

Installation Instructions  
for the  
8 & 15 Amp AC Motor Drivers  
for Command Control

Designed and Manufactured by



Command Control Solutions For The 21st Century

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Technical Assistance Hotline  
(330)533-7181 Monday-Friday 10a-6p EST

## Introduction/Preparation

The 8 and 15 amp drivers are designed to withstand the full stall amperage of 2 AC motors on the 8 amp driver, and up to 6 AC can on the 15 amp driver. As you will notice there is a large heat sink mounted to the bottom of the circuit board. This heat sink must be mounted to the frame of the locomotive. We recommend you use a dab of heat sink paste on each end of the heat sink where it mounts to the frame. There is also a program/run switch connected to two orange wires. This switch needs to either mount to the frame using the 2 small screws and nuts provided or mount to the underside of the frame using the thin double sided tape provided in the kit.

Once you have mounted the heat sink and program/run switch to the frame you can begin the installation. We have tried to make these instructions as simple and straight forward as possible. Should you encounter any difficulty in installing these boards, please call our technical help line at (330)533-7181 Monday-Friday 10a-6p EST.

## Installation Instructions

**Preparation;** Before you begin installation you will need to remove any pre-existing electronics or mechanical components, such as E-units, sound systems, etc. Make sure you do not remove any necessary lighting boards that could possibly regulate the voltage to headlights. Clip all wires approx. 1" away from their respective connections. This way, if you ever decide to re-install the original equipment you will have wire to work with.

You will also want to use so heat shrink tube to cover over your solder connections. If you do not have heat shrink tube you can use electrical tape, although we would rather you use the heat shrink tube. There are wire nuts included with the kit and should be used for pickup, ground and motor leads. All other connections should be soldered.

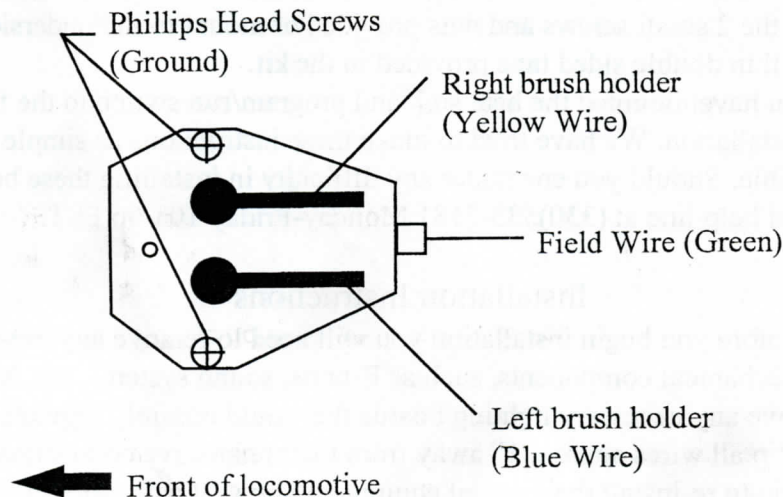
If you are uncomfortable performing this installation, we do offer professional installation for \$30.00 plus return shipping. Please call us Mon-Fri between 10a-6p EST at (330)533-7181 for assistance.

**Power & Ground;** The red wire on the 8 Amp Driver is where you should connect the Center Rail pickup rollers. The black wire on the driver is AC Ground, and should be connected to a wire that is grounded to the locomotive frame. If a ground wire is not on the frame it may be soldered to the side of a can motor, if this is the case, splice into this wire.

**4-Position E-Units;** If your train was originally equipped with a 4 position e-unit follow the directions below; (this is an e-unit that cycles forward, neutral, reverse, neutral, forward, etc.)

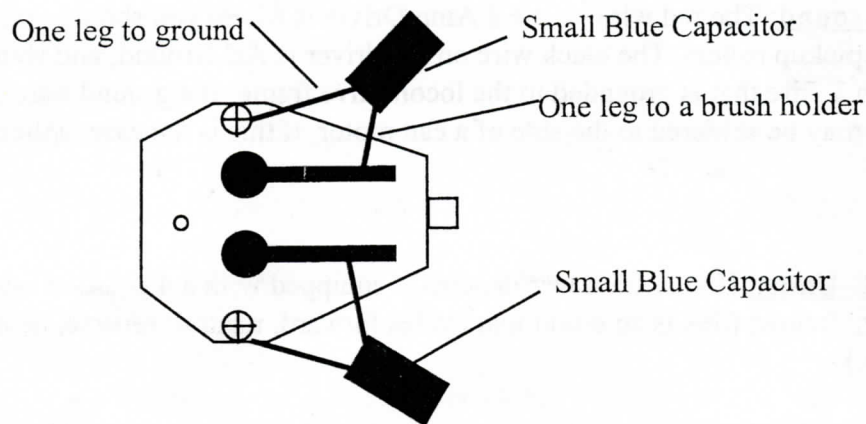
**Motor Wires;** The 8 Amp Driver has 3 motor leads, labeled Motor Lead 1 and Motor Lead 2, and Field Winding; they are Blue, Yellow & Green. Connect the blue wire to the left brush holder on the motor and the yellow wire to the right brush holder on the motor.

The green Field wire connects to the solder post on the motor (between the brush holders) that the field coil is soldered to. NOTE: Be sure to use the wire nuts included in the kit when making these connections. Once you do an initial test you may find that the motor leads are backwards. Once the initial test is complete, and you are satisfied with the position of the wires you can solder them in place to save on space. You can solder the field wire in place, as you will not have to change this later. Please see the diagram on the next page for clarity;



If your locomotive was equipped with 2 AC motors originally, then it will either have 3 black wires or 3 colored wires jumping from one motor to the next. Leave these wires in place, otherwise the second motor will not run properly.

NOTE: Your kit includes 4 small blue capacitors. The rating on these capacitors is 1 microfarad, 50 volt. These capacitors are used for noise immunity. This basically means that when power is applied to the motors a certain amount of noise is generated in the electrical current. This noise can be responsible for flickering lights and misfiring couplers. If you notice this occurring simply install these capacitors like the diagram below;



**2 Position E-Units** 2 position E-units only cycle from forward into reverse into forward into reverse. These types of E-units have motors with field wires that are different from those mentioned above. They need to be changed so the 8/15 Amp driver will operate the motor properly. These motors have either 1 or 2 field windings. If it has 1 field winding, then one end of the coil will be connected to ground, the end of the field coil should be connected to the green field wire. If the motor has 2 field wires, then they will be color coded. One coil will be green and the other will be red. (Look closely as they are very lightly coated.) One green coil and one red coil must be soldered to the green field wire. The other end of both wires must be soldered to ground. After this adjustment is made, follow the instructions above for connecting the motor wires.

**Headlights, Couplers and Smoke Unit/Strobe Light;** The end of the driver opposite the command receiver board has 10 wires. These wires may or may not be color coded. The next page shows the exact layout of these wires on the 8 Amp board. The board also has abbreviated words in line with each wire that show their purpose. Please see the next page.

