

ROLLS-ROYCE PHANTOM II SCRATCH BUILT COMPONENTS & MODIFICATIONS

Drawings & Guides Preface to the 9-09 Update

These Drawings and Guides began as just a handful of pages showing how you could add some super-detailed improvements to the Pocher Rolls-Royce Phantom II kits. There is much opportunity to do this since the kits leave out key components such as the complex, but very detail rich, engine controls mechanism.

Along the way my goal shifted and has now become one of building models that are as true to the prototypes as possible. In other words not just building another model but building something that is much closer to a specific model or a narrow period of manufacture. This focus on accuracy was, and is, driven by the simple notion that even though the vast majority of the world will neither notice nor care, those that know will know!

The more I did, and the more I looked, the more I realized how much was missing or misrepresented. As a result, both the number of changes and the number of pages have grown. There are now over seventy pages. To make them more digestible, I have divided the pages into three volumes. The first covers the engine and includes many of the previously published pages. The second covers the chassis and has many new, previously unpublished pages. This volume includes, for instance, details on the smaller 20 gallon fuel tank, the early style front shock absorbers and the auxiliary André Hartford shock absorbers which were routinely fitted to the Continental models. The third, which is still in development, will cover the body.

At the end of the day, I have found these notes to be my own best reference as I start another model. I hope they will just as useful to you.

John Haddock
September 2009

ROLLS-ROYCE PHANTOM II SCRATCH BUILT COMPONENTS & MODIFICATIONS

Drawings & Guides Vol. 2 - Chassis

Introduction

The Pocher kits are recognized as some of the most complex and detailed automobile kits ever made. Nevertheless compromises were inevitably made for production and commercial reasons. That leaves the door open for the brave-hearted to fix production quality issues, correct errors and, more importantly, add detail. The following pages describe & dimension some of the corrections and super detail modifications that can be made to the chassis of the Rolls-Royce kits.

A word of caution, however; the pages can be intimidating. They are designed for the advanced modeler and preferably someone comfortable reading an engineering drawing. Although details on components and assemblies are provided, there are no step-by-step-by-step assembly instructions. Familiarity with the Pocher Rolls-Royce kit is assumed.

The Pocher Rolls-Royce kits are historically inaccurate, mixing a variety of components from different years of production. Some of those inaccuracies are pointed out in these notes along with ways to correct them. The notes are based on Rolls-Royce drawings and photographs of prototypes.

The pages shamelessly mix both English and metric dimensions. In addition, any scratch builder is also obliged to deal with other dimensional systems for items such as wire, drills and hardware. The last page is a matrix that attempts to link all those systems across the range of dimensions most likely to be used. Hopefully it will be a useful reference tool.

Using the Pocher kit as a platform for building an historically accurate, detailed model of the Rolls-Royce Phantom II is a long, but very rewarding journey. I trust these notes will help.

John Haddock
September 2009

ROLLS-ROYCE PHANTOM II SCRATCH BUILT COMPONENTS & MODIFICATIONS

VOL. 2 - CHASSIS

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MAJOR VISIBLE CHANGES & TIMING

This chart shows the major visible changes made to the Phantom II during its life. Each column represents an historically correct configuration.

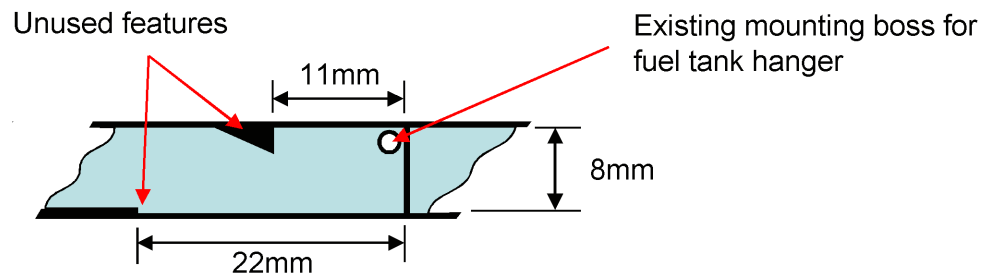
The black bars are the Pocher features. They are clearly a mix of components from different years of production.

FEATURE	Chassis # Off-Test (m/d/y)	169GN	178GY	1JS	18JS	62JS	46MS	2MY	44MY	102MY	65MW	14PY	162PY	2SK	58SK
CARBURETOR		-/5/30	12/31/30	7/25/31	8/15/31	1/28/32	7/20/32	12/31/32	2/4/33	4/3/33	7/3/33	7/31/33	12/19/33	6/8/34	8/9/34
Initial Carburetor Design		Model Motor Cars offers a correctly sized model of this version													
Modified Carburetor Air Cleaner															
Semi-expanding Carburetor & Large Air Cleaner															
EXHAUST															
Exhaust Manifold Heat Shield															
		A field-installable shield was also available. A metal strap clamped it to the manifold													
FUEL															
Telegauge Fuel Gauge															
Electric Petrol Gauge															
Screw On Petrol Filler Cap															
Hinged Petrol Filler Cap															
20 Gall (Imperial) Fuel Tank															
28 Gall (Imperial) Fuel Tank															
Remote Control Petrol Reserve (Bulkhead switch)															
RADIATOR															
Thermostatically Controlled Radiator Shutters															
ENGINE MOUNTING															
Diamond Engine Mount & Torque Reaction Dampers															
LUBRICATION															
One Shot Chassis Lubrication System															
Luvax-Bijor Chassis Lubrication System															
Extra Oil Supply To Cylinders															
Auto-Kleen Oil Filter															
WHEELS, TIRES & SUSPENSION															
7.00 x 20" Tires & Wheels															
7.00 x 19" Tires & Wheels															
Hub Cap Monogram (Rolls-Royce changed to RR)															
5-Leaf Springs															
Horizontal Style Front Shock Absorbers															
Controllable Shock Absorbers		Prior to 162PY, Hartford Adjustable Shock Absorbers were available as optional,additional, shocks.													
DWS Built-in Jacking System															
OTHER															
Overhanging Bonnet (Hood)															
Dropped Front Cross Member															
Front Apron															
Sources		Notes:													
Rolls-Royce, The Derby Phantoms		1. The semi-expanding carburetor involved a complete redesign of the carburetor, a new inlet manifold and a very large air cleaner alongside the cylinder head. This change effectively dates all unmodified Pocher models as prior to April 1933.													
Lawrence Dalton (1991)															
The Rolls-Royce Phantom II & Phantom III		2. The diamond engine mount and dampers consisted of a prominent cast fame on the front of the engine, flanked by two friction disc dampers. The dampers were attached to the frame and anchored to a 'U' shaped chassis cross member that was positioned just behind the radiator.													
Nick Whitaker & Steve Stuckey (2001)															
The Rolls-Royce Phantom II Continental		3. The cylinder extra oil supply was used when the engine was cold. The feeder line ran along the top of the crankcase wall, behind the carburetor. An on-off valve on the crankcase wall was operated by the starting carburetor switch.													
Raymond Gentile (1980)															
Rolls-Royce Owners' Club Drawings															

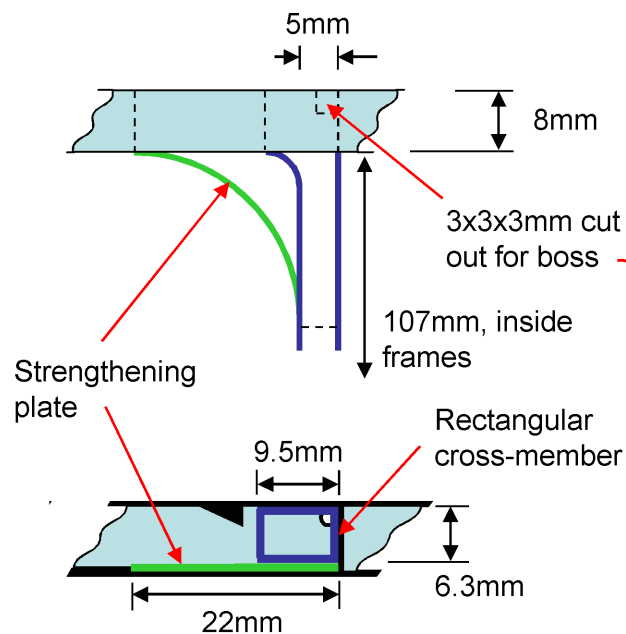
REAR CROSS MEMBER

The Pocher kit left out the rectangular cross-member in front of the fuel tank even though the frames seem to have provision for it.

Pocher Frame

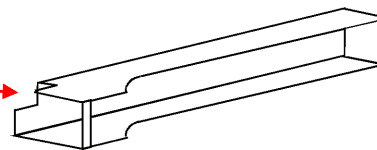


Cross-member Dimensions

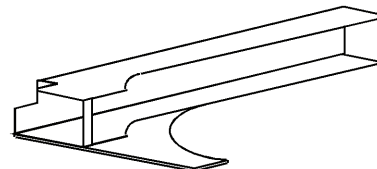


Construction

Selectively remove walls from 9.3mm x 6.5mm rectangular Styrene tubing. (left side is shown, the right side is a mirror image)



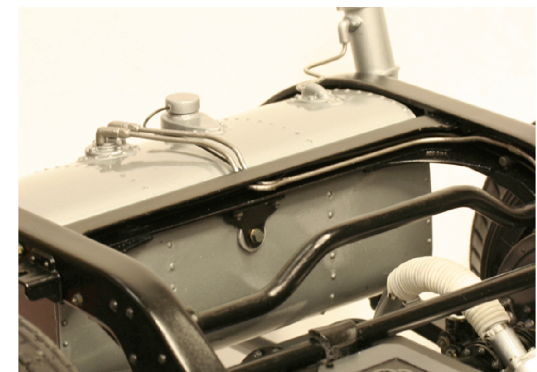
Then add strengthening plates and install



Model Under Construction



Chassis Model



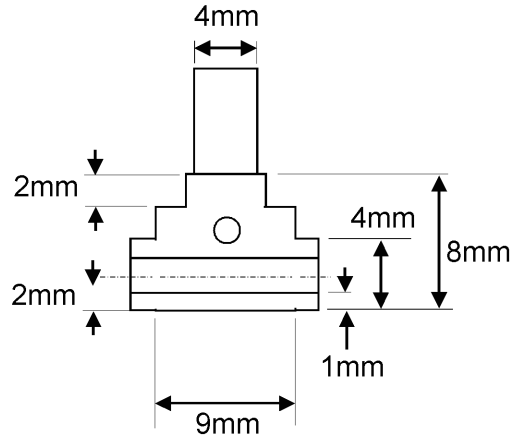
CHASSIS DUMB IRONS

The Phantom II made use of chassis tie rods linked through dumb irons to give the chassis more stiffness. The ends of the Pocher dumb irons differ significantly from the prototype. Here's a way to get them closer.

Pocher



Pocher Dumb Iron

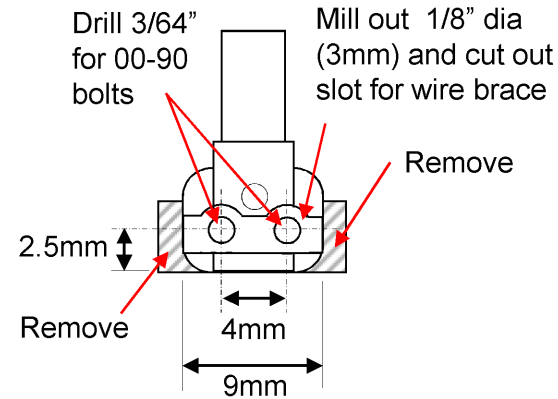


Under Construction

Edges trimmed
Holes milled



Modified Dumb Iron



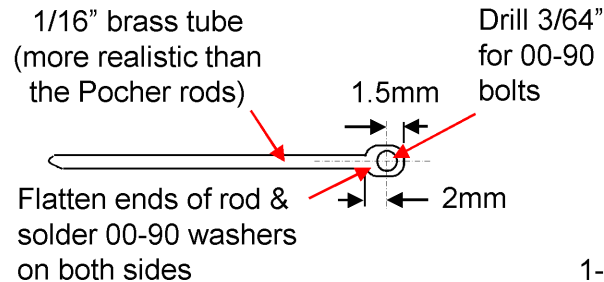
Final, Unpainted



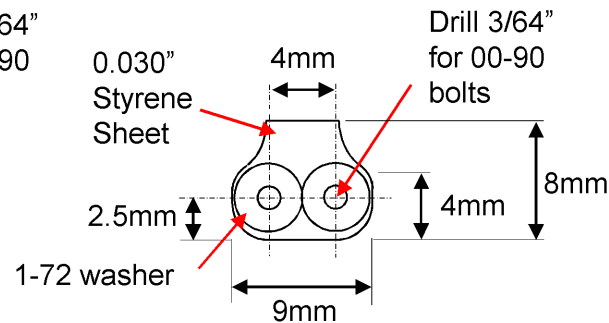
Prototype



New Tie Rods & Inner Tie Rod Ends



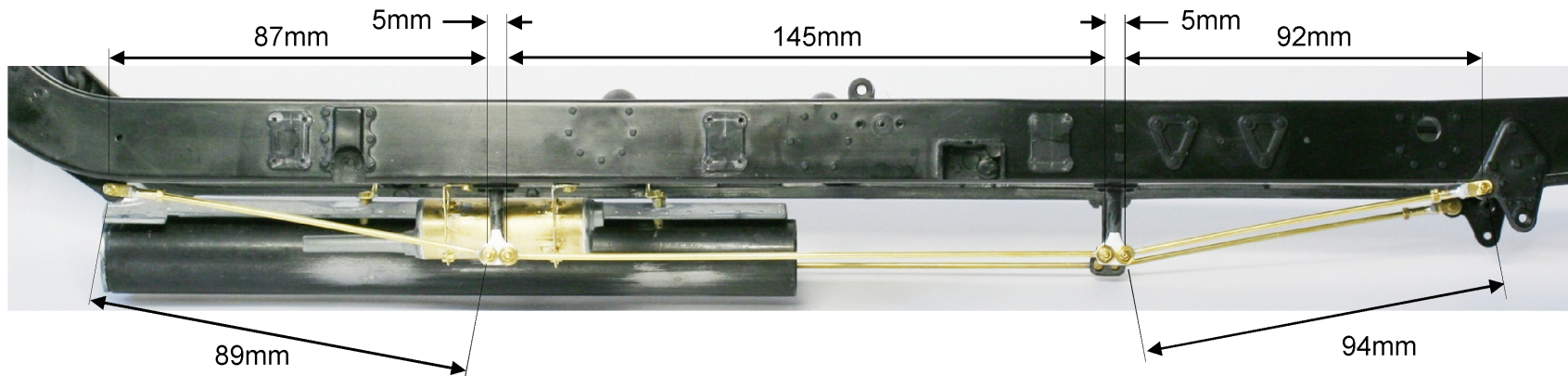
New Retention Plate & Washers



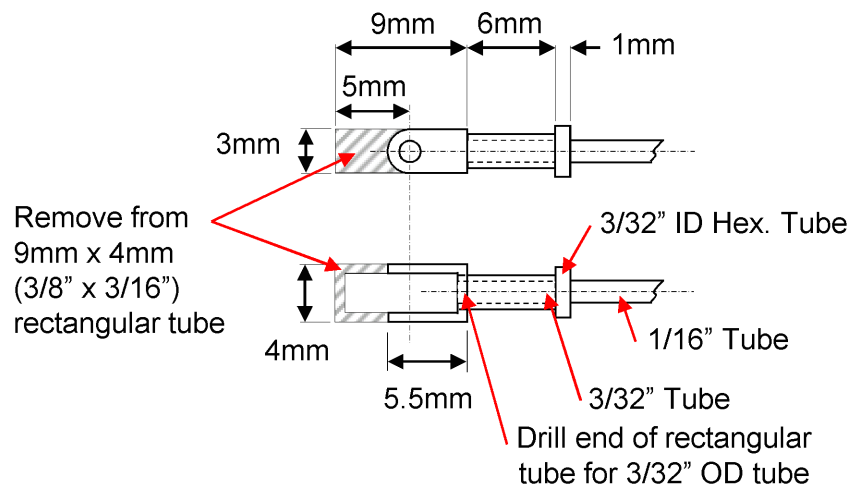
TIE RODS & SHACKLES

Using 1/16" diameter tie rods and adding outer shackles adds to the realism of the chassis profile. 1/16" tie rods are much closer to the prototype than the 2mm Pocher rods. The outer shackles replace the simple bend in the Pocher rods.

