TRANSMISSION

Automatic Transmission - Operating Fluids

1.0 GENERAL INFORMATION ON AUTOMATIC TRANSMISSION FLUIDS

Automatic Transmission Fluid was developed especially for automatic transmissions. It requires additives which are carefully matched with each other, a high viscosity index and a solidification point below-40°F/-40° C.

Friction behavior of Automatic Transmission Fluid in plate-type clutches under very different operating conditions is extremely important. Other important factors are:

- Wear protection
- Oil film shear resistance
- Adhesive property
- Oxidation resistance
- Corrosion inhibition
- Sludge prevention
- Temperature-dependent viscosity changes
- Compatibility with sealing materials.

2.0 OIL ADDITIVES

Automatic transmissions are designed so that oil additives are not necessary. BMW disapproves the use of any oil additives and cannot accept the liability for any consequential damage which results from using oil additives.

3.0 APPROVED AUTOMATIC TRANSMISSION FLUIDS FOR INITIAL FILLINGS AND CORRECTING FLUID LEVELS

3.1 GM TRANSMISSIONS

USE OF ANY OTHER OIL WILL CAUSE A NON WARRANTABLE TRANSMISSION FAILURE

***Transmission identification plate can be utilized to determine proper transmission fitted in vehicle**

A4S 270R (THM-R1W)

E36

318i/is/iC/ti from 1996 to 1999 production

323i/is/iC from 1998 to 1999 production

328i/is/iC from 1996 to 1998 production

Z3 1.9 from 1996 to 1999 production

Z3 2.3/2.8 from 1997 to 2000 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

E39

528i/iT from1997-1999 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

A4S 310R (THM-R1)

E34

525i from 1990 to 1995 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

E36

318i/is/iC/ti from 1992 to 1995 production

325i/is/iC from 1992 to 1995 production

All reputable brand name Automatic Transmission Fluids of the Dexron® III formulation.

A5S 360R (GM5)

E46

323i/Ci/Cic from 6/98 to 3/00 production

323iT from 1//00 to 3/01 to production

328i/Ci/Cic from 6/98 to 3/01 production

The transmission oil pan will be labeled with either Texaco ETL - 7045 or Dexron® III, please fill or top off with the proper fluid only. Do not mix Texaco ETL - 7045 and Dexron® III fluids.

A5S 390R (GM 5)

E46

330xi from 6/00 production to present

325xiT from 9/00 production to present

E53

X5 3.0 from 8/03 production to present

E83

X3 2.5, 3.0 from 8/03 production to present

The transmission oil pan will be labeled with either Texaco ETL - 7045 or Dexron® III, please fill or top off with the proper fluid only. Do not mix Texaco ETL - 7045 and Dexron® III fluids.

E85

Z4 3.0 from 9/02 production to present

Z4 2.5 from 9/02 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

GA6L45R (GM6)

DEXRON-VI Automatic Transmission Fluid

E83

X3 LCI from 9/06 production to present

E82, E88

128i, 135is from 12/07 production to present

E90

328Xi from 9/06 production to present

E91

328Xi from 9/06 production to present

The fluid can be sourced locally until a BMW PN is available.

3.2 ZF TRANSMISSIONS

USE OF ANY OTHER OIL WILL CAUSE A NON WARRANTABLE TRANSMISSION FAILURE

***Transmission identification plate can be utilized to determine proper transmission fitted in vehicle**

ZF 3HP22, 4HP22, 4HP24

Utilizes Castrol TQ or Texaco Havoline Automatic Transmission Fluids of the Dexron® III formulation. Never mix any other oil with this transmission fluid when doing repairs or topping up.

A5S 310Z (5HP18)

E36

M3 from 1995 to 1999 production

Utilizes a lifetime filling of synthetic transmission fluid, ESSO LT 71141, no subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E34

530i/iT from 1993 through 1995 production

Utilizes Castrol TQ or Texaco Havoline Automatic Transmission Fluids of the Dexron® III formulation. Never mix any other oil with this transmission fluid when doing repairs or topping up.

A5S325Z (5HP19)

E46

323i/Ci/Cic from 3/00 to 8/00 production

325iT from 4/01production to present

330i/Ci/Cic from 6/00 production to present

325i/Ci/Cic from 9/00 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E39

525i/iT from 3/01 production to present

530i from 3/01 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

A5S 440Z (5HP24)

E31

840Ci from 9/96 to the present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E38

740i/iL from 1/97 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 71141, BMW Part No. 83 22 9 407 807.

E39

540i/iT from 1/97 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E53

X5 4.4i from 9/99 production to present

X5 4.6i from 9/01 production to present

No subsequent transmission fluid changes are necessary. Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

A5S 560Z (5HP30)

E31

840Ci equipped with M60 engine

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

E31

840Ci equipped with M62 engine

850Ci equipped with M73 Engine

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E32

740i/iL from 1993 through 1994 production

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

E34

540i/iT from 1993 through 1995 production

Utilizes a lifetime fill of transmission fluid, no subsequent oil changes are necessary on this transmission. If transmission fluid is required for repair purposes, use only the oil approved for this transmission. It is not permitted to mix this oil with other grades of transmission fluid.

Shell LA 2634, BMW Part No. 83 22 9 407 765.

Effective with model year 1995 and later:

E31

850Ci from 10/94 to 6/97 production

840Ci from 12/95 to 8/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E38

750iL from 1/95 production to present

740i/iL from 7/94 to 12/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

E39

540i/iT from 3/96 to 12/96 production

Utilizes lifetime fill of transmission fluid, no subsequent transmission fluid changes are necessary.

Never mix any other oil with this transmission fluid when doing repairs or topping up.

ESSO LT 711 41, BMW Part No. 83 22 9 407 807.

GA6HP19Z

E82/E88, E90/91/92

325i, 328i, 330i, 335i, All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E60/61

525i, 530i from 8/03 production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP19ZTU

E70 3.0i from start production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP26Z

E60

545i from 8/03 production to present

550i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E63, E64

645Ci, 645CiC from start of production to present

650Ci, 650CiC All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E65

745i from 11/2001 production to present

750i All

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any

other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

E66

745Li from 3/2002 production to present

750Li All

760Li from 9/2002 production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

GA6HP26ZTU

E70

X5 4.8i from start production to present

The transmission fluid has a Condition Based Service interval of approximately 100,000 miles. Never mix any other oil with this transmission fluid when doing repairs or topping up.

Shell M-1375.4, BMW Part No. 83 22 0 142 516.

4.0 CHECKING TRANSMISSION FLUID LEVEL

Due to the substantial expansion of transmission fluid when heated it is only possible to measure the oil level correctly at specified oil temperatures (after driving a distance of about 12 mi./20 km). All transmissions should be checked between a

ZF 3HP and 4HP

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A5S 560Z, A5S440Z, GA6HP19Z, GA6HP26Z, GA6HP26Z, A5S325Z, A5S 310Z

All 5 and 6 speed transmissions require the fluid to be checked when fluid temperature is between 30-50° Celsius using DIS Plus or GT1. Do not check fluid level after temperature has exceeded 50° Celsius.

A4S 270R, A4S 310R and A5S 360R

See appropriate AUTOMATIC TRANSMISSION article for fluid level check procedure. These transmissions

generally do not have a dipstick and fluid level check (if necessary) must be performed through the oil fill hole.

2400 TRANSMISSION ASSEMBLY

24 00 018 ADJUSTING SELECTOR LEVER (6HP19Z)

NOTE: Check cable for ease of movement.
Move selector lever to "P" position.

Grip clamping sleeve (1).

Loosen nut (2).

Press gearshift lever (3) forwards into park position (P). Press cable (4) in direction of arrow and release again.

Grip clamping sleeve (1).

Tighten nut (2).

Tightening torque, **25 16 2AZ** .

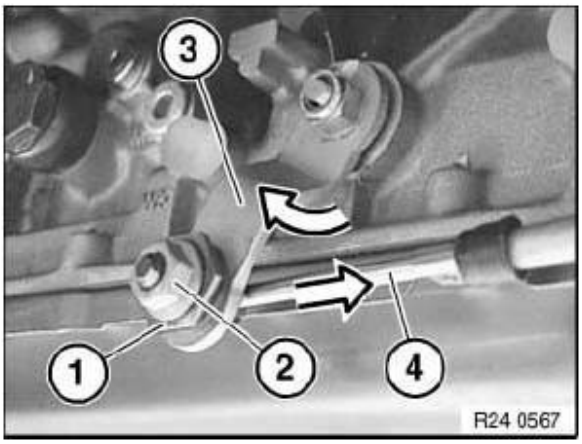


Fig. 1: Pressing Selector Lever And Cable
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Move selector lever to "P" position.

Check whether parking gear is engaged by turning propeller shaft.

00 11 237 CHECKING/TOPPING UP FLUID LEVEL IN AUTOMATIC TRANSMISSION

(GA6HP19Z)

IMPORTANT: Use only the approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS . Failure to comply with this requirement will result in serious damage to the automatic transmission!

Installation:

Tighten down filler plug using

1. Hexagon wrench 8 A/F
2. Torque wrench
3. Socket 8 A/F

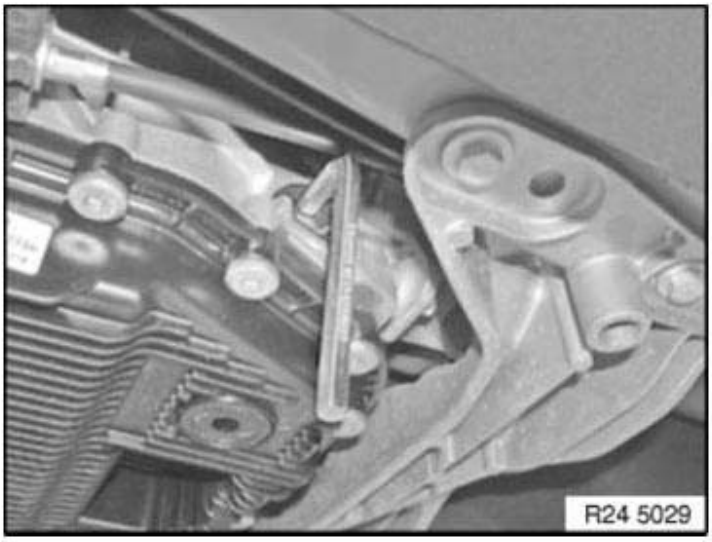


Fig. 2: Tightening Filler Plug Using Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Topping up transmission fluid after a repair

Stand vehicle on a level surface and secure against rolling off.

Undo filler plug (1).

Installation

Replace sealing ring.

Top up transmission fluid until it emerges from filling orifice.

Start engine.

Replenish transmission fluid until it emerges from filling orifice.

Screw in filler plug (1).

Tightening torque: **24 11 7AZ** .

Press brake pedal to floor and shift through gears 1 to 6 several times at idle speed. Then shift selector lever to "P" position (Park).

Then check fluid level.

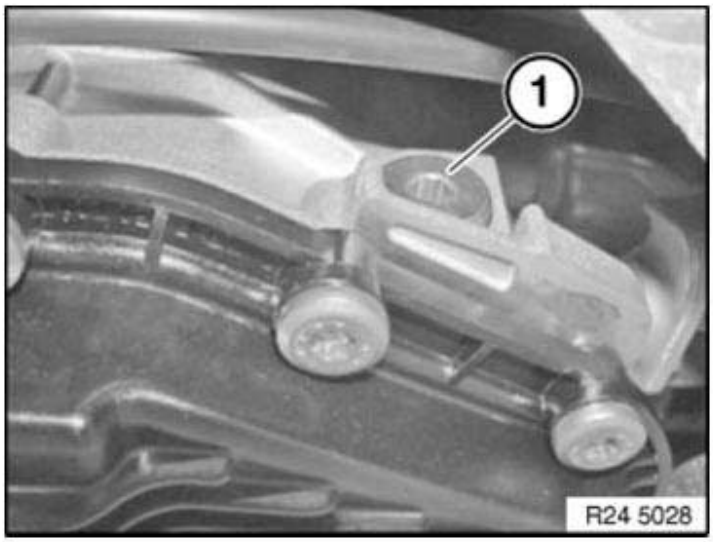


Fig. 3: Identifying Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Checking fluid level

- Connect BMW Diagnosis and Information System (DIS) or BMW MoDiC to car.
- Call up Service functions (drive).
- Carry out fluid level check in accordance with instructions.

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness

- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct

- Pour oil only into appropriately marked containers
- Do **not** pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

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24 00 050 INSTALLING REPLACEMENT TRANSMISSION (GA6HP19Z)

Drain automatic transmission fluid at oil drain plug.

Tightening torque: **24 11 6AZ** .

IMPORTANT: After completion of work, program control unit for transmission.

Recycling

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations

IMPORTANT:

- **Before installing replacement transmission, always flush TRANSMISSION FLUID COOLER TOGETHER WITH LINES .**
- **After completion of work, check TRANSMISSION OIL LEVEL .**

Replacement transmission is supplied filled with transmission fluid.

Use only the approved **AUTOMATIC TRANSMISSION - OPERATING FLUIDS** .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks

- Remove **AUTOMATIC TRANSMISSION** .

NOTE: If necessary

Release screws.

Remove and convert transmission bearing block (1).

Tightening torque **24 71 6AZ** .

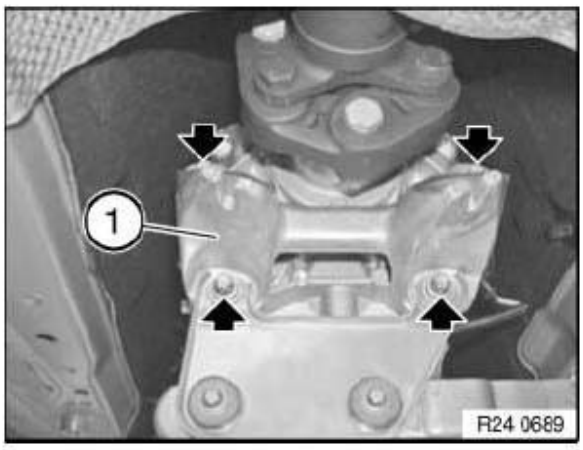


Fig. 4: Locating Transmission Bearing Block Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Convert transportation lock (1).

Convert all cable holders.

Convert all seal plugs.

Convert protective cap on output shaft.

IMPORTANT: After removing transportation lock, secure torque converter against slipping out.

Transmission identification:

- refer to BMW Parts Department.
- On type plate

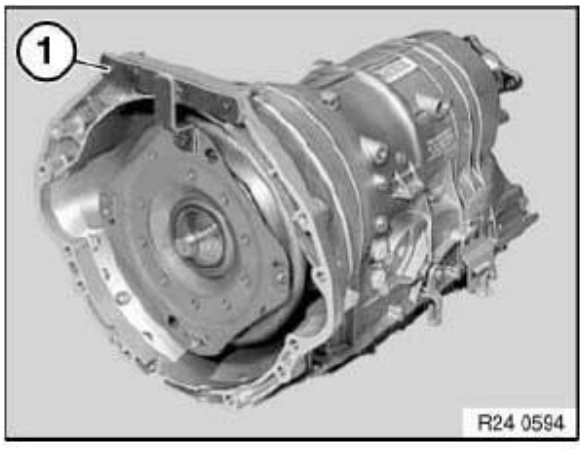


Fig. 5: Identifying Transportation Lock
Courtesy of BMW OF NORTH AMERICA, INC.

24 00 030 REMOVING AND INSTALLING AUTOMATIC TRANSMISSION (6HP19Z) N52K

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .
Use only the approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this requirement will result in serious damage to the automatic transmission!

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.

A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released.**

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic.**

Jointing torque and angle of rotation must be observed without fail **(risk of damage).**

Necessary preliminary tasks

- Remove underbody protection at front and rear
- **REMOVE FAN COWL**
- Remove complete **EXHAUST SYSTEM**
- Remove heat shields

Slacken nut (1).

Remove heat shield (2).

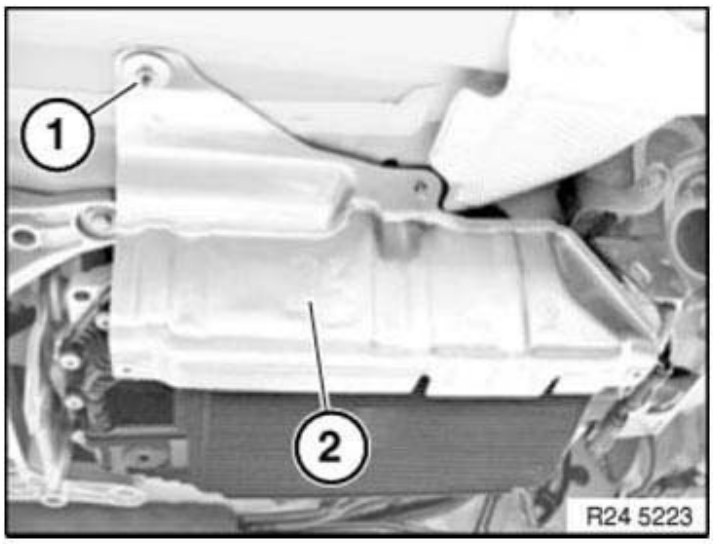


Fig. 6: Identifying Heat Shield With Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connector (1).

Unfasten screws (2).

Remove cable retaining plate (3).

Tightening torque **24 11 2AZ** .

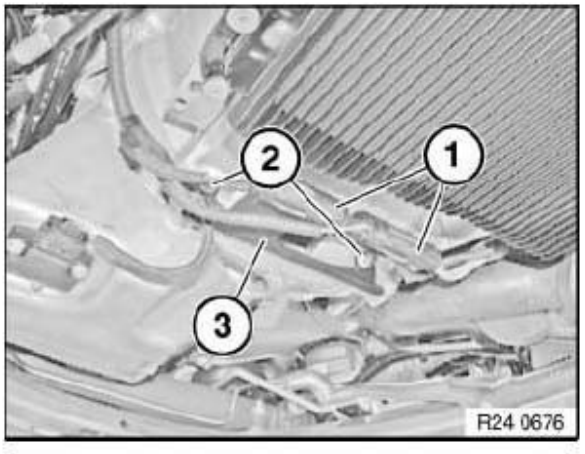


Fig. 7: Identifying Plug Connection And Cable Retaining Plate With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable (1) from holder.

Unfasten screws (2).

Remove bracket (3).

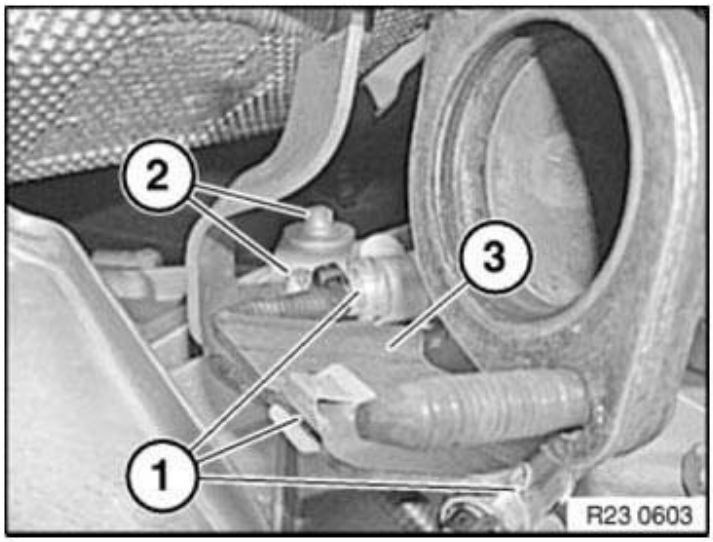


Fig. 8: Identifying Cable Of Holder And Bracket Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release aluminum bolt (1) on right next to cable retaining plate.

Aluminum screws must be replaced.

Tightening torque **24 00 2AZ** .

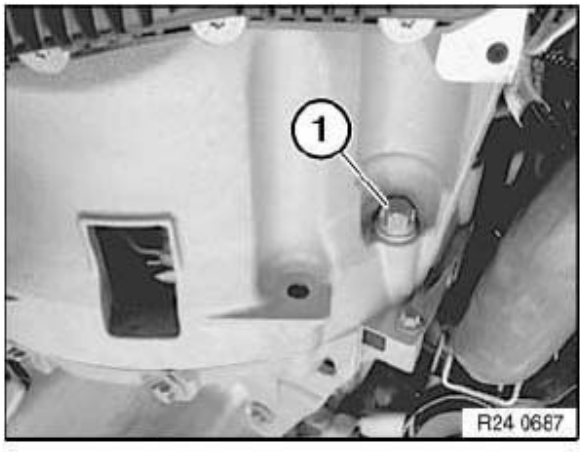


Fig. 9: Identifying Cable Retaining Plate Bolt
Courtesy of BMW OF NORTH AMERICA, INC.

Grip clamping sleeve (1).

Slacken nut (2).

Pull off retainer (3) towards bottom.

Pull cable (4) out of holder.

Installation:

ADJUST SELECTOR LEVER .

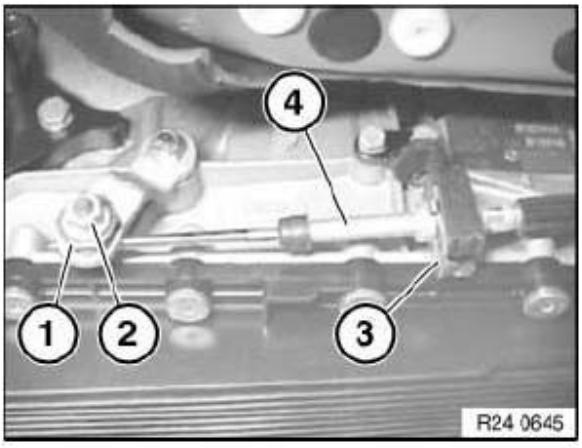


Fig. 10: Identifying Clamping Sleeve, Retainer, Cable And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools 23 4 050, 00 2 030.

Tasks are described in **23 ... UNIVERSAL BMW TRANSMISSION TAKE-UP** .

Secure transmission to mounting with tensioning strap (1).

After completion of work, check transmission oil level.

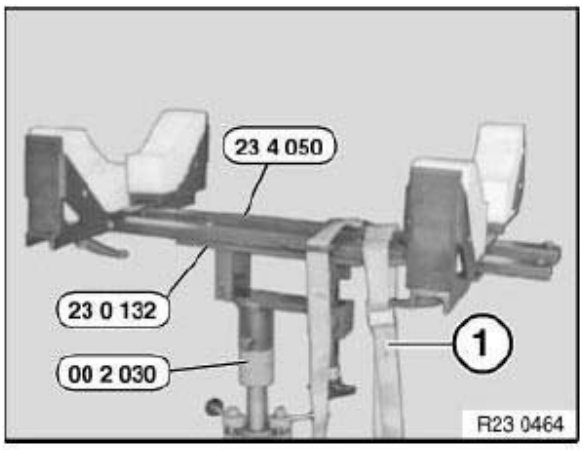


Fig. 11: Supporting Transmission Using Special Tools (23 4 050,00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and nuts (2).

Remove transmission cross-member.

Tightening torque **24 71 1AZ/2AZ** .

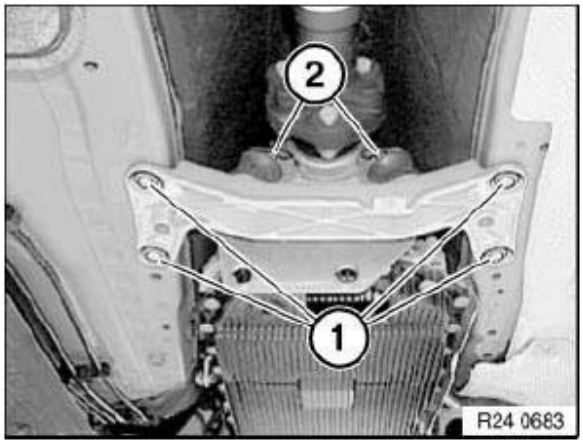


Fig. 12: Identifying Transmission Cross-Member Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

- Remove propeller shaft

Tasks are described in **REMOVING AND INSTALLING COMPLETE PROPELLER SHAFT** .

Release nut (1) and bracket from transmission oil lines on oil sump.

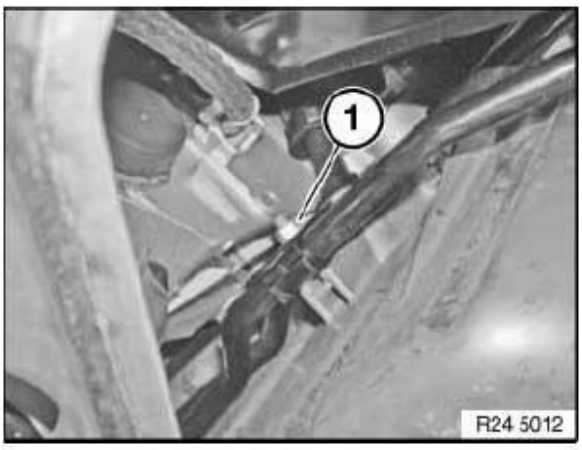


Fig. 13: Identifying Bracket Nut On Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Disconnect hydraulic lines (2) to transmission fluid cooler.

Installation:

Replace sealing rings.

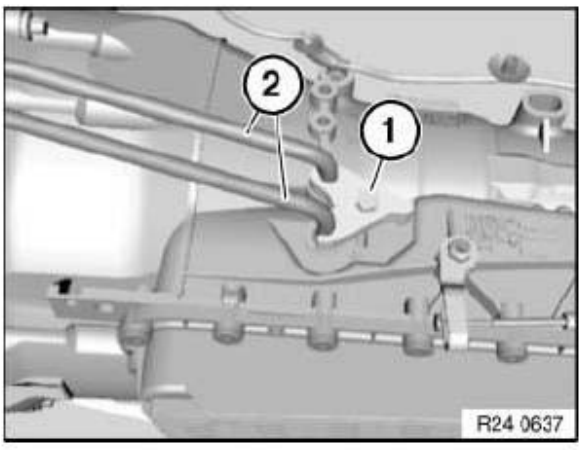


Fig. 14: Identifying Hydraulic Lines Of Transmission Fluid Cooler With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine at vibration damper in direction of arrow until bolt (1) on vibration damper is visible in opening.

Release all 6 bolts of torque converter with **24 1 110** .

Tightening torque **24 40 1AZ** .

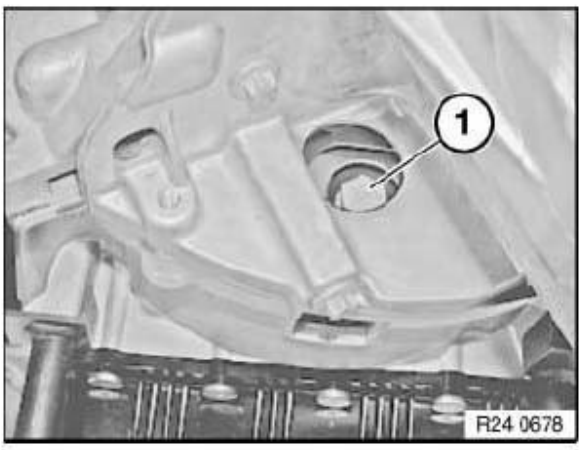


Fig. 15: Identifying Vibration Damper Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Prepare special tool (1) 24 4 161 (A) with shaped element (2) 24 4 165, side (A) to (A).

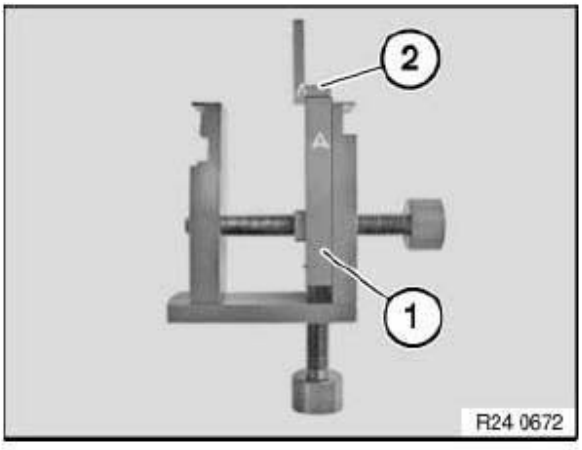


Fig. 16: Identifying Special Tool (24 4 161 And 24 4 165) With Shaped Element
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 4 160 into opening of transmission housing and clamp gently with screw (1).

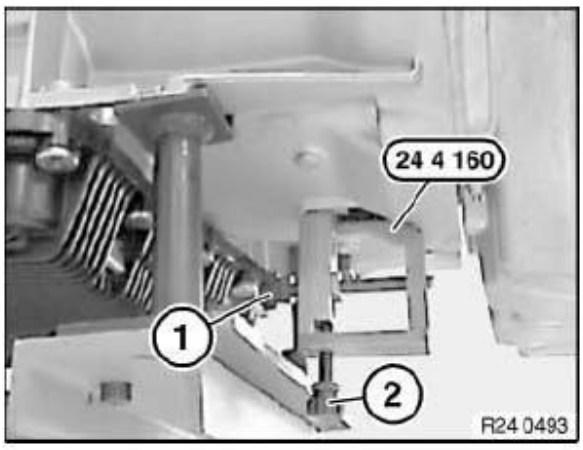


Fig. 17: Inserting Special Tool (24 4 160) Into Opening Of Transmission Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Twist in screw (2) and clamp down.

Then tighten down screw (1).

Graphics show E87.

Lower transmission and lock with a suitable block (1) between steering and oil sump.

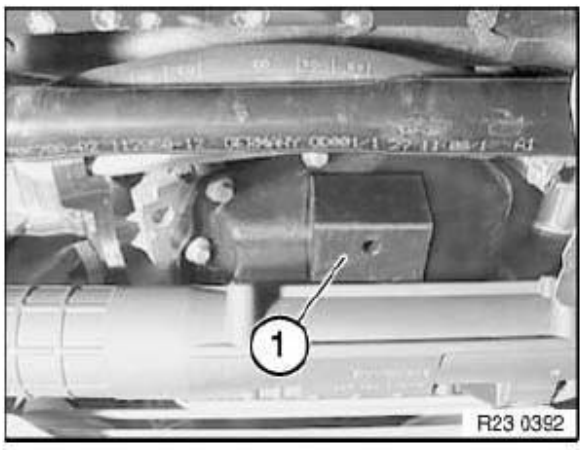


Fig. 18: Identifying Suitable Block Between Steering And Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

- Unlock and disconnect plug (1) by turning.
- Do not touch pins.
- Release cable from retainers.
- Insert special tool 24 2 390 in sealing sleeve.

IMPORTANT: Read and comply with important note.

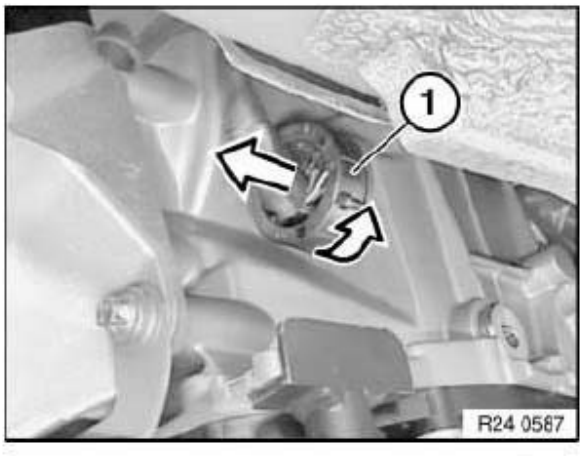


Fig. 19: Turning Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Installation:

Observe **screw fastening sequence** without fail.

Tightening torque, steel screws **24 00 1AZ** .

Aluminum screws **must** be replaced.

Tightening torque and angle of rotation, aluminum screws/bolts **24 00 2AZ** .

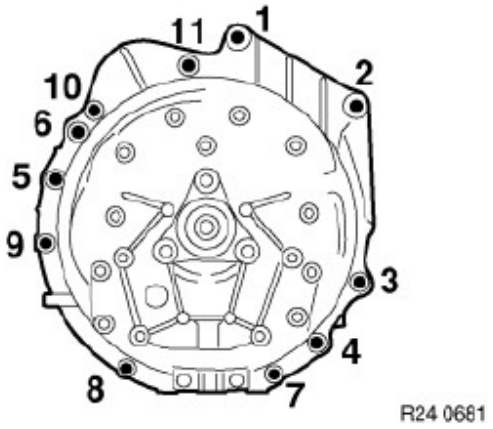


Fig. 20: Identifying Screws Fastening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down screws/bolts to specified torque.

Special angle-of-rotation tool 00 9 120 with magnet **00 9 130**

Secure to floor plate and screw down aluminum screws/bolts in accordance with angle of rotation.

Angle of rotation **24 00 2AZ** .

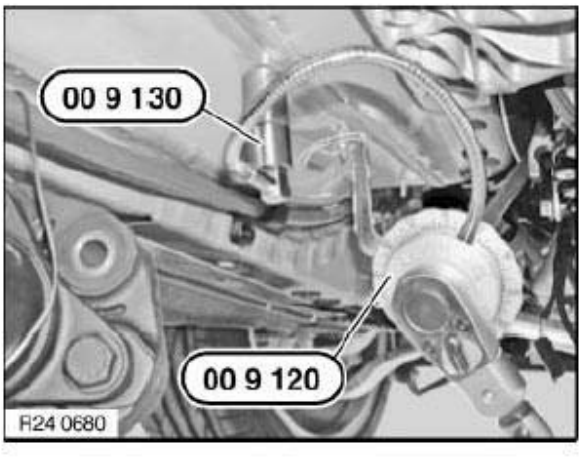


Fig. 21: Identifying Special Tool (00 9 120) And Magnet (00 9 130)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Hole (1) of drive plate must be accessible from opening on engine oil sump. Check fitting sleeves (2, 3) for correct seating.

Replace damaged dowel sleeves.

NOTE: Graphic representation similar.

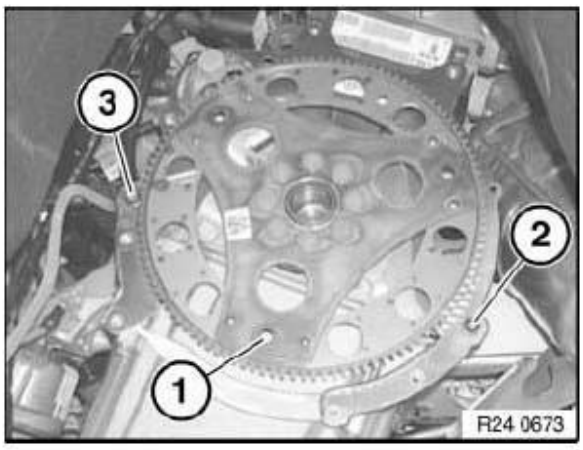


Fig. 22: Identifying Hole Of Drive Plate And Fitting Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Rotate torque converter until bore in torque converter is flush with bore in driving disc.

Bolt torque converter to drive plate.

Tightening torque **24 40 1AZ** .

Flange automatic transmission to engine.

Reassemble the vehicle.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct

- Wear protective goggles
- Wear oil-resistant protective gloves

- Observe country-specific safety regulations

First aid measures

- **Eye contact:** Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

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- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!

Recycling

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released

- **Personal precautionary measures:** Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- **Environmental protection measures:** Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- **Limiting spread:** Use oil blocks to prevent the surface spread of oil.
- **Cleaning procedure:** Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

23 TRANSMISSION DESIGNATIONS

Breakdown of BMW designation:

BREAKDOWN OF BMW DESIGNATION

A5S 300J (former designation)		
A	Transmission type	○ S = Manual gearbox ○ A = Automatic transmission
5	Number of forward gears	
S	Type of top gear	○ D = Direct gear ○ S = Overdrive gear
300	Max. input torque (Nm)	
J	Code letter of transmission manufacturer	○ G = Getrag ○ J = Jatco ○ R = GMPT (General Motors Powertrain) ○ Z = ZF (Zahnradfabrik Friedrichshafen)
SMG	Notes	SMG = Sequential M gearbox/transmission

SEQUENTIAL M GEARBOX/TRANSMISSION DESIGNATION

GS6-37BZ (new designation according to BMW Group Standard GS 90007)		
G	Transmission	
S	Transmission type	○ S = Manual gearbox ○ A = Automatic transmission
6	Number of forward gears	
-		○ - = Standard with manual gearshift ○ HP = Hydraulic planetary gear train ○ DKG= Twin-clutch transmission/gearbox

37	Transmission type	○ 26 = D-transmission ○ 31 = C-transmission ○ 39 = F-transmission ○ 37 = H-transmission ○ 53 = G-transmission ○ 17 = I-transmission ○ 47= J transmission SMG -7-speed ○ 45 = K transmission ○ 36= Transmission DKG
B	Gear set	○ B = Petrol gear ratio ○ D = Diesel gear ratio ○ S= Sport gear ratio
Z	Code letter of transmission manufacturer	○ G = Getrag ○ Z = ZF (Zahnradfabrik Friedrichshafen)

Manual gearbox

MANUAL GEARBOX DESIGNATION

BMW designation	Manufacturer	Manufacturer designation	Remarks
S5D 200G	Getrag	B transmission (220/5)	
S5D 200G	Getrag	B transmission (221/5)	for M41 engine only
S5D 250G	Getrag	B transmission (220/5)	Reinforced design
S5D 260Z	ZF	C-transmission (S5-31 D)	for M51 engine only
S5D 280Z	ZF	C-transmission (S5-31)	
S5D 310Z	ZF	C-transmission (S5-31)	up to 9.95
S5D 320Z	ZF	C-transmission (S5-31)	from 9.95 (reinforced design)
GS5S31BZ (SMG)	ZF	C transmission	SMG
GS5-39DZ	ZF	F transmission	
S6S 420G	Getrag	D-transmission (226/6)	
S6S 420G (SMG)	Getrag	D transmission	SMG
S6S 560G	Getrag	E-transmission (286/6)	
GS6-37BZ	ZF	H-transmission	
GS6S37BZ (SMG)	ZF	H-transmission	
GS6-37DZ	ZF	H-transmission	
GS6-37BG	Getrag	H-transmission	
GS6-53BZ	ZF	G-transmission	

GS6-53DZ	ZF	G-transmission	
GS6-17BG	Getrag	I-transmission	
GS6-17DG	Getrag	I-transmission	
GS7S47BG (SMG)	Getrag	J-transmission (247)	SMG -7-speed
GS7D36SG	Getrag	DKG (436)	DKG -7-speed
GS6- 45BZ	ZF	K transmission	
GS6- 45DZ	ZF	K transmission	

Automatic transmission

AUTOMATIC TRANSMISSION DESIGNATION

BMW designation	Manufacturer	Manufacturer designation	Remarks
A4S 200R	GMPT	GM4	
A4S 270R	GMPT	THM-R1w	Transmission wide-stepped
A4S 310R	GMPT	THM-R1	
A5S 300J	Jatco	Jatco	
A5S 310Z	ZF	5HP-18	
A5S 325Z	ZF	5HP-19	
A5S 440Z	ZF	5HP-24	
A5S 560Z	ZF	5HP-30	
A5S 360R/390R	GM	GM5	
GA6HP19Z	ZF	6HP19	
GA6HP26Z	ZF	6HP26	
GA6HP32Z	ZF	6HP32	
GA6L45R	GM	GM6	
GA8HP45Z	ZF	8HP45	
GA8HP70Z	ZF	8HP70	
GA8HP90Z	ZF	8HP90	
GA7AHSCD	Daimler	AHS-C	Hybrid

23 ... UNIVERSAL BMW TRANSMISSION TAKE-UP

NOTE:

- **The universal transmission bracket is introduced for the E60 AWD**
- **Suitable for manual and automatic transmissions**

IMPORTANT: Front and rear supports (1) can be laterally adjusted by means of screws (2). Carrier (3) of rear supports (1) can be longitudinally adjusted by means of screw.
Supports must be adapted in length and width to the transmission.

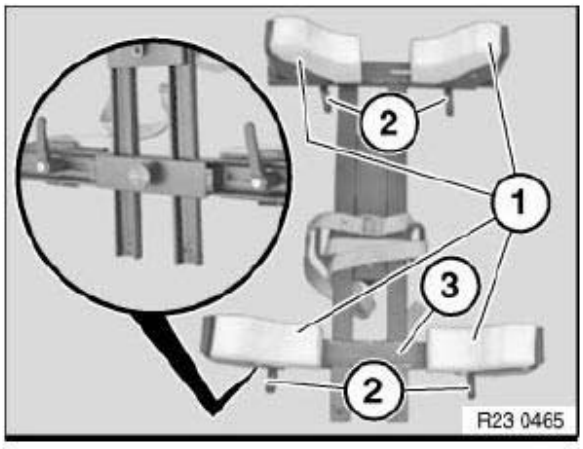


Fig. 23: Identifying Front And Rear Supports And Carrier With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools 23 4 050, 00 2 030.

IMPORTANT: Transmission must be secured with tensioning strap (1).

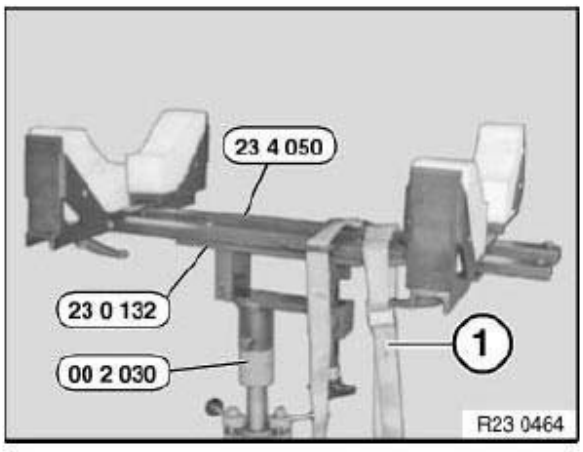


Fig. 24: Supporting Transmission With Special Tools (23 4 050,00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

23 .. ... UNIVERSAL TRANSMISSION RETAINING BRIDGE

NOTE:
- **The transmission retaining bridge 24 0 200 is suitable for both manual and automatic transmissions**

IMPORTANT: Adapters and spindles must be adapted for positive locking to the transmission.
(Risk of injury)

Adapt adapters (1) and spindle with thrust piece (3) to transmission.

Adapt length with slide (2).

Screw in spindle (4).

IMPORTANT: Before mounting on assembly stand 00 1 450, check retaining bridge for secure seating.

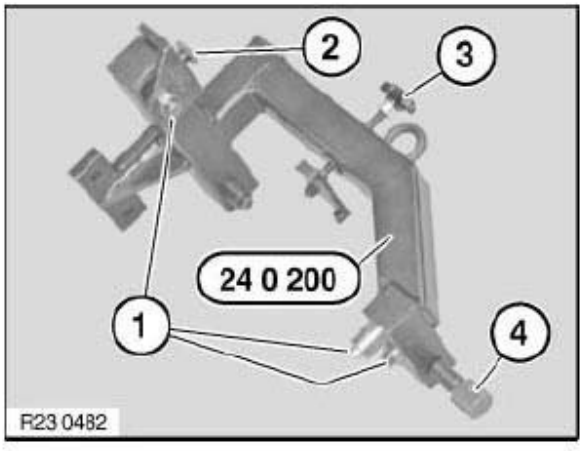


Fig. 25: Checking Universal Transmission Retaining Bridge Using Special Tool (00 1 450)
Courtesy of BMW OF NORTH AMERICA, INC.

2411 TRANSMISSION CASE, OIL SUMP

24 11 011 REMOVING AND INSTALLING/SEALING OR REPLACING TRANSMISSION SUMP (GA6HP19Z)

IMPORTANT: Remove transmission sump only after it has cooled down.
After completion of work, check TRANSMISSION OIL LEVEL .
Use only the approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

Recycling

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations.

Necessary preliminary tasks

Remove rear underbody protection.

Remove oil drain plug (1).

Tightening torque: **24 11 6AZ** .

Drain automatic transmission fluid.

Installation:

Replace oil drain plug.

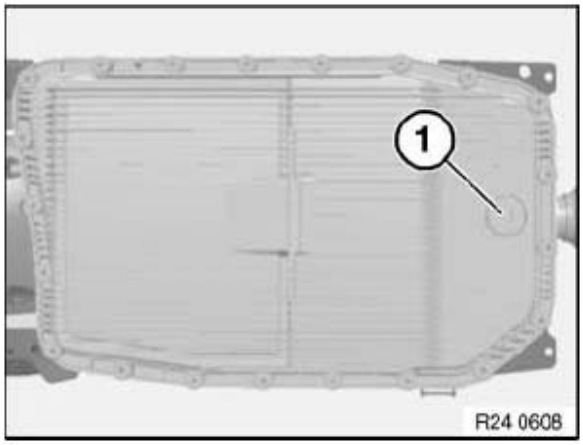


Fig. 26: Identifying Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew all bolts.

Remove transmission sump (1).

Installation:

Insert screws (2) until screw heads make contact.

Insert all further screws in diagonal sequence from inside to outside until screw heads make contact.

Tightening torque: **24 11 5AZ** .

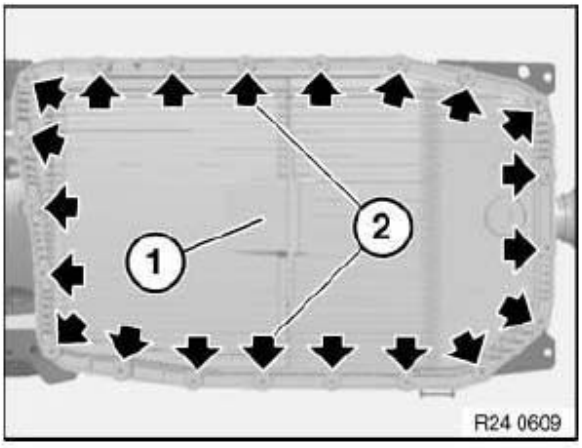


Fig. 27: Locating Transmission Sump Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove gasket (1) from transmission sump.

Clean sealing faces and groove with a cloth.

Insert new gasket in transmission sump groove.

IMPORTANT: Do not degrease transmission sump with cleaning agent.

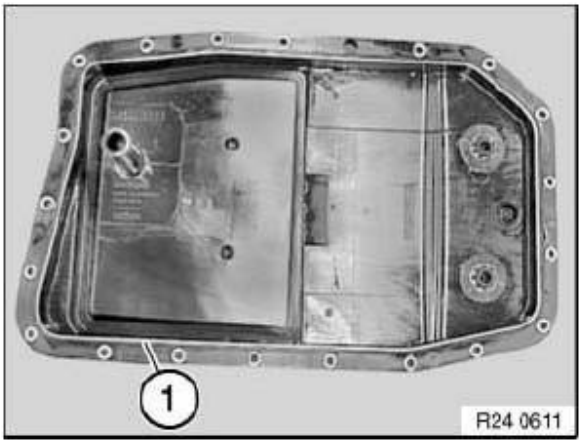


Fig. 28: Identifying Gasket Of Transmission Sump
Courtesy of BMW OF NORTH AMERICA, INC.

Replace sealing ring (1) on oil filter tube.

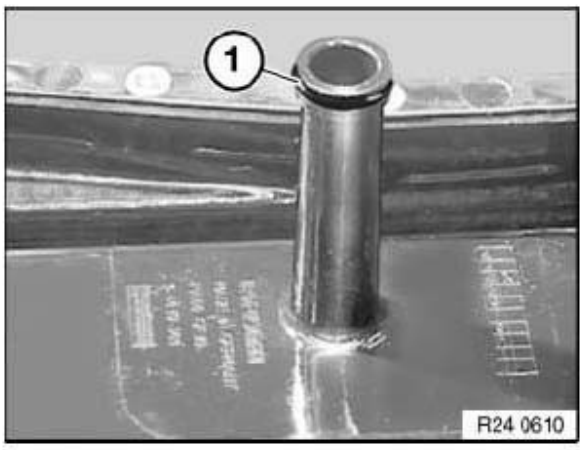


Fig. 29: Identifying Sealing Ring On Oil Filter Tube
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

The gasket is correctly installed when it is engaged in the locating opening of the transmission sump.

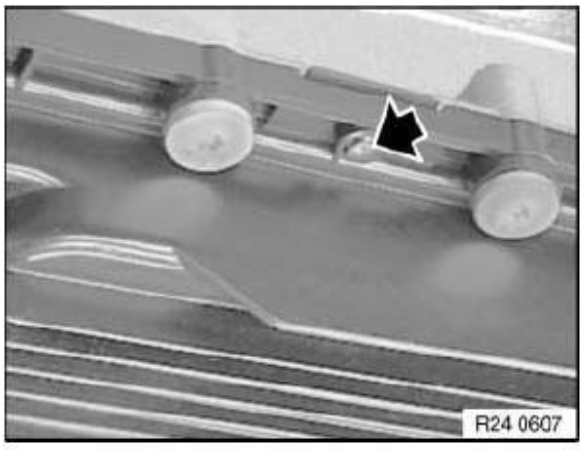


Fig. 30: Identifying Gasket Of Transmission Sump
Courtesy of BMW OF NORTH AMERICA, INC.

2413 EXTENSION HOUSING, BEARINGS, SEAL

24 13 013 REPLACING OUTPUT FLANGE SHAFT SEAL (GA6HP19Z)

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .
Use only the approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this requirement will result in serious damage to the automatic transmission!

Necessary preliminary tasks

- Remove **UNDERBODY PROTECTION**
- Remove complete **EXHAUST SYSTEM**
- Remove heat shields
- Support transmission with engine support.
- Remove **TRANSMISSION CROSS-MEMBER** .
- Remove **PROPELLER SHAFT**

Release screws.

Remove transmission bearing block (1).

Tightening torque **24 71 6AZ** .

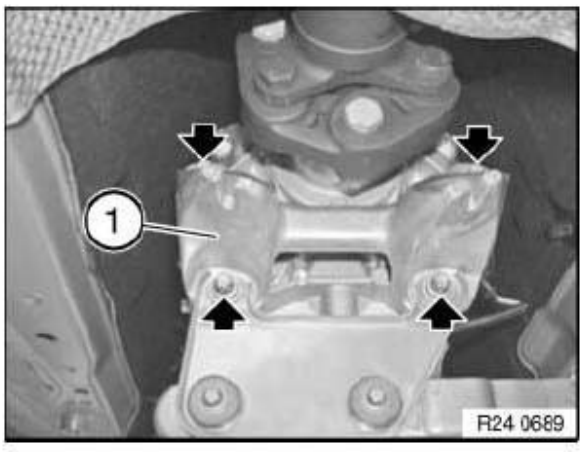


Fig. 31: Identifying Transmission Bearing Block Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Grip output flange (1) with special tool **24-0 020** .

Release nut with special tool 24 2 380.

Tightening torque: **24 13 2AZ** .

Installation:

Replace nut and secure with a mandrel (8 mm) by caulking.

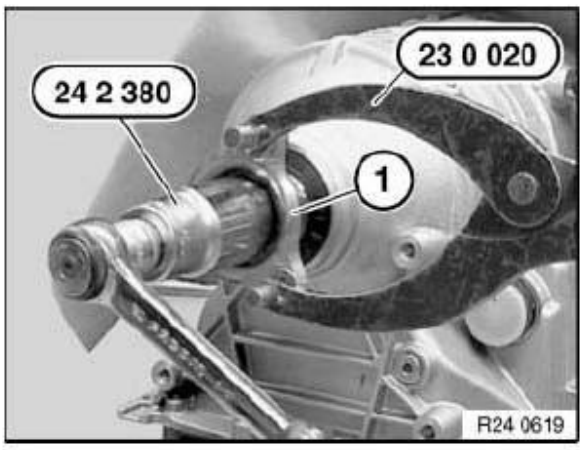


Fig. 32: Gripping Output Flange From Output Shaft Using Special Tool 23 0 020
Courtesy of BMW OF NORTH AMERICA, INC.

Detach output flange from output shaft.

Remove spacer.

Attach special tool 24 2 353 to output shaft (1).

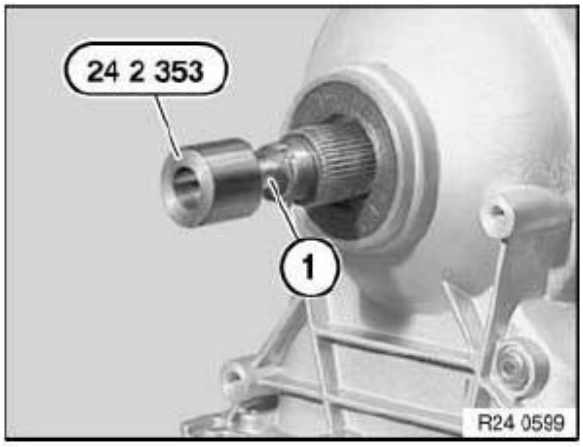


Fig. 33: Connecting Special Tool (24 2 353) To Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 24 2 351 until it is firmly connected with radial shaft seal hat.

Pull out radial shaft seal by screwing in special tool 24 2 352.

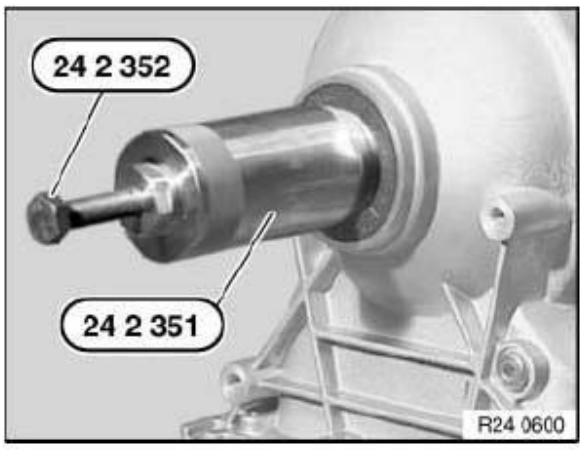


Fig. 34: Pulling Out Radial Shaft Seal Using Special Tool (24 2 352)
Courtesy of BMW OF NORTH AMERICA, INC.

Oil sealing lip of radial shaft seal (1). Drive in radial shaft seal (1) as far as it will go using special tool 24 2 370 and adapter ring **24 2 410** .

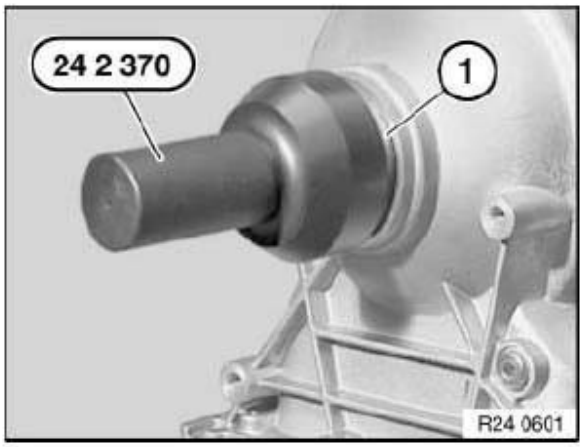


Fig. 35: Driving Radial Shaft Seal Using Special Tools (24 2 370, 24 2 370)
Courtesy of BMW OF NORTH AMERICA, INC.

2414 MECHANICAL ATTACHMENTS

24 14 002 REPLACING SHAFT SEAL FOR SELECTOR SHAFT (GA6HP19Z)

Special tools required

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .
Use only the approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this requirement will result in serious damage to the automatic transmission!

Necessary preliminary tasks

- Remove heat shields

Brace clamping bush (1) and loosen nut (2).

Detach retainer (3) downwards using a screwdriver.

Pull cable (4) out of holder.

Installation:

ADJUST SELECTOR LEVER .

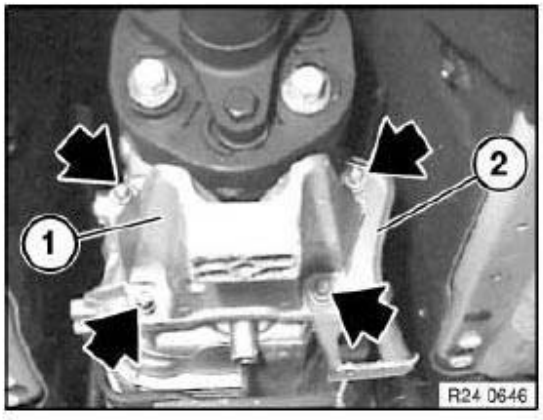


Fig. 36: Identifying Clamping Bush, Cable Of Holder And Retainer With Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Slacken nut (1).

Take off holder (2).

Tightening torque **24 51 1AZ** .

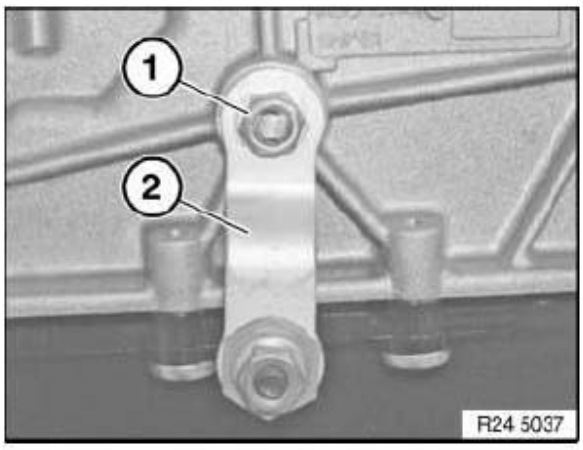


Fig. 37: Identifying Holder With Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 24 5 361 until it is firmly connected with radial shaft seal hat.

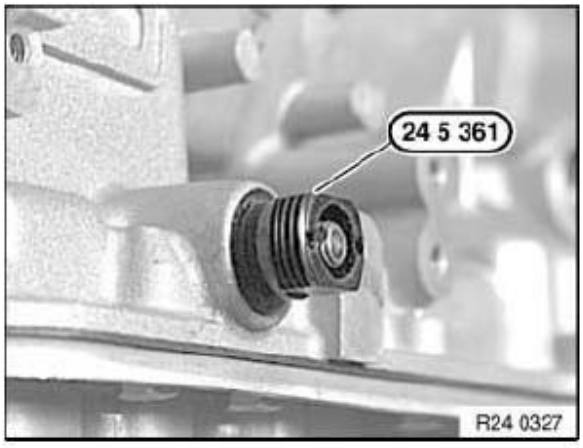


Fig. 38: Identifying Radial Shaft Seal With Special Tool (24 5 361)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 24 5 362 onto special tool 24 5 361 and tighten down.

This pulls the shaft seal out of the transmission housing.

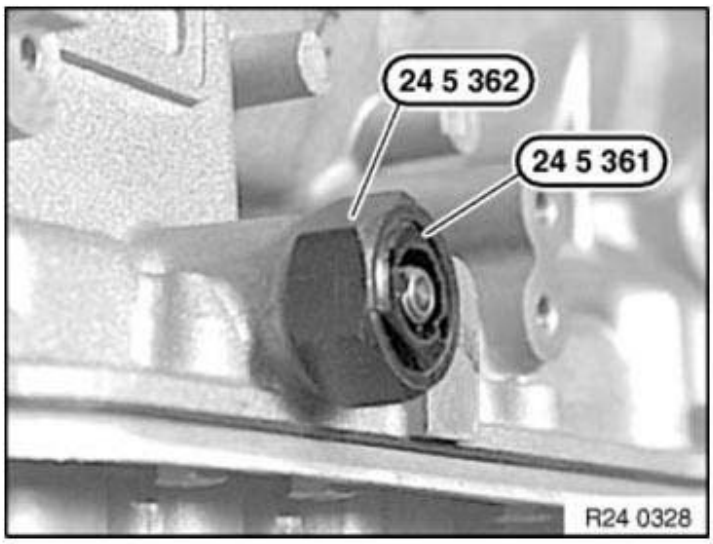


Fig. 39: Identifying Special Tools (24 5 362, 24 5 361)
Courtesy of BMW OF NORTH AMERICA, INC.

Oil sealing lip on shaft seal (1).

Screw in radial shaft seal (1) with special tools 24 5 366 and 24 5 364 as far as it will go.

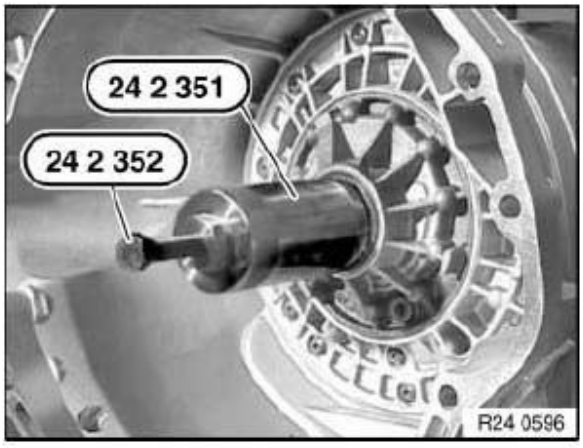


Fig. 40: Installing Radial Shaft Seal Using Special Tool (24 2 351) And (24 2 352)
Courtesy of BMW OF NORTH AMERICA, INC.

2431 OIL PUMP

24 31 011 REPLACING TORQUE CONVERTER FLANGE SHAFT SEAL (GA6HP19Z)

Necessary preliminary tasks

- Remove **AUTOMATIC TRANSMISSION** .

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .
Use only approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this instruction will result in serious damage to the transmission.

Secure transmission with special tool 24 0 200 on assembly stand 00 1 450.

Remove **TORQUE CONVERTER** .

NOTE: Read and comply with note on installation of TRANSMISSION RETAINING BRIDGE .

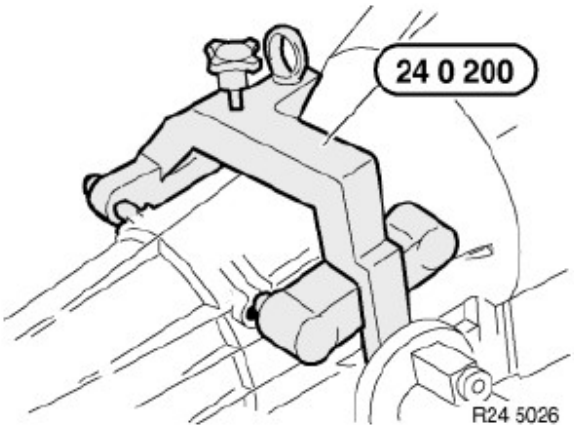


Fig. 41: Identifying Screw Special Tool 24 0 200
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 24 2 353 to input shaft (1).

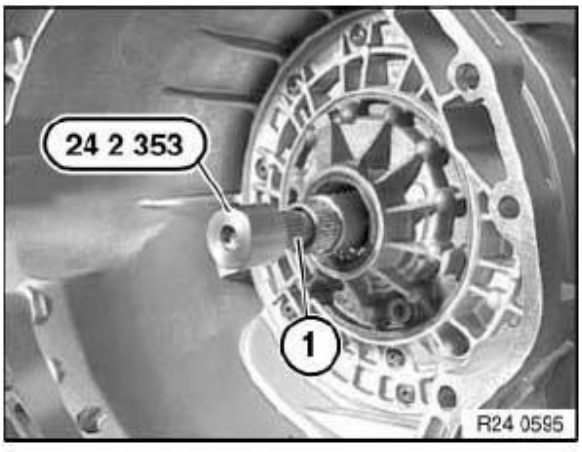


Fig. 42: Connecting Special Tool (24 2 353) To Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 24 2 351 until it is firmly connected with radial shaft seal.

Screw in special tool 24 2 352 to remove radial shaft seal.

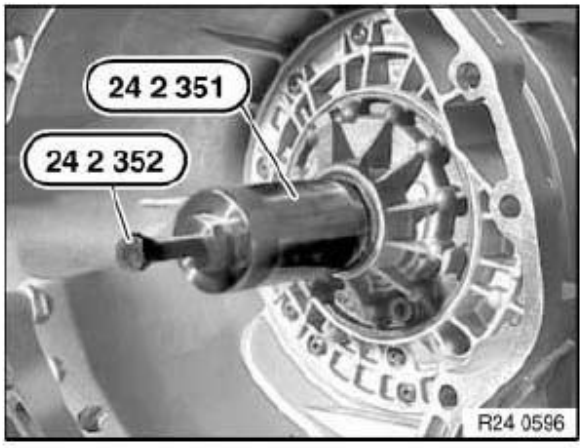


Fig. 43: Removing Radial Shaft Seal Using Special Tool (24 2 351) And (24 2 352)
Courtesy of BMW OF NORTH AMERICA, INC.

Oil sealing lip on shaft seal.

Drive in radial shaft seal (1) with special tool 24 2 400 as far as it will go.

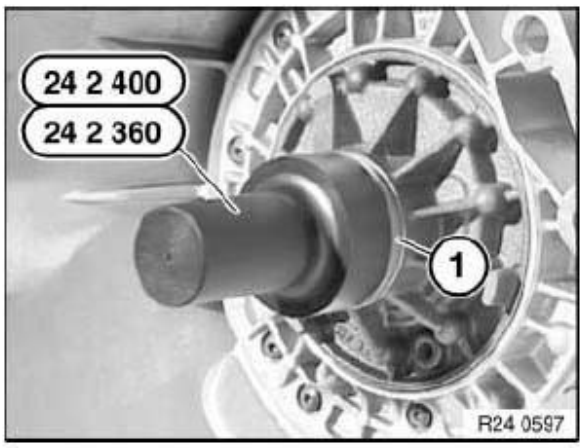


Fig. 44: Installing Radial Shaft Seal Using Special Tool 24 2 400
Courtesy of BMW OF NORTH AMERICA, INC.

2434 SHIFT VALVES, PARKING LOCK

24 34 ... NOTES ON MECHATRONICS (GA6HP26Z/GA6HP32Z

IMPORTANT: After completing work:

- Load specific data version with DIS
- Check **TRANSMISSION OIL LEVEL**

Use only **AUTOMATIC TRANSMISSION - OPERATING FLUIDS** .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DISCHARGE (ESD PROTECTION) .

Unscrew plug (1) and disconnect.

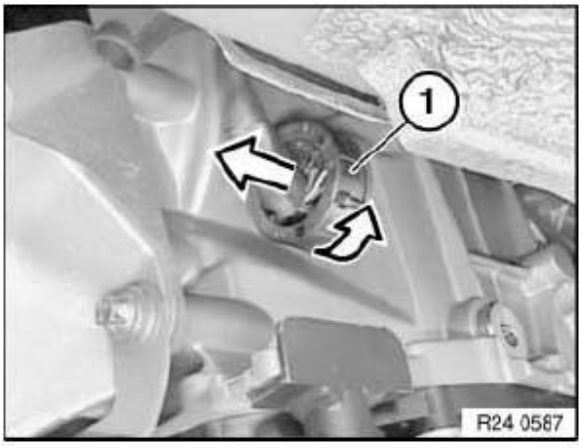


Fig. 45: Disconnecting Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 2 390 in sealing sleeve (1).

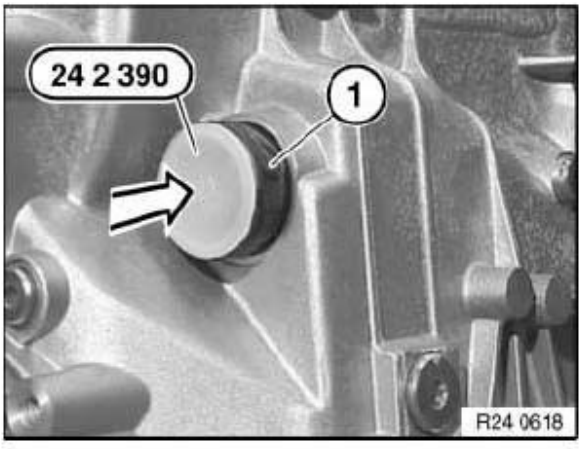


Fig. 46: Inserting Sealing Sleeve Using Special Tool (24 2 390)
Courtesy of BMW OF NORTH AMERICA, INC.

24 34 ... RELEASE TRANSMISSION LOCK ELECTRONICALLY

For various tasks, it is necessary to unlock and lock the parking lock.

Before unlocking the parking lock, secure the vehicle against rolling away.

- Emergency release is only possible if the engine does not start and the starter turns over.
- If an emergency release needs to be performed although the engine starts, pull out the fuse of the electrical fuel pump.
- Emergency release is active for 15 min.
- As soon as a wheel speed signal is recorded, this time increases by 15 min.
- After this period, the parking lock is engaged without a message.
- The time specification depends on the battery capacity.
- Only specially trained service personnel are permitted to operate both the mechanical as well as the electrical emergency transmission release system.
- The vehicle must be raised and the underbody panelling removed in order to operate the mechanical emergency transmission release.

IMPORTANT: To operate the electronic emergency transmission release the vehicle must not be towed but rather only pushed.
In the case of misuse, a corresponding fault code is stored in the fault code memory.

Release transmission lock electronically

- Switch the ignition on.
- Press on brake pedal and keep depressed throughout the procedure.
- Press START-STOP button.
- As soon as the starter can be heard to operate (this may take several seconds on diesel engines or at low temperatures).
- Press and hold release button (1).



Fig. 47: Identifying Transmission Release Button
Courtesy of BMW OF NORTH AMERICA, INC.

1. The specified time must be adhere to!
2. Push gear selector switch (2) forward up to pressure point and hold for two seconds.
3. Release gear selector switch and move one step forward briefly.

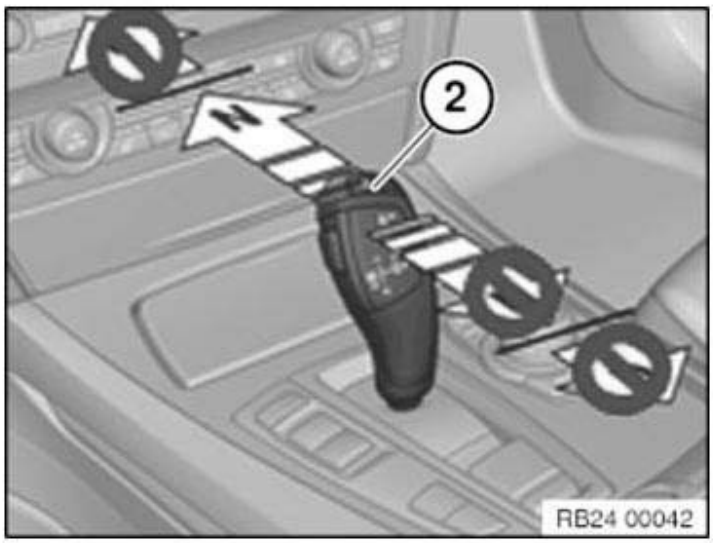


Fig. 48: Identifying Gear Selector Switch
Courtesy of BMW OF NORTH AMERICA, INC.

- Gear position N is shown in the instrument cluster.
- The parking lock is now electronically unlocked.
- After the parking lock is successfully unlocked, release the brake pedal.

- Leave the ignition switched on in order to subsequently move the vehicle.
- The transmission automatically shifts into P when the ignition is turned off.



Fig. 49: Identifying Gear Position N
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: After the start-stop button is pressed again, the parking lock is activated without a message.
If the gearbox cannot be released, turn the ignition off and on again and repeat the previous steps.
Allow the starter to cool down for approx. 10 minutes after unsuccessful attempts.

24 34 562 REPLACING MECHATRONICS (GA6HP19Z)

NOTE: After completing work:

- Load specific data version with DIS.

IMPORTANT: After completion of work, CHECK TRANSMISSION OIL LEVEL .
Use only AUTOMATIC TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this requirement will result in serious damage to the automatic transmission!

IMPORTANT: Read and comply with notes on PROTECTION AGAINST ELECTROSTATIC DISCHARGE (ESD PROTECTION) .

Necessary preliminary tasks

- Remove heat shields.
- Support automatic transmission with hydraulic lifter.
- Remove **TRANSMISSION CROSS-MEMBER** .

Brace clamping bush (1) and loosen nut (2).

Detach retainer (3) downwards using a screwdriver.

Pull cable (4) out of holder.

Installation:

ADJUST SELECTOR LEVER .

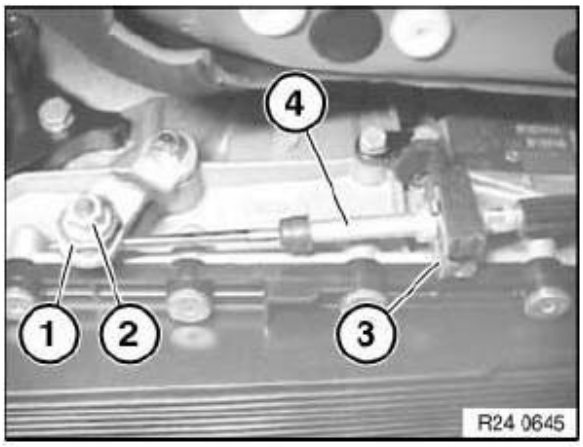


Fig. 50: Identifying Clamping Bush Cable, Retainer With Nut
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Mechatronics can be destroyed by static discharges. Therefore the contacts inside the plug must not be touched. Insert special tool immediately after work step.

Unscrew plug (1) and disconnect.

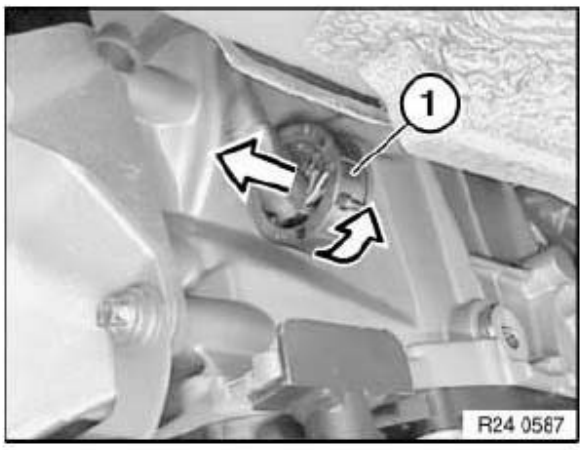


Fig. 51: Disconnecting Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 2 390 in sealing sleeve (1).

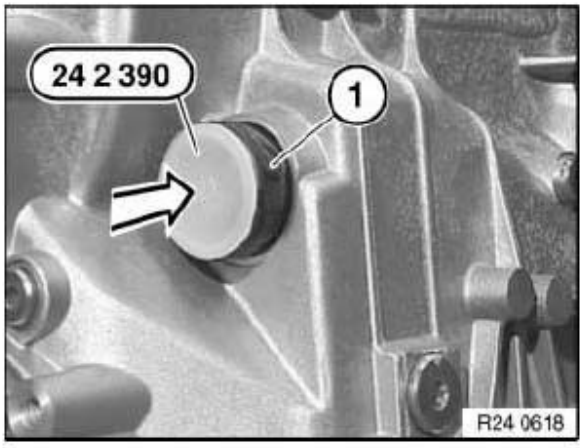


Fig. 52: Inserting Sealing Sleeve Using Special Tool (24 2 390)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **TRANSMISSION OIL SUMP** .

Unlock sealing sleeve with slide (1).

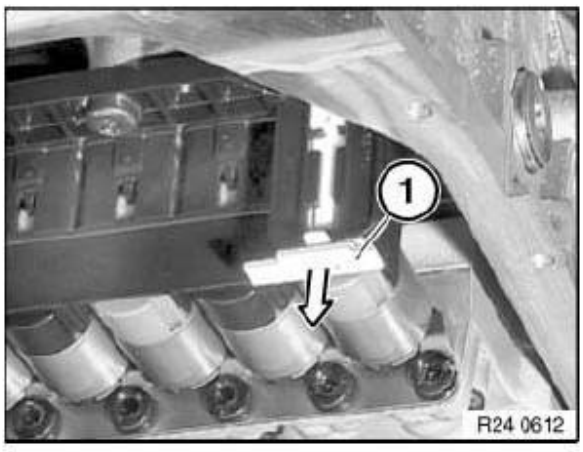


Fig. 53: Removing Sleeve With Slide
Courtesy of BMW OF NORTH AMERICA, INC.

Note position of sealing sleeve.

Pull out sealing sleeve (1).

Installation:

Screw in sealing sleeve partially (lug in upper area). Turn until lug engages in groove of transmission. Slide in sealing sleeve.

Lug on sealing sleeve must not be damaged!

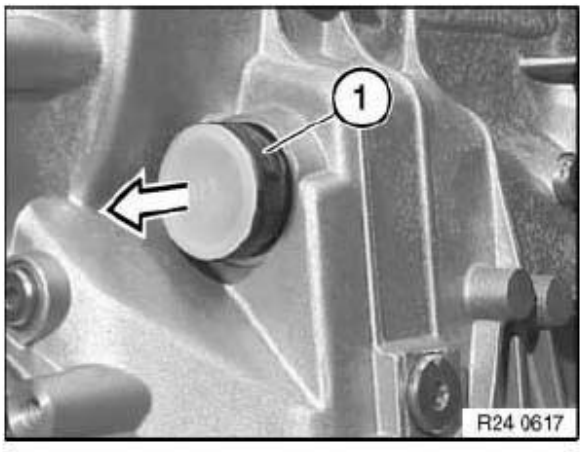


Fig. 54: Pulling Out Sealing Cup
Courtesy of BMW OF NORTH AMERICA, INC.

Release all screws (1 and 2).

- 1 = M6 x 59 mm

- 2 = M6 x 20 mm

Remove mechatronics.

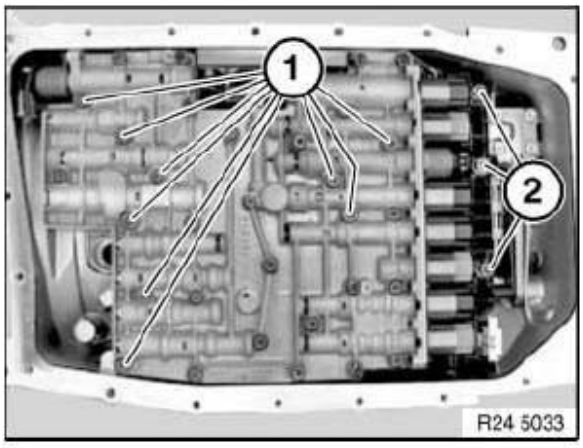


Fig. 55: Identifying Mechatronics Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check gaskets (1 and 2) for damage, replace gaskets if necessary.

Coat new seals with automatic transmission fluid and install.

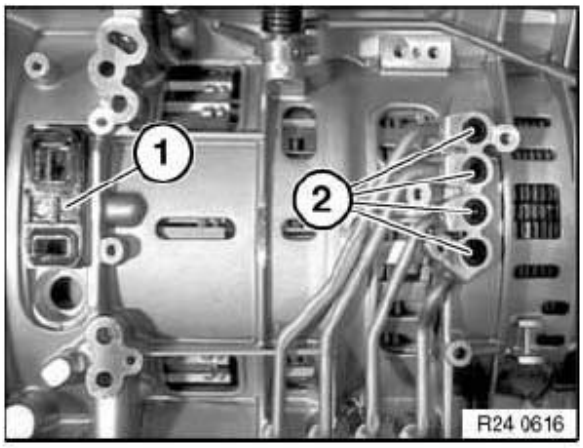


Fig. 56: Identifying Gaskets
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Insert screws (3) alternately until contact is made with each screw head.

Insert all further screws contact is made with each screw head.

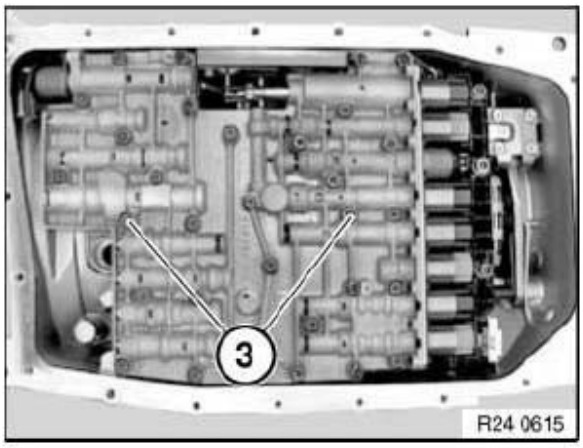


Fig. 57: Identifying Screw Head Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: GA6HP19Z TU

IMPORTANT: Tighten down screws in order 1...13.
Failure to comply with this requirement will result in serious damage to the automatic transmission!
Tightening torque 24 30 1AZ .

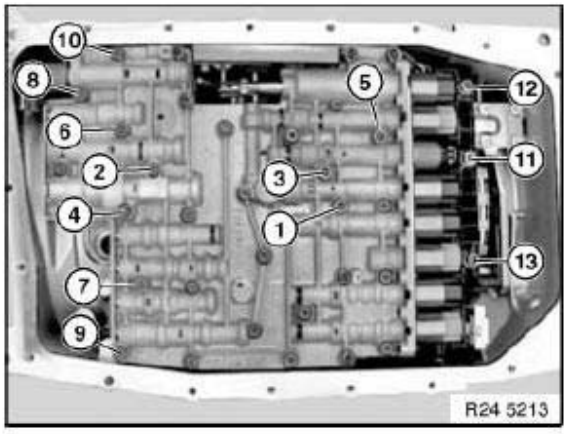


Fig. 58: Identifying Screw Head Screws
Courtesy of BMW OF NORTH AMERICA, INC.

24 34 021 REPLACING SEALING SLEEVE FOR TRANSMISSION HOUSING (GA6HP19Z)

IMPORTANT: After completion of work, CHECK TRANSMISSION OIL LEVEL .
Use only AUTOMATIC TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this requirement will result in serious damage to the automatic transmission!

Necessary preliminary tasks

- Remove heat shields
- Remove **TRANSMISSION FLUID SUMP**
- Remove **TRANSMISSION CROSS-MEMBER** .

IMPORTANT: Support transmission with workshop hoist.

Unlock and disconnect plug (1) by turning.

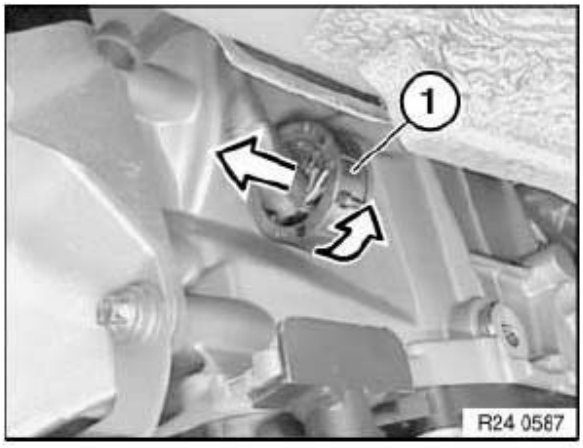


Fig. 59: Turning Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 24 2 390 in sealing sleeve (1).

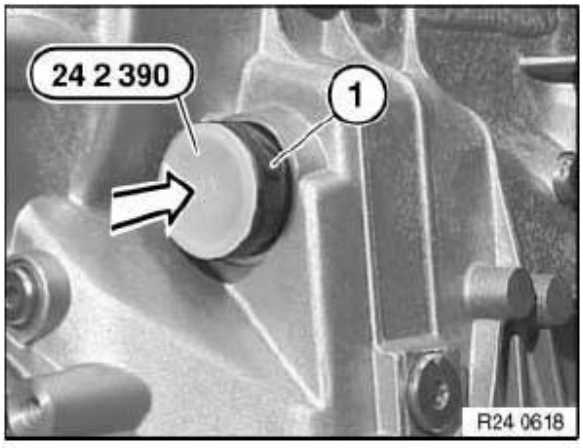


Fig. 60: Inserting Sealing Sleeve Using Special Tool (24 2 390)

Courtesy of BMW OF NORTH AMERICA, INC.

Unlock sealing sleeve with slide (1).

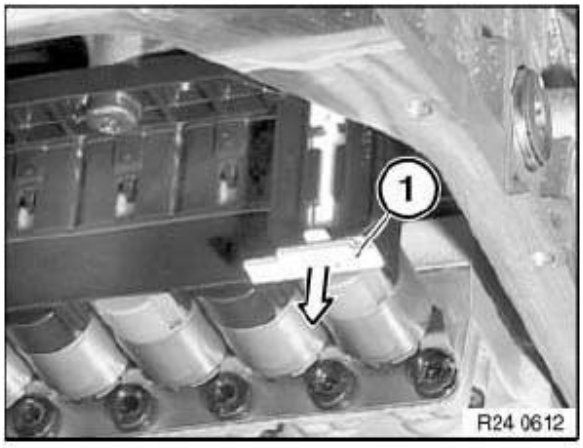


Fig. 61: Removing Sleeve With Slide
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Note position of sealing sleeve.

Pull out sealing sleeve (1).

Installation:

Screw in sealing sleeve partially (lug in upper area). Turn until lug engages in groove of gearbox. Slide in sealing sleeve.

Lug on sealing sleeve must not be damaged!

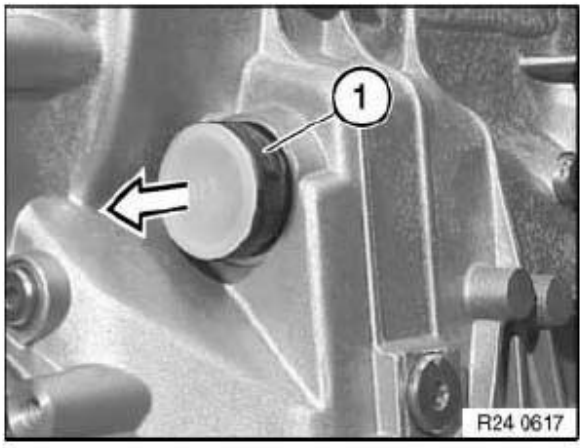


Fig. 62: Pulling Out Sealing Cup
Courtesy of BMW OF NORTH AMERICA, INC.

2440 TORQUE CONVERTER

24 40 011 REMOVING AND INSTALLING/REPLACING TORQUE CONVERTER (GA6HP19Z)

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .
Use only approved AUTOMATIC TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks

- Remove **AUTOMATIC TRANSMISSION**

Screw special tool 24 4 000 into torque converter.

Remove torque converter.

NOTE: When torque converter is removed, transmission oil flows out.

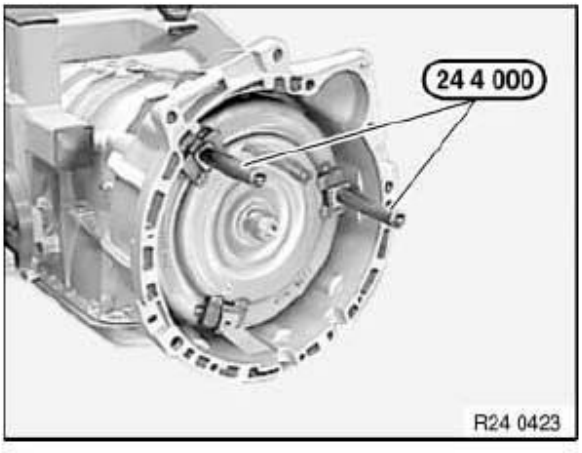


Fig. 63: Identifying Screw Special Tool 24 4 000
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When installing, do not damage shaft seal and bearing.

If the torque converter is not correctly installed, the driver of the pump impeller may be damaged when the transmission is flanged to the engine.

Remove torque converter and set down vertically.

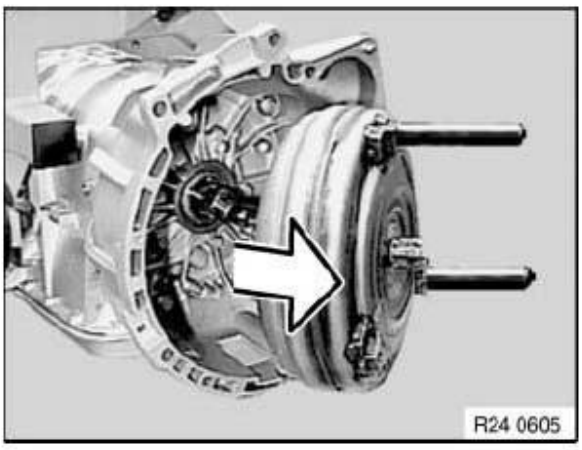


Fig. 64: Removing Torque Converter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Push torque converter through shaft seal onto transmission shaft as far as it will go.

Press torque converter by hand into converter housing and turn in the process. Converter hub opening must snap into place in driver of pump impeller. Torque converter must be felt to slip inwards.

24 AUTOMATIC TRANSMISSION

24-0030 ADAPTER

0491628 240030 Adapter MW

NOTE: For pressure gauge 13 3 061/For checking the converter pressure

Storage Location

A4



W24 0 030

Fig. 1: Identifying Adapter (240030)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2410 ADAPTER

0496482 242410 Adapter Minimum set: Mechanical tools MW

NOTE: (Adapter ring) For driving in radial shaft seal on output shaft.

Storage Location

B25

SI number

01 18 08 (482)



Fig. 2: Identifying Adapter (242410)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5190 ADAPTER

0491767 245190 Adapter MW

NOTE: For pressure gauge 13 3 061 for checking oil pressure in transmission

Storage Location

A4

SI number

01 03 90 (184)



W24 5 190

Fig. 3: Identifying Adapter (245190)
Courtesy of BMW OF NORTH AMERICA, INC.

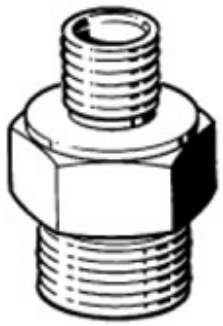
24-0070 ADAPTER

0491635 240070 Adapter MW

NOTE: For testing the pump pressure

Storage Location

A4



W24 0 070

Fig. 4: Identifying Adapter (240070)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1210 ANGLE

0491674 241210 Angle MW

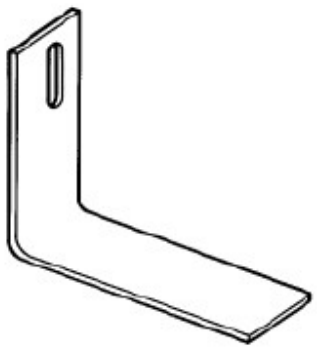
NOTE: (Sheet metal part) Retaining plate for disc package As of transmission number 11 2 300 not required

Storage Location

Z4

SI number

01 09 90 (282)



W24 1 210

Fig. 5: Identifying Angle (241210)

Courtesy of BMW OF NORTH AMERICA, INC.

24-5270 BUSH

0491775 245270 Bush Minimum set: Mechanical tools MW

NOTE: For fitting the radial sealing ring of the selector shaft

Storage Location

B3

SI number

01 08 96 (080)

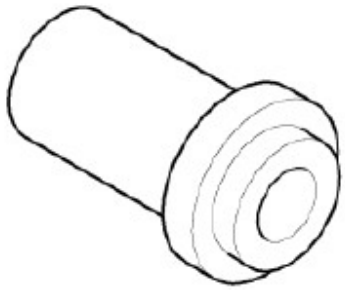


Fig. 6: Identifying Bush (245270)
Courtesy of BMW OF NORTH AMERICA, INC.

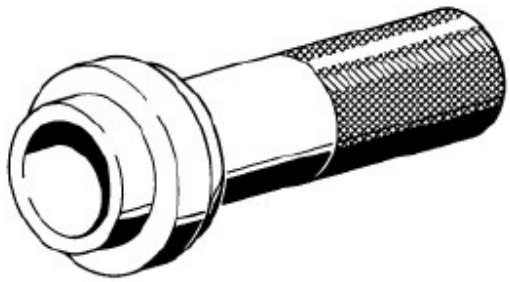
24-1050 BUSH

0491664 Bush 241050 MW

NOTE: (Impact bush) For fitting radial shaft seal for torque converter in oil pump housing

Storage Location

Y7



W24 1 050

Fig. 7: Identifying Bush (241050)
Courtesy of BMW OF NORTH AMERICA, INC.

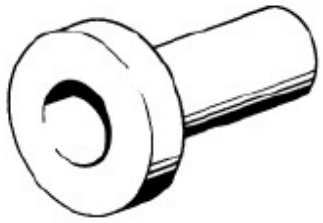
24-1060 BUSH

0491665 Bush 241060 MW

NOTE: (Impact bush) For driving in the radial seal ring for the torque converter in the oil pump housing and at the output flange

Storage Location

Y7



W24 1 060

Fig. 8: Identifying Bush (241060)
Courtesy of BMW OF NORTH AMERICA, INC.

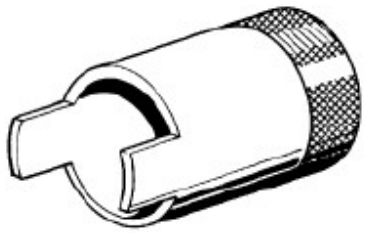
24-3140 BUSH

0491709 Bush 243140 MW

NOTE: (Driver bush) For checking the oil pump for ease of movement

Storage Location

A10



W24 3 140

Fig. 9: Identifying Bush (243140)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5200 BUSH

0491768 245200 Bush MW

Replaced by: 0491781

NOTE: (Impact bush) For fitting the radial sealing ring of the selector lever shaft/Replaced by 24 5 360 (0 491 781)

SI number

01 03 90 (184)



W24 5 200

Fig. 10: Identifying Bush (245200)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1080 BUSH

0493254 241080 Bush Minimum set: Mechanical tools MW

NOTE: (bushing (aluminium)) For placing on the drive shaft during removal of the shaft seal from the oil pump housing

Storage Location

C4

SI number

01 03 98 (303)



W24 1 080

Fig. 11: Identifying Bush (241080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5250 BUSH

0491773 245250 Bush Minimum set: Mechanical tools MW

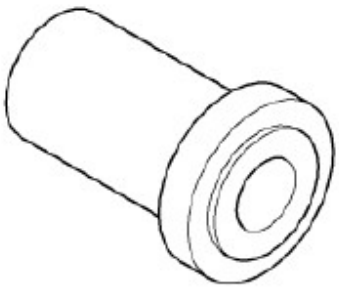
NOTE: For pressing in the radial seal ring of the selector shaft

Storage Location

B3

SI number

01 02 95 (896)



W 24 5 250

Fig. 12: Identifying Bush (245250)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1100 BUSH

0491666 241100 Bush MW

NOTE: (Impact bush) For driving in the radial seal ring for the output flange into the transmission extension

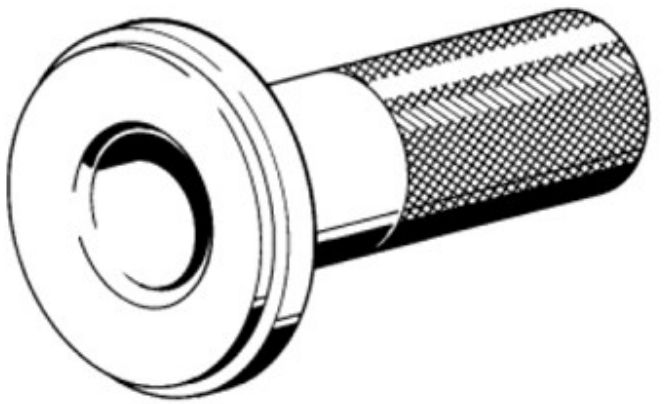


Fig. 13: Identifying Bush (241100)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4380 BUSH

0495601 244380 Bush Minimum set: Mechanical tools MW

NOTE: (Bush with nut) For inserting radial shaft seal of selector shaft.

Storage Location

A24

SI number

01 02 07 (334)

Consisting of:

1 = 0495788 Bush

2 = 0495789 Nut

NOTE: (Nut M8x1)

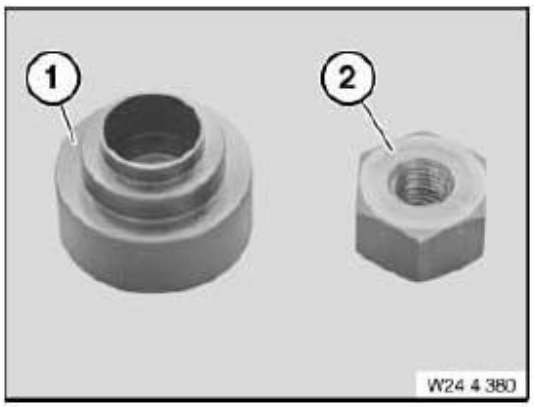


Fig. 14: Identifying Bush (244380)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1090 BUSH

0493335 241090 Bush MW

NOTE: (Impact bush) For driving in the radial shaft seal on the output flange

SI number

01 08 98 (333)

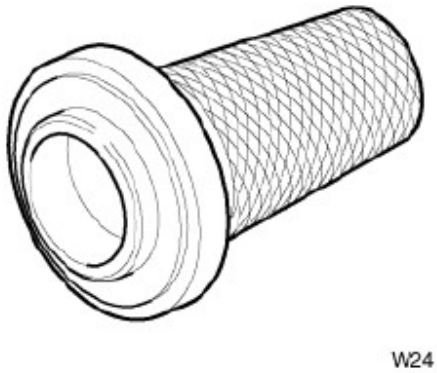


Fig. 15: Identifying Bush (241090)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1070 BUSH

0493253 241070 Bush Minimum set: Mechanical tools MW

NOTE: (Impact bush) For fitting radial shaft seal into oil pump housing

Storage Location

C17

SI number

01 03 98 (303)

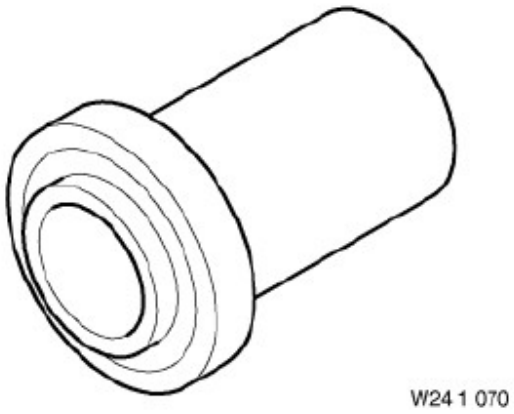


Fig. 16: Identifying Bush (241070)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2390 CAP

0494213 242390 Cap Minimum set: Mechanical tools MW

NOTE: (protective cap) For sealing off the guide sleeve of the transmission connector

Storage Location

C49

SI number

01 14 01 (766)



Fig. 17: Identifying Cap (242390)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5140 CENTERING PIN

24 5 140 Centering pin

NOTE: For transfer plate and gasket to shift unit (2 x)

Transmission: A4S 310R

24-0150 CLIP

0491644 240150 Clip MW

NOTE: (Mounting bracket) For mounting the transmission on the assembly stand

Consisting of:

6 = 0493913 Spindle

NOTE: With synchronising key, transmission: All

3 = 0491645 Shaped part

NOTE: (Shaped part) For mounting the transmission/transmissions: A5S 310Z

2 = 0491646 Frame

NOTE: (Main frame)

3 = 0491647 Spindle

NOTE: **(Spindle with rotary handle)**

3 = 0491648 Bolt

NOTE: **(Mounting bolts)**

3 = 0491649 Bush

NOTE: **(Spacer bush for spindle) Transmissions: A4S 310R**

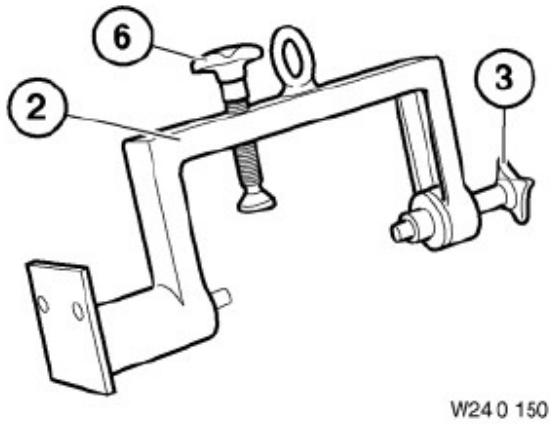


Fig. 18: Identifying Clip (240150)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0140 CONNECTION

0491643 240140 Connection Minimum set: Mechanical tools MW

Replaced by: 0495498

NOTE: **(Connection) For pressure gauge 13 3 061 and BMW diagnosis and information system for measuring the oil pressure in the transmission Replaced by 23 4 050 (0 495 498)**

Storage Location

A4

SI number

01 01 92 (469)

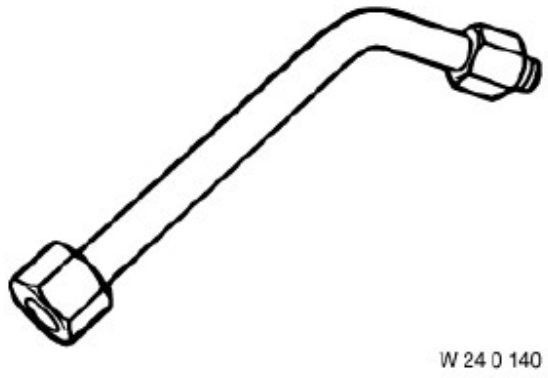


Fig. 19: Identifying Connection (240140)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0020 CONNECTION

0491618 240020 Connection Minimum set: Mechanical tools MW

NOTE: (Connections) Oil pressure testing accessory for pressure gauge 13 3 061 or BMW DIS for checking the oil pressure.

Storage Location

B24

B23

Individual

Consisting of:

1 = 0491619 Hose

NOTE: (Line) Pressure hose 1.7 m, connection M12x1.5 - M14x1.5 outer thread/For checking the different converter pressures/transmission: A4S 310R, A4S 270R

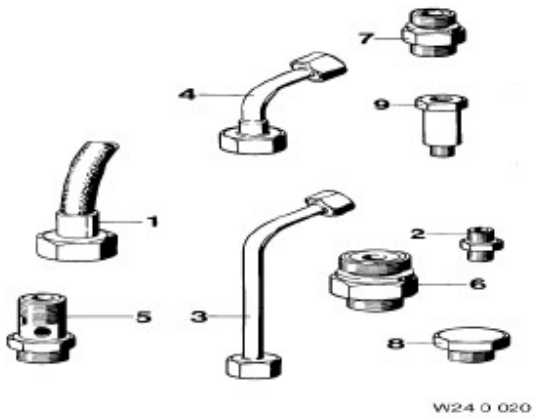


Fig. 20: Identifying Connection (240020)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491620 Connection

NOTE: (Connection) For checking the main pressure (3 HP 22, A5S 310Z) and clutch A (ZF transmission)/transmission: 3 HP 22, A5S 310Z, A5S 560Z and all ZF transmissions

3 = 0491621 Connection

NOTE: (Connection) Pipe bend, 145 mm, stretched length 145 mm/transmission: 4 HP 22, 4 HP 24

4 = 0491622 Connection

NOTE: (Connection) Pipe bend, 90 mm, stretched length 90 mm

5 = 0491623 Screw

NOTE: (Connection) Banjo bolt M20x1. - M18x1./For checking the converter pressure/transmission: 3 HP 12

6 = 0491624 Connection

NOTE: (Connection) Reducer M24x1.5 - 20x1.5/For checking the main pressure/transmission: 3 HP 20

7 = 0491625 Connection

NOTE: (Connection) Reducer M20x1.5 - M18x1.5/For checking the main pressure (3 HP 12) an converter pressure (3 HP 20)/Transmission: 3 HP 12, 3 HP 20

8 = 0491626 Screw

NOTE: (Screw) M18x1./For closing the engine oil feed pipe when checking the converter pressure/transmission: 3 HP 20

9 = 0491627 Adapter

NOTE: For closing the feed and return lines when checking the main pressure/transmission: 3 HP 22

24-0190 COUNTER SUPPORT

0491657 240190 Counter support Minimum set: Mechanical tools MW

NOTE: (Steady device) For the output flange of the propeller shaft while releasing and tightening the slotted nut

SI number

01 06 92 (509)

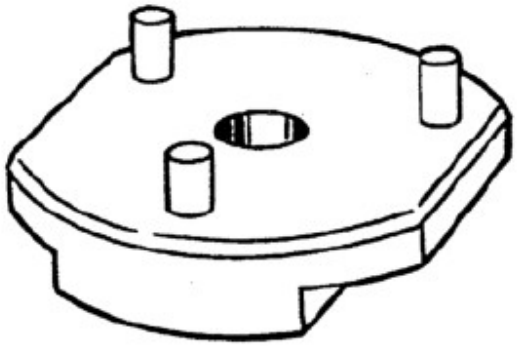


Fig. 21: Identifying Counter Support (240190)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1230 DEVICE

0491676 241230 Device MW

NOTE: (Pressing device) For removing and installing the piston (cover) at brake C

Storage Location

Y6

SI number

01 14 93 (718)

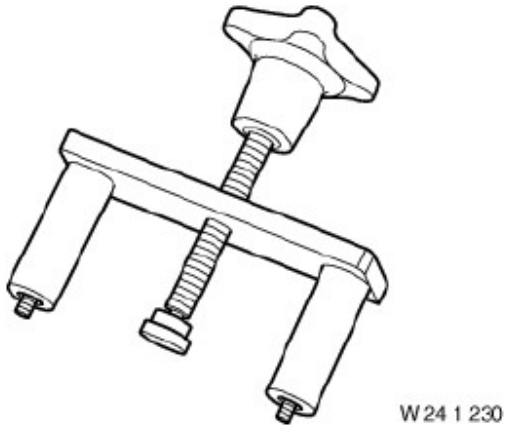


Fig. 22: Identifying Device (241230)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4120 DEVICE

0491730 244120 Device MW

Replaced by: 0491731

NOTE: For firmly holding torque converter in position while removing and fitting the transmission. Replaced by 24 4 130 (0 491 731)

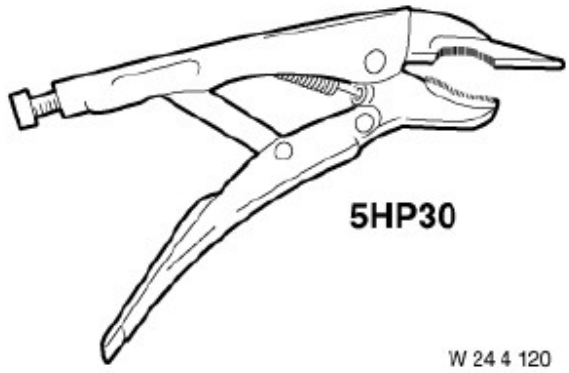


Fig. 23: Identifying Device (244120)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1240 DEVICE

0491677 241240 Device MW

NOTE: **(device) For determining the shims on the brake C**

Storage Location

Y6

SI number

01 14 93 (718)

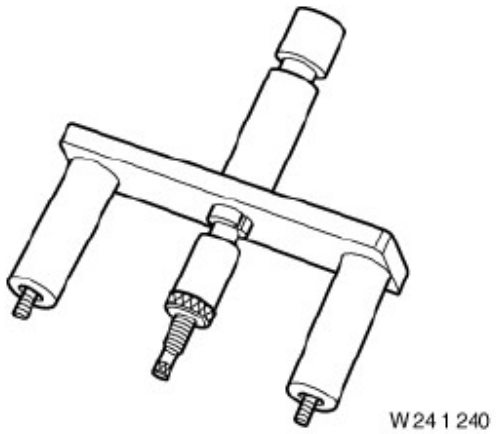


Fig. 24: Identifying Device (241240)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1370 DEVICE

0495486 241370 Device Minimum set: Mechanical tools MW

NOTE: **(locating fixture) For securing converter during removal and installation of transmission.**

Storage Location

A20

B20

SI number

01 23 05 (224)

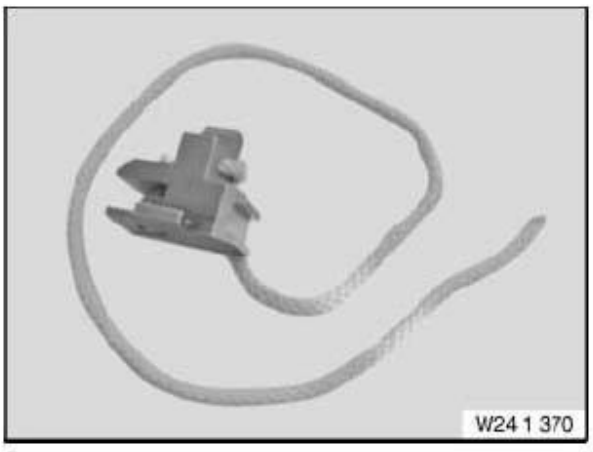


Fig. 25: Identifying Device (241370)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1250 DEVICE

0491678 241250 Device MW

NOTE: (Lifting gear) For removing and installing the brake clutch unit D/G incl. the parking lock gear

Storage Location

Y3

Z3

SI number

01 14 93 (718)

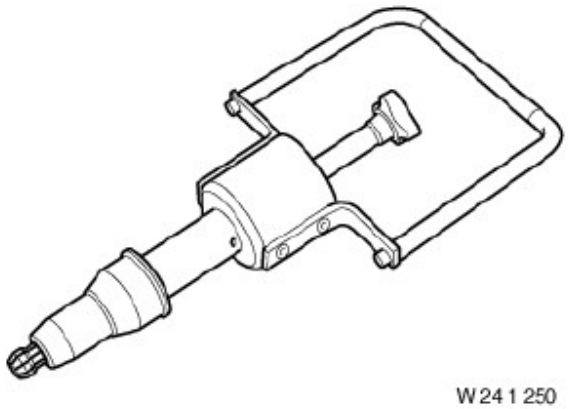


Fig. 26: Identifying Device (241250)

Courtesy of BMW OF NORTH AMERICA, INC.

24-5260 DEVICE

0491774 245260 Device Minimum set: Mechanical tools MW

NOTE: (Pulling device) For pulling off the radial seal of the selector shaft/transmission with positioning switch

Storage Location

B3

SI number

01 02 95 (896)

Consisting of:

1 = 0494592 Use

2 = 0494593 Bush

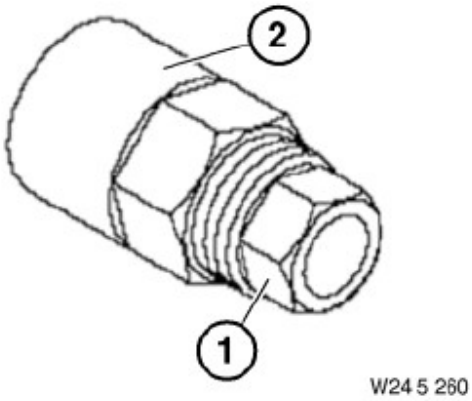


Fig. 27: Identifying Device (245260)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2310 DEVICE

0493156 242310 Device MW

NOTE: (Device) Tool set for dismantling and fitting the R gear piston. For dismantling and assembling the transmission for "Sealing the intermediate plate".

SI number

01 22 97 (239)

Consisting of:

1 = 0493157 Plate

NOTE: (Pressure plate) For removing and installing the spring cup

2 = 0493158 Spindle

NOTE: (Spindle with pressure plate) Spindle M14x1.5, nut M14, pressure plate and washer/For removing and installing the spring cup

3 = 0493159 Pin

NOTE: (Guide pin (2 pieces)) For fixing the gaskets and the intermediate plate on the intermediate case

4 = 0493160 Bush

NOTE: (Slip bush) For installing the piston in the cylinder of the intermediate plate

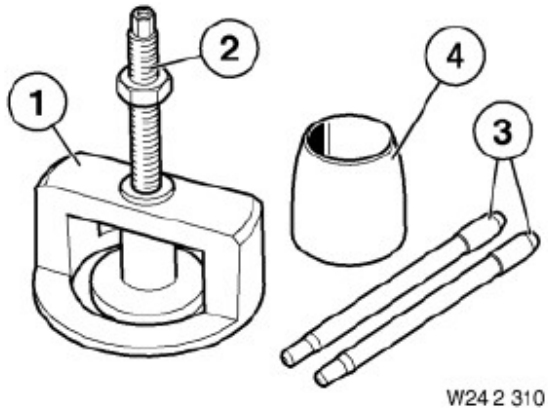


Fig. 28: Identifying Device (242310)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1180 DEVICE

0491671 241180 Device MW

NOTE: For removing and installing oil pump

Storage Location

Z2

Z1

SI number

01 09 90 (282)

Consisting of:

1 = 0494586 Tube

NOTE: (Retaining tube)

2 = 0494588 Spindle

NOTE: (Threaded spindle)

3 = 0494589 Ring

NOTE: (Clamping ring)

4 = 0496375 Ring

NOTE: (Clamping ring) Gearbox: GA6HP19Z, GA6HP26Z

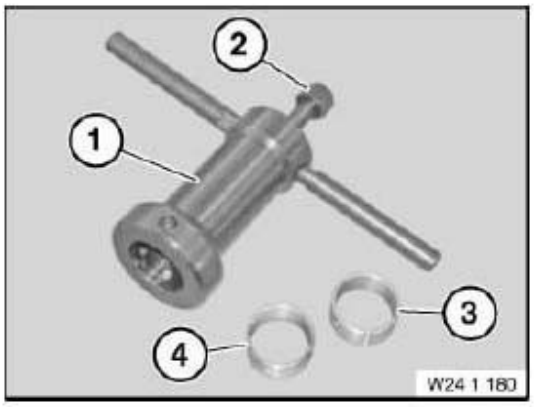
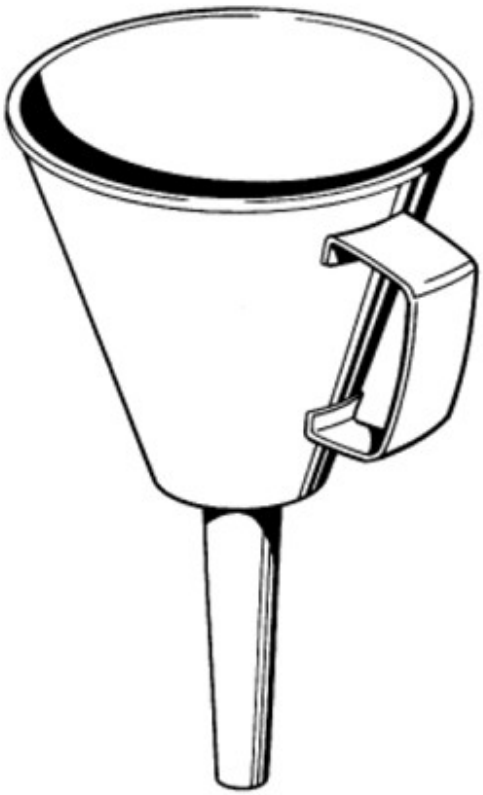


Fig. 29: Identifying Device (241180)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0080 DEVICE

0491636 240080 Device Minimum set: Mechanical tools MW

NOTE: **(funnel) For filling the transmission with transmission oil**



W24 0 080

Fig. 30: Identifying Device (240080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1260 DEVICE

0491679 241260 Device MW

NOTE: **(Removal and mounting device) For removing and installing the cylinders D/E with the planetary gear set**

Storage Location

C1

C2

SI number

01 01 95 (892)

Consisting of:

1 = 0491680 Handle

2 = 0491681 Spindle

NOTE: (Spindle with knurled nut)

3 = 0491682 Bush

NOTE: (Centring bush)

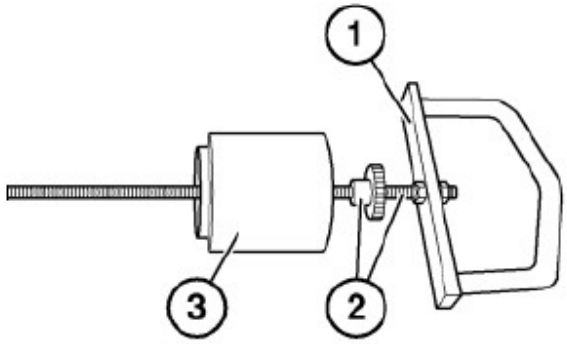


Fig. 31: Identifying Device (241260)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1270 DEVICE

0491683 241270 Device MW

NOTE: Removal and mounting device) For removing and installing the drive clutch A/B/C

Storage Location

Y2

Z2

SI number

01 01 95 (892)

Consisting of:

1 = 0491684 Pipe

NOTE: (Jack tube with ring bolt)

2 = 0491685 Pin

NOTE: (Locking pin)

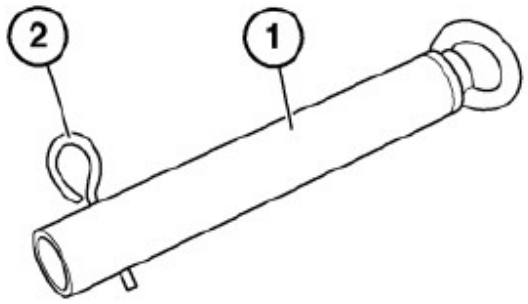


Fig. 32: Identifying Device (241270)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5360 DEVICE

0491781 245360 Device Minimum set: Mechanical tools MW

NOTE: For removing and installing the radial shaft seal of the gearshift shaft 24 5 361, 24 5 362, 24 5 364 and 24 5 366 for E90

Storage Location

C4

SI number

01 14 96 (105)

Consisting of:

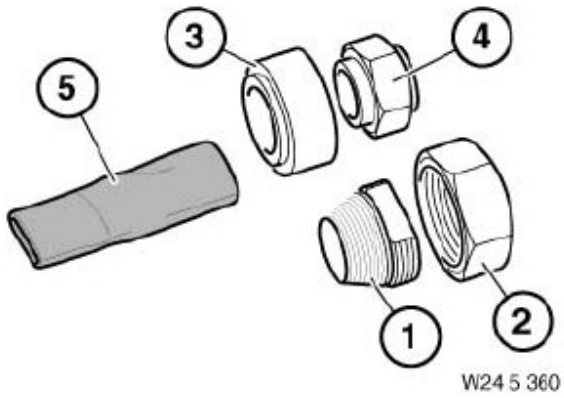


Fig. 33: Identifying Device (245360)
Courtesy of BMW OF NORTH AMERICA, INC.

6 = 0494208 Bush

NOTE: For fitting the radial shaft seal on the selector shaft (emergency release) Transmission: GA6 HP26Z

1 = 0491782 Bush

NOTE: (Threaded bush)

2 = 0491783 Nut

NOTE: (Union nut)

3 = 0491784 Bush

NOTE: For transmission without positioning switch Transmission: A4S 310R

4 = 0491785 Nut

5 = 0491786 Sleeve

NOTE: (Sliding sleeve (5 pieces)) Transmission: A4S 310R

24-1280 DEVICE

0491686 241280 Device MW

NOTE: (Assembly and disassembly tool) For removing and installing brake clutch F

Storage Location

Z4

Z3

SI number

01 01 95 (892)

Consisting of:

1 = 0491687 Handle

NOTE: (Handle)

2 = 0491688 Nut

NOTE: (knurled nut)

3 = 0491689 Handle

NOTE: (Centring handle)

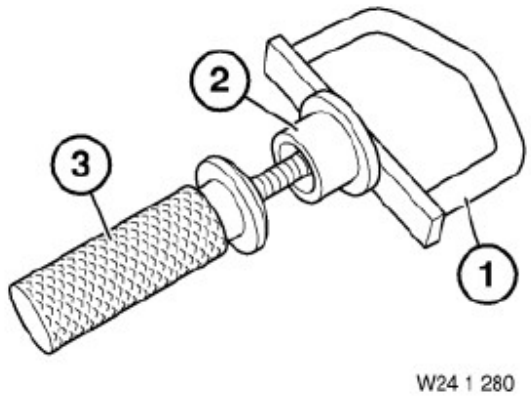


Fig. 34: Identifying Device (241280)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4080 DEVICE

0491726 244080 Device MW

NOTE: For fixing torque converter in position while removing and installing transmission.

Storage Location

Individual

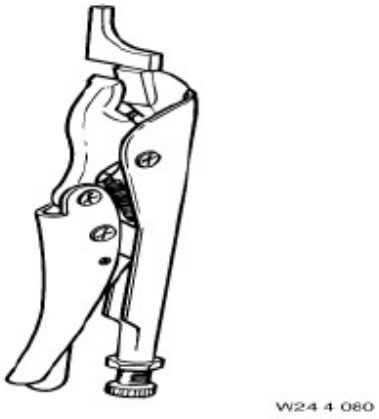


Fig. 35: Identifying Device (244080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0010 DEVICE

0491615 240010 Device MW

NOTE: For checking the side clearance of the drive shaft

Storage Location

Y3

Consisting of:

1 = 0491616 Holder

NOTE: (Dial gauge holder)

2 = 0491617 Terminal

NOTE: (Terminal)

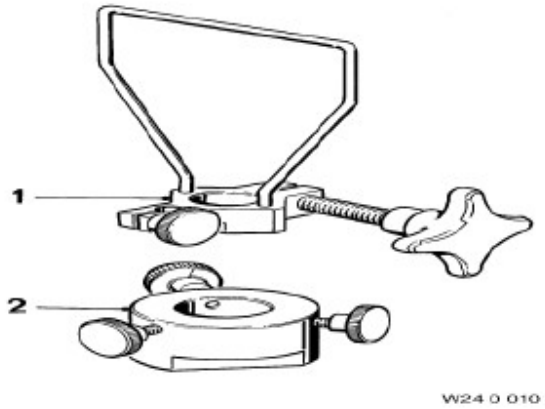


Fig. 36: Identifying Device (240010)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2140 DEVICE

0491698 242140 Device MW

NOTE: (Tensioning device) For removal and installation of the snap ring before the centring plate on ZF transmissions

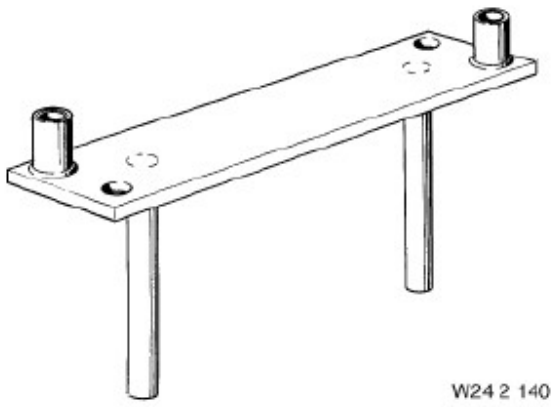


Fig. 37: Identifying Device (242140)
Courtesy of BMW OF NORTH AMERICA, INC.

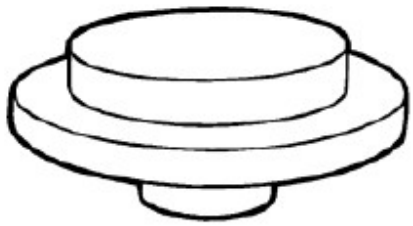
24-5400 DRIFT

24 5 400 Drift

In conjunction with: 00 5 500

NOTE: For drive shaft seal.

Transmission: GACVT16Z



W 24 5 400

Fig. 38: Identifying Drift (245400)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0180 FIXTURE

0491652 240180 Fixture MW

Replaced by: 0495446

NOTE: For mounting the gearbox on the assembly stand. Replaced by 24 0 200 (0 495 446)

SI number

01 06 92 (509)

Consisting of:

5 = 0495439 Adapter

NOTE: Replaced by 24 0 205 (0 495 492)

3 = 0491655 Spindle

NOTE: Replaced by 24 0 184 (0 491 656)

1 = 0491653 Frame

NOTE: (Main frame)

2 = 0491654 Spindle

NOTE: (Pressure spindle with star handle)

4 = 0491656 Spindle

NOTE: (spindle, long (2 pieces))

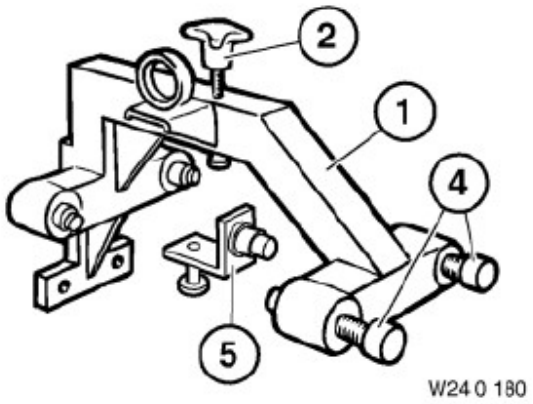


Fig. 39: Identifying Fixture (240180)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0200 FIXTURE

0495446 240200 Fixture MW

NOTE: For mounting the gearbox on the assembly stand.

SI number

01 27 06 (328)

Consisting of:

1 = 0495488 Basic body

2 = 0495489 Spindle

NOTE: (spindle with synchronising key)

3 = 0495490 Spindle

NOTE: (spindle with screw)

4 = 0495491 Shaped part

NOTE: (Shaped part)

5 = 0495492 Adapter

NOTE: **(adapter (long))**

6 = 0495493 Adapter

NOTE: **(adapter (medium))**

7 = 0495494 Adapter

NOTE: **(adapter (short))**

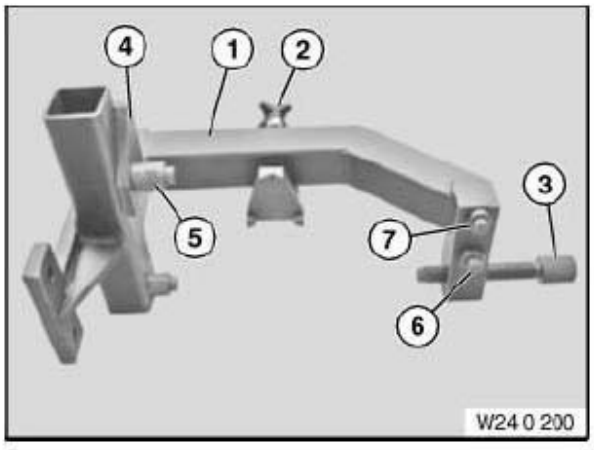


Fig. 40: Identifying Fixture (240200)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0130 FIXTURE

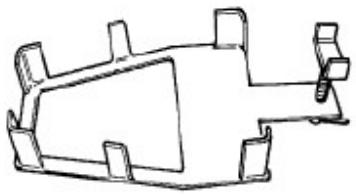
0491642 240130 Fixture MW

Replaced by: 0495498

NOTE: **(Fixture for transmission) For removal and installation Replaced by 23 4 050 (0 495 498)**

SI number

01 02 87 (721)



W24 0 130

Fig. 41: Identifying Fixture (240130)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0170 FIXTURE

0491651 240170 Fixture MW

Replaced by: 0495498

NOTE: For removing and installing transmission. Replaced by 23 4 050 (0 495 498)

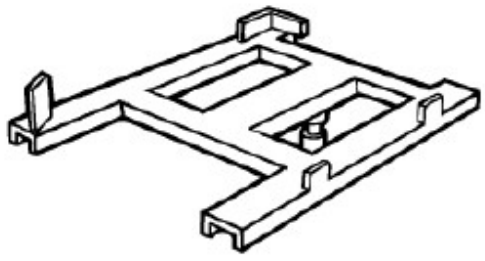
SI number

01 06 92 (509)

Consisting of:

3 = 0493258 Bolt

NOTE: (Adjusting screw) Discontinuation and replaced by 23 4 050 (0 495 498)



W 24 0 170

Fig. 42: Identifying Fixture (240170)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0250 FIXTURE

0491661 240250 Fixture MW

Replaced by: 0495498

NOTE: (Fixture for transmission) For removing and installing the transmission. Replaced by 23 4 050 (0 495 498)

SI number

01 08 96 (080)

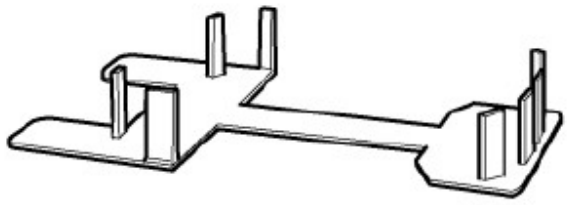


Fig. 43: Identifying Fixture (240250)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1120 GAUGE

0491668 241120 Gauge MW

NOTE: For setting the position switch to "P position" during installation/model year: from 03/96

SI number

01 07 96 (068)

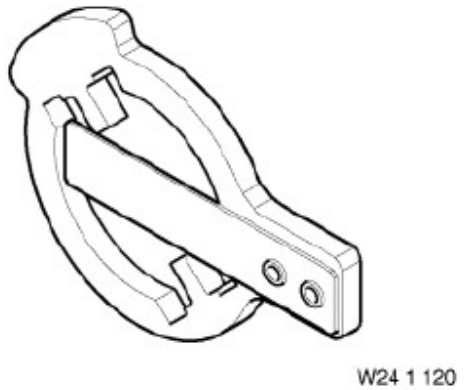


Fig. 44: Identifying Gauge (241120)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1440 HANDLE

0496717 241440 Handle MW

NOTE: For installing and removing the torque converter. 8HPxx

SI number

01 17 09 (577)

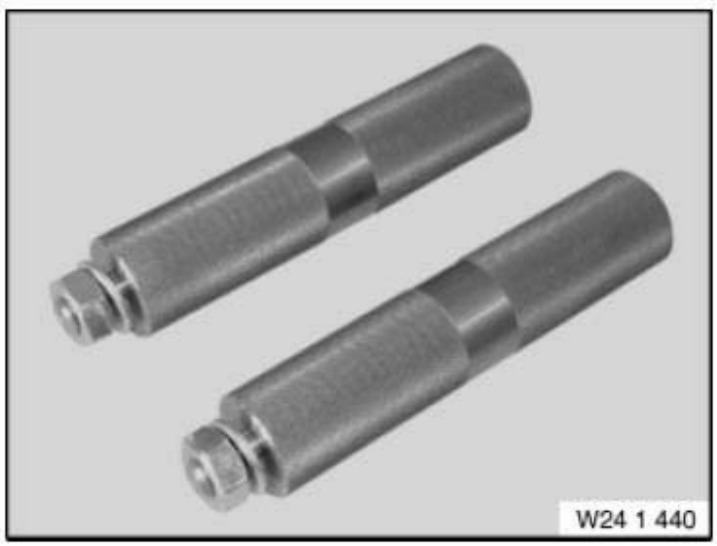


Fig. 45: Identifying Handle (241440)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2050 HANDLE

0491697 242050 Handle MW

Replaced by: 0491633

NOTE: (Pulling handle) For sealing plug in the lower section of the transmission housing/Replaced by 24 0 050 (0 491 633)

24-4000 HANDLE

0491715 244000 Handle Minimum set: Mechanical tools MW

NOTE: (Assembly handle (2 x)) For removing and installing the torque converter

Storage Location

B5

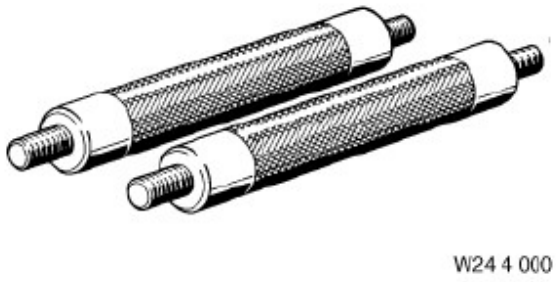


Fig. 46: Identifying Handle (244000)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0050 HANDLE

0491633 240050 Handle MW

NOTE: (extractor handle) For sealing plug in the lower section of transmission housing

Storage Location

Y5



Fig. 47: Identifying Handle (240050)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5240 HOLDER

0491772 245240 Holder MW

NOTE: (Counter support) For releasing and tightening the gear selector cable/transmission with position switch

Storage Location

A4

SI number

01 06 92 (509)

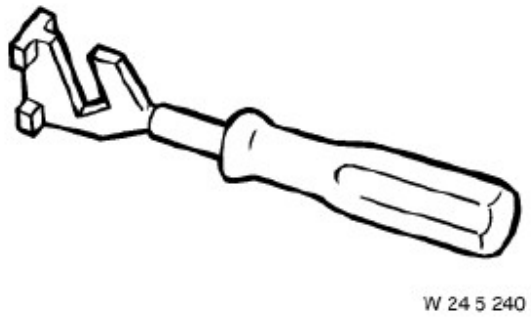


Fig. 48: Identifying Holder (245240)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5210 HOLDER

0491769 245210 Holder MW

NOTE: (counter support) For loosening and tightening the gear selector cable

Storage Location

A4

SI number

01 04 91 (372)

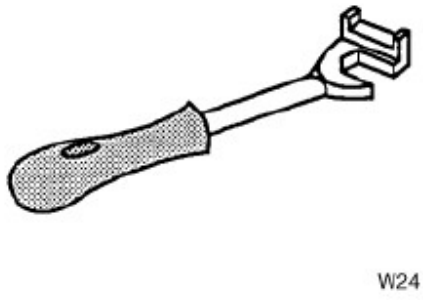


Fig. 49: Identifying Holder (245210)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5220 HOLDER

0491770 245220 Holder MW

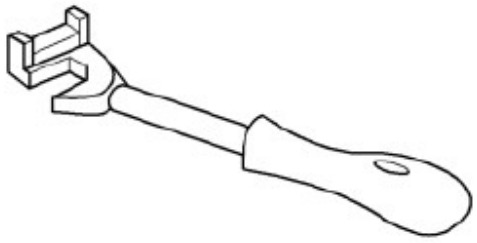
NOTE: (Counter support) For slackening and tightening the gear selector cable

Storage Location

A4

SI number

01 04 91 (372)



W24 5 220

Fig. 50: Identifying Holder (245220)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4160 HOLDER

0494451 244160 Holder Minimum set: Mechanical tools MW

NOTE: For securing converter during removal and installation of transmission

Storage Location

C46

A47

SI number

01 11 02 (908)

Consisting of:

3 = 0494477 Shaped element

NOTE: For converter variantM57TU

1 = 0494478 Basic body

2 = 0494479 Shaped element

NOTE: For converter variantN73

4 = 0494622 Shaped element

NOTE: For converter variantM54

5 = 0494965 Shaped element

NOTE: Transmission: GA6 HP19 in E87, E90

6 = 0496061 Shaped element

NOTE: Transmission: GA6L45R (GM6) in E83/N52K

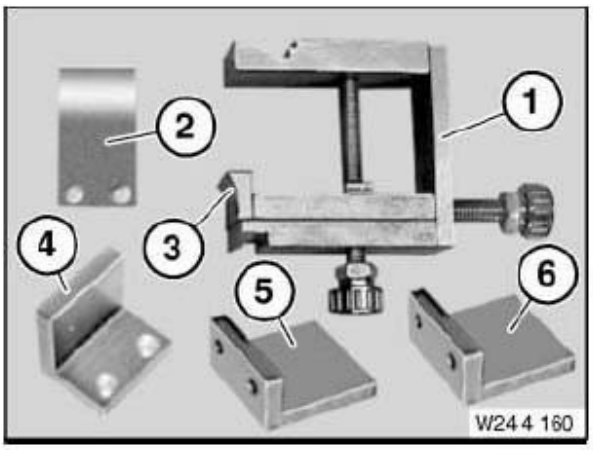


Fig. 51: Identifying Holder (244160)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1200 HOLDING SLEEVE

0491673 241200 Holding sleeve Minimum set: Mechanical tools MW

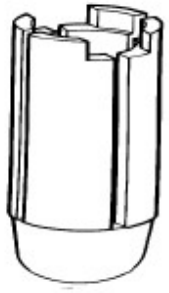
NOTE: (Assembly sleeve) For preventing damage to radial shaft seal when fitting it onto selector shaft

Storage Location

B3

SI number

01 09 90 (282)



W24 1 200

Fig. 52: Identifying Holding Sleeve (241200)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4110 KEY

0491729 244110 Key Minimum set: Mechanical tools MW

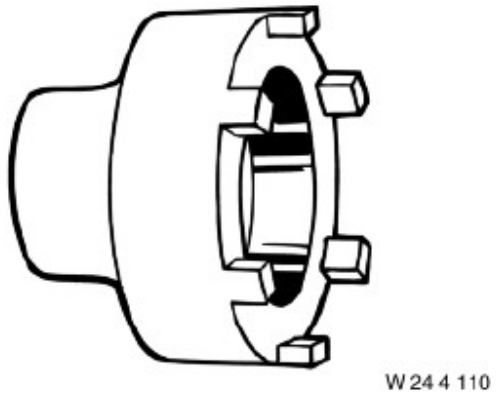
NOTE: For releasing and tightening the slotted nut of the output flange

Storage Location

A10

SI number

01 06 92 (509)



W24 4 110

Fig. 53: Identifying Key (244110)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4340 LEVER

0496312 244340 Lever MW

NOTE: For removing and installing oil filler cap.

Storage Location

B22

SI number

01 19 07 (397)



Fig. 54: Identifying Lever (244340)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4100 MANDREL

0491728 244100 Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in the radial seal ring on the drive side (behind converter)

Storage Location

A17

SI number

01 06 92 (509)

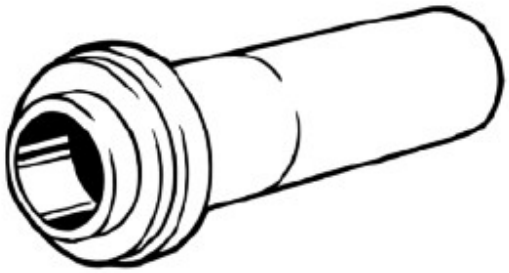


Fig. 55: Identifying Mandrel (244100)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4370 MANDREL

0495600 244370 Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in radial shaft seal of output shaft (4x2).

Storage Location

A24

SI number

01 02 07 (334)



Fig. 56: Identifying Mandrel (244370)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4400 MANDREL

0495603 244400 Mandrel Minimum set: Mechanical tools MW

NOTE: **(Drift) For driving in oil filter sealing ring.**

Storage Location

A24

SI number

01 02 07 (334)

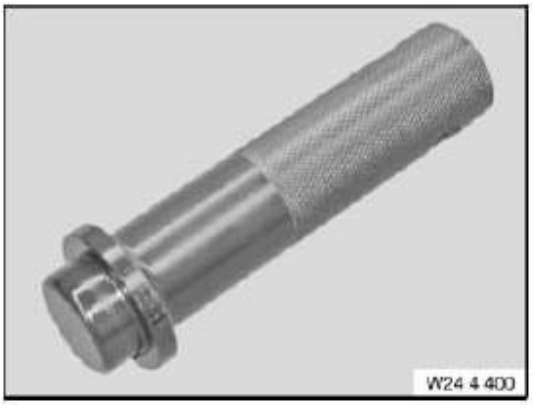


Fig. 57: Identifying Mandrel (244400)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0340 MANDREL

2208426 240340 Mandrel MW

NOTE: **For driving in the radial shaft seal on the output end.**

SI number

01 09 10 (639)

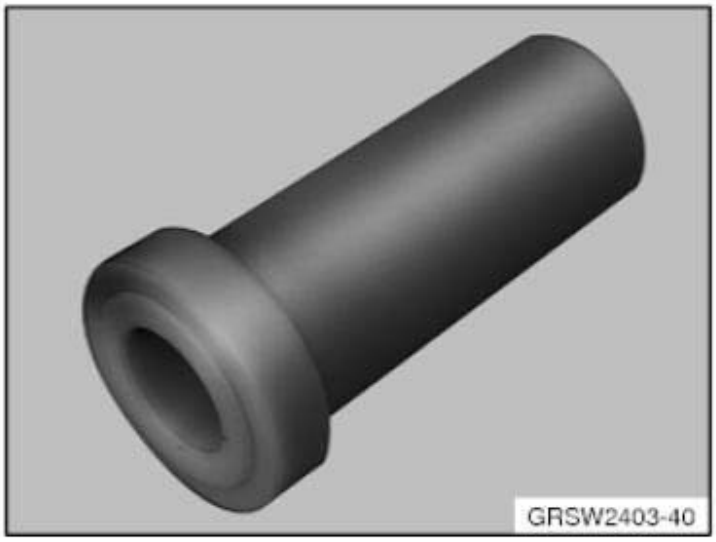


Fig. 58: Identifying Mandrel (240340)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0090 MANDREL

0491637 240090 Mandrel MW

Replaced by: 0491639

NOTE: (Drift) For punching the radial sealing ring in the front section of the transmission housing/Replaced by 24 0 110 (0 491 639) November 96



Fig. 59: Identifying Mandrel (240090)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0110 MANDREL

0491639 240110 Mandrel MW

NOTE: **(drift) For driving in the radial sealing ring in the front section of the transmission housing/Model year: from 90 and for the output flange of the transmissions S5D 200G and S5D 250G**

Storage Location

B17

SI number

01 03 90 (184)

Consisting of:

3 = 0491640 Washer

NOTE: **(ring washer 1 mm) Transmissions: 4 HP 24 - no. 0 029 160, 4 HP 22 - no. 1 113 936**

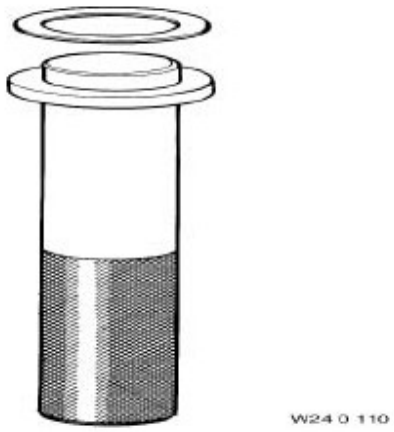


Fig. 60: Identifying Mandrel (240110)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0330 MANDREL

0496860 240330 Mandrel MW

NOTE: **For driving in the radial shaft seal on the drive end.**

SI number

01 09 10 (639)

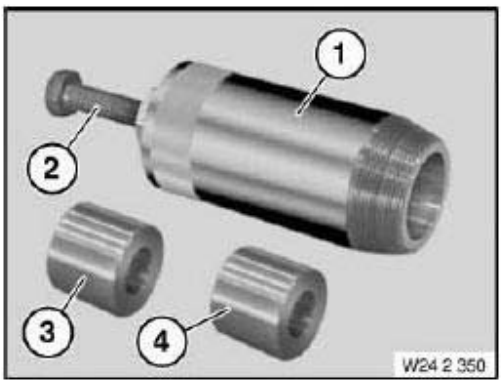


Fig. 61: Identifying Mandrel (240330)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0350 MANDREL

2208427 240350 Mandrel MW

NOTE: For driving in shaft seal on selector shaft.

SI number

01 09 10 (639)



Fig. 62: Identifying Mandrel (240350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2370 MANDREL

0494199 242370 Mandrel Minimum set: Mechanical tools MW

NOTE: **(Drift) For inserting the radial shaft seal on the output flange**

Storage Location

B46

A46

SI number

01 14 01 (766)



Fig. 63: Identifying Mandrel (242370)
Courtesy of BMW OF NORTH AMERICA, INC.

0491672 241190 Mandrel Minimum set: Mechanical tools MW

NOTE: **(drift) For driving in the radial sealing ring in the front section of the transmission housing**

Storage Location

A15

SI number

01 09 90 (282)

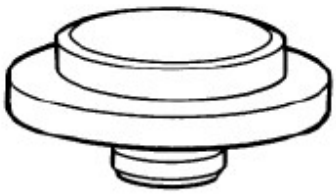


Fig. 64: Identifying Mandrel (242370)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2360 MANDREL

0494200 242360 Mandrel Minimum set: Mechanical tools MW

Replaced by: 0494506

NOTE: (Drift) For installing the radial shaft seal on the torque converter Replaced by 24 2 400 (0 494 506)

Storage Location

B46

SI number

01 14 01 (766)



Fig. 65: Identifying Mandrel (242360)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1410 MANDREL

0496719 241410 Mandrel Minimum set: Mechanical tools MW

NOTE: For driving in the radial shaft seal of the drive shaft.

SI number

01 17 09 (577)



Fig. 66: Identifying Mandrel (241410)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4330 MANDREL

0495497 244330 Mandrel MW

NOTE: (Drift) For driving in radial shaft seal of output shaft (all-wheel drive).

Storage Location

A23



Fig. 67: Identifying Mandrel (244330)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4090 MANDREL

0491727 244090 Mandrel Minimum set: Mechanical tools MW

NOTE: (drift) For fitting the radial sealing ring to the output end

Storage Location

A15

SI number

01 06 92 (509)

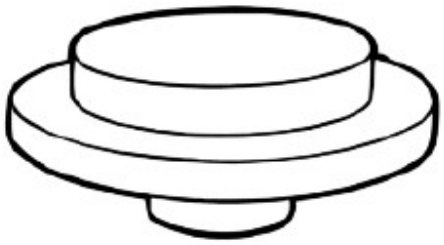


Fig. 68: Identifying Mandrel (244090)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2330 OPEN-END WRENCH

0493115 242330 Open-end wrench MW

NOTE: (Open-end wrench) Open-end wrench 1/2" for adjusting the brake band

SI number

01 24 97 (257)

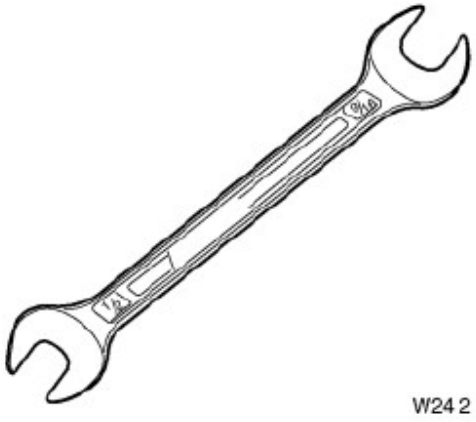


Fig. 69: Identifying Open-End Wrench (242330)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1430 PIN

0496715 241430 Pin MW

NOTE: For fixing the mechatronics in position during installation.

SI number

01 17 09 (577)

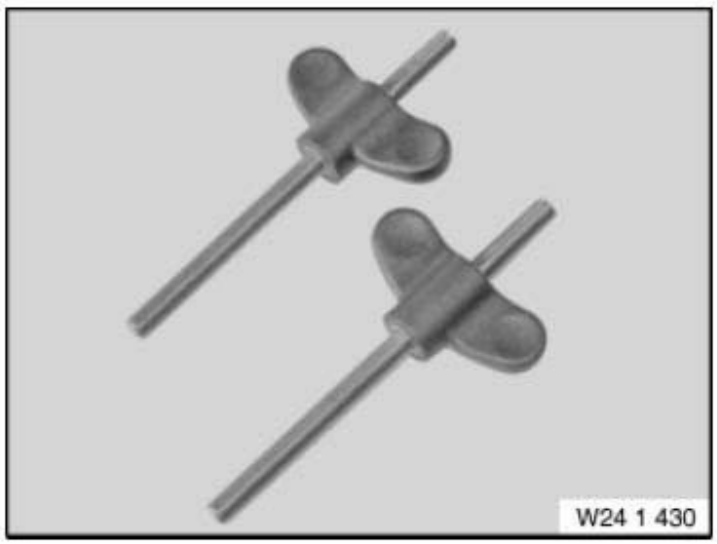


Fig. 70: Identifying Pin (241430)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0320 PIN

0496728 240320 Pin MW

NOTE: For securing transmission when installing in engine.

SI number

01 29 09 (601)



Fig. 71: Identifying Pin (240320)

Courtesy of BMW OF NORTH AMERICA, INC.

24-5160 PIN

0491764 245160 Pin MW

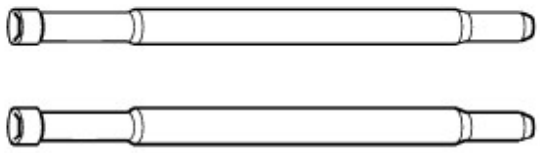
NOTE: (centring pin) For centring the main housing to the intermediate and converter housing (2 x)

Storage Location

Y3

SI number

01 03 93 (663)



W24 5 160

Fig. 72: Identifying Pin (245160)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1170 PIN WRENCH

0491670 241170 Pin wrench Minimum set: Mechanical tools MW

NOTE: For loosening and tightening the slotted nut on the output flange

Storage Location

A13

SI number

01 09 90 (282)



W24 1 170

Fig. 73: Identifying Pin Wrench (241170)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4360 PULLER

0495599 244360 Puller Minimum set: Mechanical tools MW

NOTE: For withdrawing radial shaft seal of output shaft (4 x 2).

Storage Location

A24

SI number

01 02 07 (334)

Consisting of:

1 = 0496113 Basic body

2 = 0496114 Claw

NOTE: (Claw (4 x))

3 = 0496115 Screw

4 = 0496116 Spindle

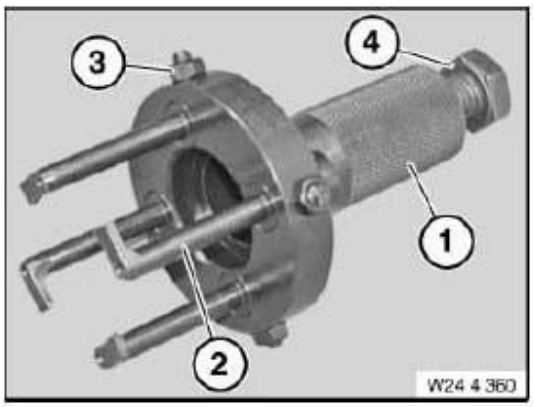


Fig. 74: Identifying Puller (244360)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2350 PULLER

0494201 242350 Puller Minimum set: Mechanical tools MW

NOTE: For extracting radial shaft seal on torque converter and on output flange

Storage Location

A46

SI number

01 14 01 (766)

Consisting of:

1 = 0494202 Puller

2 = 0494203 Spindle

NOTE: (Spindle M12 x 65 with ball head)

3 = 0494204 Synchronising key

4 = 0495597 Synchronising key

NOTE: Transmission: GA6L45R (GM6)

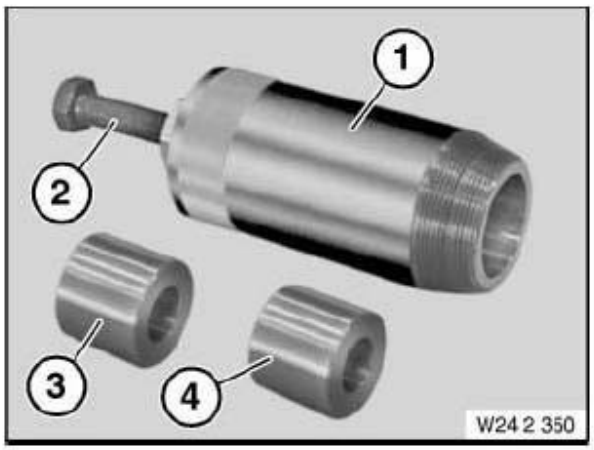


Fig. 75: Identifying Puller (242350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4320 PULLER

0495496 244320 Puller MW

NOTE: For withdrawing output shaft seal (four-wheel drive).

SI number

01 02 07 (334)

Consisting of:

1 = 0495569 Basic body

2 = 0495570 Ring

NOTE: (Retaining ring)

3 = 0495571 Spindle

4 = 0495572 Hook wrench

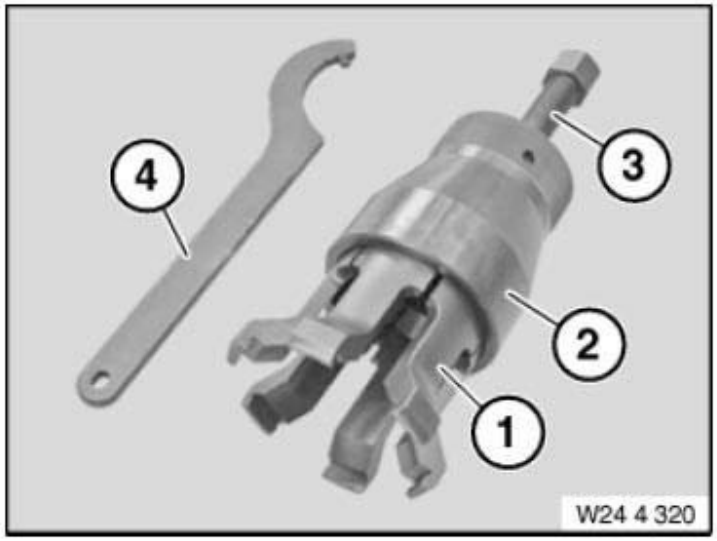


Fig. 76: Identifying Puller (244320)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5367 PULLER

0496718 245367 Puller Minimum set: Mechanical tools MW

NOTE: For removing the radial shaft seal of the gearshift shaft from the gearbox housing.

SI number

01 17 09 (577)



Fig. 77: Identifying Puller (245367)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1420 PULLER

0496716 241420 Puller MW

NOTE: Removing radial shaft seal from torque converter.

SI number

01 17 09 (577)

Consisting of:

1 = 2209493 Blade

NOTE: Replacement blade for 24 1 420

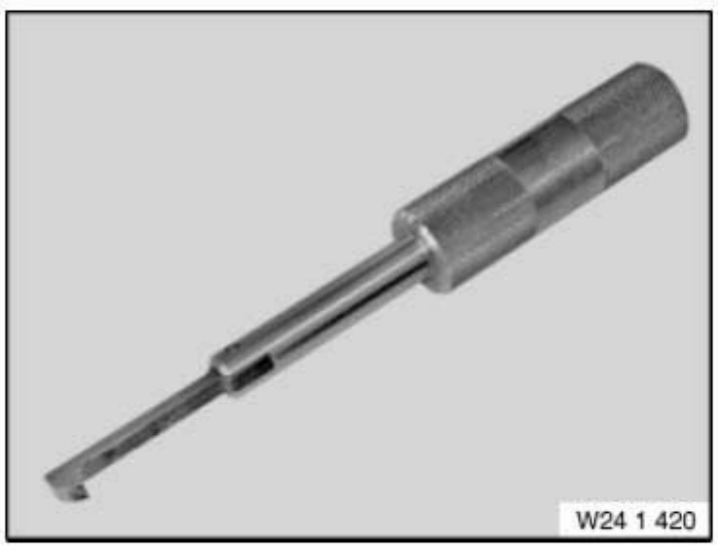


Fig. 78: Identifying Puller (241420)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4390 PULLER

0495602 244390 Puller Minimum set: Mechanical tools MW

NOTE: For removing oil filter sealing ring.

Storage Location

A23

SI number

01 02 07 (334)



Fig. 79: Identifying Puller (244390)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1310 RELEASE TOOL

0491692 241310 Release tool MW

NOTE: (release tool) For releasing the retaining tabs on the disc carrier C

Storage Location

Y6

SI number

01 01 95 (892)

Consisting of:

1 = 0494693 Shaped part

NOTE: (shaped part)

2 = 0494694 Basic body

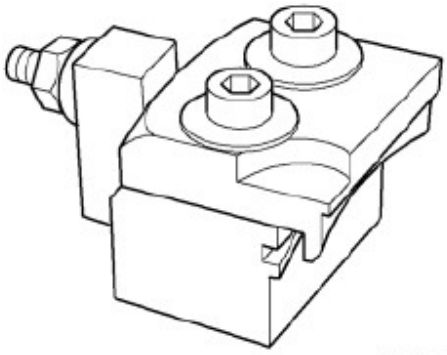


Fig. 80: Identifying Release Tool (241310)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5230 RING

0491771 245230 Ring Minimum set: Mechanical tools MW

NOTE: (Assembly ring) For pressing in the radial seal of the gearshift shaft

Storage Location

B3

SI number

01 04 91 (372)

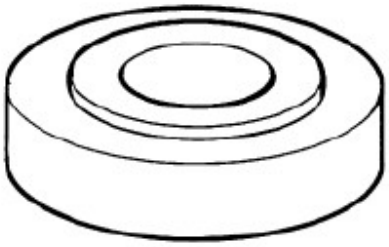


Fig. 81: Identifying Ring (245230)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5490 SLEEVE

0491789 245490 Sleeve Minimum set: Mechanical tools MW

NOTE: (sliding sleeve (5 x)) For prevention of damage to the radial sealing ring while

fitting on the gearshift shaft

SI number

01 02 95 (896)

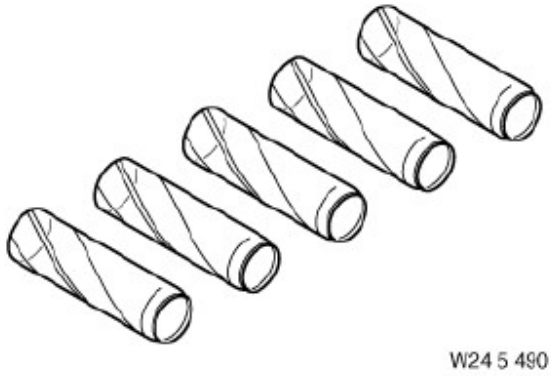


Fig. 82: Identifying Sleeve (245490)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1010 SLEEVE

0491662 241010 Sleeve MW

NOTE: (Assembly sleeve) For removing the disc set (4-gear) and for pressing in the needle bearing in the oil pump housing (A5S 560Z)

Storage Location

X5

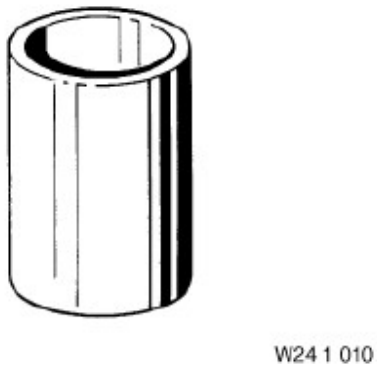


Fig. 83: Identifying Sleeve (241010)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4350 SOCKET

0495598 244350 Socket Minimum set: Mechanical tools MW

NOTE: (Socket with special Torx profile) For releasing and tightening down screw connection of Mechatronic.

Storage Location

A23

SI number

01 02 07 (334)



Fig. 84: Identifying Socket (244350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2320 SOCKET WRENCH

0493114 242320 Socket wrench MW

NOTE: For hexagon socket screw 3/16" with 1/4" drive for adjusting the brake band

SI number

01 24 97 (257)



W24 2 320

Fig. 85: Identifying Socket Wrench (242320)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0120 SUPPORT

0491641 240120 Support MW

NOTE: (support) For removing and fitting the transmission. Replaced by 24 0 130 in March 87

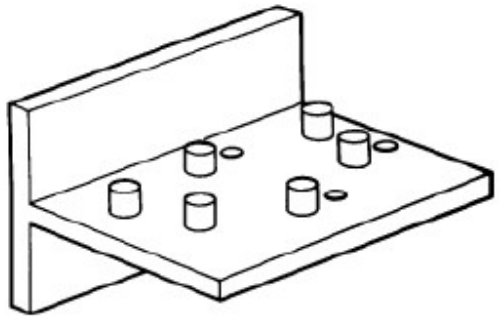
24-1220 SUPPORT

0491675 241220 Support MW

NOTE: (Fixture for drive flange) When undoing the slotted nut

SI number

01 09 90 (282)



W24 1 220

Fig. 86: Identifying Support (241220)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0300 SUPPORT

0496729 240300 Support MW

NOTE: For mounting transmission on assembly stand 00 2 300 and for transport.

SI number

01 29 09 (601)

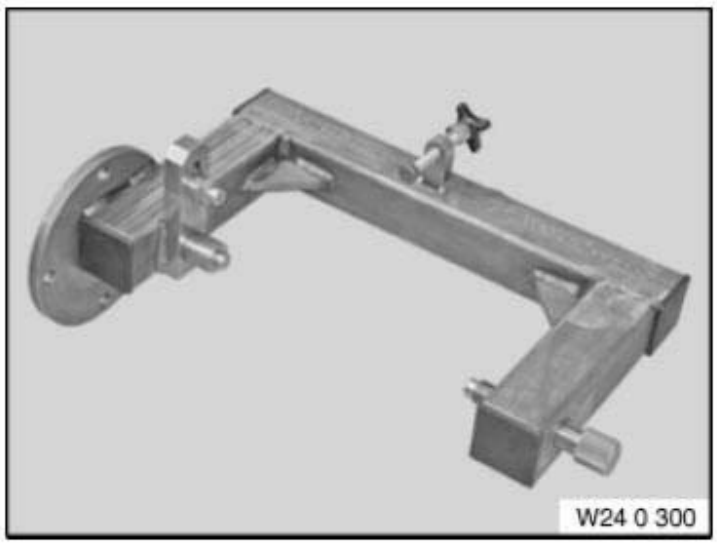


Fig. 87: Identifying Support (240300)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5350 SUPPORT

0491780 245350 Support MW

NOTE: (Support for automatic transmission) Other: Only Japan and South Africa

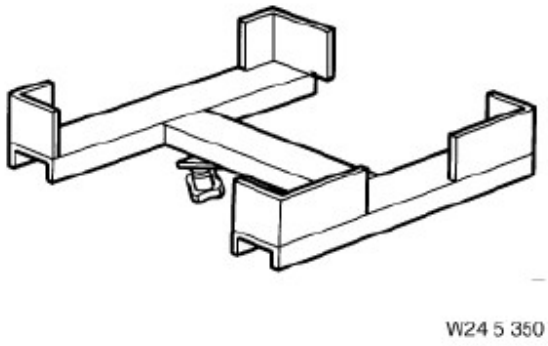


Fig. 88: Identifying Support (245350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6080 TEST CABLE

0494137 246080 Test cable Minimum set: Measuring and testing equipment MP

NOTE: (test cable 16-pin)

Storage Location

L204

SI number

02 06 01 (763)

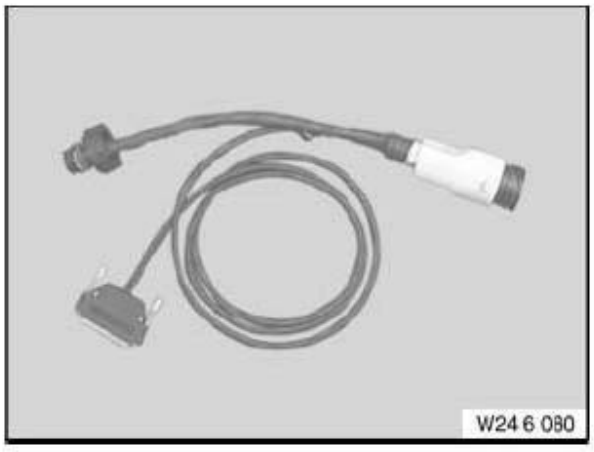


Fig. 89: Identifying Test Cable (246080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6010 TEST CABLE

0491791 246010 Test cable MW

NOTE: (Test cable, 9-pin) For automatic transmission (EH transmission)

SI number

02 03 91 (313)

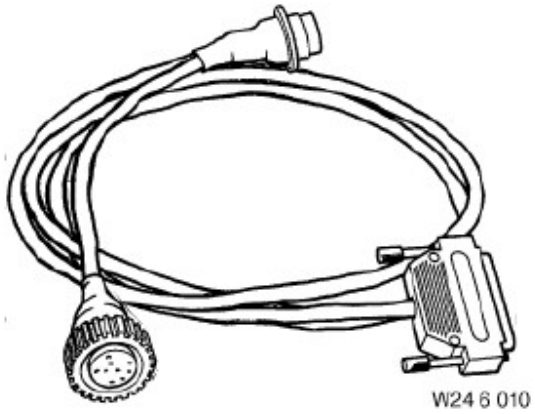


Fig. 90: Identifying Test Cable (246010)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6050 TEST CABLE

0491796 246050 Test cable MW

NOTE: (Test cable, 10-pin) For Jatco gearbox (AMP plug connection)

SI number

02 01 93 (649)

24-6000 TEST CABLE

0491790 246000 Test cable MW

NOTE: (Test cable, 8-pin) For automatic transmission (EH gearbox)

SI number

02 03 91 (313)

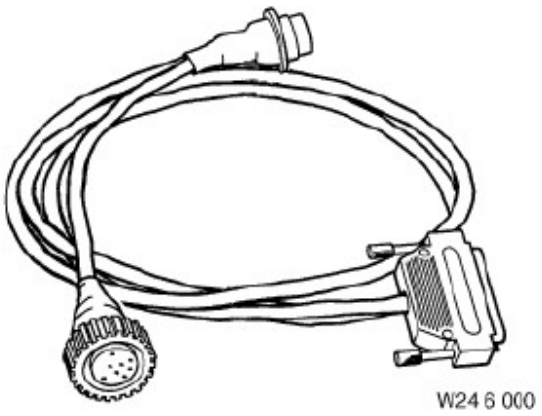


Fig. 91: Identifying Test Cable (246000)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6070 TEST CABLE

0493654 246070 Test cable MW

NOTE: (Test cable, 20-pin) For automatic transmission GM5

SI number

02 01 99 (468)

24-6060 TEST CABLE

0491797 246060 Test cable MW

NOTE: (Test cable, 16-pin) For automatic transmission (EH gearbox)

SI number

02 02 93 (650)

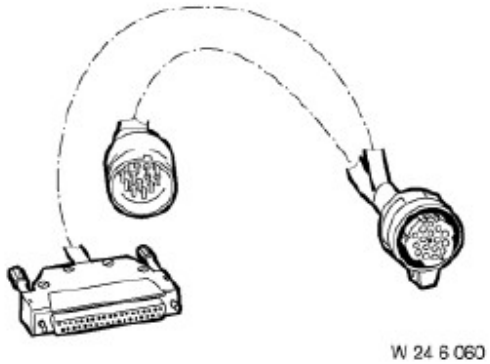


Fig. 92: Identifying Test Cable (246060)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6020 TEST CABLE

0491792 246020 Test cable MW

NOTE: (Test cable, 14-pin) For automatic transmission (EH transmission)

SI number

00 02 99 (399)

Consisting of:

5 = 0491793 Operating instructions

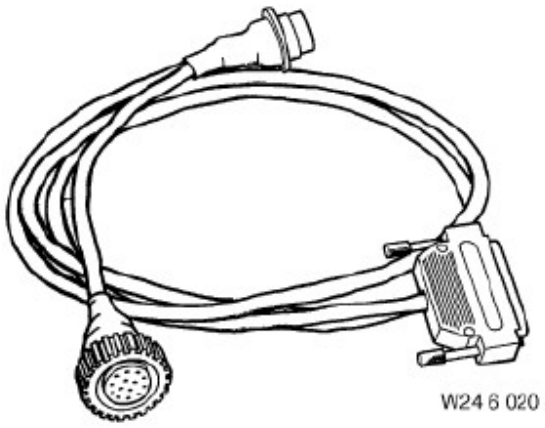


Fig. 93: Identifying Test Cable (246020)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2020 TOOL

0491694 242020 Tool MW

NOTE: For squeezing the disc spring

Storage Location

X5

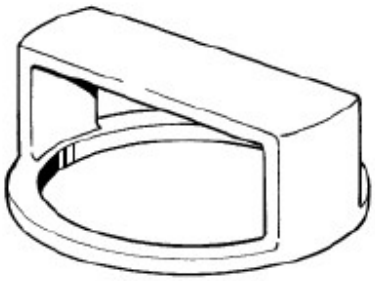


Fig. 94: Identifying Tool (242020)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5120 TOOL

0491758 245120 Tool MW

NOTE: For centring the converter housing relative to the oil pump when mounting

Storage Location

B2

SI number

01 04 95 (906)

Consisting of:

1 = 0491759 Bush

NOTE: (Centring bush)

2 = 0491760 Pin

NOTE: (Centring pin (3 pieces))

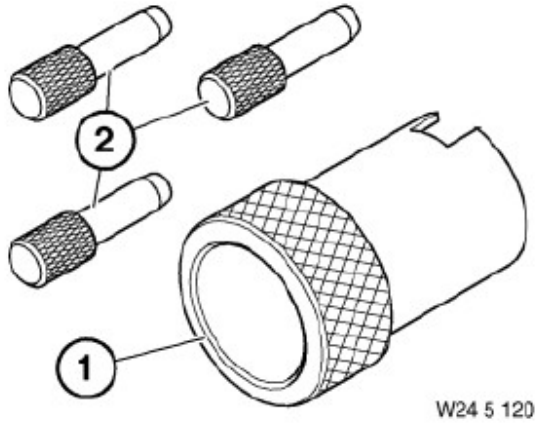


Fig. 95: Identifying Tool (245120)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4130 TOOL

0491731 244130 Tool Minimum set: Mechanical tools MW

NOTE: (Locating tool) For fixing torque converter during removal and installation of gearbox

Storage Location

C6

SI number

01 05 97 (181)

Consisting of:

7 = 0493804 Blade

NOTE: Transmission: A5S 360R

1 = 0491732 Basic body

NOTE: (basic body)

2 = 0491733 Blade

NOTE: Transmission: A5S 440Z, GA6HP26Z (N62)

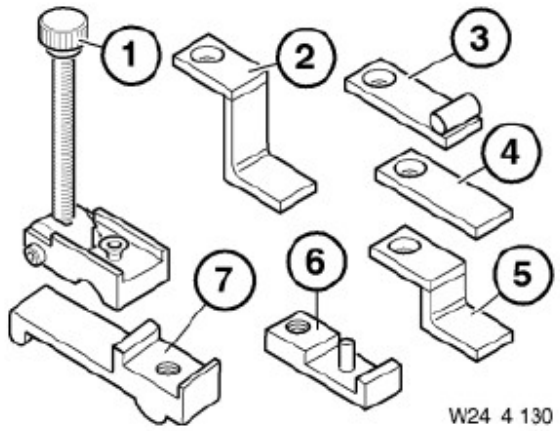


Fig. 96: Identifying Tool (244130)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0491734 Blade

NOTE: (Blade) Gearbox: A4S 310R and A5S 390G

4 = 0491735 Blade

NOTE: Transmission: A5S 310Z, A5S 560Z, A5S 300J and A5S 325Z

5 = 0491736 Blade

NOTE: Transmission: A5S 560Z, GA6 HP26Z (M67), GA6 HP32Z (N73)

6 = 0493180 Plate

NOTE: (Counter-support plate)

8 = 0496742 Blade

NOTE: For securing converter during removal and installation of transmission. In conjunction with: 24 4 131

24-1300 TOOL

0491691 241300 Tool MW

NOTE: (Striking tool) For securing the retaining tabs on disc carrier C

Storage Location

X5

SI number

01 01 95 (892)

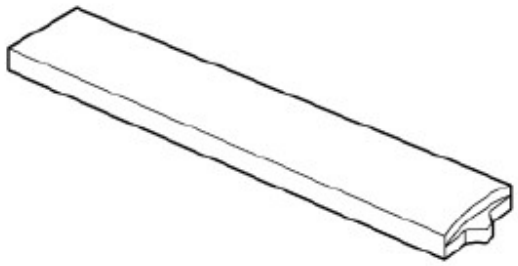


Fig. 97: Identifying Tool (241300)
Courtesy of BMW OF NORTH AMERICA, INC.

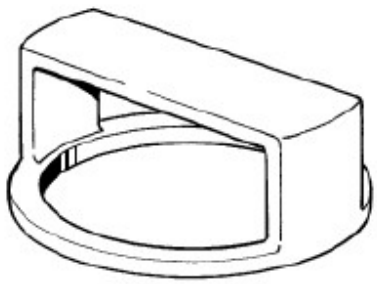
24-2040 TOOL

0491696 242040 Tool MW

NOTE: For squeezing the disc spring

Storage Location

X6



W24 2 020

Fig. 98: Identifying Tool (242040)
Courtesy of BMW OF NORTH AMERICA, INC.

