Instructions for Assembly of The Rolling Lift Bridge - Single Track

Kit Contents

Base Parts:
30 each laser cut acrylic parts
2 each Bronze Bushings
1 each .1875 x 9" Brass Rod

Bridge Parts:
80 each laser cut acrylic parts
4 each .020 x .060 x 10" Styrene
4 each .081 x .375 Brass Rod
4 each Brass Pulley
2 each .157 x .5" Brass Rod
2 each Nylon Gear
4 each .060 x .5" Styrene Tube
Rigging Line (approx. 6")

Items you will need:

Counterweight: approximately 3oz of weights (not included) will be needed to balance the counterweight.

Bridge track: you will need to purchase track for your rolling lift bridge. We recommend Micro Engineering bridge track.

Rolling Lift Bridge Motor Kit (sold separately by CMR):
1 each gear motor, 1 each worm w. set screw, 1 each worm gear w. set screw, 1 each allen wrench, 2 each limit switch w. mounting hardware, 2 each diode, 1 each on/off/on toggle, 1 each resistor.

Power supply: a 12 volt dc power supply (not included) (e.g. RadioShack Model: 273-316).
Thank you for purchasing this kit. Please read these instructions completely before beginning and take your time. Drawings of all the parts have been included for ease of part identification. Allow parts to dry after painting or gluing and do not try to build this in one night.

This kit is involved and designed for the advanced modeler. It is intended to be motorized and operate mechanically. All parts must be perfectly assembled, square and true in order for it to operate properly.

You can build this kit with or without the motor. The motor is sold separately. If you plan to use the motor you must install it when you build the bridge. It cannot be added later.

CMR is happy to help with technical support. Replacement parts may be purchased if you make a mistake and need spare parts.

You will need the following items to assemble your model: hobby knife, fine sandpaper, file, paint (see Painting Your Model), paint brushes, glue (see Gluing Acrylic), modeling putty, soldering tools, tweezers.
About the Kit

Our model is based on a bridge built in the early 1900's and was designed by the Scherzer Rolling Lift Bridge Co. The bridge has a counterweight and raises with a rolling lift motion that moves the bridge up and out of the way. The rotation axis occurs at the pinion point which is located along a toothed rack. By pulling the pinion gear horizontally along the rack the bridge is rolled back and lifted up.

The bridge rolls along the bottom on a segmented girder. The curved part of the girder has guide pockets that roll across guide blocks. This keeps the bridge aligned and prevents slipping.

Our bridge has a 75' (10.25") lift bridge span and a 30' (4.0") fixed bridge span. The total length is 110' (15") including the abutments. The single track bridge requires a space 15" long and 3" wide. The distance from the bottom of the base to the bottom of the track is 3.5".

The bridge and motor are sold separately. These instructions cover both. If you do not intend to motorize your bridge skip the parts about installing the motor. Please note, however, that once you build the bridge it will not be possible to add the motor later. You may also use a hand crank (not included) to raise and lower your bridge.

For ease of part identification, we paint our model between steps to illustrate part placement. When building your model, follow the directions for painting at the appropriate point of construction. Your model may be made from a different colored plastic than what is shown in these instructions.
Gluing Methods

There are several types of material in this kit and each one must be glued in a unique way as outlined below. You will need solvent type liquid glue and CA (Super Glue). Always glue acrylic in a well-ventilated area, and read the glue manufacturer’s label for instructions.

*Liquid Glue*

For gluing unpainted acrylic pieces together we recommend using Tenax 7R by Hebco or Plastruct brand Plastic Weld Solvent Cement (PC-2 or PPC-16) or Bondine Solvent Cement (Bond-2 or BOND-16). Most hobby shops carry these products or they may be ordered directly from Hebco or Plastruct.

Acrylic must be glued together using a solvent that will melt the two edges and literally fuse them together. To do this, place the two pieces to be joined together and run a bead of solvent down the edge. Capillary action will suck the solvent into the joint and after several seconds the pieces will be fused. After only a few minutes the pieces will be strong enough to work with. The bond will be completely dry within twenty-four hours using the above mentioned products.

