

LocoMatic™ type4 DIESEL Sound & Control for AC or DC track power by



Instructions rev 1.2

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.

AC or DC TRACK POWERED SOUND & CONTROL SYSTEM for DIESEL LOCOMOTIVES

OVERVIEW: This sound / control system includes features that have not previously been available in the model train industry. DC operators should operate in LocoMatic™ command control only. If operated with variable DC track power in standard mode, then normal AC like sequencing will occur with either a Horn or Bell constantly operating (unless switch 3 is set on for calf mode). Conventional AC operation follows the usual sequence of forward - neutral - reverse - neutral - forward sequence pattern except that the initial state is switch selectable for either start in forward or start in neutral. A locomotive can also be switch locked in the forward position to accomodate operation under automated situations. An additional direction switch is provided so that if several locomotives are run in a multiple unit lash-up simply set this switch on each locomotive to specify which direction is forward. Recordings of actual diesel locomotives, were digitized, to be reproduced by the microprocessor sound system so that the sounds you hear will be as prototypically correct as possible. Sounds produced include user controlled horn and bell, periodic air system release, brake release and diesel prime mover sound automatically adjusted to speed and load conditions. The prime mover sound can also be user forced to its full throttle position. This sound / control system also incorporates provisions for directional head and back up lights, also marker lights as well as other lighting, including roof top strobes. Most lighting can also be manually controlled by means of the LocoMatic™ controller. The LocoMatic™ controller is also used to activate optional electric coil couplers (requires coil couplers, not included) for remote uncoupling of the locomotive from its train.

This sound / control system can be operated by all known classic and modern power transformers that output low voltage 6-18 vAC or up to 25vDC to the track and will also operate with Lionel Trainmaster or other type fixed voltage systems in conventional mode. See appended instructions regarding the operation of this sound / control system in LocoMatic™ command mode simultaneously with Lionel Trainmaster Command Control.

Additionally the sound / control system will operate with the LocoMatic™ controller either in conjunction with your transformer or independently with a fixed voltage supplied through the LocoMatic™ controller to the track.

If all you want are sounds, merely connect the speaker and track power inputs. As long as the internal e-unit remains in sync with the LocoMatic™ sound/control systems e-unit the sounds will be produced in sync with the locomotive.

INSTALLATION INSTRUCTIONS:

This sound / control system consists of a double stacked printed circuit board with an additional small circuit board attached by a wire harness. Also included is a speaker, two screws, two 5 volt light bulbs, a 6 pin, and twelve 2 pin connectors.

Refer to pages 6 and 7 to familiarize yourself with the connectors and controls on the sound / control board. 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 stacked circuit board measures 4.2" l x 1.3" w x 1.4" h and should be mounted where space permits using the double sided tape attached to the circuit board. The small circuit board (1" x 3/4") containing the volume control and 6 switches should be mounted so that the controls are accessible either through the frame or via a hatch or a hole in the body shell. 2/56 x 1/4" screws are supplied to mount this board. Be certain that the components on the circuit boards do not come in contact with any metal objects as such contact can destroy the sound / control system.

LIGHTING INSTALLATION: There are eight 2-pin connectors located along one edge of the lower circuit board. These connectors output 5 volts for lighting applications as follows:

Cab 1 "on" when sound / control system has power primary use is for cab interior lights

Cab 2 rooftop Strobe or Mars light*

Lmp F automatic / manually* controlled headlight

Lmp R automatic / manually* controlled back up light

Mkr F automatic / manually* controlled forward marker lights

Mkr R automatic / manually* controlled rear marker lights

Aux 1 manually* controlled as desired

Aux 2 manually* controlled as desired

..... Aux 1 & 2 can be number boards, ditch lights or strobes depending on equipment on specific locomotives. Note - if you prefer controllable cab interior lights use Aux 1 or 2 rather than Cab 1.

..... *requires LocoMatic™ Controller.

SPEAKER INSTALLATION:

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. The speaker is to connect to a 2 pin connector located on the corner of the lower circuit board opposite the lighting outputs.

The speaker generally should be mounted so that the sound can actually "get out" of the locomotive. A hole in the floor or fuel tank is acceptable but open grills or a doorway may be a better choice as the sound can exit upward rather than down toward the track. In some cases, particularly with plastic body shells, just mounting the speaker against the shell will be adequate as the vibrations of the shell 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 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.

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.

OPTIONAL ITEMS INSTALLATION Two 2 pin connections are provided to operate optional coil couplers. Original Lionel coil couplers were grounded to the locomotive frame so **MUST BE REWOUND** ungrounded in order to be used with this sound / control system. Coil couplers from the "O" gauge market can be adapted and used in the "G" gauge market as well.

This sound / control system also has a 2 pin connector that can be used to add an optional battery backup. The battery must be an 8.4 volt high capacity rechargeable type. Our Item #647 is specified for this unit. Once installed with the sound / control system, the battery will be charging whenever there is track power "on". When track power turns "off", the battery will remain in circuit for about 30 seconds and then automatically turn "off" (providing sufficient charge exists in the battery). Battery backup is not generally necessary as this sound / control system has storage capacitors that are adequate to keep the sound system functioning during normal power "off" for direction sequencing.

In LocoMatic™ **COMMAND MODE**, a battery backup is definitely not needed as full voltage track power is "on" continuously. Under this operating mode it is suggested that no battery be installed or that if a battery is in circuit you limit operation to not more than a continuous 4 hours so that you do not overcharge the battery.

SOUNDS REPRODUCED:

HORN is user activated in several ways. It can be activated by the whistle switch or button on transformers so equipped or by a separate sound activation button. The horn can also be activated by the **HORN** button on the LocoMatic™ Controller. The horn will play as long as the switch or button is held on. A manual switch allows the horn and bell to be deactivated so that, for multiple locomotive operation, only the lead locomotive's horn and bell will sound. When operating in LocoMatic™ **COMMAND MODE**, only the LocoMatic™ Controller will activate the Horn.

BELL is user activated by the bell control on transformers so equipped or by a separate sound activation button wired to do so. The **BELL** can also be activated by the **BELL** button on the LocoMatic™ controller. The **BELL** sound will latch "on" when the bell control is activated and will latch "off" when the control is again activated. When **BELL** sound is requested the sound system will first adjust the diesel sound to the RPM required for simultaneous play. When deactivating, the **BELL** will stop at the end of a ring and the diesel sound will return to the correct throttle setting. **BELL** sound can also be requested when diesel prime mover sound has been turned "off". Again, a manual switch allows the bell to be deactivated for multiple locomotive operation. When operating in LocoMatic™ **COMMAND MODE**, only the LocoMatic™ controller will activate the Bell.

AIR SYSTEM RELEASE (POPS) Air is pumped continuously in a diesel locomotive to maintain pressure in the brake system

and for other purposes. Periodically, accumulated moisture and any excess pressure will be vented through a release valve. These **AIR RELEASE** sounds (pops) are generated at random intervals during idle and at all throttle settings.

BRAKE RELEASE sound is produced when the locomotive changes from neutral to a movement direction and will always precede locomotive movement.

PRIME MOVER (DIESEL) sounds range from idle to full RPM with eight throttle notches. In neutral or with no power to the motor the sound system will produce diesel engine idle sounds. When a movement direction is selected and the speed control is advanced to put the locomotive in motion, a brake release will sound (see above) and the diesel sound will initially accelerate to about throttle notch #4, and then seek the correct notch setting for locomotive speed. This simulates the normal delay on a diesel locomotive between throttle action and actual movement. There will be a distinct volume increase during acceleration. Sound volume should be somewhat lower once speed has stabilized and should be reduced during deceleration.

Depressing the **ALT / FORWARD** button on the LocoMatic™ Controller will direct the sound system to accelerate to full RPM regardless of motor voltage. Depressing the **ALT / FORWARD** button again will release the sound system to return to the correct throttle notch setting. This feature allows the simulation of a heavy load with very slow locomotive speed or "pumping air" in a standing train.

LIGHTING FEATURES:

The sound / control system has outputs at 5 volts available for head lights, back up lights, front and rear marker lights and two auxillary lights. There are also two additional outputs that are always "on". Cab 1 is a fixed 5 volts and Cab 2 has a strobe effect so it can be used to illuminate roof top strobes or a mars light effect. These are selectable via the LocoMatic™ Controller **Alt-Horn** buttons.

The sound / control system allows lighting that is directional so that the forward headlight and the rear marker lights will illuminate when the locomotive is in forward motion. When the locomotive is in reverse motion the rear headlight and forward marker lights can illuminate. The headlights, marker lights and auxillary lights can also be manually operated by means of the LocoMatic™ Controller.

Two 5 volt light bulbs are included with this sound / control system and additional 5 volt bulbs are available in 5 - packs (Item 756). These are high intensity bulbs and are ideal for headlights. For interior or other lighting locations it is suggested that 2 bulbs be wired in series to afford a lower light level.

In most cases, marker lights have been represented by LED devices usually wired in parallel. LED marker lights will function best with this sound / control system if they are rewired in series with each other and in series with a 68 ohm 1/4 watt resistor, two of which have been included. In some cases, 1.5 volt bulbs have been used for marker lights and / or headlights. There are many variations of these 1.5 volt bulbs dependent on current draw, but generally if two bulbs are wired in series and in series with a 100 ohm 1/4 watt resistor they will function properly with this sound / control system.

Because of size considerations a single 1.5 volt bulb may have been used for a headlight or backup light. In this case, again dependent on current draw of the bulb, you can generally use

about a 220 ohm 1/4 watt resistor in series with a single bulb for satisfactory function with this sound / control system.

Each of the lighting outputs is designed to use 60 milliamps and should not be wired to a higher current or damage will occur to the lighting output. The cumulative output should be less than the total current capacity of the lighting regulator which is 0.5 Amp. Should this 0.5 Amp capacity be exceeded the lamps may become somewhat dimmed or the regulator itself may shut down. If this situation occurs, it may be necessary to turn "off" one or more of the lighting functions so the total current is less than the 0.5 Amp capacity.

