PE13-002

VOLVO TRUCK

5/31/2013

PV776-21209124[1]

OPERATOR'S MANUAL
I-SHIFT TRANSMISSION

Volvo Trucks. Driving Success.®

VOLVO

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This manual contains information concerning the safe operation of your vehicle. It is extremely important that this information is read and understood before the vehicle is operated. Please keep this manual in the vehicle at all times.

NOTE

It is important that this manual stays with the vehicle when it is sold. Important safety information must be passed on to the new owner.

NOTE

Illustrations in this manual are used for reference only and may differ slightly from the actual vehicle, however, key components addressed in the manual are represented as accurately as possible.

All information, illustrations and specifications contained in this manual are based upon the latest product information available at the time of publication. Volvo Trucks North America reserves the right to make changes at any time or to change specifications or design without notice and without incurring obligation.

The National Highway Traffic Safety Administration (NHTSA) and Volvo Trucks North America should be informed immediately if you believe that the vehicle has a defect that could cause a vehicle accident, injury or death.

Contact NHTSA by calling the Auto Safety Hotline at 1 (888) 327-4236, by writing to NHTSA, U.S. Department of Transportation, Washington, DC 20590, by TTY at 1 (800) 424-9153, or visit their website at www.nhtsa.dot.gov.

Volvo Trucks North America

Greensboro, NC USA

Order number: PV776-21209124

SAFETY INFORMATION

IMPORTANT: Before driving this vehicle, be certain that you have read and that you fully understand each and every step of the driving and handling information in this manual. Be certain that you fully understand and follow all safety warnings. It is extremely important that this information is read and understood before the vehicle is operated.

IT IS IMPORTANT THAT THE FOLLOWING INFORMATION BE READ, UNDERSTOOD AND ALWAYS FOLLOWED.

The following types of advisories are used throughout this manual:

⚠ DANGER

Danger ***indicates an unsafe practice that could result in death or serious personal injury. Serious personal injury is considered to be permanent injury from which full recovery is NOT expected, resulting in a change in life style.***

⚠ WARNING

Warning indicates an unsafe practice that could result in personal injury. Personal injury means that the injury is of a temporary nature and that full recovery is expected.

⚠ CAUTION

Caution indicates an unsafe practice that could result in damage to the product.

NOTE

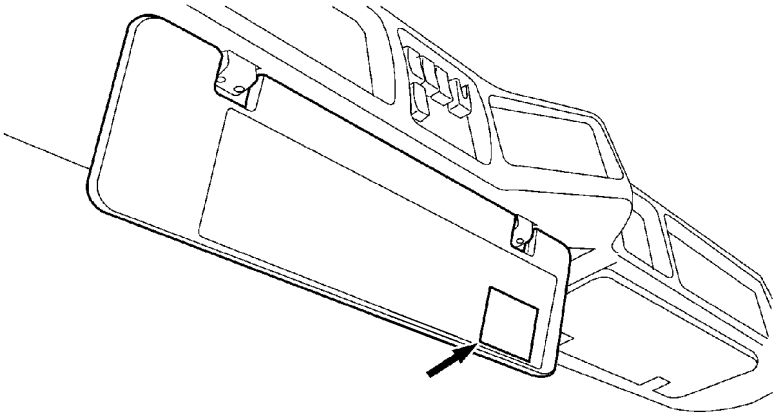
Note indicates a procedure, practice, or condition that must be followed in order for the vehicle or component to function in the manner intended.

Labels

Danger, Warning, Caution and Advisory labels are placed in various locations on the vehicle to alert drivers and service technicians about situations that may lead to personal injury or equipment damage. In the event that a label is damaged or missing the **label must be replaced**. Contact your authorized Volvo Truck dealer for assistance regarding labels.

I-Shift Transmission Label

There is a label with operating information about the I-Shift transmission located on the driver's side sun visor. It is extremely important that this information is read and understood before the vehicle is operated.



I-Shift Transmission Sun Visor Label Location

GENERAL INFORMATION

The Volvo I-Shift transmission is a single countershaft transmission with 12 forward gears and two reverse gears. Some vehicles have four reverse gears. The I-Shift is an automated **mechanical** transmission. The transmitted torque (both engine and braking) will be interrupted during gear shifting, in both driving and coasting conditions. There is no clutch pedal and the gear shifting is controlled by the transmission or the driver through the ergonomic gear selector. The I-Shift is available as an overdrive or direct drive transmission.

Nomenclature and Ratios

The I-Shift transmission is available in four configurations:

- AT2512C – Direct Drive for Volvo D11 and D13 Engines
- ATO2512C – Overdrive for Volvo D11 and D13 Engines
- AT2812C – Direct Drive for Volvo D16 Engine
- ATO3112C – Overdrive for Volvo D16 Engine

NOMENCLATURE

AT	O	XX	12	C
Automated Mechanical Transmission	O = Overdrive No Letter = Direct Drive	Maximum Input Torque Nm (lb-ft) 25 = 2500 (1850) 28 = 2800 (2050) 31 = 3100 (2300)	Forward Speeds	Design Level

GEAR RATIOS

Gear Selection	AT2512C and AT2812C	ATO2512C and ATO3112C
1st	14.94:1	11.73:1
2nd	11.73:1	9.21:1
3rd	9.04:1	7.09:1
4th	7.09:1	5.57:1
5th	5.54:1	4.35:1
6th	4.35:1	3.41:1
7th	3.44:1	2.70:1
8th	2.70:1	2.12:1
9th	2.08:1	1.63:1
10th	1.63:1	1.28:1
11th	1.27:1	1.00:1
12th	1.00:1	0.78:1
Reverse Gear R1	17.48:1	13.73:1
Reverse Gear R2	13.73:1	10.78:1
Reverse Gear R3	4.02:1	3.16:1
Reverse Gear R4	3.16:1	2.48:1

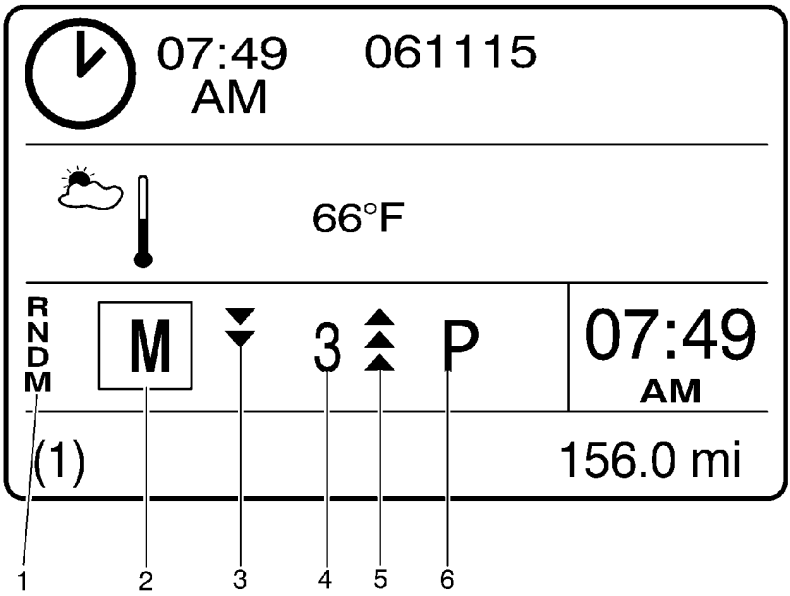
Identification Tag

Each transmission has two identification tags. One is on the top of the clutch housing and the other is on the back of the range housing. Write the serial number in the space provided below.

Serial Number _____

Display

The Driver Information Display (DID) in the instrument cluster provides current operating information about the I-Shift transmission. The I-Shift information is always displayed in a portion of the DID.

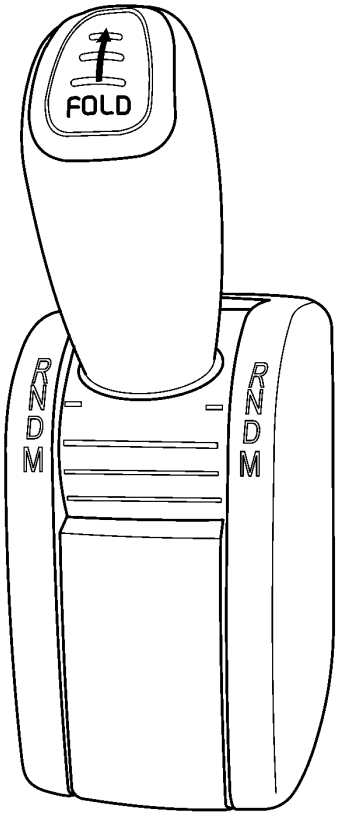


Driver Information Display with I-Shift Transmission

1. **Gear Selector Pattern** is shown in the display so the driver does not have to look down at the gear selector to determine which way to move the gear lever to obtain a different gear range.
2. **Selected Gear Position** indicates the current position of the gear lever.
3. **Available Gears Down** indicates the number of downshifts with the current vehicle operating conditions.
4. **Current Gear** indicates the current transmission operating gear.
5. **Available Gears Up** indicates the number of upshifts with the current vehicle operating conditions.
6. **Driving Mode** indicates if the transmission is operating in Economy, Performance, Engine Brake Performance or Eco-Roll mode.

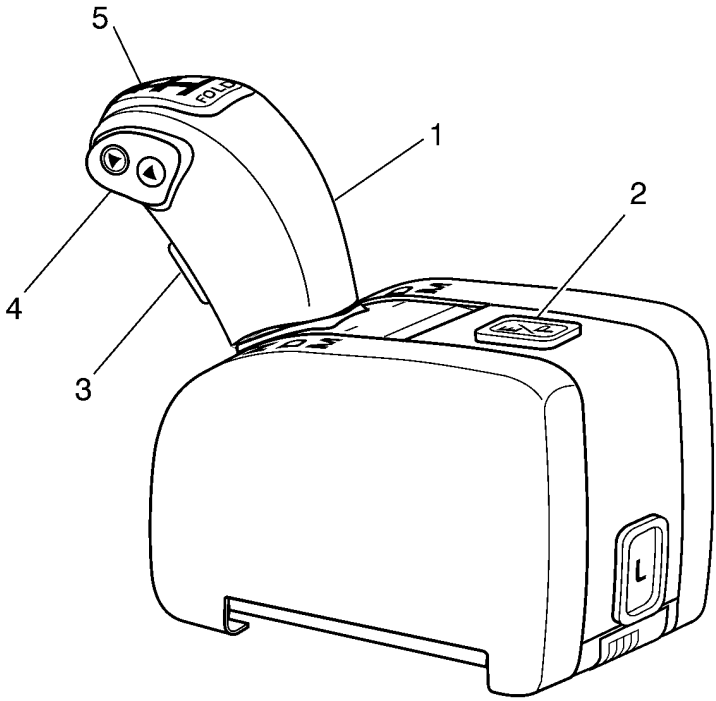
GEAR SELECTOR

Two gear selectors are available with the I-Shift transmission: Premium and Basic. The gear selector is attached to the driver's seat. There are four gear selector positions: R, N, D and M. When the gear lever is in the R position, the reverse gears are engaged. The N position places the transmission in neutral. The D position is the automatic drive mode. With the Premium gear selector, the M position allows the driver to manually select the operating and starting gear. With the Basic gear selector, the M position holds the current operating gear and puts the transmission in first gear when starting from a stop.



Basic Gear Selector Shown

The gear selector lock must be depressed to move the gear lever from the N position. The gear lever can be moved from the R position to N, back and forth between the D and M positions, and from the D position to N without pressing the gear selector lock.



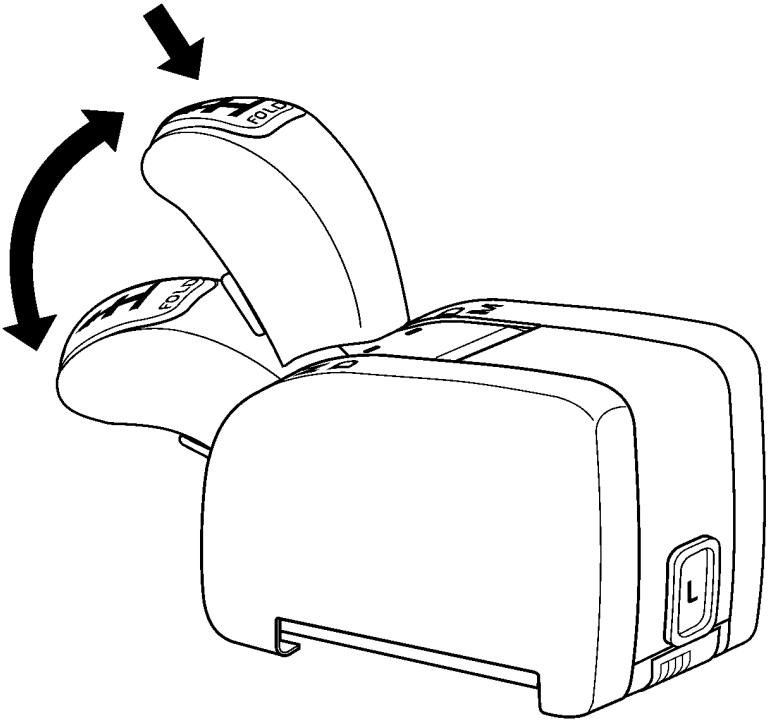
Premium Gear Selector Shown

1. Gear Lever 2. Economy/Performance Button (Premium gear selector only) 3. Gear Selector Lock	4. Manual Gear Selection Buttons (Premium gear selector only) 5. Fold Button

With the Premium gear selector, the manual gear selection buttons allow the operator to manually select the operating gear in both the automatic and manual driving modes. Also, the operator can use the manual gear selection buttons to select the vehicle start gear and the idle driving gear.

Premium gear selectors have an Economy/Performance button. The transmission is in Economy mode when the vehicle is started. Press the E/P button to enable Performance mode.

The gear lever can be folded to the horizontal position by depressing the Fold button on the top of the lever. It is not necessary to press the Fold button again to return the gear lever to the vertical position. The gear lever is in the N position when returned to the vertical position.



Gear Lever Horizontal and Vertical Positions

When the gear lever is in the horizontal or folded position, F is displayed as the gear position and the installed feature package is displayed as the driving mode in the DID. The installed feature package can be modified by adjusting customer parameters in the software. Contact your Volvo Truck dealer for more information about modifying customer parameters and the optional feature packages listed below:

- B = Basic
- EB = Enhanced Basic
- FE = Fuel Economy
- P = Performance
- CO = Comprehensive

I-SHIFT TRANSMISSION FEATURES

NOTE

The I-Shift transmission is available with optional feature packages. Customer-requested options allow these packages to be modified to meet specific operating conditions. Contact your Volvo Truck dealer for more information about standard and optional features.

I-Shift transmission optional feature packages can be upgraded to add additional benefits. The following features are available.

Economy and Performance Modes

When the engine is started, the transmission is in Economy mode. An E is displayed as the driving mode in the DID. The transmission automatically selects shift points and engine parameters to maximize fuel economy. Economy mode is primarily used when driving under normal conditions.

In Performance mode, a P is displayed as the driving mode in the DID. The transmission maximizes gradeability. Performance mode is designed for use in vocational and specialty vehicles such as construction and heavy haul.

Customer-requested options allow the Performance mode to be modified to meet specific operating conditions. Options include full operator control, no operator control and automatic return to Economy mode under certain operating conditions. A customer-requested option is available to disable the Kick-Down function when the transmission is operating in Performance mode. Contact your Volvo Truck dealer for more information about standard and optional features.

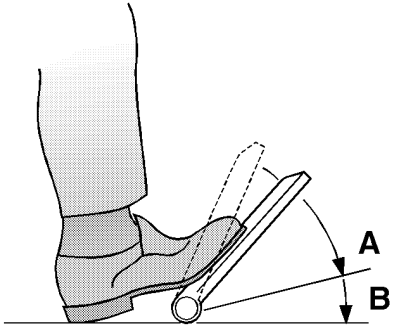
The Performance Mode feature can also be enabled by the Volvo Performance Bonus software package to reward the driver for saving fuel.

NOTE

Operating the vehicle in Performance mode for extended periods can result in a loss of fuel economy.

Kick-Down

When the Kick-Down switch on the accelerator pedal is engaged, the transmission will optimize vehicle acceleration, which may result in a downshift. Kick-Down is engaged by pressing the accelerator pedal all the way down to the floor. The gear selector must be in the D position to engage Kick-Down. Kick-Down disables when the accelerator pedal is lifted. The Kick-Down function can be enabled or disabled based on customer preference. The Kick-Down feature can also be enabled by the Volvo Performance Bonus software package to reward the driver for saving fuel.



Kick-Down Switch

A = 100% Throttle	B = Kick-Down

NOTE

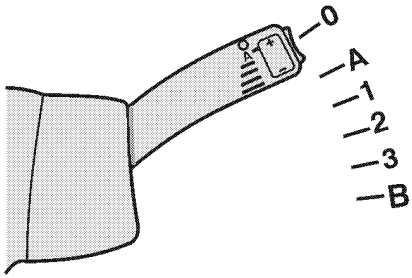
Operating the vehicle with Kick-Down engaged for extended periods can result in a loss of fuel economy.

Engine Brake Performance Mode

NOTE

When the Volvo engine brake is active and transmission is shifting gears, there will be a momentary interruption of the braking torque. This may result in a temporary increase of vehicle speed. The operator will experience the same momentary loss of engine braking as is experienced when downshifting a conventional manual transmission.

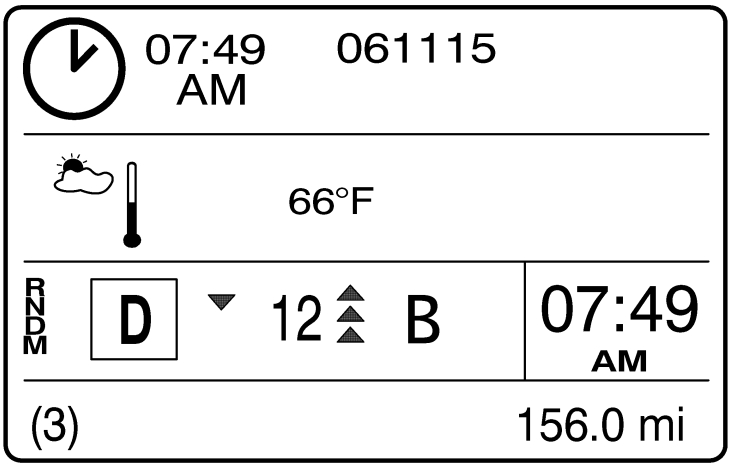
Volvo's enhanced engine brake (I-VEB) is standard with I-Shift transmissions. The current brake position is displayed in the status bar in the DID. The switch on the end of the 6-position engine brake control sets and changes the set speed for the engine brake.



Brake Control Positions

When cruise control is set, move the engine brake control to the A position and set the brake cruise speed with the set switch to maintain the set speed. The transmission interacts with the engine brake to provide optimum performance.

When the vehicle is operated in Engine Brake Performance Mode, the transmission selects the gear with the highest level of braking and keeps engine speed above 1500 rpm. The Engine Brake Performance Mode is activated by moving the brake control to the B position and holding the control in the B position for at least 1 second. When the control is moved to the B position, B is displayed in the status bar in the DID. When Engine Brake Performance Mode is engaged, B is displayed in the driving mode in the DID.



Engine Brake Position Display

Engine Idle Governor Driving Mode

The Engine Idle Governor driving mode (if equipped) allows slow speed vehicle maneuvering such as at the loading dock or in slow moving traffic. This feature operates the engine at idle while the operator selects a gear to adjust the vehicle speed. The automatic clutch remains closed and there is no slipping or overheating. The idle governor will adjust the torque to maintain idle speed and constant vehicle speed, although the engine load may vary. Tapping the service brake will cause the transmission to shift down one gear, if necessary. With the Premium gear selector, it is also possible to downshift using the manual gear selection buttons. Press the accelerator pedal to increase vehicle speed. The clutch is only disengaged when the vehicle is stopped or the brake pedal is fully applied.

Eco-Roll (Optional Feature)

Eco-Roll reduces fuel consumption by automatically disengaging the driveline when the engine is not needed to maintain vehicle speed. When Eco-Roll is active, the engine speed is temporarily reduced to idle. Eco-Roll can be used during normal driving with the accelerator pedal or while in cruise control mode.

If your vehicle is equipped with the optional dash-mounted switch, Eco-Roll is enabled at Key On. Pressing the switch will temporarily disable Eco-Roll. To re-enable Eco-Roll, press the switch again. A key off-on cycle will also re-enable Eco-Roll.

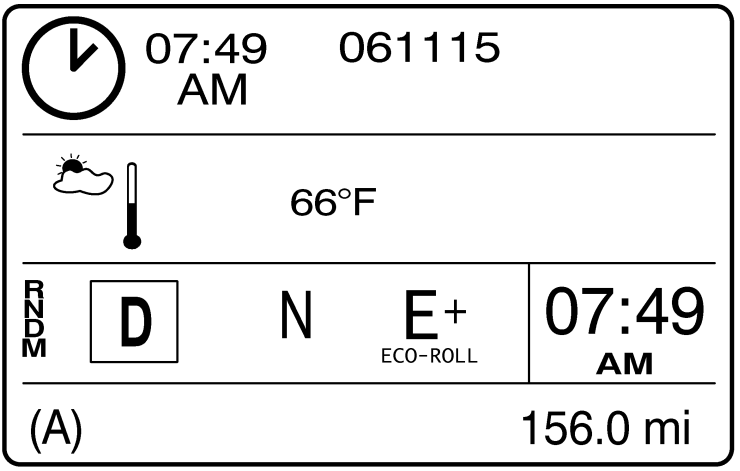
Eco-Roll Icon for Dash-Mounted Switch

For vehicles not equipped with the optional dash-mounted switch, Eco-Roll is only enabled in brake-stalk position A. To disable Eco-Roll, move the brake-stalk to position 0. In this instance, Eco-Roll will be linked to the E+ driving mode.

When Eco-Roll is enabled, it activates automatically, but only when the following conditions exist:

- Vehicle is not operating on a steep downhill or uphill grade
- Transmission is operating in the Economy mode
- Shift lever is in the D position
- I-VEB stalk switch is in the 0 or A position (or A position only with vehicles not equipped with the dash-mounted switch)
- Service brake is released
- Accelerator pedal is released
- Selected gear is 7 or higher
- Brake cruise set speed is greater than 5 km/h (3 mph) above cruise set-speed
- Vehicle speed is less than 125 km/h (78 mph)
- ESP and ABS are not active
- Exhaust Aftertreatment System regeneration is not active

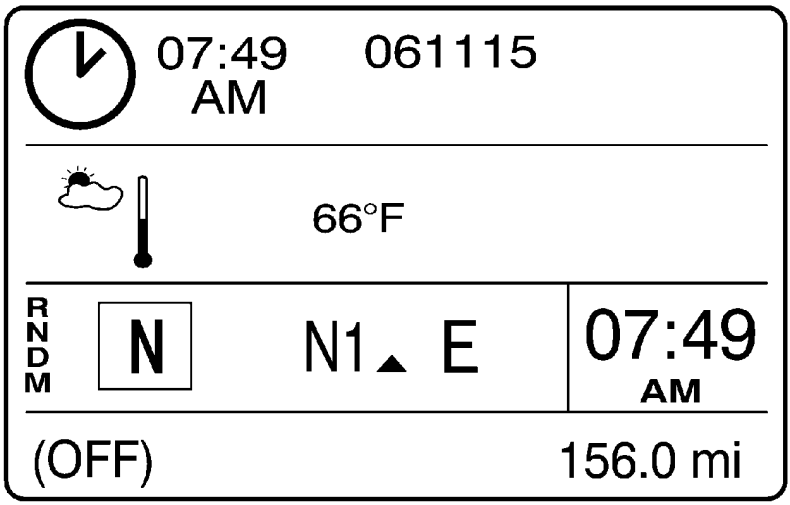
When Eco-Roll is available, E+ is displayed as the driving mode. When Eco-Roll is active, the current gear (7–12) changes to N in the Driver Information Display.



Transmission Power Take-Off (PTO)

Basic PTO functions include pre-defined splitter positions. Parameters that define which splitter gear to engage when transmission Power Take-Off 1 and 2 are engaged can be adjusted.

With the Premium gear selector, when the gear lever is in the N position, the operator can use the manual gear selection buttons to select the split gear when using the power take-off.



N Position Display

STARTING AND STOPPING

Starting

The transmission gear lever must be in the N position or the engine will not start. If the gear lever is not in neutral, a starter protection message will appear in the DID along with the Information light and an audible warning.

If there is not enough air pressure in the I-Shift air reservoir, a low air supply message will appear in the DID along with the Information light and an audible warning. Start the engine and allow the air pressure to build in the reservoir. Wait until the message and light go off before attempting to shift the transmission into gear.

The gear selector lock must be depressed to move the gear lever from the N position. Also the brake pedal must be pressed down. If the brake pedal is not pressed down before attempting to move the gear lever from the N position, the message “Depress Brake Pedal Before Selecting a Gear” will appear in the DID along with the Information light and an audible warning. Move the gear lever back to the N position, apply the brake pedal and move the gear lever to the desired gear.

With the Premium gear selector, the operator can always select a lower start gear in both the D and M position. Also, the operator can always select a higher start gear in the R position.

Stopping

⚠ DANGER

When parking the vehicle, always apply the parking brake and move the gear lever to the N position on the gear selector. Make sure the parking brake is holding the vehicle before leaving the driver position. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

When the vehicle is stopped:

1. Apply the parking brake.
2. Move the gear lever to the N position on the gear selector.
3. Switch off the engine.

DRIVING

The most efficient way to operate the vehicle is to use the automatic drive program, the D position on the gear selector. Gear changing is automatic and the operator can concentrate on the road ahead. With the Premium gear selector, the operator has limited ability to change gears manually with the gear selector in the D position. In addition, the brake control switch should be in the A position to maximize the integration of the transmission and brake system. This means optimum performance and fuel economy at all times.

When the gear selector is in the D position and the engine speed is below 1500 rpm, moving the brake control to the B position will cause the transmission to downshift. Move the gear lever to the M position to hold the transmission in the newly selected gear.

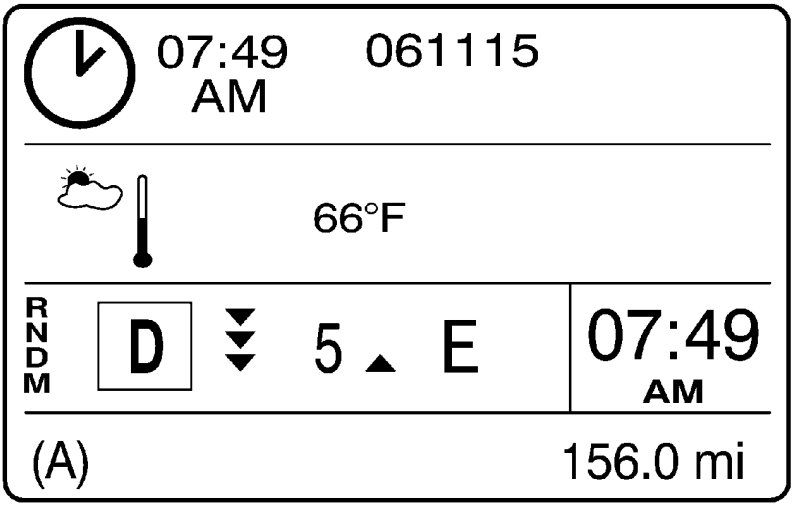
In difficult driving conditions such as forests, construction sites and off-road, manual mode, the M position on the gear selector, and Performance Mode (if equipped), give the operator more control.

NOTE

When changing gears manually, the accelerator pedal should not be released.

D Position

When the Premium gear selector lever is in the D position, the current transmission operating gear is displayed along with up and down arrows on each side of the gear display. These arrows indicate the number of available manual upshifts or downshifts based on the current driving conditions. The operator can use the manual gear selection buttons to upshift or downshift as indicated by the arrows. The transmission will automatically upshift and downshift as necessary to maintain the desired vehicle speed for the current driving conditions. The number of available manual upshifts and downshifts will change as driving conditions change.



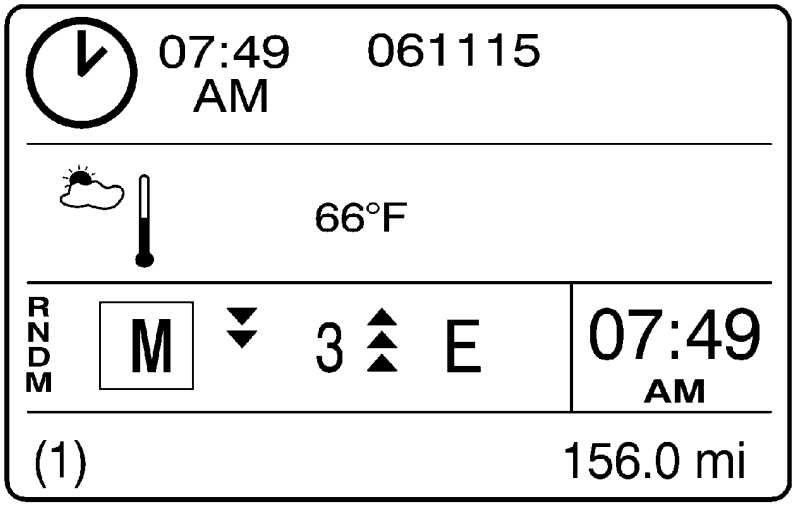
D Position Display

NOTE

Press the manual gear selection buttons multiple times to “skip shift” or jump up or down more than one gear at a time (three gears maximum).

M Position

When the Premium gear selector lever is in the M position, the current gear is displayed along with the up and down arrows. The transmission will not automatically change gears as the driving conditions change. The operator can use the manual gear selection buttons to upshift or downshift manually. The number of available upshifts and downshifts will change as driving conditions change.



M Position Display

⚠ CAUTION

Starting the vehicle in too high a gear causes excessive wear to the clutch and can result in clutch damage.

With the Premium gear selector, when the vehicle is stationary, the gear lever is in the M position and the transmission has detected conditions that require a lower vehicle start gear, a select lower gear message will appear in the DID along with the Information light and an audible warning. Move the gear lever to the D position on the gear selector, or use the manual gear selection button to select a lower start gear. If necessary, continue to use the manual gear selection button to select lower start gears until the message and light go off.

With the Basic gear selector, when the vehicle is stationary and the gear lever is moved from the D position to M, the vehicle start gear will change to first.

NOTE

There is the risk of over-revving the engine when the transmission is locked in a gear. Damage to the engine may occur.

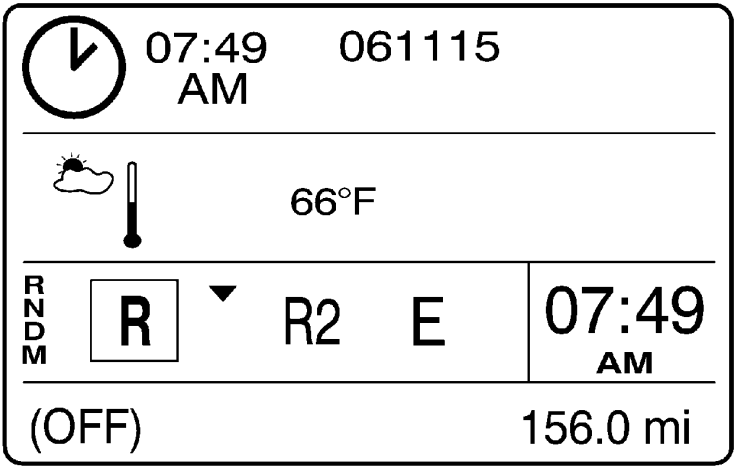
To lock the transmission in the current gear, move the gear lever from the D position to the M position. This function can be used for all 12 forward gears. To return to the automatic program, move the gear lever back to the D position.

NOTE

Operating the vehicle in the M position for extended periods can result in a loss of fuel economy.

R Position

When the Premium gear selector lever is in the R position, the current gear is displayed along with the up and down arrows. The transmission will not automatically change gears as the driving conditions change. The operator can use the manual gear selection buttons to upshift or downshift manually. If the vehicle has four reverse gears, the vehicle must be stationary to shift between reverse gear R2 and reverse gear R3.



R Position Display

With the Basic gear selector, when the vehicle is moving and the gear lever is moved from the D or R position to M, the transmission will stay in the current gear until the lever is moved back to D, R or N.

Starting the Vehicle Uphill and Downhill

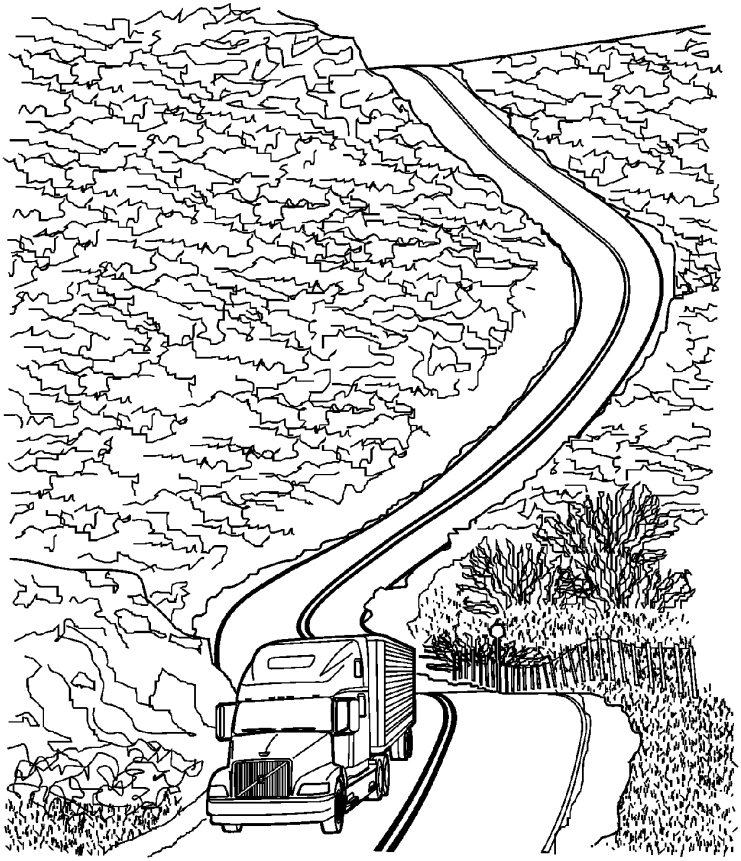
⚠ DANGER

The vehicle can roll when stopped on a hill or grade, or when the vehicle is starting from a stop on a hill or grade. Always use the brakes to hold the vehicle stationary on a hill or grade. Failure to do so can result in serious personal injury or death.

⚠ CAUTION

Always use the brakes to hold the vehicle stationary on a uphill stop. *Never hold the vehicle stationary on an uphill slope using the accelerator pedal. The clutch could overheat, which could cause it to breakdown.*

The I-Shift transmission clutch is a dry disc type, with **no torque converter**. Never allow the clutch to slip in too high a gear when starting the vehicle. If the clutch overheats, a high clutch load message or clutch protection active message will appear in the DID along with the Check light and an audible warning.



Hilly Operating Conditions

When starting the vehicle on an uphill slope:

1. Press the brake pedal.
2. Move the gear lever to the D position on the gear selector. With the Premium gear selector, the operator can use the manual gear selection button to select a lower start gear.
3. Quickly move your foot from the brake pedal and firmly press the accelerator pedal.

Hill Start Assist (Optional Feature)

Hill Start Assist provides anti-roll assistance during the transition from standing to starting on a grade. The brake system maintains pressure in the brake chambers for a predefined period of time after the service brake pedal is released, which allows the driver time to move their foot from the brake pedal to the accelerator pedal.

⚠ DANGER

Hill Start Assist is only intended to temporarily hold the vehicle on a grade before the vehicle is put into motion. The vehicle brake must be applied, independent of Hill Start Assist, to hold the vehicle on a grade for an extended period of time. Failure to follow this instruction can result in loss of vehicle control and serious personal injury or death.

When available, Hill Start Assist is enabled at key-on. Pressing a dash-mounted switch will temporarily disable Hill Start Assist. The Hill Start Assist telltale in the instrument cluster will blink to indicate that the feature is temporarily disabled. Hill Start Assist is re-enabled by pressing the switch again, or when vehicle speed exceeds 20 km/h (12 mph). A key off-on cycle also re-enables Hill Start Assist. If a Hill Start Assist fault occurs, the Hill Start Assist telltale in the instrument cluster will illuminate and the feature is permanently unavailable until the fault is repaired.

Hill Start Assist Icon for Instrument Cluster Telltale and Dash-Mounted Switch

When Hill Start Assist is enabled, it activates automatically, but only when the following conditions exist:

- Vehicle speed is zero
- Vehicle is on a greater than 2 percent incline or decline
- Shift lever is in the D position on an incline or R position on a decline
- Service brake is applied
- ABS is functioning normally
- There has been no ABS activity in the preceding stops

When the service brake pedal is released, the brakes are applied for approximately 3 seconds or until the accelerator pedal is depressed, whichever occurs first.

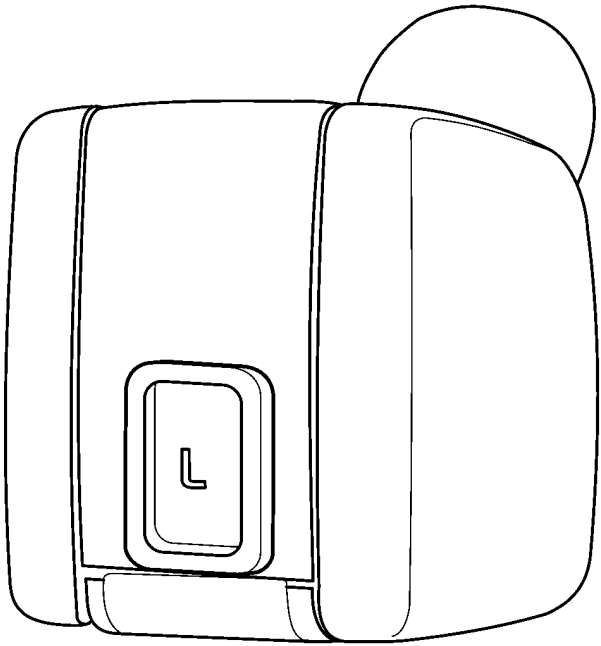
When Hill Start Assist is active, an instrument cluster pop-up message is displayed.

Limp Home Mode

NOTE

Limp Home Mode should only be used to move the vehicle to a safe location. Only use Limp Home Mode when no other way to move the vehicle is available.

If the transmission has a mechanical problem, press and hold the L button on the gear selector while moving the gear lever to the D position to activate Limp Home Mode. When activated, L is displayed as the driving mode in the DID. With the Premium gear selector, only 1st, 3rd and 5th forward start gears and reverse gear R1 are available. With the Basic gear selector, only 1st forward start gear and reverse gear R1 are available. The operator cannot change gears in Limp Home Mode. The Limp Home Mode will be deactivated when the ignition is turned off.

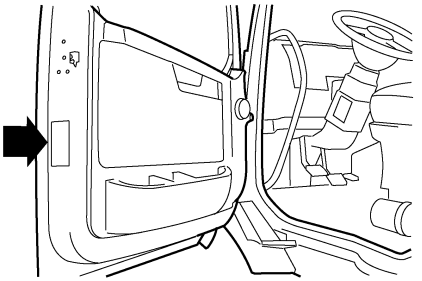


Limp Home Mode Button

TOWING

⚠ CAUTION

Never tow an I-Shift transmission without removing the driveline, regardless of the distance. Failure to do so will result in damage to the transmission.



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I-Shift Towing Caution Label Location

⚠ CAUTION

You must tow a vehicle equipped with an I-Shift transmission according to the guidelines below. Failure to do so can result in damage to transmission components.

When towing the vehicle, the output shaft of the transmission must not be allowed to spin or turn. If the vehicle is towed with the drive wheels still in contact with the road surface, the vehicle axle shafts or driveline must be removed or disconnected.

MAINTENANCE

⚠ DANGER

Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and chock the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make your vehicle unsafe and lead to serious personal injury or death.

Drain the moisture from the transmission air reservoir daily. Draining the moisture from the air reservoir helps prevent moisture and contaminants from entering the transmission. Moisture in the transmission can affect operation and damage components.

Transmission Oil

⚠ CAUTION

Only use Volvo approved synthetic SAE 75W/85 gearbox oil (specification 97307) in the I-Shift transmission. Using non-approved oil can result in damage to transmission components.

⚠ CAUTION

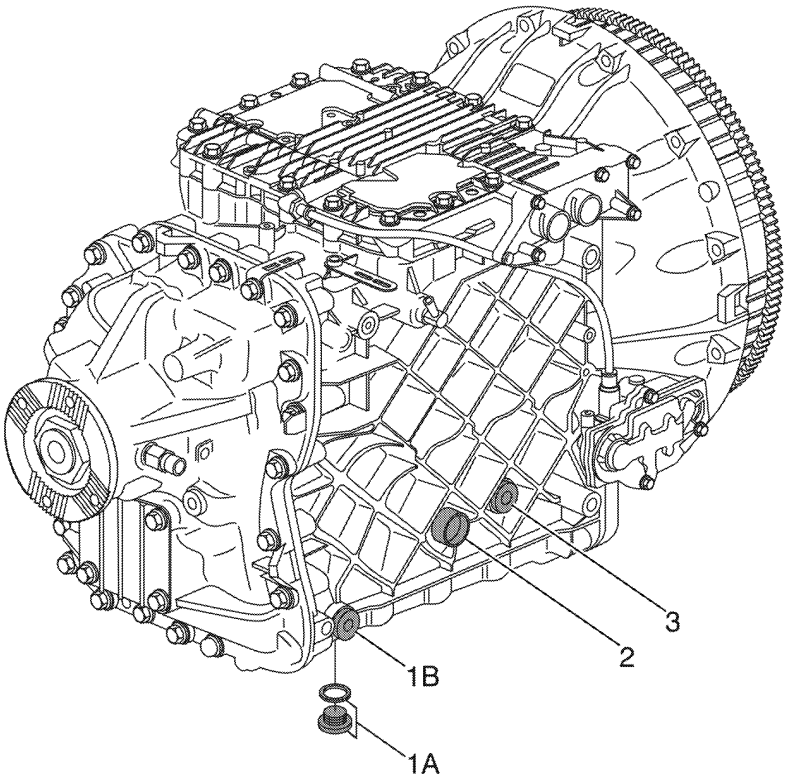
Never reuse drained I-Shift oil. The oil must be replaced along with the oil filter. Reusing drained oil can result in damage to transmission components.

Keep the transmission oil at the proper level and change it at the Volvo recommended intervals. Always replace the oil filter when the oil is changed. Always use the Volvo approved synthetic oil whenever adding or changing the transmission oil.

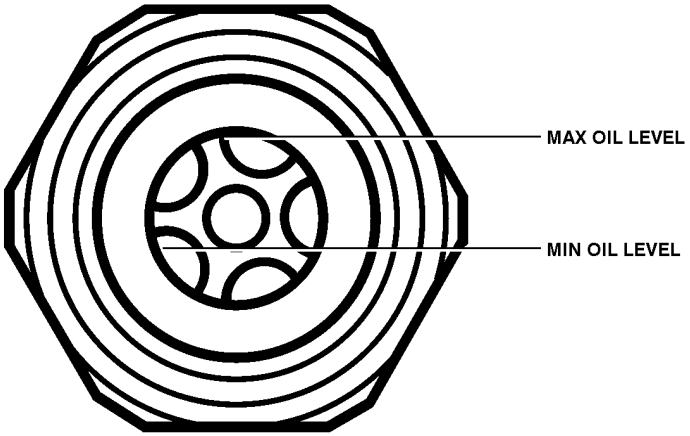
For a complete list of approved oils, contact your Volvo Truck dealer. Also, refer to Bulletin 175-61, *Approved Oils, Volvo Components*.

Check Oil Level

Check the transmission oil level at each service interval. Park the vehicle on a level surface. Check the oil level through the sight glass on the side of the transmission. Add oil as necessary. Always use the correct Volvo approved synthetic oil.



1. Drain Plug	2. Sight Glass	3. Fill Plug and Oil Level



Sight Glass for Checking Oil Level

Oil Change Interval

The length of time a transmission can operate before an oil change is required depends on the quality of the oil used and the vehicle application. For severe service or off-highway applications, more frequent oil changes may be necessary.

For on-highway applications, change the transmission oil every 400 000 km (250,000 miles). Always replace the oil filter when the oil is changed. Always use the Volvo approved synthetic oil whenever changing the transmission oil.

For additional information about oil change intervals, contact your Volvo Truck dealer. Also, refer to Bulletin 175-60, *Oil and Filters, Volvo Components*.

Oil Change

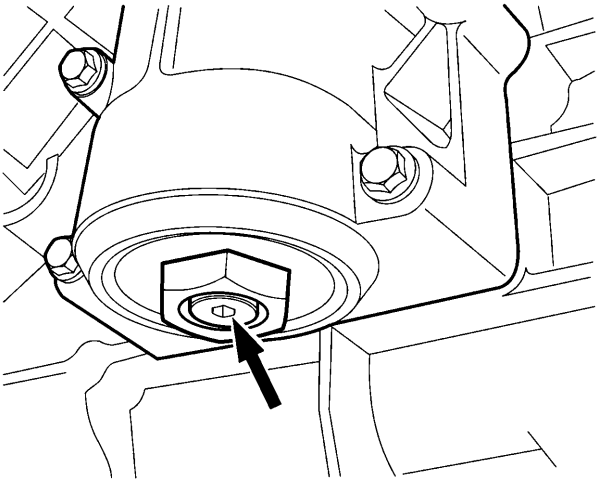
⚠ WARNING

Hot oil can cause burns. DO NOT allow hot oil to contact the skin. When changing oil, wear protective gloves.

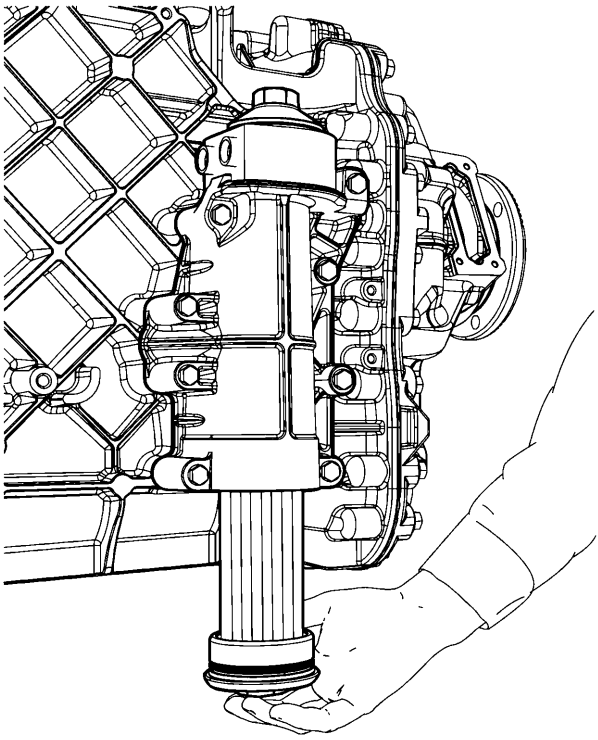
⚠ CAUTION

Always dispose of all lubricants (engine oil, coolant, transmission oil, etc) and filters according to Federal or local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife.

Change the oil filter at every oil change. Drain the oil filter housing before you remove the filter.



Oil Filter Housing Drain Plug



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1-800-52-VOLVO

Volvo Action Service (VAS) Support Center

- If you need assistance on the road or if you need service repairs, contact the VAS support center. VAS is available 24 hours per day, 7 days per week at **1-800-528-6586**.
- Please report the specific nature of the service problem to the Volvo Customer Support Specialist, who will answer your questions and arrange for the assistance you need.

Truck Model & Serial _____

Engine Model & Serial _____

Transmission Model & Serial _____

Rear Axle Model & Serial _____

Your Truck Was Delivered By:

Volvo Trucks North America
P.O. Box 26115 Greensboro, NC 27402-6115
Volvo Trucks Canada, Ltd.
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VOLVO TRUCK

5/31/2013

PV776-21651077[1]

OPERATOR'S MANUAL
I-SHIFT TRANSMISSION

Volvo Trucks. Driving Success.®

VOLVO

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Foreword

This manual contains information concerning the safe operation of your vehicle. It is extremely important that this information is read and understood before the vehicle is operated. Please keep this manual in the vehicle at all times.

Note: It is important that this manual stays with the vehicle when it is sold. Important safety information must be passed on to the new owner.

Note: Illustrations in this manual are used for reference only and may differ slightly from the actual vehicle, however, key components addressed in the manual are represented as accurately as possible.

All information, illustrations and specifications contained in this manual are based upon the latest product information available at the time of publication. VOLVO Trucks North America reserves the right to make changes at any time or to change specifications or design without notice and without incurring obligation.

The National Highway Traffic Safety Administration (NHTSA) and VOLVO Trucks North America should be informed immediately if you believe that the vehicle has a defect that could cause a vehicle accident, injury or death.

Contact NHTSA by calling the Auto Safety Hotline at 1 (888) 327-4236, by writing to NHTSA, U.S. Department of Transportation, Washington, DC 20590, by TTY at 1 (800) 424-9153, or visit their website at www.nhtsa.dot.gov.

VOLVO Trucks North America

Greensboro, NC USA

Order number: PV776-21651077

Safety Information

IMPORTANT: Before driving this vehicle, be certain that you have read and that you fully understand each and every step of the driving and handling information in this manual. Be certain that you fully understand and follow all safety warnings. It is extremely important that this information is read and understood before the vehicle is operated.

IT IS IMPORTANT THAT THE FOLLOWING INFORMATION BE READ, UNDERSTOOD AND ALWAYS FOLLOWED.

The following types of advisories are used throughout this manual:

⚠ DANGER

Danger indicates an unsafe practice that could result in death or serious personal injury. Serious personal injury is considered to be permanent injury from which full recovery is NOT expected, resulting in a change in life style.

⚠ WARNING

Warning indicates an unsafe practice that could result in personal injury. Personal injury means that the injury is of a temporary nature and that full recovery is expected.

⚠ CAUTION

Caution indicates an unsafe practice that could result in damage to the product.

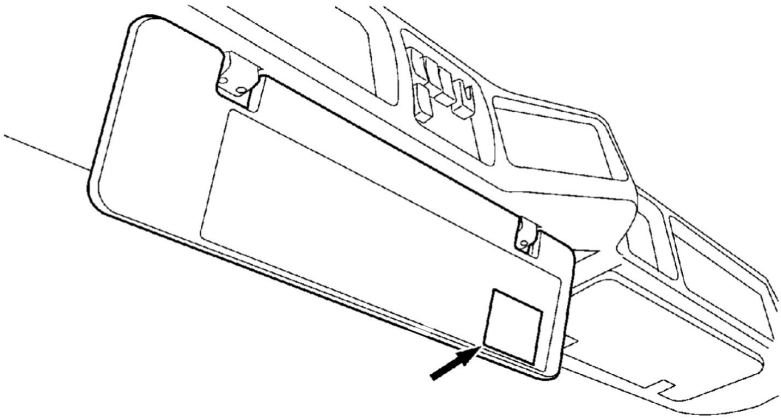
Note: Note indicates a procedure, practice, or condition that must be followed in order for the vehicle or component to function in the manner intended.

Labels

Danger, Warning, Caution and Advisory labels are placed in various locations on the vehicle to alert drivers and service technicians about situations that may lead to personal injury or equipment damage. In the event that a label is damaged or missing the **label must be replaced**. Contact your authorized VOLVO Truck dealer for assistance regarding labels.

I-Shift Transmission Label

There is a label with operating information about the I-Shift transmission located on the drivers side sun visor. It is extremely important that this information is read and understood before the vehicle is operated.



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I-Shift Transmission Sun Visor Label Location

VOLVO I-Shift Transmission

General Information

The VOLVO I-Shift transmission is a single countershaft transmission with 12 forward gears and two reverse gears. Some vehicles have four reverse gears (VHD vehicles only). The I-Shift is an automated **mechanical** transmission. The transmitted torque (both engine and braking) will be interrupted during gear shifting, in both driving and coasting conditions. There is no clutch pedal and the gear shifting is controlled by the transmission or the driver through the ergonomic gear selector. The I-Shift is available as an overdrive or direct drive transmission.

Nomenclature and Ratios

The I-Shift transmission is available in three configurations:

- AT2612D – Direct Drive for VOLVO D11 and D13 Engines
- ATO2612D – Overdrive for VOLVO D11 and D13 Engines
- ATO3112D – Overdrive for VOLVO D16 Engines

Nomenclature

AT	O	XX	12	D
Automated Mechanical Transmission	O = Overdrive No Letter = Direct Drive	Maximum Input Torque Nm (lb-ft) 26 = 2600 (1918) 31 = 3100 (2300)	Forward Speeds	Design Level

Gear Ratios

Gear Selection	**AT2612D**	**ATO2612D**	**ATO3112D**
	Direct Drive	**Overdrive**	**Overdrive**
1st	14.94:1	11.73	11.73
2nd	11.73:1	9.21	9.21
3rd	9.04:1	7.09	7.09
4th	7.09:1	5.50	5.50
5th	5.54:1	4.35	4.35
6th	4.35:1	3.41	3.41
7th	3.44:1	2.70	2.70
8th	2.70:1	2.12	2.12
9th	2.08:1	1.63	1.63
10th	1.63:1	1.28	1.28
11th	1.27:1	1.00	1.00
12th	1.00:1	0.79	0.79
Reverse Gear R1	17.48:1	13.73	13.73
Reverse Gear R2	13.73:1	10.78	10.78
Reverse Gear R3	4.02:1	3.16	3.16
Reverse Gear R4	3.16:1	2.48	2.48

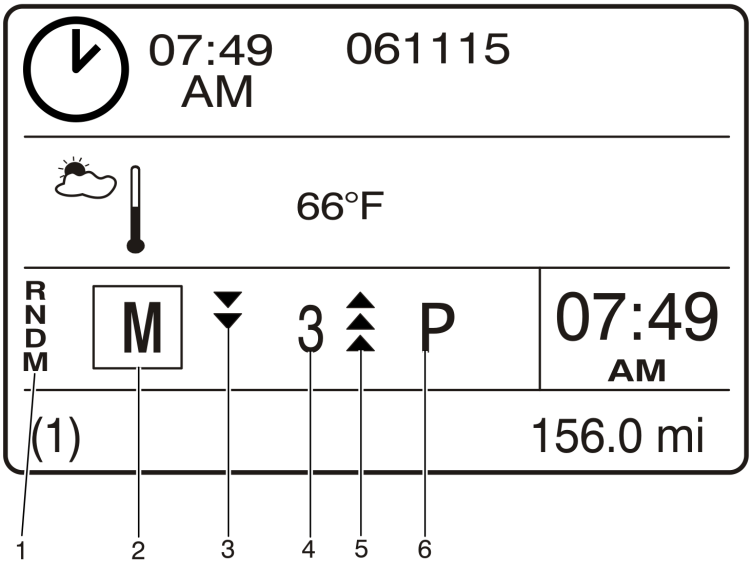
Identification Tag

Each transmission has two identification tags. One is on the top of the clutch housing and the other is on the back of the range housing. Write the serial number in the space provided below.

Serial Number _____

Display

The Driver Information Display (DID) in the instrument cluster provides current operating information about the I-Shift transmission. The I-Shift information is always displayed in a portion of the DID.



Driver Information Display with I-Shift Transmission

1. **Gear Selector Pattern** is shown in the display so the operator does not have to look down at the gear selector to determine which way to move the gear lever to obtain a different gear range. 2. **Selected Gear Position** indicates the current position of the gear lever. 3. **Available Gears Down** indicates the number of downshifts with the current vehicle operating conditions.	4. **Current Gear** indicates the current transmission operating gear. 5. **Available Gears Up** indicates the number of upshifts with the current vehicle operating conditions. 6. **Driving Mode** indicates if the transmission is operating in Economy (E), Eco-Roll (E+), Performance (P), Performance Plus (P+), or Engine Brake Performance (B) mode.

Feature Package

When the gear lever is in the horizontal or folded position, F is displayed as the gear position and the installed feature package is displayed as the driving mode in the DID. The installed feature package can be modified by adjusting customer parameters in the software. Contact your VOLVO Truck dealer for more information about modifying customer parameters and the optional feature packages listed below:

- B = Basic: This package is primarily for pick-up. delivery, and distribution vehicles. M-position = hold gear.
- EB = Enhanced Basic: Primarily for distribution vehicles. This package provides better acceleration and performance than the basic package. The Kick-down pedal is required in order to support kick-down functionality. M-position = hold gear.
- FE = Fuel Economy: This package is for line haul fleet vehicles. It includes all features that can improve fuel economy but lacks features that boost performance. The Kick-down pedal is required in order to support kick-down functionality. M-position = hold gear.
- P = Performance: The Performance mode is for vocational and specialty vehicles such as construction and heavy load haulers. The aim is to have bigger margins in terms of engine torque and use a more defensive gear selection pattern. The engine is allowed to rev higher and skip shifting is avoided. M-position = Full Manual mode.
- CO = Comprehensive: This is the full functionality package. This package is for owner operator vehicles and premium fleets. It includes all features that can improve fuel economy, comfort, and performance. The Kick-down pedal is best for acceleration. The premium gear lever include the Economy Performance (EP) switch and gear selection switch. M-position = Full Manual mode.
- G = Gentle: This package is optimal for livestock haul and recreational vehicle applications. It offers the same features as the comprehensive package, but with a revised shift strategy, which provides smoother launches, less aggressive shifts, and gentle driving. M-position = Full Manual mode.

Feature	I-Shift Transmission Software Packages					
	Basic Shifter			Premium Shifter		
	Basic	Enhanced Basic	Fuel Economy	Performance	Comprehensive	Gentle
Ergonomic seat mounted shifter	X	X	X	X	X	X
Basic Shifter type without manual controls	X	X	X			
Premium Shifter type with manual controls				X	X	X
Manual gear shifting in Drive mode				X	X	X
Manual gear shifting in Manual mode	Hold gear only	Hold gear only	Hold gear only	X	X	X
Manual selection of start gear				X	X	X
Idle Governor driving mode		X	X	X	X	X
Manual selection of Idle driving gears				X	X	X
Economy mode	X	X	X	X	X	X
Performance mode					X	X
P+ Performance mode				X		

Feature	I-Shift Transmission Software Packages					
	Basic Shifter			Premium Shifter		
	Basic	Enhanced Basic	Fuel Economy	Performance	Comprehensive	Gentle
Kick-Down		X	X	X	X	X
Eco-Roll			X		X	X
Engine Brake Performance mode	X	X	X	X	X	X
Auto Neutral when parking brake applied	X	X	X	X	X	X
Auto Neutral at key-off if gear engaged	X	X	X	X	X	X
Hill Start Assist	Optional	Optional	Optional	Optional	Optional	Optional
STD PTO features	X	X	X	X	X	X
Enhanced PTO features	Optional	Optional	Optional	Optional	Optional	Optional

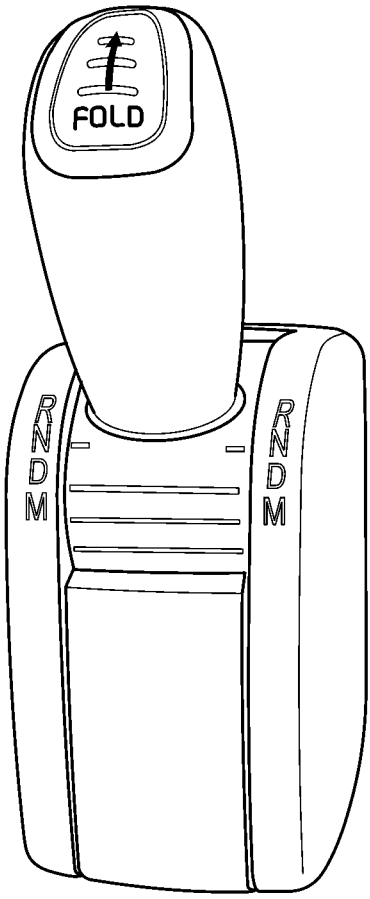
I-Shift Transmission Features

Note: The I-Shift transmission is available with optional features. Customer-requested options are available. Contact your VOLVO Truck dealer for more information about standard and optional features.

I-Shift transmission optional feature packages can be upgraded to add additional benefits. The following features are available.

Gear Selector

Two gear selectors are available with the I-Shift transmission: Premium and Basic. The gear selector is attached to the drivers seat. There are four gear selector positions: R, N, D and M. When the gear lever is in the R position, the reverse gears are engaged. The N position places the transmission in neutral. The D position is the automatic drive mode. With the Premium gear selector, the M position allows the operator to manually select the operating and starting gear. With the Basic gear selector, the M position holds the current operating gear and puts the transmission in first gear when starting from a stop.



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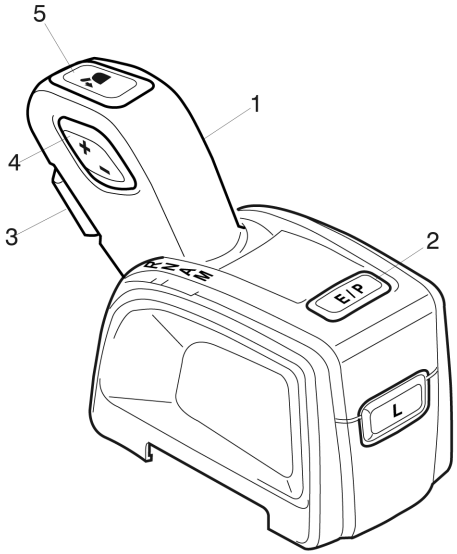
Basic Gear Selector Shown

The gear selector lock must be depressed to move the gear lever from the N position. The gear lever can be moved from the R position to N, back and forth between the D and M positions, and from the D position to N without pressing the gear selector lock.



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Premium Gear Selector Shown

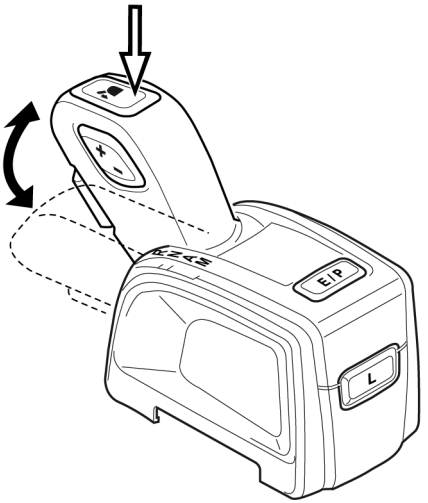
1. Gear Lever 2. Economy/Performance Button (Premium gear selector only) 3. Gear Selector Lock	4. Manual Gear Selection Buttons (Premium gear selector only) 5. Fold Button

With the Premium gear selector, the manual gear selection buttons allow the operator to manually select the operating gear in both the automatic and manual driving modes. Also, the operator can use the manual gear selection buttons to select the vehicle start gear and the idle driving gear.

Premium gear selectors have an Economy/Performance button. The transmission is in Economy mode when the vehicle is started. Press the E/P button to enable Performance mode.

Note: If the E/P parameter is disabled then the Performance mode cannot be engaged.

From the N position the gear lever can be folded to the horizontal position by depressing the Fold button on the top of the lever. It is not necessary to press the Fold button again to return the gear lever to the vertical position. The gear lever is in the N position when returned to the vertical position.



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Gear Lever Horizontal and Vertical Positions

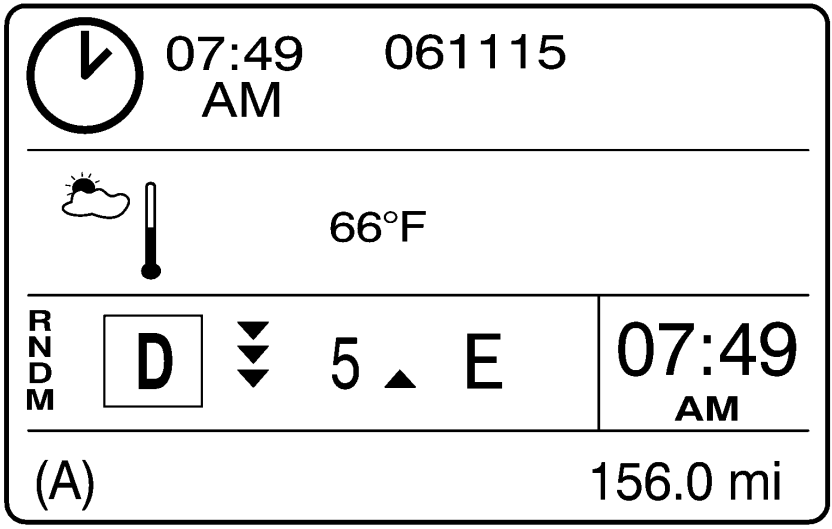
D Position

The transmission will automatically upshift and downshift, as necessary, to maintain the desired vehicle speed for the current driving conditions.

The Basic gear selector doesn't allow the driver to manually select a different gear.

Using the Premium gear selector lever in the D position, the current transmission operating gear is displayed along with up and down arrows on each side of the gear display. These arrows indicate the number of available manual upshifts or downshifts based on the current driving conditions. The operator can use the manual gear selection buttons to upshift or downshift as indicated by the arrows. The transmission will automatically upshift and downshift as necessary to maintain the desired vehicle speed for the current driving conditions. The number of available manual upshifts and downshifts will change as driving conditions change.

Press the manual gear selection buttons multiple times to skip shift (jump up or down) more than one gear at a time (three gears maximum).



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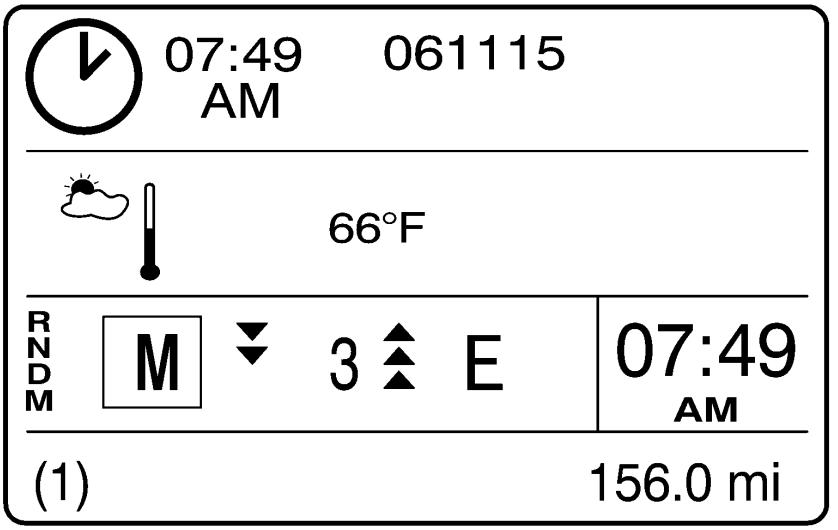
D Position Display

M Position

When the Premium gear selector lever is in the M position, the current gear is displayed along with the up and down arrows. The transmission will not automatically change gears as the driving conditions change. The operator can use the manual gear selection buttons to upshift or downshift manually. The number of available upshifts and downshifts will change as driving conditions change.

If the engine RPM drops below the allowable driveable range, the transmission automatically engages the proper gear. The M-position should be used to control the engine RPM, in the desired gear, while driving on a steep downhill.



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M Position Display

CAUTION

Starting the vehicle in too high a gear causes excessive wear to the clutch and can result in clutch damage.

With the Premium gear selector, when the vehicle is stationary, the gear lever is in the M position and the transmission has detected conditions that require a lower vehicle start gear, a select lower gear message will appear in the DID along with the Information light and an audible warning. Move the gear lever to the D position on the gear selector, or use the manual gear selection button to select a lower start gear. If necessary, continue to use the manual gear selection button to select lower start gears until the message and light go off.

With the Basic gear selector, when the vehicle is stationary and the gear lever is moved from the D position to M, the vehicle start gear will change to first.

Note: There is the risk of over-revving the engine when the transmission is locked in a gear. Damage to the engine may occur

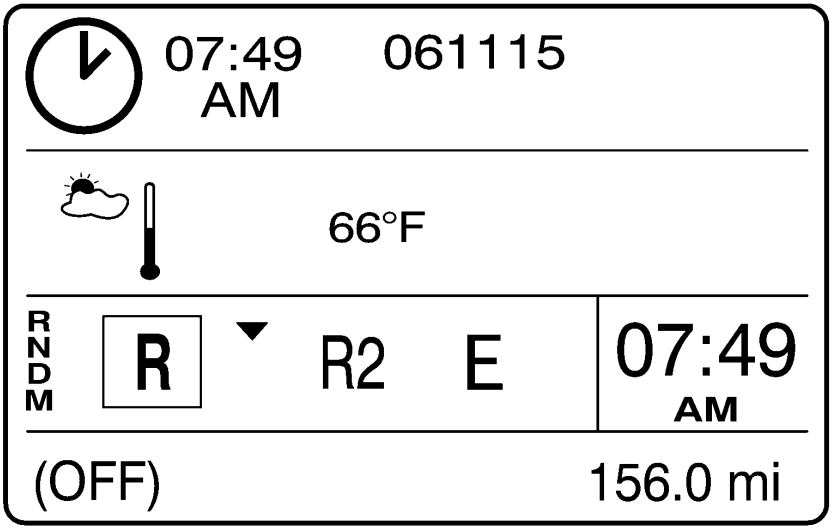
To lock the transmission in the current gear, move the gear lever from the D position to the M position. This function can be used for all 12 forward gears. To return to the automated program, move the gear lever back to the D position.

Note: Operating the vehicle in the M position for extended periods can result in a loss of fuel economy.

R Position

When the Premium gear selector lever is in the R position, the current gear is displayed along with the up and down arrows. The transmission will not automatically change gears as the driving conditions change. The operator can use the manual gear selection buttons to upshift or downshift manually. If the vehicle has four reverse gears, the vehicle must be stationary to shift between reverse gear R2 and reverse gear R3.

Note: Reverse gears R3 and R4 are available on VHD vehicles only.



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R Position Display

With the Basic gear selector, when the vehicle is moving and the gear lever is moved from the D or R position to M, the transmission will stay in the current gear until the lever is moved back to D, R or N.

