

IN LOCOMOTIVE STEAM SOUND  
DC TRACK POWER  
DALLEE ELECTRONICS

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.

OVERVIEW

This device is an electronic, self contained, battery powered sound system for installation in model steam locomotives that are designed to operate with DC track power. Because of its actual dimensions the sound system is limited to "0" gauge or larger models.

This sound system is designed to be operated with any existing DC power pack by including a DALLEE ELECTRONICS SOUND CONTROLLER between the power pack and the track. The SOUND CONTROLLER contains a switch to operate the BELL sound and a push button to operate the WHISTLE. While the SOUND CONTROLLER, as designed, requires a 9 volt battery, an external *REGULATED* DC source of 9 to 12 volts, such as the DALLEE ELECTRONICS 12 VFS (Item 369), can be substituted.

Sound volume is adjustable and a 2 inch diameter speaker is supplied. Sounds produced include user controlled bell and whistle, a blower to maintain fire box draft, safety valve to vent excess steam pressure, air pumps, steam cylinder blow out prior to locomotive motion and exhaust chuffs synchronized with drive wheel rotation at four chuffs per revolution.

The sound system requires two 9 volt batteries wired in series so that a total of 18 volts is available. Rechargeable batteries may be substituted however they must be disconnected from the sound system for charging and less than 18 volts will be available so there will be some loss in volume potential. A switch to turn the sound system "on" or "off" is also included.

INSTALLATION INSTRUCTIONS

The sound system consists of two stacked printed circuit boards which should be mounted in the steam locomotive tender so that the volume control on the top board is accessible either through the coal load or via a hatch or hole in the tender shell. The speaker is mounted as suits your preference and available space. Common mounting is on the tender floor with adequate holes drilled or punched to allow the sound to come out of the enclosure. The speaker is to be wired to pins #1(gray wire) and #2(black wire) of the four pin connector at the edge of the upper circuit board. Twin two pin female connectors may be supplied in lieu of a four pin connector. In either case the gray wire connects to pin #1, black wire to pin #2, green wire to pin #3 and the red wire to pin #4.

Input from track power is to be wired to the four pin connector at the edge of the the circuit board such that the right hand rail (locomotive pick up) is connected to pin #4(red wire) and the left hand rail (tender pick up) is connected to pin #2(black wire). The motor and other loads such as lights or smoke units are to be connected between pins #2(black wire) and #3(green wire) and is wired so that when the right hand rail is positive "+", locomotive motion is forward. This is standard DC wiring as recommended by the National Model Railroad Association and adhered to by most model railroad manufacturers. (LGB locomotives appear to be wired opposite of this standard). You may find it convenient to install an extra four pin connector (Item 611) to transfer power between the locomotive and tender.

Also located on the upper board is a two pin connector labeled "DC INPUT POWER". This connector is for the input power from the two 9 volt batteries which should be mounted in the tender and are to be wired in series. It is also suggested that the included on-off toggle switch be placed in this power wiring so that the sound unit can be turned off.

At the edge of the circuit board is a three pin connector which is to connect the infra-red optical coupler that is to be mounted in the locomotive and which is used to synchronize the exhaust chuffs. Sound systems furnished for articulated locomotives will have a second three pin connector at the edge of the circuit board so that an additional optical coupler can be installed to synchronize the exhaust chuffs independently for both sets of drivers. These three pin connectors are to be wired so that the red wire connects to pin #1, the combined black and green wires connect to pin #2 and the white wire connects to pin #3. Again as a convenience you may wish to install an extra connector (Item 521) to carry these three wires between the locomotive and the tender.

IT IS ESSENTIAL THAT THE INCLUDED CONNECTORS BE USED WHEN MAKING CONNECTIONS TO THE SOUND UNIT CIRCUIT BOARDS AS *SOLDERING WIRES TO THE PINS ON THESE CIRCUIT BOARDS IS NOT PERMITTED.*

THIS WILL VOID ANY PRODUCT WARRANTY.

