

7309 INSTRUCTIONS FOR MILD STEEL A-ARM AVENGER CHASSIS 1993-1996 CAMARO/FIREBIRD

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u> <u>TUBE SIZE</u>	<u>TUBE CODE</u>	<u>DESCRIPTION</u>
1	1	4070		Main hoop
2	1 pr	4170		Cage side (driver & passenger side)
3	1	4294		Windshield brace
4	1 pr	7010		Forward struts
5	1	4295		Mid mount bar
6	1	4261		Collector riser (loop makes two)
7	1	4273		Lower 4 link support
8	1	4274		Backbrace
9	1 pr	4267		Rear frame
10	1	4251		Butt bar
11	1	4276		Upper 4 link support
12	2	4260		Rear head restraints
13	1	4253		Outside shoulder bar & head restraint
14	1	4252		Inside shoulder bar & head restraint
15	1	4058		Auxiliary main hoop
16	1 pr	4717		Rear accessory struts
17	1	4709		Motor plate tube-1 loop makes 2 parts
18	2	1 5/8 x 34	A & B	Driver & passenger rocker tube
19	1	1 5/8 x 40	C	Driver's long side bar
20	1	1 5/8 x 24	D	Transmission crossmember
21	2	1 5/8 x 6	A	Rear head restraint tie bar
22	1	1 5/8 x 19	B	Driver's cage diagonal
23	2	1 5/8 x 60	E & F	Forward frame rails
24	1	1 5/8 x 23	I	Rack and pinion crossmember
25	2	1 5/8 x 35	G & H	Center frame rails
26	1	1 5/8 x 40	I	Passenger long side bar
27	2	1 5/8 x 23	J	Upper door X brace
28	2	1 5/8 x 23	K & L	Lower door X brace
29	1	1 5/8 x 39	K	Passenger main hoop rear strut
30	1	1 5/8 x 24	L	Driver main hoop rear strut
31	1	1 5/8 x 22	L	Passenger main hoop 4 link strut
32	2	1 5/8 x 25	G & H	Cage side support
33	2	1 1/4 x 43	M & N	Forward strut support
34	2	1 1/4 x 18	M & N	Mid mount support
35	2	1 1/4 x 57	O & P	Double frame rail top
36	1	1 1/4 x 36	Q	Cage top triangulator
37	1	1 1/4 x 17	R	Seat support
38	2	1 1/4 x 41	R & S	Rear frame strut
39	1	1 1/4 x 20	S	Rear crossmember
40	2	1 1/4 x 40	U & V	Floor X brace

<u>ITEM</u>	<u>QTY</u>	<u>PART NO.</u>	<u>TUBE CODE</u>	<u>DESCRIPTION</u>
		<u>TUBE SIZE</u>		
41	2	1 1/4 x 44	W & X	Outer frame triangulator
42	2	1 1/4 x 25	U & V	Rear frame x brace
43	2	1 1/4 x 20	W & X	Rear frame side support
44	2	1 1/4 x 7	M & N	Back brace rear strut tie bar
45	2	1 1/4 x 3	R	Double rail front upright
46	4	1 1/4 x 9	Q	Roll cage gussets
47	2	1 1/4 x 36	T	Lower bracket support tube
48	2	2300		Rack and pinion mount
49	12	2101		Suspension tab 1/2 hole
50	2	2015		Frame end cap 1 5/8 round
51	8	2103		Lower A-arm bracket 1 5/8
52	4	2301		Lower bracket cap
53	2	2329		Control arm cap
54	1	927309		Assembly drawing

All straight tubes are cut from two boxes labeled #4404, they contain the following tubes:

TUBE CHART

<u>QTY</u>	<u>TUBE SIZE</u>	<u>TUBE CODE</u>	<u>ITEM # FROM</u>
			<u>INSTRUCTION SHEET</u>
12	1 5/8 x .134 x 72"	A	18, 21, 21
		B	18, 22
		C	19
		D	20
		E	23
		F	23
		G	25, 32
		H	25, 32
		I	26, 24
		J	27, 27
		K	28, 29
		L	28, 30, 31
12	1 1/4 x .134 X 72"	M	33, 34, 44
		N	33, 34, 44
		O	35
		P	35
		Q	36, 46
		R	38, 37, 45
		S	38, 39
		T	47, 47
		U	40, 42
		V	40, 42
		W	41, 43
		X	41, 43

When you receive your chassis the first thing to do is to make sure you have all the parts. Use the above list of components to verify that you have all the parts. The bent cage parts will usually be banded together in two bundles. The straight tubes will come in two identical boxes labeled #4404. The brackets will be in a small box labeled #3006 and #6217. The assembly drawing will be in the same 8 1/2 x 11 envelope these instructions were in. If anything is missing, contact Chassisworks for assistance.

