

Modifying Thomas Engine

Go Baby Go Central Ohio

IMPORTANT! Follow this sequence:

- 1) Put decals on sides and rear bumper
- 2) Do the wiring modifications
- 3) Build the PVC frame. Follow the manufacturer's instructions to assemble the car **LAST**. (Wiring of Trailer Connector to Charger [Steps 37-40] can be done at any time, or by a person working separately.)

WIRING MODIFICATIONS

1) If the black seat is installed, remove it. Loosen (but do not fully remove) two screws at the top rear of the seat. Pull the rear upward and slide the seat up and back. **Fig. 1**

2) Working in the Wiring Compartment, **unplug the Battery**. Don't tug on the wires. The two plastic halves just pull apart. **Fig. 2**

Lay a **cloth over the motor and axle** so drill shavings do not fall in. **Fig. 2**

TIP: You are going to be drilling several holes. Before you drill, use a **scratch awl** or nail to poke a small nick in the plastic where you want the hole. That will prevent the drill from "walking" away from where you want the hole.

3) Working from inside the wiring compartment, drill two 3/8" holes in the back of the Wiring Compartment. (Above the motor.) **See Fig. 3** (These holes will pass wires from the Parent Switch and Charger Connector into the Wiring Compartment.)



Loosen

Fig. 1 Remove seat

Unplug Battery

Cover with Cloth

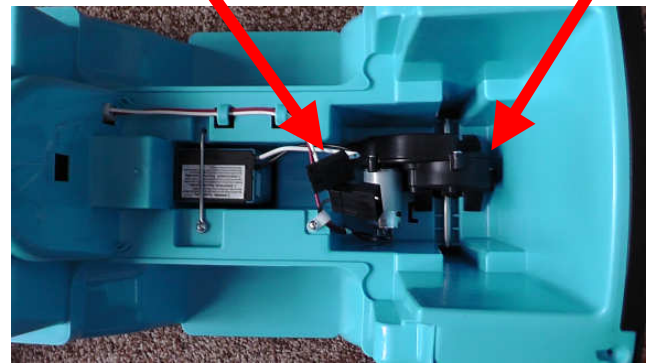


Fig. 2 Wiring Compartment

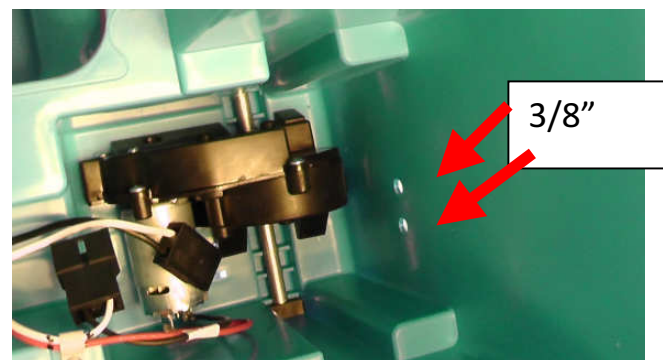


Fig. 3 Drill two 3/8" Holes

4) Working from the rear of the car, drill a 1/2" hole in the rear bumper for the Parent Switch. See Fig. 4

TIP: For larger holes like the 1/2" hole, it works better to use a Step Bit.

5) Locate the Parent Switch (Kill Switch) in the parts bag. See Fig. 5

6) Remove the switch plate (has "ON" and "OFF" on it) and switch plate ring from the switch. Leave the nut that is on the threaded switch extension. The nut should be just far enough back so the switch plate and switch plate ring can be installed after the switch is pushed through the bumper.

7) Loosen the screws on the switch connectors but don't remove the screws. The space between the head of the screw and the switch connector should be slightly more than the diameter of the wire you are connecting.

8) Take two 10" pieces of #18 gauge insulated wire and strip 1/2" of insulation off both ends of each.

9) Be sure the stripped portion of the wires is twisted tightly clockwise.

10) Bend the stripped portion of the wire to be attached to the switch into a small loop ("hook shaped") that is slightly smaller than the screw head on the switch connector.

Tip: While bending the wire end into a loop, continue to twist it clockwise at the same time.

