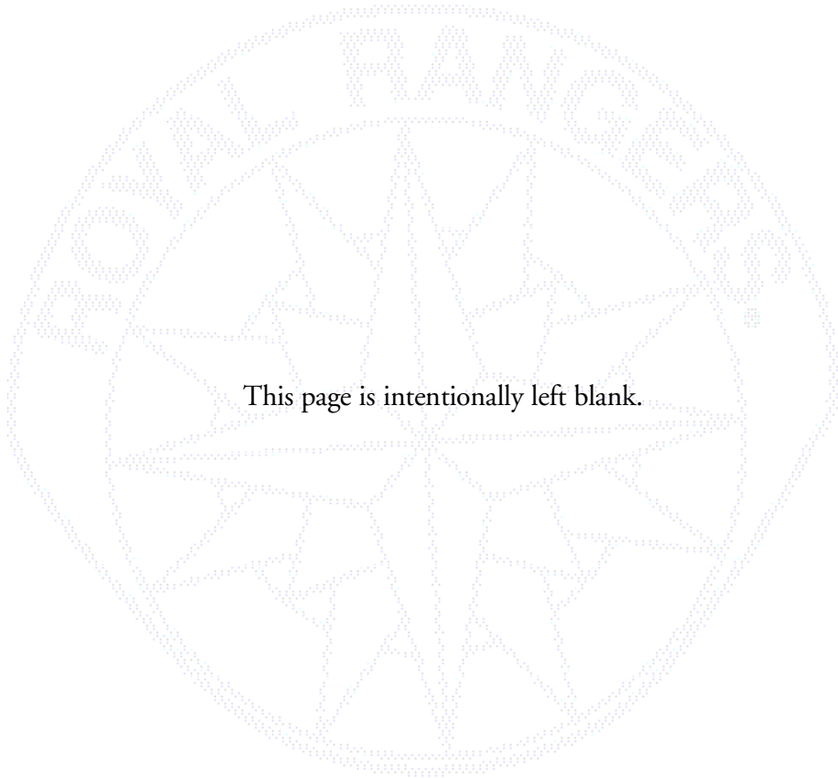
Royal Rangers

Ranger Derby Racing

Version 08/2010

Contents



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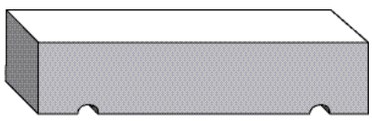
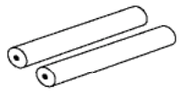
Ranger Derby Kits

For official Royal Rangers Ranger Derby competition, cars must be made from a kit sold by Gospel Publishing House or any other kit using similar components. Parts may be modified, reshaped, polished, or smoothed but must be used in their intended position.

- a pinewood block



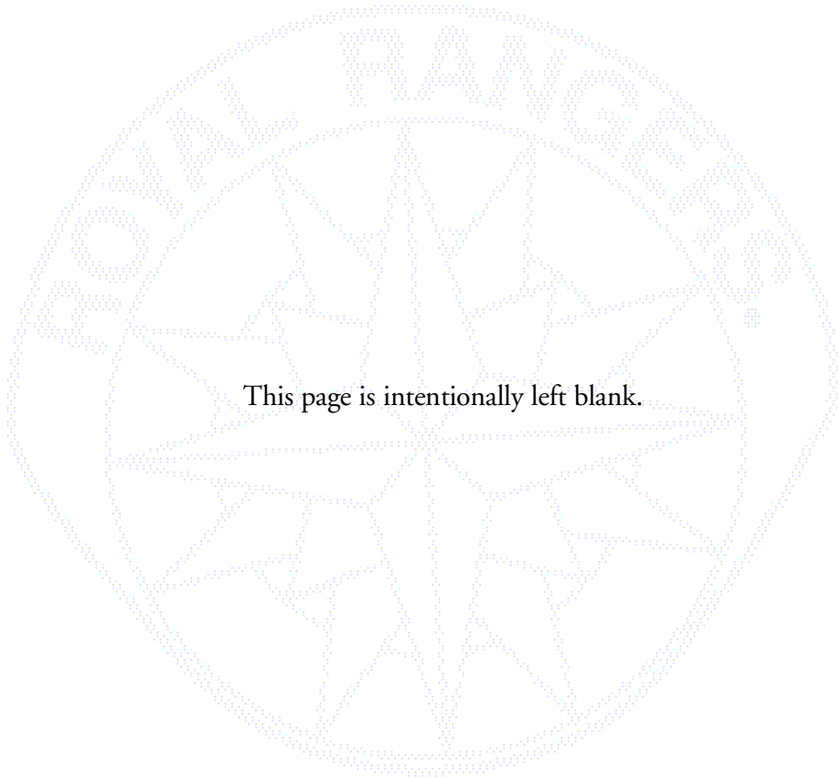
- two wood dowels for axles



- four metal wood screws to attach wheels to wood dowels

- four wheels

(Kits with metal axles through the width of the pinewood block are not allowed.)



