

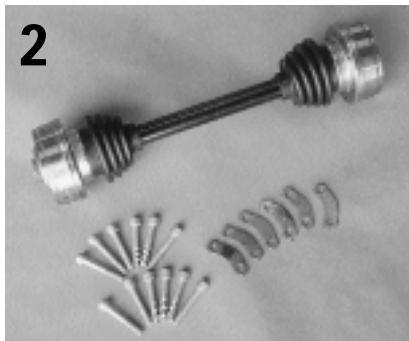
20 Transaxle Upgrades

Regardless of the size of your engine or the shine on your wheels, you can't mate the two together without a transmission. The transmission and its associated parts are as important as headlights at night. After all, they help transmit (hence the name) all of that ground-pounded power to the road. Following is a collection of parts that no Volkswagen should be without.

1 SoCal Imports' heavy duty Rhino transmission case comes directly from the OE manufacturer in Brazil. Extra gusseting along the central spine of the casting makes this one tough case.



2 Complete IRS axle assemblies are also available from SoCal. This is a complete assembly and includes the drive shaft, dust boots, CV joints and all connecting hardware and clamps. SoCal also offers refurbishing services for old, used IRS axles.



SoCal Imports
6851 N. Paramount Blvd.
Long Beach, CA 90805
(562) 633-4979

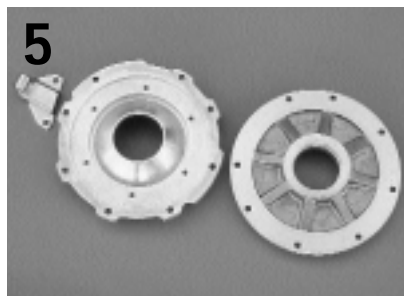
3 BUGPACK IRS differentials provide added strength needed to withstand the abuse doled out by high-horsepower engines. They eliminate the flex found in stock housings and provide for an extra pair of spider gears. They also allow infinite ring gear lash adjustment and do not affect steering or steering brake operation.



4 The answer to noisy steel transaxle mounts, these durable mounts are made in-house by BUGPACK from top quality urethane. They feature steel sleeves and grade five hardware, and the manufacturer claims they are virtually indestructible.



5 For serious off-road performance applications, BUGPACK offers these heavy-duty aluminum side plates. They replace the thrust side cover in order to prevent flexing and damage under high horsepower and high side load conditions. Models are available for swingaxle or IRS type assemblies on 1961 or later VW transaxles.



BUGPACK
3560 Cadillac Ave.
Costa Mesa, CA 92626
(714) 979-4990
Fax (714) 979-3468

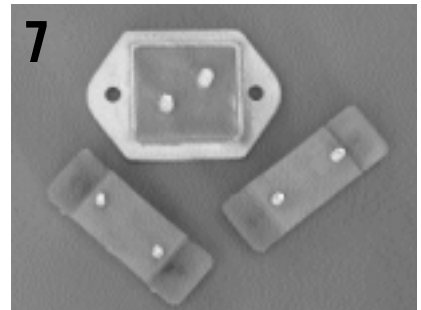
6 Gene Berg's five-speed Conversion Kit includes lengthened main and pinion shafts, a new intermediate and shift housing, new five-speed selector rods, special GB 667 keys for fifth gear, an extra thrust washer for fifth, a 5mm fifth shift fork, fifth stop washer, special pinion and mainshaft nuts, and all needed nuts, bolts and washers. Instructions are also included for the dauntless do-it-yourselfer. This system has undergone several revisions since its first prototype in 1965, and stands as the premier five-speed kit on the market today. Gene Berg Enterprises



1725 N. Lime St.
Orange, CA 92865
(714) 998-7500
Fax (714) 998-7528

7 According to CB Performance, these Rhino transmission mounts effectively double the strength of stock rubber mounts. They are constructed from injected Isoform material for improved strength and noise reduction. They are available to fit both swingaxle and IRS configurations.

