

IN LOCOMOTIVE DELUXE STEAM SOUND

for various track power by **DALLEE**
ELECTRONICS, Inc.

Version 1.1

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, polyphonic 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. The sound system is limited to "O" scale and larger gauge models and may also require the use of a trailing car. An on/off switch (Item #524, not included) must be used to turn the sound unit on and off in some applications. If there is sufficient input power, the three audio amplifiers can each 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, treble, and bass is adjustable for each audio channel. 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 must be synchronized to actual piston movement, 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, main sounds on/off and other lighting features. DCC and other command control operators can use remote functions on their systems to activate these functions. Radio control with fixed track power or on board batteries would be similar to DCC installations.

INSTALLATION INSTRUCTIONS: The sound system consists of three printed circuit boards, and multiple mating connectors with wires. A CHOKE (item 702 or 703 depending on motor power requirements), not included, is required for DC track power installations. All installations require a synchronization device which is not included. Some manufacturers have this built into the engine, others do not. We offer item 583 (infra-red optics) and 584 (reed sw/magnets) for this function.

Refer to the drawing on page 3 to familiarize yourself with the connections required to the sound boards. These are required for all installations. 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 sound boards also have appropriate silk screen labeling to further clarify the functions of controls and connections.

The circuit boards should be mounted in appropriate locations. The main board is usually in the locomotive tender along with the volume/treble/bass board 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 tender speaker, which contains all sounds, should be mounted as per available space bearing in mind that sound reproduction is enhanced when a speaker is properly enclosed and baffled (the tender will serve as a proper baffle if near or fully enclosed).

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 6 AA batteries in series (7.2 volts for rechargeable's or 9 volts for standard batteries) to maximize volume potential and battery life. Rechargeable

batteries can also be used. When connecting the battery (DC) power leads be absolutely certain that wires connect to the proper DC input leads. **IF THESE CONNECTIONS ARE REVERSED YOU WILL DAMAGE THE SOUND SYSTEM.** This is not covered under any warranty and will be obvious to us when returned for repair (tracks are burned through on the circuit board and parts can be totally destroyed). Damage resulting from loose wire or other metal making contact with the circuit board or its components is also not covered under warranty. These sound systems are thoroughly tested and inspected before packing to insure proper function. There is a minimum charge of \$75.00 (plus s/i, PA residents require sales tax) for non-warranty repair so please be careful when making these power connections.

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. A remote function control does not require the PUSH ON - PUSH OFF sequence. The CYLINDER BLOW DOWN will automatically turn off after the locomotive starts running and an appropriate number of exhaust chuffs have occurred with the ball cocks in the open position or the engine starts moving too fast. During this motion, the Cylinder Blow Down can always be turned off. After the engine is brought to rest, several seconds must elapse before this function can be turned back on. After all, condensation takes a while to occur, so you wouldn't open the ball cocks to blow the cylinder's out right after stopping.

WHISTLE sound is controlled by the WHISTLE button on the LocoMatic™ Controller 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 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. 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 an OPTICAL INPUT (Item #583) or optional switch contacts (item #584), with actual movement of the drive wheels or other axles. Additionally, the EXHAUST CHUFF is dynamic and it's volume will increase above normal during acceleration and will be lower when decelerating.

LIGHTING EFFECTS: Automatic headlight, backup, marker, cab lighting with motor polarity. Override control is available to DC operators via the LocoMatic™ Controller (#755). After any manual lighting operation is selected, automatic lighting may be accomplished via the Alt-Bell buttons. Depressing this set returns the lighting back to automatic operation.

SPEAKER MOUNTING: The main speaker (connected to SPKR on the main board) 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 thereby not requiring a tube type enclosure. A simple wall behind the speaker may be all that is possible or perhaps all that is needed.

The other two speakers should be mounted in the main boiler if possible. Speaker 1 (connected to SPKR1 on the Engine board), from the Engine board, contains the whistle and front exhaust sounds. Speaker 2 (connected to SPKR2 on the Engine board) contains the Bell and rear exhaust sounds (in compound engines). Other sounds are also produced from all of the speakers. Since these are mounted in the boiler, round speakers are the best selection with proper baffles. Do not mount the speakers without a proper baffle since that will produce an inferior sound.

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 if so desired. Medicine bottles make excellent sound chamber enclosures for round speaker types. Attachment with "hot melt" is advantageous as the "hot melt" can be used as a gap filler when creating an enclosure.

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 ADJUSTMENTS: should be set as desired for your application. These volume controls do not allow for the sound volume to go completely off, they merely give a range for the individual volumes. Vol1 controls SPKR1, Vol2 - SPKR2, Vol3 - SPKR. Again, SPKR1 and SPKR2 are the speakers connected to the Engine board. The main tender speaker is labeled SPKR on the main board and is controlled by Vol3. 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.

