

General Purpose Sound System

Owners Manual



- Self-Contained Sound System for Ride-On Applications
- Applicable to Steam, Diesel, Electric, Gas, and Interurban Locomotives or Self-Powered Cars
- Steam Sounds are Synchronized to Wheel Rotation
- Speed Pickup From Motor Voltage of Electric Motor Driven Applications
- Speed Pickup From Wheel or Shaft Rotation in All Applications
- Choice of 84 Different Sound Packages To Match Most Applications
- Based On Popular Phoenix Sound System
- Includes Two Dual Cone Stereo Quality Speakers Driven by High Wattage Amplifier
- Simple Installation Fully Explained in Manual

Real Trains[®]

Table of Contents

Your System and Its Specific Sounds	1
Terminology	1
Background	1
Operating Modes	1
Start Up Sequence	2
Mode 1	2
Mode 2	2
Mute	2
Physical Installation	2
Mounting	2
Location and Access	3
Electrical Connections	4
Summary of Connections	4
Large 2 Pin Connector	4
Small 2 Pin Connector	4
9 Pin Connector	5
Power Connection	5
Wiring	6
Power Control	6
Mode 1 - Sound System Speed Detection From an Electric Motor Driving Unit	6
Mode 2 - Sound System Speed Detection From a Rotary Source	7
Amplifier Mute Function	8
Control Panel Functions and Connections	9
Minimum Configuration – Horn or Whistle	9
Expanded Configuration	9
Setting Up Your Preferences	10
Manual Programming	11
Volume Setting	11
For Mode 1 - Setting Where the Engine Sound Begins to Speed Up from Idle	11
For Mode 1 - Setting How Fast the Engine Speeds Up	11
For Mode 2	12
Computer Based Programming	12
Maintenance	12
Repair	12
Replacement Parts List	12
Appendix A – Real Trains to Phoenix Cross Reference	1
Large 2 Pin Connector	1
Small 2 Pin Connector	1
9 Pin Connector	1
Programming Connector	1
Appendix B – Available Sound Programs	1
Appendix C – Synchronized Steam Sounds	1
Geared Steam Locomotives	1
Steam Locomotives With More Than Two Cylinders	1
Appendix D – Warranty	1

Your System and Its Specific Sounds

The sound system will be shipped to you containing one of a range of specific sound program packages (see Appendix B). These are available to simulate a wide selection of diesel or steam locomotive types as well as certain gas mechanical, interurban and other powered railroad equipment. The specifics of what sounds are generated, as well as what, when, and how loud are determined by a specific program. Modifications may be made by purchasing an optional computer programming interface. If you feel your initial choice is not optimum please contact the factory about reprogramming.

NOTE – Some sound program packages do not offer some of the features listed here. Others may differ in their connections. If this applies to your selection a supplemental page listing these differences will be included at the back of this manual.

Terminology

In the sections that follow references to the sound system are specified simply by saying the “system”. References to the locomotive, car or other location where you are installing the sound system hardware are made by saying the “unit”.

Background

The sound system provided for your unit is based on a product from the Phoenix Company. If you are familiar with their products from other scales you will find many similar features. The major difference in our system is the inclusion of a power amplifier and two stereo quality dual-cone speakers inside of a rugged housing.

The manual provided by the Phoenix company is included for your reference. It is very important to note that the external connections they describe do not apply to the system we are providing you as far as pin numbers are concerned. You should follow the instructions in the following sections of this manual as to wiring connections. This is very important or damage may result.

Operating Modes

Depending on what you are installing the system into there are two major operation modes possible. The system changes the type, speed, and loudness of sounds generated in response to the speed at which it senses it is moving. How it senses this speed can be either of two ways:

1. If the unit is driven with a direct current (DC) electric motor¹ the system can measure the voltage across the motor. The voltage at which the unit starts to move, and the speed at which the sounds increase with increasing voltage, can be set as will be discussed later.
2. For any type of drive (electric, engine, etc.) the rotation of a wheel, shaft, etc. can be sensed as the opening and closing of an electrical contact. The frequency at which this occurs will control the systems detection of speed. This mode is necessary if modeling a steam locomotive where you want the “chuff” sound of the steam to match the rotation of the drive wheels (see Appendix C)

Connections for both of these will be discussed in later sections.

¹ As furnished the system will operate with motors of up to 24 VDC. For higher voltages please contact us for a special cable needed to reduce the voltage of the motor to what the system can utilize.

Start Up Sequence

You need to understand when the system will begin to make sounds. This is a function of the Phoenix sound system design and cannot be modified.

Mode 1

If you are installing the system to sense motor voltage (paragraph 1 above) you will normally install some type of on-off switch, either for everything electrical, or for the system only. This may also be a circuit breaker or a key switch as you desire. When this is turned on the system will be powered but will remain silent. When you take whatever action that causes voltage to be applied to the motor of your unit the system will make sounds of the model starting up and going to stopped, low or idle speed sounds. With changes in motor voltage the sounds will follow. The system will continue to make sounds until the power is turned off.²

Mode 2

If you are installing the system to sense rotation (paragraph 2 above) you will still normally want some type of on-off control for power to the unit. In this mode when power is applied the system will go directly to the start up sounds and then run following the speed it senses. It will run until the power is turned off.³

Mute

When power is applied to an amplifier it often makes a “pop” sound that some users find objectionable. You may also desire a way to stop the sounds at certain times. In the wiring provided, and discussed later, a “mute” switch can be installed that will silence the amplifier whenever this switch is turned off. In mode 1 this switch can be turned on after the power is applied to the system and before power is applied to the motor to eliminate the pop sounds. If used in mode 2 it may cause some of the initial start-up sounds to be missed. In both modes it will silence the system at any time.

