All Nation Transmission Installation for the Lambert Locomotive Works Lima Switcher

The O Scale Lima Switcher Engine released by Lambert Locomotive Works is a fine scale model that comes in the form of a kit without power.

Before we begin, consider using Personal Protection Equipment for your own safety. This includes eye protection, dust masks and hearing protection.

This document describes the installation of All Nation drives and the process to implement single or dual power for an operational model.

Modelers can build out this model in 3 configurations.

(1) Non-powered, dummy trucks only
(2) Single truck transmissions

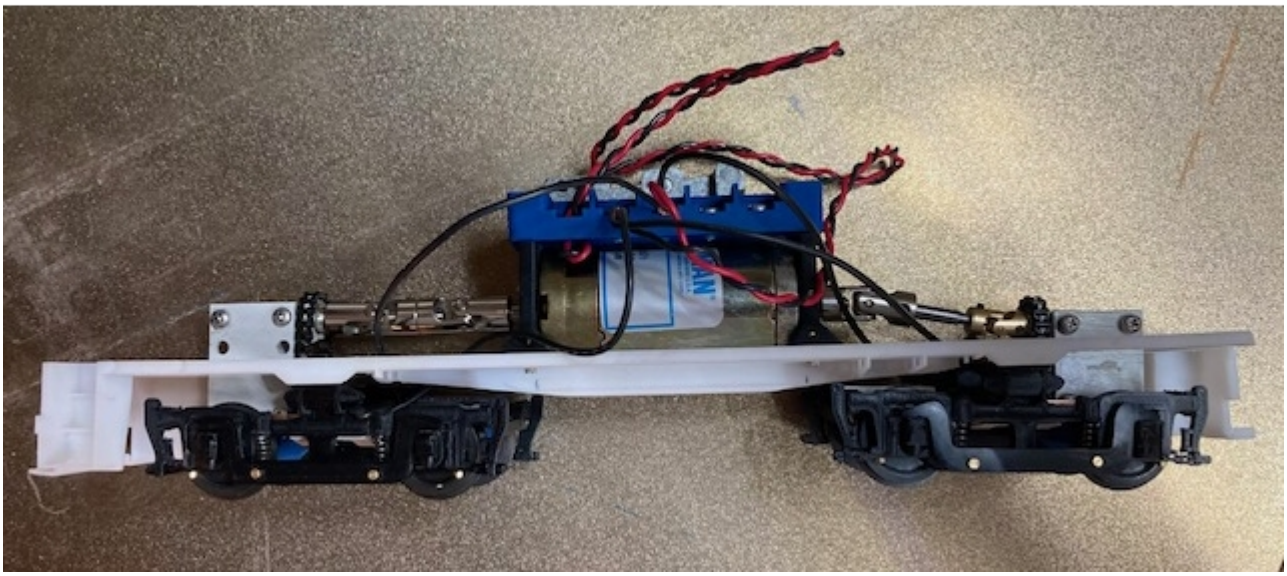
(3) Dual truck transmissions

The discussion here will focus on the most robust implementation, the dual-powered engine.

To aid in following this discussion, please refer to the Parts List with associated photos and drawings. Part numbers for various components can also be referenced on the All Nation Line web site using the search facility.

The Lima engine comes with the floor mounted to the engine body using 6 self-tapping screws.

The floor with the pilots is the main object under discussion here with the following photo showing the semi-finished product with a terminal strip for wiring and bench testing.



The main features in the above photo are the following:

1. Left side front-end transmission in AAR Type A truck
2. Right side cab-end transmission in AAR Type A truck
3. Pittman Motor 30mm x 63mm 38 vdc