TREBLE / BASS CONTROLS Each audio channel has it's independent Treble and Bass controls. These are true Treble and Bass controls and not just tone type controls. If full boost is used, it may be necessary to reduce the volume on that channel to prevent overdrive of the amplifier and speaker. Again, the relationships are the same as the volume controls. Vol1 (Volume control 1) - BASS1 (Bass control 1) - Trbl1 (Treble control 1) all control SPKR1. The others follow the same nomenclature.

MISC: 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 inputs.



Speaker enclosure: Normally the shell of a tender sealed to the base will form an enclosure. However, if this is not ideal, a pill bottle with it's end cut, as shown, off makes a nice enclosure as well. Be sure to seal the entire edge around the speaker to the bottle. The wires come through a small notch placed in the lip so that they do not become pinched from the speaker.

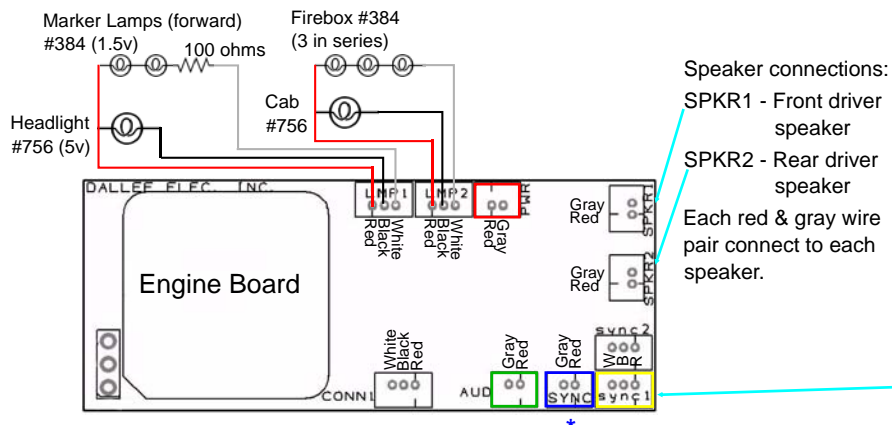
Common wiring practices
Wires with a "*" ARE a connection!
Wires crossing over (without a "*") are not a connection.
Therefore DO NOT CONNECT them!

Common Whistle signals	
SOUND	INDICATION
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

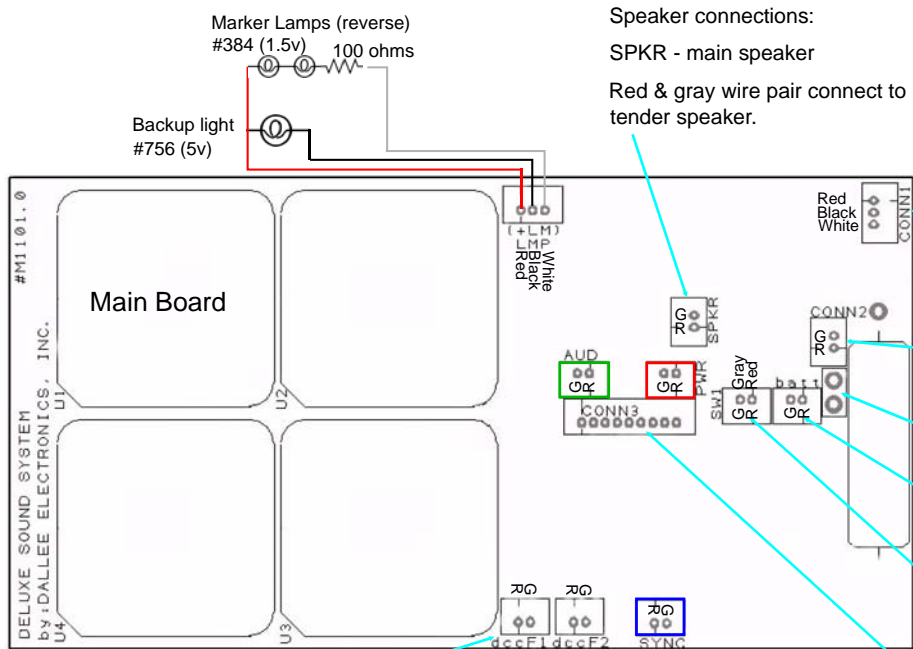
SPECIFIC INSTRUCTION SHEETS	
PAGE	INSTALLATION TYPE
3	overall wiring
4	Conventional DC
5	DCC Receiver
6	Radio Receiver
7	Aristocrat Receiver
8	Synchronization Installation
9	Synchronization Patterns
10	blank

DALLEE 246 W. Main St.
Leola, PA 17540
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Common connections between boards & components for All installations.



Lighting: Red wire is a regulated +5 volts which is common to all lamps. All outputs are pulled to ground ("-") to turn the lamps or LED's on. Outputs are capable of 120 milliamps. Exceeding the current rating will damage the output driver.