Physical Installation

The system must be located in a protected area of your unit. It is not designed for exposure to weather such as rain, or to physical damage from handling. At the same time the location must provide openings from which the sound can be heard. Avoid heat and vibration producing equipment such as gas engines or high power controllers.

Mounting

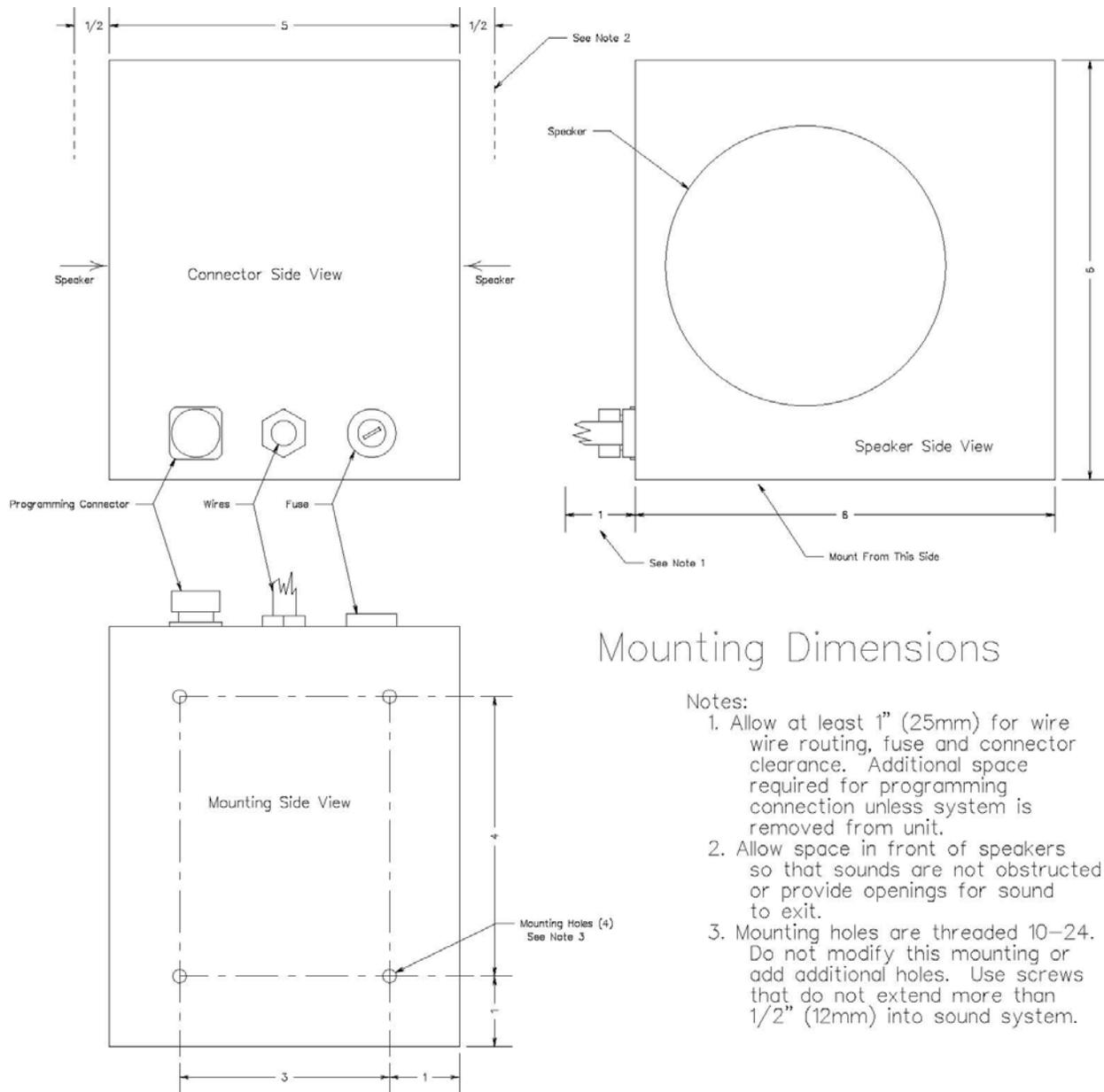
The system housing is provided with four mounting screw locations as shown in the figure on the next page. The system may be oriented with the side having these holes on the top, bottom, side or at an angle depending on space in your unit. The mounting surface must be solid and capable of securely mounting and supporting the system.

A package of mounting screws is provided with the system. If the material you are mounting the system to is 1/4” (6mm) or less in thickness use the shorter 4 screws. For materials up to 3/4” (19mm) in thickness use the longer screws. If you are using even thicker mounting materials you will need to purchase 10-24 thread machine screws as required. Do not use screws that

² If you purchase the optional programming cable used with a computer the system can be set to “time out” and shut off after a certain period at idle.

³ See note 2.

project more than 1/2" (12mm) into the system or damage may result. The proper drill size for these mounting screws is 3/16" (5mm). Do not modify these holes or add additional holes. Do not attempt to mount the system using adhesives, tape, straps, etc.



Location and Access

The system produces a moderate amount of heat and should be located where it can both conduct heat to the mounting surface and have some air movement to radiate heat. As noted in the drawing above it is also necessary to provide either space or openings for the sound to properly exit the speakers without being muffled or distorted.

On one side of the system are a programming cable connector, a fuse holder, and the wires to connect to the unit. As shown in the drawing above allow at least 1" (25mm) of space to clear these items and allow safe routing of the wires.

The use of the programming cable will be discussed later. It is not connected for normal operation. Access to connect this cable will require more than the minimum space discussed above. Fuse replacement will also require additional space. For easy access a minimum of 3” (75mm) is recommended if it is available directly outwards from the connector and fuse holder. An alternative where space is not available is to remove the system from its mounting position when access is required.

