws are buried deep into their mounting holes. Use your long shank screwdriver to remove all 10 screws. You will need to swing the trucks and/or wheels to gain access to some of the holes.

The image below shows the chassis with all 10 screw holes numbered from 2 to 12.



Separate Top Shell From Bottom Chassis

First turn the locomotive over with the trucks on the ground. Grasp the top shell and gently pull straight up and then lay it the floor, upside down. The smoke generator cable is very short - don't break it.



USA-Trains Alco PA Drop-In Installation

8. If you have installed the Phoenix sound decoder, push the 2 key and the P8 horn will sound.

This concludes the preliminary checkout. If everything above checks, you are ready to reassembly the locomotive.

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 flashes slowly: 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. While the power is on, use a small screwdriver to rotate the selector left or right. If the GP light turns on steady, then you have found the correct frequency.

Make sure everything checks - you don't want to have to take the locomotive apart more than once.

Closing Up The Locomotive

This will take a few minutes so don't rush - take your time. Start by turning the top shell upside down on your towel Pick up the bottom chassis by the trucks and place it onto the top shell. 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 when the top half is mated to the bottom half. Also push the smoke generator wires towards the rear of the locomotive. Keep all wires away from the antenna. Look on both sides of the locomotive. Make sure you can't see any wires. The antenna is usually the one that escapes.

The chassis 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. 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.

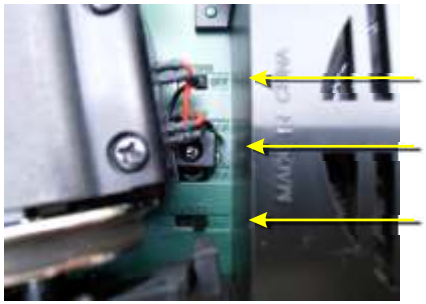
Once the two halves are together, it is time to reinstall all the screws. The first task is to remove the two screws holding the fuel tank. Lift it off enough to insert the two screws into the their mounting holes and tight. To start the screw, first turn it slightly counter-clockwise to get it seated in the threads, then turn it clockwise to tighten. Do not over tighten. Put the fuel tank back in place, insert its screws and then finish the reassembly by installing the remaining screws.

If You Accidentally Break A Wire

If you accidentally break the wire, splice it back together, solder the joint and then cover it with tape or heat-shrink tubing. Never leave wires uninsulated. You risk damaging the decoder and locomotive.

Customization, Settings, Changes, Programming: See Drop-In User Manual

All motion control settings, options and selections as well as changes to the frequency are made from the throttle. The Phoenix P8 settings are changed via the programming interface jack you mounted in the fuel tank. Changing all other locomotive features and settings are covered in detail in the Drop-In User Guide.



Power Switches And Charger Jack

Sound Module Power Switch [shown OFF]

Battery Charger Jack

Drop-In Power Switch [shown OFF]

Slide Switch Actuator Towards Truck = ON

Slide Switch Actuator Towards Fuel Tank = OFF

USA-Trains GP7/9 Drop-In Installation

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 twist ties. These will be used later.

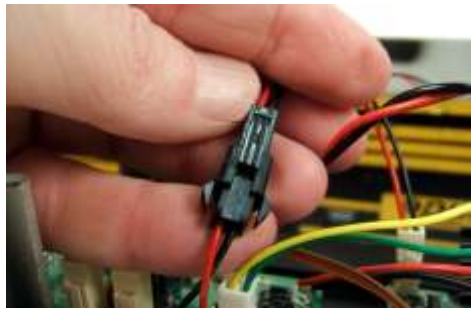
The lighting connectors are relatively robust and are held in place by friction. Grasp the white plug and pull straight up. Do not pull on the wires. The red and white cab wires are relatively small and easily broken. The other wires are somewhat larger but you need to take care not pull the wire out of the plug.

Unplug the smoke generator from the main board. The connection is made with a large black plug and socket. The motor and pickup connections use the same black plug and socket. Press down on the tab to release it. Don't pull on the wires.

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

See below for what to do about the smoke controller board on the floor of the chassis.

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

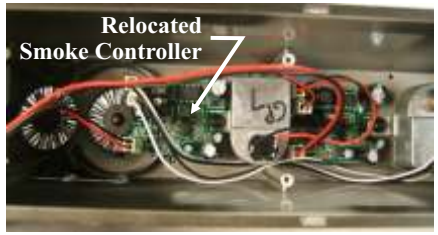


Relocate/Remove The Smoke Generator Board

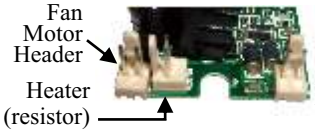
This locomotive has two smoke generators and two controller circuit boards; one controller board in the roof and the other mounted to the chassis floor.

To make room for the sound module, battery and GP7/9 Drop-In decoder, you have a decision to make: get rid of one controller circuit board or mount the extra board in the shell's roof.

The easiest choice is to simply eliminate the controller board mounted on the chassis floor along with its accompanying smoke generator. But if you wish to keep both smoke generators, you need mount the generator board in the roof. We did that to this locomotive.



First remove the smoke generator board from the chassis floor. The two screws are not needed and may be discarded. Next, loosen the left screw holding the roof-mounted smoke unit. Slip the circuit board under the screw and tighten it. Route the wires between the posts and generators to keep them out of the way.



For reference, the smoke generator little fan motor connects to the header labeled "motor" and the other connector (heater) goes to the header labeled resistor.

USA-Trains GP7/9 Drop-In Installation

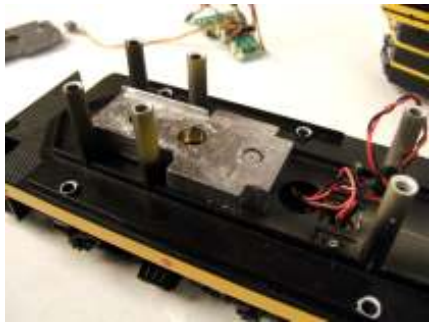
Removing The Font Truck - Optional But Recommended

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. However, it is real easy to nick or break the truck wires so we recommend removing it. It isn't hard.

