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*AUTOMATIC TRANSMISSION SERVICE GROUP*

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## *TECHNICAL SERVICE INFORMATION*

### INTRODUCTION

#### **V.W. - AUDI 095, 096 AND 097**

The 095, 096 and 097 transmission is a fully electronic four speed automatic transaxle and is currently found in the Volkswagen Cabrio, Corrado, Golf, Jetta, Passat, and the Audi 80, 90, 100, and Cabriolet vehicles. The information compiled in this manual is as accurate and complete as possible at the time of printing. The intent of this book is to assist the professional technician in the diagnosis, teardown and repair of this unit. Repairs should not be attempted by unqualified or untrained individuals. Standard safety precautions must be taken in order to protect the vehicle and the individual working on it. Use only the proper tools for the application you are working on in accordance with the Manufacturers tool recommendation.

The information and part numbers contained in this booklet have been carefully compiled from industry sources known for their reliability, but ATSG does not guarantee its accuracy.

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## V.W. 096 IDENTIFICATION

The V.W. 096 transaxle vehicle code and date of manufacture code is located on the top of the bellhousing in the center. The transaxle model code is located on the transaxle case, below the manual shift lever. The torque converter has a four letter code located on the outside diameter, near the base to aid in proper identification. The torque converter code is also on a tag located behind the vehicle and manufacture code. The valve body has a three letter code on the solenoid hold down plate, or may be inscribed on the main body. Additional identification and gear ratio information has been provided below. See figures 1 through 8.

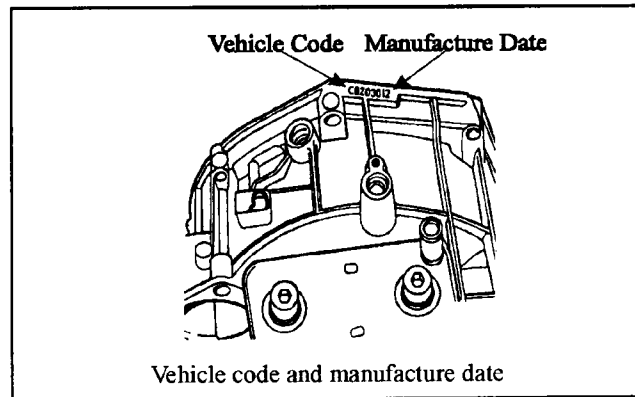


Figure 1

| MODEL     | YEARS | ENGINE SIZE       |
|-----------|-------|-------------------|
| Cabrio    | 95    | L4 2.0L           |
| Corrado   | 90-94 | L4 1.8L V6 2.8L   |
| Golf      | 93-94 | L4 1.8L 1.9L 2.0L |
| Jetta     | 93-94 | L4 1.8L 1.9L 2.0L |
| Jetta GLX | 94    | V6 2.8L           |
| Passat    | 90-94 | L4 2.0L           |

VW vehicles currently equipped with the 096 transaxle

Figure 2

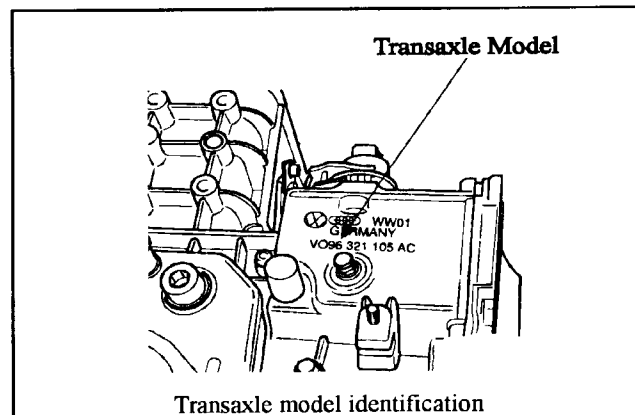


Figure 3

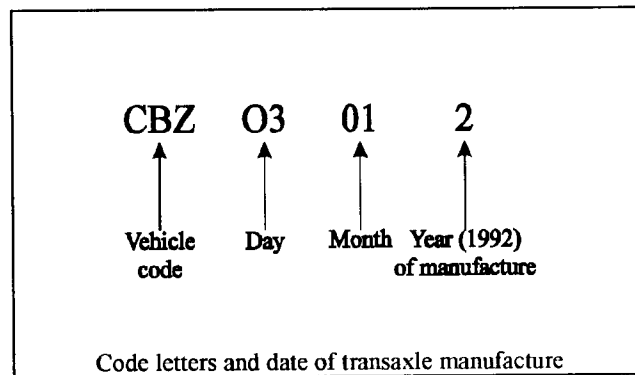


Figure 4

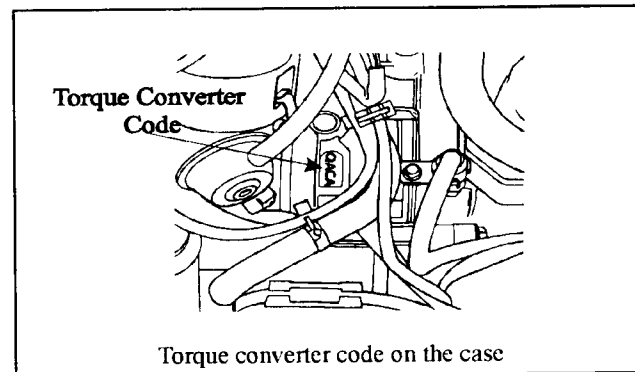


Figure 5

## AUTOMATIC TRANSMISSION SERVICE GROUP

## VW 096 IDENTIFICATION CONTINUED

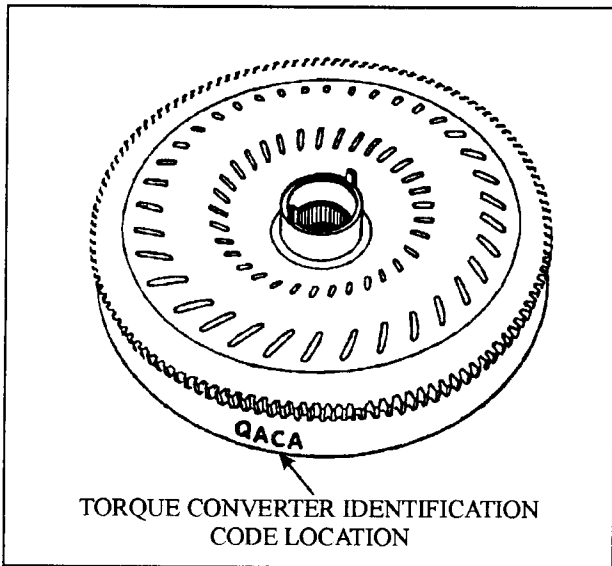


Figure 6

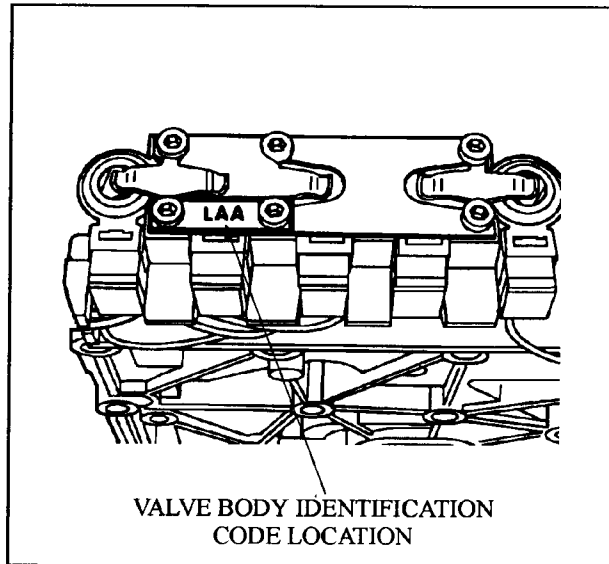


Figure 7

### 096 GEAR RATIOS

| MODEL | FIRST | SECOND | THIRD | FOURTH | REVERSE | FINAL DRIVE |
|-------|-------|--------|-------|--------|---------|-------------|
| APB   | 2.714 | 1.551  | 1.000 | 0.679  | 2.111   | 4.222       |
| APC   | 2.714 | 1.551  | 1.000 | 0.679  | 2.111   | 4.222       |
| APE   | 2.714 | 1.551  | 1.000 | 0.679  | 2.111   | 4.222       |
| CBZ   | 2.714 | 1.551  | 1.000 | 0.679  | 2.111   | 4.222       |
| CFA   | 2.714 | 1.551  | 1.000 | 0.679  | 2.111   | 4.222       |
| CFC   | 2.714 | 1.551  | 1.000 | 0.679  | 2.111   | 4.222       |
| CFF   | 2.714 | 1.441  | 1.000 | 0.742  | 2.884   | 3.700       |
| CFH   | 2.714 | 1.441  | 1.000 | 0.742  | 2.884   | 4.222       |
| CHG   | 2.714 | 1.441  | 1.000 | 0.742  | 2.884   | 3.700       |

Figure 8

## AUTOMATIC TRANSMISSION SERVICE GROUP



## Technical Service Information

### AUDI 097 IDENTIFICATION

The Audi 097 transaxle identification codes are located in two places on the transaxle case. The transaxle vehicle code and date of manufacture codes are located on the left side of the transaxle, rearward of the bellhousing. The transaxle model code is located on the left side of the transaxle case about half way towards the rear.

The torque converter has a four letter code located on the outer diameter, near the torque converter base to aid in proper identification.

The valve body has a three letter code located on the solenoid hold down plate, or may be inscribed on the main valve body casting. Additional identification information has been provided below. See figures 9 through 13.

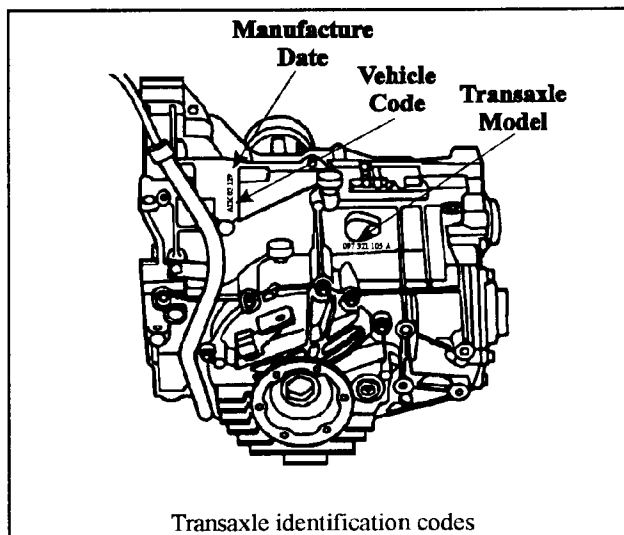


Figure 9

| MODEL     | YEARS | ENGINE SIZE |
|-----------|-------|-------------|
| 80        | 91-92 | L5 2.3L     |
| 90        | 91-92 | L5 2.3L     |
| 90        | 93-94 | V6 2.6-2.8L |
| 100       | 91    | L5 2.3L     |
| Cabriolet | 94    | V6 2.8L     |

Audi vehicles currently equipped with the 097 transaxle

Figure 10

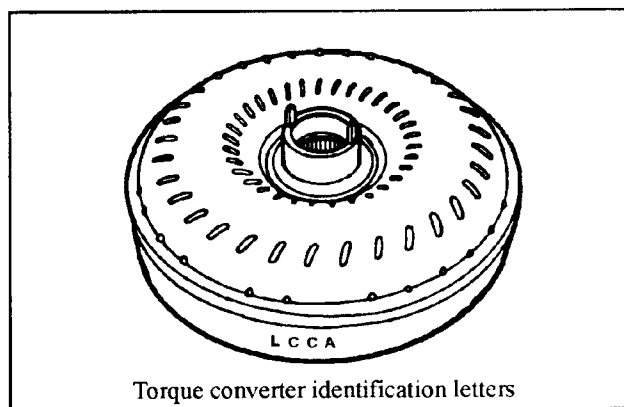


Figure 11

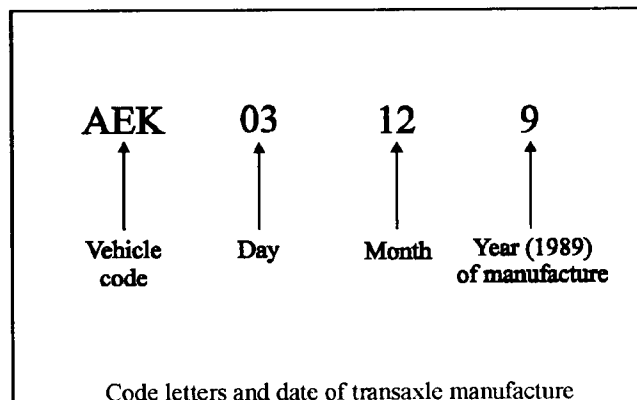


Figure 12

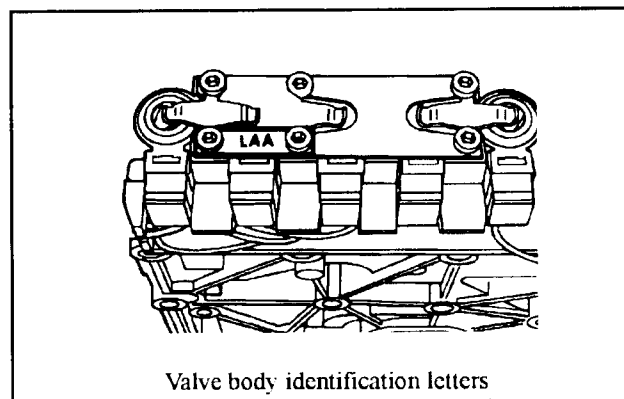
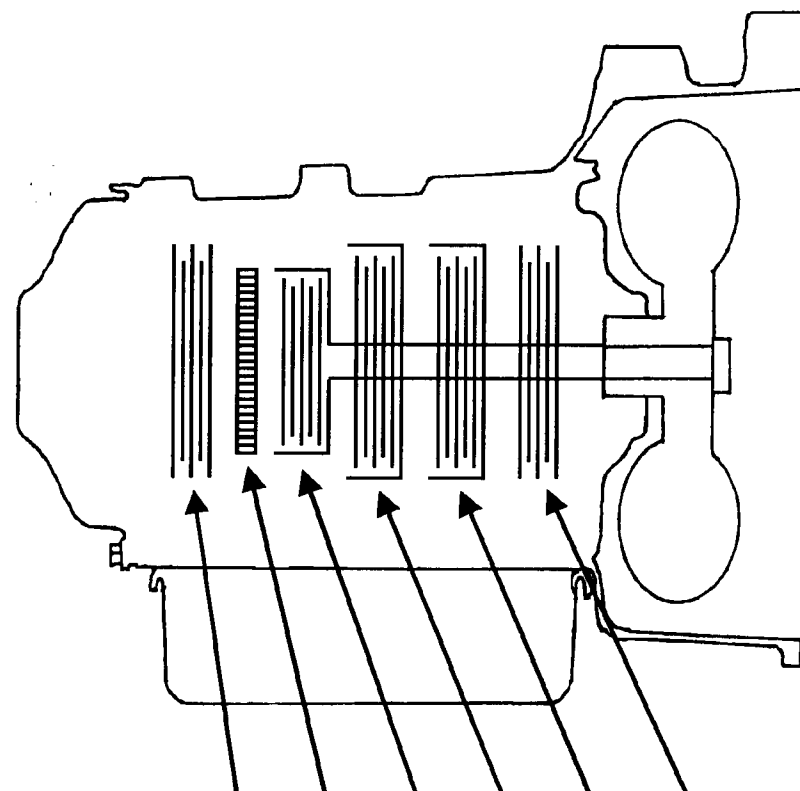


Figure 13

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## V.W. AUDI 096 - 097 CLUTCH APPLY CHART



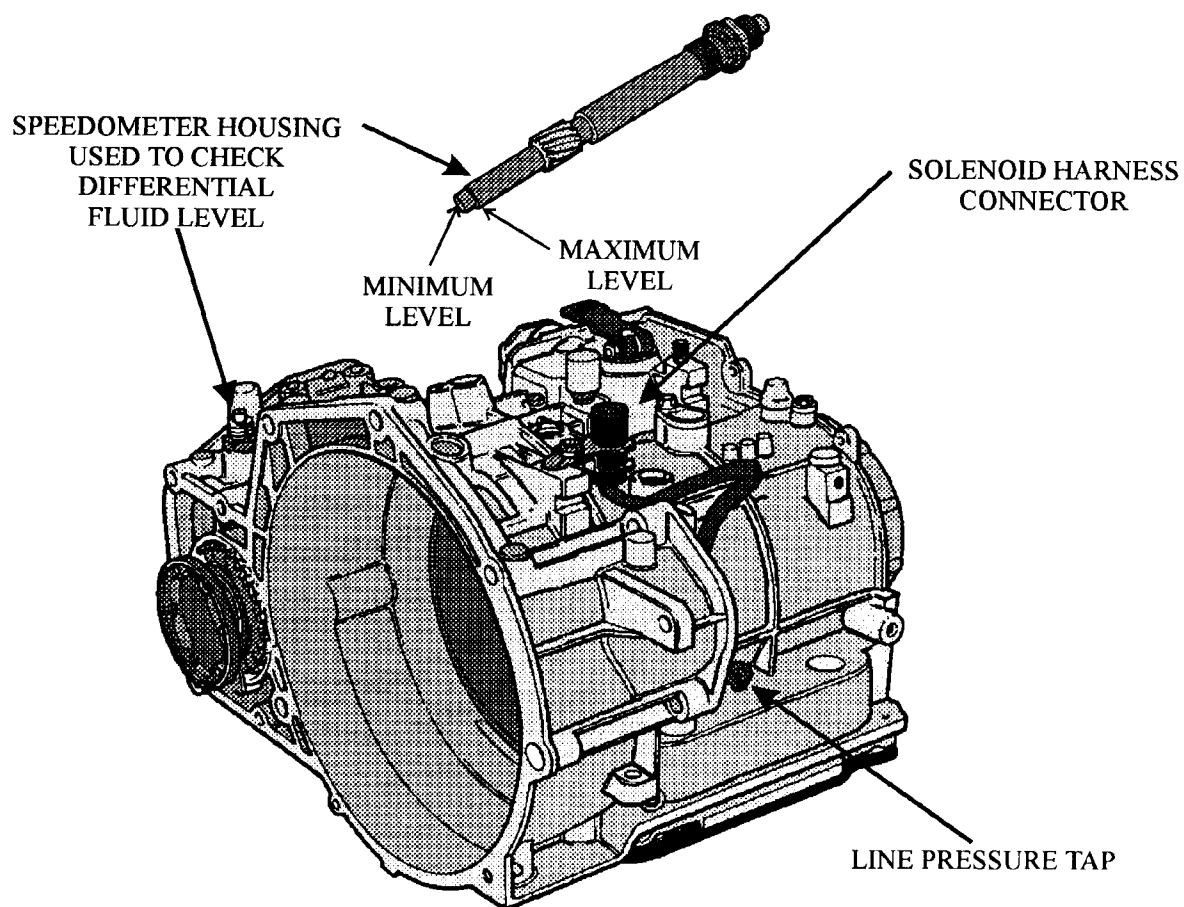
| RANGE | GEAR    | B1<br>CLUTCH | LOW<br>ONEWAY<br>CLUTCH | K3<br>CLUTCH | K1<br>CLUTCH | K2<br>CLUTCH | B2<br>CLUTCH |
|-------|---------|--------------|-------------------------|--------------|--------------|--------------|--------------|
| D4    | 1ST     |              | ON                      |              | ON           |              |              |
|       | 2ND     |              |                         |              | ON           |              | ON           |
|       | 3RD (H) |              |                         |              | ON           | ON           |              |
|       | 3RD (M) |              |                         | ON           | ON           | ON           |              |
|       | 4TH     |              |                         | ON           |              |              | ON           |
| L     | 1ST     | ON           |                         |              | ON           |              |              |
| R     | REV     | ON           |                         |              |              | ON           |              |

D3 - IS THE SAME AS D4 BUT NO 4TH GEAR

D2 - IS THE SAME AS D4 BUT NO 3RD OR 4TH GEAR

Figure 14

## V.W. TRANSAXLE MODEL 096 PRESSURE TESTING



| GEAR    | TEST CONDITION                               | PRESSURE (psi) | BARS        |
|---------|----------------------------------------------|----------------|-------------|
| Drive   | Idling with solenoid connector plugged in    | 49 - 55        | 3.4 - 3.8   |
| Reverse | Idling with solenoid connector plugged in    | 94 - 109       | 6.5 - 7.5   |
| Drive   | 2000 Rpm's with solenoid connector unplugged | 146 - 164      | 10.1 - 11.3 |
| Reverse | 2000 Rpm's with solenoid connector unplugged | 333 - 349      | 23 - 24     |

Figure 15

## V.W. AUDI 096 - 097 PRELIMINARY INFORMATION

There are 7 solenoids mounted on the valve body of the Passat 096 transaxle. These solenoids connect to a detachable plastic harness retainer. The harness itself travels through the case with the main round connector attached to a plate that is bolted to the top of the case beside the linkage. The main voltage supply is fed through pin # 1 as shown in figure 18 on the next page. This terminal feeds battery voltage through a brown wire which travels all the way to the end of the detachable plastic retainer. There, it is soldered, to a temperature sensor and 6 other brown wires which goes on to feed battery voltage to 6 out of the 7 solenoids (See Figure 16 below).

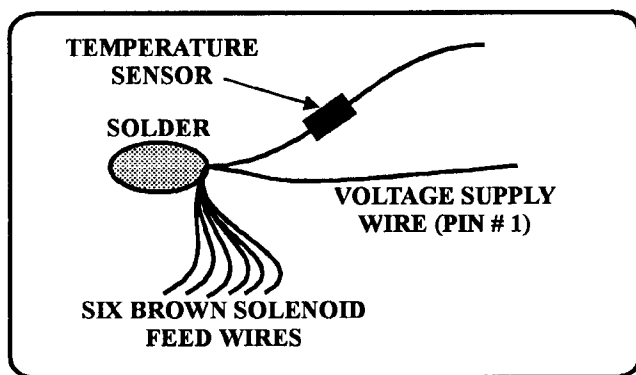


Figure 16

### TEMPERATURE SENSOR

The Temperature Sensor shown above measures approximately 200K ohms at room temperature and drops in resistance as the transmission fluid heats up. The Temperature Sensor signal wire is red in color and goes to pin # 12 in the connector as shown in figure 18 on the next page. This sensor monitors the transmission's fluid temperature continuously.

When transmission fluid temperatures exceed a predetermined limit, the ECU is programmed to cause later shifts resulting in higher engine revs. This produces greater coolant flow in an attempt to bring the fluid temperature down. Also, this transaxle has a hydraulic and a mechanical third gear. The ECU will command a mechanical third gear sooner in an attempt to reduce converter slip which produces heat. As soon as the transmission fluid cools down, the normal driving program is resumed.

### SOLENOIDS

The resistance of six out of the seven solenoids (Solenoid #'s 1, 2, 3, 4, 5, and 7) measure approximately 60 ohms each. The remaining #6 solenoid measures approximately 5 ohms in resistance (See Figure 18 on the following page for the solenoid locations on the valve body). All six solenoids that measure 60 ohms in resistance are **normally open** solenoids and close to hold pressure when they are energized. The # 6 solenoid is a pulsed width modulated pressure control solenoid and it is a **normally closed** solenoid. This solenoid has its own voltage supply through pin # 2 as shown in figure ? on the next page. A 200 ohm resistor is soldered in a parallel circuit with the pressure control solenoid (See Figure 17 Below).

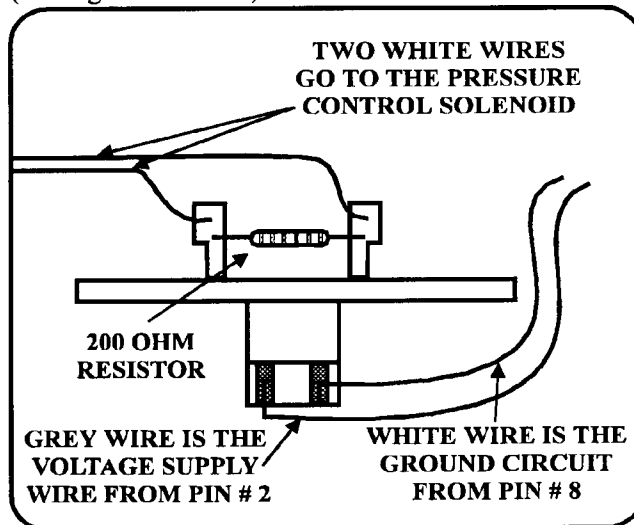


Figure 17

The ECU controls shift timing and shift feel by providing ground signals for each of the seven solenoids. Solenoid #'s 1, 2, 3 and 4 are used to control shift timing. The gearshift transitions are controlled by solenoids # 5 and # 7. Solenoid # 6 controls main line pressure as previously stated.

If all power was lost so that the solenoids could not be energized, the transaxle would have third gear starts. Manual low and reverse could also be achieved if power to the solenoids were lost. The ECU will also cause third gear starts as a failsafe in the event it had monitored a problem within the system.

## V.W. AUDI 096 - 097 SOLENOIDS

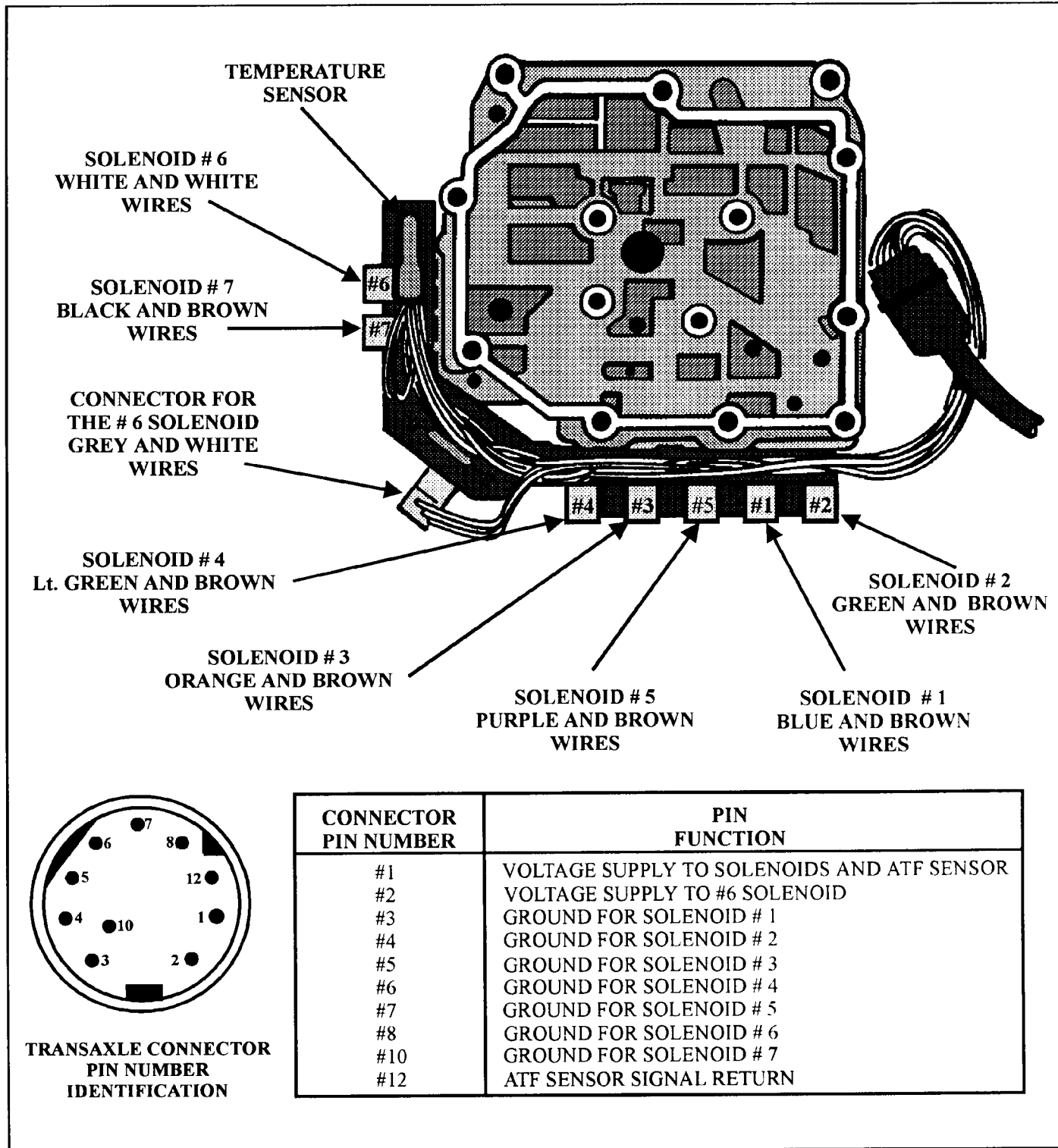


Figure 18

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## Technical Service Information

### V.W. AUDI 096 - 097 SOLENOID RESISTANCE CHECK

#### SOLENOIDS Continued

To check each solenoid for resistance, place the positive lead of a multimeter to pin # 1 in the connector. With the ground lead of the meter, check each solenoid by touching the appropriate ground pin (Use Figure 18 for pin location). Below is a chart that can be used as a quick reference guide.

| DEVICE TO BE CHECKED                                                                                   | NEGATIVE METER LEAD TO PIN # | OHMS VALUE * |
|--------------------------------------------------------------------------------------------------------|------------------------------|--------------|
| Solenoid #1                                                                                            | Pin # 3                      | 60           |
| Solenoid #2                                                                                            | Pin # 4                      | 60           |
| Solenoid #3                                                                                            | Pin # 5                      | 60           |
| Solenoid #4                                                                                            | Pin # 6                      | 60           |
| Solenoid #5                                                                                            | Pin # 7                      | 60           |
| Solenoid #7                                                                                            | Pin # 10                     | 60           |
| ATF Sensor                                                                                             | Pin # 12                     | 200K         |
| Solenoid #6 place negative lead to pin 8 and positive lead to pin 2. Should read approximately 5 ohms. |                              |              |

*\* All values are approximate at room temperature.*

The electrical management system that operates or controls this transaxle is called DIGIMAT. No it is not misspelled, it is just a strange name. Unfortunately, this Digimat ECU has a permanent fault memory and self diagnosis capability with stored codes that can only be retrieved with the use of a VAG 1551 scanner by, guess who? Fahrvergnugen! Short for V.W.. This means that when this unit comes into your shop in failsafe, and it is a 93 model or earlier, you'll have to run it down to your FRIENDLY and COOPERATIVE Volkswagen Dealership and ask them to hook up their scanner to retrieve the codes.

If you want to shift the transmission separate from the computer, it can be done if you have patience. First supply 12 volts through a 20 amp fuse to pin # 1 in the connector and keep it there. Now you can begin to ground the appropriate pins:

Ground pin 6 to get 1st gear.  
Ground pins 4 and 6 to get 2nd gear.  
No grounds is a hydraulic 3rd gear.  
Ground pin 5 for a mechanical 3rd gear.  
Here is the Grand Finale':  
Ground pins 3, 4, 5 and 6 to get 4th gear.

This test can be helpful in a pinch, but the best way to

As you can see the solenoid shift pattern is quite different when it is compared to any other solenoid shifted transmission. This shouldn't have come at much of a surprise, after all, it is a Digimat electrical system.

When the selector lever is placed into Drive, line pressure is fed to the K1 and K2 clutch. The K1 clutch can be thought of as a 1st to 3rd clutch and the K2 as a 3rd and reverse clutch. When solenoid #4 is energized by grounding pin # 6, the K2 clutch feed is exhausted allowing just the K1 clutch to be applied. A spring and roller one way clutch now becomes effective and the transaxle has first gear.

To make a shift into 2nd, solenoid # 4 remains energized to keep the K2 clutch from applying. Solenoid # 2 is energized by grounding pin # 4 which allows the B2 clutch (2/4 clutch) to come on.

A shift into a hydraulic 3rd gear takes place when all the grounds are removed. The K1 clutch is still applied, the B2 clutch comes off and now the K2 clutch finally comes on because the # 4 solenoid was turned off. With both the K1 and K2 clutch on at the same time, the planetary gear set is locked spinning 1:1.

A mechanical 3rd gear can be achieved by grounding the # 5 pin which energizes the # 3 solenoid. This allows the K3 clutch (3/4 clutch) to be applied. The K3 clutch drum is splined into a damper plate in the torque converter which provides a direct mechanical link to the crank shaft eliminating the need for a converter clutch. This also produces the mechanical 3rd gear. Remember, the K1 and K2 clutch is still applied, by energizing the # 3 solenoid, we add the K3 clutch connecting the gear train to the crank shaft which eliminates all converter slip.

The shift into 4th gear occurs when a ground is made to the # 3 pin to energize the # 1 solenoid. This exhaust oil from the K1 clutch turning this clutch off. Solenoid # 2 is turned back on to apply the B2 clutch (2/4 clutch), the K3 clutch (3/4 clutch) is already on from the mechanical 3rd shift. Solenoid # 4 is turned back on to exhaust the oil from the K2 clutch (3rd and reverse). All this happens at once leaving the B2 and K3 clutches as the only two clutch packs on to achieve 4th gear. Mario Aristides from Independent Transmissions has provided us with valve body illustrations for this book. (See Figures 169 - 172 on Pages 72 - 75), Thanks Mario!

## AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 ELECTRICAL DIAGNOSIS

The 096 and 097 transaxles are completely computer controlled. The Digimat Electronic Control Unit (ECU) operates the solenoid valves in the valve body. The ECU controls the up/down shifting schedule as well as the quality of the shifts in to input signals from various components on the automobile. These components, or inputs are: 1. Multi-function switch (selector lever position sensor). 2. Sport mode switch. 3. Engine speed signal. 4. Transmission speed sensor. 5. Throttle valve potentiometer (throttle position sensor). 6. ATF temperature sensor. 7 Kickdown switch. 8. Brake light switch. Below is a picture of the input sensors, and a description of each.

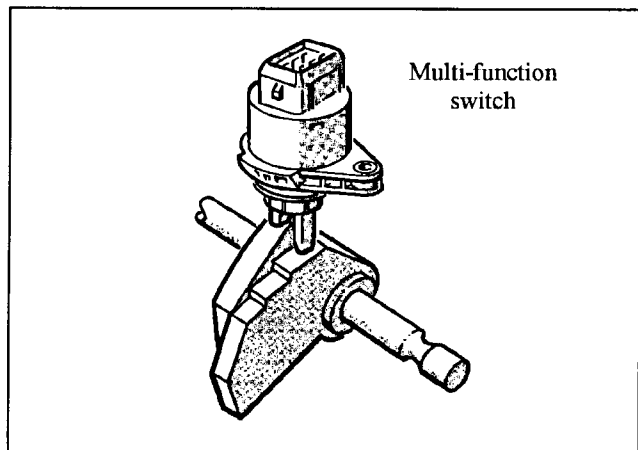


Figure 19

The Multi-function switch is located on the back of the transmission housing. This switch is operated by the cam on the manual selector lever. The switch consists of two neutral double pole reversing switches. The purpose of this switch is to send information to the computer as to manual lever position, activate the back-up lights, control starter lock-out function, give information to the computer to supply power to the cruise control unit, and provide information for activating the Shift Lock II system..

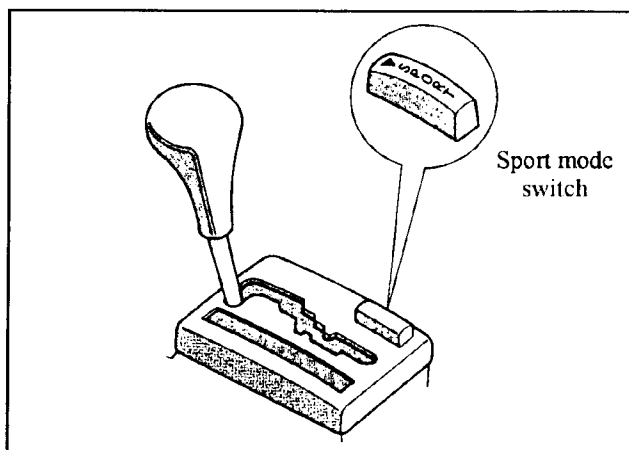


Figure 20

The Sport Mode switch is located on the vehicle shift console. This switch is used to change the shift timing of the transmission to suit the drivers desire for sportier shifting. When the sport button is depressed, a reference signal sent from the computer is grounded. This alerts the computer that the sport mode has been requested, and the shift scheduling changes to provide higher firmer shifts.

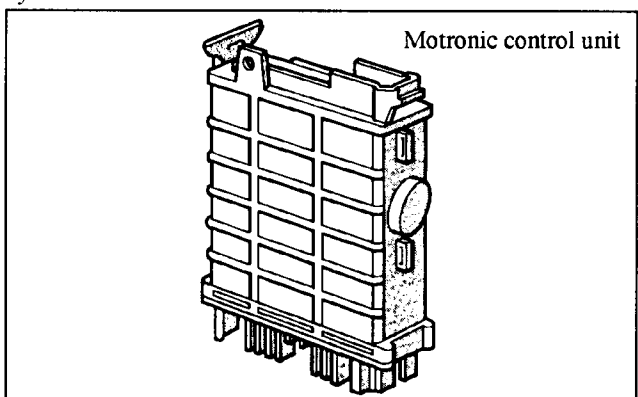


Figure 21

The engine speed signal comes from a sensor on the engine that inputs into the Engine Management System's Motronic Control Unit. This input is used to aid in determining transmission shift timing, and to determine the amount of ignition retard needed during shifting to provide smooth gear changes.

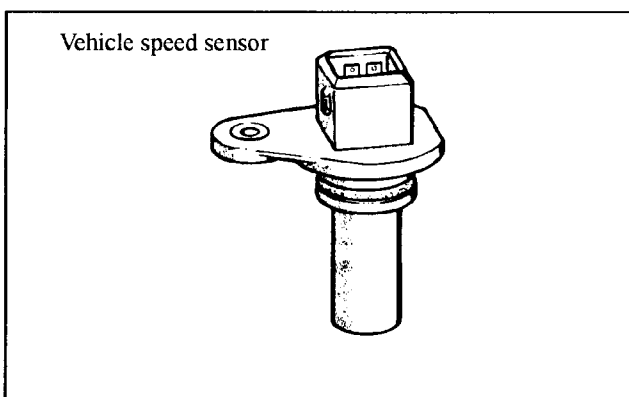


Figure 22

The transmission speed sensor is located on the back of the transmission housing. It is an A/C generator and produces a Hz signal that is proportional to road speed. The computer uses this information to determine transmission shifting schedule.

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## V.W. AUDI 096 - 097 ELECTRICAL DIAGNOSIS CONT'D

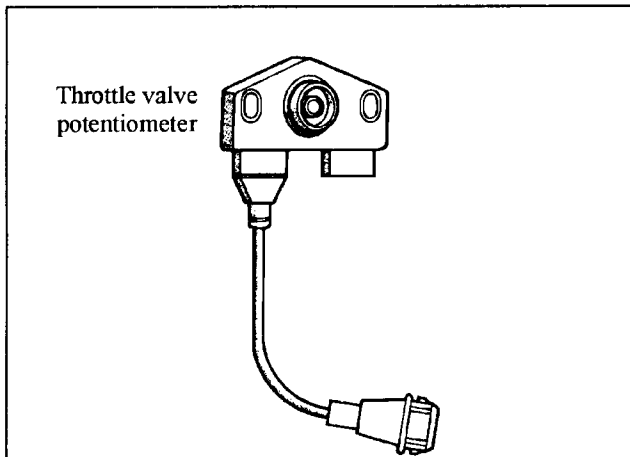


Figure 23

The Throttle Valve Potentiometer is located on the throttle body. The purpose of this switch is to give the computer information on the position of the throttle. It is also used to aid in controlling shift timing, and main line pressure. The potentiometer receives a 5 volt reference signal from the control unit. The throttle valve potentiometer then sends a voltage signal back to the computer. The voltage starts at approximately .5 volts at a closed throttle, and increases to approximately 4.5 volts at a wide open throttle.

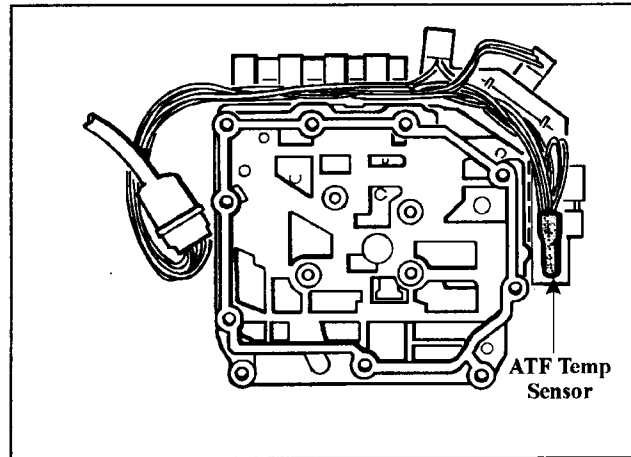


Figure 24

The ATF Temperature Sensor is located on the transmission valve body, and monitors the temperature of the transmission oil. This sensor is checked by measuring the resistance. When the oil temperature is cold, the resistance will be high, at 68 degrees F, you should see approximately 247K ohms. At 140 degrees F, you should see approximately 48,800 ohms, and at 160 degrees F you should see approximately 7,400 ohms. If the temperature should go above 300 degrees F, the computer will raise the shifting points to help reduce converter slippage and lower trans oil temperature.

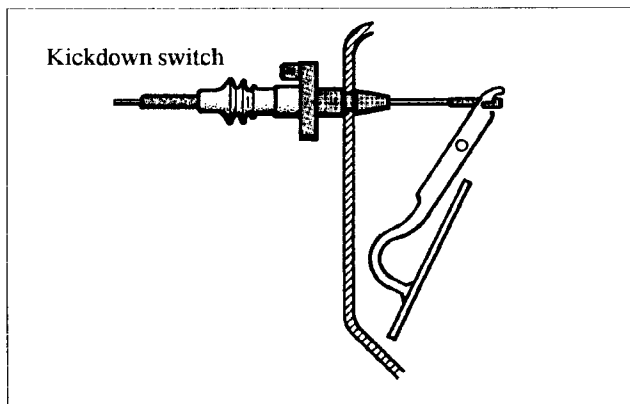


Figure 25

The kickdown switch is located either on the floor under the accelerator pedal stop, or integrated into the accelerator cable. When the switch is actuated the transmission will downshift to the next lowest gear and subsequent upshifts will take place at higher engine and vehicle speeds than normal. If the switch is stuck closed, then transmission upshifts will be late and harsh.

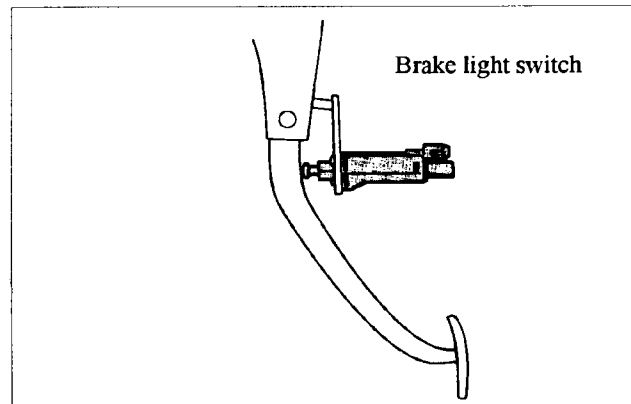


Figure 26

The brake light switch is located on the brake pedal bracket assembly. The transmission control unit receives a signal from this switch when the brake pedal is depressed. This signal is used only for internal controller calculations.