Tie Rod Arrangement

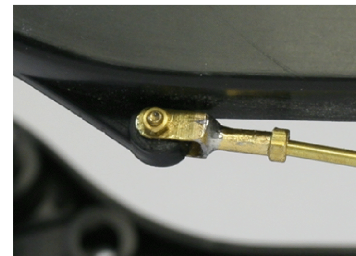


Shackles

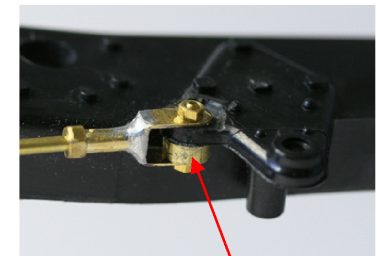


Under Construction

Rear Shackle



Front Shackle

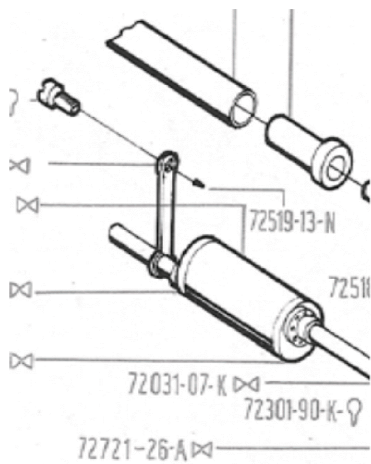


Note the two 1-72 washers as spacer

BRACKETS FOR SILENCER FOR EXHAUST HEATED THROTTLE

Prototype silencers were suspended from the chassis rails as the photograph shows, not by the method used by Pocher. On the model, the rear bracket needed a 1.5mm offset and altered profile to clear the chassis brace rod.

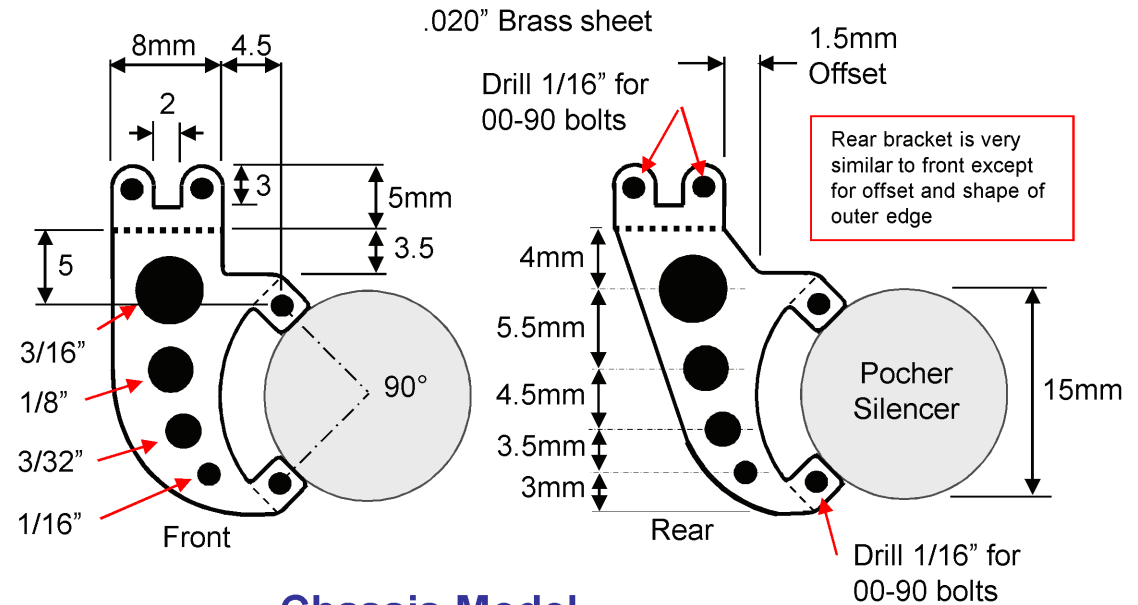
Pocher



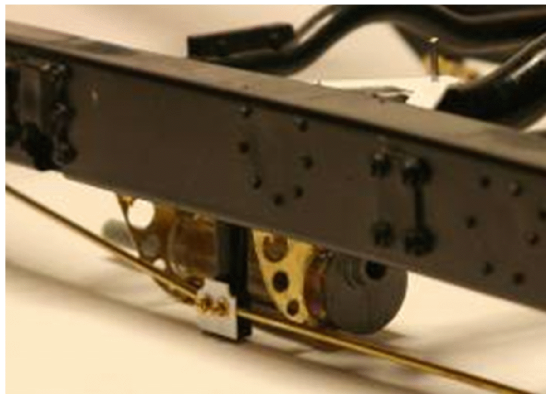
Prototype



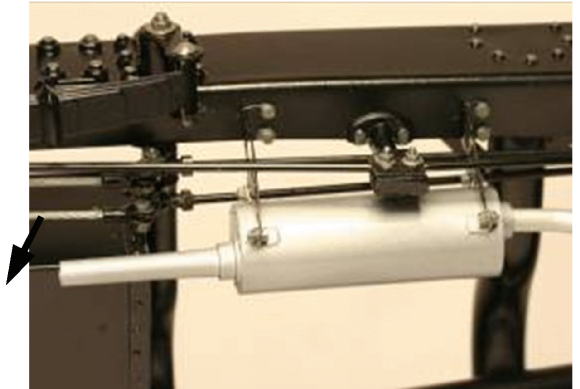
Model Bracket Dimensions



Under Construction



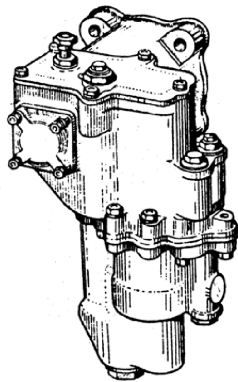
Chassis Model



VERTICAL TYPE FRONT SHOCK ABSORBERS - 1

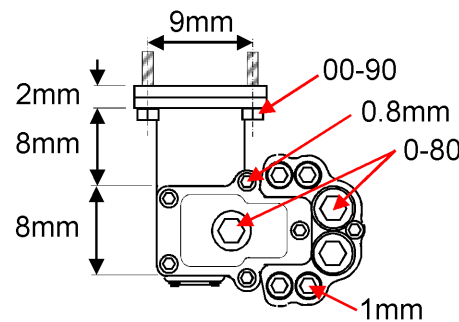
On the Pocher models, the front hydraulic shock absorbers are a horizontal type mounted on the outside of the chassis rails. However, prior to introduction of chassis #65MW in July 1933, the front hydraulic shock absorbers were a vertical type mounted on the inside of the rails. The next three pages detail the dimensions and mounting arrangements for this earlier type shock absorber.

Prototype



Dimensions

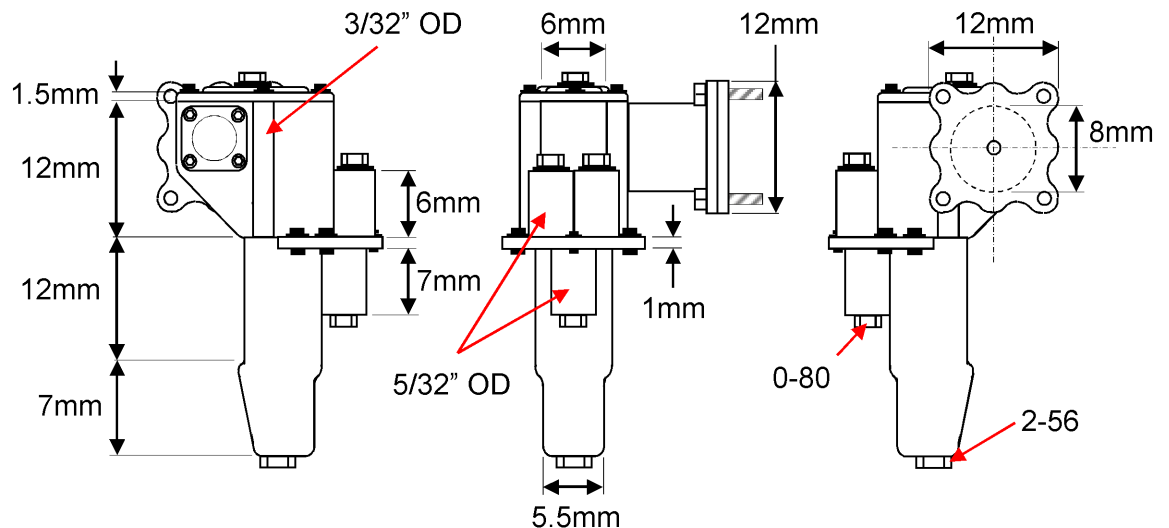
To minimize clutter only key dimensions are shown on the drawings below. The drawings are to scale, so other dimensions can be measured.



Scale:



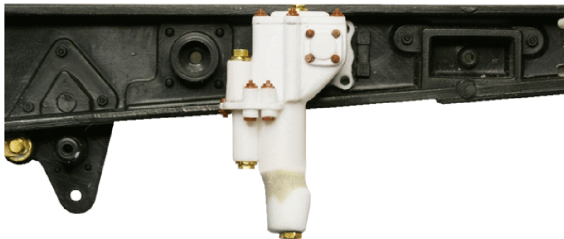
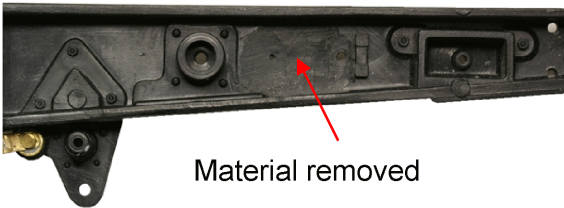
Under Construction



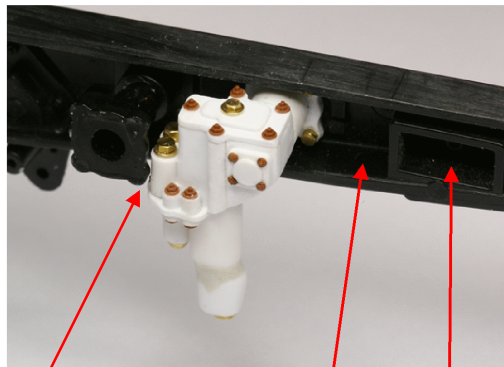
VERTICAL TYPE FRONT SHOCK ABSORBERS - 2

Here's where the shock absorber is mounted ...

Mounting



Validating The Fit

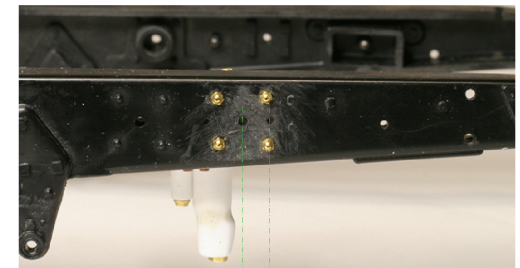
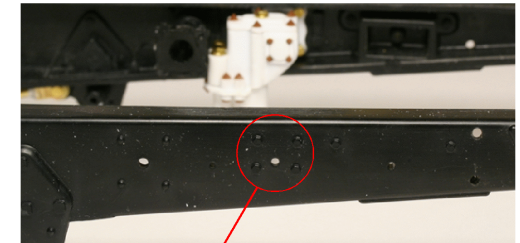


Shock absorber just clears engine mount.

Room in front for torque reaction damper cross-member

Radiator support cross-beam fits here

Chassis Rail Exterior



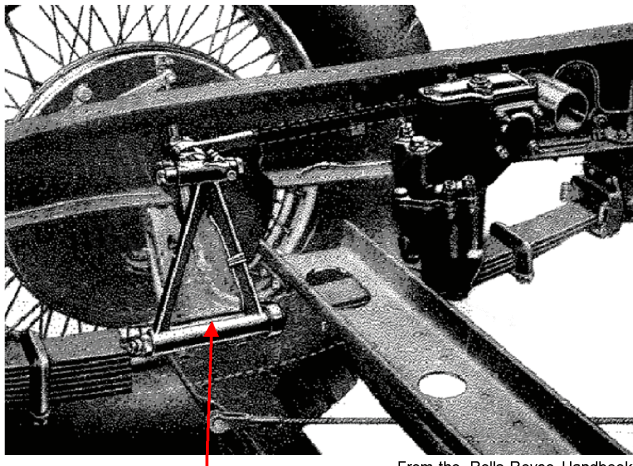
→ ← 4mm

Drill new mounting hole for lever arm 4mm to rear of existing hole

VERTICAL TYPE FRONT SHOCK ABSORBERS - 3

The front shock absorber is connected via a lever arm to the top of the front axle anchor bracket. The anchor brackets used with the early, vertical type shock absorbers are different than those supplied with the Pocher kit. This page shows the dimensions and construction of an anchor bracket that is much closer to the prototype.

Prototype Arrangement

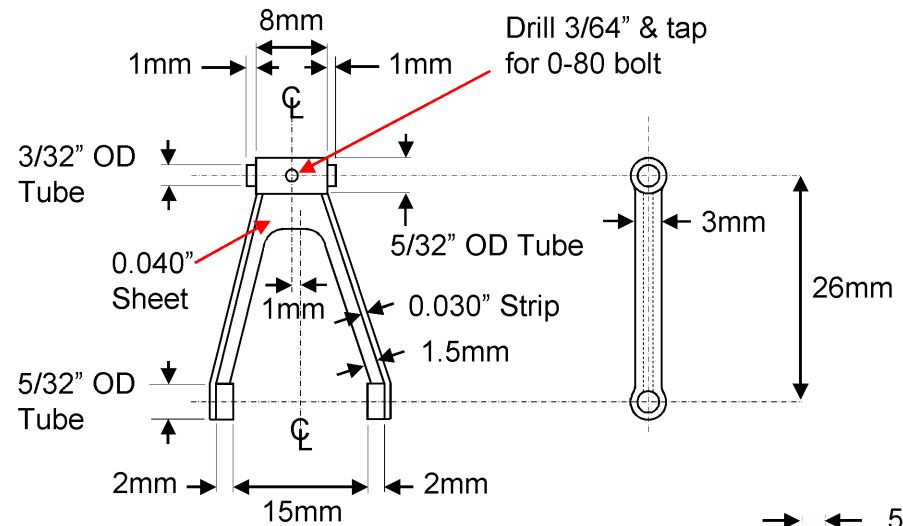


From the Rolls-Royce Handbook

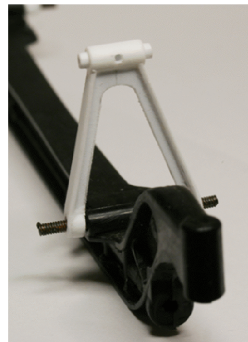
Anchor bracket
(Note the bracket and lever arm are on the outside of the chassis rail)

Anchor Bracket Dimensions

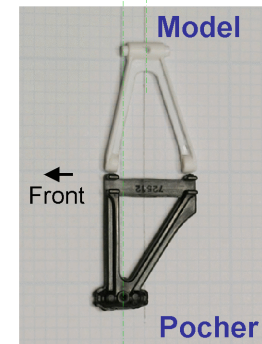
There is a 1mm offset between the upper and lower parts. The longer arm is towards the shock absorber. The shock absorber arm should be 32mm long.



Under Construction



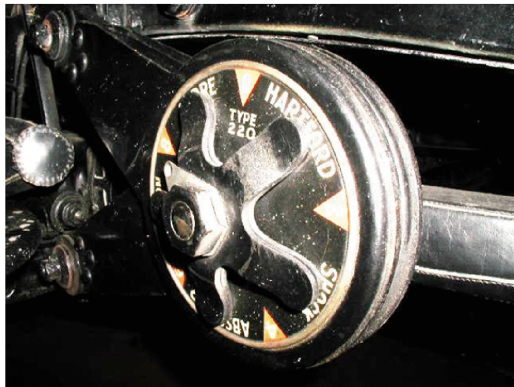
The new shape accommodates the backward shift of the lever arm mounting hole on the chassis rail



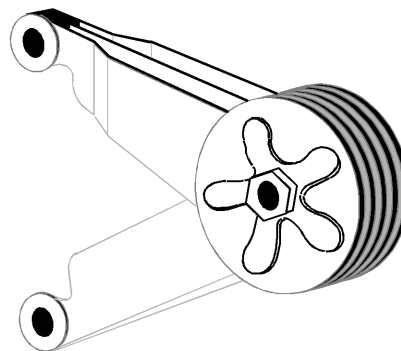
ANDRE-HARTFORD SHOCK ABSORBERS

The Pocher kits are based on the short wheelbase (144") version of the Phantom II which was utilized for the Continental models. Virtually all Continental versions of the Phantom II were fitted with adjustable Hartford shock absorbers in addition to the regular hydraulic type. Mounted both front and rear, the shock absorbers were of the dry friction disk type.

