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- **Adjust left front and right rear to get you in to the corner.**
- **Adjust right front and left rear to get you out.**
- **Adjust stagger for the middle.**
- **Push (tight) means too much rear bite.**
- **Loose means too much front bite.**
- **If you're pushing, move the seat forward.**
- **If you're loose, move the seat backward.**
- **If you have right front camber of -2.5 and go to -3.0 what is the affect? If the kart was tight, the kart will now be freer. If the kart was right, it will now be loose.**

Track Conditions

Cool, wet, soft tracks normally like lower left side weights as well as lower cross weights.

Harder fast track conditions normally yield higher corner force, which requires more left side, and / or more cross.

On flat track:
- Less rear percentage
- More left side percentage

On banked track:
- More rear percentage
- Less left side percentage

Pushes entering corner

Understeer - Too much rear end grip

Increase left front camber (more positive)

Increase right front caster

Decrease front track

Decrease right front stagger

Softer right front compound

Harder right rear compound

Wider right rear wheel

Decrease right front air pressure

Increase right rear air pressure

Increase right rear stagger in 1/8" - 1/4" increments

Move left front wheel out

Move right rear wheel out 1/4" at a time

Move left rear wheel in

Move rear track to right

Increase left side weight

Decrease cross weight

Decrease rear weight percentage

Increase front weight in .25% increments

Move seat forward

Check toe out

Tight in center of corner

Increase air pressure in the left front 1/2 lb. at a time

Move left front out 1/8" - 1/4" at a time

Reduce air pressure in the right front 1/2 lb. at a time

Increase air pressure in the left rear and right rear 1/2 lb. at a time

Try the same compound tire on a narrower wheel.

Pushes leaving corner

Decrease right front camber

Increase left front caster

Increase nose weight

Decrease cross weight 1/2%-1% increments

Harder left rear compound

Harder right rear compound

Decrease front stagger

Move left rear wheel out 1/4"-1/2" increments

Move right rear wheel out

Move rear track to right

Increase rear stagger

Increase right rear air pressure

Widen the front wheel width

Stiffen rear of chassis

Increase air in left front

Increase air in right rear

Decrease air in right front

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Decrease air In left rear
The change that's making the difference is a reduction in cross weight. These changes either decrease left rear - right front loading, or increase left front - right rear loading, all resulting in lower cross.

Loose entering corner

Oversteer - Too much front end grip
Rear is loose
Decrease nose weight in 1/2% - 1% increments
Increase rear weight
Increase cross weight
Decrease left side weight
Decrease left front camber (more negative)
Less right front camber (more positive)
Decrease left front caster
Increase right front stagger
Decrease rear stagger in 1/8" - 1/4" increments
Move right front wheel out
Move left front wheel in
Move right rear wheel in
Move left rear wheel out
Move rear track to left
Move seat back
Raise center of gravity
Harder right front tire compound
Decrease right rear tire pressure
Softer right rear compound
Narrower right rear wheel
Stiffen front of chassis
Check toe out

Loose in center of corner

Decrease air pressure in left front (1/4 - 1/2 lb. at a time)
Move left front in (1/8" - 1/4" at a time)
Increase air pressure in left rear and right rear (1/2 lb. at a time)
Move right rear in as close as possible

Loose leaving corner

Too much front end bite
Increase right front camber (more positive)
Decrease left front camber
Decrease right front caster
Softer left rear compound
Move left rear wheel in 1/4"-1/2" increments
Move right rear wheel in
Move rear track to left
Increase cross weight 1/2%-1% increments
Increase rear weight percentage
Decrease right rear tire pressure
Increase front stagger
Decrease rear stagger
Raise center of gravity
Raise rear of kart