11) Slip the wire loop over the screw such that if the insulated part of the wire is at

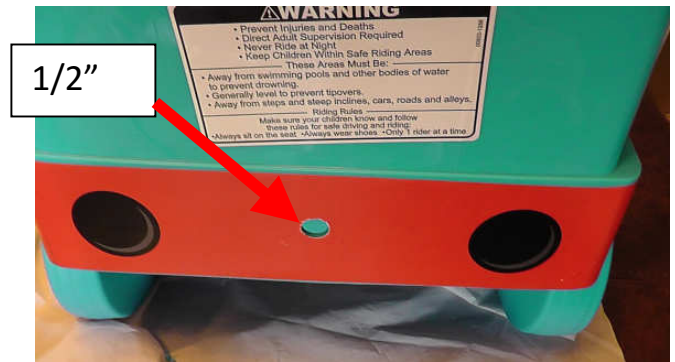


Fig. 4 Drill a 1/2" Hole for Switch

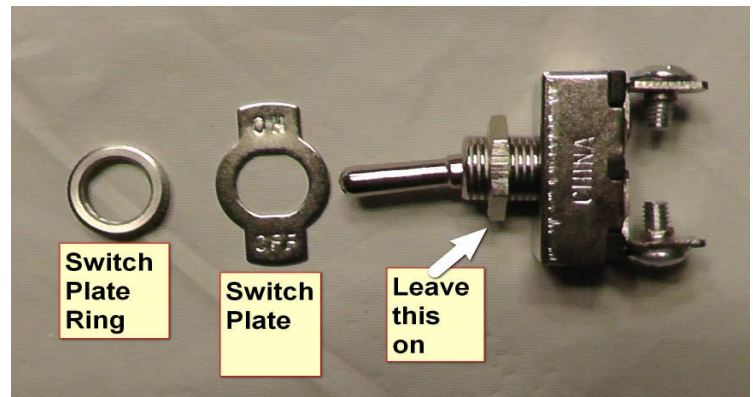


Fig. 5 Parent Switch (Kill Switch) parts

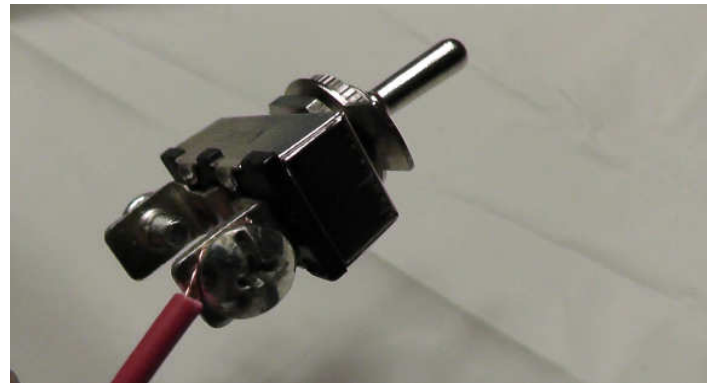


Fig. 6 Parent Switch (Kill Switch) wires

12 o'clock, the stripped portion of wire would be at 3 o'clock and the cut end would be at 10 o'clock.

12) Tighten the screw. When you finish, the wire should not slide around under the screw. Be sure none of the insulated part of the wire is under the screw.

Tip: If you hold the wire under the screw with your thumb and forefinger while tightening, it will not slide out.

Tip: When you finish, it is OK if the wire is partially visible under the screw, as long as it doesn't extend outside the switch connector and there are no small wires poking out.

13) Working from under the car, slide the wires attached to the Parent Switch up under the rear of the car and through the **right** 3/8" hole you drilled in Step 3, thereby feeding the wires into the Wiring Compartment.

14) Still working from under the car, slide the switch handle and threaded extension of the Parent Switch out through the 1/2" hole you drilled in Step 4. Put the Switch Plate on. Be sure "ON" is up. Twist the switch body until ON is up. **Tighten the Switch Plate Ring.**

TIP: You will need **pliers** for this. Hand tight is not enough. Be sure the switch body can't rotate.

15) Working from inside the Wiring Compartment, **wrap electrical tape** around and around the wires from the Parent Switch near the back wall of the Wiring Compartment so the wires can't slide backwards out of the car through the hole.

Tip: This usually takes 8-10 wraps or more.

The next Steps involve making wiring connections. See Instructions below.