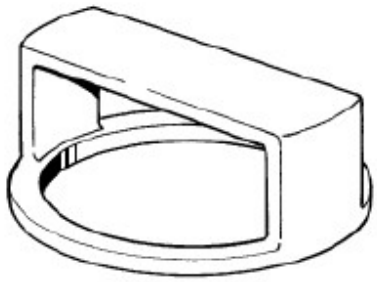
24-2030 TOOL

0491695 242030 Tool MW

NOTE: For compressing the disc spring

Storage Location

X5



W24 2 020

Fig. 99: Identifying Tool (242030)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1290 WEDGE

0491690 241290 Wedge MW

NOTE: (Wedges) For fixing the disc carrier C when securing the retaining tabs

Storage Location

X5

SI number

01 01 95 (892)

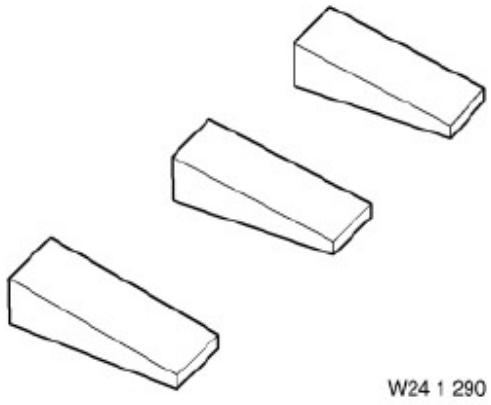


Fig. 100: Identifying Wedge (241290)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1110 WRENCH SOCKET

0491667 241110 Wrench socket Minimum set: Mechanical tools MW

NOTE: (Wrench socket with magnet) For loosening and tightening the converter fixation

Storage Location

A11

SI number

01 04 86 (566)

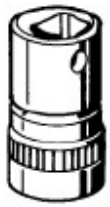


Fig. 101: Identifying Wrench Socket (241110)
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FILLING CAPACITIES

24 00 TRANSMISSION FILLING CAPACITIES GA6HP19Z GA6HP26Z

TRANSMISSION FILLING CAPACITIES SPECIFICATION

Total oil volume (transmission and torque converter drained)	approx. ltr.	9.0-10

EXTERNAL SHIFT LINKAGE

24 51 EXTERNAL SHIFT LINKAGE

TIGHTENING TORQUE SPECIFICATION - EXTERNAL SHIFT LINKAGE

	Type	Thread	Tightening specification	Measure
1AZ Selector lever on transmission	A4S 200R/A4S 270R/A4S 310R/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R/GA6HP19Z/GA6HP26Z/GA6 HP32Z/GA6L45R	M8x1		10 Nm
	A5S 300J	M8		15 Nm

HYDRAULIC/ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS

24 30 HYDRAULIC/ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS

TIGHTENING TORQUE SPECIFICATION - HYDRAULIC/ELECTRIC CONTROL PARTS AND CONTROLLING ELEMENTS

	Type	Thread	Tightening specifications	Dimension
1AZ Valve body to transmission	3HP-22	M6		11 Nm
	4HP-22/4HP-24/A5S 310Z/A5S 440Z/A5S 300J/A5S 325Z/GA6HP19Z/GA6HP26Z/GA6HP32Z	M6		8 Nm
	GA6HP19Z TU/GA6HP26TU	M6		10 Nm
	A4S 270R/A4S 310R	5/16 inch		20 Nm
	A5S 360R/A4S 360R	M6		11 Nm
	A5S 560Z	M6 x 12		6 Nm
	A5S 560Z	M6 x 55		8 Nm
	GA6L45R	M5		8 Nm
2AZ Valve housing to valve body	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 310Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M6		5 Nm
3AZ Intermediate plate on shift unit	A4S 270R/A4S 310			13 Nm

4AZ	Input- and output speed sensors to mechatronics		M6		12 Nm

INTERIOR SHIFT ELEMENTS

24 52 INTERIOR SHIFT ELEMENTS

TIGHTENING TORQUE SPECIFICATION - INTERIOR SHIFT ELEMENTS

	Type	Thread	Tightening specification	Measure
1AZ Shift segment to shaft	A4S 270R/A4S 310R			22 Nm
	A5S 300J	M14x1.5		35 Nm
2AZ Detent spring on shift unit	A4S 270R/A4S 310R	5/16"		25 Nm

PLANETARY GEAR DRIVE

24 22 PLANETARY GEAR DRIVE

TIGHTENING TORQUE SPECIFICATION - PLANETARY GEAR DRIVE

		Type	thread	tightening specification	Measure
1AZ	Brake coupling D/G on gear box housing	A5S 310Z/A5S 560Z	M10	Insert all screws until contact is made with screw head in each case center bolt both outer screws center bolt both outer screws both outer screws	 30 Nm 15 Nm 63 Nm 30 Nm 63 Nm

SHIFT CLUTCHES

24 23 SHIFT CLUTCHES

TIGHTENING TORQUE SPECIFICATION - SHIFT CLUTCHES

		Type	thread	tightening specification	Measure
1AZ	Torx screws for F clutch on transmission case	4HP-22/4HP- 24	M6		10 Nm
		/A5S 560Z	M8		23 Nm
2AZ	Brake band adjusting screw	A 4 S 270 R/A 4 S 310 R	5/16"		5 Nm
3AZ	Lock nut of brake band adjusting screw	A 4 S 270 R/A 4 S 310 R	5/16"		21 Nm

SHIFT VALVES, PARKING LOCK

24 34 SHIFT VALVES, PARKING LOCK

TIGHTENING TORQUE SPECIFICATION - SHIFT VALVES, PARKING LOCK

	Type	thread	tightening specification	Measure
7AZ Pulse generator, output speed	A5S 325Z			6 Nm
8AZ Pulse generator, turbine speed	A5S 325Z			8 Nm
9AZ Plug	A5S 325Z			20 Nm

TORQUE CONVERTER

24 40 TORQUE CONVERTER

TIGHTENING TORQUE SPECIFICATION - TORQUE CONVERTER

		Type	Thread	Tightening specification	Measure
1AZ	Torque converter to flywheel		M8		26 Nm
		A4S 270R/A4S 310R/A5S 310Z/A5S 300J/A5S 440Z/A5S 560Z/A5S 325Z/A4S 200R/GA6HP26Z/GA6HP19Z	M10 8.8		45 Nm
		A5S360/390R	M10		45 Nm
		A5S360/390R/GA6HP19Z/GA6HP26Z/GA6HP32Z/GA6L45R	M10 10.9		56 Nm

TRANSMISSION EXTENSION, BEARINGS, SEALS

24 13 TRANSMISSION EXTENSION, BEARINGS, SEALS

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION EXTENSION, BEARINGS, SEALS

		Type	Thread	Tightening specification	Measure
1AZ	Slotted nut/output flange	A5S 310Z/A5S 440Z/A5S 560Z/A5S 325Z			120 Nm
2AZ	Double hexagon nut/output flange	GA6HP26Z		until 09/02 without sealing ring in output flange	80 Nm
		GA6HP19Z/GA6HP26Z		from 09/02 with sealing ring in output flange	60 Nm
3AZ	Output shaft nut to output flange	GA6L45R	22x1.5		55 Nm

TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION HOUSING, TRANSMISSION OIL

SUMP

	Type	Thread	Tightening specification	Measure
5AZ Transmission oil sump	4HP-22/4HP-24/A5S 310Z/A5S 325Z	M6		6 Nm
	A5S 560Z/A5S 440Z	M6		10 Nm
	A4S 270R/A4S 310R	M6		12 Nm
	A5S 360R/A4S 360R	M6		10 Nm
	A5S 300J			9 Nm
	GA6HP26Z/GA6HP19Z/GA6L45R/GA6HP32Z	M6		10 Nm
6AZ Oil drain plug	A4S 200R/A5S 310Z/	M10		16 Nm
	A5S 325Z			35 Nm
	A5S 440Z	M16x1.5		30 Nm
	A5S 560Z			50 Nm
	A5S 360R/A5S 390R	M14		18 Nm
	A4S 270R/A4S 310R			25 Nm
	A5S 300J			35 Nm
	GA6L45R	M12x1.75		14 Nm
	GA6HP19Z/GA6HP26Z/GA6HP32Z	M10x1	Metal oil sump	12 Nm
	GA6HP19Z/GA6HP26Z/GA6HP32Z	M16x1.5 M24x1	Plastic oil sump	8 Nm
7AZ Oil filler plug	A5S 325Z			30 Nm
	A5S 310Z/A5S 560Z			100 Nm
	A5S 440Z	M18x1.5		35 Nm
	A4S 270R/A4S 310R			33 Nm
	A5S 360R/A4S 360R	M14		18 Nm
	A5S 300J			40 Nm
	GA6HP26Z/GA6HP32Z	M30x1.5		80 Nm
	GA6HP19Z/GA6HP26Z/GA6HP32Z	M18x1.5		35 Nm
	GA6L45R	M18x1.5		19 Nm

TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

24 11 TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION HOUSING, TRANSMISSION OIL SUMP

	Type	Thread	Tightening specification	Measure
1AZ Transmission extension	A4s 200R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M8		25 Nm
		5/16		

	A4S 270R/A4S 310R	inch		32 Nm
	A5S 360R/A4S 360R	M8		22 Nm
2AZ Guard	A4s 200R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M6		9 Nm
3AZ Converter housing	A4s 200R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M8		25 Nm
	4HP-22/4HP-24	M10		46 Nm
	A4S 270R/A4S 310R	1/2 inch		42 Nm
4AZ Screw plug to intermediate plate	A4s 200R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M10		16 Nm
	4HP-22/4HP-24	M14		40 Nm
	4HP-22/4HP-24	M20		50 Nm
	A5S 440Z	M12		23 Nm

TRANSMISSION IN GENERAL

24 00 TRANSMISSION IN GENERAL

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION IN GENERAL

	Type	Thread	Tightening specifications	Dimens
1AZ Transmission to engine				
6 Kant Schrauben	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M8		24 Nm
6 Kant Schrauben	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M10		45 Nm
6 Kant Schrauben	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M12		82 Nm
Torx-Schrauben	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R	M8		21 Nm
Torx-Schrauben	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R	M10		42 Nm

Torx-Schrauben		A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R	M12		72 Nm
Torx-Schrauben		GA6HP19Z/GA6HP26Z	M6		9 Nm
Torx-Schrauben		GA6HP26Z	M10		38 Nm
Torx-Schrauben Stahl		GA6HP19Z/GA6L26Z/GA6L45R	M8		19 Nm
Torx-Schrauben Stahl		GA6HP19Z/GA6HP26Z/GA6L45R	M12		66 Nm
2AZ	Transmission to engine N51/N52/N52K/N53/N54/N55 Aluminum screws are not magnetic	GA6HP19Z/GA6HP26Z/GA6L45R		Replace screws Jointing torque and angle of rotation must be observed without fail	
		GA6HP19Z/GA6L45R	M10x30	Jointing torque Angle of rotation	20 Nm 90-110
		GA6HP19Z	M10x85	Jointing torque Angle of rotation	20 Nm 180-20(
		GA6HP19Z/GA6L45R	M12	Jointing torque Angle of rotation	25 Nm 130 °
3AZ	Reinforcement shell to transmission/extension	A4S 200R/A4S 270R/A4S 310R/A5S 300J/A5S 310Z/A5S 325Z/A5S 440Z/A5S 560Z/A5S 360R/A5S 390R/GA6HP19Z/GA6HP26Z/GA6HP32Z	M8		23 Nm
4AZ	Cover plate for transmission	GA6HP19Z/GA6L45R	M6		9 Nm
5AZ	Heat shield, oil sump	GA6L45R	M6		8 Nm
6AZ	Air duct plate	GA6HP26Z	M6		10 Nm
7AZ	Line cover plate	GA6HP26Z	M6		10 Nm

TRANSMISSION MOUNTING

24 71 TRANSMISSION MOUNTING

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION MOUNTING

		Type
1AZ	Cross member to	E36/E38/E39/E46/E53/E85/E86/E83

	body	E60/E61/E63/E64/E66/E67/E68/E65/E83/E81/E87/E93/E92/E91/E90/E88/E82/E89/E
2AZ	Rubber mounts to cross member or transmission	E36/E38/E39/E46/E53
		E81/E60/E61/E63/E64/E65/E66/E87/E93/E92/E91/E90/E87/E86/E85/E68/E67/E88/E
		E83
3AZ	Support tube to engine subframe	E36
4AZ	Rubber mounts to carrier pipe	E36
5AZ	Carrier plate	E36
6AZ	Transmission support block to transmission	E60/E61/E63/E64/E87/E85/E86/E87/E90/E91/E92/E93/E81/E82/E88/E84
		E60/E61/E63/E64/E87/E85/E86/E87/E90/E91/E92/E93/E81/E82/E88/E84
7AZ	Transmission mount to transmission support bracket/transmission cross-member	E60/E61/E63/E64/E87/E90/E91/E92/E93/E81/E82/E88/E84

WIRE HARNESS, SHIFT ELEMENTS AND SENSOR

24 35 WIRE HARNESS, SHIFT ELEMENTS AND SENSOR

TIGHTENING TORQUE SPECIFICATION - WIRE HARNESS, SHIFT ELEMENTS AND SENSOR

		Type	thread	tightening specification	Measure
1AZ	Transmission socket to case	4HP-22 EH/4 HP- 24EH/A5S 310Z	M26		12 Nm
		A4S 270R/A4S 310R	M26		14 Nm

24 AUTOMATIC TRANSMISSION

24-0030 ADAPTER

Adapter MW

NOTE: For pressure gauge 13 3 061/For checking the converter pressure

Storage Location

A4



W24 0 030

Fig. 1: Identifying Adapter (24-0030)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2410 ADAPTER

Adapter Minimum set: Mechanical tools MW

NOTE: (Adapter ring) For driving in radial shaft seal on output shaft.

Storage Location

B25

SI number

01 18 08 (482)



Fig. 2: Identifying Adapter (24-2410)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5190 ADAPTER

Adapter MW

NOTE: For pressure gauge 13 3 061 for checking oil pressure in transmission

Storage Location

A4

SI number

01 03 90 (184)



W24 5 190

Fig. 3: Identifying Adapter (24-5190)
Courtesy of BMW OF NORTH AMERICA, INC.

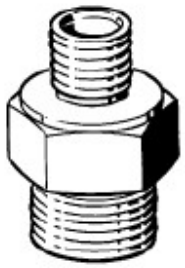
24-0070 ADAPTER

Adapter MW

NOTE: For testing the pump pressure

Storage Location

A4



W24 0 070

Fig. 4: Identifying Adapter (24-0070)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1210 ANGLE

Angle MW

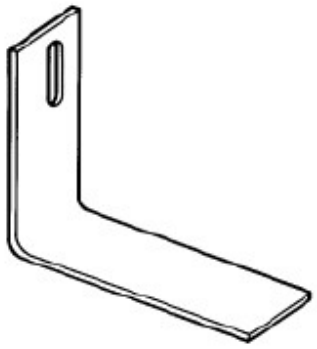
NOTE: (Sheet metal part) Retaining plate for disc package As of transmission number 11 2 300 not required

Storage Location

Z4

SI number

01 09 90 (282)



W24 1 210

Fig. 5: Identifying Angle (24-1210)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5270 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: For fitting the radial sealing ring of the selector shaft

Storage Location

B3

SI number

01 08 96 (080)

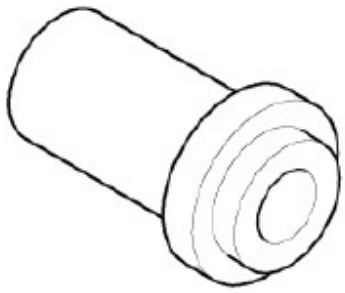


Fig. 6: Identifying Bush (24-5270)
Courtesy of BMW OF NORTH AMERICA, INC.

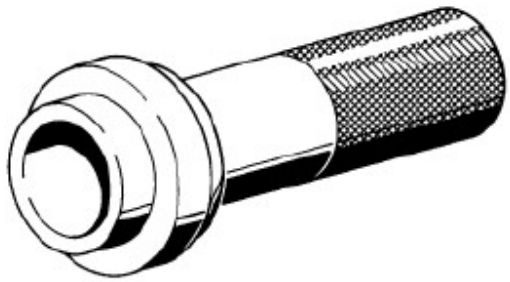
24-1050 BUSH

Bush MW

NOTE: (Impact bush) For fitting radial shaft seal for torque converter in oil pump housing

Storage Location

Y7



W24 1 050

Fig. 7: Identifying Bush (24-1050)
Courtesy of BMW OF NORTH AMERICA, INC.

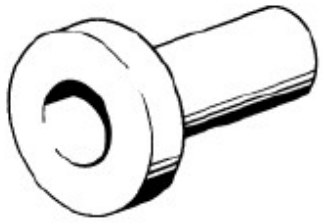
24-1060 BUSH

Bush MW

NOTE: **(Impact bush) For driving in the radial seal ring for the torque converter in the oil pump housing and at the output flange**

Storage Location

Y7



W24 1 060

Fig. 8: Identifying Bush (24-1060)
Courtesy of BMW OF NORTH AMERICA, INC.

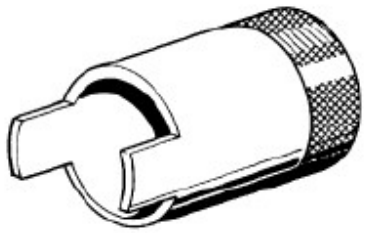
24-3140 BUSH

Bush MW

NOTE: **(Driver bush) For checking the oil pump for ease of movement**

Storage Location

A10



W24 3 140

Fig. 9: Identifying Bush (24-3140)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5200 BUSH

Bush MW

Replaced by: 0491781

NOTE: (Impact bush) For fitting the radial sealing ring of the selector lever shaft/Replaced by 24 5 360 (0 491 781)

SI number

01 03 90 (184)



W24 5 200

Fig. 10: Identifying Bush (24-5200)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1080 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: (bushing (aluminium)) For placing on the drive shaft during removal of the shaft seal from the oil pump housing

Storage Location

C4

SI number

01 03 98 (303)



W24 1 080

Fig. 11: Identifying Bush (24-1080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5250 BUSH

Bush Minimum set: Mechanical tools MW

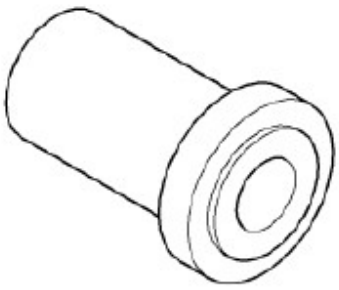
NOTE: For pressing in the radial seal ring of the selector shaft

Storage Location

B3

SI number

01 02 95 (896)



W 24 5 250

Fig. 12: Identifying Bush (24-5250)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1100 BUSH

Bush MW

NOTE: (Impact bush) For driving in the radial seal ring for the output flange into the transmission extension

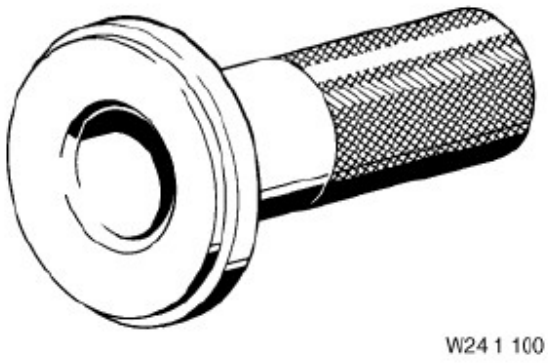


Fig. 13: Identifying Bush (24-1100)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4380 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: (Bush with nut) For inserting radial shaft seal of selector shaft.

Storage Location

A24

SI number

01 02 07 (334)

Consisting of:

1 = 0495788 Bush

2 = 0495789 Nut

NOTE: (Nut M8x1)

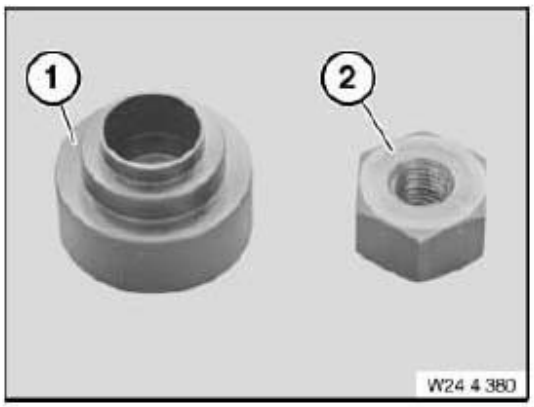


Fig. 14: Identifying Bush (24-4380)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1090 BUSH

Bush MW

NOTE: (Impact bush) For driving in the radial shaft seal on the output flange

SI number

01 08 98 (333)

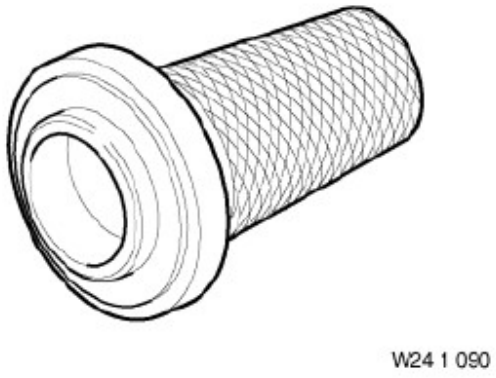


Fig. 15: Identifying Bush (24-1090)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1070 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: (Impact bush) For fitting radial shaft seal into oil pump housing

Storage Location

C17

SI number

01 03 98 (303)

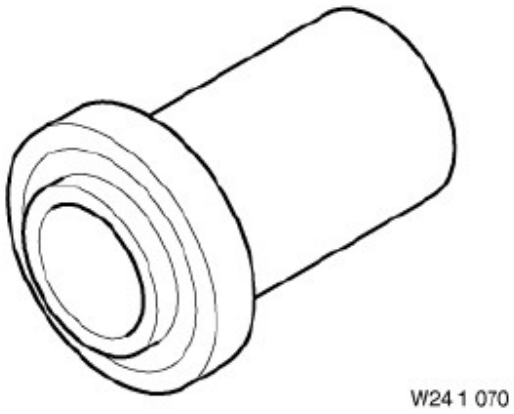


Fig. 16: Identifying Bush (24-1070)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2390 CAP

Cap Minimum set: Mechanical tools MW

NOTE: (protective cap) For sealing off the guide sleeve of the transmission connector

Storage Location

C49

SI number

01 14 01 (766)



Fig. 17: Identifying Cap (24-2390)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0150 CLIP

MW

NOTE: (Mounting bracket) For mounting the transmission on the assembly stand

Consisting of:

6 = 0493913 Spindle

NOTE: With synchronizing key, transmission: All

3 = 0491645 Shaped part

NOTE: (Shaped part) For mounting the transmission/transmissions: A5S 310Z

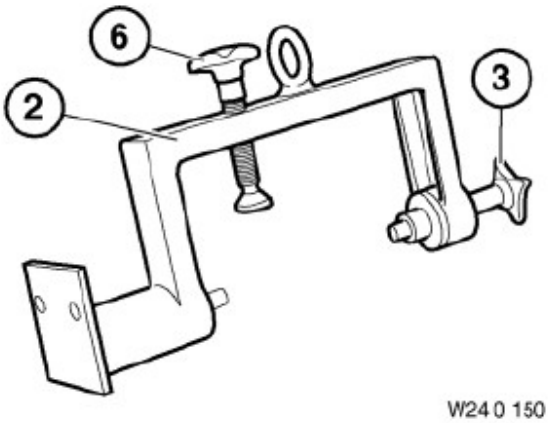


Fig. 18: Identifying Clip (24-0150)

Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491646 Frame

NOTE: (Main frame)

3 = 0491647 Spindle

NOTE: (Spindle with rotary handle)

3 = 0491648 Bolt

NOTE: (Mounting bolts)

3 = 0491649 Bush

NOTE: (Spacer bush for spindle) Transmissions: A4S 310R

24-0140 CONNECTION

Connection Minimum set: Mechanical tools MW

Replaced by: 0495498

NOTE: (Connection) For pressure gauge 13 3 061 and BMW diagnosis and information system for measuring the oil pressure in the transmission Replaced by 23 4 050 (0 495 498)

Storage Location

A4

SI number

01 01 92 (469)

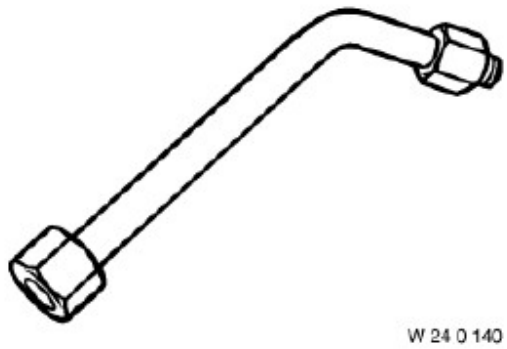


Fig. 19: Identifying Connection (24-0140)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0020 CONNECTION

Connection Minimum set: Mechanical tools MW

NOTE: (Connections) Oil pressure testing accessory for pressure gauge 13 3 061 or BMW DIS for checking the oil pressure.

Storage Location

B24

B23

Individual

Consisting of:

1 = 0491619 Hose

NOTE: (Line) Pressure hose 1.7 m, connection M12x1.5 - M14x1.5 outer thread/For checking the different converter pressures/transmission: A4S 310R, A4S 270R

2 = 0491620 Connection

NOTE: (Connection) For checking the main pressure (3 HP 22, A5S 310Z) and clutch A (ZF transmission)/transmission: 3 HP 22, A5S 310Z, A5S 560Z and all ZF transmissions

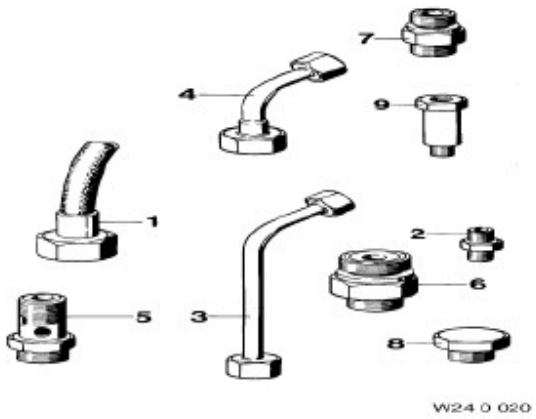


Fig. 20: Identifying Connection (24-0020)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0491621 Connection

NOTE: (Connection) Pipe bend, 145 mm, stretched length 145 mm/transmission: 4 HP 22, 4 HP 24

4 = 0491622 Connection

NOTE: (Connection) Pipe bend, 90 mm, stretched length 90 mm

5 = 0491623 Screw

NOTE: (Connection) Banjo bolt M20x1. - M18x1./For checking the converter pressure/transmission: 3 HP 12

6 = 0491624 Connection

NOTE: (Connection) Reducer M24x1.5 - 20x1.5/For checking the main pressure/transmission: 3 HP 20

7 = 0491625 Connection

NOTE: (Connection) Reducer M20x1.5 - M18x1.5/For checking the main pressure (3 HP 12) an converter pressure (3 HP 20)/Transmission: 3 HP 12, 3 HP 20

8 = 0491626 Screw

NOTE: (Screw) M18x1./For closing the engine oil feed pipe when checking the converter pressure/transmission: 3 HP 20

9 = 0491627 Adapter

NOTE: For closing the feed and return lines when checking the main pressure/transmission: 3 HP 22

24-0190 COUNTER SUPPORT

Counter support Minimum set: Mechanical tools MW

NOTE: (Steady device) For the output flange of the propeller shaft while releasing and tightening the slotted nut

SI number

01 06 92 (509)

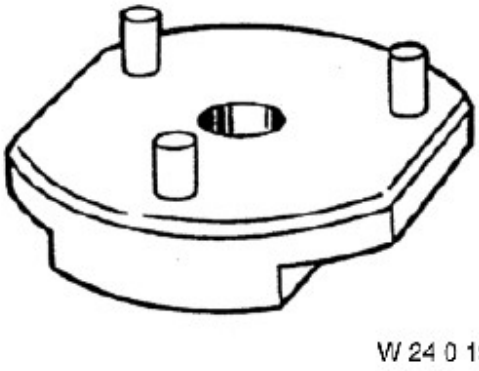


Fig. 21: Identifying Counter Support (24-0190)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1230 DEVICE

Device MW

NOTE: (Pressing device) For removing and installing the piston (cover) at brake C

Storage Location

Y6

SI number

01 14 93 (718)

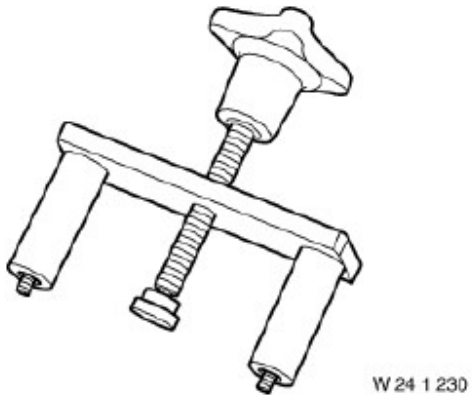


Fig. 22: Identifying Device (24-1230)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4120 DEVICE

Device MW

Replaced by: 0491731

NOTE: For firmly holding torque converter in position while removing and fitting the transmission. Replaced by 24 4 130 (0 491 731)

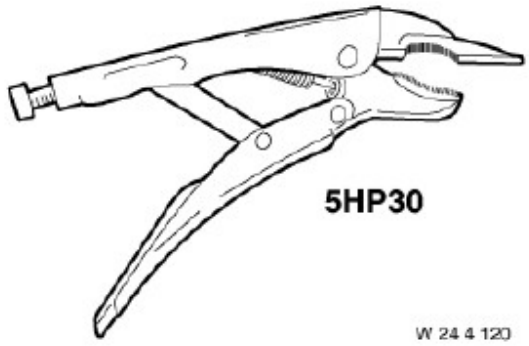


Fig. 23: Identifying Device (24-4120)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1240 DEVICE

Device MW

NOTE: (device) For determining the shims on the brake C

Storage Location

Y6

SI number

01 14 93 (718)

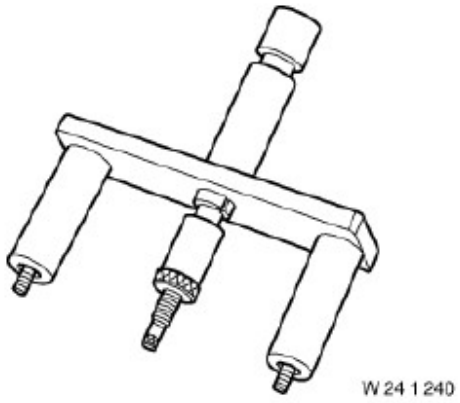


Fig. 24: Identifying Device (24-1240)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1370 DEVICE

Device Minimum set: Mechanical tools MW

NOTE: (locating fixture) For securing converter during removal and installation of transmission.

Storage Location

A20

B20

SI number

01 23 05 (224)

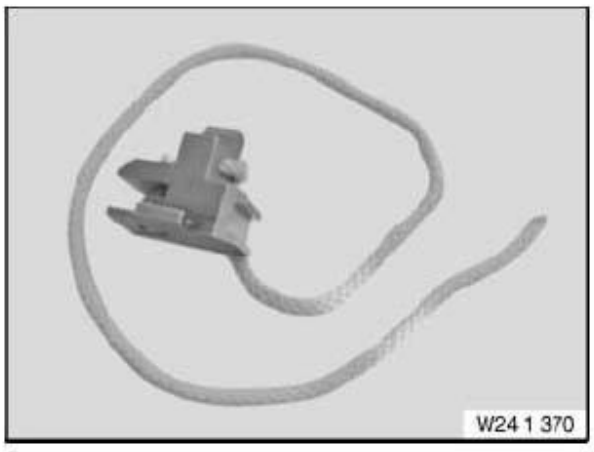


Fig. 25: Identifying Device (24-1370)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1250 DEVICE

Device MW

NOTE: (Lifting gear) For removing and installing the brake clutch unit D/G incl. the parking lock gear

Storage Location

Y3

Z3

SI number

01 14 93 (718)

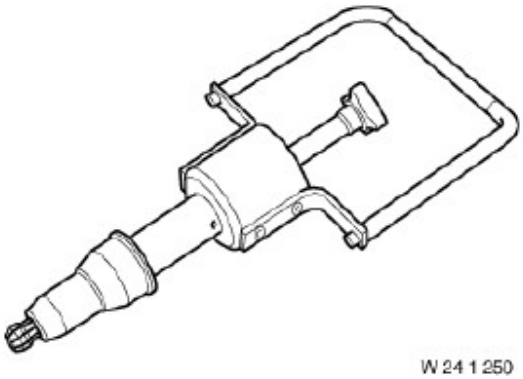


Fig. 26: Identifying Device (24-1250)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5260 DEVICE

Device Minimum set: Mechanical tools MW

NOTE: (Pulling device) For pulling off the radial seal of the selector shaft/transmission with positioning switch

Storage Location

B3

SI number

01 02 95 (896)

Consisting of:

1 = 0494592 Use

2 = 0494593 Bush

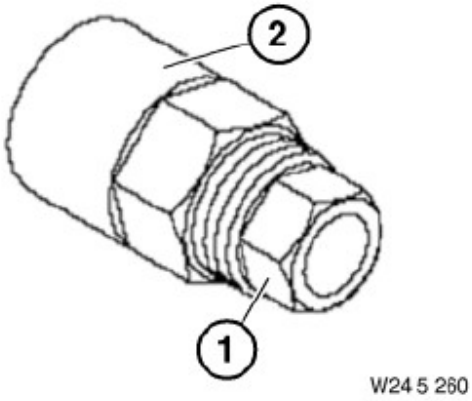


Fig. 27: Identifying Device (24-5260)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2310 DEVICE

Device MW

NOTE: (Device) Tool set for dismantling and fitting the R gear piston. For dismantling and assembling the transmission for "Sealing the intermediate plate".

SI number

01 22 97 (239)

Consisting of:

1 = 0493157 Plate

NOTE: (Pressure plate) For removing and installing the spring cup

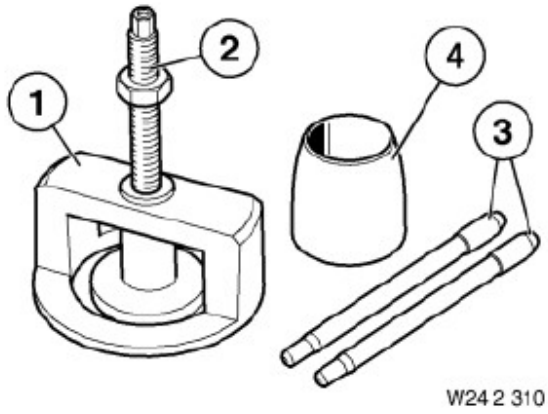


Fig. 28: Identifying Device (24-2310)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0493158 Spindle

NOTE: (Spindle with pressure plate) Spindle M14x1.5, nut M14, pressure plate and washer/For removing and installing the spring cup

3 = 0493159 Pin

NOTE: (Guide pin (2 pieces)) For fixing the gaskets and the intermediate plate on the intermediate case

4 = 0493160 Bush

NOTE: (Slip bush) For installing the piston in the cylinder of the intermediate plate

24-1180 DEVICE

Device MW

NOTE: For removing and installing oil pump

Storage Location

Z2

Z1

SI number

01 09 90 (282)

Consisting of:

1 = 0494586 Tube

NOTE: (Retaining tube)

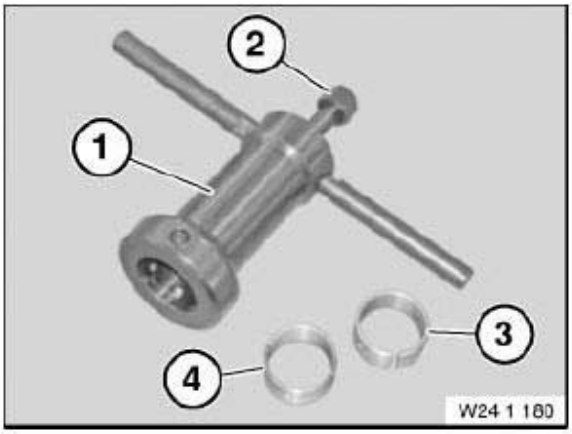


Fig. 29: Identifying Device (24-1180)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0494588 Spindle

NOTE: (Threaded spindle)

3 = 0494589 Ring

NOTE: (Clamping ring)

4 = 0496375 Ring

NOTE: (Clamping ring) Gearbox: GA6HP19Z, GA6HP26Z

24-0080 DEVICE

Device Minimum set: Mechanical tools MW

NOTE: (funnel) For filling the transmission with transmission oil



Fig. 30: Identifying Device (24-0080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1260 DEVICE

Device MW

NOTE: (Removal and mounting device) For removing and installing the cylinders D/E with the planetary gear set

Storage Location

C1

C2

SI number

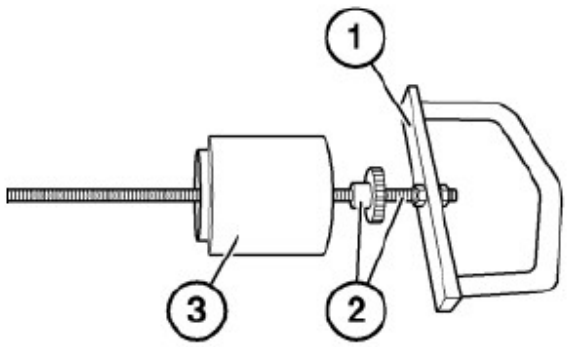
01 01 95 (892)

Consisting of:

1 = 0491680 Handle

2 = 0491681 Spindle

NOTE: (Spindle with knurled nut)



W24 1 260

Fig. 31: Identifying Device (24-1260)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0491682 Bush

NOTE: (Centring bush)

24-1270 DEVICE

Device MW

NOTE: Removal and mounting device) For removing and installing the drive clutch A/B/C

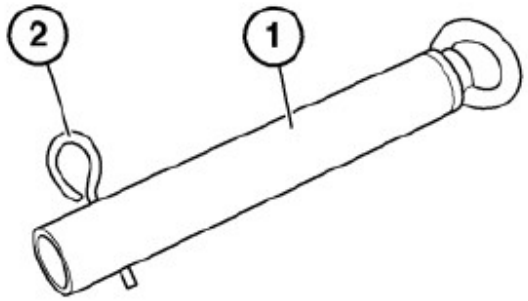
Storage Location

Y2

Z2

SI number

01 01 95 (892)



W24 1 270

Fig. 32: Identifying Device (24-1270)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0491684 Pipe

NOTE: (Jack tube with ring bolt)

2 = 0491685 Pin

NOTE: (Locking pin)

24-5360 DEVICE

Device Minimum set: Mechanical tools MW

NOTE: For removing and installing the radial shaft seal of the gearshift shaft 24 5 361, 24 5 362, 24 5 364 and 24 5 366 for E90

Storage Location

C4

SI number

01 14 96 (105)

Consisting of:

6 = 0494208 Bush

NOTE: For fitting the radial shaft seal on the selector shaft (emergency release) Transmission: GA6 HP26Z

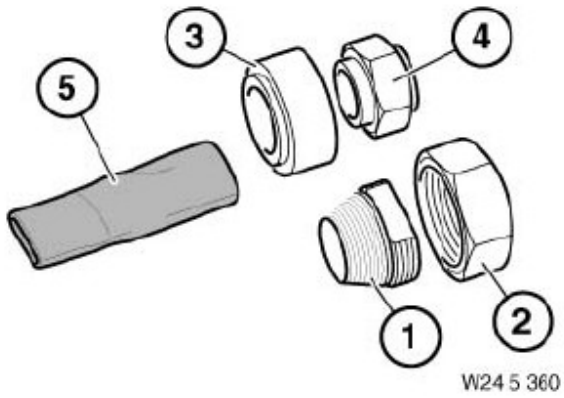


Fig. 33: Identifying Device (24-5360)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0491782 Bush

NOTE: (Threaded bush)

2 = 0491783 Nut

NOTE: (Union nut)

3 = 0491784 Bush

NOTE: For transmission without positioning switch Transmission: A4S 310R

4 = 0491785 Nut

5 = 0491786 Sleeve

NOTE: (Sliding sleeve (5 pieces)) Transmission: A4S 310R

24-1280 DEVICE

Device MW

NOTE: (Assembly and disassembly tool) For removing and installing brake clutch F

Storage Location

Z4

Z3

SI number

01 01 95 (892)

Consisting of:

1 = 0491687 Handle

NOTE: (Handle)

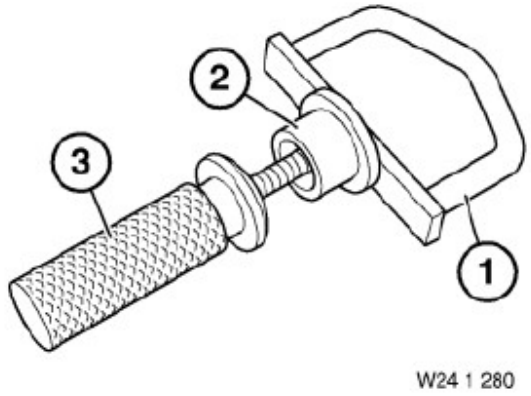


Fig. 34: Identifying Device (24-1280)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491688 Nut

NOTE: (knurled nut)

3 = 0491689 Handle

NOTE: (Centring handle)

24-4080 DEVICE

Device MW

NOTE: For fixing torque converter in position while removing and installing transmission.

Storage Location

Individual



Fig. 35: Identifying Device (24-4080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0010 DEVICE

Device MW

NOTE: For checking the side clearance of the drive shaft

Storage Location

Y3

Consisting of:

1 = 0491616 Holder

NOTE: (Dial gauge holder)

2 = 0491617 Terminal

NOTE: (Terminal)

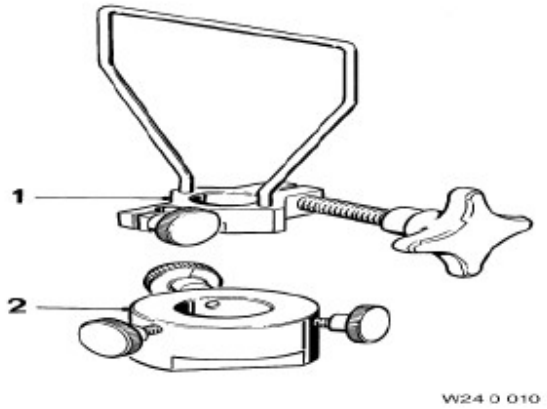


Fig. 36: Identifying Device (24-0010)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2140 DEVICE

Device MW

NOTE: (Tensioning device) For removal and installation of the snap ring before the centring plate on ZF transmissions

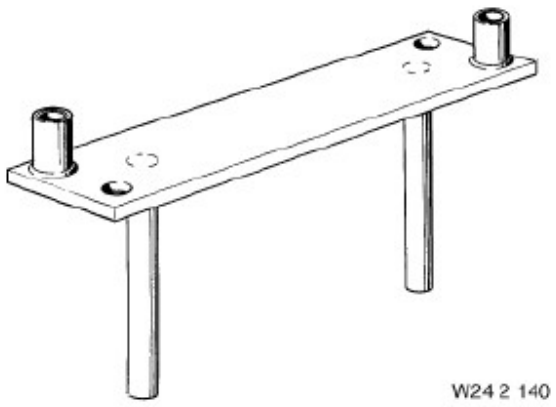


Fig. 37: Identifying Device (24-2140)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0180 FIXTURE

Fixture MW

Replaced by: 0495446

NOTE: For mounting the gearbox on the assembly stand. Replaced by 24 0 200 (0 495 446)

SI number

01 06 92 (509)

Consisting of:

5 = 0495439 Adapter

NOTE: Replaced by 24 0 205 (0 495 492)

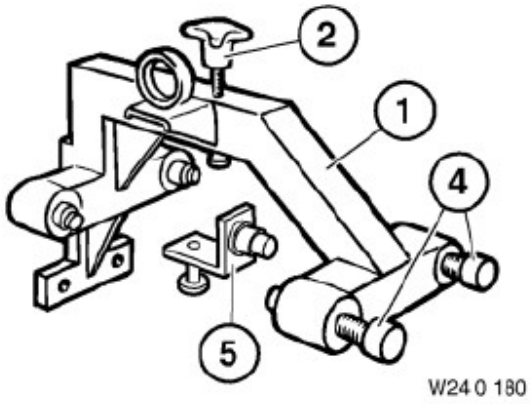


Fig. 38: Identifying Fixture (24-0180)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0491655 Spindle

NOTE: Replaced by 24 0 184 (0 491 656)

1 = 0491653 Frame

NOTE: (Main frame)

2 = 0491654 Spindle

NOTE: (Pressure spindle with star handle)

4 = 0491656 Spindle

NOTE: (spindle, long (2 pieces))

24-0200 FIXTURE

Fixture MW

NOTE: For mounting the gearbox on the assembly stand.

SI number

01 27 06 (328)

Consisting of:

1 = 0495488 Basic body

2 = 0495489 Spindle

NOTE: (spindle with synchronizing key)

3 = 0495490 Spindle

NOTE: (spindle with screw)

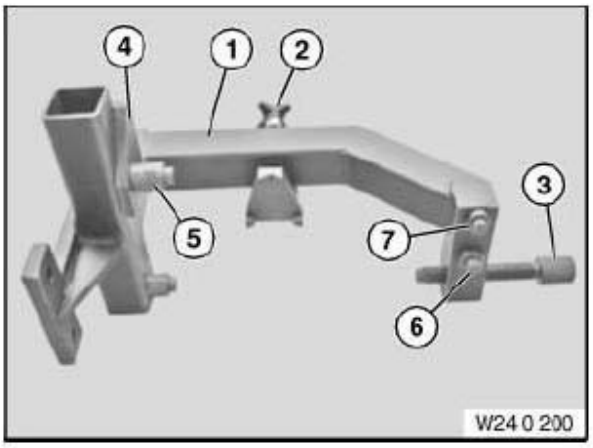


Fig. 39: Identifying Fixture (24-0200)
Courtesy of BMW OF NORTH AMERICA, INC.

4 = 0495491 Shaped part

NOTE: (Shaped part)

5 = 0495492 Adapter

NOTE: (adapter (long))

6 = 0495493 Adapter

NOTE: (adapter (medium))

7 = 0495494 Adapter

NOTE: (adapter (short))

24-0130 FIXTURE

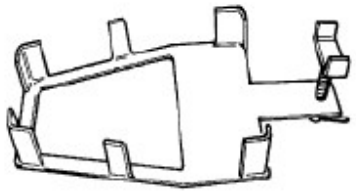
Fixture MW

Replaced by: 0495498

NOTE: (Fixture for transmission) For removal and installation Replaced by 23 4 050 (0 495 498)

SI number

01 02 87 (721)



W24 0 130

Fig. 40: Identifying Fixture (24-0130)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0170 FIXTURE

Fixture MW

Replaced by: 0495498

NOTE: For removing and installing transmission. Replaced by 23 4 050 (0 495 498)

SI number

01 06 92 (509)

Consisting of:

3 = 0493258 Bolt

NOTE: (Adjusting screw) Discontinuation and replaced by 23 4 050 (0 495 498)

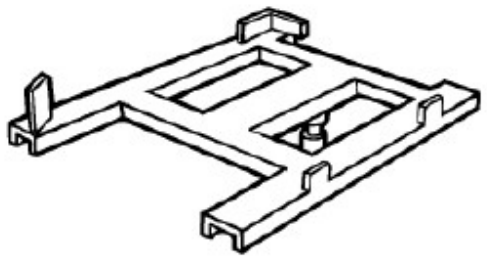


Fig. 41: Identifying Fixture (24-0170)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0250 FIXTURE

Fixture MW

Replaced by: 0495498

NOTE: (Fixture for transmission) For removing and installing the transmission. Replaced by 23 4 050 (0 495 498)

SI number

01 08 96 (080)

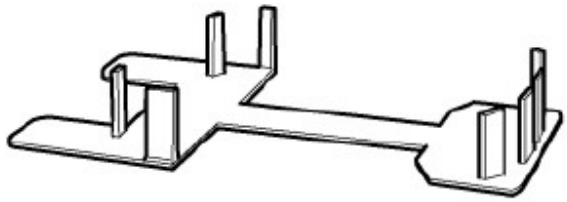


Fig. 42: Identifying Fixture (24-0250)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1120 GAUGE

Gauge MW

NOTE: For setting the position switch to "P position" during installation/model year: from 03/96

SI number

01 07 96 (068)

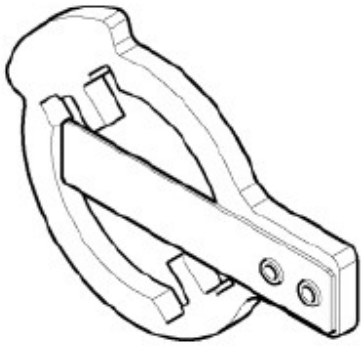


Fig. 43: Identifying Gauge (24-1120)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1440 HANDLE

Handle MW

NOTE: For installing and removing the torque converter. 8HPxx

SI number

01 17 09 (577)



Fig. 44: Identifying Handle (24-1440)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2050 HANDLE

Handle MW

Replaced by: 0491633

NOTE: (Pulling handle) For sealing plug in the lower section of the transmission housing/Replaced by 24 0 050 (0 491 633)

24-4000 HANDLE

Handle Minimum set: Mechanical tools MW

NOTE: (Assembly handle (2 x)) For removing and installing the torque converter

Storage Location

B5

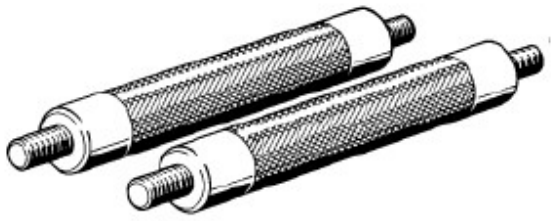


Fig. 45: Identifying Handle (24-4000)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0050 HANDLE

Handle MW

NOTE: (extractor handle) For sealing plug in the lower section of transmission housing

Storage Location

Y5



W24 0 060

Fig. 46: Identifying Handle (24-0050)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5240 HOLDER

Holder MW

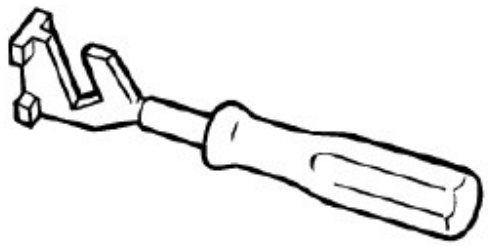
NOTE: (Counter support) For releasing and tightening the gear selector cable/transmission with position switch

Storage Location

A4

SI number

01 06 92 (509)



W 24 5 240

Fig. 47: Identifying Holder (24-5240)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5210 HOLDER

Holder MW

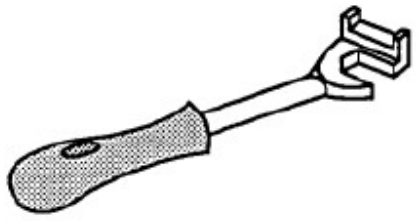
NOTE: (counter support) For loosening and tightening the gear selector cable

Storage Location

A4

SI number

01 04 91 (372)



W24 5 210

Fig. 48: Identifying Holder (24-5210)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5220 HOLDER

Holder MW

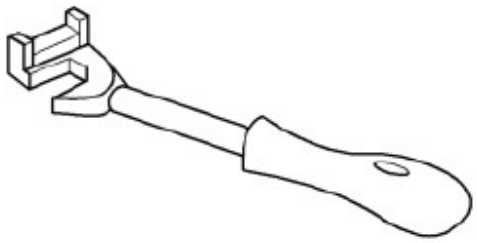
NOTE: (Counter support) For slackening and tightening the gear selector cable

Storage Location

A4

SI number

01 04 91 (372)



W24 5 220

Fig. 49: Identifying Holder (24-5220)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4160 HOLDER

Holder Minimum set: Mechanical tools MW

NOTE: For securing converter during removal and installation of transmission

Storage Location

C46

A47

SI number

01 11 02 (908)

Consisting of:

3 = 0494477 Shaped element

NOTE: For converter variantM57TU

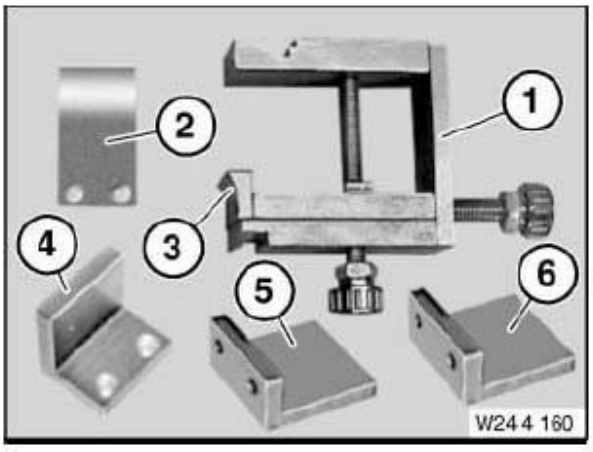


Fig. 50: Identifying Holder (24-4160)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0494478 Basic body

2 = 0494479 Shaped element

NOTE: For converter variantN73

4 = 0494622 Shaped element

NOTE: For converter variantM54

5 = 0494965 Shaped element

NOTE: Transmission: GA6 HP19 in E87, E90

6 = 0496061 Shaped element

NOTE: Transmission: GA6L45R (GM6) in E83/N52K

24-1200 HOLDING SLEEVE

Holding sleeve Minimum set: Mechanical tools MW

NOTE: (Assembly sleeve) For preventing damage to radial shaft seal when fitting it onto selector shaft

Storage Location

B3

SI number

01 09 90 (282)



W24 1 200

Fig. 51: Identifying Holding Sleeve (24-1200)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4110 KEY

Key Minimum set: Mechanical tools MW

NOTE: For releasing and tightening the slotted nut of the output flange

Storage Location

A10

SI number

01 06 92 (509)

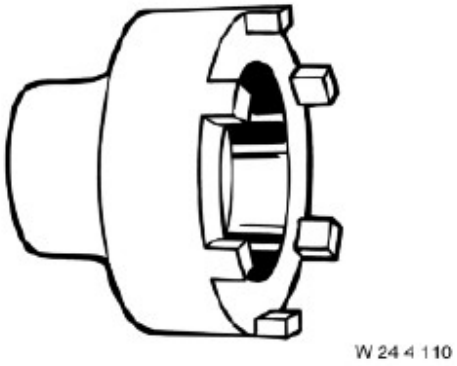


Fig. 52: Identifying Key (24-4110)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4340 LEVER

Lever MW

NOTE: For removing and installing oil filler cap.

Storage Location

B22

SI number

01 19 07 (397)

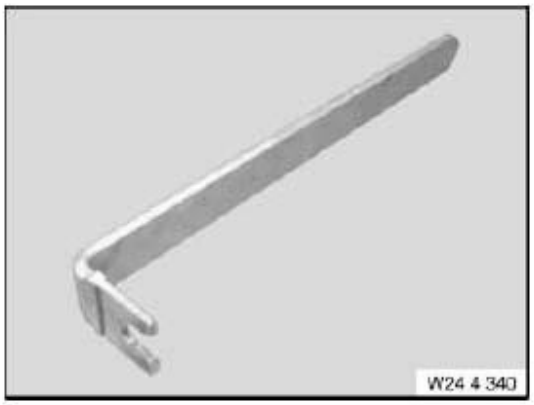


Fig. 53: Identifying Lever (24-4340)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4100 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in the radial seal ring on the drive side (behind converter)

Storage Location

A17

SI number

01 06 92 (509)

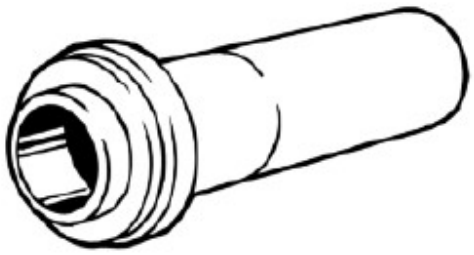


Fig. 54: Identifying Mandrel (24-4100)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4370 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in radial shaft seal of output shaft (4x2).

Storage Location

A24

SI number

01 02 07 (334)



Fig. 55: Identifying Mandrel (24-4370)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4400 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in oil filter sealing ring.

Storage Location

A24

SI number

01 02 07 (334)



Fig. 56: Identifying Mandrel (24-4400)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0340 MANDREL

Mandrel MW

NOTE: **For driving in the radial shaft seal on the output end.**

SI number

01 09 10 (639)

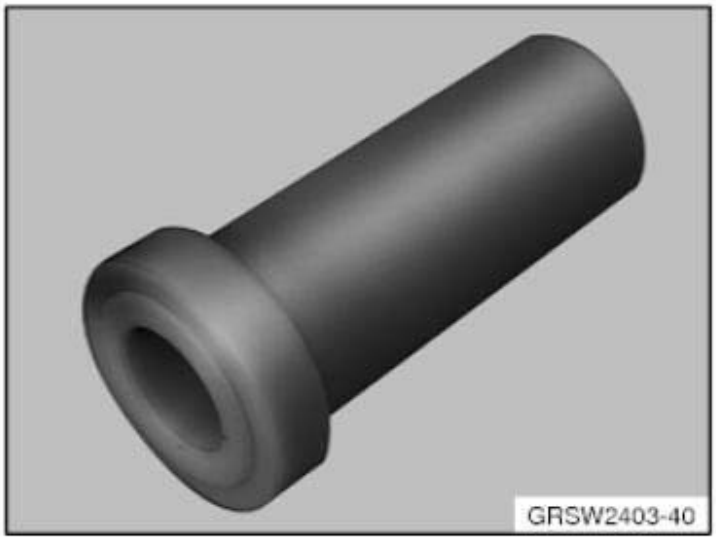


Fig. 57: Identifying Mandrel (24-0340)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0090 MANDREL

Mandrel MW

Replaced by: 0491639

NOTE: **(Drift) For punching the radial sealing ring in the front section of the transmission housing/Replaced by 24 0 110 (0 491 639) November 96**



Fig. 58: Identifying Mandrel (24-0090)

Courtesy of BMW OF NORTH AMERICA, INC.

24-0110 MANDREL

Mandrel MW

NOTE: (drift) For driving in the radial sealing ring in the front section of the transmission housing/Model year: from 90 and for the output flange of the transmissions S5D 200G and S5D 250G

Storage Location

B17

SI number

01 03 90 (184)

Consisting of:

3 = 0491640 Washer

NOTE: (ring washer 1 mm) Transmissions: 4 HP 24 - no. 0 029 160, 4 HP 22 - no. 1 113 936

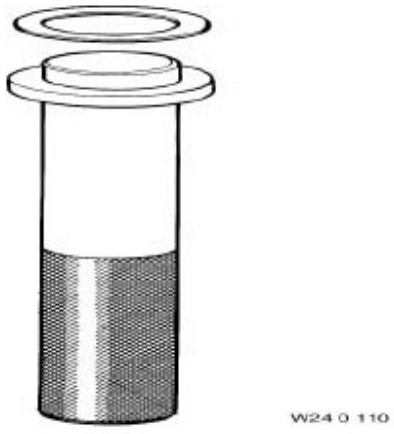


Fig. 59: Identifying Mandrel (24-0110)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0330 MANDREL

Mandrel MW

NOTE: For driving in the radial shaft seal on the drive end.

SI number

01 09 10 (639)



Fig. 60: Identifying Mandrel (24-0330)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0350 MANDREL

Mandrel MW

NOTE: For driving in shaft seal on selector shaft.

SI number

01 09 10 (639)



Fig. 61: Identifying Mandrel (24-0350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2370 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For inserting the radial shaft seal on the output flange

Storage Location

B46

A46

SI number

01 14 01 (766)



Fig. 62: Identifying Mandrel (24-2370)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1190 MANDREL

Mandrel Minimum set: Mechanical tools MW

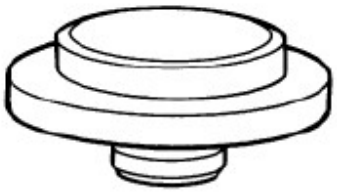
NOTE: (drift) For driving in the radial sealing ring in the front section of the transmission housing

Storage Location

A15

SI number

01 09 90 (282)



W24 1 190

Fig. 63: Identifying Mandrel (24-1190)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2360 MANDREL

Mandrel Minimum set: Mechanical tools MW

Replaced by: 0494506

NOTE: (Drift) For installing the radial shaft seal on the torque converter Replaced by 24 2 400 (0 494 506)

Storage Location

B46

SI number

01 14 01 (766)



Fig. 64: Identifying Mandrel (24-2360)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1410 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: For driving in the radial shaft seal of the drive shaft.

SI number

01 17 09 (577)



Fig. 65: Identifying Mandrel (24-1410)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4330 MANDREL

Mandrel MW

NOTE: (Drift) For driving in radial shaft seal of output shaft (all-wheel drive).

Storage Location

A23



Fig. 66: Identifying Mandrel (24-4330)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4090 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (drift) For fitting the radial sealing ring to the output end

Storage Location

A15

SI number

01 06 92 (509)

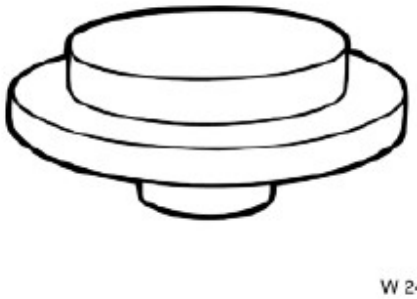


Fig. 67: Identifying Mandrel (24-4090)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2330 OPEN-END WRENCH

Open-end wrench MW

NOTE: (Open-end wrench) Open-end wrench 1/2" for adjusting the brake band

SI number

01 24 97 (257)

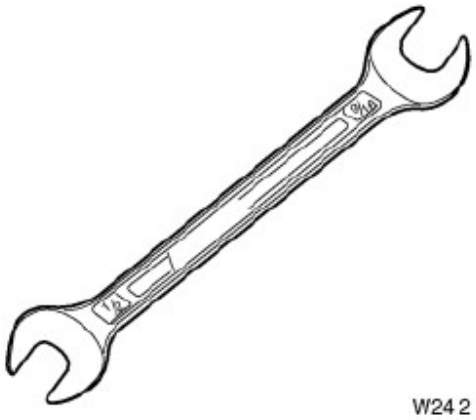


Fig. 68: Identifying Open-End Wrench (24-2330)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1430 PIN

Pin MW

NOTE: For fixing the mechatronics in position during installation.

SI number

01 17 09 (577)

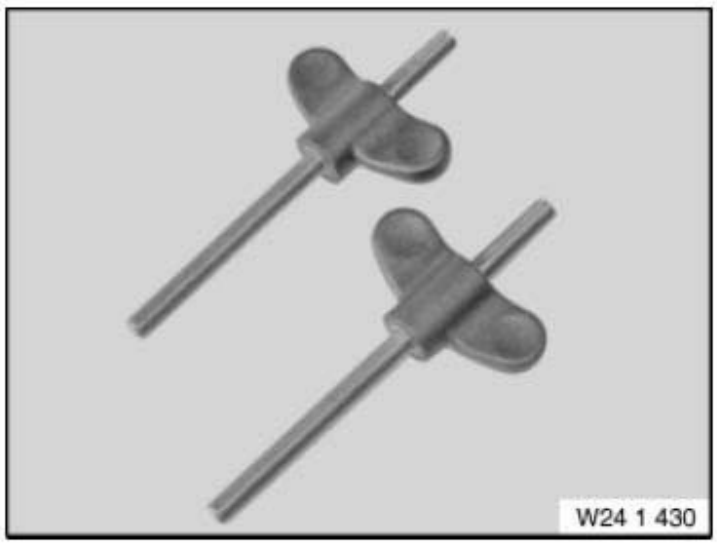


Fig. 69: Identifying Pin (24-1430)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0320 PIN

Pin MW

NOTE: For securing transmission when installing in engine.

SI number

01 29 09 (601)

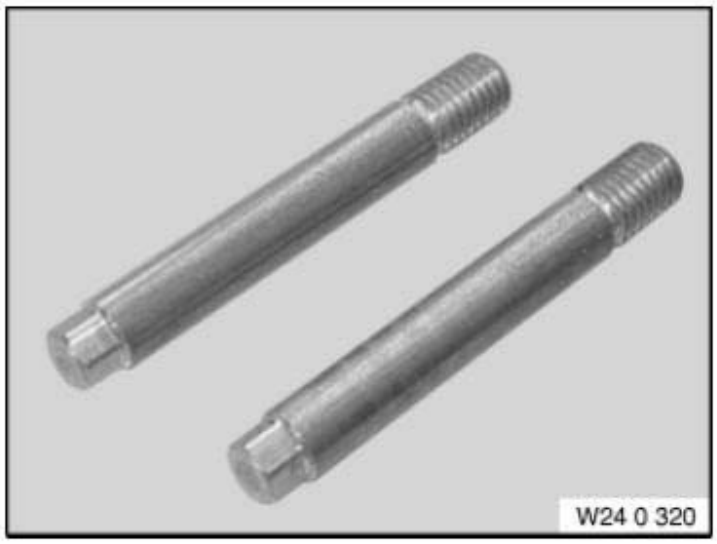


Fig. 70: Identifying Pin (24-0320)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5160 PIN

Pin MW

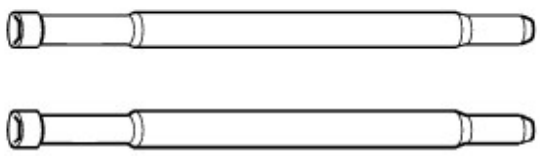
NOTE: (centring pin) For centring the main housing to the intermediate and converter housing (2 x)

Storage Location

Y3

SI number

01 03 93 (663)



W24 5 160

Fig. 71: Identifying Pin (24-5160)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1170 PIN WRENCH

Pin wrench Minimum set: Mechanical tools MW

NOTE: For loosening and tightening the slotted nut on the output flange

Storage Location

A13

SI number

01 09 90 (282)



W24 1 170

Fig. 72: Identifying Pin Wrench (24-1170)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4360 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: For withdrawing radial shaft seal of output shaft (4 x 2).

Storage Location

A24

SI number

01 02 07 (334)

Consisting of:

1 = 0496113 Basic body

2 = 0496114 Claw

NOTE: (Claw (4 x))

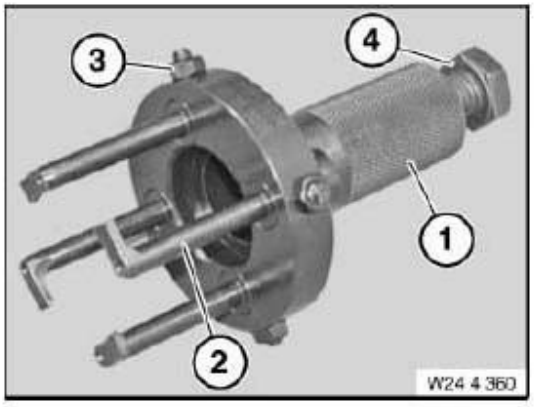


Fig. 73: Identifying Puller (24-4360)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0496115 Screw

4 = 0496116 Spindle

24-2350 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: For extracting radial shaft seal on torque converter and on output flange

Storage Location

A46

SI number

01 14 01 (766)

Consisting of:

1 = 0494202 Puller

2 = 0494203 Spindle

NOTE: (Spindle M12 x 65 with ball head)

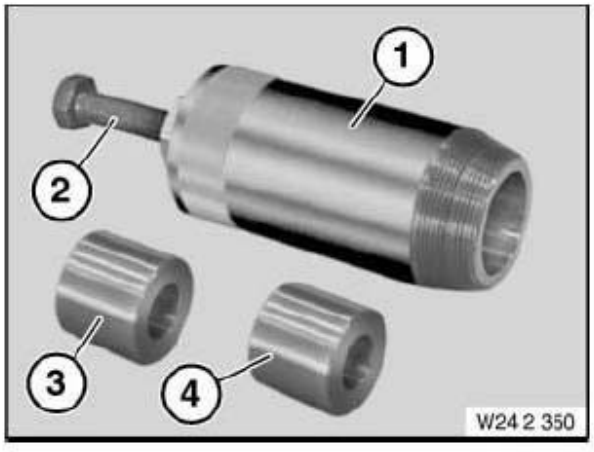


Fig. 74: Identifying Puller (24-2350)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0494204 Synchronizing key

4 = 0495597 Synchronizing key

NOTE: Transmission: GA6L45R (GM6)

24-4320 PULLER

Puller MW

NOTE: For withdrawing output shaft seal (four-wheel drive).

SI number

01 02 07 (334)

Consisting of:

1 = 0495569 Basic body

2 = 0495570 Ring

NOTE: (Retaining ring)

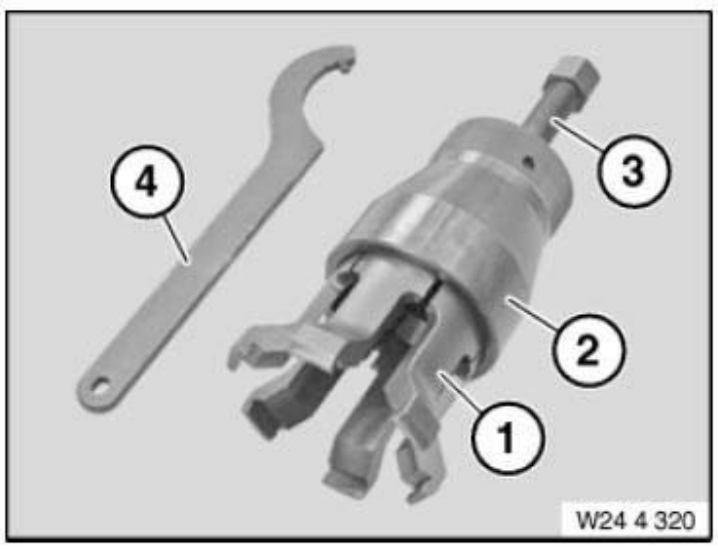


Fig. 75: Identifying Puller (24-4320)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0495571 Spindle

4 = 0495572 Hook wrench

24-5367 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: For removing the radial shaft seal of the gearshift shaft from the gearbox housing.

SI number

01 17 09 (577)



Fig. 76: Identifying Puller (24-5367)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1420 PULLER

Puller MW

NOTE: Removing radial shaft seal from torque converter.

SI number

01 17 09 (577)

Consisting of:

1 = 2209493 Blade

NOTE: Replacement blade for 24 1 420

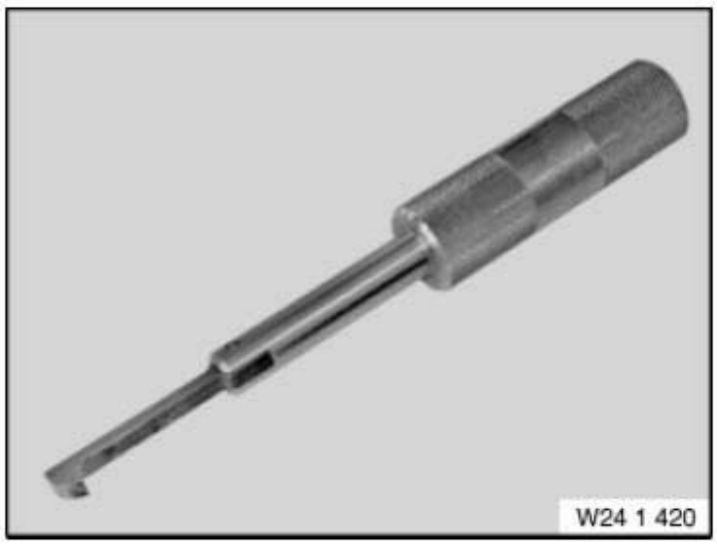


Fig. 77: Identifying Puller (24-1420)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4390 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: For removing oil filter sealing ring.

Storage Location

A23

SI number

01 02 07 (334)



Fig. 78: Identifying Puller (24-4390)

Courtesy of BMW OF NORTH AMERICA, INC.

24-1310 RELEASE TOOL

Release tool MW

NOTE: (release tool) For releasing the retaining tabs on the disc carrier C

Storage Location

Y6

SI number

01 01 95 (892)

Consisting of:

1 = 0494693 Shaped part

NOTE: (shaped part)

2 = 0494694 Basic body

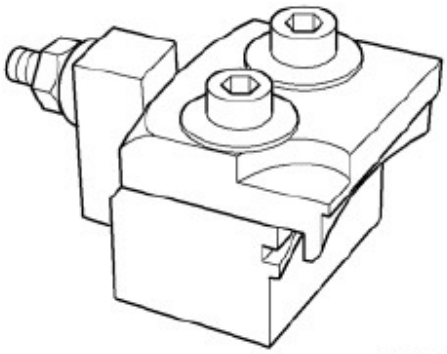


Fig. 79: Identifying Release Tool (24-1310)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5230 RING

Ring Minimum set: Mechanical tools MW

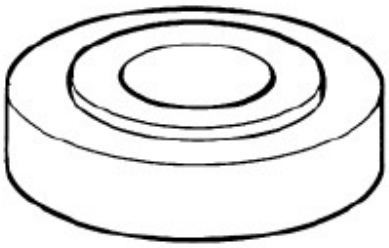
NOTE: (Assembly ring) For pressing in the radial seal of the gearshift shaft

Storage Location

B3

SI number

01 04 91 (372)



W24 5 230

Fig. 80: Identifying Ring (24-5230)
Courtesy of BMW OF NORTH AMERICA, INC.

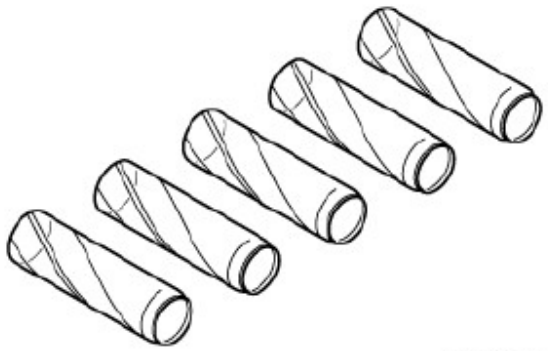
24-5490 SLEEVE

Sleeve Minimum set: Mechanical tools MW

NOTE: (sliding sleeve (5 x)) For prevention of damage to the radial sealing ring while fitting on the gearshift shaft

SI number

01 02 95 (896)



W24 5 490

Fig. 81: Identifying Sleeve (24-5490)
Courtesy of BMW OF NORTH AMERICA, INC.

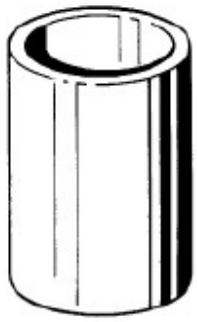
24-1010 SLEEVE

Sleeve MW

NOTE: **(Assembly sleeve) For removing the disc set (4-gear) and for pressing in the needle bearing in the oil pump housing (A5S 560Z)**

Storage Location

X5



W24 1 010

Fig. 82: Identifying Sleeve (24-1010)
Courtesy of BMW OF NORTH AMERICA, INC.

24-4350 SOCKET

Socket Minimum set: Mechanical tools MW

NOTE: **(Socket with special Torx profile) For releasing and tightening down screw connection of Mechatronic.**

Storage Location

A23

SI number

01 02 07 (334)



Fig. 83: Identifying Socket (24-4350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2320 SOCKET WRENCH

Socket wrench MW

NOTE: For hexagon socket screw 3/16" with 1/4" drive for adjusting the brake band

SI number

01 24 97 (257)



Fig. 84: Identifying Socket Wrench (24-2320)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0120 SUPPORT

Support MW

NOTE: (support) For removing and fitting the transmission. Replaced by 24 0 130 in March 87

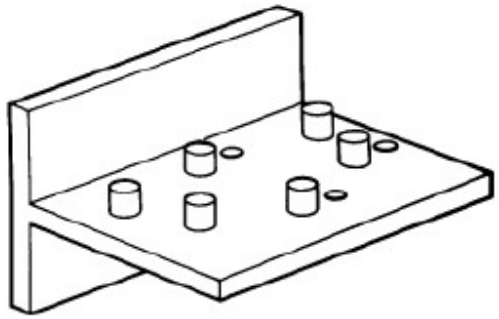
24-1220 SUPPORT

Support MW

NOTE: (Fixture for drive flange) When undoing the slotted nut

SI number

01 09 90 (282)



W24 1 220

Fig. 85: Identifying Support (24-1220)
Courtesy of BMW OF NORTH AMERICA, INC.

24-0300 SUPPORT

Support MW

NOTE: For mounting transmission on assembly stand 00 2 300 and for transport.

SI number

01 29 09 (601)

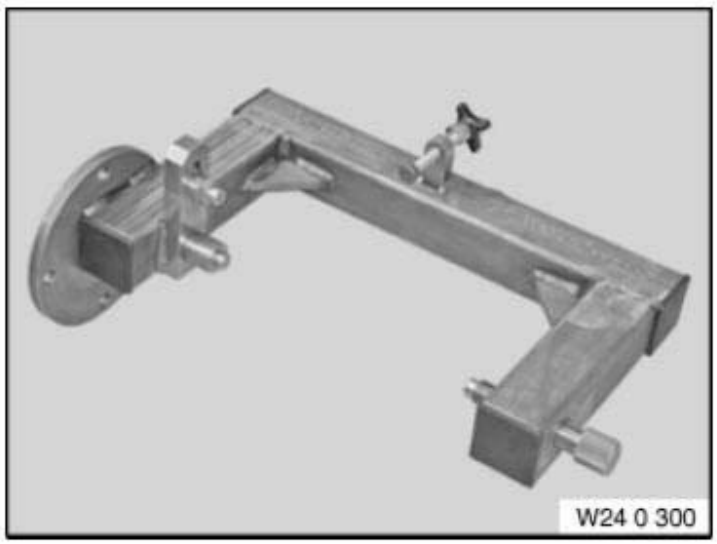


Fig. 86: Identifying Support (24-0300)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5350 SUPPORT

Support MW

NOTE: (Support for automatic transmission) Other: Only Japan and South Africa

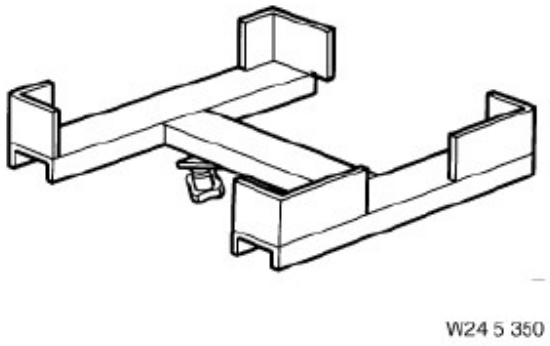


Fig. 87: Identifying Support (24-5350)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6080 TEST CABLE

Test cable Minimum set: Measuring and testing equipment MP

NOTE: (test cable 16-pin)

Storage Location

L204

SI number

02 06 01 (763)

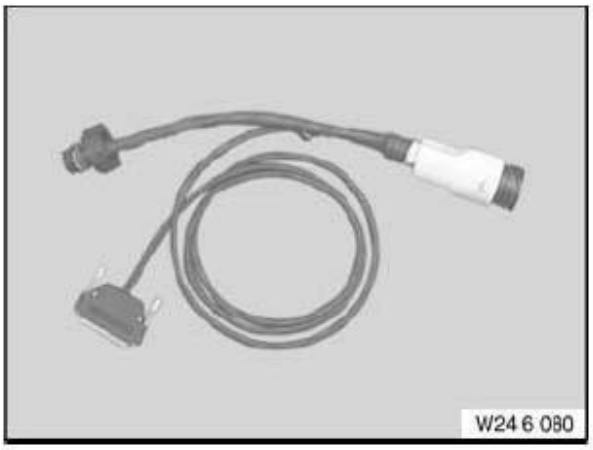


Fig. 88: Identifying Test Cable (24-6080)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6010 TEST CABLE

Test cable MW

NOTE: (Test cable, 9-pin) For automatic transmission (EH transmission)

SI number

02 03 91 (313)

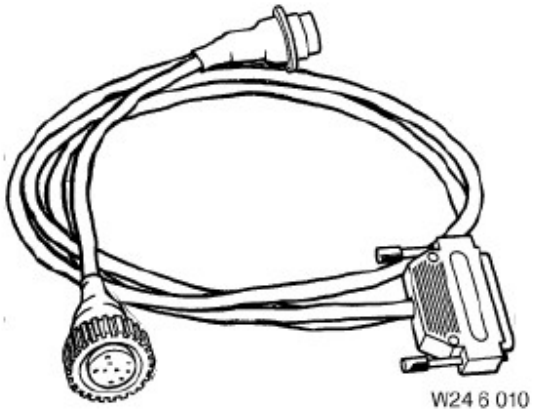


Fig. 89: Identifying Test Cable (24-6010)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6050 TEST CABLE

Test cable MW

NOTE: (Test cable, 10-pin) For Jatco gearbox (AMP plug connection)

SI number

02 01 93 (649)

24-6000 TEST CABLE

Test cable MW

NOTE: (Test cable, 8-pin) For automatic transmission (EH gearbox)

SI number

02 03 91 (313)

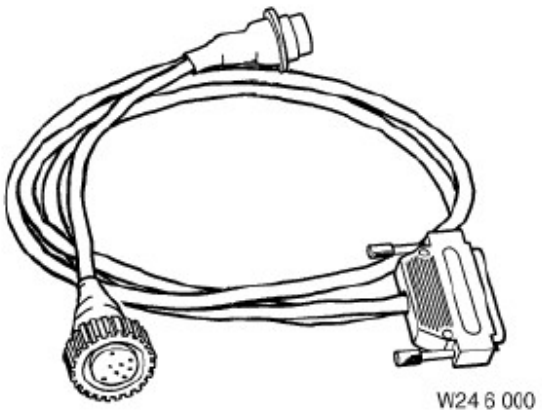


Fig. 90: Identifying Test Cable (24-6000)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6070 TEST CABLE

Test cable MW

NOTE: (Test cable, 20-pin) For automatic transmission GM5

SI number

02 01 99 (468)

24-6060 TEST CABLE

Test cable MW

NOTE: (Test cable, 16-pin) For automatic transmission (EH gearbox)

SI number

02 02 93 (650)

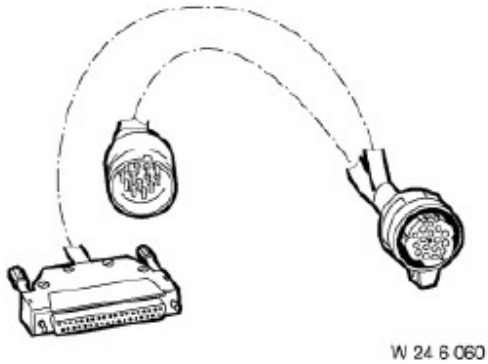


Fig. 91: Identifying Test Cable (24-6060)
Courtesy of BMW OF NORTH AMERICA, INC.

24-6020 TEST CABLE

Test cable MW

NOTE: (Test cable, 14-pin) For automatic transmission (EH transmission)

SI number

00 02 99 (399)

Consisting of:

5 = 0491793 Operating instructions

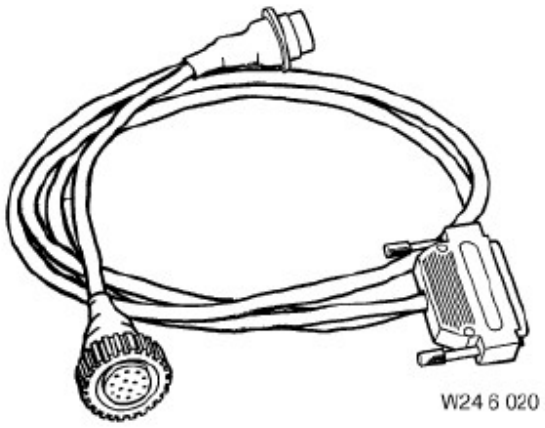


Fig. 92: Identifying Test Cable (24-6020)
Courtesy of BMW OF NORTH AMERICA, INC.

24-2020 TOOL

Tool MW

NOTE: For squeezing the disc spring

Storage Location

X5

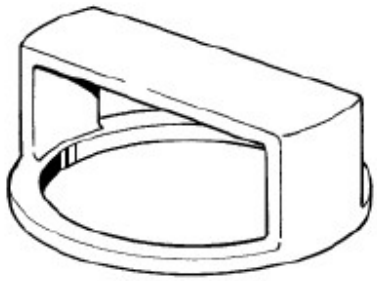


Fig. 93: Identifying Tool (24-2020)
Courtesy of BMW OF NORTH AMERICA, INC.

24-5120 TOOL

Tool MW

NOTE: For centring the converter housing relative to the oil pump when mounting

Storage Location

B2

SI number

01 04 95 (906)

Consisting of:

1 = 0491759 Bush

NOTE: (Centring bush)

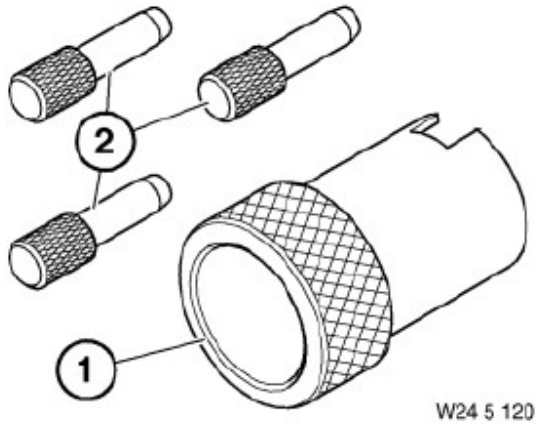


Fig. 94: Identifying Tool (24-5120)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491760 Pin

NOTE: (Centring pin (3 pieces))

24-4130 TOOL

Tool Minimum set: Mechanical tools MW

NOTE: (Locating tool) For fixing torque converter during removal and installation of gearbox

Storage Location

C6

SI number

01 05 97 (181)

Consisting of:

7 = 0493804 Blade

NOTE: Transmission: A5S 360R

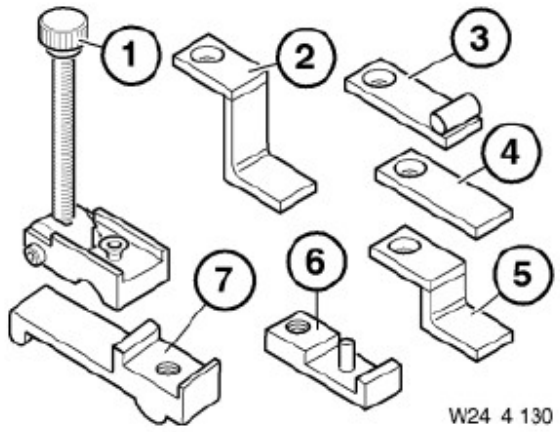


Fig. 95: Identifying Tool (24-4130)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0491732 Basic body

NOTE: (basic body)

2 = 0491733 Blade

NOTE: Transmission: A5S 440Z, GA6HP26Z (N62)

3 = 0491734 Blade

NOTE: (Blade) Gearbox: A4S 310R and A5S 390G

4 = 0491735 Blade

NOTE: Transmission: A5S 310Z, A5S 560Z, A5S 300J and A5S 325Z

5 = 0491736 Blade

NOTE: Transmission: A5S 560Z, GA6 HP26Z (M67), GA6 HP32Z (N73)

6 = 0493180 Plate

NOTE: (Counter-support plate)

8 = 0496742 Blade

NOTE: For securing converter during removal and installation of transmission.

In conjunction with: 24 4 131

24-1300 TOOL

Tool MW

NOTE: (Striking tool) For securing the retaining tabs on disc carrier C

Storage Location

X5

SI number

01 01 95 (892)

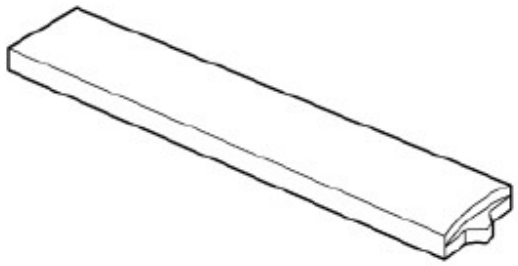


Fig. 96: Identifying Tool (24-1300)
Courtesy of BMW OF NORTH AMERICA, INC.

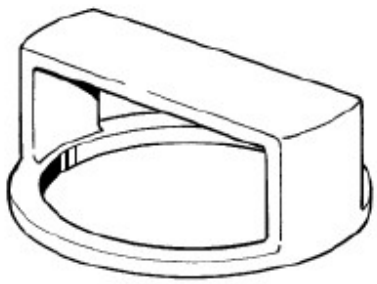
24-2040 TOOL

Tool MW

NOTE: For squeezing the disc spring

Storage Location

X6



W24 2 020

Fig. 97: Identifying Tool (24-2040)
Courtesy of BMW OF NORTH AMERICA, INC.

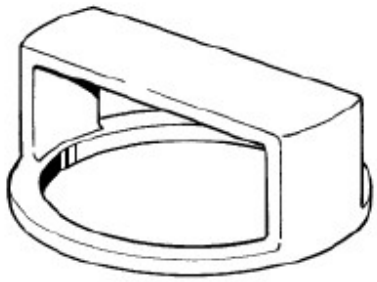
24-2030 TOOL

Tool MW

NOTE: For compressing the disc spring

Storage Location

X5



W24 2 020

Fig. 98: Identifying Tool (24-2030)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1290 WEDGE

Wedge MW

NOTE: (Wedges) For fixing the disc carrier C when securing the retaining tabs

Storage Location

X5

SI number

01 01 95 (892)

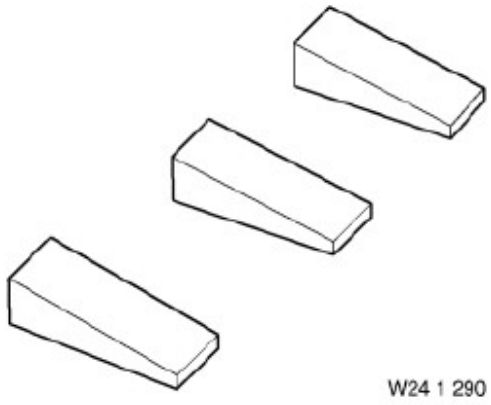


Fig. 99: Identifying Wedge (24-1290)
Courtesy of BMW OF NORTH AMERICA, INC.

24-1110 WRENCH SOCKET

Wrench socket Minimum set: Mechanical tools MW

NOTE: (Wrench socket with magnet) For loosening and tightening the converter fixation

Storage Location

A11

SI number

01 04 86 (566)

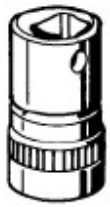


Fig. 100: Identifying Wrench Socket (24-1110)
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION

Clutch - Operating Fluids

1.0 GENERAL INFORMATION

Brake fluid is used as an operating fluid for hydraulic clutch operation.

2.0 SMG: SEQUENTIAL MANUAL GEAR BOX

All models SMG Hydraulic Unit require the use of Pentosin CHF 11S fluid.

3.0 OTHER OPERATING FLUIDS

CLUTCH COMPONENT GREASE

Use UNIREX S2 (replaces Klueber Microlube GL 261) for the lubrication of splines on the transmission input shaft, lubricating groove of the clutch release bearing, piston rod sleeve, clutch master cylinder and front push rod of the clutch slave cylinder.

UNIREX S2 Grease BMW Part No. 83 23 9 416 138

As of 11/93 the clutch release bearings are available as a replacement part which have plastic sliding sleeves instead of aluminum. Such updated bearings should not be lubricated at all. This applies to all models with manual transmission except for 8 Series models.

2100 MAINTENANCE AND INSPECTIONS

21 00 006 BLEEDING CLUTCH HYDRAULICS (PLASTIC SLAVE CYLINDER)

Necessary preliminary tasks

- Remove **UNDERBODY PROTECTION**

Connect bleeder unit to brake fluid expansion tank.

IMPORTANT: Check relevant Operating Instructions for each device. Charging pressure should not exceed 2 bar.

Connect bleeder hose to bleed valve (1).

Open bleed valve (1) and flush until clear brake fluid emerges without air bubbles.

Close bleed valve.

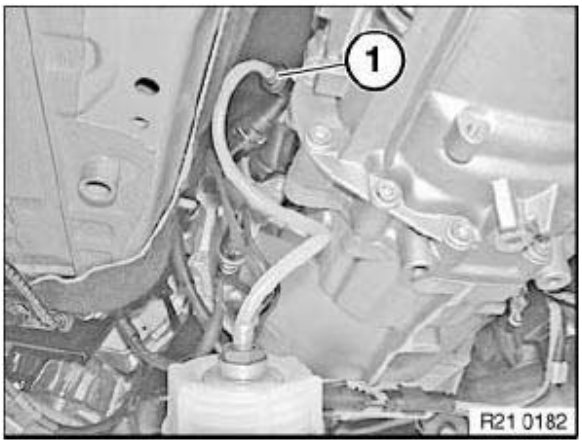


Fig. 1: Identifying Bleed Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Switch off bleeder unit or remove from brake fluid expansion tank.

Correct brake fluid level in expansion tank.

2121 CLUTCH WITH DRIVING DISC

21 21 500 REMOVING AND INSTALLING OR REPLACING CLUTCH (SAC 228)

Necessary preliminary tasks:

- Remove **TRANSMISSION** .

Installation:

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

Identification SAC clutch (Self-Adjusting Clutch)

- 3 openings each with a pressure piece (1) of adjustment ring and a pressure spring (2)

NOTE: Illustration shows new position of pressure pieces.

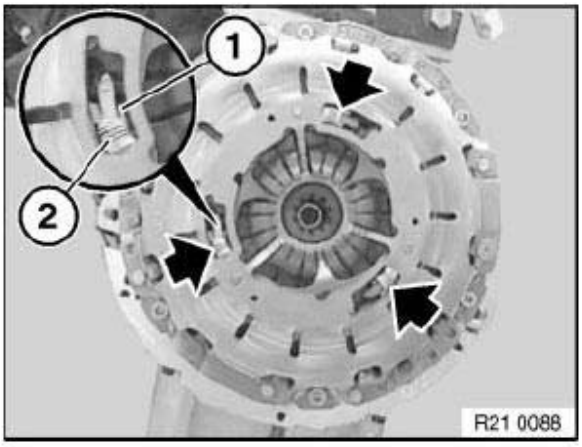


Fig. 2: Locating Pressure Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Block flywheel with special tool 11 9 260 Holder.

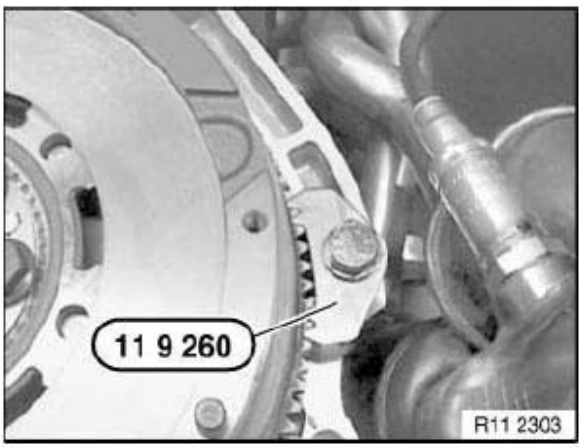


Fig. 3: Identifying Flywheel With Special Tools (11 9 260)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten bolts and remove SAC clutch from flywheel.

IMPORTANT: Do not use a special tool to detach SAC clutch from flywheel.

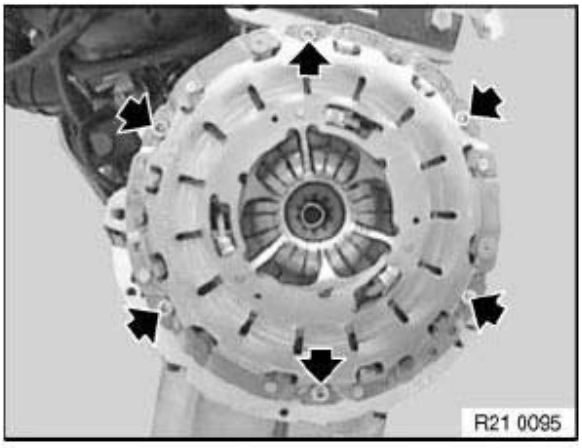


Fig. 4: Locating SAC Clutch Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove clutch plate (1) from flywheel.

Clean flywheel, check for wear and damage.

REPLACE DAMAGED FLYWHEEL.

Check grooved ball bearing in crankshaft for ease of movement and for leaks and if necessary replace **ROLLER BEARING** .

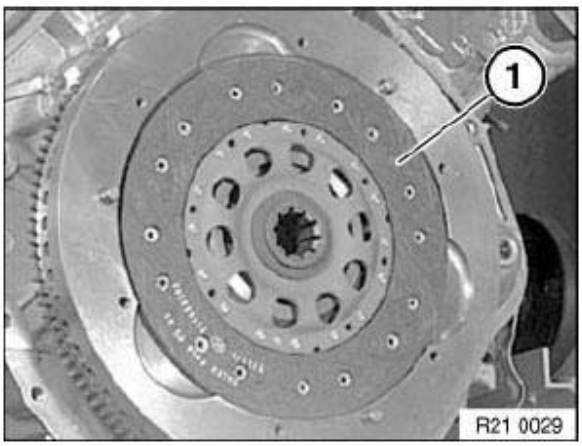


Fig. 5: Identifying Clutch Plate
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Always replace clutch plates fouled e.g. by oil, cleaning agent.

Check clutch plate for damage and friction rust in hub profile and replace if necessary.

Check clutch disk for wear:

Measure lining protrusion at lining rivets at closing head (A) in each case.

NOTE: Rivet connection

a. **Closing head**
b. **Swage head**

Replace clutch plate if lining protrusion at closing head (A) is less than 1 mm.

Push clutch disk onto the cleaned transmission input shaft and check for easy movability.

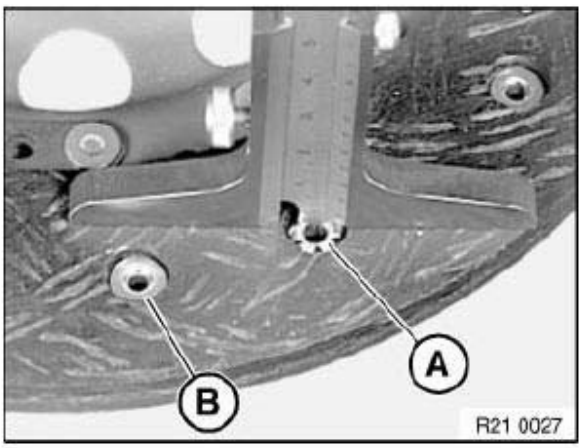


Fig. 6: Identifying Closing And Swage Head
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not clean SAC clutch with high-pressure cleaner or washing machine as this may impair function of adjustment unit.
Clean friction surface only.
Check SAC clutch for wear and damage and replace if necessary.

Reinstalling removed SAC clutch and clutch plate

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

Set SAC clutch (1) down on a clean surface.

Install special tool **21 2 180** in SAC clutch (1).

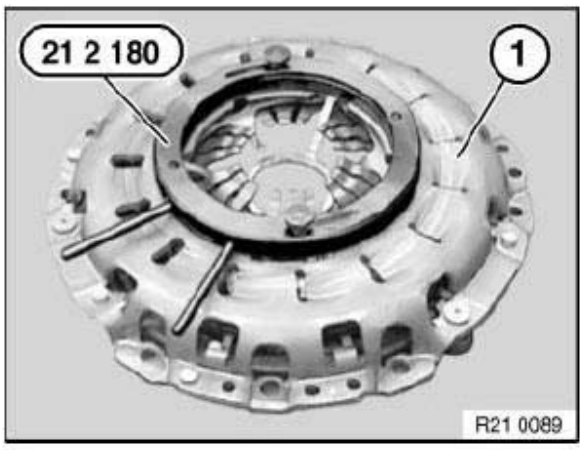


Fig. 7: Identifying SAC Clutch And Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Locking hooks (1) of special tool 21 2 180 must engage in openings in SAC clutch.

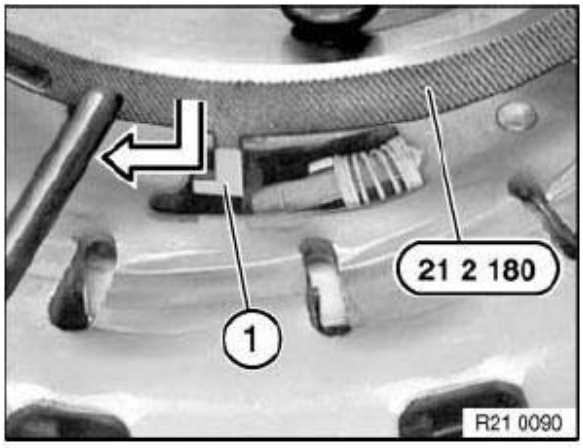


Fig. 8: Locking Hooks Using Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Press special tool **21 2 180** together at handles (1) as far as it will go and grip firmly.

At same time tighten down knurled screws (2).

Adjustment ring of SAC clutch is now secured in its original position (wear position).

IMPORTANT: Do not reset adjustment ring to new position.

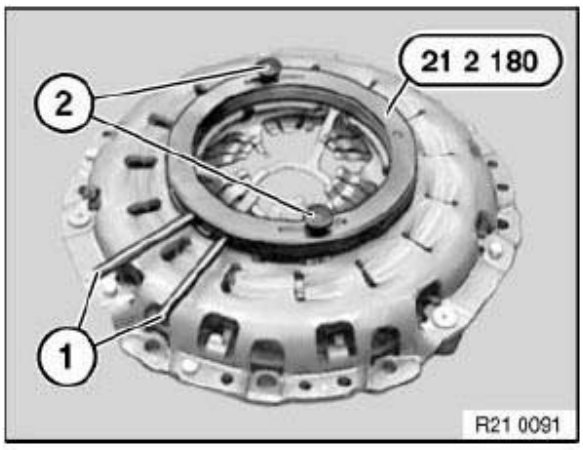


Fig. 9: Pressing Handles Using Special Tools (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Insert special tool 21 2 170 Device only in area of bores for dowel pins.

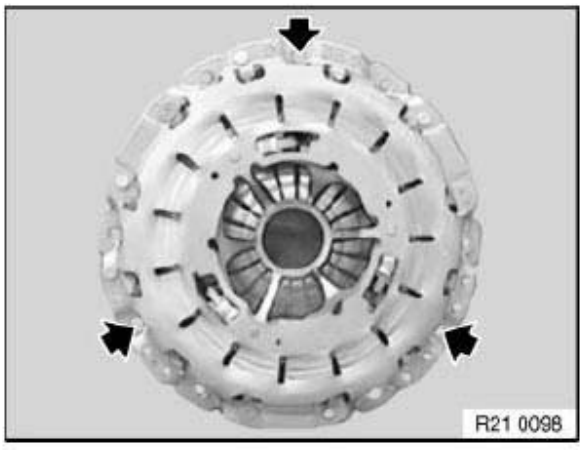


Fig. 10: Identifying Bores For Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 21 2 170 Device and tighten down at knurled screw (1).

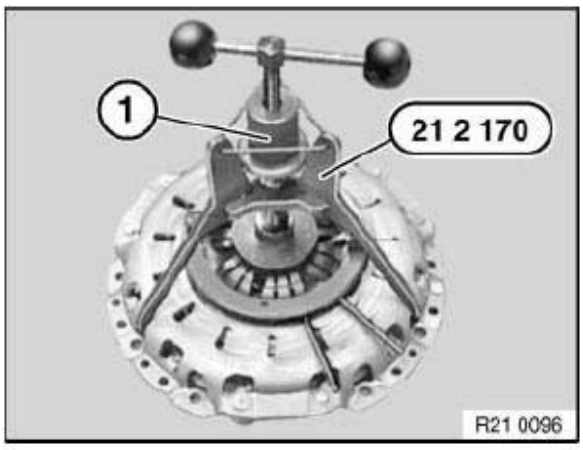


Fig. 11: Identifying Special Tool (21 2 170)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in spindle (1) until diaphragm spring (2) is tensioned up to stop.

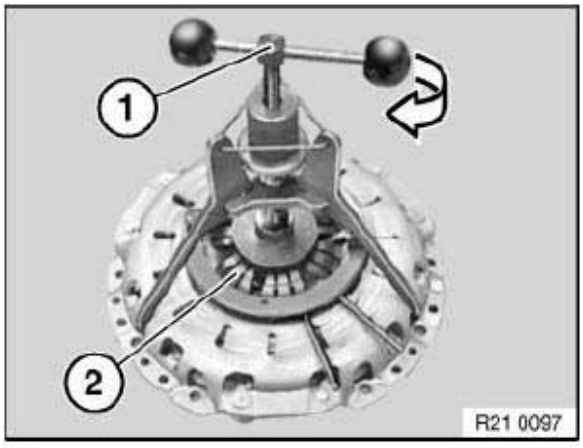


Fig. 12: Turning Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Handle clutch disk carefully, do not touch surfaces of friction pads.
Install clutch plate in correct position.
Note designation for "engine side"/"transmission side".

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

Centre clutch plate (1) with special tool.

Special tool

Transmission

21 2 141

S6S 420G; S6S 560G; S5D 390Z

21 2 142

S5D 200G; S5D 250G; S5D 260Z; S5D 310Z

21 2 201

GS6-37BZ

21 2 230 Mandrel

GS6-53DZ

21 2 250 Mandrel

GS6-17BG

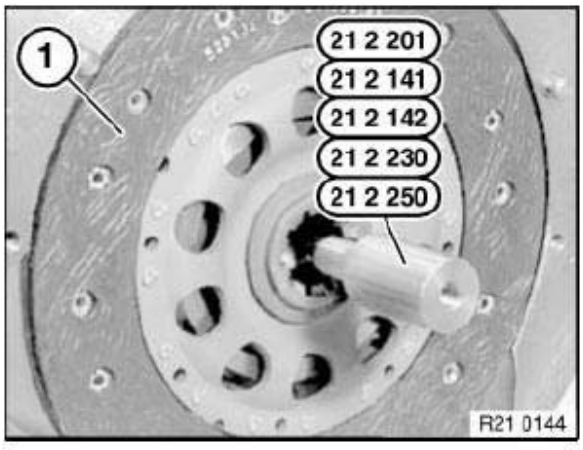


Fig. 13: Identifying Clutch Plate And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Fit SAC clutch (1) on flywheel.

Pay attention to dowel pins (2).

SAC clutch (1) must be secured by way of dowel pins (2).

Insert screws and tighten down.

Tightening torque: **21 21 1AZ** .

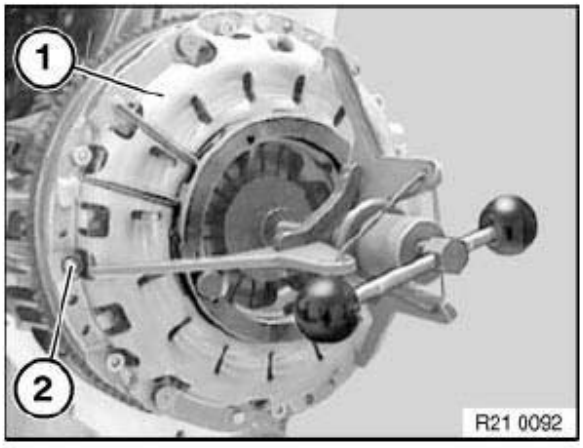


Fig. 14: Identifying SAC Clutch And Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Release spindle (1) until tension is completely removed from diaphragm spring (2).

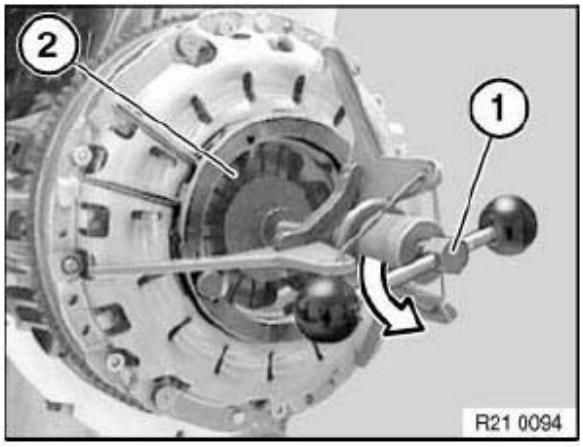


Fig. 15: Identifying Spindle And Diaphragm Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Release knurled screw (1) and remove special tool 21 2 170 Device from SAC clutch.

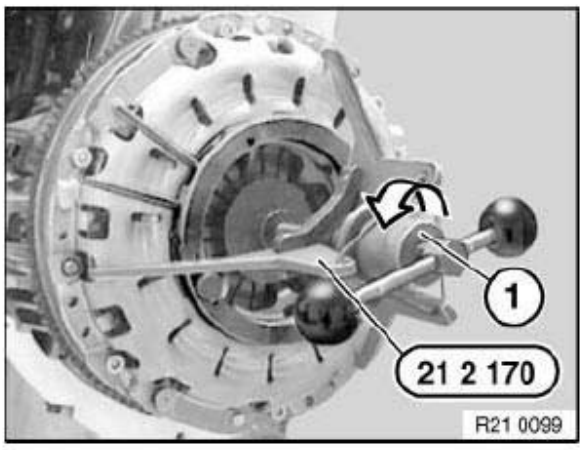


Fig. 16: Removing SAC Clutch Using Special Tools (21 2 170)
Courtesy of BMW OF NORTH AMERICA, INC.

Release knurled screws (2) and remove special tool **21 2 180** from SAC clutch.

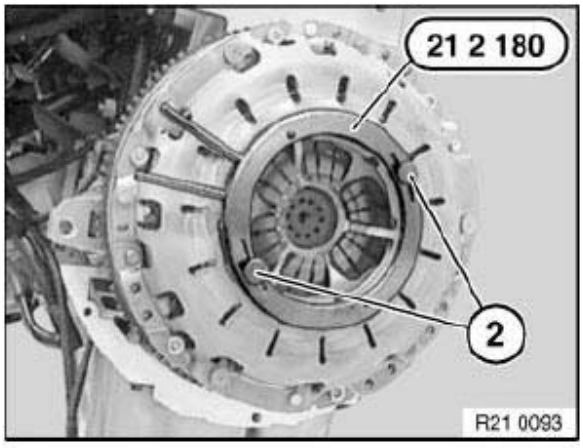


Fig. 17: Removing SAC Clutch Using Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

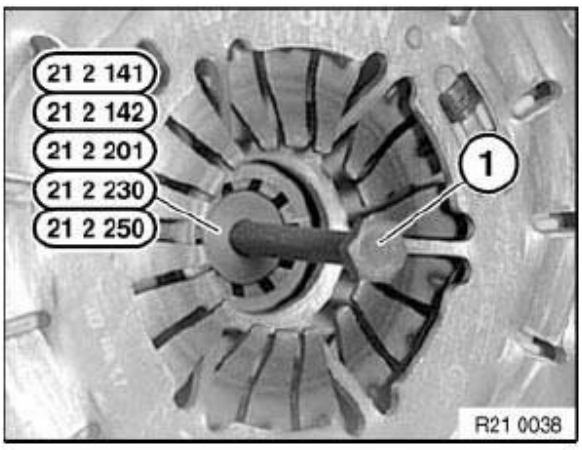


Fig. 18: Identifying Special Tools And Clutch Plate Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installing removed SAC clutch with new clutch plate

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

IMPORTANT: Before installing an SAC clutch which has been in service with a new clutch plate: always reset adjustment ring in new position.

Set SAC clutch down on a clean surface.

Install special tool **21 2 180** in SAC clutch (1).

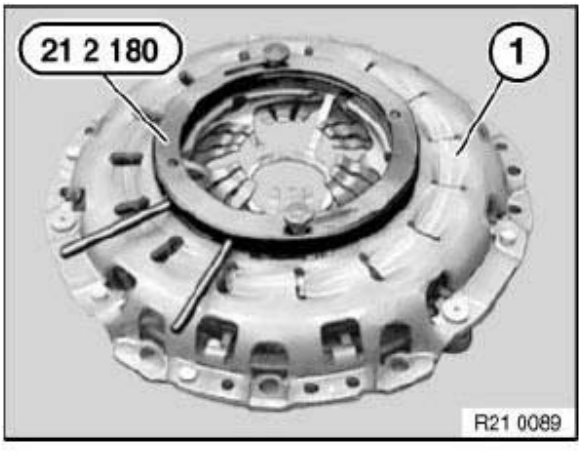


Fig. 19: Identifying SAC Clutch And Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Locking hooks (1) of special tool 21 2 180 must engage in openings in SAC clutch.

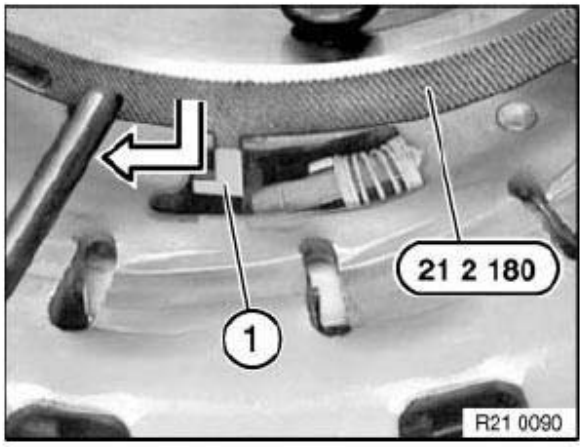


Fig. 20: Locking Hooks Using Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Insert special tool 21 2 170 Device only in area of bores for dowel pins.

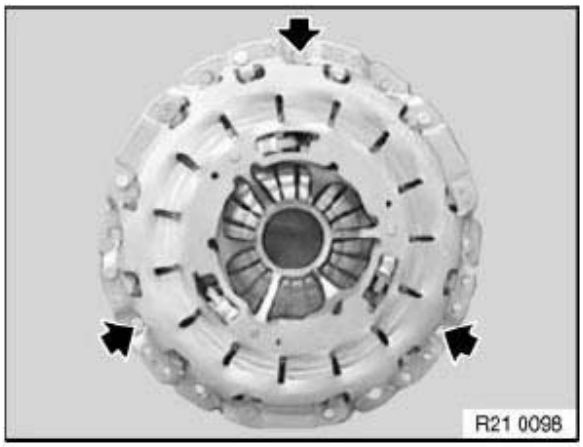


Fig. 21: Identifying Bores For Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 21 2 170 Device and tighten down at knurled screw (1).

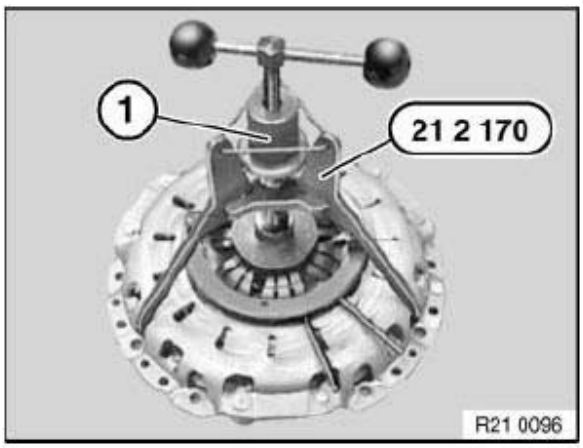


Fig. 22: Identifying Special Tool (21 2 170)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in spindle (1) until adjustment ring of SAC clutch (2) can be turned with special tool **21 2 180** at handles (3).

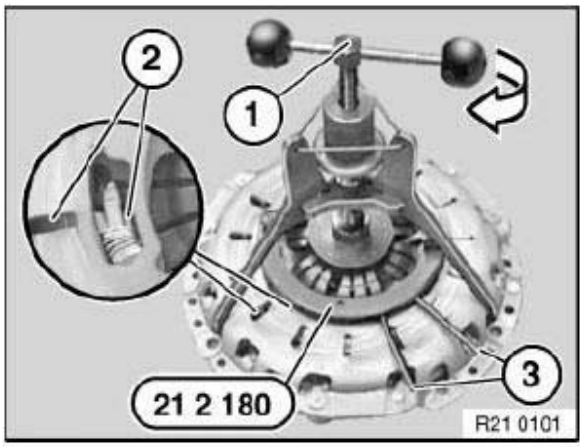


Fig. 23: Turning Handles Using Special Tools (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Press special tool **21 2 180** together at handles (3) as far as it will go and grip firmly.

At same time tighten down knurled screws (2).

Adjustment ring of SAC clutch is now secured in new position.

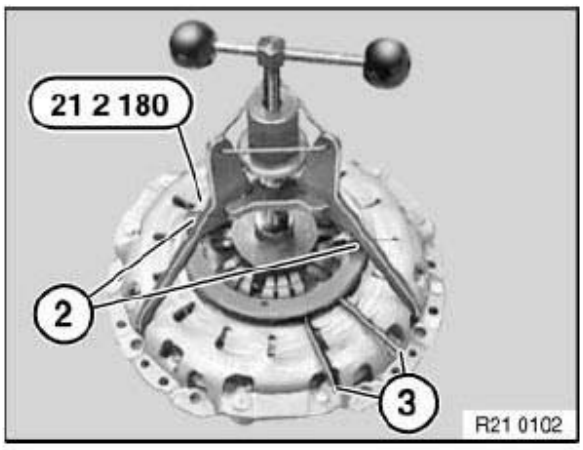


Fig. 24: Pressing Handles Using Special Tools (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in spindle (1) until diaphragm spring (2) is tensioned up to stop.

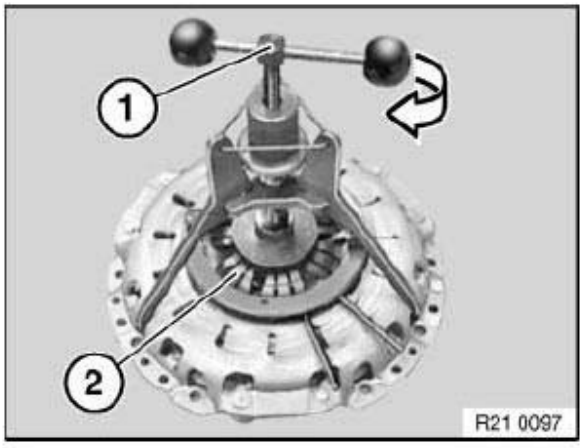


Fig. 25: Turning Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Handle clutch plate with care, do not touch surfaces of friction linings.
Install clutch plate in correct position.
Pay attention to text "engine end"/"transmission side".

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

Centre clutch plate (1) with special tool.

Special tool

Transmission

21 2 141

S6S 420G; S6S 560G; S5D 390Z

21 2 142

S5D 200G; S5D 250G; S5D 260Z; S5D 310Z

21 2 201

GS6-37BZ

21 2 230 mandrel

GS6-53DZ

21 2 250 mandrel

GS6-17BG

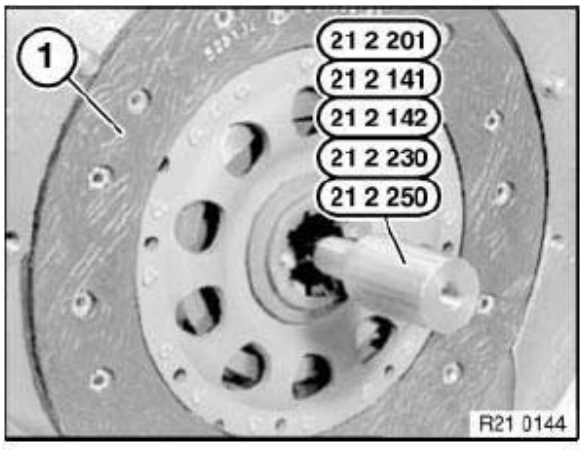


Fig. 26: Identifying Clutch Plate And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Fit SAC clutch (1) on flywheel.

Pay attention to dowel pins (2).

SAC clutch (1) must be secured by way of dowel pins (2).

Install retaining screws of SAC clutch and tighten down.

Tightening torque: **21 21 1AZ** .

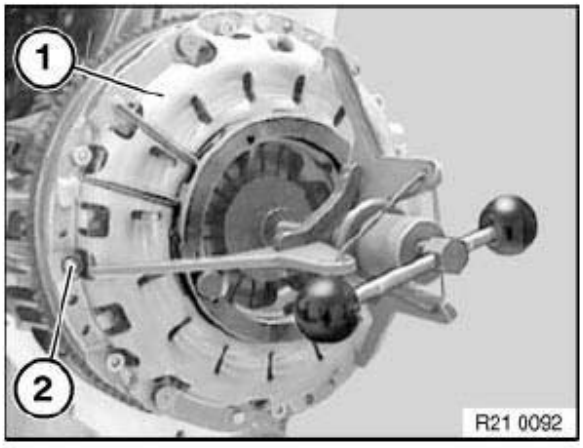


Fig. 27: Identifying SAC Clutch And Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Release spindle (1) until tension is completely removed from diaphragm spring (2).

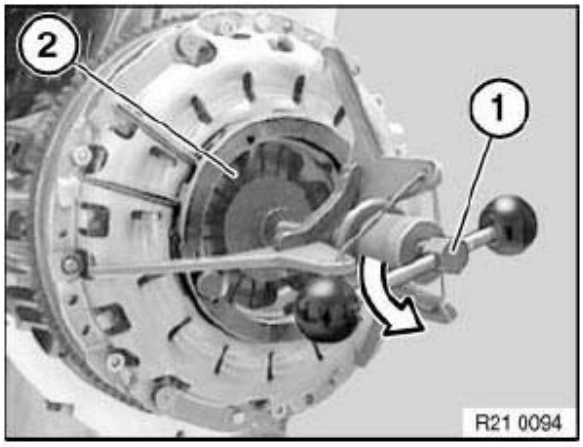


Fig. 28: Identifying Spindle And Diaphragm Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Release knurled screw (1) and remove special tool 21 2 170 Device from SAC clutch.

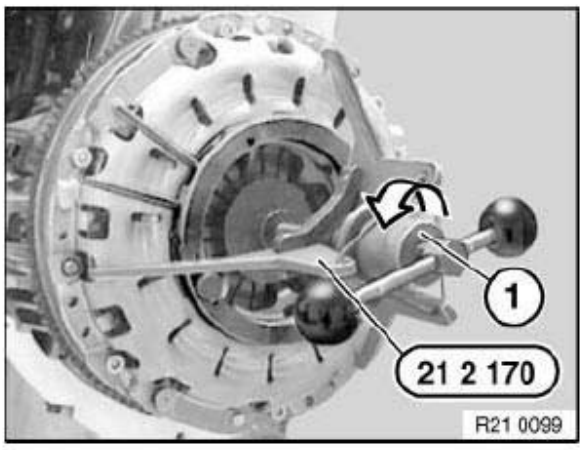


Fig. 29: Removing SAC Clutch Using Special Tools (21 2 170)
Courtesy of BMW OF NORTH AMERICA, INC.

Release knurled screws (2) and remove special tool **21 2 180** from SAC clutch.

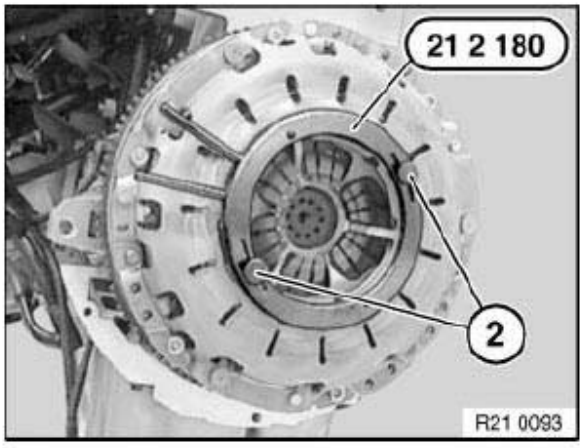


Fig. 30: Removing SAC Clutch Using Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

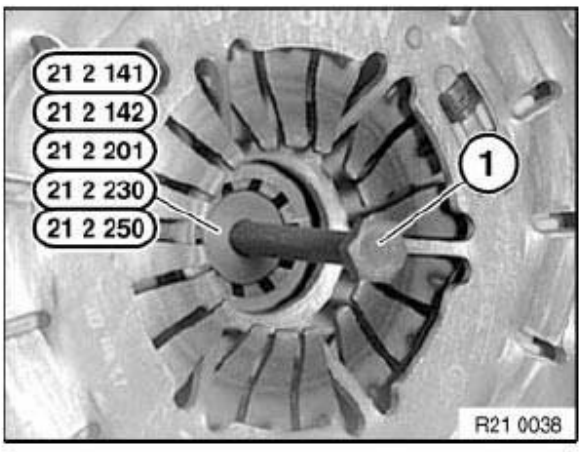


Fig. 31: Identifying Special Tools And Clutch Plate Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installing new SAC clutch

Installation:

N52

Screws must be replaced.

Jointing torque and angle of rotation must be observed without fail.

IMPORTANT: Handle clutch disk carefully, do not touch surfaces of friction pads. Install clutch plate (1) in correct position.

Note designation for "engine side"/"transmission side".

Centre clutch plate (1) with special tool.

Special tool

Transmission

21 2 141

S6S 420G; S6S 560G; S5D 390Z

21 2 142

S5D 200G; S5D 250G; S5D 260Z; S5D 310Z

21 2 201

GS6-37BZ

21 2 230 mandrel

GS6-53DZ

21 2 250 mandrel

GS6-17BG

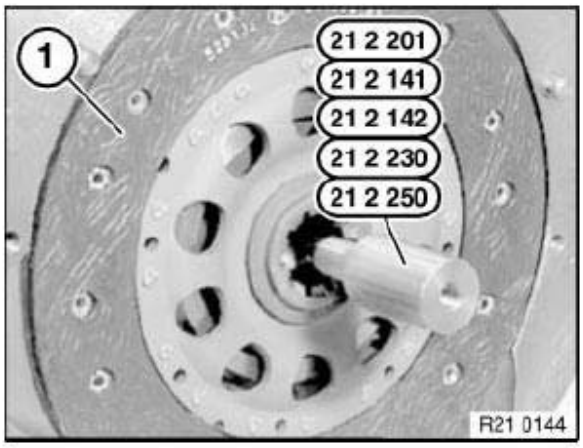


Fig. 32: Identifying Clutch Plate And Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

Push SAC clutch onto dowel pins (1) located in flywheel and screw down.

Tightening torque: **21 21 1AZ** .

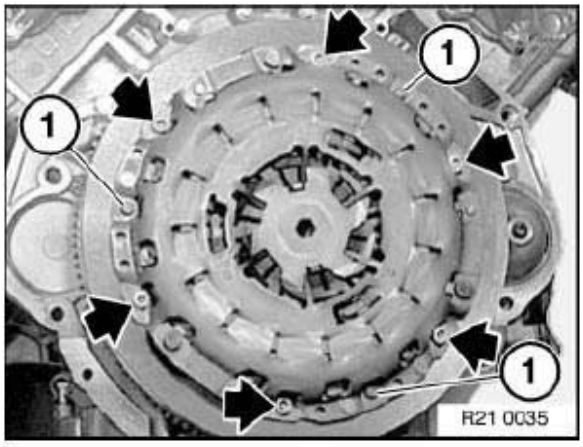


Fig. 33: Identifying Clutch And Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Locking piece (1) may only be removed with SAC screw-mounted clutch!

Carefully unscrew locking piece (1) clockwise or counterclockwise with a hexagon socket wrench 14 A/F (2).

NOTE: A slight snapping of the plate spring while unscrewing is possible.

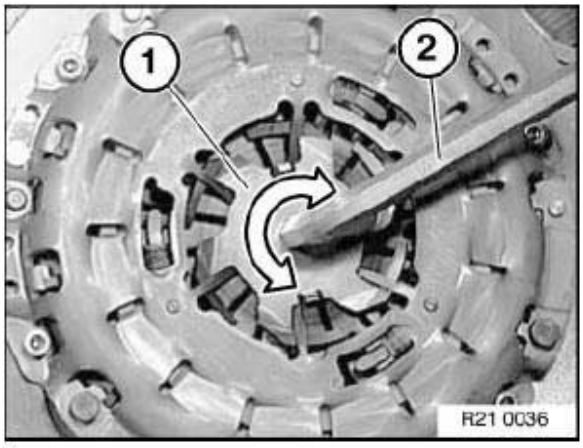


Fig. 34: Removing Clutch Plate Screw Using Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

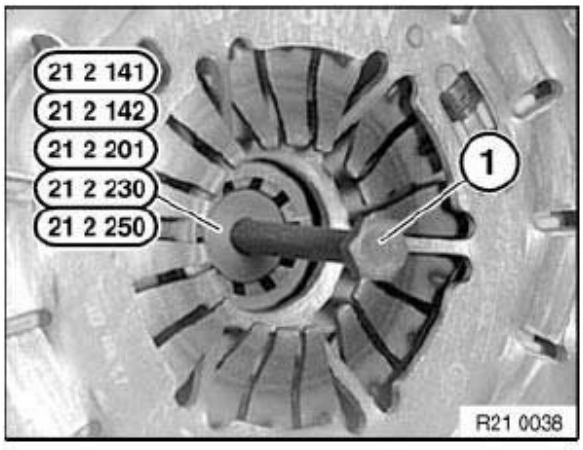


Fig. 35: Identifying Special Tools And Clutch Plate Screw
Courtesy of BMW OF NORTH AMERICA, INC.

2151 CLUTCH RELEASE CONTROLLER WITH LEVER

21 51 500 REMOVING AND INSTALLING OR REPLACING CLUTCH RELEASE BEARING/LEVER

NOTE: (transmission removed)

New version (except M models)

Release bearing and release lever have been combined to form a single release module.

Do not disassemble the release module. Otherwise there is a risk of the release module being **incorrectly** reassembled.

Installation:

Make sure that the correct cam (1) of the release bearing is on the sliding surface (2) of the release lever.

NOTE: Do not grease sliding surfaces (2).

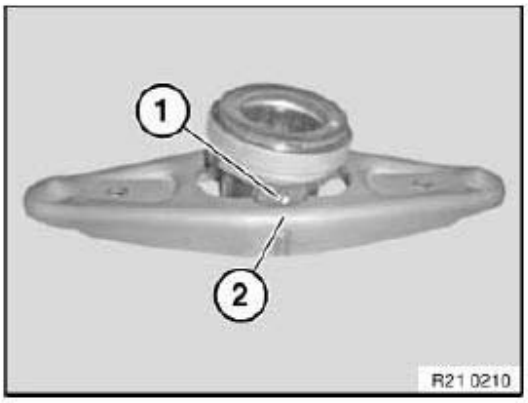


Fig. 36: Identifying Release Bearing And Lever Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Fig. 37: Cam (1) of release bearing (A=12 mm) is on sliding surface of release lever.

Version: 4-cylinder petrol/gasoline engines.

Fig. 37: Cam (1) of release bearing (A=7 mm) is on sliding surface of release lever.

Version: 6-cylinder petrol/gasoline engines and diesel engines.

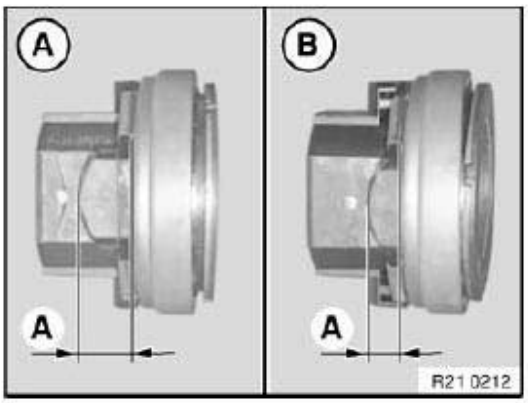


Fig. 37: Identifying Release Bearing And Lever Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Remove release module (1) from spring wire clip.

Remove release module.

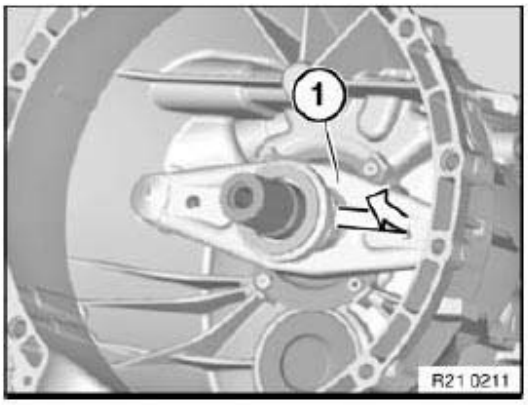


Fig. 38: Removing Release Module From Spring Wire Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw release lever (4) from spring wire clip (5) and remove.

Installation:

Clean release lever.

NOTE: Illustration similar.

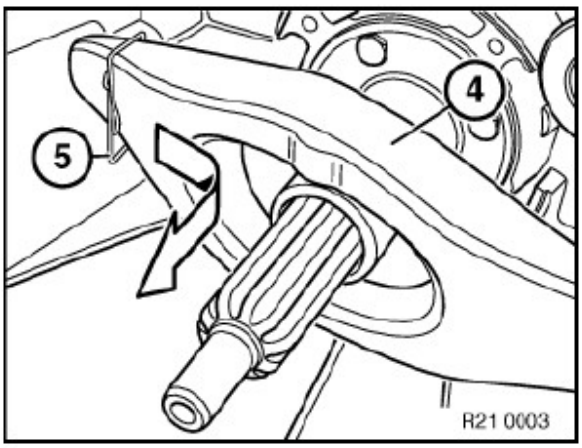


Fig. 39: Removing Release Lever From Spring Wire Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check spring wire clip (5) and ball pin (6) for damage and replace if necessary.

Apply a thin coating of grease to ball pin (6).

Grease, refer to **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

Illustration similar.

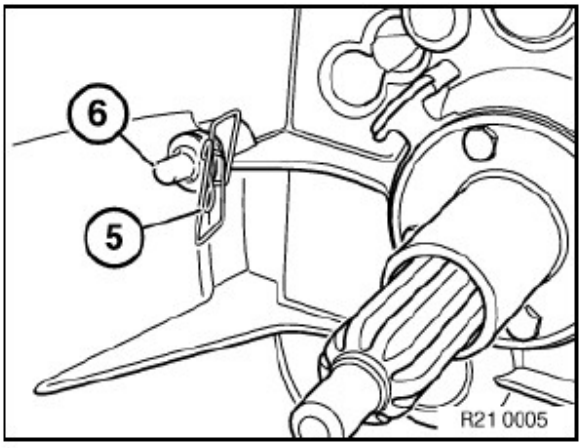


Fig. 40: Identifying Spring Wire Clip And Ball Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Clean guide sleeve (7).

Installation:

Do **not** grease guide sleeve.

If guide sleeve is greased, the release lever can stick on the guide sleeve.

NOTE: Illustration similar.

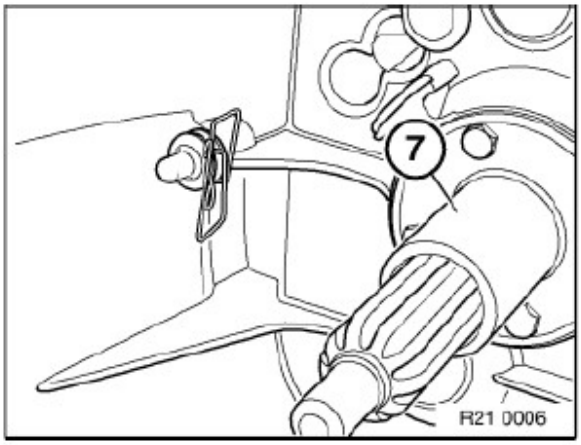


Fig. 41: Identifying Guide Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

2152 CLUTCH OPERATION (HYDRAULIC)

21 52 500 REMOVING AND INSTALLING/REPLACING CLUTCH MASTER CYLINDER

NOTE: After completing work, bleed CLUTCH HYDRAULIC SYSTEM .

Necessary preliminary tasks:

- Remove **TRIM PANEL** for pedal assembly.
- Remove **FOOTWELL MODULE** .

Draw off brake fluid up to supply hose of clutch hydraulic system (1). For this purpose, use only a vacuum pipe that is exclusively used for removing brake fluid.

Detach supply hose (1) from expansion tank.

NOTE: Illustration similar.

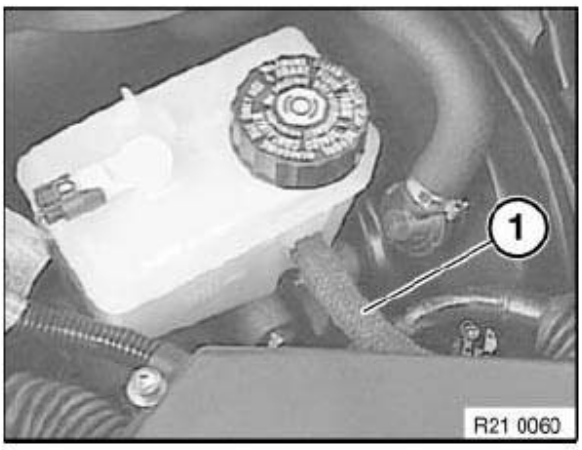


Fig. 42: Identifying Supply Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on cylinder (2).

Tightening torque: **21 52 4AZ**

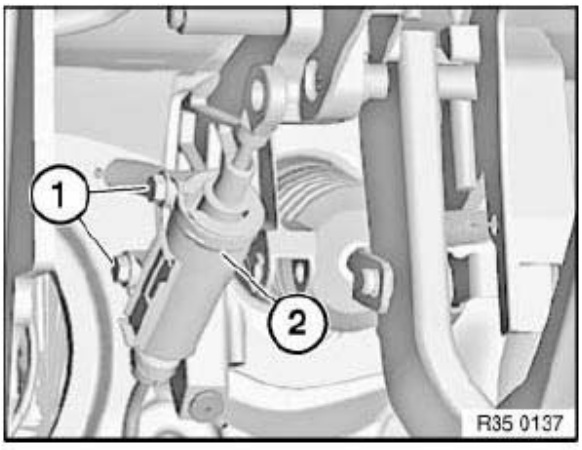


Fig. 43: Identifying Clutch Master Cylinder And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Two versions of clutch pedal.

Version 1 - plastic clutch pedal

Disconnect return spring (1).

Detach locking clip (3) and pull clutch pedal with clutch master cylinder off bearing block.

Press pin ends (2) together and remove pin.

Version 2 - metal clutch pedal

Detach retaining clip and remove clutch master cylinder from pedal

Installation:

Replace locking clip.

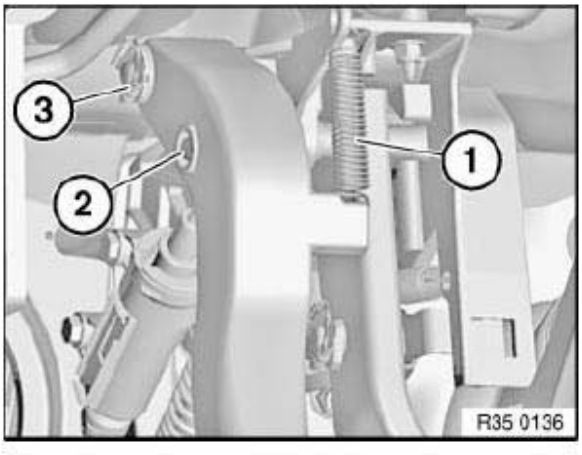


Fig. 44: Identifying Return Spring, Pin And Locking Clips
Courtesy of BMW OF NORTH AMERICA, INC.

The locking clip must be seated with both legs in the pin groove.

Detach retainer (1) with a screwdriver (2).

NOTE: Do not foul carpet with brake fluid.

Detach hydraulic line from clutch master cylinder.

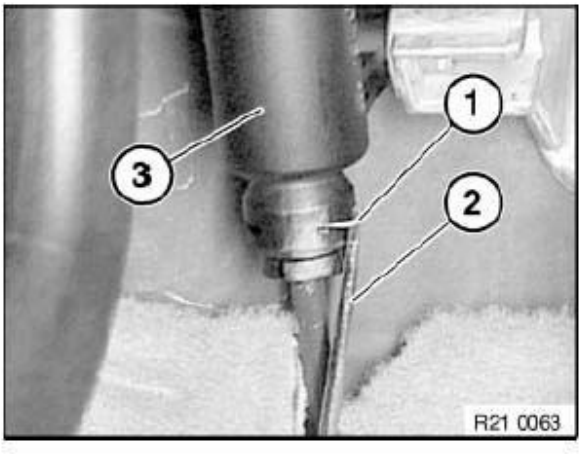


Fig. 45: Identifying Hydraulic Line Retainer

Courtesy of BMW OF NORTH AMERICA, INC.

Detach supply hose (1) from clutch master cylinder.

IMPORTANT: Do not pull supply hose completely into interior.

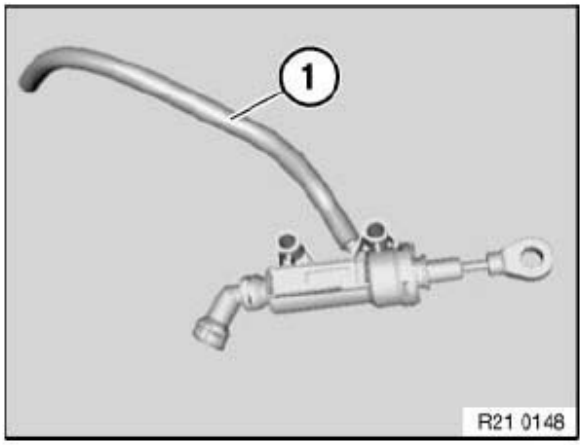


Fig. 46: Identifying Clutch Master Cylinder Supply Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out shift element (1) from clutch master cylinder (2) with screwdriver.

Release plug connection (3) and disconnect plug (4) from shift element (1).

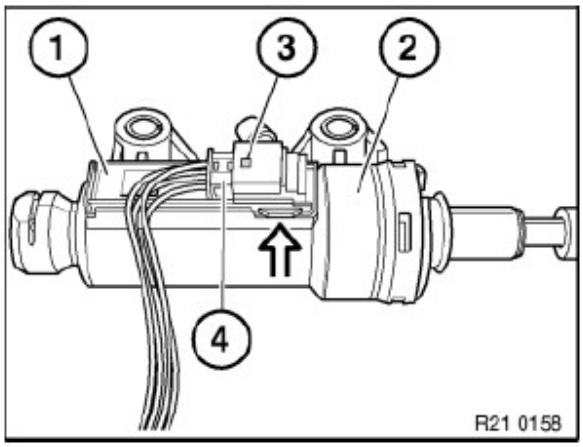


Fig. 47: Disconnecting Plug From Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Shift element is secured against incorrect installation.

Shift element must snap audibly into place.

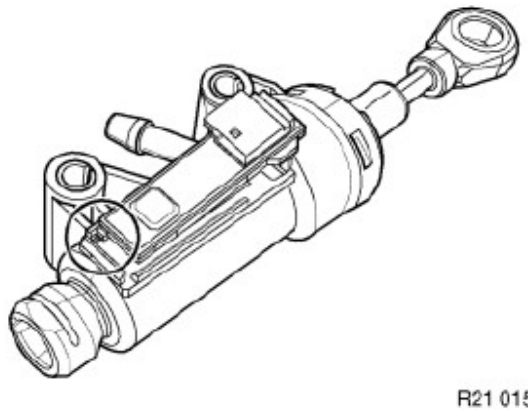


Fig. 48: Identifying Clutch Switch Module
Courtesy of BMW OF NORTH AMERICA, INC.

21 52 510 REMOVING AND INSTALLING/REPLACING CLUTCH SLAVE CYLINDER (PLASTIC)

NOTE: After completing work bleed CLUTCH HYDRAULIC SYSTEM .

Seal hydraulic line to clutch slave cylinder with special tool 13 3 010 hose clip.

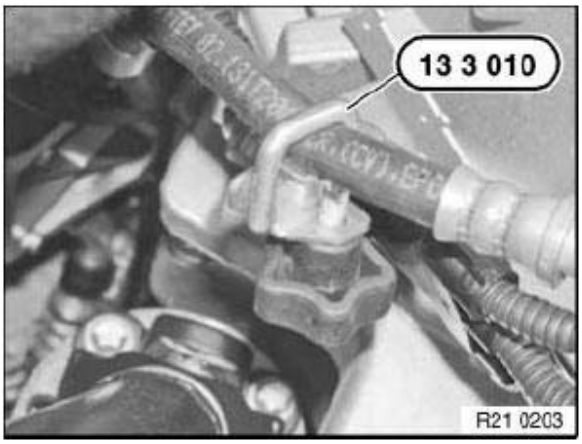


Fig. 49: Sealing Hydraulic Line To Clutch Slave Cylinder Using Special Tools (13 3 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove clutch slave cylinder (1) with holder (2).

Installation:

Replace self-locking nuts.

Tightening torque **21 52 5AZ** .

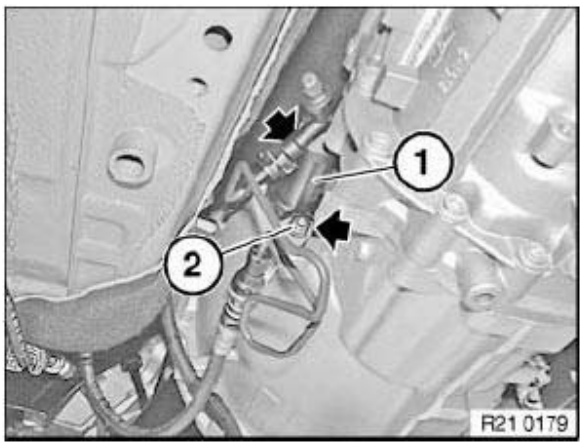


Fig. 50: Identifying Clutch Slave Cylinder Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock spring retainer (1).

Disconnect hydraulic line (2).

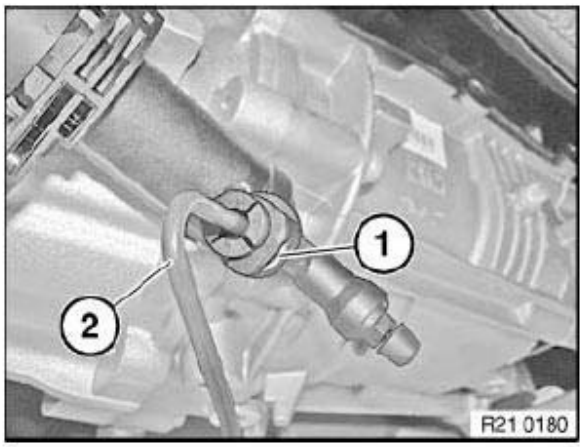


Fig. 51: Identifying Hydraulic Line And Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Press cylinder together by hand.

Connect hydraulic line with cylinder pressed.

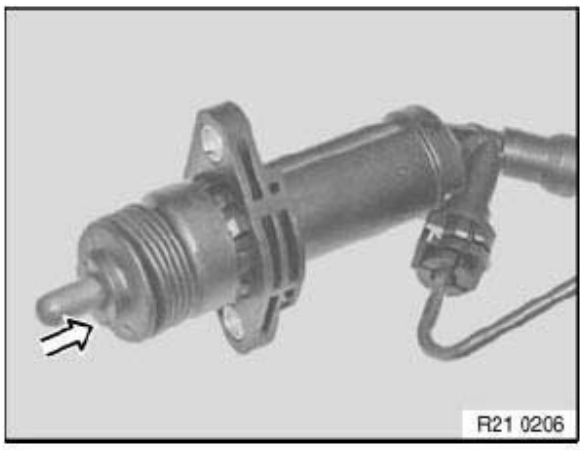


Fig. 52: Pressing Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 13 3 010 hose clip .

Hold cylinder piston vertically downwards.

Press piston 5 times into cylinder.

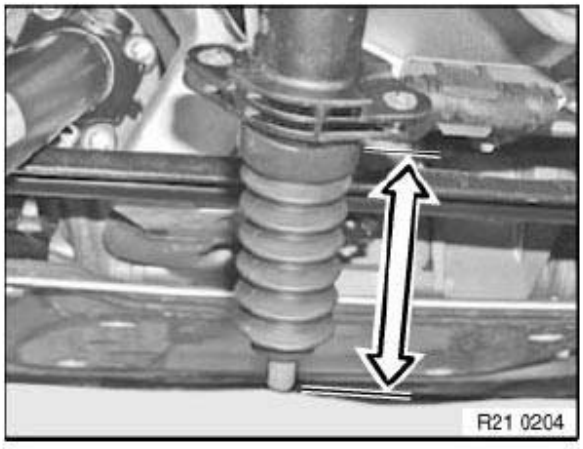


Fig. 53: Holding Cylinder Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Press in piston until it engages.

Install clutch slave cylinder.

Bleed **CLUTCH HYDRAULICS** .

Installation:

Clean thrust member (1) and contact face on release lever.

Lightly grease thrust member (1) on contact face (2). See **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

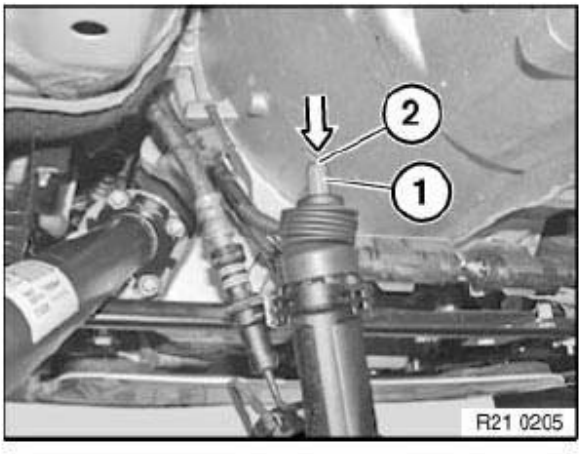


Fig. 54: Pressing Piston
Courtesy of BMW OF NORTH AMERICA, INC.

2100 MAINTENANCE AND INSPECTION

21 00 006 BLEEDING CLUTCH HYDRAULICS (PLASTIC SLAVE CYLINDER)

Necessary preliminary tasks

- Remove **REAR UNDERBODY PROTECTION**

Connect bleeder unit to brake fluid expansion tank.

IMPORTANT: Check relevant Operating Instructions for each device.

Charging pressure should not exceed 2 bar.

Connect bleeder hose to bleed valve (1).

Open bleed valve (1) and flush until clear brake fluid emerges without air bubbles.

Close bleed valve.

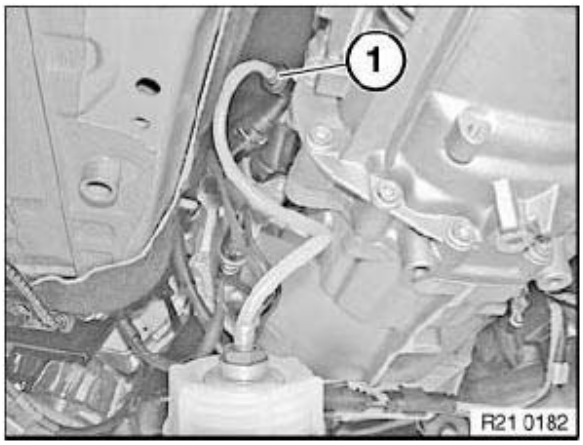


Fig. 1: Identifying Bleed Valve
Courtesy of BMW OF NORTH AMERICA, INC.

Switch off bleeder unit or remove from brake fluid expansion tank.

Correct brake fluid level in expansion tank.

2121 CLUTCH WITH DRIVING DISC

21 21 500 REMOVING AND INSTALLING/REPLACING CLUTCH (SAC 240)

Necessary preliminary tasks

- move **TRANSMISSION** .

N54

Block flywheel with special tools **11 9 260** and 11 9 265.

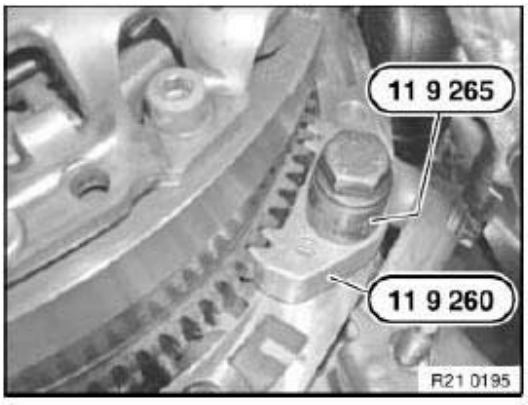


Fig. 2: Blocked Flywheel With Special Tool (11 9 260) And (11 9 265)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws and remove clutch from flywheel.

Installation:

Clean flywheel and check for wear and damage.

Replace damaged flywheel.

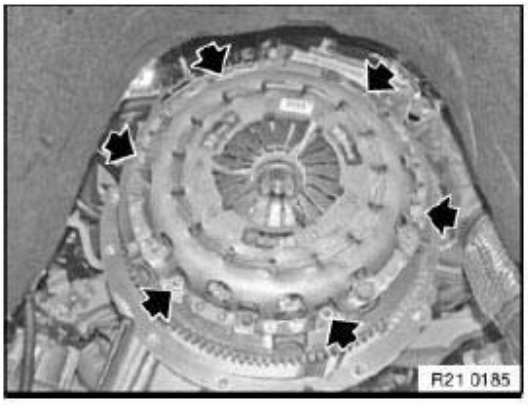


Fig. 3: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Always replace clutch plates fouled e.g. by oil, cleaning agent.

Observe the following procedure when installing the removed clutch and clutch plate.

Insert special tool **21 2 180** in clutch.

Press special tool **21 2 180** together at handles (1) as far as it will go and tighten down knurled screws (2).

Adjustment ring of clutch is now secured in its original position (wear position).

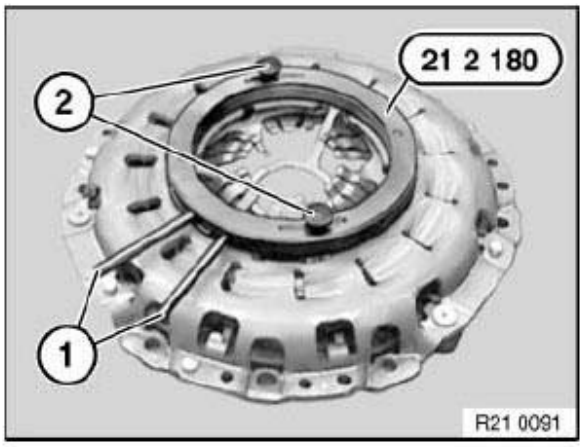


Fig. 4: Pressing Handles Using Special Tools (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Locking hooks (1) of special tool 21 2 180 must engage in openings of pressure spring.

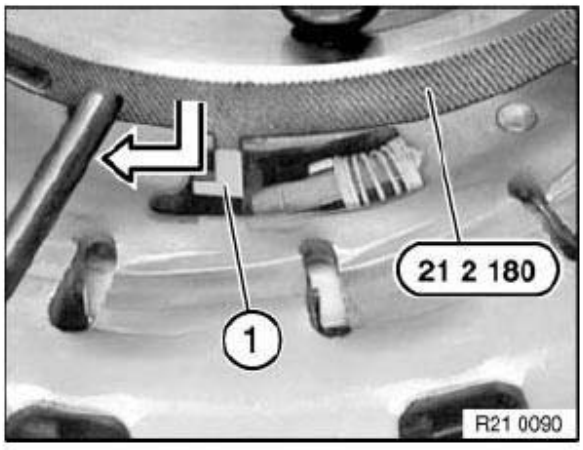


Fig. 5: Locking Hooks Using Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool **21 2 170** and tighten down at knurled screw (1).

Screw in spindle (2) until diaphragm spring (3) is tensioned on stop.

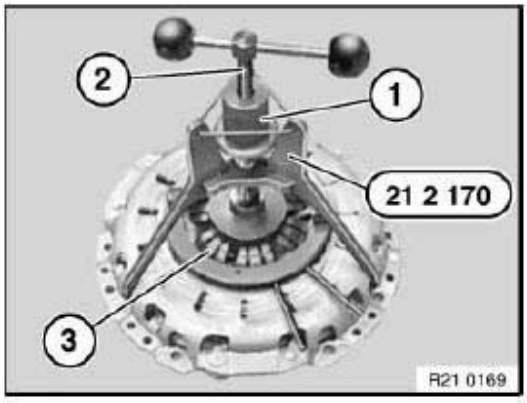


Fig. 6: Fitting Special Tool (21 2 170) Onto Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Insert special tool 21 2 170 only in area of bores for dowel pins.

Centre clutch plate (1) with special tool **21 2 270** .

IMPORTANT: Install clutch plate in correct position. Note designation for "engine side"/"transmission side".

Handle clutch plate with care. Do not touch surfaces of friction linings.

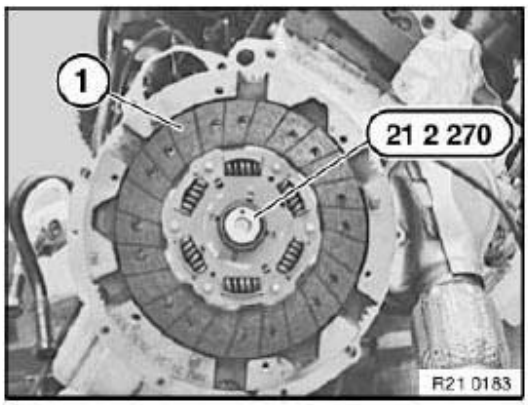


Fig. 7: Identifying Centre Clutch Plate With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch (1) to flywheel.

Tightening torque **21 21 1AZ** .

NOTE: Clutch (1) must be secured by way of dowel pins (2).

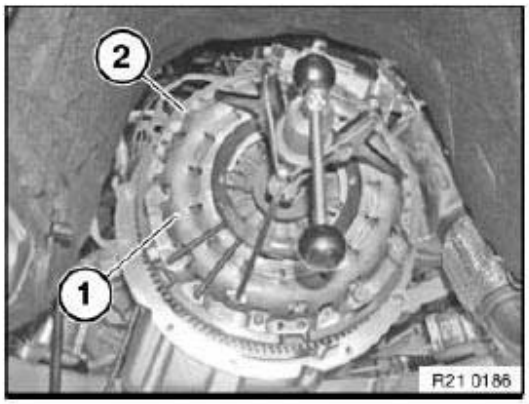


Fig. 8: Identifying Clutch And Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Release spindle (1) until load is fully removed from diaphragm spring (2) Remove special tools **21 2 170** and **21 2 180** .

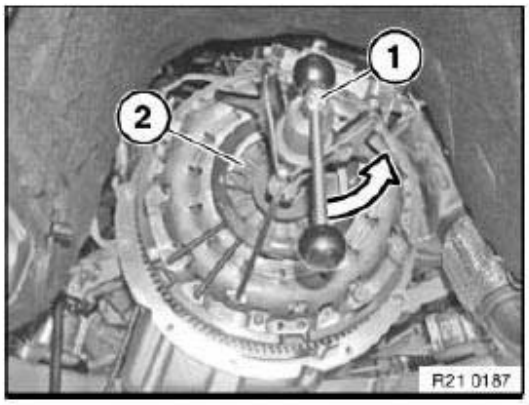


Fig. 9: Removing Spindle From Diaphragm Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

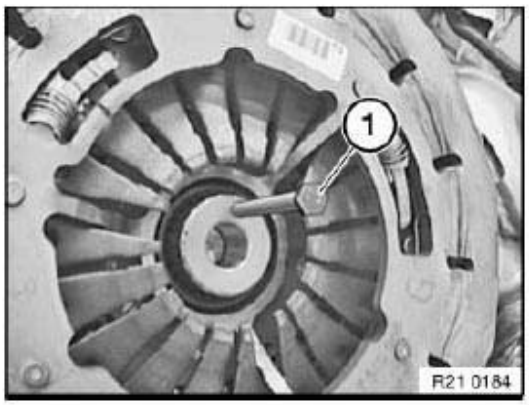


Fig. 10: Identifying Special Tool From Clutch Plate
Courtesy of BMW OF NORTH AMERICA, INC.

Installing removed clutch with new clutch plate

IMPORTANT: Before installing a used clutch with a new clutch plate, always reset adjustment ring in new position.

Set clutch down on a clean surface.

Insert special tool **21 2 180** in clutch (1).

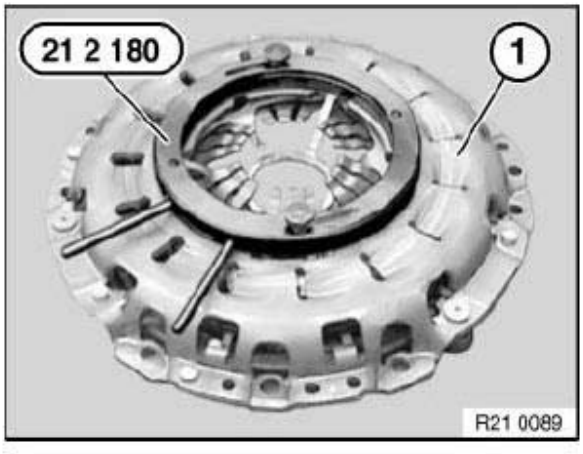


Fig. 11: Identifying SAC Clutch And Special Tool (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Locking hooks (1) of special tool 21 2 180 must engage in openings in clutch.

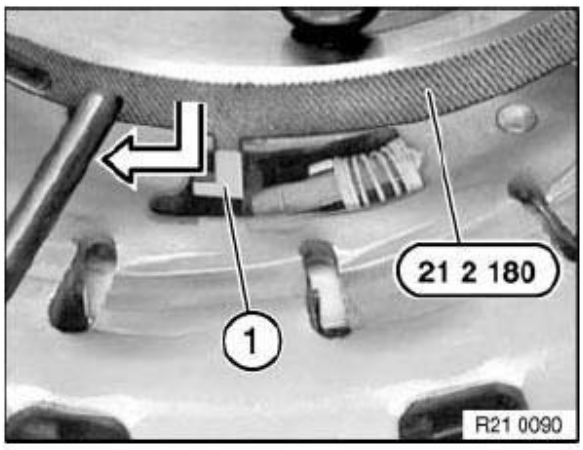


Fig. 12: Locking Special Tool (21 2 180) Hooks
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool **21 2 170** and tighten down at knurled screw (1).

NOTE: Insert special tool 21 2 170 only in area of bores for dowel pins.

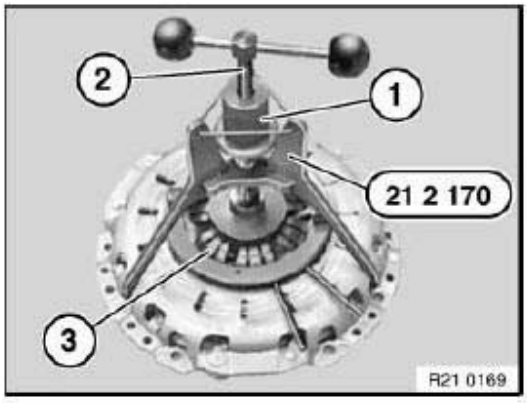


Fig. 13: Fitting Special Tool (21 2 170) Onto Knurled Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in spindle (1) until adjustment ring of clutch (2) can be turned with special tool **21 2 180** at handles (3).

Press special tool **21 2 180** together at handles (3) as far as it will go and grip firmly.

At same time tighten down knurled screws (2).

Adjustment ring of clutch is now secured in new position.

Screw in spindle (1) until diaphragm spring is tensioned on stop.

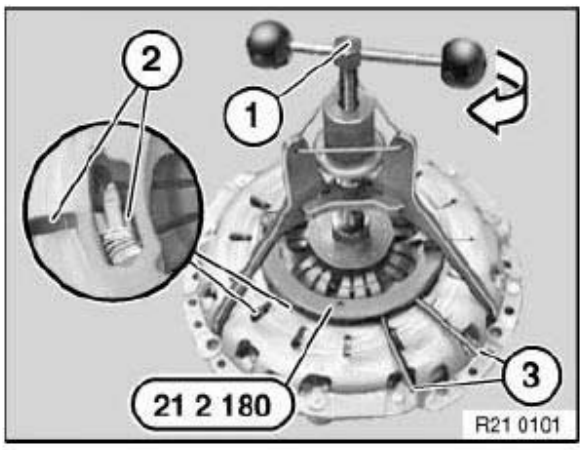


Fig. 14: Turning Handles Using Special Tools (21 2 180)
Courtesy of BMW OF NORTH AMERICA, INC.

Centre clutch plate (1) with special tool **21 2 270** .

IMPORTANT: Install clutch plate in correct position.

Note designation for "engine side"/"transmission side".

Handle clutch plate with care. Do not touch surfaces of friction linings.

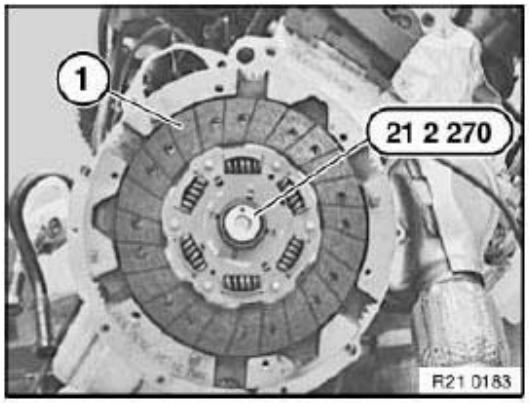


Fig. 15: Identifying Centre Clutch Plate With Special Tool (21 2 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch (1) to flywheel.

Tightening torque **21 21 1AZ** .

IMPORTANT: Clutch (1) must be secured by way of dowel pins (2).

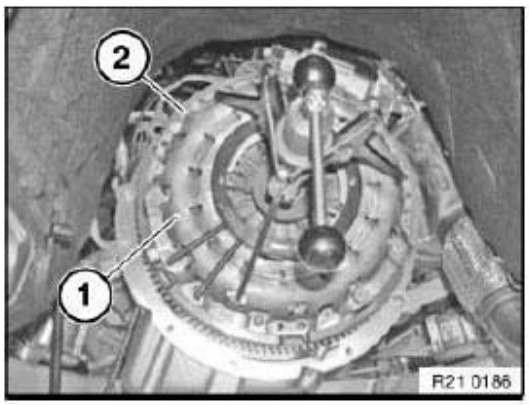


Fig. 16: Identifying Clutch And Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Release spindle (1) until load is fully removed from diaphragm spring (2)

Remove special tools **21 2 170** and **21 2 180** .

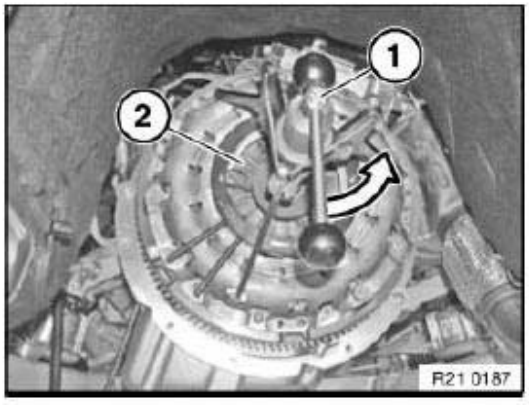


Fig. 17: Removing Spindle From Diaphragm Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

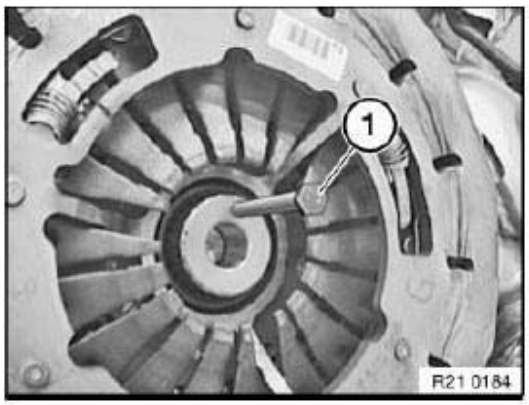


Fig. 18: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Installing new clutch

IMPORTANT: Locking piece may only be removed clutch is screwed down!

Centre clutch plate (1) with special tool **21 2 270** .

IMPORTANT: Install clutch plate in correct position.
Note designation for "engine side"/"transmission side".

Handle clutch plate with care. Do not touch surfaces of friction linings.

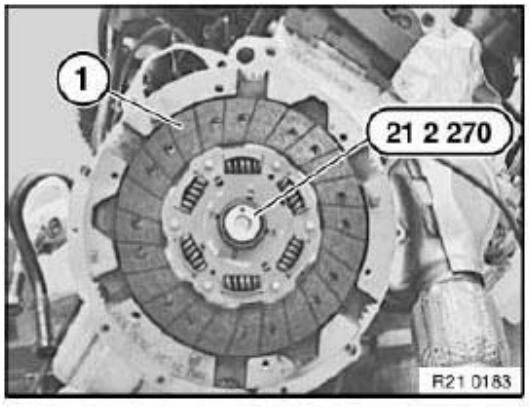


Fig. 19: Identifying Centre Clutch Plate With Special Tool (21 2 270)
Courtesy of BMW OF NORTH AMERICA, INC.

Fit clutch to flywheel.

Tightening torque **21 21 1AZ** .

IMPORTANT: Clutch must be secured by way of dowel pins (1).

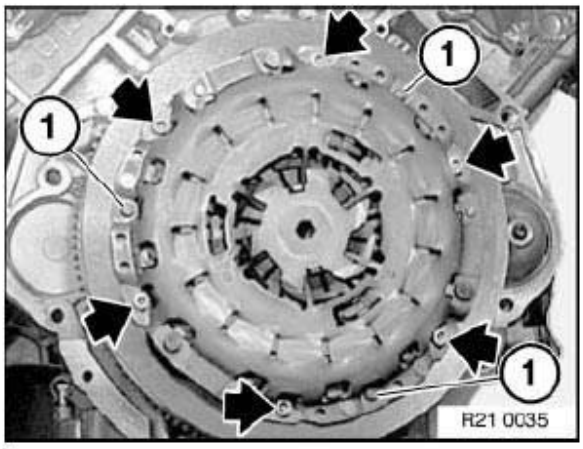


Fig. 20: Identifying Clutch And Dowel Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Carefully unscrew locking piece (1) clockwise or counterclockwise with a WAF 14 hexagon socket wrench (2).

NOTE: A slight snapping of the plate spring while unscrewing the lock is possible.

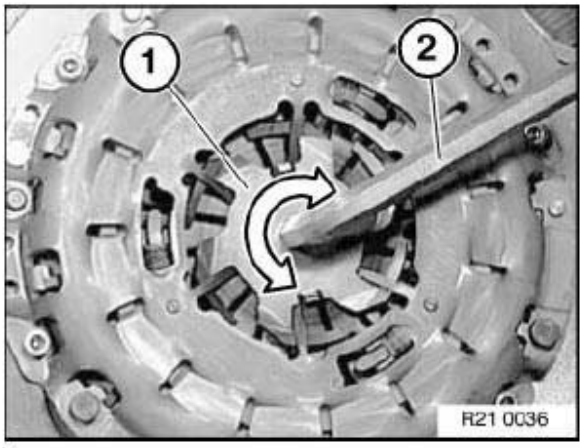


Fig. 21: Removing Locking Piece Using Hexagon Socket Wrench 14 A/F
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw special tool from clutch plate with aid of accompanying screw (1).

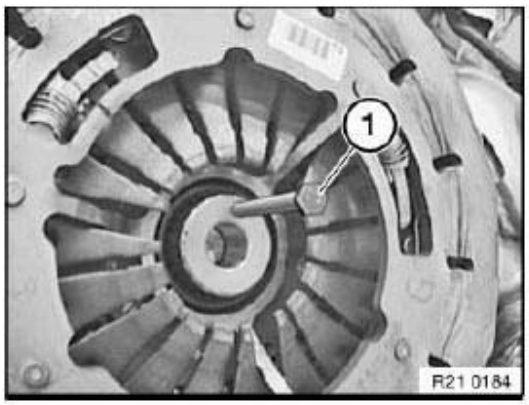


Fig. 22: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Necessary preliminary tasks

- **TRANSMISSION** removed.
- Remove **CLUTCH RELEASE BEARING**

Pressing out roller bearing

Install special tool 23 4 031 in front of drive shaft spline teeth.

Screw in grease spindle 23 4 033 completely.

Brass tip must immerse fully into roller bearing.

Press in grease with grease gun **23 4 040** until roller bearing is disengaged from drive shaft.

When tensioning spring is compressed to full extent, release grease spindle and twist out slightly until spring is relieved.

Repeat grease press-in procedure until roller bearing has released completely.

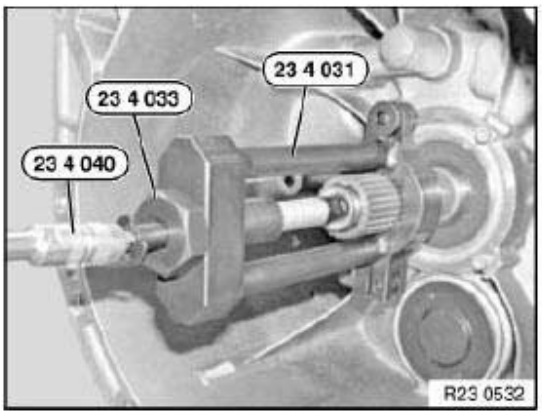


Fig. 23: Identifying Special Tools (23 4 033), (23 4 031) And (23 4 040)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 23 4 031.

Remove pressed-in grease (1) from drive shaft completely.

Then reinstall special tool.

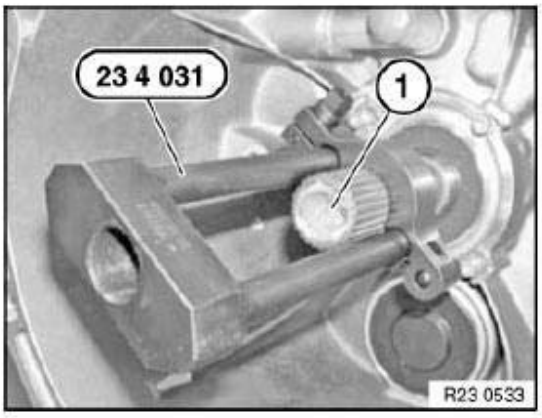


Fig. 24: Identifying Pressed-In Grease On Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Pressing in roller bearing

Slide in pressure spindle 23 4 035.

Attach thrust piece 23 4 036 to pressure spindle.

Push roller bearing (1) onto thrust piece.

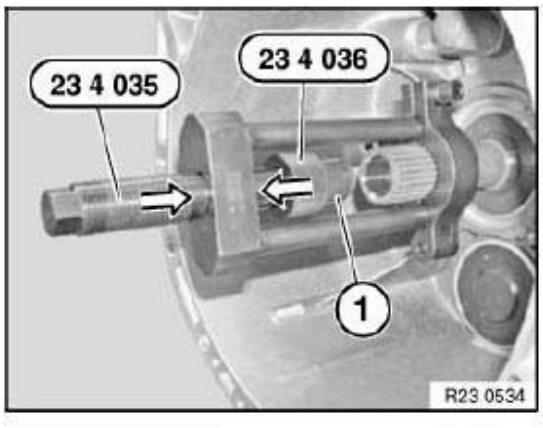


Fig. 25: Pushing Roller Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in pressure spindle (1) until roller bearing is fully pressed in.

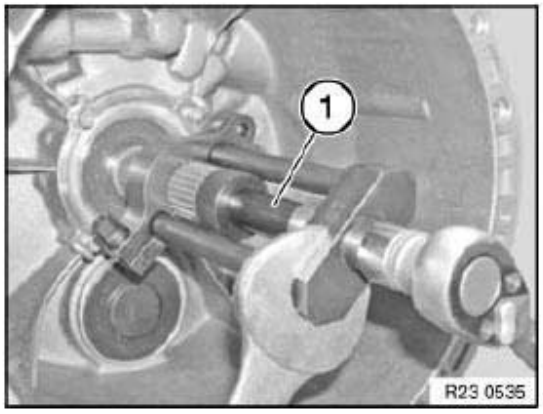


Fig. 26: Identifying Pressure Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

2151 CLUTCH RELEASE CONTROLLER WITH LEVER

21 51 500 REMOVING AND INSTALLING OR REPLACING CLUTCH RELEASE BEARING/LEVER

NOTE: (transmission removed)

New version (except M models)

Release bearing and release lever have been combined to form a single release module.

Do not disassemble the release module. Otherwise there is a risk of the release module being **incorrectly** reassembled.

Installation:

Make sure that the correct cam (1) of the release bearing is on the sliding surface (2) of the release lever.

NOTE: Do not grease sliding surfaces (2).

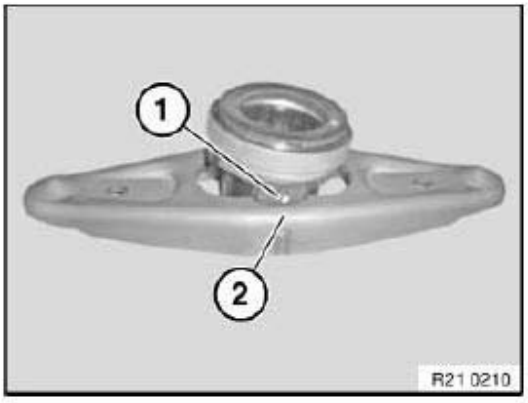


Fig. 27: Identifying Release Bearing And Lever Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Fig. 28: Cam (1) of release

bearing (A=12 mm) is on sliding surface of release lever.

Version: 4-cylinder petrol/gasoline engines.

Fig. 28: Cam (1) of release bearing (A=7 mm) is on sliding surface of release lever.

Version: 6-cylinder petrol/gasoline engines and diesel engines.

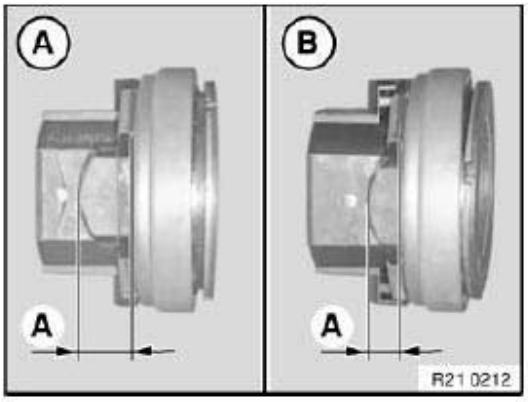


Fig. 28: Identifying Release Bearing And Lever Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Remove release module (1) from spring wire clip.

Remove release module.

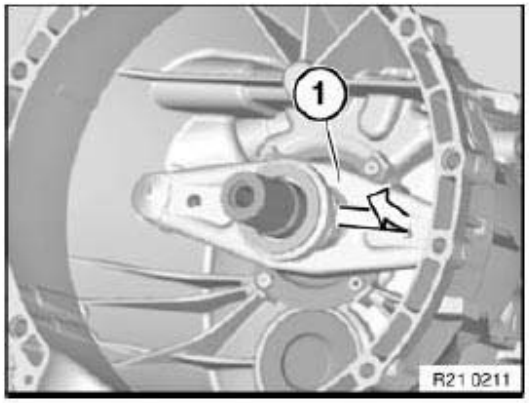


Fig. 29: Removing Release Module From Spring Wire Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw release lever (4) from spring wire clip (5) and remove.

Installation:

Clean release lever.

NOTE: Illustration similar.

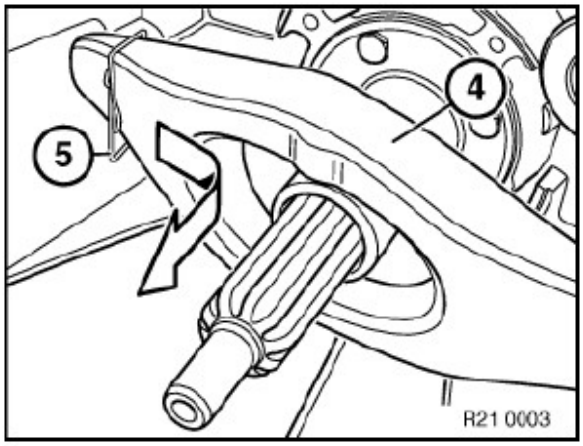


Fig. 30: Removing Release Lever From Spring Wire Clip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check spring wire clip (5) and ball pin (6) for damage and replace if necessary.

Apply a thin coating of grease to ball pin (6).

Grease, refer to **CLUTCH - OPERATING FLUIDS** .

Illustration similar.

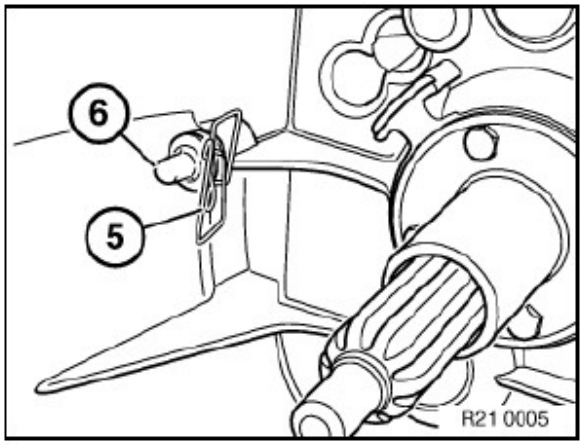


Fig. 31: Identifying Spring Wire Clip And Ball Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Clean guide sleeve (7).

Installation:

Do **not** grease guide sleeve.

If guide sleeve is greased, the release lever can stick on the guide sleeve.

NOTE: Illustration similar.

