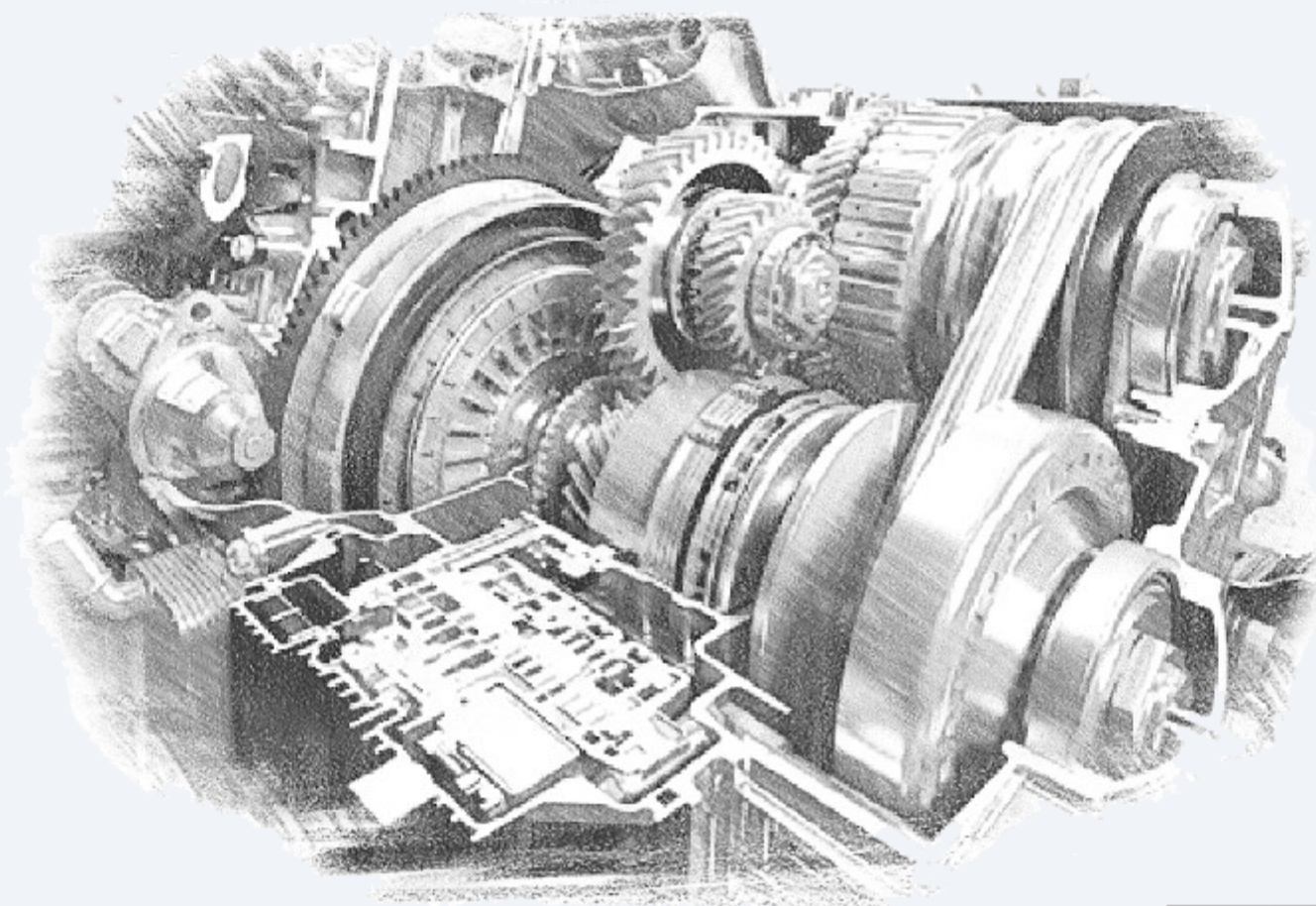


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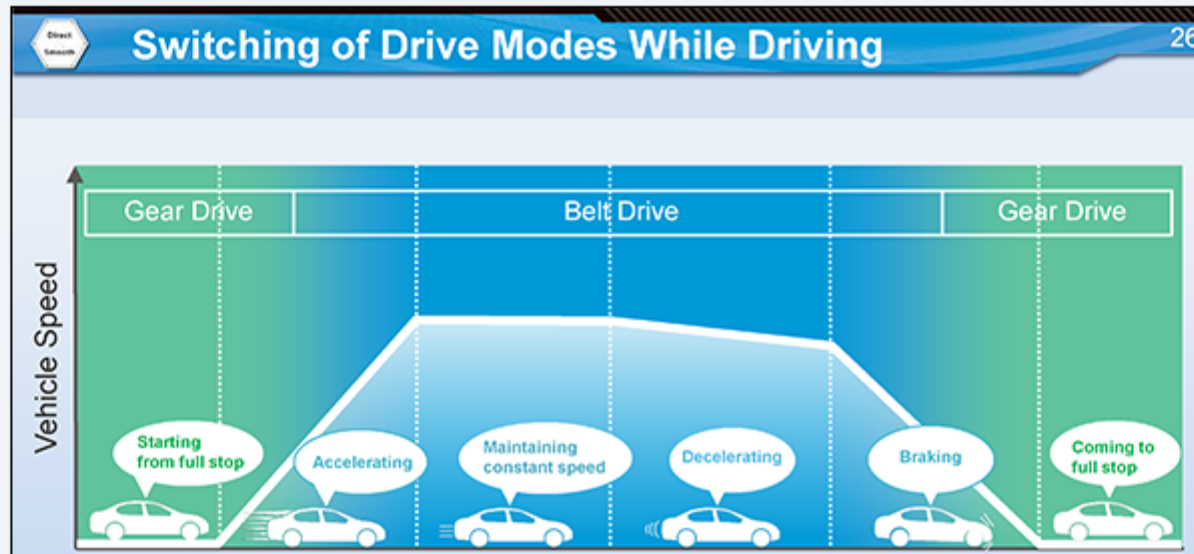


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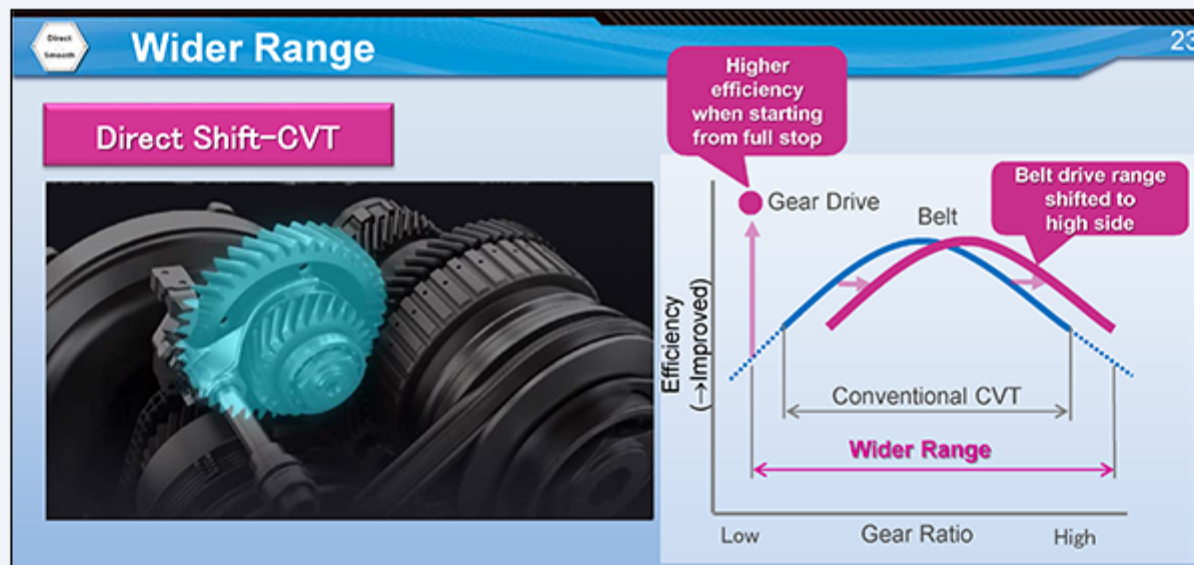
K120F • K320

The new generation of CVT transmissions was introduced in 2018 and debuted on the Corolla 210 and RAV4 50 series vehicles.

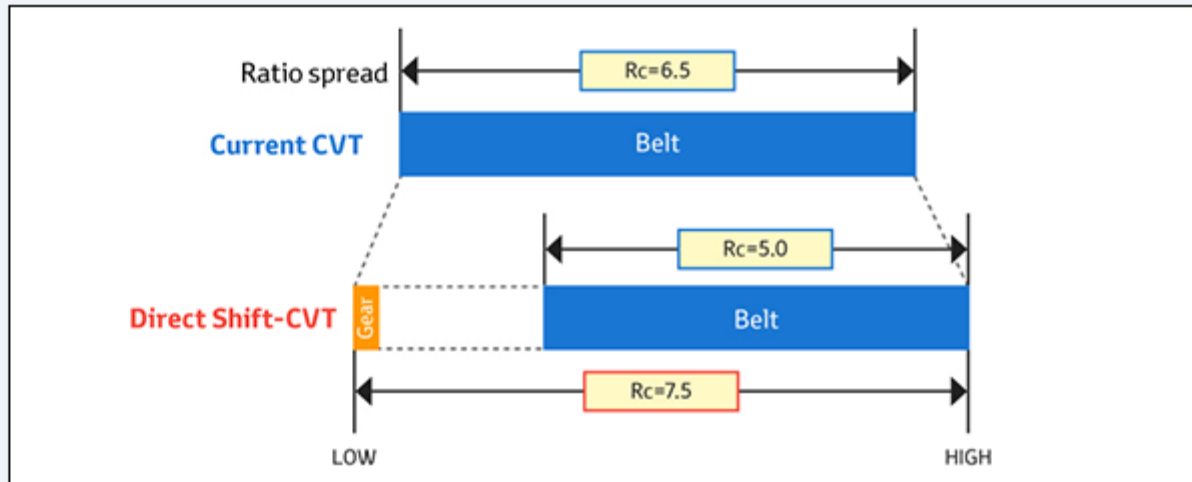
The main innovation - launch gear: in addition to the metal belt between pulleys, a gear mechanism is used when starting off, driving at low speeds and reverse.