Electrical Connections

A number of wires extend from the system to plugs and sockets that allow removal of the system should service become necessary. Wires extend beyond the sockets as necessary to make all needed connections. The length of these as provided is longer than usually required and they may be trimmed shorter if needed. A number of the wires not commonly used are terminated (folded over and shrink tubed) to insulate them. These may be cut short and the end re-insulated if not being used. If it is necessary to extend any wires be sure to use wire of the same or larger size and it is recommended that all connections be soldered and well insulated with either shrink tubing or tape, or made with proper crimp type connectors. Connectors are also recommended for the connections at the end of these wires to other parts of your unit. These items are available at electronic and automotive parts stores.

CRITICAL NOTE – Many of the wires provided connect directly to microcircuits on the sound board and are very sensitive to static electricity. Any type of arc or spark, or a misconnection, can damage the system. It is recommended that you make all wiring connections to the unit with the cables unplugged from the system. When ready, plug in the large 2 pin power cable first, with the power turned off, then connect the other cables by plugging them in to the system.

Summary of Connections

The table provided below summarizes the wiring extending from the system. Detailed diagrams for all of these connections are provided later.

Large 2 Pin Connector

Wire Color	Wire Size	Function Usage	Notes
Red	#14	Positive Voltage Input Power	+12 VDC
Black	#14	Negative Voltage Input Power	-12 VDC or Ground ⁴

Small 2 Pin Connector

Wire Color	Wire Size	Function Usage	Notes
Red	#18	Mode 1 – Motor Voltage Sense Mode 2 – Sound Start-Up Signal	See Text for Polarity 9 Pin Connector Red Wire ⁵
Black	#18	Mode 1 – Motor Voltage Sense Mode 2 – No Connection	See Text for Polarity Insulate End

⁴ It is common for the negative lead of a system to be terminated on the metal of the chassis and defined as “ground”. Unconnected metal components can produce electrical noise that interferes with operation of some electronics.

⁵ For Mode 2 connect this wire to the red wire from the 9 pin connector so sound will start when power is applied.

9 Pin Connector

Wire Color	Wire Size	Function Usage	Notes
Black	#22	Trigger Common	Multiple Connections
Gray	#22	Mode 2 - Train Speed Sense	To Rotation Sensor
Blue	#22	Horn or Whistle Control	To Your Control Panel
Green	#22	Bell Control	To Your Control Panel
Brown	#22	Rev Up or Coal Loading Control	To Your Control Panel
Violet	#22	Dynamic Brake or Water Fill Control	To Your Control Panel
Yellow	#22	Working or Drifting Control	To Your Control Panel
Orange	#18	Amplifier Mute ⁶	Mute Switch or Red Wire
Red	#18	Output Power ⁷	Multiple Connections

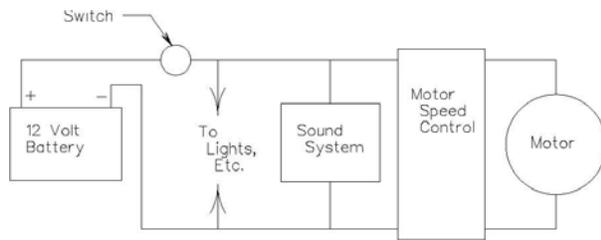
Power Connection

The system is designed to be powered from a 12 volt direct current (12 VDC) source such as an automotive battery. Your unit must provide such a source. If your unit is designed to operate on 24 VDC using two 12 VDC batteries in series you must either power the system from one battery or provide a separate battery. Several possible connections are shown in the figure on the next page. Note that these are power connections and have nothing to do with the speed sensing function as discussed in the next section.

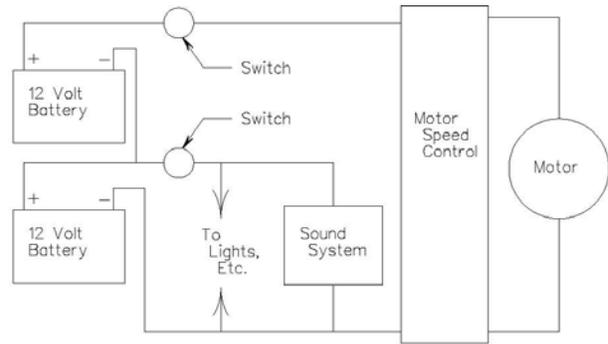
CRITICAL NOTE – The speed sensing part of the system can be connected to motors of up to 24 VDC but the system itself must only be powered from 12 VDC. Total destruction of the system will take place instantly if connected to a voltage source higher than 12 VDC. This is not covered by warranty.

⁶ As supplied this wire is connected to the red wire to enable the amplifier. Cut this connection if using mute switch.

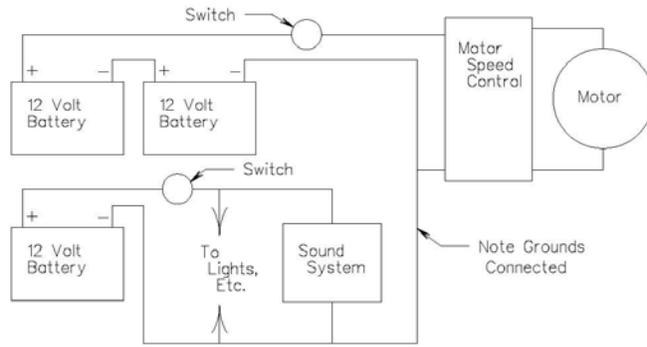
⁷ See notes 5 and 6.



12 Volt Motor With 1 Battery

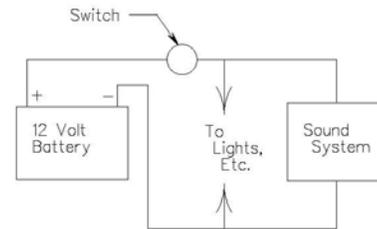


24 Volt Motor With 2 Batteries



24 Volt Motor With 3 Batteries

Power Connections



Basic 12 Volt System
Engine Driven, Etc.