- ddcF1
 - 1 - Whistle (red)
 - 2 - Bell (gray)
- ddcF2
 - 1 - Cylinder Blow Down (red)
 - 2 - no function (gray)

All of the following connections are required for any type of installation.

For simplicity in drawing and viewing, the following connections, which are outlined in colored boxes for easier identification, need to be connected from the Main board to the Engine board. The red wire goes to the mating red wire and the gray wire to the mating gray wire between both boards. Do not reverse the colors and do not plug them into the wrong locations.

- PWR connections
- AUD connections
- SYNC connections

* The "SYNC" connections (blue highlighted connector) red and gray wires get connected together making a single wire between the Main Board and Engine Board. This is an exception to all other two wire connectors.

The yellow framed connection "SYNC1" go to the optical pickup sensor.

- SYNC1 wire Optical Sensor
- White..... White
- Black..... Black & Green
- Red..... Red

The optical sensor needs to be mounted so that the front focal distance is 1/8" to 1/4" maximum. With the sound system "ON", the optics can be easily aligned since an exhaust chuff can be heard from any white (reflection) to black (no reflection) transition. See page 8 for further details.

Definitions of connections to be shown on later pages:

- CONN1:
 - 1 - REDMotor 1
 - 2 - BLACK.....Motor 2
 - 3 - WHITEtrack RF input (for DC operators only)

- CONN2:
 - 1 - REDDCC rail 1.....also AC input 1
 - 2 - GRAY.....DCC rail 2.....also AC input 2

unlabeled, battery select jumper:
 on - rechargeable batteries..... off - standard batteries

- batt:
 - 1 - REDDC power "+"
 - 2 - GRAY.....DC power "-"

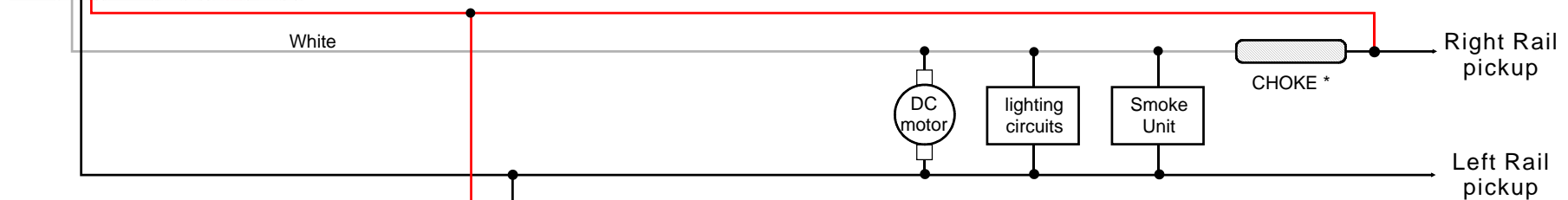
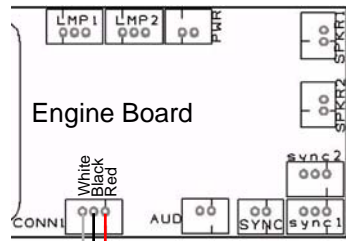
- SW1:
 - 1 - REDswitch common
 - 2 - GRAY.....switch open

CONN3 - this connector mates to the Volume/Treble/Bass board (not shown) cable.

DC track power installation using batteries & DALLEE controller #755

Connect all wires between boards as shown on page 3.

Place the Engine Board in an appropriate location in the engine. Also place the choke in the engine as shown. It is important to make all of the previous connections from the right rail to move to the side after the choke. While the drawing shows the motor, previously installed lighting, and a smoke unit, your engine may not contain all of them. You may also wish to change the factory installed lighting to that supplied from the sound cards. Failure to connect other power drawing items to the other side of the choke will result in the LocoMatic™ Controller to not be able to operate the sound system properly.

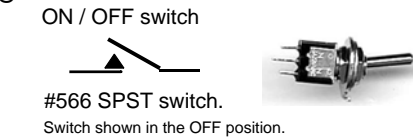
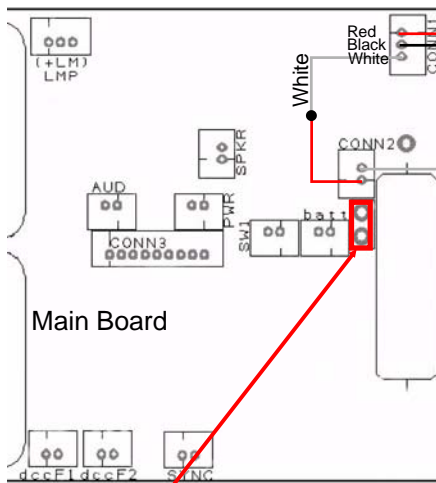


The Aux Tender lamp is controlled via the LocoMatic™ Controller's "Aux2" function (Cntrl-Aux buttons together).

*Larger motors require a larger capacity choke.