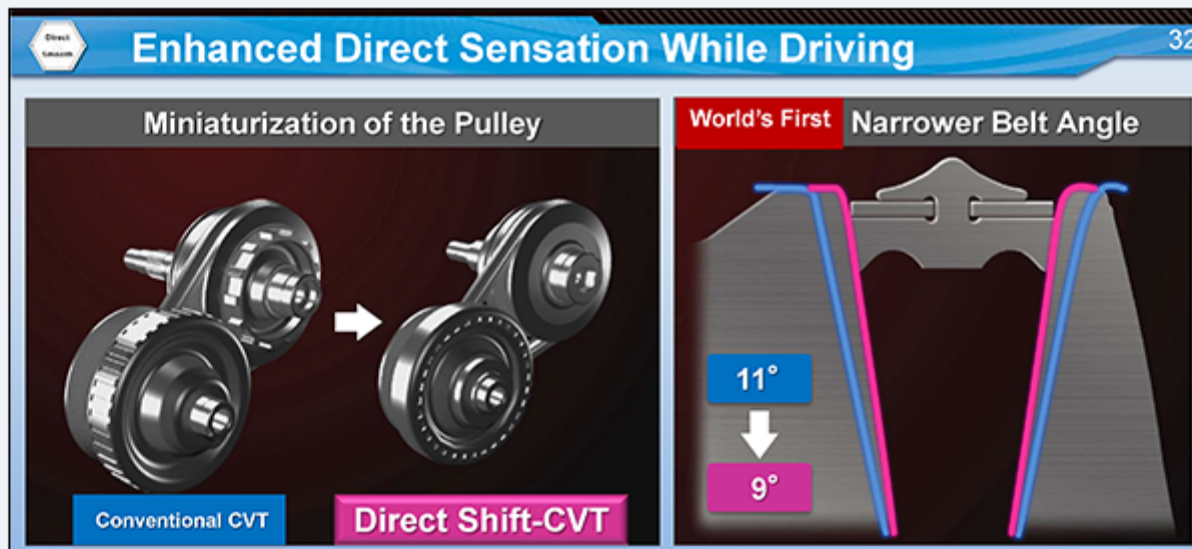
Thus, the launch gear replaces the belt in the most difficult modes: the extreme position when the bended belt operating along the minimum radius at minimum contact area with the drive pulley, and while slipping, and starting from a full stop.



Formally, the ratio range of the new transmission increased to 7.5 instead of 6-6.5, although the ratio range of the variator itself, on the contrary, decreased to 5.0 - which clearly benefited the belt.



The diameter of pulleys reduced significantly, the belt (pulley) angle has been narrowed from 11° to 9° , resulting in higher shifting speed.



Specs

K120F

Fluid capacity (full): 8.3-8.6 liters

Fluid type: Toyota genuine CVT Fluid FE

Gear ratio: 3.377 (forward) / 3.136 (reverse)

Pulley ratio: 2.236~0.447

Final gear ratio: 4.262

Weight (with fluid): 90-91 kg

K320

Fluid capacity (full): 8.4 liters

Fluid type: Toyota genuine CVT Fluid FE

Gear ratio: 3.362 (forward) / 3.120 (reverse)

Pulley ratio: 2.236~0.447

Final gear ratio: 4.007

Weight (with fluid): 90 kg

General timeline of Toyota's (Aisin AW) CVT:

2000-2009 - **K110** - for models with 2.0 1AZ-FSE engine (Opa, Allion/Premio, Wish). The very first belt-type CVT of Toyota.

2001-2008 - **P210** - for hybrid models with 2.4 2AZ-FXE engine (Estima/Alphard Hybrid). The only hybrid transaxle with belt-type CVT.

2002-2015 - **K210** - for models with 1.5 1NZ-FE or 1.3 2SZ-FE engines (Vitz, Ractis Sienta). Basic type - Aisin AW XA-15LN

2004 - Start of mass-production of metal V-belts at Aisin CVTEC plant (instead of previously imported metal belts produced by Van Doorne's Transmissie (VDT))

2004-2018 - **K111/K111F** - for 2WD or 4WD models with 2.0 1AZ-FSE, 3ZR-FE, 3ZR-FAE engines (Noah/Voxy, Isis, Allion/Premio, Avensis)

2004-2019 - **K410** - for models with 1.0 1KR-FE or 1.3 2SZ-FE engines (Vitz, Ractis, Belta). Basic type - Aisin AW XA-10LN

2005-2019 - **K112/K112F** - for 2WD or 4WD models with 2.4 2AZ-FE, 3ZR-FE, 3ZR-FAE engines (RAV4/Vanguard, Estima/Alphard/Vellfire, Mark X Zio, Blade)

2006→ **K310/K310F** - for 2WD or 4WD models with 1.5 1NZ-FE engine (Corolla Axio/Fielder, Auris, Ist, Allion/Premio, Corolla Rumion, Ractis/Verso-S/Trezia, Vitz, Porte/Spade, Sienta, Probox/Succeed). Basic type - Aisin AW XB-20LN

2006→ **K311/K311F** - for 2WD or 4WD models with 1.8 2ZR-FE, 2ZR-FAE or 1.6 1ZR-FE, 1ZR-FAE engines (Corolla Fielder, Avensis, Corolla, Auris, Verso, Allion/Premio, Isis, Wish, Corolla Rumion)

2008-2016 - **K41A** - for models with 1.0 1KR-FE engine (iQ)

2009-2016 - **K41B** - for models with 1.3 1NR-FE engine (iQ)

2010→ **K411** - for models with 1.3 1NR-FE engine (Vitz, Corolla Axio, Ractis/Verso-S/Trezia, Probox/Succeed, Porte/Spade). Basic type - Aisin AW XA-12SN

2012→ **K312** - for models with 1.5 1NZ-FE or 2.0 2NZ-FE engines (Corolla Axio/Fielder, Auris, Sienta, Porte /Spade, Ractis, Probox/Succeed). Basic type - Aisin AW AWFCX12

2013→ **K114/K114F** - for 2WD or 4WD models with 2.0 3ZR-FAE engine (RAV4, Noah/Voxy, C-HR, Harrier, Avensis)

2013→ **K313/K313F** - for 2WD or 4WD models with 1.8 2ZR-FE, 2ZR-FAE or 1.2 8NR-FTS engines (Corolla, Auris, Avensis, Verso, C-HR). Basic type - Aisin AW AWFCX18

2015→ **K115/K115F** - for 2WD or 4WD models with 2.5 2AR-FE engine (Alphard/Vellfire)

2019→ **K120/K120F** - for 2WD or 4WD models with 2.0 M20A-FKS engine (RAV4, Corolla, Camry/Avalon/ES, Corolla Cross, Harrier, Noah/Voxy, UX). Basic type - Aisin AW AWFCW21

2020→ **K320/K320F** - for 2WD or 4WD models with 1.5 M15A-FKS engine (Yaris, Yaris Cross)

Quite numerous Daihatsu models sold under the Toyota brand can be added to this list - they can be equipped with own Daihatsu CVTs (D-18C, E-18C, PT-08) or with Akashi Kikai products, as well as Aisin CVTs.

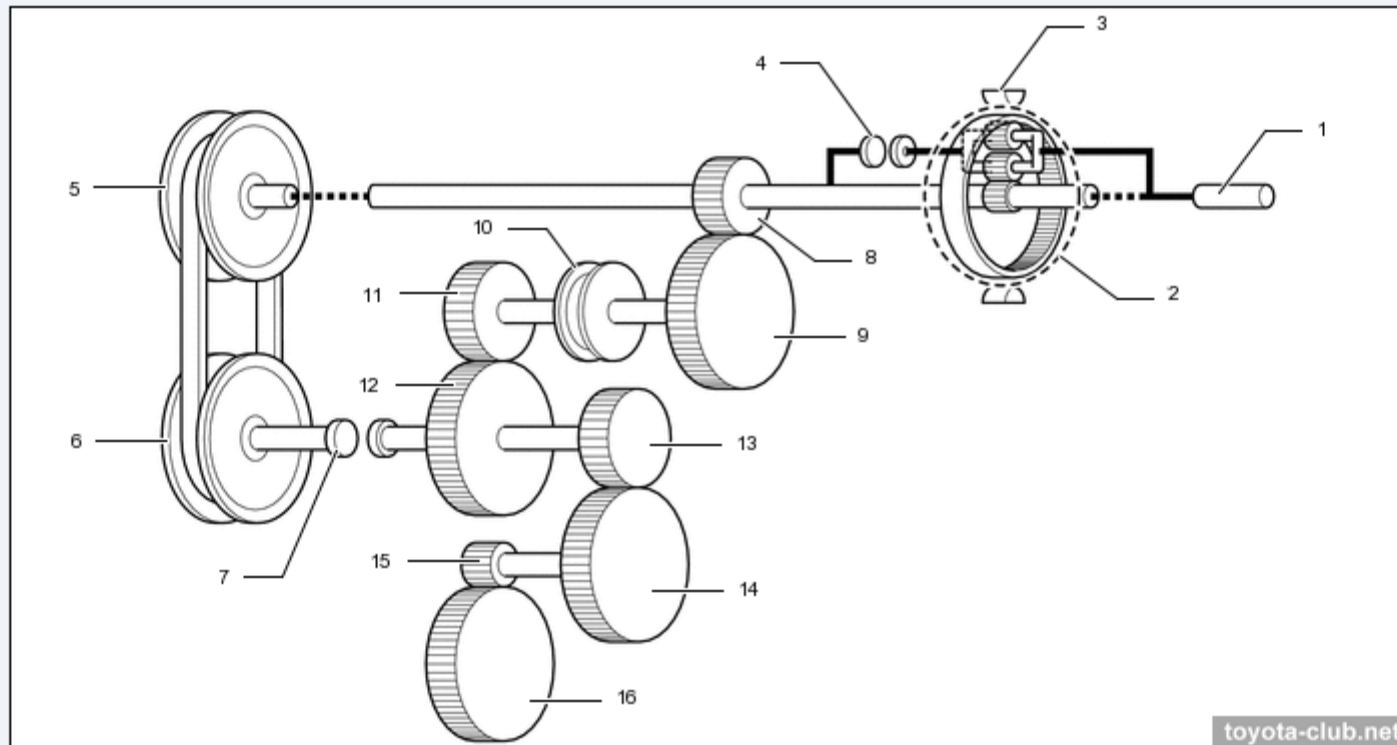
Aisin vs. Jatco

Sometimes you can hear that Toyota repeats the long-known concept of Jatco CVT7. In fact, the fundamental difference of Jatco solution is that an additional planetary gearbox is installed *in series* with a constantly operating belt variator, while Aisin installed a gear train *parallel* to the variator and it works alternatively.

The merit of Jatco can be recognized as the largest continuous ratio range (7.3 or 8.7), but the CVT7's area is limited - small cars with engine torque within 150 nm.