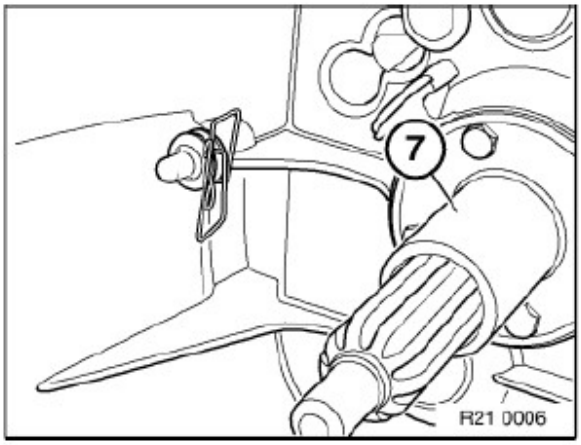


Fig. 32: Identifying Guide Sleeve

Courtesy of BMW OF NORTH AMERICA, INC.

2152 CLUTCH OPERATION (HYDRAULIC)

21 52 500 REMOVING AND INSTALLING/REPLACING CLUTCH MASTER CYLINDER

NOTE: After completing work, bleed CLUTCH HYDRAULIC SYSTEM .

Necessary preliminary tasks

- Remove **PANEL FOR PEDALS** for pedal assembly.
- Remove **FOOTWELL MODULE** .

Draw off brake fluid up to supply hose of clutch hydraulic system (1). For this purpose, use only a vacuum pipe that is exclusively used for removing brake fluid.

Detach supply hose (1) from expansion tank.

NOTE: Illustration similar.

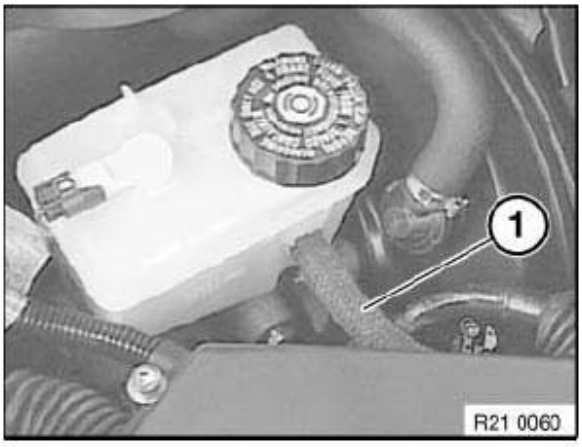


Fig. 33: Identifying Supply Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) on cylinder (2).

Tightening torque: **21 52 4AZ**

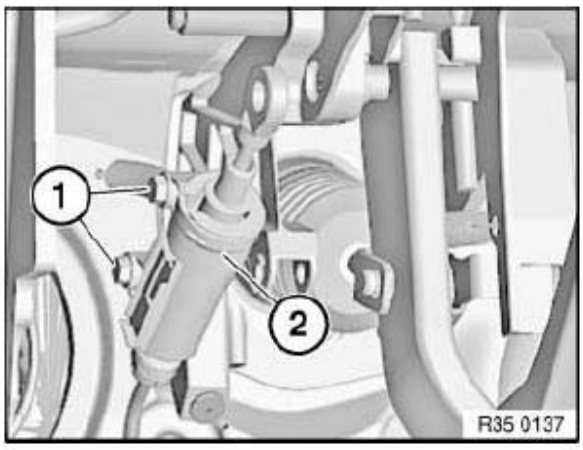


Fig. 34: Identifying Clutch Master Cylinder Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Two versions of clutch pedal.

Version 1 - plastic clutch pedal

Disconnect return spring (1).

Detach locking clip (3) and pull clutch pedal with clutch master cylinder off bearing block.

Press pin ends (2) together and remove pin.

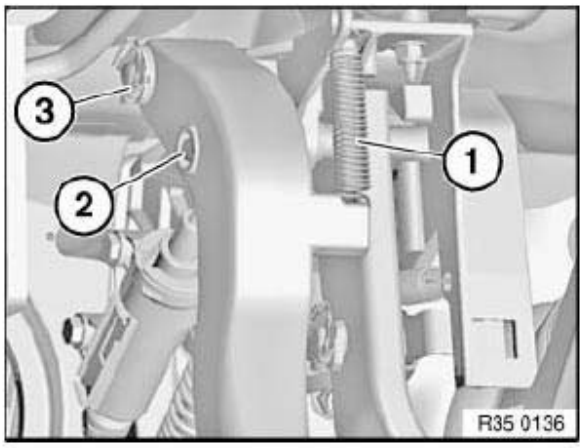


Fig. 35: Identifying Return Spring, Pin And Locking Clips
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2 - metal clutch pedal

Detach retaining clip and remove clutch master cylinder from pedal

Installation:

Replace locking clip.

The locking clip must be seated with both legs in the pin groove.

Detach retainer (1) with a screwdriver (2).

NOTE: Do not foul carpet with brake fluid.

Detach hydraulic line from clutch master cylinder.

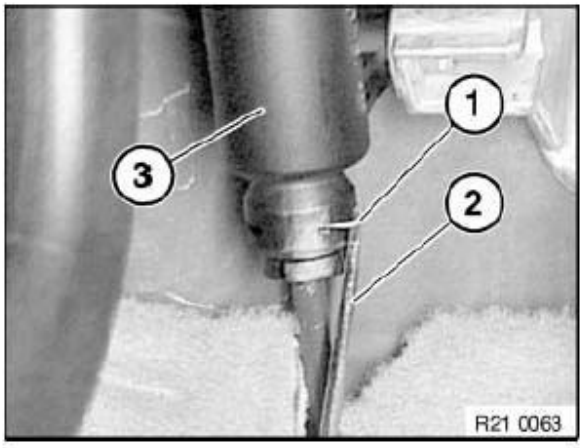


Fig. 36: Identifying Hydraulic Line Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Detach supply hose (1) from clutch master cylinder.

IMPORTANT: Do not pull supply hose completely into interior.

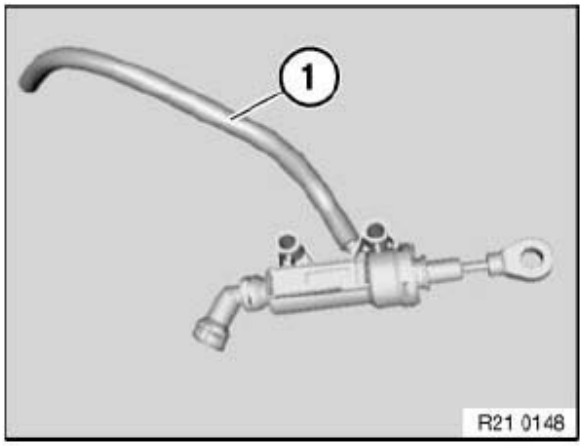


Fig. 37: Identifying Clutch Master Cylinder Supply Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out shift element (1) from clutch master cylinder (2) with screwdriver.

Release plug connection (3) and disconnect plug (4) from shift element (1).

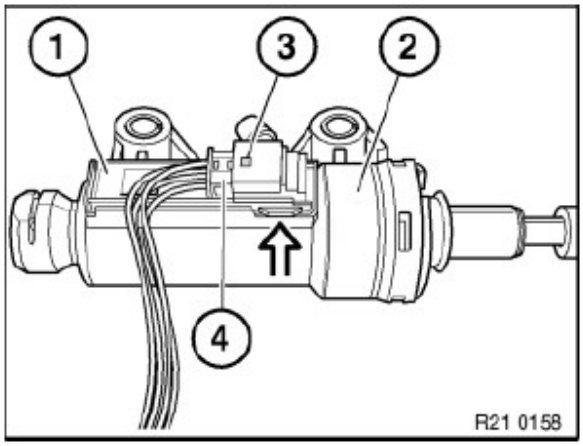


Fig. 38: Removing Clutch Master Cylinder And Shift Element
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Shift element is secured against incorrect installation.

Shift element must snap audibly into place.

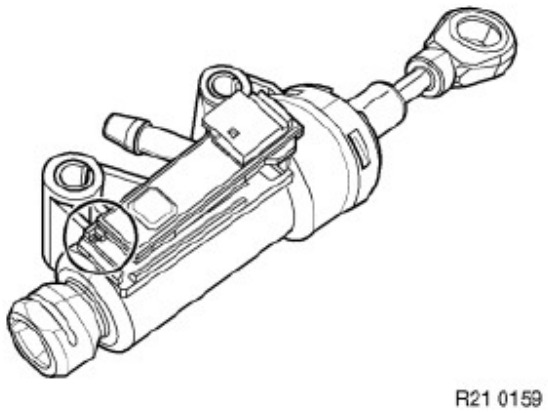


Fig. 39: Identifying Clutch Switch Module
Courtesy of BMW OF NORTH AMERICA, INC.

21 52 510 REMOVING AND INSTALLING/REPLACING CLUTCH SLAVE CYLINDER (PLASTIC)

NOTE: After completing work bleed CLUTCH HYDRAULIC SYSTEM .

Seal hydraulic line to clutch slave cylinder with special tool **13 3 010** .

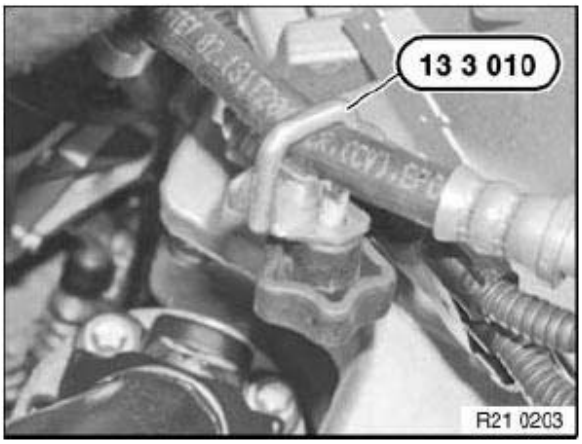


Fig. 40: Sealing Hydraulic Line To Clutch Slave Cylinder Using Special Tools (13 3 010)
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove clutch slave cylinder (1) with holder (2).

Installation:

Replace self-locking nuts.

Tightening torque **21 52 5AZ** .

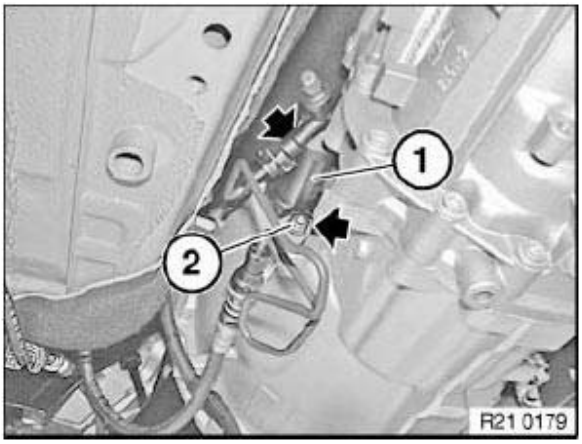


Fig. 41: Identifying Clutch Slave Cylinder Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock spring retainer (1).

Disconnect hydraulic line (2).

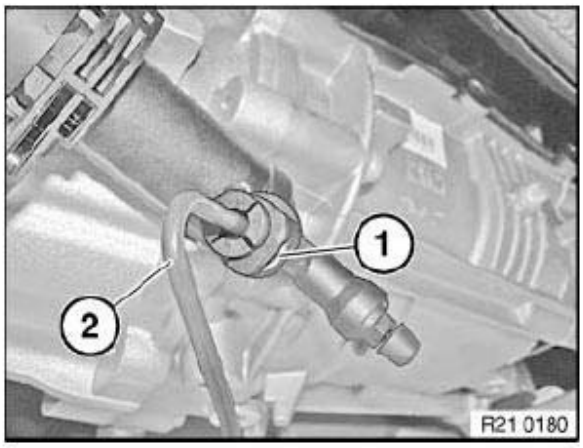


Fig. 42: Identifying Hydraulic Line And Spring Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Press cylinder together by hand.

Connect hydraulic line with cylinder pressed.

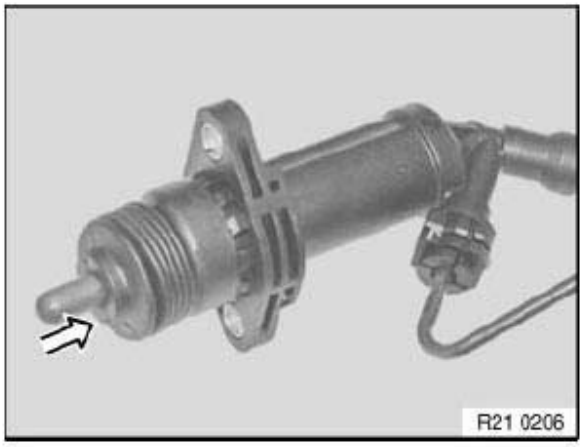


Fig. 43: Connecting Hydraulic Line With Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool **13 3 010** .

Hold cylinder piston vertically downwards.

Press piston 5 times into cylinder.

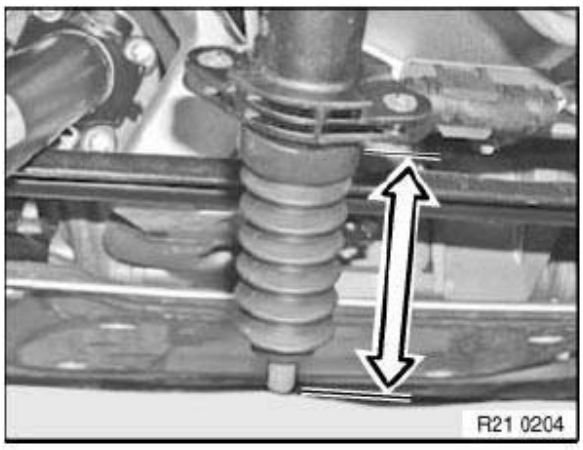


Fig. 44: Holding Cylinder Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Press in piston until it engages.

Install clutch slave cylinder.

Bleed **CLUTCH HYDRAULICS** .

Installation:

Clean thrust member (1) and contact face on release lever.

Lightly grease thrust member (1) on contact face (2).

See **CLUTCH - OPERATING FLUIDS** .

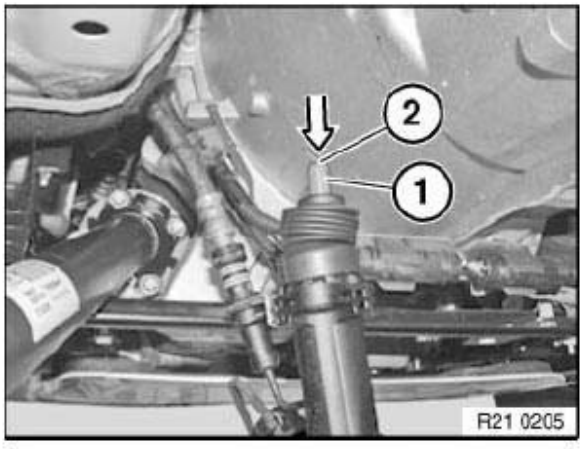


Fig. 45: Pressing Piston
Courtesy of BMW OF NORTH AMERICA, INC.

21 CLUTCH

21-5010 ADAPTER

Adapter MW

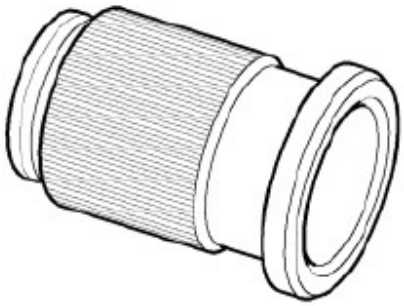
NOTE: For expansion tank when bleeding clutch hydraulic system on automatic transmission

Storage Location

Z4

SI number

01 06 97 (186)



W21 5 010

Fig. 1: Identifying Adapter (215010)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2270 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: (Clutch centering socket) For centering drive plate to pressure plate when installing clutch on engine. Transmission: GS6- 53DG with M57T2, GS6-53BZ with N54 in E92, E60.

Storage Location

C52

SI number

01 20 05 (218)

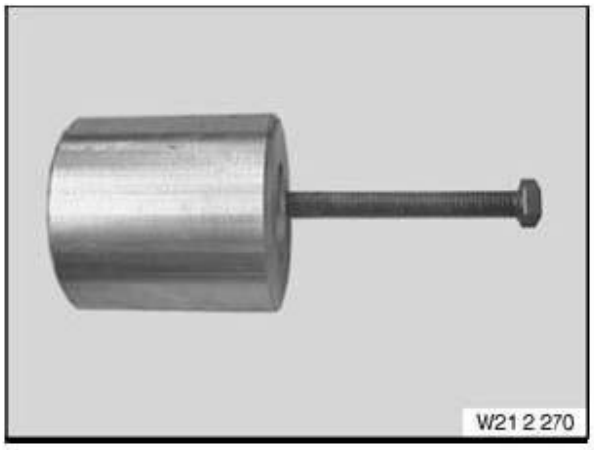


Fig. 2: Identifying Bush (212270)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2120 CLUTCH TOOL

Clutch tool Minimum set: Mechanical tools MW

NOTE: For centering drive plate when installing clutch and for pressing splined output shaft out of constant-velocity joint

Storage Location

B4

SI number

01 05 90 (207)

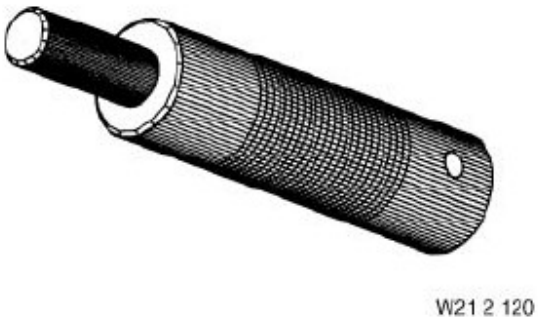


Fig. 3: Identifying Clutch Tool (212120)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2130 CLUTCH TOOL

Clutch tool Minimum set: Mechanical tools MW

NOTE: For centering driving disc when installing clutch.

Storage Location

B4

SI number

01 01 91 (312)

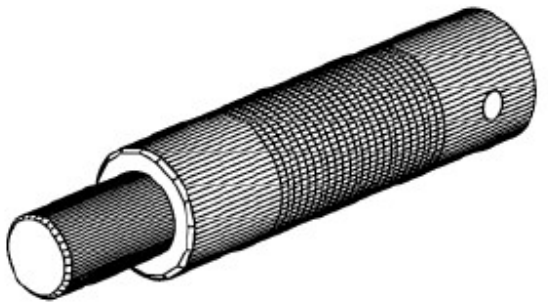


Fig. 4: Identifying Clutch Tool (212130)
Courtesy of BMW OF NORTH AMERICA, INC.

21-5020 CONTAINER

Container MW

NOTE: (Container) For hydraulic fluid (Pentosin) - For bleeding the clutch hydraulic system on the sequential M-drive.

SI number

01 15 97 (211)



Fig. 5: Identifying Container (215020)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2170 DEVICE

Device Minimum set: Mechanical tools MW

NOTE: (tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.

SI number

01 16 00 (622)

Consisting of:

1 = 0494558 Basic body

NOTE: (basic body) Basic body with adjusting spindle

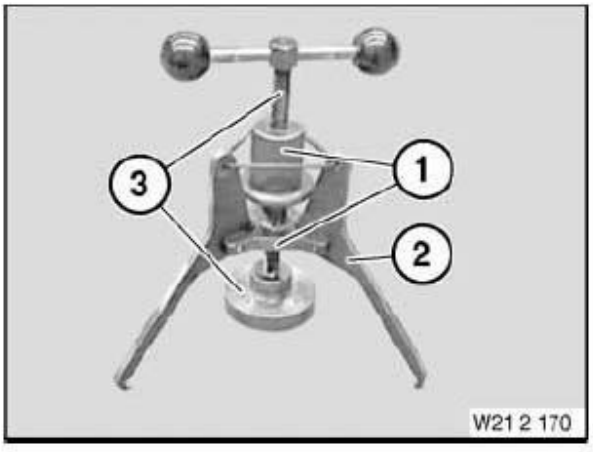


Fig. 6: Identifying Device (212170)

Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0494559 Claw

NOTE: (clamping claw (1 piece))

3 = 0494560 Spindle

NOTE: (pressure spindle with disc)

21-2070 GAUGE

Gauge MW

Replaced by: 0491418

NOTE: For checking lining thickness on clutch drive plate. Replaced 8/95 by 21 2 080 (0 491 418)

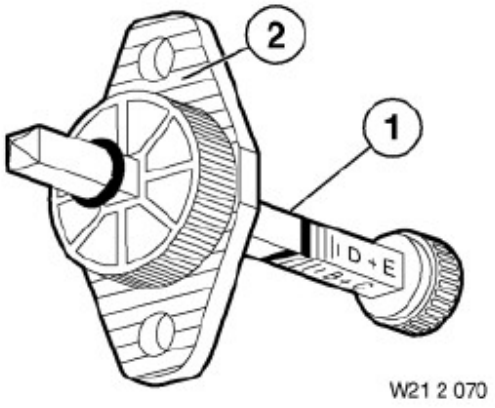


Fig. 7: Identifying Gauge (212070)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2230 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (clutch centering drift) With screw M10 (G transmission)

Storage Location

A47

SI number

01 03 03 (960)

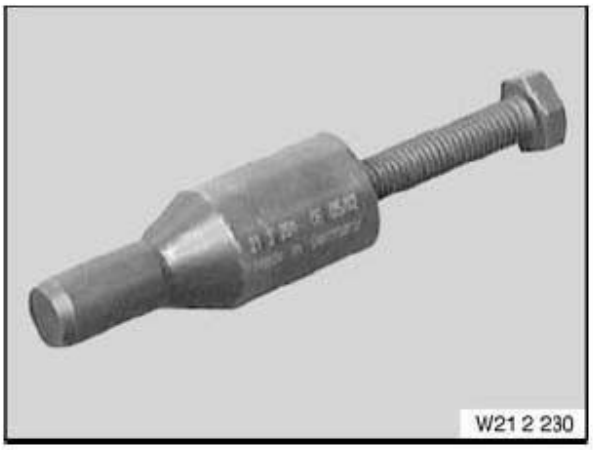


Fig. 8: Identifying Mandrel (212230)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2140 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Clutch centering drift (2 pieces)) For centering the drive plate on the flywheel when installing the SAC clutch (self-adjusting clutch) - Use of SAC in E46, 09/97

Storage Location

B4

SI number

01 13 96 (104)

Consisting of:

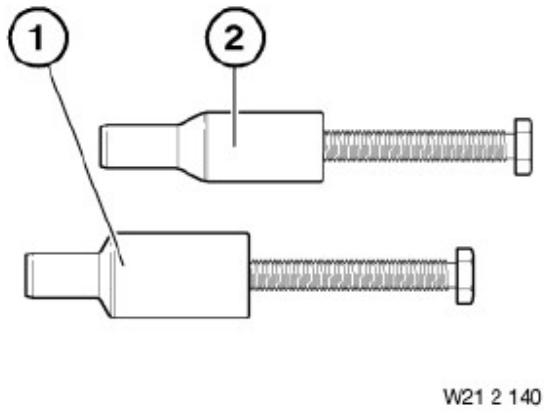


Fig. 9: Identifying Mandrel (212140)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0491426 Mandrel

NOTE: (Clutch centering drift) With screw M10 Transmission: S6S 420G, S6S 560G

2 = 0491427 Mandrel

NOTE: (Clutch centering drift) With screw M10 Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S5D 320Z

21-2200 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Clutch centering pin and screw M10.) For centering clutch disc during installation.

Storage Location

C44

B44

SI number

01 10 02 (907)



Fig. 10: Identifying Mandrel (212200)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2250 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Clutch centering drift) For centering drive plate when installing. Clutch disc with modified gearing. Transmission: S5D 250G (B transmission)

Storage Location

A50

SI number

01 20 04 (135)

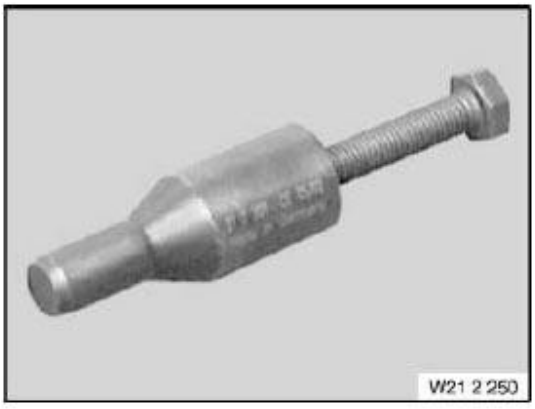


Fig. 11: Identifying Mandrel (212250)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2100 MANDREL

Mandrel MW

NOTE: For centering drive plate while installing clutch

Storage Location

Y4

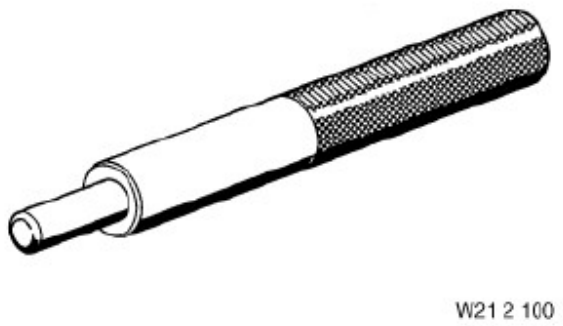


Fig. 12: Identifying Mandrel (212100)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2280 MANDREL

Mandrel MW

NOTE: (Clutch centering pin) For centering drive plate to pressure plate when installing clutch on engine. Transmission: GS6-53DG with S85, S65

Storage Location

C18

SI number

01 18 06 (295)

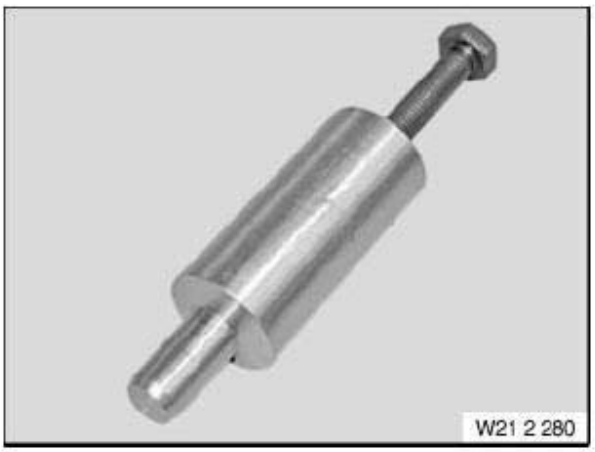


Fig. 13: Identifying Mandrel (212280)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2240 RING

Ring Minimum set: Mechanical tools MW

NOTE: (Grease scraper ring) Scraping grease off splines of transmission drive shaft (G-transmission)

Storage Location

A47

SI number

01 03 03 (960)



Fig. 14: Identifying Ring (212240)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2180 RING

Ring Minimum set: Mechanical tools MW

NOTE: (Locating ring) For locating and resetting adjusting ring of self-adjusting clutch on all 6- and 8-cylinder engines.

Storage Location

A44

SI number

01 16 00 (622)

Consisting of:

1 = 0494561 Ring

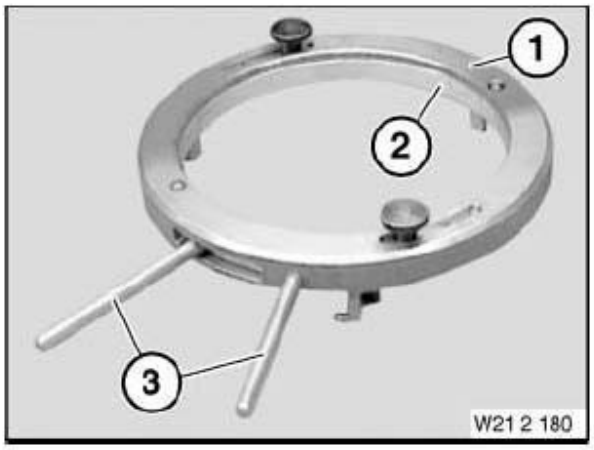


Fig. 15: Identifying Ring (212180)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: (Outer ring)

2 = 0494562 Ring

NOTE: (Inner ring)

3 = 0494563 Pin

NOTE: (Threaded bolt) Scope: 2 pcs.

21 CLUTCH

21-5010 ADAPTER

Adapter MW

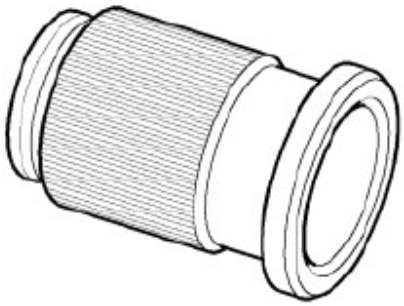
NOTE: For expansion tank when bleeding clutch hydraulic system on automatic transmission

Storage Location

Z4

SI number

01 06 97 (186)



W21 5 010

Fig. 1: Identifying Adapter (21-5010)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2270 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: (Clutch centring socket) For centring drive plate to pressure plate when installing clutch on engine. Transmission: GS6- 53DG with M57T2, GS6-53BZ with N54 in E92, E60.

Storage Location

C52

SI number

01 20 05 (218)

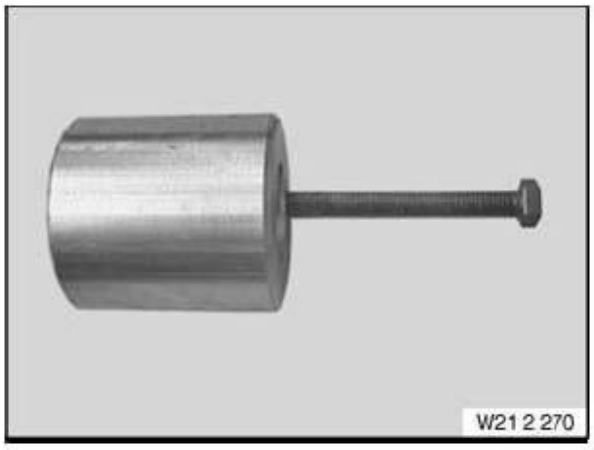


Fig. 2: Identifying Bush (21-2270)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2120 CLUTCH TOOL

Clutch tool Minimum set: Mechanical tools MW

NOTE: For centering drive plate when installing clutch and for pressing splined output shaft out of constant-velocity joint

Storage Location

B4

SI number

01 05 90 (207)

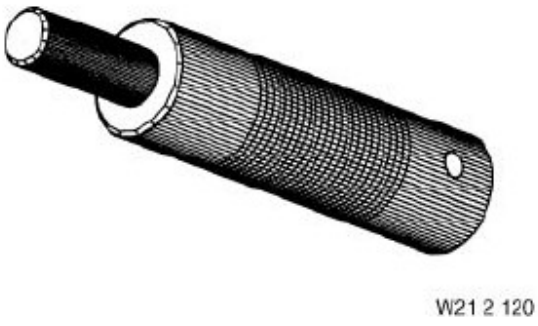


Fig. 3: Identifying Clutch Tool (21-2120)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2130 CLUTCH TOOL

Clutch tool Minimum set: Mechanical tools MW

NOTE: For centering driving disc when installing clutch.

Storage Location

B4

SI number

01 01 91 (312)

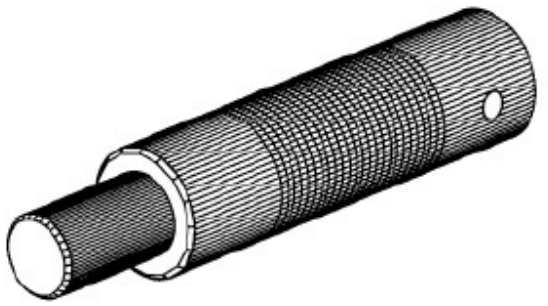


Fig. 4: Identifying Clutch Tool (21-2130)
Courtesy of BMW OF NORTH AMERICA, INC.

21-5020 CONTAINER

Container MW

NOTE: (Container) For hydraulic fluid (Pentosin) - For bleeding the clutch hydraulic system on the sequential M-drive.

SI number

01 15 97 (211)



Fig. 5: Identifying Container (21-5020)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2170 DEVICE

Device Minimum set: Mechanical tools MW

NOTE: (tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.

SI number

01 16 00 (622)

Consisting of:

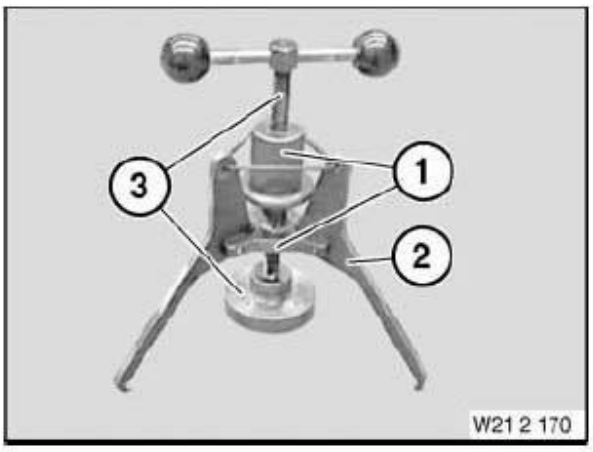


Fig. 6: Identifying Device (21-2170)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0494558 Basic body

NOTE: **(basic body) Basic body with adjusting spindle**

2 = 0494559 Claw

NOTE: **(clamping claw (1 piece))**

3 = 0494560 Spindle

NOTE: **(pressure spindle with disc)**

21-2070 GAUGE

Gauge MW

Replaced by: 0491418

NOTE: **For checking lining thickness on clutch drive plate. Replaced 8/95 by 21 2 080 (0 491 418)**

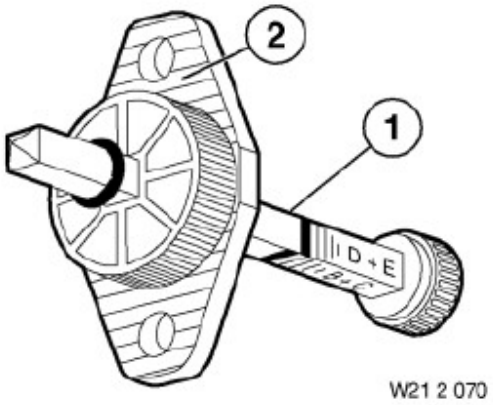


Fig. 7: Identifying Gauge (21-2070)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2230 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: **(clutch centring drift) With screw M10 (G transmission)**

Storage Location

A47

SI number

01 03 03 (960)

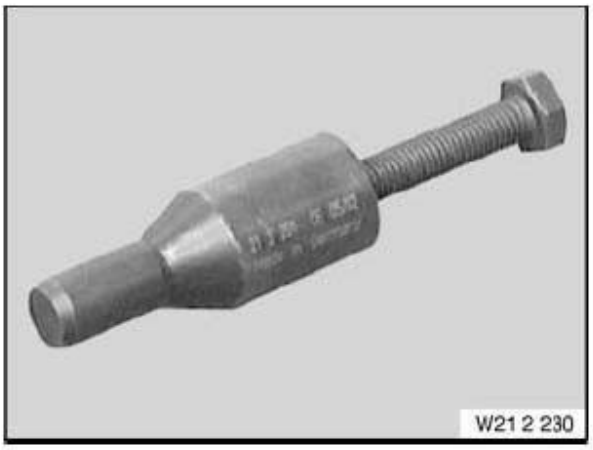


Fig. 8: Identifying Mandrel (21-2230)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2140 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Clutch centring drift (2 pieces)) For centring the drive plate on the flywheel when installing the SAC clutch (self-adjusting clutch) - Use of SAC in E46, 09/97

Storage Location

B4

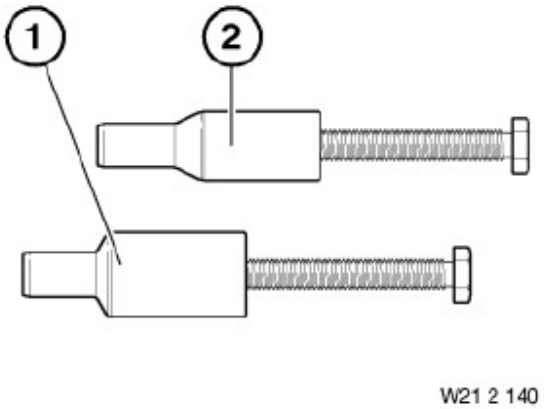


Fig. 9: Identifying Mandrel (21-2140)
Courtesy of BMW OF NORTH AMERICA, INC.

SI number

01 13 96 (104)

Consisting of:

1 = 0491426 Mandrel

NOTE: (Clutch centring drift) With screw M10 Transmission: S6S 420G, S6S 560G

2 = 0491427 Mandrel

NOTE: (Clutch centring drift) With screw M10 Transmission: S5D 200G, S5D 250G, S5D 260Z, S5D 310Z, S5D 320Z

21-2200 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Clutch centring pin and screw M10.) For centering clutch disc during installation.

Storage Location

C44

B44

SI number

01 10 02 (907)



Fig. 10: Identifying Mandrel (21-2200)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2250 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Clutch centring drift) For centring drive plate when installing. Clutch disc with modified gearing. Transmission: S5D 250G (B transmission)

Storage Location

A50

SI number

01 20 04 (135)

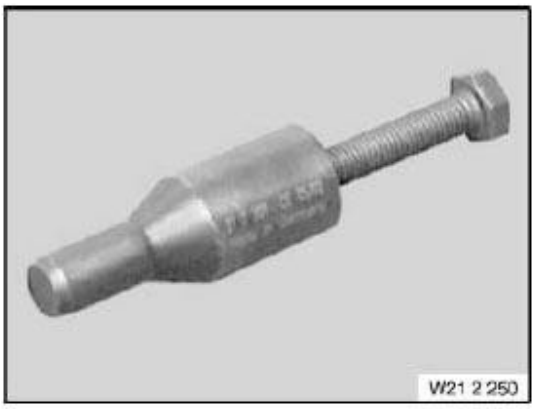


Fig. 11: Identifying Mandrel (21-2250)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2100 MANDREL

Mandrel MW

NOTE: For centering drive plate while installing clutch

Storage Location

Y4

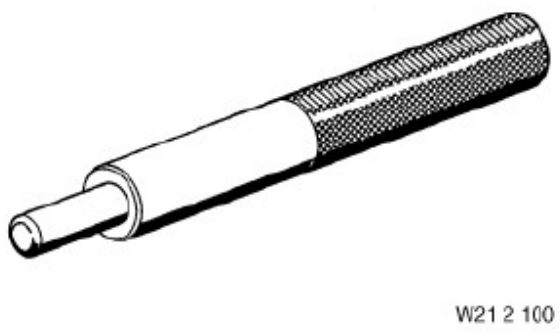


Fig. 12: Identifying Mandrel (21-2100)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2280 MANDREL

Mandrel MW

NOTE: (Clutch centring pin) For centring drive plate to pressure plate when installing clutch on engine. Transmission: GS6- 53DG with S85, S65

Storage Location

C18

SI number

01 18 06 (295)



Fig. 13: Identifying Mandrel (21-2280)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2240 RING

Ring Minimum set: Mechanical tools MW

NOTE: **(Grease scraper ring) Scraping grease off splines of transmission drive shaft (G-transmission)**

Storage Location

A47

SI number

01 03 03 (960)



Fig. 14: Identifying Ring (21-2240)
Courtesy of BMW OF NORTH AMERICA, INC.

21-2180 RING

Ring Minimum set: Mechanical tools MW

NOTE: **(Locating ring) For locating and resetting adjusting ring of self-adjusting clutch on all 6- and 8-cylinder engines.**

Storage Location

A44

SI number

01 16 00 (622)

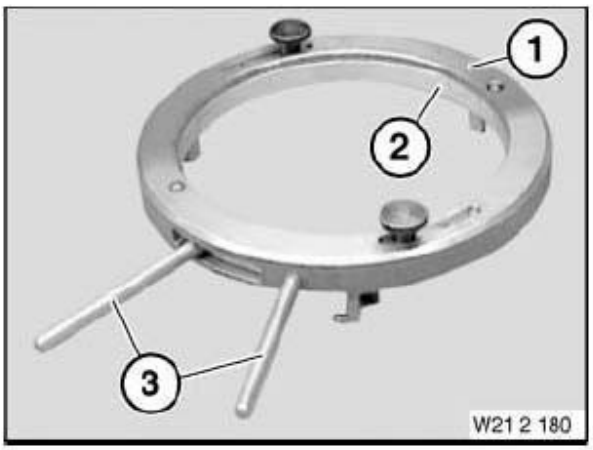


Fig. 15: Identifying Ring (21-2180)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0494561 Ring

NOTE: (Outer ring)

2 = 0494562 Ring

NOTE: (Inner ring)

3 = 0494563 Pin

NOTE: (Threaded bolt) Scope: 2 pcs.

CLUTCH DISC AND DRIVE PLATE

21 21 CLUTCH DISC AND DRIVE PLATE

TIGHTENING TORQUE SPECIFICATION - CLUTCH DISC AND DRIVE PLATE

	Type	Thread	W in
1AZ Clutch to flywheel	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E83/E85/E86/E87/E90/E91	M8 8.8	Re sc
	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E83/E85/E86/E87/E90/E91	M8 10.9	Re sc
Clutch to flywheel With ZNS bolts			Re Zl Jo to an ro m ob wi
	S85/S65		Jo to To an
	N52/N53/N52K/M47T2/N45T/N54/N46T/N43/N45K/N47/M57T2/N47S/N62TU/N57	M8 10.9	Jo to To an

CLUTCH OPERATION (HYDRAULIC)

21 52 CLUTCH OPERATION (HYDRAULIC)

TIGHTENING TORQUE SPECIFICATION - CLUTCH OPERATION (HYDRAULIC)

		Type
1AZ	Hydraulic line to clutch slave cylinder or throttle.	E36/E38/E39/E52/E53/E60/E61/E63/E64/E83/E85/E86/E81/E87/E90/E91/E92
		E46
2AZ	Clutch master cylinder to bearing	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E85/E84/E86/E87/E89/E90/E91/E92
		E83

	support	
3AZ	Fitting screw, clutch master cylinder	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E83/E85/E86/E87/E90/E91/E92/E93
4AZ	Clutch master cylinder to pedal assembly	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E81/E82/E83/E84/E85/E86/E87/E88
5AZ	Clutch slave cylinder to clutch housing/transmission case	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E81/E82/E83/E84/E85/E86/E87/E88
		E60/E63
6AZ	Pressure accumulator to hydraulic unit	E36/M3
7AZ	Coupling bolts for hydraulic pipes	E46/M3
8AZ	Pressure accumulator for hydraulic unit	E46/M3
9AZ	Clutch position sensor to clutch slave cylinder	E46/E60/E61/E63/E64/E85
		E60/E61/E63
10AZ	Banjo bolt, pipe, actuator/pump block	E60/E61/E63
11AZ	Filler plug, expansion tank, pump block	E60/E61/E63
12AZ	Throttle valve to clutch slave cylinder	E60, E61

CLUTCH DISC AND DRIVE PLATE

21 21 CLUTCH DISC AND DRIVE PLATE

TIGHTENING TORQUE SPECIFICATION - CLUTCH DISC AND DRIVE PLATE

	Type	Thread	Work instruc
1AZ Clutch to flywheel	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E83/E85/E86/E87/E90/E91	M8 8.8	Replac screws
	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E83/E85/E86/E87/E90/E91	M8 10.9	Replac screws
Clutch to flywheel With ZNS bolts			Replac ZNS b Jointin torque angle c rotatio must b observ withou
	S85/S65		Jointin torque Torque angle
	N52/N53/N52K/M47T2/N45T/N54/N46T/N43/N45K/N47/M57T2/N47S/N62TU/N57	M8 10.9	Jointin torque Torque angle

CLUTCH OPERATION (HYDRAULIC)

21 52 CLUTCH OPERATION (HYDRAULIC)

TIGHTENING TORQUE SPECIFICATION - CLUTCH OPERATION (HYDRAULIC)

	Type
1AZ Hydraulic line to clutch slave cylinder or throttle.	E36/E38/E39/E52/E53/E60/E61/E63/E64/E83/E85/E86/E81/E87/E90/E91/E92
	E46
2AZ Clutch master cylinder to bearing	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E85/E84/E86/E87/E89/E90/E91/E92/E93
	E83

support	
3AZ Fitting screw, clutch master cylinder	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E83/E85/E86/E87/E90/E91/E92/E93
4AZ Clutch master cylinder to pedal assembly	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E81/E82/E83/E84/E85/E86/E87/E88/E89/I
5AZ Clutch slave cylinder to clutch housing/transmission case	E36/E38/E39/E46/E52/E53/E60/E61/E63/E64/E81/E82/E83/E84/E85/E86/E87/E88/E89/I
	E60/E63
6AZ Pressure accumulator to hydraulic unit	E36/M3
7AZ Coupling bolts for hydraulic pipes	E46/M3
8AZ Pressure accumulator for hydraulic unit	E46/M3
9AZ Clutch position sensor to clutch slave cylinder	E46/E60/E61/E63/E64/E85
	E60/E61/E63
10AZ Banjo bolt, pipe, actuator/pump block	E60/E61/E63
11AZ Filler plug, expansion tank, pump block	E60/E61/E63
12AZ Throttle valve to clutch slave cylinder	E60, E61

28 DOUBLE CLUTCH GEARBOX (DKG)

28 00 ... CHECKING/TOPPING UP OIL LEVEL IN TWIN-CLUTCH GEARBOX (GS7D36SG)

Checking oil level

- Call up Service functions (Drive) in BMW diagnosis system
- Carry out oil level check in accordance with instructions

IMPORTANT: On the twin-clutch gearbox a run-in check fluid change is not required at 2000 km.
Use only the approved gear oil for dual clutch transmission GS7D36SG DCTF-1 Pentosin (P/N 83 22 2 147 477). .
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: The testing and filling procedure must be completed before the transmission oil temperature of 40°C is reached.
If a temperature in excess of 40°C is reached and no oil has emerged, insert the fluid adjusting screw and repeat the testing and filling procedure when it has cooled down.

Installation note:

Tighten down filler plug using

1. Hexagon wrench 8 A/F
2. Torque wrench
3. Socket 8 A/F

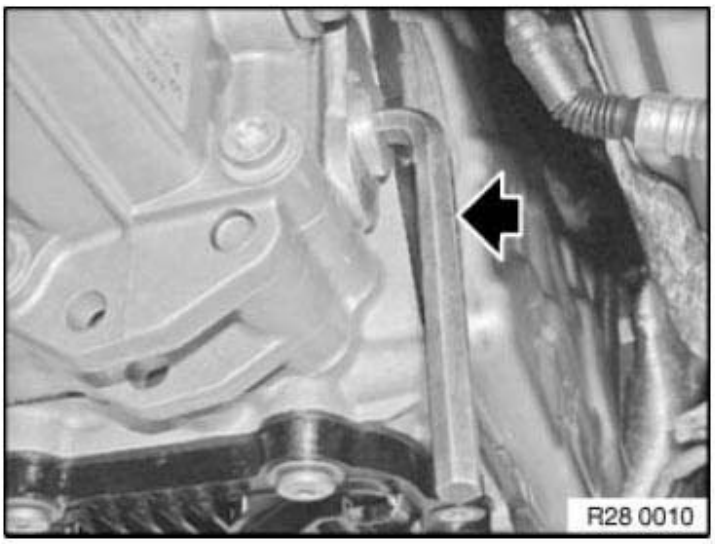


Fig. 1: Identifying Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Topping up transmission oil after a repair

Stand vehicle on a level surface and secure against rolling off.

- Open fluid adjusting screw (1). If oil emerges, close screw again immediately

  If no oil emerges, top up until oil emerges and close oil adjusting screw (1) again

  NOTE: If oil has been replenished here, a further refill must be carried out during the actual oil adjustment.

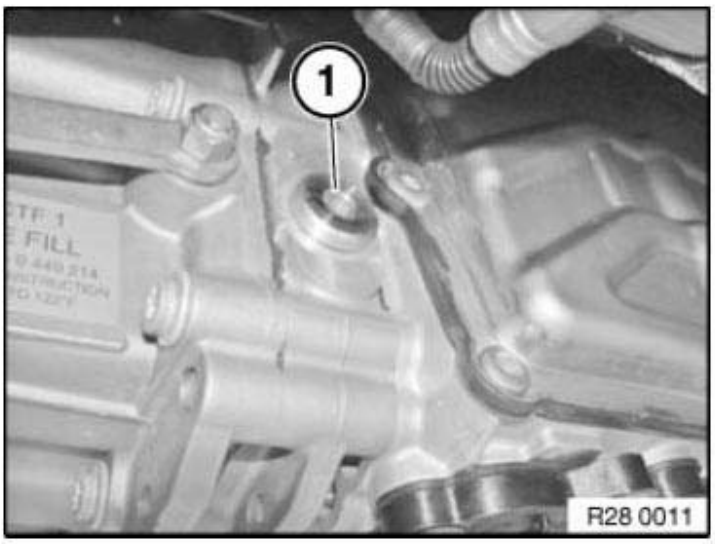


Fig. 2: Identifying Fluid Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

- Connect diagnosis system and start service functions (drive).
- Start engine (drive position N or P)
- Record transmission temperature using Tester.
- (Drive position P)
- Permissible starting temperature < or = 32°C
- Idle speed: maintain at approx. 2000 RPM for 1 minute.
- Open the oil adjusting screw (1)
- Fill until oil emerges.

  Max. transmission oil temperature 40 degrees Celsius

- Insert screw.

Installation note:

Replace screw.

64 00 000 INFORMATION ON USING CLEANING AGENT/PAINTS (PERSONAL PROTECTION EQUIPMENT)

WARNING: Use of cleaning agents/paints not compliant with instructions can cause serious injuries or burns!
Handling cleaning agents/paints can trigger allergic skin and respiratory reactions!

IMPORTANT: Observe following instructions:

- **Store cleaning agents/paints only in a secure cabinet.**
- **Keep cleaning agents/paints away from naked flames and other sources of ignition.**
- **Protect cleaning agents/paints from high temperatures and direct sunlight.**
- **Always keep an eye bath on hand, change the water regularly (once a month).**

IMPORTANT: Observe following instructions before use:

- **Manufacturer's instructions (on container/packaging)**
- **Hazard warnings (on container/packaging)**
- **Manufacturer's instructions on package insert**

- **Material safety data sheet of manufacturer**
- **Product information in EPC**
- **National market regulations**

IMPORTANT: Observe following instructions during use:

- **Do not eat, drink or smoke while working with these products.**
- **Avoid direct contact with skin and eyes.**
- **Wear personal protective clothing/equipment.**
- **Ensure that all enclosed areas are well ventilated or extract fumes directly.**
- **Immediately change working clothes soiled with cleaning agent/paint.**
- **After finishing work, wash your hands and apply protective skin cream.**

IMPORTANT: Follow hazard warnings and wear personal protection equipment!

First Aid

- If product comes in contact with eyes, immediately flush with running water for about 10 - 15 minutes. Seek the advice of eye specialist.
- In the event of skin contact and where applicable an allergic skin reaction, clean the affected areas immediately with soap and water and then apply silicone-free skin cream. Seek advice of physician.
- If an adhesive product is swallowed, rinse mouth/parts of mouth thoroughly with running water. Drink 1-2 glasses of water. Do not induce vomiting. Consult a doctor.
- After inhaling vapors ensure ample supply of fresh air. Keep calm, keep respiratory tracks clear and call doctor.

Recycling

Dispose of cleaning agents/paints in a professional manner!

Observe national/country-specific disposal regulations.

28 00 101 INSTALLING REPLACEMENT TRANSMISSION (GS7D36SG)

Drain gear oil at oil drain plug.

IMPORTANT: After completion of work, program transmission control unit.

Recycling

Catch and dispose of escaping transmission fluid.

Observe country-specific waste disposal regulations

IMPORTANT:

- **In case of twin-clutch gearbox N54, N55, before installing exchange transmission, always flush TRANSMISSION OIL COOLER TOGETHER WITH LINES .**
- **After completion of work, check oil level. .**

Replacement transmission is supplied filled with transmission fluid.

Use only the approved gear oil for dual clutch transmission GS7D36SG DCTF-1 Pentosin (P/N 83 22 2 147 477). .

Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

Necessary preliminary tasks

- Remove twin-clutch gearbox.

NOTE: **Release screws.**
Remove and convert transmission bearing block (1).

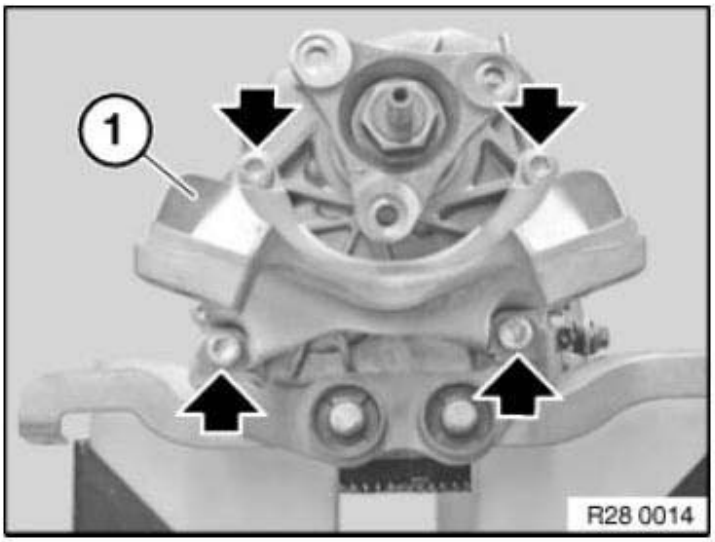


Fig. 3: Identifying Bearing Block With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Picture shows N54.

Modify all transportation retainers.

Convert all cable clips.

Convert all seal plugs.

Convert protective cap on input shaft.

Transmission identification:

- refer to BMW Parts Department.
- On type plate

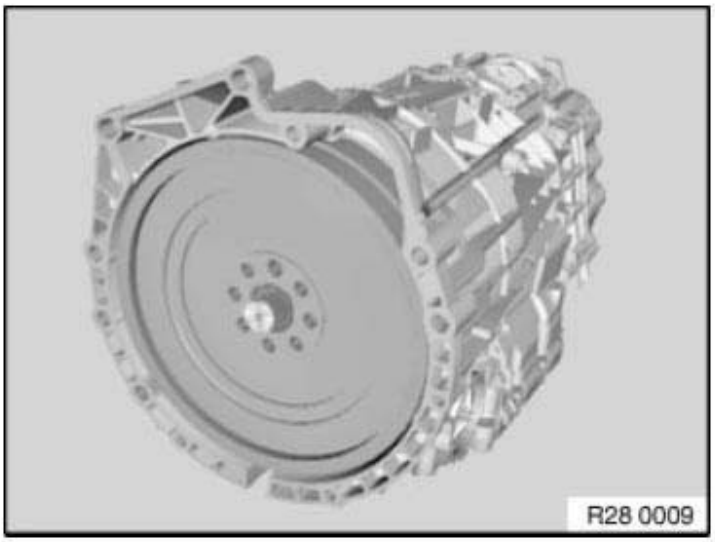


Fig. 4: Identifying Transportation Retainers, Cable Clips, Seal Plugs And Protective Cap
Courtesy of BMW OF NORTH AMERICA, INC.

00 .. ... INSTRUCTIONS FOR PERFORMING SERVICE FUNCTIONS ON THE TWIN-CLUTCH GEARBOX (GS7D36SG)

NOTE: The service functions must be carried out in the relevant order!

TWIN-CLUTCH GEARBOX SERVICE FUNCTIONS CHART

Replacement of clutch and after all work on opened transmission	1. Carry out fluid adjustment 2. Teach in valve characteristic curves 3. Teach in kiss point 4. Parking lock hook test
Replacement of oil pump	1. Carry out fluid adjustment 2. Teach in valve characteristic curves 3. Teach in kiss point 4. Parking lock hook test
Replacement of transmission (complete)	1. Read out transmission data before

	replacement 2. Parking lock hook test 3. Write transmission data 4. Carry out fluid adjustment
Replacement/repair of parking lock cable, selector lever with parking lock unit	1. Parking lock hook test
Replacement of combination sensor	1. Carry out fluid adjustment 2. Teach in valve characteristic curves 3. Teach in kiss point 4. Parking lock hook test
Opening/replacement of fluid adjustment screw, repair/replacement of transmission fluid cooler, oil cooler lines, thermostat, water/oil heat exchanger (M3) and seals	1. Carry out fluid adjustment

28 60 ... NOTES ON MECHATRONICS (GS7D36SG)

IMPORTANT: After completing work:

- **Load specific data status with the BMW diagnosis system**
- **Check oil level.**

  Use only gear oil for dual clutch transmission GS7D36SG DCTF-1 Pentosin (P/N 83 22 2 147 477). .

  Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Unscrew plug (1) and disconnect.

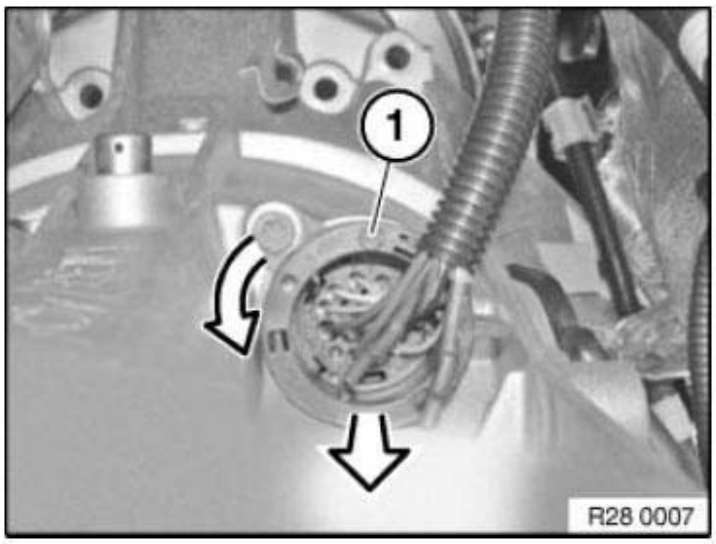


Fig. 5: Identifying Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool **24 2 390** in sealing sleeve (1).

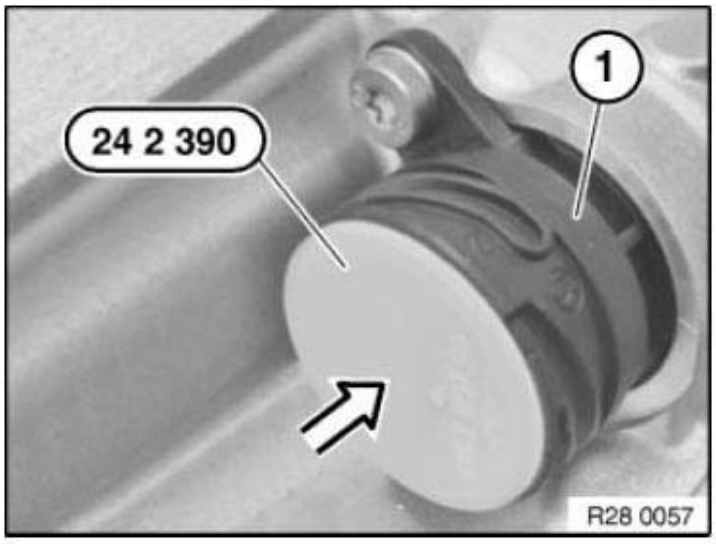
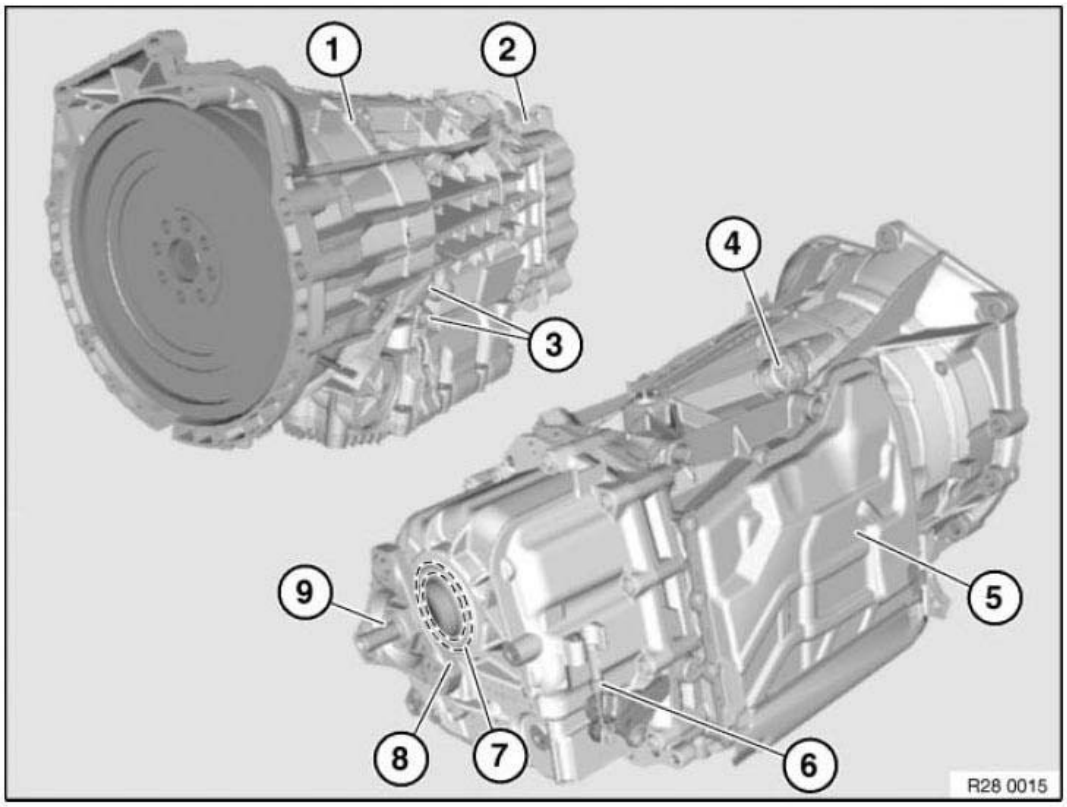


Fig. 6: Inserting Special Tool (24 2 390) In Sealing Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

28 00 ... OVERVIEW OF TRANSMISSION HOUSING (GS7D36SG)



0	General information	Transmission designations, complete transmission, check fluid level, mechatronics
1	Transmission housing, front section	
2	Transmission housing, rear section	
3	Cooling line connection	
4	Transmission connector	
5	Mechatronics module	
6	Transmission interlock	
7	Radial seal	For output flange
8	Output flange	
9	Output shaft	

Fig. 7: Overview Of Transmission Housing
Courtesy of BMW OF NORTH AMERICA, INC.

28 60 010 REMOVING AND INSTALLING MECHATRONICS (GS7D36SG)

NOTE: When replacing mechatronics:

- Import present transmission data into new mechatronics

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before the hydraulic cap is loosened.
After completion of work, check oil level. .
USE ONLY THE APPROVED gear oil for dual clutch transmission GS7D36SG DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks

- Read out transmission data of mechatronics to be replaced
- Remove **twin-clutch gearbox**

Place twin clutch transmission on a suitable surface.

To prevent the gearbox oil from spilling out, make sure that the hydraulic cap points upward.

Remove **hydraulic cap** .

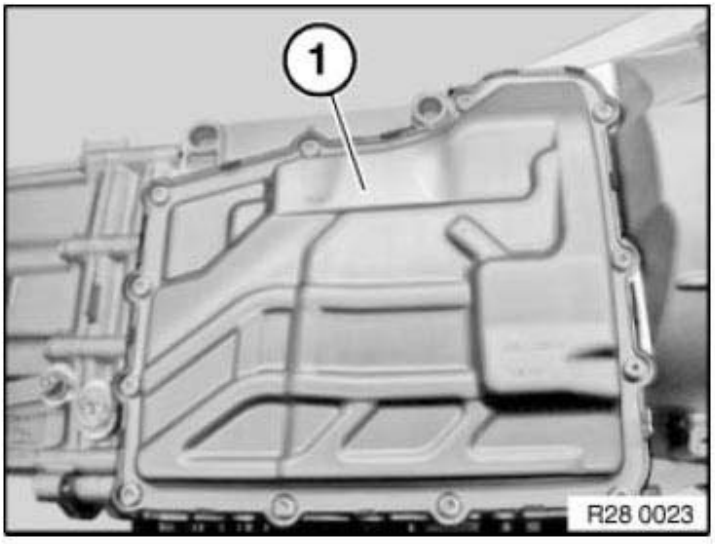


Fig. 8: Identifying Hydraulic cap
Courtesy of BMW OF NORTH AMERICA, INC.

Ensure correct installation position.

Press holder (2) together from right and release cable (1).

Installation note:

Replace holder.

Retaining lugs must point to the right.

If fitted: Pull out CPA pin (7) to second locking position.

Release connector lock (6) and at same time detach connector (3) from retaining tabs (5) towards right.

IMPORTANT: Bridge (4) of connector must not break.
Wiring harness must be replaced if bridge breaks.

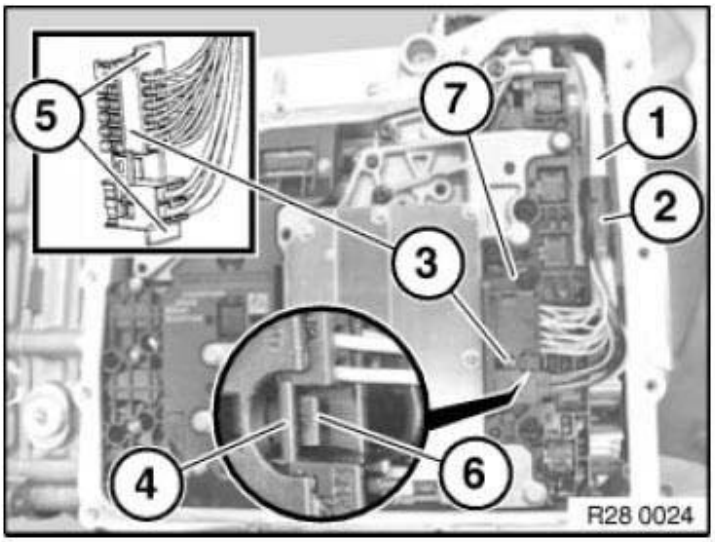


Fig. 9: Identifying Cable, Holder, Connector Bridge, Connector Lock And CPA Pin
Courtesy of BMW OF NORTH AMERICA, INC.

CPA (1) in second locking position.

Installation note:

Press CPA pin down until it is flush with the housing.

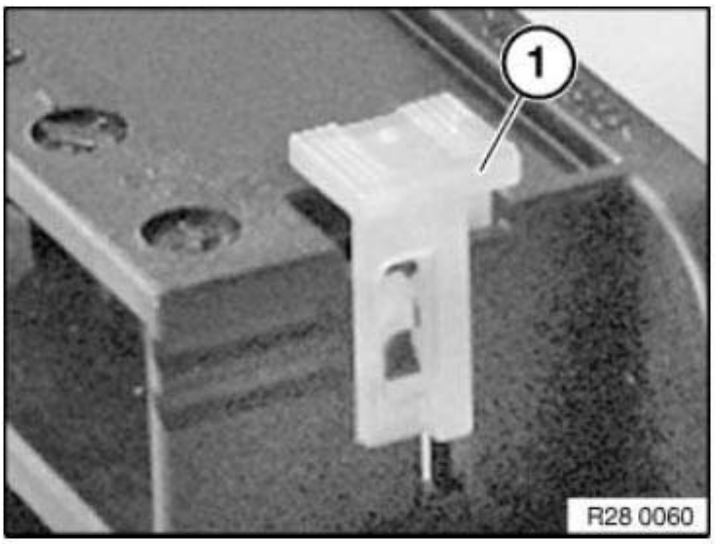


Fig. 10: Identifying CPA Pin
Courtesy of BMW OF NORTH AMERICA, INC.

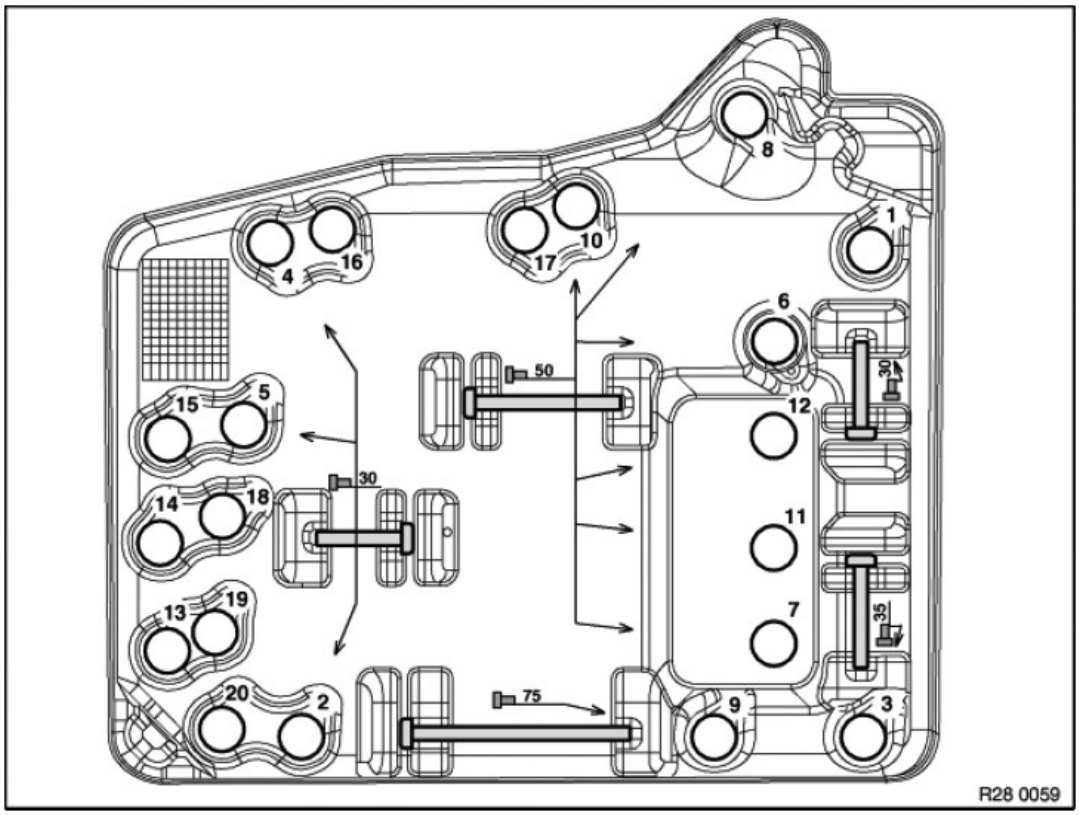


Fig. 11: Placing Mounting Template Over Mechatronics
Courtesy of BMW OF NORTH AMERICA, INC.

Place mounting template over mechatronics.

Open screws 1-20.

NOTE: Replace screws 1-12.

Screws 13-20 remain captive on module.

Remove mounting template.

Lift mechatronics out of housing.

Remove metal bead gasket.

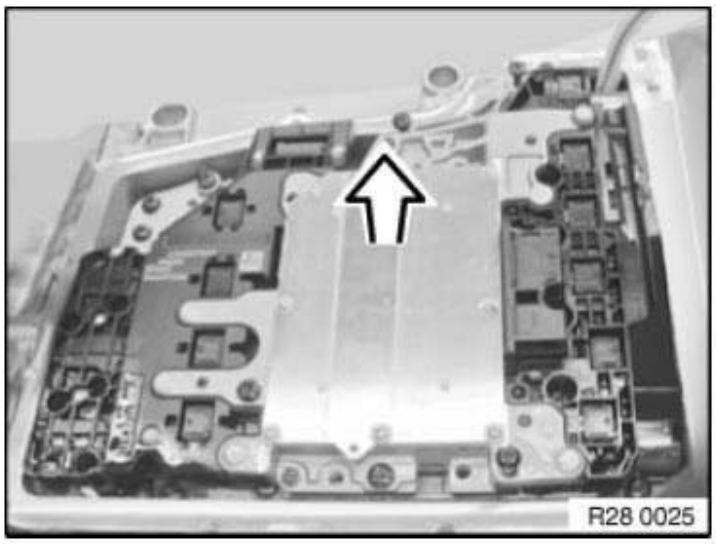


Fig. 12: Removing Metal Bead Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Check the installation location of the centering pins (1).
The centering pins (1) of the mechatronics remain in the housing.

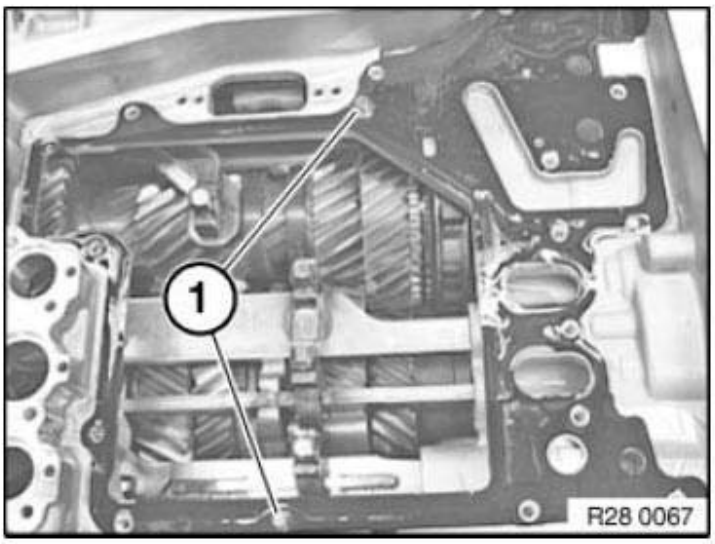


Fig. 13: Identifying Centering Pins
Courtesy of BMW OF NORTH AMERICA, INC.

Installing mechatronics

Install a new metal bead gasket.

Install mechatronics.

Fit mounting template.

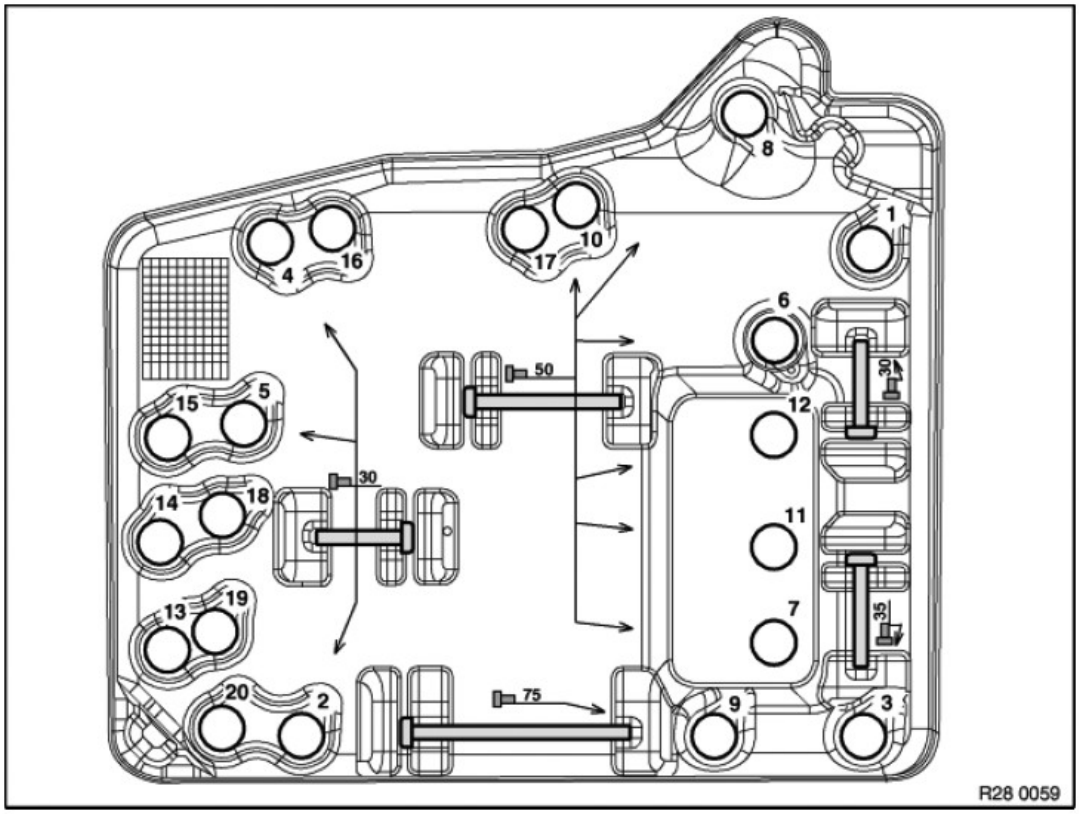


Fig. 14: Placing Mounting Template Over Mechatronics
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Adhere without fail to the screwing sequence indicated on the template.

The screw length can be checked by means of the insert pockets shaped in the template.

1. Insert screws in sequence 1-12 and pre-tighten to 2 Nm.
2. Tighten down screws 1-12 to tightening torque and angle of rotation.
3. Tighten down screws in sequence 13-20 to 5 Nm.
4. Remove mounting template.

28 40 000 REMOVING AND INSTALLING OR REPLACING CLUTCH COVER (GS7D36SG)

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before removing the clutch cover.
After completion of work, check oil level. .
Use only the approved DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC

DISCHARGE) .

Installation note:

- **Removal and installation of clutch cover:**

  Replace **shaft seal for clutch cover** , O-ring and snap ring.

- **Replacement clutch cover:**

  Replace as a single assembly only (incl. radial shaft seal, O-ring, bearing, retaining plate and snap ring).

Necessary preliminary work

- Remove **twin-clutch gearbox**

To prevent the gearbox oil from spilling out, tilt the gearbox back before removing the clutch cover.

Installation note:

After completing work, add transmission oil and check **oil level**. .

Lever snap ring (1) out of housing with a suitable tool.

Installation note:

Replace snap ring.

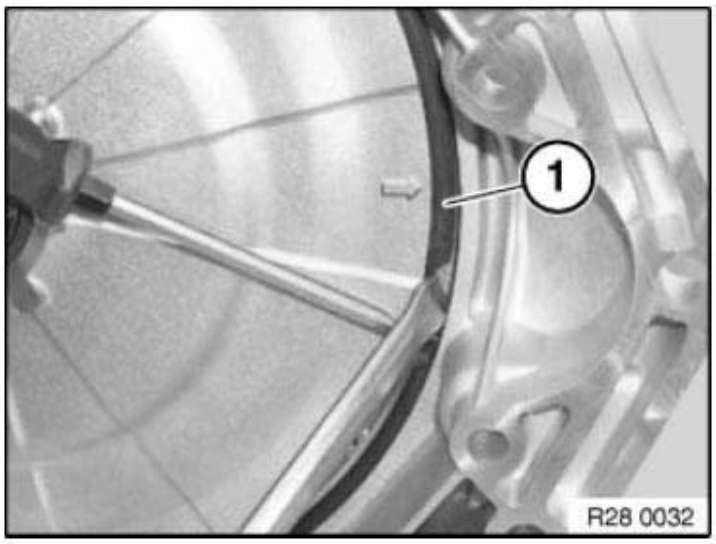


Fig. 15: Identifying Snap Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Graphic shows: Twin-clutch gearbox S65 Slip bush **23 0 390 must** be used when clutch cover is removed and installed.

Pull clutch cover with special tool **13 5 250** and adapter 54 0 163 out of housing.

IMPORTANT: Ensure uniform (non-tilting) detachment by alternately using the 3 tightening threads.

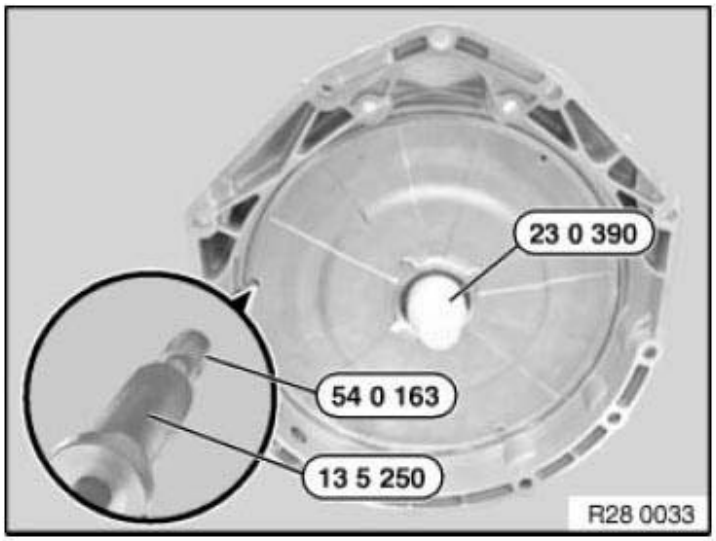


Fig. 16: Pulling Clutch Cover Using Special Tool (13 5 250) And (54 0 163)
Courtesy of BMW OF NORTH AMERICA, INC.

Graphic shows: Twin-clutch gearbox S65 Remove oil fouling with fluff-free cloth.

Clean snap ring groove before installing clutch cover.

Press clutch cover (1) into housing with arrow pointing up and strike evenly with a plastic hammer.

Then secure clutch cover with snap ring.

Make sure snap ring is correctly fitted.

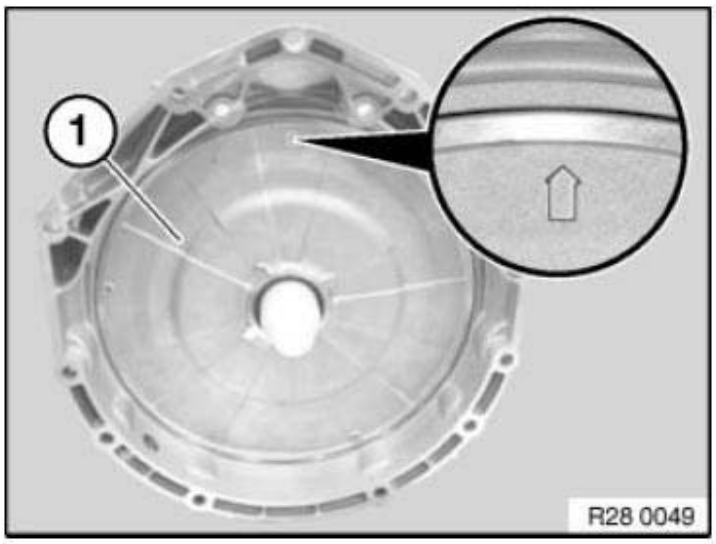


Fig. 17: Identifying Clutch Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Moisten O-ring and radial shaft seal with gearbox oil.

28 40 020 REMOVING AND INSTALLING OR REPLACING CLUTCH SUPPORT (GS7D36SG)

IMPORTANT: After completion of work, check oil level. .
Use only the approved DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary work

- Remove **twin-clutch gearbox**
- Remove **clutch**

Remove **pump unit**.

Unfasten screws (2).

Remove clutch support (3).

Installation note:

Replace screws and seal.

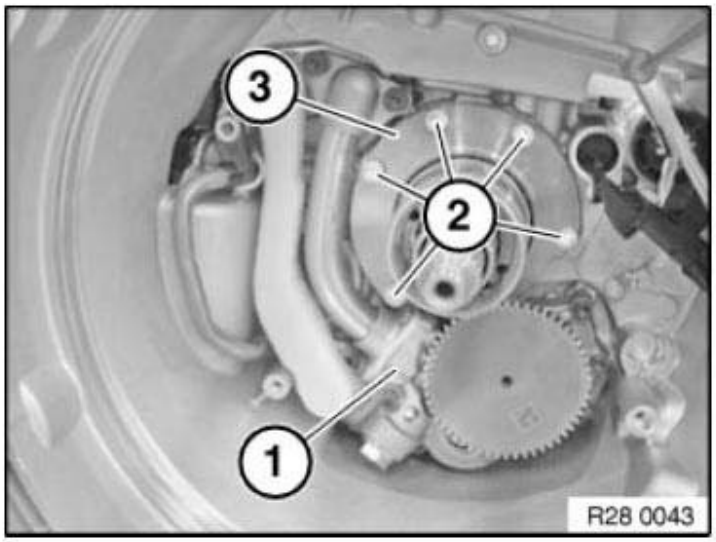


Fig. 18: Identifying Clutch Support, Oil Pump And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Before installing clutch support:
Make sure without fail that seal (1) is installed in correct position and piston rings are correctly fitted on drive shaft.
Secure clutch support screw connections in diagonal sequence.

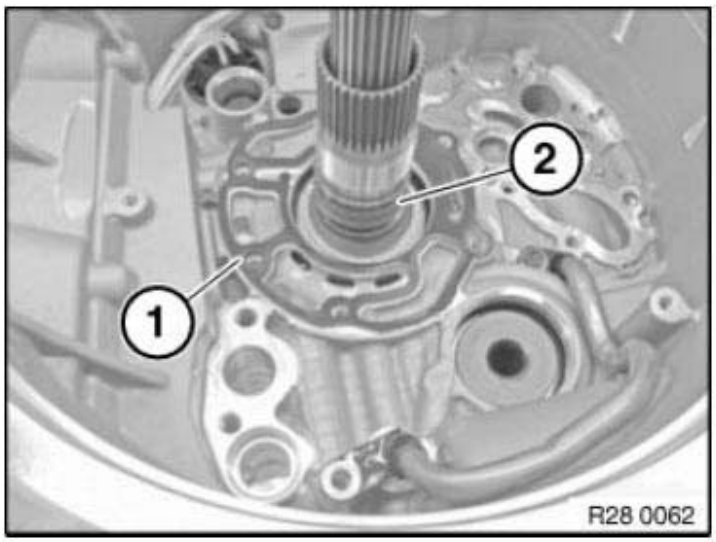


Fig. 19: Identifying Seal With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

28 10 020 REMOVING AND INSTALLING OR REPLACING COMBINATION SENSOR (GS7D36SG)

IMPORTANT: After completion of work, check oil level. .
Use only the DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary work

- Remove **twin-clutch gearbox**
- Remove **clutch**

Release screw (1).

Release combination sensor (2) from housing.

Disconnect connector (3).

Installation note:

Replace screw.

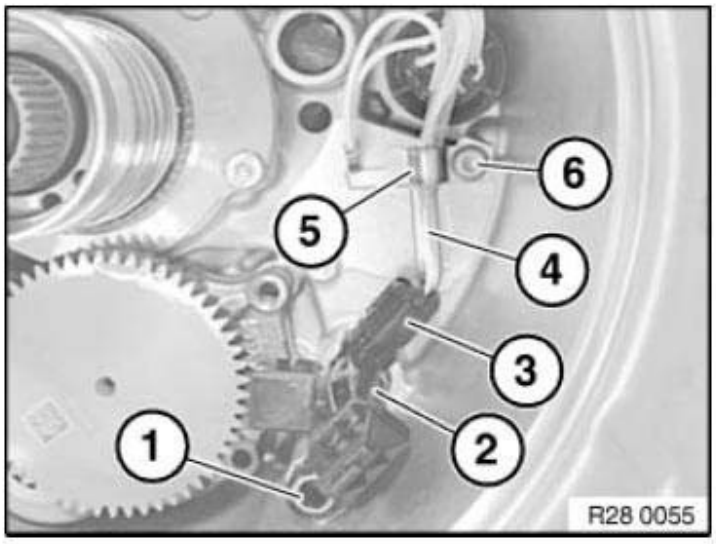


Fig. 20: Identifying Screw, Combination Sensor, Connector, Cable And Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not where possible release cable (4) from bracket (5).

Installation note:

If bracket (5) does have to be released, replace aluminum screw (6).

Tightening torque, see 28 10 11AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

IMPORTANT: To disconnect the combination sensor connector:
Press lock together in area (1) and simultaneously detach connector.

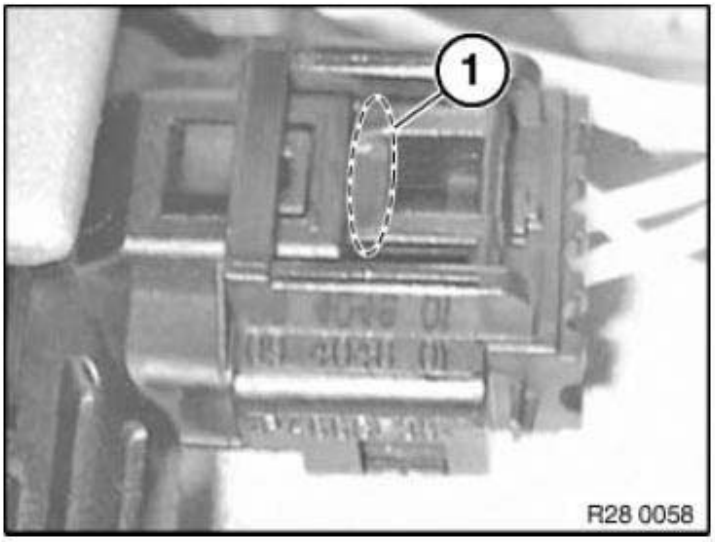


Fig. 21: Pressing Combination Sensor Connector Lock
Courtesy of BMW OF NORTH AMERICA, INC.

28 10 010 REMOVING AND INSTALLING OR REPLACING PUMP UNIT (GS7D36SG)

IMPORTANT: After completion of work, check oil level. .
Checking/topping up oil level in twin-clutch gearbox (GS7D36SG). Use only the approved transmission oil DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary work

- Remove **twin-clutch gearbox**
- Remove **clutch**

Release screws (1).

Tightening torque, see 28 10 7AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Remove oil separator (2).

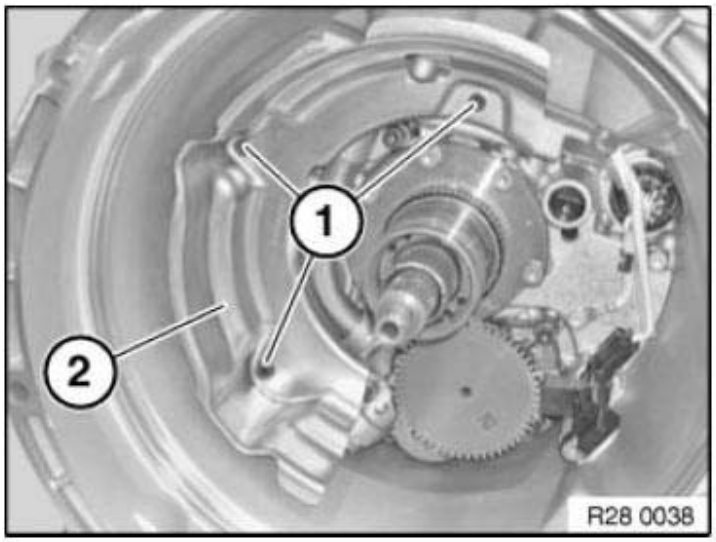


Fig. 22: Identifying Oil Separator And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 28 10 6AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Disconnect connector (3).

Release combination sensor (2) from housing.

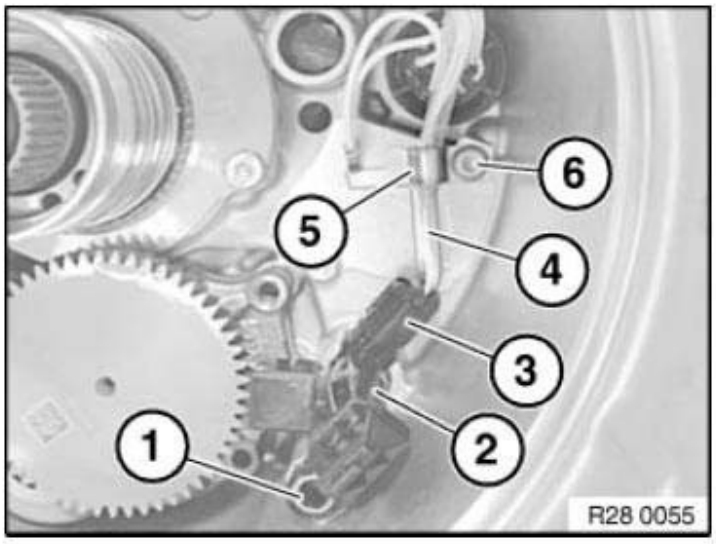


Fig. 23: Identifying Combination Sensor, Connector And Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and (2).

Tightening torque, see 28 10 8AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Installation note:

Observe installation position and screw length.

Replace sealing washer on screw (2).

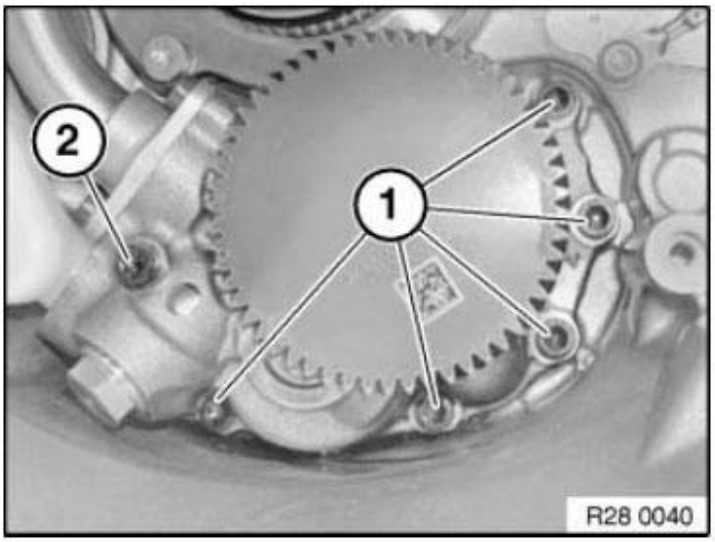


Fig. 24: Identifying Sealing Washer With Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque, see 28 10 9AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Release oil pump with pressure pipe (2) and return line (3) from housing.

Installation note:

Replace flat seal (4).

During reinstallation O-ring remains on return line.

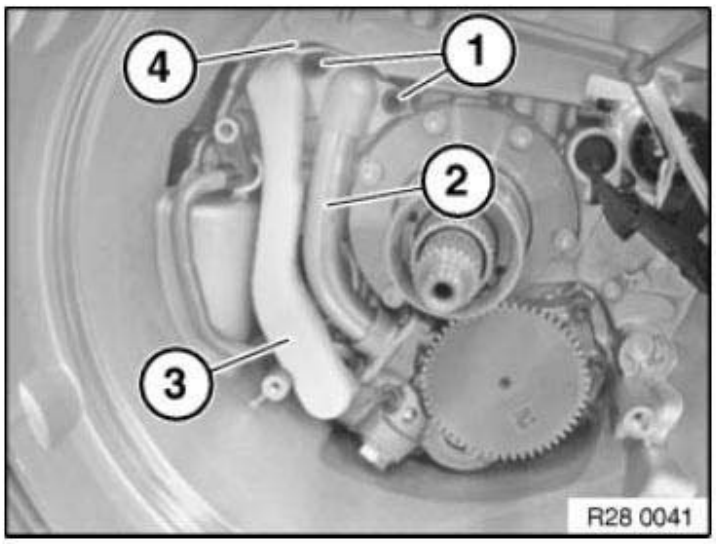


Fig. 25: Identifying Screws, Pressure Pipe, Return Line And Flat Seal
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: The pressure pipe must not be detached from the pump.

IMPORTANT: Before installing oil pump:
Depending on version, there is a bore hole and a recess for the O-ring (1).
If the bore hole is present, attention must be paid to ensuring the O-ring (1) is in the right installation position and correctly seated behind the pump.

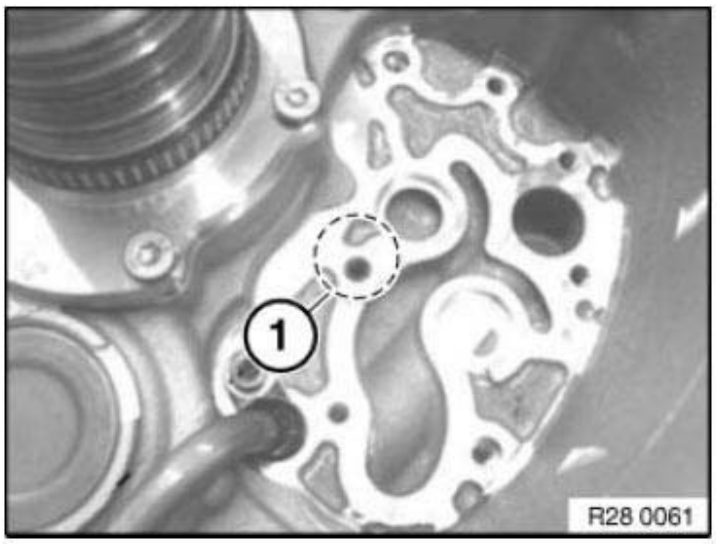


Fig. 26: Identifying O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT:

Installation sequence, oil pump

1. Moisten O-ring with transmission oil
2. Position pump in transmission using centering sleeves.
3. Gently insert screws (1) with pressure pipe
4. Press in return line (2) until it audibly snaps into place
5. Screw in oil pump
6. The tightening sequence from 1-8 is mandatory

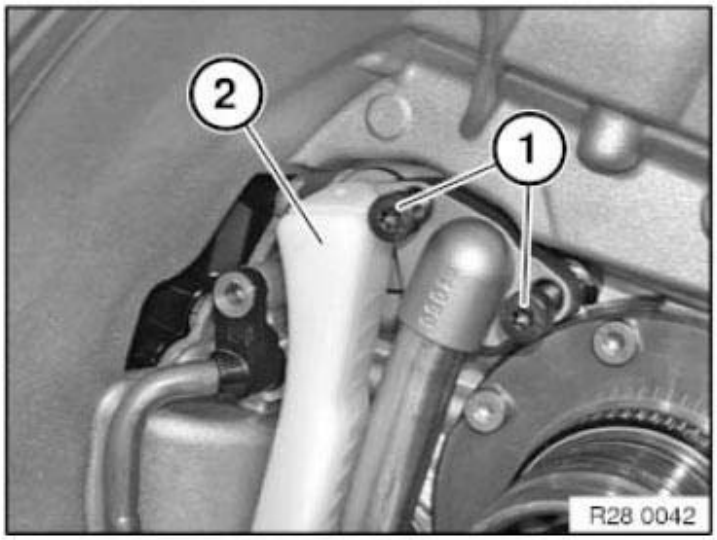


Fig. 27: Identifying Return Line With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Centering sleeves must not be damaged or crushed.

IMPORTANT:

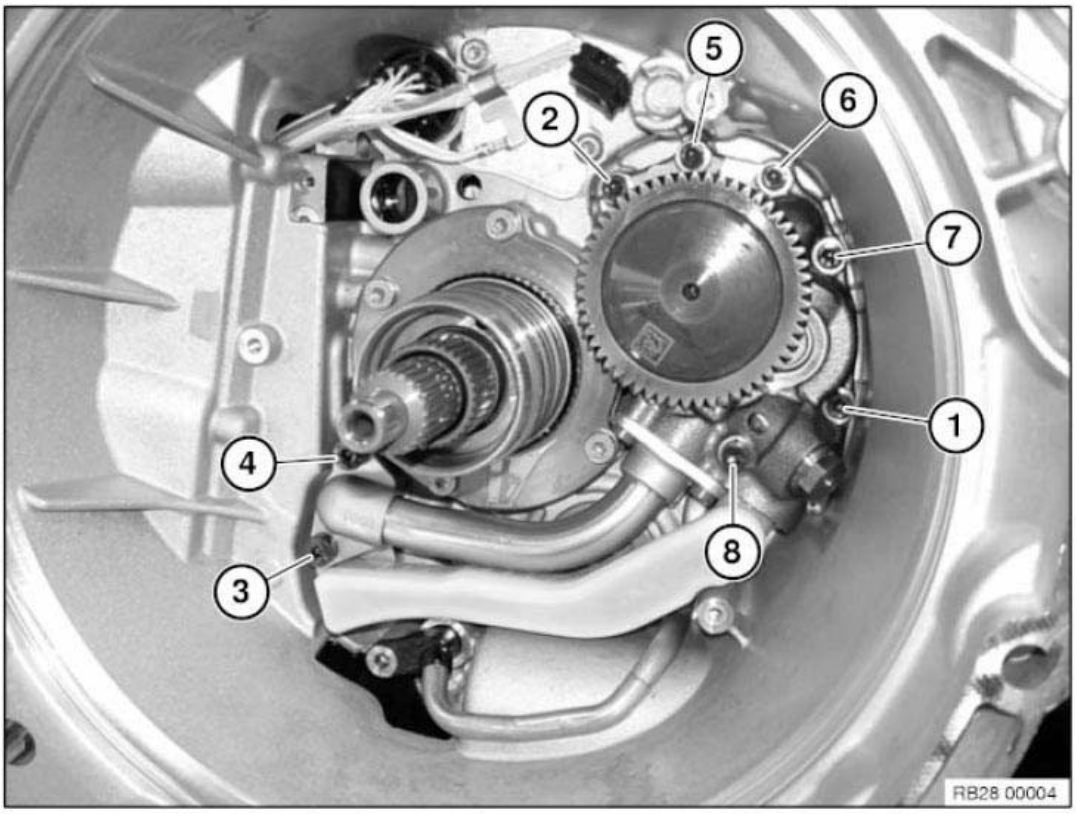


Fig. 28: Bolts Tightening Sequence Of Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

28 02 020 REMOVING AND INSTALLING OR REPLACING TRANSMISSION OIL SUMP (GS7D36SG)

IMPORTANT: Remove transmission oil sump only after it has cooled down.
It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before the hydraulic cap is loosened.
After completion of work, check oil level. .
Use only the DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

Recycling

Catch and dispose of escaping transmission oil.

Observe country-specific waste disposal regulations.

Necessary preliminary work

- Remove rear underbody protection.

Remove oil drain plug (1).

Tightening torque, see 28 00 3AZ in **28 00 DOUBLE CLUTCH GEARBOX** .

Drain off transmission oil.

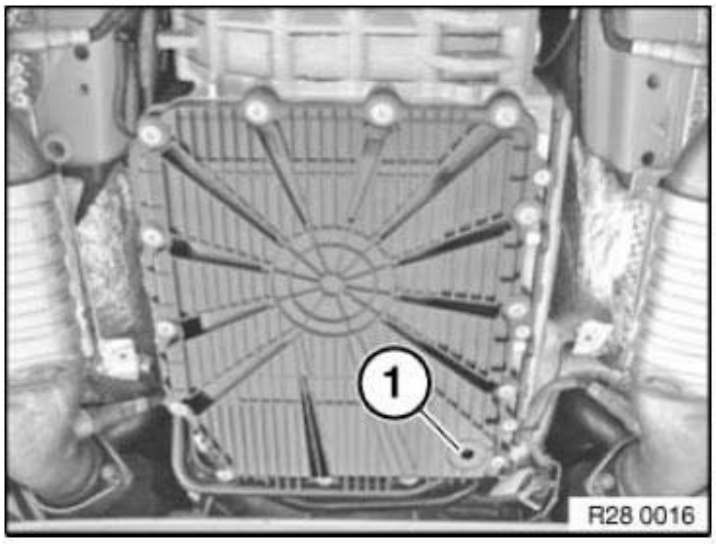


Fig. 29: Identifying Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew all bolts.

Remove transmission oil sump (1).

Installation note:

Clean sealing ring groove with fluff-free cloth.

Installation note:

Insert screws until contact with screw heads is made.

Screw down to torque in specified sequence (1-14).

Tightening torque, see 28 00 4AZ in **28 00 DOUBLE CLUTCH GEARBOX** .

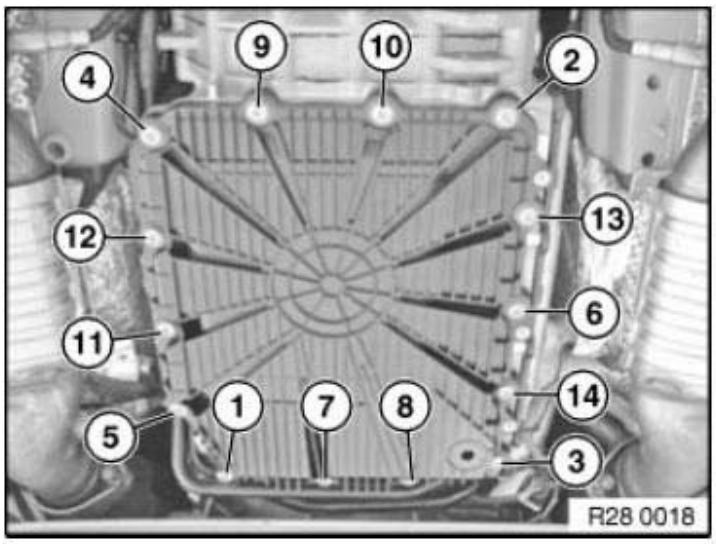


Fig. 30: Identifying Transmission Oil Sump With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

28 40 010 REMOVING AND INSTALLING OR REPLACING TWIN CLUTCH (GS7D36SG)

IMPORTANT: After completing work:

- **Check oil level. .**

  Use only the DCTF-1 Pentosin (P/N 83 22 2 147 477) approved transmission oil . .

- **Perform clutch adaptation (Service Functions).**
- **Teach in valve characteristics (Service Functions).**

Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

IMPORTANT: Twin-clutch gearbox must be on neutral (position "N") prior to removal of clutch or gear box!
Gear shifts are only possible with the engine running.
To prevent the transmission oil from spilling out, set the gearbox upright before removing the twin clutch.

Necessary preliminary tasks

- Remove twin-clutch gearbox
- Remove **clutch cover**

IMPORTANT: The clutch cage can only be removed and installed with special tool 23 0 400 . Special tool 23 0 400 must be pushed in entirely and rest flush on clutch cage. If necessary, turn the gearbox input shafts relative to each other.

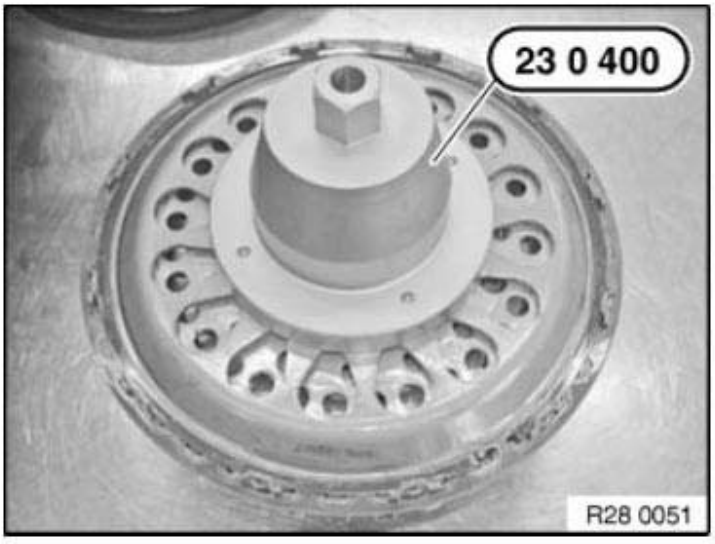


Fig. 31: Installing Clutch Cage Using Special Tool (23 0 400)
Courtesy of BMW OF NORTH AMERICA, INC.

Push parking lock lever (1) all the way up and secure it with cable strap (2).

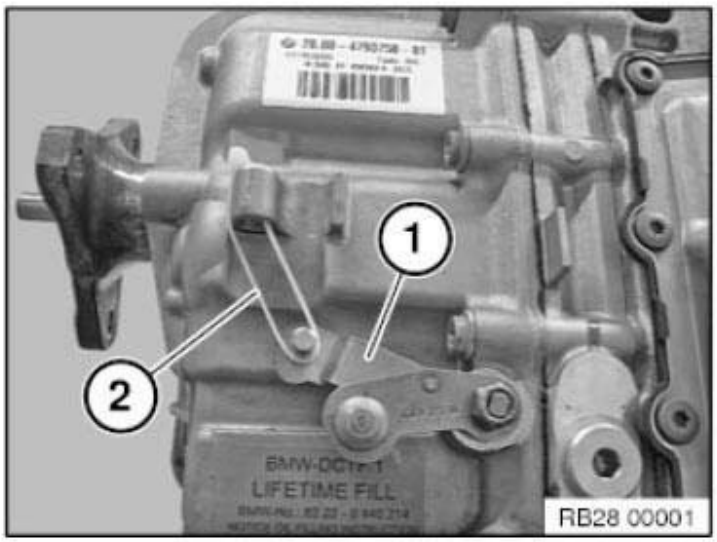


Fig. 32: Identifying Parking Lock Lever And Cable Strap
Courtesy of BMW OF NORTH AMERICA, INC.

Rotate drive shaft (1) until holes (2) are directly visible.

Check clearance with a suitable tool.

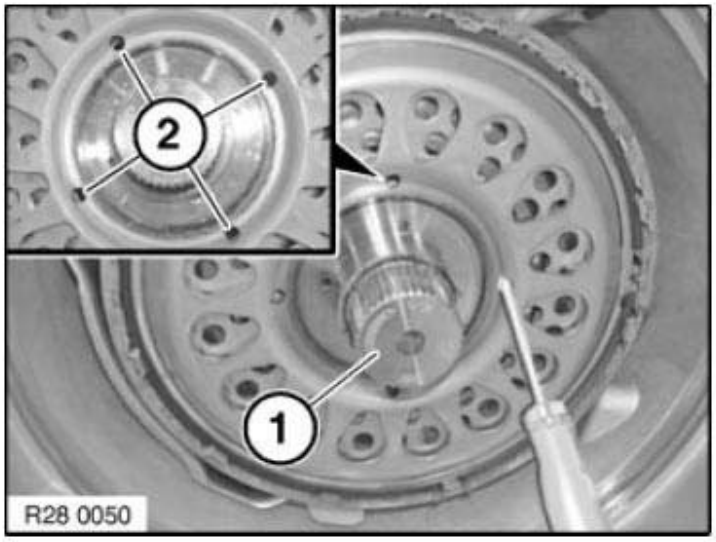


Fig. 33: Identifying Drive Shaft With Holes
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool **23 0 400** and turn anticlockwise to release clutch (approx. 8 turns).

Pull clutch out of housing.

Installation note:

Set gearbox upright.

The clutch is correctly installed if the oil pump gear turns.

Install the clutch with special tool **23 0 400** while constantly rotating.

Turn clockwise up to stop, then screw down to torque.

Tightening torque, see 28 40 1AZ in **28 40 DOUBLE CLUTCH GEARBOX (DKG)** .

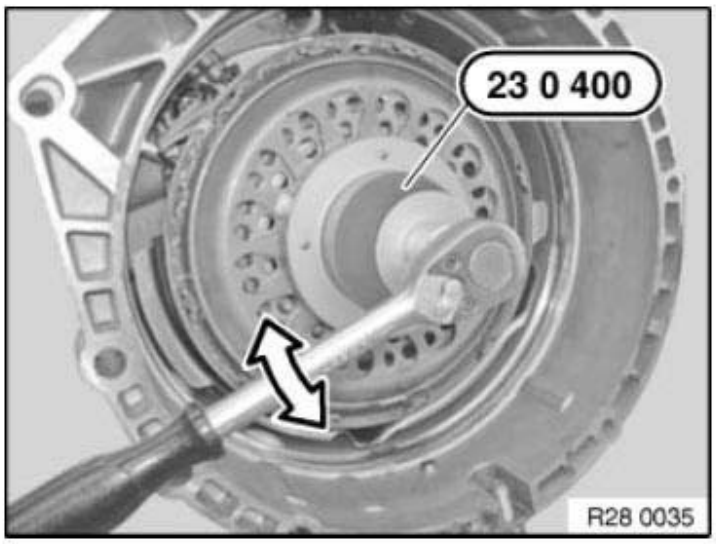


Fig. 34: Pulling Clutch From Housing Special Tool (23 0 400)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Warning: Installing the clutch may involve the danger of injury!

Installation note:

Under no circumstances are hammers or other pounding tools to be used when installing the clutch.

The clutch must be slid over the piston rings and onto the clutch support.

IMPORTANT: When reinstalling the clutch, check that piston rings (1) and needle bearing (2) are present and correctly seated on the clutch support.
Mount clutch carefully to clutch support/do not tilt, to avoid damaging the piston rings (1).

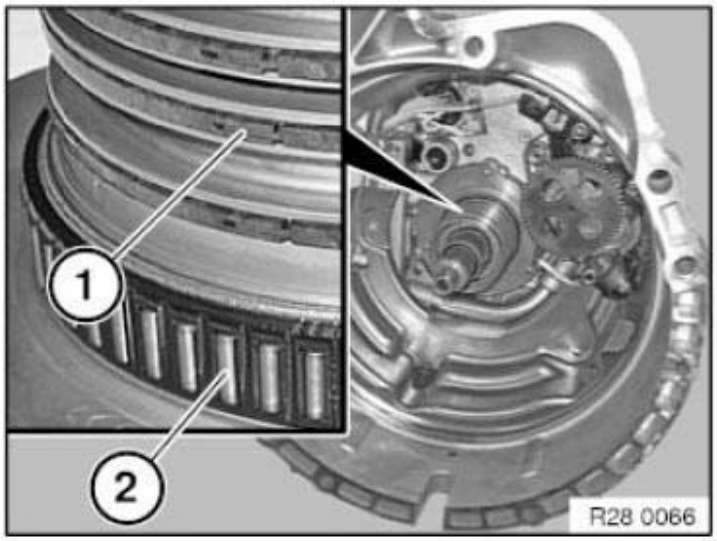


Fig. 35: Identifying Piston Rings And Needle Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

28 00 001 REMOVING AND INSTALLING TWIN-CLUTCH GEARBOX (GS7D36SG) N54

IMPORTANT: Before the gearbox is removed, it is imperative that a read-out is taken of the specific gearbox data status.
After completion of work, check oil level. .
Use only the approved DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this requirement will result in serious damage to the twin-clutch gearbox!
Apply a thin coating of "MI_Setral- 43N" grease to transmission input shaft!

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.
Aluminum screws/bolts are permitted with and without color coding (blue).
For reliable identification:
Aluminum screws/bolts are not magnetic.
Jointing torque and angle of rotation must be observed without fail (risk of damage).

Necessary preliminary work

- Read out transmission data of the gearbox to be replaced with the BMW diagnosis system
- Clamp off **BATTERY NEGATIVE LEAD** .
- Remove underbody protection at front and rear. See **51 47 490 REMOVING AND INSTALLING/REPLACING FRONT UNDERBODY PROTECTION** .
- Remove complete **EXHAUST SYSTEM** .
- Support engine with lifter when removing transmission.

Release screws (1).

Remove exhaust bracket (2).

Remove bracket (3).

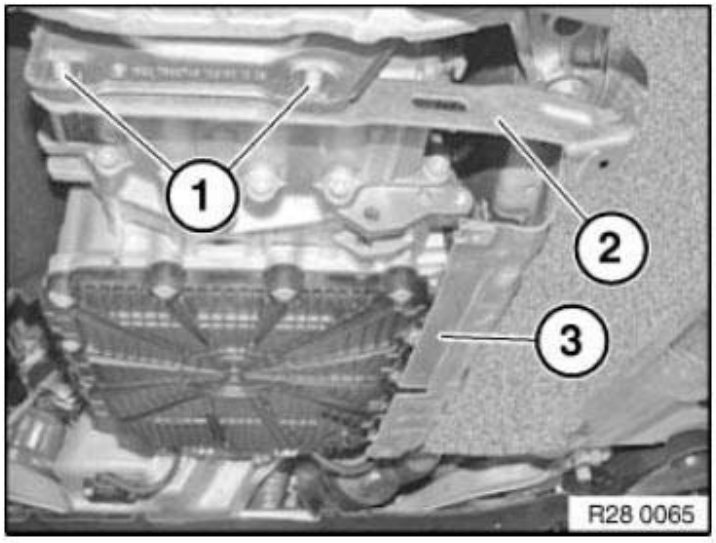


Fig. 36: Identifying Bracket, Exhaust Bracket And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect connectors (1) and release leads.

Unfasten screws (2).

Remove cover plate (4).

Release aluminum bolt (3) on right next to cable retaining plate.

Aluminum screws must be replaced.

Tightening torque, see 28 00 1AZ in **28 00 DOUBLE CLUTCH GEARBOX** .

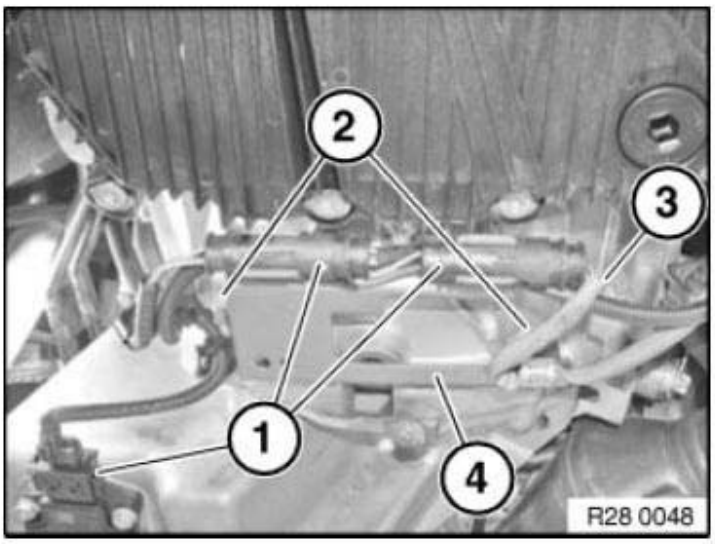


Fig. 37: Identifying Cover Plate, Connectors, Screws And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Unlock retainer (2).

Release cable from lever and holder.

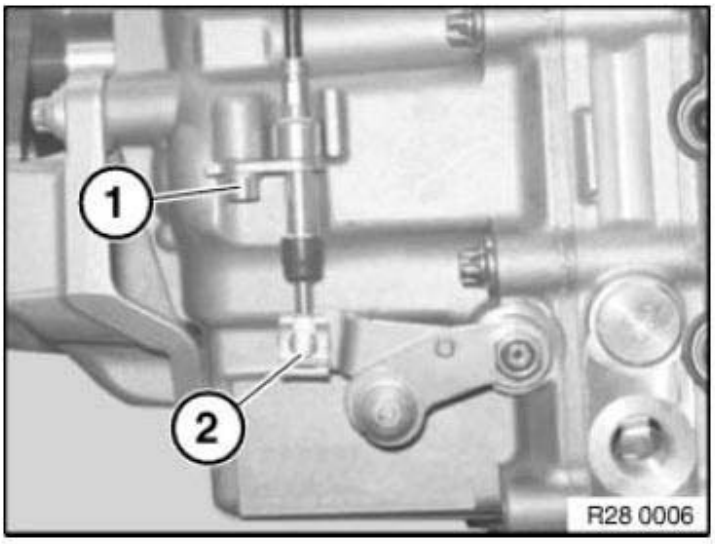


Fig. 38: Identifying Screw And Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools **23 4 050** .

Secure transmission to mounting with tensioning strap (1).

Torque is in **TRANSMISSION HOLDER** .

After completion of work, check **oil level**.

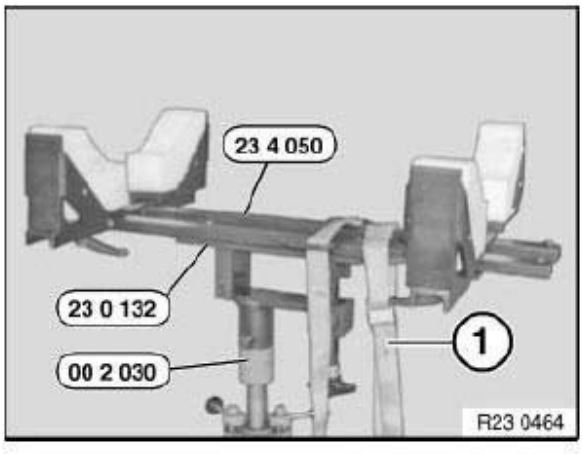


Fig. 39: Supporting Transmission Using Special Tools (23 4 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws (1) and nuts (2).

Remove transmission cross-member.

Tightening torque **22 32 3AZ/4AZ** .

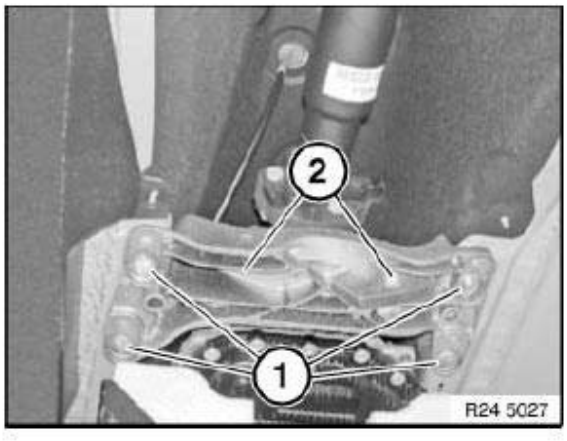


Fig. 40: Identifying Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **PROPELLER SHAFT** .

Release screw (1).

Disconnect hydraulic lines (2) to transmission oil cooler.

Seal off pipes and connection holes on gearbox with plugs.

Installation note:

Replace sealing rings.

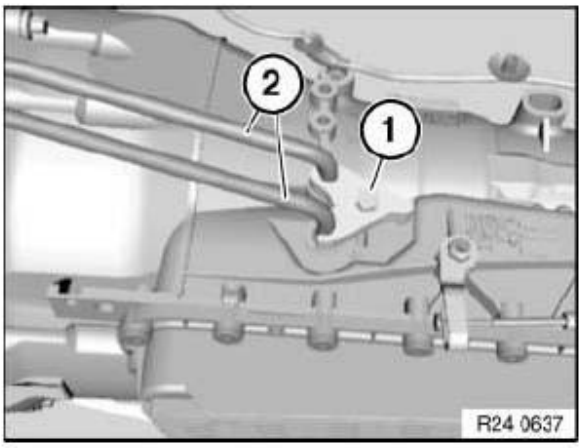


Fig. 41: Identifying Hydraulic Lines Of Transmission Fluid Cooler With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release nut (1) and bracket from transmission oil lines on oil sump.

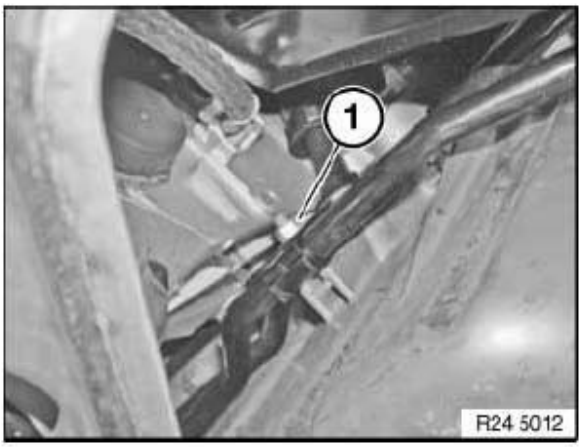


Fig. 42: Identifying Nut On Oil Sump
Courtesy of BMW OF NORTH AMERICA, INC.

- Lower transmission
- Unlock central transmission plug (1) by turning and disconnect.

- Do not touch pins.
- Release cable from retainers.

Operations are described in

Notes on mechatronics

IMPORTANT: Read and comply with important note.

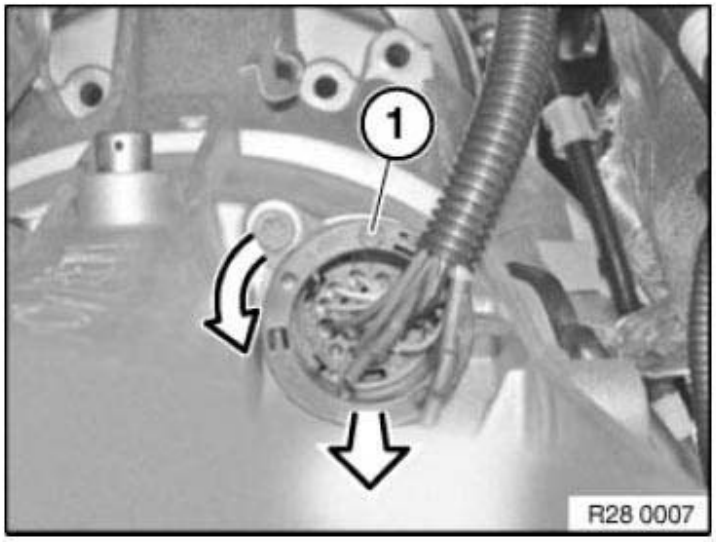


Fig. 43: Removing Central Transmission Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Pay attention to routing and length of wiring harness.

Insert special tool **24 2 390** in sealing cup (1).

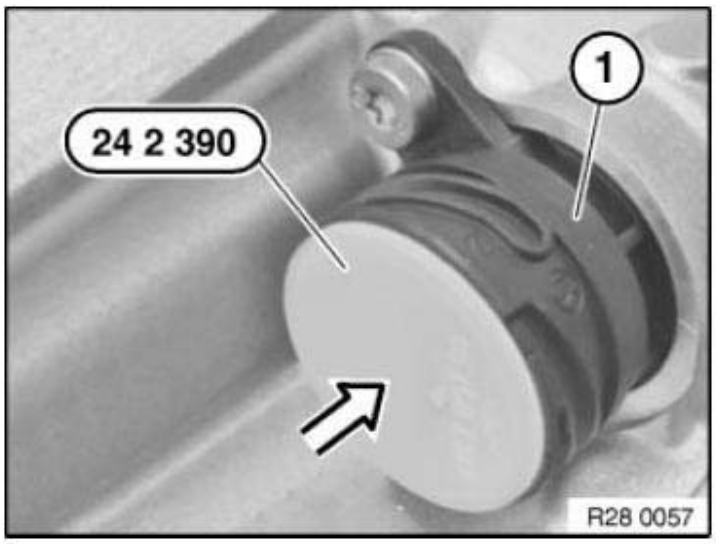


Fig. 44: Inserting Special Tool (24 2 390) In Sealing Cup
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Installation note:

Observe **screw fastening sequence** without fail.

Tightening torque, see 28 00 1AZ in **28 00 DOUBLE CLUTCH GEARBOX** .

Aluminum screws **must** be replaced.

Tightening torque and angle of rotation, aluminum screws (7.8.9.10.11), see 28 00 1AZ in **28 00 DOUBLE CLUTCH GEARBOX**

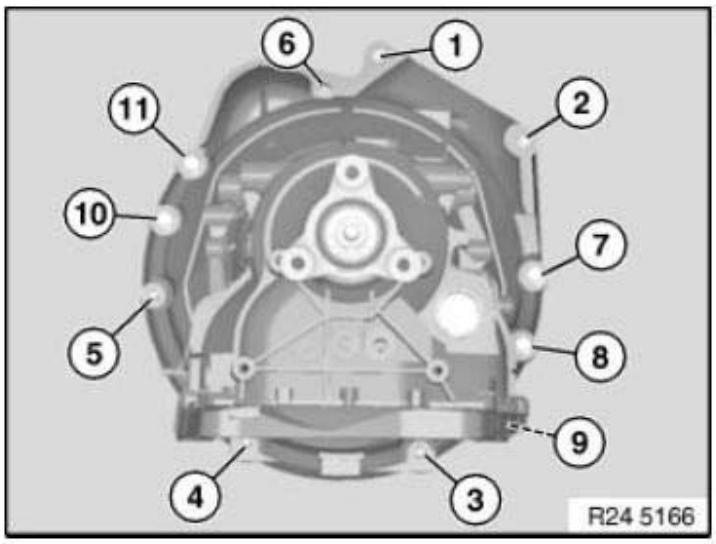


Fig. 45: Identifying Screw Fastening Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Tighten down screws/bolts to specified torque.

Special angle-of-rotation tool **00 9 120** with **00 9 130 MAGNET**

Secure to floor plate and screw down aluminum screws/bolts in accordance with angle of rotation.

Angle of rotation, see **28 00 1AZ** in **28 00 DOUBLE CLUTCH GEARBOX** .

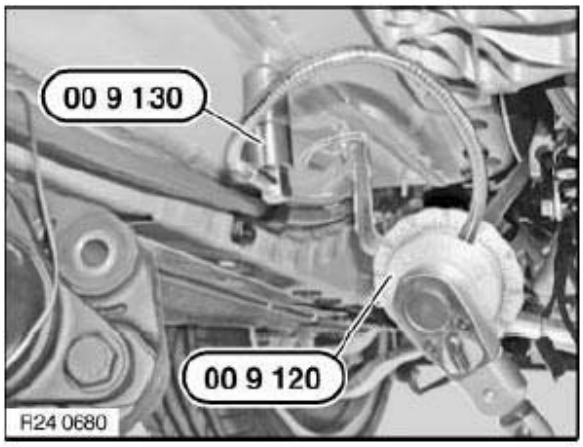


Fig. 46: Securing Angle Of Rotation Using Special Tool (00 9 120) And Magnet (00 9 130)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Apply a thin coating of "MI_Setral-43N" grease to transmission input shaft!

BMW part number EU: 83 23 2 152 082

BMW part number USA: 83 23 2 152 081

Check that fitting sleeves are correctly fitted.

Replace damaged fitting sleeves.

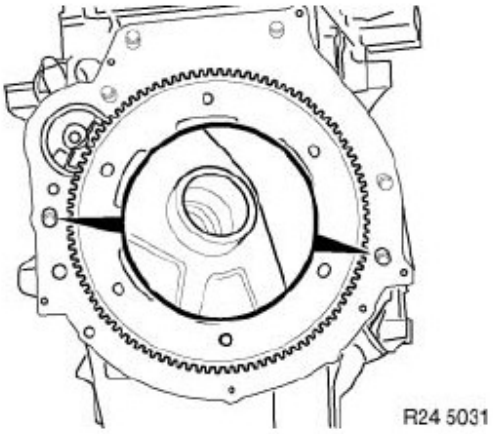


Fig. 47: Identifying Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

28 60 030 REMOVING AND INSTALLING/REPLACING THE HYDRAULIC CAP (GS7D36SG)

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before the hydraulic cap is loosened.
After completion of work, check oil level..
Use only the DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary work

- Remove **twin-clutch gearbox**

Place twin clutch transmission on a suitable surface.

To prevent the transmission oil from spilling out, make sure that the hydraulic cap points upward.

Release screws.

Remove hydraulic cover (1).

Installation note:

Replace seal.

Replace screws.

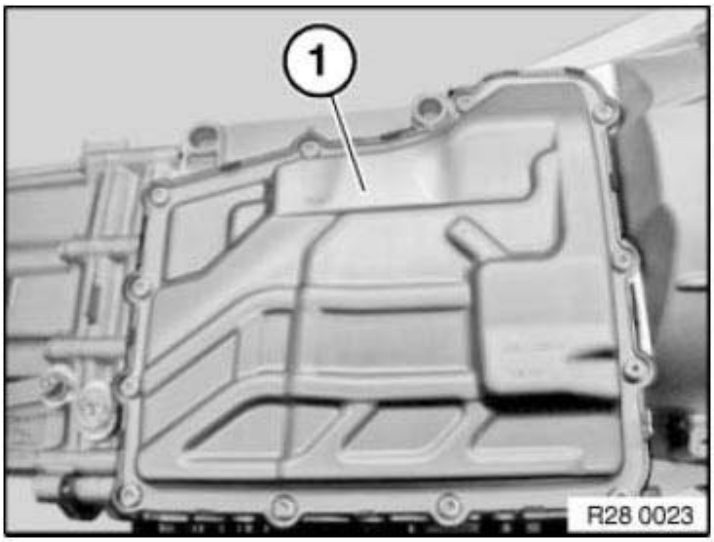


Fig. 48: Identifying Hydraulic Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation of hydraulic cap:

Make sure seal is exactly seated.

It is mandatory to comply with the specified order of screw connections 1-12.

Tightening torque, see 28 60 1AZ in **28 60 CONTROL UNIT, MECHATRONICS, HYDRAULICS** .

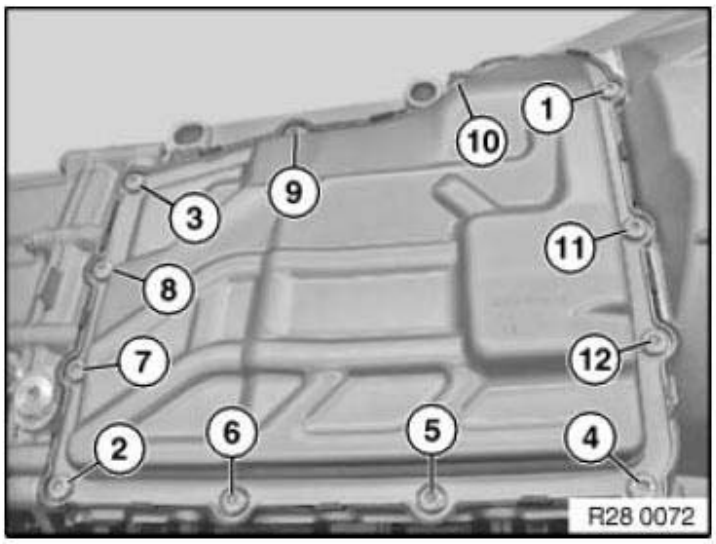


Fig. 49: Identifying Hydraulic Cover Screw Connections
Courtesy of BMW OF NORTH AMERICA, INC.

28 60 514 REPLACING MECHATRONICS (GS7D36SG)

NOTE: When replacing mechatronics:

- **Import present transmission data into new mechatronics**

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before the hydraulic cap is loosened.
After completion of work, check oil level. .
Use only the approved transmission oil DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary tasks

- Read out transmission data of mechatronics to be replaced
- Remove **twin-clutch gearbox**

Place twin clutch transmission on a suitable surface.

To prevent the transmission oil from spilling out, make sure that the hydraulic cap points upward.

Remove **hydraulic cap** .

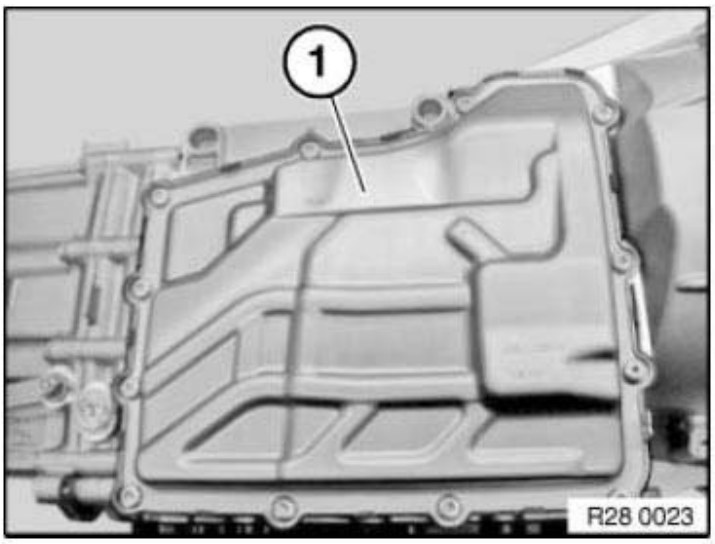


Fig. 50: Identifying Hydraulic Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Ensure correct installation position.

Press holder (2) together from right and release cable (1).

Installation note:

Replace holder.

Retaining lugs must point to the right.

If fitted: Pull out CPA pin (7) to second locking position.

Release connector lock (6) and at same time detach connector (3) from retaining tabs (5) towards right.

IMPORTANT: Bridge (4) of connector must not break.
Wiring harness must be replaced if bridge breaks.

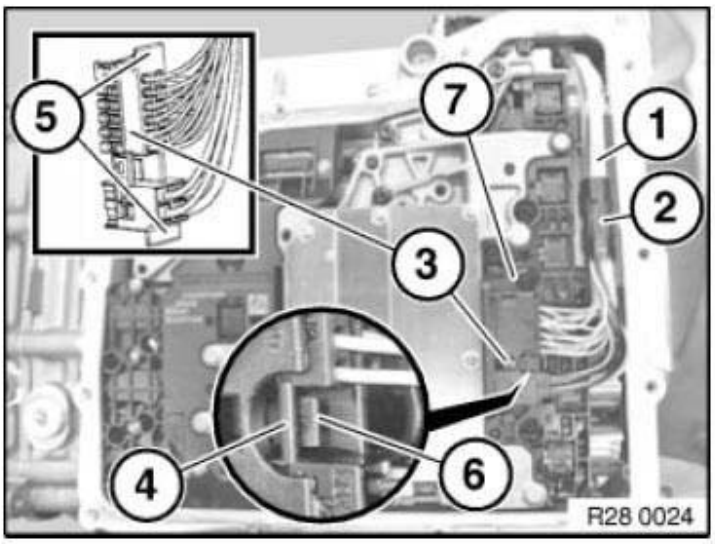


Fig. 51: Identifying Holder, Cable, Retaining Tabs, CPA Pin, Connector Lock And Bridge
Courtesy of BMW OF NORTH AMERICA, INC.

CPA (1) in second locking position.

Installation note:

Press CPA pin down until it is flush with the housing.

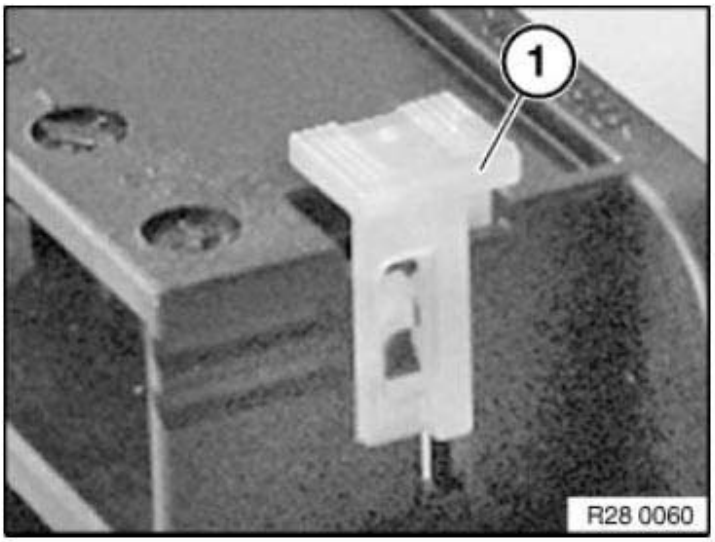


Fig. 52: Identifying CPA Pin
Courtesy of BMW OF NORTH AMERICA, INC.

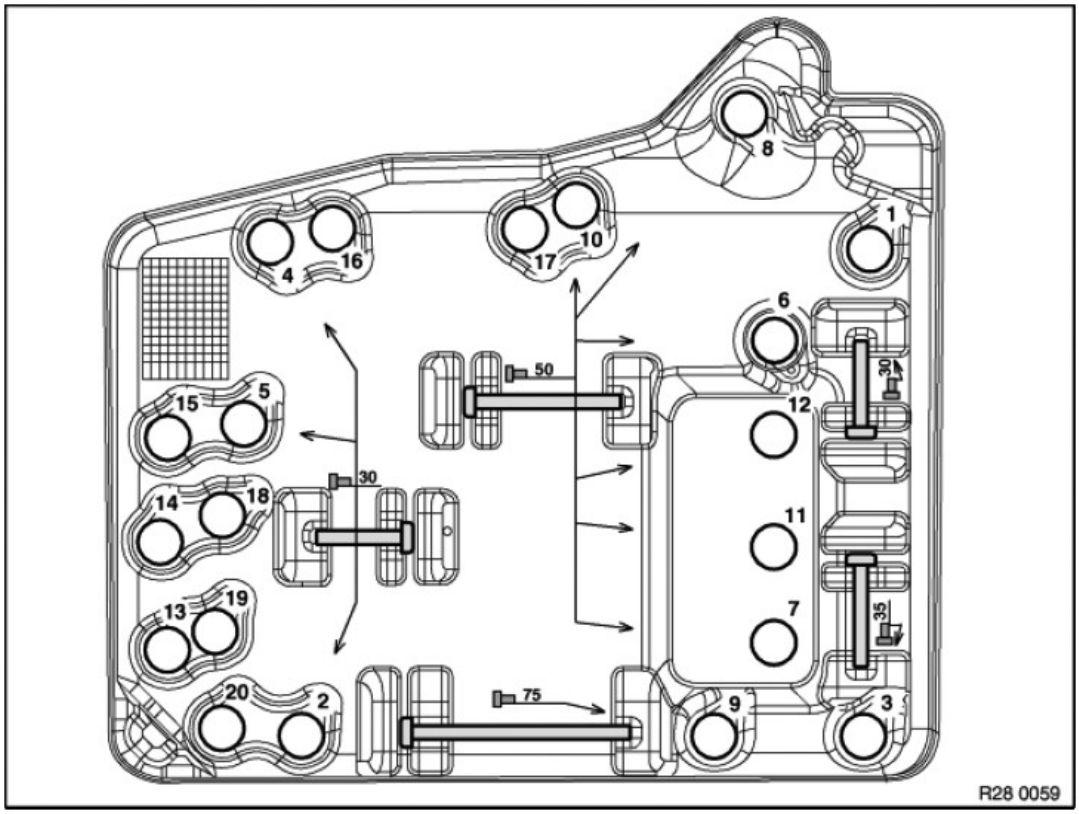


Fig. 53: Placing Mounting Template Over Mechatronics
Courtesy of BMW OF NORTH AMERICA, INC.

Place mounting template over mechatronics.

Open screws 1-20.

NOTE: Replace screws 1-12.
Screws 13-20 remain captive on module.
Remove mounting template.

Lift mechatronics out of housing.

Remove metal bead gasket.

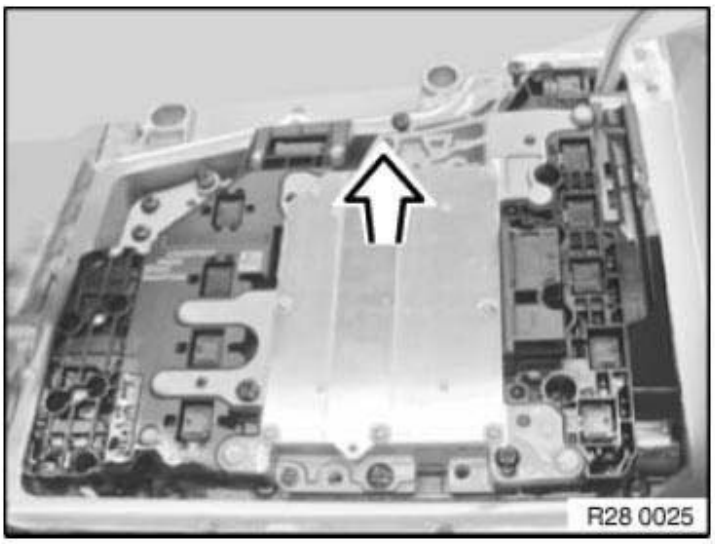


Fig. 54: Lifting Mechatronics From Housing
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Check the installation position of the centering pins (1).
The centering pins (1) of the mechatronics remain in the housing.

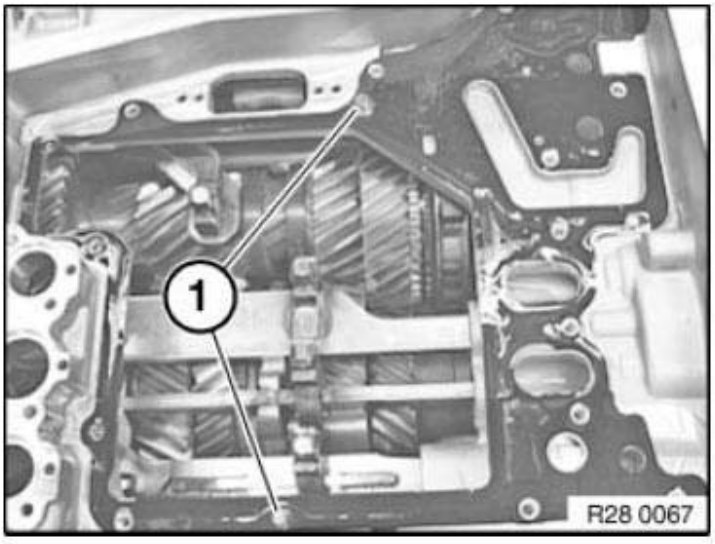


Fig. 55: Identifying Centering Pins
Courtesy of BMW OF NORTH AMERICA, INC.

The new mechatronics are supplied with the shift piston in neutral position as illustrated.

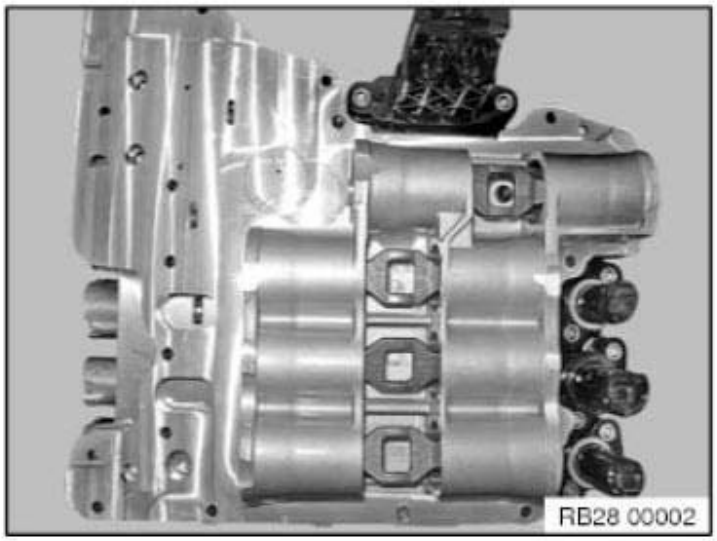


Fig. 56: Identifying Mechatronics Shift Piston In Neutral Position
Courtesy of BMW OF NORTH AMERICA, INC.

In the gearbox the gearshift rods must be set to neutral position (N) as illustrated before the new mechatronics are fitted.

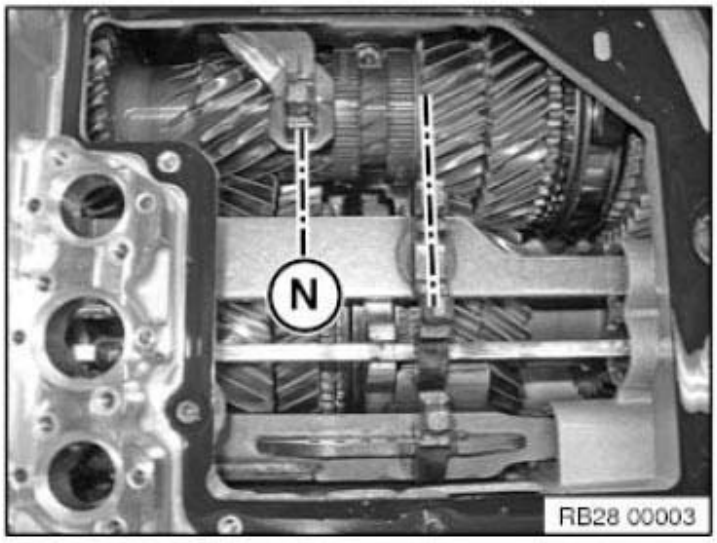


Fig. 57: Identifying Gearshift Rods In Neutral Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installing mechatronics

Install a new metal bead gasket.

Install mechatronics.

Fit mounting template.

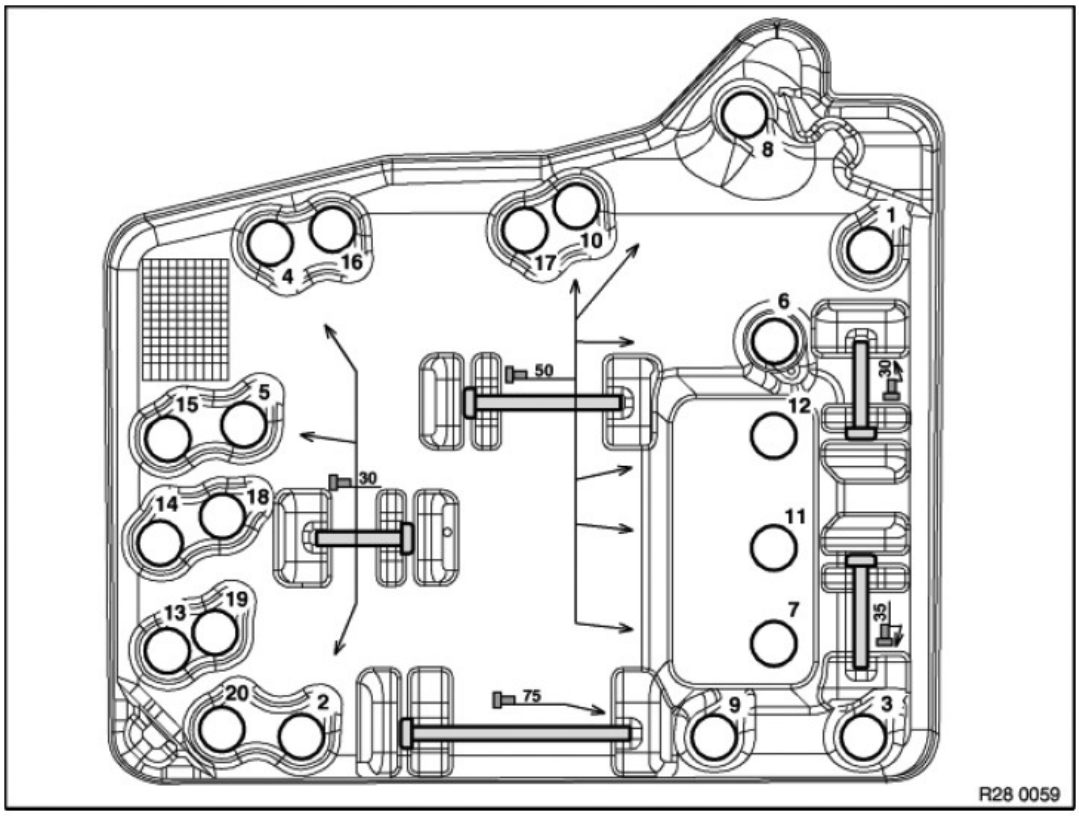


Fig. 58: Placing Mounting Template Over Mechatronics
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Adhere without fail to the screwing sequence indicated on the template. The screw length can be checked by means of the insert pockets shaped in the template.

1. **Insert screws in sequence 1-12 and pre-tighten to 2 Nm.**
2. **Tighten down screws 1-12 to tightening torque and angle of rotation. See 28 60 2AZ in 28 60 CONTROL UNIT, MECHATRONICS, HYDRAULICS .**
3. **Tighten down screws in sequence 13-20 to 5 Nm.**
4. **Remove mounting template.**

28 00 060 REPLACING OUTPUT FLANGE RADIAL SHAFT SEAL (GS7D36SG)

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before the hydraulic cap is loosened.
After completion of work, check oil level. .
Use only the approved transmission oil DCTF-1 Pentosin (P/N 83 22 2 147 477).
Failure to comply with this instruction will result in serious damage to the twin-

clutch gearbox.

Necessary preliminary work

- Remove underbody protection. See **REMOVING AND INSTALLING/REPLACING FRONT UNDERBODY PROTECTION**
- Remove heat shields.
- Remove **EXHAUST SYSTEM** .
- Support transmission from underneath. See **23 ... UNIVERSAL BMW TRANSMISSION TAKE-UP** .
- Remove transmission cross member.

- Remove propeller shaft.
- Tasks are described in **PROPELLER SHAFT** .

NOTE: To rotate propeller shaft, unlock parking lock.

Release screws.

Remove transmission bearing block (1).

Tightening torque: **22 32 2AZ** .

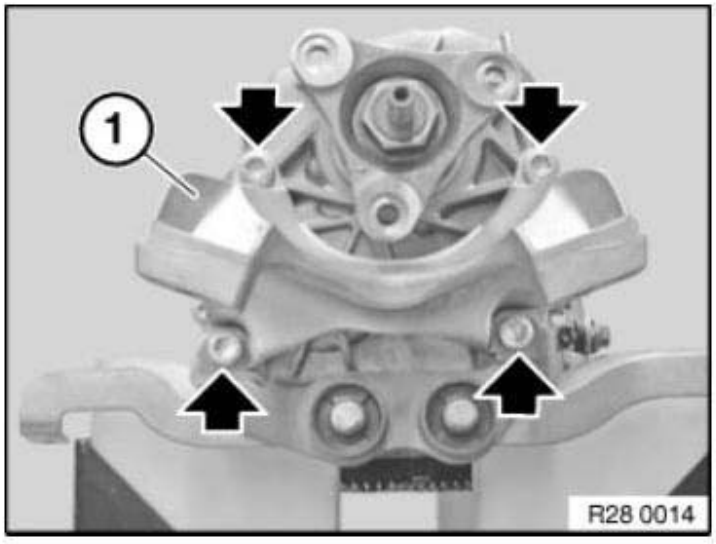


Fig. 59: Identifying Bearing Block With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Grip output flange (1) with special tool **23 0 020** .

Release nut with special tool **23 2 320** .

Tightening torque, see 28 10 14AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Installation note:

Replace nut and secure with Loctite 243.

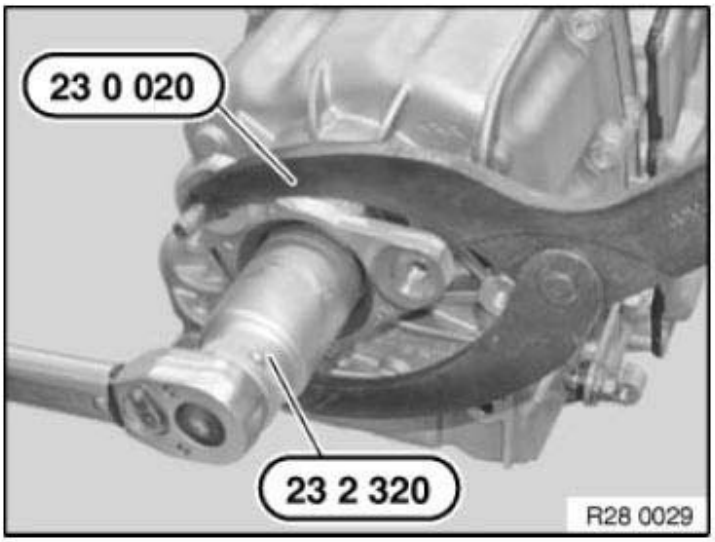


Fig. 60: Gripping Output Flange Using Special Tool (23 2 320)
Courtesy of BMW OF NORTH AMERICA, INC.

Detach output flange (1) with special tool **331 150 DEVICE** and adapter plate 33 1 154 from output shaft.

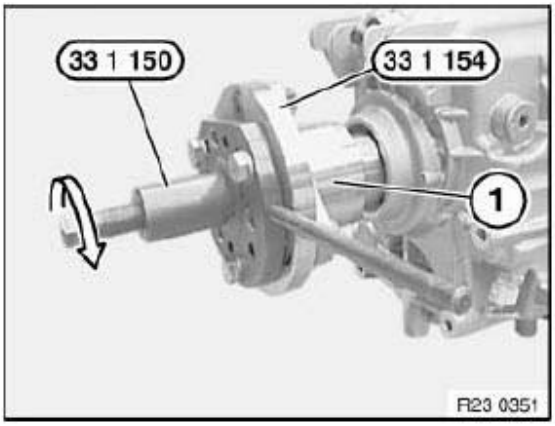


Fig. 61: Removing Output Flange Using Special Tool (33 1 150) And Adapter Plate (33 1 154)
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 24 2 353 to output shaft (1).

Graphic shows: Automatic transmission

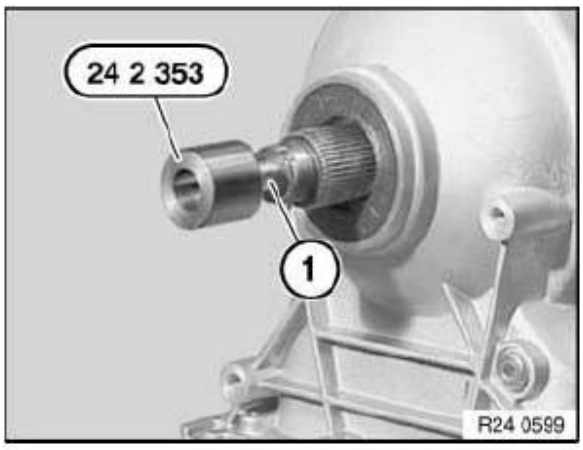


Fig. 62: Connecting Special Tool (24 2 353) To Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 24 2 351 until it is firmly connected with radial shaft seal.

Pull out radial shaft seal by screwing in special tool 24 2 352.

Graphic shows: Automatic transmission

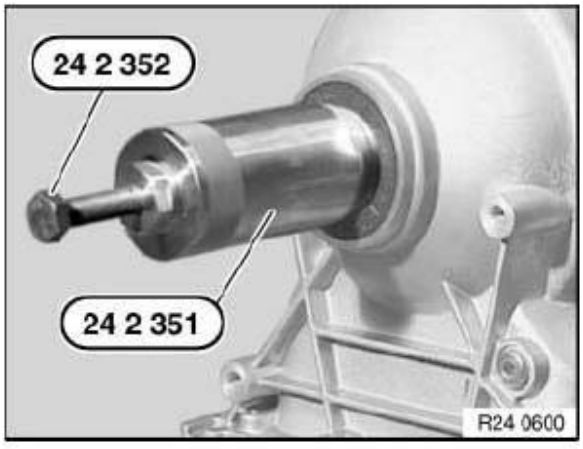


Fig. 63: Pulling Out Radial Shaft Seal Using Special Tool (24 2 352)
Courtesy of BMW OF NORTH AMERICA, INC.

Apply oil to the sealing lip of radial shaft seal (1). Drive in radial shaft seal (1) with special tool **23 0 410** as far as it will go.

Graphic shows: Automatic transmission

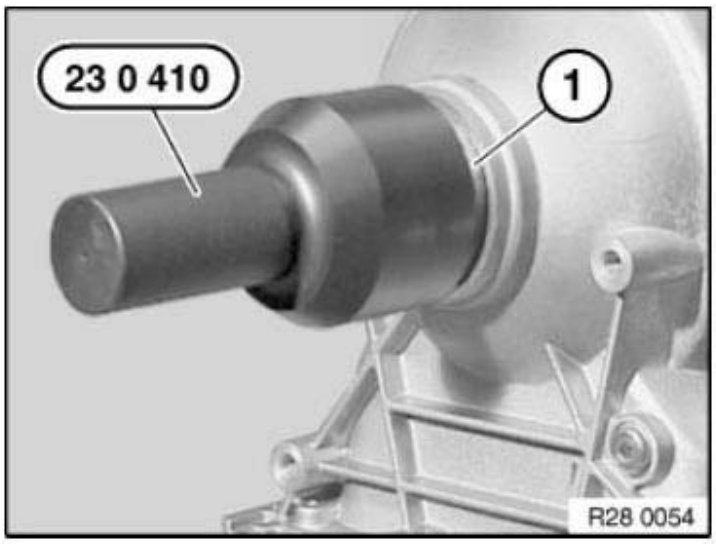


Fig. 64: Applying Oil To Radial Shaft Seal Sealing Lip
Courtesy of BMW OF NORTH AMERICA, INC.

28 60 000 REPLACING PRESSURE FILTER (GS7D36SG)

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before the hydraulic cap is loosened.
After completion of work, check oil level. .
Use only the DCTF-1 Pentosin (P/N 83 22 2 147 477) approved transmission oil.
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

Recycling

Catch and dispose of escaping transmission oil.

Observe country-specific waste disposal regulations.

Necessary preliminary work

- Remove underbody protection at front and rear. See **51 47 490 REMOVING AND INSTALLING/REPLACING FRONT UNDERBODY PROTECTION**
- Remove **EXHAUST SYSTEM**
- Remove **PROPELLER SHAFT**

Supporting transmission

Support transmission with special tools **23 4 050** , **00-2030 DEVICE** .

Secure transmission with tensioning strap (1).

Tasks are described in **Gearbox holder** .

After completion of work, check **oil level**.

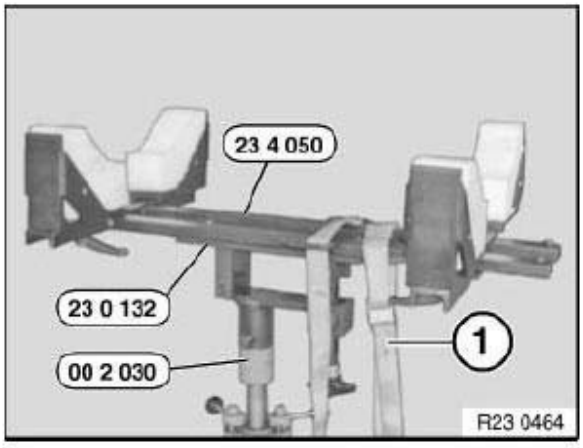


Fig. 65: Supporting Transmission Using Special Tools (23 4 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Lower engine with transmission until pressure filter lid (1) is accessible.

Remove retainer (2).

Installation note:

Replace retainer.

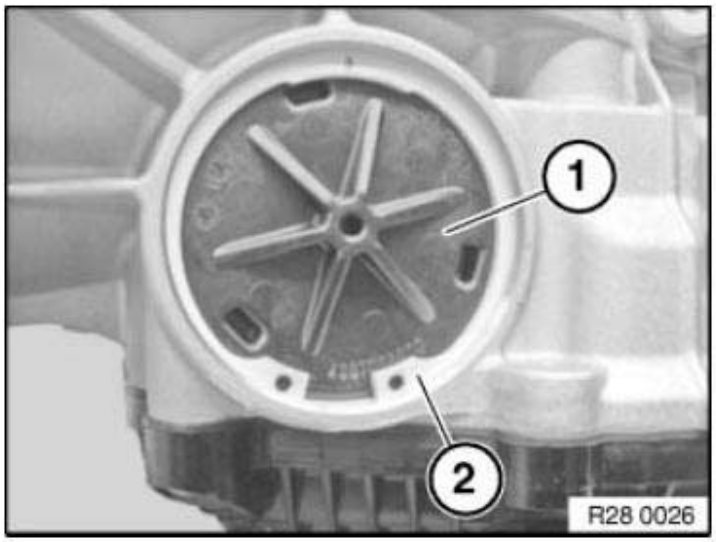


Fig. 66: Identifying Filter Lid And Retainer
Courtesy of BMW OF NORTH AMERICA, INC.

Lever out lid (1) with sealing ring.

Installation note:

Replace lid with sealing ring.

Lubricate sealing ring with transmission oil before installing.

IMPORTANT: Catch and dispose of escaping transmission oil.

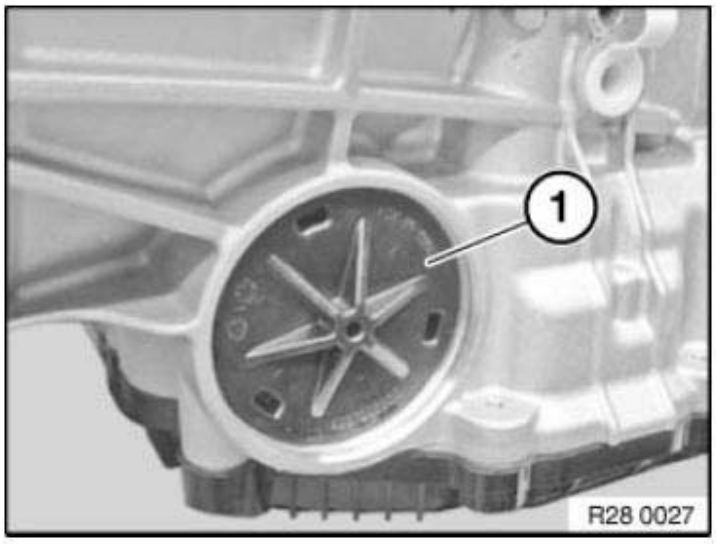


Fig. 67: Identifying Filter Lid With Sealing Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Remove pressure filter (1).

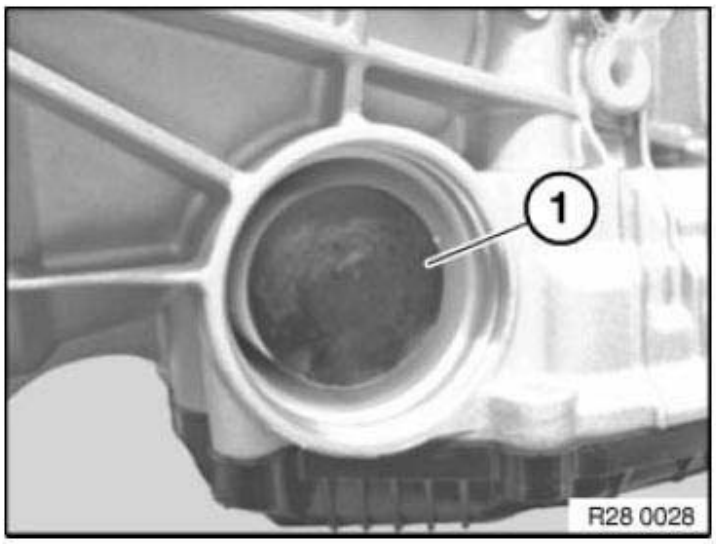


Fig. 68: Identifying Pressure Filter
Courtesy of BMW OF NORTH AMERICA, INC.

28 40 050 REPLACING SHAFT SEAL FOR CLUTCH COVER (GS7D36SG)

IMPORTANT: It is essential to adhere to conditions of absolute cleanliness. Any dirty parts must be cleaned before removing the clutch cover.

Necessary preliminary work

- Remove **clutch cover**

To prevent the transmission oil from spilling out, tilt the gearbox back before removing the clutch cover.

Installation note:

After completion of work, check **oil level**. .

Use only the DCTF-1 Pentosin (P/N 83 22 2 147 477) approved transmission oil.

Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

Use a suitable tool to take the radial shaft seal (1) off the clutch cover.

IMPORTANT: Risk of damage:
Damage to the clutch cover will result in oil leaks!
If the clutch cover was damaged on removing the radial shaft seal, it is imperative that the cover be replaced.

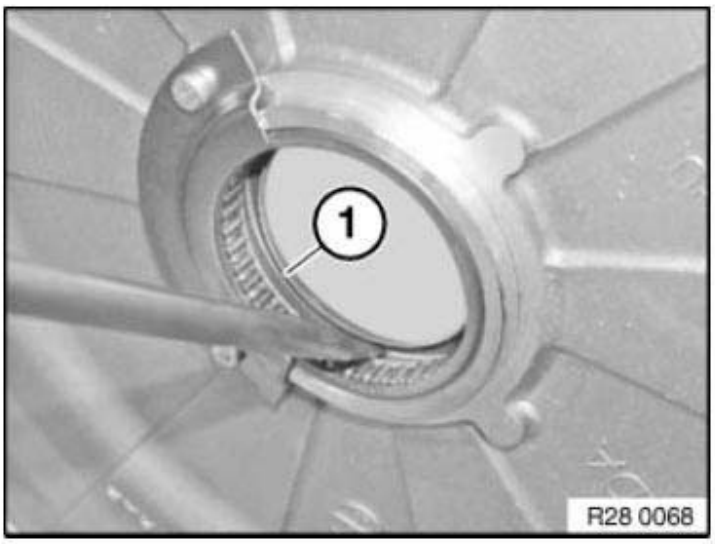


Fig. 69: Removing Radial Shaft Seal From Clutch Cover Using Suitable Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Place the clutch cover (1) out flat on a workbench.

IMPORTANT: Pay attention to lug (2).

Coat sealing lips of radial shaft seal with transmission oil.

Press the radial shaft seal (3) lightly into the clutch cover.

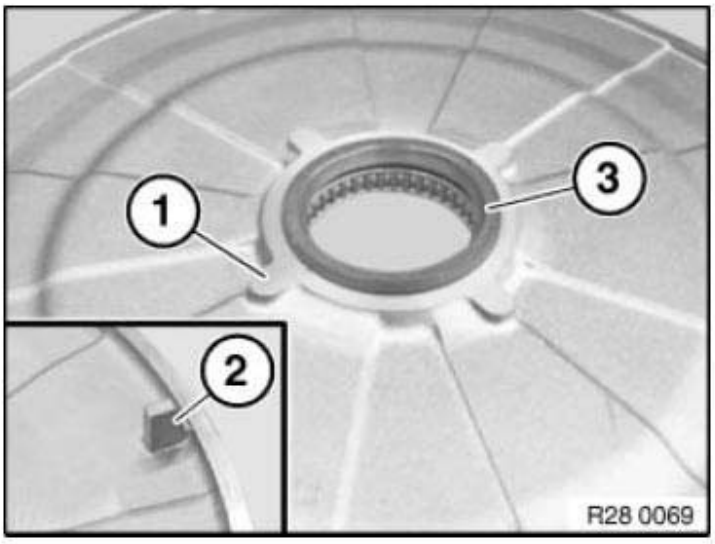


Fig. 70: Identifying Clutch Cover, Lug And Radial Shaft Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Use special tool **24 2 370** to drive the radial shaft seal into the clutch cover until the sealing ring is flush.

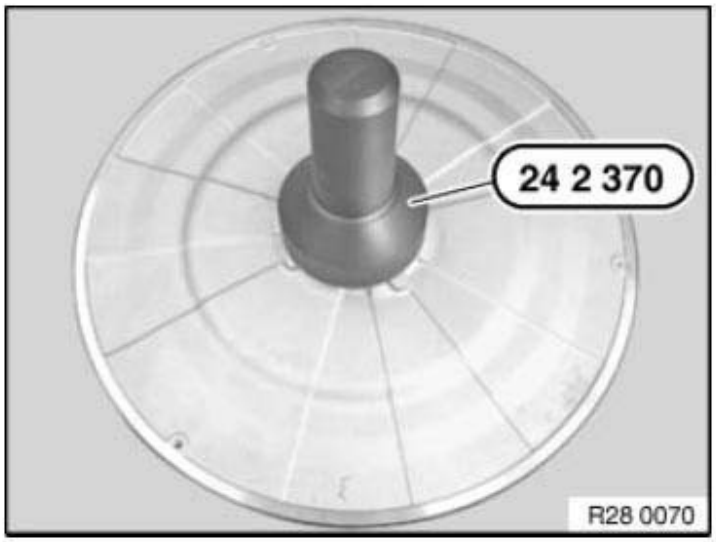


Fig. 71: Pressing Sealing Cap With Special Tool (24 2 370)
Courtesy of BMW OF NORTH AMERICA, INC.

Use a suitable tool to take the O-ring of the clutch cover out of the groove.

Use a lint-free cloth to remove oil contamination from the O-ring groove.

Installation note:

Replace O-ring.

Coat O-ring with transmission oil before installing.

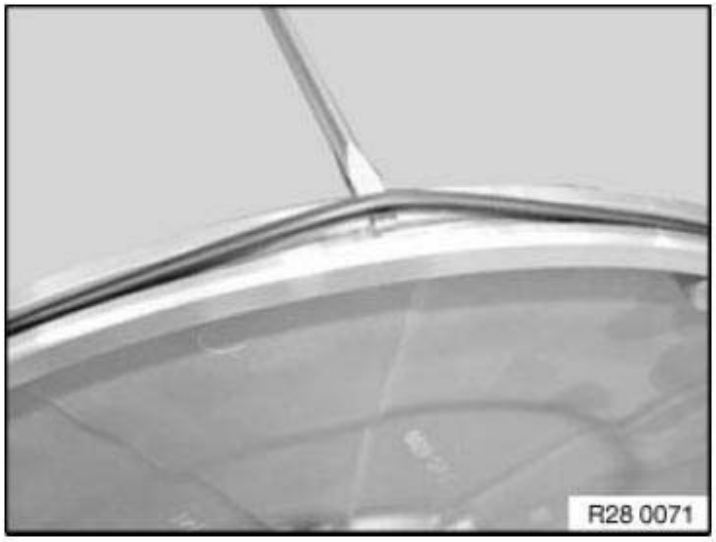


Fig. 72: Identifying Clutch Cover O-Ring From Groove Using Suitable Tool
Courtesy of BMW OF NORTH AMERICA, INC.

28 10 000 REPLACING SUCTION FILTER (GS7D36SG)

IMPORTANT: After completion of the work, check the oil level. .
Use only the approved DCTF-1 Pentosin (P/N 83 22 2 147 477).

Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

Recycling

Catch and dispose of escaping transmission oil.

Observe country-specific waste disposal regulations.

Necessary preliminary work

- Remove **TRANSMISSION SUMP** .

Release screw (1).

Tightening torque, see 28 10 12AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Pull suction jet pump (2) out of housing.

Installation note:

Moisten seals with transmission oil before installing.

Replace suction jet pump.

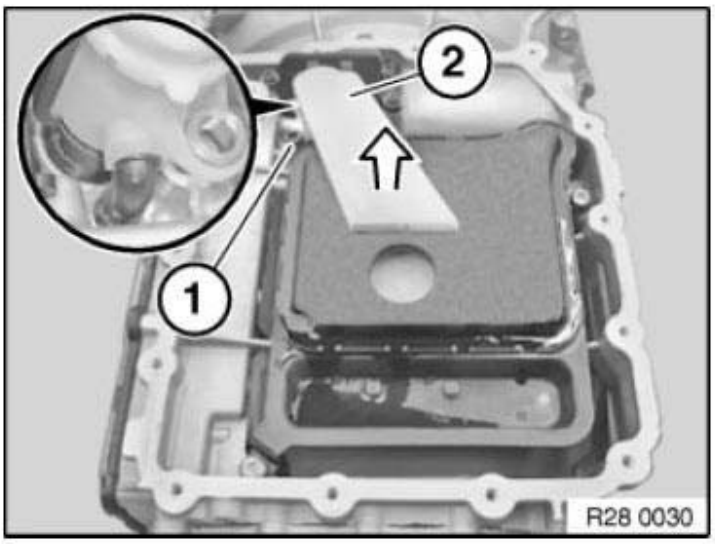


Fig. 73: Pulling Out Jet Pump From Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) and (2).

IMPORTANT: Screws have different torques.

Tightening torque, see 28 10 13AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Pull suction filter out of housing.

Installation note:

Moisten seal with transmission oil before installing.

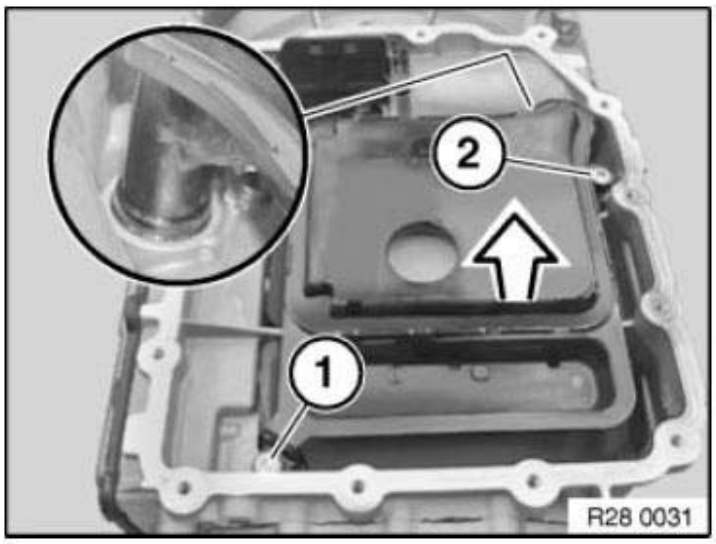


Fig. 74: Pulling Suction From Housing
Courtesy of BMW OF NORTH AMERICA, INC.

28 60 020 REPLACING WIRING HARNESS (GS7D36SG)

IMPORTANT: After completion of work, check oil level. .
Use only the approved DCTF-1 Pentosin (P/N 83 22 2 147 477) transmission oil. Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox.

IMPORTANT: Read and comply with notes on ESD PROTECTION (ELECTRO STATIC DISCHARGE) .

Necessary preliminary work

- Remove **twin-clutch gearbox**
- Remove mechatronics
- Remove **clutch**

Release screw (1).