NOTE: When the 8 Amp Driver was designed, we thought it would be a good idea to put a ground lead next to each "add-on" component. You will notice on the diagram on the next page that each output also has a corresponding ground. You can connect the ground of the "add-on" components (i.e. couplers, lights, smoke) directly to the chassis or directly to these "ground wires". If you connect the ground wires to the chassis, simply cut the "ground wires" off the board so a short does not occur.

**Front Headlight;** The driver board has 2 wires labeled "FLT" and FGND" These are Front Light (+) and Front Light Ground (-). *Please keep in mind that if you are installing this board into an MTH, Weaver or Sunset locomotive you will want to add a resistor in line with the "FLT" wire to prevent burning out the bulb(s). For assistance on this please see the chapter labeled "Lighting"*

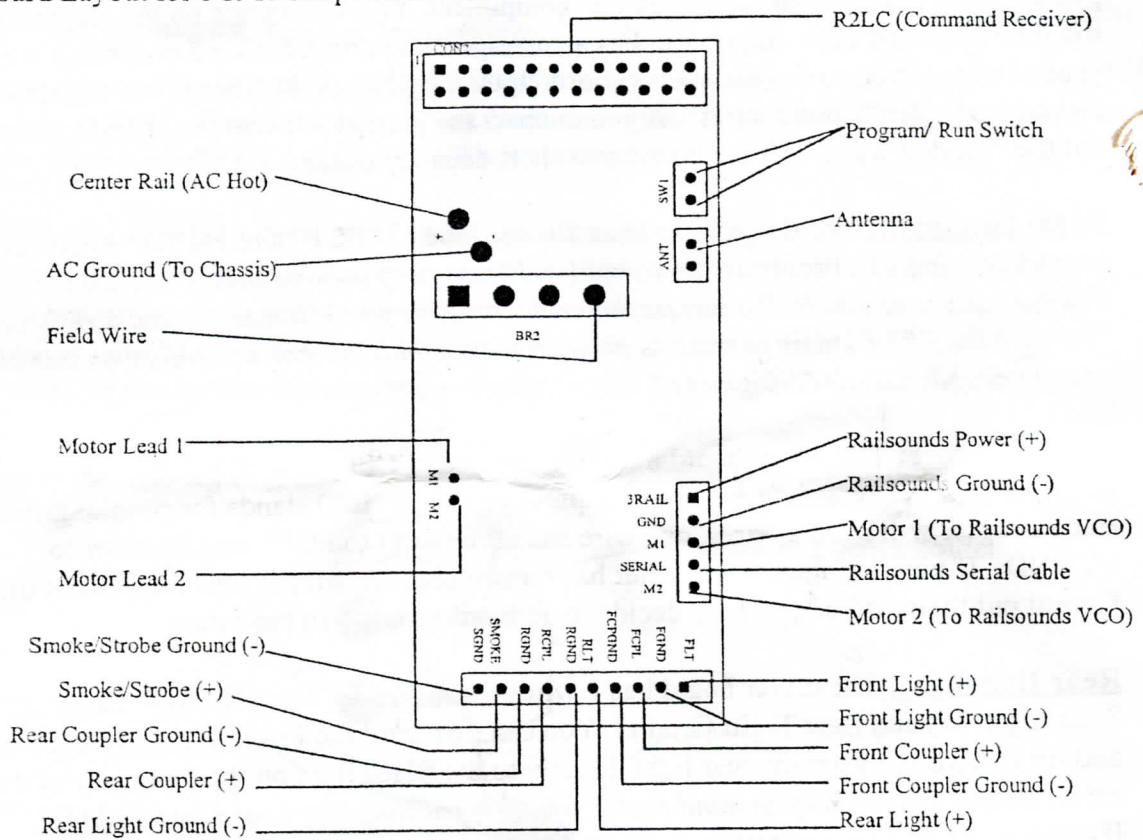
**Front Coupler;** The driver board has wires labeled "FCPL" and "CPGND" These are for coil couplers. FCPL stands for front coupler (+) and CPGND stands for coupler ground. Each coupler will have 2 wires, one wire should connect to FCPL and the other to FCGND. If your locomotive does not have a coil coupler, simply tape these wires off. Do not cut them off, as you may decide to add coil couplers in the future.

**Rear Headlight;** The driver board has 2 wires labeled "RLT" and RGND" These are Rear Light (+) and Rear Light Ground. You can disregard the Front Light Ground wire and tie the ground from the rear light directly to the Black wire on the input side of the driver board. *Please keep in mind that if you are installing this board into an MTH, Weaver or Sunset locomotive you will want to add a resistor in line with the "FLT" wire to prevent burning out the bulb(s). For assistance on this please see the chapter labeled "Lighting"*

**Rear Coupler:** The driver board has wires labeled "RCPL" and "RGND" These are for coil couplers. RCPL stands for rear coupler (+) and RGND stands for coupler ground. Each coupler will have 2 wires, one wire should connect to RCPL and the other to RCGND. If your locomotive does not have a coil coupler, simply tape these wires off. If your locomotive does not have a coil coupler, simply tape these wires off. Do not cut them off, as you may decide to add coil couplers in the future.

**Smoke Unit/Strobe Light:** The driver board has 2 wires labeled "SMOKE" and "SGND". "SMOKE" is the positive lead for the smoke unit or strobe light. "SGND" is the smoke unit ground. If your locomotive has a strobe light or mars light, the positive and ground wires connect the same as they would for a smoke unit. If your locomotive does not have a smoke unit, strobe light or MARS light, simply cut these wires off, flush with the board.

