

CHAPTER 5

Steering Unit

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5.1 INTRODUCTION

The steering unit is a permanent reduction in the line of drive that directs the power from the pack to the left and right sides of the vehicle through a crown wheel and pinion.

The unit contains a spur gear differential which can be controlled by adjustable brakes, which when applied individually, varies the speed of the outputs thus causing the vehicle to steer, and with both brakes applied simultaneously the vehicle can be slowed, stopped or parked.

5.2 CONSTRUCTION

Each set of differential planet gears has an extension gear mounted on the same shaft but carried outside the differential carrier or housing. These extension gears, known as planet pinion extensions, are in mesh with a sun gear. Attached to the sun gear is a brake drum, which has around it its own external contracting brake band. The brake band can be contracted individually or simultaneously by the driver through a mechanical linkage.

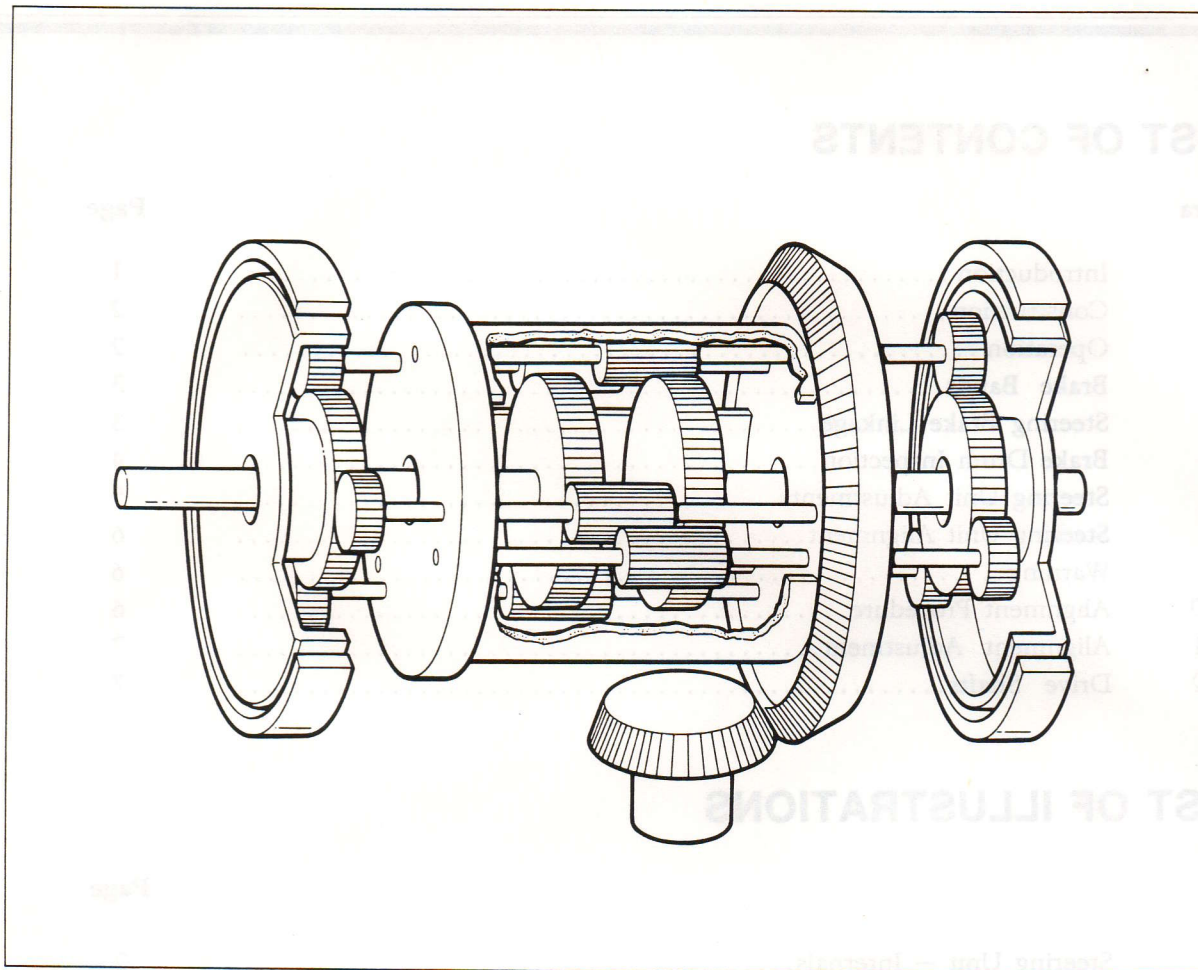


Fig 5.1 Steering Unit — Internals

5.3 OPERATION

See Fig 5.1.