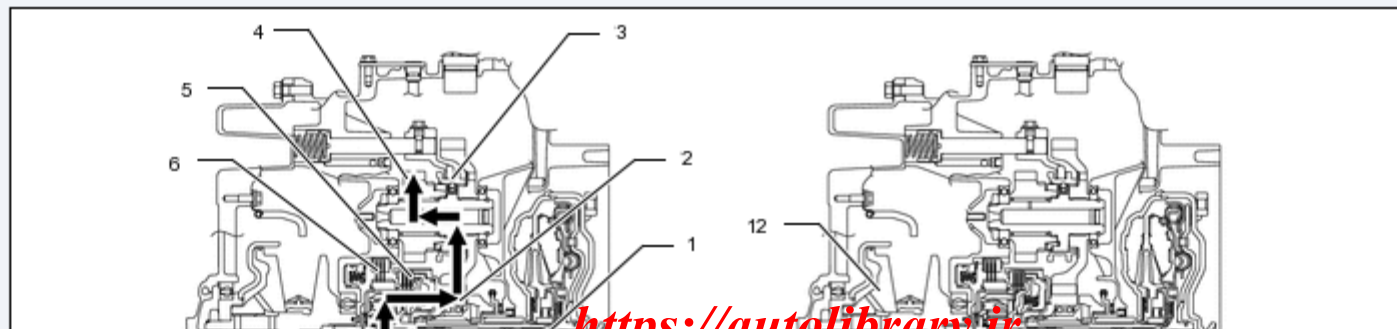


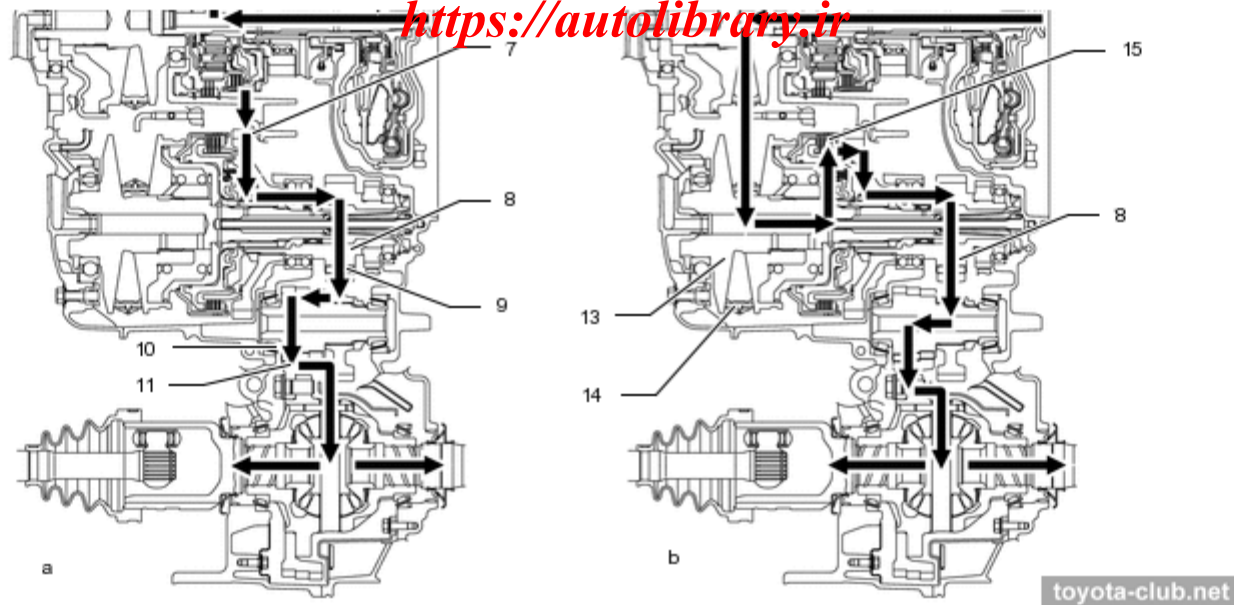
Belt-mode / gear-mode



K120F. 1 - input shaft, 2 - planetary gear unit, 3 - B1 brake, 4 - C1 clutch, 5 - primary pulley, 6 - secondary pulley, 7 - C2 clutch, 8 - drive gear #1, 9 - driven gear #1, 10 - synchronizer mechanism, 11 - drive gear #2, 12 - driven gear #2, 13 - reduction drive gear, 14 - reduction driven gear, 15 - differential drive pinion, 16 - differential ring gear

By engaging/disengaging the C1 clutch and C2 clutch the transmission switch between belt and gear mode.

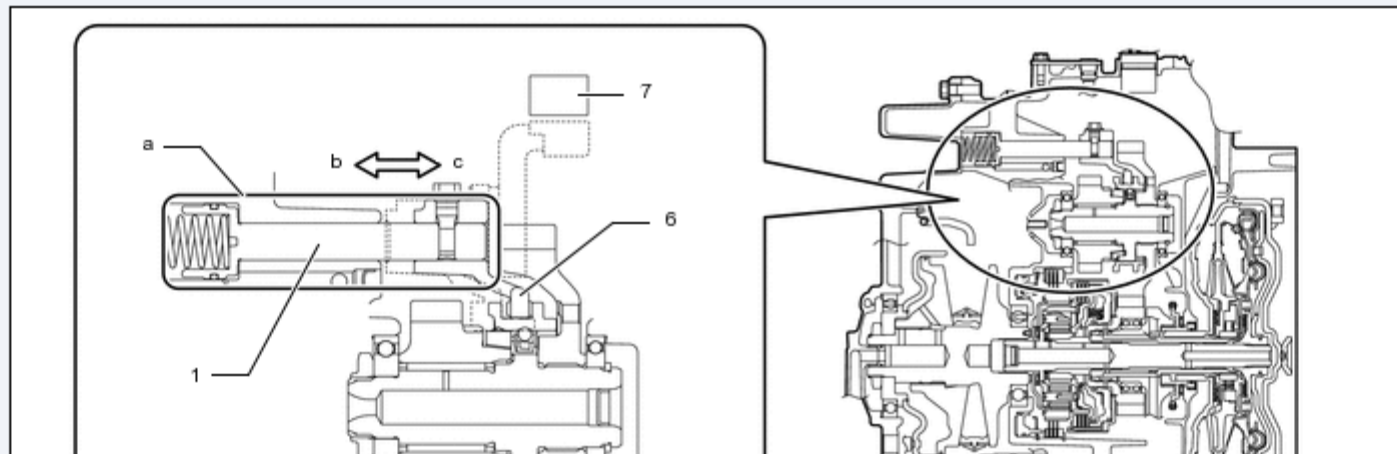


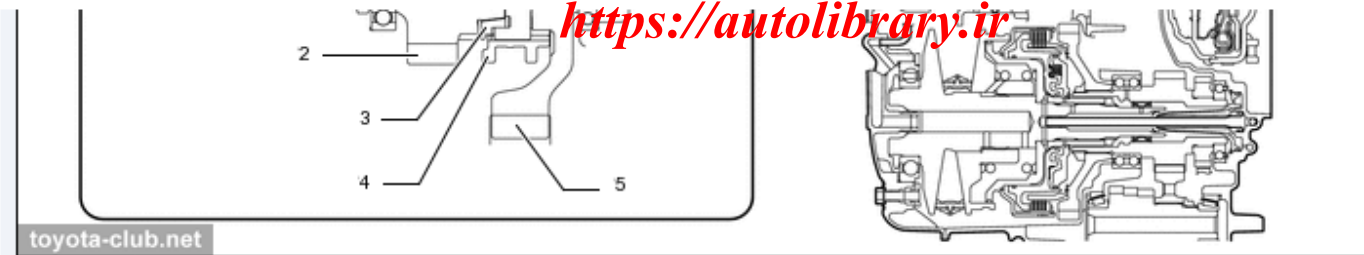


K120F. 1 - input shaft, 2 - drive gear #1, 3 - synchromesh, 4 - drive gear #2, 5 - C1 clutch, 6 - B1 brake, 7 - driven gear #2, 8 - reduction drive gear, 9 - reduction driven gear, 10 - differential drive pinion, 11 - differential ring gear, 12 - primary pulley, 13 - secondary pulley, 14 - steel belt, 15 - C2 clutch. a - gear type, b - belt type

Gear mode is used when the vehicle starts off, at low speeds or reverse.

The synchronizer engages/disengages the driven gear #1 and drive gear #2. The system controls the shift fork shaft and synchronizer by varying oil pressure. Synchronizer engagement/release is controlled by the stroke sensor (shift fork shaft position).





1 - shift fork shaft, 2 - drive gear #2, 3 - synchronizer ring, 4 - hub sleeve, 5 - driven gear #1, 6 - shift fork, 7 - clutch stroke sensor. a - servo mechanism, b - engaged, c - disengaged

Gear-mode: disengaging C2 clutch, engaging C1 clutch or B1 brake (vehicle starts off, is being driven at low speeds or is reversing). Power is transmitted from the sun gear via the drive gear #1 to the gear type mechanism, and then to the reduction drive gear mechanism via the driven gear #2.

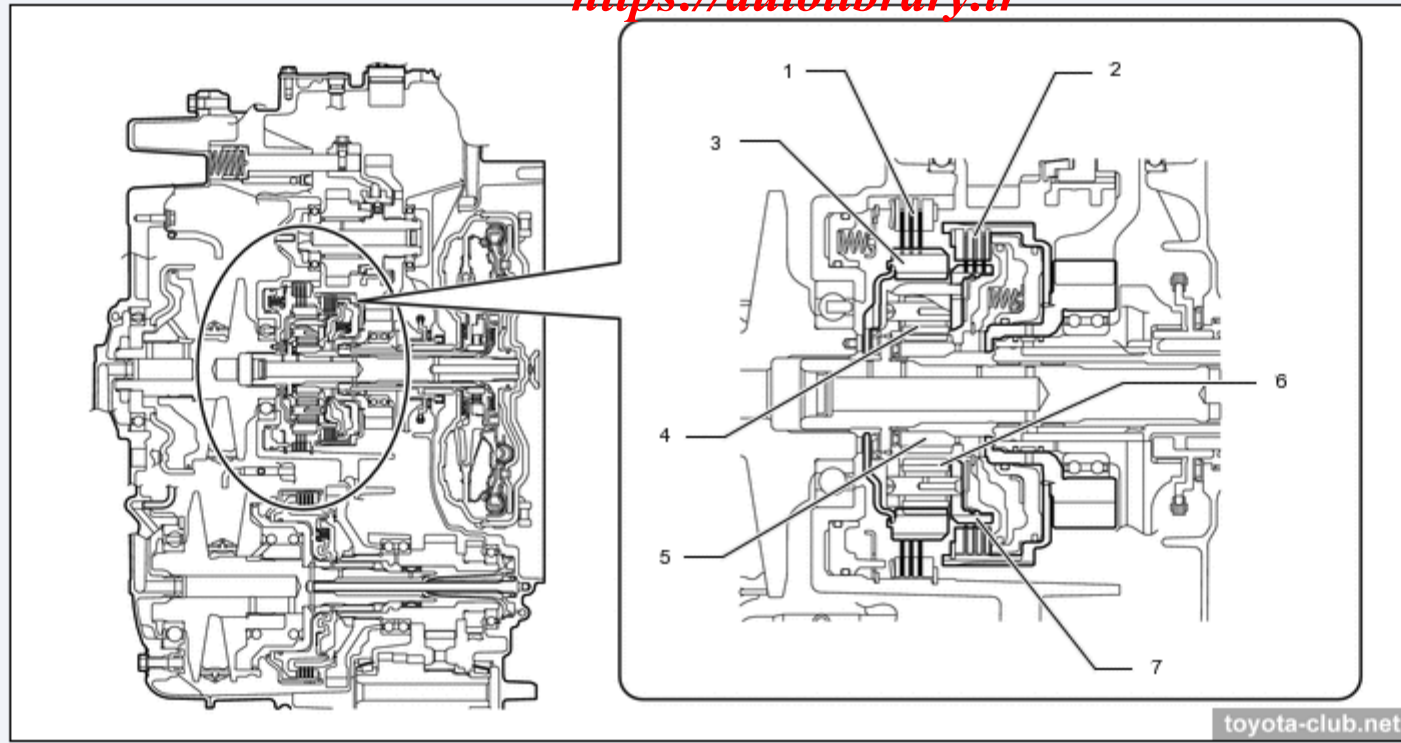
Belt-mode: engaging C2 clutch, disengaging C1 clutch and B1 brake. By disengaging C1 clutch and B1 brake, the planetary gear is disengaged and engine torque is transmitted to the belt-type mechanism. Power is transmitted from the primary pulley to the secondary pulley via the belt, then to the reduction drive gear via C2 clutch.



