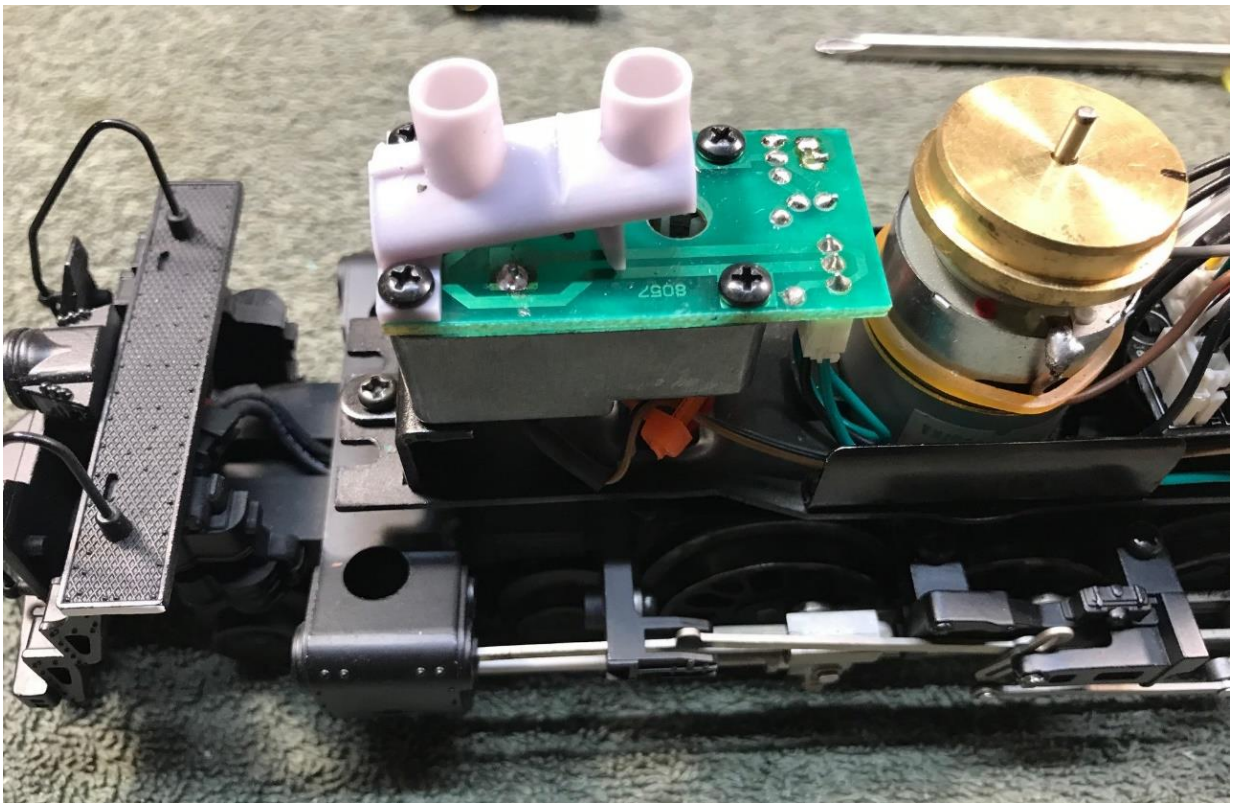
Custom 3D Smoke Funnel for Lionmaster Challenger & BigBoy Aug 2022

Intro: These articulated 2002-2004 TMCC engines look and sound good, run great, are well proportioned, and 031 capable. The OEM smoke funnel is a 2 piece cast affair #6SP-8077-210, with a single restrictive passage feeding twin stack openings. The boiler has a cast in “splitter” wedge intended to split the flow to both stacks. Sadly the smoke output is anemic at best, even after the Mike Reagan mods. And the splitter wedge pushes smoke ***forward*** from the front stack, which looks quite strange. This condition affects all LM Challengers of this era, #6-38021/22/23; WP/WM/UP. And it’s typical of many other mid-2000’s TMCC & early Legacy era articulated Challengers and Bigboys with twin stacks.

