
Turbo Smoke

Fan Driven Smoke Unit
Installation Instructions

By

**TRAIN
AMERICA
STUDIOS**

Command Control Solutions For The 21st Century

AC

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Introduction

Congratulations on your purchase of the *Turbo Smoke* fan driven smoke unit from TASTudios. We are confident that you will be impressed with the performance of this new smoke unit. We have incorporated many design changes into this new unit. Changes such as a low value heating element to generate smoke at lower operating voltages. A fiberglass batting inside the heating chamber that will not sink once fluid is added. Each unit features our Auto Shut Off circuit which protects both the heating element and batting from burning and ensures your smoke unit will have a long, maintenance free life. On top of all the improvements we have made to the *Turbo Smoke* fan driven smoke unit we have also added our popular Puff N Chuff feature as well as an all new Diesel Accel feature.

Special Effects

The *Turbo Smoke* fan driven smoke unit features 3 special effects previously unavailable on the market. These special effects are Auto Shut Off, Puff N Chuff, and Diesel Accel.

The Auto Shut Off circuit is on all the time, regardless of whether your smoke unit is powered with AC or DC power. It works like this; the temperature of the heating element is constantly monitored. In the event the heating element goes over temperature, due to a lack of fluid or over-voltage, the power to the heating element is shut off. The fan motor will run at full speed to cool the heating element. Once the heating element reaches nominal operating temperature the power is turned back on and the fan resumes normal operation. This cycle will continue as long as power is applied to the unit.

Puff N Chuff is designed for steam locomotives exclusively. When the locomotive sits at idle smoke lofts out of the stack. Once the locomotive begins moving the smoke is forced out of the stack in sync with the chuffing of the sound system. Once the locomotive reaches more than 4 chuffs per second the smoke unit turns on full blast (this is because you couldn't see the distinct pulses of smoke at this speed anyway). When the locomotive returns to an idle position the smoke once again lofts out of the stack.

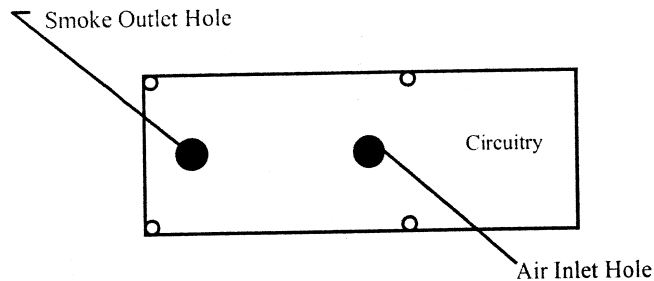
Diesel Accel is designed for diesel locomotives, but it can also be used for steam locomotives as well. Diesel Accel lofts smoke out of the stack when the engine sits at idle, when the locomotive begins moving the smoke volume is increased drastically. The volume of smoke will stay constant until the locomotive returns to an idle position at which point it will loft smoke out of the stack.

Each Turbo Smoke unit is equipped with a special effects jumper plug. This jumper allows you to select which special effect mode you want the unit to operate in. Please refer to page 10 for more detailed instructions.

Turbo Smoke can also be configured to run at full speed all the time with the Auto Shut Off circuit working as well. To read more on how to perform this conversion please refer to page 9.

Inlet & Outlet Holes

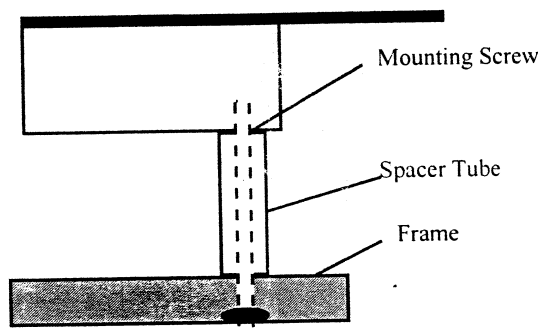
Below is an overhead view of the *Turbo Smoke*. Please note the inlet hole and outlet hole. For premium performance the outlet hole should be located directly underneath the smoke stack. The inlet hole should also not be blocked. If the inlet hole is blocked you may notice decreased performance in the operation of your smoke unit.