Solvent can be dispensed two ways. Typically the solvent comes in a small bottle with a brush in the lid. The brush allows you to dispense a drop or two of solvent at a time. You may want to use a polyethylene bottle or syringe with a blunt needle dispenser. These may be purchased from CMR. This allows larger amounts of solvent to be dispensed quickly and cleanly. Be sure the bottle you are using is approved for the solvent you are using or you may melt through it.

*Cyanoacrylate (CA) Super Glue*

For gluing plastic to metal or parts that are painted prior to gluing, they must be glued together using a non solvent based glue. This means the parts are held together by the glue and not the process of fusing or welding them together with solvent. For this we recommend using CA where noted in the instructions.

Preparing Your Model for Painting

We recommend lightly sanding all parts to remove the raised edge created during the laser cutting process. If necessary you can hide the seams using hobbyist putty such as Green Squadron modeling putty. Do this in a very well ventilated area. Apply the putty over the seams and allow to dry overnight. Once the putty has dried, place a sheet of fine sandpaper on a flat surface and sand smooth. You may need to apply a second coat of putty and sand again.

Painting Your Model

Paint it black! Usually these bridges were painted black and tinged with rust streaks. After assembling each unit we sprayed our model with Flat Black Krylon spray paint. Then we detailed it with acrylic hobby paints.
Assembling the Bridge Base

The bridge sits on a base. The pulleys and motor that raise and lower the bridge are built into the bottom of the base. The construction of the base is as important as the bridge in order for it to function properly.

Parts of the base will be assembled upside down and then flipped later so pay attention to the correct orientation and familiarize yourself with the instructions prior to construction.

Begin by placing part (1) on your work surface and gluing parts (2), (3), (4A) and (4B) to it to form a box. Take note of the orientation of the parts to each other as shown in the figures.

Parts (4A) and (4B) are engraved with their part number and the engraving should be facing out when built.

See Figures 1 & 2.

Flip the assembly over and check that it is constructed properly, that all the parts are square and that the openings, slots and tabs are facing the correct way.

See Figure 3.
Glue the assembly to the base part (5).

Glue part (6) in place using the tabs and slots for placement.

Make sure everything is square and the tabs are properly seated in their slots.

See Figure 4.

Next build the bridge piers and concrete abutments.

Begin by gluing part (7) x 2 into the slots on part (1). Next glue parts (8) x 2 and (9) x 2 as shown.

See Figure 5.

Glue part (10) between parts (9) so that it is flush with the front of the tall parts.

Glue part (11), (12) and (13) x 2 to form the far abutment as shown.

See Figure 6.
Glue the caps onto the piers.

Part (14) should abut part (11) and overhang a little on the other long side.

Part (15) should be centered and overhang a little on all sides.

Part (16) should abut part (10) and overhang a little on the other sides.

Part (17) should be flush with the backs of parts (9) and overhang a little on the other sides.

See Figures 7 & 8.

Paint the entire base concrete color.
Mechanics

You must decide at this point if you are going to motorize your bridge kit. The motor kit is sold separately. These instructions assume that you are using the motor and include parts from the motor kit as indicated. If you want to use the bridge manually with a hand crank do not cut the main axle as instructed below. Leave the axle extending out of the base on one side. You can attach a hand crank (not included) to the axle. If you do not install the worm gear on the shaft, you cannot do it later. It will be impossible to motorize your bridge as shown.

The following parts are included in the motor kit and not in the bridge kit: (19) worm gear, (22) gear motor, (23) worm, (28) limit switches, (29) diodes, (30) toggle, resistor, set screws, allen wrench.

Note: Motor and gear parts are expensive and not covered under any warranty against user error. The motors have been pre-tested before leaving our shop to ensure that they work properly. If you damage these parts by incorrectly installing them or applying too much or incorrect voltage you may purchase replacement parts from CMR.

