

LIMITED SLIP DIFFERENTIAL - ANTI-SPIN - Dana 30 VOLVO LSD

PLUS Information and Pictures on Volvo DANA DIFFERENTIALS 1030 1031

Major technical article © by Anthony Hyde, Australia
First release Nov. 2005. Updated July 2014

This webpage fills a literature & picture void on Volvo / Dana LSD internals. I hope you find this information most informative. A.H.

LSD FUNCTION : (Source - 1979 Volvo green manual)

"Two shafts make up the spider for the differential pinion gears. On the side where it is against the differential carrier, each shaft has a V-shaped bevel. The differential carrier is correspondingly designed. When power from the engine starts to drive the vehicle, the shafts glide up the bevelled recess in the differential carrier. This compresses the friction plates behind the differential side gears so the differential assembly brakes (locks up). The bevel angle on the carrier is chosen in such a way that the differential gears are not entirely locked, but a **maximum 75% of engine torque can be transmitted to a drive shaft.**"



Volvo Dana 30 - MARKING 2 6 80 A
H . 26421X

(Likely made in 1980)

- SECTION 1 - DANA 30 -SPICER LSD VERSIONS**
- SECTION 2 - 240 DIFF ID 1030 &1031**
- SECTION 3 - DIFFERENCES 1030 and 1031**
- SECTION 4 - CROSS SHAFTS & LSD ISSUES**
- SECTION 5 - TECHNICAL**

Modern name = Dana Power-Lok

(Source: Reider Racing) The Dana Power-Lok provides approximately 75% more traction than standard conventional "Open" differential. Its two-piece case construction with four pinion mate spider gears provides for more than double the strength of standard open differentials. Durable all steel clutch plates with unique torque applying cross shafts provides for long life positive action.

SECTION 1 - DANA 30 - SPICER 27 LSD VOLVO VERSIONS [CLICK IMAGES TO ENLARGE](#)



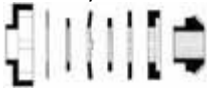



1st set of five steel friction discs, side gear retainer and side gear.



Unexpected find on rebuild. One of the two **cross shafts** had cracked through. Spider gears run either side of the shaft(s).
Cross shafts are the most common



Dana 30 LSD (27 spline)
(10 spline) on early versions

<p>2nd set is repeated on either side of cross shaft. Each axle is in metal-to-metal contact in diff oil. Disc order - external spline, internal spline, 3rd plate cupped (like a C), internal, external.</p>  <p>Friction Disc Orientation Source: Volvo Green Manual - Rear Axle</p>	<p>failure point in Dana 30 LSDiffs</p>	
		
<p>The 'spider' is made up of two cross-shafts that interlock and four side gears. Look closer to spot why this LSD wasn't working so well.</p>	<p>Spreader tool - Diff housing was spread 0.3 mm before LSD centre released (max spread 0.38 mm). This very tight fit ensures no end-play is possible to alter the crown & pinion relationship. Side arms of expander tool each have a round spigot (pin) that fits into either side of the diff housing. A screwthread spreads the centre apart by just a little, allowing the complete diff centre to be extracted.</p>	<p>LSD Carriers (Housings) - small & large carriers attach together with left-hand threaded bolts</p>

THERE are 3 main LSD VERSIONS for 'rear wheel drive' Volvos: (For simplicity I'll term them LSD 1 - LSD 2 and AutoLocking ALD

The limited slip differential (LSD) or in Volvo terminology **Anti-Spin**, was an optional extra on nearly all Volvo models (up to 850 era) - with the **LSD centre fitted up from new only by the Dealership**, by replacing the cars original standard diff centre.

Exception being the 123GT fitted in Canada at the Halifax factory with LSD as standard. And reportably, the P1800 and 122S could be ordered from the factory with an LSD (Spicer 27), or this could be fitted later by the Dealer (source G.L.)

Dana's Powr-Lok® differential - The New York Times declared Dana's Powr-Lok® differential to be "among the more significant engineering improvements" in automotive history. The Powr-Lok was launched in 1956, so has a long development history.

