SETUP MANUAL

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BASELINE CHASSIS SETUP

The baseline setup is defined as the zero point from which all changes are made and described from. It is basic and repeatable. It is documented, and changes can be made to it, with the purpose of recording the results gain (or loss) in performance. When the setup is changed, it should be in reference to this point.

MATERIALS

- Two framing squares, measuring approximately 12″ X 12″
- 8′ tape measure
- Setup blocks (these can be made from wood or any material) 1-3-3/4″ tall (REAR). 1- 1-7/8″ tall (LF). 1- 1-3/4″ tall (RF)
- Basic wrenches, 2- 9/16 end wrenches, 2-3/4, 2-15/16 and a 1/4" allen wrench
- Rubber mallet/hammer
- Floor Jack
- Air pressure gauge
- Angle finder/gauge
- Toe plates (or paint & scribe to mark center of tire)
- Setup sheet
- Scales

PROCEDURE

Follow these steps in the order listed to properly setup your Bat Wing Chassis Outlaw Mini Mod car. These are standard base line setup guidelines with some valuable info added in each section. Please take the time to read and understand thoroughly. Feel free to contact me with further questions.

#1 SQUARING FRONT AXLE

Place setup blocks between front axle and frame. First- set the front panhard bar clamp height on frame, the bottom edge of the clamp should be at the top edge of the front axle. Next- located the front axle laterally (side to side) With the setup blocks under the front axle and the front wheel hubs pointing straight ahead, measure from the inside face of the hub to the chassis frame rail on both sides (right & left). Adjust the front panhard bar length until the distance is equal on both sides. This means the axle is centered in the chassis. Now the front axle can be squared off of the chassis tube located directly below the front axle. Set the front axle so it is parallel with this frame tube. Do this by lengthening or shortening the control rods that locate the front axle in chassis. This means the front axle is square and parallel to the chassis, now we square everything off the front axle from this point forward. Tighten the panhard bar clamp. When tightening the panhard bar pinch clamp, make sure the clamp is in line with the bar and not at an angle. *Always tighten the bolt going through the rod end first, then the clamp bolt to avoid breaking or stripping out the clamp.

#2 SETTING CAMBER

Camber is the amount the wheel tips in or out. Negative camber is the amount the wheel is tipped inward. Positive camber is when the top of the wheel is tipped outward. To adjust this you will move the jam nuts in or out on the two 5/8" rod ends that hold the spindle. These require a 15/16" wrench. You can adjust the upper or lower or both to achieve the proper camber degree. Check at ride height & with both front wheels pointing straight forward.

LF- 0 (straight up & down) RF- -2 degrees (top of wheel tipped in)

#3 SETTING CASTER

Caster is the amount the upper ball joint/rod-end is ahead or behind the lower one. Positive caster is when the upper rod-end is behind the lower, and negative is opposite (upper rod-end is ahead of lower). To set this correctly you must start by setting the right front caster FIRST. We do this by lengthening and/or shortening the upper and/or lower control rods. **Remember when doing this that it will affect the squaring of the front axle, so take that into consideration and adjust accordingly.** Next- set the left front caster. Do this by sliding the upper rod end forward or back in the slotted adjustment hole. Use a rubber mallet to tap the rod end forward or back. You can measure this angle multiple ways. One way is to use an angle finder on the vertical portion of the spindle shaft, or you can use a straight edge up against the threaded area of the upper and lower rod end in conjunction with an angle finder. (Less caster makes the car wander going down the straight-away, but also makes it easier to turn. More caster makes car hold a straight line, but also makes it harder to turn)

LF- +2-4 degrees RF- +2 degrees

#4 SETTING TOE

Toe is the term used to describe the direction the front wheels point relative to each other. To set the toe you can use “toe plates” (two plates with slots to hook a tape measure on the front and back side of the wheel) then measure the distance on the front side of the wheel and the back side of the wheel at the same height. Set this distance at- 1/8” – 1/4” toe out for bigger long straightaway tracks. 1/4”- 1/2” toe out for smaller tighter corner tracks. Adjust this distance with the long tie rod bar that connects the two spindles. If you do not have “toe plates” You can spin the front tires and paint a line in the center, then use a scribe to mark a straight line on your paint mark, then pull a measurement from line to line in the front and rear of the tire. Small amounts of toe variation does not have any significant handling effects on the chassis. However stay away from toe in. Up to 1/2” of toe out can be used without any noticeable change. More toe adds more drag down the straightaway.