INSTRUCTIONS FOR WIRING

Stripping Insulation from Wires

- 1) Use calibrated Wire Strippers
Most wires will be **18 gauge**
- 2) Remove ½" of insulation
- 3) Check that wire was not nicked
- 4) After stripping the insulation, twist the exposed wire strands clockwise so they don't separate.

Twisting Wires Together

- 1) Be sure they are stripped the same amount
- 2) Be sure the edges of insulation align
- 3) Twist them together clockwise

Attaching Wire Nuts

- 1) Twist the wires together clockwise first.
- 2) Put two wraps of tape around the insulated part of the wires just below where the insulation was removed.
- 3) Then twist the wire nut on clockwise. Be sure it is very tight.
- 4) Be sure no uninsulated wire is visible below the bottom edge of the wire nut.
- 5) Tape the wire nut in place. Tape the wires together below the wire nuts first with 2 turns. Then go diagonally up the wire nut and back down below it (in a "Figure 8" pattern). Then do 2 more turns below the wire nut again. Do this with one continuous piece of electrical tape.

Fig. 7 Wiring Instructions

16) Locate the **Trailer Connectors** in the parts bag. There are two plugs, and they are presently wired together.

17) Locate the plug where the white wire is connected to the male pin. (On the right side in Fig. 8). Cut the wires about 3" from the tip of that plug. **This plug will be attached to the charger in Steps 37-40.** Remove 1/2" of insulation from all four wires.

18) The trailer connector with the long wires (on the left side in Fig. 8) will be wired to the car. You may find it necessary to add about 3" of #18 insulated wire to the RED wire to do this. If you use wire nuts or butt connectors, add the additional wire after the trailer connector wire is threaded into the wiring compartment of the car. If you are going to solder the additional wire on, you can do it now if you like.

19) Slide the wires from Trailer Connector with the LONG wires through the **left 3/8"** hole you drilled in the rear of the Wiring Compartment (in Step 3) thereby running these wires into the Wiring Compartment.

Leave about 1" of wire on the outside of the car between the plug and the back of the car. The plug should not be pulled tight against the car body. It needs to be easily accessible by reaching up under the bumper but it should not touch the ground.

20) Working from inside the Wiring Compartment, **wrap electrical tape** around and around the wires from the Trailer connector near the back wall of the Wiring Compartment so the wires can't be pulled backwards out of the car through the hole.

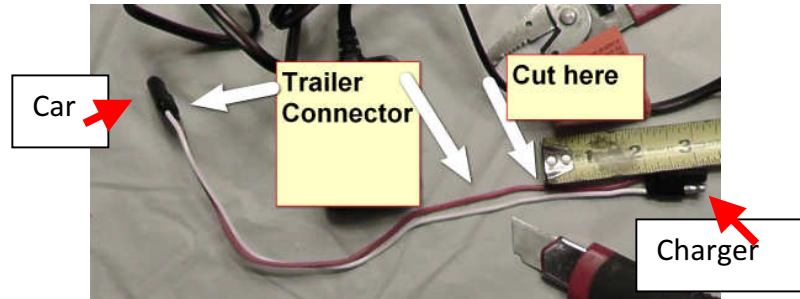


Fig. 8 Cut Trailer Connector Wires

21) Working in the Wiring Compartment, cut the **black** wire that runs from the car's battery connector to the motor. Cut it right in the middle between the battery connector and motor. **Fig. 9**

CAUTION! Do NOT cut the wires running between the battery and its connector.

22) Remove 1/2" of insulation off each end of the cut wire.

23) Connect the black wire that comes from the motor to one of the wires from the Parent Switch. (Does not matter which.) Twist the wires together clockwise, twist a wire nut on clockwise, tape the wire nut.

24) Working inside the Wiring Compartment, cut the 18 gauge **white** wire that runs from the battery connector (under a wire clamp) through center of the car to the Go Switch connector. **See Fig. 10.**

25) Remove 1/2" of insulation off each end of the cut wire, then reconnect them. Twist them back together clockwise.

26) Locate the **RED** wire from the Trailer Connector. Wrap it clockwise around the two rejoined white wires, twist a wire nut on clockwise, and tape the wire nut in place.

27) The Red wire from the Trailer connector might not reach to the splice point. You may have to add 3" of wire to the Red wire if you did not do so at Step 18. There must be some slack in the wire -- do not try to pull it to make it reach.

