

# STEAM SOUND

for various uses by **DALLEE**  
**ELECTRONICS, Inc.**

DCv3 rev14

**CAUTION:** This device can be damaged by static discharge. Please exercise care during installation to avoid this possibility. Discharge yourself to an electrical ground (outlet cover screw) before removing this device from its anti-static bag. Please read instruction sheet completely before attempting to install and operate this product. Save the anti-static bag for possible reuse of storing or shipping the sound unit!

**OVERVIEW:** This device is an electronic, self contained, sound system for installation in model steam locomotives that are designed to operate with conventional DC track power, digital (DCC), other types of command control systems including radio with either track or battery power, or as a stationary sound system. Because of its dimensions (2.5" x 0.9" x approx. 0.5" high) the sound system may be limited to larger gauge models and may also require the use of a trailing car. An alternative installation under the layout is also possible including the use of our TRAK-DT devices to switch the sound through multiple speakers so as to follow the movement of the train. A drawing for this application is in our Model Railroaders Wiring Guide.

An on/off switch (not included) must be used to turn the sound unit on and off in some applications. If there is sufficient input power, the audio amplifier can produce 1.1 watts of audio power which is in excess of what most small speakers can handle. The speaker impedance must be 8 ohms or higher. Sound volume is adjustable. Refer to our catalog for available speakers.

Sounds produced include user controlled steam whistle and bell, random air pumps, periodic safety valve pressure release, cylinder blow down and steam exhaust chuff sound automatically adjusted to speed and load conditions. Exhaust chuff can also be synchronized to actual piston movement or drive wheel or axle rotation.

This sound system, when used with conventional DC track power, requires the use of our LocoMatic™ Controller (Item 755) to operate the whistle, bell, cylinder blow down, and main sounds on/off. DCC and other command control operators can use remote functions on their systems to activate these functions. For stationary installations these sounds can be accessed by switches. Radio control with fixed track power or on board batteries would be similar to DCC installations and large gauge (where you ride the locomotive) would be similar to a stationary installation.

**INSTALLATION INSTRUCTIONS:** The sound system consists of a printed circuit board, a speaker, five 2-pin connectors with wires and one 3-pin connector with wires. A CHOKE (item 702 or 703 depending on motor power requirements), not included, is required for DC track power installations.

Refer to the drawing on page 2 to familiarize yourself with the connectors and controls on the sound board. Then refer to the specific instruction sheets for the type of installation you intend to make. Before proceeding with the installation read the balance of the instructions carefully so you will be completely familiar with what is required and what sounds you should hear.

The circuit board should be mounted, usually in the locomotive tender, so that the volume and other controls are accessible either through the frame or via a hatch or a hole in the tender body shell. Be certain that the components on the circuit board do not come in contact with any metal objects as such contact can destroy the sound system. The speaker should be mounted as per available space bearing in mind that sound reproduction is enhanced when a speaker is properly enclosed and baffled.

If a DC locomotive is not moving, there is no track power, therefore to have sound it is necessary to have a separate power supply for the sound system. For in locomotive use, this separate supply is a battery. We suggest the use of one 9 volt, 6 AA, or 6 AAA batteries in series (7.2 - 25 volts) to maximize volume potential and battery life. Rechargeable batteries can be used. When connecting the battery (DC) power leads be absolutely certain that wires connect to the proper DC input leads.

If any connections are not done properly, especially the power connections, you will damage the sound system. This type of damage is not covered under any warranty. The sound system is thoroughly tested and inspected before packing to insure proper function. There is a minimum charge of \$40.00 plus s/h for repair.

## SOUND INFORMATION:

**AIR PUMPS** are needed to maintain air pressure in the train and locomotive braking systems. These pumps must run periodically as pressure drops, due to brake applications or through normal leakage. To simulate this action, AIR PUMP sounds are generated at random intervals when the sound system is on and there is no power to the track / motor. AIR PUMP sounds will also be heard when power is first applied to the sound system. This will give you an indication that the system is in fact functioning.

**BLOWERS** are used on a steam locomotive to maintain fire box draft when the locomotive is not in motion. BLOWER sound will be generated whenever the locomotive has stopped moving and there is no power to the track / motor.

**SAFETY VALVE** will vent if steam pressure in the locomotive boiler becomes excessive. The sound system will produce a SAFETY VALVE release at random intervals whenever the blowers are on and steam is not otherwise being used.

**CYLINDER BLOW DOWN** is required to remove condensate that accumulates in the cylinders when a locomotive has been at rest. This condensate must be exhausted from the cylinders prior to the pistons being powered by steam or there can be damage to the cylinders. CYLINDER BLOW DOWN sounds will be generated by the sound system when requested. With the LocoMatic™ Controller you depress and release the ALT & F3 button to turn on the CYLINDER BLOW DOWN and then again depress and release the button to turn the CYLINDER BLOW DOWN off. Toggle switch or remote function control does not require the PUSH ON - PUSH OFF sequence. The CYLINDER BLOW DOWN will automatically turn off when the locomotive starts running (1.5 - 2 volts is required on the motor input terminals, J3 pins 2 and 3, to be sensed).

**WHISTLE** sound is controlled by the WHISTLE button on the LocoMatic™ Controller, by a momentary push button or by remote function, dependent upon the type of installation. The WHISTLE will sound as long you are holding the control on. This will allow you to actually play the sound as on a real locomotive. DCC and similar systems will have a sound delay equivalent to system response time.

**BELL** sound is controlled by the BELL button on the LocoMatic™ Controller, by a toggle switch or by remote function, dependent upon the type of installation. When BELL sound is requested the sound system will ring the BELL continuously. After a ring or two, the BELL can be turned off and will stop at the end of a ring. With the LocoMatic™ Controller you depress and release the BELL button to turn on the BELL and then again depress and release the button to turn the BELL off. Toggle switch or remote function control does not require the PUSH ON - PUSH OFF sequence.