Important Note: Volvo termed its gearboxes, differentials & diff centres with much the same letter / number identity systems, so be clear to what part your referring to; for example **Rear back axle models:** M27, M30, M31. **Gearboxes** M30, M31, M40, M41 etc.

'Diff centre assembly' - Volvo uses the term **Anti-Spin** for M27 and M30 (no M31).

Designed by Dana Spicer, these are termed worldwide as **Dana 27 (Spicer 27) & Dana 30, with no such thing as a Dana 31.**

On Volvo diff part-diagrams they also use the term for example 'Märkt 27' (in english

'MARKED 27') to refer to the model version. So the Volvo 'M' probably just refers to the model, as in M30.

A lot of the information below has been refined after **knowledgable contributors** have contacted me from around the world with updates. This information aims to be as accurate as possible and when new information is provided and proved, this reference list is updated.



LSD 1 - Spicer 27 with 10 spline axle (to late 1966) - Volvo termed this LSD a '**differential brake**' with Spicer mentioned in the manual.

LSD **1** was an option for the following models till late in 1966: 120, P1800, 1800S, PV Duett (544 210). These models will have rear drum brakes.

Additional info: 1961 Amazon - lsd now available as an option. The housing hex head bolts are left-hand thread (UNF)

Spicer Manufacturing was renamed Dana Corp (in 1946). Spicer brand name Divisions continue in name.

There are **differences** between LSD **1** & the later LSD **1.1**. The Spicer 27 (10 spline) cross shafts are different size to the Dana 30 (10 spline). Length of Sp27 is 103 mm, 30 is 110 mm. Shaft dia for side pinion Sp27 is Ø15.9, 30 is 17.6. Spacer sleeve hole Sp27 & 30 both are Ø11 mm.

LSD 1.1 - Dana 30 with 10 spline axle (From late 1966) - Drum brake version has a 10 spline axle.

Found in Amazon (120, 130) late 1966 to 70 (for example the Canadian 123 GT) and 1800S late 1966 to 69 (with rear drum brakes). In Sweden, a LSD can also be found on special cars, eg. nearly all police cars had LSD as standard equipment. The **123GT** in Canada was fitted at the factory standard with LSD. Lars Björklund.



ID plate and 'S' (S = special edition items): If a **123GT** ID plate has a **S5145** number, this indicates an LSD is fitted. **S5324** indicates a Canadian built GT (from the Halifax factory) and is not found on other versions except a Canadian 123GT.

The 123GT was not imported to the USA by Volvo dealers. The Dana rebuild kit (when new) was #700206X, later updated to #706009X, being no longer available after the late 70's. - Chris Horn, USA.

With the **123GT** imported to Australia from Volvo Sweden, a LSD was not 'factory fitted'. No 123GT in Australia has a **S** number on it. - George Minassian, Australia.



LSD 2 - Dana 30 with 27 spline axle (140-240 era) - Rear Disc brake version has 27 splines. *'**Hexagon head attachment bolts'** bolt head protrudes from carrier / housing.

LSD **2** was an option for the following models: 1800E/ES 1970-73, the 140 from 1967- end 1974, the 240/260 series 1975 to around 1980.

8x LSD housing hex head bolts are special left-hand thread (3/8"x 24 UNF). (10x Crown wheel bolt threads are standard RH right hand)

Note: Socket cap screws from LSD **2.1** fit, but ultimately do NOT

suit as the cap screw head sticks out too far and interferes with the inside of the cast diff housing (read diff centre won't rotate !). On fitment I found this terrible fact out myself. You can't modify by machining a counterbore in the LSD 2 as there's not enough material in the housing to remachine additional depth, so I have a handful of very expensive socket cap screws I can't use. A.H



Darkened areas around the carrier case is factory case hardening. Shafts are hardened separately.



LSD 2, 2.1, 2.2
Internal 27 Spline 'side gear'
mates to the 27 spline axle



L: Socket cap screw LSD2.1
R: Hex head bolt LSD1+2

There's debate over terms 'bolts & screws' and this varies from country to country, as there's many types out there.