#### MOUNTING THE OPTICAL COUPLER

The infra-red optical coupler could be mounted with a screw on a bracket in the locomotive frame so that face of the device, housing the emitter and reflective detector, is located in line with a driver axle and at a distance of 1/8 inch away. This 1/8 inch distance is the optimum focus for the reflection of the infra-red beam and is critical. The slot in the housing will permit final adjustment of the position of the optical coupler. A reflective surface on the driver axle will give the optical coupler the necessary information to generate a chuff command in the sound system. The enclosed sheets contain blocks of alternating black and white stripes which can be cemented to the axle to give correct reflections. A rubber type of contact cement works well in this

application. Modern steam locomotives tend to be more efficient than older engines and will probably have less exhaust which can be simulated with the 60% sheet. Use the 50% sheet for older type locomotives.

Measure the diameter of the axle and match it to the block length necessary to cut from the paper. If the diameter of the axle is not shown, calculate the axle circumference and used the block length closest to this dimension. The block lengths correspond to the black bar adjacent to each block. Cut the paper to this full length and then trim to just the alternating stripes. You will now have a block of paper which when wrapped around the axle will show four uniform sets of black, then white sections. Adjust the paper so the white stripes correspond to the end positions of the main side rods. This will result in the exhaust chuffs matching the piston travel inside the steam cylinders.

#### SOUND INFORMATION

Water that condenses in the cylinders of a steam locomotive must be blown out before moving the locomotive or serious damage can occur to the cylinders, pistons or running gear. BLOW OUT sounds will be produced whenever track power turns "on". This BLOW OUT should always precede the motion of the locomotive.

EXHAUST sound is synchronized with driver rotation at four chuffs per revolution by the optical coupler. When this coupler "sees" the reflected white stripe, it commands a chuff. At slow rotation the chuff duration is longer than at faster speeds however, there is a maximum chuff duration which is determined internally in the sound system and is not adjustable. Wider white stripes will produce longer chuff durations up to the maximum allowed. As speed increases, sound volume reduces simulating a change in cylinder valve cutoff, also minimizing the "machine gun" effect.

WHISTLE sound is controlled by operating the whistle button on the SOUND CONTROLLER. The whistle can actually be played by practiced manipulation of the control.

BELL sound is controlled by the BELL switch on the SOUND CONTROLLER. When the switch is "on" the bell will ring.

AIR PUMPS are needed to maintain air pressure in the train brake line. These pumps must run periodically as pressure drops due to brake applications or through normal leakage. To simulate this action, the AIR PUMP sounds are generated at random intervals not only while the locomotive is in motion but also while standing.

When a steam locomotive is not in motion there is no exhaust to create a draft so blowers are turned on to maintain the fire in the fire box and therefore steam pressure in the boiler. After a time period with track power "off", BLOWER sounds come on and continue until track power again comes "on".

If pressure in a steam locomotive boiler exceeds safety limits, such excess pressure is vented by the SAFETY VALVE. While this can happen at any time it is more likely during blower operation. With track power "off", and blowers running, "pop off" of the SAFETY VALVE is simulated at random intervals.

#### OPERATING INSTRUCTIONS

Begin with the locomotive on the track, all connections made, and the volume control set at about mid range. Switch the sound system "on" and wait about 5 to 10 seconds for the BLOWER sound to begin. While the BLOWER is running you will also hear, at random intervals, the SAFETY VALVE and AIR PUMPS. Turn on the BELL with the switch on the SOUND CONTROLLER, also activate the WHISTLE with the WHISTLE button. It is possible to activate both sounds at the same time.