Mounting your smoke unit

The die cast reservoir of the smoke unit features 4 mounting holes. Not all 4 holes need to be used. The location of these holes is identical to those on a Lionel fan driven smoke unit. If you are replacing a Lionel fan driven smoke unit with the *Turbo Smoke*, simply reuse the mounting posts provided with your Lionel locomotive. If you are installing this unit into a locomotive that never came with a smoke unit you will have to get a bit creative.

We recommend that at least 2 of the bottom holes be used when mounting the smoke unit. Any combination of holes can be used. The *Turbo Smoke* will generate heat under normal operation. It is good to have the die cast reservoir attached to something metal to act as a heat sink. The unit will not get hot enough to melt plastic, but it could potentially bubble paint if it were not mounted properly. Any metallic material can be used for mounting the unit; copper, brass, steel, aluminum, etc. One possibility is using long screws with a spacer tube, cut to the length required for your application (see diagram below).



AC Version Wiring

The *Turbo Smoke* is designed for AC or DC operation. Both versions look very similar, however, if your smoke unit was shipped without a bridge rectifier connected to the 3-pin wire harness, then it is definitely an AC version.

The *Turbo Smoke* is designed to operate in both a command controlled and a conventional locomotive. There is a slight difference between the wiring for each locomotive. Please select the instructions that best fit your requirements.

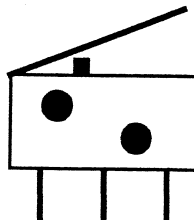
Trainmaster Command Equipped Locomotives

(Please refer to the wiring diagram shown on page 6)

If your loco is equipped with TMCC you need to locate the smoke leads from your Trainmaster motherboard. More than likely your loco is already equipped with a smoke unit. The power connection will either be a white 3-pin connector or a wire connected to the heating element. In either event, disconnect it from it's current location and connect it to the AC hot lead of the new connector provided with your smoke unit. (the hot lead will be connected to the on/off switch for the smoke unit).

Locate a ground lead (a wire attached to either the frame or the TMCC motherboard). Disconnect the wire from it's current location and connect it to the AC ground lead of the new connector provided with your smoke unit.

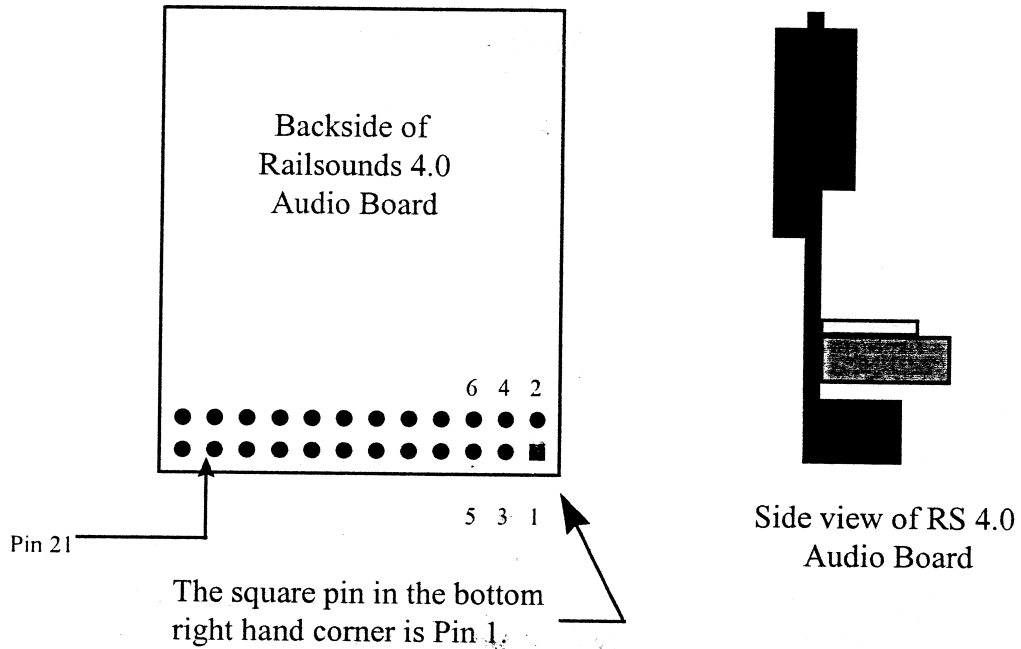
The 3rd wire on the new connector is for the chuff sensor input. On steam locomotives this will be a small momentary contact switch located near an axle or near the smoke bellows arm. The sketch below illustrates what this switch looks like;



