Performance Reviews By Paul Shoemaker

THE AUTO WORLD SUPER III

Greetings All! I will be contributing this and future articles here at SCI. The performance reviews will be based solely on scientific analysis, using the same tests, in the same environmental baseline, to compare the functionality and performance of various cars, track and accessories. The source of test material may come from various sources, manufacturers, mail-order or from retail hobby stores. The tests will be performed using a variety of equipment, but will stay consistent throughout. If and when tests are updated (new sensors or more accurate/granular equipment), I will post results of past articles, updated with the new tests and results. That way you will be comparing apples to apples as new items and ways to test them become available. I will describe each test in detail before posting the results.

I will work with the manufacturers to get as much direct and accurate information on their products as possible. The results will be generated by tests on the products I receive. If you see any corrections that need to be made, please contact me through SCI's private messaging service at Pshoe64.

I hope you find the articles enjoyable and a good source of information. One last note, I will concentrate on the factual test results and only offer an opinion on the product(s) at the end of the review. I will rate each section on a scale of 1-10 based on the observations and test results.

Packaging

The Auto World Super III comes packaged in the familiar cube AW has been using with other model chassis. A major difference that I appreciate is the elimination of the wire wraps on the axles. The cars are held tightly by a vacu-formed shaped piece of plastic inside the cube. This protects the car and body nicely and you don't need to have to spend 15 minutes getting your new prize out of the packaging.

Body and Appearance

I purchased 2 cars from a local hobby shop. I chose the blue and white stripped 2007 Mustang GT and the generic Dodge Charger Stock Car in yellow, silver and black. Both cars are nicely finished and well detailed. The Mustang comes with chrome 5-spoke rims, sharp detail in the body lines and clean, glossy finish on the body. It looks much better in person than what I had seen on the web. The proportion looks correct and the stance is fairly low and even across its horizontal lines. The Charger has the same 5-spoke rims in flat black. The Charger body is also well detailed with the appropriate flaps, window net and gas cap in place. There were no hood pins or air vents in the side windows, but front and rear window retaining straps and clips were in place and not too heavy in appearance. The grill, headlights and taillights are nicely done decals, all other decals are a generic #27. The only down side on the Charger body is a mold flash line in the front left quarter panel. This may be only on my car and not appear on all castings.

Both cars are cast in a light poly-based plastic. The Mustang weighed in at 6.2 grams (.220 oz.), the Charger also at 6.2 grams . I honestly thought the Charger would come in heavier. Compared to some other cars in my collection these are normal to light in weight.

The bodies mount to the chassis via the same shaped tab and slot used in other AW snap on chassis, however, they are located approximately 3mm to the rear of the chassis than other AW/AFX body mounts. This means the new bodies and chassis are not interchangeable with older designs. This will be a good opportunity for an after-market supplier to make adapter clips. The bodies fit tightly and have no slop. They are removed and snapped back on easily, giving access to the chassis quickly.

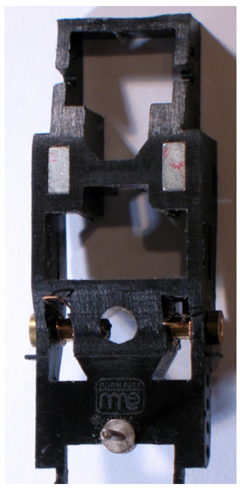
Observations and Opinion:

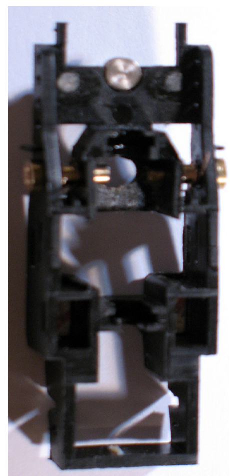
The bodies are clean, light and well made. The fit and finish are very good. The detail is excellent. I like how AW focuses on street and race cars. I would like to see a blank/white stock car option in the future or maybe some licensed paint schemes of actual cars. But if generics keep the price lower then I am happy to repaint! I'm a bit disappointed in the location of the body clip and that I can't use the bodies on older chassis or vice-versa.

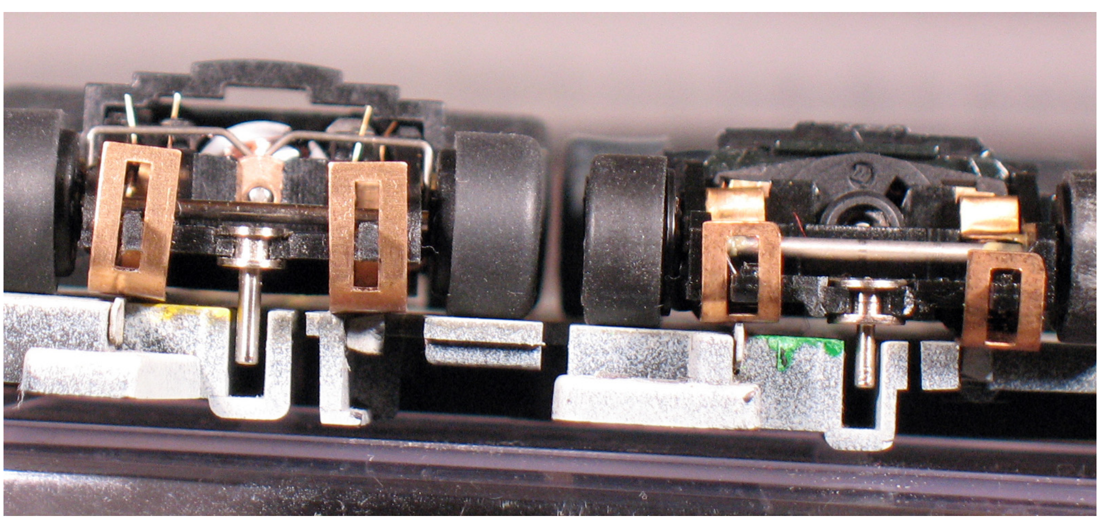
Rating: 7.5 This would have been an easy 9 if the body mounts were the same as previous X-traction offerings.

