BigSound™ P8 Handbook

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Introduction

Dear Model Railroading Friends,

    Thank you for choosing Phoenix Sound Systems to fill your railroad with sound. The P8 board is designed for applications with a constant power source - DCC, constant track power, on board batteries or stationary installations.

    The P8 system, like all of our systems since the 2K2, can be loaded and customized using a PC. You will need to upgrade your PC software to version 1.2.73 and ROM library to version R7 or newer in order to load and save P8 compatible files.

    We know you're eager to do some listening, so continue through the initial checkout. The Phoenix BigSound™ P8 board comes with high input voltage tolerances to keep pace with todays larger trains and bigger power supplies. The board is highly protected against improper wiring and over-voltage gremlins. However, if you notice static electric sparks when you touch things you should ground yourself by touching something conductive before handling your board. Also be careful not to lay the board on metal surfaces or model parts when powered. Basic electrical component handling care is always a good idea.

Happy Listening!

Getting Acquainted

One of the ideas behind the P8 system is to tailor the system to your needs to avoid unnecessary expense. The P8 Basic system includes the sound board (pictured below) and basic connectors. We also offer the P8 as a kit which includes the sound board with a speaker and any connectors appropriate to the locomotive.

There are 3 connectors on the P8 board. The chart on the following page shows the pin out for each. This chart also details the length and coloring of the wire leads if you order the generic plugs.

The Sound Board & Connectors
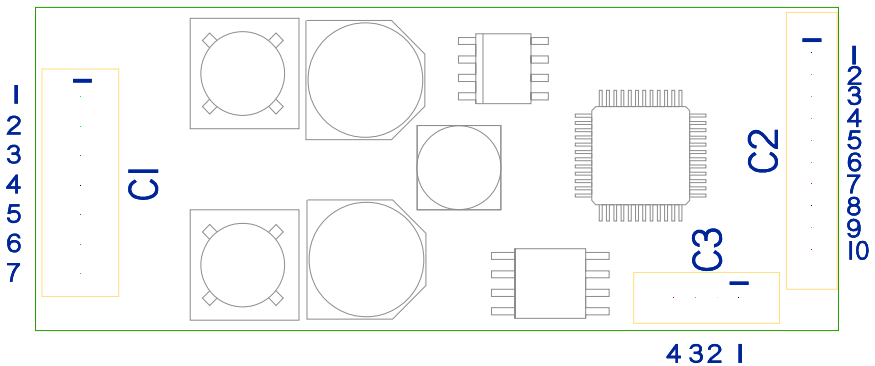
Differences from the P5

The P8 uses the same connectors as the P5. However it is not directly plug in compatible. Plugging a P8 into a P5 hookup will not cause damage, it just won't work quite right.

The main difference is that the P8 does not combine speed and power on pins C1:1 and C1:2 as the P5 does. Other changes were to move the expansion signal connections (for the P5T) to C3, as it is on the PB9, and redefine those pins on C2 as trigger inputs.

See the chart on the next page for complete details of the P8 pin out.

Connector Pin Out Chart

Connector: Pin	Purpose	Color	Termination
C1:1	Power	Green	Bare
C1:2	Power	Green	Bare
C1:3	Speaker	Brown	SPOX-3
C1:4	Ground	-	–
C1:5	Speaker	Brown	SPOX-3
C1:6	Speed (DCC or M+)	Orange	Bare
C1:7	Speed (DCC or M-)	Gray	Bare
C2:1	Trigger Ground	Blue	Bare*
C2:2	Trigger1	Orange	Bare*
C2:3	Trigger 2	White	Bare*
C2:4	Trigger 3	Brown	Bare*
C2:5	Trigger 4	Yellow	Bare*
C2:6	Trigger 5	Violet	Bare*
C2:7	+5V Expansion	Red	Bare*
C2:8	Ground	Black	Volume Switch
C2:9	Volume Level	Yellow	Volume Switch
C2:10	Volume +5V	Red	Volume Switch
C3:1	Ground	Black	Jack
C3:2	CAN Data	White	–
C3:3	Serial Data	Yellow	Jack
C3:4	+5V	Red	Jack

- These connections can terminate in either nothing, bare wire or reed switches, depending upon the type of engine the unit is ordered for.

Initial Checkout

The Basic Bench Test

Each system is tested before shipping but we recommend that you hook things up on your workbench, play with the system and get comfortable with the components before installation.

The speaker and power supply connect to C1. The speaker connects to the speaker jack (brown wires). Hook your bench power supply to the power wires and the speed wires. A power source of any polarity is acceptable. The maximum peak input voltage is 30 volts. If you are using a volume switch plug it into C2. This connector can only be inserted in one direction, so if you wired your own following the pin out chart on page 5 or are using one we supplied, it should work correctly.