**EXHAUST CHUFF** is the most notable sound of a steam locomotive in motion. The sound is the result of the used steam from the cylinders being vented through the stack. Each cylinder will exhaust twice during each drive wheel revolution and since most steam locomotives have two cylinders, the exhaust should chuff four times for each drive wheel revolution. EXHAUST CHUFF sounds should vary from a very slow chuff rate to an almost continuous roar at high speed. EXHAUST CHUFF should also vary as to the load on the locomotive with a heavy train making a louder exhaust. This sound system will vary the EXHAUST CHUFF sound either by voltage supplied to the track / motor or, as an option using the "SYNC" input for actual movement of the drive wheels or other axles. The EXHAUST CHUFF volume will increase above normal during acceleration and will be lower when decelerating.

**SPEAKER MOUNTING:** The speaker generally should be mounted so that the sound can actually "get out" of the locomotive. A hole in the floor of the tender is acceptable but the front of the coal bunker or even through a simulated coal load may be a better choice as the sound can exit forward or upward rather than down toward the track. In some cases, particularly in the larger gauges, mounting a speaker inside the front of the boiler with an open stack can enhance the sound. Enclosing the speaker in a chamber will also enhance sound reproduction. A very simple enclosure can be made with a tube. It is usually best to seal the end of the tube, so there are no air passages to the rear of the speaker, thus creating a sound chamber. By carefully sealing all openings it may be possible to use the entire tender body shell as a sound chamber. A simple wall behind the speaker may be all that is possible or perhaps all that is needed.

Speakers can be attached with double sided tape, with glue or with "hot melt". Enclosures can be made with plastic, wood, card stock or even metal. Film cans or medicine bottles make excellent sound chamber enclosures for small diameter speakers. Attachment with "hot melt" is advantageous as the "hot melt" can be used as a gap filler when creating an enclosure.

A second speaker, wired in series with the main speaker, can also enhance sound quality and will permit a higher volume without damage to the individual speakers.  
 Speaker enclosure is an art and experimentation is definitely in order for your installation so as to gain the maximum benefit of the superb sound quality available in this sound system.

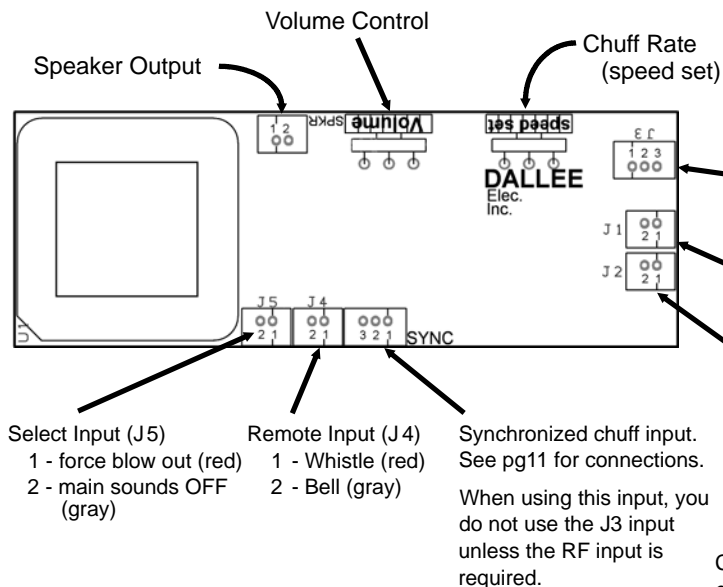
**GENERAL OPERATING INFORMATION:**

**VOLUME ADJUSTMENT:** should be set as desired for your application. Please remember that the amplifier can produce more power than a small speaker can handle and that the sound will be louder if the speaker is properly enclosed and baffled. If you are using batteries, the louder the volume the shorter the battery life.

**CHUFF RATE** control adjusts the rate of chuff when in auto-chuff mode. This adjusts the maximum chuff speed for voltage variable automatic exhaust chuff. Rotate the control CCW to increase the voltage required to reach maximum chuff speed. Adjust as desired for a chuff rate to match your locomotive. When using the "SYNC" input, the CHUFF RATE control has no effect.

Another feature incorporated in this sound system is the ability to turn all sounds off, leaving only the Whistle and Bell to operate. This can be done with the LocoMatic™ Controller by using the ALT & F4 button and is a push on / push off function. Other operators can access this with using function / switch inputs.

<u>SOUND</u>	<u>INDICATION</u>
short.....	apply brakes, stop
2-long.....	release brakes, proceed
long, 3-short.....	flagman protect rear of train
4 or 5 long.....	recall flagman
2-short.....	acknowledgment
3-short.....	back up movement
4-short.....	call for signals
short, long.....	inspect train line for leak or brakes sticking
2-long, short.....	approaching meet or wait point
2-long, short, long....	approaching grade crossings
continuous long.....	approaching stations or junctions
successive shorts....	alarm for something on track



This system features an optically coupled motor input sensor. This means that any connection to J3 pins 1, 2, and 3, do not electrically connect to any other power to the board!

- J3 connections:
- 1 - track RF input (RED)
  - 2 - Motor 1 (BLACK)
  - 3 - Motor 2 (WHITE)

- J1 connections:
- 1 - DCC rail 1 .....also AC input 1.....(RED)
  - 2 - DCC rail 2.....also AC input 2.....(GRAY)

- J2 connections:
- 1 - DC power "+" (RED)
  - 2 - DC power "-" (GRAY)

Select Input (J5)  
 1 - force blow out (red)  
 2 - main sounds OFF (gray)

Remote Input (J4)  
 1 - Whistle (red)  
 2 - Bell (gray)

Synchronized chuff input.  
 See pg11 for connections.  
 When using this input, you do not use the J3 input unless the RF input is required.