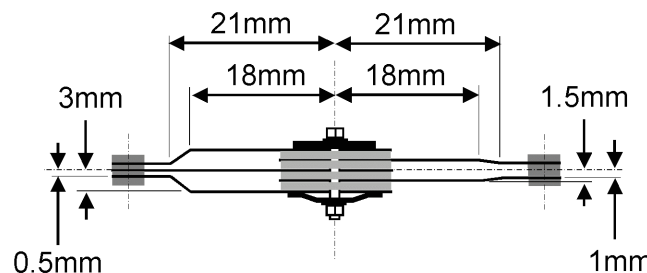
Prototype



Arrangement



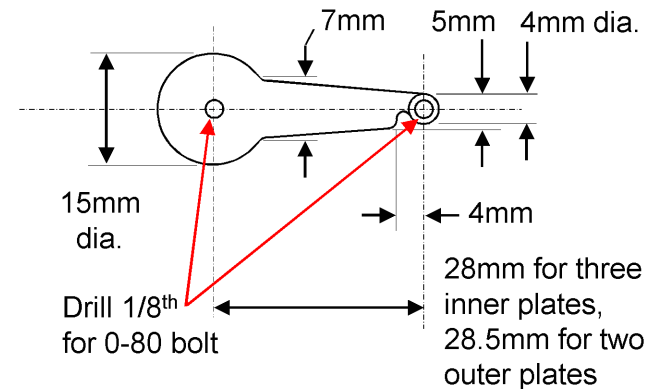
There are five arm plates and four friction disks. The center arm plate and two outer arm plates form the upper arm and the two others form the lower arm. The arm lengths are the same. Tightening or loosening the nut on the five spoke spring plate adjusted the stiffness of the shock absorber.



Components

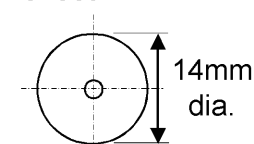
Arm Plates

0.015" brass sheet



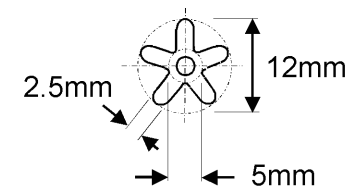
Friction Disks

0.040" styrene sheet



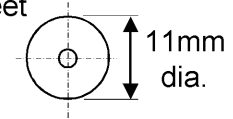
Spring Plate

0.030" brass sheet or two layers of 0.015"



Backing Plate

0.040" styrene sheet



Under Construction



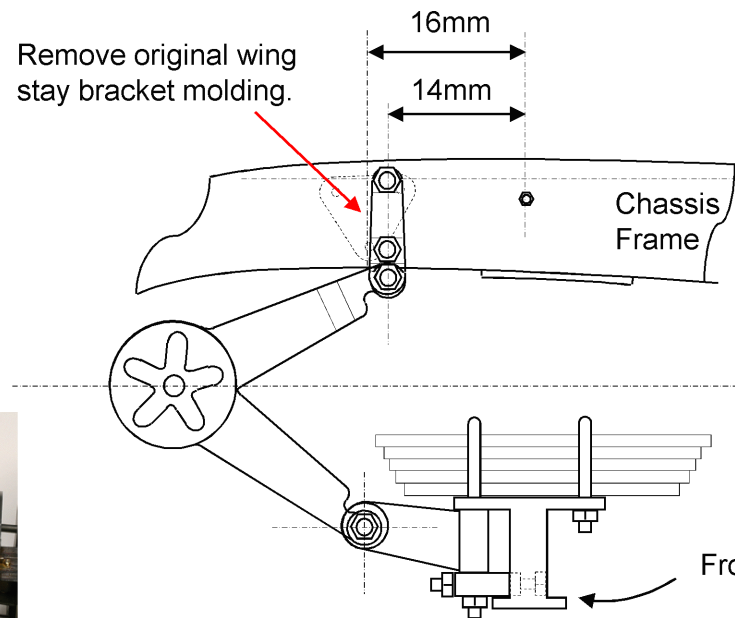
ANDRE-HARTFORD SHOCK ABSORBER – FRONT MOUNTINGS

Each front shock absorber was secured in place by an upper bracket on the chassis rail, and a lower bracket on the front of the axle. The lower bracket is held in place by an elongated leg of the front 'U' clip and two bolts passing through the axle from the rear. This page shows the location and configuration of the shock absorber mounting. The next page dimensions each of the brackets.

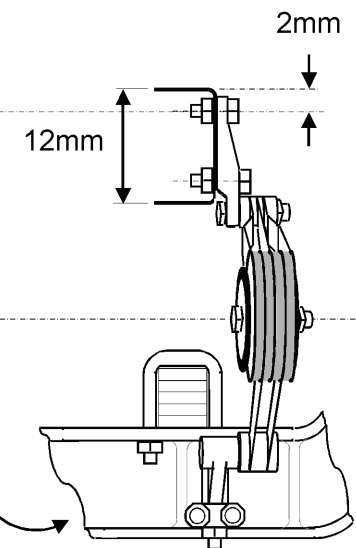
Prototype



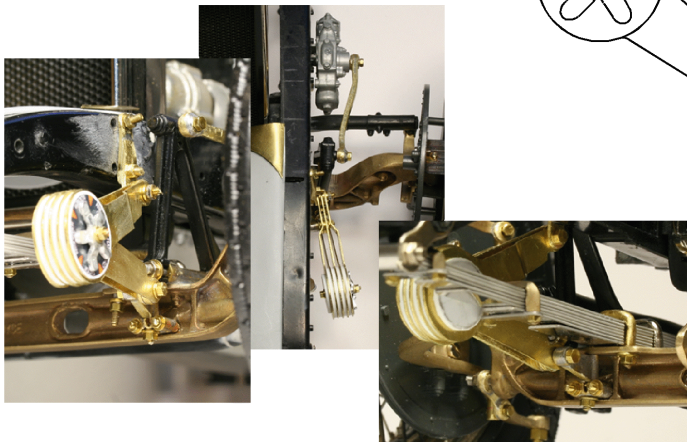
Left Side View



Front Right View



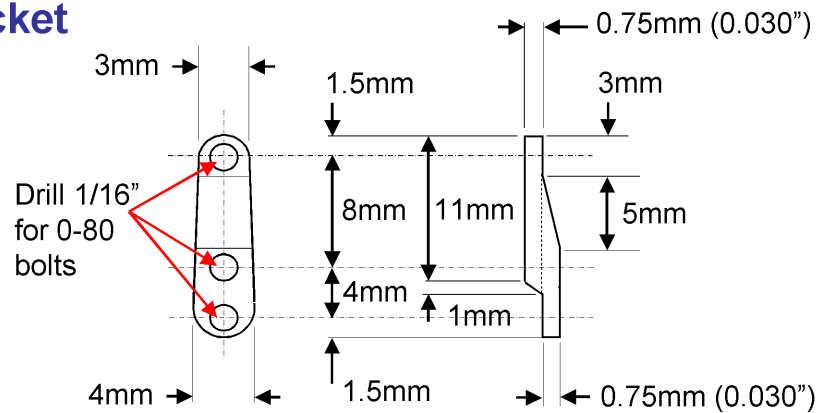
Model (Under Construction)



ANDRE-HARTFORD SHOCK ABSORBER - FRONT BRACKETS

The upper bracket is straightforward, but the lower bracket may need some fiddling.

Upper Bracket

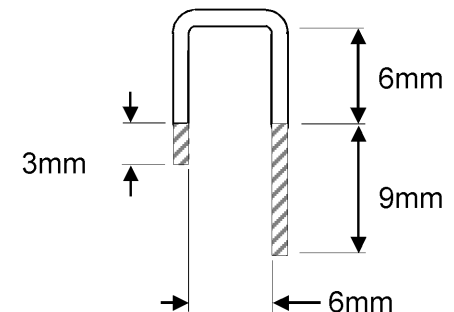
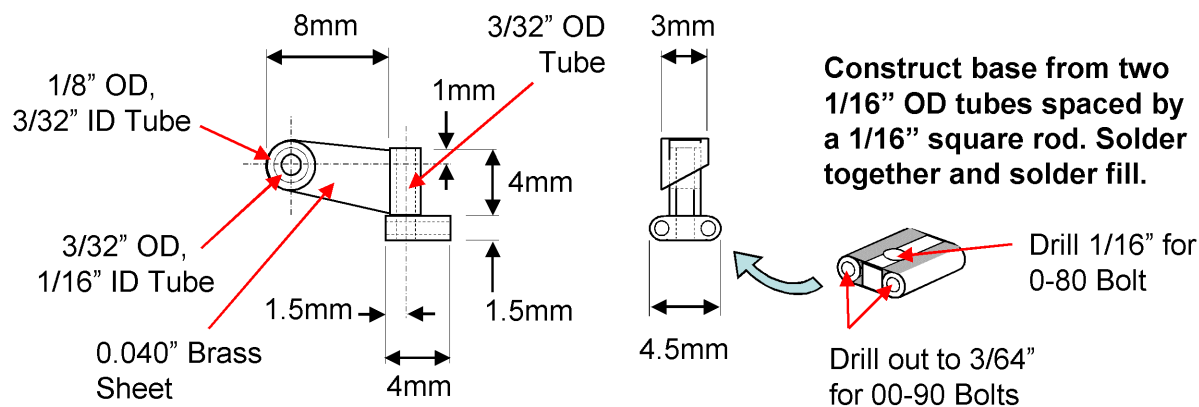


Front Spring Retainer Clip

A new front spring retainer 'U' clip is required on each side. The elongated leg of the clip passes through the lower mounting bracket.

Fabricate from 5/64" OD (1/16" ID) thin wall brass tube, 21mm long. Form (use a 1/16" brass rod inside the tube to provide support when bending the corners), then solder 0-80 studs to the ends.

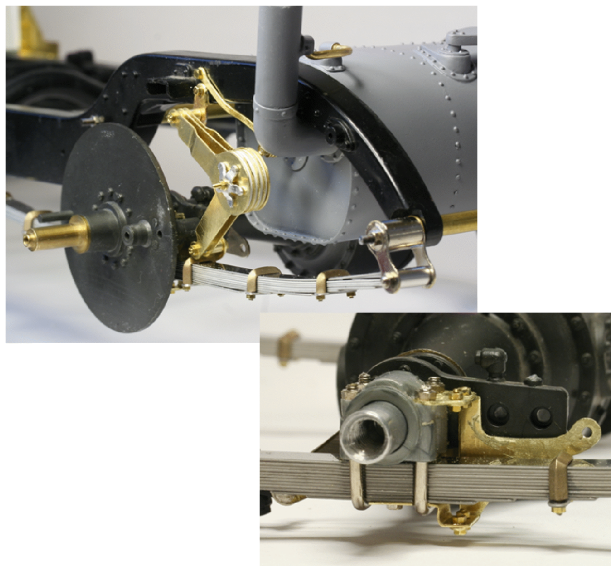
Lower Bracket



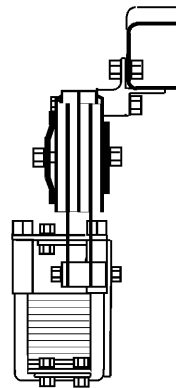
ANDRE-HARTFORD SHOCK ABSORBER – REAR MOUNTINGS

Each rear shock absorber was secured in place by an upper bracket on the chassis rail, and an arrangement of three brackets fixed to the axle mount. This page shows the location and configuration of the mounting. The next page dimensions each of the brackets.

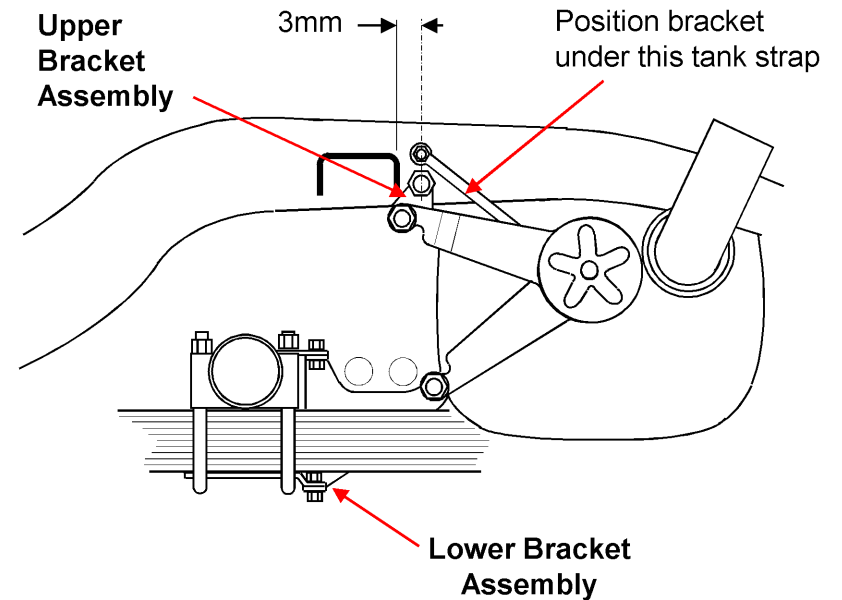
**Model
(Under Construction)**



**Left Rear
View**



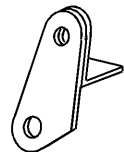
Left Side View



ANDRE-HARTFORD SHOCK ABSORBER - REAR BRACKETS

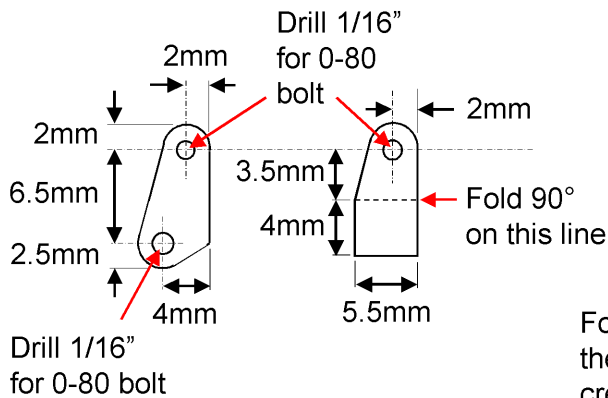
The lower brackets are best assembled as a system before mounting on the axle / spring clamp.