Forward/reverse driving

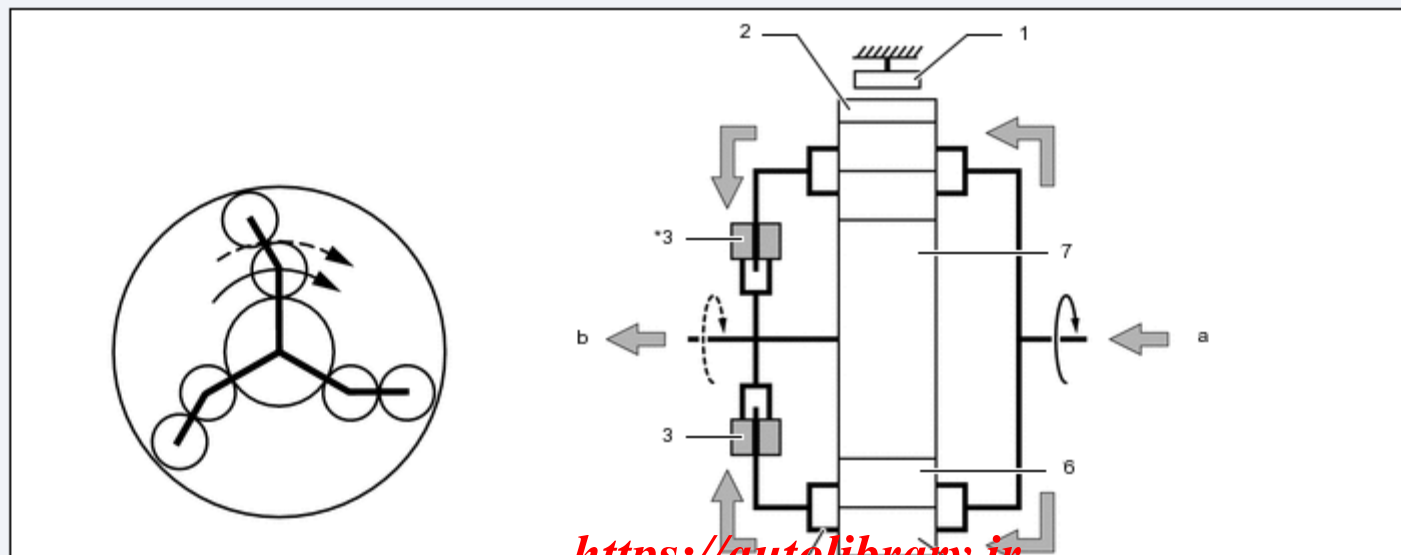
Forward/reverse switch is performing by planetary gear, C1 clutch, B1 brake.

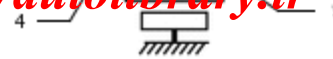
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1 - B1 brake, 2 - C1 clutch, 3 - ring gear, 4 - pinion #1, 5 - sun gear, 6 - pinion #2, 7 - planetary carrier

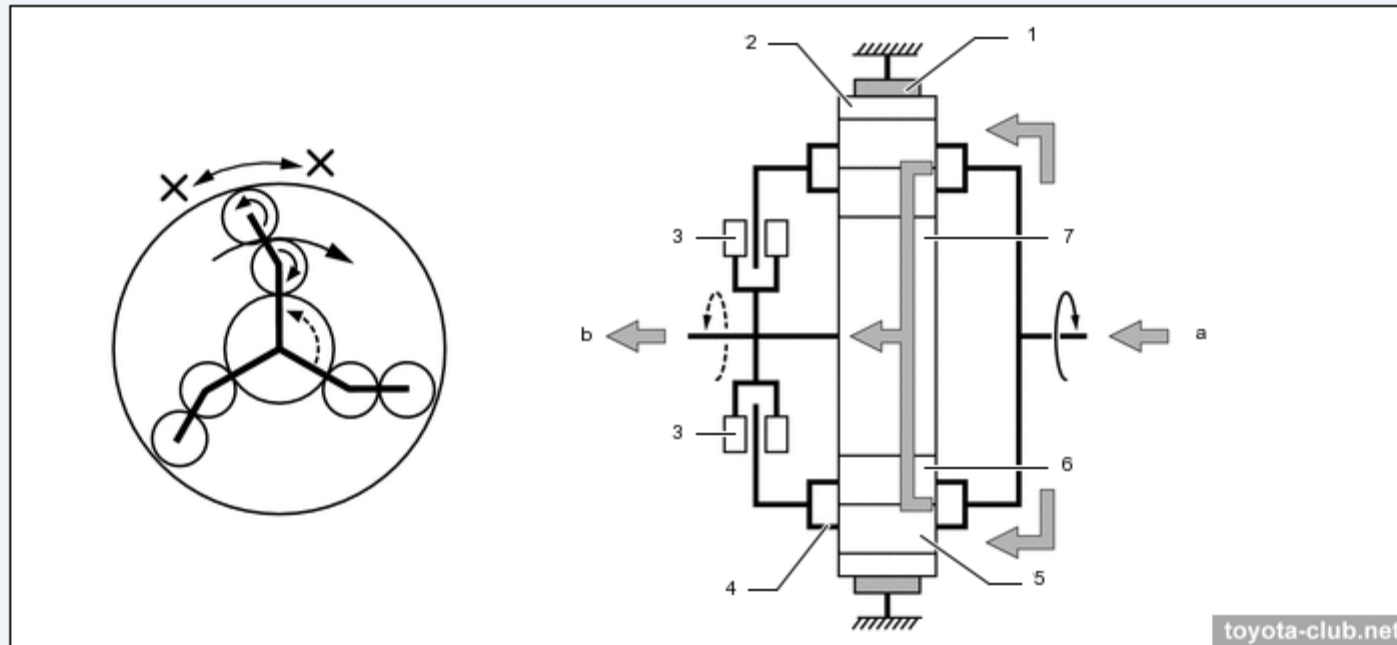
Forward movement: C1 clutch connects the input shaft with the planetary carrier, then the torque is output to the sun gear.





1 - B1 brake (off), 2 - ring gear, 3 - C1 clutch (on), 4 - planetary carrier, 5 - pinion #2, 6 - pinion #1, 7 - sun gear. a - input, b - output

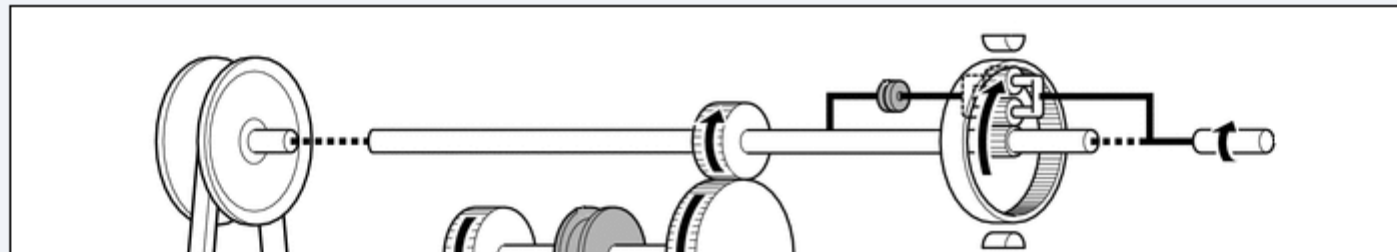
Reverse movement: B1 brake keeps the ring gear stationary, the engine torque is input to the planetary carrier and is output to the sun gear with inverse rotation.

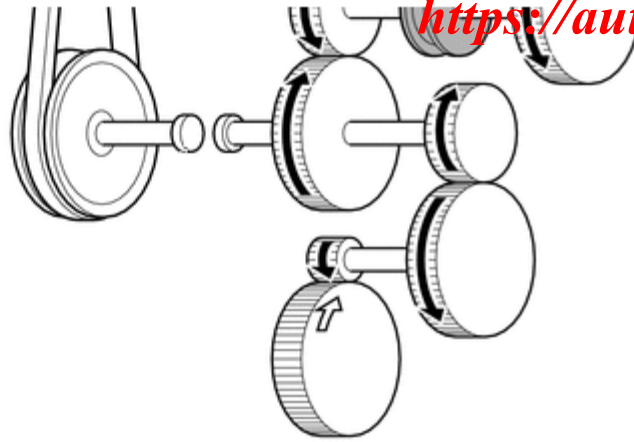


1 - B1 brake (on), 2 - ring gear, 3 - C1 clutch (off), 4 - planetary carrier, 5 - pinion #2, 6 - pinion #1, 7 - sun gear. a - input, b - output

Drive modes

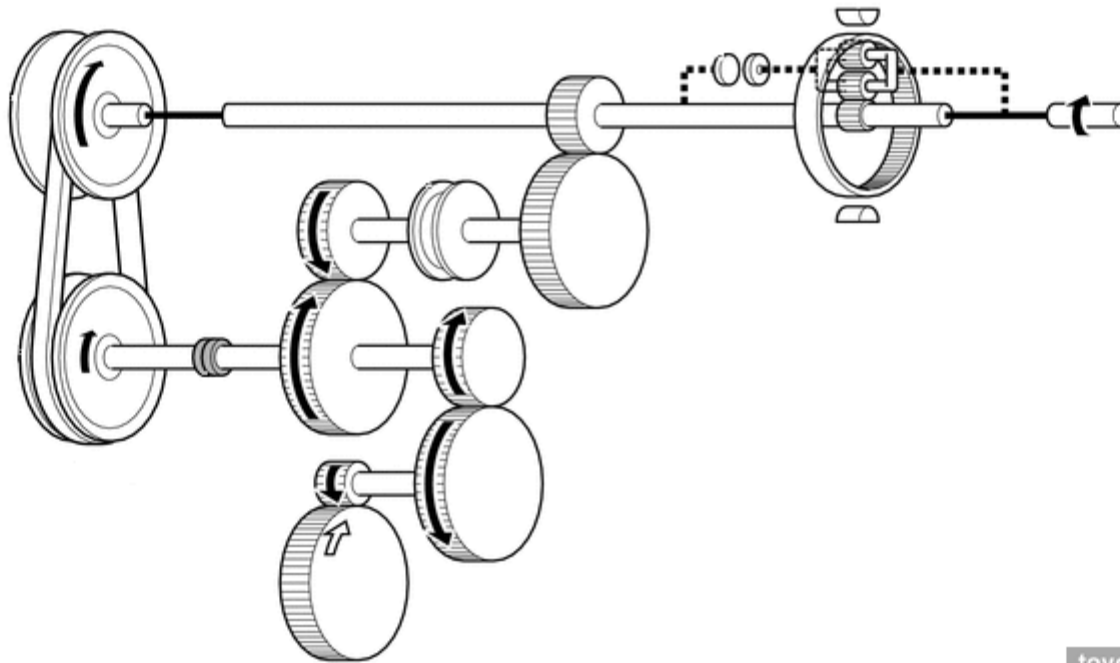
D range (starting off and low-speed driving): B1 brake - off, C1 clutch - on, C2 clutch - off, synchronizer - engaged