I use the following identifier for engineering bolts/screws:
If tightened on the outside by a socket, or spanner, then a BOLT.
If tightened using the inner area (screwdriver/allen key) then SCREW.

Self tappers are screws. Set screws are often threaded over the entire length.

LSD 2.1 - Dana 30 with 27 spline axle -

This version was updated to include '**Socket Head Cap Screws, replacing the Hex head attachment bolts.** Socket cap screws fit into a machined counterbore in the carrier housing (Note: imperial size Allen key). 8x socket cap screws are of the stretch type and left-hand threads (3/8"x 24 UNF)

Found in later 200 series, 700, 900 - there are a few out there, but they are not as common as the earlier 1 & 2 variety.



12 segment tone wheel
LSD 2.1



12 segment tone ring is machined into the carrier. Volvo introduced the electronic speedo after 1986 in the 240 & 740.

965/940 1994, **765** 1989-90, **740** 89-92 = #8360 725-9 - For normal driving conditions. Torque 60-100 Nm

764 1982-87, **765** 1985-88, **740** 84-88 = #8360 724-2 - For normal driving conditions. Torque 60-100 Nm

764 1982-87, **765** 1985-88, **740** 84-88 = #8360 722-6 - Greater diff. braking effect which makes it suitable for racing or more severe driving conditions. Torque 130-170 Nm.

LSD 2.2 - Dana 30 with 27 spline axle

Pic - Customer chose a LSD as an optional extra on his USA 1992 245 with 3.3:1 ratio diff (1992 price US \$315)

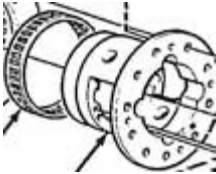
The 48 segment tone ring was used in ABS brake models and would have been the very last before the 'next generation' auto



48 segment tone wheel

locking diff (ALD) was introduced in 1993. The diff cover is fitted with a tooth sensor that transmits a pulse all the way back to the electronic speedo to be processed.

Note: You can have a 48T tone ring in the diff and not have ABS brakes fitted. More details are provided below in the [Speedo & ABS section](#).



Auto Lock Diff on 1041 standard solid axle diff

NEXT GENERATION: 'Automatic Locking Differential' (ALD). Volvo speak = 'Differential Brake'.

ALD best describes the mechanical function of the diff in English, and is the term used in the USA.

With **ALD**, if one wheel spins it locks both axles up to 40 km/h (25 mph) then cuts out when the **latching pawl is released by a centrifugal governor & weights**, or cuts out when normal traction occurs. **The ALD is fitted with friction discs similar to LSD types, but controlled differently.**

240 (rear wheel drive) - The **ALD** was introduced in 1993, the final year of 240 production, as a **factory installed option**.

Reportably fitted to the '**240 Polar**' but for a typical 1993 240 it may not be fitted.

740 - In 1993 the **740** (rear wheel drive) was replaced by the new model 940 (rear wheel drive).

940 had **ALD** fitted to the **1041 diff** with a **standard solid axle**.

The 960 had a **ALD** on the **1045 Multilink IRS** (independent rear suspension). Later in 1996, the 960 had the **1065** on the Multilink MkII (nil on 1055).

In summary, the AutoLockDiff is speed limited, whereas a traditional Dana 30 is always active and engaged.

850 - A front wheel drive version of the ALD is termed '**TRACS**' (Traction control system) and comes standard from the factory starting with the **850 Turbo** and continued with newer models. Reportably the differential is a version of the Eaton G80. It works in conjunction with the ABS brake system to regain traction by pulsing the brake on the spinning wheel. See complicated parts exploded view in the next section.

LSD MARKINGS - examples (Email [Anthony](#) your number so we can follow a trend)

LSD 1.1 4 10 68 25193 X -(10 spline, axle/diff was manufactured by Hayes, came fitted with ratio 4.10:1. Ex 1969 former police 121 Amazon

LSD 1.1 3 16 67 A. 25193 X -(10 spline from a 123GT from Canada (Halifax factory fitted).