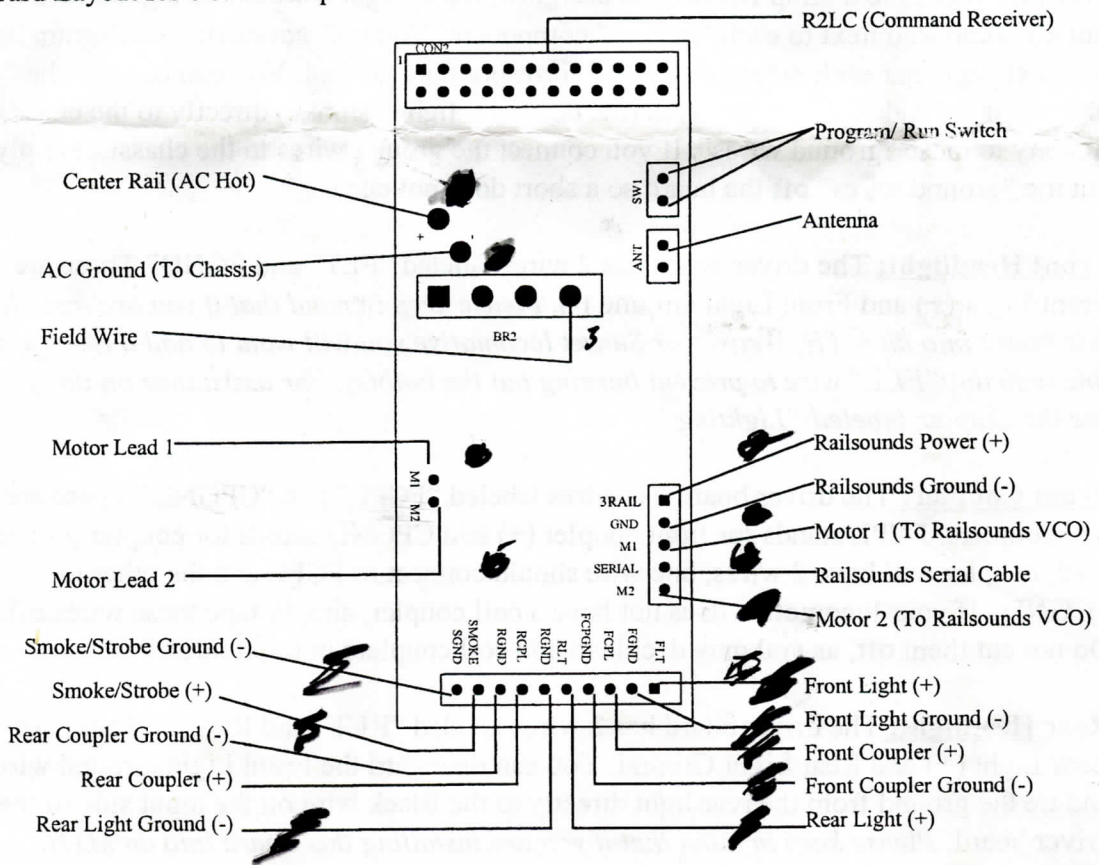
Board Layout for 8 & 15 Amp AC Driver



**Rear Coupler:** The driver board has wires labeled "RCPL" and "RGND" These are for coil couplers. RCPL stands for rear coupler (+) and RGND stands for coupler ground. Each coupler will have 2 wires, one wire should connect to RCPL and the other to RCGND. If your locomotive does not have a coil coupler, simply tape these wires off. If your locomotive does not have a coil coupler, simply tape these wires off. Do not cut them off, as you may decide to add coil couplers in the future.

**Smoke Unit/Strobe Light:** The driver board has 2 wires labeled "SMOKE" and "SGND". "SMOKE" is the positive lead for the smoke unit or strobe light. "SGND" is the smoke unit ground. If your locomotive has a strobe light or mars light, the positive and ground wires connect the same as they would for a smoke unit. If your locomotive does not have a smoke unit, strobe light or MARS light, simply cut these wires off, flush with the board.

Board Layout for 8 & 15 Amp AC Driver



## Initial Testing

By this point, the 8/15 amp driver should be almost completely installed, with the exception of the lights, antenna and sound system (if you are installing one).

You should perform an initial test to verify that the motor leads are in the correct position and the couplers are functioning properly.

Place the locomotive on the track, ensure the command base is plugged in and connected to the outside rails. Leave the copper antenna hanging in the air, and ensure that it is not touching ground (i.e. the frame or outside rails) Slowly turn the track power to 18 volts AC. Once you have 18 volts on the track grab your Cab-1 remote and address engine 1 (all command boards that leave TASTudios are preset to Engine 1). Turn the red throttle clockwise slowly. The engine will start to move, ensure that it is going in the correct forward position. If it is moving backwards simply reverse the motor leads at the solderless wire nuts once you get back to the bench.

Press the F coupler button and verify the front coupler works. Press the R coupler button and verify the rear coupler works. If the couplers are reversed (the F button opens the rear and vice versa) change the wiring once you return to the bench.

Once you have completed the initial test, turn the track power off and return to the bench and proceed with the installation.

## Lighting

If you are reading this section then you obviously have an MTH, Weaver or Sunset locomotive with lights that run on less than 12 volts. These bulbs can easily be identified by the fact that they are smaller than the screw and bayonet bulbs used in passenger cars and Lionel O gauge switches. (They also have no sockets; and in most cases, the wires just come right out of the bulb itself.)

Chances are these bulbs are 6V or 1.5V, therefore without a resistor in line they will simply blow out when 12 volts is applied to them.

If the locomotive has more than just a headlight then you must identify which bulb(s) are the headlight and which bulb(s) are marker lights, strobe lights, MARS lights, etc..

For headlights, chances are they are 6 volt bulbs. But, you need to make sure. You will need a couple different resistors to test the voltages. You will also need an AC transformer with a variable throttle (such as a ZW, TW, 1033, Z-750, MRC Trainpower O27, etc.). The resistor values you will need are listed below, along with the Radio Shack catalog number. They are;

560 Ohm ½ watt (catalog # 900-0373)

390 Ohm ½ Watt (catalog # 900-0369)

270 Ohm ½ Watt (catalog # 900-0365)

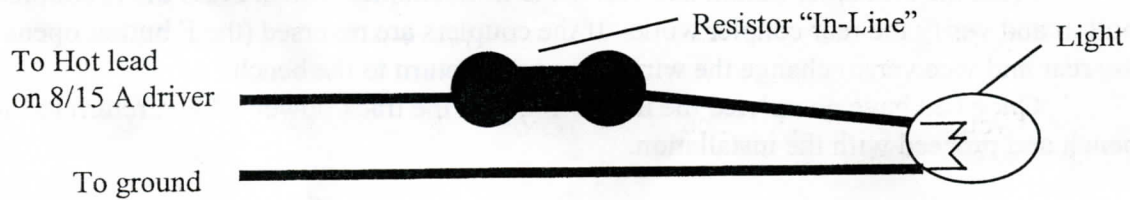
220 Ohm ½ Watt (catalog # 900-0363)

NOTE: Please bare in mind that when you operate any command equipped locomotive in the conventional mode, the light output power is the same as the track power.

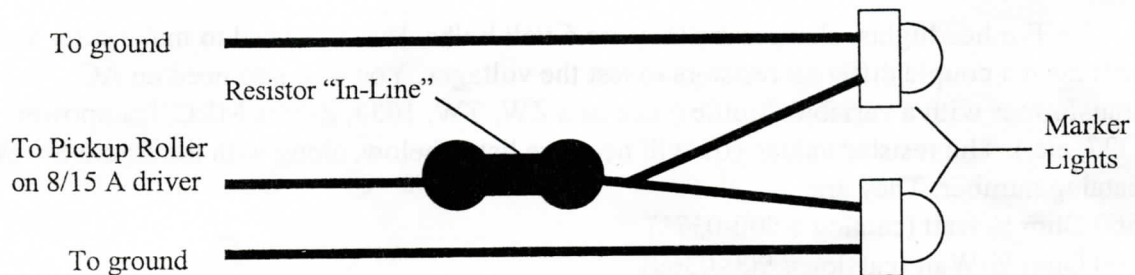


Start with the highest value resistor. Connect one lead of the light to the ground terminal of your transformer. Connect one resistor leg to the hot terminal of your transformer. Set the transformer output at 12 Volts AC. Using your fingers touch the other leg of the resistor to the remaining lead of the light. If the light comes on, it is a 1.5 Volt headlight and you want to use that resistor in your installation. If the light does not come on, you should try the test again with the second highest value resistor, and so on. Repeat this test if your locomotive has a MARS light or strobe light.

