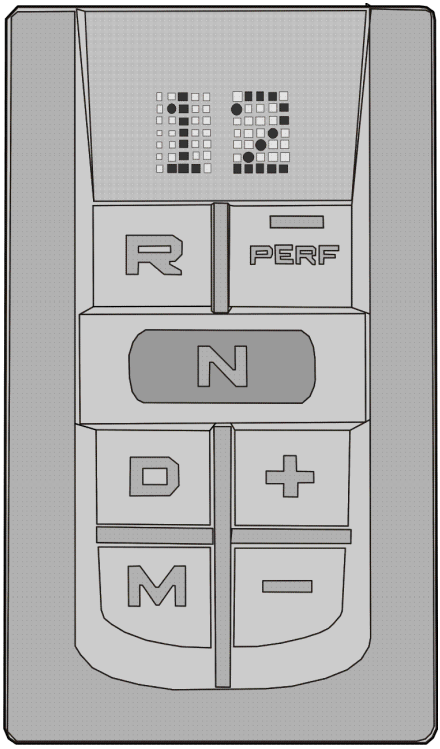
Operating Instructions

I-shift gear selector pad

B13R



VOLVO

Foreword

The following levels of observations, cautions and warnings are used in this Service Documentation:

Danger: Indicates an unsafe practice where serious personal injury or death could occur.

Warning: Indicates an unsafe practice where personal injury or severe damage to the product could occur.

Caution: Indicates an unsafe practice where damage to the product could occur.

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

Technical data, construction information, descriptions and illustrations in this driver's handbook, were current when the book was published, and it can have been changed. Volvo company reserve the right to make changes without prior notice.
This manual contains information concerning the operation and function of **I-shift gear selector pad**
This manual contains general information about instruments and controls, as well as driving instructions. In case a bus is not equipped with all functions described in this manual, it is due to the custom adaptation and different levels of equipment.

Volvo Bus Corporation
Göteborg, Sweden

Order number: 89219726

Contents

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 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 serious personal injury or death. A danger advisory banner is in **white** type on a **black** background with a **black** border.

WARNING

Warning indicates an unsafe practice that could result in personal injury. A warning advisory banner is in **black** type on a **gray** background with a **black** border.

CAUTION

Caution indicates an unsafe practice that could result in damage to the product. A caution advisory is in **black** type on a **white** background with a **black** border.

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.

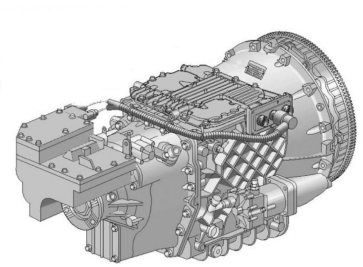
Driver's responsibility

- As the driver, you are responsible for the safety and comfort of the passengers during the journey. Therefore, do not drive the bus before you have read this driver's manual. You must be familiar with all the indicators and warning lights and know what to do if something unexpected happens.
- Follow the recommended service and maintenance program to maintain the bus's condition and safety.
- As the driver of the vehicle, you should be aware of the vehicle weight and loading capacity. See instructions on warning stickers, the vehicle registration book and on the identification plate.
- As the driver of the vehicle, it is your responsibility to foresee any hazards that could threaten your passengers.
- It is also your responsibility to ensure that all the safety equipment of the bus is in place. Therefore check regularly the working order of safety belts, emergency door and window opening, door sensitive edges, fire extinguishers and first aid equipment.

2 Introduction

I-shift, general

The I-Shift is an automated **mechanical** transmission with 12 forward gears and 4 reverse gears. There is no clutch pedal and the gear shifting is controlled by the transmission or the driver through the ergonomic gear selector so that the driver can concentrate on traffic. If necessary, the driver can chose to shift manually.



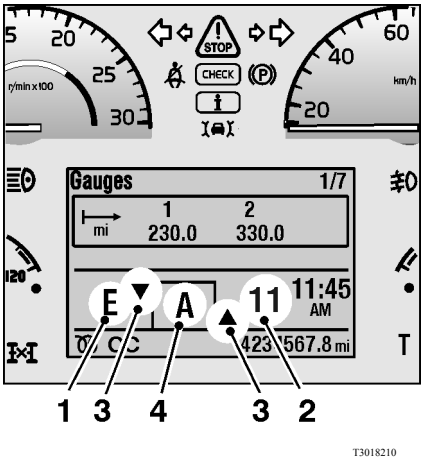
I-shift is delivered with two different software packages. As some functions are optional, not everything in this document is applicable to your gearbox.