Connections to J3 and the "Sync" input for use with our LocoMatic™ Controller requires another 3 pin connector assy. This is not included and needs to be purchased separately.

<b>SPECIFIC INSTRUCTION SHEETS</b>	
<u>PAGE</u>	<u>INSTALLATION TYPE</u>
3, 4.....	Conventional DC
5.....	Stationary Sound
6.....	DCC receiver
7.....	OTHER receiver
7.....	with DC Controller
8.....	Speaker installation
9.....	Synchronization

Other wiring / application notes can be found on our web site under "current product instruction index".

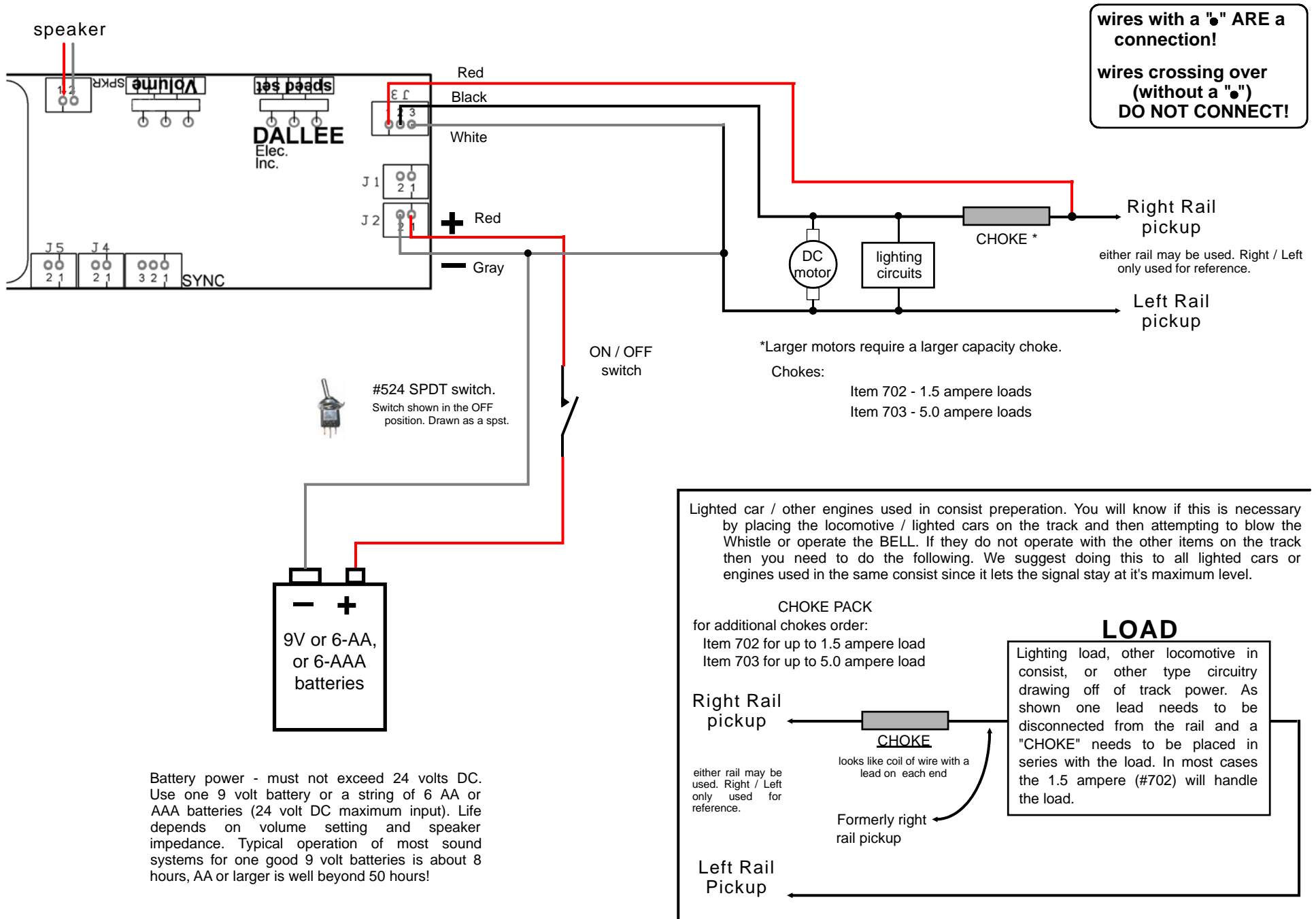
NOTE: The speaker impedance should be kept near or above 8 ohms, therefore four 8 ohm speakers in a series/parallel configuration is acceptable since it yields 8 ohms total impedance. If you care to use two 8 ohm speakers you **must** place them in **SERIES**.

DO NOT touch the speaker wires to anything else, this will damage the amplifier which is not covered under warranty!

When connecting DC power to the sound unit be absolutely sure that the "+" and "-" are connect correctly! If not, you will either burn out the sound unit or the supply feeding it. This is not covered under warranty!