When the power rises above 9 volts you should hear sound. If you are using our volume switch, raise and lower the volume. Steam systems will play idle sounds; diesel units will rev up.
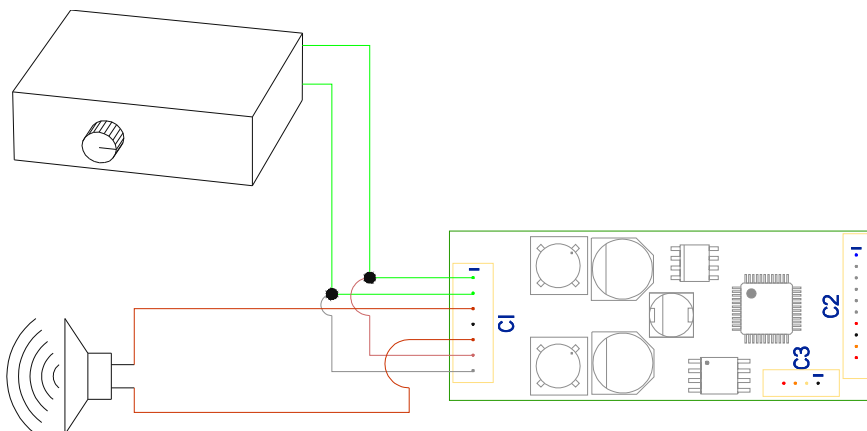
IF YOU ONLY CONNECT POWER TO C1:1 & C1:2 AND DO NOT FEED ANYTHING TO THE SPEED PINS (C1:6, C1:7) YOU WILL NOT GET ANY SOUND. PLEASE KEEP THIS IN MIND AS YOU TEST AND INSTALL THE SYSTEM.

Reed Switch Speed Checkout

STEAM UNITS ARE FACTORY SET FOR SPEED FROM TRIGGERS. DIESELS ARE SET FOR SPEED FROM INPUTS C1:6 & C1:7 (MOTOR VOLTAGE / DCC) BY DEFAULT.

If you will be using a reed switch and magnets to sense speed, you may wish to hook them up and experiment with the magnets to get an idea of the sensitivity of the reed switches. This will help you decide how to mount them in the locomotive or car. Whenever the speed trigger (C2:2) is connected to the trigger ground (C2:1) the system sees motion. The first closure should play the start toots and the starting bell.

Trigger Checkout

If you will be using reed switches and track magnets or other triggers, such as non-DCC remote control receiver outputs or Hall Effect devices, to trigger sounds you may wish to test them out before final installation. If you will be using reed switches you can use the same methods as for the Speed Reed above. If you are using RC outputs, connect them as per the appropriate wiring diagram and test their response for range and reliability. The chart below shows the default trigger terminal assignments.

Default Trigger Assignments

C2 Pin	Diesel	Steam
1	Trigger Ground	Trigger Ground
2	*None*	Chuff
3	Manual Horn	Whistle
4	Bell	Bell
5	Defect Detectors	Blowdown
6	Station Announcement	Station Announcement
7	*+5V (100mA) for Hall Effect Device or similar*	

DCC

DCC Checkout

Connect both the Power and Speed wire sets to the track pick ups of your locomotive. The sound board default address is 3. Select 3 on your DCC controller. Turn the speed up and down. Sounds should play in coordination with the changing speed commands. Test the function buttons. The default function button assignments are in the chart below.

DCC Function Defaults

Address: 3

Function	Diesel	Steam
F1	Bell	Bell
F2	Manual Horn	Manual Whistle
F3	Coupler Clank	Coupler Clank
F4	Crossing Horn	Crossing Whistle
F5	Defect Detectors	Coal Loading
F6	Rev Up	Water Fill
F7	Volume Up	Volume Up
F8	Volume Down	Volume Down
F9	Rev Down	Blow Down
F10	Station Announcement	Station Announcement
F11	Brake Screech	*<none>*
F12	Shutdown	Shutdown

STEAM LOCOMOTIVES WILL REMAIN IN IDLE UNLESS SET FOR SPEED FROM DCC RATHER THAN SPEED FROM TRIGGERS. SEE THE SECTION ON DCC CVS TO CONFIGURE STEAM TO USE THE DCC THROTTLE FOR SPEED RATHER THAN TRIGGERS SUCH AS A REED SWITCH.

Control Variables (DCC CV)

P8 firmware supports the following Control Variables. These can be programmed on the program track or using service mode programming.

OPS MODE ("PROGRAMMING ON THE MAIN") IS NOT RECOMMENDED FOR ADDRESS CHANGE COMMANDS.

CV	Description	Default Value
1	Short Address	3
17	Long Address	0
18	Long Address	3
49	0 = Speed from Triggers; $\neq 0$, speed from DCC	0
50	The DCC Value where motion starts.	2
51	The DCC Rate (Speed vs. Throttle)	100
52	Seconds to simulate DCC if DCC signal is lost. 0 = Forever	0
53	Seconds in idle before shutdown. 0 = Never shutdown	0

Standard Sounds and Effects

Most sounds play automatically based on train speed. Many sounds can also be set to play using designated trigger inputs. The following section describes the standard sound system configuration.

All Systems

Whistle/Horn: Toots when starting (2 forward, 3 reverse) and stopping (one toot). Crossing whistle sequence plays when you reach the Whistle/Horn play speed. You must slow down to at least 75% of the play speed in order to have it play again when you speed back up.