8 Genuine VW 5.14:1 ring and pinion sets

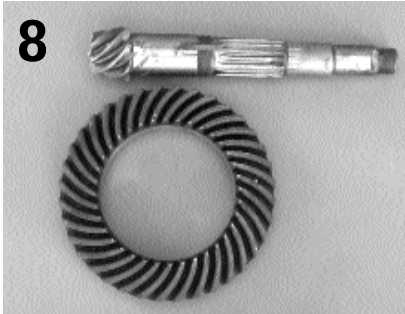


For Longer Life and Better Performance

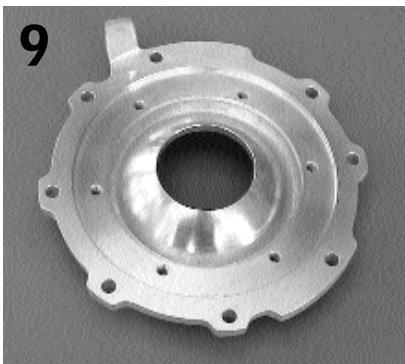
BY VWT STAFF

restore highway cruising power and economy on vehicles that run tall aftermarket tires. Baja Bugs and off-road machines will especially benefit from the lower 5.14:1 ratio. The kit is drilled and tapped for eight bolts and uses a keyed fourth gear.

9 CB's Super Duty Side Plates are



designed to keep your ring and pinion gear properly meshed. They are thicker and provide more strength than stock factory side plates. The design includes an external O-ring to aid in preventing oil leaks at the location where the axle tube is bolted to the side plate. Super Duty Side plates are available in two models to fit all 1961-'68 swingaxle transmissions and 1969-'77 IRS Type I transmissions.
CB Performance
1715 N. Farmersville Blvd.



Farmersville, CA 93223
(800) 274-8337
Fax (559) 733-7967

10 California Imports offers a CV joint rebuild kit for 1968-'91 Type II and 1969-'77 Type I applications. Kits include all needed hardware to execute the rebuild. Lubrication is supplied separately.

California Imports

What's What in That Pile of Gears

Volkswagen Transmission Glossary COMPILED BY ERIC DEBORD

002 differential—The type of differential used in Three- and Five-rib Bus transmissions.

091 differential—Considered heavier and stronger than a 002, this differential is used in late style Type II transmissions from 1976.

Anti Shocker—Device used to slow the travel of the clutch arm/pressure plate and to take the shock off of a transmission in drag race-type starts.

Ball Bearings—Round bearings used in various places in VW transmissions.

Cone Washer—Concave washer used on mainshaft on early Type I transmissions and Three-rib Type II transmissions.

Coupler—Gear that couples the input shaft and mainshaft together in all VW transmissions. Also has external teeth to drive the reverse idler shaft.

CV bells—Output final drive flanges for constant velocity joints

CV joint—Constant velocity joint (see sidebar)

Detent balls—Used to hold shift rails in position

End Gears—Sometimes called axle gears, these are the outer gears in the differential.

Five-Rib Transmission—Type II transmission made from 1974-'75

Flanges—See CV bells

Four-Bolt Housing—Early type of transmission case used in Type I transmissions.

Gear Carrier Housing—Sometimes called intermediate housing. This is the next section of a VW transmission behind the nose cone.

Gear Ratios—Driven gear divided by drive gear. Example—First gear is 10 tooth drive and 38 driven. Divide 38 by 10 to equal 3.80

Gear Selector—The main shift fork some times called a "hockey stick."

Guide Tube—Tube for the throw-out bearing to ride on. Used in various VW transmissions

Hydraulic Slave Cylinders—Clutch actuating cylinder used with a clutch master cylinder to release the clutch and pressure plate

Input Shaft—Splined shaft that the center of the clutch disc rides on and is the first input shaft of a VW transmission

Input Shaft Coupler Gear—See Coupler Gear

Intermediate Housing—See Gear Carrier Housing

IRS—Independent Rear Suspension—The type of suspension and transmission VW used from 1970 up. Before that VW used a Swingaxle suspension and transmission.

Mainshaft—Top shaft in a VW transmission. Contains half of the 1st-4th gearset.

Needle Bearings—Long small bearings used in various places in VW transmissions.