The straight tubes boxes will provide enough material to build your chassis provided you cut the correct lengths from each tube. The following chart will give you a guideline. Cut the straight tubes out as needed and be careful when measuring because lengths may vary a little from the instructions. Do not cut the tubes before you need them and try to cut the long tubes first.

Chassisworks makes no guarantee or claims that this chassis will be accepted by any sanctioning body. It is the sole responsibility of the chassis's owner to determine that this chassis can be used for the owner's intended use. We suggest that you carefully examine the rules that pertain to chassis construction for the associations that you race under and, make sure that this chassis fits those rules. We also require you to measure the diameter and wall thickness of every tube (bent and straight) that goes into the chassis to make sure it is the correct size for the rules. With the advent of sonic testing, it is important that you measure the wall thickness of every tube in the roll cage that is subject to the sonic test. See your association's rulebook to determine which tubes must be above the minimum wall thickness. Do not install any tube that is not above the minimum. Chassisworks will replace any tube that is undersized and has not been installed.

Read all the instructions completely and make sure you understand them before you begin. Only tack weld the chassis components whenever possible. This will make it easier to remove components if you make a mistake. All joints that are covered by another tube or bracket must be completely welded before they are covered up. An experienced welder must weld this chassis - *your life depends on it!*

Construction of a chassis cannot be accomplished without a jig. To assemble the chassis you will need a level surface as large as the car. This should be a steel table or an "I" beam. You will need to hold the body up off your surface at ride height, the table surface will simulate the ground. Also, weld a little of each joint at a time to help avoid distortion.

Do not assemble the roll cage portion of the chassis without positioning the body over the frame. This will insure that you get the optimum fit for the cage. Failure to do this could result in a roll cage that will not fit the body. The dimensions on the drawing are for a 1993-1996 Camaro/Firebird with the following body modification. The wheelbase has been lengthened from stock to 108 1/2 inches. The body should be placed on the chassis so that the rocker panels are 3 to 3 1/2 inches off the ground. The rear axle centerline is 20" behind the B pillar door opening which is the crack in the body formed by the door and the rear quarter panel.

This chassis can easily be modified to fit other intermediate size cars. Most intermediate size cars are very close to the same width inside. They also have very similar windshield angles. This allows this cage to fit many cars. If you are altering the dimensions on the assembly drawing for different vehicles, do not change any dimensions that affect where any front or rear suspension brackets mount in relation to other brackets or the chassis will not work.

Prepare the body by trimming all inner panels. You just want the single outer skin. You need to attach the body at the rocker panel, A pillar, B pillar, rear valance, and top 4 corners of the cage. On steel bodies, weld tabs to the chassis and body that bolt together. This will make it easier to remove and re-install the body as you build the car. Fiberglass bodies should be attached to sheet metal plates and fiber-glassed inside the body. Cleco the body to the plates until the final assembly when the plates should be fiber-glassed in. Do not use pop rivets, they will rattle out and crack the fiberglass.

1. Install the lower 4-link support, driver and passenger rocker tubes, center frame rails, collector risers, and the transmission cross-member. The rocker tubes should be installed so they are open at both ends. This provides a convenient place to run the battery cables and fuel lines without putting them under the chassis. Also, install the floor "X" brace, outer frame triangulator and seat support.

2. Mount the body over your jig at the correct ride height and rear axle position. Install the main hoop cage sides, windshield brace and the upper 4-link support. Use the 4-link front brackets (part of kit #6246) to help position the tube. Install the rear head restraints and the back brace. Make sure the back brace clears the body by the rear window. To gain clearance, you can raise the rear window or move the body to the rear. While the body is on, hold the rear accessories strut in place to make sure it will clear the decklid, rear taillight panel and bumper.

3. Remove the body and install the rear frame. Cut 4" to 5" of straight off the short end before you fit the top of the rear frame.

4. Next, install the rear accessories strut, rear crossmember, rear frame strut, rear frame side support, rear frame x-brace and the upper shock mount.

5. To complete the funny car cage, install the auxiliary main hoop, butt bar, outside shoulder bar, and outside head restraint. (The outside shoulder bar and outside head restraint are shipped in one piece, you must cut them apart.) Next, the inside shoulder bar and inside head restraint (also shipped as one piece) need to be cut apart and installed per the assembly drawing. Also install the rear head restraint tie bars, and the driver's cage diagonal.