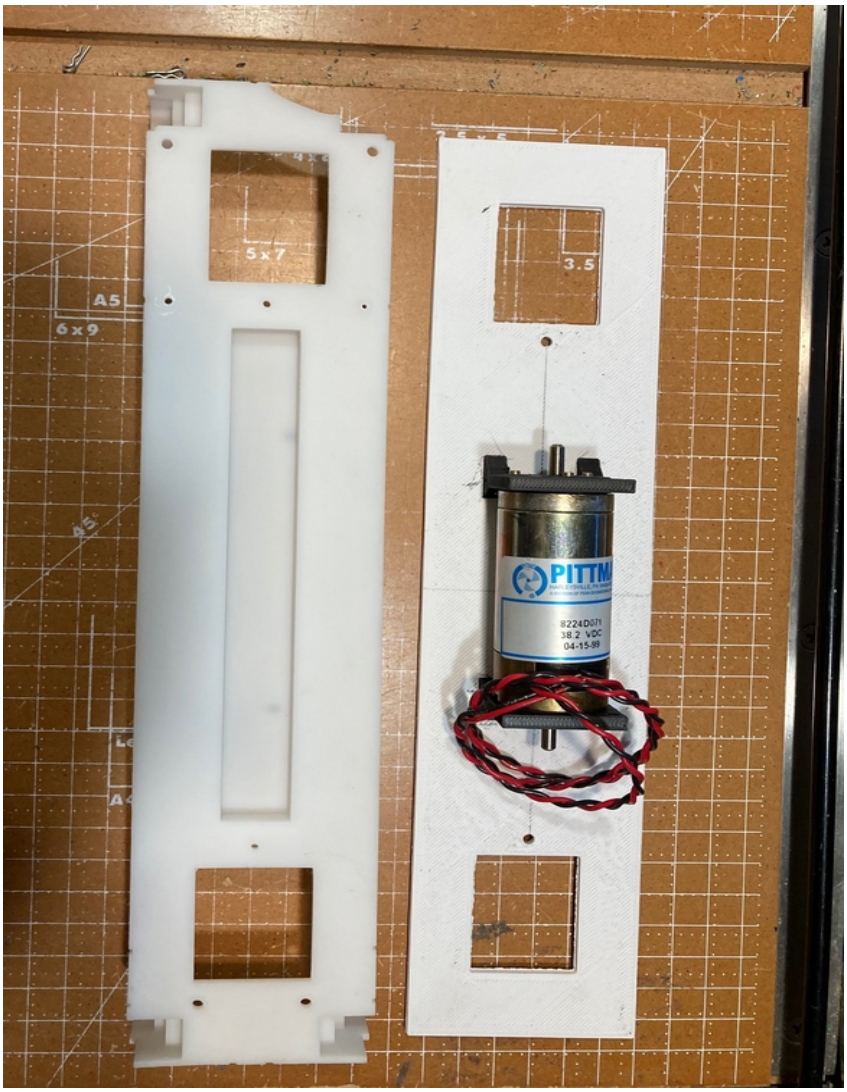
One should note that the front end of the engine body can accommodate a taller tower transmission than the cab end. The cab has a floor where underside clearance is a consideration. For single drive installations, the front end is preferred because the motor drive shaft is in alignment with the driven shaft of the transmission.

If the engine has dummy trucks mounted, there are no modifications required for the engine shell. If, however a single or dual power installation is to be done, then the following stringers will need to be cut out. See the photo below with red marks to remove this material.

Optionally, the body can be tapped for 2-56 flat head machine screws to replace the self-tapping screws and a counter sink on the under side of the floor to conceal the head of the screw.

Next, the floor can be described as having the required opening already facilitated by the 3D printing such that there is enough space for the transmissions to turn or rotate in place as the engine navigates the curved track on the layout. The center of the floor has the structure known as the girder box, otherwise also known as a center sill on freight cars. The box can house added weight to the engine, especially for a non-powered engine. For powered models, the extra weight may not be needed.

The engine shell can only house a motor that is 30mm in diameter. In this implementation, the motor will sit in the center of the floor slightly lower into the girder box to better align drive shafts.



The width of the motor mount face plates were designed so that the engine body fits snug over the entire mechanism hardware installed on the floor.

Next, we will discuss the modifications required ahead of doing any assembly of the mechanism onto the floor. Using the Pittman motors model #8224D071, 2 Face Plates are used to secure the motor to the floor. Face Plate A is attached to the end of the motor where the 2 wires, near the end of the casing using 3, 2-56 machine screws, that can be ¼" or 3/8" in length. The following photos illustrate the face plates and mounting hole positions.