MANUAL ADJUSTMENTS

A potentiometer, located on the lower circuit board, permits adjustment of the diesel throttle notch settings. This potentiometer is factory set at a mid range (12 o'clock). Rotating this control clockwise will increase the throttle sound RPM rate for a given track voltage. If you are in LocoMatic™ COMMAND MODE this control has no effect.

There are six switches and a volume control on the small circuit board which should be mounted as space permits and is still accessible. It is suggested that the volume control be set at about the middle of its range for comfortable listening. The six switches are normally set to the "off" position and select the following operations:

	OFF	ON
Switch 1 -----start in		
	forward	neutral
Switch 2 -----sequencing		
	normal.....	lock in start position
Switch 3 -----horn & bell		
	can sound.....	do not sound
Switch 4 -----forward coupler		
	operational.....	deactivated
Switch 5 -----rear coupler		
	operational.....	deactivated
Switch 6 -----forward direction is to locomotive		
	front.....	rear

Switches 3 thru 6 are used primarily when two or more locomotives are operated together. You can turn off the horn and bell in the trailing locomotives and deactivate the couplers between locomotives so that only the couplers at the front and rear are operational. If any of the locomotives are actually facing to the rear, Switch 6 on such locomotives allows operation in concert with other locomotives facing forward. When Switch 6 changes forward to rear all directional functions such as headlights, marker lights and couplers are switched also.

OPERATION USING A TRANSFORMER:

With this sound / control system installed, your locomotive will operate in the same manner as other locomotives when using a transformer to vary speed. When power is applied the locomotive will come "on" in either the forward or neutral position as you have selected. Momentary interruptions of power will allow the locomotive to sequence through the usual direction positions. Sequencing can be accomplished either by a direction switch/button or by turning the speed control to "off" and then back "on".

Power interruptions for direction sequencing should be momentary only. If power remains "off" for more than a short time it is possible that the stored energy will be used up and the sound / control system will shut down. When power then returns the system will come "on" in its initial start position. If you prefer to employ a battery back up to maintain sound during more extended power "off" situations, provisions are there to connect a rechargeable 9 volt (8.4 volt actual) battery.

If your transformer includes whistle or bell controls, or if you have provided sound activation buttons, you will be able to sound the horn or the bell with these controls whenever there is power to the track. The horn will sound as long as you hold the control "on". The bell control is a push "on", push "off".

An added feature of this sound / control system involves the way the motor is driven, particularly at slow speeds. When track power is at lower voltages the system further reduces the power to the motor so as to provide extremely smooth slow speeds for starting and stopping of your train. If the track power fluctuates at these lower voltages you may notice a slight surging in the speed of the locomotive. If track power is set high while in neutral and you sequence to a direction, the locomotive will gradually increase its speed rather than jump directly to the high speed. This type of operation not only looks better but also results in less strain on the entire motor / gear drive system and is less likely to cause derailments of the locomotive or its train.

The LocoMatic™ Controller contains ten operating buttons and is usable either in conjunction with your regular transformer or as an independent control with a fixed voltage applied to the track. The LocoMatic™ Controller is a pass through type of device which is wired between your transformer and the track. The LocoMatic™ Controller itself is powered by a 9 volt DC plug in power supply which is included with the Controller. Some of the buttons cause activation as long as they are held "on" while others work in a push-on,push-off mode. The lower right hand button, labled 'ALT', is the alternate button which provides a second function to each of the other nine buttons. When using an alternate function it is suggested that the ALT button be held depressed and then another button be pressed. For example; pressing the COUPLER button will operate the trailing coupler while pressing ALT / COUPLER will operate the leading coupler. Not all of the buttons will have alternate functions on all locomotives.

The ten LocoMatic™ Controller buttons perform the following:

BELLturns bell "on" or "off"

ALT / BELL.....restores automatic directional lighting
Note: lighting is directional until a request is made via the LocoMatic™ Controller for a manual activation. Lighting functions will then remain manual via the LocoMatic™ Controller. Pressing ALT / BELL will allow all lighting functions to return to directional operation at the next direction request.

HEADLIGHT.....turns front headlight "on" or "off"

ALT / HEADLIGHT.....turns rear headlight "on" or "off"

MARKERSturns front marker lights "on" or "off"

ALT / MARKERS.....turns rear marker lights "on" or "off"

AUXturns front aux lights "on" or "off"

ALT / AUXturns rear aux lights "on" or "off"

COUPLER.....activates the locomotive's trailing coupler

ALT / COUPLER.....activates the locomotive's leading coupler

HORN.....activates the horn

ALT / HORN.....activates STROBE or MARS light.

FORWARD.....forward motion overriding sequencing

ALT / FORWARD.....activates full throttle diesel sound

REVERSE.....reverse motion overriding sequencing

ALT / REVERSE.....turns PRIME MOVER DIESEL sound "on" or "off"

SLOW.....neutral position overriding sequencing

ALT / SLOW.....neutral position or emergency stop

ALT.....alternate button for second functions.
When using this button in conjunction with another button, press and hold this button first.

OPERATION USING THE LocoMatic™ Controller WITH YOUR TRANSFORMER: As previously stated, a locomotive with this sound / control system installed will operate with your transformer in the same manner as other locomotives, but you will have the advantage of ADDITIONAL features available with the LocoMatic™ Controller.

The horn and bell can be activated by either your transformer controls or by the LocoMatic™ Controller. If the bell is turned "on" by your transformer it can be turned "off" by either your transformer or by the LocoMatic™ Controller, but if the bell is turned "on" by the LocoMatic™ Controller it must also be turned "off" by the LocoMatic™ Controller.

You can manually operate any of the lighting features on your locomotive, that you have connected to the sound / control system, by use of the LocoMatic™ Controller. Once you have selected any manual lighting, all automatic directional operation is overridden, however you can return to directional lighting at any time by using the ALT / BELL button.

The optional electric coil couplers are activated ONLY by the LocoMatic™ Controller. There is a brief waiting time between coupler activations and a minimum of 14 volts on track is necessary in order to allow the coupler circuit to recharge. The couplers can be activated either in neutral or in a motion direction as you prefer.

With the LocoMatic™ Controller in place it is no longer necessary to follow the forward - neutral - reverse - neutral - forward sequence. If you are in neutral and wish to go forward, depress the FORWARD button and advance the speed control. The locomotive will move in the forward direction. You can actually set the speed control at a fixed voltage and operate the locomotive with just the FORWARD, REVERSE and SLOW buttons. The sound / control system has incorporated a momentum feature that will gradually increase speed to the the set voltage rather than just jump to that speed. The FORWARD button will result in a gradual increase in speed up to the preset voltage in the forward direction. The SLOW or ALT / SLOW button will return the locomotive to neutral. The REVERSE button will result in a gradual increase in speed up to the preset voltage in the reverse direction. The momentum feature will also work with the direction control on your transformer if you prefer to employ usual sequencing.

If there seems to be a lack of response to the buttons on the LocoMatic™ Controller it is generally due to either poor electrical contact between the pick up rollers and wheels and the track because of dirt, or the lack of a choke (SEE SUPPLEMENTAL

NOTE) in series with something that is getting its power from the track.

In summary, a locomotive with this unique sound / control system installed and with the LocoMatic™ Controller will function in the same manner as other locomotives, has the added benefit of very smooth slow speed operation with momentum acceleration and has sequence override so that you can select the direction of motion as you desire.

Mars / Strobe Lighting Effects with the LocoMatic™ Controller: This LocoMatic™ Sound & Control System is equipped with a Mars or Strobe lighting effect. They are selected with the LocoMatic™ controllers Alt-Horn button.

To activate the Mars light press and release the Alt-Horn button. If the headlight is on, then the Mars light effect will start. If the Headlight is off the Mars light effect will start when the Headlight comes on. When the Mars light is on and the Headlight goes off, as in normal sequence operation, the Mars light will also go off. If you want the Mars light to stay on, merely enter manual lighting operation by turning on the Headlight. Since the Mars light follows the headlight operation, A-A operation is not compromised when selection switch 6 is placed ON. This way only the locomotive with the Headlight on will have the Mars light operational.

To activate the Strobe light function press and release the Alt-Horn button twice, with a pause between presses. The first activation starts the Mars light. The second activation starts the Strobe light. The Strobe light operates whenever the LocoMatic™ Sound & Control System remains powered.

To turn all Mars and Strobe lighting effects off, merely press and release the Alt-Horn button a third time.

LocoMatic™ COMMAND CONTROL: In ADDITION to all of the previously described features this sound / control system will operate independently with a fixed 15 to 18 volts AC passing through the LocoMatic™ Controller to the track. To enter the LocoMatic™ COMMAND MODE all power to the locomotive must be "off" and all stored energy exhausted. Once you are sure that all power is gone, set Switch 1 to select neutral start and set Switch 2 to lock. With the locomotive locked to start in neutral, full LocoMatic™ COMMAND MODE is entered as soon as track power is applied. Turn the speed control on your transformer to output approximately 15 to 18 volts and you are ready to operate in LocoMatic™ COMMAND MODE. UNDER NO CIRCUMSTANCES SHOULD THE TRANSFORMER VOLTAGE IN THIS OPERATING MODE EXCEED 20 VOLTS.

With the fixed voltage on track in this operating mode all lights when turned "on" including lighting in passenger cars or other equipment will be at full illumination. The coil coupler circuit will also have full voltage for recharging so there will be less delay time between coupler activations.

The horn, bell, lighting and coupler controls function as before except that the locomotive will no longer respond to the whistle and bell controls on your transformer. Lowering the voltage on your transformer will only effect a reduction in the top speed possible. We do not recommend operating at less than 14 volts as this is the minimum voltage for recharging the coil couplers.

The FORWARD, REVERSE and SLOW buttons are now speed and direction controls. Press and release either FORWARD or REVERSE and your locomotive will begin in that direction. With each, approximately 1/2 second, momentary button activation the speed will increase one step through a total of 24 steps. Holding a

button "on" will continuously increase through the steps to full speed. To slow down you can activate or hold the SLOW button through the steps to a stop. You can also slow down by using the opposite direction button. If the locomotive is in forward direction and you hold the REVERSE button, the locomotive will slow to a stop and then accelerate in reverse. Similarly, if running in reverse, holding the FORWARD button will result in a slow to stop and then an acceleration in forward. The ALT / SLOW button results in an emergency stop.