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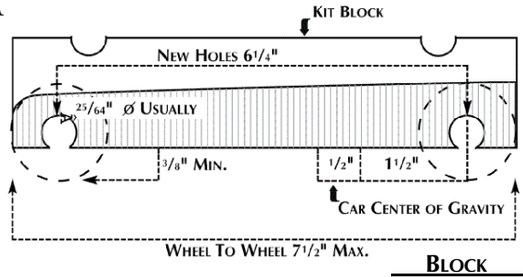
Building a Fast Ranger Derby Car

Reducing Friction

Reducing friction and resistance is the main goal to increase your car's speed.

Car Design

When you build your derby car, design has the least effect on the speed. However, it could make the difference in a photo finish, so build or shape your car like a race car. Keep it sleek so it will cut through the air. (Science calls this "aerodynamic.") However, don't design your car with a needle nose. Cars with this design are too light in the front and could shimmy going down the track. Avoid friction whenever possible. A smooth race car is what you want. Remember: Leave room to mount weights in or on the car (see figure 1).



BLOCK
Figure 1

Wheels

Your car's wheels will have burs and mold ridges (see figure 2). If you can see or feel the burs and ridges, you have work to do. Lightly sand the wheels with 600-grit sandpaper, being careful not to put a flat spot on the wheel. There are also mold ridges in the center of some wheels. Using #000 steel wool, carefully twist a thin

WHEELS
Figure 2

strand to fit through the center hole of the wheel. This is a major friction point, so take your time to do it right.

Screws

Your kit will have four screws.

The following step requires supervision by an adult.

Place the threaded part of the screw into the chuck of an electric drill. While the drill is on, take a strip of wet emery cloth about the width of the screw shaft and polish the shaft and the inside of the axle screw head. Gently move the emery cloth back and forth to avoid creating grooves in the shaft. Do this for 4 to 5 minutes. Then finish your polishing with steel wool, metal polish, or jeweler's rouge. Repeat this step with each screw (see figure 3). When you think your screws' shafts are finished, ask a jeweler if you can examine them under his microscope. Most will let you if they are not too busy, so pick a time best for them.

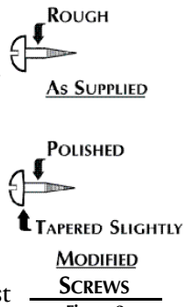


Figure 3

Axles/Dowels

Your kit will have two wood dowel axles. You may find that the holes have not been drilled in the exact center of the dowels. If this is the case with your kit, fill the drilled hole with wood glue and a wooden toothpick or wooden matchstick end and let it dry. After the glue has dried, find the center of the dowel and

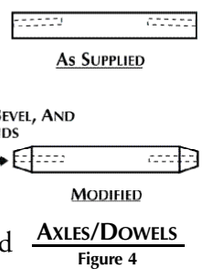


Figure 4

redrill the hole. Square, bevel, and polish both ends of the wooden dowel. This reduces friction by creating a smaller area of contact between the axles and the wheels (see figure 4). When installing the dowels into the pinewood block, use epoxy glue and place dowels squarely into the notch. Allow the glue to dry for a minimum of six hours. Twenty-four hours is best.

Mounting Wheels

Your car has four wheels, but it will go faster with only three on the track surface. In order to accomplish this, the following is recommended for one of the front tires. Raise the screw holding one wheel or mount it higher in the dowel or sand the wheel until its diameter is about 1/16″ smaller. When your car races down the track, that wheel must be functional. The speed of the car will cause it to rock diagonally at the bottom of the slope and back again.

Carefully adjust each wheel with a screwdriver. First, tighten the screw lightly. Then back off the screw tension just until the wheel spins freely. The screw should be tight enough to help prevent wheel wobble and loose enough to avoid binding the wheel. Remember, the maximum width is 2¾″.

A longer wheelbase can also improve performance. Prior to cutting your car's design, you can turn your block over and make new axle grooves. Place the dowels so that the wheels are even with the front and back of the car (see figure 1). Kits with extended axle placement may also be purchased.