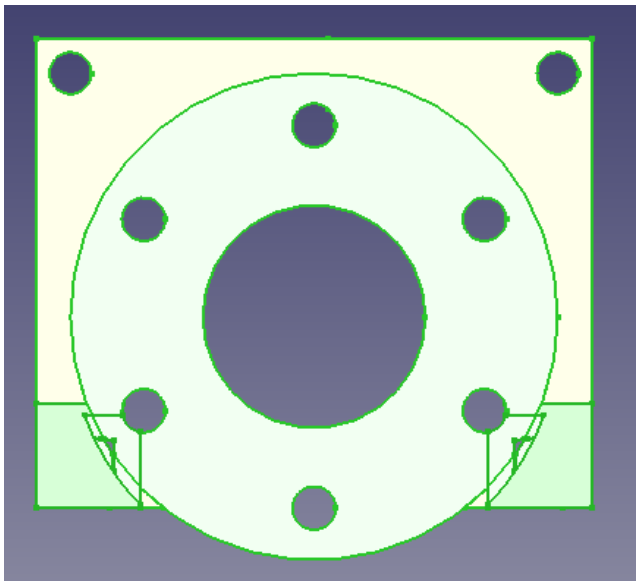


Figure 2: Face Plate A

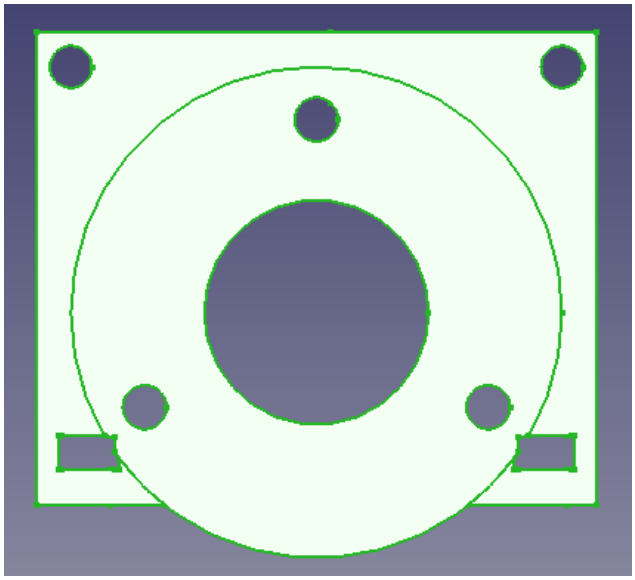