The Fix: To make these engines smoke realistically we need to open up the smoke passages, and manifold the feeds separately to both stack openings, so as to balance the flow to each. This custom 3D printed funnel provides the perfect solution. It has an upsized ¼” spigot to flow approx 50% more smoke from the smoke unit. It also has a large oval shaped center manifold and two separate 5/16” (8mm) vertical smoke pipes, one feeding each stack. The oval manifold is sloped downwards to the feed spigot, so that smoke fluid naturally runs directly into the smoke unit, regardless of which stack is used to fill it. It has a built in recess notch to clear the OEM splitter wedge, and a support bracket which rests near the middle of the smoke unit PCB. There are two mounting tabs with holes to secure the funnel to the smoke unit using the OEM screws.

This picture shows the funnel mounted on a typical OEM 8057-200 smoke unit:



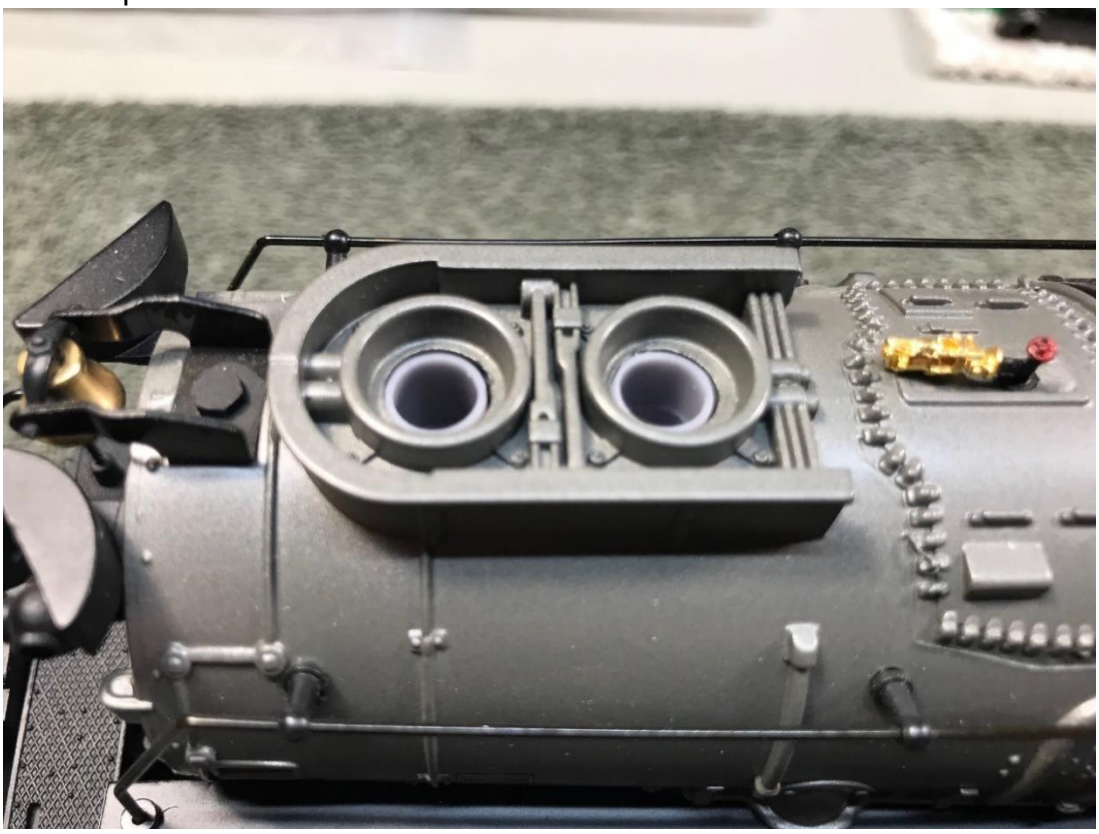
Installation: It would be wise to first service the smoke unit if it has not been done in a while. This should include the Mike Reagan mods, including upsizing the fan intake hole

to 7/32”, removing the fiberglass heater element sleeve if present, and changing the OEM 27 ohm heater to an 18 or 20 ohm unit as well. Also replace the original wadding if burnt or charred. You can use tiki torch wicking if OEM wadding is not available. If you are upgrading a 691-SSMU-F unit with a 6 ohm element, it should be changed to an 8 ohm unit so as to reduce the likelihood of burning out the OEM 8VAC regulator.