Engine Idle Governor Driving Mode

The Engine Idle Governor driving mode (if equipped) allows slow speed vehicle manoeuvring such as at the loading dock or in slow moving traffic. This feature operates the engine at idle while the operator selects a gear to adjust the vehicle speed. The clutch remains closed and there is no slipping or overheating. The idle governor will adjust the torque to maintain idle speed and constant vehicle speed, although the engine load may vary. Tapping the service brake will cause the transmission to shift down one gear, if necessary.

With the Premium gear selector, once the start gear is fully engaged it is possible to perform both up and downshifting, using the manual gear selection buttons. This is useful when driving in slow traffic. There is no need to press the accelerator pedal to increase vehicle speed, just select a higher gear with the gear selection button and the engine will control the torque to fit the next gear. To stop the vehicle just press the brake pedal and the clutch will disengage the transmission.

Note: The +/- button can be used to adjust speed up to 6th gear while in idle drive.

Economy and Performance Modes (Only with Premium Gear Selector)

When the engine is started, the transmission defaults to Economy mode. An E is displayed as the driving mode in the DID. The transmission automatically selects shift points and engine parameters to maximize fuel economy. Economy mode is primarily used when driving under normal conditions.

In Performance mode, a P/P+ is displayed as the driving mode in the DID. The Performance mode does not differ from the Economy mode in terms of vehicle acceleration from a standstill. The Performance mode does not cause the vehicle to accelerate faster. Instead it provides higher engine speed and offers less skip shifting. This allows a larger margin in engine torque, which improves driving in severe conditions (e.g., hilly and/or poor surfaces).

The Performance Plus (P+) mode replaces the ordinary Performance (P) mode for vehicles with Performance feature package. P+ is designed for vocational, construction and heavy hauler vehicles. Gear shifting and standard features are modified to improve driving in severe conditions.

Note: The Performance software package allows the vehicle to operate in the Performance Plus (P+) mode. The Comprehensive and Gentle packages do not have the Performance Plus mode. Selecting P in the Gentle or Comprehensive package only activates the normal P mode, not P + mode.

Customer-requested options allow the Performance mode to be modified to meet specific operating conditions. Options include full operator control, no operator control and automatic return to Economy mode under certain operating conditions. A customer-requested option is available to disable the Kick-Down function when the transmission is operating in Performance mode. Contact your VOLVO Truck dealer for more information about standard and optional features.

The Performance Mode feature can also be enabled by the VOLVO Performance Bonus software package to reward the operator for saving fuel.

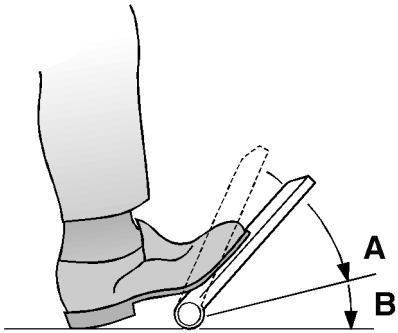
Note: Operating the vehicle in Performance mode for extended periods will result in a loss of fuel economy.

Kick-Down

There are two versions of accelerator pedals, with and without kick-down switch. Kick-Down function is included in some software packages and can be enabled or disabled based on customer preference. The Kick-Down feature can also be enabled by the VOLVO Performance Bonus software package to reward the operator for saving fuel. The gear selector must be in the D position to allow Kick-Down.

Kick-down is requested by pressing the accelerator pedal all the way down to the floor. Kick-Down is cancelled when the accelerator pedal is lifted. When Kick-Down is requested, the transmission will optimize vehicle acceleration, which may result in a downshift. However, if the transmission determines the vehicle will accelerate faster by remaining in the current gear, the transmission will not downshift. This insures maximum acceleration without downshifting.

Note: Operating the vehicle with Kick-Down engaged for extended periods will result in a loss of fuel economy.



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Kick-Down Switch

A = 100% Throttle	B = Kick-Down

Eco-Roll (Optional Feature)

Eco-Roll reduces fuel consumption by automatically disengaging the driveline when the engine is not needed to maintain vehicle speed. When Eco-Roll is active, the engine speed is temporarily reduced to idle. The engine brake control stalk must be in the A position for the Eco-Roll feature to be enabled. Eco-Roll can be used during normal driving with the accelerator pedal or while in cruise control mode.

If your vehicle is equipped with the optional dash-mounted switch, you can temporarily disable the Eco-Roll with this switch. To re-enable Eco-Roll, press the switch again. A key off-on cycle will also re-enable Eco-Roll.

Note: The selected gear for the Eco-Roll option is 7th gear or higher. 12th gear is the default gear.

W0033982

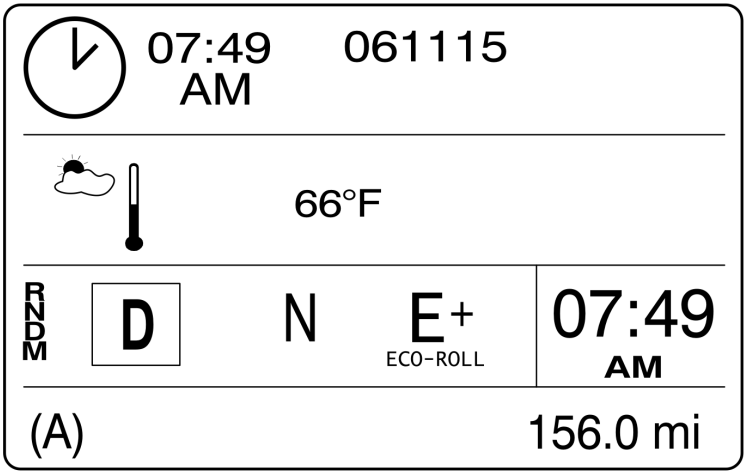
Eco-Roll Icon for Dash-Mounted Switch

For vehicles not equipped with the optional dash-mounted switch, Eco-Roll is only enabled in brake-stalk position A. To disable Eco-Roll, move the brake-stalk to position 0, 1, 2 or 3. In this instance, Eco-Roll will be linked to the E+ driving mode.

When Eco-Roll is enabled, it activates automatically, but only when the following conditions exist:

- Vehicle is not operating on a steep downhill or uphill grade
- Transmission is operating in the Economy mode
- Shift lever is in the D position
- I-VEB stalk switch is in the A position
- The optional switch for Eco-Roll should not have been used to disable Eco-Roll
- Service brake is released
- Accelerator pedal is released
- Selected gear is 7 or higher, depending on the customer selectable parameter. The default selected gear is 12.
- Brake cruise set speed is greater than 5 km/h (3 mph) above cruise set-speed
- Vehicle speed is less than 125 km/h (78 mph)
- VEST and ABS are not active

When Eco-Roll is available, E+ is displayed as the driving mode and the Eco-Roll is also shown in the DID. When Eco-Roll is active, the current gear (7 – 12) changes to N in the Driver Information Display.



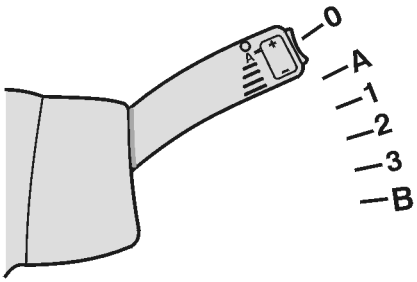
W0033983

Engine Brake Performance Mode

Note: When the VOLVO engine brake is active and the transmission is shifting gears, there will be a momentary interruption of the braking torque. This may result in a temporary increase of vehicle speed if travelling downhill. The operator will experience the same momentary loss of engine braking as is experienced when downshifting a conventional manual transmission.

VOLVO's enhanced engine brake (I-VEB) is standard with I-Shift transmissions. It is possible to activate after engine has reached normal working temperature. The current brake position is displayed in the status bar in the DID. The switch on the end of the 6-position engine brake control sets and changes the set speed for the brake cruise and engine brake activation during coasting.

In A-position the engine brake will automatically assist the service brake (brake blending). In position 1, 2 and 3 there is 1/3, 2/3 and 3/3 of available braking torque from the engine applied. In B-position engine speed will be kept on a higher level to maximize available braking torque.

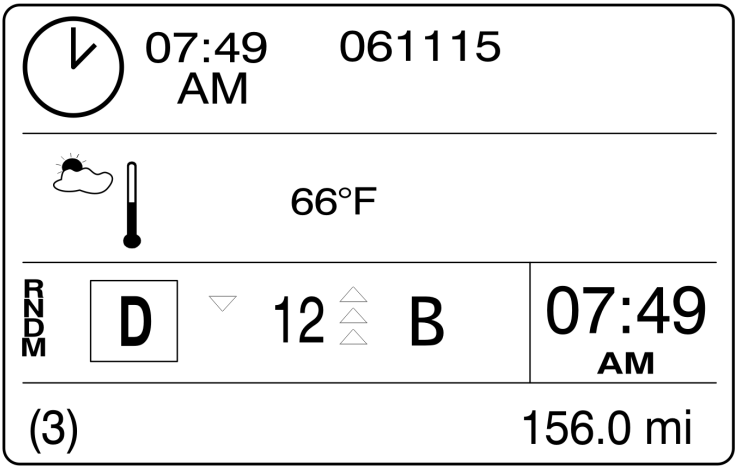


T5012243

Brake Control Positions

With the brake control lever in A-position and driving with the cruise control on it is possible to adjust the brake cruise speed. The set speed and brake cruise speed is shown in the DID. The transmission interacts with the engine brake to provide optimum performance.

When the vehicle is operated in Engine Brake Performance Mode, the transmission selects the gear with the highest level of braking. The Engine Brake Performance Mode is activated by moving the brake control to the B position and holding the control in the B position for at least 1 second. When Engine Brake Performance Mode is activated, B is displayed in the driving mode in the DID.



W0033981

Engine Brake Position Display

Hill Start Assist (Optional Feature)

Hill Start Assist provides anti-roll back assistance during the transition from a stopped position to starting on a grade. The brake system maintains pressure in the brake chambers for a predefined period of time after the service brake pedal is released, which allows the driver time to move their foot from the brake pedal to the accelerator pedal.

⚠ DANGER

Hill Start Assist is only intended to temporarily hold the vehicle on a grade before the vehicle is put into motion. The vehicle brake must be applied, independent of Hill Start Assist, to hold the vehicle on a grade for an extended period of time. Failure to follow this instruction can result in loss of vehicle control and serious personal injury or death.

When available, Hill Start Assist is enabled at key-on. Pressing a dash-mounted switch will temporarily disable Hill Start Assist. The Hill Start Assist telltale in the instrument cluster will blink to indicate that the feature is temporarily disabled. Hill Start Assist is re-enabled by pressing the switch again, or when vehicle speed exceeds 20 km/h (12 mph). A key off-on cycle also re-enables Hill Start Assist. If a Hill Start Assist fault occurs, the Hill Start Assist telltale in the instrument cluster will illuminate and the feature is permanently unavailable until the fault is repaired.

W0033985

Hill Start Assist Icon for Instrument Cluster Telltale and Dash-Mounted Switch

When Hill Start Assist is enabled, it activates automatically, but only when the following conditions exist:

- Vehicle speed is zero
- Vehicle is on a greater than 2 percent incline or decline
- Shift lever is in the D position on an incline or R position on a decline
- Service brake is applied
- ABS is functioning normally
- There has been no ABS activity in the preceding stops

When the service brake pedal is released, the brakes are applied for approximately 3 seconds or until the accelerator pedal is depressed, whichever occurs first.

When Hill Start Assist is active, an instrument cluster pop-up message is displayed.

W0033984

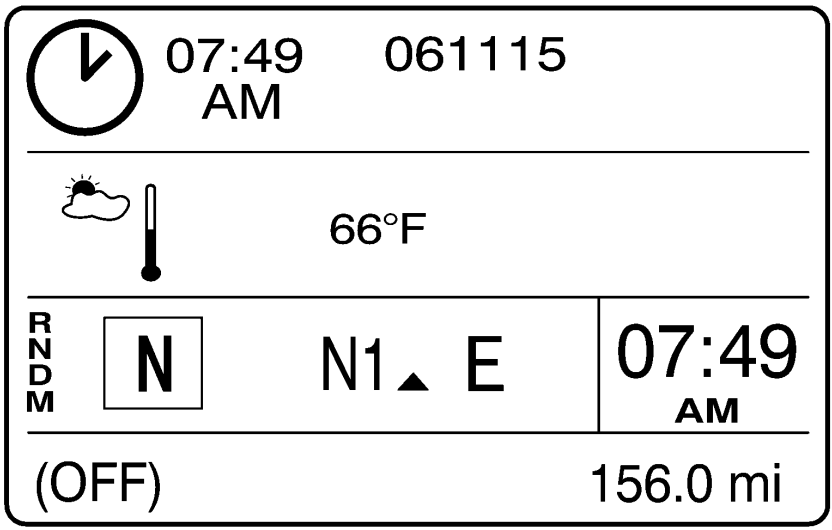
Transmission Power Take-Off (PTO)

Basic PTO functions include pre-defined splitter positions. Parameters that define which splitter gear (low or high) to engage when transmission Power Take-Off 1 and 2 are engaged can be adjusted. If two or more PTOs are used at the same time, PTO1 will take precedence.

With the Premium gear selector, when the gear lever is in the N position, the operator can use the manual gear selection buttons to select the split gear when using the power take-off.

Note: In lower vehicle speeds the PTO can be engaged while driving the vehicle up to 10 km/h (6 mph).

Note: The transmission remains in the current gear while the PTO is engaged and shifting does not occur.



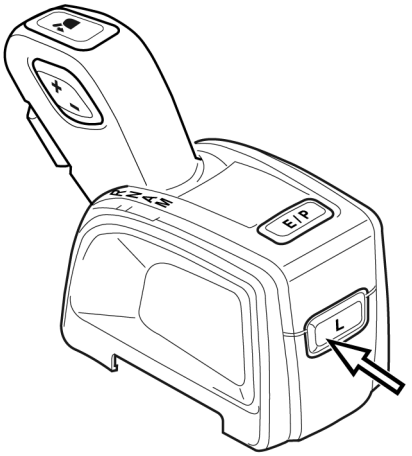
W4002866

N Position Display

Limp Home Mode

Note: Limp Home Mode should only be used to move the vehicle to a safe location. Only use Limp Home Mode when no other way to move the vehicle is available.

If the transmission has a mechanical problem, press and hold the L button on the gear selector while moving the gear lever to the M position to activate Limp Home Mode. When activated, L is displayed as the driving mode in the DID. With the Premium gear selector, only 1st, 3rd and 5th forward start gears and reverse gear R1 are available. The desired gear must be selected during stand still. With the Basic gear selector, only 1st forward start gear and reverse gear R1 are available. The operator cannot change gears in Limp Home Mode. The Limp Home Mode will be deactivated when the ignition is turned off.



T0031367

Limp Home Mode Button

Starting and Stopping

Starting

The transmission gear lever must be in the N position or the engine will not start. If the gear lever is not in neutral, a starter protection message will appear in the DID along with the Information light and an audible warning.

If there is not enough air pressure in the I-Shift air reservoir, a low air supply message will appear in the DID along with the Information light and an audible warning. Start the engine and allow the air pressure to build in the reservoir. Wait until the message and light go off before attempting to shift the transmission into gear.

The gear selector lock must be depressed to move the gear lever from the N position. Also the brake pedal must be applied. If the brake pedal is not applied before attempting to move the gear lever from the N position, the message Depress Brake Pedal Before Selecting a Gear will appear in the DID along with the Information light and an audible warning. Move the gear lever back to the N position, apply the brake pedal and move the gear lever to the desired gear.

With the Premium gear selector, the operator can always select a lower or higher start gear in both the D and M position. Also, the operator can always select a higher start gear in the R position.

Stopping

⚠ DANGER

When parking the vehicle, always apply the parking brake and move the gear lever to the N position on the gear selector. Make sure the parking brake is holding the vehicle before leaving the operator position. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

When the vehicle is stopped:

1 Apply the parking brake.

2 Move the gear lever to the N position on the gear selector.

3 Switch off the engine.

Driving

The most efficient way to operate the vehicle is to use the automated drive program; the D position on the gear selector. Gear changing is automatic and the operator can concentrate on the road ahead. With the Premium gear selector, the operator has the ability to change gears manually with the gear selector in the D position. In addition, the brake control switch should be in the A position to maximize the integration of the transmission and brake system. This means optimum performance and fuel economy at all times.

In difficult driving conditions such as forests, construction sites and off-road, manual mode, the M position on the gear selector, and Premium gear level (if equipped), give the operator more control.

Note: When changing gears manually, the accelerator pedal does not need to be released.

Starting the Vehicle Uphill and Downhill

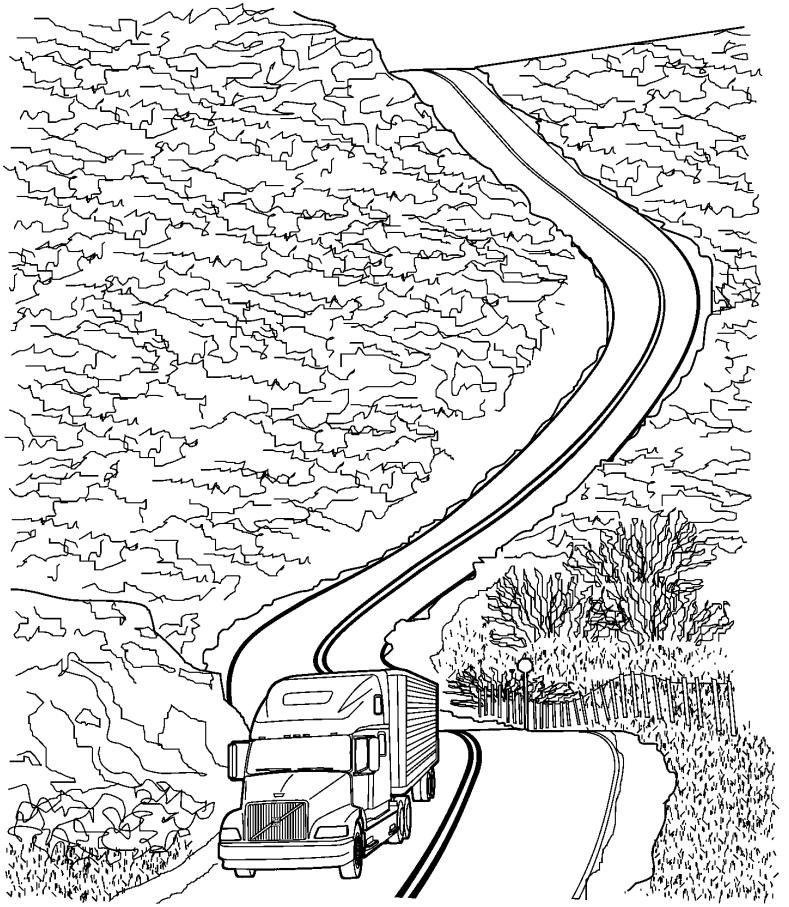
⚠ DANGER

The vehicle can roll when stopped on a hill or grade, or when the vehicle is starting from a stop on a hill or grade. Always use the brakes to hold the vehicle stationary on a hill or grade. Failure to do so can result in serious personal injury or death.

⚠ CAUTION

Always use the brakes to hold the vehicle stationary on a uphill stop. Never hold the vehicle stationary on an uphill slope using the accelerator pedal. The clutch could overheat, which could cause it to breakdown.

The I-Shift transmission clutch is a dry disc type, with **no torque converter**. Never allow the clutch to slip in too high a gear when starting the vehicle. If the clutch overheats, a high clutch load message or clutch protection active message will appear in the DID along with the Check light and an audible warning.



W1034589

Hilly Operating Conditions

When starting the vehicle on an uphill slope:

1 Press the brake pedal while at the same time releasing the parking brake.

2 Move the gear lever to the D position on the gear selector. With the Premium gear selector, the operator can use the manual gear selection button to select a different start gear.

3 Quickly move your foot from the brake pedal and firmly press the accelerator pedal.

Note: Vehicle startability improves in the Performance mode.

Down Shifting before a Steep Hill

To obtain the greatest possible down shifting before ascending a steep hill:

1 Press and hold the minus button **AND** move the gear selector from the D to the M position.

2 Release the minus button.

Note: This method initiates immediate high engine speed as the vehicle climbs a steep hill.

3 Keep the lever in the M position as long as you wish to prevent a new gear change.

Rocking Free When Stuck

If the vehicle becomes stuck on a slippery surface (e.g., snow, mud or sand) the truck can be rocked free using the following procedure:

1 Make sure the differential locks are fully engaged.

Note: For more information about the differential locks refer to your vehicle's operators manual.

2 Inactivate the Traction Control System (TCS).

Note: For more information about the TCS refer to your vehicle's operators manual.

3 Choose the driving mode P/P+.

Note: For more information about the P/P+ driving mode refer to "Economy and Performance Modes (Only with Premium Gear Selector)", page 20.

4 Move the gear selector to the M position, select gear 1, or the 1st reverse gear (5).

5 Carefully press the accelerator pedal up and down with a smooth pumping action.

Starting with Heavy Loads on Poor Services

To free your vehicle, if stuck while carrying a heavy load (e.g., on a hill or soft surface), use the following procedure:

1 Choose the driving mode P/P+.

Note: For more information about the P/P+ driving mode refer to "Economy and Performance Modes (Only with Premium Gear Selector)", page 20.

2 Select starting gear 1.

3 Completely depress the accelerator pedal.

4 Keep the accelerator pedal depressed until the vehicle is free.

Power Launch

In situations where the vehicle is stuck and other options have failed to free the vehicle, the Power Launch option is available. This option is only available on vehicles with the Performance Plus (P+) software package. This option allows the I-Shift transmission to use extra engine torque to free the vehicle.

To use the Power Launch option use the following procedures:

1 Select the P+ mode.

2 Using the gear selector, select the D or M position, gear 1 or R1.

3 On the gear selector, push and hold the minus (-) button.

4 Completely depress the accelerator pedal. The engine will rev to 1300 rpm.

5 Release the minus (-) button. The clutch will engage, launching the vehicle free.

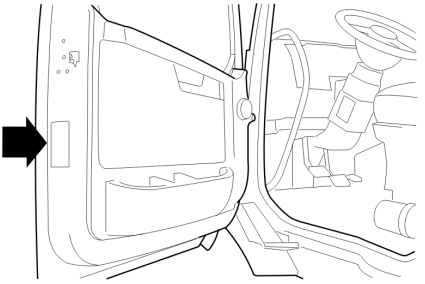
Towing

CAUTION

Never tow an I-Shift transmission without removing the driveline, regardless of the distance. Failure to do so will result in damage to the transmission.

CAUTION

You must tow a vehicle equipped with an I-Shift transmission according to the guidelines below. Failure to do so can result in damage to transmission components.



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W0033986

I-Shift Towing Caution Label Location

When towing the vehicle, the output shaft of the transmission must not be allowed to spin or turn. If the vehicle is towed with the drive wheels still in contact with the road surface, the vehicle axle shafts or driveline must be removed or disconnected.

Maintenance

⚠ DANGER

Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and chock the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make your vehicle unsafe and lead to serious personal injury or death.

Drain the moisture from the transmission air reservoir daily. Draining the moisture from the air reservoir helps prevent moisture and contaminants from entering the transmission. Moisture in the transmission can affect operation and damage components.

Transmission Oil

⚠ CAUTION

Only use VOLVO approved synthetic SAE 75W/85 gearbox oil (specification 97307) in the I-Shift transmission. Using non-approved oil can result in damage to transmission components.

⚠ CAUTION

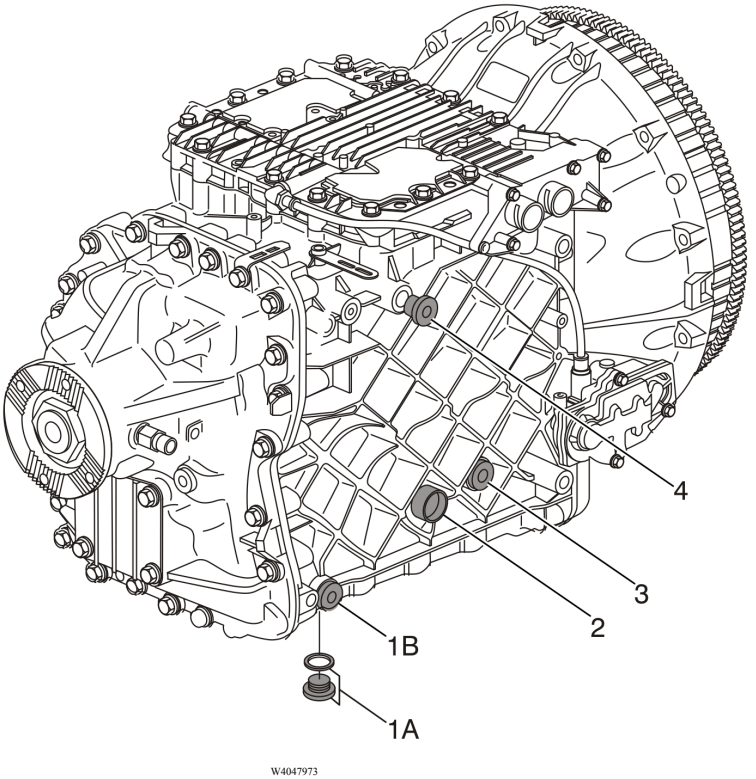
Never reuse drained I-Shift oil. The oil must be replaced along with the oil filter. Reusing drained oil can result in damage to transmission components.

Keep the transmission oil at the proper level and change it at the VOLVO recommended intervals. Always replace the oil filter when the oil is changed. Always use the VOLVO approved synthetic oil whenever adding or changing the transmission oil.

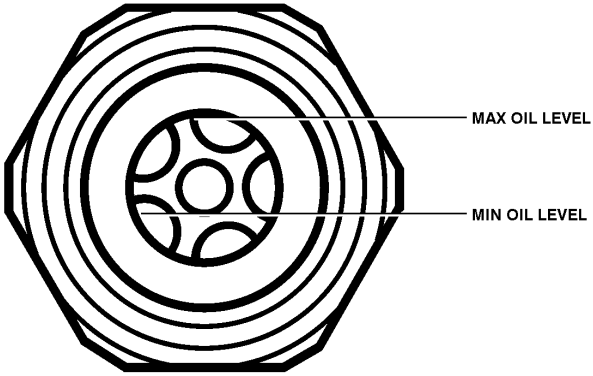
For a complete list of approved oils, contact your VOLVO Truck dealer. Also, refer to Bulletin 175-61, *Approved Oils, VOLVO Components*.

Check Oil Level

Check the transmission oil level at each service interval. Park the vehicle on a level surface. Check the oil level through the sight glass on the side of the transmission. Add oil as necessary. Always use the correct VOLVO approved synthetic oil.



1	Drain Plug
2	Sight Glass
3	Fill Plug and Oil Level
4	Oil Plug



T4021684

Sight Glass for Checking Oil Level

Oil Change Interval

The length of time a transmission can operate before an oil change is required depends on the quality of the oil used and the vehicle application. For severe service or off-highway applications, more frequent oil changes may be necessary.

For on-highway applications (Gross combination 36 000 kg [80,000 lbs]), change the transmission oil every 800 000 km (500,000 miles) or every 5 years. This extended oil change interval only applies when using the VOLVO approved synthetic oil (Castrol Syntrans). Always replace the oil filter when the oil is changed. Always use the VOLVO approved synthetic oil whenever changing the transmission oil.

For all other vehicle applications change the transmission oil every 400 000 km (250,000 miles) or every 3 years.

For additional information about oil change intervals, contact your VOLVO Truck dealer. Also, refer to Bulletin 175-60, *Oil and Filters, VOLVO Components*.

Oil Change

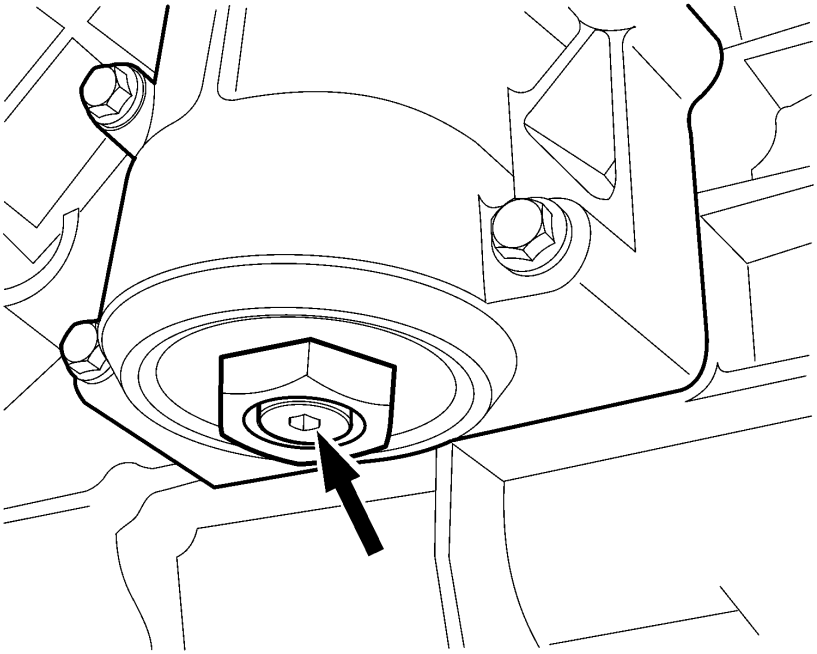
WARNING

Hot oil can cause burns. DO NOT allow hot oil to contact the skin. When changing oil, wear protective gloves.

CAUTION

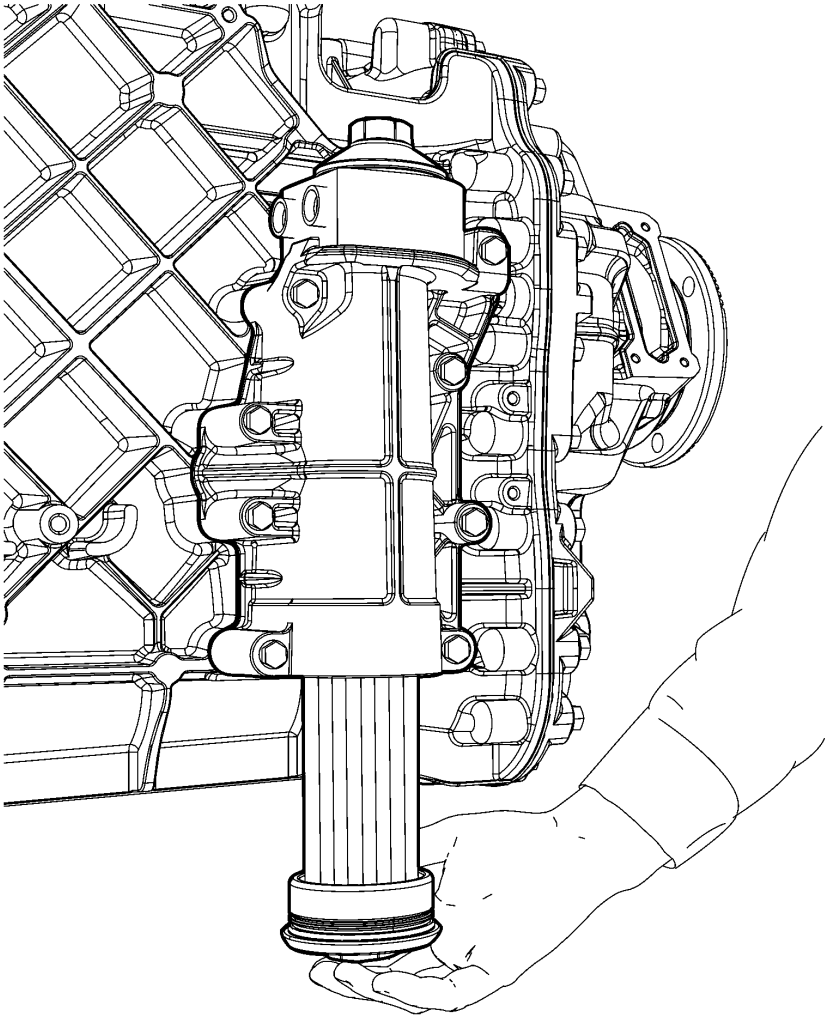
Always dispose of all lubricants (engine oil, coolant, transmission oil, etc.) and filters according to Federal or local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife.

Change the oil filter at every oil change. Drain the oil filter housing before you remove the filter.



W4002889

Oil Filter Housing Drain Plug



W4002908

Oil Filter

Volvo Trucks North America
P.O. Box 26115, Greensboro, NC 27402-6115

Volvo Trucks Canada, Ltd.
5600A Cancross Court, Missisauga, Ontario L5R 3E9

http://www.volvotrucks.com

PV776-21651077 English 03.2010

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88949086[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

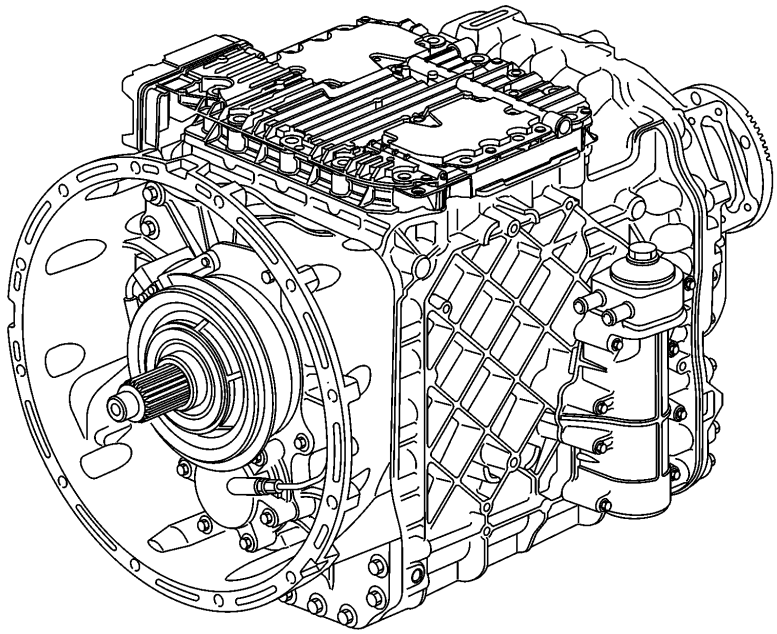
Service Bulletin Trucks

This service bulletin replaces bulletins 431–05 and 431–16 “Transmission, Replacement” dated (6.2007).

Transmission, Replacement

I-Shift Transmission

Transmission, Replacement



T4021207

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Transmission, Replacement”, page 2

4311-03-02-02
Transmission, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

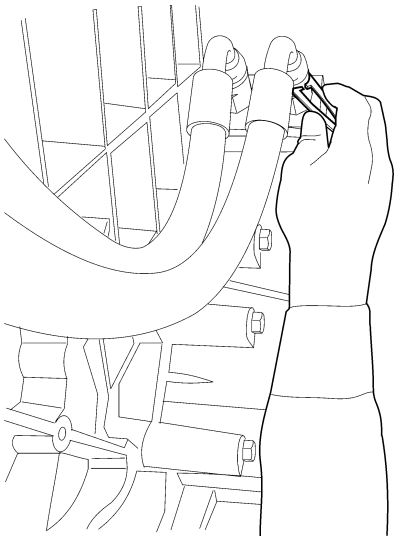
Special tools: 85108826

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

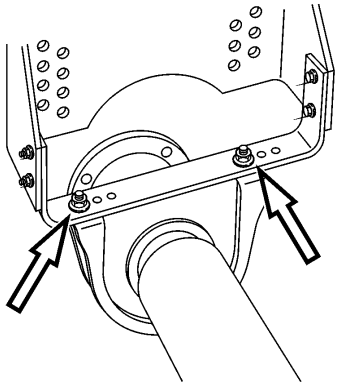
4
Raise the vehicle and support with jack stands.



W4002890

5
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

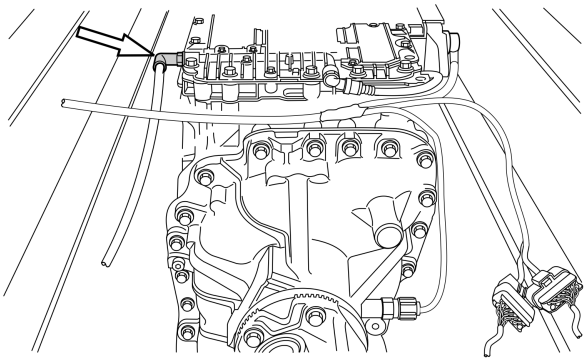


T4018155

6
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

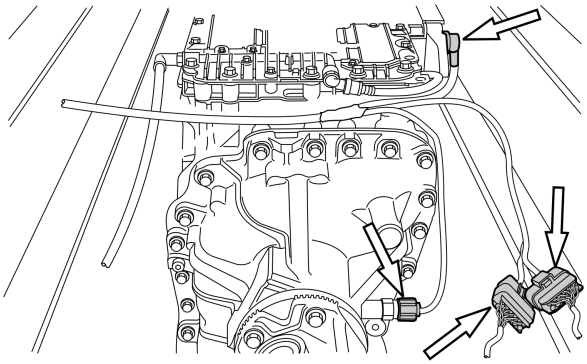
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

7
Disconnect the air supply hose at the rear of the transmission.

8
Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, the speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

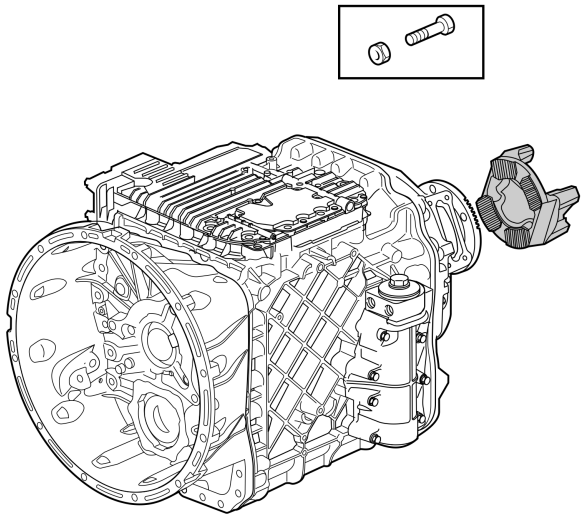
12
Position the transmission jack and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it, such as wiring or air hoses.



W4002942

16
Transfer the drive shaft yoke to the new transmission and torque the bolts.

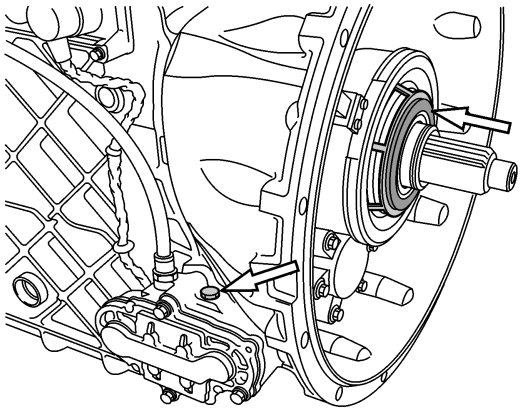
190±15 Nm (140±11ft-lb)

17

⚠ DANGER

Use a hoist or get assistance when lifting components that weigh 23 kg (50 lb) or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. Always use a spreader bar when necessary. The lifting hooks MUST NOT be side loaded. Failure to follow these warnings may result in serious personal injury.

Remove the old transmission from the jack. Position the new transmission in place and secure it to the jack.



T4021203

18
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1ft-lb)

19
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

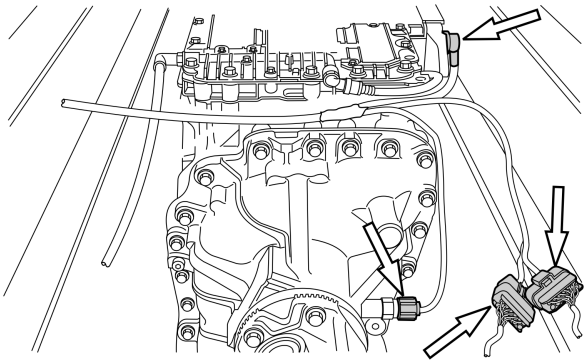
20
Install the remaining transmission-to-engine mounting bolts, torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first, then remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

21
Position the battery cables and install their mounting bolts.

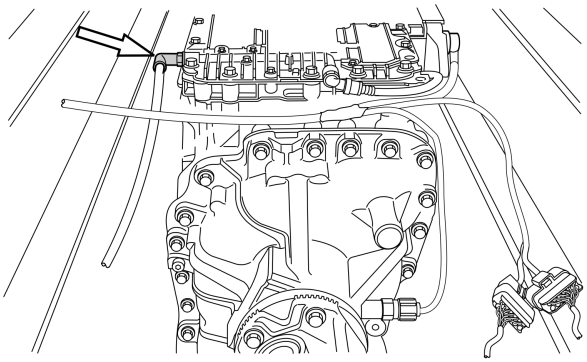
22
Install the cab engine cover.



W4002941

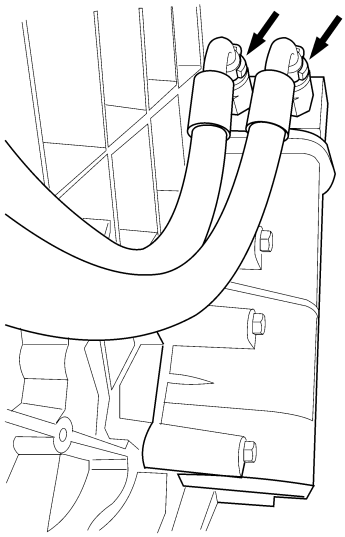
23
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

24
Install new tie straps to secure the wiring harness to the transmission.



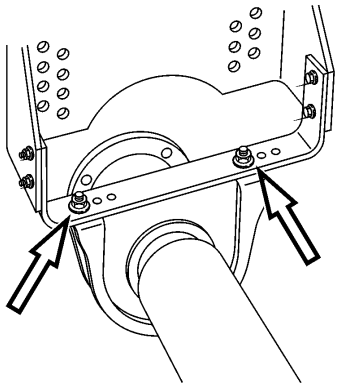
W4002940

25
Connect the air supply hose at the rear of the transmission.



W4002894

26
Connect the transmission oil cooler hoses to the filter housing.



T4018155

27
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

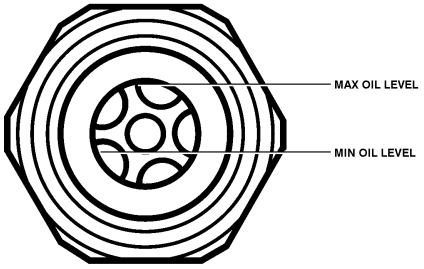
Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing - 175±30 Nm (129±22 ft-lb)
Universal Joint Caps - 166±10 Nm (122±7 ft-lb)

28
Remove the supporting jack stands and lower the vehicle.

29
Pressurize the air system and check for leaks.



T4021684

30
Restore power to the vehicle by connecting the batteries negative cable.

31
Fill the transmission with transmission oil.

32
After the transmission is installed, it is necessary to configure the new Transmission Control Module (TCM) with its software using the scan tool.

33
After the TCM has been flashed with its software, it is necessary to perform a “clutch engagement position calibration” using the scan tool.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88949183[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

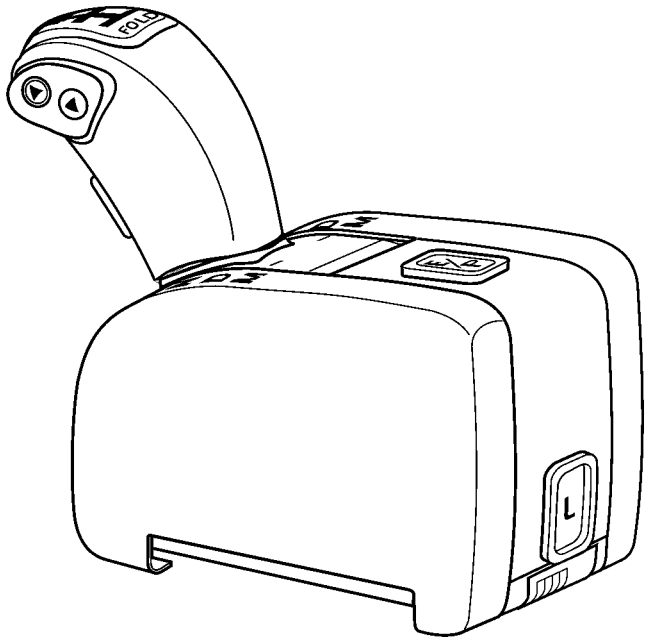
Date	Group	No.	Release	Page
4.2010	**432**	**09**		1(5)

This service bulletin replaces bulletins 432–02 and 432–09 "Wiring Harness, Gear Selector, Replacement" dated (6.2007).

Wiring Harness, Gear Selector, Replacement

I-Shift Transmission

Wiring Harness, Gear Selector, Replacement



W4002900

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Wiring Harness, Gear Selector, Replacement”, page 2

4322-03-02-04
Wiring Harness, Gear Selector, Replacement

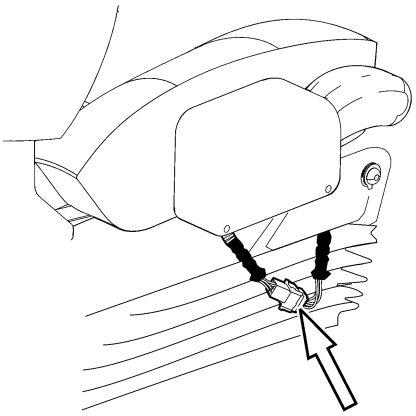
You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

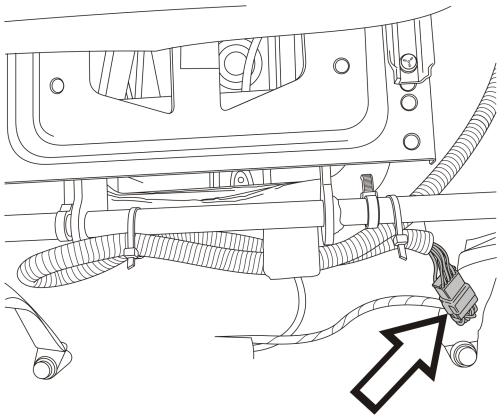
⚠ CAUTION

Possible damage to electronic components. Turn the vehicle ignition switch OFF before disconnecting or connecting any electronic components. Failure to de-energize circuits may result in permanent damage to electronic components.

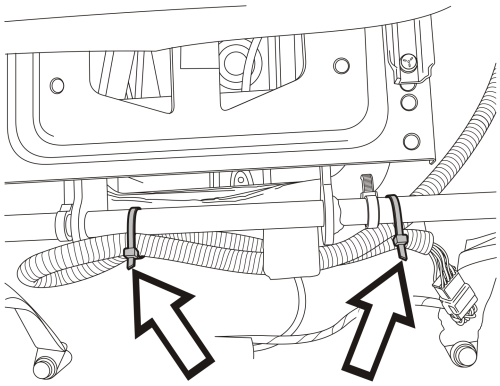


W4002929

1
Disconnect the wiring harness connectors at the selector and at the back of the seat.

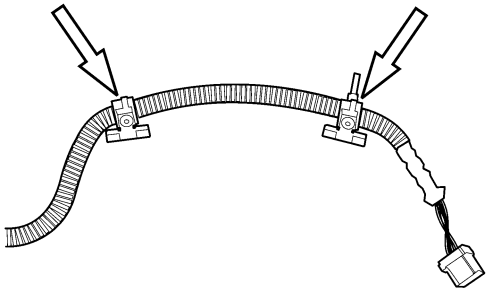


W4002930



W4002931

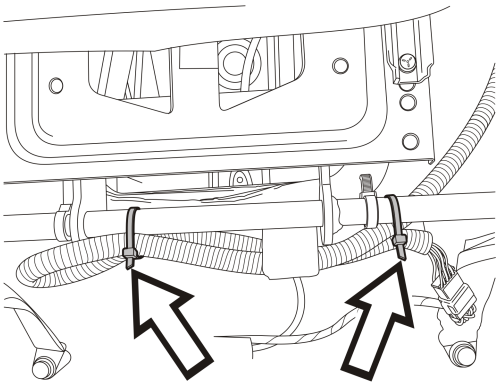
2
Cut the two tie straps retaining the harness to the seat frame and remove the harness from the seat.



W3007491

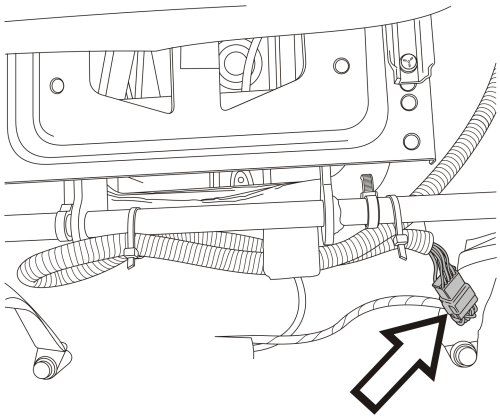
3
Transfer the two harness retaining clips to the new harness.

Note: Note the position of the clips on the old harness before removal. Install them in the same position on the new harness.



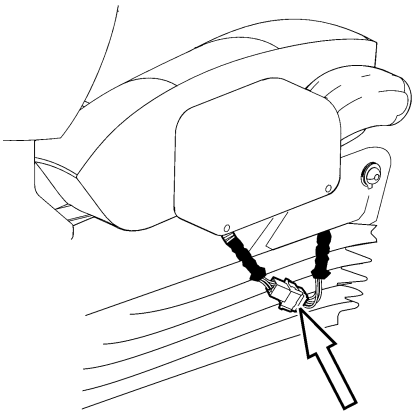
W4002931

4
Install the new harness on the seat frame. Leave the tie straps loose on the seat frame to allow for harness slack adjustment.



W4002930

5
Connect the wiring harness connectors at the selector and at the back of the seat.



W4002929

6
Adjust the wiring harness to allow enough slack for seat movement. Tighten the harness tie straps.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88949193[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

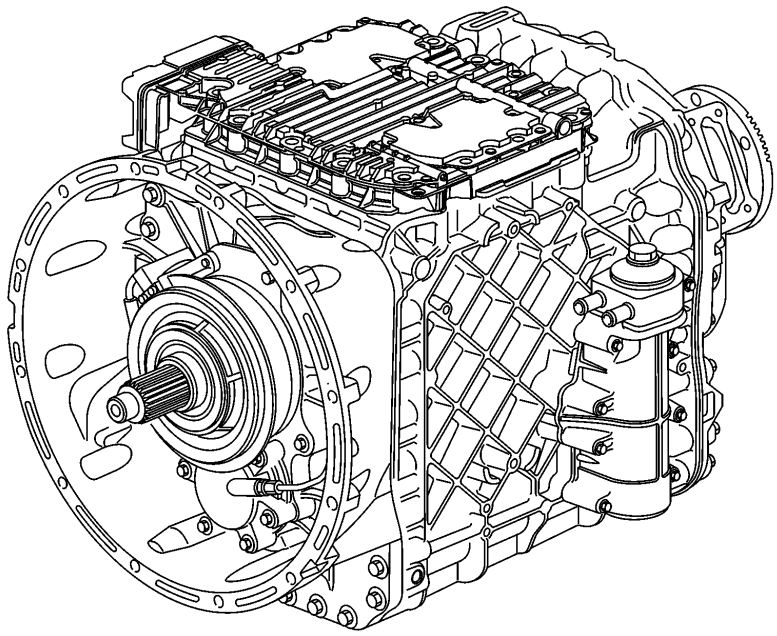
Date	Group	No.	Release	Page
4.2010	**432**	**07**		1(22)

This service bulletin replaces bulletins 432-04 and 432-07 “Speed Sensor and Cable Harness, Replacement” dated 6.2007.

Speed Sensor and Cable Harness, Replacement

I-Shift Transmission

Speed Sensor and Cable Harness, Replacement



T4021207

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Speed Sensor and Cable Harness, Replacement”, page 2

4329-03-02-39
Speed Sensor and Cable Harness, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

⚠ CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Special tools: 85108826

1
Using the scan tool, perform the “Gear Activation, Control Housing (for Removal/Installation)”. Follow the instructions as outlined within the scan tool.

Note: For overdrive transmissions, the transmission must be positioned as follows:

- Low Split
- High Range
- 2nd/3rd — Neutral Position
- 1st/Reverse — Reverse Position

Note: For direct-drive transmissions, the transmission must be positioned as follows:

- High Split
- High Range
- 2nd/3rd — Neutral Position

- 1st/Reverse — Reverse Position

Note: This operation can also be performed with the transmission out of the vehicle if needed or necessary.

Note: If the scan tool is unable to activate the necessary gears for control housing removal, follow the manual activation steps outlined in this procedure after transmission removal.

Note: It may be necessary to move the vehicle forward or backward to fully engage the gears within the transmission.

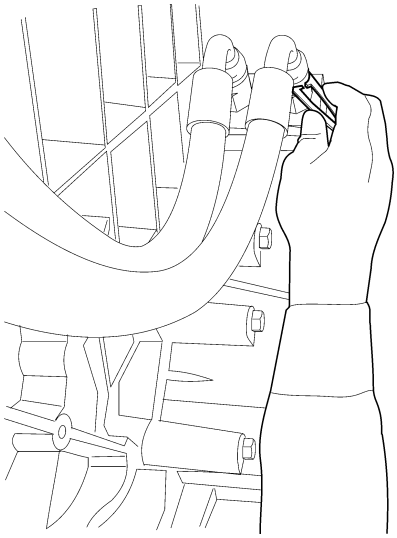
2
Apply the parking brake.

3
Disconnect power to the vehicle by removing the batteries negative cable.

4
Drain the air system.

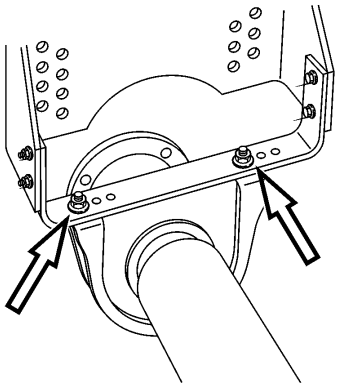
5
Raise the vehicle and support with jack stands.

6
Disconnect the transmission oil cooler hoses from the filter housing.



W4002890

85108826

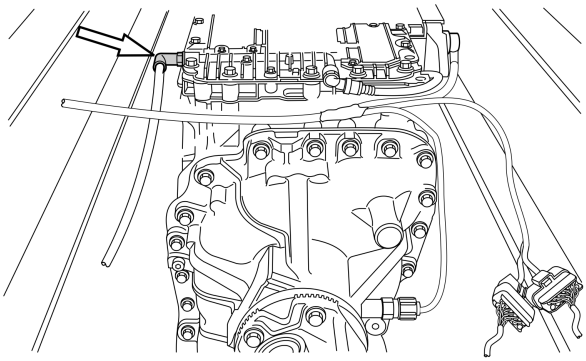


T4018155

7
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

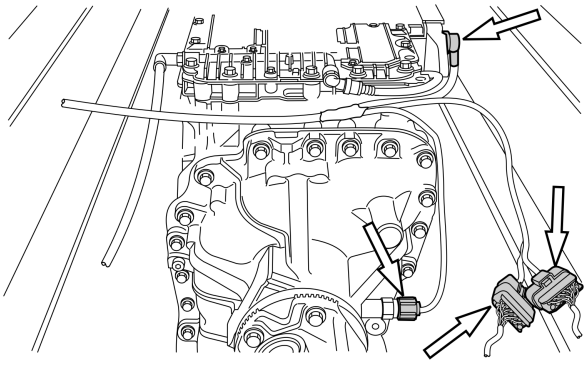
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

8
Disconnect the air supply hose at the rear of the transmission.

9
Remove the tie straps securing the wiring harness to the transmission.



W4002941

10
Disconnect the electrical harness at the control housing, the speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

11
Remove the cab engine cover.

12
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

13
Position the transmission jack and secure the transmission to it.

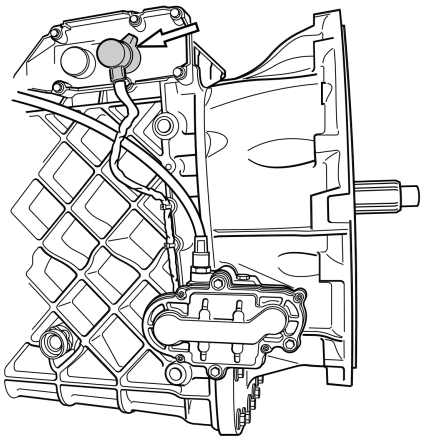
14
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

15
Remove the top four transmission-to-engine mounting bolts.

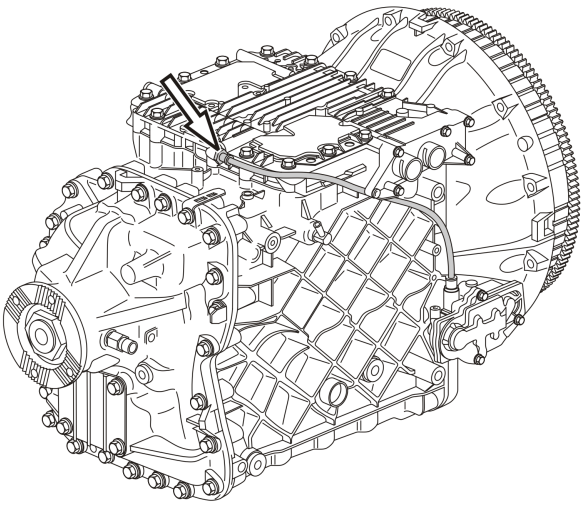
16
Carefully pull the transmission back, until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission periodically check around it to assure nothing is caught or hung up on it, such as wiring or air hoses.

17
Disconnect the clutch valve wiring connector at the control housing.



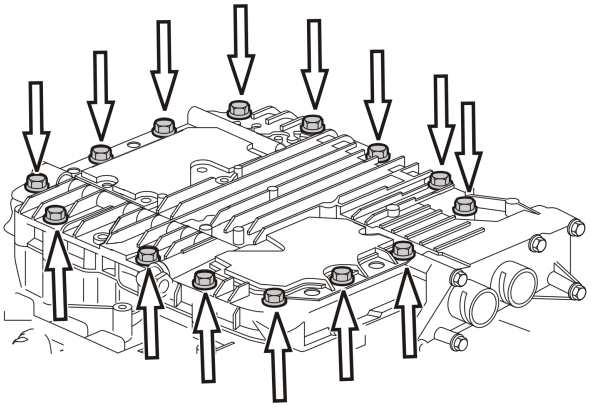
W4002881



W4002947

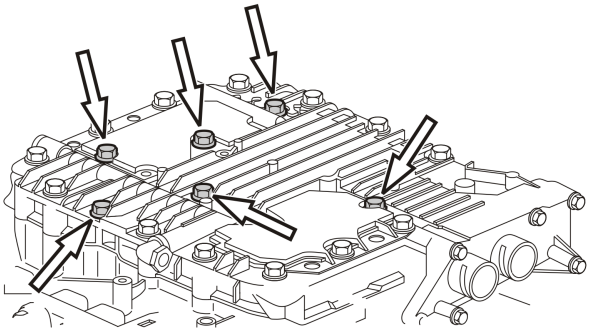
18
Disconnect the clutch control valve air supply tube at the upper control housing fitting.

19
Remove the control housing mounting bolts.

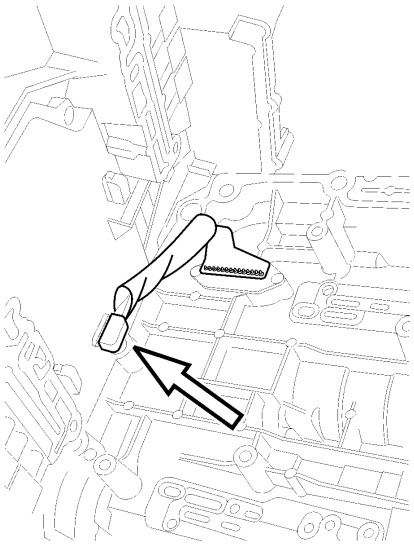


W4002951

20
Remove the six upper cover mounting bolts.



W4002952



W4002953

21

> **CAUTION**
>
> Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

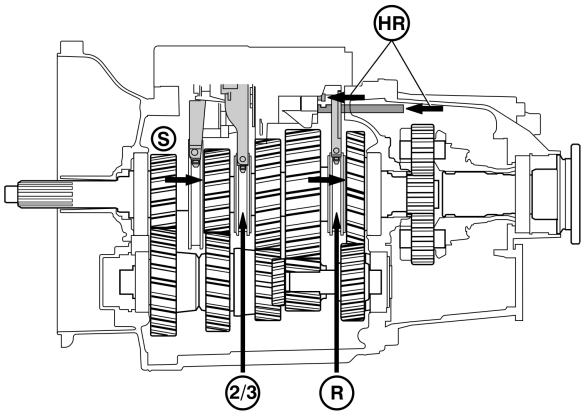
Gently lift the top edge of the upper cover and angle it down carefully against the clutch housing. Carefully disconnect the electrical connection and remove the top cover.

Note: Do not apply tension or weight to the wiring harness or connector.

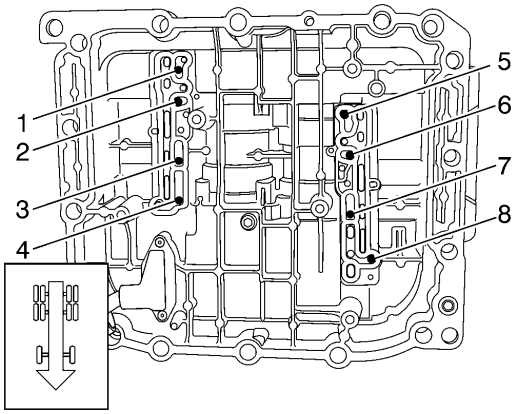
22

Manually perform the “Gear Activation, Control Housing (for Removal/Replacement)” procedure as outlined in the next two steps.

Note: The next two steps are performed **only** if the scan tool could not activate the necessary gears for control housing removal. If the scan tool activated the necessary gears, proceed to step 25.



T4021451



W4002895

Over Drive Transmission

1 High Range

2 3rd Gear

3 Low Range

4 2nd Gear

5 1st Gear

6 High Split

7 Reverse Gear

8 Low Split

23

Using compressed air, apply air pressure to the appropriate bore holes to place the transmission gears in the proper position for control housing removal.

Note: The following list shows the necessary gear positions for an **overdrive** transmission. If working on a direct-drive unit, proceed to step 24.

- Low Split
- High Range
- 2nd/3rd — Neutral Position
- 1st/Reverse — Reverse Position

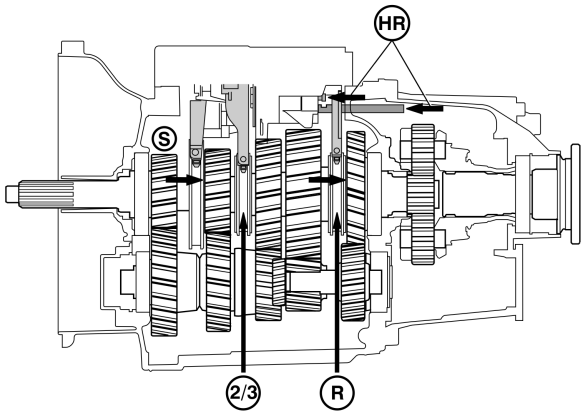
Note: It is necessary to rotate the input shaft while engaging the splitter section to mesh the gears.

Note: It is necessary to rotate the output shaft while engaging the range section to mesh the gears.

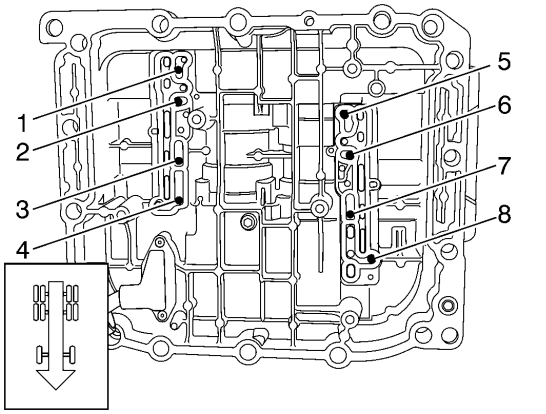
Note: If 2nd or 3rd gear is engaged, it will be necessary to position that gear set to neutral before attempting to engage reverse.

Note: To engage neutral for the 2nd/3rd gear set, it will be necessary to gently apply air pressure to the bore holes. If too much air pressure is applied, it will engage one of the two gears. To aid positioning, **do not** rotate the shaft when attempting to position this gear set.

Note: It is necessary to rotate the output or input shaft while engaging reverse to mesh the gears.



T4021451



W4002895

Direct- Drive Transmission

1 High Range

2 3rd Gear

3 Low Range

4 2nd Gear

5 1st Gear

6 Low Split

7 Reverse Gear

8 High Split

24

Using compressed air, apply air pressure to the appropriate bore holes to place the transmission gears in the proper position for control housing removal.

Note: The following list shows the necessary gear positions for a **direct-drive** transmission. If working on an overdrive unit, refer to step 23.

- High Split
- High Range
- 2nd/3rd — Neutral Position
- 1st/Reverse — Reverse Position

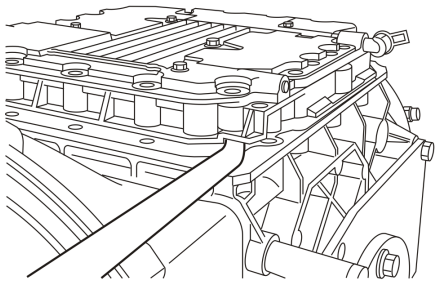
Note: It is necessary to rotate the input shaft while engaging the splitter section to mesh the gears.

Note: It is necessary to rotate the output shaft while engaging the range section to mesh the gears.

Note: If 2nd or 3rd gear is engaged, it will be necessary to position that gear set to neutral before attempting to engage reverse.

Note: To engage neutral for the 2nd/3rd gear set, it will be necessary to gently apply air pressure to the bore holes. If too much air pressure is applied, it will engage one of the two gears. To aid positioning, **do not** rotate the shaft when attempting to position this gear set.

Note: It is necessary to rotate the output or input shaft while engaging reverse to mesh the gears.



W4002955

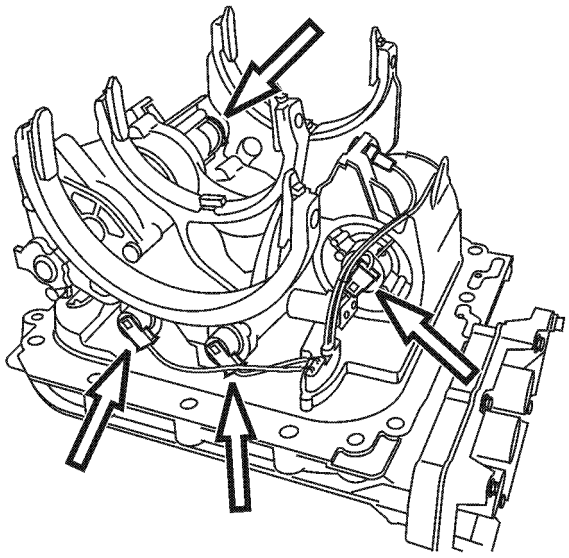
25

> **⚠ CAUTION**
>
> Gentle consistent pressure should be used to lift the control housing from the transmission. Applying excessive force is not necessary or needed and may result in damage to components.

Using a pry bar, gently separate the control housing from the locating pins then remove the control housing.

Note: If the control housing doesn't separate from the transmission while applying gentle pressure upward, it may be necessary to refer back to steps 23 or 24 before attempting control housing removal again.

Note: Exercise care during removal to keep from damaging the tooth wheel in the transmission.

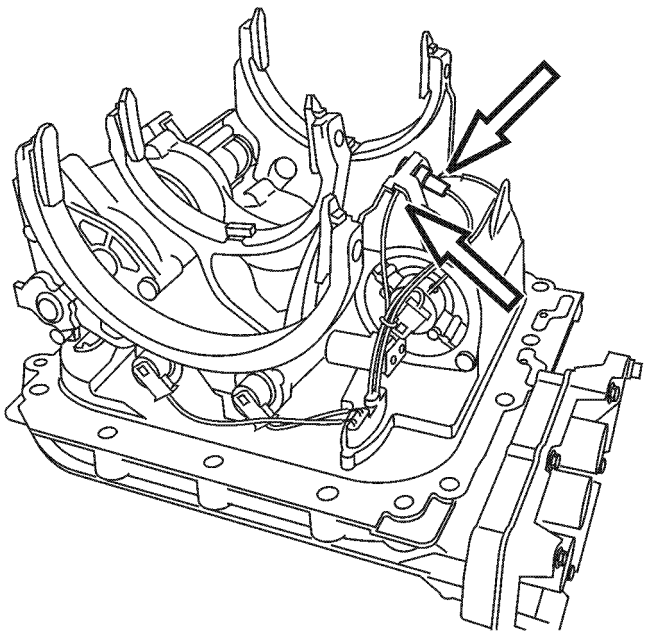


T4020592

26

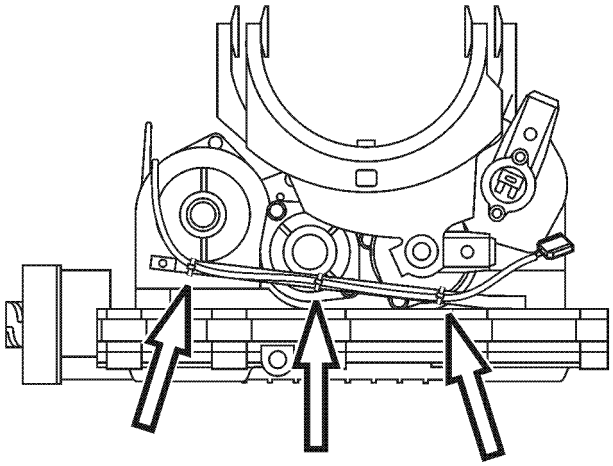
Disconnect all the position sensor wiring connectors.

Note: Note the routing of the wiring harness prior to disconnecting and removing the harness.