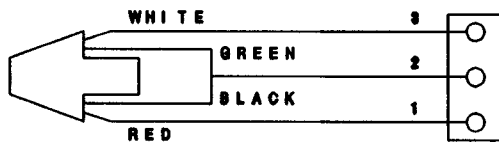
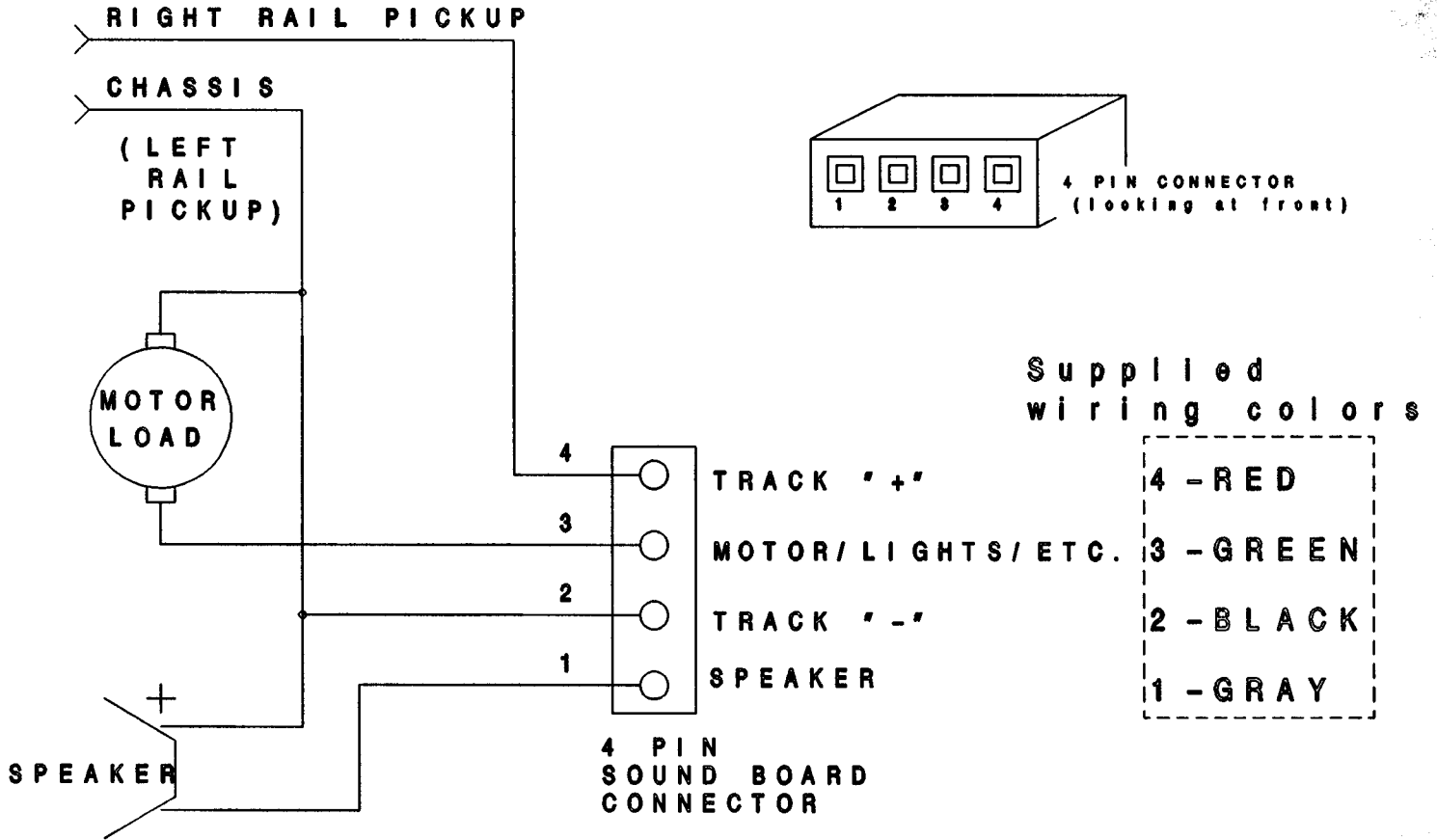
When track power is applied, for forward motion, the sound system will first simulate the blow out of water that may have accumulated in the cylinders. As the locomotive moves forward the exhaust chuffs will be heard. As previously mentioned, with the reflective stripes on the axle there should be four chuffs per wheel revolution. *If the locomotive starts in REVERSE, the connections to the motor are backwards and should be changed by switching the wires at the motor brushes.* When track power is applied for reverse movement the sound system will also blow out the cylinders and as the locomotive moves, the exhaust chuffs will begin.

All sounds are generated internally in the sound system so if the sound system itself is powered, sounds are produced regardless of power to the track or whether the locomotive is moving or not. The commands to the BELL and WHISTLE are generated in the SOUND CONTROLLER and are transmitted via the rails to the sound system, therefore the controller must be connected to the section of track where the locomotive is located in order for the BELL and/or WHISTLE sounds to be heard.