Upper Bracket Assembly (Left Hand Side)

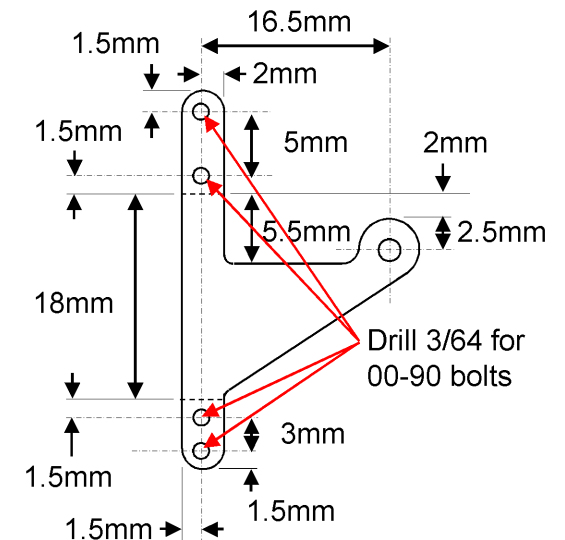
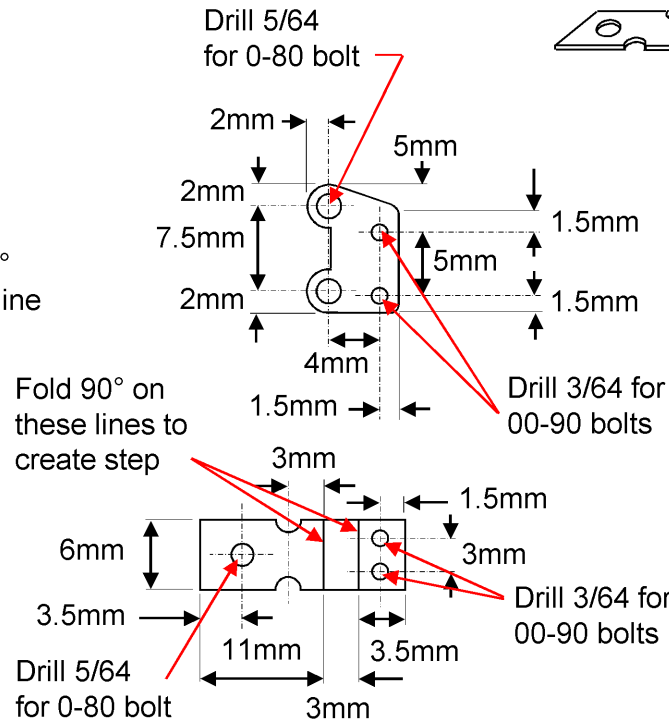
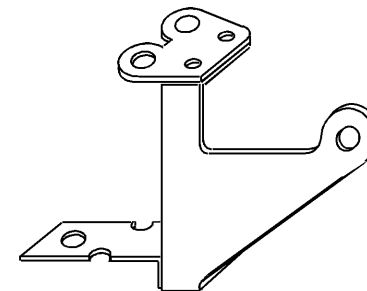


Solder these two pieces together

Cut from 0.025" sheet



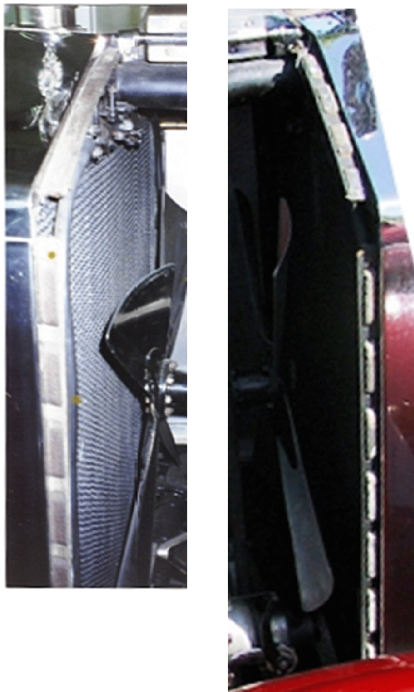
Lower Bracket Assembly (Right Hand Side)



RADIATOR - CORE

The bonnet (hood) was supported at each end on flanges. At the front end, the flanges were attached to the radiator and, at the other end, to the firewall. Canvas straps were woven through the flanges to act as wear protectors. On the Pocher radiator, the flanges and straps are molded into the side of the radiator core. This is incorrect. As a result the radiator core is too thick which can create interference with the end of the crankshaft. The next two pages describe how to modify the radiator to the correct thickness and add proper support flanges.

Prototypes

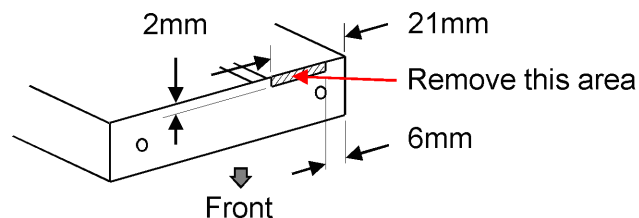


Construction

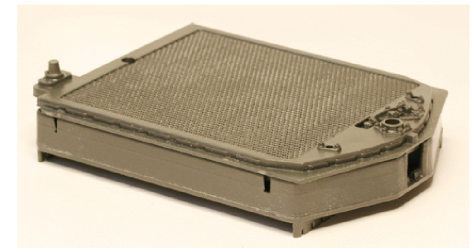
- Remove the flange from the inward (i.e. engine) facing radiator molding. Grind off the molded straps
- On that molding, and measuring from the outer edge, cut the four posts down to 9mm.
- On the outer facing radiator molding, cut or grind down each of the four small inside bosses to 2mm high.
- At the top of that same molding, reduce the height of the walls of the small box to 4mm.
- On the outer molding, reduce the bottom wall height 2mm

The face of the inner molding should now be flush with the edge of the outer molding and there should be an approximately 1mm gap between the sides of the inner and outer moldings.

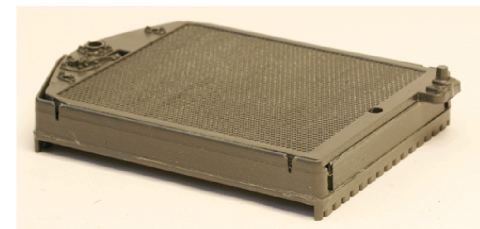
- Notch the nickel-plated shell to accommodate the hose flange at the bottom of the inner molding, as follows:



Pocher

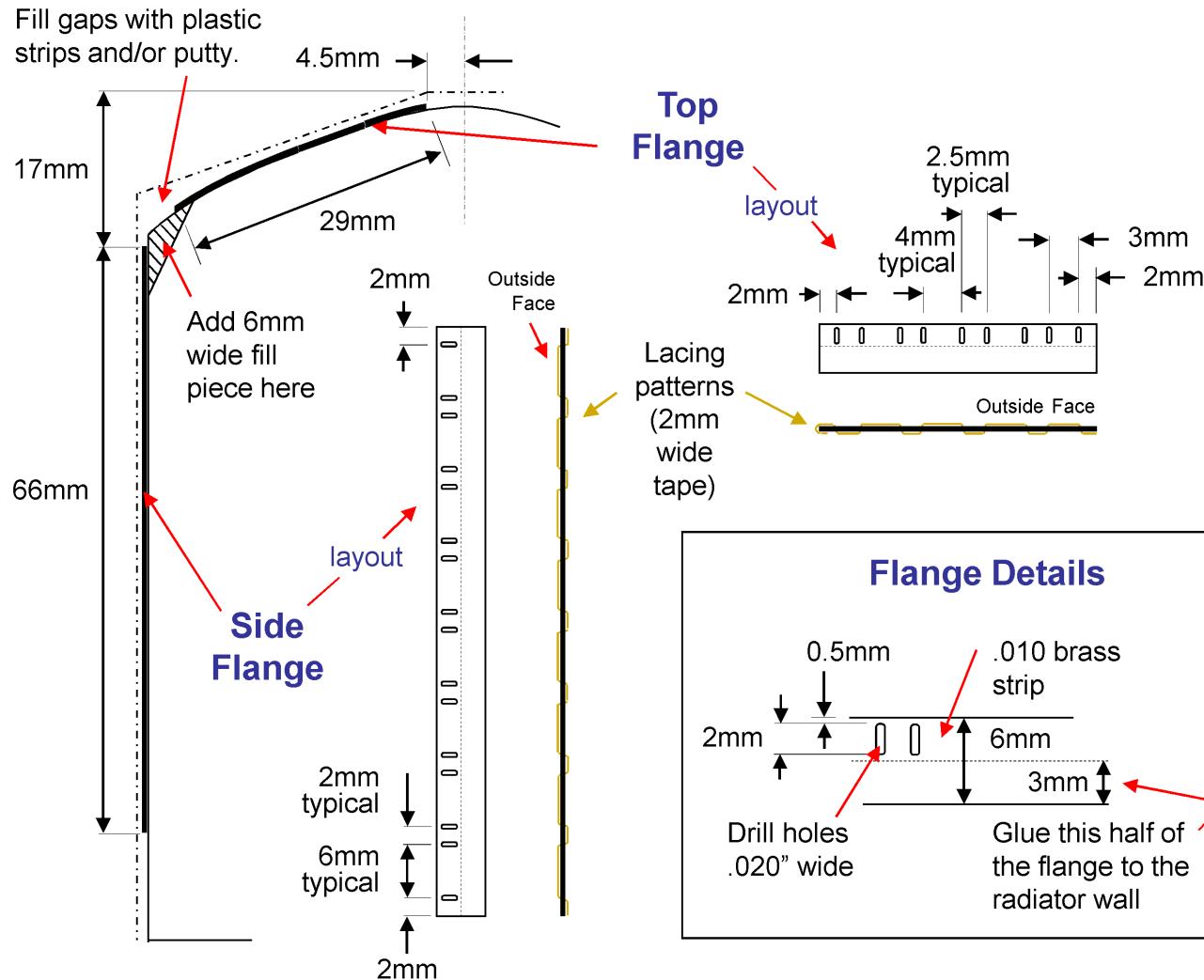


Under Construction (before adding flanges)



RADIATOR - FLANGES

Flange Arrangement & Construction



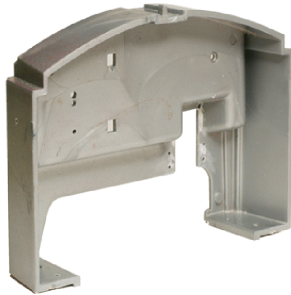
Earlier Finished Model
(slightly different)



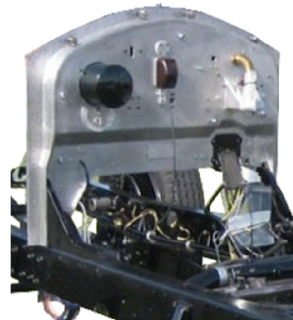
FIREWALL - 1

The firewall in the Pocher Phantom II kits is only an approximation of the real thing. If it is going to be visible, as for example in a chassis-only model, or if historical accuracy is desired, significant modifications are needed to better represent the prototypes. The next two pages describe the firewall material removals and additions needed to better represent the prototypes.

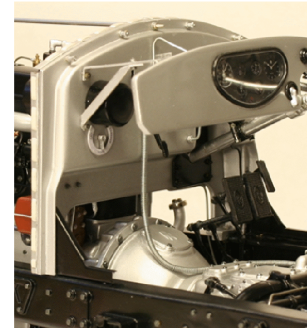
Pocher



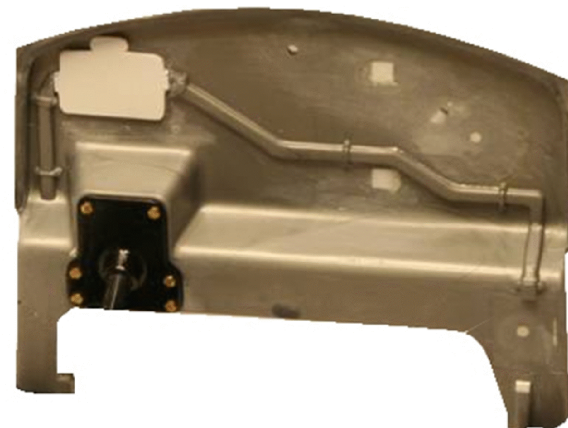
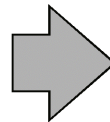
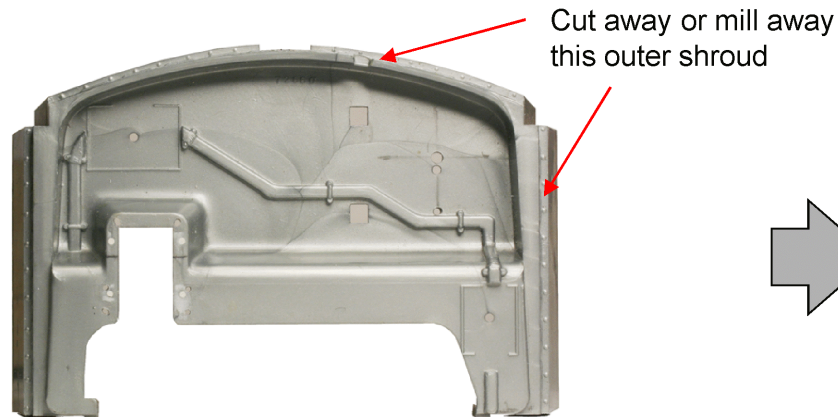
Prototype



Model



Material Removal

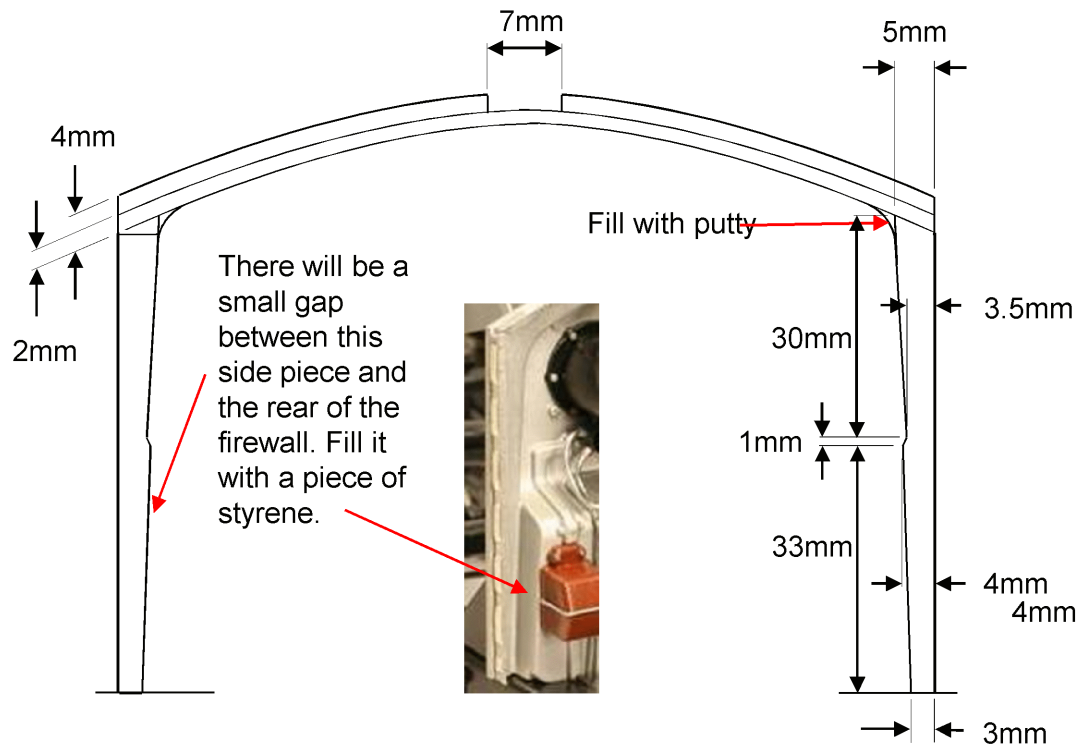


FIREWALL - 2

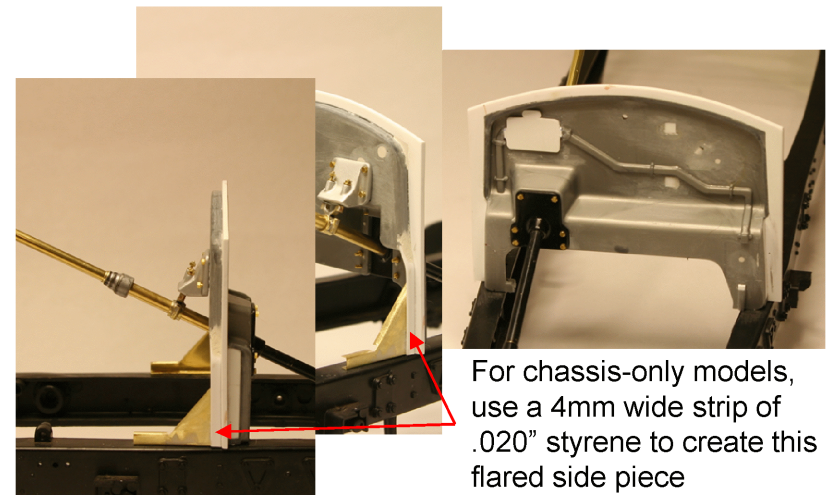
Once the top and side skirts have been removed from the Pocher firewall, new crown and new side pieces need to be added. The bonnet support flanges will be attached to these pieces. For a chassis-only models, adding a flared side piece to the back part of the firewall will further improve realism.

Adding Changes

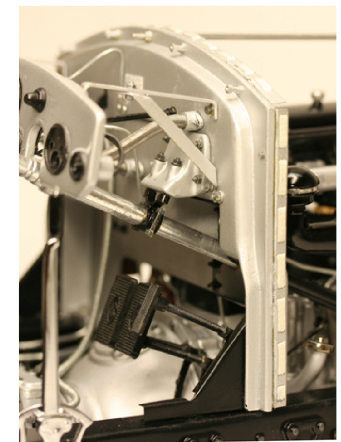
Make side pieces from .080" styrene sheet.
Crown pieces can be made from 2mm x 2mm (.080" x .080") strips.