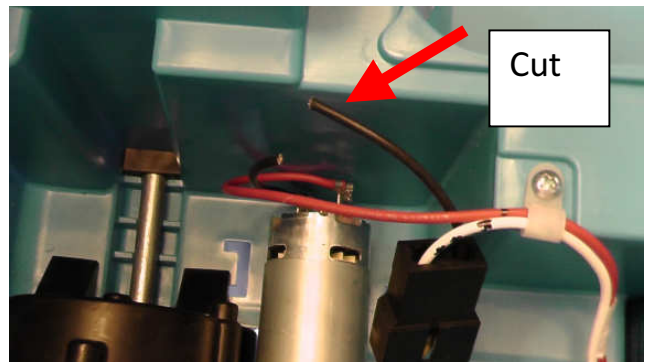


Fig. 9 Cut Black Wire

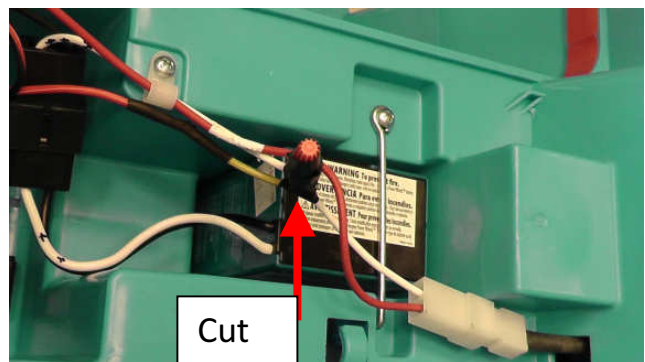


Fig. 10 Splice White Wire

28) Connect the black wire that comes from the battery connector to the other wire from the Parent switch and the **white** wire from the Trailer Connector. Twist the wires together clockwise, twist a wire nut on clockwise, then tape the wire nut.

Figs. 11-12 show wiring connections.

29) With another person, **recheck the wiring:**

- () a) Red Wire from Trailer Connector connected to White wire between Battery Connector and Go Switch Connector
- () b) Black wire from motor connected to wire from Parent Switch
- () c) Black wire from Battery Connector connected to other wire from Parent Switch and White Wire from Trailer Connector

30) If needed, **tape the wires together** with electrical tape to prevent them from touching the motor, gear box, or axle.

Install GO BUTTON Jack

31) Locate the Steering T-handle from the car shipping box. Remove the 5 screws that hold the two halves of the handle together and separate them. **Fig. 13**

Be careful. The screw on the stem also holds the steering shaft. Be sure the shaft does not get displaced or flipped.