First remove the weight. You have already removed one screw so there is only one left that holds the weight in place. Go ahead and remove the last screw and remove the weight. Don't lose the screws.

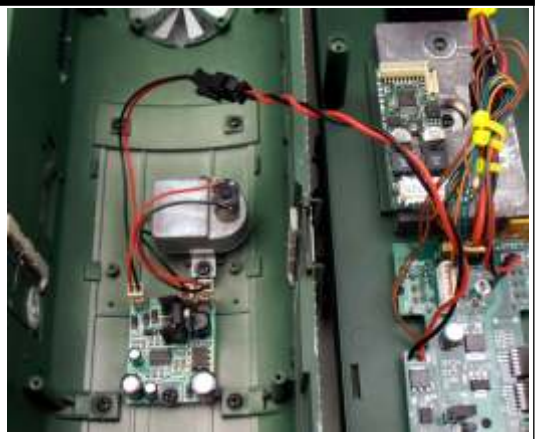
The remaining screw and washer are what hold the truck to the chassis. Remove the screw to free the truck.

Gently pull the truck wire through the chassis hole and set the truck aside.



USA-Trains Alco PA Drop-In Installation

Smoke Generator Hookup

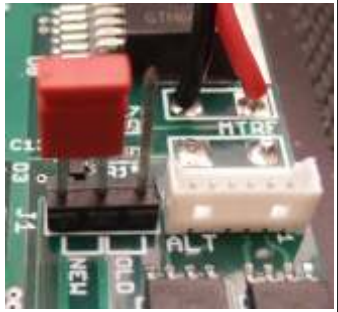


The smoke generator is connected with the cable that comes from the Drop-In board labeled SMOKE.

Connect the two cables together. Use a twist-tie to gather up the excess cable and fasten it to the existing wad of wires near the battery.

Neatness counts. Always arrange the wires to keep them inside and between the mounting posts. Using the tie-wraps or twist-ties helps hold them in place and helps to insure they don't interfere or block the mounting posts when the shell and chassis are rejoined.

J1 Lamp Power Supply Jumper Setting



Make sure the jumper is across the posts labeled "NEW." The PA unit only uses low voltage bulbs.

Warning - If you set the jumper for OLD, you will burn out every bulb in the locomotive.

Tidy The Wiring

Use the left over twist-ties or miniature wire ties (available from hardware stores) to bundle all wires together. Keep all wires away from the antenna as much as possible. Make sure the antenna is pointed vertical relative to the chassis floor.

The next step will be to check the installation and verify correct operation. A T5000 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 and frequency 0.

1. Turn on both power switches on the drop-in. The ON position is when 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 (if installed). 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 and 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. Slowly turn up the throttle until you see the motor attempt to move. Verify that both motors turn in the same direction.

5. Push the 0 key (called Function 0 or F0) to turn on the front headlight, the number boards and front green marker lights. Change directions and confirm the front headlight turns off and the markers turn red. Push F0 to turn off the headlights.

6. Push the F6 key to turn on the cab interior light. Push F6 again to turn it off.

7. Push the * key followed by the 0 key (called Function 10 or F10). You will hear the smoke generator's fan motor turn on. Push * and 0 again (F10) to turn it off. Don't leave it running since there is probably no smoke fluid in it.

If the smoke generator doesn't turn on, check that all of the connectors are attached to the generators. On our locomotive, the connector from the smoke generator to the main board tended to loosen and pop off as we worked at plugging in the other connectors.

USA-Trains Alco PA Drop-In Installation

Lighting Cable Extension

Included with your PA decoder are two lengths of cable with the same type of plug on each end. You need to connect these two cables together to make an extension cable. The extension cable connects between the Drop-In and the front cab lighting board.

Build The Cable

If you want to be extra neat, you can shorten the wires. However, since the cable takes a circuitous route to exit the cab without fouling any mounting posts, it's best not to trim it.

Stip back the insulation about 1/2 inch from each wire end. Twist the strands together and tin each end with solder. Solder the red wire from one plug to the red wire of the other plug. Insulate the solder joint with heatshrink or plastic tape. Join the two black wires in the same way. Make sure no bare wire is visible.

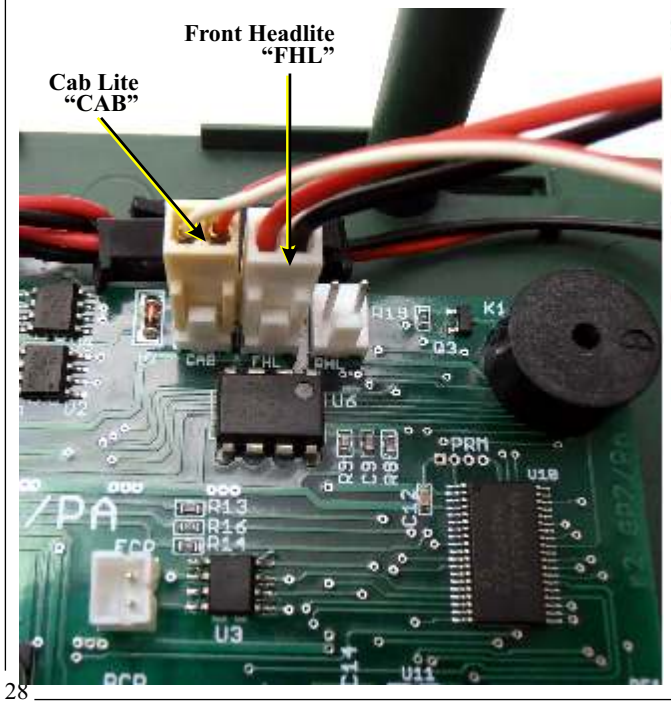
Attach Lighting Extension Cable

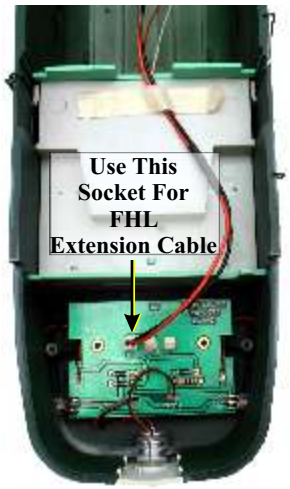
Move the shell near the chassis and orient it so the cab is aligned with the front of the chassis.