Under Construction



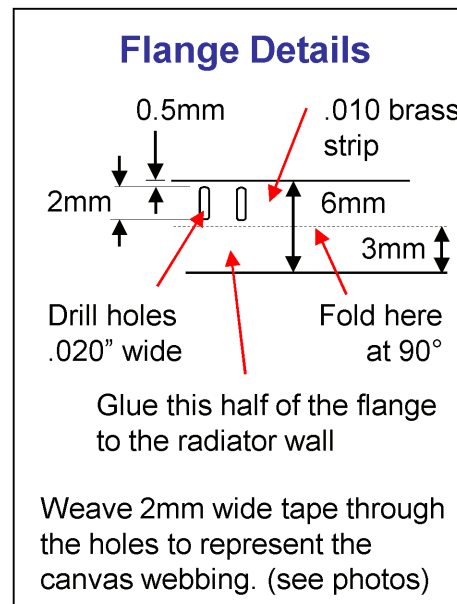
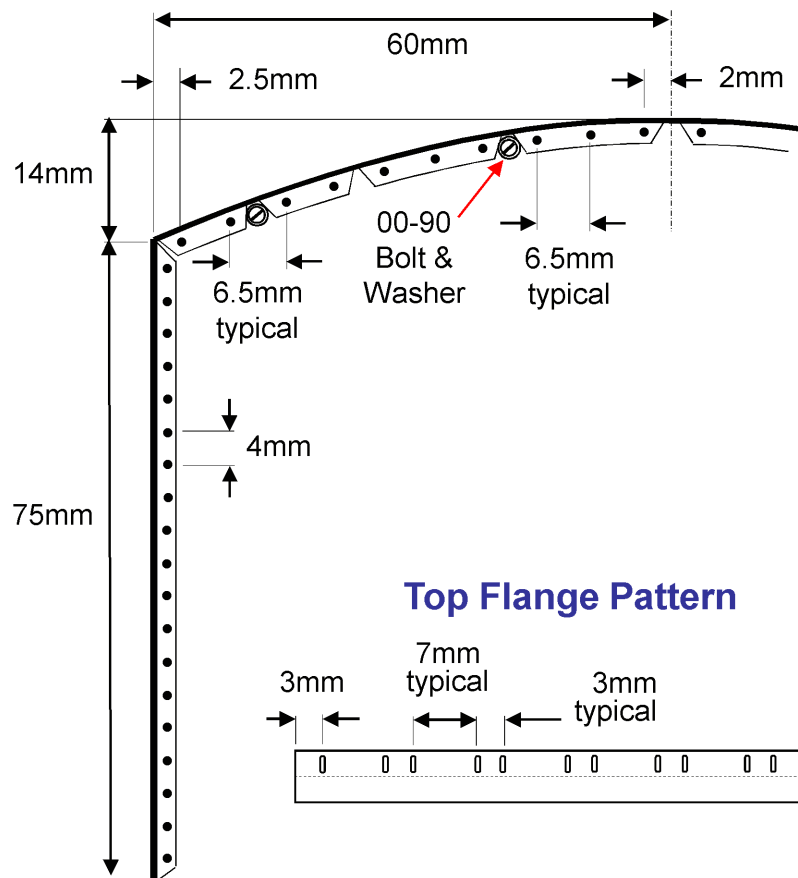
Completed Firewall



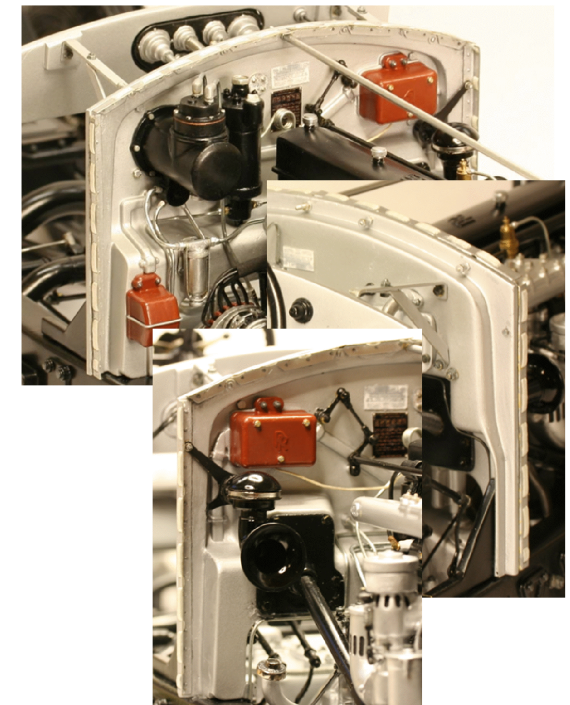
FIREWALL BONNET FLANGES

As is the case with the radiator, Pocher molded the bonnet (hood) support flanges and straps into the firewall. As a consequence, they are representational only and serve no useful purpose. Here's how to add proper support flanges to the modified firewall.

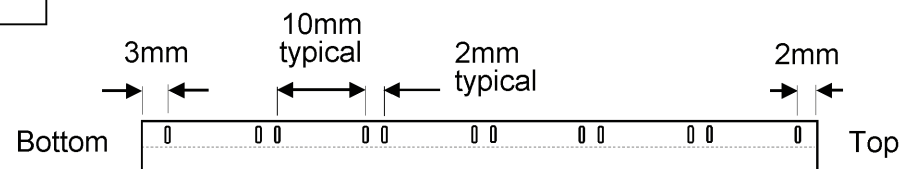
Flange Layout



Model



Side Flange Pattern

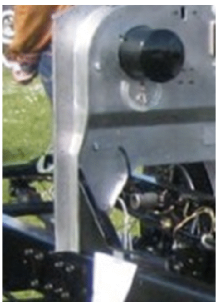


FIREWALL SUPPORTS & CONNECTIONS

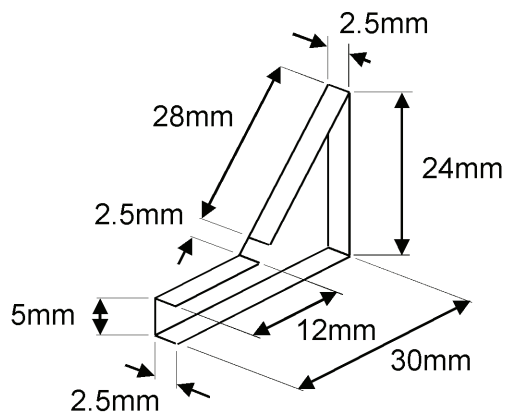
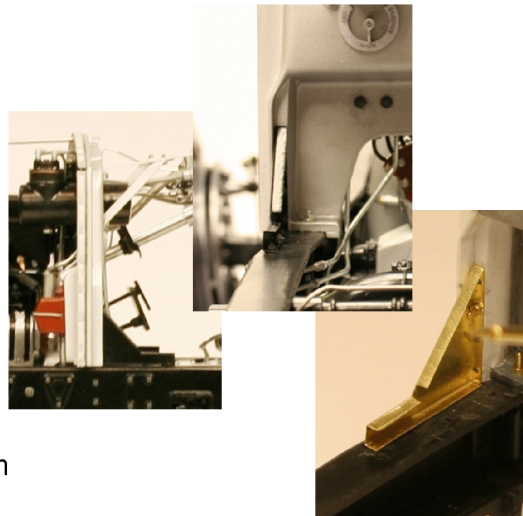
The firewall itself was attached to the frame with two supports. Those supports are dimensioned on this page. There are also a number of connections through the firewall. Detail is provided for two of them.

Firewall Supports

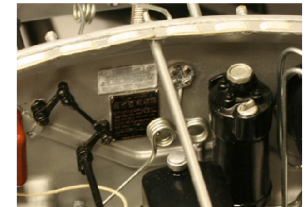
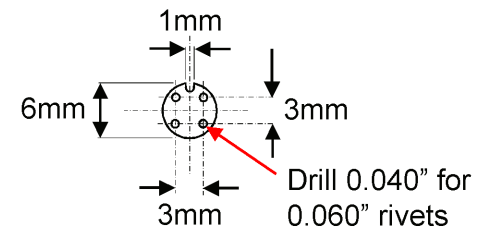
Prototype
(Unpainted)



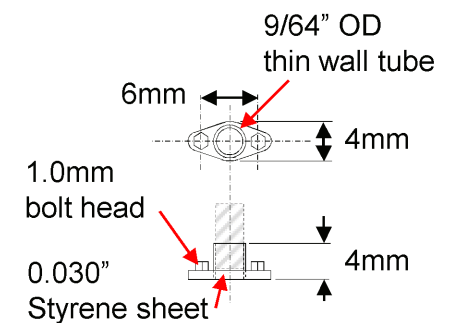
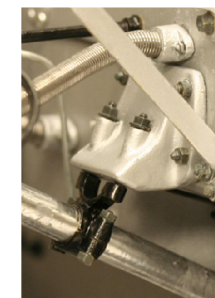
Under Construction



Water Temperature Line Covers



Electrical Connector Boss



HORN & SUPPORT BRACKET

A little license was taken to utilize the beautiful Model Motor Cars horn, but still incorporate the RR mounting bracket.

Prototypes



Testing the fit



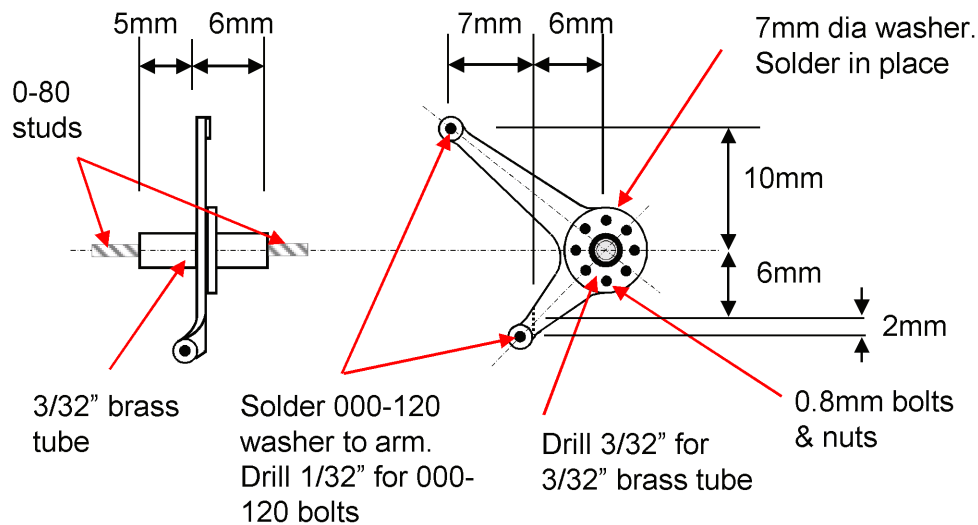
Model

Final



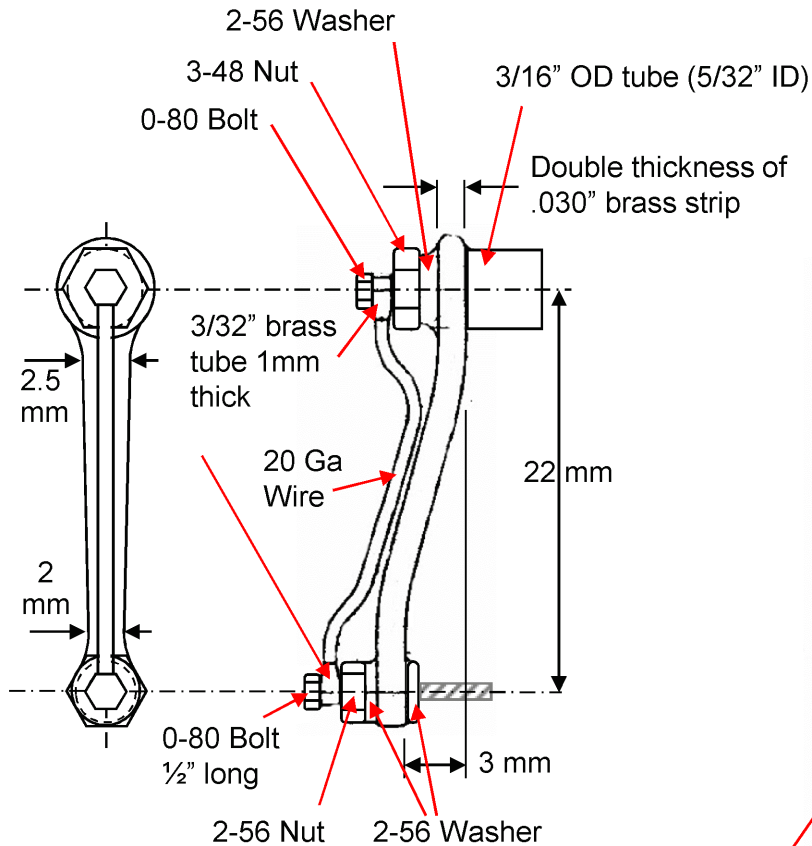
Gloss black finish with aluminum foil trim

Model Bracket Dimensions



STEERING ARM & ROD

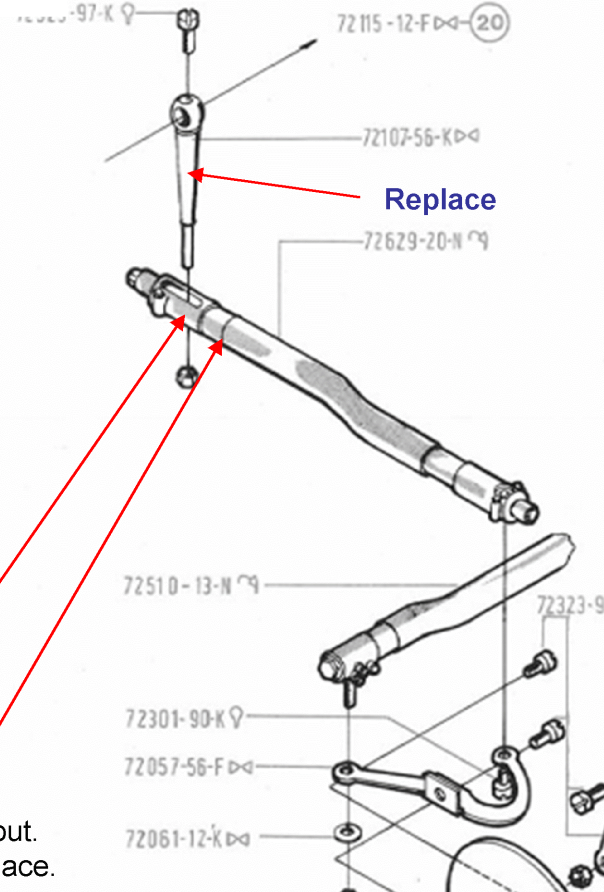
Steering Arm Model Dimensions



Drill out hole for 0-80 bolt.
 Cut Steering Arm here.
 Drill out centers for 1/32 rod.
 Rotate end with spring 90° to face out.
 Insert rod into two pieces, glue in place.

The Pocher steering arm arrangement is incorrect. The attachment point of the arm to the steering rod was on the outside of the rod, not on the top. To be correct, the Pocher steering arm should be replaced and the steering rod modified as below.