Wiring

Locate the larger of the 2 pin connectors extending from the system. The two conductor 14 gauge wire extending from this connector is used to supply power to the system (this is also the largest of all the wires). The cable has red and black wires that are molded together (but not electrically connected). These may be pulled apart for connection. The red wire is the positive (+12) connection and the black wire is the minus or ground connection. Trim these wires to length if needed and attach whatever terminals are needed to make the connection with your unit. If extending the wires a long distance use a larger size wire to prevent voltage drop.

DANGER – Connection of the system in reverse, positive to black, negative to red, for even an instant will destroy the circuits provided and is not covered by warranty.

Power Control

You must provide a power on-off control as shown in the prior figure for the system. This can be a switch, circuit breaker, or relay that is dedicated to the system or part of the other controls within your unit.

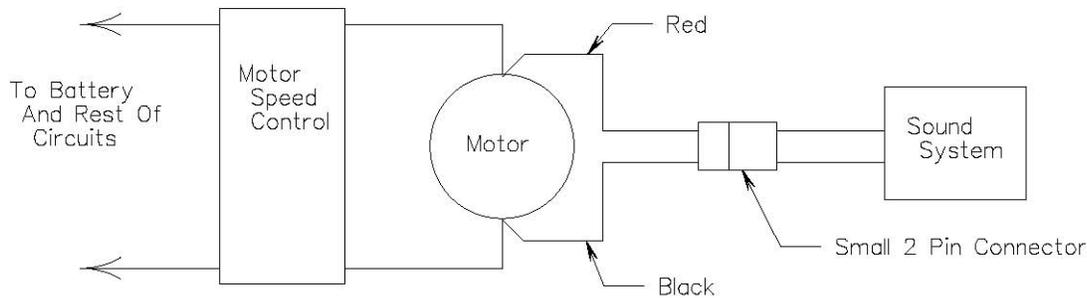
The power input to the system includes a fuse rated at 10 amps. You can provide additional external protection for your circuits in addition to this fuse if desired. Service of this fuse is discussed later.

Mode 1 - Sound System Speed Detection From an Electric Motor Driving Unit

If the drive for your unit is an electric motor you can use the voltage applied to this motor as an input to the system. This will cause the sounds to change as appropriate to the speed of the unit (e.g. a diesel engine sound will speed up as the voltage becomes greater). The adjustment of this connection is explained in a later section.

To make the connection locate the smaller of the 2 pin connectors extending from the system. You will connect these directly across any portion of your wiring that is after your speed control (which can be either a variable voltage or an on/off control going to the motor). See the figure below for more information.

CRITICAL NOTE – The speed sensing part of the system can be connected to motors of up to 24 VDC. Connection of the system as supplied to a higher voltage will result in damage to the system and is not covered by warranty. If your motor uses a higher voltage please contact us for a special cable that is needed.



Mode 1 Connection

The cable has red and black wires that are molded together. These may be pulled apart for connection. Trim these wires to length if needed and attach whatever terminals are needed to make the connection with your system.

A feature of the sound system that is not normally enabled but may be selected using the optional computer programming interface is to automatically sound the horn two times before moving forward and three times for reverse. In order to make this operate correctly the red wire must be connected to the motor lead that is more positive when going forwards. If this is not used then either wire may be connected to the motor in either order.

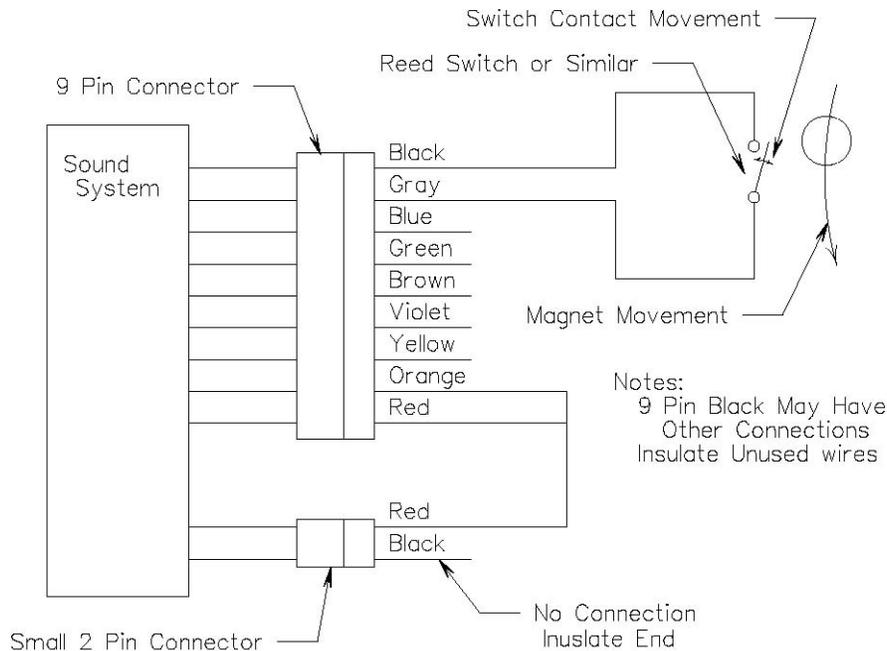
Mode 2 - Sound System Speed Detection From a Rotary Source

Units driven with another power source such as a gas engine or an electric motor powered steam locomotive where you wish to synchronize the sound with the motion of the pistons and rods must use an electrical contact that is opened and closed by the movement of the unit. This may also be done for other electric drives if you wish.

The most common way that this is done is to use what is known as a “reed switch”. This is a small glass tube with a contact inside in which the contact is made to open and close with the presence or absence of a magnet. In most applications the one or more (typically 4 for a steam locomotive) magnets are attached to the back of one of the driver wheels and the reed switch is mounted close enough to be operated without actually touching.