Once you have determined the lights operating voltage, simply connect the resistor "In-Line" with the hot side of the light lead. Connect the other side of the light lead to ground. See the diagram below for clarity;

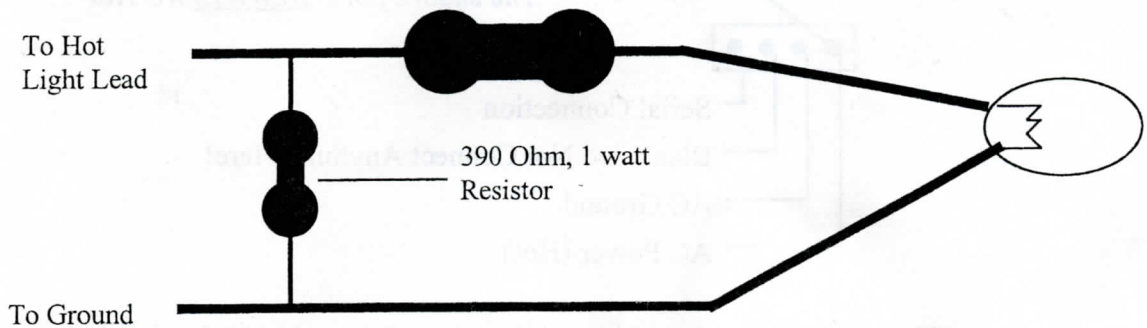


If your locomotive is equipped with marker lights (small green or red LED's) use a 560 Ohm, ½ watt resistor (Radio Shack catalog #900-0369) in line with BOTH hot leads and connect it to the pickup roller/Power wire of the 8/15 Amp driver. Connect the ground side of the lights to ground. This will ensure the marker lights stay on all the time and will keep them from burning out. Please refer to the diagram below;



NOTE: The command receiver board (referred to as the R2LC) uses triacs to power the lights. The normal load needed to keep the triac gates open (power staying on) is 90 milliamps. If your lights needed a resistor then chances are you are not pulling 90 mA.

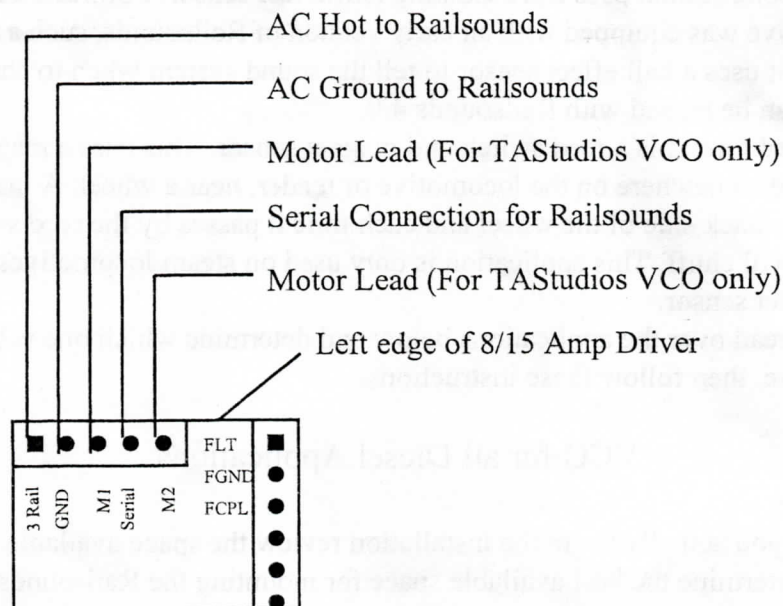
(This only applies to headlights, MARS lights and strobe lights.) To keep the triac gate open, another resistor is required. It is a 390 Ohm, 1 Watt resistor (Radio Shack catalog # 900-0680). This resistor goes between the hot light lead (between the in line resistor and the 8/15 Amp driver) and ground. Although it sounds like a short, it isn't. This 390 Ohm 1 Watt resistor forces the triac gate to remain open by increasing the milliamperage draw. Please see the diagram below for clarity;



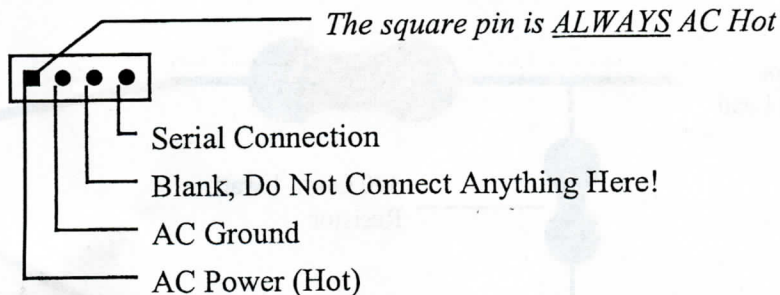
If you encounter any difficulty with choosing the correct resistor contact TASTudios for assistance.

### Railsounds Connections

The 8 and 15 amp driver will only support Railsounds 2.0, 2.5, 3.0 and 4.0. On the left side of the board there are 5 holes labeled "3RAIL", "GND", "M1", "SERIAL" and "M2". These wires all get connected to the Railsounds VCO board that is sold by TASTudios. Please refer to the diagram below illustrating the location of these wires and how they connect to the Railsounds VCO board;



If you are connecting the 8/15 Amp driver to an older Railsounds 2.0, 2.5 or 3.0 platform, the Railsounds board will have a white 4-pin serial plug. There are only 3 wires that connect to this 4-pin plug. They are; AC Hot, AC Ground and Serial. (The M1 and M2 wires are only for the TASTudios VCO). Please see the diagram below for the proper connections to a Railsounds 2.0, 2.5 or 3.0 connector;



There will always be a white plug on top of the solder pads, simply look at the reverse side of the board to determine which pad is AC hot. As mentioned above, AC Hot will always be the square pad.

### Installing Railsounds 4.0 from TASTudios

If you have purchased a Railsounds kit along with your 8/15 Amp driver, follow the instructions below before finishing the installation of the driver.

The Railsounds VCO comes in 3 formats. The first format is with a VCO (voltage control oscillator) this means that the Railsounds looks at the amount of motor voltage being applied to the motors to determine how fast to chuff, or when to ramp up and down.