If there seems to be a lack of response to the buttons on the LocoMatic™ Controller it is generally due to either poor electrical contact between the pick up rollers and wheels and the track because of dirt, or the lack of a choke (SEE SUPPLEMENTAL NOTE below) in series with something that is getting its power from the track.

NOTE: REGARDING MULTIPLE UNIT LASHUPS - because of the possibility of lack of response due to poor electrical contact it is suggested that you do not attempt control changes to multiple units while such locomotives are on track areas of poor contact such as switches or crossings. If a multiple unit locomotive loses synchronization between units either increase to full speed or come to a full stop to restore synchronization.

Operating a locomotive, with this sound / control system installed, under LocoMatic™ COMMAND CONTROL is simply the use of the buttons on the LocoMatic™ Controller to implement the desired motions and sounds.

***** SUPPLEMENTAL NOTE *****

The signals generated by the LocoMatic™ Controller may be adversely affected by any powered device that is connected to the track at the same time that the LocoMatic™ Controller is functional. This would include track powered accessories, lighted cars or a lighted or powered locomotive operating from the same transformer that is passed through the LocoMatic™ Controller.

To eliminate this possibility it is required that all accessories be independently powered by a separate transformer or transformers. Lighted cars or other lighted or powered locomotives that will be operating with a locomotive with this sound / control system installed **MUST BE MODIFIED** by installation of a choke in series between track pick up and the lights and/or motor.

The most common installation would be to locate the wires coming from the center rail rollers and disconnect them from the present location. Connect these wires to one end of the choke and then connect the other end of the choke to the same location that the wires were originally connected to. Be sure to properly insulate your connections and to mount the choke so that it does not move. Double sided mounting tape makes a simple and neat installation.

In some situations it may be simpler to connect the choke between the load and the frame ground. Either method is acceptable as long as the choke is in series between the track and the load.

APPENDIX

SIMULTANEOUS OPERATION OF A LocoMatic™ COMPATIBLE LOCOMOTIVE WITH A LIONEL TRAINMASTER™ COMMAND EQUIPPED LOCOMOTIVE. Since both of these control systems can function with a fixed AC voltage it becomes possible to operate simultaneously and independently with both systems on the same track if certain conditions are met.

The fixed voltage power to the Lionel Trainmaster Command System must be passed through the LocoMatic™ Controller before being connected to the track. The LocoMatic™ Controller

does not interfere with the Lionel Trainmaster Command Control System. All Command equipped locomotives or other devices that are common to the fixed voltage power supply will require the installation of a choke in series with power pick up. This series connection can be made either on the center rail pick up or on the ground, whichever is easier. Refer to SUPPLEMENTAL NOTE for additional information.

With the above installation completed and track power "on", the Lionel Command equipped locomotive is operational via the Trainmaster Command Control System. Another locomotive, equipped with a LocoMatic sound / control system in the LocoMatic™ COMMAND MODE, can also be operated at the same time on the same track via the LocoMatic™ Controller.

Motor Problems: If your locomotive reset's to the forward position when operating in standard mode, or lurches intermittently when operating in LocoMatic™ command mode, you will need to install a choke in series with each motor lead to eliminate large motor noise from becoming fed back to the sound system. The chokes function best when placed at or as near to the motor as possible. Chokes from item 702 or 703 can be used in most cases. There is on board filtering for this problem but it is best handled at the motor brushes. This is also why a capacitor is placed across the motor brushes as shown in the wiring instructions. This only happens with motors that produce severe spikes or generate RF when operating.

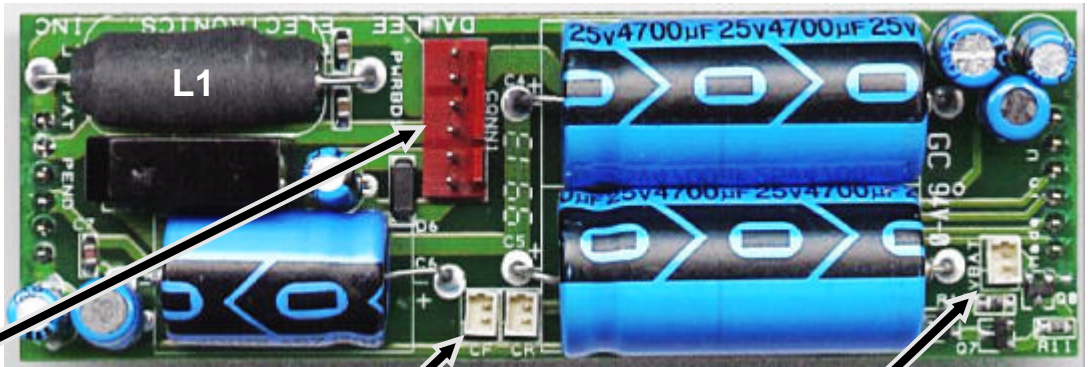
DUAL MOTORS: When connecting to a locomotive with dual motors, the motors are normally connected in parallel from the factory. The filter capacitor should be placed on the motor brushes closest to the LocoMatic™ board. If the locomotive has DC can motors, try connecting the motors in series instead of parallel. Most locomotives have an extremely high rate of speed. By connecting the motors in series not only reduces the top end speed of the locomotive but also results in a lower motor current consumption with better locomotive low end performance! To make a series connection, simply place one power lead on the motor#1 brush, then take the other brush lead to motor#2's brush. The other power lead then connects to the other motor#2 brush. If the motors rotate opposite of each other simply reverse the brush leads of the motor that rotates opposite of the direction you want the locomotive to go when in the forward state.

COMMON HORN SIGNALS

<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

Installation - power board (top board)

LocoMatic™ Power Board



Main Power / Motor Connections

Motor Brushes

- 1Red
- 2Brown

Track Power Input

- 3Blue (center roller pickup)
- 4Black (chassis pickup)

Motor Field Wires

- 5Yellow
- 6Orange

Coil Coupler Connectors

- CF - Coupler Front
- CR - Coupler Rear

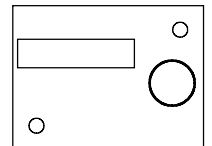
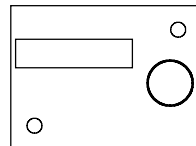
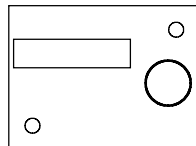
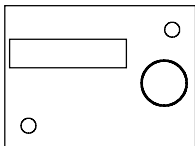
Connect the red and gray wires to the coil coupler wires. Be sure that the coil coupler wires do not touch the chassis! You do have to rewind the older Lionel coil couplers to be insulated from the chassis if you are going to use them.

Auxillary Backup Battery input

Use only item #647 rechargeable battery! Item #578 contains connector snaps with wires. Item #579 contains mounting clips or use Item #388 double sided foam tape.

Connect the red wire to the red battery clip wire and the gray wire to the black battery clip wire. Insulate the connection properly. DO NOT get these wires reversed, severe damage to the battery / unit / and you can occur!

Mounting Templates for LocoMatic™ SwVol Board



mounting template to assist in mounting the switch / volume control board.

Installation - Control Board (lower board)

Selector Switch & Volume Control Board.

Mount with two 2X56 screws supplied in a convenient location. Be sure not to allow any metal parts to contact the board, this will damage the system. This board connects to the Control Board with a 9 pin wire harness to allow for a more convenient operator placement.

Rotating the "VOL" (volume) control clockwise will increase the volume. A complete counter-clockwise rotation will yield no sound!

Note: It is possible to destroy the standard 2" round speaker when operating at full volume. This is especially true with EMD type sound systems. The sound system contains a 1 watt audio amplifier and the standard speaker is capable of sustaining 0.2 watts continuous. The standard speaker is a high efficiency type.

Locomatic™ SwVol Board



speaker



when soldering wires to rear of speaker, care must be taken so that the wires do not come in contact with the speakers metal frame!

LocoMatic™ Control Board

Notch Control



SYNC input not used with
Diesel sound systems

Lighting Outputs

Aux 1
Aux 2
Marker Rear
Marker Front
Headlight Rear
Headlight Front
Strobe (cab2)
Cab1



.Item # 756
5 Volt, 60 milliamp
high intensity lamp.

LocoMatic™ Control Board

Although the bottom board is shown without the top power board, we do not recommend the separation of the two. This is shown for simpler identification of the connectors. When placing the connector mates into their appropriate sockets care must be exercised for proper alignment. Improper alignment may cause a pin to become bent. It is suggested to use a tweezers or small needle nose pliers to place the connectors together. When separating the connectors DO NOT pull on the wires! Instead, slide a tweezers (or small flat screwdriver between the top connectors lip and the board mate. Care must be taken when handling these small connectors.

If you do elect to separate the two boards be sure to do so in an electrostatically controlled area and by all means make sure they are not rotated when remated! If the top and bottom boards are reconnected rotated and powered up you will damage the system! In order to assist in alignment, both pictures are shown in the same direction. The picture from the top of the Power Board, on page 6, is oriented in the same direction as the Control Board on this page. When correctly assembled, L1 (shown on the Power Board) should be directly above the Notch potentiometer of the Control Board.

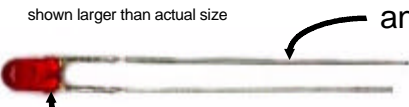
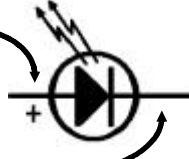






Lighting Outputs:

each output shown, as described in the main text, is capable of driving one 60milliamp load. This load may be a light bulb, as supplied, LED's (with limiting resistor), or a series of light bulbs. Item #756 contains more lamps as provided. More detailed optional connections exist on the following pages.