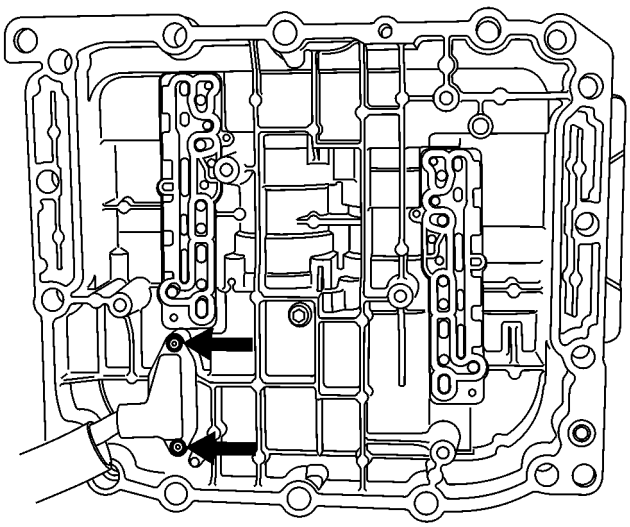
T4020593

27
Remove the main shaft and the countershaft speed sensors.



T4020594

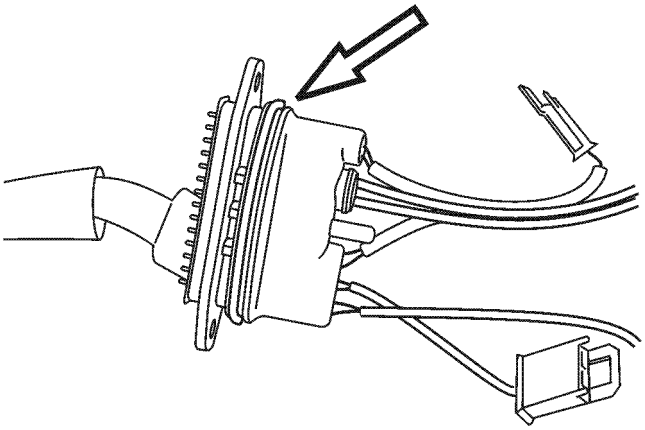
28
Remove the tie straps securing the wiring harness to the attachment plate.



T4020598

29
Remove the screws securing the wiring harness to the housing, and then remove the harness.

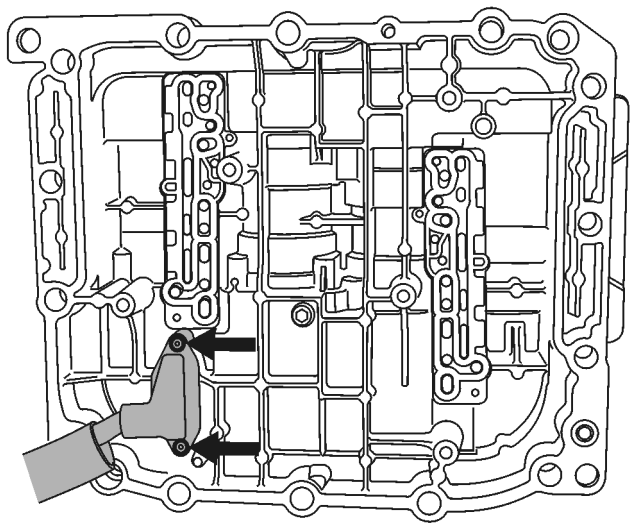
Note: Note the direction of installation prior to removing the wiring harness. The harness can be installed in two manners. If installed backward, the wiring harness will not connect to all of the sensors.



T4020599

30
Install the O-ring on the wiring harness.

Grease the O-ring to aid installation.

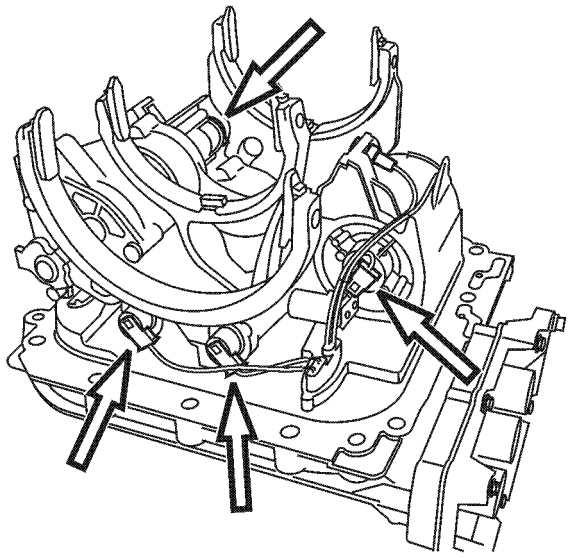


T4020815

31
Install the new wiring harness.

Note: The harness can be installed in two manners. Be sure to install it in the same direction as noted before removal. If installed backward, the wiring harness will not connect to all of the sensors.

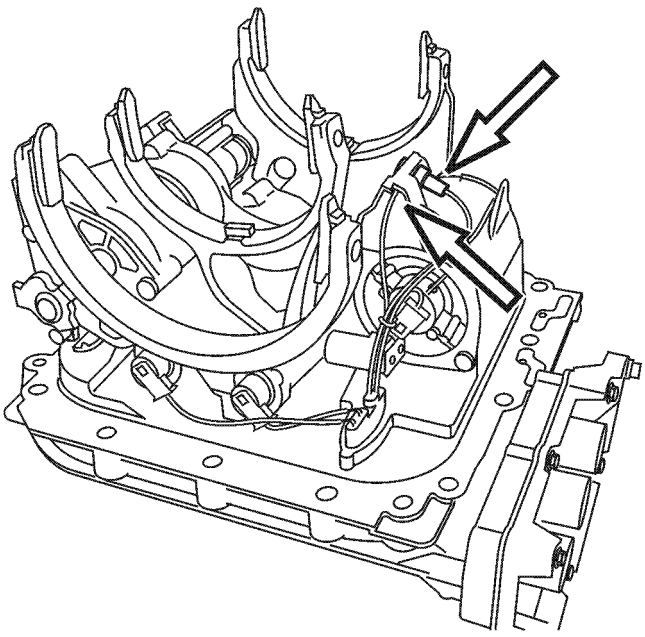
Note: The wiring should be routed away from the split cylinder.



T4020592

32
Connect all the position sensor wiring connectors.

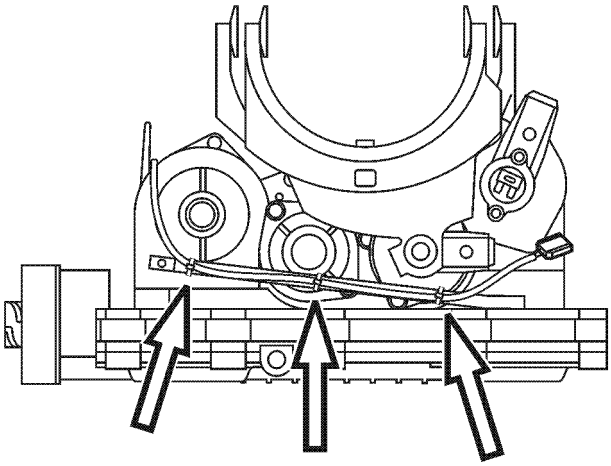
Note: The electrical cable must lie inside the lug on the range cylinder.



T4020593

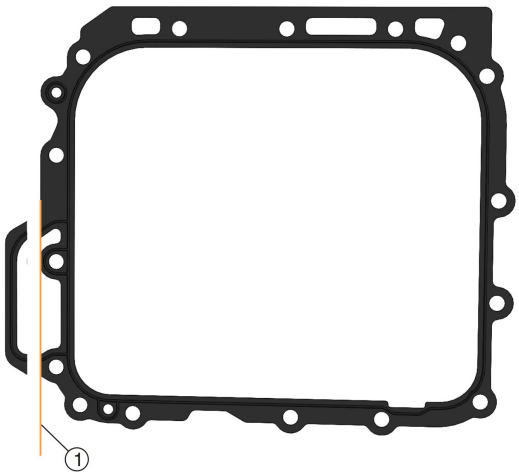
33
Install the main shaft and the countershaft speed sensors.

6±0.6 Nm (53±5 in-lb)



T4020594

34
Install new tie straps to secure the wiring harness to the attachment plate.

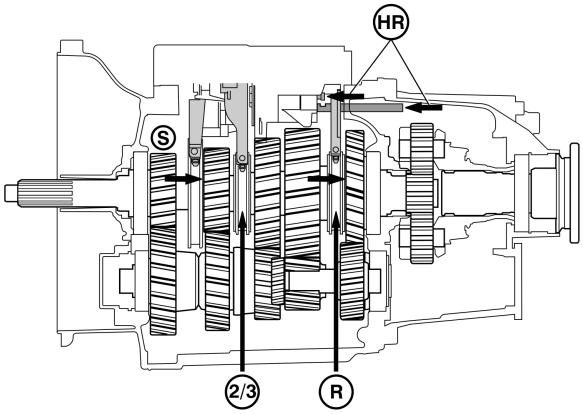


W4055781

1 Trim excess gasket material.

35
Check that the control housing sealing surface is clean and install a new control housing gasket.

Note: When installing a new gasket on a C design level transmission, some gasket material will protrude from the control housing. Trim excess gasket material.



T4021451

Figure 1

HR - high range

S — split

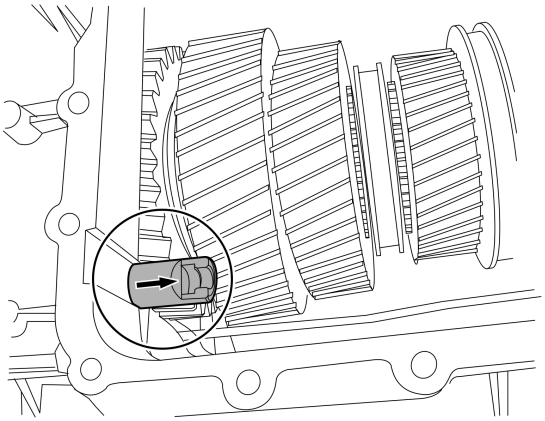
2/3 – 2nd/3rd gear in neutral

R — reverse gear

36
Ensure that:

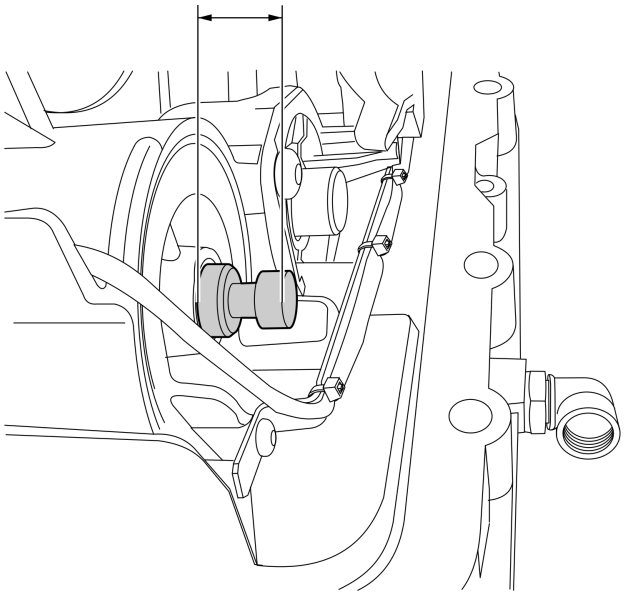
- the split engaging ring is in its rearmost position
- the 2nd/3rd engaging ring is in neutral position or middle position
- reverse gear engaging ring is in its rearmost position (fig. 1)
- the range gear is in high range (fig. 2).

Note: Ensure that the control housing forks correspond to the position of the engaging rings. If they do not, gently position them by hand.



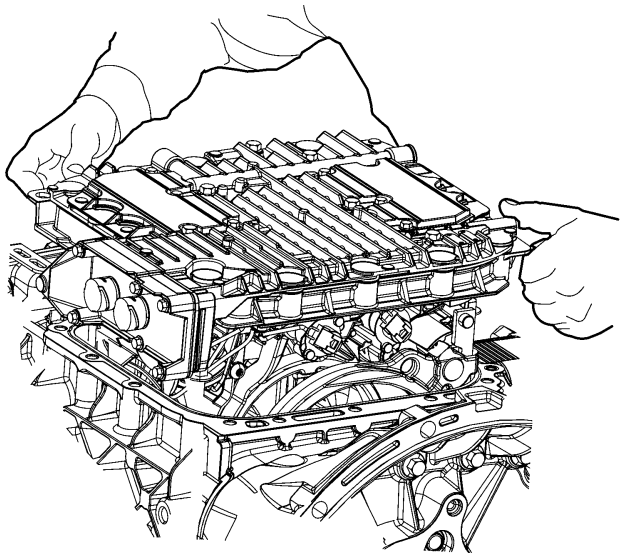
W4002948

Figure 2



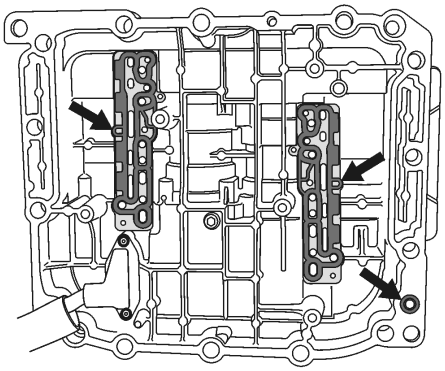
W4002950

37
Ensure that the range servo piston is positioned out 25.4 mm (1” in.) to properly mate with the main housing.



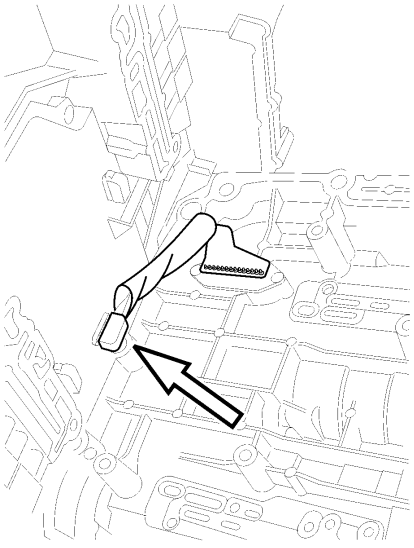
W4002949

38
Carefully lower the control housing to avoid damaging the tooth wheel in the transmission. Ensure that the split fork ends up in the correct position in the engaging ring.



T4020778

39
Install new solenoid valve seals, an O-ring for the countershaft brake, and a new upper cover gasket.



W4002953

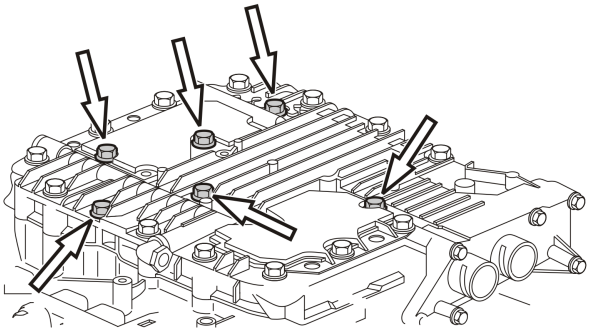
40

⚠ CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Place the new upper cover in position and carefully connect the electric harness. Lower the upper cover into position.

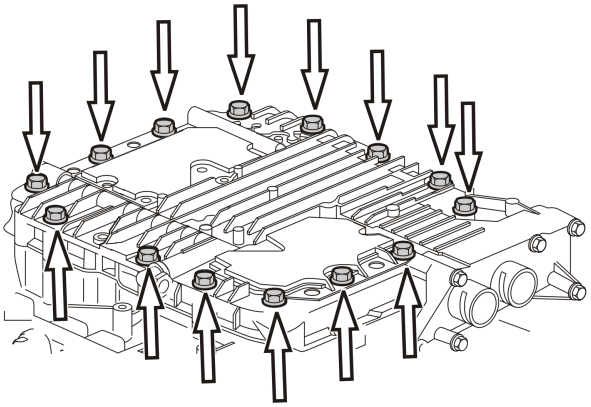
Note: Do not apply tension or weight to the wiring harness or connector.



W4002952

41
Install and torque the six upper cover mounting bolts.

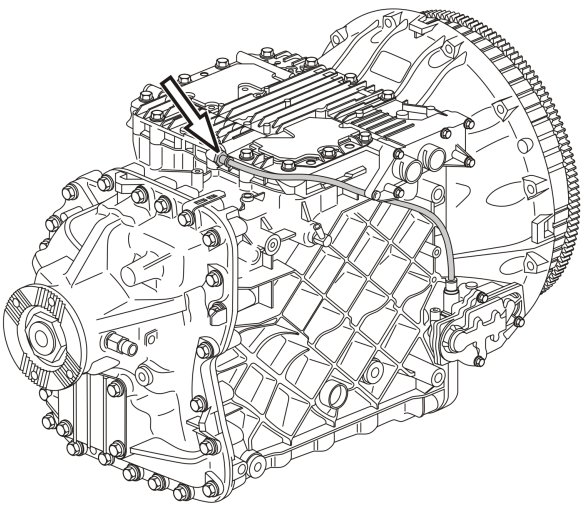
24±4 Nm (18±3 ft-lb)



W4002951

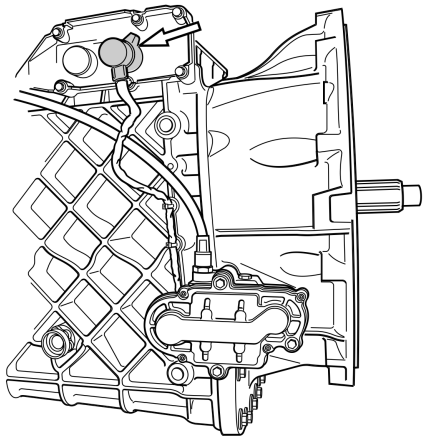
42
Install the control housing bolts and torque them in a diagonal pattern.

110±10 Nm (81±7 ft-lb)



W4002947

43
Connect the clutch control valve air supply tube to the upper control housing fitting.

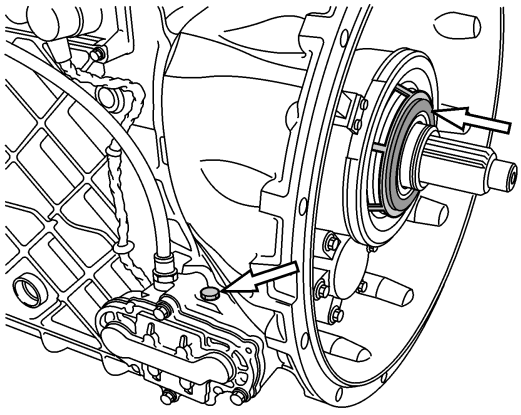


W4002881

44
Connect the clutch valve wiring connector to the control housing.

45
After the control housing has been installed, perform the “Transmission Calibration (Transmission Removed)” Procedure. Follow the instructions as outlined within the scan tool.

Note: If calibration fails, check that the shift fork position sensor values are within the specification ranges. Shift fork values out of range may indicate incorrect assembly of shift forks to engaging rings preventing correct transmission shifting. Remove control housing and inspect shift fork and engaging ring positions. Repeat control housing installation beginning at Step 36



T4021203

46
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

47
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

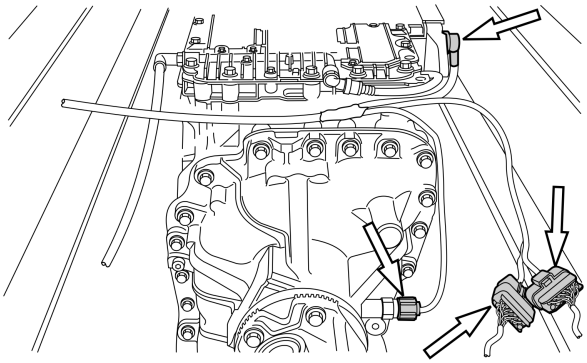
48
Install the remaining transmission to engine mounting bolts. Torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Then, remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

49
Position the battery cables and install their mounting bolts.

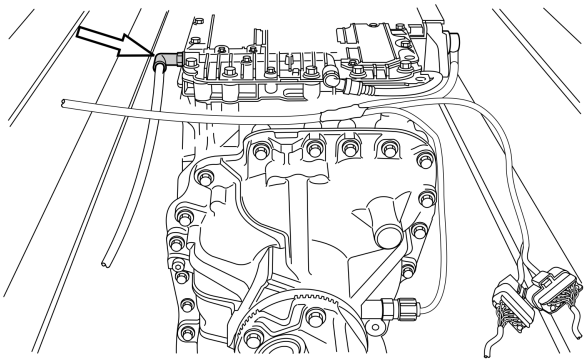
50
Install the cab engine cover.



W4002941

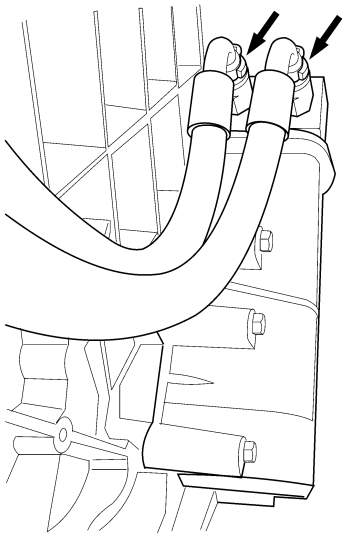
51
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

52
Install new tie straps to secure the wiring harness to the transmission.



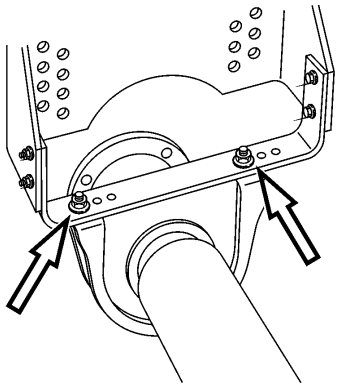
W4002940

53
Connect the air supply hose at the rear of the transmission.



W4002894

54
Connect the transmission oil cooler hoses to the filter housing.



T4018155

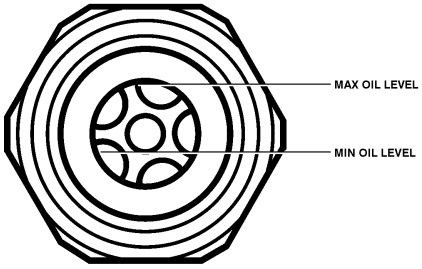
55
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing - 175±30 Nm (129±22 ft-lb)
Universal Joint Caps - 166±10 Nm (122±7 ft-lb)

56
Remove the supporting jack stands and lower the vehicle.

57
Pressurize the air system and check for leaks.



T4021684

58
Restore power to the vehicle by connecting the batteries negative cable.

59
Check and fill the transmission with approved transmission oil.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88949834[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

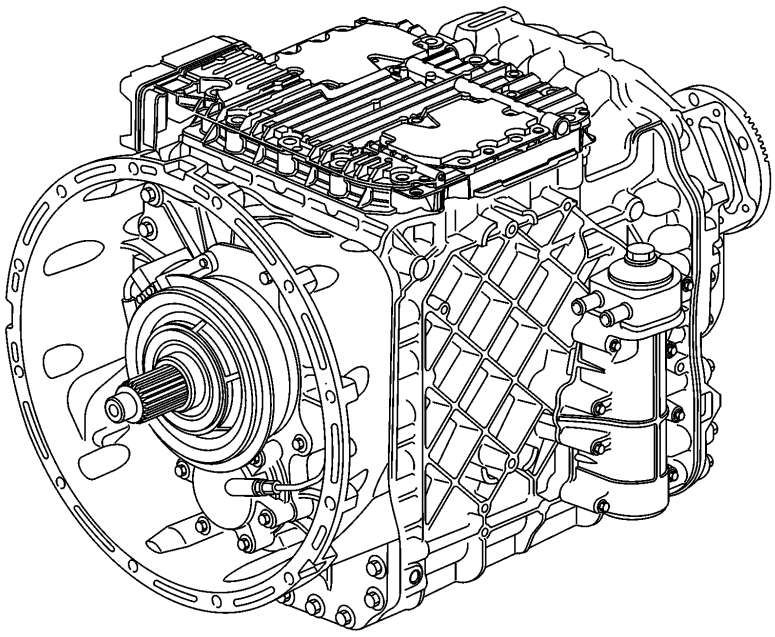
Date	Group	No.	Release	Page
4.2010	**431**	**03**		1(38)

This Service Bulletin replaces Service Bulletin, 431–03 “I-Shift Transmission, Design and Function” dated 1.2008.

Design and Function

I-Shift Transmission

Transmission, Design and Function



T4021207

The I-Shift transmission is a technologically advanced automated **mechanical** transmission, designed specifically to work in conjunction with Volvo’s new family of heavy-duty diesel engines. In order to work as a total package, the I-Shift is programmed with each engines’ efficiency map and is offered with different software options to fulfill each operators needs.

- “Transmission, Mechanical”, page 2

Transmission, Mechanical

General

All variants of the Volvo I-Shift have 12 forward speeds and up to 4 reverse speeds depending on programming. It is a single countershaft transmission built up with a splitter section, a main section with three forward and one reverse gear, and a range gear section. It is an automated **mechanical** transmission and uses synchronizers in its splitter and range gears but not in the main section. The main section utilizes a countershaft brake to mesh gears and equalize shaft speeds as needed. A single disc automated clutch system is utilized in place of a torque converter. The I-Shift is a "two pedal" transmission and does not require a clutch pedal.

The I-Shift uses compressed air and electrical solenoids to perform shift functions, clutch control and countershaft brake functions. All of these functions are timed and controlled by the transmission control module (TCM). A dedicated air tank is needed on the vehicle to supply air for these components. The air is plumbed to the transmission via a supply line and is distributed to the other components internally. The air control solenoids are housed in the transmission control housing and in the clutch control valve assembly.

All Volvo Truck models will be available with this transmission including the VT, VN Series & VHD vocational trucks. Multiple I-Shift models will be offered to support the power ranges of the engines as well as offering different gear arrangements.

	AT2512C	**ATO2512C**	**AT2812C**	**ATO3112C**
Operation	Two Pedal	Two Pedal	Two Pedal	Two Pedal
Forward Speeds	12	12	12	12
Engines Available	D11/D13	D11/D13	D16	D16
Overall Ratio	14.94:1	15.04:1	14.94:1	15.04:1
Top Ratio	Direct 1.00:1	Overdrive 0.78:1	Direct 1.00:1	Overdrive 0.78:1
Weight lbs (kg)	597 (275)	597 (275)	610 (281)	610 (281)

	AT2612D	**ATO2612D**	**ATO3112D**
Operation	Two Pedal	Two Pedal	Two Pedal
Forward Speeds	12	12	12
Engines Available	D11/D13	D11/D13	D16
Overall Ratio	14.94:1	15.04:1	15.04:1
Top Ratio	Direct 1.00:1	Overdrive 0.78:1	Overdrive 0.78:1
Weight lbs (kg)	614 (279)	614 (279)	627 (285)

Transmission Identification

Each transmission has two identification tags. One is found on the top of the clutch housing and the other is found on the back of the range housing. The transmission version can be readily identified by the following nomenclature table.

Make	Volvo
Type	AT2512C, ATO2512C, AT2612D, ATO2612D, AT2812C, ATO3112C, and ATO3112D
Transmission Nomenclature	A — Automatic T — Transmission O — Overdrive 25 — Torque Capacity 2500 Nm (1850 ft-lb) 26 — Torque Capacity 2600 Nm (1900 ft-lb) 28 — Torque Capacity 2800 Nm (2050 ft-lb) 31 — Torque Capacity 3100 Nm (2300 ft-lb) 12 — Number of forward gears C or D — Design Level

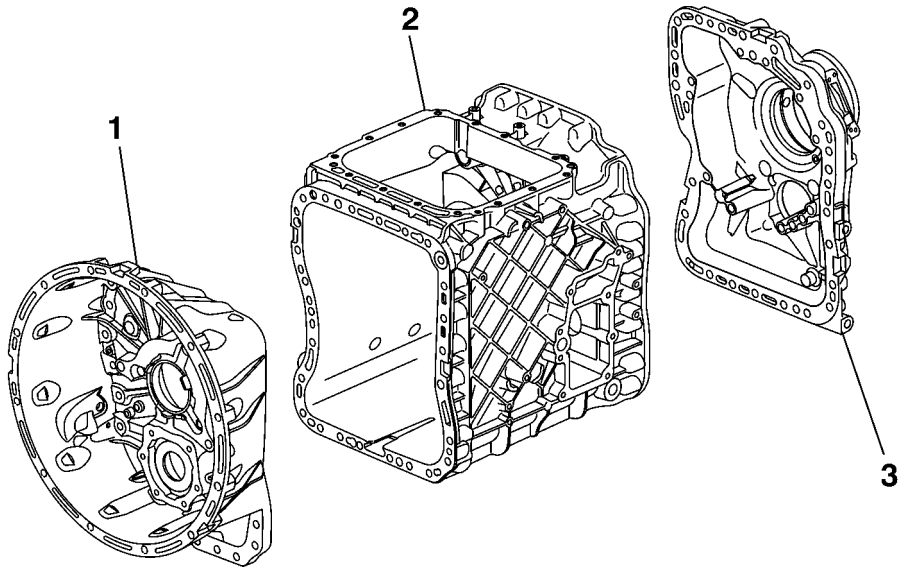
Gear Ratio

Gear ratios for AT2512C, AT2612D, AT2812C, ATO2512C, ATO2612D, ATO3112C, and ATO3112D are as shown in the table:

Gear selection	**12 geared AT2512C, AT2612D, AT2812C**	**12 geared ATO2512C, ATO2612D, ATO3112C, ATO3112D**
1st	14.94:1	11.73:1
2nd	11.73:1	9.21:1
3rd	9.04:1	7.09:1
4th	7.09:1	5.57:1
5th	5.54:1	4.35:1
6th	4.35:1	3.41:1
7th	3.44:1	2.70:1
8th	2.70:1	2.12:1
9th	2.08:1	1.63:1
10th	1.63:1	1.28:1
11th	1.27:1	1.00:1
12th	1.00:1	0.78:1
Reverse gear R1	17.48:1	13.73:1
Reverse gear R2	13.73:1	10.78:1
Reverse gear R3	4.02:1	3.16:1
Reverse gear R4	3.16:1	2.48:1

Transmission Construction

The transmission has three main parts: a clutch housing, main housing and range housing. The **clutch housing (1)** also forms the front wall of the transmission housing. The **main housing (2)** contains the main, counter and reverse shafts along with the selector assembly which is integrated into the transmission control housing. The **range housing (3)** contains the range planetary gear assembly and output shaft.



W4002905

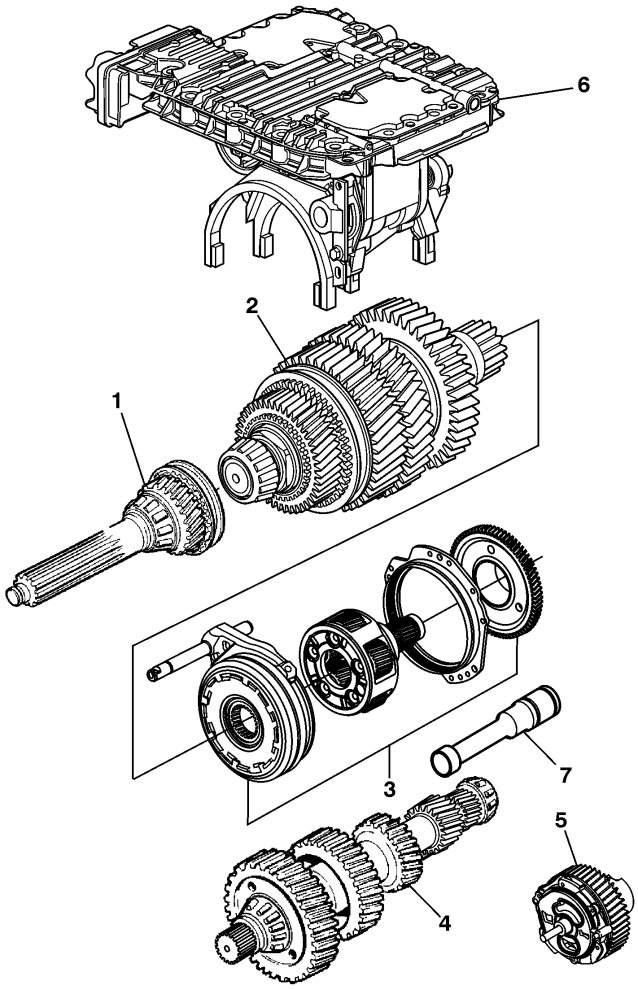
1 Clutch housing

2 Main housing

3 Range housing

The main internal parts in the transmission are the input shaft (1), main shaft (2), range gear with selector unit (3), countershaft (4), oil pump with reverse shaft (5), control housing with selector unit (6) and if equipped, a power takeoff (PTO) drive shaft (7).

The trailing wheel for the reverse gear, the main gears and the range sections sun gear are located on the main shaft. The range section also incorporates planetary gears that are integrated with the output shaft. The countershaft has fixed gears.



T4021728

1 Input shaft

2 Main shaft

3 Range gear with selector unit

4 Countershaft

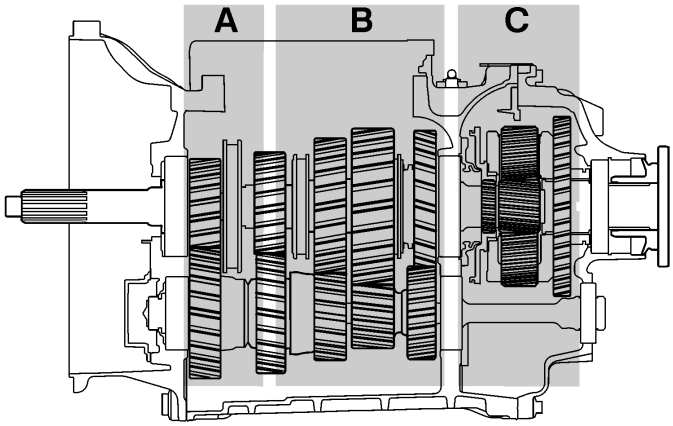
5 Oil pump with reverse shaft

6 Control housing with selector unit

7 Drive shaft for PTO

Synchronization

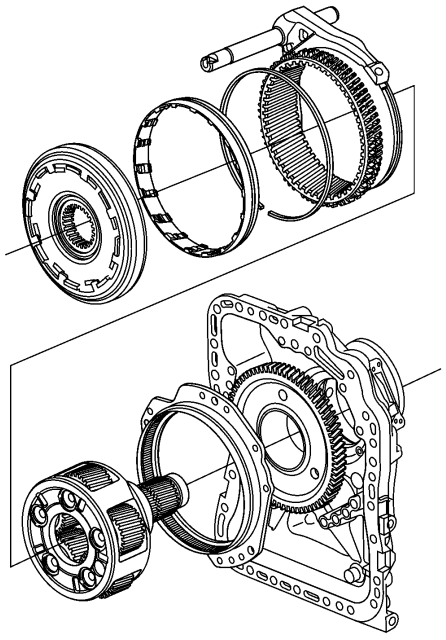
- The split gear **(A)** is synchronized.
- The main transmission housing gears **(B)** are non—synchronized, but instead utilize a countershaft brake to equalize shaft speeds and mesh the gears. For more information see, page 11.
- The range gear **(C)** is synchronized.



T4021404

Range Gear

The range gears synchronization lies outside the ring gear, reducing the unit's length. The large synchronization area results in short selection time; the wide planetary gears offer strength and the helical gears result in a quiet planetary gear operation.

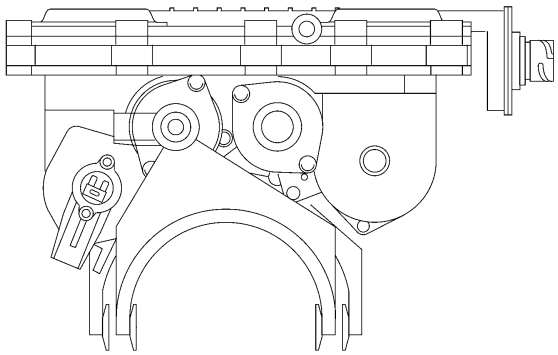


W4002906

Range gear assembly with selector unit

Control Housing Assembly

The control housing assembly contains the transmission control module (TCM), shift solenoids, countershaft brake solenoid, gear position sensors, oil temperature sensor, shaft speed sensors, the shift forks and their shift cylinders. When a gear is selected using the gear selector, these components work in conjunction with the engine control module (ECM) to reduce the engine torque to a suitable level, before the control housing shifts the transmission to neutral and then to the selected gear. The solenoids are used to control pressurized air to cylinders, that perform the action of changing the gears. The control housing also contains and controls the countershaft brake solenoid. This solenoid controls air pressure to the brake assembly which aids in synchronizing the shaft speeds to mesh the main gears. After the transmission has been put into neutral, the ECM begins to adjust engine speed (RPM) to accommodate the selected gear after the shift takes place.

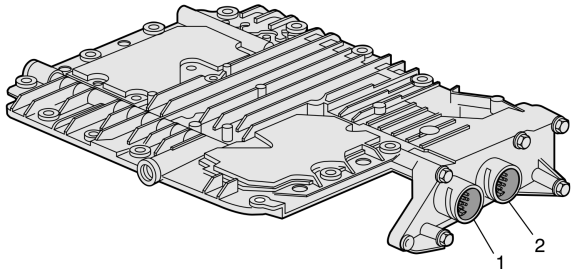


W4002915

The control housing cover has two electrical sockets and also contains the TCM.

1 Vehicle communication

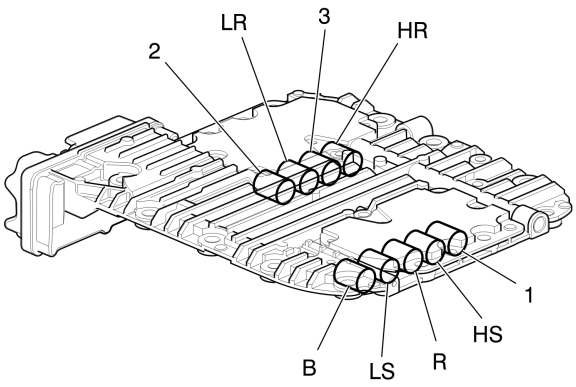
2 Clutch cylinder



W4002936

The control housing cover contains nine solenoid valves that control the path of pressurized air:

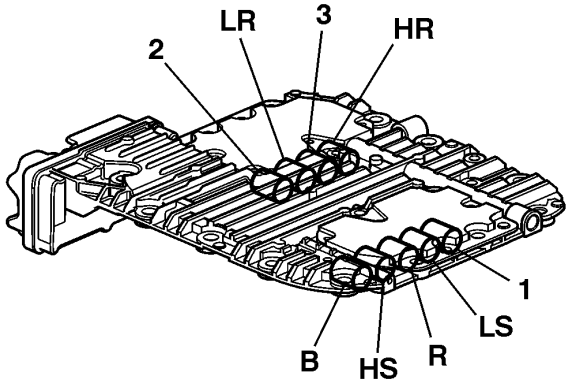
- **2.** Solenoid valve 2nd gear
- **LR.** Solenoid valve, low range
- **3.** Solenoid valve 3rd gear
- **HR.** Solenoid valve, high range
- **B.** Solenoid valve, brake
- **LS.** Solenoid valve, low split
- **R.** Solenoid valve, reverse
- **HS.** Solenoid valve, high split
- **1.** Solenoid valve 1st gear



W4002918

Overdrive Transmissions

- **2.** Solenoid valve 2nd gear
- **LR.** Solenoid valve, low range
- **3.** Solenoid valve 3rd gear
- **HR.** Solenoid valve, high range
- **B.** Solenoid valve, brake
- **HS.** Solenoid valve, high split
- **R.** Solenoid valve, reverse
- **LS.** Solenoid valve, low split
- **1.** Solenoid valve 1st gear



T4018189

Direct Drive Tranmission

The following shows the locations of the four parallel cylinders and one of the cylinder position sensors.

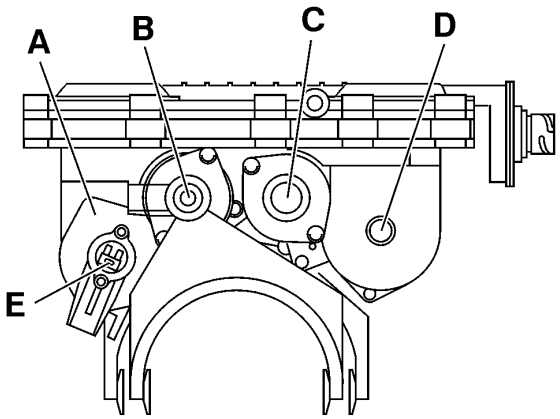
A. Split cylinder

B. 1/R cylinder

C. 2/3 cylinder

D. Range cylinder

E. Split cylinder position sensor



T4018494

The following shows the locations of the other three cylinder position sensors and the speed sensors.

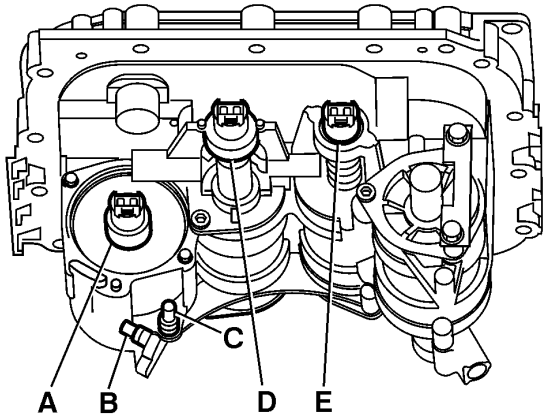
A. Range cylinder position sensor

B. Countershaft speed sensor

C. Main shaft speed sensor

D. 2nd/3rd gear cylinder position sensor

E. 1st/reverse cylinder position sensor



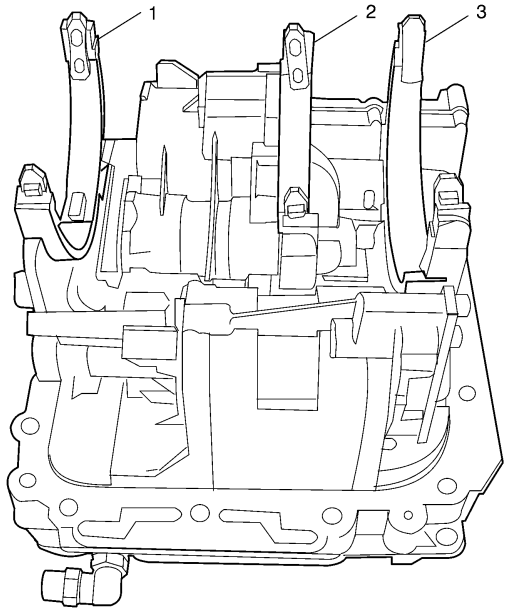
T4018201

The following shows the locations of the other three shift forks.

1. 1st-Reverse gear shift fork

2. 2nd-3rd gear shift fork

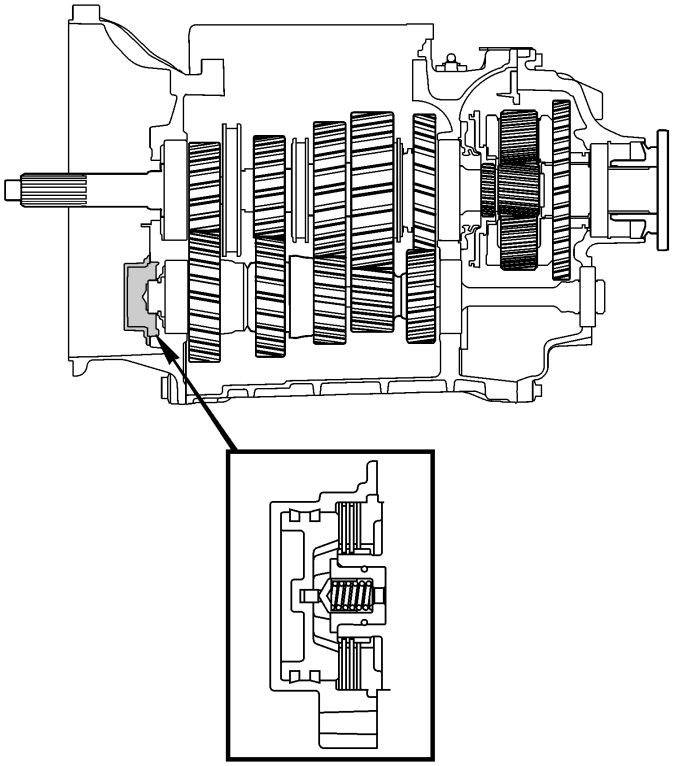
3. Splitter gear shift fork



W4002920

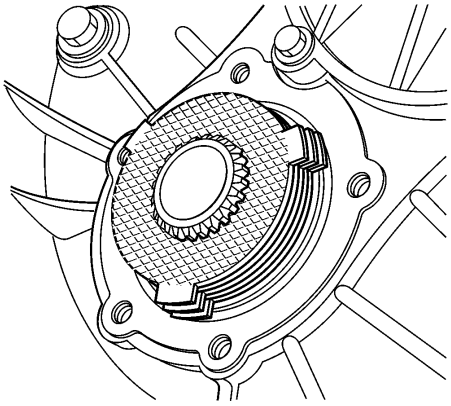
Countershaft Brake

The countershaft brake is located at the front of the countershaft within the clutch housing. It is used to stop the rotating parts in the transmission when a starting gear is selected, which eliminates transmission wear and noise. The brake is also used when changing gears, to aid in synchronizing the shaft speeds for quicker gear changes. It is activated by a solenoid contained in the control housing. The solenoid controls pressurized air flow to the brakes integrated pneumatic cylinder which applies pressure to friction and steel disc plates.



T4021408

Countershaft brake location



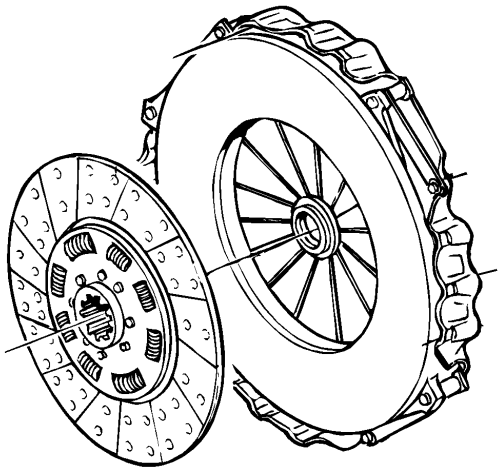
T4022010

Countershaft brake discs

Clutch

All I-Shift equipped vehicles have a single disc, dry type clutch. The pressure plate used in the vehicles will vary depending on the engine that the vehicle is built with. Vehicles equipped with the D11 or D13 engines, will use a non adjustable pressure plate while the D16 equipped vehicles will use a self adjusting pressure plate. Due to the self adjusting nature of the D16's pressure plate, it's necessary to cage the adjusting system prior to pressure plate removal. The adjuster can not be reset if not caged properly. All clutch and pressure plates are replaced in matched sets.

The I-Shift clutch is fully automated and is actuated by a clutch cylinder mounted behind the pressure plate. This automation includes clutch protection that is programmed into the transmission control module (TCM) software. If a vehicle is held stationary on a grade using the accelerator or too high gear is selected which allows excessive clutch slippage or load, a "clutch protection active"warning or "high clutch load" warning will appear in the driver information display (DID) and an audible warning. If these warnings are ignored the clutch will slowly engage to protect the clutch. If the accelerator pedal (AP) is released the clutch will immediately disengage.



T4012799

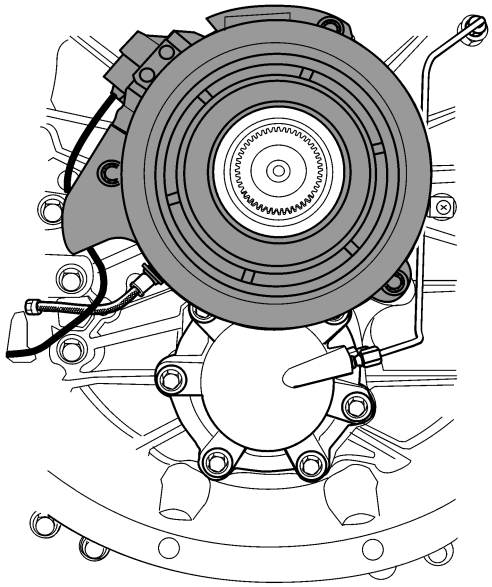
Clutch Cylinder

The clutch cylinder is located inside the clutch housing. This fully automated cylinder encircles the input shaft and is responsible for the actuation of the clutch. Compressed air is used to move the cylinder as needed to actuate the clutch. The pressurized air, is regulated by the clutch control valve located on the outside of the clutch housing. The clutch cylinder also houses the release bearing. In situations where the I-Shift is unintentionally left in gear and the parking brake has been applied, the transmission control module (TCM) will automatically go into neutral after a period of four minutes. This provides protection against release bearing damage as well as crank shaft thrust bearing wear and damage.

A clutch cylinder position sensor is mounted to the outside of the cylinder. It is used to monitor clutch position and clutch engagement point. As a secondary responsibility it is used to calculate clutch wear. There are two clutch position reference values that are necessary in monitoring the clutch.

1 X1 Value — This is the base line value set whenever a new clutch is installed. This is done using the scan tool by performing the "Clutch Engagement Point Calibration".

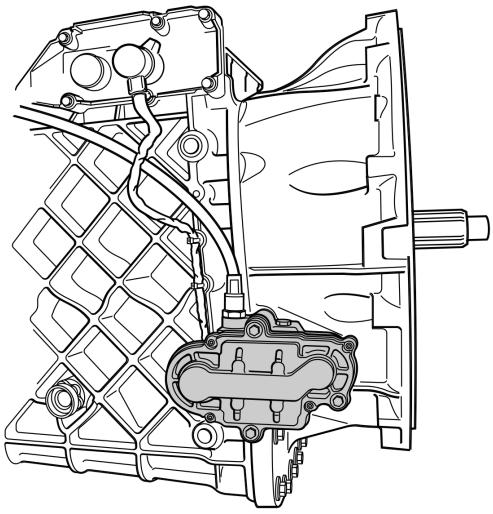
2 X2 Value — This is the value that represents the present position of the clutch.



T4021527

Clutch Control Valve

The clutch control valve is located on the outside of the clutch housing. It controls the supply of compressed air to the clutch cylinder to control clutch engagement and disengagement. The control valve contains four solenoid valves. There are two engagement valves, one slow and one fast. There are also two disengagement valves, one slow and one fast. These valves can be used alone or together as needed to achieve the desired engagement or disengagement speed. The valve also contains a serviceable filter to prevent contaminants from entering the clutch cylinder through the air supply.



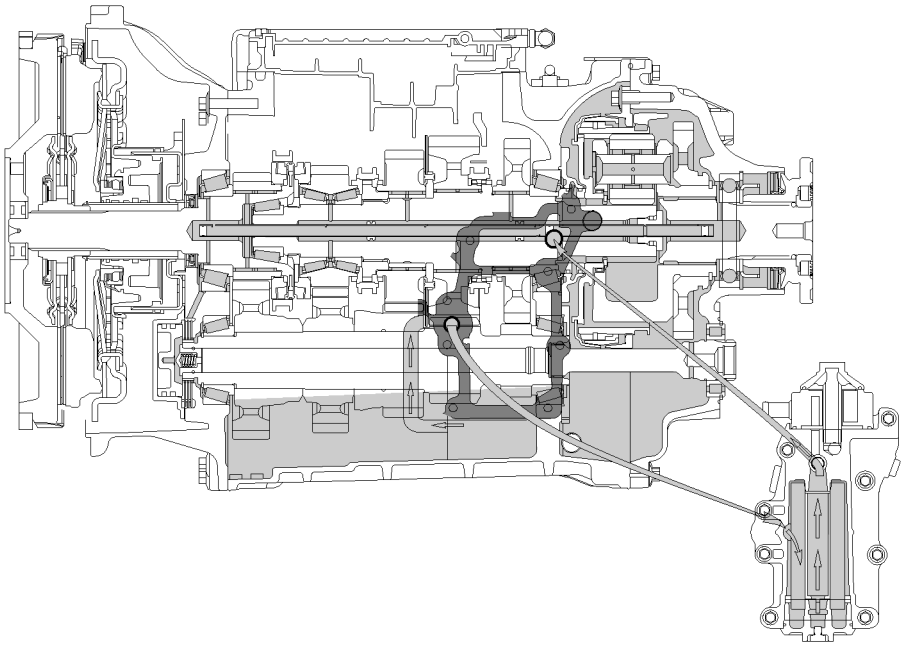
W4002898

Lubrication System

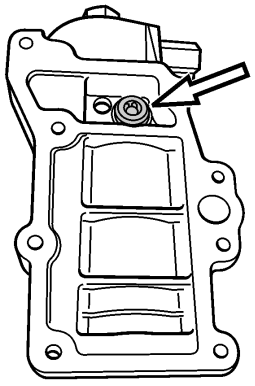
⚠ CAUTION

Never reuse drained I-Shift oil. The oil must be replaced along with the oil filter. Reusing drained oil can result in damage to transmission components.

The transmission is lubricated through a combination of pressure from an oil pump and splashing. The oil is led into the main shaft to lubricate and cool the range gears, the input shaft and main shaft bearings. The countershaft brake and output shaft bearings, are also lubricated. The lubrication system has two overflow valves. One valve ensures that the transmission is lubricated if the filter gets blocked while the other prevents excessive pressure in the system, e.g. during cold start. The valves are made up of a compression spring and a valve peg.

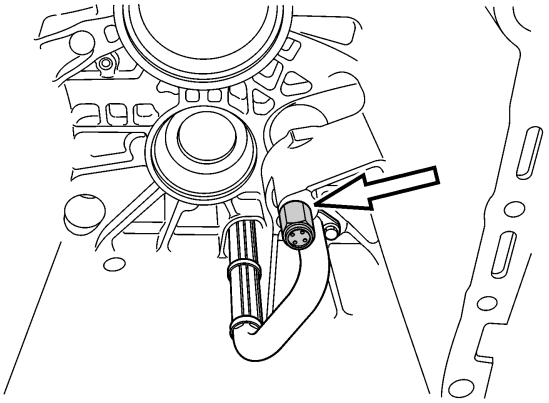


T4021401



T4021730

Overflow valve to ensure that the transmission is lubricated.



T4021729

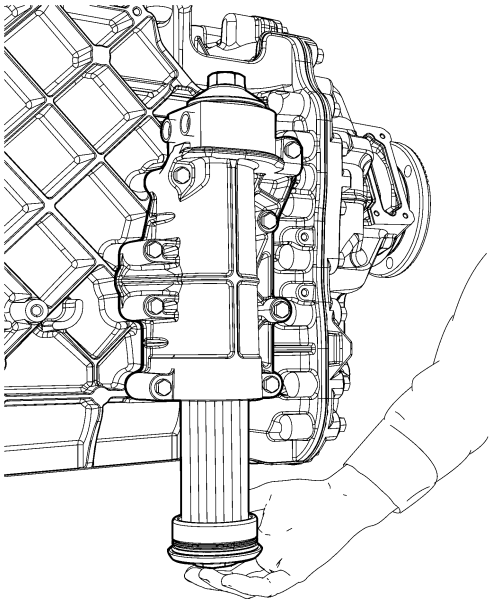
Overflow valve to prevent excessive oil pressure.

Oil Pump

The oil pump is an eccentric pump. It is driven off of the reverse gear. The oil is filtered by a cartridge style filter on the pressure side of the pump.

Oil Filter

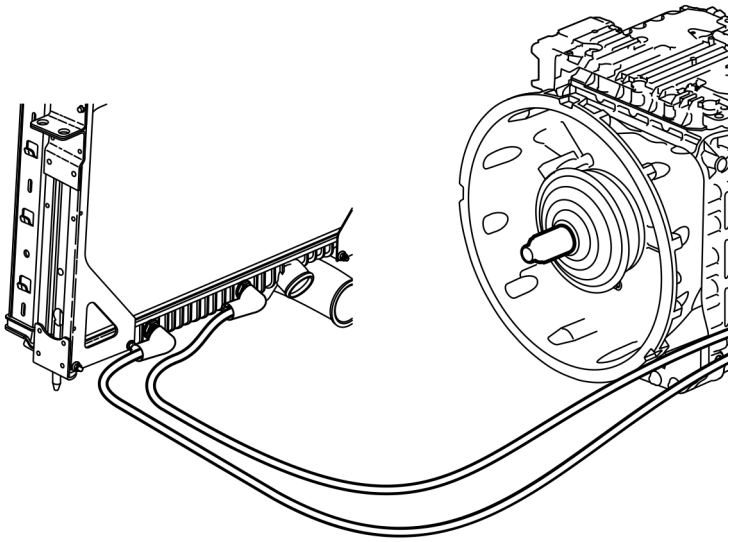
The transmission oil filter is located in a filter housing that is bolted to the outside of the main housing. It is a cartridge style filter. A filter support tube is integrated in the cover to prevent the filter from collapsing. The top portion of the housing contains the inlet and outlet ports for the oil cooler lines.



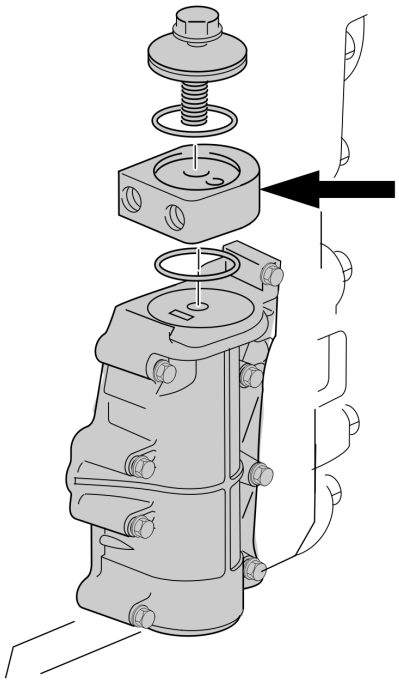
W4002908

Oil Cooler

The transmission oil cooler is of a liquid to liquid design and is located inside the lower tank of the radiator. Transmission oil is pumped to the cooler where the transmission oil can transfer its heat, and then back to the transmission.



W4002919



W4002917

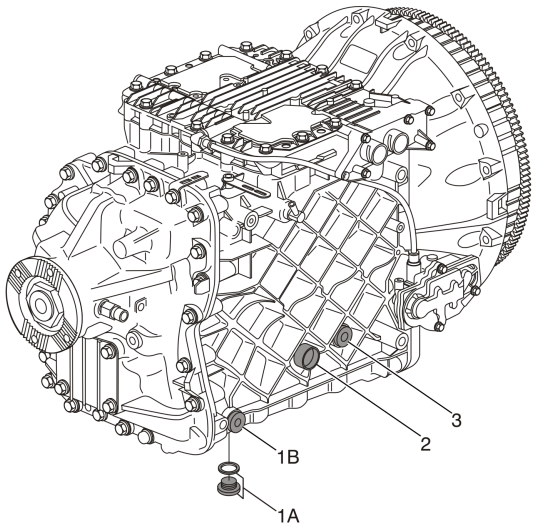
Transmission Cooler Inlet/Outlet Housing

Oil Level

The oil is drained via a plug at the bottom (1A) and/or a plug on the right side (1B) of the transmission..

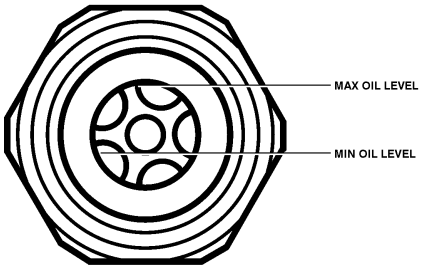
Note: There are two oil drain plugs.

The oil fill plug (3), is on the right side. Check the oil level through the sight glass (2).



W4002904

1A. Drain plug at the bottom of the transmission, 1B. Drain plug on the right side of the transmission, 2. Sight glass, 3. Fill plug and level.

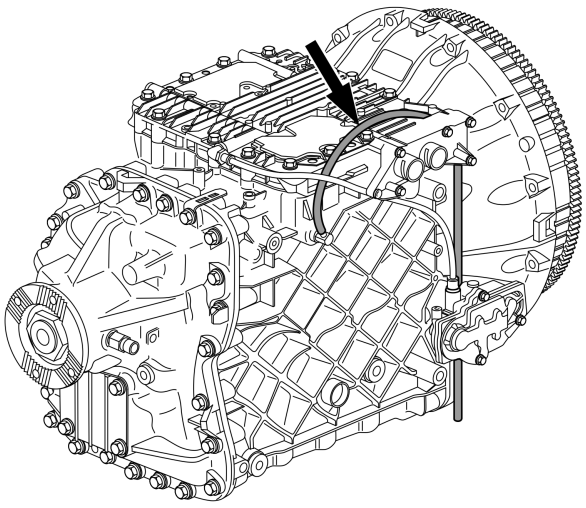


T4021684

Sight glass for checking the oil level.

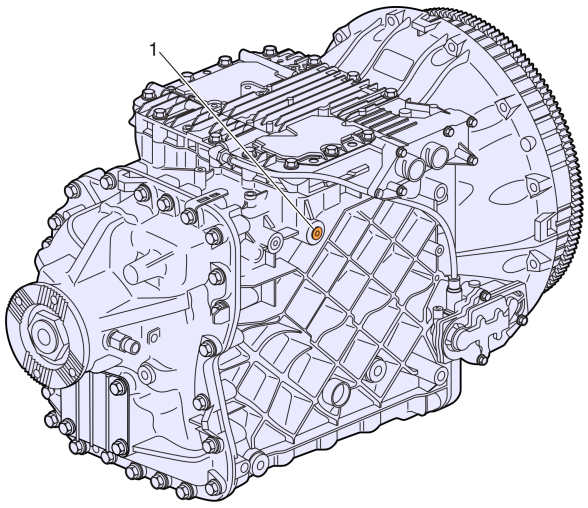
Ventilation

For design level C transmissions, case ventilation is provided via a hose that passes over the control housing and down behind the clutch control valve unit. The vent fitting in the side of the transmission is installed at a 45 degree upward angle to prevent oil leakage.



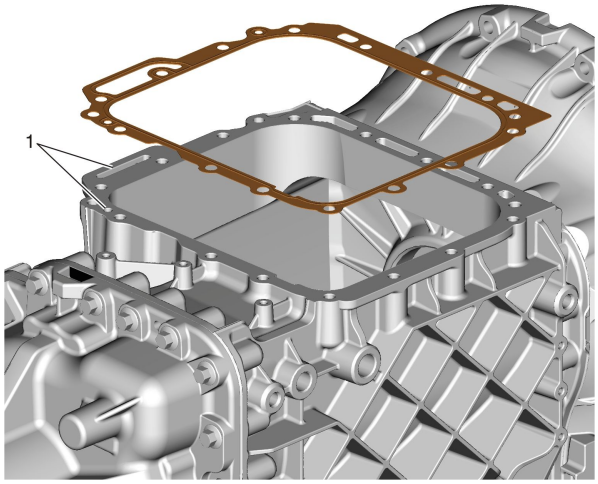
W4002937

For design level D transmissions, case ventilation is enhanced to add internal case venting. This extends oil life and maintenance intervals.



W4054739

1. Plugged vent.

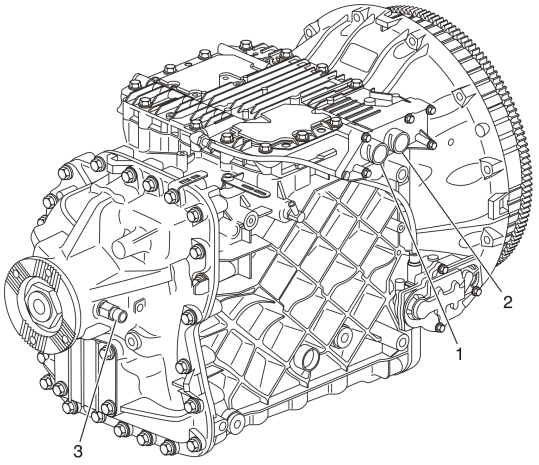


W4054740

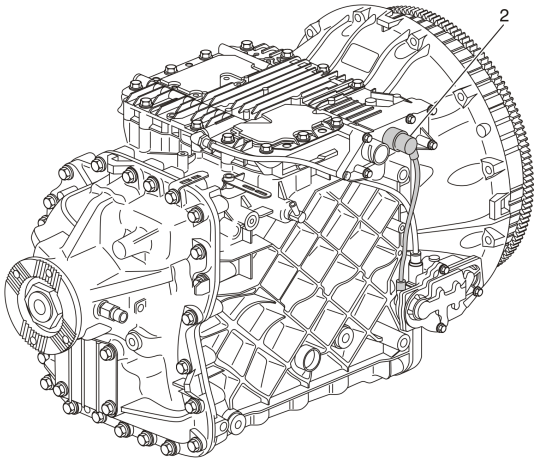
1. Vent holes.

Electrical System

Sensors and Electrical Connections



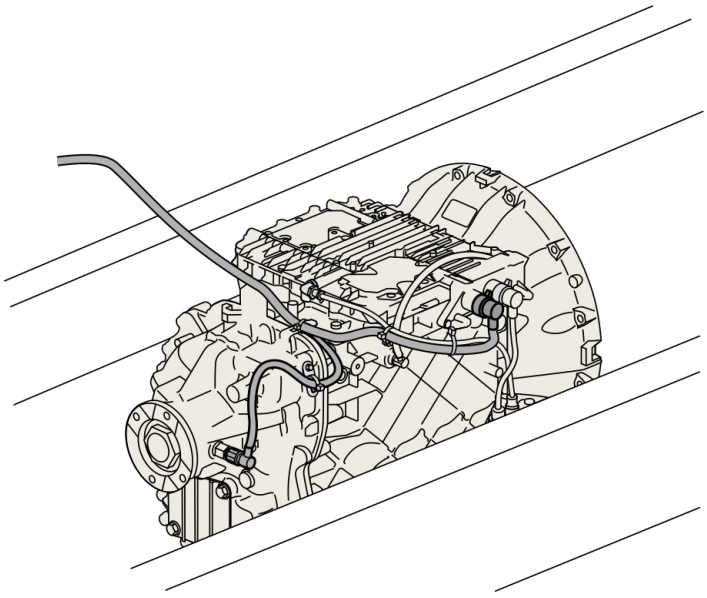
W4002910



W4002911

1. Vehicle communication
2. Clutch control valve
3. Speed sensor

Wiring harness connector **2** to the clutch control valve.



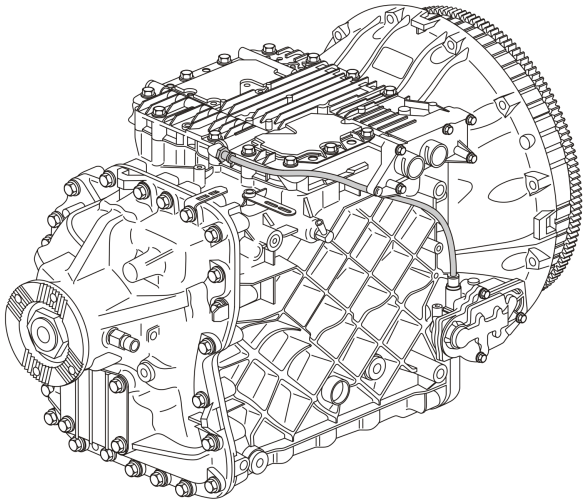
W4002939

General wiring harness routing

Pneumatic System

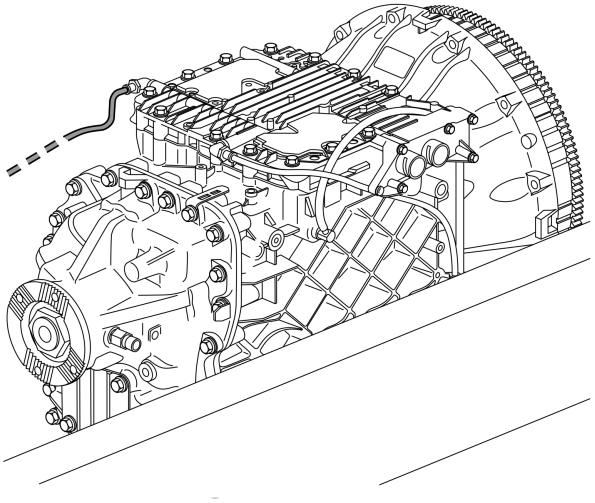
Compressed Air Connections

Compressed air is used to perform the shifting, clutch disengagement and countershaft brake engagement. The compressed air is controlled by solenoid valves. A dedicated air tank mounted to the frame is needed to supply the air for the transmission. Air is supplied to the transmission via a supply line to the left side of control housing. The tank is pressurized by the engine mounted air compressor and contains a check valve, to prevent air pressure lose if a leak is present in the main air system.



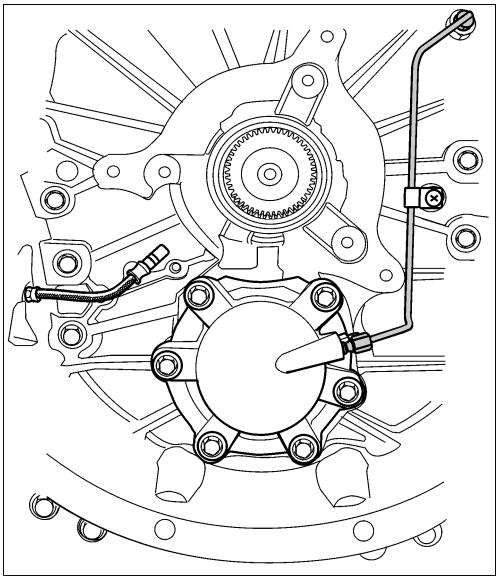
W4002913

Compressed air connection between the control housing and the clutch control valve.



W4002938

Compressed air connection between the tank and the control housing.