Bell: Plays when you first start moving and just before stopping. You must reach twice the bell stopping speed in order to replay the bell when stopping. The bell will not replay unless 35 seconds have elapsed since the last time it played.

Coupler Clank: Plays when you come to a stop in reverse; will not replay until you go forward and back up again.

Brake Screech: Plays just before stopping.

Diesel Systems

Air Pop: Plays periodically during idle.

Brake Release: Plays as the engine starts moving.

Steam Systems

Blow Down: A longer and more vigorous steam release that clears the flues. Plays as you slow down.

Steam Release: Plays after you come to a stop.

Generator: Basically runs all the time but the engineer will shut it down if the engine sits in idle for awhile. Comes back on when voltage approaches the start voltage.

Air-Pump: Plays in idle to maintain air pressure.

Air-Pump 2: A sustained compressor run that restores air pressure after it's been depleted.

Rod clank: Plays at slow speed

Hiss: Plays at low speed, clears the cylinders of excess water.

Coal Shoveling: Plays periodically while engine sits at idle. Not enabled on wood and oil burning locomotives.

Triggered Sounds and Effects

The P8 board has five trigger inputs. The Auxiliary Input Board [P5T] allows you to trigger additional sounds using reed switches or outputs from remote control receivers. The following section describes sounds which may be assigned to triggers or DCC functions. Of course, any sound can be assigned to a trigger. See the tables on pages 7 and 22 for factory default trigger and DCC Function assignments.

All Systems

Tunnel Fade: This trigger causes the volume to fade down to a lower setting. When the input is triggered again, the volume will come back to the prefade setting.

Doppler: In diesel, when you trigger this input, the next time the crossing horn plays it will go thorough the pitch shift that you hear as a train is speeding toward and then away from you. Doppler is speed sensitive. In steam, triggering this effect will cause the pitch of the chuff to shift as the engine approaches and a second triggering will cause the pitch to shift back to normal.

Working/Drifting: An effect that makes the locomotive sound like it is struggling with a heavy train or coasting into a station.

Diesel Only

Dynamic Brake: A triggered only sound. It is almost a tone which results from using diesel drive motors as generators.

Rev Up/Down: Causes the prime mover sound to go to the next/previous rev. The sound will return to the corresponding rev based upon speed changes.

Steam Only

Water Fill: Plays 10 seconds after trigger unless set to manual.

Coal Loading: Plays 10 seconds after trigger unless set to manual.

Mallet Mode: Plays a second set of chuffs, moving in and out of phase with the main chuff.

**Second Chuff Trigger:** Plays chuffs independently of the main chuff trigger.

Installation Guidelines

Speaker – Use the largest speaker that can reasonably fit your available space. For best acoustics the speaker should be sealed to the floor so that sound going out the front of the speaker is isolated from the back side.

Volume Switch and Access Jack – Unobtrusive but accessible. Typically in the floor of tenders and boxcars and on the fuel tanks of diesels. Many models have removable pieces, doors, etc. where you can mount these. Volume switch: ¼" hole; Jack: 9/32" hole.

Mounting the Sound Board – Make sure that the sound board will not touch anything metal. Use the foam tape provided; many modelers prefer hook and loop tape. We strongly advise against the use of Hot Melt glue to mount the sound board.

Reed Switches – If you use track magnets and reed switches to trigger sounds and effects, keep the reed switches away from the speaker magnet and strong motor magnets. Reed switches should ride about ¼" above rail head and be spaced ½" on either side of center. Reed Switch: ¼" hole.
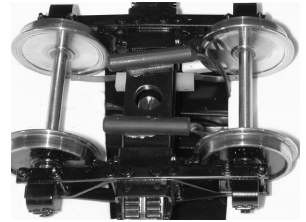
Speed Sensor – You may need to experiment to get reliable triggering from a rotating axle with magnets on it. After mounting the magnets on the axle, hold the reed switch in various positions and hook something to the reed so you can tell when the switch is closed. An ohm meter with a beeper works great. You can point the reed switch directly at the axle/magnets but there will be less motion tolerance. With the magnets sweeping the side of the reed switch (as shown) a clearance of about 3/16" is usually right. If you are too close you may get extra closures—one as the magnet approaches, and one as it leaves.
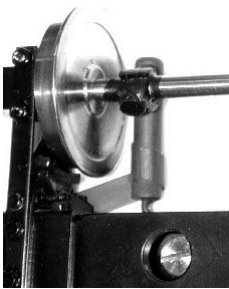
Troubleshooting

Wrong directional toots – Swap speed wires (C1:6, C1:7) or change the track polarity using the Computer Interface.

No Sound – Start by rechecking the wiring to the speaker, volume switch, and power connector. A connection may have been missed or become loose. Measure the voltage applied to the power connector when you think the board should be on. The power pins (C1:1, C1:2) must see at least 9V and the speed pins (C1:6, C1:7) must register at least 0.5V for the system to make sound. It may be something as simple as the volume being turned down, try raising the volume. Also check the volume switch and its connectors to make sure there is no damage, broken connections or that the switch terminals are not touching anything metal.