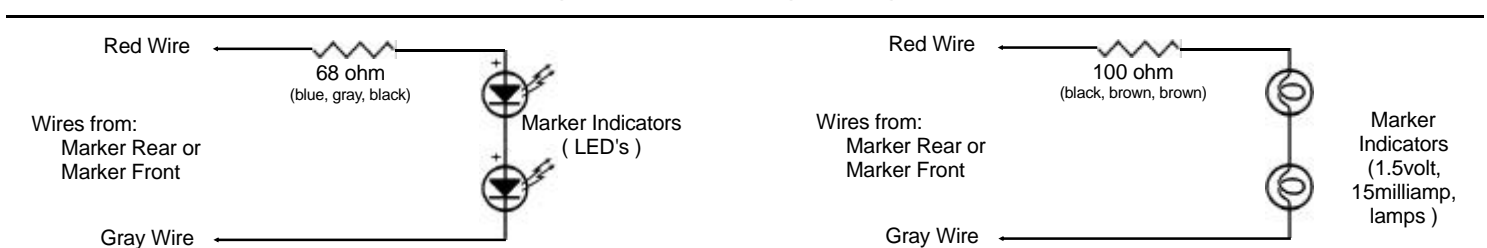
Connect the Red and Gray wires to supplied lamp. Insulate properly. As with any connections, an improperly or uninsulated wire touching the frame or other wire will damage the unit! Any damage as such is not covered under warranty.

When remoting several lamps and one common wire is desired, it is permissible to connect all red wires to a heavier gauge red wire. The red wires are the +5 volt lamp supply. The gray wire is the switched lead except for the Cab1 connection, in this case the gray wire is the same as ground. If any switched lamp output no longer operates, this is a sign that the output was either overloaded or came in contact with another wire. A short between wires to the lamp is also a overload. This would indicate a need for repair and has to be returned. Again, this type of failure is not covered under warranty since it is due to improper handling during installation.

Electrical parts and their symbols

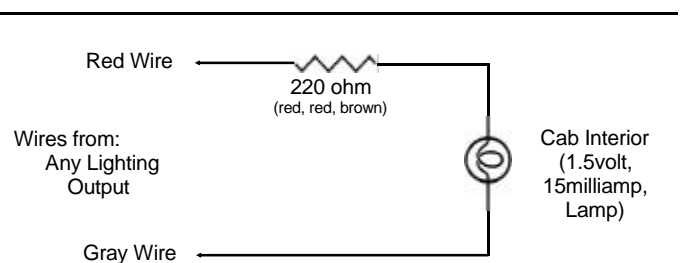
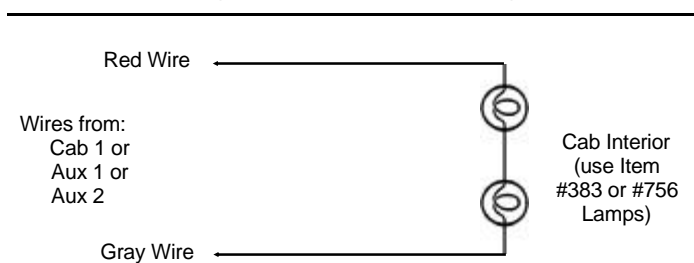
Physical	Electrical symbol	Physical	Electrical symbol
<p>shown larger than actual size</p>  <p>anode</p> <p>LED (light emitting diode)</p> <p>flat side = short lead = cathode</p>		<p>shown larger than actual size</p>  <p>light bulb</p>	
<p>shown larger than actual size</p>  <p>resistor</p>		 <p>anode</p> <p>diode</p>	

Wiring various Lighting Effects



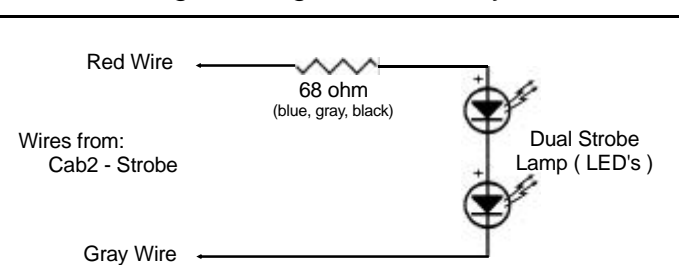
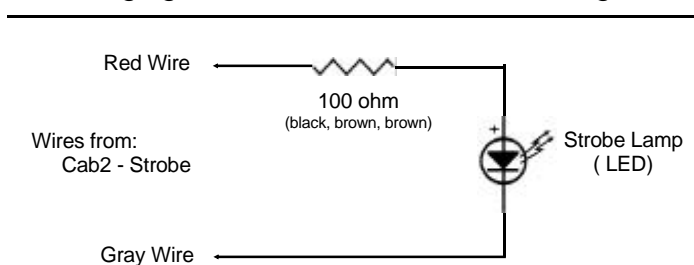
Wiring LED's as Marker Lights

Wiring 1.5v Light bulbs as Marker Lights



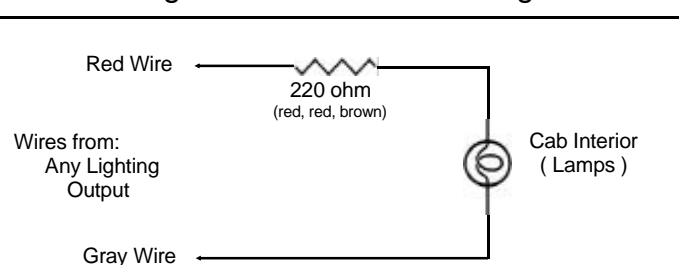
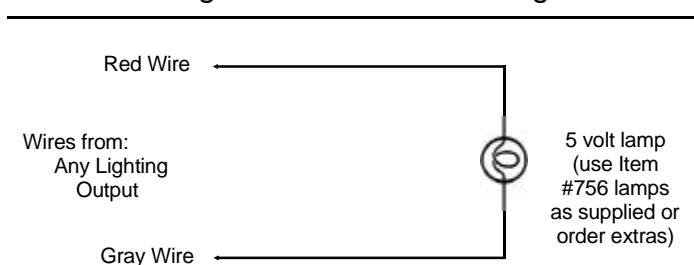
Wiring light bulbs in series as Interior Lights

Wiring 1.5v Light bulb for any use



Wiring an LED as a Strobe Light

Wiring dual LED's as Strobe Lights

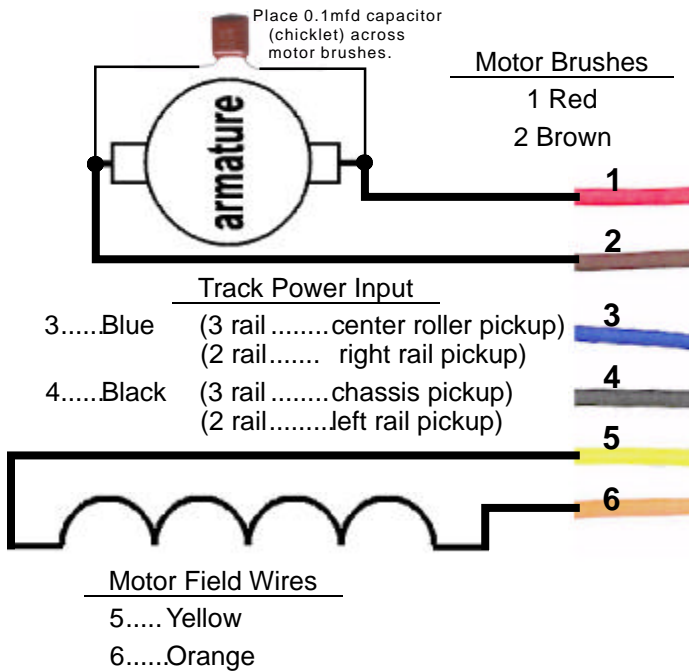


Wiring 5v Light bulb for any use

Wiring 1.5v Light bulb for any use

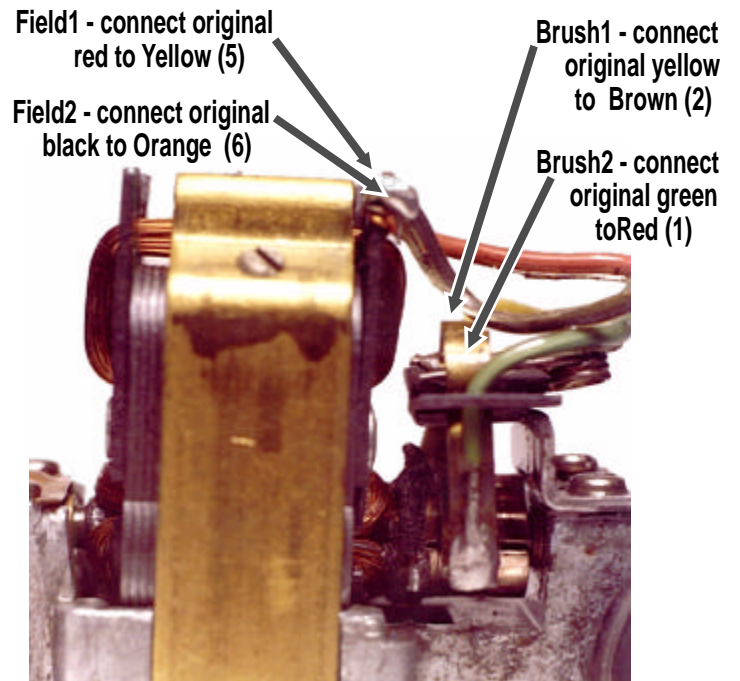
Installation - Series Motor / Track connections

Main Power / Motor Connections



If the engine does not have a chassis (outside rail) pickup from each truck you should add one to prevent intermittent track pickup from occurring. Adding multiple center rail pickups will also help.

Help for Am FlyerI series motors. This picture shows where the wires are normally terminated. Colors indicated are those that match the LocoMatic™ board connector and not the locomotives existing wires.



Help for Lionel series motors. These pictures show where the grounded field wire needs to be broken from the chassis for the motor power. Left picture is early Lionel. Right is later series motor style. It is always better to add a ground wire to both outside rail pickups and the chassis. When more than one center roller is available always connect to both, also secure the center pin from rotating with the roller.