Figure 1: Face Plate B locations of 2-56 nut embeds

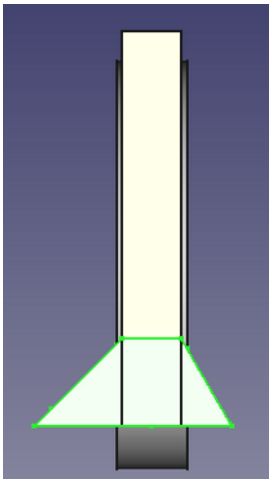
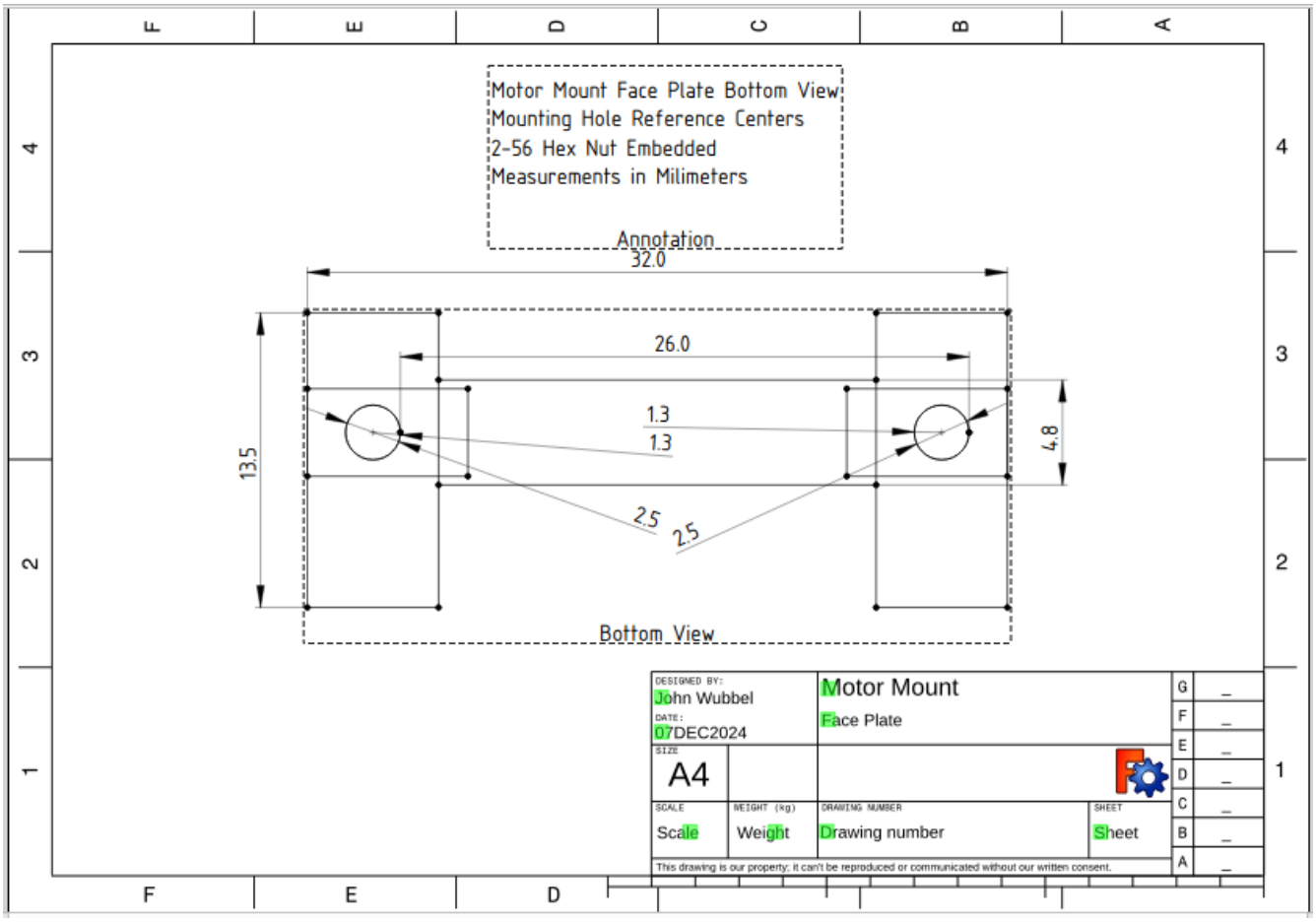