With the vehicle moving forward and equal resistance on both output shafts, the differential and the drums rotate as a complete locked mass.

To steer right the R/H, externally contracting, brake band stops the R/H brake drum and sun gear. When this happens the planet pinion extensions now have to do two things:

- a. Rotate with the differential carrier.
- b. Walk around the stationary sun gear.

To do this the planet pinion extensions have to walk around the stationary sun whilst turning on their own axis in the same direction as the differential assembly.

The second action turns the planetary gears against the direction of the R/H output shaft and this opposes or "winds off" some of the R/H output shaft's speed.

As the R/H planet gear is in mesh with the L/H planet gear, the L/H planet gear must rotate in the opposite direction, and this assists or "winds on" the L/H output shaft, increasing its speed.

The speed lost to the R/H output is transferred, through differential action, to the L/H output.

If an output shaft breaks in normal bevel pinion differential the vehicle has no drive, but with a controlled differential the vehicle still has drive in a straight line, providing one brake is applied and the drum is stopped.

However, application of one steering lever will give a different speed of drive to the serviceable side, than would the application of the other steering lever.

5.4 BRAKE BANDS

The bands consist of steel bands with saddles bolted to either end. The linings are rivetted to the bands. The linings have angled grooves in them which, when fitted to the band, form chevrons. The chevrons must point against the direction of drum rotation when the vehicle is being driven forward. The chevrons form part of an Archimedes thread around the rotating drums and during braking channel away cooling oil from the surface of the drums.

On each saddle there is a stud used to suspend the brake band centrally around the drum. The stud is used in conjunction with a spring steel guide plate, slider and nuts.

A compression spring is fitted between the saddles to fully release the brake.

5.5 STEERING BRAKE LINKAGE

See Fig 5.2.

Both steering levers are bushed in the tiller block which also contains the parking brake quadrants and the brake light switches.

To obtain the maximum mechanical advantage the linkage rods are set to the following dimensions between clevis pin centres:

Long rod 25" (This is an initial setting and may be altered to obtain the correct plunger protrusion).

Short rod 14.7" (All variants except FV 433).

Short rod on FV 433 $18\frac{3}{16}$ ".