Chassis Components
Chassis

The chassis appears to be made in a ridged black plastic, possibly a delrin type material. It has a little give and flexibility, but not as much as nylon based chassis. In stock, out of the box configuration, the chassis sets .020 inches above the track. The guide pin is much longer than other offerings in the past. This is due to the upswept angle the front of the Super III chassis has. But the guide pin still sets at a normal depth in the slot as other cars (See the 2nd picture below. The S-III is on left). This upswept design allows the pickup shoes a longer length of travel. The rear of the chassis is squared off, allowing for just enough room for the stock crown gear to move without interference. The total length of the chassis is 2 1/8th inches and the width at its widest point (without wheels and body clip) is 3/4rds inches. The chassis is 7/16ths inches high, from bottom to top. The tabbed body clip is removable. I'm presuming that will be for open wheel cars sometime in the future. The armature bulkheads are integrated into the chassis assembly and are not removable. The rear axle is in a fixed location, parallel to the center of the armature (no hypoid gearing). The front axles have 4 available positions creating wheel bases of 1 3/8th, 1 1/2, 1 5/8th, and 1 3/4rd inches . The chassis weighs in at 16.2 Grams (.570 oz), is 2 1/8th inches long including PU tabs, 13/16ths inches wide without the body clip, and 1 1/16th inches wide with the body clip.



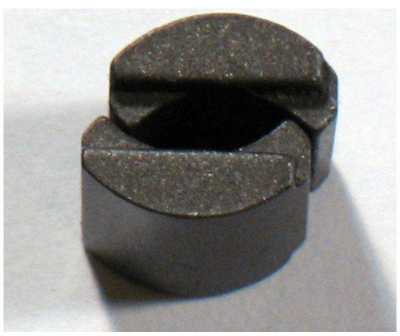


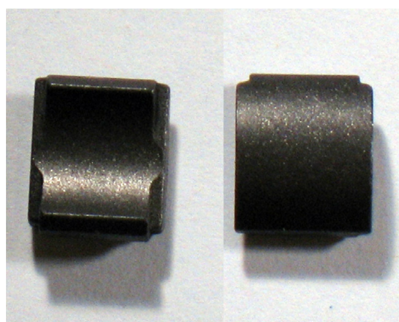


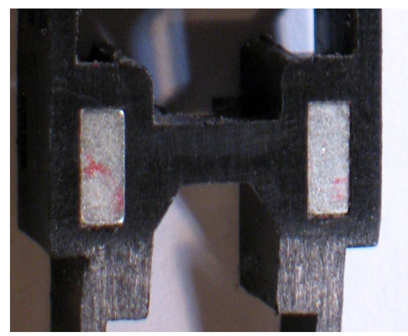
Magnets

Motor Magnets

The motor magnets are polymer units. They are concave on the armature facing side with a flat edge facing the chassis. The ends are tabbed and slide into position in bulkhead slots in the chassis that keeps them in place. The magnets and armature all slide into place together and is a bit tricky to do the first time. The magnet poles are North at the top of the magnet when viewed from the top of the chassis. The air gap to the armature is .025 inches. There are no additional shims or flux collectors on the stock unit. The motor magnets are fairly strong. They are not as strong as some after-market units I have tested, but they are close. Using the formula B=1000*(V0-V1)/k, where B= Gauss, V0 is the calibrated measure (supplied by the manufacturer) for the Hall device sensor (magnetic sensor), V1 is the measured value read from the magnet and k is the sensitivity (supplied by the manufacturer) of the Hall Device (magnetic sensor). In simple terms, the Hall device restricts or increases voltage when a magnet is near it. By measuring the voltage change you can use the formula to determine the gauss strength. I built my own device for about $20.00. It is fairly accurate and gives excellent comparative numbers. This is how I determined the strength of the motor and traction magnets. I will use this same method in future reviews so you can compare the strengths from the same testing process, apple to apples so to speak. The AW motor magnets measured 5.05 voltage increase on the North Pole of the magnets and a .06 voltage change on the South Pole. This translates to 996 and 1000 Gauss strength.







Traction Magnets

There are 2 traction magnets and they are made from neodymium. They are located in the typical area of the chassis just in front of the rear wheel location. They are located 2/3rds over the track rail, running the length of the magnet itself.   These units are press fit into the slots from the top of the chassis. They do not have any shims or flux collectors. Both cars I purchased had the magnetic poles match to the motor magnet they were next to. The air gap to the track rail (using Tomy/AFX track) was .020 inches. These magnets were very strong and compared well to after-market units. Using the same method as the motor magnets, the tractions measured at 400 gauss on both the North and South Poles. The edges of the magnet had the strongest field and was concentrated at the edges of the magnet.

Axles/Wheels/Tires

Axles

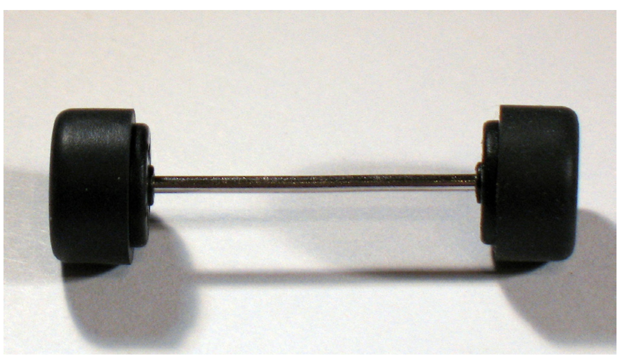
The front axle is a solid unit made from steel. There is no independent rotation of the front wheels, this is a single bar axle. They have a cross cut, diamond pattern on the ends to retain the push-on rims. I noticed a bit of rim remained on the axle after removal. This may ream the rim after several removals and require glue to secure the rim back to the axle. This is something to keep an eye on during the testing phase. The front axle is .047 inches in diameter and 1 1/4th inches long with rims and tires.

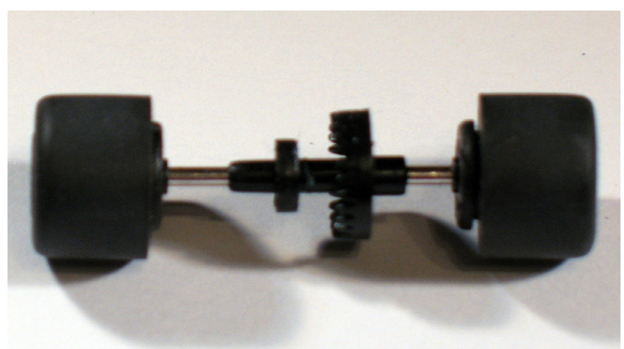
The rear axle is a solid unit made from steel. They do not have the cross cut, diamond pattern on the ends. The crown gear and pinion retainer are pushed onto a splined section, centered on the axle. The rear axle is .060 inches in diameter and 1 3/8th inches long with tires and rims. This makes the car 1/16th of an inch too wide to fit through my tech block (1 5/16th). It's easy enough to grind that much from the axle, but AW should consider changing this since 1 5/16ths rules apply to most organizations rule books.