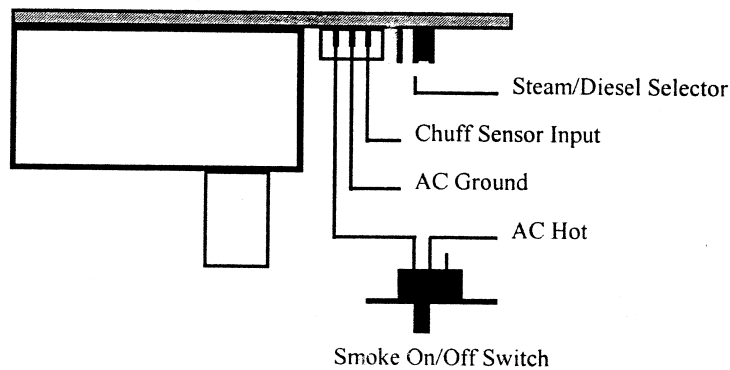
Once you have located the momentary contact switch you will need to determine which one of the leads is the chuff input. One lead will be connected to the frame (ground). The other lead is the chuff input lead. (The easiest way to determine this is make sure the flapper arm is not depressed. Using a volt meter set on continuity check the two connected leads of the switch against the frame. One lead will definitely be connected to the frame, while the other will go to the motherboard.) The wire that is not connected to ground, but goes to the motherboard is the wire that connects to the 3rd wire in the connector that came with the smoke unit. (This is the wire that syncs the puffing smoke with the chuffing. It also activates the Diesel Accel effect.)

On diesel locomotives a VCO (voltage control oscillator) is used to ramp the sounds up and down. Most diesel locos do not have a chuff sensor switch like steam locos

do. You will need to make a solder connection directly on the Railsounds audio board. The diagram below shows exactly which pin the 3rd wire of the connector must be soldered to. Be careful not to be sloppy with this connection. If the lead touches any other pin than pin 21 a short will occur which may void your warranty.



Wiring Schematic for AC Version



Conventional Locomotives

If your locomotive is not equipped with a smoke on/off switch we highly recommend you install one before proceeding. A smoke on/off switch will allow you to turn the smoke on and off. Otherwise the unit will be on all the time. If you do not have an SPDT switch available, TASTudios has them with mounting screws.

Locate the center rail pickup roller on your locomotive. This is the AC hot lead, it connects to the on/off switch which is connected to the AC hot lead on the connector. Locate a ground lead (this will be connected to the frame. AC motors will have a solder lug connected to a screw on the motor cover). The ground lead connects to the center wire of the connector provided with your smoke unit. This is the basic wiring for the smoke unit.

If you are using your smoke units special effects; Puff N Chuff or Diesel Accel you will need to install a reed switch. The reed switch, combined with a magnet will provide a chuff sensor input to the smoke unit. (these are the pulses that sync the smoke with the movement of the locomotive). In the event you do not want to install a reed switch you can make the fan motor run at full speed all the time. Please refer to page 9 for complete instructions.

If you are going to install the reed switch please follow the instructions on page 8.

DC Version Wiring Instructions

(Please refer to the wiring diagram for DC smoke on page 8)

All DC version smoke units have "AC Version" printed on the top side of the circuit board. Don't panic! You will know your smoke unit is DC if the 3-pin harness is connected to a bridge rectifier. The AC and DC versions look very similar, in fact there are only 2 components that separate the two versions.