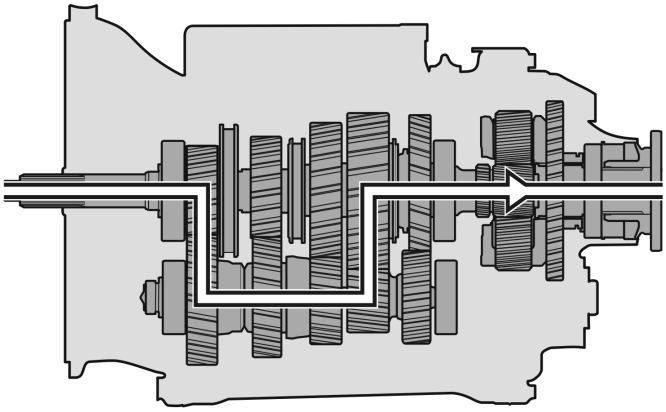


T4021417

Air connection between control housing and countershaft brake (hard line). Air connection from the clutch control valve to the clutch cylinder (hose).

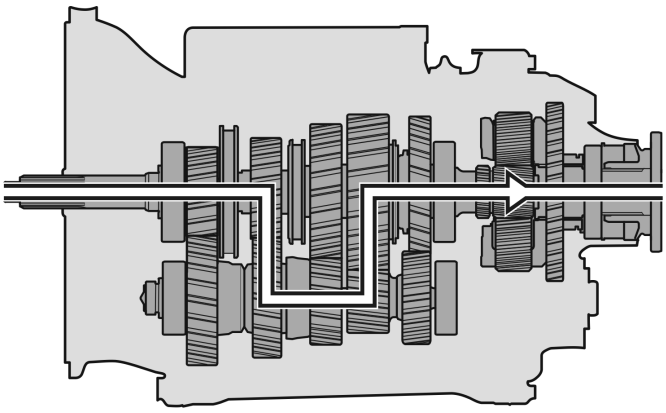
Power Path

The following illustrations show the power path for AT2512C, AT2612D, and AT2812C.



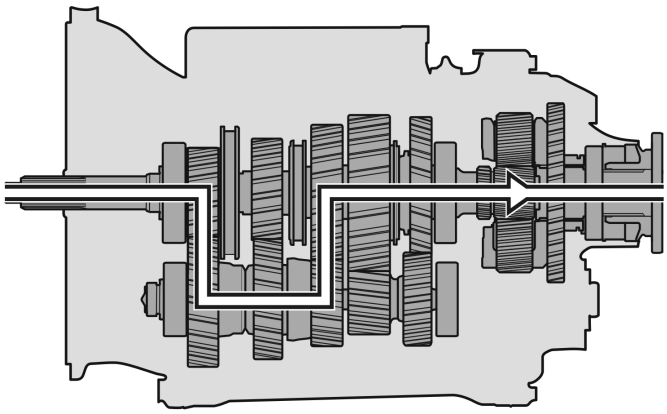
T4021693

1st gear (planetary section engaged, low range)



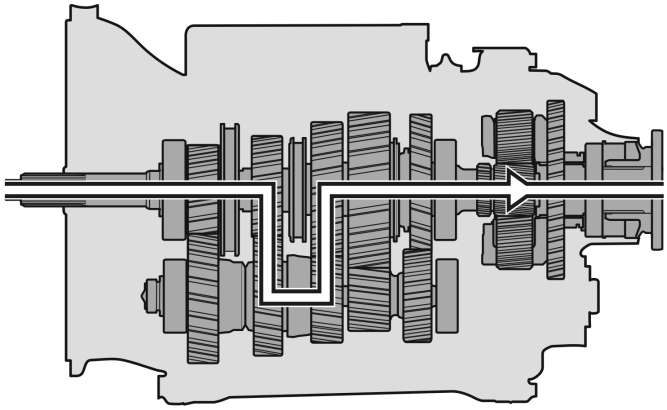
T4021694

2nd gear (planetary section engaged, low range)



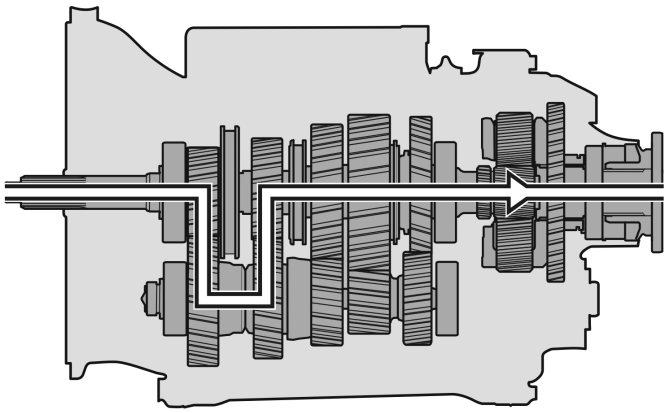
T4021695

3rd gear (planetary section engaged, low range)



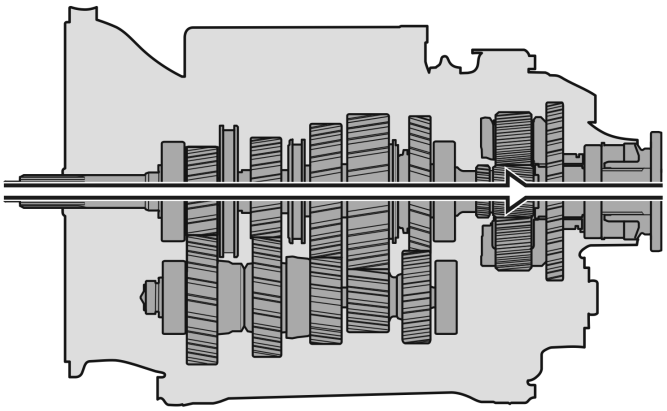
T4021696

4th gear (planetary section engaged, low range)



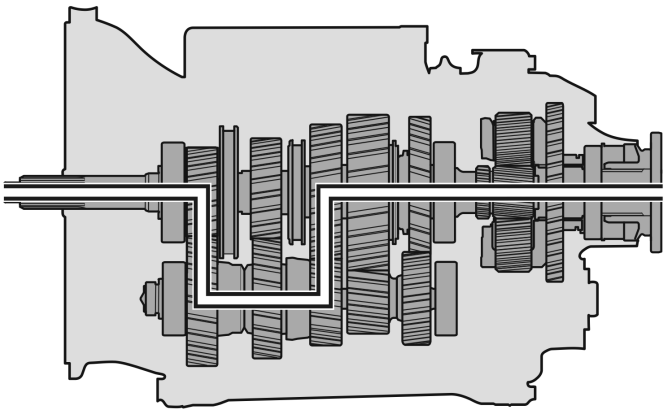
T4021697

5th gear (planetary section engaged, low range)



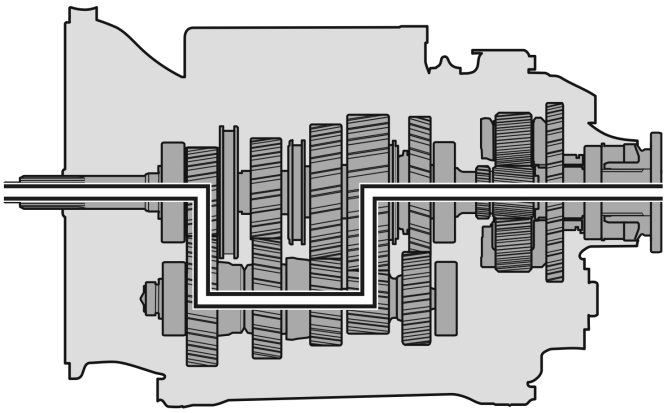
T4021698

6th gear (planetary section engaged, low range)



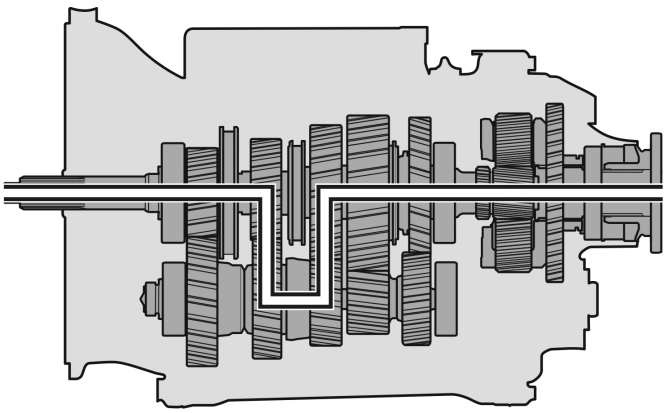
T4021701

9th gear (direct drive through range section, high range)



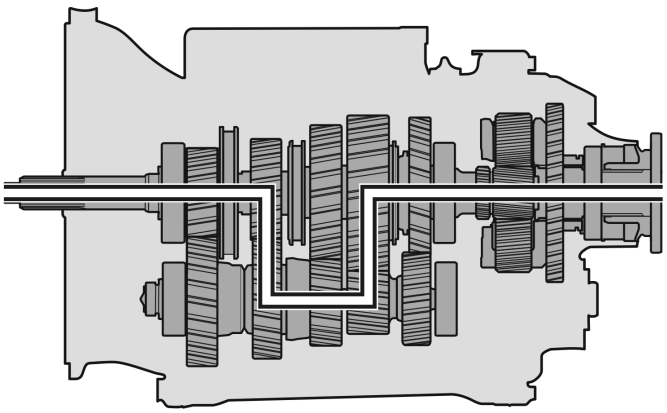
T4021699

7th gear (direct drive through range section, high range)



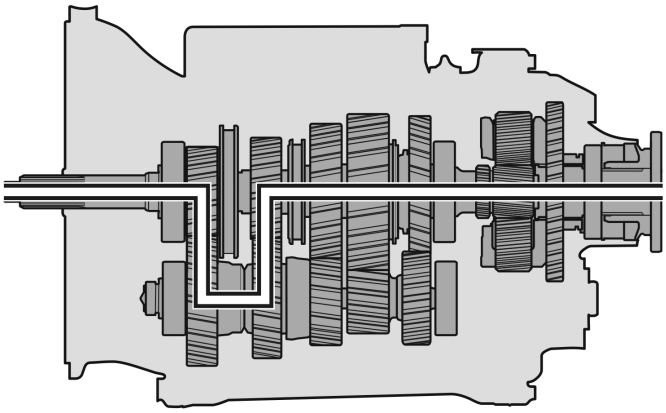
T4021702

10th gear (direct drive through range section, high range)



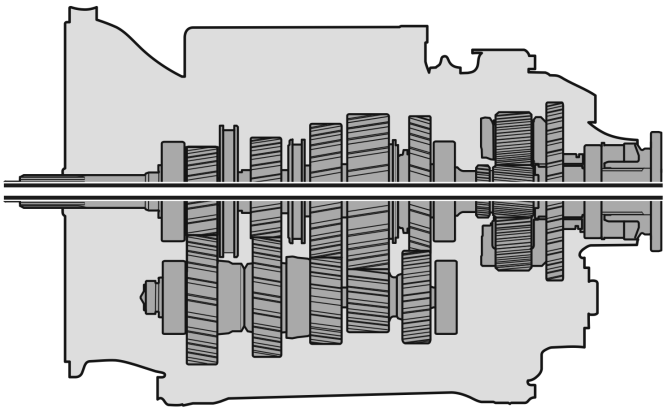
T4021700

8th gear (direct drive through range section, high range)



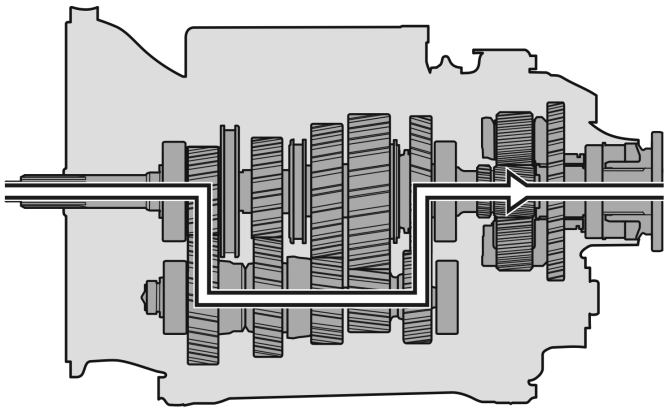
T4021703

11th gear (direct drive through range section, high range)



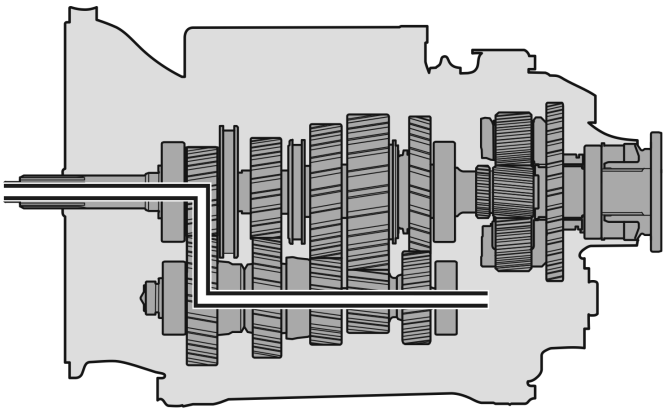
T4021704

12th gear (direct drive through range section, high range)



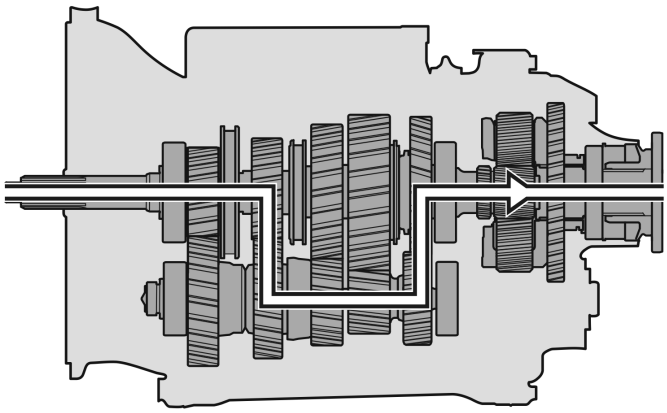
T4021687

Reverse gear R1 (planetary section engaged, low range)



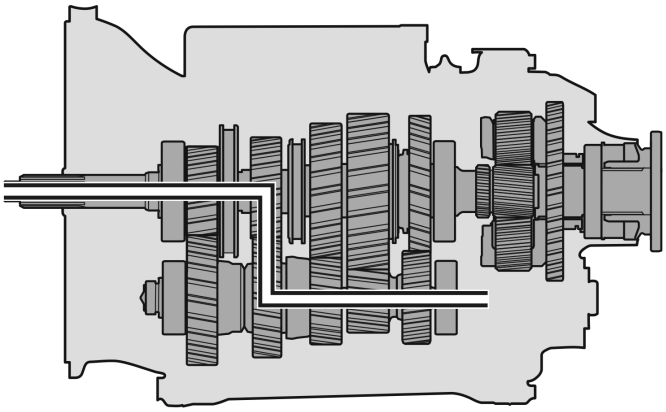
T4021691

Neutral N1



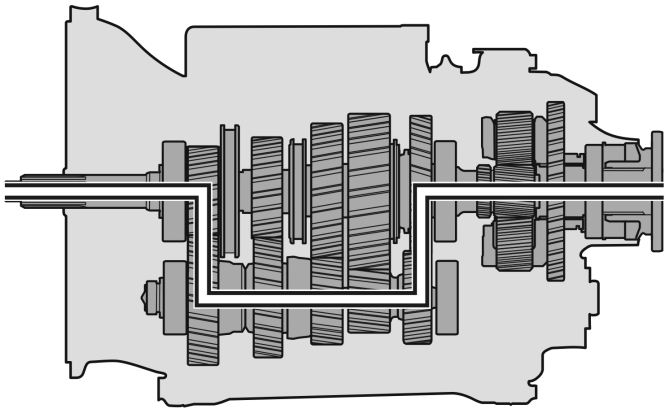
T4021688

Reverse gear R2 (planetary section engaged, low range)



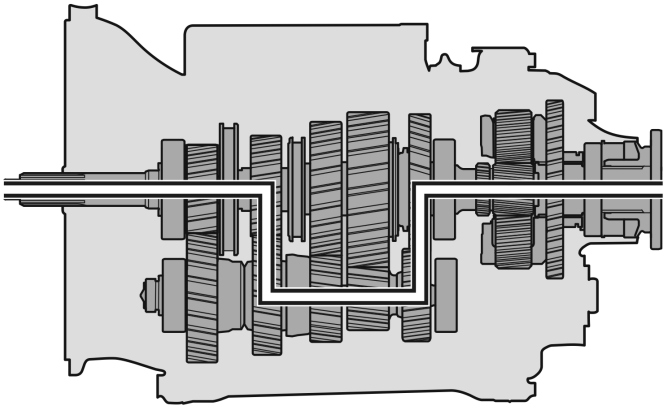
T4021692

Neutral N2



T4021689

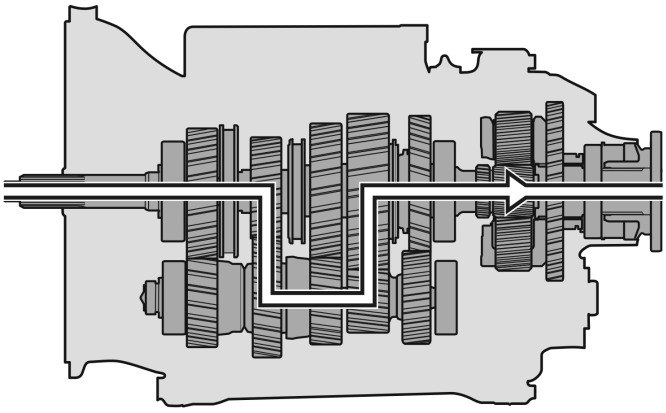
Reverse gear R3 (direct drive through range section, high range)



T4021690

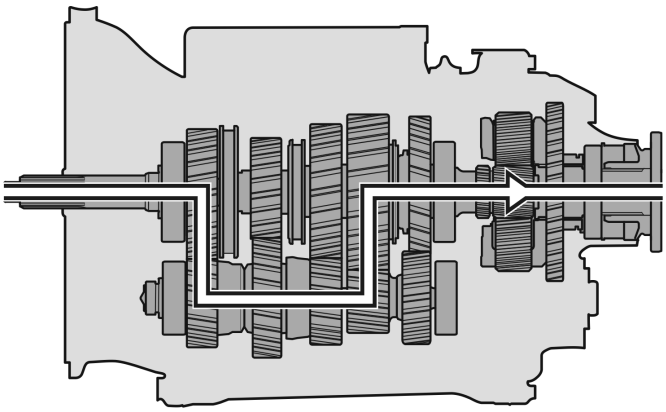
Reverse gear R4 (direct drive through range section, high range)

The following illustrations show the power path for ATO2512C, ATO2612D, ATO3112C, and ATO3112D.



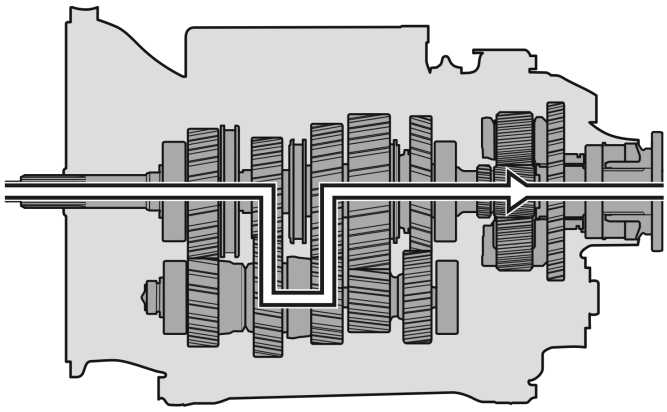
T4021711

1st gear (planetary section engaged, low range)



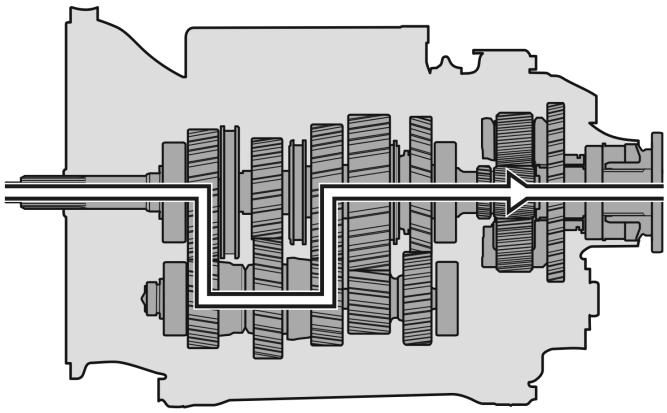
T4021712

2nd gear (planetary section engaged, low range)



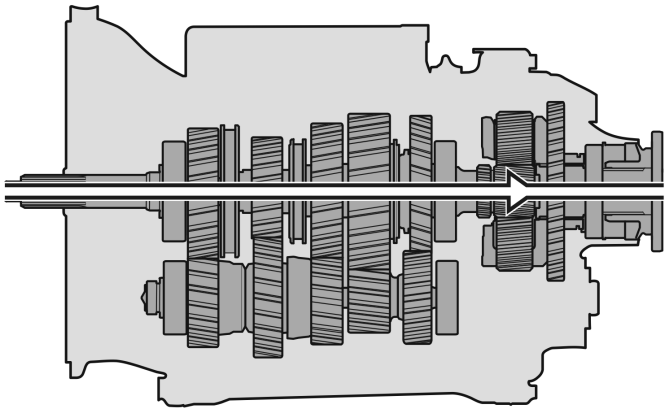
T4021713

3rd gear (planetary section engaged, low range)



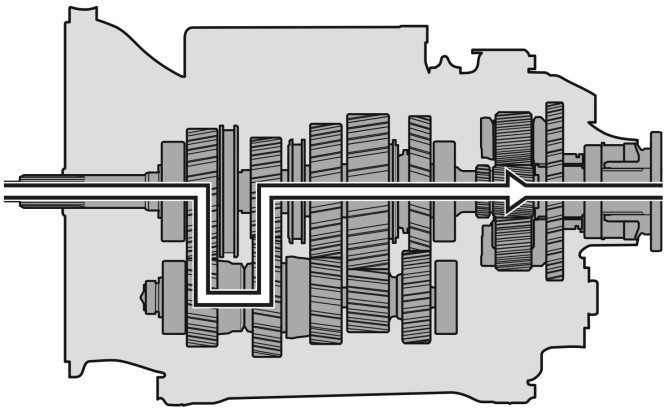
T4021714

4th gear (planetary section engaged, low range)



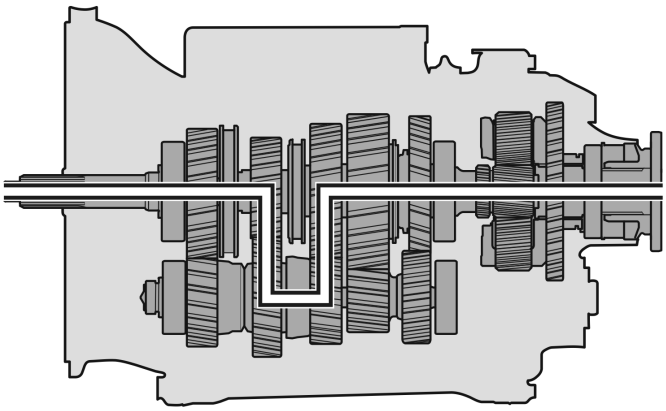
T4021716

5th gear (planetary section engaged, low range)



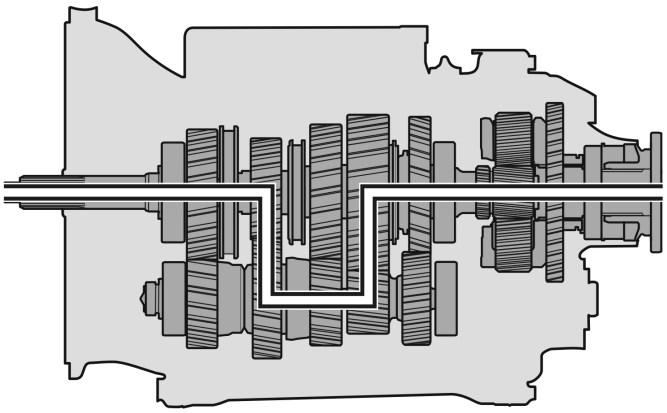
T4021715

6th gear (planetary section engaged, low range)



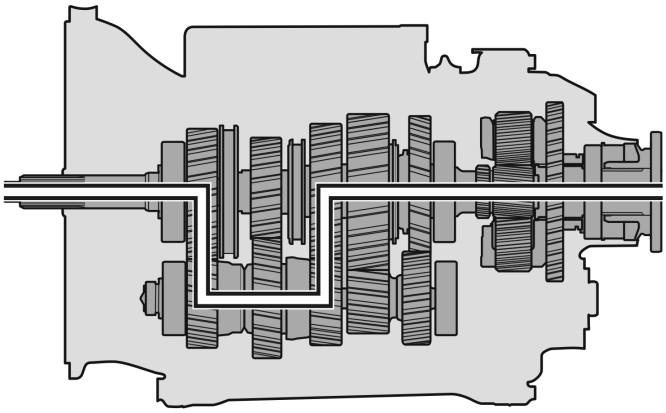
T4021719

9th gear (direct drive through range section, high range)



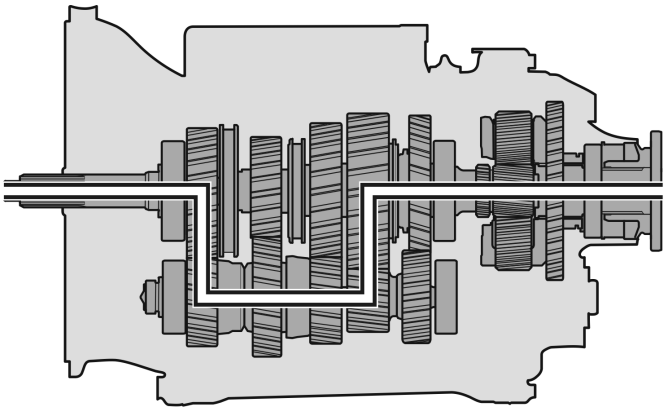
T4021717

7th gear (direct drive through range section, high range)



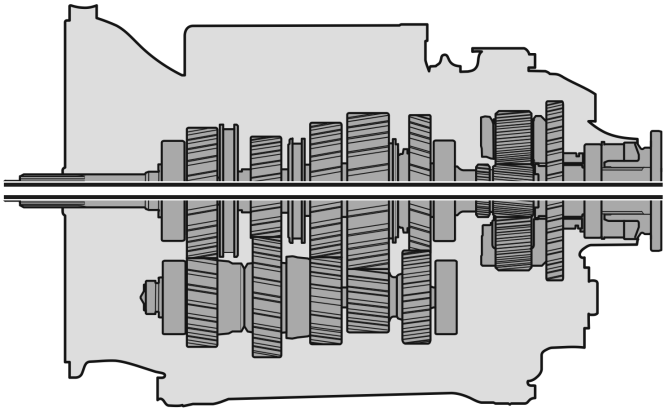
T4021720

10th gear (direct drive through range section, high range)



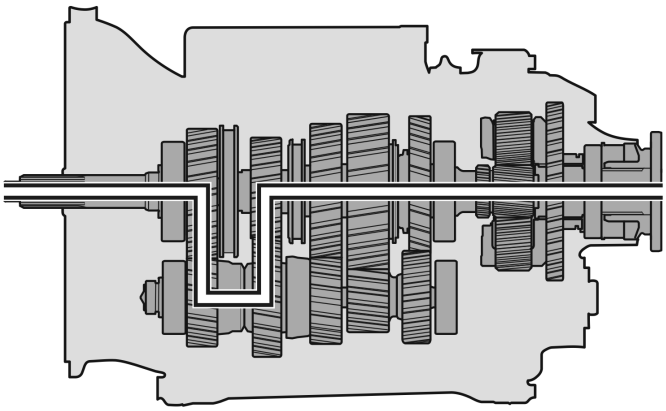
T4021718

8th gear (direct drive through range section, high range)



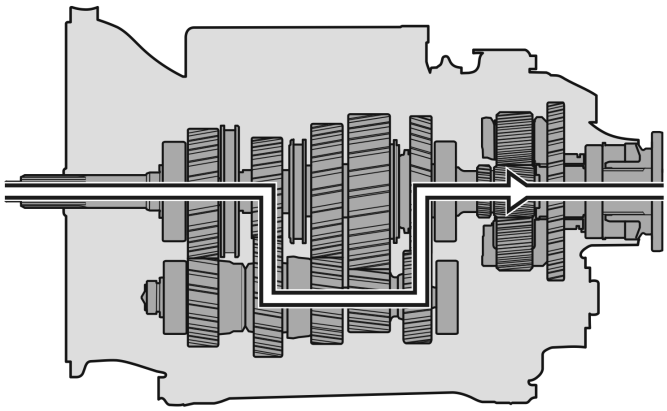
T4021721

11th gear (direct drive through range section, high range)



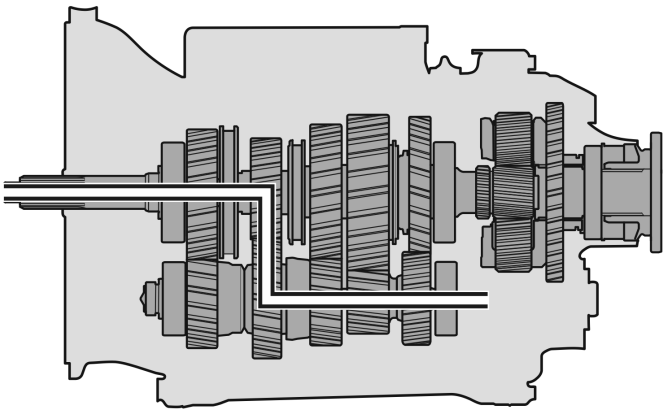
T4021722

12th gear (direct drive through range section, high range)



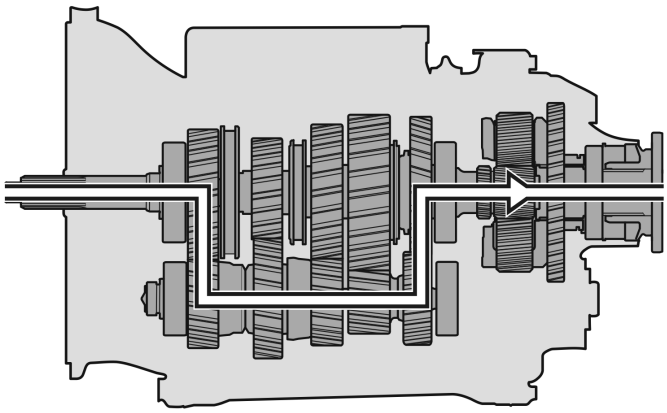
T4021705

Reverse gear R1 (planetary section engaged, low range)



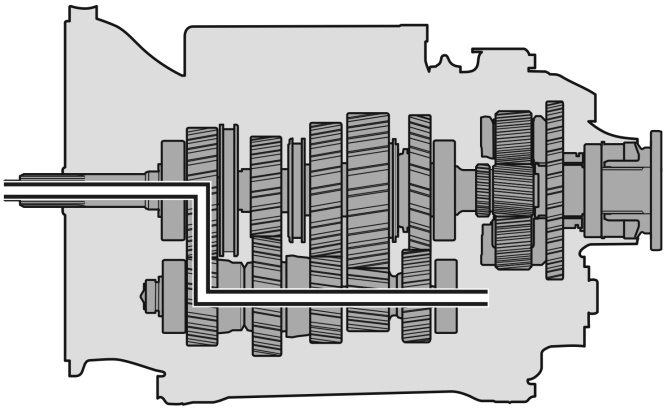
T4021709

Neutral N1



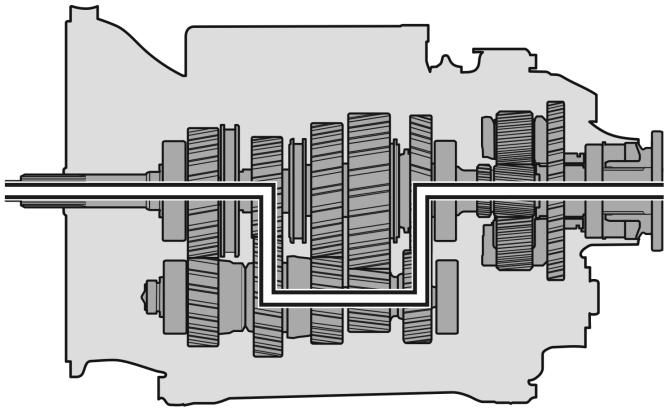
T4021706

Reverse gear R2 (planetary section engaged, low range)



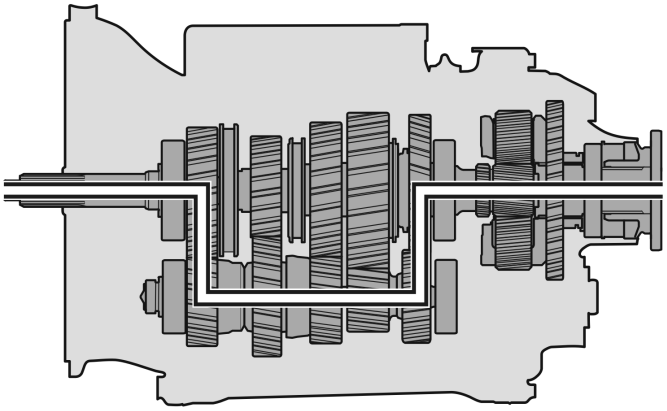
T4021710

Neutral N2



T4021707

Reverse gear R3 (direct drive through range section, high range)



T4021708

Reverse gear R4 (direct drive through range section, high range)

Volvo Engine Brake

Note: For basic operator information about the Volvo engine brake, refer to the Operator's Manual.

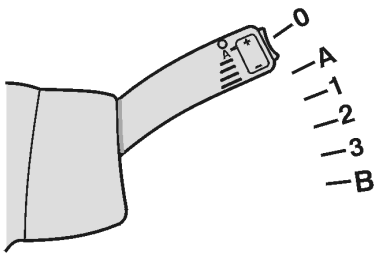
Volvo's enhanced engine brake (I-VEB) is standard with I-Shift transmissions. I-Shift equipped vehicles with this system operate with some new features that are now available due to the integrated operation of the transmission control module (TCM) and the engine control module (ECM). This sharing of information and integration allows for a more optimized engine brake performance. The transmission can now down shift to increase the engine braking effect. As the vehicle slows, the transmission may downshift to keep braking torque high. All I-Shift equipped vehicles will have a new 6 position brake stalk. Positions 0, A, 1, 2, and 3 are of a fixed or locking switch position while the B position is of a momentary type switch. The following chart shows the braking effect in each brake stalk position.

Note: When the Volvo engine brake is active and the transmission is shifting gear, there will be a momentary interruption of the braking torque. This may lead to a temporary increase of the speed.

Stalk Position	Percentage of Available Engine Torque Used For Braking
0 (Off)	0%
A	50%[1]
1	40%
2	70%
3	100%
B	100%[2]

1 50% when the service brake is applied. 0–100% depending on brake cruise request, and braking demand to maintain vehicle brake cruise setting

2 + Downshifts if necessary



T5012243

1 **0** I-VEB Off

2 **A** Automatic Mode

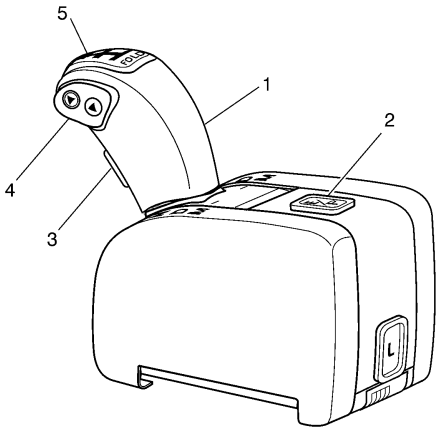
3 **1–3** Manual Modes

4 **B** Brake Performance Mode

Gear Selector

Note: For basic operator information about the gear selector, refer to the Operator's Manual.

The gear selector is attached to the drivers seat and can be folded away to aid in entering the cabin. There are two available selector configurations, a basic and a premium. The selector in the vehicle is dependant on which program package level the vehicle is built with.
Both selectors have gear positions of R (Reverse), N (Neutral), D (Drive), and M (Manual). With the selector in the drive position the transmission will shift as an automatic, performing gear selections and shifting without driver input. When in the manual position, the driver either selects the gears using the gear selector button (premium selector) or will lock the gear that the transmission is presently operating in and hold that gear until the selector is placed in the drive position again (basic selector). With the basic selector, if the manual position is engaged at a stop the vehicle will start in first and hold that gear. The basic selector isn't equipped with a gear selector button or a economy/performance drive mode button.
In situations where the I-Shift is unintentionally left in gear with the parking brake applied, the transmission control module (TCM) will automatically go to neutral when the ignition key is turned to OFF position. This is done to avoid the transmission getting stuck in gear due to drive line "torque up".
There is a gear selector control module (GSCM) that is located in the dashboard. The GSCM receives signals from the selector and interprets these signals into communication information that is transmitted to the TCM.

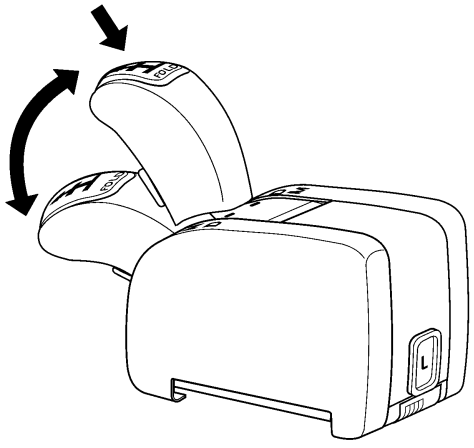


W4002922

1 Gear Lever
2 Economy/Performance Drive Mode Select Button
3 Gear Selector Lock
4 Gear Selector Button
5 Lever Fold Button

Selector Folding

The gear selector is capable of folding forward to aid in cab entry and is also used to identify which software level that is program in the TCM. With the selector in the neutral position (N) press in the fold button and the lever can be folded forward. The display will then show the program package level in place of the driving mode. This is found just to the right of the present gear within the display.



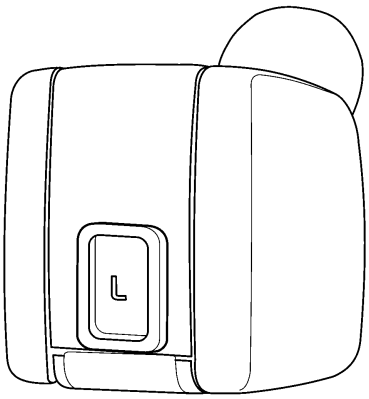
W4002855

Folding the Selector

Limp Home Mode

Note: Limp Home Mode should only be used to get a vehicle to a safe or secure location. It is not meant for driving any distance.

At times when a major sensor failure or internal transmission damage has occurred, “Limp Home Mode” can be activated. Press and hold the L button on the gear selector while moving the gear lever to the D position to active “Limp Home Mode”. When activated, L is displayed as the driving mode in the driver information display (DID). In “Limp Home Mode”, only forward gears 1, 3 and 5 are available for vehicles with the premium selector and only first gear for vehicles with the basic selector. No matter which selector the vehicle has, reverse gear 1 is available also. The vehicle must be stationary to shift gears. The “Limp Home Mode”, will be deactivated when the ignition key is turned to OFF position. This mode is only meant to get a vehicle to a safe or secure location. It is not meant for driving any type of distance.



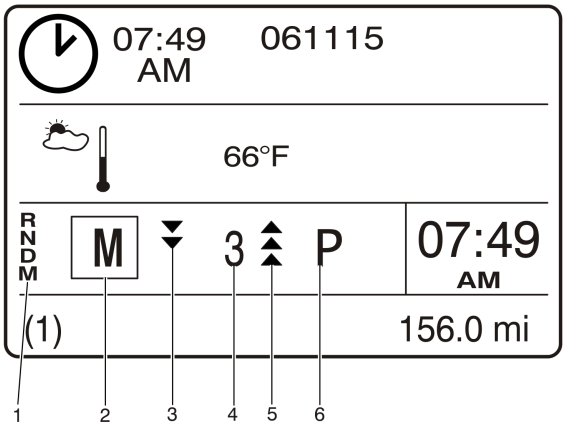
W4002856

Limp Home Mode Button

Driver Information Display (DID)

Note: For basic operator information about the DID, refer to the Operator’s Manual.

The DID in the instrument cluster provides current operating information.



W4002916

1 Gear Selector Pattern

2 Gear Range

3 Available Gears (down)

4 Current Gear

5 Available Gears (up)

6 Driving Mode (program package level with shift lever in folded position)

Programming and Features

I-Shift Hill Start Assist

⚠ DANGER

Hill Start Assist is only intended to temporarily hold the vehicle on a grade during a vehicle launch. The vehicle brake must be applied, independent of Hill Start Assist, to hold the vehicle on a grade for an extended period of time. Failure to follow this instruction can result in loss of vehicle control and serious personal injury or death.

Note: For basic operator information about the Hill Start Assist feature, refer to the Operator's Manual.

The Volvo I-Shift Hill Start Assist feature (option), provides the operator with anti-rollback assistance during vehicle launch on a hill. Hill Start Assist works by applying the vehicles brakes when in a forward gear and starting on an incline, or in a reverse gear when starting on a decline. When enabled, it automatically activates when all of the following conditions are met:

- Ignition key in the RUN position and the engine speed (RPM) is present
- **and** the vehicle speed is equal to 0 km/h (0 mph)
- **and** vehicle is in a forward gear on an incline equal to or greater then 2%, or in a reverse gear on a decline equal to or greater then 2%
- **and** the service brake applied
- **and** the Hill Start Assist disable switch is not selected
- **and** no failures with expected SAE J1939 data link communications are present
- **and** the function is not in a downgraded mode.

Function in a downgraded mode:

- When an existing fault or loss of information from other necessary control modules such as the transmission control module (TCM) and the anti-lock brake system control module (ABS).
- Another downgraded mode would be if braking with active ABS, automatic traction control (ATC) or electronic stability program (ESP) is detected.

Activation of the system is triggered by the release of the service brake pedal. Once activated, brake chamber pressure is maintained for up to three seconds or until positive torque is identified in the drive line (which ever occurs first). When active, the driver information display (DID) will read "Hill Start Assist Active" to alert the operator of the function.
Hill Start Assist always defaults to the on position upon vehicle start up. A momentary switch is located on the dash for temporary deactivation of the feature but, will re-enable if the vehicle begins another drive cycle, the momentary switch is depressed again or the vehicle exceeds 20 km/h (12 mph). When temporarily disabled, the Hill Start Assist telltale in the instrument cluster will blink. This telltale is also used to alert the driver of a permanently disabled system, but the telltale will be solidly illuminated in this instance.

The following components are responsible for operating this feature:

- Hill Start Assist momentary switch
- Vehicle Electronic Control Unit (Vehicle ECU)
- Solenoids to the ABS

The following components are used to support the operation of this feature with input to the Vehicle ECU:

- TCM
- Brake Control Unit (ABS)

Program Packages

Note: For basic operator information about the program packages and there functions, refer to the Operator's Manual.

Aside from the I-Shift being programmed to compliment the engines characteristics, it is available with different optional program packages. These packages offer flexibility to tailor the truck to specific applications or operator needs. The transmission has different characteristics or features, depending on which program package software is installed in the transmission control module (TCM). It is also dependant on which features are active within the package. Some features within a given package can be deactivated to further tailor the system if desired. The following program packages are available.

- **Basic**
- **Enhanced Basic**
- **Performance**
- **Fuel Economy**
- **Comprehensive**
- **Gentle**

Program Package Identification

To identify which software level the transmission control module (TCM) is program with, move the gear selector to the folded position. With the selector in the neutral (N) position, press in the fold button and the lever can be folded forward. The Driver's Information Display (DID) then shows the software variant.

Software Variant Display Terms	Program Packages
B	Basic
EB	Enhanced Basic
P	Performance
FE	Fuel Economy
CO	Comprehensive
G	Gentle

Replacing the Program Package

When a program package is replaced, an update of the "Vehicle Data Administration (VDA)", must be performed before it can be downloaded into the vehicle. This is done by entering the appropriate "Conversion Kit Number" into the scan tool. For more information refer to, "VCADS PRO Conversion Kit and Accessory Kit Numbers" in function group 0. After completion of the conversion, reprogramming of the TCM (MID 130) must be carried out.

Package Features

Program packages are made up of different features. Some features are standard and some are optional within a program package. Not all features may be active within a given package and some parameters have adjustable values. This allows the operator flexibility to tailor the package to their specific needs or liking. For more information about these features and parameters refer to “Parameter Programming”, found in function group 1 in the scan tool.

Features	Basic	Enhanced Basic	Fuel Economy	Perfor-mance	Comprehensive	Gentle
Automatic Gear Shifting in Drive Mode	**X**	**X**	**X**	**X**	**X**	**X**
Manual Gear Shifting in Drive Mode				**X**	**X**	**X**
Manual Gear Shifting in Manual Mode	Hold Only	Hold Only	Hold Only	**X**	**X**	**X**
Manual Selection of Start Gear				**X**	**X**	**X**
Idle Governor Driving Mode		**X**	**X**	**X**	**X**	**X**
Economy Mode	**X**	**X**	**X**	**X**	**X**	**X**
Performance Mode				**X**[1]	**X**[1]	**X**[1]
Kick-Down		**X**[1]	**X**[1]	**X**[1]	**X**[1]	**X**[1]
Eco-Roll			**X**[1]		**X**[1]	**X**[1]
Extra Engine Brake Performance Mode	**X**[2]	**X**	**X**	**X**	**X**	**X**[1]
Dynamometer Mode	**X**	**X**	**X**	**X**	**X**	**X**
Standard PTO Features	**X**	**X**	**X**	**X**	**X**	**X**
Enhanced PTO Features	Optional	Optional	Optional	Optional	Optional	Optional

1 Feature can be enabled or disabled per customer preference

2 Limited functionality.

Feature Description and Function

- **Automatic Gear Shifting in Drive Mode**
  This mode is the default mode and should be used in most driving situations. When necessary or able, this automated mode will take full advantage of other I-Shift features whether its Engine Braking, Eco-Roll, Kick-Down, Performance Mode or Economy Mode. The starting gear will be selected based on the engine power rating, load and slope of the road. Typically the start gear is 1 or 2 with a trailer connected and 4 when bob-tailing. The transmission will perform all gear changes to optimize fuel economy or performance, depending on the mode selected.
- **Manual Shifting in Drive and Manual Mode**
  The driver can manually select gears using the up/down buttons located on the handle of the premium selector. The driver information display (DID) will indicate how many up/down gears are available by the means of up/down arrows.
- **Manual Selection of Starting Gear**
  In "Manual mode" the driver can select starting gears within the range from 1- 6 without trailer and 1–3 with a trailer connected. In “Drive Mode” the starting gear will be selected based on the engine power rating and slope of the road. However, the driver can adjust the selected gear by up to two gears above the calculated as long as it does not exceed "Highest available start gear". The highest available start gear is a customer programmable parameter in the range from 1-6 with a default value of 6.
- **Idle Governor Driving Mode**
  The idle drive mode allows driving in congested traffic without the need to constantly depress or release the accelerator pedal (AP). The transmission control module (TCM) fully engages the clutch and utilizes the engine control module (ECM) to control engine speed (RPM) by means of the engine idle governor. Although the engine load may vary, the idle governor will adjust the torque to maintain idle speed and constant vehicle speed. Since the clutch remains fully engaged it eliminates wear and over heating of the clutch. In order to enable the idle-drive mode, the vehicle speed is increased to a desired gear and then the pedal is fully released. Typically there are two methods of selecting a lower idle-driver speed. This can be accomplished by depressing the down-arrow on the gear lever or by slightly applying the service brake. Both will cause the transmission to down shift to a lower gear.
- **Economy Mode**
  When the key switch is turned on, the transmission is in Economy mode. An E is displayed as the driving mode in the DID. The transmission automatically selects shift points and engine parameters to optimize fuel economy. Economy mode should be used as the primary driving mode under normal conditions.
- **Performance Mode**
  In Performance mode, a P is displayed as the driving mode in the DID. The transmission strategy changes to optimize gradeability. The TCM is able (based on customer parameters) to revert back to Economy Mode if it determines that Performance Mode is no longer necessary.
- **Kick-Down**
  This feature is activated by depressing the AP all the way to the floor, thus depressing the kickdown switch located on the AP assembly. The system changes the gear selection strategy to maximize vehicle acceleration. Typically this results in an immediate gear downshift. In some situations depending on the available engine power, the TCM will not downshift. The kick-down is deactivated once the AP is lifted, thus releasing the kickdown switch.
- **Eco-Roll**
  Two versions of this feature exist. The basic version is activated when the brake stalk switch is in the A position where as the second version is activated with the brake stalk in the 0 position as well as the A positions. This feature optimizes the topology (down grades) by opening the driveline via the splitter gears, thus contributing to fuel savings. With the splitter gears being synchronized they are able to re-engage at an instant if the driver touches the brake, AP, or if the engine brake engages. The main section of the transmission stays in gear during this free-rolling. It operates when driving with the AP or with the cruise control set. With the cruise control set and the brake stalk in the A position, if the vehicle is free-rolling and the over speed setting of the cruise control is met, the engine brake will engage automatically to keep the vehicle at the desired max speed. When engaged, an E+ along with the text “Eco-Roll” is displayed in the driving mode window as well as an N in the current gear window within the DID when the vehicle is free-rolling. The second version is easily identified by a momentary switch on the dash board. The switch can be used to turn the feature off but the system defaults to **on** whenever the vehicle is started.

- **Extra Engine Brake Performance Mode**
  The Engine Brake Performance Mode is activated by moving the 6-position engine brake stalk switch to the B position, which is a momentary switch position. When activated, B is driving mode in the drivers display. When the Extra Engine Brake Performance mode is requested, the transmission monitors the RPMs and helps the engine provide maximum braking torque by automatically selecting a lower gear(s) in order to keep the engine speed as high as possible. This function is only available in the high range gears (7–12) and will automatically disable once a low range gear is attained.
- **Dynamometer Mode**
  A Dynamometer mode is part of all vehicles software for times when the vehicle is run on a dynamometer. The I-Shift transmission, will not up shift if the front wheels are not moving at or near the same speed as the rear wheels. Due to this, when on a dynamometer, place the gear selector in the D position and depress the AP all the way to the floor. The vehicle will hold its present gear for 10 second at which time, the dynamometer mode will engage and the transmission will begin to shift. To disengage dynamometer mode, release the AP. When the transmission is operated in Dynamometer Mode, E^ is displayed as the driving mode in the DID.
- **Standard Power Takeoff (PTO) Features**
  The Basic PTO Function is standard with the I-Shift transmission and is always available. Predefined splitter positions are included in the Basic function. It is possible to set software parameters that define which splitter gear to engage when transmission PTO 1 and/or 2 are engaged.
- **Enhanced PTO Features**
  The Enhanced PTO Functions option for I-Shift make it possible to activate PTO features by setting software parameters. The following list show the features and require that a bodybuilders module (BBM) is installed in the vehicle.

  1 **Gear Selection adaptation to RPM limits** It is possible to set software parameters that will limit the RPMs when engine or transmission PTO(s) are used. This feature will adapt the gear selection strategy to these speed limitations.

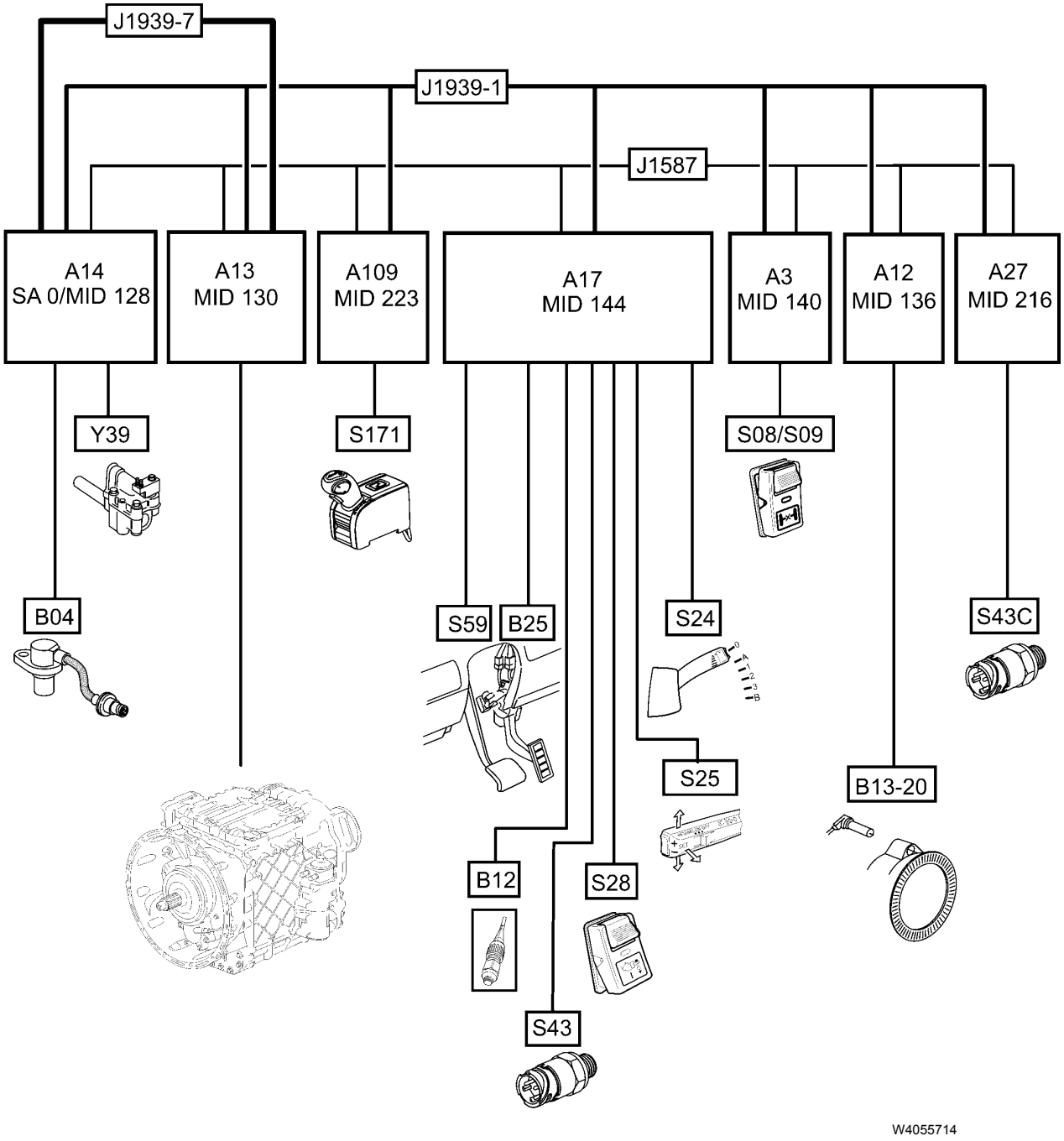
  2 **Auto Neutral** The “Auto Neutral” function provides the transmission the ability to go to neutral and back into gear based on an external input (e.g. parking brake status), regardless of the gear lever position.

  3 **Reverse Inhibit** The “Reverse Inhibit” function provides necessary applications the ability to block the reverse gear even though the operator has moved the gear lever to reverse.

  4 **Split Box Engagement** The use of a chassis mounted splitter box for running high capacity PTO(s), is supported by the software. The direct gear is engaged when the Body Builder Module engages the split box.

Communication With Other Electronic Control Units (ECUs)

Summary, Components (signal summary)



Component list

MID	Component	Description
SA 0/MID128/ECM	A14	ECM (engine control module)
	B04	Sensor, crankshaft position (CKP)
	Y39	Solenoid valve, VCB (Volvo compression brake)
MID130/TCM	A13	TCM (transmission control module)
MID223/GSCM	A109	GSCM (gear selector control module)
	S171	Gear selector
MID144/Vehicle ECU	A17	Vehicle ECU (vehicle electronic control unit)
	S59	Position switch, brake pedal
	B25	Sensor, accelerator pedal (with kickdown)
	B12	Sensor, output shaft speed (road speed)
	S43	Pressure switch, parking brake
	S28	Switch, power takeoff
	S25	Stalk switch, cruise control
	S24	Stalk switch, engine brake
MID140/Central Instrument Cluster	A3	Instrument cluster
	S08/S09	Switch, differential lock / wheel lock
MID136/ABS	A12	ABS control unit (anti-lock brake system control module)
	B13-20	Sensor, wheel speed
MID216/LCM	A27	LCM (lamp control module), external lighting
	S43C	Pressure Switch, Trailer parking brake

Communication with Engine Control Module (ECM), SA 0/MID 128

Signals / information:

- Engine signals such as; engine speed (RPM) and torque monitoring

Communication with Gear Selector Control Module (GSCM), MID 223

Signals / information:

- Gear selector input

Communication with Vehicle ECU, MID 144

Signals / information:

- Accelerator pedal (AP) position, including “kickdown”.
- Cruise control.
- Power takeoff (PTO) control
- Brake pedal status
- Parking brake status
- Engine brake stalk switch
- Hill start assist (HSA)

Communication with Instrument Cluster MID 140

Signals / information:

- Gear selector display information
- Driver information display (DID) warnings
- On board diagnostics trouble codes (DTCs) for the TCM and GSCM

Communication with Anti-Lock Brake System (ABS) Control Module, MID 136

Signals / information:

- Wheel speed sensor information
- ABS status information
- Traction control status information
- Volvo enhanced stability technology (VEST) information
- Hill start assist (HSA)

Communication with Lighting Control Module (LCM), MID 216

Signals / information:

- Trailer parking brake switch status, (trailer connected)
- The transmission control module (TCM) will select the wrong starting gear and wrong gears if the parameter ID “ANI” is not enabled. Since the TCM can not detect if a trailer is connected, the TCM will default to the lowest possible starting gear.
- Reverse lights (lights are illuminated once the reverse gear is physically attained)

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88951965[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

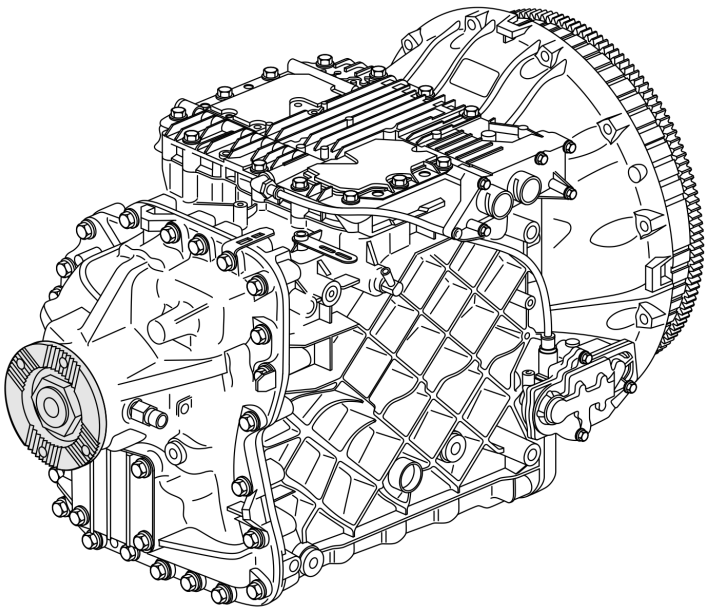
Date	Group	No.	Release	Page
4.2010	**431**	**06**		1(6)

This service bulletin replaces bulletins 431-06 “Companion Flange, Replacement”, dated 11.2007.

Companion Flange, Replacement

I-Shift Transmission

Companion Flange, Replacement



W4002884

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Companion Flange, Replacement”, page 2

4317-03-02-01
Companion Flange, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

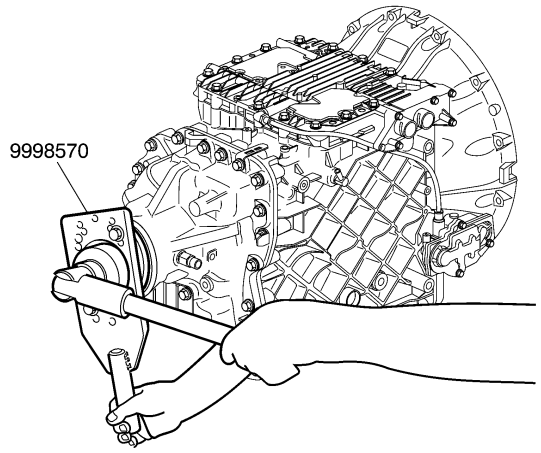
Special tools: 9998570 , 9990084, 9992619, 9992653, 9992671, 9998597, 9996222, 9998575, 9996315, 9996901, 9996925,

1
Apply the parking brake.

2
Clean the transmission around the companion flange.

3
Remove the universal joint caps. Disconnect the front of the drive shaft from the yoke and position it aside.

4
Remove the universal joint yoke from the companion flange.



W4002957

5
Remove the companion flange nut.

Note: Attach the counterhold tool and remove it after companion flange nut removal.

9998570

6
Assemble companion flange removal tools.

1 Attach tool 9998597 to the companion flange.

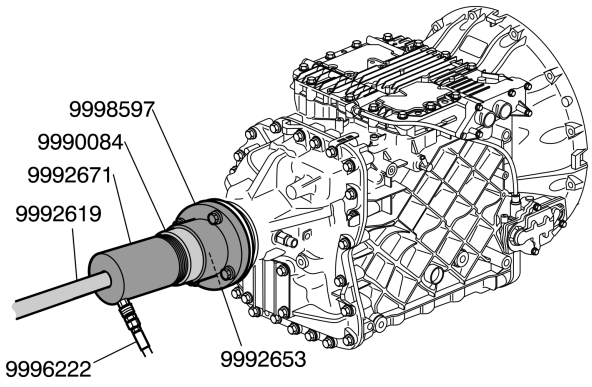
2 Assemble tools 9992619 and 9992653 together and thread tools 9992671 and 9990084 together.

3 Thread tool 9992619 all the way into tool 9992671.

4 Thread tool 9990084 into tool 9998597.

5 Adjust tool 9992619 inward until it touches the output shaft.

9990084 , 9992619 , 9992653 , 9992671 , 9998597



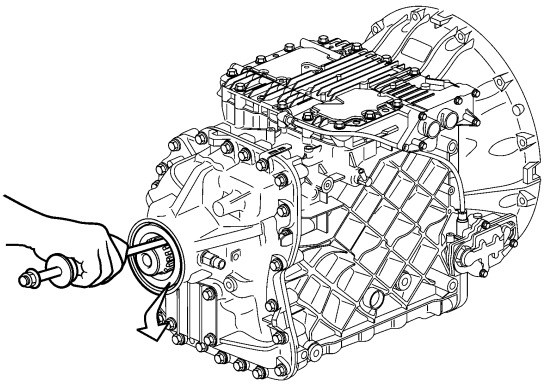
W4002956

7
Pull off the companion flange.

Note: Attach tool 9996222 to provide hydraulic pressure.

Note: It is always necessary to replace the output shaft seal when the companion flange is removed or replaced.

9990084 , 9992619 , 9992653 , 9992671 , 9996222 , 9998597

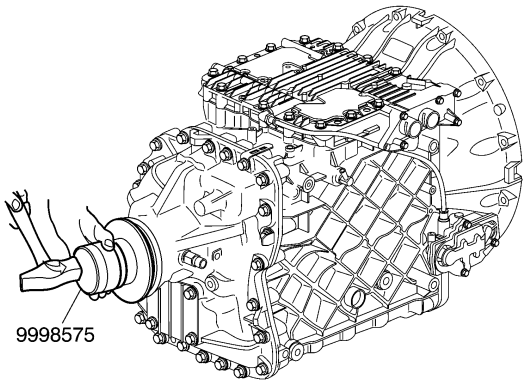


W4002958

8
Using a suitable extracting tool, remove the output shaft seal.

9
Clean the seal mating surface in the transmission tail housing.

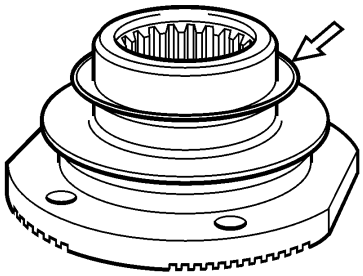
10
Lubricate the new seal lip with grease.



W4002959

11
Install the output shaft seal.

9998575

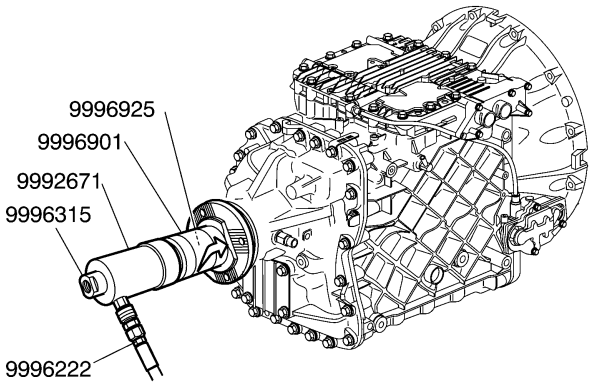


T4018998

12
Replace the V-ring on the companion flange.

Note: The V-ring should lie against the stop on the companion flange.

Note: Inspect the companion flange mating surfaces to ensure that there is no visible damage.



W4002960

13

CAUTION

Under no circumstance should the companion flange be heated or hit with a hammer. Install using only the approved special tools. Installing it by any other means, may lead to component damage.

CAUTION

The companion flange must be completely installed before installing or tightening the retaining nut. Failure to press it on completely, may result in damage to the output shaft bearing or the range oil pipe.

Assemble the installation tools and press the companion flange on the output shaft.

1 Position the companion flange on the output shaft.

2 Thread tool 9996925 into the end of the output shaft.

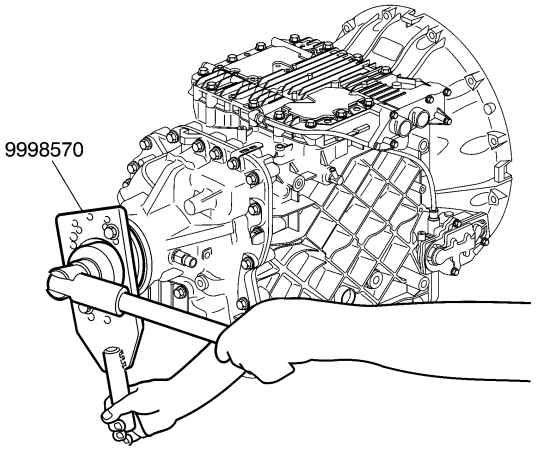
3 Place tools 9996901 over 9996315 and thread tool 9996315 into 9996925 until it bottoms.

4 Slide tool 9992671 onto tool 9996315 and install the mounting nut on the end of the assemble.

9992671 , 9996222 , 9996315 , 9996901 , 9996925

14

Install a new O-ring for the companion flange nut.



W4002957

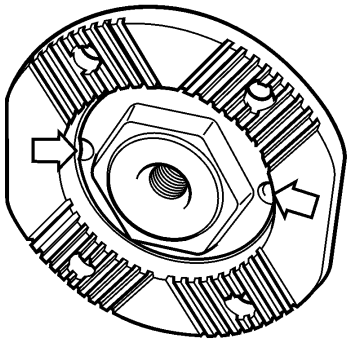
15

Install and torque the companion flange nut.

Note: Attach the counterhold tool and remove it after companion flange nut is installed and torqued.

Note: An assistant may be necessary to install and torque the companion flange nut.

550±50 Nm (406±37 ft-lb) 9998570



T4018646

16
Lock the companion flange nut in place. Using a punch, peen the nut in both recesses on the companion flange.

Note: The punch must have a rounded tip and should be pushed in to the bottom. Check that no cracks have occurred.

17
Install the universal joint yoke on the companion flange and torque the mounting bolts.

190±15 Nm (140±11ft-lb)

18
Position the drive shaft back into its yoke. Install the universal joint caps and torque the mounting bolts.

166±10 Nm (122±7 ft-lb)

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88952038[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

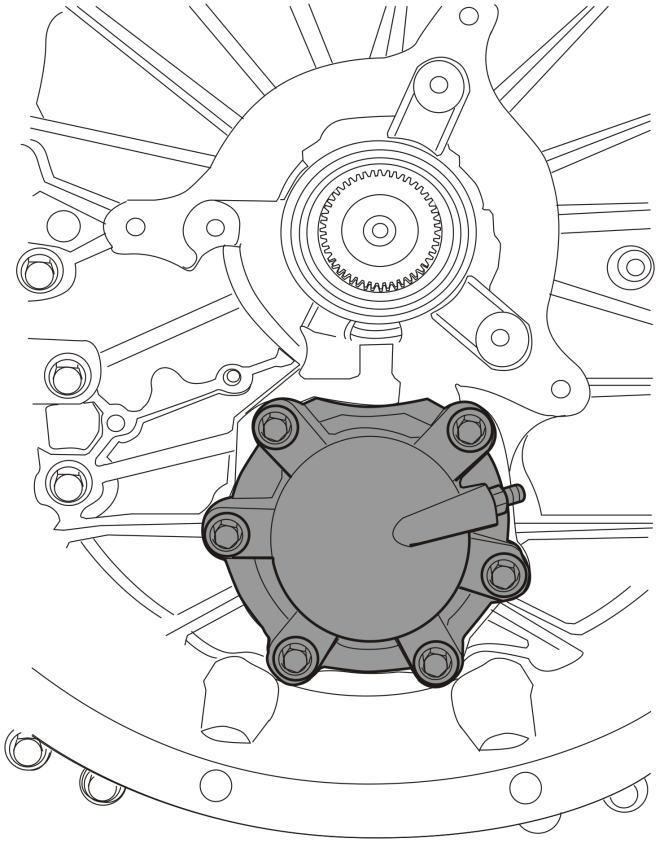
Service Bulletin Trucks

This service bulletin replaces bulletin 431-11 “Brake, Intermediate Shaft, Overhaul", dated 6.2007.