Low Volume – If the volume is lower than your chosen setting the board may not be receiving full power at connector C1.

Erratic Chuffing – The axle magnets may not be mounted symmetrically. Also, if the reed switch is not mounted to the truck, the distance to the magnet might change during curves. The wires coming from the reed switch might be broken or loose. Engines with built-in contacts (Bachmann Spectrum) may require cleaning or oiling of the contacts. Contact Problems are the normal cause for faster then normal chuffing.

Whistle too frequent – The whistle plays based upon the speed reaching the whistle play speed threshold. If the train slows down in curves or at grades this may cause additional whistle triggering. Running at a slightly higher or slower speed may help. If a reed switch is used to blow the whistle, triggering may occur due to unexpected magnetic fields such as those generated by the speaker. Make sure your reed switch is not mounted too close to your speaker.

Technical Specifications

Length – 2.25 in; 57 mm

Width – 0.875 in (7/8"); 22.225 mm

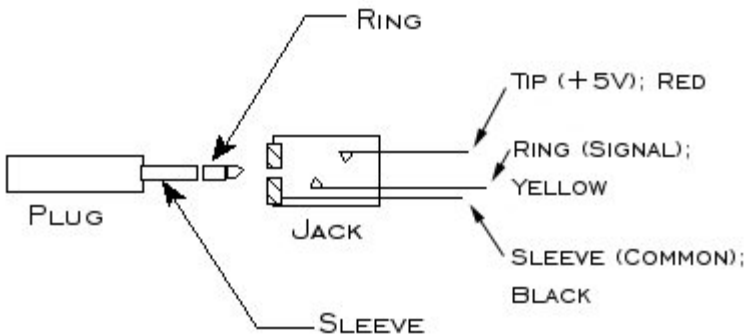**Height** – 0.4375 in (7/16"); 11.1125 mm

Max Volts at Track – 30V.

Power Consumption – Varies with volume; can go as high as 1000mA if at max volume; typical is less than 100mA - medium volume.

Amplifier – 6 Watts maximum.

Speaker Load – 4 Ohms or greater; two 8 Ohm speakers in parallel is fine.
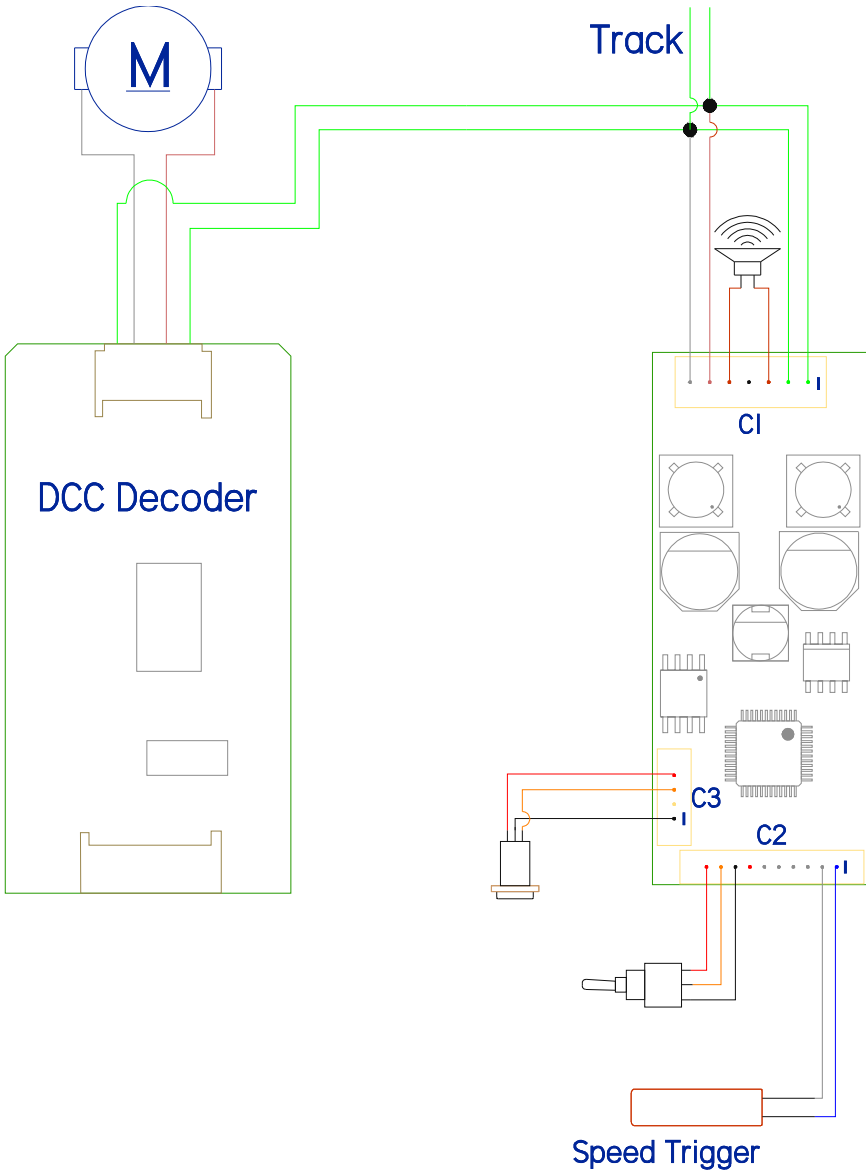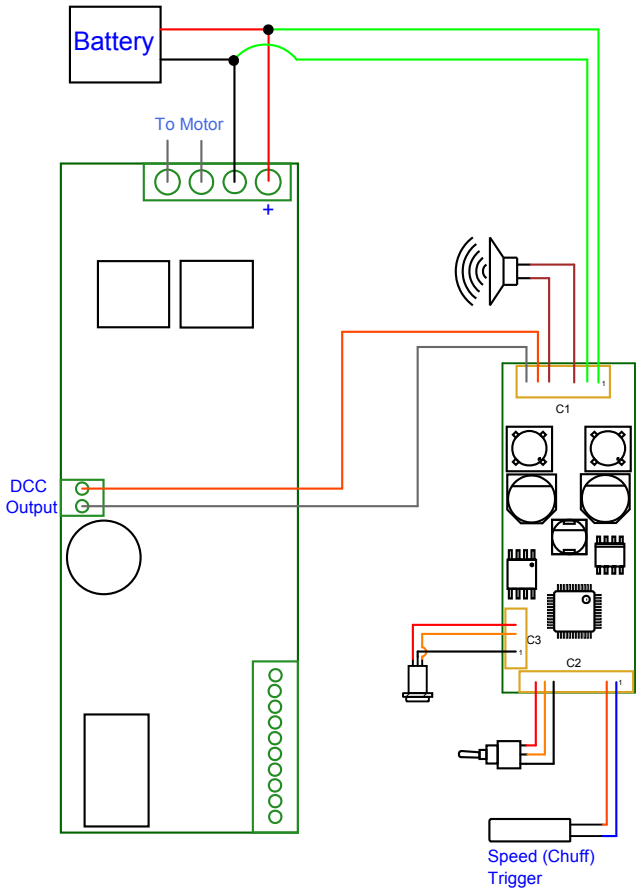
Access Jack Diagram