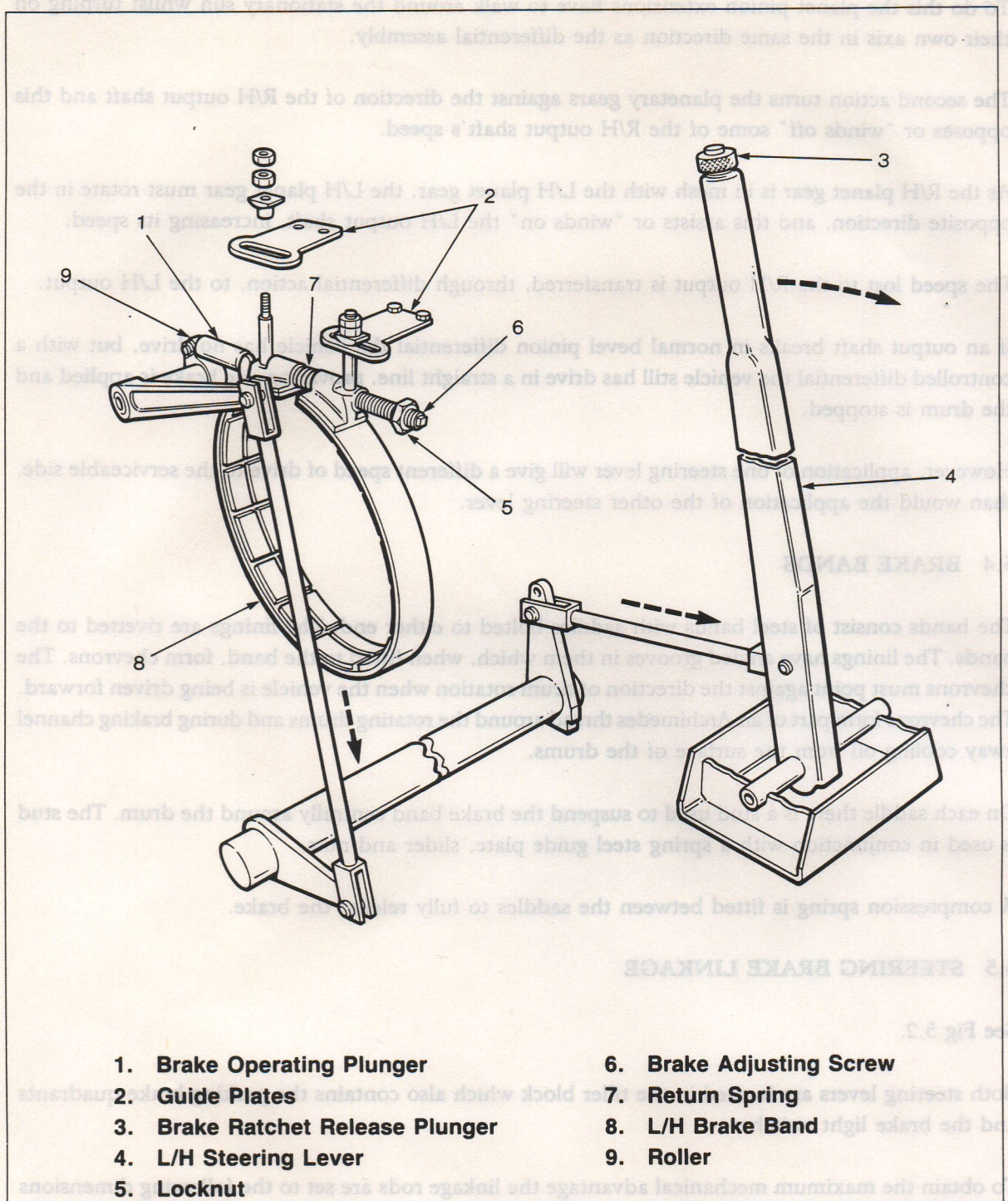


Fig 5.2 FV 432 Steering Linkage (L/H)

5.6 BRAKE DRUM INSPECTION

When renewing brake bands, or carrying out steering unit adjustments, the steering unit brake drums must be inspected for signs of cracking, especially around the oil feed holes. Any sign of cracking must be reported to the repair section SNCO.

5.7 STEERING UNIT ADJUSTMENTS

See Fig 5.3.

- a. Carry out safety precautions:
 - (1) Vehicle must be on flat ground.
- P (2) Chock vehicle.
- (3) Release tillers.
- (4) Switch off battery master switch.
- (5) Turn off fuel tap.
- P b. Check the protrusion of the operating plunger. It must be protruding from its housing by $\frac{9}{32}$ ". If it is incorrect adjust the length of the long rod at the top yoke.
- A c. Slacken brake band adjuster locknut, screw adjuster in until band is fully in contact with drum. Unscrew adjuster eight flats and fully tighten locknut.
- S d. Slacken band suspension nuts. Push bands into contact with drum and tighten suspension adjusting nut until slider is just held on guide plate. Tighten nut a further $1\frac{1}{2}$ turns and lock with locknut.
- T e. Check tiller movement as measured at the top, from fully off to fully on. This should be 6-8", with both levers having equal travel.
- f. If the tiller movement is not as in para e. then the complete procedure must be carried out again. If after the second attempt it is still incorrect, obtain the correct adjustment by using the brake band adjusters. One flat on the adjuster is equal to $\frac{3}{4}$ " of travel at the tiller.