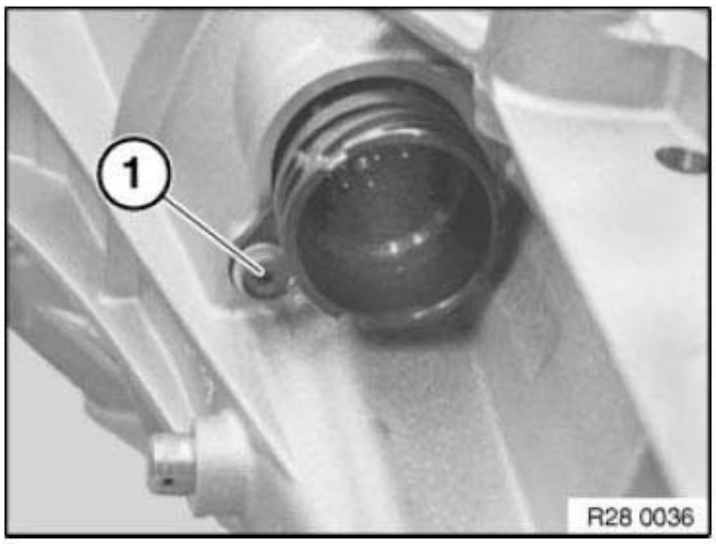


Fig. 75: Identifying Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw (1).

Tightening torque, see 28 10 6AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Release aluminum screw (6).

Tightening torque, see 28 10 11AZ in **28 10 HOUSING WITH ADD-ON PARTS** .

Installation note:

Replace aluminum screw.

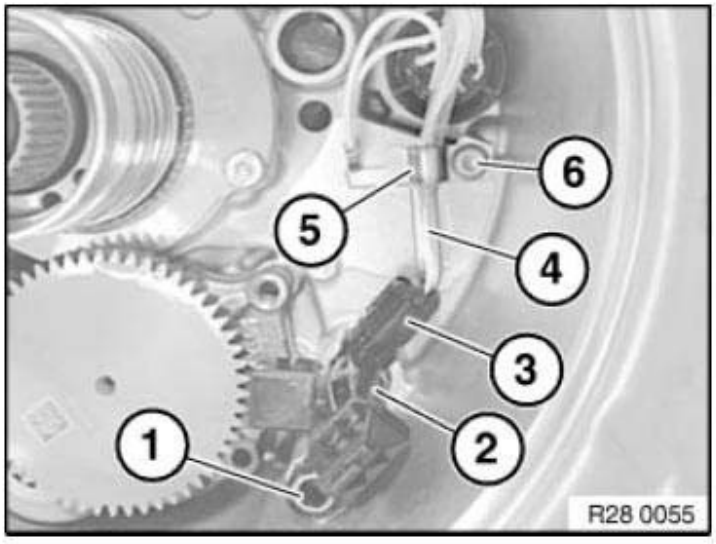


Fig. 76: Identifying Screw, Aluminum Screw, Combination Sensor, Connector, Wiring Harness And Earth Terminal
Courtesy of BMW OF NORTH AMERICA, INC.

Release combination sensor (2) from housing.

Disconnect connector (3).

Removing wiring harness (4) with earth terminal (5) from housing.

IMPORTANT: Guide earth terminal (5) carefully through transmission connector bore.

Risk of damage to sealing surface.

IMPORTANT: To disconnect the combination sensor connector:
Press lock together in area (1) and simultaneously detach connector.

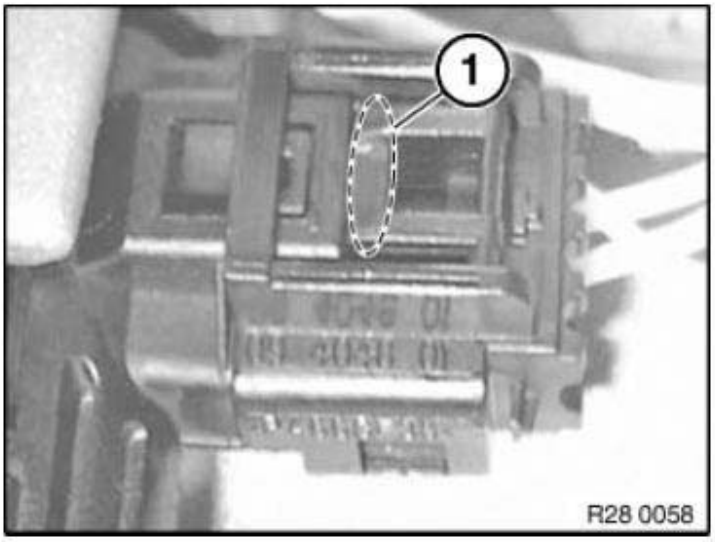


Fig. 77: Pressing Combination Sensor Lock
Courtesy of BMW OF NORTH AMERICA, INC.

DOUBLE CLUTCH GEARBOX

28 00 DOUBLE CLUTCH GEARBOX

Transmission In General

	Type	Thread	Tightening specification	Measure
Torx screw, steel	GS7D36SG	M8x50		19 Nm
	GS7D36SG	M10		38 Nm
	GS7D36SG	M12x50		66 Nm
Aluminium screws/bolts are not magnetic N54	GS7D36SG		Replace screws Jointing torque and angle of rotation must be observed without fail	
	GS7D36SG	M12	Jointing torque	25 Nm
			Torque angle	130 °
2AZ Oil filler plug	GS7D36SG	Replace screw		25±3 Nm
3AZ Oil drain plug	GS7D36SG	Replace screw		8 Nm
4AZ Transmission oil sump	GS7D36SG			10±1 Nm

HOUSING WITH ADD-ON PARTS

28 10 HOUSING WITH ADD-ON PARTS

Housing with add-on parts

	Type	Thread	Tightening specifications	Dimension
1AZ Oil-coolant heat exchanger to S65 transmission	GS7D36SG	M6		10 Nm
2AZ Holder, oil-coolant heat exchanger to S65 transmission	GS7D36SG	M6		8 Nm
3AZ Oil thermostat to transmission	GS7D36SG	M8x60		19 Nm
4AZ Hydraulic line to oil thermostat	GS7D36SG	M8		19 Nm

5AZ Transmission input speed sensor to transmission	GS7D36SG	M6		9 Nm
6AZ Instrument cluster sensor, oil pump, to transmission	GS7D36SG	M6		6 Nm
7AZ Oil pump spray plate to transmission	GS7D36SG			10 Nm
8AZ Oil pump to transmission	GS7D36SG	M6	Position:1, 2, 5, 6, 7, 8 to final torque.	
			Position: 1 loosen and to final torque.	10 Nm
9AZ Oil pump pressure pipe to transmission	GS7D36SG	M8	Position: 3 and 4 to final torque	25 Nm
10AZ Clutch support to transmission	GS7D36SG			10 Nm
11AZ Aluminium screws/bolts, earth cable to transmission	GS7D36SG		Jointing torque	5 Nm
12AZ Suction jet pump to transmission	GS7D36SG	M8		6 Nm
13AZ Suction filter to transmission	GS7D36SG	M6	Screw (1)	5 Nm
			Screw (2)	8 Nm
14AZ Output flange	GS7D36SG		Collar nut installed with screw locking	
			Pretension	175 Nm
			Release	
			Tighten Down	125 Nm

DOUBLE CLUTCH GEARBOX (DKG)

28 40 DOUBLE CLUTCH GEARBOX (DKG)

Twin clutch

	Type	Thread	Tightening specification	Measure
1AZ Twin clutch on support/ retaining nut	GS7D36SG			10-20 Nm

CONTROL UNIT, MECHATRONICS, HYDRAULICS

28 60 CONTROL UNIT, MECHATRONICS, HYDRAULICS

Mechatronics control unit

	Type	Thread	Tightening specification	Measure
1AZ Hydraulic cover to transmission	GS7D36SG	M6		10 Nm
2AZ Mechatronics to transmission	GS7D36SG	M5x30	Jointing torque	3 Nm
			Torque angle	+50 °
		M5X35	Jointing torque	3 Nm
			Torque angle	+50 °
		M5X50	Jointing torque	3 Nm
			Torque angle	+50 °
		M5X75	Jointing torque	3 Nm
			Torque angle	+90 °

GENERAL INFORMATION

Electronic Transmission Control - Overview

ELECTRONIC TRANSMISSION CONTROL

PURPOSE OF THE SYSTEM

Electronically controlled transmissions were introduced on BMW products in 1986 on 5 and 7 series vehicles. Currently EH (Electro-hydraulic) transmissions are offered on almost every production model (Except E46 M3 and E39 M5). EH transmissions offer the following benefits the to driver:

- Increased driving safety by reducing fatigue. All shifts are automatic as opposed to manual transmissions which require more driver interaction.
- Increased fuel economy through use of lock up torque converter.
- Increased fuel economy through optimized shift points.
- Improved shift comfort by use of "Overlap Shift" technology (ZF).
- More available features through the use of CAN bus technology.

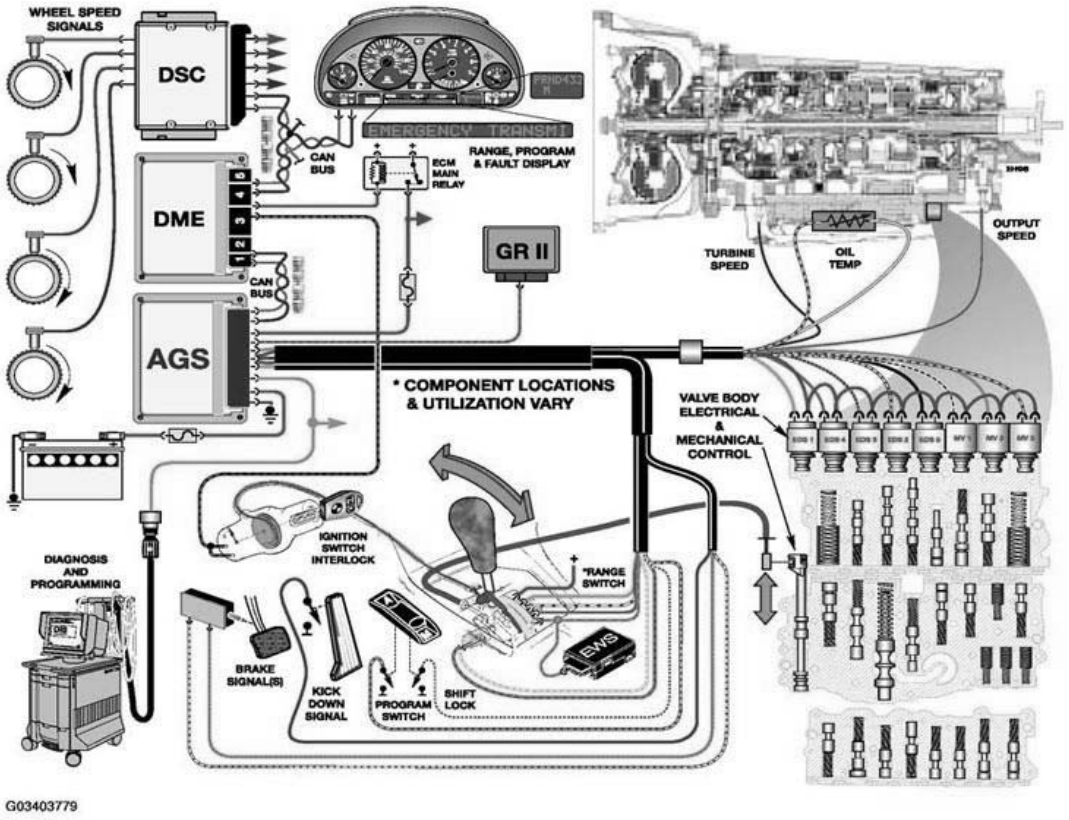


Fig. 1: Identifying Electro-Hydraulic Transmission Inputs/Outputs
Courtesy of BMW OF NORTH AMERICA, INC.

The EH Control System is designed to work in conjunction with the engine electronics for precise shift control. The TCM receives information on engine RPM, load and throttle position to provide optimum shift points to maximize fuel economy and driver comfort.

The function of an EGS System is to:

- Monitor all operating conditions through input signals
- Continually assess operating conditions by processing input data and select the appropriate operating program for current conditions.
- Activate transmission system components and to communicate with other drivetrain control systems.
- Respond to driver selected driving program (Economy, Sport or Manual).

In addition to providing shift control, the TCM also adapts to changing conditions within the transmission by monitoring slip ratios and modifying line pressure. This increases the life of the transmission and reduces maintenance and adjustments. The TCM controls the operation of the Lock-Up Torque Converter which further increases economy.

On current models, the TCM also has the capability of adapting to driver habits and responds to changing environmental conditions. Items such as rate of throttle input and kickdown requests are monitored to select the most appropriate shift program.

The EGS system is also required to maintain occupant safety, safeguard drivetrain damage, improve vehicle emissions and operate in fail-safe mode when a malfunction occurs.

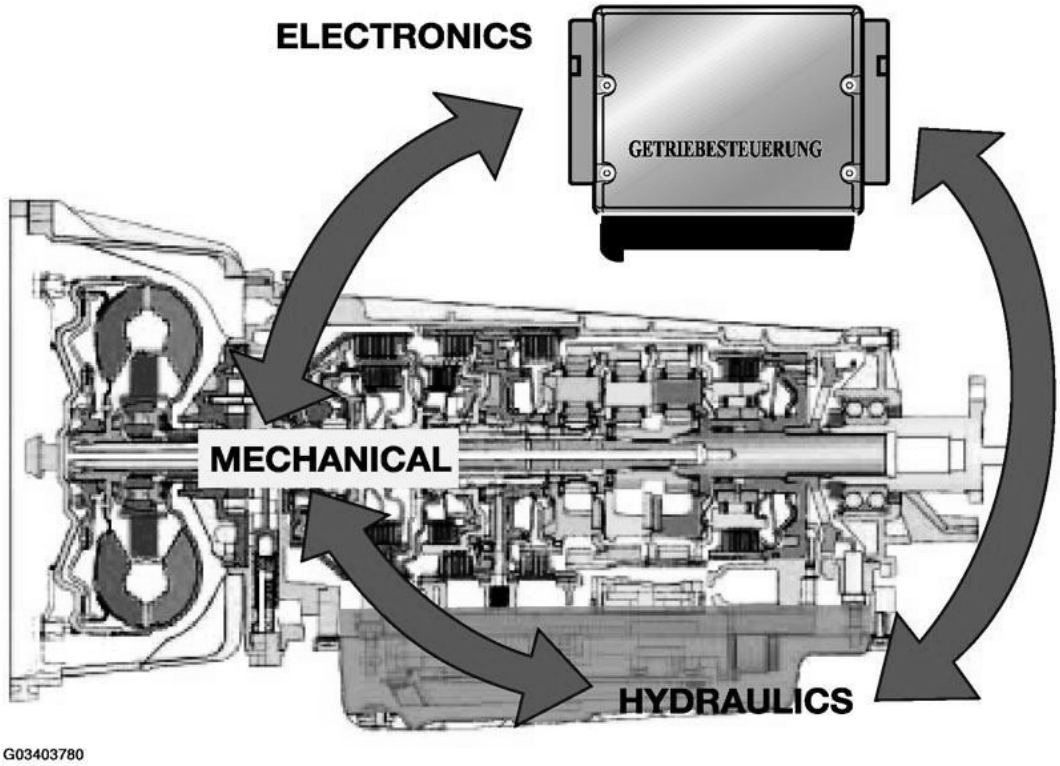


Fig. 2: Identifying EGS System
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION VERSION AND CONTROL SYSTEMS

Each BMW Electro-hydraulic transmission has a corresponding control system. They are designated "GS" which stands for Transmission Control. This acronym is from the German words **G** etriebe **S** teurung. Each transmission can have more than one control system, this depends upon application (model year, series etc.). Below is a listing of ZF control systems used on BMW vehicles, Hydramatic control systems are shown on the opposing page.

ZF Control Systems

ZF CONTROL SYSTEMS SPECIFICATIONS

Transmission BMW ID #	Manufacturer ID	Model/Year	Control System	Engine
4HP22 (EH)	4HP22 (EH)	86 535i 86 635i 86 735i	GS 1.2X GS 1.2X GS 1.2X	M30 M30 M30
4HP24 (EH)	4HP24 (EH)	88-9/91 750iL (E32) 92-94 750iL (E32) 90-94 850i/Ci (E31)	GS 1.27 GS 1.29 GS 1.29	M70 M70 M70
A5S310Z	5HP18	93 530i/iT (E34)	GS 7.3	M60

		94 530i/iT (E34) 95 M3 (E36) 96-99 M3 (E36)	GS 7.32 GS 7.11 GS 8.32	M60 S50 (US) S52
A5S325Z	5HP19	00 323i/Ci/CiC (3/00-8/00) 01 323iT (from 4/01) 01-02 325i/Ci/CiC from 9/00 00-01 330i/Ci/CiC from 6/00 01- 525 from 3/01 01- 530 from 3/01 03 Z4 (E85) 2.5i and 3.0i	GS 8.60 GS 8.60 GS 8.60.4 GS 8.60.4 GS 8.60.4 GS 8.60.4 GS 8.60.4	M52 TU M52 TU M54 M54 M54 M54 M54
A5S440Z	5HP24	97 840Ci (E31) from 9/96 97 540i (E39) 1/97-8/97 97 740i/iL (1/97 - 4/97) 97 740i/iL (5/97-8/97) 98-03 540i 98-01 740i/iL 00- X5 4.4i	GS 8.55 (CAN index 50) GS 8.55 (CAN index 50) GS 8.55 (CAN index 50) GS 8.55 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2 (CAN index 60) GS 8.60.2	M62 M62 M62 M62 M62, M62 TU 99-02 M62, M62 TU 99-01 M62TU
A5S560Z	5HP30	93-94 740i/iL (E32) 93 540i (E34) 94-95 540i (E34) 94-95 840Ci (E31) 95 740i/iL (E38) 95-01 750iL (E38) 96-97 740i/iL (-1/97) 96 840Ci (E31) 95-97 850Ci	GS 9.2 GS 9.2 GS 9.22 GS 9.22 GS 9.22 GS 9.22.1 GS 9.22.1 GS 9.22.1 GS 9.22.1	M60 M60 M60 M60 M60 M73/M73TU M62 M62 M73
GA6HP26Z	GA6HP26Z GA6HP26Z	02- 745Li (E65/E66) 03- 760Li (E66)	GS 19 GS 19	N62 N73

Hydramatic Control Systems

HYDRAMATIC CONTROL SYSTEMS SPECIFICATIONS

Transmission BMW ID #	Manufacturer ID #	Model/Year	Control System	Engine

A4S310R (THM-R1)	4L30-E(A4S310R) >>>	90-92 525i (E34) 93-95 525i (E34) 92 325i,is,ic (E36) 93-95325i,is,ic (E36) 92-95 318ti (E36)	GS 4.14 GS 4.16 GS 4.14 GS 4.16 GS 4.14 & GS 4.16	M50 M50 TU M50 M50 TU M42
A4S270R	4L30-E(A4S270R) >>>	96-98 328i (is,ic - 97) 96-98 318i (is,ic-97) 96-98 318ti (E36/5) 96-98 Z3 1.9 (E36/7) 96-98 Z3 2.8 97-98 528i (E39)	GS 8.34 GS 8.34 GS 8.34 GS 8.34 GS 8.34 GS 8.34	M52 M44 M44 M44 M52 M52
A5S360R (GMS)	5L40-E (A5S360R) >>	99-00 323i/Ci (7/98-3/00) 99-00 328i/Ci (6/98-5/00) 99-00 528i (E39) 9/99-8/00 99-00 Z3 (E36/7) 2.3/2.8	GS 20 GS 20 GS 20 GS 20	M52 TU M52 TU M52 TU M52 TU
A5S390R (GM5)	5L40-E (A5S390R) >>	00-03 X5 3.0i (4/00 -) 01 325iT (8/00-3/01) 01-03 325xi/xiT & 330Xi (-8/00) 01 525i/iT (9/00-3/01) 01 530i (9/00-3/01) 01-02 Z3 2.5/3.0 (6/00-)	GS 20 GS 20 GS 20 GS 20 GS 20 GS 20	M54 M54 M54 M54 M54 M54



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Fig. 3: Hydramatic Control Systems - GS 20 TCM (Siemens)
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmission are manufactured by two suppliers for the US market:

- **Zahnradfabrik Friedrichshafen:** Commonly referred to as ZF. ZF manufactures both manual as well as automatic transmissions.
- **GM Powertrain - Hydramatic:** Hydramatic is a manufacturing division of General Motors located in Strasbourg, France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for ordering parts, information research and identification. Also, each transmission manufacturer uses an internal identification system. Here is a breakdown of these identification codes:

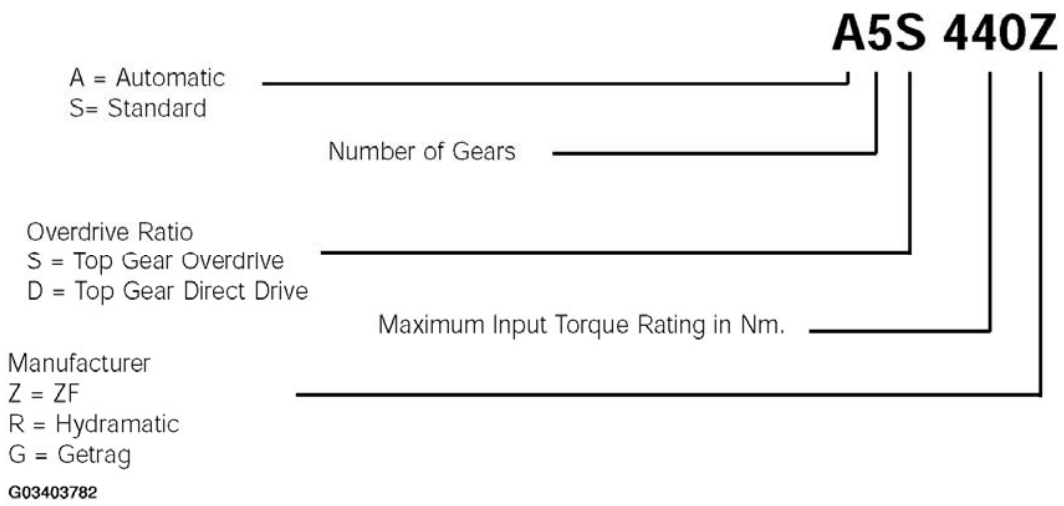


Fig. 4: Identifying BMW Identification Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

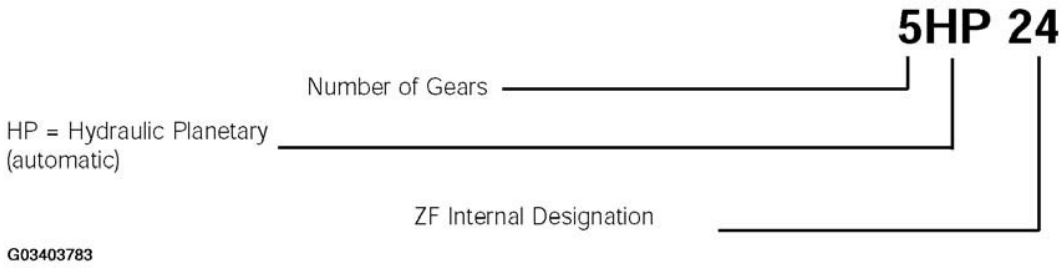


Fig. 5: Identifying ZF Identification Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

Hydramatic Transmissions have internal designations, however they are not used often. The internal code for the A4S310/270R is 4L30-E and the A5S360/390R is 5L40-E.

Transmission ID Tag Location

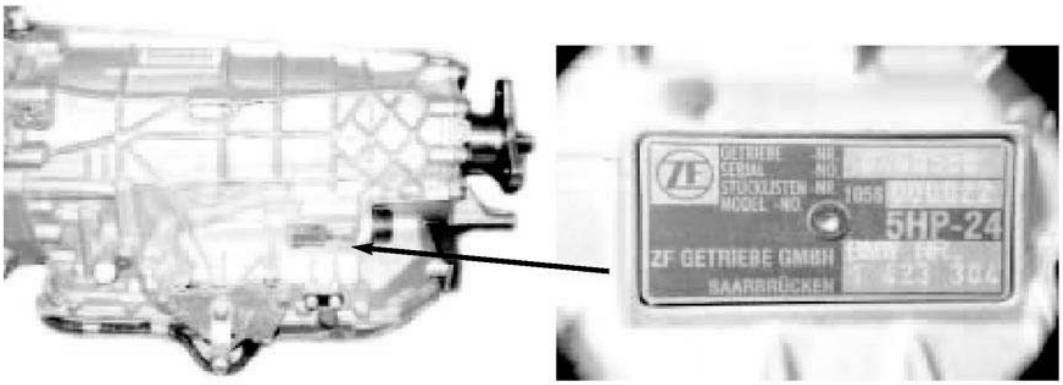
In order to identify BMW transmissions there are identification tags located externally on the transmission case. The tag contains information such as Manufacturer, Serial number, transmission type etc. This information is needed when ordering parts, referencing bulletins and calling for technical assistance.

- **ZF - Tag is Located on -**
    1. Right hand side (passenger side) of transmission case. (5HP30 and 5HP18)
    2. Left hand side (drivers side) of transmission case. (6HP26Z, 5HP24 and all 4HP)
    3. Rear under output shaft. (5HP19)



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Fig. 6: Identifying ID Tag Location 5HP19
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 7: Identifying Typical ZF Tag
Courtesy of BMW OF NORTH AMERICA, INC.

- **GM** - Located on left hand side (drivers side) of transmission case.

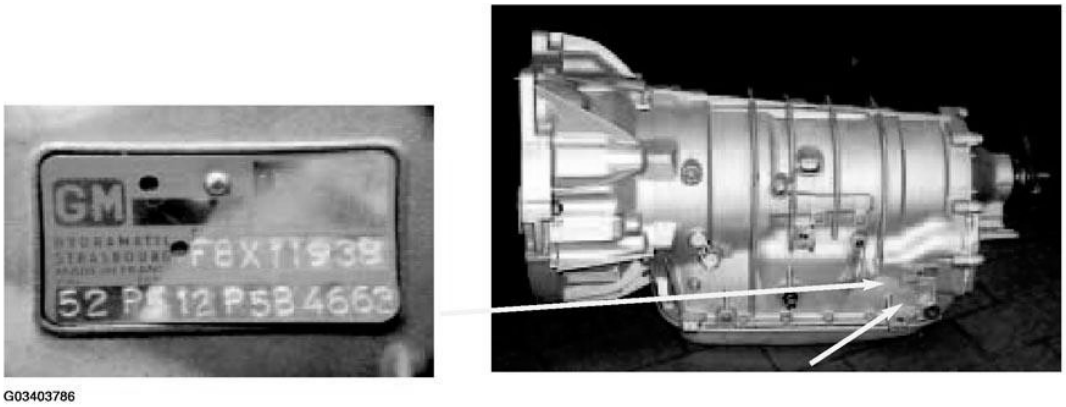


Fig. 8: Identifying GM ID Tag (GM 5)
Courtesy of BMW OF NORTH AMERICA, INC.

SYSTEM COMPONENTS (ELECTRICAL)

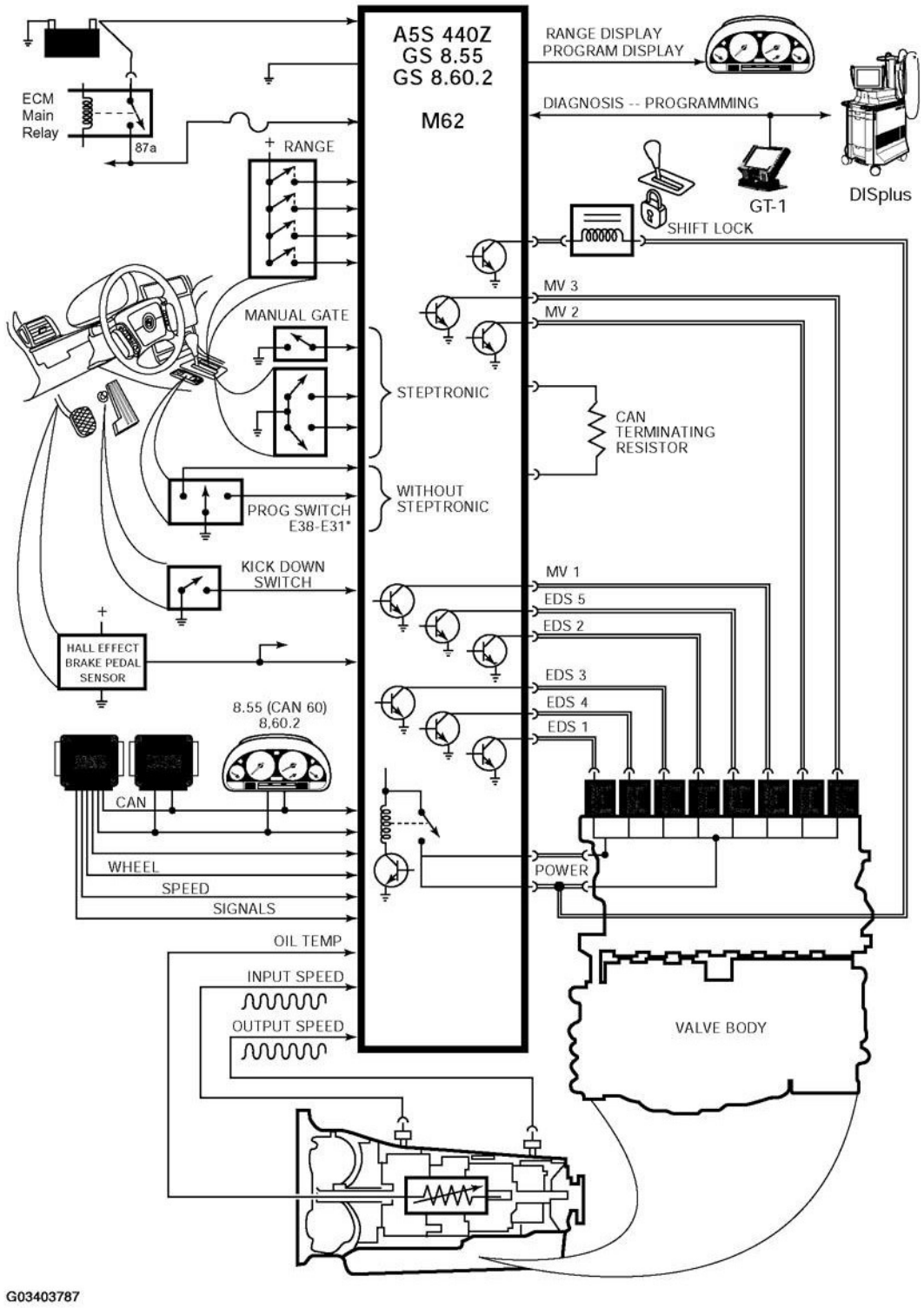


Fig. 9: Identifying System Components (Electrical)
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Control Module

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME).

There are several types of TCM housings:

- 35 Pin TCM (TCU) - used on the 4HP transmissions
- 55 Pin TCM - used on the A4S310R (THM-R1)
- 88 Pin TCM - used on all others up to 98
- 134 Pin TCM - used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors 1, 3 and 4) are used. Connectors 2 and 5 are blank and are **NOT** used. The connectors are blue in color to avoid confusion with the ECM (DME) connectors which are black.

!34 Pin control modules are supplied by Bosch for ZF transmissions and Siemens for Hydramatic transmissions. Bosch and Siemens control modules are NOT interchangeable.

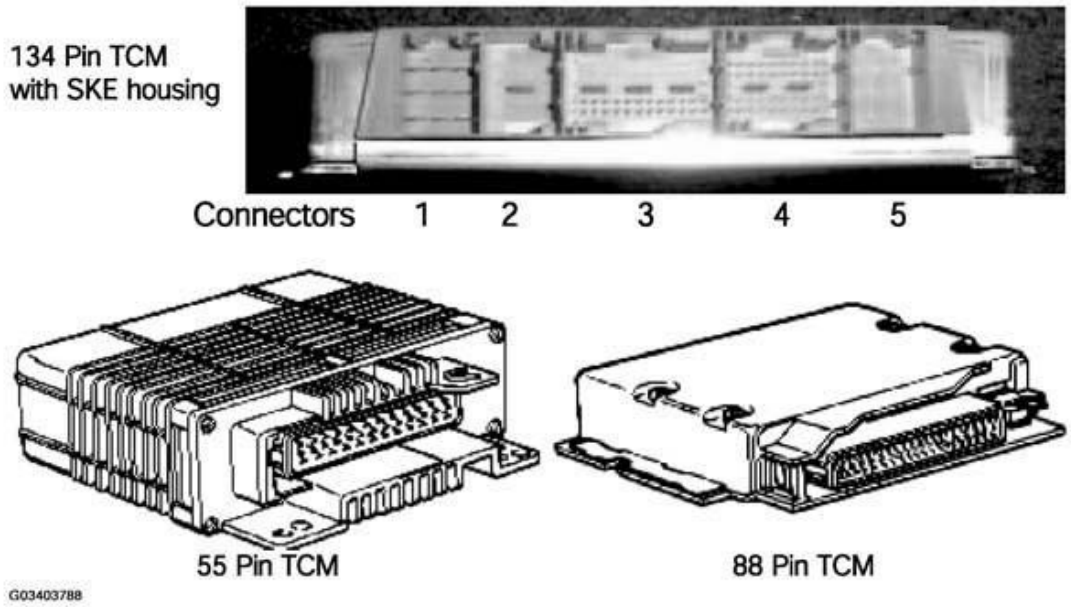


Fig. 10: Identifying Transmission Control Module
Courtesy of BMW OF NORTH AMERICA, INC.

Turbine Speed Sensor

The Turbine Speed Sensor is used to provide input (turbine) shaft speed information to the TCM (EGS). The input shaft speed signal is used in conjunction with the output shaft speed signal to determine gear range and slip time information for processing in the TCM. Not all BMW transmissions use a turbine speed sensor. Some TCM's use the TD (engine speed) signal to determine input shaft speed. All transmissions with the exception of the A5S325Z use an inductive type sensor which generates an AC analog signal. The A5S325Z currently uses a Hall Effect Turbine Speed Sensor which will send a digital square wave signal to the TCM.

4HP22/24 (EH), A4S310/270R: These transmissions do not use a Turbine Speed Sensor. The TD signal is used to determine input shaft speed. The TD signal is an output signal of the DME control unit.

A5S310Z, A5S325Z, A5S440Z, A5S560Z, A5S360/390R: These transmission use a turbine speed sensor. The TD signal is also used with the turbine speed signal to allow the TCM to monitor Torque Converter Clutch operation. The TCM can control torque converter clutch slippage and also monitor for faults.

Output Shaft Speed Sensor

The Output Shaft Speed Sensor is used to provide output shaft speed information to the TCM. The output shaft speed signal is used in conjunction with the turbine speed signal to provide the TCM with information on gear ranges and slip times.

All BMW electronic transmissions have an output shaft speed sensor. The output shaft speed sensor is an inductive type which will generate an AC analog signal to the TCM. The frequency and amplitude of the signal will increase as output shaft speed increases. The exact location of the output shaft speed sensor varies by transmission model.

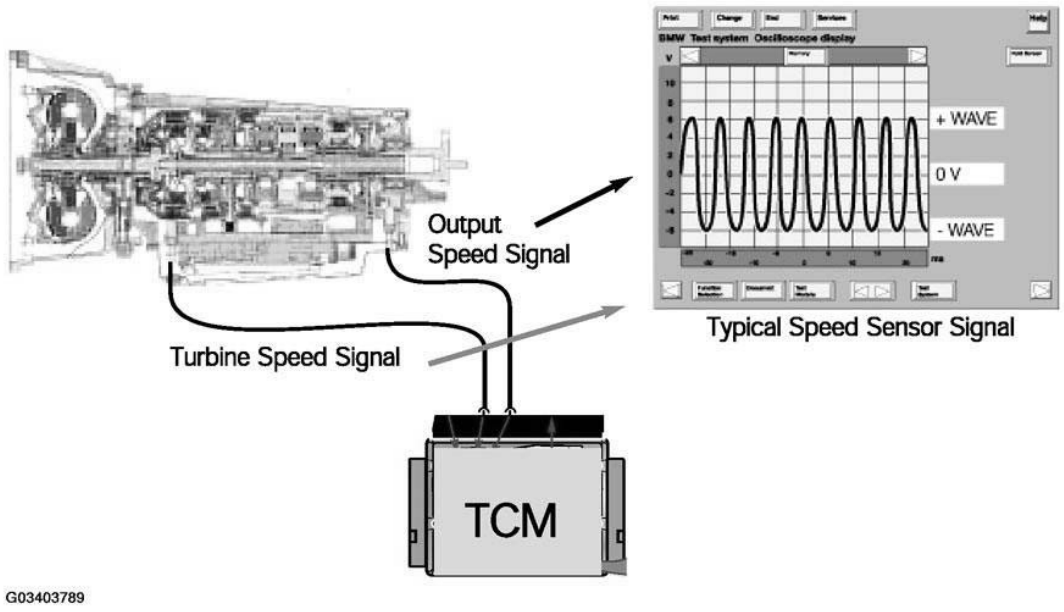


Fig. 11: Identifying Output Shaft Speed Sensor Graph
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Oil Temp Sensor

The TCM is provided with transmission oil temperature information via a temperature sensor. On most BMW transmissions, the sensor is an NTC element which is part of the transmission internal wiring harness.

4HP22/24 (EH): These transmissions do not use a transmission oil temperature sensor. There are no transmission oil temperature influenced features on the 4HP transmissions.

All Except A5S360/390R, GA6HP26Z: The transmission fluid temp sensor is part of the transmission internal wiring harness. On these transmissions, the sensor cannot be replaced separately. The harness must be replaced.

A5S360/390R transmission: the sensor is a separate, replaceable sensor that can be unplugged from the harness.

GA6HP26Z: the sensor is located in the Mechatronics Module, which is located inside of the transmission.

NOTE: The Mechatronics Module is not currently serviceable at this time. Contact the BMW Technical Hotline in the event of a failure. Do not attempt any repair or replacement of the Mechatronics Module.

The transmission oil temperature information is used to:

- Initiate the Warm Up Program
- To inhibit TCC operation until a specified temperature has been reached.
- For determining fluid level when used with diagnostic equipment.

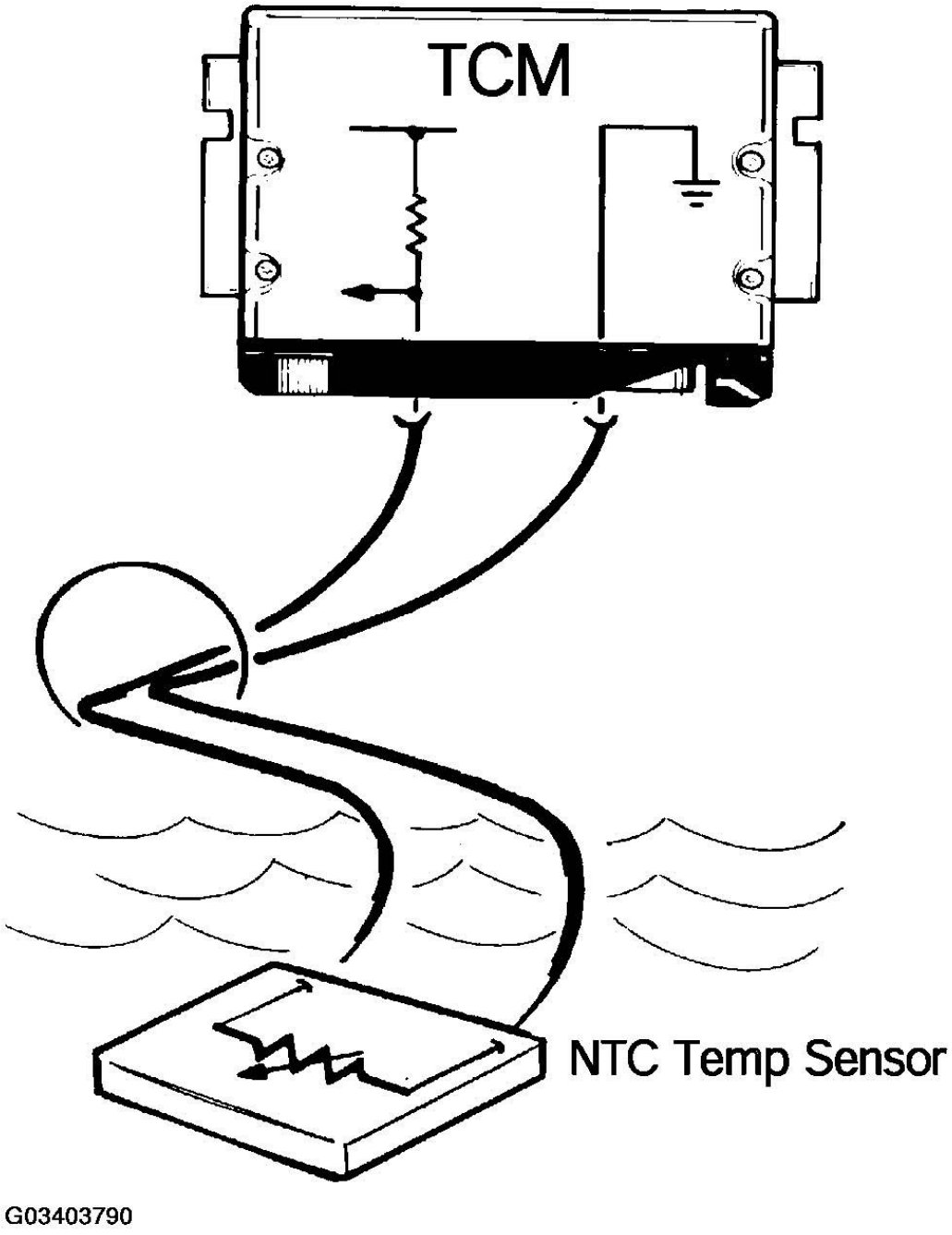


Fig. 12: Transmission Oil Temperature Sensor Is Connected To TCM
Courtesy of BMW OF NORTH AMERICA, INC.

The transmission oil temperature sensor is connected to the TCM via a 5 Volt reference and a circuit ground. As transmission oil temperature increases, the circuit resistance and voltage decrease proportionately.

Kickdown Switch

The TCM receives a kickdown request via one of two possible methods:

- The kickdown signal is a direct ground input to the TCM. The kickdown input is provided by a kickdown switch located under the accelerator pedal. This method is used on most BMW vehicles without electronic throttle control systems (except M52TU with MDK).



Fig. 13: Identifying Kickdown Switch
Courtesy of BMW OF NORTH AMERICA, INC.

- The kickdown request is provided by the ECM (DME) via the CAN bus. The kick down request originates from the PWG. There is no separate switch in the PWG. When the PWG voltage reaches approximately 4.5 volts, the ECM will process a kickdown request to the TCM via CAN. The PWG contains a kickdown detent to simulate the feel of a kickdown switch.

  This method is used on the M62TU, M54, M73, M73TU, N73 and N62 engines.

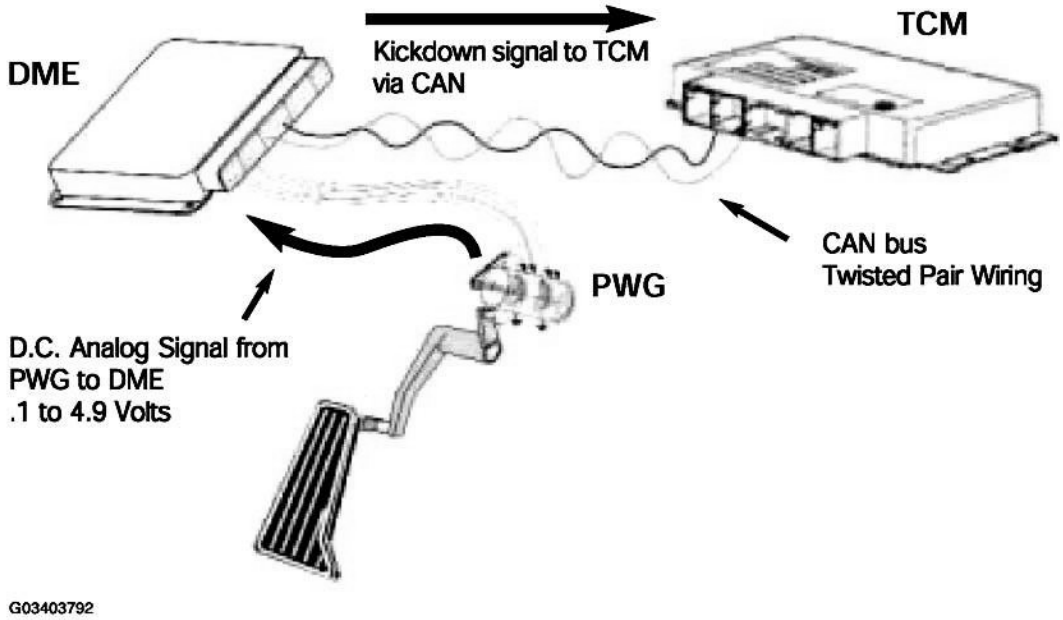


Fig. 14: Identifying Kickdown Signal Is A Direct Ground Input To
Courtesy of BMW OF NORTH AMERICA, INC.

Brake Switch

The brake switch is located on the brake pedal linkage. The brake switch signal is an input to the TCM which is used for:

- De-activation of the shift lock solenoid. When the ignition key is turned to KL15 the shift lock is active. The shift lock solenoid is de-activated when the brakes are applied.
- De-activate the Torque Converter. The TCC is deactivated whenever the brake is applied. (only on Hydramatic Transmissions).

There are two types of brake switches used on BMW vehicles:

- On early vehicles such as E32, E34, E36, E24, E28 and E31 the brake switch is a double-contact mechanical switch. There is a brake light circuit and a brake test circuit. The brake test circuit is used for a plausibility check to indicate faults within the brake light circuit.
- On the E38, E39, E46, E65/66, E85 and E53 the brake switch is a hall effect type switch. The electronic switch is also monitored for faults and plausibility.

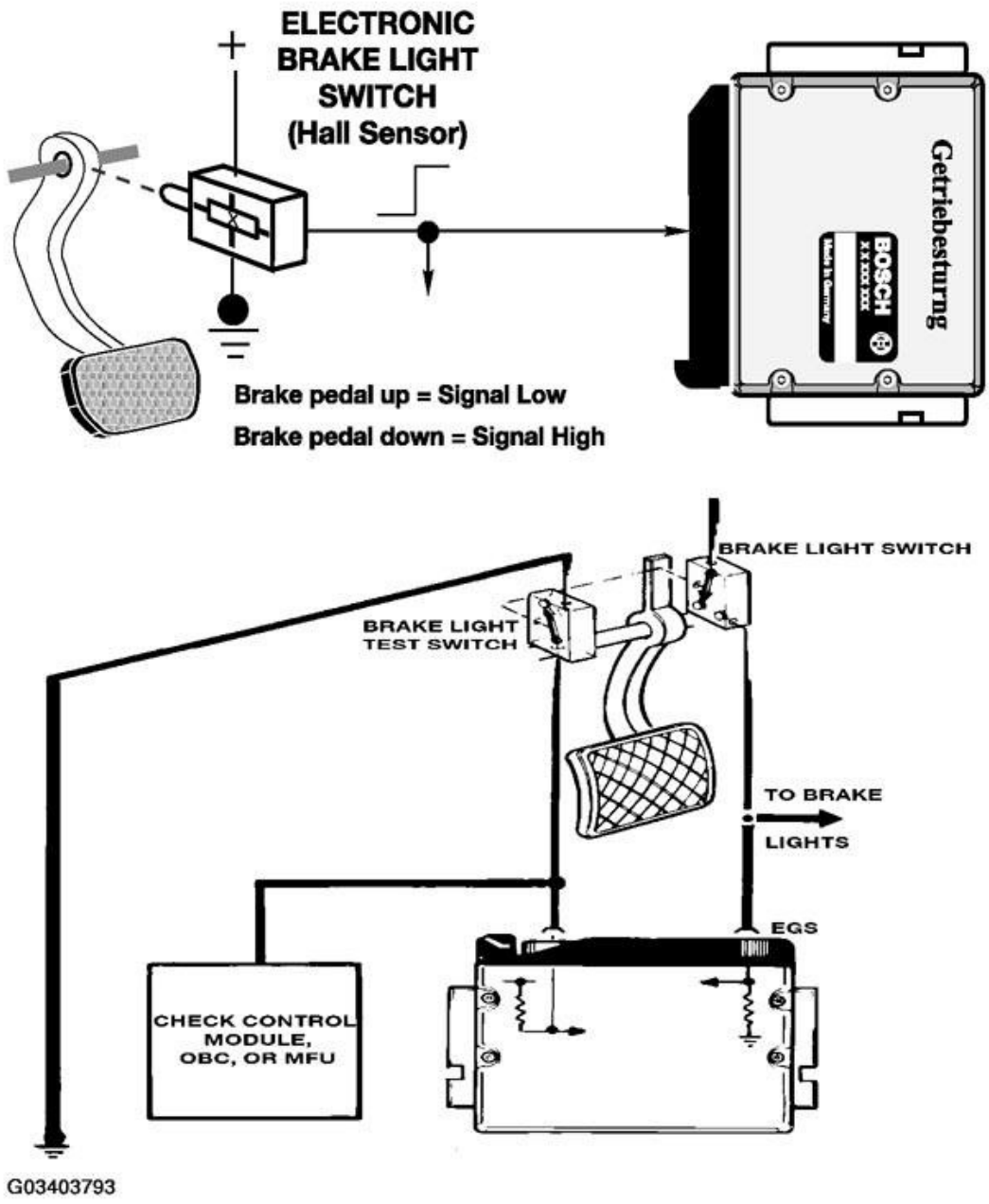


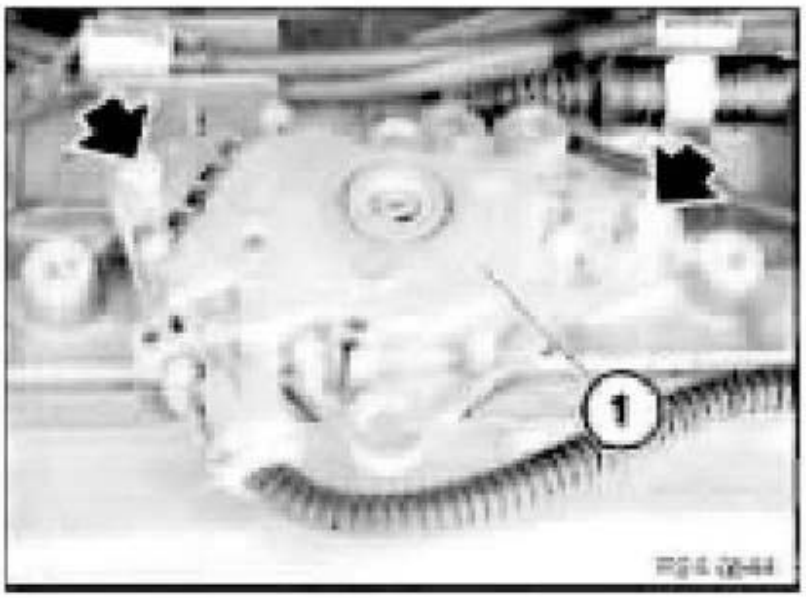
Fig. 15: Identifying Brake Switch Signal Is An Input To TCM
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Range Selector Switch

The range selector switch is an input to the TCM. The input is used by the TCM to determine the position of the manual valve. The range switch uses the familiar "coded input" signal to determine selector lever position. On all transmissions except the A5S360/390R, the range switch uses a 4 wire configuration to determine 7 range

selector positions. The A5S360/390R uses a five wire arrangement.

Most range switches are located on the transmission case with some exceptions. The E36 with the A4S270/310R the range switch is located is the center console on the selector lever assembly. The E39 with A4S270R the range switch is located on the transmission case and is adjustable. The range selector switch on the A5S360/390R is located inside the transmission housing. GA6HP26Z is part of the Mechatronics Module.



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Fig. 16: Identifying Transmission Range Selector Switch
Courtesy of BMW OF NORTH AMERICA, INC.

The range switch can be checked by using "Status Requests" in the DISplus or GT-1.

A multimeter or an oscilloscope can also be used to check the range switch. If the reading on "Status Requests" does not match the actual selector lever position, there will be various transmission malfunctions.

Use the switch logic chart to diagnose faults in the switch.

In the example below, the range switch is in neutral. Using the logic chart, switches L1, L2 and L3 are closed providing B+ voltage to the corresponding pins of the TCM. Switch L4 is open and no voltage is sent to the TCM. Malfunctions in the range switch or wiring can cause various shifting complaints and possible No-Start complaints.

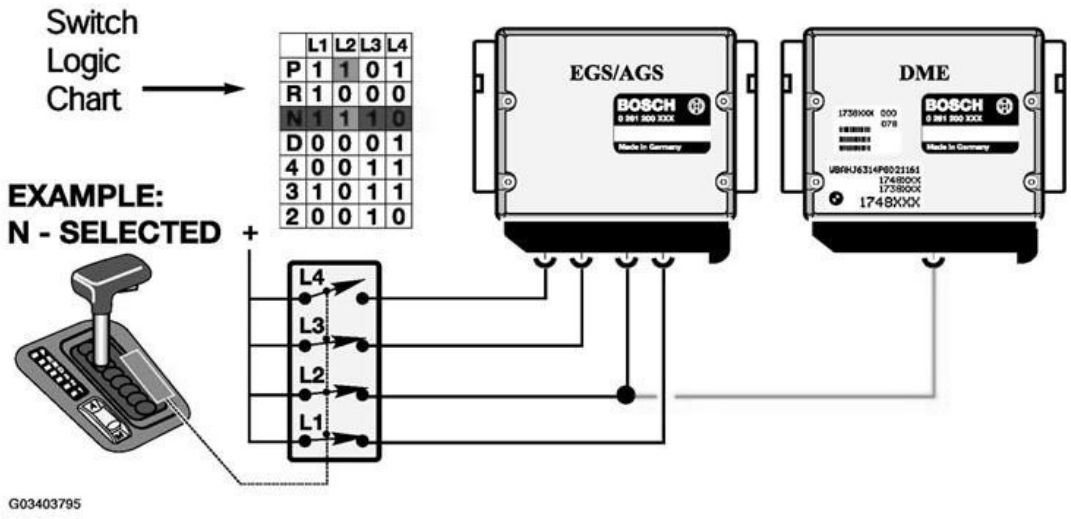


Fig. 17: Identifying Transmission Range Selector Switch Logic Chart
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Program Switch

The transmission program switch is used to switch between various operating modes of the transmission. The normal default mode of the TCM is Economy which is indicated in the program display as "E". Economy mode allows the transmission to operate in the most efficient mode. Shift priorities are for maximum economy and shift comfort. On some vehicles the program switch is designated "A" for economy mode. Program switches come in 2 or 3 position configurations. Early vehicles with the 4HP (Early E7) used a rotary program switch.

The TCM can also be switched to "Manual Mode" which on some vehicles is designated "Winter Mode". Manual mode is used to start the vehicle off in a higher gear when encountering slippery conditions. The program display will indicate "M" (manual) or an asterisk symbol for "Winter Mode".

Sport Mode is the third operating mode that is available. Sport mode allows for a slightly delayed and more aggressive shift. Sport mode is obtained a number of ways. On vehicles with 2 position program switches, moving the selector lever out of drive to 4,3, or 2 with the program switch in Economy will allow Sport mode. On vehicles with 3 position program switches, Sport mode can be obtained by switching to "S".

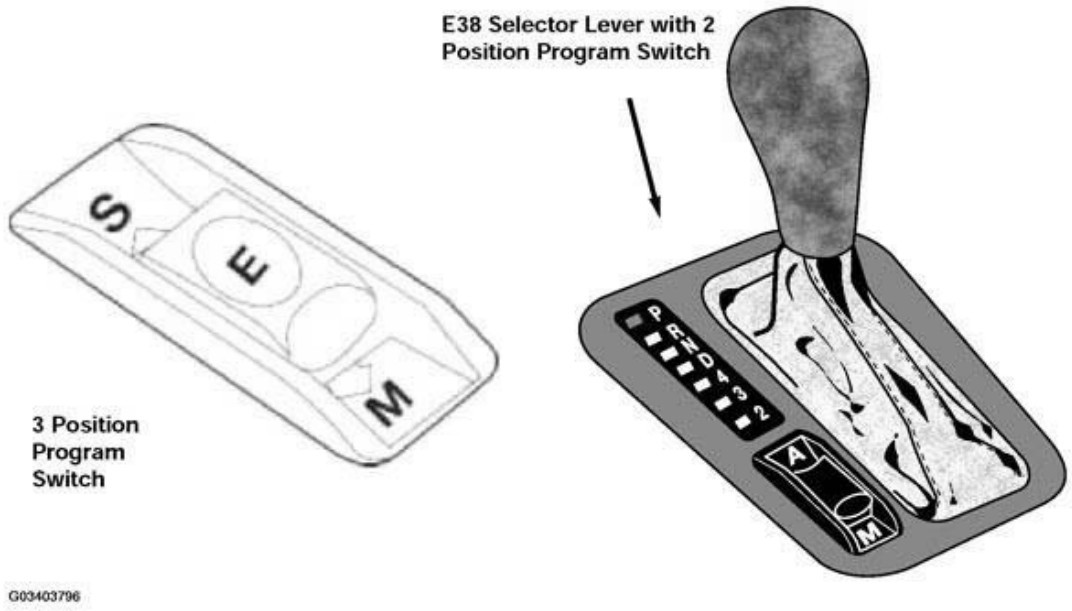


Fig. 18: Identifying Transmission Program Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Components

The Steptronic system uses additional components not found on a conventional system. These components consist of a manual switch and an Up/Down microswitch. Otherwise, the Steptronic system uses the same transmission and TCM.

The TCM monitors the Steptronic shifter position from P through D via the conventional range selector switch located on the transmission. The Range Selector Switch provides positions P through D to the TCM because the automatic gate of the shifter only travels through these positions.

When the Steptronic Shifter is moved to the left 15 degrees into the manual gate, the TCM receives a ground input from the manual gate switch. The ground signal is provided to the TCM through the Transmission Position Indicator. The transmission position indicator also provides range position signaling to the range position indicator in the shift console.

Steptronic was introduced on the E31 850Ci (10/94) and the 840Ci (1/96). Steptronic was subsequently introduced into the E38, E39, E46, E36/7 and the E53.

The Steptronic system can be diagnosed through "Status Requests" with the DISplus or GT-1.

From 2002 model year the Steptronic shifter has changed slightly. Downshifts are now achieved by moving the selector lever forward and upshifts are now rearward.

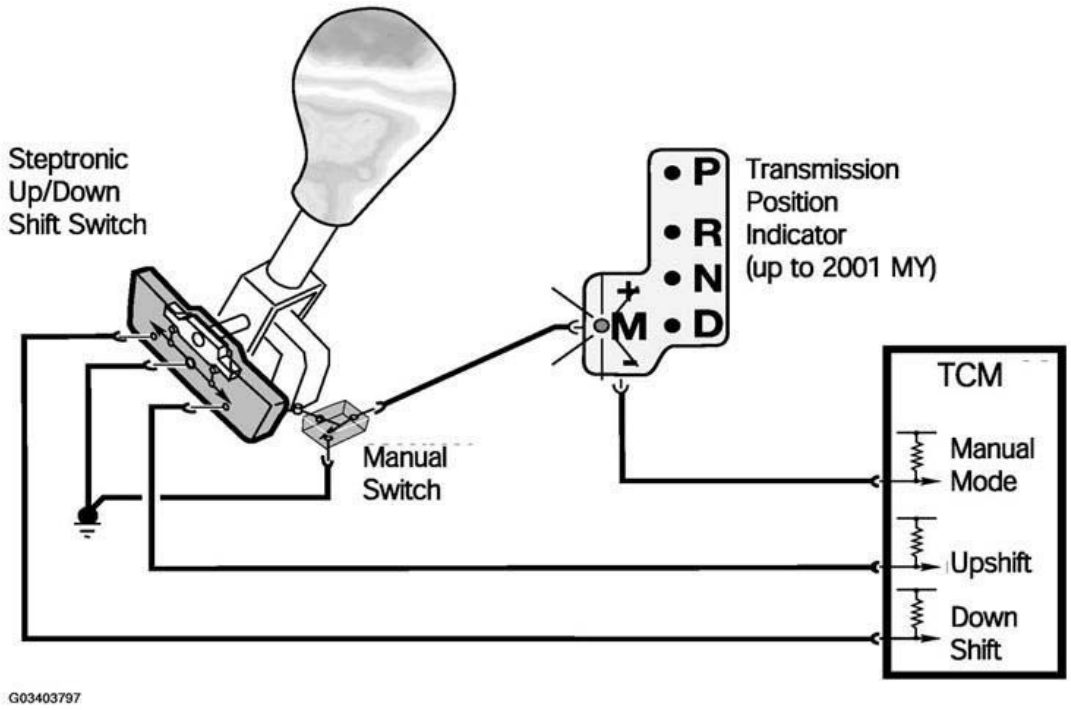


Fig. 19: Identifying Steptronic Components
Courtesy of BMW OF NORTH AMERICA, INC.

Magnetic Valves

Magnetic Valves (MV) are used to electronically control hydraulic fluid flow to the various shift elements within the transmission. Magnetic valves are located on the valvebody and replaceable as separate components. In ZF transmissions, MV valves are designated MV1, MV2, MV3 etc. In Hydramatic transmissions, they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

The magnetic valves are controlled by the TCM. They are supplied power by an internal TCM relay and are ground controlled. The TCM switches one or more of the MV's on or off in various combinations to achieve various shifts. Most transmission have 2 or 3 MV's to control shifting.

In addition to controlling shifts within the transmission, magnetic valves are also used for overlap shifting and pressure regulation on some transmission applications. For example MV4 and MV5 are used for overlap shifting in the A5S310Z. MV5 is used for pressure regulation on the 4HP22/24EH transmissions. When used for pressure regulation, the magnetic valves are pulse width modulated by the TCM.

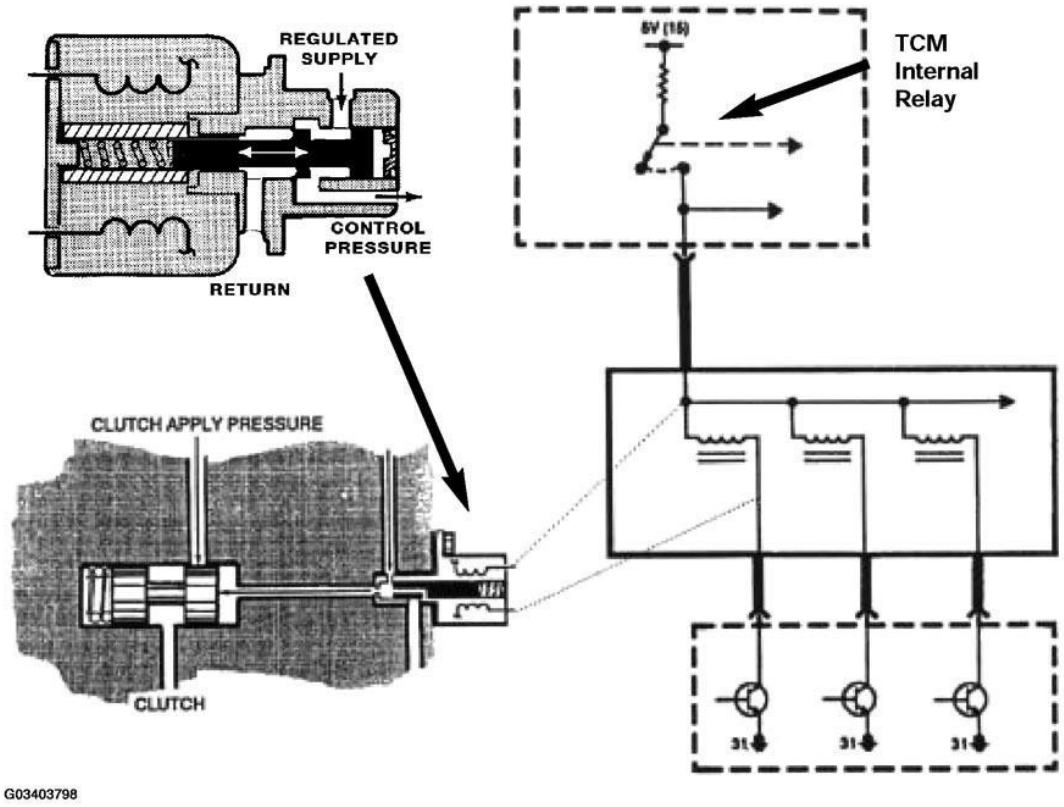


Fig. 20: Identifying Magnetic Valves Are Pulse Width Modulated By TCM
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulating Solenoids

Pressure Regulating Solenoids are used to modify line pressure for use in the transmission. There are numerous terms for these solenoids depending upon transmission type and manufacturer. ZF transmissions use the term EDS, while Hydramatic Transmissions use the term DR solenoid, Force Motor Solenoid and Variable Bleed Solenoid (VBS).

EDS valves are used for main line pressure regulation, TCC application and Overlap Shift Pressure Control on the A5S440Z and A5S560Z. All pressure regulating solenoid are controlled by Pulse Width Modulation.

Using the example in the picture below, this is a section of the A5S440Z/560Z valve body. The EDS valves are used for the following:

- EDS 1 is used for main line pressure regulation
- EDS 2, 3 and 5 are used Overlap Shift Pressure Control
- EDS 4 is used for TCC application. (GWK) Gradually applied TCC.

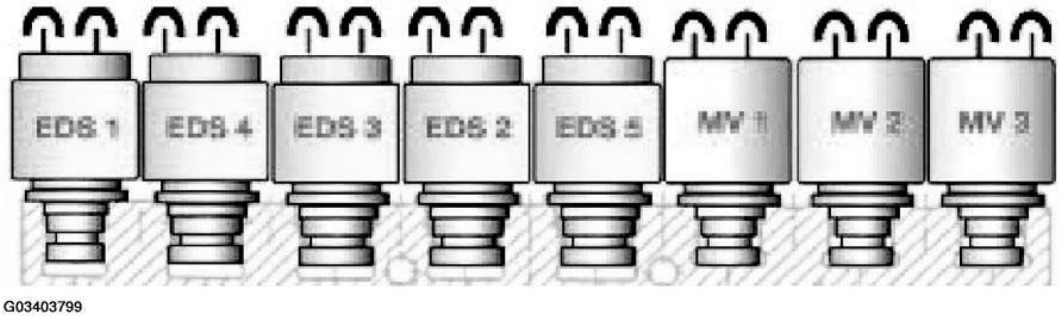


Fig. 21: Identifying Pressure Regulating Solenoids
Courtesy of BMW OF NORTH AMERICA, INC.

Hydramatic Pressure Regulator

The valve body shown at the right is from the A5S360/390R. Note the location of the main pressure regulator. Depending upon the reference text, the pressure regulator is also known as the Force Motor Solenoid, Variable Bleed Solenoid or PC Solenoid.

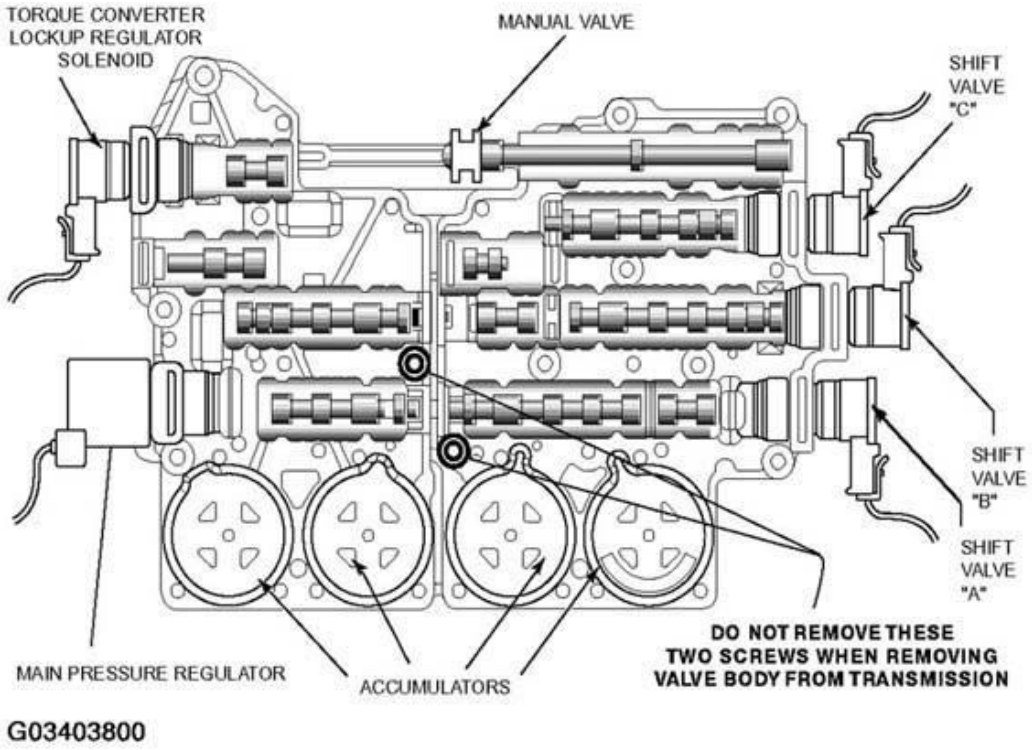
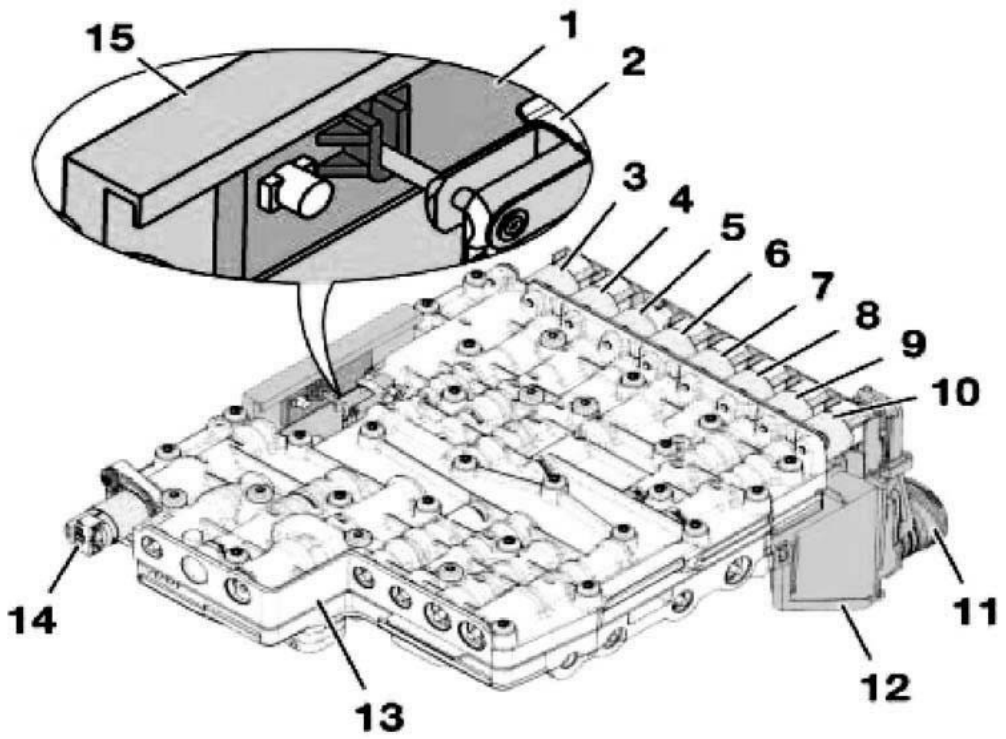


Fig. 22: Identifying Hydramatic Pressure Regulator
Courtesy of BMW OF NORTH AMERICA, INC.

Mechatronics Module GA 6HP26Z



1	Position Slide Switch	9	EDS 2
2	Parking Lock Cylinder Piston	10	EDS 1
3	Solenoid Valve 3, parking lock Cylinder	11	Electronic Plug Connector
4	EDS	12	Electronic Module
5	Solenoid Valve 1	13	Hydraulic Module (Valve body)
6	EDS 4	14	Solenoid Valve 2
7	EDS 5	15	Position Switch
8	EDS 3		

G03403801

Fig. 23: Identifying Mechatronics Module GA 6HP26Z
Courtesy of BMW OF NORTH AMERICA, INC.

Instrument Cluster

The cluster is used to report information to the driver regarding transmission status. There are three items of information needed by the driver:

- **Transmission Range** - this indicates the position of the range selector lever. The driver needs to know whether the transmission is in P, R, N, D, 4, 3, or 2.
- **Transmission Program** - this indicates the mode of operation. There are 3 modes, Economy, Manual and

Sport.

- **Transmission Fault Information** - the driver needs to know of there is a malfunction in the transmission. Depending upon application, transmission faults can be indicated by an icon or by a "Transmission Program" message in the instrument cluster display matrix.

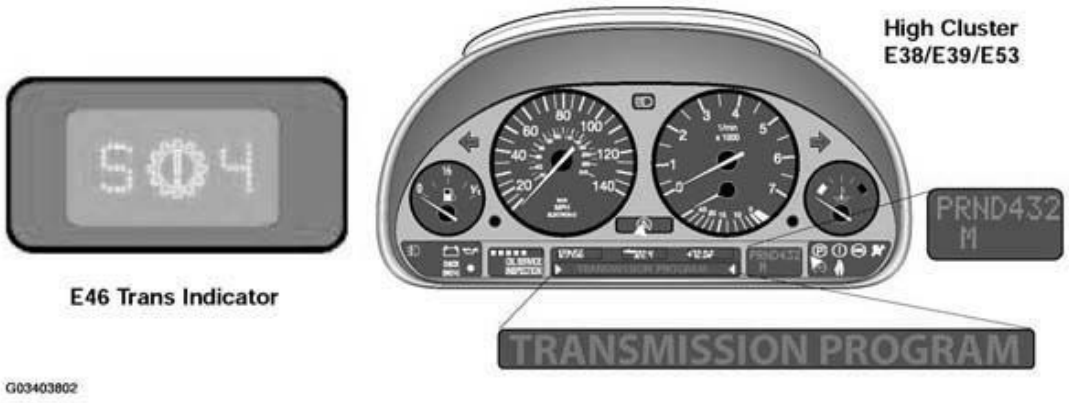


Fig. 24: Identifying Instrument Cluster
Courtesy of BMW OF NORTH AMERICA, INC.

Depending upon vehicle model and transmission, these pieces of information arrive at the cluster through different methods.

- The most current method for this information to arrive at the cluster is through the CAN bus. The cluster processes this information from the TCM via CAN.
- On early E38 and E39 vehicles these is a "One Way Data Signal" from the TCM to the cluster. There is a one way serial data line that transfers this information to the cluster. On later vehicles, the cluster was introduced to the CAN bus and this method was no longer used. This was used on the E38 vehicles to 5/97 and E39 vehicles to 8/97 production.
- Early vehicles such as E32, E34, E36 etc. used a various combination of methods to transfer this data. Some clusters use the "Coded Input" method for the program indicator. Fault indication is done by a ground circuit through the TCM. Transmission range indication is achieved by a direct connection between the range switch and cluster or by a coded input to cluster.

There will be a FC6 in the Kombi when the TCM goes into fail-safe mode.

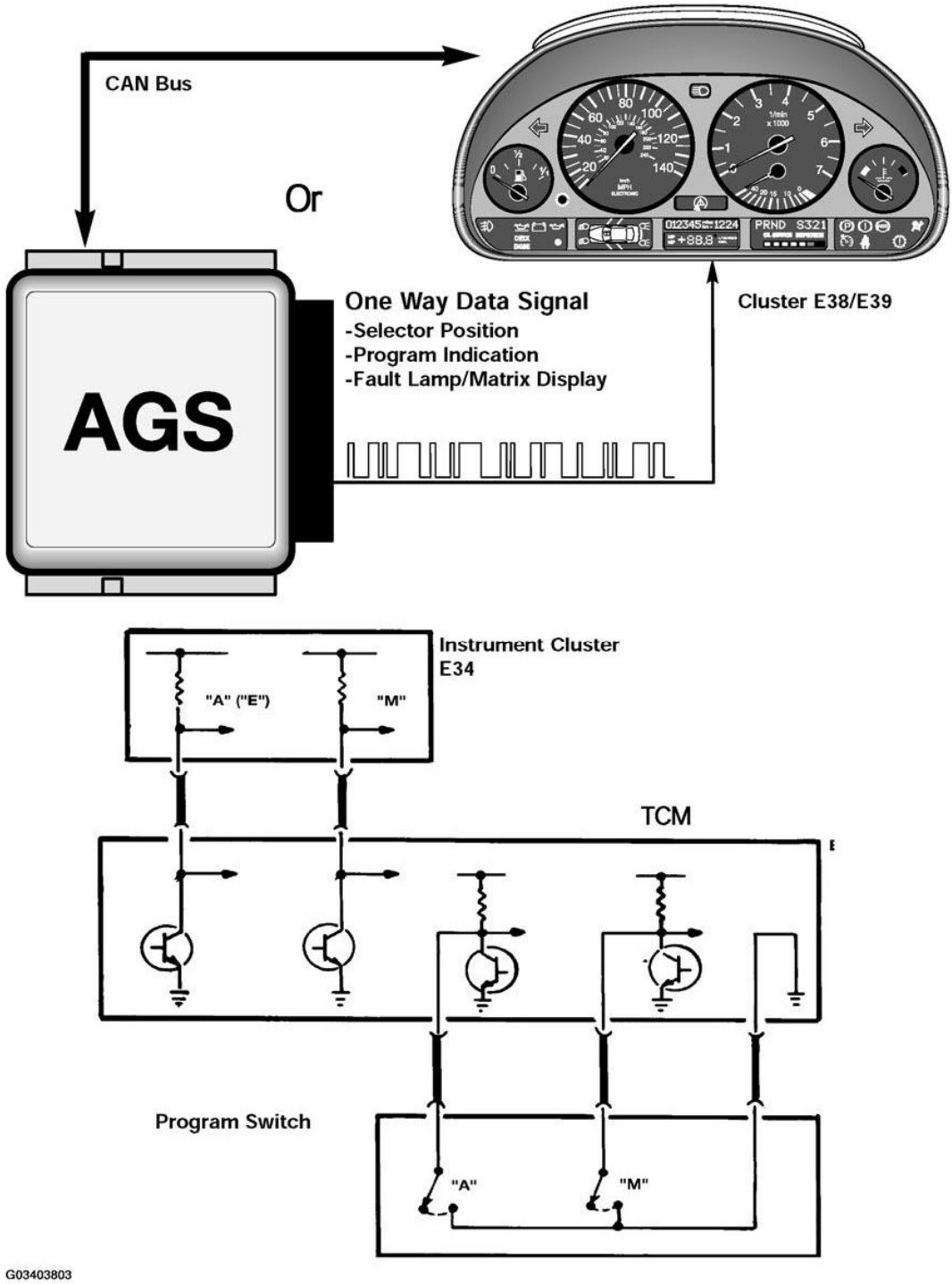


Fig. 25: Identifying Instrument Cluster Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FEATURES AND PRINCIPLES OF OPERATION

Adaptive Hydraulic Pressure Control

Pressure adaptation has been a feature of ZF automatic transmissions since the 4HP22EH. The TCM will maximize shift quality by adapting to transmission wear over time. The TCM will adjust transmission shift pressures to compensate for wear in the multi-plate clutches. This is accomplished by monitoring the input and output speeds of the transmission. When the transmission shifts, the TCM monitors the time that it takes to accomplish the shift. The time change in gear ratio is monitored and compared to an internal time value in the TCM. If the ratio change takes more time than the stored value, the TCM will compensate by adjusting the transmission shift pressures via the EDS valve solenoids. The adaptation value is stored in the TCM. This adaptation values can only be cleared by the diagnostic tester (DIS plus or GT-1).

NOTE: DO NOT clear adaptation values unless directed to do so by technical assistance. Clearing pressure adaptations should not be done to resolve a customer complaint. The only time that you would need to do so is after a transmission or valve body replacement or software change.
Also it is important not to confuse pressure adaptation with AGS features. AGS features will be discussed later in this chapter. AGS features are not stored on a long term basis and will not be cleared when the pressure adaptations are cleared. Driving style is NOT stored.

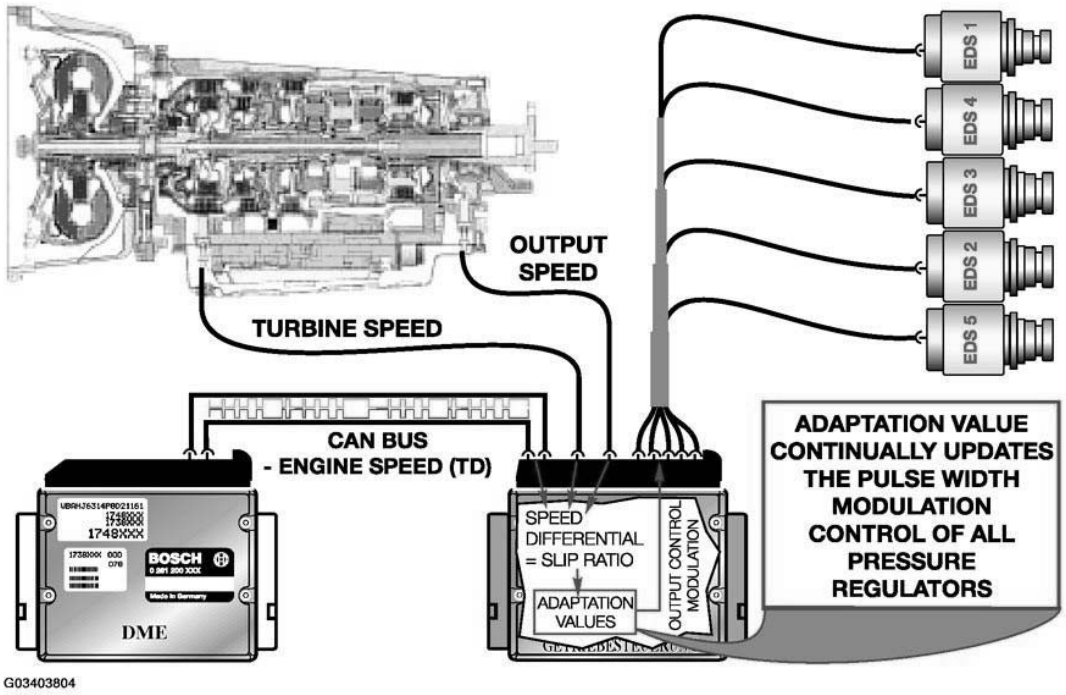


Fig. 26: Identifying Adaptive Hydraulic Pressure Control
Courtesy of BMW OF NORTH AMERICA, INC.

Downshift Protection

Downshift protection is a feature that prevents unwanted or improper downshifting. If the range selector were moved to a lower gear at a high road speed, engine damage could occur from an unintended over-rev. This feature will prevent engine over-rev by delaying or preventing the unwanted downshift until the proper road speed is achieved. The result is increased safety by preventing unwanted deceleration slip.

Reverse Lockout

The TCM will lockout reverse above 3 MPH to prevent drivetrain damage. The range selector lever will go into the reverse detent, but reverse will not engage. This is achieved by the TCM through hydraulic intervention. The transmission will appear to be in neutral.

NOTE: Reverse Lockout is not operative when in fail-safe.

Engine Warm Up Cycle

The transmission shift points are modified after cold start to raise engine RPM during shifting. This allows for a faster engine warm up and reduction of catalyst warm up time. The TCM uses the transmission oil temperature information to determine the implementation of this function.

The warm up phase program will be terminated if any of the following conditions exist:

- The vehicle exceeds 25 MPH or
- Transmission oil temperature exceeds 60 Degrees Celsius or
- A Maximum of three minutes is exceeded.

ASC/DSC Shift Intervention

During ASC/DSC regulation upshifts are inhibited to enhance the effectiveness of tractional control. Depending upon vehicle model, this action can take place via the CAN bus or a dedicated shift intervention signal wire. On later model vehicles where the ASC/DSC module is connected to the CAN bus, the shift intervention signal is sent to the TCM via CAN.

Torque Reduction

In order to allow a smoother shift and reduce load on the transmission, engine torque is reduced during shifting. This is accomplished by a signal that is sent from the TCM (EGS) to the ECM (DME) during shifting. The ECM will retard timing momentarily during the shift for a few milliseconds. This timing change is transparent to the driver. Depending upon application, the torque reduction signal is sent over a dedicated wire or a signal over the CAN bus.

Emergency Program

When a malfunction occurs within the transmission, the Emergency program (fail-safe mode) will be initiated. The Emergency Program will prevent unintended gear engagement and ensure driver safety. The following will occur during Fail-safe Operation:

- All shift solenoids are de-energized via TCM internal relay.

- The pressure regulation solenoid is de-energized resulting in maximum line pressure.
- The Torque Converter Clutch is de-activated.
- The Reverse Lockout function is cancelled.
- Shift lock solenoid is de-energized.
- Fault indicators are active.

The fault indicator varies depending upon model, year and cluster type etc. High version instrument cluster will display a message in the matrix display. Vehicles with low version clusters will display a fault symbol in the cluster.

During fail-safe mode the transmission will be shifted into a higher gear to allow the vehicle to be driven to a service location. Depending upon application, the transmission will shift into 3rd or 4th gear (on a 4spd) and 4th or 5th gear (on a 5 spd). For example the A5S360R transmission will go into 5th gear when there is a malfunction and 4th when there is a power failure to the TCM. Since pressure regulation ceases, the shift to fail-safe mode will be abrupt or harsh, unless the transmission is already in the fail-safe gear.

On newer OBD II compliant vehicles, the MIL light will also be illuminated by the ECM (DME).

NOTE: **When diagnosing transmission related complaints, it is possible to have an erroneous fault indicator warning. Faults in the cluster can cause a false indication or "Trans Program" message. One indication of this scenario would be a transmission fault message in the cluster with no transmission faults stored in the TCM.**

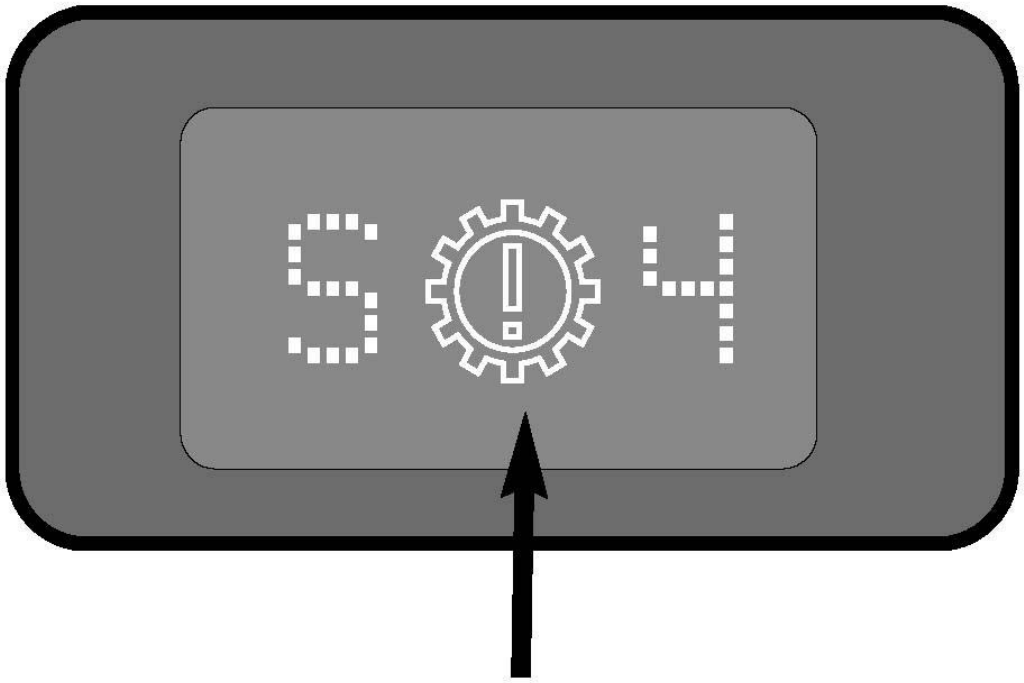


Fig. 27: Identifying E46 Transmission Fault Indicator
Courtesy of BMW OF NORTH AMERICA, INC.

AC Compressor Load Sensing (Hydramatic Transmissions)

When the AC Compressor is switched on, additional load is placed on the engine. To compensate for the additional load, the TCM modifies line pressure and shift points. On the THMR-1, the TCM receives these signals via a direct connection to the AC compressor control circuit.

On vehicles equipped with CAN bus technology, the "AC on" signal is sent to the TCM from the DME as a CAN bus message.

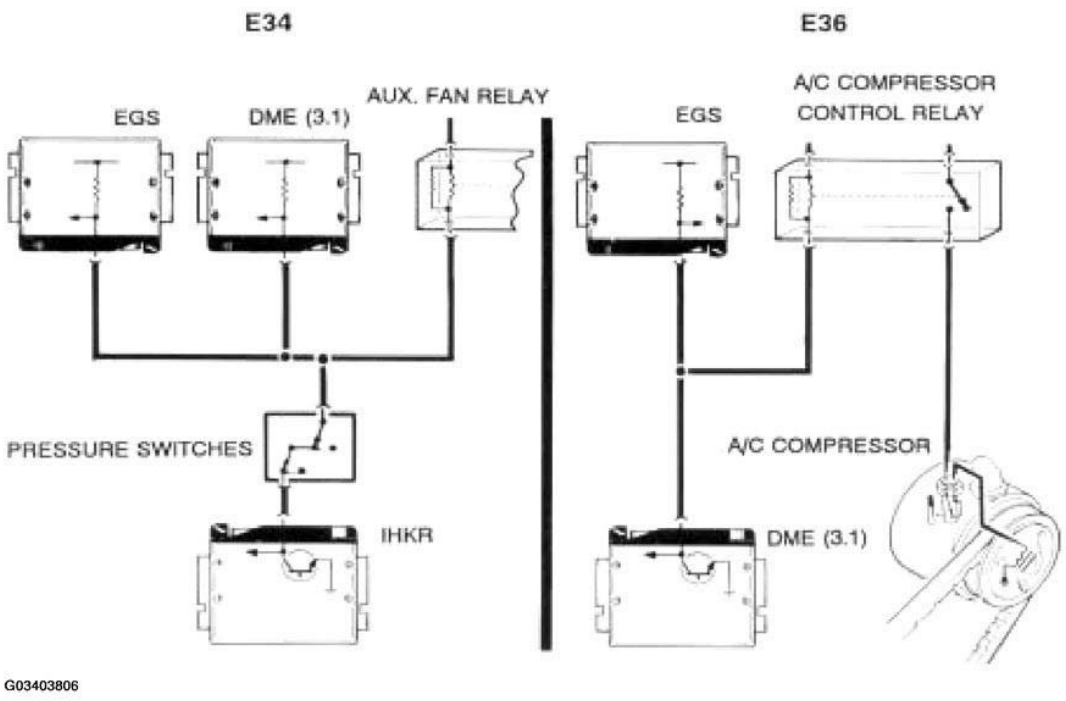


Fig. 28: Identifying AC Compressor Load Sensing (Hydramatic Transmissions)
Courtesy of BMW OF NORTH AMERICA, INC.

Shift Lock

The shift lock solenoid is mounted on the selector lever assembly and locks the selector lever in Park or Neutral when the ignition is ON. This prevent the selection of a gear unless the brake pedal is depressed. The solenoid is activated by a switched ground from the TCM. Power is supplied by the TCM internal relay. During fail-safe operation, the shift lock is disabled. On later models, the shift lock will also be active when the TD signal is present and the shifter will remain locked above an engine speed of 2500 RPM regardless of brake application.

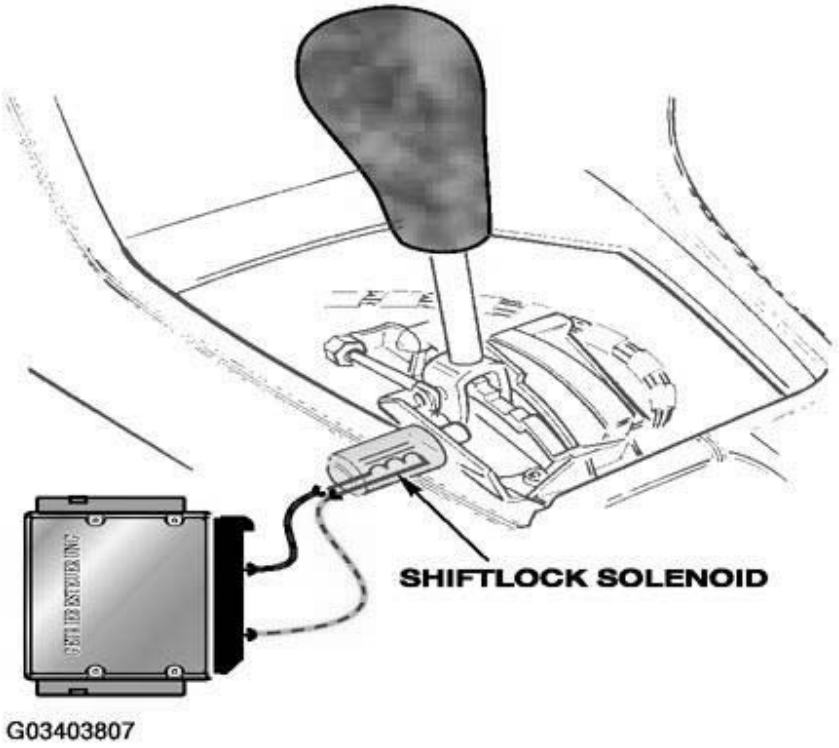


Fig. 29: Identifying Shift Lock Solenoid
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Clutch

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds, the torque converter clutch must be disengaged at low engine speeds to prevent stalling.

There are two methods for controlling the torque converter clutch on BMW transmissions:

- **A4S310/270R, 4HP22/24 EH, A5S310Z** - These transmissions use an on/off control method to lock and unlock the torque converter. The Torque Converter Clutch is either completely engaged or disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be undesirable to some drivers.
- **A5S560Z, A5S440Z, A5S325Z, GA6HP26Z,A5S360/390R** - These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling.

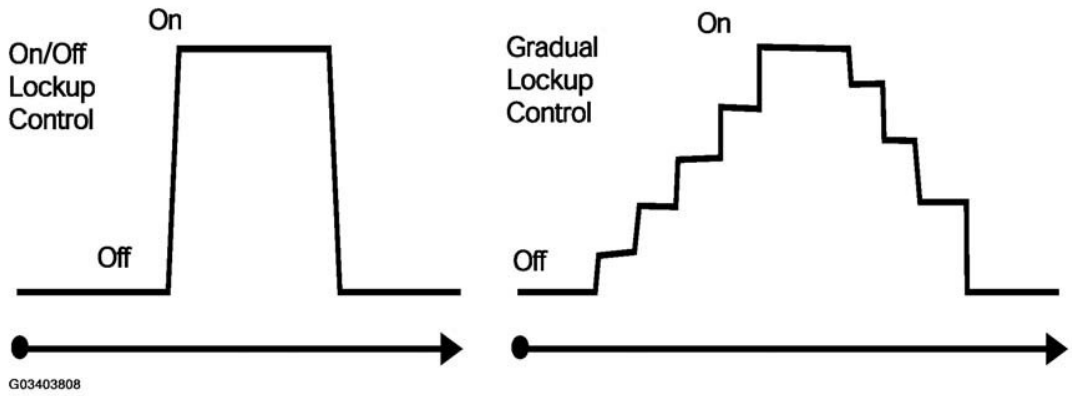


Fig. 30: Identifying Two Methods For Controlling Torque Converter Clutch On BMW Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Lock-Up Torque Converter

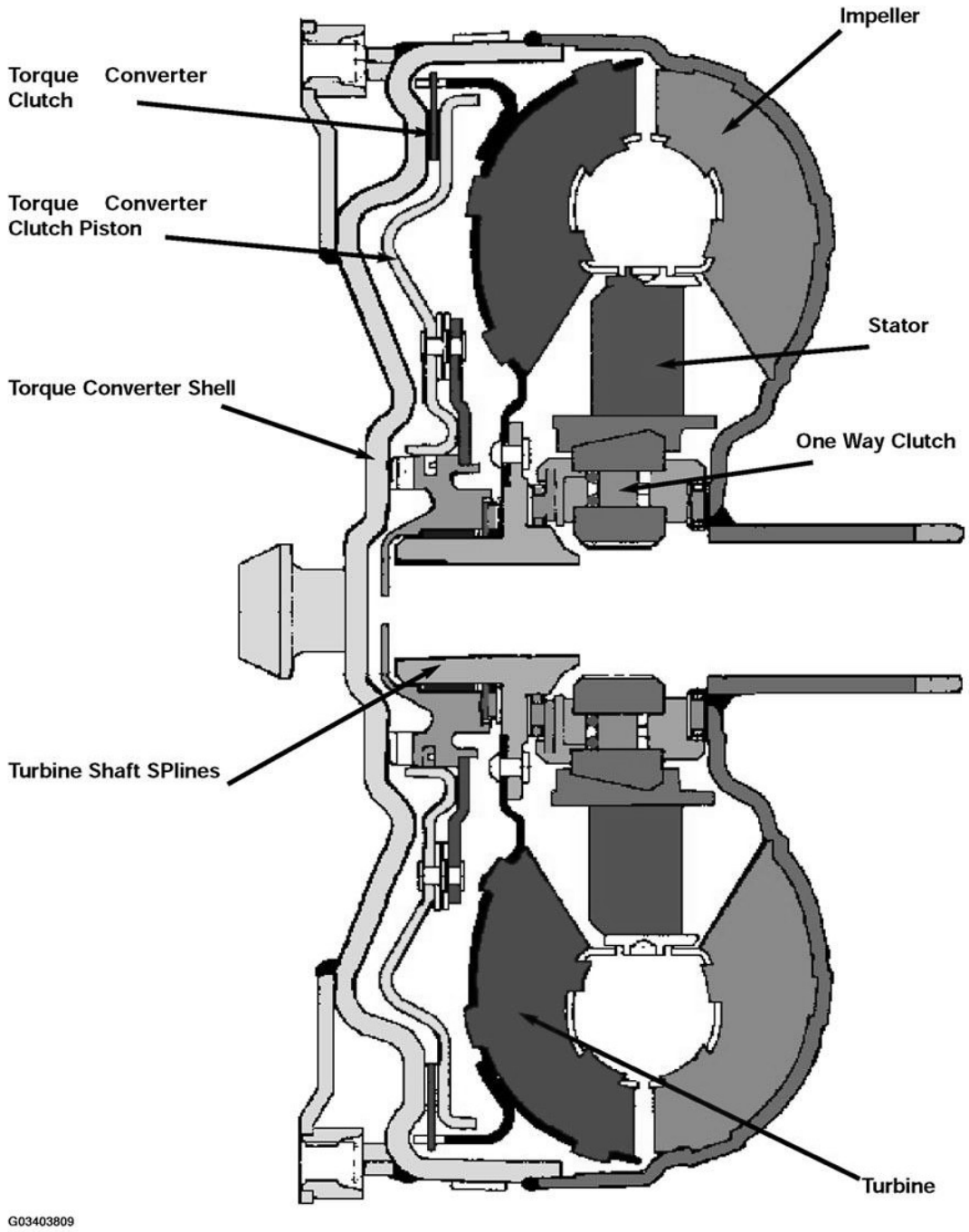


Fig. 31: Identifying Cross Section View Of Lock-Up Torque Converter
Courtesy of BMW OF NORTH AMERICA, INC.

Shift Solenoid Control

Magnetic valves are used to direct the flow of transmission fluid to control shift elements in the transmission. Another Term for "Magnetic Valve" is "Shift Valve". Magnetic valves (MV) are solenoids controlled by the

TCM. They can be switched by B+ or B-.

On ZF transmissions, magnetic valves are designated MV1, MV2, MV3 etc. On GM transmissions they are designated Shift Valve A, Shift Valve B, Shift Valve C etc.

Either valve can be checked for proper resistance using a multi-meter, DISplus or GT-1. Also, the "Activate Components" function can be used to check the Magnetic valves. Most all magnetic valves are switched on/off instead of Pulse Width Modulation (PWM).

All magnetic valves (except THM R-1 to 12/95) are supplied power from an internal relay located in the TCM. The magnetic valves are switched on and off by final stage transistors in the TCM. During fail-safe operation, power to all MV's is switched off by the internal relay.

Magnetic valves are located on the valve body. They can be replaced individually.

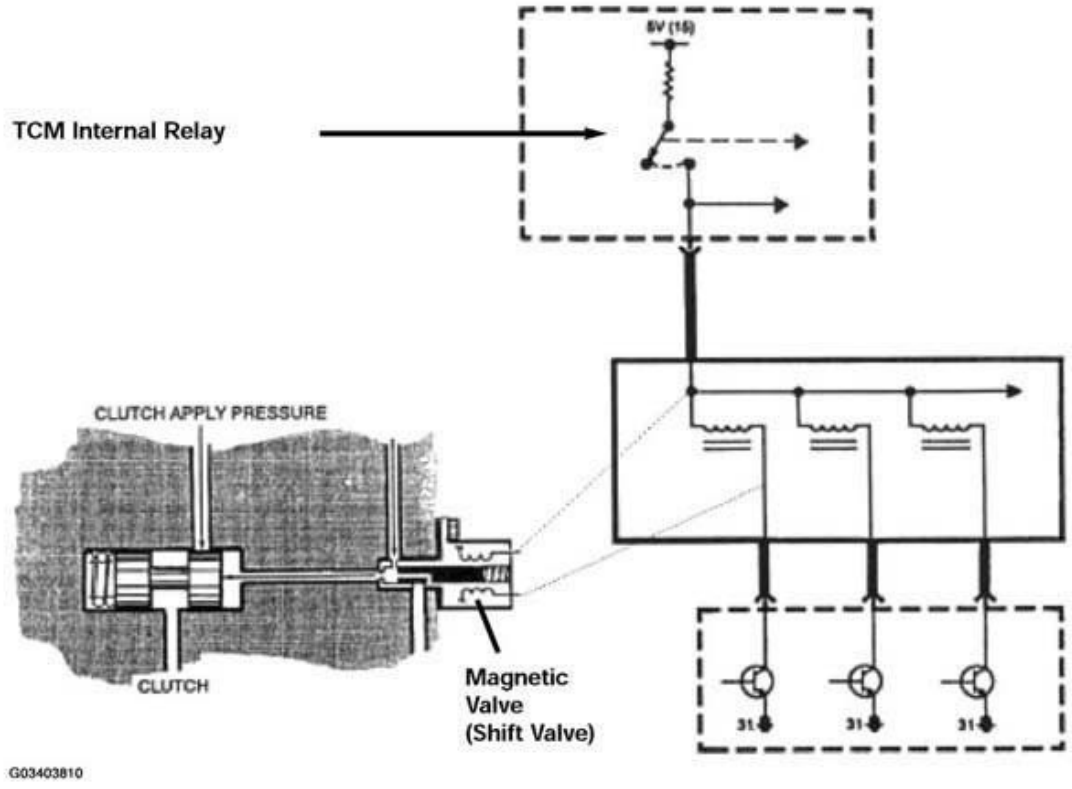


Fig. 32: Identifying Shift Solenoid Control Circuit Diagram
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

Pressure regulating solenoids modify line pressure for hydraulic operation. Solenoids for pressure regulation are referred to as EDS valves in ZF transmissions. GM transmissions have a few terms such as Force Motor Solenoid, Variable Bleed Solenoid, and DR solenoid. Regardless of the name used, they are all used to control

main line pressure based on throttle position and engine load.

On ZF transmissions, EDS valves are also used to control "Overlap Shifting". This allows for improved shift comfort by controlling pressures during shifting.

Depending upon transmission application, pressure regulating solenoids can be controlled using Pulse Width Modulation on B+ or B-.

The TCM will increase line pressure by regulating current flow to the pressure regulator. Current flow is controlled by pulse width modulation. When the duty cycle is low, the current flow to the solenoid is low. This allows spring pressure to close the valve. Therefore maximum line pressure is achieved. As the duty cycle increases, the current flow also increases. The valve opening increases, which allows pressure to be released through the pressure discharge which in turn decreases line pressure.

Main line pressure is also increased during fail-safe operation and when needed during "Adaptive Hydraulic Pressure Control" functions. Mainline pressure will also default to maximum pressure when power to the TCM is switched off.

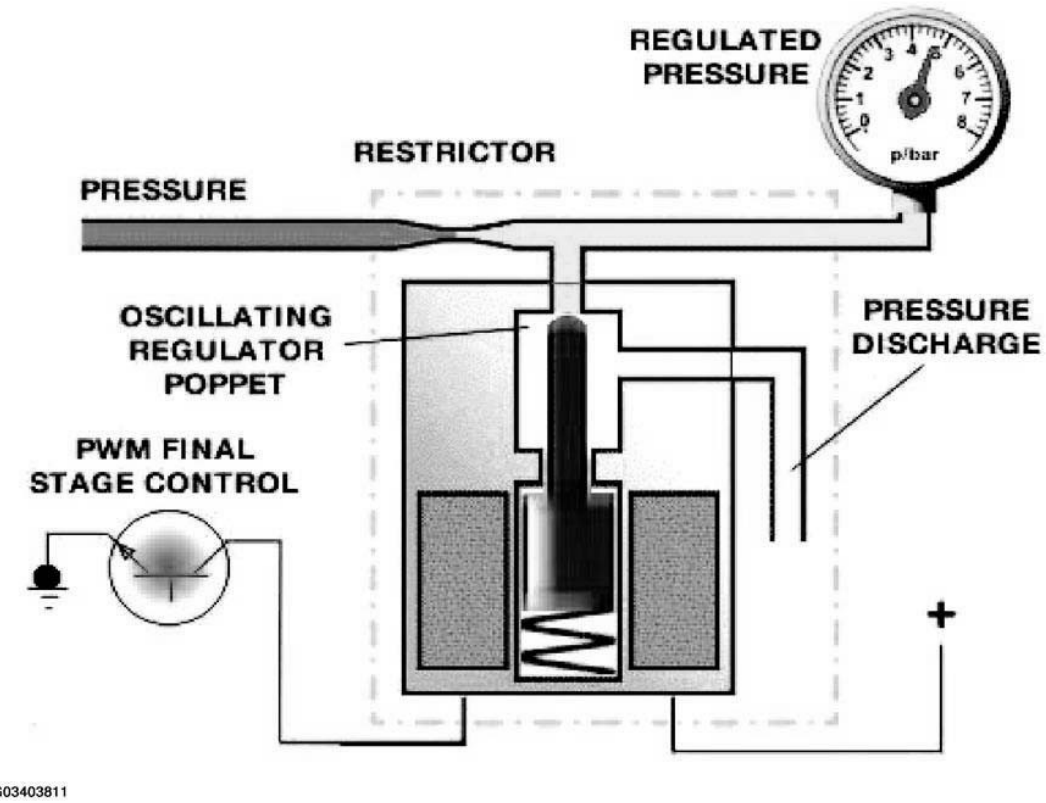


Fig. 33: Identifying Pressure Regulation
Courtesy of BMW OF NORTH AMERICA, INC.

Shift Programs

BMW EH transmissions have selectable shift programs (or modes) to suit driver needs and operating conditions. There are 3 basic shift programs available:

- **Economy Program** - The economy program is the default program which is adopted every time the vehicle is started. When in economy mode, the operating priority is for maximum economy and shift comfort. Shifts will take place at low engine RPM and road speed. The economy mode is indicated by an **"A"** on the program switch. The cluster will display an **"E"** to indicate economy mode.
- **Manual Mode (Winter Mode)** - Manual mode is used to start out the vehicle in a higher gear on slippery surfaces when more traction is needed. A higher gear will reduce torque to the rear wheels. Manual mode can also be used to select a lower gear when needed such as when climbing a hill. Depending upon vehicle application an **"M"** will appear in the cluster when in Manual Mode or an asterisk (*) symbol will appear in the instrument cluster to indicate Winter Mode.
- **Sport Mode** - Sport Mode provides raised shift points and a more aggressive shift program for the "Enthusiastic" BMW driver. The cluster will display an "S" when in sport mode.

Regardless of vehicle application, the program switch provides a momentary ground to the TCM to switch between modes. There have been numerous designs of the program switch since it's introduction. The program switch configurations are as follows:

- **2 Position Slide Switch** - This switch has the "A" and the "M" selection. Sport mode is achieved by moving the selector lever from "D" to 4, 3 or 2 when in the Economy Mode. The 2 Position slide switch is used on most models. These vehicles usually have a range and program display located in the instrument cluster.
- **2 Position Rocker Switch** - This switch operates the same as the slide switch, but it is used exclusively on the E36. The E36 does not have a program indicator in the cluster. The rocker switch will illuminate, indicating the current program.
- **3 Position Slide Switch** - This switch has the added position for sport mode. The shifter does not have to be moved out of drive (D) to be in sport mode. This switch is used on the E36 M3 and the 4HP22/24 EH (Version Late E-7).
- **3 Position Rotary Switch** - This switch is used only on the Early 4HP22 EH trans missions (Version Early E-7).
- **No Program Switch** - On some vehicles with AGS features, there is no program switch. Shift modes are obtained by moving the shift lever out of "D" range or automatically by adaptive shift functions. (Example E39)

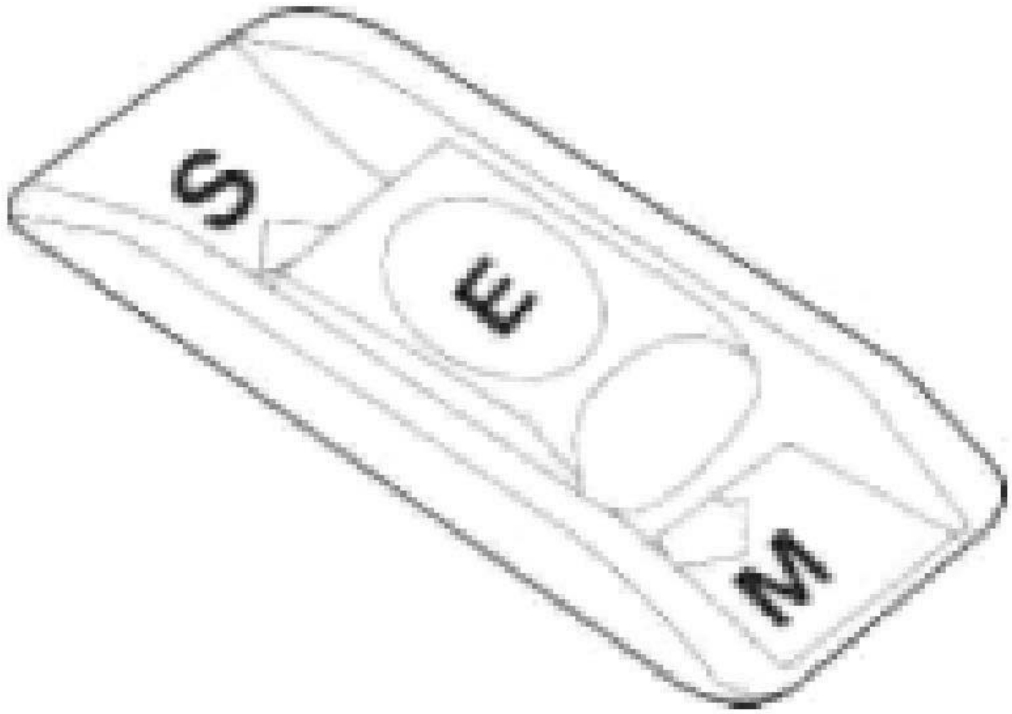


Fig. 34: Identifying 3 Position Program Switch
Courtesy of BMW OF NORTH AMERICA, INC.

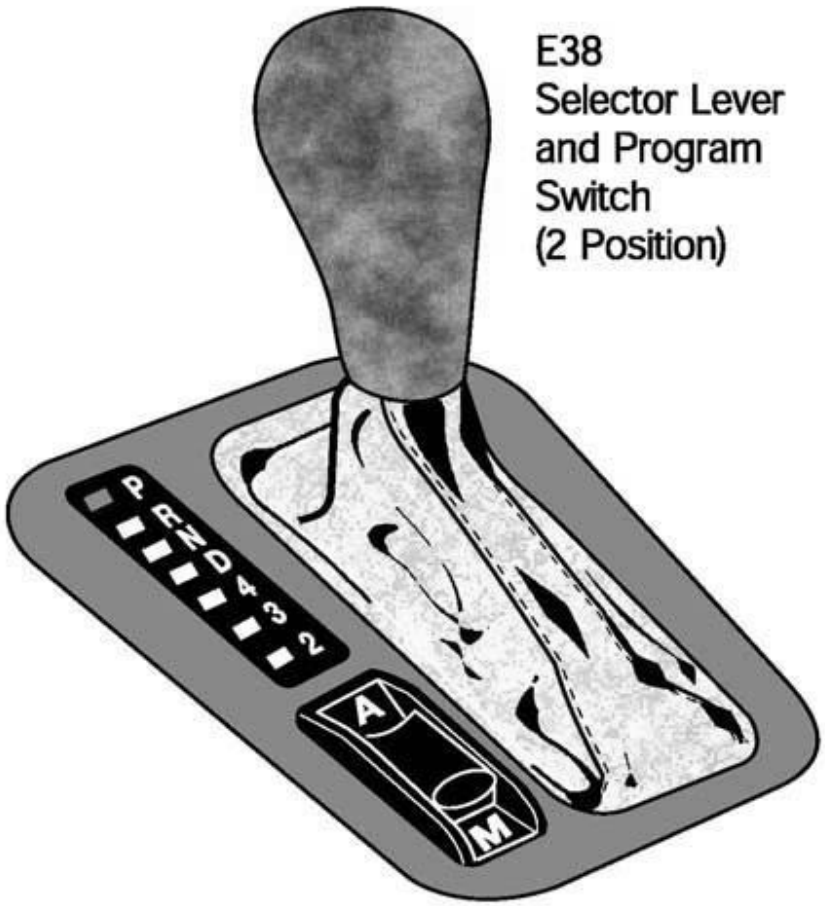


Fig. 35: Identifying E38 Selector Lever And Program Switch (2 Position)
Courtesy of BMW OF NORTH AMERICA, INC.

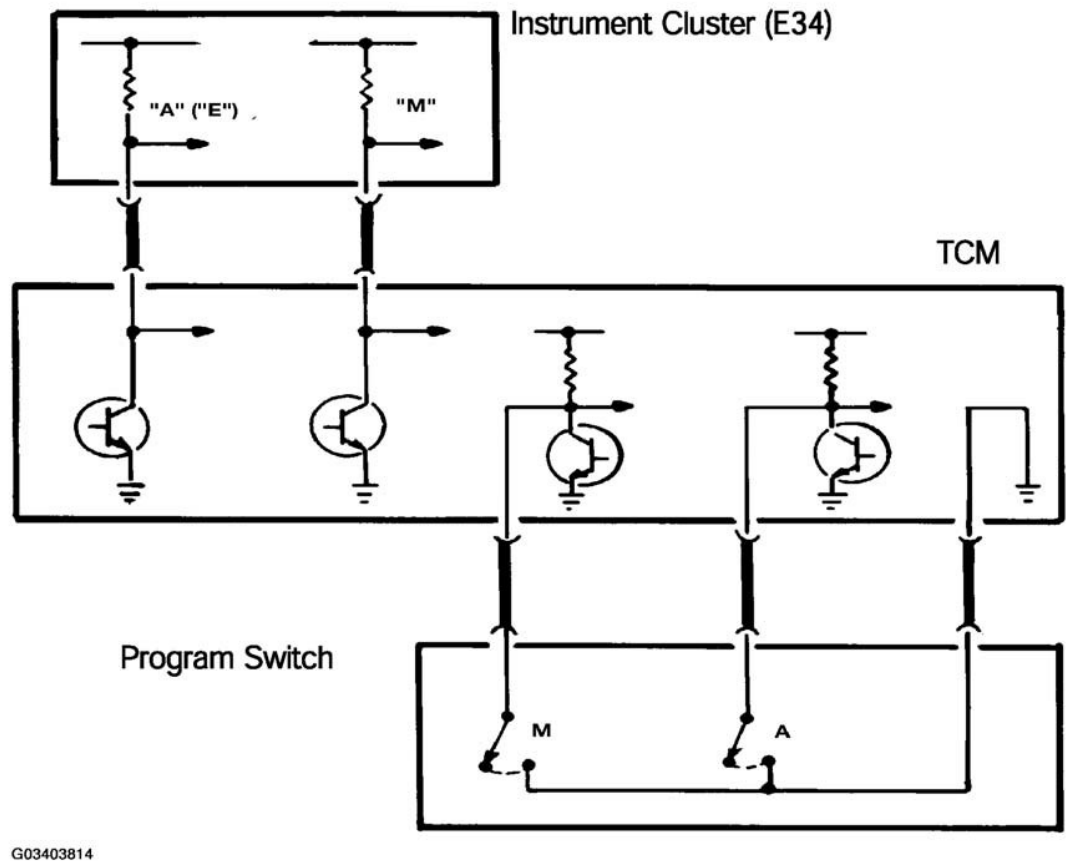


Fig. 36: Shift Programs Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Shift Modes

The Steptronic shifting system was introduced to the BMW model line on the 95 E31 850Ci (from 10/94). Steptronic was subsequently added to other BMW models and is available on all BMW models with automatic transmissions. Other than a few additional components in the shifter mechanism, Steptronic equipped vehicles use the same transmission and TCM as non-Steptronic equipped vehicles.

Since the introduction of Steptronic, there have been several variations in Steptronic function. Regardless of version, the Steptronic system provides the driver with two modes of operation:

- To operate the transmission in fully automatic mode as with a non-Steptronic transmission.
- To operate the transmission in the manual shift mode by tilting the shift lever forward or backward when in the manual gate.

The Steptronic shift lever console contains and automatic and a manual shift gate. The automatic gate contains the gear lever positions P/R/N/D. When the lever is placed in "D" all of the shifting takes place based on the shift map programming in the TCM. To enter the manual gate the shift lever is moved 15 degrees to the left.

Depending upon application, there are three possible configurations of the manual gate:

- On the E31 850Ci, the gate is marked as "M" only. There is a plus and minus sign for manual shifting. Upshifts are achieved by momentarily moving the shifter forward. Downshifts are achieved by moving the shifter rearward. When placing the shifter into the "M" gate, the transmission will adopt the current gear that is engaged. The transmission will stay in that gear until an upshift or down shift request is made.
- On all other vehicles until the 2002 model year, the gate is marked M/S. There is also a plus and minus sign for manual shifting. When placing the shifter into the M/S gate, the transmission will adopt Sport mode. All shifts will still be automatic. Full manual mode is achieved when an upshift or downshift request is made. Upshifts are achieved by moving the shifter forward momentarily and downshifts are achieved by moving the shifter rearward.
- On all models with Steptronic from 2002, the only change is to the manual shifting modes. In order to be consistent with SMG operation, the positions were reversed. Upshifts are now achieved by moving the shifter rearward and downshifts are now forward. Otherwise, Steptronic operation is identical to the previous models.

Automatic Functions In Manual Mode

When in manual mode there are certain functions which occur automatically to prevent drivetrain damage and improve driveability:

- **Engine Overspeed Prevention:** To prevent engine over-rev, the TCM will upshift automatically just prior to max engine cutoff.
- **Kickdown:** If plausible, the TCM will automatically shift down to the next lower when a kickdown request is received.
- **Decelerating:** If in 5th gear and coasting to a stop, the TCM will automatically down shift to 4th gear at approximately 31 mph and then 3rd gear at approximately 19 mph. The automatic downshift allows for an acceptable gear when re-accelerating. (6 cylinder models will shift to 2nd gear when stopping vehicle)
- **Implausible Gear Requests:** Certain shift requests are ignored by the TCM. For example, requesting a downshift at a high rate of speed would be ignored. Any shift request that would cause the engine to exceed the maximum RPM limit would not be allowed. Also starting out in a high gear is also not allowed. Only 1st, 2nd or third gear is allowed when accelerating from a stop.

E31 850Ci Shifter Console

1995 to 1997 Model Year.

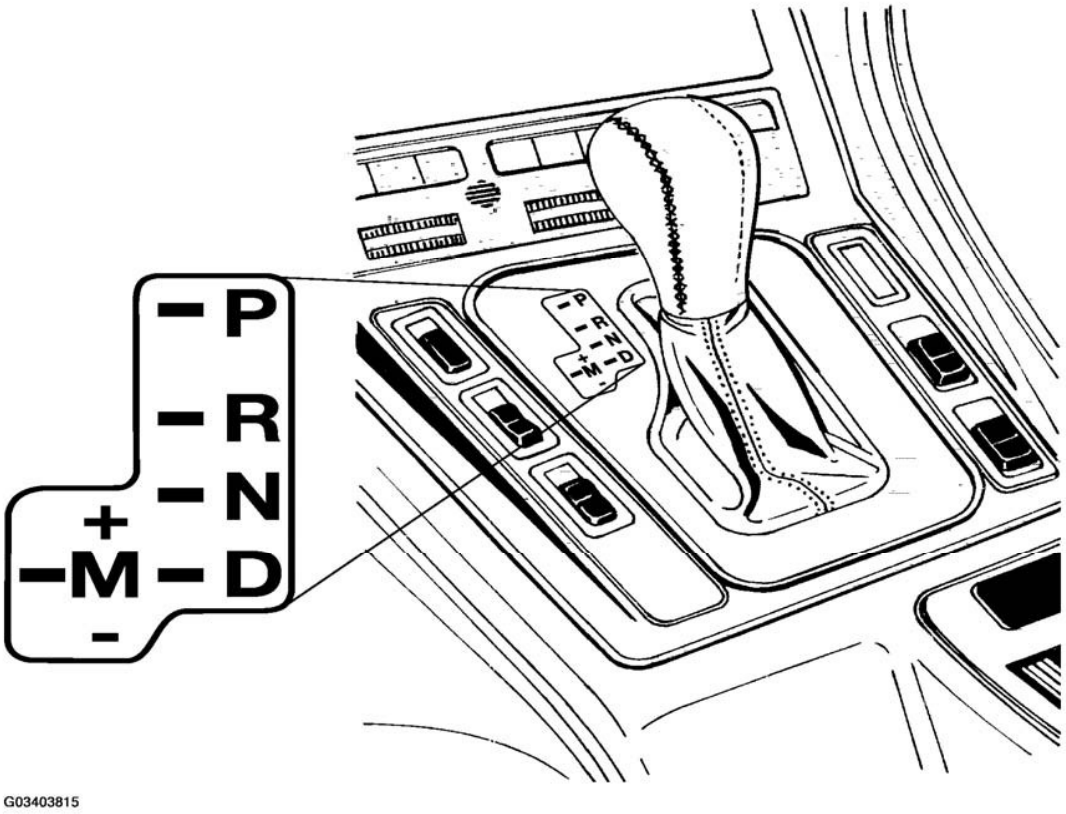


Fig. 37: Identifying E31 850Ci Shifter Console
Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic Shifter Circuit

In order to achieve manual shifts with Steptronic, the selector lever is moved 15 degrees to the left. A pin on the selector lever engages the "up/down" microswitches which are a ground input to the TCM. The selector lever also triggers the "M" gate microswitch which is also a ground input to the TCM.

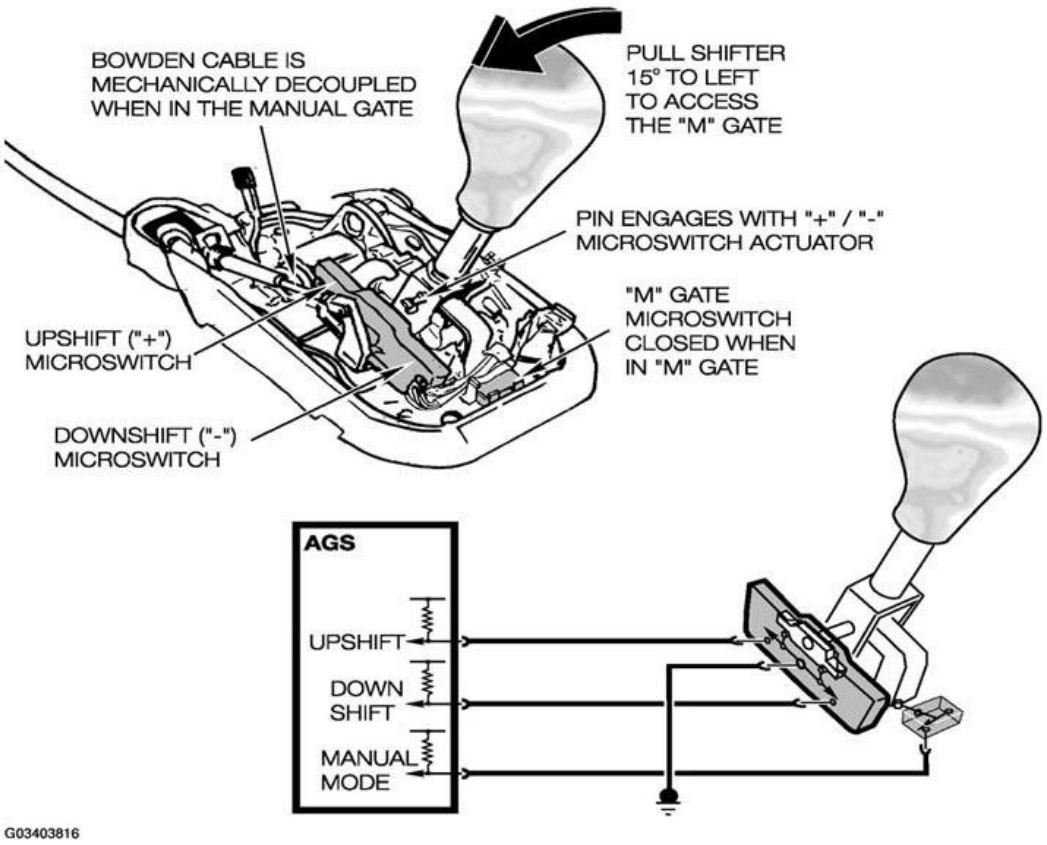


Fig. 38: Identifying Steptronic Shifter Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

The example on the right shows a typical shift console for an E31. Note the shift pattern, upshifts are forward and downshifts are rearward. This shift pattern was used on vehicles up to the end of 2001 production. On vehicles from 2002 production, the shift pattern is reversed.

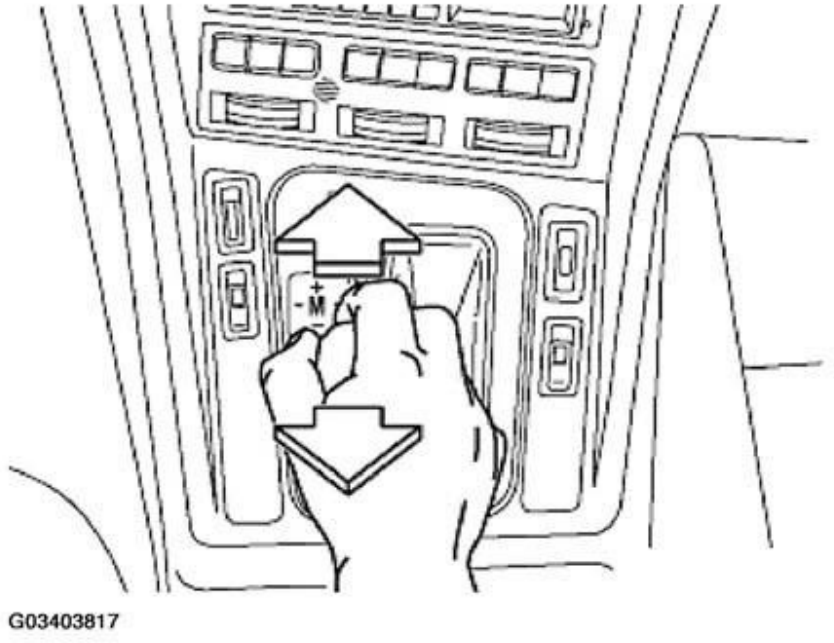


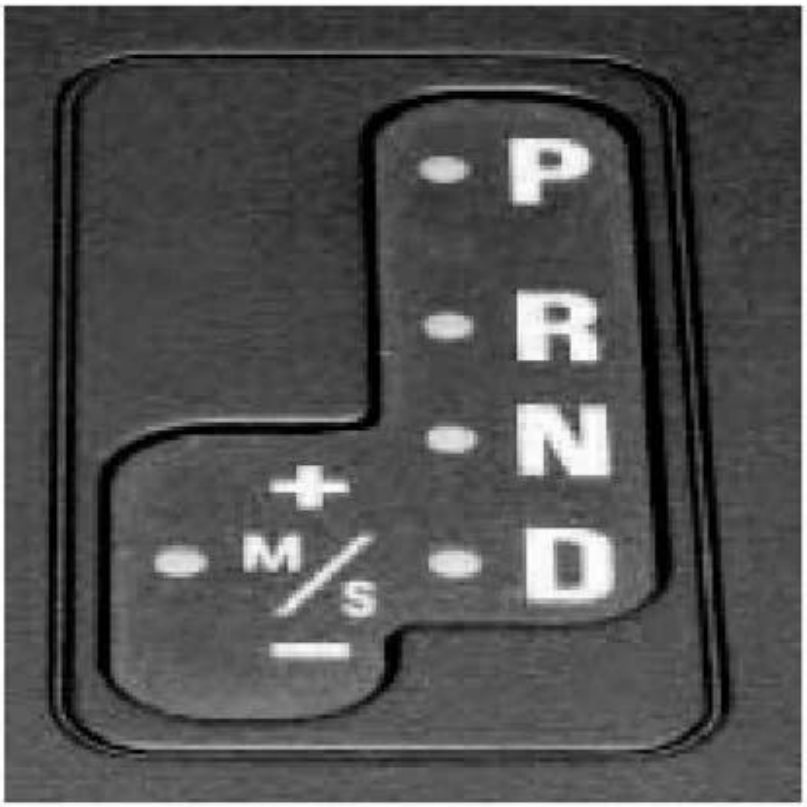
Fig. 39: Identifying Shift Pattern
Courtesy of BMW OF NORTH AMERICA, INC.

Steptronic System Comparison

STEPTRONIC SYSTEM COMPARISON

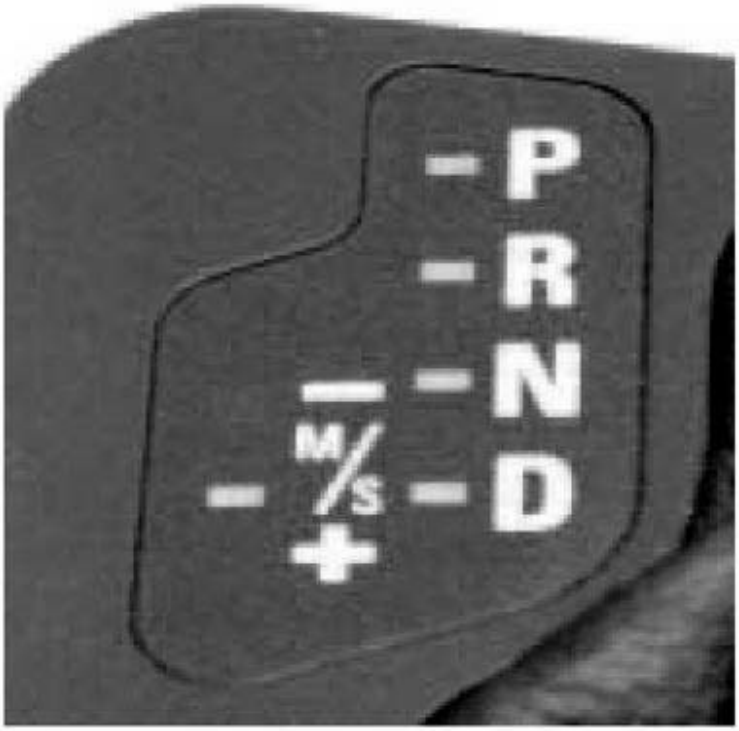
Detail	E31 850Ci 1995 to 1997	All model except E31 850Ci up to 2001 Model year with Steptronic.	All Models from 2002 model year with Steptronic
Shift Console Layout	"M" Gate	M/S Gate	M/S Gate
Selection of Manual Mode	Shift to "M" gate	Shift to "M/S" gate and move lever momentarily to "+" or to "-".	Shift to "M/S" gate and move lever momentarily to "+" or to "-".
Gear Range in Manual Mode.	2nd to 5th gear (1st gear only accepted for 2 minutes after cold start. If the throttle is pressed 100% a 2-1 shift will occur	1st to 5th gears	1st to 5th gears
Un-allowable gear requests.	4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev. 1st gear after engine warm up.	4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev.	4th and 5th gear after vehicle standstill. Downshifts that can cause engine over-rev.

Upshifts/Downshifts	Upshifts - Forward Downshifts - Rear	Upshifts - Forward Downshifts - Rear	Upshifts - Rear Downshifts - Forward



G03403818

Fig. 40: Identifying Shift Pattern Up To 2001
Courtesy of BMW OF NORTH AMERICA, INC.



G03403819

Fig. 41: Identifying Shift Pattern From 2002
Courtesy of BMW OF NORTH AMERICA, INC.

ADAPTIVE FEATURES (AGS)

AGS features were introduced in 1994 with the A5S560Z transmission. AGS control consists of adaptive features that will modify transmission operation according to various factors. AGS operation can be influenced by two major functional groups:

- Driver influenced features (influenced by throttle and kickdown input)
- Environmental influences (such as road conditions - icy, traffic etc.)

--EGS-- CONDITIONS THAT INFLUENCE SHIFT PROGRAM

--AGS-- ADDITIONAL CONDITIONS THAT INFLUENCE SHIFT PROGRAM

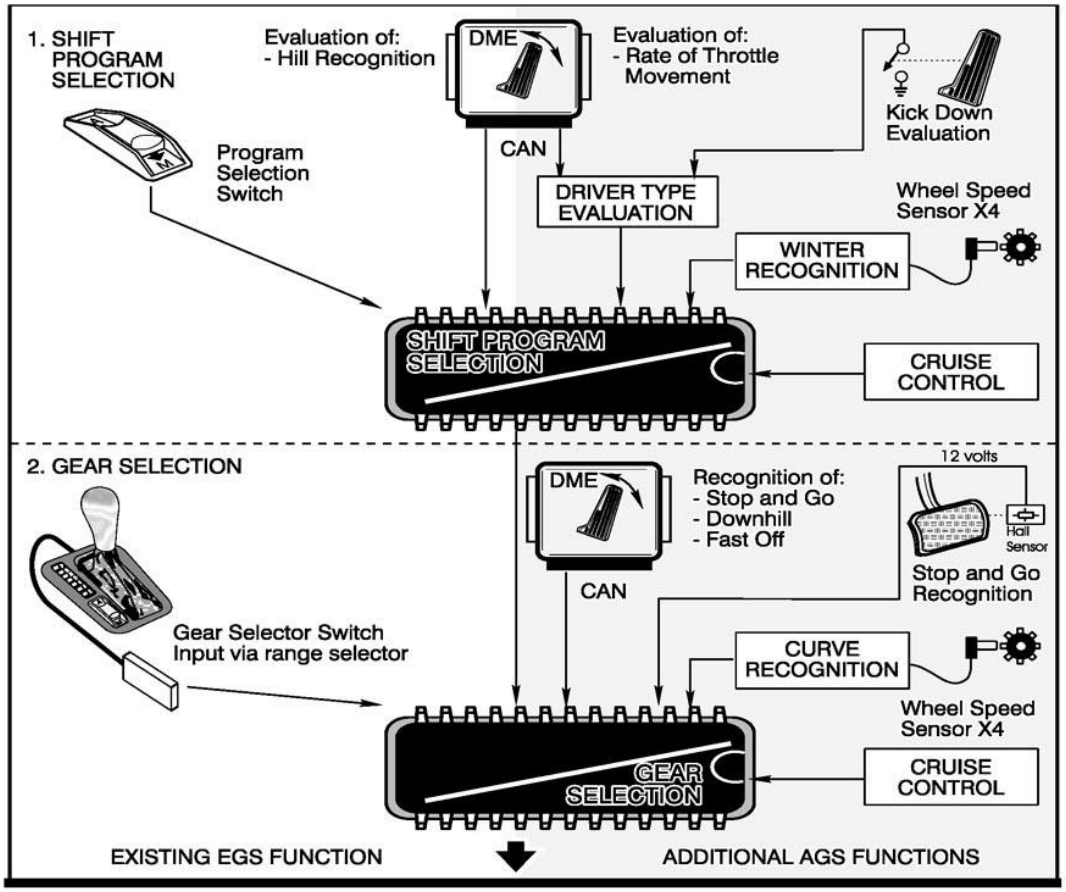


Fig. 42: Identifying Adaptive Features (AGS)
Courtesy of BMW OF NORTH AMERICA, INC.

The driving program selection is not adapted on a long term basis - nor is it stored in the control module memory when the ignition is switched off. It continually changes as the driver of the vehicle changes driving habits.

Driver Influenced Features Of AGS

The adaptive drive program is based primarily on throttle input. The throttle information comes from the ECM (DME) via the CAN bus. The TCM continuously monitors the throttle input for:

- The current throttle position
- The rate of change in pedal movement
- The number of acceleration requests
- The number of kickdown requests

Drive Away Evaluation

The AGS system selects the appropriate shift program based on the amount of acceleration that occurs during takeoff. When driving away under full throttle the transmission will shift from XE to E.

Kick Fast Feature

Based on these inputs, the AGS will select one three different driving programs as follows:

- Extreme Economy - Shift points are a low speeds for maximum comfort and economy
- Economy - The shift points are raised for more performance with economy as priority
- Sport - The shift points are higher to take advantage of full engine performance.

  Under full throttle acceleration at high speed, single gear downshifts are possible. A two gear downshift is possible if the accelerator pedal is moved quickly to kick-down. The Extreme Sport program was eliminated as part of the kick-fast feature.

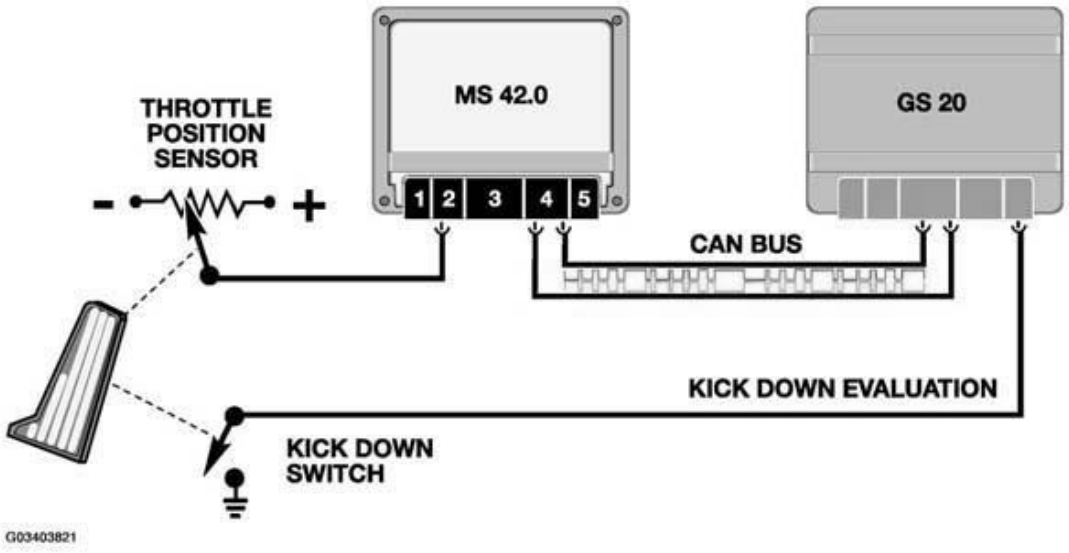


Fig. 43: Identifying Kick Fast Feature
Courtesy of BMW OF NORTH AMERICA, INC.

Environmentally Influenced AGS Features

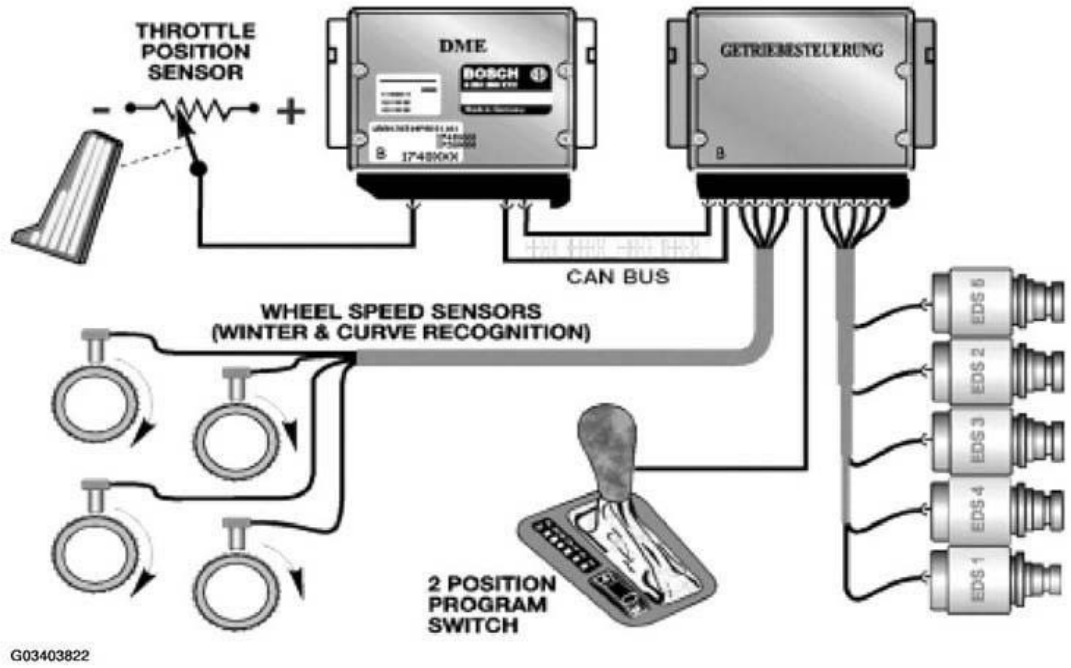


Fig. 44: Identifying Environmentally Influenced AGS Features
Courtesy of BMW OF NORTH AMERICA, INC.

STOP And GO

The feature is activated by defined sequence of shifts which are as follows:

- Upshift from first to second - followed by a downshift from second to first - followed by another upshift from first to second. This is then followed by the vehicle coming to a complete stop.

After this sequence occurs, the transmission will stay in second gear. The AGS control has recognized stop and go driving and this function will prevent excessive shifting during heavy conditions. The second gear start will be cancelled when:

- The vehicle speed exceeds 40 MPH
- The throttle pedal is pressed more than 90%
- The range selector is moved to Park, Neutral, Reverse or Sport (4,3 or 2)
- The vehicle is in Sport Mode

Winter Drive Program

This feature is activated when the TCM detects slippage at the rear wheels by comparing front and rear wheel speed signals. When slippage is detected by the TCM, the transmission will start in second gear and the shift points will be lowered. This will reduce torque to the rear wheels allowing improved driveability and traction on slippery roads.

Hill Recognition Program

There are two hill recognition programs, one for Uphill and one for Downhill. The TCM will activate this feature when it receives a high engine load signal at slower road speeds. The TCM will perceive this information as being consistent with climbing a hill. The shift points will be raised to prevent constant up and down shifting. This is referred to as the pendulum shift effect. When driving downhill, road speed will increase with minimal throttle input. The TCM will detect a downhill situation and hold the current gear to prevent an upshift when going downhill.

Curve Recognition

This feature will inhibit upshifts when the vehicle is in a curve. This is to improve stability when the vehicle is cornering at high speeds. The TCM will initiate this feature when it detects a difference between left and right (front) wheel speed signals. The difference in these signals will indicate that the vehicle is in a curve. Be aware that improper tire sizes, brands and inflation pressures can influence this feature. Always address these issues first when diagnosing delayed upshift complaints.

Cruise Control Drive program

A special cruise control shift map is selected by the TCM when cruise control is active. The TCM will prevent unwanted locking and unlocking of the torque converter clutch. Also, upshifting and downshifting will be minimized. Depending upon application, the cruise control interfaces with TCM via a single wire data link or as on vehicles with electronic throttle control, the TCM will interface with the ECM (DME).

Manually Selected "Extreme Sport" Program

This feature is activated by moving the shift lever to position 4, 3 or 2. This activates the "Extreme Sport Program" where the shift points are raised for maximum RPM and performance. On Steptronic equipped vehicles, the sport program is obtained by moving the shifter to the manual gate to initiate the "Sport Program".

Modifications To AGS Features

Since the introduction of AGS features in 1994, there have been some software changes to address customer concerns. Some AGS features have been perceived by the customer as malfunctions. To correct this, some of the AGS features were modified with updated software. The AGS features previously discussed in this text reflect the updated modifications.

CAN BUS COMMUNICATION

The CAN bus is a serial communications bus in which all connected control units can send as well as receive information. Data over the CAN bus operates at a rate of up to 1Mb/s (megabits per second).

The CAN protocol was developed by Intel and Bosch in 1988 for use in the automotive industry to provide a standardized, reliable and cost-effective communications bus to combat the increasing size of wiring harnesses.

The CAN bus was originally introduced on BMW automobiles in the 1993 E32 740i/IL as a data link between the TCM (EGS) and the ECM (DME).

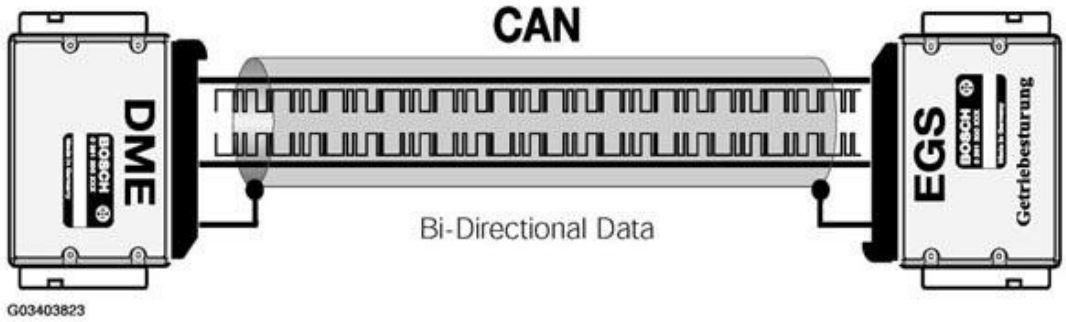


Fig. 45: Identifying CAN Bus
Courtesy of BMW OF NORTH AMERICA, INC.

On earlier EGS systems, various signals were transmitted on individual signal wires. This reduced reliability and increased the amount of wiring needed. The CAN bus allows faster signal transmission and increased versatility. For example, the signals listed in the chart below were previously transmitted on individual wires, now these signals are all on the CAN bus. This chart represents only some of the signals on the CAN bus, there are many more signals transmitted between the TCM and ECM.

EGS SYSTEMS SIGNALS

Sender	Information Item	Receiver	Signal Use
ECM	Engine Temperature	TCM	Shift Point Calculation
ECM	Engine Load (tL)	TCM	Shift Point Calculation
ECM	Engine RPM (TD)	TCM	TCC Slippage
ECM	Throttle Position (DKV)	TCM	Shift Point Calculation
ECM	A/C Compressor ON	TCM	Fine tune shift points to compensate for increased engine load.
TCM	Transmission Range	ECM	Engine Idle Speed Control
TCM	Torque Reduction Signal (ME)	ECM	Timing Retard during shifts.
TCM	TCC Lockup Status	ECM	Engine Timing Map adjustment.

CAN Bus Topology

The CAN bus consists of two twisted copper wires. Each wire contains an opposing signal with the exact same information (CAN-High, CAN-Low). The opposing signals transmitted through the twisted wire serve to suppress any electrical interference. Early CAN bus wiring included a grounded shield around the two wires, later vehicles discarded the shield in favor of the unshielded twisted pair wiring.

Due to the linear structure of the network, the CAN bus is available for other modules in the event of a disconnected or failed control unit. This is referred to as a "Tree" structure with each control unit occupying a branch.

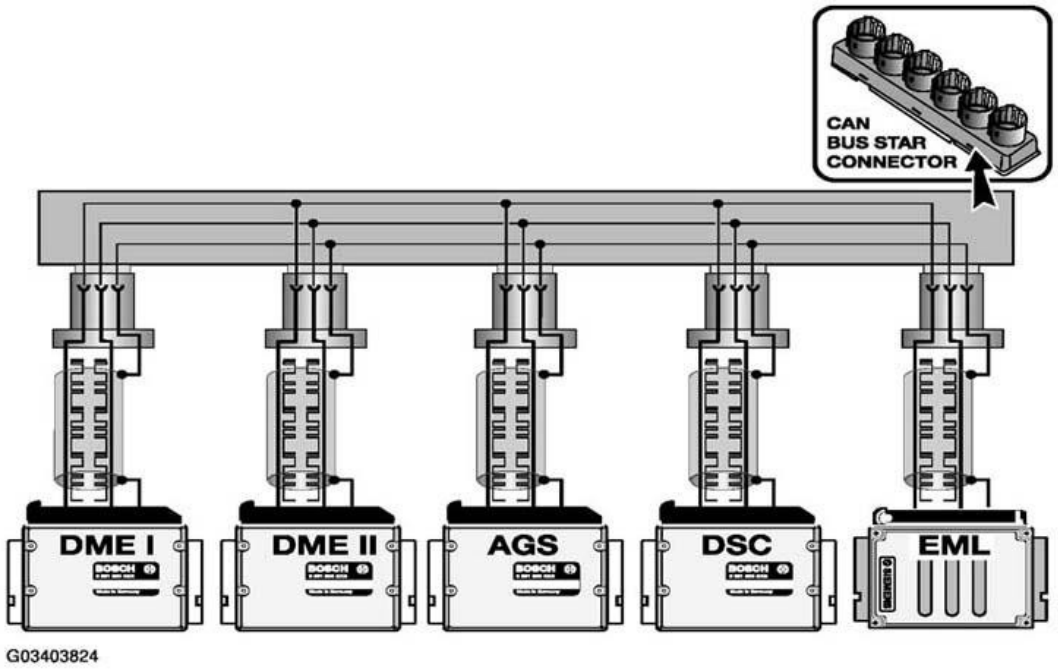


Fig. 46: Identifying CAN Bus Topology
Courtesy of BMW OF NORTH AMERICA, INC.

As previously mentioned, the CAN bus initially was used as a high speed communication link between the DME and AGS control units.

With the introduction of the E38 750iL (95 M.Y.), the CAN bus was expanded to include the EML and DSC control modules. The 750iL made exclusive use of the "star coupler" to link the individual CAN bus ends to a common connector.

The 1998 model year introduced new users of the CAN bus. The instrument cluster and the steering angle sensor were linked to expand the signal sharing capabilities of the vehicle.

The 1999 750iL was the last vehicle to use the shielded cable, after which the entire CAN bus went to twisted pair wiring.

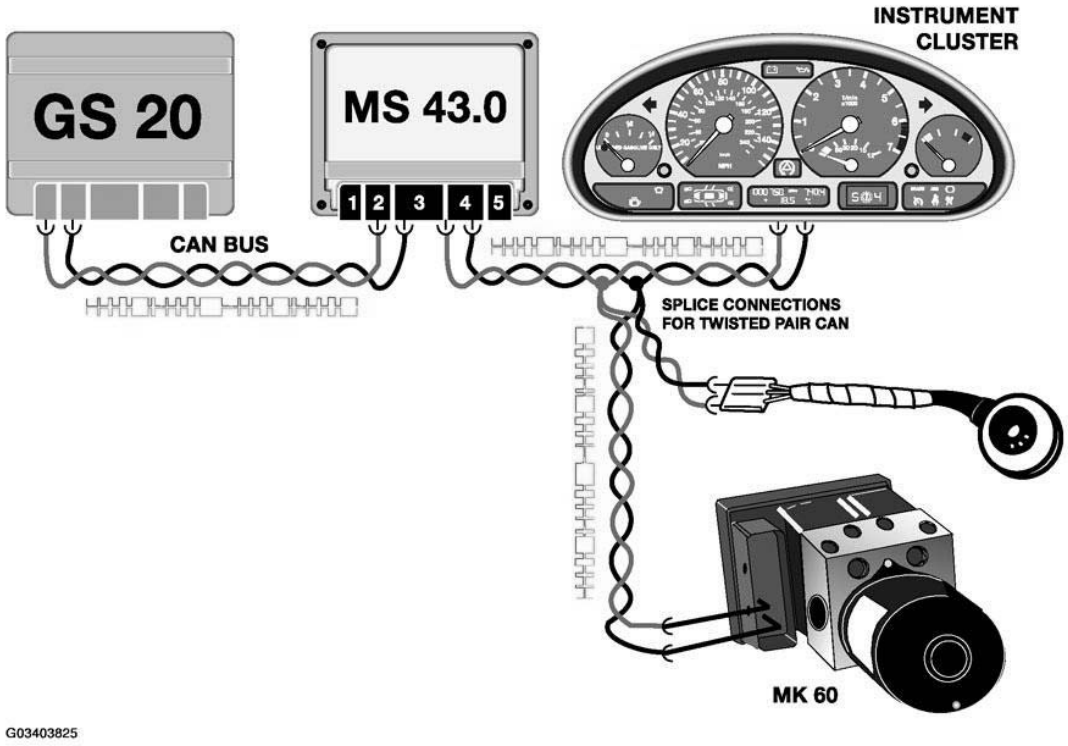


Fig. 47: Identifying CAN Bus Signal Sharing Capabilities
Courtesy of BMW OF NORTH AMERICA, INC.

On most current models the CAN bus provides data exchange between the following control modules:

- ECM (DME)
- EML (750iL E38)
- TCM (EGS)
- IKE/Kombi
- ASC/DSC
- LEW

On models that use twisted pair, the wire color of the CAN bus is uniform throughout the vehicle with: CAN-Low GE/BR and CAN-High GE/SW or GE/RT. Shielded wiring is easily identified by the black sheath surrounding the CAN bus.

Troubleshooting The CAN Bus

The failure of communication on the CAN bus can be caused by several sources:

- Failure of the CAN bus cables.
- Failure of one of the control units attached to the CAN.

- Failure of the voltage supply or ground to individual modules.
- Interference in the CAN bus cables.

Failure of the CAN bus cables

The following faults can occur to the CAN bus wiring:

- CAN-H/L interrupted
- CAN-H/L shorted to battery voltage
- CAN-H/L shorted to ground
- CAN-H shorted to CAN-L
- Defective plug connections (damaged, corroded, or improperly crimped)

In each instance, the connected control units will store a fault due to the lack of information received over the CAN bus.

The voltage of the CAN bus is divided between the two data lines: CAN-High and CAN-Low for an average of 2.5V per line. The voltage measurement is taken from each data line to ground. Each module on the CAN contributes to this voltage.

The fact that 2.5V are present does not mean that the CAN bus is fault free, it just means that the voltage level is sufficient to support communication.

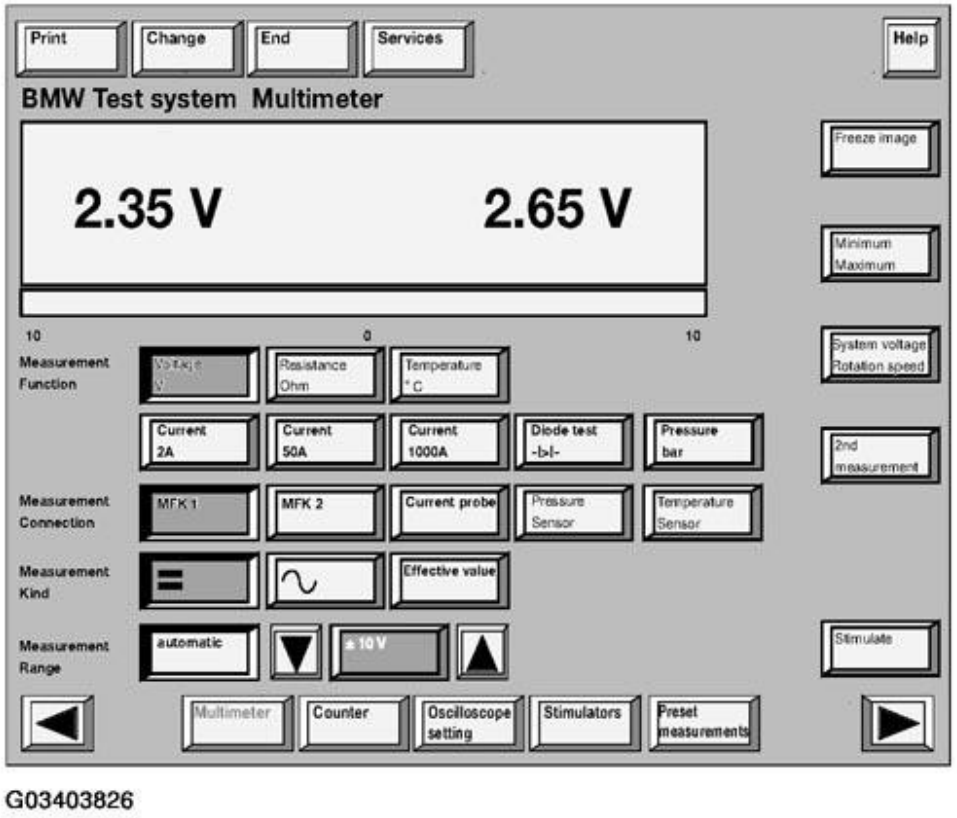


Fig. 48: Identifying BMW Test System Multimeter Display
Courtesy of BMW OF NORTH AMERICA, INC.

Terminal Resistors: are used in the CAN bus circuit to establish the correct impedance to ensure fault free communication. A 120 Ohm resistor is installed in two control units of the CAN between CAN-H and CAN-L. Because the CAN is a parallel circuit, the effective resistance of the complete circuit is 60 Ohms. On some vehicles there is a jumper wire that connects the two parallel branches together, others have an internal connection at the instrument cluster.

The resistance is measured by connecting the appropriate adapter to any of the modules on the CAN and measuring the resistance between CAN-L and CAN-H. The resistance should be 60 Ohms. The CAN bus is very stable and can continue to communicate if the resistance on the CAN bus is not completely correct; however, sporadic communication faults will occur.

The terminal resistors are located in the ASC/DSC control unit and either the instrument cluster or in the DME.

Early 750iL vehicles that used the star connector have a separate external resistor which connect CAN-H and CAN-L together.

Modules which do not have the terminal resistor can be checked by disconnecting the module and checking the

resistance directly between the pins for CANH and CAN-L. The value at these control units should be between 10 kOhms and 50 kOhms.

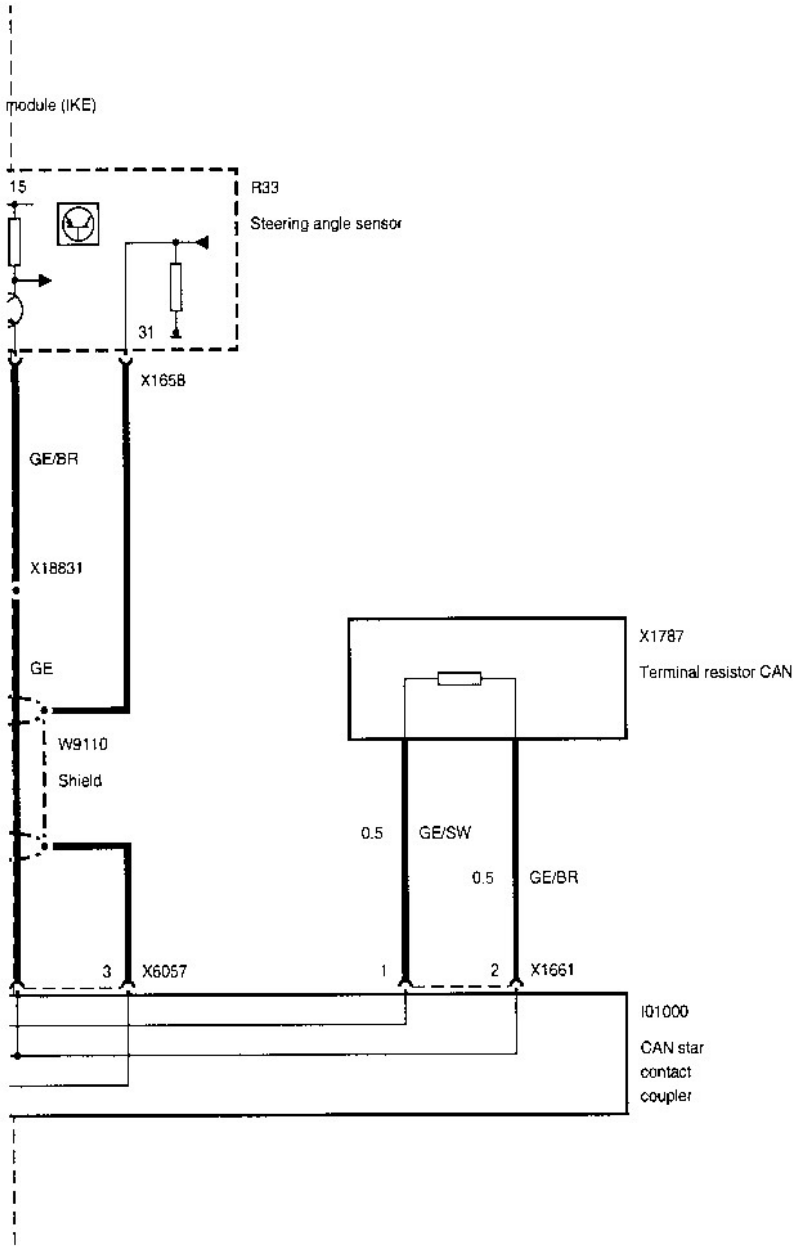


Fig. 49: Identifying Terminal Resistor Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

DIAGNOSIS AND TROUBLESHOOTING

Due to the cost and complexity of today's electronic transmissions, BMW recommends that the technical hotline be contacted before any repairs are performed. It is important that the technician perform some basic diagnostic procedures before contacting technical assistance. The following procedures should be followed:

- Always Verify customer complaint, make sure the complaint is not related to normal operation. (i.e. Warm Up Phase, AGS operation etc.)
- Survey Fault Memory - Perform **complete** quick test. There may be other systems that interface with EGS that could cause faults. (i.e DME, ASC/DSC, IKE/Kombi etc.)
- Print out all fault code with fault conditions. Also print out copy of Identification page and diagnostic report.
- CHECK TO SEE IF THERE ARE ANY SERVICE BULLETINS THAT APPLY TO YOUR SPECIFIC COMPLAINT. THIS INCLUDES THE SERVICE ROUND TABLE.
- Ensure that battery voltage is sufficient. Battery voltage must be greater than 12.5 with ignition switched off. Check battery connections for tightness and condition.
- Check ground connections. (chassis to engine, grounds to bulkhead and shock tower.)
- Check over vehicle to look for transmission leaks, physical damage, loose connections etc.
- If necessary, check fluid level and condition using DISplus or GT-1.
- Check to see if any aftermarket or performance components have been installed that could effect transmission operation. (DME or EGS software as well as any engine modifications).
- Check repair history to see if there were any recent repairs that could effect the proper operation of the transmission (i.e. Engine replacement with damaged dowel pin etc.).
- Check DCS for any open campaigns or recalls pertaining to drivetrain.
- Check and record chassis number, production date and transmission serial # before contacting technical assistance.

Establishing A Diagnostic Plan

Once all of the pre-diagnostic criteria has been satisfied, a logical diagnostic plan should be followed. A logical, well organized diagnostic plan will help avoid improper diagnosis, unnecessary parts replacement and lost diagnostic time. A technician's goal should be to satisfy the customer by "Fixing it the first time, on time, every time". The productivity of the technician can also be improved by following a logical, common-sense approach to problem solving. The following steps are recommended to form a diagnostic plan:

- **Verify the Customer Complaint** - This step is the most important, but also the most overlooked. The focus should always be on the exact customer concern. Make sure that the customer complaint is not a misunderstanding of proper vehicle operation. This step can avoid unnecessary diagnosis and lost time. If the customer concern is not exactly identified, any subsequent repairs can not be verified as being effective. This is the most common cause of "comeback" repairs. Communication between the customer to advisor and the advisor to technician must be clear. Vague or misunderstood customer complaints are often improperly diagnosed. Also make sure that the conditions under which the concern has occurred are duplicated. For example: If the customer is customer is complaining about a shifting concern after a cold start, then the vehicle should be road tested under those conditions.
- **Analyze the Problem** - Once the complaint has been verified, then all available resources should be used

to find the "root cause" of the complaint. Start out by checking Service Information Bulletins, DCS messages, and Service Round table information. Use the DISplus or GT-1 to access the diagnostic program and per form Diagnostic Test Modules where applicable. Electrical Troubleshooting Manuals (ETM's) should also be used when needed.

- **Isolate the Problem** - Now, the problem can be narrowed down into the final steps of diagnosis. Using proper tools and procedures, the technician can "Isolate" by using the process of elimination and common sense. Having a working knowledge of BMW systems is helpful in this area. When applicable, use all available BMW special tools and equipment. Perform all necessary electrical checks such as Voltage Drop, resistance measurements etc.
- **Repair the Problem** - Once the concern has been correctly identified, perform all necessary repairs as per BMW guidelines. Make sure all repairs are properly documented to comply with warranty policies and procedures.
- **Verify the Repair** - Make sure the customer concern has been rectified. Road test the vehicle under the same conditions whenever possible. Failure to complete this step properly is almost a guaranteed comeback. Repeat repair attempts are costly to the BMW Center and the BMW Service Technician.

REMEMBER - Fix it the first time, On Time, Every time.

Fault Codes

When diagnosing transmission fault codes, always print out the fault code(s) and the fault conditions. When referring to the fault code itself, be aware that there are actually 3 formats for the fault code. The fault code breakdown is as follows:

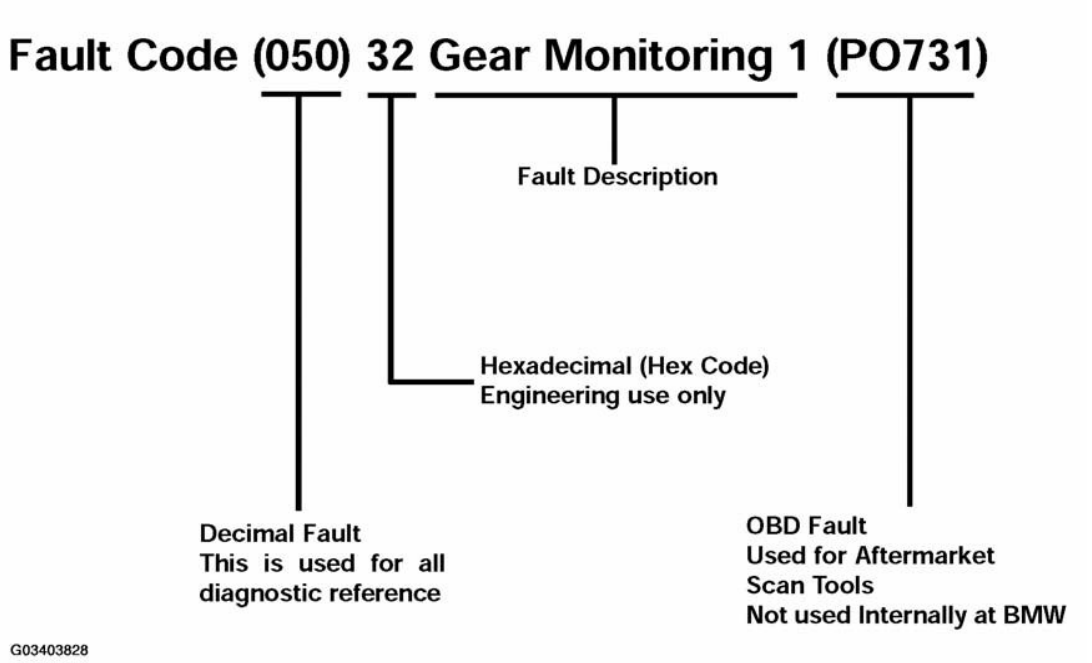


Fig. 50: Identifying Fault Codes
Courtesy of BMW OF NORTH AMERICA, INC.

When referring to the "Fault Code" during diagnosis always use the fault that is in Decimal Format. The Decimal fault is referred to in all reference material such as Service Information Bulletins, Test Modules and DCS messages etc. In the example above, FC 050 would be the correct choice.

Fault Conditions

When a fault code is set, it is stored with a set of environmental conditions. The environmental conditions are used to aid in pinpointing the root cause of the fault. Some of the information found in the fault conditions contain information on transmission temperature, engine speed and road speed etc. This information is also helpful when trying to duplicate the customer complaint. For example, if a customer complains about a shifting complaint when cold, check the fault conditions to verify this complaint. Remember to always print out the fault codes with the fault conditions. This information is helpful to the technician as well as technical assistance.

Identification Page

The ID page is helpful to determine the Transmission and control system used as well as the chassis number and current software version. Always print out a copy of the ID page when performing any diagnosis or programming procedures.

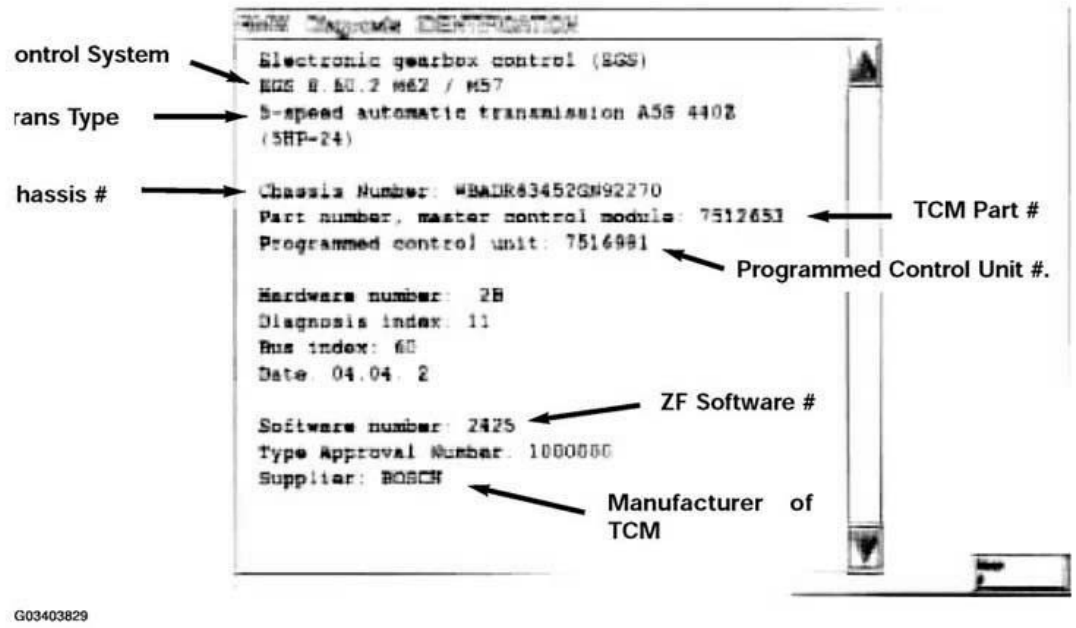


Fig. 51: Identifying Identification Page
Courtesy of BMW OF NORTH AMERICA, INC.

Diagnosis Program

There are two diagnostic formats (programs) used on current model BMW vehicles. The earlier diagnostic program was used on the E38 and E39. The latter diagnostic program was introduced as the "E46 Diagnostic Concept". This is used on the E46, E65 and the E52 (Z8). The E53 X5 uses a mixture of both diagnostic programs depending upon engine/transmission options. Below is an example of the earlier diagnostic program.



G03403830

Fig. 52: Identifying Diagnosis Program
Courtesy of BMW OF NORTH AMERICA, INC.

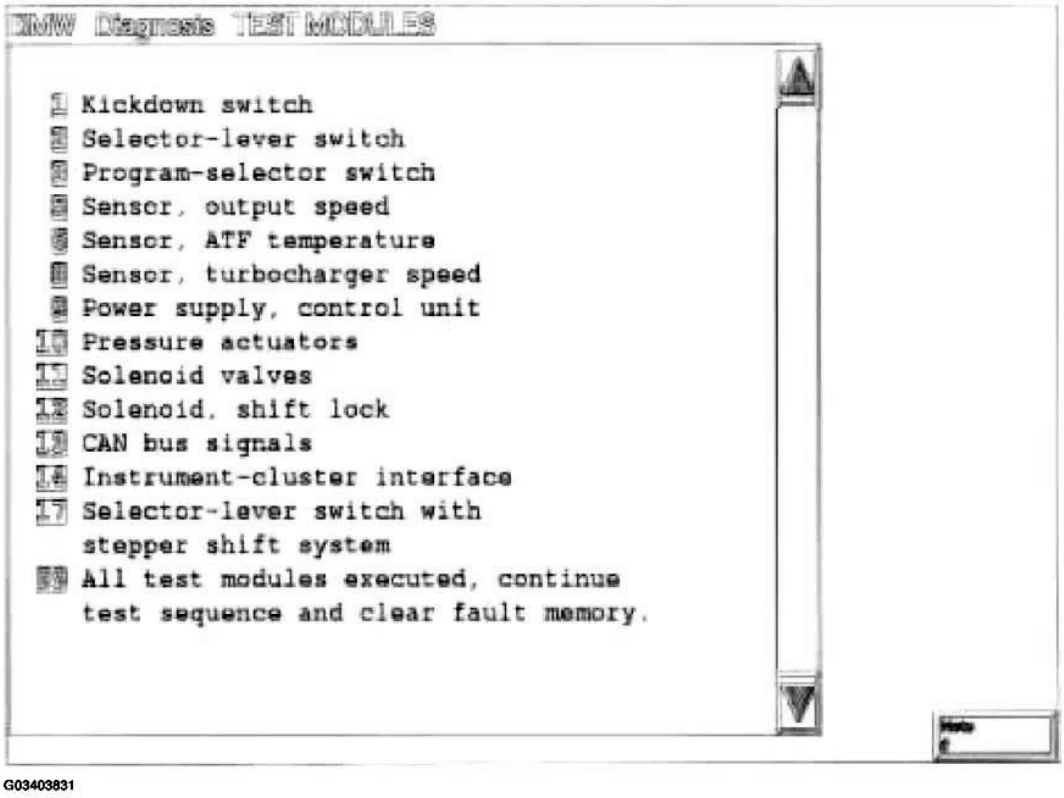
The diagnostic program contains the following features:

- **Fault Symptoms** - This is a symptom driven program that will lead the technician into guided diagnostics. It contains several possible fault scenarios that are common to electronic transmissions. This path is helpful when the technician is not sure where to start in his diagnostic plan.
- **Function Test** - There are no function tests for electronic transmissions.
- **Service Functions** - This is where you will find the ATF level check function. Also Test Codes can be obtained and printed out for warranty purposes. The Adaptation values can be cleared as well as printed out.
- **Expert Mode** - Expert Mode should be used when the technician has a thorough working knowledge of the system. You will find several items in expert mode: Read/Clear fault memory, Diagnosis (Status) requests, Component Activation and Test Modules.