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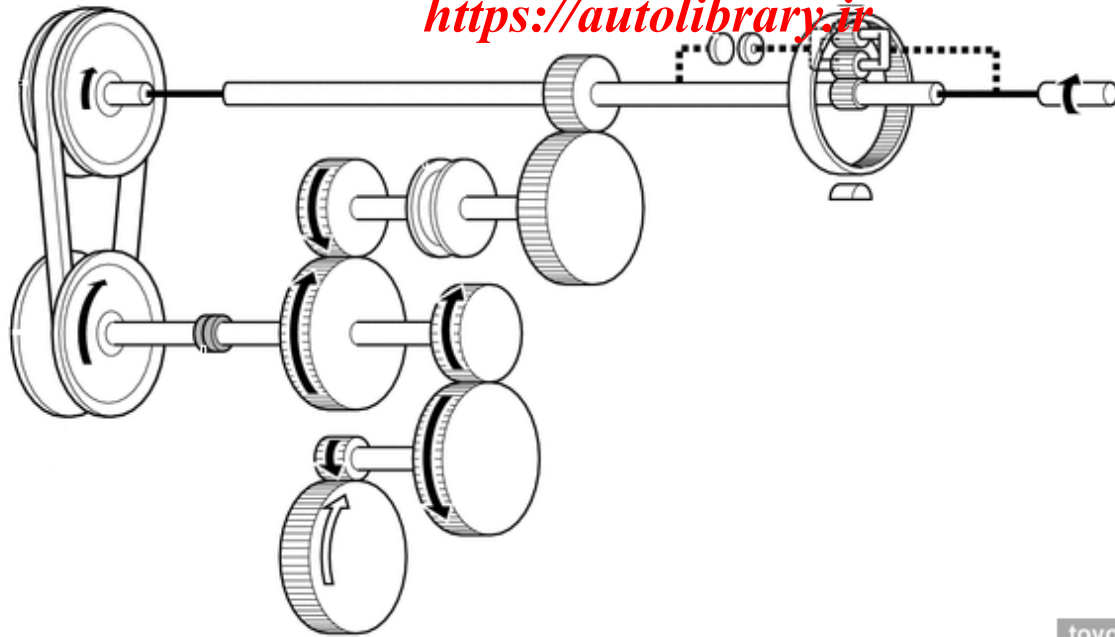
D range (pulley ratio low): B1 brake - off, C1 clutch - off, C2 clutch - on, synchronizer - disengaged



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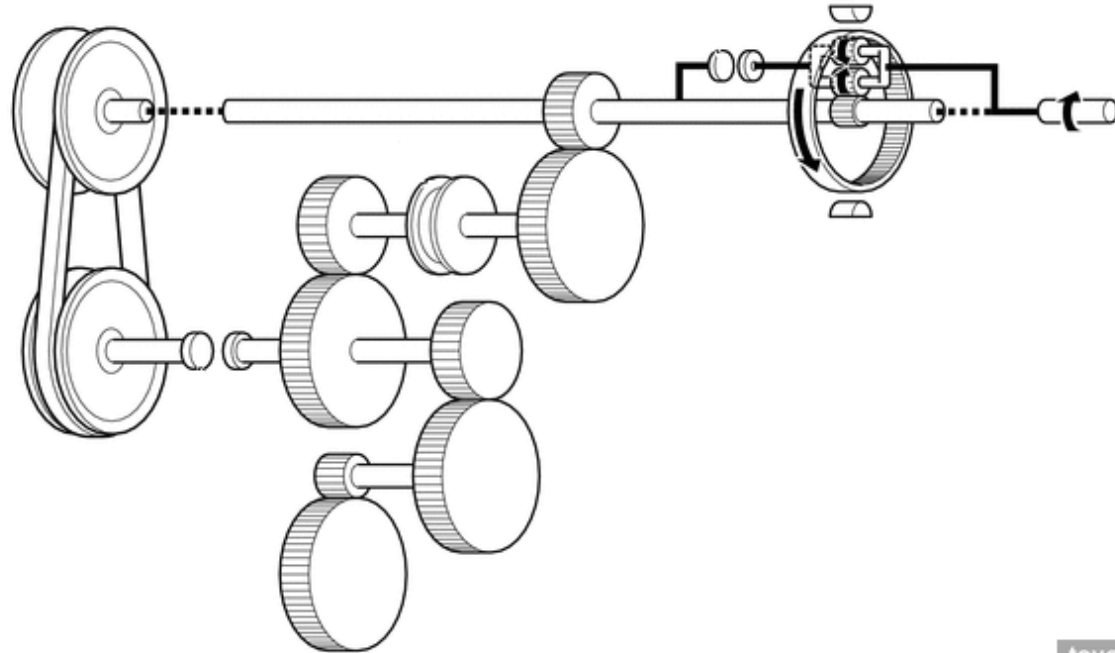
D range (pulley ratio high): B1 brake - off, C1 clutch - off, C2 clutch - on, synchronizer - disengaged





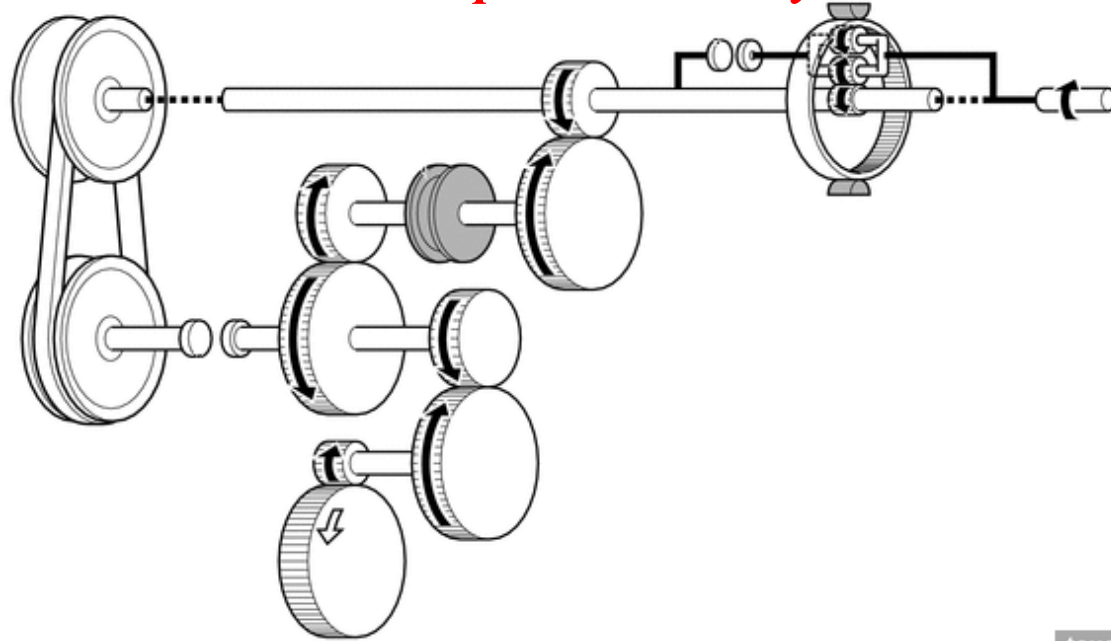
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N range: B1 brake - off, C1 clutch - off, C2 clutch - off, synchronizer - disengaged



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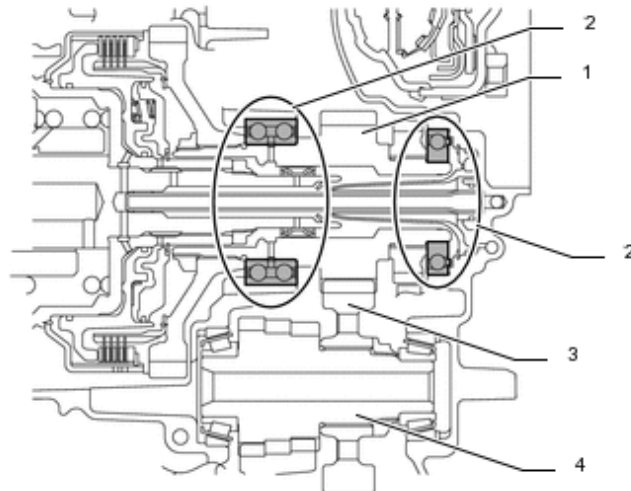
R range: B1 brake - on, C1 clutch - off, C2 clutch - off, synchronizer - engaged



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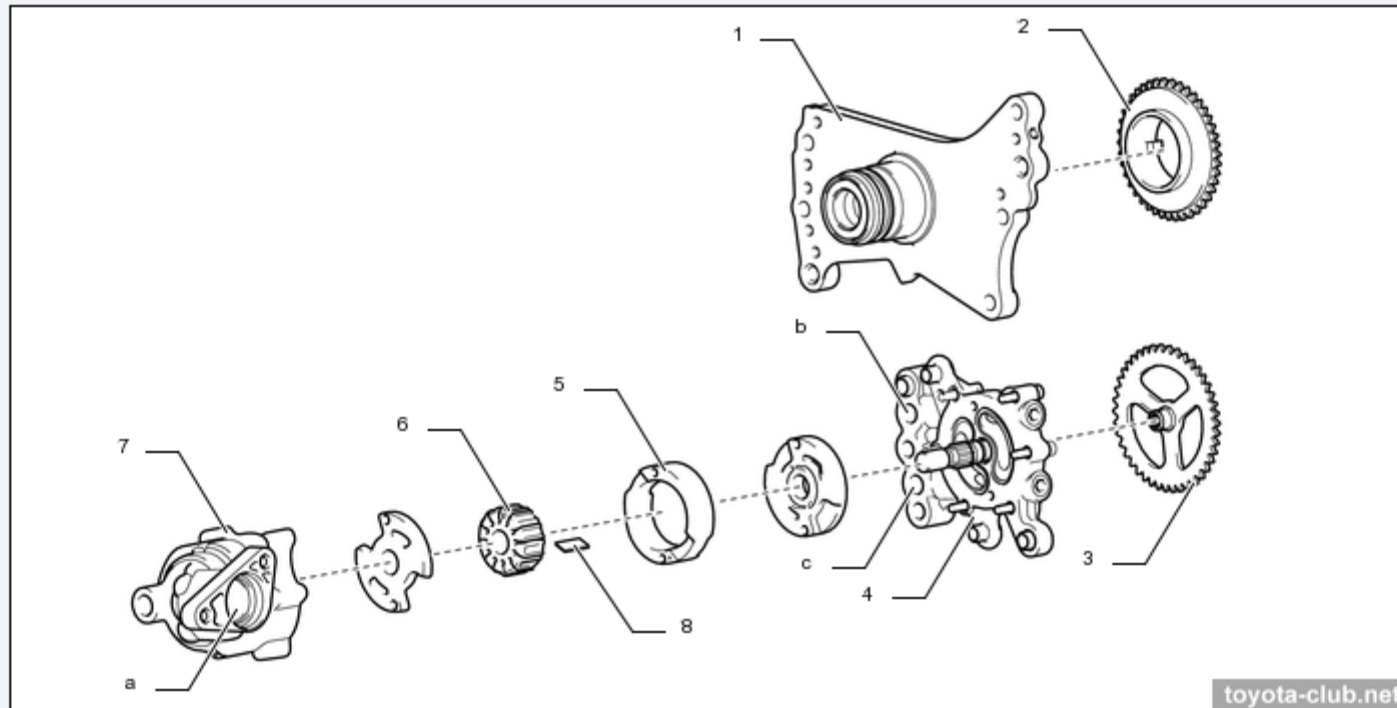
Components

The reduction gear reduces the rotation from the secondary pulley and transmits the power from the secondary pulley to the differential. In the new CVT the drive gear is supported by ball-type bearings instead of older roller-type.



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New CVT obtained a vane type oil pump, driven by chain from input shaft. The pump chain drive is used in modern Aisin transmissions, which is considered more progressive in comparison with the classic (it does not increase the length of the transmission, does not limit the minimum rotor diameter by the dimensions of the input shaft, and gives considerable freedom of maneuver in layout and design).