Chokes:

- Item 702 - 1.5 ampere loads
- Item 703 - 5.0 ampere loads



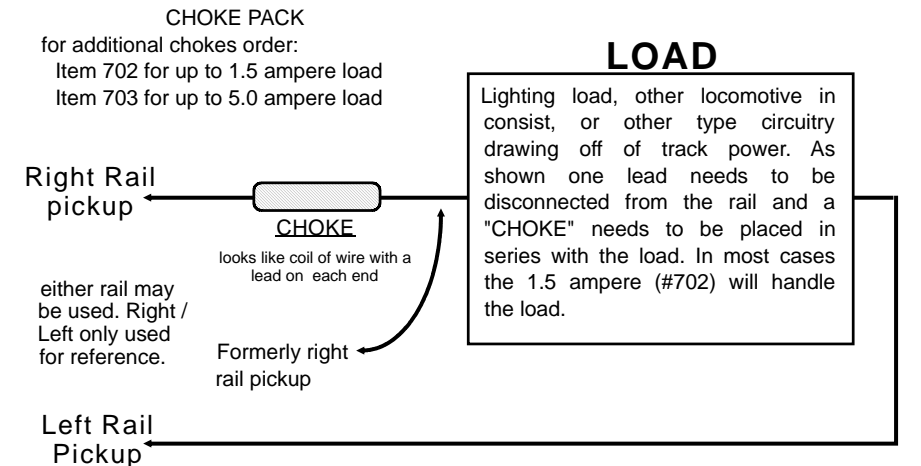
as explained on page 3, connected on/off switch to SW1 red and gray wires (see pg6 for a better drawing of this connection).

batt: Make sure the **RED** wire goes to the battery **+** and the **GRAY** wire goes to the battery **-**. Failure to do so may create severe damage to the board as well as the batteries and is not covered under warranty!

Battery power: When using standard, non-rechargeable, battery power you must make sure that the jumper is removed (located to the right of the "batt" label and shown in **RED** above) must not exceed 24 volts DC. Use a string of 6 or more AA or AAA batteries (24 volt DC maximum input). Life depends on volume settings. Typical operation is in excess of 12 hours using good AA batteries.

Rechargeable battery power: use 6, 1.2volt 700ma, rechargeable batteries (item #648). Place the jumper onto the selector located above and highlighted in **RED**. This will allow the batteries to charge whenever the track voltage is higher than the battery voltage. The batteries will also charge when the sound system "SW1" is in the off position. Full charge will result when power is applied for 14 hours. Item #652 is a 6 pack AA battery holder.

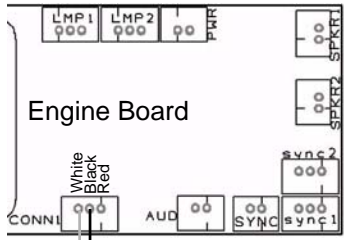
Lighted car / other engines used in consist preparation. You will know if this is necessary by placing the locomotive / lighted cars on the track and then attempting to blow the Whistle or operate the BELL. If they do not operate with the other items on the track then you need to do the following. We suggest doing this to all lighted cars or engines used in the same consist since it lets the signal stay at it's maximum level.



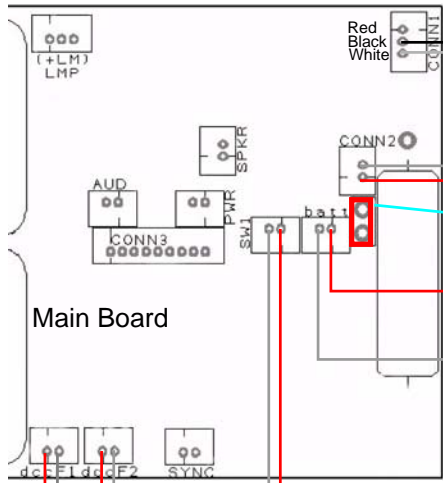
See pg 8 for optional lighting boards.

DCC receiver installation

Connect all wires between boards as shown on page 3. Place the Engine Board in an appropriate location in the engine. Place the Main Board and Volume/Treble/Bass board in the tender body at appropriate locations as well as the DCC decoder. Be careful, as always not to short anything to the boards or wires. Regulated 5 volt lighting can be either connected to the sound boards or to a function output from the decoder. You can use the 5 volt lamps with their + lead connected to the red +5 volt regulated output from the sound card and then connect the other end of the light bulb (or LED with appropriate limiting resistor) to the appropriate function on the decoder. The headlight, marker lights, and cab lights will operate automatically with the sound system. Whenever motor power is detected, the cab light will turn off and the appropriate headlight and marker lights will illuminate. So, you have your choice, either operate them with the decoder or leave them connected to the sound system for automatic operation. The flickering fire box, if desired, can be either lamps in series or a 5 volt lamp painted red. Light bulbs will function better than LED's in this application.



The white wire from CONN1 on the Engine Board and Main Board do not get connected. Either remove from connector housing, cut, or tape end.