Nosecone—The front or first section of a VW transmission which contains the main shift fork, sometimes called a "hockey stick"

Operating Sleeves—Round rings with teeth on the inside and are what is shifted when you go into any forward gears.

One-Ringed Side Cover—A IRS transmission with one ring cast into the outside of the differential cover.

One-Sided Case—A IRS transmission case that only has one unboltable side cover. The early ones had two.

Output Flanges—See CV bells

Output Splines—The splines that the CV bells go onto.

Pinion—One half of a gearset. The "ring" gear is the other half. This is the final drive of a VW transmission.

Pinion Depth—Distance of the pinion into the ring gear in the final drive section.

Pinion Shaft—Bottom shaft in a VW transmission. Contains the other half of the gearset, plus the pinion gear for the final drive.

Pressure Plate—Mechanism that applies force to the clutch disc and flywheel to turn the input shaft of a transmission

Reduction Gearbox—Old-style Bus transmission that further reduced the final drive by having another set of gears next to the wheels.

These outer sets of gears were in housings and called "gear reduction" boxes.

Reverse Gear Holder Setup—The fork that supports the reverse idler gear.

Rhino Case—Aftermarket braced Type I VW transmission case.

Ring and Pinion—Final drive set of gears used to lower the overall ratio of a transmission.

Six-Rib Transmission—Later style VW Type II transmission from 1976

Snap Rings—Used to keep bearings and gears from coming off of shafts

Spider Gears—The small set of gears in differential. They look somewhat like a spider, hence the name.

Swingaxle—Early type of suspension and transaxle VW used. Until about 1969

Three-Rib Transmission—Early style of Type II Bus transmission used from about 1968-'73

Throwout Bearing—Bearing that pushes in the pressure plate.

Transaxle—Term used for transmission and rear axle as one unit.

Two-Ringed Side Cover—IRS transmission side cover that has two rings cast into it.

Two-Sided Case—VW transmission Type I case that has two unboltable side covers. (all swingaxles and IRS up to 1973).

Rebuilders and Suppliers

The best way to solve a wide variety of transmission woes is to give it to a professional transmission rebuilder or to purchase a rebuilt transmission.

Following is a list of competent rebuilders and suppliers that carry just about any type of transmission you may need.

MOFOCO

MOFOCO refurbished transmissions undergo an extensive road testing, total disassembly and cleaning. MOFOCO will rebuild all Beetle transmissions including swing axle, IRS and auto-stick applications, and all aircooled, watercooled and diesel Bus transmissions.

102 W. Capitol Drive
Milwaukee, WI 53212
(800) 558-8955
Fax (414) 963-2045

TRANSMISSION WEST

Transmission West build VW transmissions to factory-spec and custom high performance, for off-road, sand and drag racing applications. According to the company, customer satisfaction is their primary goal.

(310) 782-2413

STUFF TRANSAXLES

Stuff Transaxles is an internet-based company specializing in rebuilt factory and high-performance transaxles for vintage Types I, 181, II and III VWs. Two, three, four and five-speed transmissions are available, from strictly stock rebuilds to beefed up "gorillas." The company ships anywhere in the world.

3205 Production Ave., #1
Oceanside, CA 92054
(760) 721-8878
Fax (760) 721-8188
www.bugtrans.com

FISHER BUGGIES

Fisher Buggies offers rebuilt stock swingaxle or IRS transmissions, Pro-Street and Pro-Comp applications, and for strict racing applications, the Turbo Pro transaxle. Fisher also carries transmissions for Type II applications from model years 1968-'79.

5126 S. Lois Ave.
Tampa, FL 33611
(813) 837-6696

KCR VW TRANSMISSIONS

KCR Transmissions specializes in building standard shift VW transmissions. The company claims its low overhead allows them to sell top-quality rebuilds for less than many bigger companies. Custom rebuilds are available, including sand, street or strip performance.

9000 Arlington Ave. #108
Riverside, CA 92503
(909) 688-1904

TRANSFORM

Transform offers rebuilds on numerous VW transmissions. They specialize in Type II sand performance and offer eight different stages of Type II performance

trans rebuilds with special gear ratios, super diffs and gusseted cases. Three different Type I sand transaxles are also available.