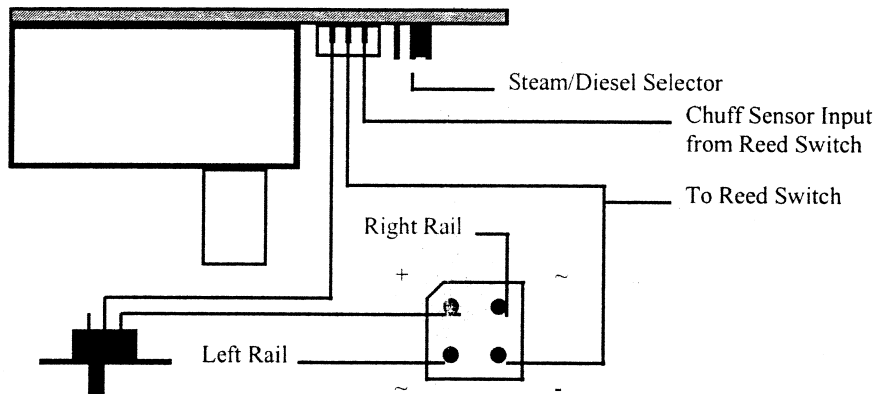
If your locomotive is not equipped with a smoke unit on/off switch we highly recommend to install one. All that is required is a simple SPDT slide switch. If you do not have access to one of these switches TASTudios has them available with mounting screws.

Conventional DC locomotives are very simple to wire. Both the left rail and right rail pickups need to be connected to the bridge rectifier (the bridge rectifier is used so when a reverse in polarity occurs it does not "shock" the circuit). The bridge rectifier in return is connected to the harness that goes to the smoke unit. The third wire of the harness is the chuff sensor input. This input can be from a pre-existing hall effect sensor, cherry switch or from a newly added reed switch. If you need to install the reed switch, please refer to page 8. For complete instructions.

Wiring with DCC Decoders

We have not experimented wiring this smoke unit into DCC decoders. The maximum current draw on the smoke unit is 1.5 amps. Please refer to your decoders owners manual for instructions on how to wire this unit.

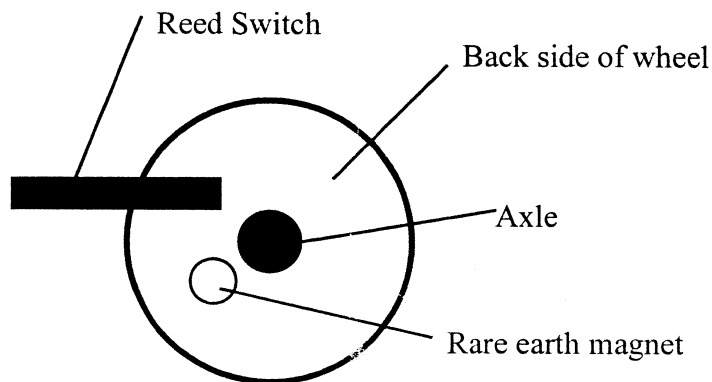
DC Version Wiring Diagram



Mounting a Reed Switch & Magnet

The reed switch is extremely simple to install. There are 2 components that make up the reed switch; a small 1/8" diameter rare earth magnet and a reed switch. The rare earth magnet needs to install to the back side of a wheel, any wheel either on the locomotive or tender. Make sure there is enough clearance between the backside of the wheel and the frame, so the magnet does not bind up. Once you have determined the location for the magnet make sure to mount it far enough up the wheel to avoid the engine from "hopping" over switch guide rails. We recommend you add a drop of super glue between the magnet and the wheel, so it doesn't decide to "jump ship" in the future.

Once the magnet is secured to the wheel you will need to install the reed switch. The reed switch needs to mount within a close proximity of the magnet. Simply use super glue or 5 minute epoxy to secure the reed switch in place. The diagram below shows an example of the placement of the reed switch and magnet;



If you install the magnet and reed switch to a locomotive driver you will need two magnets. If you install the reed switch on a pony or trailing truck or a tender truck you will only need one magnet since the tender wheel is usually at least half the diameter of the driver wheel, you will get 2 puffs per revolution.

AC Versions

Once the reed switch is in place simply connect one lead to the chassis (ground). Connect the remaining lead to the 3rd wire of the connector labeled Chuff Sensor Input.