Display

Select the INDICATORS menu on the display to show information about I-shift (valid both when the vehicle is stopped and when the vehicle is in motion). Information about the transmission will be presented on the driver display.

See the “Driver's instructions, Display ” for information about how to configure the transmission information as a standard display.

The gearbox section is divided into smaller sections showing:



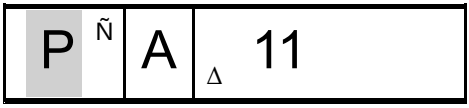
1 Driving program

2 Selected gear

3 Available gears (down/up)

4 Gear selector option.

1. Driving program



The section to the left of the gearbox field shows the driving program. The following driving programs are available:

E = economy

E+ = freewheel possible[1]

P = power

B = braking[2]

L = Limp-Home function

B = Basic

CO = Commuter Traffic

LH = Line Haul Traffic

TC = Tourist & Charter Traffic

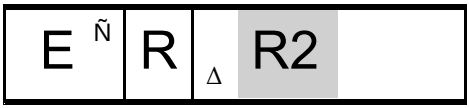
For more information about driving programs, refer to section “Driving”, page 10.

[1]The freewheel function is included in some program packages

[2]The brake program is included in some program packages

2. Selected gear

The section to the right of the gearbox field shows the selected gear.



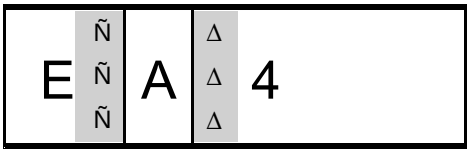
Gear no.1 - 12

N = neutral
(N1 = low split, N2 = high split)

R = reverse

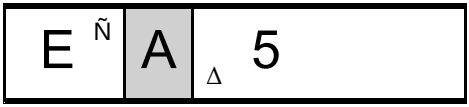
3. Available gears

The second section from the left in the gearbox field shows, with arrows, the number of lower gears that are available (maximum 3 arrows).
The second section from the right in the gearbox field shows how many higher gears are available (maximum 3 arrows).



4. Gear selector buttons

The section in the middle of the display shows the button pressed of gear selector.



R = reverse

N = neutral

A = automatic (Drive)

M = manual

For more information about gear selection buttons , refer to section “Instruments and controls”, page 5.

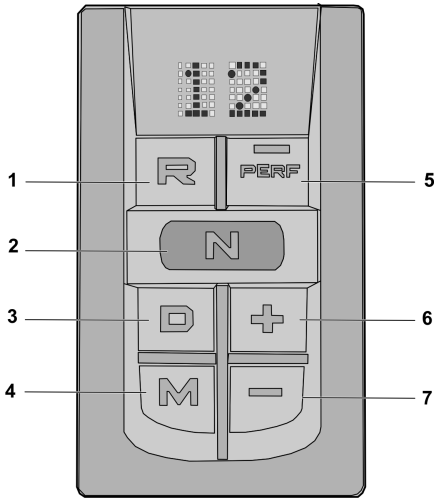
I-shift gear selector pad

The I-shift gear selector pad is located on the left side of the driver's seat. This pad is available on two versions :

- Premium
- Basic

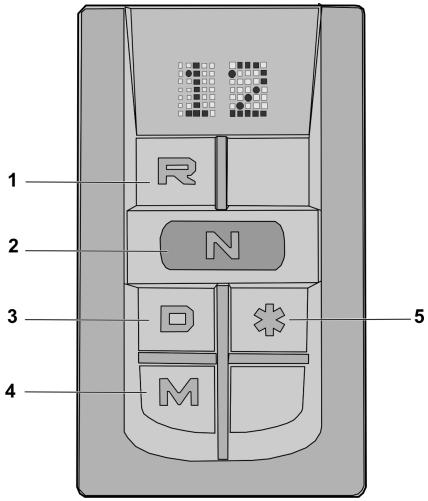
Premium version description

1 Reverse
2 Neutral
3 (Automatic) Drive
4 Manual
5 Economy/Performance
6 Upshift
7 Downshift



Basic version description

1 Reverse
2 Neutral
3 Drive (Automatic)
4 Manual
5 Limp mode



I-shift gear selector pad programs

Note: The available programs depends on the I-shift gear selector pad version

The I-shift gear selector pad is used to choose between four different driving programs.