Weight

Weights are not provided in the standard kit. Weight placement will affect the speed and momentum of your car. Cars weighted in

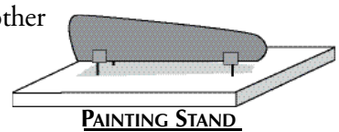
the front will be the first down the slope and last to finish. A car weighted in the back will be the last down the slope, but one of the first to finish. Cars that perform best are weighted in the middle to rear of the car.

The following step requires supervision by an adult.

Some people prefer to melt lead and pour it into a hole or groove on the bottom of the car. (The groove can be made with a router.) You should also put small holes in the front and back of the groove to hold the lead in it. Do not paint the car until the lead has cooled; hot lead will blister a great paint job. Other types of weights include plates that can be screwed onto the car, round weights that are placed inside the block, and decorative weights in the shape of drivers, engines, etc.

Painting Your Car

Why a shiny car? Less friction. First, seal the wood. (Remember, take off the wheels and metal screws and tape off the axle ends to prevent paint getting onto the highly polished ends.) This can be done with glue, paint, or wood sealer. Lightly sand the finish with 600-grit sandpaper. This will smooth the natural wood surface even more. Do this process twice. If you want a mirror finish, purchase a spray can of high-gloss auto paint at an automotive store. Place your car bottom down on a painting stand. (You can make one by driving three sharp nails through a small board. Be sure that there is nothing on the other side of the board and that all three nails are the same size [see figure 5].) Spray the paint color you want five



PAINTING STAND
Figure 5

to seven times, allowing each coat to dry for 3 to 4 hours between coats. You may want to paint clear coats after the color coats.

Test Run and Fine-Tune Your Car

You can test your car by using a piece of stiff plywood or cardboard. Hold it up at an angle with one edge on a smooth floor (see figure 6). Perform these two tests: First, see if the car rolls straight or to the right or left. It must roll straight to go fast. Second, see how far the car rolls. Allow plenty of room and don't hold your ramp too high. If you have made a car before, compare your new car with last year's car. The farther a car travels, the faster it will be on a regular track.

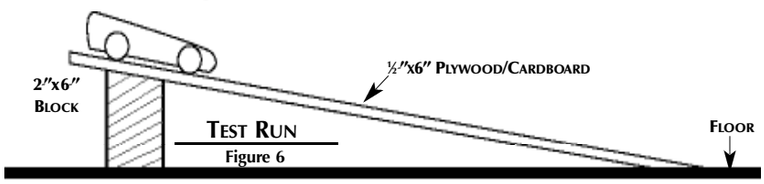


Figure 6

Lubrication

Some districts specify what type(s) of lubrication can and cannot be used. The national guidelines do not restrict or specify lubrication. Check your local rules to see what lubrication to use. Commonly used lubricants include mineral oil, silicone, glycerine, and dry graphite.

The Finish Line

After you have taken a close look at every point of friction on your car, completed your lubrication, and made your final adjustments, you should be ready to go for the finish line. Enjoy the fun and competition of Ranger Derby with your fellow Royal Rangers!

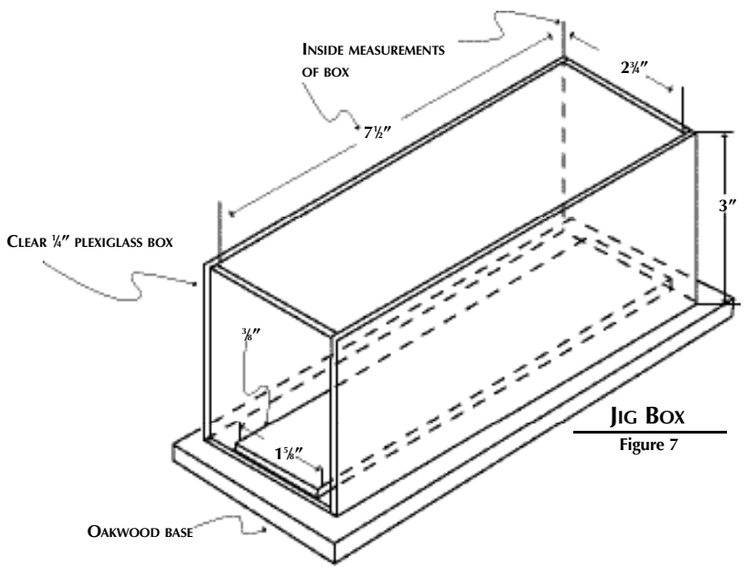
National Guidelines

Ranger Derby Rules for National/Regional Sanctioned Events

The following are national guidelines and specifications for the Ranger Derby car. These guidelines and specifications will be used at national and regional-sanctioned events. Although they are suggested for use at the district level, rules in your district may vary.

