

# Rolling Chassis

***Note:** If you have purchased your body and chassis together, refer to the "Body Shell Preparation" section first!*

## First step:

Place the chassis on supports that bring it up off the ground to a level that is comfortable to work at, that will not cause back pain. (Trestles or two work mates will be fine).

**REMOVE EXCESS ZINC:** Using a hand drill (battery drill is best as they have a clutch) drill out the excess zinc (galvanizing process) from the treaded holes. Use a **9.8mm or 9.9mm (NOT 10mm)** bit to drill out the **8 threaded holes** for the seat belts anchors. Use a **7/16" UNF** tap to remove the excess zinc. The zinc is softer than the steel and it should find its own start and easily follow the tread (don't force). Next drill the **6 treaded holes (M10x1.5mm)** for the front cross member using an **8.4mm or 8.5 mm** drill and tap. You may find it easier to invert the chassis to clear these **M10** holes.



Drill



First Tap



Second Tap

There are **TWO** location holes on the under side of the chassis (front) to locate the cross member. These will also require the excess zinc removed. With the chassis inverted the location holes can be easily accessed. Use a rotary burr in a drill (or a round file) to remove any lumps of zinc and round up the hole. Test fit the cross member, removing excess zinc, until the location pins drop into place.



**Note:** The holes must remain round, remove only the zinc! The zinc is approximately .4mm thick all over the chassis. The steel has a different colour if you go through the zinc. Do not worry if it's a small area.

Test fit the cross member and ensure that the treads are clear and to the correct depth by test fitting the bolts in the holes. Do not use washers at this time to ensure that the bolt does not stop on the thread but clamps the cross member tightly to the chassis.



Blow out threads & pin holes



Test Fit Cross Member

## **Second stage:**

If all your running gear is modified and painted then you are ready to continue the build up. If not, refer to the appropriate sections of the manual for modifications and preparation before continuing!

***NOTE: It is always best to grease all bolts and location pins on assembly. Use copper grease or a good quality chassis grease, to prevent water gaining access to mating surfaces and corroding. IT COULD BE YOU THAT TRIES TO REMOVE A RUSTED BOLT IN YEARS TO COME!***

You should have your shocks and springs ready for installation (refer to shock specs section) and all the nuts bolts and washers as specified (donor and/or new). You can use steel tubes in place of the shocks if you do not yet have them. The rear tubes should have holes at 12 ½" 310mm centers and the front tubes at 13" 330mm centers. This will give an approximate ride height.

- 1.** Assemble the steering box on to the cross member along with the drag link and parallel arm to the box arm, and tighten all bolts to the BMW standard setting in the workshop manual.
- 2.** Position the chassis on suitable stands around 1ft 300mm off the ground at least, higher is OK.
- 3.** Place the cross member under the chassis in line with the location holes and pins. With the aid of a friend or an engine crane or a suitable jack lift the cross member up into place. Then place the two outer bolts into their holes and tighten until the cross member comes into contact with the chassis. Place the two rear bolts in their holes and tighten to just over finger tight.



- 4.** Take the left and right hand anti-roll bar brackets top half's, place the 150mm bolt through the bracket tube and then up into the chassis, tighten lightly, clamp the front part of the bracket to the radiator support section of the chassis.
- 5.** Drill the **2 holes** each side through the holes in the anti-roll brackets. Deburr and fit the **2 M8x25** bolts with washers and lock nuts. And tighten fully to **35ftlb**.



- 6.** Remove the **150mm** bolt from the bracket and cross member. Fit the rubbers to the anti roll bar push the lower part of the anti roll bar bracket over the rubber, with the short side of the bracket toward the front of the car.
- 7.** Lift the roll bar into place, fit the front **M10x 25** bolts loosely with lock nuts, replace the **150mm** bolt this time through the lower bracket as well and tighten loosely.
- 8.** Tighten all the **6 M10** bolts + the 2 front roll bar bolts to **40ftlbs**, starting with the 2 outer and then the rear and last the front 2, repeat this again but now at **65ftlb** for the **6 main bolts**. The cross member is now complete.

