Chapter 1

VW Bus chassis, suspension & brake design

IN THE BEGINNING

The VW Transporter first appeared in Volkswagen blueprints as early as 1948, although full production would not take place for another two years. The vehicle's introduction was born out of a post war necessity for economic and reliable transport, and as a commercial response to

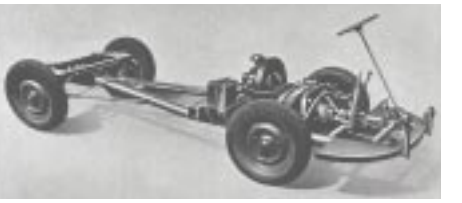
Plattenwagens were crude VW-based transporters used to move components around the VW factory. (Courtesy Walter Bach)

Front-wheel drive commercial vehicle, the Tempo Matador, used the air-cooled engine from a VW Beetle.

competition. The design also heeded the recommendations of Ben Pon, a Dutch VW importer, who had already recognised a market need beyond the Beetle. Pon had seen the crude vehicles used to transport components around the VW factory (called Plattenwagens) - which were essentially the axles and drivetrain of a wartime Kubelwagen attached to a ladder frame - and quickly appreciated their potential as commercial vehicles.

Failing to get street-legal certification on this design in the Netherlands, due to the location of the driving position at the rear, he nevertheless argued that VW should produce a more refined transporter to meet growing market needs.

His efforts may have been incidental, however, as VW was more



View of the Tempo Matador chassis, steering and drivetrain.

concerned with the appearance of the Tempo Matador forward control vans and trucks from the firm of Vidal und Sohn KG in Hamburg. These lightweight commercial vehicles used an air-cooled Volkswagen engine

Chapter 2
Front suspension & brakes

The underside of a fully restored 1963 Split-screen Bus. The front suspension is a very strong unit, with steering pivots provided by king and linkpins. (Courtesy Alex Leighton)

The front suspension fitted to a VW Bus is, by its very nature, an incredibly strong unit. It has to be, as it has almost one ton of weight riding on it. Since it is such a robust design it's tempting to think that parts will not easily wear out. However, like all things mechanical, this isn't the case and you'll need to routinely check items for wear and excessive play. This is particularly true of the earlier king and linkpin style front suspension unit fitted to Split-screen Buses, so we will start by looking at that design.

KING & LINKPIN FRONT SUSPENSION

All VW Buses produced up until July 1967 used a king and linkpin front suspension design. This features steering knuckles with stub axles swivelled on upper and lower kingpins, within kingpin carriers. The knuckles are turned by the action of ball-jointed track rods operated by a swing lever shaft pivoted at a mounting point on the lower torsion bar tube. This, in turn, is operated by a drag link that attaches, at the forward end, to a pitman arm. This is turned by the action of the steering gearbox and

we start work on the torsion beams in earnest.

REPLACING THE BALL JOINTS

Unless you have access to an hydraulic press, replacing the ball joints is one operation that you'll have to farm out to a garage or engineering shop. The ball joints should always be replaced if there's any sign of excessive ball joint play, or if the rubber seals have been damaged on removal, or dirt will enter the joint. Ball joint play is measured by pressing the stud in, all the way (in the arm), and taking a measurement with a vernier caliper. It's then pulled out as far as it will go, and a second measurement taken. Used ball joints must not exceed 2.00mm (0.080in), and new ones must not exceed 0.30mm (0.012in).

The joints must be pressed out on the hydraulic press, and new ones are press fitted into the torsion arms in the same way. If the eye of the arm has ever been oversized, due to wear, then oversized joints must be used. The torsion arms will be stamped with an embossed letter 'B' on them to indicate this, and the joints (0.30mm/0.012in oversized) have two additional V-shaped notches in them, but are otherwise fitted the same way, and are peened into the arm.

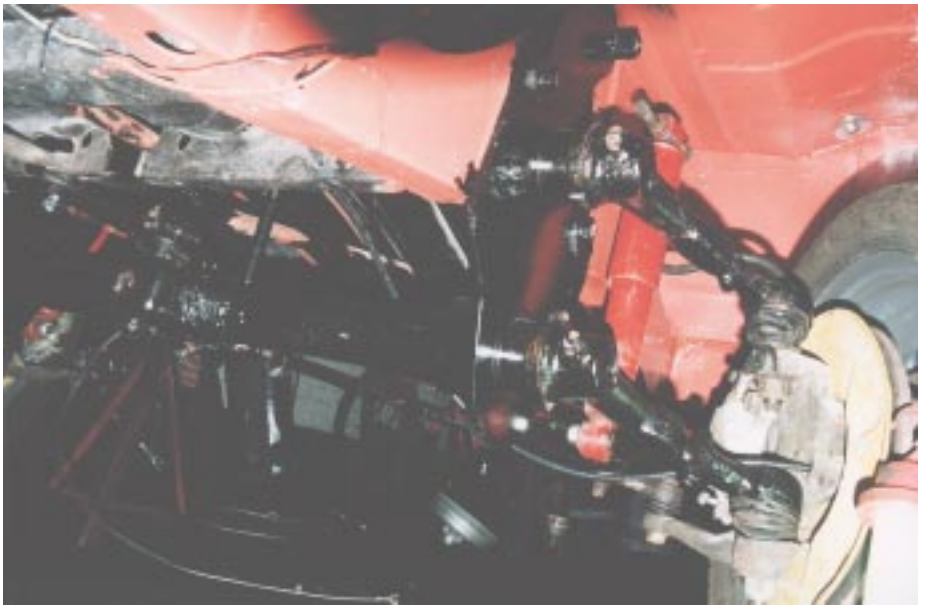
CHECKING THE SUSPENSION BEAM & HARRY HARPIC'S BEAM MODIFICATIONS

There are numerous ways you can modify the front beam for your performance Bus, and we'll look at the many options available. One of the most fundamental things is to work on a beam that hasn't suffered the ravages of rust or corrosion. Check the inside of the shock absorber towers for any signs of corrosion - you may be lucky, but some need minor repairs first. You may also wish to inject a rust inhibiting fluid such as Waxoyl into the uprights to prevent any further problems.