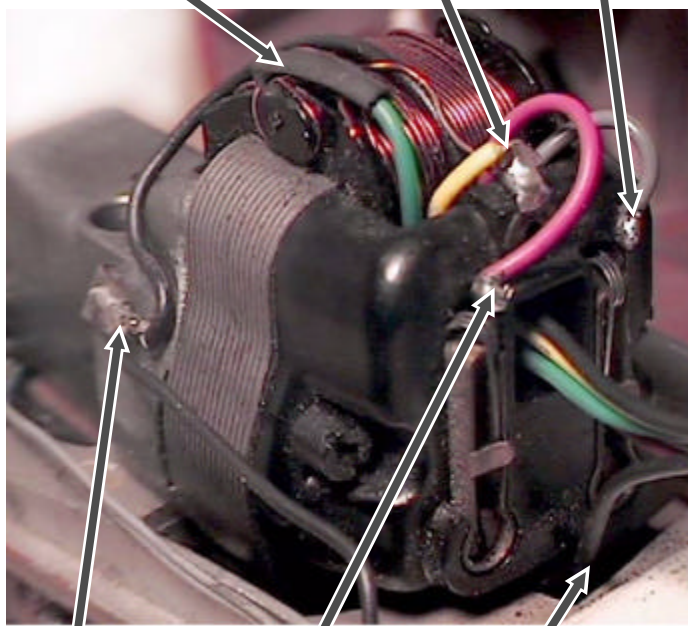
Colors indicated are those that match the LocoMatic™ main board connector and not the locomotives existing wires.

Field - Orange

(previously connected to the chassis pickup ground lug above)

Brush - Brown

Field - Yellow

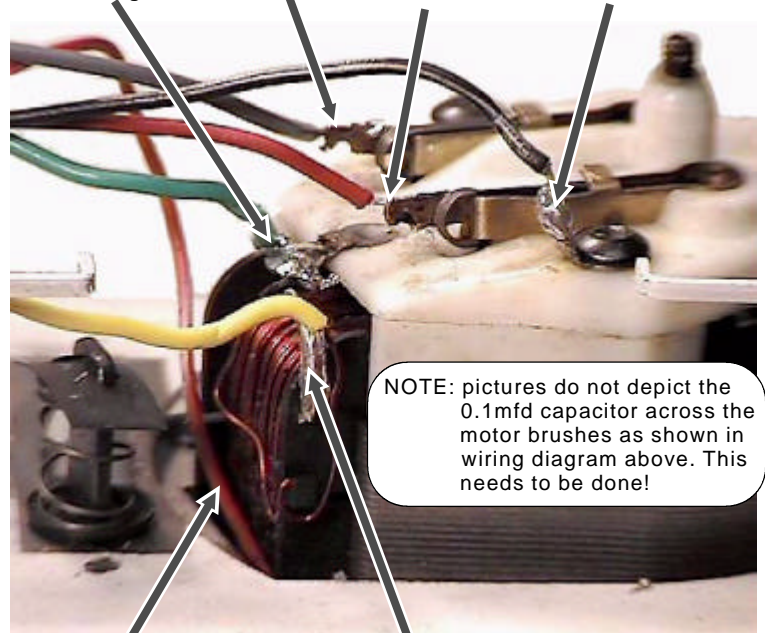


Field - Orange

Brush - Brown

Brush - Red

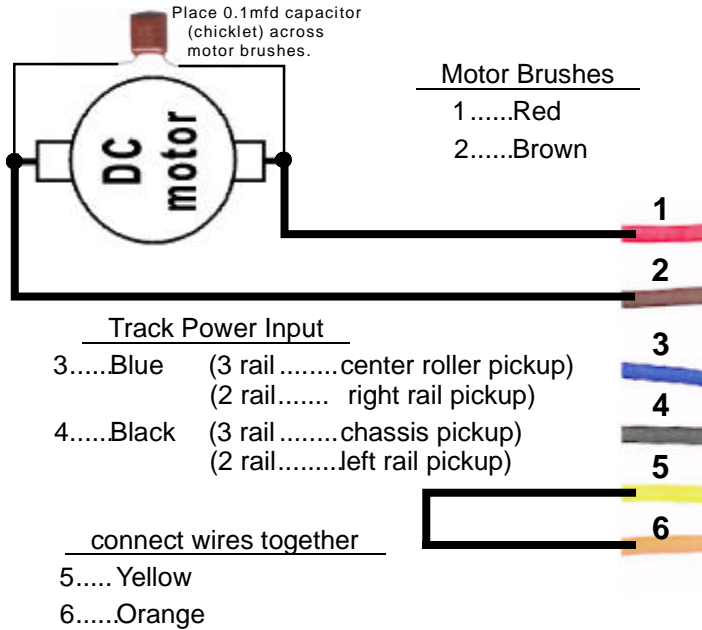
Track Input - Black (chassis pickup)



NOTE: pictures do not depict the 0.1mfd capacitor across the motor brushes as shown in wiring diagram above. This needs to be done!

Installation - DC Motor / Track connections

Main Power / Motor Connections

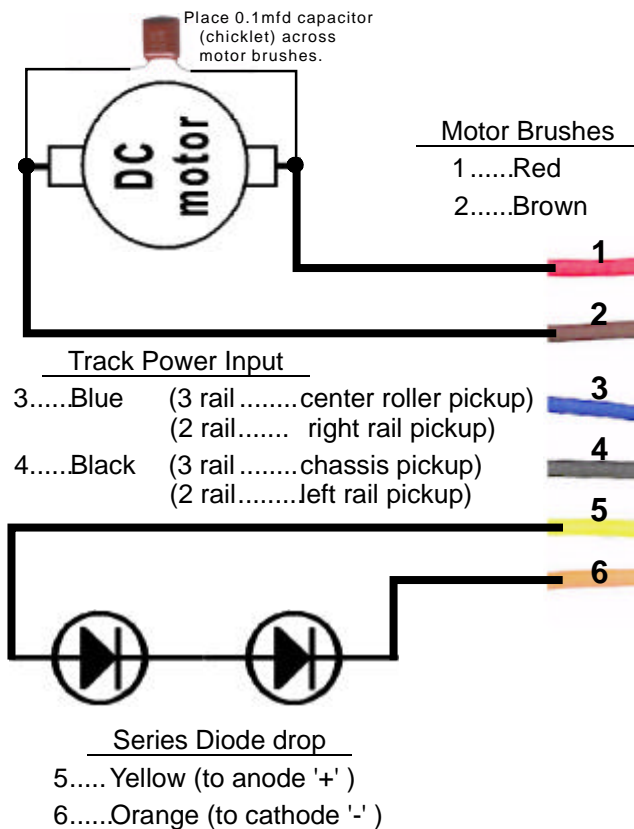


3 rail operators: If the engine does not have a chassis (outside rail) pickup from each truck you should add one to prevent intermittent track pickup from occurring. Adding multiple center rail pickups will also help.

2 rail operators: If the engine does not have a pickup wire for each rail, you should add one. DO NOT rely on proper pickup through the wiping action of a truck against the chassis for a proper pickup.

Multiple motors: when more than one motor is present you may want to wire them in series to reduce the top end speed. This is especially true of most 3 rail chassis since the gear ratio is higher than necessary. Place the capacitor shown on the motor brushes closest to the connection of the power feeds (red & brown) from the main board. If placing motors in series, either place one capacitor on each motor or connect to wire splice at closest motor to power feed.

Main Power / Motor Connections using series diodes to drop motor speed



Series Diode drop:

Use 6 ampere diodes (item 375) for heavy motor loads, 1 ampere diodes (item 374) for lighter motor loads (as in newer 'S' gauge equipment) . One or more diodes can be used. As shown, two diodes are used yielding a 1.5 volt drop. This is also a drop in voltage going to the DC motor, thus lowering it's RPM for a given voltage. By adding more diodes in series you can effectively reduce the top end speed of any locomotive and make a jack rabbit engine more tolerable without effecting the sound system.

Note: When more than one motor is in a locomotive you can either leave them in parallel, as originally wired, or place them in series to reduce the top end speed. Remember, the power stage is rated for 3 amperes. Higher load current will damage the electronics. In general, most newer locomotives with dual motors are only consuming 3 amperes. If in doubt you can always place a fuse in series with a motor brush wire.