## V.W. AUDI 096 - 097

### ELECTRICAL DIAGNOSIS CONT'D

### COMPUTER PIN CHECK

| COMPUTER<br>TERMINAL<br>PINS | COMPONENTS<br>CHECKED           | TEST CONDITION<br>ADDITIONAL STEPS                                            | VOLTAGE<br>VALUES                      | RESULTS NOT WITH-IN<br>SPECIFICATIONS                         |
|------------------------------|---------------------------------|-------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------|
| PIN 19<br>PIN 1              | Control Unit<br>Power Supply    | Ignition Switch On                                                            | Battery<br>Voltage                     | Check wire between terminal<br>(1) and ground for continuity. |
| PIN 10<br>PIN 29             | Throttle Valve<br>Potentiometer | TCU reference voltage                                                         | Reference<br>5 volts                   | Replace the ECU                                               |
| PIN 9<br>PIN 29              | Throttle Valve<br>Potentiometer | Closed Throttle Voltage                                                       | .3 V min.<br>4.5 V max                 | Adjust or replace the Throttle<br>Valve Potentiometer         |
| PIN 19<br>PIN 20             | Solenoid<br>Shift Lock          | Ignition "on" Selector in "P"<br>or "N"<br>Brake Applied                      | Battery<br>voltage<br>No voltage       | Replacethe ECU<br>Check the Brake Switch                      |
| PIN 26<br>PIN 1              | Brake Light Switch              | Ignition "on" Brake "off"<br>Brake Applied                                    | No voltage<br>Battery<br>voltage       | Check the Brake Switch and the<br>wiring                      |
| PIN 34<br>PIN 1              | Multi-Function<br>Switch        | Ignition "on" Selector in "N"<br>"D" "3"                                      | 4.5 to 5 volts                         | Check the wiring or replace the<br>Multi-Function Switch      |
| PIN 15<br>PIN 1              | Multi-Function<br>Switch        | Selector in "P" "1"<br>Selector in "P" "R" "2" "1"<br>Selector in "N" "D" "3" | 0. to .8 V<br>4.5 to 5 V<br>0. to .8 V |                                                               |
| PIN 35<br>PIN 1              | Multi-Function<br>Switch        | Selector in "P" "R" "N" "D"<br>Selector in "3" "2" "1"                        | 4.5 to 5 V<br>0. to .8 V               |                                                               |
| PIN 16<br>PIN 1              | Multi-Function<br>Switch        | Selector in "P" "R" "N"<br>Selector in "D" "3" "2" "1"                        | Battery V<br>0. to .8 V                |                                                               |
| PIN 22<br>PIN 18             | Solenoid Valve EV1              | Ignition "off"                                                                | 55 - 65<br>ohms                        | Check wires for opens or shorts                               |
| PIN 22<br>PIN 1              | Solenoid Valve EV1              | ECU disconnected                                                              | Infinity                               | Replace the Valve body                                        |
| PIN 23<br>PIN 18             | Solenoid Valve EV2              | Ignition "off"                                                                | 55 - 65<br>ohms                        | Check wires for opens or shorts                               |
| PIN 23<br>PIN 1              | Solenoid Valve EV2              | ECU disconnected                                                              | Infinity                               | Replace the Valve body                                        |

Figure 27



## Technical Service Information

### V.W. AUDI 096 - 097 ELECTRICAL DIAGNOSIS CONT'D COMPUTER PIN CHECK

| COMPUTER<br>TERMINAL<br>PINS        | COMPONENTS<br>CHECKED                    | TEST CONDITION<br>ADDITIONAL STEPS                                                                   | VOLTAGE<br>VALUES                 | RESULTS NOT WITH-IN<br>SPECIFICATIONS                                           |
|-------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------|
| PIN 18<br>PIN 3<br>PIN 3<br>PIN 1   | Solenoid Valve EV3<br>Solenoid Valve EV3 | Ignition Switch "off"<br>ECU disconnected                                                            | 55 - 65<br>ohms<br>infinty        | Check wiring for opens or<br>shorts<br>Replace Valve body                       |
| PIN 2<br>PIN 18<br>PIN 2<br>PIN 1   | Solenoid Valve EV4<br>Solenoid Valve EV4 | Ignition Switch "off"<br>ECU disconnected                                                            | 55 - 65<br>ohms<br>infinity       | Check wiring for opens or<br>shorts<br>Replace Valve body                       |
| PIN 24<br>PIN 18<br>PIN 24<br>PIN 1 | Solenoid Valve EV5<br>Solenoid Valve EV5 | Ignition Switch "off"<br>ECU disconnected                                                            | 55 - 65<br>ohms<br>infinity       | Check wiring for opens or<br>shorts<br>Replace Valve body                       |
| PIN 25<br>PIN 18<br>PIN 25<br>PIN 1 | Solenoid Valve EV6<br>Solenoid Valve EV6 | Ignition Switch "off"<br>ECU disconnected                                                            | 55 - 65<br>ohms<br>infinity       | Check wiring for opens or<br>shorts<br>Replace Valve body                       |
| PIN 21<br>PIN 18<br>PIN 21<br>PIN 1 | Solenoid Valve EV7<br>Solenoid Valve EV7 | Ignition Switch "off"<br>ECU disconnected                                                            | 55 - 65<br>ohms<br>infinity       | Check wiring for opens or<br>shorts<br>Replace Valve body                       |
| PIN 19<br>PIN 20                    | Solenoid Switch Shift<br>Interlock       | Ignition Switch "off"<br>ECU disconnected                                                            | 14 - 25<br>ohms                   | Check wiring for opens or<br>shorts<br>Replace Valve body                       |
| PIN 1<br>PIN 17                     | Kickdown Switch                          | Ignition Switch "off"<br>ECU disconnected<br>accelerator pedal closed<br>accelerator pedal wide open | infinity<br>less than 1.5<br>ohms | Check wiring for opens or<br>shorts<br>Adjust or replace the Kickdown<br>Switch |
| PIN 32<br>PIN 33                    | Vehicle Speed Sensor                     | Ignition Switch "off"                                                                                | 800 - 830<br>ohms                 | Check wiring for opens or<br>shorts<br>Replace Vehicle Speed Sensor             |

Figure 28



Technical Service Information  
**V.W. AUDI 096 - 097**  
**ELECTRICAL DIAGNOSIS CONT'D**  
**COMPUTER PIN CHECK**

| COMPUTER<br>TERMINAL<br>PINS | COMPONENTS<br>CHECKED     | TEST CONDITION<br>ADDITIONAL STEPS                                                                                                                                                                 | VOLTAGE<br>VALUES                             | RESULTS NOT WITH-IN<br>SPECIFICATIONS                                    |
|------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------|
| PIN 36<br>PIN 1              | Power/Auto Switch         | Ignition Switch "off"<br>ECU disconnected<br>Power Switch "off"<br>Power Switch "on"                                                                                                               | infinity<br>less than 1.5<br>ohms             | Check wiring for opens or<br>shorts<br>Replace Power/Auto Switch         |
| PIN 30<br>PIN 18             | ATF Temperature<br>Sensor | Ignition Switch "off"<br>ECU disconnected<br>ATF Temperature approx.<br>20 degrees C (68 F)<br>ATF temperature approx.<br>60 degrees C (140 F)<br>ATF temperature approx.<br>120 degrees C (216 F) | 247K<br>ohms<br>48.8K<br>ohms<br>7400<br>ohms | Check wiring for opens or<br>shorts<br>Replace ATF temperature<br>Sensor |

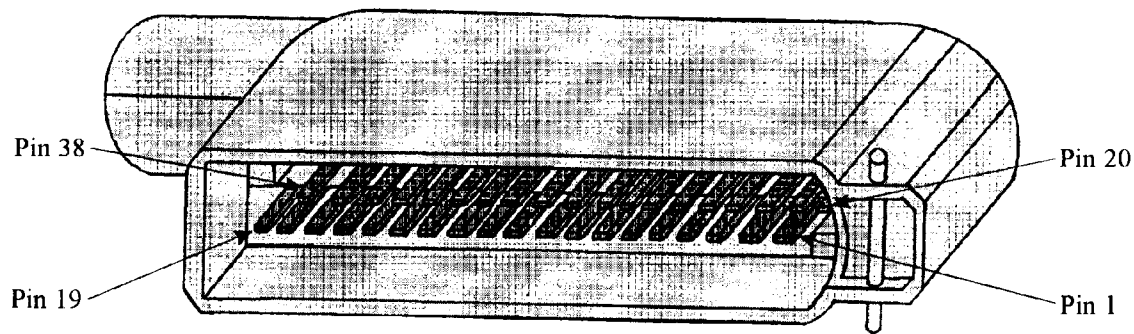
Figure 29

## V.W. AUDI 096 - 097 ELECTRICAL DIAGNOSIS CONT'D

### Typical Connector

To aid in electrical diagnosis when a computer pin check is required. Figure 30 below shows a typical transaxle connector. The pin numbers and wire colors are also provided to aid the technician. **Note:** the wires are run through the side of the connector, not the back. The connector will need to be taken apart in order to access the pin cavities. Be careful when taking the connector apart the wires may pull out of the connector easily with the connector dismantled.

|       |      |      |         |      |    |    |      |     |      |    |    |    |    |      |    |      |    |       |  |
|-------|------|------|---------|------|----|----|------|-----|------|----|----|----|----|------|----|------|----|-------|--|
| Not   |      |      | 2 wires |      |    |    | Not  |     |      |    |    |    |    |      |    |      |    |       |  |
| Bk/Gr | Used | Gy/R | Gy/B    | Bk/R | W  | Y  | Used | R/W | Gy/R | Y  | Gr | R  | Gy | Gr/W | G  | Bl/W | Bl | Br/Bk |  |
| 38    | 37   | 36   | 35      | 34   | 33 | 32 | 31   | 30  | 29   | 28 | 27 | 26 | 25 | 24   | 23 | 22   | 21 | 20    |  |



|         |      |         |      |     |      |    |      |      |      |      |      |      |      |      |     |    |   |    |  |
|---------|------|---------|------|-----|------|----|------|------|------|------|------|------|------|------|-----|----|---|----|--|
| 2 wires |      | 2 wires |      |     |      |    | Not  |      |      |      |      | Not  |      |      |     |    |   |    |  |
| Bk      | Bk/W | Gy/Bl   | Bk/W | Pur | Y/Br | Bk | Bl/R | Used | Bl/Y | Bl/Y | Br/W | Used | Gy/W | R/Bk | Y/R | Pk | Y | Br |  |
| 19      | 18   | 17      | 16   | 15  | 14   | 13 | 12   | 11   | 10   | 9    | 8    | 7    | 6    | 5    | 4   | 3  | 2 | 1  |  |

Figure 30

A continuity test chart is provided in Figure 31 below to aid the technician in diagnosing a faulty Multi-function switch. The pin arrangement as well as a view of the switch is shown in Figure 32.

| terminal<br>lever<br>position | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------------------------------|---|---|---|---|---|---|---|
| Park                          | ● |   | ● | ● | ● |   | ● |
| Reverse                       |   |   | ● | ● | ● |   | ● |
| Neutral                       |   | ● | ● | ● | ● |   | ● |
| Overdrive                     |   | ● | ● | ● |   |   |   |
| Drive                         |   | ● | ● | ● |   | ● |   |
| Second                        |   |   | ● | ● |   | ● |   |
| Manual low                    | ● |   | ● | ● |   | ● |   |

Figure 31

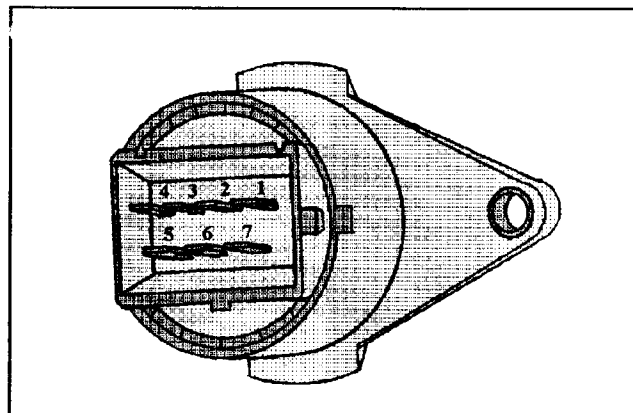


Figure 32

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. 096

### RETRIEVING DIAGNOSTIC TROUBLE CODES WITHOUT THE VAG 1551 SCAN TOOL

Starting with the vehicle production date of 8/94, Jetta III, Cabrio, GTI, and Golf III vehicles will be equipped with an OBD 1 adapter for use with the **On Board Diagnostic (OBD) system**. This adapter is used to check Diagnostic Trouble Codes when the VAG 1551 scan tool is not available. Codes that are stored in memory are displayed as blink codes at the **Check Trans (MIL)** on the dash in the vehicle. The blink codes are activated either by inserting the **OBD 1 adapter**, (see Figure 33) or by placing a jumper wire between terminals 4 and 15 on the **Data Link Connector (DLC)** (See Figure 34). The DLC is located to the right of the ash tray. In order to access the connector, first remove the ash tray and slide the panel next to it to the left, you should now see the OBD 1 connector. If the ECM detects a malfunction, that information will be stored in permanent memory and will be displayed at the MIL. The MIL is illuminated when the ignition is switched on and will stay on until the engine is started. Any stored malfunctions will be represented by a four digit blink code when the display is activated. To initiate the sequence, turn the ignition to the "ON" position. Place a jumper wire or the provided adapter between terminals 4 and 15 of the OBD 1 connector for 2.5 seconds, then remove. The display sequence begins with the MIL blinking once. Approximately one second later the blink code sequence will begin. When the light starts blinking, count the number of flashes. You will see a four digit trouble code. There will be a brief pause between each of the four digit trouble codes. When all codes have been displayed, the light will discontinue blinking. **Note:** A 4 - 4 - 4 - 4 flash sequence indicates no codes stored. To clear any stored trouble codes. Connect the OBD 1 adapter to the DLC, switch the ignition on, leaving the adapter connected for at least 5 seconds and remove. Reconnect the OBD 1 adapter for 2.5 seconds and remove again. Wait for the trouble code sequence to run until the light quits blinking. Connect the OBD 1 adapter again for 2.5 seconds. Trouble codes should now be erased from the computer's memory.

#### Location of the OBD1 adapter

In vehicles that are not equipped with Anti-Lock Brakes, (**non ABS**) the OBD1 adapter is located underneath the rear seat. The OBD1 adapter is secured by a plastic tie strap (See Figure 35). In vehicles that **ARE** equipped with **Anti-Lock Brakes (ABS)** the OBD1 adapter is located under the ABS coaxial cable near the ABS control module (See Figure 36).

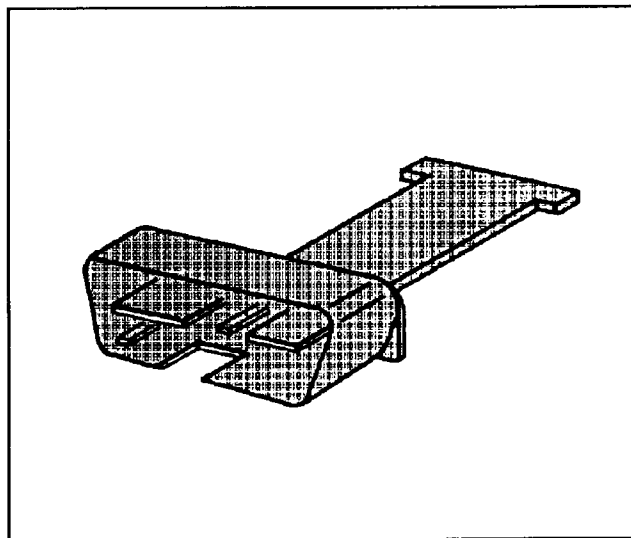


Figure 33

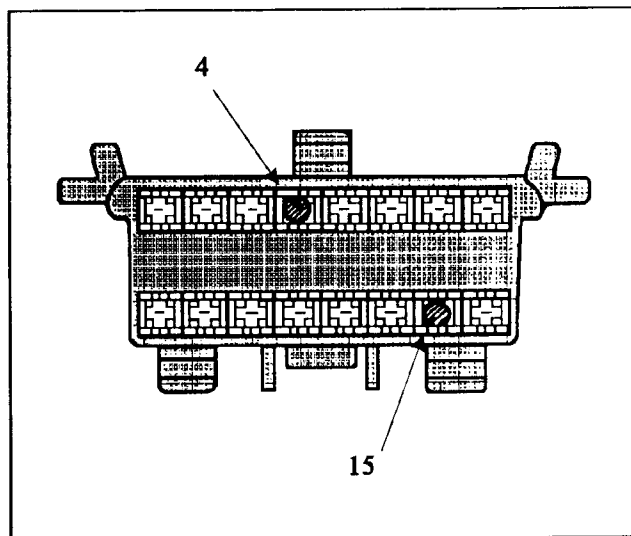


Figure 34

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. 096 RETRIEVING DIAGNOSTIC TROUBLE CODES WITHOUT THE VAG 1551 SCAN TOOL CONT.

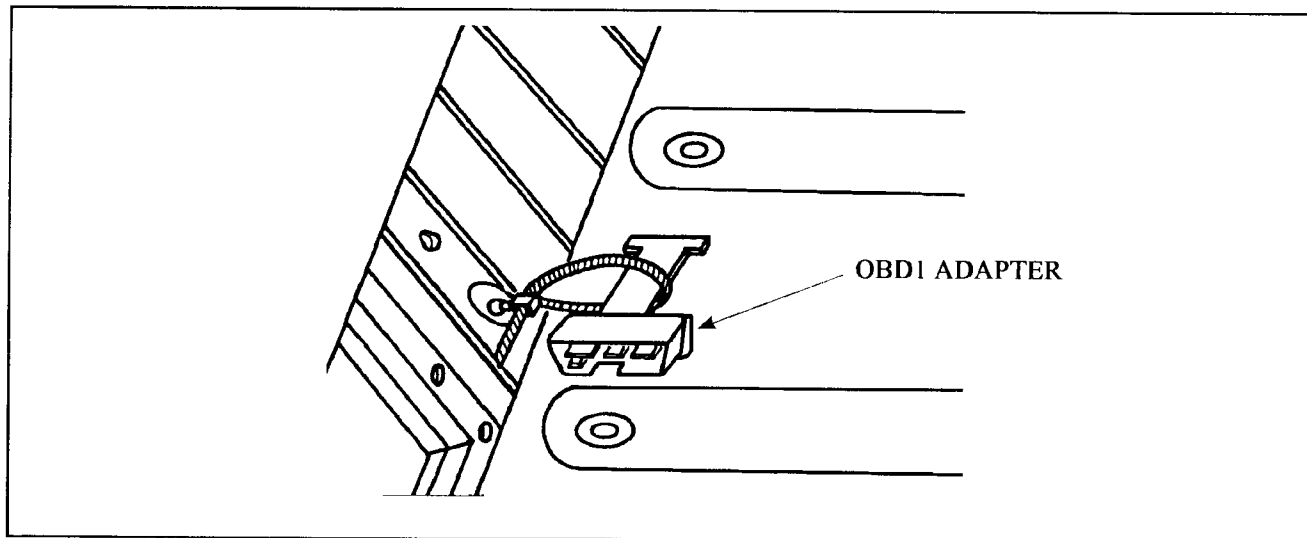


Figure 35

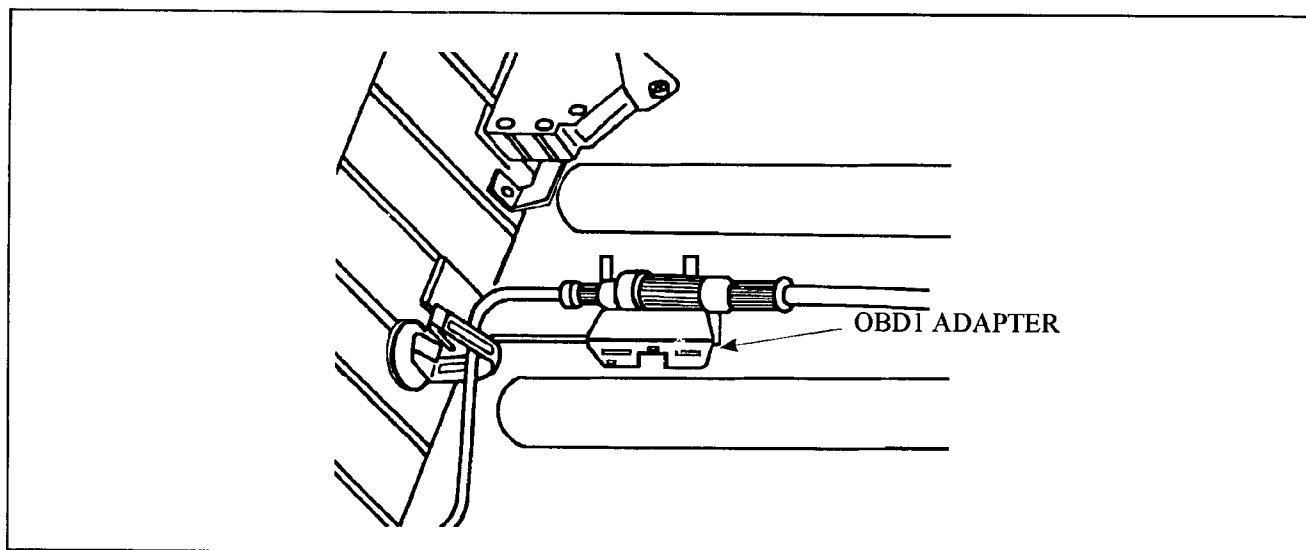


Figure 36

AUTOMATIC TRANSMISSION SERVICE GROUP

## 095-096 GEAR TRAIN CROSS SECTIONAL VIEW

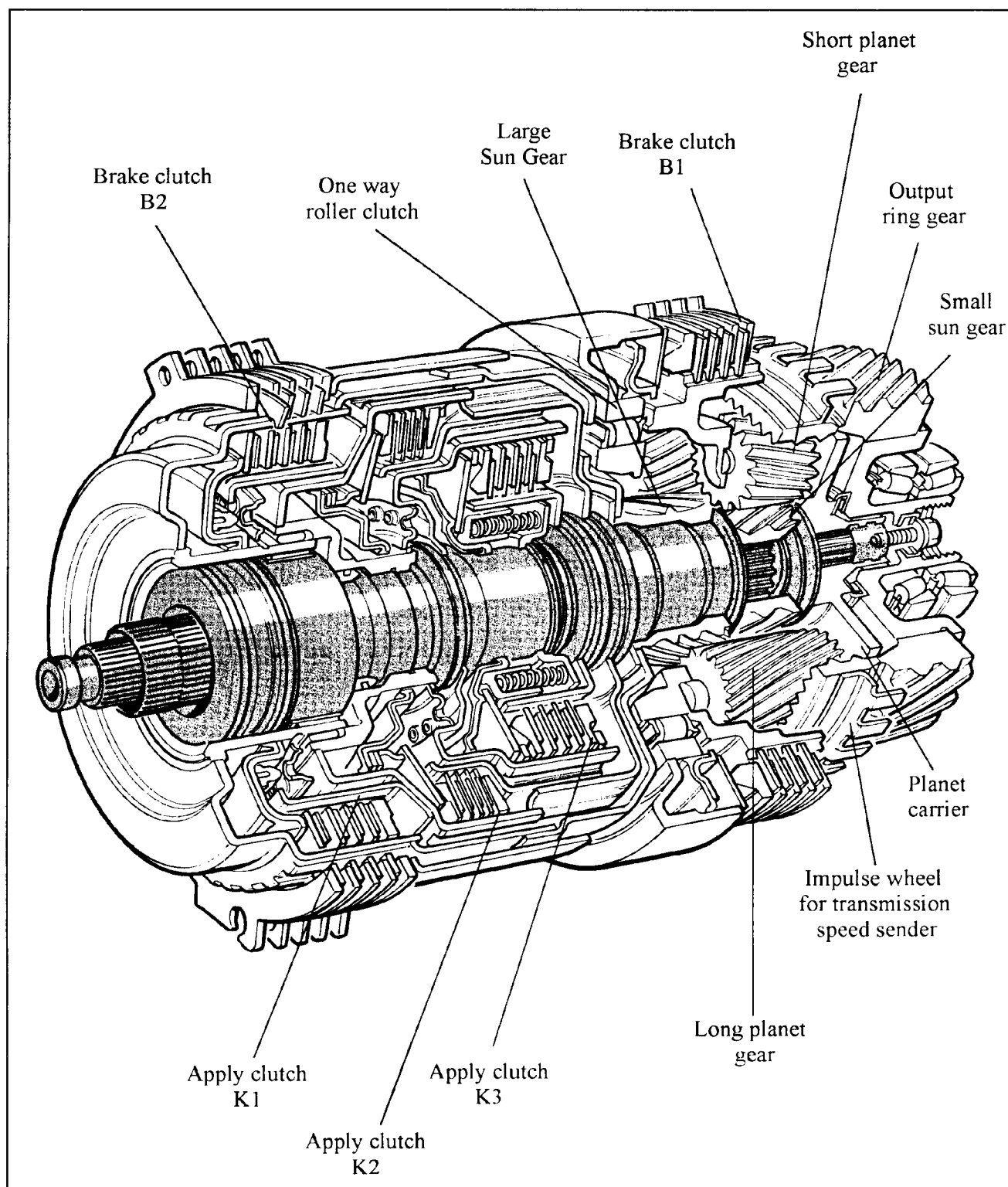


Figure 37

AUTOMATIC TRANSMISSION SERVICE GROUP

# **AUDI MODEL 097** **CROSS SECTIONAL VIEW**

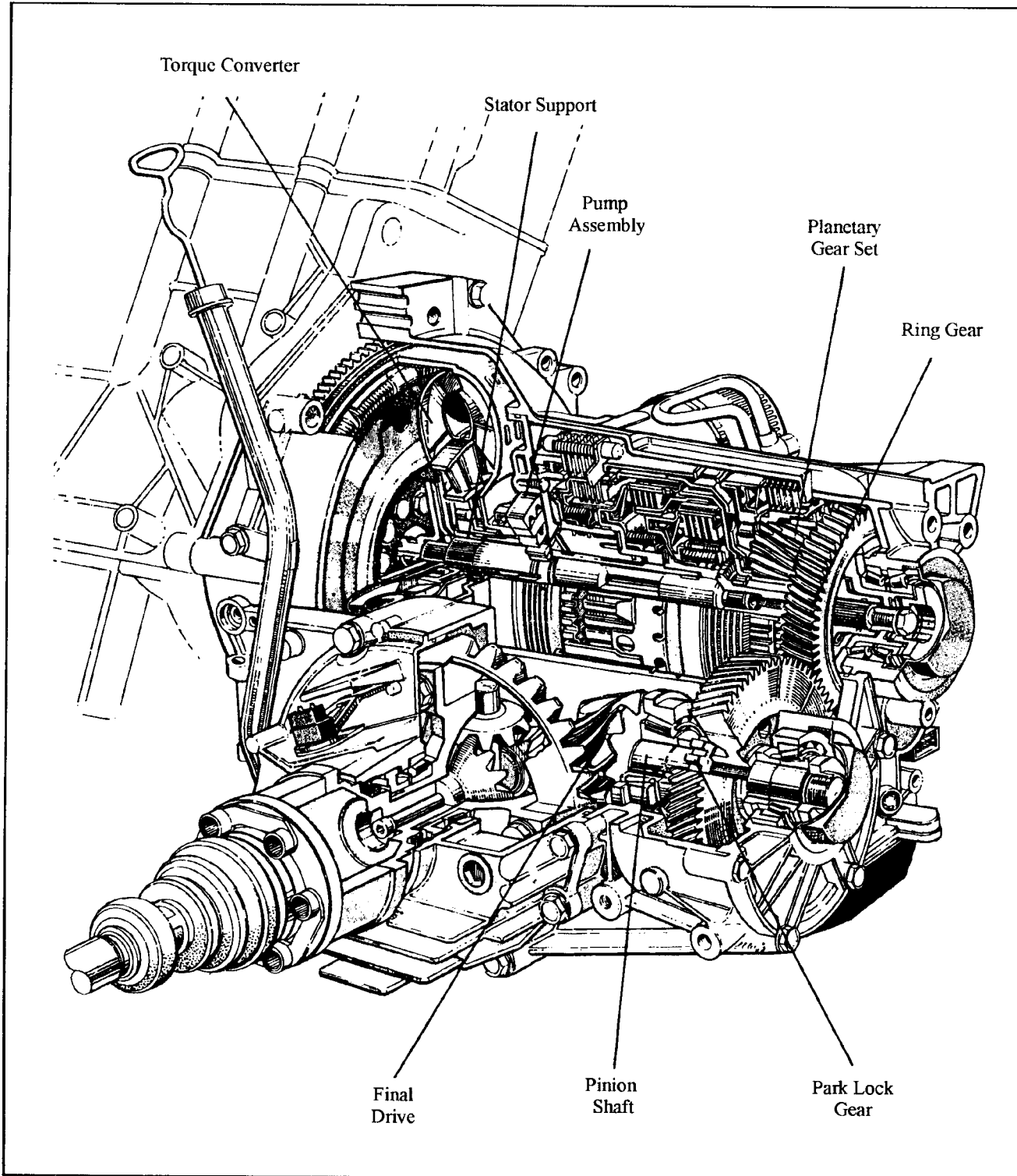


Figure 38

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW (D) POSITION 1ST GEAR

### Selector lever position "D", 1st gear.

With the selector lever placed into the "D" position, the manual valve directs line pressure to the K1 and K2 clutches. If these two clutches are applied at the same time third gear will result. Solenoid EV4 in the valve body is energized by the computer and exhausts pressure from the K2 clutch circuit which allows only the K1 clutch to be applied. With the K1 clutch applied, power flows from the impeller in the converter to the turbine shaft through the K1 clutch which drives the small sun gear driveshaft in a clockwise direction. The small sun gear driveshaft is splined into the small sun gear which will also be driven in a clockwise direction. The small sun gear will drive the shorter pinion gears of the planetary carrier in a clockwise direction. The planetary carrier is kept from turning in a counter clockwise direction by the one way roller clutch. This holds the planetary carrier stationary and forces the short and tall planetary pinion gears to rotate in a clockwise direction. When this occurs, the tall planetary pinions will drive the rear ring gear in a clockwise direction. The rear ring gear will turn the transfer drive gear in a clockwise direction which turns the driven gear counter clockwise. Since the driven gear is splined to the pinion gear shaft, the pinion gear will also rotate counter clockwise. This action will cause the differential ring gear to rotate in a clockwise direction and thereby provide power to the drive axles giving a forward movement at a ratio of, 2.714 to 1.

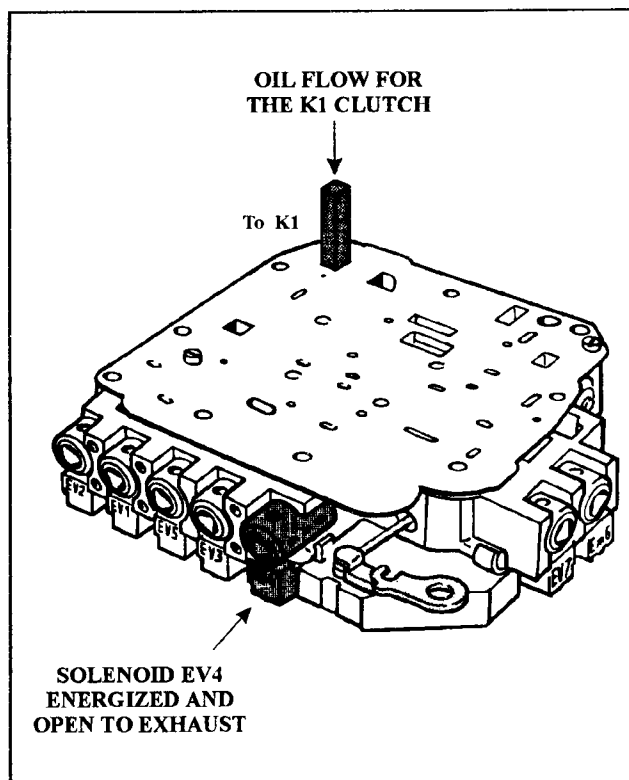
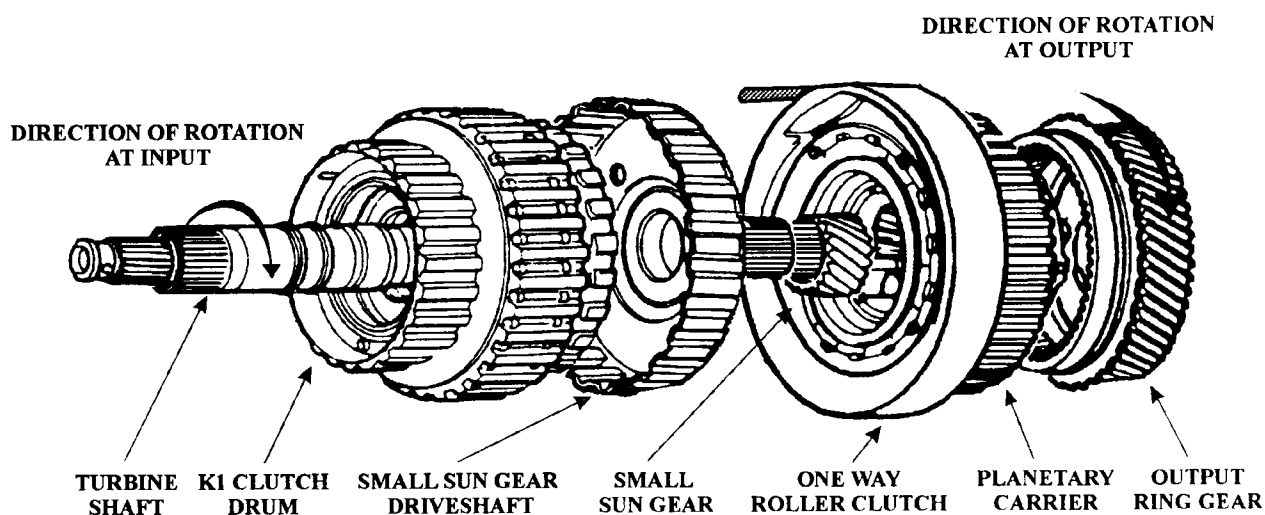


Figure 39



AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW (D) POSITION 2ND GEAR

### Selector lever position "D", 2nd gear.

With the selector lever placed in the "D" position, the manual valve directs line pressure to the K1 and K2 clutches. Solenoid EV4 in the valve body is energized by the computer and exhausts the pressure from the K2 clutch circuit which allows only clutch K1 to be applied. When the computer commands second gear, solenoid EV2 is energized and applies the second and fourth gear brake (B2). Power flows from the impeller in the converter to the turbine shaft through the K1 clutch, which is rotating in a clock wise direction. The B2 Brake holds the K2 clutch drum from turning which holds the large sun gear drive shell from turning. The K1 Clutch drives the small sun gear drive shaft in a clock wise direction. The small sun gear drive shaft is splined into the small sun gear, rotating it in a clock wise direction. The small sun gear rotates the short planetary pinions in a counter clock wise direction. This will drive the tall planetary pinions in a clock wise direction. The tall planetary pinions will walk around the drive shell sun gear and rotate the output ring gear in a clock wise direction. The output ring gear will rotate the transfer drive gear in a clock wise direction. The transfer drive gear will rotate the transfer driven gear in a counter clock wise direction. Since the transfer driven gear is splined to the pinion gear shaft, the pinion gear will also rotate in a counter clock wise direction. This action will cause the differential ring gear to rotate in a clock wise direction and thereby provide power to the drive axles giving a forward movement at a ratio of 1.551 to 1.

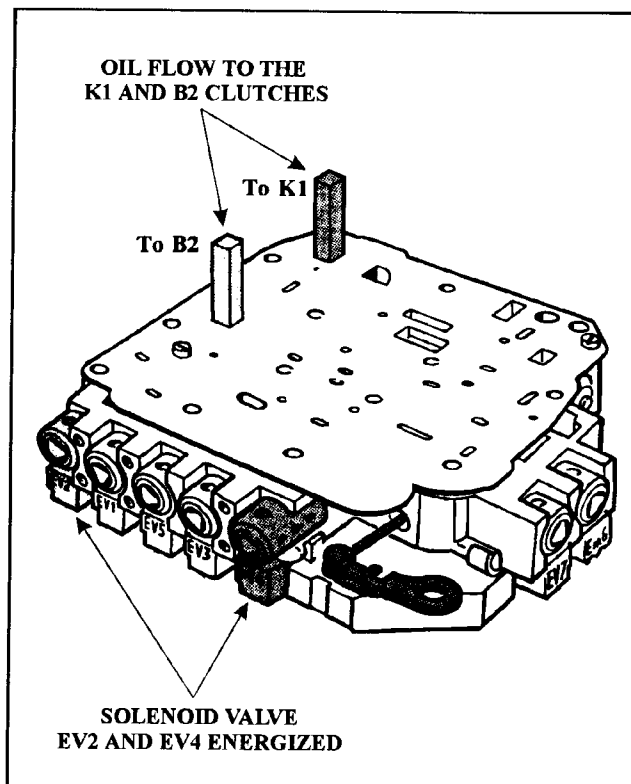
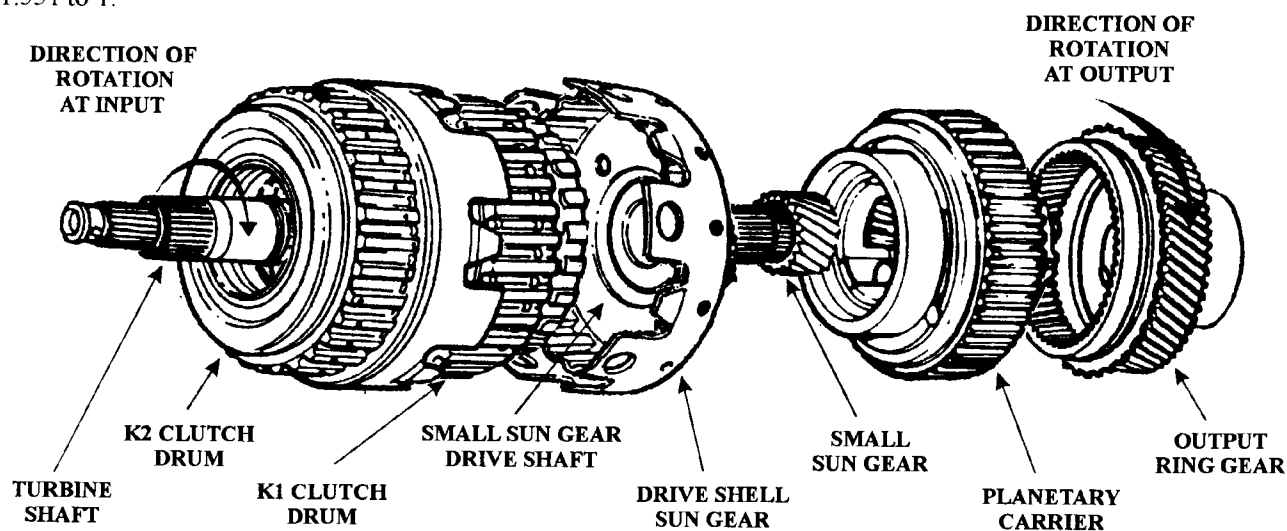


Figure 40



AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW (D) POSITION 3RD GEAR HYDRAULIC

### Selector lever position "D", 3rd gear (hydraulic)

With the selector lever placed in the "D" position, the manual valve directs line pressure to the K1 and the K2 clutches. Third gear, or (direct drive) can be achieved either hydraulically or mechanically. Power flows from the impeller in the converter to the turbine shaft through the K1 clutch which drives the small sun gear drive shaft in a clock wise direction. The small sun gear is splined directly to the small sun gear drive shaft, and drives the small sun gear in a clock wise direction. The K2 clutch is applied and rotates the drive shell sun gear in a clock wise direction. With the large sun gear and the small sun gear both rotating in a clock wise direction at the same speed, it locks the planetary gear set as a whole along with the output ring gear in a clock wise direction. The output ring gear rotates the transfer drive gear in a clock wise direction. The transfer drive gear rotates the transfer driven gear in a counter clock wise direction. Since the driven gear is splined to the pinion gear shaft, the pinion gear will also rotate counter clock wise. This action will cause the differential ring gear to rotate in a clock wise direction and thereby provide power to the drive axles giving a forward movement in a direct drive which is a ratio of 1 to 1.

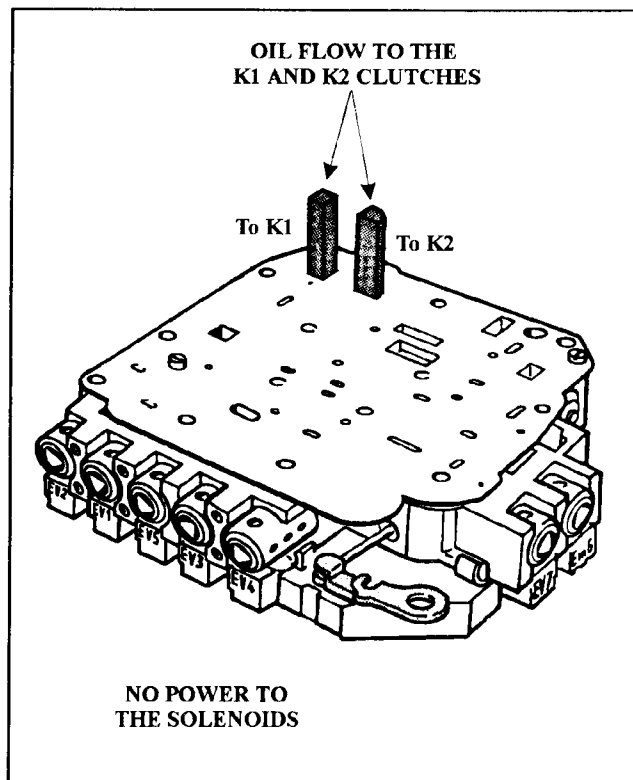
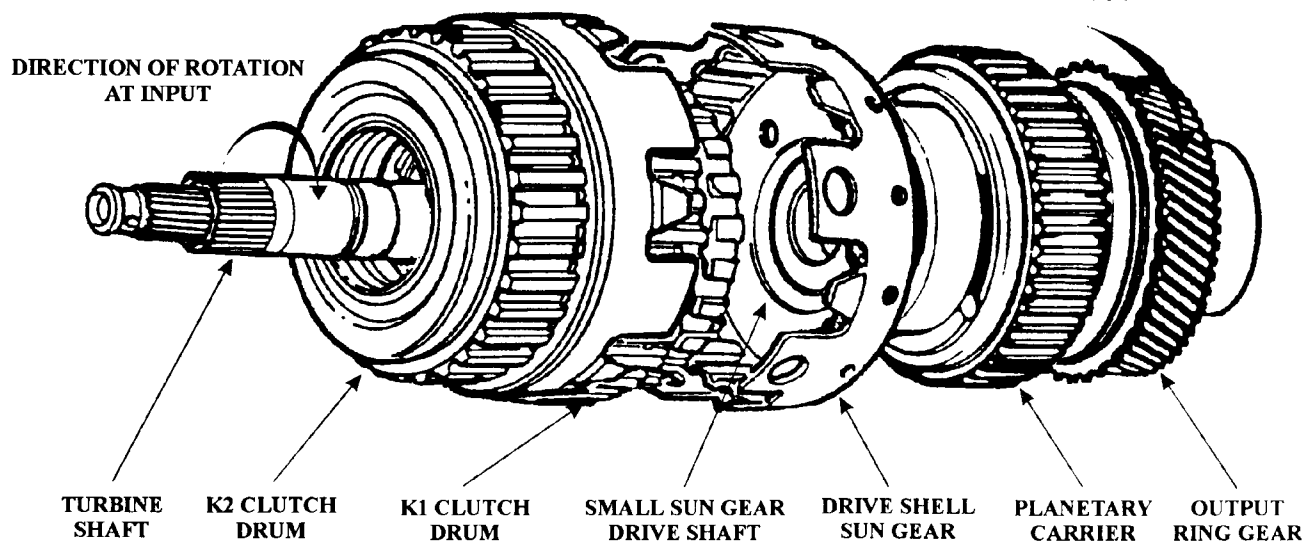


Figure 41

### DIRECTION OF ROTATION AT OUTPUT



AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW (D) POSITION 3RD GEAR MECHANICAL

**Selector lever position "D", 3rd gear (mechanical)**  
With the selector lever in the "D" position, the manual valve directs line pressure to the K1 clutch and the K2 clutch. With both of these clutches applied, we have a hydraulic third gear which is shown on the previous page. When engine speed and load reach a certain point determined by the computer, a signal is sent to solenoid EV3 and engages the K3 clutch. With the K3 clutch applied, power is transmitted from the damper plate in the converter to the K3 clutch drum shaft. The K3 clutch drum is now mechanically connected to the crank shaft. The hub in the K3 clutch drum is splined directly into the planet carrier. The K3 hub shaft, small sun gear, large sun gear, and planetary carrier are all rotating in a clock wise direction. With this gear set locked, the tall planetary pinion gears drive the output ring gear in a clock wise direction. The output ring gear drives the transfer drive gear in a clock wise direction. The transfer drive gear turns the transfer driven gear in a counter clock wise direction. Since the driven gear is splined to the pinion gear shaft, the pinion gear will also rotate counter clock wise. This action will cause the differential ring gear to rotate in a clock wise direction and thereby provide power to the drive axles giving a forward movement in a mechanical direct drive at a ratio of 1 to 1.