R Reverse. The vehicle must be stopped in order to put the lever in position R.

N Neutral position. No gear engaged.

D Automatic programme. The gearbox itself selects the gear with respect to load, slope, speed and accelerator position.

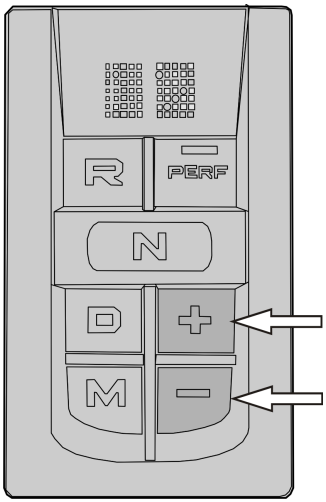
M Manual program. Changing up and down is done with the +/- buttons on the I-shift gear selector pad.

Buttons

Changing up/down

The +/- button is used to:

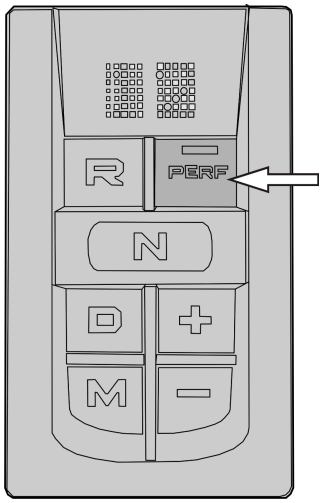
- change up or down one step at a time when in manual mode
- adjustment of gears in automatic mode
- to select split gear in neutral position when using power take-off
- to select reverse, see “Reverse gears”, page 19
- choice of start gear in automatic mode



Economy/Performance (E/P)

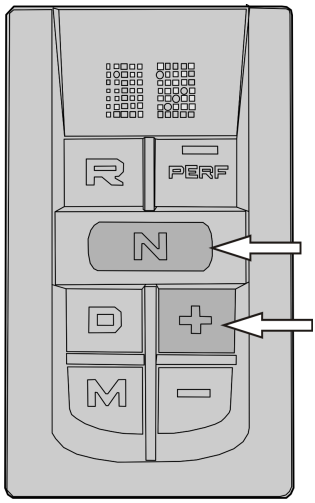
There is an economy/performance button (Perf) on the I-shift gear selector pad. This is used to:

- switch between the economy program and the power program



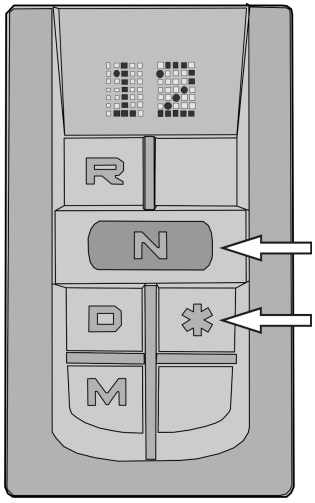
Limp-Home

Limp home is an emergency mode that can be engaged if a fault has occurred in the gearbox that prevents the vehicle from being driven in automatic, manual or reverse modes.; see “In case of gearbox malfunction”, page 20



To activate the Limp Home mode for premium version of gear selector pad:

- Simultaneously press N and + buttons. Activating can only be done while the vehicle is stationary.
- Select M position or R position as required.



To activate the Limp Home mode for basic version of gear selector pad:

- Simultaneously press N and + limp mode buttons. Activating can only be done while the vehicle is stationary.
- Select M position or R position as required.

Note: Limp Home mode should only be used for moving short distances.

Starting instructions

The neutral button must be selected on the I shift pad gear selector otherwise the engine will not start.

When the air pressure to the gearbox is too low, a warning will be displayed automatically. An icon will appear on the display at the same time as the information lamp comes on. Wait until the lamp has gone out before driving off.

Icon for low air pressure to gearbox

Stopping the vehicle

When the vehicle is stationary:

- Apply the parking brake.
- Push the I-shift gear selector pad N button (neutral).
- Switch off the engine.

⚠ CAUTION

Always apply the parking brake and put the I-shift gear selector pad in N when the vehicle is parked or whenever the driver leaves the driver position.