Pocher



Prototype

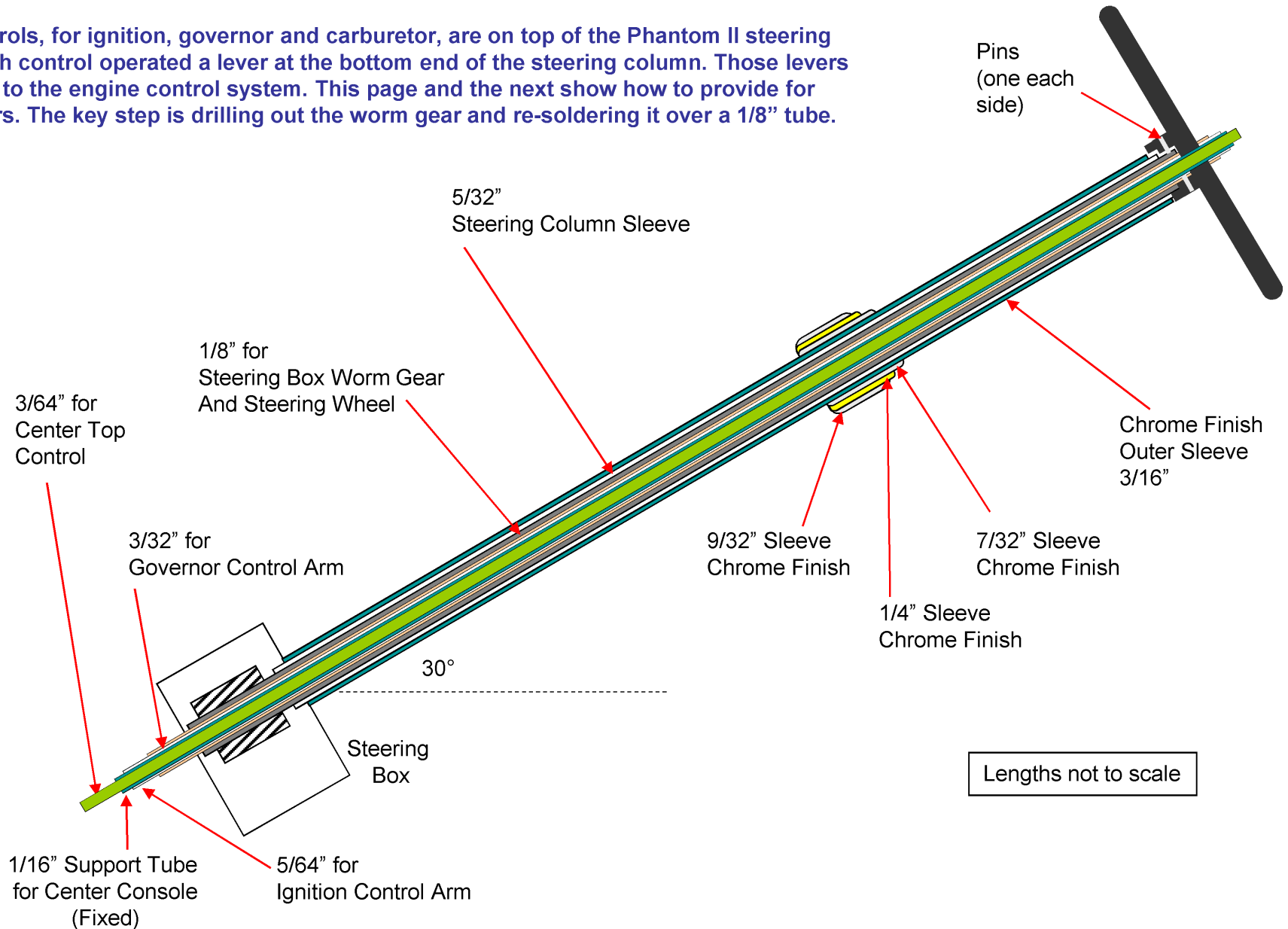


Chassis Model



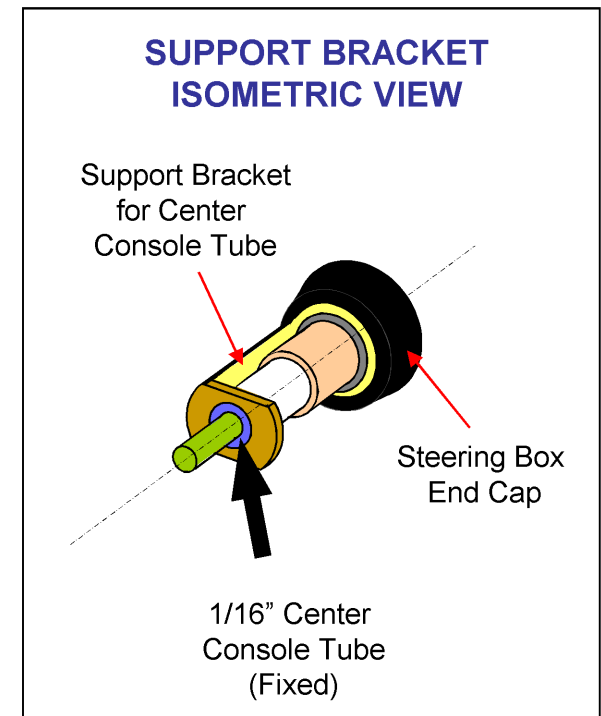
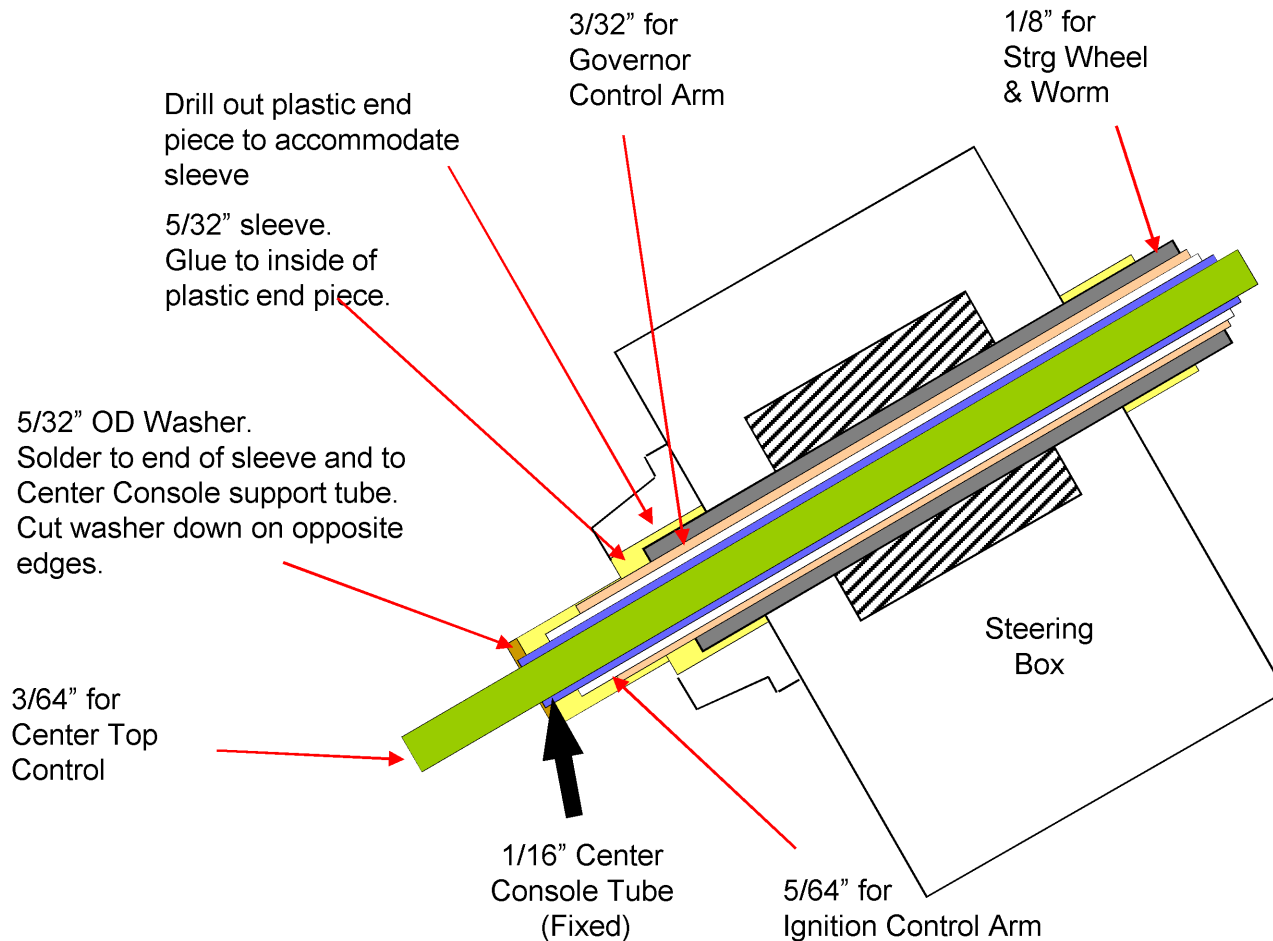
STEERING COLUMN ARRANGEMENT

Three controls, for ignition, governor and carburetor, are on top of the Phantom II steering wheel. Each control operated a lever at the bottom end of the steering column. Those levers connected to the engine control system. This page and the next show how to provide for those levers. The key step is drilling out the worm gear and re-soldering it over a 1/8" tube.



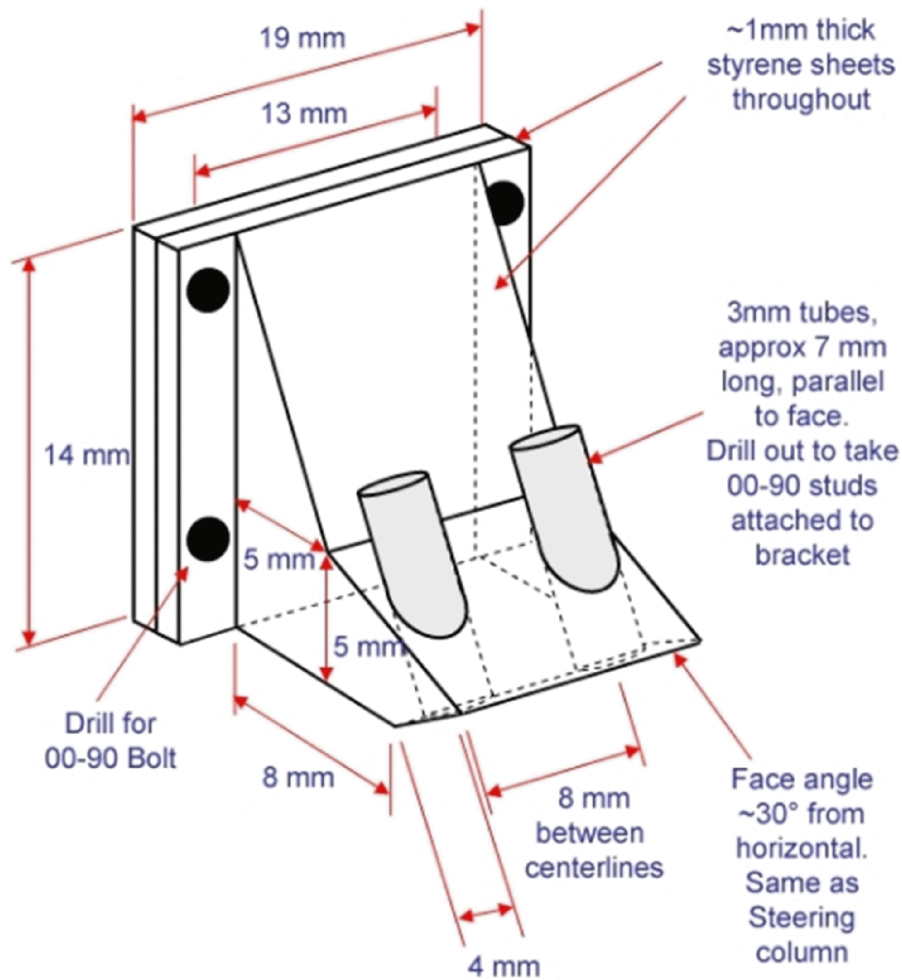
STEERING COLUMN END ARRANGEMENT DETAIL

Above the steering wheel was a console that acted as a reference plate for the three control levers. It remained centered in place even when the steering wheel turned. This page describes a method to hold the console in place by attaching it to a tube which is then anchored to the steering box. The console tube is highlighted with the large arrows.



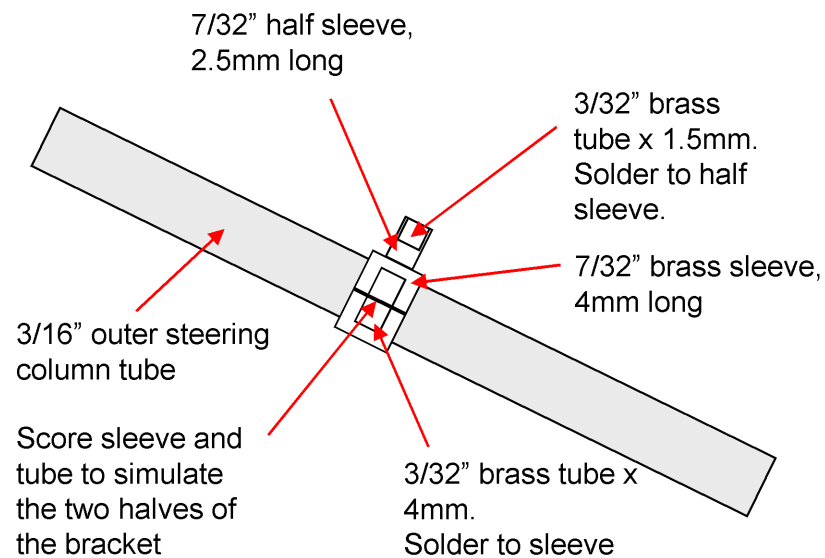
STEERING COLUMN SUPPORT CASTING

On prototypes, the steering column was supported by a bulkhead mounted, cast aluminum support with a steel collar as the photograph shows. It can't be ignored for a chassis model!! The bracket construction is on the following page.

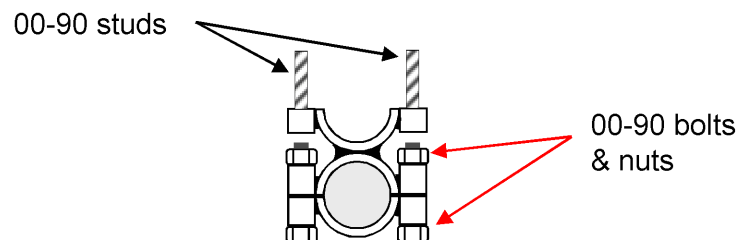


STEERING COLUMN SUPPORT BRACKET

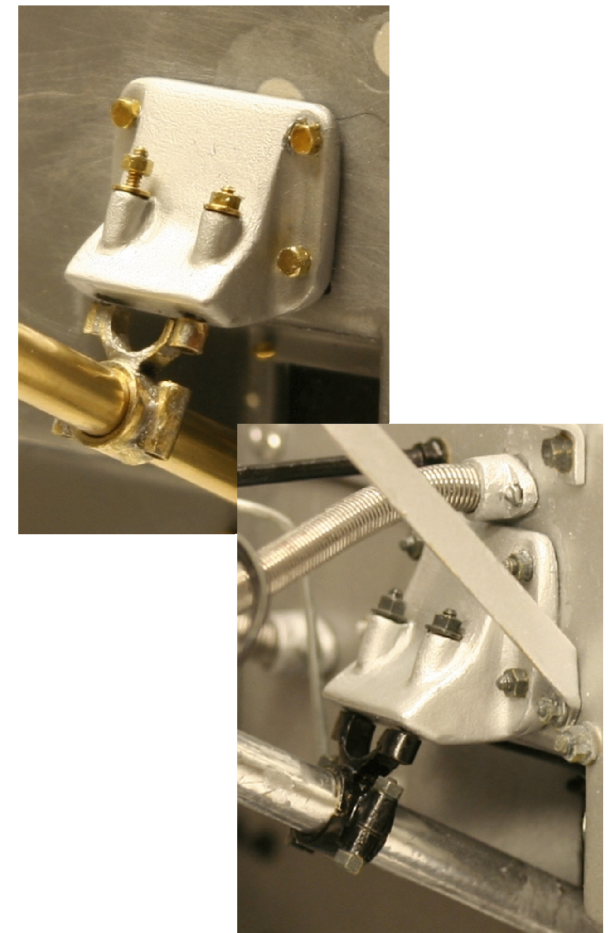
Basic Construction



Cross-section



Chassis Model

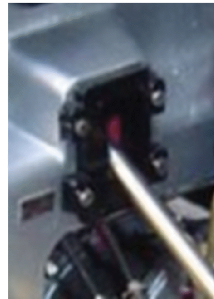


STEERING COLUMN COVER PLATES

The steering column passes through a cutout in the firewall which is covered by a plate. Here's an alternative to the Pocher cover plate that is both closer to the prototype design and provides a more credible arrangement for sealing the engine compartment from the passenger compartment. To improve the aesthetics an interior cover plate is also dimensioned.

Note: these dimensions assume the firewall is mounted directly to the chassis frame and that the Pocher spacers are omitted.