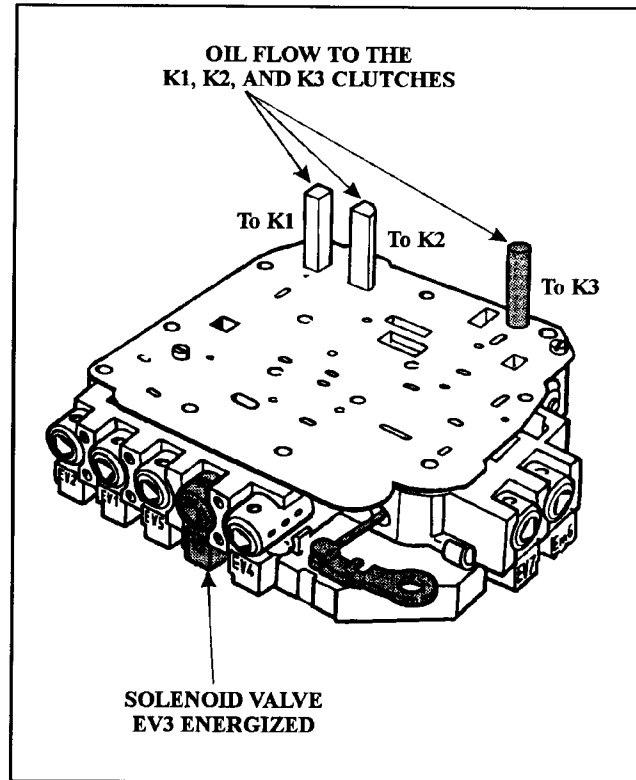
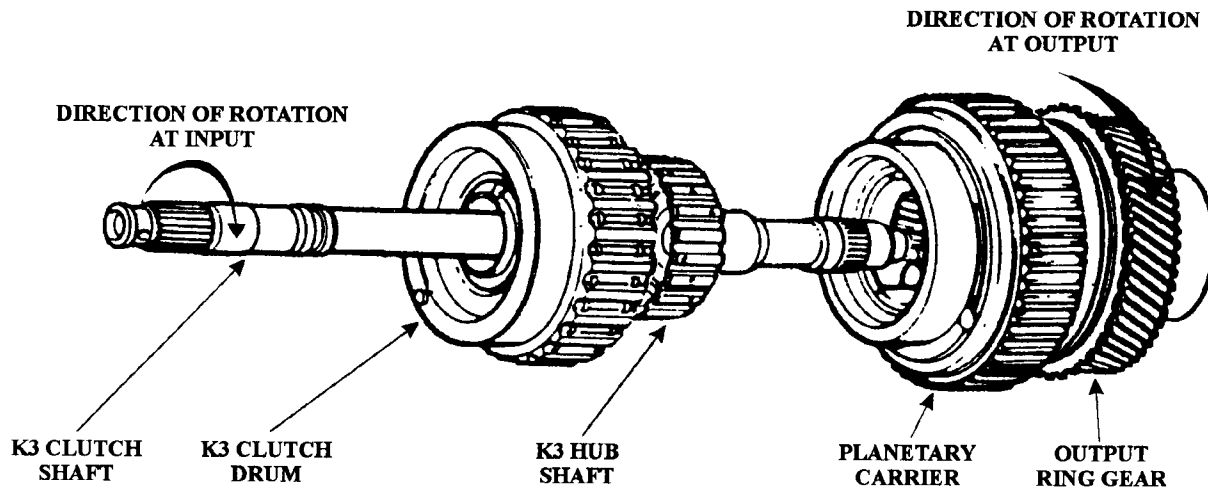


Figure 42



AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW (D) POSTITION 4TH GEAR

### Selector lever position "D", 4th gear.

With the selector lever placed into the "D" position, the manual valve directs line pressure to the K1 and K2 clutches. If these two clutches are applied at the same time third gear will result. The computer energizes solenoids EV1 and EV4 in order to exhaust line pressure from the K1 and K2 clutches. Solenoid EV2 and EV3 are also energized by the computer and direct line pressure to the B2 brake and K3 clutch. Power flows from the converter damper plate to the planetary carrier drive shaft via the K3 clutch. The planetary carrier drive shaft rotates the planetary carrier in a clock wise direction. The B2 brake is applied and holds the K2 clutch drum and sun gear drive shell stationary. With the planetary carrier rotating clock wise and the drive shell stationary, the long planetary pinion gears rotate clock wise around the large sun gear. The action of the long planetary pinion gears causes the short planetary pinion gears to rotate in a counter clock wise direction. The long planetary pinion gears rotate the output ring gear in a clock wise direction. The output ring gear rotates the transfer drive gear in a clock wise direction. The transfer drive gear rotates the transfer driven gear in a counter clock wise direction. Since the transfer driven gear is splined to the pinion gear shaft, the pinion gear also rotates in a counter clock wise direction. This action will cause the differential ring gear to rotate in a clock wise direction and thereby provide power to the drive axles giving a forward movement at a ratio of .679 to 1

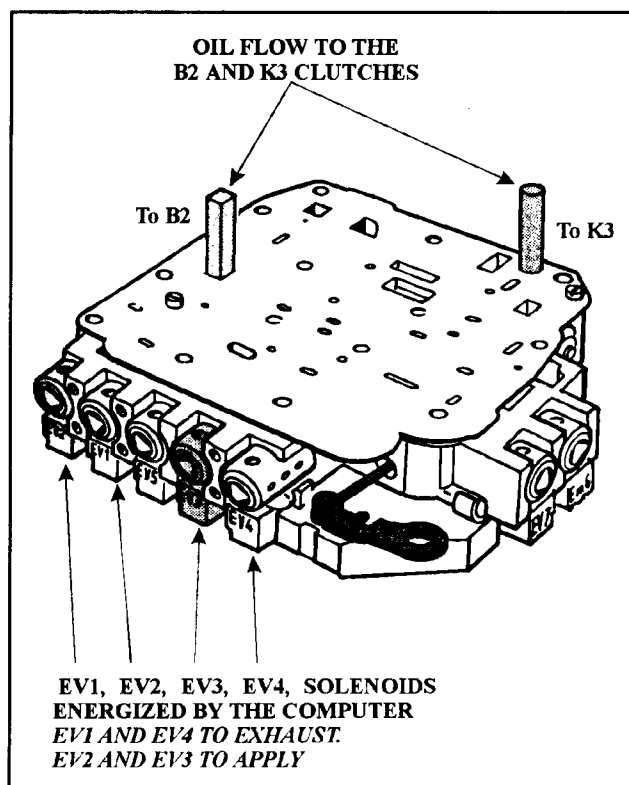
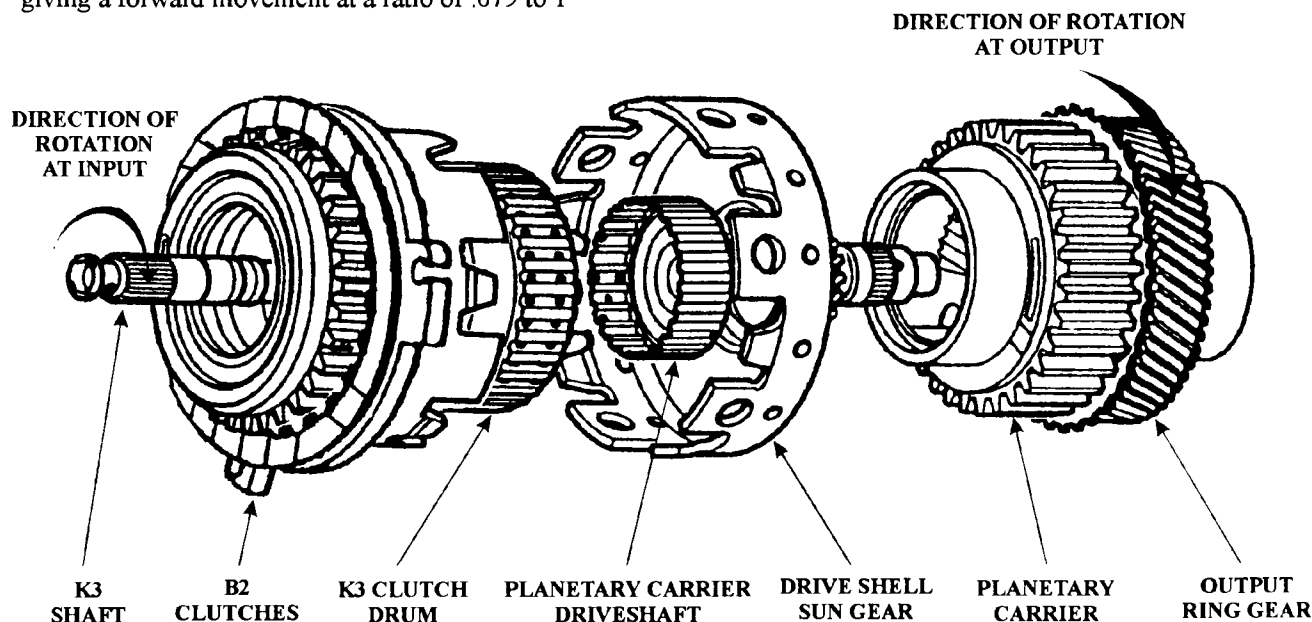


Figure 43



AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW MANUAL LOW 1ST GEAR

### Selector lever position "1" Manual Low

With the selector lever in the Manual Low position, the manual valve directs line pressure to the K1 clutches and the B1 brake. Power flows from the turbine shaft via the K1 clutch. The K1 clutch rotates the large drive shaft in a clock wise direction. The large drive shaft is splined to the small sun gear and rotates the small sun gear in a clock wise direction. The small sun gear rotates the small planetary pinion gears in a counter clock wise direction. The small planetary pinion gears rotate the large planetary pinion gears in a clock wise direction. The planetary carrier is held stationary in both directions by the holding power of the B1 brake. (Because the planetary carrier is held in both directions, engine braking is possible during deceleration). Since the planetary carrier is held stationary, the long planetary pinion gears rotate the output ring gear in a clock wise direction. The output ring gear rotates the transfer drive gear in a clock wise direction. The transfer drive gear rotates the transfer driven gear in a counter clock wise direction. Since the transfer driven gear is splined directly to the pinion gear shaft, the pinion gear also rotates in a counter clock wise direction. This action will cause the differential ring gear to rotate in a clock wise direction and thereby provide power to the drive axles giving a forward movement at a ratio of, 2.714 to 1

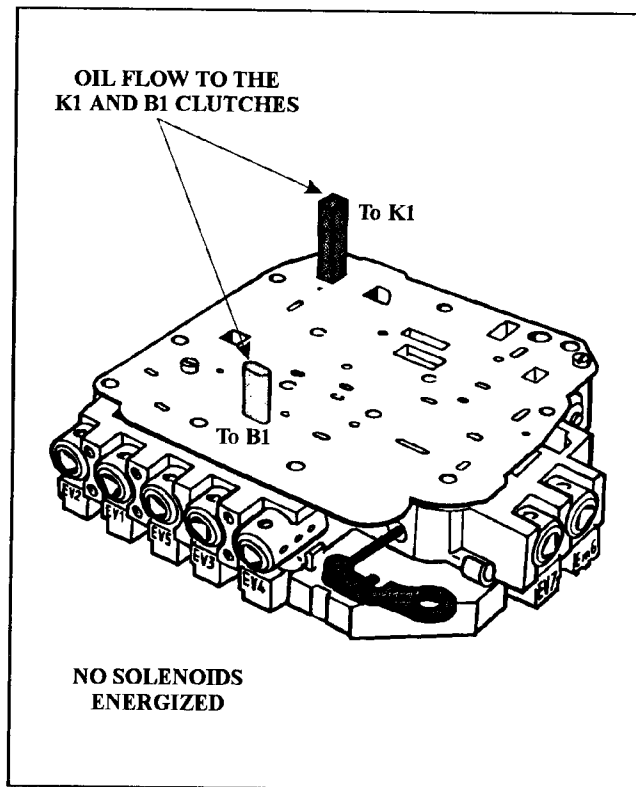
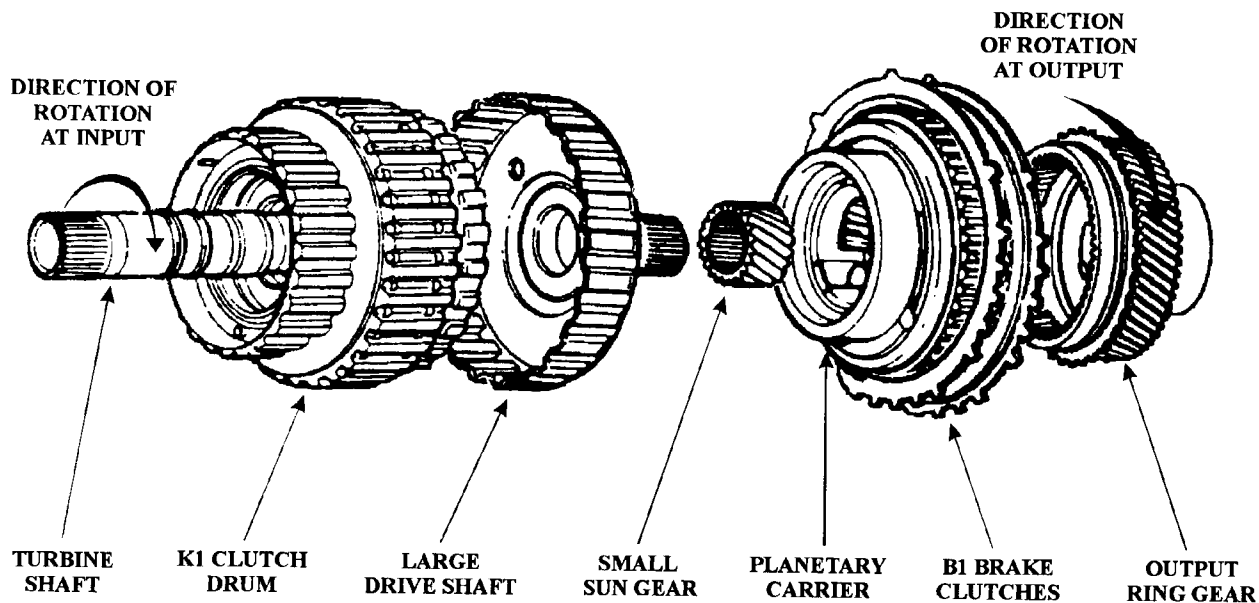


Figure 44



AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE POWER FLOW REVERSE GEAR

### Selector lever position "R" Reverse

With the selector lever placed into the "R" position, the manual valve directs line pressure to the K2 clutch and the B1 brake. Power flows from the turbine shaft via the K2 clutch. The K2 clutch rotates the sun gear drive shell in a clockwise direction. The sun gear drive shell rotates the long pinions of the planetary carrier in a counter clock wise direction. The planetary carrier is being held stationary by the holding power of the B1 brake. This causes the long planetary pinion gears to rotate the output ring gear in a counter clock wise direction. The output ring gear rotates the transfer drive gear in a counter clock wise direction. The transfer drive gear rotates the transfer driven gear in a clock wise direction. Since the transfer driven gear is splined to the pinion gear shaft, the pinion gear also rotates in a clock wise direction. This action will cause the differential ring gear to rotate in a counter clock wise direction and thereby provide power to the drive axles giving a movement in a reverse direction at a ratio of 2.111 to 1

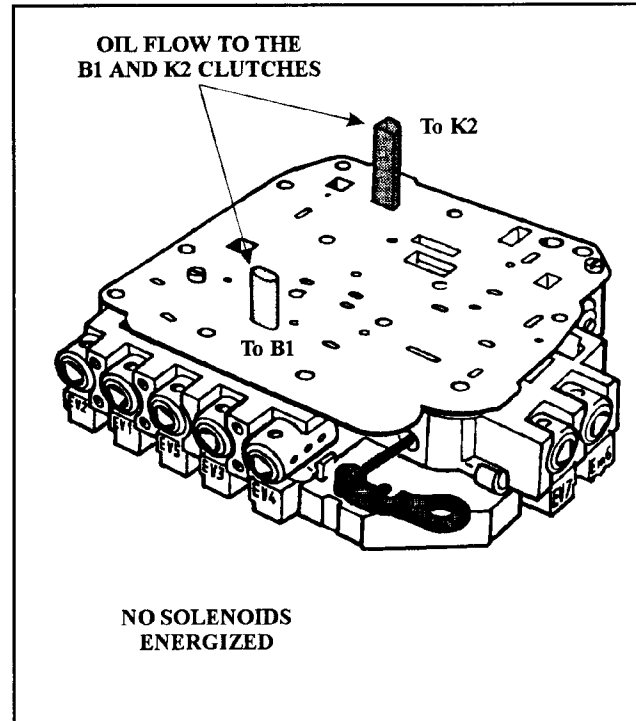
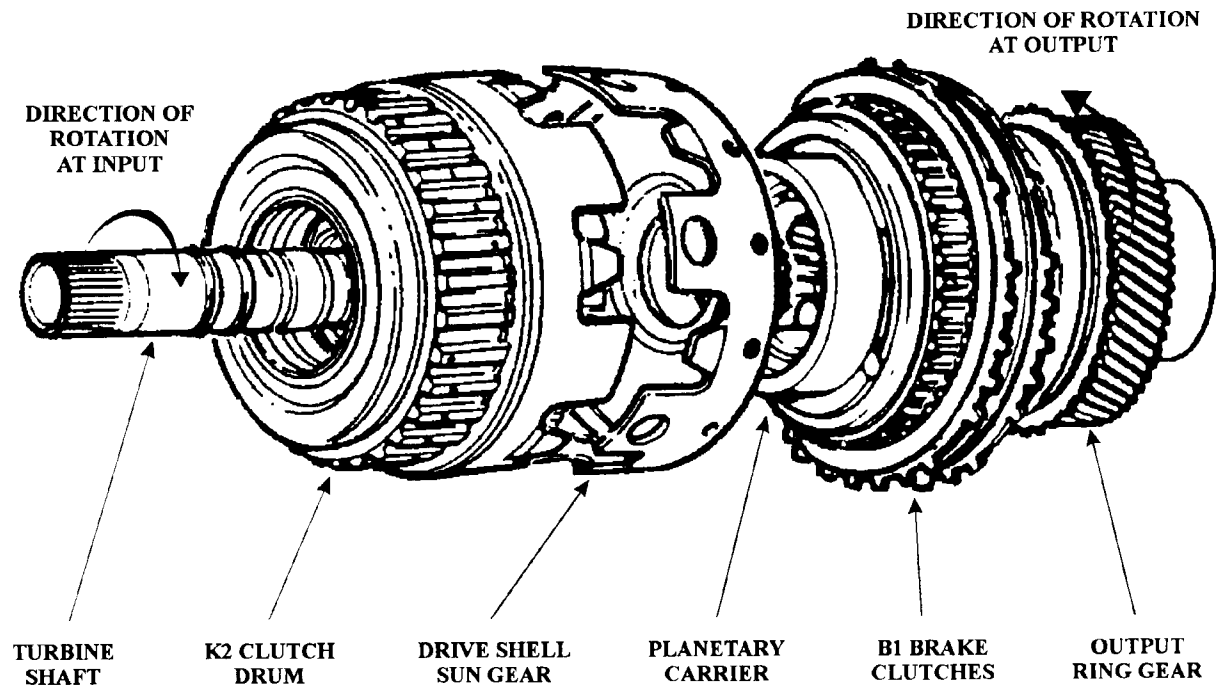


Figure 45



AUTOMATIC TRANSMISSION SERVICE GROUP

095 - 096  
DIS-ASSEMBLED VIEW

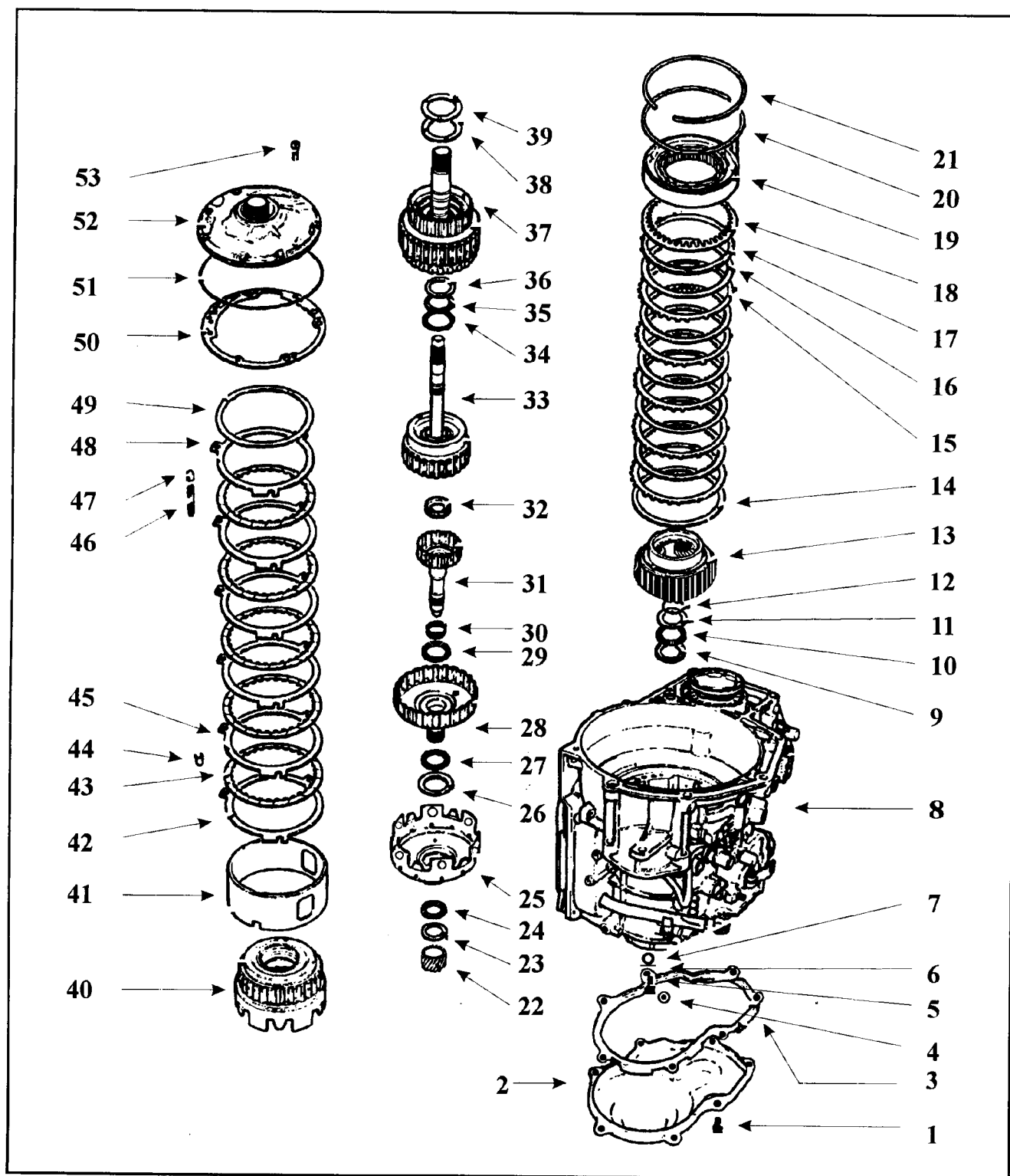


Figure 46

AUTOMATIC TRANSMISSION SERVICE GROUP

095 - 096

# **DIS-ASSEMBLED VIEW** **DESCRIPTION OF COMPONENTS**

1. Bolt, Transfer Gear Cover 8Nm (70 in. lb.)
2. Transfer Gear Cover.
3. Gasket, Transfer Gear.
4. Spacer Bushing.
5. Bolt, Transfer Gear Shaft 30 Nm (22ft. lb.)
6. Washer.
7. Shim for Planet Carrier.
8. Transmission Housing.
9. Washer, Thrust.
10. Axial needle bearing.
11. Washer, Thrust.
12. O-ring.
13. Planet carrier
14. Wave plate
15. Clutch B1, steel plate
16. Clutch B1, friction
17. Pressure plate B1
18. Return spring, piston B1
19. One-way clutch, B1 piston housing
20. Snap ring
21. Snap ring
22. Small sun gear.
23. Washer
24. Axial needle bearing
25. Large sun gear
26. Washer
27. Axial needle bearing

Figure 47

28. Large drive shaft
29. Axial needle bearing
30. Needle bearing
31. Small drive shaft
32. Axial needle bearing
33. 3rd 4th clutch K3 drum
34. Washer
35. Axial needle bearing
36. Washer
37. 1st to 3rd clutch K1 drum
38. Adjusting shim
39. Adjusting shim
40. Reverse clutch drum K2
41. Supporting tube.
42. Clutch B2, steel 3mm
43. Clutch B2, friction
44. Spring cap 3 required
45. Clutch B2, steel 2mm
46. Spring 3 required
47. Spring cap 3 required
48. Clutch B2 pressure plate 4mm or use two 2mm steel plates as in #44
49. Spring plate, cushion
50. Gasket, pump
51. O-ring, pump
52. Pump assembly
53. Bolt, pump to case. 8nm (70 in lb ) Then tighten an extra 90 degrees (1/4 turn)

Figure 48

1. Attach the transmission to a transmission repair stand or a suitable work area, assuring that the transmission will not roll over and damage any of the electrical connections or other components (See Figure 49).

2. Remove the four 13mm bolts for the transmission pan and remove the pan, gasket and the gasket spacers and set them aside (See Figure 50).

3. Remove the two 10mm bolts that hold the filter to the valvebody then set the bolts and filter aside (See Figure 50).

4. There are fourteen #30 Torx head bolts that hold the valve body to the case. There is one 10mm bolt that holds the wire harness at the pass-through connector to the case. There is one 10mm bolt that holds a bracket for the wire harness on the outside of the transmission. Remove these bolts and set them aside. Carefully lift the valve body away from the transmission while sliding the harness through the case. Be careful not to damage the harness connector (See Figure 50).

5. Remove the B1 clutch feed plug in the case and inspect the plug for cracks then remove the two o-rings from the plug and discard them (See Figure 51).

6. Remove the seven #30 Torx head bolts that hold the pump assembly in the case then set the bolts aside (See Figure 52).

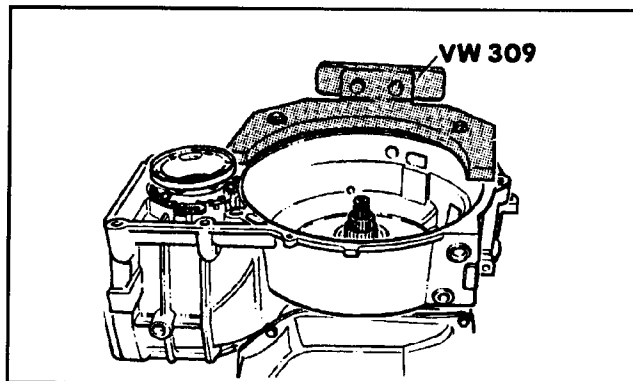


Figure 49

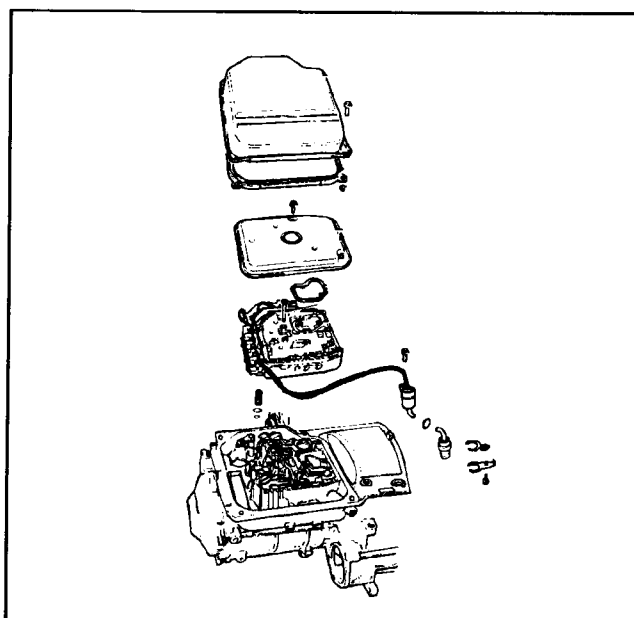


Figure 50

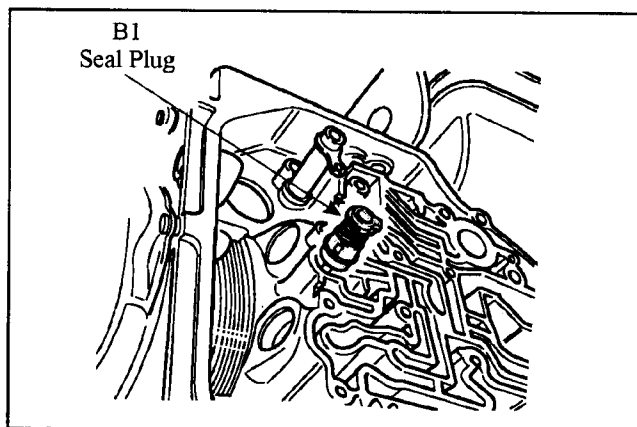


Figure 51

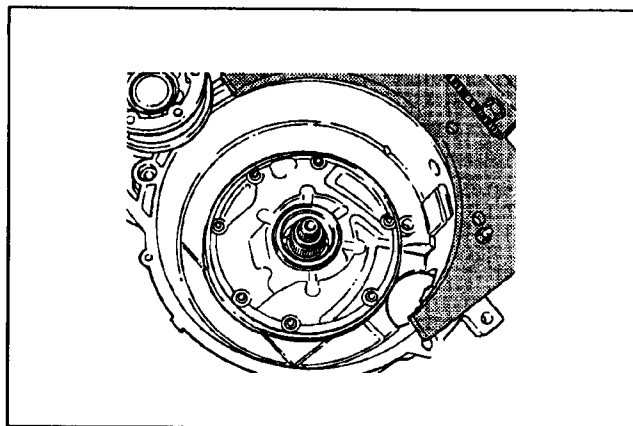


Figure 52

## AUTOMATIC TRANSMISSION SERVICE GROUP

7. After removing the pump bolts from the case, use two 8mm thread bolts and screw them into the holes marked by "A" on both sides of the pump assembly as shown in (Figure 53). Install the bolts into the pump evenly as shown in Figure 53. Using these bolts, lift the pump away from the transmission case, and set the pump aside for inspection and cleaning (See figure 54).

**Caution:** Do not use an impact wrench or other air powered nut driver to remove the pump assembly from the case.

8. The B2 clutch assembly has a unique stack up as shown in Figure 54 and 55. Lift and remove the B2 clutch wave spring and the two top steel plates from the case, then remove the three spring caps and load springs. Remove the rest of the B2 friction plates and steel plates along with the last three spring caps. Do not lose these caps or springs. You should have a total of six spring caps and three springs.

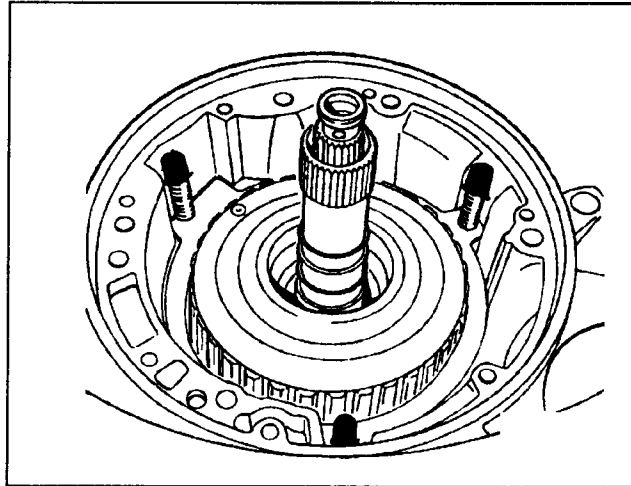


Figure 55

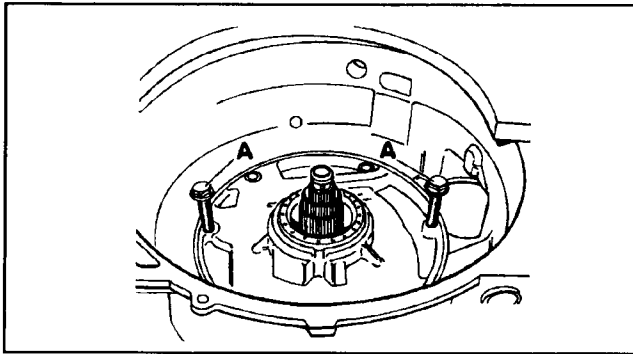


Figure 53

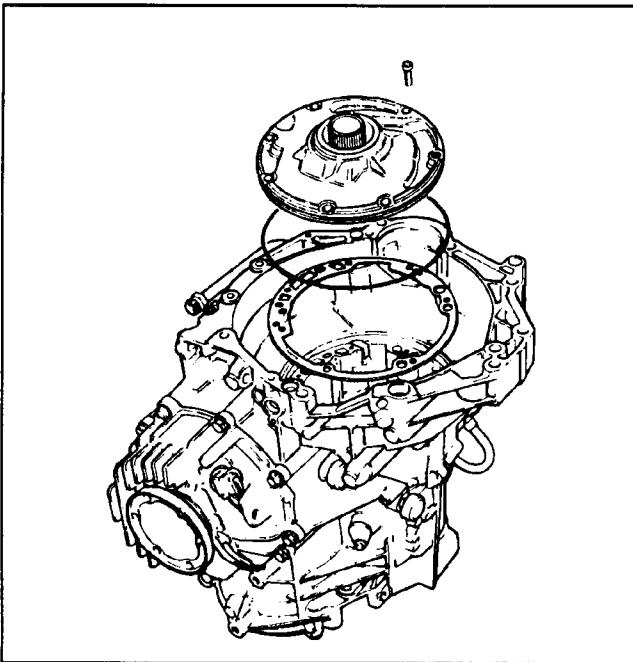


Figure 54

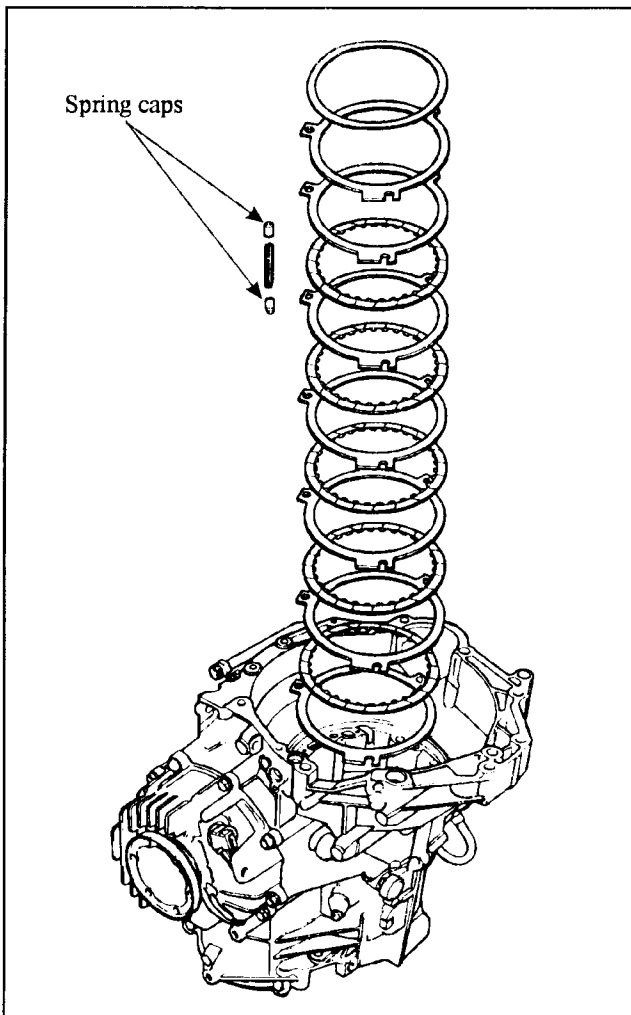


Figure 56

## AUTOMATIC TRANSMISSION SERVICE GROUP

9. Remove the hollow supporting tube for the B2 clutches and the K2 clutch drum (See Figure 57).

**NOTE:** The supporting tube sits in the case. A notch in the bottom of the tube fits over the locating stem on the B1 clutch housing (see figure 58).

10. Lift and remove the K1 clutch drum (hollow splined shaft figure 59 and 60) from the transmission case. **Note:** there are two plastic thrust washers that sit on the side of the K1 drum where the turbine shaft is located, make sure that these do not get lost.

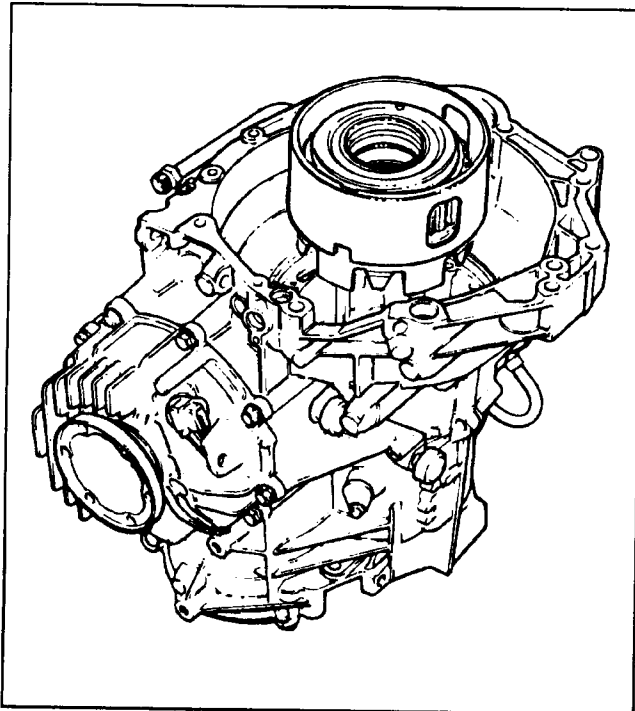


Figure 57

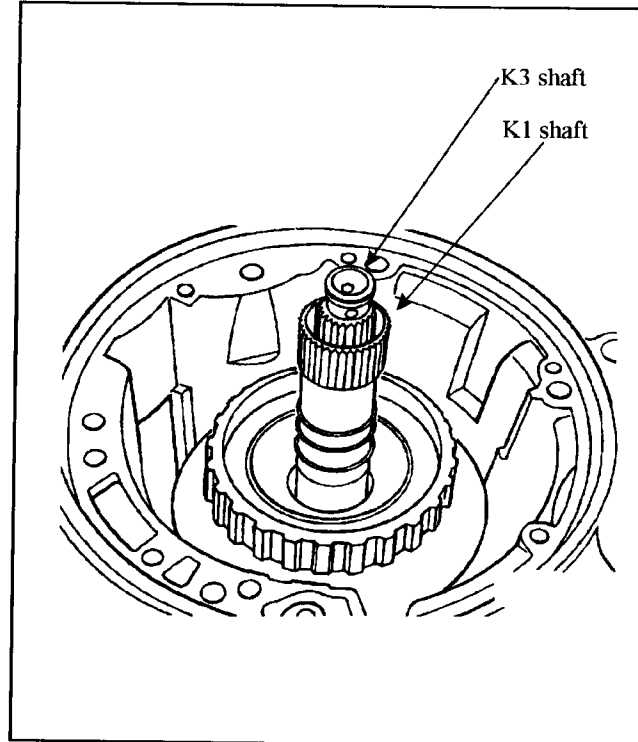


Figure 59

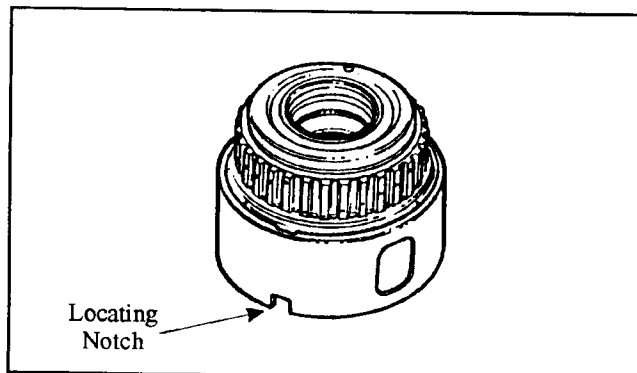


Figure 58

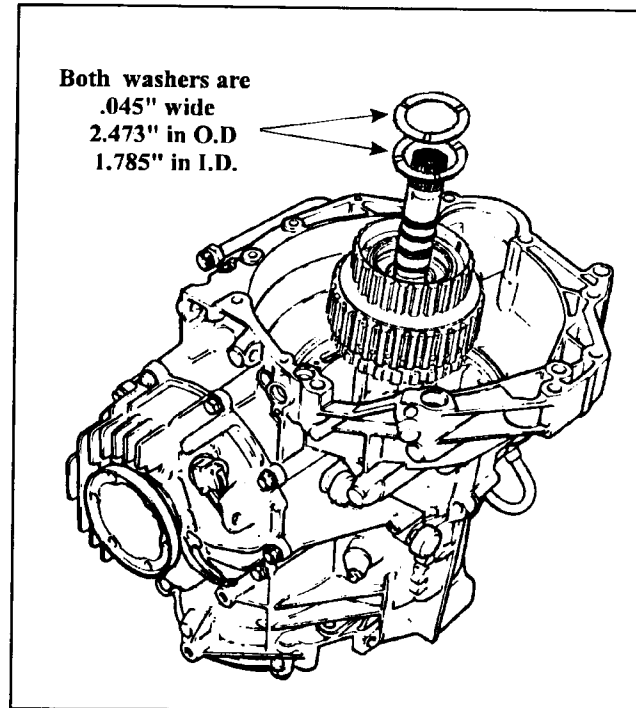


Figure 60

11. Remove the three piece torrrington bearing and set aside. Lift and remove the drum assembly for the K3 clutch, and then remove the two piece torrrington bearing and set aside. (See Figure 61)

12. Remove the rear transfer gear cover and locate the 13mm bolt in the rear of the output shaft (See Figure 63).

13. Engage the parking gear. Using a screwdriver insert the blade end into one of the holes in the large drive shaft (See Figure 62) and then remove the 13mm bolt from the output shaft.

14. Remove the small drive shaft for the planetary carrier from the transmission. (See Figure 63)

15. Remove the two torrrington bearings that sit in the large drive shaft.

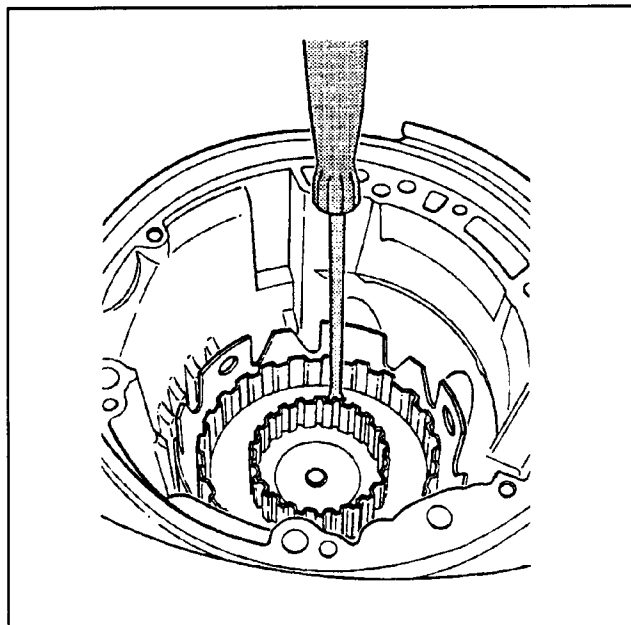


Figure 62

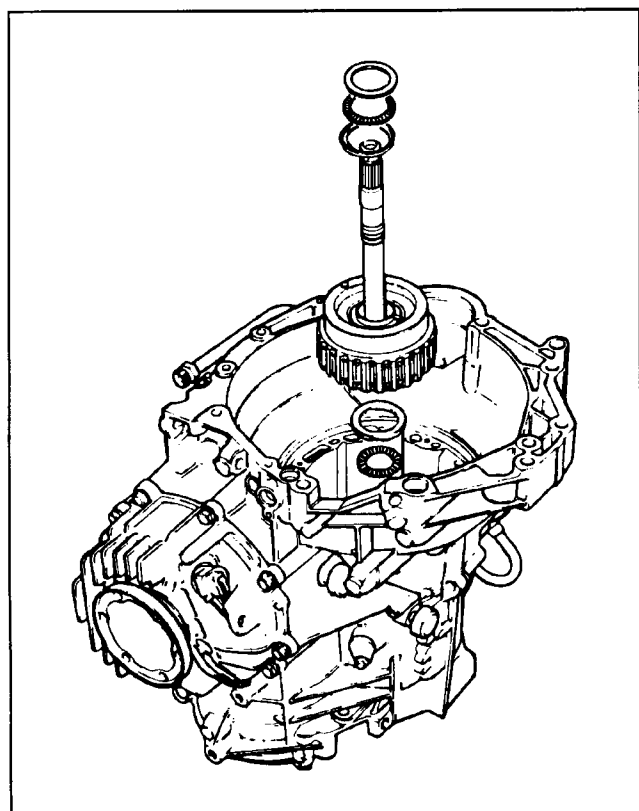


Figure 61

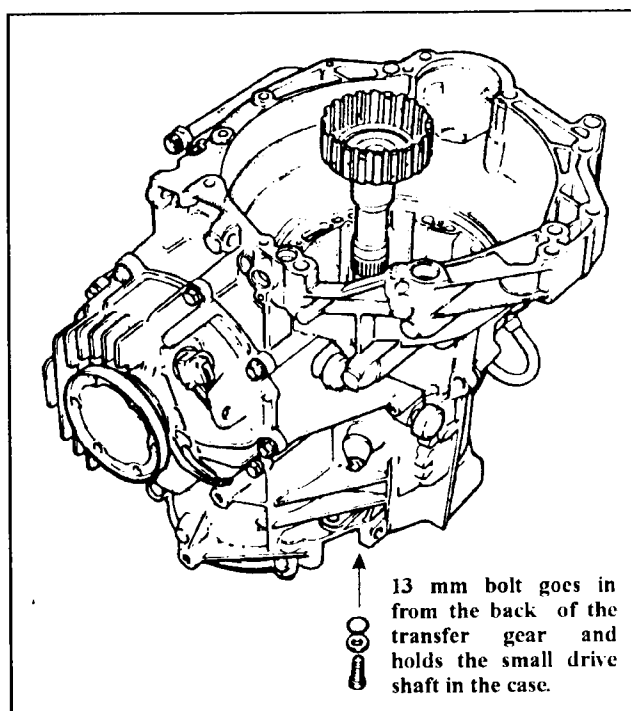


Figure 63

## AUTOMATIC TRANSMISSION SERVICE GROUP

16. Remove the round needle cage and the flat torrrington bearing, then remove the large drive shaft for the small sun gear. (See Figure 64)

17. Remove the torrrington bearing and the race for the drive shell, then remove the drive shell (See Figure 65).

18. Remove the torrrington bearing and the race for the small sun gear and then remove the small sun gear (See Figure 66).