DC Versions

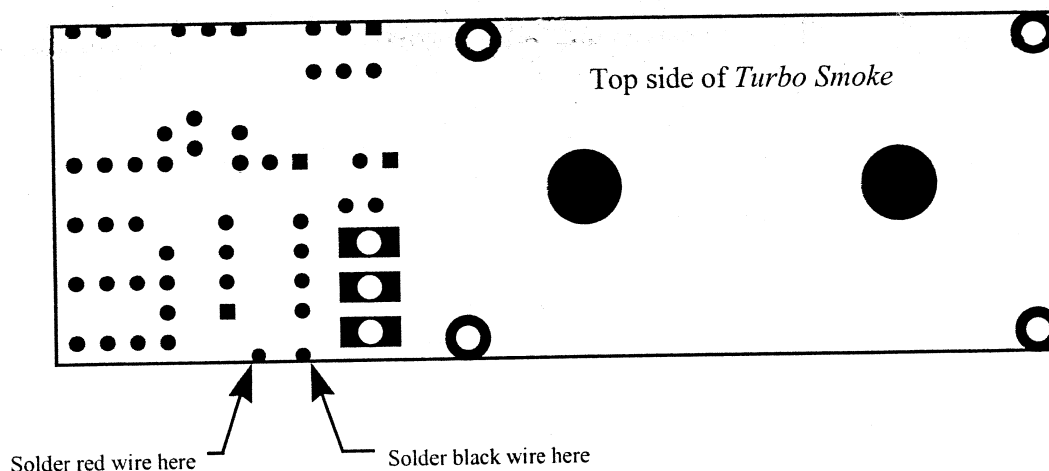
Once the reed switch is mounted simply connect one lead of the reed switch to the - side of the bridge rectifier. Connect the remaining lead to the 3rd wire in the connector labeled "Chuff Sensor Input".

Full Speed Operation

The *Turbo Smoke* unit is capable of running at full tilt with the auto shut off circuit still in effect. In the event you decide you do not want to take advantage of the special effects you can configure the smoke unit to operate at maximum output all the time. The conversion is quite simple, but it will require some soldering.

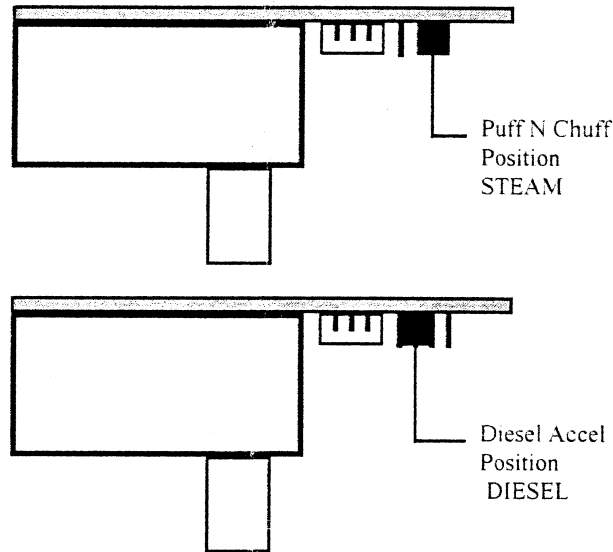
You will need to disconnect the black and red motor wires from their current location. The red and black wires will need to be soldered at the locations defined below. Follow this schematic for both AC and DC versions.

Original Motor
Wire Location



Special Effects Selector

Each smoke unit is equipped with a special effects jumper plug. This jumper plug allows you to select which feature you want the smoke unit to perform. The diagrams below show the two possible positions for both Puff N Chuff and Diesel Accel.



You can also install an SPST switch to allow you to select either special effect once the shell of the locomotive is installed. This is not required, but it can be done if you'd like.

Suggestions from TASTudios

When mounting your smoke unit try to ensure the smoke outlet hole is directly under the smoke stack. We realize that in some instances this may not be possible. Keep in mind that a 90 degree bend for the smoke is equivalent to the same diameter pipe 5 inches long. If your installation requires an angular stack try to make it two 45 degree angles instead of one 90 degree angle for maximum smoke output.

TASTudios manufactures our own line of smoke fluid. A4 fluid ounce bottle is available for \$7.95 and includes a flip top lid for adding fluid. TASTudios smoke is recommended for use with our Turbo Smoke units for maximum smoke volume.