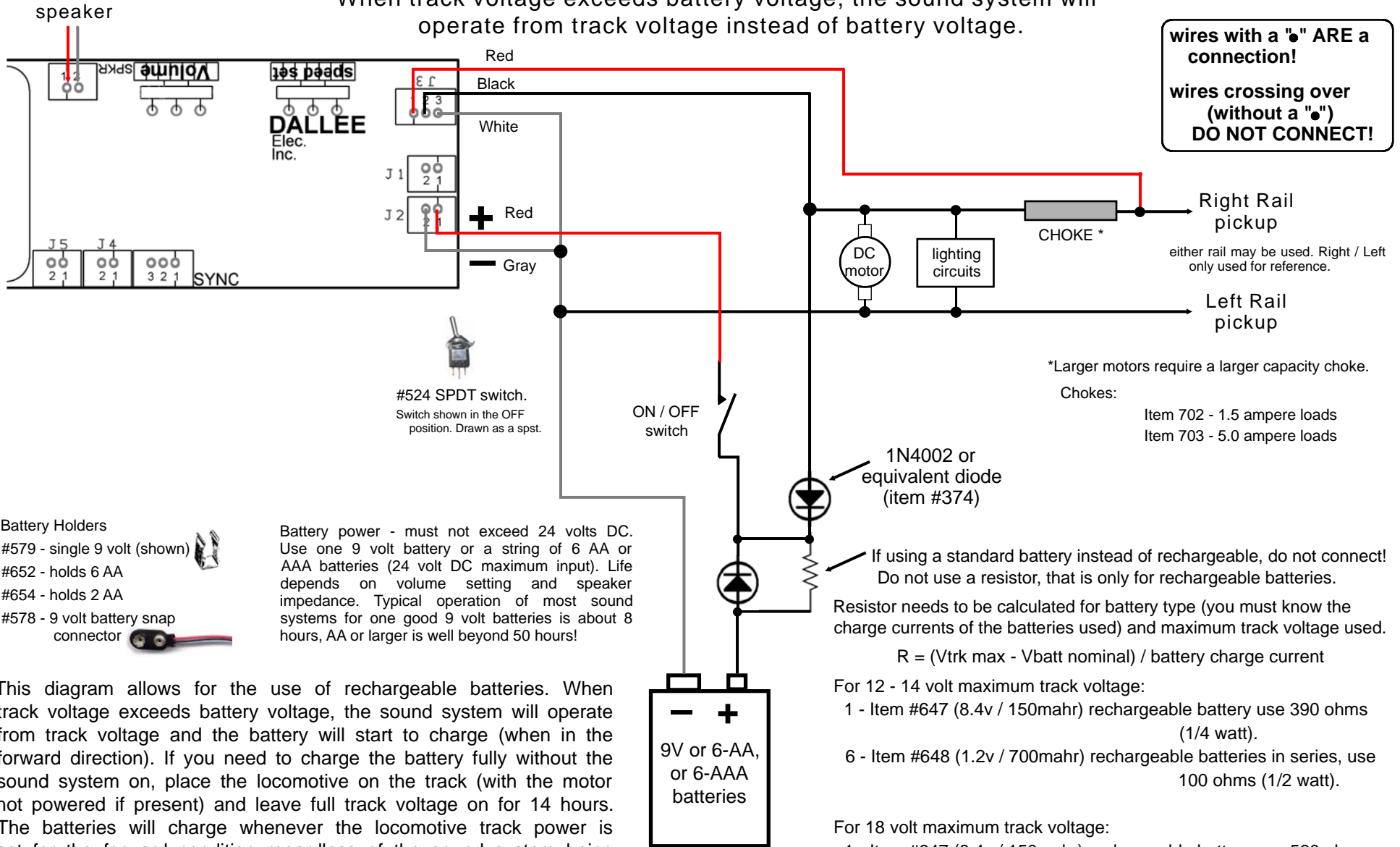
**DALLEE**  
**ELECTRONICS, Inc.**  
 246 W. Main St.  
 Leola, PA 17540  
 (717) 661-7041  
 www.dallee.com

# DC track power installation using standard batteries & DALLEE controller #755



# DC track power installation #2 with DALLEE controller #755. With rechargeable or standard battery.

When track voltage exceeds battery voltage, the sound system will operate from track voltage instead of battery voltage.



- Battery Holders**
- #579 - single 9 volt (shown)
  - #652 - holds 6 AA
  - #654 - holds 2 AA
  - #578 - 9 volt battery snap connector

Battery power - must not exceed 24 volts DC. Use one 9 volt battery or a string of 6 AA or AAA batteries (24 volt DC maximum input). Life depends on volume setting and speaker impedance. Typical operation of most sound systems for one good 9 volt batteries is about 8 hours, AA or larger is well beyond 50 hours!

This diagram allows for the use of rechargeable batteries. When track voltage exceeds battery voltage, the sound system will operate from track voltage and the battery will start to charge (when in the forward direction). If you need to charge the battery fully without the sound system on, place the locomotive on the track (with the motor not powered if present) and leave full track voltage on for 14 hours. The batteries will charge whenever the locomotive track power is set for the forward condition regardless of the sound system being on or off. They will not charge when the polarity on the track is set in reverse. When running in reverse, the sound system will only operate from the battery. A bridge rectifier could be used instead of a single diode alleviating this potential problem.

\*Larger motors require a larger capacity choke.  
Chokes:  
Item 702 - 1.5 ampere loads  
Item 703 - 5.0 ampere loads

1N4002 or equivalent diode (item #374)

If using a standard battery instead of rechargeable, do not connect! Do not use a resistor, that is only for rechargeable batteries.

Resistor needs to be calculated for battery type (you must know the charge currents of the batteries used) and maximum track voltage used.