**Be sure to check the torrrington bearings and the races for any wear. Replace if necessary.**

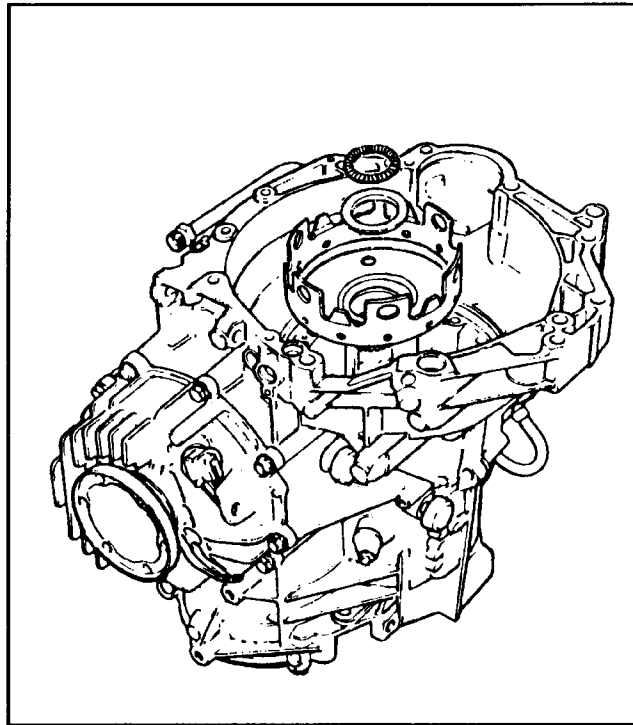


Figure 65

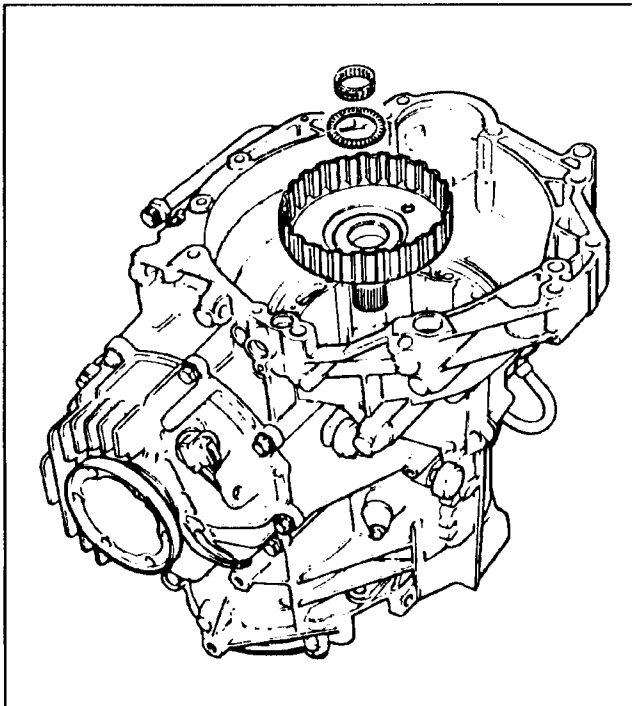


Figure 64

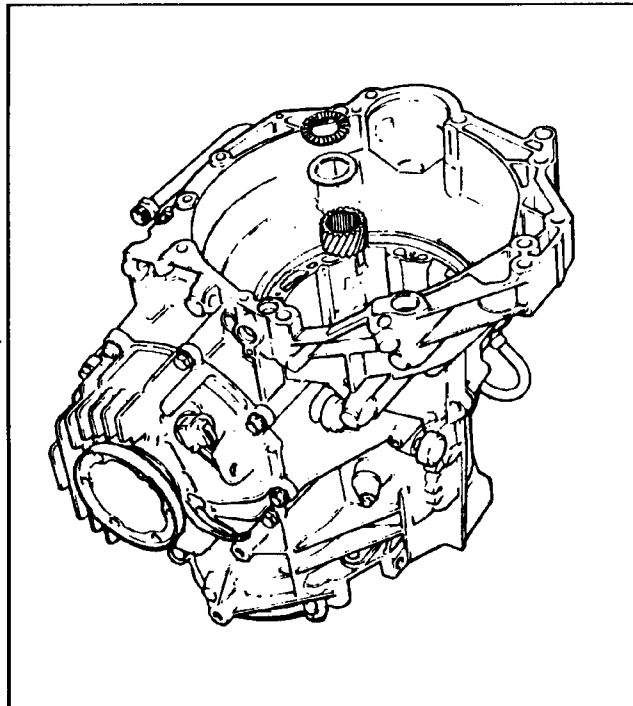


Figure 66

## AUTOMATIC TRANSMISSION SERVICE GROUP

19. Remove the snap ring that holds up the hollow supporting tube then remove the snap ring that holds down the B1 clutch piston housing and set them aside. Using a pair of needle nosed pliers grab the tab on the B1 clutch piston housing and gently wiggle it out of the case. Be careful not to break the tab off of the housing. (See figure 67).

20. Lift and remove the planetary from the case and set it aside. Remove the torrington bearing and both races and check them for wear. (See figure 68).

21. Note the direction of the piston return spring then remove it from the case. Note the direction of the pressure plate then remove it from the case. Remove the friction plates, steel plates, and the steel apply plate. and set them aside. (See figure 69).

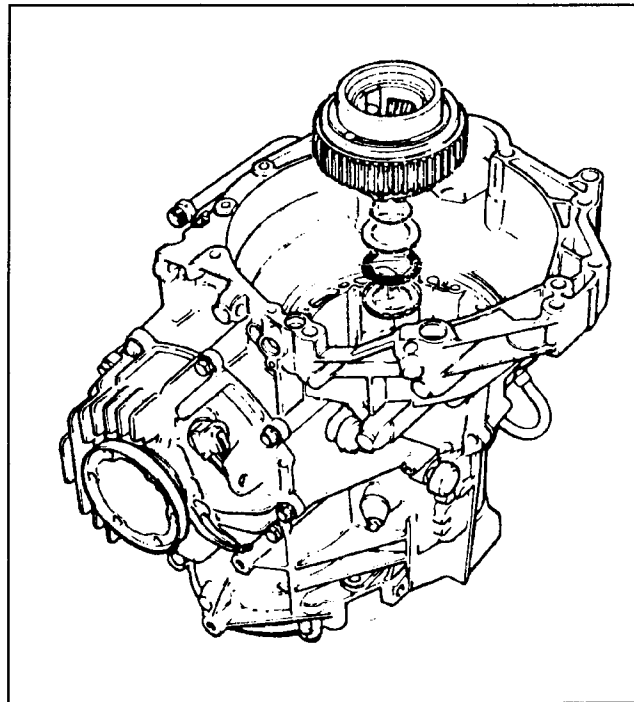


Figure 68

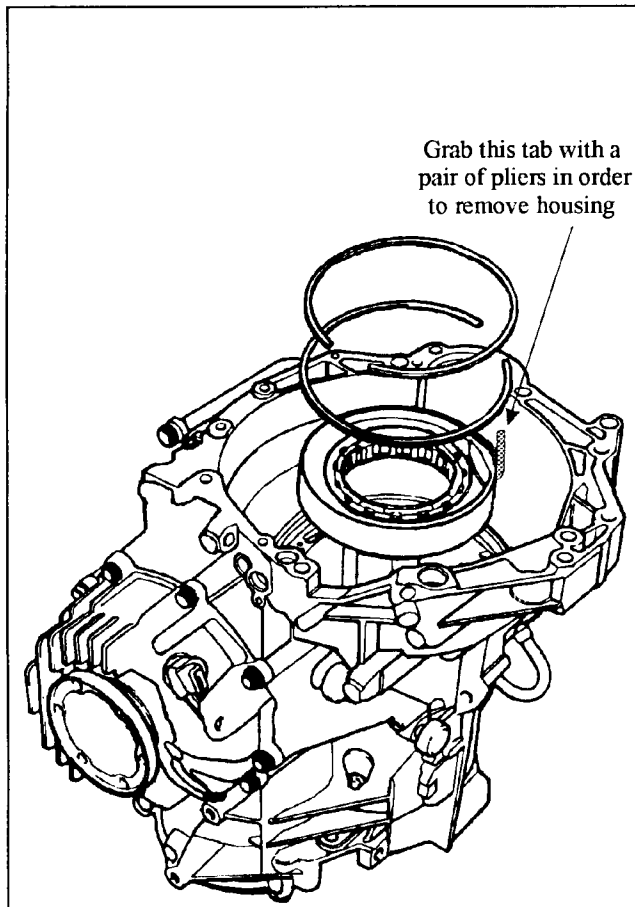


Figure 67

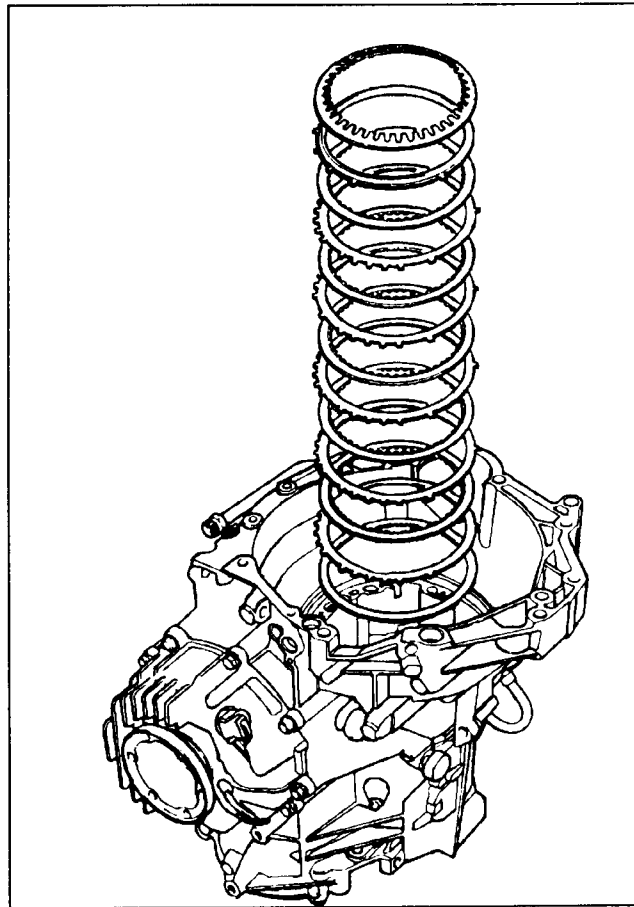


Figure 69

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 PUMP DISASSEMBLY

1. Remove the three sealing rings from the stator housing and check the sealing ring groove areas for any signs of wear (See Figure 70).
2. Remove the vulcanized B2 clutch piston from the pump assembly (See Figure 71).
3. Carefully remove the pump washer from the stator housing (See Figure 71).
4. Remove the 5 #30 Torx. bolts that hold the stator housing to the pump body and carefully lift the stator housing way from the pump (See Figure 71).
5. Remove the inner and the outer pump gears from the pump body. Be sure to check the inner gear bushing for wear, replace as necessary (See Figure 72).
6. Carefully remove the seal from the front pump. Inspect the front pump bushing for wear, replace as necessary (See Figure 72).

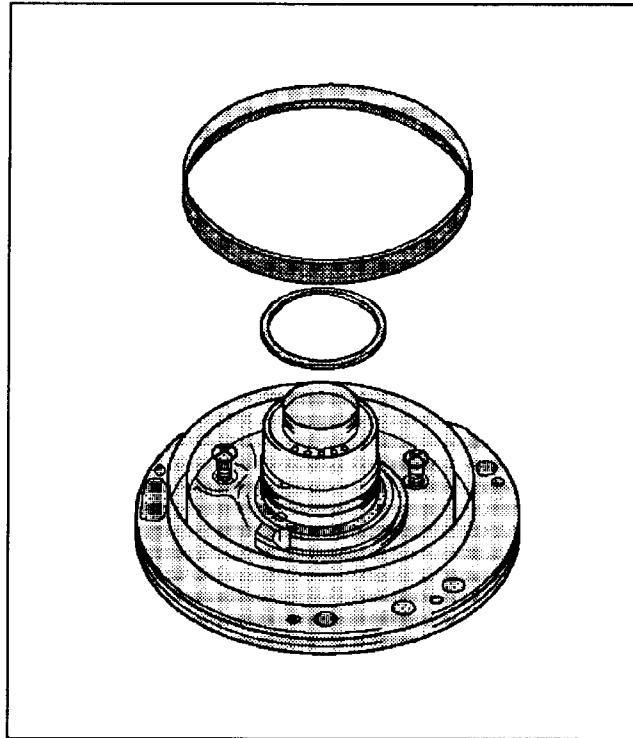


Figure 71

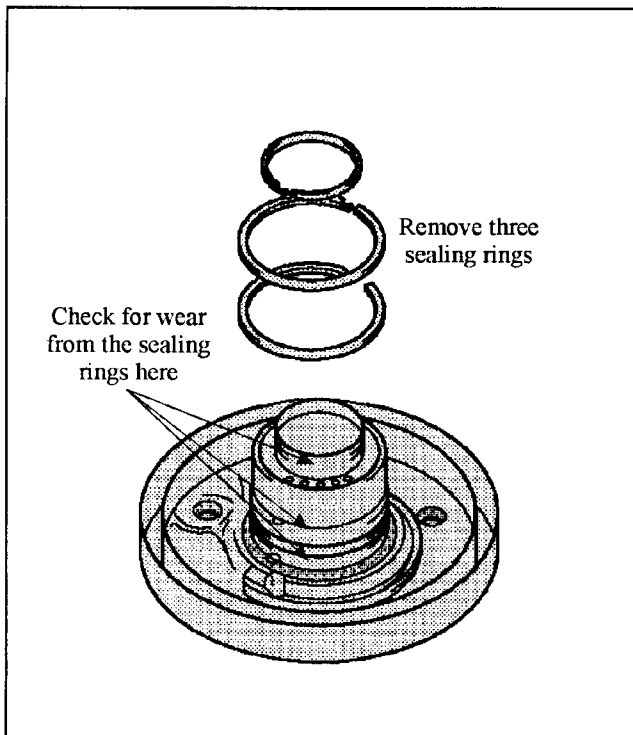


Figure 70

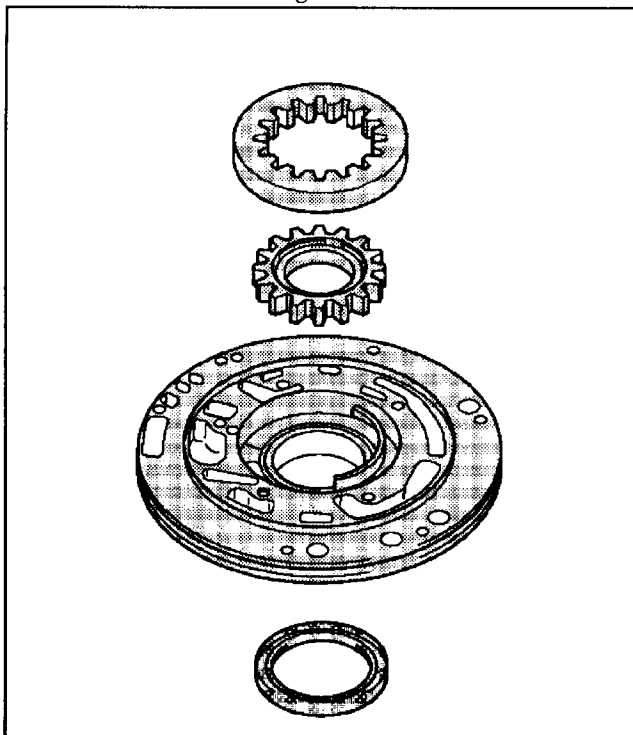


Figure 72

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 K1 CLUTCH DRUM DISASSEMBLY

1. Using a small screwdriver, remove the snap ring that retains the clutches in the K1 drum (See Figure 73).
2. Grasp the clutch hub and remove the clutch assembly from the drum. The clutch assembly will include the clutch hub, snap ring, plastic supporting clips, four clutch friction disks, three clutch steels and the pressure plate. (Use caution when disassembling the clutch assembly, as the plastic supporting clips are fragile and may break if caution is not used to remove them gently).
3. Remove the remaining clutch friction, clutch steel and clutch apply plate from the drum.
4. Remove the snap ring for the diaphragm return spring then remove the return spring from the drum.
5. Put the drum in a suitable press, and compress the piston return spring.
6. Using a pair of snap ring pliers, remove the snap ring and lift out the return spring, apply ring, cushion springs (2 needed) and the piston.
7. Remove the six sealing rings from the drum and inspect them and their grooves for wear.
8. Inspect the clutch apply piston to make sure the vulcanized lip seals are not torn or pulled away from the piston or hardened from age. If the lip seals are no good then the piston will need to be replaced.

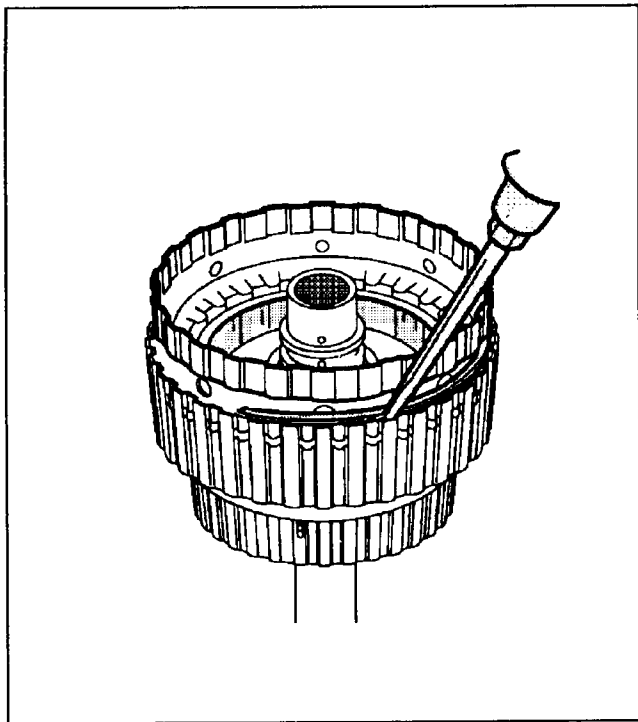


Figure 73

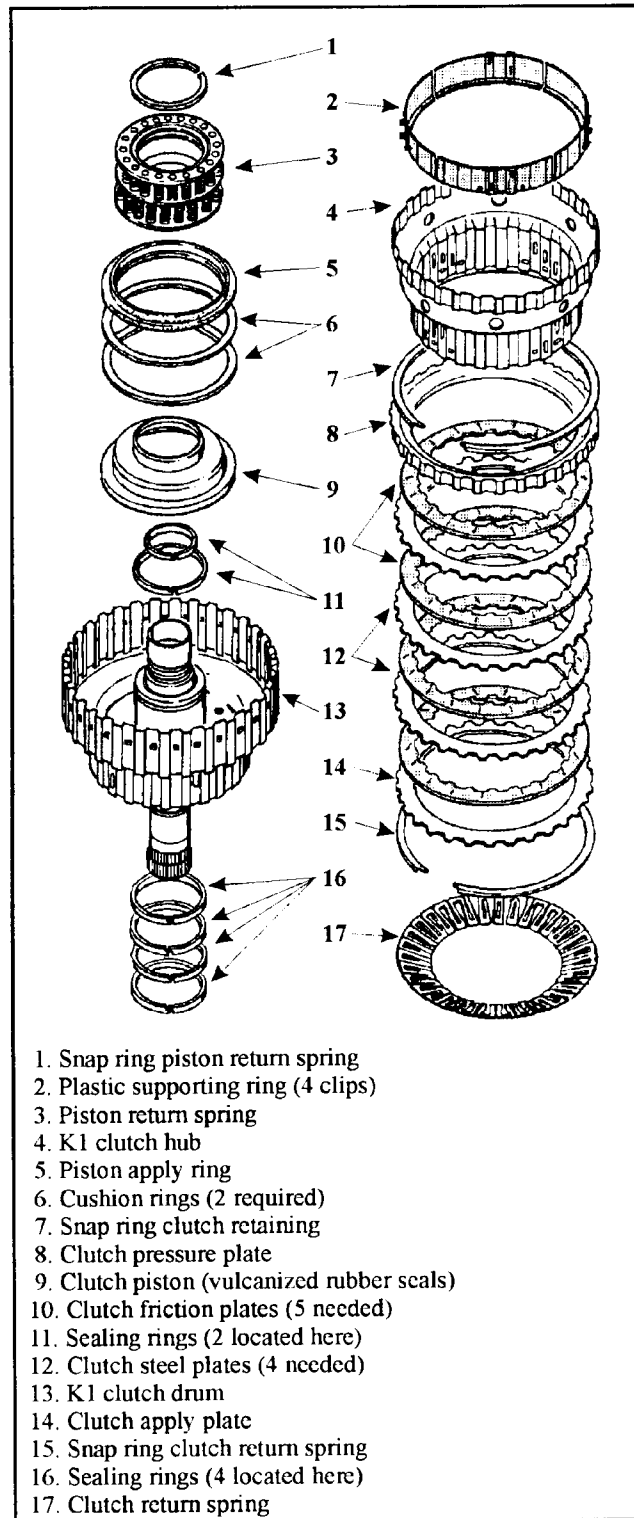


Figure 74

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 K2 CLUTCH DRUM DISASSEMBLY

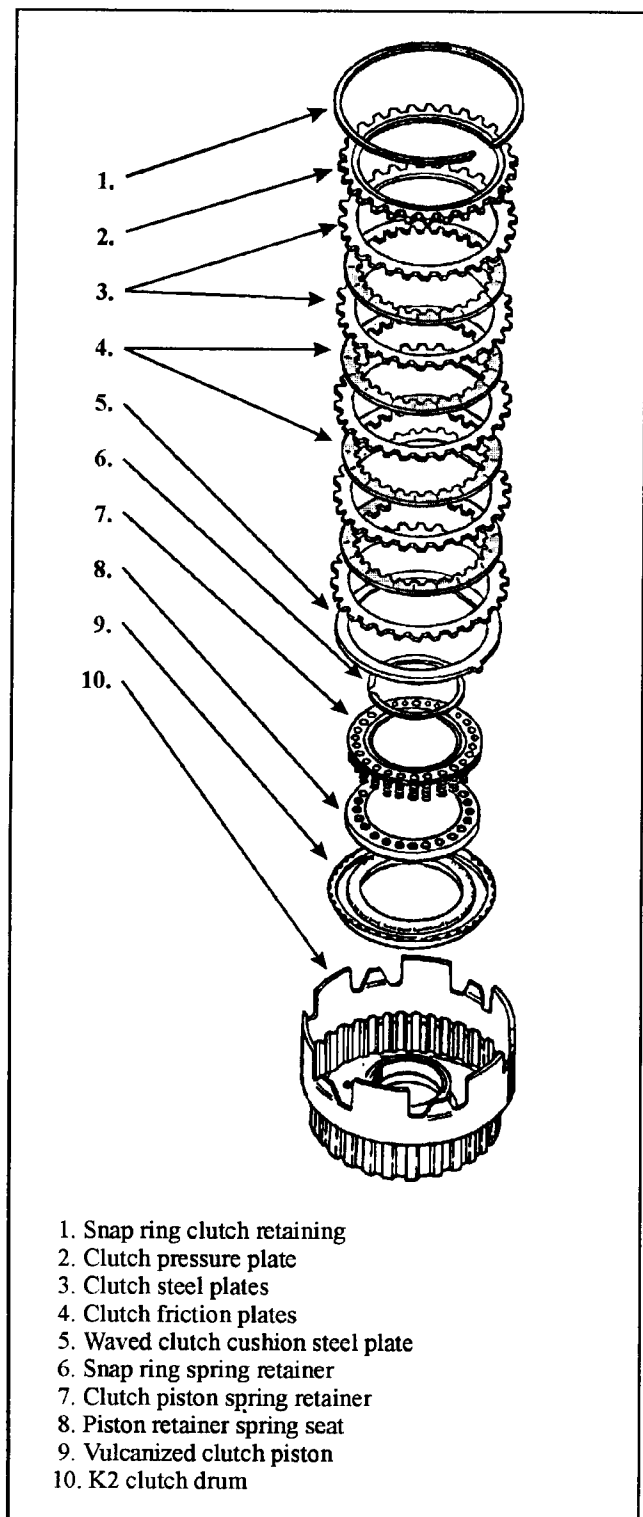


Figure 75

16. Using a screwdriver, remove the snap ring that retains the K2 clutches in the drum.

17. Remove the pressure plate along with the steel plates the friction plates and the waved cushion steel plate (See Figure 75).

18. Place the K2 drum in a suitable press and compress the spring retainer for the piston (See Figure 76). Use caution when compressing the spring retainer it is fragile and may be bent beyond use if not compressed evenly.

19. With the spring retainer compressed, remove the snap ring for the spring retainer using a pair of snap ring pliers.

20. Remove the spring retainer, the plastic spring seat and the vulcanized piston from the K2 drum

21. Inspect the clutch piston for any signs of the vulcanized lip seal cracking or separating from the piston or any signs of hardening from age. If the piston shows any of these signs of wear, it must be replaced.

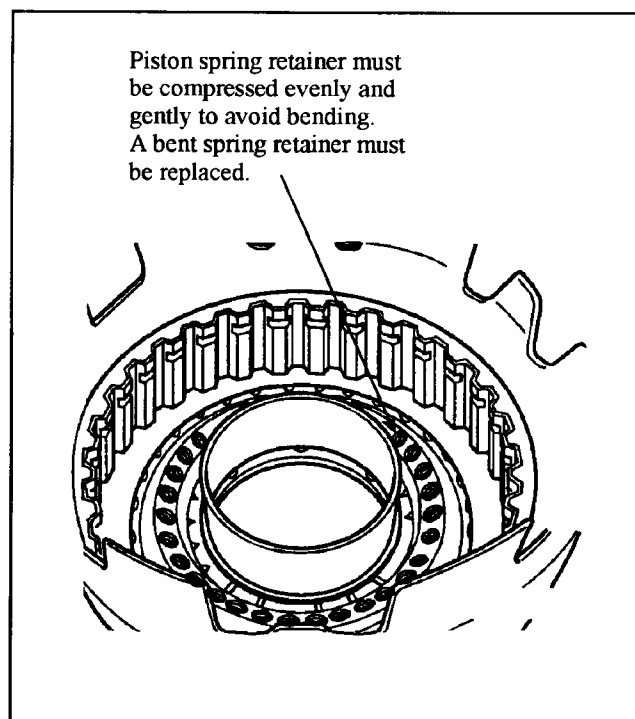


Figure 76

## V.W. AUDI 096 - 097 K3 CLUTCH DRUM DISASSEMBLY

9. Remove the snap ring that retains the clutches in the K3 clutch drum (See Figure 78).

10. Remove the pressure plate, clutch friction plates, clutch steel plates, and the clutch apply pressure plate along with the clutch apply ring.

11. Place the K3 clutch drum in a suitable press and compress the clutch piston spring retainer. Use caution when compressing the spring retainer. The retainer is not made of a strong material and excessive force may cause the retainer to crack and break.

12. Remove the piston spring retainer and the spring support seat.

13. Using a small screwdriver or scribe, remove the snap ring that holds the clutch return spring in the drum.

14. Remove the clutch piston from the drum. Check for any signs of the vulcanized lip seal cracking or separating from the piston or any signs of hardening from age. If the piston shows any of these signs of wear, it must be replaced.

15. Note in Figure 78 there are three sealing rings shown for the K3 clutch drum. There is one sealing ring hidden in the area shown in Figure 77. Procedure for removing and servicing will be shown in the reassembly portion of this manual.

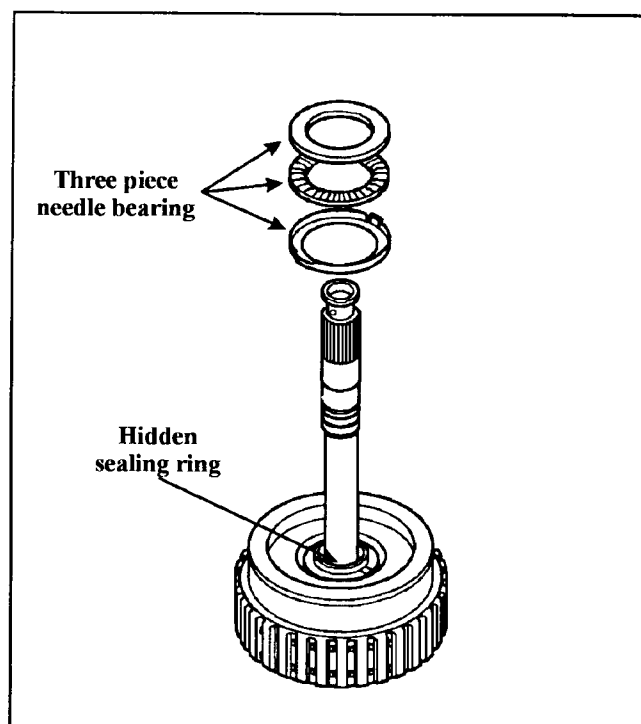


Figure 77

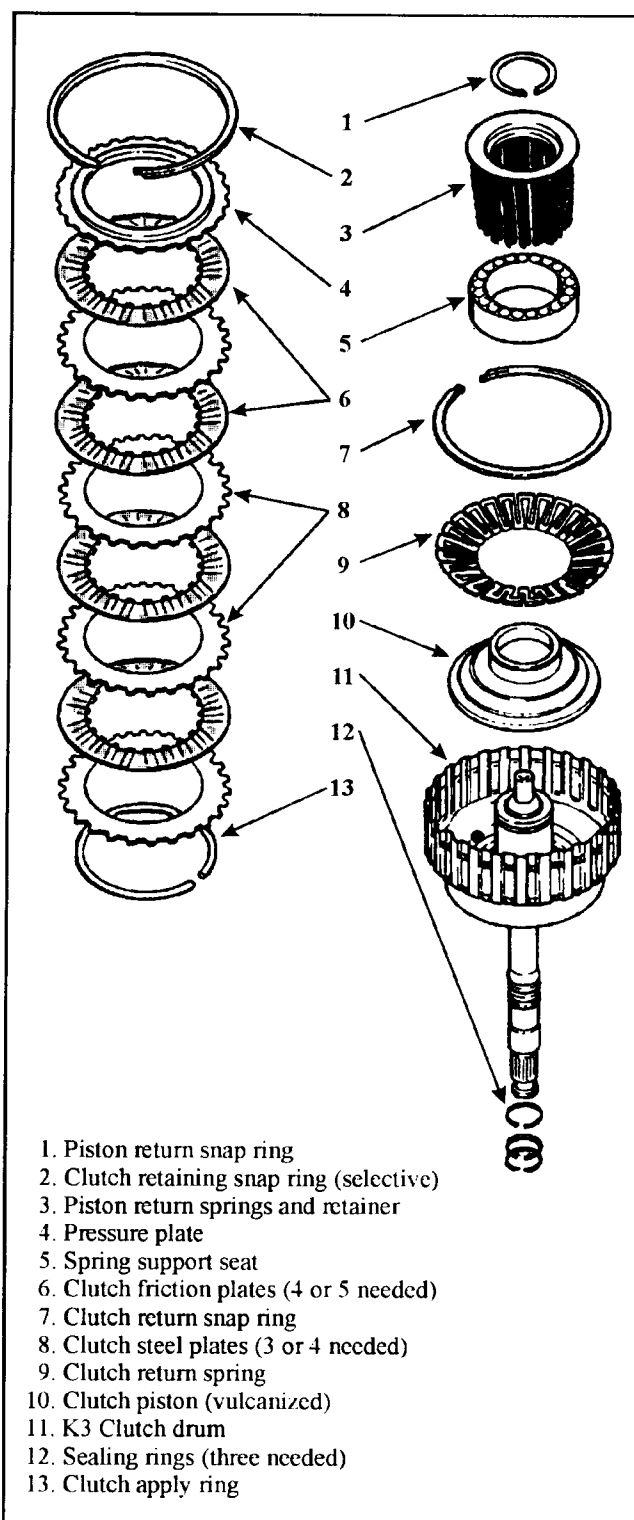


Figure 78

AUTOMATIC TRANSMISSION SERVICE GROUP

1. When removing the sprag for cleaning, you will need to be careful not to break the plastic retainer that holds the springs and rollers, also note the way that the sprag goes into the B1 piston housing.
2. If you look at Figure 80 you will notice that the flat tabs of the plastic retainer lay on the top of the housing on the side where the alignment arm sticks up. This is opposite of the side that houses the B1 piston. The rollers and springs may fall out of the sprag assembly and they will need to be arranged the correct way should they fall out (See Figure 81).
3. Correct sprag assembly is shown in Figure 81.
4. When assembling the sprag grasp the plastic retainer with both thumbs and turn in the direction of the arrow shown in Figure 82. This will lock the sprag in the housing for proper installation.
5. **Note:** for correct sprag rotation. Hold the planetary carrier from moving. With the carrier stationary the sprag will freewheel counter clockwise and it will lock clockwise. If the sprag is in the transmission, the planetary carrier will freewheel clockwise and lock counterclockwise.

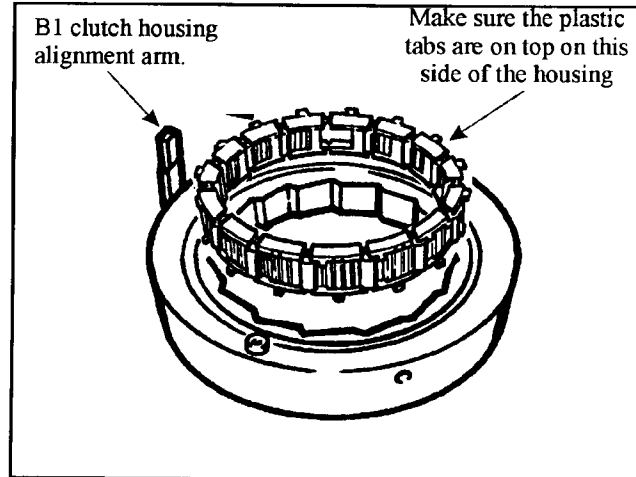


Figure 80

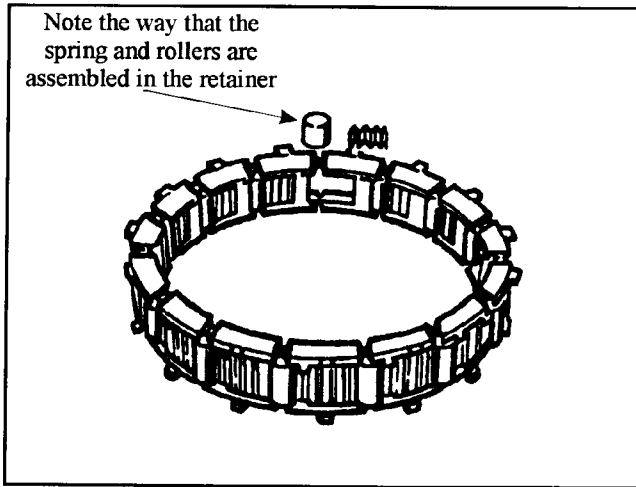


Figure 81

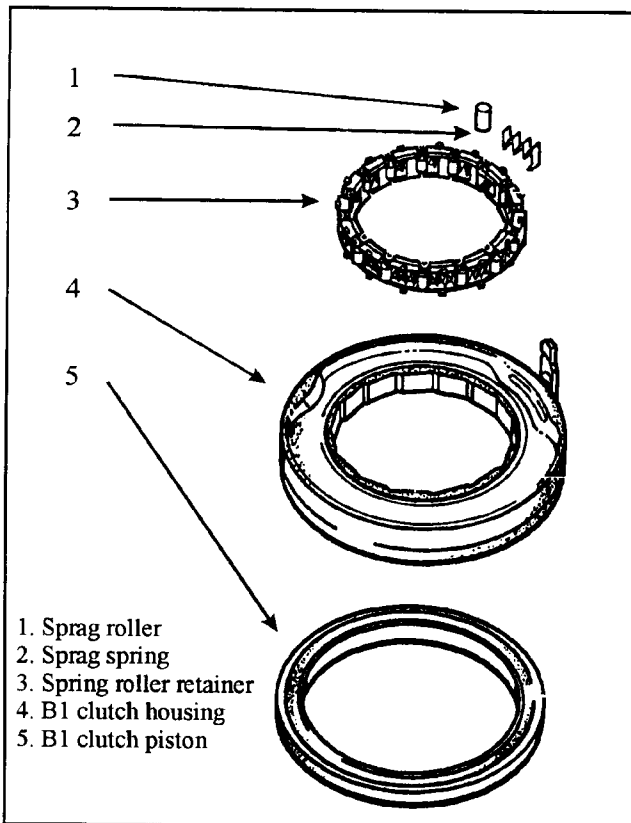


Figure 79

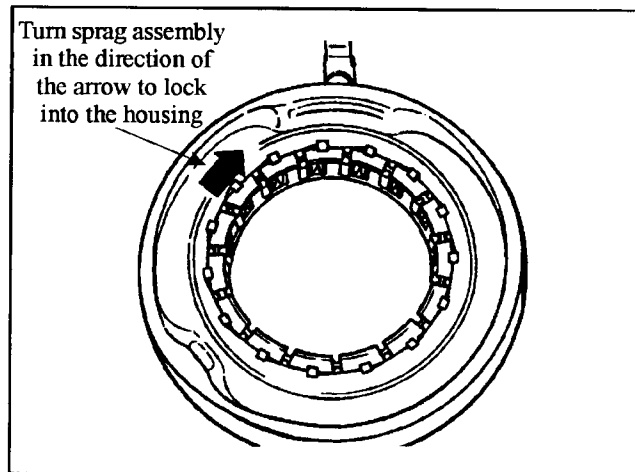


Figure 82

## AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. MODEL 096 TRANSAXLE MANUAL LINKAGE EXPLODED VIEW

1. Bolt torx #30 for the detent spring
2. Selector lever detent spring
3. Retaining pin
4. Bolt torx #20 for manual selector
5. Manual selector arm
6. Park rod lever
7. Manual selector shaft
8. Bolt torx #30 for selector shaft hold down washer
9. Hold down washer for manual selector shaft.
10. Retaining pin
11. Detent actuator

Figure 83

12. Locking clip
13. Washer
14. Parking pawl shaft
15. Return spring for parking pawl
16. Parking pawl
17. Parking lock gear
18. Bolt 10mm for support plate (2) needed
19. Supporting plate
20. Park rod guide plate

Figure 84

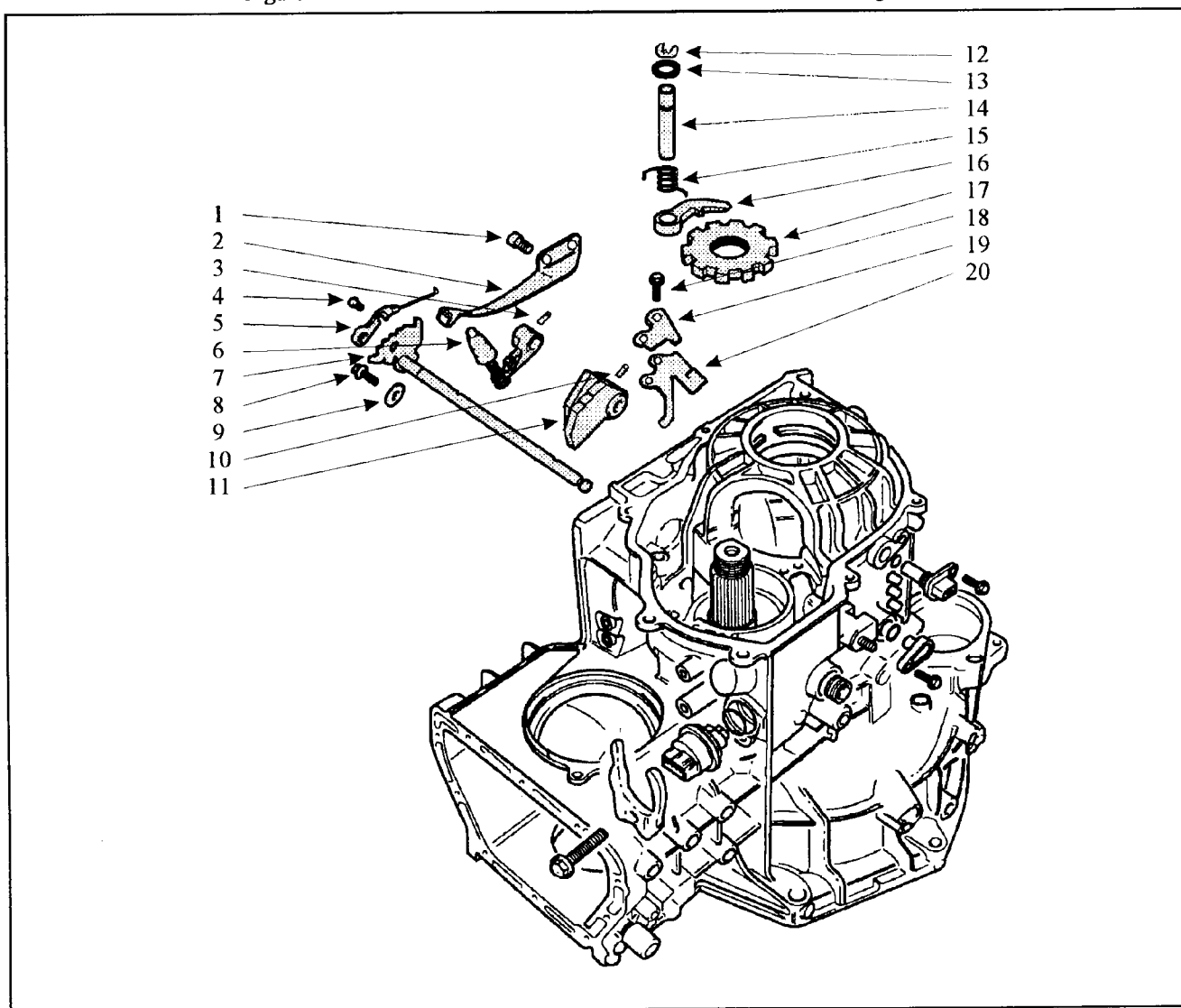


Figure 85

AUTOMATIC TRANSMISSION SERVICE GROUP

## LINKAGE DISASSEMBLY

1. Carefully remove the "C" clip from the parking pawl shaft taking care not to lose the clip, then remove the washer (See Figure 88).
2. Remove the parking pawl return spring and the parking pawl, then remove the parking pawl shaft.
3. Using a roll pin punch, hold the selector steady and carefully remove the two retaining pins from the manual selector shaft (See Figure 86). Note, the retaining pins may fall into the transmission case when removed, be careful not to lose them..
4. Remove the two 10mm bolts for the support plate, and remove the support plate and the park rod guide plate (See Figure 89).
5. Remove the 5mm hex head bolt and the hold down washer for the manual selector shaft.
6. While carefully lifting up on the detent spring, gently twist and remove the manual selector lever shaft from the transmission (See Figure 87). Be careful not to damage the detent spring when removing the selector shaft.
7. Remove the detent lever and the detent actuator from the transmission.
8. Remove the two number 30 torx head bolts that hold the detent spring to the case and remove the detent spring.