Figure 3: Face Plate Side View

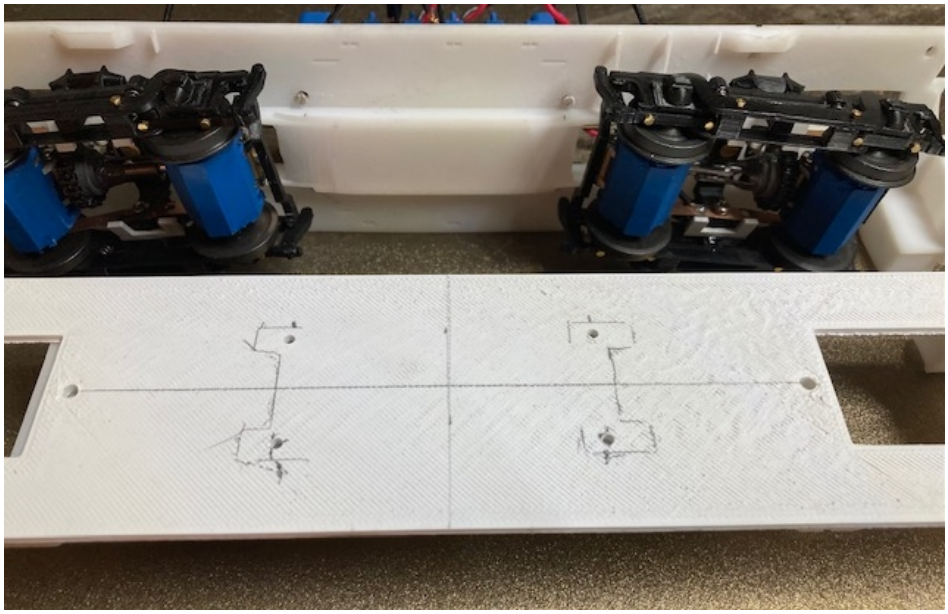
It is important to be aware of the hole locations from the bottom view point of the face plates.