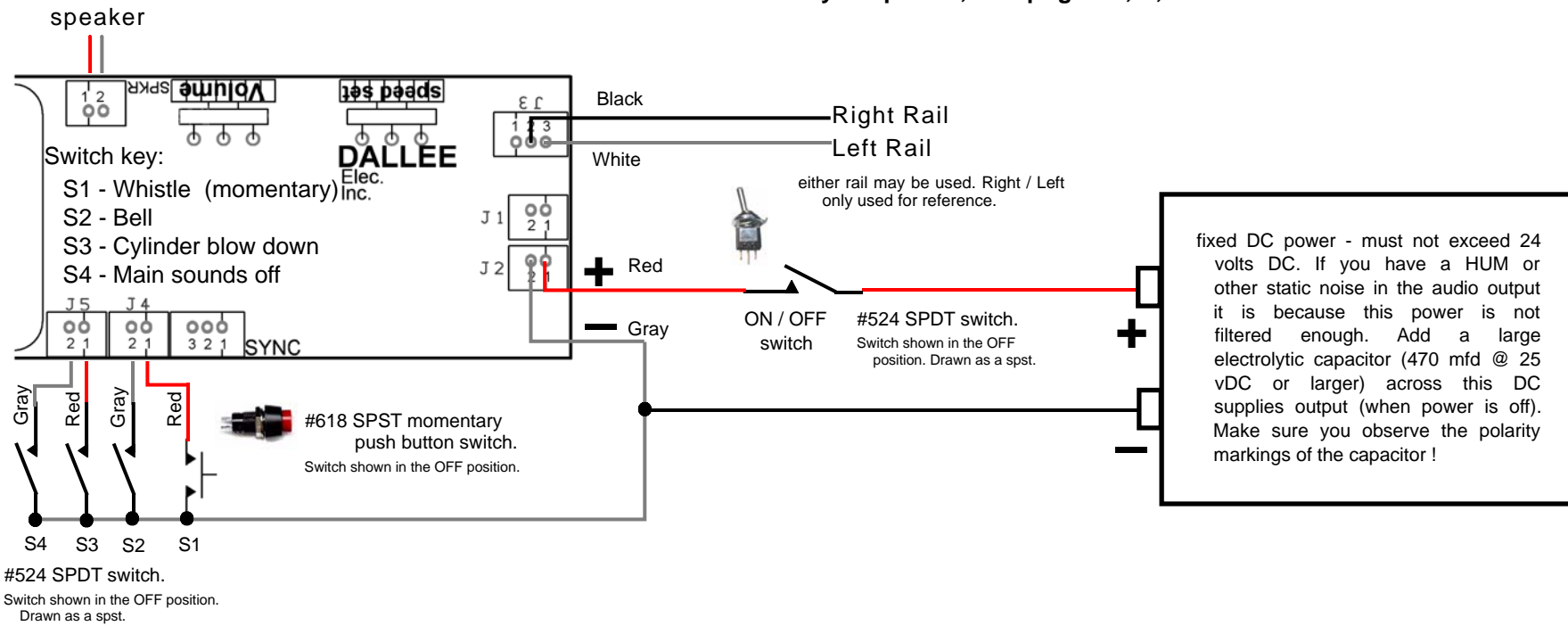
$$R = (V_{trk\ max} - V_{batt\ nominal}) / \text{battery charge current}$$

For 12 - 14 volt maximum track voltage:  
1 - Item #647 (8.4v / 150mahr) rechargeable battery use 390 ohms (1/4 watt).  
6 - Item #648 (1.2v / 700mahr) rechargeable batteries in series, use 100 ohms (1/2 watt).

For 18 volt maximum track voltage:  
1 - Item #647 (8.4v / 150mahr) rechargeable battery use 560 ohms (1/4 watt).  
6 - Item #648 (1.2v / 700mahr) rechargeable batteries in series, use 180 ohms (1 watt).

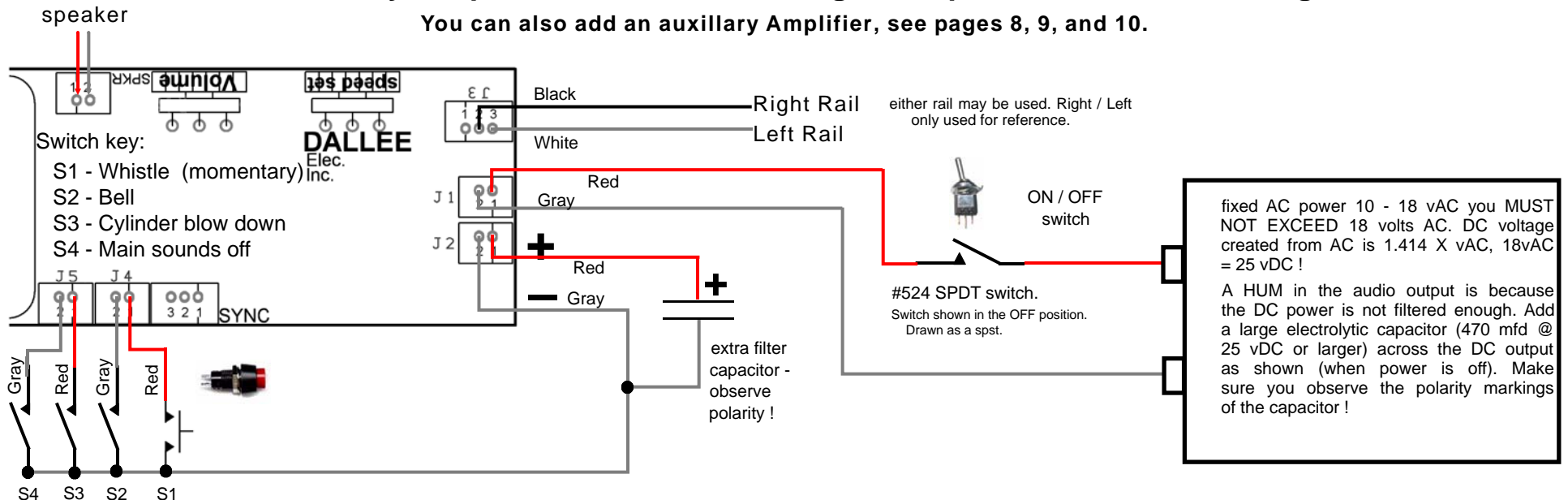
## Stationary DC power installation using track power for notch setting.