#5 SETTING PULL-BAR & REAR PANHARD BAR

The pull-bar is on the right hand side of the motor. (this bar holds the rear-end/ motor in the car front to rear) The pull-bar plate is mounted to the right side of rear-end housing. The pull-bar should be bolted into the middle hole (4th hole down from top) of the pull-bar plate. This bar then connects to a slide clamp on the chassis directly ahead. To set the angle of this, use an angle finder on the top side of this bar. Set at 7-8 degree down ward angle. So the front where the slide clamp is will be lower than the rear/back. Use a rubber hammer to tap up/or down to get angle correct, then tighten 1/2’” bolt through rod end first, then 1/4” allen pinch bolts. Next- set **panhard bar plate** angle to 7 degrees. This is the plate that bolts to the right front side of rear-end housing and the panhard bar bolts to it. To check this angle place an angle finder on the top side of this plate. To set/adjust this angle you will lengthen or shorten the **pull-bar** (which you just set the angle of) Lastly- set the **panhard bar** angle. (this is the bar that holds the rear-end in the car laterally/ side to side) This bar should be bolted in

the 2nd hole up from the bottom on the panhard bar plate, and connects to a slide clamp on the left hand side of the chassis behind the driver. To set the panhard bar angle use your angle finder on the top side of bar, then use a rubber hammer to tap slide clamp on frame up or down to achieve a 7-9 degree angle. (slide clamp on frame should be higher than panhard bar mounting location on plate for correct angle) *Remember when raising or lowering the panhard bar that it will not only change the square ness of the rear-end but also the wheelbase slightly. So be sure to **recheck** those measurements again.*

#6 SQUARING REAR-END & MEASURING WHEELBASE

Before the rear-end is squared, set the rear end placement side to side. This is done by lengthening or shortening the pan hard bar. You want to line up the two main frame rails of chassis with the two bearing plates on rear-end housing. The rear-end housing should be centered between the two frame rails with car at ride height. Once this is set, you can use a straight edge off the brake rotor ahead to the chassis and make a mark on the frame for a quick reference point moving forward. Next- measure/ set the wheelbase. This is done with two squares and a tape measure. (this is most easily done with two people, one in front and one in rear of car.. it can be done alone, but you will need to get creative with a way to hold one of the squares) Set the front square up against the front or rear side of front axle (doesn't matter) towards the outside section of the front axle, between shock mount and spindle plate. Set the rear square up against the back side of the birdcage housing. Car should be at ride height and squares should be flat on the ground and up to front axle and birdcage in rear. Now pull a measurement on each side of the car (right & left) between the two squares. Adjust the wishbone adjusters (on the front side of wishbone there is a turnbuckle adjuster to easily lengthen or shorten each side) until the wheelbase is EVEN/EQUAL on both sides. Now the rear-end is square to the front axle AND square to the chassis.

#7 SHOCKS & SETTING RIDE-HEIGHT

Front Shock- The front shock mounting location is pre-set on the chassis of 2016 and newer cars. (for instructions on how to set the front shock clamp on pre- 2016 cars, follow the guidelines outlined in setting rear shock clamp location listed below. This info will translate to the front also) Adjust the threaded coil-over portion of the shock up or down until the ride height blocks just slide freely between the front axle and frame. Check this on both RF & LF.

Rear Shock- Here we will set shock travel & angle. On the RR shock, you want the top of the shock tilted inward between 8-10 degrees. As the chassis rolls over in the corner this angle decreases, so you want it angled in so you are on top of the spring as the car rolls over. If it is straight up at ride height, when the car rolls over going into the corner you are actually taking spring rate away form that tire, or springing OFF the RR (not good) Next you will set the travel of the shock. To do this- raise the chassis a bit to reduce spring tension, slightly loosen 1/4" allen bolts and 1/2" shock bolt then tap the slide clamp up/or down on chassis mount. On the RR shock, set the clamp so there is approximately **4"** of shock shaft showing/ extended out of shock body. Now remember this needs to be set at ride height, so you will need to adjust the coil spring adjuster to hold the car at the correct ride height, then also adjust the shock slide clamp to achieve the correct amount of shock shaft showing/ or shock travel. **This most likely will require a few tries to get set correctly**. Check at ride height and if correct, tighten all bolts. Repeat this procedure for the LR shock, BUT you will only want approximately **2"** of shock shaft showing on the left side. Set the LR shock angle straight up and down.

Pre-2016 cars- with slide clamp front shock mounts. You want to set the shock clamp on the LF so there is approximately 2" of shock shaft showing, and the RF with approximately 4" of shock shaft showing.

#8 SCALING

Now you are ready to scale the car. If everything is set correctly the car should be very close when put on the scales. To achieve the correct scale numbers, **ONLY turn the front two coil overs! NEVER the rear!** With the engine mounted on the rear axle the car has almost 75% rear weight, so turning the rear coil overs does not change the scale numbers like it does when you change the front. You will end up messing up the ride heights and literally chasing your tail. Usually 1-2 turns in or out of the front will bring the car right in where it needs to be. 1- turn "in / or down" on the RF translates to approximately 5# of weight to be transferred to the LR wheel. And vice-versa on LF. And/ or taking 1-turn "out / or up" will reduce the wheel diagonally to it by 5#. Scaling the car can be useful in detecting binds in the chassis caused by bent or bad rods or rod ends, bent shocks, or bent axles. First scale your car after the setup procedure is complete and record all the numbers and exact setup used. Then rescale the car after any major crash or suspension altering, or if the car handling significantly changes. Compare the numbers and adjust from there. Use scaling as a diagnostic tool.