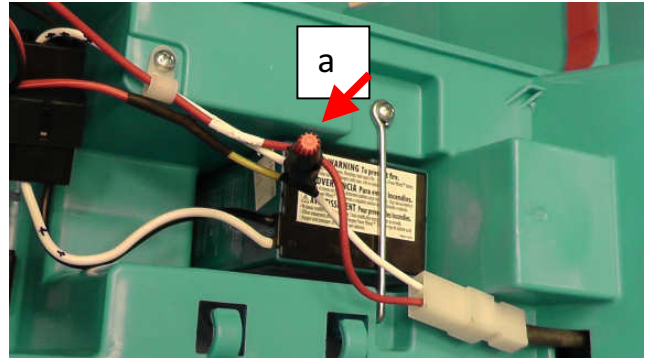


Fig. 11 Wiring

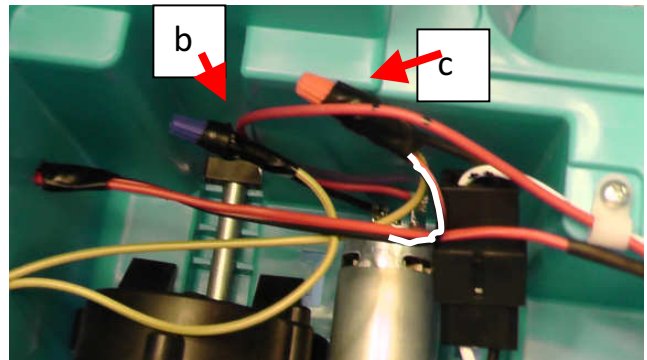


Fig. 12 Wiring

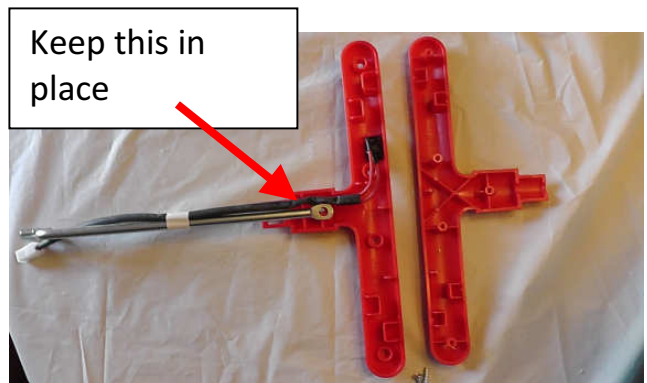


Fig. 13 Steering T-Handle

32) Cut the wires going to the current Go Switch close to the switch, and strip the insulation back 3/8" from the ends. **Fig. 14**

33) **Drill** a 1/4" hole through the dashboard at the point you want the GO BUTTON Jack to be. **Fig. 14**

(Note: we are suggesting that the jack go in the opposite side of the handle from the current switch. The GO BUTTON therefore plugs in from the front so there is less chance the child will break the plug off.)

34) Locate the jack in the parts bag. Solder the wires you cut from the original switch onto the jack. (You can do this after you mount the jack if you prefer.) **Fig. 15**

(Note: the jack may have more than two connectors. Identify the ones that contact the tip and sleeve of the plug when it is inserted. If the jack is sealed, use a meter. Once you have identified the right two connectors, it doesn't matter which wire attaches to which connector.)

35) Remove the **threaded ring** from the front of the jack. Slide the jack through the hole you drilled in Step 33. Put the threaded ring back on the jack and tighten it .

TIP: You will need **pliers** for this. Hand tight is not enough. Be sure the jack can't rotate.

36) Reassemble the T-handle. Be sure the cable goes through the slot near the steering shaft. **Fig. 16**

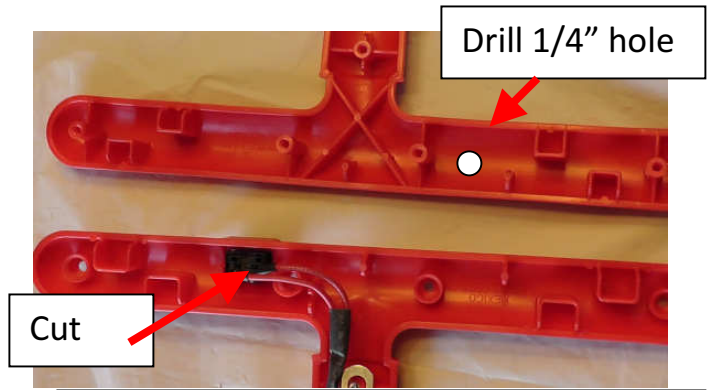


Fig. 14 Cut Wires and Drill Hole

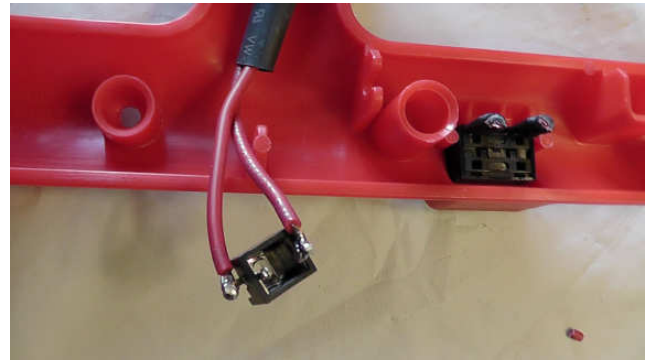


Fig. 15 Solder Jack



Fig. 16 Reassemble T-handle

Attach Trailer Connector to Charger

This step can be done any time, independent of other build work. Or it can be done by a person working separately.