You can also add an auxillary Amplifier, see pages 8, 9, and 10.

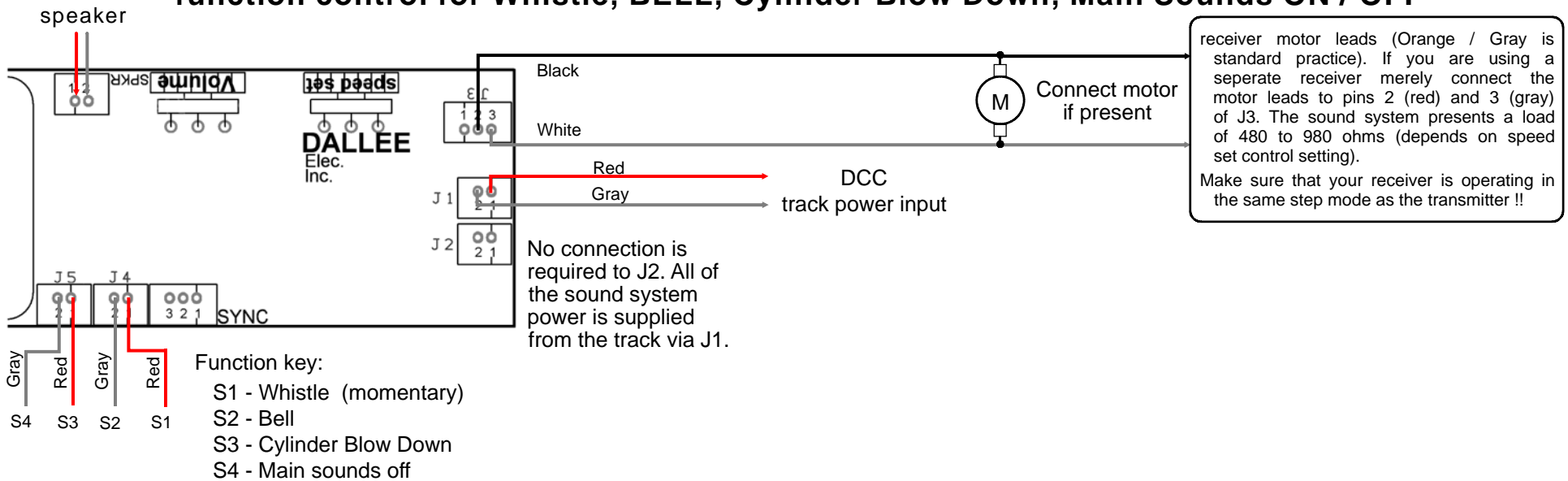


## Stationary AC power installation using track power for notch setting.

You can also add an auxillary Amplifier, see pages 8, 9, and 10.



# DCC receiver installation using motor power for notch settings and function control for Whistle, BELL, Cylinder Blow Down, Main Sounds ON / OFF



Connect S1 thru S4 to function control desired.  
You do not need to connect functions you do not intend on using.

S1 - Whistle function. Connect to desired function output of module. Activate low to play Whistle.  
Some DCC systems offer a momentary type function. It is best to use what the system you are using suggests.  
Digitrax - use F2 function  
Wangro - use F3 function

S2 - BELL function. Connect to function output of module. Activate low to play BELL.  
Suggest function as set by DCC system you are using.  
Digitrax - use F1 function  
Wangro - use F2 function

S2 -> S4 - function. Connect to extra function, if desired. When using an extra receiver you can use either Forward or Reverse lamp function output of module. Normally not activated = "high". Activated = "low" (function ON).

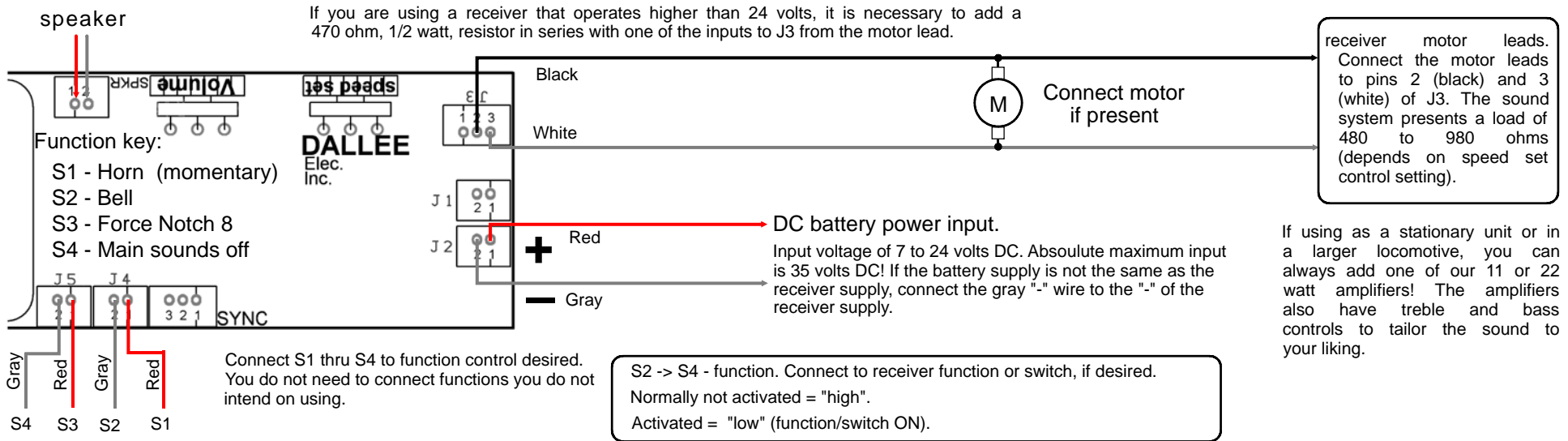
## ATTENTION

ALL FUNCTION CONNECTIONS are for OPEN COLLECTOR type FUNCTIONS such as those found on DIGITRAX, LENZ, NCE, and WANGRO receivers. Although there should not be any problem with any other type, we have not verified it. The sound unit has been designed and operated with WANGRO, DIGITRAX, and LENZ systems to verify DCC operation and compatibility.