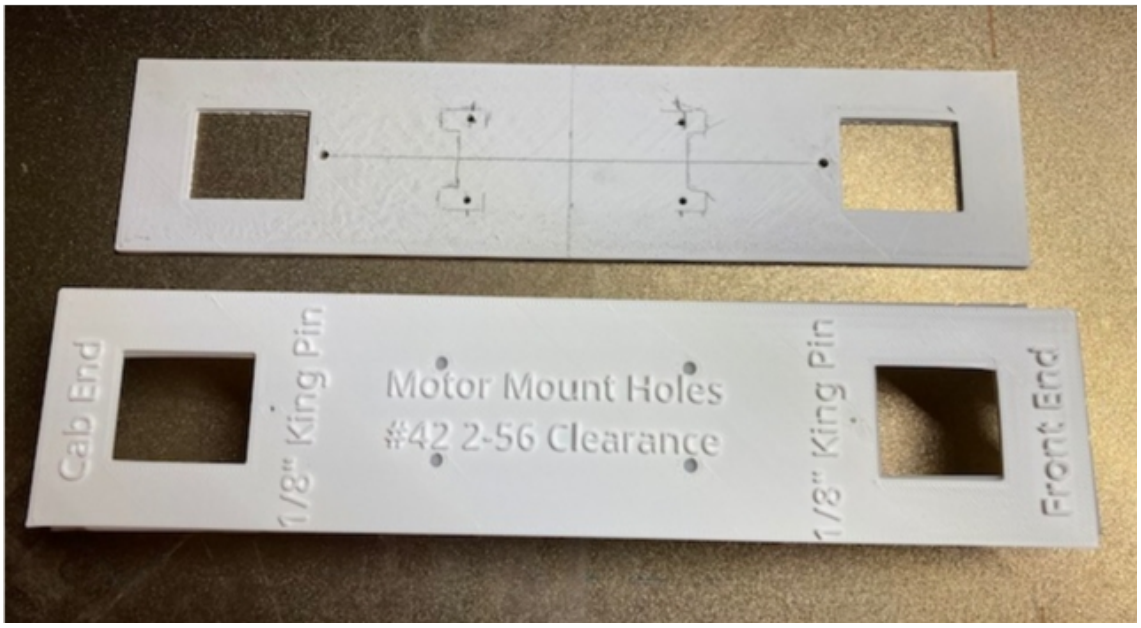


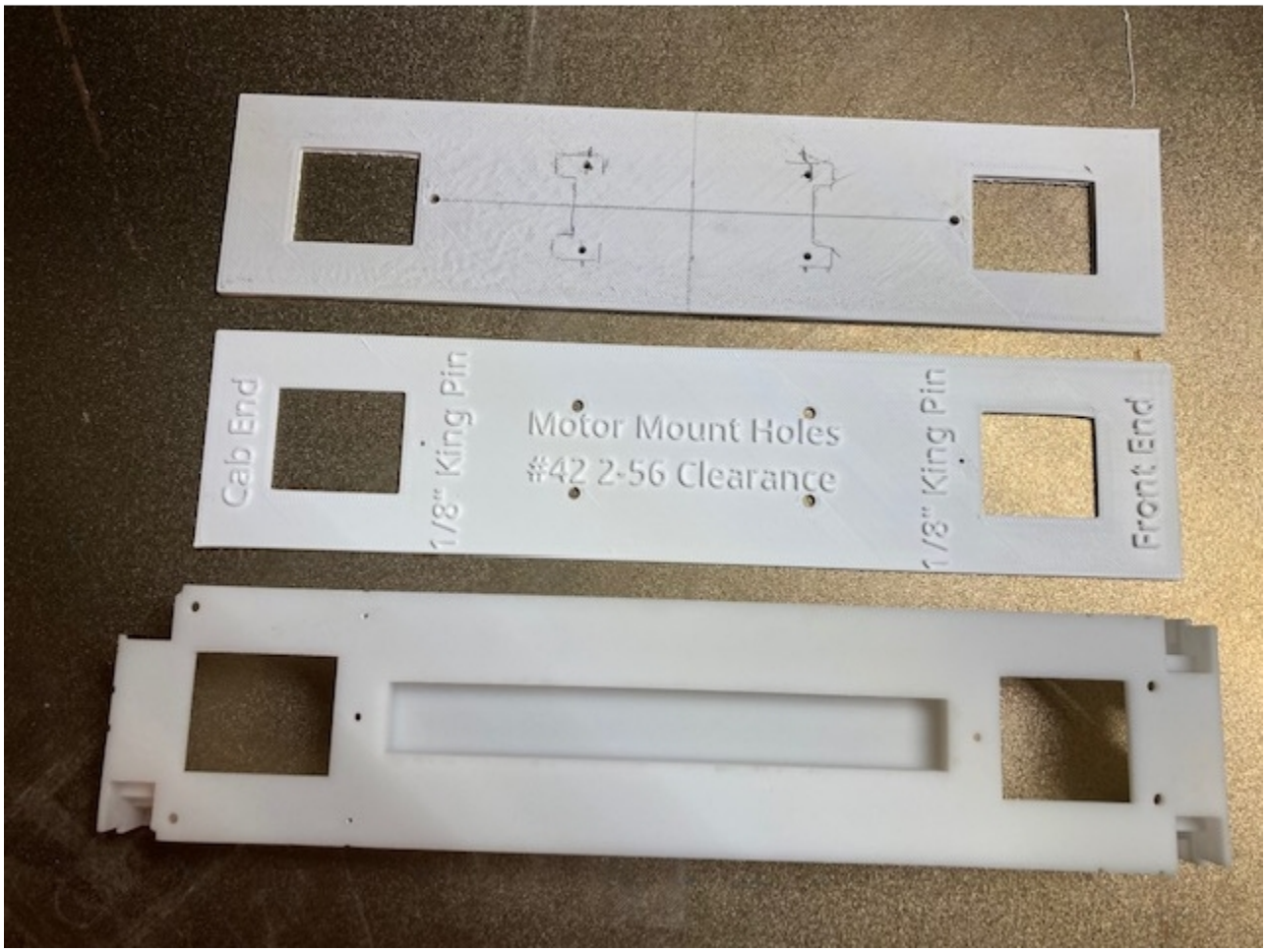
We provide the above data in case you wish to compute where the hole locations will need to be when the motor is centered on the floor. Note, the short side of the feet on both plates should be mounted toward each other, i.e., opposing.

In order to make this task easier for the modeler, we provide a template that can be temporarily overlaid on top of the floor to mark where the clearance holes should be drilled for the 2-56 machine screws used to attach the motor to the floor. A #42 drill should be used as clearance holes and can also be counter sunk from the under side.

The following are a few photos to illustrate the templates.