2105 W. Cowles St.
Long Beach, CA 90813
(800) 508-7267
Fax (562) 435-8098

KUSTOM 1 WAREHOUSE

Kustom 1 Warehouse offers stock IRS or swingaxle transmission rebuilds for Types I and III. They also offer Pro Street, Pro Comp and sand applications. All rebuilt and custom transaxles are available with or without stock axles.

1314 W. Collins Ave.
Orange, CA 92867
(714) 997-9893
Fax (714) 289-0893

MOTORWORKS

Rocky Mountain Motorworks offers rebuilt transmissions with or without the axles. Transmissions are completely disassembled and cleaned, and all worn or damaged parts are replaced. Rebuilds for most years for all Types are available.

1003 Tamarac Pkwy.
Woodland Park, CO 80863
(800) 258-1996

THE REAL SOURCE

The Real Source offers rebuilt swingaxle transaxles for Beetles and Ghias 1961-'68 and Type IIIs from 1964-'66. They offer rebuilt IRS transaxles for Beetles, Super Beetles and Ghias from 1969-'77. All rebuilt transmissions are thoroughly tested for quality.

One Mid America Place
P.O. Box 1248
Effingham, IL 62401
(800) 588-2844
Fax (217) 347-2952

RANCHO TRANSAXLES

Rancho Performance Transaxles offers transmissions for every VW application imaginable, ranging from bone stock rebuilds to performance street, strip or off-road applications. Jobs are tailored to customers' specific needs, with numerous performance options available.

1631 Placentia Ave. Unit G
Anaheim, CA 92806
(800) 304-8726
(714) 680-3110

FAST GERMAN AUTO

Fast German Auto offers remanufactured transmissions for practically every model VW. The company can also customize transmissions according to customers' needs. All transmissions are backed by a 12-month, 12,000-mile warranty covering parts and workmanship.

2911 S. Oak
Santa Ana, CA 92707
(888) 211-3334
Fax (714) 979-2974

VW PARADISE

VW Paradise assembles transmissions for all applications, including stock rebuilds, automatics, street or racing performance, or off road performance. Paradise is one of the only shops to exclusively offer the new Mendeola transmissions for racing applications.

1510 Grand Ave.
San Marcos, CA 92069
(760) 744-9140
Fax (760) 744-0967

CALIFORNIA PACIFIC

California Pacific offers transmission services for almost any application. Custom jobs include reduced-rpm Freeway Fliers and Pro Street transmissions. Custom options and builds are available.

2040 Oceanside Blvd.
Oceanside, CA 92054
(800) 231-1784
Fax (760) 433-5527

CHIRCO

Chirco offers rebuilt transmissions for all applications, including IRS, swingaxle and automatic. Performance options are available, and transmissions can be assembled on a case by case basis.

9101 E. 22nd St.
Tucson, AZ 85710
(520) 722-1987
Fax (520) 298-4069

LONG ENTERPRISES

Long Enterprises has been remanufacturing VW transaxles since the early 70s. They offer standard OE and high-performance replacement parts for vintage builders and high-performance enthusiasts alike.

2475 Morse Road
Sebastopol, CA 95472
(707) 829-1169
Fax (707) 823-5664

STRICTLY FOREIGN

Strictly Foreign offers transaxle rebuilding services for any application, including daily drivers, race cars and off-road vehicles. According to the company, they offer quality products at a fair price, as well as a 24-month warranty on all new parts sold.

405 Union Ave. #A
Grants Pass, OR 97527
(541) 476-1999
Fax (541) 476-2131

WEDDLE ENGINEERING

Weddle Engineering offers standard transmission rebuilding services, as well as promoting several different high performance packages, including ring and pinion sets, tall gearing kits and high-strength replacement gears.

700 Becknell Road, Unit A
Goleta, CA 93117
(805) 696-9665
Fax (805) 696-9666

Please call the company directly for more information and a detailed list of services and products provided.