For units programmed with steam engine sounds, the reed switch and four magnets are provided with your system. Details of mounting and wiring these depends totally on your unit and are something you must provide as required. Any other type of contact system (such as a cam and micro switch, hall effect sensor, etc.) that is available to you may also be used.

The electrical connection is detailed in the figure below. The reed switch or other contact is to be connected between the black and the gray wires from the 9 pin connector. Note that you will also need to extend the black wire to your control panel to allow other controls, such as the horn, whistle or bell, to operate. An additional connection between the red wire from the 9 pin connector and the red wire from the smaller 2 pin connector is also required. The wire from the 9 pin connector is supplied connected to the orange wire from the same connector and should remain connected unless you are implementing the mute function as discussed below. The black wire from the smaller 2 pin connector is not to be connected for this mode and should be insulated as necessary.



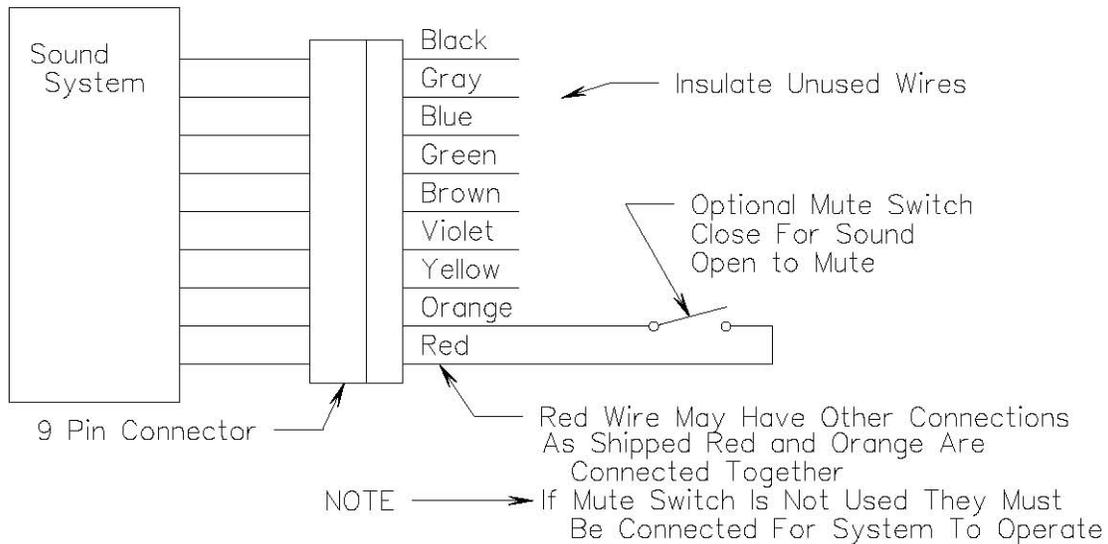
Mode 2 Connection

Amplifier Mute Function

As furnished, the audio amplifier of the system is enabled at all times. If you wish to turn it on and off you will need to install a mute switch in your unit. This is shown in the figure on the next page.

Locate the Orange and Red wires extending from the 9 pin connector. These are sent to you connected together. To add a mute function separate these wires and install a switch between them. When the switch is on (making contact) the amplifier will operate normally, When the switch is off the amplifier will be silenced but the rest of the system will continue to operate.

NOTE – If you desire to turn off the system for extended periods, to save battery power, or for testing of other parts of the unit it is recommended that you do so by removing the fuse. Do this only with the power off.



Addition Of Mute Switch

When making this connection please note that the Red wire may also be connected to other wires.

Control Panel Functions and Connections

The sound system is capable of generating many other sounds. These are described in more detail in the Phoenix manuals provided. Depending on the sound configuration you ordered there may be one or more of these sounds that you can trigger by the addition of control switches as discussed here. If you have purchased the optional computer programming interface it is possible to make extensive changes to these selections as discussed in the documentation that comes with that interface. Also, please see Appendix A.

Minimum Configuration – Horn or Whistle

As shown in the figure on the next page you may add a push button switch to your unit to control the horn or whistle sound. It is assumed that you will locate this switch based on convenient and safe operation and provide additional wiring and connections as needed.

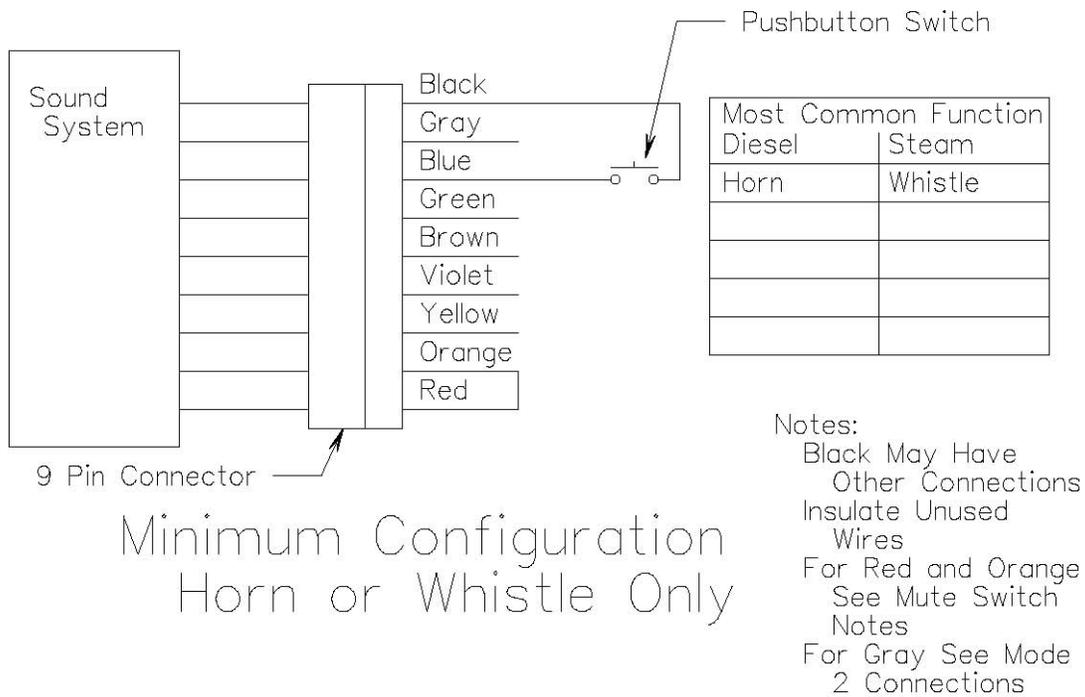
The switch connects between the Black and Blue wires from the 9 pin connector. When pushed to close the contacts the horn or whistle sound that was programmed into your sound unit will sound. It will sound as long as the button is pressed and will stop when it is released. Changes to this may be made with the optional computer programming interface.