Pocher



Prototype



Under Construction

Exterior

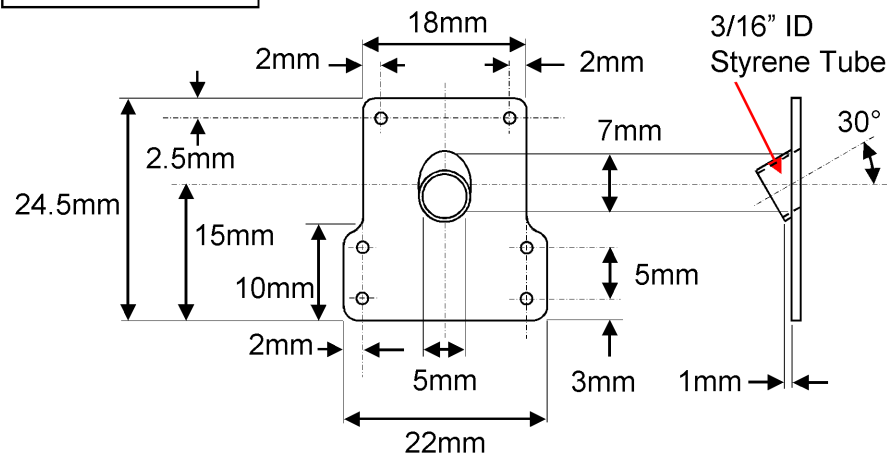


Interior

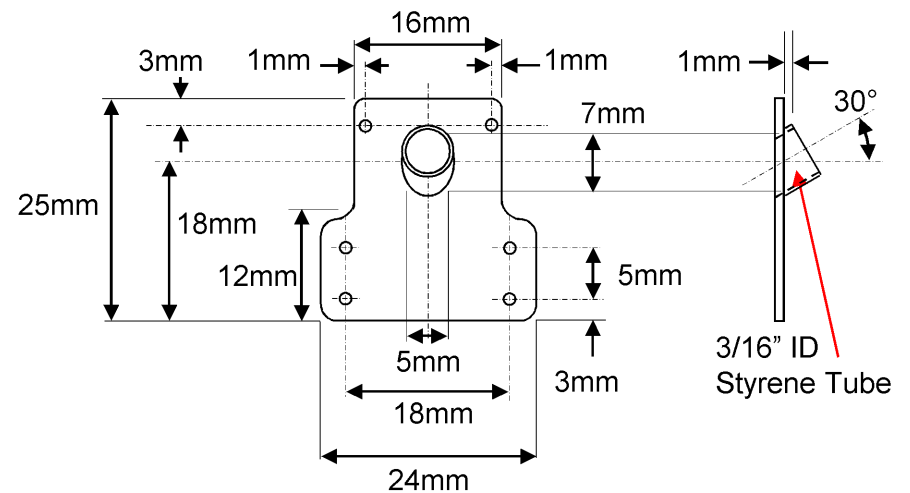


Plates are 0.040" styrene sheet.

Exterior Plate



Interior Plate



ELECTRIC FUEL GAUGE & INSTRUMENT CLUSTER

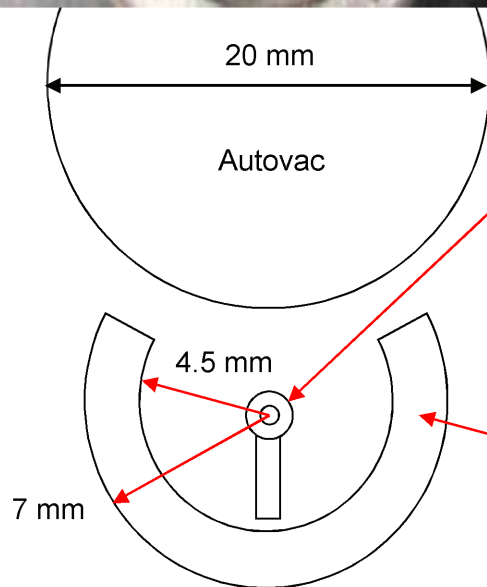
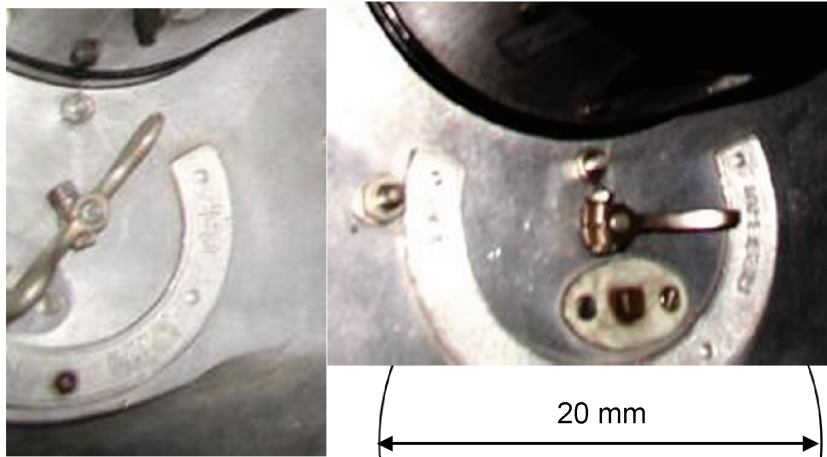
In July 1933, a larger 28 gall. fuel tank (used in all Pocher kits) was introduced. It provided for a 4 $\frac{1}{2}$ gall reserve with its own supply line along the chassis rail and a manual switch on the bulkhead (or firewall). An electric petrol gauge replaced the Telegauge (Pocher incorrectly uses this with the larger tank). This page shows the instrument cluster modified to accommodate the petrol gauge. Interestingly, there appeared to be no consistent placement of the speedometer relative to the steering wheel and driver. Sometimes on the left of the cluster, other times on the right.



FUEL SUPPLY SWITCH

After July 1931, all Phantom IIs were fitted with a fuel reserve. The fuel source was selectable by a manual switch under the Autovac.

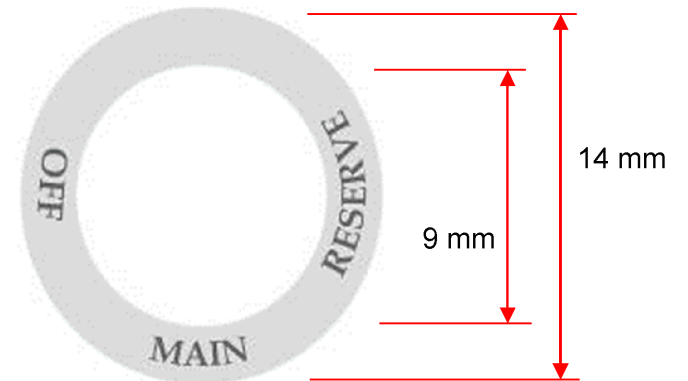
Prototypes



3/64" tube over
1/32" rod.
Solder to arm
made from .040"
brass strip

.020" styrene
sheet

Decal



Chassis Model



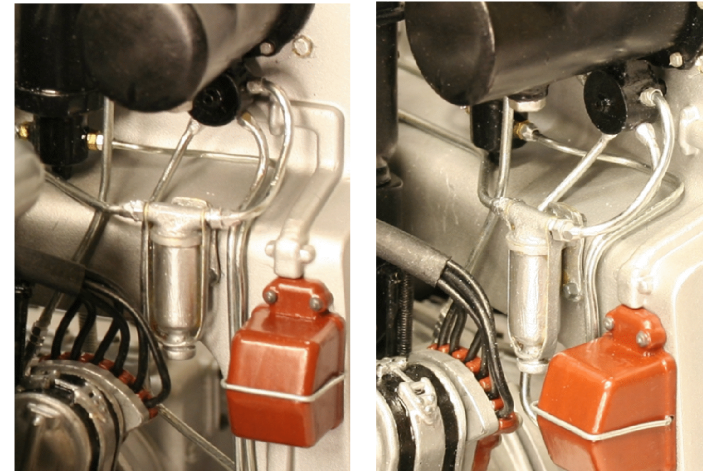
FUEL FILTER

The fuel filter was a prominent feature on the bulkhead. Its location could be behind the magneto, as in this model, or on the offside adjacent to the steering column.

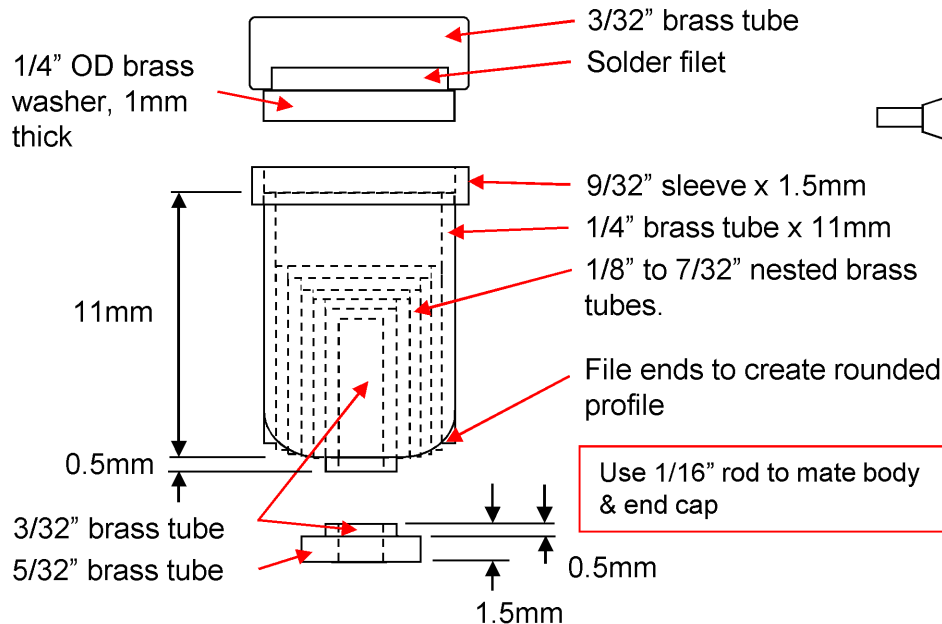
Model Motor Cars offers an excellent resin model of the filter, although with a longer than usual body.

This unit was scratch built since a long filter body would have interfered with the magneto.

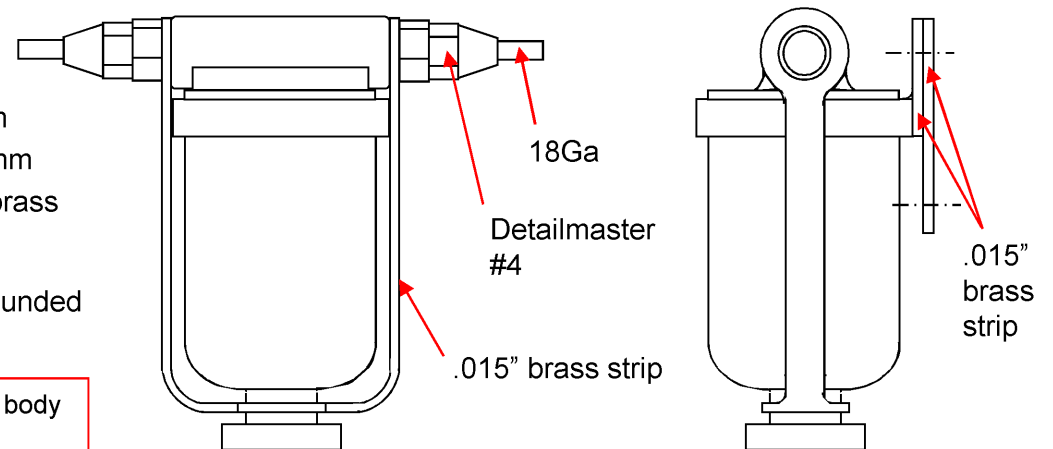
Chassis Model



Filter Construction



Finished Filter

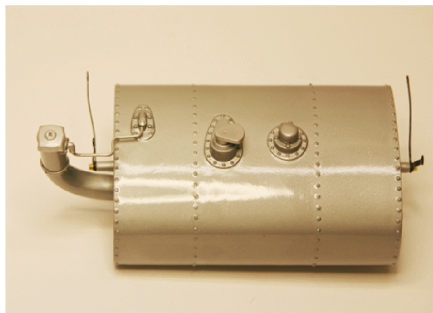


Bolt strips together and attach assembly to bulkhead with 0.8mm hardware

20 GALLON FUEL TANK - 1

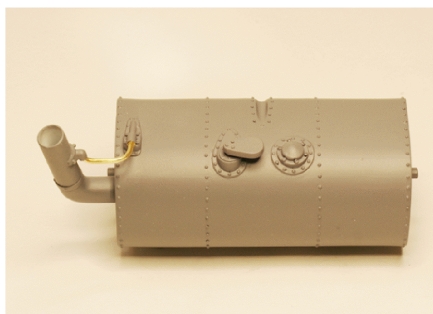
Pocher models use a 28 gallon (Imperial)* fuel tank. This larger tank was introduced by Rolls-Royce in July, 1933, but at that point almost three-quarters of all Phantom IIs had been produced. The earlier prototypes had a 20 gallon tank. This page shows the 20 gallon tank under construction and the next page provides key dimensions.

Pocher

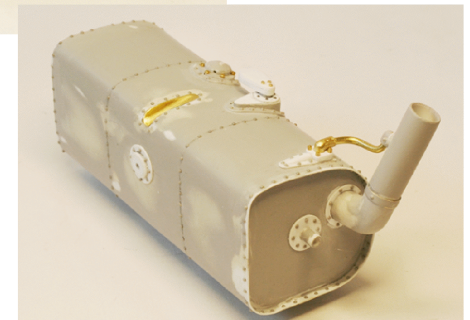
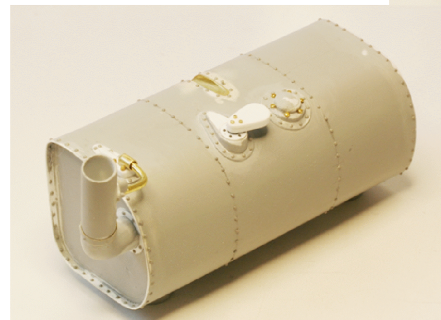


Model

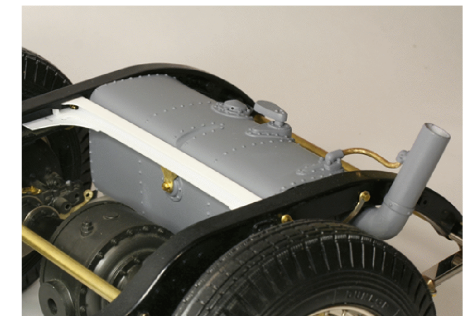
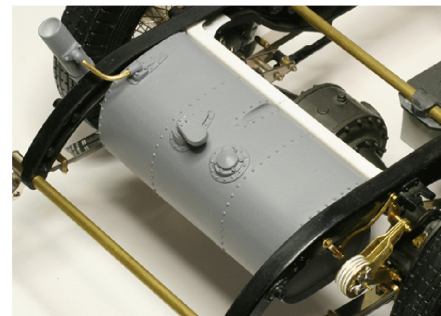
(Primed, but not painted)



Under Construction



Testing Installation

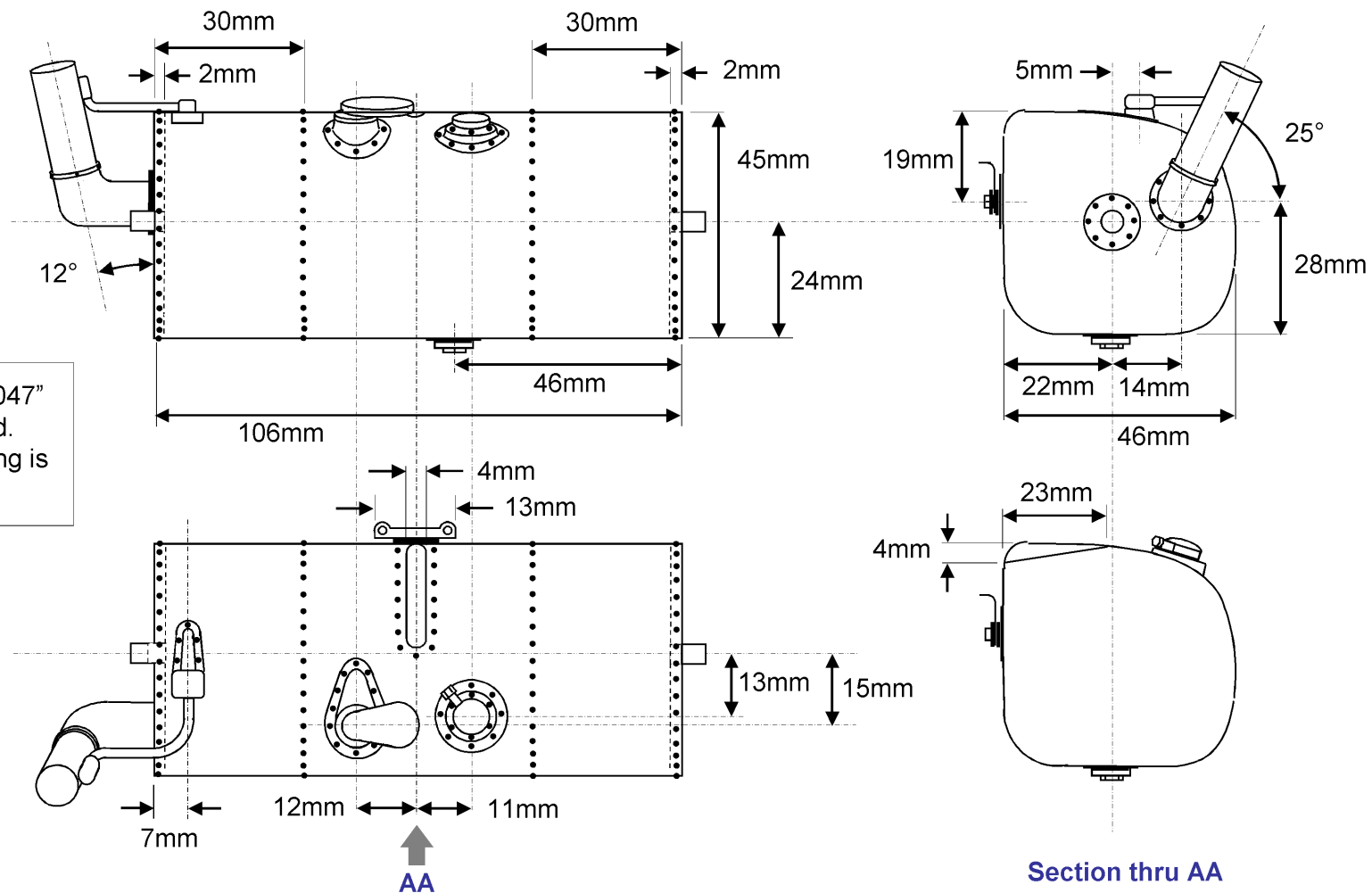


* An Imperial gallon is 160 fluid ounces; a US gallon 128 fluid ounces

20 GALLON FUEL TANK - 2

The overall width of the 20 gallon tank is 106mm, the same as the Pocher 28 gallon tank. The fittings are virtually identical. Only key dimensions are provided on this page, but the drawings are proportionally correct, so other dimensions can be scaled. Note that both the 20 gallon and 28 gallon tanks had a front support attaching the tank to the rear cross member.