Cab End
1/8" King Pin
Motor Mount Holes
#42 2-56 Clearance
1/8" King Pin
Front End

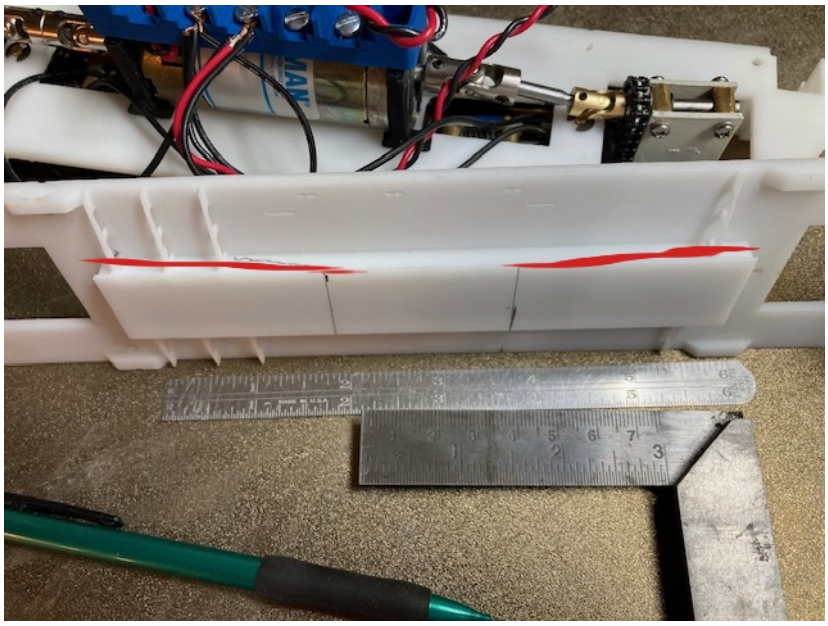


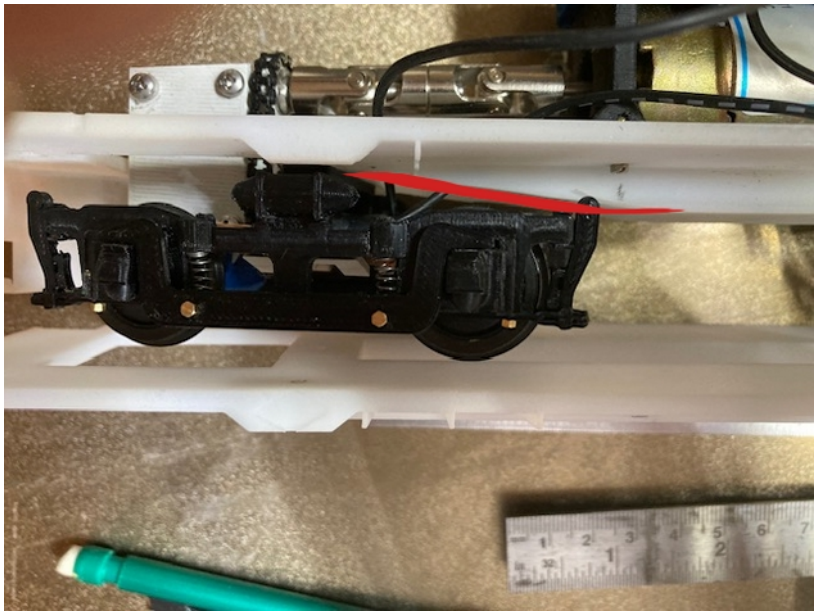
The template has the indicated labeling as a guide. It should be centered on top of the floor with the king pin holes lined up and held in position until the holes for the motor are marked. Before drilling the holes, assemble the face plates on the motor and double check that the hole positions as marked align. Make sure the face plates are tight against the ends of the motor.

Lastly, the king pin holes should be reamed or drilled out so the king pin can be inserted when mounting the trucks to the floor.

The last modification to the floor requires machining the girder box such that when finished, the center sill looks like a fish belly. This modification is required in order for there to be enough clearance for the transmissions on the small gear box opposite the tower chain drive component. This task is more easily done using a 1 x 30 belt sander. Once the final details are put on the model, the

fuel and air tanks will hide the center sill from site. The angle from the end of the girder to approximately 2” toward the center of the sill is 8 to 10 degree. The next 2 photos illustrations via the red line the limit to which the material should be removed for truck clearance.