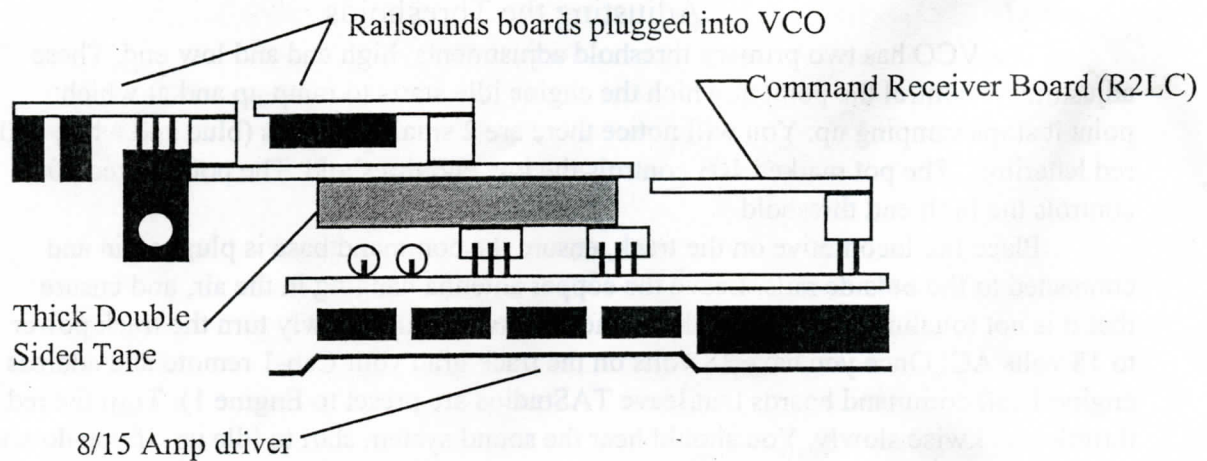
The second format uses a pre-existing hall effect sensor. For instance, if your steam locomotive was equipped with an early version of Railsounds, such as Railsounds 1, chances are it uses a hall effect sensor to tell the sound system when to chuff. That hall effect sensor can be reused with Railsounds 4.0.

The third format is a reed switch and magnet sensor. This uses a magnetic reed switch mounted somewhere on the locomotive or tender, near a wheel. A magnet is then cemented to the back side of the wheel and each time it passes by the reed switch the sound system will chuff. This application is only used on steam locomotives that do not have a hall effect sensor.

Please read over the applications below and determine which one is best suited for your locomotive, then follow those instructions.

### VCO for all Diesel Applications

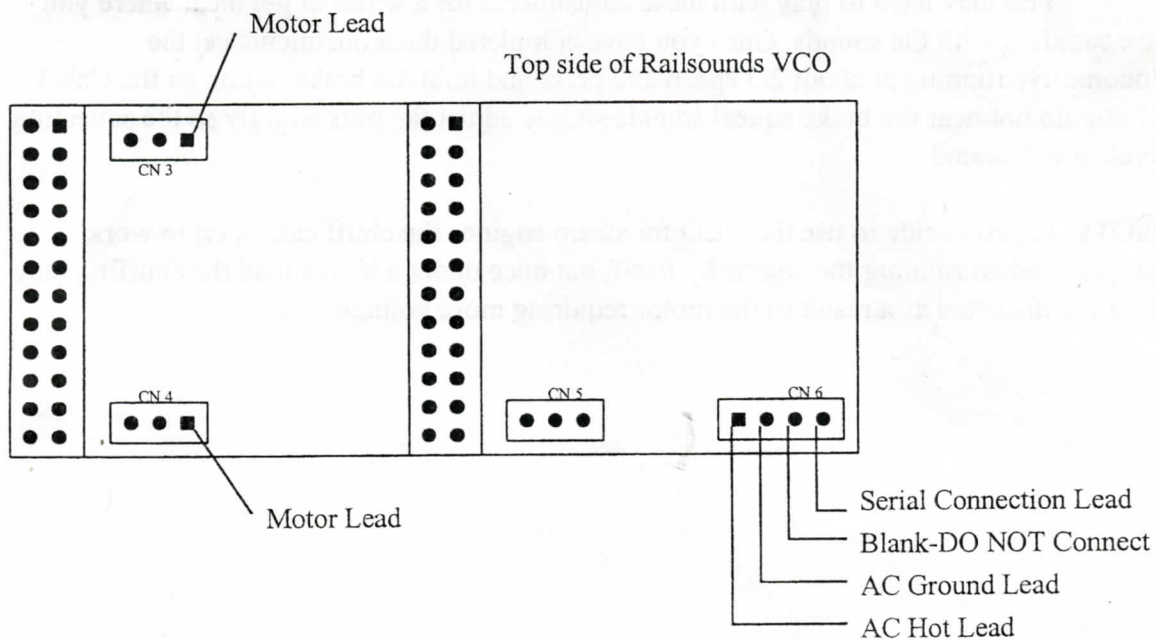
Before you actually begin the installation review the space available in your locomotive. Determine the best available space for mounting the Railsounds board. In most cases, due to tight space restraints, you may be required to mount the VCO on top of the 8/15 Amp driver. If this is the case see the sketch on the next page for clarity;



Use the thick double sided tape to mount the bottom of the green VCO board to the top of the 8/15 amp driver. You may also want to secure the underside of the Railsounds Power board (the black plug in board with the large components hanging off of it).

Locate a good mounting position for the speaker, keep in mind that the sounds will be much louder if the speaker has resonance (which is basically the same thing as an echo). For instance, if the speaker goes in the fuel tank, does the frame have a hole in it, over top of the fuel tank? If you mount the speaker inside the locomotive do you have a speaker cone? A paper towel roll will do just fine. If you are mounting the speaker in an F-3 mount the speaker facing up under the grilles on the roof using hot glue. The placement of the speaker will make a world of difference when it comes to volume.

As for wiring the Railsounds board to the 8/15 Amp driver please follow the diagram below for complete wiring instructions (These connections are made to the driver);



## Adjusting the Thresholds

The VCO has two primary threshold adjustments; high end and low end. These adjustments control the point at which the engine idle starts to ramp up and at which point it stops ramping up. You will notice there are 2 small tune pots (blue and white with red lettering). The pot marked 103 controls the low end threshold. The pot marked 204 controls the high end threshold.

Place the locomotive on the track, ensure the command base is plugged in and connected to the outside rails. Leave the copper antenna hanging in the air, and ensure that it is not touching ground (i.e. the frame or outside rails) Slowly turn the track power to 18 volts AC. Once you have 18 volts on the track grab your Cab-1 remote and address engine 1 (all command boards that leave TA Studios are preset to Engine 1). Turn the red throttle clockwise slowly. You should hear the sound system start to idle up, if you do not hear it idling up you need to adjust the tune pot.

Turning the 103 pot clockwise will decrease the rate at which the sounds ramp up. Turning it counterclockwise will increase the rate at which the sounds ramp up. Make the necessary adjustment so the sounds start to ramp up when you turn the red throttle.

Once the low end adjustment is set run the locomotive at one speed setting (of your choice). The sounds should stay at the first ramp speed (there are a total of 3 ramp speeds, not including idle). Increase the speed a little more (about 2/3 the total speed of the locomotive). The sounds should stay at the second ramp sound. Turning the throttle to full speed should result in the sounds going to the highest ramp speed.

If the sounds seem to ramp up immediately you need to adjust the high end threshold. This is done by adjusting the pot marked 204. Turning the pot clockwise will decrease the rate at which the sounds ramp up to the next highest levels. If the sounds do not idle up turn the pot counterclockwise to increase the rate. When making the adjustments, a little turn is all you need. Just a small adjustment will result in a big change.

