



2006

Field Setup

Overview

The Challenge field is an obstacle course on a mat. The obstacles are called mission models, and the mat is called the field mat. Some of the models are secured to the mat using 3M Dual Lock fastening material. The mat must be on a smooth hard flat surface, and it must be surrounded by border walls to contain all the action.

Requirements

This step first requires that you...

- have read and followed the instructions under "Surface & Borders" so you now have an official framework on which to stage your field.
- have read and followed the instructions on the CD that came with your Field Setup Kit so you now have the LEGO mission models.
- have the field mat and Dual Lock fastening material that came in your Field Setup Kit.

Field Mat Placement

Step 1:

Clear any and all debris off the surface you intend to put the mat on. Even the tiniest particle under the mat can give the robot trouble. Vacuum the surface if you can, and run your hand over the surface afterward. Get rid of any protruding imperfections you find.

Step 2:

Unroll the mat and position it so the image is up and the area with logos is at your lower left, at the southwest corner of your surface. See the sketch labeled Table/Mat Orientation.

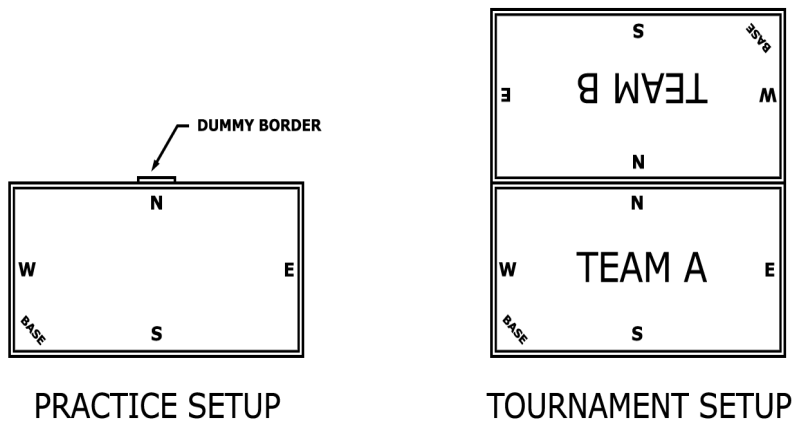
Step 3:

Slide and align the mat so that there is no gap between the "Base" corner's edges of the mat and the corresponding southwest borders. Gaps are expected and acceptable at the north and east edges.

Step 4:

With help from another person, pull the mat at opposite ends, then massage out any waviness from east to west and re-check the requirement of Step 3. It is expected that some waviness will persist, but that should relax over time.

Table/Mat Orientation



Using Dual Lock

The Mission Models can be taken off the field mat for transport and storage. Some are loose, but others are secured using a re-usable fastening material from 3M called Dual Lock, which comes with the LEGO bricks in your Mission Model Set. Dual Lock is designed to stick or “lock” to itself when two faces of it are pressed together, but you can unlock it too.

When a model’s placement requires Dual Lock, the model’s location mark on the mat will contain boxes with X in them. For each X box, apply a piece of Dual Lock, adhesive side down, to the mat. Square pieces will need to be cut in half for the rectangular boxes. Next, press (lock) a like-sized piece of Dual Lock, adhesive side up, onto to the ones you just finished sticking to the mat.

Tip: Since the second piece of each Dual Lock pair would rather stick to you than lock to its partner, press the second piece onto the first using the wax paper the Dual Lock was supplied on, instead of your bare finger, then peel away the paper.

Finally, for each Dual Locked model, line the model up exactly over its location, being sure that all labeled features are facing as labeled. Carefully lower the model and press it down onto the Dual Lock. Try to press down on the lowest solid structure of each model instead of crushing the whole model. This application process for the Dual Lock is only needed once—later, the models can simply be locked onto the mat or unlocked.