Expanded Configuration

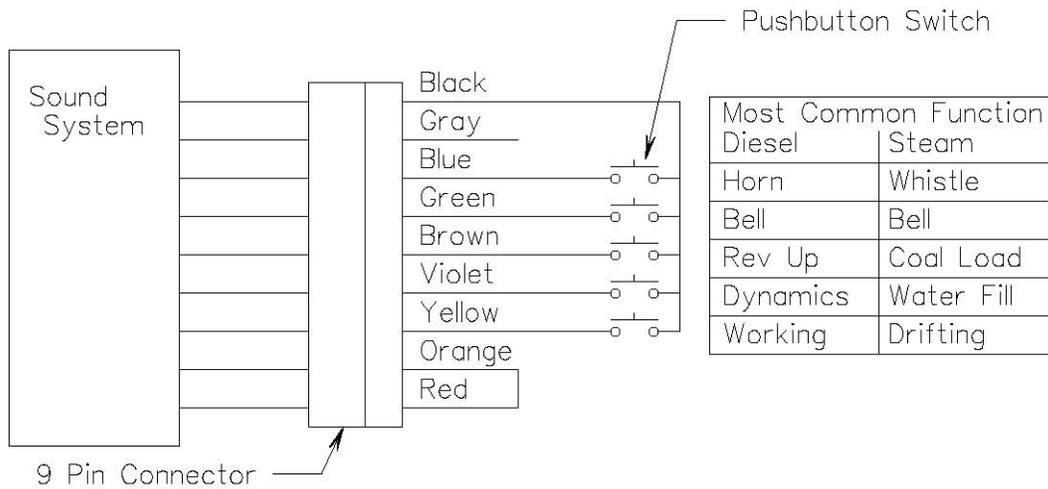
To fully expand the control capabilities you will need to add 5 pushbutton switches as shown in the figure. Each of these connect between the Black wire that is common to all and to one of the other inputs to the sound system.

In this configuration the second switch added will control the bell which normally rings about once per second. Pressing and releasing the button once causes the bell to start ringing and to continue until the button is pressed a second time. Changes to this may be made with the optional computer programming interface.

The sounds and their characteristics for the other buttons are described in the Phoenix manual or as stated in your order to us. Changes to this may be made with the optional computer programming interface.



Minimum Configuration
Horn or Whistle Only



Fully Expanded Configuration

Setting Up Your Preferences

All systems are provided with a manual programming cable. This allows setup of basic functions necessary to provide compatibility with your drive parameters. Much more extensive programming of the sounds is possible with a computer interface package consisting of a special cable and CD that allows almost any part of the sound generation to be changed. It also allows changes in the types of locomotives among a long list of standard sound packages. Both of these are discussed below.

Manual Programming

The manual programming cable has a single switch that has a center position and may be moved away from this position in either direction with a spring return to the center position. The two alternative positions of this switch are marked “Raise” and “Lower” and these correspond to the instructions in the Phoenix manual. Use this cable for all manual programming operations.

To program your unit you should place it up on blocks so it will not move. You should open or remove any parts necessary to allow access to the connector on the system. Remove the cover on the connector by turning it 1/8 turn counterclockwise and pulling it off. With the power off, plug the manual programming cable into this receptacle and turn the lock ring to secure it in place. Use the methods discussed below as desired. Unplug the cable only with the power off and replace the cover when you are finished.

Volume Setting

With the manual programming cable plugged in, turn on the system power. If you have installed a mute switch make sure the amplifier is enabled. If using a Mode 1 connection take whatever action is needed to apply voltage to the motor so the system will start. You may stop the motor but the sounds will continue. This is not necessary for Mode 2.

You may now increase or decrease the sound system volume by pressing the switch on the manual programming cable in either the raise or lower direction to either increase or decrease the volume. If you decrease the volume too far the sound system may stop, do not turn the system off in this condition, you must increase the volume again or the system may fail to operate correctly.

DANGER – If you wish to disable the sound system do not turn the volume all the way down. This may damage the sound system. You may use a mute switch if installed. Otherwise, on the system there is a fuse, if you remove it (with the power off) it will disable the sound system. Note that this also eliminates the use of the horn or bell.

For Mode 1 - Setting Where the Engine Sound Begins to Speed Up from Idle

To make an adjustment to the start voltage do the following: With the manual programming cable plugged in, hold the switch in the “Lower” position. If you have installed a mute switch make sure the amplifier is enabled. Take whatever action is needed to apply voltage to the motor so the system will start. You may stop the motor but the sounds will continue. Release the switch.

You can now use the raise and lower switch positions to change the point at which the engine sounds transition from idle to higher speeds. Make a change and then use your speed control to see its effect. When done turn the system off. When turned on again it will be in the normal volume setting mode.