1123 Fir Ave.
Blaine, WA 98230
(800) 313-3811
Fax (877) 511-8111

11 The Hurst-style shifter features positive reverse lock out for slamming into second gear and a spring loaded gate for quicker shifts into third. Shifting into reverse is as simple as pulling up on the trigger and easing the handle back as you would a stock assembly.



12 If you're having a tough time shifting gears, it might be time to change your shift coupler. Couplers are available in stock rubber or durable urethane, and are available for Bugs and Ghias from 1950-'79.

www.VWcyberStore.com



13 The SCAT Drag Fast shifter features an unbreakable forged shaft and heat treated steel at all critical wear surfaces. In addition, it features positive reverse lock out for peace of mind and a fully chrome plated shaft for great show car looks. Drag Fast shifters are available for Type I Sedans and Type II 1961 and up.



SCAT Enterprises, Inc.
 1400 Kingsdale Ave.
 Redondo Beach, CA 90278
 (310) 370-5501
 Fax (310) 214-2285

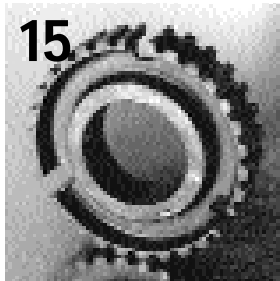
14 If you are contemplating removing or replacing your VW's transaxle, Volume Five from the Bug Me Video series, Transmission Replacement, is an invaluable resource. The "Doctor," Rick Higgins, shows you how to remove and reinstall the 1968 and earlier swingaxle tranny, as well as how to remove and reinstall the 1969 and later IRS transaxle, including CV joint inspection and maintenance. He even shows you how to renew leaky axle seals and how to adapt 6-volt trannies to 12-volt flywheels.

Bug Me Video
 P.O. Box 4176
 N. Fort Myers, FL 33918
 (800) 662-0071



15 This is a replacement gear for defective third and fourth Vanagon clutch gears. It was developed by Long Enterprises to fix the cracking problem on third and fourth gears experienced by many Vanagon owners.

Long Enterprises
 2475 Morse Road
 Sebastopol, CA 95472
 (707) 829-1169
 Fax (707) 823-5664



Know What You've Got Volkswagen Transmission Codes

Code	Engine	Mate	Final Drive Model
AA	1200	4.375	From Chassis Number 0981810
AB	1300	4.375	Up to 1970
AC	1500	4.125	On some 1300 from 1971
AD	1200	4.375	Limited Slip Diff. (LSD)
AE	1300	4.375	With LSD
AF	1500	4.125	LSD to 1970
AG	1200	4.375	Used on Type 147
AH	1500	4.125	IRS from 1969
	1600	4.125	1970-71
AK	1500	3.875	Type 181 to 1970
	1600	3.875	Type 181 from 1971
AL	1500	3.875	Type 181 with LSD to 1970
	1600	3.875	Type 181 with IRS and LSD from 1971
AM	1300	4.375	Sedan and Vert from 1971
AN	1600	3.875	KG with IRS from 1971
AO	1300	3.875	KG from 1971
AP	1300	4.375	LSD from 1970-71
AQ	1600	4.125	LSD from 1971-1972
AR	1600	3.875	KG with LSD from 1971
AS	1600	3.875	Type I from 1973
AT	1600	3.875	Type 1303 and Verts from 1973
AU	1600	3.875	Type 1303 with LSD from 1973
BA	1300/1500	4.375	Auto-stick from 1969-70
BC	1300/1500	4.375	Auto-stick from 1969-70 with LSD
BE	1600	4.125	Auto-stick from 1971-72
BF	1600	4.125	Auto-stick from 1971-72 with LSD
BG	1300	4.125	KG with auto-stick from 1971
BH	1300	4.125	KG with auto-stick from 1971 with LSD
BJ	1300	4.375	Auto-stick from 1971
BK	1300	4.375	Auto-stick from 1971 with LSD
DA	1500/1600	4.125	Type III SA to 1968
DB	1500/1600	4.125	Type III SA to 1968 with LSD
DC	1500/1600	4.125	Type III IRS from 1969
DD	1500/1600	4.125	Type III IRS from 1969 with LSD

NOTES

Keeping a Constant Velocity

A Closer Look at C.V. Joints

Constant velocity joints (CV joints) are an overlooked lot. They go about their business much like that of an oil pump or brake line, with little or no general maintenance, and it is high time they get the recognition they deserve.