Both axles were true and straight, even after removing the rims. The rims are solid in the front, so a standard rim remover would damage the rim and only allow the rim to be pushed on so far on the axle.

Hubs/Rims

The front rims are 5-spoke units, either chromed or black plastic on the cars I purchased. The front facing part of the rim is solid, no axle is visible. They are press on type and do not rotate independently. The front rims are .267 inch in diameter and .245 inch wide. The width includes the lip and nub that spaces the axle.
The rear rims are also 5 spoke units, either chrome or black plastic. The front facing part is also solid, no axle is visible. They are the press on type. The rims are .277 in diameter and .325 inch wide. The width includes the lip and nub that spaces the axle.





All rims were true and round, no flat spots or odd shapes. The possibility of the rims stripping from the knurls on the axle is a concern. Both rims are flanged on the inside for tire retention/position.

Tires

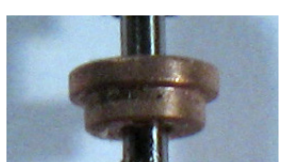
The front tires are a fairly stiff/hard rubber compound, with the tread squared on the inside edge and slightly rounded on the outward facing edge. The tire's outside diameter is .415 inches and the width is .200 inches. The tires were true and had no flat spots or flashing.

The rear tires are a bit softer than the front, but not by much. Like the front tires the tread is squared on the inside edge and rounded on the outside edge. The rear tire's diameter is .485 inches and the width is .280 inches. The tires were true and had no flat spots or flashing.

The rear tires seem to have a descent grip for stock tires. Silicones or some sili-spongies would of course improve the grip considerably. The front tires appear a bit large, lifting the chassis and the guide pin higher than I'd expect. We'll see how well that works during the testing phase.

Bushings and Bearing

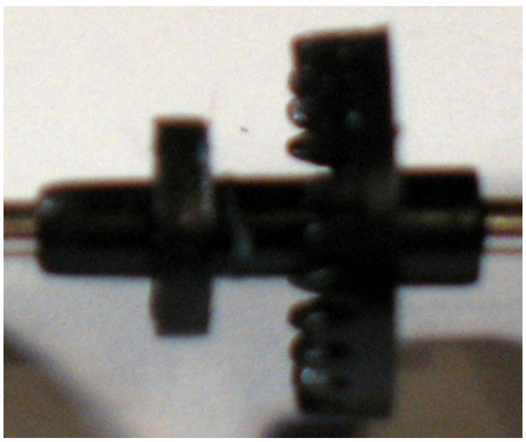
The Super III uses oil-lite type bearing on the front and rear of the armature shafts. These appear very smooth and allows for the armature to spin very freely. After removing the rear axle assembly and motor magnets, the arm spins quite freely and for a considerable duration. Very little friction is displayed. The oil-lites are kept in place with 2 retainers, a metal clip in the front and a plastic clip in the rear. The front and rear axles have no separate bushings or bearing but rely on the chassis material to ride through.   These were also fairly smooth for this type of design.

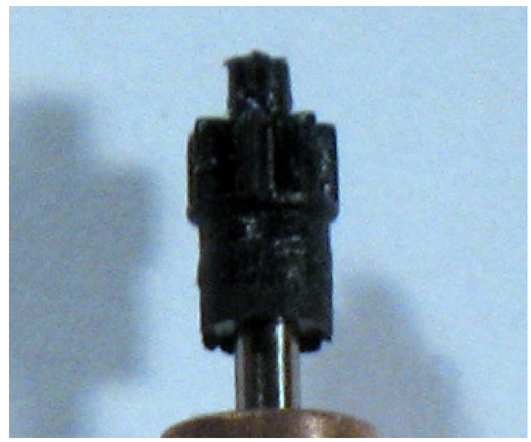


Gears

The crown gear is a 25 tooth gear, standard pitch (SAE). The material appears to be delrin or similar plastic. It is fairly rigid and the teeth are well defined. It sets well on the rear axle and has a separate retainer/spacer for pinion mesh.
The pinion gear is a 7 tooth gear, standard pitch (SAE). The material appears to be the same as the crown. The pinion also has a spacing nipple that rides along the crown spacer. The gear fits tightly on the armature shaft and shows no sign of slipping.

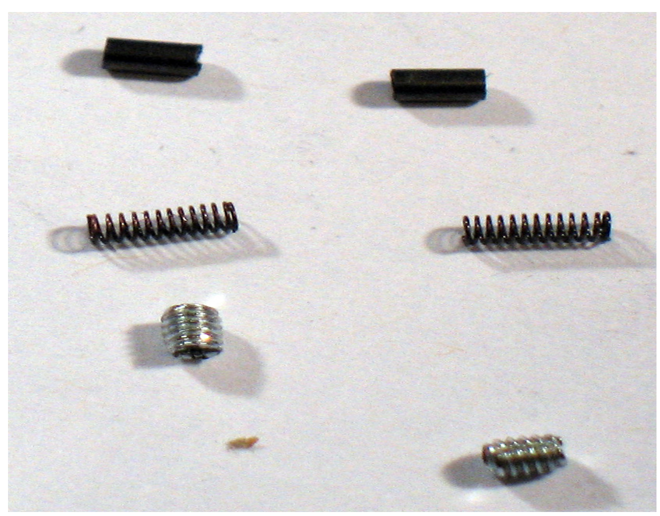
The gears mesh well. There is no sign of skipping or slippage. The spacer/retainer holds the pinion in place and shows minimal friction on the pinion gear. Both cars were well greased out of the box.





Electrical System

The brush tubes are threaded brass units. They are press fit into the chassis bulkheads. The set screw is steel and has a very small Phillips socket. The set screws appear to be stainless steel. The fit and mesh of the set screws to the brush barrel threads are smooth and not binding.

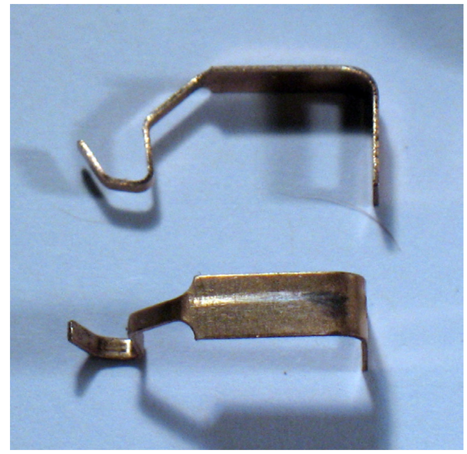


The brush springs are high tension, tight coiled steel. They appear to be very stout and would be less likely to compress under heat. The wire measures approximately .009 inches and is just shy of .25 inches long and has 12 coils.