The batt jumper (outlined in **RED**) should not be put in place.
do not connect batt red wire! Tape end, cut, or remove from housing of connector.

Some DCC systems may require the addition of another capacitor to stabilize the regulator which will show in the lights flickering (if using the 5v lighting supplied). If this is experienced, add a 470mfd to 1000mfd, 25 volt, capacitor as shown. The **RED** side of the capacitor is the **+** lead, the **GRAY** wire is the **-** lead.



If you want the sound system on at all times, connect the on/off switch wires (SW1) together or use a function with a relay to provide remote switch operation.

Connect to appropriate functions from the decoder. →

- dccF1
1 - Whistle (red)
2 - Bell (gray)

- dccF2
1 - Cylinder Blow Down (red)
2 - no function (gray)

DCC Receiver

receiver motor leads (Orange / Gray is standard practice).

Make sure that your receiver is operating in the same step mode as the transmitter !!

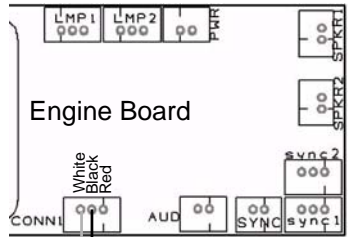
Track power input to decoder (Red / Black is standard practice).

Function outputs to appropriate Main Board inputs as shown on lower left of drawing.

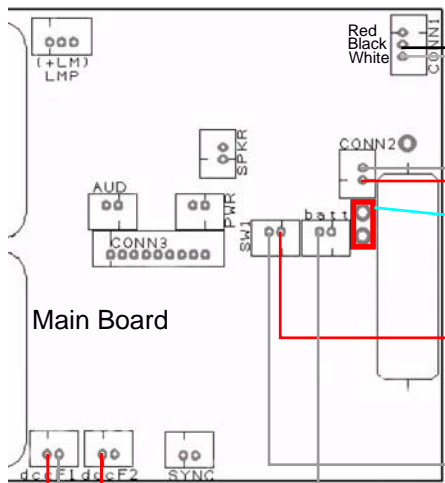
Aristocraft/Crest #CRE-55492 receiver installation using fixed track power and Aristocraft relay board (ART-5490) for sound function operation.

Connect all wires between boards as shown on page 3. Place the Engine Board in an appropriate location in the engine. Place the Main Board and Volume/Treble/Bass board in the tender body at appropriate locations. Also place the Aristocraft radio receiver boards in their appropriate locations or where space permits. Be careful, as always not to short anything to the boards or wires.

The headlight, marker lights, and cab lights will operate automatically with the sound system or you can choose to utilize the lighting from the Aristocraft receiver. Whenever motor power is detected, the cab light will turn off and the appropriate headlight and marker lights will illuminate. So, you have your choice, either operate them with the receiver or leave them connected to the sound system for automatic operation. The flickering fire box, if desired, can be either lamps in series or a 5 volt lamp painted red. Light bulbs will function better than LED's in this application.



The white wire from CONN1 on the Engine Board and Main Board do not get connected. Either remove from connector housing, cut, or tape end.

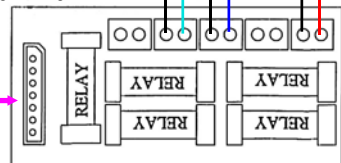


The batt jumper (outlined in RED) should not be put in place.