For Mode 1 - Setting How Fast the Engine Speeds Up

To make an adjustment to the rate do the following: With the manual programming cable plugged in, hold the switch in the “Raise” position. If you have installed a mute switch make sure the amplifier is enabled. Take whatever action is needed to apply voltage to the motor so the system will start. You may stop the motor but the sounds will continue.. Release the switch.

You can now use the raise and lower switch positions to change the rate at which the engine sounds speed up. Make a change and then use your speed control to see its effect. When done turn the system off. When turned on again it will be in the normal volume setting mode.

For Mode 2

For mode 2 connections only volume setting is necessary.

Computer Based Programming

If you have purchased the optional computer interface cable please see the instructions provided with it.

CAUTION – The changes possible with this computer interface are beyond the scope of our warranty and technical support. The user assumes all risk of its use.

Maintenance

Once installed and programmed, operation is fully automatic and you will not have to do anything different in the operation of the unit.

You should periodically check all wiring to make sure it is not touching moving parts or rubbing against sharp edges. If erratic operation of the steam locomotive sounds are noted check to make sure the reed switch is properly positioned and that all required magnets are in place.

Repair

If the external wiring, reed switches or magnets become damaged they should be replaced. In general, any other repairs should be referred to the factory.

If the fuse blows it should be replaced with a 10 amp, fast blow type (typically called type 3AG). If it repeatedly blows please check all wiring for damage, otherwise refer service to the factory.

CRITICAL NOTE – No user serviceable parts are inside of the case. It has been sealed at the factory and opening it will void the warranty.

Replacement Parts List

Part Name	Part Number	Quantity
Manual Programming Cable	15L1-6005	replacement
Computer Interface (cables, CD, instructions)	15L1-6002	if wanted
Fuse, 10 amp	15L1-6011	as required
Mounting screw, short	15L1-6012	replacement
Mounting screw, long	15L1-6013	replacement
Cable, Power, Large 2 Pin Connector	15L1-6014	replacement
Cable, Sense, Small 2 Pin Connector	15L1-6015	replacement
Cable, Function, 9 Pin Connector	15L1-6016	replacement
Reed Switch	15L1-6017	replacement
Magnet	15L1-6018	replacement

Appendix A – Real Trains to Phoenix Cross Reference

The tables below provide information as to which wires from your sound system connect internally to which pins on the Phoenix sound card. This information is useful for special configurations and for modifications made with the programming interface.

Large 2 Pin Connector

Wire Color	Function Usage	Connection on Phoenix Sound Card
Red	Positive Voltage Input Power	Battery Connector Plus ⁸
Black	Negative Voltage Input Power	Battery Connector Minus ⁹

Small 2 Pin Connector

Wire Color	Function Usage	Connection on Phoenix Sound Card
Red	Motor Sense Red	Terminal 1 ¹⁰
Black	Motor Sense Black	Terminal 2 ¹¹

9 Pin Connector

Wire Color	Function Usage	Connection on Phoenix Sound Card
Black	Trigger Common	Terminal 16 ¹²
Gray	Mode 2 - Train Speed Sense	Terminal 15
Blue	Horn or Whistle Control	Terminal 14
Green	Bell Control	Terminal 13
Brown	Rev Up or Coal Loading Control	Terminal 12
Violet	Dynamic Brake or Water Fill	Terminal 11
Yellow	Working or Drifting Control	Terminal 10 ¹³
Orange	No Phoenix Use	No Connection
Red	No Phoenix Use	No Connection

Programming Connector

Pin Number	Function Usage	Connection on Phoenix Sound Card
1	Jack Red	Terminal 9
2	Jack Yellow	Terminal 10 ¹⁴
3	Jack Black	Terminal 16 ¹⁵
4	Raise	Terminal 4
5	Ground ¹⁶	Terminal 5
6	Lower	Terminal 6
7	Not Used	No Connection

⁸ Through a 10 amp fuse. Additional internal connections are also present.

⁹ Additional internal connections are also present.

¹⁰ Through a 100 ohm resistor. Cables for motor voltages higher than 24 VDC also contain other components.

¹¹ Same as note 10.

¹² Also programming connector pin 3.

¹³ Also programming connector pin 2.

¹⁴ Also 9 pin connector Yellow wire.

¹⁵ Also 9 pin connector Black wire.

¹⁶ Additional internal connections are also present.

Appendix B – Available Sound Programs

Listed below is the name of a sound file (first column) and its description (second column). They may be listened to at www.phoenixsound.com select “downloads”

AMERICAN DIESEL LOCOMOTIVES

ALCO	American Locomotive Company Diesel
DASH 8	GE Dash 8 Diesel
DASH 9	GE Dash 9 Diesel
E8	EMD E8 Diesel, dual engine start-up/shut-down
F3	EMD F series, single chime
F7	EMD F series, multi-chime
GENESIS	GE Amtrak Genesis, any phase
GP7	EMD GP7/9 with Hancock Horn
GP9	EMD GP7/9 Diesel, multi-chime
GP30	EMD GP30 Turbocharged Diesel
GP38	EMD GP38 Diesel, Roots Blower
GP40	EMD GP40 Diesel
HH660	Alco HH660
NW2	EMD NW2, single chime
PA	Alco PA (244 Prime Mover)
PLYM	Plymouth Switcher / 44 Ton / 45 Ton
RS3	Alco RS3 (244 Prime Mover)
RSD	Alco RSD (251-C Prime Mover)
SD40	EMD SD40 (645E3 Prime Mover)
SD45	EMD SD45 Diesel
SD70	EMD SD70MAC (710 Prime Mover)
U25B	GE U25B, 'uboat' class diesel