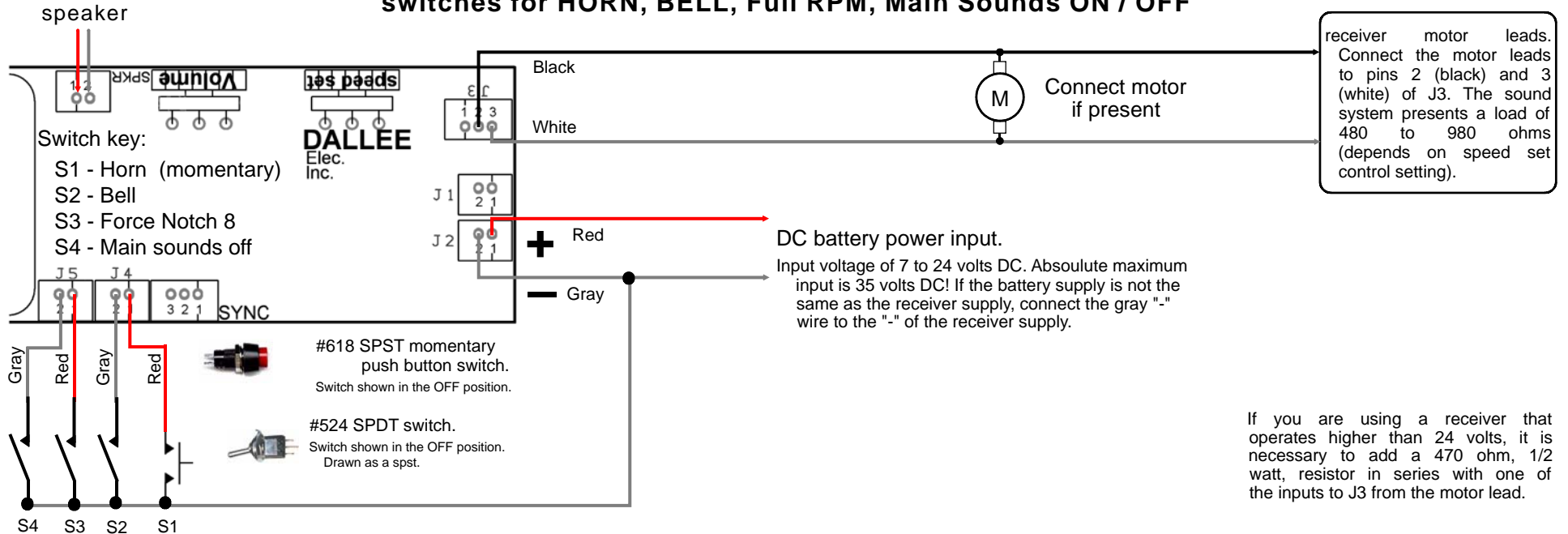
## ADDITIONAL NOTES:

If you feel that you need longer running time when an intermittent track power input occurs simply attach a larger filter capacitor across the DC power leads (J2). Observe proper polarity. The plus connects to pin 1 (red), minus to pin 2 (gray) - the polarity is very important since some capacitors when connected in reverse can actually blow up like a fire cracker! The larger the capacitor the longer operating time without track power. A capacitor of 470 mfd @ 25vDC should be sufficient, too large of a value will require a very large surge current when track power is applied. Some transmitters cannot take the large surge current on startup and will show an overload condition when powering up.

## Other receiver or controller installation using motor power for notch settings and function control for HORN, BELL, Full RPM, Main Sounds ON / OFF



## Other receiver or controller installation using motor power for notch settings and switches for HORN, BELL, Full RPM, Main Sounds ON / OFF

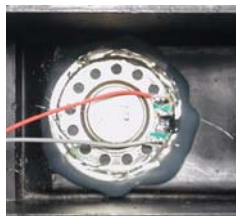


# Sample Speaker Installations

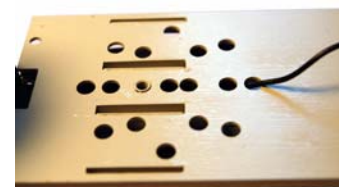
## Closed top Tender

It is best to have the sound projected up instead of down. To do so, locate the highest part of the existing coal pile. Use a small, sharp, drill bit (#60) to open a series of holes within the speaker cone diameter. Always drill slowly so the plastic does not melt.

Mount the speaker with "Hot Melt" or glue. Be sure to cover all sides of the speaker so no air can escape.



When mounting the sound unit in an open chassis (car or locomotive) area with a power feed entering under the speaker requires raising the speaker from the chassis floor. This is easily accomplished by adding item #388, 1/8" thick double sided tape, to the rim of the speaker. As you can see, only a small amount is needed. This creates an air tightness from the front side of the speaker which is required for a good baffle. In this case, the entire body shell is used for the speaker baffle which is why nothing is required on the back side of the speaker.



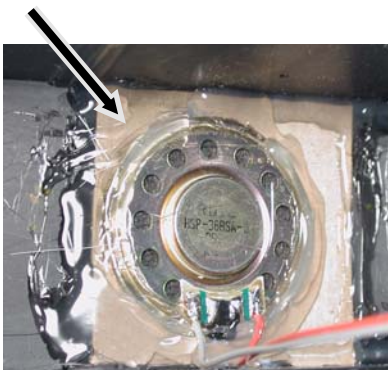
In larger tenders with a lot of air passage between the tender top and frame, it may become necessary to make your own enclosure as shown here. Especially if you don't want to drill the top open (or it's an oil burner).