LSD 2 - [2 6 80 A H. 26421 X](#) -(6 Feb 1980)(27 spline, 26421X is Case Assembly for Model 30/181) Don't know exactly what the H means.

LSD 2 - 11 10 83 26421 X

LSD 2 - 280-03-A 26421 X

LSD 2.1 - 2-22-85 72722 X -(22 Feb 1985) (72728X are typical Dana number system)

LSD 2.1 - [6-22-85 72728 X](#) [Pic link](#)

LSD 2.2 - car 1992 245 no markings on housing, diff tube axle label says P1216412, 3.31 ratio, T10D065



Left **LSD 2.1** with 12 segments for diff mounted speed sensor.

Right **LSD 2** (vehicle speed is via gearbox and speedo cable)

[Click](#) to enlarge.

Note: you will see the older right **LSD 2** (1030 diff) has a thicker crown gear.

The left **2.1** from 1981-on (1031 diff) crown gear/wheel is made thinner but larger in outside diameter and therefore stronger due to increased gear contact patch. The 1031 has a larger dia pinion, and the other reason for making the crown gear thinner is in order to keep the same overall diff centre dimensions.

LSD 2 and 2.1 ? -> 2.1 has Socket Cap screws that sit in a counterbore, and a machined tone ring for electronic speedo sensor pickup.

See [SECTION 3](#) for additional differences in casing size and diameter of crown wheel & pinion.

SPEEDO and ABS / Non - ABS

info on 240. ABS = Anti-lock braking system

On the diff centre, a non-ABS 240 has a 12 segment tone ring cutout. A 240 with ABS brakes will have a 48-tooth diff mounted tone ring PLUS located at each axle is a 48 tooth sensor wheel connected to wheel position sensors.

Note: You can still have a 48T tone ring in the diff and not have factory ABS brakes.

(The ABS 240 also has a matching 48- tooth sensor wheel on the front left wheel.)

ABS Electronic Speedo - With the ABS 48T diff version, the ABS speedo version has an add-on "daughter board" on the speedo cluster to scale the 48 pulses back to 12 pulses per wheel rotation, (to end up with with much the same resolution as the non-ABS system 12 pulse system).

LSD Primary information - The LSD 2 & 2.1 centres are size-wise the same, so apparently either will fit or can be retrofitted to a 1031 diff. If your 240/740 is after 1986 and requires the electronic speedo, then you will need the tone wheel LSD 2.1 or 2.2 version.

***This does not apply to the bolt-on crown wheel or pinion as they are different sizes (more info in [Section 2](#))** and the big C&P design won't fit into the 1030 housing. From 1970, the Volvo / R-Sport LSD #279951-8 (Lsd 2) was available from the dealer. You can still buy new Volvo LSD's (eg. Volvo dealer. Reider Racing, SAM, with most **spare parts** readily available from SAM in Sweden. OR via the Volvo dealer network for most 'but not all' internal components are available - the price logic on some dealer parts is questionable, other parts reasonable. **IPD** used to sell a Spicer Pow-R-Lok type 30, 27 spline #4G1012 (LSD 2)

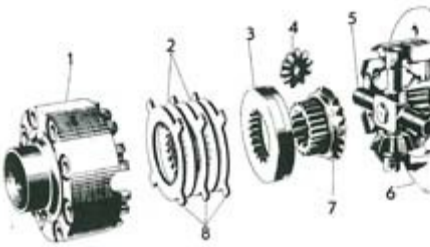
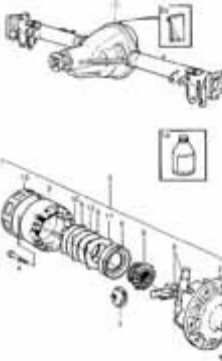
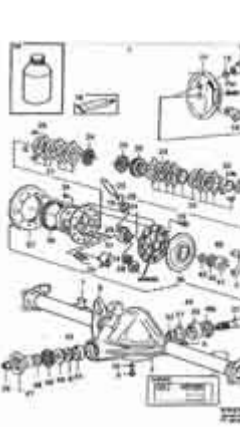
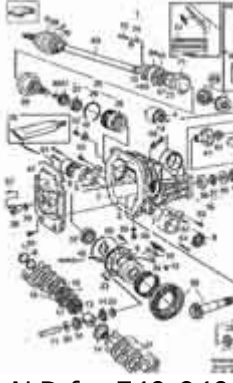

