

IN LOCOMOTIVE STEAM SOUND  
AC 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, sound system for installation in model steam locomotives that are designed to operate with AC track power even though the locomotive itself has a DC, permanent magnet, motor. Because of its actual dimensions the sound system is limited to "O" gauge or larger models.

The sound system controls the motor so a separate direction device (E-UNIT) is not needed. Usual direction sequencing of FORWARD-NEUTRAL-REVERSE-NEUTRAL-FORWARD is provided and power up in either FORWARD or NEUTRAL can be selected. The locomotive can also be locked in either the FORWARD position for continuous running or the NEUTRAL position for display.

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.

This sound system is designed to be operated by all existing AC transformer-throttles which have whistle and/or bell controls either incorporated or as add on devices. Please see also the DALLEE ELECTRONICS HOSTLER - AC, a voltage regulated, walk-around with memory, throttle which was designed specifically to operate with this sound system and is also fully compatible with all LIONEL RAILSOUNDS locomotives.

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 pile or via a hatch or hole in the tender shell. A hole should also be made in the tender floor so that the two miniature rocker switches located on the bottom of the lower circuit board can be reached. 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 wired to a two pin connector on the upper circuit board that is labeled "SP".

Also located on the upper board are two two pin connectors labeled "M" and "AC". The "M" connector is the output to the DC motor. The "AC" connector is for input from track power and should be wired so that the "A" pin is to the center rail (hot) roller pick up and the "C" pin connects to the locomotive frame or outside rails (common ground). As a matter of convenience you may wish to add a four pin connector (Item 611) to carry the "M" and "AC" wires between your locomotive and tender for easier disconnect when removing the locomotive from the track.

RED 1  
BLACK/GREEN 2  
WHITE 3

On the extended portion of the lower board is a three pin connector labeled "OI" (Optical Input) 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. 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.

#### 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 use 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" with the locomotive in either the FORWARD or REVERSE positions. This BLOW OUT will 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 lever or button on your transformer-throttle. The whistle can actually be played by practiced manipulation of the control. Should the bell ring instead, there is a reversal of wires either between the transformer and the track or from the track to the sound system. In all cases the "hot" of the transformer should go to the center rail and the "U" or "base post" should go to the ground (outside) rails.

BELL sound is controlled by the BELL control on transformer-throttles so equipped or by a separate BELL button. When the control button is depressed the sound system will lock in the circuit and the bell will ring continuously. To stop the bell cycle you must hold the control "on" until the bell ring stops and then release the control.

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 still with track power "on" in NEUTRAL.

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 "on" in the NEUTRAL position, BLOWER sounds come on and continue as long as there is power in the sound system or until another sequence position is selected.

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 "on" in NEUTRAL, and blowers running, "pop off" of the SAFETY VALVE is simulated at random intervals.

## OPERATING INSTRUCTIONS

Initially, begin with the locomotive on the track, all connections made, the two rocker switches in the "off" position and the volume control set at about mid range. When track power is applied the sound system will first simulate the blow out of water that may have accumulated in the cylinders, and then route power to the motor for motion in the FORWARD direction. *If the locomotive starts in REVERSE, the connections to the motor are backwards and should be changed either by switching the wires at the motor brushes or by rotating the M connector.* 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. Brief interruptions of track power will sequence the locomotive to NEUTRAL, then to the REVERSE position. Again, the sound system will blow out the cylinders before applying power to the motor. The sound system will store track power so that it can continue to operate during the brief sequencing interruptions. If track power remains "off" beyond the storage time, the sound system will reset to its initial position as established by Rocker Switch #2. With this switch "on" the initial position is NEUTRAL and the next sequence will be FORWARD. Rocker Switch #1 when "on" eliminates sequencing and therefore "locks" the locomotive in its initial position of either FORWARD or NEUTRAL.

The sound system has an added feature that will allow you to override normal sequencing when ever you desire. If you depress the BELL control as you turn "on" track power, the FORWARD position is selected. Depressing the WHISTLE control as you turn "on" track power will select the REVERSE position. In either case, the sound system will still blow out the cylinders before routing power to the motor. Some older transformers have substantial voltage drop when the whistle control is activated. If the voltage drops too low the sound system will revert to its initialization settings. This situation can be avoided by not activating the bell or whistle at very low speeds, except on start up, unless you are sure that your transformer will not drop the voltage below the initialization point.

This sound system is equipped with a substantial capacitor which stores track power to maintain sound during sequencing or other power interruptions. DO NOT DISCONNECT OR OTHERWISE ADJUST THE SOUND SYSTEM FOR AT LEAST ONE MINUTE AFTER TURNING OFF TRACK POWER TO ALLOW THIS CAPACITOR TO DISCHARGE ITS STORED ELECTRICITY.

# common axle diameters in english & metric

3/16"	15.1					
5mm	15.9					
5.5mm	17.4					
7/32"	17.6					
6mm	19.0					
1/4"	20.1					
6.5mm	20.6					
7mm	22.14					
9/32"	22.44					
7.5mm	23.6					
5/16"	25.0					
8mm	25.1					

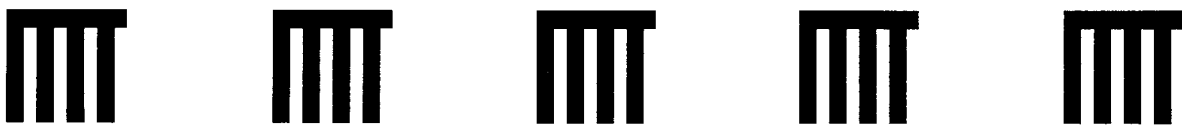
50% optical pattern for steam locomotive axles. The long black stripe indicates the total circumference of the axle leaving 4 white stripes which are read as chuffs.

common axle diameters in english & metric

3/16"  
15.1



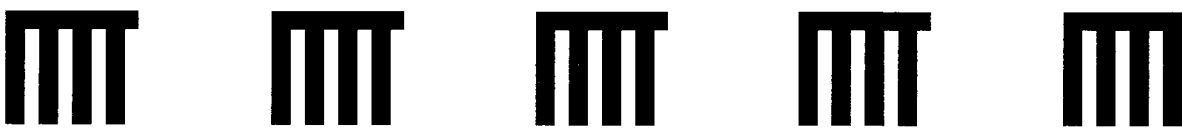
5mm  
15.9



5.5mm  
17.4



7/32"  
17.6



6mm  
19.0



1/4"  
20.1



6.5mm  
20.6



7mm  
22.14



9/32"  
22.44



7.5mm  
23.6



5/16"  
25.0



8mm  
25.1



60% optical pattern for steam locomotive axles. The long black stripe indicates the total circumference of the axle leaving 4 white stripes which are read as chuffs.