## Next step:

1. Fit the 2 lower arm to the cross member using the set of holes closest to the center of the car (not the outer holes 7-series setting). Using **2 M10x80** bolts & lock nuts washers, then attach the rear trust arms and the lower upright plate. With **2 M14** bolts & lock nut at the chassis end connect the track control arm both sides to the Drag link and then to the lower upright plate. **The M10 & M14 bolts should be left finger tight until setting the correct ride height and geometry!**



2. Assemble the bushes into the upper wishbone arms (4 off Polly top hat bushes) this is best done with a soft mallet or a G clamp. Fill the gap between the Polly bushes with grease (best silicon based) and push the steel center tube into the top hats, use a G clamp or a press to complete this task.
3. Clear any zinc from the 4 tubes in the 40x40 box above the cross member to allow the **M12** bolts to have a “running” fit.
4. Thread the locking nuts on to the ball joints in the kit supplied noting left and right threads. Thread these into the end of the wishbones until the end of the thread is flush with the inside edge of the threaded tube of the wishbone. (This will give a point to start with, but will need adjusting on completion of the car)
5. Now position the wishbone in-between the two 40x40 posts above the cross member, with some grease on the matting faces, you may need to “tap” it into position, use a soft mallet or the palm of your hand, **not anything that will damage paint or the wishbone!** (Note the ball joint should be too the rear of the car, or they are on the wrong side)
6. Place the **M12x 115 high tensile 12.9** bolts through the tubes in the chassis into the center of the steel sleeve (both sides). Place one of the **38mm** Dia thick washers over the end of the bolt each side. Now tap the center threaded spacer tube in between the two thick washers, push the bolts in until you can find the start of the thread, (both sides) tighten just over finger tight, and repeat on other side.



7. Position the front shocks into the yoke at the end of the upper wishbone arm, with **M12x65** bolt & washers, locknut. (Finger tight) place the other end in-between the plates on the cross member, and fit with another **M12** bolt, repeat on other side.
8. Now tighten all the **8 off M12** bolts to **first 40ftlb** and then to **65ftlb**.
9. Find a long extension bar and a **19mm, 3/4"** socket to reach up through the center of the upright to the nut point for the ball joint, place the locknut from the ball joint kit in the end of the socket with a small amount of grease (to stop it falling out easily) and stick the washer on with grease to the top of the socket.



10. Take your modified upright, rotate the ball joint so that the tread is horizontal. Slip the socket at the top of the upright over the ball joint thread and push home. Hold with one hand and pass the socket up to the thread of the ball joint and tighten to finger tight, then add the ratchet and tighten slightly more until the taper on the joint is home. **BUT NOT OVER TIGHT AS YOU WILL HAVE TO REMOVE THESE ON SETTING UP THE FINAL GEOMETRY!**
11. Swing the upright down to meet the lower upright plate. Locate the lugs on the plate with the slots on the upright & align the **3 M12** bolt holes. Fit bolts again to just over finger tight, as these have to be removed for final geometry setting.

12. Take the drop links for the anti roll bar and bend the center rod in the center at 90 deg to the spigot of the ball joint until it is level with the outside of the ball joint casing. This gives the clearance on full lock that is needed to prevent it contact with the rear wishbone arm.



13. Fit the ball joint to the anti-roll bar end and then to the upright with the bend facing forward. Tighten fully to BMW standard.
14. Fit brake discs and calipers, brake hose to caliper and to the plate provided on chassis. Make sure the pipe does not touch at any point as the wheel turns lock to lock.



## Rear End:

### Diff

Make sure all the bolt holes in the diff are free from paint or corrosion, as it is very heavy and if you cannot fit the bolts with your fingers it will be very hard to fit them. Clean all bolt holes of excess zinc as before.

1. Place a piece of old carpet or thick rag over the lifting plate of a trolley jack. Place the diff on to the jack plate and carefully wheel under the chassis into position. (You may find this is best done with some help, as if it falls and trap a part of you it will hurt). Slowly jack the diff up until it starts to fit into position.