Very loose or four wheel drift

Decrease left side percentage
Increase cross weight
Raise seat for more weight transfer
Softer compound for more traction
Softer right rear tire compound
If softer compound unavailable use new uncut tires over cut tires
Decrease right front tire pressure
Decrease right rear tire pressure
Decrease right rear stagger
Reduce air pressure all the way around (same amount each tire)
Move front and rear wheels in
If you start out with this condition and are 10" wheels, go to 9.5"
Increase castor on both right front and left front in equal increments

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No grip in corners

Other karts are faster in corners
Too little grip/speed too fast
Too much slide
Loss of time in corner
Raise seat
Move front track out
Move rear track in
Adjust tire pressures

Bogs down in corners

Unstable, hops and loss of time
Too much grip
Right rear tire overloaded
Move front wheels out
Move right rear wheel out
Move rear track to right
Increase front and rear stagger
Increase left side weight
Lower cross weight
Increase rear weight
Lower seat
Increase right side air pressure
Harder tire compound

Much slower in the straights

Gear ratio too short
Wrong driving line in previous corner
Take off a few teeth
Evaluate driving line
Check carb settings

No short distance acceleration

Gear ratio too tall
Wrong line in previous corners
Evaluate driving line in corner
Add a few teeth
Check carb settings
Check kart setup

Loose in the rear (oversteer)

Wider front track
Narrower front tires
Harder compound in front
Narrower rear tires
Wider rear tires
Softer compound in rear
Higher air pressure in front
Lower air pressure in rear
Move weight to rear
Decrease stagger
Loosen rear bumper
Increase frame flex

Pushing (understeer)

Narrower front track
Wider front tires
Softer compound in front
Wider rear track
Narrower rear tires
Harder compound in rear
Lower air pressure in front
Higher air pressure in rear
Move weight to front
Increase stagger
Tighten rear bumper
Decrease frame flex

Bite: Front, left, cross weight

To increase bite:
- Increase nose weight
- Decrease left side weight
- Decrease cross

To decrease bite:
- Decrease nose
- Increase left side weight
- Increase cross
- Tight kart has more rear grip than front
- Loose kart has less rear grip than front
- Stiff chassis is tight
- Stiff chassis transfers more weight
- Flexible chassis is loose
- Flexible chassis transfers less weight

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Tires

Sidewall:
- Stiff sidewall for hard track
- Soft sidewall for soft track

Screwdriver test:
- Blade all the in track = 22
- Blade in 1/2” = 33
- Blade in 1/4” = 44

Hardness:
- Hard tire for abrasive track
- Soft tire for not abrasive track

Air pressure:
- Less available grip = less air
- More available grip = more air

Rear stagger:
- Pushes rear of kart in corner

Tighter turning radius, more stagger
- Wider turning radius, less stagger

Front Stagger:
- Controls weight transfer across front of kart
- Less stagger = quicker transfer
- More stagger = slower transfer

Increase or decrease weight percentages with tire pressure

Very little changes required in tire pressure and stagger as small as 1/4 lb. to 1/8” stagger to notice performance change

Let air out of mounted tires after racing. When air is left in mounted tires they will grow larger in diameter especially in warm and/or sunny locations.

A properly treated tire compound will show grain but no feathering/ shredding. It will pick up .3 to .4 in 5 to 7 laps and maybe another .1 through the run

If your tires are gaining .7 to .8 through a run and level off in the last 5 laps, your compound is right but your chemical is not aggressive enough

If your tires are still picking up at the end of the run, you have too much compound

If your tires feather but don’t fall off on the clock, you have the right compound but to much chemical

If your tires feather and fade on the clock, your compound is too soft

When the kart is locked down to the track or your tires are showing signs of wear, they are too soft

If you time other classes when you’re not racing and the track is getting quicker, it is time to go to a harder tire

If the track is getting slower, it’s time to go to a softer tire

Durometer readings from Burris

The durometer readings below are taken with a lab grade durometer at 70 F with 20 psi in the tire

SS-55 = 62 - 64
SS-44 = 54 - 56
SS-33 / DXA = 50 - 52
SS-22 / DXB = 42 - 44
SS-11 / DXC = 32 - 34

Air pressure

Higher air pressure loosens chassis:
- Less bite (looser)
- Same effect as harder

compound
Tire wears in center
Lower air pressure tightens chassis:
More bite (tighter)
Reduce loose condition
Same effect as softer compound
Tire wears on outside edges
The bigger the split, the freer your kart.
Left: 4-10 lbs.
Right: 5-12 lbs.