37) Cut the Charger Cable approximately 7" from the plug. Separate the wires in the cable for about 2" on each side. Strip the ends (these wires are 16 gauge) and twist them back together. Be sure the pure black wires and black-with-red-stripe wires match up. **Fig. 17**

38) Twist the Red wire from the short Trailer Connector to the wires in the Charger Cable that have the red stripe. Put on a wire nut and tape it. **Figs. 18**

39) Twist the White wire from the short Trailer Connector to the black wires in the Charger Cable that do not have a red stripe. Put on a wire nut and tape it. **Figs. 18**

40) Put extra turns of tape around the red and white wires from the Trailer Connector, and the wires from the Charger. **Fig. 19**

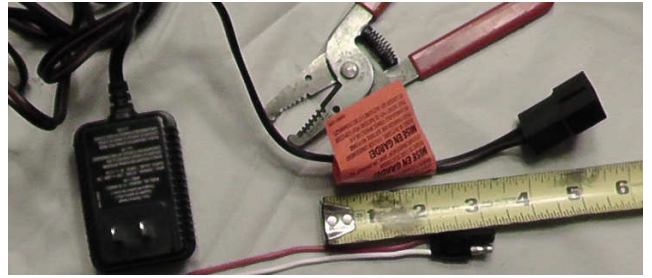


Fig. 17 Cut Charger Cable

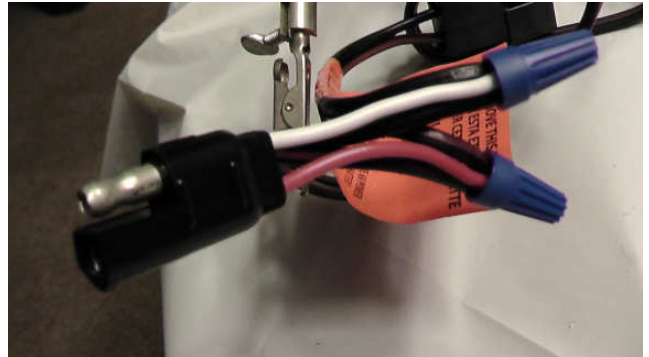


Fig. 18 Wiring before Taping



Fig. 19 Wiring after taping

Construct the PVC Frame

41) Drill a 1/4" hole in the center of the larger cab panel on both sides of the car.
Fig. 20

42) Assemble the PVC pipes for the frame as shown in **Fig. 21**.

Note: in Steps 43 and 45 you will be drilling holes in the PVC and bolting the pipes to the rear. It may be easier to temporarily remove the 5-1/2" pieces to do these.