Test Modules

Test modules are found in the diagnosis program of the DISplus and GT-1. These allow the technician to take advantage of a guided diagnostic plan. The program will direct the technician through the various steps using a "trouble tree" format. When using test modules it is important to follow the instructions exactly. Due to the complex nature of some faults, the test modules are not always conclusive. The test module is only as effective

as the information provided by the technician. The technician also needs to rely on his experience and some common sense. The test modules should be used to assist the technician, not as a replacement for good diagnostic skills.



G03403831

Fig. 53: Identifying Test Modules
Courtesy of BMW OF NORTH AMERICA, INC.

Test modules come in two formats. The one shown above is used on E38/E39 vehicles and the E53 with 4.4 and 4.6 engines. The E46, E65 and E53 (with 3.0 M54) uses the new "E46 Diagnostic Concept" which was introduced with the E46 in the 1999 model year. Regardless of the format used, the technician is still guided through a step by step procedure.

Diagnostic Tips

The following consists of some helpful hints to assist the BMW diagnostic technician. It is designed to assist the technician to form a logical path of diagnosis. These suggestions should be used in conjunction with other approved diagnostic routines. This does not exclude the technician from the responsibility to contact technical assistance. All major repairs and transmission replacement must be pre-approved by the BMW Technical Hotline. Transmission concerns can be broken down into several categories:

- **Shift Quality Complaints** - Shift Quality complaints consist of harsh up or down shifts, improper shift points and erratic shifting. These complaints could be related to electronic/software issues or hydraulic/mechanical problems. Perform quick test and check SIB's before proceeding. As with most

concerns, check the transmission fluid level and condition as well.

Do not clear adaptation values unless instructed to do so by BMW Technical Hotline.

- **Delayed/No Upshifts** - Before proceeding on delayed upshift complaints, make sure you are aware of the conditions that this occurs. This could be normal operation, such as the "Warm-up Phase" program. Always check front tires for proper inflation pressures, correct size and type. Also check for uneven tire wear. Variations in front tire size from left to right can activate the AGS "Curve Recognition" feature. The TCM will interpret the difference in wheel speed signals as being a turn and suppress (or delay) upshifts.
- **Slipping** - This type of issue is usually associated with a fault code. Be sure to check the transmission fluid level and condition.
- **Noise, Vibration** - Noises and vibrations should be checked over by a good visual inspection. Look for loose transmission or engine mounts. Check the driveshaft, center bearing and flexible coupling (or constant velocity joints). Also check the lateral alignment of the driveshaft. There are several SIB's pertaining to noise and vibration.
- **No Forward or Reverse Gear** - Start by checking transmission fluid level and note the fluid condition. Inspect for leaks and external transmission damage.
- **Leaks** - When investigation transmission leaks, be sure to verify that the suspected leak is actually transmission fluid. Engine oil, hydraulic and brake fluid can be mistaken for a transmission leak. Check the transmission cooler lines, transmission cooler and transmission pan gasket. Try to locate the source of the leak. Do not make any major repairs until the technical hotline is contacted.
- **Fault Codes** - Perform COMPLETE short test (Quick test) on all vehicle systems. It is important to survey all systems in the event that a related system is causing the transmission fault. Always print out the ID Page, Fault codes and fault conditions.

Information Resources

When diagnosing transmission related concerns it is important to use all information resources available. The following information sources should be utilized at all times:

- Service Information Bulletins
- Technical Data
- ETM Electrical Troubleshooting Manual
- DCS (Dealer Communication System)
- Repair Instructions
- Tightening Torques
- Technical Training Manuals
- Special Tool Information

Technical Information System (TIS)

Most of the above information can be accessed by using the BMW TIS CD or by logging on the BMW TIS website through **www.bmwcenternet.com.** The BMW TIS website contains a wealth of helpful information for the technician. The information is updated on a regular basis.

Service Round Table

In addition to the above sources of information, the technician should be up to date on the latest edition of the BMW Service Round table. The round table will cover the most recent topics and offer some hints that will assist the technician. The Service Round table is broadcast live on a monthly basis via the BMW Visionwerke Network. In addition to live broadcasts, the round table is rebroadcast on a regular schedule during the month.

TCM CODING AND PROGRAMMING

As with other control modules used on BMW systems, the TCM must be programmed and/or coded for the vehicle. Over the years, these methods have varied from system to system.

Coding

Coding will assign the control unit to a particular application. Information such as differential ratio, tire size, vehicle series, engine, engine control system, w/wo AC etc.are some of the possible variants that have to be considered. Transmission control units are coded using various methods.

- **Grounding pins in wiring harness connector** - On early models equipped with the 4HP22/24 EH transmissions, the TCM was coded to the vehicle by means of grounding pins in the wiring harness connector for the TCM. By selectively grounding specific pins in the harness, the TCM was assigned to that vehicle. For Example: The TCM could be installed in a 535, 635, or a 735. This only applies to the Early E- 7 Versions. (E23, E24, E28)
- **TCM ordered for Specific Application** - On some later models, the TCM was ordered for a specific vehicle application, coding was not necessary.
- **Coding performed during programming** - On systems that use a flash programmable TCM, the coding process is done during flash programming.

Programming

Programming refers to the instructions that the TCM is to follow. The TCM is programmed to apply certain shift maps according to operating conditions such as vehicle speed, engine speed, engine temperature, engine load and throttle position. This information can be entered into the TCM via an updated EPROM or through flash programming.

Flash programmable control units use a EEPROM which is Electronically Erasable. The EEPROM is also soldered into the TCM and cannot be removed or replaced. Flash programmable TCM's can be programmed up to 14 times (with a new TCM).

NOTE: Always clear adaptations after programming.

NOTE: Do not program a TCM to correct a complaint unless there is a specific SIB that covers the issue. Only program when installing a new TCM or when instructed to do so by BMW Technical Assistance. Always have the ID page available when calling for technical assistance.

TCM PROGRAMMING

Control System	Transmission	Coding	Programming	TCM Type
GS 1.26 GS 1.27 GS 1.29	4HP22 EH (Early E-7) 4HP22/24 EH (Late E-7 and E-9)	Grounding pins in Harness. (Early E-7 Only) TCM ordered for specific application. Coding not needed.	Replaceable EPROM Replaceable EPROM	35 Pin 35 Pin
GS 7.3 GS 7.32 GS 7.11 GS 8.32	A5S310Z (5HP18)	TCM ordered for specific application. Coding not needed.	Replaceable EPROM	88 Pin
GS 8.60 GS 8.60.4	A5S325Z (5HP19)	Coding done when Programmed	Flash Programming (EEPROM)	134 Pin SKE
GS 8.55 GS 8.60.2	A5S440Z (5HP24)	Coding done when programmed	Flash Programming (EEPROM)	88 Pin up to 98 (E38 M62) 134 Pin SKE from 98 to present.
GS 9.2 GS 9.22 GS 9.22.1 GS 8.60.3	A5S560Z (5HP30) A5S560Z (5HP30) (E38 M73TU)	TCM ordered for specific application. Coding not needed. Coding done when programmed.	Replaceable EPROM Flash Programming (EEPROM)	88 Pin 134 Pin
GS 4.14 GS 4.16	A4S310R (THMR-1)	TCM ordered for specific application. Coding not needed.	Replaceable EPROM	55 Pin
GS 8.34	A4S270R (THMR-1)	TCM ordered for specific application. Coding not needed.	Replaceable EPROM	88 Pin
GS 20	A5S360R A5S390R	Coding done when programmed	Flash Programming (EEPROM)	134 Pin SKE

TRANSMISSION FLUID INFORMATION

Transmission Fluid (Oil)

The automatic transmission provides filtered, pressure regulated hydraulic fluid for all of the transmissions functional requirements. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty.

The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (Heat Exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.

- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application.

Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions and noises.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.

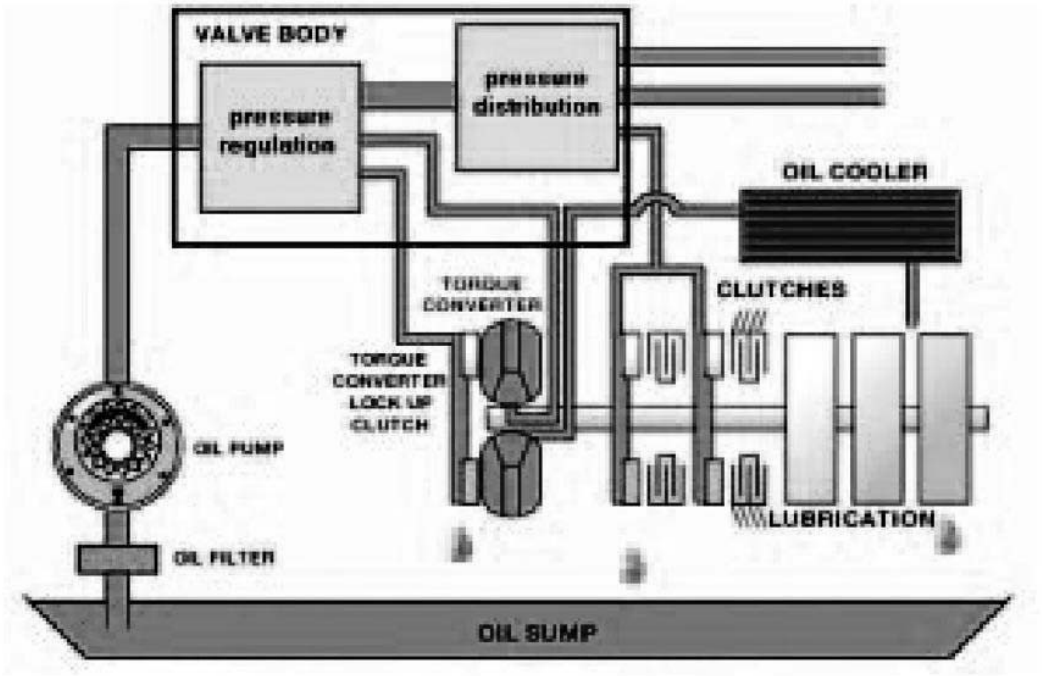


Fig. 54: Identifying Transmission Fluid Flow
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Fluid Checking Procedures

Transmission fluid checking is accomplished using the DISplus or GT-1. The DISplus or GT-1 is used to monitor transmission fluid temperature to insure the transmission is not over or under-filled. As with most other current ZF transmissions there is no dipstick, the fluid level is checked and filled at the fill plug. The location of the fill plug varies between transmissions.

Transmission fluid should be checked between 30 and 50 degrees Celsius (unless otherwise specified). Use the DISplus and/or GT-1 to determine transmission temperature. The transmission temperature information can be found in the diagnosis section under Service Functions.

Proper procedures for checking and filling transmission fluid can be found in BMW Service Information Bulletin B 24 01 98.

When checking transmission fluid, observe the following items:



G03403833

Fig. 55: Identifying Transmission Fluid Checking Procedures
Courtesy of BMW OF NORTH AMERICA, INC.

- Transmission in Park
- Parking brake applied
- Engine Running
- Vehicle level
- No engine load
- Trans Temp 30-50C
- Observe correct drain plug torque

- Use correct fluid

  When replacing parts on transmissions that use lifetime fluid, drain fluid into a clean container and reuse.

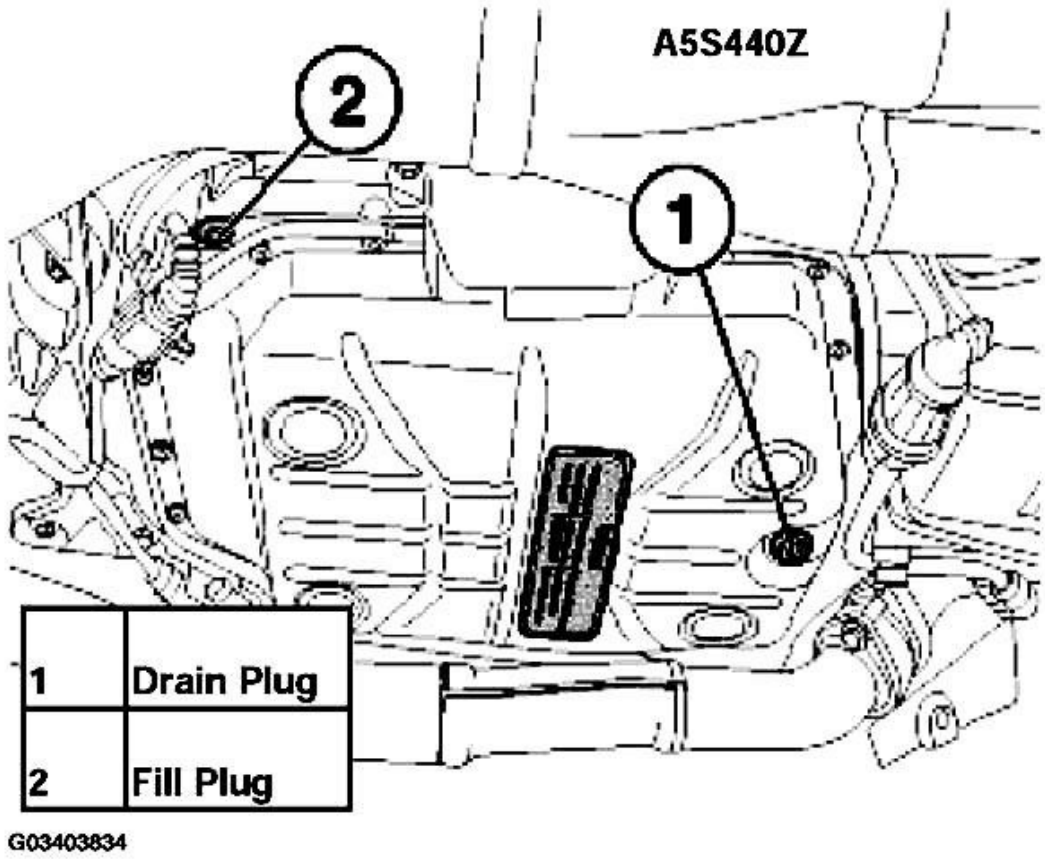


Fig. 56: Identifying Transmissions Drain Plug And Fill Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Fluid Application

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z in the E34) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission.

When servicing or repairing BMW automatic transmissions, refer to TIS for fluid capacities.

TRANSMISSION FLUID

Transmission	Fluid Type	BMW Part #	Container	SIB Ref.
4HP22 **4HP24**	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S310Z 530i/iT (E34)	Dexron III	Available Commercially (Castrol or Texaco)	N/A	
M3 (E36)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 03 95
A5S325Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S440Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93-12/94) 740i/iL-750iL (E38)	Shell LA2634	83 22 9 407 765	5 liter container	B 24 11 92
540i (3/96-12/96) 850Ci (10/94-6/97)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 02 94
A4S310R **A4S270R** **(THM-R1)**	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S360R **A5S390R**	Texaco ETL 7045E Texaco ETL 8072B	83 22 0 026 922 83 22 0 024 359	25 liter container 25 liter container	
GA6HP26Z **GA6HP32Z**	Shell M-1375.4	83 22 0 142 516	20 liter container	

TRANSMISSION SERVICE

Overview Of Allowable Repairs

Currently, service of transmissions covered under warranty is limited to level I. Level I service includes electrical, minor mechanical and hydraulic repairs as well as repair manual provided service adjustments.

Part availability is limited to include the repair of the following:

- **Oil Leaks** - Radial Seals and gaskets.
- **Mechanical/Hydraulic Faults** - Torque Converter, Valve Body, parking pawl, oil pan, output shaft bearing.
- **Electrical Faults** - Solenoid Valves, pressure regulator valves, wiring harness.
- **Signal Sensing** - Turbine and Output Speed Sensors, CAN bus, Temp Sensor.

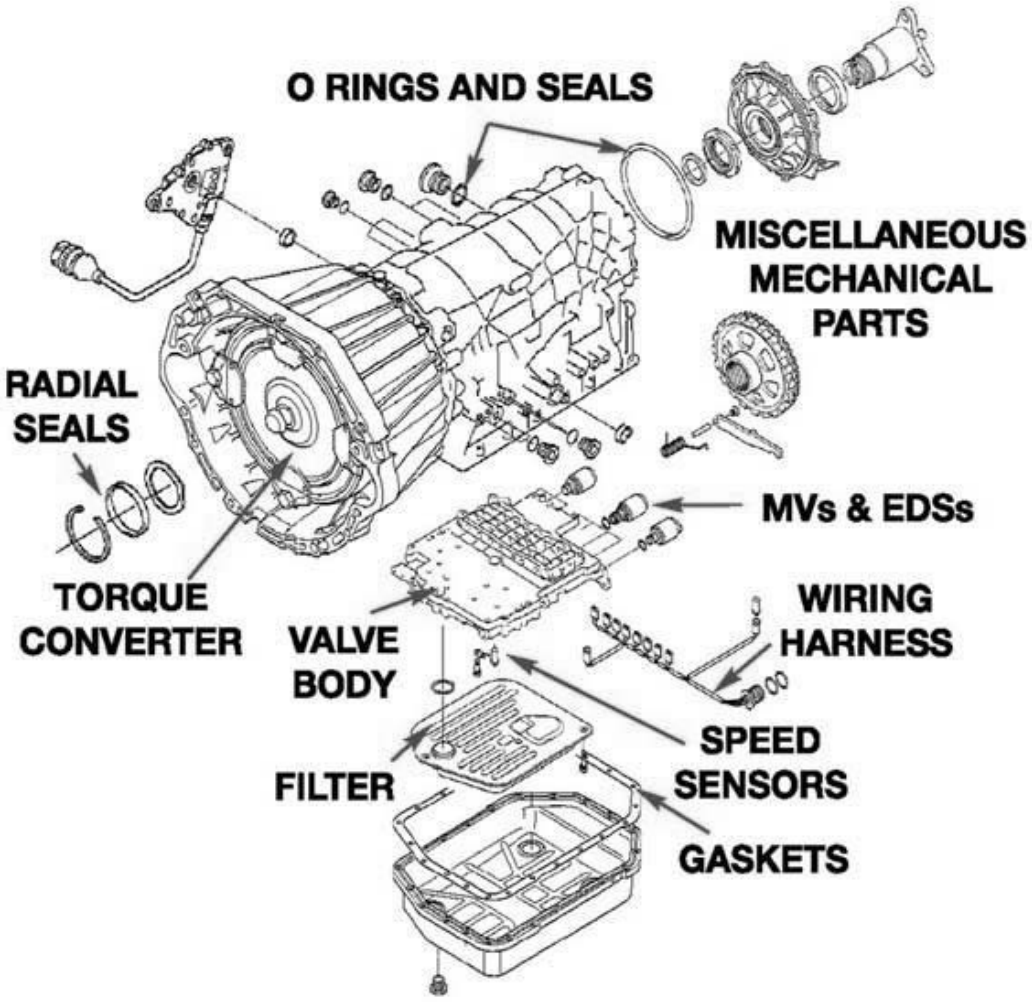


Fig. 57: Exploded View Of Transmission Parts
Courtesy of BMW OF NORTH AMERICA, INC.

BMW Technical Hotline

Before performing any majors repairs or transmission replacement, always contact the BMW Technical Hotline at 1-800-472-7222. When prompted to do so, select option 1 for the Drivetrain Group. Be prepared will all necessary information such as transmission serial number, ID page, fault codes etc. Failure to contact the technical hotline could result in the non payment of warranty claims.

BMW Value Line Program

The Value-Line replacement transmission program provides the availability of factory certified rebuilt units at a very competitive cost.

BMW SPECIAL TOOLS (TRANSMISSION)

The following pages contain information about BMW special tools, this is not an all inclusive list. This is a list of tools that would be helpful in the diagnosis and service of BMW transmissions.

Transmission Removal And Installation

Tool # 24 1 110

This tool is used to remove the torque converter to flexplate bolts. It is a 17 mm socket with 3/8" drive. There is a magnet to help retain the bolt during installation and removal.



Fig. 58: Identifying BMW Special Tools - Tool # 24 1 110
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 4 130

During transmission installation and removal the oil pump must be protected from damage. This tool helps keep the torque converter in place, to prevent oil pump damage due to misalignment.

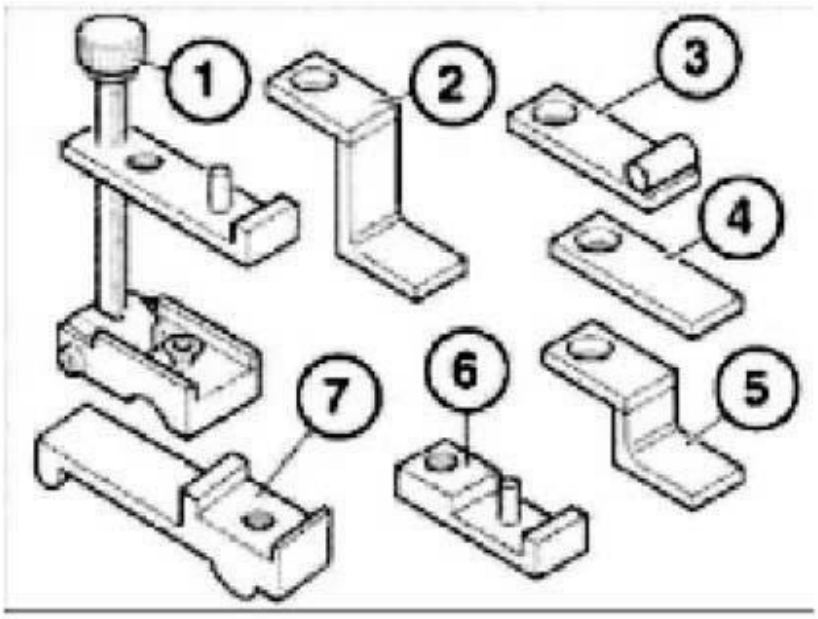


Fig. 59: Identifying BMW Special Tools - Tool # 24 4 130
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 300

Used to align torque converter with flexplate during installation. Use on all BMW automatic transmissions.

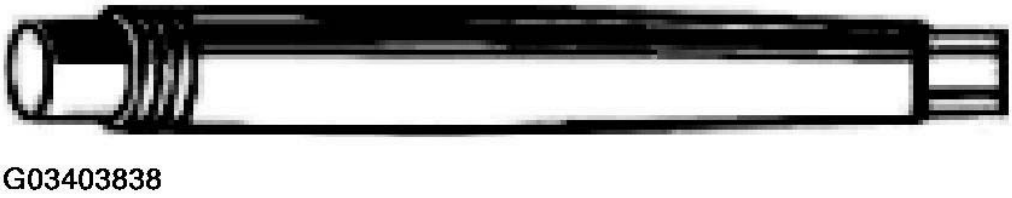


Fig. 60: Identifying BMW Special Tools - Tool # 24 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Adjustments

Tool # 24 2 320

3/16" socket head cap screw (hex) with 1/4" drive. Used to adjust brake band on the THMR-1.

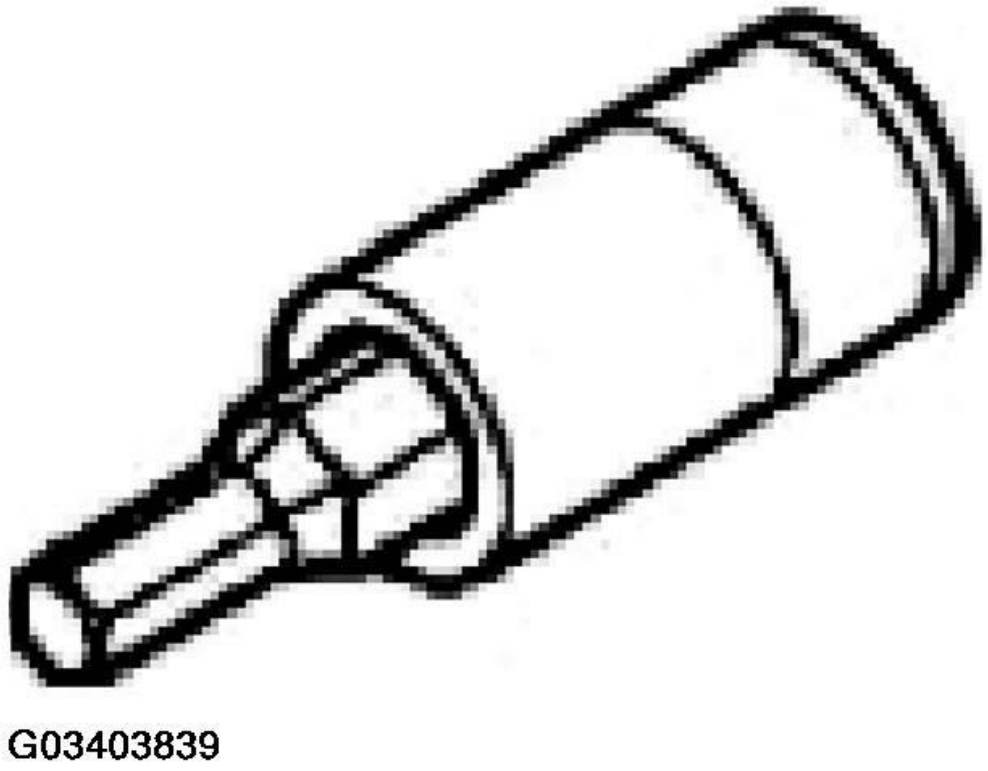


Fig. 61: Identifying BMW Special Tools - Tool # 24 2 320
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 330

1/2 open end wrench used to turn lock-nut on the brake band servo when adjusting the brake band. Used only on the THMR-1 transmissions.

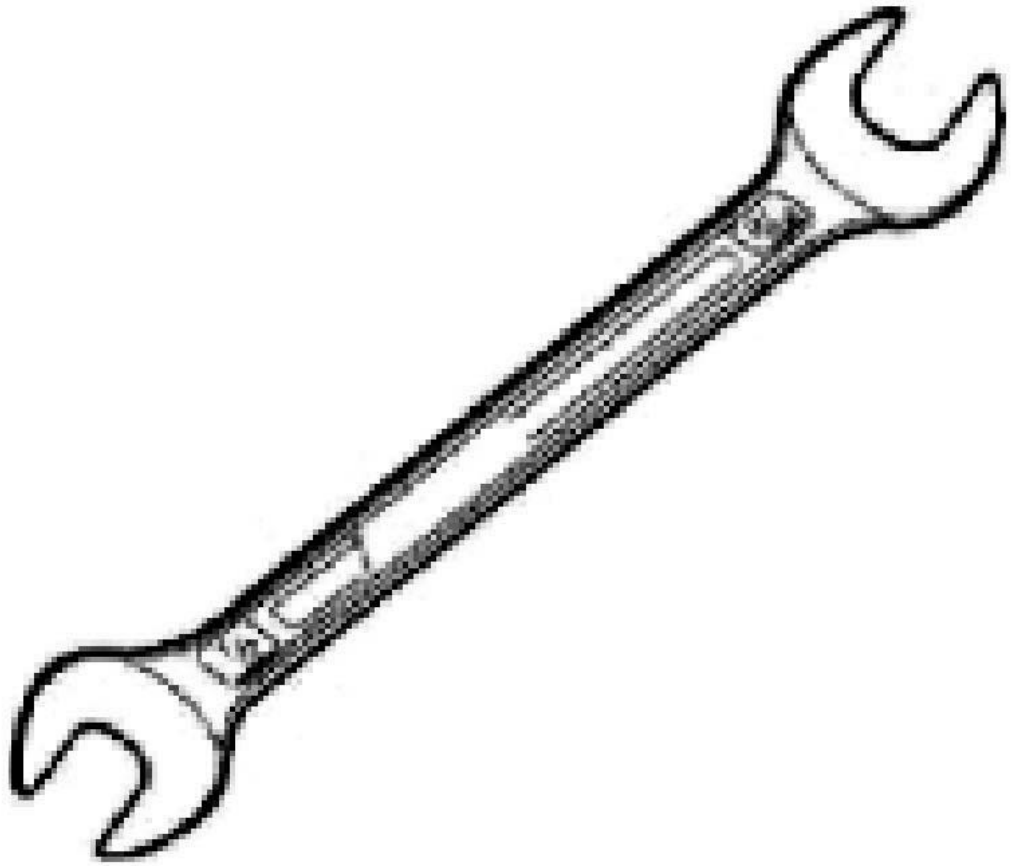


Fig. 62: Identifying BMW Special Tools - Tool # 24 2 330
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 120

Used as guide to lock the range selector switch in "P" when installing. It is used on the A4S270R transmission. Used only for applications which have the selector switch mounted on the transmission case.

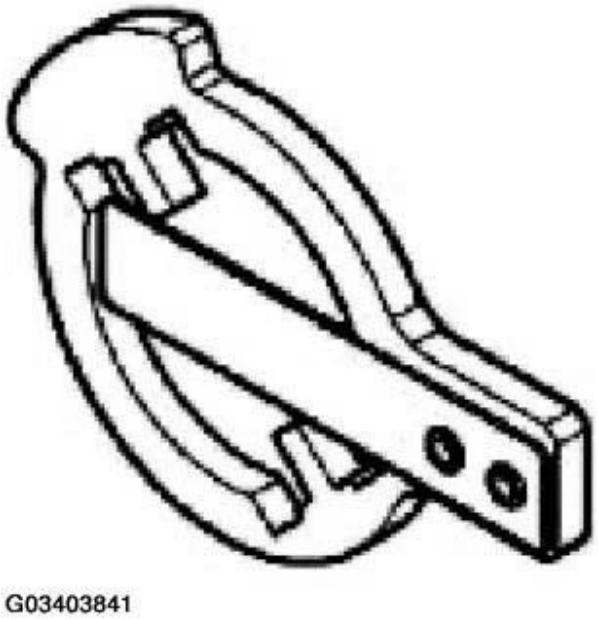


Fig. 63: Identifying BMW Special Tools - Tool # 24 1 120
Courtesy of BMW OF NORTH AMERICA, INC.

Transmission Diagnostic Tools

Tool # 24 6 000

8-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the 4HP22/24 EH. Used in conjunction with 61 1 459.



Fig. 64: Identifying Transmission Diagnostic Tools - Tool # 24 6 000
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 060

16 pin test cable used to test the transmission at the "Cannon Plug" located on the transmission case. This cable is used for the A5S310Z and A5S560Z. Used in conjunction with 61 1 459.

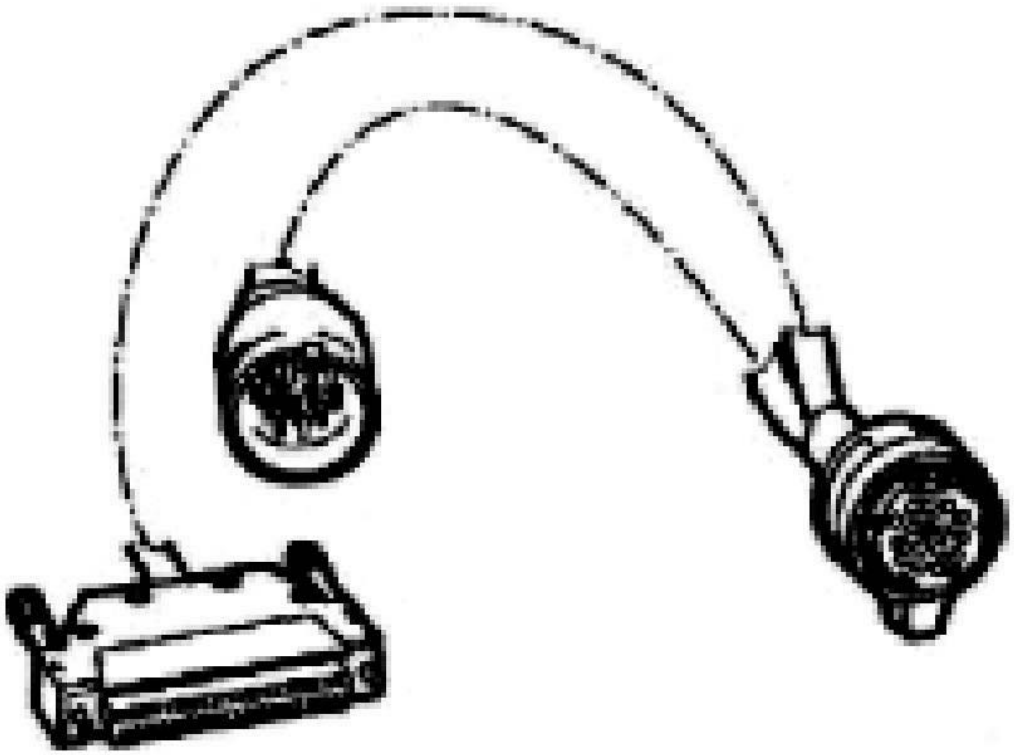


Fig. 65: Identifying Transmission Diagnostic Tools - Tool # 24 6 060
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 020

14 pin test cable used to test the transmission at the "Cannon Plug" located on the transmission case. This cable is used on the A5S310Z.

Used in conjunction with 61 1 459.

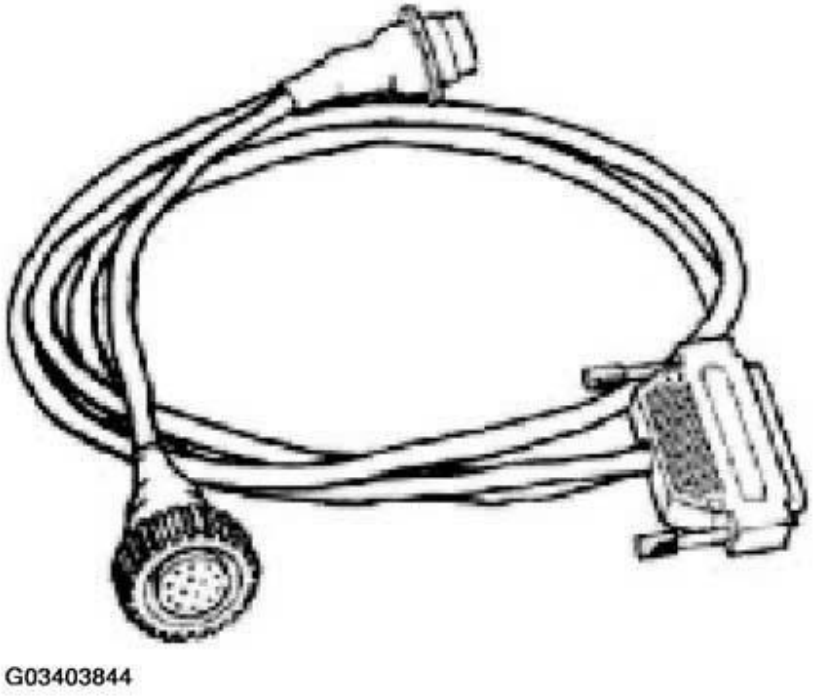


Fig. 66: Identifying Transmission Diagnostic Tools - Tool # 24 6 020
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 010

8-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the A4S270/310R.

Used in conjunction with 61 1 459.



Fig. 67: Identifying Transmission Diagnostic Tools - Tool # 24 6 010
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 080

16-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the 6HP26Z.

Used in conjunction with 61 1 459.



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Fig. 68: Identifying Transmission Diagnostic Tools - Tool # 24 6 080
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 6 070

20-pin test cable used to test the transmission at the "Cannon Plug" located on transmission case. This cable is used for the A5S360/390R.

Used in conjunction with 61 1 459.

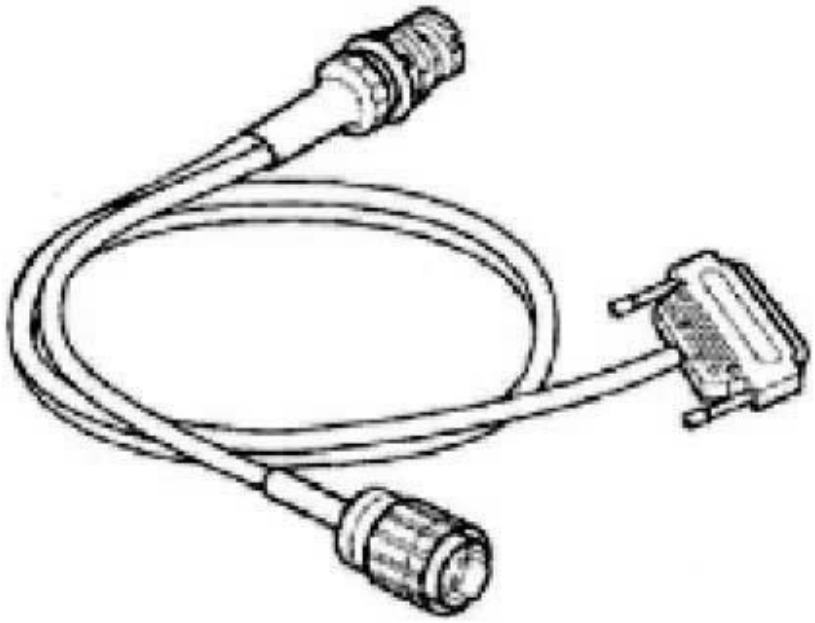


Fig. 69: Identifying Transmission Diagnostic Tools - Tool # 24 6 070
Courtesy of BMW OF NORTH AMERICA, INC.

Service and Repair Tools

Tool # 24 1 170

For loosening and tightening slotted nut on output drive flange. Used on 5HP18 (A5S310Z). Use in conjunction with tool #24 1 220.



Fig. 70: Identifying Service And Repair Tools - Tool # 24 1 170
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 4 110

For loosening and tightening slotted nut on output drive flange. Used on 5HP24 and 5HP30. Use in conjunction with tool #24 1 220.

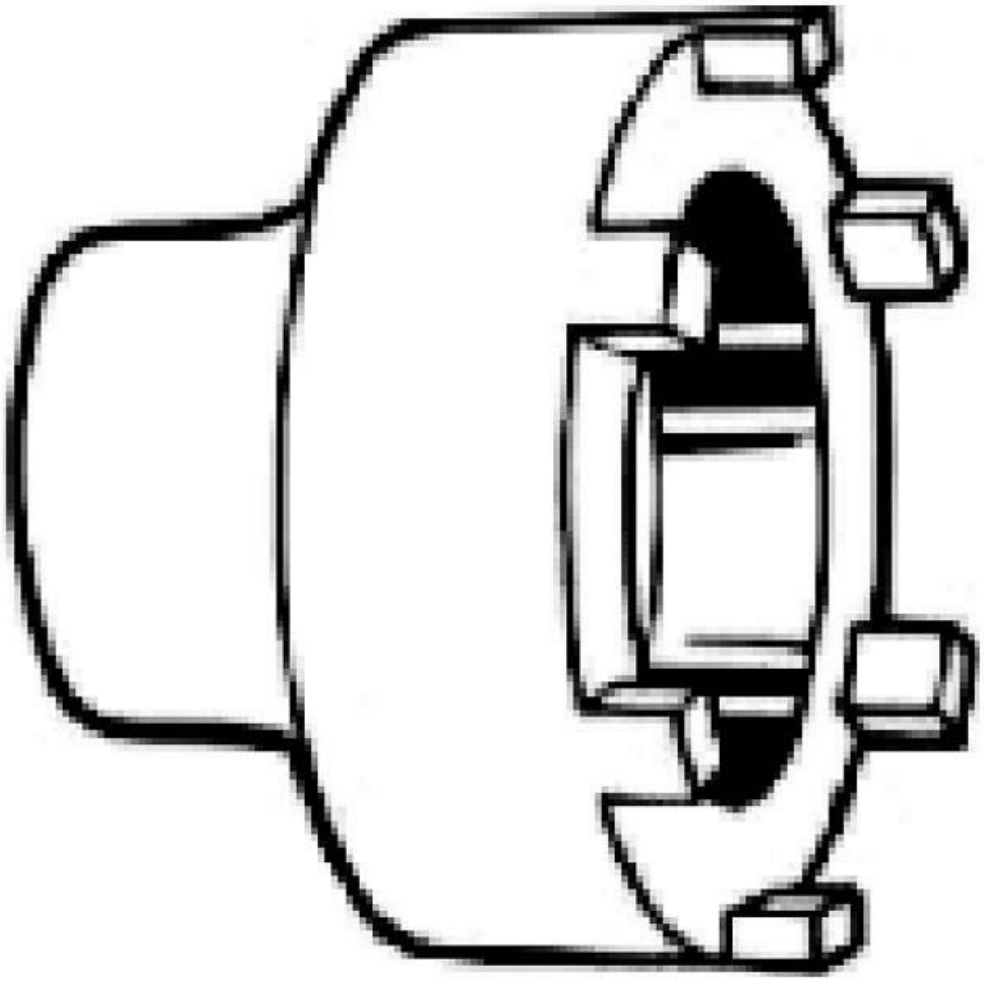
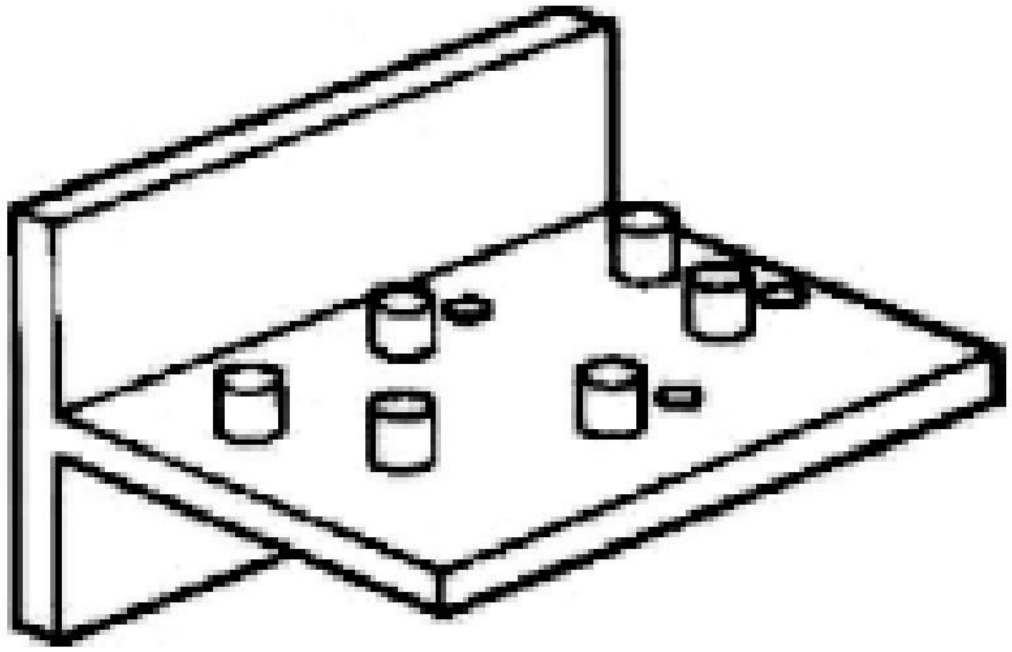


Fig. 71: Identifying Service And Repair Tools - Tool # 24 4 110
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 220

Take up support for drive flange. Used when tightening of loosening slotted nut on output drive flange. Used with tool numbers 24 4 170 and 24 4 110.



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Fig. 72: Identifying Service And Repair Tools - Tool # 24 1 220
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 380

34 mm Socket used to tighten and loosen nut on output drive flange. Used with special tool 23 0 020. For GA6HP26Z transmission.

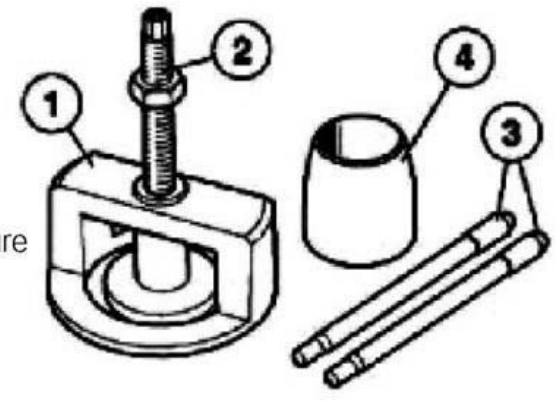


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Fig. 73: Identifying Service And Repair Tools - Tool # 24 2 380
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 2 310

Set of tools used to re-seal intermediate plate. Used on A4S310R and A4S270R. Tool Set Consists of:



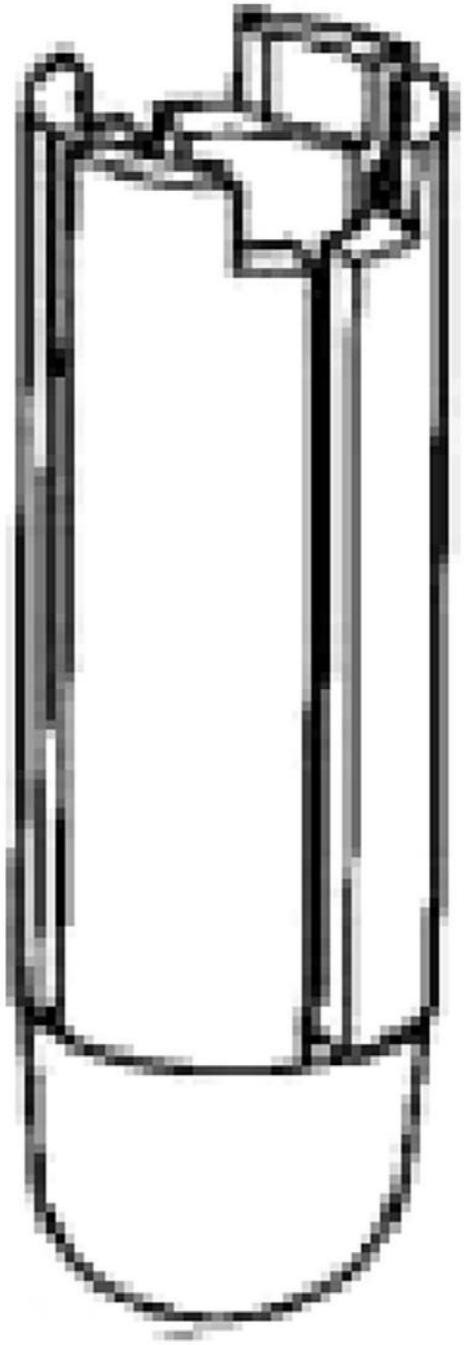
1. 24 2 311 Pressure Plate
2. 24 2 312 Spindle with Pressure Plate
3. 24 2 313 Guide Pins (2)
4. 24 2 314 Slip Bushing

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Fig. 74: Identifying Service And Repair Tools - Tool # 24 2 310
Courtesy of BMW OF NORTH AMERICA, INC.

Tool # 24 1 200

Used to prevent damage to rotary shift shaft seal when fitting new seal on shift shaft. Used on A5S310Z (5HP18).



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Fig. 75: Identifying Service And Repair Tools - Tool # 24 1 200
Courtesy of BMW OF NORTH AMERICA, INC.

1.0 GENERAL INFORMATION

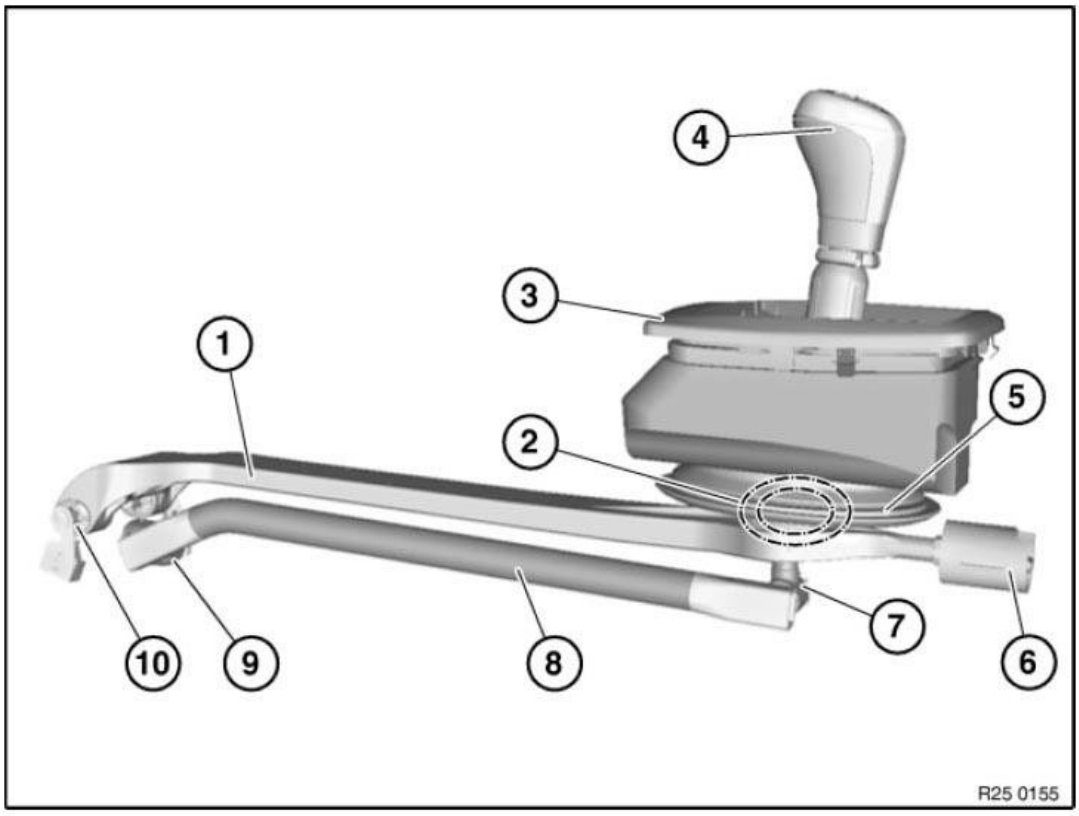
Components of the gear shift mechanism located outside of the transmission housings, such as ball cups, bearing bushings, gearshift joints, etc. may be lubricated with Polylub GLY 801 (BMW Part No. 81 22 9 407 647).

TRANSMISSION

Gear Shift Mechanism - Repair - Z4

2511 CENTRE SHIFT, MANUAL TRANSMISSION

25 11 ... OVERVIEW OF GEARSHIFT MECHANISM FOR MANUAL TRANSMISSION



1 Shift arm	6 Support bearing (shift arm bearing)
2 Ball socket (shift lever bearing)	7 Shift lever
3 Shift lever cover (gaiter)	8 Shift rod
4 Shift lever knob	9 Shift rod joint
5 U-gaiter	10 Bearing bush

Fig. 1: Overview Of Gearshift Mechanism For Manual Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

1. Shift arm

2. Ball socket (shift lever bearing)
3. Shift lever cover (gaiter)
4. Shift lever knob
5. U-gaiter
6. Support bearing (shift arm bearing)
7. Shift lever
8. Shift rod
9. Shift rod joint
10. Bearing bush

25 11 000 REMOVING AND INSTALLING SHIFT LEVER

Necessary preliminary tasks:

- Remove **KNOB** for shift lever.
- Remove complete **EXHAUST SYSTEM** .
- Remove rear **UNDERBODY PROTECTION** .
- Remove heat shields.

If necessary

Support transmission with workshop jack.

Remove screws and nuts.

Remove cross-member.

Tightening torque **23 71 1AZ/2AZ** .

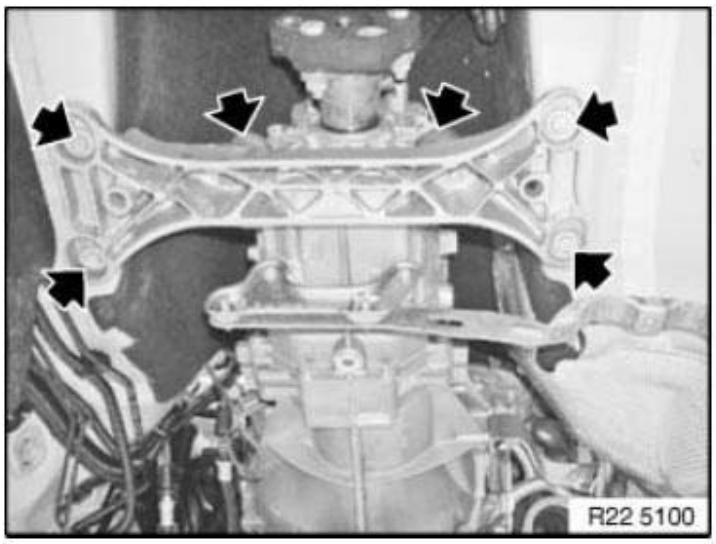
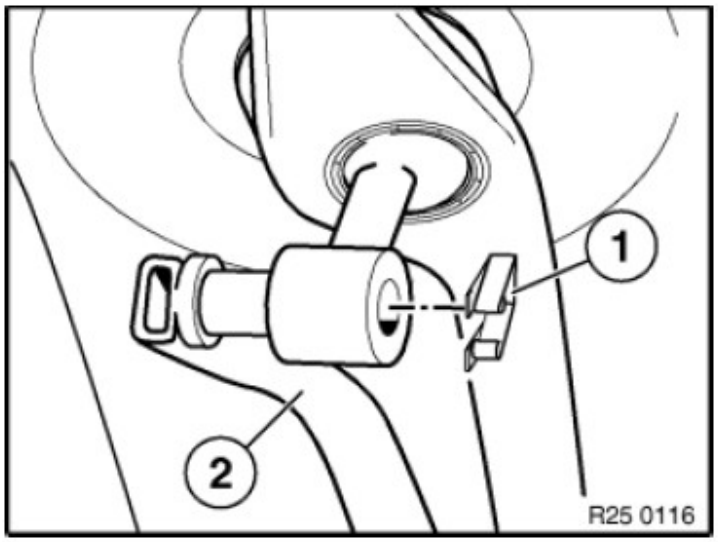


Fig. 2: Locating Cross-Member Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **SHIFT ROD** (2).

Installation:

Grease shift rod pin. See **GEAR SHIFT MECHANISM - OPERATING FLUIDS**



1. Retainer
2. Shift rod

Fig. 3: Identifying Retainer And Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Key:

1. Retainer

2. Shift rod

IMPORTANT: New retaining clips fitted as from 04.08.
Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

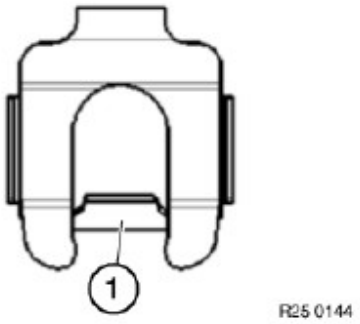


Fig. 4: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 25 1 120 into mount and turn 90° counterclockwise.

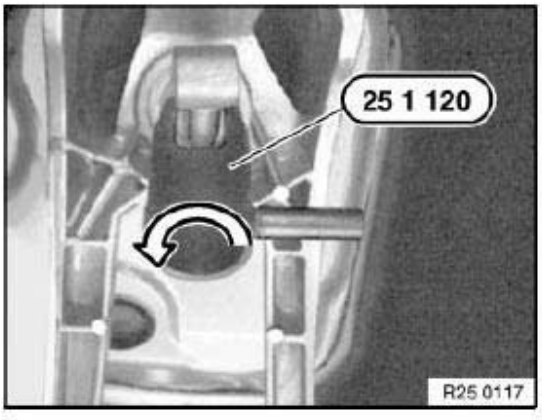


Fig. 5: Inserting Mount Using Special Tools (25 1 120)
Courtesy of BMW OF NORTH AMERICA, INC.

Press mount upwards out of shift arm.

Feed U-gaiter from shift arm and out of body cutout.

Lift out shift lever.

Installation:

Pull U-gaiter from below completely over shift arm receptacle.

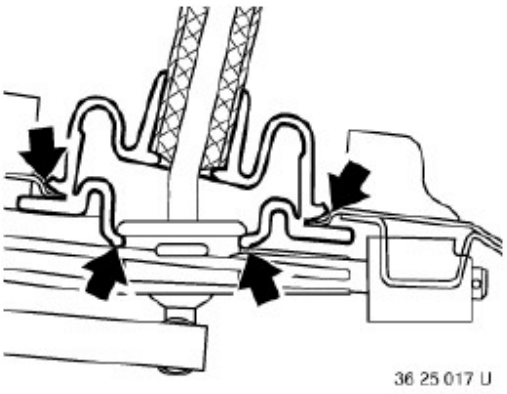


Fig. 6: Locating U-Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pull U-gaiter bead (4) over receptacle on shift arm and pop U-gaiter lips (3) into body cutout.

Make sure the arrow on the upper U-gaiter lip (3) is seated in the direction of travel and crossways to the shift lever eye (5).

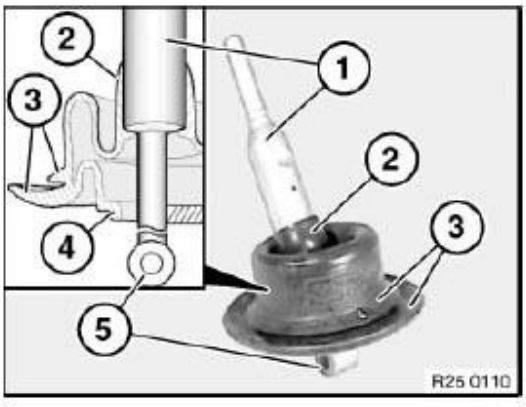


Fig. 7: Identifying Shift Lever Components
Courtesy of BMW OF NORTH AMERICA, INC.

Key:

1. Shift lever
2. U-gaiter moulded section
3. U-gaiter lips
4. U-gaiter bead
5. Shift lever eye

Installation:

Grease shift lever ball. See **GEAR SHIFT MECHANISM - OPERATING FLUIDS**

Fit mount on shift arm receptacle.

Align retaining lugs of mount to openings in receptacle (crossways to direction of travel).

Press shift arm with mount downwards until mount snaps audibly into place (if necessary, use a pressing-in tool).

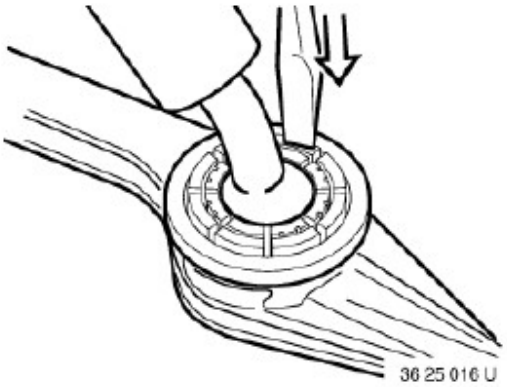


Fig. 8: Fitting Mount On Shift Arm
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 ... REPLACING U-GAITER

Necessary preliminary tasks

- Remove **SHIFT LEVER**

Detach U-gaiter from shift lever.

If necessary, rub inside of moulded section (1) beforehand with Circolight.

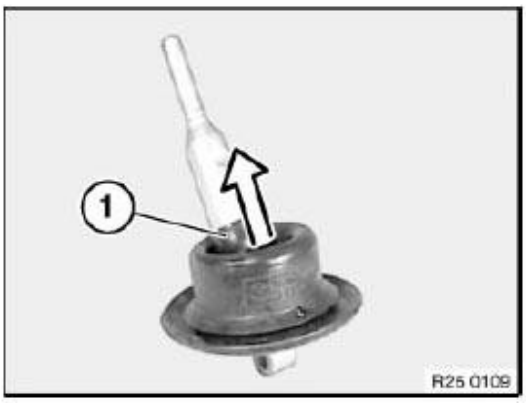


Fig. 9: Removing Moulded Section

Courtesy of BMW OF NORTH AMERICA, INC.

Installation

- Degrease shift lever (1)
- Coat inside of moulded section (2) with Circolight.
- Pull U-gaiter from above over shift lever and align
- Arrow on upper lip (3) must point crossways to mount eye (5) in direction of travel

Key:

1. Shift lever
2. U-gaiter moulded section
3. U-gaiter lip
4. U-gaiter bead
5. Mount eye

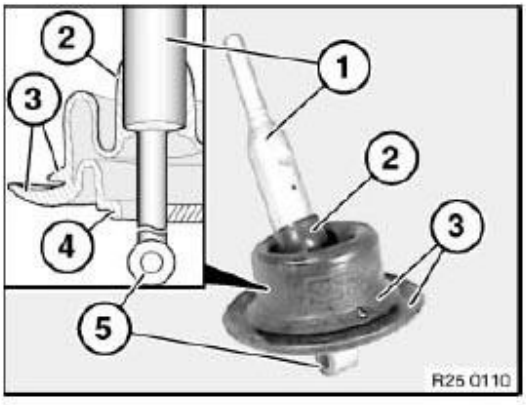


Fig. 10: Identifying Shift Lever Components
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 235 REPLACING BEARING BUSHES FOR SHIFT ARM

Necessary preliminary tasks

- Remove **SHIFT ARM**

- Press out bearing bush (1).
- Coat new bearing bush with Circolight.
- Then press into shift arm until side surface of bush protrudes uniformly.

NOTE: Illustration shows: shift arm simply supported.

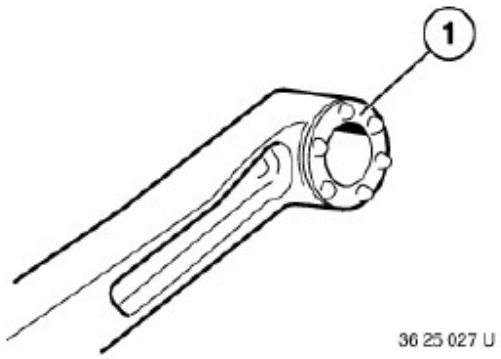


Fig. 11: Identifying Bearing Bush
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 041 REPLACING BEARING SHELL FOR SHIFT LEVER

Necessary preliminary tasks

- Remove **SHIFT LEVER**

Detach mount from selector lever.

Installation:

Grease ball joint. See **GEAR SHIFT MECHANISM - OPERATING FLUIDS**

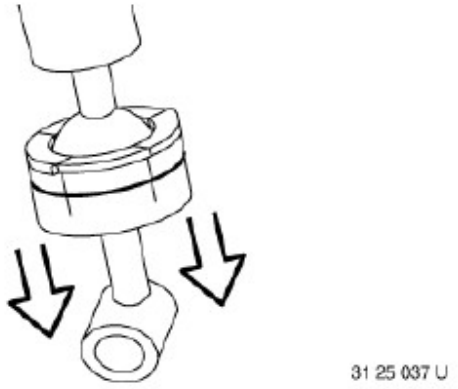


Fig. 12: Removing Mount From Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 001 REPLACING COMPLETE SHIFT LEVER

Necessary preliminary tasks:

- Remove **SHIFT LEVER** .

Detach mount from selector lever.

Installation:

Grease ball joint.

Grease, refer to **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

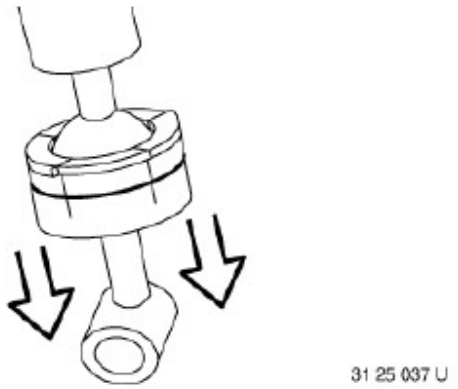


Fig. 13: Removing Mount From Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Detach rubber gaiter from selector lever.

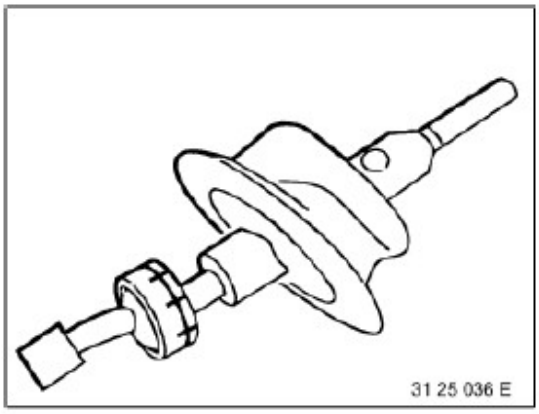


Fig. 14: Identifying Rubber Gaiter Of Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Degrease selector lever (1).

Coat rubber bellows on inside of shaped section (2) with Circolight.

Pull rubber gaiter from above over selector lever and align. Arrow (3) on rubber gaiter must point in direction of

travel (A).

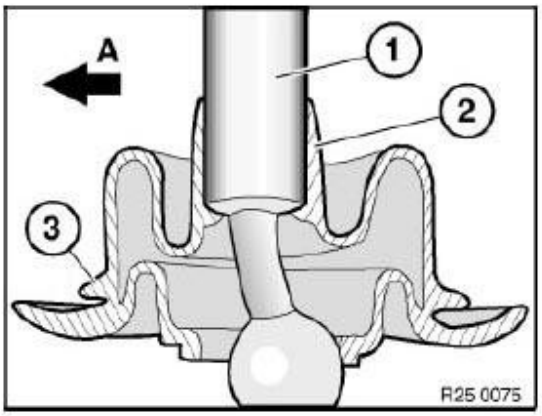


Fig. 15: Pulling Rubber Gaiter Over Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 071 REPLACING KNOB FOR SHIFT LEVER

Pull installation frame of gaiter (1) from front upwards out of centre console.

IMPORTANT: Do not use a tool, as this would damage the installation frame or the centre console.

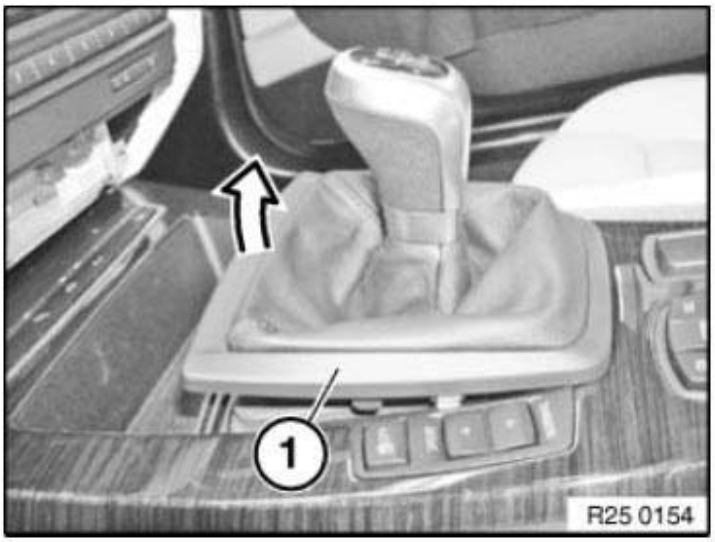


Fig. 16: Pulling Gaiter Installation Frame From Centre Console
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not twist knob during removal as this would cause the turning lock in the knob to shear off.

Tug firmly to remove knob.

Installation:

Fit knob on shift lever, align and press on until it snaps noticeably into place.

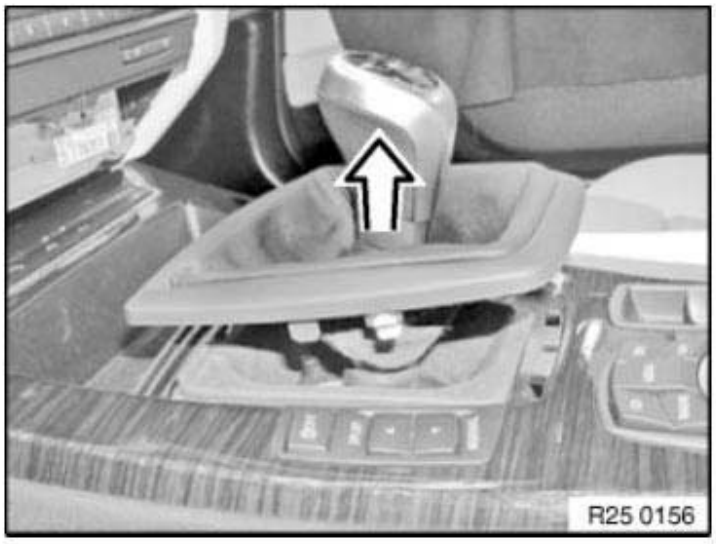


Fig. 17: Removing Knob
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 211 REPLACING SHIFT ARM FOR SHIFT LEVER MOUNT

Necessary preliminary tasks

- Remove **SHIFT LEVER**

Lever support bearing (1) out of fixture.

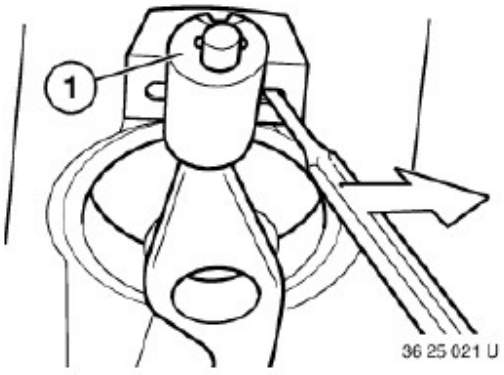


Fig. 18: Removing Support Bearing From Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install support bearing (1) with arrow (2) facing upwards in holder.

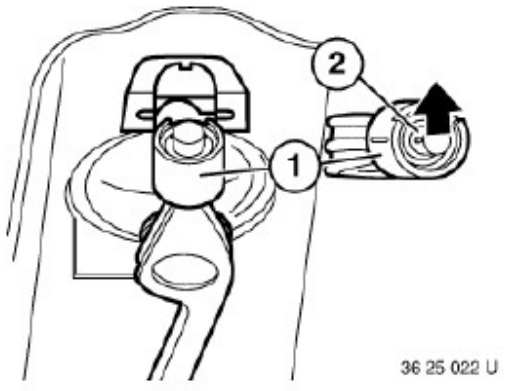


Fig. 19: Identifying Support Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock bearing pin (1) in direction of arrow and remove.

Installation:

Grease bearing pin.

Grease, refer to **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

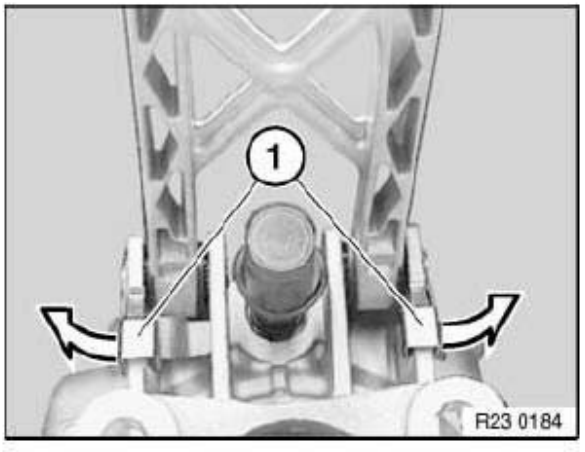


Fig. 20: Removing Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Remove shift arm.

Detach support bearing (1) from shift arm.

Installation:

Grease bearing journal.

Grease, refer to **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

Attach support bearing (1) with opening (3) towards rear on shift arm.

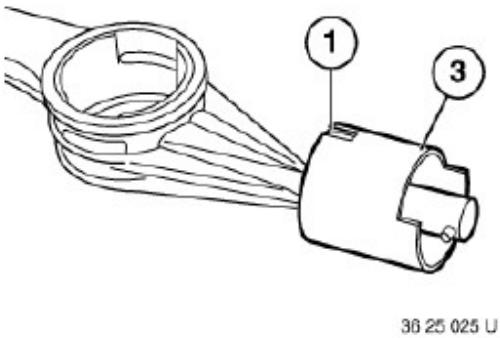


Fig. 21: Identifying Support Bearing With Opening
Courtesy of BMW OF NORTH AMERICA, INC.

Replace **BEARING BUSH** (1) if damaged.

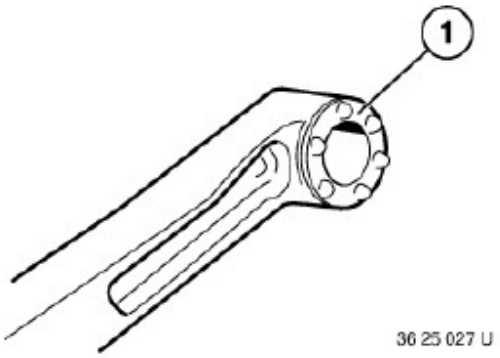


Fig. 22: Identifying Bearing Bush
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 245 REPLACING SHIFT ARM SUPPORT BEARING

Necessary preliminary tasks

- Remove complete **EXHAUST SYSTEM** .
- Remove rear **UNDERBODY PROTECTION** .
- Remove heat shield.

Lever support bearing (1) with a short screwdriver out of mounting.

Pull support off shift arm.

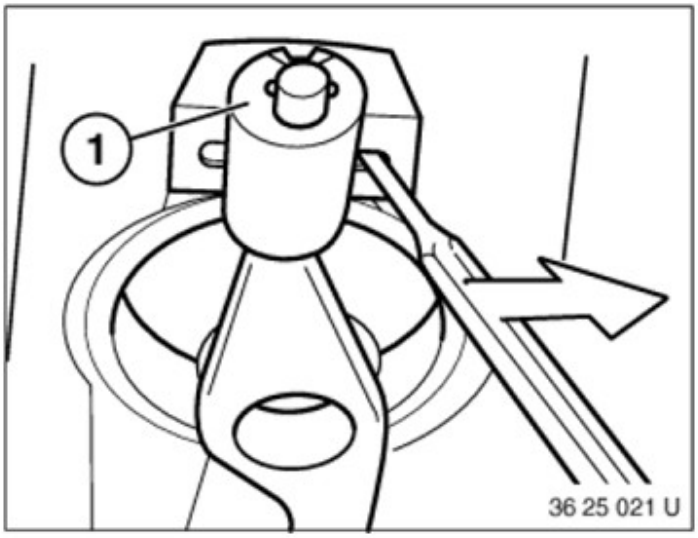


Fig. 23: Removing Support Bearing With Short Screwdriver Out Of Mounting
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Grease bearing pin of shift arm. See **GEAR SHIFT MECHANISM - OPERATING FLUIDS**

Fit support bearing (1) with opening (2) towards top rear onto mounting.

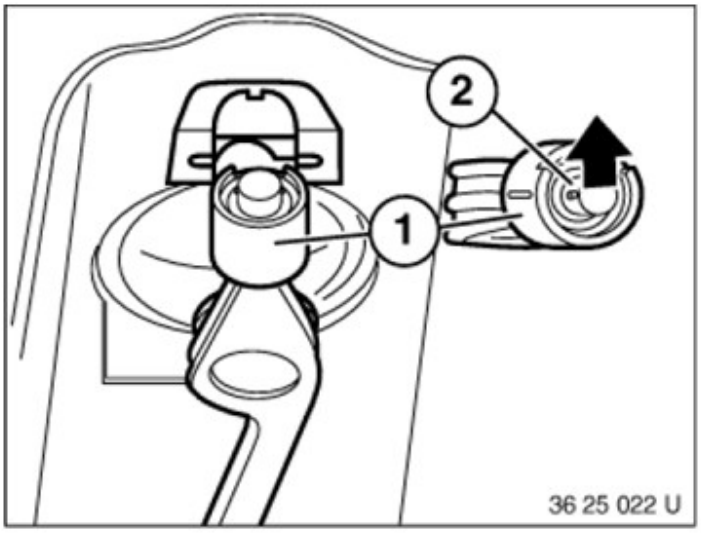


Fig. 24: Identifying Support Bearing With Opening
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 101 REPLACING SHIFT ROD

Necessary preliminary tasks

- Remove rear assembly underside protection
- Release bracket for exhaust system on transmission
- Remove heat shields
- Remove **TRANSMISSION CROSS-MEMBER** .

Detach locking clip.

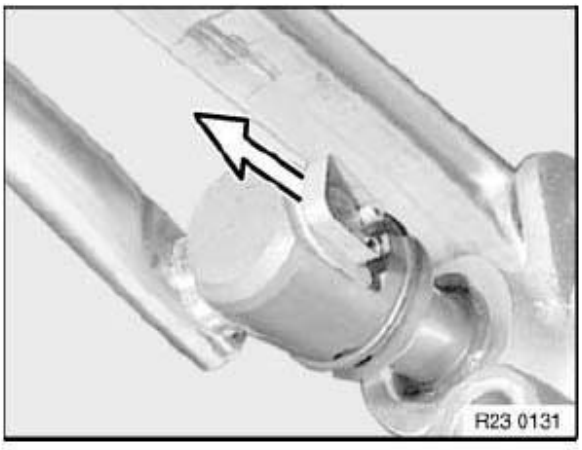


Fig. 25: Removing Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: New retaining clips fitted as from 04.08.
Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

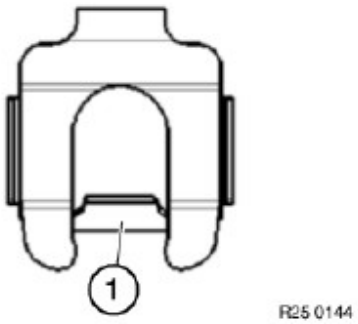


Fig. 26: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Pull shift rod (1) out of shift rod joint (2).

Installation

Grease shift rod pin (3). See **GEAR SHIFT MECHANISM - OPERATING FLUIDS**

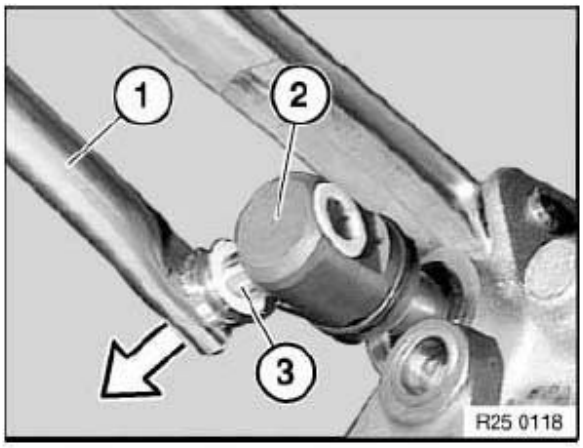


Fig. 27: Pulling Shift Rod From Shift Rod Joint
Courtesy of BMW OF NORTH AMERICA, INC.

Detach locking clip (1).

Remove selector rod (2).

Installation:

Grease selector rod pin. See **GEAR SHIFT MECHANISM - OPERATING FLUIDS**

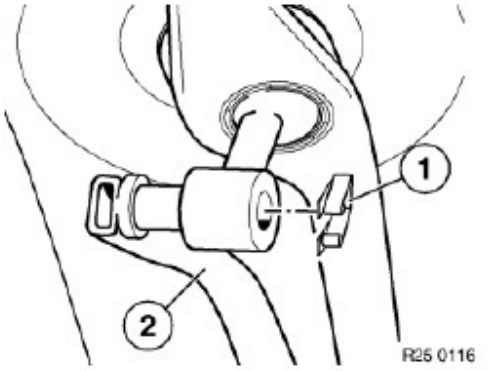


Fig. 28: Identifying Clip And Selector Rod
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 111 REPLACING SHIFT ROD JOINT

Necessary preliminary tasks

- Release propeller shaft at transmission and centre mount, tie propeller shaft to one side

Tasks are described in **REMOVING PROPELLER SHAFT** .

Lift off retainer (1).

Clamp off shift rod (2).

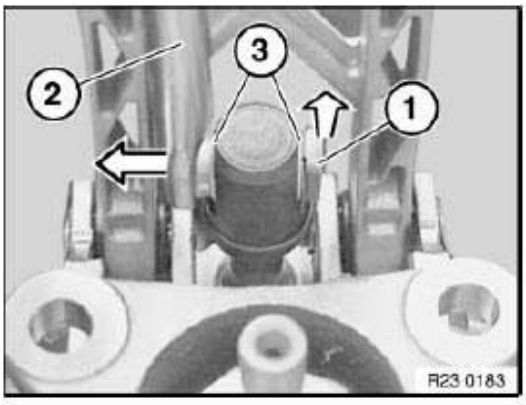


Fig. 29: Disconnecting Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Grease shift rod.

Grease, refer to **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

Make sure shims (3) are in correct position.

IMPORTANT: New retaining clips fitted as from 04.08.
Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

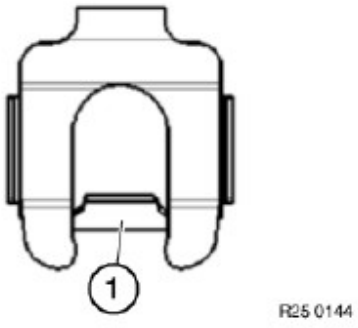


Fig. 30: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Lever spring washer (1) out of groove and push a little towards rear.

Press dowel pin (2) upwards/downwards out of shift rod joint and remove shift rod joint.

Installation:

Grease ball of selector shaft.

Grease, refer to **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

Replace spring washer (1).

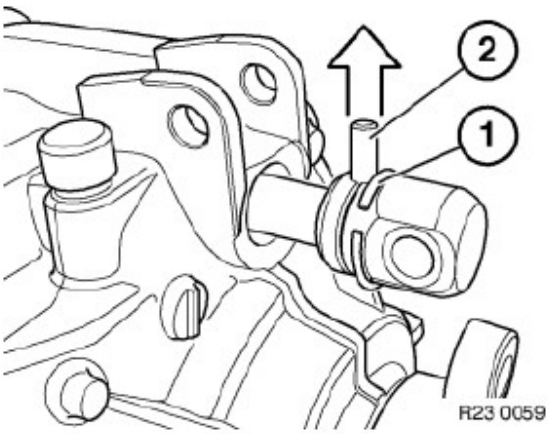


Fig. 31: Pressing Dowel Pin From Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check rubber ring (1) in shift rod joint (2) and replace if necessary.

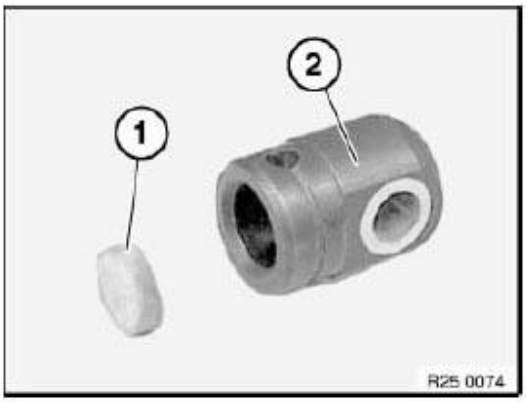


Fig. 32: Identifying Rubber Ring And Shift Rod Joint
Courtesy of BMW OF NORTH AMERICA, INC.

2516 CENTRE SHIFT, AUTOMATIC TRANSMISSION

25 16 056 REMOVING AND INSTALLING OR REPLACING SHIFT TOWER (STEPTRONIC)

Necessary preliminary tasks

- Remove rear underbody protection.
- Remove **TRIM** for storage compartment.

Grip clamping sleeve (1) and slacken nut (2).

Detach retainer (3) downwards using a screwdriver.

Pull cable (4) out of holder.

Installation:

ADJUSTING SHIFT LEVER

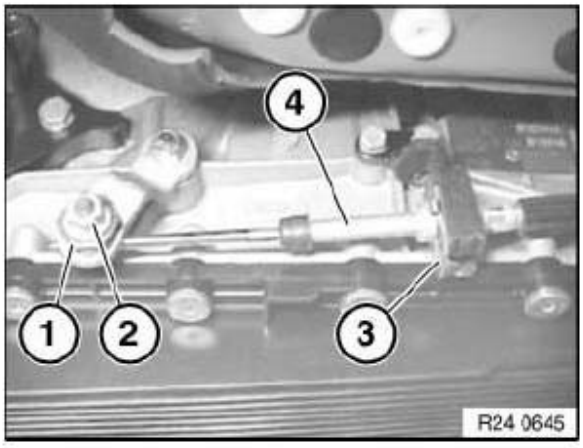


Fig. 33: Identifying Clamping Sleeve, Retainer, Cable And Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Tightening torque: **25 16 3AZ** .

Disconnect plug connections (2).

Remove cables from holders.

Lift shift tower out of centre console.

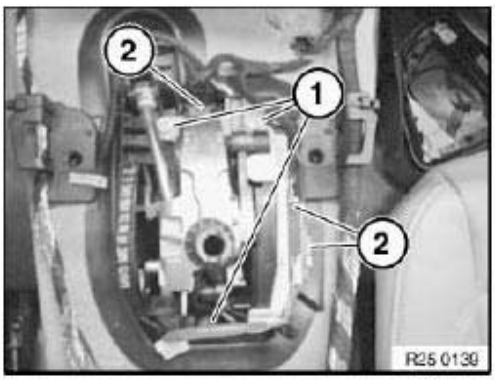


Fig. 34: Identifying Plug Connections With Screws
Courtesy of BMW OF NORTH AMERICA, INC.

25 16 065 REPLACING GAITER (SELECTOR LEVER COVER) FOR SHIFT TOWER

Necessary preliminary tasks

- Remove **GRIP**

1. Carefully pull gaiter taut on leather
2. Gently press frame inwards until catch is released
3. Lift out gaiter



Fig. 35: Lifting Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Start removing at top left, otherwise the frame will be damaged.

Installation:

Retaining lugs must not be damaged.

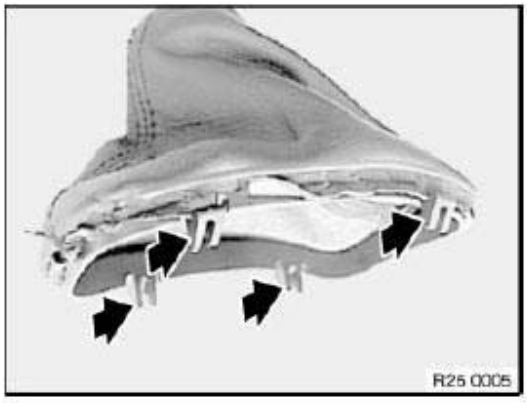


Fig. 36: Locating Retaining Lugs
Courtesy of BMW OF NORTH AMERICA, INC.

25 16 061 REPLACING SELECTOR LEVER KNOB

NOTE: Do not twist selector lever knob during removal as this would cause the anti-twist lock to shear off.

Pull off knob with a firm tug in direction of arrow.

Installation:

Fit knob on gearshift lever, align and press on until it snaps noticeably into place.

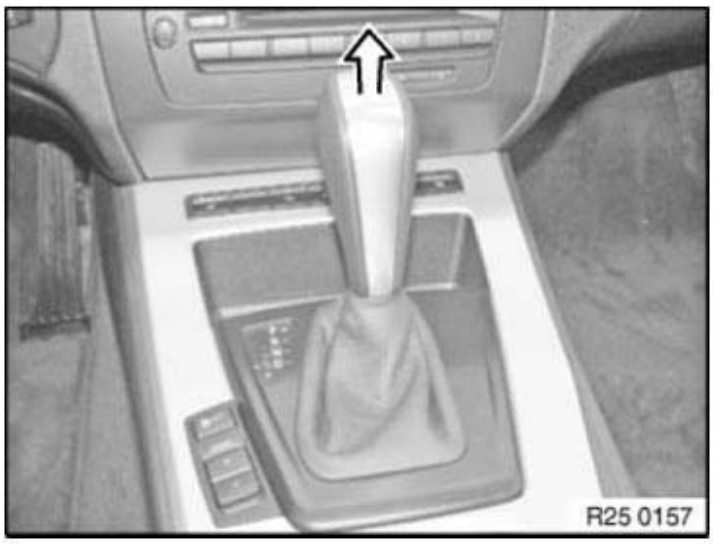
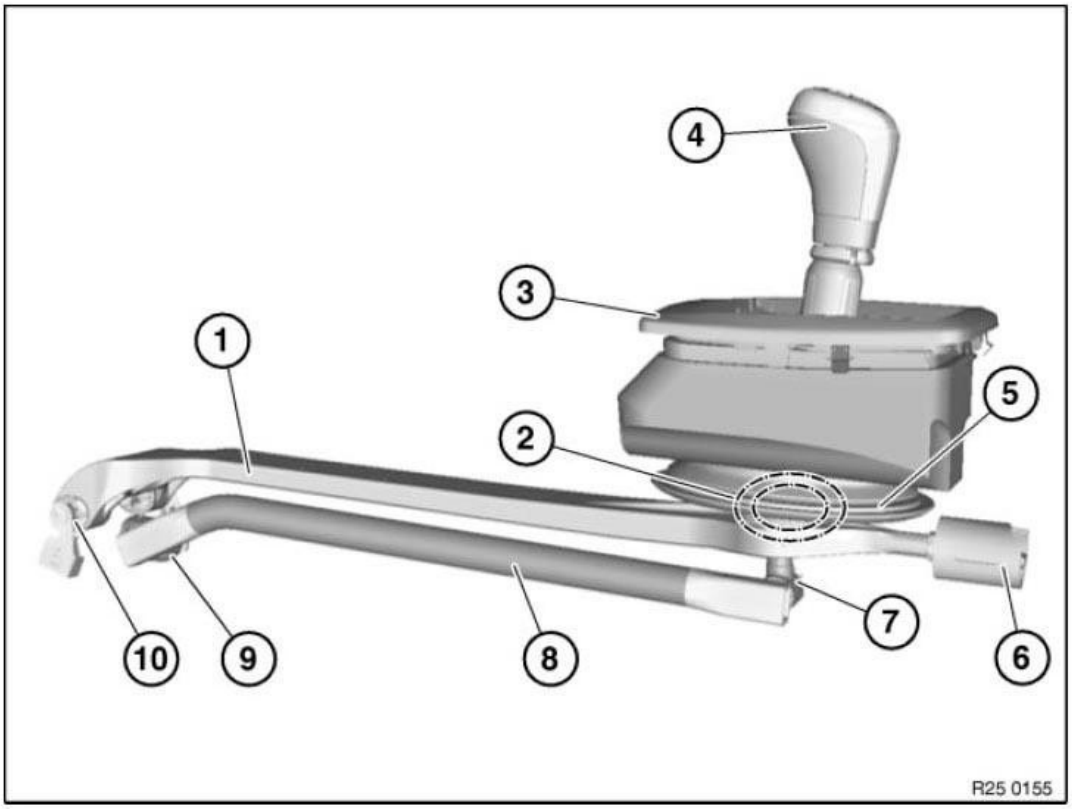


Fig. 37: Pulling Knob With Firm Tug
Courtesy of BMW OF NORTH AMERICA, INC.

2511 CENTRE SHIFT, MANUAL TRANSMISSION

25 11 ... OVERVIEW OF GEARSHIFT MECHANISM FOR MANUAL TRANSMISSION



1 Shift arm
2 Ball socket (shift lever bearing)
3 Shift lever cover (gaiter)
4 Shift lever knob
5 U-gaiter
6 Support bearing (shift arm bearing)
7 Shift lever
8 Shift rod
9 Shift rod joint
10 Bearing bush

Fig. 1: Overview Of Gearshift Mechanism For Manual Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 000 REMOVING AND INSTALLING SHIFT LEVER

Necessary preliminary tasks

- Remove **KNOB** for shift lever.
- Remove complete **EXHAUST SYSTEM** .

- Remove rear underbody protection .
- Remove heat shields.

If necessary

Support transmission with workshop jack.

Remove screws and nuts.

Remove cross-member.

Tightening torque **23 71 1AZ/2AZ** .

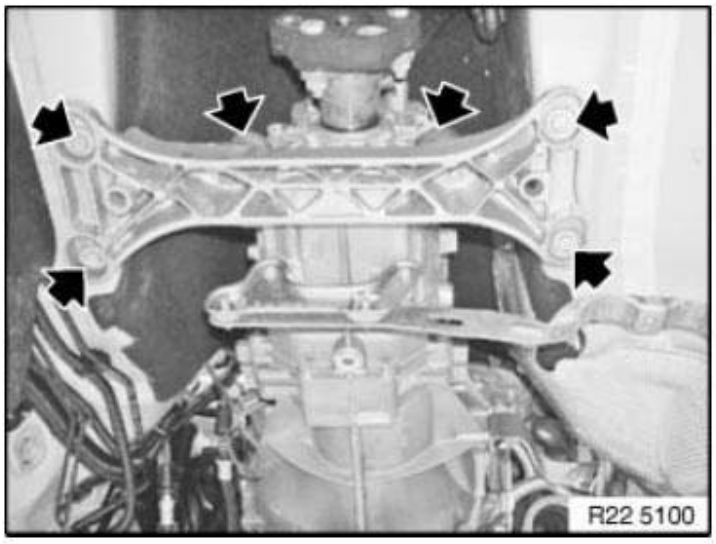


Fig. 2: Locating Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **SHIFT ROD** (2).

Installation:

Grease shift rod pin.

Key:

1. Retainer
2. Shift rod

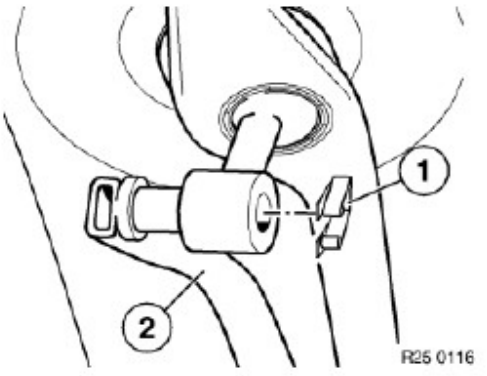


Fig. 3: Identifying Retainer And Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: New retaining clips fitted as from 04.08.

Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

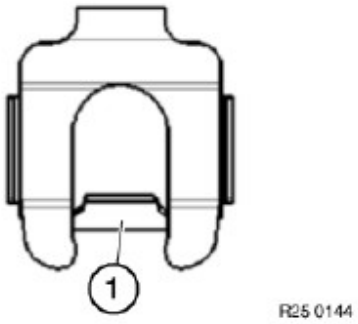


Fig. 4: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool **25 1 120** into mount and turn 90° counterclockwise.

Press mount upwards out of shift arm.

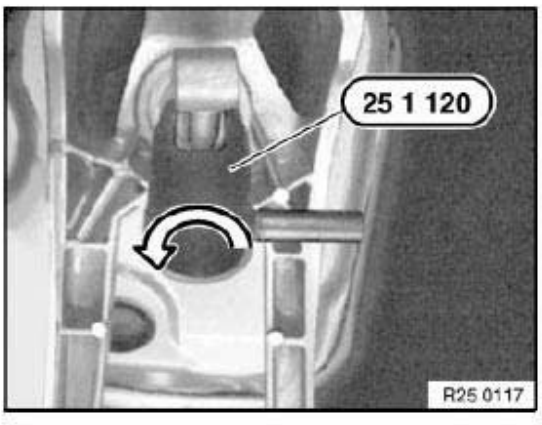


Fig. 5: Inserting Special Tools (25 1 120) Into Mount
Courtesy of BMW OF NORTH AMERICA, INC.

Feed U-gaiter from shift arm and out of body cutout.

Lift out shift lever.

Installation:

Pull U-gaiter from below completely over shift arm receptacle.

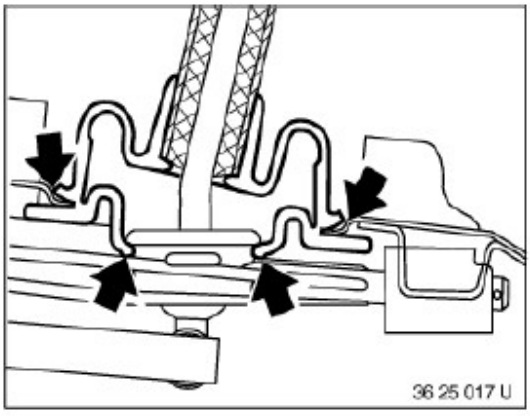


Fig. 6: Locating U-Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Pull U-gaiter bead (4) over receptacle on shift arm and pop U-gaiter lips (3) into body cutout.

Make sure the arrow on the upper U-gaiter lip (3) is seated in the direction of travel and crossways to the shift lever eye (5).

Key:

1. Shift lever
2. U-gaiter moulded section
3. U-gaiter lips
4. U-gaiter bead
5. Shift lever eye

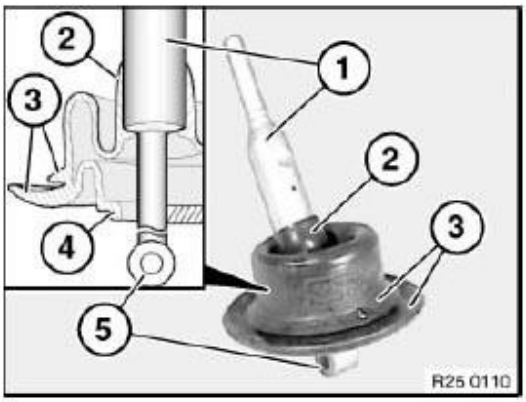


Fig. 7: Identifying Shift Lever, Shift Lever Eye, U-Gaiter Moulded Section, U-Gaiter Lips And Bead
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Grease shift lever ball.

Fit mount on shift arm receptacle.

Align retaining lugs of mount to openings in receptacle (crossways to direction of travel).

Press shift arm with mount downwards until mount snaps audibly into place (if necessary, use a pressing-in tool).

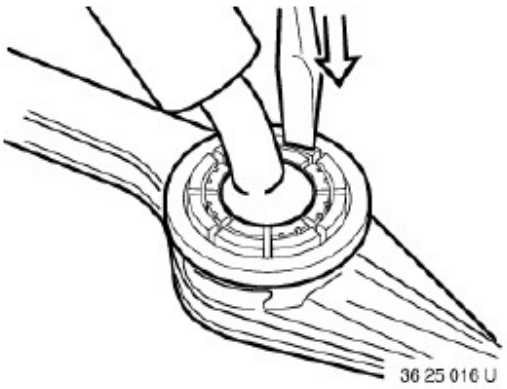


Fig. 8: Fitting Mount On Shift Arm
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 ... REPLACING U-GAITER

Necessary preliminary tasks

- Remove **SHIFT LEVER**

Detach U-gaiter from shift lever.

If necessary, rub inside of moulded section (1) beforehand with Circolight.

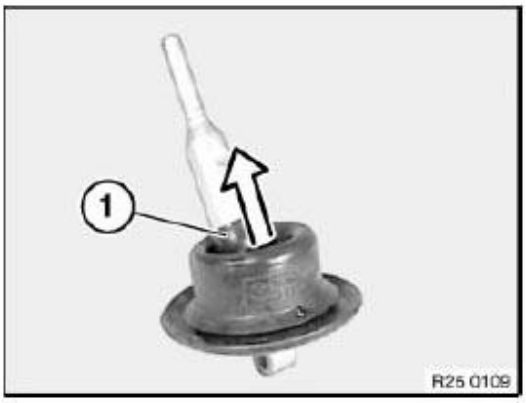


Fig. 9: Removing Moulded Section
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

- Degrease shift lever (1)
- Coat inside of moulded section (2) with Circolight
- Pull U-gaiter from above over shift lever and align
- Arrow on upper lip (3) must point crossways to mount eye (5) in direction of travel

Key:

1. Shift lever
2. U-gaiter moulded section
3. U-gaiter lip
4. U-gaiter bead
5. Mount eye

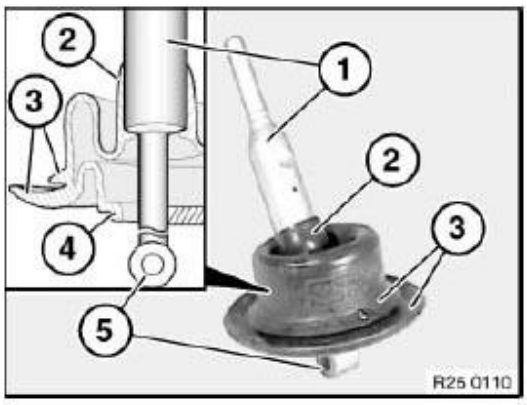


Fig. 10: Identifying Shift Lever, Shift Lever Eye, U-Gaiter Moulded Section, U-Gaiter Lips And Bead
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 235 REPLACING BEARING BUSHES FOR SHIFT ARM

Necessary preliminary tasks

- Remove **SHIFT ARM**

- Press out bearing bush (1).
- Coat new bearing bush with Circolight
- Then press into shift arm until side surface of bush protrudes uniformly.

NOTE: Illustration shows: shift arm simply supported.

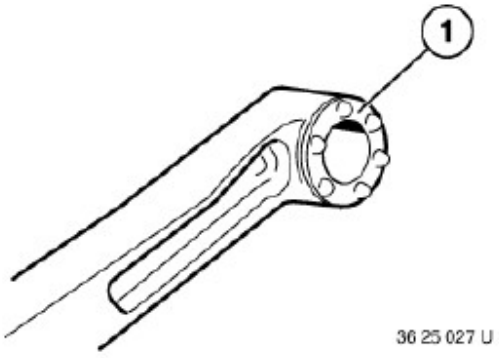


Fig. 11: Identifying Bearing Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 041 REPLACING BEARING SHELL FOR SHIFT LEVER

Necessary preliminary tasks

- Remove **SHIFT LEVER**

Detach mount from selector lever.

Installation

Grease ball joint.

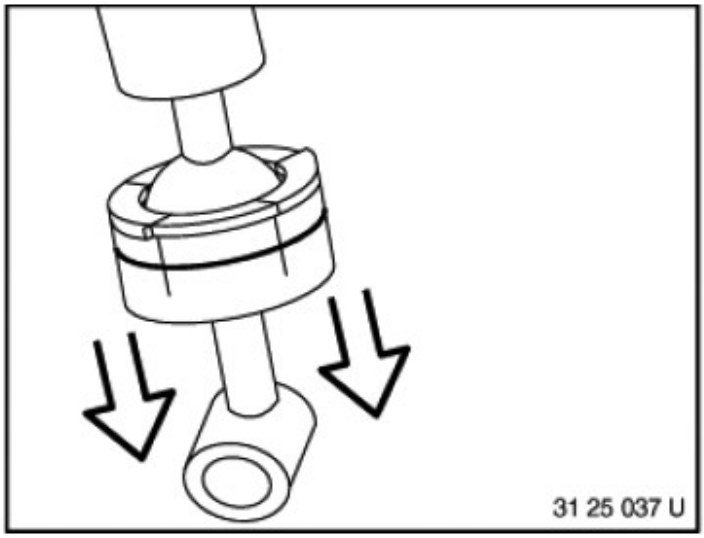


Fig. 12: Removing Mount From Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 001 REPLACING COMPLETE SHIFT LEVER

Necessary preliminary tasks:

- Remove **SHIFT LEVER** .

Detach mount from selector lever.

Installation

Grease ball joint.

Grease,

refer to BMW Service **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

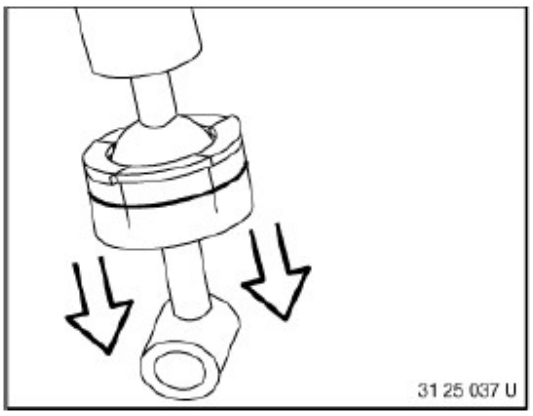


Fig. 13: Removing Mount From Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Detach rubber gaiter from selector lever.

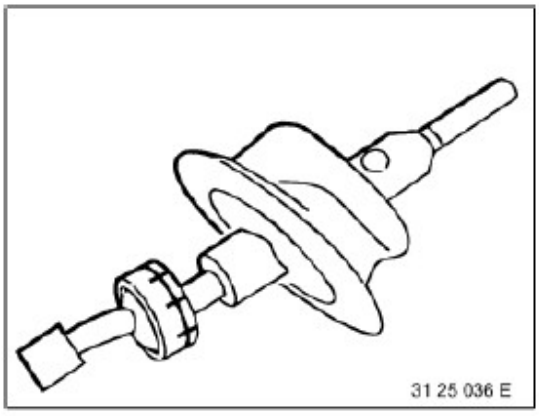


Fig. 14: Detaching Rubber Gaiter From Selector Lever
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Degrease selector lever (1).

Coat rubber bellows on inside of shaped section (2) with Circolight.

Pull rubber gaiter from above over selector lever and align. Arrow (3) on rubber gaiter must point in direction of travel (A).

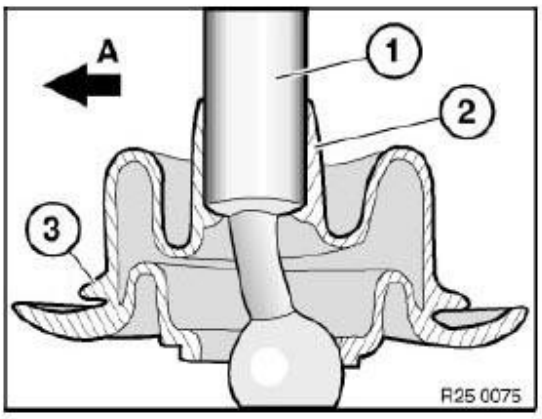


Fig. 15: Identifying Selector Lever And Rubber Gaiter
Courtesy of BMW OF NORTH AMERICA, INC.

25 12 060 REPLACING GEARSHIFT LEVER KNOB FOR TWIN-CLUTCH GEARBOX N54

Release installation frame (1) from centre console.

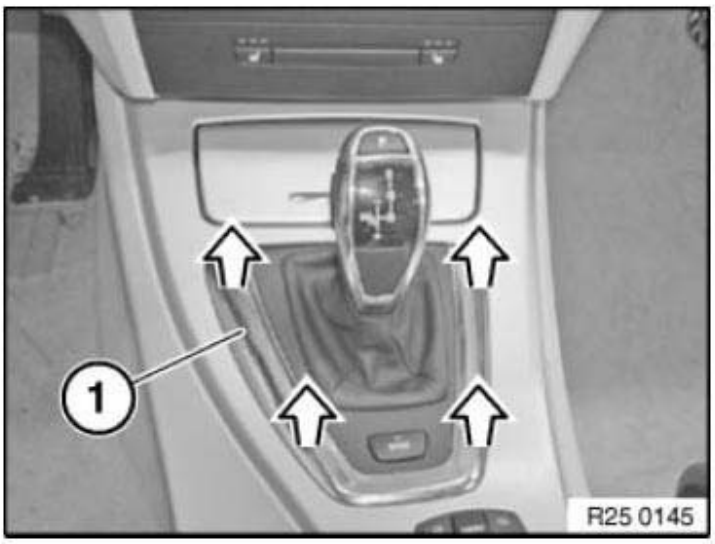


Fig. 16: Removing Installation Frame From Centre Console
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plugs (1) and (2).

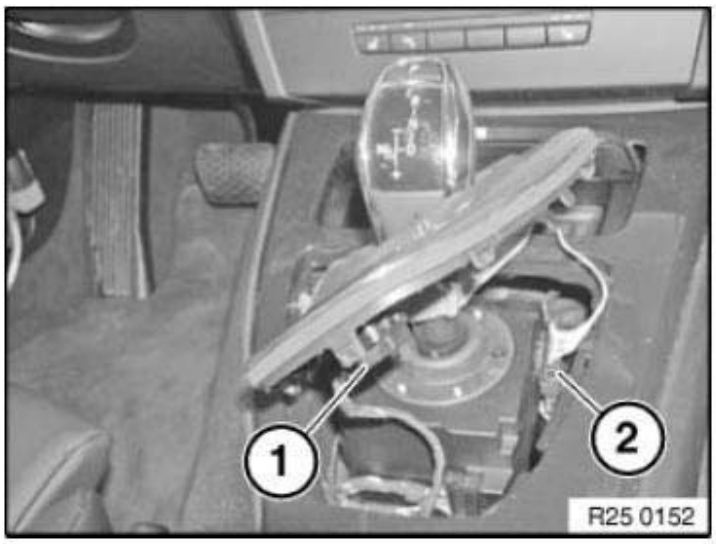


Fig. 17: Identifying Plugs
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not twist shift lever knob during removal as this would cause the antitwist lock in the knob to shear off.

Tug firmly to remove knob.

Installation

Fit shift lever knob on shift lever, align and press on until it snaps noticeably into place.



Fig. 18: Removing Knob
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 071 REPLACING KNOB FOR SHIFT LEVER

Pull installation frame of gaiter (1) from front upwards out of centre console.

IMPORTANT: Do not use a tool, as this would damage the installation frame or the centre console.

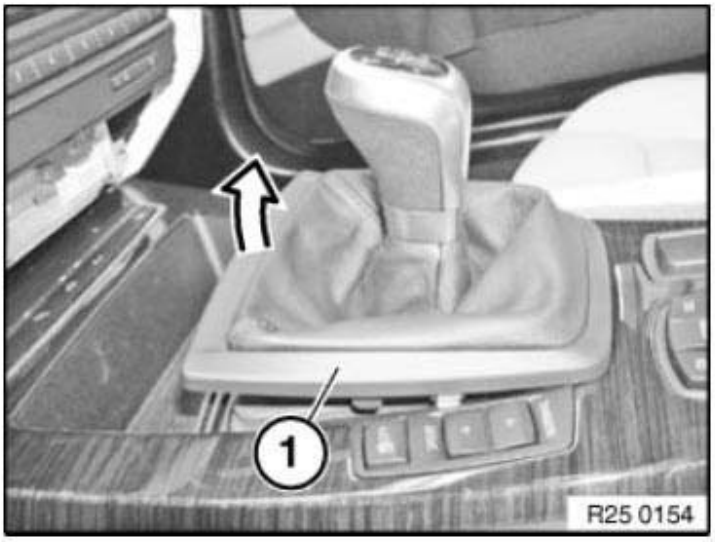


Fig. 19: Pulling Gaiter Installation Frame From Centre Console
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not twist knob during removal as this would cause the turning lock in the knob to shear off.

Tug firmly to remove knob.

Installation

Fit knob on shift lever, align and press on until it snaps noticeably into place.

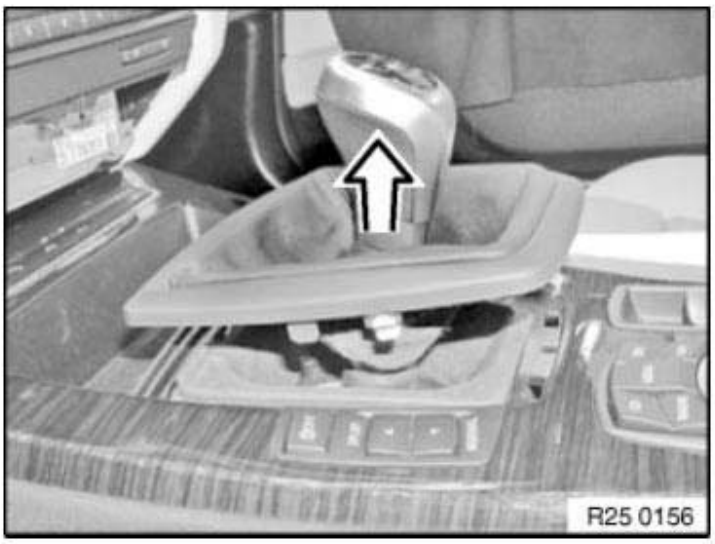


Fig. 20: Removing Knob
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 211 REPLACING SHIFT ARM FOR SHIFT LEVER MOUNT

Necessary preliminary tasks

- Remove **SHIFT LEVER**

Lever support bearing (1) out of fixture.

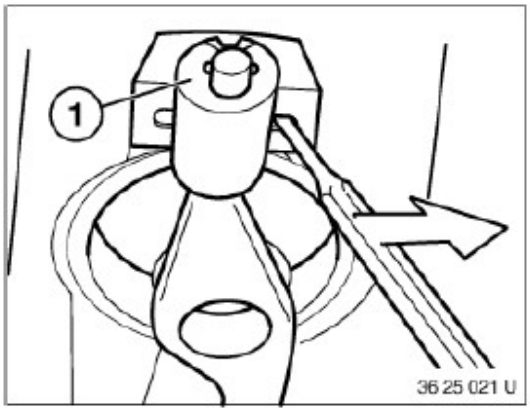


Fig. 21: Removing Support Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install support bearing (1) with arrow (2) facing upwards in holder.

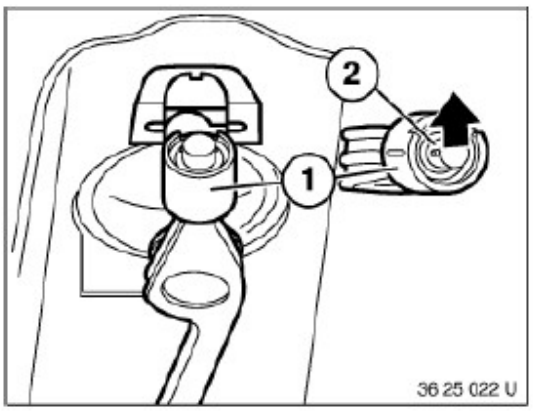


Fig. 22: Identifying Support Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock bearing pin (1) in direction of arrow and remove.

Installation:

Grease bearing pin.

Grease, refer to BMW Service **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

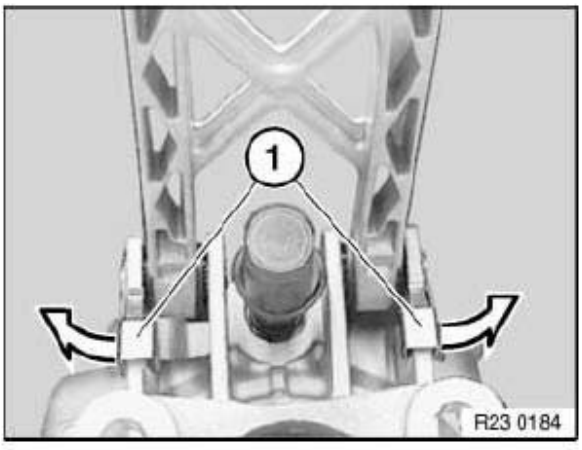


Fig. 23: Removing Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Remove shift arm.

Detach support bearing (1) from shift arm.

Installation:

Grease bearing journal.

Grease, refer to BMW Service **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

Attach support bearing (1) with opening (3) towards rear on shift arm.

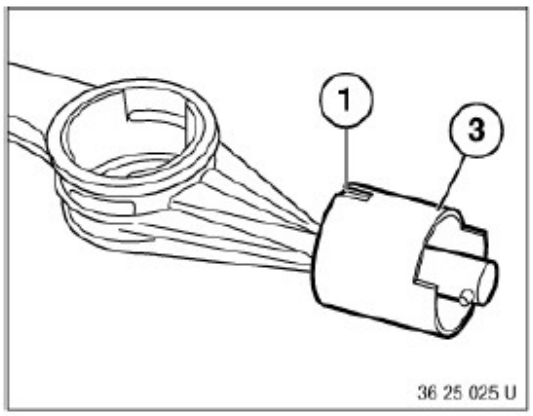


Fig. 24: Identifying Support Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Replace **BEARING BUSH** (1) if damaged.

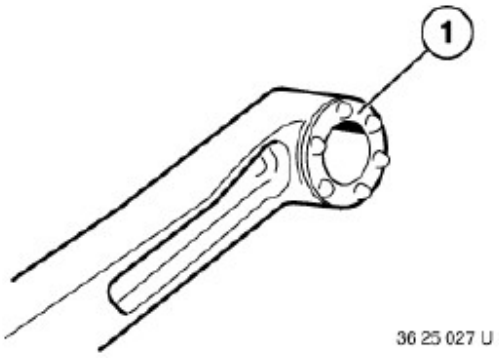


Fig. 25: Identifying Bearing Bush
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 245 REPLACING SHIFT ARM SUPPORT BEARING

Necessary preliminary tasks

- Remove complete **EXHAUST SYSTEM** .
- Remove rear underbody protection .
- Remove heat shield.

Lever support bearing (1) with a short screwdriver out of mounting.

Pull support off shift arm.

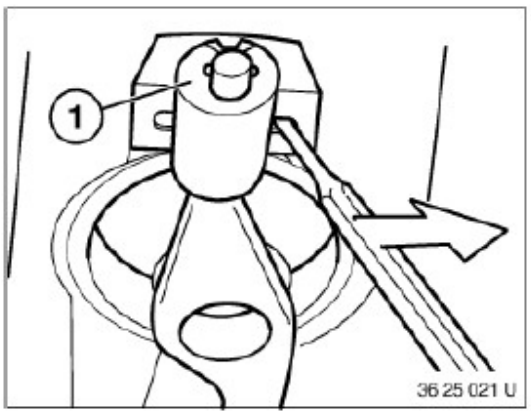


Fig. 26: Removing Support Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Grease bearing pin of shift arm.

Fit support bearing (1) with opening (2) towards top rear onto mounting.

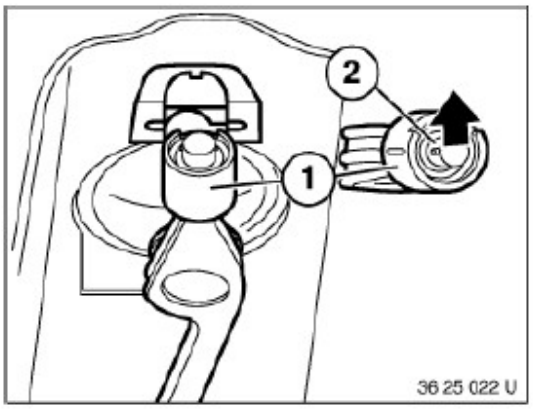


Fig. 27: Identifying Support Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 101 REPLACING SHIFT ROD

Necessary preliminary tasks

- Remove rear assembly underside protection
- Release bracket for exhaust system on transmission
- Remove heat shields
- Remove **TRANSMISSION CROSSMEMBER** .

Detach locking clip.

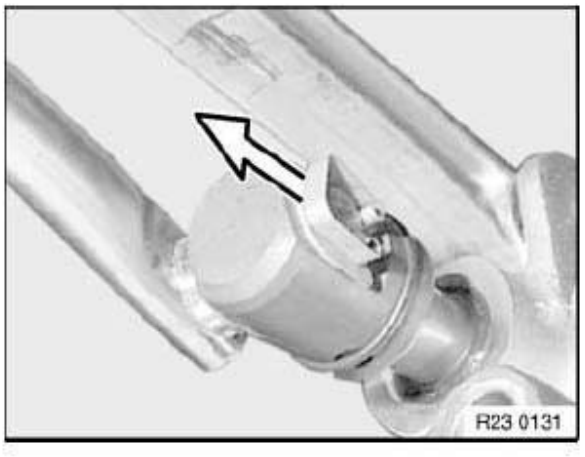


Fig. 28: Removing Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: New retaining clips fitted as from 04.08.

Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

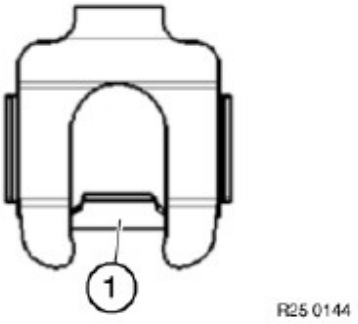


Fig. 29: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Pull shift rod (1) out of shift rod joint (2).

Installation

Grease shift rod pin (3).

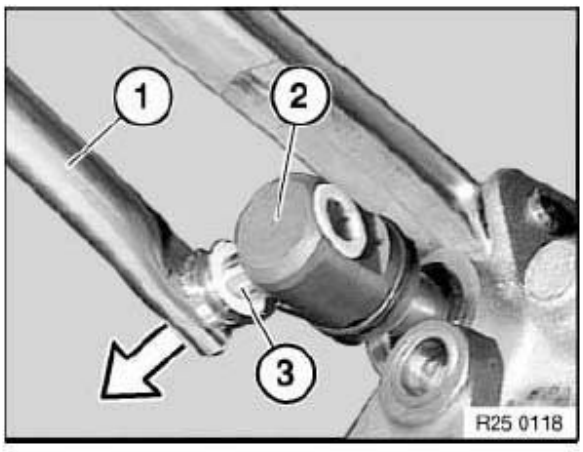


Fig. 30: Pulling Shift Rod From Shift Rod Joint
Courtesy of BMW OF NORTH AMERICA, INC.

Detach locking clip (1).

Remove selector rod (2).

Installation

Grease selector rod pin.

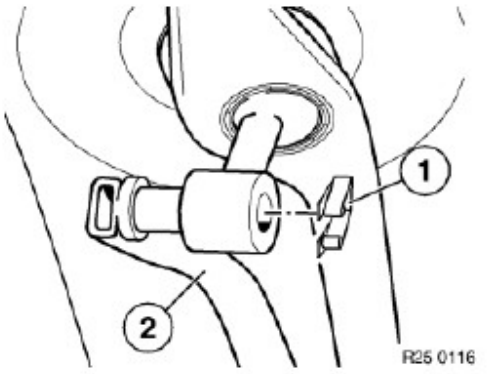


Fig. 31: Identifying Clip And Selector Rod
Courtesy of BMW OF NORTH AMERICA, INC.

25 11 111 REPLACING SHIFT ROD JOINT

Necessary preliminary tasks

- Release propeller shaft at transmission and centre mount, tie propeller shaft to one side

Tasks are described in **REMOVING PROPELLER SHAFT** .

Lift off retainer (1).

Clamp off shift rod (2).

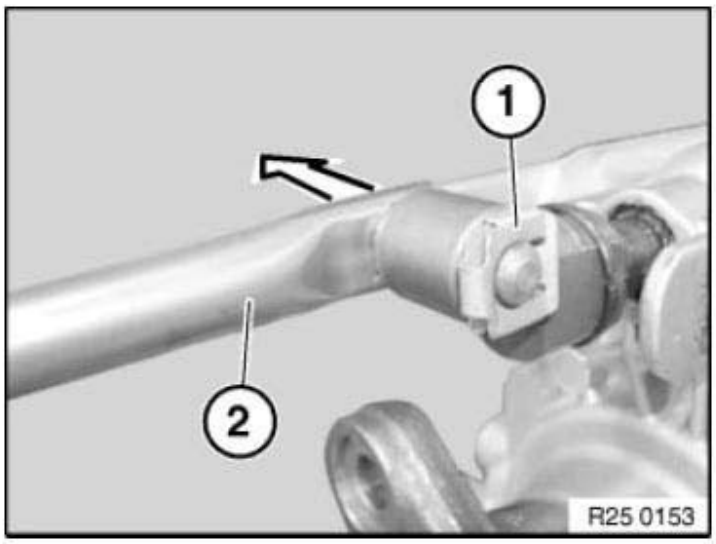


Fig. 32: Identifying Retainer And Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Grease shift rod.

Grease, refer to BMW Service **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

IMPORTANT: New retaining clips fitted as from 04.08.

Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

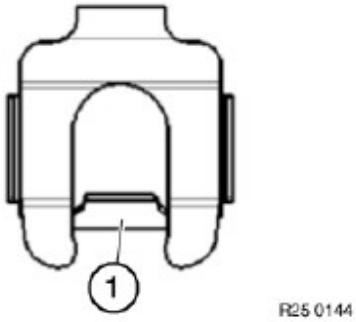


Fig. 33: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Lever spring washer (1) out of groove and push a little towards rear.

Press dowel pin (2) upwards/downwards out of shift rod joint and remove shift rod joint.

Installation

Grease ball of selector shaft.

Grease, refer to BMW Service **GEAR SHIFT MECHANISM - OPERATING FLUIDS** .

Replace spring washer (1).

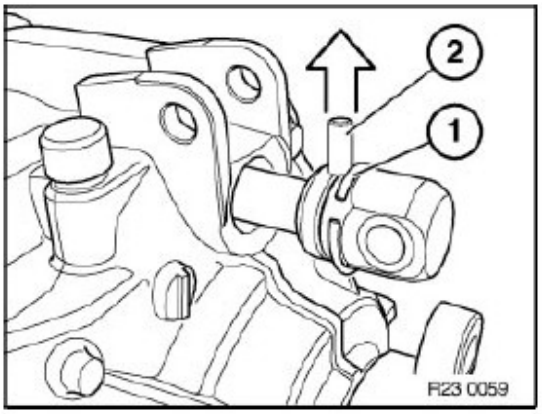


Fig. 34: Pressing Dowel Pin Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check rubber ring (1) in shift rod joint (2) and replace if necessary.

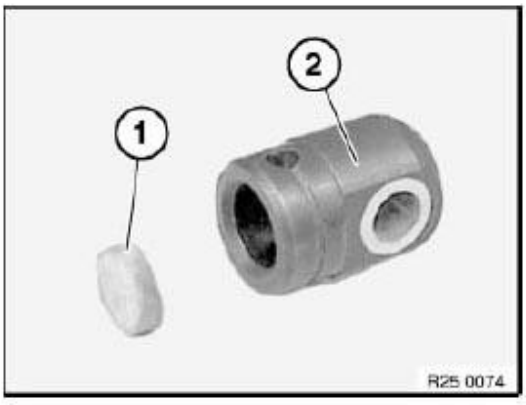


Fig. 35: Identifying Rubber Ring And Shift Rod Joint
Courtesy of BMW OF NORTH AMERICA, INC.

25 GEAR SHIFT MECHANISM

25-1120 PIN WRENCH

Pin wrench Minimum set: Mechanical tools MW

NOTE: For removing gear lever (releasing gearshift lever bearing).

Storage Location

A10

SI number

01 17 05 (212)



Fig. 1: Identifing Pin Wrench (251120)
Courtesy of BMW OF NORTH AMERICA, INC.

25 GEAR SHIFT MECHANISM

25-1120 PIN WRENCH

Pin wrench Minimum set: Mechanical tools MW

NOTE: For removing gear lever (releasing gearshift lever bearing).

Storage Location

A10

SI number

01 17 05 (212)



Fig. 1: Identifying Pin Wrench (25-1120)
Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT CONSOLE - AUTOMATIC TRANSMISSION

25 16 SHIFT CONSOLE - AUTOMATIC TRANSMISSION

TIGHTENING TORQUE SPECIFICATION - SHIFT CONSOLE - AUTOMATIC TRANSMISSION

		Type
1AZ	Bowden cable to shift tower/transmission	E36/E38/E39/E46/E53/E60/E61/E63/E64/E65/E66/E67/E68/E83/E85/E86/E87/E90/E9
2AZ	Clamping screw on shift lever	E36/E38/E39/E46/E53/E60/E61/E63/E64/E65/E66/E67/E68/E83/E85/E86/E87/E90/E9
3AZ	Shift console to tunnel	E36/E38/E39/E46/E53/E60/E61/E63/E64/E65/E66/E67/E68/E83/E85/E86/E87/E90/E9
4AZ	Switch to shift console	E36/E38/E39/E46/E53/E60/E61/E63/E64/E65/E66/E67/E68/E83/E85/E86/E87/E90/E9
5AZ	Interlock cable to shift tower	E36/E38/E39/E46/E53/E60/E61/E63/E64/E65/E66/E67/E68/E83/E85/E86
6AZ	Cable retaining tab to transmission	E91/E92 4WD
7AZ	Oval-head screw for emergency release device	E60, E61
8AZ	Screw for adjusting cable on transmission	E60/E61/E81/E82/E83/E84/E87/E88/E90/E91/E92/E93
9AZ	Vulcanised support angle to transmission	E81/E82/E87/E88/E90/E91/E92/E93/E84

Manual Transmission - Operating Fluids

1.0 GENERAL INFORMATION ON GEAR LUBRICANTS

Gear lubricants for manual transmissions must conform to the following requirements due to the different transmission designs with considerable variation in loads, temperature and speeds.

The qualities of a recommended gear lubricant are:

A. Load carrying capacity, i.e. high-pressure resistance.
B. Noise reduction.
C. Non-corrosive to various metals.
D. Non-foaming.
E. Non-separation of additives at operating temperatures.
F. Non-sludge forming.
G. Prevention of swelling, hardening and shrinking of seals.

These properties are already provided in manual transmission oil by:

- High-pressure additives.
- Corrosion inhibitors.
- Oxidation inhibitors (inhibitors which limit or prevent chemical reactions).
- Anti-foaming agents.

2.0 OIL ADDITIVES

BMW manual transmissions are designed so that they do not require aftermarket oil additives.

BMW disapproves the use of any oil additives and cannot accept the liability for any consequential damage that results from using oil additives.

3.0 MANUAL TRANSMISSION OIL REQUIREMENTS AND SPECIFICATIONS

BMW

A. All reputable brand mineral-based transmission oils of viscosity class SAE 80 according to specifications MIL-L-2105 or API GL-4 (**no label** on transmission bell housing).
B. Synthetic transmission fluid, Mobil SHC 630 (325e/528e without dual mass flywheel, produced before mid-1986). Manual transmissions which are filled with Mobil SHC 630 synthetic gear lube have a **green label** with the words "Special Oil" located next to the oil filter plug.



Fig. 1: Identifying Manual Transmission - Green Label
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Mobil SHC 630 is available in 5-gallon pails or 55-gallon drums from:

Filling BMW transmissions with unapproved synthetic gear lubes could cause the following damage:

- Premature synchromesh ring wear
- Reduced service life of bearings
- Tooth profile damage
- Faster wear of selector forks
- Damage to radial shaft oil seals

Transmission gear clashing will eventually result.

NOTE: Do not use synthetic fluid Mobil SHC 630 in other vehicles. The transmission synchronizers of cars other than listed above are not compatible with synthetic fluid and premature wear will result.

NOTE: To reduce the physical effort required to change gear at low ambient temperatures, the following oils can be used in the transmission during the winter:

- Single-grade HD mineral engine oils SAE40, SAE30, SAE20
- In countries where the ambient temperatures are particularly low, ATF oils can also be used.

This has the disadvantage that the transmission tends to rattle or knock while in neutral at higher temperatures.

CAUTION: These transmissions must never be filled with synthetic engine oils or multigrade engine oils, since these oils contain coefficient of friction-reducing agents that can adversely affect operation of the synchromesh mechanism.

C. Automatic Transmission Fluid (ATF) of Dexron® II or Dexron® III formulation on any of the following:
   - Dual mass flywheel
   - Direct drive fifth gear as of 9/90
   - Six-speeds

Manual transmissions which are filled with ATF have 17mm external hex plugs in the filler and drain openings as well as an **orange label** on the transmission bell housing next to the filler plug.



Fig. 2: Identifying Manual Transmission - Orange Label
Courtesy of BMW OF NORTH AMERICA, INC.

D. From model year 1998 (9/97 production) all manual transmissions are filled with Esso/Exxon "MTF-LT-1" lifetime fluid. A **yellow label** with the letters "MTF-LT-1" is located next to the oil filler plug.

No oil change is required for the entire service life of these transmissions.

In the event of a repair, the transmission must only be filled with the lifetime oil.

Esso/Exxon MTF-LT-1

BMW P/N 83 22 9 408 942.

E. From model year 2004 some manual transmissions are filled with Castrol "MTF-LT-2" lifetime fluid. This fluid has the same properties as the "MTF-LT-1" fluid indicated above in section D. The "MTF-LT-1" fluid may be mixed and/or substituted for the "MTF-LT-2" manual transmission fluid.

2006 MY and later E60 M5 and E63/64 M6 equipped with and without SMG utilizes only MTF-LT-2 fluid.

2006 MY and later E85 M Roadster and Coupe require MTF-LT-2 fluid.

MTF-LT-2 Fluid

BMW P/N 83 22 0 309 031

F. From Model Year 2006 all vehicles equipped with a manual transmission and the N52 engine require the MTF-LT-3 lifetime fluid.

N52 equipped vehicles:

- E60 from 3/2005 production
- E85 from 9/2005 production
- E86 from 1/2006 production
- E90/91 from 3/2005 production
- E92 from 7/2006 production

- E83 from 9/2006 production

MTF-LT-3

BMW P/N 83 22 0 409 878

No oil change is required for the entire service life of these transmissions.

MANUAL TRANSMISSION COLD SHIFT EFFORT

NOTE: The following information does not apply to transmissions filled with lifetime fluid.

Transmission cold shift effort is reduced by replacing the original oil (SAE 80 or Mobil SHC 630) with a reputable brand single-grade HD engine mineral oil of API-SE standards (SAE 20, SAE 30, or SAE 40). Thinner oils will run the risk of increased gear noise.

A further reduction in shift effort can be obtained by using ATF, but gear noise will be more noticeable compared to single-grade engine mineral oils.

For summer operation it is recommended that ATF or engine oil be drained and replaced by the original lubricant, either SAE 80 or Mobil SHC 630 (as specified) transmission fluid.

CAUTION: Never fill a manual transmission with synthetic engine oils or multigrade mineral-based engine oils, since they have friction-reducing components that could impair the function of the synchronizers.

4.0 TRANSMISSION OIL CHANGE INTERVAL

Starting with 1998 models all manual transmissions are filled with lifetime fluid and require no fluid changes for the life of the vehicle.

5.0 SMG: SEQUENTIAL MANUAL GEAR BOX

All models SMG Hydraulic Unit require the use of Pentosin CHF 11S fluid.

2300 COMPLETE TRANSMISSION

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct

- Pour oil only into appropriately marked containers
- Do **not** pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

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If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 11.. ... DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION

NOTE: Gearbox must be at normal operating temperature.

Gear oil:

- Refer to **MANUAL TRANSMISSION - OPERATING FLUIDS** .

Filling capacities:

- Refer to Technical Data . See **TRANSMISSION FILLING CAPACITIES** .

Draining gear oil:

- Release oil drain plug (1) and filler plug (2).
- Clean oil drain plug (1) and screw in.

Tightening torque **23 00 4AZ** .

Fill transmission with ATF.

- Pour in gear oil until overflowing.
- Tighten in filler screw (2).

Tightening torque: **23 00 4AZ** .

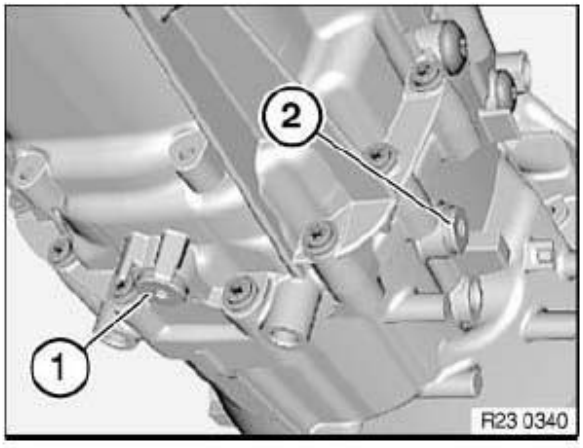


Fig. 1: Identifying Gear Oil Drain Plug And Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

23 00 038 INSTALLING REPLACEMENT TRANSMISSION (GS6-17BG/DG)

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL . Use only approved transmission oil. See MANUAL TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this instruction will result in serious damage to the transmission.

Recycling

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations

Necessary preliminary tasks

- Drain gear oil at oil drain plug. Tightening torque:**23 00 4AZ**
- Remove **TRANSMISSION**

Transfer shift-rod joint.

Slide back retaining ring (1) and drive out cylinder pin (2).

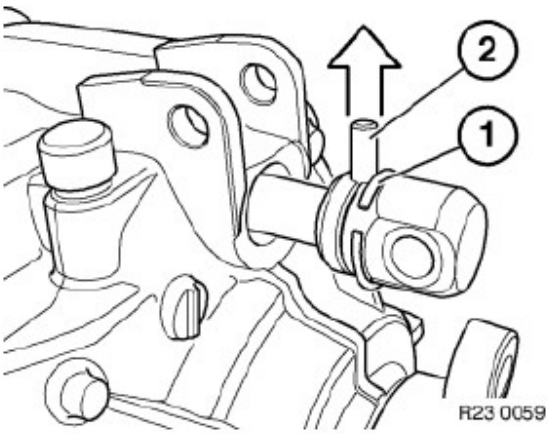


Fig. 2: Pressing Dowel Pin Upwards
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check damping disk (6) for damage and replace if necessary.

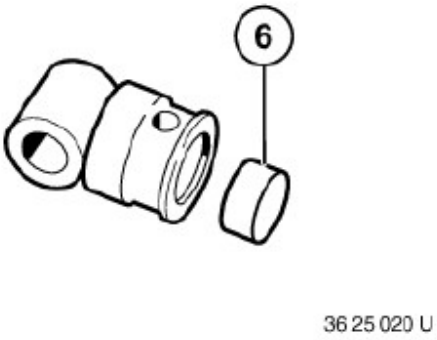


Fig. 3: Identifying Damping Disk
Courtesy of BMW OF NORTH AMERICA, INC.

Convert following parts from previous transmission to new transmission.

- **RELEASE BEARING AND RELEASE LEVER**
- Ball pin and spring wire clip
- Studs for clutch slave cylinder
- Reversing light switch, tightening torque: **23 11 1AZ**

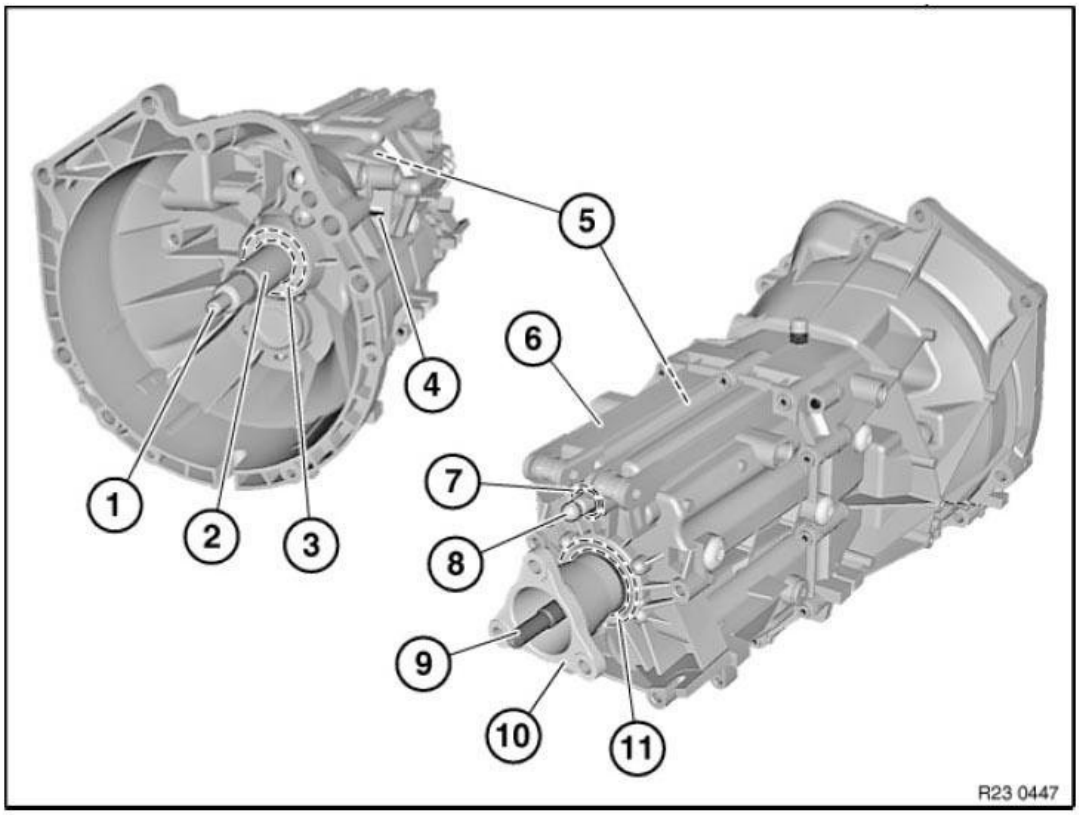
Add final details to vehicle.

Check oil level.

Installation:

Observe **GREASING SPECIFICATION** .

23 00 ... OVERVIEW OF TRANSMISSION HOUSING (GS6-17BG)



1	Input shaft	
2	Guide tube	
3	Radial seal	For drive shaft
4	Transmission housing, front section	
5	Internal components	
6	Transmission housing, rear section	shafts, gear wheels, gearshift components
7	Radial seal	For selector shaft
8	Shift shaft	
9	Output shaft	
10	Output flange	
11	Radial seal	For output flange

Fig. 4: Overview Of Transmission Housing (GS6-17BG)
Courtesy of BMW OF NORTH AMERICA, INC.

0 General information Complete transmission, oil change, transmission designations

1. Input shaft
2. Guide tube
3. Radial seal For drive shaft
4. Transmission housing, front section
5. Internal components
6. Transmission housing, rear section shafts, gear wheels, gearshift components
7. Radial seal For selector shaft
8. Shift shaft
9. Output shaft
10. Output flange
11. Radial seal For output flange

23 00 017 REMOVING AND INSTALLING TRANSMISSION (GS6-17BG) N52K

IMPORTANT: After completion of work, check transmission oil level.
Use only the approved transmission fluid. See MANUAL TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this requirement will result in serious damage to the manual transmission.

IMPORTANT: Aluminium-magnesium materials.
No steel screws/bolts may be used due to the threat of electrochemical corrosion.
A magnesium crankcase requires aluminum screws/bolts exclusively.

Aluminum screws/bolts must be replaced each time they are **released** .

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are not **magnetic** .

Jointing torque and angle of rotation must be observed without fail **(risk of damage)** .

Necessary preliminary tasks

- Clamp off **BATTERY**
- Remove underbody protection
- Remove complete exhaust system . See **EXHAUST SYSTEM - REPAIR (N52)**
- Remove heat shields
- Support engine

Release screws (1).

Remove exhaust system bracket (2).

Tightening torque **23 00 1AZ** .

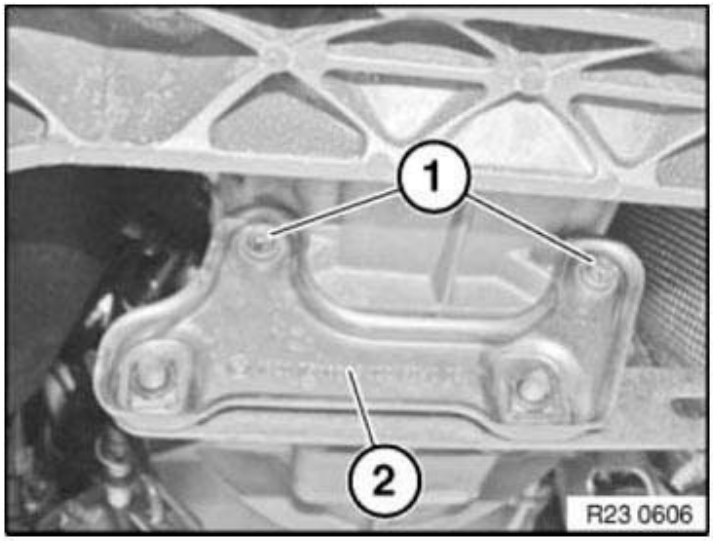


Fig. 5: Identifying Screw And Exhaust System Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Remove holder (1).

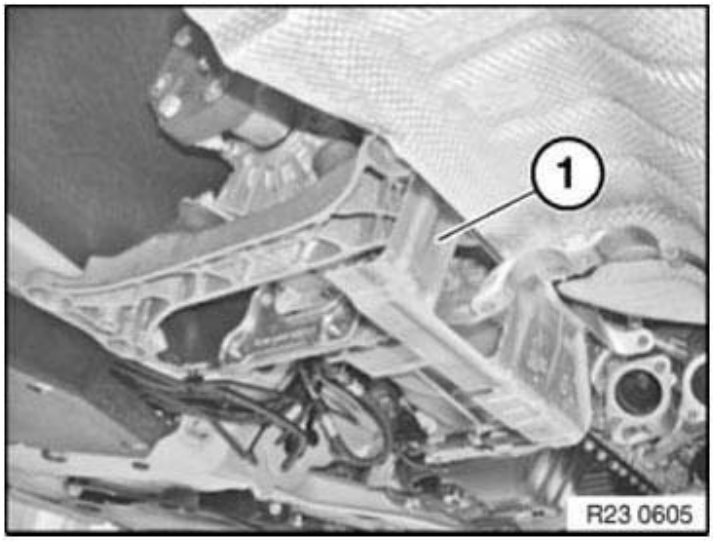


Fig. 6: Identifying Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect connector (1).

Unfasten screws (2).

Release screw (3) on grounding strap

Remove holder (4).

Tightening torque **23 00 1AZ** .

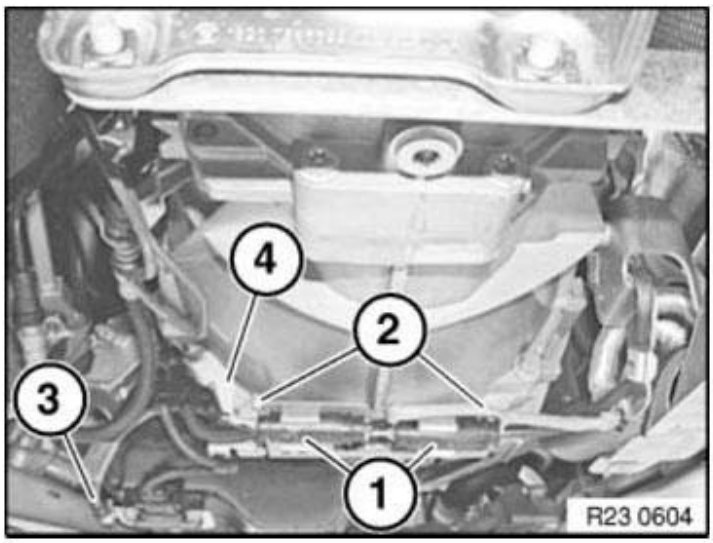


Fig. 7: Identifying Connector, Screw And Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Unclip cable (1) from holder.

Unfasten screws (2).

Remove bracket (3).

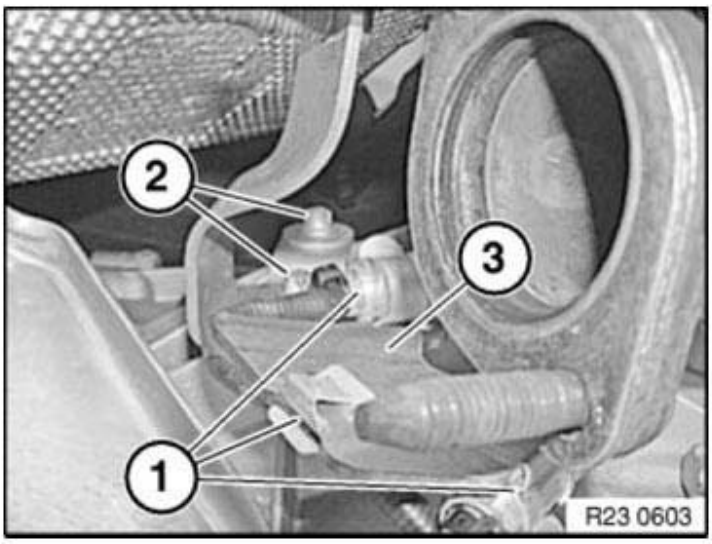


Fig. 8: Identifying Cable, Screws And Bracket
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug (1) from reverse gear switch.

Detach cables from fixtures on transmission.

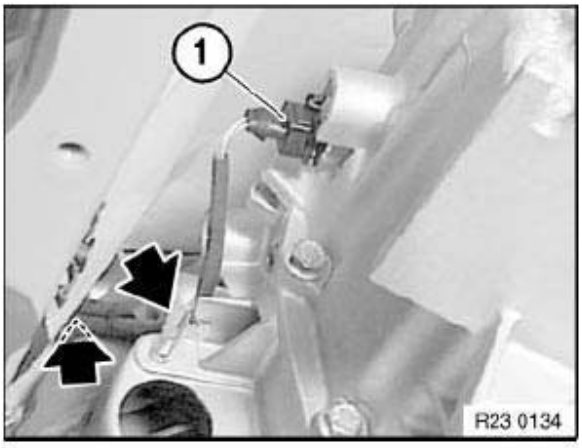


Fig. 9: Identifying Reverse Gear Switch Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools **23 4 050** .

Secure transmission to mounting with tensioning strap (1).

Tasks are described in **Universal BMW transmission take-up**.

After completion of work, check transmission oil level.

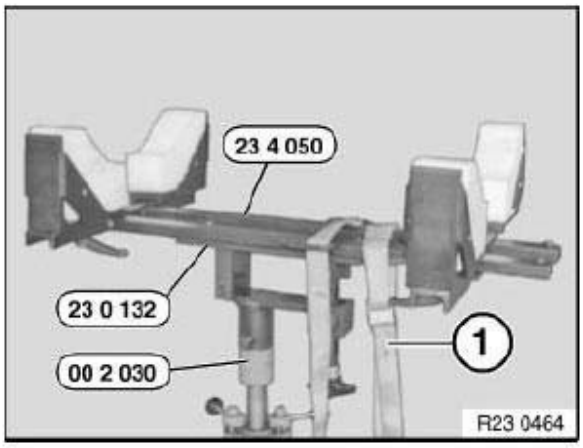


Fig. 10: Support Transmission With Special Tools (23 4 050,00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

Remove screws and nuts.

Unscrew cross member.

Tightening torque **23 71 1AZ/2AZ** .

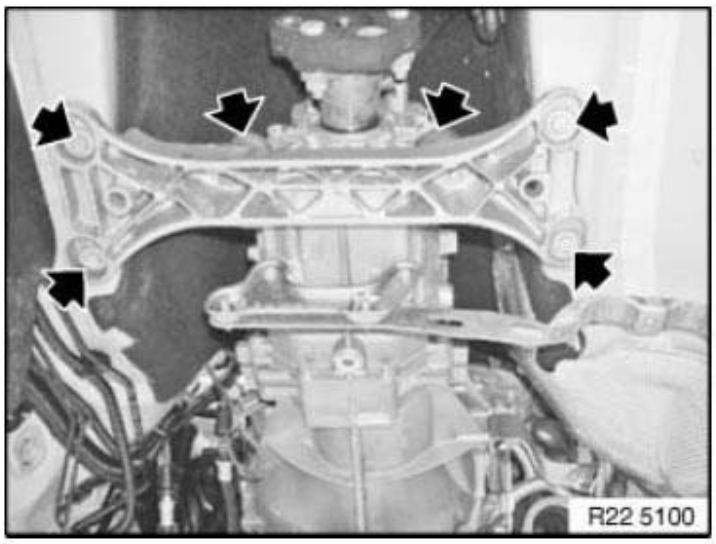


Fig. 11: Locating Screws And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Remove **PROPELLER SHAFT**

NOTE: Pressure line of clutch slave cylinder remains connected.

IMPORTANT: Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing sleeve.

Release nuts (2) and remove clutch slave cylinder (1).

Tightening torque **21 52 5AZ** .

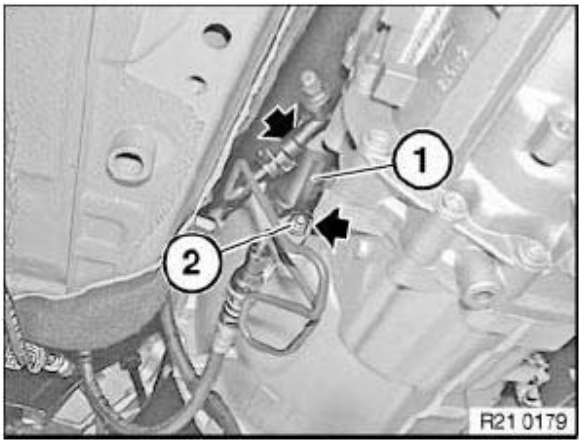


Fig. 12: Identifying Clutch Slave Cylinder Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Detach locking clip.

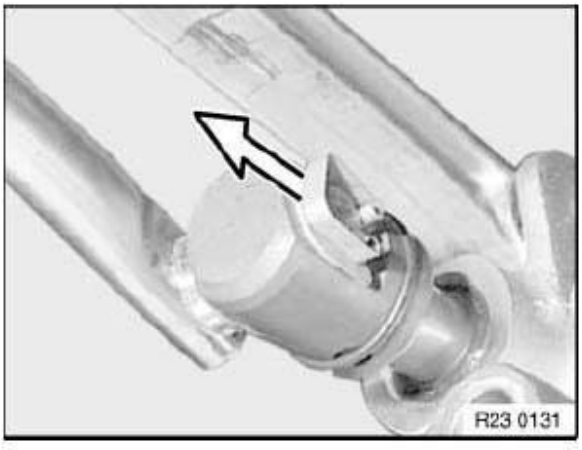


Fig. 13: Removing Locking Clip
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: New retaining clips fitted as from 04.08.
Retaining clip must interlock captively with retaining web (1) behind shift rod pin.

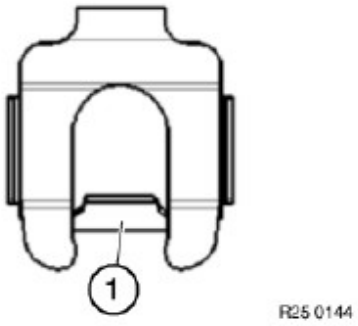


Fig. 14: Identifying Retaining Web
Courtesy of BMW OF NORTH AMERICA, INC.

Pull shift rod (1) out of shift rod joint (2).

Installation:

Grease shift rod pin (3).

Grease, refer to **OPERATING FLUIDS** .

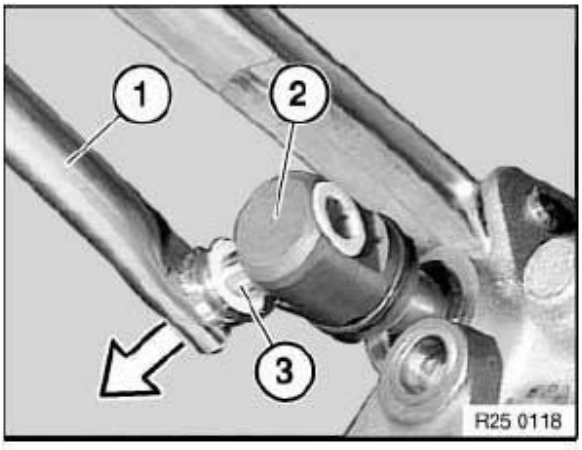


Fig. 15: Pulling Shift Rod From Shift Rod Joint
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock bearing pin (1) in direction of arrow and remove.

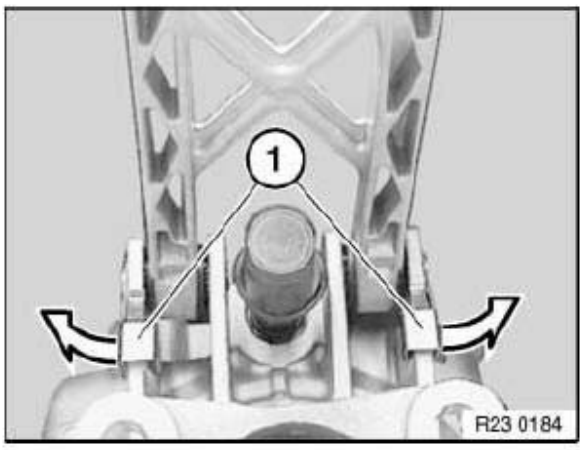


Fig. 16: Removing Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out shift arm (1).

Installation:

Grease bearing pin.

Grease, refer to **OPERATING FLUIDS** .

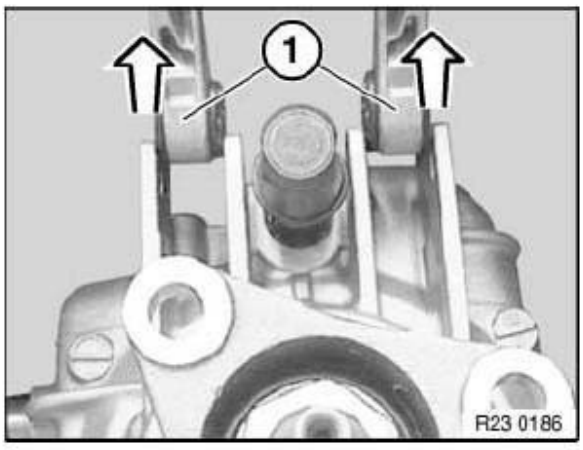


Fig. 17: Lifting Out Shift Arm
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Installation:

Tightening torque, steel screws **23 00 1AZ** .

Aluminum screws **must** be replaced.

Tightening torque and angle of rotation

Aluminum screws/bolts **23 00 2AZ** .

IMPORTANT: Do not suspend the transmission from the transmission input shaft during removal and installation as this will deform the clutch plate. Pull out transmission towards rear and remove.

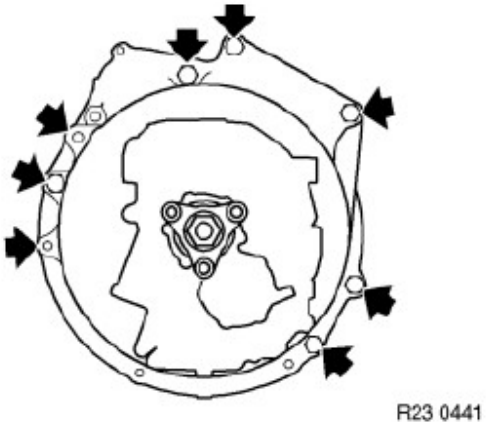


Fig. 18: Locating Clutch Disc Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Tighten down screws/bolts to specified torque.

Secure special tool and angle of rotation 00 9 120 with magnet **00 9 130** to floor plate.

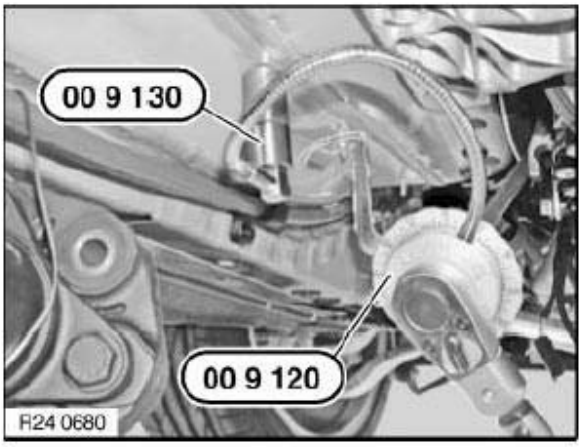


Fig. 19: Identifying Special Tool (00 9 120) And Magnet (00 9 130)

Courtesy of BMW OF NORTH AMERICA, INC.

Screw down aluminum screws/bolts further according to angle of rotation.

Angle of rotation **23 00 2AZ** .

Installation

Check dowel sleeves (1 and 2) for correct seating.

Replace damaged sleeves.

Ensure correct position of cover plate.

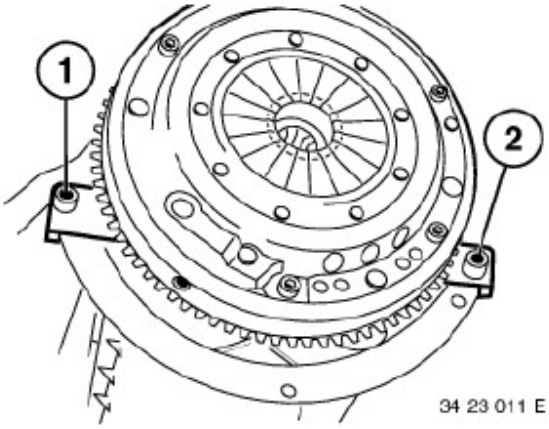


Fig. 20: Identifying Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Check lubrication of transmission input shaft for sticky consistency. If grease is sticky, clean input shaft and **REPLACE CLUTCH PLATE** .

Check clutch plate for friction rust in splines and **REPLACE IF NECESSARY** .

Remove any grease and lining abrasion from splines of clutch plate by mechanical means (with a cloth).

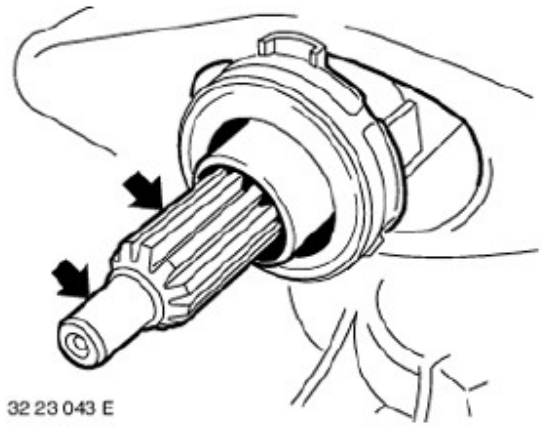


Fig. 21: Locating Transmission Input Shaft Lubrication
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Greasing specification:

- Remove and clean release bearing and release lever (do not grease).
- Push on grease scraper ring 21 2 220 as far as it will go.
- Grease splines (1) of input shaft with a brush.
- Refer to **OPERATING FLUIDS**
- Detach grease scraper ring.

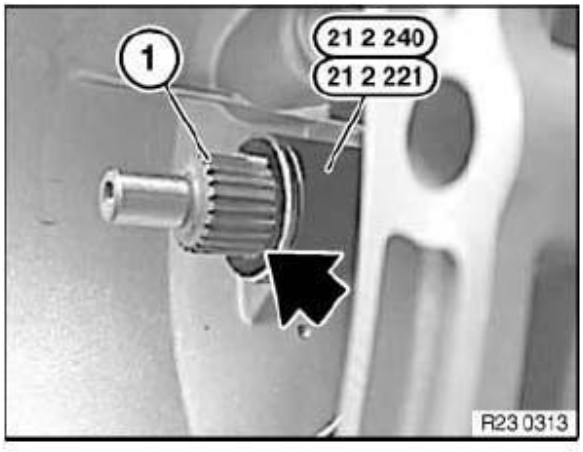


Fig. 22: Identifying Grease Scraper Ring And Splines
Courtesy of BMW OF NORTH AMERICA, INC.

23 01 010 REPLACING SEALING CAP (GS6-17BG/DG)

Necessary preliminary work:

- Remove **GEARBOX**
- Remove **CLUTCH RELEASE BEARING/LEVER**

Drive a hole into the sealing cap (1) with a suitable tool (2).

IMPORTANT: Do not use a drill as drillings may result in transmission malfunction.

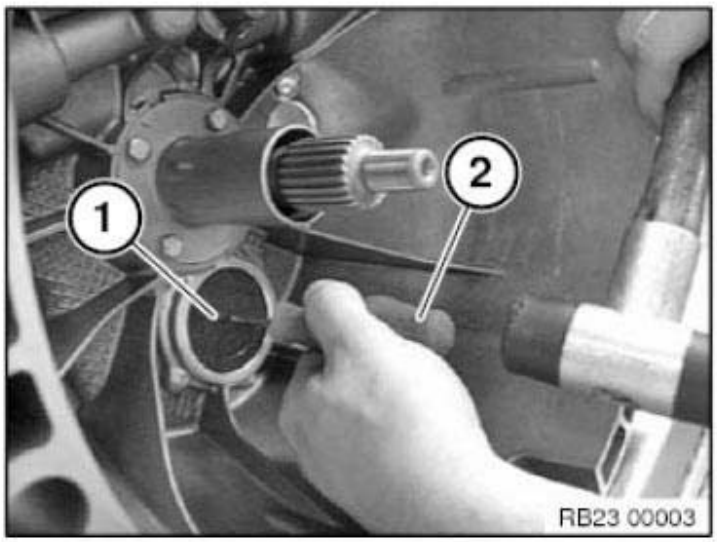


Fig. 23: Drilling Hole Into Sealing Cap Using Suitable Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 23 0 490 into sealing cap.

Withdraw sealing cap from transmission housing with aid of impact weight.

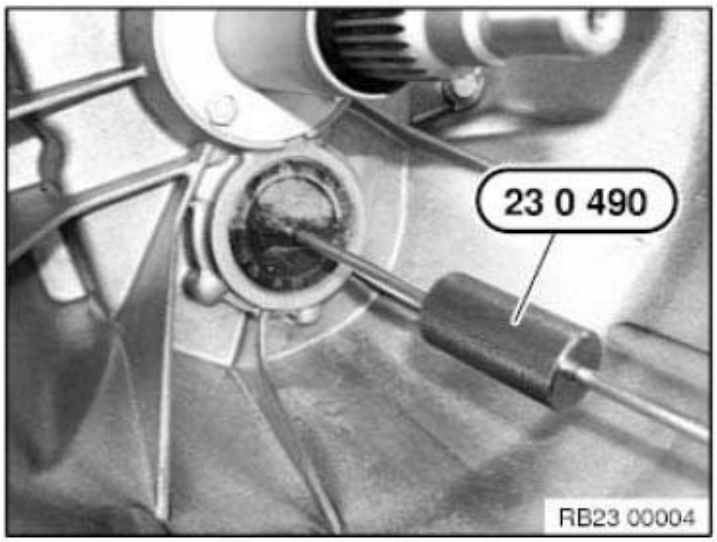


Fig. 24: Turning Sealing Cap Using Special Tool (23 0 490)
Courtesy of BMW OF NORTH AMERICA, INC.

Apply transmission oil to the sealing lip of the sealing cap (1) and insert.

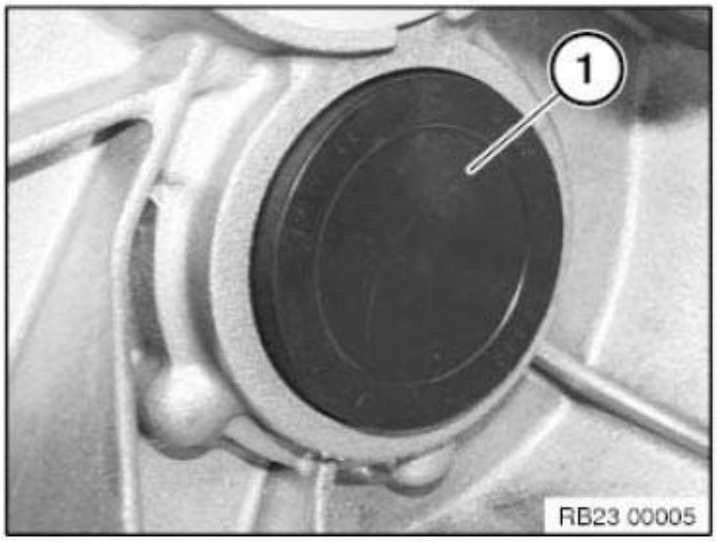


Fig. 25: Identifying Sealing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Drive sealing cap firmly home with special tool 23 0 330.

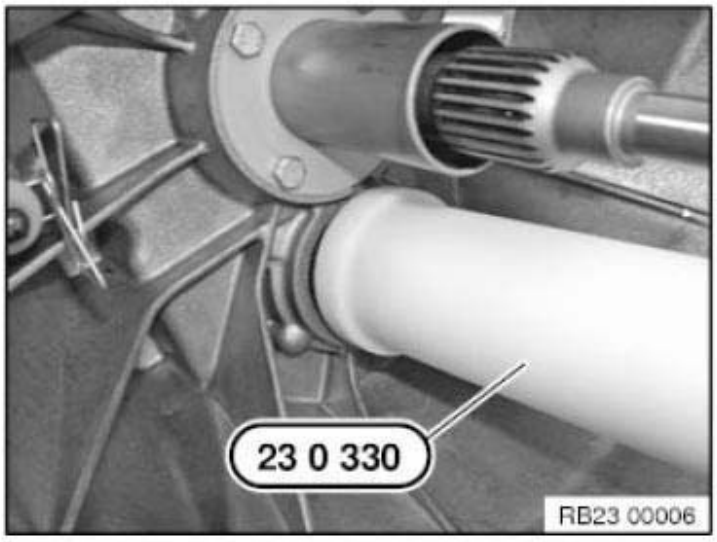


Fig. 26: Inserting Sealing Cap Using Special Tool (23 0 330)
Courtesy of BMW OF NORTH AMERICA, INC.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures

- **Eye contact:** Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Risk of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

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- Irritation of the eyes
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- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!

Recycling

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released

- **Personal precautionary measures:** Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- **Environmental protection measures:** Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- **Limiting spread:** Use oil blocks to prevent the surface spread of oil.
- **Cleaning procedure:** Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

23 TRANSMISSION DESIGNATIONS

Breakdown of BMW designation

BMW BREAKDOWN DESIGNATION - TRANSMISSION

A5S 300J (former designation)		
A	Transmission type	○ S = Manual gearbox ○ A = Automatic transmission
5	Number of forward gears	
S	Type of top gear	○ D = Direct gear ○ S = Overdrive gear
300	Max. input torque (Nm)	
J	Code letter of transmission manufacturer	○ G = Getrag ○ J = Jatco

		○ R = GMPT (General Motors Powertrain) ○ Z = ZF (Zahnradfabrik Friedrichshafen)
SMG	Notes	SMG = Sequential M gearbox/transmission

BMW BREAKDOWN DESIGNATION - SEQUENTIAL M GEARBOX

GS6-37BZ (new designation according to BMW Group Standard GS 90007)		
G	Transmission	
S	Transmission type	○ S = Manual gearbox ○ A = Automatic transmission
6	Number of forward gears	○ - = Standard with manual gearshift ○ HP = Hydraulic planetary gear train ○ DKG= Twin-clutch transmission/gearbox
37	Transmission type	○ 26 = D-transmission ○ 31 = C-transmission ○ 39 = F-transmission ○ 37 = H-transmission ○ 53 = G-transmission ○ 17 = I-transmission ○ 47= J transmission SMG -7-speed ○ 45 = K transmission ○ 36= Transmission DKG
B	Gear set	○ B = Petrol gear ratio ○ D = Diesel gear ratio ○ S= Sport gear ratio
Z	Code letter of transmission manufacturer	○ G = Getrag ○ Z = ZF (Zahnradfabrik Friedrichshafen)

Manual gearbox

BMW BREAKDOWN DESIGNATION - MANUAL GEARBOX

BMW designation	**Manufacturer**	**Manufacturer designation**	**Remarks**
S5D 200G	Getrag	B transmission (220/5)	
S5D 200G	Getrag B transmission (221/5)	for M41 engine only	
S5D 250G	Getrag B transmission (220/5)	Reinforced design	
S5D 260Z	ZF	C-transmission (S5-31 D)	for M51 engine only
S5D 280Z	ZF	C-transmission (S5-31)	
S5D 310Z	ZF	C-transmission (S5-31)	up to 9.95

S5D 320Z	ZF C-transmission (S5-31)	from 9.95 (reinforced design)	
GS5S31BZ (SMG)	ZF	C transmission	SMG
GS5-39DZ	ZF	F transmission	
S6S 420G	Getrag	D-transmission (226/6)	
S6S 420G	(SMG)	Getrag D transmission	SMG
S6S 560G	Getrag	E-transmission (286/6)	
GS6-37BZ	ZF	H-transmission	
GS6S37BZ (SMG)	ZF	H-transmission	
GS6-37DZ	ZF	H-transmission	
GS6-37B	Getrag	H-transmission	
GS6-53BZ	ZF	G-transmission	
GS6-53DZ	ZF	G-transmission	
GS6-17BG	Getrag	I-transmission	
GS6-17DG	Getrag	I-transmission	
GS7S47BG (SMG)	Getrag	J-transmission (247)	SMG -7-speed
GS7D36SG	Getrag	DKG (436)	DKG -7-speed
GS6- 45BZ	ZF	K transmission	
GS6- 45DZ	ZF	K transmission	

Automatic transmission

BMW BREAKDOWN DESIGNATION - AUTOMATIC TRANSMISSION

BMW designation	Manufacturer	Manufacturer designation	Remarks
A4S 200R	GMPT	GM4	
A4S 270R	GMPT	THM-R1w	Transmission wide-stepped
A4S 310R	GMPT	THM-R1	
A5S 300J	Jatco	Jatco	

A5S 310Z	ZF	5HP-18	
A5S 325Z	ZF	5HP-19	
A5S 440Z	ZF	5HP-24	
A5S 560Z	ZF	5HP-30	
A5S 360R/390R	GM	GM5	
GA6HP19Z	ZF	6HP19	
GA6HP26Z	ZF	6HP26	
GA6HP32Z	ZF	6HP32	
GA6L45R	GM	GM6	
GA8HP45Z	ZF	8HP45	
GA8HP70Z	ZF	8HP70	
GA8HP90Z	ZF	8HP90	
GA7AHSCD	Daimler	AHS-C	Hybrid

23 ... UNIVERSAL BMW TRANSMISSION TAKE-UP

NOTE:

- **The universal transmission bracket is introduced for the E60 AWD**
- **Suitable for manual and automatic transmissions**

IMPORTANT: Front and rear supports (1) can be laterally adjusted by means of screws (2). Carrier (3) of rear supports (1) can be longitudinally adjusted by means of screw.
Supports must be adapted in length and width to the transmission.

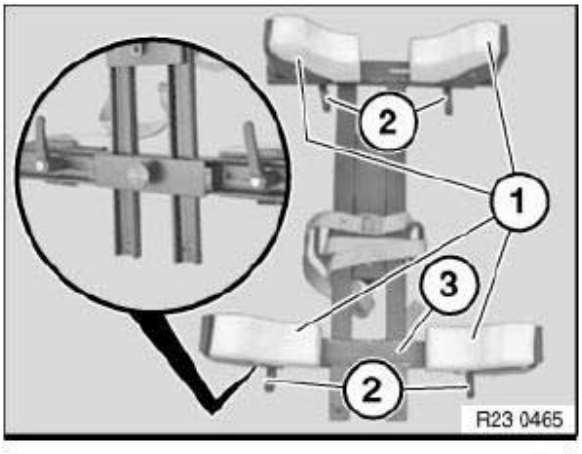


Fig. 27: Identifying Carrier, Screw, Front And Rear Supports

Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools 23 4 050, 00 2 030.

IMPORTANT: Transmission must be secured with tensioning strap (1).

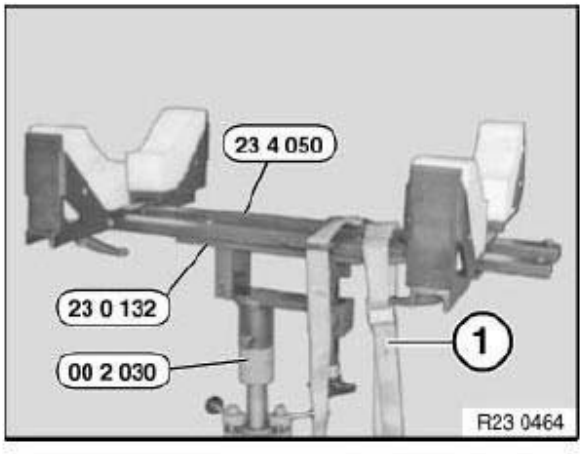


Fig. 28: Support Transmission With Special Tools (23 4 050,00 2 030)
Courtesy of BMW OF NORTH AMERICA, INC.

23 .. ... UNIVERSAL TRANSMISSION RETAINING BRIDGE

NOTE:

- **The transmission retaining bridge 24 0 200 is suitable for both manual and automatic transmissions**

IMPORTANT: Adapters and spindles must be adapted for positive locking to the transmission.
(Risk of injury)

Adapt adapters (1) and spindle with thrust piece (3) to transmission.

Adapt length with slide (2).

Screw in spindle (4).

IMPORTANT: Before mounting on assembly stand 00 1 450, check retaining bridge for secure seating.

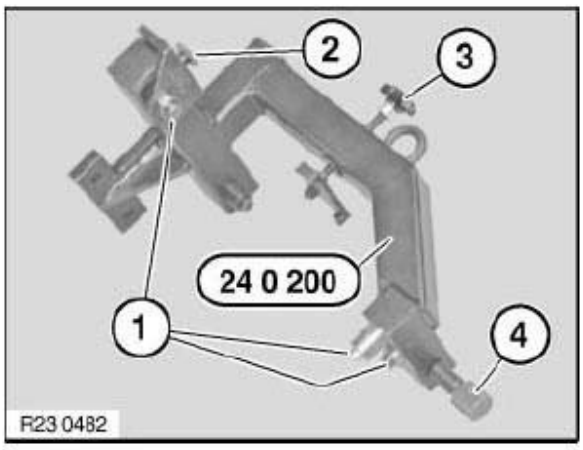


Fig. 29: Checking Universal Transmission Retaining Bridge Using Special Tool (00 1 450)
Courtesy of BMW OF NORTH AMERICA, INC.

2311 HOUSING WITH COVER

23 11 608 REPLACING GUIDE TUBE FOR CLUTCH RELEASE UNIT (GS6-17BG/DG)

Necessary preliminary tasks:

- Remove **TRANSMISSION**
- Remove **CLUTCH CONTROLLER** and release lever from guide tube.