Higher air pressure

Left front:
Helps kart turn in center of corner
Right front:
Less turn at the center of corner
Left rear:
Loosens from center of corner out
Right rear:
Less bite at center of corner and exit

Lower air pressure

Left front:
Less turn at center of corner
Right front:
Turn better at center of corner
Left rear:
Tightens from the center of corner out
Right rear:
More bite at the center of corner and exit

Stagger

Rear stagger is used to make the left and right rear tires correspond with each other so the castor doesn't have to completely lift the left rear.
The kart will want to turn left at a greater degree as stagger is increased.
Front stagger: 1 1/4" to 2"
Rear stagger: 1/4" to 1"
Starting point:
Front: 1 1/2"
Rear: 3/4"
Rear stagger helps kart turn
Increase rear stagger for tighter turns
Decrease rear stagger for wider, more sweeping turns.
Too much stagger can create too high inside tire temperatures
Too much rear stagger causes a scrubbing effect and increases rolling resistance
Front stagger is commonly increased or decreased to change cross weight
Increases in front stagger will create more negative camber in both wheels

Balancing tires

Mount tire on the balancer and let it roll to a stop.
Mark a spot on the tire 180 degrees from the heavy spot.
Estimate how much weight it will require to balance.
Tape weights in place using duct tape.
Rotate tire until the weight is at three (or nine) o'clock and observe which direction it wants to rotate.
If the weight wants to rotate back to 12 o'clock. add more weight.
If it wants to rotate to 6 o'clock, take some off.
Do this until you can rotate the tire to three or nine o'clock and let it go and there is little or no movement.
Peel off the adhesive strip and permanently attach the

weights to the wheel.
Place duct tape over the weights for safety.

Stretching tires

To stretch start with more air, first 30 to 40 psi for an hour and if that doesn't work about 60 psi for longer (up to days). Take it slow, try not to overshoot. After you get them sized, check them every few days to make sure they haven't moved. If they do, work on them some more. You need to check them each week.

Front track

If kart is not turning into the corner properly:
Widen the front on each side to reduce the front end slide (understeer) causing the steering to be more direct.
Narrowing the front track will make the steering less responsive.
- Wider front track is tight
- Wider front track steers harder
- Wider front track transfers less weight
- Wider front track makes rear bite more
- Narrow front track is loose (more bite)
- Narrow front track steers easier
- Narrow front track transfers more weight
- Narrow front track makes rear bite less

Rear track

Move rear wheels in for more grip
Moving rear wheels in will make front bite less (push more)
Move rear wheels out for less bite
Moving rear wheels out will make front bite more (push less)
- Wide rear track is loose
- Wide track transfers less weight
- Narrow rear track is tight
- Narrow track transfers more weight

Left front (Timing)

Increase air pressure:
- Frees chassis at apex

Increase camber:
- Starts rotation sooner

Increase caster or move wheel out on spindle:
- Speeds reloaded chassis center off

Raise spindle & reset cross:
- Slows weight transfer across the kart

Tire choice:
- Determined by track conditions

Controls amount of left front use

Left rear (Timing)

Increase air pressure:
- Reduces contact patch and slightly decreases stagger

Move out on axle:
- Slows rate of transfer
- Frees kart coming out

Tire choice:
- Determined by track conditions

Controls amount of left rear use

Right front (In charge of turning)