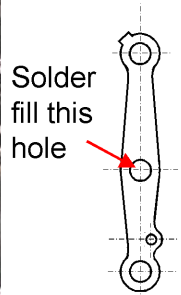
Model Dimensions



REAR AXLE - 1

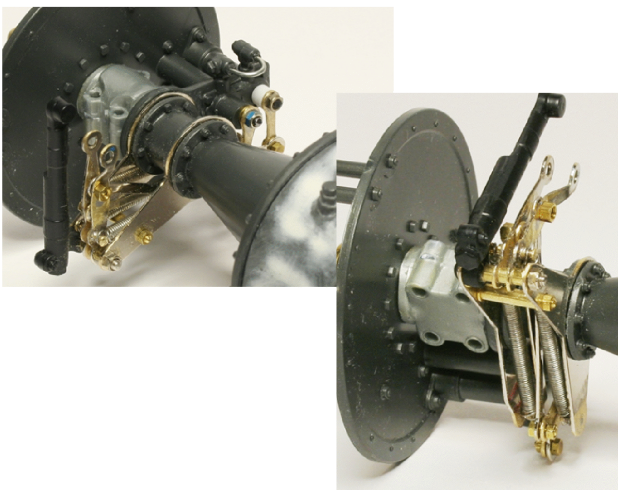
On prototypes, the brake lever arrangement on the rear axle includes return springs. There were two springs on each side. One spring released the foot brake, the other the handbrake. Pocher left out these springs, replacing them with a single spring acting between the footbrake pedal and the gearbox. As a result the Pocher models 'push' on the brakes through solid brake rods. By contrast, prototypes 'pull' on the brakes (against the springs) using a combination of rods and wires. Here's how to replicate the prototype rear axle arrangement.

Prototype

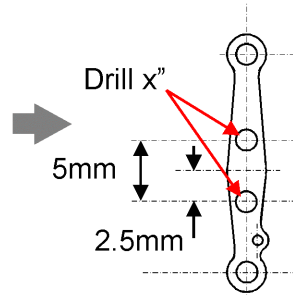


Pocher

Under Construction

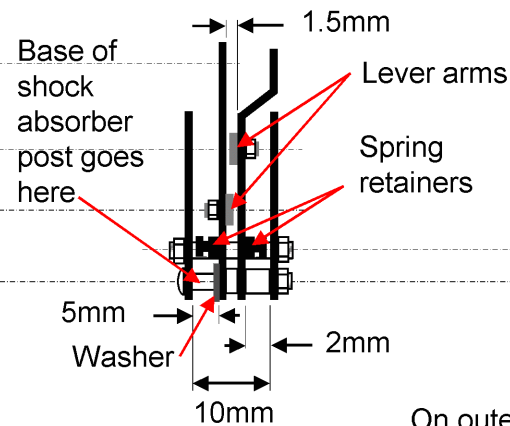


Pivot Rod

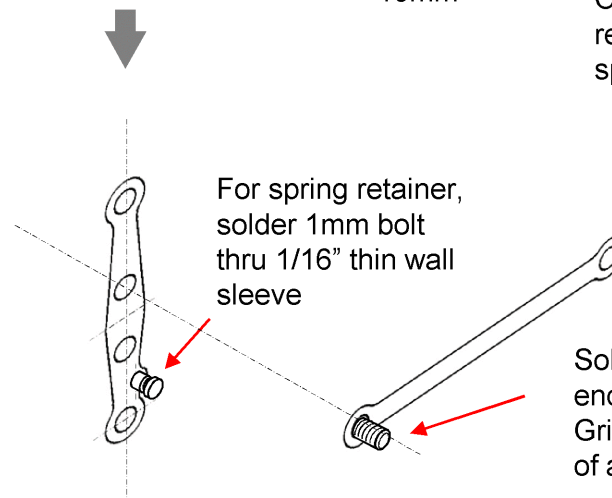
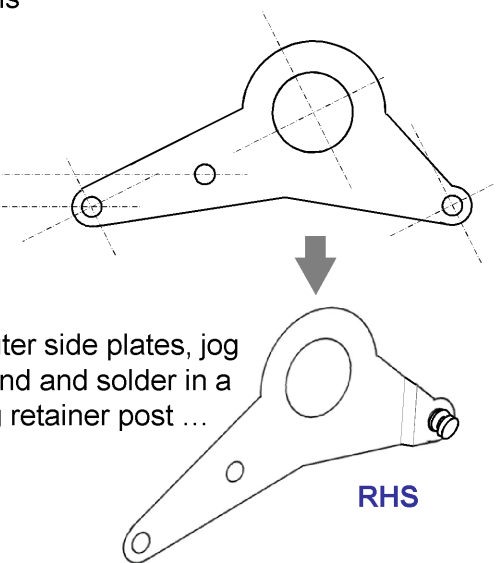


Model

Assembly



Side Plate

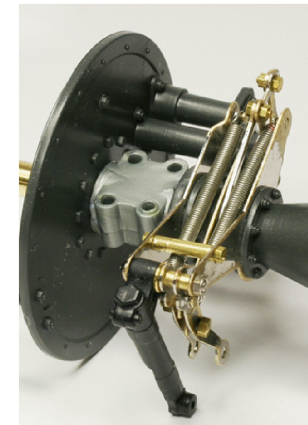
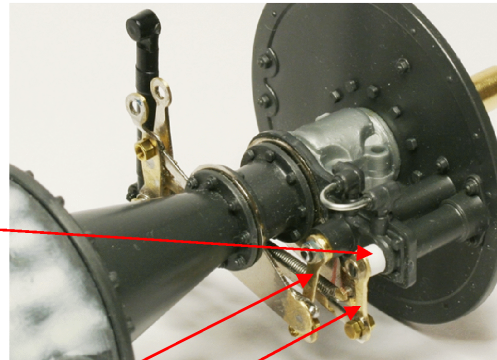
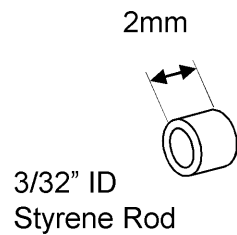


REAR AXLE - 2

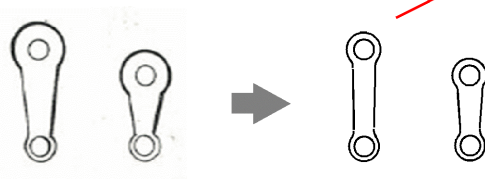
Minor changes to the rear lever arms and mounting completes the modifications.

Under Construction

Add an extension sleeve to the rear pivot rod housing ...



Slim down the rear lever arms ...

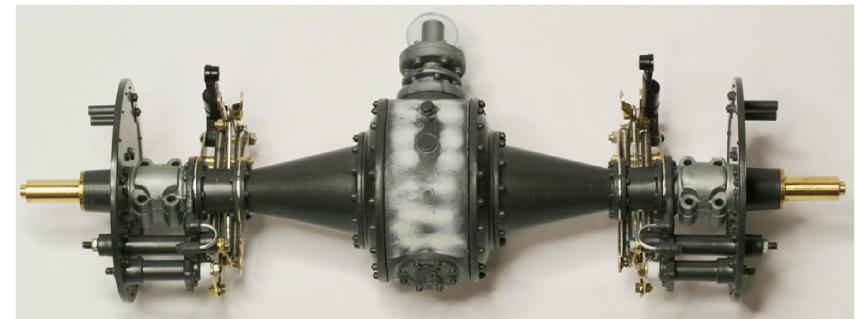


Pocher

Model

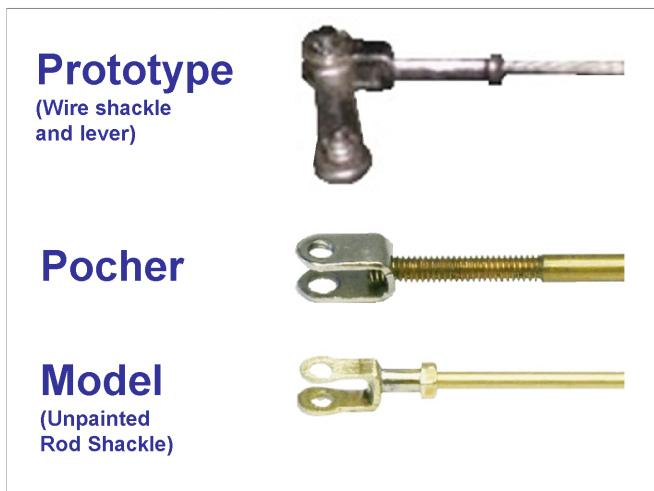
Model

(Assembled but not painted)

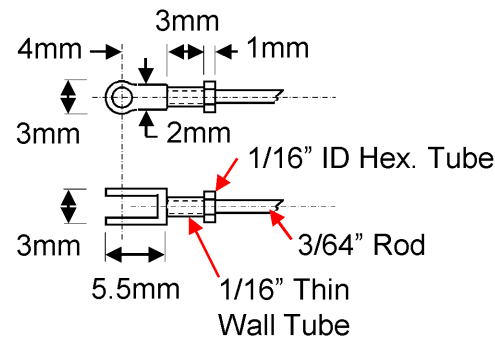


BRAKE LINKAGES

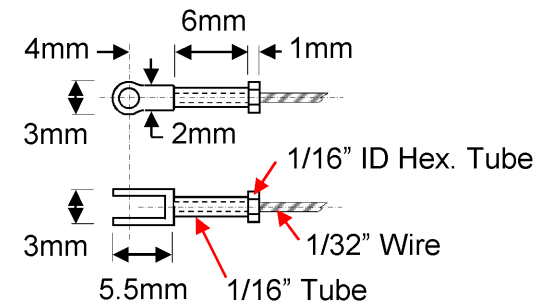
The Pocher brake linkages use oversized rods and shackles. In addition to smaller shackles, prototype linkages also used a combination of rods and wires. This page shows how to construct linkages that are much closer to the prototypes. However, to include wires in the brake linkages, the rear axle must also be modified to add the return springs.



Rod Shackle

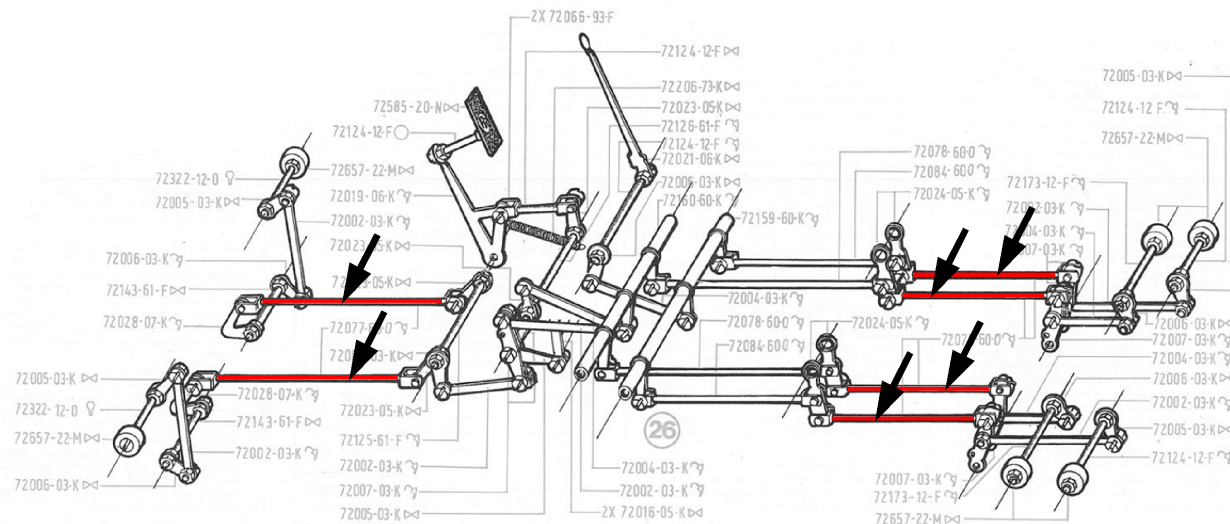


Wire Shackle



Pocher Layout

On the prototypes, the linkages marked with arrows are wires.



LINKING DIMENSIONS

Scratch building requires dealing with a variety of dimensional systems; not just English and metric, but also systems for wire, drills and hardware. For reference, this table links some of the key dimensions. Each row represents a common diameter.

Dimensions				American	Selected Telescopic				Drill Sizes		Hardware						
English		Metric		Selected Full Size	Wire Gauge		Round Brass Tubes						(typical dimensions)				
Fraction	Decimal		Round	Eqvit			Normal	Thin Wall			Size	Bolt Shaft		Hex Head			
in	in	mm	mm	(1/8 Scale)	Ga	ins	OD	ID	OD	ID	#	ins	(in)	(mm)	(in)	(mm)	
							(.014" Wall)		(.006" Wall)								
					28	0.014											
1/64	0.016	0.40	0.4	1/8							78	0.016					
					26	0.017											
					24	0.020					76	0.020	0.5mm	0.020	0.50	0.030	0.76
				3/16							74	0.022	0000-160	0.021	0.53	0.047	1.19
					22	0.025											
1/32	0.031	0.79	0.8	1/4					1/32	1/64	68	0.031	0.8mm	0.031	0.80	0.042	1.07
					20	0.032											
											66	0.033					
											64	0.036	000-120	0.034	0.86	0.078	1.98
				5/16	18	0.040					60	0.040	1.0mm	0.039	1.00	0.055	1.40
3/64	0.047	1.19	1.2	3/8					3/64	1/32	56	0.047	00-90	0.047	1.19	5/64	1.98
					16	0.051											
													0-80	0.060	1.52	3/32	2.38
1/16	0.063	1.59		1/2	14	0.064	1/16	1/32	1/16	3/64	52	0.063					
5/64	0.078	1.98	2.0	5/8			5/64	3/64	5/64	1/16			1-72	0.073	1.85	7/64	2.78
					12	0.081					46	0.081	Pocher Rod	0.079	2.00		
											42	0.094	2-56	0.084	2.13	1/8	3.18
3/32	0.094	2.38		3/4			3/32	1/16	3/32	5/64							
7/64	0.109	2.78		7/8	10	0.102	7/64	5/64	7/64	3/32							
1/8	0.125	3.18		1			1/8	3/32	1/8	7/64							
9/64	0.141	3.57					9/64	7/64	9/64	1/8							
5/32	0.156	3.97	4.0	11/4			5/32	1/8	5/32	9/64							
11/64	0.172	4.37					11/64	9/64	11/64	5/32							
3/16	0.188	4.76		11/2			3/16	5/32	3/16	11/64							
13/64	0.203	5.16															
7/32	0.219	5.56															
15/64	0.234	5.95	6.0														
1/4	0.250	6.35															
17/64	0.266	6.75															
9/32	0.281	7.14															
19/64	0.297	7.54															
5/16	0.313	7.94	8.0														