6. To finish the cage, install the three rear supports, passenger side main hoop strut, driver side main hoop strut and passenger side main hoop to 4-link strut. Next, install the cage top triangulator, back brace rear strut tie bar, and the roll cage gussets.

7. Before you install the front frame, you must verify the frame width you need for your tires to clear your fenders. Due to the many different front wheel and tire combinations, you should do the following calculations for your vehicle to make sure you won't have a clearance problem.

Step 1: Determine the outside front tire width that you need. Measure the width between the front fenders. You will need 4 to 5 inches of clearance from the side of the tire to the inner front fender lip. Subtract 8 to 10 inches from the inner fender width. This will equal the outside tire width.

Step 2: To determine the hub width, you need to know how much wider the outside of the tire is than the front hub. Put a yardstick across the outside of the tire and measure through the center to the side of the wheel that bolts to the hub. When the wheel is bolted on, it is this much wider than the hub. Multiply this by 2 and subtract this amount from the outside tire width you calculated in step one. This will be the required hub width.

Step 3: Subtract 26 1/4 inches from the hub width to find the outside frame width. The frame cannot be narrower than 24 inches. Write your frame width on the Assembly Drawing.

8. Position the new front frame rails in the chassis. The rear end will most likely be too long, it attaches to the transmission cross-member. Try to put the first bend by the new firewall location. If the front frame does not clear the grillwork, shorten it. Be careful not to cut too much. The end of the frame must be at least 13 inches forward of the front spindle centerline. The rails should be parallel at the correct width you determined and centered in the frame. Measure diagonally to make sure the frame is square. Measure from the side of the frame to the body in several places to make sure the frame is centered in the body.

The top of the frame rail (measured at the front spindle line) should be 16 inches off the ground. This will give you 3 1/2 inches of ground clearance on the bottom of the frame. The frame does not have to be level in the engine bay or the driver's compartment. Use whatever frame rake is necessary to attach the rear of the frame correctly. The top of the frame in the engine compartment should be within 3 degrees of level.

9. Measure forward from the transmission crossmember to locate the front spindle line. Use a large square or plumb bob to put a line on both sides of the new front frame rails, which will represent the front spindle centerline. All of your brackets will locate off of this line. Using the A-arm assembly tool #6706, install the lower A-arm brackets to the frame. Bolt the brackets together with the correct spacers. See the Assembly Drawing for the correct dimensions. Hold the assembly under the frame and tack it in place. The rear A-arm bracket goes 3/4 of an inch behind the spindle centerline. Use the control arm cap to gusset the front pair of lower A-arm brackets. Use two of the lower A-arm bracket caps on each rear set of lower A-arm brackets. One caps the bottom of the brackets and the other provides an additional gusset for the top adjustable shock mount. See the Assembly Drawing for the correct location.

10. Cut the 1 5/8-inch tube to the correct length for the rack and pinion crossmember. Install it between the front A-arm brackets so it is even with the bottom and rear edges of the front A-arm brackets. Install the rack and pinion mounts per the dimensions on the assembly drawing. If the frame outside width is less than 29 inches, you will have to trim the driver's side rack and pinion mount as it will actually weld to the lower A-arm bracket. Just tack weld the crossmember in place until after you have checked for bump steer on the front end.

11. Install the upper A-arm brackets and adjustable shock mount (purchased separately). Use the #6706 Spacer Set to properly space the brackets. See the Assembly Drawing for the correct dimensions. Position the A-arm brackets so the adjustable shock mount is 1/4 inch forward of the front spindle line. Just tack weld the upper mounts in place until after you have installed the A-arms and been able to properly align the front end. Also install the forward frame struts. Make sure they clear the A-arms and shock mounts.

12. Install the complete front suspension and steering less the springs. Align the front end to 1/32 to 1/8-inch toe in, zero degree camber, and 6 to 10 degrees of caster. The front end can be aligned by using a machinist level on the spindle flats.

13. Move the spindle through its full travel to make sure nothing binds up. Also, check for bump steer. If assembled correctly, all unnecessary bump steer can be removed by shimming the tie rods up and down at the spindle or by raising or lowering the rack and pinion slightly (1/16 of an inch at a time).

14. Install the mid mount bar, motor plate tubes, mid mount support, cage side support, forward strut support, and motor mount gussets. Use an engine with the motor plate and mid plate to help position the motor plate tubes and mid mount support.
15. Install the double rail top, and front uprights, Make sure the double rail top bar and uprights clear the driver's seat. Complete the cage with the driver and passenger long side bar and the upper and lower door x-brace.
16. Double-check everything and then final weld the chassis.
17. Chris Alston's Chassisworks, Inc., carries a complete line of accessories to make completion of your car easier.

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