General Rules and Ranger Derby Car Specifications

1. A contestant may enter only one car per racing class. It will be raced and judged for workmanship.
2. In order to be eligible for competition (either racing or workmanship), a car must fit on and roll down the track without interfering with any other car.
3. Cars (except those entered in the unlimited class) must meet the following specifications. Note: Check the kit block before you start to ensure that it does not exceed any specifications (including all attachments).
   a. Maximum length 7½″
   b. Maximum width 2¾″
   c. Maximum height 3″
   d. Maximum weight 5½ oz. (156 g.)
   e. Minimum under car clearance ⅜″
   f. Minimum distance between wheels 1¾″
   g. Adding washers, bushings, or bearings to the wheels will not be allowed.



JIG BOX
Figure 7

Each outpost should build or obtain a jig box that checks all dimension specifications at one time (see figure 7).

4. Ranger Derby cars may be made from Royal Rangers kits or other kits using similar components. Parts may be modified, reshaped, polished, or smoothed but must be used in their intended position.

5. The contestant may add weights to the car in order to bring the car to the maximum allowed weight. If weights are used, they must be an integral part of the car. They may be placed inside the block, mounted as an ornament, or be otherwise permanently attached. Weights may not be taped or set on a car. If weights or any other part of a car comes off during a

heat, the heat will be re run. If the same car or parts leave the track again, the car is disqualified from racing. No heat or race will be delayed while repairs are made.

6. Once a car has been registered, no further work may be done to it. A place should be designated to lubricate and work on cars before they are registered.
7. The following racing classes are recommended:
   a. Ranger Kids
   b. Discovery Rangers
   c. Adventure Rangers
   d. Expedition Rangers
   e. Adult Leaders
   f. Unlimited
   g. Open
   h. Grand Champion
8. Unlimited Class: As the name implies, this is a class in which you can use all your ingenuity and imagination; however, you must use the parts in the kit for their designed purpose.
   a. The car must be made from an authorized Ranger Derby kit except the block. Use all the parts in their proper locations (see rule 4 and the Ranger Derby Kits section).
   b. The car may not be entered in another class.
   c. Standard specifications listed in rule 3 are waived; however, the car must fit on the track and run on the track without interfering with other cars.

d. No car shall weigh more than 32 oz. (908 g.).

e. No car may exceed 12″ in length.

f. All other Royal Rangers Ranger Derby rules apply.

9. Open Class: This class is open to any family member of a person entering classes A through E. All rules apply. There may be more than one open class depending on the number of entries.

10. Grand Champion: All first- through third-place winners in each class, except unlimited class, may compete in the final racing after all other races are completed. This competition will be called Grand Champion.

11. Workmanship/Design: Each contestant may enter one car in this event per class they enter. It must meet the same qualifications (fits on and is able to roll down the track) as cars entered in the race classes.

    Guidelines for judging will be as follows:

    a. The judges will not converse while judging.

    b. Any comments will be in writing and will consist of the car number and score using the "Workmanship Judging Score Sheet" (see sample form on page 26).

    c. Score sheets will be given to the officer in charge as soon as a judge has completed judging.

    d. These are the areas cars will be judged on:

    Originality: Was the design the idea of this artist himself? How much creative thought went into the design? Score 0–20

Craftsmanship: The skill the workman showed in cutting, carving, sanding, and detailing the car. Did the owner make the car's extra ornaments, or are they something bought and attached which should receive fewer points? (Handcrafted ornaments will receive a higher rating/score.) Score 0–50

Color and Appearance: What is the outward appearance? Is the painting of the car appealing? Are the color and paint even all over? Is the appearance pleasing to the eye? Score 0–30

Building a Track

Building a Ranger Derby track is a complicated process that requires strict attention to detail and a high level of skill. If your outpost wants to build a track, you should seek assistance from professionals in the area of woodworking. The track design in this section is provided to assist you in building a track for your outpost, section, or district.

Description of the Track

The track consists of four 8′ sections and an additional section (4′ is recommended) at the end to catch the cars. It has a sloped portion with a starting gate near the top, a flat (i.e., horizontal) portion, a gradually curved section connecting the slope and the flat, and a stopping section beyond the finish line.

A variety of materials may be used as long as you adhere to the dimensions in the guidelines. These dimensions will be used for the track at all national events.