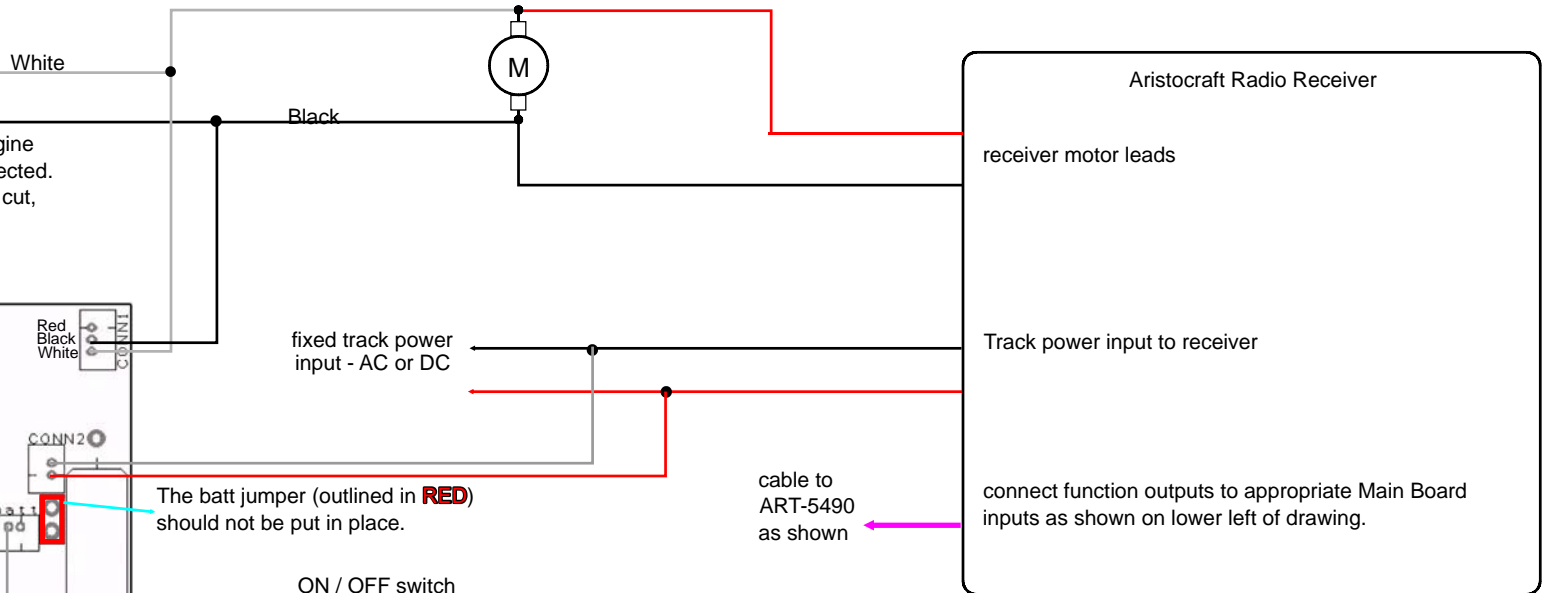


If you want the sound system on at all times, connect the on/off switch wires (SW1) together.

different colors utilized for easier wiring/viewing.



- Connections as shown:
- | | |
|---------------------------------------|--------------|
| Sound Function | Relay/Keypad |
| F1 - Whistle..... | A |
| F2 - Bell..... | C |
| F3 - Cylinder Blow Down..... | D |
| F4 - no function, tape off or cut off | |
- you may elect to connect all, some, or none.



Track Power.
Input voltage of 12 to 24 volts DC or AC. This voltage must be permitted by the track operated receiver as well.
Connect to the track input from each truck. If this is an Aristocraft receiver in a non-equipped plug in, then connect to the same wires as the receiver board (wire #1 & #7, blue & yellow)

Aristocraft Power Truck wire pickup help guide.
Terminal connection wire color receiver color

○ Left Rail pickup	Black	→ Yellow
○ Motor	Brown	→ White
○ Motor	Blue	→ Red
○ Right Rail pickup	Black	→ Blue

Left / right rail will reverse in the opposite pickup truck. This drawing was made from their SD45.

Cable plugs into receiver board



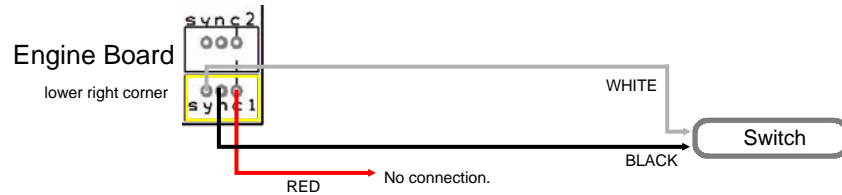
Aristocraft relay board (ART-5490)

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.

You can also use other switch type contacts but DO NOT use a leaf switch to the chassis (quartering lobe) this will damage the sound unit!

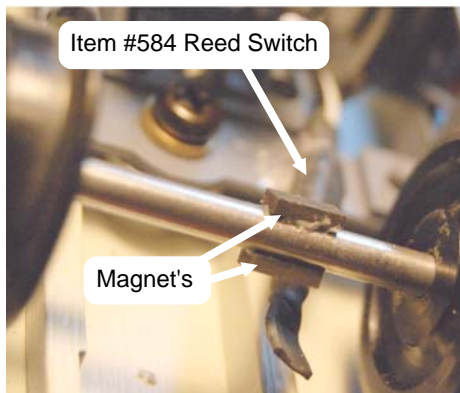


Axle synchronization can also be accomplished by gluing one or two magnets onto any axle. The reed switch is supplied with two wires and encased in heatshrink tubing. These connect to the White and Black wires from the "SYNC" connector as shown above.