Program package

Gearboxes have different characteristics and functions depending on the program package that is installed. The following program packages are available:

- **Basic** (B is shown on the display) is the standard transmission program
- **Commuter** is suited to the requirements of commuter traffic and includes functions that make the bus more easily manoeuvrable.
- **Line Haul** is suited to the re||quirements of line haul traffic and includes functions that provide improved fuel economy and also make the bus more easily manoeuvrable.
- **Tourist & Charter** are appropriate for tourist traffic demands. The program also includes functions that help improve fuel economy and make it easier to manoeuvre the bus.

Basic is the standard program and the other two programs include extra equipment. The table below shows the functions that are included in the different program options.

Functions	**Basic**	**Commuter**	**Line Haul**	**Tourist & Charter**
Launch Control		X[1]	X	X
Enhanced Shift strategy		X	X	X
Kick-down			X	X
I- Roll including Smart cruise control				X
Gear selection Adjustment In Auto				X
Possible optional functions	**Basic**	**Commuter**	**Line Haul**	**Tourist & Charter**
I–Roll including Smart cruise control		O[2]	O	

1 X - Standard application

2 O - Optional application

Function description

Standard characteristics

- **Performance Shift**
  The function selects the best way of performing a gear shift. This provides more nimble and comfortable shifting.
- **Basic Shifting Strategy**
  See “Automatic choice of starting gear”, page 13
- **Basic Shifting Regulation**
  Allows adjustment of automatically selected gear when engine braking.
- **Gearbox Oil Temperature Monitor**
  A warning system informs the driver if the oil temperature becomes too high.

Optional characteristics

- **I–Roll (requires VEB or retarder)**
  Automatic clutching in or out of the freewheel function, with the aim of reducing fuel consumption. When the accelerator pedal is released, the drive line is disconnected so that the vehicle can roll freely, and the engine is brought down to idling speed.
- **Intelligent Auto Pilot**
  Only active when the cruise control is activated. Saves fuel by deactivating the auxiliary brakes in certain conditions. This function improves the auto pilot by disengaging the auxiliary brakes (VEB) while driving on ascents.
- **Pull-away control**
  Allows the clutch to be controlled at low speeds using the brake pedal. Allows the engine to idle without depressing the clutch. Regulates engine torque when pulling away for optimum gear changing and avoid high engine speed.
- **Enhanced Shift Strategy**
  Works together with EBS as compensation for lack of engine braking during gear changing. This function enhances comfort.
- **Gear Selection Adjustment in Auto**
  Allows gears to be selected automatically even when the accelerator pedal is depressed.
- **Kick down** the Kick Down function supplied maximum acceleration.

Automatic shifting

The easiest way to drive the vehicle is to use the automatic program (D button). Gears will shift automatically, and the driver can focus on the actual driving.

When changing gear, the system will govern the clutch, gearbox and throttle. The system selects the gear and the point in time for gear changing for optimum driving performance based on accelerator pedal position, vehicle weight, road inclination, vehicle acceleration, etc.

In automatic mode it is also possible to adjust the gears up or down. The arrows in the display show how many steps it is possible to change up or down.

Automatic choice of starting gear

The gearbox can also select a suitable pulling away gear based on vehicle weight and road inclination.

Freewheel (I-Roll)

The freewheel can be activated if the lever for the auxiliary brake is in position A and E+ is shown in the display. When the freewheel is activated, the split gear is set to N, neutral. The freewheel is activated differently depending on whether the cruise control is on or not.

1 If the cruise control is active:

- The free wheel is engaged in downhill stretches when speeds exceed the set driving speed (for example 80 km/h). The set permitted excess speed must be 6 km/h or more. (Please refer to “Driver's Manual ”, the chapter on auxiliary brakes for more information on how the auxiliary brake functions and how the excess speed can be set.)
- The free wheel is disengaged when the speed exceeds the set excess speed or below the set driving speed (for example 80 km/h).
- The I-Roll function also includes the Smart Cruise Control that inactivates the auxiliary brakes at the end of downhill slopes to further save fuel.