The lighting extension cable must follow a specific route up into the nose or there is risk of interference between the wire and the shell and chassis. Notice the notch in the edge of the green plastic cab wall. This is where the wire must go. It exits out the back of the cab floor in the middle notch. There is a piece of masking tape to hold the other wires and can be used to keep the new wire in place. Unplug the red/white wires which go to the interior cab light.

Plug in the extension cable to the left most socket on the cab's circuit board. This insures the correct lights will be on when the loco is moving forward. The other two sockets are unused.

Connect the other end of the lighting cable to the FHL header on the Drop-In decoder.





After unplugging the red/white plug from the nose circuit board, plug it into the CAB header on the Drop-In. This provides for independent control of the cab interior lighting.

Most lighting options are in the Drop-In User Guide.

USA-Trains GP7/9 Drop-In Installation

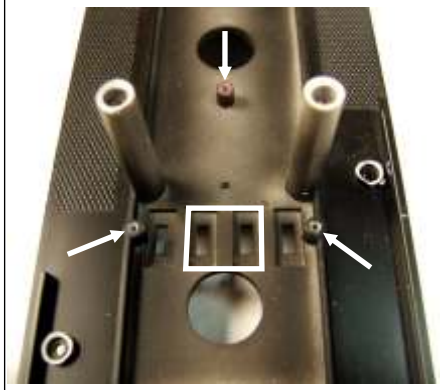
Enlarge Switch Opening In Chassis Floor

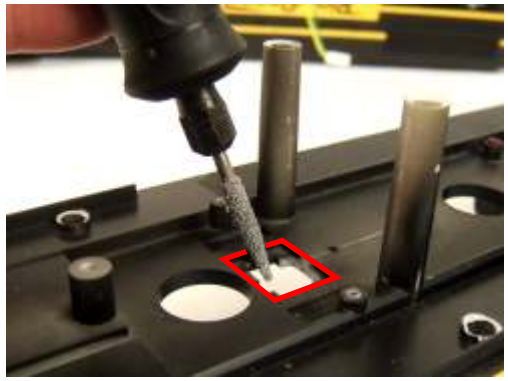
Look at the bottom of the Drop-In board. Note the two switches and jack. The switches fit the outside switch holes in the locomotive floor. However, the area for the charging jack needs to be enlarged.

In the picture to the left, the area to be enlarged is outlined by a white box. Use a hobby knife or motor tool with an abrasive or routing bit to enlarge this area so the jack simply drops through. The jack must not bind. Temporarily mount the Drop-In board when the hole is complete. It must fit flush to the mounting posts (white arrows) and the jack must not bind in the opening. When you get a good fit, remove the Drop-In, clean away the debris and proceed on to the next step.

Reattach Front Truck and Front Weight

With the hole enlarged, you can now reattach the front truck. Feed the wires through the hole in the chassis floor. Do not forget the washer when attaching the truck. Once the truck is mounted, go ahead and reattach the weight.





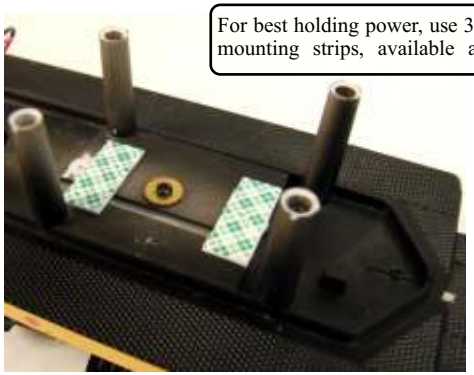
Battery Mounting

This installation makes use of CVP's BATT2 Lithium battery pack. The small size makes for a simple installation and the 6.8Ah capacity provides hours of operation.

The battery replaces the rear weight. The two plastic posts that were holding the weight must be trimmed flush to the floor. Use a pair of flush-cutting wire cutters or your motor tool. Smooth the area flush to the floor. For added strength and stability when transporting the locomotive, we attached a plastic tie-wrap to the floor and fastened it around the battery.

The battery is mounted over the rear truck on layers of double stick foam tape. The battery must not touch the truck mounting screw. Apply several layers of tape so the battery clears the truck mounting screw. Before permanently mounting the battery, verify the truck screw is not rubbing on the bottom of the battery. Mount the battery between the posts onto the tape and press down firmly.

For best holding power, use 3M's "Extremely Strong" mounting strips, available at office supply stores.



USA-Trains GP7/9 Drop-In Installation

In 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 front 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 P8 programming cable. 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 include a two wire plug pre-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 silicone 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.

USA-Trains Alco PA Drop-In Installation

Mount PA-B Drop-In Decoder

Before mounting the Drop-In decoder, verify that both power switches are off. The actuators will be towards the cab when off. 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. Verify the pair of brown wires from the speaker are clear of the mounting posts, switches and charger jack. Make sure the speaker and programming wires exit from under the Drop-In board and head towards the P8 module. You can see them exiting from the side of the Drop-In board in the pictures. Use the 3 screws from the old circuit board to mount the Drop-In.

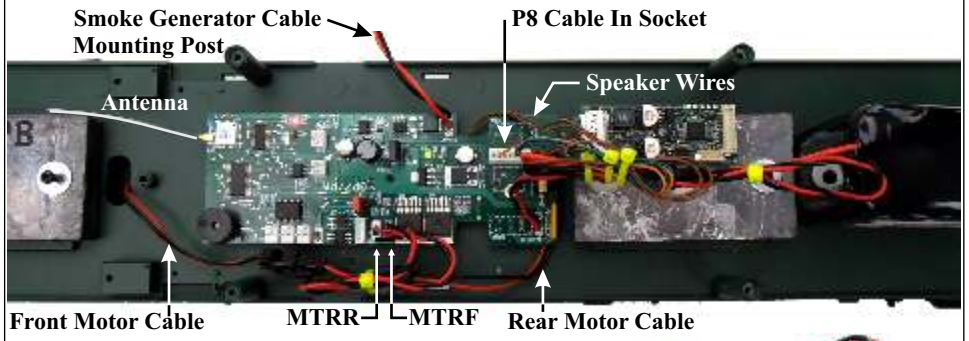
The next set of steps involve making connections. There will be a wad of wires and connectors near the battery. As you plug in cables, move the wires towards the center of the locomotive. Make sure all wires are between the tall mounting tubes.