Cut part (18), the brass rod, 2.75" long. Test fit the worm gear (19) on the rod. Use the set screw and the wrench to tighten the worm gear onto the shaft as a test fit, and then remove.

See Figure 9.

Flip your bridge base upside down. Slide the brass rod into the base and onto the worm gear as you install it. The rod slides through the holes in parts (4A&B). Center the worm gear on the rod and tighten the set screw. Do not over tighten.

Next install the two brass bushings (20) over the rod and into the holes on each side of the base. The flanged part of the bushing should be facing out.

Attach the motor (22) to the motor mount (21) using the two small screws in the motor. Next attach the worm (23) to the shaft of the motor. The shaft has a flat spot and the worm has a threaded hole for a set screw. Do not over tighten.

See Figure 10.
Install (do not glue) the motor mount and motor into the bridge base as shown. It should fit into the slots in the base easily. The worm should mesh with the worm gear. If needed adjust the location of the gears with the set screws.

Test the motor and gear using the supplied resistor in line with a 12 VDC power supply. Be sure the voltage is DC and does not exceed 12 volts or you may damage the motor. The shaft should turn with little effort from the motor. As the shaft has nothing to hold it in place at this time it may move to the left or right when it turns.

Glue the motor mount to the base once you are satisfied with the fit.

See Figure 11.

Assemble the drive pulleys to raise and lower the bridge. These are made up of four parts that must be glued together perfectly centered. Use a piece of the .1875 brass (left over from part (18)) to align them but do not glue them to the brass rod.

Parts (24), (25), (26) and (27) glue together in order as shown. Part (27) has a nub that will be used to engage a limit switch. Make two drive pulley assemblies.

See Figure 12.

Test fit (do not glue) the drive pulley onto the axle on the ‘A’ side of the bridge base. The axle will not quite come through the drive pulley. Install the limit switch using the included hardware. The limit switch should just barely touch the side of the drive pulley and when rotated the nub on the drive pulley should cause it to engage with a ‘click’.

See Figure 13.
Do the same on the ‘B’ side of the base, installing the limit switch and testing the location with the drive pulley.

When the drive pulley on the ‘A’ side engages the limit switch at the 3 o’clock position the drive pulley on the ‘B’ side should be at the 12 o’clock position.

The drive pulleys should just touch the bushings on the back as they will keep the axle from sliding side to side.

Once the limit switches and drive pulleys are located correctly glue the drive pulleys onto the axle using a small drop of CA. Do not glue the axle to the bushings or the side of the bridge base.

See Figures 13 and 14.

**Wiring**

Wire the motor, resistor, toggle, limit switches, and diodes as shown below. Note that the diodes should be connected to the Common and the Normally Closed contacts. The Normally Open contact is not used. You may want to test wire it first and then clean it up and solder it when you know it is all working. You may need to swap the polarity of the input voltage or the motor voltage if it does not operate properly.

See Figure 15.

![Rolling Lift Bridge Wiring Diagram](image)
Test the motor. When you apply voltage the drive pulleys should turn three quarters of the way around until the pulley on the ‘B’ side engages the limit switch. Then when you switch the toggle it should reverse back until the drive pulley on the ‘A’ side engages the limit switch. Each time the drive pulleys should travel three quarters of the way around. If you need to stop the motor for an emergency or to adjust something you can use the center ‘Off’ position to stop it.

Install the toggle in the back of the motor base or leave it loose to install on the fascia of your layout at a later time. It is a very tight fit to get the toggle in the single track bridge base. You will need to loosen the screws (do not remove the nuts) holding the limit switch in place to allow the toggle to fit in. Tighten the screws back up after you have installed the toggle.

See Figures 16 & 17.

The base and motor installation are completed and you are ready to begin building the bridge.
Assembling the Fixed Bridge with Gear Racks

Test fit all parts before final assembly. Some parts are very similar so make sure you have the proper part and the proper orientation prior to gluing.