THE PLUG IS A STANDARD 2.5MM STEREO (TRS) PLUG. THE SUPPLIED JACK IS FULLY INSULATED FROM THE MOUNTING HOLE. OTHER 2.5MM JACKS MAY BE SUBSTITUTED - BUT MAKE SURE THAT THERE IS NO GROUND PATH BETWEEN THE COMMON TO ANY OF THE POWER INPUTS (C1:1,6 OR 7).

Appendix A: Wiring Diagrams

Basic DCC

M

Track

DCC Decoder

CI

C3

C2

Speed Trigger

CVP Airwire 900 G3

NOTE: The orange wire from the P8 must connect to DCC Output #1 on the G3.
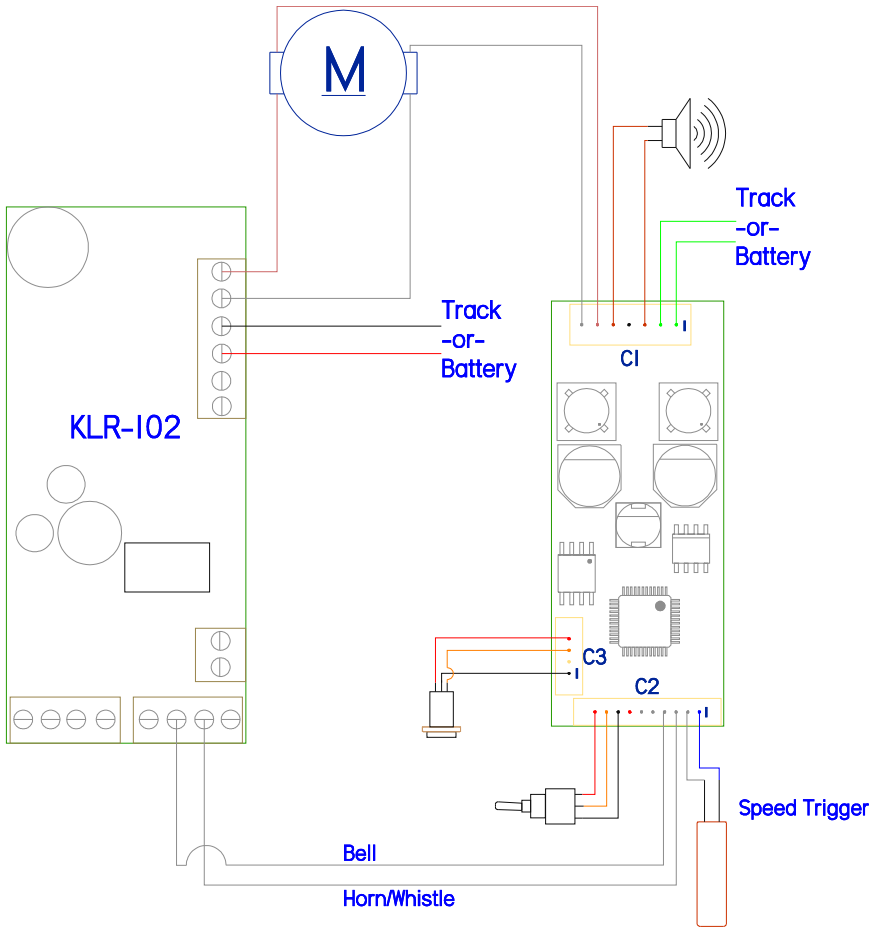
Aristocraft/Crest Revolution