Plug In Motor Connectors and Batter

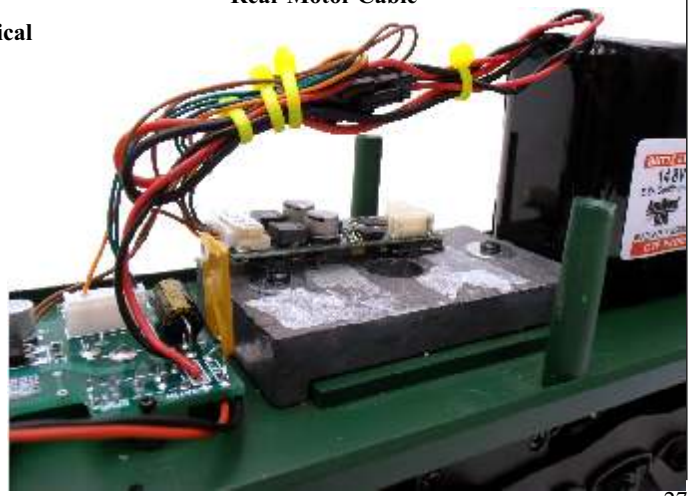
Because the Drop-In is mounted with the switches toward the rear of the chassis, the motor connections must be reversed. Find the Drop-In motor connector cable MTRR. Connect it to the locomotive front motor. Connect the other Drop-In motor connector, MTRF, to the rear locomotive motor. Connect the battery to the battery input cable. Don't confuse the battery connector with a motor connector.

Plug In P8 Cables and Connect Speaker

Start with the white connector from the P8 board. The P8 decoder cable, supplied by Phoenix, plugs into this socket, The other end has two plugs, one for the speaker and one that goes to the Drop-In decoder. Plug both in. Use twist-ties or tie-wraps to group wires together. Keep all wires between the chassis mounting posts



Bend Antenna Wire Vertical



USA-Trains Alco PA Drop-In Installation

Speaker Mounting

Newer speakers from Phoenix include a two wire plug pre-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 silicone 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.

Reattach Fuel Tank

Push the speaker and programming plugs through the hole in the floor above the fuel tank. Reattach the fuel tank to the chassis. Keep the wires away from the speaker cone.

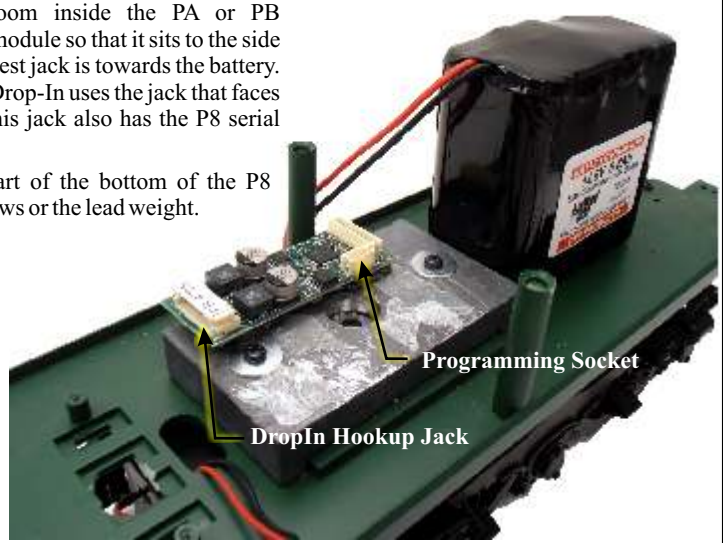
Mount The P8 Sound Module

The P8 is mounted on top of the rear weight. Use double-sided foam tape. For best results use the 3M "Extremely Strong" mounting tape

There is plenty of room inside the PA or PB locomotive. Orient the module so that it sits to the side of the screws. The smallest jack is towards the battery. The connections to the Drop-In uses the jack that faces towards the speaker. This jack also has the P8 serial number marked on it.

DO NOT allow any part of the bottom of the P8 module to touch the screws or the lead weight.

Do not hookup the connector plugs to the P8. These will be attached later, after the Drop-In is installed.



USA-Trains GP7/9 Drop-In Installation

Reattach Fuel Tank

Push the speaker and programming plugs through the hole in the floor above the fuel tank. Reattach the fuel tank to the chassis.