2 If the cruise control is not active:

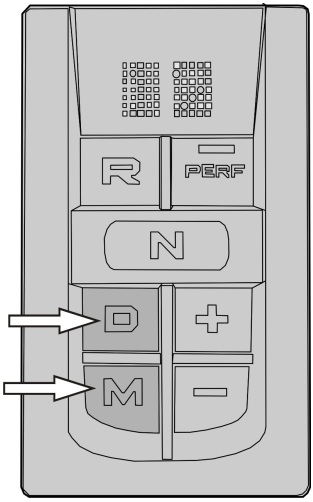
- The I-Roll is engaged when the accelerator is released and the road is flat or has a small slope upwards or downwards
- The I-Roll is disengaged when the brake pedal is depressed, the accelerator is depressed, the lever for the auxiliary brake is set in position 0, 1, 2, 3 or B or if the M button of the I-shift gear selector pad is pushed.

When the free wheel is activated, N is shown as the gear in the info display and the engine idles.

Locking gear

Do **not** use automatic up or down-changing when:

- When the vehicle gets near the top of an ascent and wants to avoid unnecessary downshifting.
- On an uphill slope with a flat section.
- When driving on poor surfaces.



This function is used only when driving with the automatic program D

The function can be used in all forward gears (1 to 12).

Whenever gear changing is not desired, (e.g. driving up a hill), change the selector from D to M. No further gear changes will be carried out and the current gear will remain engaged. The display shows an M.

To return to the automatic program, push the button A on the I-shift gear selector pad again.

Note: There is risk of over revving when the gear is locked.

Note: If the vehicle is stopped with a not permitted gear engaged in the M mode, the starting gear is automatically selected.

CAUTION

Pulling away in too high a gear causes excessive wear to the clutch and can increase the risk for breakdown in the clutch.

Driving program

There are three different driving programs:

Economy

Power or enhanced power for difficult conditions or poor roads

Braking program

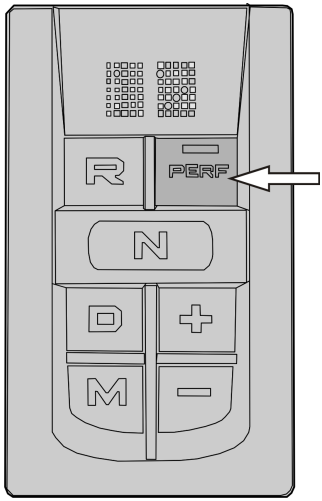
Economy

When the engine is on, the economy program is always selected (shown as an E on the display). The economy program prioritizes reduced fuel consumption while driving and is mainly used when driving under normal conditions.

Power

The power program is engaged/disengaged using the Perf button (see figure). The power program prioritizes handling at the expense of fuel economy, and is used when driving in mountainous terrain or off-road driving. The power program generally uses higher engine speeds than the economy program, and a lower pull-away gear is selected.

To save fuel, the gearbox will automatically switch off the power program when it is no longer required and returns to the economy program.



Brakes

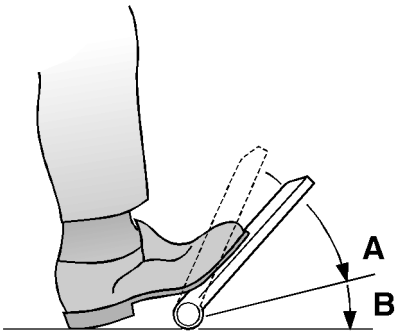
A special braking program can be engaged using the auxiliary brake lever. Please refer to “Driver's Manual”, section on auxiliary brake. (Optional function.)

Kick-down

Kick-down is activated by pressing the accelerator pedal all the way down to the floor (position B). The kick-down program optimises gear selection/throttle for maximum acceleration. This is possible in both economy and power programs but not in manual position M. (Kick-down is an option.)

Position A = full throttle

Position B = kick down



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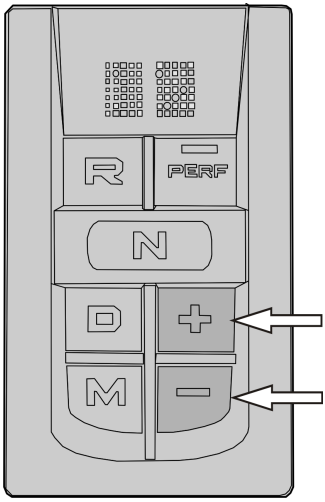
Manual gear changing



The vehicle can be driven under manual shifting, or automatic shifting can be engaged whenever needed. Shift gears by first pushing the M button on the I-shift gear selector pad. The + and - buttons on the side of the I-shift gear selector pad are then used to select the gear.