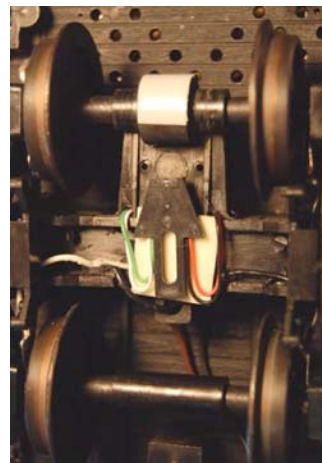
To create one chuff per revolution, which most will find creates the sound effect desired, merely glue one magnet onto the axle. For two chuff's per revolution, the second magnet needs to be glued onto the axle in the opposite position. Most trailing wheel sets are 1/2 the diameter of the main drivers,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



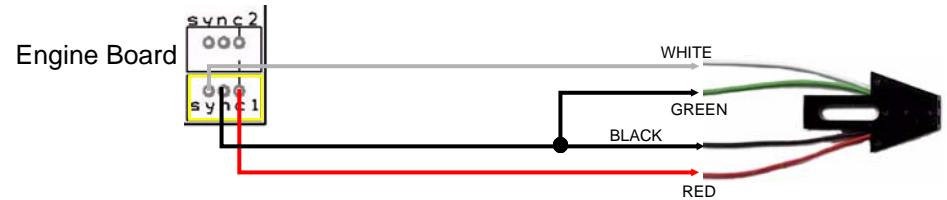
Extra wire harnesses:

2pin - item 222

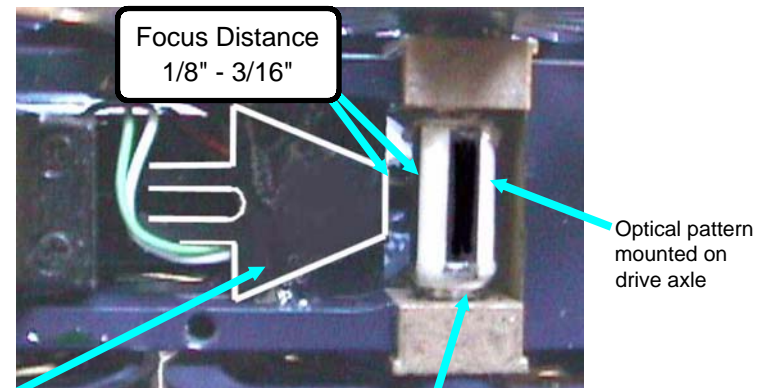
3pin - item 223

For optical coupler (item #585) 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.



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 plastruct rectangular tubing cut and glued to the axle may also work with proper alignment. Remember, some paints and other type markers will still reflect the infr-red light. So, just because it's black doesn't guarantee that it will work. The optical coupler comes with laser printed stripes.



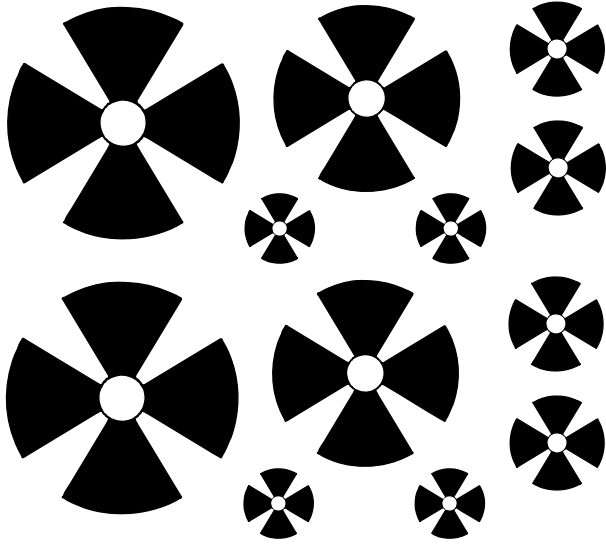
Optical Coupler (hi-lighted for ease of viewing) glued to frame 3/16" from optical end to pattern. In this installation, the end mounting ears had to be trimmed to obtain clearance to the drive gear box. When doing so care must be used to not damage the optics.

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

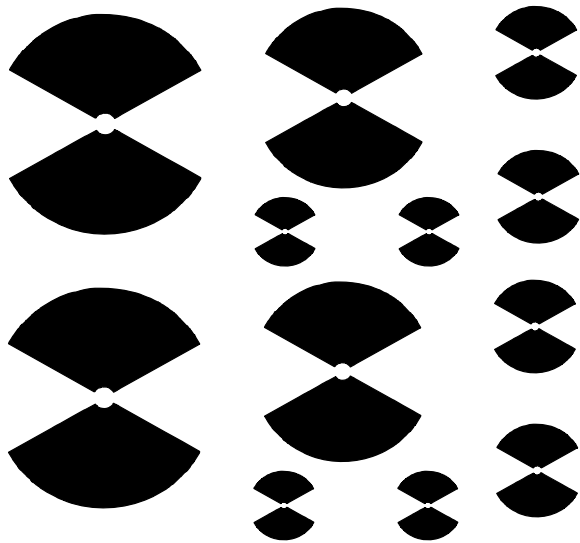
Synchronized Chuff Patterns for AXLE READ, 4 chuffs per revolution. Mount optics inside chassis and read driver axle. This is the ultimate location, when the drivers slip on the rails the sound follows! Common axle diameters shown on page 9. Select appropriate one (or make your own) and cut out. The long black strip shows total circumference of the axle leaving 4 white stripes. The chuff starts on the black stripe and ends at the end of the white stripe. For correct synchronization, place the center of the black stripe facing the optics when a piston (main rod) is at the center of it's travel. If you prefer to paint the stripes, be sure that the black paint is a flat finish. A gloss or semi-gloss will reflect as white / bare metal. You can also read the high lobes of an existing cam.