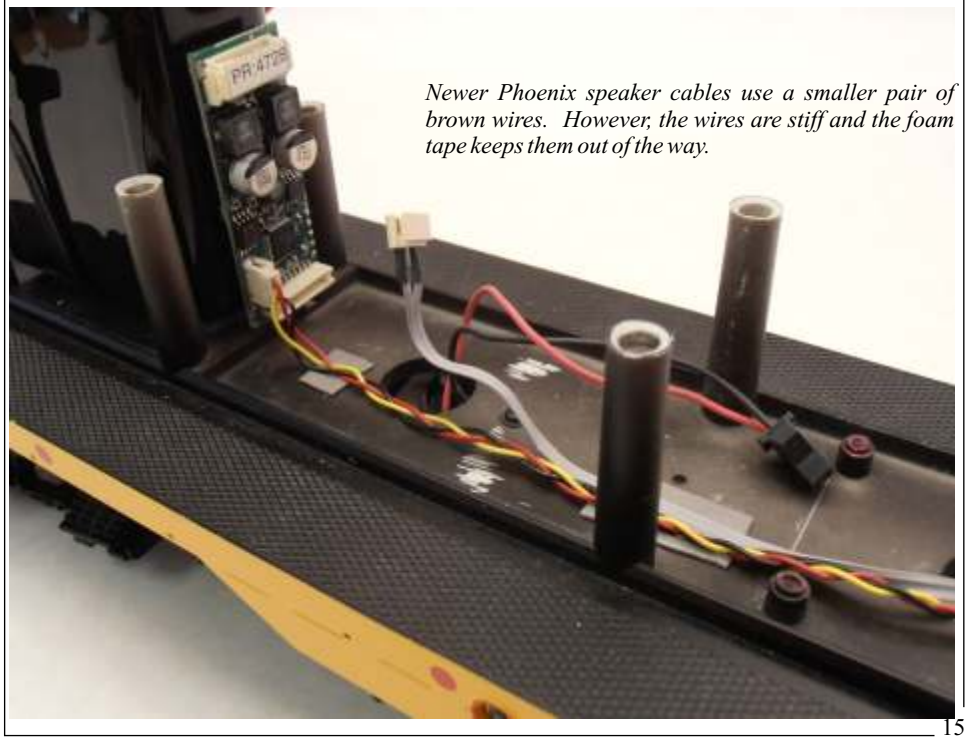
Mount The P8 Sound Module

The P8 is small and is attached to the side of the battery with foam tape. The bottom of the P8 is uneven. Turn over the P8 and place a small piece of double-sided foam tape in the area shown. Then add one more strip across the entire unit. Orient the module as shown with the programming socket towards the floor.

Plug in the 6-wire P8 Cable to P8 Header and Speaker

This Phoenix supplied cable plugs into the right angle connector on the P8 and connects to the speaker. The other end has two connectors - one for the speaker and one for the Drop-In decoder. Go ahead and plug in the speaker.

The P8 cable is stiff and will not stay put so use a piece of foam tape to hold the P8 wires to the floor. The picture below shows a small piece of the gray "Extremely Strong" tape holding the programming plug cable in place and a longer piece holding both the speaker cable and the programming cable near the mounting post



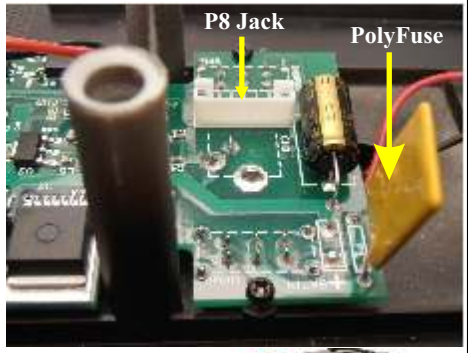
Newer Phoenix speaker cables use a smaller pair of brown wires. However, the wires are stiff and the foam tape keeps them out of the way.

USA-Trains GP7/9 Drop-In Installation

Mount GP7/9 Drop-In

Before mounting the Drop-In decoder, verify that both power switches are off. The actuators will be towards the fuel tank when off. Route the BATIN connector around and two the inside of the power switch. This keeps it from fouling the mounting posts. Bend the yellow Polyfuse vertical to expose the mounting hole. Label the BATIN connector to distinguish it from the rear motor connector. The two connectors are the same but they must never be reversed or you will damage the decoder.

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 the rear motor connector and battery connector come out from under the board and are clear of the mounting posts. Use the 3 screws from the original circuit board to mount the Drop-In.



The yellow Polyfuse is no longer needed and has been removed from the Drop-In board. In its place is a solid wire.

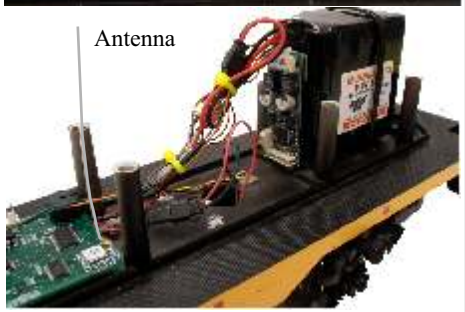
Connect the P8 Cable To P8 Jack

Connect the white connector with the attached speaker wires to the P8 sound module. Connect the other end to the P8 jack on the Drop-In. Both connectors are polarized - they only fit one way.

Plug In Front & Rear Motor and Battery Pack

Plug in the front and rear motor connectors. The motor wires exiting out the top of the board are for the front motor connector. The two wires exiting the bottom are for the rear motor connector and the battery.

The shorter wire goes to the rear motor. The longer wire goes to the battery pack. Do not accidentally reverse them or you will damage the decoder.



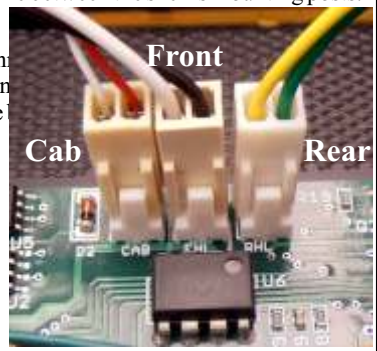
An optional antenna extension cable is available to allow the whip antenna to be moved 14 inches away from the RF module. It snaps onto the antenna and RF module. No soldering required.

Neatness Counts

There will be a wad of wires and connectors near the battery. The unused track pickup connector will also be there if it hasn't been removed. Tidy up the area using a bit of tape, plastic tie-wraps or with twist ties. We used small yellow twist ties. Make sure all wires lie between the shell's mounting posts.

Bend and Orient Radio Antenna Vertical

Bend the antenna wire vertical at its connector. Keep the antenn be tempting to attach it to the nearby mounting post, the antenn the shell is mated to the chassis. It is best to keep in towards the



Shell Lighting Connectors and Smoke Generator

Move the shell near the chassis and orient it so the cab is aligned with the front of the chassis. Plug in the three lamp connectors into their appropriate header sockets. The smoke generator is connected with the last remaining plug from the Drop-In. All connectors are polarized and only fit one orientation. Make all are pushed all the way down onto the header's pins.