Various Lighting Effects with LocoMatic™ Controller - Lionel F3



no lights



Headlight



Headlight and
Number Boards



Rear Marker
Lights and
Number Boards

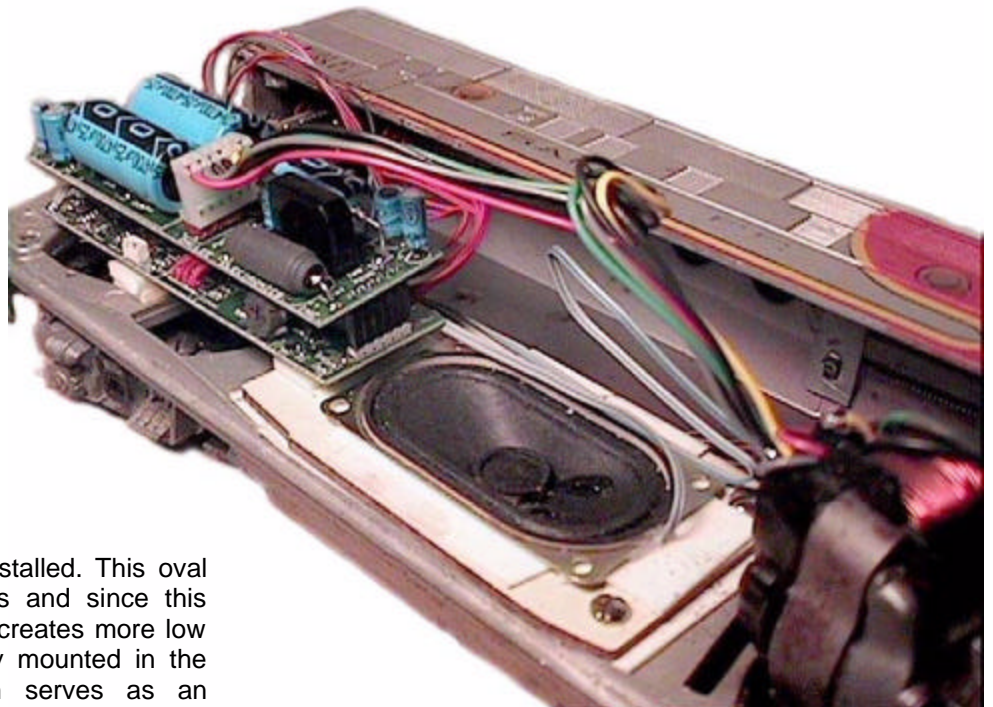


Number Boards
and Interior
Lights



Marker Lights

Sample installation - Lionel F3



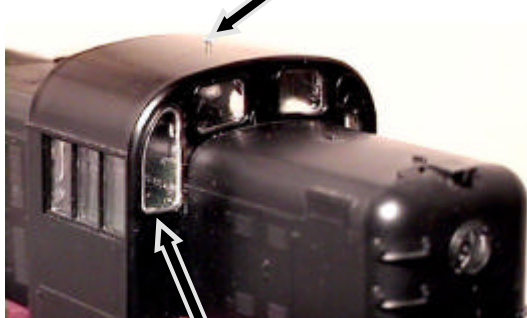
Optional Oval Speaker, Item #664, installed. This oval speaker yields better low frequencies and since this locomotive is an EMD prime mover it creates more low frequencies than highs. This is easily mounted in the diecast battery compartment, which serves as an excellent baffle, by making a mounting template thick enough for clearances as shown. You could also mount the standard 2" round speaker against the grill but the plastic grill supports would have to be removed so that the speaker can be mounted flush and sealed properly around the edges.

Sample installation - Weaver RS-3

Metal exhaust grill used as speaker grill.



Strobe



Windows

Mounting optional oval speaker (item #662) requires using an etched metal grill. By mounting the speaker facing up, better sound is produced. Simply drill out the existing molded plastic grill (leaving a lip to glue the metal grill) and glue the metal grill in place. Then carefully align the oval speaker and either glue or hot melt it in place. Be sure to encase the entire rear surface so that no sound can be transmitted about the speaker edges! A note of caution, make sure that the light lens can be placed in and out before securing the speaker too far forward.

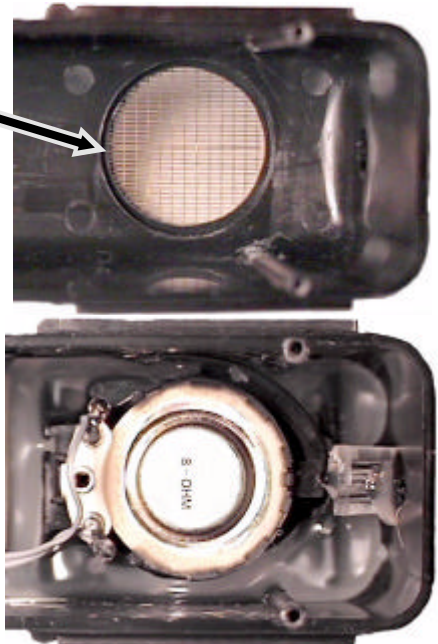
Placing the miniature 5 volt lights into the existing lenses is quite easy. If the existing lenses have become melted, replacements are available from Weaver Models. Dabs of hot melt, or tape, can be used to secure the wires to the plastic shell.

When mounting the Locomatic™ unit in the chassis you must remove the weight. Care must be taken so that it sits above the truck screw. Extra 1/8" double sided foam tape is available, item #388, for this and other purposes. The unit must also be mounted almost flush to the first two molded sprues. The motor must be rotated and secured so that the brush connections can not come in contact with the board.

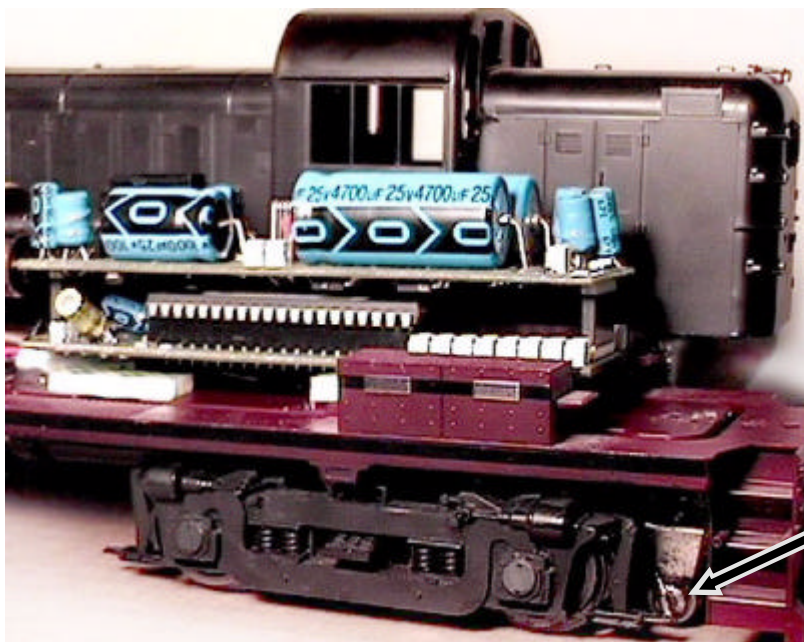
The metal grill and windows are available from:

P&D Hobby Shop
31902 Groesbeck
Fraser, MI 48026
Ph: (810) 296-6116

Inside shell - grill installed.



Speaker and light installed.

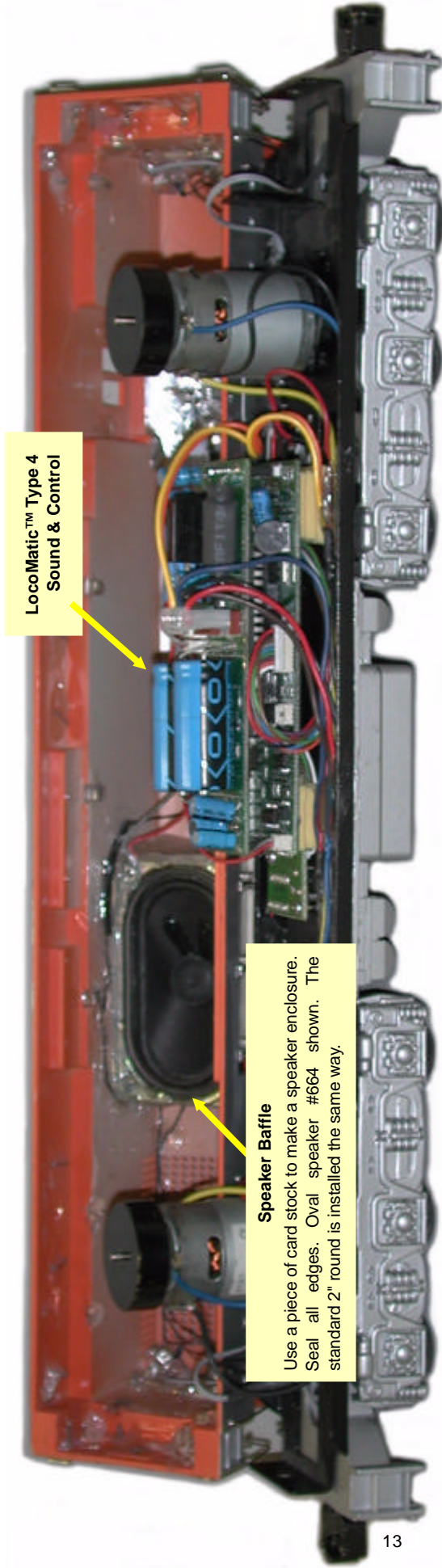


For best operation, secure center roller pickup to the roller's pin. Do this on both pickups. File the side of the pin to allow the Rosin core solder to quickly clean and allow the solder to flow without melting the plastic support.

Weaver does make a new double roller. You should replace this roller with a double roller on each truck.

Faribanks Morse Installation

with optional oval speaker, marker lights, dual coil couplers, and extra lighting.



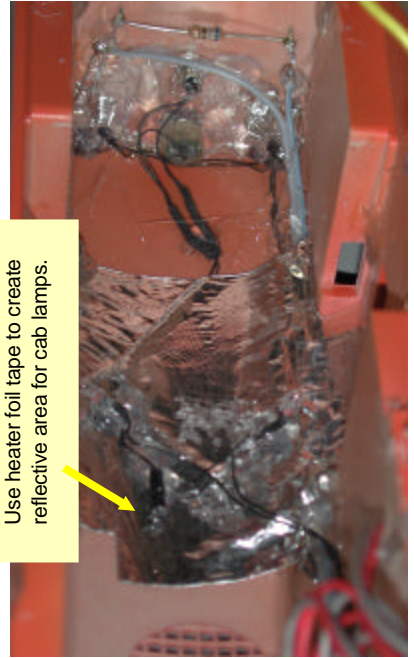
**LocoMatic™ Type 4
Sound & Control**

Speaker Baffle

Use a piece of card stock to make a speaker enclosure. Seal all edges. Oval speaker #664 shown. The standard 2" round is installed the same way.

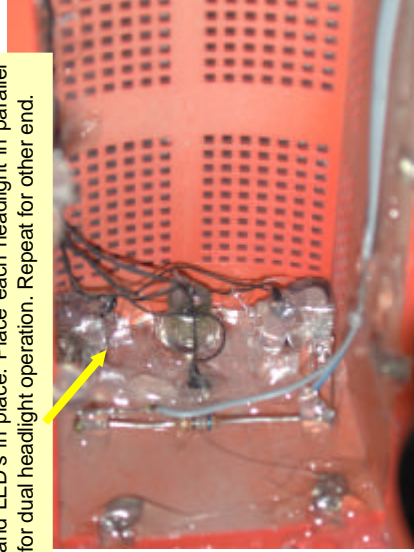
Cab Lights

Use heater foil tape to create reflective area for cab lamps.