Guidelines

Overall length: 32′ plus a stopping section (4′ is recommended)

Height at top of track: 40½″ (measured from the surface of the horizontal part of the track to the top of the slope)*

Slope angle: 14.12°

Radius of curve: 195″

Starting gate: 12″ from top

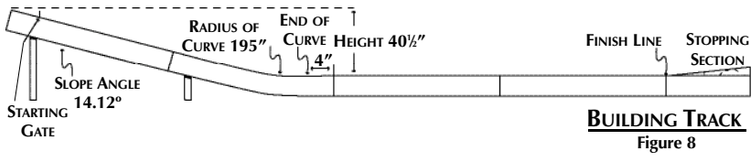
Runner height: ¼″

Runner width: 1⅝″

Space between runners: 2″

Width of track: Variable according to the number of lanes (e.g., a six-lane track would be 23¼″ wide.).

*Overall height will va ry because different dimensions may be used for the sides of the track sections. To calculate the actual height above the floor, add the height of the horizontal track surface to 40½″.



Building Track
Figure 8

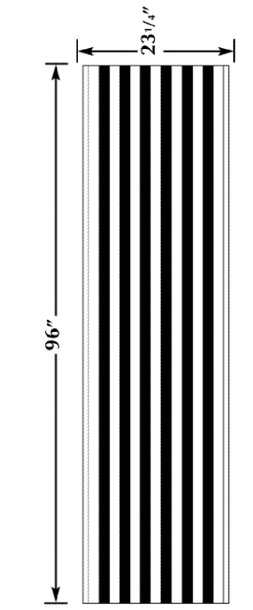
Track Building Tips

The three straight sections are essentially the same. Figures 9, 10, and 11 show details of how to build them. For the section with the starting gate, any kind of starting mechanism can be used as long as the nose of the car is 12″ from the top of the track (see figure 12).

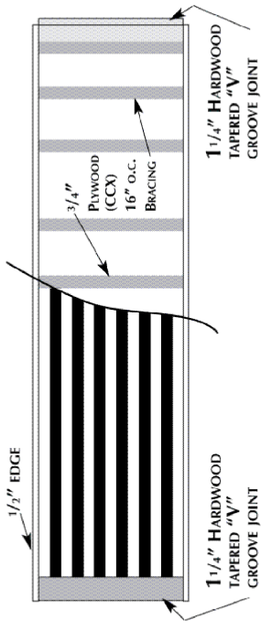
When selecting materials to be used for the building of the track, consider that the track should be basically rigid, but flexible enough to allow for leveling. When setting up the track in a building, it is very important to level the track. The horizontal sections should be level throughout their length. They should also be level side to side. Shims, levelers, and/or feet may be used for this. The roadway can be made of any smooth material that complies with the noted dimensions (see figure 11).

The runners on the track are ¼″ high and 1⅝″ wide. They should be slightly rounded on the top edges so cars can run down the track smoothly (See figure 11). The runners should be permanently fastened to the track.

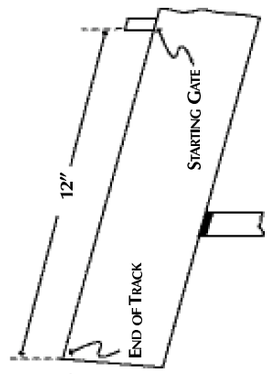
Building a Track



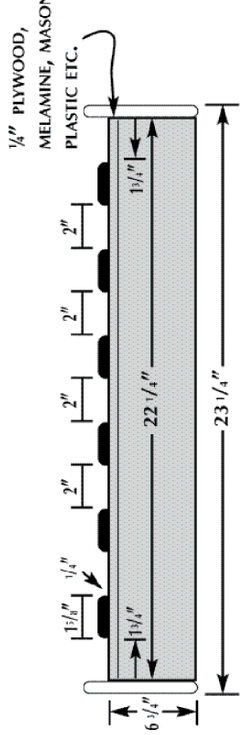
Track Section
Figure 10



Cut-away Section
Figure 9



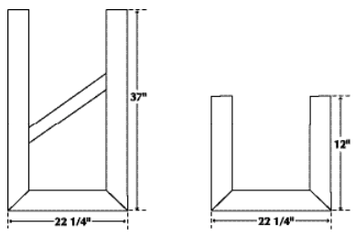
Starting Gate
Figure 12



End View
Figure 11

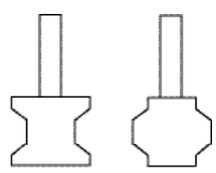
A specially designed joint system connects adjacent sections of the track (figure 13). This "V" groove does not have to be a large taper, nor thick. It needs to run along the entire length of the joint and be precise enough to prevent a sloppy joint. You can make the groove with router bits like the ones in figure 13. The joint should be constructed from a hard material. Drill through both parts at the same time and use bolts to hold one section to the next (see figure 14). The joint pieces should be attached to the ends of the track sections. Use a spacer (at least ¾") between the track surface and joint pieces.