Harry Harpic's modified torsion beam with welded steel endplates to adapt late ball joint beams into earlier Buses. (Courtesy Paul Knight)

If the corrosion is bad, you have three options - either find a good replacement used beam; buy a new one (if you can find the correct type for your Bus); or consider a front beam modification from an engineering company, such as Harry Harpic's. Their experience with fitting 1968 - 1969 Bay-window ball joints and disc-braked front suspensions to earlier Buses and the increasing scarcity of parts caused them to seek an alternative option.

They discovered that post-'68 front suspension beams only differ from the earlier units, in that the outer needle bearings supporting the torsion arms are bigger in diameter. The inner metal bushings, however, are exactly the same diameter. The mounting points locating the beam to the chassis are also different. However, by completely removing the original (and often rotten) pressed steel front shock absorber towers, and welding on new specially machined and shaped thick



The modified beam can also be narrowed to prevent front inner wheel arch modification when lowering a Bus. (Courtesy Paul Knight)

Split-screen and Bay-window Buses look good 'raised up', and generally retain better suspension geometry than lowered equivalents. (Courtesy Simon Glen)

the lock nuts tightened down. This allows the trailing arms to be free to pivot and be properly located.

The coil-over springs and dampers can now be mounted in place of the original dampers that you removed earlier. For Buses with king and linkpin front suspensions, you'll also need to install an extra 'lower coil-over mount' that's provided in the kit. These are 'handed', and should be mounted with the rear end turned as high up as possible.

With the components fitted, you'll now need to refit the track rod ball joint to the steering arm (or replace it with a new one if the rubber seal has been damaged), reconnect the speedometer cable and re-plumb the brakes before bleeding them, to purge any air in the system. The road wheels can be refitted, and the Bus should then be taken to a tyre shop to have the whole front-end suspension geometry checked and adjusted. The dampers can, of course, be adjusted to fine tune the ride on the Bus, but that's it! It really is an easy and economic answer to the problem of getting a Bus 'down' in the front, and making it handle.

One last point concerning late, lowered, Buses that came with factory fitted disc brakes is that they have a brake bias valve within the braking system that can cause problems. This is purely on Buses that have been severely lowered at the front, and thus 'tip forward', and not those at stock height, or lowered (but level) Buses. The bias valve basically helps the braking system apply more pressure to the rear brakes when it senses the front dipping downwards, as it would upon heavy braking. The nose down stance of a Bus lowered more at the front than back can therefore upset the valve, as it thinks the Bus is continually braking, and is therefore trying to apply more pressure to the back brakes. If you notice this tendency, you'll have to compensate by adjusting the bracket (inside the left-hand chassis rail) that locates the valve. This can only be done with the Bus being tested on a brake roller to find the optimum performance of the valve.

RAISING THE FRONT SUSPENSION

It may seem from the conversions that

A thick steel plate is normally welded to the axle beam flange to 'lift' the body about 4in from the suspension. (Courtesy Simon Glen)

Chassis channelled to clear IRS axles for road use – here shown on a 1971 Crew Cab Bus. (Courtesy Simon Glen)

be offered up to the plates. The arms will have been shortened near the point where they attach to the spring plates, and the curve of the arms changed where they mount to the brackets on the torsion tube. Before fully bolting them up to the spring plates and stub axle housings, clean a section on each side of the torsion bar tube with a grinder at the place where the arm brackets will have to be welded on. Bolt the mounts that were cut from a donor Bay-window Bus up to the A-arms, put the stub axles and drums back in place, and check everything for fit. There may be a slight clearance problem between the arms as they move upwards, and the rear cradle This may need modification to relieve it.

With the wheels back on the Bus, but with it still jacked up, set all the components as near to the measurements you took before removing components from the donor Bay-window Bus (or to the specifications of the supplier). Set a small amount of positive camber, since the Bus will squat down slightly at the back when set on the floor. You will now need to tack weld the brackets in place, so lower the van down and see if it sits correctly. A tracking gauge will help here, if you have one. It is possible to make small adjustments to the settings by inserting shims between the spring plate and axle housings, but this isn't recommended as it will weaken the design. If the settings are wrong, the tack welds will have to be ground down, and the process repeated. If you wish, you can weld the brackets to a curved plate that can be clamped around the torsion tube and adjusted without tacking until the correct position has been found. It may take many attempts to get the settings correct, so take plenty of time and get it right.

When everything is aligned, take the A-arms off, and fully weld the mounts to the torsion tube. If you don't feel competent to weld (or don't

A-arms fitted and drums in place on Split Screen van. (Courtesy Paul Utting)

Trial fit of all IRS components into early Bus before welding brackets in place. (Courtesy Paul Utting)