The brushes are a silver compound and very soft. They came with the armature facing side shaped to the comm. They are approximately 1/8th inch long.

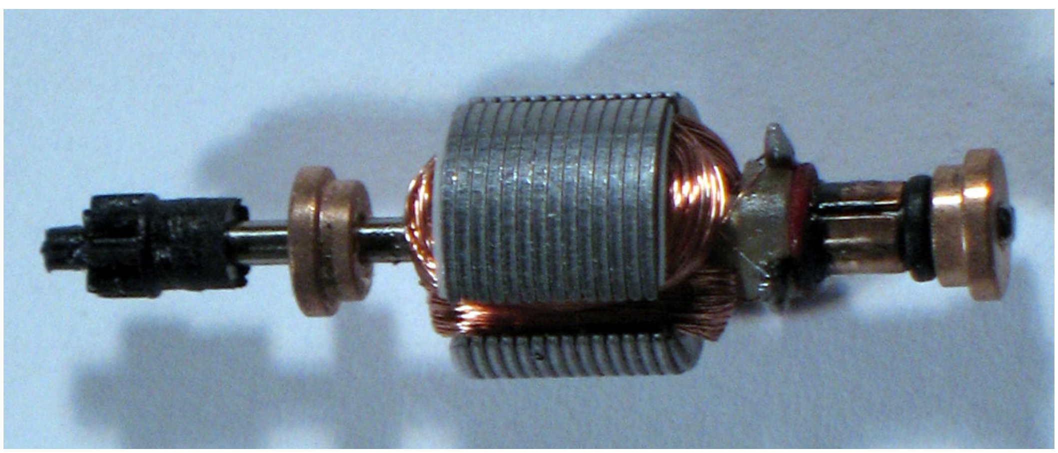
Electrical System

The pickup shoes are copper and thin. The flat area of the shoe that rides the rail are 3/16th of an inch wide and 3/8th of an inch long. The tail of the pickups wrap around the brush barrel.
The locking tabs are tall, ¼ inch high. The hole for the tab is almost as long, providing a long field of travel.



The Pickup springs are similar to the old Tyco X-2 springs with the exception that the spring has a much longer wire and is bent to provide 2 wires and a flat tab across the pickup shoe. This is similar to the old racing trick of using 2 PU springs to make the PU shoe lay even and increase tension. This spring has the exact same effect. Out of the box, the shoes do not lay completely flat to the rails. The front third of the shoe rides the rail and forces the front of the car higher. This is easily fixed by bending the shoe slightly, about 5 degrees, to make the flat area of the shoe ride evenly on the rail. This will improve performance by getting more surface to the rail.

The armature is a standard 3-pole arm with 14 laminations. The wire appears to be 37.5 gauge and ohms out at 6.4 Ohms per pole. The laminations are straight in design and show no indication of being balanced. The commutator is copper bonded to phenolic. The timing of the comm. Is 0 degrees, tap dead-center. The wire is folded onto tabs and soldered in place.



Fit and Finish

The overall fit and finish of my 2 samples were pretty good. The pickup shoes on both needed adjusting to ride properly on the rail. I'm not too keen on the cross-cut knurls on the front and rear axle. They will eventually wear the rim/hub down until glue will be required, depending on how often you need or want to remove the front wheels. The gear mesh was excellent out of the box and all parts were lubricated well. The bodies were very well made, light and the paint and finish were excellent. Wheel well clearance was adequate and I saw no binding or rubbing anywhere.

Performance Testing

Break-In Period

There are four phases to the break in process.

1.) First, the cars will be run at 6 volts/3 amps, rear axle assembly in place but free-wheeling, no load, for 5 minutes.
2.) After the first run, the cars will disassembled and all parts examined to determine any abnormal wear.
3.) The cars will be cleaned, re-assembled, adjusted where needed, lubricated and run in for another 5 minutes at 6volts/3amps.
4.) If no issues show, the cars will proceed to the remaining tests. Otherwise, repairs or adjustments will be made until the cars can complete the remaining tests or be retired from the review.

Observations

Both cars were placed upside down and the power connected to the pickups with clips. The voltage was dialed to 6 volts. The Mustang drew 1.25 amps on start and dropped down to .5 amp. The Charger drew a bit more amps at 1.8 on start and settled down to .49 amp. The Charger sounded a bit dry in the gears and ran progressively slower until it stopped. Upon examination the driver's side brush screw has worked itself loose taking tension off the brush. I readjusted the set screw and the car ran fine for the remaining 4 minutes left of its break in time. The Mustang showed no similar symptoms.

