

Magnetic Levitation Troubleshooting Guide

Label	Problem/Issue	Questions to Investigate	Try This
1.a	My car won't move past the start line	Is your motor turning on?	<ul style="list-style-type: none"> • If yes, is your battery charged? You can check this with a voltmeter or simply by trying a new battery. • If no, check the wires connecting your battery to your motor to make sure nothing has shaken loose.
1.b		Is your propeller turning?	<ul style="list-style-type: none"> • If yes, do you feel air moving in the direction that you intend? That is, is the air moving in the direction opposite of your intended vehicle's track? If not, reverse the polarity of your motor by switching the wires on your motor. • If no, if your motor is working, work to better secure your propeller to the motor shaft to prevent slipping.
1.c		Is your car tilting in any way when you turn on your motor?	<ul style="list-style-type: none"> • If yes, turn off your motor and check the balance of your vehicle by sliding it up and down the track. Check to see if your vehicle tilts in any way as it is moving on the track without the motor on. If it is not tilting, the motor is out of alignment with your car and you have two options: <ol style="list-style-type: none"> 1. Add, remove, or simply relocate mass on your car to adjust for this balance issue and re-check your vehicle's balance with the motor on. Keep adding/removing/relocating mass on your car until the car does not tilt when the motor is turned on. 2. Twist your motor to better line up your motor shaft with the track. Your motor shaft should be parallel to the side rails of the track to prevent a sideways force from tilting your vehicle. Keep twisting your motor and checking the car's balance/tilt until the car does not tilt when the motor is turned on. • If no, check other issues.
1.d		Is your car too wide? Is it hard to slide up and down the track without the motor on?	<ul style="list-style-type: none"> • If yes, you need to make your car narrower. <i>It is highly recommended that you build your car with an adjustable width system using shims or thick tape.</i> If there is too much friction between your car's sides and the side walls of the track, your car will not move as the force generated by the moving air from your motor/propeller system is not great enough to overcome significant friction. You need to adjust the width of your car until it glides easily up and

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			<p>down the track without the motor on. Keep adjusting the width of your car until it glides easily up and down the track.</p> <ul style="list-style-type: none"> • If no, is your car too narrow? Your car should be nearly as wide as the track width, but not too wide to create excessive contact and friction. If there is too little contact between your car's sides and the side walls, the car is more likely to twist or tilt in the track when the motor is turned on, causing it to appear that it is getting stuck in the track when it is actually turning at an angle and getting wedged in the track. Adjust the width of your vehicle until it glides easily up and down the track.
<p>1.e</p>		<p>Is your car levitated on the track?</p>	<ul style="list-style-type: none"> • If yes, is the levitation generally consistent along the entire base of your vehicle with no mass added? If not, you may have one or more of your magnets on your vehicle in the wrong orientation. Check the polarity orientation of every magnet on your vehicle. All magnets on one side of your vehicle should be of the same polarity, and opposite of the polarity of all of the magnets on the opposite side of your vehicle. • If no, Is the polarity of the magnets that you have on your car correct? Check the polarity of the magnets on one side of your car first. Are they all of the same polarity? If not, flip over the magnets that are of a different polarity. If they are, check the magnets on the other side of your car. Are they all of the same polarity and opposite to the polarity of the magnets on the first side? If not, flip the magnets upside down that are of the wrong polarity. • If no, is your car too heavy? Remove some mass from your vehicle and see if it levitates OR add more magnets to the base of your car to increase levitation. • If no, also check the following issues that may arise between your car and the Maglev track: <ol style="list-style-type: none"> 1. The magnets on the track should be of the same width as the magnets on your car. Different widths can create significant balance issues for your car and it will be much more difficult to get your car levitated and to stay levitated in motion. 2. Rare Issue. The magnets on the track should have a similar magnetic force to the magnets on your car. If the

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			<p>magnets on the track are too strong, then the car will be much more difficult to balance and keep balanced in motion. Avoid Rare Earth Magnets...they will only cause significant issues for your car and track and may end up permanently damaging your track and/or car!</p>
1.f		<p>Is the motor/propeller combination producing enough thrust to move your vehicle?</p>	<ul style="list-style-type: none"> • If yes, then you vehicle should move down the track when it is properly balanced without any issues. • If no, you will need to try different motors and propellers to create additional thrust to move your vehicle OR decrease the mass of your vehicle OR decrease the width of your vehicle to decrease friction between the sides of your vehicle and the side rails.
2.a	<p>Is your car getting stuck in the track?</p>	<p>Is your car too wide? Is it hard to slide up and down the track without the motor on?</p>	<p>See 1.d</p>
2.b		<p>Is your car tilting or twisting in any way when you turn on your motor? This may be causing your car to twist in the track and wedge itself between the side rails.</p>	<p>See 1.c</p>
3.a	<p>Is your car capsizing or tilting to one side?</p>		<p>See 1.c</p>