EUROPEAN

ABe44	European Electric
CLASS 66	British Rail Class 66 (EMD 710 Prime Mover)
CROC	RhB Ge 6/6 Crocodile
ERBUS	European Railbus
ERACK	Electric Rack Locomotive
EURO	European Steam
GE44I	German E44
GE44II	Ge4/4 II -- Swiss MOB
GE44III	Maienfeld 641
G45	RhB G4/5 Steam
HARZ	Harz (HSB) German Railway
SRACK	Swiss Rack

GAS, ELECTRIC AND EFFECTS

BCE	Box Cab Electric
CABLE	San Francisco Cable Car
CITY	Urban Streetcar
DESIRE	New Orleans Streetcar
DOODLE	Doodlebug Gas/Electric Interurban
GG1	PRR GG1 Electric
GOOSE	RGS Gallopin' Goose
RDC	Rail Diesel Car
RTRY	Rotary Snow Plow
SFX	Special Effects
SPEEDR	Speeder
TROL	Trolley

AMERICAN STEAM

1361	Pennsy K4 (Pacific) #1361
440	4-4-0 'American'
ACS1	American Classic Steam 1
ACS2	American Classic Steam 2
BIGBOY	Union Pacific 4-8-8-4 Big Boy
CabF	Southern Pacific 4-8-8-2 Cab Forward
C16	Consolidation
C21	Consolidation
DAYH	Daylight
Dock	0-6-0 Dockside Switcher
DRGW	Denver & Rio Grande Western
EBT	East Broad Top
FRIS	Frisco #1522
GTW	Grand Trunk Western (Canadian National)
HDSO	-6-4 J1e Hudson
HUD49	4-6-4 J1e Hudson with SP Daylight Horn
K463	K-27 #463
K473	K-28 #473
K480	K-36 #480
K487	K-36 #487
MALLET	2-8-8-2 Mallet
MIKADO	2-8-2 Mikado
MOGUL	Older 2-6-0 Mogul
NORTH	4-8-4 Northern class
PORT	Porter
PRR	Pennsylvania Railroad
RGS	Rio Grande Southern
SPAC	Southern Pacific #1218
SRRL	Sandy River & Rangeley Lakes Forney
UINT	Uintah
V&T	Virginia & Truckee INYO #22

STEAM – GEARED AND SPECIAL

CLMX	Climax
GYPSY	Gypsy
HEIS	Heisler
PSHAY	Shay, 38 Ton
SHAY	Shay, 36 Ton
3SHAY	Shay, 3 Truck 55 Ton
WEST	Westside Shay

Appendix C – Synchronized Steam Sounds

As discussed in the connections section for Mode 2, it is possible to have the “chuff” sound of a steam locomotive occur at the correct times relative to the wheel rotation. If you have ordered a system containing a steam locomotive sound package the hardware needed for most applications will also be included in your order. This consists of a reed switch and four magnets.

Geared Steam Locomotives

Locomotives that have drive shafts and gears between the crankshaft and the wheels (Shay, Heisler, Climax, etc.) require special considerations. If you sense the crankshaft speed then the magnets will correspond to the piston motion directly. If you sense the wheel speed the engine may be running at a faster speed because of gear reduction between the crankshaft and the wheel. To accommodate this, you will need additional magnets. For example if the reduction ratio is 2 to 1 then install 8 magnets on the wheel. Additional magnets are available from us, Phoenix or most hobby shops.

Steam Locomotives With More Than Two Cylinders

Most locomotives have two double acting cylinders which results in four exhaust sounds for each rotation of the wheels.

For some types of locomotives you need to be aware of how many cylinders exhaust into the stack. Compound locomotives having three cylinders typically have only two that will make sounds and can be connected without modifications. Locomotives having 2 high pressure and 2 low pressure cylinders, commonly called “Mallets” should be connected such that the low pressure cylinders (the larger diameter ones) control the chuff sound (mount the magnets on the wheels driven by these cylinders).

Configuring the system for locomotives that have more than two exhausting cylinders depends on how the cylinders are connected. If they are on the same crankshaft, such as a three cylinder Shay, then install one and one half times as many magnets (since 3 cylinders is 1 1/2 times as many as 2 cylinders). Locomotives with two independent engines (called a “simple articulated” such as a UP Challenger) are connected with the system timed by only one set of wheels. The sound package for this type of locomotive generates additional chuff sounds at a random interval between the synchronized sounds. The only alternative to this is to use two sound systems, one for each set of wheels.

Appendix D – Warranty

REAL TRAINS guarantees this sound system as manufactured by it to be free from defects in workmanship and materials when operated under normal conditions and in accordance with procedures set forth in this manual. There is no warranty on systems that have been modified, neglected, abused, or improperly installed, operated or maintained. Normal wear items, specifically connectors and switches are excluded from this warranty.

This warranty shall in no event be in effect for more than twelve months from the date of shipment to its initial owner. This warranty is not transferable. THIS WARRANTY SHALL BE IN LIEU OF ANY OTHER WARRANTY EXPRESS OR IMPLIED, INCLUDING , BUT NOT LIMITED TO, AN IMPLIED WARRANTY OR MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE.

The internally mounted sound board is covered by a repair or replacement warranty provided by its manufacturer. Determinations of warranty coverage applicable by this manufacturer shall be final in determining warranty coverage to be provided.

REAL TRAINS will repair or replace, at it option, any covered system or parts thereof, which has been found to be defective and is within the warranty period, provided that the system or parts are shipped, with previous factory authorization, freight prepaid to REAL TRAINS plant in Yucaipa, California, USA. All return shipments are made F.O.B. factory. REAL TRAINS is not responsible for removal, installation, or other incidental expenses incurred.

REAL TRAINS liability under this warranty shall be solely limited to repair or replacement of the system or parts within the warranty period, and REAL TRAINS shall not be liable under any circumstances, for consequential or incidental damages, including, but not limited to, personal injury or labor costs.

Under no circumstances will REAL TRAINS be responsible for any expense in connection with any repairs made by anyone other than the factory unless such repairs have been specifically authorized in writing.