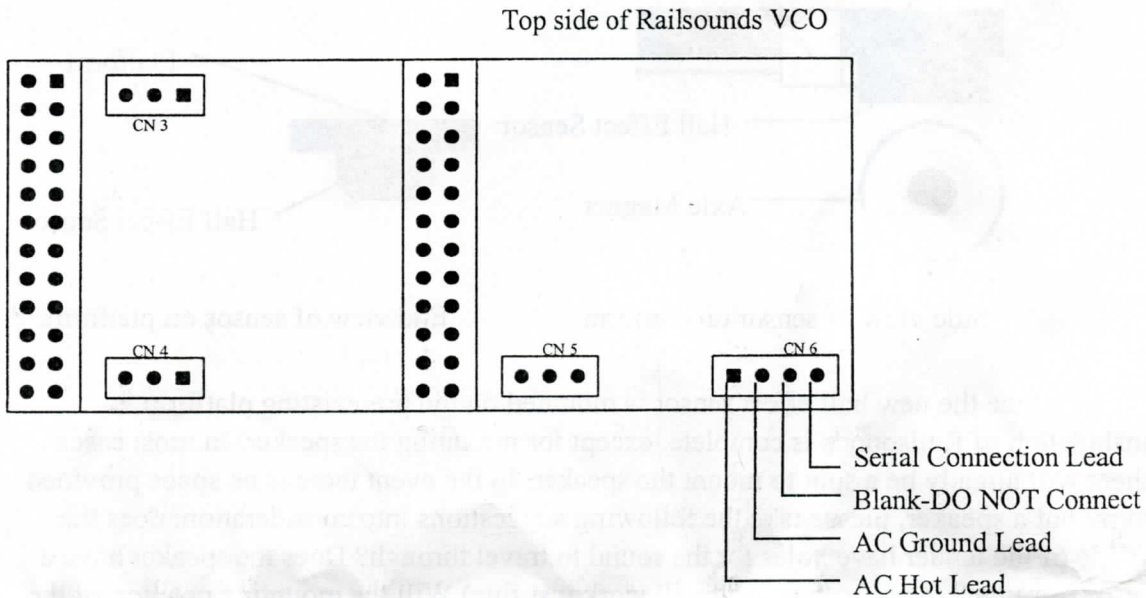
You may have to play with these adjustments for a while to get them where you are satisfied with the sounds. Once you have completed the adjustments get the locomotive running at about 2/3 speed and press and hold the brake button on the Cab-1. If you do not hear the brake squeal sounds simply adjust the pots slightly so the squealing brakes will sound.

NOTE: If you decide to use the VCO for steam engines the chuff can be set to work properly when running the engine by itself, but once under a heavy load the chuffing may become distorted as a result of the motor requiring more voltage.

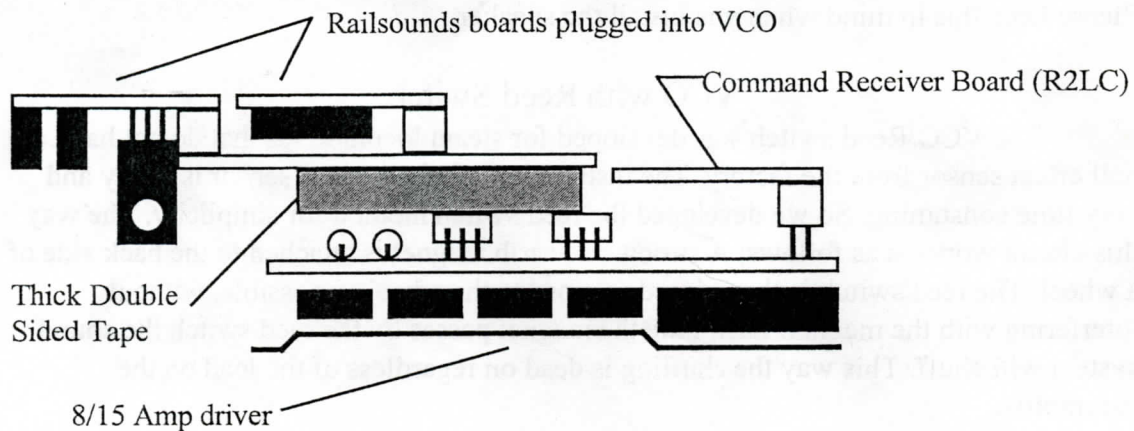
## VCO with Hall Effect Sensor

If you have ordered the Railsounds kit with a hall effect sensor, you need to follow these directions.

The wiring between the green VCO board and the 8/15 Amp driver is as follows; (all connections are made between the VCO board and the 8/15 Amp driver).



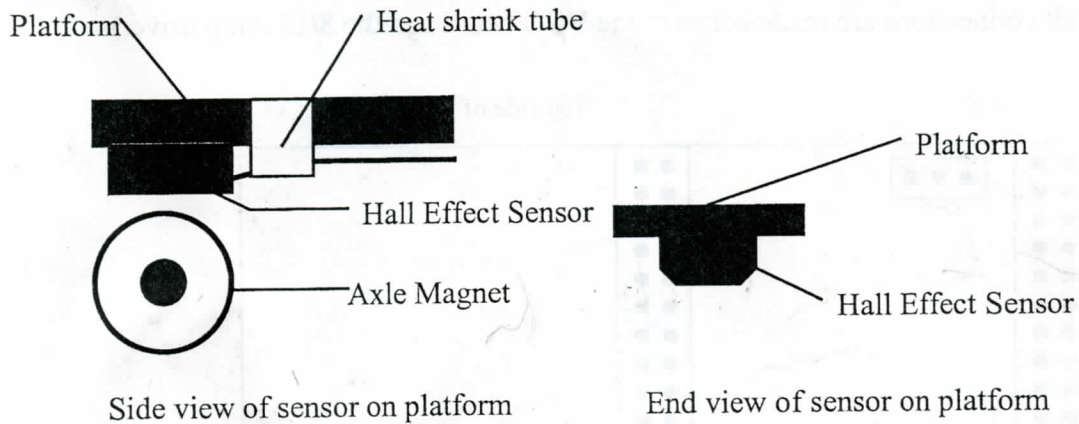
Once these connections are made you can go ahead and mount the board as shown below using the thick double sided tape included in the kit;



If your locomotive has a pre-existing hall effect sensor, you will need to remove the actual sensor from its current mounting location, as it will be replaced with the one included in the TASTudios kit.