Note that the cross braces (32) on the fixed bridge have a flat spot on top of them. Do not use parts (50) which are very similar.

Begin assembly of the fixed bridge by gluing the cross braces (32) x 5 to one of the side girders (31).

Use the tabs and slots for placement and be sure that the engraved rivets on the girder (31) are facing out. Glue the beams (33) x 2 onto the cross braces. While the glue is still soft, test fit but do not glue part (34) to check that the parts are square and in the proper alignment.

See Figure 18.

Glue the other side girder (31) in place and then glue the webbing (34) onto the assembly.

See Figure 19.
Prior to assembly lightly sand part (36). This is the part with the guide blocks. You should sand the sides of the guide blocks to gently round over the edges. This will help the guide pockets in the bridge ride over the blocks smoothly. Don’t over do it, you do not want to make the blocks smaller.

You should also note that the parts are not symmetrical. One end of part (36) has a long space after the last guide block and the other end has a short space after the last guide block. Keep this in mind as you proceed with assembly.

Glue one part (35) onto the flat spot on top of the cross braces and the inside of the side girder. It should be flush with the top and ends of the girder. Next glue part (36) onto the flat spot on top of the cross brace and to the side of part (35) with the ‘guide blocks’ facing up. Finally, glue part (37) on top of the side girder and parts (35) and (36). Use the notches in part (37) for alignment.

Make sure that the parts are square to each other and that part (37) is perfectly flat. This is what the bridge will roll on.

Remember that parts (36) and (37) are not symmetrical. Be sure to get part (37) oriented properly with part (36).

See Figures 20 & 21.

Repeat the previous steps for the other side. Be sure to get the short and long spaces on the same ends.

Add the bridge feet (37) onto the bottom corners of the bridge.

See Figure 21.
Build the gear rack supports. Sandwich part (40) between parts (39) and (41). There is a left and right part (41) as it has engraved rivets on one side. Build two left and two right supports.

See Figure 22.

Glue two of the rack supports to one side of the fixed bridge assembly using the tabs and slots for alignment. The rivets on the supports should face out and the ‘H’ shaped slots face in towards each other.

Glue part (42) to the rack supports. You will need to very gently flex it in order to get it to fit into the ‘H’ slots in the rack supports. Make sure that the end with the gear stop is at the end of the bridge with the short space behind the guide block.

Glue the cross bracing parts (44) and (45) in place. You will need to gently flex part (44) to get it to fit into the ‘H’ slots in the rack supports. Glue parts (46) x 2 in place. Note that the large slots in parts (46) should be at the bottom.

Glue part (43) to the other side of the assembly making sure it is oriented correctly.

See Figure 23.

Make sure the entire assembly is perfectly square in every direction and that the holes in the parts align perfectly. You can check (do not glue) the hole alignment with the small brass rods (60).

Repeat the process for the other side to create mirrored assembly.

See Figure 24.
Double check that everything is square and aligned. Set aside to dry.

See Figure 25.

Use the .020 x .060 styrene strip to cover the slots on the sides of the girders.

See Figure 26.

Paint the assembly black or your choice of color.

Figure 25

Figure 26
Assembly of the Rolling Lift Bridge

Note that part (48) is slightly different than part (49).

Glue part (48) to part (47). It should be glued to the side of part (47) with the engraved rivets. The parts should be perfectly flush on all sides. Be sure to keep the guide pockets on part (47) clear.

See Figure 27.

Flip the assembly over and glue part (49) to the other side. Part (49) will hang over on the curved side to create a flange. Be sure that the guide pockets are clear and not clogged with glue and melted plastic.

See Figure 28.

Repeat the process to make the opposite mirrored side.

Glue the eight cross braces (50) to one of the bridge side assemblies. The side of the cross brace with the engraved rivets should face away from the end with the counter weight.

Glue the beams (51) x2 to the cross braces. While the glue is still soft test fit, but do not glue, part (52) to the assembly to make sure it is square and the parts align.