Increase air pressure:
- Decreases front grip on entry

Increase camber:
- Controls contact patch across the tire

Increase caster:
- Controls amount of weight transfer to right front

Pull out on spindle:
Reduces amount of weight transfer to right front
Raise spindle & reset cross:
Increases rate of weight transfer across front of kart
Tire choice:
Determined by track conditions

Right rear (In charge of rotation)

Increase air pressure:
Decreases contact patch
May change stagger
Move out on rear axle:
Decreases weight transfer to right rear
Tire choice:
Determined by track conditions

Wheel placement

Moving wheel out from frame:
Left front:
Helps turning in center of corner
Right front:
Increase in cross weight speeds steering.
Left rear:
Less bite
Frees it up off corner
Right rear:
Less bite in center of corner
Moving wheel into frame:
Left front:
Tightens from center out
Right front:
Slows steering reaction
Left rear:
Tightens from center of corner out
Right rear:
More bite in center of corner

Small wheel circumference

Left front:
Smaller will increase the cross weight which effects kart ability to turn in and exit
Right front:
Less turn into the corner
Helps keep kart behind you
Keeps kart from becoming loose in rear
Left rear:
Turns better into corner
Helps from getting push in middle of corner.
Right rear:
Tightens kart entering into corner

Large wheel circumference

Left front:
Will decrease cross weight
Right front:
Tightens kart, increase cross weight
Left rear:
Less turn into corner
Rear tight
Too much could cause push

Bearings

Worn bearings at the spindles or hubs in the front end can affect castor / camber and the overall handling of the chassis, it can mask a problem that no changes will cure.
Neglected rear axle bearings can rob the engine of horsepower that could be sent to the rear wheels instead.

Toe in / toe out

Vital to the driveability and speed on the straightaways
A scrubbing front track will make the tires heat up faster

and diminish speed when driving straight.

Toe settings from 1/16 to 1/8 of an inch out seem to be adequate and help the kart turn in quicker.

Cross

Moving rear axle down toward track raises chassis up = raises cross

Move rear axle up to decrease cross

1 turn of rear screw = 1 percent change in cross

Lower right front spindle to increase cross

Raise right front spindle to lower cross

Lower left front spindle to decrease cross

Raise left front spindle to increase cross

Increase front stagger to increase cross

Check toe and camber after changing washers

Low cross low stagger setups work good for long hairpin tracks - tracks where you can make up more time on the straights than you can in the corners.

Say 50% is neutral. If you put the left front down = more weight on it, that will lower cross. That puts less weight on the right front. That would be the same as raising the right front.

If you raise the right front you will take pressure off of the left rear.

Raising the right front will take weight off of that corner and the left rear corner.

Ballpark left rear weight

To come up with a ballpark left rear weight, multiply right weight x left side%. This is how much your left rear should weight. Adjust cross to get there.

Camber

After finding your setup numbers, paint the top flat of the camber nut for reference when making changes. One flat = approximately .1.

Changing camber on RF

Yellow on top flat = -2.5

Turn outer nut toward back for more negative camber.

Turn outer nut toward front for more positive camber.

Changing camber on LF

Yellow on top = + 1.2

Turn outer nut toward back for more positive camber.

Turn outer nut toward front for more negative camber.

Caster

More caster (both sides) will make the front end jack more weight and thus, make it grip harder.

Less caster (both sides) will make the front end jack (transfer) less weight and therefore, make it grip less (tend to push).

More caster split (more in right front than left front) will make the kart want to turn into the corner on its own. If there is too much caster split in the

center, the kart may want to push because the left front isn't de-wedging the kart enough with respect to the right front to free up the left rear.

Less caster split will make the kart more responsive to driver input getting in and in the center but may either A) make the kart too twitchy or B) make the kart bind up because its not wanting to travel the corner radius as much on its own.

A good rule of thumb for caster split is 2 degrees. Some manufacturers run more but, with the high cross weights being run these days, the right front is so much more pre-loaded than the left front that more caster split isn't generally needed to get the front end to turn left on its own.