Note: the rear wheel drive LSD for 2, 7, 9 series Volvo after approx 1984 were a little different in external carrier shape, and use for instance different securing bolts & screws (updated to socket cap head) that hold the small and large carrier together. Note: the bolt head size (same left-hand UNF thread) is incompatible with earlier LSD's as the socket cap head pokes out too far and fouls the diff housing. KEEP old LH housing bolts

they will be in demand soon enough.

Left-hand threads are used in cases where the screw is subject to anti-clockwise forces that might undo a right-hand thread.

Spec sheets show 'Limited Slip Friction Torque' 40-110 Ft.Lbs (54-149 N.m). This refers to a check you can do with a torque wrench with both wheels off the ground.

The quality of this website benefits from your feedback, so if you know of changes or have information, please [email Anthony](#)

<p>Final drive with differential brake (anti-spin) Except for the differential assembly, the design is the same as a final drive without differential brake.</p>  <p>1 Differential carrier, smaller section 2 Disc, internally toothed 3 Differential side gear, smaller 4 Differential pinion gear 5 Spider 6 Differential carrier, larger section 7 Disc, externally toothed</p> <p>click images to expand - LSD 2 (pic source; Volvo Green manual p.46)</p>	 <p>LSD 2 is common for 1030 diff VADIS image is a hybrid 2/3</p>	 <p>ALD rare with 1031 diff</p>	 <p>ALD for 740-940 IRS axles (rare)</p>
	<p>SAM in Sweden offer this 'competition' Volvo Dana LSD unit. LSD 2 version in picture (with hex head bolts)</p> <p>(Pic source: SAM parts website)</p> <p>German magazine, Auto, Motor & Sport - said years ago "In fast driving you are continually aware of the limited-slip feature because it locks the action of the differential every time you try to drift through a bend. When lock-up occurs in mid-bend it can be mildly irritating to the driver. For this reason it is better to enter bends fast in order to bring the differential's locking action into play early on. This technique produces a rather clumsy but ultimately effective style of driving."</p>		

SECTION 2 - 240 DIFF IDENTIFICATION - TWO VERSIONS DISCUSSED - 1030 and 1031



Outlined below are two Volvo 240 diff versions. Both are a '**solid live rear axle**' with internal size based on the 27 spline axle **Dana 30** -> **Volvo added a '10' in front of the Dana 30 number** to get **1030**, and **1031** for the **stiffer dual rib case**, to probably indicate Volvo manufacture.

The diff is nearly all Dana (Imperial) with a little Volvo (Metric) on the outer bits. For example, the thread system is mostly **UNF** (Unified National Fine) from the tailshaft flange bolts (Front 5/16 x 24 TPI UNF & Rear diff flange 3/8 x 24 TPI UNF) all the way to the **wheel studs (240 = 1/2"x 20 TPI UNF) (740 = M12x1.5 pitch)**, with diff cover

plate bolts and other areas being **UNC** (Coarse). Metric threads are found on the diff ends where the dust, disc & handbrake assemblies attach. Essentially much of the manual transmission driveline utilizes imperial dimensions and threads starting rearward with the Laycock overdrive / tailshaft flanges and splines / universal joints / diff cover. Regarding torque handling of a Dana 240 diff as a function of gearing, two figures have been mentioned from Dana over the years - 475 Nm (350 lb-ft) and 690 Nm (509 lb-ft) output.

How to tell if the junkyard Volvo has an LSD ? - first indicator to look for is a small metal tag (Use LSD oil) attached to a bolt on the diff cover. To mechanically check, you need to jack the whole rear end of the car up so both rear wheels are just off the ground. Rotate a wheel by hand looking whilst looking at the other wheels rotation. If both wheels rotate in the same direction its an LSD, if they rotate opposite each other its standard.

For a running car, you can just do a short quick wheel spin in the dirt and then check for two equal tyre/tire marks.