Synchronized Chuff Patterns for RIM READING for 4 chuffs per revolution.

Cut pattern that suits wheel diameter and cut large enough to cover inside flange. Mount pattern on inside flange (clearing center axle from pattern). Trim excess beyond flange. Align optics to read pattern. Any external light shining on the optical sense end will cause improper readings.

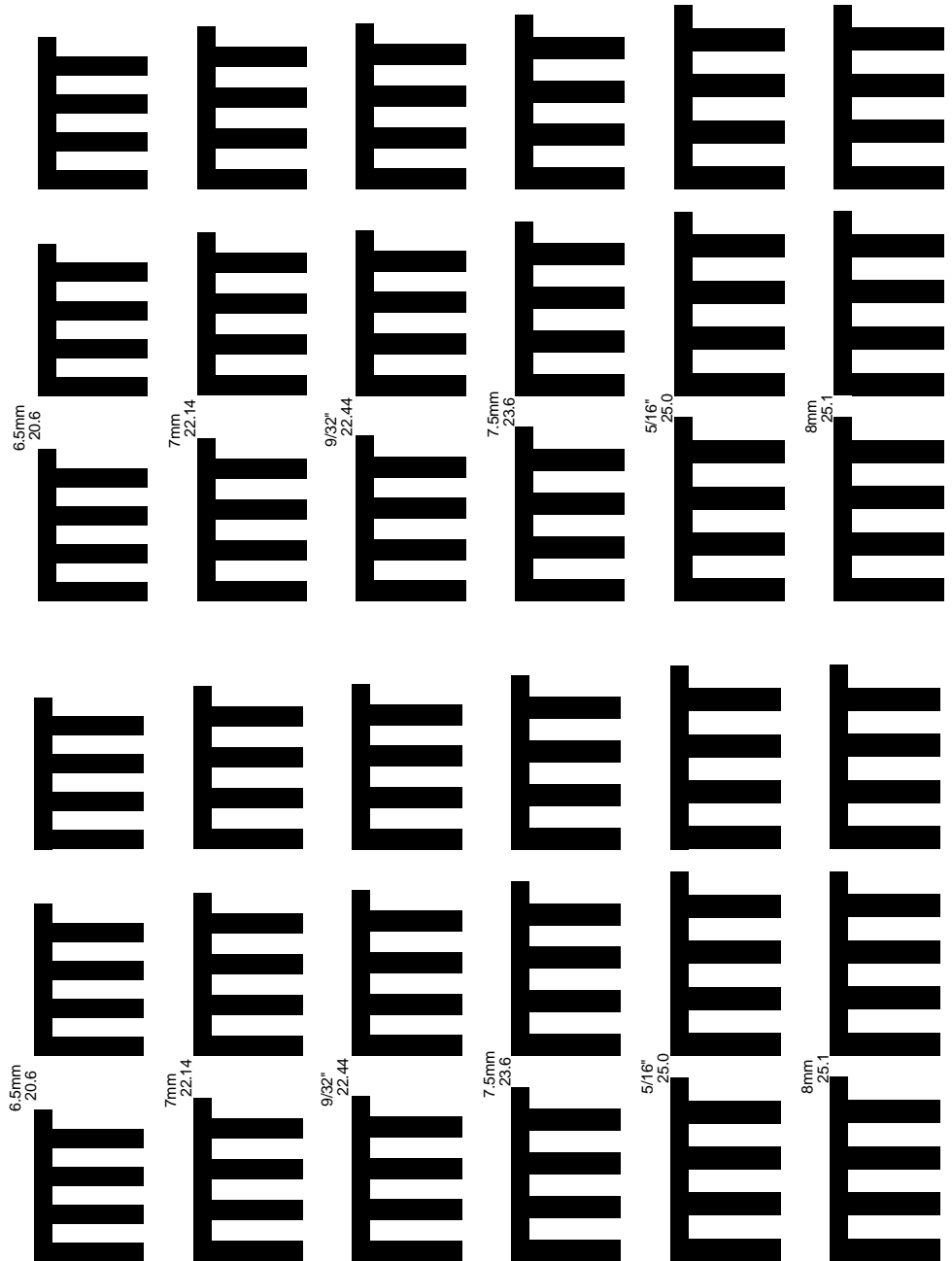


RIM READING for 2 chuffs per revolution



RIM READ
- shown mounted
inside truck.

Synchronized Chuff Patterns for Reading an Axle



Remember to shield the optic from stray light entering the pickup end. If light does strike the sensor it can overcome the infra-red reflection creating the loss of exhaust chuff synchronization.