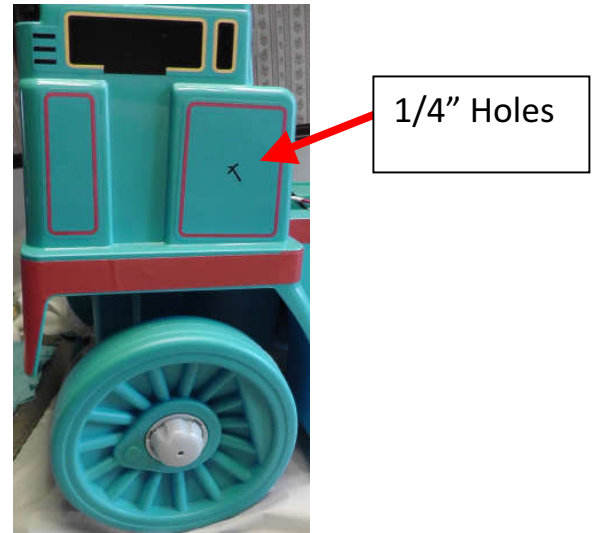


Fig. 20 Drill 1/4" holes

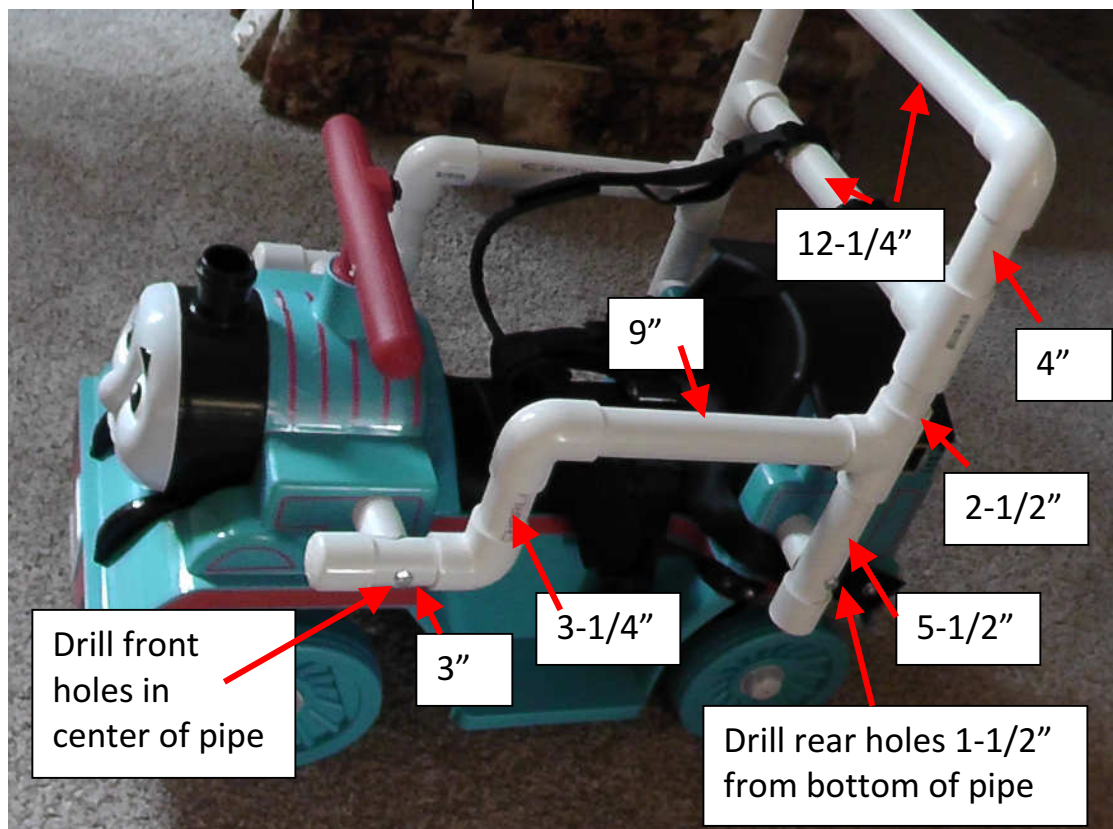


Fig. 21 Frame

43) Drill four 1/4" holes in the PVC pipes at the points marked in **Fig. 21**. Drill straight through the pipe such that both holes are on exact opposite sides of the pipe.

Note that there are 1" spacers between the frame and the PVC frame. Without these, the frame would be too tight for the child.

44) The **shape of the spacers** is shown in **Fig. 22**. Their installation is shown in **Fig. 23** (note that the pipes in this picture are upside down to show the nut access.)

- the curve on the left side of the spacer can be cut with a 1-1/2" hole saw or by hand
- the purpose of this curve is to eliminate sharp edges where the spacer joins the PVC pipe. A regular 1" square-cut section of PVC pipe can be used as a spacer, but it will have the sharp edges
- the 1/2" notch cut in the right-hand side of the spacer allows access to the exterior nut
- note that the 1/2" notch is in a different location on the front spacer than the rear because the connecting point on the frame is on a horizontal piece in front but a vertical piece in the rear.
- the spacer can be made of SDR-21 instead of Sch 40 like the rest of the frame because there is no stress on it and it will be easier to cut.

45) **Install the rear bolts first.** Slide a 3" 1/4x20 bolt through the PVC pipe. Put a 1/4" x20 regular nut on followed by a 1/4" interior tooth washer. Thread the nut and washer down only about 1". Put the spacer on the bolt with the access slot down and slide the end of the bolt through the hole in the car body that you drilled in Step 41.