- 2.** Line up the two holes at the rear of the diff first and insert the **2 M12** bolts, tighten to finger tight. Now you can use the jack to raise or lower the front of the diff to line up the front holes. The large diff has a hole in the chassis to allow the bolt to be fitted. Take care not to drop it into the box section of the chassis as it will be very hard to remove! A piece of strong thread around the bolt will help retrieval if it falls in to the chassis



- 3.** Tighten the rear bolts to BMW settings. The bolts at the side (large diff) you will not be able to get a torque wrench to (unless you have the right tools) tighten these as much as you can with a large spanner and a short length of tube. (These are **M14** high tensile and hard to break).



**Small diff mounts E34 518i 520i different to E34 525i 530i 535i**

## Hand brake cable holes:

You will need to make two holes in the two center 80x40mm chassis rails above the diff to allow the hand brake cables to pass through. These holes need to be approximately 3" 75mm forward of the rear transverse 80x40mm box and 5/8" 16mm down from the top edge. It's best to drill these with a 90deg drill or attachment. If that is not available you can drill at an angle from each side and open up with a file. **Later chassis may have these holes, if we can remember to do it.**



## Swinging arms:

1. Check to ensure you have all the bolts and the two **RVD adjusting cams**.
2. Position the arms on the relevant sides below the fixing lugs on the chassis.
3. Lift the bushed ends of the arm into position in-between the lugs of the chassis.
4. Place the inner bolt **90mm M12** through the chassis holes and through to bush from the center of the chassis out and the nut on the outer end.





- 5.** Place the cam on the longer bolt **100mm M12** with the flats towards the head of the bolt. Line up the holes and insert the bolt with washer and lock nut, as inner bolt. Tighten slightly but not enough to pinch the bush and prevent it turning, as these again can only be fully tightened on completion of the car and the correct ride height and final geometry is set.
- 6.** Now lift the hub end up and support it with a block of wood or equivalent.
- 7.** Fit the **M14** bolt through the swing arm tie bar (a small part like a dog bone) into the threaded boss on the under side of the outer bush of the arm. Then fit the bolt through the tube on the chassis. If this seems that it does not want to line up raise or lower the hub as this will aid alignment. Fit a washer between the tie bar and the tube on the chassis to raise the outer end and prevent the rubber boot touching the chassis. Torque to BMW settings.

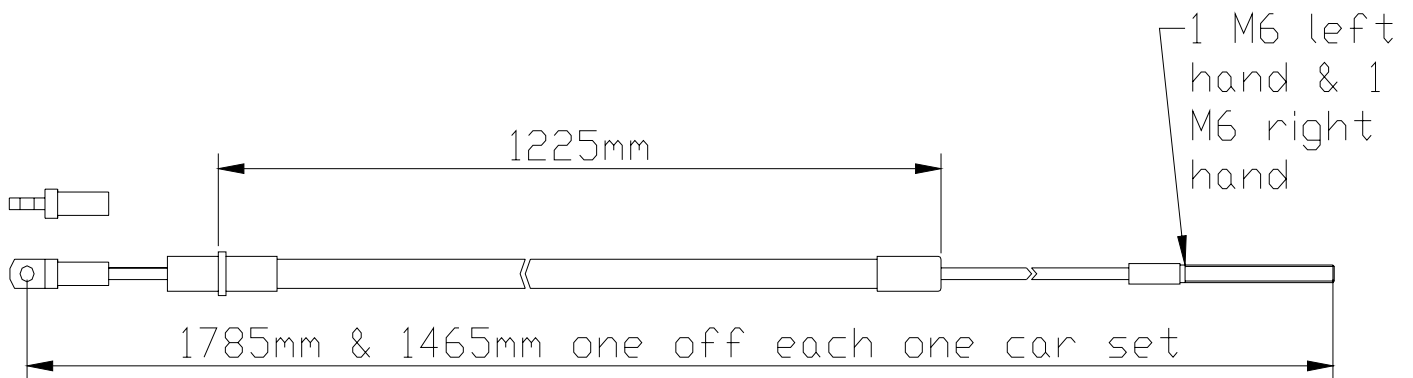


- 8.** Fit the top **M12 x 65mm** bolt through the top eye and top mount for the rear shocks with the adjusting knob to the rear.
- 9.** With the **RVD spacer** put the **M14 bolt** through a washer and then through the bottom eye of the shock (38mm 1 1/2" width eye). The **RVD spacer** with the reduced end outwards, fits into the socket of the original BMW shock mount. Tighten to **65ftlb** top and **85ftlb** bottom.