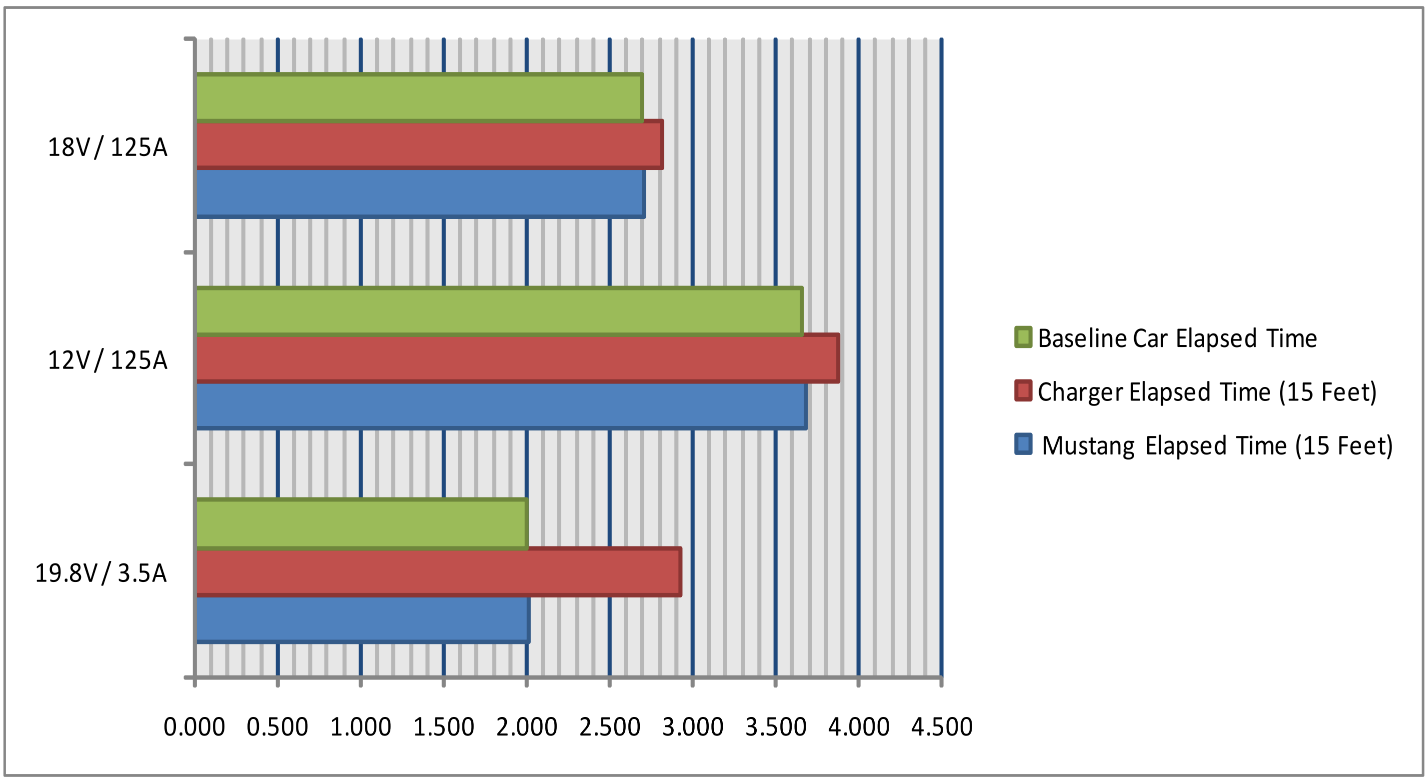
Both cars ran their 5 minutes and were completely disassembled. All parts were cleaned and examined for excessive wear or other problems. Neither car showed any issues with the exception of brush wear and a dirty comm. This could be attributed to the soft compound of the brushes, or too much tension from the springs or set screws. The brushes were worn down some. A better description would be the curve that seats to the comm was more defined. The length was not noticeably changed. I cleaned the inside of the barrels, no excessive material was found there.
I reassembled both cars, lubricated them and ran them again for 5 minutes at 6 volts/3 amps. While running I adjusted the brush screws and tuning the motor by ear. I had both sounding the same and putting out a nice whine. Amperage draw dropped slightly to .47 amp for both cars. I noticed after the 2nd 5 minute run that the gear mesh on the Mustang seemed a bit tight. I could not get a cleaner mesh by adjusting the position of the crown or spacer. So I got them close and ran tooth paste between the crown and pinion and ran that mixture in at a slow speed for 5 minutes. After cleaning the gears and axles, I reassembled the car and lubricated the axles and gears. Wow, what a difference! The car was much, much smoother. I repeated the process for the Charger with similar results. Both cars required adjustments of the pickup shoes. Slight bends to the shoe allowed a greater area of the flat to ride on the rail. It took me less than 15 minutes to have both cars running well with minor adjustments.

Now the cars are ready for performance tests.

Acceleration Tests

The acceleration test is ran on a 25 foot straight strip, made from Tomy AFX track. The track is painted with Acetone based paint. All rails are level and are set at .015 inch above the plastic surface. Power is available in 2 forms, an AC to DC converter at 19.8 Volts and 3.5 Amps or DC Battery Power, either 12 or 18 Volts at 125 Amps. All acceleration tests will be ran from each power source. The cars will be controlled by a single pole switch to full power. The first 15 feet of track is powered, the last 10 feet is dead section. The dead section can be wired for coast or dynamic braking. There will be sensors placed at the beginning of the strip and at the 15 ft. mark. An electronic timer will engage at the tripping of the first sensor and stopped at the tripping of the 2nd sensor. Times will be measured in ..000 thousandths of a second. Five passes for each power option will be made and averaged for each power option. I will set these results in comparison to a box stock Tomy AFX Super G+ (1st Generation) car as the baseline

Mustang GT		**Charger Stocker**	
19.8 Volts/3.5 Amps	2.808 Sec.	19.8 Volts/3.5 Amps	2.928 Sec.
Battery Power 12 Volts/125 Amps	3.687 Sec	Battery Power 12 Volts/125 Amps	3.881 Sec.
Battery Power 18 Volts/125Amps	2.702 Sec.	Battery Power 18 Volts/125Amps	2.820 Sec.



Braking Tests

The braking test is ran on a 25 foot straight strip, made from Tomy AFX track. The track is painted with Acetone based paint. All rails are level and are set at .015 inch above the plastic surface. Power is available in 2 forms, an AC to DC converter at 19.8 Volts and 3.5 Amps or DC Battery Power, either 12 or 18 Volts at 125 Amps. All acceleration tests will be ran from each power source. The cars will be controlled by a single pole switch to full power. The first 15 feet of track is powered, the last 10 feet is dead section. The dead section can be wired for coast or dynamic braking. There will be sensors placed at the beginning of the dead section and the track marked in inches starting at the dead strip. An electronic timer will engage at the tripping of the first sensor. Times will be measured in .000 thousandths of a second and recorded by sight when the car stops completely. Five passes for each power option will be made and averaged for each power option and for each braking option.