The stands hold up the two inclined sections and can be made of any material (see figure 15). Note the height of each section as illustrated. Any form of leveling device can be used to allow for easy adjustments once the track is set up. The shorter leg should be 12 inches in height and its placement under the track can be adjusted so that the track lies flat on the floor. The legs may be attached to the track either by bolts through the sides of the track or by holders under the track. The rear leg can be built to remain attached to the track or as a separate piece.

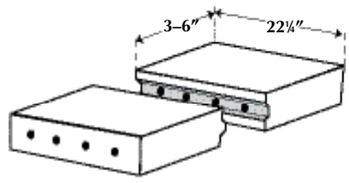


STANDS
Figure 15

Any method of stopping the cars at the end of the track may be used as long as it does not damage the cars or interfere with their wheels and axles. The design pictured in figure 16 is both effective and safe for the cars. In this design, the runners gradually increase in height, causing the cars to come to rest on their undersides. Use soft rubber like weather stripping.

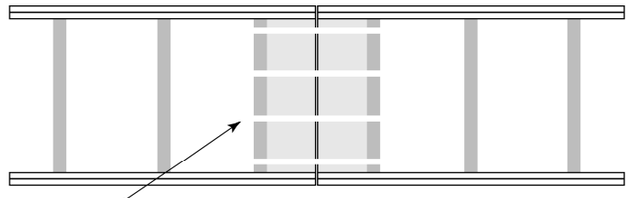


ROUTER BITS



SECTION JOINT

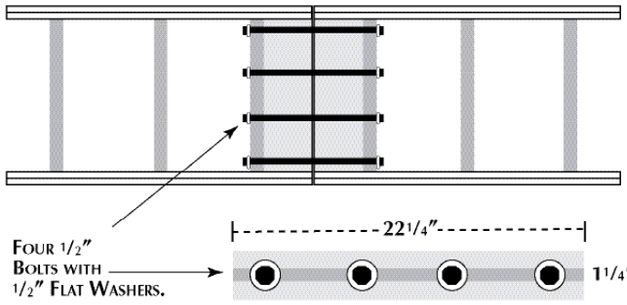
Figure 13

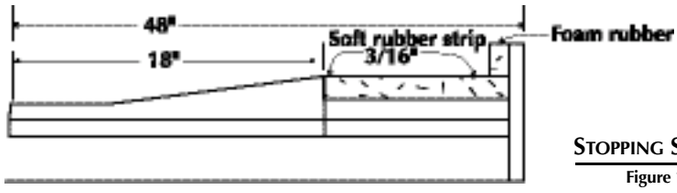


PREDRILL FOUR HOLES FOR 1/2″ BOLTS, THROUGH THE CENTER OF BOTH JOINTS AT THE SAME TIME.