Brake, Intermediate Shaft, Overhaul

I-Shift Transmission

Brake, Intermediate Shaft, Overhaul



W4002903

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Brake, Intermediate Shaft, Overhaul”, page 2

4313-04-02-02
Brake, Intermediate Shaft, Overhaul

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

Special tools: 85108826

1
Apply the parking brake.

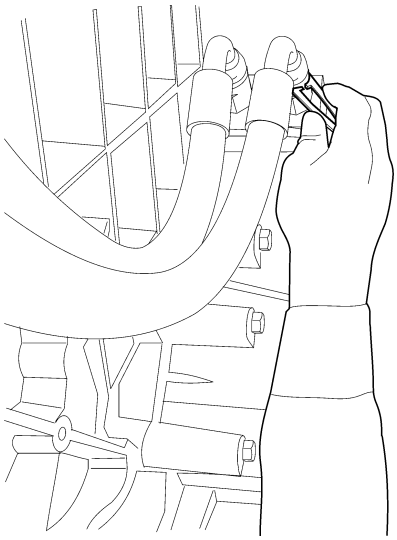
2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

4
Raise the vehicle and support with jack stands.

5
Remove the transmission drain plug and drain transmission oil. Install and torque the plug.

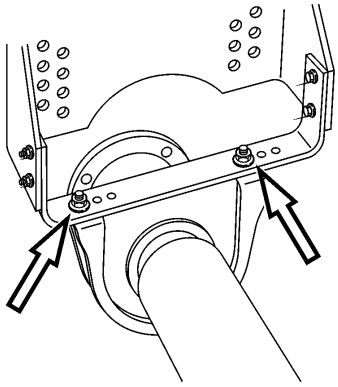
35±5Nm (26±4 ft-lb)



W4002890

6
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

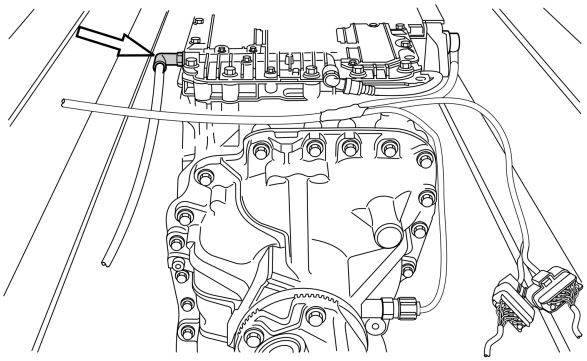


T4018155

7
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

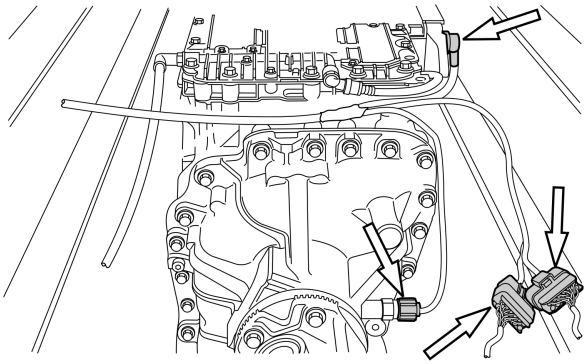
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

8
Disconnect the air supply hose at the rear of the transmission.

9
Remove the tie straps securing the wiring harness to the transmission.



W4002941

10
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

11
Remove the cab engine cover.

12
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

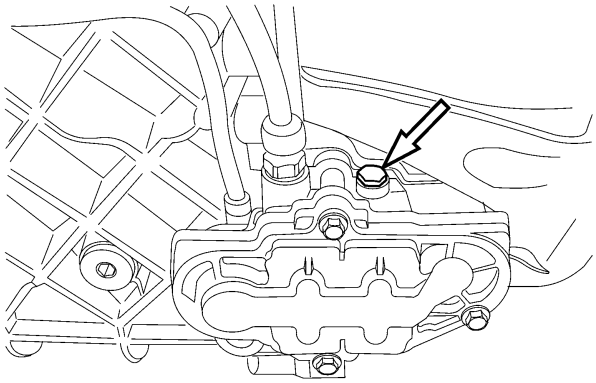
13
Position the transmission jack and secure the transmission to it.

14
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

15
Remove the top four transmission-to-engine mounting bolts.

16
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.



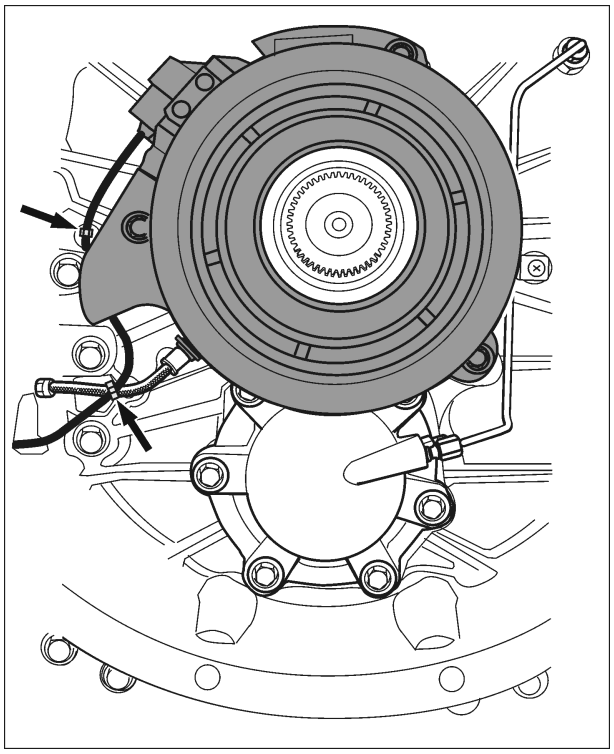
W4002879

17

⚠ DANGER

The Clutch Valve Unit contains air under high pressure. Do not remove the drain plug entirely because doing so may allow the plug to quickly and forcefully become a projectile. Leave the drain plug slightly cracked to allow air pressure to be released. Failure to do so may result in serious personal injury.

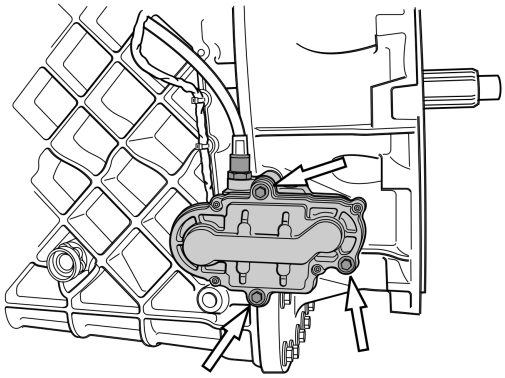
Remove the service plug located on top of the clutch valve to ensure that no air remains in the system.



T4021344

18

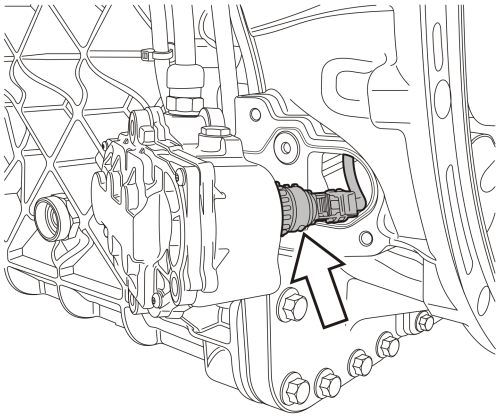
Carefully remove the tie straps for the wiring harness and remove the air supply hose to the clutch cylinder.



W4002923

19

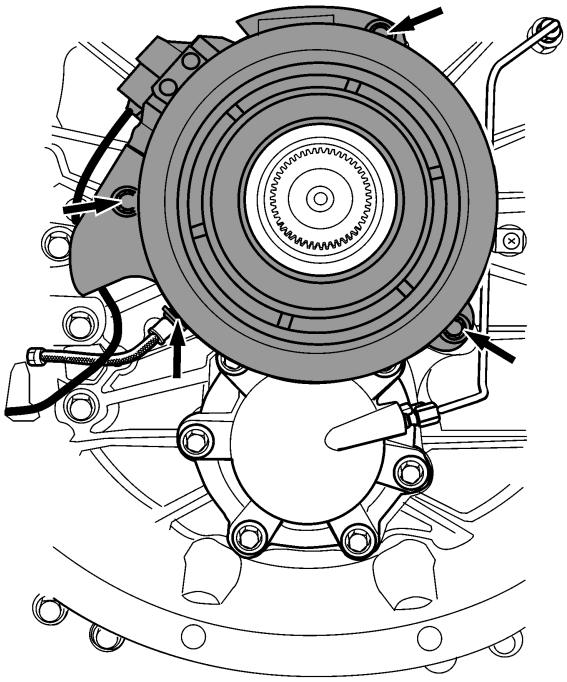
Remove the clutch valve mounting bolts.



W4002924

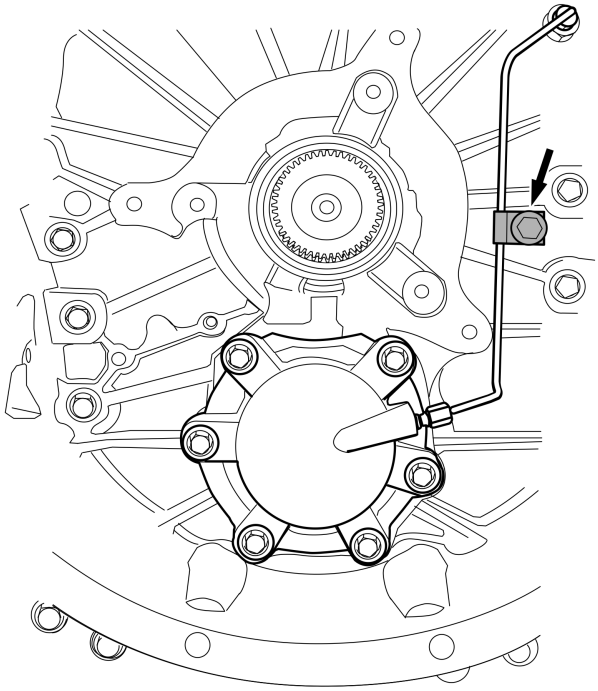
20

Disconnect the clutch position sensor wiring and position the clutch valve aside.



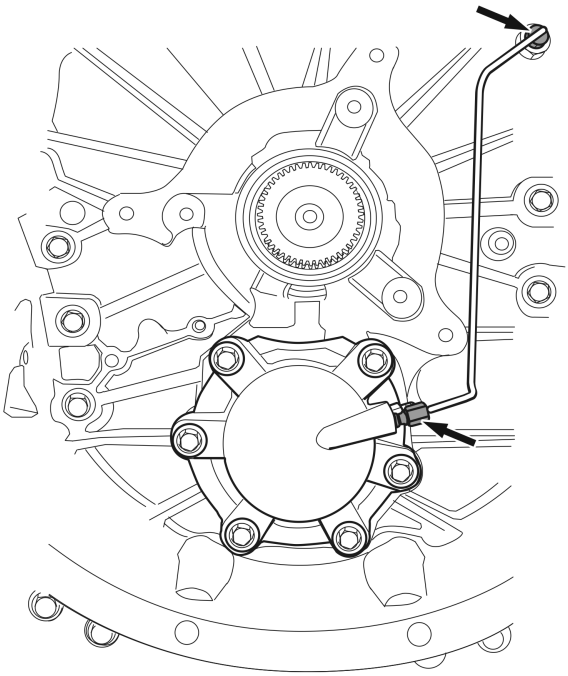
T4020990

21
Remove the clip holding the air hose in the clutch cylinder. Disconnect the air hose from the clutch cylinder. Remove the clutch cylinder mounting bolts and then the clutch cylinder.



W4002926

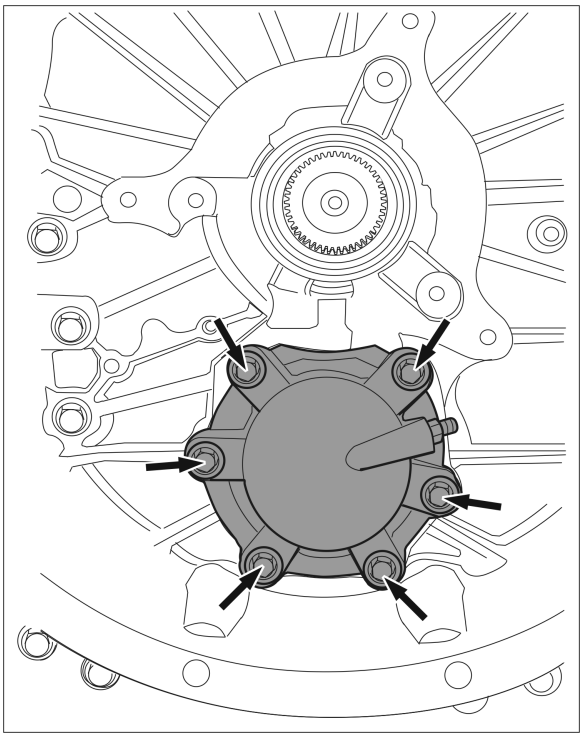
22
Remove bolt securing the air supply tube P-clamp.



T4021419

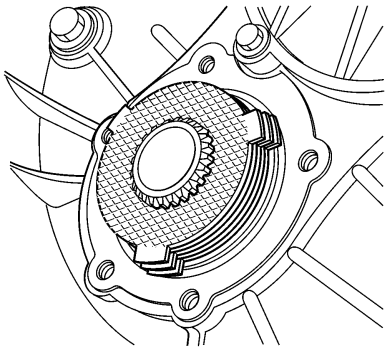
23
Disconnect the air supply tube from the intermediate shaft brake cover.

Note: Loosen the tubes upper fitting and disconnect the lower fitting. Rotate the tube to the side and gently tighten the upper fitting to keep the tube in position.



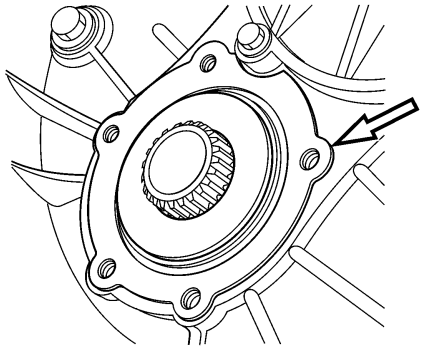
T4021474

24
Remove the intermediate shaft brake cover.



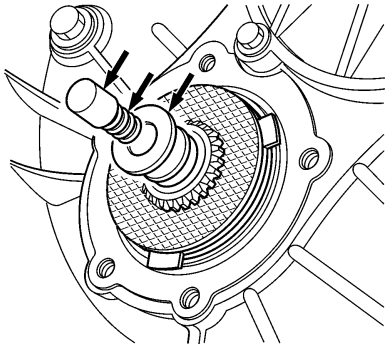
T4022010

25
Remove the brake plates, two friction plates and three steel plates.



T4022008

26
Remove the intermediate shaft brake cover gasket.



T4019286

27
Remove the piston, the spring and the sleeve.

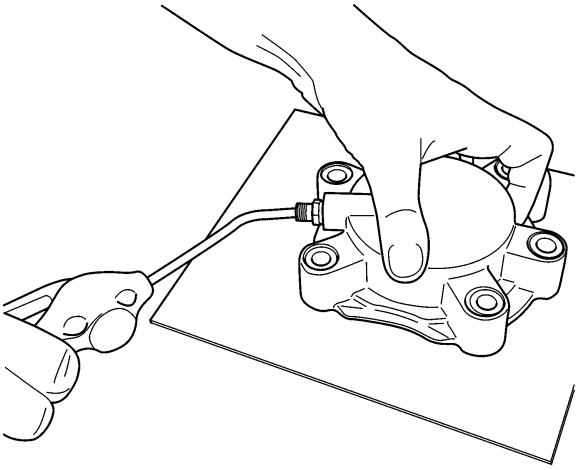
Note: Replace the sleeve O-ring.

28
Inspect the contact surfaces on the friction and steel plates.

Note: Friction plates that are completely or partially worn out and steel plates that are tarnished blue or damaged need to be replaced.

29
Wash and inspect all parts that are to be reused.

Note: The friction plates must not be washed.



T4021420

30

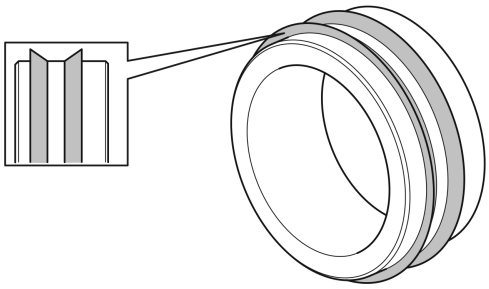
⚠ DANGER

For safety reasons, the cylinder must point piston side down toward a workbench. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

⚠ CAUTION

Place the cylinder on a clean soft surface such as a few shop towels, to avoid damaging the piston.

Slowly apply compressed air into the cylinder inlet to remove the piston and seals.



T4021421

31

Remove the old seals from the piston and install new seals. The new seal should be installed with the lips facing away from each other.

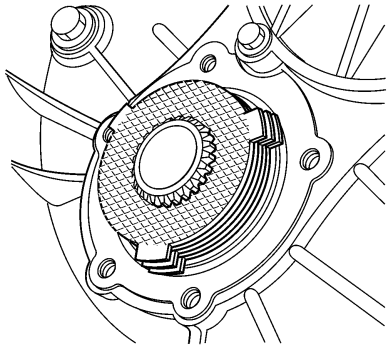
Note: Coat the seals with clean transmission oil.

32

⚠ CAUTION

Care must be exercised when inserting the piston to avoid damaging the seals.

Insert the piston into the cylinder and gently press it into place.



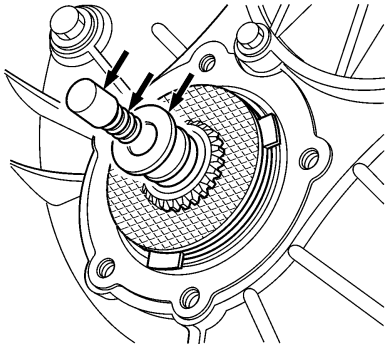
T4022010

33

Install the friction plate and steel plates. Start and finish with steel plates. Alternate the two friction plates and three steel plates during installation.

Note: To ease assembly, place the last steel plate inside the brake cover and install it with the cover.

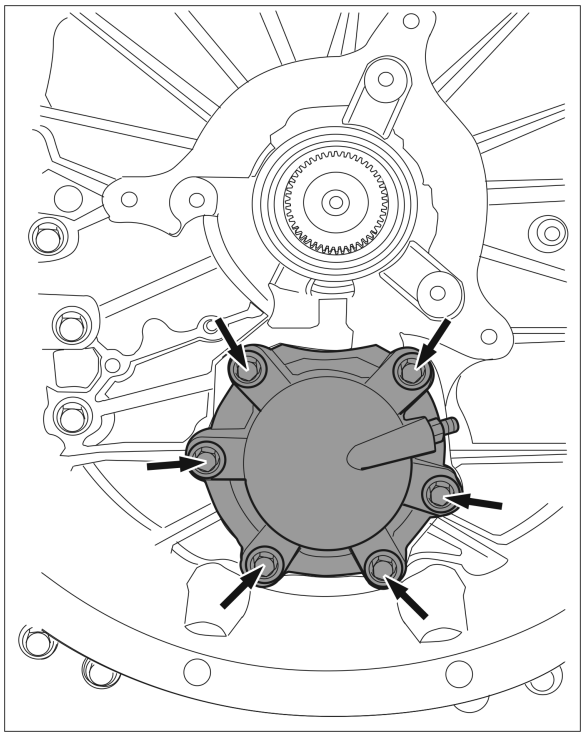
Note: Lubricate the plates with clean transmission oil.



T4019286

34
Install the sleeve with its new O-ring, the spring and the piston.

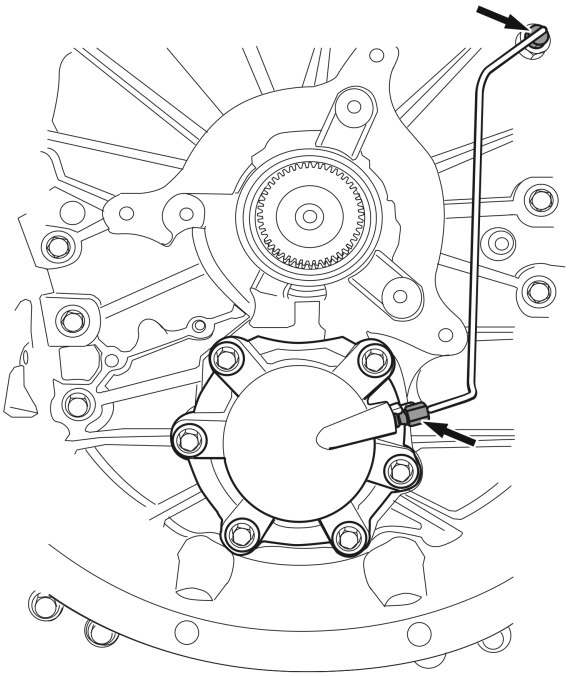
Note: Coat the sleeve with clean transmission oil.



T4021474

35
Install the intermediate shaft brake cover and a new cover gasket over the discs. Install and torque the mounting bolts.

45±5 Nm (33±4 ft-lb)

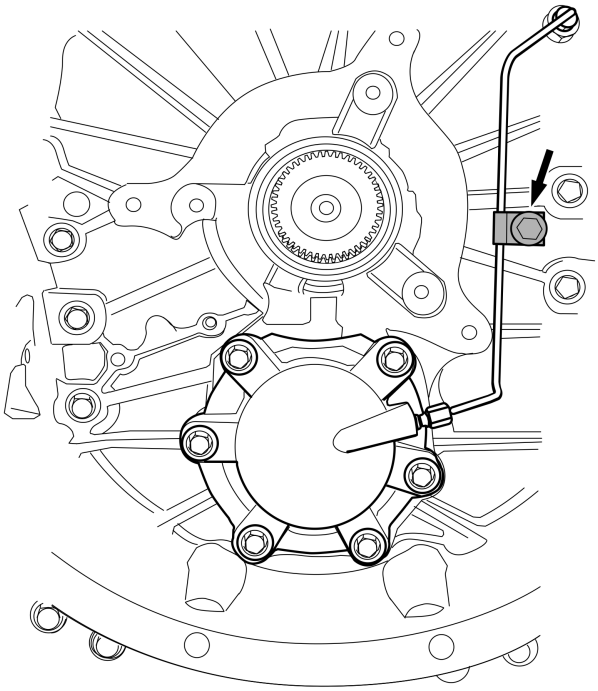


T4021419

36
Attach the air supply tube to the intermediate shaft brake cover and torque the fittings.

Note: Clean the threads for the air tube prior to attaching.

25±4 Nm (18±3 ft-lb)



W4002926

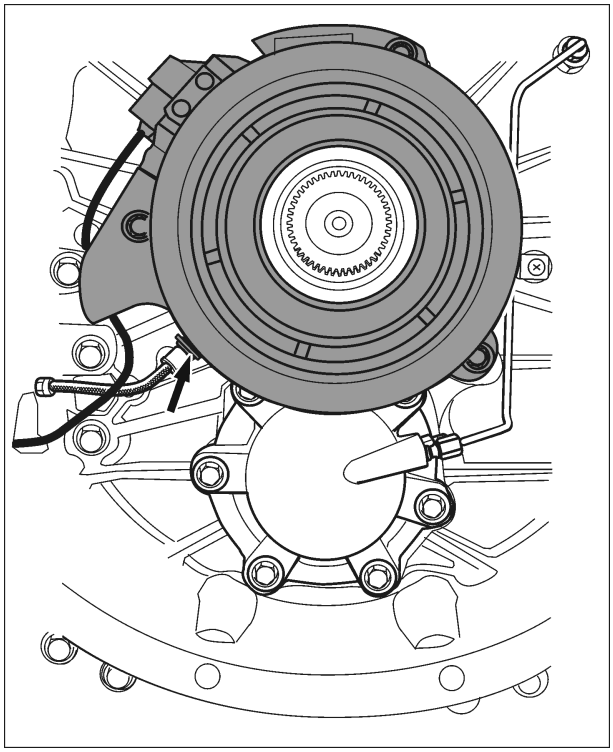
37
Install and torque the bolt securing the air supply tube P-clamp.

20±2 Nm (15±2 ft-lb)

38
Clean and inspect the supply hose connections. Replace the hose O-rings. If there is any damage to the hose or connections, replace the damaged part.

39
Position the clutch cylinder. Install and torque the mounting bolts.

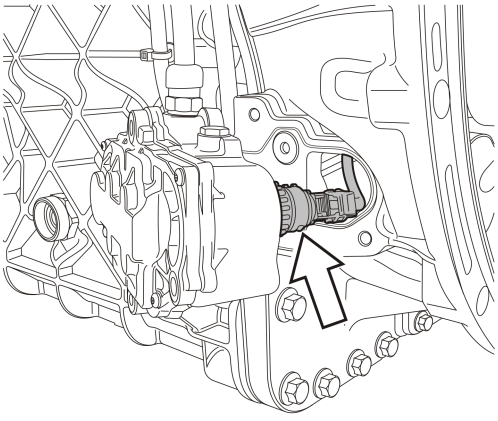
45±5 Nm (33±4 ft-lb)



T4021345

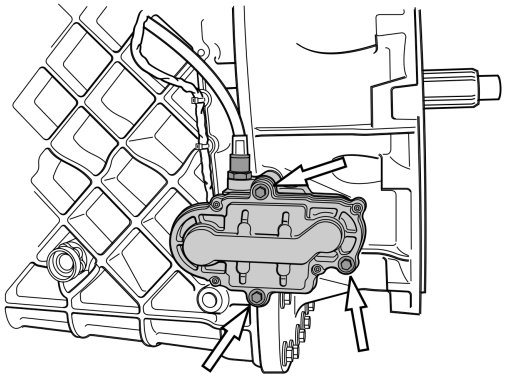
40
Connect the air hose to the clutch cylinder and install the locking clip.

41
Check that the sealing surface on the clutch valve is clean. Inspect the clutch valve seal and replace as needed.



W4002924

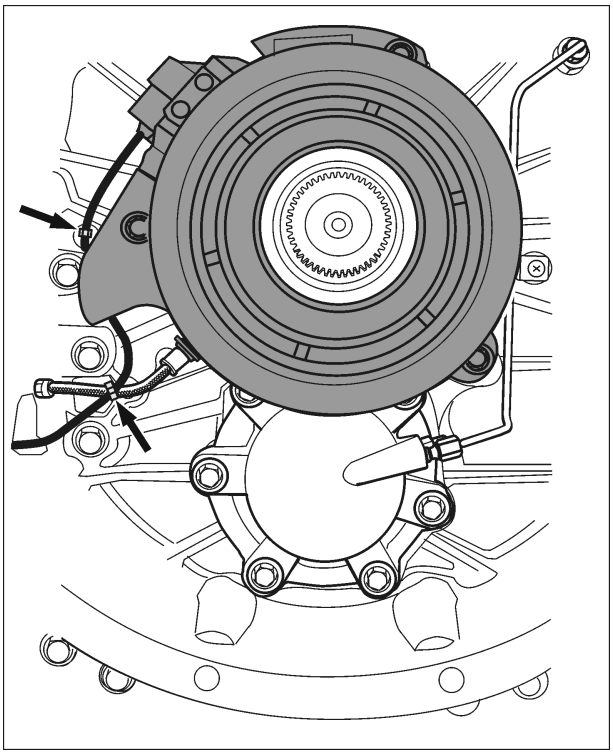
42
Connect the clutch position sensor wiring to the clutch valve.



W4002923

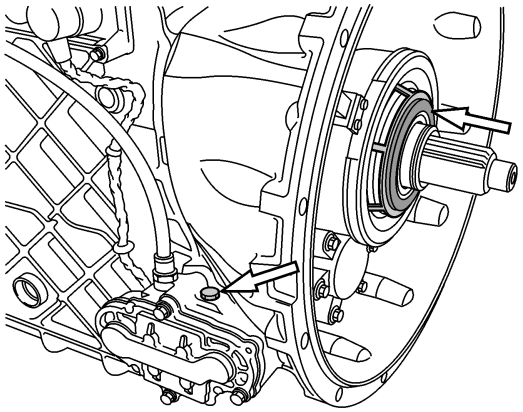
43
Install and torque the clutch valve mounting bolts.

20±3 Nm (15±2 ft-lb)



T4021344

44
Secure the wiring harness and air hose in position with new tie straps.



T4021203

45
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

46
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

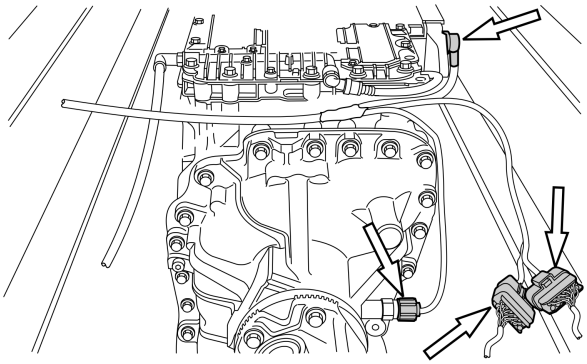
47
Install the remaining transmission-to-engine mounting bolts. Torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

48
Position the battery cables and install their mounting bolts.

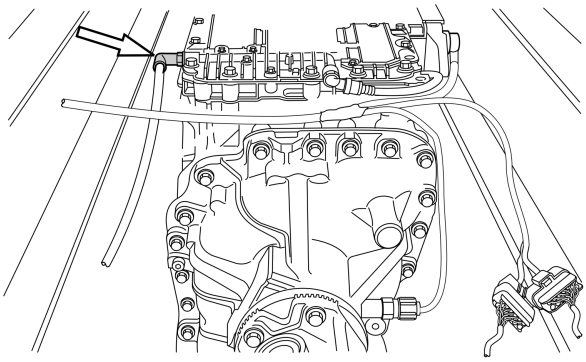
49
Install the cab engine cover.



W4002941

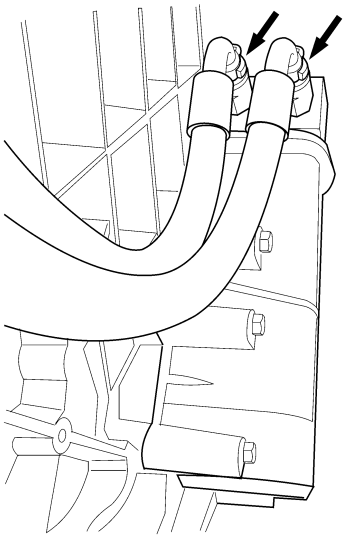
50
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

51
Install new tie straps to secure the wiring harness to the transmission.



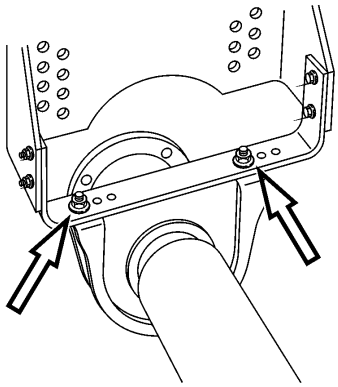
W4002940

52
Connect the air supply hose at the rear of the transmission.



W4002894

53
Connect the transmission oil cooler hoses to the filter housing.



T4018155

54
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

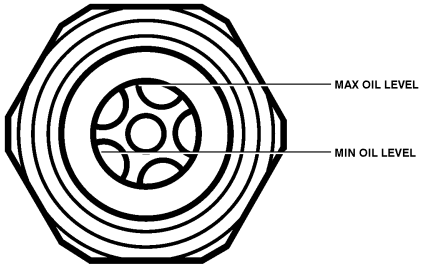
Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing - 175±30 Nm (129±22 ft-lb)
Universal Joint Caps - 166±10 Nm (122±7 ft-lb)

55
Remove the supporting jack stands and lower the vehicle.

56
Pressurize the air system and check for leaks.

57
Restore power to the vehicle by connecting the batteries negative cable.



T4021684

58
Fill the transmission with approved transmission oil.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88952819[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

Date	Group	No.	Release	Page
4.2010	**411**	**39**		1(11)

This service bulletin replaces bulletin 411–39 “Clutch, Replacement” dated 6.2007.

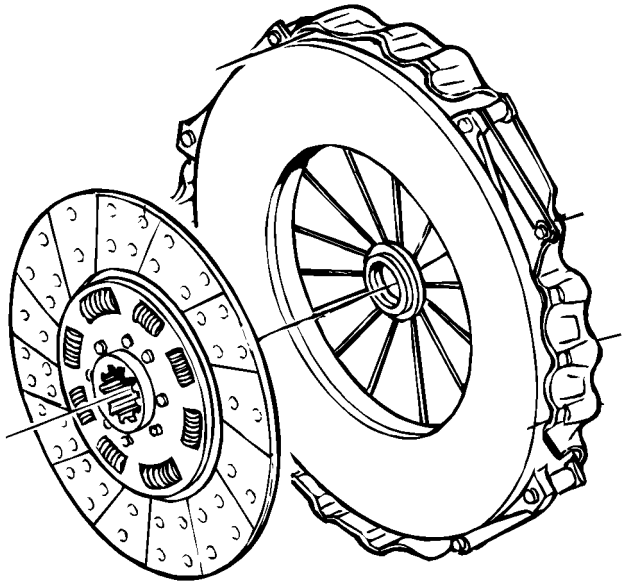
Clutch, Replacement

I-Shift Transmission

VN, VHD VERSION2

D11F, D11H, D13F, D13H

Clutch, Replacement



T4012799

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Clutch, Replacement”, page 2

4111-03-02-02
Clutch, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

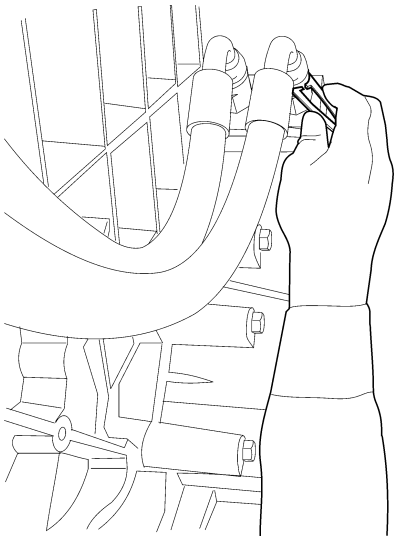
Special tools: 85108826 9990024 9996857 9991821 9992564 9991801 9996896 9996857 OTC 5018

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

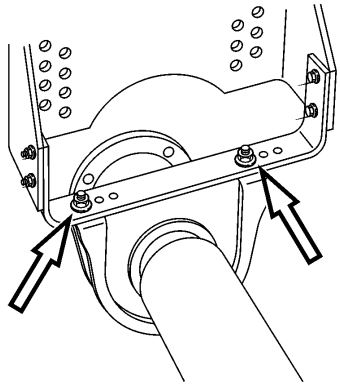
4
Raise the vehicle and support with jack stands.



W4002890

5
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

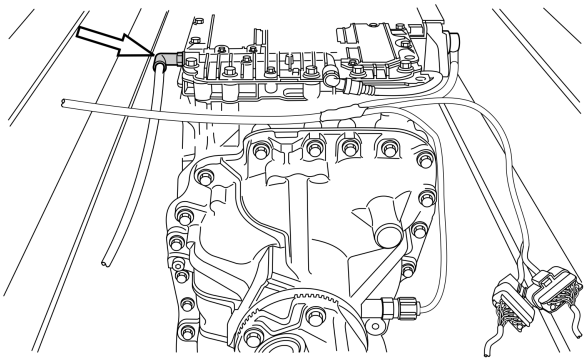


T4018155

6
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

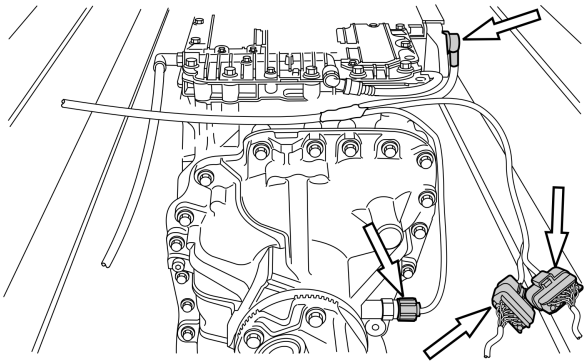
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

7
Disconnect the air supply hose at the rear of the transmission.

8
Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

12
Position the transmission jack and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

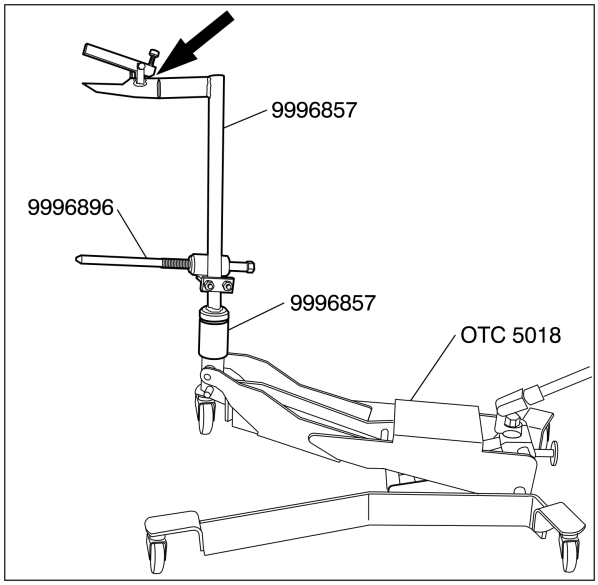
Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.

16
Install the clutch line up shaft.

9990024

17
Remove the bolts from the pressure plate by loosening them a couple of turns at a time in a diagonal pattern. Loosen the two nuts on the alignment studs.

Note: Do not fully remove the nuts from the two alignment studs.

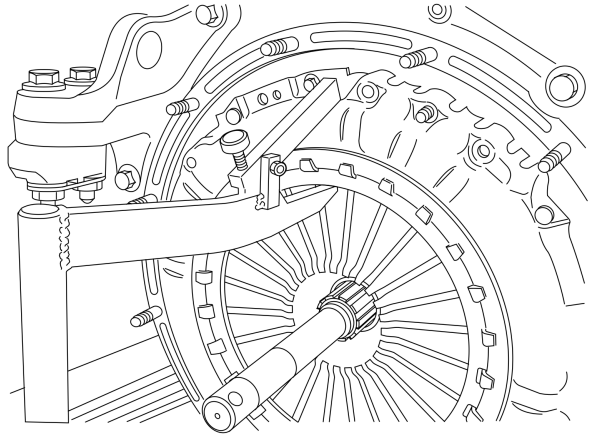


W4002943

18
Attach the lifting tool (9996857), the retainer (9996896) and the adapter (9996857) to the clutch jack (OTC 5018). Position the lifting hook on the lifting tool between the diaphragm spring and the casing. Adjust the lifting tool and retainer to the pressure plate.

Note: It will be necessary to modify the lifting tool by grinding or cutting off the corner (arrow shown in the accompanying illustration).

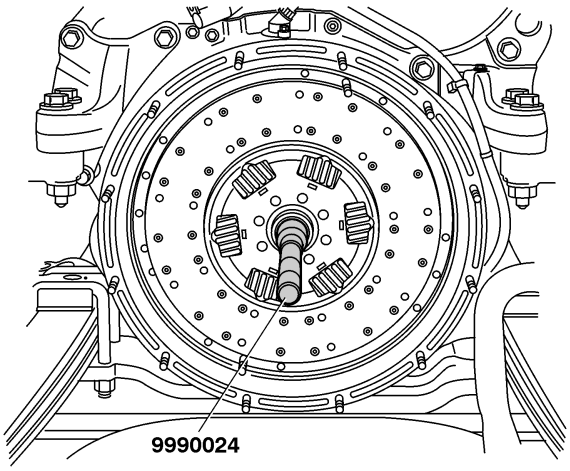
9996857, 9996896, 9996857, OTC 5018



W4002944

19
Remove the nuts from the alignment studs, and the pressure plate from the vehicle.

9996857, 9996896, 9996857, OTC 5018



T4021200

20
Remove the clutch disc and the line up shaft.

9990024

21
Inspect the flywheel for wear or damage and to ensure that it is clean and free of oil. Clean as necessary. Inspect the flywheel, clutch cylinder, release bearing, and clutch position sensor. Replace any damaged parts.

22
Remove the pilot bearing.

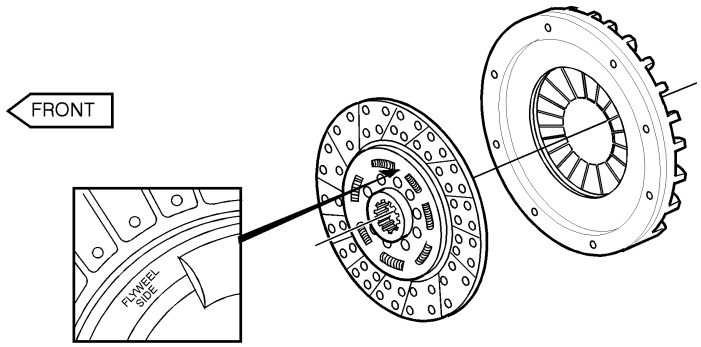
9991821

23
Install a new pilot bearing.

9992564, 9991801

24
Position the new pressure plate on the lifting tool.

Note: Note the orientation of the old pressure plate prior to removal and position the new pressure plate on the fixture in the same manner.



T4012503

25

CAUTION

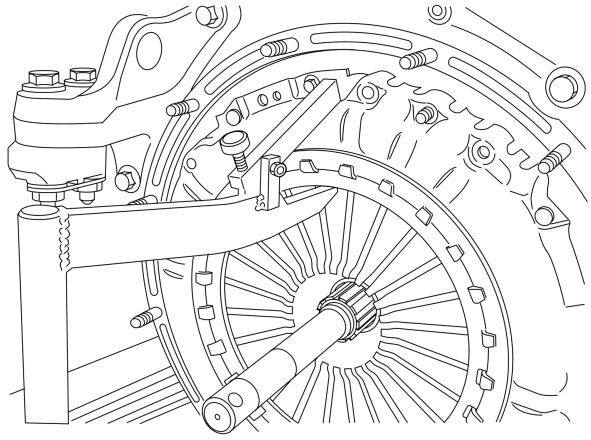
Do not install the clutch disc in the wrong direction! Correct installation of the clutch disc is essential for proper operation and to avoid damage. Failure to install the disc in the correct manner, will result in component damage.

Install the new clutch disc with the line up shaft.

Note: The clutch disc hub is stamped on the flywheel side. Be sure to install the clutch disc with that side facing toward the flywheel.

Note: A yellow sticker will be found on the pressure plate side of the clutch. Be sure to install the clutch disc with that side facing toward the pressure plate.

9990024



W4002944

26
Position the new pressure plate and loosely install the two nuts on the alignment studs.

9996857, 9996896, 9996857, OTC 5018

27
Remove the lifting tool and jack.

28

CAUTION

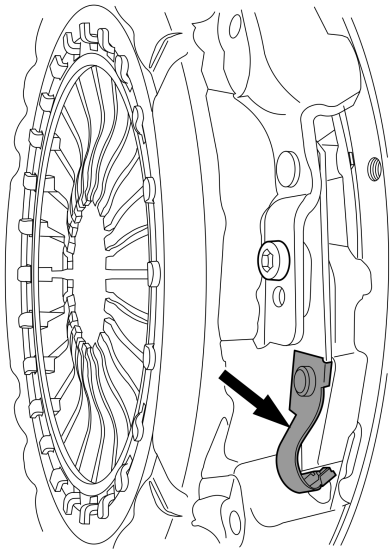
Retainer installation instructions must be strictly followed. Failure to follow the bolt tightening instructions, may result in component damage.

Install the mounting bolts for the pressure plate then torque the bolts and nuts.

Note: Tighten in a diagonal pattern a few turns at a time to assure that the pressure plate is not exposed to undue force.

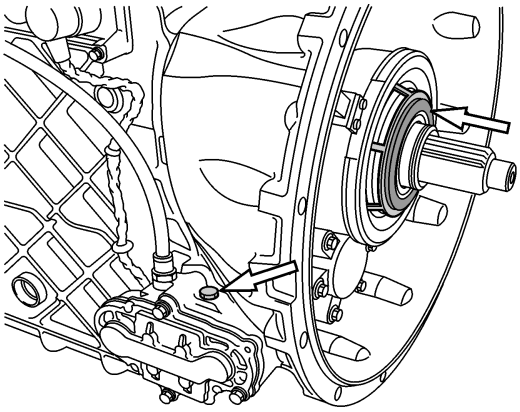
53±5 Nm (39±4 ft-lb)

29
Remove the clutch line up shaft.



W4002962

30
After the clutch and pressure plate are installed, make sure that all four form springs have snapped out.



T4021203

31
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

32
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

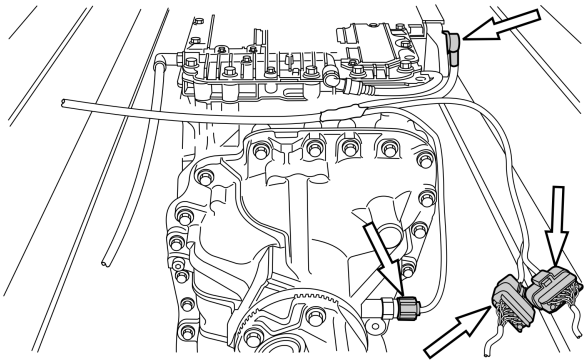
33
Install the remaining transmission-to-engine mounting bolts. Torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

34
Position the battery cables and install their mounting bolts.

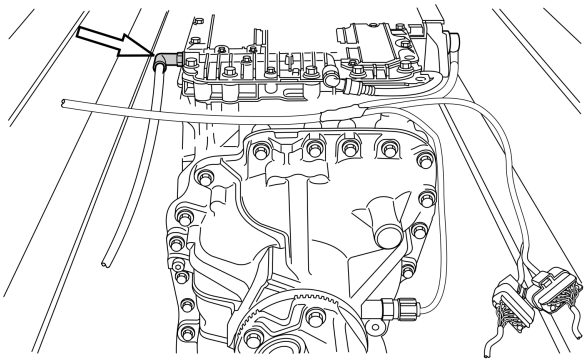
35
Install the cab engine cover.



W4002941

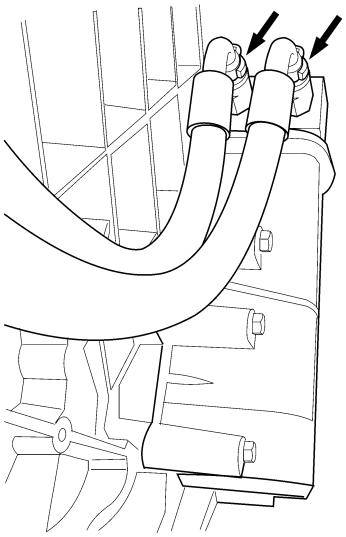
36
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

37
Install new tie straps to securing the wiring harness to the transmission.



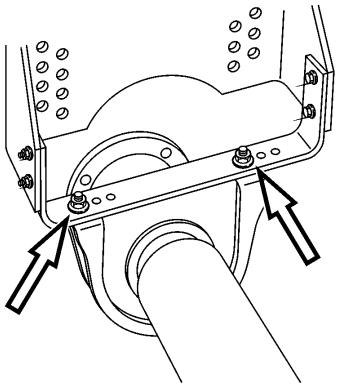
W4002940

38
Connect the air supply hose at the rear of the transmission.



W4002894

39
Connect the transmission oil cooler hoses to the filter housing.



T4018155

40
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

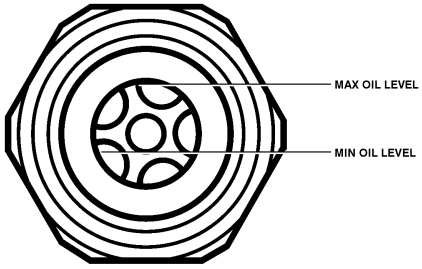
Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing - 175±30 Nm (129±22 ft-lb)
Universal Joint Caps- 166±10 Nm (122±7 ft-lb)

41
Remove the supporting jack stands and lower the vehicle.

42
Pressurize the air system and check for leaks.



T4021684

43
Restore power to the vehicle by connecting the batteries negative cable.

44
Check and fill the transmission with approved transmission oil.

45
After the transmission is installed, it is necessary to perform a “clutch engagement point calibration” using the scan tool.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88952983[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

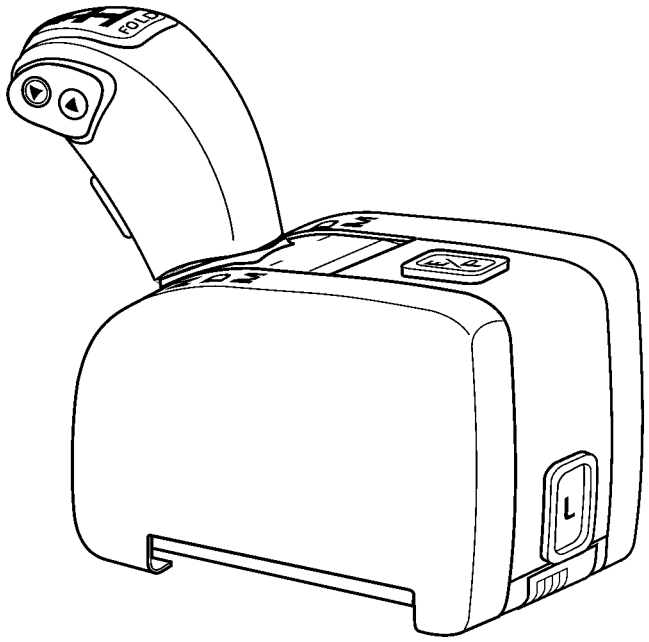
Date	Group	No.	Release	Page
4.2010	**432**	**01**		1(4)

This service bulletin replaces bulletins 432–01 and 432–08 “Gear Selector, Replacement” dated 6.2007.

Gear Selector, Replacement

I-Shift Transmission

Gear Selector, Replacement



W4002900

Note: Information is subject to change without notice.
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- “Gear Selector, Replacement”, page 2

4321-03-02-02
Gear Selector, Replacement

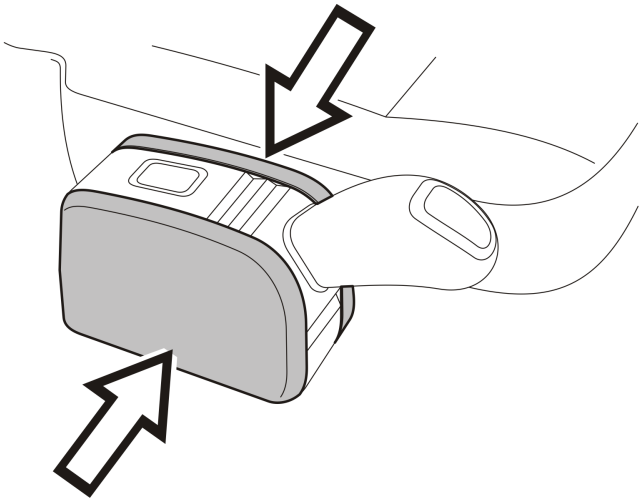
You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ CAUTION

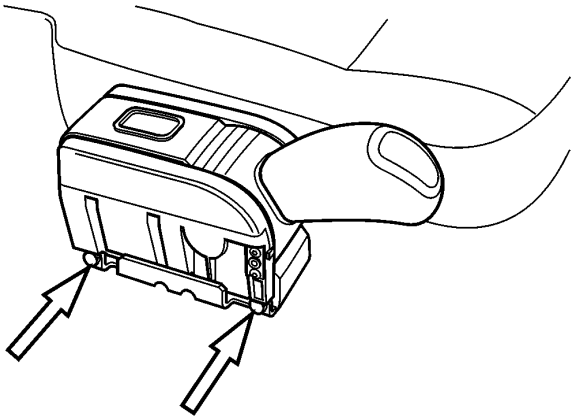
Possible damage to electronic components. Turn the vehicle ignition switch OFF before disconnecting or connecting any electronic components. Failure to de-energize circuits may result in permanent damage to electronic components.



W4002932

1
Remove both the side covers from the gear selector.

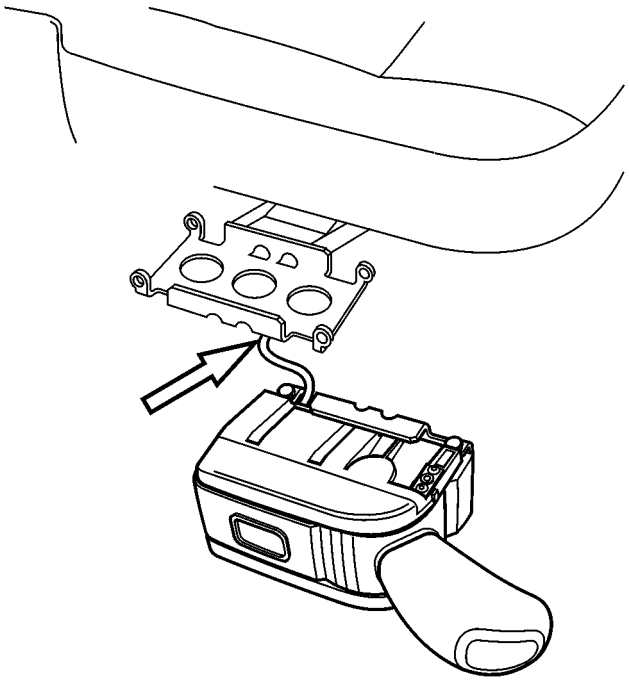
Note: It may be necessary to lift the front seat cushion upward to access the inner side of the gear selector. To do so, lift up the front of the seat cushion, slide it forward and then lift the back of the seat cushion upward.



T4019001

2
Remove the bolts holding the gear selector to the seat.

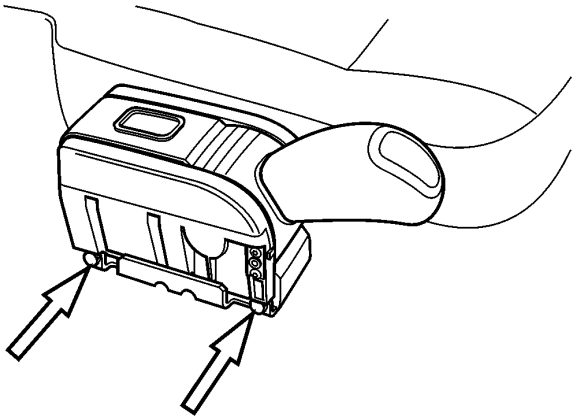
Note: Using a wrench, hold the nuts found on the inside of the selector.



T4018999

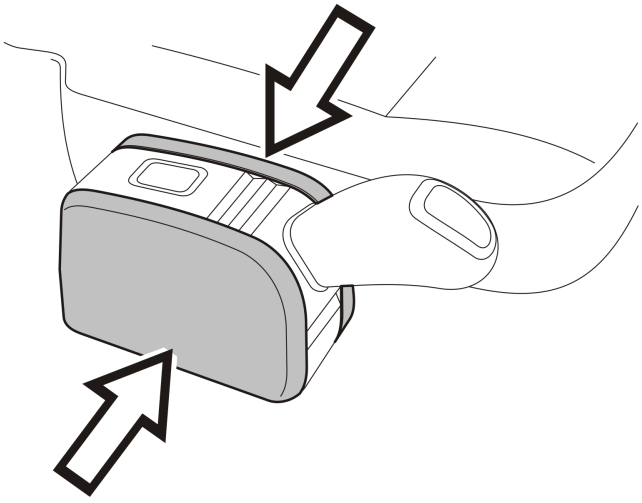
3
Disconnect the gear selector wiring harness connector and remove the gear selector.

4
Install the new gear selector and connect the selector wiring connector.



T4019001

5
Install the gear selector bolts.



W4002932

6
Install both the side covers from the gear selector.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88952996[1]

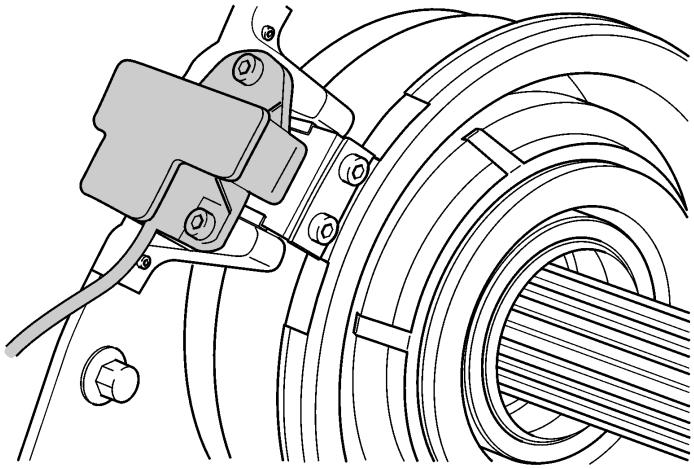
VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

This service bulletin replaces bulletin 413–08 “Position Sensor, Clutch, Replacement” dated 8.2008.

Position Sensor, Clutch, Replacement



T4021528

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Position Sensor, Clutch, Replacement”, page 2

4135-03-02-01
Position Sensor, Clutch, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

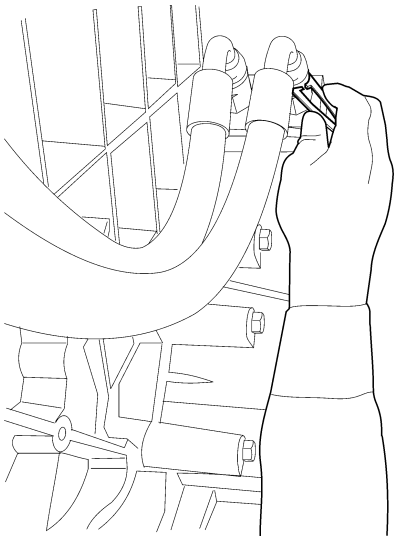
Special tools: 85108826

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

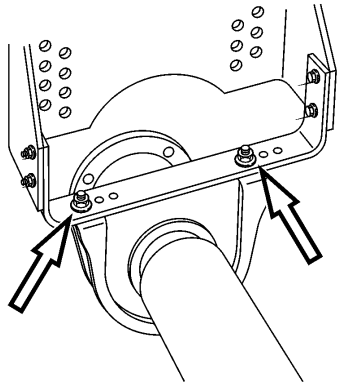
4
Raise the vehicle and support with jack stands.



W4002890

5
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

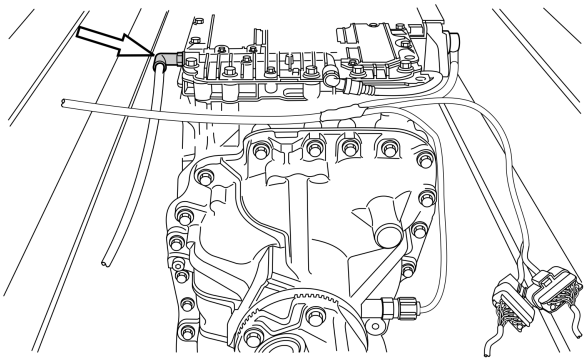


T4018155

6
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

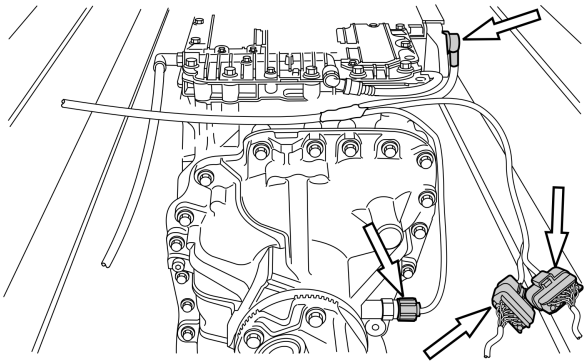
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

7
Disconnect the air supply hose at the rear of the transmission.

8
Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

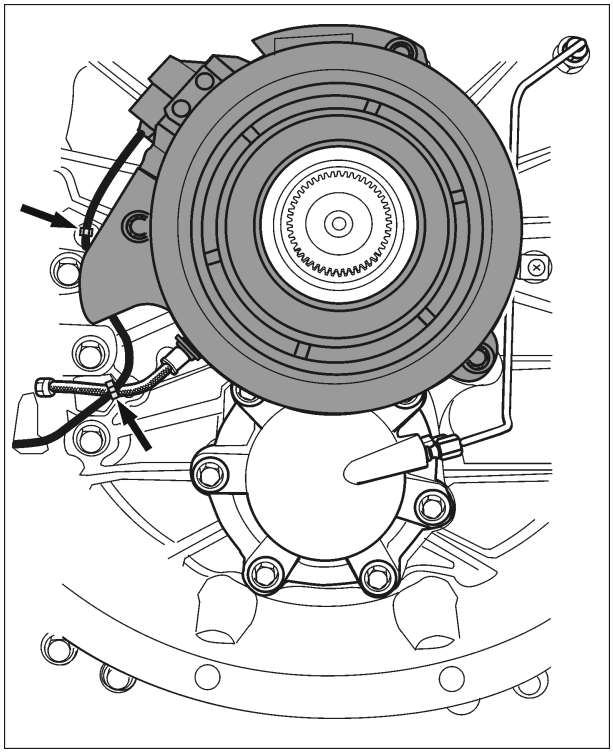
12
Position the transmission jack and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

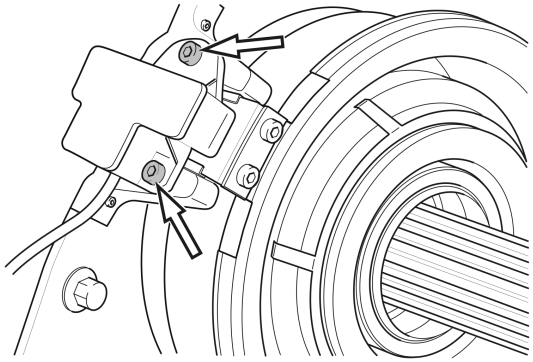
Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.



T4021344

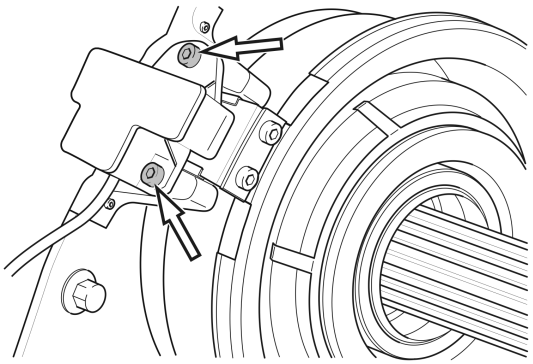
16
Carefully remove the tie straps for the wiring harness and the air hose to the clutch cylinder.

17
Disconnect the clutch cylinder position sensor wiring connector from the clutch control valve.



T4021478

18
Remove the position sensor retaining bolts and then the sensor.



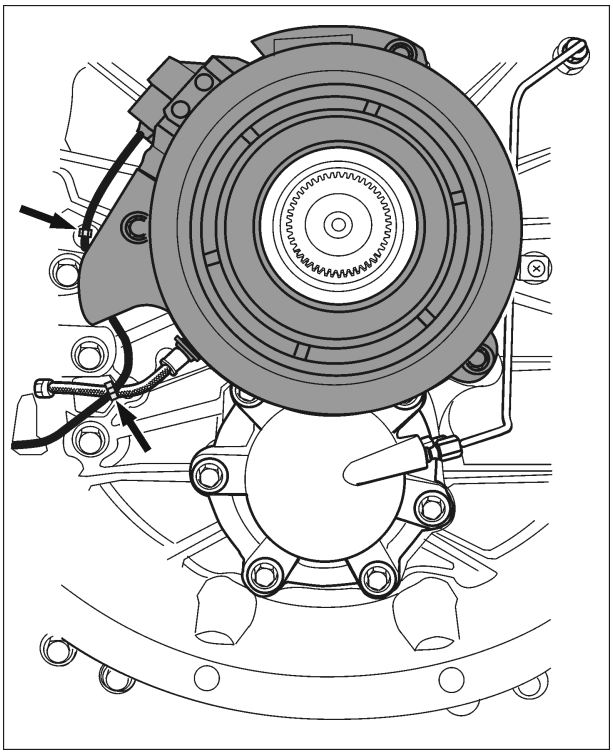
T4021478

19
Install the new position sensor and torque the retaining bolts.

Note: Install new retaining bolts with the new sensor.

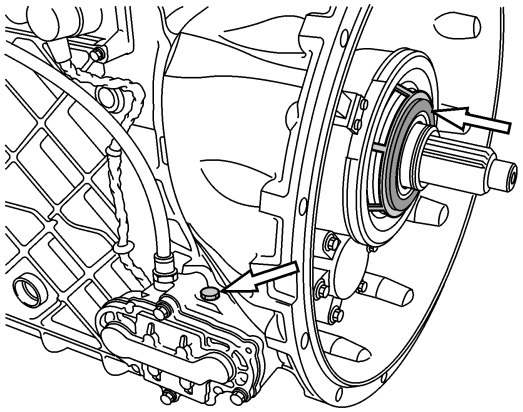
10±2 Nm (7±1 ft-lb)

20
Connect the clutch cylinder position sensor wiring connector to the clutch control valve.



T4021344

21
Secure the wiring harness and air hose in position with new tie straps.



T4021203

22
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

23
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

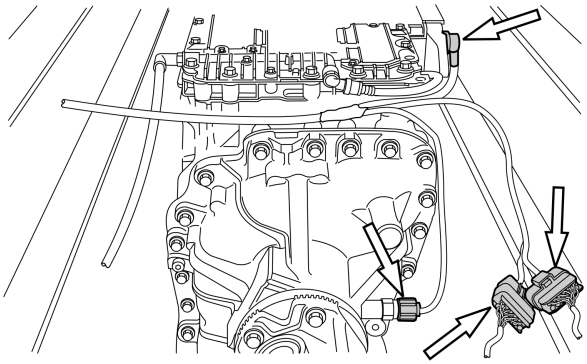
24
Install the remaining transmission-to-engine mounting bolts. Torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

25
Position the battery cables and install their mounting bolts.

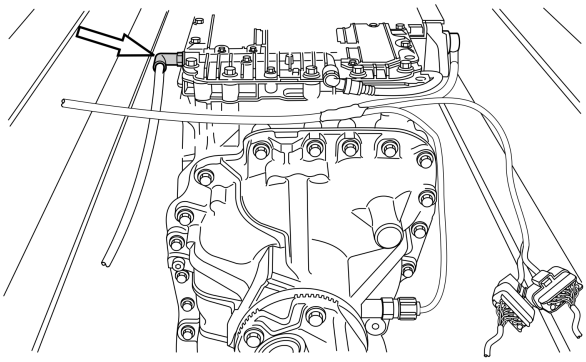
26
Install the cab engine cover.



W4002941

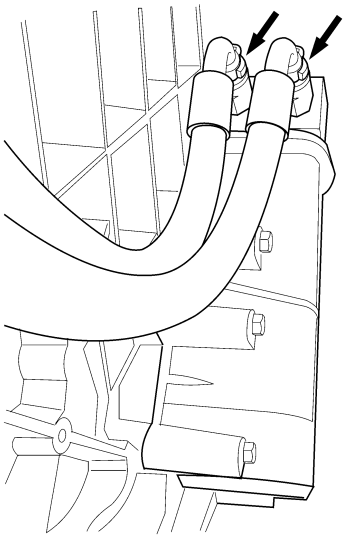
27
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

28
Install new tie straps to secure the wiring harness to the transmission.



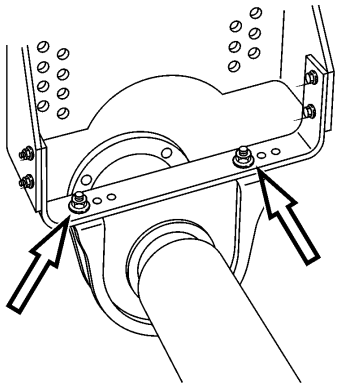
W4002940

29
Connect the air supply hose at the rear of the transmission.



W4002894

30
Connect the transmission oil cooler hoses to the filter housing.



T4018155

31
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

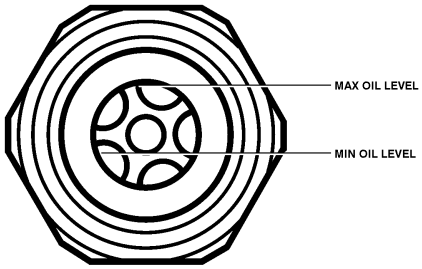
Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing – 175±30 Nm (129±22 ft-lb)
Universal Joint Caps– 166±10 Nm (122±7 ft-lb)

32
Remove the supporting jack stands and lower the vehicle.

33
Pressurize the air system and check for leaks.

34
Restore power to the vehicle by connecting the batteries negative cable.



T4021684

35
Check and fill the transmission with approved transmission oil.

36
After the transmission is installed, it is necessary to perform a “clutch engagement point calibration” using the scan tool.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88954776[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

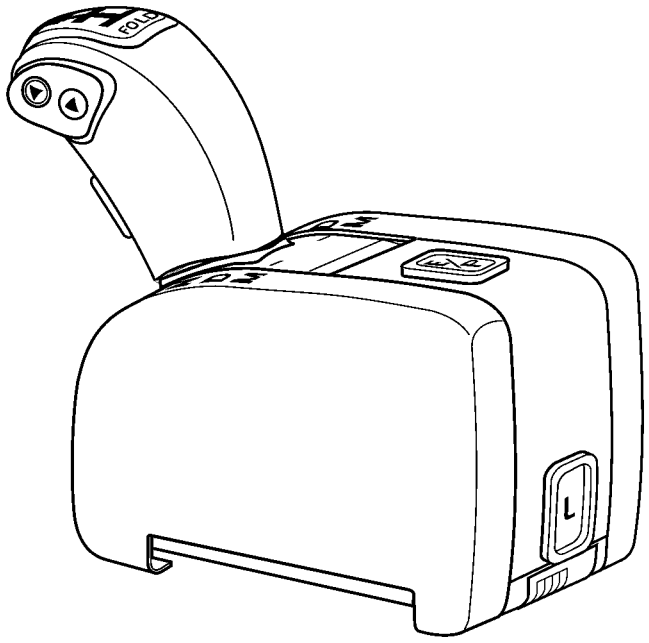
Date	Group	No.	Release	Page
4.2010	**432**	**05**		1(4)

This service bulletin replaces bulletin 432–05 "Control Unit, Gear Selector, Replacement" dated 2.2008.