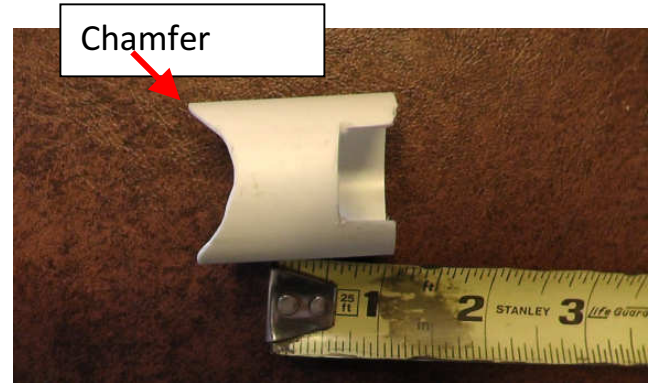


Fig. 22 Spacer Shape



Fig. 23 Spacer Being Installed

46) Working from under the car, put a 1/4" interior tooth washer on the bolt, followed by a 1/4" **self-locking** nut. Holding the undercar nut, tighten the bolt head moderately, then tighten the outer nut through the access notch as much as possible.

47) Holding the outer nut through the access notch, fully tighten the nut under the car.

48) Repeat 45-47 for the other rear bolt on the opposite side of the car.

49) Holding the frame square with the car and with the side pieces level, put a 1/4" drill through the holes in the front pieces that you drilled in Step 43. Drill straight into the body of the car.

50) Repeat Steps 45-47 for each of the two front bolts.

51) At this point, proceed with the assembly of the car per the manufacturer's instructions.

Before you install the seat in Step 6 on page 15, test the Wiring per instructions at right.

Test the Wiring

52) Be sure the Parent switch is OFF. Connect the battery connector inside the Wiring Compartment.

53) Plug a switch (GO BUTTON) into the jack on the T-handle.

54) Press the switch (GO BUTTON). Nothing should happen.

55) Lift the rear wheels off the ground, turn the Parent Switch to ON and press the GO BUTTON again. The wheels should turn.

56) Turn the Parent Switch off again. Connect a voltmeter to the trailer connector at the rear of the car and measure the voltage. Write it down. Remove the meter.

57) Connect the charger to the rear of the car using the Trailer Connectors. Connect a voltmeter to the manufacturer's charging plug on the charger. Plug the charger into an outlet and look at the voltage on the meter. It should be slightly higher than in the previous step. If it's lower, something is wired wrong.

If you do not have a meter, wait a few minutes and then touch the cable between the charger and the car. It should not be warm.

58) Unplug the charger from the outlet and then from the Trailer Connector.

59) If everything worked OK, install the car seat following the manufacturer's instructions, Step 6 on page 15.

Child-Specific Steps

The following modifications must be done specific to the child based on the therapist's decision:

60) Choose the type and location of the **GO BUTTON**. (Large, small, location on steering wheel, etc.) Attach it with Velcro.

61) Be sure to plug it into the jack. Be sure its cable is secured and out of the way.

62) Choose the location and install any **seat belts** and / or **harnesses**.

63) Attach the Swim Board to the horizontal pieces of the frame with Velcro. You may have to cut holes in the Swim Board for harness straps.

64) Cut pieces of Swim Noodle and put them on the side braces.

Parts List

1" PVC pipe

- (2) 3"
- (2) 3-1/4"
- (2) 9"
- (2) 5-1/2"
- (2) 2-1/2"
- (2) 4"
- (2) 12-1/2"
- (4) 1" curved notched spacers

- (4) tees
- (6) ells
- (4) caps

Hardware

- (4) 3" x 1/4" Bolts
- (8) 1/4" Internal star washers
- (4) 1/4" coarse nuts

(4) 1/4" coarse self-locking nuts

- 23" of #18 insulated wire
- 3.5 mm jack
- trailer connector
- SPST 25 amp switch with screw terminals

- solder
- electrical tape
- (5) orange wire nuts

- **heat shrink tubing**

- swim board
- swim noodles
- velcro
- Go Button
- colored duct tape

As Needed for Child

- seat belt
- harness

Tools List

- PVC pipe cutter
- measuring tape
- Sharpie

- small towel to lay in wiring compartment
- soldering iron or gun or rework station
- wire cutters
- calibrated wire strippers
- scissors
- utility knife
- pliers
- scratch awl or nail

- Cordless drill
- 1/4" drill bit
- 3/8" drill bit - 1/8" drill for screws for harness

- step drill bit

- 7/16" open and box end wrenches
- 7/16" regular and deep sockets
- 11 mm ratcheting offset
- ratchet and breaker bar

- Philips screwdriver
- straight screwdriver

- multifunction electrical meter

- **heat gun / rework station**

- **shorted plug for testing**