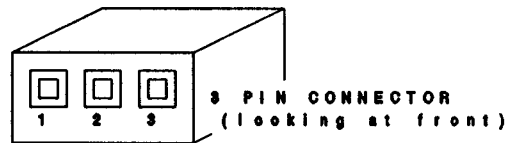
To get the most realistic sound effects it is suggested that you operate your locomotive in a reasonably prototypical manner. If, for example, you reverse your locomotive without a full stop, you may miss the cylinder blow out. This becomes especially apparent with throttles that vary speed by changing phase or frequency rather than by varying voltage.

When the power to the sound system is turned "on" there may be a short whistle sound. This is not an abnormal condition. Battery life will vary with your usage of the sound system. In tests at trade shows where sound systems have been operated continuously, batteries last an average 10 to 12 hours. In the SOUND CONTROLLER power is only consumed when the switch or button are activated so battery life is almost indefinite.

# DALLEE ELECTRONICS DC SOUND SYSTEM WIRING

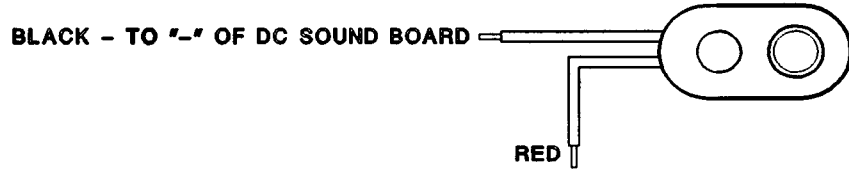


**3 PIN OPTICAL PICKUP CONNECTOR**

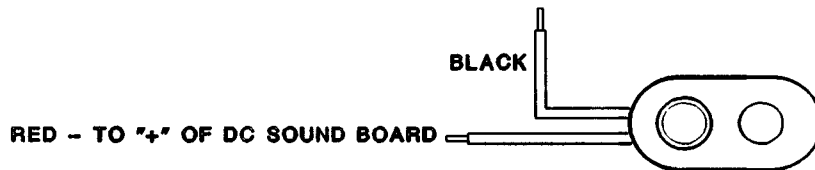


# DC SOUND SYSTEM

## I/O CONNECTIONS

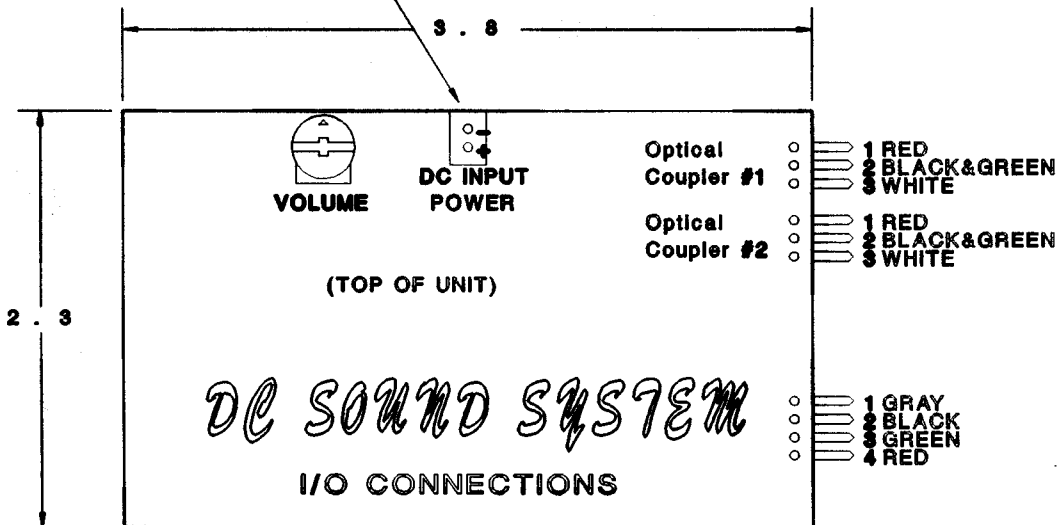


TO ON/OFF SWITCH



USE TWO 9 VOLT  
ALKALINE BATTERIES

DO NOT place  
reverse polarity  
on DC INPUT  
WILL DAMAGE  
SOUND UNIT !



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