Press the + or - buttons once for each up-shift or downshift, respectively, until the desired gear is reached.

Press the + or - buttons several times to shift several gears at once.

Note: When changing a gear, the accelerator pedal should **not** be released.

Note: If the vehicle is stopped with a not permitted gear engaged in the M mode, the starting gear is automatically selected.

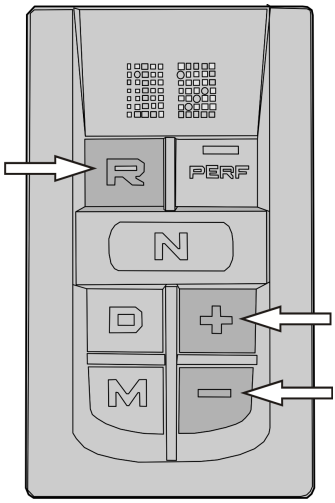
⚠ CAUTION
Starting in a too high gear exposes the clutch to high levels of wear.

Reverse gears

The gearbox has four reverse gears (R1 through R4). The vehicle must be stopped before reverse can be engaged. The system will automatically select R1 when the I-shift gear selector pad is set to R.

While driving, it is possible to shift between R1 and R2, and between R3 and R4. To shift between R2 and R3, the vehicle must be stopped.

Use the + or - buttons on the I-shift gear selector pad to change gear manually.



CAUTION

Starting in a too high gear exposes the clutch to high levels of wear.

In case of gearbox malfunction

Where there is a fault with the gearbox that means that you cannot drive the vehicle, activate the Limp-Home function and drive on.

Note: The Limp-Home function should only be used for short distances and activating can only be done while the vehicle is stationary

Activate Limp-Home as follows:

1 Simultaneously press N and + buttons (or limp mode for basic version).

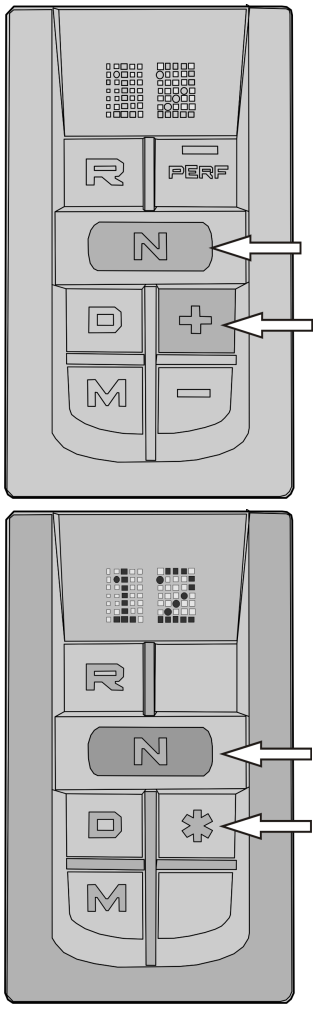
2 Select M position or R position as required

3 Select a gear using the + or - buttons on the I-shift gear selector pad

When Limp-Home is selected, the vehicle cannot be driven if the I-shift gear selector pad is set on automatic mode. Only forward gears 1, 3 and 5, and reverse gear 1 may be used. The transmission can only be shifted when the vehicle is stopped.

To select reverse, set the I-shift gear selector pad to R. Set the I-shift gear selector pad back to M to drive forwards again.

The Limp-Home function will be disengaged when the ignition is turned off.



Fuel economy driving

I-Shift is optimized to provide the best fuel economy for the vehicle's situation. To achieve better fuel economy, drive in mode automatic whenever possible. Only chose mode manual when driving in conditions that require manual shifting.

I-Roll

During normal driving, the I-shift gear selector pad should be set on D (automatic), and the auxiliary brake should be in position A so that I-Roll can be accessed. Use I-Roll whenever possible: for example, on gentle descents.

Set the cruise control's speed slightly lower and instead increase the overspeed. This gives more opportunities when I-Roll can be activated and thereby save fuel.

Avoid downshifting

In some cases, it may be better to stay in a higher gear if the engine speed is low. For example, immediately before reaching the top of an incline, it's better to reach the top without downshifting, which saves on fuel. When driving, hold the + button down until the vehicle starts to accelerate again to avoid downshifts.

Avoid up-shifts

To avoid up-shifting (for example, when climbing a hill) the - button should be held down until the vehicle starts to brake (hill climbing).