Model Details

SPACE ELEVATOR

PLACEMENT: Use Dual Lock as shown on the mat. One space elevator model will be shared by both teams at a tournament, with each team having half the model (two of the four feet) on their mat. Since your practice table doesn’t have another table next to it, you’ll need to find some other way to support the far-side feet so the model stands solid and level. One way would be to nail some scrap wood to the underside of your Dummy Border, but any

such staging would be fine. When placing the elevator, the car with yellow cargo can face either east or west.

OTHER SETUP: The cargo car is in the up position, and the car without cargo is locked in the down position.

ACTIVATION: When both rolling trigger arms are pushed toward the elevator, the cars should slowly trade places. To reset, simply press the car with no cargo down against the docking area.

TROUBLESHOOTING: If the cars don't move, be sure that the string is at the center of each pulley wheel. Be sure that each car is hooked to its beam, and be sure the heavier car has its yellow cargo and astronaut. Check to be sure no beam connections are loose. Check to be sure all axles spin freely. If the model won't reset, make sure both rolling trigger arms are pushed all the way toward the elevator, and the little red axles are pointing up, then try again.

FABRIC TESTER

PLACEMENT: Use Dual Lock as shown on the mat for the main body. The fabric faces Base. Be sure not to get any Dual Lock near the black diamonds. **OTHER SETUP:** The dirt trap is loosely placed (without Dual Lock) anywhere in Base. The eight little blue cylinders considered "dirt" in the Missions are loosely placed in the yellow dumper.

ACTIVATION: When the red beams opposite the fabric are pushed, the dumper dumps.

TROUBLESHOOTING: It is normal for some dirt to stay on the fabric, or fly out of control, depending on how fast the red beams are pushed.

MOLECULAR MOTOR

PLACEMENT: Use Dual Lock as shown on the mat. Be sure not to get any Dual Lock near the black diamonds.

OTHER SETUP: 1) Pull the rubber-band lever clockwise until the end of the rubber band is stretched past all the yellow beams. While holding that there, 2) lift the double gray axles up to the square black frame, and let go of the rubber band lever. 3) At the opposite end of the square frame, pull the black engagement lever clockwise until its 24-tooth gear meshes fully with the 40-tooth gear. 4) Slide the battery holder (black & gray) so its gear is free, lift it about two-thirds as high as possible, then slide it so its gear is meshed fully. 5) Place the battery loosely in its holder (direction doesn't matter). The two ATP (yellow) molecules are placed anywhere in Base.

ACTIVATION: When an ATP molecule is dropped or otherwise forced through the square black frame, the spinner spins, and the battery is released onto the mat.

TROUBLESHOOTING: If nothing happens when the double gray bars are weighted, you probably forgot step 3. If the battery doesn't release, check to be sure no beam connections are loose, and that all axles spin freely.

SELF ASSEMBLY

PLACEMENT: Use Dual Lock as shown on the mat for the main body. The blue side faces the east border wall.

OTHER SETUP: The gray trigger lever axle points directly downward. When looking at the model from the east, and working from right to left, rotate each blue segment counter-clockwise until the red end of the corresponding stopper arm drops down, preventing back-rotation. Then push each red stopper arm downward to be sure it's firmly in place.

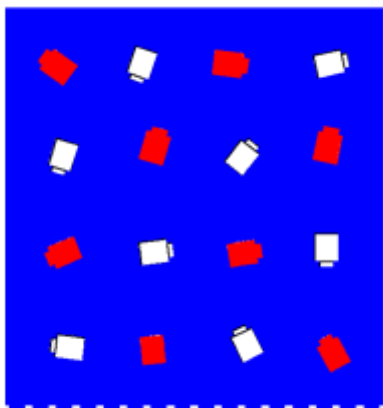
ACTIVATION: Pushing the gray trigger axle frees each blue segment to fall into place, lining up like the structure of a carbon nanotube.

TROUBLESHOOTING: If the segments don't spin freely, make sure the gray stoppers at the far side are not pinching against the model's frame, and be sure there are no loose beam connections. If the segments are not lining up with each other, one or more of them may be over-rotated. Make sure each tiny red axle stays under its stopper arm, but above the lower frame beam.