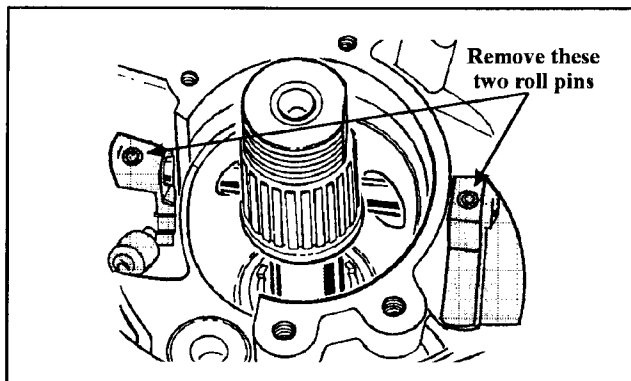


Figure 86

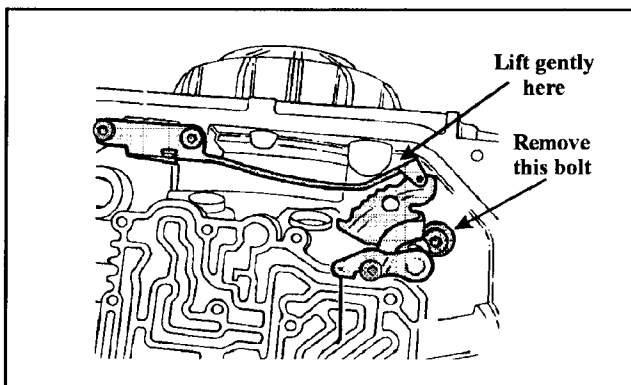


Figure 87

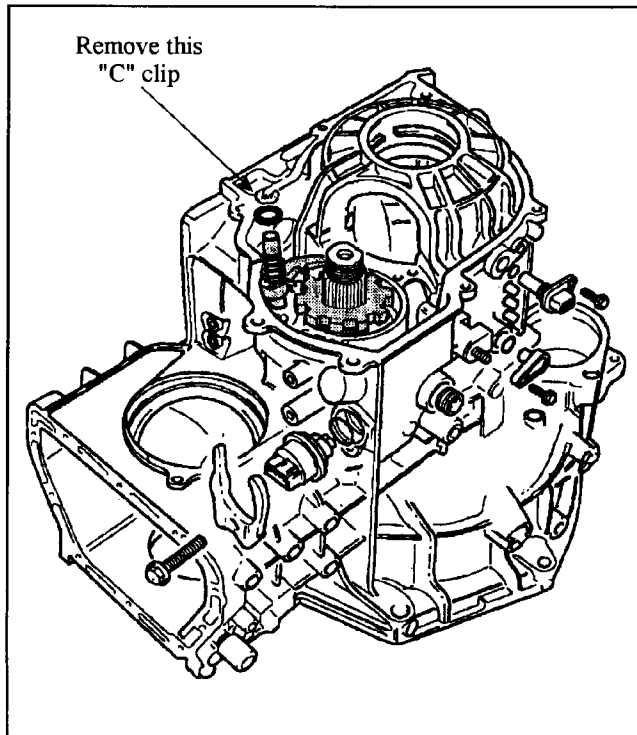


Figure 88

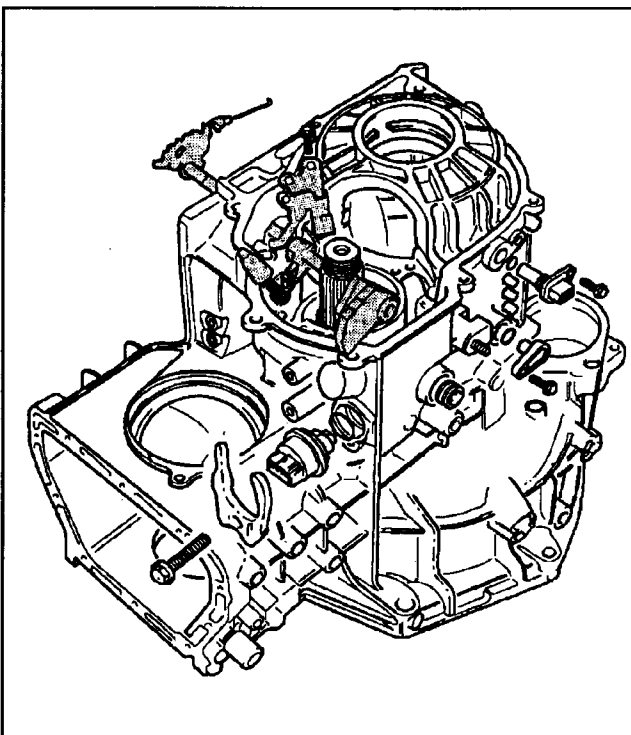


Figure 89

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 DIFFERENTIAL DISASSEMBLY

1. Move the shift linkage to lock the parking gear and remove the 22mm locking bolt from the back of the transfer housing (See Figure 90).
2. Remove the dished washer, the adjusting shim and the axial bearing.
3. Thread the locking bolt back into the output shaft until approximately 3mm of bolt is raised above the back side of the tapered bearing outer race.
4. Using tool VW 771 or equivalent, carefully drive the output gear out up to the stop of the tapered roller bearing race (See Figure 92).
5. When the locking bolt is touching the tapered roller bearing race, unscrew the bolt and carefully remove the output ring gear with the inner tapered roller bearing from the transmission (See Figure 91 and 92).

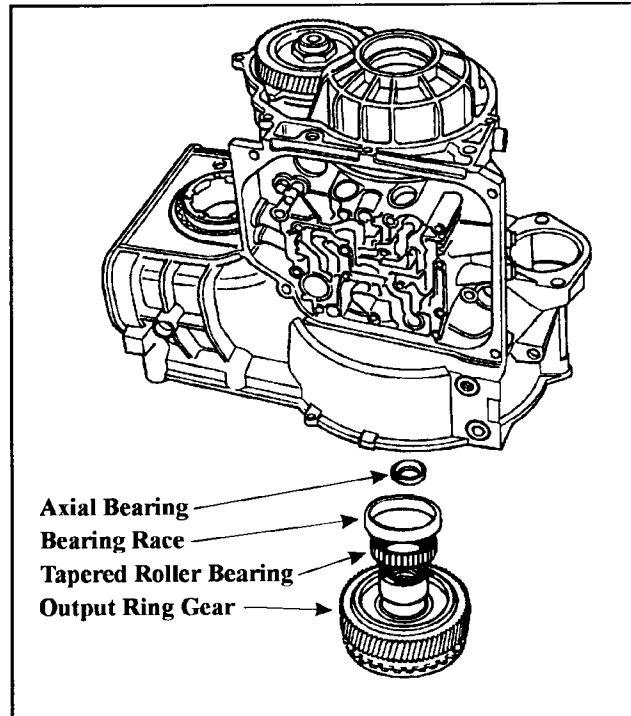


Figure 91

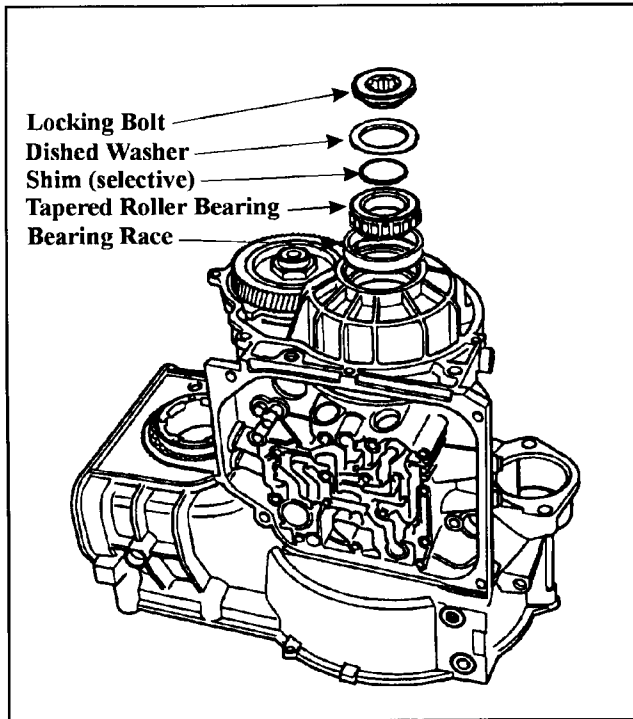


Figure 90

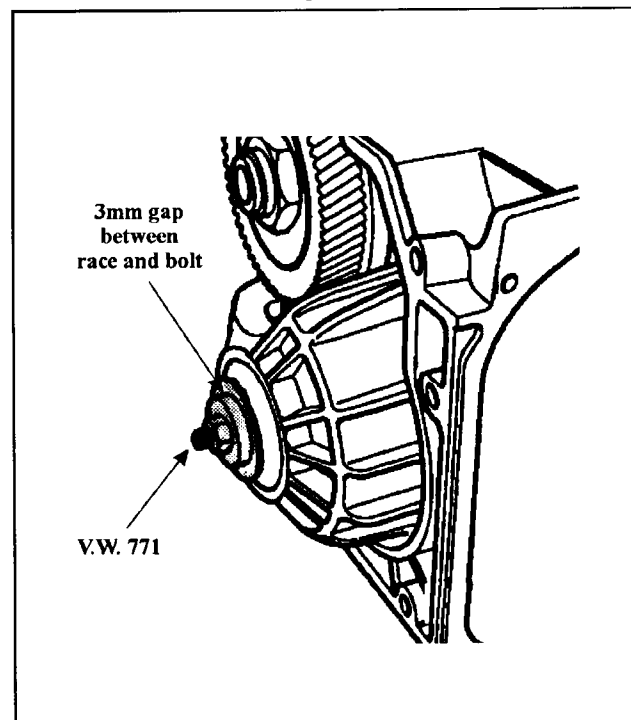


Figure 92

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 DIFFERENTIAL DISASSEMBLY

6. Remove the retaining nut for the pinion gear shaft.
7. Using a gear puller carefully remove the transfer driven gear from the pinion gear shaft (See Figure 93).
8. Remove the retaining bolts from the bearing cover then carefully lift and remove the cover from the transmission case. Examine the bearing race for wear (See Figure 94).
9. Lift and remove the selective spacing shim for the bearing and the parking gear.
10. Remove the locking bolt that holds the threaded bearing cover then remove the cover by turning. Take care not to damage any of the threads on the bearing cover.
11. Carefully remove the pinion gear shaft from the transmission housing.

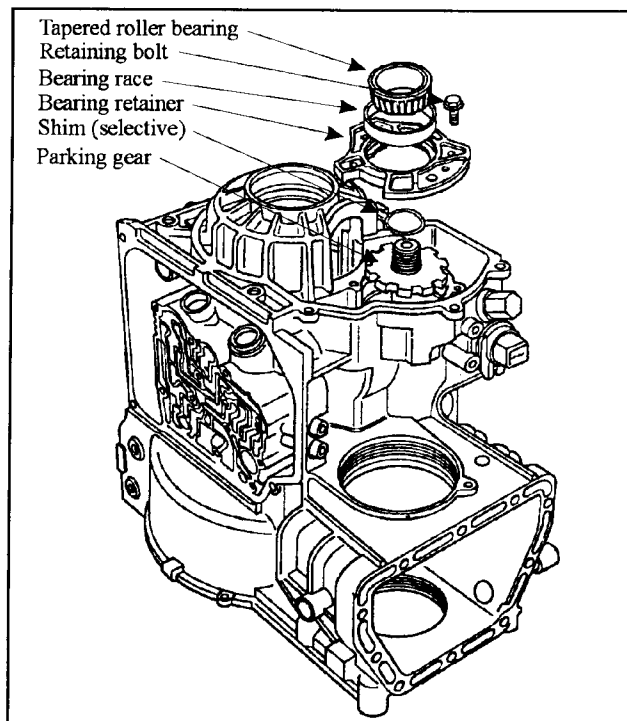


Figure 94

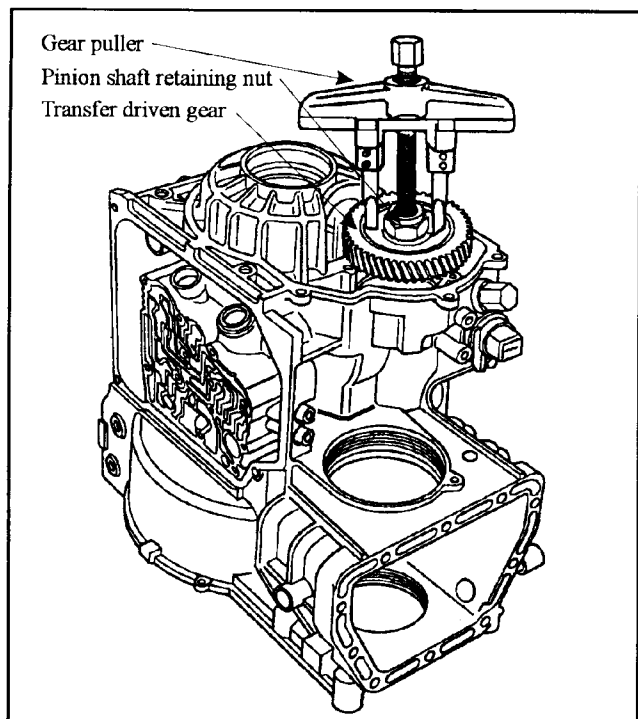


Figure 93

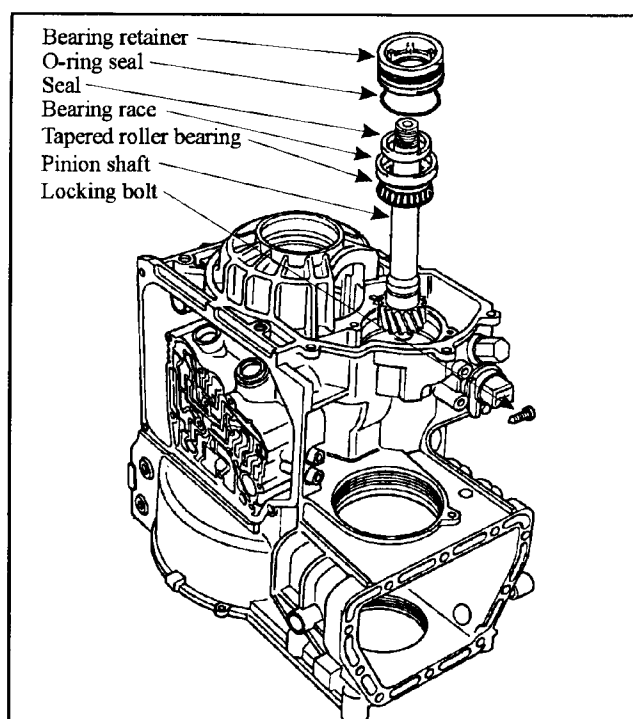


Figure 95

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 DIFFERENTIAL DISASSEMBLY

12. Using a screwdriver or similar tool, pry the seal out from the differential axle flange (See Figure 96).

13. With a pair of snap ring pliers, carefully remove the locking snap ring from the axle drive shaft.

14. Remove the dished washer from the axle flange and remove the flange from the axle drive shaft. (Note, it may be necessary to use a gear puller to remove the flange).

15. Remove the compression spring, cap and the tapered ring, then remove the drive flange seal.

16. Remove the hold down bolt and bracket for the differential bearing housing. Remove the housing by turning counter clock wise and lift away from the transaxle. If the bearings are not to be replaced during overhaul, count the number of turns needed to remove the housing (See Figure 97).

17. Remove the ten 13mm bolts from the differential cover pan and remove the pan from the side of the transaxle.

18. Using two screwdrivers, remove the clips that hold the axle drive shafts in the pinion gears. When this is done remove the shafts and the carrier from the transaxle housing (See Figure 98).

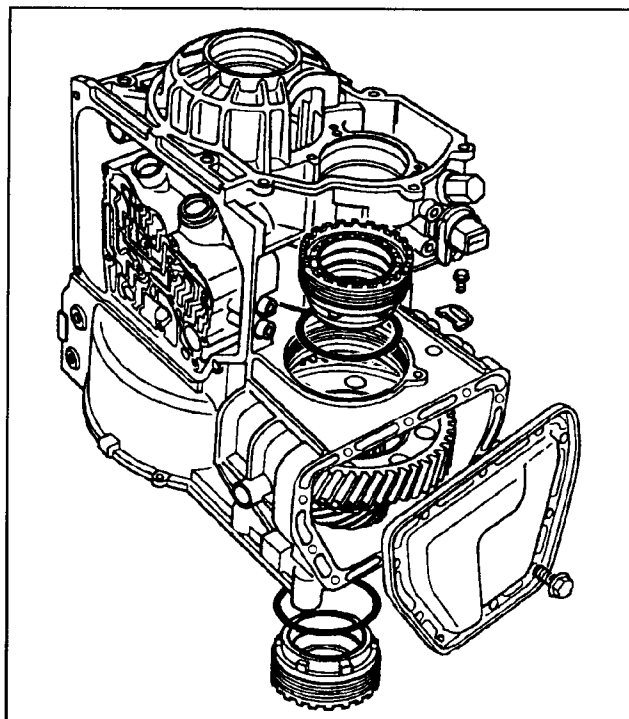


Figure 97

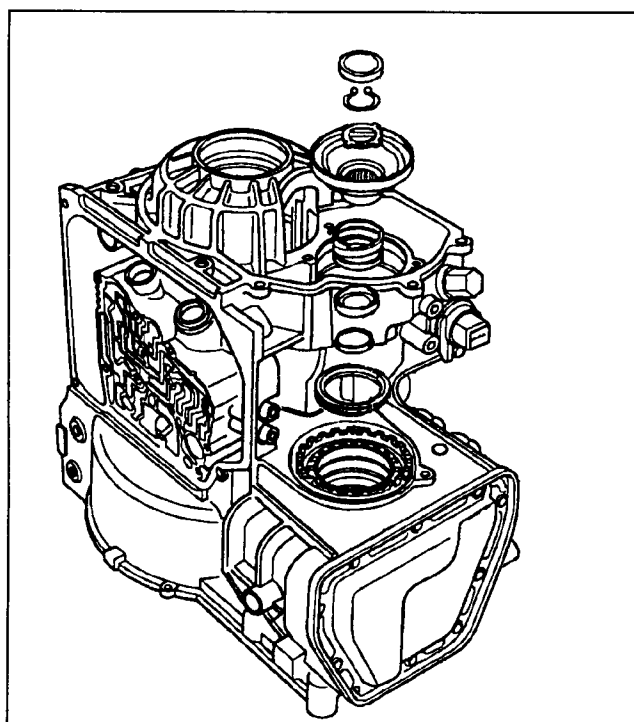


Figure 96

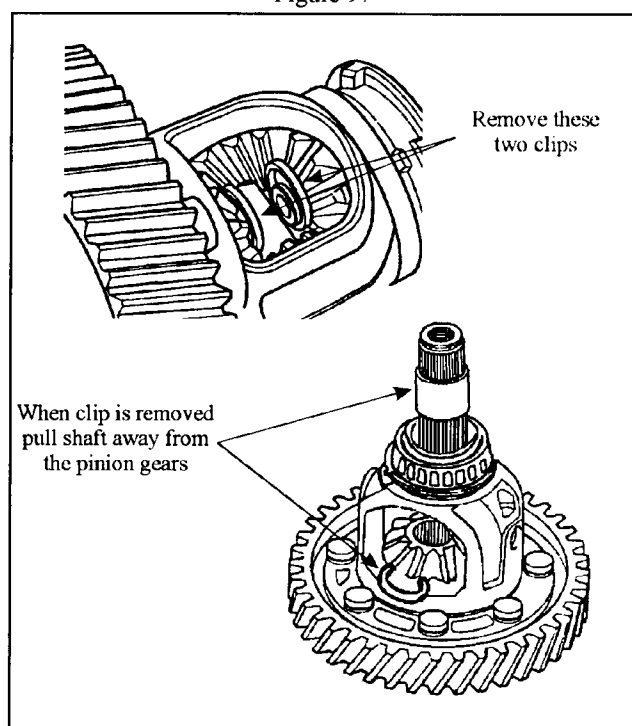


Figure 98

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 DIFFERENTIAL RING GEAR DISASSEMBLY

1. Set the differential ring gear assembly on a flat work surface.
2. Use a screw extractor or similar tool and remove the roll pin that holds the pinion shaft in the differential (See Figure 99)
3. Remove the pinion shaft then roll the pinion gears to the side and remove them from the differential.
4. Remove the one piece plastic thrust washer.
5. Inspect all parts for any signs of wear, and replace as necessary.
6. Heat the differential to 100 degrees F. then remove the tapered roller bearing (See Figure 100)
7. Turn the differential over to the other side, be careful not to break the plastic speedometer drive gear. Using tool VAG 1582 and adaptor 1582/3 remove the tapered roller bearing from this side of the differential (See Figure 101).

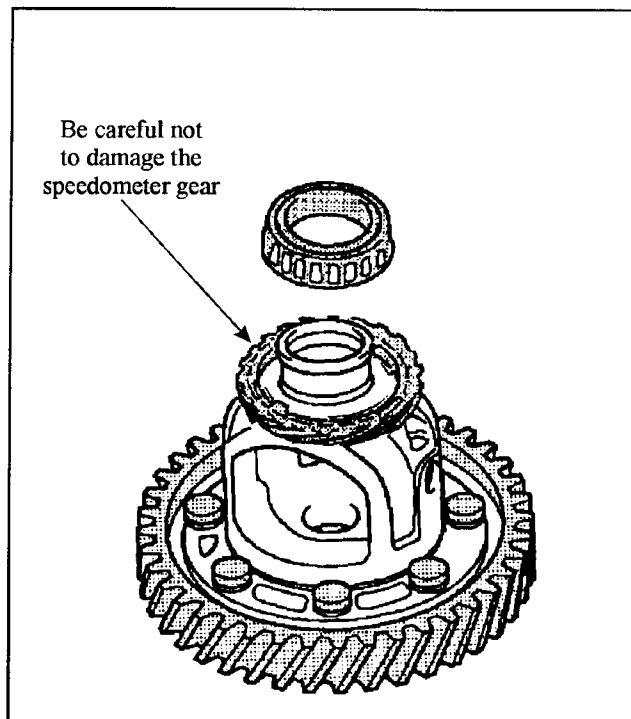


Figure 100

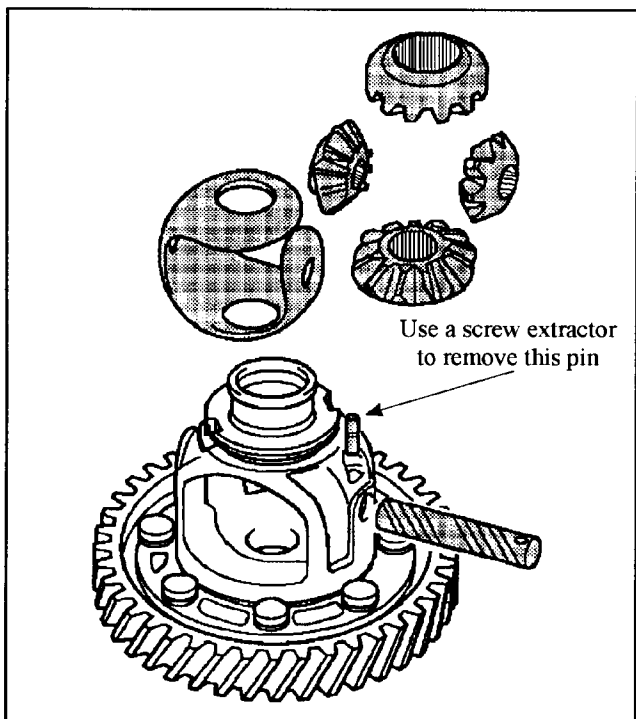


Figure 99

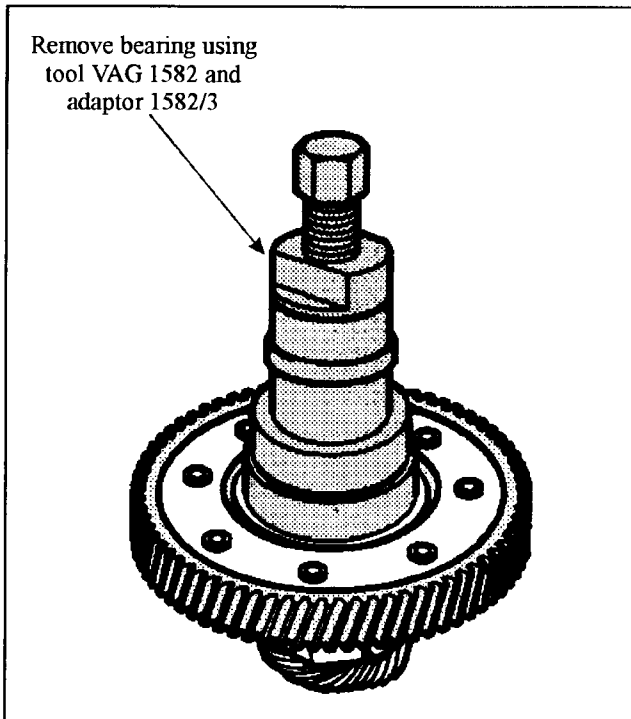


Figure 101

AUTOMATIC TRANSMISSION SERVICE GROUP

## AUDI 097 TRANSAXLE DIFFERENTIAL EXPLODED VIEW

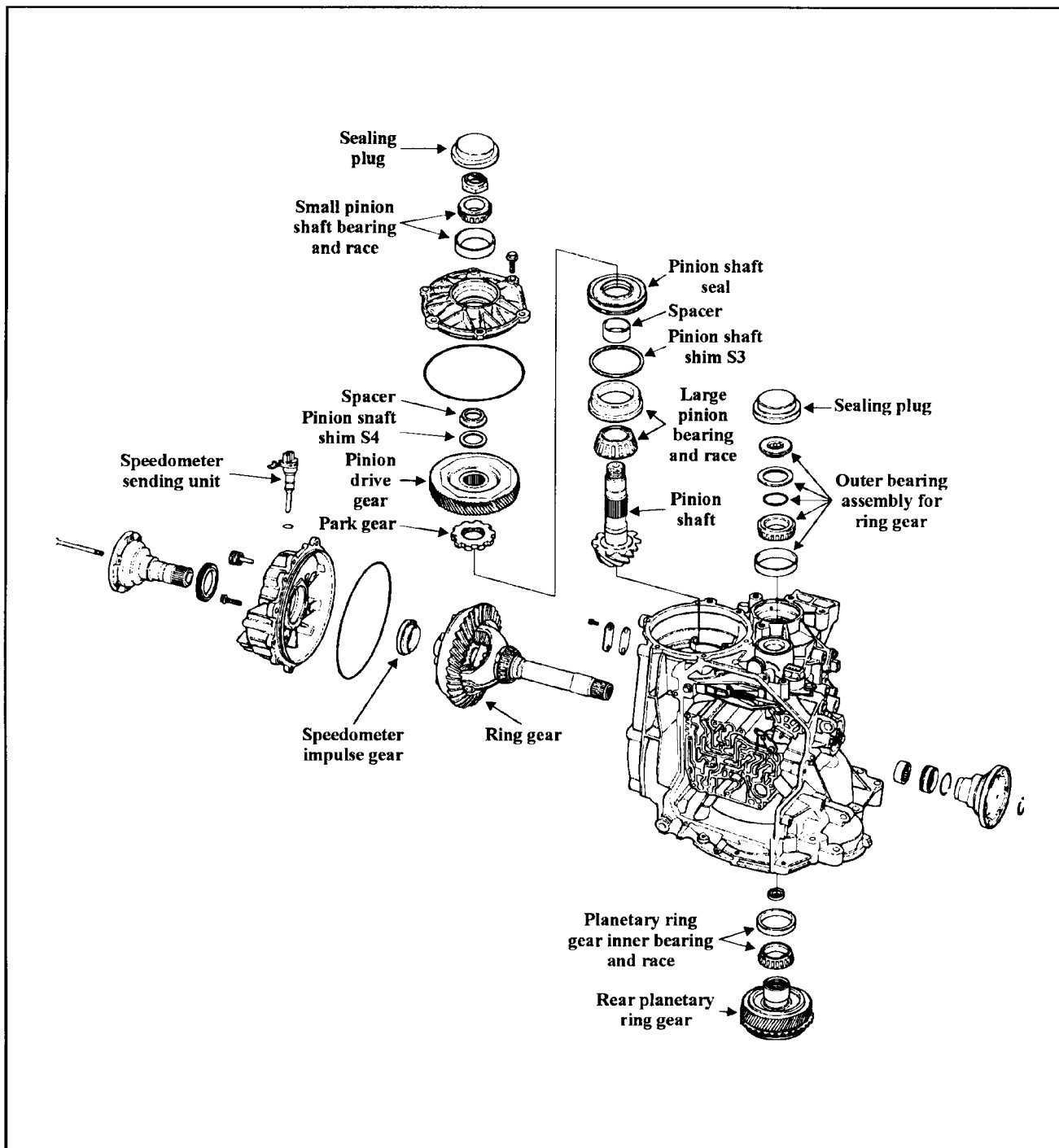


Figure 102

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 DIFFERENTIAL REASSEMBLY

1. Install the axle drive shafts into the pinion gears and install locking clips into place as shown in Figure 103.
2. Coat the new differential bearings with gear oil and install ring gear in differential housing.
3. Place new o-rings on the differential bearing housings and coat with vaseline or ATF. Coat the bearing races with gear oil, and carefully turn the bearing housings clock wise into differential housing (See Figure 104). Using tool VW 3155 or equivalent torque housing "A" to 111 ft.lb. Torque housing "B" to 37 ft.lb. Make a mark on housing "B" and tighten exactly 5 lugs further. This will give you your differential preload. When adjusting the differential preload, do not turn the ring gear as it will settle the bearings and the ring gear preload will be incorrect.
4. Install the hold down bracket for the differential housing on the transmission and align with the proper lugs then coat the bolt with a small amount of thread lock and torque the bolt to 9 ft .lb.
5. Install the tapered ring in the differential then install a new drive flange seal. Install the compression spring and cap on the drive flange then install the drive flange on the axle drive shaft.
6. Compress the drive flange and install the dished washer and the locking snap ring.

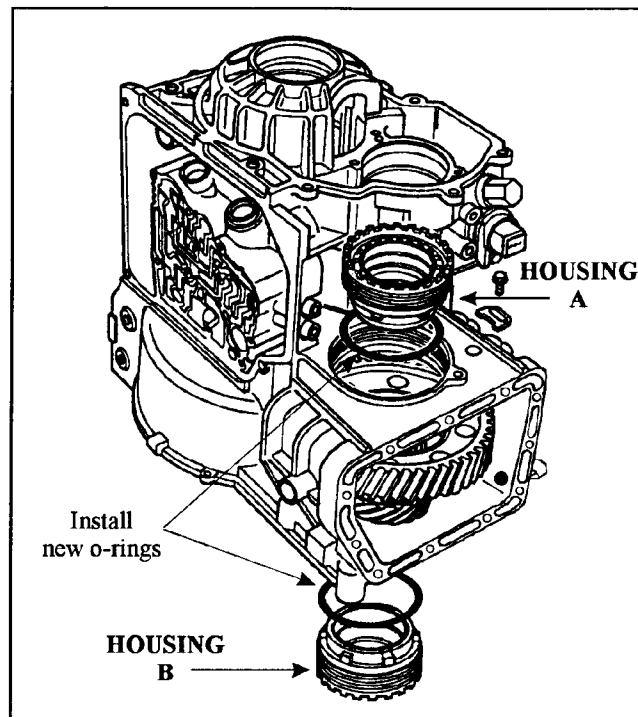


Figure 104

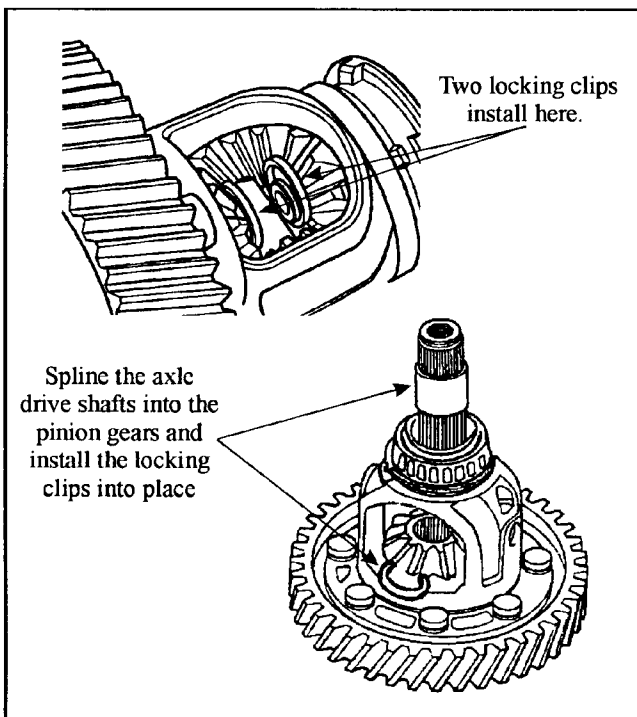


Figure 103

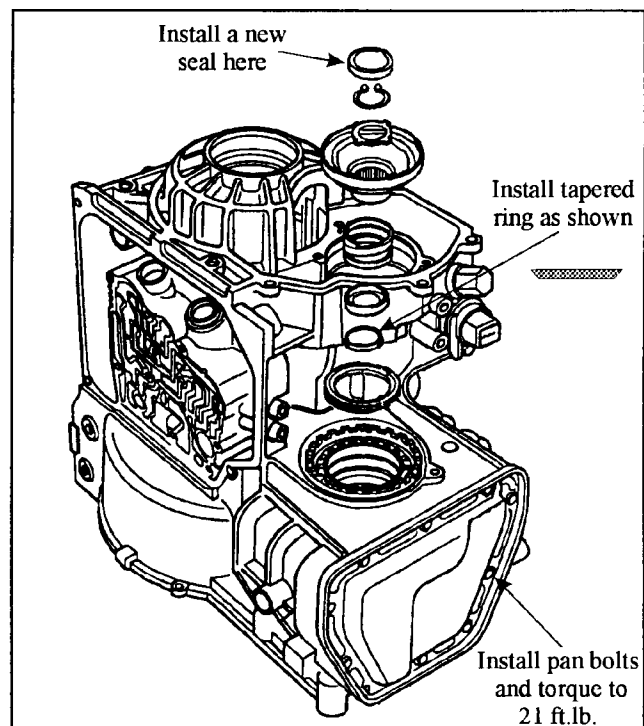


Figure 105

AUTOMATIC TRANSMISSION SERVICE GROUP

## DIFFERENTIAL REASSEMBLY CONT'D

7. Install a new axle flange plug seal (See Figure 105).
8. Remove all the old gasket material from the differential cover pan then place a new gasket on the differential housing and install the cover pan. Coat the bolts with a thin coat of thread lock and torque the bolts to 21 ft.lb.
9. Install the pinion shaft and coat the bearing lightly with gear oil.
10. Install a new seal and a new rubber o-ring in the bearing housing and thread the housing into the transmission case. Do not cross-thread the housing into the case (See Figure 106). Torque the housing to 148 ft.lb.
11. Spline the parking gear onto the pinion shaft, and install the selective shim. (For adjustment information see Figure 115 and 116 Page 52).
12. Coat the locking bolt with a small amount of thread lock and torque the bolt to 9 ft.lb. (See Figure 106).
13. Install the bearing retainer with a new bearing. Install the and torque to 10ft.lb. for the 6mm bolts and 18ft.lb. for the 8mm bolts. bolt size may vary. Always check the size of the bolts in your bearing retainer (See Figure 107).
14. Install pinion driven gear and retaining nut (See Figure 108). (For adjustment procedure see Figure 119 and 120 Page 54).

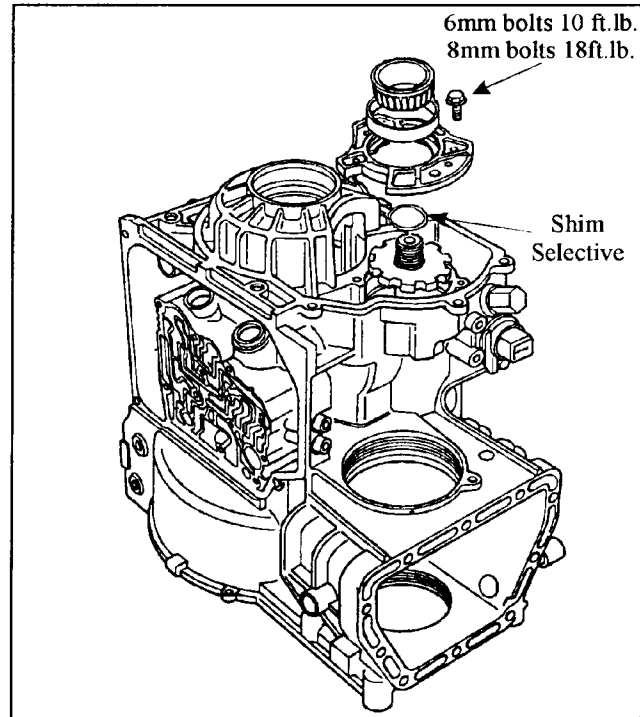


Figure 107

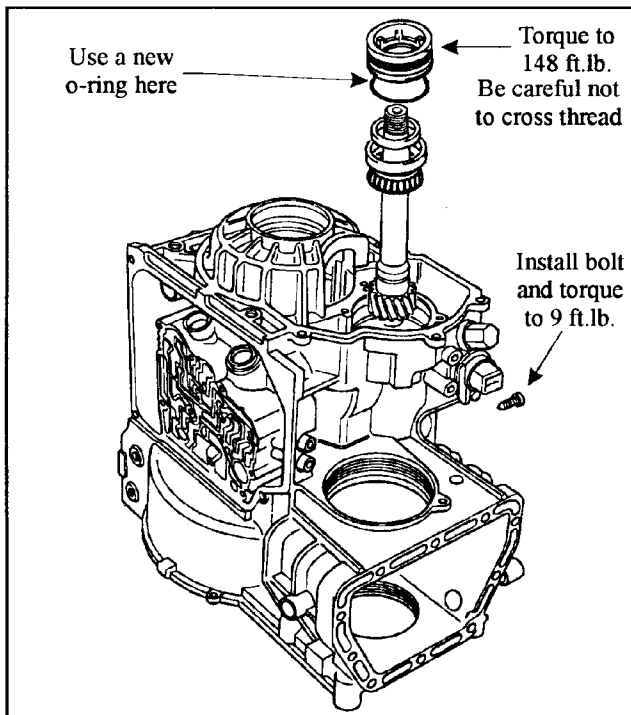


Figure 106

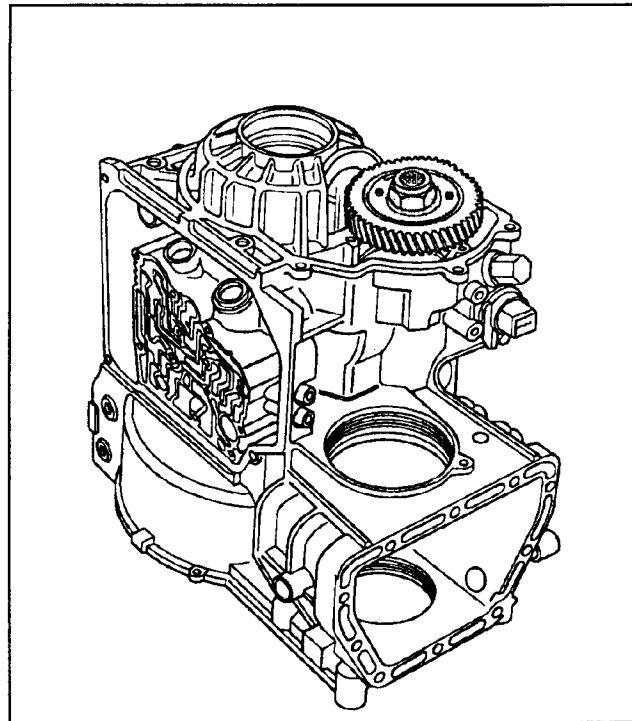


Figure 108

AUTOMATIC TRANSMISSION SERVICE GROUP

## LINKAGE REASSEMBLY

1. Insert the manual selector shaft into the transmission then slide the park rod lever and the detent actuator onto the manual selector shaft (See Figure 109).
2. Gently lift up on the detent spring high enough to allow the manual lever shaft rooster comb slide underneath then release the detent spring (See Figure 110).
3. Place the manual selector shaft in the park detent position and install the retaining roll pins through the detent actuator and the park rod lever (See Figure 110).
4. Install the park rod guide and the support plate, then install the two 10mm bolts for the support plate and torque them to 10 ft.lb.
5. Install the parking pawl shaft and the parking pawl.
6. Install the parking pawl return spring on the parking pawl then install the washer and lock in the retaining "C" clip on the parking pawl shaft (See Figure 111).
7. Coat the manual selector shaft with a small amount of grease and install a new linkage seal in the case (See Figure 111).

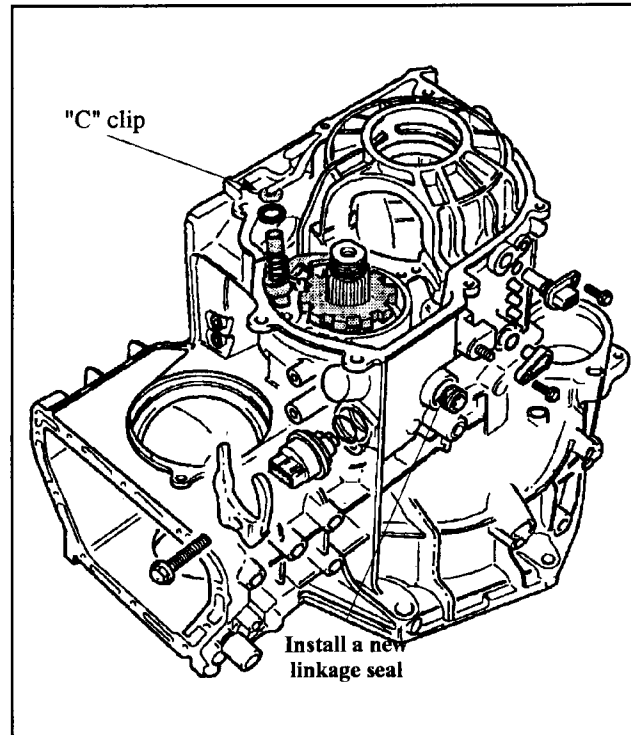


Figure 110

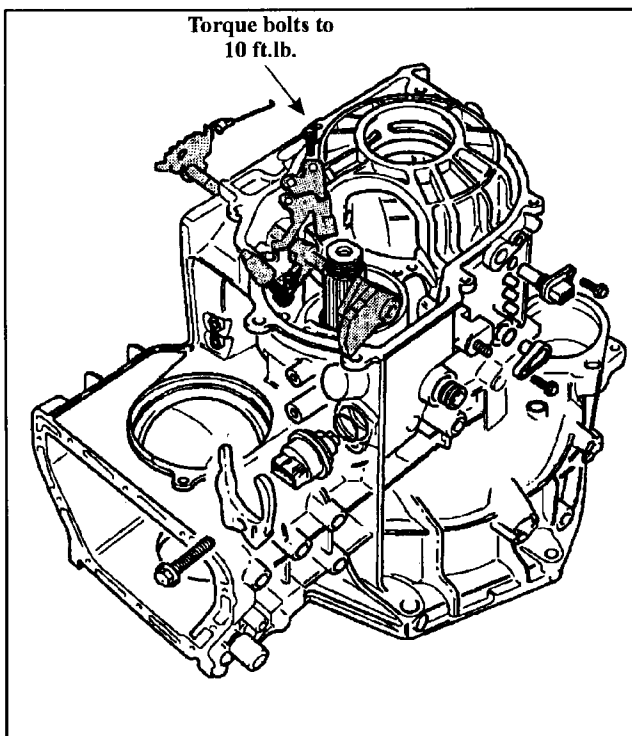


Figure 109

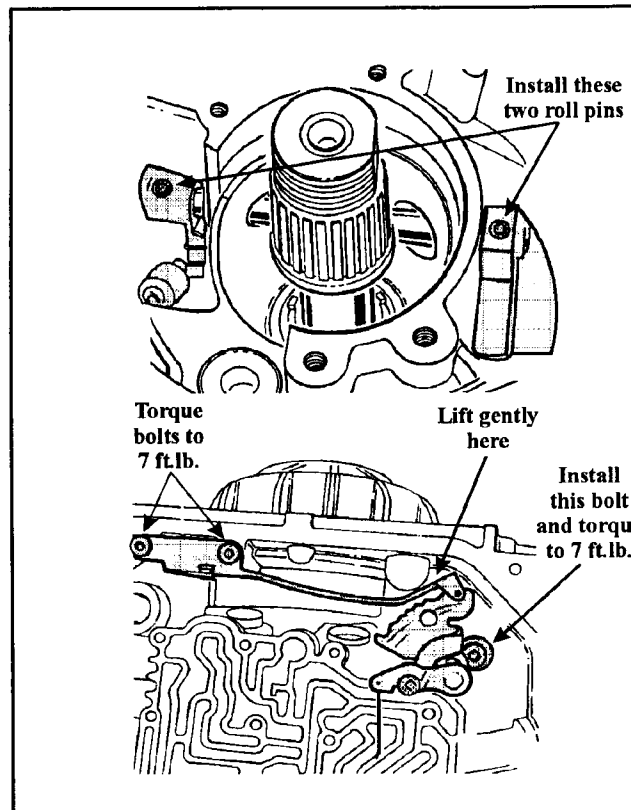


Figure 111

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 DIFFERENTIAL RING GEAR ASSEMBLY

1. Clean the differential assembly thoroughly in solvent, dry with compressed air, and set on a clean work area.
2. Heat the differential to 100 degrees F. and install a new tapered roller bearing, using tool V.W. 411 with adapter 40-21 or equivalent (See Figure 112 and 113).
3. Turn the differential over and install a new bearing on this side. Be careful not to break the speedometer drive gear (See Figure 113).
4. Coat the inside and outside of the plastic differential thrust washer with a small amount of gear oil and install into the differential (See Figure 114).
5. Insert the side pinion gears into the differential, one at a time, then coat the pinion shaft with a small amount of gear oil and carefully work the pinion shaft through the differential carrier and the gears with a twisting motion (See Figure 114).
6. Line up the hole in the pinion shaft with the hole in the carrier, then carefully install the retaining pin into the carrier with a drift punch.
7. Install the remaining two pinion gears into the carrier and make sure the splines line up with the holes in the carrier. Set the carrier aside for installation.