Control Unit, Gear Selector, Replacement

I-Shift Transmission

Control Unit, Gear Selector, Replacement



W4002900

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Control Unit, Gear Selector, Replacement”, page 2

4320-03-03-01
Control Unit, Gear Selector, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

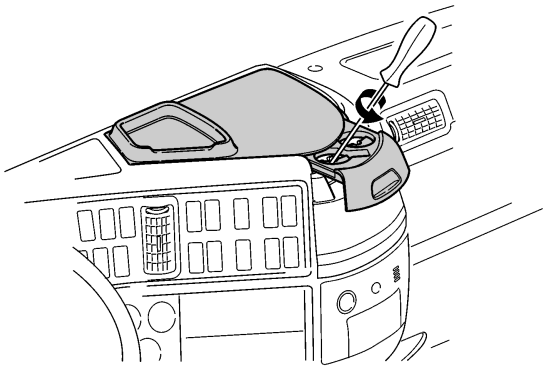
⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ CAUTION

Possible damage to electronic components. Turn the vehicle ignition switch OFF before disconnecting or connecting any electronic components. Failure to de-energize circuits may result in permanent damage to electronic components.

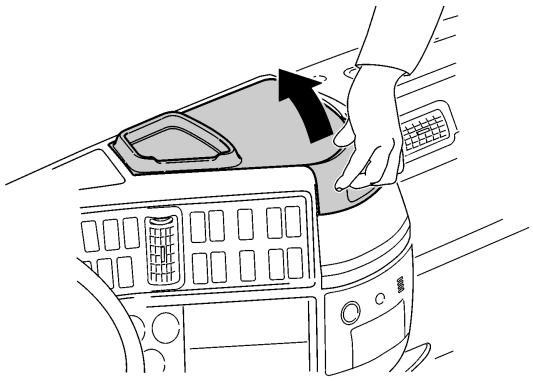
1
Disconnect the power to the vehicle by removing the batteries negative cable.



T8010130

2
Remove the mounting screws for the Fuse Relay Center (FRC) cover.

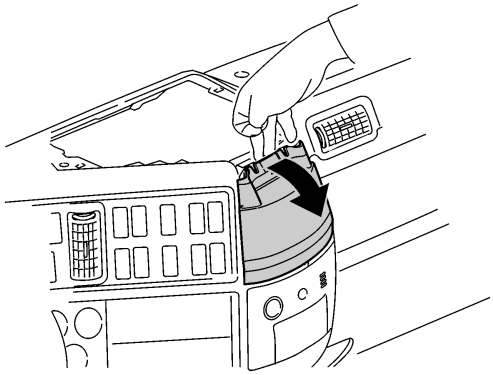
Note: Pull out the cup holder to access the screws.



T8010131

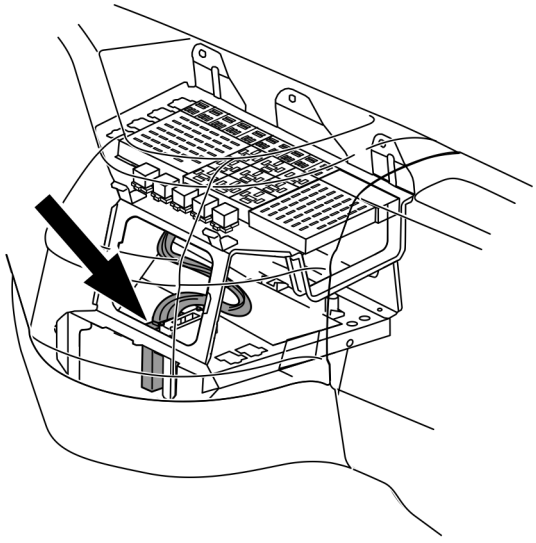
3
Remove the FRC cover.

Note: Close the cup holder.



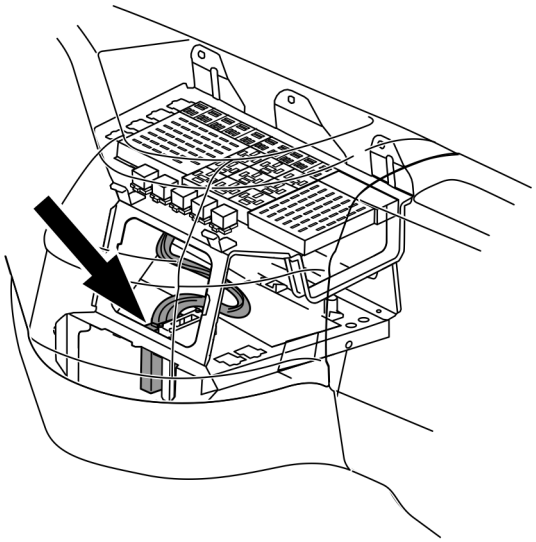
T8010132

4
Remove the cover panel.



W4002961

5
Disconnect the Gear Selector Control Module (GSCM) wiring connector. Remove the two mounting screws and then the GSCM.



W4002961

6
Install the new GSCM and the two mounting screws. Connect the wiring connector.

7
Install the cover panel.

8
Install the FRC cover.

9
Install the mounting screws for the FRC cover.

10
Restore vehicle power by connecting the batteries negative cable.

11
Configure the new GSCM with its software using the scan tool.

Note: When replacing parts on a C design level transmission with D design level transmission spare parts and the GSCM is replaced, run accessory kit 85120151.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88954826[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

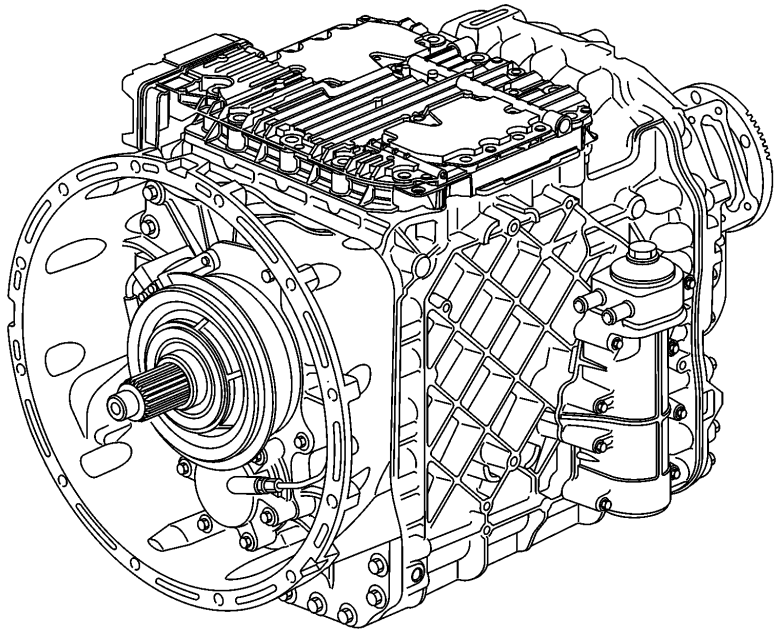
This service bulletin replaces bulletins 431- 07 and 431- 12 “Transmission ECU, Replacement” dated 6.2007.

Date	Group	No.	Release	Page
4.2010	**431**	**07**		1(11)

Transmission ECU, Replacement

I-Shift Transmission

Transmission ECU, Replacement



T4021207

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

• “Transmission ECU, Replacement”, page 2

4319-03-02-03
Transmission ECU, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

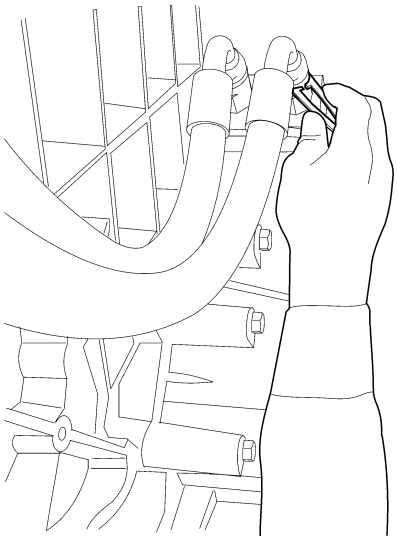
Special tools: 85108826

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

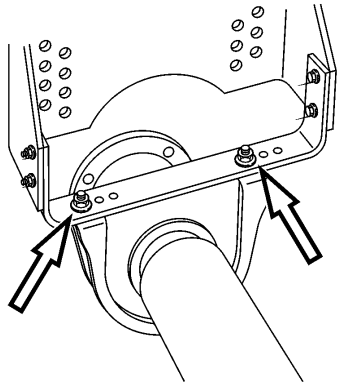
4
Raise the vehicle and support with jack stands.



W4002890

5
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

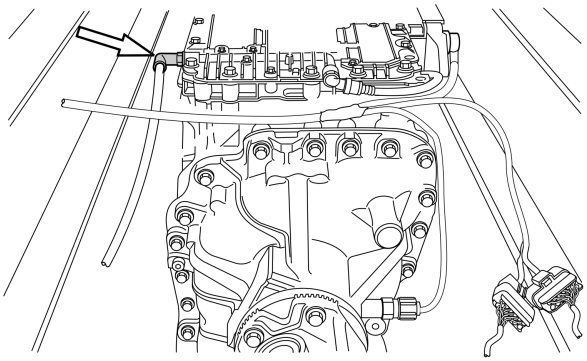


T4018155

6
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

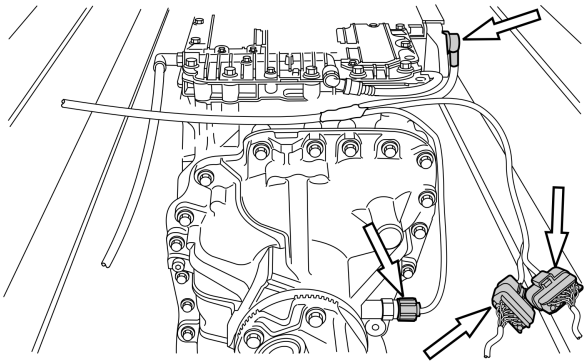
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

7
Disconnect the air supply hose at the rear of the transmission.

8
Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

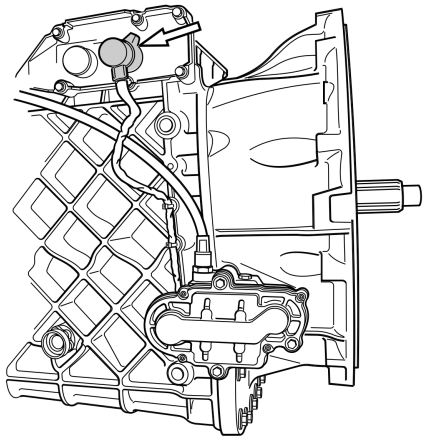
12
Position the transmission jack and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

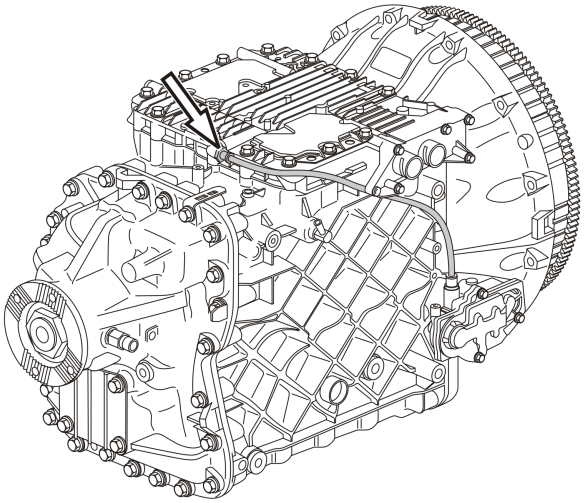
15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.



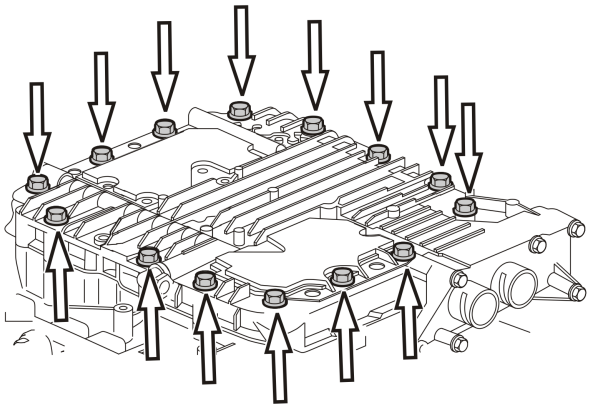
W4002881

16
Disconnect the clutch valve wiring connector at the control housing.



W4002947

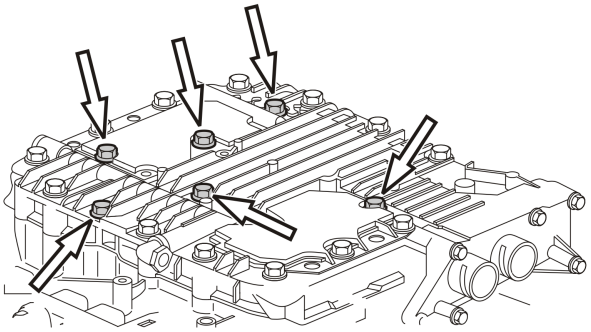
17
Disconnect the clutch control valve air supply tube at the upper control housing fitting.



W4002951

18
Remove the control housing mounting bolts.

19
Remove the six upper cover mounting bolts.



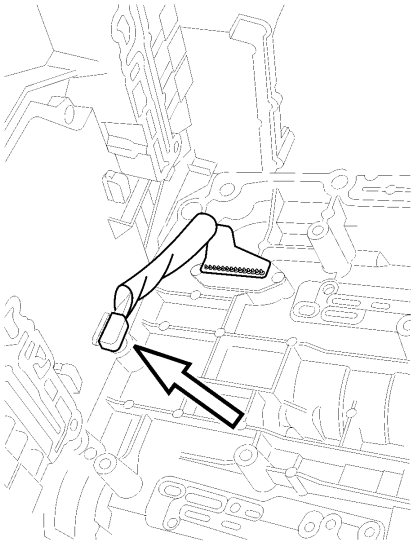
W4002952

20

> **CAUTION**
>
> Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

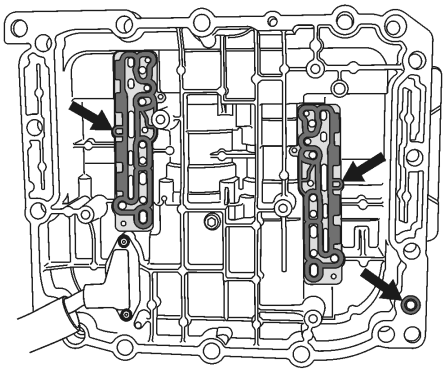
Gently lift the top edge of the upper cover and angle it down carefully against the clutch housing. Carefully disconnect the electrical connection and remove the top cover.

Note: Do not apply tension or weight to the wiring harness or connector.

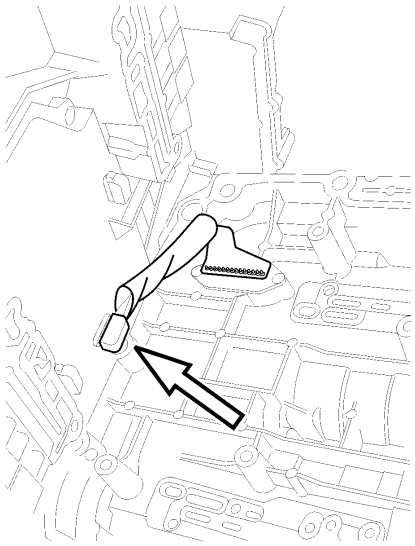


W4002953

21
Install new solenoid valve seals, an O-ring for the countershaft brake and a new upper cover gasket.



T4020778



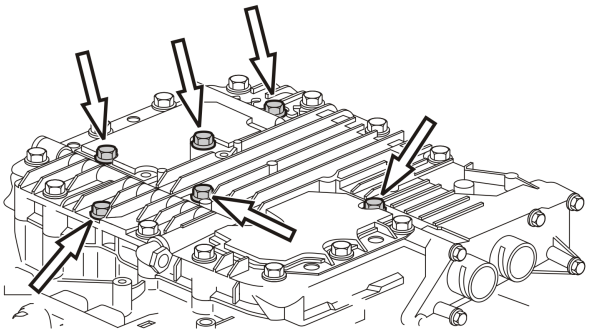
W4002953

22

> **CAUTION**
>
> Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Place the new upper cover in position and carefully connect the electric harness. Install the upper cover.

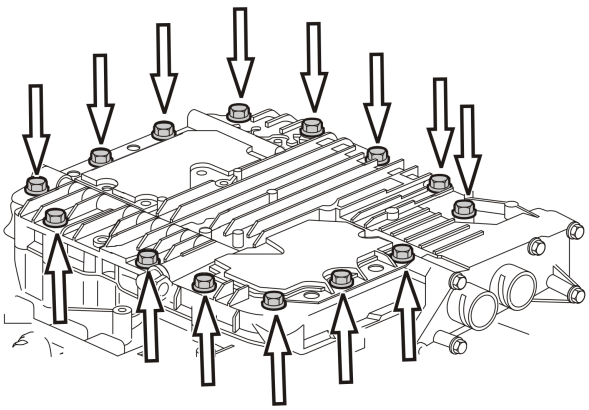
Note: Do not apply tension or weight to the wiring harness or connector.



W4002952

23
Install and torque the six upper cover mounting bolts.

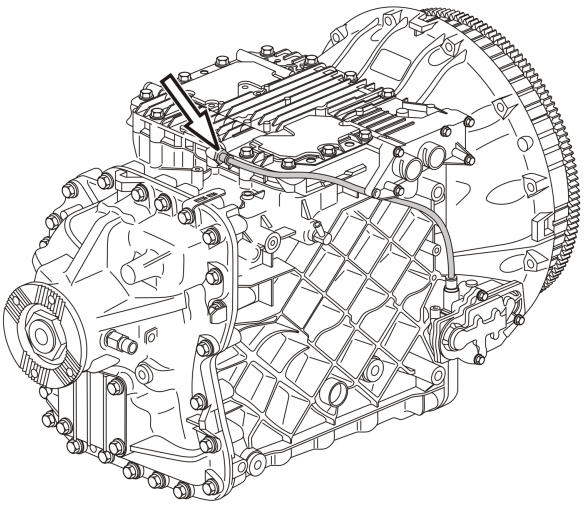
24±4 Nm (18±3 ft-lb)



W4002951

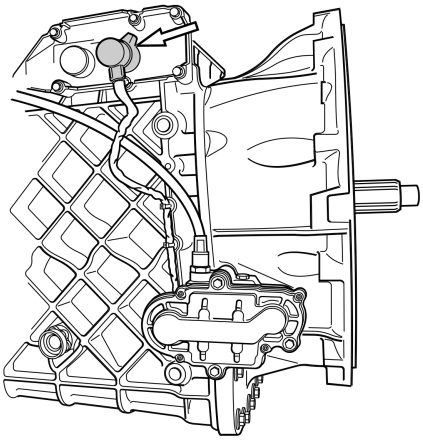
24
Install the control housing bolts and torque them in a diagonal pattern.

110±10 Nm (81±7 ft-lb)



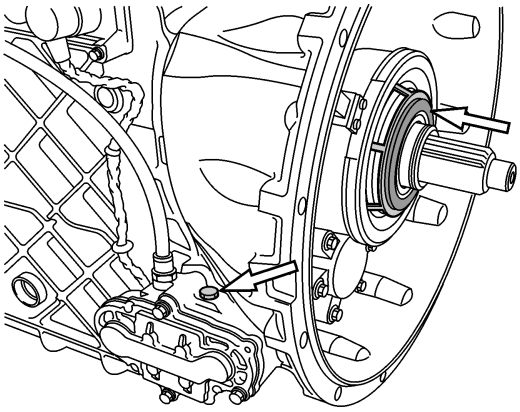
W4002947

25
Connect the clutch control valve air supply tube to the upper control housing fitting.



W4002881

26
Connect the clutch valve wiring connector to the control housing.



T4021203

27
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

28
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

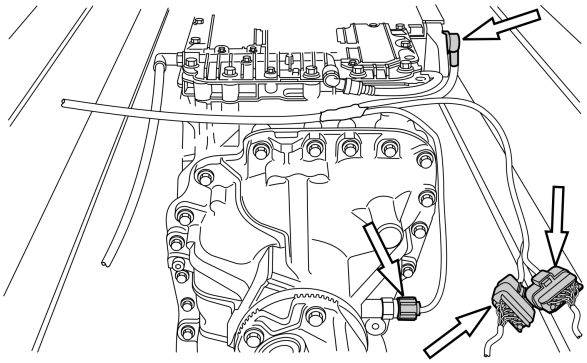
29
Install the remaining transmission-to-engine mounting bolts, torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

30
Position the battery cables and install their mounting bolts.

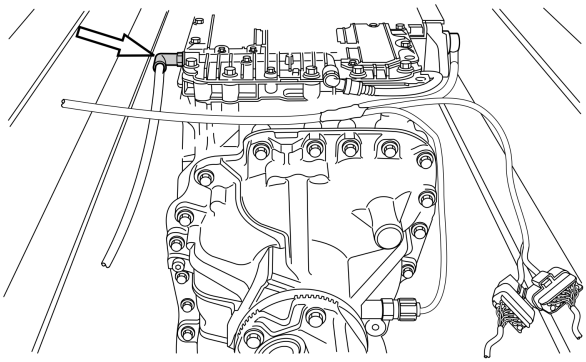
31
Install the cab engine cover.



W4002941

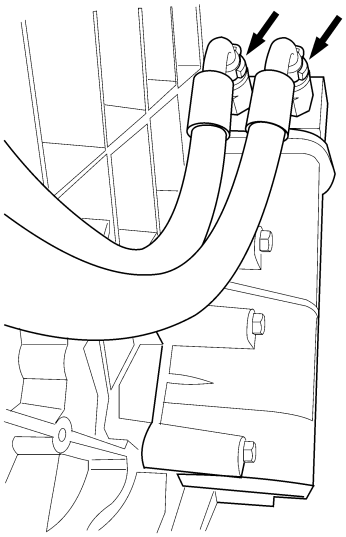
32
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

33
Install new tie straps to secure the wiring harness to the transmission.



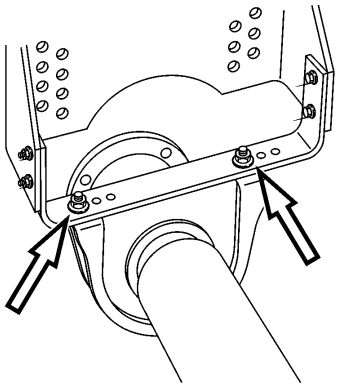
W4002940

34
Connect the air supply hose at the rear of the transmission.



W4002894

35
Connect the transmission oil cooler hoses to the filter housing.



T4018155

36
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

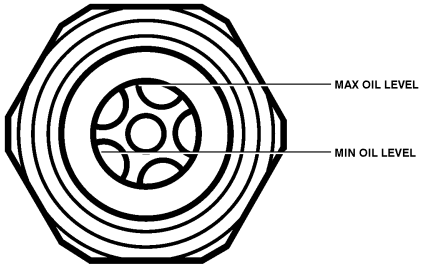
Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing – 175±30 Nm (129±22 ft-lb)
Universal Joint Caps— 166±10 Nm (122±7 ft-lb)

37
Remove the supporting jack stands and lower the vehicle.

38
Pressurize the air system and check for leaks.



T4021684

39
Restore power to the vehicle by connecting the batteries negative cable.

40
Check and fill the transmission with approved transmission oil.

41
After the transmission is installed, it is necessary to configure the new Transmission Control Module (TCM) with its software using the scan tool.

Note: When replacing parts on a C design level transmission with D design level transmission spare parts and the TCM cover is replaced, run accessory kit 85120150.

42
After the TCM has been flashed with its software, it is necessary to perform a “clutch engagement position calibration” using the scan tool.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88954920[1]

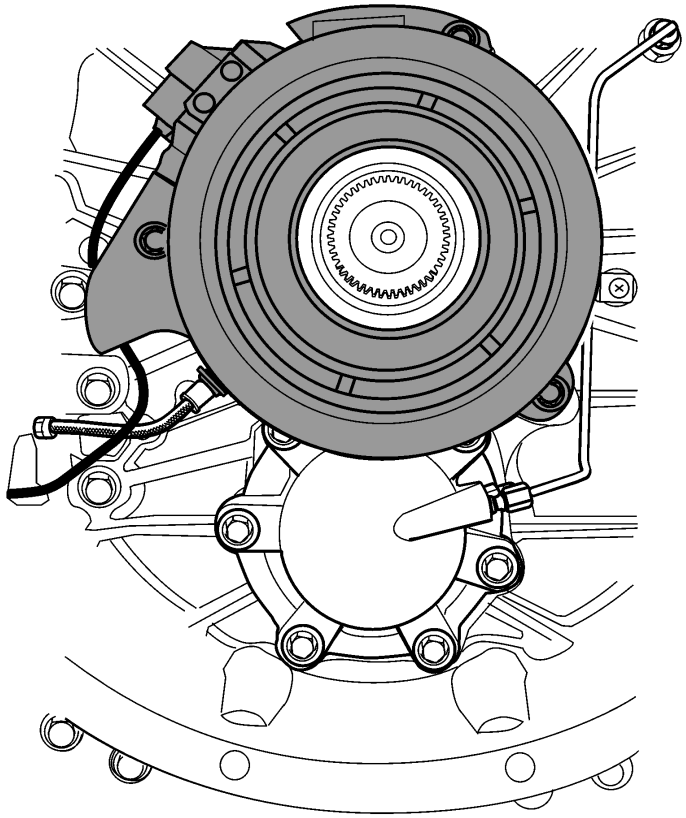
VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

This service bulletin replaces bulletins 413-04 and 413-05 “Supply Hose, Clutch Cylinder, Replacement” dated 6.2007.

Supply Hose, Clutch Cylinder, Replacement



T4021527

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Supply Hose, Clutch Cylinder, Replacement”, page 2

4135-03-02-02
Supply Hose, Clutch Cylinder, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

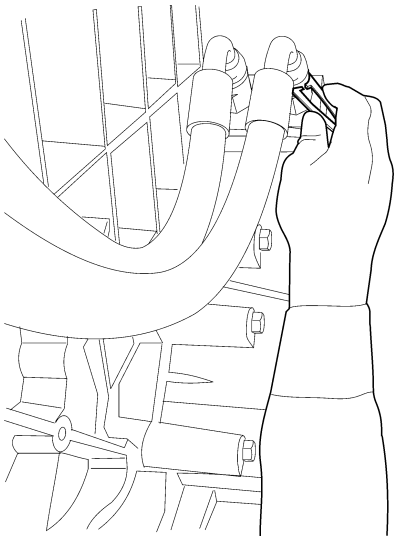
Special tools: 85108826

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

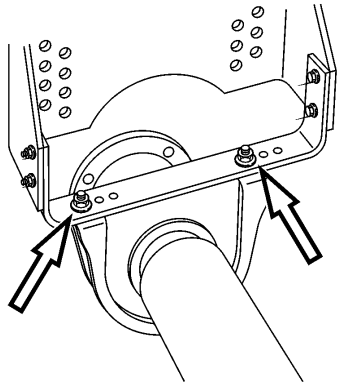
4
Raise the vehicle and support with jack stands.



W4002890

5
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

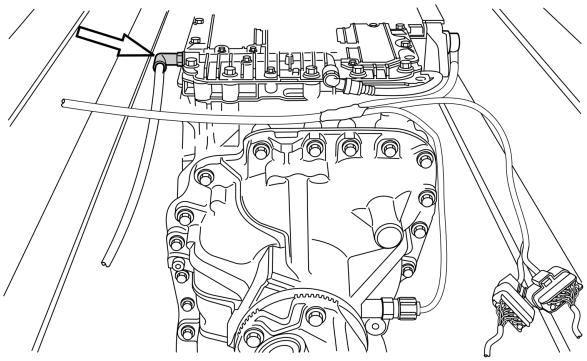


T4018155

6
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

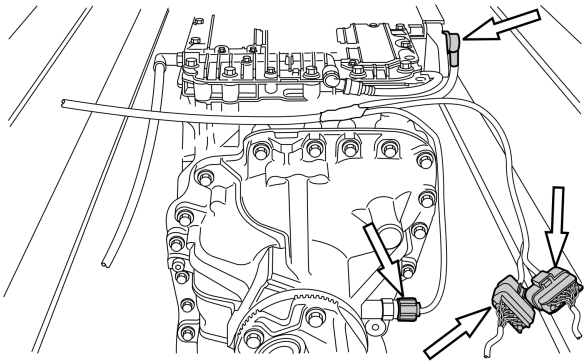
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

7
Disconnect the air supply hose at the rear of the transmission.

8
Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

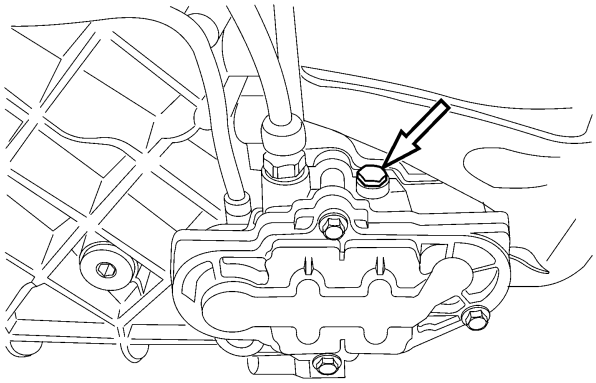
12
Position the transmission jack and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

15
Carefully pull the transmission back, until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.



W4002879

16

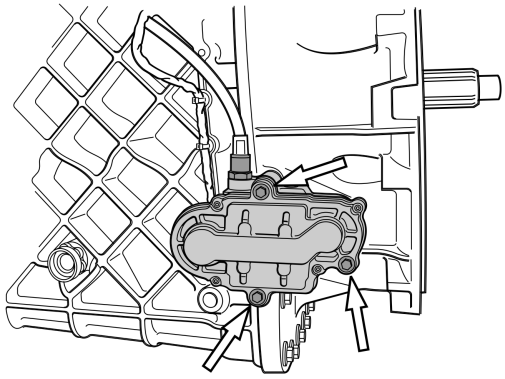
⚠ DANGER

The Clutch Valve Unit contains air under high pressure. Do not remove the drain plug entirely because doing so may allow the plug to quickly and forcefully become a projectile. Leave the drain plug slightly cracked to allow air pressure to be released. Failure to do so may result in serious personal injury.

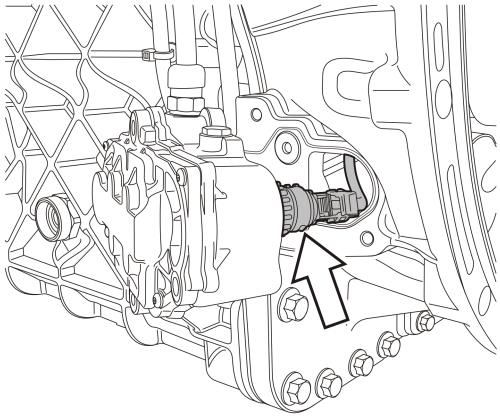
Remove the service plug located on top of the clutch valve to ensure that no air remains in the system.

17

Remove the clutch valve mounting bolts.



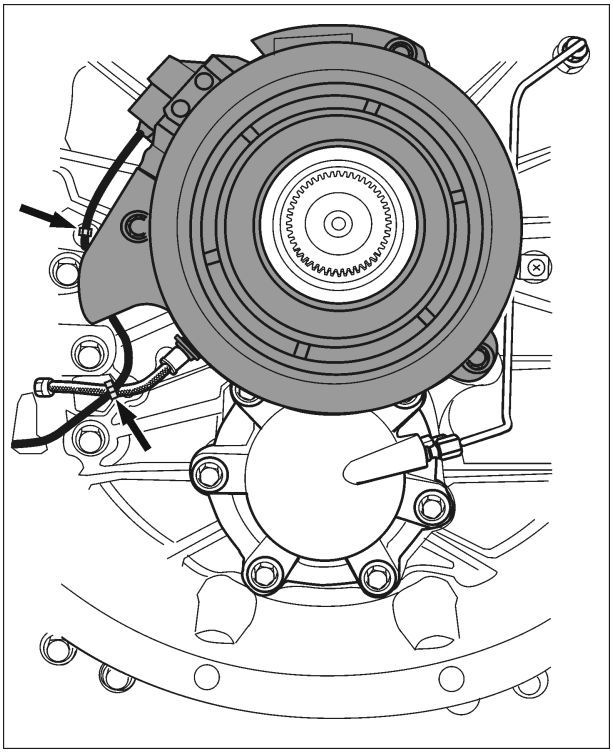
W4002923



W4002924

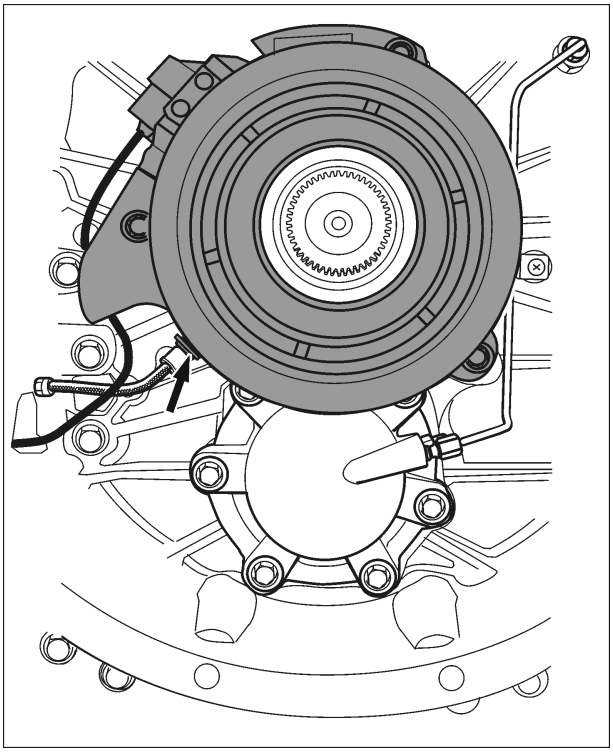
18

Disconnect the clutch position sensor wiring and position the clutch valve aside.



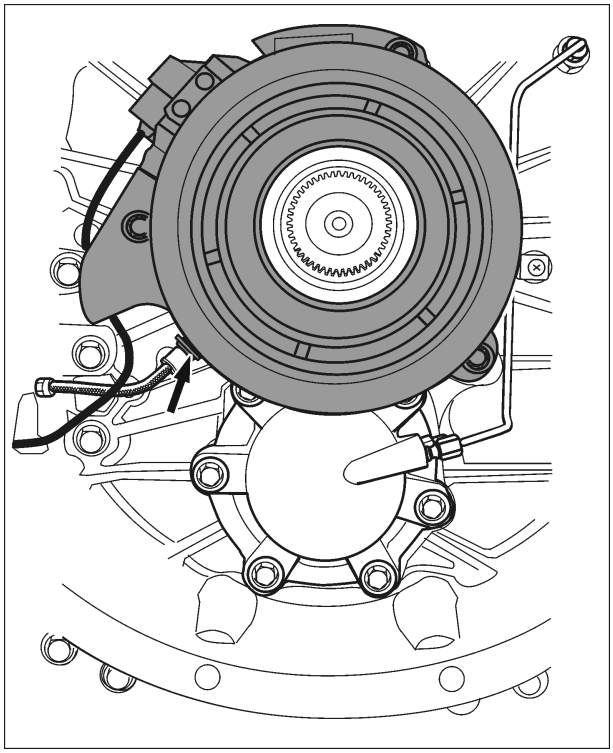
T4021344

19
Carefully remove the tie straps for the wiring harness, and the air hose to the clutch cylinder.



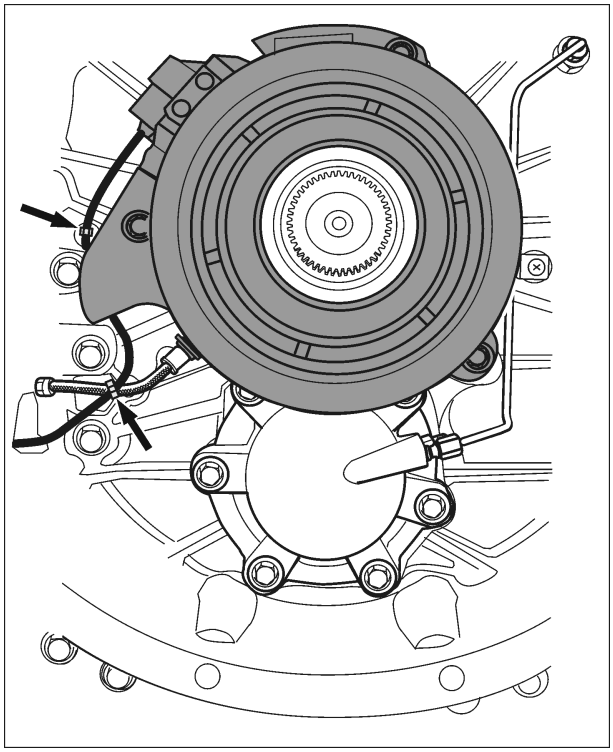
T4021345

20
Remove the clip holding the air hose in the clutch cylinder. Disconnect the air hose from the clutch cylinder and push the hose out through the side of the transmission clutch housing.



T4021345

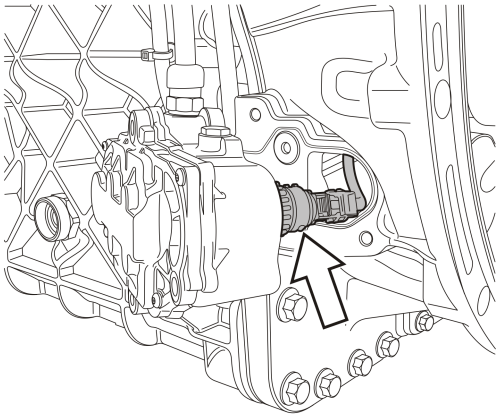
21
Push the new hose through the clutch housing. Connect the air hose to the clutch cylinder and install the locking clip.



T4021344

22
Secure the wiring harness and air hose in position with new tie straps.

23
Check that the sealing surface on the clutch valve is clean. Inspect the clutch valve seal and replace as needed.

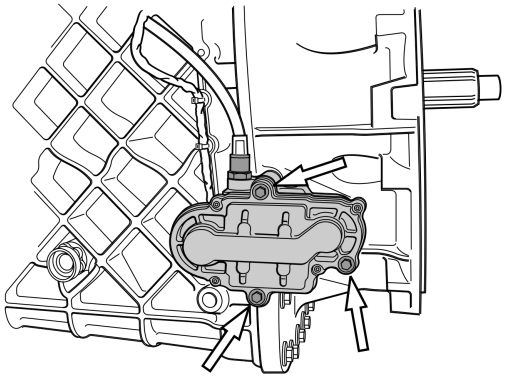


W4002924

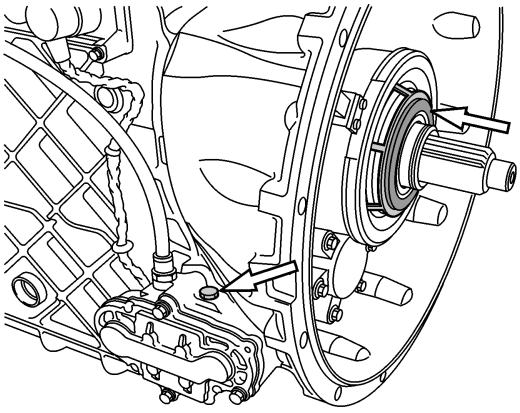
24
Connect the clutch position sensor wiring to the clutch valve.

25
Install and torque the clutch valve mounting bolts.

20±3 Nm (15±2 ft-lb)



W4002923



T4021203

26
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

27
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

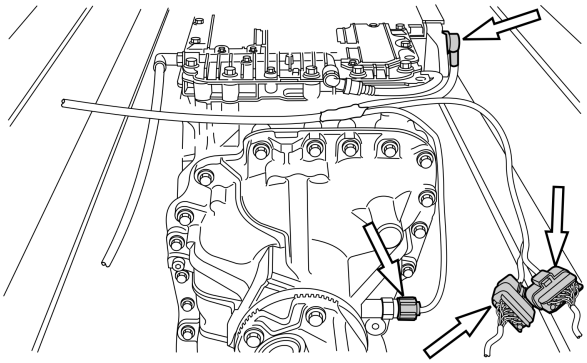
28
Install the remaining transmission-to-engine mounting bolts, torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

29
Position the battery cables and install their mounting bolts.

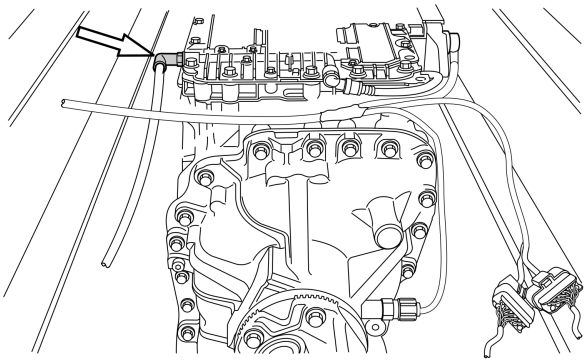
30
Install the cab engine cover.



W4002941

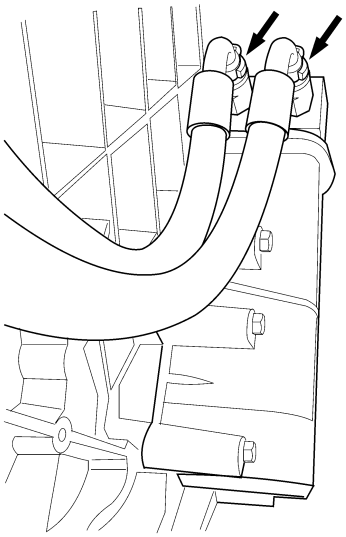
31
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

32
Install new tie straps to secure the wiring harness to the transmission.



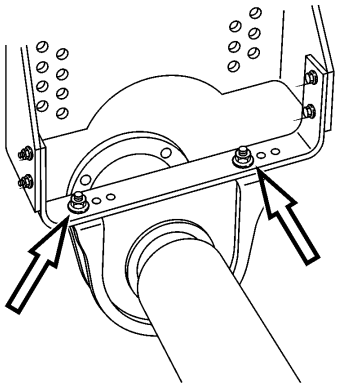
W4002940

33
Connect the air supply hose at the rear of the transmission.



W4002894

34
Connect the transmission oil cooler hoses to the filter housing.



T4018155

35
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

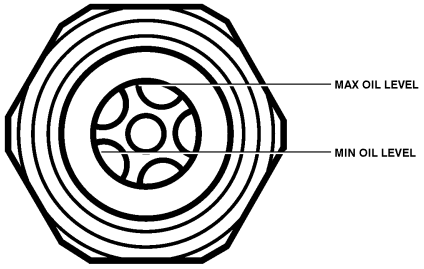
Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing – 175±30 Nm (129±22 ft-lb)
Universal Joint Caps – 166±10 Nm (122±7 ft-lb)

36
Remove the supporting jack stands and lower the vehicle.

37
Pressurize the air system and check for leaks.



T4021684

38
Restore power to the vehicle by connecting the batteries negative cable.

39
Check and fill the transmission with approved transmission oil.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88955074[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

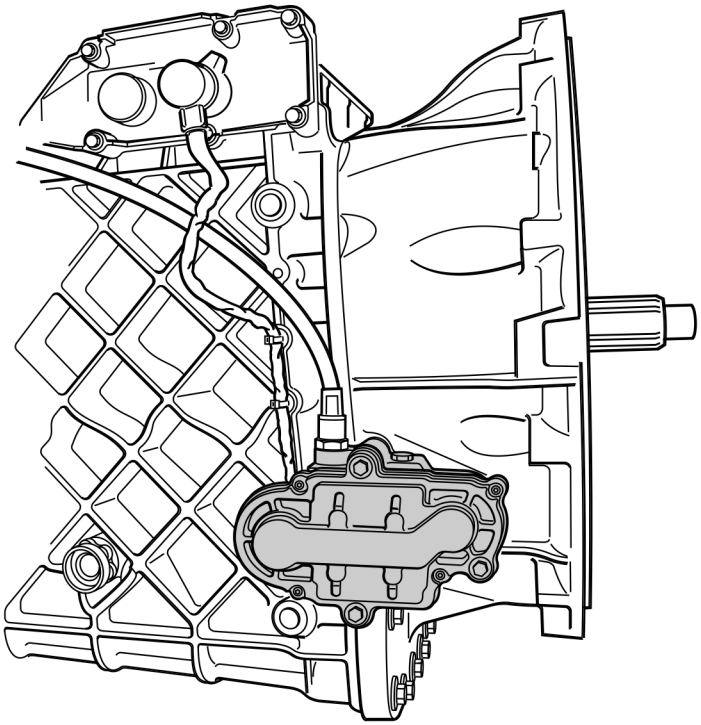
Date	Group	No.	Release	Page
4.2010	**411**	**37**		1(6)

This service bulletin replaces bulletins 411–37 and 411–43 “Filter, Clutch Control Valve, Replacement” dated 6.2007.

Filter, Clutch Control Valve, Replacement

I-Shift Transmission

Filter, Clutch Control Valve, Replacement



W4002898

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Filter, Clutch Control Valve, Replacement”, page 2

4119-03-02-02
Filter, Clutch Control Valve, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

1

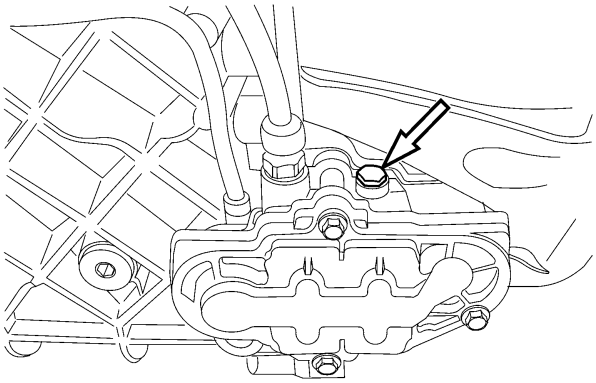
Drain the air system.

2

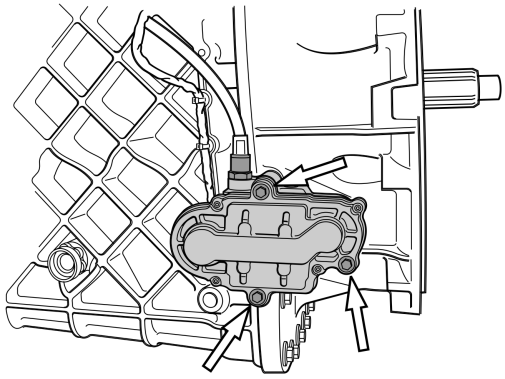
⚠ DANGER

The Clutch Valve Unit contains air under high pressure. Do not remove the drain plug entirely because doing so may allow the plug to quickly and forcefully and become a projectile. Leave the drain plug slightly cracked to allow air pressure to be released. Failure to do so may result in serious personal injury.

Remove the service plug located on top of the clutch valve to ensure that no air remains in the system.



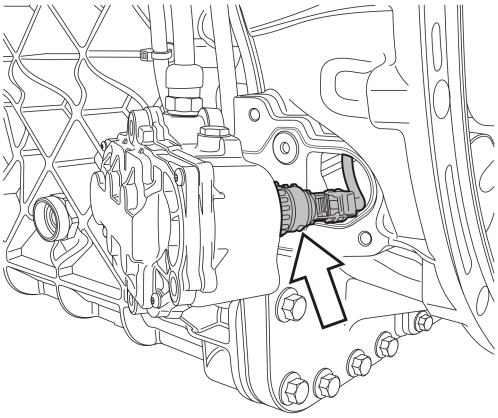
W4002879



W4002923

3

Remove the clutch valve mounting bolts.



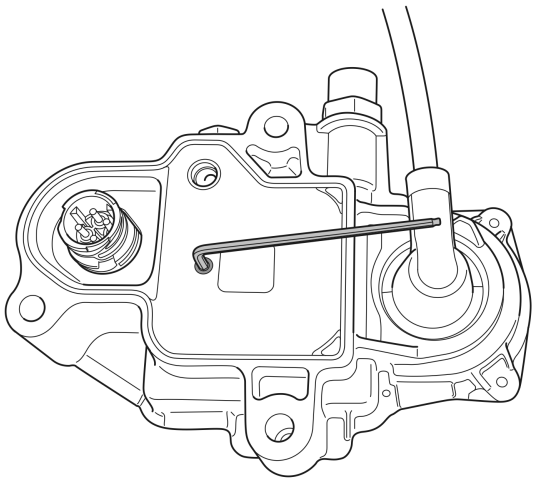
W4002924

4

Disconnect the clutch position sensor wiring and rotate the valve around to access the filter.

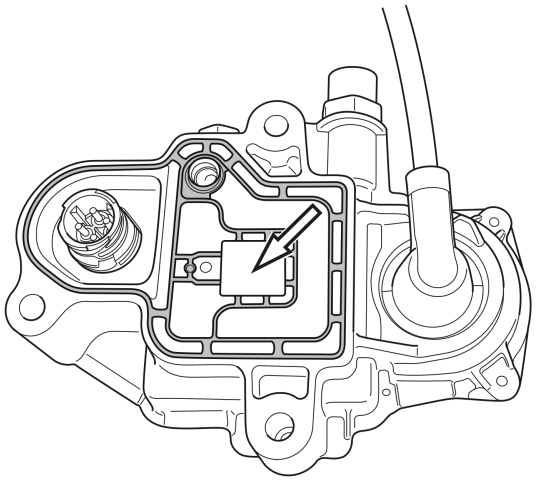
5

Check that the sealing surfaces on the clutch valve and transmission assembly are clean.



T4021422

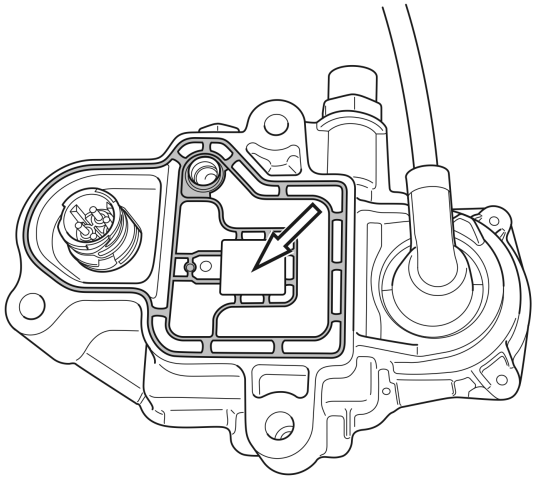
6
Remove the screw securing the cover plate on the back of the clutch valve.



T4021423

7
Remove the rubber seal and then the filter.

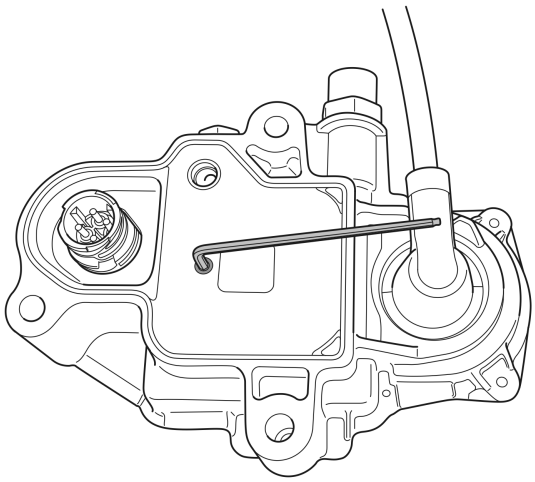
Note: Note the orientation of the gasket and the filter prior to removal.



T4021423

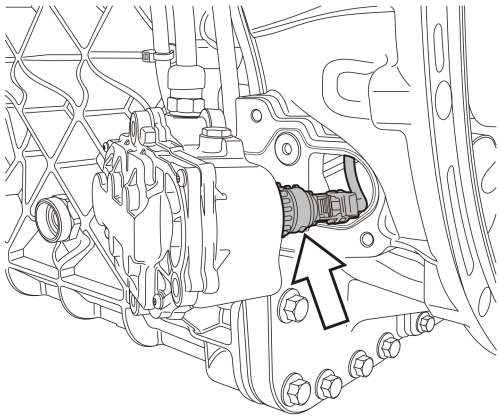
8
Install a new filter and then a new rubber seal.

Note: The filter should be installed with the ridge facing outward away from the valve.



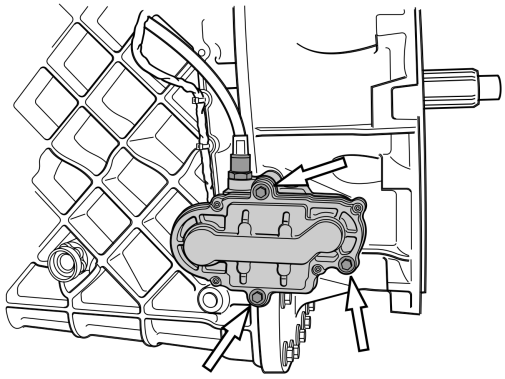
T4021422

9
Install the cover plate on the back of the clutch valve using a new screw.



W4002924

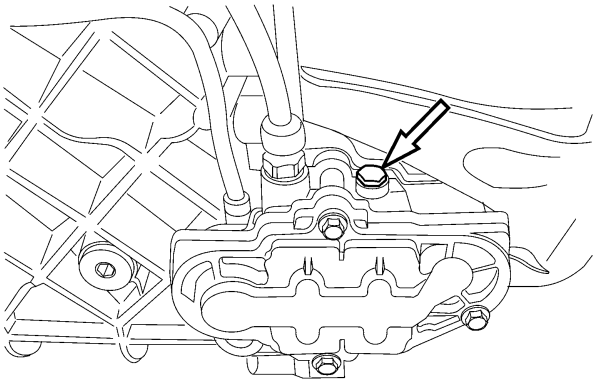
10
Connect the clutch position sensor wiring to the clutch valve.



W4002923

11
Install and torque the clutch valve mounting bolts.

20±3 Nm (15±2 ft-lb)



W4002879

12

Install and torque the clutch valve service plug.

7±2 Nm (5±1 ft-lb)

13

Pressurize the air system and check for leaks.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88956669[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

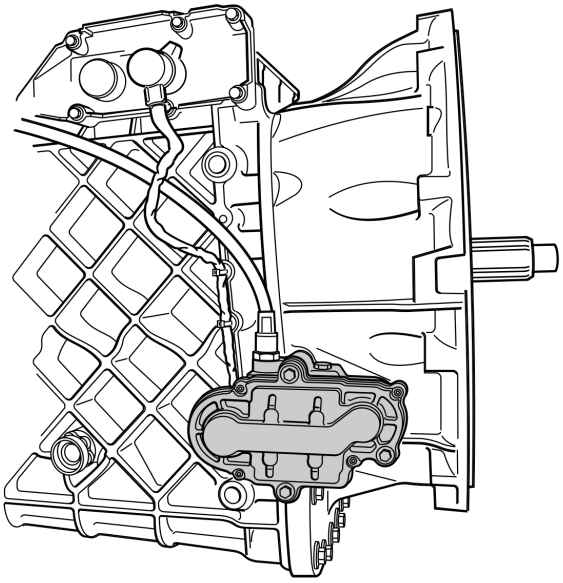
Date	Group	No.	Release	Page
4.2010	**411**	**38**		1(4)

This service bulletin replaces bulletins 411–38 and 411–42 “Valve Assembly, Clutch, Replacement” dated 6.2007.

Valve Assembly, Clutch, Replacement

I-Shift Transmission

Valve Assembly, Clutch, Replacement



W4002898

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Valve Assembly, Clutch, Replacement”, page 2

4119-03-02-01
Valve Assembly, Clutch, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

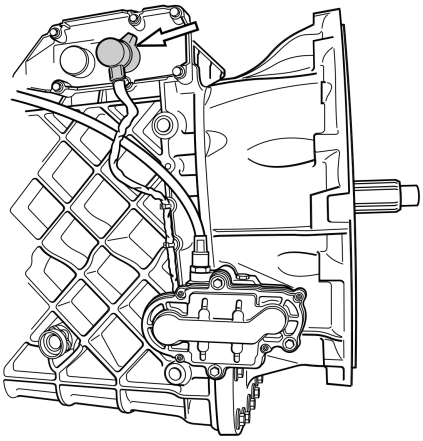
⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

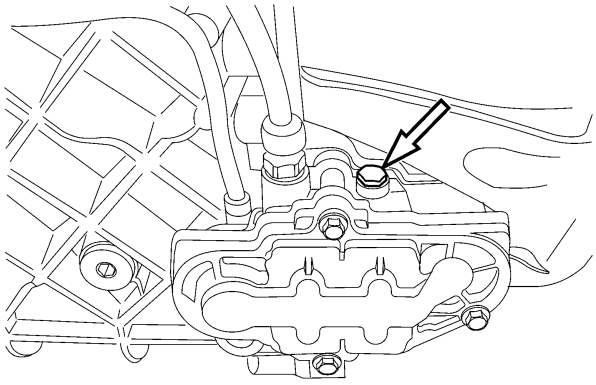
Special tools: J44773

1
Drain the air system.

2
Disconnect the clutch valve wiring connector at the control housing.



W4002881



W4002879

3

⚠ DANGER

The Clutch Valve Unit contains air under high pressure. Do not remove the drain plug entirely because doing so may allow the plug to quickly and forcefully and become a projectile. Leave the drain plug slightly cracked to allow air pressure to be released. Failure to do so may result in serious personal injury.

Remove the plug located on top of the clutch valve to ensure that no air remains in the system.

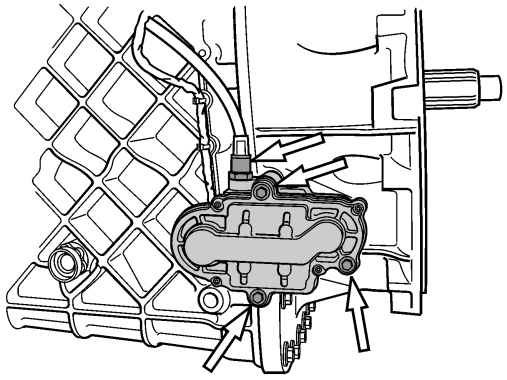
4

Cut the tie strap that secures the air supply line to the transmission case.

5

Disconnect the air supply line for the clutch valve and remove the valve mounting bolts.

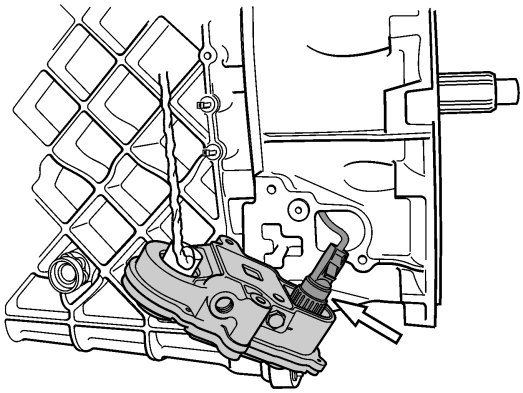
J44773



T4021353

6

Disconnect the clutch position sensor wiring.



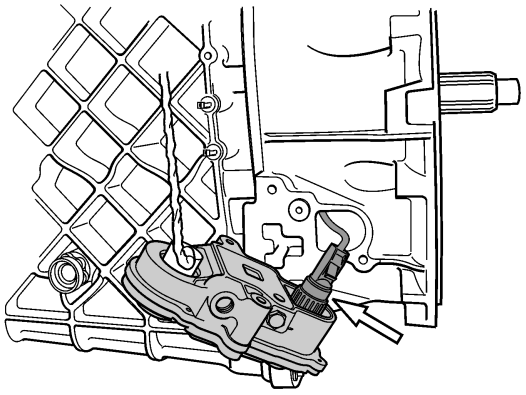
T4021354

7
Cut the tie strap securing the clutch valve wiring harness and remove the valve.

8
Check that the clutch valve sealing surface on the transmission is clean. Visually inspect the new valve to ensure the gasket is in place and properly installed.

9
Connect the clutch position sensor wiring to the **new** clutch valve. Install and torque the valves mounting bolts.

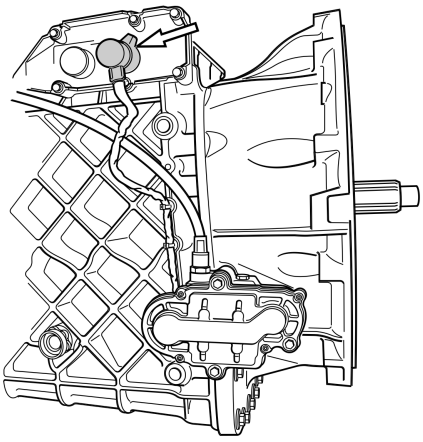
20±3 Nm (15±2 ft-lb)



T4021354

10
Connect the air supply line to the clutch valve.

11
Connect the clutch valve wiring connector to the control housing.



W4002881

12
Install new tie straps to secure the air supply line and the clutch valve wiring harness.

13
Pressurize the air system and check for leaks.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88956888[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

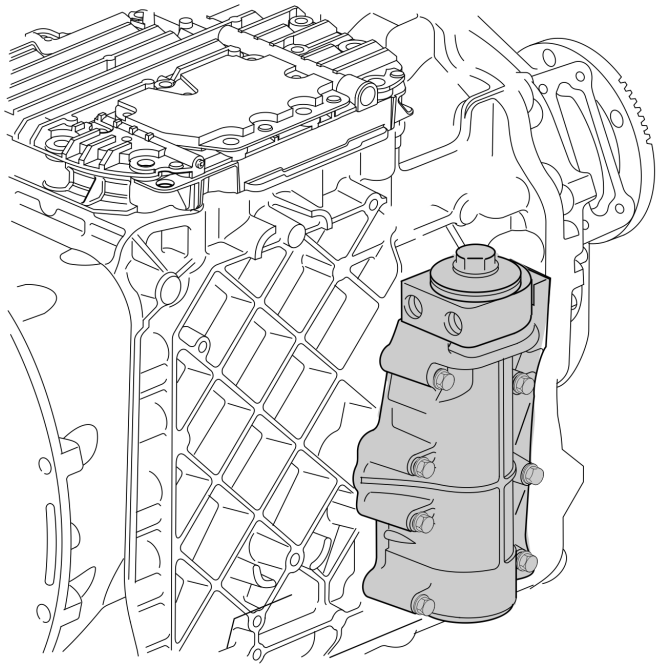
Date	Group	No.	Release	Page
4.2010	**431**	**02**		1(5)

This service bulletin replaces bulletins 431–02 and 431-15 “Oil Filter Housing, Replacement” dated 6.2007.

Oil Filter Housing, Replacement

I-Shift Transmission

Oil Filter Housing, Replacement



W4002888

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Oil Filter Housing, Replacement”, page 2

Service Procedures

4319-03-02-02
Oil Filter Housing, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

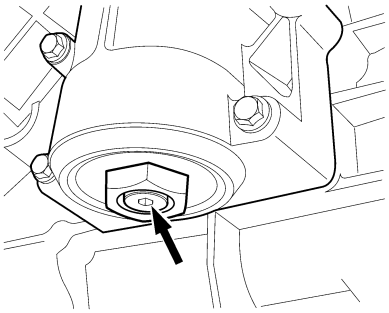
⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

Special tools: 85108826

1
Remove the transmission drain plug and drain transmission oil. Install and torque the plug.

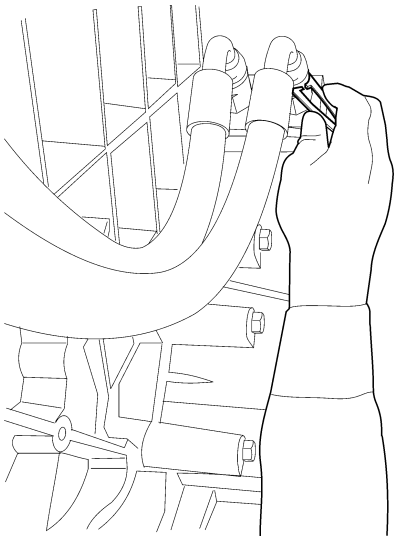
35±5Nm (26±4 ft-lb)



W4002889

2
Remove the oil drain plug at the bottom of the oil filter housing and drain the oil.

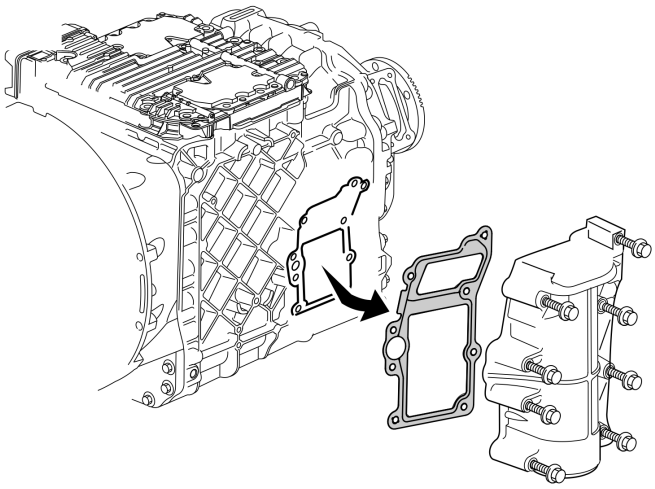
Note: Reinstall the plug after the housing has drained to stop dripping oil.



W4002890

3
Disconnect the transmission oil cooler hoses.

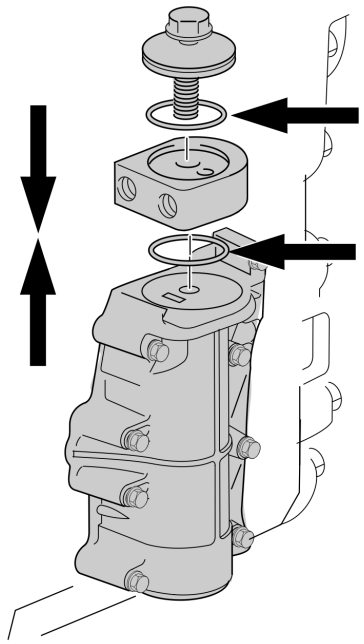
85108826



W4002891

4
Remove the oil filter housing mounting bolts, the housing and the gasket.

5
Check that the oil filter housing sealing surface is clean. Install a new gasket.

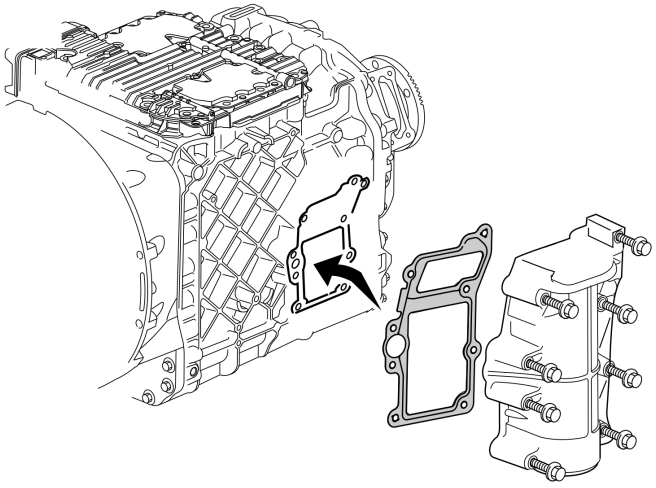


W4002892

6
Transfer the oil cooler to the new filter housing. Install the cooler and torque the retainer.

Note: Replace both of the oil cooler O-rings.

55±8 Nm (41±6 ft-lb)



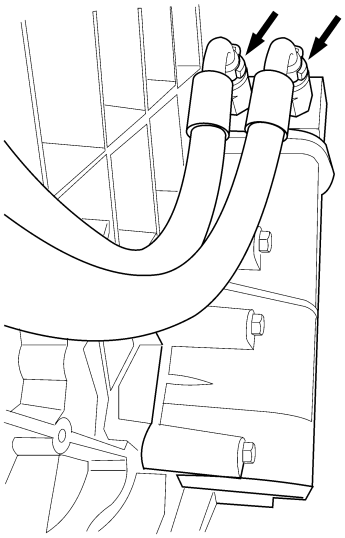
W4002893

7
Install the new oil filter housing and torque the bolts.

Note: Initially install the housing, the gasket and two of the center bolts to get the housing positioned in place.

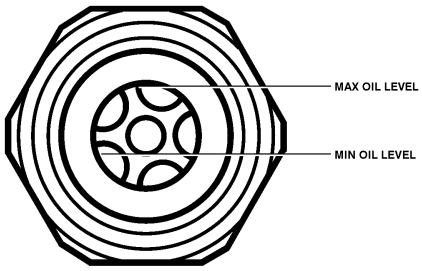
Note: Begin torquing with the center bolts and work outward.

20±3 Nm (15±2 ft-lb)



W4002894

8
Connect the transmission oil cooler hoses.



T4021684

9
Fill the transmission with approved transmission oil.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88956918[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

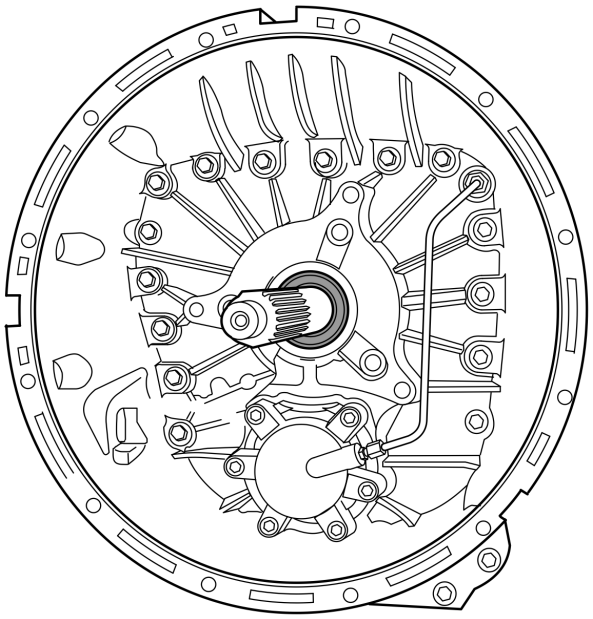
Date	Group	No.	Release	Page
4.2010	**465**	**01**		1(13)

This service bulletin replaces bulletins 465-01 and 465-02 “Input Shaft Sealing Ring, Replacement” dated 6.2007.