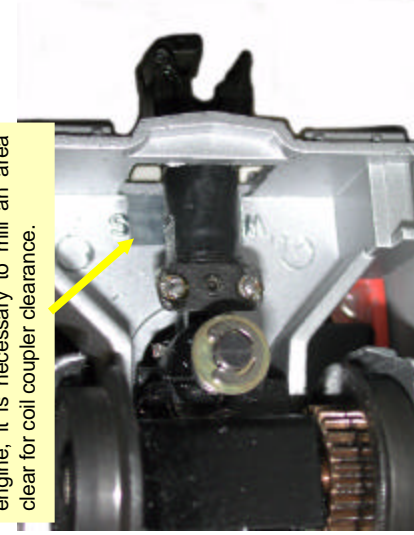
Headlights & Marker lights

Use hotmelt or other glue to secure lamps (#756) and LED's in place. Place each headlight in parallel for dual headlight operation. Repeat for other end.



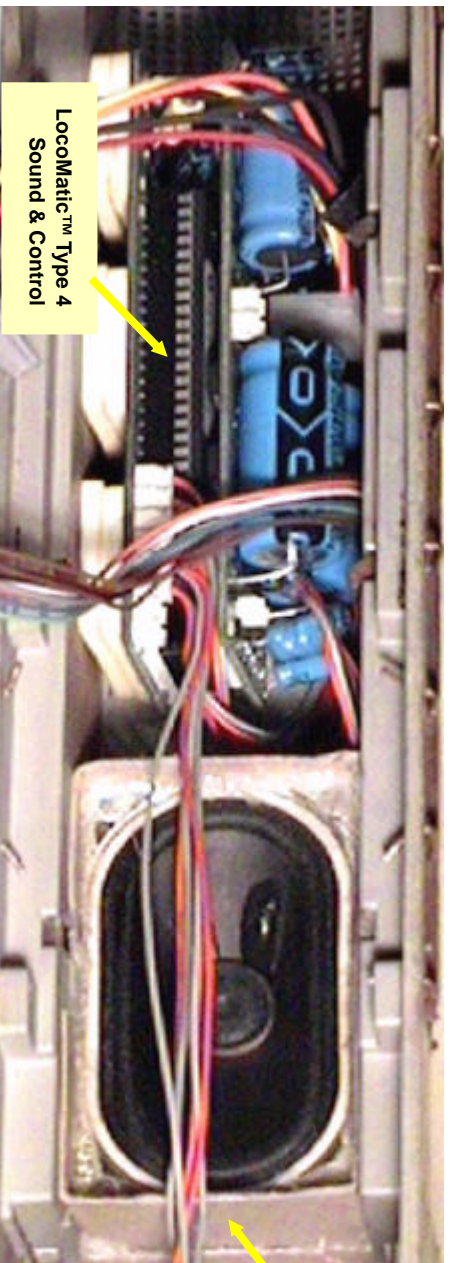
Coil Couplers

When adding coil couplers to a Williams engine, it is necessary to mill an area clear for coil coupler clearance.



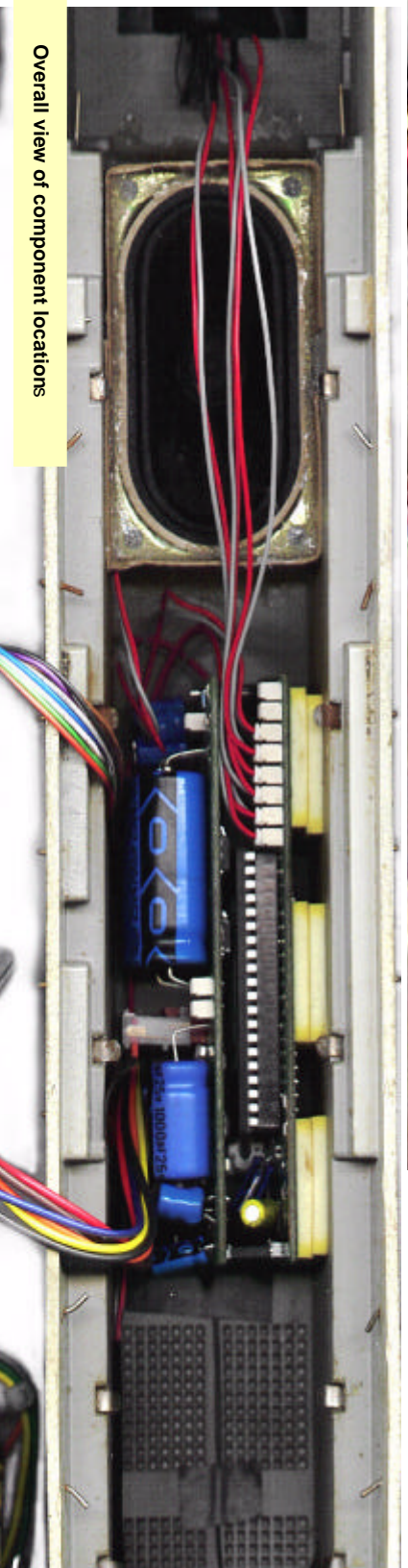
Lionel Faribanks Morse Installation

with optional oval speaker, marker lights, dual coil couplers, and extra lighting.

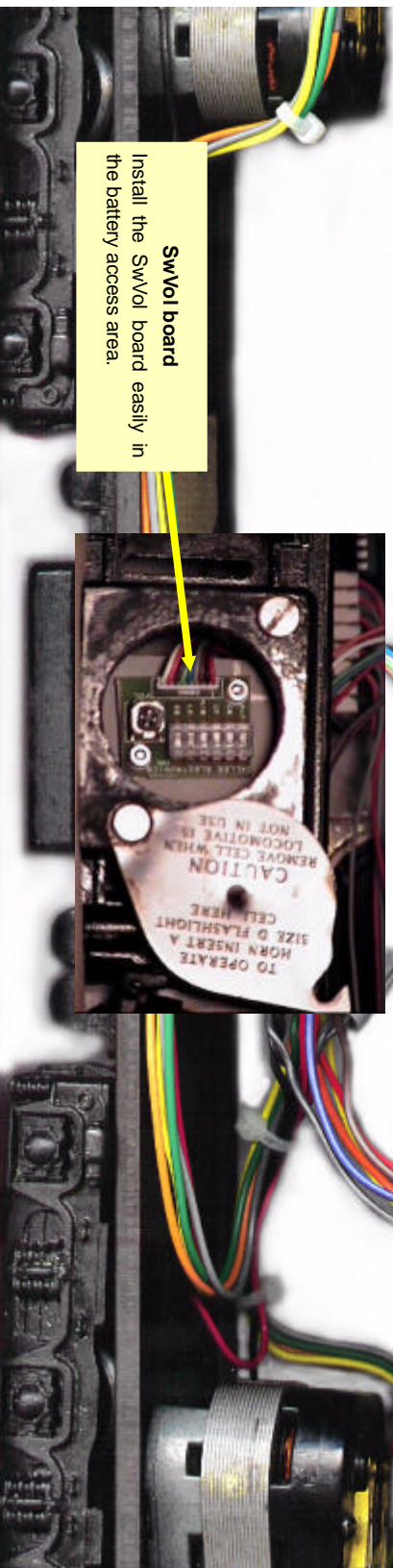


LocoMatic™ Type 4
Sound & Control

Speaker Baffle
Use a piece of card stock to make a speaker enclosure. Seal all edges. Oval speaker #664 shown. The standard 2" round is installed the same way.