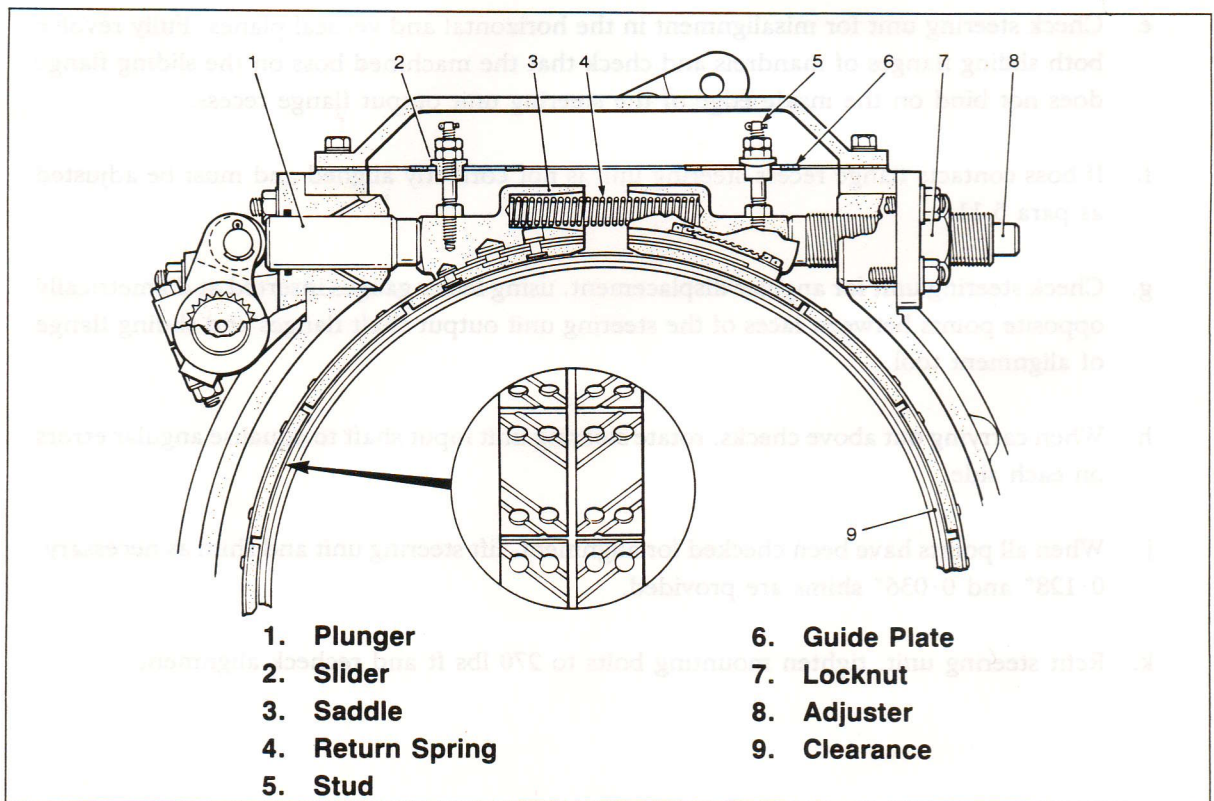


Fig 5.3 Brake Band Fitment

5.8 STEERING UNIT ALIGNMENT

It is **VITAL** that the steering unit (original or new) is re-aligned to the final drives when fitted to the vehicle. It is important that steering unit output shafts are aligned to within 0.015" in both the horizontal and vertical planes; and that the angular displacement is within 0.030".

5.9 WARNING

If the steering unit alignment is not checked and adjusted, the solid drive shafts will begin to loosen the coupling securing bolts. Should these bolts sheer and the couplings disengage, ALL STEERING AND BRAKING WILL BE LOST.

5.10 ALIGNMENT PROCEDURE

See Fig 5.4.