Troubleshooting

Symptom	Solution
Fan runs, but no smoke comes out	Make sure you added smoke fluid. The Turbo Smoke unit will

hold up to as many as 40 drops of fluid at one time.

Blow into the smoke stack, sometimes the fluid creates an air bubble which restricts the smoke from coming out.

Smoke comes out of the stack full blast, all the time

Check the input voltage on the track. This is the Auto Shut Off circuit in action. The heating element has gone over temperature and the fan has kicked up to full tilt to cool it off. If the problem persists please contact TASTudios.

The fan runs in neutral, but the Special Effect doesn't work when the train runs

Check the reed switch, or the device you connected it to. It may not be pulsing the chuff input signal. Make sure no wires are pinched or shorting out against the frame.

I get too much smoke

Turn the unit off.

Smoke volume is low

Make sure fluid has been added. The Turbo Smoke unit uses a 10 Ohm heating element which ensures efficient heat at low voltage. If the voltage is below 5-6 volts the unit will not generate much smoke.

A short occurs only when the train runs

The input leads are crossed. Go back to the wiring section for power type and recheck your connections. Chances are the reed switch is pulsing ground to a hot connection, thus creating the short.

Turbo Smoke does not operate at all

Recheck your wiring. If you installed a smoke on/off switch make sure the switch is good. Also make sure it is in the on position

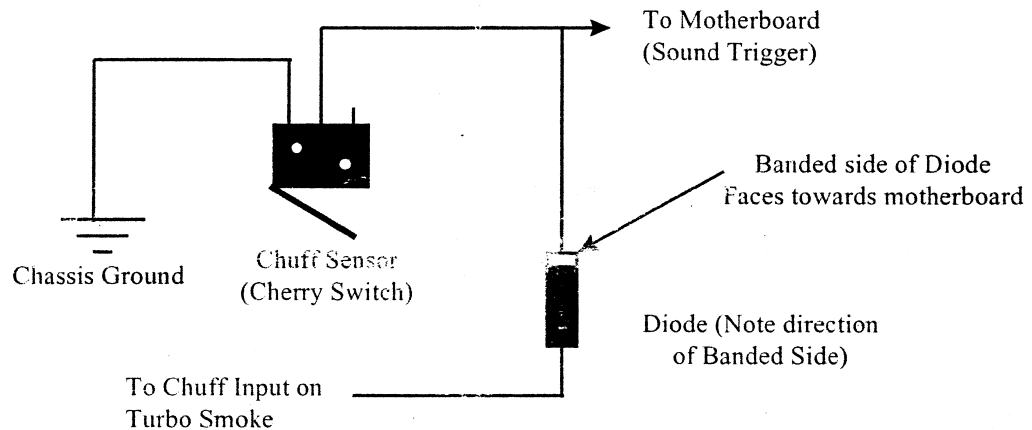
If you experience a symptom not shown in the above table, please contact TASTudios directly at (330)533-7181 Mon-Fri 10a-6p EST.

Supplement for All TMCC Equipped Steam Locomotives

Most Lionel, Weaver and K-Line steam locomotives use a momentary contact cherry switch to activate the chuffing for Railsounds 4.0. Sunset locomotives use a hall effect sensor. All of these devices basically “pulse” a ground signal to the sound system to make the chuff sound. When adding a Turbo Smoke unit to steam locomotives such as these a small “patch” must be added to make both Puff N Chuff or Diesel Accel function properly. This “patch” is a diode (included in each kit).

The chuff input wire for the trigger on the Turbo Smoke unit is constantly pulled low (pulled to ground). To prevent this anomaly from effecting the chuffing effect the diode must be added in line with the chuff input sensor. Once the diode is added all features will work perfectly.

The diagram below illustrates exactly where the diode is located and the position in which it must be located;



This simple correction will prevent the sound system from NOT chuffing. Without the diode the sound system will not chuff. With the diode added the sound system will be unaffected and the special effects will work in sync with the chuffing sound.

If you have any questions regarding this fix please contact Train America Studios at (330)533-7181 Mon-Fri 10a-6p EST and speak with one of our technicians.