LocoMatic™ type2d DIESEL Sound & Control

for AC or DC track power by DALLEE ELECTRONICS, Inc.

instructions, rev1

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 - DIESEL LOCOMOTIVES

OVERVIEW: This unit operates with AC or DC track power and is different from most other LocoMatic™ systems. It does not contain the DC shift for operation of the Horn and Bell. Therefore it requires the use of the LocoMatic™ Controller for these functions. 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. The Horn or Bell will not constantly operating since the decoding circuitry is not present in this system. 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, cab light, and also other lighting, including roof top strobes or a mars light operation. Lighting can also be manually controlled by means of the LocoMatic™ controller.

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 other AC systems in conventional mode.

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 small main printed circuit board with a wires attached. Also included are, two white T1 LED's (item #536) and limiting resistors (item #558).

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 main circuit board measures 1"w x 3"l x 0.5"h (approx.) and should be mounted where space permits using the double sided tape attached to the circuit board. Consideration should also be taken so that the volume control and 4 switches can be accessed when mounting. Double sided tape (item 388) is supplied to mount this board. Be certain that the components on the circuit boards or traces do not come in contact with any metal objects as such contact can destroy the sound / control system.

POWER CONNECTIONS: The track input power is connected to the Blue and Black wires. The Blue wire connects to the right rail pickup. The Black wire connects to the left rail pickup. Left and Right rails are determined by looking from the engineer's side to the front of the engine. The motor connects to the Red and Brown wires. If the direction of the locomotive is opposite of that desired, reverse the motor connections.

Blue.....Right Rail Input / pickup power

Black.....Left Rail Input / pickup power

Red.....Motor "+" / Brush 1

Brown.....Motor "-" / Brush 2

Brush "+" and "-" refer to the polarity of the power from the board when the locomotive is place in the forward direction. It does not necessarially mean that they get connected to the marked polarity of the motor. The orientation and gearing to the motor determines what polarity needs to be connected to the motor to make the engine move in a forward direction.

LIGHTING INSTALLATION: The lighting outputs are as follows:

Orange.....common "+" power for led lighting

White.....Lamp Front**.....automatic / manually* controlled headlight

Yellow.....Lamp Rear**.....automatic / manually* controlled headlight

Green.....Cab Light**.....manually* controlled

Violet.....Mars/Strobe**.....manually* controlled

*requires LocoMatic™ Controller. ** requires less than a 100 milliamp load. LED's require the use of a 1k ohm 1/2 watt limiting resistor (item #558).

SPEAKER INSTALLATION: A proper 8 ohm speaker is required and should be selected from our available speakers. The speakers we list are high efficiency speakers. This means they produce more audible sound per watt of input power. After selecting a speaker, it 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 the two gray wires connected to pins 9 and 10 of the main board.

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, preferably with a few openenings at the front of the speaker, 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, glue or "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. Observe the installation example pictures for more ideas.

SOUNDS REPRODUCED:

HORN is user activated by the HORN button on the LocoMatic™ controller. The horn will play as long as the button is held on. Intermittent Horn operation is caused by dirty track or poor track pickup by the locomotive.

BELL is user 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". A manual switch (#3) allows the bell to be deactivated for multiple locomotive operation.

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

All lighting outputs are capable of handling up to 120 milliamps. This requires the use of LED's or miniature lamps with proper voltage and current requirements. When using LED's a limiting resistor is required! Without a limiting resistor, the output transistors will be damaged.

Exceeding 120 milliamps willl damage the lighting output.

The Cab, Mars/Strobe outputs each require either an LED with limiting resistor or a properly rated lamp. Three 5 volt lamps (item 756) can be placed in series or an appropriate limiting resistor can be used. The "+" voltage presented to the lamps is generally the track voltage times 1.414 yielding 25 volts when 18 volts AC is used. For DC operators it is merely the DC track voltage less 1.4 volts.