<u>Mustang GT Coasting Stop</u>

19.8 Volts/3.5 Amps	.080	26.25”
Battery Power 12 Volts/125 Amps	.077	24.5”
Battery Power 18 Volts/125Amps	.082	28.0”

<u>Charger Stocker Coasting Stop</u>

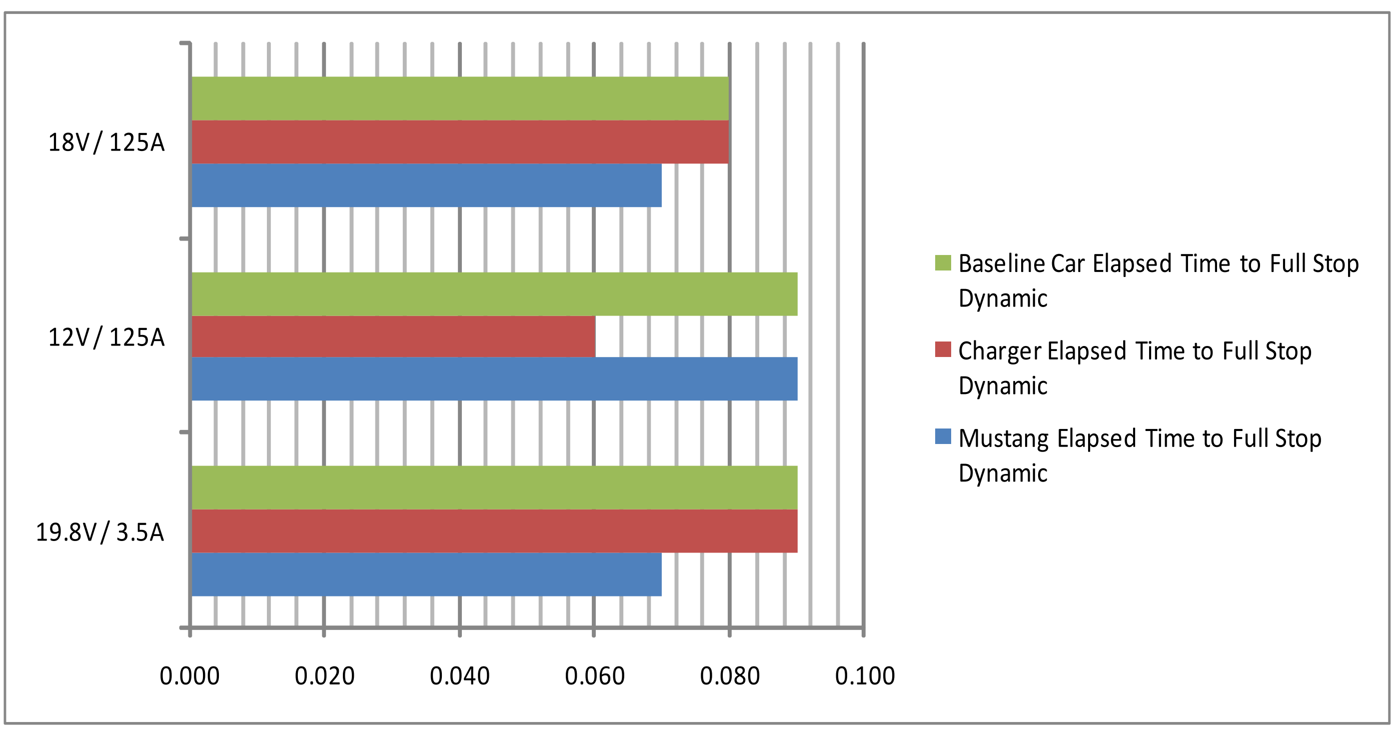
19.8 Volts/3.5 Amps	.071	25.0”
Battery Power 12 Volts/125 Amps	.066	20.25”
Battery Power 18 Volts/125Amps	.079	26.3