See Figure 29.
Glue the other side of the bridge to the assembly. Glue the webbing (52) to the bridge.

Glue the two parts (53) to the top of the bridge girders. You will need to gently bend the angled support from the counterweight to get it to fit into the slot on part (52).

See Figure 30.

Glue the cross braces (54) and (55) onto the bridge using the tabs and slots for alignment. Be careful because the bridge is thin in this area. It will get stronger as you add bracing and the counterweight.

See Figure 31.

Make the counterweight by gluing parts (56), (57) x 2, and (58) together to form a box. Do not attach part (59) at this time. Set it aside.

See Figure 32.

Dry fit the counterweight into the bridge to make sure it is square and fits properly. Do not glue in place at this time as we will remove it later to paint.
Cut the .020 x .060 styrene strips just slightly longer than the girders. Glue the strips onto the bridge to hide the slots. When dry trim off the bottom.

Glue two bridge feet (37) to the end of the bridge away from the counterweight.

See Figures 33 & 34.

Test fit the bridge with the approach bridge. The guide blocks should mesh with the guide pockets and the bridge should roll freely back and forth with out rubbing or hitting the rack and supports.

See Figure 34.

If it does not roll freely this is the time to correct any problems before you start adding expensive hardware.

Test fit the bridge onto the base and make sure that the bridge clears the piers when it opens and closes. You may need to file the bridge feet slightly if it is too tight.

See Figure 35.

Remove the counterweight from the bridge, prime and paint it as well as part (59) concrete color.

Paint the bridge assemblies black (or the color of your choice). Allow the paint to dry and reinstall the counterweight. Glue in place with CA.

Add 3 oz of weight to the inside of the counterweight and glue in place. We used a couple bolts. Glue part (59) to the top of the counterweight to cover the opening.

See Figure 36.
Assembly of the Bridge Gears & Pulleys

This part gets a little tricky so please don’t attempt late at night and pay attention.

You are going to glue some items to the brass rods while leaving other items free spinning.

The parts are shown in Figure 37.

To build the drive pinion, glue two rings (63) to one end of the brass rod (62) with CA. There should be a small gap between the two rings wide enough for the rigging line to fit in. Make sure they are square and allow the glue to dry.

Place the gear (64) onto the rod but do not glue. It should spin easily. If it does not you will need to ream it out.

Now glue another ring (63) to the other side of the gear allowing just enough room so that the gear spins. Use a dab of CA on the
end of a hobby knife blade and apply it to the side of part (63) away from the gear. Make sure the gear still spins.

Make two drive pinions.

See Figure 38.

The four brass pulleys (61) should spin on the axles (60). If they do not you will need to ream them out so that they spin freely.

Insert one axle (60) into the holes on each of the four corners of the rack while inserting the brass pulley (61) onto the axle. The axle should be flush on the inside of the bridge and extend beyond the outside of the bridge. Glue the axle to the rack using CA. Make sure that the brass pulleys still rotate.

See Figure 39.

Now seat the rolling lift bridge in the fixed bridge. The guide blocks should mesh with the guide pockets and the bridge should roll freely. Put the bridge in the down position.

Place the drive pinions in the slots in the bridge as shown. The slot is oblong so there is some ability to position the drive pinion. The gear in the drive pinion should rest in the rack teeth and mesh easily. Using CA glue the drive pinions in place and apply another ring (63) to the back side to help secure it. Make sure you do not get any glue on the gear (64). Repeat on the other side with the other drive pinion. Make sure the gears still spin easily.

See Figure 40.

Roll the bridge back and forth in the fixed bridge, the bridge should roll smoothly and the gear on the drive pinion should roll and mesh perfectly with the rack throughout its travel.