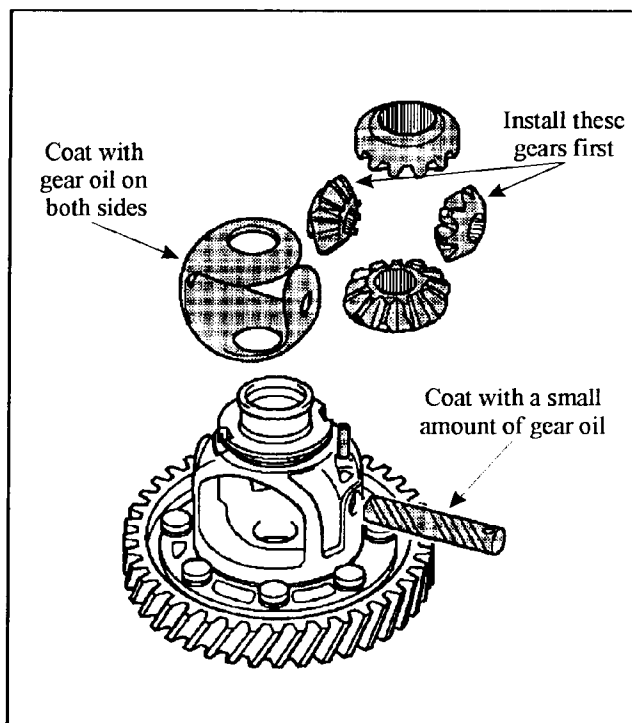


Figure 113

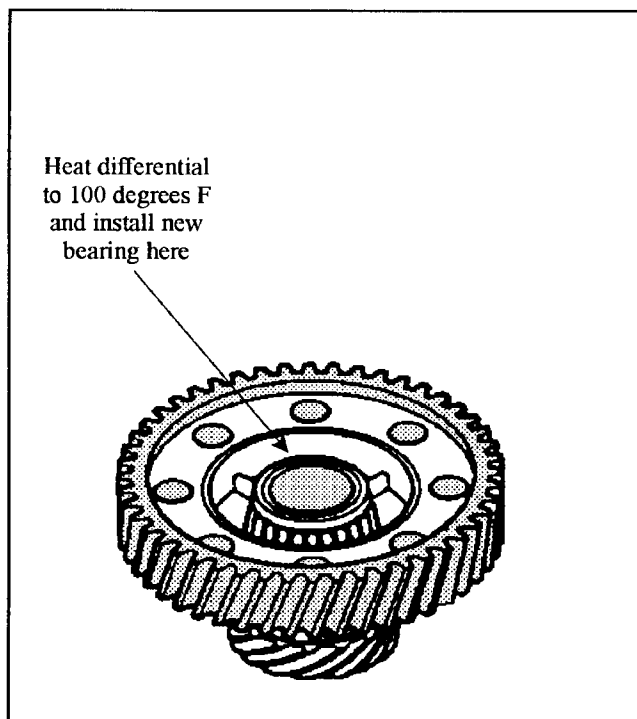


Figure 112

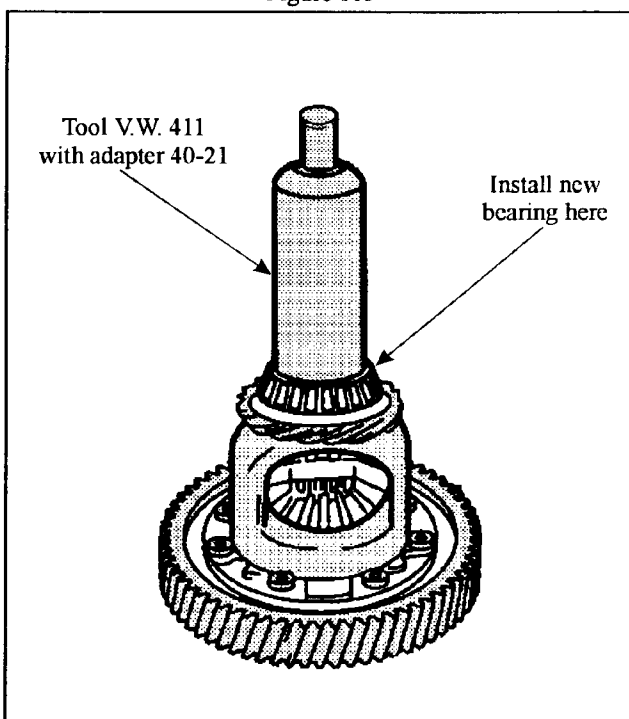


Figure 114

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. 096 PINION SHAFT ADJUSTMENT

To check pinion shaft end play, utilize the following manufacturer's procedure and calculation:

1. Place two 1.5mm (0.060") thick shims onto the pinion shaft as shown in Figure 115.
2. Install the pinion drive gear with the tapered roller bearing on the shaft. Engage the parking gear and tighten the 41mm hex head nut to 250 Nm (185 ft.lb.)
3. Attach a dial indicator to measure the shaft. set the gauge to read 1mm (0.040") and then ZERO the gauge.
4. Move the pinion shaft and read the end play clearance of the gauge.

An example of end play clearance of 0.93mm (0.004") will be used for the following calculation that is needed to determine the shim needed for proper end play.

**IMPORTANT:** When performing this end play check, never turn the pinion shaft during this procedure.

### CALCULATION:

1. Always use the total thickness of the shims installed:  
3mm (1.20")
2. Always use the figure 0.12mm (0.004") for the preload.
3. Always use the figure 0.10mm (0.003") for the compression.
4. This is how you calculate these numbers with the endplay clearance that was obtained with the dial indicator to determine the shim to be used.
 

|                                          |                             |
|------------------------------------------|-----------------------------|
| 1. Add the clearance of the pinion shaft | .93mm (0.04")               |
| to the preload figure                    | .12mm (.004")               |
| and to the compression figure            | .10mm (.003")               |
|                                          | <b>TOTAL 1.15mm (.047")</b> |
2. Subtract the total of the shim thickness used from the total calculated in step 1 above.
 

|  |                             |
|--|-----------------------------|
|  | 3.00mm (1.20")              |
|  | <b>MINUS 1.15mm (0.47")</b> |
3. The remaining number is the size of shim to be used.
 

|  |                |
|--|----------------|
|  | 1.85mm (0.73") |
|--|----------------|
4. Remove the transfer driven gear, and determine shim according to table on (Page 55 Figure 121). Install shim onto pinion shaft.
5. Reinstall the transfer driven gear, and tighten locking nut to 185 ft.lb. and peen nut over with a drift punch.

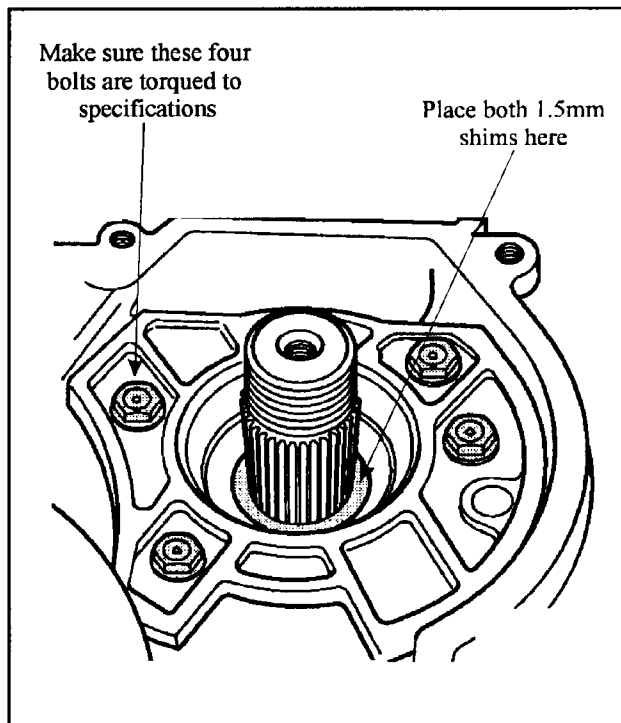


Figure 115

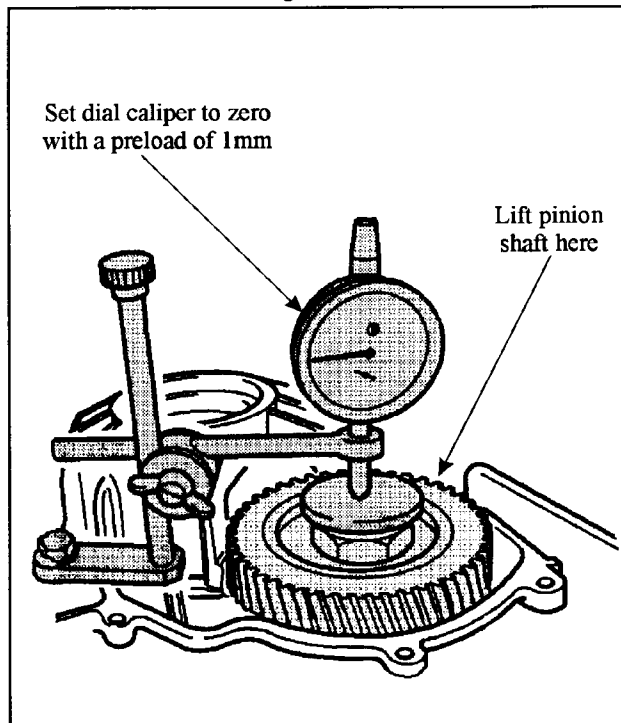


Figure 116

## V.W. 096 OUTPUT GEAR ADJUSTMENT

1. Install the output gear into the transaxle housing without the dished washer and without the shim.
2. Using a torque wrench, tighten the locking bolt for the output gear to 74ft.lb. Lock the parking gear if necessary (See Figure 117).
3. Remove the locking bolt.
4. Measure the distance between drive gear and tapered roller bearing inner race (See Figure 118).
5. Insert a dial gauge across the case and set it to zero, with a preload of 3mm then write down the reading (example 1.00mm).
6. The thickness of the dished washer 1.50mm must be added to this reading of 1.00mm, for a total reading of 2.50mm.
7. In order to calculate the specified bearing preload, subtract the bearing preload (0.18) from the total reading of the dial gauge (dished washer + reading = 2.50mm).

Example:

Dished washer + reading    2.50mm

Bearing preload            0.18mm

Gauged thickness of shim   2.32mm

8. Select the adjustment shim from the chart on (Page 55 Figure 121) and place the shim onto the output shaft.

9. Insert the axial bearing and the dished washer, then tighten the locking bolt to 185 ft.lb.

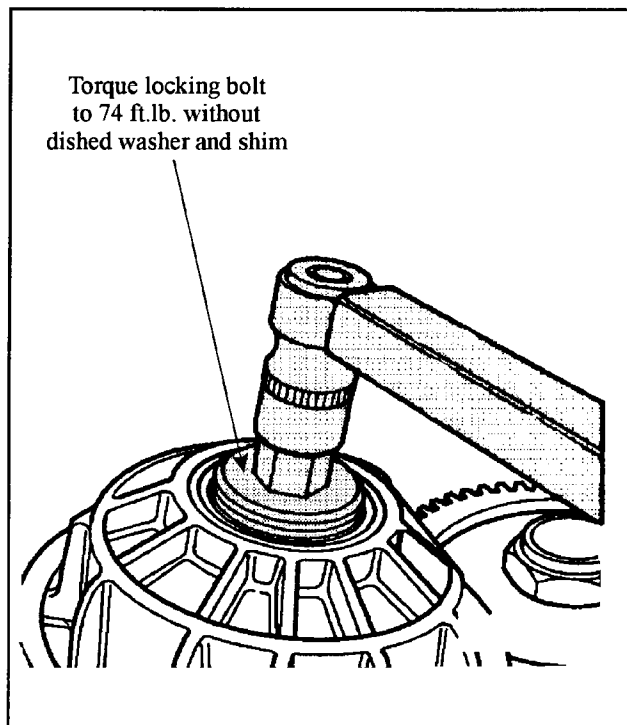


Figure 117

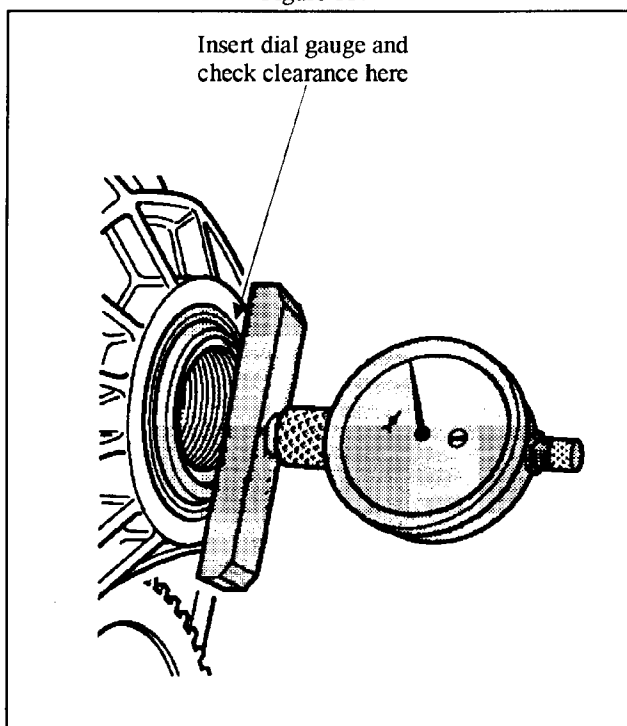


Figure 118

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. 096 TURNING TORQUE REQUIREMENTS

1. When checking turning torque for the transfer driven gear, it will first be necessary to lubricate the bearings with a small amount of gear oil before proceeding.
2. The turning torque for new tapered roller bearings on the transfer driven gear should be between (7.1 and 10.6 in.lb.) (See Figure 119 ).
3. When checking turning torque for the output ring gear, it will first be necessary to lubricate the bearings with a small amount of ATF before proceeding.
4. The turning torque for new tapered roller bearings on the output ring gear, should be between (15.9 and 19.5 in.lb.) higher than the turning torque at the transfer driven gear.

|                                       |                |
|---------------------------------------|----------------|
| Example:                              | Turning Torque |
| Transfer driven gear (measured value) | 8.85in.lb.     |
| Output gear (average value)           | 17.7 in.lb.    |
| Combined torque                       | 26.5 in.lb.    |

5. The friction torque of new tapered roller bearings should be between (5.3 and 7.1 in.lb.) higher than at the pinion.

|                                       |                |
|---------------------------------------|----------------|
| Example:                              | Turning Torque |
| Transfer driven gear (measured value) | 26.5 in.lb.    |
| Output gear (average value)           | 6.19 in.lb.    |
| Combined torque                       | 32.7 in.lb.    |

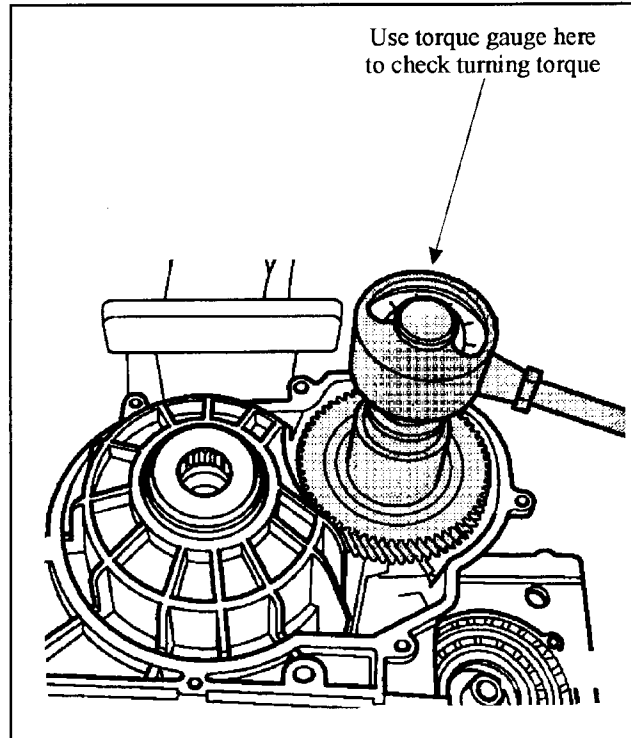


Figure 119

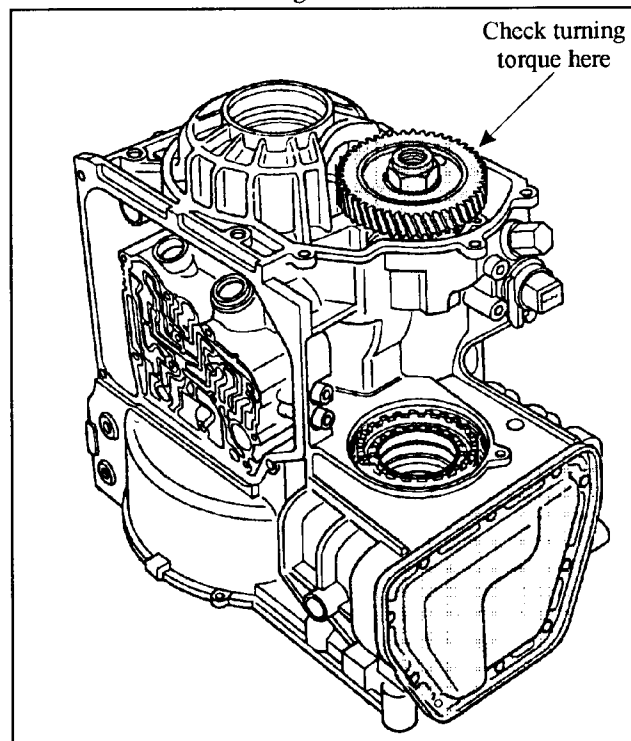


Figure 120

## AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. 096

### SHIM TABLE FOR PINION DRIVE AND OUTPUT GEARS

| Gauged Thickness (mm) | Shim Thickness (mm) | Gauged Thickness (mm) | Shim Thickness (mm) | Gauged Thickness (mm) | Shim Thickness (mm) |
|-----------------------|---------------------|-----------------------|---------------------|-----------------------|---------------------|
| 0.975 ... 0.999       | 1.000               | 1.550 ... 1.574       | 1.575               | 2.125 ... 2.149       | 2.150               |
| 1.000 ... 1.024       | 1.025               | 1.575 ... 1.599       | 1.600               | 2.150 ... 2.174       | 2.175               |
| 1.025 ... 1.049       | 1.050               | 1.600 ... 1.624       | 1.625               | 2.175 ... 2.199       | 2.200               |
| 1.050 ... 1.074       | 1.075               | 1.625 ... 1.649       | 1.650               | 2.200 ... 2.224       | 2.225               |
| 1.075 ... 1.099       | 1.100               | 1.650 ... 1.674       | 1.675               | 2.225 ... 2.249       | 2.250               |
| 1.100 ... 1.124       | 1.125               | 1.675 ... 1.699       | 1.700               | 2.250 ... 2.274       | 2.275               |
| 1.125 ... 1.149       | 1.150               | 1.700 ... 1.724       | 1.725               | 2.275 ... 2.299       | 2.300               |
| 1.150 ... 1.174       | 1.175               | 1.725 ... 1.749       | 1.750               | 2.300 ... 2.324       | 2.325               |
| 1.175 ... 1.199       | 1.200               | 1.750 ... 1.774       | 1.775               | 2.325 ... 2.349       | 2.350               |
| 1.200 ... 1.224       | 1.225               | 1.775 ... 1.799       | 1.800               | 2.350 ... 2.374       | 2.375               |
| 1.225 ... 1.249       | 1.250               | 1.800 ... 1.824       | 1.825               | 2.375 ... 2.399       | 2.400               |
| 1.250 ... 1.274       | 1.275               | 1.825 ... 1.849       | 1.850               | 2.400 ... 2.424       | 2.425               |
| 1.275 ... 1.299       | 1.300               | 1.850 ... 1.874       | 1.875               | 2.425 ... 2.449       | 2.450               |
| 1.300 ... 1.324       | 1.325               | 1.875 ... 1.894       | 1.900               | 2.450 ... 2.474       | 2.475               |
| 1.325 ... 1.349       | 1.350               | 1.900 ... 1.924       | 1.925               | 2.475 ... 2.499       | 2.500               |
| 1.350 ... 1.374       | 1.375               | 1.925 ... 1.949       | 1.950               | 2.500 ... 2.524       | 2.525               |
| 1.375 ... 1.399       | 1.400               | 1.950 ... 1.974       | 1.975               | 2.525 ... 2.549       | 2.550               |
| 1.400 ... 1.424       | 1.425               | 1.975 ... 1.999       | 2.000               | 2.550 ... 2.574       | 2.575               |
| 1.425 ... 1.449       | 1.450               | 2.000 ... 2.024       | 2.025               | 2.575 ... 2.599       | 2.600               |
| 1.450 ... 1.474       | 1.475               | 2.025 ... 2.049       | 2.050               | 2.600 ... 2.624       | 2.625               |
| 1.475 ... 1.499       | 1.500               | 2.050 ... 2.074       | 2.075               | 2.625 ... 2.649       | 2.650               |
| 1.500 ... 1.524       | 1.525               | 2.075 ... 2.099       | 2.100               | 2.650 ... 2.674       | 2.675               |
| 1.525 ... 1.549       | 1.550               | 2.100 ... 2.124       | 2.125               | 2.675 ... 2.699       | 2.700               |

Figure 121

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 PUMP REASSEMBLY

1. Set pump body on a flat work surface insert the pump gears in the body. The large gear will have a dot facing you when the gear is installed correctly. The smaller gear when installed correctly will have the deeper recess facing the stator housing (See Figure 122).
2. Insert the stator housing into the pump body and align the bolt holes.
3. Hand thread the 5 #30 Torx. bolts and hand tighten. When the bolts are snug, torque the bolts to 7 ft.lb. (See Figure 123).
4. Coat the vulcanized B2 piston with a small amount of vaseline or assembly lube and insert into the pump stator with a twisting motion (See Figure 123).
5. Place the pump washer on the stator, use a small amount of vaseline to hold washer in place if necessary.
6. Bore fit the smaller pump stator ring in the K1 clutch drum. Bore fit the two larger pump stator rings in the K2 clutch drum. Make sure all three rings fit snugly in the drums, then place them on the stator support and lock the tabs into place. Coat with a small amount of vaseline to aid in the assembly (See Figure 124).

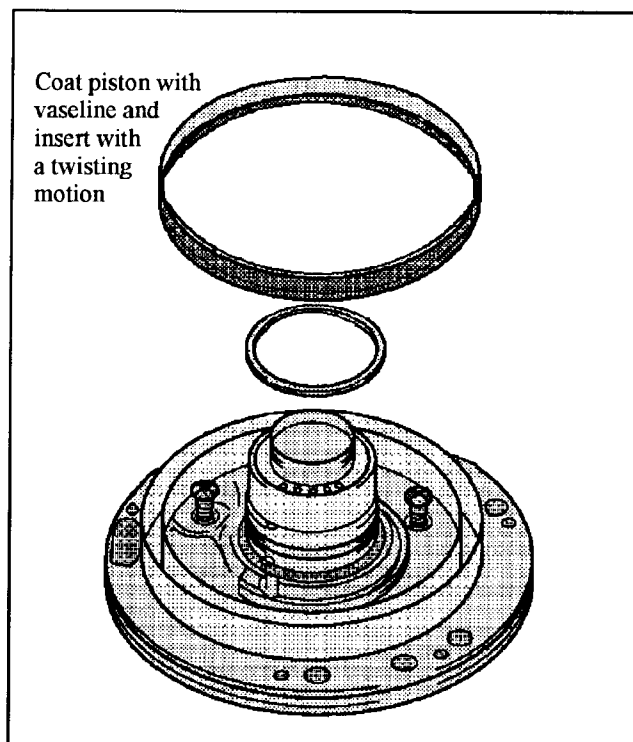


Figure 123

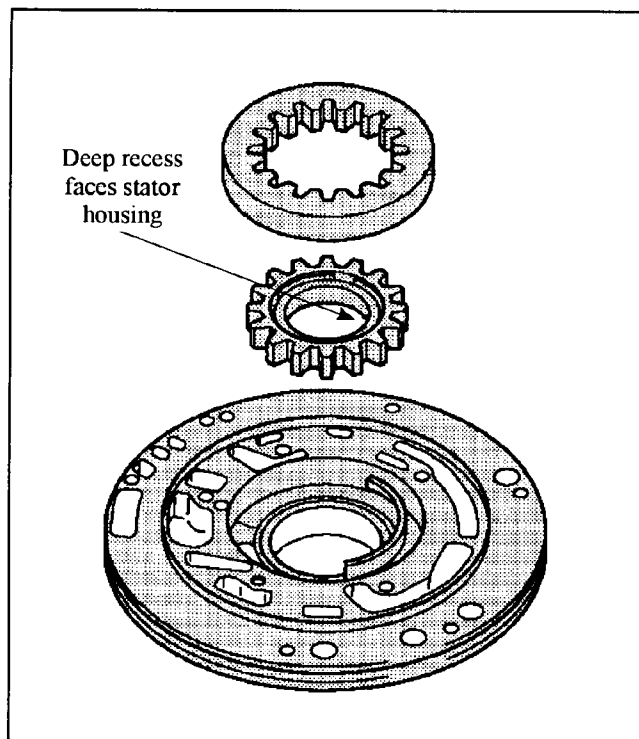


Figure 122

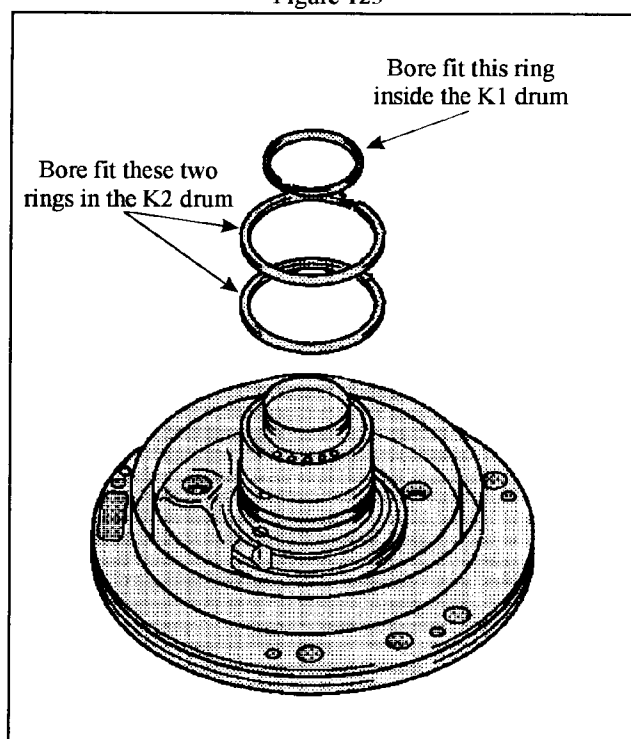


Figure 124

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 K1 CLUTCH DRUM REASSEMBLY

1. Inspect the K1 drum and insure that the check ball capsule is in good condition and not leaking.
2. Coat the vulcanized lip seals on the piston with vaseline or ATF and using a twisting motion install the piston into the clutch drum.
3. Install the two cushion rings on top of the piston as shown in Figure 129.
4. Install the piston apply ring and the clutch return spring, then install the .063 clutch return snap ring into the bottom groove in the drum and lock in place.
5. Install the piston return spring and then place the drum in a suitable press and compress the spring and install the snap ring and lock it in the groove in the top of the drum.
6. Install the clutch apply plate and one friction plate in the drum. Assemble the remaining friction plates and steels on the clutch hub in the following order: Pressure plate, friction, steel, friction, steel, friction, steel, and then lock the plastic support rings in the hub, and install the assembly in the drum (See Figure 130).
8. Install the .083 clutch retaining snap ring in the drum and check for clutch clearance. Adjust if necessary to approximately .008" to .010" per friction.
9. Install the sealing rings on the drum and set aside for reassembly later.

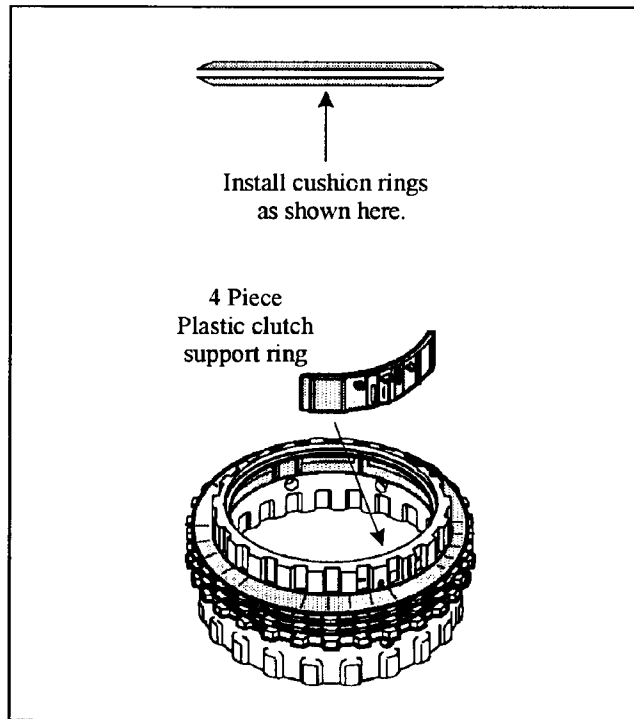


Figure 125

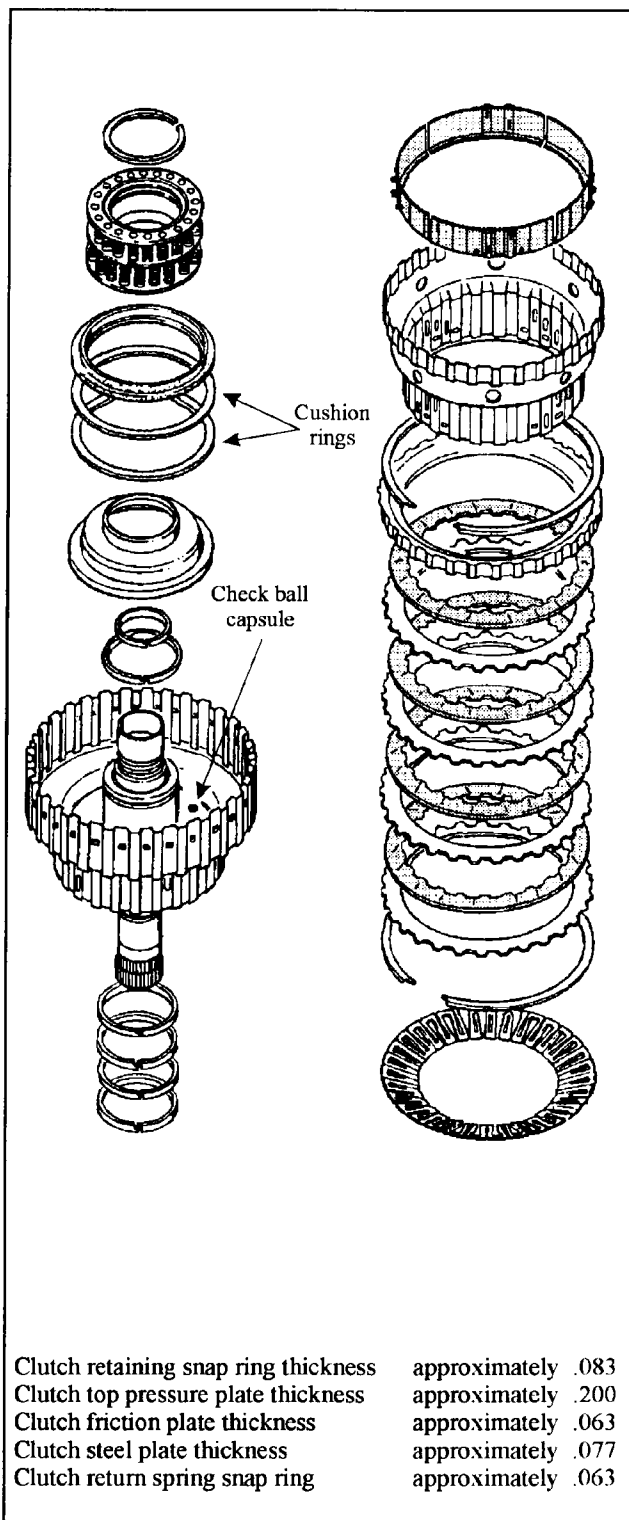


Figure 126

## V.W. AUDI 096 - 097 K2 CLUTCH DRUM REASSEMBLY

19. Inspect the K2 drum and insure that the check ball capsule is in good condition and not leaking (See Figure 128).

20. Coat the vulcanized lip seals on the piston with Vaseline or ATF and using a twisting motion install the piston into the clutch drum.

21. Install the piston retainer spring seat and the piston return spring retainer in the drum.

22. Place the drum in a press and carefully compress the spring far enough to install the piston retainer snap ring in the snap ring groove. Take care when compressing the retainer spring it is fragile and may be easily bent if not compressed evenly and carefully (See Figure 127).

23. Install the waved cushion plate in the drum and stack remaining clutches and steels as follows: steel, friction, steel, friction, steel, friction, steel, pressure plate (See Figure 128).

24. Install the .057" snap ring in the snap ring groove and check for clutch clearance. Adjust if necessary to approximately .008" to .010" per friction.

Care must be taken when compressing this spring retainer. Make sure that the retainer goes down over the drum evenly and does not get caught in the snap ring groove and bent. A bent or damaged spring retainer must be replaced.

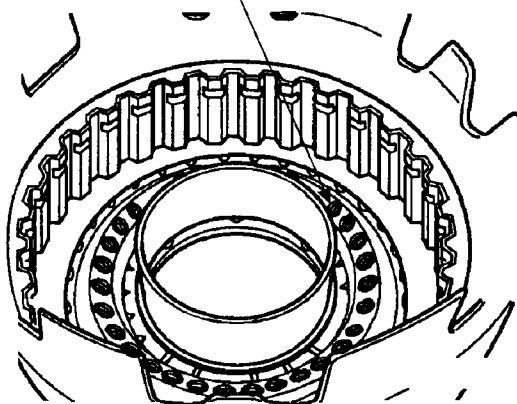
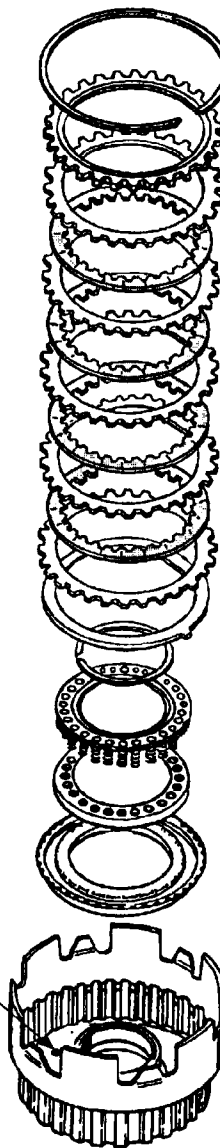


Figure 127

Check ball capsule



|                                      |                    |
|--------------------------------------|--------------------|
| Clutch retaining snap ring thickness | approximately .057 |
| Clutch top pressure plate thickness  | approximately .185 |
| Clutch friction plate thickness      | approximately .061 |
| Clutch steel plate thickness         | approximately .077 |
| Clutch waved steel thickness         | approximately .058 |

Figure 128

## V.W. AUDI 096 - 097 K3 CLUTCH DRUM REASSEMBLY

10. Inspect the K3 drum and insure that the check ball capsule is in good condition and not leaking Figure 130.
11. Coat the vulcanized lip seals on the piston with Vaseline or ATF and using a twisting motion install the piston into the clutch drum.
12. Install the clutch return spring into the drum then install the .095" snap ring into the bottom groove in the drum and lock in place.
13. Install the piston return springs in the spring retainer then place them in the spring seat and set the assembly on top of the piston in the drum.
14. Place the drum in a press and compress the springs far enough to replace the snap ring in the snap ring groove. Be careful not to damage the spring retainer.
15. Install the bottom pressure plate with the apply ring in the bottom of the drum.
16. Stack the clutches in the drum as follows: friction, steel, friction, steel, friction, steel, friction, and the top pressure plate (See Figure 130).
17. Install the clutch retaining snap ring .095" in the drum, and check for clutch clearance. Adjust if necessary to .008" to .010" per friction.
18. Install the sealing rings in the drum. Use care when installing the hidden ring, use a pair of scribes to remove and replace the ring (See Figure 129). **Do not attempt to press the shaft out of the drum. It may result in damage to the drum.**