CONNECTING TRACK SECTIONS

Figure 14





STOPPING SECTION

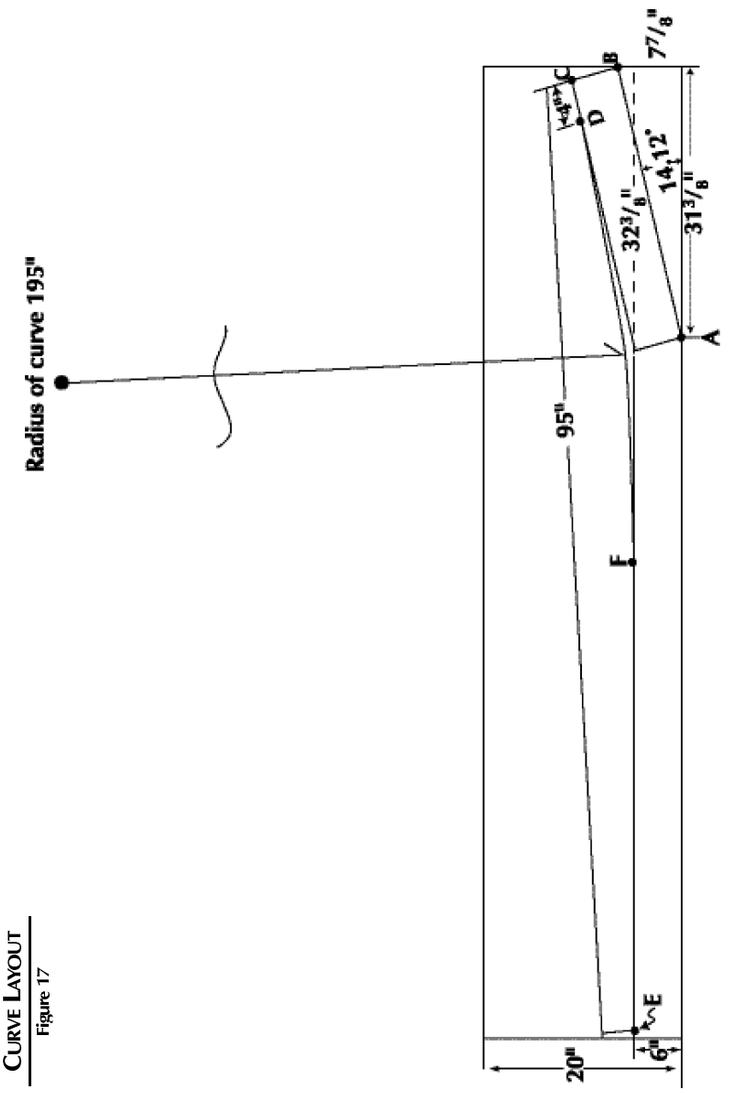
Figure 16

The curved section is the most difficult part of the track to make, but it is also the most important. To make each side of the curve (see figure 17), you'll need one piece of material at least 20″ wide and 8′ long. You will also need to precut a piece of wood 6″ wide and 32⅜″ long to use as a marking guide.

Make a chalk line 6″ (the same dimension as the width of your marking guide) from one edge along the 8′ length of the board. Place the precut marking guide on the larger piece of wood at a 14.12° angle with its lower corners touching the other board's lower and right edges at points A and B. (Point A is 31⅜″ to the left of the lower right corner; point B is 7⅞″ above it.) Mark the location of the corners of the marking guide and remove it. Connect these corner marks with chalk lines. The upper right corner is point C. Plot and mark point D by measuring 4″ from point C along the line where the top of the marking guide had been.

Plot and mark point E by measuring from point C back to where the first chalk line and the 95″ mark on your tape measure meet. Secure one end of a 195″ metal wire to a fixed point and attach a marking device to the other end. Pull the wire taut and place the marked material so that point D is touching the marking device on the end of the wire. Adjust the position of the board until the marking device touches the lines you have drawn only at point D and at one tangent (where a line barely touches the outside of a circle) point, point F, on the chalk line you marked earlier.

Once you have established these points, mark the curve carefully and slowly. Remember, always "measure twice and cut once." Always double-check the angles, distances, and marked points. Once the entire curved part of the track is marked, begin cutting.



CURVE LAYOUT
Figure 17

Ranger Derby Racing

Cut along the line between points A and B, B and C, and C and D. Cut along the curve from D to F and along the line from F to E. Cut the board at E. You will need to do this process for both sides of the track unless you build yourself a template.

To really make your track complete, we recommend connecting it to a computer. Programs are available that can simplify timing and ranking of the racers. See the Gospel Publishing House catalog for details about this exciting option. Other racing paraphernalia can be purchased from the Royal Rangers catalog.

Setting Up a Race

Setting up and running a Ranger Derby race can seem like a huge task at first, but with a little planning, you and your outpost can put together a great day of racing fun.

Instructions for Registration

Here's a suggested set of instructions for the registration workers that should make everything work smoothly as the racers come through the registration area.

1. Ensure that the car meets all the physical requirements for size, weight, and wheel assembly.

Specifications:

Length: 7½″ (maximum)

Height: 3″ (maximum)

Width: 2¾″ (maximum)

Bottom clearance: ⅜″ (minimum)

Distance between wheels: 1¾″ (minimum)

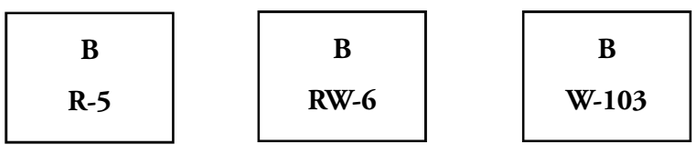
Weight: 5½ oz. or 156 g.

All Ranger Derby kit parts are original (no substitutions).