USA-Trains Alco PA Drop-In Installation

Battery Mounting

This installation makes use of the CVP Products BATT2 14.8V Lithium battery pack. The small size yet high power capacity makes for a simple installation and lots of running time. The best place for it is the area just behind the rear weight.

Make sure the battery is oriented with the wires facing towards the locomotive center.

Using double-side foam tape, mount the battery in the center of the chassis and inline with the weight.

The rear pickup wires and black plug have been removed in this installation.

Phoenix P8 Programming Jack Mounting

Phoenix P8 Programming Jack Installation

The Phoenix P8 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. First, remove and discard the nut - the wall is to thick.

Programming Jack Location

There is insufficient space to put the programming jack on either end of the tank and allow the programming plug to fit. For the PA, the best location is on the side of the fuel tank. The selected spot is the fuel tank inlet. The jack's small brass colored ring makes appear as if it is part of the fuel tank. If you don't like the brass color, use a black permanent marker to color the brass ring. It will nearly be invisible.

Drill The Hole and Mount The Jack

The picture shows this jack mounted at the end of the tank at the position of the fuel inlet. Drill a a 5/16 inch hole for the jack. Remove any burrs from around the hole.

Push the small plug and wire through the fuel tank hole. Use either epoxy or hot-melt glue to permanently mount the jack.

USA-Trains Alco PA Drop-In Installation

Remove The Rear Truck

The rear truck and the connecting wires are in the way of the work that needs to be done to enlarge the switch holes in the bottom of the chassis.

This is a 6 wheel truck with the back wheel set attached to a metal guide frame. The 4 screws holding the frame to the chassis must be removed first before removing the truck mounting screw. Rotate the wheels to expose the frame's screws and remove them.

Turn the locomotive right side up. Remove the screw and washer holding the truck to the chassis.

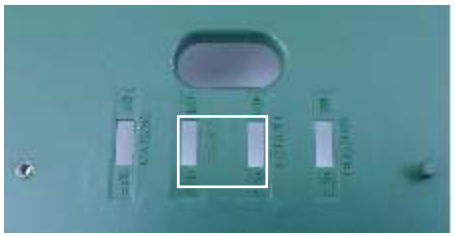
Gently pull the truck wire through the chassis hole and set the truck aside.

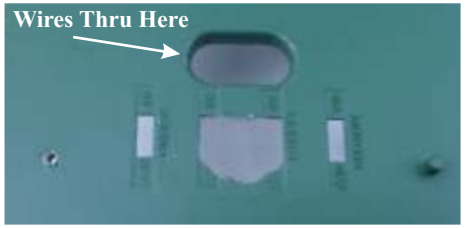
Enlarge Switch Opening In Chassis Floor

Look at the bottom of the Drop-In board. Note the two switches and 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 picture to the left, the area to be enlarged is outlined by a white box. Working from the bottom side of the chassis, use a hobby knife or motor tool with an abrasive or routing bit to enlarge this area so the jack simply drops through. The jack must not bind. Nobody can see the hole so neatness doesn't count.

Turn the chassis right side up and temporarily mount the Drop-In board. The boad must fit flush to the mounting posts and the jack must not bind in the opening. When you get a good fit, remove the Drop-In, clean away the debris and proceed on to the next step.





Reattach Rear Truck

With the hole enlarged, you can now reattach the rear truck. Feed the wires through the hole in the chassis floor. Don't use the new hole for the wires! Do not forget the washer when attaching the truck. Check that the truck can turn freely and doesn't bind.

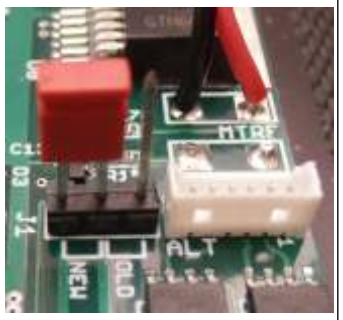
Using a Remote Charger Jack

If you wish to mount the charger jack in a different location, perhaps on top or side of the locomotive, you will need to purchase a separate charger jack and connect it to the Drop-In. See the bottom of page 21 for details.

You should also download the application note from the cvpusa.com website (documentation center) that has more information on the use of a remote charger jack.

USA-Trains GP7/9 Drop-In Installation

J1 Lamp Power Supply Jumper Setting



First generation production models of the GP7/9 used 18 volt light bulbs for all lighting. Second generation production models used lower voltage lights. As delivered from CVP, the jumper is set of the newer locomotives so the lights only received about 3 volts. If your locomotive is older and uses the higher voltage bulbs, move the jumper to the "OLD" setting which drives the bulbs with battery voltage.

Warning - If you set the jumper for OLD, and your locomotive actually is a newer model that uses low voltage bulbs, you will burn out every bulb in the locomotive. If unsure leave the jumper set for NEW.

Tidy The Wiring

Use the left over twist-ties or miniature wire ties (available from hardware stores) to bundle all wires together. Keep all wires away from the antenna as much as possible. Make sure the antenna is pointed vertical relative to the chassis floor.

The next step will be to check the installation and verify correct operation. A T5000 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 and frequency 0.

1. Turn on both power switches on the drop-in. The ON position is when 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 (if installed). 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 and 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. Slowly turn up the throttle until you see the motor attempt to move. Verify that both motors turn in the same direction.

5. Push the 0 key (called Function 0 or F0) to turn on the front headlight, the number boards and front green marker lights.The rear red marker lights will also be on but the rear headlight will be off. Change directions and confirm the rear headlight and rear green markers turn on. Push F0 to turn off the headlights.

6. Push the F6 key to turn on the cab interior light. Push F6 again to turn it off.

7. Push the * key followed by the 0 key (called Function 10 or F10). You will hear the smoke generator's fan motor turn on. Push * and 0 again (F10) to turn it off. Don't leave it running since there is probably no smoke fluid in it.

If the smoke generator doesn't turn on, check that all of the connectors are attached to the generators. On our locomotive, the connector from the smoke generator to the main board tended to loosen and pop off as we worked at plugging in the other connectors.