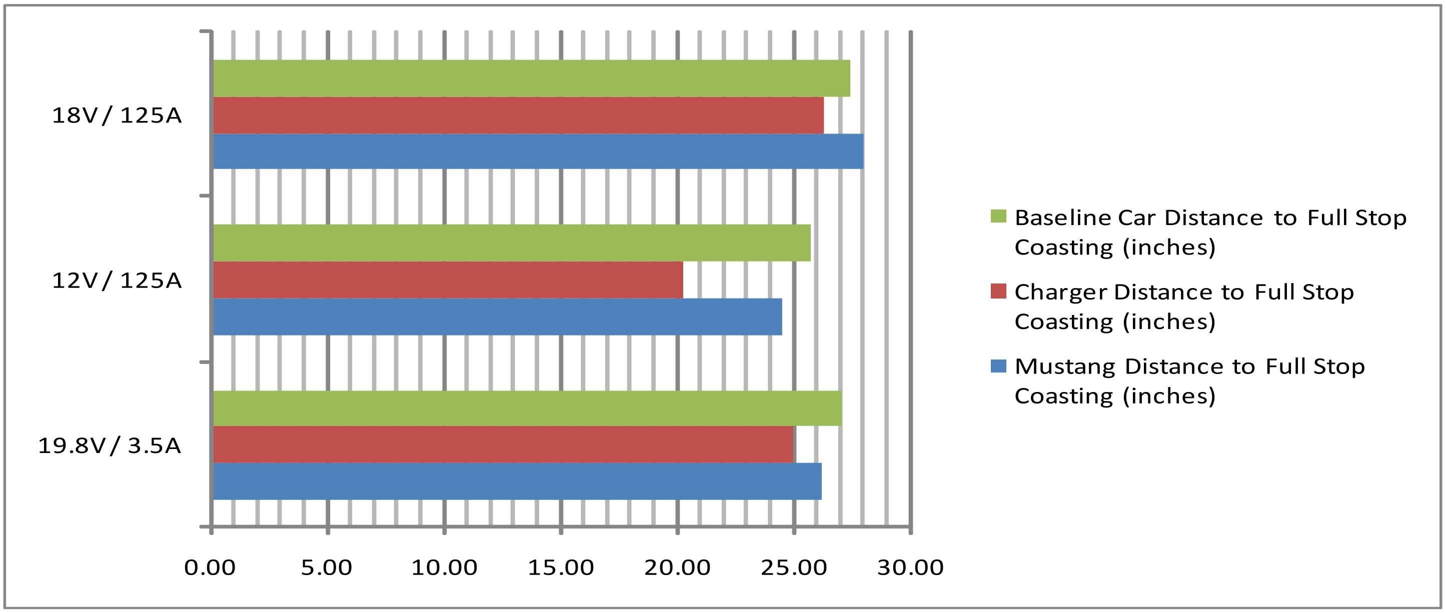
<u>Mustang GT Dynamic Braking</u>

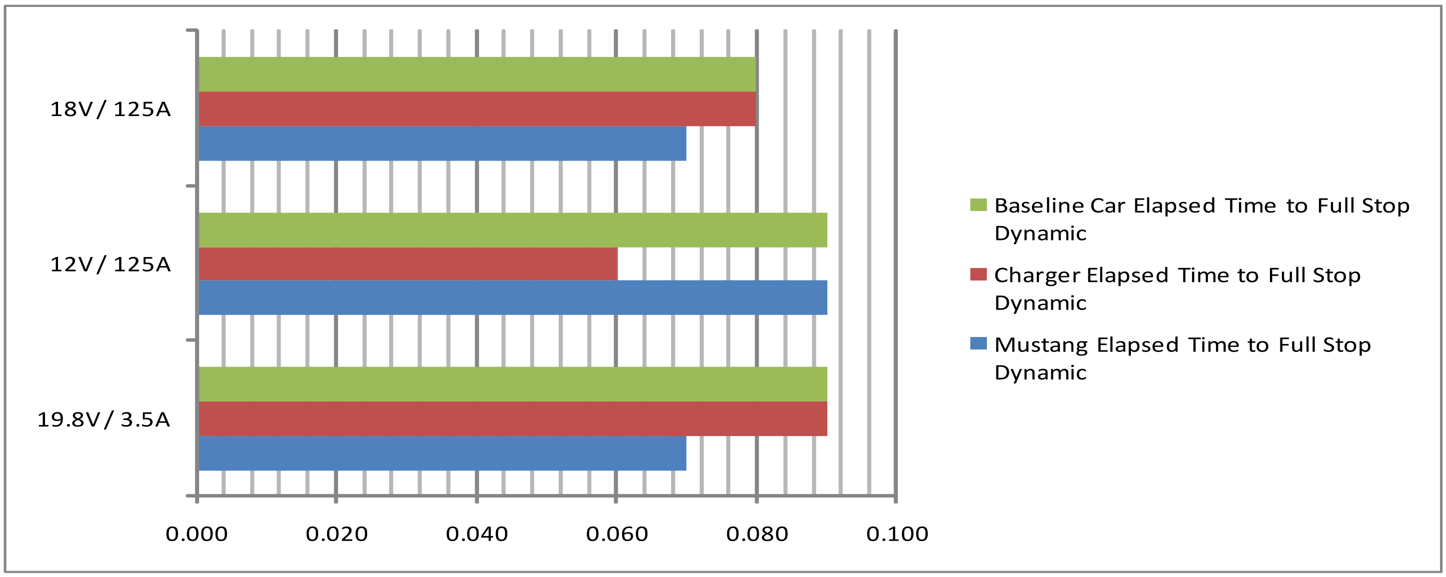
19.8 Volts/3.5 Amps	.010	4.1”
Battery Power 12 Volts/125 Amps	.009	3.9”
Battery Power 18 Volts/125Amps	.010	4.0”

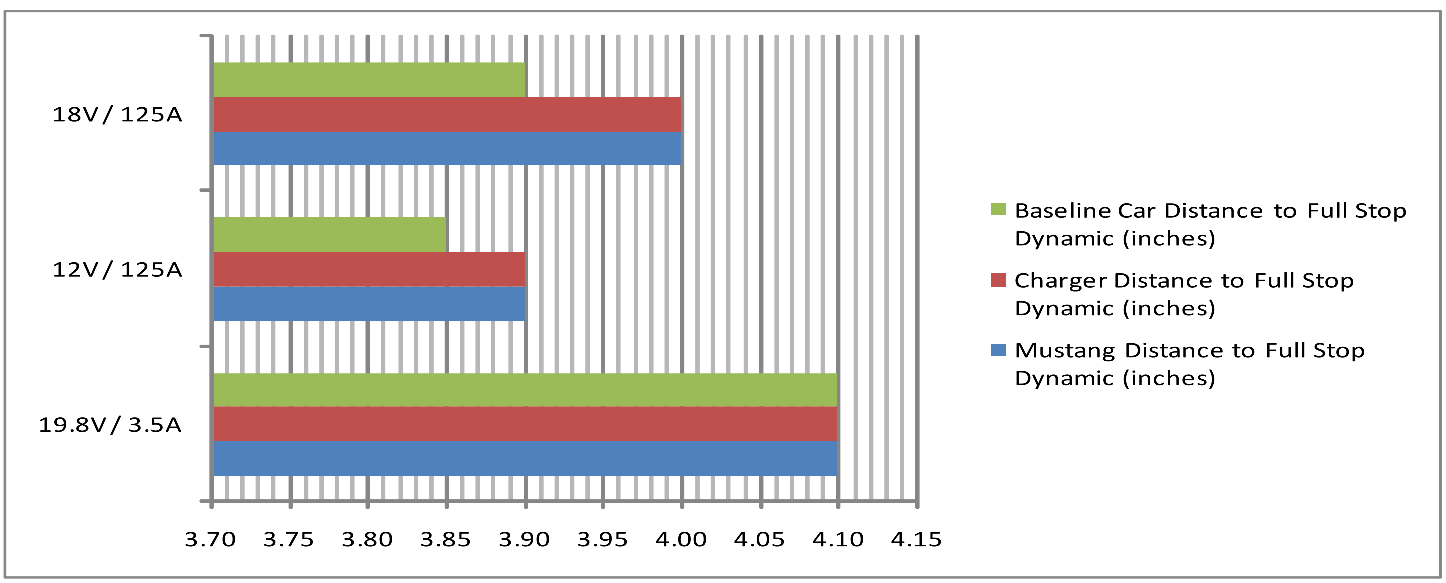
<u>Charger Stocker Dynamic Braking</u>

19.8 Volts/3.5 Amps	.009	3.85”
Battery Power 12 Volts/125 Amps	.010	3.9”
Battery Power 18 Volts/125Amps	.009	3.8”




18V / 125A
12V / 125A
19.8V / 3.5A
0.00
5.00
10.00
15.00
20.00
25.00
30.00
Baseline Car Distance to Full Stop Coasting (inches)
Charger Distance to Full Stop Coasting (inches)
Mustang Distance to Full Stop Coasting (inches)


18V / 125A
12V / 125A
19.8V / 3.5A
0.000
0.020
0.040
0.060
0.080
0.100
Baseline Car Elapsed Time to Full Stop Dynamic
Charger Elapsed Time to Full Stop Dynamic
Mustang Elapsed Time to Full Stop Dynamic


18V / 125A
12V / 125A
19.8V / 3.5A
3.70
3.75
3.80
3.85
3.90
3.95
4.00
4.05
4.10
4.15
Baseline Car Distance to Full Stop Dynamic (inches)
Charger Distance to Full Stop Dynamic (inches)
Mustang Distance to Full Stop Dynamic (inches)