MANUAL ADJUSTMENTS: There are four switches and a volume control on the main board. It is suggested that the volume control be set at about the 10 o'clock position for comfortable listening. High volume settings may prematurely damage the speaker. This is especially true for an EMD type prime mover sound system. The four 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 ----------Bell	can sound	can't sound
Switch 4 ----------forward direction is to locomotive	front	rear

Switches 3 and 4 are used primarily when two or more locomotives are operated together. You can turn off the bell in the trailing locomotives and if any of the locomotives are actually facing to the rear, Switch 4 on such locomotives allows operation in concert with other locomotives facing forward. When Switch 4 changes forward to rear all directional functions such as headlights, 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 interuptions of power will allow the locomotive to sequence through the usual direction positions. Sequencing can be accomplished either by a direction switch or by turning the speed control to "off" and then back "on".

Power interuptions for direction sequencing should be momentary only. If power remains "off" for more than 20 seconds, 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. This unit contains the latest technology in energy storage. It is normal for the sound system to make some extra sounds long after the power has been removed.

An added feature of this sound / control system involves the way the

motor is driven. 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. It will not interfere with track power passing through it when not in use (you do not have to disconnect it for operating standard type trains). Some of the buttons cause activation as long as they are held "on" while others work in a push-on, push-off mode. A pause of a second or so is required between pushes. 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, with this unit, will operate the Mars light function while pressing ALT / COUPLER will operate the Strobe light function. Not all of the buttons will have alternate functions.

The ten LocoMatic™ controller buttons perform the following:

BELL ..... turns 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"

ALT / AUX ..... turns CAB light "on" or "off"

COUPLER..... turns Mars light "on" or "off"

ALT / COUPLER ..... turns Strobe light "on" or "off"

HORN..... activates the horn

FORWARD..... forward motion overiding sequencing

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

REVERSE..... reverse motion overiding sequencing

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

SLOW ..... neutral position overiding 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 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 overidden, however you can return to directional lighting at any time by using the ALT / BELL button.

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 as described above. The activation of this function is different than LocoMatic™ Type 3 and Type 4 systems.

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 and release the FORWARD button. The locomotive will accellerate in the forward direction to the speed set by track voltage. 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" below) 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 overide so that you can select the direction of motion as you desire.

LocoMatic™ COMMAND CONTROL

In addition to all of the previously described features this sound / control system will operate independently with a fixed 10 to 18 volts AC, or up to 25 volts DC, 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 (in this unit that may take several minutes), 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 10 to18 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 AC, 26 VOLTS DC.

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 horn, bell, and lighting function as before. Lowering the voltage on your transformer will only effect a reduction in the top speed possible.

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 (3 rail operators) or right rail (2 rail operators) 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.

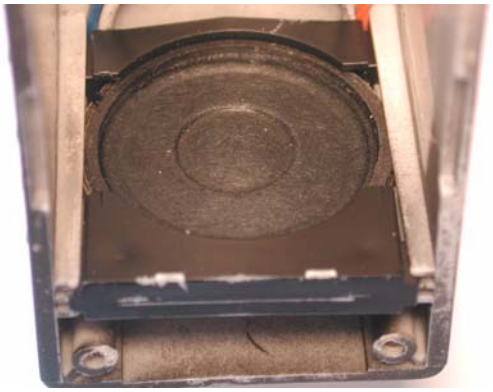
In some situations for two rail operators, it may be simpler to connect the choke between the lamp base and the proper rail previously going to the lamp base. Either method is acceptable as long as the choke is in series between the track and the load and the bases of each car are not connecting to each other with metal couplers.

APPENDIX:

DUAL MOTORS: While this unit is only capable of 2 ampere motor loads it is still possible to operate units with lower current consumption motors. When connecting to a locomotive with dual motors, the motors are normally connected in parallel from the factory. If the locomotive has DC can motors, try connecting the motors in series instead of parallel. Most locomotives, especially in the 3-rail market, 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.