Release screws.

Remove guide tube.

Tightening torque **23 11 2AZ** .

Installation:

Replace bolts.

Clean new guide tube.

Guide surface must be clean (no labels/stickers or residual adhesive, etc.).

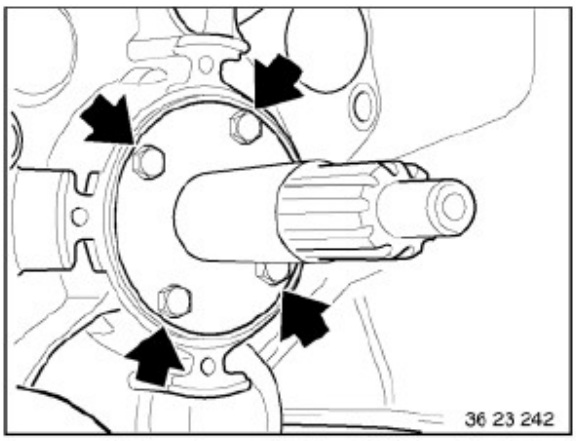


Fig. 30: Locating Guide Tube Screws
Courtesy of BMW OF NORTH AMERICA, INC.

2312 BEARING IN HOUSING, SEALING RING

23 11 608 REPLACING GUIDE TUBE FOR CLUTCH RELEASE UNIT (GS6-17BG/DG)

Necessary preliminary tasks:

- Remove **TRANSMISSION**
- Remove **CLUTCH CONTROLLER** and release lever from guide tube.

Release screws.

Remove guide tube.

Tightening torque **23 11 2AZ** .

Installation:

Replace bolts.

Clean new guide tube.

Guide surface must be clean (no labels/stickers or residual adhesive, etc.).

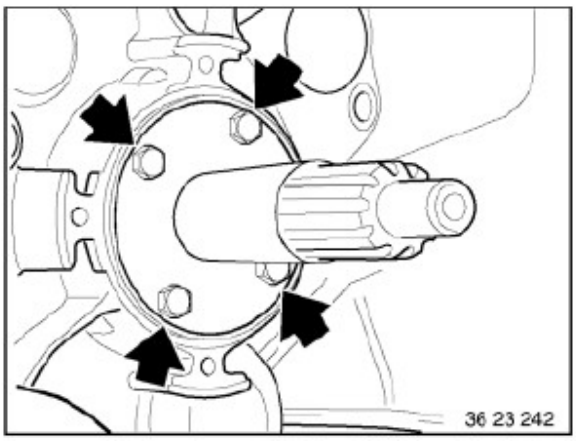


Fig. 31: Locating Guide Tube Screws
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 513 REPLACING RADIAL SEAL FOR DRIVE SHAFT (GS6-17BG/DG)

IMPORTANT: After completion of work, change FINAL DRIVE FLUID .
Use only approved transmission oil. See MANUAL TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove **GUIDE TUBE**

NOTE: Two covered removal holes (1) are located on end face of radial seal.

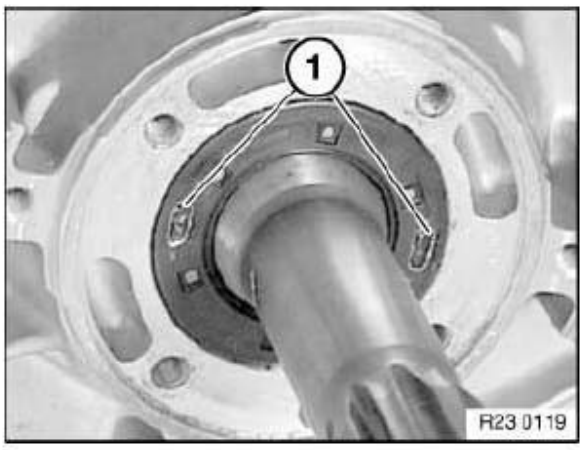


Fig. 32: Identifying Radial Seal Holes
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 23 0 490 into one of two removal holes.

Withdraw radial seal from transmission housing with aid of impact weight.

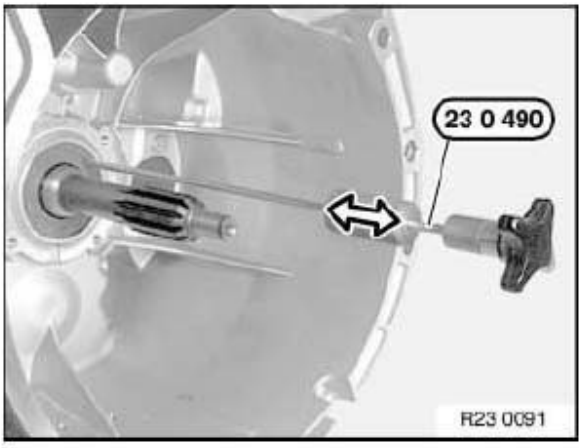


Fig. 33: Removing Radial Shaft Seal Special Tools (23 0 490)
Courtesy of BMW OF NORTH AMERICA, INC.

Push radial seal (1) onto special tool 23 0 320 .

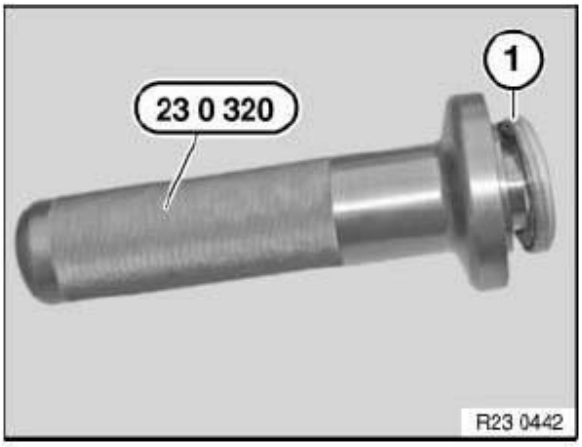


Fig. 34: Pushing Radial Shaft Seal Using Special Tools (23 0 320)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat sealing lips of radial seal with gear oil.

Slide special tool 23 0 320 onto input shaft.

Drive in radial seal with plastic hammer as far as it will go.

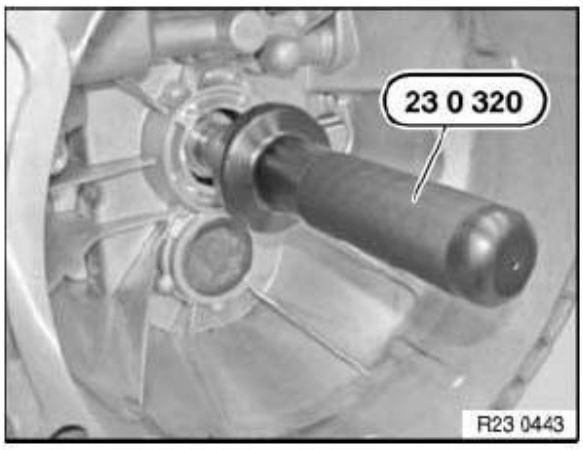


Fig. 35: Positioning Special Tools (23 0 320) Onto Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 090 REPLACING RADIAL SEAL FOR SELECTOR SHAFT (GS6-17BG)

IMPORTANT: Use only approved transmission oil. See MANUAL TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this requirement will result in serious damage to the manual transmission.

NOTE: After completion of work, check transmission oil level.

Shift transmission into 2nd gear.

Unflange propeller **SHAFT** from transmission and tie up to one side.

Lever retaining ring (1) out of groove with a small screwdriver.

Slide locking ring (1) towards rear.

Drive out cylindrical pin (2).

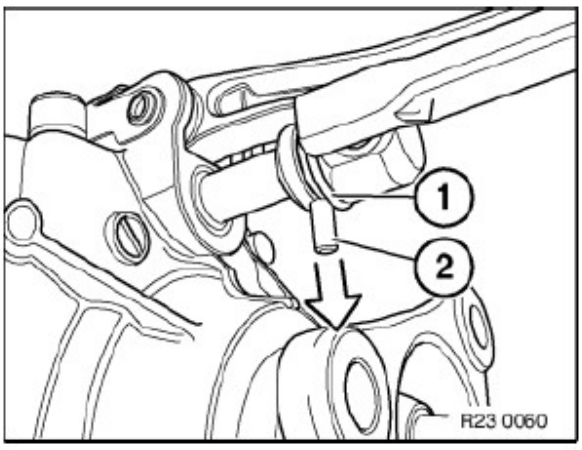


Fig. 36: Removing Cylindrical Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 23 0 210 until it is firmly connected with radial seal (1).

Pull out radial seal with special tool 23 0 210 .

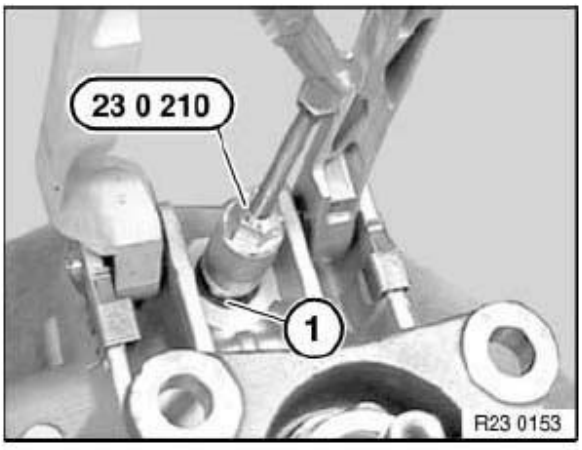


Fig. 37: Connecting Radial Shaft Seal Using Special Tool (23 0 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of radial seal and selector shaft with gear oil.

Drive in radial seal with special tool 23 0 220 .

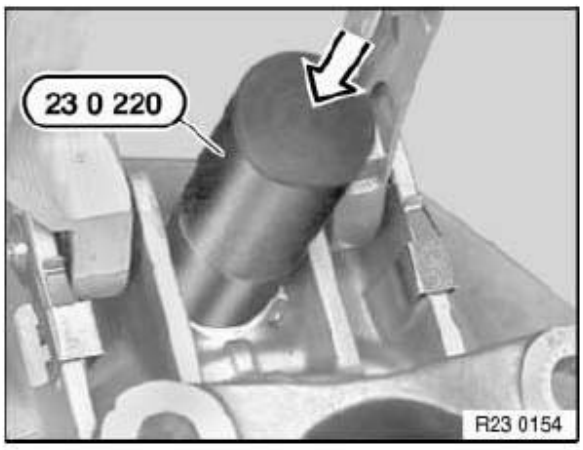


Fig. 38: Installing Radial Seal Using Special Tool (23 0 220)
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 060 REPLACING RADIAL SHAFT SEAL FOR OUTPUT FLANGE (GS6-17BG/DG)

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .
Use only approved transmission oil. See MANUAL TRANSMISSION - OPERATING FLUIDS .
Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks:

- Remove underbody protection
- Remove **EXHAUST SYSTEM**
- Remove heat shields
- Tie **PROPELLER SHAFT** to one side.

Brace output flange with special tool 23 0 020 .

Release collar nut with special tool 23 1 210 .

Tightening torque **23 21 1AZ** .

Insert collar nut with Loctite 243 screw securing adhesive (sourcing reference: BMW Parts Service).

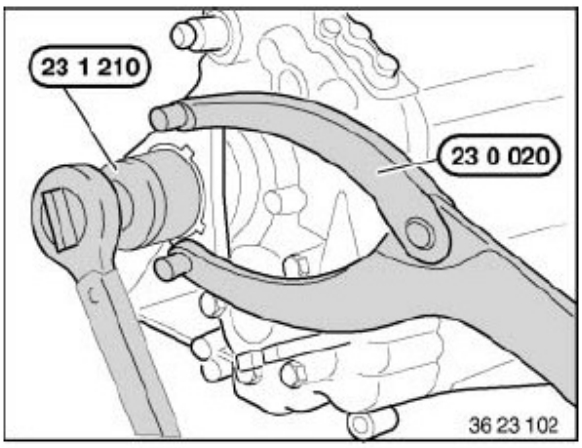


Fig. 39: Removing Collar Nut Using Special Tool (23 1 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Detach output flange with special tool 33 1 150 from output shaft.

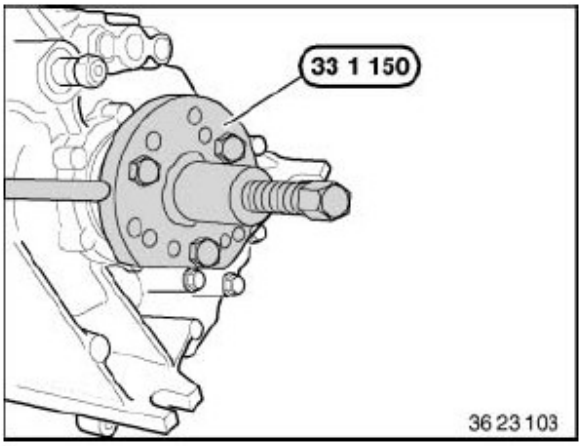


Fig. 40: Removing Output Flange From Output Shaft Using Special Tool (33 1 150)
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw radial shaft seal with special tool 00 5 011.

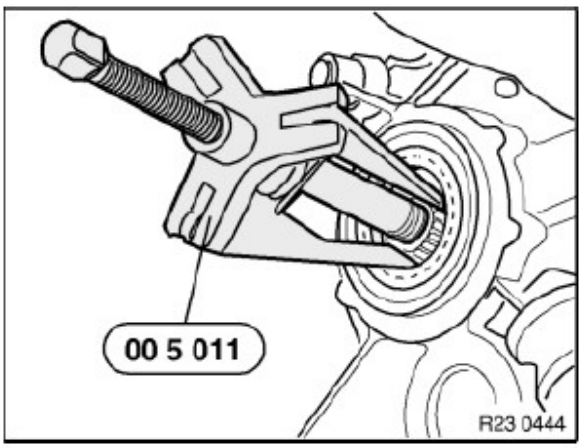


Fig. 41: Pulling Radial Shaft Seal Using Special Tool (00 5 011)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat sealing lips of new radial seal with gear oil.

Drive in radial shaft seal with special tool 24 0 110 and plastic hammer until flush.

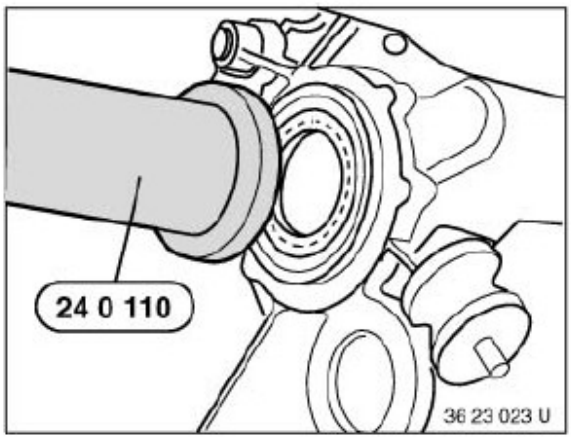


Fig. 42: Installing Radial Shaft Seal Using Special Tool (24 0 110)
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 506 REPLACING THE DRIVE SHAFT RADIAL SHAFT SEAL (GS6-85BG)

NOTE: After completion of work, check gearbox oil level.
Use only the approved gearbox oil.
Failure to comply with this requirement will result in serious damage to the manual transmission!

Necessary preliminary work:

- Remove transmission.
- Remove clutch release bearing.

Release bolts (1) and remove guide tube (2).

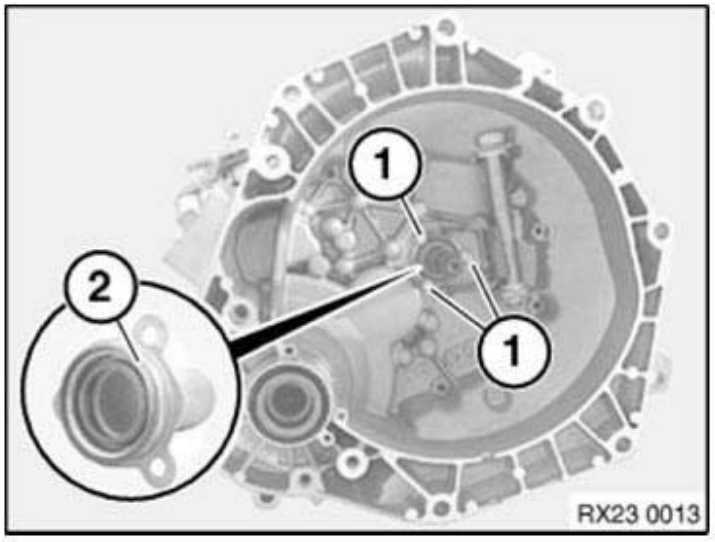


Fig. 43: Identifying Guide Tube With Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The shaft seal and the guide tube are replaced together.

Installation note:

Wrap adhesive tape round keyway splines of drive shaft to avoid damaging the sealing ring while it is being installed.

Lubricate sealing lip of sealing ring.

Replace mounting bolts of guide bush.

Tightening torque 23 11 1AZ.

23 MANUAL TRANSMISSION

23-2470 BUSH

0491595 232470 Bush MW

NOTE: (Impact bush) For driving in the retainer of the mounting nut on the output flange

Storage Location

C15

SI number

01 10 93 (689)

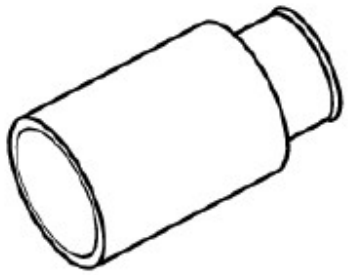


Fig. 1: Identifying Bush (232470)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2490 BUSH

0491597 232490 Bush Minimum set: Mechanical tools MW

NOTE: (impact bush and sliding sleeve) For fitting the radial sealing ring to the drive shaft

Storage Location

A17

SI number

01 10 93 (689)

Consisting of:

1 = 0491598 Bush

NOTE: (impact bush)

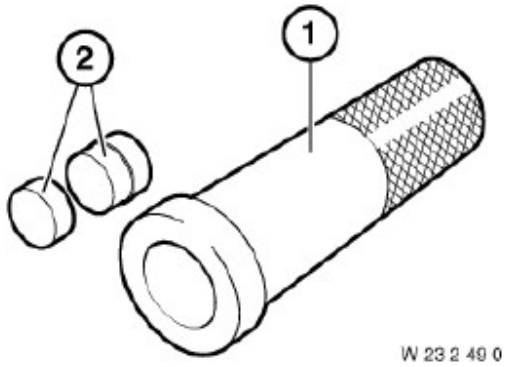


Fig. 2: Identifying Bush (232490)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491599 Sleeve

NOTE: (sliding sleeve (2-part))

23-3020 BUSH

0491604 233020 Bush MW

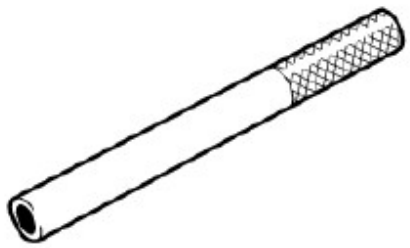
NOTE: (Assembly bush) For installing the gaiter of the gearshift rod

Storage Location

Z3

SI number

01 10 93 (689)



W 23 3 020

Fig. 3: Identifying Bush (233020)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0190 BUSH

0493420 230190 Bush Minimum set: Mechanical tools MW

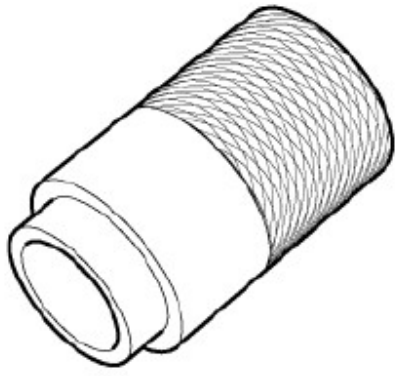
NOTE: (Impact bush) For driving in the radial shaft seal on the output end - F transmission

Storage Location

A17

SI number

01 14 99 (482)



W23 0 190

Fig. 4: Identifying Bush (230190)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2180 BUSH

0491562 232180 Bush MW

NOTE: **(Guide bush) For fitting the transmission housing front section onto the gearshift shaft**

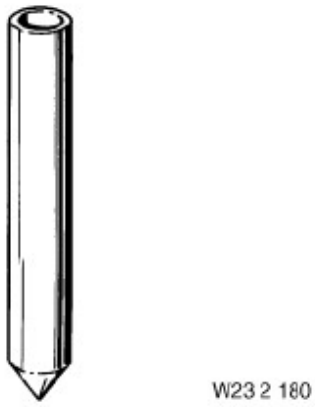


Fig. 5: Identifying Bush (232180)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0390 BUSH

0496582 230390 Bush MW

NOTE: **(slip bush) For removing and installing clutch cover with shaft seal on drive shaft.**

SI number

01 04 09 (517)



Fig. 6: Identifying Bush (230390)

Courtesy of BMW OF NORTH AMERICA, INC.

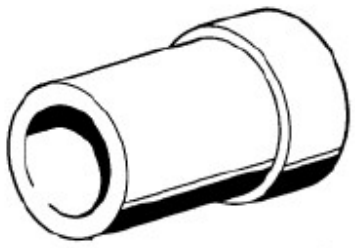
23-2150 BUSH

0491559 232150 Bush MW

NOTE: (Pressure bush) For pressing in the grooved ball bearing of the transmission output shaft (260/5, 245/5), pressing the front taper roller bearing onto the drive bevel gear for all rear axle final drives as well as installation of the lid of the countershaft (S5D 310Z)

Storage Location

Y6



W23 2 150

Fig. 7: Identifying Bush (232150)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0220 BUSH

0493423 230220 Bush Minimum set: Mechanical tools MW

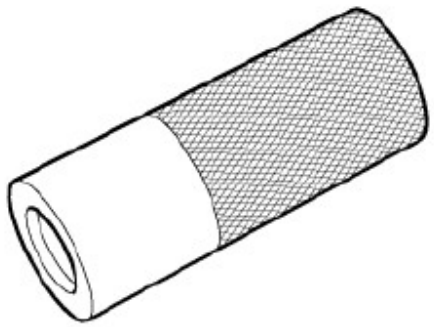
NOTE: (Impact bush) For driving in radial shaft seal on gearshift shaft - F transmission

Storage Location

B15

SI number

01 14 99 (482)



W23 0 220

Fig. 8: Identifying Bush (230220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2480 BUSH

0491596 232480 Bush MW

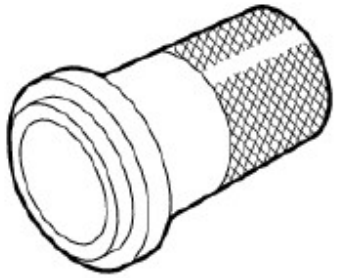
NOTE: (Impact bush) For driving radial shaft seal onto output shaft

Storage Location

A17

SI number

01 10 93 (689)



W 23 2 480

Fig. 9: Identifying Bush (232480)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4040 CARTRIDGE GUN

0495530 234040 Cartridge gun MW

NOTE: (grease gun) For actuating cartridge 23 4 033.

SI number

01 05 06 (248)

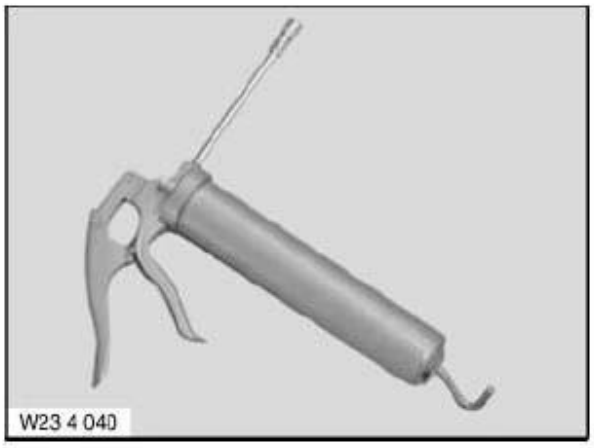


Fig. 10: Identifying Cartridge Gun (234040)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2250 CLAMP

0491569 232250 Clamp MW

NOTE: For clamping together the main shaft and countershaft

Storage Location

Y7

SI number

01 07 90 (244)

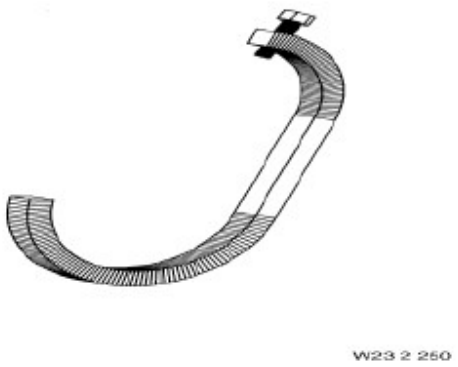


Fig. 11: Identifying Clamp (232250)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1100 CLAW

0491481 231100 Claw MW

NOTE: (Extractor claw) For the speedometer wheel

Storage Location

Y9

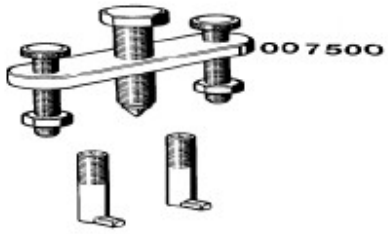


Fig. 12: Identifying Claw (231100)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1400 DEVICE

0491522 231400 Device MW

NOTE: For inserting the radial seal ring in the plug socket of the speedometer-drive pinion

Consisting of:

1 = 0491523 Shaft

NOTE: (Press-in shaft)

2 = 0491524 Shaped part

NOTE: (shaped part)

3 = 0491525 Holding sleeve

NOTE: (Union sleeve)



Fig. 13: Identifying Device (231400)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4030 DEVICE

0495529 234030 Device MW

NOTE: For removing and installing guide bearing (pilot bearing) in transmission drive shaft.

SI number

01 05 06 (248)

Consisting of:

1 = 0495535 Basic body

2 = 0495536 Nut

NOTE: (nut M8)

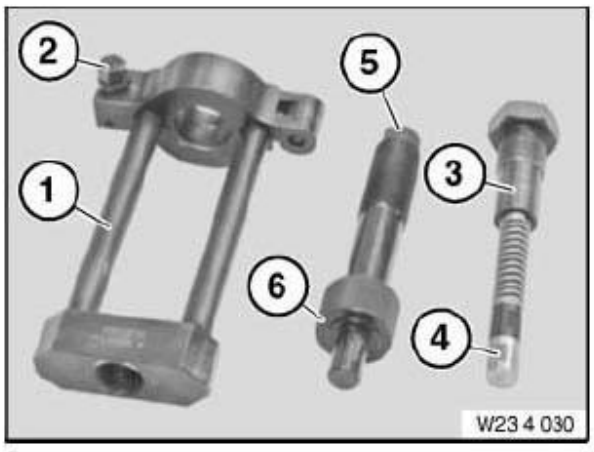


Fig. 14: Identifying Device (234030)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0495537 Cartridge

NOTE: (cartridge)

4 = 0495538 Adapter

5 = 0495539 Spindle

NOTE: (pressure spindle)

6 = 0495540 Thrust piece

NOTE: (thrust piece)

23-1350 DEVICE

0491514 231350 Device MW

NOTE: (Pull-off device) For transmission housing rear section

Consisting of:

1 = 0491515 Plate

2 = 0491516 Screw

NOTE: (Screw, short (2 x))

3 = 0491517 Screw

NOTE: (Screw, long (2 x))

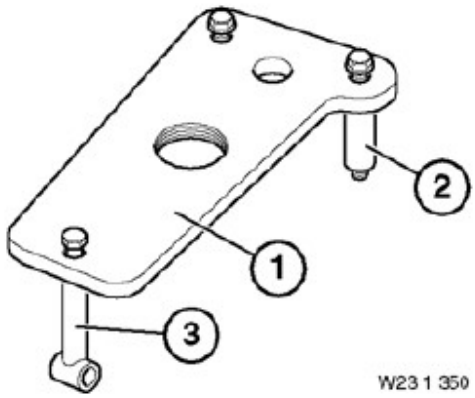


Fig. 15: Identifying Device (231350)

Courtesy of BMW OF NORTH AMERICA, INC.

23-2270 DEVICE

0491571 232270 Device MW

NOTE: For centering the gearshift shaft when fitting the front section of the transmission housing

Storage Location

Z6

SI number

01 07 90 (244)



W23 2 270

Fig. 16: Identifying Device (232270)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2330 DEVICE

0491581 232330 Device MW

NOTE: For pulling the complete gear set into the transmission housing rear section

Storage Location

Z6

SI number

01 07 90 (244)



W23 2 330

Fig. 17: Identifying Device (232330)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1420 DEVICE

0491527 231420 Device MW

NOTE: For pulling off the sliding piece (5th gear)

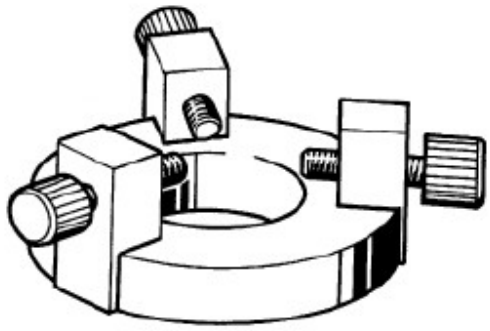
Storage Location

Z4

Consisting of:

3 = 0493257 Screw

NOTE: (Clamping bolt)



W23 1 420

Fig. 18: Identifying Device (231420)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1490 DEVICE

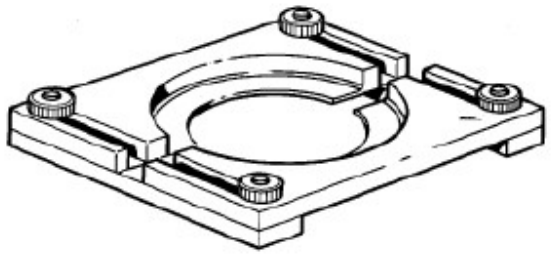
0491534 231490 Device MW

NOTE: For pressure-test of the gear wheels

Consisting of:

3 = 0491535 Shaped part

NOTE: (shaped part)



W23 1 490

Fig. 19: Identifying Device (231490)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1170 DEVICE

0491492 231170 Device MW

NOTE: For pulling off the gearbox housing front section

Consisting of:

1 = 0491493 Plate

2 = 0491494 Screw

NOTE: (Knurled screw (3 x))

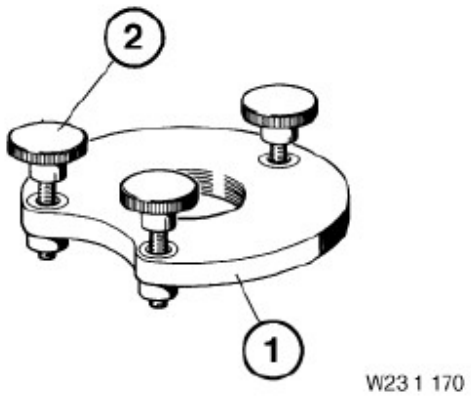


Fig. 20: Identifying Device (231170)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3010 DEVICE

0491600 233010 Device MW

NOTE: For mounting the output flange on the output shaft

Storage Location

B16

SI number

01 10 93 (689)

Consisting of:

1 = 0491601 Spindle

NOTE: (Adapter spindle)

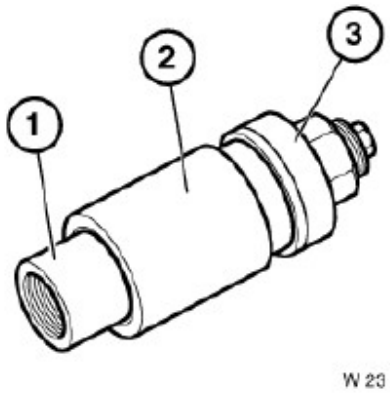


Fig. 21: Identifying Device (233010)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491602 Sleeve

NOTE: (Pressure sleeve)

3 = 0491603 Nut

NOTE: (Thrust nut with bearing)

23-1060 DEVICE

0491474 231060 Device MW

NOTE: For extracting the bearing inner race - reverse gearwheel

Storage Location

Z4

Consisting of:

1 = 0491475 Shell

NOTE: (bearing shell) 2 pieces

2 = 0491476 Ring

NOTE: (threaded ring)

3 = 0491477 Sleeve

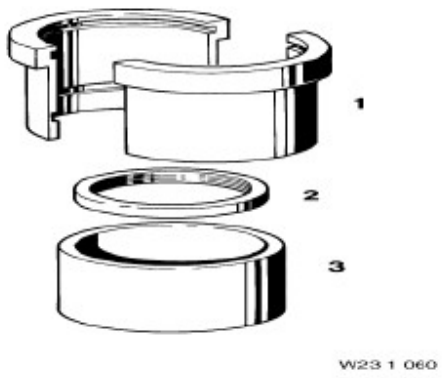


Fig. 22: Identifying Device (231060)

Courtesy of BMW OF NORTH AMERICA, INC.

23-2310 DEVICE

0491579 232310 Device MW

NOTE: For pressure-test of the 3rd and 4th gear wheels of the countershaft

Storage Location

Y7

SI number

01 07 90 (244)

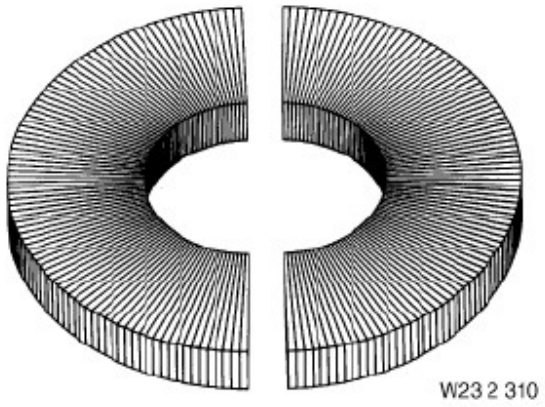


Fig. 23: Identifying Device (232310)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1020 DEVICE

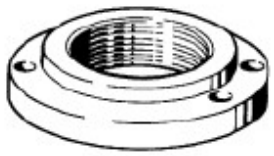
0491466 231020 Device MW

NOTE: (Device for pulling off the transmission housing (front and rear sections))

Storage Location

Z5

Z6



W23 1 020

Fig. 24: Identifying Device (231020)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0080 DEVICE

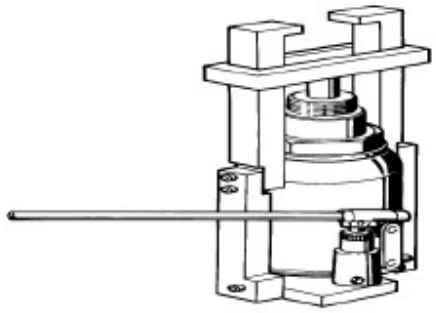
0491448 230080 Device MW

NOTE: For pulling off 5th gear wheel

Consisting of:

2 = 0491449 Shaped part

NOTE: (Shaped part) 2x



W23 0 080

Fig. 25: Identifying Device (230080)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1010 DEVICE

0491465 231010 Device MW

NOTE: (Device for pulling off the rear part of the transmission housing)



Fig. 26: Identifying Device (231010)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1000 DEVICE

0491457 231000 Device MW

NOTE: For pressing the transmission housing and grooved ball bearing onto the transmission drive shaft and into the transmission housing

Storage Location

C15

C16

Consisting of:

1 = 0491458 Holding sleeve

2 = 0491459 Pin

NOTE: (Dowel pin (2 x))

3 = 0491460 Synchronizing key

NOTE: (Synchronizing key, long)

4 = 0491461 Synchronizing key

NOTE: (Synchronizing key, short)

5 = 0491462 Handle

5 = 0491463 Pin

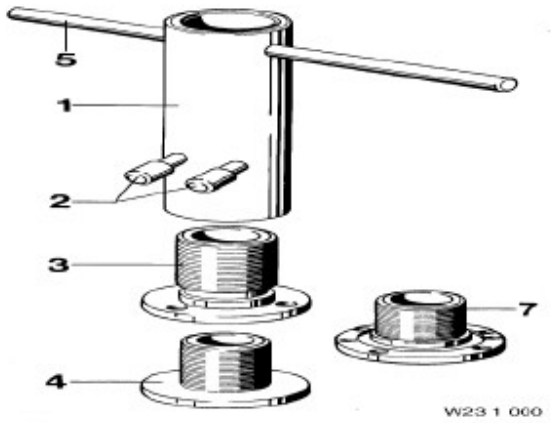


Fig. 27: Identifying Device (231000)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: (Dowel pins for Getrag transmission)

7 = 0491464 Synchronizing key

NOTE: (Synchronizing key for Getrag transmission)

23-2170 DEVICE

0491561 232170 Device MW

NOTE: For tensioning the transmission leaf springs

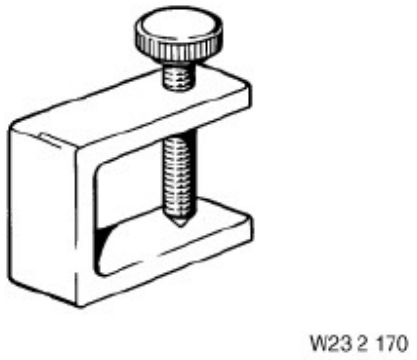


Fig. 28: Identifying Device (232170)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2370 DEVICE

0491585 232370 Device MW

NOTE: For removing the gear set

Storage Location

Y8

SI number

01 02 91 (330)

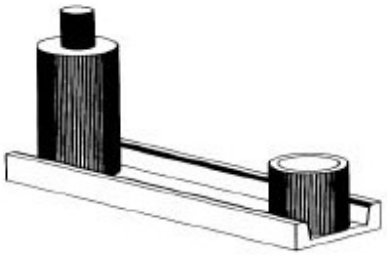


Fig. 29: Identifying Device (232370)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1050 EXTRACTOR

0491469 231050 Extractor MW

NOTE: (Extractor (Kukko)) For the 5th gear - and for the reverse gear wheel

Consisting of:

1 = 0491470 Claw

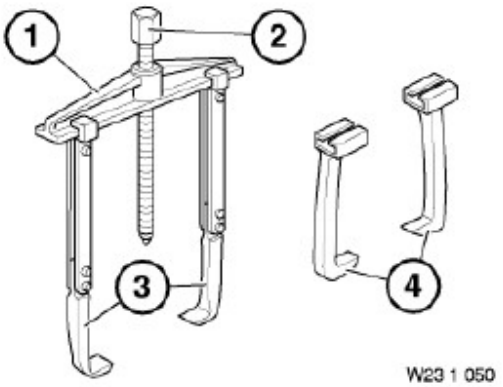


Fig. 30: Identifying Extractor (231050)

Courtesy of BMW OF NORTH AMERICA, INC.

23-0040 FIXTURE

0491442 230040 Fixture MW

Replaced by: 0495498

NOTE: For transmissions for removal and installation. Replaced by 23 4 050 (0 495 498)

SI number

01 05 90 (207)

Consisting of:

1 = 0491443 Cage

NOTE: (Retaining cage) Transmission: S6S 560G Replaced by 23 4 050 (0 495 498)

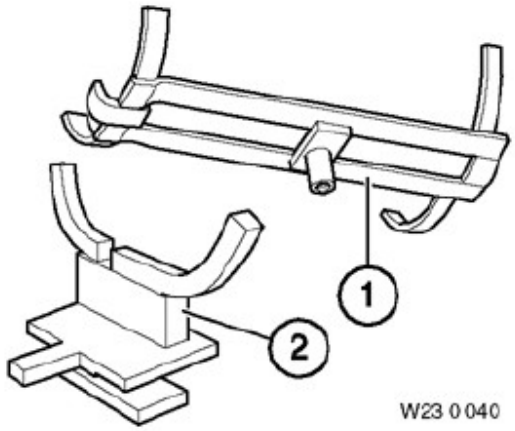


Fig. 31: Identifying Fixture (230040)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491444 Retaining bracket

NOTE: (Holding bracket) Transmission: S6S 420G Replaced by 23 4 050 (0 495 498)

23-0140 FIXTURE

0493417 230140 Fixture MW

Replaced by: 0495498

NOTE: **For accommodating transmission during removal and installation. Transmission: F-transmission. Replaced by 23 4 050 (0 495 498)**

SI number

01 20 98 (378)



W23 0 160

Fig. 32: Identifying Fixture (230140)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4050 FIXTURE

0495498 234050 Fixture MW

NOTE: **(Universal gearbox holder) Fixture for removing and installing manual and automatic transmissions for BMW&RR.**

SI number

01 07 06 (256)

Consisting of:

4 = 0495550 Belt

NOTE: **(Tensioning strap)**

5 = 0496018 Fixture

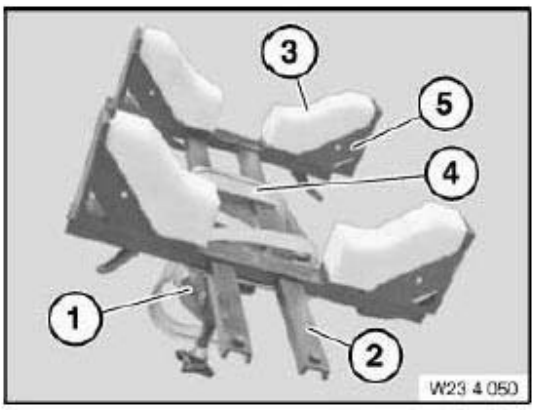


Fig. 33: Identifying Fixture (234050)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: (Fixture for foam material insert)

1 = 0495547 Joint

2 = 0495548 Frame

NOTE: (Main frame)

3 = 0495549 Insert

NOTE: (Foam inserts (1 set = 4 pieces))

23-0150 FIXTURE

0491452 230150 Fixture MW

NOTE: For supporting the transmission on the assembly stand. For ZF transmissions.

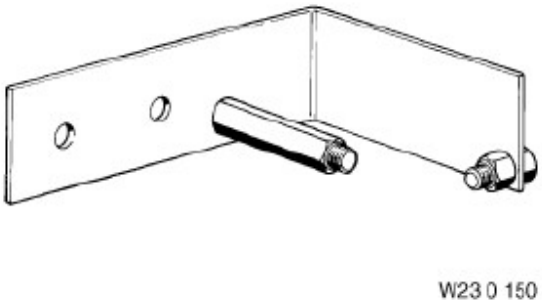


Fig. 34: Identifying Fixture (230150)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0170 FIXTURE

0493418 230170 Fixture MW

Replaced by: 0495466

NOTE: For mounting the F gearbox on the assembly stand. Replaced by 24 0 200 (0 495 466)

SI number

01 14 99 (482)

Consisting of:

1 = 0493439 Basic body

NOTE: Replaced by 24 0 201 (0 495 488)

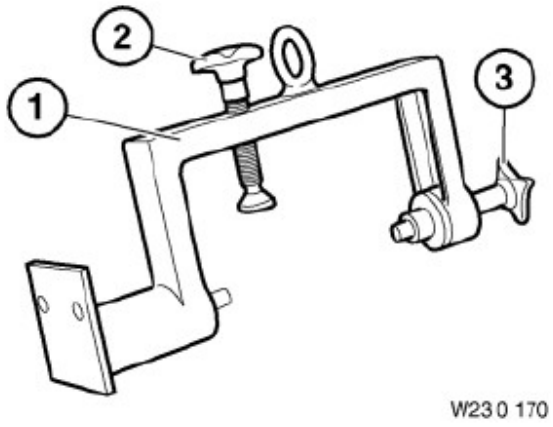


Fig. 35: Identifying Fixture (230170)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0493440 Spindle

NOTE: (Spindle (2 pieces)) With handle Replaced by 24 0202 (0 495 489)

23-0110 FIXTURE

0493764 230110 Fixture MW

NOTE: For removing and installing transmission. Replaced by 23 4 050.

SI number

01 02 00 (551)

Consisting of:

1 = 0494568 Fixture

NOTE: Transmission: S6S 560G

2 = 0494569 Retaining bracket

NOTE: (Holding bracket (not shown)) Transmission: S6S 420G

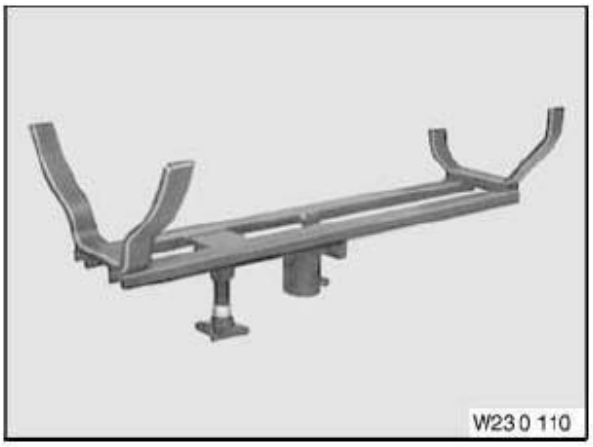


Fig. 36: Identifying Fixture (230110)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0100 FIXTURE

0491451 230100 Fixture MW

NOTE: For mounting transmission on assembly stand

SI number

01 07 90 (244)

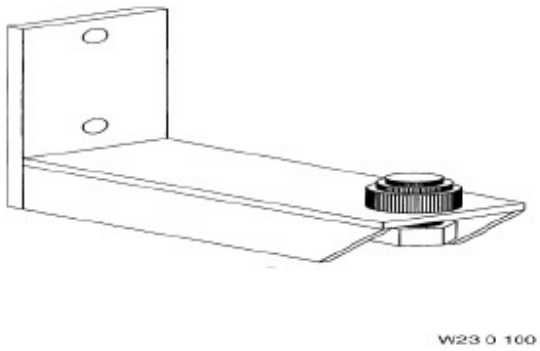


Fig. 37: Identifying Fixture (230100)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0250 HOLDER

0493685 230250 Holder Minimum set: Mechanical tools MW

NOTE: (Counter support) Help with slackening and tightening the output flange

Storage Location

B41

SI number

01 06 00 (575)

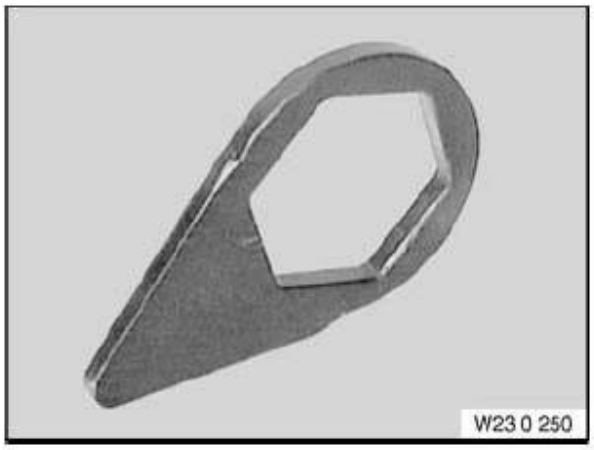


Fig. 38: Identifying Holder (230250)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0020 HOLDER

0491440 230020 Holder Minimum set: Mechanical tools MW

NOTE: **(counter support) For all three- and four-hole flanges when releasing and tightening down**

Storage Location

A1

C1

B1

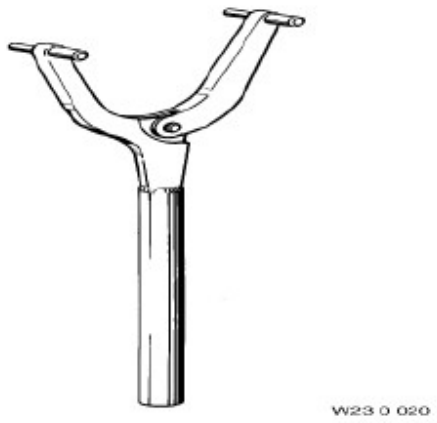


Fig. 39: Identifying Holder (230020)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1320 HOLDER

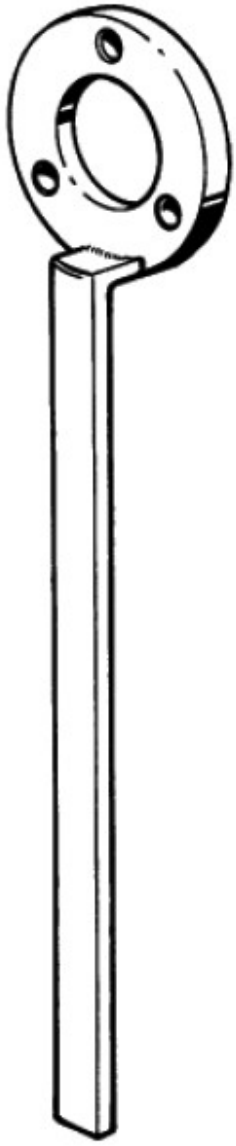
0491511 231320 Holder MW

NOTE: **(Counter support) For releasing and tightening the nut on the output flange with vibration absorber**

Storage Location

Y2

X2



W23 1 320

Fig. 40: Identifying Holder (231320)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1440 HOLDING SLEEVE

0491529 231440 Holding sleeve MW

NOTE: For pressing the bearing bush and bearing inner race onto the output shaft, as

well as for driving out the bearing of the output shaft (S5D 310Z)

Storage Location

Z7

Z8



W23 1 440

Fig. 41: Identifying Holding Sleeve (231440)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0400 KEY

0496583 230400 Key MW

NOTE: For removing and installing clutch package.

SI number

01 04 09 (517)

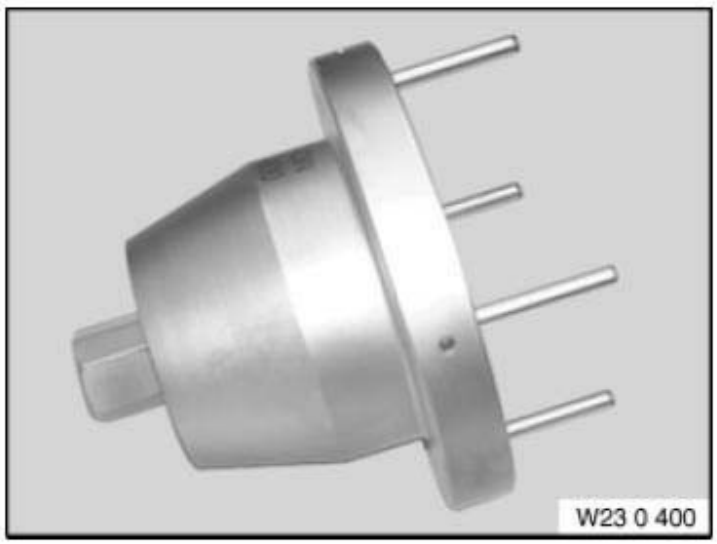


Fig. 42: Identifying Key (230400)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3220 MANDREL

0494651 233220 Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in the radial shaft seal of drive shaft (G transmission)

Storage Location

A49

SI number

01 11 04 (093)



Fig. 43: Identifying Mandrel (233220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2160 MANDREL

0491560 232160 Mandrel MW

NOTE: (Mandrel) For radial seal ring in the transmission housing rear section - output shaft

Storage Location

B17

A17



W23 2 160

Fig. 44: Identifying Mandrel (232160)
Courtesy of BMW OF NORTH AMERICA, INC.

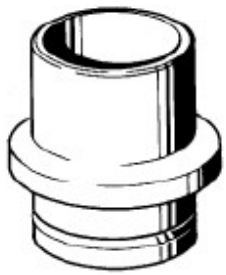
23-1390 MANDREL

0491521 231390 Mandrel MW

NOTE: (Drift) For driving in the roller bearing of the countershaft in the transmission housing rear section

Storage Location

X8



W31 1 440

Fig. 45: Identifying Mandrel (231390)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2220 MANDREL

0491566 232220 Mandrel MW

NOTE: (Drift) For bearing (countershaft) in front and rear sections of transmission housing



W23 2 220

Fig. 46: Identifying Mandrel (232220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2300 MANDREL

0491578 232300 Mandrel Minimum set: Mechanical tools MW

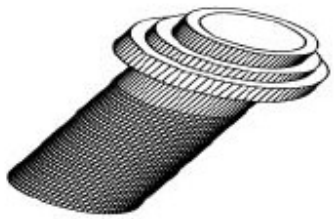
NOTE: (Drift) For fitting the radial seal of the output shaft in the rear part of the transmission housing

Storage Location

B17

SI number

01 07 90 (244)



W23 2 300

Fig. 47: Identifying Mandrel (232300)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0410 MANDREL

0496584 230410 Mandrel MW

NOTE: (drift) For driving in output shaft seal.

Storage Location

B54

SI number

01 04 09 (517)

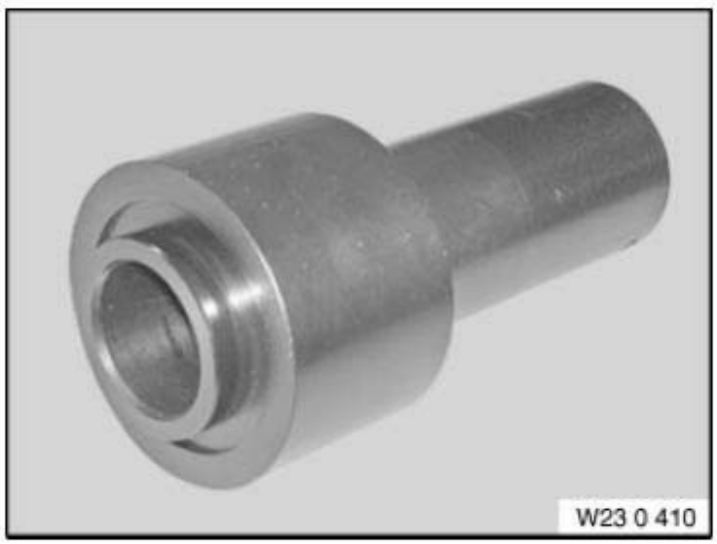


Fig. 48: Identifying Mandrel (230410)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1160 MANDREL

0491491 231160 Mandrel MW

NOTE: (drift) For fitting bearing inner race and bearing bush on output shaft (245) - Fitting sliding piece (5th gear-265/5) -Mounting output flange -Mounting bearing on countershaft (S5D 310Z) -Mounting centre bearing on propeller shaft, E46

Storage Location

B17



W23 1 160

Fig. 49: Identifying Mandrel (231160)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1240 MANDREL

0491501 231240 Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in the radial seal ring on the gearshift shaft

Storage Location

A10



W23 1 240

Fig. 50: Identifying Mandrel (231240)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2340 MANDREL

0491582 232340 Mandrel Minimum set: Mechanical tools MW

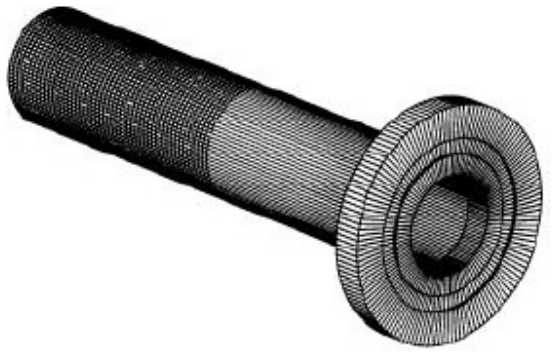
NOTE: (drift) For driving in the radial sealing ring into the front section of the transmission housing

Storage Location

B17

SI number

01 07 90 (244)



W23 2 340

Fig. 51: Identifying Mandrel (232340)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2360 MANDREL

0491584 232360 Mandrel MW

NOTE: **(Drift) For driving in seal cap for catch pin**

Storage Location

Z3

SI number

01 07 90 (244)



W23 2 360

Fig. 52: Identifying Mandrel (232360)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0330 MANDREL

0496958 230330 Mandrel Minimum set: Mechanical tools MW

NOTE: **For driving in the sealing cap of the countershaft.**

SI number

01 08 10 (638)



Fig. 53: Identifying Mandrel (230330)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1370 MANDREL

0491519 231370 Mandrel MW

NOTE: (Drift) For fitting the radial seal of the transmission output flange

Storage Location

Z7



W23 1 370

Fig. 54: Identifying Mandrel (231370)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3240 MANDREL

0495627 233240 Mandrel MW

NOTE: **(Drift) Driving in radial shaft seal of drive shaft. Transmission: GS6-53BZ (G gearbox) with engine S85, S65**

Storage Location

B18

A18

SI number

01 18 06 (295)



Fig. 55: Identifying Mandrel (233240)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2350 MANDREL

0491583 232350 Mandrel MW

NOTE: **(drift) For fitting the sealing cap for the gearshift shaft catch pin**

Storage Location

Z3

SI number

01 07 90 (244)



W23 2 350

Fig. 56: Identifying Mandrel (232350)
Courtesy of BMW OF NORTH AMERICA, INC.

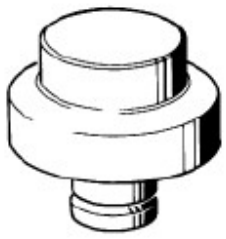
23-1220 MANDREL

0491499 231220 Mandrel MW

NOTE: (drift) For removing and fitting the countershaft roller bearing in the front section of the transmission housing

Storage Location

X7



W23 1 220

Fig. 57: Identifying Mandrel (231220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3110 MANDREL

0494500 233110 Mandrel MW

NOTE: For fitting guide bushes for catch pins on manual gearboxes.

Storage Location

Y5

SI number

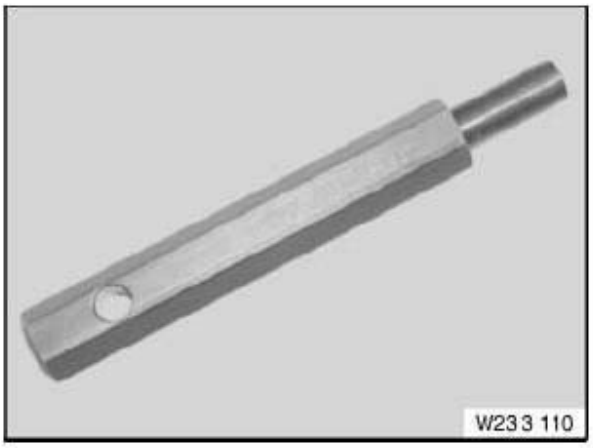


Fig. 58: Identifying Mandrel (233110)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1480 MANDREL

0491533 231480 Mandrel MW

NOTE: (drift) For removing and fitting the grooved ball bearing in the front section of the transmission

Storage Location

X8

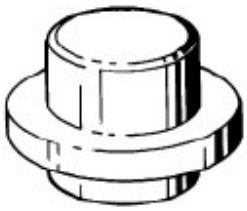


Fig. 59: Identifying Mandrel (231480)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4020 MANDREL

0494888 234020 Mandrel MW

NOTE: (Drift) For driving in bearing bushes for locking bolts, 5th and reverse gears.

Storage Location

B49

SI number

01 03 04 (070)

Consisting of:

1 = 0494889 Mandrel

NOTE: (Drift) For driving in cover caps on gear notch, 5th and reverse gears.

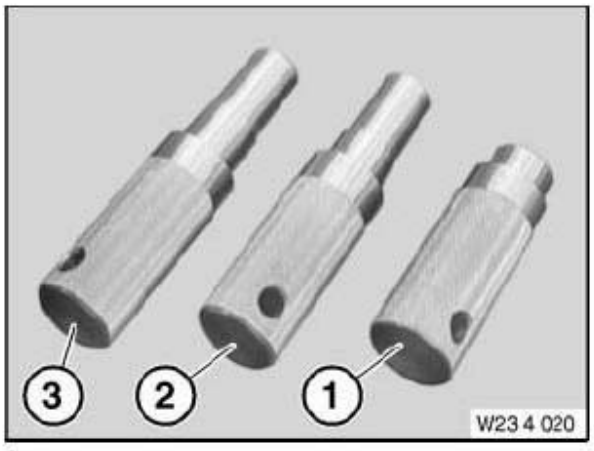


Fig. 60: Identifying Mandrel (234020)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0494890 Mandrel

NOTE: (Drift) For driving in bearing bush for locking bolt, 5th gear.

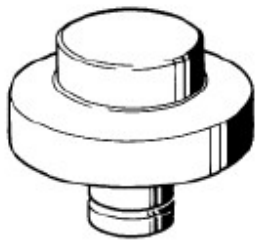
3 = 0494891 Mandrel

NOTE: (Drift) For driving in bearing bush for locking bolt, reverse gear.

23-1190 MANDREL

0491496 231190 Mandrel MW

NOTE: (drift) For removing and fitting the drive shaft ball bearing in the front section of transmission housing



W23 1 190

Fig. 61: Identifying Mandrel (231190)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1090 MANDREL

0491480 231090 Mandrel MW

NOTE: **(drift) For removing and fitting the outer bearing race of the drive shaft in the front section of the transmission housing**

Storage Location

A15



W23 1 090

Fig. 62: Identifying Mandrel (231090)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1040 MANDREL

0491468 231040 Mandrel MW

NOTE: **(Drift) For mounting sliding piece (5th gear) and driving water pipe out of engine block, engine: N73**

Storage Location

Z7



Fig. 63: Identifying Mandrel (231040)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3230 MANDREL

0494652 233230 Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in shaft seal on output shaft (G-transmission)

Storage Location

A49

SI number

01 11 04 (093)



Fig. 64: Identifying Mandrel (233230)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0320 MANDREL

0495213 230320 Mandrel Minimum set: Mechanical tools MW

NOTE: **For driving in the radial shaft seal on the drive shaft.**

Storage Location

B54

SI number

01 06 06 (249)



Fig. 65: Identifying Mandrel (230320)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1080 MANDREL

0491479 231080 Mandrel MW

NOTE: **(Drift) For driving outer bearing race into and out of front and centre sections of transmission housing (countershaft) and for driving ball bearing into and out of rear section of transmission housing (drive shaft)**

Storage Location

X8



W23 1 080

Fig. 66: Identifying Mandrel (231080)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1270 MANDREL

0491504 231270 Mandrel MW

NOTE: (Drift) For driving out the outer bearing race for the countershaft in the transmission housing front section, as well as for pressing the sealing ring and needle bearing out of the oil pump housing (A5S 560Z)

Storage Location

X7



W23 1 270

Fig. 67: Identifying Mandrel (231270)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1380 MANDREL

0491520 231380 Mandrel MW

NOTE: (drift) For fitting the countershaft roller bearing in the rear section of the transmission housing

Storage Location

X8

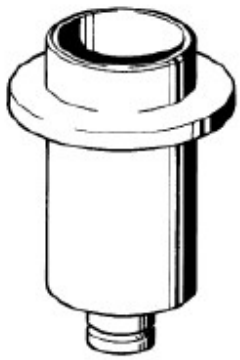


Fig. 68: Identifying Mandrel (231380)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2260 MANDREL

0491570 232260 Mandrel Minimum set: Mechanical tools MW

NOTE: (Fitting mandrel) For driving in the radial sealing ring on the gearshift shaft of the rear section of transmission housing

Storage Location

A10

SI number

01 07 90 (244)



Fig. 69: Identifying Mandrel (232260)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2280 PLATE

0491572 232280 Plate MW

NOTE: (Extractor plate) For the front section of the transmission housing

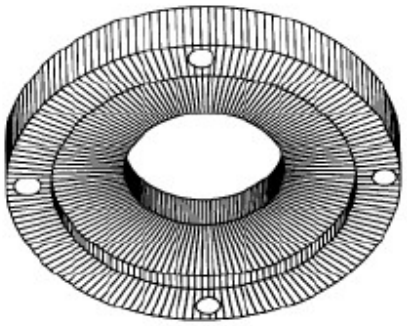
Storage Location

Z4

Z3

SI number

01 07 90 (244)



W23 2 280

Fig. 70: Identifying Plate (232280)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2210 PLIERS

0491565 232210 Pliers MW

NOTE: (Circlip pliers (straight)) For removing and installing the inside circlip in the transmission housings when replacing the grooved ball bearings



W23 2 210

Fig. 71: Identifying Pliers (232210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2100 PLIERS

0491558 232100 Pliers MW

NOTE: **For removing and fitting the circlip on the transmission output shaft**



W23 2 100

Fig. 72: Identifying Pliers (232100)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2200 PLIERS

0491564 232200 Pliers MW

NOTE: **(Seeger ring pliers (straight)) For removing and installing the outer Seeger rings on the gearbox shaft**



W23 2 200

Fig. 73: Identifying Pliers (232200)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3210 PULLER

0494546 233210 Puller Minimum set: Mechanical tools MW

NOTE: **For removing shaft seal on output shaft**

Storage Location

A50

SI number

01 11 04 (093)



Fig. 74: Identifying Puller (233210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3200 PULLER

0494543 233200 Puller Minimum set: Mechanical tools MW

NOTE: For removing shaft seal on drive shaft

Storage Location

A49

A50

SI number

01 11 04 (093)



Fig. 75: Identifying Puller (233200)

Courtesy of BMW OF NORTH AMERICA, INC.

23-0210 PULLER

0493422 230210 Puller Minimum set: Mechanical tools MW

NOTE: For removing radial shaft seal on gearshift shaft - F transmission

Storage Location

A12

SI number

01 14 99 (482)

Consisting of:

1 = 0493632 Basic body

2 = 0493633 Spindle

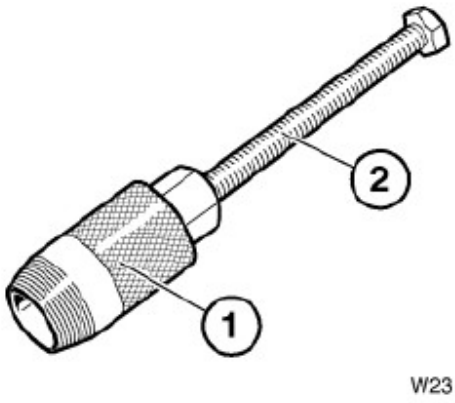


Fig. 76: Identifying Puller (230210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0490 PULLER

0491454 230490 Puller MW

NOTE: For removing shaft seal

Storage Location

A13

B13

SI number

01 15 96 (106)

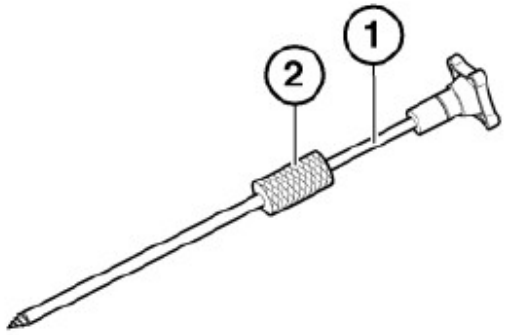
Consisting of:

1 = 0491455 Rod

NOTE: With self-tapping screw

2 = 0491456 Weight

NOTE: (Weight)



W23 0 490

Fig. 77: Identifying Puller (230490)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2000 PULLER

0491536 232000 Puller MW

NOTE: (Rillex ball-bearing extractor 6206) 9 ball bearings with steel cage - For pulling out the grooved ball bearing of the transmission drive shaft

Consisting of:

1 = 0491537 Claw

NOTE: (Claw for Rillex 6206 (9 x))

2 = 0491538 Holding sleeve

NOTE: **(Union sleeve)**

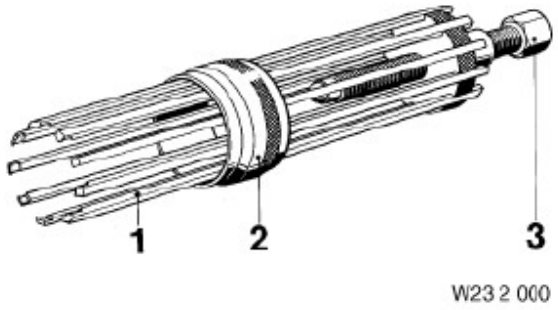


Fig. 78: Identifying Puller (232000)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0491539 Spindle

NOTE: **(pressure spindle)**

23-1070 RING

0491478 231070 Ring MW

NOTE: **(Measuring ring) For determining the shim between the outer bearing race and the countershaft circlip**

Storage Location

X6



Fig. 79: Identifying Ring (231070)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0180 RING

0493419 230180 Ring Minimum set: Mechanical tools MW

NOTE: **(impact ring with sliding sleeve) For fitting the radial shaft seal to the input end - F transmission**

SI number

01 14 99 (482)

Consisting of:

1 = 0493424 Ring

NOTE: (impact ring)

2 = 0493425 Sleeve

NOTE: (Sliding sleeve)

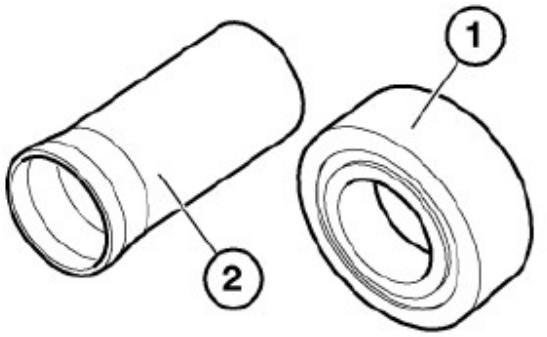


Fig. 80: Identifying Ring (230180)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3169 SET OF TOOLS

23 3 169 Set of tools Minimum set: Mechanical tools

NOTE: Removing and installing shaft seals on output side

Transmission: GS6-37BZ

23-2080 SHAPED ELEMENT

0491557 232080 Shaped element MW

NOTE: For pressure testing the guide sleeve - 2nd/3rd gear

Storage Location

Y8

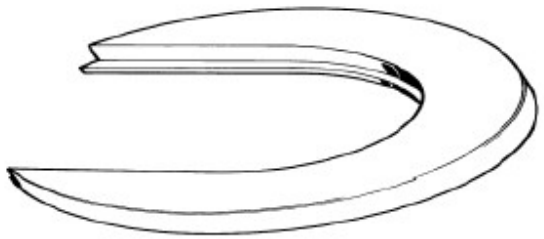


Fig. 81: Identifying Shaped Element (232080)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2460 SLEEVE

0491594 232460 Sleeve MW

NOTE: (Assembly sleeve) For the retaining ring on the drive shaft

Storage Location

A7

SI number

01 02 91 (330)

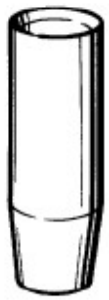


Fig. 82: Identifying Sleeve (232460)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2380 SLEEVE

0491586 232380 Sleeve MW

NOTE: (assembly sleeve) For the circlip on the drive shaft

Storage Location

A7

SI number

01 02 91 (330)



W23 2 380

Fig. 83: Identifying Sleeve (232380)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0200 SOCKET

0493421 230200 Socket Minimum set: Mechanical tools MW

NOTE: (Socket) SW41 Long version for loosening and tightening output flange - F-transmission

Storage Location

A9

SI number

01 14 99 (482)



W23 0 200

Fig. 84: Identifying Socket (230200)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1210 SOCKET WRENCH INSERT

0491498 231210 Socket wrench insert MW

NOTE: (socket wrench insert SW30) For releasing and tightening down gearbox output flange and rear axle final drive flange

Storage Location

A9



W23 1 210

Fig. 85: Identifying Socket Wrench Insert (231210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2320 SOCKET WRENCH INSERT

0491580 232320 Socket wrench insert Minimum set: Mechanical tools MW

NOTE: (socket wrench insert WAF 36) For loosening and tightening the collar nut

Storage Location

A13

SI number

01 07 90 (244)



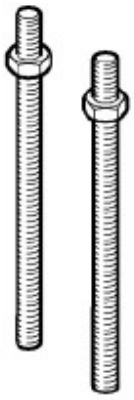
W23 2 320

Fig. 86: Identifying Socket Wrench Insert (232320)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1230 SPINDLE

0491500 231230 Spindle MW

NOTE: (spindle (2 pieces)) For pulling off the bearing inner race from the drive shaft in the front section of the transmission housing



W23 1 230

Fig. 87: Identifying Spindle (231230)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3150 TOOL

0494410 233150 Tool Minimum set: Mechanical tools MW

NOTE: **(Tool set) For removing and installing the radial shaft seal of the drive shaft. Transmission: GS6-37BZ/DZ (H transmission)**

Storage Location

B44

C44

SI number

01 10 02 (907)

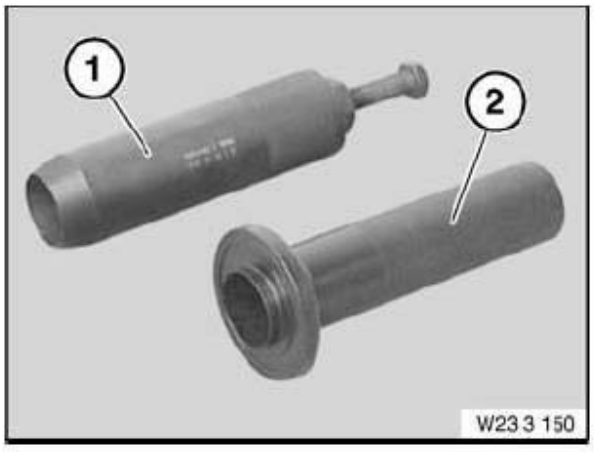


Fig. 88: Identifying Tool (233150)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0494411 Puller

2 = 0494412 Mandrel

NOTE: **(Drift)**

23-1310 TOOL

0491510 231310 Tool MW

NOTE: **For inserting the fuse on the relay lever**



W23 1 310

Fig. 89: Identifying Tool (231310)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3160 TOOL

0494416 233160 Tool Minimum set: Mechanical tools MW

NOTE: (Tool set) For removing and installing the radial shaft seal of the output shaft. Transmission: GS6-37BZ/DZ (H transmission)

Storage Location

B44

C44

SI number

01 10 02 (907)

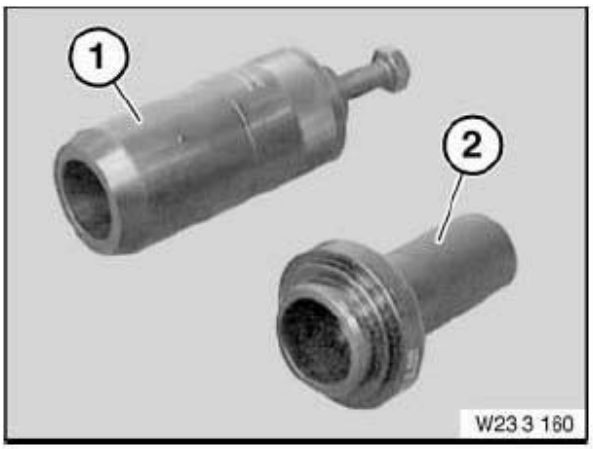


Fig. 90: Identifying Tool (233160)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0494414 Puller

2 = 0494415 Mandrel

NOTE: **(Drift)**

CASE AND COVER 240/5/MECH/OVERDRIVE

23 11 CASE AND COVER 240/5/MECH OVERDRIVE

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER 260/5/MECH/OVERDRIVE

23 11 CASE AND COVER 260/5/MECH OVERDRIVE

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER 260/5/MECH/SPORT

23 11 CASE AND COVER 260/5/MECH SPORT

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER 260/6/MECH/OVERDRIVE

23 11 CASE AND COVER 260/6/MECH OVERDRIVE

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER 265/5/MECH/SPORT

23 11 CASE AND COVER 265/5/MECH SPORT

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER 265/6/MECH/OVERDRIVE

23 11 CASE AND COVER 265/6/MECH OVERDRIVE

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER 280/5/MECH/SPORT

23 11 CASE AND COVER 280/5/MECH SPORT

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER S6-37BZ/DZ/MECH

23 11 CASE AND COVER S6-37BZ/DZ/MECH

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

CASE AND COVER ZF-S5-16/MECH

23 11 CASE AND COVER ZF-S5-16/MECH

CASE AND COVER SPECIFICATION

Temperature for installation of bearings	°C	80

GEARS (LAYSHAFT) 240/5/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 240/5/MECH OVERDRIVE

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
5th gear wheel	t	4.5 ... 5.5
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -

GEARS (LAYSHAFT) 260/5/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 260/5/MECH OVERDRIVE

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8

Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	4.9 ... 6.8approx. 120

GEARS (LAYSHAFT) 260/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 260/5/MECH SPORT

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	4.9 ... 6.8approx. 120

GEARS (LAYSHAFT) 260/6/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 260/6/MECH OVERDRIVE

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	4.9 ... 6.8 120

GEARS (LAYSHAFT) 260/6/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 260/6/MECH OVERDRIVE

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	4.9 ... 6.8 120

GEARS (LAYSHAFT) 265/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 265/5/MECH SPORT

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

GEARS (LAYSHAFT) 265/6/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 265/6/MECH OVERDRIVE

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

GEARS (LAYSHAFT) 280/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 280/5/MECH SPORT

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6 150

GEARS (LAYSHAFT) 280/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 280/5/MECH SPORT

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

GEARS (LAYSHAFT) GS6-53DZ/MECH

23 22 GEARS (LAYSHAFT) GS6-53DZ/MECH

GEARS (LAYSHAFT) SPECIFICATION

Press-off and press-on force		
5th gear wheel	kN	50
4th gear wheel	kN	50

GEARS (LAYSHAFT) S 5 D 200 G/MECH

23 22 GEARS (LAYSHAFT) S 5 D 200 G/MECH

GEARS (LAYSHAFT) SPECIFICATION

Press-off and press-on force		
5th gear wheel	kN	50 ... 70
4th gear wheel	kN	

GEARS (LAYSHAFT) S 5 D 250 G/MECH

23 22 GEARS (LAYSHAFT) S 5 D 250 G/MECH

GEARS (LAYSHAFT) SPECIFICATION

Press-off and press-on force		
5th gear wheel	kN	50 ... 70

GEARS (LAYSHAFT) ZF-S5-16/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) ZF-S5-16/MECH OVERDRIVE

GEARS (LAYSHAFT) SPECIFICATION

Pressing-off force at ambient temperature		
3rd	gear	wheel t 7.5
4th	gear	wheel t 8.0
5th	gear	wheel t 8.0
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	0.015 150 ... 180
5th gear wheel	t °C	- -

INTERNAL SHIFT COMPONENTS 240/5/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 240/5/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 260/5/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 260/5/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 260/5/MECH/SPORT

23 31 INTERNAL SHIFT COMPONENTS 260/5/MECH SPORT

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 260/6/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 260/6/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 265/5/MECH/SPORT

23 31 INTERNAL SHIFT COMPONENTS 265/5/MECH SPORT

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 265/6/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 265/6/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		

Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 280/5/MECH/SPORT

23 31 INTERNAL SHIFT COMPONENTS 280/5/MECH SPORT

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS ZF-S5-16/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS ZF-S5-16/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS SPECIFICATION

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

SYNCHRONIZATION 240/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 240/5/MECH OVERDRIVE

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 260/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 260/5/MECH OVERDRIVE

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 260/5/MECH/SPORT

23 23 SYNCHRONIZATION 260/5/MECH SPORT

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 260/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 260/6/MECH OVERDRIVE

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 265/5/MECH/SPORT

23 23 SYNCHRONIZATION 265/5/MECH SPORT

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 265/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 265/6/MECH OVERDRIVE

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3

Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 280/5/MECH/SPORT

23 23 SYNCHRONIZATION 280/5/MECH SPORT

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION GS6-37BZ/DZ/MECH

23 23 SYNCHRONIZATION GS6-37BZ/DZ/MECH

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.05
Wear limit size	mm	1.0
3st/4nd gear	mm	0.8 ... 1.40
Wear limit size	mm	0.7
5/6st gear	mm	0.95 ... 1.5
Wear limit size	mm	0.75
Reverse gear		
New condition	mm	0.65 ... 1.25
Max. wear limit size	mm	0.5

SYNCHRONIZATION GS6-53DZ

23 23 SYNCHRONIZATION GS6-53DZ

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	2.70 ... 3.50

3rd/4th gear	mm	2.40 ... 3.10
5th/6th gear	mm	1.75 ... 2.10
Max. wear limit size	mm	
Reverse gear		
New condition	mm	2.70 ... 3.25
Max. wear limit size	mm	

SYNCHRONIZATION GUIDE SLEEVES 240/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 240/5/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 265/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 265/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 265/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 265/6/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ/MECH

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

1st/2nd gear	kN	10 ... 36
3rd/4th gear	kN	20 ... 58
5th/6th gear	kN	19 ... 55

SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ/MECH

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Press-off and press-on force	kN	50/2

SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G/MECH

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Press-off and press-on force	kN	10 ... 20

SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G/MECH

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Press-off and press-on force	kN	10 ... 20

SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES SPECIFICATION

Pressing-off force		
Pressing-on force		
1st/2nd and 5th/R gear	t max	0.08
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION S 5 D 200 G/MECH

23 23 SYNCHRONIZATION S 5 D 200 G/MECH

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.1
3rd gear	mm	1.1 ... 1.5
4th/5th gear	mm	0.9 ... 1.5
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	1.1 ... 1.7
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 5 D 250 G/MECH

23 23 SYNCHRONIZATION S 5 D 250 G/MECH

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.1
3rd gear	mm	1.1 ... 1.5
4th/5th gear	mm	0.9 ... 1.5
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	1.1 ... 1.7
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 5 D 310 Z/MECH

23 23 SYNCHRONIZATION S 5 D 310 Z/MECH

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.1 ... 1.6
3rd gear	mm	0.95 ... 1.35
4th/5th gear	mm	0.95 ... 1.35
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.7 ... 1.15
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 6 S 420 G/MECH

23 23 SYNCHRONIZATION S 6 S 420 G/MECH

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
Max. wear limit size	mm	0.8
Reverse gear		
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 6 S 560 G/MECH

23 23 SYNCHRONIZATION S 6 S 560 G/MECH

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition		
Max. wear limit size	mm	0.8
Reverse gear		
Max. wear limit size	mm	0.5

SYNCHRONIZATION ZF-S5-16/MECH/OVERDRIVE

23 23 SYNCHRONIZATION ZF-S5-16/MECH OVERDRIVE

SYNCHRONIZATION SPECIFICATION

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8

Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

TRANSMISSION SHAFTS 240/5/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 240/5/MECH OVERDRIVE

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 260/5/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 260/5/MECH OVERDRIVE

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 260/5/MECH/SPORT

23 21 TRANSMISSION SHAFTS 260/5/MECH SPORT

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09

Layshaft	mm	0.13 ... 0.23
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 260/6/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 260/6/MECH OVERDRIVE

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 265/5/MECH/SPORT

23 21 TRANSMISSION SHAFTS 265/5/MECH SPORT

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 265/6/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 265/6/MECH OVERDRIVE

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 280/5/MECH/SPORT

23 21 TRANSMISSION SHAFTS 280/5/MECH SPORT

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS GS6-37BZ/DZ

23 21 TRANSMISSION SHAFTS GS6-37BZ/DZ

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0.15 ... 0.19
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS GS6-53DZ/MECH

23 21 TRANSMISSION SHAFTS GS6-53DZ/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing play) of:		
Output shaft	mm	
Input shaft	Max. mm	
Output journal:		
Radial runout	Max. mm	0.15
Output flange		
Radial runout	Max. mm	0.15
Axial runout	Max. mm	0.15

TRANSMISSION SHAFTS S 5 D 200 G/MECH

23 21 TRANSMISSION SHAFTS S 5 D 200 G/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	Max. mm	0.04
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 5 D 250 G/MECH

23 21 TRANSMISSION SHAFTS S 5 D 250 G/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	Max. mm	0.04
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 5 D 310 Z/MECH

23 21 TRANSMISSION SHAFTS S 5 D 310 Z/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 6 S 420 G/MECH

23 21 TRANSMISSION SHAFTS S 6 S 420 G/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 6 S 560 G/MECH

23 21 TRANSMISSION SHAFTS S 6 S 560 G/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS ZF-S5-16/MECH

23 21 TRANSMISSION SHAFTS ZF-S5-16/MECH

TRANSMISSION SHAFTS SPECIFICATION

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	1.1 ... 1.3

Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION FILLING CAPACITIES

23 00 TRANSMISSION FILLING CAPACITIES
E46/E53/E60/E61/E63/E64/E81/E82/E83/E87/E89/E90/E91/E92/E93 GS6-53DZ/BZ/MANUAL

TRANSMISSION FILLING CAPACITIES SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	litre	1.5
Oil fill quantity for initial fill or replacement transmission	litre	1.6

TRANSMISSION FILLING CAPACITIES

23 00 TRANSMISSION FILLING CAPACITIES
E60/E61/E63/E64/E81/E82/E83/E84/E85/E87/E89/E90/E91/E92/E93 GS6-17BG/DG/MANUAL

TRANSMISSION FILLING CAPACITIES SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	litre	1.3
Oil fill quantity for initial fill or replacement transmission	litre	1.4

TRANSMISSION IN GENERAL 240/5/MECH/OVERDRIVE

23 00 TRANSMISSION IN GENERAL 240/5/MECH OVERDRIVE

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.05
Oil fill quantity for initial fill or replacement transmission	ltr.	1.15

TRANSMISSION IN GENERAL 260/5/MECH/OVERDRIVE

23 00 TRANSMISSION IN GENERAL 260/5/MECH OVERDRIVE

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or replacement transmission	ltr.	1.35

TRANSMISSION IN GENERAL 260/5/MECH/SPORT

23 00 TRANSMISSION IN GENERAL 260/5/MECH SPORT

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or replacement transmission	ltr.	1.35

TRANSMISSION IN GENERAL S5D 280Z

23 00 TRANSMISSION IN GENERAL S5D 280Z

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade, refer to Operating Fluids		
Oil fill quantity for oil change	Litres	- -
Oil fill quantity for initial fill or replacement transmission	Litres	1.3

TRANSMISSION IN GENERAL S7S 47BG

23 00 TRANSMISSION IN GENERAL S7S 47BG

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade, refer to Operating Fluids		
Oil fill quantity for oil change	Litres	2.55
Oil fill quantity for initial fill or replacement transmission	Litres	2.75

TRANSMISSION IN GENERAL ZF-S5-16/MECH

23 00 TRANSMISSION IN GENERAL ZF-S5-16/MECH

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.05
Oil fill quantity for initial fill or replacement transmission	ltr.	1.15

TRANSMISSION IN GENERAL: 260/6/MECH/OVERDRIVE

23 00 TRANSMISSION IN GENERAL: 260/6/MECH OVERDRIVE

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or repair transmission	ltr.	1.35

TRANSMISSION IN GENERAL: 265/5/MECH/SPORT

23 00 TRANSMISSION IN GENERAL: 265/5/MECH SPORT

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.5
Oil fill quantity for initial fill or repair transmission	ltr.	1.7

TRANSMISSION IN GENERAL: 265/6/MECH/OVERDRIVE

23 00 TRANSMISSION IN GENERAL: 265/6/MECH OVERDRIVE

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.5
Oil fill quantity for initial fill or repair transmission	ltr.	1.7

TRANSMISSION IN GENERAL: 280/5/MECH/SPORT

23 00 TRANSMISSION IN GENERAL: 280/5/MECH SPORT

TRANSMISSION IN GENERAL SPECIFICATION

Oil grade: refer to Operating Fluids		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or repair transmission	ltr.	1.35

CASE AND COVER 240/5/MECH/OVERDRIVE

23 11 CASE AND COVER 240/5/MECH OVERDRIVE

CASE AND COVER 240/5/MECH/OVERDRIVE SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER 260/5/MECH/OVERDRIVE

23 11 CASE AND COVER 260/5/MECH OVERDRIVE

CASE AND COVER 260/5/MECH/OVERDRIVE SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER 260/5/MECH/SPORT

23 11 CASE AND COVER 260/5/MECH SPORT

CASE AND COVER 260/5/MECH/SPORT SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER 260/6/MECH/OVERDRIVE

23 11 CASE AND COVER 260/6/MECH OVERDRIVE

CASE AND COVER 260/6/MECH/OVERDRIVE SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER 265/5/MECH/SPORT

23 11 CASE AND COVER 265/5/MECH SPORT

CASE AND COVER 265/5/MECH/SPORT SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER 265/6/MECH/OVERDRIVE

23 11 CASE AND COVER 265/6/MECH OVERDRIVE

CASE AND COVER 265/6/MECH/OVERDRIVE SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER 280/5/MECH/SPORT

23 11 CASE AND COVER 280/5/MECH SPORT

CASE AND COVER 280/5/MECH/SPORT SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER S6-37BZ/DZ/MECH

23 11 CASE AND COVER S6-37BZ/DZ/MECH

CASE AND COVER S6-37BZ/DZ/MECH SPECIFICATIONS

Temperature for installation of bearings	°C	80

CASE AND COVER ZF-S5-16/MECH

23 11 CASE AND COVER ZF-S5-16/MECH

CASE AND COVER ZF-S5-16/MECH SPECIFICATIONS

Temperature for installation of bearings	°C	80

GEARS (LAYSHAFT) 240/5/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 240/5/MECH OVERDRIVE

GEARS (LAYSHAFT) 240/5/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force at ambient temperature		
5th gear wheel	t	4.5 ... 5.5
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -

GEARS (LAYSHAFT) 260/5/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 260/5/MECH OVERDRIVE

GEARS (LAYSHAFT) 260/5/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8

Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	4.9 ... 6.8approx. 120

GEARS (LAYSHAFT) 260/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 260/5/MECH SPORT

GEARS (LAYSHAFT) 260/5/MECH/SPORT SPECIFICATIONS

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t °C	4.9 ... 6.8approx. 120

GEARS (LAYSHAFT) 260/6/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 260/6/MECH OVERDRIVE

GEARS (LAYSHAFT) 260/6/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	4.9 ... 6.8 120

GEARS (LAYSHAFT) 260/6/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 260/6/MECH OVERDRIVE

GEARS (LAYSHAFT) 260/6/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force at ambient temperature		
5th gear wheel	t	5.5 ... 6.8
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	4.9 ... 6.8 120

GEARS (LAYSHAFT) 265/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 265/5/MECH SPORT

GEARS (LAYSHAFT) 265/5/MECH/SPORT SPECIFICATIONS

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

GEARS (LAYSHAFT) 265/6/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) 265/6/MECH OVERDRIVE

GEARS (LAYSHAFT) 265/6/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

GEARS (LAYSHAFT) 280/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 280/5/MECH SPORT

GEARS (LAYSHAFT) 280/5/MECH/SPORT SPECIFICATIONS

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6 150

GEARS (LAYSHAFT) 280/5/MECH/SPORT

23 22 GEARS (LAYSHAFT) 280/5/MECH SPORT

GEARS (LAYSHAFT) 280/5/MECH/SPORT SPECIFICATIONS

Pressing-off force at ambient temperature		
3rd gear wheel	t	5 ... 7
4th gear wheel	t	5 ... 7
5th gear wheel	t	9 ... 10
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	- -
5th gear wheel	t approx. °C	5 ... 6150

GEARS (LAYSHAFT) GS6-53DZ/MECH

23 22 GEARS (LAYSHAFT) GS6-53DZ/MECH

GEARS (LAYSHAFT) GS6-53DZ/MECH SPECIFICATIONS

Press-off and press-on force		
5th gear wheel	kN	50
4th gear wheel	kN	50

GEARS (LAYSHAFT) S 5 D 200 G/MECH

23 22 GEARS (LAYSHAFT) S 5 D 200 G/MECH

GEARS (LAYSHAFT) S 5 D 200 G/MECH SPECIFICATIONS

Press-off and press-on force		
5th gear wheel	kN	50 ... 70
4th gear wheel	kN	

GEARS (LAYSHAFT) S 5 D 250 G/MECH

23 22 GEARS (LAYSHAFT) S 5 D 250 G/MECH

GEARS (LAYSHAFT) S 5 D 250 G/MECH SPECIFICATIONS

Press-off and press-on force		
5th gear wheel	kN	50 ... 70

GEARS (LAYSHAFT) ZF-S5-16/MECH/OVERDRIVE

23 22 GEARS (LAYSHAFT) ZF-S5-16/MECH OVERDRIVE

GEARS (LAYSHAFT) ZF-S5-16/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force at ambient temperature		
3rd gear wheel	t	7.5
4th gear wheel	t	8.0
5th gear wheel	t	8.0
Contact pressure force at warming temperature		
3rd gear wheel	t °C	- -
4th gear wheel	t °C	0.015 150 ... 180
5th gear wheel	t °C	- -

INTERNAL SHIFT COMPONENTS 240/5/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 240/5/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS 240/5/MECH/OVERDRIVE SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 260/5/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 260/5/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS 260/5/MECH/OVERDRIVE SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 260/5/MECH/SPORT

23 31 INTERNAL SHIFT COMPONENTS 260/5/MECH SPORT

INTERNAL SHIFT COMPONENTS 260/5/MECH/SPORT SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 260/6/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 260/6/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS 260/6/MECH/OVERDRIVE SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 265/5/MECH/SPORT

23 31 INTERNAL SHIFT COMPONENTS 265/5/MECH SPORT

INTERNAL SHIFT COMPONENTS 265/5/MECH/SPORT SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 265/6/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS 265/6/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS 265/6/MECH/OVERDRIVE SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		

Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS 280/5/MECH/SPORT

23 31 INTERNAL SHIFT COMPONENTS 280/5/MECH SPORT

INTERNAL SHIFT COMPONENTS 280/5/MECH/SPORT SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

INTERNAL SHIFT COMPONENTS ZF-S5-16/MECH/OVERDRIVE

23 31 INTERNAL SHIFT COMPONENTS ZF-S5-16/MECH OVERDRIVE

INTERNAL SHIFT COMPONENTS ZF-S5-16/MECH/OVERDRIVE SPECIFICATIONS

Shift fork guide width		
1st ... 5th gear		
Wear limit	mm	4.8

SYNCHRONIZATION 240/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 240/5/MECH OVERDRIVE

SYNCHRONIZATION 240/5/MECH/OVERDRIVE SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 260/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 260/5/MECH OVERDRIVE

SYNCHRONIZATION 260/5/MECH/OVERDRIVE SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 260/5/MECH/SPORT

23 23 SYNCHRONIZATION 260/5/MECH SPORT

SYNCHRONIZATION 260/5/MECH/SPORT SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 260/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 260/6/MECH OVERDRIVE

SYNCHRONIZATION 260/6/MECH/OVERDRIVE SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 265/5/MECH/SPORT

23 23 SYNCHRONIZATION 265/5/MECH SPORT

SYNCHRONIZATION 265/5/MECH/SPORT SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 265/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION 265/6/MECH OVERDRIVE

SYNCHRONIZATION 265/6/MECH/OVERDRIVE SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3

Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION 280/5/MECH/SPORT

23 23 SYNCHRONIZATION 280/5/MECH SPORT

SYNCHRONIZATION 280/5/MECH/SPORT SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

SYNCHRONIZATION GS6-37BZ/DZ/MECH

23 23 SYNCHRONIZATION GS6-37BZ/DZ/MECH

SYNCHRONIZATION GS6-37BZ/DZ/MECH SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.05
Wear limit size	mm	1.0
3st/4nd gear	mm	0.8 ... 1.40
Wear limit size	mm	0.7
5/6st gear	mm	0.95 ... 1.5
Wear limit size	mm	0.75
Reverse gear		
New condition	mm	0.65 ... 1.25
Max. wear limit size	mm	0.5

SYNCHRONIZATION GS6-53DZ

23 23 SYNCHRONIZATION GS6-53DZ

SYNCHRONIZATION GS6-53DZ SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	2.70 ... 3.50

3rd/4th gear	mm	2.40 ... 3.10
5th/6th gear	mm	1.75 ... 2.10
Max. wear limit size	mm	
Reverse gear		
New condition	mm	2.70 ... 3.25
Max. wear limit size	mm	

SYNCHRONIZATION GUIDE SLEEVES 240/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 240/5/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES 240/5/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.0
3rd/4th gear	t max	2.7
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.1
3rd/4th gear	t max	1.9
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES 260/5/MECH/SPORT SPECIFICATIONS

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		

1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES 260/6/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force		
1st/2nd and 5th/R gear	t max	3.7
3rd/4th gear	t max	3.0
Pressing-on force		
1st/2nd and 5th/R gear	t max	2.5
3rd/4th gear	t max	2.1
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 265/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 265/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES 265/5/MECH/SPORT SPECIFICATIONS

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 265/6/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES 265/6/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES 265/6/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH/SPORT SPECIFICATIONS

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH/SPORT

23 23 SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH SPORT

SYNCHRONIZATION GUIDE SLEEVES 280/5/MECH/SPORT SPECIFICATIONS

Pressing-off force		
Pressing-on force		
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ/MECH

SYNCHRONIZATION GUIDE SLEEVES GS6-37BZ/DZ/MECH SPECIFICATIONS

1st/2nd gear	**kN**	**10 ... 36**
3rd/4th gear	kN	20 ... 58
5th/6th gear	kN	19 ... 55

SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ/MECH

SYNCHRONIZATION GUIDE SLEEVES GS6-53DZ/MECH SPECIFICATIONS

Press-off and press-on force	kN	50/2

SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G/MECH

SYNCHRONIZATION GUIDE SLEEVES S 5 D 200 G/MECH SPECIFICATIONS

Press-off and press-on force	kN	10 ... 20

SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G/MECH

23 23 SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G/MECH

SYNCHRONIZATION GUIDE SLEEVES S 5 D 250 G/MECH SPECIFICATIONS

Press-off and press-on force	kN	10 ... 20

SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16/MECH/OVERDRIVE

23 23 SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16/MECH OVERDRIVE

SYNCHRONIZATION GUIDE SLEEVES ZF-S5-16/MECH/OVERDRIVE SPECIFICATIONS

Pressing-off force		
Pressing-on force		
1st/2nd and 5th/R gear	t max	0.08
Bearing Sleeves	approx. °C	80

SYNCHRONIZATION S 5 D 200 G/MECH

23 23 SYNCHRONIZATION S 5 D 200 G/MECH

SYNCHRONIZATION S 5 D 200 G/MECH SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.1
3rd gear	mm	1.1 ... 1.5
4th/5th gear	mm	0.9 ... 1.5
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	1.1 ... 1.7
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 5 D 250 G/MECH

23 23 SYNCHRONIZATION S 5 D 250 G/MECH

SYNCHRONIZATION S 5 D 250 G/MECH SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.3 ... 2.1

3rd gear	mm	1.1 ... 1.5
4th/5th gear	mm	0.9 ... 1.5
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	1.1 ... 1.7
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 5 D 310 Z/MECH

23 23 SYNCHRONIZATION S 5 D 310 Z/MECH

SYNCHRONIZATION S 5 D 310 Z/MECH SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
1st/2nd gear	mm	1.1 ... 1.6
3rd gear	mm	0.95 ... 1.35
4th/5th gear	mm	0.95 ... 1.35
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.7 ... 1.15
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 6 S 420 G/MECH

23 23 SYNCHRONIZATION S 6 S 420 G/MECH

SYNCHRONIZATION S 6 S 420 G/MECH SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
Max. wear limit size	mm	0.8
Reverse gear		
Max. wear limit size	mm	0.5

SYNCHRONIZATION S 6 S 560 G/MECH

23 23 SYNCHRONIZATION S 6 S 560 G/MECH

SYNCHRONIZATION S 6 S 560 G/MECH SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition		
Max. wear limit size	mm	0.8
Reverse gear		

Max. wear limit size	mm	0.5

SYNCHRONIZATION ZF-S5-16/MECH/OVERDRIVE

23 23 SYNCHRONIZATION ZF-S5-16/MECH OVERDRIVE

SYNCHRONIZATION ZF-S5-16/MECH/OVERDRIVE SPECIFICATIONS

Distance between synchronizer ring and clutch body		
New condition	mm	1.0 ... 1.3
Max. wear limit size	mm	0.8
Reverse gear		
New condition	mm	0.5 ... 0.6
Max. wear limit size	mm	0.4

TRANSMISSION SHAFTS 240/5/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 240/5/MECH OVERDRIVE

TRANSMISSION SHAFTS 240/5/MECH/OVERDRIVE SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout max	mm	0.07
Output flange		
Radial runout max	mm	0.07
Axial runout max	mm	0.1

TRANSMISSION SHAFTS 260/5/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 260/5/MECH OVERDRIVE

TRANSMISSION SHAFTS 260/5/MECH/OVERDRIVE SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout max	mm	0.07
Output flange		
Radial runout	max mm	0.07

Axial runout	max mm	0.1

TRANSMISSION SHAFTS 260/5/MECH/SPORT

23 21 TRANSMISSION SHAFTS 260/5/MECH SPORT

TRANSMISSION SHAFTS 260/5/MECH/SPORT SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.13 ... 0.23
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 260/6/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 260/6/MECH OVERDRIVE

TRANSMISSION SHAFTS 260/6/MECH/OVERDRIVE SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 265/5/MECH/SPORT

23 21 TRANSMISSION SHAFTS 265/5/MECH SPORT

TRANSMISSION SHAFTS 265/5/MECH/SPORT SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		

Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 265/6/MECH/OVERDRIVE

23 21 TRANSMISSION SHAFTS 265/6/MECH OVERDRIVE

TRANSMISSION SHAFTS 265/6/MECH/OVERDRIVE SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Layshaft	mm	0.1 ... 0.2
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS 280/5/MECH/SPORT

23 21 TRANSMISSION SHAFTS 280/5/MECH SPORT

TRANSMISSION SHAFTS 280/5/MECH/SPORT SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	0 ... 0.09
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION SHAFTS GS6-37BZ/DZ

23 21 TRANSMISSION SHAFTS GS6-37BZ/DZ

TRANSMISSION SHAFTS GS6-37BZ/DZ SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0.15 ... 0.19
Output spigot		

Radial runout Max.	max mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS GS6-53DZ/MECH

23 21 TRANSMISSION SHAFTS GS6-53DZ/MECH

TRANSMISSION SHAFTS GS6-53DZ/MECH SPECIFICATIONS

Axial play (axial bearing play) of:		
Output shaft	mm	
Input shaft	Max. mm	
Output journal:		
Radial runout	Max. mm	0.15
Output flange		
Radial runout	Max. mm	0.15
Axial runout	Max. mm	0.15

TRANSMISSION SHAFTS S 5 D 200 G/MECH

23 21 TRANSMISSION SHAFTS S 5 D 200 G/MECH

TRANSMISSION SHAFTS S 5 D 200 G/MECH SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	Max. mm	0.04
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 5 D 250 G/MECH

23 21 TRANSMISSION SHAFTS S 5 D 250 G/MECH

TRANSMISSION SHAFTS S 5 D 250 G/MECH SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	Max. mm	0.04
Output spigot		

Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 5 D 310 Z/MECH

23 21 TRANSMISSION SHAFTS S 5 D 310 Z/MECH

TRANSMISSION SHAFTS S 5 D 310 Z/MECH SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 6 S 420 G/MECH

23 21 TRANSMISSION SHAFTS S 6 S 420 G/MECH

TRANSMISSION SHAFTS S 6 S 420 G/MECH SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07
Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS S 6 S 560 G/MECH

23 21 TRANSMISSION SHAFTS S 6 S 560 G/MECH

TRANSMISSION SHAFTS S 6 S 560 G/MECH SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Output spigot		
Radial runout	Max. mm	0.07
Output flange		
Radial runout	Max. mm	0.07

Axial runout	Max. mm	0.1

TRANSMISSION SHAFTS ZF-S5-16/MECH

23 21 TRANSMISSION SHAFTS ZF-S5-16/MECH

TRANSMISSION SHAFTS ZF-S5-16/MECH SPECIFICATIONS

Axial play (axial bearing clearance) of:		
Output shaft	mm	0 ... 0.09
Input shaft	mm	1.1 ... 1.3
Output spigot		
Radial runout	max mm	0.07
Output flange		
Radial runout	max mm	0.07
Axial runout	max mm	0.1

TRANSMISSION FILLING CAPACITIES

23 00 TRANSMISSION FILLING CAPACITIES E46/E53/E60/E61/E63/E64/E81/E82/E83/E87/E89/E90/E91/E92/E93 GS6-53DZ/BZ/MANUAL

TRANSMISSION FILLING CAPACITIES SPECIFICATIONS

Oil grade: refer to Operating Fluids		
Oil volume	litre	1.5
Oil fill quantity for initial fill or replacement transmission	litre	1.6

TRANSMISSION FILLING CAPACITIES

23 00 TRANSMISSION FILLING CAPACITIES E60/E61/E63/E64/E81/E82/E83/E84/E85/E87/E89/E90/E91/E92/E93 GS6-17BG/DG/MANUAL

TRANSMISSION FILLING CAPACITIES SPECIFICATIONS

Oil grade: refer to Operating Fluids		
Oil volume	litre	1.3
Oil fill quantity for initial fill or replacement transmission	litre	1.4

TRANSMISSION FILLING CAPACITIES

28 00 TRANSMISSION FILLING CAPACITIES E92/E93/E89/N54/N55 GS7D36SG/MANUAL

TRANSMISSION FILLING CAPACITIES SPECIFICATIONS

Oil grade: **refer to Operating Fluids Specifications**		
Oil capacity on initial filling	litre	7.8

TRANSMISSION FILLING CAPACITIES 240/5/MECH/OVERDRIVE

23 00 TRANSMISSION FILLING CAPACITIES 240/5/MECH OVERDRIVE

Transmission filling capacities 240/5/MECH/OVERDRIVE SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.05
Oil fill quantity for initial fill or replacement transmission	ltr.	1.15

TRANSMISSION FILLING CAPACITIES 260/5/MECH/OVERDRIVE

23 00 TRANSMISSION FILLING CAPACITIES 260/5/MECH OVERDRIVE

Transmission filling capacities 260/5/MECH/OVERDRIVE SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or replacement transmission	ltr.	1.35

TRANSMISSION FILLING CAPACITIES 260/5/MECH/SPORT

23 00 TRANSMISSION FILLING CAPACITIES 260/5/MECH SPORT

Transmission filling capacities 260/5/MECH/SPORT SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or replacement transmission	ltr.	1.35

TRANSMISSION FILLING CAPACITIES S5D 280Z

23 00 TRANSMISSION FILLING CAPACITIES S5D 280Z

Transmission filling capacities S5D 280Z SPECIFICATIONS

Oil grade, refer to Operating Fluids		
Oil fill quantity for oil change	Litres	- -
Oil fill quantity for initial fill or replacement transmission	Litres	1.3

TRANSMISSION FILLING CAPACITIES S7S 47BG

23 00 TRANSMISSION FILLING CAPACITIES S7S 47BG

Transmission filling capacities S7S 47BG SPECIFICATIONS

Oil grade, refer to Operating Fluids		
Oil fill quantity for oil change	Litres	2.55
Oil fill quantity for initial fill or replacement transmission	Litres	2.75

TRANSMISSION FILLING CAPACITIES ZF-S5-16/MECH

23 00 TRANSMISSION FILLING CAPACITIES ZF-S5-16/MECH

Transmission filling capacities ZF-S5-16/MECH SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.05
Oil fill quantity for initial fill or replacement transmission	ltr.	1.15

TRANSMISSION FILLING CAPACITIES: 260/6/MECH/OVERDRIVE

23 00 TRANSMISSION FILLING CAPACITIES: 260/6/MECH OVERDRIVE

Transmission filling capacities: 260/6/MECH/OVERDRIVE SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or repair transmission	ltr.	1.35

TRANSMISSION FILLING CAPACITIES: 265/5/MECH/SPORT

23 00 TRANSMISSION FILLING CAPACITIES: 265/5/MECH SPORT

Transmission filling capacities: 265/5/MECH/SPORT SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.5
Oil fill quantity for initial fill or repair transmission	ltr.	1.7

TRANSMISSION FILLING CAPACITIES: 265/6/MECH/OVERDRIVE

23 00 TRANSMISSION FILLING CAPACITIES: 265/6/MECH OVERDRIVE

Transmission filling capacities: 265/6/MECH/OVERDRIVE SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.5
Oil fill quantity for initial fill or repair transmission	ltr.	1.7

TRANSMISSION FILLING CAPACITIES: 280/5/MECH/SPORT

23 00 TRANSMISSION FILLING CAPACITIES: 280/5/MECH SPORT

Transmission filling capacities: 280/5/MECH/SPORT SPECIFICATIONS

Oil grade: **refer to Operating Fluids**		
Oil volume	ltr.	1.25
Oil fill quantity for initial fill or repair transmission	ltr.	1.35

CASE AND COVER

23 11 CASE AND COVER

TIGHTENING TORQUE SPECIFICATION - CASE AND COVER

		Type	Thread	Tightening specification	Measure
16AZ	Holder to transfer case	265/Sport	M6		9 Nm
17AZ	Retaining plates for bearings on housing	S5D 310Z/S5D 320Z/S5D 200G/S5D 250G	M6		10 Nm
18AZ	Retaining plate to housing	S5D 320Z SMG	M6		5.5 Nm

CASE AND COVER

23 11 CASE AND COVER

TIGHTENING TORQUE SPECIFICATION - CASE AND COVER

		Type	Thread	Tightening specification	Measure
1AZ	Transmission housing, rear section/front section	B/C/D/E/F/G/H/I/7-speed SMG			22 Nm
2AZ	Cover with guide tube/transmission case	B/C/D/E/F/G/H/I/7-speed SMG	M8 x 22		18 Nm
		B/C/D/E/F/G/H/I/7-speed SMG	M8 x 30		25 Nm
		B/C/D/E/F/G/H/I/7-speed SMG	M6		10 Nm
3AZ	Bearing cap/sealing flange	B/C/D/E/F/G/H/I/7-speed SMG			10.5 Nm
4AZ	Reverse gear wheel axle to intermediate housing	B/C/D/E/F/G/H/I/7-speed SMG			49 Nm
5AZ	Retaining plate for reverse gear wheel axle to intermediate housing	B/C/D/E/F/G/H/I/7-speed SMG			25 Nm

6AZ	Transmission closing plate	B/C/D/E/F/G/H/I/7-speed SMG	M6		8 Nm

ELECTRICAL ADD-ON PARTS

23 14 ELECTRICAL ADD-ON PARTS

TIGHTENING TORQUE SPECIFICATION - ELECTRICAL ADD-ON PARTS

		Type	Thread	Tightening specifications	Dimension
1AZ	Reversing light switch	G/H/I/C/Gearbox	M12		16 Nm
2AZ	Zero-gear sensor to transmission	G/H/I/C/Gearbox			5 Nm

INTERIOR SHIFT COMPONENTS

23 31 INTERIOR SHIFT COMPONENTS

TIGHTENING TORQUE SPECIFICATION - INTERIOR SHIFT COMPONENTS

		Type	Thread	Tightening specification	Measure
1AZ	Shift arms to transmission case	S5D 310Z			45 Nm
2AZ	Sealing cap for locking sleeves of gearshift rods	S6S 420G	M6		10 Nm
3AZ	Retaining screw, shift actuator/selector shaft	S5D 320Z/S6S37BZ/S6S53BZ SMG	M6		10 Nm

TRANSMISSION SHAFTS

23 21 TRANSMISSION SHAFTS

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION SHAFTS

		Type	Thread	Tightening specification	Measure
1AZ	Output flange	S5D 200G/S5D 250G/S5D260Z/S5D 310Z/S6S 420G		Collar nut installed with bolt cement Pretension	 190 Nm

				Release Tighten down	120 Nm
		S5D 280Z/S5D 320Z		Collar nut installed with bolt cement Pretension Release Tighten down	170 Nm 130 Nm
		S5D 390Z		Collar nut installed with bolt cement Pretension Release Tighten down	200 Nm 145 Nm
		GS6-37BZ/GS6-17BG		Collar nut installed with bolt cement Pretension Release Tighten down	170 Nm 120 Nm
		GS6-53DZ		Collar nut installed with bolt cement Pretension Release Tighten down	200 Nm 140 Nm
		GS7S47BG		Collar nut installed with bolt cement	200 Nm
2AZ	Gear to countershaft	265/Sport	M10		60 Nm

TRANSMISSION IN GENERAL

23 00 TRANSMISSION IN GENERAL

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION IN GENERAL

		Type	Thread	Tightening specification	Measure
2AZ	Transmission to clutch housing	B/C/D/E/F/G/H/I/7-speed SMG	M12		76 Nm
3AZ	Reinforcement plate to transmission	B/C/D/E/F/G/H/I/7-speed SMG	M8		23 Nm

4AZ	Oil drain plug/filler plug	B/C-transmission			50 Nm
		D/E-transmission			52 Nm
		G/H-transmission	M18x1.5 hexagon socket		35 Nm
		H/I-transmission	M12x1.5		25 Nm
		I transmission	M18x1.5	Steel screw without seal	45 Nm
		7-speed SMG			40 Nm
5AZ	Transmission extension	g/H transmission	M10		46 Nm

TRANSMISSION IN GENERAL

23 00 TRANSMISSION IN GENERAL

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION IN GENERAL

		Type	Thread	Tightening specifications	Dimension
1AZ	Transmission to engine **TRANSMISSION DESIGNATIONS**				
6 KT-Schrauben		B/C/D/E/F/G/H/I/7 Gang SMG	M6		8 Nm
		B/C/D/E/F/G/H/I/7 Gang SMG	M8		25 Nm
		B/C/D/E/F/G/H/I/7 Gang SMG	M10		49 Nm
		B/C/D/E/F/G/H/I/7 Gang SMG	M12		74 Nm
Torx-Schraube		B/C/D/E/F/G/H/I/7 Gang SMG	M6		9 Nm
		B/C/D/E/F/7 Gang SMG	M8		19 Nm
		B/C/D/E/H/I/7 Gang SMG	M10		43 Nm
		G-Getriebe	M10		38 Nm
		7 Gang SMG	M10x55 8.8		43 Nm
		7 Gang SMG	M10x42 8.8		42 Nm
Stahlschrauben mit Torx-Kopf		I/G/H-Getriebe	M8		19 Nm
Stahlschrauben mit Torx-Kopf		I/G/H-Getriebe	M12		66 Nm
2AZ	Transmission to N52/N52K/N53/N54 aluminum screws/bolts are not magnetic.	I/G/H-transmission		Replace screws Jointing torque and angle of rotation must be	

				observed without fail	
		I/G/H-transmission	M10x30	Jointing torque Angle of rotation	20 Nm 90 -110°
		I/G/H-transmission	M10x85	Jointing torque Angle of rotation	20 Nm 180 -200°
		I/H/G-transmission	M12	Jointing torque Angle of rotation	25 Nm 130 ° +20 °
3AZ	Cover plate, transmission	I/H transmission	M6		8 Nm

TRANSMISSION MOUNTS

23 71 TRANSMISSION MOUNTS

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION MOUNTS

		Type	Thread	Tightening specification	Measure
1AZ	Transmission mounts (rubber) to body	B/C/D/E/F/G/H/I/7-speed SMG	M10		42 Nm
		B/C/D/E/F/G/H/I/7-speed SMG	M12		73 Nm
2AZ	Transmission cross-member to body	B/C/D/E/F/G/H/I/7-speed SMG	M10		42 Nm
		B/C/D/E/F/G/H/I/7-speed SMG	M8		19 Nm
		B/C/D/E/F/G/H/I/7-speed SMG	M8	E83, E85, E86, E46 only	21 Nm
3AZ	Mount bracket to transmission	B/C/D/E/F/G/H/I/7-speed SMG	M8		19 Nm
4AZ	Transmission support block to transmission	B/C/D/E/F/G/H/I/7-speed SMG	M10 ASA screw		38 Nm
		B/C/D/E/F/G/H/I/7-speed SMG	M10 ISA pan head		48 Nm
5AZ	Transmission mount to transmission support bracket/transmission crossmember	B/C/D/E/F/G/H/I/7-speed SMG	M8		19 Nm

CASE AND COVER

23 11 CASE AND COVER

TIGHTENING TORQUE SPECIFICATION - CASE AND COVER

	Type	Thread	Tightening specification	Measure
16AZ Holder to transfer case	265/Sport	M6		9 Nm
17AZ Retaining plates for bearings on housing	S5D 310Z/S5D 320Z/S5D 200G/S5D 250G	M6		10 Nm
18AZ Retaining plate to housing	S5D 320Z SMG	M6		5.5 Nm

CASE AND COVER

23 11 CASE AND COVER

TIGHTENING TORQUE SPECIFICATION - CASE AND COVER

	Type	Thread	Tightening specification	Measure
1AZ Transmission housing, rear section/front section	B/C/D/E/F/G/H/I/7-speed SMG			22 Nm
2AZ Cover with guide tube/transmission case	B/C/D/E/F/G/H/I/7-speed SMG	M8 x 22		18 Nm
	B/C/D/E/F/G/H/I/7-speed SMG	M8 x 30		25 Nm
	B/C/D/E/F/G/H/I/7-speed SMG	M6		10 Nm
3AZ Bearing cap/sealing flange	B/C/D/E/F/G/H/I/7-speed SMG			10.5 Nm
4AZ Reverse gear wheel axle to intermediate housing	B/C/D/E/F/G/H/I/7-speed SMG			49 Nm
5AZ Retaining plate for reverse gear wheel axle to intermediate housing	B/C/D/E/F/G/H/I/7-speed SMG			25 Nm
6AZ Transmission closing plate	B/C/D/E/F/G/H/I/7-speed SMG	M6		8 Nm

ELECTRICAL ADD-ON PARTS

23 14 ELECTRICAL ADD-ON PARTS

TIGHTENING TORQUE SPECIFICATION - ELECTRICAL ADD-ON PARTS

	Type	Thread	Tightening specifications	Dimension
1AZ Reversing light switch	G/H/I/C/Gearbox	M12		16 Nm
2AZ Zero-gear sensor to transmission	G/H/I/C/Gearbox			5 Nm

INTERIOR SHIFT COMPONENTS

23 31 INTERIOR SHIFT COMPONENTS

TIGHTENING TORQUE SPECIFICATION - INTERIOR SHIFT COMPONENTS

	Type	Thread	Tightening specification	Measure
1AZ Shift arms to transmission case	S5D 310Z			45 Nm
2AZ Sealing cap for locking sleeves of gearshift rods	S6S 420G	M6		10 Nm
3AZ Retaining screw, shift actuator/selector shaft	S5D 320Z/S6S37BZ/S6S53BZ SMG	M6		10 Nm

TRANSMISSION SHAFTS

23 21 TRANSMISSION SHAFTS

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION SHAFTS

	Type	Thread	Tightening specification	Measure
1AZ Output flange	S5D 200G/S5D 250G/S5D260Z/S5D 310Z/S6S 420G		Collar nut installed with bolt cement	
			Pretension Release	190 Nm
			Tighten down	120 Nm
	S5D 280Z/S5D 320Z		Collar nut installed with bolt cement	
			Pretension Release	170 Nm
			Tighten down	130 Nm
	S5D 390Z		Collar nut installed with bolt cement	
			Pretension Release	200 Nm
			Tighten down	145 Nm
			Collar nut installed with	

	GS6-37BZ/GS6-17BG		bolt cement	
			Pretension Release	170 Nm
			Tighten down	120 Nm
	GS6-53DZ		Collar nut installed with bolt cement	
			Pretension Release	200 Nm
			Tighten down	140 Nm
		GS7S47BG	Collar nut installed with bolt cement	200 Nm
2AZ Gear to countershaft	265/Sport	M10		60 Nm

TRANSMISSION IN GENERAL

23 00 TRANSMISSION IN GENERAL

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION IN GENERAL

	Type	Thread	Tightening specification	Measure
2AZ Transmission to clutch housing	B/C/D/E/F/G/H/I/7-speed SMG	M12		76 Nm
3AZ Reinforcement plate to transmission	B/C/D/E/F/G/H/I/7-speed SMG	M8		23 Nm
4AZ Oil drain plug/filler plug	B/C-transmission			50 Nm
	D/E-transmission			52 Nm
	G/H-transmission	M18x1.5 hexagon socket		35 Nm
	H/I-transmission	M12x1.5		25 Nm
	I transmission	M18x1.5	Steel screw without seal	45 Nm
	7-speed SMG			40 Nm
5AZ Transmission extension	g/H transmission	M10		46 Nm

TRANSMISSION IN GENERAL

23 00 TRANSMISSION IN GENERAL

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION IN GENERAL

	Type	Thread	Tightening specifications	Dimension
6 KT-Schrauben	B/C/D/E/F/G/H/I/7 Gang SMG	M6		8 Nm

	B/C/D/E/F/G/H/I/7 Gang SMG	M8		25 Nm
	B/C/D/E/F/G/H/I/7 Gang SMG	M10		49 Nm
	B/C/D/E/F/G/H/I/7 Gang SMG	M12		74 Nm
Torx-Schraube	B/C/D/E/F/G/H/I/7 Gang SMG	M6		9 Nm
	B/C/D/E/F/7 Gang SMG	M8		19 Nm
	B/C/D/E/H/I/7 Gang SMG	M10		43 Nm
	G-Getriebe	M10		38 Nm
	7 Gang SMG	M10x55 8.8		43 Nm
	7 Gang SMG	M10x42 8.8		42 Nm
Stahlschrauben mit Torx-Kopf	I/G/H-Getriebe	M8		19 Nm
Stahlschrauben mit Torx-Kopf	I/G/H-Getriebe	M12		66 Nm
2Az Transmission to N52/N52K/N53/N54 aluminium screws/bolts are not magnetic.	I/G/H-transmission		Replace screws Jointing torque and angle of rotation must be observed without fail	
	I/G/H-transmission	M10x30	Jointing torque Angle of rotation	20 Nm 90 - -110°
	I/G/H-transmission	M10x85	Jointing torque Angle of rotation	20 Nm 180 - -200°
	I/H/G-transmission	M12	Jointing torque Angle of rotation	25 Nm 130° +20°
3AZ Cover plate, transmission	I/H-transmission	M6		8 Nm

TRANSMISSION MOUNTS

23 71 TRANSMISSION MOUNTS

TIGHTENING TORQUE SPECIFICATION - TRANSMISSION MOUNTS

	Type	Thread	Tightening specification	Measure
1AZ Transmission mounts (rubber) to body	B/C/D/E/F/G/H/I/7-speed SMG	M10		42 Nm
	B/C/D/E/F/G/H/I/7-speed SMG	M12		73 Nm

2AZ Transmission cross-member to body	B/C/D/E/F/G/H/I/7-speed SMG	M10		42 Nm
	B/C/D/E/F/G/H/I/7-speed SMG	M8		19 Nm
	B/C/D/E/F/G/H/I/7-speed SMG	M8	E83, E85, E86, E46 only	21 Nm
3AZ Mount bracket to transmission	B/C/D/E/F/G/H/I/7-speed SMG	M8		19 Nm
4AZ Transmission support block to transmission	B/C/D/E/F/G/H/I/7-speed SMG	M10 ASA screw		38 Nm
	B/C/D/E/F/G/H/I/7-speed SMG	M10 ISA pan head		48 Nm
5AZ Transmission mount to transmission support bracket/transmission cross-member	B/C/D/E/F/G/H/I/7-speed SMG	M8		19 Nm

23 MANUAL TRANSMISSION

23-2470 BUSH

Bush MW

NOTE: (Impact bush) For driving in the retainer of the mounting nut on the output flange

Storage Location

C15

SI number

01 10 93 (689)

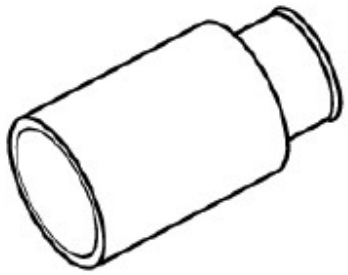


Fig. 1: Identifying Bush (23-2470)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2490 BUSH

Bush Minimum set: Mechanical tools MW

NOTE: (impact bush and sliding sleeve) For fitting the radial sealing ring to the drive shaft

Storage Location

A17

SI number

01 10 93 (689)

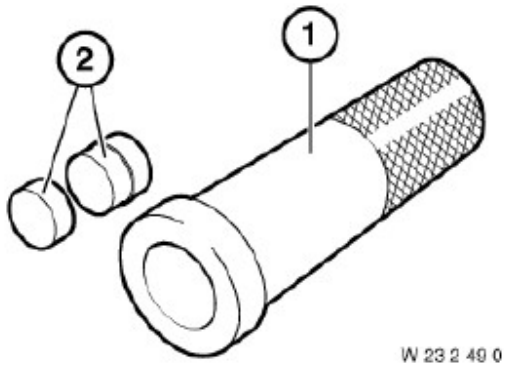


Fig. 2: Identifying Bush (23-2490)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0491598 Bush

NOTE: (impact bush)

2 = 0491599 Sleeve

NOTE: (sliding sleeve (2-part))

23-3020 BUSH

Bush MW

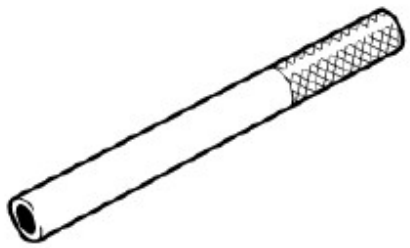
NOTE: (Assembly bush) For installing the gaiter of the gearshift rod

Storage Location

Z3

SI number

01 10 93 (689)



W 23 3 020

Fig. 3: Identifying Bush (23-3020)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0190 BUSH

Bush Minimum set: Mechanical tools MW

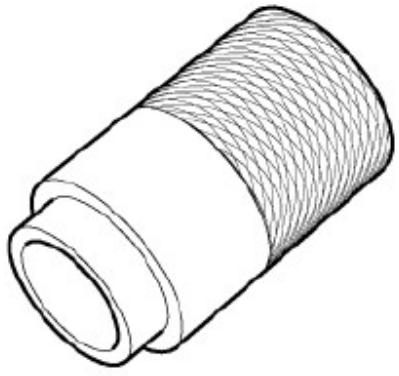
NOTE: (Impact bush) For driving in the radial shaft seal on the output end - F transmission

Storage Location

A17

SI number

01 14 99 (482)



W23 0 190

Fig. 4: Identifying Bush (23-0190)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2180 BUSH

Bush MW

NOTE: **(Guide bush) For fitting the transmission housing front section onto the gearshift shaft**

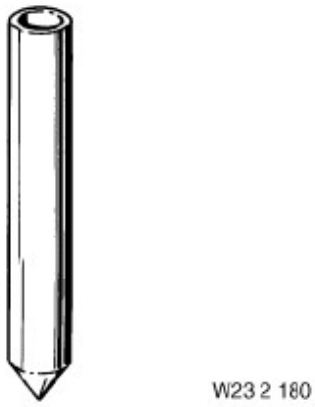


Fig. 5: Identifying Bush (23-2180)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0390 BUSH

Bush MW

NOTE: **(slip bush) For removing and installing clutch cover with shaft seal on drive shaft.**

SI number

01 04 09 (517)



Fig. 6: Identifying Bush (23-0390)

Courtesy of BMW OF NORTH AMERICA, INC.

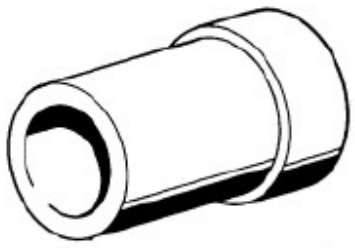
23-2150 BUSH

Bush MW

NOTE: (Pressure bush) For pressing in the grooved ball bearing of the transmission output shaft (260/5, 245/5), pressing the front taper roller bearing onto the drive bevel gear for all rear axle final drives as well as installation of the lid of the countershaft (S5D 310Z)

Storage Location

Y6



W23 2 150

Fig. 7: Identifying Bush (23-2150)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0220 BUSH

Bush Minimum set: Mechanical tools MW

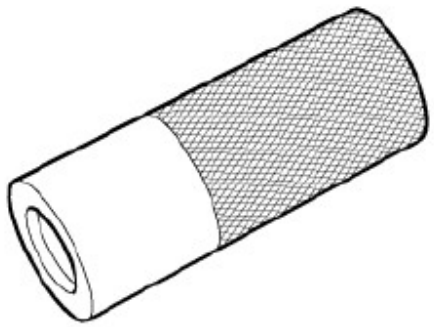
NOTE: (Impact bush) For driving in radial shaft seal on gearshift shaft - F transmission

Storage Location

B15

SI number

01 14 99 (482)



W23 0 220

Fig. 8: Identifying Bush (23-0220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2480 BUSH

Bush MW

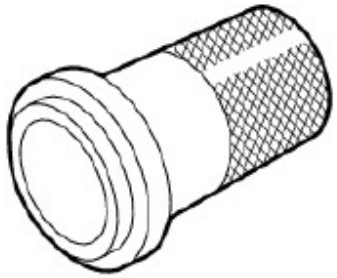
NOTE: (Impact bush) For driving radial shaft seal onto output shaft

Storage Location

A17

SI number

01 10 93 (689)



W 23 2 480

Fig. 9: Identifying Bush (23-2480)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4040 CARTRIDGE GUN

Cartridge gun MW

NOTE: (grease gun) For actuating cartridge 23 4 033.

SI number

01 05 06 (248)

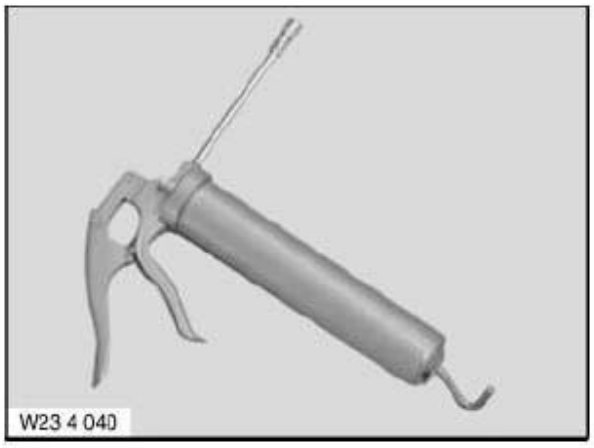


Fig. 10: Identifying Cartridge Gun (23-4040)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2250 CLAMP

Clamp MW

NOTE: For clamping together the main shaft and countershaft

Storage Location

Y7

SI number

01 07 90 (244)

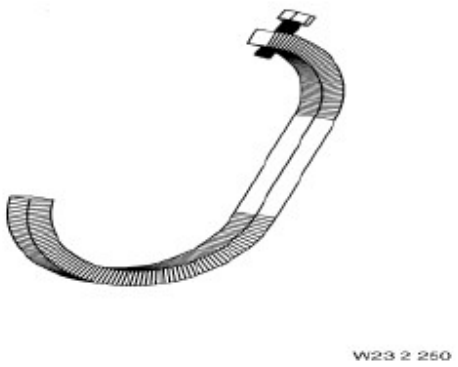


Fig. 11: Identifying Clamp (23-2250)
Courtesy of BMW OF NORTH AMERICA, INC.

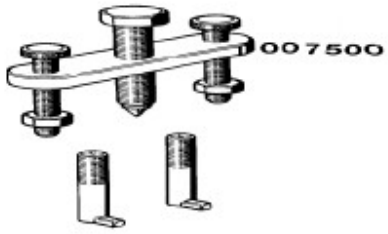
23-1100 CLAW

Claw MW

NOTE: (Extractor claw) For the speedometer wheel

Storage Location

Y9



W23 1 100

Fig. 12: Identifying Claw (23-1100)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1400 DEVICE

Device MW

NOTE: For inserting the radial seal ring in the plug socket of the speedometer-drive pinion

Consisting of

1 = 0491523 Shaft

NOTE: (Press-in shaft)

2 = 0491524 Shaped part

NOTE: (shaped part)

3 = 0491525 Holding sleeve

NOTE: (Union sleeve)

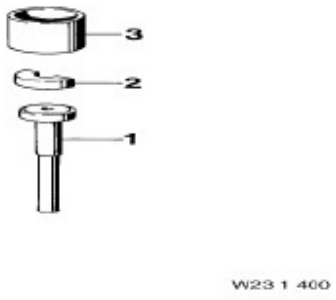


Fig. 13: Identifying Device (23-1400)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4030 DEVICE

Device MW

NOTE: For removing and installing guide bearing (pilot bearing) in transmission drive shaft.

SI number

01 05 06 (248)

Consisting of:

1 = 0495535 Basic body

2 = 0495536 Nut

NOTE: (nut M8)

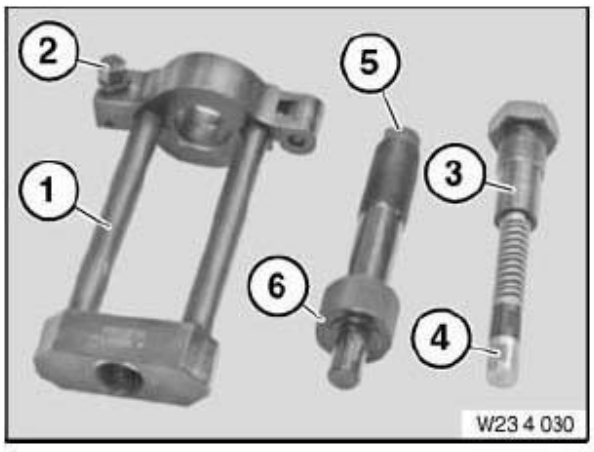


Fig. 14: Identifying Device (23-4030)
Courtesy of BMW OF NORTH AMERICA, INC.

3 = 0495537 Cartridge

NOTE: (cartridge)

4 = 0495538 Adapter

5 = 0495539 Spindle

NOTE: (pressure spindle)

6 = 0495540 Thrust piece

NOTE: (thrust piece)

23-1350 DEVICE

Device MW

NOTE: (Pull-off device) For transmission housing rear section

Consisting of:

1 = 0491515 Plate

2 = 0491516 Screw

NOTE: (Screw, short (2 x))

3 = 0491517 Screw

NOTE: (Screw, long (2 x))

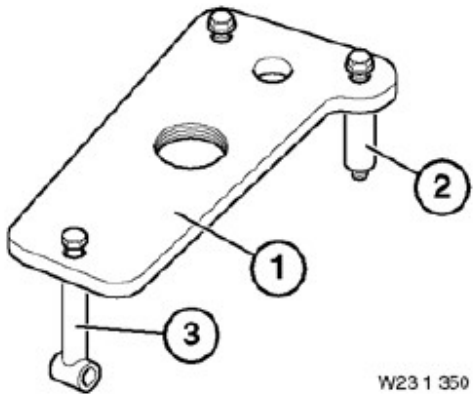


Fig. 15: Identifying Device (23-1350)

Courtesy of BMW OF NORTH AMERICA, INC.

23-2270 DEVICE

Device MW

NOTE: For centring the gearshift shaft when fitting the front section of the transmission housing

Storage Location

Z6

SI number

01 07 90 (244)



W23 2 270

Fig. 16: Identifying Device (23-2270)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2330 DEVICE

Device MW

NOTE: For pulling the complete gear set into the transmission housing rear section

Storage Location

Z6

SI number

01 07 90 (244)



W23 2 330

Fig. 17: Identifying Device (23-2330)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1420 DEVICE

Device MW

NOTE: For pulling off the sliding piece (5th gear)

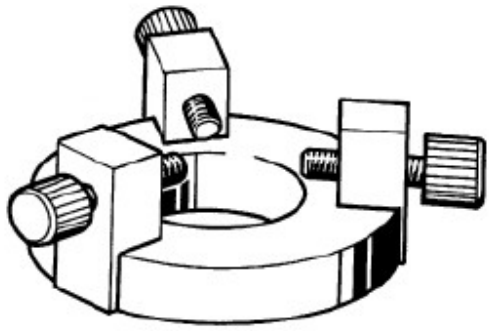
Storage Location

Z4

Consisting of:

3 = 0493257 Screw

NOTE: (Clamping bolt)



W23 1 420

Fig. 18: Identifying Device (23-1420)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1490 DEVICE

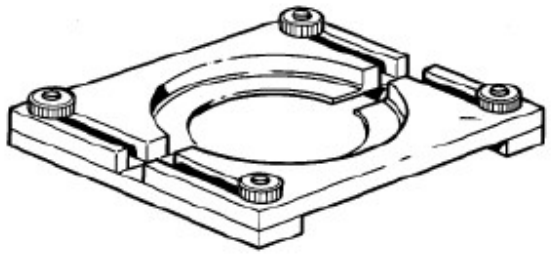
Device MW

NOTE: For pressure-test of the gear wheels

Consisting of:

3 = 0491535 Shaped part

NOTE: (shaped part)



W23 1 490

Fig. 19: Identifying Device (23-1490)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1170 DEVICE

Device MW

NOTE: For pulling off the gearbox housing front section

Consisting of:

1 = 0491493 Plate

2 = 0491494 Screw

NOTE: (Knurled screw (3 x))

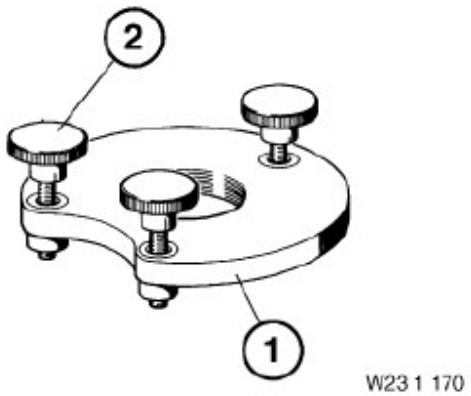


Fig. 20: Identifying Device (23-1170)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3010 DEVICE

Device MW

NOTE: For mounting the output flange on the output shaft

Storage Location

B16

SI number

01 10 93 (689)

Consisting of:

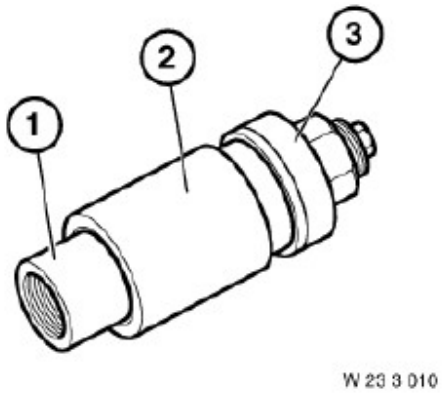


Fig. 21: Identifying Device (23-3010)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0491601 Spindle

NOTE: (Adapter spindle)

2 = 0491602 Sleeve

NOTE: (Pressure sleeve)

3 = 0491603 Nut

NOTE: (Thrust nut with bearing)

23-1060 DEVICE

Device MW

NOTE: For extracting the bearing inner race - reverse gearwheel

Storage Location

Z4

Consisting of:

1 = 0491475 Shell

NOTE: (bearing shell) 2 pieces

2 = 0491476 Ring

NOTE: (threaded ring)

3 = 0491477 Sleeve

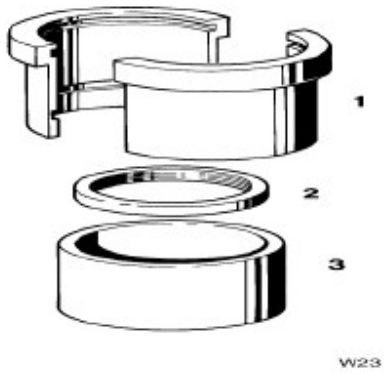


Fig. 22: Identifying Device (23-1060)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2310 DEVICE

Device MW

NOTE: For pressure-test of the 3rd and 4th gear wheels of the countershaft

Storage Location

Y7

SI number

01 07 90 (244)

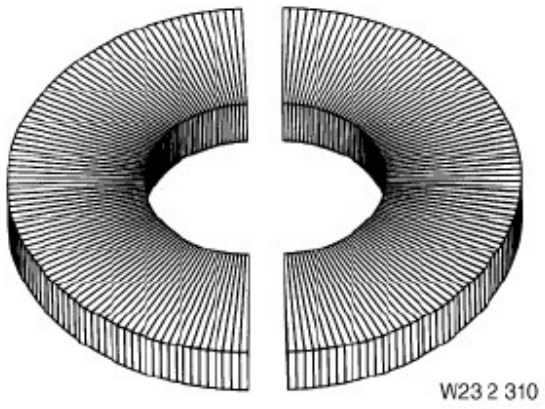


Fig. 23: Identifying Device (23-2310)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1020 DEVICE

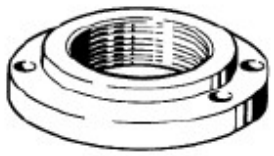
Device MW

NOTE: (Device for pulling off the transmission housing (front and rear sections))

Storage Location

Z5

Z6



W23 1 020

Fig. 24: Identifying Device (23-1020)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0080 DEVICE

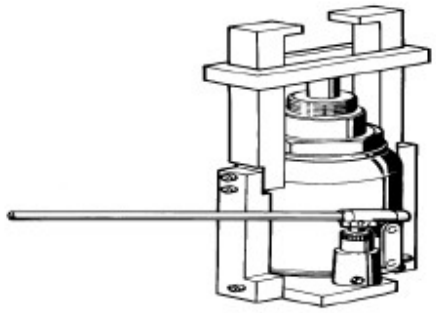
Device MW

NOTE: For pulling off 5th gear wheel

Consisting of:

2 = 0491449 Shaped part

NOTE: (Shaped part) 2x



W23 0 080

Fig. 25: Identifying Device (23-0080)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1010 DEVICE

Device MW

NOTE: (Device for pulling off the rear part of the transmission housing)



Fig. 26: Identifying Device (23-1010)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1000 DEVICE

Device MW

NOTE: For pressing the transmission housing and grooved ball bearing onto the transmission drive shaft and into the transmission housing

Storage Location

C15

C16

Consisting of:

1 = 0491458 Holding sleeve

2 = 0491459 Pin

NOTE: (Dowel pin (2 x))

3 = 0491460 Synchronizing key

NOTE: (Synchronizing key, long)

4 = 0491461 Synchronizing key

NOTE: (Synchronizing key, short)

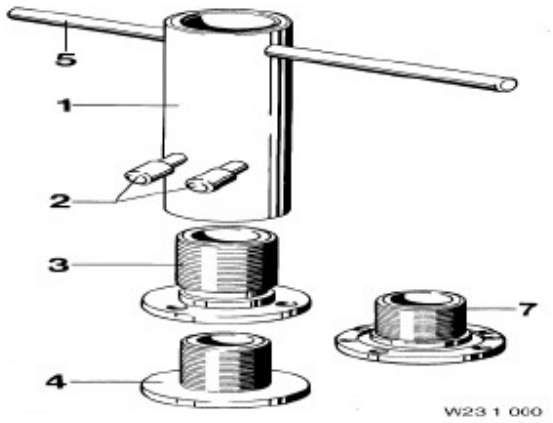


Fig. 27: Identifying Device (23-1000)
Courtesy of BMW OF NORTH AMERICA, INC.

5 = 0491462 Handle

5 = 0491463 Pin

NOTE: (Dowel pins for Getrag transmission)

7 = 0491464 Synchronizing key

NOTE: (Synchronizing key for Getrag transmission)

23-2170 DEVICE

Device MW

NOTE: For tensioning the transmission leaf springs

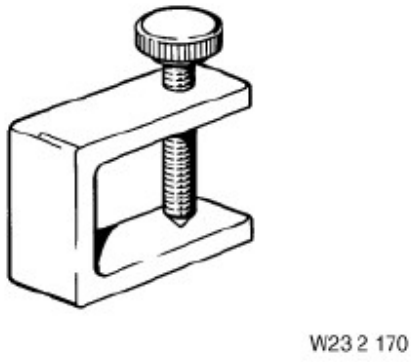


Fig. 28: Identifying Device (23-2170)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2370 DEVICE

Device MW

NOTE: For removing the gear set

Storage Location

Y8

SI number

01 02 91 (330)

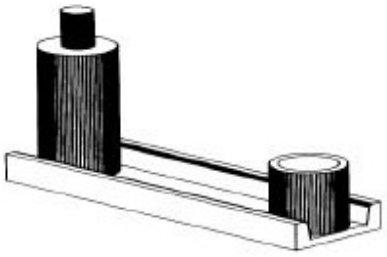


Fig. 29: Identifying Device (23-2370)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1050 EXTRACTOR

Extractor MW

NOTE: (Extractor (Kukko)) For the 5th gear - and for the reverse gear wheel

Consisting of:

1 = 0491470 Claw

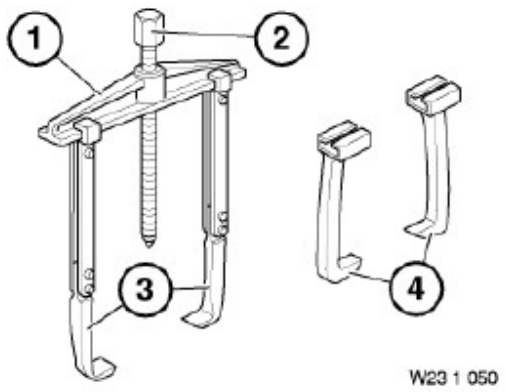


Fig. 30: Identifying Extractor (23-1050)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0040 FIXTURE

Fixture MW

Replaced by: 0495498

NOTE: For transmissions for removal and installation. Replaced by 23 4 050 (0 495 498)

SI number

01 05 90 (207)

Consisting of:

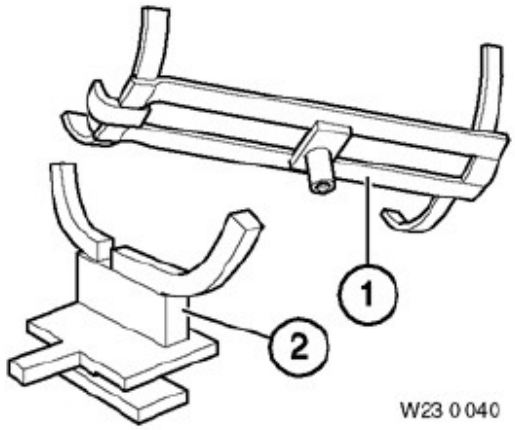


Fig. 31: Identifying Fixture (23-0040)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0491443 Cage

NOTE: **(Retaining cage) Transmission: S6S 560G Replaced by 23 4 050 (0 495 498)**

2 = 0491444 Retaining bracket

NOTE: **(Holding bracket) Transmission: S6S 420G Replaced by 23 4 050 (0 495 498)**

23-0140 FIXTURE

Fixture MW

Replaced by: 0495498

NOTE: **For accommodating transmission during removal and installation. Transmission: F-transmission. Replaced by 23 4 050 (0 495 498)**

SI number

01 20 98 (378)

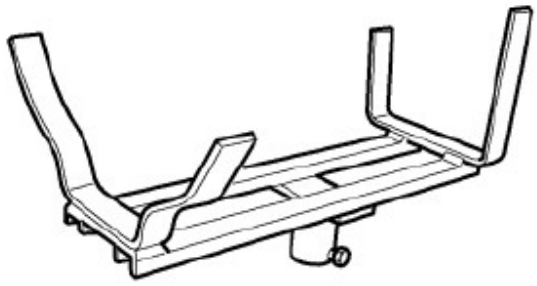


Fig. 32: Identifying Fixture (23-0140)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4050 FIXTURE

Fixture MW

NOTE: **(Universal gearbox holder) Fixture for removing and installing manual and automatic transmissions for BMW&RR.**

SI number

01 07 06 (256)

Consisting of:

4 = 0495550 Belt

NOTE: **(Tensioning strap)**

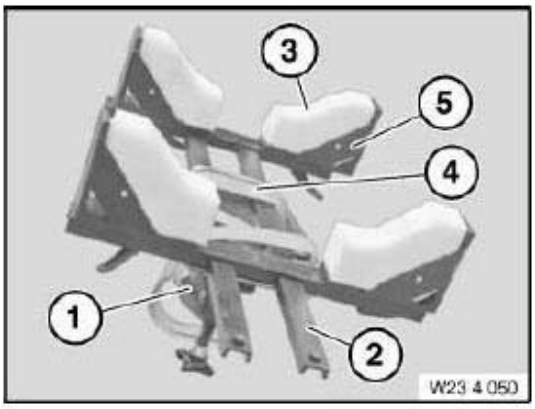


Fig. 33: Identifying Fixture (23-4050)
Courtesy of BMW OF NORTH AMERICA, INC.

5 = 0496018 Fixture

NOTE: **(Fixture for foam material insert)**

1 = 0495547 Joint

2 = 0495548 Frame

NOTE: **(Main frame)**

3 = 0495549 Insert

NOTE: **(Foam inserts (1 set = 4 pieces))**

23-0150 FIXTURE

Fixture MW

NOTE: **For supporting the transmission on the assembly stand. For ZF transmissions.**

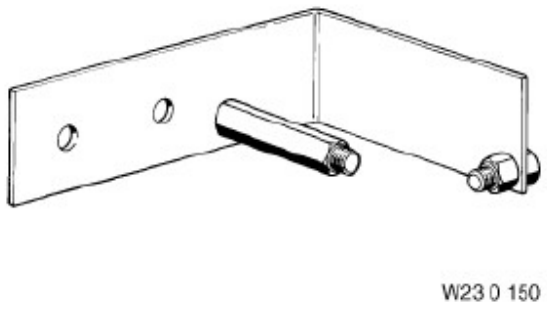


Fig. 34: Identifying Fixture (23-0150)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0170 FIXTURE

Fixture MW

Replaced by: 0495466

NOTE: For mounting the F gearbox on the assembly stand. Replaced by 24 0 200 (0 495 466)

SI number

01 14 99 (482)

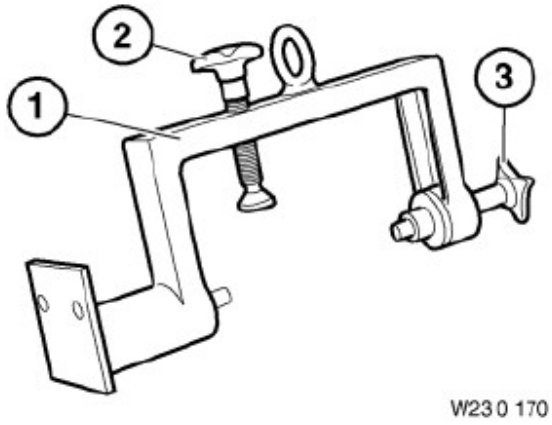


Fig. 35: Identifying Fixture (23-0170)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0493439 Basic body

NOTE: Replaced by 24 0 201 (0 495 488)

2 = 0493440 Spindle

NOTE: (Spindle (2 pieces)) With handle Replaced by 24 0202 (0 495 489)

23-0110 FIXTURE

Fixture MW

NOTE: For removing and installing transmission. Replaced by 23 4 050.

SI number

01 02 00 (551)

Consisting of:

1 = 0494568 Fixture

NOTE: Transmission: S6S 560G

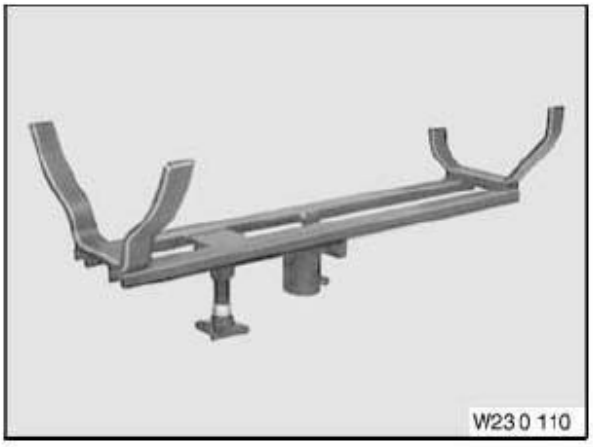


Fig. 36: Identifying Fixture (23-0110)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0494569 Retaining bracket

NOTE: (Holding bracket (not shown)) Transmission: S6S 420G

23-0100 FIXTURE

Fixture MW

NOTE: For mounting transmission on assembly stand

SI number

01 07 90 (244)

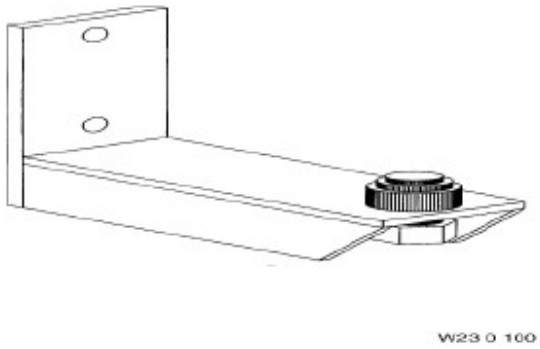


Fig. 37: Identifying Fixture (23-0100)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0250 HOLDER

Holder Minimum set: Mechanical tools MW

NOTE: (Counter support) Help with slackening and tightening the output flange

Storage Location

B41

SI number

01 06 00 (575)

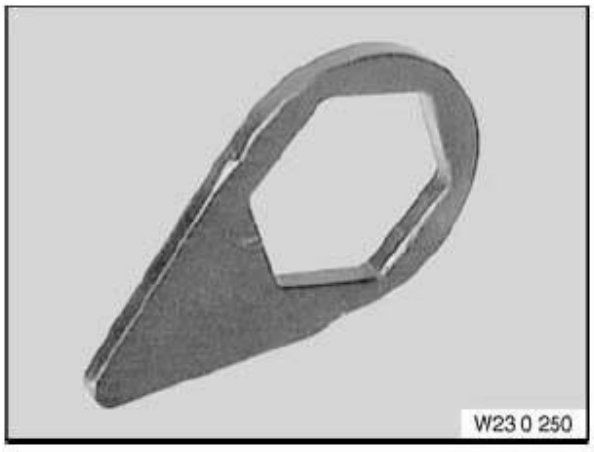


Fig. 38: Identifying Holder (23-0250)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0020 HOLDER

Holder Minimum set: Mechanical tools MW

NOTE: (counter support) For all three- and four-hole flanges when releasing and tightening down

Storage Location

A1

C1

B1

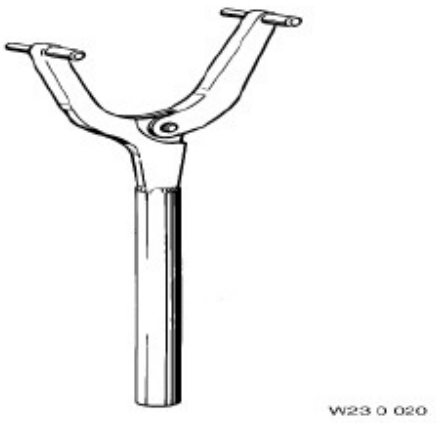


Fig. 39: Identifying Holder (23-0020)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1320 HOLDER

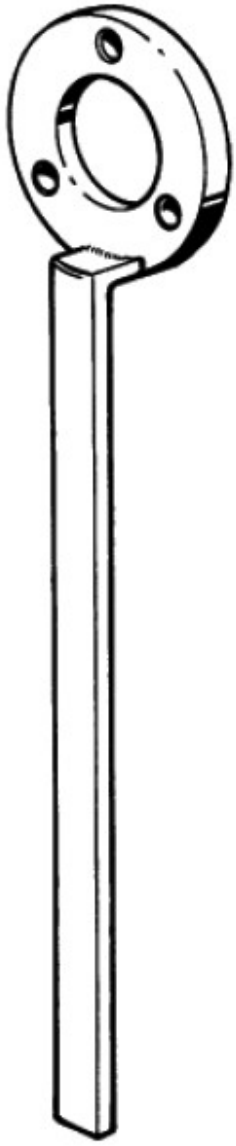
Holder MW

NOTE: (Counter support) For releasing and tightening the nut on the output flange with vibration absorber

Storage Location

Y2

X2



W23 1 320

Fig. 40: Identifying Holder (23-1320)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1440 HOLDING SLEEVE

Holding sleeve MW

NOTE: For pressing the bearing bush and bearing inner race onto the output shaft, as

well as for driving out the bearing of the output shaft (S5D 310Z)

Storage Location

Z7

Z8



W23 1 440

Fig. 41: Identifying Holding Sleeve (23-1440)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0400 KEY

Key MW

NOTE: For removing and installing clutch package.

SI number

01 04 09 (517)

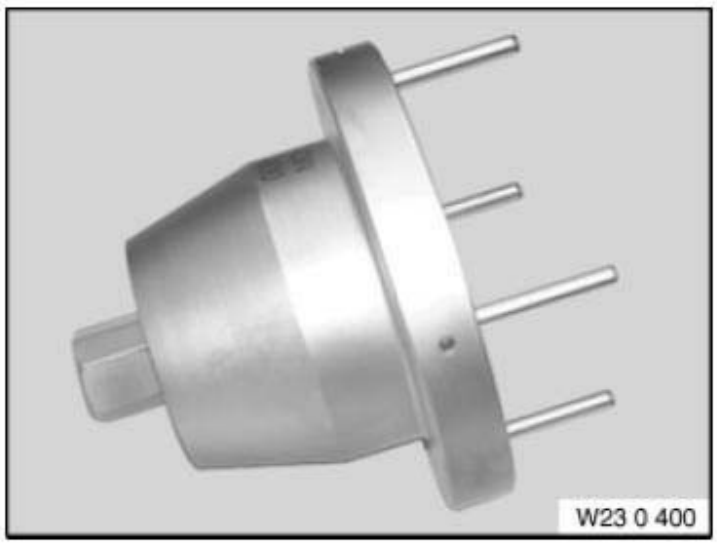


Fig. 42: Identifying Key (23-0400)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3220 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in the radial shaft seal of drive shaft (G transmission)

Storage Location

A49

SI number

01 11 04 (093)



Fig. 43: Identifying Mandrel (23-3220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2160 MANDREL

Mandrel MW

NOTE: (Mandrel) For radial seal ring in the transmission housing rear section - output shaft

Storage Location

B17

A17



W23 2 160

Fig. 44: Identifying Mandrel (23-2160)
Courtesy of BMW OF NORTH AMERICA, INC.

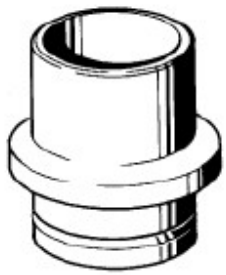
23-1390 MANDREL

Mandrel MW

NOTE: (Drift) For driving in the roller bearing of the countershaft in the transmission housing rear section

Storage Location

X8



W31 1 440

Fig. 45: Identifying Mandrel (23-1390)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2220 MANDREL

Mandrel MW

NOTE: **(Drift) For bearing (countershaft) in front and rear sections of transmission housing**



W23 2 220

Fig. 46: Identifying Mandrel (23-2220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2300 MANDREL

Mandrel Minimum set: Mechanical tools MW

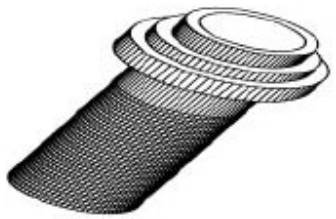
NOTE: **(Drift) For fitting the radial seal of the output shaft in the rear part of the transmission housing**

Storage Location

B17

SI number

01 07 90 (244)



W23 2 300

Fig. 47: Identifying Mandrel (23-2300)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0410 MANDREL

Mandrel MW

NOTE: (drift) For driving in output shaft seal.

Storage Location

B54

SI number

01 04 09 (517)

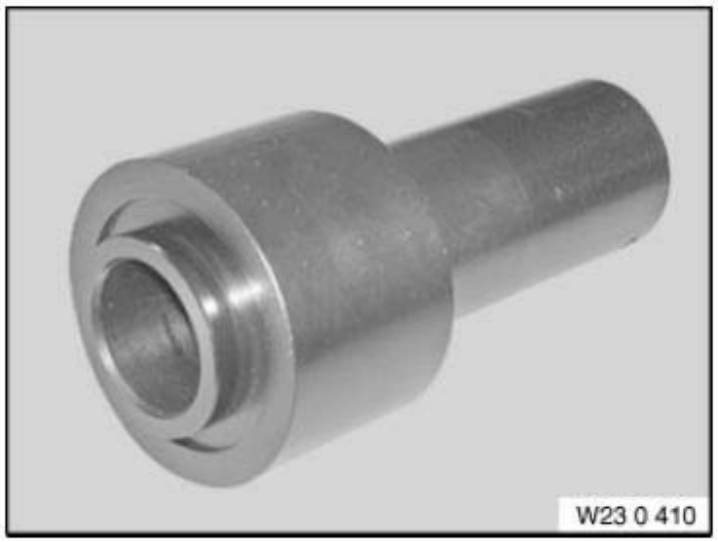


Fig. 48: Identifying Mandrel (23-0410)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1160 MANDREL

Mandrel MW

NOTE: **(drift) For fitting bearing inner race and bearing bush on output shaft (245) - Fitting sliding piece (5th gear-265/5) -Mounting output flange -Mounting bearing on countershaft (S5D 310Z) -Mounting centre bearing on propeller shaft, E46**

Storage Location

B17



W23 1 160

Fig. 49: Identifying Mandrel (23-1160)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1240 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: **(Drift) For driving in the radial seal ring on the gearshift shaft**

Storage Location

A10



W23 1 240

Fig. 50: Identifying Mandrel (23-1240)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2340 MANDREL

Mandrel Minimum set: Mechanical tools MW

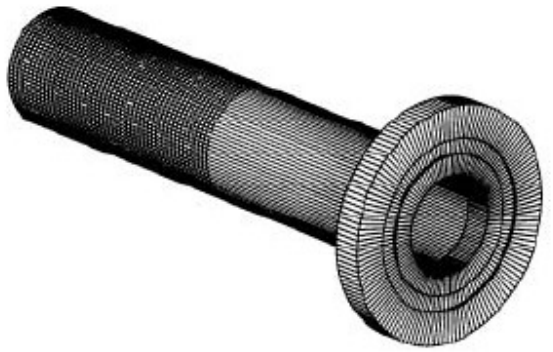
NOTE: (drift) For driving in the radial sealing ring into the front section of the transmission housing

Storage Location

B17

SI number

01 07 90 (244)



W23 2 340

Fig. 51: Identifying Mandrel (23-2340)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2360 MANDREL

Mandrel MW

NOTE: **(Drift) For driving in seal cap for catch pin**

Storage Location

Z3

SI number

01 07 90 (244)



W23 2 360

Fig. 52: Identifying Mandrel (23-2360)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0330 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: **For driving in the sealing cap of the countershaft.**

SI number

01 08 10 (638)



Fig. 53: Identifying Mandrel (23-0330)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1370 MANDREL

Mandrel MW

NOTE: (Drift) For fitting the radial seal of the transmission output flange

Storage Location

Z7



W23 1 370

Fig. 54: Identifying Mandrel (23-1370)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3240 MANDREL

Mandrel MW

NOTE: **(Drift) Driving in radial shaft seal of drive shaft. Transmission: GS6-53BZ (G gearbox) with engine S85, S65**

Storage Location

B18

A18

SI number

01 18 06 (295)



Fig. 55: Identifying Mandrel (23-3240)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2350 MANDREL

Mandrel MW

NOTE: **(drift) For fitting the sealing cap for the gearshift shaft catch pin**

Storage Location

Z3

SI number

01 07 90 (244)



W23 2 350

Fig. 56: Identifying Mandrel (23-2350)
Courtesy of BMW OF NORTH AMERICA, INC.

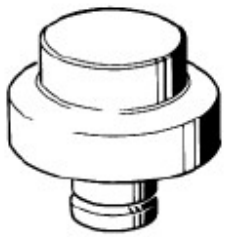
23-1220 MANDREL

Mandrel MW

NOTE: **(drift) For removing and fitting the countershaft roller bearing in the front section of the transmission housing**

Storage Location

X7



W23 1 220

Fig. 57: Identifying Mandrel (23-1220)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3110 MANDREL

Mandrel MW

NOTE: **For fitting guide bushes for catch pins on manual gearboxes.**

Storage Location

Y5

SI number

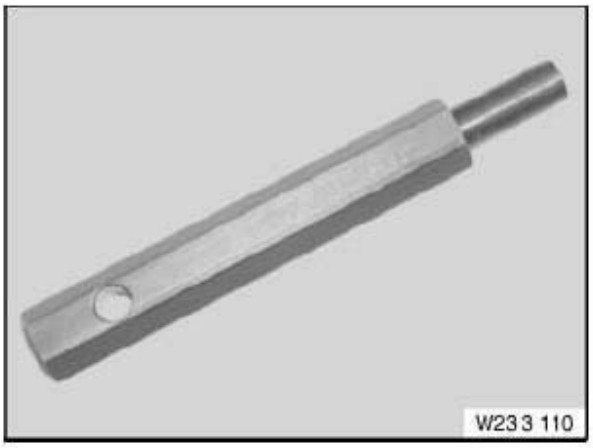


Fig. 58: Identifying Mandrel (23-3110)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1480 MANDREL

Mandrel MW

NOTE: (drift) For removing and fitting the grooved ball bearing in the front section of the transmission

Storage Location

X8

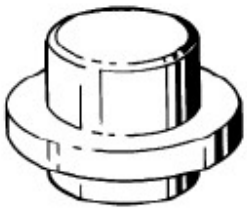


Fig. 59: Identifying Mandrel (23-1480)
Courtesy of BMW OF NORTH AMERICA, INC.

23-4020 MANDREL

Mandrel MW

NOTE: (Drift) For driving in bearing bushes for locking bolts, 5th and reverse gears.

Storage Location

B49

SI number

01 03 04 (070)

Consisting of:

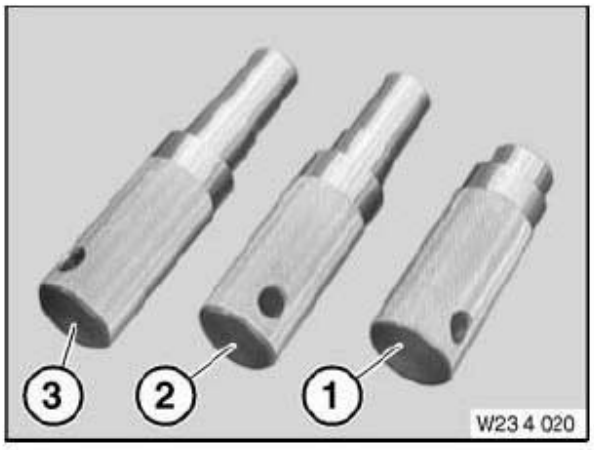


Fig. 60: Identifying Mandrel (23-4020)
Courtesy of BMW OF NORTH AMERICA, INC.

1 = 0494889 Mandrel

NOTE: (Drift) For driving in cover caps on gear notch, 5th and reverse gears.

2 = 0494890 Mandrel

NOTE: (Drift) For driving in bearing bush for locking bolt, 5th gear.

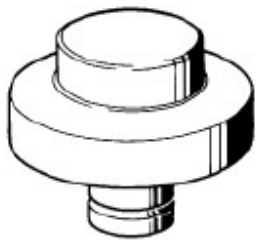
3 = 0494891 Mandrel

NOTE: (Drift) For driving in bearing bush for locking bolt, reverse gear.

23-1190 MANDREL

0491496

NOTE: (drift) For removing and fitting the drive shaft ball bearing in the front section of transmission housing



W23 1 190

Fig. 61: Identifying Mandrel (23-1190)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1090 MANDREL

Mandrel MW

NOTE: **(drift) For removing and fitting the outer bearing race of the drive shaft in the front section of the transmission housing**

Storage Location

A15



W23 1 090

Fig. 62: Identifying Mandrel (23-1090)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1040 MANDREL

Mandrel MW

NOTE: **(Drift) For mounting sliding piece (5th gear) and driving water pipe out of engine block, engine: N73**

Storage Location

Z7



Fig. 63: Identifying Mandrel (23-1040)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3230 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: (Drift) For driving in shaft seal on output shaft (G-transmission)

Storage Location

A49

SI number

01 11 04 (093)



Fig. 64: Identifying Mandrel (23-3230)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0320 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: **For driving in the radial shaft seal on the drive shaft.**

Storage Location

B54

SI number

01 06 06 (249)



Fig. 65: Identifying Mandrel (23-0320)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1080 MANDREL

Mandrel MW

NOTE: **(Drift) For driving outer bearing race into and out of front and centre sections of transmission housing (countershaft) and for driving ball bearing into and out of rear section of transmission housing (drive shaft)**

Storage Location

X8



W23 1 080

Fig. 66: Identifying Mandrel (23-1080)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1270 MANDREL

Mandrel MW

NOTE: **(Drift) For driving out the outer bearing race for the countershaft in the transmission housing front section, as well as for pressing the sealing ring and needle bearing out of the oil pump housing (A5S 560Z)**

Storage Location

X7



W23 1 270

Fig. 67: Identifying Mandrel (23-1270)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1380 MANDREL

Mandrel MW

NOTE: **(drift) For fitting the countershaft roller bearing in the rear section of the transmission housing**

Storage Location

X8

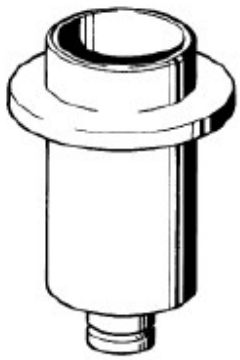


Fig. 68: Identifying Mandrel (23-1380)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2260 MANDREL

Mandrel Minimum set: Mechanical tools MW

NOTE: **(Fitting mandrel) For driving in the radial sealing ring on the gearshift shaft of the rear section of transmission housing**

Storage Location

A10

SI number

01 07 90 (244)



Fig. 69: Identifying Mandrel (23-2260)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2280 PLATE

Plate MW

NOTE: **(Extractor plate) For the front section of the transmission housing**

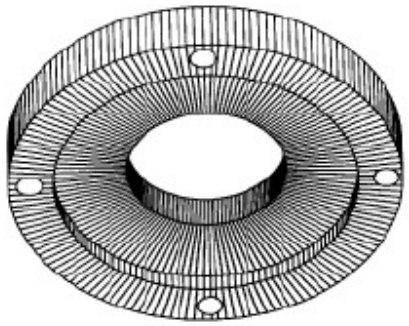
Storage Location

Z4

Z3

SI number

01 07 90 (244)



W23 2 280

Fig. 70: Identifying Plate (23-2280)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2210 PLIERS

Pliers MW

NOTE: (Circlip pliers (straight)) For removing and installing the inside circlip in the transmission housings when replacing the grooved ball bearings



W23 2 210

Fig. 71: Identifying Pliers (23-2210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2100 PLIERS

Pliers MW

NOTE: **For removing and fitting the circlip on the transmission output shaft**



W23 2 100

Fig. 72: Identifying Pliers (23-2100)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2200 PLIERS

Pliers MW

NOTE: **(Seeger ring pliers (straight)) For removing and installing the outer Seeger rings on the gearbox shaft**



W23 2 200

Fig. 73: Identifying Pliers (23-2200)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3210 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: **For removing shaft seal on output shaft**

Storage Location

A50

SI number

01 11 04 (093)



Fig. 74: Identifying Puller (23-3210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3200 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: For removing shaft seal on drive shaft

Storage Location

A49

A50

SI number

01 11 04 (093)



Fig. 75: Identifying Puller (23-3200)

Courtesy of BMW OF NORTH AMERICA, INC.

23-0210 PULLER

Puller Minimum set: Mechanical tools MW

NOTE: For removing radial shaft seal on gearshift shaft - F transmission

Storage Location

A12

SI number

01 14 99 (482)

Consisting of:

1 = 0493632 Basic body

2 = 0493633 Spindle

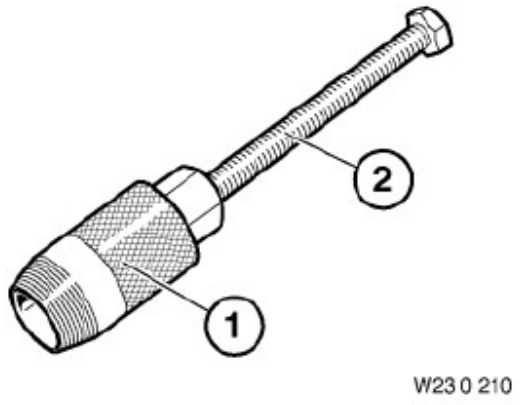


Fig. 76: Identifying Puller (23-0210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0490 PULLER

Puller MW

NOTE: For removing shaft seal

Storage Location

A13

B13

SI number

01 15 96 (106)

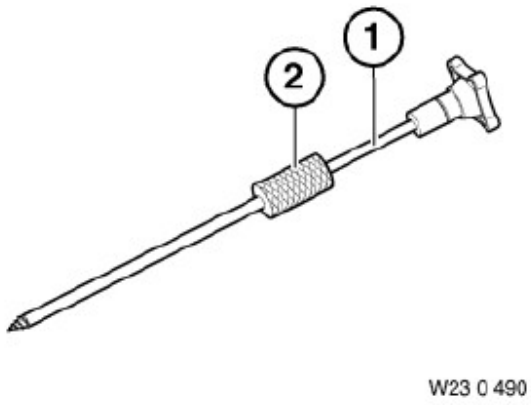


Fig. 77: Identifying Puller (23-0490)
Courtesy of BMW OF NORTH AMERICA, INC.

Consisting of:

1 = 0491455 Rod

NOTE: With self-tapping screw

2 = 0491456 Weight

NOTE: (Weight)

23-2000 PULLER

Puller MW

NOTE: (Rillex ball-bearing extractor 6206) 9 ball bearings with steel cage - For pulling out the grooved ball bearing of the transmission drive shaft

Consisting of:

1 = 0491537 Claw

NOTE: (Claw for Rillex 6206 (9 x))

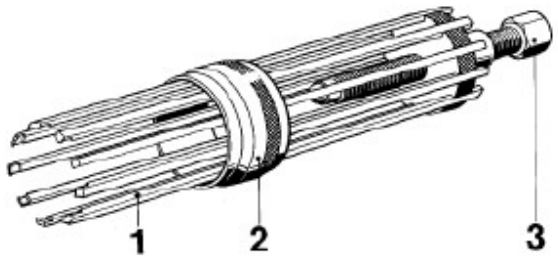


Fig. 78: Identifying Puller (23-2000)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0491538 Holding sleeve

NOTE: (Union sleeve)

3 = 0491539 Spindle

NOTE: (pressure spindle)

23-1070 RING

Ring MW

NOTE: (Measuring ring) For determining the shim between the outer bearing race and the countershaft circlip

Storage Location

X6



Fig. 79: Identifying Ring (23-1070)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0180 RING

Ring Minimum set: Mechanical tools MW

NOTE: **(impact ring with sliding sleeve) For fitting the radial shaft seal to the input end - F transmission**

SI number

01 14 99 (482)

Consisting of:

1 = 0493424 Ring

NOTE: **(impact ring)**

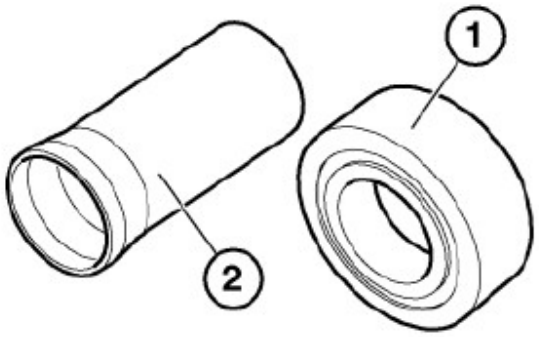


Fig. 80: Identifying Ring (23-0180)
Courtesy of BMW OF NORTH AMERICA, INC.

2 = 0493425 Sleeve

NOTE: **(Sliding sleeve)**

23-3169 SET OF TOOLS

Set of tools Minimum set: Mechanical tools

NOTE: **Removing and installing shaft seals on output side**

Transmission: GS6-37BZ

23-2080 SHAPED ELEMENT

Shaped element MW

NOTE: **For pressure testing the guide sleeve - 2nd/3rd gear**

Storage Location

Y8

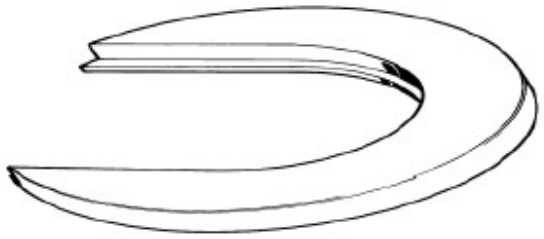


Fig. 81: Identifying Shaped Element (23-2080)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2460 SLEEVE

Sleeve MW

NOTE: (Assembly sleeve) For the retaining ring on the drive shaft

Storage Location

A7

SI number

01 02 91 (330)

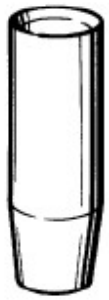


Fig. 82: Identifying Sleeve (23-2460)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2380 SLEEVE

Sleeve MW

NOTE: (assembly sleeve) For the circlip on the drive shaft

Storage Location

A7

SI number

01 02 91 (330)



Fig. 83: Identifying Sleeve (23-2380)
Courtesy of BMW OF NORTH AMERICA, INC.