8. If you have installed the Phoenix sound decoder, push the 2 key and the P8 horn will sound.

This concludes the preliminary checkout. If everything above checks, you are ready to reassembly the locomotive.

Customization, Settings, Changes, Programming: See Drop-In User Manual

All motion control settings, options and selections as well as changes to the frequency are made from the throttle. The Phoenix P8 settings are changed via the programming interface jack you mounted in the fuel tank. Changing all other locomotive features and settings are covered in detail in the Drop-In User Guide.

USA-Trains GP7/9 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 the throttle frequency doesn't match the locomotive frequency. .

Make sure everything checks - you don't want to have to take the locomotive apart more than once.

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 all wires are INSIDE the mounting posts. Don't allow a wire to fall on the outside of the post or you risk pinching it when the top half is mated to the bottom half. Also push the smoke generator wires towards the rear of the locomotive. Keep them away from the antenna. Look on both sides of the locomotive. Make sure you can't see any wires. The antenna is usually the one that escapes. Some strategically placed scotch tape can help keep wires in place.

The top shell 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.

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.

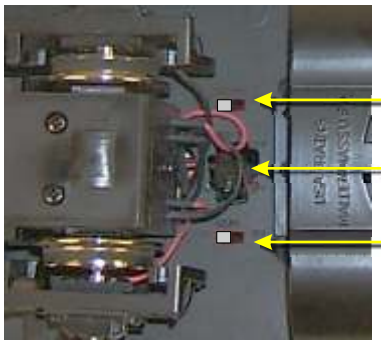
Once the two halves are together, turn the locomotive upside down. Once again check for alignment of the two halves. Install the two chassis screws that are hidden by the fuel tank. To start the screw, first turn it slightly counter-clockwise to get it seated in the threads, then turn it clockwise to tighten. Do not over tighten. Finish the reassembly by installing the remaining screws. Don't forget to reattach the roof details.

Here's a hint - leave out the screws hidden by the front truck - they aren't really needed.

If You Accidentally Break A Wire

If you accidentally break the wire, splice it back together, solder the joint and then cover it with tape or heat-shrink tubing. Never leave wires uninsulated. You risk damaging the decoder and locomotive.

Be very careful with the antenna. If it is cut by a mounting screw, you'll get poor reception and it will have to be replaced.



Power Switches And Charger Jack

Drop-In Power Switch [shown ON]

Battery Charger Jack

Phoenix P8 Module Power Switch [shown ON]

Slide Switch Actuator Towards Truck = ON

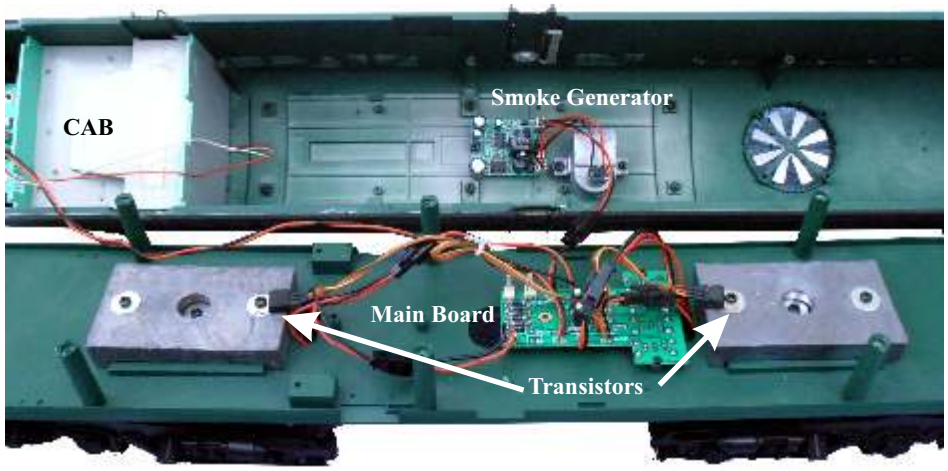
Slide Switch Actuator Towards Fuel Tank = OFF

USA-Trains Alco PA Drop-In Installation

Separating the Top Shell and Bottom Chassis

Make sure you use the towel so as not to break the top shell detail. While the unit is on its wheels, grab the top shell at each end and gently pull straight up. Lift the shell off the chassis. If it doesn't easily separate, you may have missed a screw.

Lay the shell down next to the top portion. Take care not to pull any wires loose. In our unit, the smoke generator wiring was tight and the top shell could not lie directly on its back.

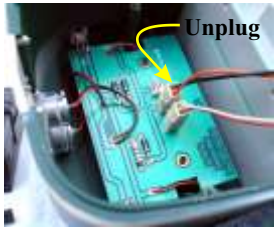


Unscrew Transistors From Front and Rear Weights

There are two transistors each mounted to one of the lead weights. Remove the screws and the washers to separate these devices from the weights. Reinstall the screw and washers after removing the transistors.

Unplug All Connectors and Remove The PA Main Board

Unplug all the connectors from the main board. Unplug the smoke generator, motor and pickup wires from the main board. The connections are made with a large black plugs and sockets. Press down on the tab to release it. Don't pull on the wires.



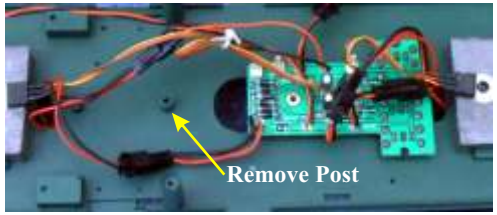
Unplug the cable that goes from the main board to the cab. Grasp the white plug with the red and black wires pull straight up. The other plug connects the cab interior light which remains.

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

Set the top shell aside. It won't be needed until it is time to reassemble the locomotive.

Trim The Unneeded Mounting Post

Use a pair of wire cutters to cut and remove the mounting post shown in the picture. It is not needed and interferes with the mounting of the Drop-In decoder which will be done later.



You can remove and discard the track sliders since they are no longer required

Side Steps and Hand Rails

The front cab an rear hand rails are press fit into the steps and the top portion of the chassis. The steps are on the chassis bottom and the handrails are on the top shell. The handrails must be disconnected from the steps to avoid damaging them.