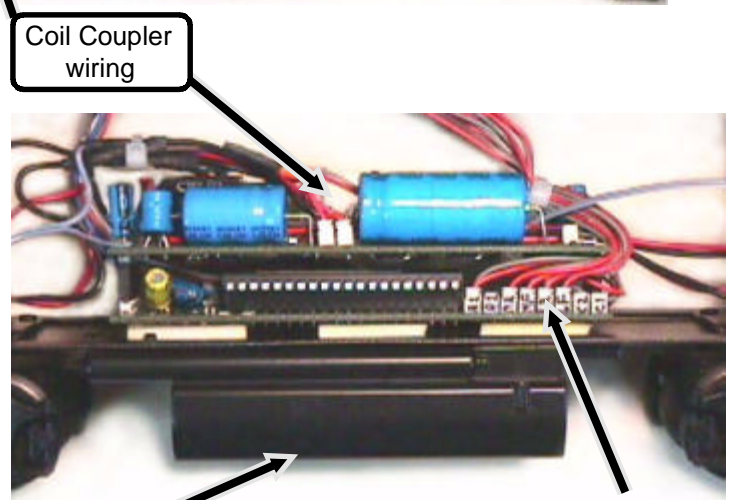
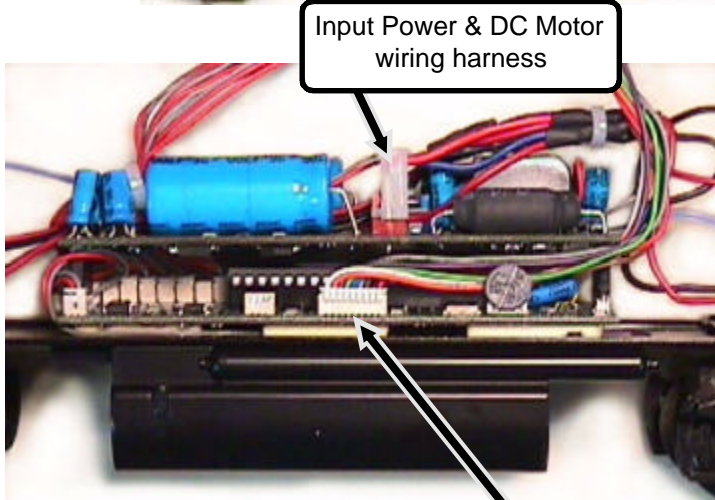
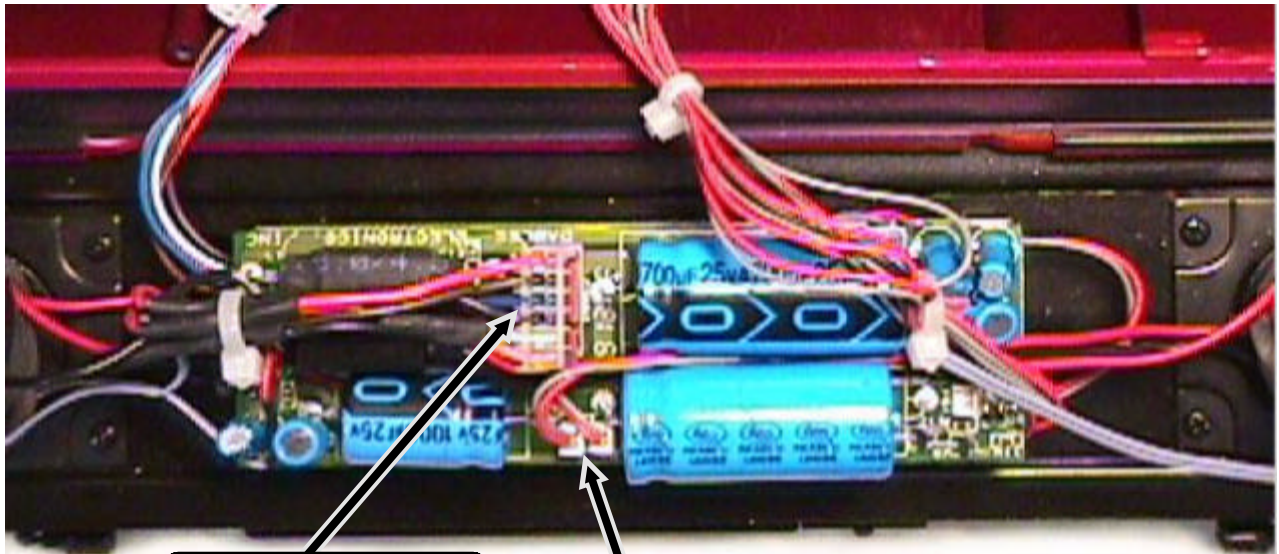
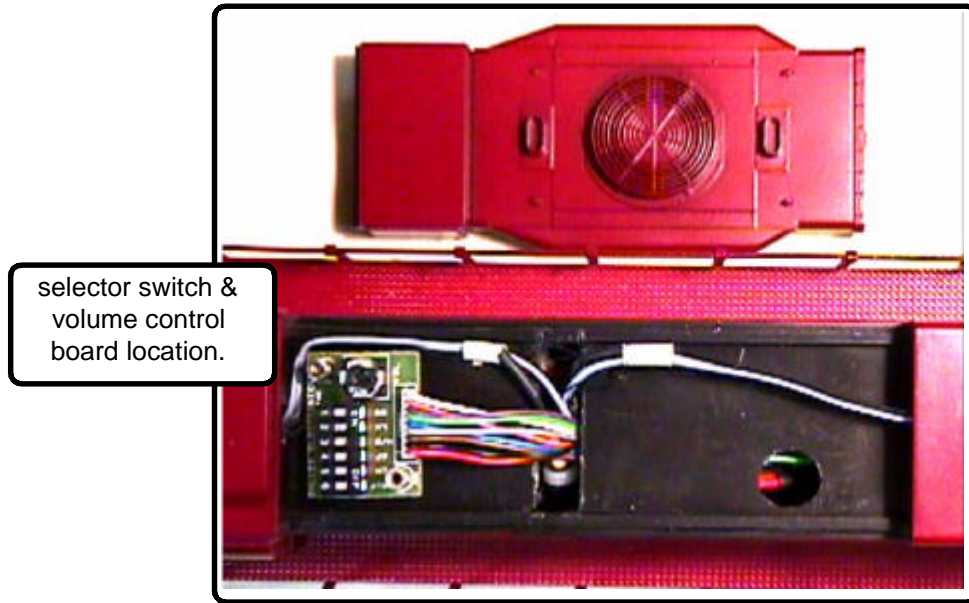


Overall view of component locations



SwVol board
Install the SwVol board easily in the battery access area.

Sample installation - Weaver Models GP38



Input Power Side View

SwVol wiring harness

Speaker Location

Lamp / Coupler Side View

Lamp / Marker wiring harness

Choke installation

When using other equipment on the same track with the LocoMatic™ system, it is necessary to install chokes in series with the other items drawing power. These other items could be lighted cars or other engines running in the consist. This is necessary to insure proper signal strength from the LocoMatic™ Controller. Without proper signal strength, the locomotive could receive improper instructions or no instructions at all when an operation is selected from the LocoMatic™ Controller.



To install the choke in other 2-rail lighted cars:

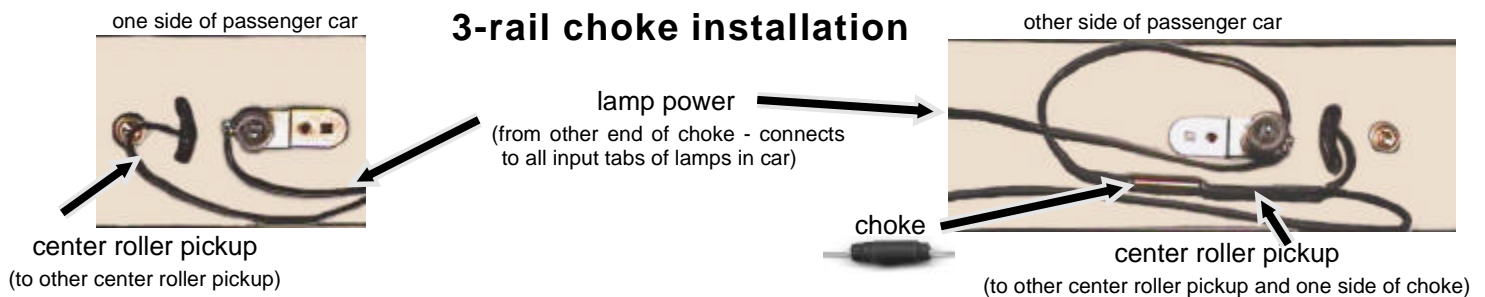
- 1.....locate right rail lamp power feed wire.
- 2.....inside the car, cut the power feed wire making two ends.
- 3.....connect one power feed end to one side of the choke and connect the other power feed end to the other side of the choke.
- 4.....be sure to electrically insulate all connections.

To install the choke in 3-rail passenger cars with multiple pickups:

- 1.....remove the existing center roller pickup wires.
- 2.....connect these wires together to form a common wire.
- 3.....place a new wire from one truck roller to the second truck roller. This will give you better pickup and should be done on all lighted cars.
- 4.....connect one end of the previous center roller pickup wire to one end of the choke.
- 5.....connect the center roller jumper wire (the new wire installed in step #3) to the other end of the choke.
- 6.....be sure to electrically insulate all connections.

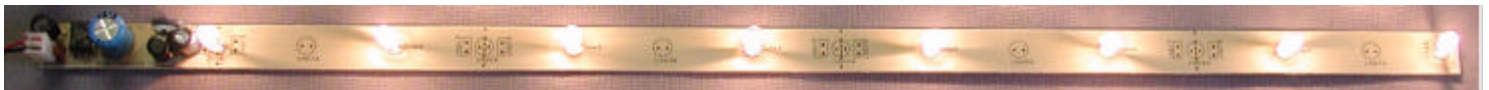
To install the choke in 2-rail AF lighted cars:

- 1.....locate center lamp power feed wire.
- 2.....inside the car, cut the power feed wire making two ends.
- 3.....connect one power feed end to one side of the choke and connect the other power feed end to the other side of the choke.
- 4.....be sure to electrically insulate all connections.

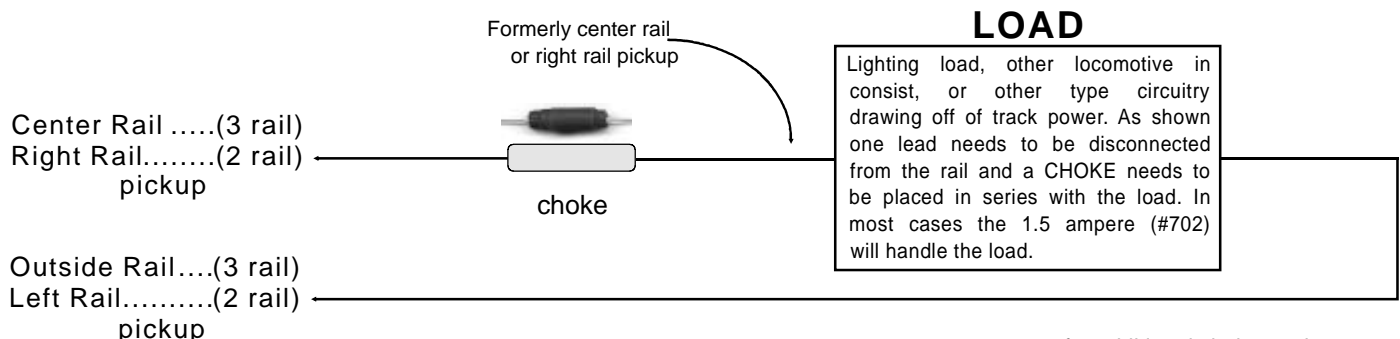


alternative lighting

you might also want to consider installing our Adjustable Regulated Lighting board. The RL-ADJ (item 379) comes with 4 lamps but is capable of driving eight lamps, as shown. You can set the intensity desired (1.25 - 5 volts). It maintains constant voltage to the lamps and has it's own choke so no other modifications are needed. Simply install the lamps where desired, connect the input power, and peel the tape to secure. The unit can be broken into smaller strip lengths where needed. Install in cabooses, passenger cars, or buildings. Measures only 1/2" wide. Extra, low voltage lamps, are available (item 383).



basic choke installation diagram



When installing in 2 rail equipment, use all Center Rail references as Right Rail and all Outside Rail as Left Rail.

for additional chokes order:

- Item 702 for up to 1.5 ampere load
- Item 703 for up to 5.0 ampere load