- a. Before fitting steering unit alignment tools check that final drive input shaft bearings are adjusted in accordance with EMER TKD VEHS E103/2 Chap 5, paras 130-132.8. Also check machined boss on sliding flange for wear, even a small flat on the machined button will prevent steering unit from being aligned correctly.
- b. Remove L/H and R/H drive shafts.
- c. Secure each mandrel to input shafts of final drives.
- d. Slide each sliding flange up to steering unit output shaft.
- e. Check steering unit for misalignment in the horizontal and vertical planes. Fully revolve both sliding flanges of mandrels and check that the machined boss on the sliding flange does not bind on the inside edge of the steering unit output flange recess.
- f. If boss contacts flange recess steering unit is not correctly aligned and must be adjusted as para 5.11.
- g. Check steering unit for angular displacement, using feeler gauges inserted at diametrically opposite points between faces of the steering unit output shaft flanges and sliding flange of alignment tool.
- h. When carrying out above checks, rotate steering unit input shaft to equalise angular errors on each side.
- j. When all points have been checked for alignment, lift steering unit and shim as necessary. 0.128" and 0.036" shims are provided.
- k. Refit steering unit, tighten mounting bolts to 270 lbs ft and recheck alignment.

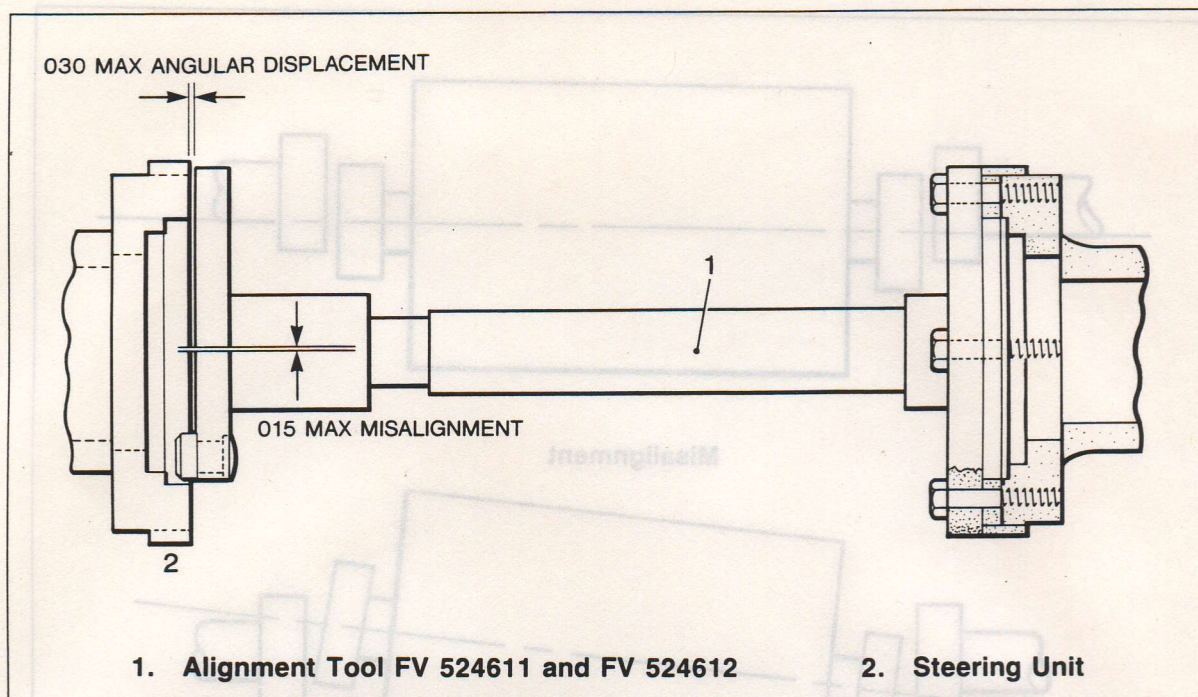


Fig 5.4 Steering Unit Alignment Mandrel

5.11 ALIGNMENT ADJUSTMENT

See Figs 5.5 and 5.6.

- a. **Misalignment.** Horizontal misalignment is rectified by removing or inserting shims between steering unit boss mounting bracket and hull support brackets. This allows the assembly to be moved forwards and backwards.

Vertical misalignment is rectified by removing or inserting shims at all three mounting points, between steering unit mounting bosses and boss brackets and hull mounting boss. This allows the assembly to be raised or lowered.

- b. **Angular Displacement.** Angular displacement is rectified by removing or inserting shims (from one side only), between steering unit mounting bosses and bracket. This allows rectification if the assembly is tilted.
- c. If horizontal and vertical alignment are correct but there is excessive angular displacement, then suspect a worn or damaged steering unit.