**10.** Fit drive shafts as per standard workshop manual. At torque as stated. (Can only use **E34, E28** shafts **NOT E32**)

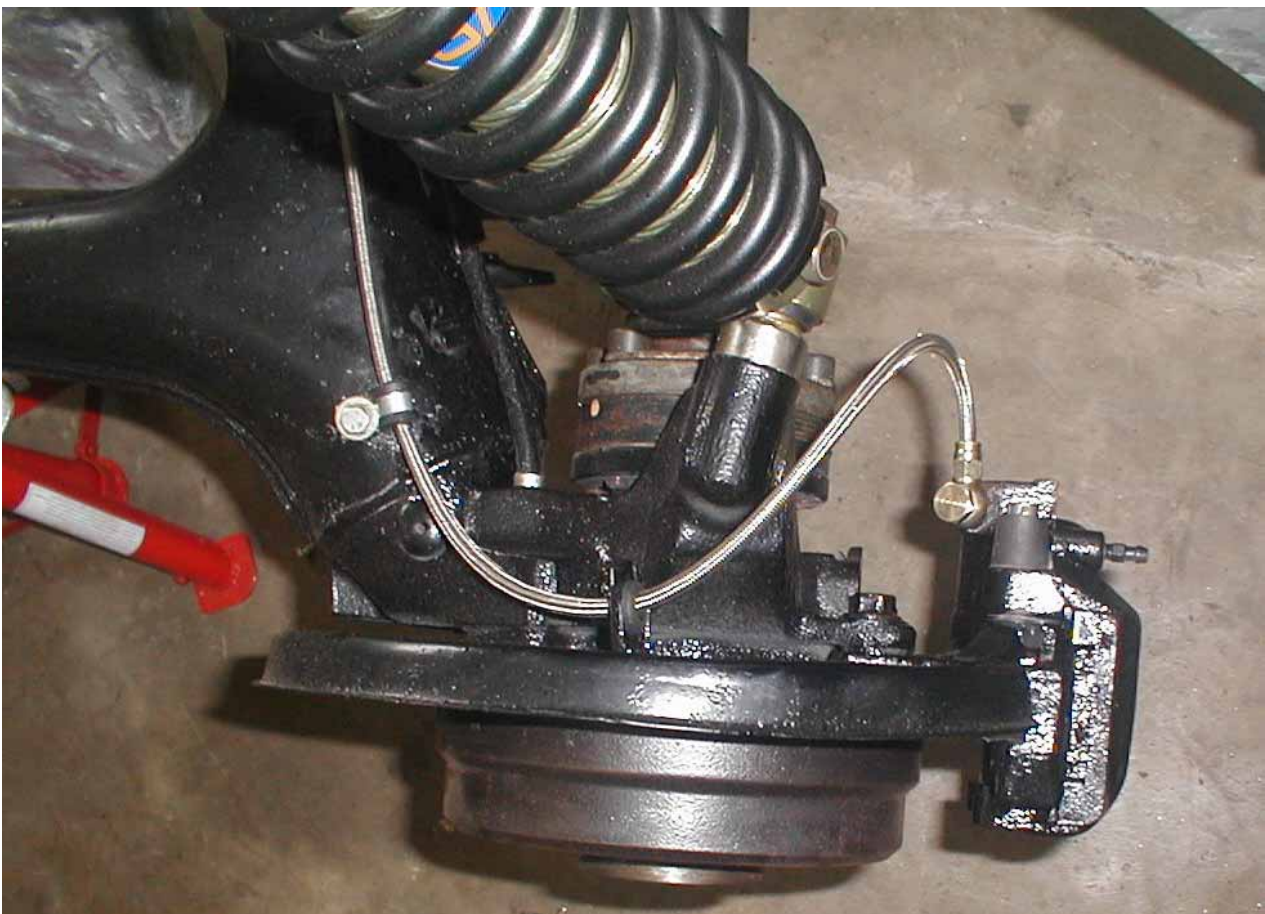
**11.** Fit the **RVD hand brake cables** into hub end (or obtain from other specialist cable suppliers).