Input Shaft Sealing Ring, Replacement

I-Shift Transmission

Input Shaft Sealing Ring, Replacement



W4002883

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Input Shaft Sealing Ring, Replacement”, page 2

4658-03-02-02
Input Shaft Sealing Ring, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

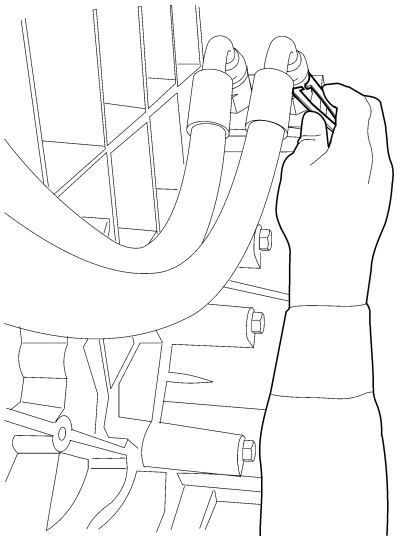
Special tools: 88800005, 85108826

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

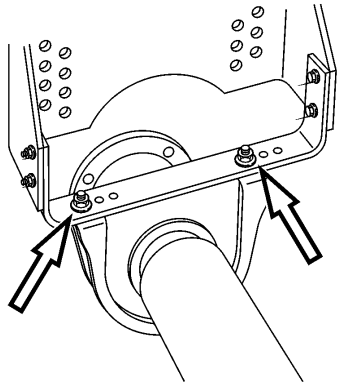
4
Raise the vehicle and support with jack stands.



W4002890

5
Disconnect the transmission oil cooler hoses from the filter housing.

85108826

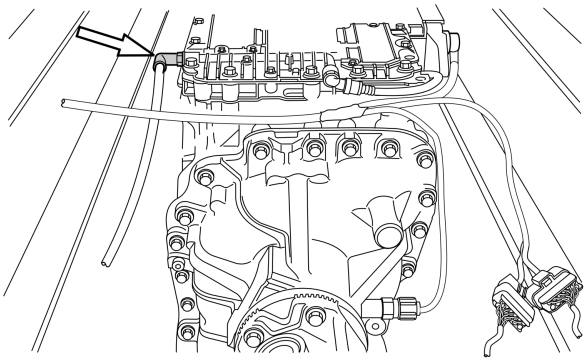


T4018155

6
Remove the drive shaft.

Note: Remove the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

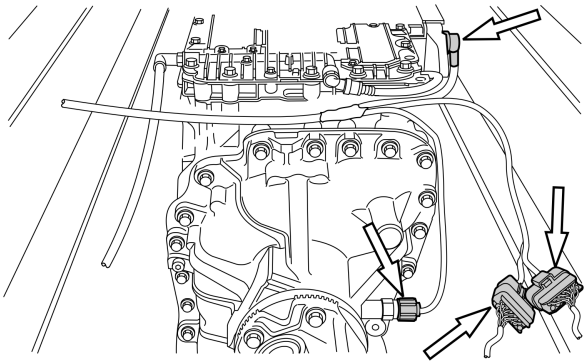
Note: Mark the position of the bolts on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



W4002940

7
Disconnect the air supply hose at the rear of the transmission.

8
Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

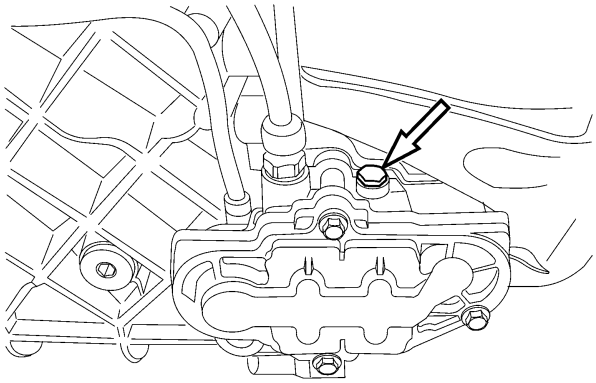
12
Position the transmission jack and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.



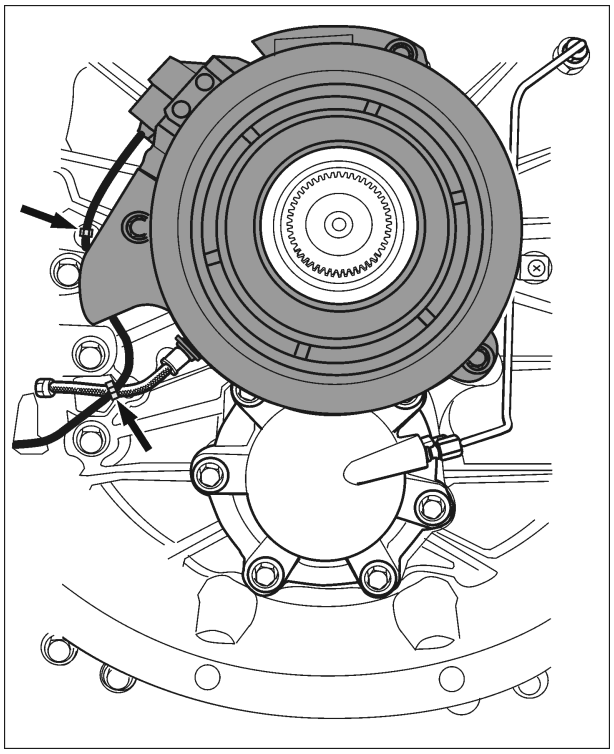
W4002879

16

⚠ DANGER

The Clutch Valve Unit contains air under high pressure. Do not remove the drain plug entirely because doing so may allow the plug to quickly and forcefully and become a projectile. Leave the drain plug slightly cracked to allow air pressure to be released. Failure to do so may result in serious personal injury.

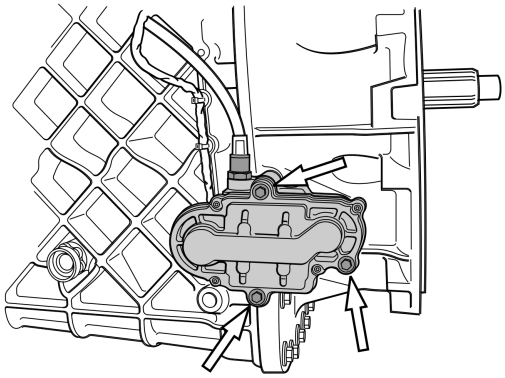
Remove the service plug located on top of the clutch valve to ensure that no air remains in the system.



T4021344

17

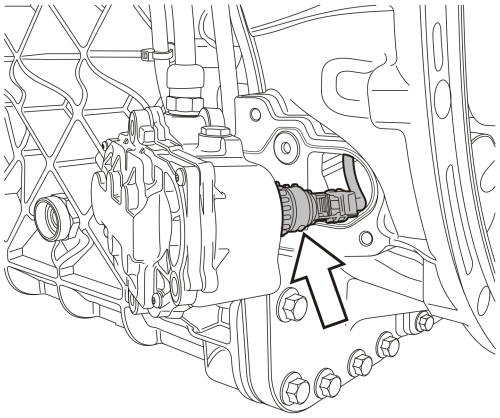
Carefully remove the tie straps for the wiring harness, and the air hose to the clutch cylinder.



W4002923

18

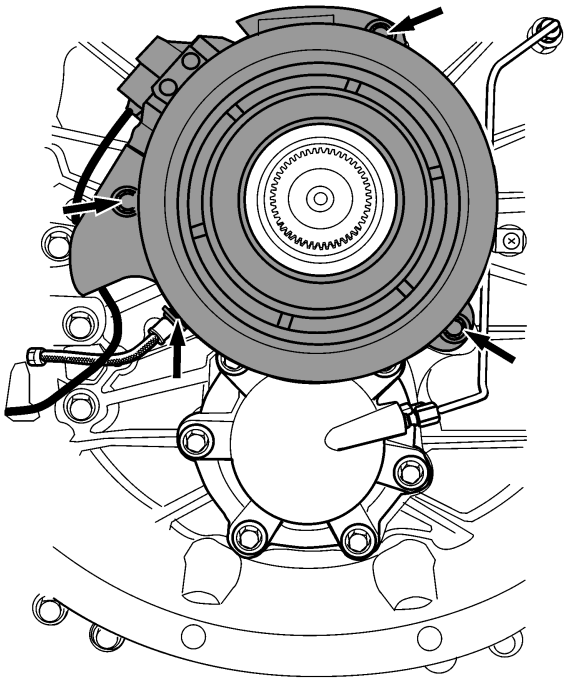
Remove the clutch valve mounting bolts.



W4002924

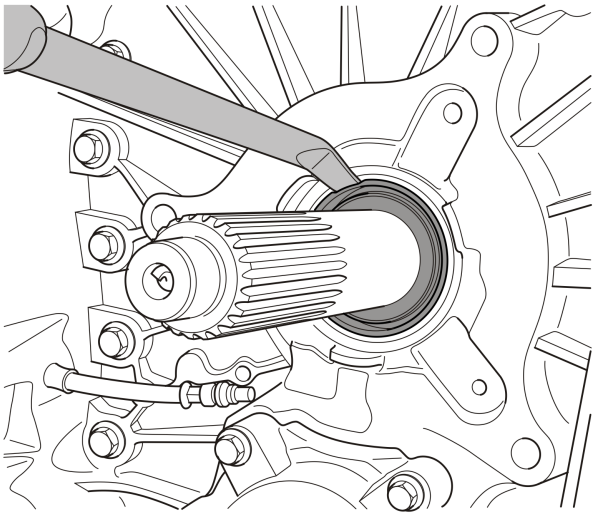
19

Disconnect the clutch position sensor wiring and position the clutch valve aside.



T4020990

20
Remove the clip holding the air hose in the clutch cylinder. Disconnect the air hose from the clutch cylinder. Remove the clutch cylinder mounting bolts and then the clutch cylinder.

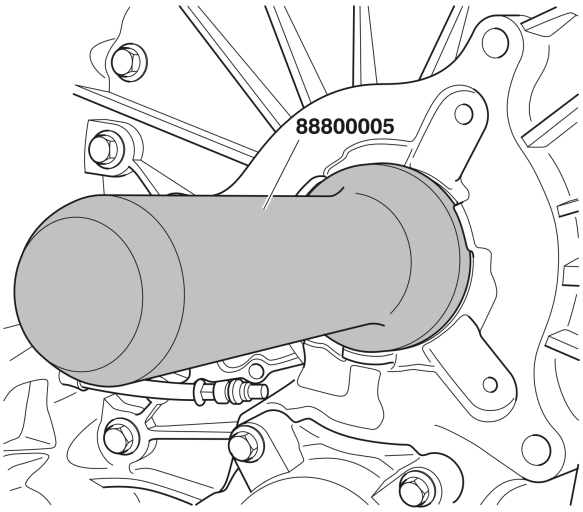


W4002954

21
Using an appropriate seal removal tool, remove the input shaft seal.

22
Clean and inspect the contact surfaces for the seal.

23
Apply fresh transmission oil on the new sealing lip.



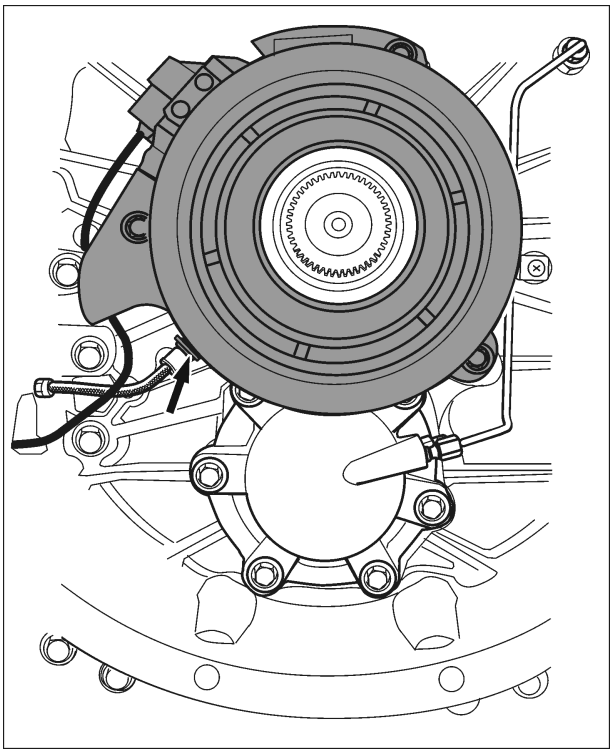
T4021446

24
Install the new input shaft seal.

25
Clean and inspect the supply hose connections. Replace the supply hose O-rings. If there is any damage to the hose or connections, replace the damaged part.

26
Position the clutch cylinder. Install and torque the mounting bolts.

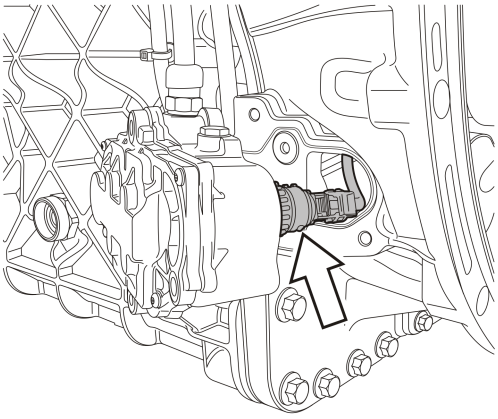
45±5 Nm (33±4 ft-lb)



T4021345

27
Connect the air hose to the clutch cylinder and install the locking clip.

28
Check that the sealing surface on the clutch valve assembly is clean. Inspect the clutch valve seal and replace as needed.

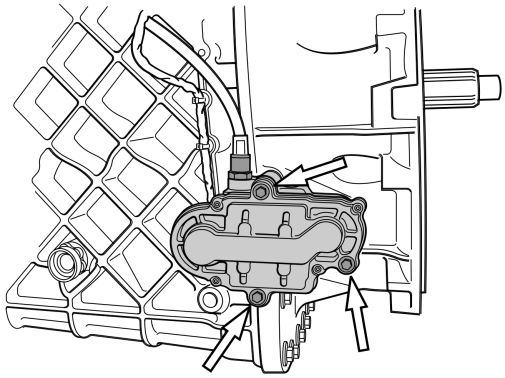


W4002924

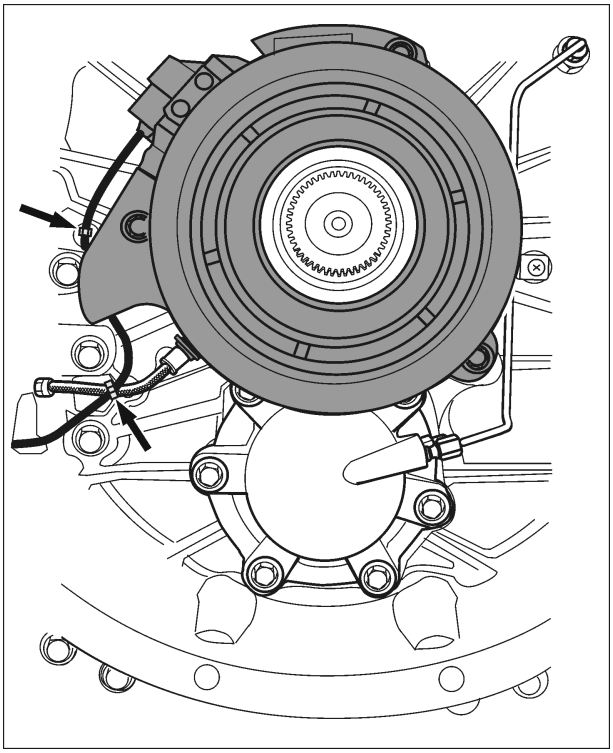
29
Connect the clutch position sensor wiring to the clutch valve.

30
Install and torque the clutch valve mounting bolts.

20±3 Nm (15±2 ft-lb)

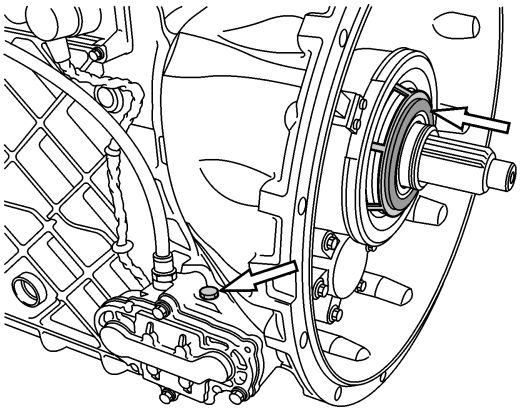


W4002923



T4021344

31
Secure the wiring harness and air hose in position with new tie straps.



T4021203

32
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and torque.

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

7±2 Nm (5±1 ft-lb)

33
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

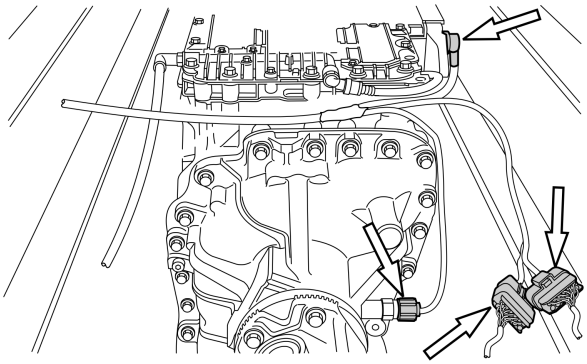
34
Install the remaining transmission-to-engine mounting bolts. Torque the bolts and remove the transmission jack.

Note: To aid access, install and tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

92±8 Nm (68±6 ft-lb)

35
Position the battery cables and install their mounting bolts.

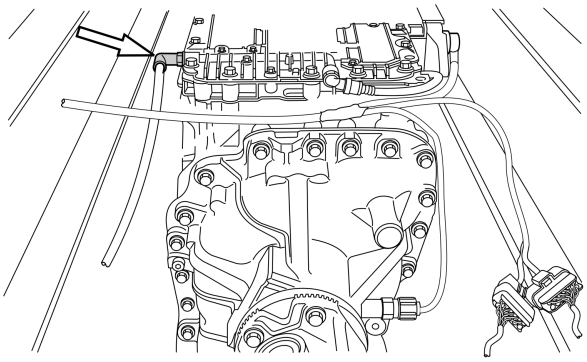
36
Install the cab engine cover.



W4002941

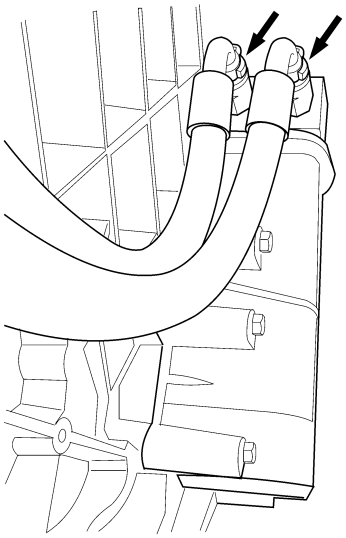
37
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

38
Install new tie straps to securing the wiring harness to the transmission.



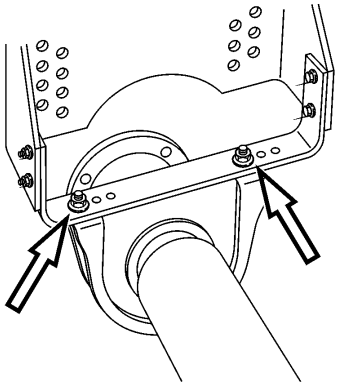
W4002940

39
Connect the air supply hose at the rear of the transmission.



W4002894

40
Connect the transmission oil cooler hoses to the filter housing.



T4018155

41
Install the drive shaft, the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

Note: Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped).

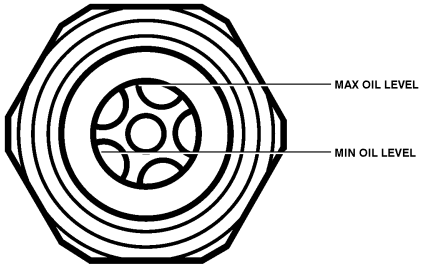
Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing – 175±30 Nm (129±22 ft-lb)
Universal Joint Caps – 166±10 Nm (122±7 ft-lb)

42
Remove the supporting jack stands and lower the vehicle.

43
Pressurize the air system and check for leaks.

44
Restore power to the vehicle by connecting the batteries negative cable.



T4021684

45
Check and fill the transmission with approved transmission oil.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-88956925[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

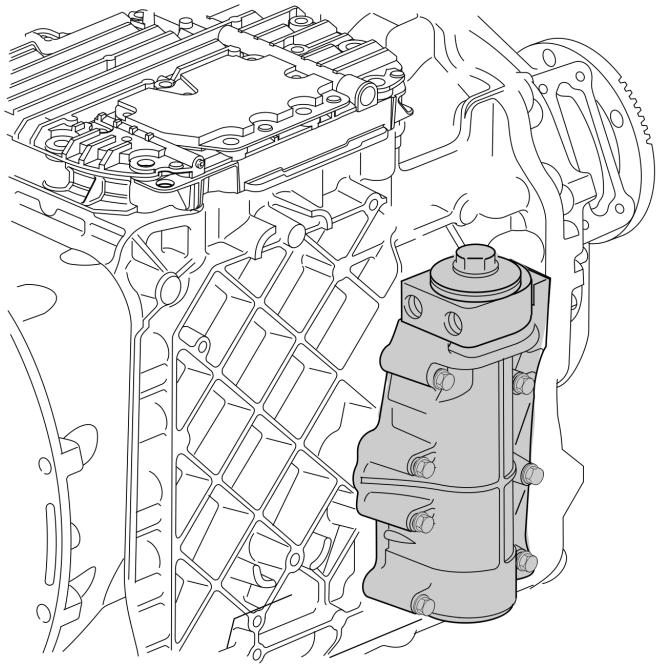
This service bulletin replaces bulletins 431-01 and 431-14 “Gasket, Oil Filter Housing, Replacement”, dated 6.2007.

Date	Group	No.	Release	Page
4.2010	**431**	**01**		1(4)

Gasket, Oil Filter Housing, Replacement

I-Shift Transmission

Gasket, Oil Filter Housing, Replacement



W4002888

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- “Gasket, Oil Filter Housing, Replacement”, page 2

4319-03-02-05
Gasket, Oil Filter Housing, Replacement

You must read and understand the precautions and guidelines in Service Information, group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

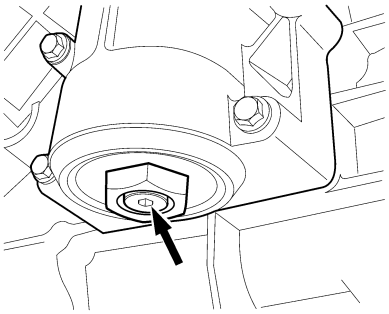
⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

Special tools: 85108826

1
Remove the transmission drain plug and drain transmission oil. Install and torque the plug.

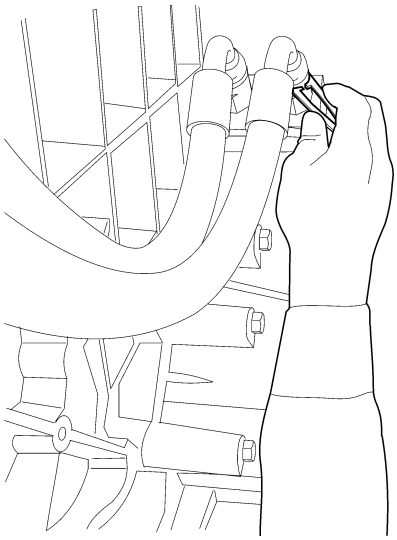
35±5Nm (26±4 ft-lb)



W4002889

2
Remove the oil drain plug at the bottom of the oil filter housing and drain the oil.

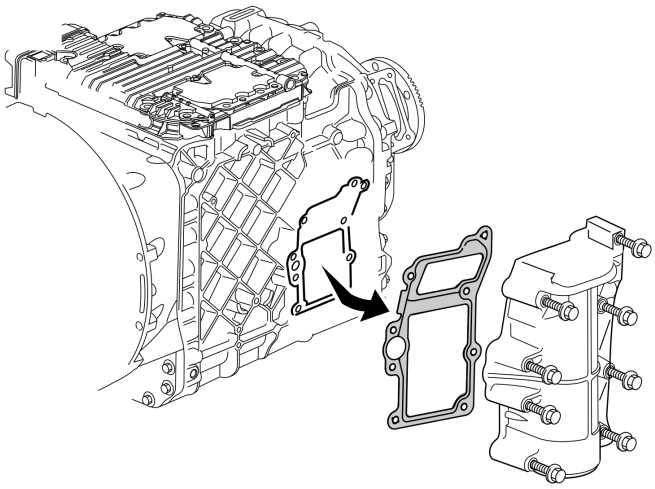
Note: Reinstall the plug after the housing has drained to stop dripping oil.



W4002890

3
Disconnect the transmission oil cooler hoses.

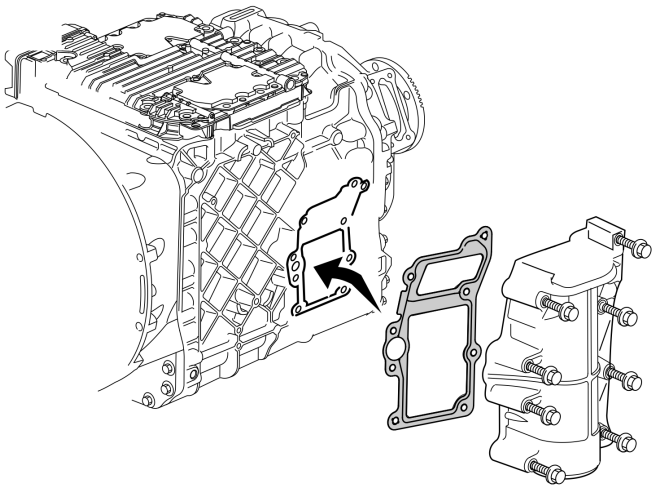
85108826



W4002891

4
Remove the oil filter housing mounting bolts, the housing and the gasket.

5
Check that the oil filter housing sealing surfaces are clean. Install a new gasket.



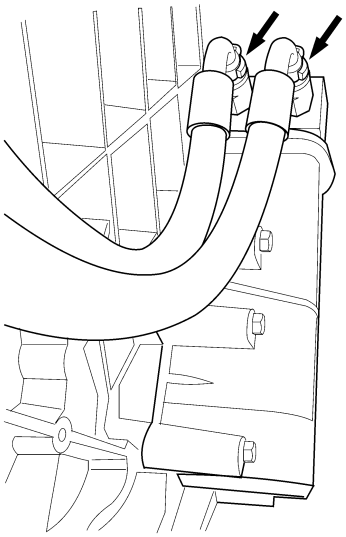
W4002893

6
Install the oil filter housing and torque the bolts.

Note: Initially install the housing, the gasket, and two of the center bolts to get the housing positioned in place.

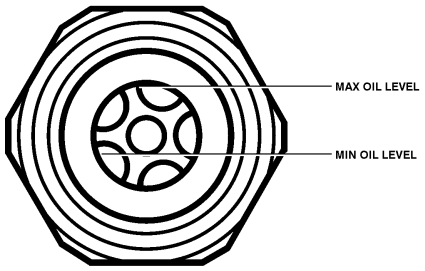
Note: Begin torquing with the center bolts and work outward.

20±3 Nm (15±2 ft-lb)



W4002894

7
Connect the transmission oil cooler hoses.



T4021684

8
Fill the transmission with approved transmission oil.

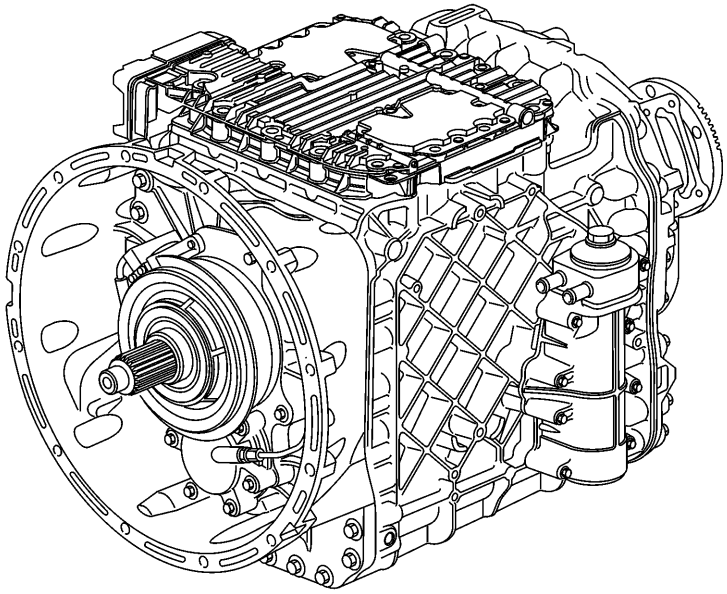
PE13-002

VOLVO TRUCK

5/31/2013

PV776-88960518[1]

Specifications



T4021207

- “Transmission, Mechanical”, page 2

Transmission, Mechanical

Shaft Bearing Preload

	mm (inches)		
Main shaft	0.10-0.20 (0.004–0.008)	Countershaft	0.10-0.20 (0.004–0.008)

Axial Clearance

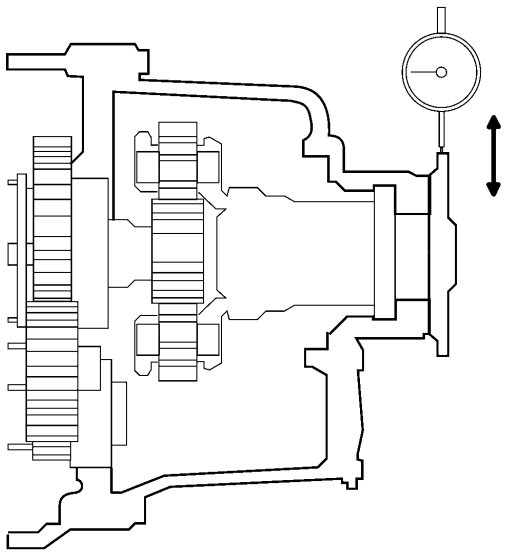
	mm (inches)
Locking ring, input shaft	max 0.05 (0.004)
Locking ring, countershaft	max 0.10 (0.004)
Locking ring, output shaft	max 0.10 (0.004)
Planet wheel, range	0.50-1.30 (0.02–0.051)

Runout

	mm (inches)		
		Tooth wheel	max 0.4 (0.016)

Radial Clearance

	mm (inches)
Output Shaft (as measured at the companion flange, refer to figure 1.)	max. 1 (0.040)



W4003071

Fig. 1 Output shaft runout check

System Pressure

	bar (psi)
System air pressure, at control housing	6.5 - 10 (95–145)

Press Forces

Note: Press forces apply to cleaned parts.

		Min (ton)	**Max (tons)**	**Notes**
Input shaft	Bearing, inner race	-	5	
Main shaft	Bearing, inner race	-	5	
Main shaft	Hub, 2nd high primary	2.5	20	
Main shaft	Tooth wheel	1	5	
Main shaft	Coupling ring, high range	5	25	
Countershaft	Gear, high primary	21	40	
Countershaft	Gear, low primary	21	40	
Countershaft	Bearing, inner race	-	5	
Countershaft	2nd gear	17	40	
Output shaft	Companion flange	1	12	
Output shaft	Bearings	-	8	
Main housing	Reverse gear	0.5	5	
Main housing - clutch housing	Outer rings	-	2	

Tightening Torques

Main Housing

	Thread	Nm (lb/ft)	Notes
Housing vent, fitting (design level C transmission only)	M26x1.5	-	Loosely tightened, approx 2 turns, stop at 45° upward angle.
Suction pipe, flange	M8	28±5 (21±4)	Self-tapping flange screw.
Oil drain plug	M26x1.5	35±5 (26±4)	
Oil filler plug	M26x1.5	35±5 (26±4)	
Oil filter housing drain, plug	M12x1.5	16±2 (12±1)	
Oil filter housing, bolt	M8	20±3 (15±2)[1]	
Oil filter, cover	M80x2	50±5 (37±4)	
Oil cooler, nut	M22x1.5	55±8 (41±6)	
Oil level glass	M26x1.5	35±5 (26±4)	
Oil pressure, plug	M12x1.5	16±2 (12±1)	
Clutch control valve, bolts	M8	20±3 (15±2)	
Clutch control valve, service plug		7±2 (5±1)	
Overflow valve, bolt	M22	47±6 (35±4)	
Lifting bracket, bolts	M16	110±10 (81±7)	

Control Housing

	Thread	Nm (lb/ft)	Notes
Control housing	M12	110±10 (81± 7)[1]	Self-tapping flange screw.
Control housing, upper cover	M8	24±4 (18±3)[1]	
Push lock, fittings	M16x1.5	20±3 (15±2)[2]	
Gear position sensor, bolts	M6	10±1 (7±1)	

1 Tightened diagonally. Full torque only when the cover is in contact with the housing.

2 Screw the nipple until the counterhold nut is in contact with the control housing.

Clutch/Range Housings

	Thread	Nm (lb/ft)	Notes
Countershaft brake, bolt	M10	45±5 (30±4)[1]	
Brake pipe, nut	M8x1.5	20±3 (15±2)	
Brake pipe, fitting	M10x1	25±4 (18±3)	
Brake pipe, reduction fitting	M16x1.5	48±5 (35±4)	
Clutch cylinder, air intake hose fitting	M4x12	2.5±0.4 (2±1)	
Clutch cylinder, bolt	M10	45±5 (33±4)	
Clutch housing, to engine bolt		92±8 (68±6)	
Clutch housing, bolts	M12	110±10 (81± 7)[1]	Self-tapping flange screw.
Range housing, bolts	M12	110±10 (81± 7)[1]	Self-tapping flange screw.
Shift fork, locking screw	M16x1	75±7 (55±5)	
PTO cover	M12	40±5 (30±4)	
Speedometer sensor	M18x1.5	25±4 (18±3)	
Companion flange, nut	M60x2	550±50 (406±37)	
Drive shaft end yoke, bolts	M14	190±15 (140±11)	

1 Tightened diagonally. Full torque only when the cover is in contact with the housing.

General Tightening Torques

Note: General torques are only used when no specific torque is given.

Standard Bolts, Property Class 8.8

Fastener Size	Nm (lb/ft)
M6 standard bolt 8.8	10±1 (7±1)
M8 standard bolt 8.8	24±4 (18±3)
M10 standard bolt 8.8	48±8 (35±6)
M12 standard bolt 8.8	85±15 (63±11)
M14 standard bolt 8.8	140±25 (103±18)
M16 standard bolt 8.8	190±35 (140±26)

PE13-002

VOLVO TRUCK

5/31/2013

PV776-89036622[1]

VOLVO

Volvo Trucks North America
Greensboro, NC USA

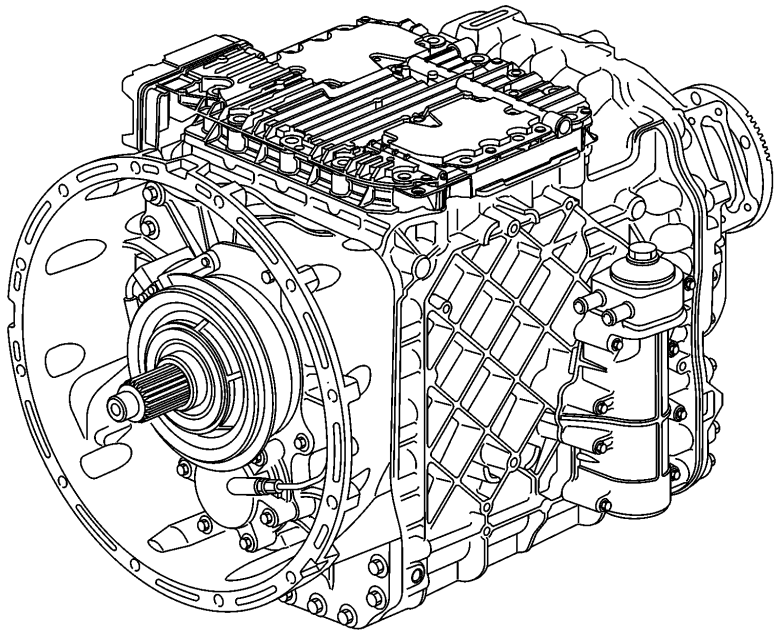
Service Bulletin Trucks

Date	Group	No.	Release	Page
11.2011	**432**	**18**	**01**	1(7)

Pressure Sensor, Control Housing, Replacement

I-Shift Transmission

Pressure Sensor, Control Housing, Replacement



T4021207

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

• “Pressure Sensor, Control Housing, Replacement”, page 2

4320-03-04-01
Pressure Sensor, Control Housing, Replacement

You must read and understand the precautions and guidelines in Service Information, Function Group 4, “Transmission Safety Practices” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

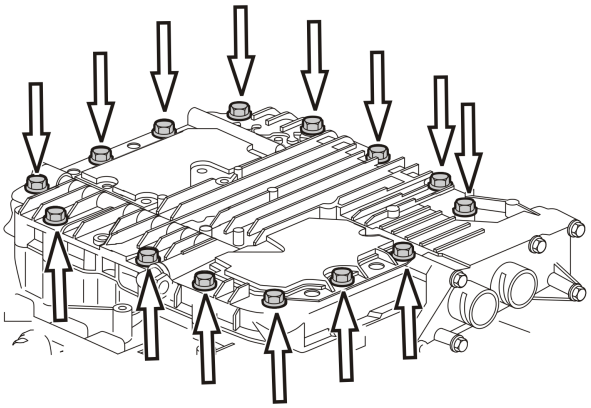
Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ CAUTION

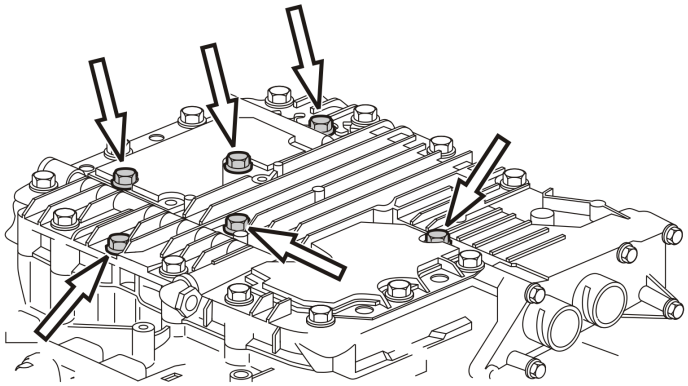
Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

1
Remove the transmission from the vehicle. Refer to Function Group 43.

2
Remove the control housing mounting bolts.

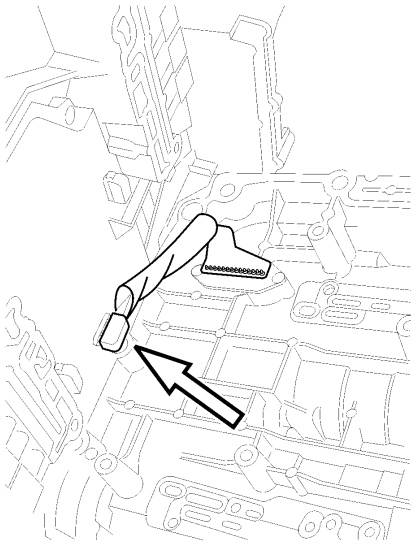


W4002951



W4002952

3
Remove the upper cover mounting bolts.



W4002953

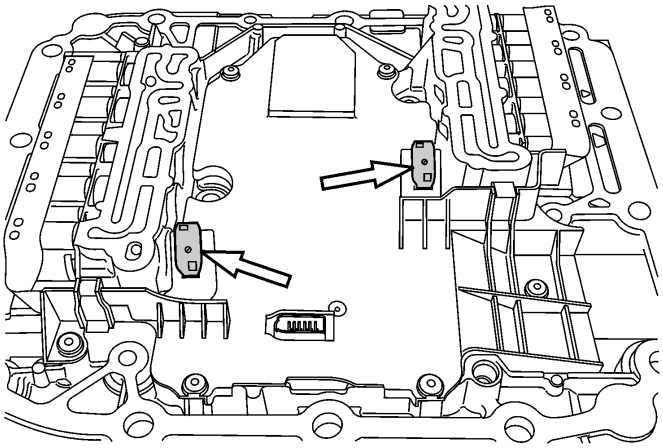
4

⚠ CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Gently lift the top edge of the upper cover and angle it down carefully against the clutch housing. Carefully disconnect the electrical connection and remove the top cover.

Note: Do not apply tension or weight to the wiring harness or connector.



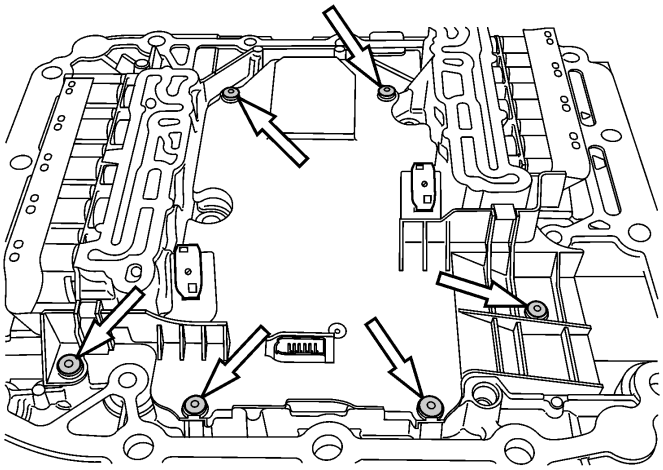
T4021233

5

⚠ CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Carefully release the solenoid valve connectors so that the ribbon is not damaged.



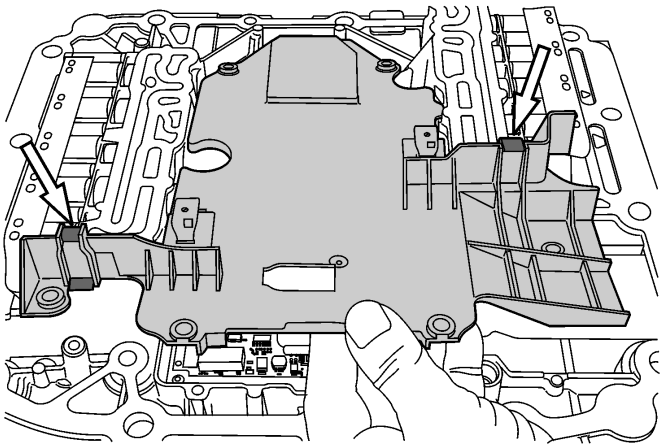
T4021234

6

Remove the screw rivets from the cover using a 2.5 mm Allen key that is pushed in as far as it will go.

Note: The screw rivets are not reused, discard the rivets.

Note: Once the cover has been removed, the printed circuit board must not be touched as static electricity can damage the electronics.



T4021236

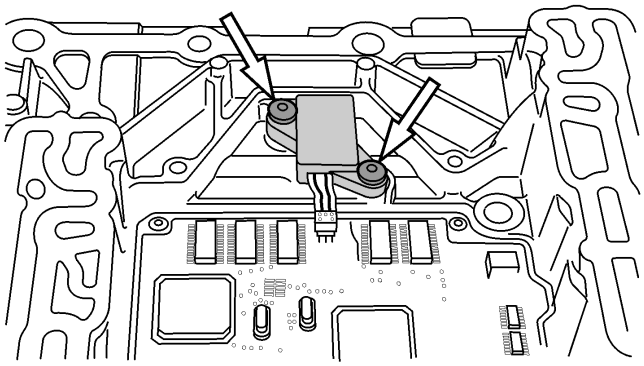
7

⚠ CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Carefully lift off the cover. Remove both the ribbon clips. Carefully release the ribbon from the guide pin in the cover. Remove the cover.

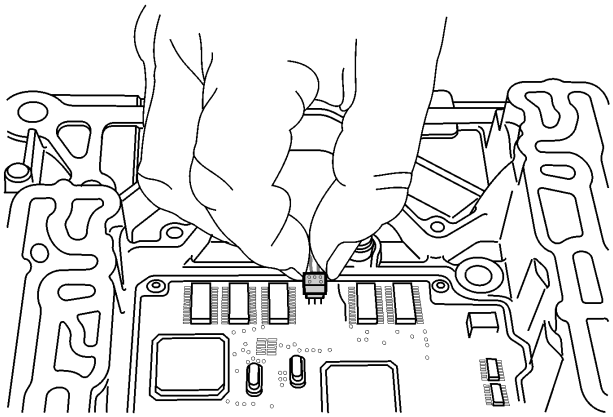
Note: Note that the clips are facing in different directions.



T4021237

8

Remove the pressure sensor screw rivets.



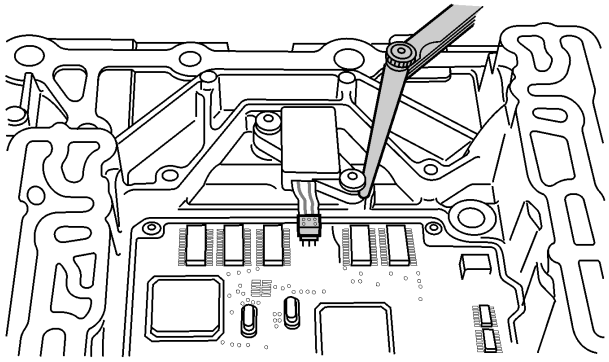
T4021238

9

CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Carefully release the connector without touching the circuit board. Remove the sensor as well as any O-ring that is still in the cover.



T4021245

10

CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Install a new O-ring onto the new pressure sensor. Carefully connect the connector to the circuit board and install the sensor with the new self-tapping screws. Tighten the screws until there is 0.1 - 0.2 mm (0.004 - 0.008 in) clearance between the sensor and the screw heads. Then tighten the screw an additional 120° to 180° (180° = a half turn).

11

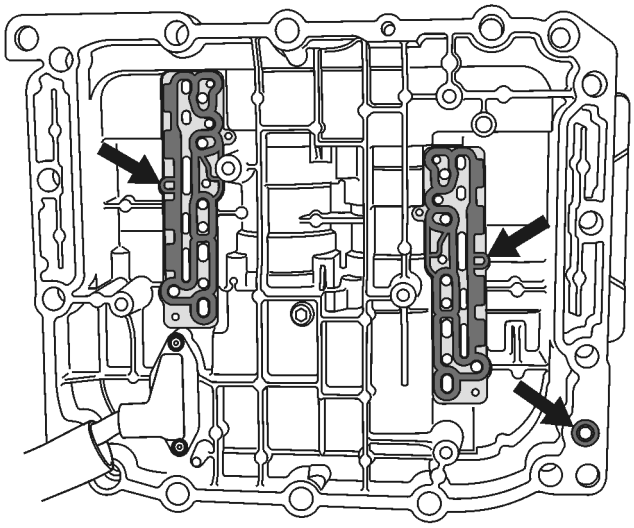
> **CAUTION**
>
> Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Position the cover before the top cover is screwed into place. Carefully lift the top cover and install the ribbon for the solenoids onto the guide pin in the top cover. Then install the clips.

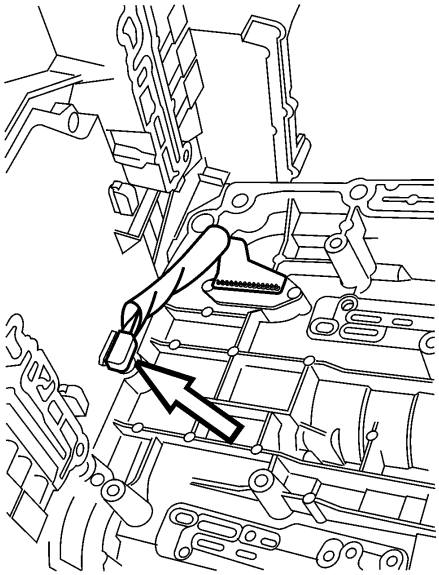
Note: Note that the clips are facing different directions.

12
Install new self-tapping screws rivets and tighten to 4 ±1 Nm (35 ±9 in-lb).

13
Remove the old gasket from the cover. Install new solenoid valve seals, the O-ring onto the counter shaft brake and a new upper cover gasket.



T4020778



T4021264

14
Install the cover onto the control housing. Connect the electrical contacts to the control housing without damaging the ribbon.

15
Install new screws in the cover and tighten to 24 ±4 Nm (18 ±3 ft-lb).

16
Install the control housing screws and tighten to 110 ±10 Nm (80 ±8 ft-lb).

17
Install the transmission in the vehicle. Refer to Function Group 43.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-89061509[1]

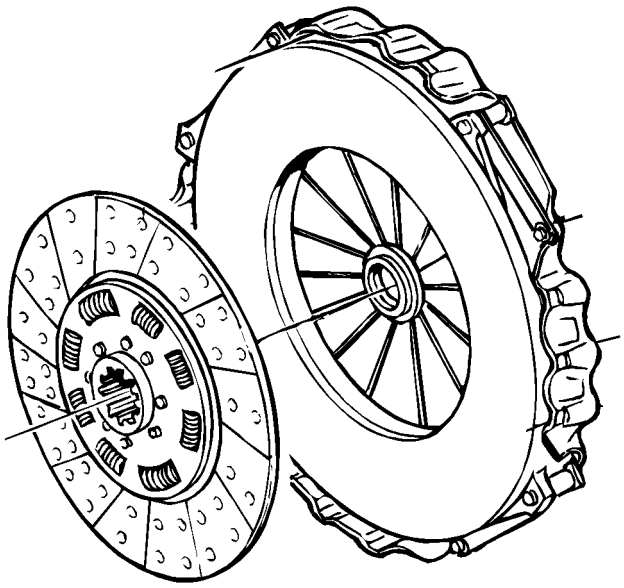
VOLVO
Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

This service bulletin replaces bulletin 411-41 dated 4.2010.

Date	Group	No.	Release	Page
10.2012	**411**	**41**	**03**	1(12)

Clutch, Replacement



T4012799

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- "Clutch, Replacement", page 2

4111-03-02-02
Clutch, Replacement

You must read and understand the precautions and guidelines in Service Information, Function Group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

Note: Due to the design of the dual mass flywheel used with the D16 engine, some torsional movement of the flywheel may be noticed while working on the clutch and its components. This torsional movement is normal, and is not due to improper flywheel installation or a damaged component.

Note: Before the transmission is removed from the vehicle, the following operation must be performed with Tech Tool, **4320-08-03-32, PWM Valves Clutch, Test** . Evaluate the test results to identify any clutch control issues before removing the transmission. Record the results to the job card.

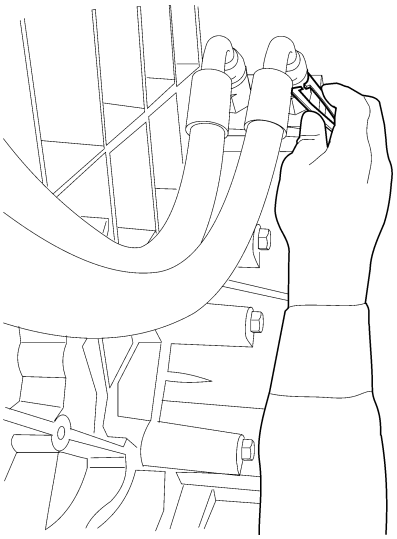
Special tools: 85108826, 9990024, 9996857, 9991821, 9992564, 9991801, 9996896, 9996857, OTC 5018

1
Apply the parking brake.

2
Disconnect power to the vehicle by removing the batteries negative cable.

3
Drain the air system.

4
Raise the vehicle and support with jack stands.

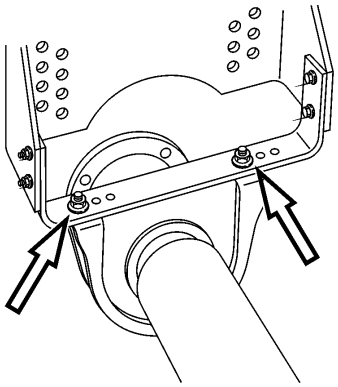


W4002890

5

Place a suitable container under the filter housing and the transmission oil cooler hoses. Disconnect the transmission oil cooler hoses from the filter housing. Dispose of used oil in accordance with all state, local and federal regulations.

85108826



T4018155

6

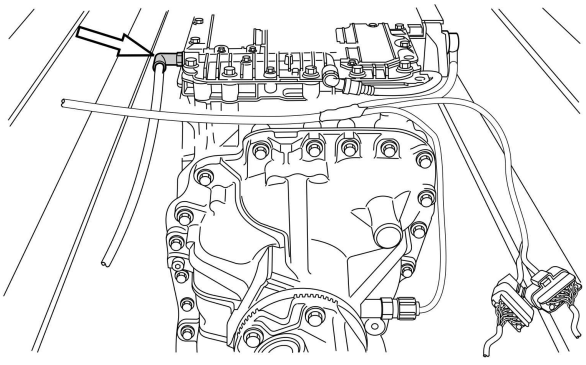
⚠ WARNING

Drive shafts can be very heavy. Install a support strap when servicing a drive shaft. Failure to install a support strap can result in personal injury.

Remove the drive shaft. Discard the fasteners and straps.

Note: Remove the universal joint caps and the fasteners holding the intermediate bearing to the support bracket (if equipped).

Note: Mark the position of the fasteners on the bracket so that the intermediate bearing is installed in exactly the same position as before. Position the shaft aside.



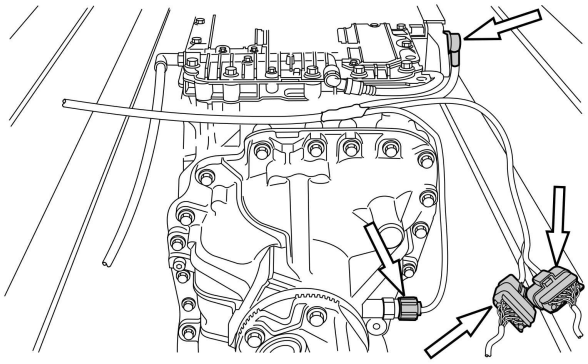
W4002940

7

Disconnect the air supply hose at the rear of the transmission.

8

Remove the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the electrical harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
Remove the cab engine cover.

11
Remove the transmission-to-engine mounting fasteners along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting fasteners at this time.

12
Position the transmission jack and secure the transmission to it.

13
Remove the fasteners securing the battery cables to the brackets on the top of the clutch housing.

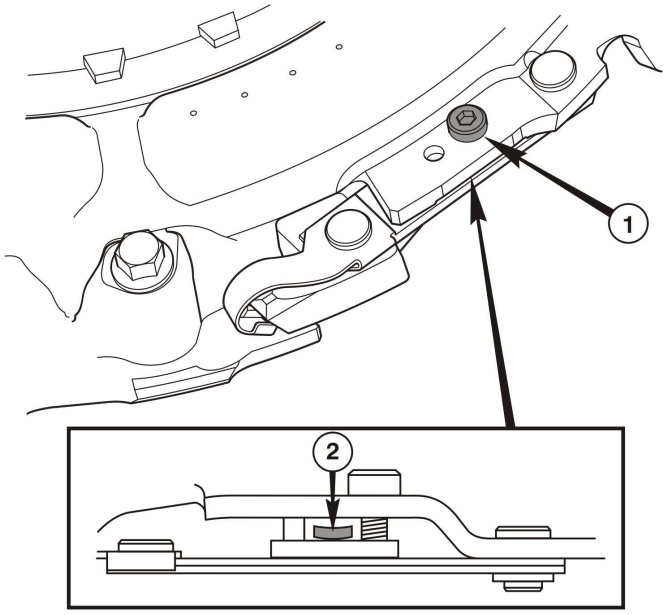
14
Remove the top four transmission-to-engine mounting fasteners.

15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it such as wiring or air hoses.

16
Install the clutch line up shaft.

9990024



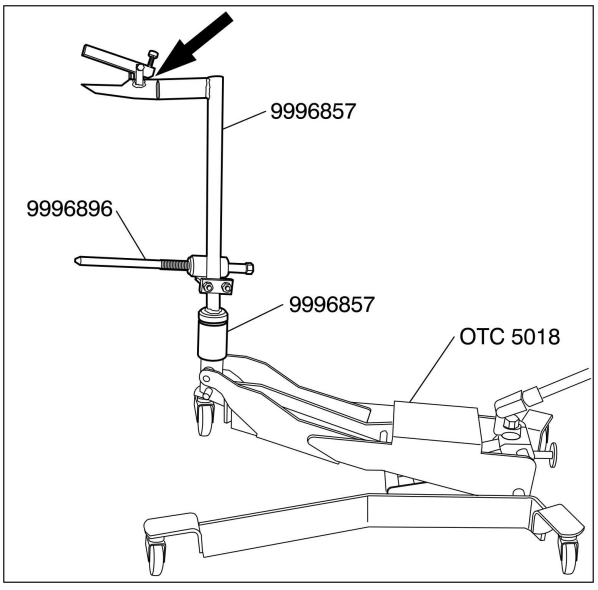
T4022584

17

> **CAUTION**
>
> **The clutch disc and pressure plate must not be changed separately. Damage to components can result.**

Note: The engine is equipped with a dual mass flywheel and the clutch is a self-adjusting type.**If the clutch and clutch disc have to be removed for any reason, the socket cap screw (1) must be unscrewed not more than 2.5 turns and must not be removed**, this is to prevent using up the adjustment range.**The following applies to the socket cap screw, and is extremely important:**
A. **The socket cap screw shall be screwed out a maximum of 2.5 turns.**
B. If the socket cap screw is not unscrewed at all, there is a risk that all the adjustment of the pressure plate will be used up, **if this is the case, replace with a new pressure plate and clutch disc.**
C. If the socket cap screw has been fully unscrewed by mistake, screw the socket cap screw back in at once.

Rotate the engine so that the socket cap screw (1) passes downwards. Fit the locking lug under the finger (2), align the guide pin and screw in the socket cap screw (1).



W4002943

18

Remove the fasteners from the pressure plate by loosening them a couple of turns at a time in a diagonal pattern. Loosen the two nuts on the alignment studs.

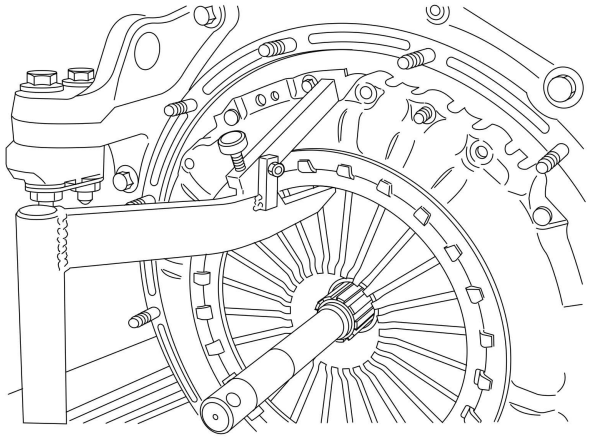
Note: Do not fully remove the nuts from the two alignment studs.

19

Attach the lifting tool, the retainer and the adapter to the clutch jack. Position the lifting hook on the lifting tool between the diaphragm spring and the casing. Adjust the lifting tool and retainer to the pressure plate.

Note: It will be necessary to modify the lifting tool by grinding or cutting off the corner (arrow shown in the accompanying illustration).

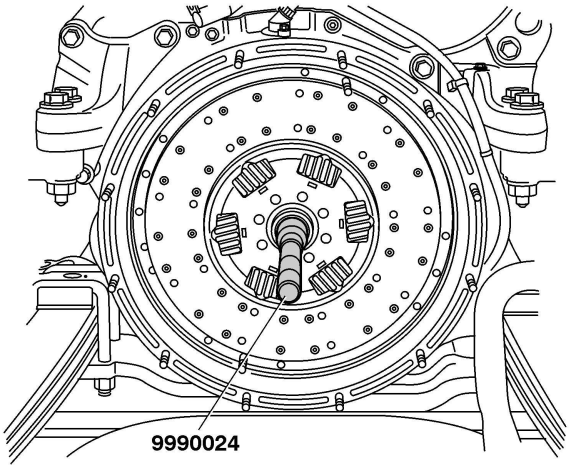
9996857, 9996896, 9996857, OTC 5018



W4002944

20
Remove the nuts from the alignment studs and the pressure plate from the vehicle.

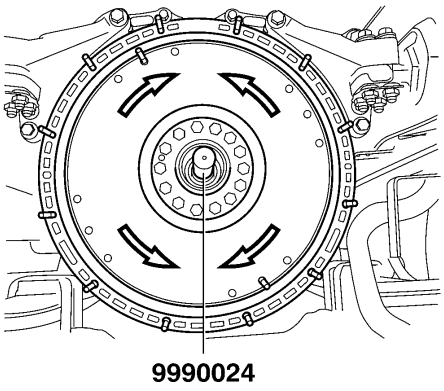
9996857, 9996896, 9996857, OTC 5018



T4021200

21
Remove the clutch disc and the line up shaft.

9990024



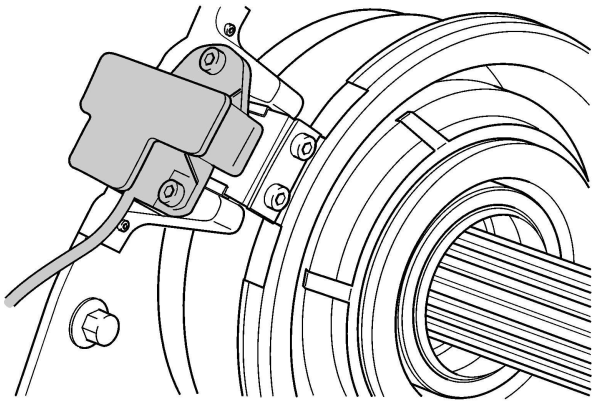
T4022542

22

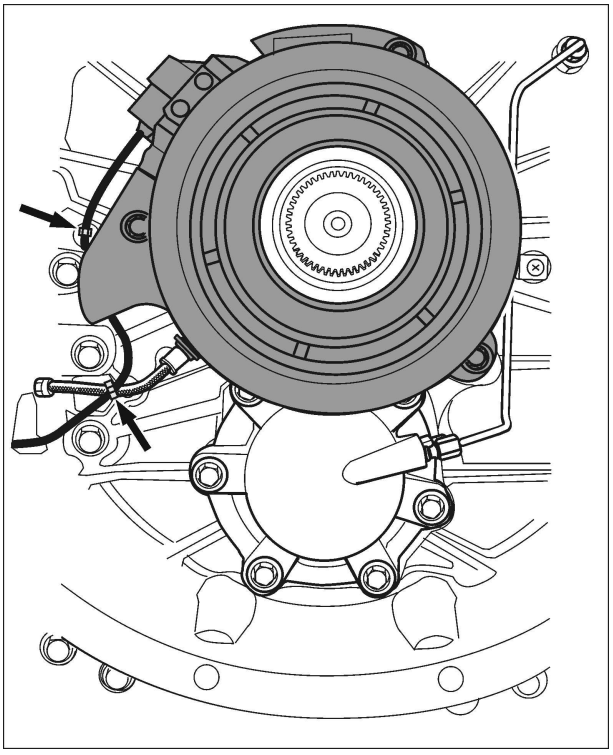
Note: Due to the design of the dual mass flywheel used with the D16 engine, some torsional movement of the flywheel may be noticed while working on the clutch and its components. This torsional movement is normal, and is not due to improper flywheel installation or a damaged component.

Note: It is important to obtain a completely clean surface without oil.

Inspect the flywheel for wear or damage and to ensure that it is clean and free of oil. Clean as necessary. Inspect the flywheel, clutch cylinder, release bearing, and clutch position sensor. Replace any damaged parts.



T4021528



T4021344

23

Note: If the release bearing has been run hot, it may have damaged the clutch cylinder.

If the PWM Valves Clutch Test 4320-08-03-32 shows incorrect values or if there are indications that the release bearing and support bearing have been run ho, do one of the following operations: Position Sensor, Clutch Replacement and Clutch Cylinder, Replacement. Make a visual inspection of the sensor, to ensure that it is firmly fastened and does not have any visible faults. Replace any damaged components.

24
Remove the pilot bearing.

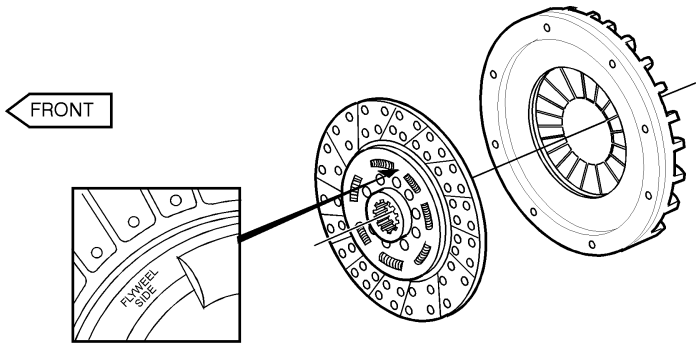
9991821

25
Install a new pilot bearing.

9992564, 9991801

26
Position the new pressure plate on the lifting tool.

Note: Note the orientation of the old pressure plate prior to removal and position the new pressure plate on the fixture in the same manner.



T4012503

27

⚠ CAUTION

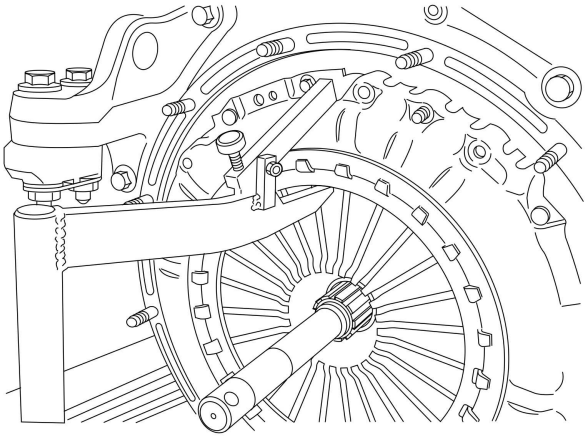
Do not install the clutch disc in the wrong direction! Correct installation of the clutch disc is essential for proper operation and to avoid damage. Failure to install the disc in the correct manner, will result in component damage.

Install the new clutch disc with the line up shaft.

Note: The clutch disc hub is stamped flywheel side. Be sure to install the clutch disc with that side facing toward the flywheel.

Note: A yellow sticker will be found on the pressure plate side of the clutch. Be sure to install the clutch disc with that side facing toward the pressure plate.

9990024



W4002944

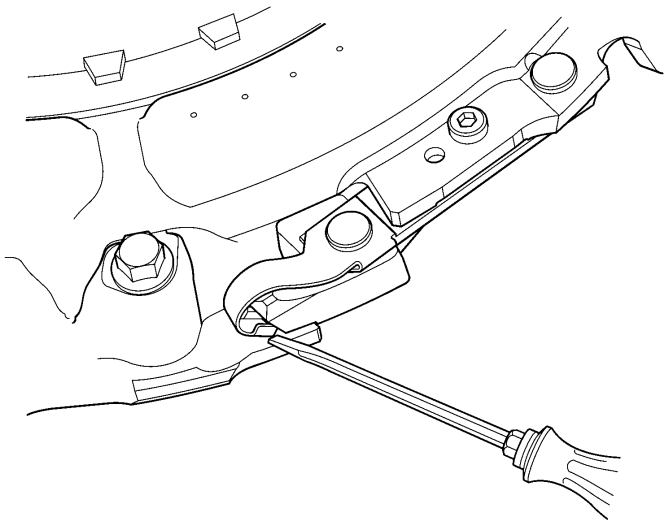
28

Position the new pressure plate and loosely install the two nuts on the alignment studs.

9996857, 9996896, 9996857, OTC 5018

29

Remove the lifting tool and jack.



30

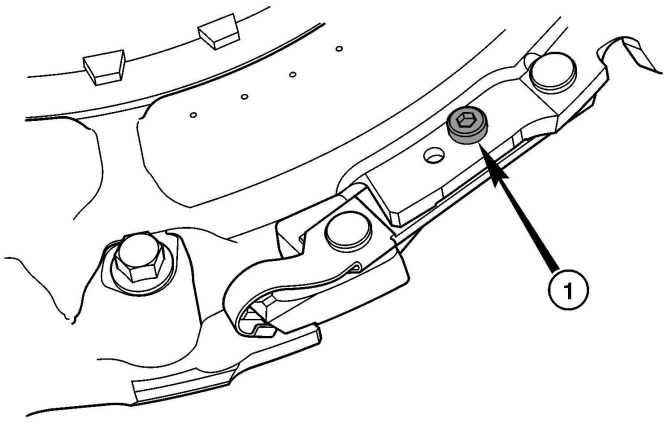
⚠ CAUTION

Retainer installation instructions must be strictly followed. Failure to follow the bolt tightening instructions, may result in component damage.

Install the mounting fasteners for the pressure plate and tighten in three stages:

1. 18 ±5 Nm (13 ±4 ft-lb)
2. 36 ±5 Nm (27 ±4 ft-lb)
3. 53 ±5 Nm (39 ±4 ft-lb)

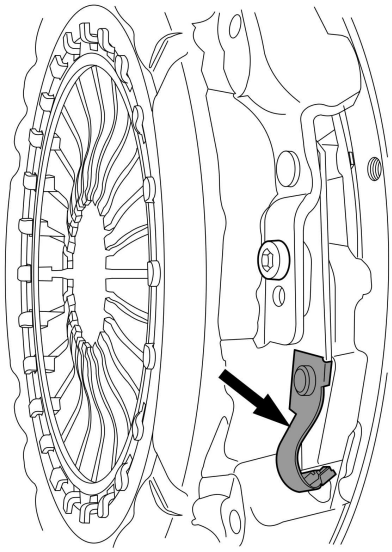
Note: Tighten in a diagonal pattern a few turns at a time to assure that the pressure plate is not exposed to undue force.