Before installation use a file to remove any resin flash and stack gussets (These are a necessary part of the 3D printing process) Test fit the funnel up inside the boiler to make sure the stacks line up like below. If the splitter wedge interferes with it you will want to grind the wedge down some with a Dremel or a die grinder. (The clearance V notch may not be quite enough for some installations.) On early Legacy engines such as 6-11201 you may need to slightly enlarge the boiler stack holes to 11/32” or so.

To mount the unit on the smoke unit you will need to upsize the small spigot hole in the front of the PCB from 13/64” to ¼”. This is easily done using a step drill bit. It’s best to remove the PCB to do this so as to keep drillings out of the wadding, but they won’t hurt anything. The new resin spigot should clear the aluminum body just fine. Use a round file to relieve the body and gasket slightly if required. When done the spigot should nicely fit into the hole with slight interference, and sit flush on the PCB. Replace the front smoke unit OEM screws through the tab holes, just snug, and you are set. The funnel should sit like the above picture, with the rear support block resting on the PCB.

After re-connecting the wiring, lower the boiler onto the engine frame very carefully, making sure the stack pipes line up with the boiler stack holes.
Once in position it should look like this:



Making It Puff: Sadly TMCC engines with the 8057-200 smoke unit were not equipped to puff smoke, so you may wish to convert it at this time. (Later TMCC and Legacy with the 691-SSMU-F smoke units puff already) Your engine will look way more realistic with puffing smoke. This can be done using several methods as documented on the OGR forum. But the easiest method (as long as you are handy with wiring) is by installation of a JWA Super Chuffer, sold by Hennings Trains.

Essentially the Super Chuffer uses the pulse from the OEM cam-operated cherry switch to create a pulse to drive the smoke fan and produce puffs of smoke. The beauty of this method is that the puffs are perfectly timed to the “chuff” sounds, and synced to the speed of the drivers. And when the smoke unit is turned off the fan pulses terminate, so there is no needless wear and tear on the fan motor. (A side benefit to the SC is Rule 17 headlight operation, and cab lights that switch on when stopped, and off when moving. A couple of nice Legacy type features for TMCC engines.)

One operational note; you can use either stack for adding smoke fluid (no need to use both), but make sure you get the dropper fully INSIDE the rim of the resin smoke pipe shown above. If you miss, smoke fluid will run down inside the engine all over the smoke unit and frame/front truck below. You have been warned! Use the standard 12-15 drops of fluid; about ¾” in a dropper. The 8057-200 and 691-SSMU-F will both easily handle that amount.

A word on resin compatibility: Fully cured resin is not like plastic; it is quite hard, even brittle, and has good resistance to many chemical products. It does not seem at all affected by smoke fluids I have used, including Lionel and Mega Steam products.

Resins are also good at elevated temperatures, though the recommended limits are not clear. One measure is the Glass Transition Temperature, or Tg. This is defined as the temperature at which the resin changes from a glass-like texture to a “rubbery” texture. (But sadly resin manufacturers do not normally spec this) One source quoted this as about 128C; which is well in excess of the boiling point of water. The “smoke” our engines produce is not really smoke from combustion, but rather vaporized hydrocarbon fluid. It is somewhat warm to the touch, but *nowhere near* hot. In my limited testing the printed resin funnel did not change texture from glass-like at all. With the test smoke unit running at 11 watts (14VAC into 18 ohms), the highest funnel temp I saw was about 65C. And at no time did its texture become anything like rubbery. So it seems certain that this 3D resin printed funnel should be good for anything we might throw at it.