SCALING PREPARATION

- The chassis must be in a race ready condition with all bolts tight and components in place. Make sure there are no bent rods, rod ends, spindles, shocks, axles, hubs. Make sure all rods/hiem ends move freely with no bind thru out suspension movement. Choose a flat level surface-preferably use the same spot each time you scale & check setup.

- For scaling purposes start with front hubs centered on spindle. (1- ¾" Spacer on outside of hub, 1- ¾" Spacer on inside of hub, and long spaced on very inside)

- Make sure car is full of fuel. (Make sure car has appropriate weight plates under seat for drivers weighing less than #150) **Car is scaled WITH-OUT Driver**

- If car is equipped with RR Spacer Kit- Start with hub in Center location.

- **Air Pressure-** As a general rule; only vary tire pressure (2-8psi) with track conditions. More tire pressure will be used on a tacky track. Tire pressures control the spring rate of a tire. The tire spring rates work exactly like the spring rates on the chassis. More tire pressure or stiffer spring rates on the right side of the car will make it looser. More tire pressure or stiffer spring rates on the left side of the car will make it tighter. A common misconception is that taking tire pressure out of the LR will tighten the car, when actually the opposite is true. Not only does more left rear tire pressure make the LR spring rate stiffer, but it also adds static weight to the LR because it raises the car on that corner and takes away stagger because adding tire pressure will always make the tire larger in circumference.
    - LF- 10 RF- 10
    - LR- 10 RR- 12
    - Use these pressures as a constant when setting-up & scaling car

- **Stagger-** Stagger is the difference in circumference between the left and right side tires. Circumference is the distance around the outside of the tire. Check stagger by using a small thin tape measure and wrapping it around the tire for measurement. Always set tire pressure first. It is good practice to measure all tires at one set air pressure. Make adjustments to stagger based on track size, condition and driver preference. **Prestretch** new tires by inflating them to 20 psi and then letting them down to racing pressures. This will help "size" the new tire before you go on the track. Always check stagger before you race. Tires are always stretching and shrinking. Tires can be **stretched** by as much as 1" by inflating them to 40-50psi, let them sit for as long as you can allow. Tires can also be **shrunk** by

removing the valve stem, sitting on them to remove all air, put valve stem back in and let them sit. This process of growing and shrinking tires can become an art and is necessary to achieve the right stagger to get the chassis to handle correctly.

  - Front- ½" - 1" (right side tire bigger then left side)
  - Rear- 3" - 4" (right side tire bigger then left side)

- **Set Ride Heights-**
  - Front ride heights are measured between front axle and frame rail.
  - LF- 1-7/8" RF- 1-3/4"
  - Rear ride height is measured between rear frame cross bar behind driver and the ground. Check this in center of car. Measurement- 3-3/4"

- **Springs-** 1-7/8" dia. 10" tall
  - LF- 120# RF- 150#
  - LR- 130# RR- 140#

- **Shocks-** Standard 6" stroke steel body shock
  - LF- 1-1 valve RF- 2-2 valve
  - LR- 2-2 valve RR- 3-3 valve

- **Scale Numbers-** You want the front wheel weights as close as possible, and the rear wheel weights within 5-10# of each other. More weight/or heavier RR wheel weight will free/ or loosen the car. More weight/ or heavier LR wheel weight will tighten the car.
  - LF- 90-100# RF-90-100#
  - LR- 255-265# RR- 255-265#

    Cross- 48-50%

NOTES

Outlaw Mini Mod Chassis Set-up Sheet

Date:_____ Track:_____ Track Conditions:_____

LF

Spring Rate_____
Shock #_____
Corner Weight_____
Caster_____
Camber_____
Tire Circ. _____
Ride Height_____
Tire Pressure_____

RF

Spring Rate_____
Shock #_____
Corner Weight_____
Caster_____
Camber_____
Tire Circ. _____
Ride Height_____
Tire Pressure_____

Front Stagger_____
Toe-Out_____

Weight Percentages

Left_____ Cross_____ Rear_____

Left Side Wheel Base_____ Right Side Wheel Base_____

LR

Spring Rate_____
Shock#_____
Corner Weight_____
Ride Height_____
Tire Circ._____
Tire Pressure_____

RR

Spring Rate_____
Shock #_____
Corner Weight_____
Ride Height_____
Tire Circ. _____
Tire Pressure_____

Rear Stagger_____
Gear Ratio- Top:_____
Bottom:_____

Notes

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Check *BOTH* axel nuts after *EVERY* race! Lube Drive Chain after *EVERY* race!

Have FUN Every Race!!