A CV joint is required to transmit all of the power generated by the engine and transmission through the axles and to the ground via the wheels. As if that wasn't stressing enough, they must perform their job while the suspension moves up and down. To give you a good example of their beating, consider an off-road application. As the car leaves the ground, the engine sometimes surges in power until the car returns to the ground. At which time all of that torque is pushed through the CV joint and sometimes at radically acute angles. There are no small tasks, only small parts.

The CV joint consists of four interlocking components: the outer shell, the cage, the ball bearings and the center star. All of the inner parts ride inside the outer shell. The cage secures the steel ball bearings in the CV joint, while the center star holds the ball bearings to the outside of the cage.

When you have your transmission out, it doesn't hurt to pull the CV boots off and have a look at your joints. Inspect them for grooves in the outer shell and a brownish discoloration of

the ball bearings, signs of lack of lubrication and excess heat. If they appear slightly marred, it is best to replace them and make sure your new joints have plenty of moly-type grease.

—Ryan Lee Price



The most important thing to consider is the precision that's needed to assemble one of these, especially considering the heat and abuse these components must endure.

16 For a more judicious application of power on your spirited performance street machine, Quaife torque biasing limited slip differentials are among the best available. Differentials are available for most Type I applications, including both swingaxle and



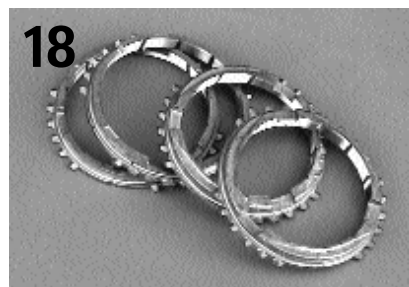
IRS configurations.

17 Several different replacement gear packages are available through ERCO. Shown is the company's Phoenix brand 1131 Keyed Main Shaft kit. The kit includes a super heavy duty third gear and heavy duty fourth, and is ideal for performance street



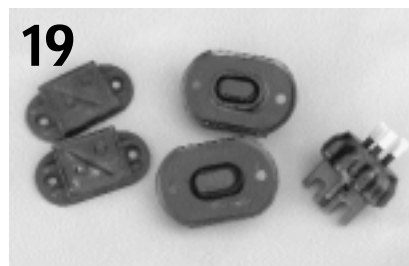
or drag racing applications.

18 Diehl brand synchros are also available from ERCO. According to the company, this should be the first thing you replace when rebuilding your transmission. Shown are synchros for gears one through four.



ERCO
9880 Indiana Ave. #26
Riverside, CA 92503
(909) 689-4430
Fax (909) 689-2640

19 Kustom 1 Warehouse offers transmission mounts for virtually any aircooled VW application. Pictured here are replacement nose cone mounts, available for 1961-'77 Type Is, 1955-'72 Type IIs, and 1965-'73 Type IIIs.



20 Of course, Kustom 1 carries rear tranny mounts as well. Rear mounts are available for 1964-'79 Type Is, 1967 Type IIs and 1964-'79 Type IIIs.



Kustom 1 Warehouse
1314 W. Collins Ave.
Orange, CA 92867
(714) 997-9893
Fax (714) 289-0893



These are the components that make up a constant velocity joint: The outer shell houses the cage (top) the ball bearings and the center star (right).

The Transaxle Zone

Inside the Gobs of Gears and Grease

Who really knows what happens under the backseat of your Beetle or the rear bench or cargo area of your Bus? The engine runs, the lever moves from one gear to the other and the car goes forward and backward on command. But what happens when it doesn't or won't or can't? What then? For most of us, we'd simply pull the engine, drop the transaxle and run it down to the trusty Volkswagen transmission specialist of our choice (see sidebar on Page XX if you don't have one). They work their magic, and it would come back to us (minus the grease and the broken parts) all shiny and new! We'd put it back in and presto, we're in business. What's inside of that black case is probably the most mysterious part of the whole car.