The function can also be used just before an uphill slope to get a higher speed into the uphill slope. Down-changing functions normally in these cases.

Greatest possible down-change

To optimize downshifting, for example, after a steep climb:

- Hold the minus button pressed in
- Change the I-shift gear selector pad from D to the M
- Release the minus button

This allows for better downshifting, since immediately after releasing the (-) button the engine speeds up. Keep the M program when you want to avoid another shift in gears.

Save brakes

Preferably use the engine brake to brake towards a stop to save the service brakes. When braking hard, brake program B can be used. Down-changing will then occur which contributes to an increased braking effect from the engine brake.

Queue driving

The Launch control function allows you to drive the vehicle in idle, which is sufficient when driving in traffic jams. If you have selected the "Enhanced Gear Selection" setting, including Kick-down, then you can also downshift or up-shift to adjust to the speed of traffic. The gearbox will then increase the engine speed a bit to allow the transmission to shift.

Activating while standing still:

1 Choose position D or M

2 Release the brake

3 Depress the accelerator pedal

4 Release the accelerator pedal once the vehicle starts to move forward.

When the brake pedal is depressed or it becomes so heavy that the engine risks stopping, the clutch is disengaged to prevent the engine from stopping. To return to queue driving, press on the accelerator pedal.

Note: The vehicle does not need to be stopped for this function to be activated.

Note: At low speeds and gears, queue driving is activated automatically. Depress the brake pedal to inactivate.

Hill Start

If the vehicle is equipped with “Auxiliary uphill pull-away ” this must be used to prevent the vehicle from rolling back when pulling away on an uphill slope.

- Keep the vehicle stationary using the handbrake.
- Change the I-shift gear selector pad to the A or M position and select a suitable starting gear.
- Depress the accelerator pedal at the same time as releasing the parking brake.

This icon will be shown on the cluster when hill start mode is activated

CAUTION

Never hold the vehicle stationary on an uphill slope by using the accelerator pedal. The clutch could overheat, which could cause it to fail.

Driving on poor roads and in difficult conditions

In difficult driving conditions or mountainous terrain (for example, on forest roads, job sites or off-road) it can be helpful to use the P driving program, which allows fewer shifts to be made. The gear selection is optimized for higher engine speeds, in order to achieve good response and acceleration while maintaining good fuel economy. This also offers higher tolerance for shifts during on-road ascents.

To prevent unplanned gear changing, e.g. on a soft surface or sudden change of the terrain that the automatic gear changing can not foresee, use manual mode.

To prevent up-changing when e.g. driving uphill, the minus button can be held pressed in. The function can also be used just before an uphill slope to get a higher speed into the uphill slope.

To achieve the greatest down-change possible, e.g. just before a steep uphill slope, hold down the minus button, move the I-shift gear selector pad from position A to M and then release the minus button.

In normal driving conditions, return to the E driving program by pressing the Perf button for optimum fuel consumption.

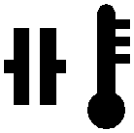
Clutch

The clutch is a dry disc type, i.e. has no torque converter. Therefore, never allow the clutch to slip in too high a gear when pulling away. The information lamp will come on and a symbol will appear on the display if the clutch overheats.

If the lamp lights up when the vehicle is started and the bus is already moving, continue driving.

If the lamp lights up when the vehicle is started and the bus is not moving, set the gear to position D or position R and let the engine idle until the light goes out.

When starting in manual position, choose 1st gear to avoid straining the clutch.



These icons will appear on the cluster if clutch overheats

CAUTION

Never hold the vehicle stationary on an uphill slope by using the accelerator pedal. The clutch could overheat, which could cause it to fail.

Declutching

If rapid declutching is required, e.g. in slippery conditions, change the I-shift gear selector pad to N, neutral.

Extra down-changing for maximum engine brake in low gears

For maximum comfort in low gears, the braking program B does not permit more than one down-change at a time when the gearbox has one of these gears engaged. To get maximum braking power e.g. at construction site driving, move the auxiliary brake stalk to the B position repeatedly, which results in a down-change each time. Thereby a higher engine speed and maximum engine brake is obtained.

Changing driving direction

(Applies only to units equipped with EBS)

The driving direction, forwards (A or D) or backwards (R), can be changed while driving using the I-shift gear selector pad without the brake pedal being used. The bus does not need to be standing still. The unit brakes slowly down automatically and when stationary the gear is changed for the new driving direction.