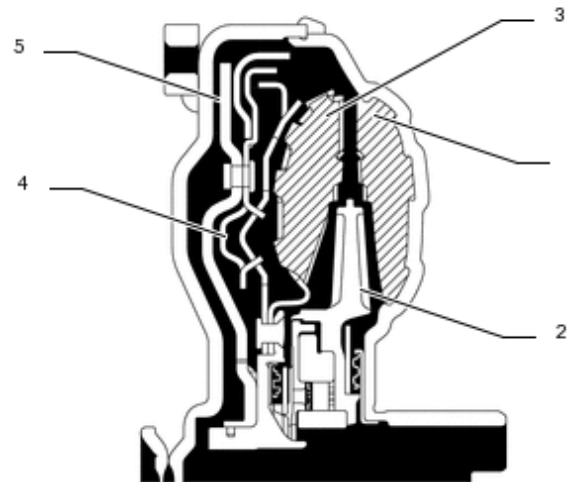


1 - front support, 2 - drive sprocket, 3 - driven sprocket, 4 - oil pump body, 5 - cam ring, 6 - rotor, 7 - oil pump case, 8 - vane. a - inlet port, b - low pressure discharge port, c - high pressure discharge port





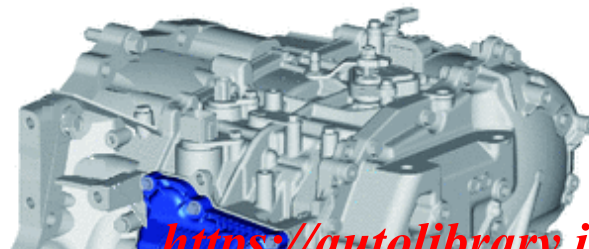
The standard torque converter with flex lock-up clutch.

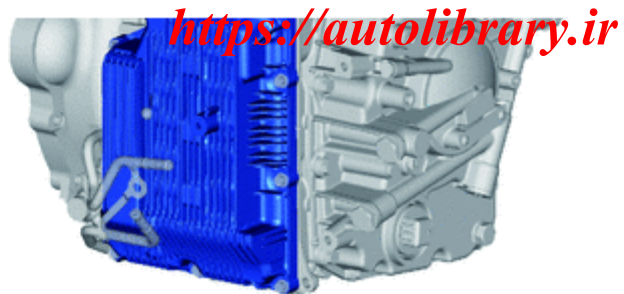


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1 - pump impeller, 2 - stator, 3 - turbine runner, 4 - lock-up damper, 5 - lock-up clutch

The lightweight resin side cover turned to the front of vehicle.





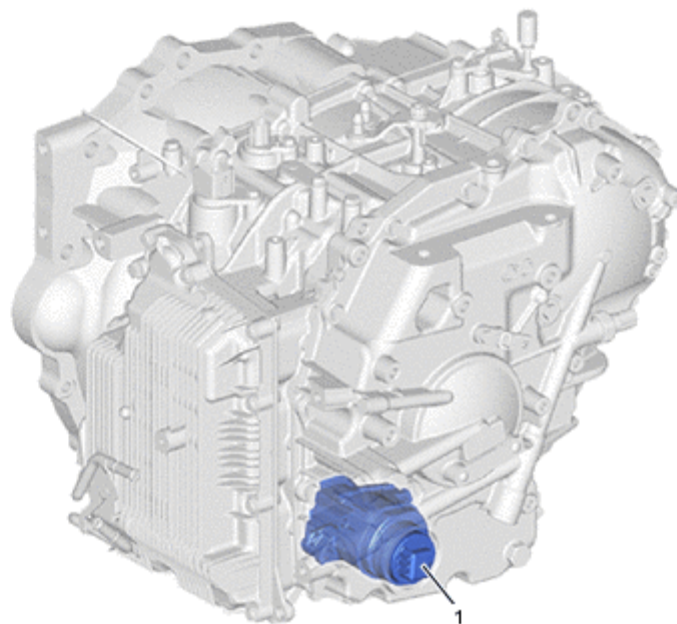
<https://autolibrary.ir>

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Models with stop-start system obtain CVT electric oil pump.

Periodically, the question arises - what is the strange plug or connector located at the bottom of the side cover? Apparently, it is worth to show this pump in a little more detail.

The electric pump is designed to maintain a stable pressure in the CVT hydraulic system when the engine is turned off by the stop-start system and to ensure the subsequent smooth start-off.

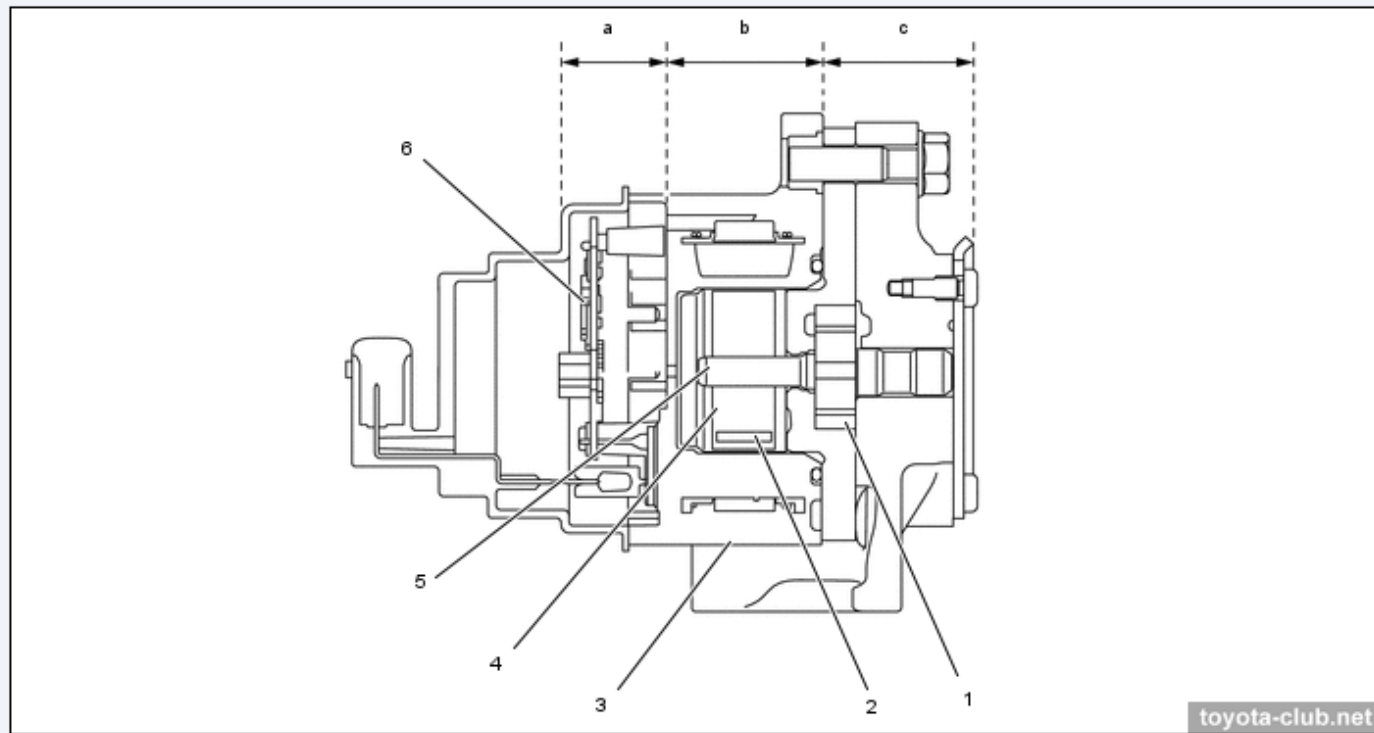


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1 - electric oil pump for CVT

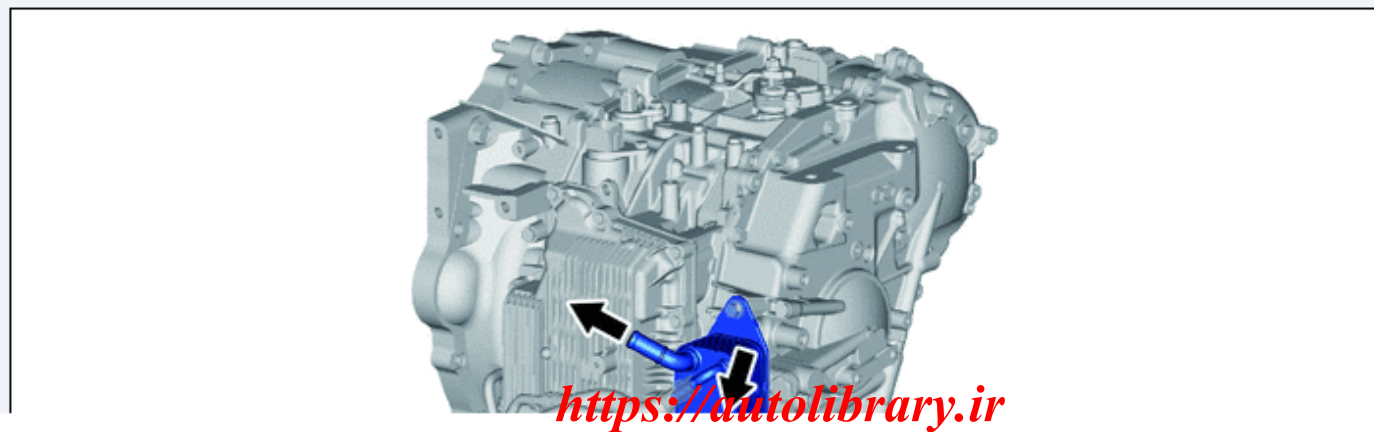
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<https://autolibrary.ir>
It is installed in the CVT cover and is not supplied as a spare part separately. It is controlled by PWM signal from the stop-start system control unit.

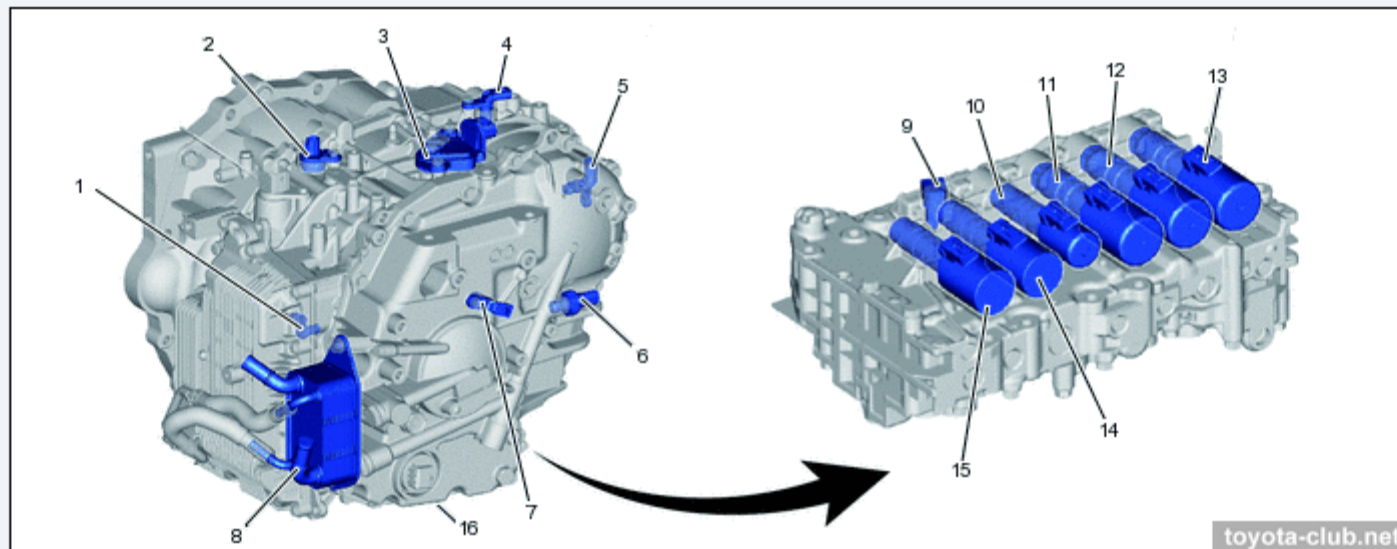


1 - pump rotor, 2 - magnet, 3 - stator, 4 - yoke, 5 - shaft, 6 - oil pump motor driver. a - oil pump motor driver section, b - DC sensorless and brushless motor section, c - oil pump section.