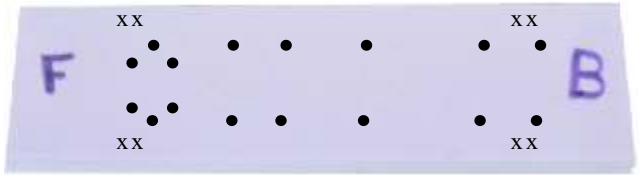
Gently pull on the metal hand rails to remove them from the step. It's best to leave them attached to the top portion of the chassis. Needle-nose pliers are helpful although you should put some electrical tape over the teeth to protect the paint.

The 4 sets of steps, 2 at each end, are held to the chassis by two sets of screws. These don't have to be removed although they are somewhat vulnerable when working with the chassis in subsequent steps. We removed them since they were easy to get to.

The side doors and handrails are part of the top chassis and do not have to be removed. They don't connect to the bottom chassis.

Check Your Screw Count - 16 Total Screws

With all screws now removed, take a moment and compare your count and foam board holder to the one below. Not counting the step's screws (shown as x), the total count is 16. If your count is different, you've missed some. Go back and find the missing screws and remove them. If all screws are not removed, the top shell and bottom chassis can not be separated.



USA-Trains Alco PA Drop-In Installation

USA-Trains Alco PA Locomotive Drop-In™ Decoder Installation Guide

AirWire® 900

USA-Trains Alco PA Drop-In Installation

Warning: Many parts of the shell and chassis are fragile and easily break. Especially vulnerable are the steps, doors, side-frame assemblies, and railings. If possible, pull up and remove both of the horn assemblies. However, if they resist and appear glued, stop and just be careful not to break them.




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.

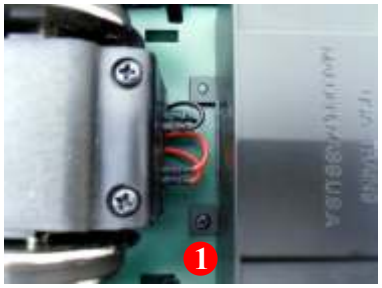
Total Mounting Screw Count is 16

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

Remove Fuel Tank - 2 Screws

The 2 screws are number below and the red circles are where you will find the screws. Remove the 2 screws, lift off the tank and set it aside for now.

Take care not to break the small posts that center the fuel tank in the chassis.

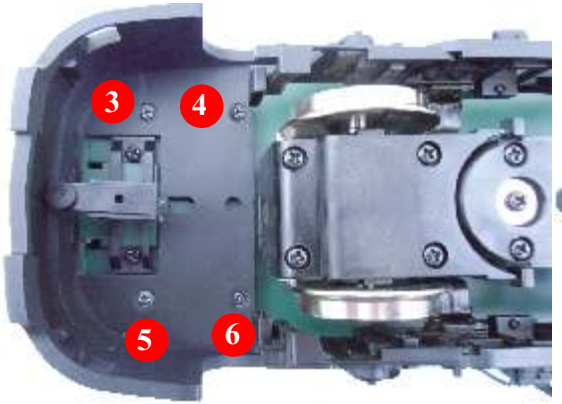


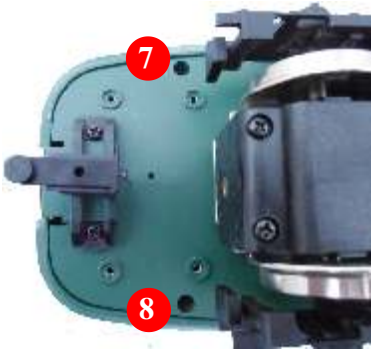
USA-Trains Alco PA Drop-In Installation

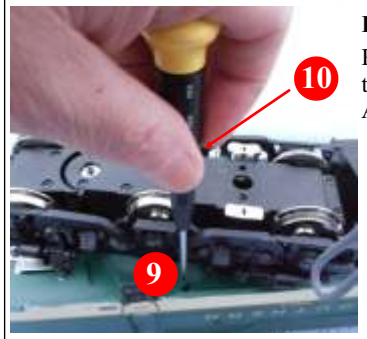
Nose and Pilot/Coupler Area - 6 Screws

Remove the 4 screws holding the front pilot and coupler plate cover. It snaps off once the 4 screws are removed. The front coupler mounting post does not need to be removed.

With the pilot removed, there are two main chassis mounting screws exposed. These two screws are located in the deep hollow tubes and you will need the long, thin-shafted screw driver. As each screw is removed, place it into the foam block.





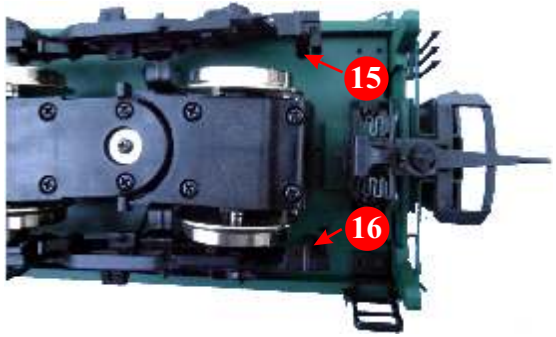


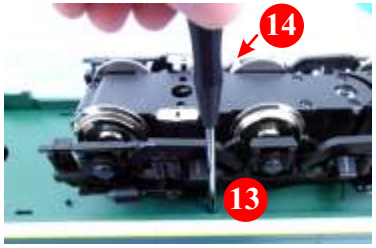
Front Truck And Under Fuel Tank - 4 Screws

Rotate the front truck to expose the holes on either side of the truck. There are 2 screws located in the deep pockets shown. Also remove the two screws that are under the fuel tank.

Rear Truck Area- 4 Screws

Straighten the rear truck and insert the screwdriver into the hole shown and remove the screw. Remove the screw on the other side of the truck using the same technique.





To get to the last two screws, rotate the rear wheels and frame to expose the two holes.

Make a count of the screws. There should be a total of 16.