23-0200 SOCKET

Socket Minimum set: Mechanical tools MW

NOTE: (Socket) SW41 Long version for loosening and tightening output flange - F-transmission

Storage Location

A9

SI number

01 14 99 (482)



Fig. 84: Identifying Socket (23-0200)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1210 SOCKET WRENCH INSERT

Socket wrench insert MW

NOTE: (socket wrench insert SW30) For releasing and tightening down gearbox output flange and rear axle final drive flange

Storage Location

A9



Fig. 85: Identifying Socket Wrench Insert (23-1210)
Courtesy of BMW OF NORTH AMERICA, INC.

23-2320 SOCKET WRENCH INSERT

Socket wrench insert Minimum set: Mechanical tools MW

NOTE: (socket wrench insert WAF 36) For loosening and tightening the collar nut

Storage Location

A13

SI number

01 07 90 (244)



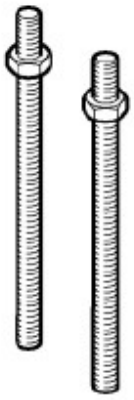
W23 2 320

Fig. 86: Identifying Socket Wrench Insert (23-2320)
Courtesy of BMW OF NORTH AMERICA, INC.

23-1230 SPINDLE

Spindle MW

NOTE: (spindle (2 pieces)) For pulling off the bearing inner race from the drive shaft in the front section of the transmission housing



W23 1 230

Fig. 87: Identifying Spindle (23-1230)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3150 TOOL

Tool Minimum set: Mechanical tools MW

NOTE: **(Tool set) For removing and installing the radial shaft seal of the drive shaft. Transmission: GS6-37BZ/DZ (H transmission)**

Storage Location

B44

C44

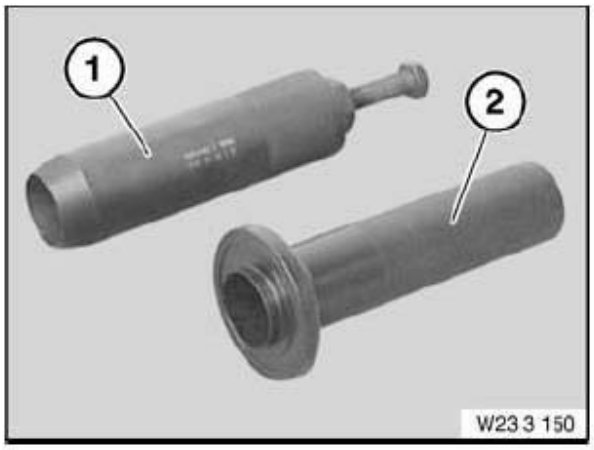


Fig. 88: Identifying Tool (23-3150)
Courtesy of BMW OF NORTH AMERICA, INC.

SI number

01 10 02 (907)

Consisting of:

1 = 0494411 Puller

2 = 0494412 Mandrel

NOTE: **(Drift)**

23-1310 TOOL

Tool MW

NOTE: **For inserting the fuse on the relay lever**



W23 1 310

Fig. 89: Identifying Tool (23-1310)
Courtesy of BMW OF NORTH AMERICA, INC.

23-3160 TOOL

Tool Minimum set: Mechanical tools MW

NOTE: (Tool set) For removing and installing the radial shaft seal of the output shaft. Transmission: GS6-37BZ/DZ (H transmission)

Storage Location

B44

C44

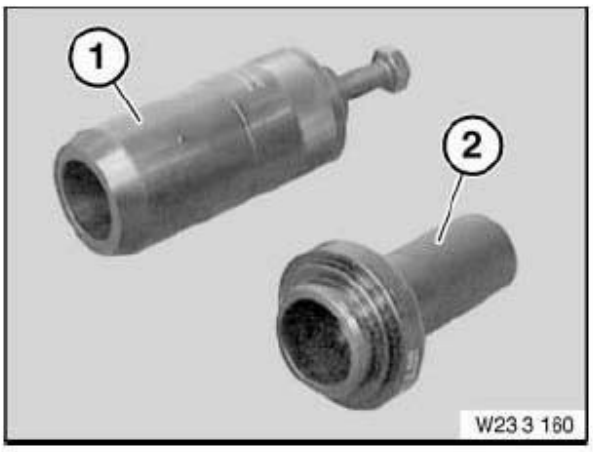


Fig. 90: Identifying Tool (23-3160)
Courtesy of BMW OF NORTH AMERICA, INC.

SI number

01 10 02 (907)

Consisting of:

1 = 0494414 Puller

2 = 0494415 Mandrel

NOTE: **(Drift)**

2300 COMPLETE TRANSMISSION

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct

- Pour oil only into appropriately marked containers
- Do **not** pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
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- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

00 11.. ... DRAINING/TOPPING UP GEAR OIL IN MANUAL TRANSMISSION

NOTE: Gearbox must be at normal operating temperature.

Gear oil:

- Refer to **MANUAL TRANSMISSION - OPERATING FLUIDS**

Filling capacities:

- See **TRANSMISSION FILLING CAPACITIES** or **TRANSMISSION FILLING CAPACITIES**

Draining gear oil:

- Release oil drain plug (1) and filler plug (2).
- Clean oil drain plug (1) and screw in.

Tightening torque **23 00 4AZ** .

Fill transmission with ATF.

- Pour in gear oil until overflowing.
- Tighten in filler screw (2).

Tightening torque: **23 00 4AZ** .

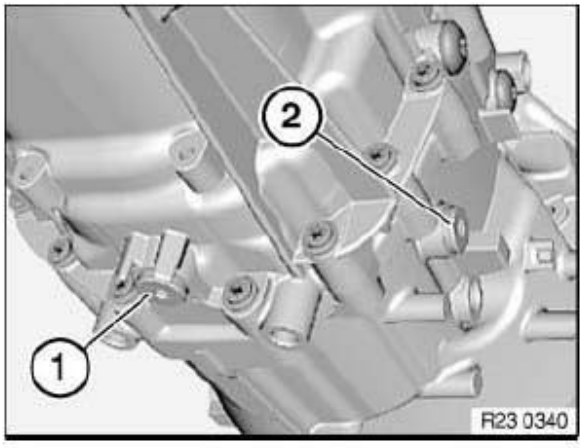


Fig. 1: Identifying Gear Oil Drain Plug And Filler Plug
Courtesy of BMW OF NORTH AMERICA, INC.

23 00 037 INSTALLING REPLACEMENT TRANSMISSION (GS6-53BZ/DZ)

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .

Use only the approved transmission fluid. See MANUAL TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this instruction will result in serious damage to the transmission.

Recycling

Catch and dispose of escaping transmission fluid.

Observe country-specific waste-disposal regulations

Necessary preliminary tasks

- Drain gear oil at oil drain plug. Tightening torque: **23 00 4AZ** .
- **REMOVE TRANSMISSION** .

If necessary, unfasten screws.

Remove and convert transmission bearing block.

Tightening torque **22 32 2AZ** .

NOTE: Illustration shows E46.

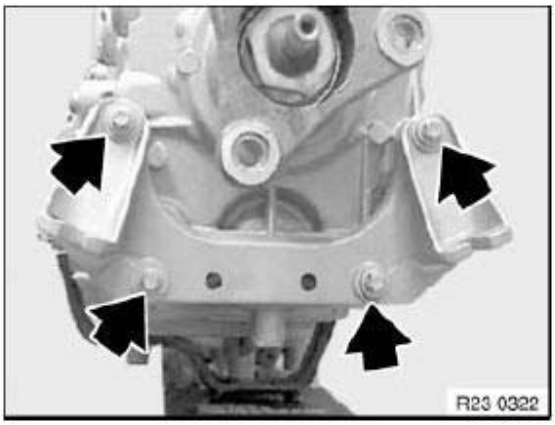


Fig. 2: Locating Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Convert shift rod joint.

Push back retaining ring (1) and drive out dowel pin (2).

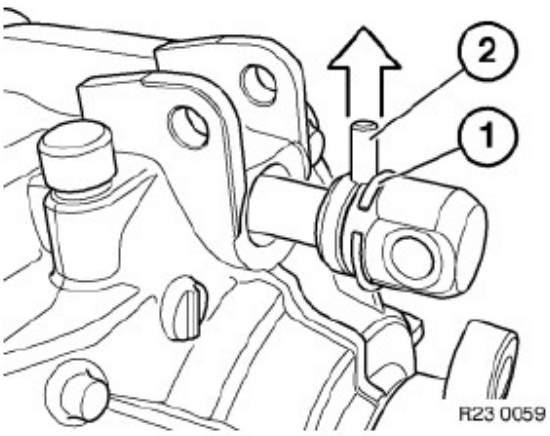


Fig. 3: Removing Dowel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Check damping disk (6) for damage and replace if necessary.

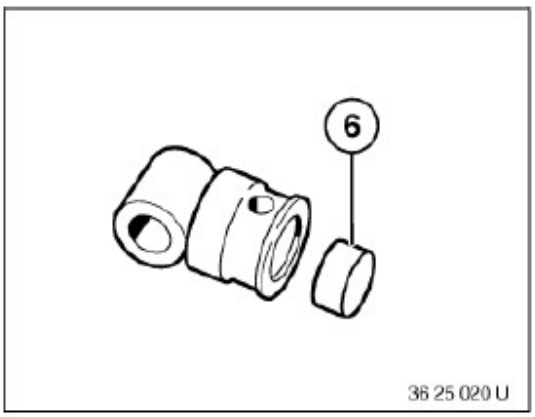


Fig. 4: Identifying Damping Disk
Courtesy of BMW OF NORTH AMERICA, INC.

Convert following parts from previous transmission to new transmission.

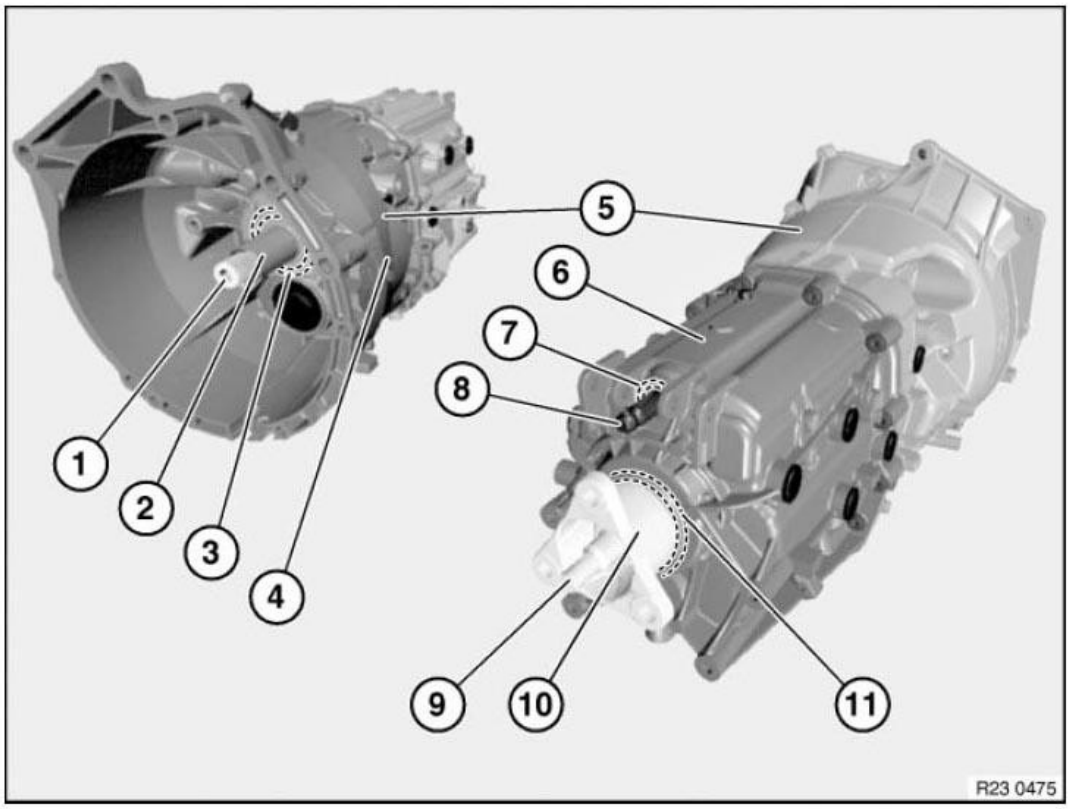
- **RELEASE BEARING AND RELEASE LEVER** .
- Ball pin and spring wire clip
- Studs for clutch slave cylinder.

Check oil level.

Installation:

Observe greasing specification. See **MANUAL TRANSMISSION - OPERATING FLUIDS** .

23 00 ... OVERVIEW OF TRANSMISSION HOUSING (GS6-53BZ/DZ)



0	General information	Complete transmission, oil change, transmission designations
1	Input shaft	
2	Guide tube	
3	Radial seal	For drive shaft
4	Transmission housing, front section	
5	Internal components	
6	Transmission housing, rear section	shafts, gear wheels, gearshift components
7	Radial seal	For selector shaft
8	Shift shaft	
9	Output shaft	
10	Output flange	
11	Radial seal	For output flange

Fig. 5: Overview Of Transmission Housing
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION HOUSING COMPONENTS

General information	Complete transmission, oil change, transmission designations

1 Input shaft	
2. **Guide tube**	
3. **Radial seal**	For drive shaft
4 Transmission housing, front section	
5 Internal components	
6 Transmission housing, rear section	shafts, gear wheels, gearshift components
7 **Radial seal**	For selector shaft
8 Shift shaft	
9 Output shaft	
10 **Output flange**	
11 **Radial seal**	

23 00 018 REMOVING AND INSTALLING TRANSMISSION (GS6-53BZ) N54

IMPORTANT: After completion of work, check TRANSMISSION OIL LEVEL .

Use only approved MANUAL TRANSMISSION - OPERATING FLUID .

Failure to comply with this instruction will result in serious damage to the transmission.

IMPORTANT: Aluminum screws/bolts must be replaced each time they are released.

Aluminum screws/bolts are permitted with and without color coding (blue).

For reliable identification:

Aluminum screws/bolts are **not magnetic.**

Jointing torque and angle of rotation must be observed without fail **(risk of damage).**

Necessary preliminary work

- Clamp off battery. See **61 20 900 DISCONNECTING AND CONNECTING BATTERY NEGATIVE LEAD**
- Remove **FRONT UNDERBODY PROTECTION**
- Remove rear underbody protection
- Remove complete **EXHAUST SYSTEM**
- Remove heat shields
- Support engine with jack when removing gearbox

Remove holder (1).

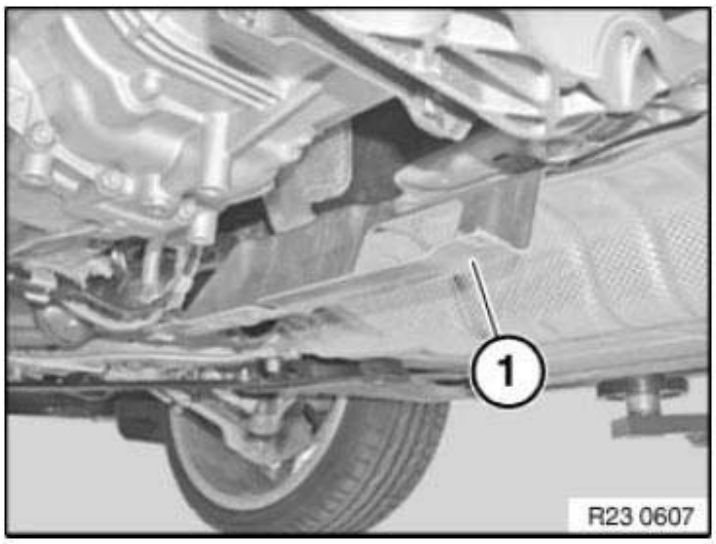


Fig. 6: Identifying Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Disconnect connector (2).

Steel screws, tightening torque **23 00 1AZ** .

Aluminum screws, tightening torque **23 00 2AZ** .

Release aluminum screws with special tool **00 9 010** .

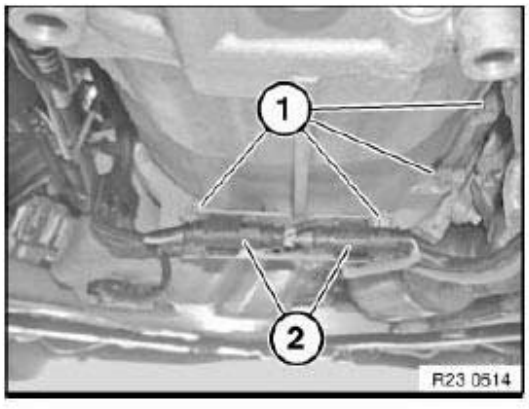


Fig. 7: Identifying Connector
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove holder (2).

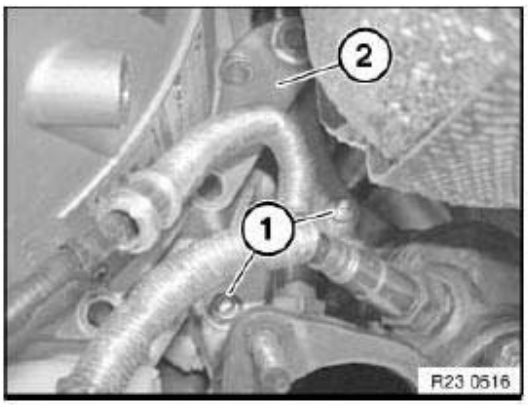


Fig. 8: Identifying Holder Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock connector (1) from reversing light switch and detach.

Release cable from brackets.

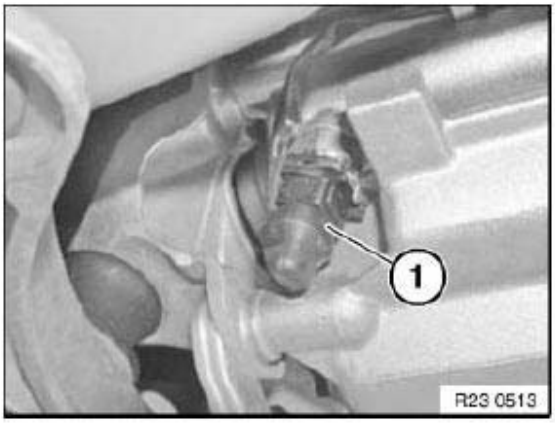


Fig. 9: Identifying Plug Connection
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1).

Remove exhaust bracket (2).

Tightening torque **23 71 4AZ** .

NOTE: Graphic similar

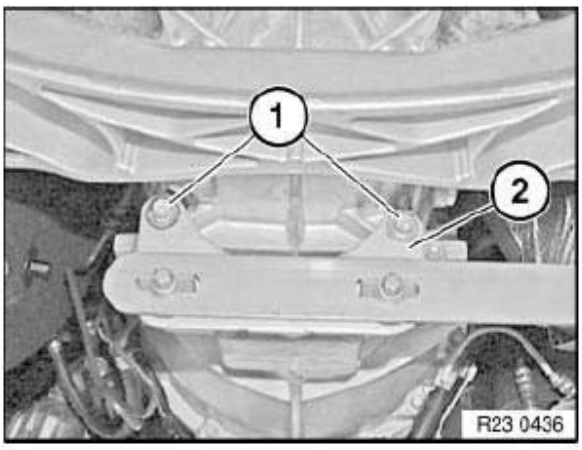


Fig. 10: Identifying Exhaust System Bracket With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools **23 4 050** , **00 2 030** .

Secure transmission to mounting with tensioning strap (1).

After completion of work, check transmission oil level.

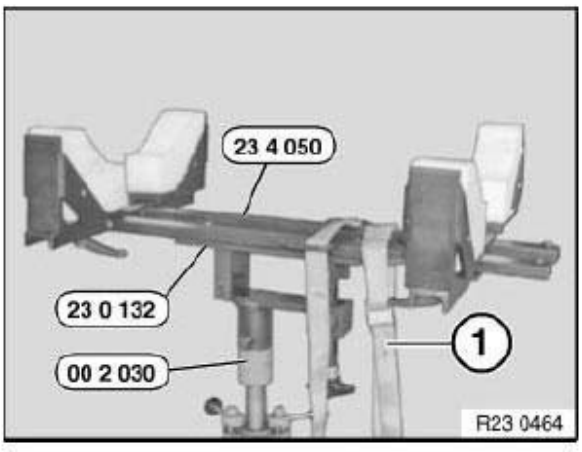


Fig. 11: Supporting Transmission Using Special Tools (23 4 050)
Courtesy of BMW OF NORTH AMERICA, INC.

Release bolts (1) and nuts (2) and remove cross-member.

Tightening torque **23 71 2AZ** .

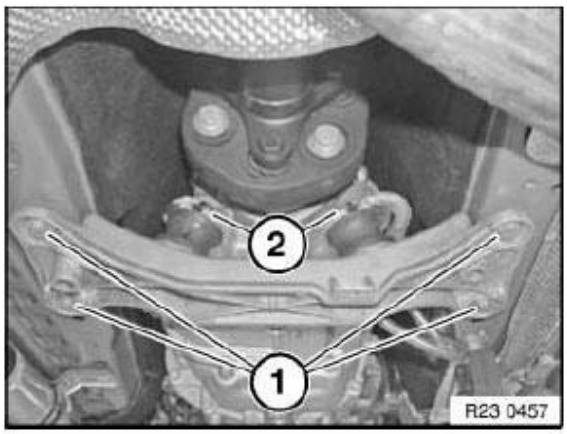


Fig. 12: Identifying Cross-Member Bolts And Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

- Remove propeller shaft from transmission. See **26 11 000 REMOVING AND INSTALLING PROPELLER SHAFT (INSERTED) COMPLETELY** .

IMPORTANT: Do not allow propeller shaft to hang from fixed ball joint (risk of damage).

NOTE: Pressure line of clutch slave cylinder remains connected.

IMPORTANT: Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing cup.

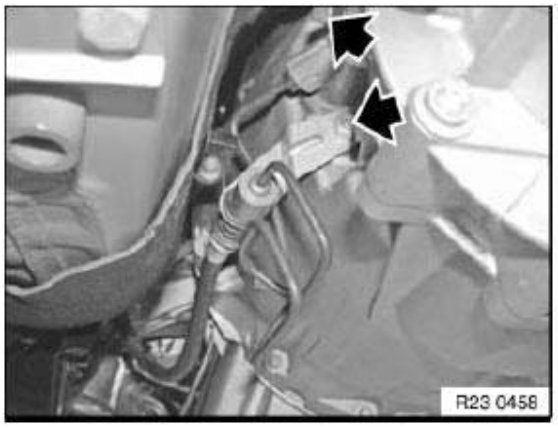


Fig. 13: Locating Clutch Slave Cylinder Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove clutch slave cylinder.

Tightening torque **21 52 5AZ** .

Lever out retainer (1).

Disengage gearshift rod (2).

Installation note:

Grease gearshift rod.

Grease, refer to **MANUAL TRANSMISSION - OPERATING FLUIDS** .

Make sure shims (3) are in correct position.

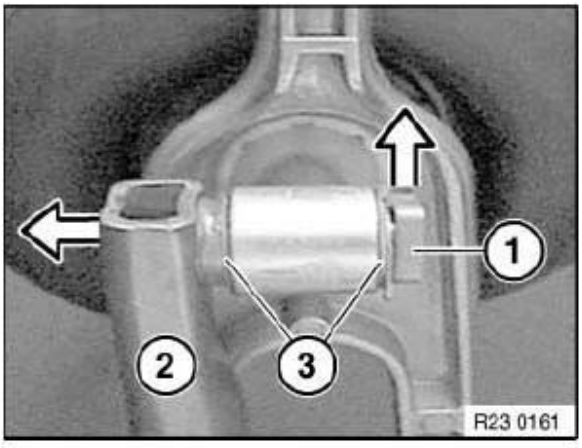


Fig. 14: Disengaging Shift Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Unlock bearing journal (1) in direction of arrow and remove.

Lift out gearshift arm.

Installation note:

Grease bearing journals (1).

Grease, refer to **MANUAL TRANSMISSION - OPERATING FLUIDS** .

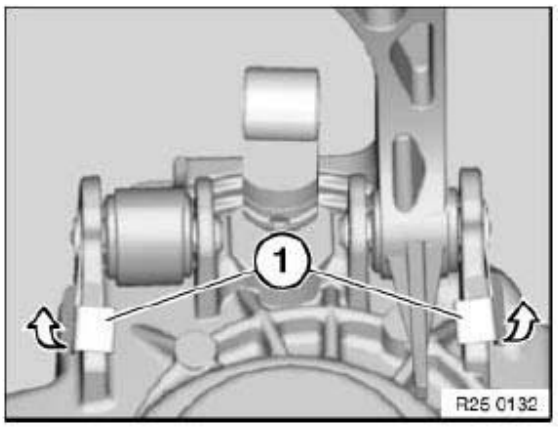


Fig. 15: Removing Bearing Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws.

Steel screws, tightening torque **23 00 1AZ** .

Aluminum screws/bolts (3, 4, 5, 9, 10), tightening torque **23 00 2AZ** .

IMPORTANT: Do not suspend the transmission from the transmission input shaft during removal and installation as this will deform the clutch disc. Pull out transmission towards rear and remove.

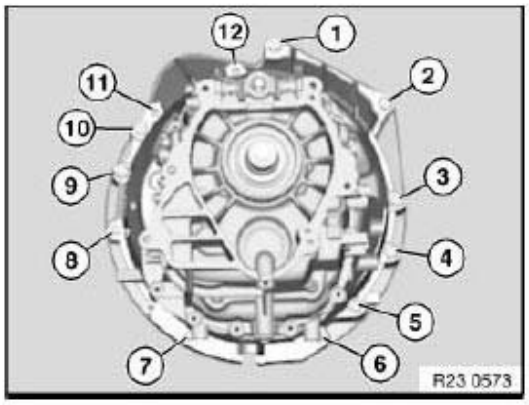


Fig. 16: Identifying Aluminum Screws And Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Tighten down screws/bolts to specified torque.

Special angle-of-rotation tool **00 9 120** with magnet **00 9 130** .

Secure to vehicle underbody and screw down aluminum screws/bolts in accordance with angle of rotation.

Angle of rotation **23 00 2AZ** .

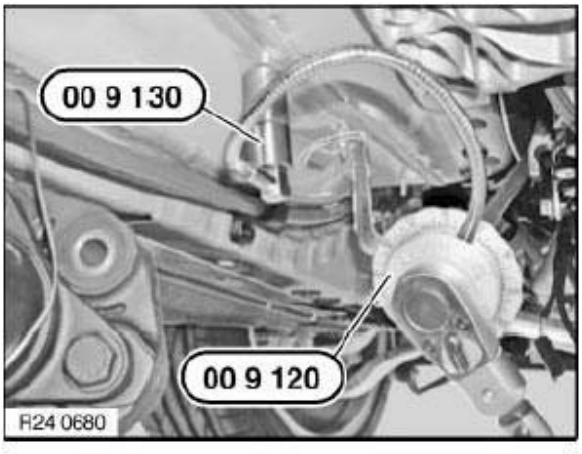


Fig. 17: Securing Angle Of Rotation Using Special Tool (00 9 120) And Magnet (00 9 130)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Check that fitting sleeves are correctly fitted.

Replace damaged fitting sleeves.

Ensure correct position of cover plate.

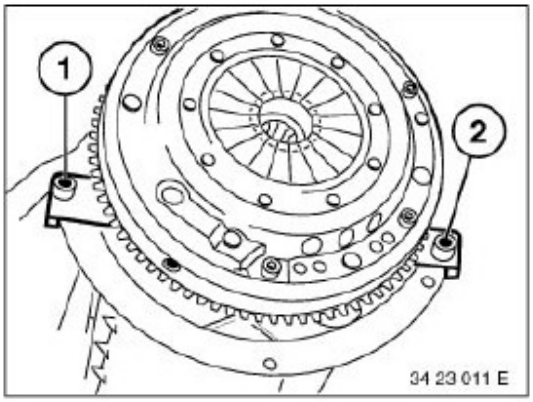


Fig. 18: Identifying Fitting Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Check lubrication of transmission input shaft for sticky consistency. If grease is sticky, clean transmission input

shaft and **REPLACE CLUTCH DISC** .

Check clutch disc for friction rust in gearing and **REPLACE** if necessary.

Mechanically remove existing grease and lining abrasion from gearing of clutch disc (with a cloth).

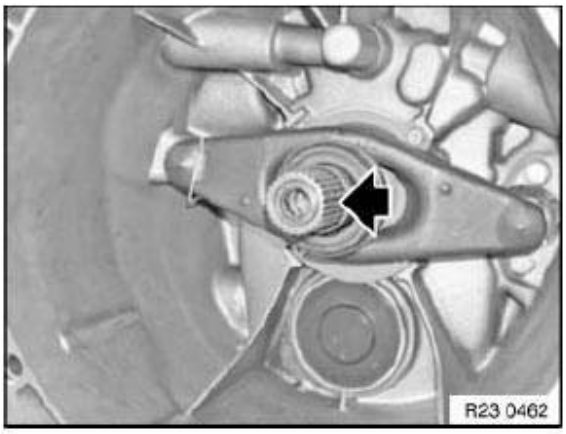


Fig. 19: Locating Transmission Input Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Greasing specification:

- Remove and clean **RELEASE BEARING AND RELEASE LEVER** .
- Push on grease scraper ring **21 2 240** to the limit position.
- Grease gearing (1) of input shaft with a brush. refer to **MANUAL TRANSMISSION - OPERATING FLUIDS** .
- Detach grease scraper ring.

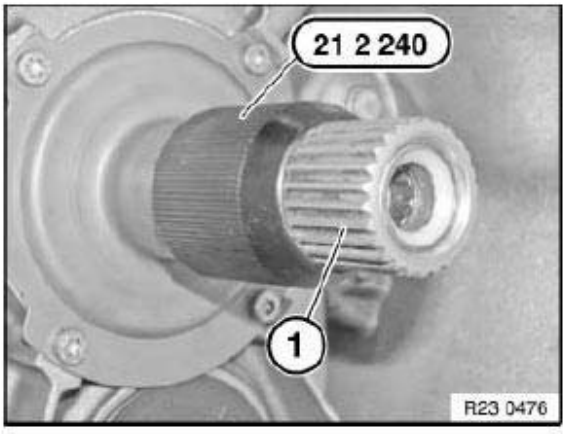


Fig. 20: Identifying Grease Scraper Ring (21 2 240) And Splines

Courtesy of BMW OF NORTH AMERICA, INC.

23 01 010 REPLACING SEALING CAP (GS6-17BG/DG)

Necessary preliminary work

- Remove gearbox
- Remove **CLUTCH RELEASE BEARING/LEVER**

Drive a hole into the sealing cap (1) with a suitable tool (2).

IMPORTANT: Do not use a drill as drillings may result in transmission malfunction.

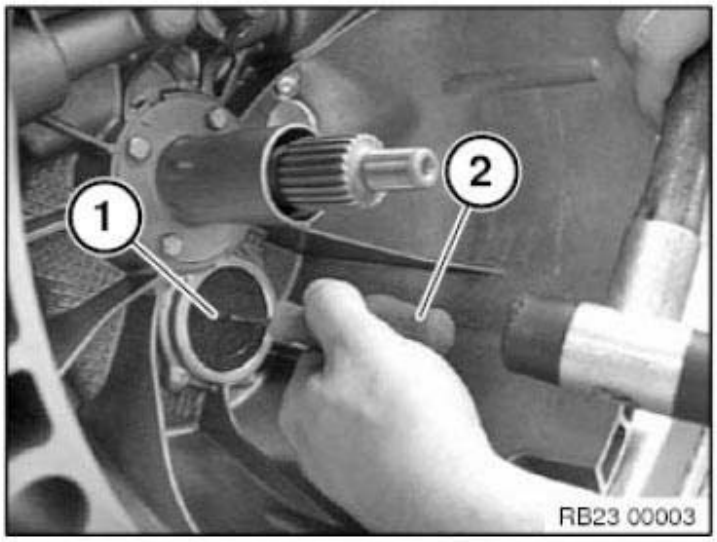


Fig. 21: Drilling Hole Into Sealing Cap Using Suitable Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool **23 0 490** into sealing cap.

Withdraw sealing cap from transmission housing with aid of impact weight.

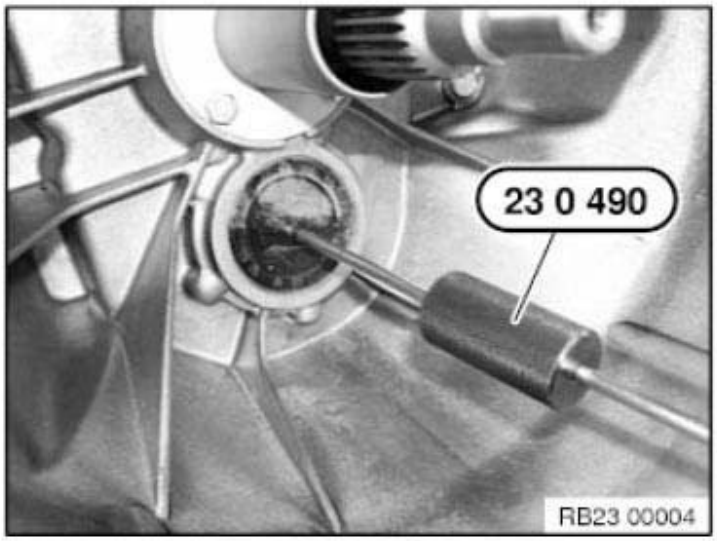


Fig. 22: Turning Sealing Cap Using Special Tool (23 0 490)
Courtesy of BMW OF NORTH AMERICA, INC.

Apply transmission oil to the sealing lip of the sealing cap (1) and insert.

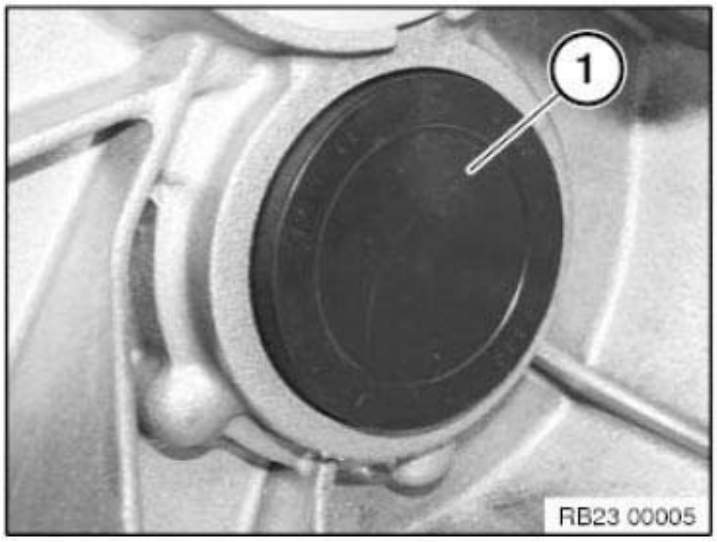


Fig. 23: Identifying Sealing Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Drive sealing cap firmly home with special tool **23 0 330** .

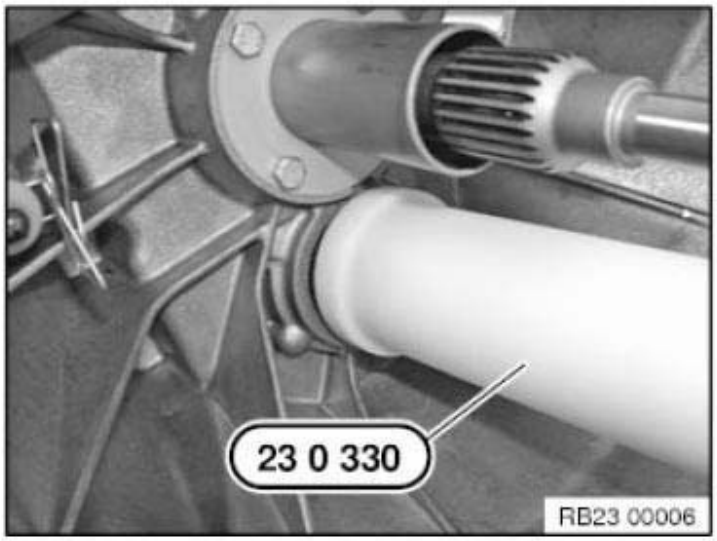


Fig. 24: Driving Sealing Cap Using Special Tool (23 0 330)
Courtesy of BMW OF NORTH AMERICA, INC.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures

- **Eye contact:** Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Risk of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
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- Wear oil-resistant protective gloves
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- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!

RISK OF INJURY if oil comes into contact with eyes and skin!

Recycling

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released

- **Personal precautionary measures:** Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- **Environmental protection measures:** Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- **Limiting spread:** Use oil blocks to prevent the surface spread of oil.

- **Cleaning procedure:** Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

23 TRANSMISSION DESIGNATIONS

Breakdown of BMW designation

BMW BREAKDOWN DESIGNATION - TRANSMISSION

A5S 300J (former designation)		
A	Transmission type	○ S = Manual gearbox ○ A = Automatic transmission
5	Number of forward gears	
S	Type of top gear	○ D = Direct gear ○ S = Overdrive gear
300	Max. input torque (Nm)	
J	Code letter of transmission manufacturer	○ G = Getrag ○ J = Jatco ○ R = GMPT (General Motors Powertrain) ○ Z = ZF (Zahnradfabrik Friedrichshafen)
SMG	Notes	SMG = Sequential M gearbox/transmission

BMW BREAKDOWN DESIGNATION - M GEARBOX/TRANSMISSION

GS6-37BZ (new designation according to BMW Group Standard GS 90007)		
G	Transmission	
S	Transmission type	○ S = Manual gearbox ○ A = Automatic transmission
6	Number of forward gears	
-		○ - = Standard with manual gearshift ○ HP = Hydraulic planetary gear train ○ DKG= Twin-clutch transmission/gearbox
37	Transmission type	○ 26 = D-transmission ○ 31 = C-transmission ○ 39 = F-transmission ○ 37 = H-transmission

		○ 53 = G-transmission ○ 17 = I-transmission ○ 47= J transmission SMG -7-speed ○ 45 = K transmission ○ 36= Transmission DKG
B	Gear set	○ B = Petrol gear ratio ○ D = Diesel gear ratio ○ S= Sport gear ratio
Z	Code letter of transmission manufacturer	○ G = Getrag ○ Z = ZF (Zahnradfabrik Friedrichshafen)

Manual gearbox

BMW BREAKDOWN DESIGNATION - MANUAL GEARBOX

BMW designation	Manufacturer	Manufacturer designation	Remarks
S5D 200G	Getrag	B transmission (220/5)	
S5D 200G	Getrag	B transmission (221/5)	for M41 engine only
S5D 250G	Getrag	B transmission (220/5)	Reinforced design
S5D 260Z	ZF	C-transmission (S5-31 D)	for M51 engine only
S5D 280Z	ZF	C-transmission (S5-31)	
S5D 310Z	ZF	C-transmission (S5-31)	up to 9.95
S5D 320Z	ZF	C-transmission (S5-31)	from 9.95 (reinforced design)
GS5S31BZ (SMG)	ZF	C transmission	SMG
GS5-39DZ	ZF	F transmission	
S6S 420G	Getrag	D-transmission (226/6)	
S6S 420G (SMG)	Getrag	D transmission	SMG
S6S 560G	Getrag	E-transmission (286/6)	
GS6-37BZ	ZF	H-transmission	
GS6S37BZ (SMG)	ZF	H-transmission	
GS6-37DZ	ZF	H-transmission	
GS6-37BG	Getrag	H-transmission	
GS6-53BZ	ZF	G-transmission	
GS6-53DZ	ZF	G-transmission	
GS6-17BG	Getrag	I-transmission	

GS6-17DG	Getrag	I-transmission	
GS7S47BG (SMG)	Getrag	J transmission (247)	SMG -7-speed
GS7D36SG	Getrag	DKG (436)	DKG -7-speed
GS6- 45BZ	ZF	K transmission	
GS6- 45DZ	ZF	K transmission	

Automatic transmission

BMW BREAKDOWN DESIGNATION - AUTOMATIC TRANSMISSION

BMW designation	Manufacturer	Manufacturer designation	Remarks
A4S 200R	GMPT	GM4	
A4S 270R	GMPT	THM-R1w	Transmission wide-stepped
A4S 310R	GMPT	THM-R1	
A5S 300J	Jatco	Jatco	
A5S 310Z	ZF	5HP-18	
A5S 325Z	ZF	5HP-19	
A5S 440Z	ZF	5HP-24	
A5S 560Z	ZF	5HP-30	
A5S 360R/390R	GM	GM5	
GA6HP19Z	ZF	6HP19	
GA6HP26Z	ZF	6HP26	
GA6HP32Z	ZF	6HP32	
GA6L45R	GM	GM6	
GA8HP45Z	ZF	8HP45	
GA8HP70Z	ZF	8HP70	
GA8HP90Z	ZF	8HP90	
GA7AHSCD	Daimler	AHS-C	Hybrid

23 ... UNIVERSAL BMW TRANSMISSION TAKE-UP

NOTE:

- **The universal transmission bracket is introduced for the E60 AWD**
- **Suitable for manual and automatic transmissions**

IMPORTANT: Front and rear supports (1) can be laterally adjusted by means of screws (2).

Carrier (3) of rear supports (1) can be longitudinally adjusted by means of screw.

Supports must be adapted in length and width to the transmission.

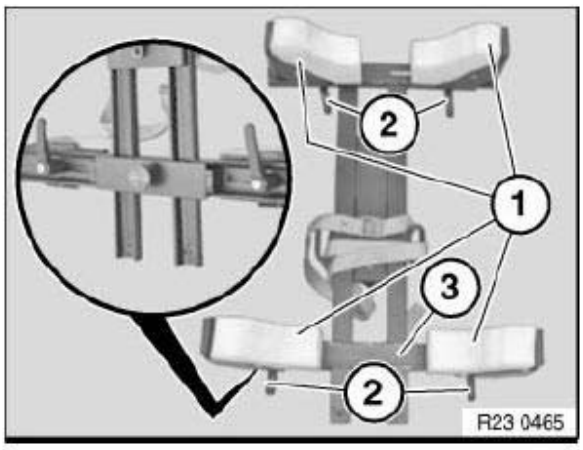


Fig. 25: Identifying Rear Support Carrier, Front And Rear Support Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Supporting transmission

Support transmission with special tools **23 4 050** , **00 2 030** .

IMPORTANT: Transmission must be secured with tensioning strap (1).

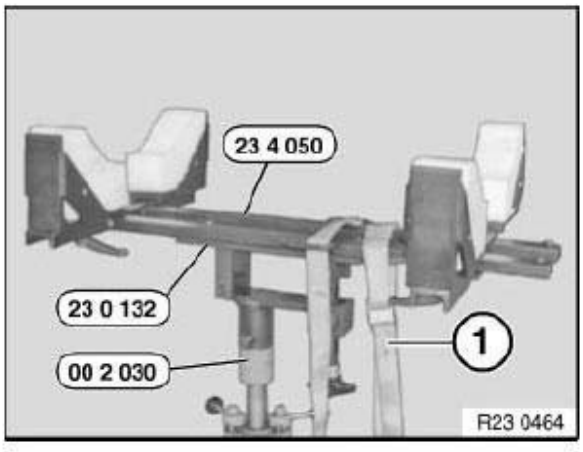


Fig. 26: Supporting Transmission Using Special Tools (23 4 050)
Courtesy of BMW OF NORTH AMERICA, INC.

23 .. ... UNIVERSAL TRANSMISSION RETAINING BRIDGE

NOTE:

- **The transmission retaining bridge 24 0 200 is suitable for both manual and automatic transmissions**

IMPORTANT: Adapters and spindles must be adapted for positive locking to the transmission.

(Risk of injury)

Adapt adapters (1) and spindle with thrust piece (3) to transmission.

Adapt length with slide (2).

Screw in spindle (4).

IMPORTANT: Before mounting on assembly stand 00 1 450, check retaining bridge for secure seating.

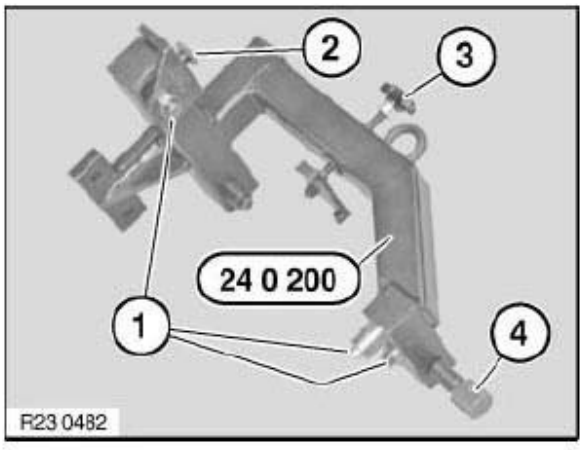


Fig. 27: Identifying Transmission Retaining Bridge, Adapters, Spindle
Courtesy of BMW OF NORTH AMERICA, INC.

2311 HOUSING WITH COVER

23 11 615 REPLACING GUIDE TUBE FOR CLUTCH RELEASE UNIT (GS6-53BZ/DZ)

NOTE: (transmission removed)

Necessary preliminary tasks

- Remove **CLUTCH RELEASE BEARING AND RELEASE LEVER** from guide tube

Release screws.

Remove guide tube (1).

Installation:

Clean thread.

Install screws with Loctite 243.

Tightening torque **23 11 2AZ** .

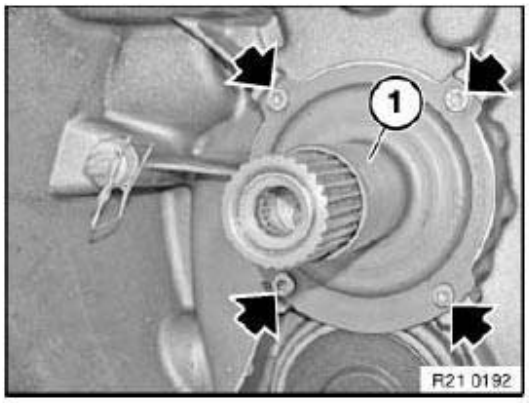


Fig. 28: Identifying Guide Tube With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Remove sticker (1) and adhesive with a suitable solvent.

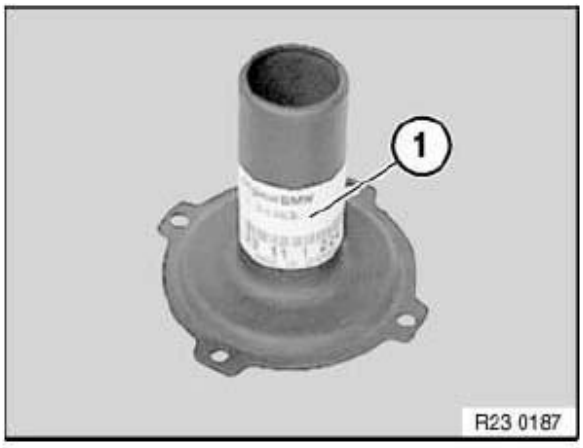


Fig. 29: Identifying Sticker
Courtesy of BMW OF NORTH AMERICA, INC.

2312 BEARING IN HOUSING, SEALING RING

23 12 510 REPLACING RADIAL SHAFT SEAL FOR DRIVE SHAFT (GS6-53BZ/DZ)

IMPORTANT: After completion of work, check TRANSMISSION FLUID LEVEL .

Use only approved MANUAL TRANSMISSION - OPERATING FLUID .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks

- Remove **TRANSMISSION** .
- Remove **CLUTCH RELEASE UNIT AND RELEASE LEVER** from guide tube.

Release screws.

Tightening torque: **23 11 2AZ** .

Remove guide tube (1).

Installation:

Clean guide tube.

Do not grease guide tube.

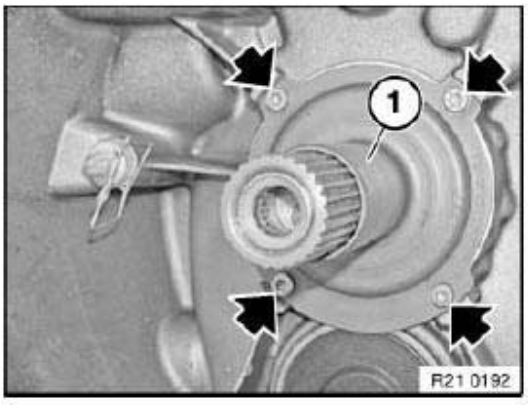


Fig. 30: Identifying Guide Tube With Mounting Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on special tool **23 3 200** .

Push special tool onto drive shaft and screw into sealing ring.

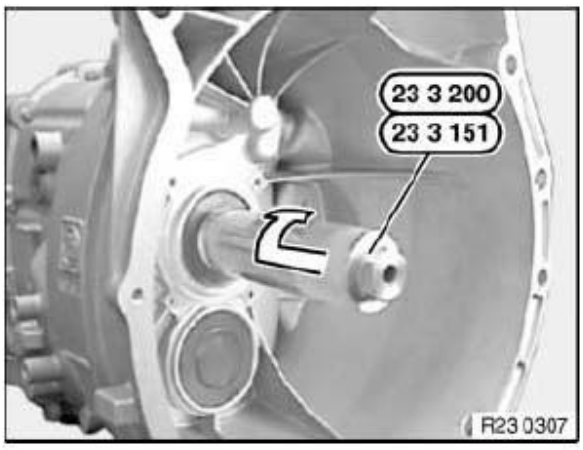


Fig. 31: Pushing Special Tool Onto Drive Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw into special tool **23 3 200** again and continue turning until sealing ring is pulled out of transmission housing.

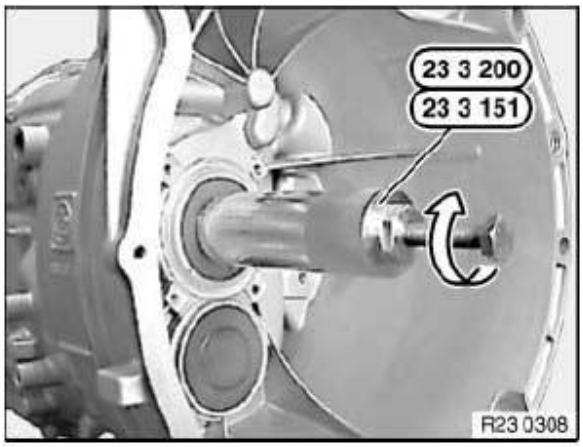


Fig. 32: Turning Screw Into Special Tool (23 3 200)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Coat sealing lips of radial seal with gear oil.

Push radial seal (1) onto drive shaft up to housing.

Drive in radial seal (1) as far as it will go with special tool **23 3 220** and plastic hammer.

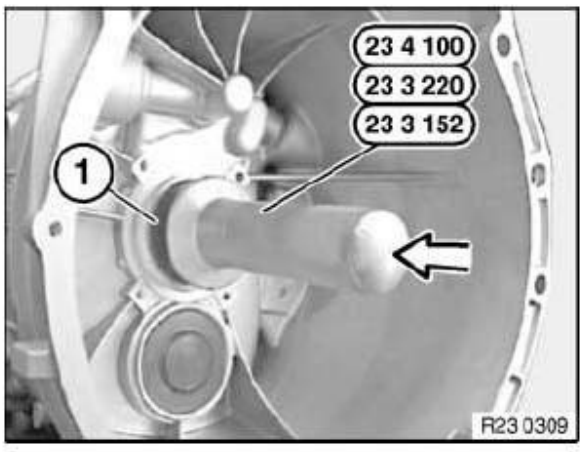


Fig. 33: Installing Radial Seal Using Special Tool 23 3 220
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 059 REPLACING RADIAL SHAFT SEAL FOR OUTPUT FLANGE (GS6-53BZ/DZ)

IMPORTANT: After completion of the work, check the TRANSMISSION OIL LEVEL .

Use only approved MANUAL TRANSMISSION - OPERATING FLUID .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary work

- Remove propeller shaft.

Tasks are described at "Removing the **PROPELLER SHAFT** ".

Brace output flange with special tool **23 0 020** .

Undo collar nuts with special tool **23 0 200** .

Installation note:

Mark flange with thermo crayon and heat to min. 80° 100°.

WARNING: Risk of burning! Fit flange with suitable protective gloves only.

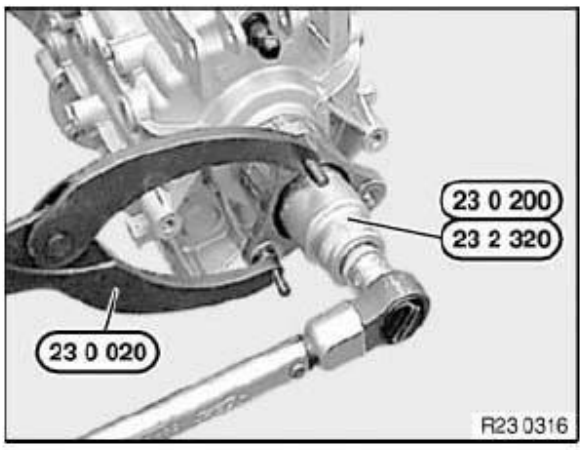


Fig. 34: Removing Collar Nut Using Special Tool (23 2 320)
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not drive on flange.

Secure collar nut with Loctite 243.

- Loctite 243: BMW Parts Department.
- Tightening torque: **23 21 1AZ** .

Detach output flange (1) with special tool **331 150 DEVICE** and adapter plate 33 1 154 from output shaft.

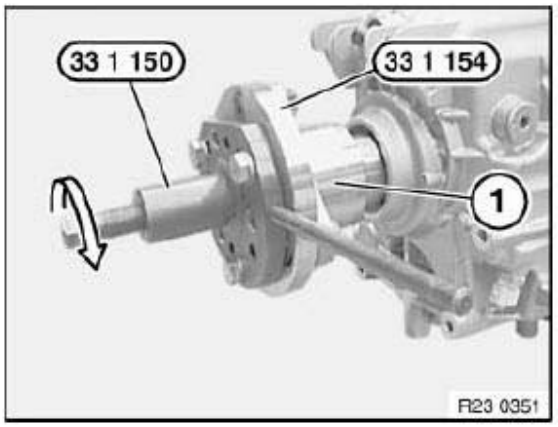


Fig. 35: Detaching Output Flange With Special Tool (33 1 150) And Adapter Plate (33 1 154)
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw on special tool **23 3 210** .

23 3 210 Push special tool over output shaft and screw firmly into sealing ring.

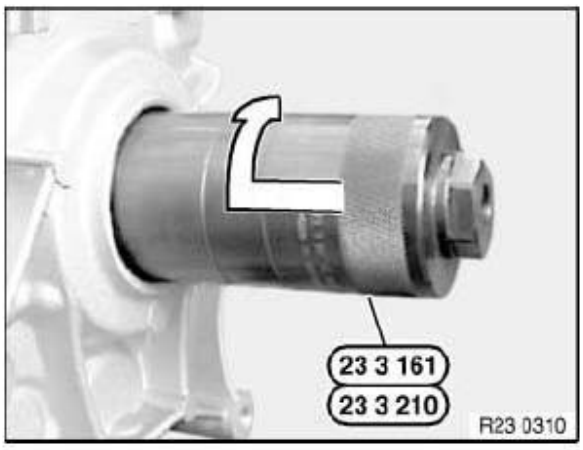


Fig. 36: Sliding Special Tool (23 3 210) Over Output Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw into special tool **23 3 210** again and continue turning until sealing ring is pulled out of transmission housing.

If necessary, remove ring spring of sealing ring.

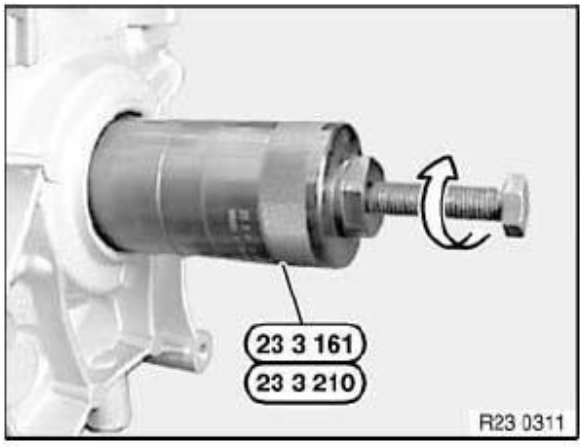


Fig. 37: Inserting Screw Into Special Tool (23 3 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Installation note:

Coat sealing lips of new radial shaft seal with transmission oil.

Drive radial shaft seal fully home using special tool **23 3 230** and plastic hammer.

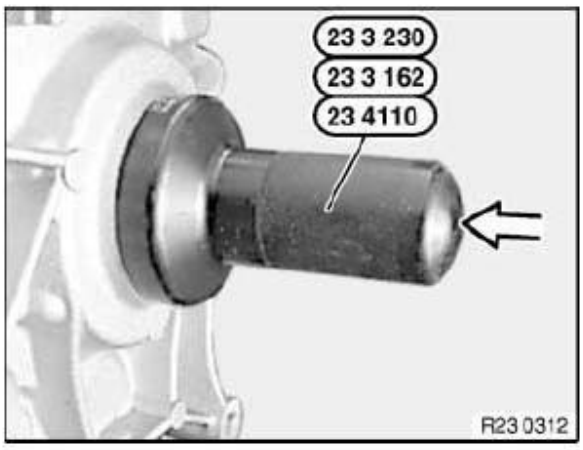


Fig. 38: Installing Radial Seal Using Special Tool (23 3 230)
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 089 REPLACING RADIAL SHAFT SEAL FOR SELECTOR SHAFT (GS6-53BZ/DZ)

IMPORTANT: After completion of work, check TRANSMISSION FLUID LEVEL .

Use only approved transmission oil. See MANUAL TRANSMISSION - OPERATING FLUID .

Failure to comply with this instruction will result in serious damage to the transmission.

Necessary preliminary tasks

- Shift transmission into 2nd gear
- Unflange propeller shaft from transmission.

Tasks are described in Removing **PROPELLER SHAFT** .

Lever retaining ring (1) out of groove with a small screwdriver.

Slide locking ring (1) towards rear.

Drive out cylinder pin (2).

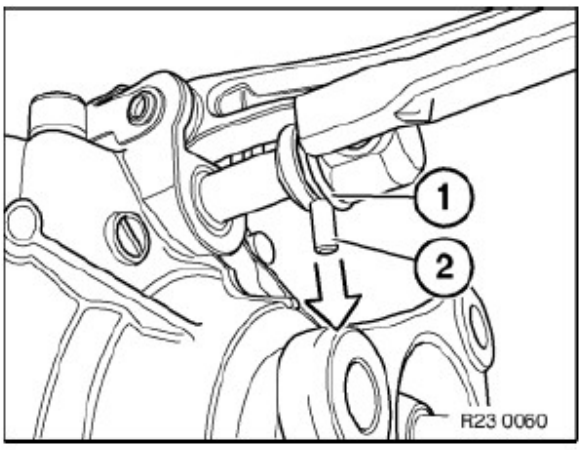


Fig. 39: Pushing Cylindrical Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool **23 0 210** until it is firmly connected with radial seal (1).

Pull out radial seal with special tool **23 0 210** .

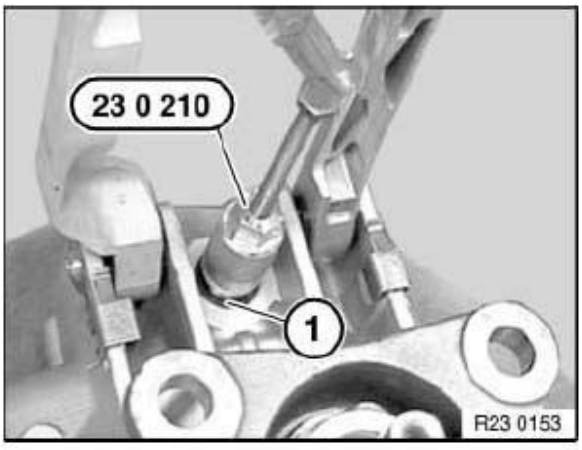


Fig. 40: Connecting Radial Shaft Seal Using Special Tool (23 0 210)
Courtesy of BMW OF NORTH AMERICA, INC.

Coat sealing lips of radial seal and selector shaft with transmission oil.

Drive in radial seal with special tool **23 0 220** .

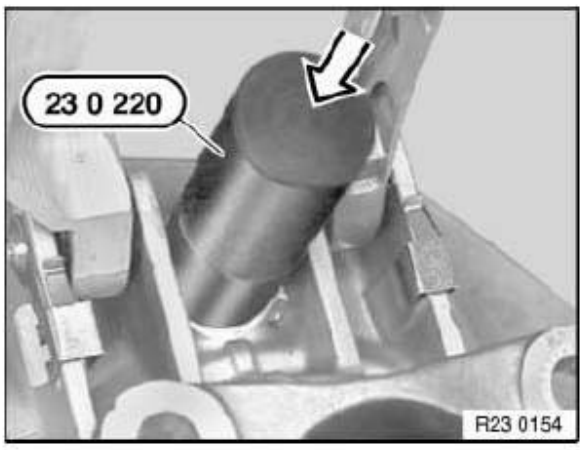


Fig. 41: Installing Radial Seal Using Special Tool (23 0 220)
Courtesy of BMW OF NORTH AMERICA, INC.

23 12 506 REPLACING THE DRIVE SHAFT RADIAL SHAFT SEAL (GS6-85BG)

NOTE: After completion of work, check gearbox oil level.

Use only the approved gearbox oil. See MANUAL TRANSMISSION - OPERATING FLUIDS .

Failure to comply with this requirement will result in serious damage to the manual transmission!

Necessary preliminary work

- Remove transmission.
- Remove clutch release bearing.

Release bolts (1) and remove guide tube (2).

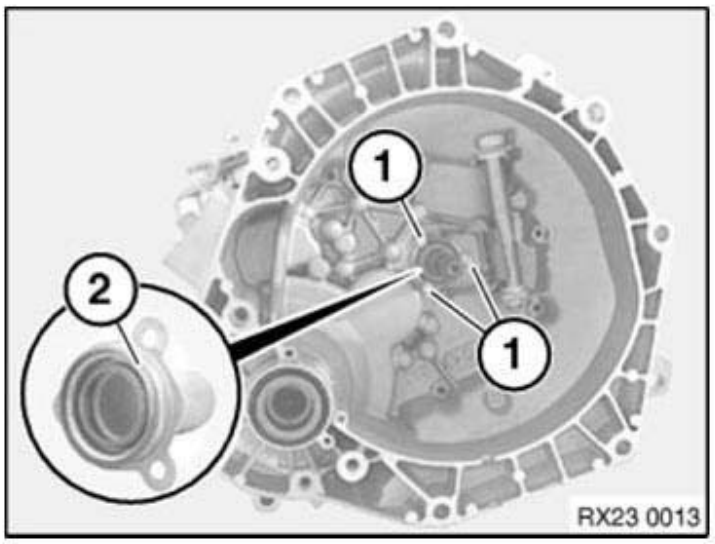


Fig. 42: Identifying Guide Tube
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The shaft seal and the guide tube are replaced together.

Installation note:

Wrap adhesive tape round keyway splines of drive shaft to avoid damaging the sealing ring while it is being installed.

Lubricate sealing lip of sealing ring.

Replace mounting bolts of guide bush.

Tightening torque **23 11 1AZ** .

STANDARD/AUTOMATIC TRANSMISSION

In today's modern vehicles, the automatic transmission has become a vital part of the powertrain. Automatic transmissions provide overall better fuel economy and efficiency while adapting to changing road conditions and driving habits. Standard transmissions offer more driver interaction with the vehicle, however automatic transmissions reduce driver fatigue and increase safety by shifting automatically. Automatic transmissions also offer improved driveability in stop and go traffic. If there is a disadvantage to an automatic transmission, it would be complexity and cost of manufacturing. See **Fig. 1**.

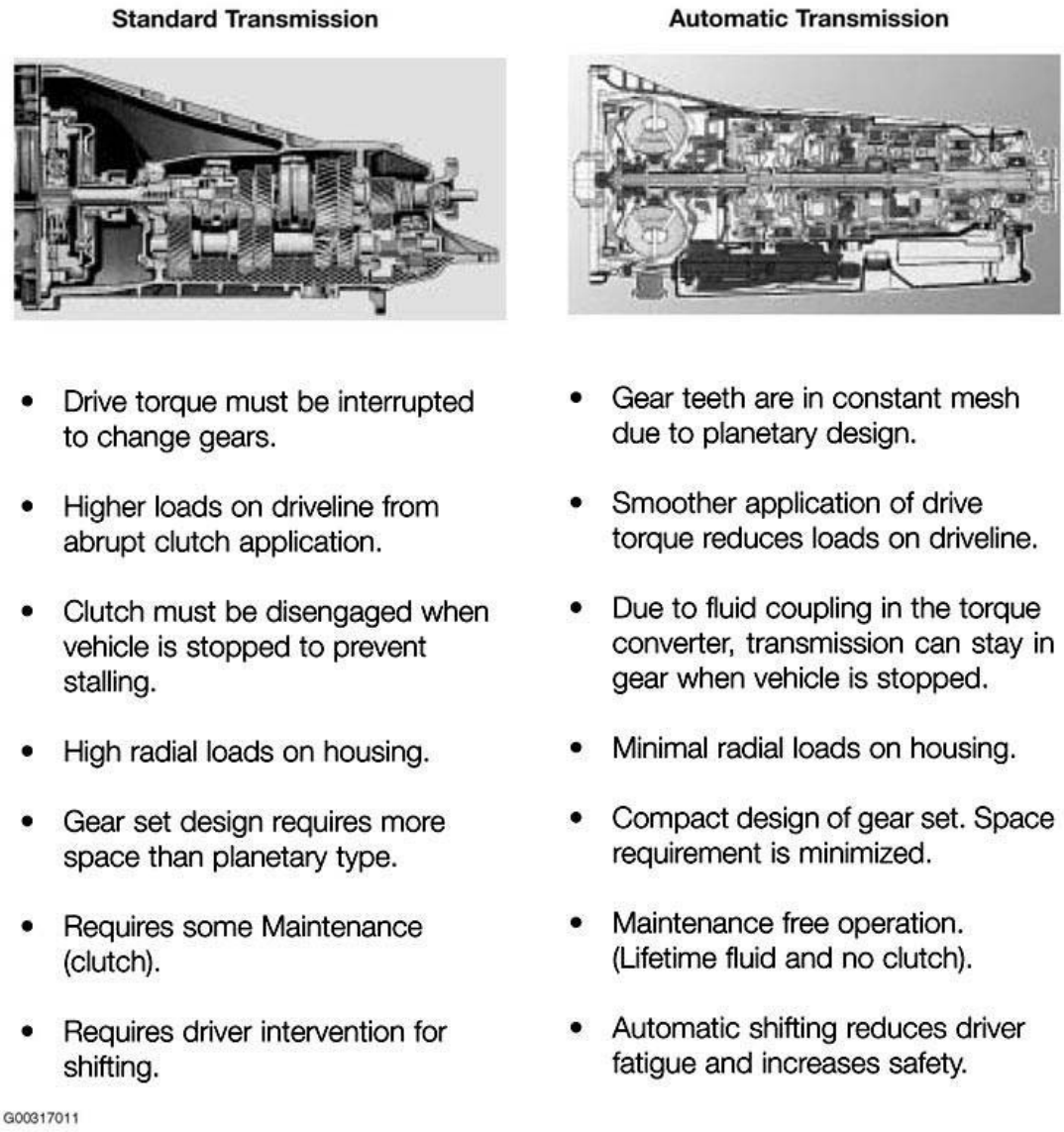


Fig. 1: Standard & Automatic Transmission Comparison
Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC TRANSMISSION VS. ELECTRO-HYDRAULIC TRANSMISSION

Since the introduction of the automatic transmission there have been numerous refinements to improve shift comfort as well as fuel economy. Early automatic transmissions used only hydraulic control, there was no electronic intervention. In 1986 BMW introduced their first EH (Electro-Hydraulic) transmission into production vehicles. The acronym EGS is used by BMW for its electronic transmission control system. EGS stands for "Electronic Transmission Control" which comes from the German words "Elektronisch Getriebe Steurung". In order to comply with SAE terminology we will refer to the EGS control module as the TCM "Transmission Control Module". EH controlled transmissions allow for optimized shift points by closely

monitoring changing conditions. Engine speed, road speed and throttle angle are some of the inputs that are monitored by the TCM to determine optimal shift points. The TCM will then process this information and control shift point via electronic solenoids mounted on the valve body. With the introduction of Adaptive Transmission Control, shift comfort and fuel economy was further improved. The TCM now monitors throttle angle deviations, wheel speeds and CAN Bus information to fine tune shift points. See **Fig. 2**.

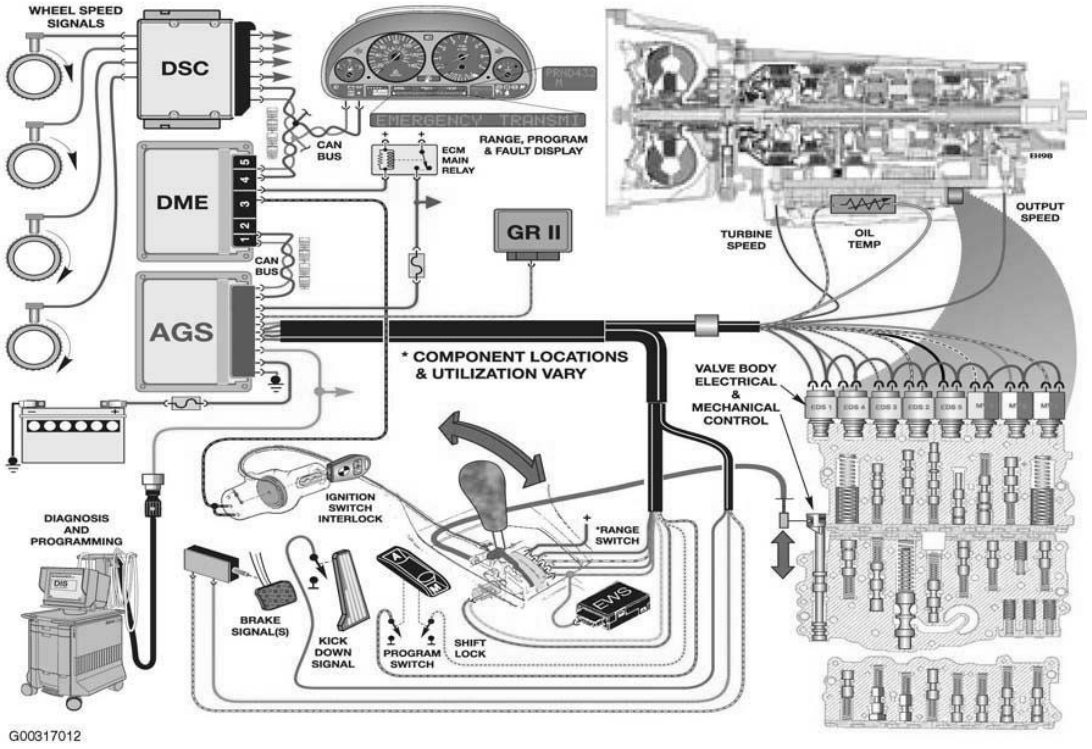


Fig. 2: Electronic Transmission Control System
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmissions are manufactured by two suppliers for the US market:

- Zahnradfabrik Friedrichshafen: Commonly referred to as ZF. ZF manufactures both manual and automatic transmissions.
- GM Powertrain - Hydramatic: Hydramatic is a manufacturing division of General Motors located in Strasbourg France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for parts ordering, information research and identification. Also, each manufacturer uses their own internal identification system. Here is a breakdown of these identification codes. See **Fig. 3**.

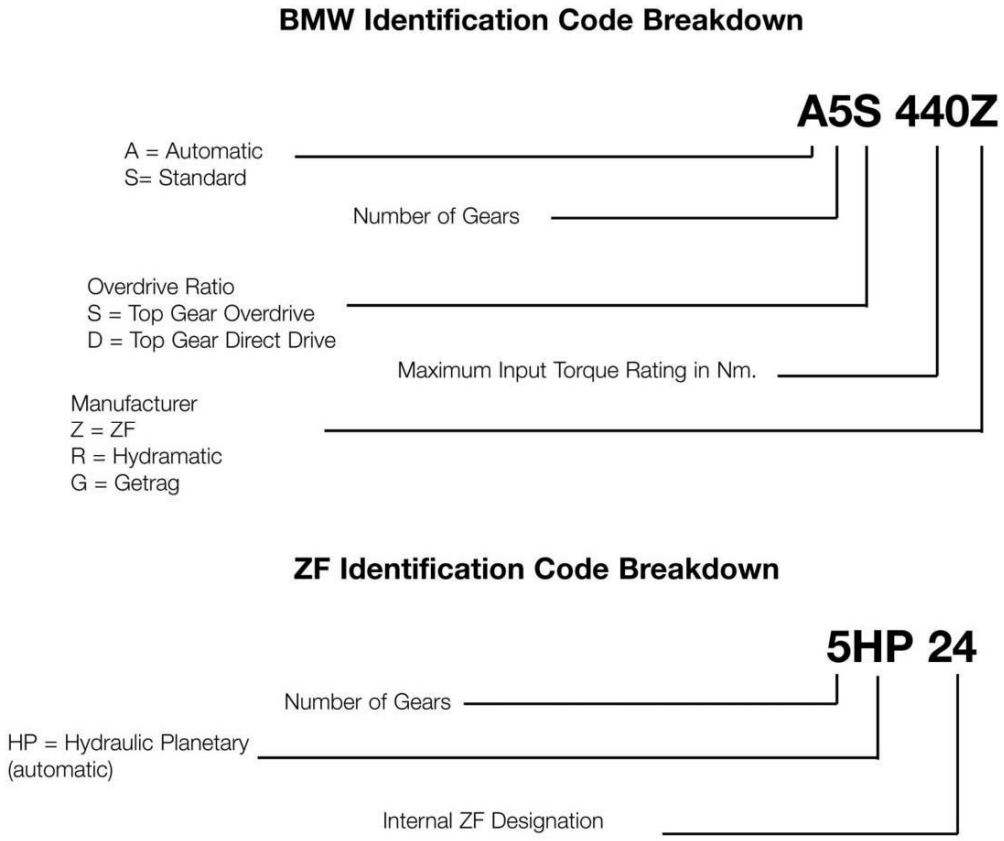


Fig. 3: Transmission Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION HYDRAULICS

TRANSMISSION FLUID (OIL)

The automatic transmission provides pressure regulated hydraulic fluid which is filtered for all of the transmissions functional requirements. See **Fig. 4**. All BMW automatic transmissions are designed to operate with specific fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty. The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (heat exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each

type of transmission fluid has properties specific for each transmission application. Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.

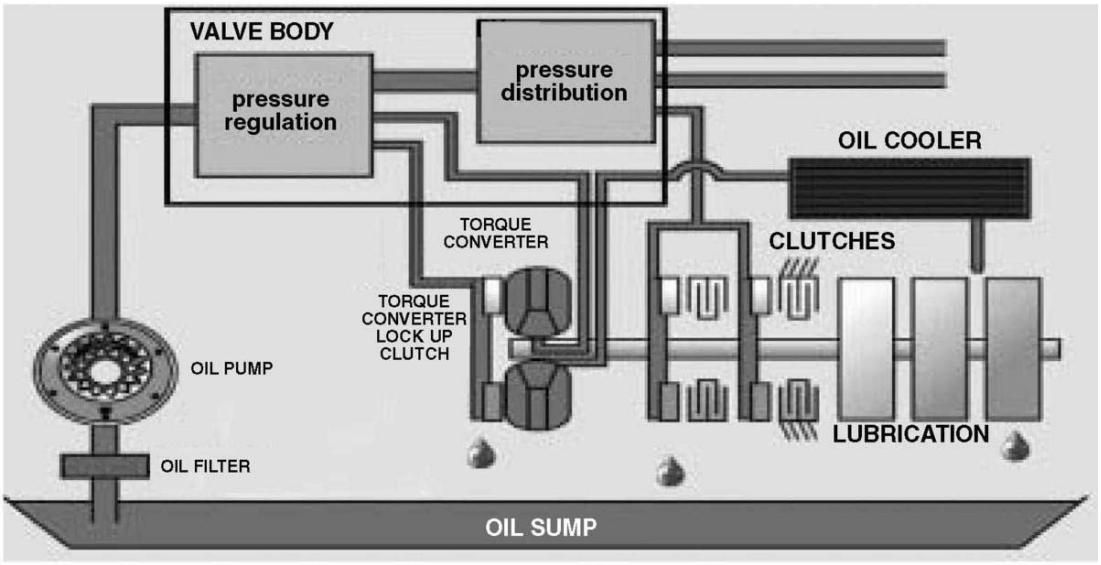


Fig. 4: Identifying Transmission Hydraulics
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FLUID APPLICATION

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission. See **Fig. 5**.

Transmission	Fluid Type	BMW Part #	Container	SIB Ref.
4HP22 **4HP24**	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S310Z 530i/iT (E34)	Dexron III	Available Commercially (Castrol or Texaco)	N/A	
M3 (E36)	ESSO LT 71141	83 22 9 407 807	20 liter contalner	B 24 03 95
A5S325Z	ESSO LT 71141	83 22 9 407 807	20 liter contalner	
A5S440Z	ESSO LT 71141	83 22 9 407 807	20 liter container	
A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93-12/94) 740i/iL-750iL (E38)	Shell LA2634	83 22 9 407 765	5 liter container	B 24 11 92
540i (3/96-12/96) 850Ci (10/94-6/97)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 02 94
A4S310R **A4S270R** **(THM-R1)**	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S360R **A5S390R**	Texaco ETL 7045E Texaco ETL 8072B	83 22 0 026 922 83 22 0 024 359	25 liter container 25 liter container	
GA6HP26Z	Shell M1375.4	83 22 0 142 516		

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Fig. 5: Transmission Fluid Application
Courtesy of BMW OF NORTH AMERICA, INC.

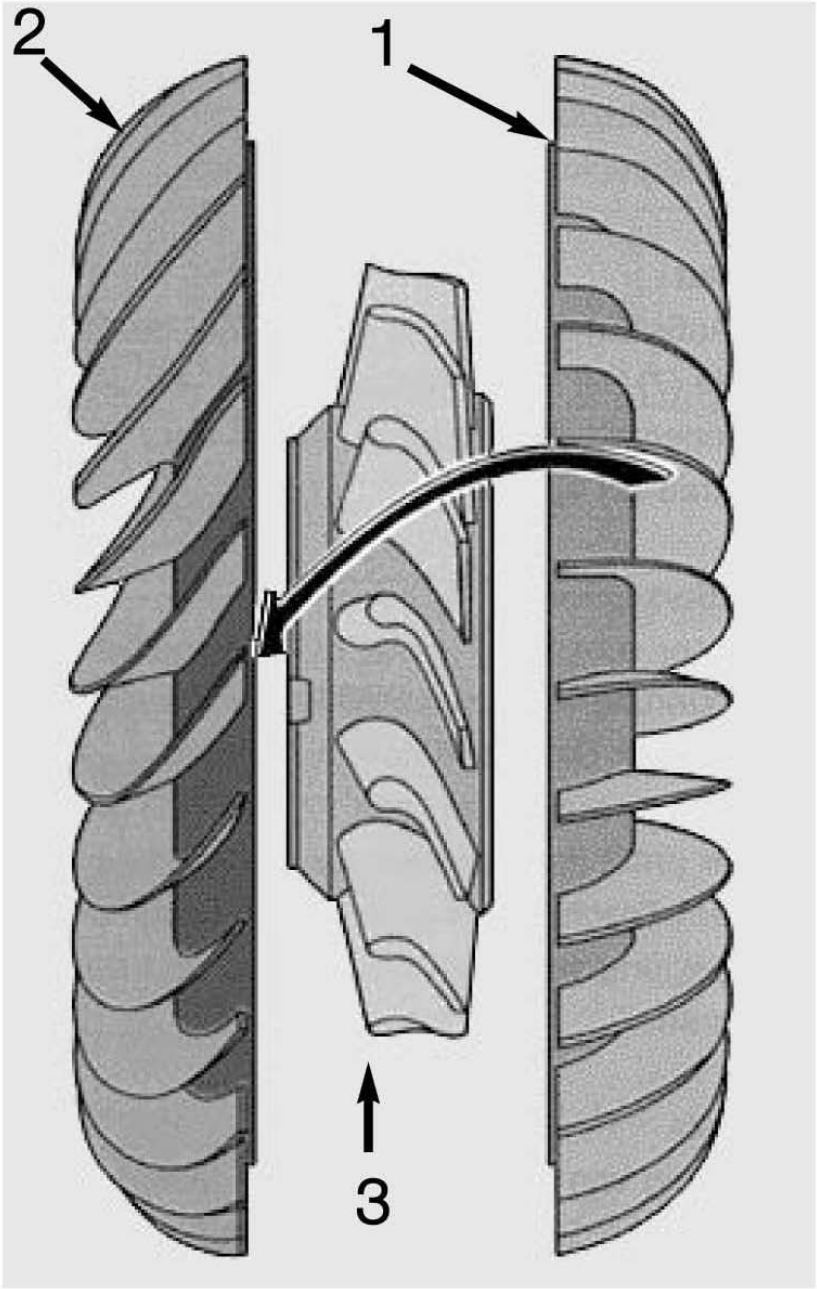
TORQUE CONVERTER

In standard transmissions the crankshaft is linked to the transmission input shaft via the clutch assembly. Power flows from the crankshaft through the flywheel. The pressure plate transfers power to the clutch disc which is splined to the transmission input shaft. The pressure plate is used to disconnect (or interrupt) power flow to the transmission input shaft. Because the engine is mechanically connected to the driveline, power flow must be interrupted when the vehicle is stationary. Otherwise the engine would stall. In automatic transmissions, there is a fluid coupling between the engine and transmission. This fluid coupling is more commonly referred to as the torque converter. In the torque converter there is no rigid connection between the engine and transmission (except for lock up clutch). In order to understand the operation of the torque converter, we must first start with the components. The breakdown of the components are as follows:

- The Impeller, which is rigidly connected to the torque converter housing.
- The Turbine, which is splined to the input shaft (turbine shaft) of the transmission.
- The Stator, which has a one-way clutch. The inner race of the one-way clutch is splined to a stationary

shaft attached to the transmission. See **Fig. 6**.

The addition of the stator allows the fluid coupling to be referred to as a torque converter. The stator provides for a multiplication of torque at low speeds. Without the stator there would be no multiplication of torque.



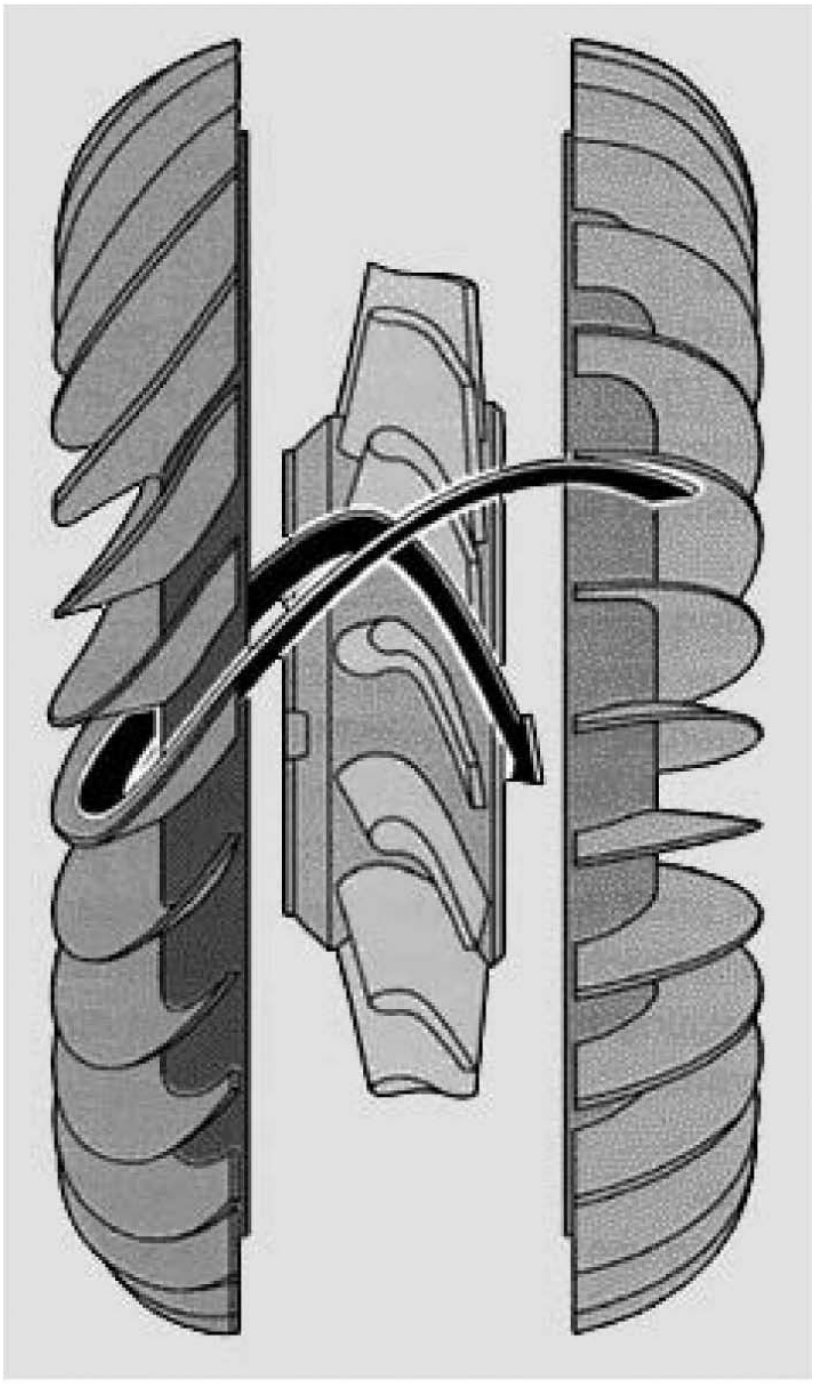
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Fig. 6: Identifying Impeller, Turbine & Stator
Courtesy of BMW OF NORTH AMERICA, INC.

When the engine is running, the impeller which is directly connected to the converter housing, rotates at engine speed. Fluid is directed from the impeller blades to the turbine blades. The fluid drives the turbine which is splined to the input (turbine) shaft of the transmission. This functions the same way as a waterfall acting on a paddle wheel. The ratio of the impeller speed to turbine speed is approximately 1.1 to 1. This ratio is improved to 1:1 with the addition of the torque converter clutch which is discussed later.

Torque Converter Operation At Low Speeds

1. At low engine speeds there is a large difference in rotational speed between the impeller and the turbine
2. Fluid flow is directed from the impeller to the turbine. Fluid strikes the vanes of the turbine. The turbine is driven forward in the direction of engine rotation.
3. Fluid flow is then directed back towards the impeller.
4. Before the fluid reaches the impeller, the fluid strikes the vanes of the stator.
5. When the fluid strikes the stator, the one way clutch prevents the stator from rotating.
6. The fluid is then re-directed by the curved vanes of the stator. The fluid is now flowing in the same direction as the impeller.
7. The fluid that is acting on the impeller increases the force on the impeller which multiplies torque. See **Fig. 7**.

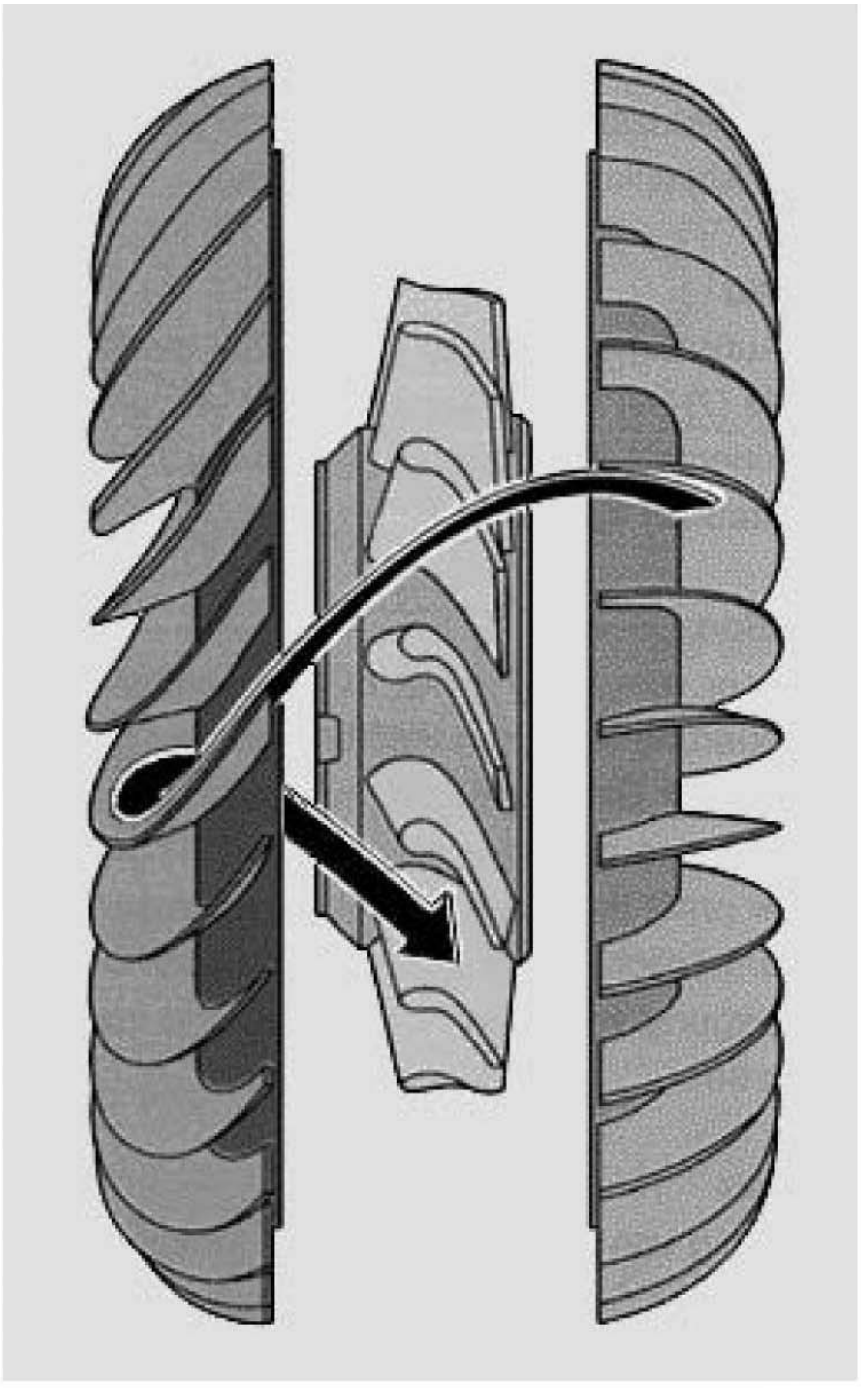


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Fig. 7: Torque Converter Operation At Low Speed
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Operation at High Speed

1. As engine speed increases, the turbine speed approaches the speed of the impeller.
2. The fluid flow is directed from the turbine to the back side of the impeller blades.
3. The one-way clutch in the stator unlocks and the stator blades turn in the direction of engine rotation.
4. Fluid is no longer re-directed and torque multiplication no longer takes place.
5. This is referred to as "Coupling Speed". The turbine never reaches the same speed as the impeller as fluid flow would come to a halt. Ratio is approximately 1.1 to 1. See **Fig. 8**.



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Fig. 8: Torque Converter Operation At High Speed
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Clutch

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds. The torque converter clutch must be disengaged at low engine speeds to prevent stalling. There are two methods for controlling the torque converter clutch on BMW transmissions:

- A4S310/270R, 4HP22/24 EH, A5S310Z - These transmission use an on/off control method to lock and unlock the torque converter. The TCC is either completely engaged or completely disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be unpleasant and undesirable to some drivers.
- A5S560Z, A5S440Z, A5S325Z, GA6HP26Z,A5S360/390R - These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling. See **Fig. 9** and **Fig. 10** .

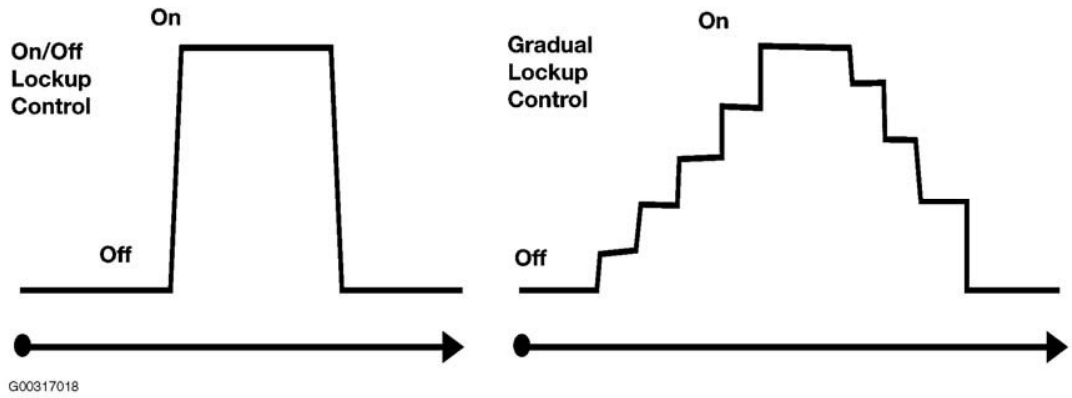


Fig. 9: Identifying TCC Operation
Courtesy of BMW OF NORTH AMERICA, INC.

Example of TCC oil control circuit from the A5S440/560Z transmission.

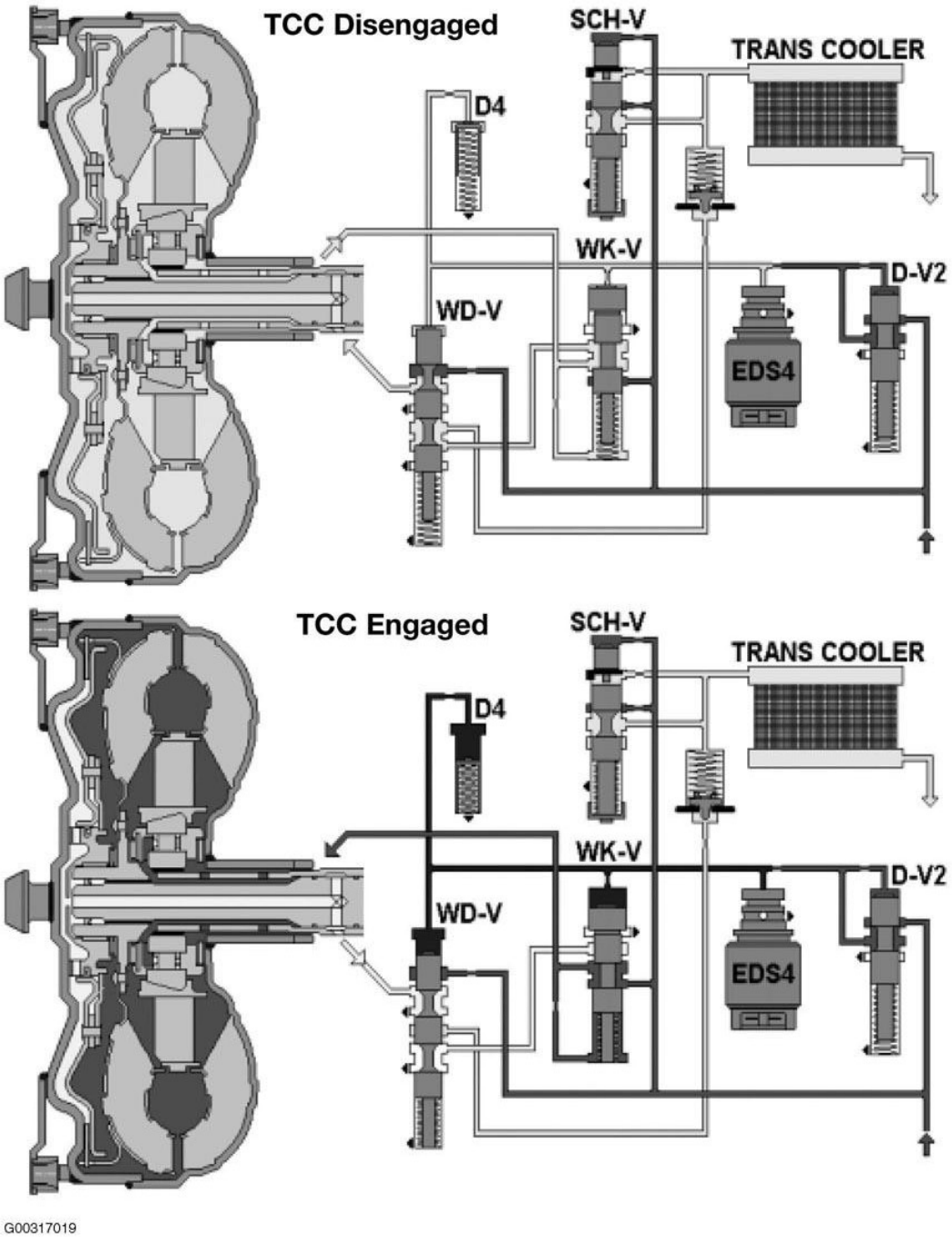
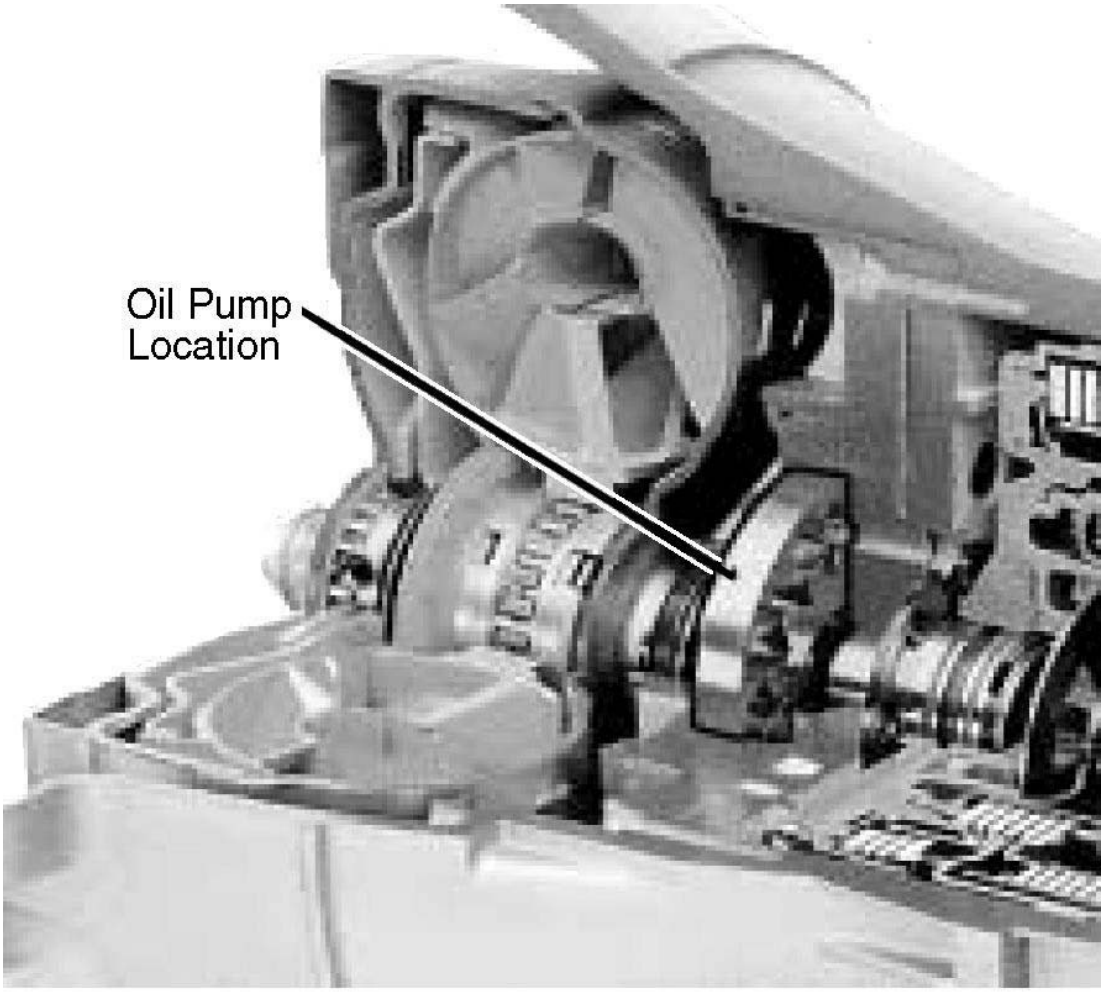


Fig. 10: TCC Oil Control Circuit
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP

The transmission oil pump is used to circulate oil and provide pressure for hydraulic operation. The pump is driven by the torque converter shell and rotates with engine. Fluid is drawn from the sump through the filter and distributed to the various transmission hydraulic systems. The output pressure is regulated to an operating pressure of approximately 25 bar. Currently there are two types of oil pumps used in BMW transmissions: Crescent type and Vane type. See **Fig. 11**.



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Fig. 11: Locating Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Crescent Type Oil Pump (All except A5S360/390R)

The crescent type is an internal gear pump containing a drive gear and a driven gear. The inner gear is driven by the torque converter and acts as the impeller. The outer gear is driven by the inner gear. The gap between the teeth varies from the input, through the crescent and to the output of the pump. A low pressure area is created on the input side of the pump by the widening gap between the gear teeth. The oil is drawn to the crescent and transferred to the output side of the pump, where the pressure is increased by the narrowing gap between the

gear teeth. The output pressure of the pump is controlled by spring loaded pressure regulator. See **Fig. 12**.

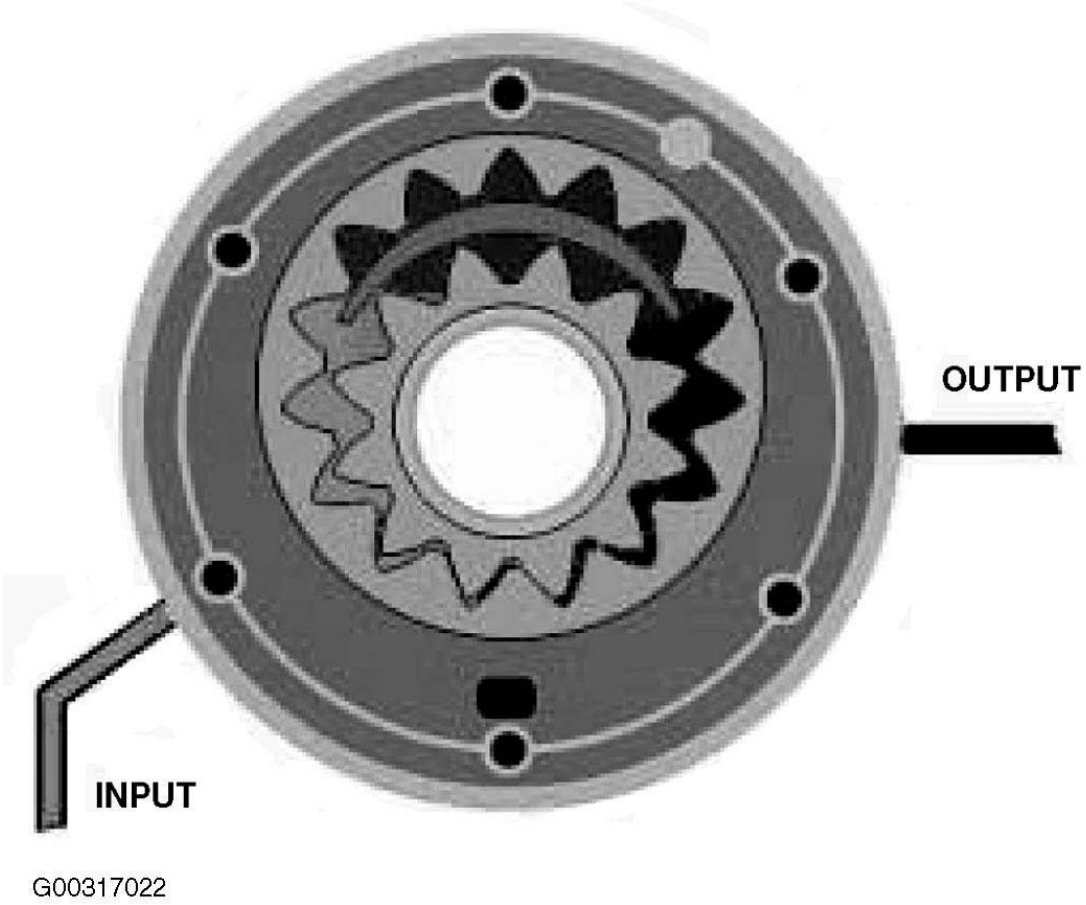


Fig. 12: Identifying Crescent Type Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Oil Volume Control

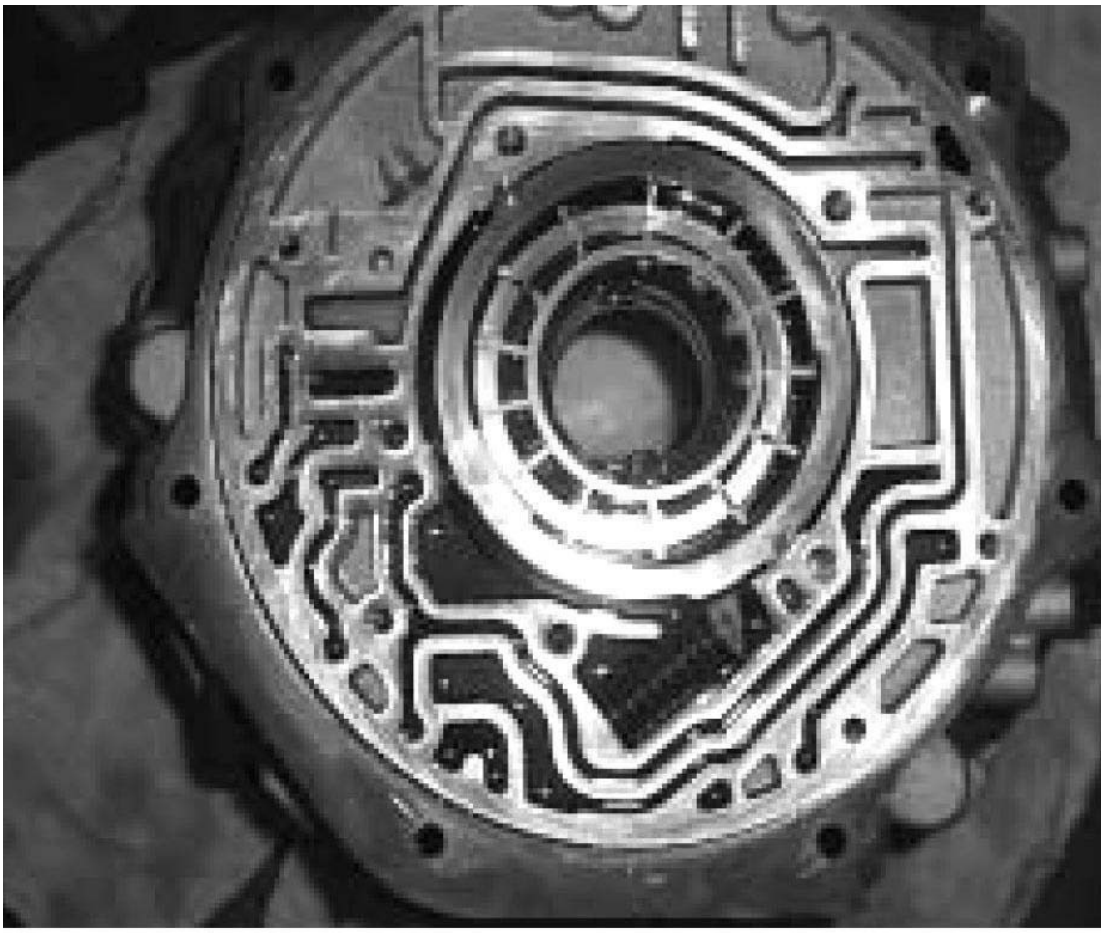
On the A5S440Z transmission, oil pump output volume is controlled based on engine RPM. High oil volume is initially required at start up to quickly fill the transmission requirements. As engine RPM increases, the volume is greater than is required. The Oil Volume Control Damper regulates the pump output volume based on engine RPM. This helps improve fuel economy by reducing the load on the engine at high RPM.

Vane Type Pump (A5S360/390R)

The new A5S360/390R (GM5) transmission uses a vane type pump. See **Fig. 13**. The torque converter drives the pump rotor and 13 vanes. The rotor and vanes are placed inside a slide mechanism. As the rotor spins, the vanes sweep oil from the pump intake to the output along the mating surface on the vane ends and the interior surface of the slide. The slide is mounted on a pivot pin. As it pivots, it changes the eccentricity of the rotor to slide mating surface. This in turn will alter the output oil volume. This provides the same function as the Oil

Control Volume Damper on the A5S440Z. The slide's position is influenced by a calibrated spring and hydraulic control pressure from the main pressure regulator solenoid on the valve body. See **Fig. 14**. The benefit of changing the slide position is to optimize pump output volume to meet the following operating conditions:

- Provide maximum volume during engine start-up. This condition provides a fast priming action of the pump for immediate lubrication and for hydraulic pressure operation.
- Regulated output volume at higher engine speeds. Maximum pump volume is not required at all times.



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Fig. 13: Identifying Vane-Type Pump
Courtesy of BMW OF NORTH AMERICA, INC.

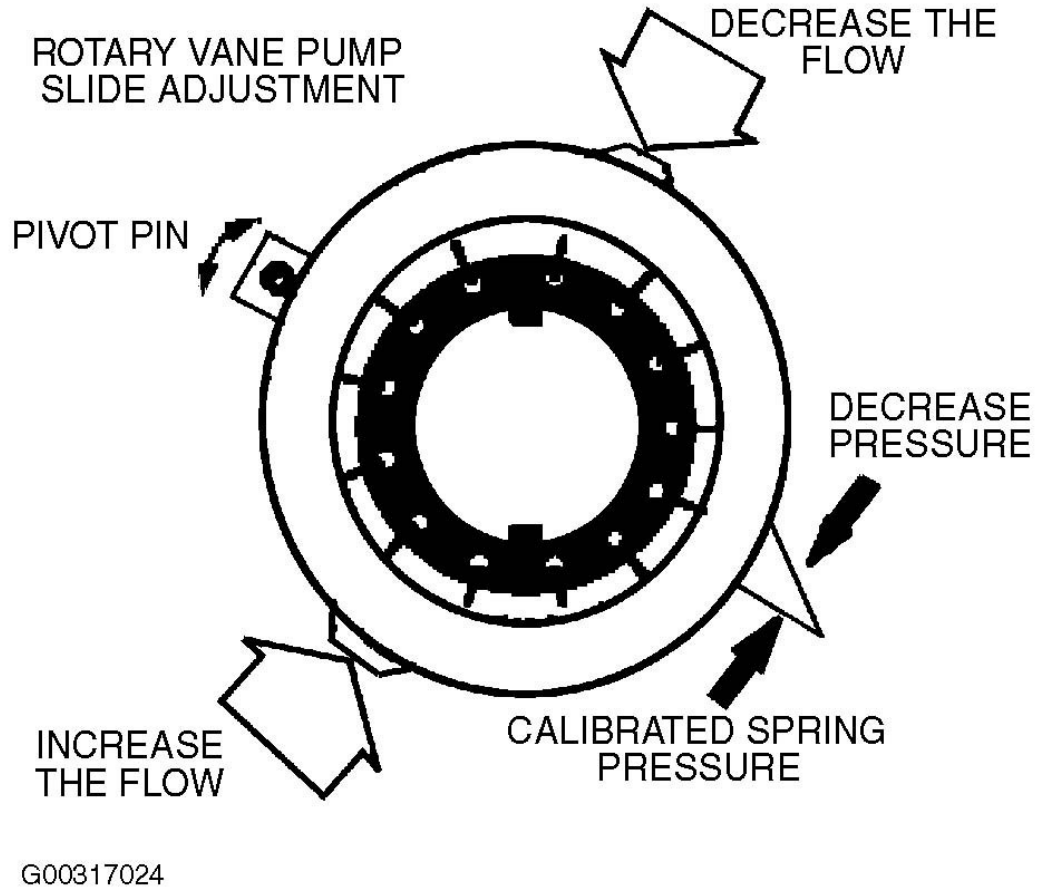


Fig. 14: Rotary Vane Pump Slide Adjustment
Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC CONTROL COMPONENTS

Electro/Hydraulic Valve Body

The valve body assembly is the main shift control element in the transmission. In non-EH transmissions the valve body was only hydraulically controlled. In the current EH (electrohydraulic) transmissions the valve body is similar in design, but now also housing a number of shift solenoids which are controlled by the TCM. The valve body consists of a number of sub-assemblies. Each sub-assembly contains a number of spool valves which are hydraulically controlled. Most spool valves are opposed by spring pressure. The spool valves are used to direct hydraulic fluid flow to the various shift elements in the transmission. There is also a manual valve which is connected to the shift assembly by a cable. The manual valve allows the drivers to select the basic operating mode (or ratio). See **Fig. 15**. The valve body is responsible for the following:

- Regulating main pressure.

- Controlling fluid flow to shift elements for Upshifts and Downshifts.
- Providing for manual operation by driver via manual valve.
- Reverse Lockout.
- Failsafe Operation.
- Shift Comfort through: Overlap Shift Control (ZF) Pressure Accumulators (GM).
- Torque Converter Control.
- Distribution of lubrication.

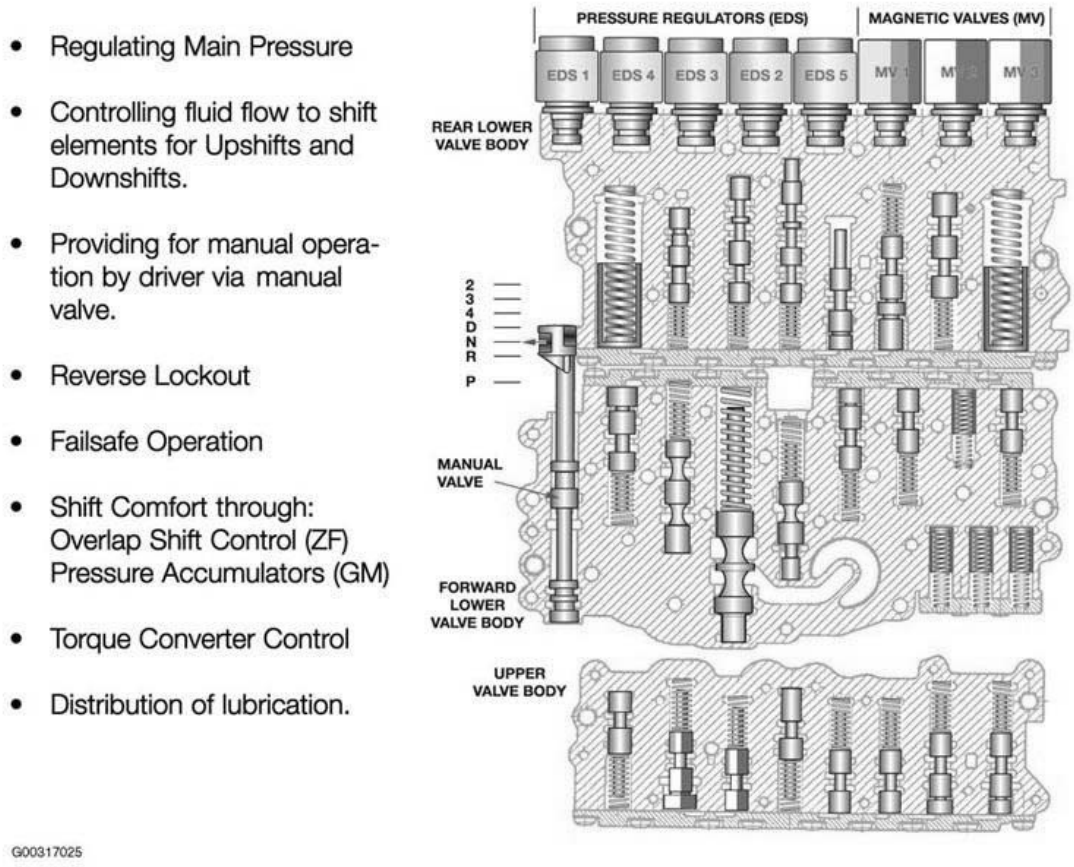


Fig. 15: Identifying Electro/Hydraulic Valve Body Components
Courtesy of BMW OF NORTH AMERICA, INC.

Shift Valves

Shift valves are used to direct application pressure to the various shift elements. Shift valves are regulated by spring pressure and control pressure for the shift solenoids. Shift valves come in various configurations depending upon application and transmission type. The most basic is the 3/2 shift valve. The 3/2 shift valve has 2 positions which are switched through one or two control pressures.

With no control pressure from shift solenoid present, the shift valve is moved to its end travel (left) by spring pressure. Operating pressure is blocked to the shift component. Also in this position any application pressure is drained from the shift component. See **Fig. 16**.

Once the control pressure is applied to the 3/2 shift valve, the shift valve moves to the right. This allows operating pressure to reach the shift component. When the control pressure is again reduced, spring pressure returns the 3/2 shift valve to the rest position. This drains and operating pressure from the shift component. See **Fig. 17**.

Operating Pressure to Shift Component. The example shown is a 4/2 shift valve. The operation is similar to the 3/2 valve. The primary difference is that the 4/2 shift valve affects 2 shift components. See **Fig. 18**.

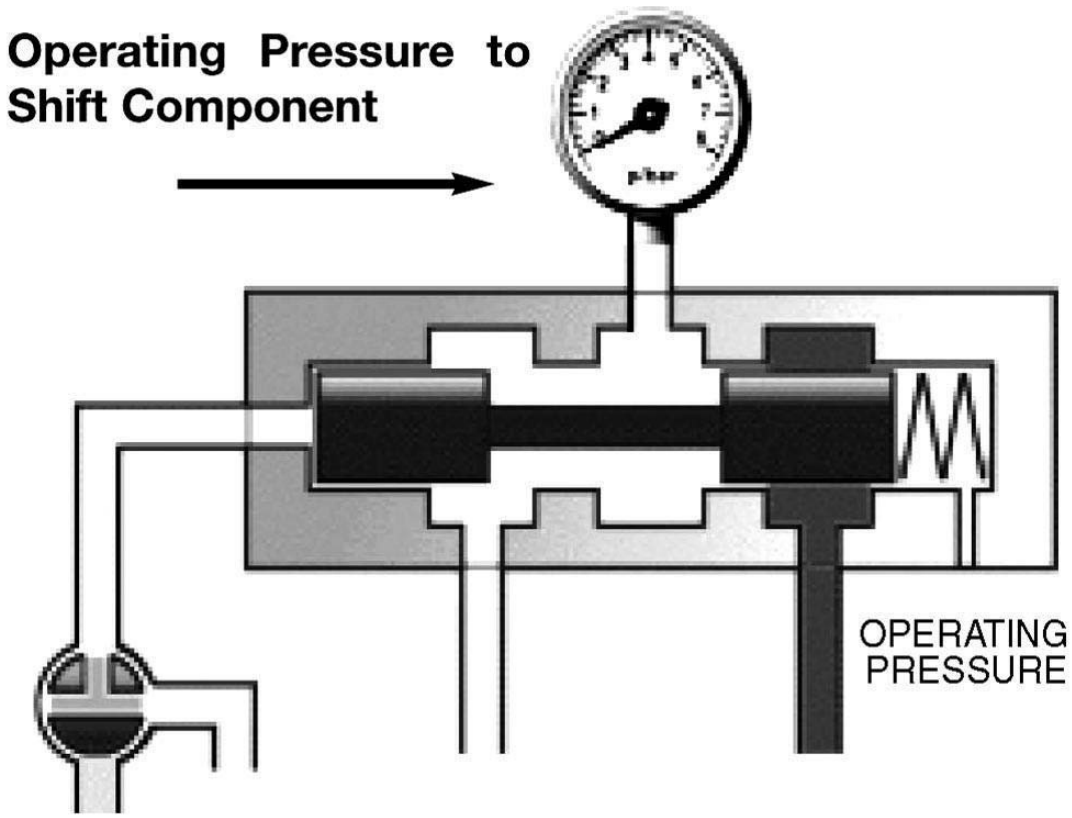


Fig. 16: Shift Valve Operation (1 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

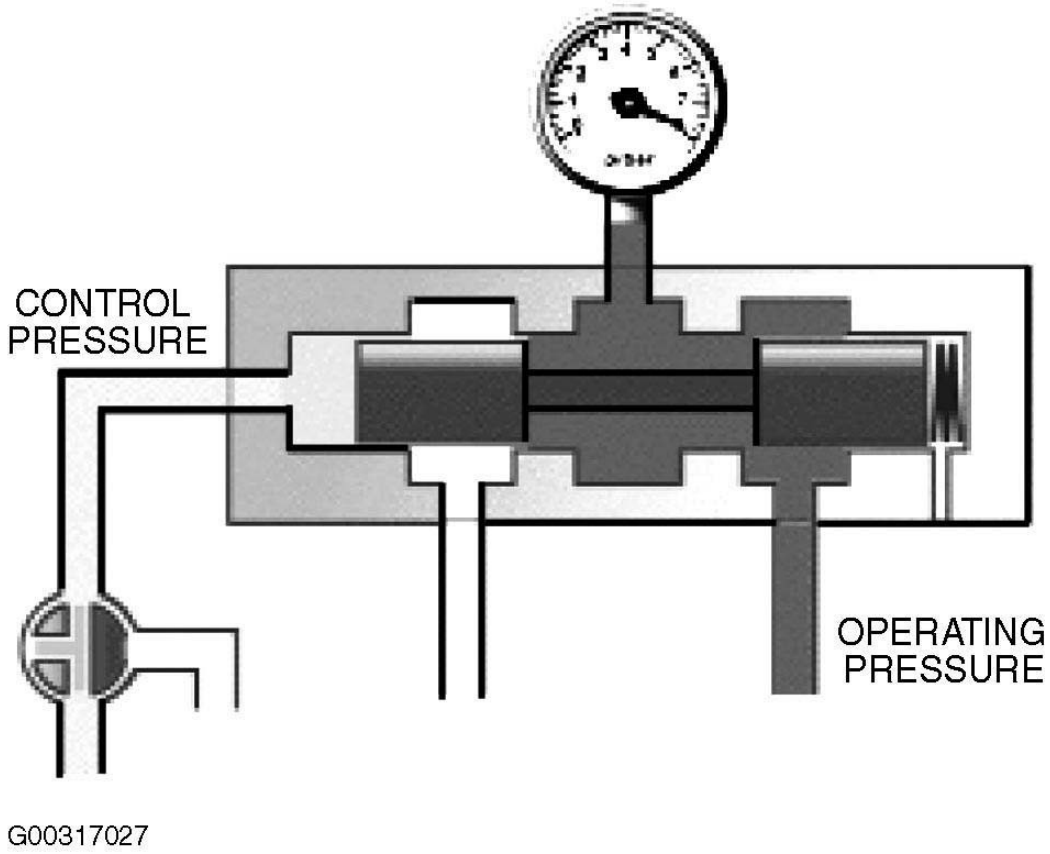


Fig. 17: Shift Valve Operation (2 Of 3)
Courtesy of BMW OF NORTH AMERICA, INC.

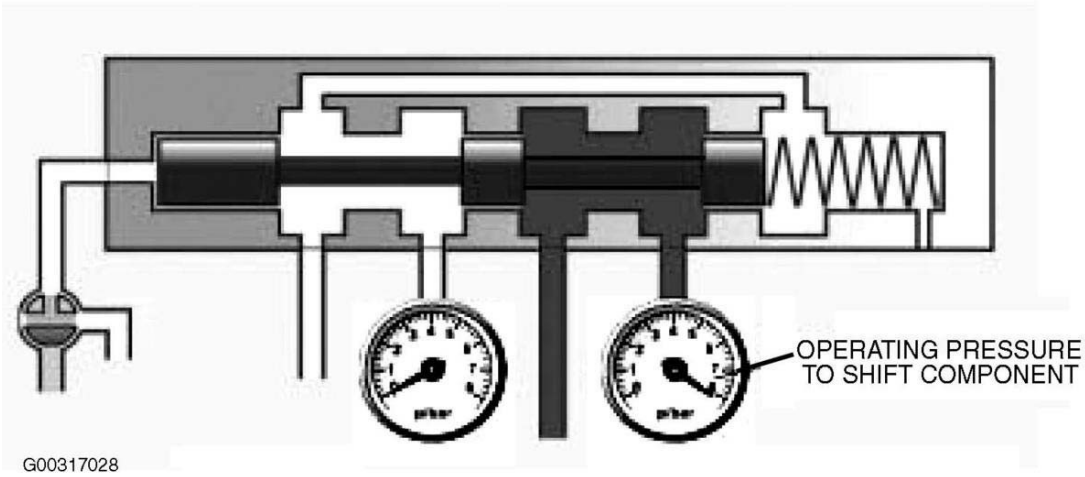


Fig. 18: Shift Valve Operation (3 Of 3)

Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

Pressurized oil from the pump must be regulated for use within the transmission. Otherwise, the high pressure directly from the pump would influence shift quality. The shifts would be more abrupt and harsh. In order to "fine tune" the pressures within the transmission, there is a pressure regulating valve and a pressure regulating solenoid. The pressure regulating valve is located in the oil pump housing or the valve body dependent upon transmission type. The pressure regulating solenoid is a pulse width modulated (PWM) solenoid. Current is controlled by the TCM. The pressure regulating solenoid is normally closed, there is maximum line pressure available when minimum (or no) current is applied to the pressure regulating solenoid. Depending upon application, pressure regulating solenoid can be PWM with B- or B+ control. GM transmissions use B+ control with a constant ground supply. ZF transmissions uses B- control with a constant B+ supply.

There are also pressure regulators used in ZF transmissions that are used to control shift pressures. The A5S440Z and A5S560Z both use EDS solenoids for "Overlap Shift Control" this will be explained later in this text. There are a few different names for pressure regulating solenoids depending upon the transmission type and manufacturer:

- ZF transmissions use the following terms - EDS solenoid (valve), or MV (magnetic valve).
- Hydramatic (GM) transmissions use the following terms: DR solenoid, Force Motor Solenoid or Variable Bleed Solenoid.

Transmission operating pressures are regulated based on engine speed, throttle angle and engine load. The regulated pressure from the pressure regulating solenoid is referred to as throttle pressure. This pressure is fed to the main pressure regulating valve. See **Fig. 19**.

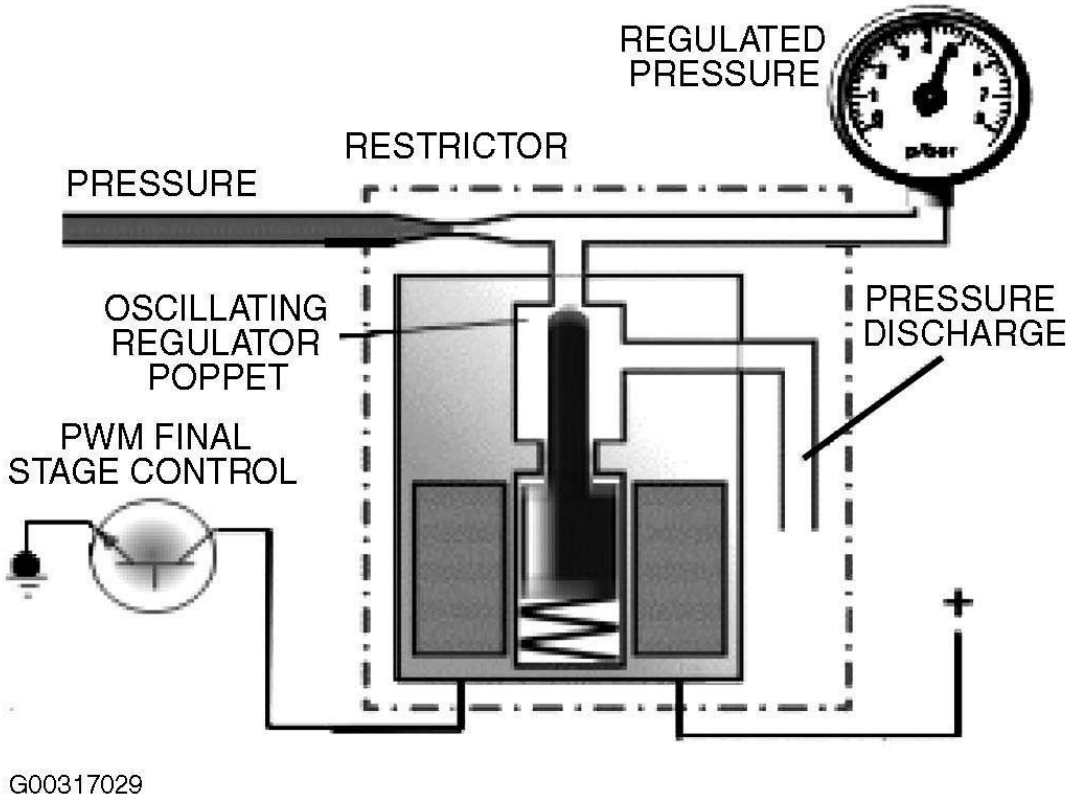


Fig. 19: Identifying Transmission Operating Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

As the diagram shows, regulating valve pressure is fed to the pressure regulating solenoid. See **Fig. 20**. This pressure is then regulated to create throttle pressure. Throttle pressure is modified based on throttle angle, engine speed and engine load. Throttle pressure is then fed to the pressure regulating valve. As throttle pressure increases, the regulating valve piston is moved to the left (with respect to the diagram). As the regulating valve piston is moved to the left , operating pressure is increased to the 4/2 shift valve. The operating pressure to the 4/2 shift valve will be fed to Shift Component A or Shift Component B depending the position on the 4/2 shift valve. The operating pressure to the shift components will be increased or decreased depending upon the throttle valve pressure. As engine speed and load are increased, the operating pressure will be increased to provide higher clamping forces on the shift components. When there is no electrical power present to the pressure regulator solenoid, throttle pressure will be a maximum. Therefore maximum operating pressure will be available at the 4/2 shift valve. This condition would exist if the transmission was operating in failsafe mode.

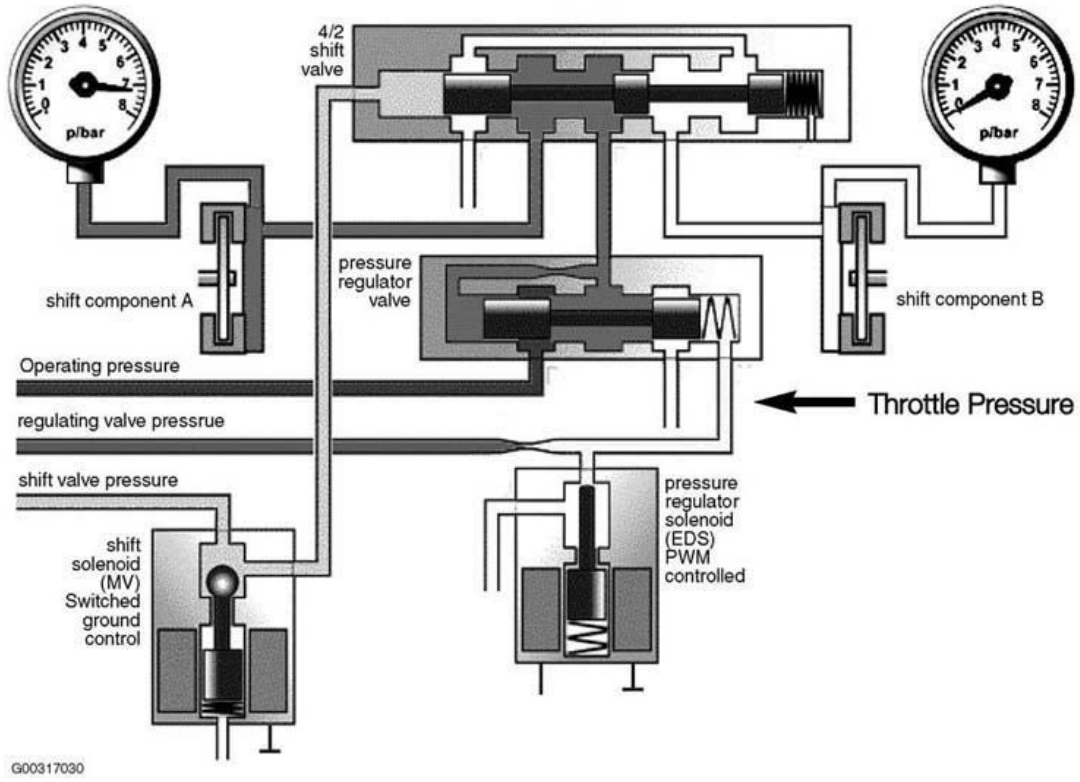


Fig. 20: Identifying Transmission Regulation Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

APPLY COMPONENTS

Multi - Plate Clutches and Brakes

Multi Plate Clutches and Brakes are used to drive or hold members of the planetary gear set. See **Fig. 21**. As a general rule, Multi Plate Clutches connect one planetary member to another. Multi Plate Brakes connect a planetary member to the case to hold it stationary. The clutches and brakes consist of a number of friction discs and steel discs. The friction discs are coated with a friction material and have engaging lugs (splines) on the inner perimeter. The steel discs are steel on both sides and have engaging lugs located on the outer perimeter. The engaging lugs on the friction discs are usually engaged with a planetary member. The engaging lugs on the steel discs are usually engaged with the clutch piston housing. In addition to the friction and steel discs, there is also an apply piston, housing and return spring. Once hydraulic fluid is applied to the clutch assembly, the friction discs and steel discs will be locked together. Once hydraulic pressure is released, the return spring will cause the clutch piston to return to its rest position which will unlock the clutch assembly. See **Fig. 22**.

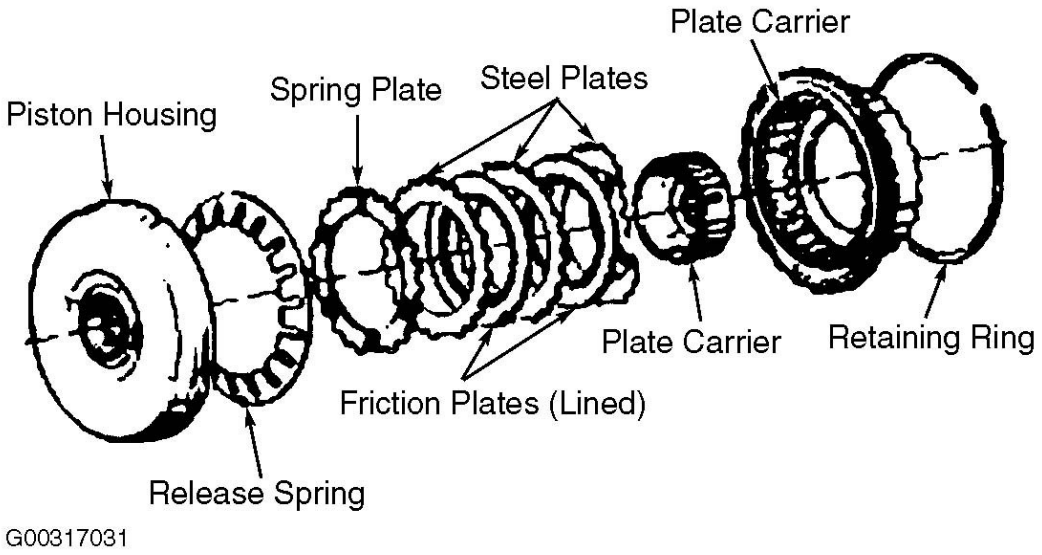


Fig. 21: Identifying Multi-Plate Clutches & Brakes
Courtesy of BMW OF NORTH AMERICA, INC.

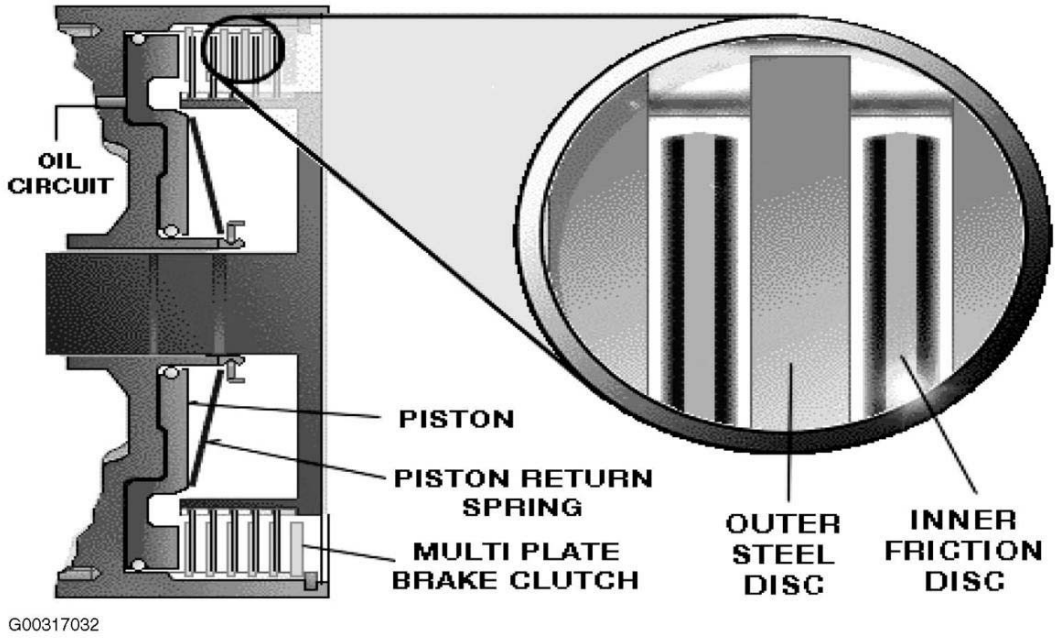


Fig. 22: Multi-Plate Clutch Identification
Courtesy of BMW OF NORTH AMERICA, INC.

Multi - Plate Clutch Operation

In order to carry out a shift in ratio, fluid needs to be applied or released from the Multi - Plate Clutch (or Brake). As shown in the example at the right, the following sequence occurs:

1. Fluid from a shift valve in the valve body is applied to the clutch assembly.
2. Fluid pressure builds behind the apply piston and overcomes the resistance from the diaphragm spring.
3. The friction and steel discs are compressed together and become locked, preventing any slippage between them.
4. Two planetary members are now locked together.
5. When fluid pressure is released, the steel and friction discs are allowed to unlock.
6. The diaphragm spring pushes against the apply piston and returns the piston back to the rest position.
7. The check ball in the apply piston is unseated by centrifugal force which allows the clutch to drain completely. See **Fig. 23**.

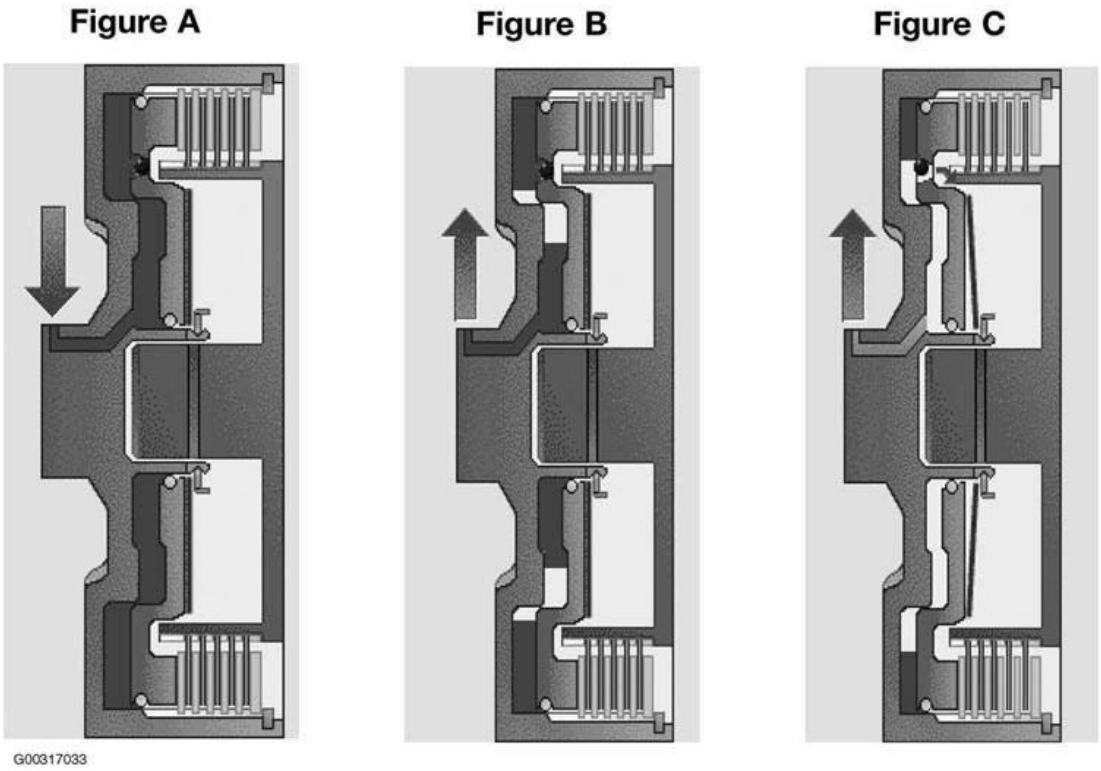


Fig. 23: Multi-Plate Clutch Operation
Courtesy of BMW OF NORTH AMERICA, INC.

BAND BRAKES

On some BMW transmissions there is a band type brake used for some applications. The A4S270/310R and the A5S310Z use a band type brake. The brake band is a circular band with friction material bonded to the inner surface. The band wraps around a particular planetary component (clutch drum) and locks that component to the transmission case. The brake band is applied and released by the clutch apply piston. The brake band is not

adjustable on the A5S310Z, however there is some adjustment allowed when needed on the A4S270/310R. The brake band functions in the following manner on BMW transmissions:

- A4S270/310R - The brake band is active (applied) in first and second gear. The brake band holds the reaction sun drum stationary. The reaction sun drum is splined to the reaction sun gear.
- A5S310Z - The brake band is active (applied) in second, third and fifth gear. The brake band holds the forward sun gear to the case. See **Fig. 24**.

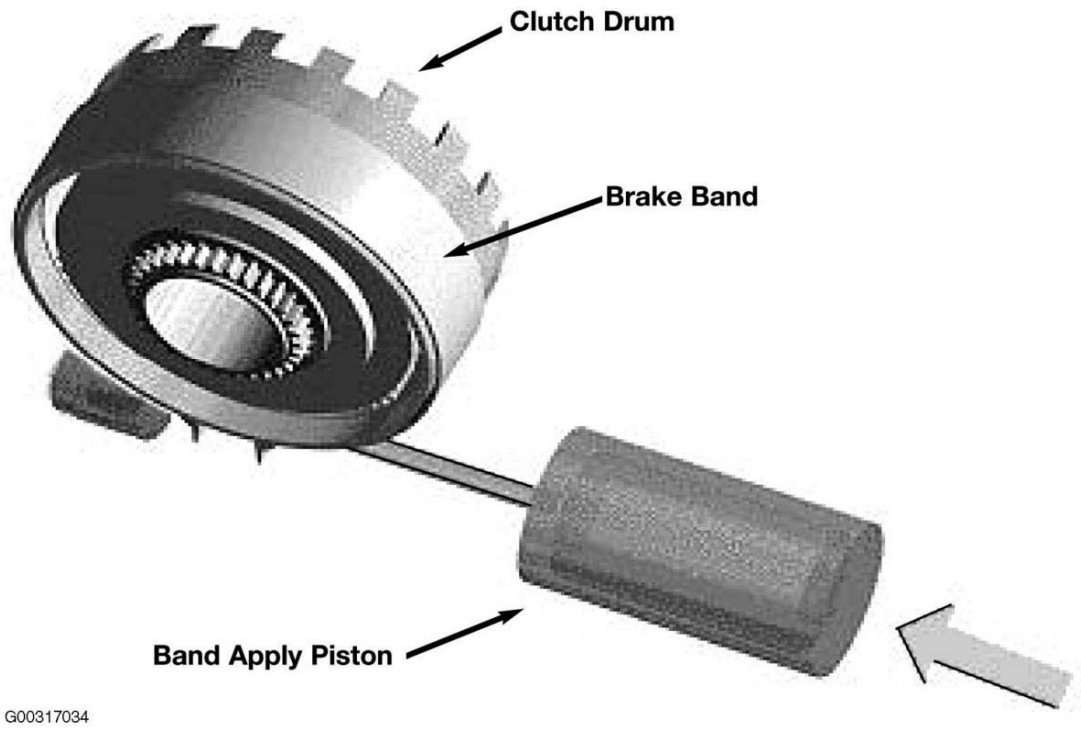


Fig. 24: Identifying Band Brake Operation
Courtesy of BMW OF NORTH AMERICA, INC.

ONE-WAY CLUTCHES (FREEWHEEL)

The one way clutch consists of an inner and outer ring with a locking device between the two. The one way clutch is designed to lock in one direction and to allow free rotation in the other direction. See **Fig. 25**. Currently there are two types of one way clutches used in BMW transmissions:

- Roller type which consists of spring loaded rollers between the inner and outer race of the one way clutch. (Roller type is also used without springs on some applications).
- Sprag type which consists of asymmetrical shaped wedges located between the inner and outer race of the one way clutch.

In both versions of the one way clutch (freewheel), rotation is only allowed in one direction. Using the diagrams above, imagine that the inner races were locked stationary. The outer race would only be allowed to turn

counter clock wise. In the clock wise direction, the outer race of both versions would be locked. In the roller type, the helper springs would push the rollers up the ramp on the outer race. This would force the rollers in to the smaller area which would cause the outer race to lock, In the sprag type, the asymmetrical wedges would lock between the inner and outer race. The one way clutches are used in the transmission to prevent an interruption of drive torque during certain gear shifts and to allow engine braking during coasting. Also there is a one way clutch in the stator of the torque converter.

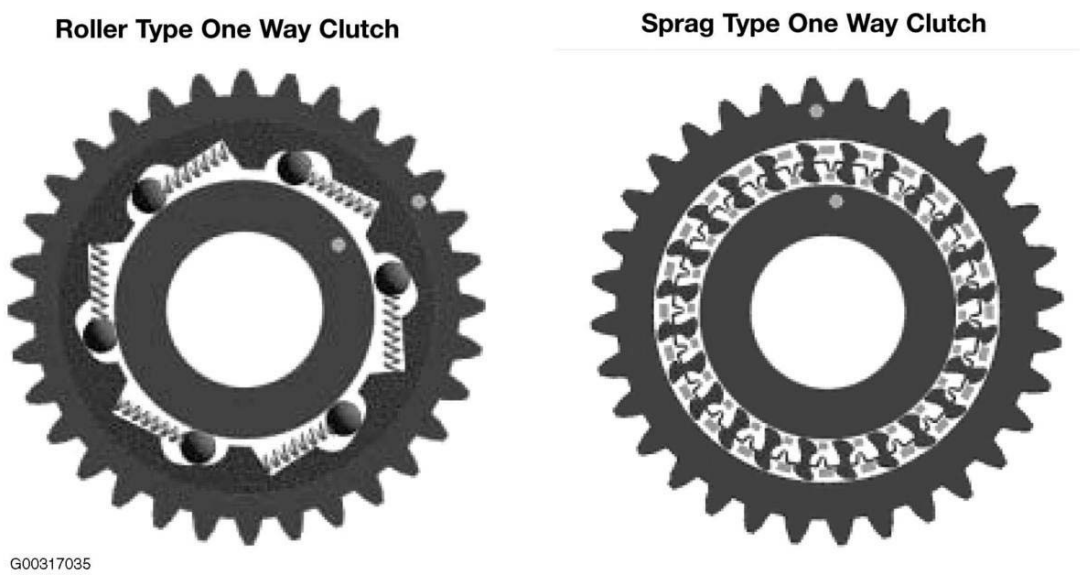


Fig. 25: Identifying One-Way Clutches
Courtesy of BMW OF NORTH AMERICA, INC.

PLANETARY GEAR SET

Planetary gear seats are compact gear units that receive input drive torque and provide the required output ratios for all forward gears and reverse gear. The planetary gear set consists of four main components:

1. Internal ring gear.
2. Planetary gears (pinions).
3. Sun gear.
4. Planetary gear carrier.

Various ratios are obtained by driving or holding different components in the planetary gear set. The example shown is a simple planetary gear set. See **Fig. 26**. Today's modern transmissions use a combination of multiple planetary gear sets referred to as a compound planetary gear set.

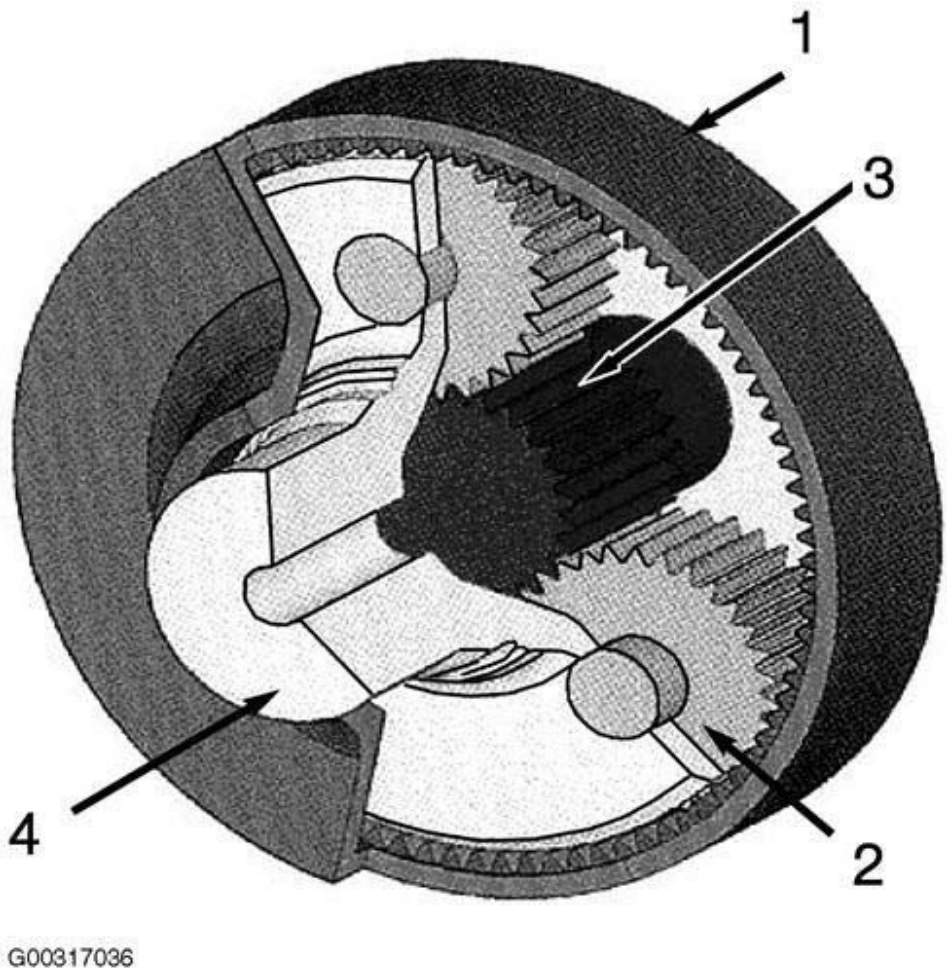


Fig. 26: Identifying Planetary Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Advantages of Planetary Design

There are distinct advantages to the planetary gear set in comparison with a standard transmission gear set. Primarily, drive torque does not need to be interrupted to change gears. The planetary members are in constant mesh and there are more teeth engaged in any given ratio. This allows more torque to be transferred through the transmission.

Basic Power Flow Example

As an example of power flow in reverse gear, planetary gear carrier (4) is held stationary. The sun gear (3) is driven in a clockwise direction. The planetary pinions (2) are driven counterclockwise, which in turn drives the internal ring gear (1) counter clockwise as well. See **Fig. 27**.

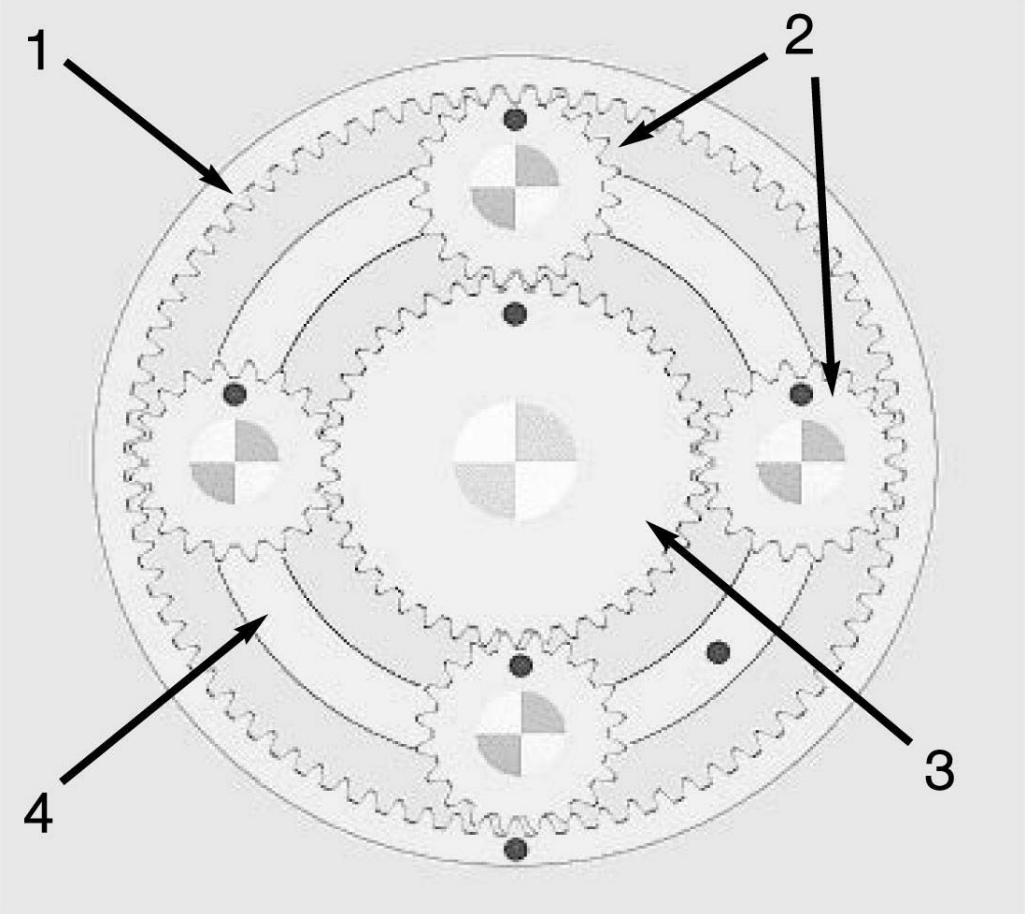


Fig. 27: Identifying Basic Power Flow
Courtesy of BMW OF NORTH AMERICA, INC.

Compound Planetary Gear Sets

Compound planetary gear sets use multiple planetary components which are a variation on the simple planetary gear set. Since the inception of the simple planetary gear set, there have been numerous compound gear sets introduced. BMW transmissions use the following gear sets:

- Simpson Gear Set - used on 4HP22 and 4HP24.
- Ravigneax Gear Set - used on A4S270R, A4S310R, A5S310Z, A5S325Z, A5S360R and A5S390R.
- Wilson Gear Set - used on A5S440Z and A5S560Z.
- Lepelletier Gear Set - used on the GA6HP26Z.

Simpson Gear Set

The Simpson Gear Set is one of the early variations on the simple set. It is capable of 3 forward gears and one

reverse. On BMW transmissions, the Simpson Gear set is used in the 4HP transmission which is a four speed automatic. See **Fig. 28**. Fourth gear (overdrive) is obtained by the addition of an auxiliary gear set (simple). Characteristics of the Simpson Gear set are as follows:

- Two Internal Ring Gears, one rear input ring and one attached to the rear planetary carrier.
- Two Planetary carriers, each containing three planetary pinions.
- One common Sun gear, which meshes with both sets of planetary pinions.

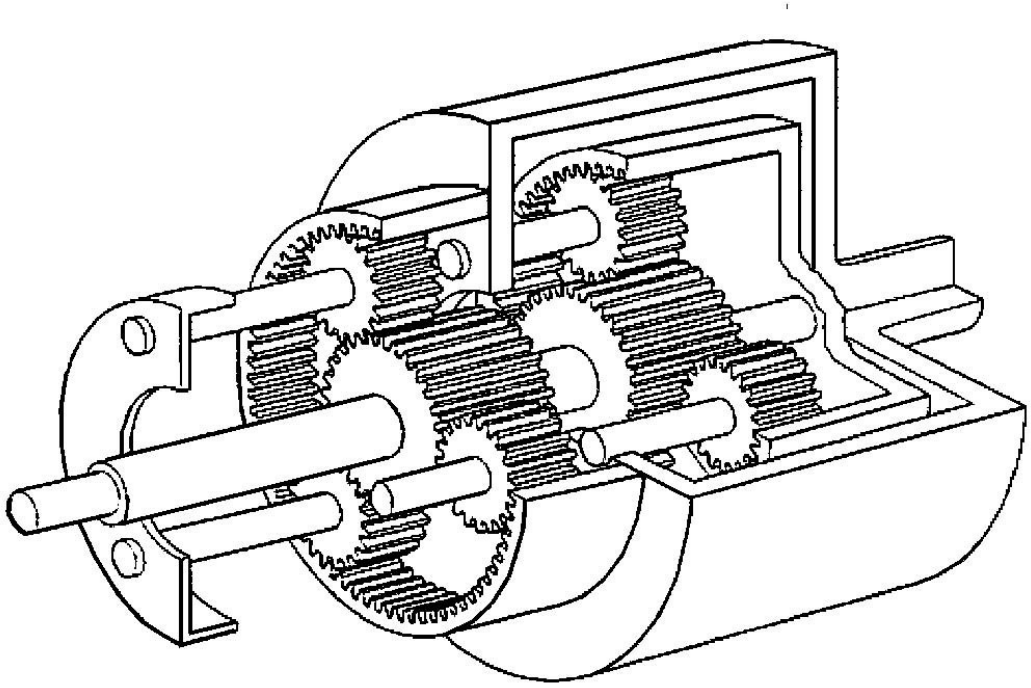


Fig. 28: Identifying Simpson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Ravigneaux Gear Set

A new version on the planetary design is the Ravigneaux gear set. See **Fig. 29**. This gear set is capable of 4 forward gears and one reverse. However, depending upon application it may be used with an auxiliary gear set. Here are some examples:

- The A4S310/270R uses the Ravigneax set for 3 forward gears and one reverse. Overdrive is obtained by the auxiliary gear set.
- The A5S310Z uses a combination of the Ravigneaux gear set and the auxiliary gear set to obtain 5 forward gear and one reverse. First, second and reverse gears are achieved by using a combination of both gear sets.

- The A5S360/390R uses a modified version of the Ravigneaux set that provides five forward gears and one reverse. There is no auxiliary gear set used.

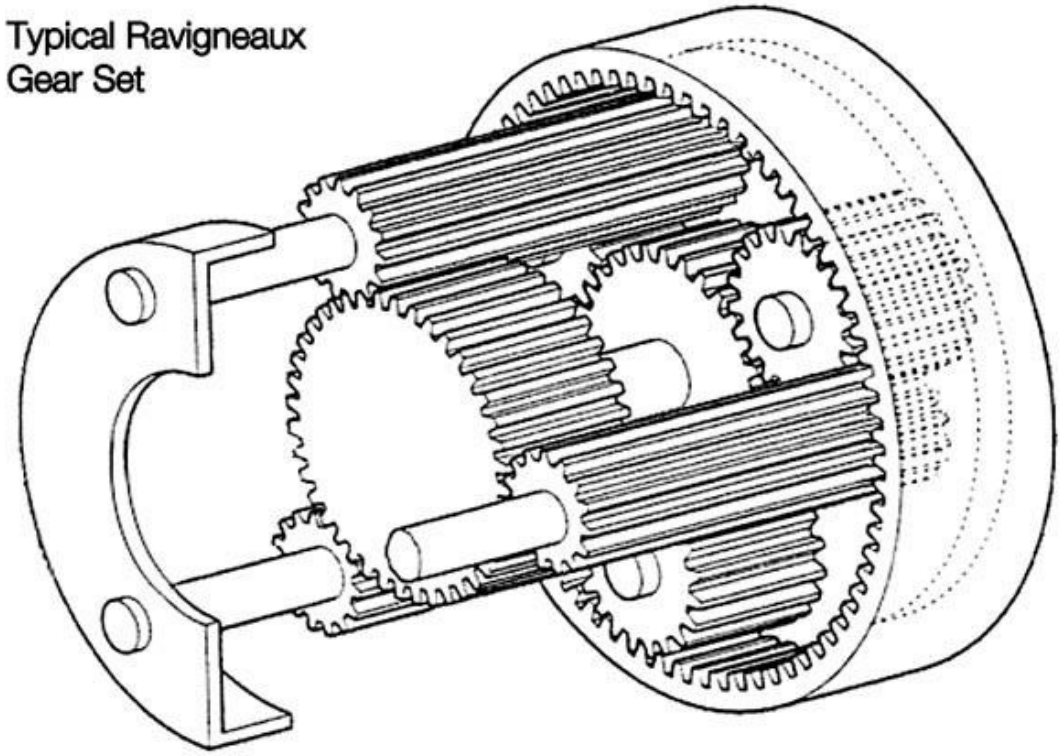


Fig. 29: Identifying Ravigneaux Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Characteristics of the Ravigneaux Gear Set are:

- One planetary carrier which is common to both sets of planetary pinions.
- Two sets of planetary pinions, one long set with small diameter and one short set with large diameter.
- Two sun gears, one input sun gear and one reaction sun gear.
- One common ring gear.

NOTE: The Ravigneaux Gear Set shown in the figure is a typical representation. There are a few variations of this arrangement used on BMW transmissions.

Wilson Gear Set

On BMW transmissions, the Wilson gear set is only used on the A5S440Z and A5S560Z. See **Fig. 30**. The Wilson Gear Set consists of three planetary gear sets. The ring gear of the first gear set, the planetary carrier of the second gear set and the ring gear of the third planetary gear set and directly connected to the "Pot". The "Pot" is a cylindrical device that slides over all of the components to unitize the individual gear sets into an

assembly. The characteristics of the Wilson Gear Set are:

- Three planetary carriers.
- Three ring gears, with ring gear 1 and 3 meshed to "Pot" assembly.
- Three sun gears, sun gear 2 and 3 are common (attached). Sun gears 2 and 3 are also referred to as the "Double Sun Gear".

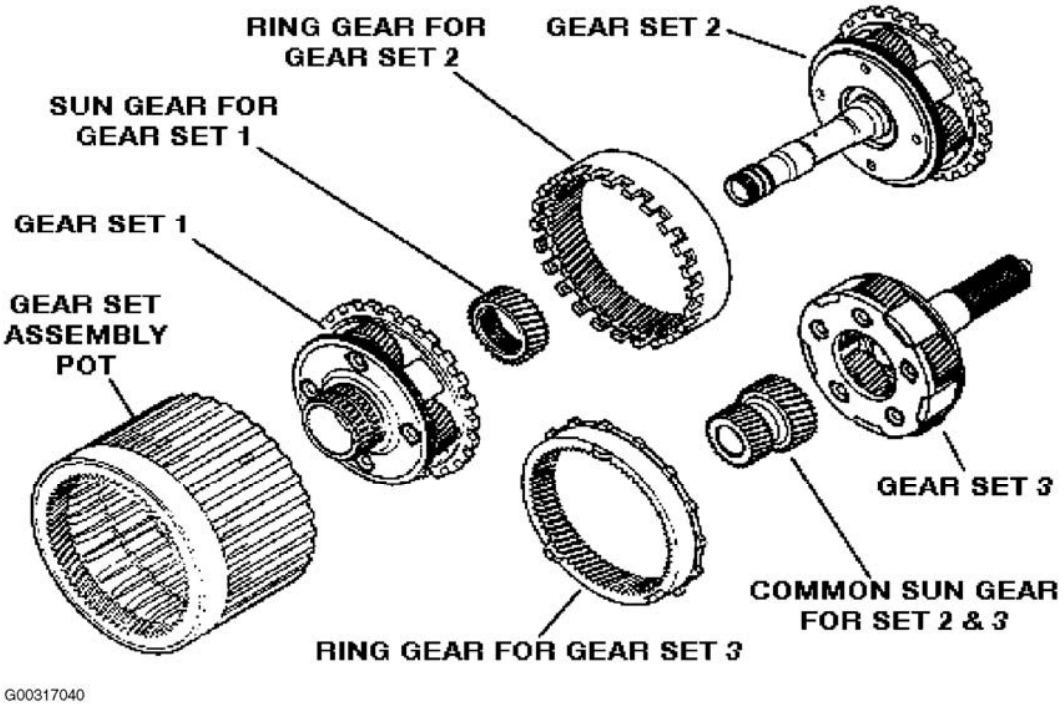


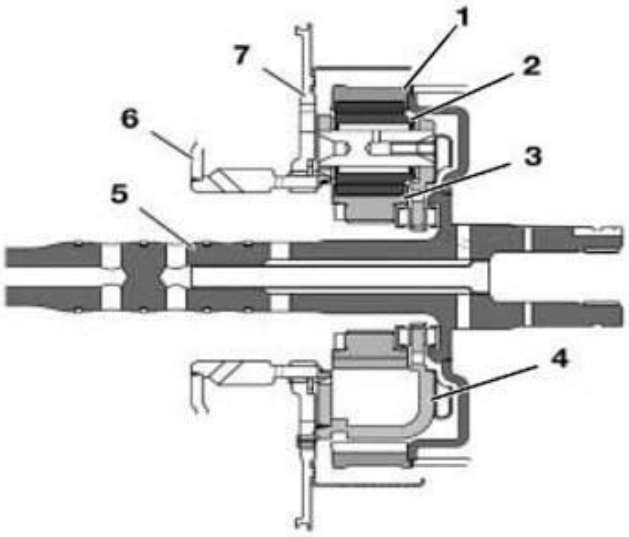
Fig. 30: Identifying Wilson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Lepelletier Gear Set

The Lepelletier Gear Set was introduced to BMW on the ZF GA6HP26Z. See **Fig. 31**. This gear set allows for 6 forward speeds and one reverse gear using a light weight design. The planetary gear train consists of a single carrier planetary gear train and a downstream double planetary gear train.

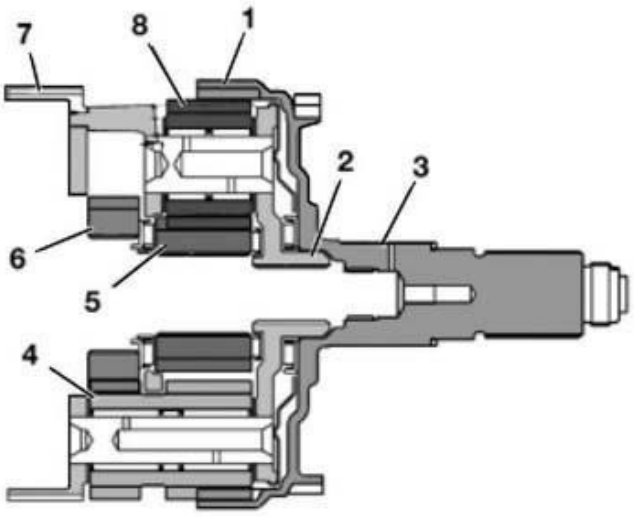
Lepelletier Gear Set

1. Internal Ring Gear 1
2. Planet Gear (pinion)
3. Planet Carrier
4. Planet Carrier
5. Turbine Shaft
6. Cylinder A
7. Pressure Plate A



Double Planetary Set

1. Internal Gear 2
2. Planet Carrier Clutch E
3. Output
4. Double Planet Gear Long
5. Sun Gear 3, Clutch E
6. Sun Gear 2, Clutch A
7. Planer carrier 1
8. Planet Gear (short)



G00317041

Fig. 31: Identifying Lepelletier Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Planetary Gear Set Operation

In order to understand planetary gear set operation, it is important to understand some basic rules of operation:

- It is assumed that engine rotation is clockwise when referring to power flow charts and diagrams.
- Planetary pinions will always rotate in the same direction as the internal ring gear.
- When the sun gear is driven clockwise and the planetary carrier is held stationary the internal ring gear will rotate counter clockwise (reverse gear).

- When two or more planetary members are locked together, the assembly will rotate together. The ratio from input to output is 1:1.
- When the sun gear is held stationary and the planetary carrier is driven clockwise, the ring gear will be driven clockwise in an overdrive ratio (.75:1)

When trying to understand power flow schematics, it is important to be able to draw a comparison between the actual planetary components and the schematic symbols. The diagram below outlines the relationship between these components and the power flow schematic. The schematic is a representation of a cross section of the transmission, but you only see the top half of the cross section. The transmission is shown as though it has been quartered lengthwise. See **Fig. 32**.

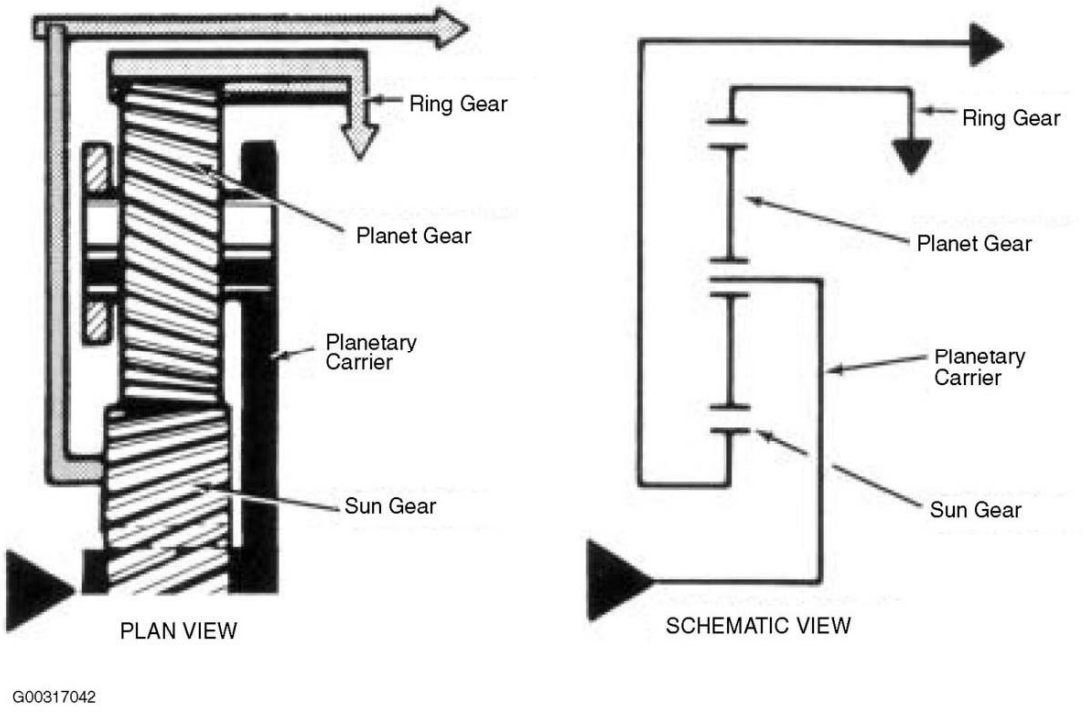


Fig. 32: Identifying Gear Set Operation
Courtesy of BMW OF NORTH AMERICA, INC.

POWER FLOW SCHEMATIC

In order to understand power flow schematics, a relationship must be drawn between the actual components and the schematic representation. This example uses the 4HP22/24 power flow schematic. The 4HP22/24 transmission uses a Simpson Planetary Gearset and an auxiliary gearset. The auxiliary gear set is a simple planetary gearset. See **Fig. 33**.

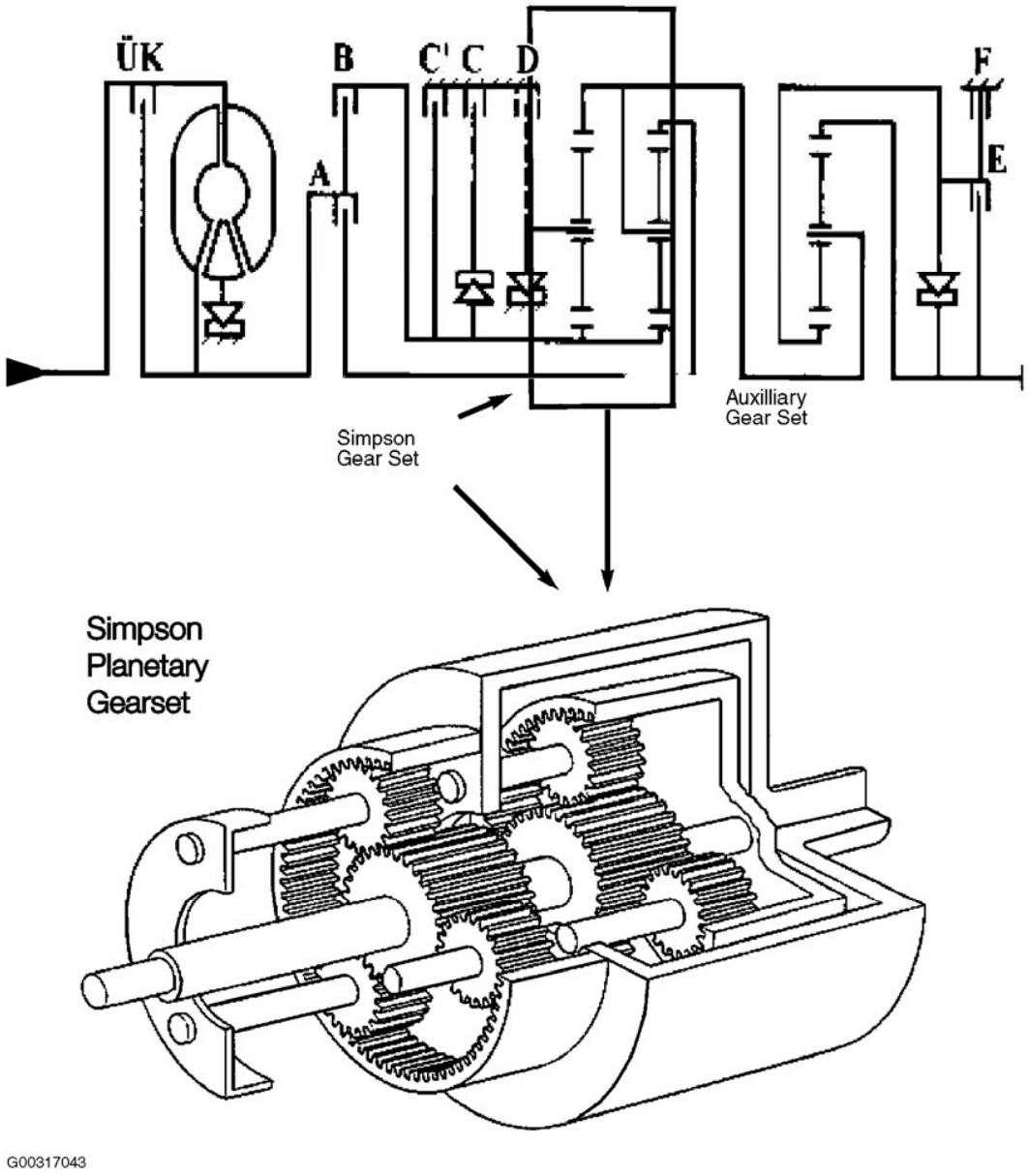


Fig. 33: Identifying Power Flow Schematic
Courtesy of BMW OF NORTH AMERICA, INC.