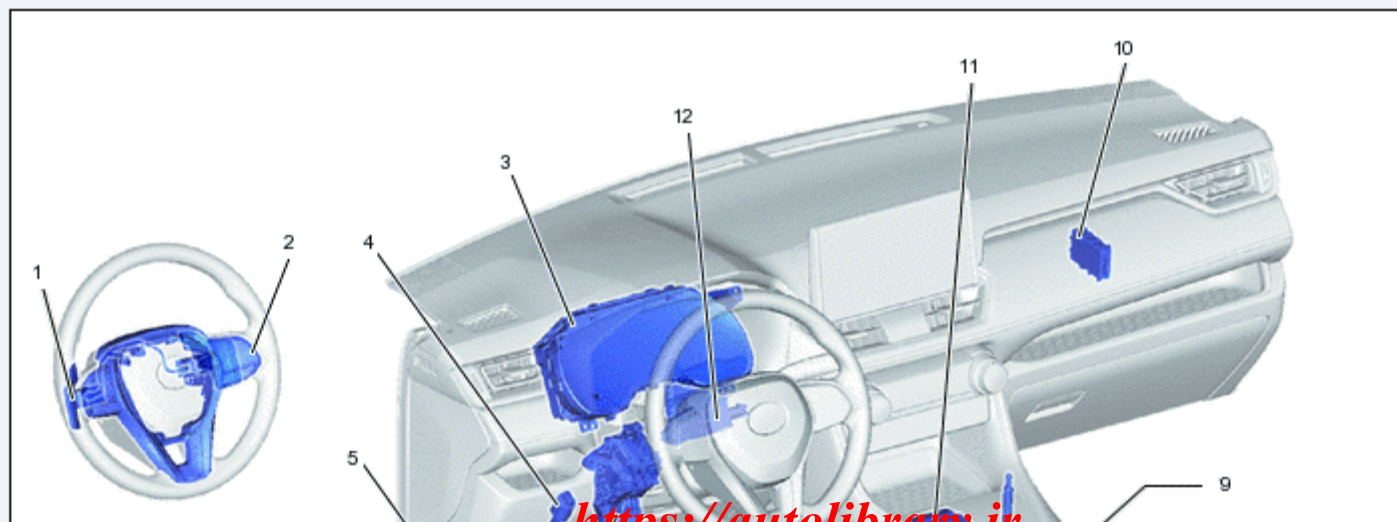
The CVT fluid warmer (oil cooler) uses engine coolant to warm up the CVT fluid quickly and maintain it within proper limits. The oil cooler is directly installed to the transmission.

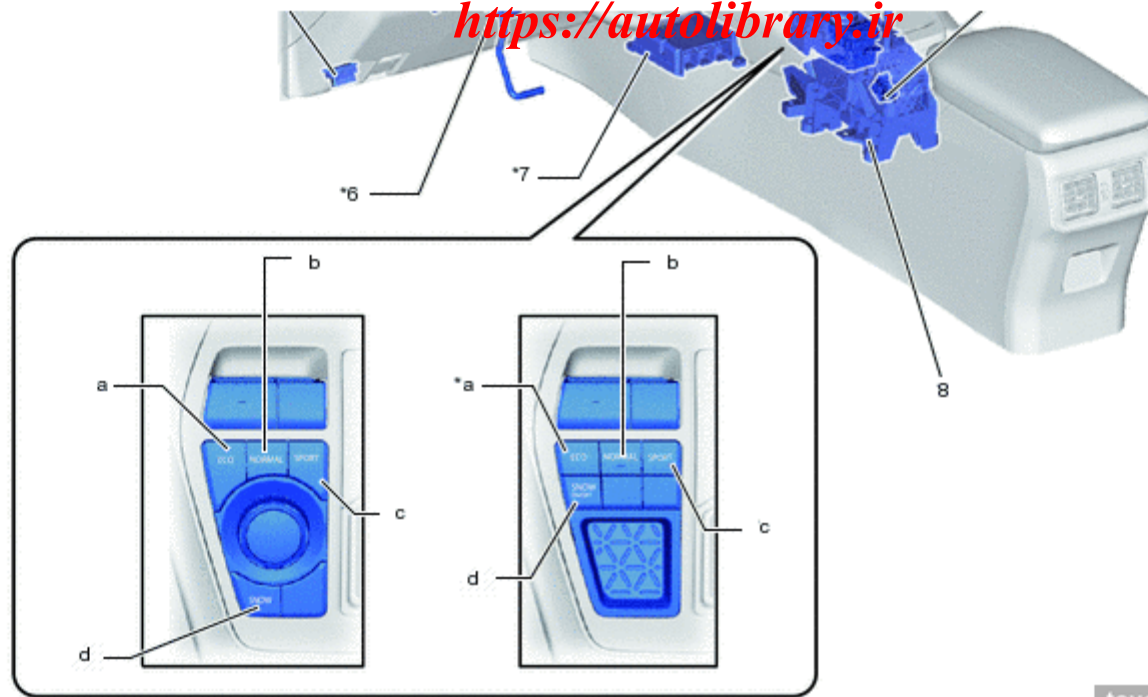


Control system



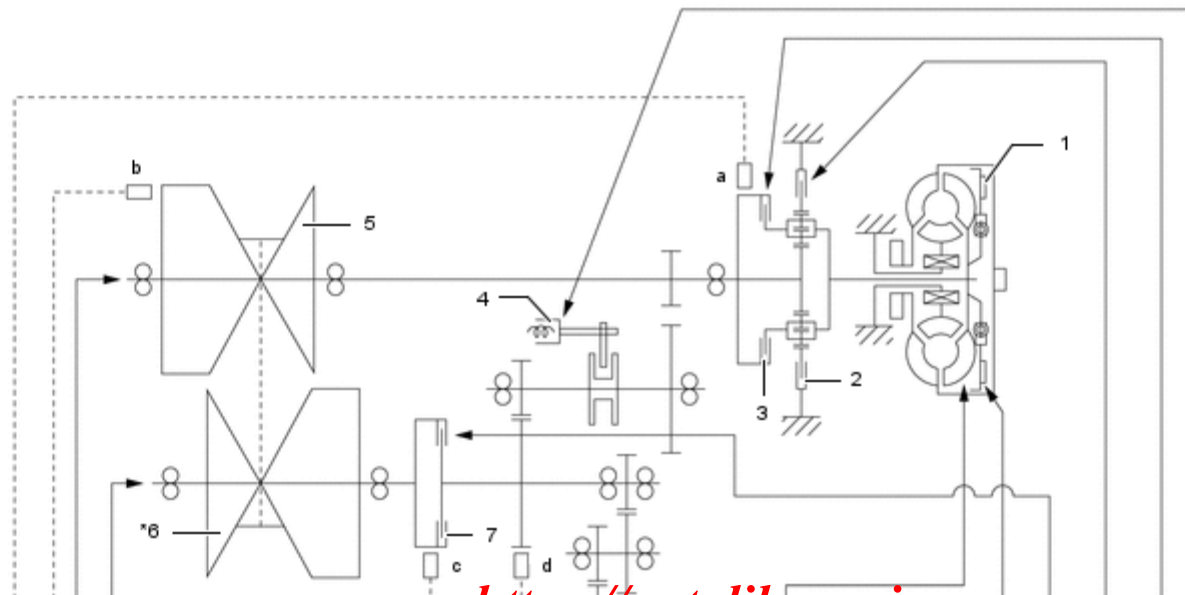
CVT K120F. 1 - transmission revolution sensor (NC1), 2 - clutch stroke sensor, 3 - pnp switch, 4 - transmission revolution sensor (NOUT), 5 - transmission revolution sensor (NSS), 6 - oil pressure sensor, 7 - transmission revolution sensor (NT), 8 - CVT fluid warmer (transmission oil cooler), 9 - CVT fluid temperature sensor, 10 - solenoid SLU, 11 - solenoid SL2, 12 - solenoid SL1, 13 - solenoid SLG, 14 - solenoid SLP, 15 - solenoid SLS, 16 - electric pump





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CVT K120F. 1 - paddle shift switch, 2 - steering pad switch, 3 - combination meter, 4 - stop light switch, 5 - DLC3, 6 - accelerator pedal sensor, 7 - airbag ECU/yawrate sensor/deceleration sensor, 8 - floor shift, 9 - transmission control switch, 10 - central gateway ECU, 11 - integration control and panel, 12 - A/C amplifier. a - ECO mode switch, b - Normal mode switch, c - Sport mode switch, d - Snow mode switch





CVT K320. 1 - lock-up clutch, 2 - B1 brake, 3 - C1 clutch, 4 - pressure servo, 5 - primary pulley, 6 - secondary pulley, 7 - C2 clutch, 8 - valve body, 9 - solenoid SLP, 10 - solenoid SLS, 11 - solenoid SLU, 12 - solenoid SLG, 13 - solenoid SL2, 14 - solenoid SL1, 15 - manual valve, 16 - TCM. a - NC1, b - NT, c - NSS, d - NOUT, e - vehicle speed control, f - belt clamping pressure control, g - lock-up control, h - pressure servo control / brake pressure control, i - clutch control



CVT K320. 1 - SLG, 2 - SL1, 3 - SL2, 4 - SLU, 5 - CVT fluid temperature sensor, 6 - SLP, 7 - SLS, 8 - CVT fluid warmer (transmission oil cooler), 9 - NC1, 10 - NT, 11 - oil pressure sensor, 12 - NSS, 13 - NOUT, 14 - pnp seitch, 15 - shift stroke sensor

Control system utilizes 6 linear solenoid valves:

SLS: oil pressure of the secondary pulley (controls belt clamping force in accordance with the input shaft torque)