This wiring diagram assumes installation in a locomotive without the appropriate plug and play socket for the revolution on board unit. Additional wiring diagrams are available from the Phoenix online knowledgebase at: http://kb.phoenixsound.com

THE P8 FOLLOWS THE NMRA WIRING SCHEME FOR MOTOR CONNECTIONS, M+ IS ORANGE AND M- IS GRAY. THE REVOLUTION USES GRAY FOR M+ AND ORANGE FOR M-. THIS DIAGRAM REFLECTS CONNECTION OF M+ TO M+ AND M- TO M- RATHER THAN MATCHING COLOR TO COLOR.
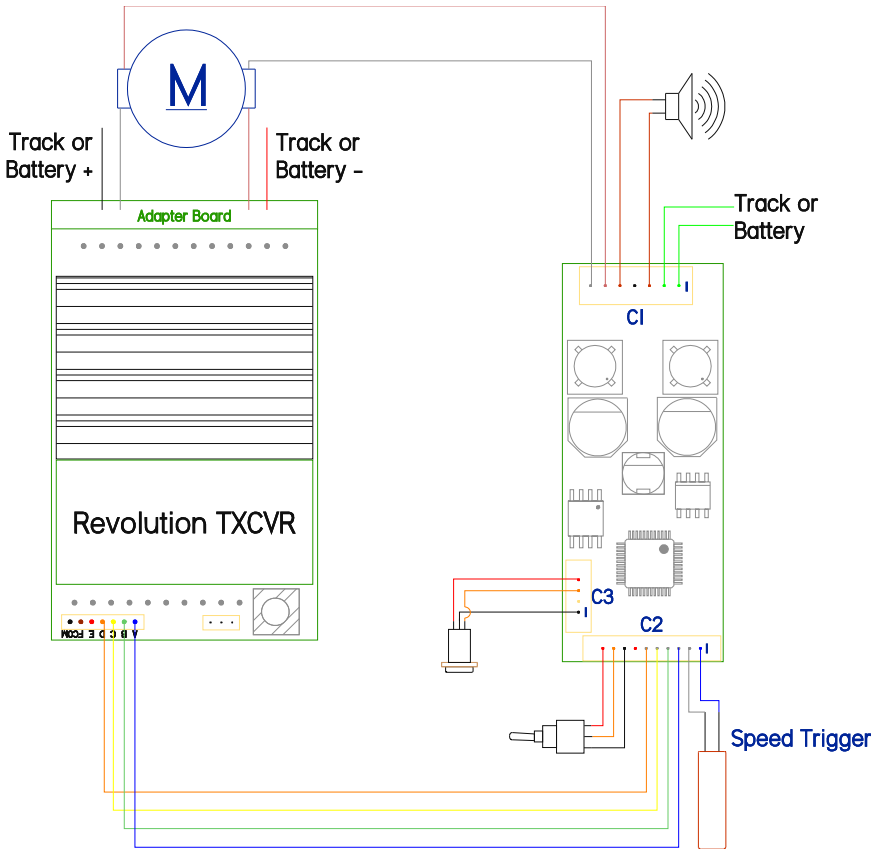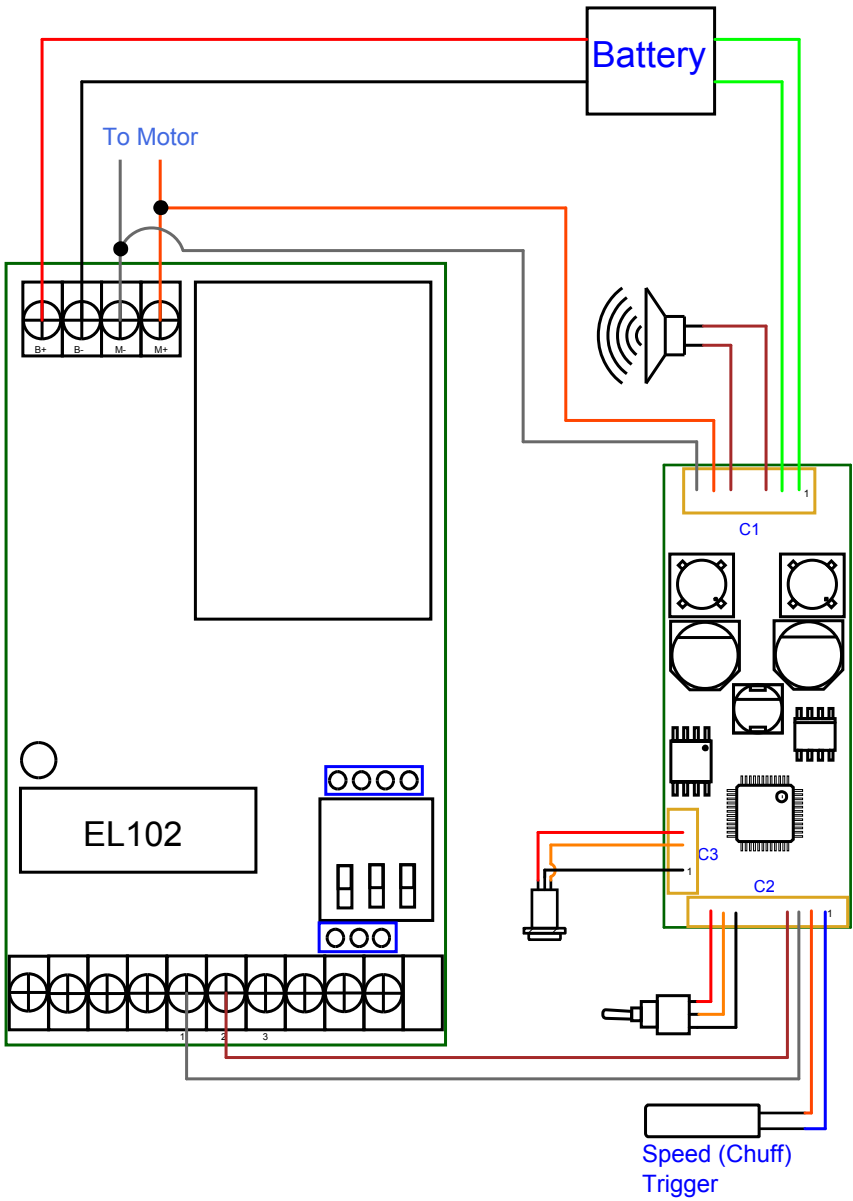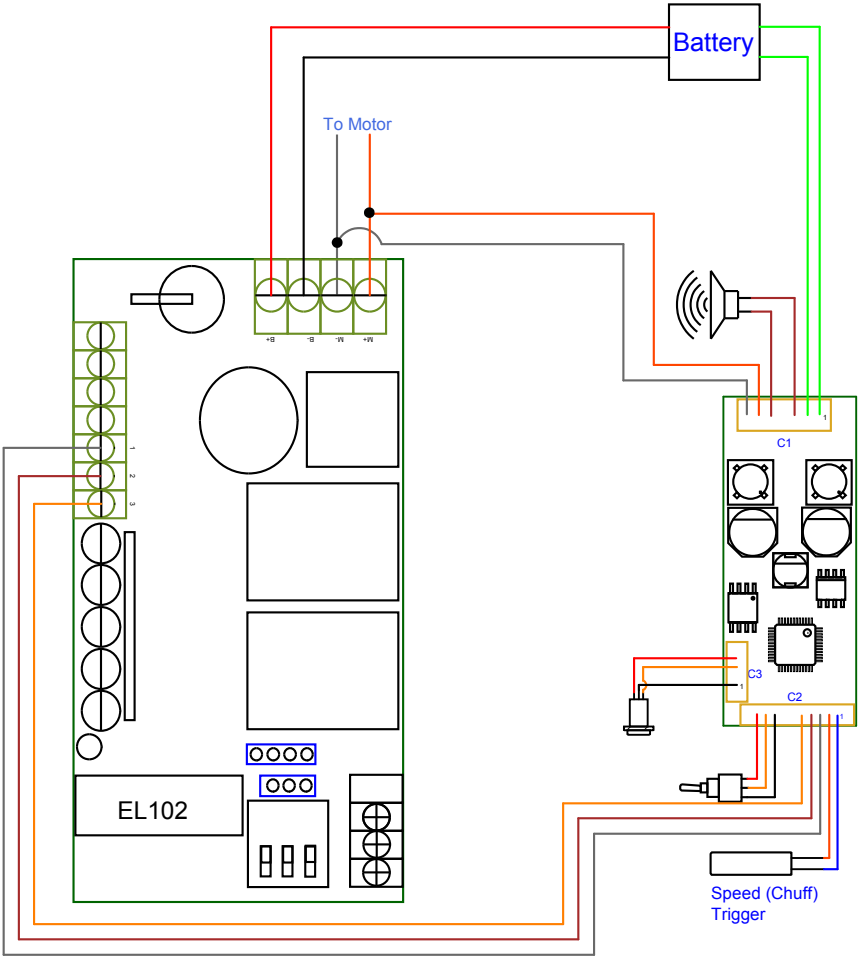
Locolinc®

Trigger sense should be set to 'Active high' rather than the default 'active low' for proper functioning with the locolinc system.