INDIVIDUAL ATOMS

PLACEMENT: Use Dual Lock as shown on the mat for the main body. The studs of the blue surface face the south border wall.

OTHER SETUP: Place the atoms (red & white) loosely on the blue surface as shown below. Always be sure the northwest atom is red. Looking diagonally, rows of each color atom should be mostly straight. Perimeter atoms should be two to three times a red atom's length from the edge. All studs face sideways (direction doesn't matter). Suggested technique: Hold the table still with one hand. Arrange the red diagonal row of four, followed by the remaining reds. Finally, place the white atoms using the red pattern as a guide.



ACTIVATION: With good technique, white atoms can be moved independently of red atoms.

TROUBLESHOOTING: If the blue surface is not level, be sure all the blue bricks are tightly joined and that all four rubber bands under it are installed correctly. If the atoms fall due to people leaning on or bumping the field table, consider securing the table to a wall or floor.

STUCK NANOTIP

PLACEMENT: Use Dual Lock as shown on the mat. The magnet end goes toward the west border wall.

OTHER SETUP: The nanotip is stuck (the tip magnet is stuck to the fixed magnet).

ACTIVATION: With good technique, the tip can be freed (magnets separated). Separating the magnets such that the tip magnet goes below the fixed magnet is considered field damage.

TROUBLESHOOTING: If the magnets don't line up, make sure the east end of the tip axle is flush with the east side of the mounting plate. If the magnets seem harder to free than they used to be, this may be due to the tip axle relaxing downward. If so, remove the tip axle with its magnet and reinsert it upside down as needed.

CABLE TESTER

PLACEMENT: Use Dual Lock as shown on the mat. While pressing this model down onto the mat, make sure the red beam "slider" part at the mat level is free to slide north and south. Reposition Dual Lock if needed.

OTHER SETUP: Push down as far as possible on the end of the boom, near the white rubber band. This will allow the slider to reset. Next, center the lift frame (with red plates) between the gray beams and push it as far north as possible while maintaining full contact with the mat. Finally, place the truck on the mat facing north with its front wheels barely touching the gray ramps. Make sure the rear wheels are centered over the slider.

ACTIVATION: When the truck is pushed onto the lift frame, pushing the slider north will cause the truck to be lifted.

TROUBLESHOOTING: If the string tension doesn't allow proper setup, use the yellow adjuster/stopper to add or remove slack. If the lift frame won't rest flat on the mat, tighten/adjust the gray ramps, and check for incorrect Dual Lock placement/interference.

ARM BONE

PLACEMENT: Use Dual Lock as shown on the mat, with the problem spot (black piece) directly over its mark. The Buckyball (colored plastic marble) is loosely placed anywhere in Base.

ACTIVATION: When placed in the bone's channel, the green Buckyball usually rolls and comes to rest at the problem spot.

TROUBLESHOOTING: It is normal for the Buckyball to miss stopping at the problem spot once in a while due to dimples on the ball.

PIZZA MOLECULES

PLACEMENT: The pizza (red) molecules are loosely aligned (exact alignment is not possible) on their marks on the pizza, tripod-style, as shown on the mat.

Field Maintenance

BORDER WALLS: Remove any obvious splinters, and cover any obvious holes.

FIELD MAT: Make sure the mat rests evenly at the bottom of the south and west border walls. Avoid cleaning the mat with anything that will leave a residue. Any residue, sticky or slippery, will affect the robot's performance compared to a new mat, which should be expected at some tournaments. Use a vacuum and/or a damp cloth for dust and debris (above and below the mat). When moving the mat for transport and storage, be sure not to let the material bend into a sharp kink point, which could affect the robot's movement. Many consistent repetitions of rubbing on the same areas of your practice mat should be expected to cause wear in the image, but such wear is unlikely at a tournament.

MISSION MODELS: Keep the models in original condition by straightening and tightening solid connections often. Ensure that spinning axles spin freely by checking for end-to-end play and replacing any that are bent.