**12.** Fit hand brake shoes per workshop manual, along with the brake discs and calipers.

**13.** Fit rear flexible brake lines (you can use the standard BMW lines, we tend to go for stainless steel & Teflon braded hoses) to calipers and to bracket provided on the chassis.

**14.** If using braded hose P clip to the swing arm as in picture, place no more than 9" apart. Pass through a rubber grommet in the back plate of the hub.



- 15.** Pass the hand brake cables through the holes in the chassis that you made at the start of this section, and then down in front of the diff over the top of the 50x25mm box section above the diff.
- 16.** Fit the **RVD rear anti roll-bar** using the rubbers, brackets and drop links from donor car. Fit each end through the hoop on the mounting plate and fix the ends with a **M8 x 25** bolt through the rubber bracket to the chassis with washers and lock nuts. Use an **M8 x 50mm** through the drop link and the bracket on the swinging arm as the old donor part. Please also review your workshop manual.
- 17.** Handbrake fitting. You will need the **RVD fitting kit** or drawings for the parts required. You can use the **RVD handbrake** or one from a **Jaguar XJ6 (1988 to 1996)**. If you use the Jag parts, you will need the lever bushes and leather boot.



- 18.** To remove the Jag hand brake from the black backing plate, you need to undo the **M10** nut on the out side of the lever. This will allow you to withdraw the center pin that runs through the black backing plate. Take care when you withdraw the pin! The ring spacer can fall out and can roll a long way on a workshop floor. Being careful will save you many hours of frustration.
- 19.** Once this is done you should have the black backing plate free. Remove the two gray top hat plastic bushes very carefully to prevent damage. The best way is to tap with a round piece of bar or socket extension bar. Remove the old clevises pin from its hole on the inner part of the Jag lever, which will free the old cable, if present.
- 20.** Clear any lumps of Zinc from the tube that is per-welded in to the chassis. Press the two bushes into the tube. Temporarily fit the handbrake in reverse order of the above procedure. Then bolt the ratchet bracket to the chassis using **M8 x 20 mm** bolts and nuts. You will also need to remove the lever on the cockpit side to aid fitting the body later).
- 21.** Next, fit the cable termination bracket too the chassis as pictured below. Mount it as high on the 19 x 19 mm box section as possible. Drill two holes, using the bracket to ensure you drill these square and true through the bracket. Use **2 M6 x 35mm** bolts and lock nuts to securely fasten in place.
- 22.** Pass the threaded ends of the cables through the tubes on the bracket you just fitted. Pass the longest cable through the lower of the two tubes.



**23.** Fit the pulley wheel onto the hole at the end of the lever in the center tunnel. This hole is the same one as the clevises pin was fitted to on the original car.

**24.** Pass the lower cable around the pulley from the bottom up and around back to the end of the short cable which is put through the top tube. Fit the **2 brass locknuts** (one L/hand and one R/hand) using the brass turnbuckle (this has Left and Right hand threads so it is critical to install properly). Screw both ends of the cables into the turnbuckle ends at the same time. Tighten until the slack is taken up. Now try the brake. If it does not operate properly, you may need to adjust at the hubs. This is done with a screw driver through the wheel stud hole and flick round the star wheel inside until it operates correctly and without binding. Refer to your BMW workshop manual.



**25.** Now fit your wheels from the donor or you new ones.

**CONGRADULATIONS:** You have just reached another major milestone in building your own personal Supercar, your chassis is **ROLLING** and you should also be able to **STOP** it as well.