You will notice that there is a small black hall effect sensor attached to a piece of 3 strand ribbon cable. This is your new hall effect sensor. Route the hall effect sensor down through the tender floor and onto the mounting platform just above the large round magnetic wheel attached to your tenders axle. Using a small piece of heat shrink tube

over the platform and the hall effect sensor to secure the sensor to the platform. Ensure the heat shrink tube does not cover the sensor itself, but rather the wires that the sensor is attached to. See the diagram below for clarity;



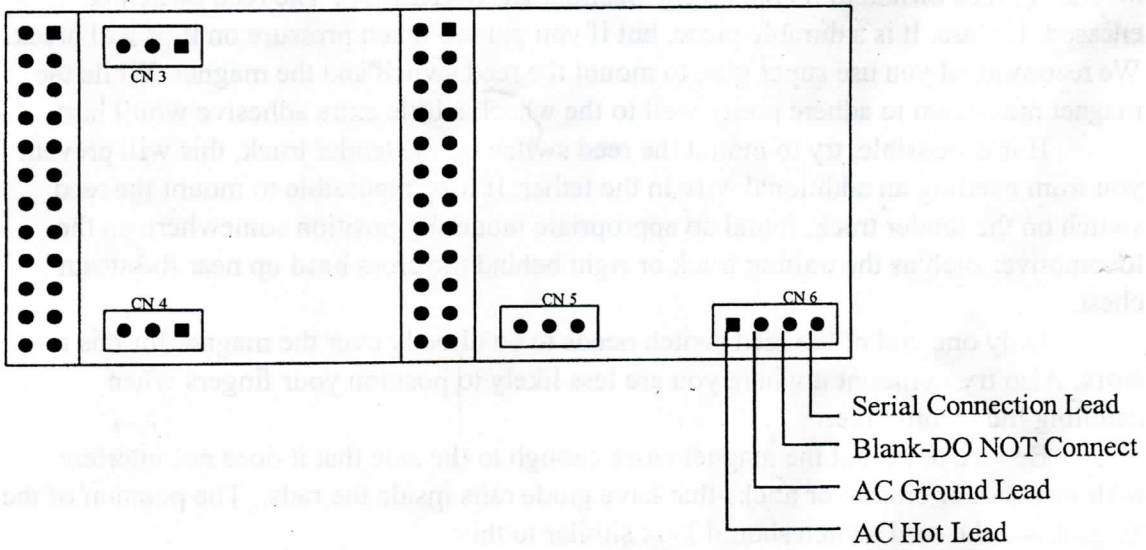
Once the new hall effect sensor is mounted on the pre-existing platform, installation of Railsounds is complete, except for mounting the speaker. In most cases there will already be a spot to mount the speaker. In the event there is no space provided to mount a speaker, please take the following suggestions into consideration; does the frame of the tender have holes for the sound to travel through? Does the speaker have a resonator tube? (a paper towel roll will work just fine) Will the mounting position of the speaker create any shorts with the back sides of the circuit boards, if so insulate them with electrical tape or double sided tape. The placement of the speaker will ultimately determine the volume of your locomotive. Poor placement will result in poor volume. Please keep this in mind when you install the speaker.

### VCO with Reed Switch

The VCO/Reed switch was developed for steam locomotives that do not have a hall effect sensor from the factory. The installation of a hall effect sensor is tricky and very time consuming. So we developed the reed switch method for simplicity. The way this circuit works is as follows; A strong rare earth magnet is attached to the back side of a wheel. The reed switch is then placed as close to the wheel as possible, without interfering with the magnet. Each time the magnet passes by the reed switch the sound system will chuff. This way the chuffing is dead on regardless of the load on the locomotive.

The wiring between the VCO board and the 8/15 amp driver is shown on the next page;

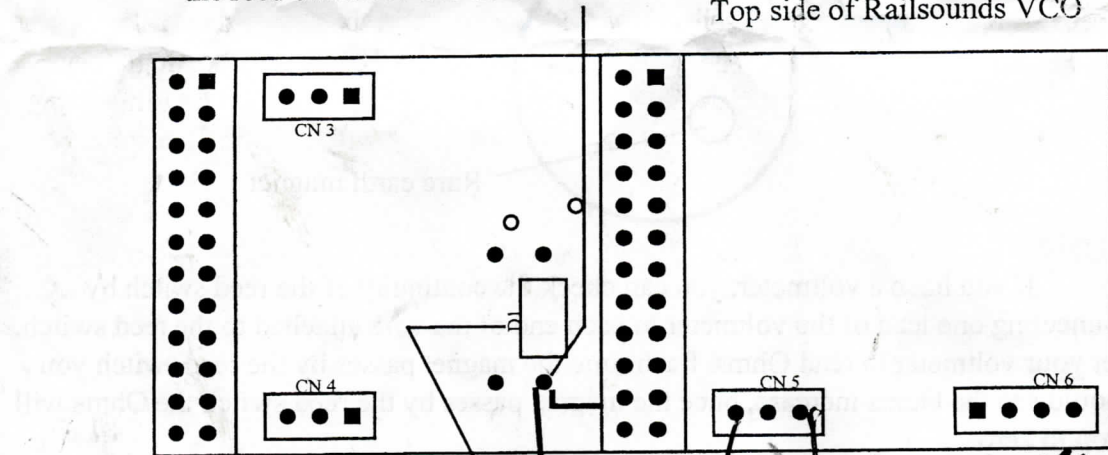
Top side of Railsounds VCO



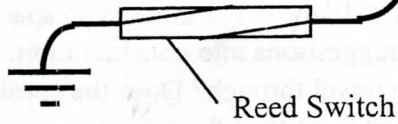
The reed switch has 2 wires on it. One wire (it doesn't matter which one) goes to chassis ground. The other wire connects to the VCO as shown below;

Connect the remaining wire on the reed switch to this hole

Top side of Railsounds VCO



D1 is labeled UNDER the VCO board



*Handwritten notes:*  
SPK  
Serial

*Handwritten signature:*  
Puff n  
Chn R.

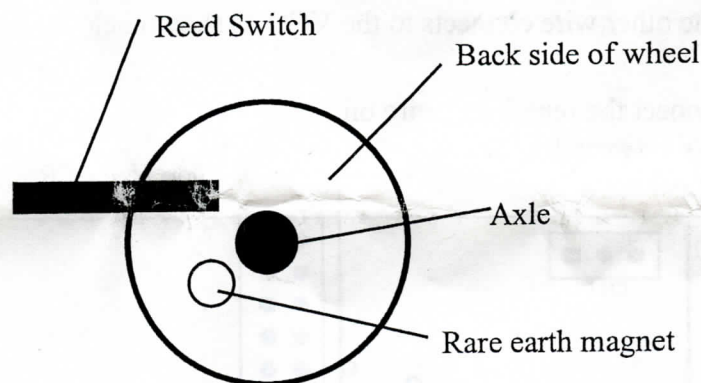


Before you make your final solder connections, it is advised that you securely mount the reed switch to its mounting location. BE CAREFUL! The reed switch is encased in glass. It is a durable piece, but if you put too much pressure on it, it will break. We recommend you use super glue to mount the reed switch and the magnet. While the magnet may seem to adhere pretty well to the wheel, a little extra adhesive won't hurt.

If it is possible, try to mount the reed switch on the tender truck, this will prevent you from needing an additional wire in the tether. If it is impossible to mount the reed switch on the tender truck, find an appropriate mounting position somewhere on the locomotive; such as the trailing truck or right behind the cross head up near the steam chest.

Only one end of the reed switch needs to be directly over the magnet for this to work. Also try to mount it where you are less likely to position your fingers when handling the locomotive.

Be sure to mount the magnet close enough to the axle that it does not interfere with switches or crossover tracks that have guide rails inside the rails. The position of the magnet and the reed switch should look similar to this;



If you have a voltmeter, you can check the continuity of the reed switch by connecting one lead of the voltmeter to each end of the wire attached to the reed switch. Set your voltmeter to read Ohms. Each time the magnet passes by the reed switch you should see the Ohms increase, once the magnet passes by the reed switch the Ohms will drop to zero.