If it all works well, glue the fixed bridge to the base. It should be centered side to side and touch the pier on the back. Make sure you get it the right way around.
Assembly of the Rigging

The rigging is complicated by the fact that the drive pulleys turn in the opposite direction from the motion of the bridge. The rigging is held to the pulleys by pulling it through a slot in the drive pulley and fastening it with a peg in one of the holes. This allows for infinite adjustment to the rigging tension and bridge position.

Use tweezers for running the rigging and take your time. There is extra rigging included in case you make a mistake. Each piece of rigging line should be 24" long.

Place the bridge in the down position and put a weight on the end of the bridge to keep it down.

Make sure the drive pulleys are turned to the down position. The drive pulley on the ‘A’ side should be rotated all the way counterclockwise and engaged with the limit switch. Begin with the ‘A’ side and then mirror it with the ‘B’ side.

Reference Figures 43 & 44 for the sequence of steps as follows:

1. Attach the end of the rigging line with a peg to the drive pulley as shown. Leave an inch or two for adjustment on the short end. Run the rigging through a notch in the drive pulley side and wrap it three quarters of the way around the drive pulley counter clockwise.

2. Run the rigging up from the drive pulley though the slot in the base.

3. Continue the rigging through the slots in the bracing and webbing of the support arms.

4. Run the rigging around the front of the small brass pulley.

5. Run the rigging counterclockwise around the drive pinion between the two rings (63). Wrap it around several times to secure it. The line should run in and out of the bottom side of the drive pinion.

Continue to next page...
6. Run the rigging between the two rails of the rack and around the small brass pulley on the far side.

7. Continue back down through the webbing and bracing.

8. Run through the slot in the base and begin to go around the drive pulley.

9. Go part way around the drive pulley and tie off the line by latching it through a slot and secure it with a peg as shown.

Test the rigging before doing the other side. Remove the weight from the end of the bridge. Hook your toggle to your power supply and flip the toggle to the up position. Remember, if there is a problem (e.g. it goes the wrong way) you can flip the toggle to the ‘Center Off’ position. The bridge should raise until the limit switch on the ‘B’ side is engaged. Then lower the bridge.

Don’t panic if it is not perfect, you can adjust it later. It may not go quite all the way down as the line may slip a little where it is tied off on the drive pinion. Adjust this later.

Now repeat the rigging on the ‘B’ side and test again. You can make adjustments to the rigging now by removing the pegs and adjusting the line. It may be a good idea to label the up and down peg as it can get confusing as to which is which when it starts turning.

Once you have it running you can make fine adjustments. The bridge should be held down by the motor and rigging in the down position. It may be necessary to raise the bridge and then adjust it back down just a hair while still in the up position so that it pulls it just past the down position to lock it in place. Do not put too much tension on the rigging or something will break. If your rigging is slipping on the pinion you may want to secure it with a drop of white glue.
Installing Track

Install track (not included) on the fixed bridge and the lift bridge. We recommend using Micro Engineering bridge track. The track should have a very small gap where they meet at the pivoting end. In order to transfer power to the rail on the lift bridge you will need to have the rail extend beyond the far end of the bridge and make contact with a brass contact attached to the rail on your layout.

See Figure 45

You can weather your bridge with drips and runs of brown and rust, as well as an airbrushed over spray of gray to resemble chalking paint. Install the bridge on your layout and enjoy.
Rolling Lift Bridge - Motor Kit Parts
(Sold Separately)

- (23) Worm
- (19) Worm Gear
- (29) Diode x 2
- (30) Toggle
- Set Screw x 2
- Allen Wrench
- (22) Gear Motor
- (28) Limit Switch x 2

---

Resistor
Single Track Rolling Lift Bridge - Bridge Parts

- (47) x 2 (left and right)
- (48) x 2
- (49) x 2
- (50) x 8
- (51) x 2
- (52)
- (53) x 2
- (54)
- (55)
- (56)
- (57) x 2
- (58)
- (59)
- (60) x 4 Brass Rod
- (61) x 4 Brass Pulley
- (62) x 2 Brass Rod
- (63) x 8
- (64) x 2 Nylon Gear