Many of you out there probably don't have the tools, the patience or the volumes of knowledge it takes to rebuild one of these, and we don't expect that you would. Any work on your transmission should be done by a professional, otherwise you'll end up paying double: half to repair what you broke and the other half to fix what you should have fixed in the first place. Of course, this is by no means a comprehensive examination of every component that is involved with the transmission (that would take a book to do). Here is just a peek inside and some clues as to what it takes to put a transaxle together

—Ryan Lee Price and Timothy N. Gavern



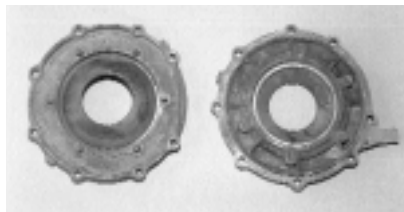
The pinion gear is at the top with first gear through fourth gear displayed in order from right to left. First gear and second gear move up and down on the pinion shaft. Third gear is splined, and fourth gear is held in place by a woodruff key, essentially making it integral to the pinion shaft. On the bottom is the main drive shaft in which first and second gear are integrally part of the shaft. At right are the third and fourth gears, which move up and down on the main drive shaft.



This is the ring gear (left) and the pinion shaft. Together they make up the ring and pinion, which is the final drive set of gears used to lower the overall ratio of a transmission.



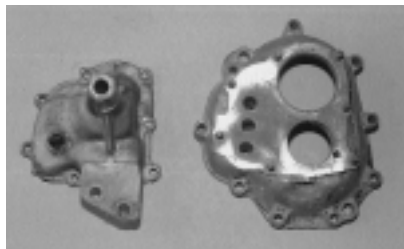
The photo on the left illustrates the position that first gear would be engaged on the pinion shaft, and the photo on the right shows second gear engaged with the syncro operating sleeve.



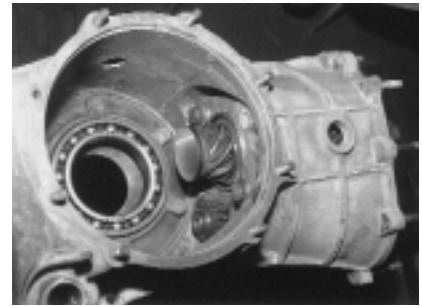
This shows both sides of the final drive covers, which are commonly called side covers, where the axle shafts originate.



This is a common example of a swing-axle, full syncro, "tunnel style" transaxle.



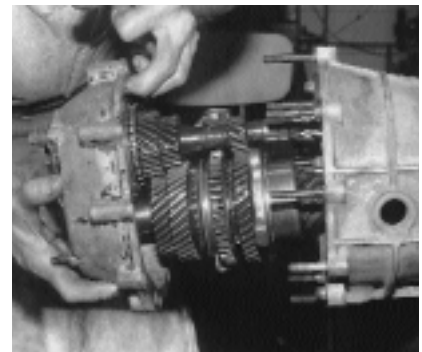
On the left is the nosecone, or gearshift housing, and on the right is the gear carrier, which fits on the front of the transaxle case.



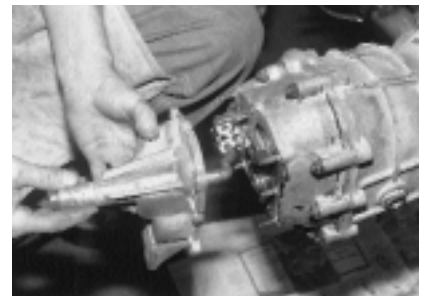
Once the pinion assembly is in position, one side cover and bearings must be installed and a perfectly flat magnetic plate is attached to the top of the pinion shaft to help determine its depth. Then, an extremely expensive tool is used to determine the correct pinion depth down to the hundredth millimeter.



With the pinion depth established, the ring gear can be installed and its backlash adjusted to help achieve a smooth operation.



Here is the completed assembly, with the gear carrier, ready to be fitted into the transaxle case.



With the gear carrier installed, the inner shift (hockey stick) and gearshift housing (nose cone) can be installed.