2. The Registration Card (see sample on page 27) will be completed at Table 1. A registration person will weigh and measure the car. If weight and measurements are satisfactory, the registration person will initial each space on the card. At Table 2, the registration person will review the card and classify the entry into the correct age group and category. The registration person will assign a registration number and circle the

classification (A, B, C, D, E, F, G, or H). He then issues a tag to be placed on the bottom of the car.

3. Tag the bottom of the car as follows:
   a. If car is for *racing only*, indicate this on the sticker on the bottom of the car by writing "R-#" where "#" is the sequential number of the cars that are racing (see figure 18, part a for an example).
   b. If the car is *racing and competing for workmanship*, write "RW-#" on the tag on the car, where "#" is the sequential number of the cars that are racing (see figure 18, part b for an example).
   c. If the car is *competing in workmanship only*, write "W-#" on the tag placed on the bottom of the car, where "#" is a sequential number starting with 101 for all cars entered in a particular class that are not racing (see figure 18, part c for an example).
4. Fill out the Registration Sheet (see sample form on page 28) while completing the applicant's registration card. This provides a record that may be needed to send the entry to the next competition (section, division, or district). This is not required in all districts.



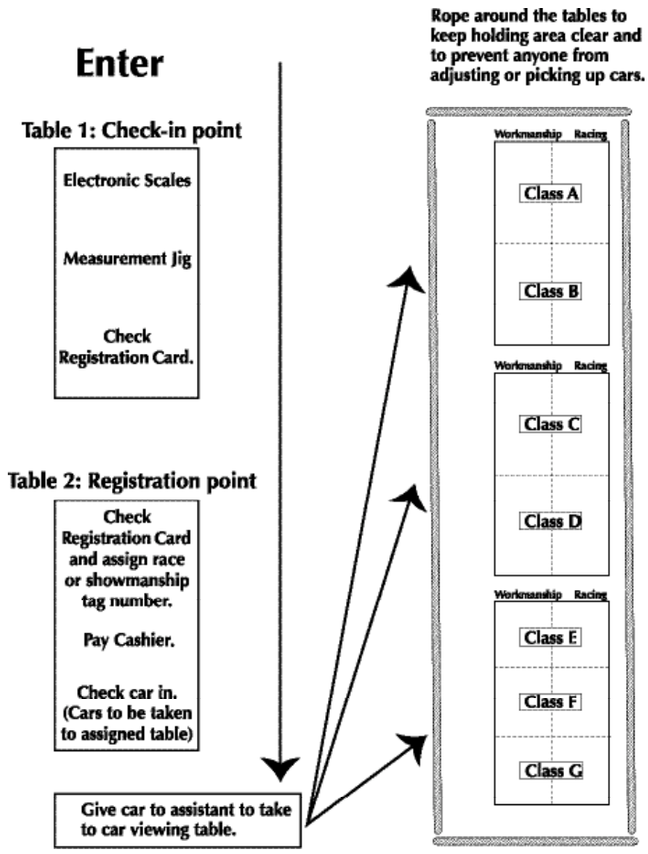
a b c

TAGS

Figure 18

Ranger Derby Registration Area Layout

Your registration area should be orderly and easy to move through. Here's a suggested plan to use when you are setting up.



Ranger Derby Racing

WORKMANSHIP JUDGING SCORE SHEET

ORIGINALITY: Unique design of the car	0–20 Points	
CRAFTSMANSHIP: Quality and skill in the construction of the car	0–50 Points	
COLOR & APPEARANCE: Appeal and overall appearance	0–30 Points	
Total Possible	100 Points	

CLASS: A B C D E F G H

	0-20 POINTS	0-50 POINTS	0-30 POINTS	
CAR #	ORIGINALITY	CRAFTSMANSHIP	APPEARANCE	TOTAL

CLASS: A B C D E F G H

	0-20 POINTS	0-50 POINTS	0-30 POINTS	
CAR #	ORIGINALITY	CRAFTSMANSHIP	APPEARANCE	TOTAL

REGISTRATION CARD

(Use a separate registration card for each car)

Name _____

Church _____Outpost _____

Age Group _____

Circle one category below:

Racing Only Racing and Workmanship Workmanship

To be filled in by track official

Check-in: Weight _____ Measurement Jig _____

Circle one: A B C D E F G H

Car # _____

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Circle one: A B C D E F G H

Car # _____

Ranger Derby Racing

Registration Sheet

Class: A B C D E F G H Year _____
Outpost #_____ Area _____ Section_____ Division_____

RACING / WORKMANSHIP

Car #	OP#	Owner's Name	Total Wins	Place in Race	Place in Workmanship