Note: The function must only be used when marshalling.

Towing with I-Shift

Note: During towing, the main switch and parking lamps shall be lit if the electrical system of the vehicle is functioning.

CAUTION

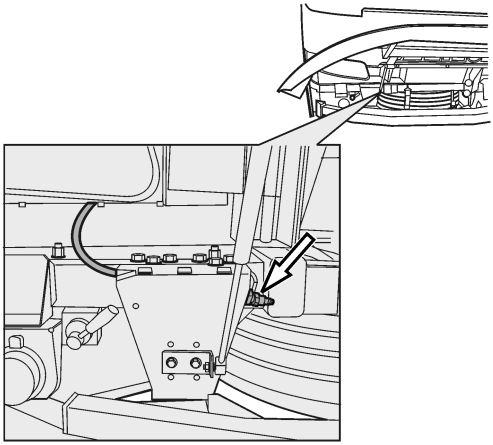
Failure to disconnect the driveshaft, remove the drive axle shaft(s) or lift the drive wheels off the ground before towing or pushing the vehicle, can cause serious transmission damage and void the transmission warranty.

Note: Traction control system should be turned off if one of the axles is raised during towing.

The parking brake must be released during towing.

For all long distance towing, assure that the tow vehicle has the necessary equipment to reach the front axle, per bus specifications. It may be necessary for the tow vehicle to attach an air supply to the bus during towing.

Towing or moving the bus for short distances can also be performed using a towing rod or bar. Refer to the accompanying illustrations for attaching points location.



Front Air Supply Connection Location

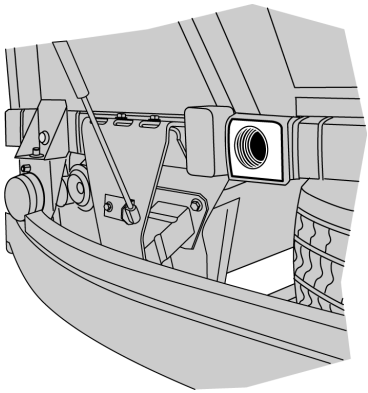
The position for attaching is available in the front of the bus. See the accompanying illustration for the general location.

After mechanically releasing the parking brake, the bus cannot be braked either with the main brake or with the parking brake. Block the wheels or connect to the tow vehicle, so that the bus cannot start moving after the parking brake has been released.

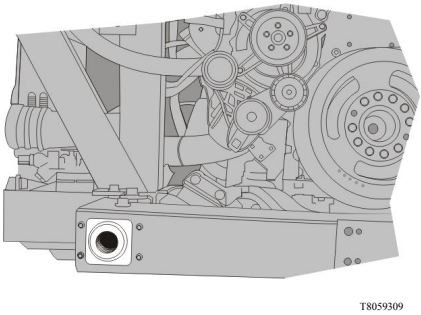
Towing requires either the drive shaft or both drive shafts to be removed, because otherwise the transmission may be damaged due to insufficient lubrication.

Note: For, punctures, the tire must be repaired before towing begins.

For more information about towing, refer to Function Group 192, Information type Description Towing information



Place for towing bar attachment (front).



Place for towing bar attachment (rear)

Towing alternative procedure.

Note: This procedure applies only for buses with I-Shift AMT-D with towing alternative procedure.

If the standard procedure can't be followed due to road conditions, follow the alternative procedure described below.

This will allow the vehicle to be towed without the removal of the driveshaft for whatever distance the vehicle need to be towed. The following conditions must be met.

⚠ CAUTION

Do not replace the towing standard procedure, this procedure does not have any indicator, if any of the steps below are not fulfilled a transmission damage may occur.

Towing gear 3 HR will be engaged if following points are fulfilled:

- The gear lever or the shift pad must be in neutral
- Engine is not running
- There must be enough air pressure to the gearbox
- The vehicle must have electrical power.
- The ignition key must be in "ON" position.
- Vehicle must be towed forward

⚠ CAUTION

Reverse towing is not allowed when such towing alternative procedure applied. Reverse towing can damage the gearbox.

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 (ft-lb) 26 = 2600 (1918) 31 = 3100 (2300)	Forward Speeds	Design Level

32 Technical Data

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

A

B

C

D

E

F

H

I

K

L

O

P

Q

R

S

T

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