Too much caster split is worse than not enough as it will tend to make the kart want to be pushy lazy getting in and through the center of the corner.

Rule of thumb: 2* split. Never run less than 8* on the right front (high biting track) or more than 13* on the right front (low biting, slow track).

Starting point percentages

	Low cross kart	High cross kart
Left side	55 - 56 %	54 - 55%
Cross weight	53 - 54 %	59 - 65%
Front	44 - 45 %	44 - 46%

Nothing can work correctly without proper percentages, settings and a well-balanced chassis. Your first successful race starts on the scales, the information you obtain on the scales is directly related to your success on the track. Notes should be taken at this time using different air pressures and how it will change the cross weight. Front to rear and left to right weight has to be changed by moving the seat or moving added weight.

Although driver comfort is first, close attention to the VCG (vertical center of gravity) is important. The VCG is changed by the seat height and can effect the dynamic weight transfer while cornering. A higher VCG will require a higher left side percentage most of the time to control side bite of the right side tires. A lower VCG has the opposite effect.

Gearing Info

Gear ratio is rear sprocket divided by driver. It multiplies the engine's torque by the ratio and divides the axle speed by the ratio.

The higher the number in the ratio, the more torque (acceleration). A 5.00:1 ratio has more torque than a 3.00:1 ratio

The smaller the number, the higher the potential top speed. A 3.00:1 ratio will go faster than a 5.00:1 ratio at the same engine rpm.

The bigger the driver with the same gear ratio, the more inertia the kart will have. It will resist

acceleration more than the smaller driver but will also resist deceleration.

1 tooth on the driver = 3-5 teeth on the rear sprocket, depending on where you are on the ratio chart.

Larger driver = higher top speed, but harder to get up to speed

Smaller driver = more pull off corner, but less high speed

Smaller driver = more RPM

Larger rear gear = more RPM

Larger rear gear = more pull off corner

1 front gear = 3 rear gears

Add 1 driver gear to drop RPM

Each rear gear = 100 RPM

1 driver gear = 400-500 RPM

If track gets faster - drier - more grip, drop teeth in rear and go up in air

If track gets slower - less grip, add gear in rear and drop air

Larger track use a larger driver

Change rear gear to keep gear ratio
13 driver to rear = 4 to 1
15 driver to rear = 4 to 1

If you are flat footing it, keep taking some gear off the rear until your lap times slow down. You should end up with more top end

Lead weight positioning

Fit lower down for bigger driver and higher up for small driver

Heavier driver should secure weight to sides of the seat to keep the kart balanced

Mount weights more toward front for better front end grip, and to back for better rear end grip

In the wet have the weight as high as possible to achieve better grip all around

Jetting

The main jet affects the carb at all RPM's. After selecting the correct jet (48-50) adjust performance with EGT. If not available use CHT to adjust with mixture screw.

General rule of thumb:

Rich-out on mixture screw helps bottom end pulling power

Lean-in on screw helps top end max RPM's.

Lean = higher CHT

Rich = lower CHT.

Shoot for 385-410 degrees

If your engine cuts out at the end of the longest straight or appears sluggish in the mid range, decrease the jet size.

When the air contains more moisture (humidity), there is less oxygen to burn. Thus you need less fuel = smaller jet.

Clutch adjustment

Spring tension, lever weight and air gap affect the stall speed or clutch slip.

You need to know what RPM your engine produces its maximum torque. This is the RPM at which you want your clutch to engage.

Stiffer springs achieve higher stall speeds (more clutch slippage).

Change the spring height by turning the bolt clockwise, which will increase the tension on the spring and raise the stall speed.

The more weight on a lever, the faster it will engage the clutch.

The levers are controlled by the springs. The more weight you put on the lever, the faster the lever can overcome the rate of the spring and achieve lockup.

Fine tune the clutch by adjusting the springs or the lever weights.

Air gap, measured with a feeler gauge, is the distance between the clutch discs.