 <p>Volvo 1030 Diff - single rib Dana 30 27 spline to 1980 / 81</p>	<p>The Volvo 1030 (Dana 30) differential is a pretty tough unit mated with beefy Volvo axle diameters of 1-3/8" stepped to 1-5/16", being similar in size to some V8's. The 1030 diff with fitted LSD is the most common model out there, found in the 140 & earlier 240 models with 4 cyl engines. In Europe, some Volvo ambulances from the period can be found with an LSD. In the 1970s-80 era, a 140 or 240 with a 4 speed synchromesh gearbox and a 'carby' engine required a greater range of diff ratios to suit the terrain, hence a full range of ratio options were available (depending on markets) - 3.31, 3.54, 3.73, 3.91, 4.11, 4.30, 4.88:1.</p> <p>Reportably, the 200-series Volvo Dana 30 type differential was manufactured in England, under DANA license.</p> <p>-> Modern Dana LSD versions are called Power Lok. Webpage © Anthony Hyde 2005</p>
 <p>Volvo 1031 Diff - dual rib Dana 30 27 spline typically 1981 to 1990</p> <p>* Note: From 1990 to last in 1993 they went back to a single rib with 1031 internals</p>	<p>The Volvo 1031 - (Dana 30) heavier duty, introduced to all 4 and V6 cyl models from 1981 onwards. However, the 264 (PRV V6 cyl models) have been fitted with the 1031 from 1969. Most 4 cyl 240s with the 1031 have ratios of 3.54, 3.73 to 4.11. Outside of Scandinavia, the 1031 with LSD is rare, compared to earlier 1030 diff being the most common for LSD fittment.</p> <p>From 1990-93 the 1031 housings went back to a single rib and most 1992-93 have a tone wheel to suit ABS (but very few (in Australia for example) have the ABS module & wiring fitted, only the mechanical infastructure). The 6 cylinder 260's use a 1031 with low numeric ratios eg 3.31, 3.54.</p> <p>John Sargent writes: "The Limited Slip Differential was fitted as a dealer option to certain 1031 rear axles. The LSD add-in for this axle is a Dana Power Lock with Volvo's name on it and a tone ring for cars with electronic speedometer."</p> <p>Differences : The 1031 housing is a bit stronger again than the 1030 evidenced by the extra rib, and beefed up internally with larger diameter gears on the crown and pinion (more info in Section 3). (Volvord in Canada writes: "30 series uses a 7.2" ring</p>

gear while the **31** uses a 7.562". This small increase in diameter of the ring gear and the larger pinion gear (1.376" vs 1.406") adds up to a marked increase in strength") from wider tooth contact area. The '**drive pinion gear shaft**' diameter & bearings are larger than the 1030 - [see pics in Section 3](#). Note: If trying to fit a different diff ratio (eg. change of crown wheel) from a 1030 diff into it a 1031 diff (or vice-versa) forget it. If you wish to change the diff (final drive) ratios, stick to the same diff version componentry. In summary, don't try and mix'n'match the 1030/1031 parts. The 1031 holds 1.6 litres of oil. Ivar Finnvik from Norway writes: we used a 240 Turbo in European Rallycross Championship in the late eighties and the (1031) was the 'one and only axle' to use.

SECTION 3 - 'DIFF'ERENCES - 1030 and 1031 - (pics thanks Jonas Borgegård)



Diff Ratio gearsets are detailed in SECTION 5

	<p>Diff Housings:</p> <p>Pic opposite of Volvo 240 units show the crossover design made between 1031 production.</p> <p>Due to the larger 1031 crown wheel diameter, and to clear the socket cap screws mentioned previously, the housing is cast with a recess/cutout on the top and bottom of the right hand side.</p> <p>One of the reasons why the newer LSD 2.1 won't fit an older 1030 housing.</p> <p>Spot ANY more changes ? - please contact me</p>
<p>Left - 1031 with casting cutouts in outer case---Right 1031 without cutout. Click to enlarge</p>	



Volvo Alloy Diff Housing

RARE 'Volvo marked' ALLOY 'diff centre'. Bolted to either side of the 'centre' are steel axle tubes with standard 240 attachment points.