RCS Railinx 3 Amp

Battery

To Motor

B+ B- M- M+

EL102

C1

C3

C2

Speed (Chuff)
Trigger

RCS Railinx 6 Amp

Battery

To Motor

C1

C3

C2

EL102

Speed (Chuff)
Trigger

Appendix B: P5T Auxiliary Input Board

The P8 system is designed as a modular system, consisting of a base board and expansion boards. This optional board adds 6 Trigger inputs to the P8 system. This is useful with conventional remote control systems where more than 5 trigger inputs are needed.

DCC SYSTEMS WOULD ALMOST NEVER NEED THE P5T.

Auxiliary Input Board (P5T) Checkout

If you are using the Auxiliary Input Board, M1 & M2 are not configured for sensing speed by default. Connecting the pins T1 through T6 to ground (GND) will activate the associated sounds and effects.
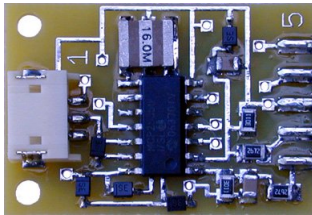
Top	Bottom
T2	T3
T1	T4
GND	GND
M2	T5
M1	T6

M1 Indicator Dot

Terminal	Color	Diesel	Steam
Top Row			
T2	Black	Dynamic Brake	Water Fill
T1	Violet	Working	Drifting
GND	Blue	Ground	
M2	Orange	*Motor (Inactive)*	
M1	Gray	*Motor (Inactive)*	
Bottom Row			
T3	White	Rev Up	Coal Load
T4	Yellow	Rev Down	Coupler
GND	Blue	Ground	
T5	Red	Coupler	Crossing Whistle
T6	Brown	Crossing Horn	*<None>*

A WIRING DIAGRAM SHOWING THE BASIC CONNECTION OF A P8 AND P5T IS AVAILABLE FROM THE PHOENIX ONLINE KNOWLEDGEBASE AT: HTTP://KB.PHOENIXSOUND.COM

Appendix C: The Computer Interface

The Computer Interface is an optional accessory that enables complete customization of all sounds.

The Computer Interface consists of a CD and USB Interface for use with Windows 2000, XP and Vista. The CD contains software to customize sounds from the Phoenix Sound library. Connecting the USB interface to the board through the access jack allows you to download sounds for different engines and change the following:

- Individual sound volumes
- Manual vs. Programmed response for bells and whistles (horns)
- Assign sounds to terminals and DCC functions
- Adjust how often a sound plays
- Change shutdown time
- Change and modify chuff rhythm, compression and tone
- Configure and fine tune for various control systems such as: AC, DC, DCC, MTS, Locolinc®, Train Engineer, Revolution, RCS, Reeds and Air Wire 900
- plus many other features you will discover as you familiarize yourself with the system

All adjustments, upgrades and sound loading can be made through the Access Jack. You will not need to take the model apart after installation is complete.

PLEASE NOTE: THE SOFTWARE WILL RUN ON ANY PC WITH WINDOWS 95 OR NEWER. IT IS THE USB INTERFACE HARDWARE WHICH REQUIRES A MINIMUM OF WINDOWS 2000. IF YOU ARE USING THE OLDER PHOENIX SERIAL CABLE INTERFACE YOU CAN CONTINUE TO USE THE UPDATED SOFTWARE WITH YOUR EXISTING SERIAL CABLE ON WINDOWS 95/98/98SE/ME.

Warranty

The BigSound™ electronic board is manufactured to the highest standards using the latest assembly technology and quality, conservatively rated parts. We are dedicated to producing the world's finest sound system for years of railroading enjoyment.

The materials and operation of the BigSound™ electronic board and associated system kit components supplied by Phoenix are guaranteed to perform correctly for one year when installed and operated according to the instruction manual. In the unlikely event that your BigSound™ system fails, please call or e-mail us so that we may evaluate the situation and save any unnecessary shipping. We prefer to evaluate potential returns because frequently there is a simple explanation for any perceived problem you may be experiencing. Repairs and or replacements covered by this warranty are at no cost. However return shipping may be charged, especially if you return your system in an engine, tender, box car or the like. A service fee may be assessed if it is determined that the failure was not due to any Phoenix supplied components.

Phoenix Sound Systems, Inc. cannot be liable for damage to the system during shipping to our facilities due to mishandling, inadequate packaging or similar circumstances beyond our control. Please be sure to package the BigSound™ in a secure, static safe manner.

Please read the handbook and any included installation notes prior to installation and operation of your BigSound™ system. Contact us if you have questions or are unsure about any aspect of installation or operation.

Physical modification of the sound board in any fashion voids this warranty. Physical modifications include but are not limited to:

- Drilling of holes in the printed circuit board for any purpose. Drilling of the circuit board may cause damage to internal layers which would not be visible to the naked eye. Custom holes could also enable the inner layers of the board to short circuit through direct contact or contact with a screw inserted into the hole.
- Removal, replacement or modification of any connectors or individual component pieces.