## Open top Tender

Make a cardstock cutout with an opening for the speaker. Mount the cardboard cutout with "Hot Melt" or glue. After the cutout sets, mount the speaker. Be sure to cover all sides of the cutout to the tender and speaker so no air can escape.

If you have other openings, be sure to close them.



top view of completed speaker installation.

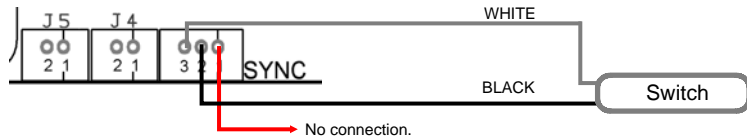


# Optional Synchronization of Exhaust Chuff

## Switch Synchronization:

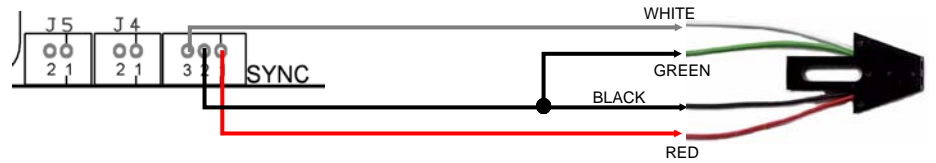
- 1 - connect Common (C) of the switch to the White wire from the SYNC input.
  - 2 - connect Normally Open (NO) of the switch to the Black wire from the SYNC input.
- Switch closure should occur on peaks of quartering lobes. We recommend using optics since they can switch much faster, don't bounce, and do not interfere with the mechanical operation of the axle.

DO NOT use a leaf switch to the chassis (quartering lobe) this will damage the sound unit!



## Optical Coupler (item #583) Synchronization:

- 1.....connect Black and Green optical pickup wires together, this then connects to the Black wire from the SYNC input.
- 2.....connect Red optical pickup wire to the Red wire from the SYNC input.
- 3.....connect White optical pickup wire to the White wire from the SYNC input.



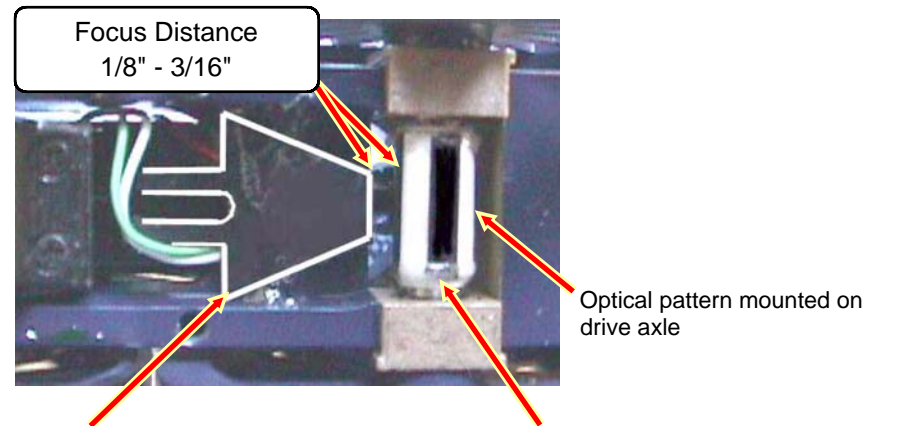
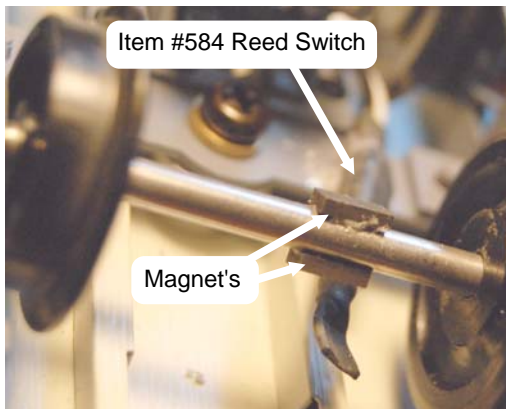
## Reed Switch Synchronization

Axle synchronization can also be accomplished by gluing one or two magnets onto any axle. The reed switch is supplied with two wires and encased in heatshrink tubing. These connect to the White and Black wires from the "SYNC" connector as shown above.

To create one chuff per revolution, which most will find creates the sound effect desired, merely glue one magnet onto the axle. For two chuff's per revolution, the second magnet needs to be glued onto the axle in the opposite position. Most trailing wheel sets are 1/2 the diameter of the main drivers, so two magnets would yield 4 chuffs per revolution of the main drivers.

These magnets are very small and measure only 0.1" wide x 0.2" long x 0.045" thick.

Two magnets and one reed switch assembly are included in this package, item #584.



Optical Coupler, item 583 (hi-lighted for ease of viewing), mounted to frame 3/16" from optical end to pattern. In this installation, the end mounting ears had to be trimmed to obtain clearance to the drive gear box. When doing so care must be used to not damage the optics.

apply a thin layer of glue on each side to prevent oil from contaminating the optical pattern.

## Synchronization Note:

When using a sync input, DO NOT connect the black and white wires of J3 to the motor brushes. While no harm is done in doing so, it is not necessary.

It is not necessary to use the black / white stripe pattern, anything that will come in and out of focus to the optical reader will work! So, engines with cams installed or a piece of rectangular tubing cut and mounted to the axle may also work with proper alignment. Remember, some paints and other type markers will still reflect the infra-red light. So, just because it's black doesn't guarantee that it will work. The optical coupler comes with laser printed stripes.