5.12 DRIVE SHAFTS

The drive shafts are connected to the final drive and steering unit with muff couplings. Each of these is held in place by half moon plates and high tensile steel bolts. The couplings contain split steel rings, to reduce chatter and rubber 'O' rings, to keep out the dirt.

New 'T' bolts and locktabs must be used every time the couplings are rebuilt and they must be torque tightened to 8 lbs/ft.

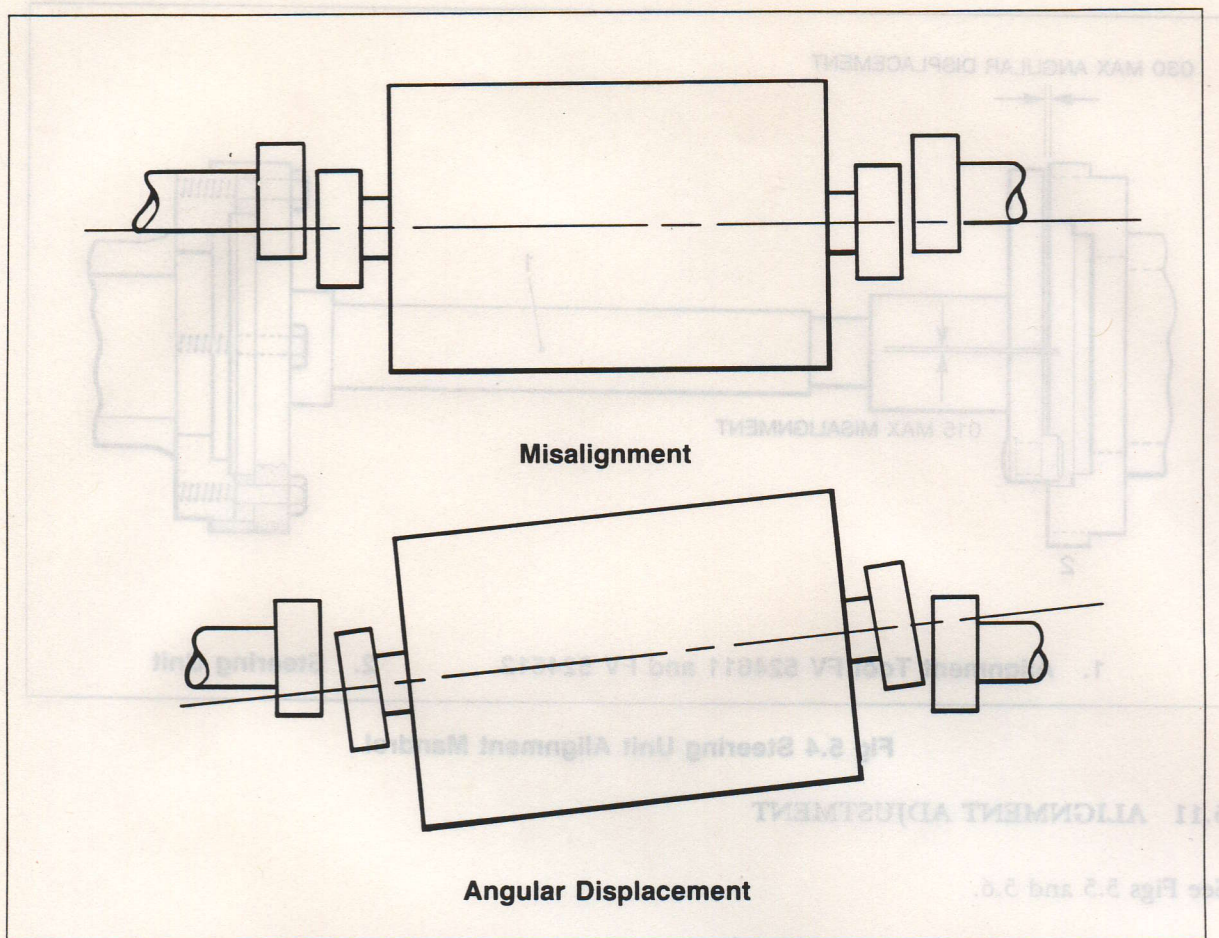


Fig 5.5 FV 430 Steering Unit Alignment

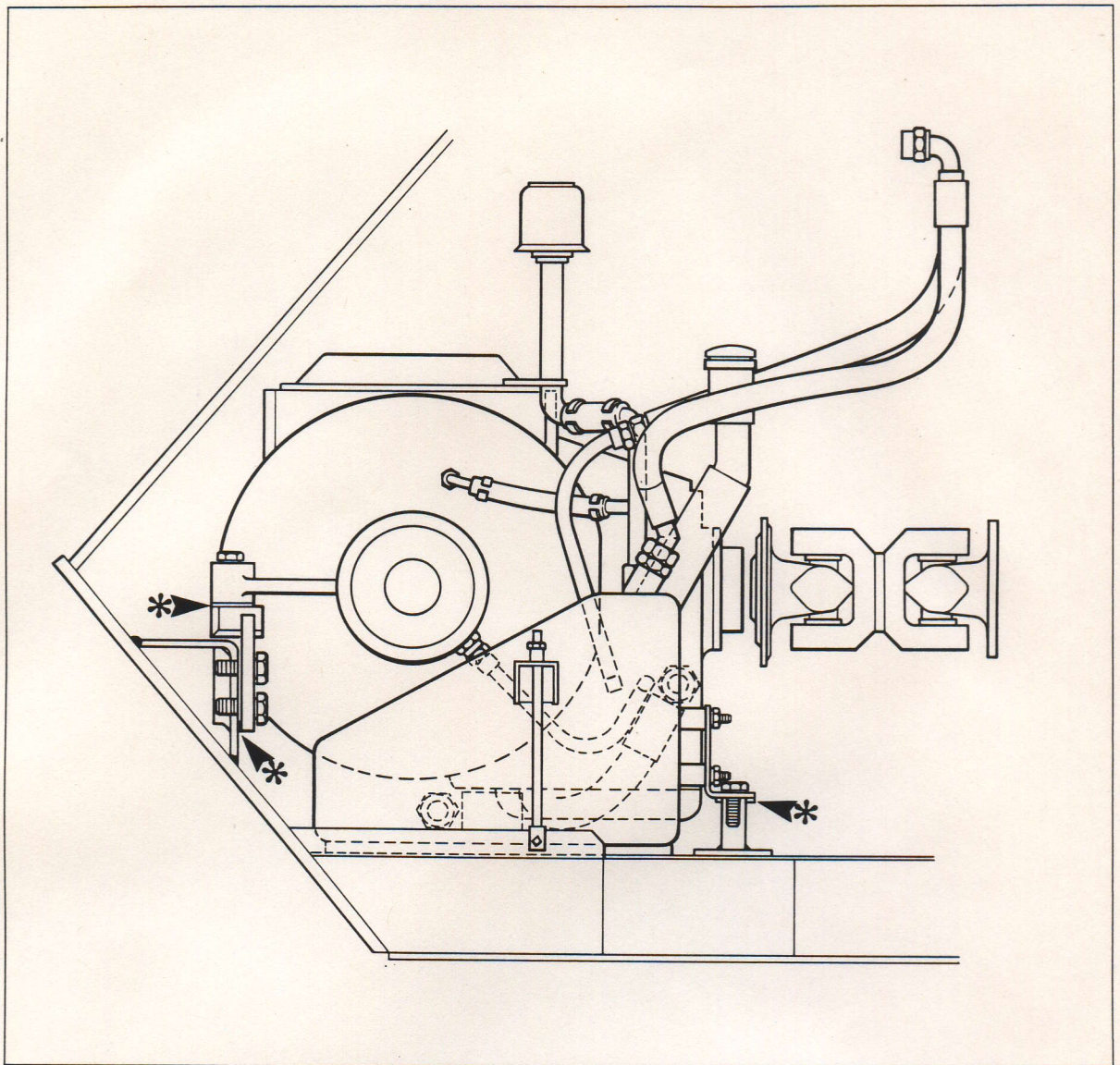


Fig 5.6 Location of Steering Alignment Shims