APPENDIX:

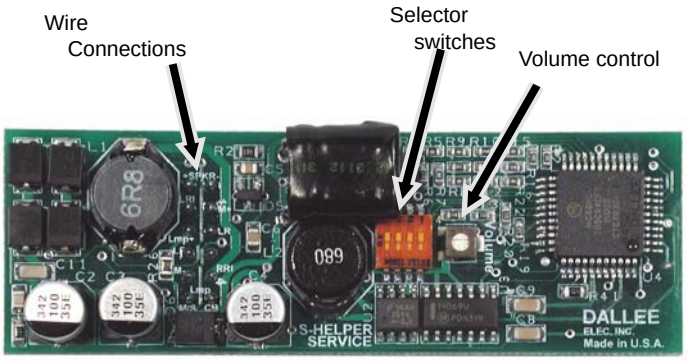
Speaker mounting in an S-Helper SW8/9. Mount near front of enging facing into the shell. Seal all edges to prevent air from escaping around the speaker mount and through the floor of the chasis. Picture shown is from new production engines with mount molded into the shell.



COMMON HORN 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

installation - main board



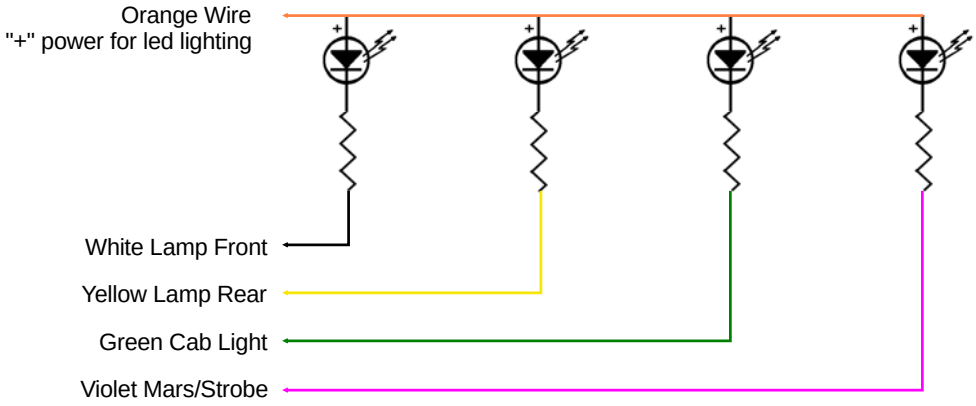
Main board shown without wires attached.

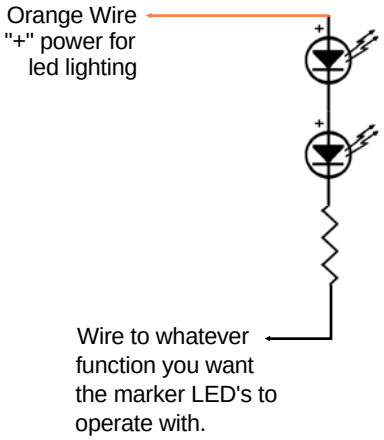
Mount the main board with tape supplied in a convenient location. Be sure not to allow any metal parts to contact any parts or traces on the board, this will damage the system. For the S-Helper SW's, this may be directly on the motor with the exhaust panel access used for the volume and selector switch operation.

Selector Switch & Volume Control are contained on the main board. Rotating the "VOLUME" control clockwise will increase the volume. A complete counter-clockwise rotation will yield no sound! As pictured, the volume control is set at half.

Note: It is possible to destroy a standard round speaker when operating at higher volumes. The sound system contains a 1 watt audio amplifier and most standard speakers are capable of sustaining 0.2 watts continuous. Item #211 is a 1.1", 1 watt speaker for use in small spaces. Others are available, refer to the price schedule. You can connect two standard speakers in series to obtain higher volumes with less damage to the speakers. For more volume with small speakers, consider using four speakers. The more surface area you have the more sound you can generate.

installation - lighting connections

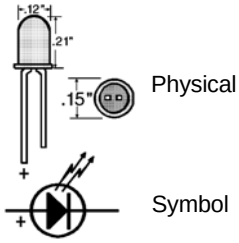




Use White LED's (item #536) with 1k limiting resistors (item #558) as shown.

Carefully connect the Forward and Rear Headlight as shown above. The other lighting functions are optional. The "+" lead of the LED's is the longer of the two leads. If they are connected in reverse they will not illuminate and can be permanently damaged. Make sure that all connections are properly insulated. Heatshrink tubing is a good method to use for insulating your connections. The optional Mars/Strobe light operates as a strobe best with an LED. The Mars light function works best with a filament light bulb. If light bulbs are used, they must be low current (less than 120 milliamps) and capable of sustaining 18 or more volts. Otherwise a limiting resistor of an appropriate value must be used. It is also possible to connect three of our 5 volt lamps (item #756) in series leaving two internally painted black and one to shine out of the locomotive.