If you do not have a voltmeter, simply test the locomotive on the track. If the components have been placed properly the sound system will chuff each time the magnet passes by the reed switch.

Once the reed switch and magnet have been mounted to the tender or locomotive you should examine the frame for a proper location to mount the speaker. In most cases there will already be a spot to mount the speaker. In the event there is no space provided to mount a speaker, please take the following suggestions into consideration; does the frame of the tender have holes for the sound to travel through? Does the speaker have a resonator tube? (a paper towel roll will work just fine) Will the mounting position of the speaker create any shorts with the back sides of the circuit boards, if so insulate them with electrical tape or double sided tape. The placement of the speaker will ultimately

determine the volume of your locomotive. Poor placement will result in poor volume. Please keep this in mind when you install the speaker.

### Programming

To begin programming your locomotive place it on the track with the program/run switch in the program position (so the switch is connecting the 2 orange wires). Ensure the Command Base is plugged in and connected to both outside rails. Also ensure the antenna is not touching ground. Turn the track power up to 18 Volts AC. Using the Cab-1 press the following keys;

ENG + your ID # + Set (the front light will flicker) Now press;  
ENG + your ID # + AUX1 + Program Code (see below)

#### Program Codes;

- 4 Steam w/ Smoke (turns smoke unit off when motor voltage is not on, turns smoke on when the motors are running. This is preferred for smoke units with a bellow.)
- 5 Diesel w/ Strobe/MARS light
- 6 Seam w/ Smoke on/off
- 7 Diesel w/ Cab Light
- 8 Diesel w/ Smoke on/off

Once you have programmed the locomotive turn the power off to the track. Slide the program/run switch back to run.

### Installing the Antenna

By this point the installation of the 8/15 amp driver is complete. All that is left to do is mount the antenna and button the locomotive up. There are 2 differences when it comes to mounting the antenna; whether your locomotive has a plastic shell or a die cast shell. Please follow the instructions below that best describes your locomotive;

#### Plastic Shells

If your locomotive has a plastic shell then mounting the antenna is quite simple. The antenna mounts on the inside roof of the shell. It must be centered so that is an equal distance from the sides of the shell. Peel the strip of paper off the backside of the copper antenna to expose the adhesive. Adhere the antenna in the position mentioned above. Cover the antenna with a strip of electrical tape to avoid it shorting out on ground. Once the antenna is securely mounted in the shell, simply replace the shell and reassemble the locomotive.

## Die-Cast & Brass Tender Shells

If your locomotive has a brass or die-cast shell, follow the directions below for proper installation of the antenna. You must understand what you are trying to accomplish and why;

The antenna is responsible for receiving the "com" that is transmitted from the command base. It then sends that signal down into the command receiver module (R2LC). The antenna is simple in design and has only two simple requirements. First, it must be located approx. 2-2.5" above the center rail (equal distance from each outside rail). Second, it must not come in contact with ground. If the antenna touches ground you will immediately lose your command signal and the locomotive will revert back to a conventional locomotive.

Mount the antenna on the inside roof of the shell by removing the paper backing to expose the adhesive. Once the antenna is in position cover it with a strip of electrical tape to avoid it making contact with ground.

On brass and die-cast tenders the shells are mounted to the frame with brass or metal screws. This obviously makes the shell grounded (since the wheels in the trucks ride on the outside (ground) rails, and the trucks are attached to the frame, the shell in turn is grounded as well. What needs to be done is the shell need to be "electrically isolated" or "Floated" from the frame. This is accomplished by adding electrical tape to any spaces where the shell touches the frame. You must study the shell itself and insure that you have covered all areas where the shell would make contact with the frame.

To secure the shell to the frame, you will use nylon screws, which are available from TASTudios at no charge, or any good hardware store. Once the shell is setting on the frame very carefully puncture the electrical tape to make a hole for the nylon screws. Using the nylon screws, reassemble the shell and test the locomotive again.

## Final Testing

After you have reinstalled the shell you are ready for a final test. Place the locomotive on the track, ensure the command base is plugged in and connected to the outside rails. Leave the copper antenna hanging in the air, and ensure that it is not touching ground (i.e. the frame or outside rails) Slowly turn the track power to 18 volts AC. Once you have 18 volts on the track grab your Cab-1 remote and address engine 1 (all command boards that leave TASTudios are preset to Engine 1). Turn the red throttle clockwise slowly. You should hear the sound system fire up and the locomotive should start to move forward.

If, upon initial power up, you see the headlights flickering erratically, this is a sure sign that your locomotive is getting a poor signal. This is caused by a couple things; First, is the command base plugged in and connected to both outside rails? Second, did you cover the antenna with electrical tape to avoid any internal shorts? Third, if it is brass or die-cast, is the shell making an electrical connection with the frame?

On plastic shells, if you hold hand above the locomotive (approx. 1-2" from the roof) while power is applied and the flickering stops, then it is a sure sign you have a signal problem. If you have followed the instructions to a "T" and the problem persists, call TASTudios for assistance.

If it is a brass or die cast shell and you have followed the instructions to a "T" and are sure that the shell is not making an electrical connection with the frame, call TASTudios for assistance.

### Thank You

We would like to take this opportunity to thank you for purchasing your command control components from TASTudios and hope that you will remember us in the future. Please keep in mind that we have an extensive line of command control components available as well as an extensive line of constant voltage lighting circuits that can really improve the look and feel of your railroad. If there is anything we can do for you in the future, please don't hesitate to contact us.

## Troubleshooting

<u>Symptom</u>	<u>Solution</u>
Engine Takes off, no control whatsoever.	Check to ensure the command base is plugged in and connected to the outside rail of the test track you are using. Verify the Cab-1 is communicating with the command base by watching the red light on the base flash while giving commands. Also make sure the antenna is not touching ground or any circuit boards.
Engine seems to strain under no load.	Make sure the motor leads are not touching ground or the motor case. Also make sure there are no loose connections that could be touching ground.
Lights flicker when the train moves. Lights dim when power is applied to the motors.	On AC motored locomotives this is caused by noise in the electrical current. This can be corrected by Adding the small blue 1 microfarad, 50 volt non-polarized electrolytic capacitors between the brush holders and ground.
Smoke unit fan sounds like it is pulsing.	The locomotive needs to be reprogrammed to AUX1 8 for smoke unit on/off. Follow the directions under the Testing heading.
Couplers fire randomly when train runs.	Make sure the wires for the lights and the couplers are as far away from each other as possible. A lot of times the electrical radiation from the lights will trigger the couplers to fire. If this doesn't correct the problem, give us a call.
Railsounds start up immediately. No control over Railsounds features	Check the serial wire between the driver and the Railsounds VCO, this is the ONLY thing that can be wrong.
The driver seems to heat up and shut down.	Heat sink paste is needed between the heat sink and the frame. Ensure the heat sink is mounted firmly to the frame with the screws that were provided.