Once floor modifications are complete, the motor is attached to the floor and the trucks can be positioned with the king pin centered in the king pin hole in the floor. Now the drive shafts can be connected

from the motor to each transmission. When installing the universal joints, be sure they are “in phase” otherwise you will have trouble.

Phasing is the process of aligning the universal joint yokes on both ends of the drive shaft (or double u-joint) in a parallel fashion. If the joints are not properly phased, they will operate at varying speeds throughout each revolution which can cause second-order vibrations. U-joint vibrations can lead to increased wear and potential damage to the assembly and failure of the application and if operated will be very noisy.

The trucks are insulated for 2 rail. Wipers are installed with JST 1.25Mm 2 Pin Micro Male Female Connector Plug with Red Black wires for all wheel electrical pickup. The red wire will be picking up from the insulated side of the wheels and black the non-insulated wheels. The JST connector coming from the trucks is the male end that will attach to the female end through the mount plate so that they can be disconnected for easy servicing of the engine mechanism. The JST mount plates are mounted to the floor with 2 2-56 screws. The female ends can then be attached to the 2 brass buss bars mounted on the motor face plates. The buss bars are 1/8” brass rods threaded on both ends with a 6 32 die and 4 brass nuts.

All Nation will make available the following:

Kit 1: 2 dummy AAR Type A Trucks - All Nation AAR Type A Truck ASSEMBLED with 40″ Wheels (Pair) PN#285AN

Kit 2: Single transmission: AAR Type A Trucks - 1 dummy truck/1 with transmission ASSEMBLED with 40″ Wheels (Pair)

Kit 3: 2 transmissions dual power AAR Type A Trucks - with transmission ASSEMBLED with 40″ Wheels see parts list below

A note about the parts list: The Lima Locomotive Kits are sold separately and available from

Lambert Locomotive Works
https://lambertlocomotiveworks.com/lima-ls1000-ls1200-switcher
www.lambertlocomotiveworks.com
lambertlocomotiveworks@gmail.com
508-769-4580

147 Peter Salem Road
Leicester, MA 01524
Kits and Detail Parts for Narrow O Scale

Parts List:

6 2-56 Machine Screws to mount face plates to the motor ends
4 2-56 Machine Screws to mount the motor assembly to the floor

1 AAR Type A truck with transmission installed for Front-end power. See:
https://allnationline.com/WP/?product=all-nation-nw2-power-truck-tower-transmission-drive-assembled-pn303an

1 AAR Type A truck with low height transmission installed for Cab-end power. See comparable transmission not installed in the truck:
https://allnationline.com/WP/?product=all-nation-f3-f7-transmission-power-truck-side-panel-4038-4039-with-gearbox-40-wheels-newpn2095new

3 Universal Joints 3-3 mm ID, PN#533AN See
https://allnationline.com/WP/?product=all-nation-universal-joint-coupling-3-3-metal-od-9mm-length-23mm-pn533an

1 Universal Joint 3-3 mm ID, PN484AN See
https://allnationline.com/WP/?product=all-nation-universal-joint-coupling-3-3-pn484an

2 drive shaft connecting rods

1 Pittman 38 vdc motor, For Single drive, See
https://allnationline.com/WP/?product=pittman-motor-38-2-vdc-single-shaft-old-new-stock-pn454an
For Dual Drive, See
https://allnationline.com/WP/?product=pittman-motor-38-2-vdc-old-new-stock-pn435an

1 non-powered truck for single drive installations PN285AN. See
https://allnationline.com/WP/?product=all-nation-aar-type-a-truck-assembled-with-40-wheels-pair-pn285ank

Set Screws with Allen Key included for all universal joints

2 C-Clips to secure king pins when mounting the truck to the floor. King pins come with the assembled truck bolster.

1 Drill Die Template specific for Pittman motors model #8224D071

2 Brass 1/8” rod buss bars with 4 nuts

2 Wire Bracket Plates to mount JST connectors with 4 2-56 x 3/16” flat head machine screws