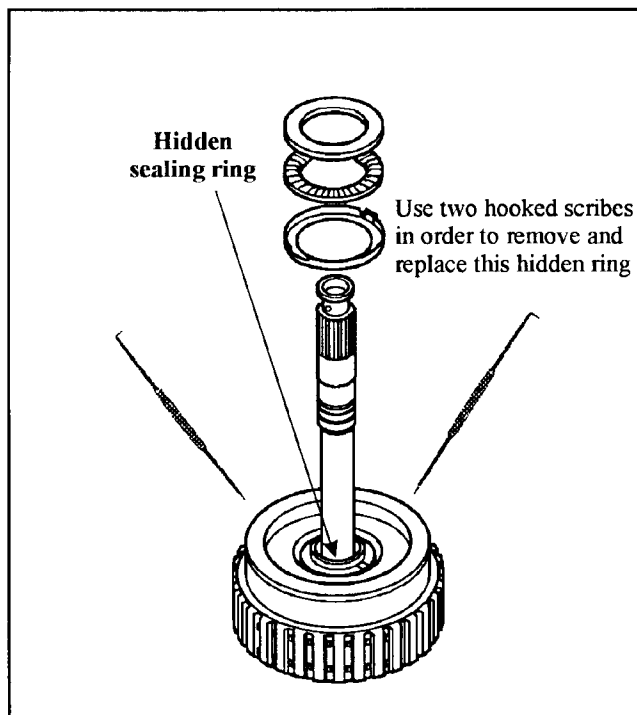


Figure 129

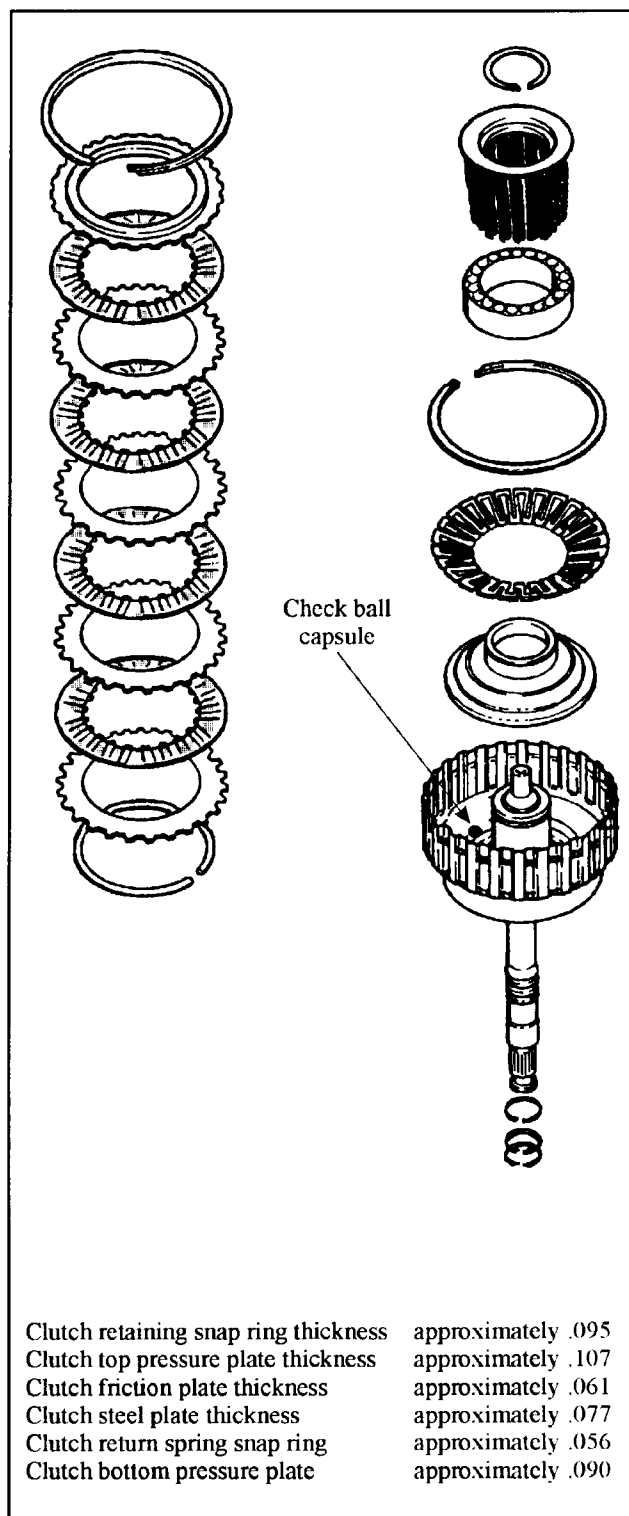


Figure 130

## V.W. AUDI 096 - 097 WASHER AND BEARING LOCATIONS

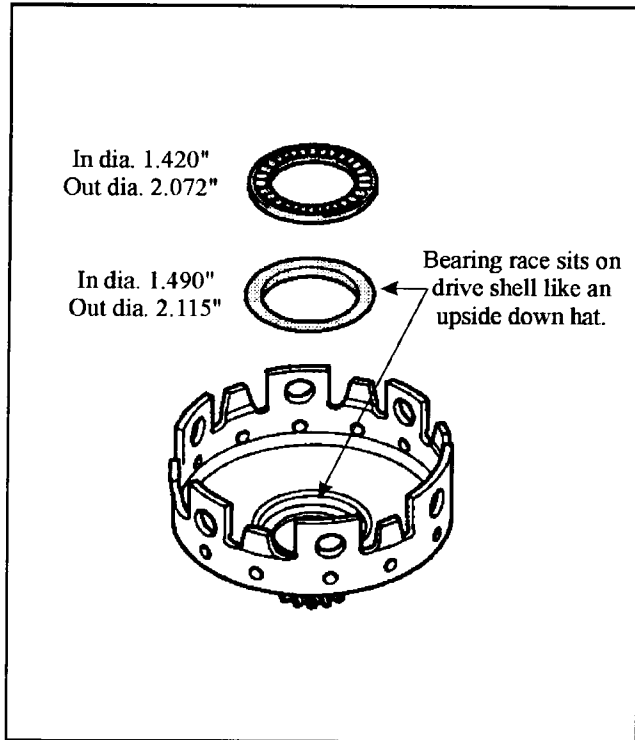


Figure 131

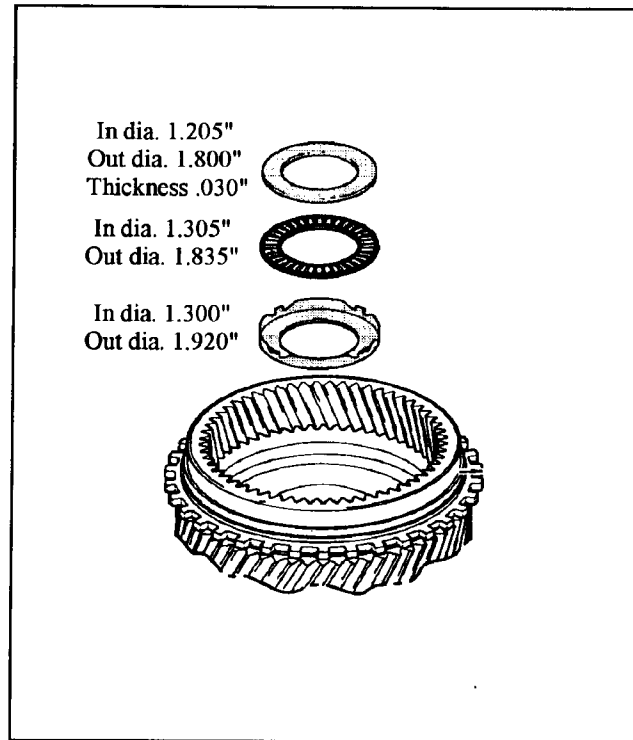


Figure 133

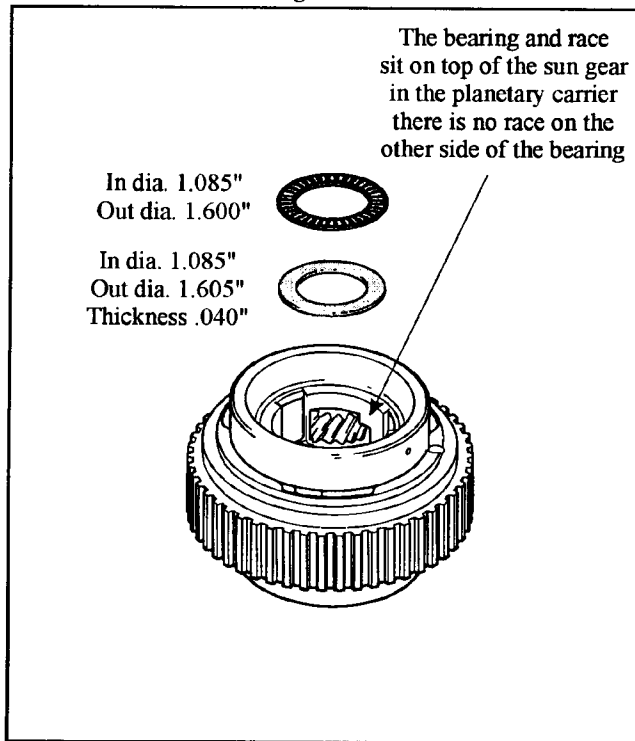


Figure 132

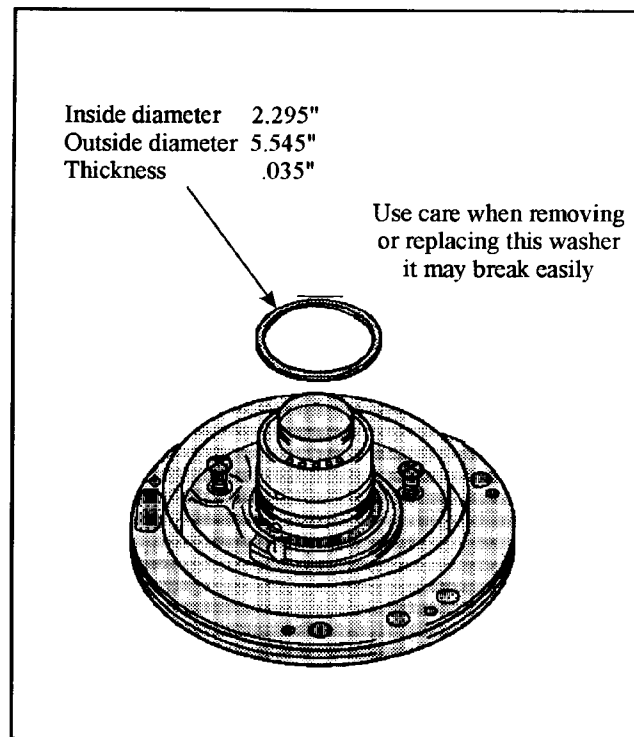


Figure 134

AUTOMATIC TRANSMISSION SERVICE GROUP

# V.W. AUDI 096 - 097 WASHER AND BEARING LOCATIONS

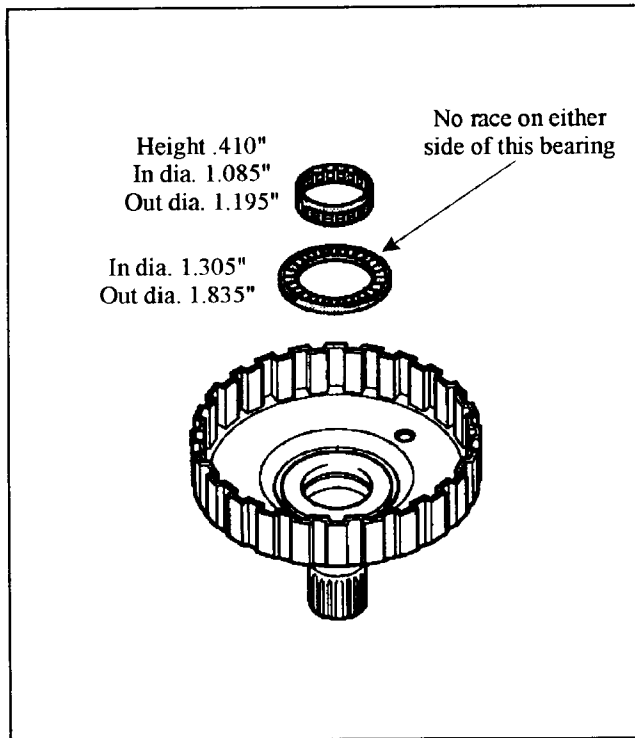


Figure 135

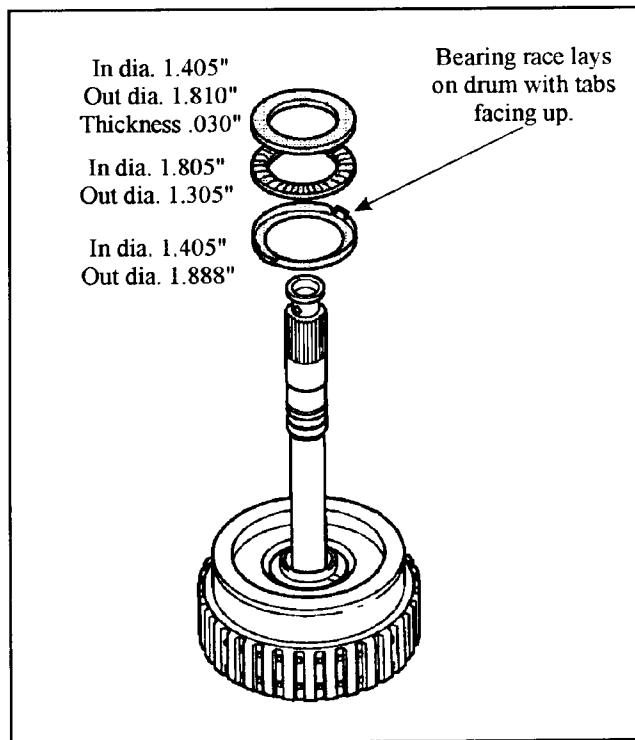


Figure 137

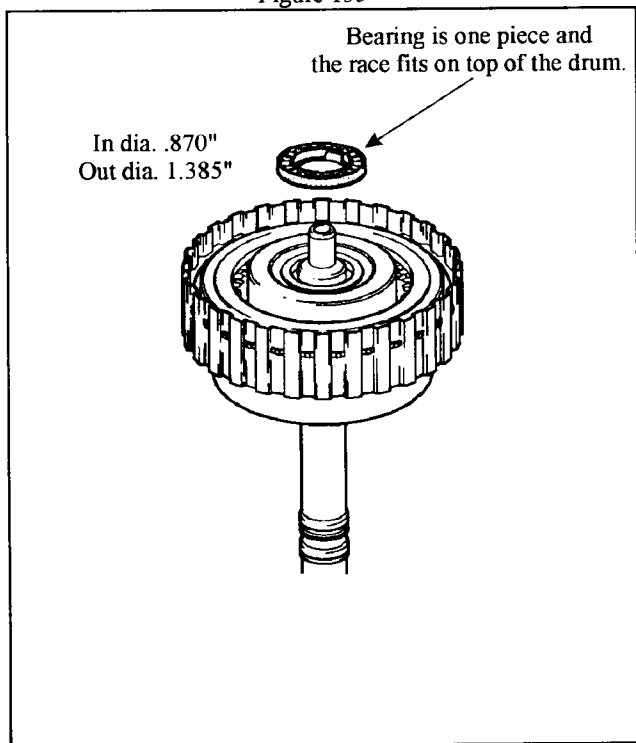


Figure 136

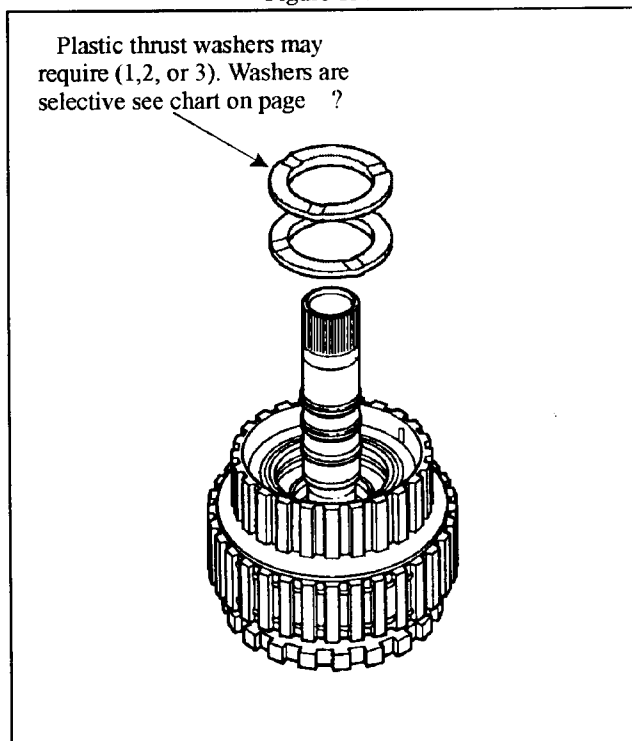


Figure 138

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TRANSAXLE REASSEMBLY

1. Place the transaxle on a workbench and insert the output ring gear into the transaxle (See Figure 139).
2. When the output ring gear bearing is seated in the inner race of the transaxle case, place the outer tapered bearing onto the output ring gear and line up the tabs as shown in Figure 140.
3. Install the axial bearing into the output ring gear, with the lip facing into the transmission (See Figure 139).
4. Install the proper shim for preload. Refer to adjustment procedure. Figure 117 and 118 Page 53 and also shim selective chart Figure 121 Page 55.
5. Install the dished washer into the output ring gear with the dish facing down as shown in Figure 141.
6. Thread the locking bolt into the threads on the output ring gear, and torque to 185 ft.lb. (See Figure 141).

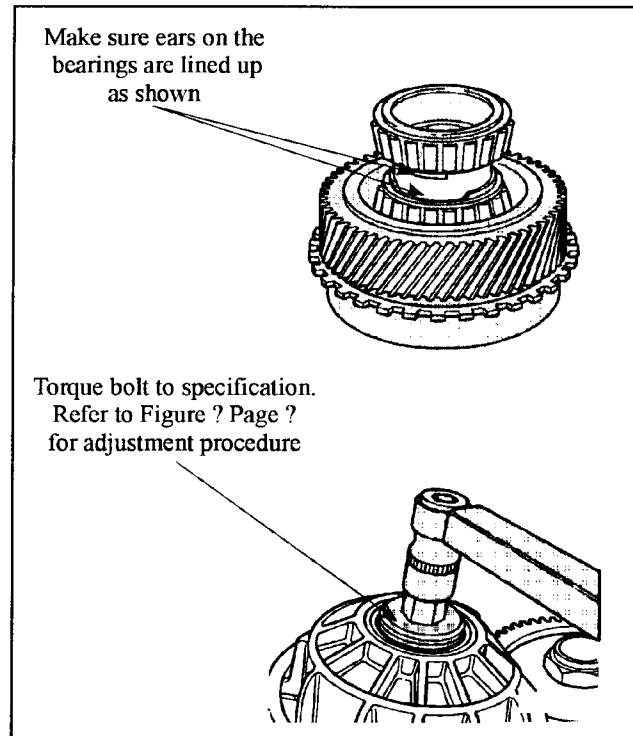


Figure 140

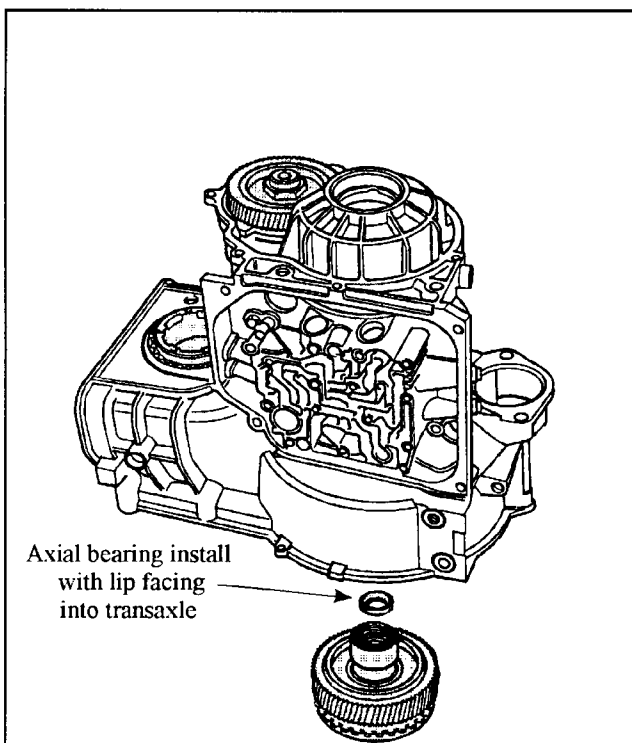


Figure 139

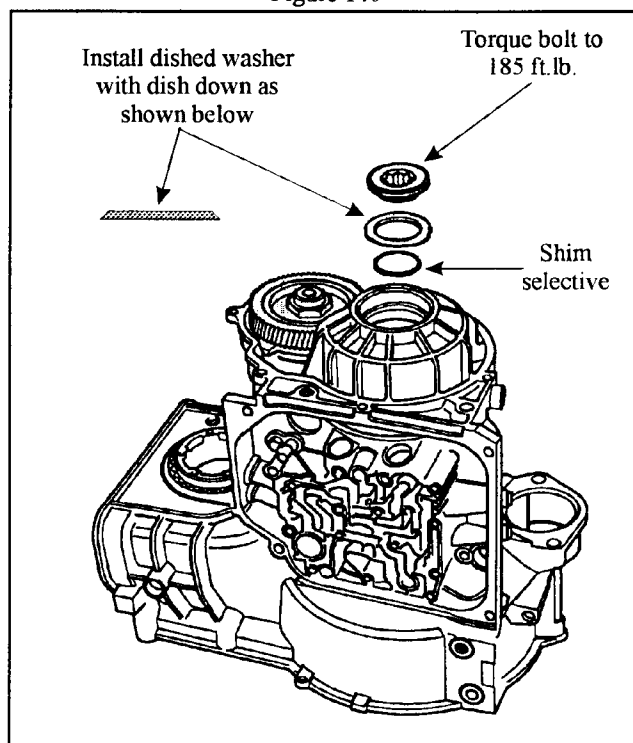


Figure 141

AUTOMATIC TRANSMISSION SERVICE GROUP

7. Install the bearing race and the torrrington bearing onto the output ring gear and secure with a small amount of Vaseline (See Figure 142).

8. Install a new O-ring in the planetary and the bearing race as shown in Figure 143.

9. Install the planetary into the output ring gear.

10. Install the B1 clutches into the transmission housing in the following order. Thick steel, steel plate, friction plate, steel plate, friction plate, steel plate, friction plate, steel plate, friction plate, steel plate, friction plate, pressure plate piston return spring (See Figure 144).

11. Set clutch clearance using a feeler gauge in the case between the frictions and steels of the B1 clutch as shown in Figure 144. Set clearance to approximately .008" to .010" per friction.

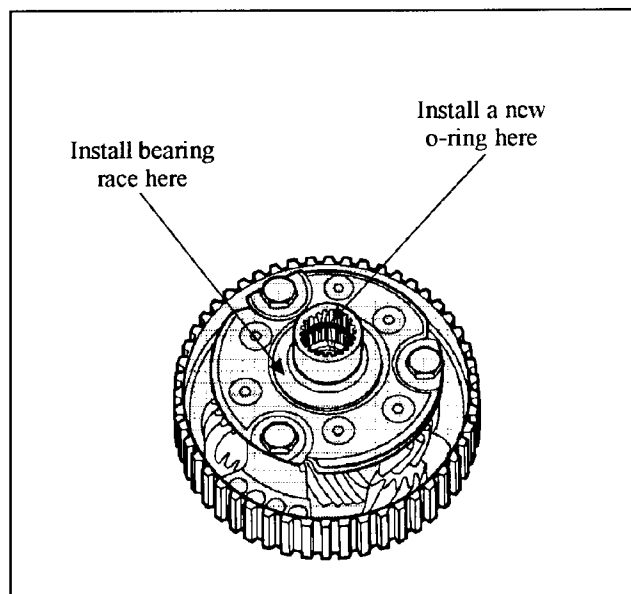


Figure 143

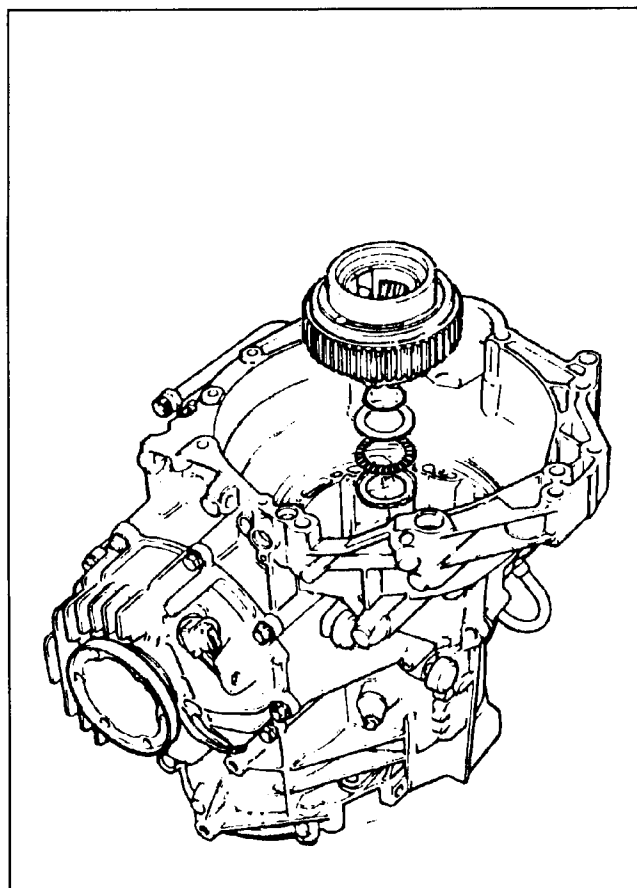


Figure 142

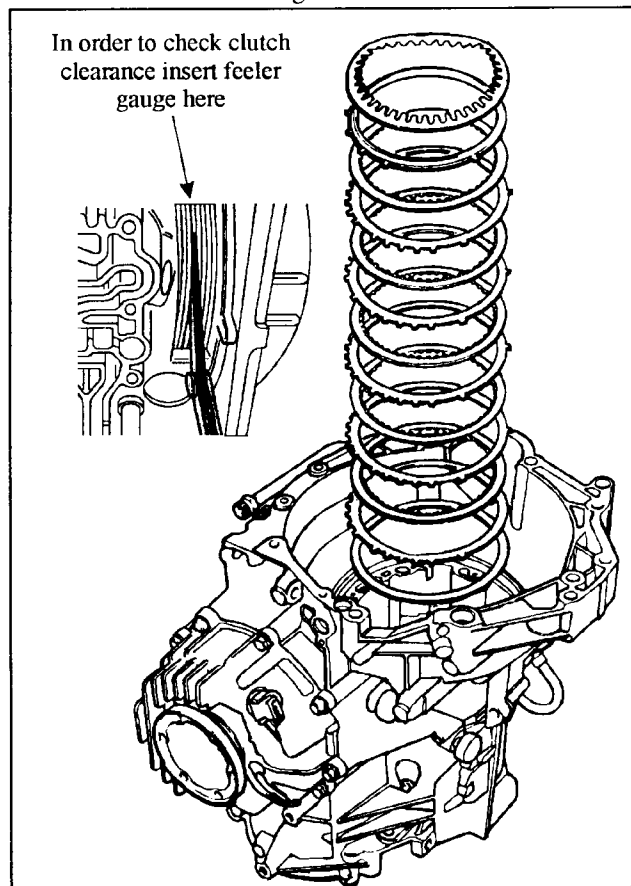


Figure 144

## AUTOMATIC TRANSMISSION SERVICE GROUP

12. Install the small sun gear into the planetary carrier then install the bearing race and torrrington bearing (See Figure 145).

13. Install the low sprag also called the B1 clutch housing into the transmission lining up the lug on the sprag with the slot in the case (See Figure 146).

14. Compress the B1 clutch housing enough to insert the snap ring into the groove in the case.

15. When the sprag is installed correctly, the planetary carrier will freewheel clockwise, and lock counter clockwise.

16. Insert the snap ring for the hollow supporting tube into the groove in the case.

17. Insert the drive shell into the planetary gears with a twisting motion.

18. Install the bearing race and the bearing onto the drive shell as shown in Figure 147.

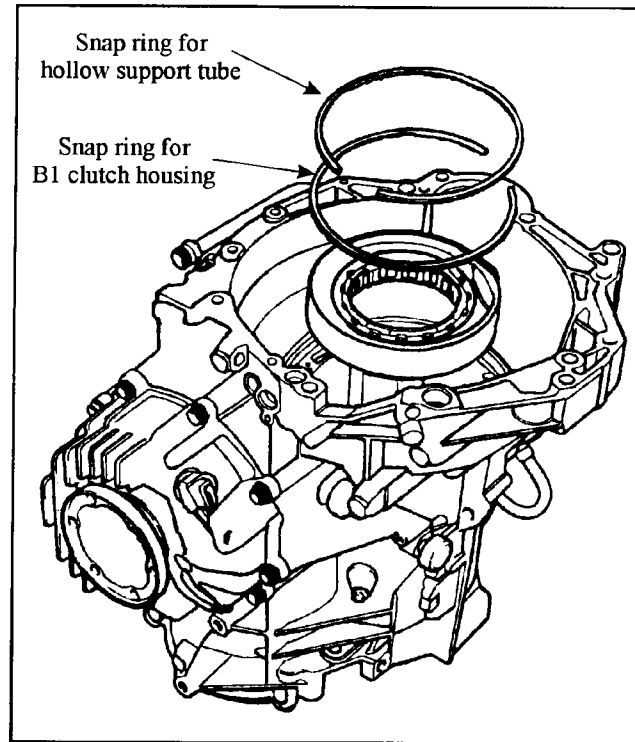


Figure 146

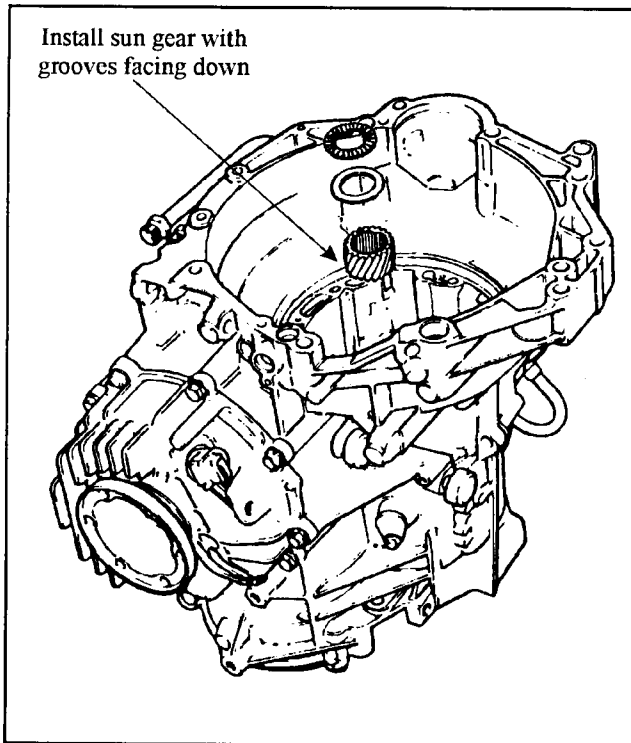


Figure 145

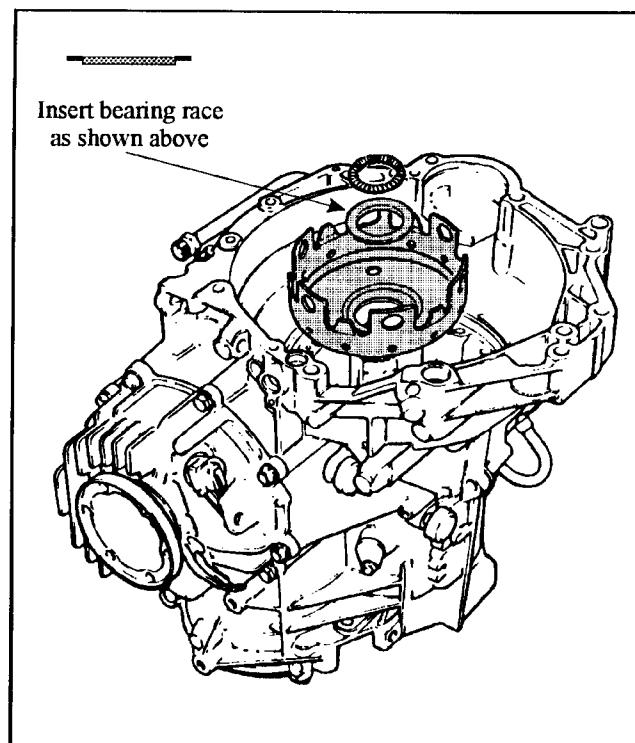


Figure 147

AUTOMATIC TRANSMISSION SERVICE GROUP

19. Install the large driveshaft into the case, and spline into the small sun gear (See Figure 148).

20. Install the two torrrington bearings into the large driveshaft (See Figure 148).

21. Install the small driveshaft into the large drive shaft and spline into the splines of the planetary carrier (See Figure 149).

22. Install the 13mm head hex bolt into the back of the small driveshaft as shown in Figure 150 and torque the bolt to 22 ft.lb.

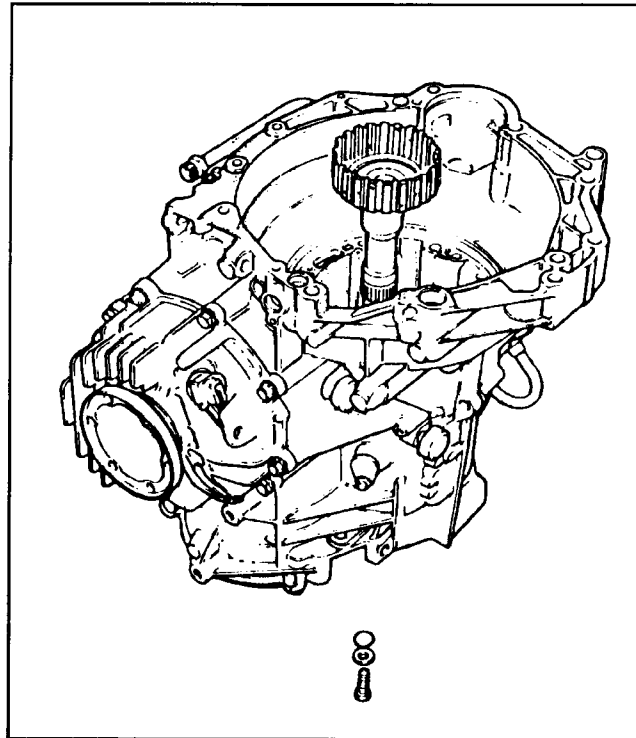


Figure 149

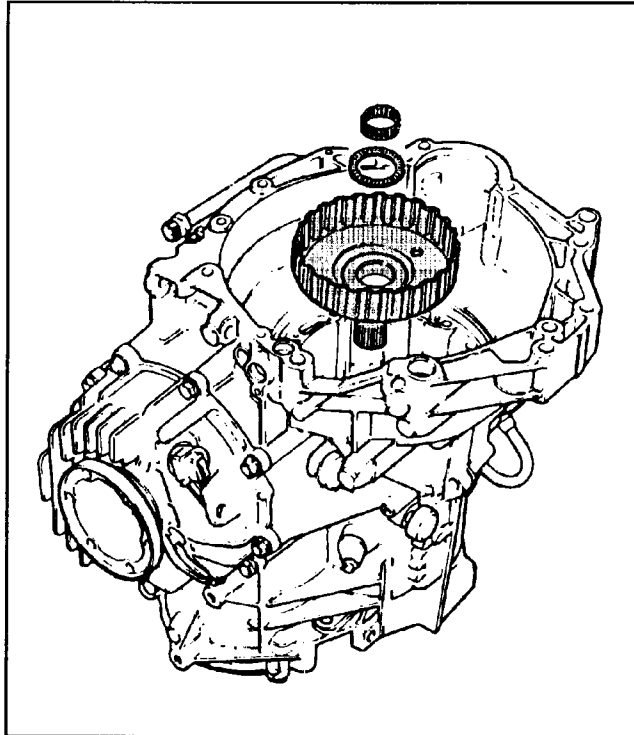


Figure 148

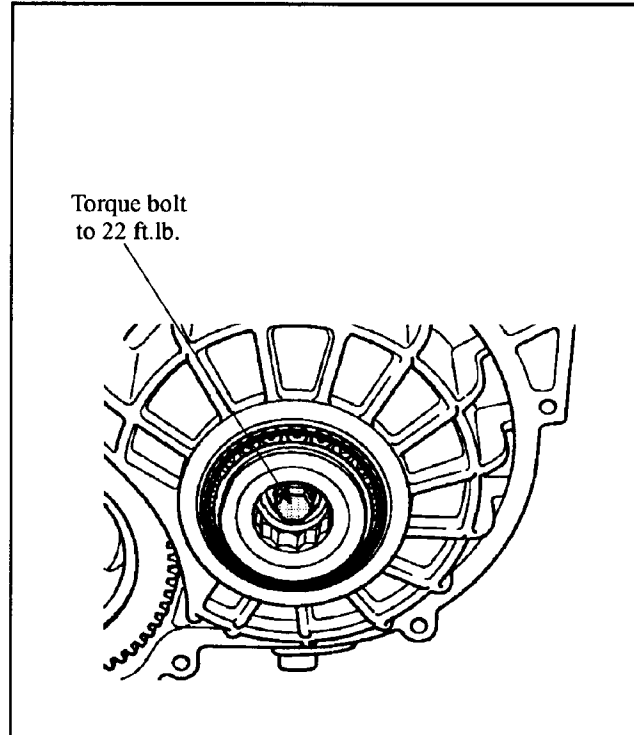


Figure 150

## AUTOMATIC TRANSMISSION SERVICE GROUP

23. Insert the bearing and race on the K3 drum.

24. Install the K3 drum into the case, and twist until the clutches are splined onto the small drive shaft (See Figure 151).

25. Insert the torrington bearing and both races onto the K3 drum (See Figure 151).

26. Install the K1 drum into the case, and twist until the clutches are splined onto the large drive shaft (See Figure 152).

27. Install the two plastic selective washers on the back side of the K1 drum (See Figure 152).

28. Install the K2 drum into the case, and twist until the clutches are splines onto the K1 drum (See Figure 153).

29. Insert the hollow supporting tube into the case over the K2 drum, and line up the notch in the tube with the lug on the B1 clutch housing (See Figure 153).

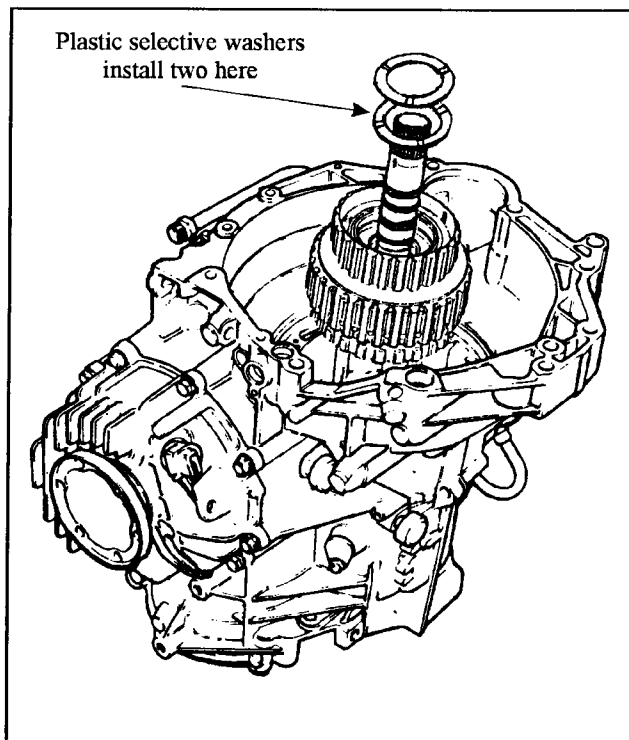


Figure 152

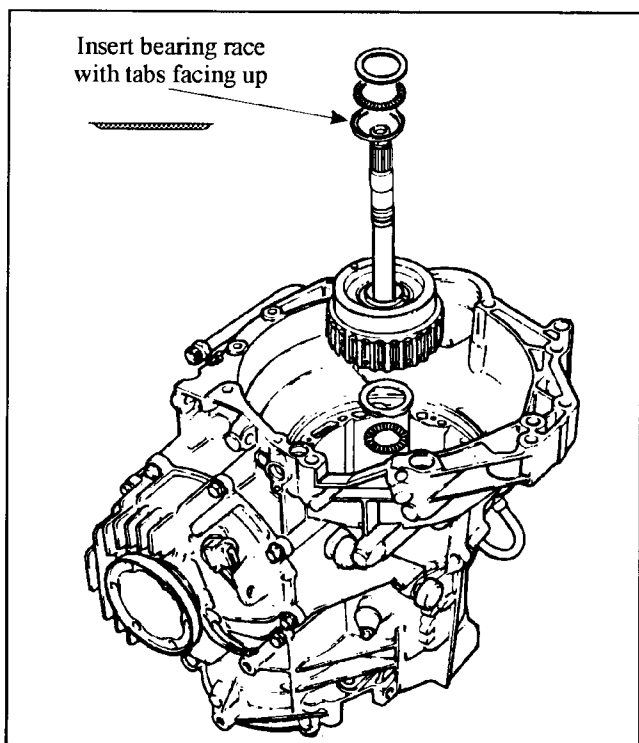


Figure 151

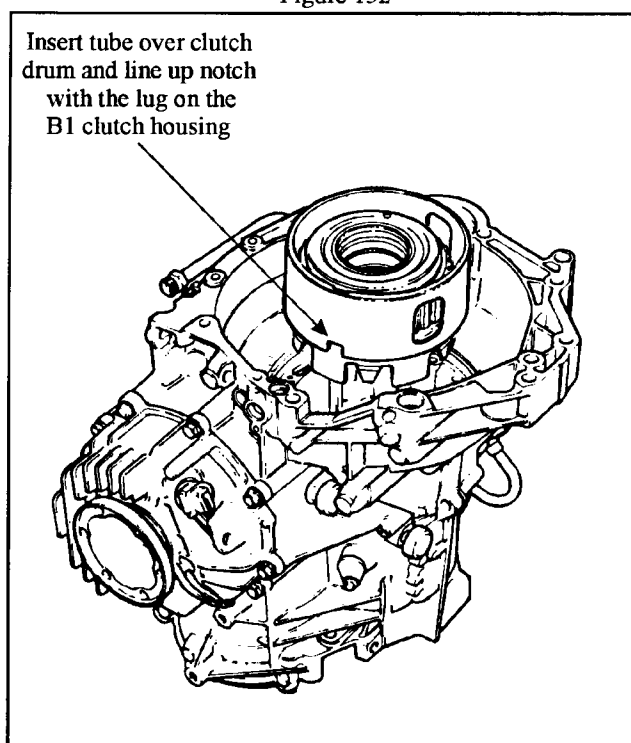


Figure 153

## AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097

### ADJUSTMENT PROCEDURE OF THE K1 AND K2 CLUTCH

1. To calculate the clutch play between the K1 and K2 clutch, first calculate the thickness of the shim. This is done by determining the size of gap and calculating the thickness of the shim. (Gap = "A" minus "B")
2. Calculating "A": Place a straightedge onto transmission housing. Press down on K1 drum with washer removed and measure distance into K1 drum with a depth gauge (See Figure 154). Example: Reading 1 = 88.5 mm).
3. Measure with a depth gauge to pump flange on the transmission housing (See Figure 155).  
Example: Reading 2 = 34.3 mm
- Reading 1      88.5 mm  
Minus Reading 2      34.3 mm "A" = 54.2 mm
4. This is the size measured from pump flange or the transmission housing into the K1 drum.
5. Calculating "B": Place straightedge onto stator support and measure with a depth gauge to gasket of pump flange (See Figure 156).  
Example: Reading      70.5 mm  
Minus Straightedge      19.5 mm "B" = 51.0 mm  
54.2 mm minus 51.0 mm = 3.2 mm
6. Determine size of shim according to table in Figure 157 Page 68.

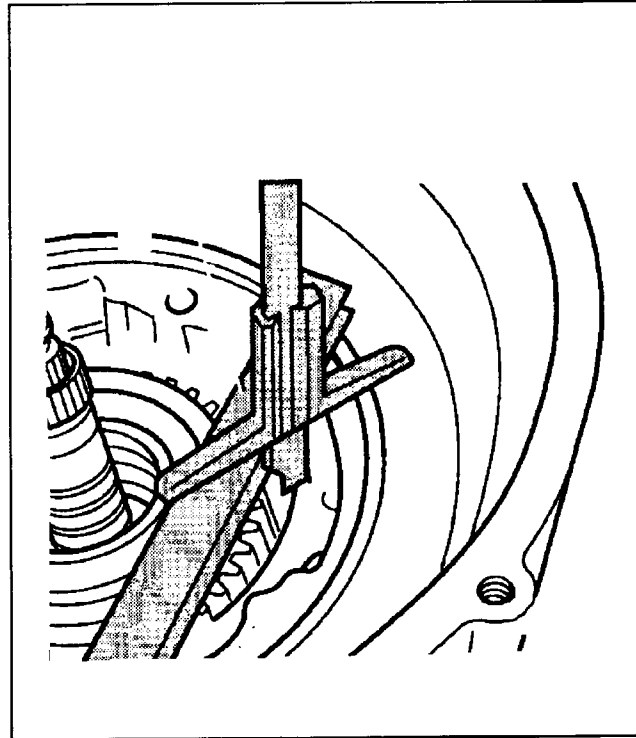


Figure 155

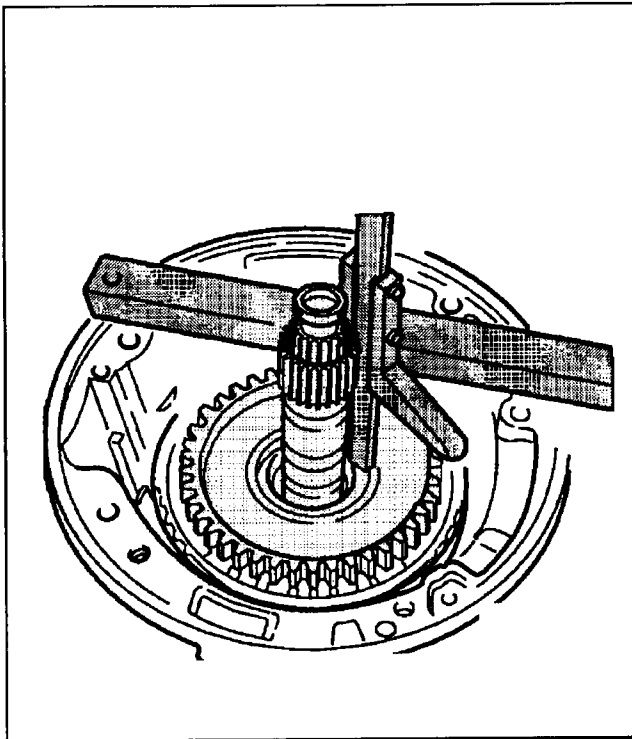


Figure 154

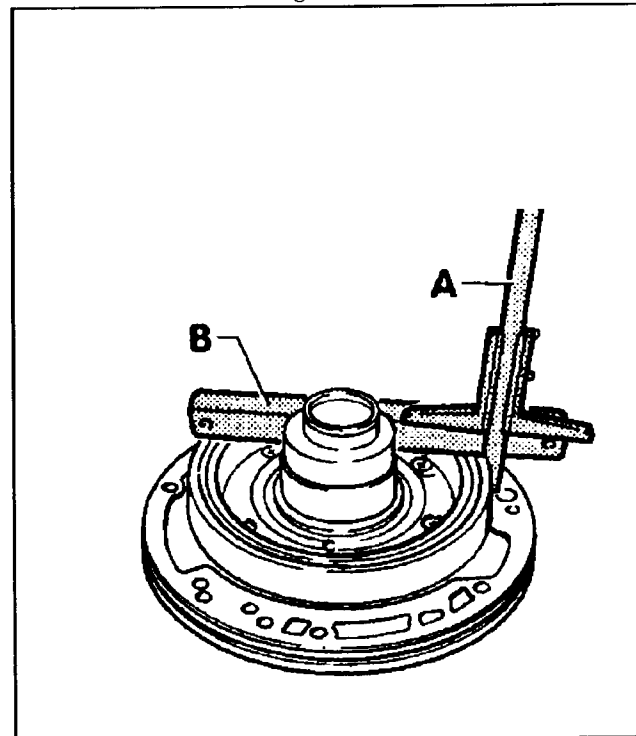


Figure 156

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 B2 CLUTCH ADJUSTMENT

1. To adjust the B2 brake, first calculate the thickness of the last externally toothed plate. This is done by determining the size of the gap and calculating the thickness of the externally toothed steel plates. Example: (Gap = "A" minus "B" minus 3.6)

2. In order to calculate "A", measure from the transmission housing to the last friction plate with a depth gauge. Press down on the last friction plate and take a measurement of the depth between the transmission housing and the last friction plate (See Figure 158)

Example: Reading "A" = 30.2 mm

3. To calculate "B", place a straightedge onto the stator support and measure with depth gauge to gasket of the pump flange as shown in Figure 159.

Example: Reading = 40.1 mm

Minus Straightedge = 19.5 mm ("B" = 20.6 mm)

(Gap = 30.2 mm minus 20.6 mm minus 3.6 = 6.00 mm)

4. Determine the thickness of the last steel plate by using the table in Figure 157 below. It may be necessary to use two steels for the last steel plate instead of one.

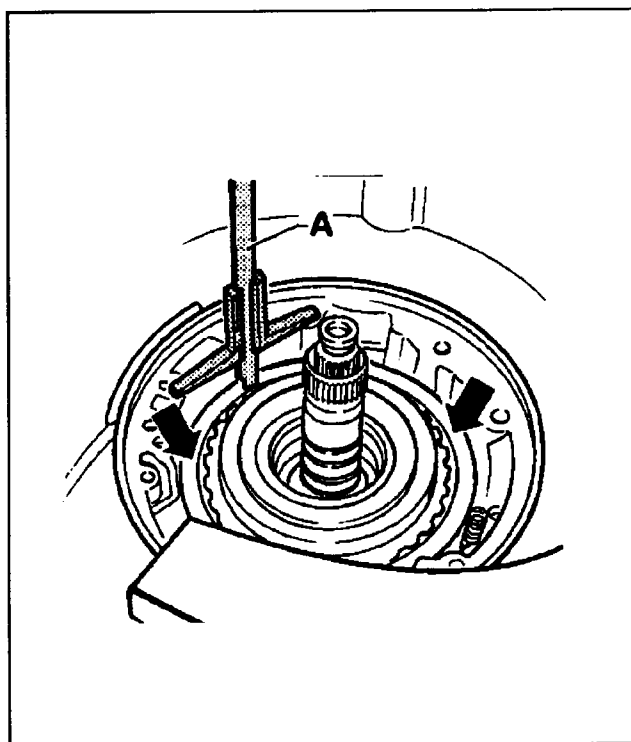


Figure 158

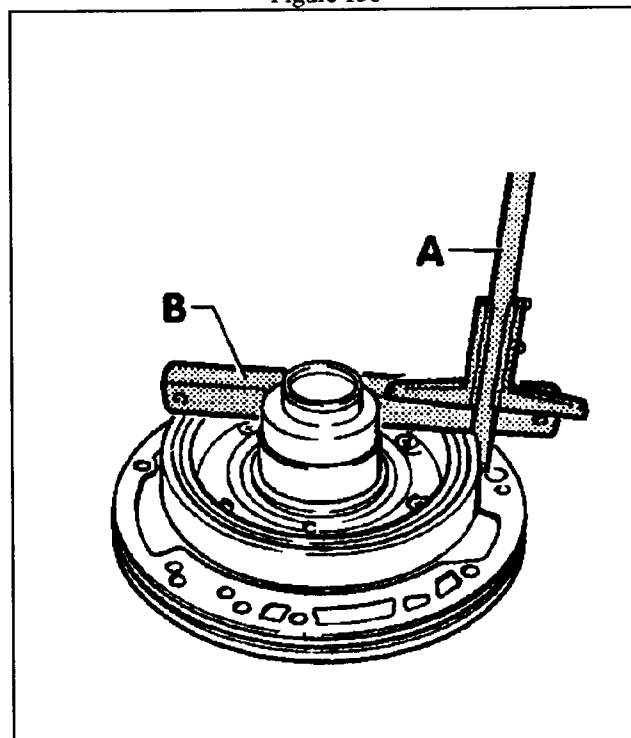


Figure 159

Shim Table

| Gap in (mm) | Shims in (mm)   |
|-------------|-----------------|
| 0.00 - 2.54 | 1.4             |
| 2.55 - 3.09 | 1 + 1           |
| 3.10 - 3.49 | 1.2 + 1.2       |
| 3.50 - 3.89 | 1.4 + 1.4       |
| 3.90 - 4.29 | 1.6 + 1.6       |
| 4.30 - 4.69 | 1.8 + 1.8       |
| 4.70 - 5.04 | 1.2 + 1.2 + 1.6 |
| 5.05 - 5.25 | 1.2 + 1.2 + 1.8 |

Steel Plate Table

| Gap in (mm) | Steel Plate in (mm) |
|-------------|---------------------|
| 4.25 - 4.49 | 2.75                |
| 4.50 - 4.74 | 3.00                |
| 4.75 - 4.99 | 3.25                |
| 5.00 - 5.24 | 3.50                |
| 5.25 - 5.49 | 3.75                |
| 5.50 - 5.74 | 2.00 + 2.00         |
| 5.75 - 5.99 | 2.00 + 2.25         |
| 6.00 - 6.24 | 2.25 + 2.25         |
| 6.25 - 6.49 | 2.25 + 2.50         |
| 6.50 - 6.74 | 2.50 + 2.50         |
| 6.75 - 7.00 | 2.50 + 2.75         |

Figure 157

AUTOMATIC TRANSMISSION SERVICE GROUP

30. Install the B2 clutches on the top of the hollow supporting tube in the following order shown in Figure 160 below. Steel, friction, steel, friction, steel, friction, steel, friction, thick steel, or use two regular steel plates, waved steel. Set clutch clearance according to Page 68 Figure 157, 158 and 159.

31. Install a new pump gasket and O-ring on the pump, and set the pump assembly into the case (See Figure 161.

32. Hand thread the 7 pump attaching bolts into the case, and **"Hand Tighten Only"** to 70 in.lb. then turn an extra one quarter turn tighter. Use the sequence shown in Figure 162.