T4022580

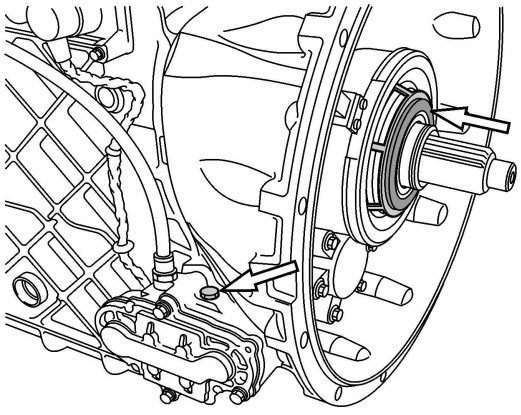
31 When reinstalling a pressure plate and clutch, tighten the socket cap screw (1) on the clutch once it has been installed on the flywheel. Tighten the socket cap screw (1) to 39 ±4 Nm (29 ±3 ft-lb).

32
Remove the clutch line up shaft.



W4002962

33
After the clutch and pressure plate are installed, make sure that all four form springs have snapped out.



T4021203

34
To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and tighten to 7 ±2 Nm (60 ±15 in-lb).

Note: Failure to perform this step will hamper installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

35
Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting fasteners to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

36

CAUTION

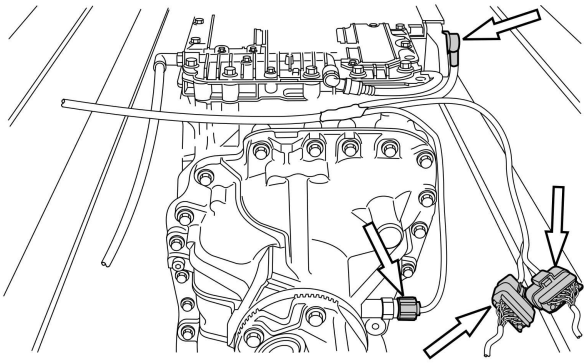
Do not use the engine mounting fasteners to pull the transmission into the engine. Using the fasteners to pull the transmission into the engine may result in component damage.

Install the remaining transmission-to-engine mounting fasteners. Tighten the fasteners to 92 ±8 Nm (68 ±6 ft-lb) and remove the transmission jack.

Note: To aid access, install and tighten the mounting fasteners on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting fasteners.

37
Position the battery cables and install their mounting fasteners.

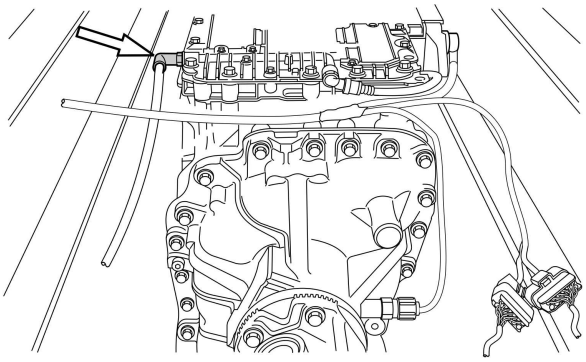
38
Install the cab engine cover.



W4002941

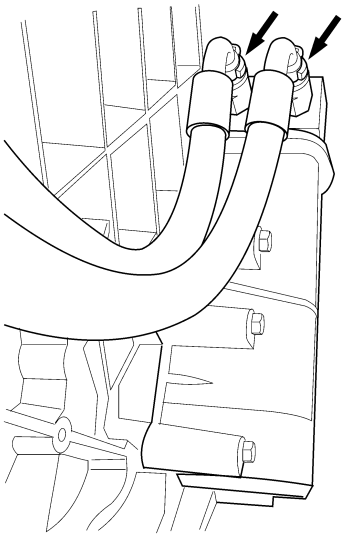
39
Position the electrical harness and reconnect the control housing, speed sensor, and the two chassis connectors.

40
Install new tie straps to secure the wiring harness to the transmission.



W4002940

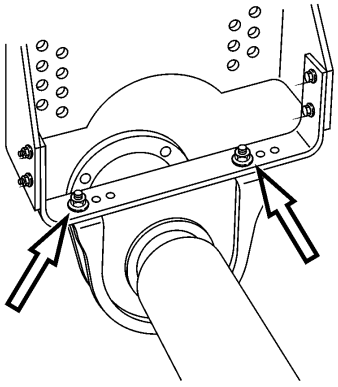
41
Connect the air supply hose at the rear of the transmission.



W4002894

42
Connect the transmission oil cooler hoses to the filter housing.

43
Inspect the companion flange mounting fasteners. If the fasteners have thread lock on them, they must be replaced. Install the universal joint yoke on the companion flange and tighten the mounting fasteners to 190 ±15 (140 ±11 ft-lb).



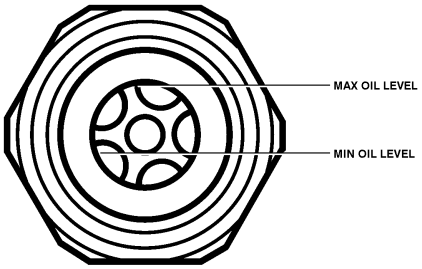
T4018155

44 Inspect the companion flange mating surfaces to ensure that there is no visible damage. Use new straps and fasteners to install the drive shaft and the universal joint caps. The fasteners holding the intermediate bearing to the support bracket (if equipped) can be reused.

Note: It is important to center the rubber insulator in the U-bracket correctly.

Intermediate Bearing – 105 ±20 Nm (78 ±15 ft-lb)
Universal Joint Caps – 170 ±15 Nm (125 ±10 ft-lb)

45
Remove the supporting jack stands and lower the vehicle.



T4021684

46
Pressurize the air system and check for leaks.

47
Restore power to the vehicle by connecting the batteries negative cable.

48
Check and fill the transmission with approved transmission oil.

49
After the transmission is installed, it is necessary to perform a Clutch Engagement Point Calibration using Tech Tool.

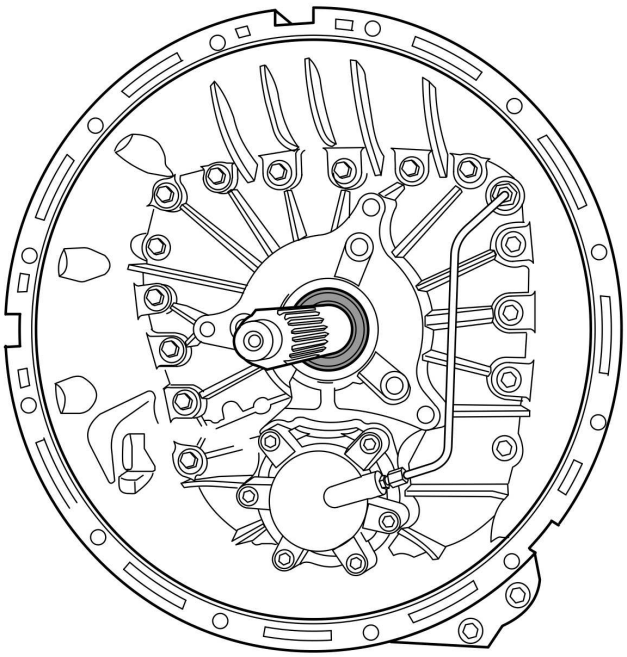
PE13-002

VOLVO TRUCK

5/31/2013

PV776-89088249[1]

Seal, Input Shaft, Replacement



W4002883

This service bulletin covers the procedure for replacing the input shaft seal on VOLVO I-Shift transmission.

Contents

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

4317-03-02-02
Seal, Input Shaft, Replacement

You must read and understand the precautions and guidelines in Service Information, Function Group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

Special tools: 88800005, 85108826

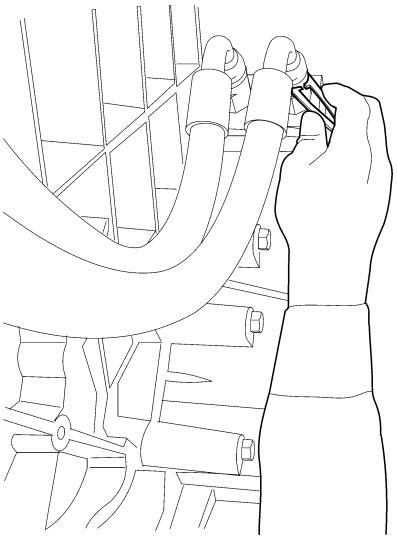
1
Apply the parking brake and place the shift lever in neutral.

2
Disconnect all cables from the negative (ground) battery terminals to prevent personal injury from electrical shock and prevent damage to electrical components.

3
Drain the air system.

4
Raise the vehicle and support it with jack stands.

Note: Be sure to raise the vehicle enough for the transmission and transmission jack to clear the vehicle when removed.

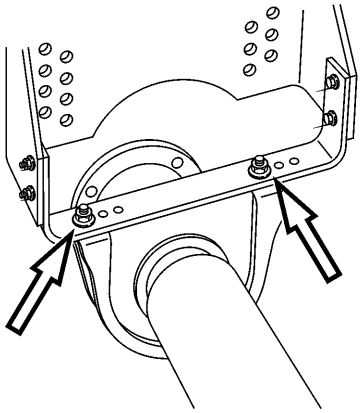


W4002890

5

Disconnect the transmission oil cooler hoses from the transmission oil filter housing.

85108826



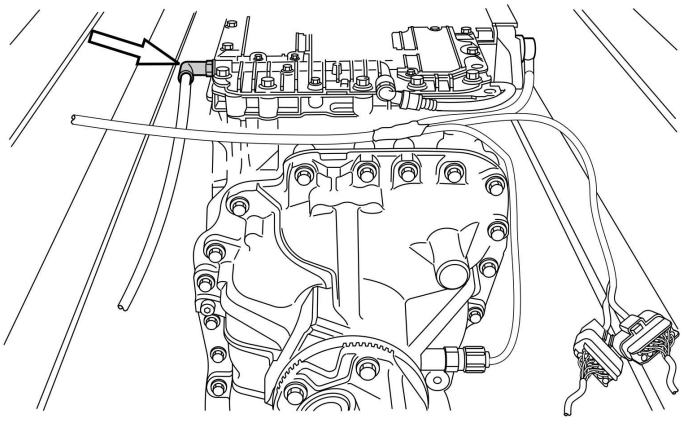
T4018155

6

Remove the drive shaft from the rear of the transmission.

Note: The universal joint caps and bolts hold the intermediate bearing to the support bracket (if equipped).

Note: Mark the position of the bolts on the bracket so that the intermediate bearing can be reinstalled in exactly the same position as before. Position the drive shaft out of the way.



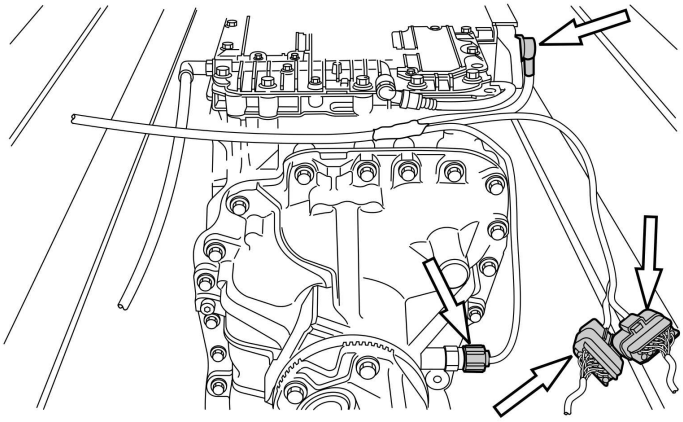
W4002940

7

Disconnect the air supply hose at the rear of the transmission by unscrewing the straight Raufoss fitting from the 90 degree fitting in the cover.

8

Cut the tie straps securing the wiring harness to the transmission.



W4002941

9
Disconnect the wiring harness at the control housing, speed sensor, and the two chassis connectors.

Note: Position the harness out of the way.

10
If needed to access the top bell housing bolts, remove the cab engine cover.

11
Remove the transmission-to-engine mounting bolts along the bottom and sides of the clutch housing.

Note: Do not remove the top four transmission-to-engine mounting bolts at this time.

12
Position the transmission jack under the transmission and secure the transmission to it.

13
Remove the bolts securing the battery cables to the brackets on the top of the clutch housing.

14
Remove the top four transmission-to-engine mounting bolts.

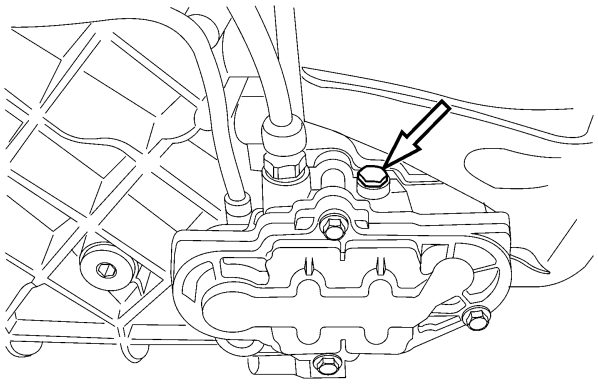
15
Carefully pull the transmission back until the input shaft clears the pressure plate. Lower the transmission and pull it out from under the vehicle.

Note: While lowering the transmission, periodically check around it to assure nothing is caught or hung up on it, such as wiring or air hoses.

16

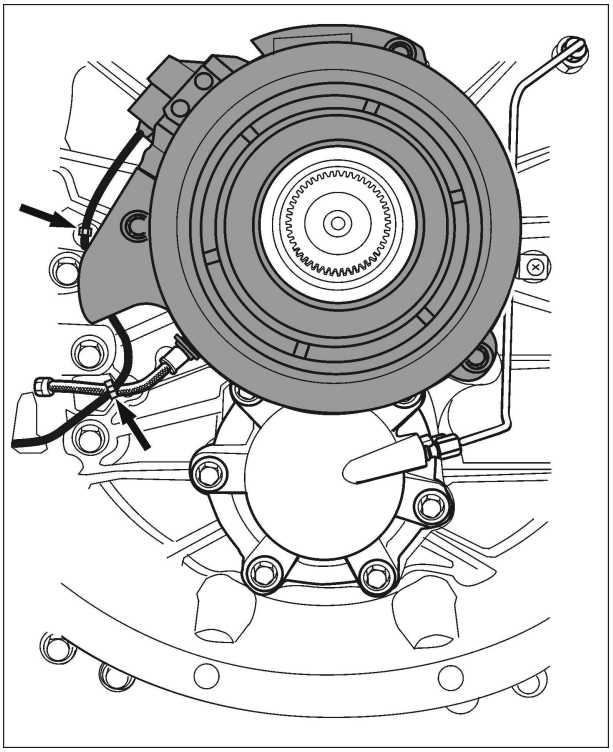
⚠ DANGER

The clutch valve unit contains air under high pressure. Do not remove the service plug entirely because doing so may allow the plug to quickly and forcefully become a projectile. Leave the drain plug slightly cracked to allow air pressure to slowly release, then remove the plug. Failure to do so may result in serious personal injury.



W4002879

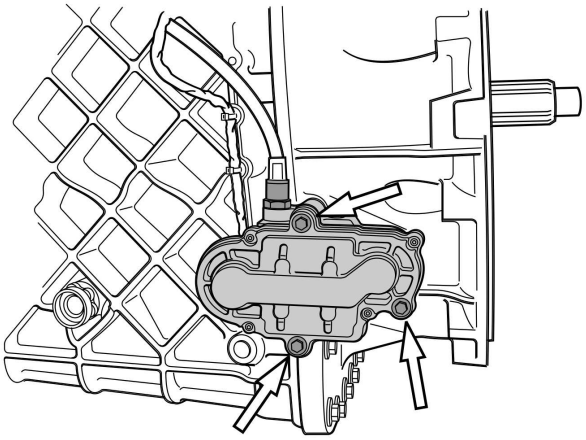
Remove the service plug located on top of the clutch valve unit to ensure that no air remains in the system.



T4021344

17

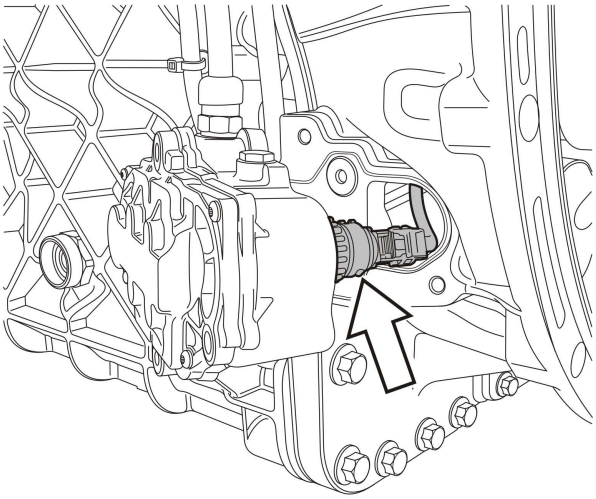
Carefully remove the tie straps for the wiring harness, and the air hose to the clutch cylinder.



W4002923

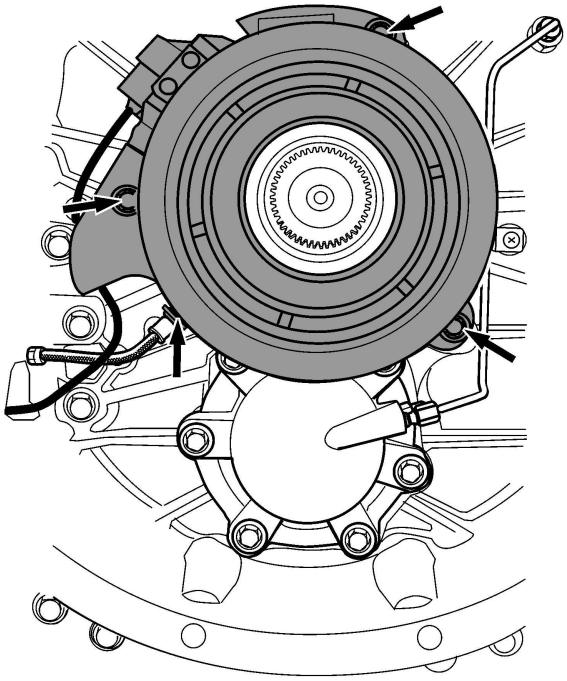
18

Remove the clutch valve mounting bolts.



W4002924

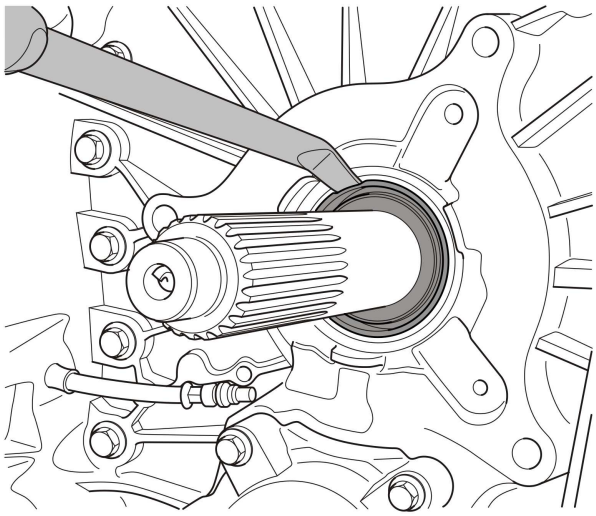
19
Disconnect the clutch position sensor wiring harness connector and position the clutch valve aside.



T4020990

20
Remove the clip holding the air hose in the clutch cylinder and disconnect the air hose from the clutch cylinder.

21
Remove the clutch cylinder mounting bolts and then the clutch cylinder.

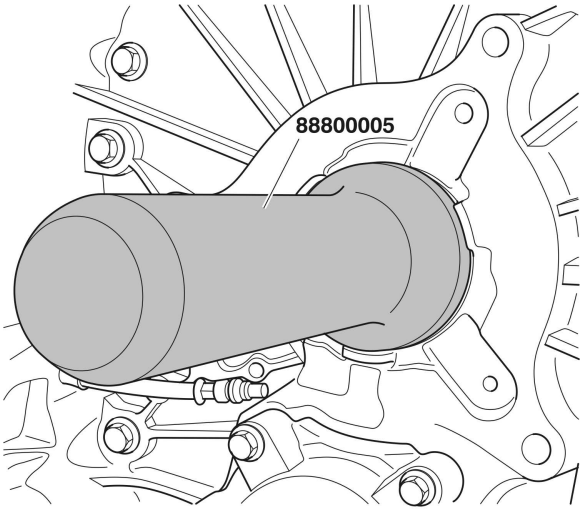


W4002954

22
Using an appropriate seal removal tool, remove the input shaft sealing ring.

23
Clean and inspect the surface where the input shaft sealing ring contacts the transmission.

24
Apply fresh transmission oil on the sealing lip of the replacement input shaft sealing ring.



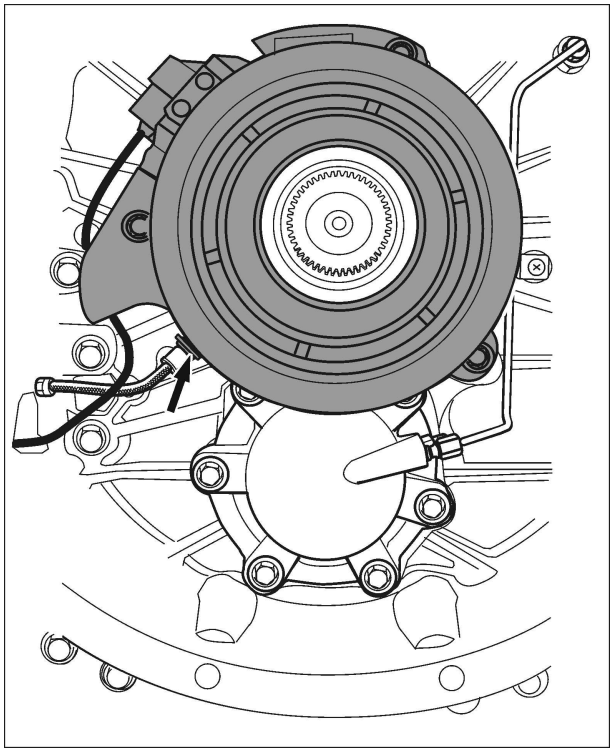
T4021446

25
Install the replacement input shaft sealing ring.

88800005

26
Clean and inspect the supply hose connections. Replace the supply hose O-rings. If there is any damage to the hose or connections, replace the damaged part.

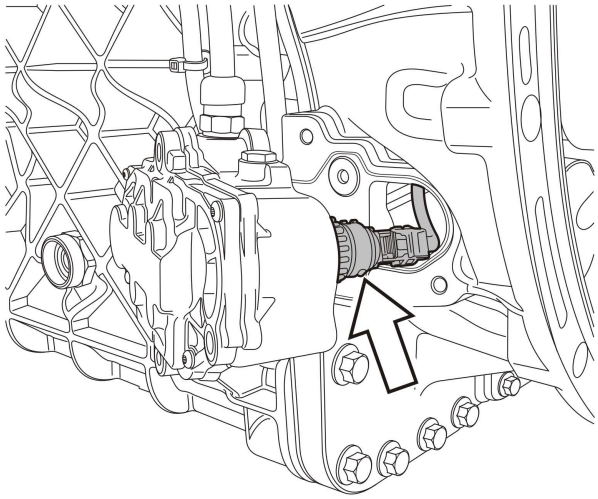
27
Position the clutch cylinder on the input shaft and install and torque the mounting bolts to specification; refer to Function Group 431, “Transmission, Mechanical.”



T4021345

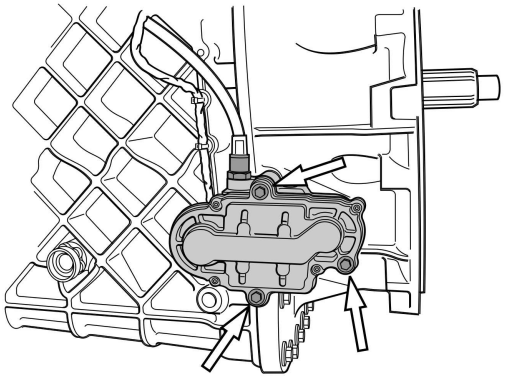
28
Reconnect the air hose to the clutch cylinder and install the locking clip.

29
Check that the sealing surface on the clutch valve assembly is clean. Inspect the clutch valve seal and replace as needed.



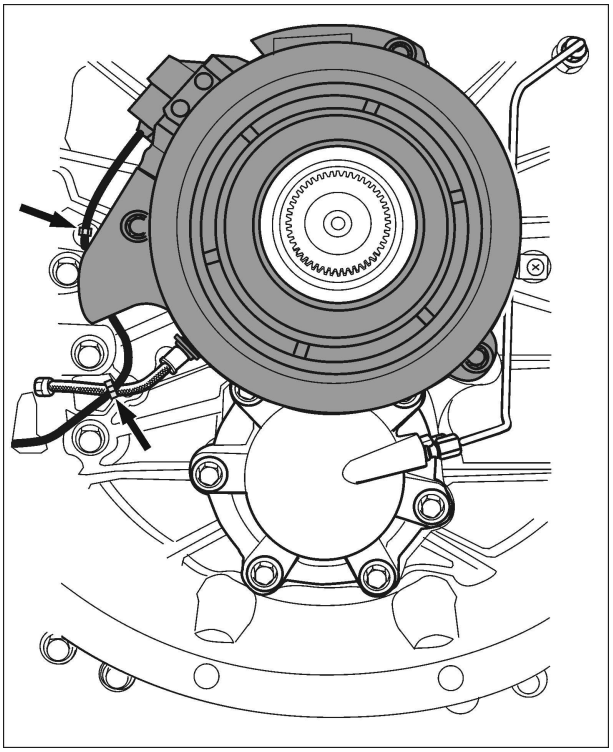
W4002924

30
Connect the clutch position sensor wiring harness connector to the clutch valve.



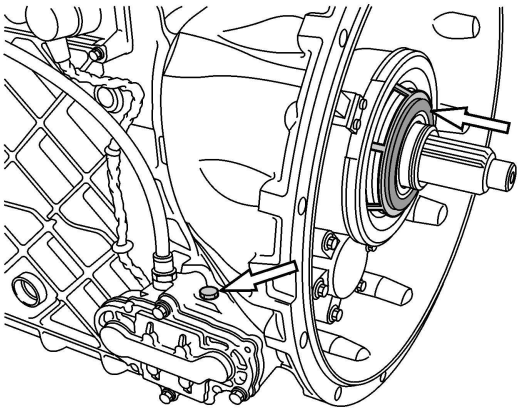
W4002923

31
Install the clutch valve mounting bolts and torque to specification; refer to Function Group 431, “Transmission, Mechanical.”



T4021344

32
Using new tie straps, secure the wiring harness and air hose in position.



T4021203

33

To aid transmission installation, remove the service plug on the clutch control valve assembly and push the piston all the way into the clutch cylinder. While holding the piston in, install the plug and tighten to specification; refer to Function Group 431, “Transmission, Mechanical.”

Note: Failure to perform this step will interfere with the installation. The transmission will be installed under clutch cylinder spring pressure and will fail to freely slide forward into place against the engine mating surface.

34

Carefully install the transmission and align it to the engine. Loosely install two upper and two lower transmission-to-engine mounting bolts to hold the transmission in place.

Note: The use of an assistant may be necessary to aid installation.

Note: Rotate the input shaft to align the clutch splines.

35

Install the remaining transmission-to-engine mounting bolts. Tighten all the mounting bolts to specification and remove the transmission jack; refer to Function Group 431, “Transmission, Mechanical.”

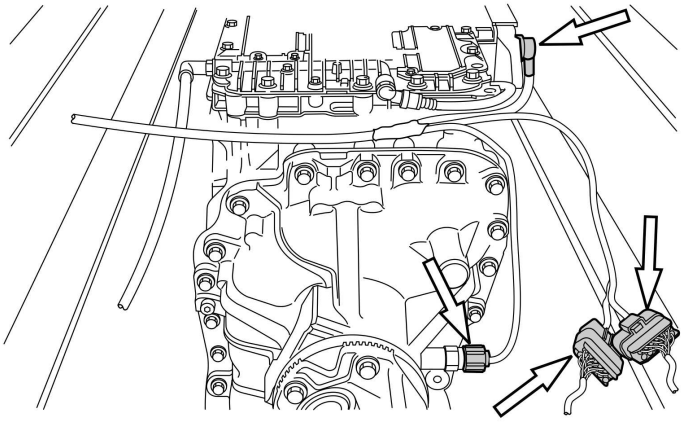
Note: To aid access, tighten the mounting bolts on the top of the clutch housing first. Remove the transmission jack and install the remaining mounting bolts.

36

Position the battery cables in the brackets on the top of the clutch housing and install the mounting bolts.

37

If removed earlier, reinstall the cab engine cover.

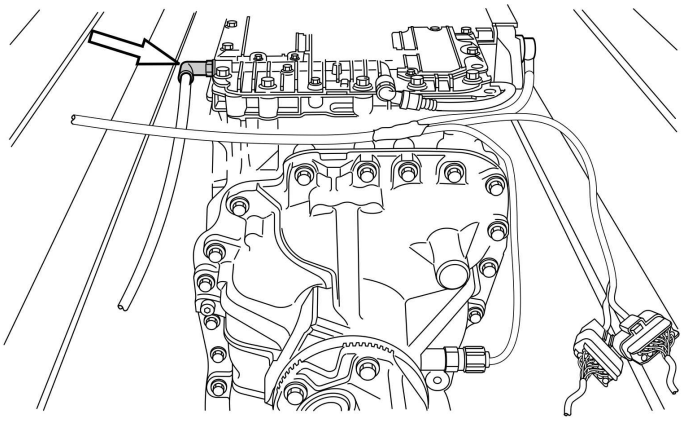


W4002941

38

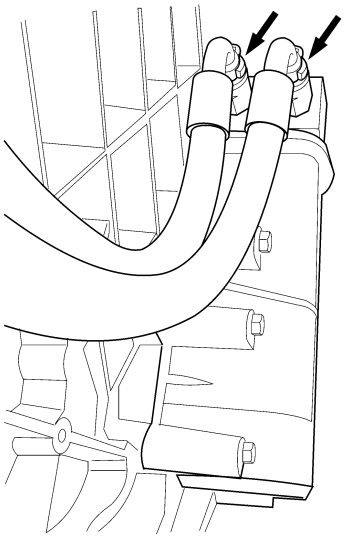
Position the wiring harness and reconnect the control housing, speed sensor, and the two chassis connectors.

39
Using new tie straps, secure the wiring harness to the transmission.



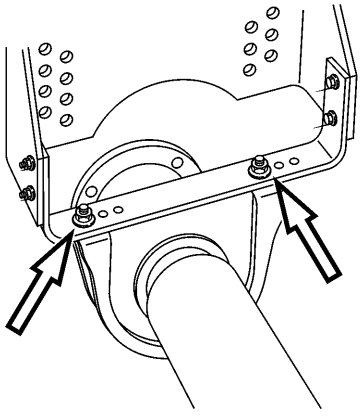
W4002940

40
Reconnect the air supply hose at the rear of the transmission by threading the straight Raufoss fitting into the 90 degree fitting in the cover.



W4002894

41
Reconnect the transmission oil cooler hoses to the transmission oil filter housing.

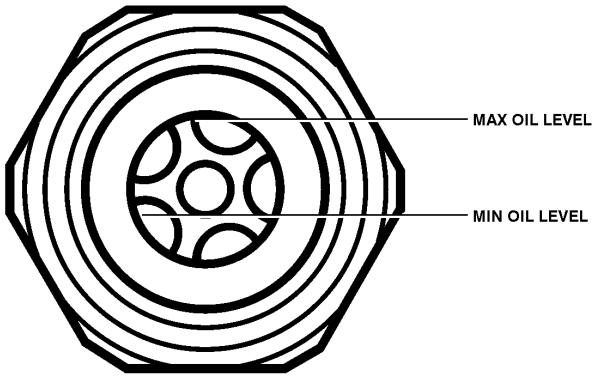


T4018155

42
Install the drive shaft to the rear of the transmission. Install the universal joint caps and the bolts holding the intermediate bearing to the support bracket (if equipped). Tighten the caps and bolts to specification; refer to Function Group 431, “Transmission, Mechanical”.

Note: It is important to correctly center the rubber insulator in the U-bracket.

43
Remove the supporting jack stands and lower the vehicle.



T4021684

44
Reconnect all previously removed cables to the negative (ground) battery terminals.

45
Pressurize the air system and check for leaks.

46
Check the transmission oil level and add approved transmission oil if needed.

PE13-002

VOLVO TRUCK

5/31/2013

PV776-89088260[1]

VOLVO
Volvo Trucks North America
Greensboro, NC USA

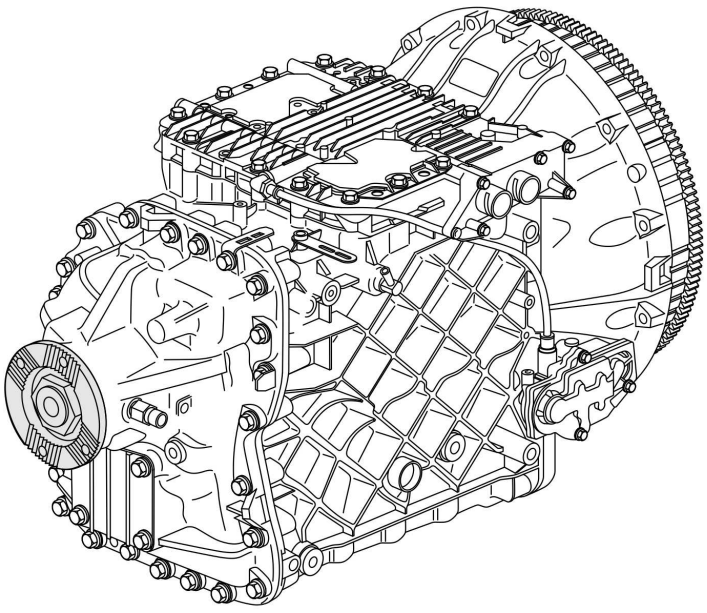
Service Bulletin Trucks

This service bulletin replaces bulletin 434-02 dated 4.2010.

Date	Group	No.	Release	Page
12.2012	**431**	**13**	**03**	1(5)

Seal, Output Shaft, Replacement
I-Shift Transmission

Seal, Output Shaft, Replacement



W4002884

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

- "Seal, Output Shaft, Replacement", page 2

4317-03-02-03
Seal, Output Shaft, Replacement

You must read and understand the precautions and guidelines in Service Information, Function Group 4, “General Safety Practices, Transmission” before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

⚠ DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

⚠ DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

Special tools: 9998570 , 9990084, 9992619, 9992653, 9992671, 9998597, 9996222, 9998575, 9996315, 9996901, 9996925

1
Apply the parking brake.

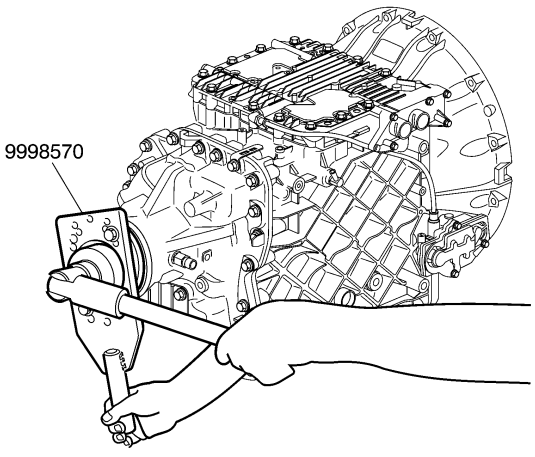
2
Clean the transmission around the companion flange.

3
Remove the universal joint caps. Disconnect the front of the drive shaft from the yoke and position it aside.

4
Remove the universal joint yoke from the companion flange.

5
Remove the companion flange nut.

Note: Attach the counterhold tool and remove it after companion flange nut removal.



W4002957

9998570

6

Assemble companion flange removal tools.

1 Attach tool 9998597 to the companion flange.

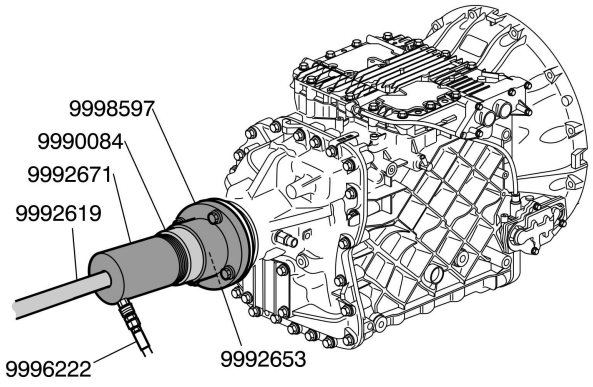
2 Assemble tools 9992619 and 9992653 together and thread tools 9992671 and 9990084 together.

3 Thread tool 9992619 all the way into tool 9992671.

4 Thread tool 9990084 into tool 9998597.

5 Adjust tool 9992619 inward until it touches the output shaft.

9990084 , 9992619 , 9992653 , 9992671 , 9998597



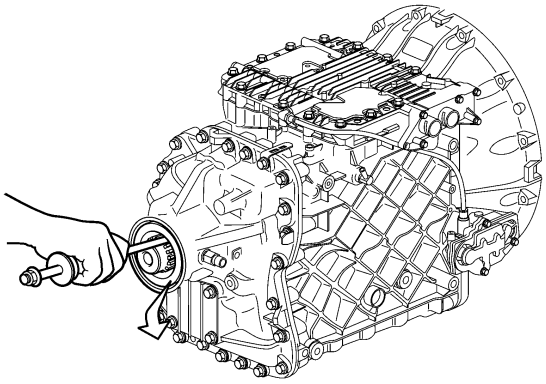
W4002956

7

Pull off the companion flange.

Note: Attach tool 9996222 to provide hydraulic pressure.

9990084 , 9992619 , 9992653 , 9992671 , 9996222 , 9998597



W4002958

8

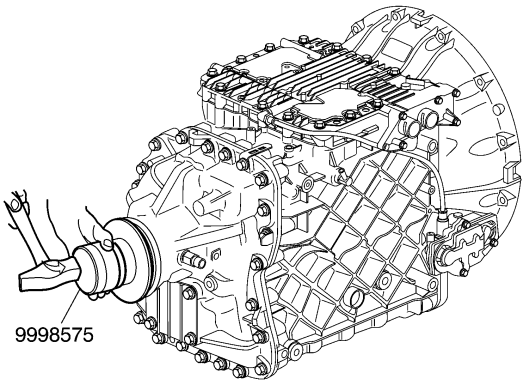
Using a suitable extracting tool, remove the output shaft seal.

9

Clean the seal mating surface in the transmission tail housing.

10

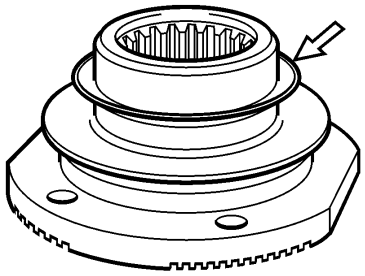
Lubricate the new seal lip with grease.



W4002959

11
Install the output shaft seal.

9998575

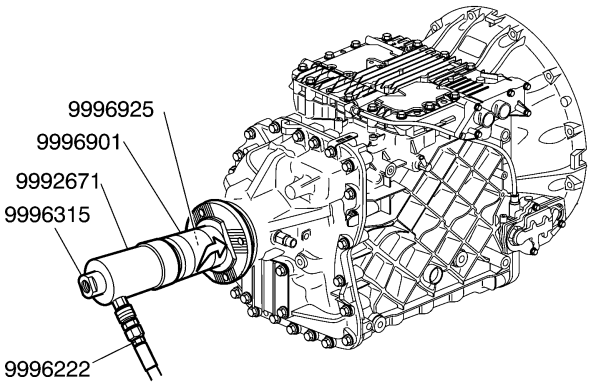


T4018998

12
Replace the V-ring on the companion flange.

Note: The V-ring should lie against the stop on the companion flange.

Note: Inspect the companion flange mating surfaces to ensure that there is no visible damage.



W4002960

13

CAUTION

Under no circumstance should the companion flange be heated up, or hit with a hammer. Install using only the approved special tools. Installing it by any other means, may lead to component damage.

CAUTION

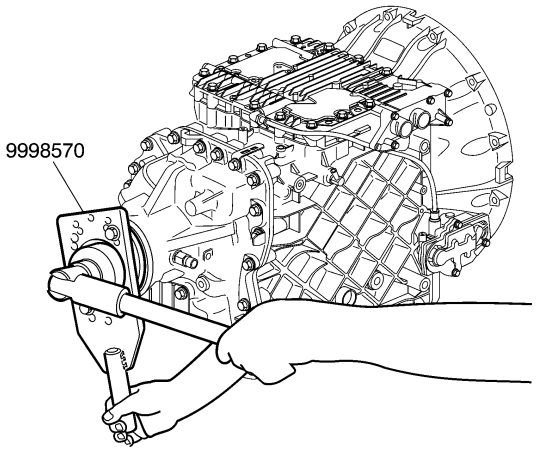
The companion flange must be completely installed before installing or tightening the retaining nut. Failure to press it on completely, may result in damage to the output shaft bearing or the range oil pipe.

Assemble the installation tools and press the companion flange on the output shaft.

1 Position the companion flange on the output shaft.
2 Thread tool 9996925 into the end of the output shaft.
3 Place tools 9996901 over 9996315 and thread tool 9996315 into 9996925 until it bottoms.
4 Slide tool 9992671 onto tool 9996315 and install the mounting nut on the end of the assemble.

9992671 , 9996222 , 9996315 , 9996901 , 9996925

14
Install a new O-ring for the companion flange nut.



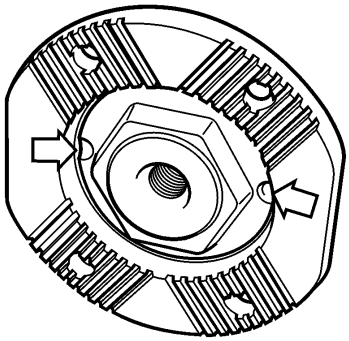
W4002957

15
Install and torque the companion flange nut.

Note: Attach the counterhold tool and remove it after companion flange nut is installed and torqued.

Note: An assistant may be necessary to install and torque the companion flange nut.

550±50 Nm (406±37 ft-lb)9998570



T4018646

16
Lock the companion flange nut in place. Using a punch, peen the nut in both recesses on the companion flange.

Note: The punch must have a rounded tip and should be pushed in right to the bottom. Check that no cracks have occurred.

17
Install the universal joint yoke on the companion flange and torque the mounting bolts.

190±15 Nm (140±11 ft-lb)

18
Position the drive shaft back into its yoke. Install the universal joint caps and torque the mounting bolts.

166±10 Nm (122±7 ft-lb)

PE13-002

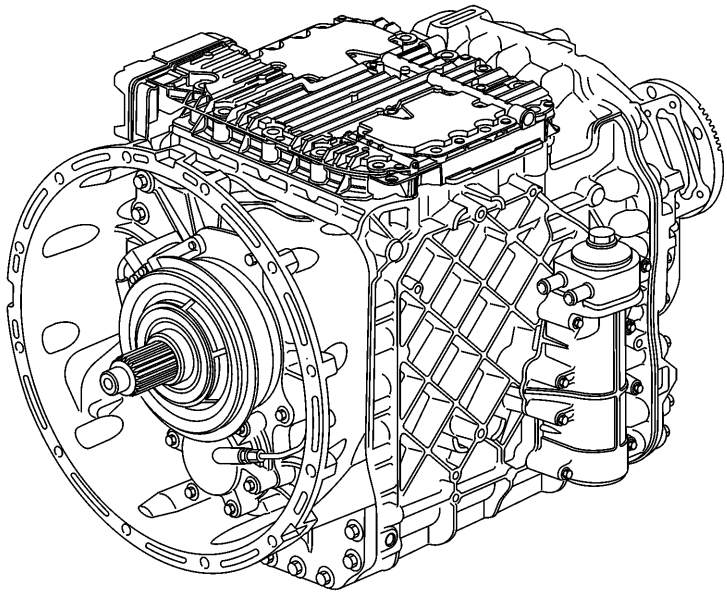
VOLVO TRUCK

5/31/2013

PV776-89089834[1]

Clutch Housing, Replacement
Transmission Removed
I-Shift Transmission

Clutch Housing, Replacement



T4021207

This information covers the procedures to replace the clutch housing on a VOLVO I-Shift transmission.

Contents

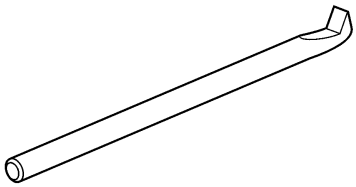
- “Special Tools”, page 2
- “Clutch Housing, Replacement”, page 3

Note: Information is subject to change without notice. Illustrations are used for reference only and can differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

Tools

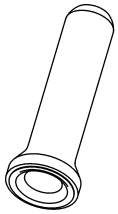
Special Tools

For Special Tools ordering instructions, refer to Tool Information, Function Group 08.



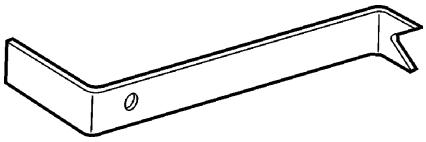
C0001789

9992337
Lever



T0011387

88800005
Hollow Drift



W0001874

J44773
Air Line Release Tool

Service Procedures

4312-03-04-01
Clutch Housing, Replacement

You must read and understand the precautions and guidelines in Service Information, Function Group 4, "General Safety Practices, Transmission" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

DANGER

Do not attempt to repair or service this vehicle without having sufficient training, the correct service literature and the proper tools. Failure to follow this could make the vehicle unsafe and lead to serious personal injury or death.

DANGER

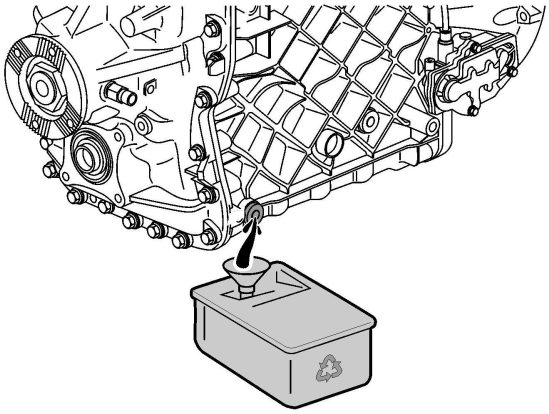
Before beginning any work on any part of the air system, be certain that the air pressure has been released. Failure to do so may cause a component to violently separate, which can result in serious personal injury.

CAUTION

Electrical components, including the wiring harness inside the transmission control housing, are delicate. Handle with extreme care. Failure to do so may result in damage to components.

Removal

Special tools: 9992337, 88800005, J44773

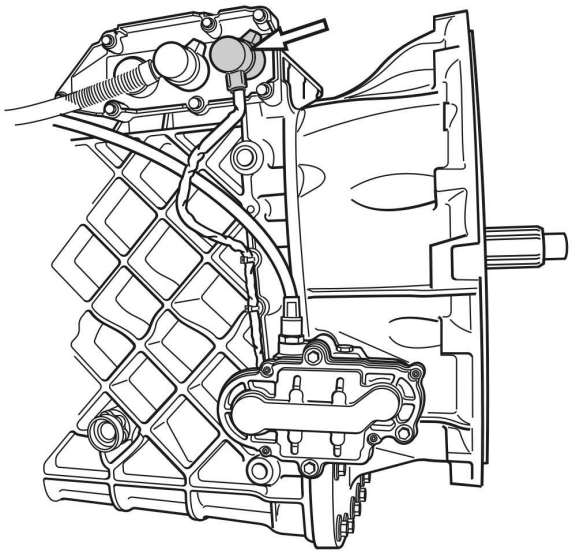


T4022639

1
Remove the transmission oil drain plug and drain the transmission oil into a suitable container. Install the transmission oil drain plug and tighten to specification, refer to Function Group 431, Transmission, Mechanical.

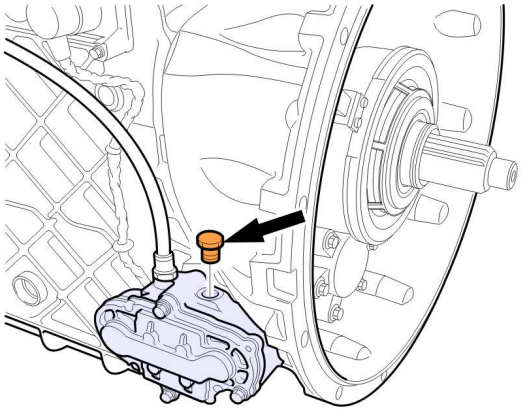
⚠ WARNING

Hot oil can cause burns. Use protective gloves.



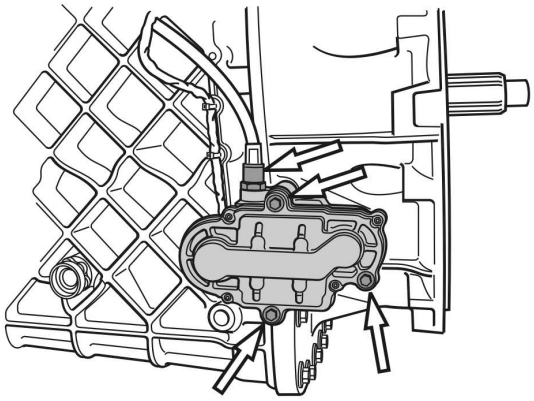
T4020995

2
Disconnect the clutch valve wiring harness connector at the control housing.



T4066711

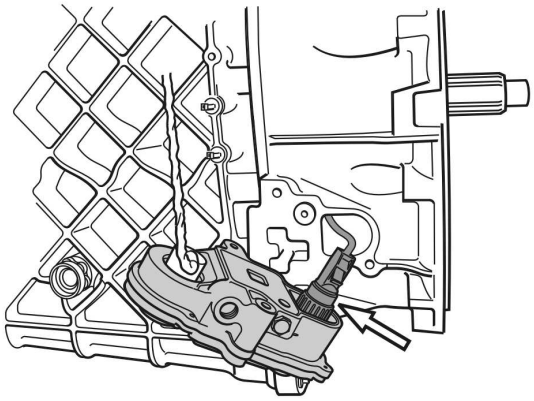
3
Remove clutch valve service plug. Cover the open port in the valve to prevent debris from entering the valve.



T4020994

4
Disconnect the air supply line for the clutch valve and remove the valve mounting fasteners.

J44773

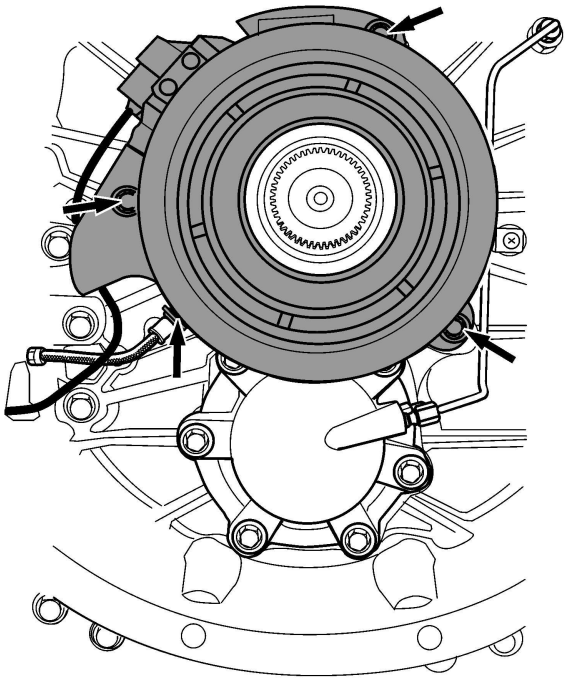


T4020996

5
Disconnect the clutch position sensor wiring harness connector.

6
Cut the tie strap securing the clutch valve wiring harness and remove the valve assembly.

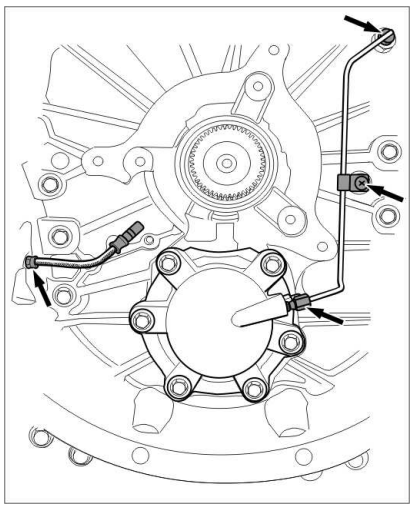
7
Turn the transmission so that the input shaft (the shaft with discs) faces upwards.



T4020990

8

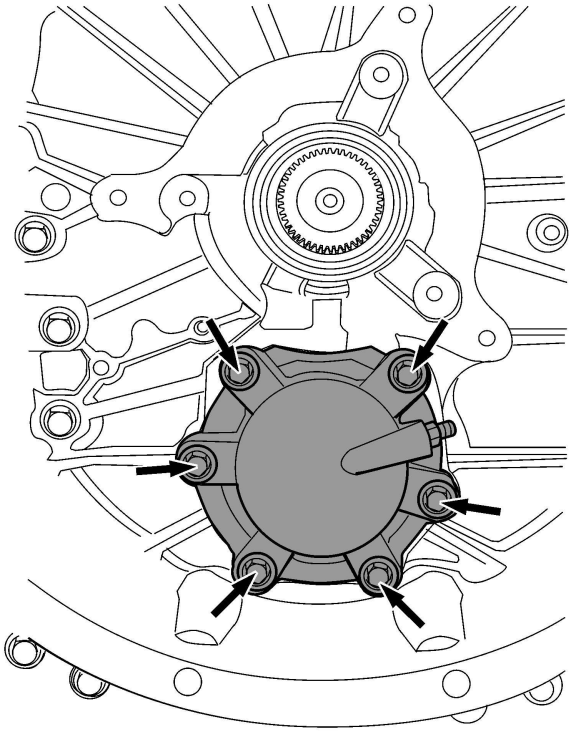
Remove the clip securing the air hose in the clutch cylinder. Disconnect the air hose from the clutch cylinder. Remove the clutch cylinder mounting fasteners and then the clutch cylinder.



T4020991

9

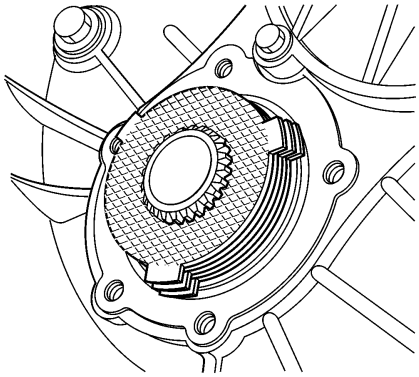
Remove the air hose for the clutch cylinder and the counter-shaft brake air supply tube.



T4020992

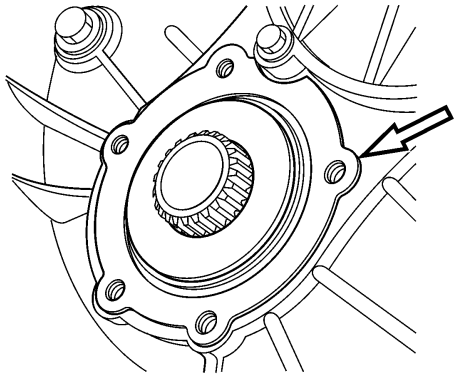
10
Remove the fasteners and remove the countershaft brake cover.

11
Remove the sleeve, spring and piston.



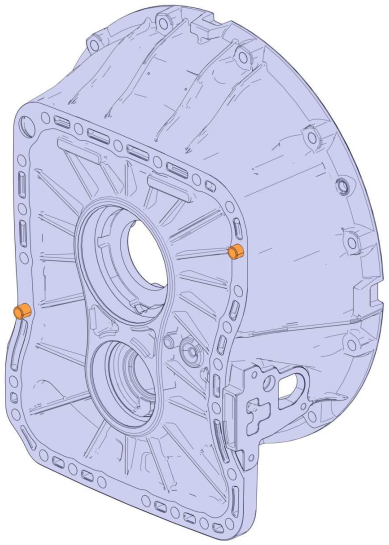
T4022010

12
Remove the brake plates, friction plates and steel plates.



T4022008

13
Remove the countershaft brake cover gasket.



W4079490

14
Remove the fasteners securing the clutch housing to the transmission and then remove the clutch housing.

15
Remove hollow alignment dowels from clutch housing, inspect, and install in transmission housing.

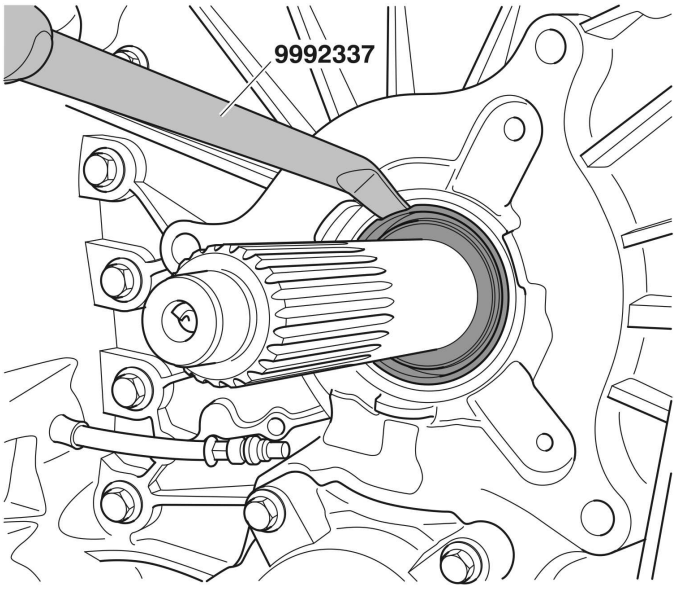
Installation

1
Clean transmission case to clutch housing mating surface thoroughly.

2
Apply sealant to clutch housing mating surface on transmission case.

3
Position the clutch housing on the base housing. Make sure that the guide dowels enter their holes in the clutch housing.

4
Install the clutch housing fasteners and tighten to specification, refer to Function Group 431, Transmission, Mechanical.

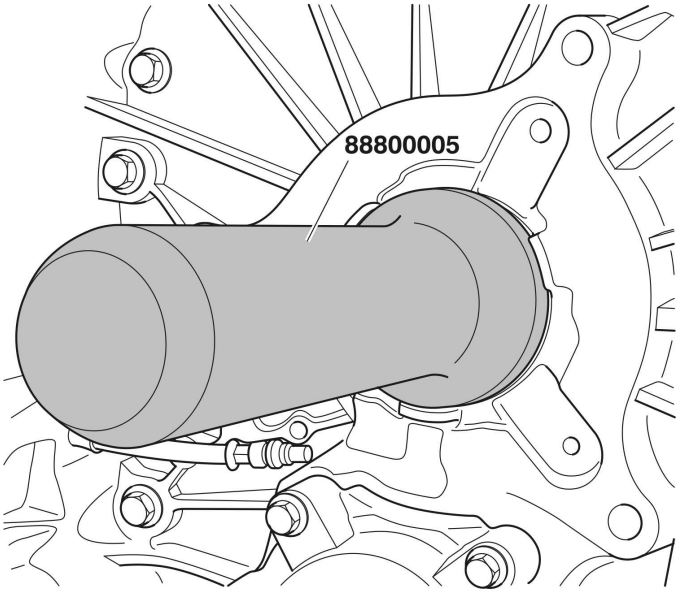


T4021445

5
If the original clutch housing is being reinstalled, remove the seal for the input shaft using a lever.

Note: If installing a new clutch housing, it is not necessary to remove the seal from the original housing.

9992337

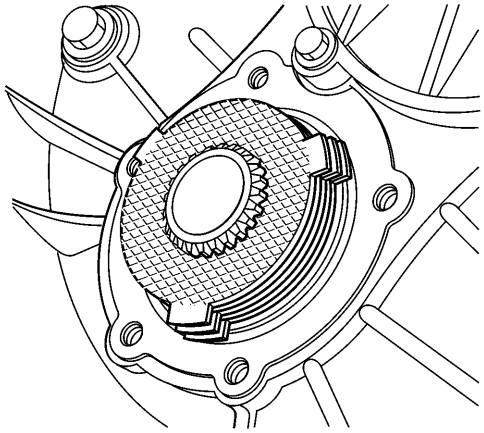


T4021446

6
Press in the new input shaft seal with a drift.

Note: Fill the space between the seal lips to **1/3** with **an approved grease**. Avoid getting grease on the felt ring. Oil the sealing ring mating face to the input shaft before assembly.

88800005



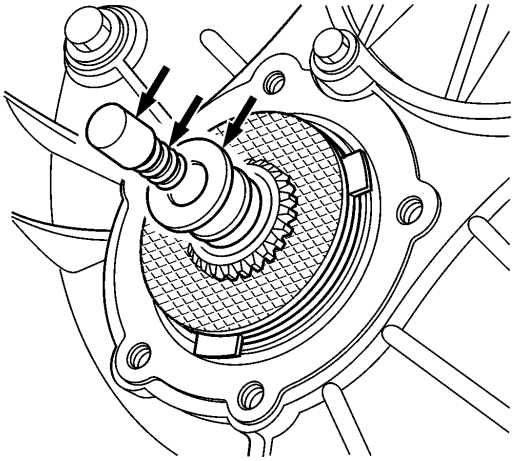
T4022010

7
Install a new gasket between the countershaft brake cover and the clutch housing.

8
Clean and inspect brake discs, piston and spring.

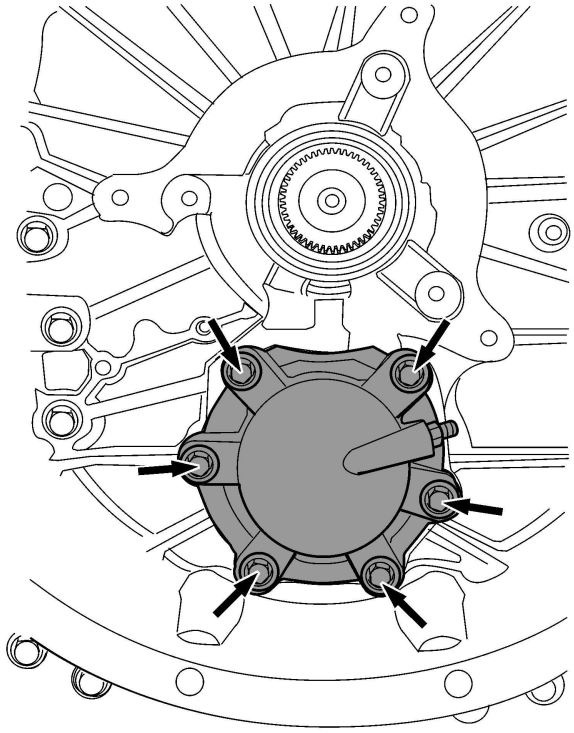
9
Lubricate the plates with clean transmission oil. Install the friction and steel plates. Start and finish with steel plates. Alternate friction plates and steel plates during installation.

Note: To ease assembly, place the last steel plate inside the brake cover and install it with the cover



T4019286

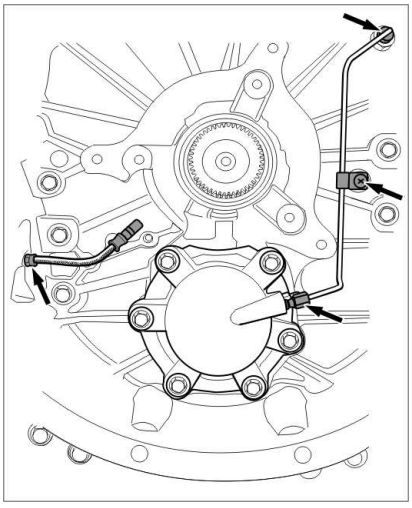
10
Install the sleeve with a new O-ring, the spring, and the piston.



T4020992

11

Install the countershaft brake cover over the discs. Install and tighten the fasteners to specification, refer to Function Group 431, Transmission, Mechanical.

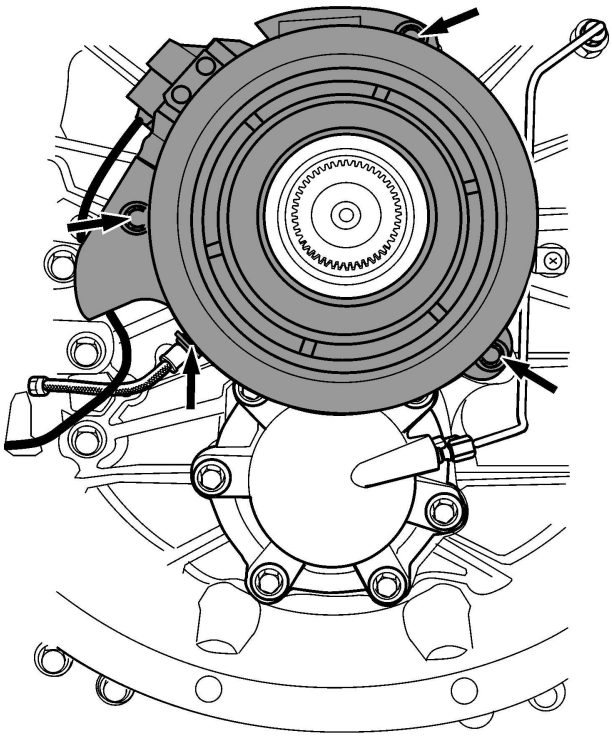


T4020991

12

Attach the air supply tube to the countershaft brake cover and tighten the fittings to specification, refer to Function Group 431, Transmission, Mechanical.

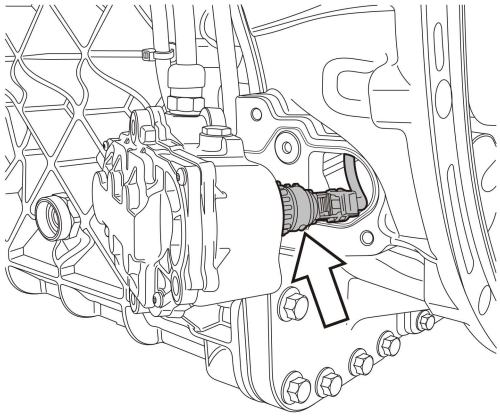
Note: Clean the threads for the air tube prior to attaching.



T4020990

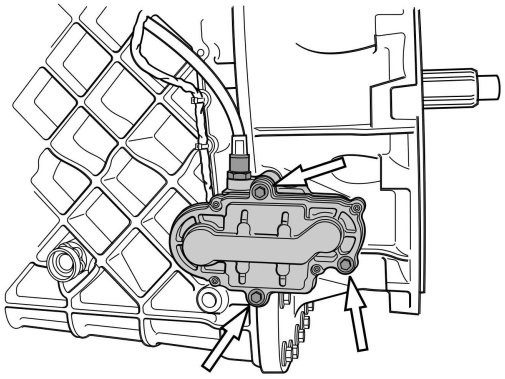
13
Replace the O-ring on the air hose. Install the clutch cylinder and air hose. Secure the hose with a clip. Tighten the fasteners to specification, refer to Function Group 431, Transmission, Mechanical.

14
Check that the sealing surface on the clutch valve is clean. Inspect the clutch valve seal and replace as needed.



W4002924

15
Connect the clutch position sensor wiring harness connector to the clutch valve.

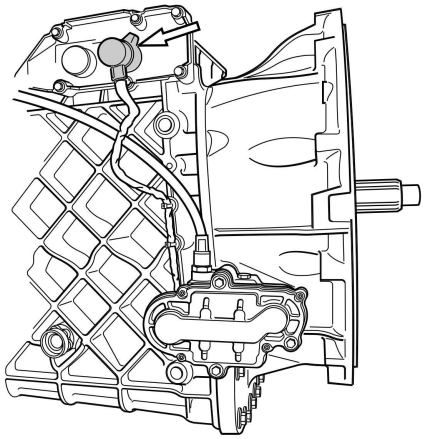


W4002923

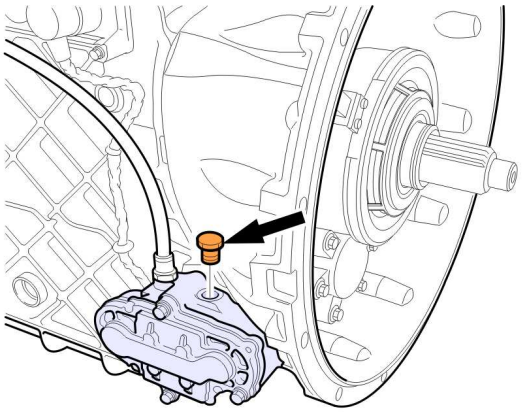
16
Install and tighten the clutch valve mounting fasteners to specification, refer to Function Group 431, Transmission, Mechanical.

17
Connect the clutch control valve air supply tube to the upper control housing fitting.

18
Connect the clutch valve wiring connector to the control housing.



W4002881



T4066711

19
Place a shop rag over the open port in control valve to prevent debris from entering the valve during installation. Once installation is complete, install the control valve service plug. Tighten the service plug to specification.

20
Fill the transmission with the correct fluid.

PE13-002

VOLVO TRUCK

5/31/2013

V922-431-063PB[1]

Replacement Transmissions
I-Shift Transmissions
VAH, VHD, VN, VT

TPI 431-063, Replacement Transmissions

There is a new part offering to service VOLVO I-Shift transmissions. The following transmissions are available:

- Complete Transmission, New or Reman
- Basic Reman, transmission without clutch cylinder actuator (CCA), clutch valve unit (CVU) and transmission control module (TCM) cover
- Short Reman, transmission without CCA, CVU, TCM cover and range housing

The tables below list the part number for each transmission and the corresponding core number.

Complete Transmission

Model	New	Reman	Core
AT2512C	3190516	85003144	85009144
ATO2512C	3190517	85003145	85009145
ATO3112C	3190519	85003147	85009147
AT2612D	3190597	85003221	85009221
ATO2612D	3190598	85003222	85009222
ATO3112D	3190599	85003223	85009223

Basic Reman

Model	Exchange	Core
AT2512C	85013417	85019417
ATO2512C	85013419	85019419
ATO3112C	85013421	85019421
AT2612D	85013431	85019431
ATO2612D	85013433	85019433
ATO3112D	85013435	85019435

Short Reman

Model	Exchange	Core
AT2512C	85013418	85019418
ATO2512C	85013420	85019420
ATO3112C	85013422	85019422
AT2612D	85013432	85019432
ATO2612D	85013434	85019434
ATO3112D	85013436	85019436