If 4 markers are to be used on one function, merely place them in series with the two as shown in series. The resistor shown can be 1k ohm or higher. Depends on how bright the marker LED's are desired to be. Also consider using item #542. This is a "special shape" LED which is ideal for marker light applications. This is also shown in pictures of the Reading Caboose used on our demonstration layout and on our web stie.



Choke installation

When using other equipment on the same track with the LocoMatic™ system, it is neccessary to install choke's in series with the other items drawing power. These other items could be lighted cars or other engines running in the consist. This is neccessary 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.

CHOKE (Coil)

Input  Output

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.

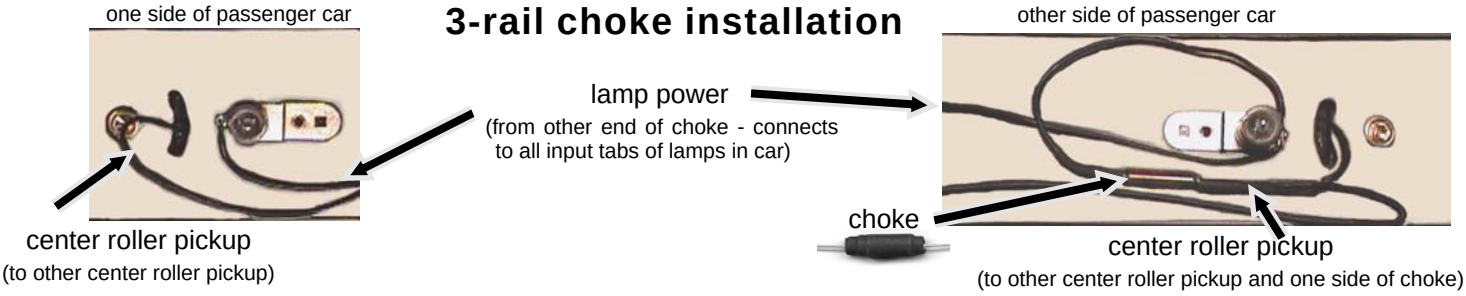
To install the choke in 3-rail passenger cars with multiple pickups:

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.

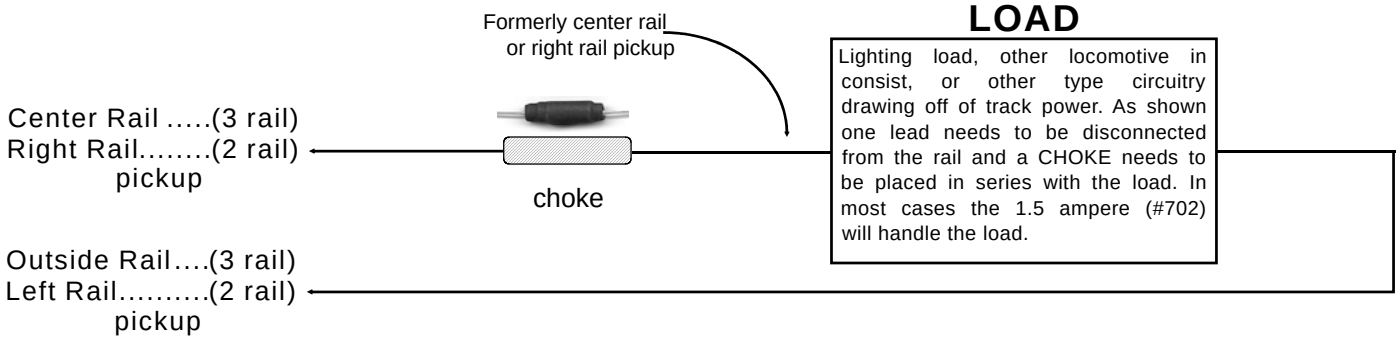
3-rail choke installation



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