Fitted to some 240 model production cars in Sweden 1979 & 1980, often in diesel models. Weight saving around 6 kg.

Only the 1030 crown and pinion fits the housing (smaller than 1031). Has LSD 2 centre inside.

The alloy version to suit the bigger 1031 crown and pinion is super rare (GpA racecars) and very expensive, thats if you can find one for sale.

SECTION 4 - CROSS SHAFT & LSD ISSUES

Dana LSD's most often fail through the cross shaft **centre hole**

You certainly hear reports with one common result - In my case, the LSD worked well for 7 years behind the turbo engine before I noticed the diff not locking up like it used to. I thought the metal to metal clutch discs were worn but one cross shaft had broken instead. Others have found both cross shafts broken. **I know a mechanic whom has a bucket full of broken Dana spider cross shafts.** Other LSDs have failed fairly quickly after fitting 2nd hand units behind their turbo engines - a full inspection before fitting would be advisable. Reports of Dana LSDs behind modded V8s are not good.

Shaft - Volvo #3845010 - Most shafts have holes in the centre, some don't - ITS REALLY CONFUSING TO FIND A CONSISTANT TREND especially if your shopping for a replacement, you would try and obtain ones without a hole as they would be stronger through the centre section. BUT have a look at the shaft picture below - they are solid shafts, but instead of breaking through the centre, they broke on the ends !

Why do they have holes in the first place ? - depends on the production era - Lars Björklund writes: Up to year 1969, the hole is used to locate a **spacer sleeve** to hold the driveshafts apart because the driveshaft bearings support each other via driveshafts and the spacer sleeve. Shims are used to adjust the driveshaft end play. Later models have another construction where the drive shaft bearings and the driveshaft are located into the diff ends and held in place with a clamping ring and 4 bolts, and hence up do not need support in the differential cross-shafts as on earlier models.

[Link](#) Engineering discussion on Shafts



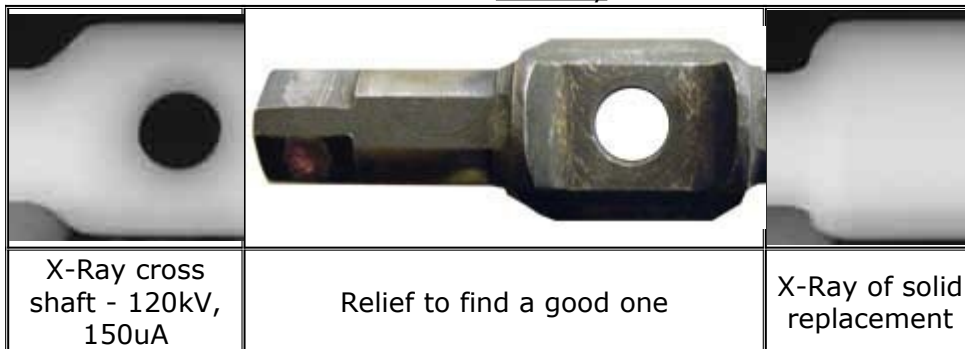
Left pic: J Williams (Australia) found two broken cross shafts that in-turn resulted in lunched



LSD
internals.
LSD 1.1
was fitted
to a **1969**
164
manual
overdrive,
3.73 ratio.
These old
cross
shafts had
no holes in
them. As
far as the
owner
knew they
were
original
from the
era.

A 1985
LSD in a
1031 diff
housing
had no
holes in
the cross
shafts
either.

IF you
have
information
you would
like to
share,
please
email
Anthony





Scout JEEP with Dana 30 LSD is close to units used in the Volvo - pic from Chris Horn.
[Click](#) to Enlarge

SECTION 5 - TECHNICAL

Q. How are the steel diff tubes held into the large outer cast iron housing?
 Diff knowledge hints from a hot rodder (reworded for clarity) - the differential outer tubes fit into machined bores of the cast iron diff housing. The tubes are held in position by a strong plug of weld, **but you don't weld steel & cast iron**. The cast iron housing has a few holes to enable access of the welding rod to the steel tubes. Welds start on the steel tube and are built-up in a circle to create a plug of weld around the diff casting.