Air gap affects stall speed. The greater the air gap, the further the pressure plate must travel to compress the discs and engage the clutch.

Air gap has the least affect on the stall speed.

If the air gap becomes too great, the clutch cannot fully lock-up and can chatter.

Minimum air gap would be .030.

Maximum air gap .060.

Air gap .040" to .050" is ideal.

Use floater discs in various thicknesses to keep the desired air gap at a constant amount.

Clutch cleaning

Remove clutch basket and sprocket from the clutch.

Soak all of the remaining parts in acetone for 5 to 10 min.

Blow the disks dry with clean air.

Repeat the above a couple of times.

Remove all the contaminates possible.

When reinstalling the clutch, put no lubricant on the thrust bearing and only enough grease on the sprocket bearing to prevent it from locking up.

Use petroleum jelly. Don't use a hi-temp lubricant. The smallest amount can get on the disks.

On the grid, put your foot on the brake and flat foot the throttle for 5 - 10 seconds. Wait 1/2 a minute and repeat. Do this 5 or 6 times, or until you start to feel the clutch "hit" harder. This process burns out the contaminates.

Repeating the process several times brings heat slowly into the steel parts which prevents distortion. Some smoke coming off of the clutch during is evidence of contaminates burning off.

What does a fast kart feel like?

Bite

To get everything working you have to get a good entry.

Front must snap, almost to the point of being loose if the driver “yips” at the wheel to initiate weight transfer

Weight must transfer pushing the driver into the right side of the seat, loading the right side tires and unloading the left

Kart must not slide at the apex

The steering wheel may feel

heavy

Flex and Pivot

The driver should feel…

The seat pushing hard into your side

The left side unloading and moving up

The right side loading and moving down

The kart rotating at the apex

After rotation the steer effort should go down and the kart should begin to accelerate (the earlier after the apex the better

Center Off

Once the kart has navigated the apex at maximum speed and pivoted, you have to get the best run possible off the corner.

The front end should still remain positive

The left rear will begin to reload and the kart should feel "alive" (as in not flat or dead)

The kart shouldn't feel dead (LR overworking) or boggy (RR overworking)

Questions to answer to make the kart faster

How does the kart feel?

Can you still drive it if it is freed up a little more, or does it feel like the kart is sliding?

Does the kart feel faster at the beginning or the end?

Did it get tighter or looser the longer you ran?

Do you have to turn the steering wheel a lot or just a little bit?

How far is that?

How is your kart compared to (some specific kart)?

Where is he faster than you?

Where do you think you are catching him?

How does your motor feel?

Is it still getting faster when you're into the corner or does it level off on the straightaway?

Does it feel fast coming off the corner?

If you could be better at one point on the track, where would it be?

If you could change one thing about how it is driving what would it be?

Can you keep up coming out of the corner?

Could you drive under someone getting off the corner if there was a chance?

Some advice Randy Major and some from Todd Godwin: www.dynamicsofspeed.com

- Always start with a good baseline and don't veer too far from it; you'll always be faster in the end

- Never run a 2 lb split with tire pressures

- Don't overanalyze things. Karting is very complex and most of the "conventional wisdom" answers are wrong. A theory may seem logical but often the more logical solutions that people come up with are incorrect (I've had about 3 tons of my own theories proven wrong because I simply didn't have a good enough understanding); if you truly want to understand you'll have to do lots of reading (which isn't too difficult) and you'll need to work with one or two of the most experienced, best drivers in the business (this is far more critical than

all the reading)

- Keep it simple, use as few adjustments as possible. With every adjustment there is just as great of likelihood that you'll go the wrong way as the right

Please Note:
I've accumulated this information from many different sources, many of them from Bob's 4-cycle and other places on the Internet. I thank everyone who supplied this information for the use of us beginners in karting. Since the information came from many different sources, some of it may or may not be correct or may conflict with something else on the list. If something you change doesn't work, try something different. Good luck!