Cornering Tests

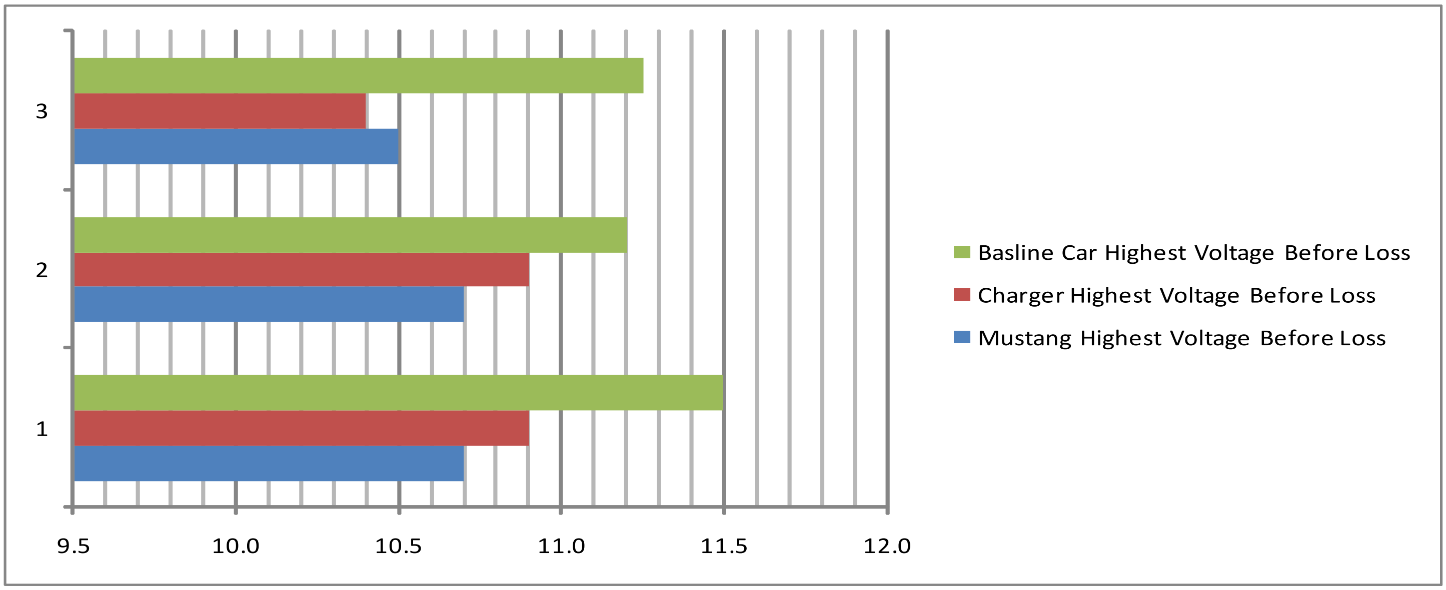
The cornering test is run on a 9 inch radius circle, made from Tomy AFX track. The track is painted with Acetone based paint. All rails are level and are set at .015 inch above the plastic surface. Power is available in 2 forms, an AC to DC converter at 19.8 Volts and 3.5 Amps or DC Battery Power, either 12 or 18 Volts at 125 Amps. All cornering tests will be run from each power source. The cars will be controlled by a measured dial that ranges from 0 to full power and is incrementally marked. Cars will be placed on the inside lane and be accelerated in marked increments until they spin out or de-slot. The power in volts/amps will be recorded at the breaking point. Five passes for each power option will be made and averaged for each power option.

Mustang GT

19.8 Volts/3.5 Amps	10.7 V
Battery Power 12 Volts/125 Amps	10.7 V
Battery Power 18 Volts/125Amps	10.5 V

Charger Stocker

19.8 Volts/3.5 Amps	10.9
Battery Power 12 Volts/125 Amps	10.9
Battery Power 18 Volts/125Amps	10.4



Overall Conclusions

Overall the AW Super III is a good start for the4 company to get into competition for faster chassis. It still has some room for improvements, like any other chassis. The three biggest issues with the chassis is the upswept front area under the PU shoes, raising the center of gravity, the front axle knurls stripping the hubs when they are removed and the rear axle being too wide, exceeding most of the racing rules used by clubs and national organizations. The last two are easily fixed and I've not reached a conclusive decision about the first yet. The cornering data shows that the car is capable of good handling out of the box. Lowering the front a bit increases that dramatically, but not too low! The strength of the magnets will lock it the chassis to the rails with just the smallest change. Remember there is only .025 of an inch clearance in stock form. The adjustable wheelbase on the S-III benefits this as well. Cornering tests were ran from the 3rd axle location from the front. By extending the front axle to the front location improved cornering by .3 and .5 Volts respectively.

Conclusions (Cont'd.)

The motor revs high and with some tweaking on the adjustable brush barrels, it can be honed in quite nicely. The braking was the one quirk in the testing. I could not get consistent braking numbers between coasting and dynamic braking. This usually lays out in a nice linear curve, but the Charger was able to brake or coast quicker under higher load than the other AW S-III and baseline car tested. The Charger also performed a bit slower in other tests compared to the Mustang but only slightly. I think a bit of tweaking here and there would equalize the performance.

The PU shoes were also a point of adjustment required before I started seeing consistent numbers. Out of the box, only the leading edge of the shoe rides the rail. Bending the shoe slightly upward at the narrowing joint will allow more of the shoe to hit the rail and improve contact.

I did not see any excessive brush wear, even after 2 hours of run time. The cars performed well on my 54 foot road course and the 44 foot oval. Even with the "Neo" traction magnets, the Older Tomy AFX Super G+ still out cornered the Super III. I chalk this up to the higher tires/center of gravity on the stock Super III. I'm quite certain a little development by the racing world and after-markets will see this chassis made competitive with other makes and models.

Things I like to see improve:

Shorten the rear axle to meet the 1 5/16th inch width rule.
AW or after-market develop a universal body clip
Re-design the front axle and get rid of the hub striping knurls
This ones for all manufacturers not just AW. How about some silicon rear tires? Let's get rid of the hard rubber. Tyco was the only one to date that supplied a set if silicon slip-ons with their original Magnum 440's. That would be a good practice to revive.

Things that are right on the money:

The adjustable brush barrels are excellent. It's nice to see these on a factory box stock car.
The wheel base options. How many things can we see now? Funny Cars? Altereds? Scale 60's Cars? The narrow and wide body clip would give us some Indy and Formula Cars too.
The Body detail. The Mustang is sharp and so is the Charger. Would love to see some period racers and take advantage of the wheelbase options.

Auto World has made a good start with the Super III. It's still young and has some development ahead of it, but it can be made a competitive car with little effort, or at least no more than we already do for our other cars. I think this would be an excellent IROC chassis for beginners getting into racing with stronger magnet cars. Both of my girls (9 and 14) ran the cars with no problems. Even the 9 year old with the "Fast and Furious" attitude was able to drive these well. They are very easy to service and so far appear pretty stout, even after the 9 year drove it into the wall a few times. I'm anxious to see where AW takes the design. It has a lot of potential both as a performance car and a platform for collector bodies.