LSD 1 and 2 centre WEIGHT: 10 kg with crown wheel attached, bearings on ends removed.

Al.P. writes 'The reason for special high pressure oil in the limited slip diff is so that the friction plates don't stick together.
 The 1030 holds 1.3 litres of oil.

DIFF & Wheel BEARINGS

1030 LSD taper roller bearings:

SKF Centre= LM5013147or9?/Q, Shell= LM501314/Q. Other quality brand is **Timken**:
 Set #69 - LM501349 and LM501314

1030 Rear Wheel 240 (outer) Axle Taper Bearings: 73 mm OD, **Timken** U360L. **Diff outer oil seal** Volvo #383222 (65 ID, 52 OD, 8.5 to 9 section)

DIFF GASKET - 10 **DIFF GASKET** - Modern diff shops use a **silicone liquid gasket**, to replace the (expensive) paper gasket. One liquid gasket highly recommended is ThreeBond #1215 (from Japan).



Note: with **speedo sensor** diffs the gasket thickness is a critical dimension.

Fel-Pro gasket **RDS 55019** (10 bolt cover) for the Dana 30 is commonly available as many Jeeps use one on their front diff, plus old Scout Jeep rear end.

IMPERIAL dimensions and thread sizes are used in the Dana diff

240 Wheel studs - 1/2"x 20 TPI UNF, Tail shaft flange - 3/8"x 24 UNF

LSD internal Housing bolts - **LSD 1 and 2** Hex head bolt (new spares are rare!)- LSD **2.1** has socket cap screws

Both use 8x left hand thread 3/8"x 24 UNF. 2.9" long, 1 1/8" thread length.

CROWN WHEELS - 1030

3.73 : 1 - Volvo #384213 P05 43-11 (384213 seems a typical Volvo number & is not found in a Dana 'Bill of materials')

3.91 : 1 - Volvo #384217 P06 43-11 (**divide** 43/11=3.91)
VOLVO 1220733 P01 43-11 1790 031078 and on the body: 6-22-85 72722X

Diff Gearset Ratios - The ratio is the number of times the drive shaft / tail shaft (or pinion) will rotate for each turn of the road wheel (or ring gear).
If you have a **3.73 :1 gear ratio, the drive shaft turns 3.73 times, and the wheel :1 (once).**

There is a 5% step change between each ratio e.g. 3.73 to 3.91.

Typical diff ratios for 240 Volvos are **3.91, 3.73, 3.54**. But note in 1981 the bigger dia gearset was introduced (see Section 3) so there's two types for each gearset ratio, up-to 1980 and from 81 onwards.

More common ratios in earlier 140 models are **4.1, 4.33** with rare **4.54** for rallying. B28 6cyl can have **3.31:1**. Note these crown and pinions will fit the up-to 1980 1030 diffs.

Further web reading:

<http://www.bakaxel.se/> its in Swedish but a great resource. Select say: **diffsparrar-diffbromsar**

[http://www.k-jet.org/files/greenbooks/200/Section 4 - Power Transmission/TP30039-2_rear_axle_repairs.pdf](http://www.k-jet.org/files/greenbooks/200/Section%204%20-%20Power%20Transmission/TP30039-2_rear_axle_repairs.pdf)

[Dana RING GEAR AND PINION TOOTH PATTERN INTERPRETATION](#)

[Dana/Spicer 30](#) Maintenance Manual Rear Axle page 19, Diff Carrier from page 27- (best to source a Volvo Green manual)

[Ring& Pinion, USA - the diff experts](#), type in Volvo model, focus on 27 spline

[DTS - Drivetrain Specialists USA](#)

The **Dana 30** LSD CARRIER is most commonly found of the front of Jeep vehicles. It can be of standard rotation or reverse rotation. (MY4BY.com)

This major article is copyright © Anthony Hyde, Australia. Nov 2005
Thanks to all contributors whom have contacted myself with information.