Power Flow In First Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The planetary pinions drive the common sun gear CCW, which in turn drive the front planet pinions CW. The front planetary carrier is held from rotating CCW by one way clutch "J". The front planetary pinions which are rotating CW drive the front ring gear/rear carrier CW. The rear

planetary carrier is rotating CW and is driving the planetary carrier from the auxiliary gear set. The "E" clutch in the auxiliary gear set is holding the Sun gear and the ring gear together. Therefore the auxiliary gear set is locked in a 1:1 ratio. See **Fig. 34**.

One Way Clutch "J" is locked to prevent the front planetary carrier from rotating CCW. One Way Clutch "H" is not used and One Way Clutch "K" is locked. One way clutch "K" is used to prevent an interruption in power flow before the "E" clutch is locked during the 4-3 shift. See **Fig. 35**.

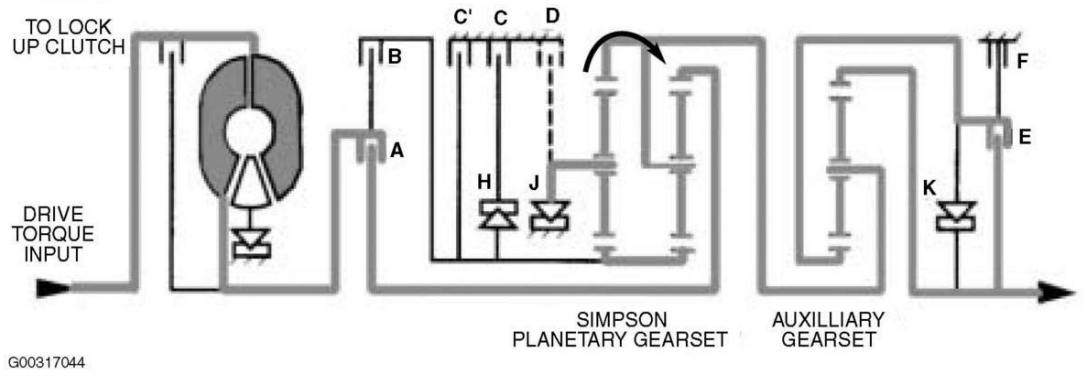


Fig. 34: Power Flow Schematic In First Gear
Courtesy of BMW OF NORTH AMERICA, INC.

ent an interruption in power flow before the "E" clutch is locked during the 4-

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

Fig. 35: Power Flow In First Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 36**. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The sun gear is held stationary by the C' clutch. The rear planet pinions rotate around the fixed sun gear CW. The rear planetary carrier will rotate CW. The rear planetary carrier will drive the auxiliary gear set and will rotate as a complete unit. The auxiliary gear set is locked in a 1:1 ratio due to the "E" clutch locking the sun and ring gear together. The "C" clutch is locking the outer race of the "H" freewheel to the case. This is used for the 3/2 downshift. Freewheel "J" is not active and Freewheel "K" is locked.

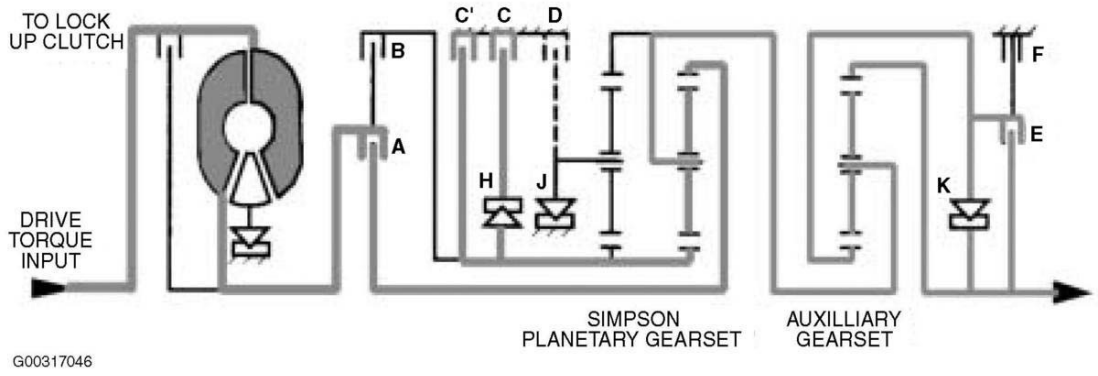


Fig. 36: Power Flow Schematic In Second Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 37**. The turbine shaft rotates clockwise (CW). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "E" clutch is locked which locks the ring gear to the sun gear in the Simpson gear set. The entire transmission planetary system is now locked in a 1:1 ratio. Freewheel "H" is overrun and freewheel "J" is not used. Freewheel "K" continues to be locked.

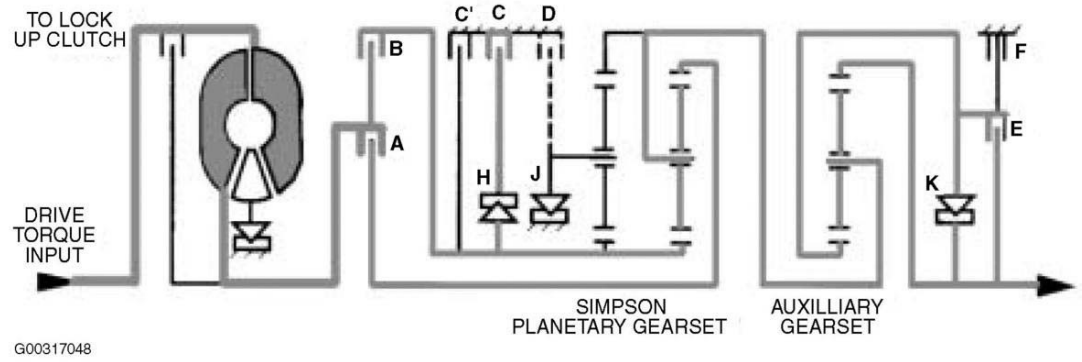


Fig. 37: Power Flow Schematic In Third Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 38**. The turbine shaft rotates clockwise (CW). (The turbine shaft can also be driven by the lock up clutch when engaged). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "F" clutch is locked which locks the sun gear in the auxiliary gear set to the case. The Simpson gear set drives the planetary carrier CW. The planet pinions walk around the fixed sun gear in a CW direction. This causes the ring gear to rotate CW as well. The ring gear, which is the output of the transmission is driven in an overdrive ratio. Freewheel "H" and "K" are overrun. Freewheel "J" is not used.

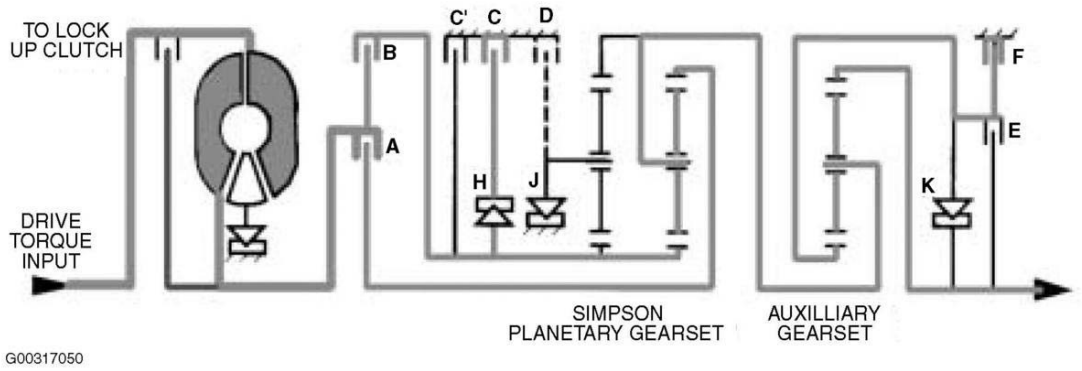


Fig. 38: Power Flow Schematic In Fourth Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Reverse Gear

Drive torque is applied to the torque converter impeller and transferred to the turbine. See **Fig. 39**. The turbine shaft rotates clockwise (CW). The "B" clutch is locked which drives the sun gear in the Simpson gear set CW.

The sun gear drives the planet pinions CCW. The planetary carrier is held stationary by the "D" clutch. The planet pinions cause the front ring gear to rotate CCW. The front ring gear (and rear carrier) drive the auxiliary gear set CCW which rotates at a ratio of 1:1 due to the "E" clutch locking the sun and ring gear of the auxiliary gear set. Freewheel "H" and "J" are not used. Freewheel "K" is locked.

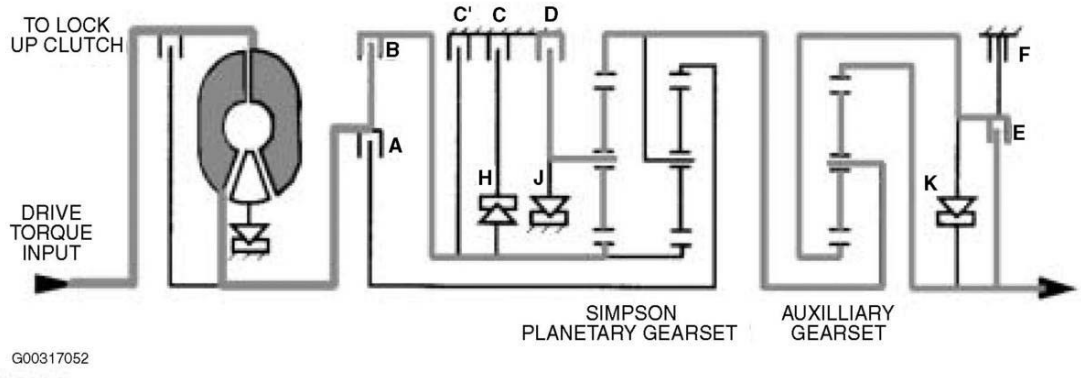


Fig. 39: Power Flow Schematic In Reverse Gear
Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT CONTROL

Freewheel Shifting

In order to prevent an interruption in power flow, freewheel (One Way Clutches) are used to lock members of the planetary gear set. Certain transmissions such as the 4HP22/24, A4S270/310R and the A5S360R use freewheel shifting on all gear shifts. Transmissions such as A5S310Z, A5S440Z, A5S560Z and GA6HP26Z use freewheel shifting for only specific shifts. Other shifts in these transmissions use overlap shifting technology. To demonstrate how the freewheel is used, the freewheel "H" in the 4HP22/24 transmission will be examined.

In third gear, the sun gear is rotating clockwise. Freewheel "H" is overrun (unlocked) allowing the sun gear to rotate. Clutch "C" is active which locks the outer race of freewheel "H" to the case. During a 3/2 downshift, clutch "B" is released. The sun gear is held from rotating counter clockwise by freewheel "H" and the "C" clutch. Freewheel "H" is used to stop the counter clockwise rotation of the sun gear before the "C" clutch can engage. This prevents an interruption of power flow during the 3/2 downshift. If freewheel "H" fails to operate, there would be an increase in engine RPM from 3rd to 2nd gear. See **Fig. 40** and **Fig. 41** .

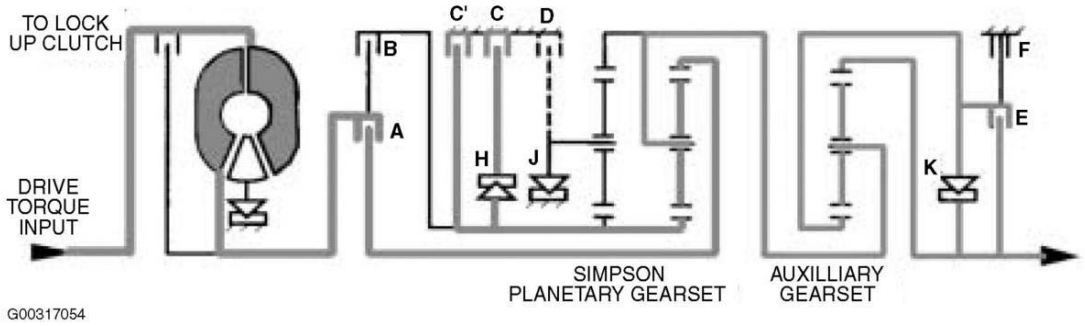


Fig. 40: Freewheel Shifting (Second Gear)
Courtesy of BMW OF NORTH AMERICA, INC.

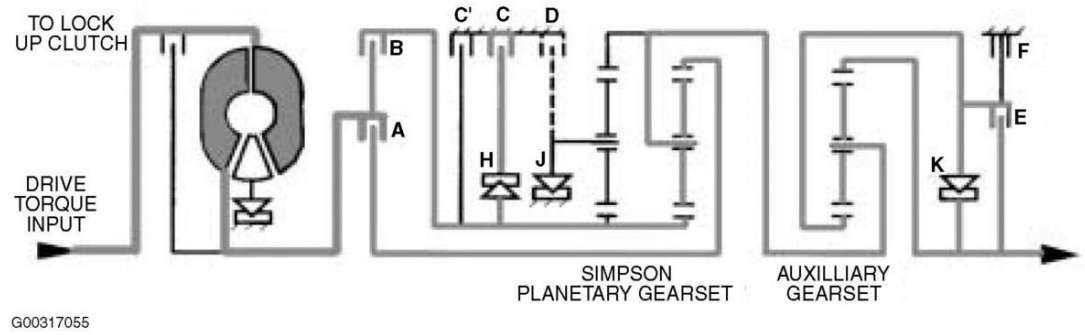


Fig. 41: Freewheel Shifting (Third Gear)
Courtesy of BMW OF NORTH AMERICA, INC.

Overlap Shift Control

Overlap shift technology is currently used on ZF transmissions. The A5S310Z, A5S440Z, A5S560Z and the GA6HP26Z use overlap shift technology on most gear changes. The advantages of this design allows for the reduction of the use of One Way Clutches (freewheel) and a significant improvement in shift quality. During an overlap shift, the releasing clutch pressure is reduced at the same rate that the engaging clutch pressure is increased. The result is a smooth transfer or torque between gear ratios.

As shown in the diagram, clutch 1 is fully engaged with maximum pressure. Clutch 2 is fully released. During overlap shifting, the TCM closely monitors the rotational speeds of the turbine (input) shaft and output shaft. The TCM then uses the EDS solenoids to control pressures during shifting to provide the optimum shift timing and overlap control. See **Fig. 42**.

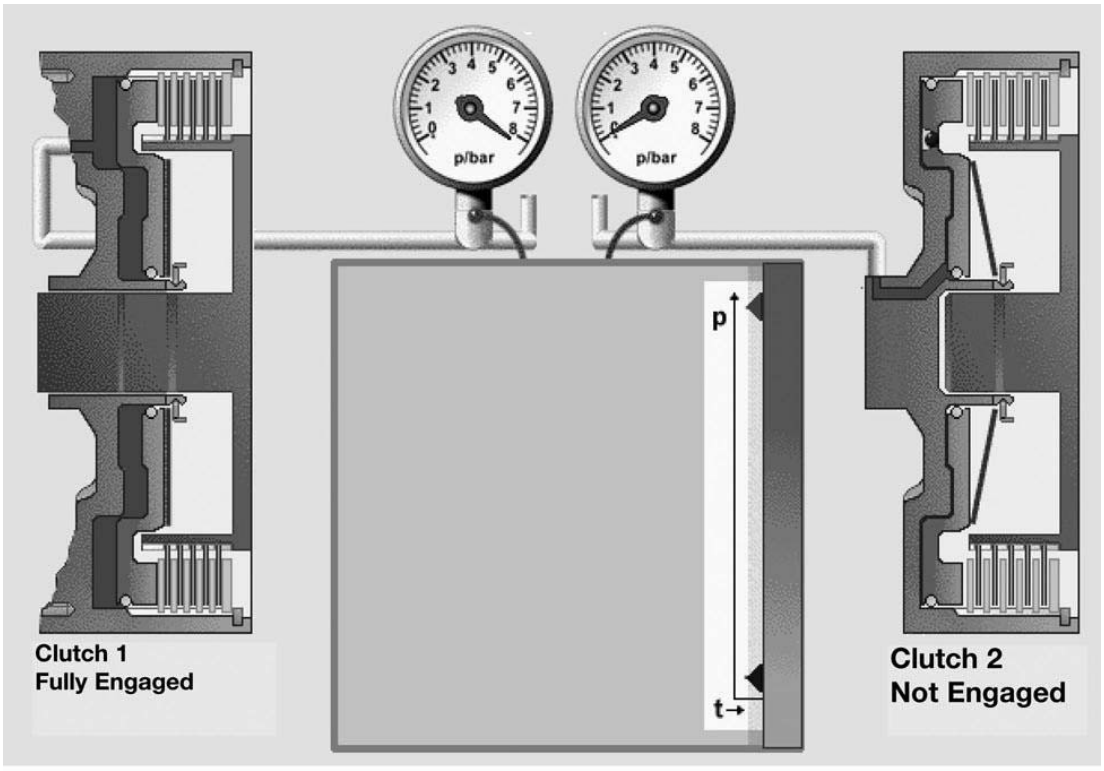
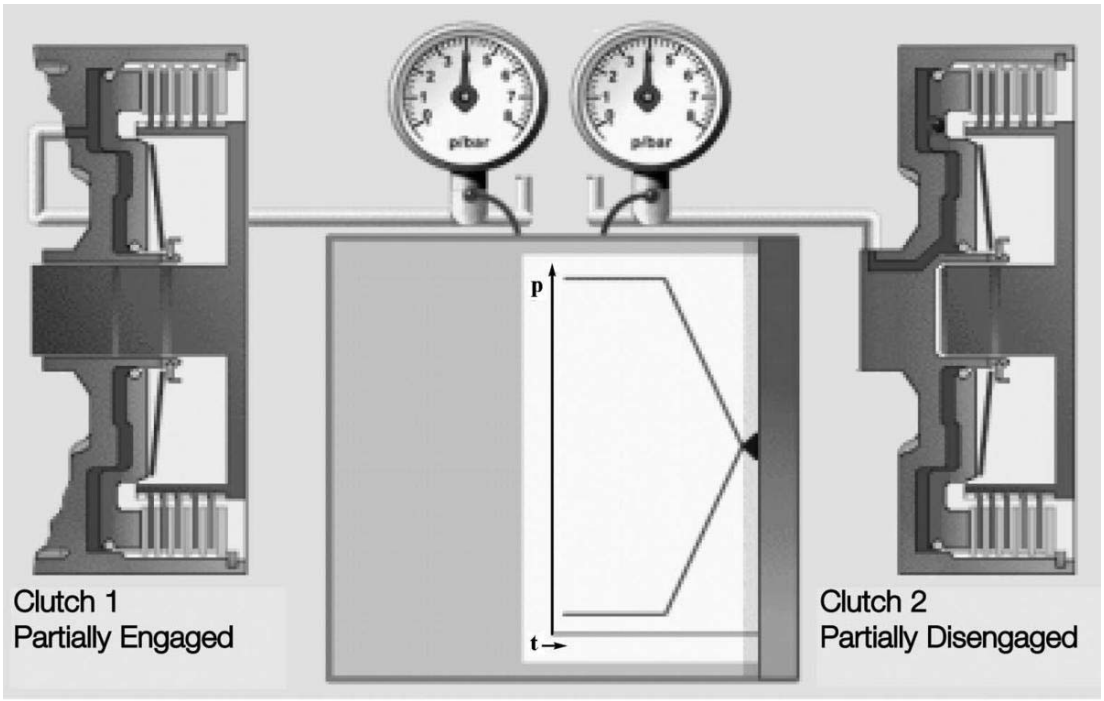


Fig. 42: Identifying Overlap Shift Control
Courtesy of BMW OF NORTH AMERICA, INC.

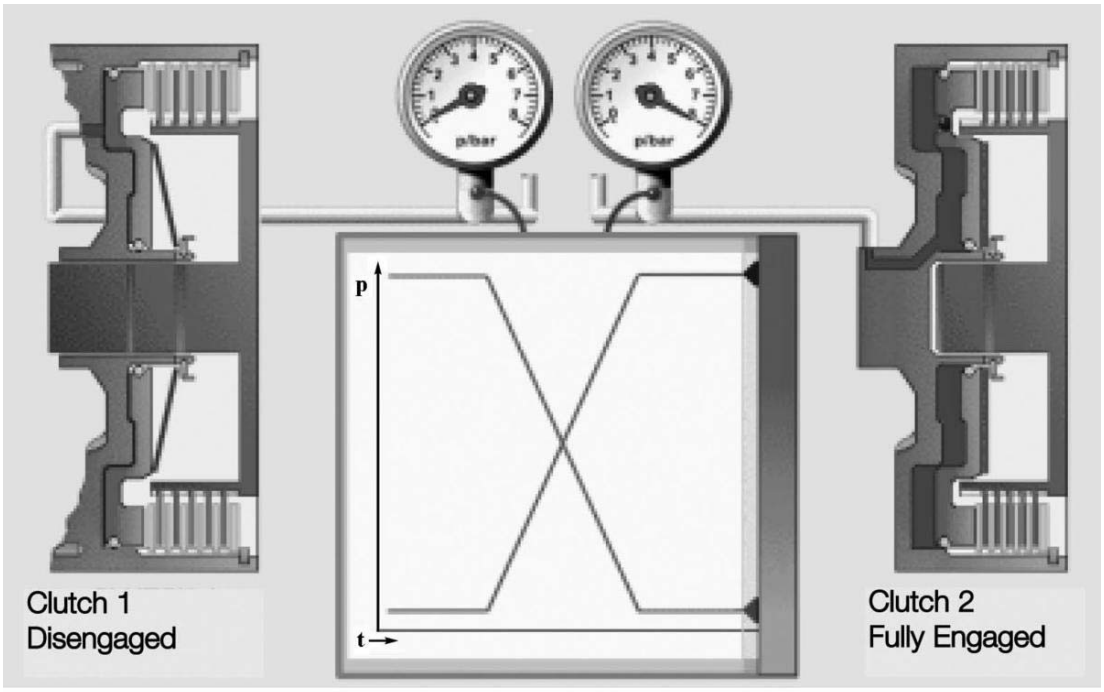
Overlap Shifting

During the transition of overlap, the clutches run through a slip zone. The torque is gradually transferred from the clutch that is releasing to the clutch that is engaging. The new gear engages the moment the torque level exceeds that of the first clutch. This is described as overlap. If the overlap is correct, (zero overlap) the engaging clutch takes over as much torque as the disengaging clutch releases. The result is a seemingly unnoticed shift of the best quality. See Fig. 43 and **Fig. 44** .



G00317057

Fig. 43: Identifying Overlap Shifting (Clutch 1 Engaged)
Courtesy of BMW OF NORTH AMERICA, INC.

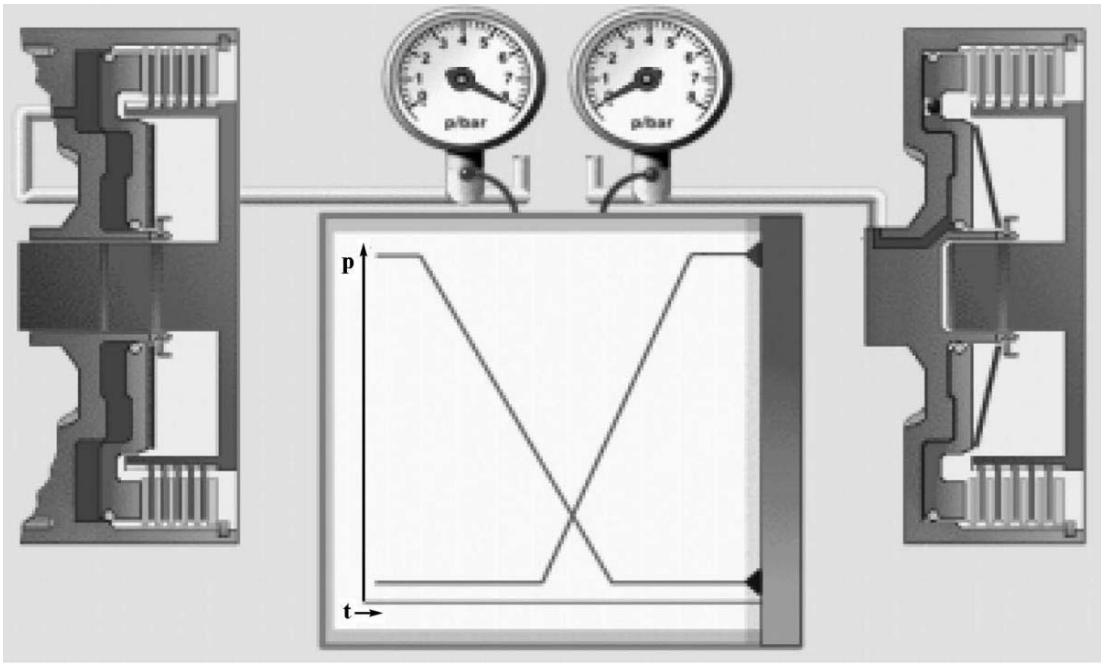


G00317058

Fig. 44: Identifying Overlap Shifting (Clutch 1 Disengaged)
Courtesy of BMW OF NORTH AMERICA, INC.

Negative Overlap

Negative overlap occurs when the engaging clutch takes over too late or the releasing clutch drops pressure too early. The result is that the drive torque is briefly interrupted. When the engine is operating under load, the engine speed increases due to the interruption. When coasting the engine speed drops. See **Fig. 45**.



G00317059

Fig. 45: Identifying Negative Overlap
Courtesy of BMW OF NORTH AMERICA, INC.

Positive Overlap

If positive overlap occurs, the engaging clutch takes over too early or the releasing clutch pressure drops too late. The gear set would become momentarily blocked if this condition occurs during an upshift. When this occurs the ratio of the gear set becomes 1:1 momentarily. The result is a loss in drive torque during a gear shift. See **Fig. 46**.

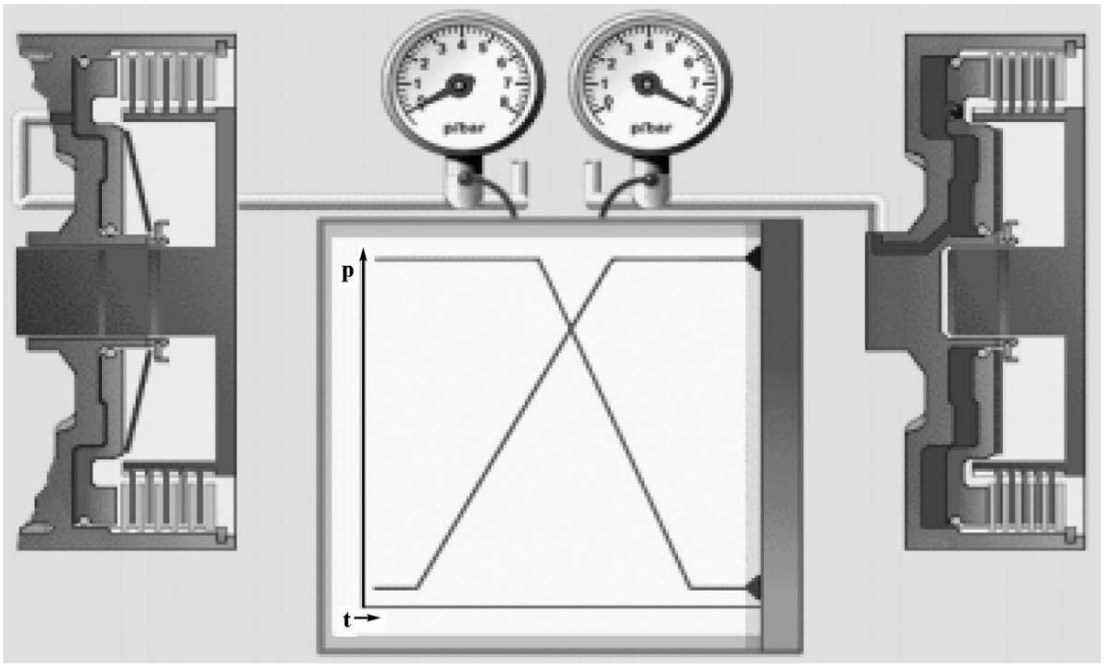


Fig. 46: Identifying Positive Overlap
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION CONTROL MODULE

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME). There are several types of TCM housings:

- 35 Pin TCM (TCU) - used on the 4HP transmissions.
- 55 Pin TCM used on the A4S310R (THM-R1).
- 88 Pin TCM used on all others up to 98.
- 134 Pin TCM used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors (1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are Blue in color to avoid confusion with the ECM (DME) connectors which are Black. See **Fig. 47**.

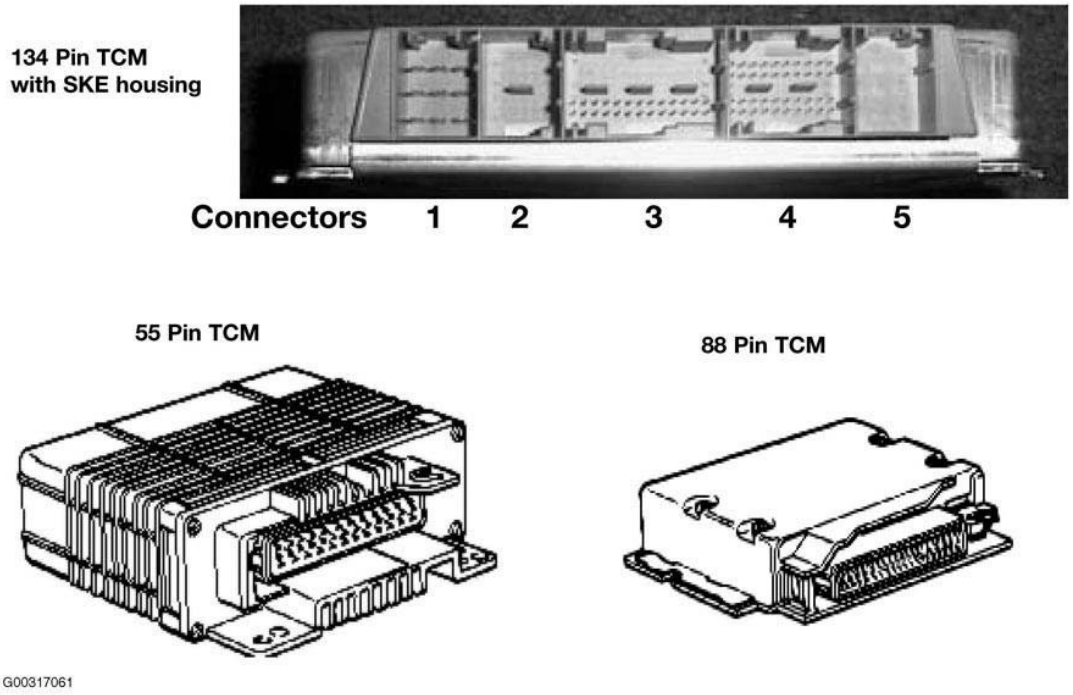


Fig. 47: Identifying Transmission Control Modules & Connectors
Courtesy of BMW OF NORTH AMERICA, INC.

2700 TRANSFER CASE, GENERAL

00 DANGER OF POISONING IF OIL IS INGESTED/ABSORBED THROUGH THE SKIN

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct

- Pour oil only into appropriately marked containers
- Do **not** pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

First aid measures

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

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00 RISK OF INJURY IF OIL COMES INTO CONTACT WITH EYES AND SKIN

Risk of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations

First aid measures

- **Eye contact:** Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- **Skin contact:** Wash off with soap and water immediately. If irritation persists, consult a doctor.

NOTE: Do not use solvents/thinners.

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00 SAFETY INSTRUCTIONS FOR HANDLING OIL

WARNING: DANGER OF POISONING if oil is ingested/absorbed through the skin!
RISK OF INJURY if oil comes into contact with eyes and skin!

Recycling

Observe country-specific waste-disposal regulations.

Measures if oil is unintentionally released

- **Personal precautionary measures:** Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- **Environmental protection measures:** Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- **Limiting spread:** Use oil blocks to prevent the surface spread of oil.
- **Cleaning procedure:** Bind and dispose of escaped oil with nonflammable absorbents.

NOTE: Do not flush oil away with water or aqueous cleaning agents.

2700 TRANSFER CASE, GENERAL

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1.0 TRANSFER CASE OPERATING FLUIDS

TRANSFER CASE OPERATING FLUIDS SPECIFICATION

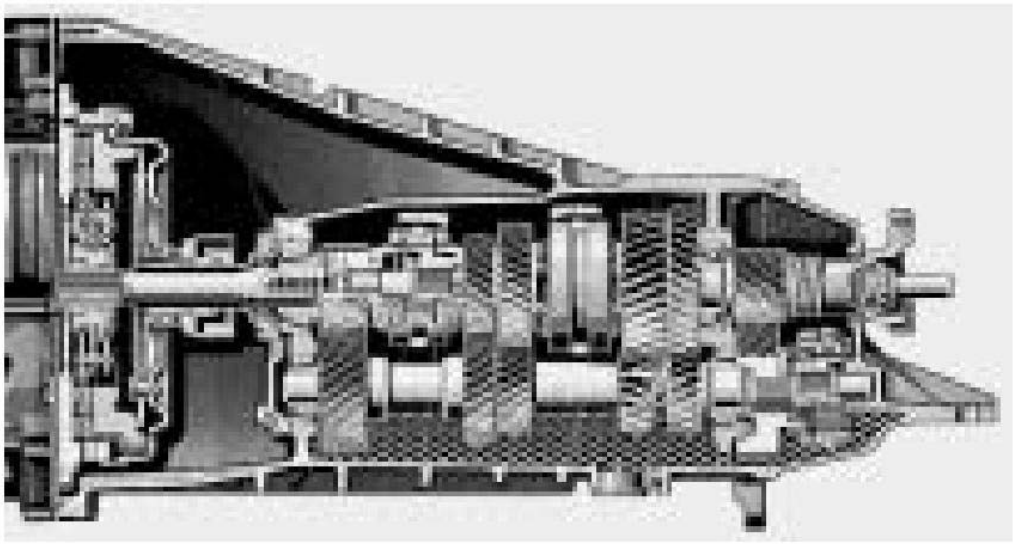
Model:	Fluid:	BMW Part Number:
E30 325iX	ATF Dexron® III formulation	
E46/16 325xi/xiT, 330xi	MTF-LT-1	83 22 9 408 942 (MTF-LT-2 = 5 Liters)
E53 All models produced up to 2/2005 with NV125 transfer case	ATF Dexron® III formulation	
E53 All models with X-Drive transfer case	TF0870	83 22 0 397 244 (1 Liter)
E60 All models	TF0870	83 22 0 397 244 (1 Liter)
E61 All models	TF0870	83 22 0 397 244 (1 Liter)
E70 All models	TF0870	83 22 0 397 244 (1 Liter)
E83 All models with X-Drive transfer case	TF0870	83 22 0 397 244 (1 Liter)
E90, E91 and E92 All models	TF0870	83 22 0 397 244 (1 Liter)

NOTE: Before opening the container, shake the container to evenly mix the additives with the oil.

TRANSMISSION FUNDAMENTALS

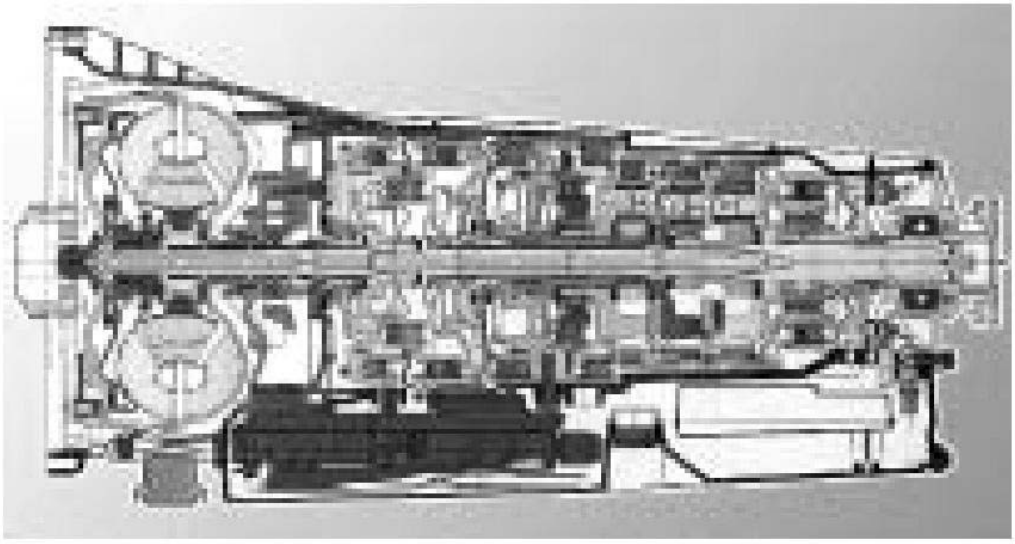
STANDARD/AUTOMATIC TRANSMISSION COMPARISON

In today's modern vehicles, the automatic transmission has become a vital part of the powertrain. Automatic transmissions provide overall better fuel economy and efficiency while adapting to changing road conditions and driving habits. Standard transmissions offer more driver interaction with the vehicle, however automatic transmissions reduce driver fatigue and increase safety by shifting automatically. Automatic transmissions also offer improved driveability in stop and go traffic. If there is a disadvantage to an automatic transmission, it would be complexity and cost of manufacturing.



G03403720

Fig. 1: Identifying Standard Transmission
Courtesy of BMW OF NORTH AMERICA, INC.



G03403721

Fig. 2: Identifying Automatic Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

- Drive torque must be interrupted to change gears.
- Higher loads on driveline from abrupt clutch application.
- Clutch must be disengaged when vehicle is stopped to prevent stalling.
- High radial loads on housing.
- Gear set design requires more space than planetary type.
- Requires some Maintenance (clutch).
- Requires driver intervention for shifting.
- Gear teeth are in constant mesh due to planetary design.
- Smoother application of drive torque reduces loads on driveline.
- Due to fluid coupling in the torque converter, transmission can stay in gear when vehicle is stopped.
- Minimal radial loads on housing.
- Compact design of gear set. Space requirement is minimized.
- Maintenance free operation. (Lifetime fluid and no clutch).
- Automatic shifting reduces driver fatigue and increases safety.

HYDRAULIC TRANSMISSION VS. ELECTRO-HYDRAULIC TRANSMISSION

Since the introduction of the automatic transmission there have been numerous refinements to improve shift comfort as well as fuel economy. Early automatic transmissions used only hydraulic control, there was no

electronic intervention. In 1986 BMW introduced their first EH (Electro-Hydraulic) transmission into production vehicles.

The acronym EGS is used by BMW for its electronic transmission control system. EGS stands for "Electronic Transmission Control" which comes from the German words **"E** lektronisch **G** etriebe **S** teurung". In order to comply with SAE terminology we will refer to the EGS control module as the TCM "**T** ransmission **C** ontrol **M** odule".

EH controlled transmissions allow for optimized shift points by closely monitoring changing conditions. Engine speed, road speed and throttle angle are some of the inputs that are monitored by the TCM to determine optimal shift points. The TCM will then process this information and control shift point via electronic solenoids mounted on the valve body.

With the introduction of Adaptive Transmission Control, shift comfort and fuel economy was further improved. The TCM now monitors throttle angle deviations, wheel speeds and CAN Bus information to fine tune shift points.

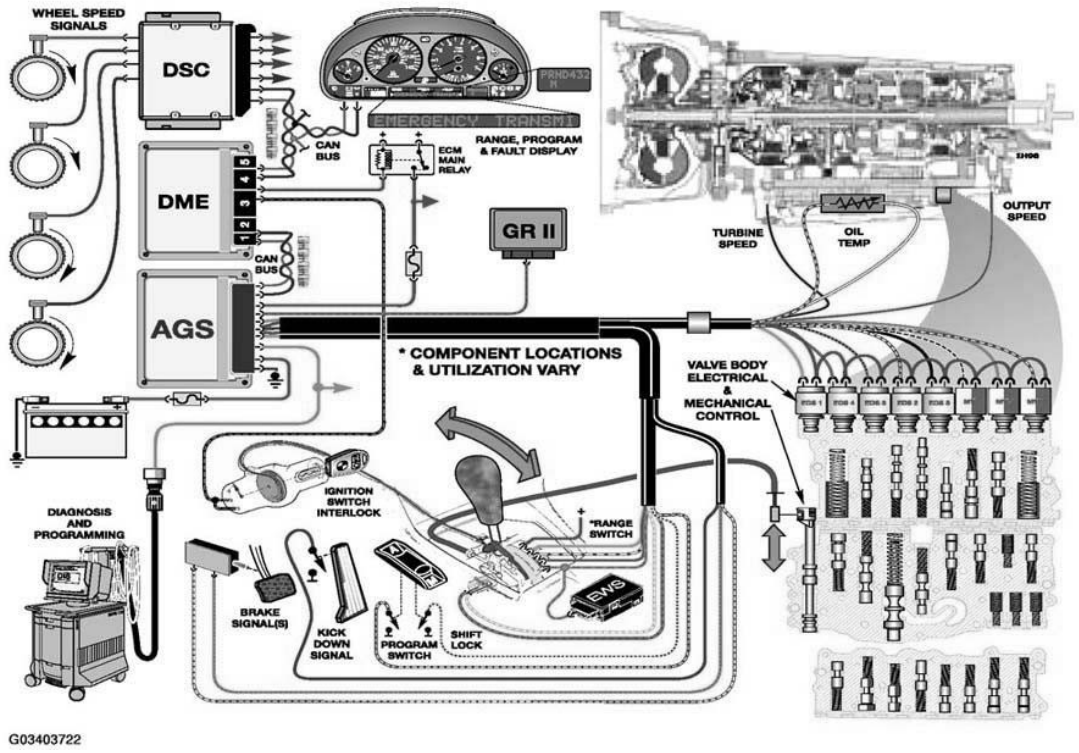


Fig. 3: Identifying Electro-Hydraulic Transmission Inputs/Outputs
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION IDENTIFICATION

BMW automatic transmission are manufactured by two suppliers for the US market:

- **Zahnradfabrik Friedrichshafen:** Commonly referred to as ZF. ZF manufactures both manual and automatic transmissions.

- **GM Powertrain - Hydramatic:** Hydramatic is a manufacturing division of General Motors located in Strasbourg France. Hydramatic supplies automatic transmissions to BMW for four and six-cylinder vehicles.

BMW has developed an internal numbering system for their transmissions for parts ordering, information research and identification. Also each manufacturer uses their own internal identification system. Here is a breakdown of these identification codes:

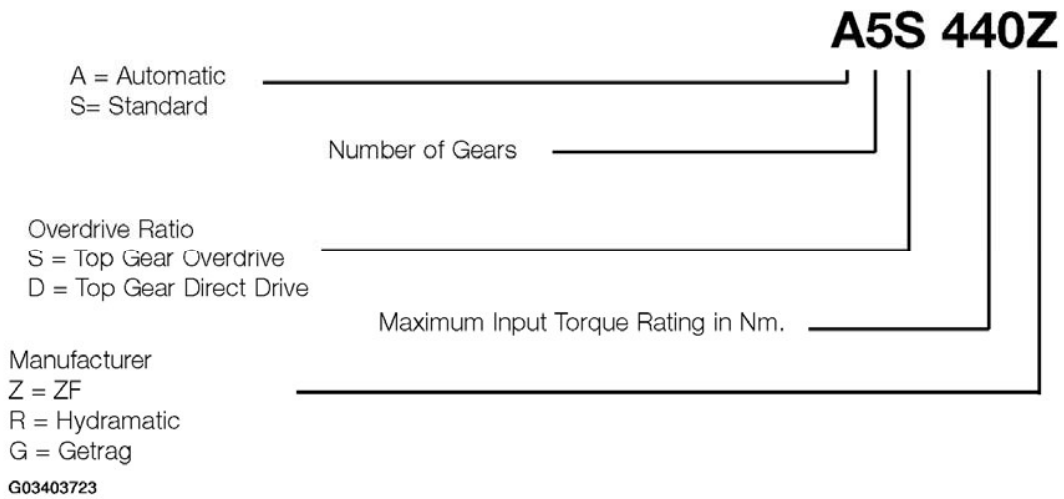


Fig. 4: Identifying BMW Identification Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

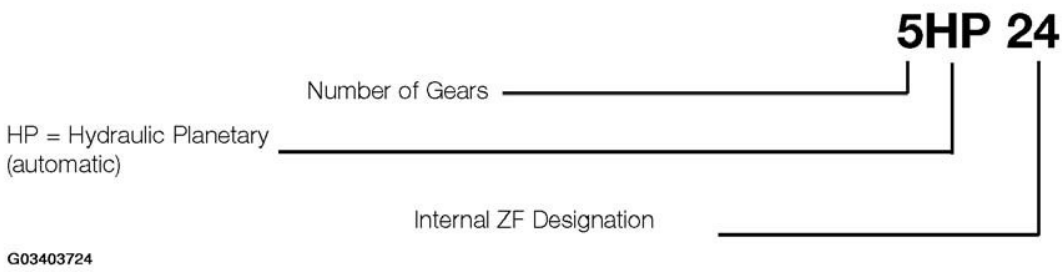


Fig. 5: Identifying ZF Identification Code Breakdown
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION HYDRAULICS

Transmission Fluid (Oil)

The automatic transmission provides pressure regulated hydraulic fluid which is filtered for all of the transmissions functional requirements. All BMW automatic transmissions are designed to operate with specific

fluids. Use of non-approved oil will cause malfunctions and irreparable transmission damage which is not covered by BMW warranty.

The transmission fluid provides the following functions:

- Lubricates mechanical components (planetary gears, bearings etc.).
- Removes heat and transfers heat to transmission cooling system. (Heat Exchanger).
- Removes debris and contaminants to sump and filter when circulated.
- Provides a transfer of kinetic energy in the torque converter.
- Allows hydraulic operation of mechanical components (clutches, brakes) via control of the valve body.

Also, transmission fluid has various properties to prevent oxidation and breakdown from heat and friction. Each type of transmission fluid has properties specific for each transmission application.

Fluid level is crucial in the proper operation of an automatic transmission. Improper fluid levels will cause improper operation and eventually irreparable transmission damage. Improper fluid level can cause:

- A low fluid level can cause an interruption in oil flow during fast acceleration or hard braking which can cause gear shift malfunctions.
- An excessively high fluid level can cause the rotating mechanical components to paddle in the oil. This produces foam which introduces air into the hydraulic system.
- A low fluid level can also cause transmission overheating causing premature transmission failure.

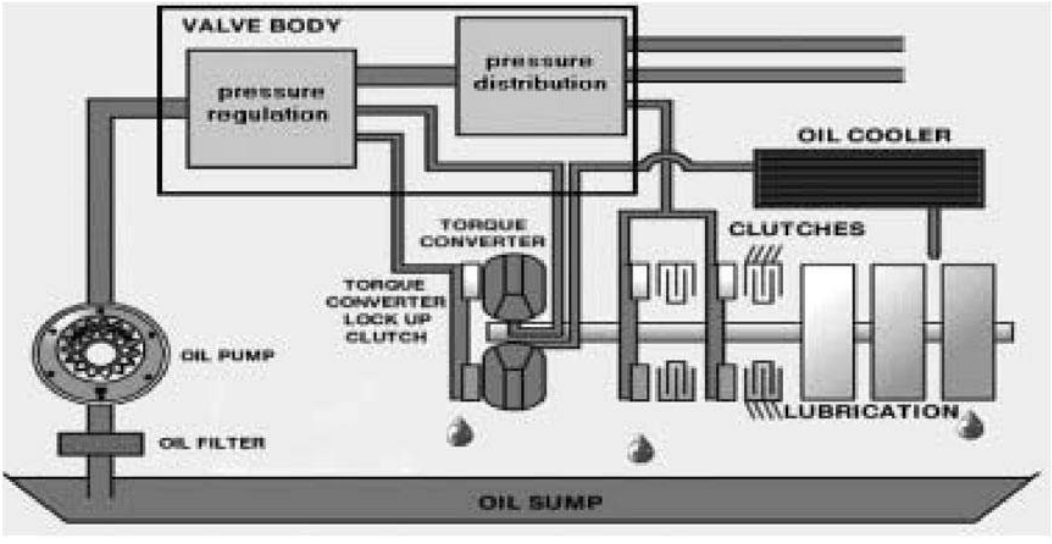


Fig. 6: Identifying Transmission Fluid Flow
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION FLUID APPLICATION

There are numerous types of transmission fluid used in BMW transmissions. With the exception of the early transmissions (4HP22/24, A4S310/270R and the A5S310Z) all current BMW transmissions use "Lifetime Fill" transmission fluid. There is no maintenance required for these transmissions. It is important to use the correct fluid. Incorrect use of the transmission fluid can cause non-warrantable transmission damage.

When performing repairs on transmissions with lifetime fluid, it is important to drain the transmission fluid in to a clean container for re-use. New fluid should only be used for transmission replacement and for topping off after repairs.

Also, transmission fluid level is vital to the proper operation of the transmission.

BMW AUTOMATIC TRANSMISSIONS FLUID SPECIFICATIONS

Transmission	Fluid Type	BMW Part #	Container	SIB Ref.
4HP22 **4HP24**	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S310Z 530i/iT (E34)	Dexron III	Available Commercially (Castrol or Texaco)	N/A	
M3 (E36)	ESSO LT 71141	83 22 9 407 807	20 liter container	B 24 03 95
A5S325Z	ESSO LT 71141	83 22 9 407 807	20 liter contalner	
A5S440Z	ESSO LT 71141	83 22 9 407 807	20 liter contalner	
A5S560Z 740 (E32), 540 (E34) 840Ci (E31- 6/93-12/94) 740i/iL-750iL (E38)	Shell LA2634	83 22 9 407 765	5 liter contalner	B 24 11 92
540i (3/96-12/96) 850Ci (10/94-6/97)	ESSO LT 71141	83 22 9 407 807	20 liter contalner	B 24 02 94
A4S310R **A4S270R** **(THM-R1)**	Dexron III Mercon	Available Commercially (Castrol or Texaco)	N/A	
A5S360R **A5S390R**	Texaco ETL 7045E Texaco ETL 8072B	83 22 0 026 922 83 22 0 024 359	25 liter contalner 25 liter contalner	
GA6HP26Z	Shell M1375.4	83 22 0 142 516		

TORQUE CONVERTER

In standard transmissions the crankshaft is linked to the transmission input shaft via the clutch assembly. Power flows from the crankshaft through the flywheel. The pressure plate transfers power to the clutch disc which is splined to the transmission input shaft. The pressure plate is used to disconnect (or interrupt) power flow to the transmission input shaft. Because the engine is mechanically connected to the driveline, power flow must be interrupted when the vehicle is stationary. Otherwise the engine would stall.

In automatic transmissions, there is a fluid coupling between the engine and transmission. This fluid coupling is more commonly referred to as the torque converter. In the torque converter there is no rigid connection between

the engine and transmission (Except for lock up clutch). In order to understand the operation of the torque converter, we must first start with the components.

The breakdown of the components are as follows:

- The Impeller (1), which is rigidly connected to the torque converter housing.
- The Turbine (2) which is splined to the input shaft (turbine shaft) of the transmission.
- The Stator (3) which has a one-way clutch. The inner race of the one-way clutch is splined to a stationary shaft attached to the transmission.

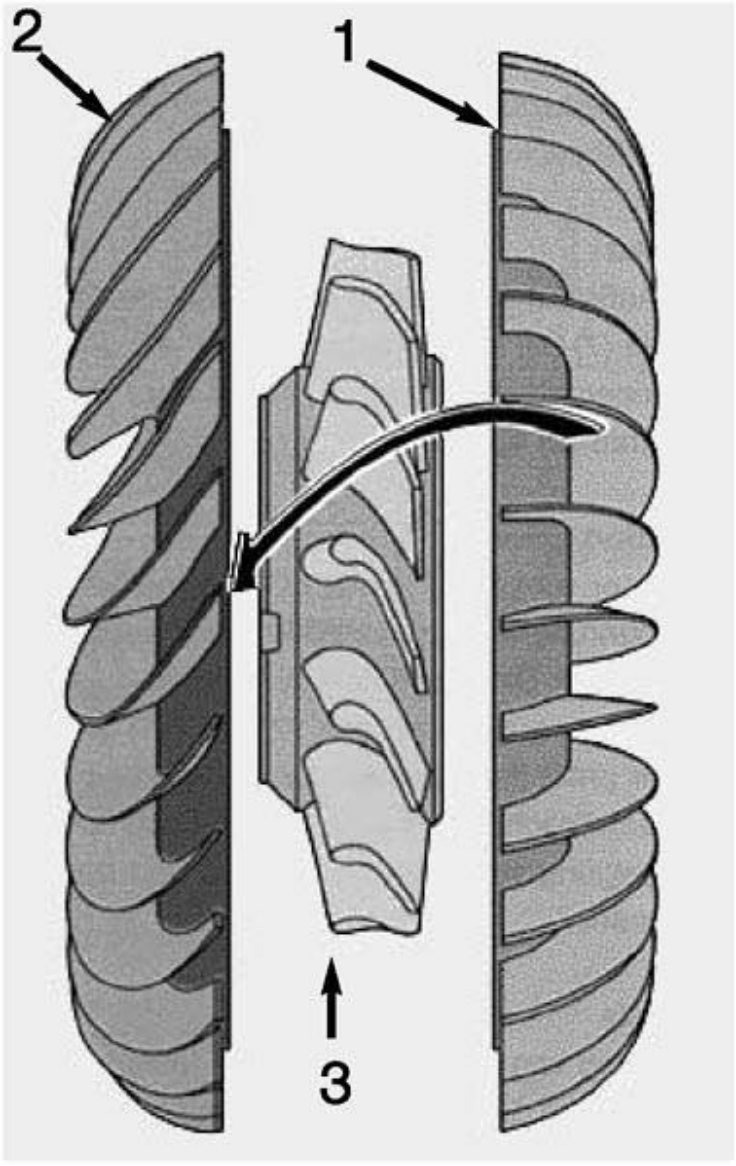


Fig. 7: Identifying Torque Converter Components
Courtesy of BMW OF NORTH AMERICA, INC.

The addition of the stator allows the fluid coupling to be referred to as a torque converter. The stator provides for a multiplication of torque at low speeds. Without the stator there would be no multiplication of torque.

When the engine is running, the impeller which is directly connected to the converter housing, rotates at engine speed. Fluid is directed from the impeller blades to the turbine blades. The fluid drives the turbine which is splined to the input (turbine) shaft of the transmission. This functions the same way as a waterfall acting on a

paddle wheel. The ratio of the impeller speed to turbine speed is approximately 1.1 to 1. This ratio is improved to 1:1 with the addition of the torque converter clutch which is discussed later.

Torque Converter

Torque Converter Operation At Low Speeds

1. At low engine speeds there is a large difference in rotational speed between the impeller and the turbine
2. Fluid flow is directed from the impeller to the turbine. Fluid strikes the vanes of the turbine. The turbine is driven forward in the direction of engine rotation.
3. Fluid flow is then directed back towards the impeller.
4. Before the fluid reaches the impeller, the fluid strikes the vanes of the stator.
5. When the fluid strikes the stator, the one way clutch prevents the stator from rotating.
6. The fluid is then re-directed by the curved vanes of the stator. The fluid is now flowing in the same direction as the impeller.
7. The fluid that is acting on the impeller increases the force on the impeller which multiplies torque.

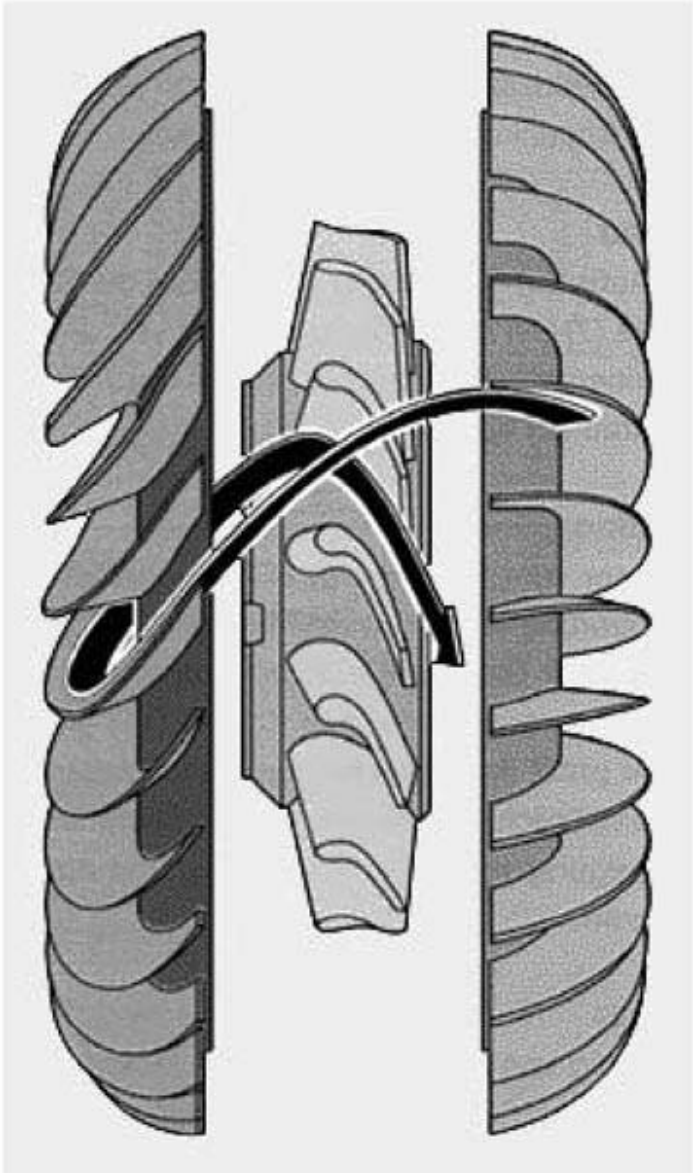


Fig. 8: Identifying Torque Converter Operation At Low Speeds
Courtesy of BMW OF NORTH AMERICA, INC.

Torque Converter Operation At High Speed

1. As engine speed increases, the turbine speed approaches the speed of the impeller.
2. The fluid flow is directed from the turbine to the back side of the impeller blades.
3. The one-way clutch in the stator unlocks and the stator blades turn in the direction of engine rotation.

4. Fluid is no longer re-directed and torque multiplication no longer takes place.
5. This is referred to as "Coupling Speed". The turbine never reaches the same speed as the impeller as fluid flow would come to a halt. Ratio is approximately 1.1 to 1.

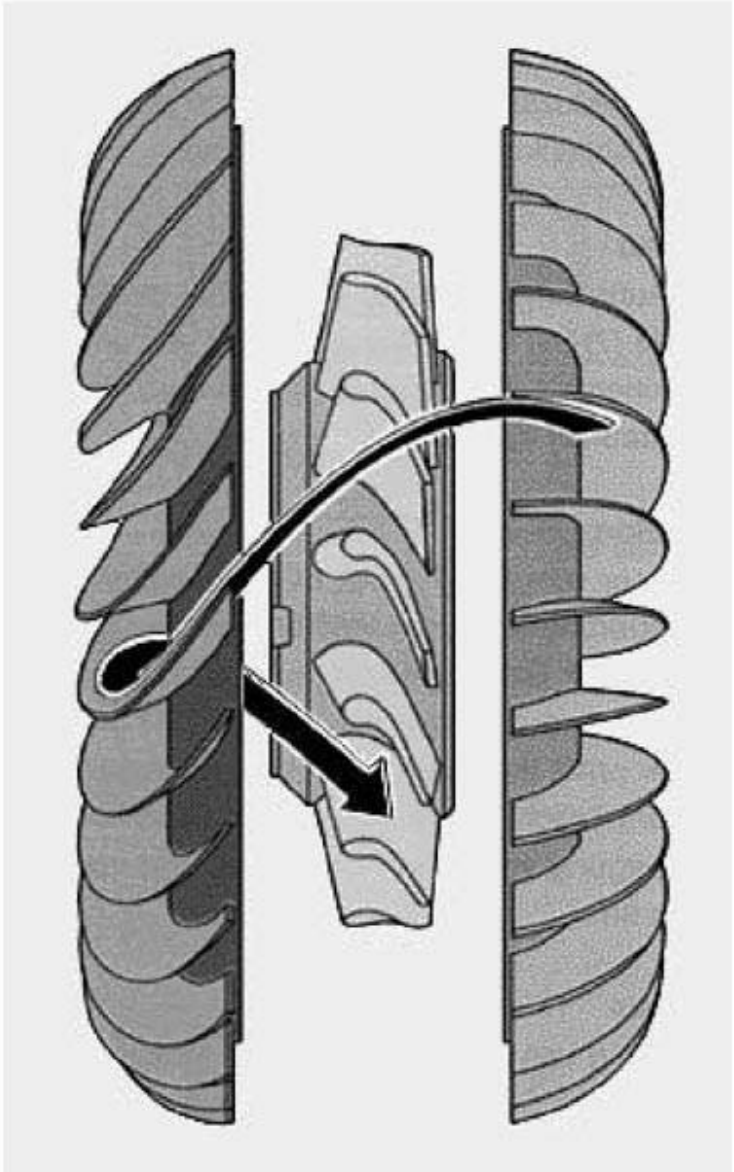


Fig. 9: Identifying Torque Converter Operation At High Speed
Courtesy of BMW OF NORTH AMERICA, INC.

TORQUE CONVERTER CLUTCH

Since the efficiency of the torque converter at coupling speed is approximately 1.1 to 1, fuel economy is compromised. To offset this a torque converter clutch was added on EH controlled transmissions. The torque converter clutch locks the turbine to the converter housing. This creates a mechanical coupling with a ratio of 1:1. This can only be achieved at higher engine speeds, the torque converter clutch must be disengaged at low engine speeds to prevent stalling.

There are two methods for controlling the torque converter clutch on BMW transmissions:

- **A4S310/270R, 4HP22/24 EH, A5S310Z** - These transmission use an on/off control method to lock and unlock the torque converter. The TCC is either completely engaged or completely disengaged. This method of engagement provides an abrupt sensation when the TCC is locking and unlocking. This abrupt sensation can be unpleasant and undesirable to some drivers.
- **A5S560Z, A5S440Z, A5S325Z, GA6HP26Z, A5S360/390R** - These transmissions use a gradual approach to TCC control. The TCC is gradually applied and released, this method reduces the abrupt feel of the on/off type TCC. The TCC solenoid is controlled by pulse width modulation. This allows fluid to be gradually introduced and released to the TCC.

The TCC is spring loaded to the engaged position. Pressurized fluid releases the TCC, when the pressurized fluid is released, the TCC is engaged. Depending on transmission application, the TCC can be engaged in 3rd, 4th or 5th gear. The TCC must be disengaged at low speeds to prevent stalling.

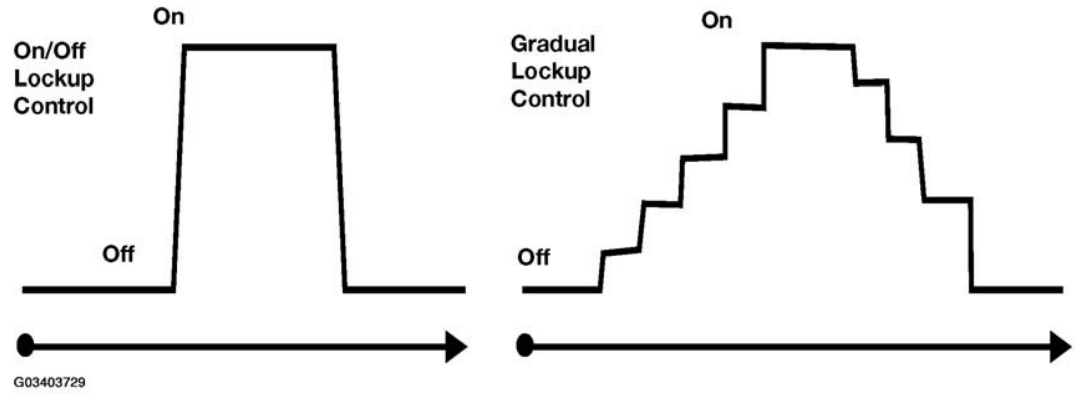


Fig. 10: Identifying Two Methods For Controlling Torque Converter Clutch On BMW Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Example Of TCC Oil Control Circuit From The A5S440/560Z Transmission.

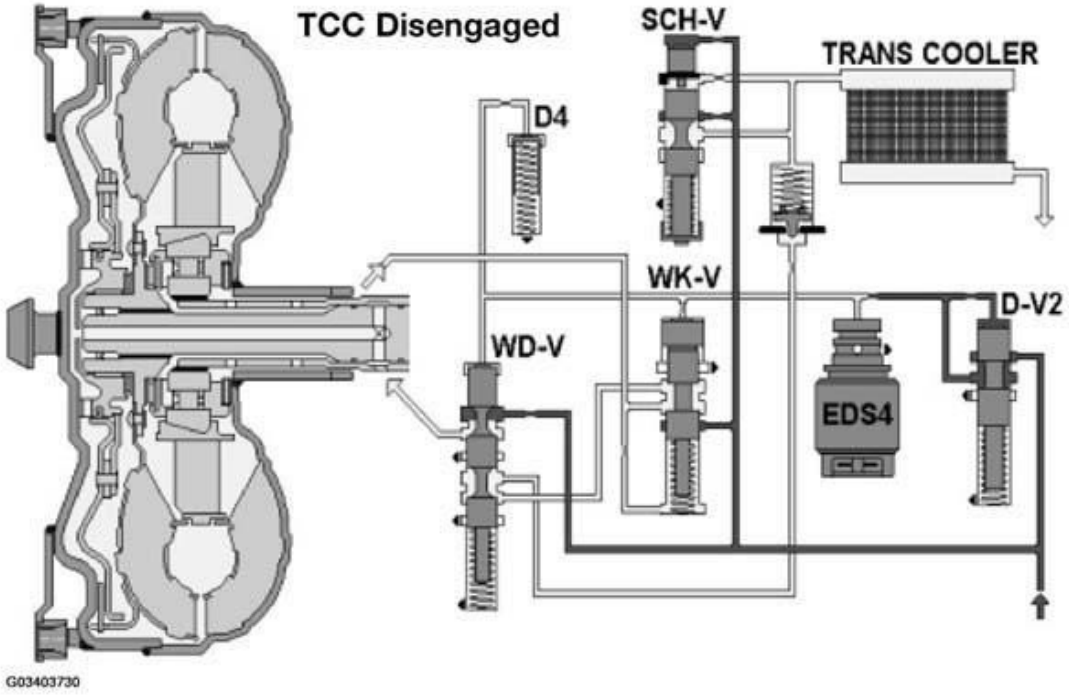


Fig. 11: Identifying TCC Oil Control Circuit From A5S440/560Z Transmission (TCC Disengaged)
Courtesy of BMW OF NORTH AMERICA, INC.

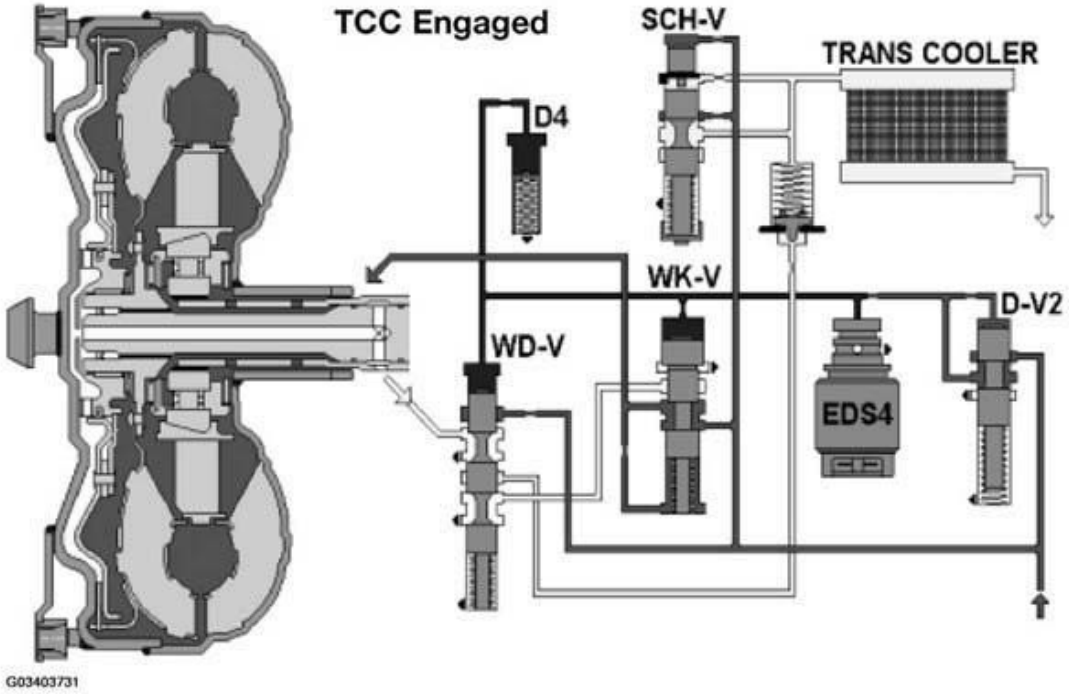


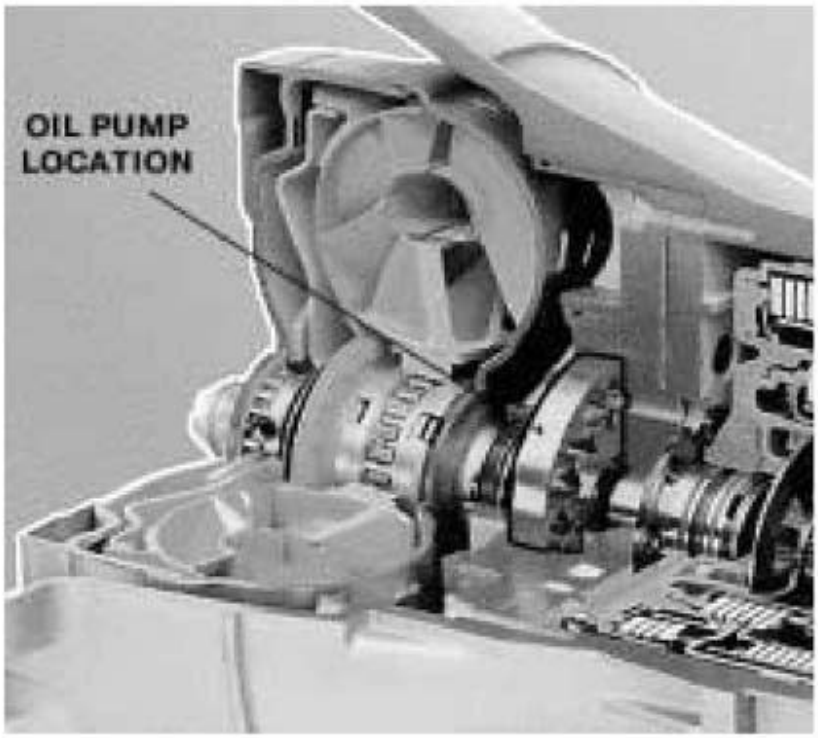
Fig. 12: Identifying TCC Oil Control Circuit From A5S440/560Z Transmission (TCC Engaged)
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP

The transmission oil pump is used to circulate oil and provide pressure for hydraulic operation.

The pump is driven by the torque converter shell and rotates with engine. Fluid is drawn from the sump through the filter and distributed to the various transmission hydraulic systems.

The output pressure is regulated to an operating pressure of approximately 25 bar.



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Fig. 13: Identifying Transmission Oil Pump Location
Courtesy of BMW OF NORTH AMERICA, INC.

Currently there are two types of oil pumps used in BMW transmissions; Crescent type and Vane type.

Crescent Type Oil Pump (All Except A5S360/390R)

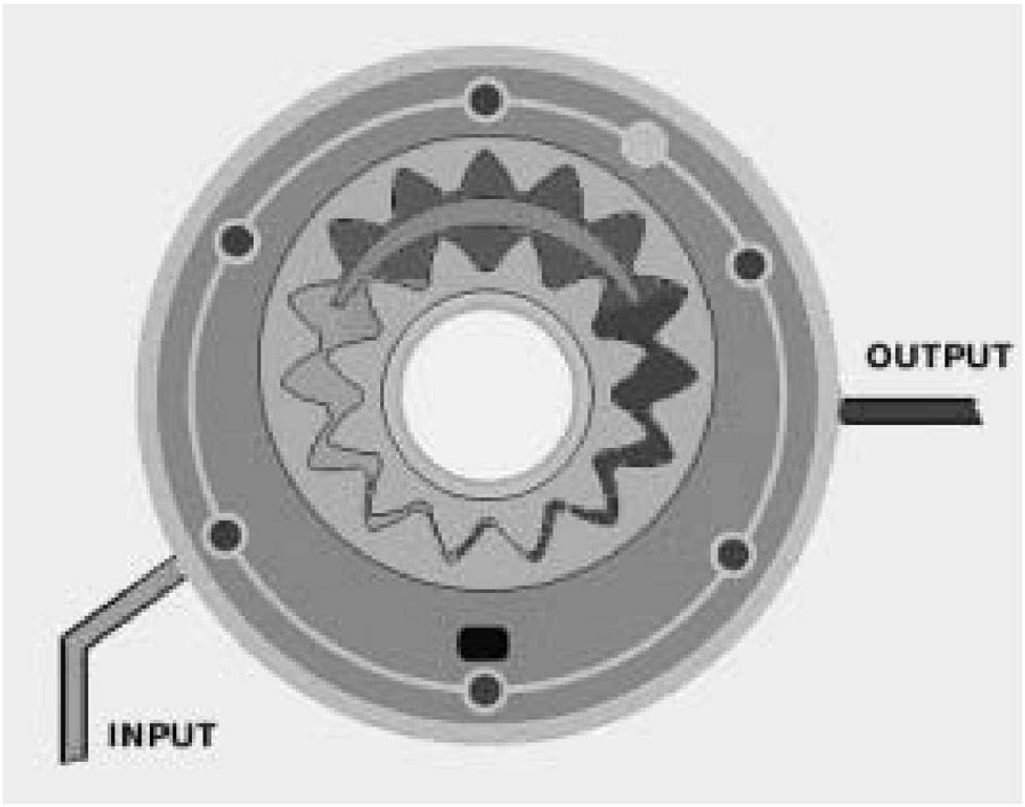
The crescent type is an internal gear pump containing a drive gear and a driven gear. The inner gear is driven by the torque converter and acts as the impeller. The outer gear is driven by the inner gear.

The gap between the teeth varies from the input, through the crescent and to the output of the pump.

A low pressure area is created on the input side of the pump by the widening gap between the gear teeth.

The oil is drawn to the crescent and transferred to the output side of the pump, where the pressure is increased by the narrowing gap between the gear teeth.

The output pressure of the pump is controlled by spring loaded pressure regulator.



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Fig. 14: Identifying Crescent Type Oil Pump (All Except A5S360/390R)
Courtesy of BMW OF NORTH AMERICA, INC.

Oil Volume Control

On the A5S440Z transmission, oil pump output volume is controlled based on engine RPM. High oil volume is initially required at start up to quickly fill the transmission requirements. As engine RPM increases, the volume is greater than is required. The Oil Volume Control Damper regulates the pump output volume based on engine RPM. This helps improve fuel economy by reducing the load on the engine at high RPM.

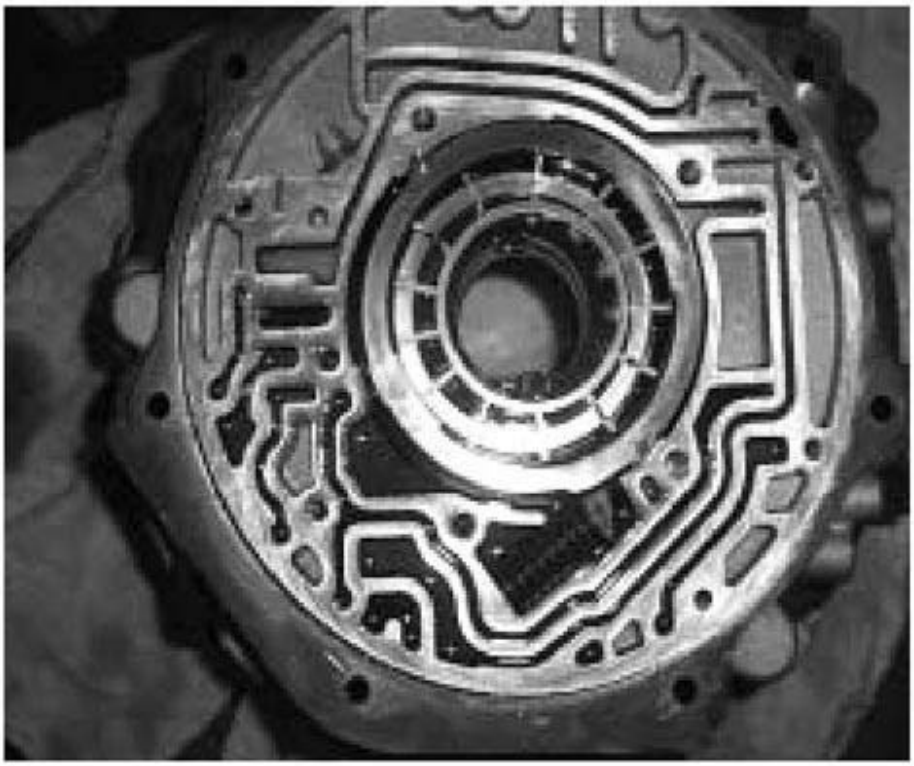
Vane Type Pump (A5S360/390R)

The new A5S360/390R (GM5) transmission uses a vane type pump. The torque converter drives the pump rotor and 13 vanes.

The rotor and vanes are placed inside a slide mechanism. As the rotor spins, the vanes sweep oil from the pump intake to the output along the mating surface on the vane ends and the interior surface of the slide.

The slide is mounted on a pivot pin. As it pivots, it changes the eccentricity of the rotor to slide mating surface. This in turn will alter the output oil volume. This provides the same function as the Oil Control Volume Damper on the A5S440Z.

The slide's position is influenced by a calibrated spring and hydraulic control pressure from the main pressure regulator solenoid on the valve body.



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Fig. 15: Identifying Vane Type Pump (A5S360/390R)
Courtesy of BMW OF NORTH AMERICA, INC.

The benefit of changing the slide position is to optimize pump output volume to meet the following operating conditions:

- Provide maximum volume during engine start-up. This condition provides a fast priming action of the pump for immediate lubrication and for hydraulic pressure operation.
- Regulated output volume at higher engine speeds. Maximum pump volume is not required at all times.

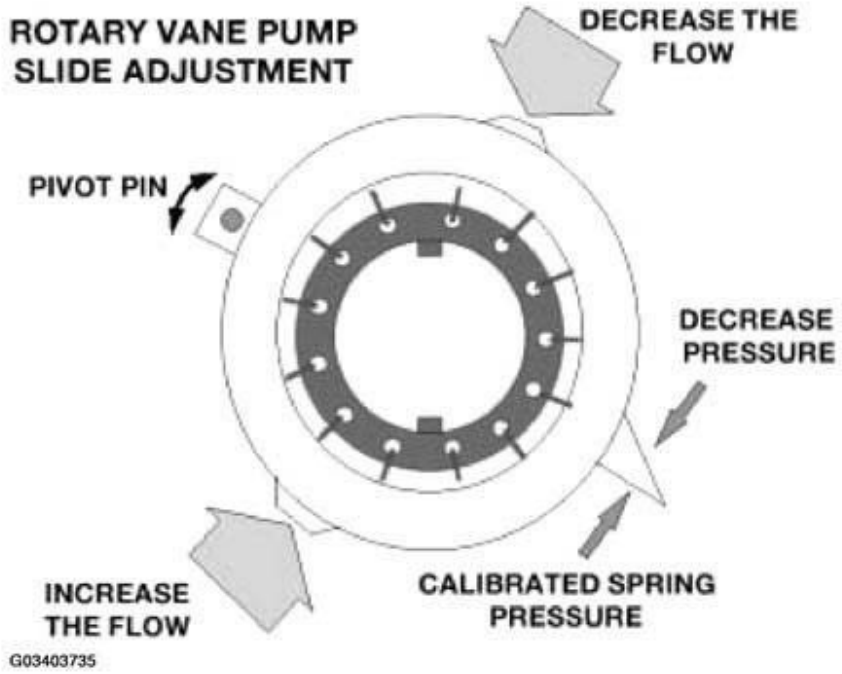


Fig. 16: Identifying Rotary Vane Pump
Courtesy of BMW OF NORTH AMERICA, INC.

HYDRAULIC CONTROL COMPONENTS

Electro/Hydraulic Valve Body

The valve body assembly is the main shift control element in the transmission. In non-EH transmissions the valve body was only hydraulically controlled. In the current EH (electrohydraulic) transmissions the valve body is similar in design, but now also housing a number of shift solenoids which are controlled by the TCM.

The valve body consists of a number of sub-assemblies. Each sub-assembly contains a number of spool valves which are hydraulically controlled. Most spool valves are opposed by spring pressure. The spool valves are used to direct hydraulic fluid flow to the various shift elements in the transmission. There is also a manual valve which is connected to the shift assembly by a cable. The manual valve allows the drivers to select the basic operating mode (or ratio).

The valve body is responsible for the following:

- Regulating Main Pressure
- Controlling fluid flow to shift elements for Upshifts and Downshifts.

- Providing for manual operation by driver via manual valve.
- Reverse Lockout
- Fail-safe Operation
- Shift Comfort through: Overlap Shift Control (ZF) Pressure Accumulators (GM)
- Torque Converter Control
- Distribution of lubrication.

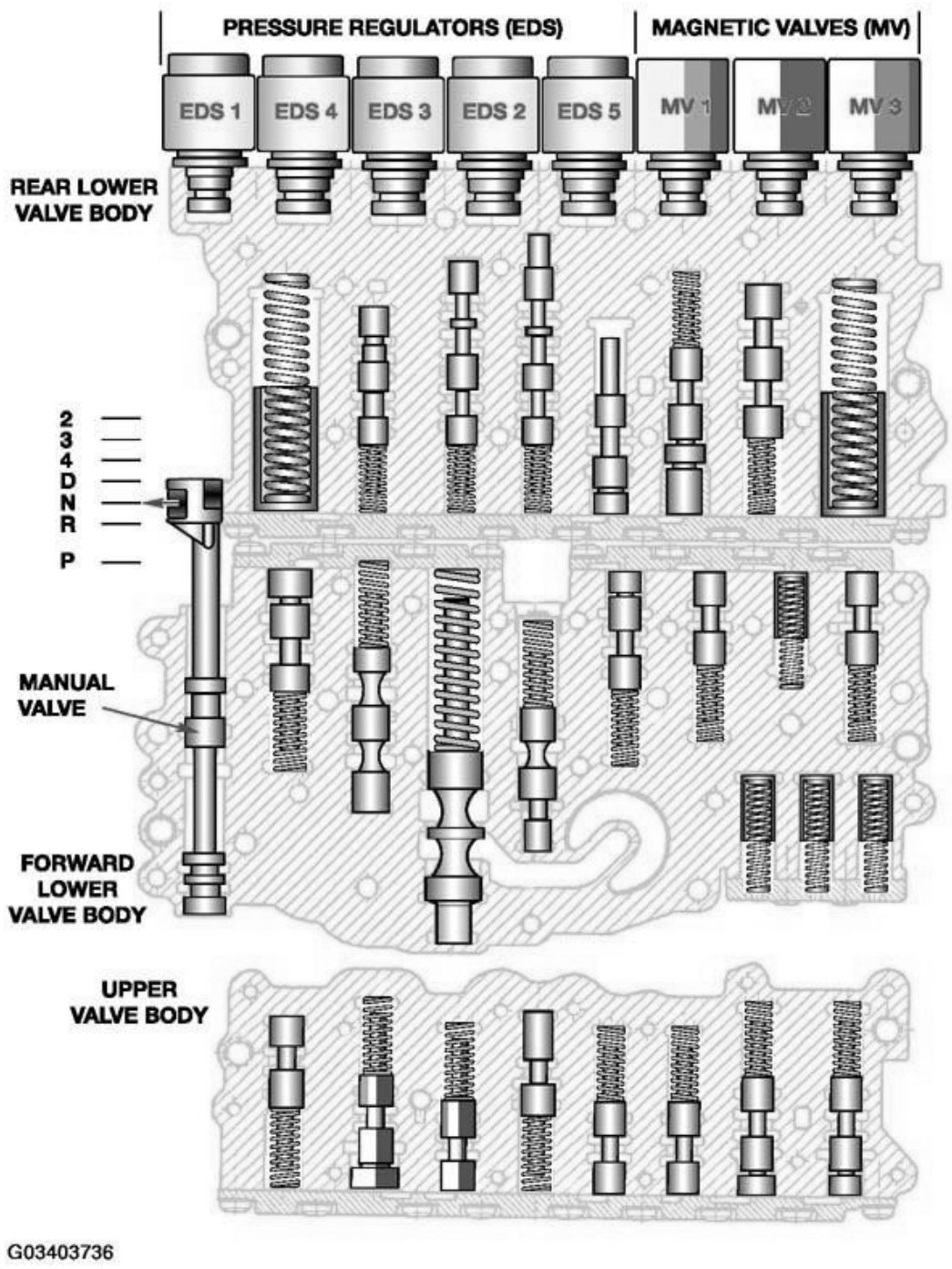


Fig. 17: Identifying Electro/Hydraulic Valve Body
Courtesy of BMW OF NORTH AMERICA, INC.

Shift Valves

Shift valves are used to direct application pressure to the various shift elements. Shift valves are regulated by spring pressure and control pressure for the shift solenoids. Shift valves come in various configurations depending upon application and transmission type. The most basic is the 3/2 shift valve. The 3/2 shift valve has 2 positions which are switched through one or two control pressures.

With no control pressure from shift solenoid present, the shift valve is moved to its end travel (left) by spring pressure.

Operating pressure is blocked to the shift component. Also in this position any application pressure is drained from the shift component.

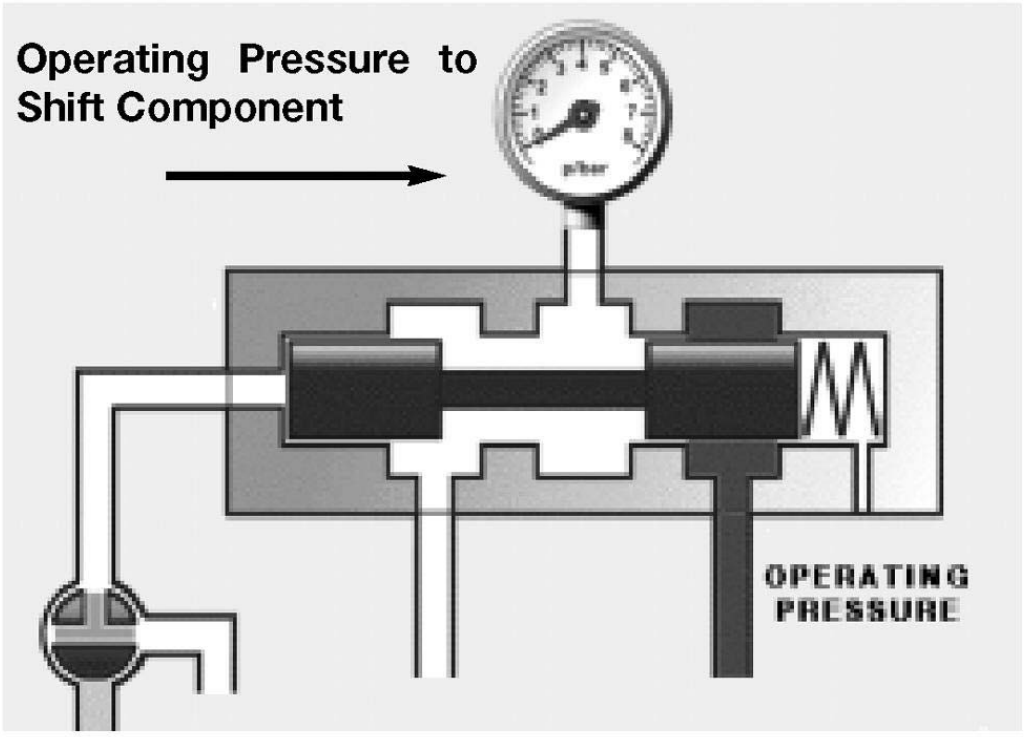
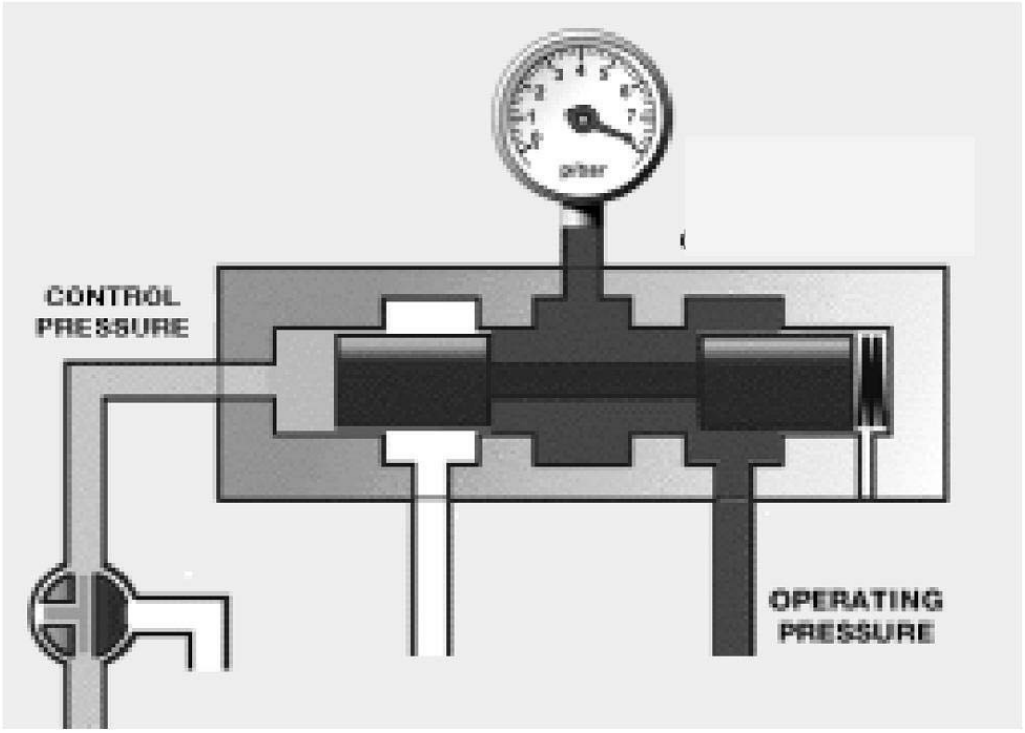


Fig. 18: Identifying Blocked Operating Pressure To Shift Component
Courtesy of BMW OF NORTH AMERICA, INC.

Once the control pressure is applied to the 3/2 shift valve, the shift valve moves to the right.

This allows operating pressure to reach the shift component.

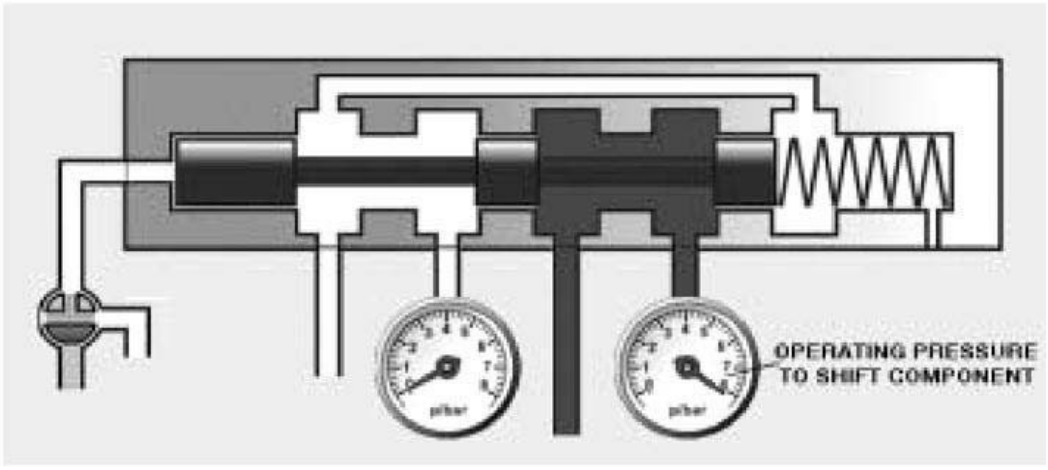
When the control pressure is again reduced, spring pressure returns the 3/2 shift valve to the rest position. This drains and operating pressure from the shift component.



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Fig. 19: Identifying Operating Pressure To Reach Shift Component
Courtesy of BMW OF NORTH AMERICA, INC.

The example shown at right is a 4/2 shift valve. The operation is similar to the 3/2 valve. The primary difference is that the 4/2 shift valve affects 2 shift components.



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Fig. 20: Identifying Primary Difference 4/2 Shift Valve Affects 2 Shift Components
Courtesy of BMW OF NORTH AMERICA, INC.

PRESSURE REGULATION

Pressurized oil from the pump must be regulated for use within the transmission. Otherwise, the high pressure directly from the pump would influence shift quality. The shifts would be more abrupt and harsh. In order to "fine tune" the pressures within the transmission, there is a pressure regulating valve and a pressure regulating solenoid. The pressure regulating valve is located in the oil pump housing or the valve body dependent upon transmission type.

The pressure regulating solenoid is a pulse width modulated (PWM) solenoid. Current is controlled by the TCM. The pressure regulating solenoid is normally closed, there is maximum line pressure available when minimum (or no) current is applied to the pressure regulating solenoid. Depending upon application, pressure regulating solenoid can be PWM with B- or B+ control. GM transmissions use B+ control with a constant ground supply. ZF transmissions uses B- control with a constant B+ supply.

There are also pressure regulators used in ZF transmissions that are used to control shift pressures. The A5S440Z and A5S560Z both use EDS solenoids for "Overlap Shift Control" this will be explained later in this text.

There are a few different names for pressure regulating solenoids depending upon the transmission type and manufacturer:

- ZF transmissions use the following terms - EDS solenoid (valve), or MV (magnetic valve).
- Hydramatic (GM) transmissions use the following terms: DR solenoid, Force Motor Solenoid or Variable Bleed Solenoid.

Transmission operating pressures are regulated based on engine speed, throttle angle and engine load. The regulated pressure from the pressure regulating solenoid is referred to as throttle pressure. This pressure is fed to

the main pressure regulating valve.

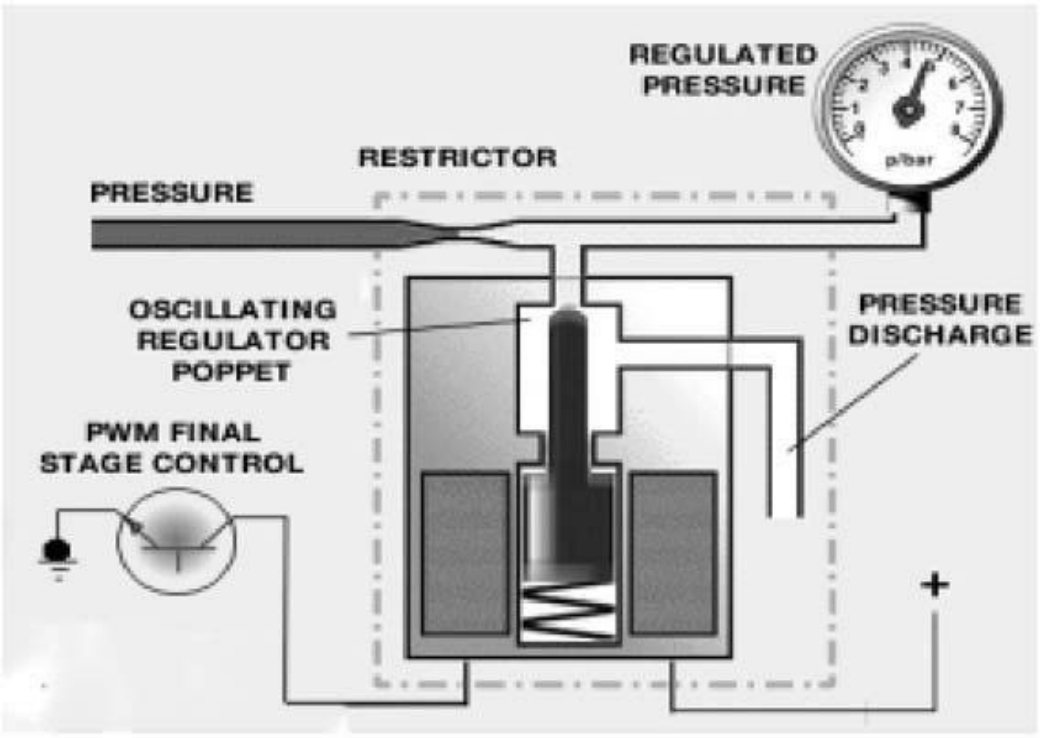


Fig. 21: Identifying Transmission Operating Pressures
Courtesy of BMW OF NORTH AMERICA, INC.

Pressure Regulation

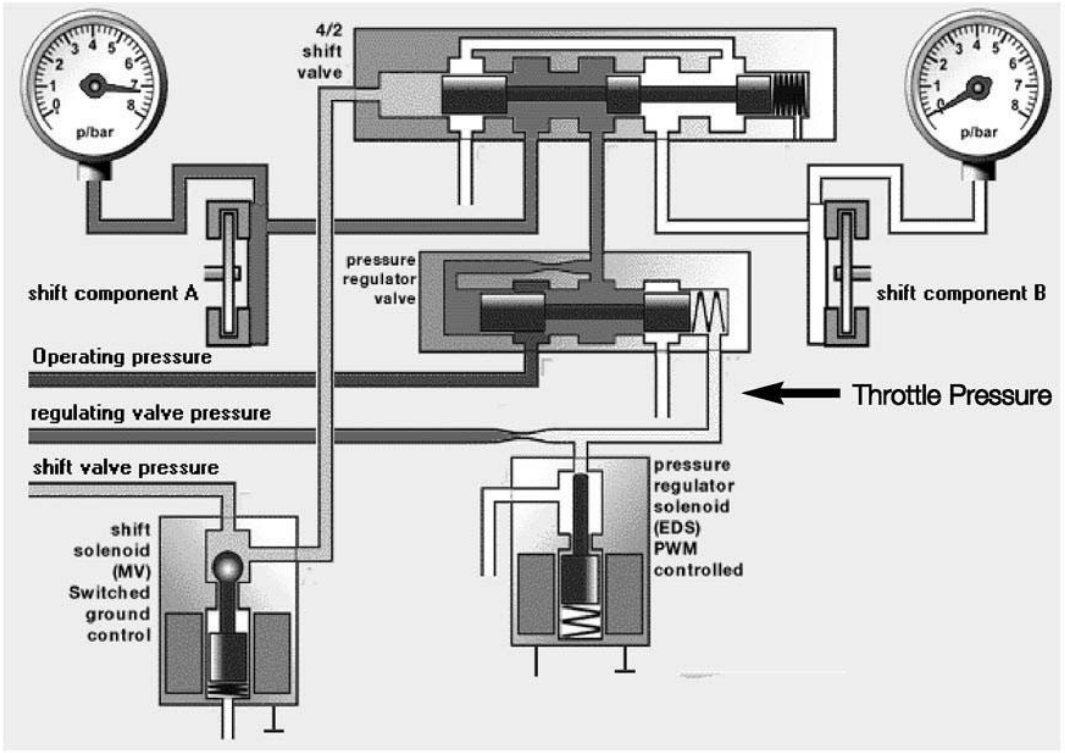


Fig. 22: Identifying Pressure Regulation
Courtesy of BMW OF NORTH AMERICA, INC.

As the diagram shows, regulating valve pressure is fed to the pressure regulating solenoid. This pressure is then regulated to create throttle pressure. Throttle pressure is modified based on throttle angle, engine speed and engine load. Throttle pressure is then fed to the pressure regulating valve. As throttle pressure increases, the regulating valve piston is moved to the left (with respect to the diagram). As the regulating valve piston is moved to the left, operating pressure is increased to the 4/2 shift valve. The operating pressure to the 4/'2 shift valve will be fed to Shift Component A or Shift Component B depending the position on the 4/2 shift valve. The operating pressure to the shift components will be increased or decreased depending upon the throttle valve pressure. As engine speed and load are increased, the operating pressure will be increased to provide higher clamping forces on the shift components.

When there is no electrical power present to the pressure regulator solenoid, throttle pressure will be a maximum. Therefore maximum operating pressure will be available at the 4/2 shift valve. This condition would exist if the transmission was operating in fail-safe mode.

APPLY COMPONENTS

Multi - Plate Clutches And Brakes

Multi Plate Clutches and Brakes are used to drive or hold members of the planetary gear set. As a general rule, Multi Plate Clutches connect one planetary member to another. Multi Plate Brakes connect a planetary member

to the case to hold it stationary.

The clutches and brakes consist of a number of friction discs and steel discs. The friction discs are coated with a friction material and have engaging lugs (splines) on the inner perimeter. The steel discs are steel on both sides and have engaging lugs located on the outer perimeter. The engaging lugs on the friction discs are usually engaged with a planetary member. The engaging lugs on the steel discs are usually engaged with the clutch piston housing.

In addition to the friction and steel discs, there is also an apply piston, housing and return spring. Once hydraulic fluid is applied to the clutch assembly, the friction discs and steel discs will be locked together. Once hydraulic pressure is released, the return spring will cause the clutch piston to return to its rest position which will unlock the clutch assembly.

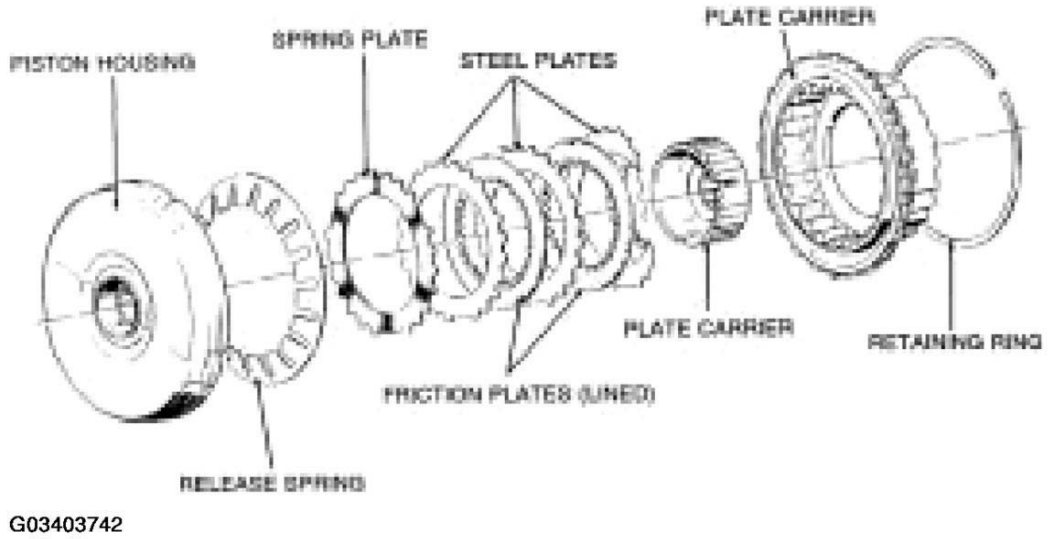


Fig. 23: Exploded View Of Multi - Plate Clutches
Courtesy of BMW OF NORTH AMERICA, INC.

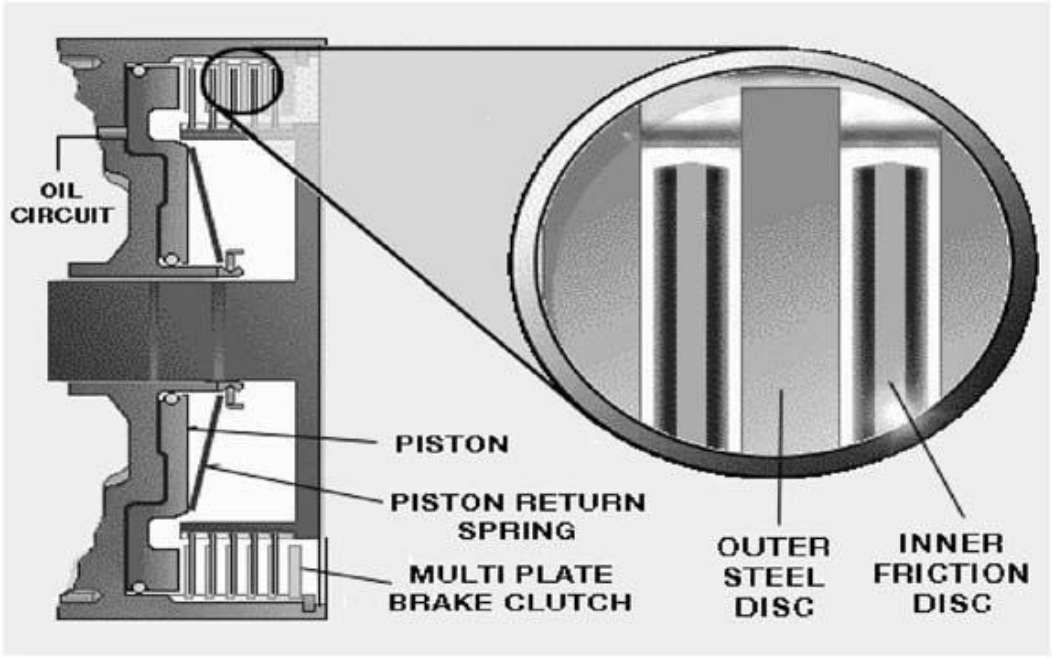


Fig. 24: Identifying Friction Discs And Steel Discs
Courtesy of BMW OF NORTH AMERICA, INC.

Multi - Plate Clutch Operation

In order to carry out a shift in ratio, fluid needs to be applied or released from the Multi - Plate Clutch (or Brake). As shown in the example , the following sequence occurs:

1. Fluid from a shift valve in the valve body is applied to the clutch assembly. (Figure A, see **Fig. 25**.)
2. Fluid pressure builds behind the apply piston and overcomes the resistance from the diaphragm spring. (Figure A, see **Fig. 25**.)
3. The friction and steel discs are compressed together and become locked, preventing any slippage between them. (Figure A, see **Fig. 25**.)
4. Two planetary members are now locked together.
5. When fluid pressure is released, the steel and friction discs are allowed to unlock. (Figure B, see **Fig. 25**.)
6. The diaphragm spring pushes against the apply piston and returns the piston back to the rest position. (Figure C, see **Fig. 25**.)
7. The check ball in the apply piston is unseated by centrifugal force which allows the clutch to drain completely.

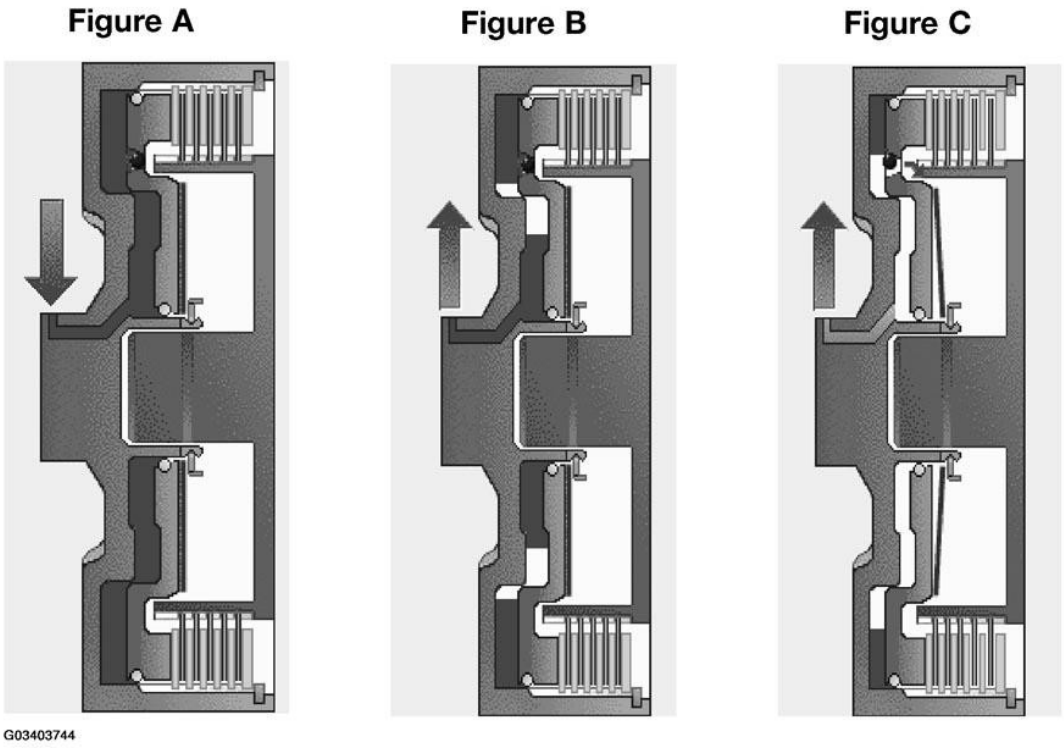


Fig. 25: Identifying Multi - Plate Clutch Operation
Courtesy of BMW OF NORTH AMERICA, INC.

Band Brakes

On some BMW transmissions there is a band type brake used for some applications. The A4S270/310R and the A5S310Z use a band type brake. The brake band is a circular band with friction material bonded to the inner surface. The band wraps around a particular planetary component (clutch drum) and locks that component to the transmission case. The brake band is applied and released by the clutch apply piston.

The brake band is not adjustable on the A5S310Z, however there is some adjustment allowed when needed on the A4S270/310R.

The brake band functions in the following manner on BMW transmissions:

- **A4S270/310R** - The brake band is active (applied) in first and second gear. The brake band holds the reaction sun drum stationary. The reaction sun drum is splined to the reaction sun gear.
- **A5S310Z** - The brake band is active (applied) in second, third and fifth gear. The brake band holds the forward sun gear to the case.

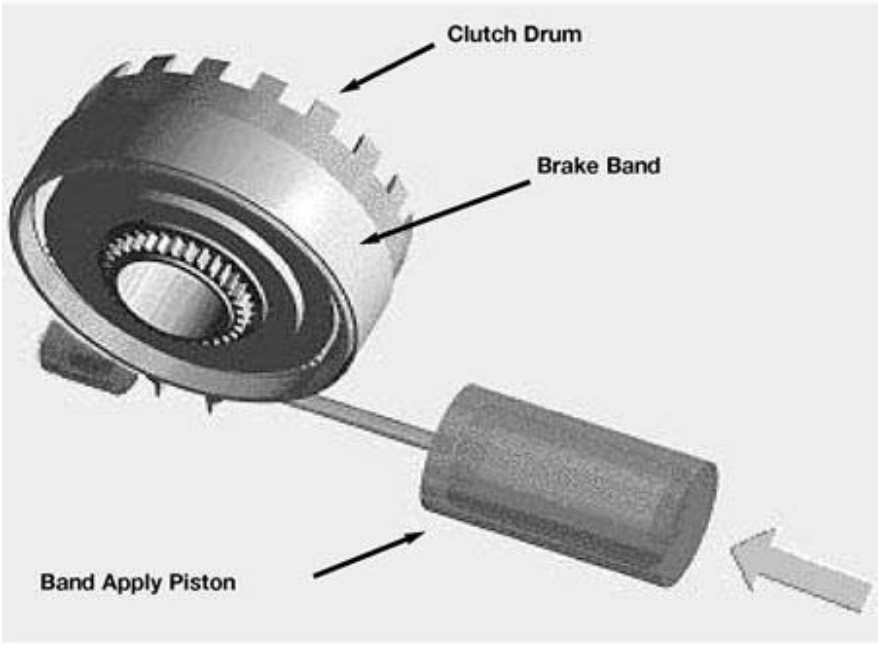


Fig. 26: Identifying Band Brakes
Courtesy of BMW OF NORTH AMERICA, INC.

One-Way Clutches (Freewheel)

The one way clutch consists of an inner and outer ring with a locking device between the two. The one way clutch is designed to lock in one direction and to allow free rotation in the other direction. Currently there are two types of one way clutches used in BMW transmissions:

- Roller type which consists of spring loaded rollers between the inner and outer race of the one way clutch. (Roller type is also used without springs on some applications)
- Sprag type which consists of asymmetrically shaped wedges located between the inner and outer race of the one way clutch.



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Fig. 27: Identifying Roller Type One Way Clutch
Courtesy of BMW OF NORTH AMERICA, INC.



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Fig. 28: Identifying Sprag Type One Way Clutch
Courtesy of BMW OF NORTH AMERICA, INC.

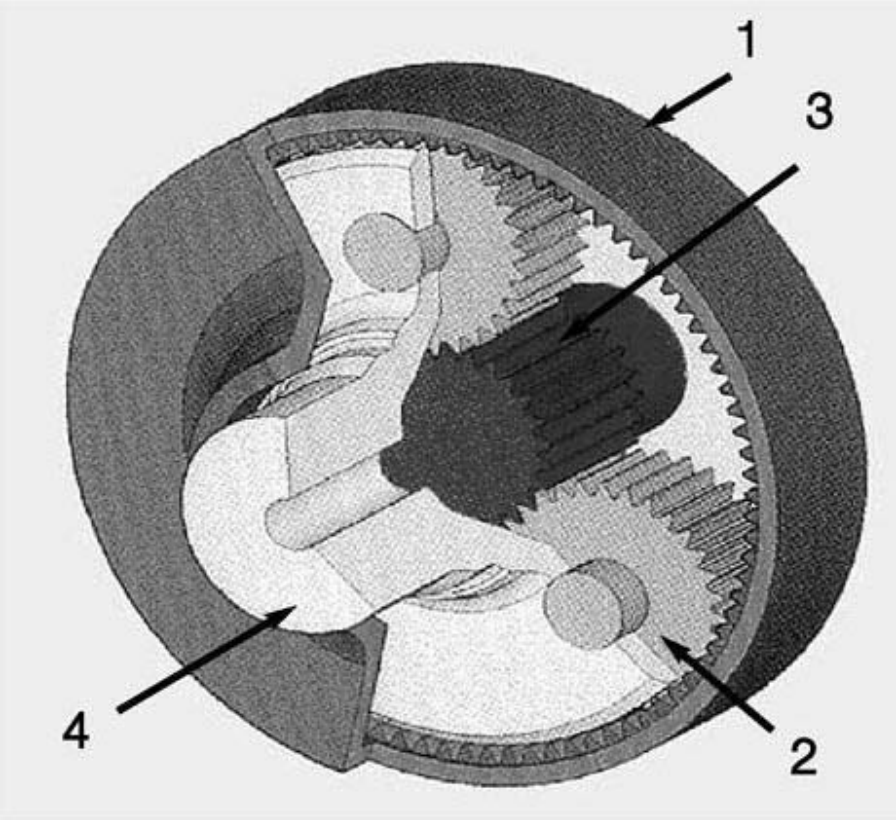
In both versions of the one way clutch (freewheel), rotation is only allowed in one direction. Using the diagrams above, imagine that the inner races were locked stationary. The outer race would only be allowed to turn counter clock wise. In the clock wise direction, the outer race of both versions would be locked. In the roller type, the helper springs would push the rollers up the ramp on the outer race. This would force the rollers in to the smaller area which would cause the outer race to lock, In the sprag type, the asymmetrical wedges would lock between the inner and outer race.

The one way clutches are used in the transmission to prevent an interruption of drive torque during certain gear shifts and to allow engine braking during coasting. Also there is a one way clutch in the stator of the torque converter.

PLANETARY GEAR SET

Planetary gear seats are compact gear units that receive input drive torque and provide the required output ratios for all forward gears and reverse gear. The planetary gear set consists of four main components:

1. Internal Ring Gear
2. Planetary Gears (pinions)
3. Sun Gear
4. Planetary Gear Carrier



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Fig. 29: Identifying Planetary Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Various ratios are obtained by driving or holding different components in the planetary gear set. The example shown at right is a simple planetary gear set. Today's modern transmissions use a combination of multiple planetary gear sets referred to as a compound planetary gear set.

Advantages Of Planetary Design

There are distinct advantages to the planetary gear set in comparison with a standard transmission gear set.

Primarily, drive torque does not need to be interrupted to change gears. The planetary members are in constant mesh and there are more teeth engaged in any given ratio. This allows more torque to be transferred through the transmission.

Basic Power Flow

In the example shown at left, let's follow through an example of power flow in reverse gear:

The Planetary gear carrier (4) is held stationary. The sun gear (3) is driven in a clockwise direction. The planetary pinions (2) are driven counterclockwise, which in turn drives the internal ring gear (1) counter clockwise as well.

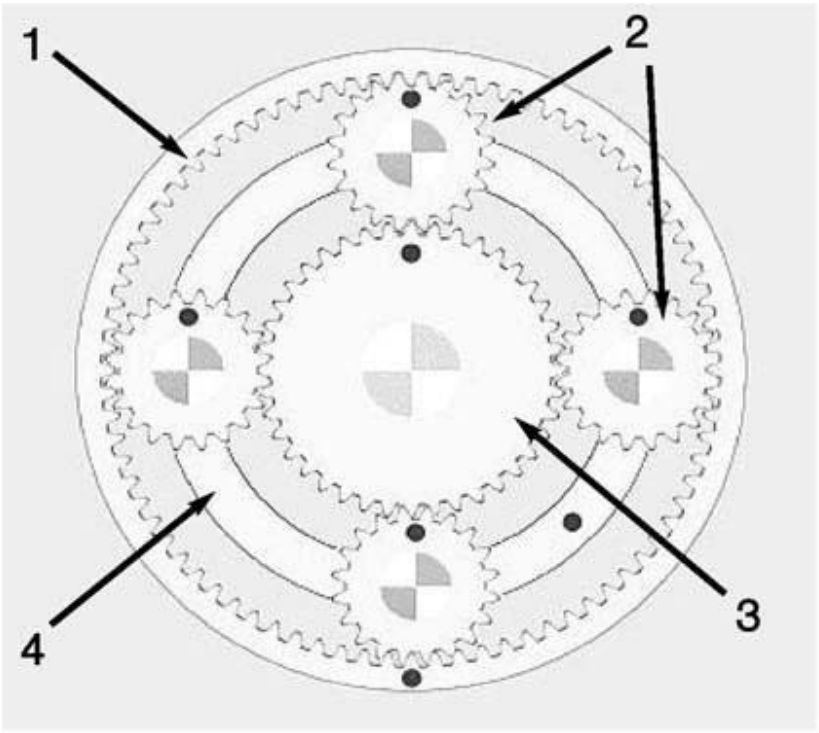


Fig. 30: Identifying Basic Power Flow
Courtesy of BMW OF NORTH AMERICA, INC.

COMPOUND PLANETARY GEAR SETS

Compound planetary gear sets use multiple planetary components which are a variation on the simple planetary gear set. Since the inception of the simple planetary gear set, there have been numerous compound gear sets introduced. BMW transmissions use the following gear sets:

- Simpson Gear Set - used on 4HP22 and 4HP24

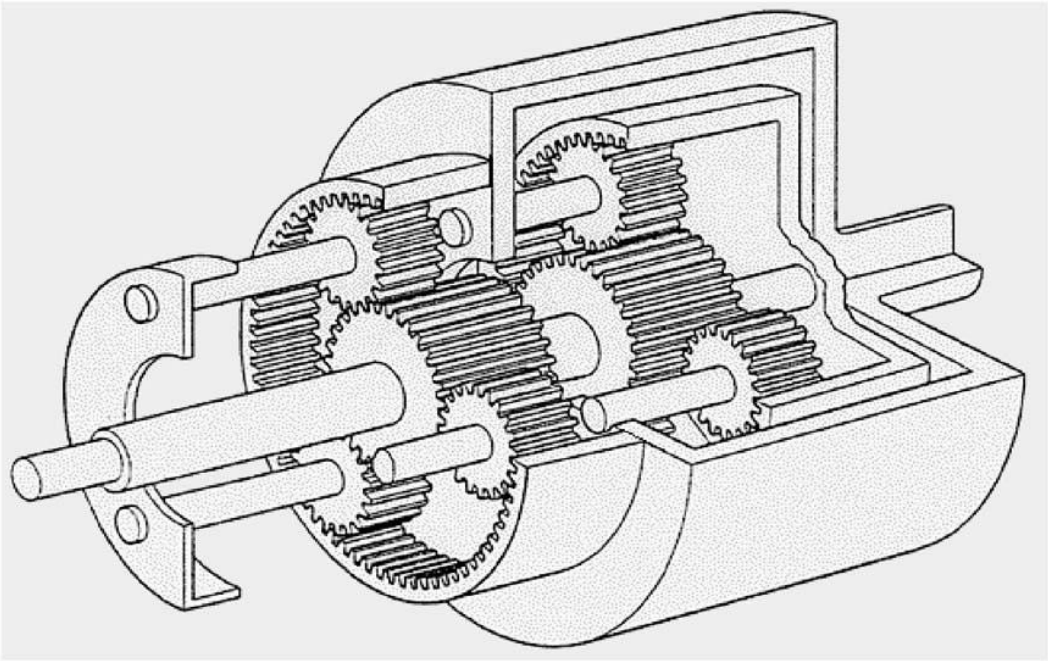
- Ravigneax Gear Set - used on A4S270R, A4S310R, A5S310Z, A5S325Z, A5S360R and A5S390R.
- Wilson Gear Set - used on A5S440Z and A5S560Z
- Lepelletier Gear Set - used on the GA6HP26Z.

Simpson Gear Set

The Simpson Gear Set is one of the early variations on the simple set. It is capable of 3 forward gears and one reverse. On BMW transmissions, the Simpson Gear set is used in the 4HP transmission which is a four speed automatic. Fourth gear (overdrive) is obtained by the addition of an auxiliary gear set (simple).

Characteristics of the Simpson Gear set are as follows:

- Two Internal Ring Gears, one rear input ring and one attached to the rear planetary carrier.
- Two Planetary carriers, each containing three planetary pinions.
- One common Sun gear, which meshes with both sets of planetary pinions.



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Fig. 31: Identifying Simpson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Ravigneaux Gear Set

A new variation on the planetary design is the Ravigneaux gear set. This gear set is capable of 4 forward gears and one reverse. However, depending upon application it may be used with an auxiliary gear set. Here are some examples:

- A4S310/270R uses the Ravigneax set for 3 forward gears and one reverse. Overdrive is obtained by the auxiliary gear set.
- A5S310Z uses a combination of the Ravigneaux gear set and the auxiliary gear set to obtain 5 forward gear and one reverse. First, second and reverse gears are achieved by using a combination of both gear sets.
- The A5S360/390R uses a modified version of the ravigneaux set that provides five forward gears and one reverse. There is no auxiliary gear set used.

Characteristics of the Ravigneaux Gear Set are:

NOTE: The Ravigneaux Gear Set shown below is a typical representation, refer to Fig. 32. There are a few variations of this arrangement used on BMW transmissions.

- One planetary carrier which is common to both sets of planetary pinions.
- Two sets of planetary pinions, one long set with small diameter and one short set with large diameter.
- Two sun gears, one input sun gear and one reaction sun gear.
- One common ring gear.

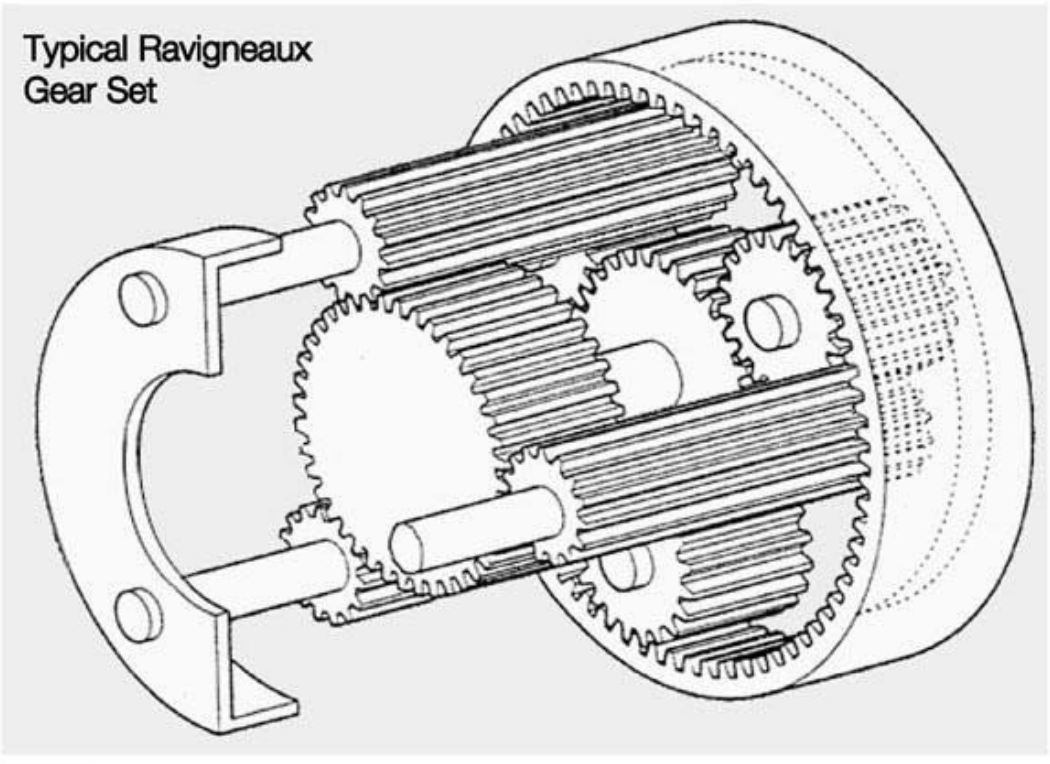


Fig. 32: Identifying Ravigneaux Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Wilson Gear Set

On BMW transmissions, the Wilson gear set is only used on the A5S440Z and A5S560Z. The Wilson Gear Set consists of three planetary gear sets.

The ring gear of the first gear set, the planetary carrier of the second gear set and the ring gear of the third planetary gear set and directly connected to the "Pot". The "Pot" is a cylindrical device that slides over all of the components to unitize the individual gear sets into an assembly.

The characteristics of the Wilson Gear Set are:

- Three planetary carriers.
- Three ring gears, with ring gear 1 and 3 meshed to "Pot" assembly.
- Three sun gears, sun gear 2 and 3 are common. (Attached). Sun gears 2 and 3 are also referred to as the "Double Sun Gear"

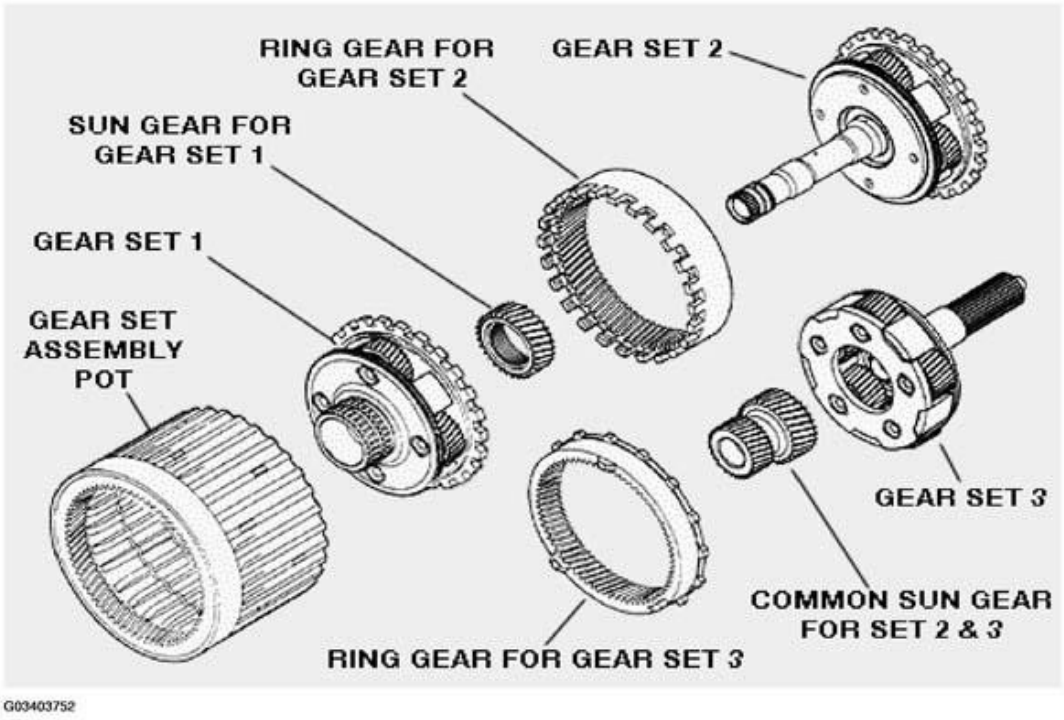
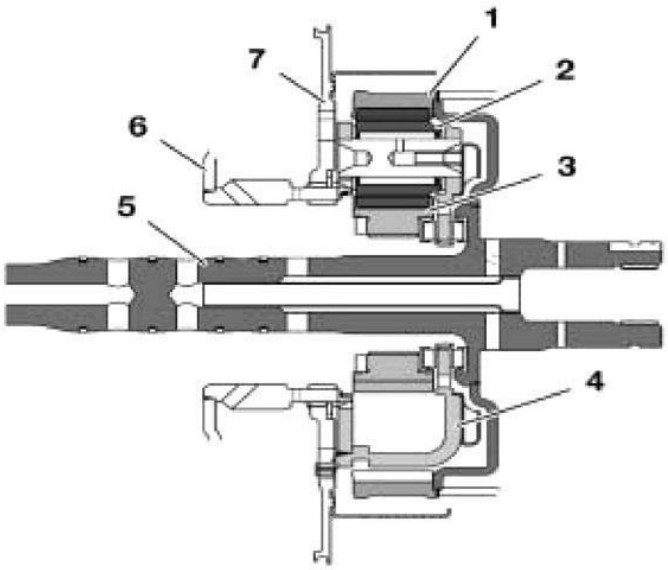


Fig. 33: Exploded View Of Wilson Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Lepelletier Gear Set

The Lepelletier Gear Set was introduced to BMW on the ZF GA6HP26Z. This gear set allows for 6 forward speeds and one reverse gear using a light weight design. The planetary gear train consists of a single carrier planetary gear train and a downstream double planetary gear train.

1. Internal Ring Gear 1
2. Planet Gear (pinion)
3. Planet Carrier
4. Planet Carrier
5. Turbine Shaft
6. Cylinder A
7. Pressure Plate A

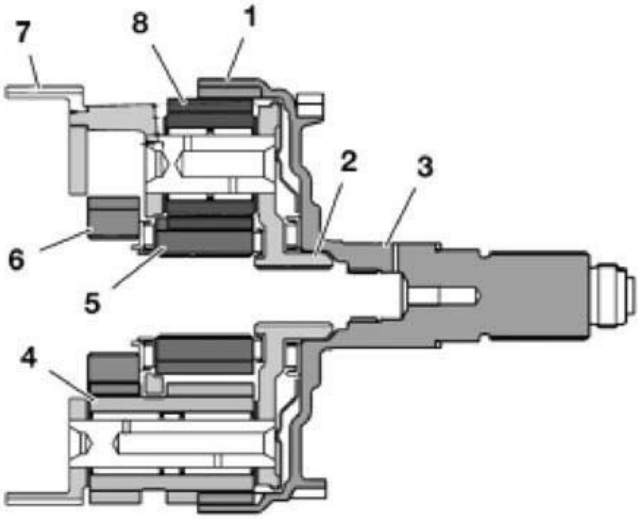


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Fig. 34: Identifying Cross Section View Of Lepelletier Gear Set
Courtesy of BMW OF NORTH AMERICA, INC.

Double Planetary Set

1. Internal Gear 2
2. Planet Carrier Clutch E
3. Output
4. Double Planet Gear Long
5. Sun Gear 3, Clutch E
6. Sun Gear 2, Clutch A
7. Planer carrier 1
8. Planet Gear (short)



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Fig. 35: Identifying Cross Section View Of Double Planetary Set
Courtesy of BMW OF NORTH AMERICA, INC.

PLANETARY GEAR SET OPERATION

In order to understand planetary gear set operation, it is important to understand some basic rules of operation.

- It is assumed that engine rotation is clockwise when referring to power flow chart s and diagrams.
- Planetary pinions will always rotate in the same direction as the internal ring gear.
- When the sun gear is driven clockwise and the planetary carrier is held stationary the internal ring gear will rotate counter clockwise (reverse gear).
- When two or more planetary members are locked together, the assembly will rotate together. The ratio from input to output is 1:1.
- When the sun gear is held stationary and the planetary carrier is driven clockwise, the ring gear will be driven clockwise in an overdrive ratio. (i.e. .75:1)

When trying to understand power flow schematics, it is important to be able to draw a comparison between the actual planetary components and the schematic symbols. The diagram below outlines the relationship between these components and the power flow schematic. The schematic is a representation of a cross section of the transmission, but you only see the top half of the cross section. The transmission is shown as though it has been quartered lengthwise.

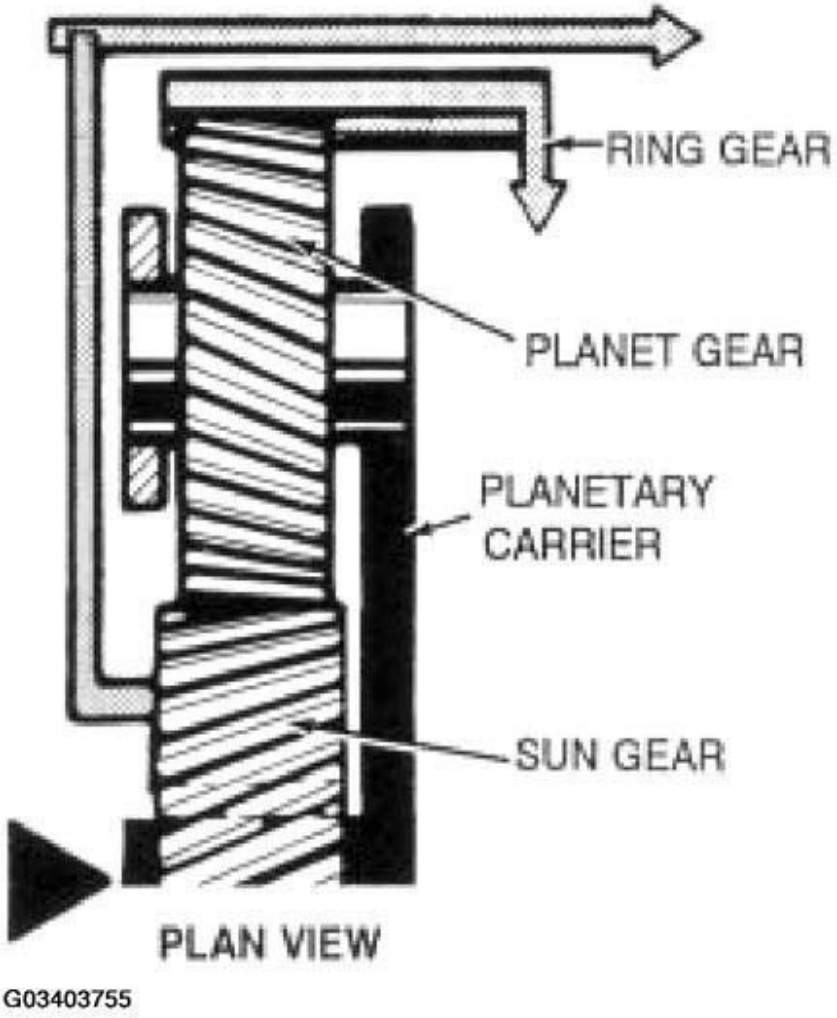


Fig. 36: Identifying Planetary Gear Set Power Flow - Plan View
Courtesy of BMW OF NORTH AMERICA, INC.

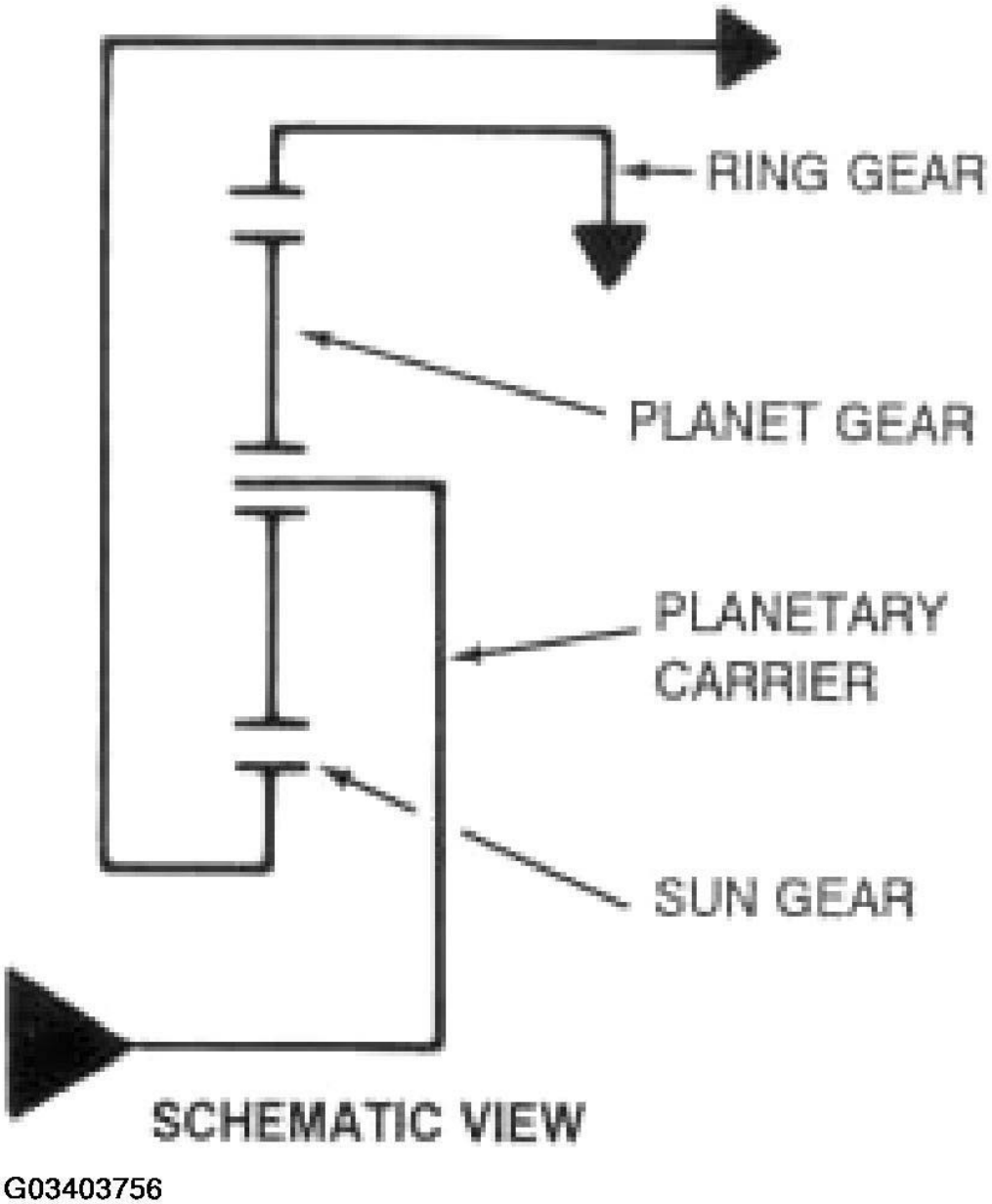


Fig. 37: Identifying Planetary Gear Set Power Flow - Schematic View
Courtesy of BMW OF NORTH AMERICA, INC.

Power Flow Schematic

In order to understand power flow schematics, a relationship must be drawn between the actual components and the schematic representation. In our example, we are going to use the 4HP22/24 power flow schematic. The

4HP22/24 transmission uses a Simpson Planetary Gearset and an auxiliary gearset. The auxiliary gear set is a simple planetary gearset.

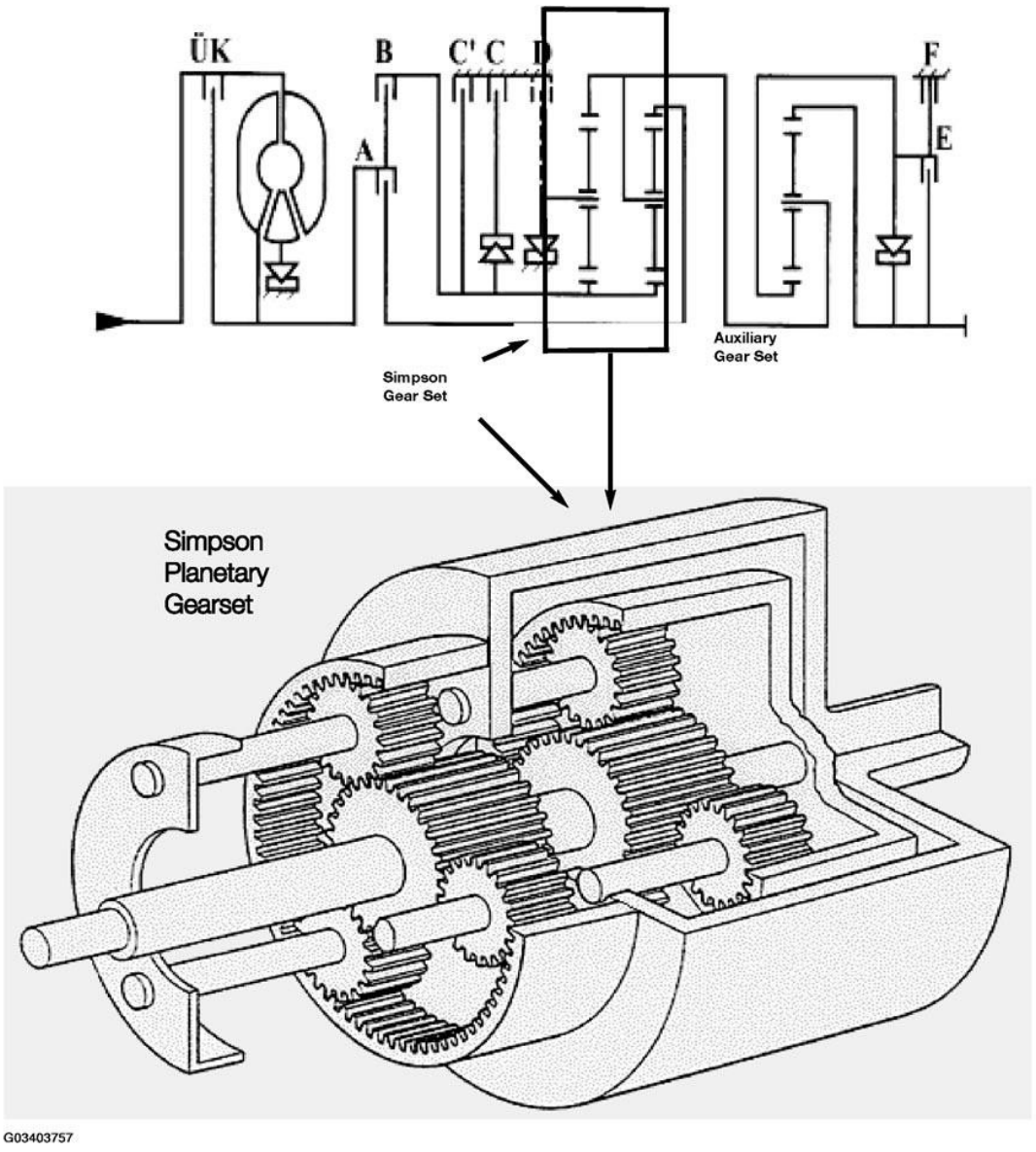


Fig. 38: Identifying Power Flow Schematic
Courtesy of BMW OF NORTH AMERICA, INC.

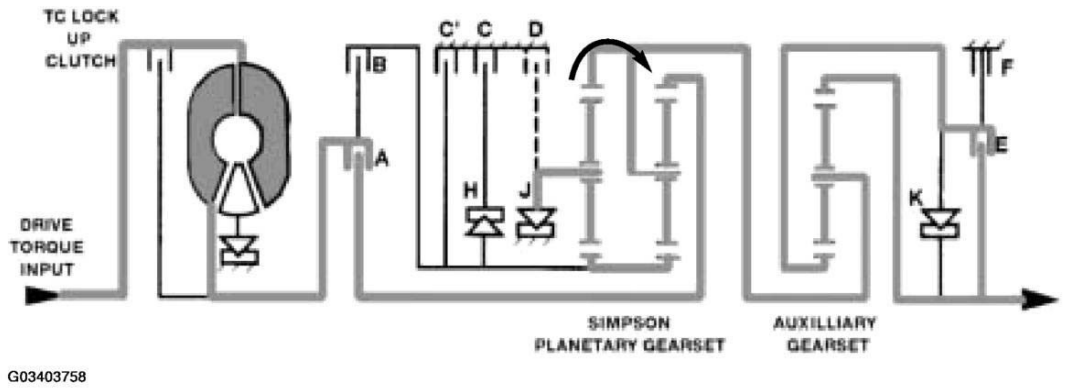


Fig. 39: Identifying Power Flow Schematic - First Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Power flow in first gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear input ring gear rotates CW driving the rear planet pinions CW. The planetary pinions drive the common sun gear CCW, which in turn drive the front planet pinions CW. The front planetary carrier is held from rotating CCW by one way clutch "J". The front planetary pinions which are rotating CW drive the front ring gear/rear carrier CW. The rear planetary carrier is rotating CW and is driving the planetary carrier from the auxiliary gear set. The "E" clutch in the auxiliary gear set is holding the Sun gear and the ring gear together. Therefore the auxiliary gear set is locked in a 1:1 ratio.

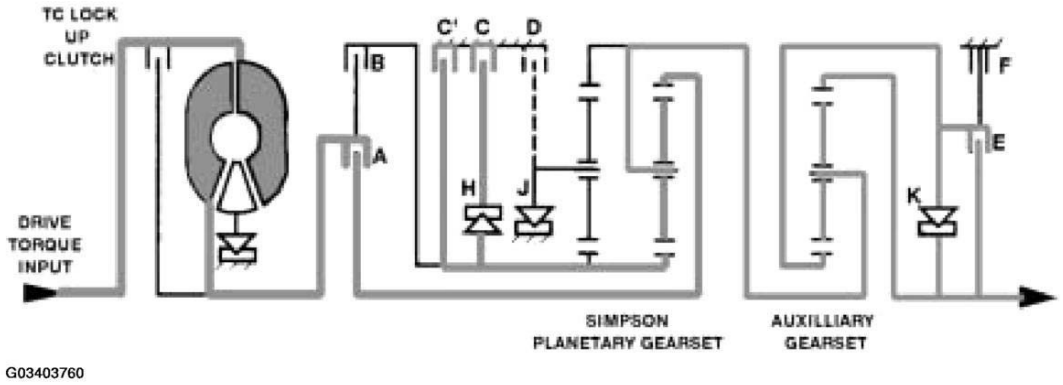
One Way Clutch "J" is locked prevent the front planetary carrier from rotating CCW. One Way Clutch "H" is not used and One Way Clutch "K" is locked. One way clutch "K" is used to prevent an interruption in power flow before the "E" clutch is locked during the 4-3 shift.

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

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Fig. 40: Gear Position Chart - First Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear



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Fig. 41: Identifying Power Flow Schematic - Second Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Second Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch locks the turbine shaft to the rear input ring gear. The rear

input ring gear rotates CW driving the rear planet pinions CW. The sun gear is held stationary by the C' clutch. The rear planet pinions rotate around the fixed sun gear CW. The rear planetary carrier will rotate CW. The rear planetary carrier will drive the auxiliary gear set will rotate as a complete unit. The auxiliary gear set is locked in a 1:1 ratio due to the "E" clutch locking the sun and ring gear together.

The "C" clutch is locking the outer race of the "H" freewheel to the case. This is used for the 3/2 downshift. Freewheel "J" is not active and Freewheel "K" is locked.

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

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Fig. 42: Gear Position Chart - Second Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear

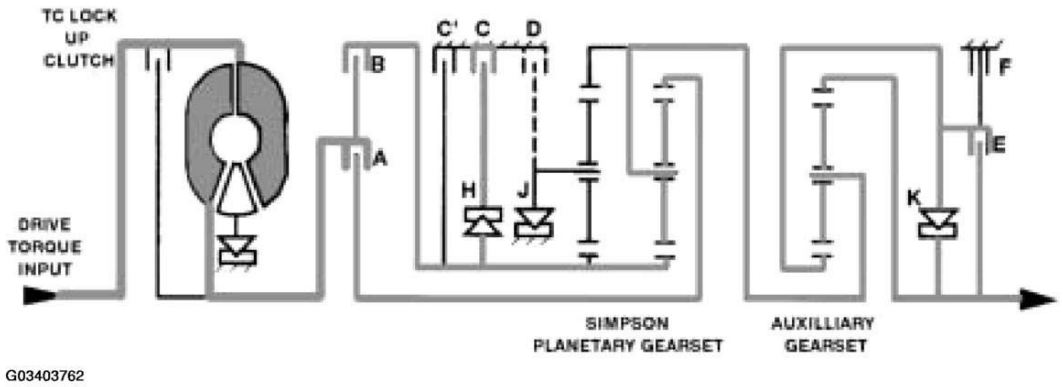


Fig. 43: Identifying Power Flow Schematic - Third Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Third Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "E" clutch is locked which locks the ring gear to the sun gear in the Simpson gear set. The entire transmission planetary system is now locked in a 1:1 ratio.

Freewheel "H" is overrun and freewheel "J" is not used. Freewheel "K" continues to be locked.

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

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Fig. 44: Gear Position Chart - Third Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear

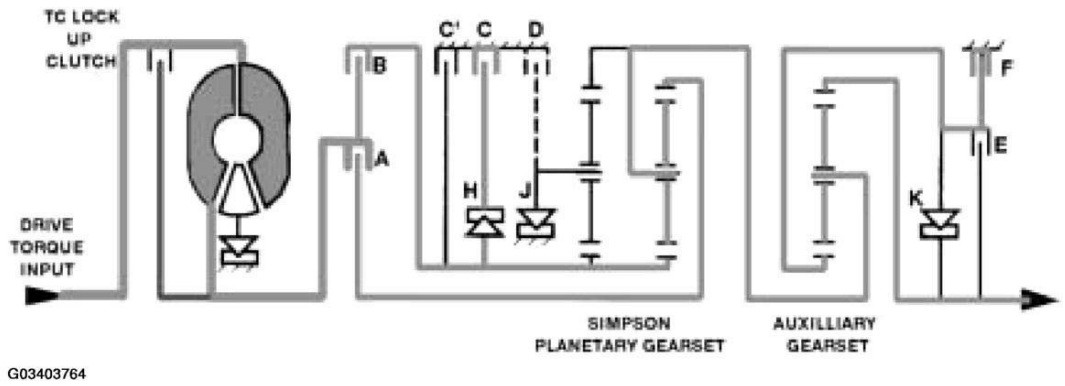


Fig. 45: Identifying Power Flow Schematic - Fourth Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Fourth Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). (The turbine shaft can also be driven by the lock up clutch when engaged). The "A" clutch and the "B" clutch are locked, this causes the rear input ring gear to be locked to the sun gear in the Simpson Gear set. The Simpson gear set is locked in a 1:1 ratio. The "F" clutch is locked which locks the sun gear in the auxiliary gear set to the case. The Simpson gear set drives the planetary carrier CW. The planet pinions walk around the fixed sun gear in a CW direction. This causes the ring gear to rotate CW as well. The ring gear, which is the output of the transmission is driven in a overdrive ratio.

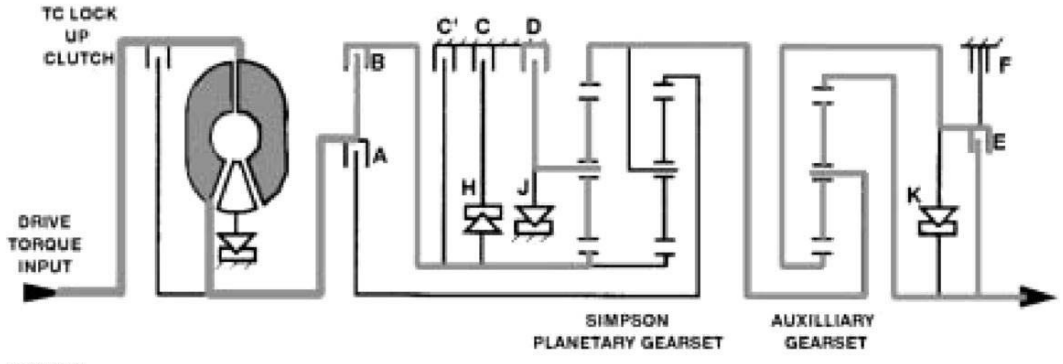
Freewheel "H" and "K" are overrun. Freewheel "J" is not used.

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

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Fig. 46: Gear Position Chart - Fourth Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Reverse Gear



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Fig. 47: Identifying Power Flow Schematic - Reverse Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Reverse Gear - Drive torque is applied to the torque converter impeller and transferred to the turbine. The turbine shaft rotates clockwise (CW). The "B" clutch is locked which drives the sun gear in the Simpson gear set CW. The sun gear drives the planet pinions CCW. The planetary carrier is held stationary by the "D" clutch. The planet pinions cause the front ring gear to rotate CCW. The front ring gear (and rear carrier) drive the

auxiliary gear set CCW which rotates at a ratio of 1:1 due to the "E" clutch locking the sun and ring gear of the auxiliary gear set.

Freewheel "H" and "J" are not used. Freewheel "K" is locked.

POSITION GEAR	D				3			2		1	R
	1	2	3	4	1	2	3	1	2	1	R
Clutch A	X	X	X	X	X	X	X	X	X	X	
Clutch B			X	X			X				X
Clutch C'		X				X			X		
Clutch C		X	X	X		X	X		X		
One Way Clutch H		X				X			X		
Clutch D										X	X
One Way Clutch J	X				X			X		X	
Clutch E	X	X	X		X	X	X	X	X	X	X
One Way Clutch K	X	X	X		X	X	X	X	X	X	X
Clutch F				X							

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Fig. 48: Gear Position Chart - Reverse Gear
Courtesy of BMW OF NORTH AMERICA, INC.

SHIFT CONTROL

Freewheel Shifting

In order to prevent an interruption in power flow, freewheel (One Way Clutches) are used to lock members of the planetary gear set. Certain transmissions such as the 4HP22/24, A4S270/310R and the A5S360R use freewheel shifting on all gear shifts. Transmissions such as A5S310Z, A5S440Z, A5S560Z and GA6HP26Z use freewheel shifting for only specific shifts. Other shifts in these transmissions use overlap shifting technology.

The demonstrate how the freewheel is used, we will examine freewheel "H" in the 4HP22/24 transmission.

In third gear, the sun gear is rotating clockwise. Freewheel "H" is overrun (unlocked) allowing the sun gear to rotate. Clutch "C" is active which locks the outer race of freewheel "H" to the case. During a 3/2 downshift, clutch "B" is released. The sun gear is held from rotating counter clockwise by freewheel "H" and the C' clutch. Freewheel "H" is used to stop the counter clockwise rotation of the sun gear before the C' clutch can engage. This prevents an interruption of power flow during the 3/2 downshift. If freewheel "H" fails to operate, there would be an increase in engine RPM from 3rd to 2nd gear.

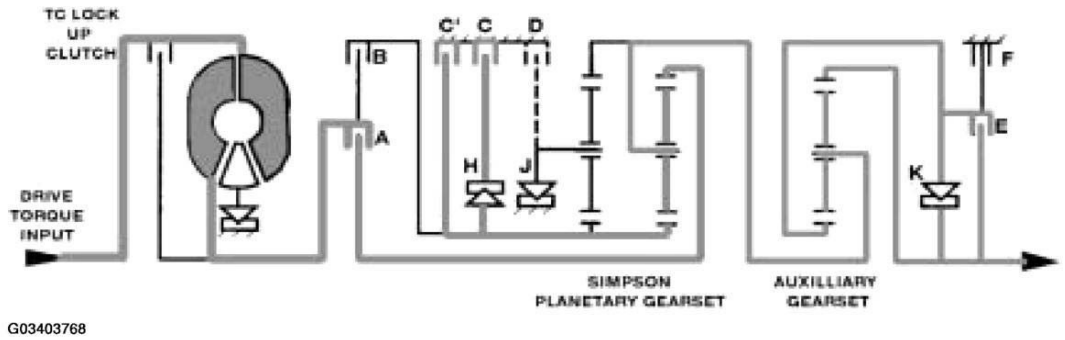


Fig. 49: Identifying Power Flow Freewheel Shifting Schematic - Second Gear
Courtesy of BMW OF NORTH AMERICA, INC.

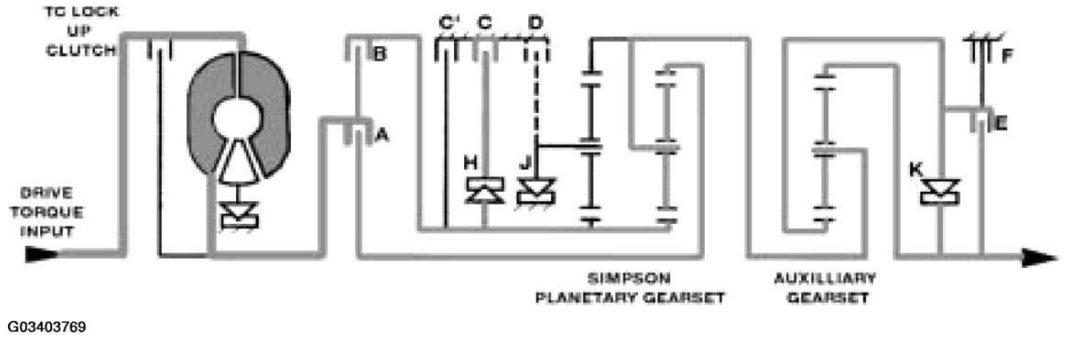


Fig. 50: Identifying Power Flow Freewheel Shifting Schematic - Third Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Overlap Shift Control

Overlap shift technology is currently used on ZF transmissions. The A5S310Z, A5S440Z, A5S560Z and the GA6HP26Z use overlap shift technology on most gear changes. The advantages of this design allows for the reduction of the use of One Way Clutches (freewheel) and a significant improvement in shift quality.

During an overlap shift, the releasing clutch pressure is reduced at the same rate that the engaging clutch pressure is increased. The result is a smooth transfer or torque between gear ratios.

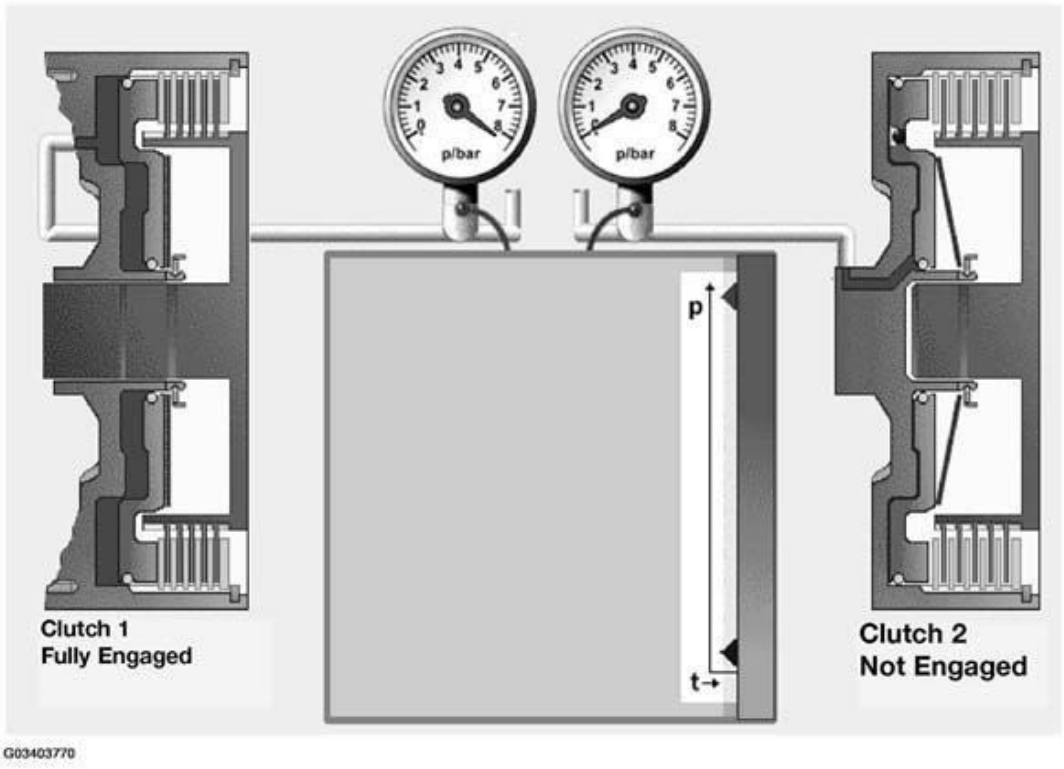


Fig. 51: Identifying Overlap Shift Technology
Courtesy of BMW OF NORTH AMERICA, INC.

As shown in the diagram above, Clutch 1 is fully engaged with maximum pressure. Clutch 2 is fully released.

During overlap shifting, the TCM closely monitors the rotational speeds of the turbine (input) shaft and output shaft. The TCM then uses the EDS solenoids to control pressures during shifting to provide the optimum shift timing and overlap control.

Overlap Shifting

During the transition of overlap, the clutches run through a slip zone. The torque is gradually transferred from the clutch that is releasing to the clutch that is engaging.

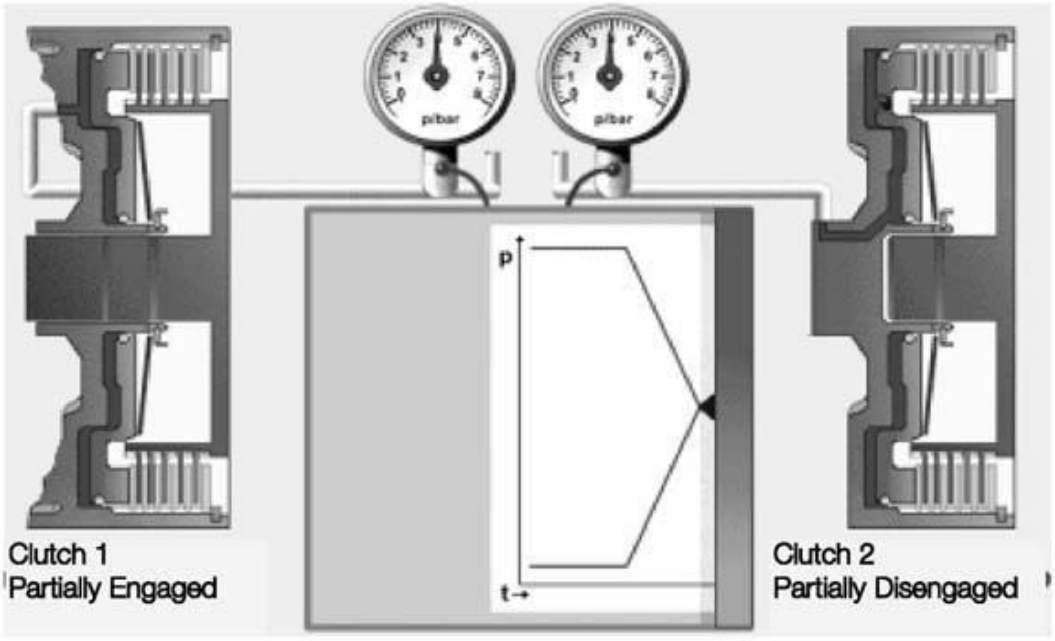


Fig. 52: Identifying Overlap Shifting (Clutch 1 Partially Engaged And Clutch 2 Partially Disengaged)
Courtesy of BMW OF NORTH AMERICA, INC.

The new gear engages the moment the torque level exceeds that of the first clutch. This is described as overlap. If the overlap is correct, (zero overlap) the engaging clutch takes over as much torque as the disengaging clutch releases. The result is a seemingly unnoticed shift of the best quality.

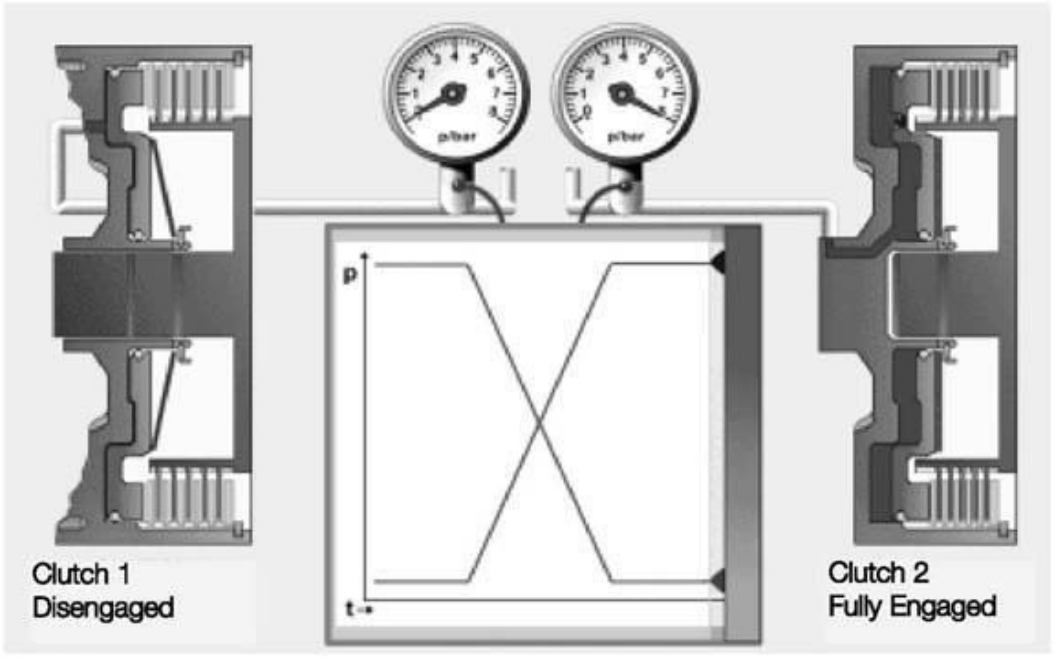
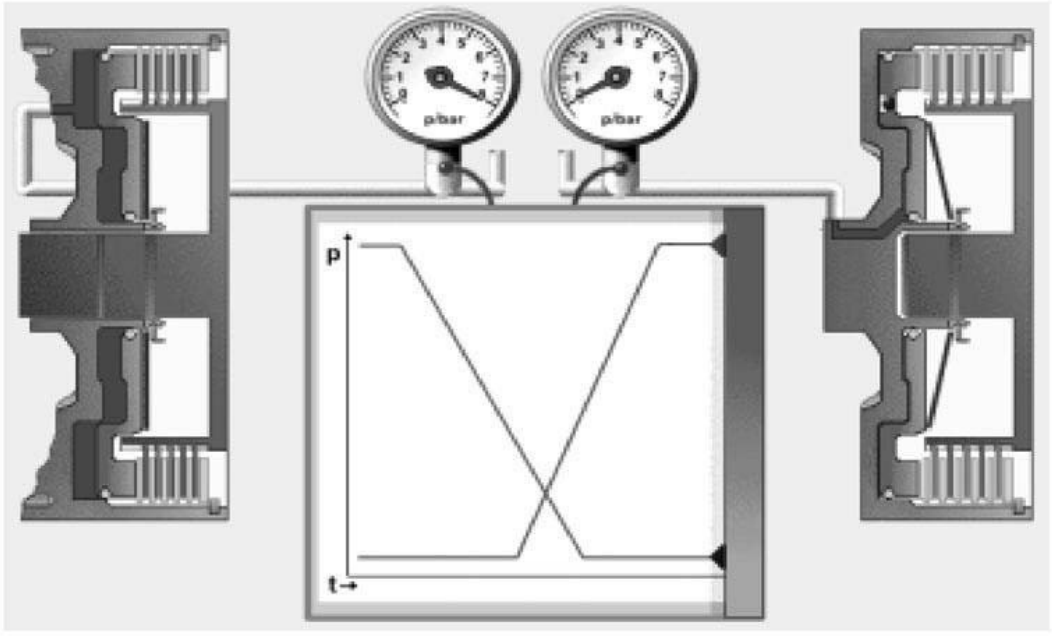


Fig. 53: Identifying Overlap Shifting (Clutch 1 Disengaged And Clutch 2 Fully Engaged)
Courtesy of BMW OF NORTH AMERICA, INC.

Negative Overlap

Negative overlap occurs when the engaging clutch takes over too late or the releasing clutch drops pressure too early.

The result is that the drive torque is briefly interrupted. When the engine is operating under load, the engine speed increases due to the interruption. When coasting the engine speed drops.



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Fig. 54: Identifying Negative Overlap
Courtesy of BMW OF NORTH AMERICA, INC.

Positive Overlap

If positive overlap occurs, the engaging clutch takes over too early or the releasing clutch pressure drops too late. The gear set would become momentarily blocked if this condition occurs during an upshift. When this occurs the ratio of the gear set becomes 1:1 momentarily. The result is a loss in drive torque during a gear shift.

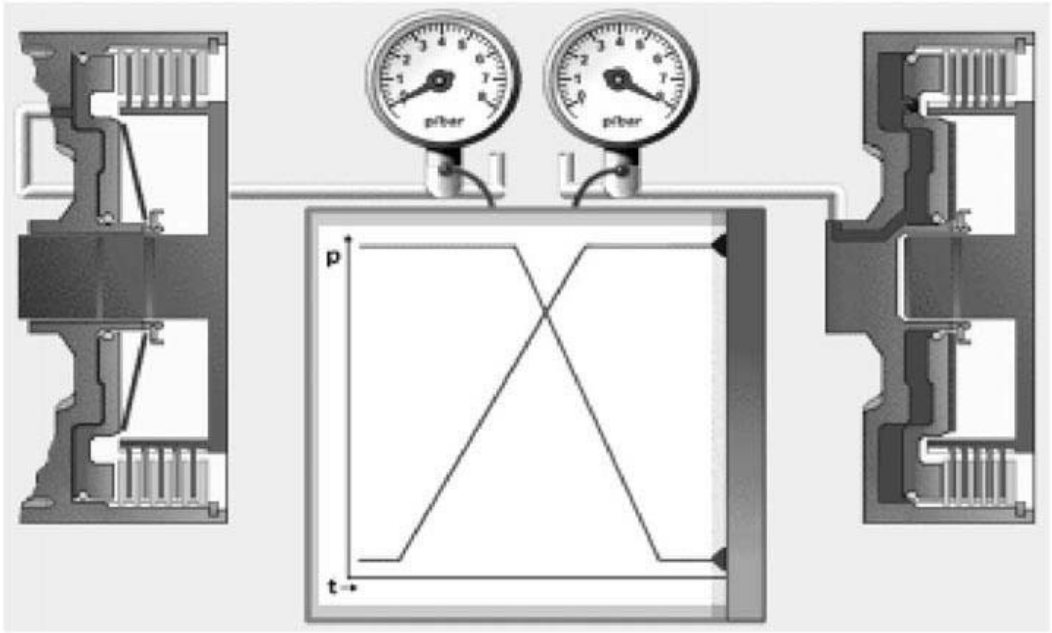


Fig. 55: Identifying Positive Overlap
Courtesy of BMW OF NORTH AMERICA, INC.

TRANSMISSION CONTROL MODULE

The TCM receives inputs, processes information and actuates the output elements to provide optimal shift points. The TCM is programmed for maximum shift comfort and fuel economy. The TCM on most BMW vehicles is located in the E-Box next to the ECM (DME).

There are several types of TCM housings:

- 35 Pin TCM (TCU) - used on the 4HP transmissions
- 55 Pin TCM used on the A4S310R (THM-R1)
- 88 Pin TCM used on all others up to 98
- 134 Pin TCM used on all BMW transmission from the 99 model year. (Note- the 134 pin TCM was introduced on the 98 Models equipped with the A5S440Z).

The 134 Pin TCM is also referred to as SKE (Standard Shell Construction). The SKE housing uses 5 separate connectors. On transmission applications only three connectors 1, 3 and 4) are used. Connectors 2 and 5 are blank and are NOT used. The connectors are blue in color to avoid confusion with the ECM (DME) connectors which are black.

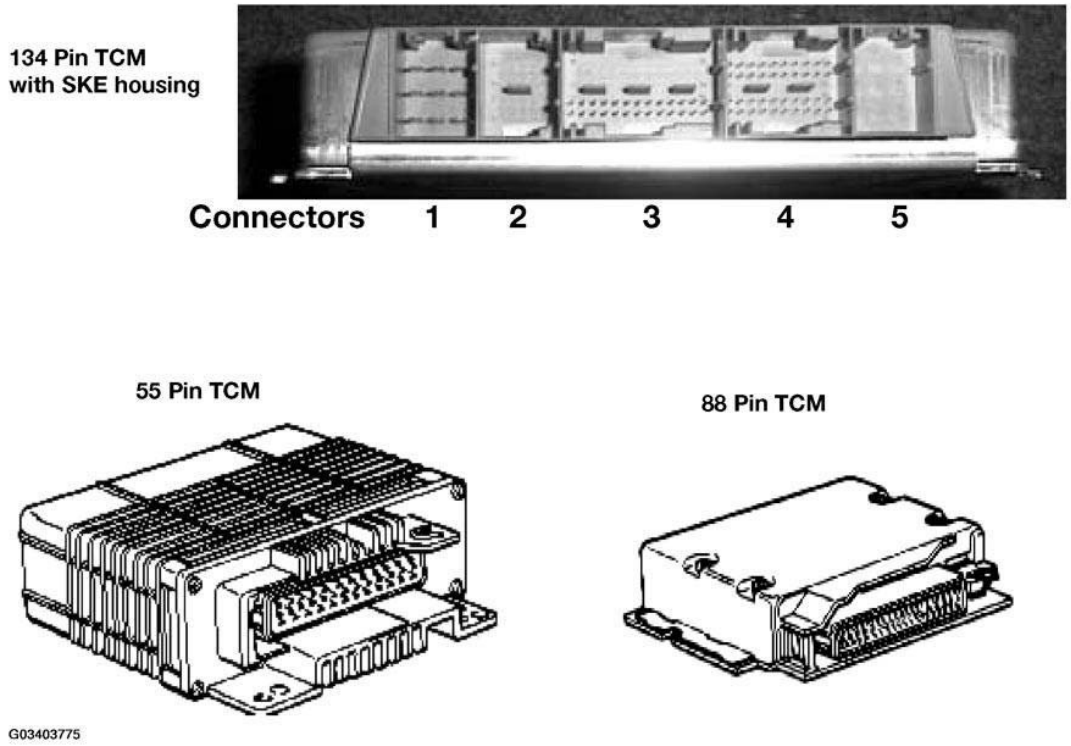


Fig. 56: Identifying Transmission Control Module
Courtesy of BMW OF NORTH AMERICA, INC.