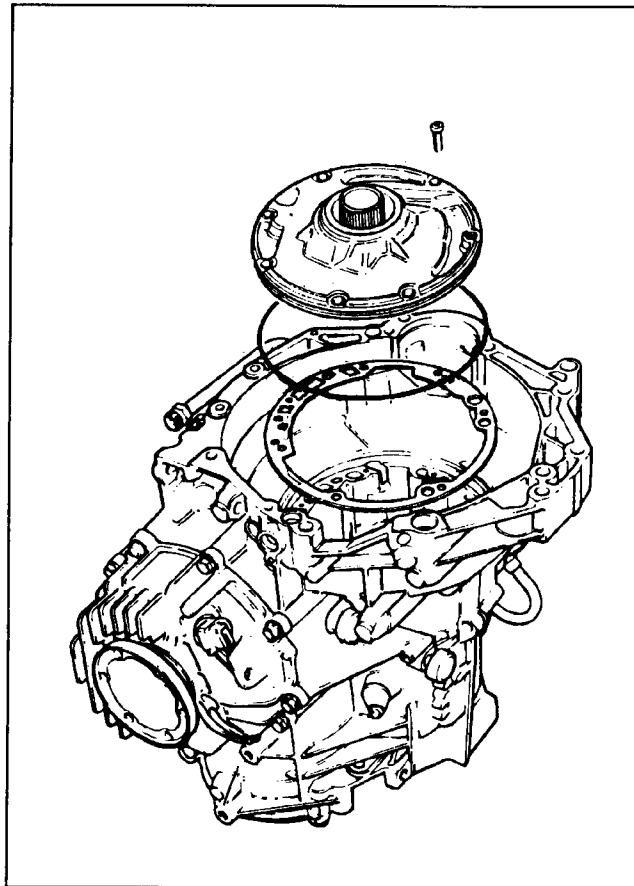


Figure 161

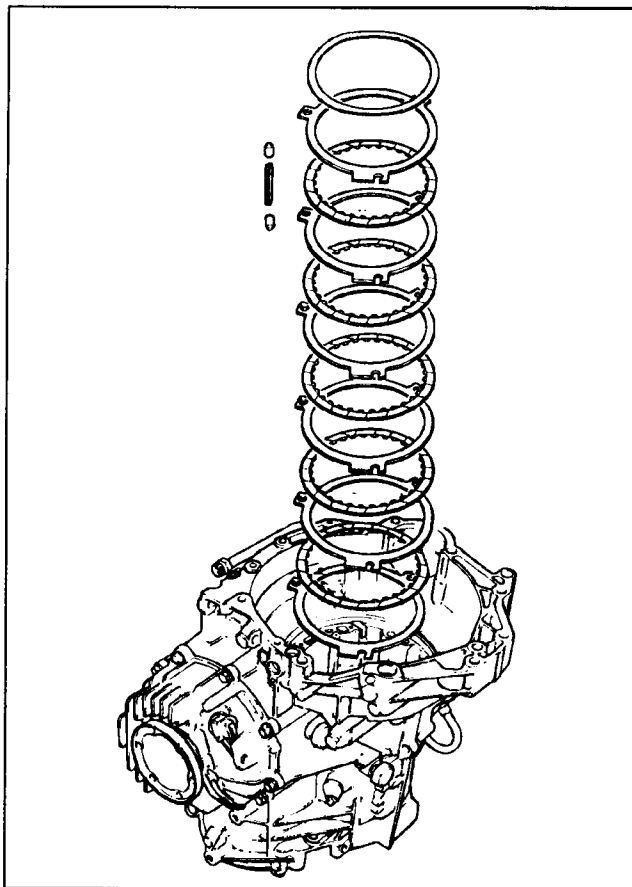


Figure 160

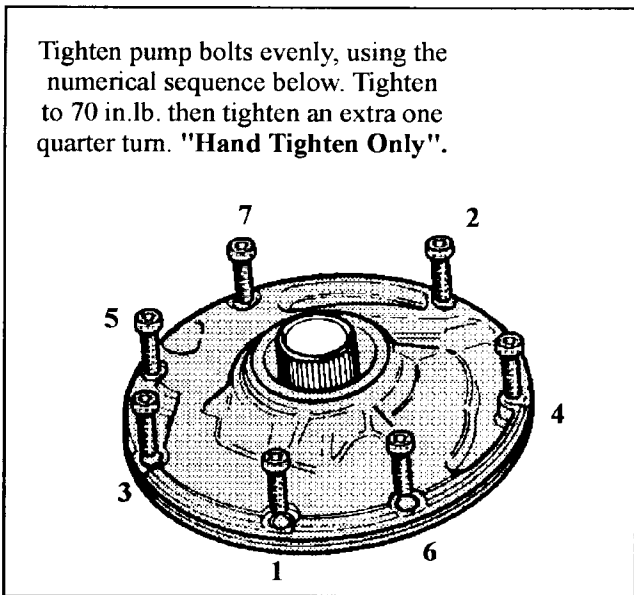


Figure 162

AUTOMATIC TRANSMISSION SERVICE GROUP

33. Check the end play on the turbine shaft. After the pump has been installed, attach a dial gauge holder to the transaxle housing, and place a dial gauge on the turbine shaft with a preload of 1 mm (See Figure 163).
34. Move the turbine shaft up and down and make a note of the play on the dial gauge.
35. Minimum allowable end play will be 0.5 mm, maximum allowable end play will be 1.2 mm.
36. Install two new O-rings on the B1 seal plug and insert the seal plug into the case in the location shown in Figure 164.
37. Carefully set the control valve assembly on the transaxle housing and hand thread the 14 #30 Torx head bolts that hold the control valve assembly to the case. Torque these bolts evenly to 44 in.lb. Figure 165.
38. Install a new O-ring on the wiring harness pass through connector and gently insert into the harness connector hole in the case (See Figure 165).
39. Install the 10 mm bolt that holds the harness to the case, and torque the bolt to 84 in.lb.

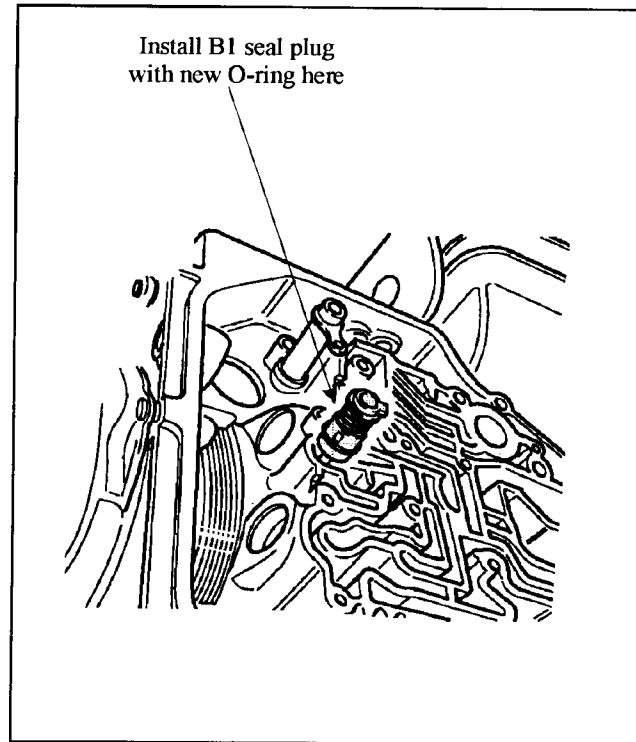


Figure 164

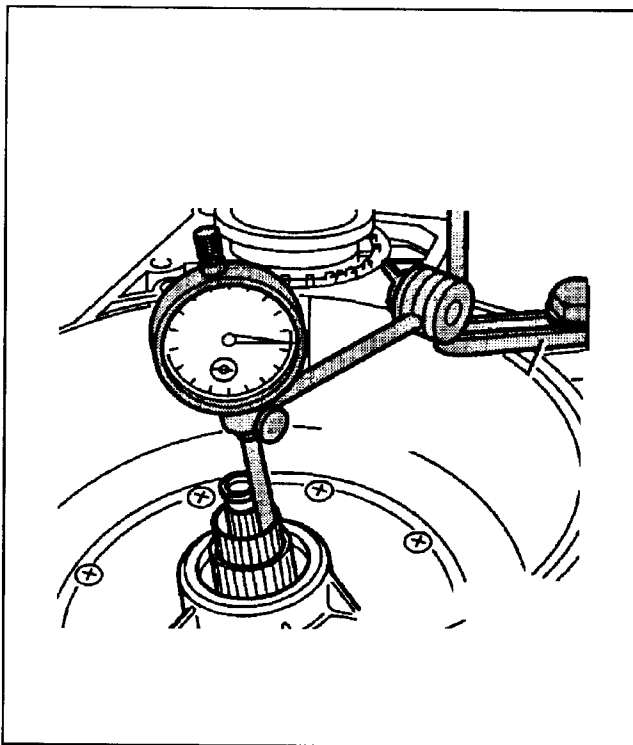


Figure 163

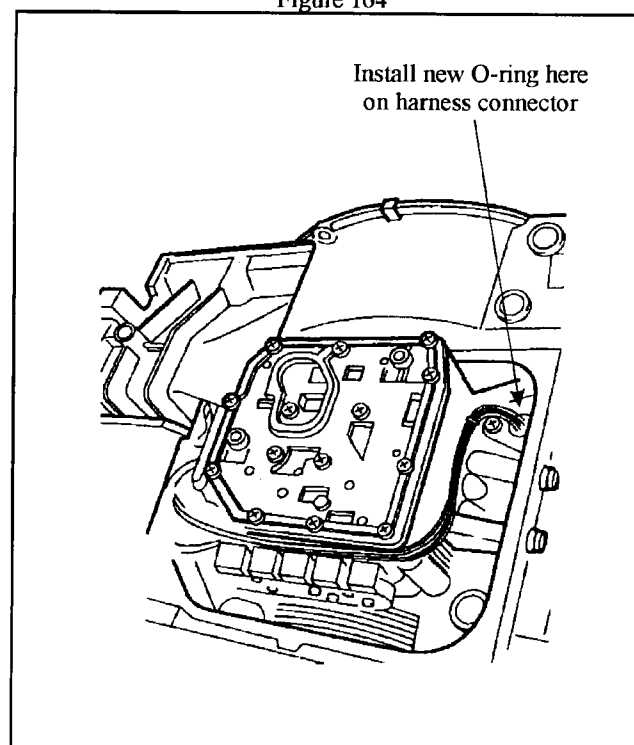


Figure 165

## AUTOMATIC TRANSMISSION SERVICE GROUP

40. When the control valve assembly is installed, make sure that the manual valve is properly adjusted.
41. To adjust manual valve: Move selector lever to the park position. Loosen the small adjusting bolt enough so that the adjusting arm will move freely. Push the manual selector control arm that is attached to the manual valve back into the bore as far as it will go. (Follow the direction of the arrow in Figure 166). When the manual valve is at the stop, hold the manual valve tight against the stop and tighten the locking bolt to (31 in.lb.).
42. Install a new filter with a new gasket on the transmission valve body. Hand thread the 2 filter bolts and tighten to (70 in.lb.) (See Figure 167).
43. Install a new pan gasket onto the transmission. Make sure to install the four spacer bushings into the gasket when installing (See Figure 168).
44. Install the transmission oil pan on the transmission case and hand thread the four bolts into the case. Torque the four bolts to (9 ft.lb.).

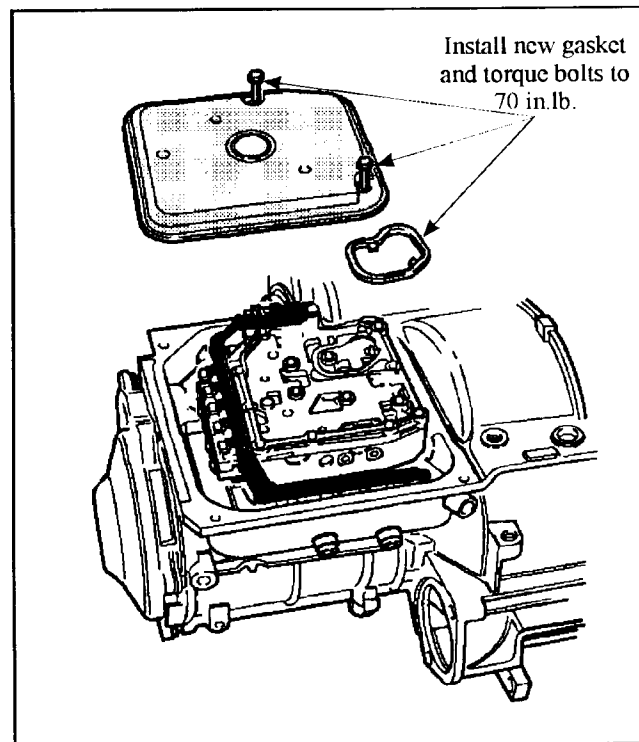


Figure 167

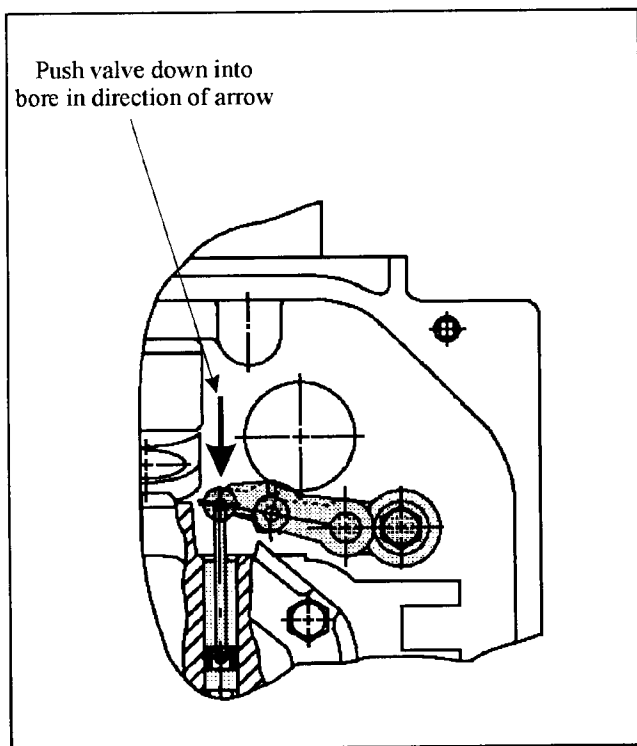


Figure 166

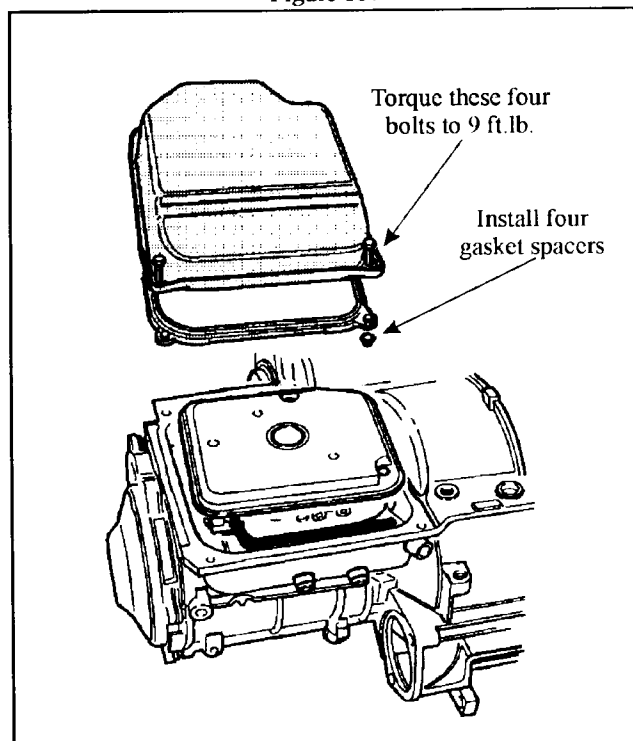


Figure 168

## AUTOMATIC TRANSMISSION SERVICE GROUP

**V.W. AUDI 096 - 097  
VALVE BODY**

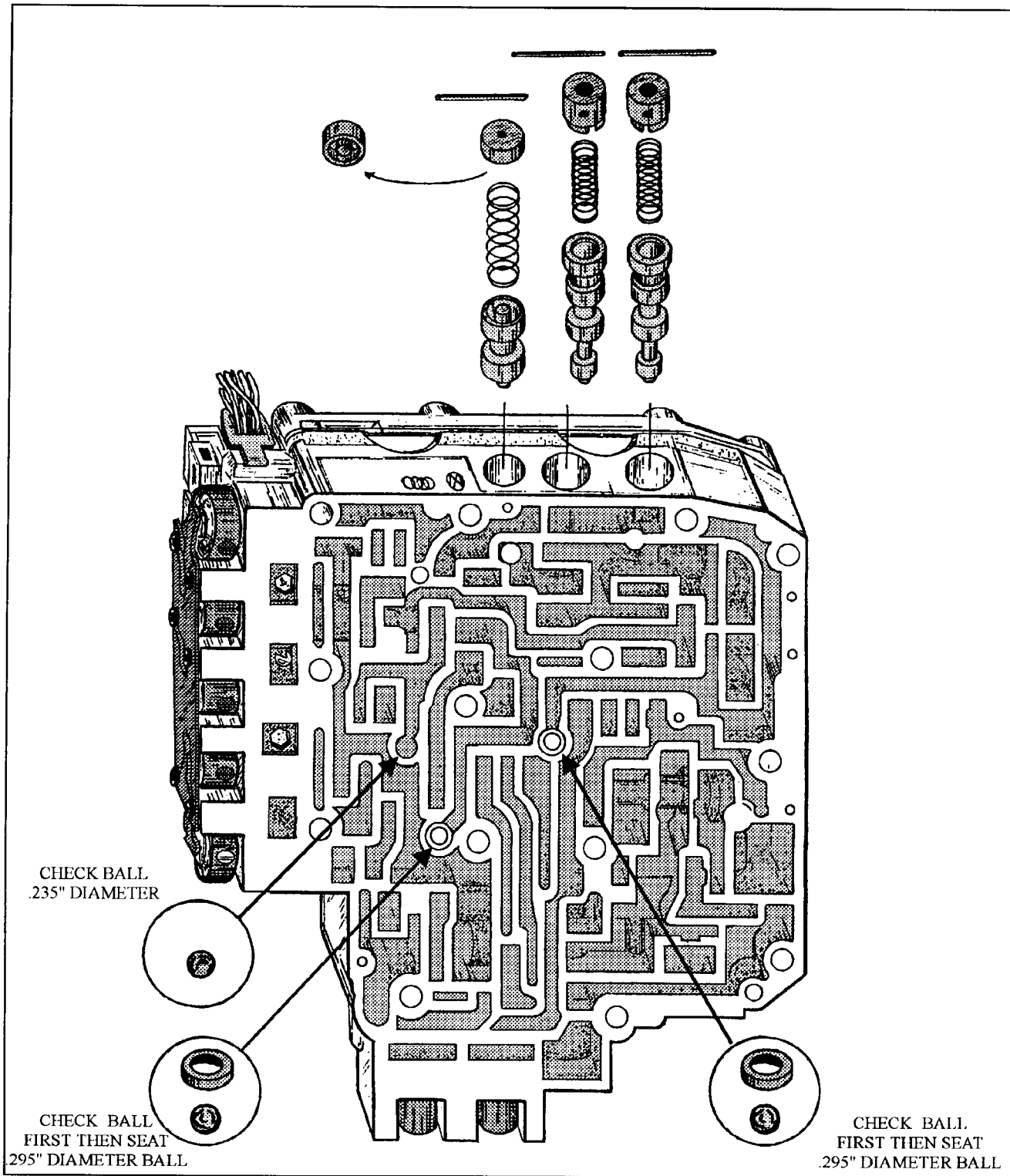


Figure 169

**AUTOMATIC TRANSMISSION SERVICE GROUP**

**V.W. AUDI 096 - 097**  
**VALVE BODY CONT.**

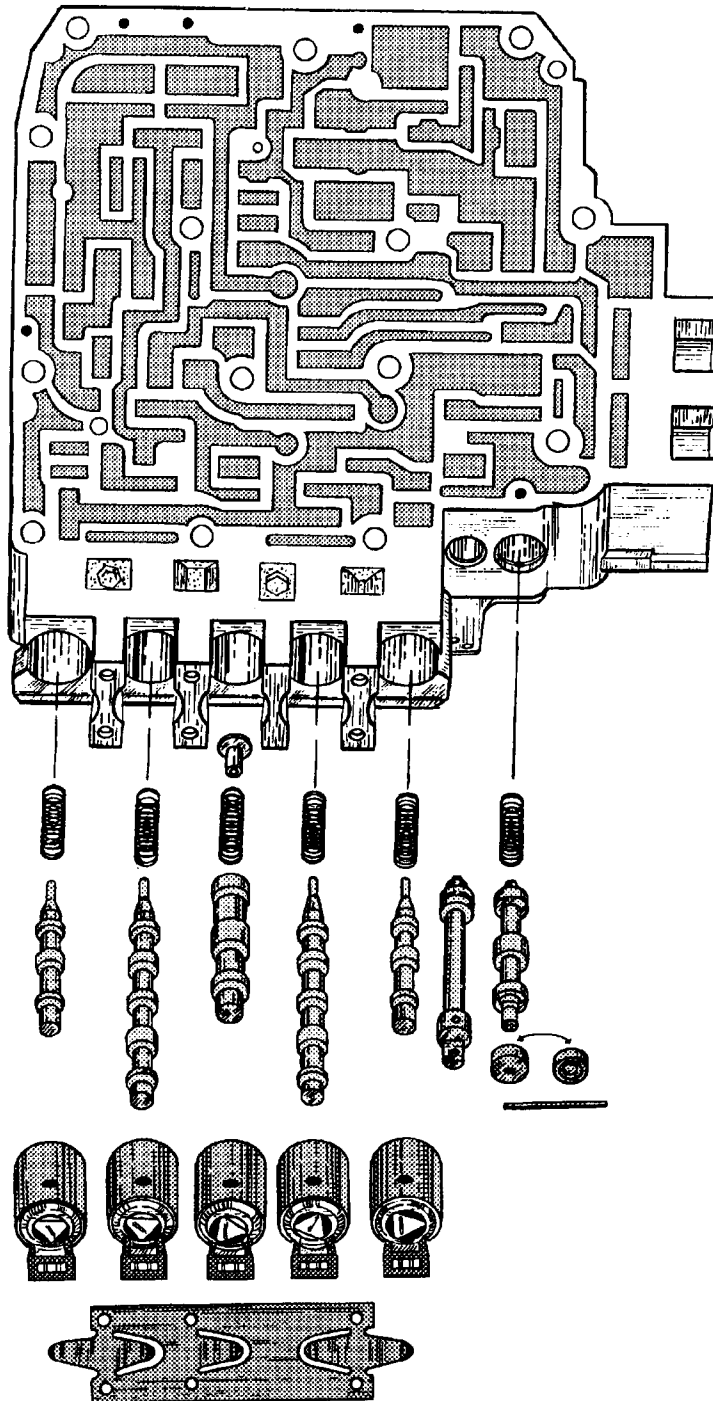


Figure 170

**V.W. AUDI 096 - 097**  
**VALVE BODY**

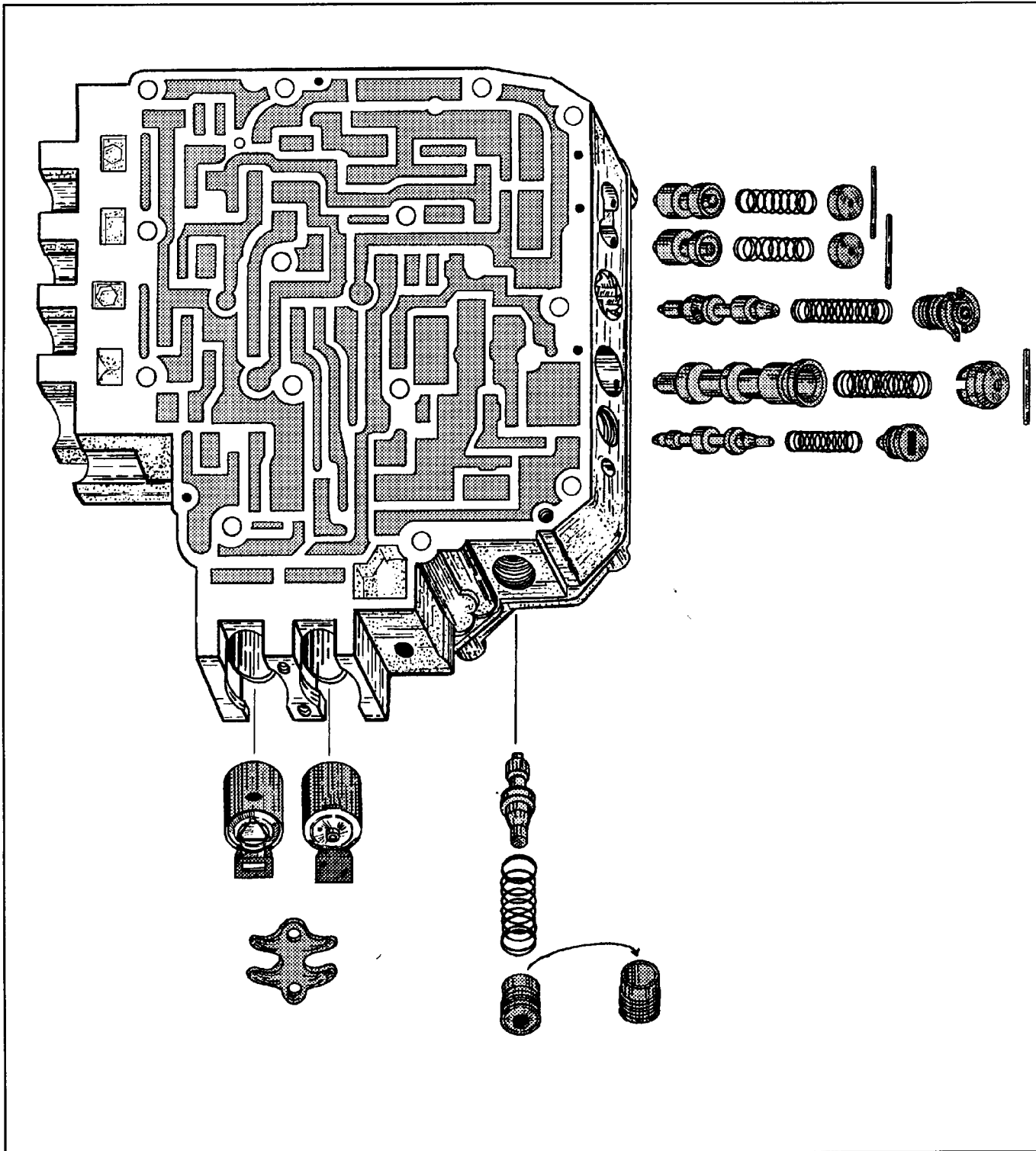


Figure 171

AUTOMATIC TRANSMISSION SERVICE GROUP

**V.W. AUDI 096 - 097  
VALVE BODY**

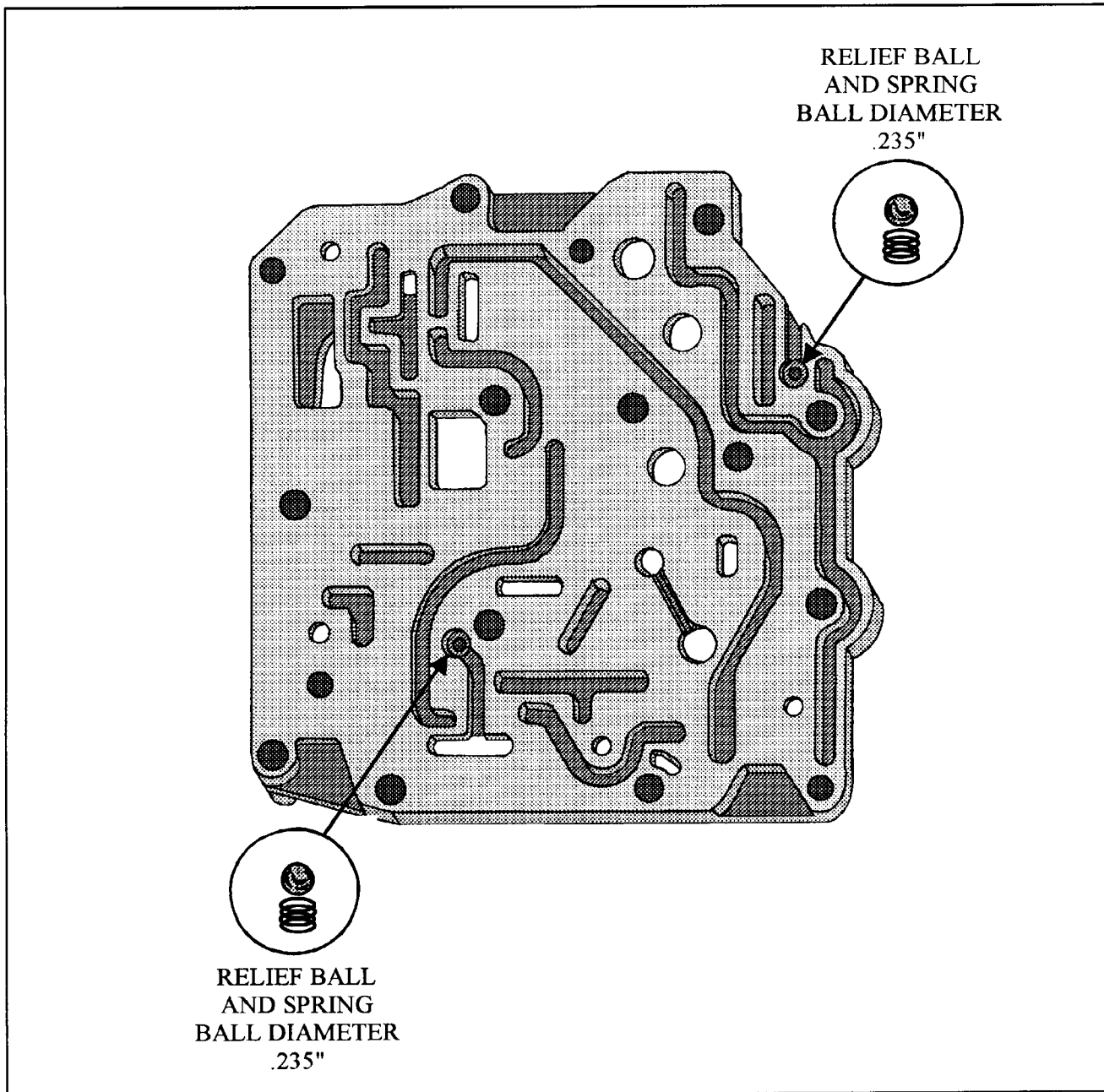


Figure 172

**V.W. AUDI 096 - 097  
CASE AIR TEST PASSAGES**

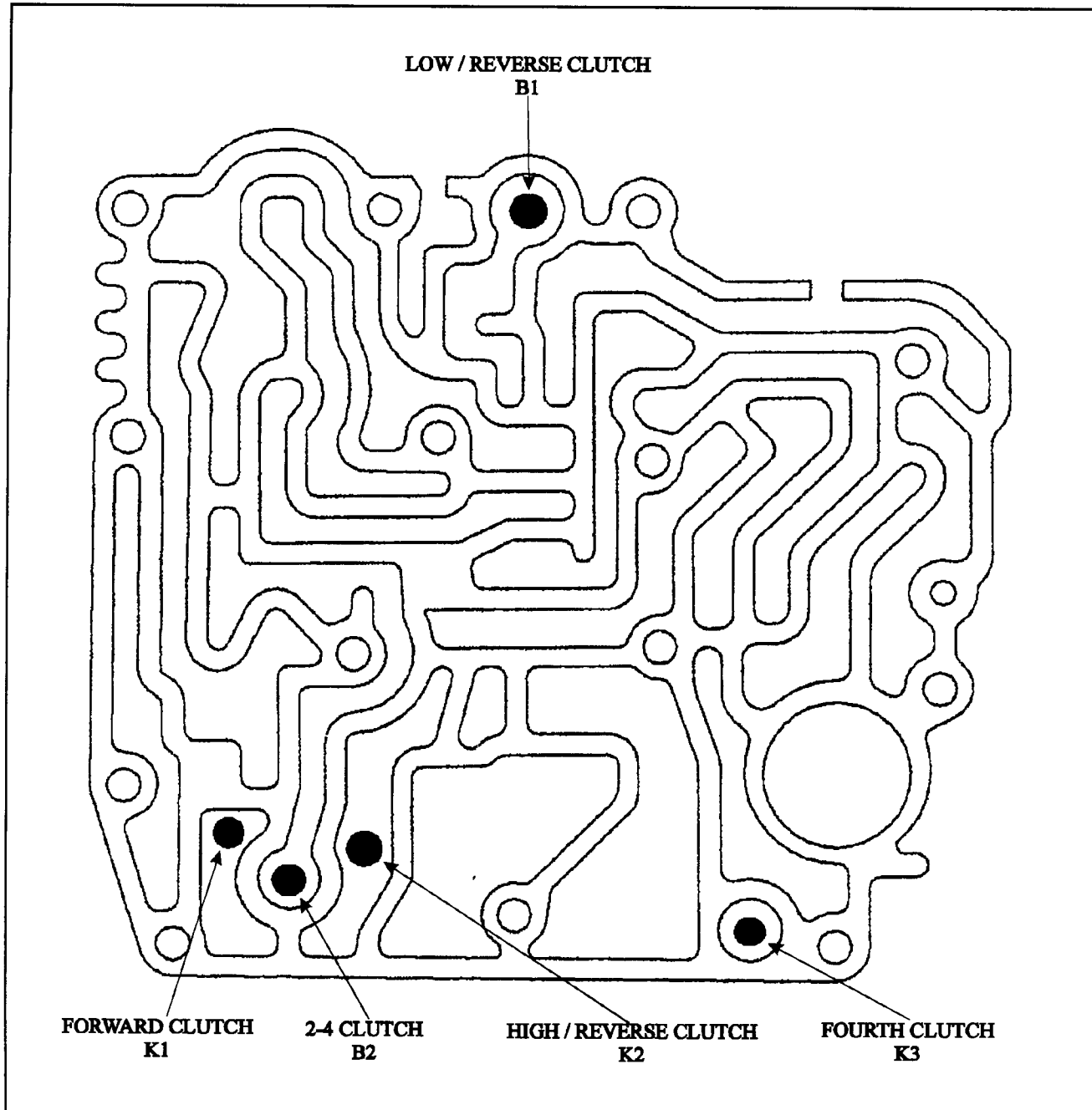


Figure 173

**V.W. AUDI 096 - 097  
ANSWERMATIC  
AIR TEST PLATE**

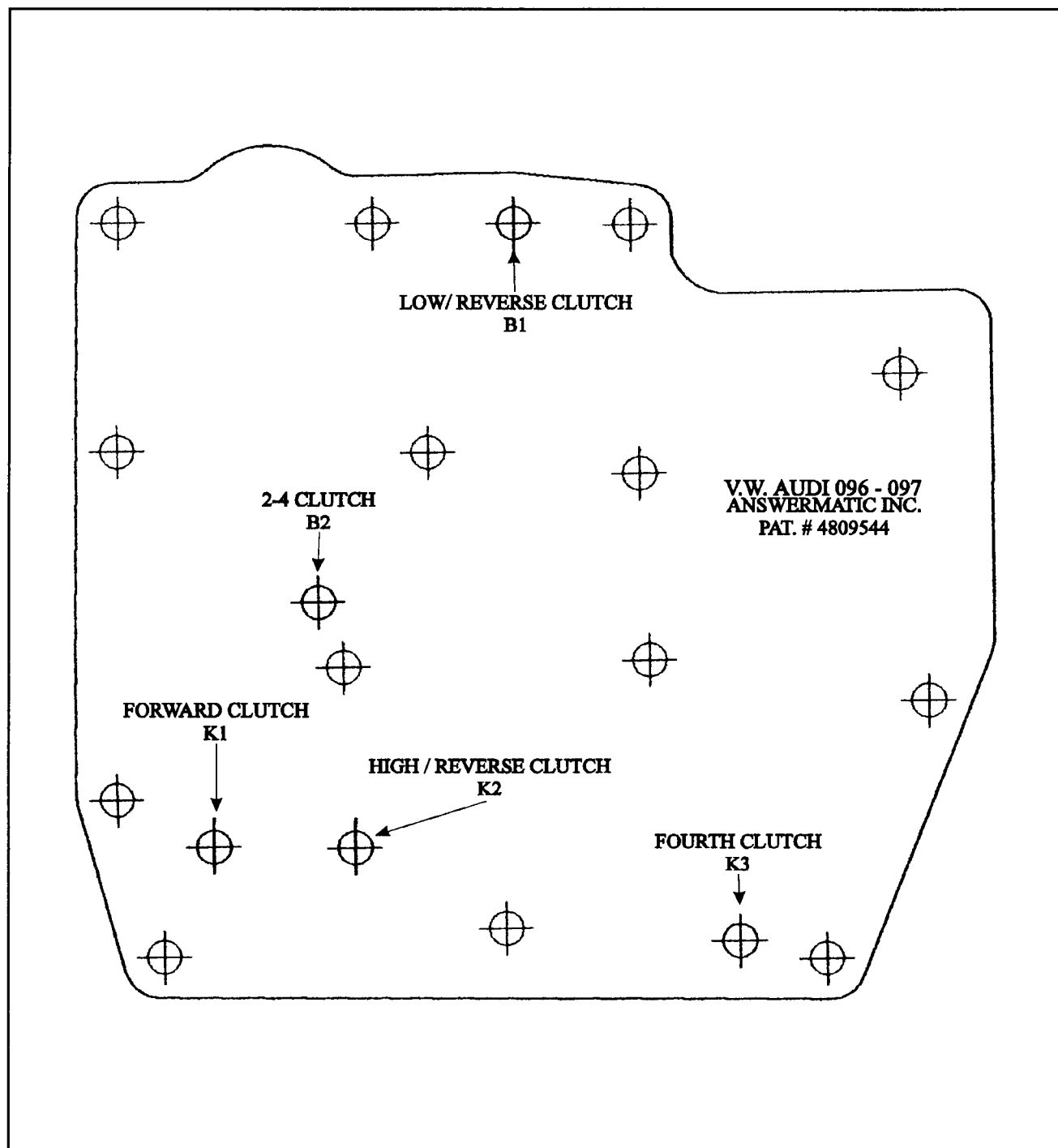


Figure 174

AUTOMATIC TRANSMISSION SERVICE GROUP

## V.W. AUDI 096 - 097 TROUBLE SHOOTING CHECK LIST

| Malfunction                                    | Possible cause                                                                 | Correction                                                                                                                                                                                         |
|------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. 1<br>Drive disc / flywheel cracked.        | Engine and transmission centralizing bushing missing                           | Replace engine / transmission centering bushings and flywheel<br>Refer to Factory Engine Repair Manual                                                                                             |
| No. 2<br>Transmission oily                     | Transmission leaking                                                           | Clean transmission and determine where transmission is leaking. Seal or replace faulty components on leaky transmissions. Replace sealing rings, seals, screw connections or transmission housing. |
|                                                | ATF overfilled                                                                 | Clean transmission, check ATF level, if necessary drain oil to proper level                                                                                                                        |
|                                                | Gear oil overfilled                                                            | Clean transmission, check gear oil level, if necessary drain oil to proper level                                                                                                                   |
| No. 3<br>ATF leak in the torque converter area | Flywheel clearance dimension not OK                                            | Adjust flywheel clearance dimension<br>Refer to Factory Engine Repair Manual                                                                                                                       |
|                                                | Torque converter bushing faulty                                                | Replace torque converter bushing and torque converter                                                                                                                                              |
|                                                | Torque converter oil seal faulty                                               | Replace torque converter seal check bushing for damage, replace as necessary                                                                                                                       |
|                                                | ATF pump O-ring leaking                                                        | Remove and disassemble ATF pump and replace faulty components                                                                                                                                      |
| No. 4<br>ATF in coolant, or coolant in ATF     | ATF cooler faulty                                                              | Replace ATF cooler and coolant and replace ATF<br>If excessive coolant is present in the ATF then the transmission will need to be disassembled and cleaned and all clutches replaced              |
| No. 5<br>ATF and gear oil mixed                | ATF level or gear oil level too low, no visible leaks on transmission exterior | Correct ATF and gear oil levels<br>Road test the vehicle recheck ATF and gear oil levels if levels have changed replace the drive pinion oil seal and bearing support ring O-ring                  |

Figure 175



**V.W. AUDI 096 - 097**  
**TROUBLE SHOOTING CHECK LIST**

| Malfunction                                                                                                   | Possible cause                                                                                                      | Correction                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No.6<br>Gear selector mechanism difficult to operate                                                          | Gear selector mechanism difficult outside transmission<br><br>Gear selector mechanism difficult inside transmission | Remove selector lever cable at selector lever shaft if selector mechanism is stiff with lever disconnected, problem is in cable or shifter. If selector mechanism is stiff inside transmission disassemble internal selector linkage and replace as necessary |
| No.7<br>Selector lever position :1<br>Transmission has no forward movement                                    | Malfunction of the K1 clutch or the B1 brake                                                                        | Remove the transmission and inspect the K1 clutch and the B1 brake. Repair or replace as necessary                                                                                                                                                            |
| No.8<br>Selector lever position :D, 3, or 2<br>transmission has no forward movement                           | Malfunction of the K1 clutch or the low roller clutch                                                               | Remove the transmission and inspect the K1 clutch assembly and the low roller clutch Repair or replace as necessary                                                                                                                                           |
| No. 9<br>Selector lever position: D<br>Transmission has no forward movement will move forward in 3,2,1 ranges | Manual valve in the control valve assembly not adjusted properly                                                    | Remove transmission oil pan and adjust manual valve correctly.<br>Refer to Factory bulletin group 38, 93-01                                                                                                                                                   |
| No. 10<br>Selector lever position: D, 3, or 2<br>transmission will not engage 2nd gear                        | Malfunction or mis-assembly of the B2 brake                                                                         | Remove transmission and inspect the B2 brake assembly. Repair or replace as necessary                                                                                                                                                                         |
| No. 11<br>Selector lever position: D or 3<br>transmission will not engage 3rd gear                            | Malfunction of the K2 clutch                                                                                        | Remove the transmission and inspect the K2 clutch assembly. Repair or replace as necessary                                                                                                                                                                    |
| No. 12<br>Selector lever position: D<br>transmission will not engage 4th gear                                 | Malfunction of the K3 clutch or the B2 brake                                                                        | Remove the transmission and inspect the K2 clutch assembly and the B2 brake assembly. Repair or replace as necessary                                                                                                                                          |
| No. 13<br>Selector lever position : R<br>transmission will not engage reverse                                 | Malfunction of the K2 clutch or the B1 brake                                                                        | Remove the transmission and inspect the K2 clutch assembly and the B1 brake assembly. repair or replace as necessary                                                                                                                                          |

Figure 176

**AUTOMATIC TRANSMISSION SERVICE GROUP**



## Technical Service Information

| Malfunction                                                             | Possible cause                                                                                                               | Correction                                                                                                                                                                                        |
|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. 14<br>Selector lever position: D, 3, 2, or 1 No drive in all ranges | Malfunction of the K1 clutch the B1 brake or the low roller clutch                                                           | Remove the transmission and inspect the K1 clutch, the B1 brake and the low roller clutch<br>Repair or replace as necessary                                                                       |
| No. 15<br>Gear selections not taking place                              | Solenoid or valves stuck in the control valve assembly                                                                       | Remove the valve body and clean thoroughly or replace the valve body                                                                                                                              |
| No. 16 Uncontrolled or harsh shifts                                     | Short circuit between solenoid wiring or Wiring harness. Valve in valve body stuck or solenoid faulty.                       | Check the wiring harness in the transmission and the valve body<br>Repair or replace as necessary                                                                                                 |
| No. 17<br>Shifting: changing gears one particular shift is harsh        | Check in which gear the harsh shifting occurs<br>Valve in valve body or solenoid faulty. Clutch element faulty               | Remove the valve body and clean thoroughly or replace the valve body<br>Remove the transmission and inspect the clutch elements<br>Repair or replace as necessary                                 |
| No. 18<br>Transmission selects the emergency mode                       | Incorrect control module installed. Valve body wiring harness faulty. Valve body faulty                                      | Select the proper Control Module and replace as necessary<br>Begin a complete electrical diagnosis including computer pin check<br>Repair or replace wiring or electrical components as necessary |
| No. 19<br>Parking lock will not engage                                  | Selector lever cable defective or incorrectly adjusted<br>Parking pawl, parking gear, or park rod actuator mechanism faulty. | Replace the selector lever cable and adjust<br>Inspect the parking pawl, parking gear, and park rod actuator mechanism<br>Replace or repair as necessary                                          |
| No. 20<br>Noise in the final drive                                      | Taper roller bearing loud<br>Drive pinion loud<br>Output gear loud<br>Input gear loud<br>Differential loud                   | Replace the tapered roller bearings<br>Replace the drive pinion bearings or gears<br>Replace the output gear<br>Replace the input gear<br>Replace the differential                                |

Figure 177