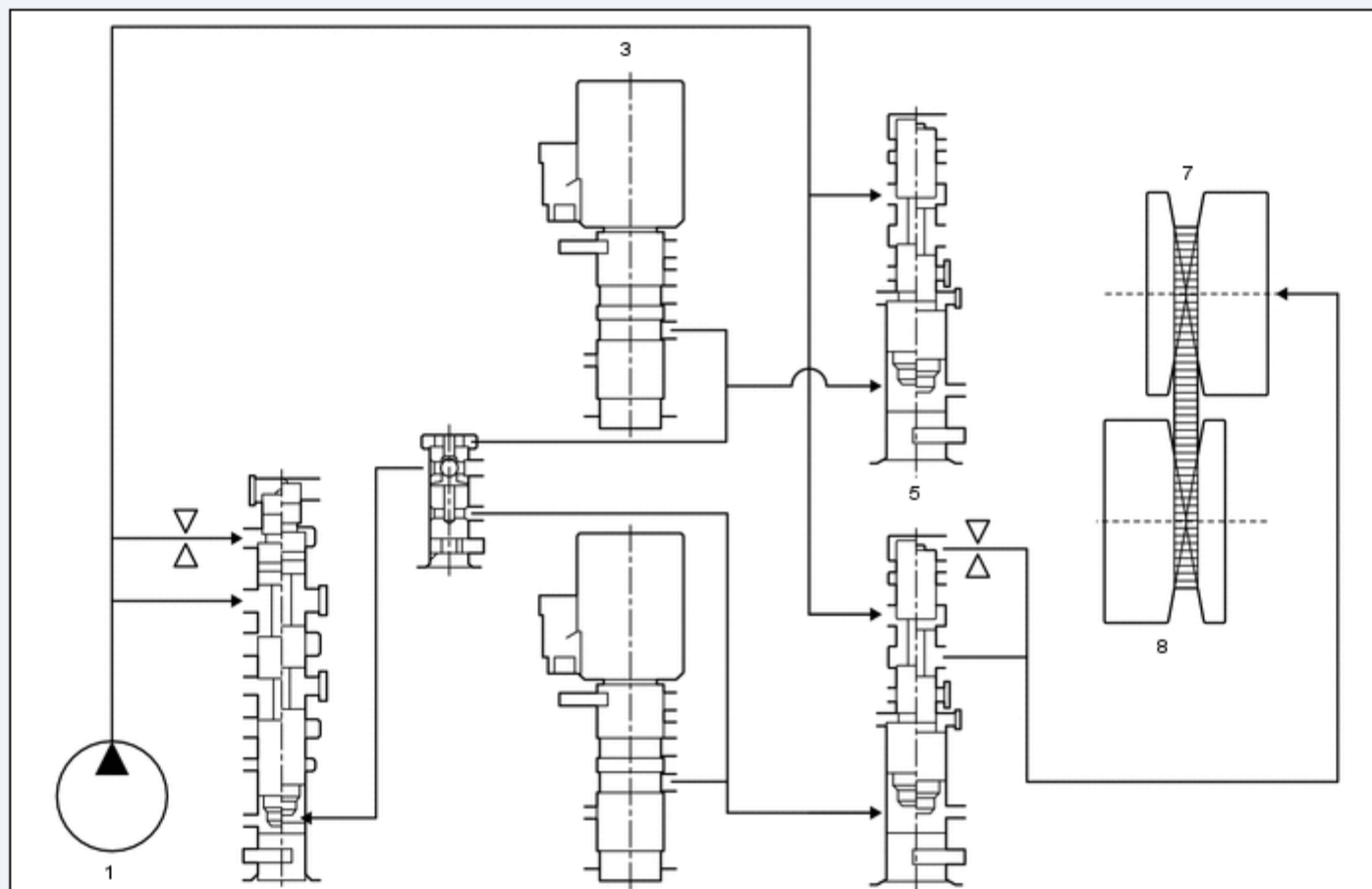
SLP: oil pressure of the primary pulley (control the speed ratio)

SLU: oil pressure of the torque converter lock-up clutch

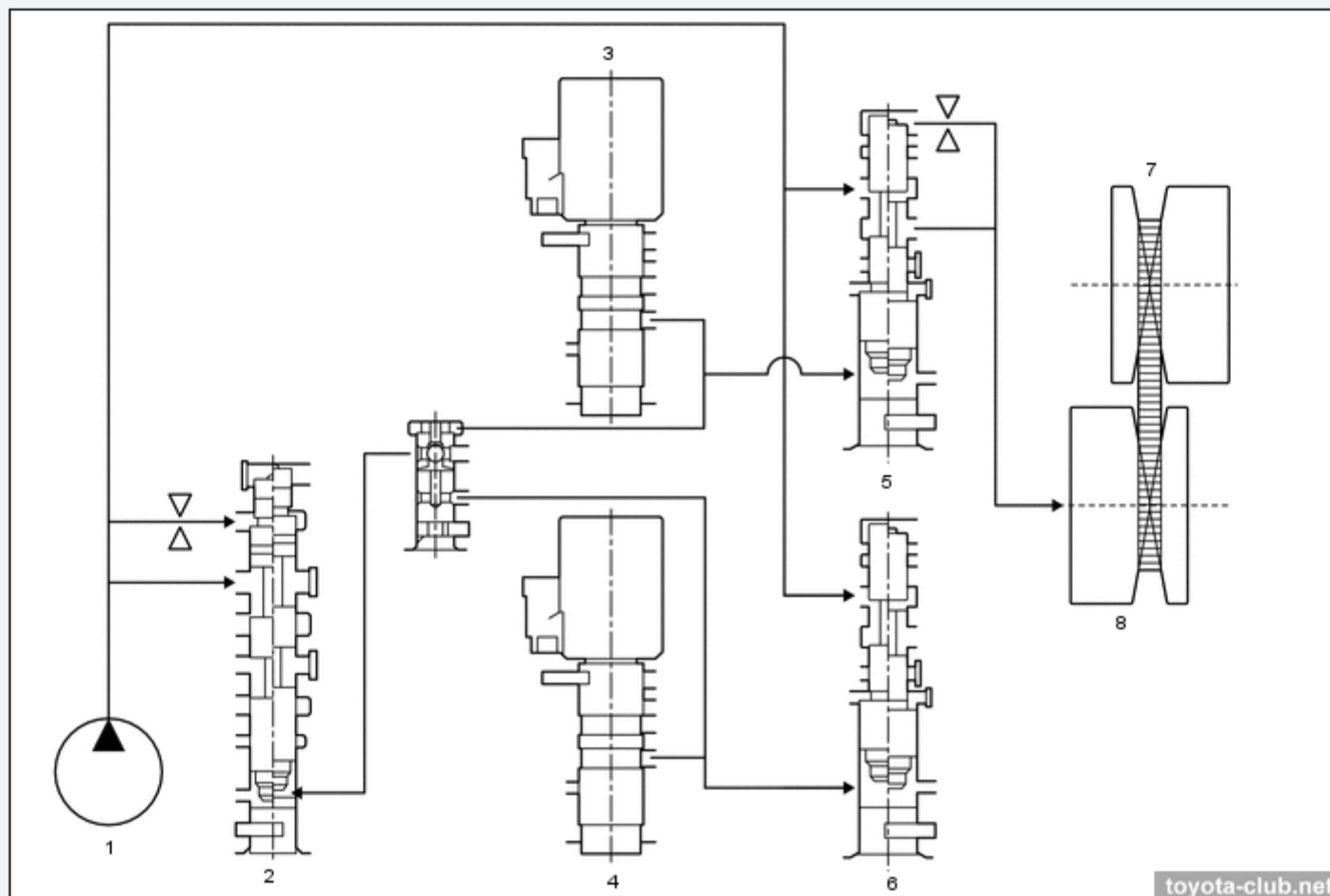
SL1: C1 clutch for gear mode

SL2: C2 clutch for belt mode

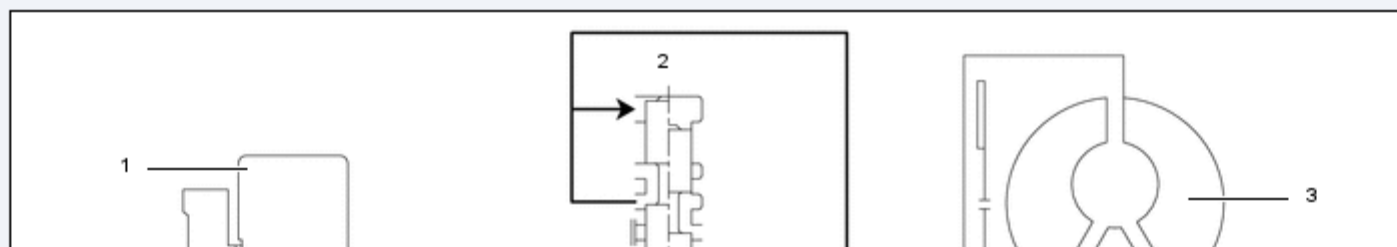
SLG: synchronizer mechanism and B1 brake

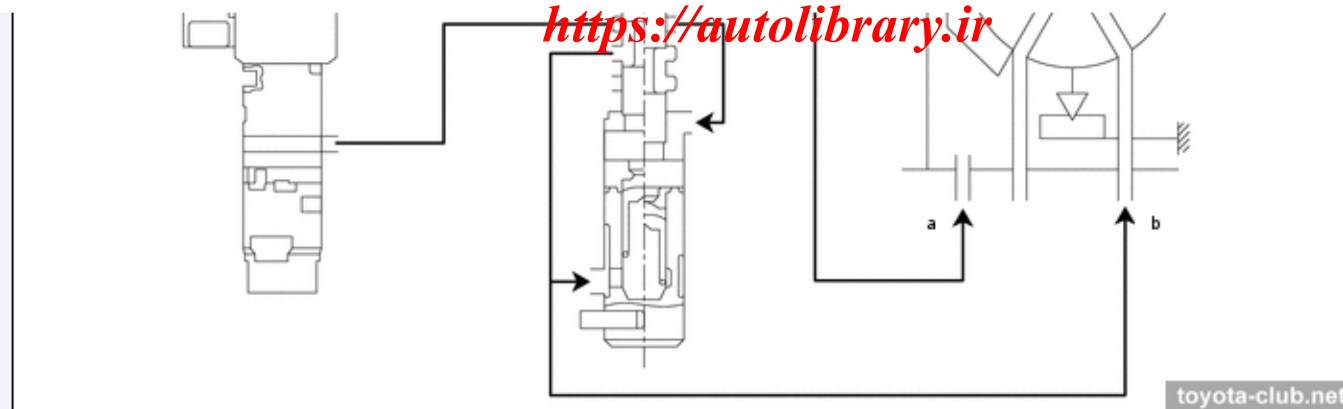


Solenoid SLP (K320). 1 - oil pump, 2 - primary regulator valve, 3 - solenoid SLS, 4 - solenoid SLP, 5 - secondary sheave control valve, 6 - primary sheave control valve, 7 - primary pulley, 8 - secondary pulley



Solenoid SLS (K320). 1 - oil pump, 2 - primary regulator valve, 3 - solenoid SLS, 4 - solenoid SLP, 5 - secondary sheave control valve, 6 - primary sheave control valve, 7 - primary pulley, 8 - secondary pulley





Solenoid SLU (K320). 1 - solenoid SLU, 2 - lock-up control valve, 3 - torque converter. a - off, b - on

System uses 4 transmission revolution sensors (Hall type):

- NC1: drive gear 1 speed
- NT: primary pulley speed
- NSS: secondary pulley speed
- NOUT: output speed

Another sensors;

- CVT fluid temperature sensor
- Oil pressure sensor
- Clutch stroke sensor (shift fork position)

- "Sport Sequential Shiftmatic" - the function of simulating a sequential gearbox with fixed gear ratios now has 10 virtual steps instead of 8 in the previous generation.

- In a traditional variator, the wheels are straight connected to the secondary pulley, therefore shock loads (during sharp braking, when driving with slipping on uneven surface, and a sharp appearance of grip) are transmitted to the steel belt and the pulley surfaces. In the new CVT, the C2 clutch acts as a damper between the variator and the wheels, plus the function of quickly reducing the belt clamping force on the secondary pulley is provided.

- The pre-tensioning mechanism in the front differential is no longer used (bevel spring between the side gear and the housing).

- The list of factory fault codes, associated with the CVT system, has doubled:

Toyota DTC	Cause
P033531	Crankshaft position sensor A no signal

P050031	Vehicle speed sensor A no signal
P060747	Control module performance bank 1 watchdog/safety MCU Failure
P061347	TCM processor watchdog/safety MCU failure
P061512	Starter relay circuit short to battery
P070312	Brake switch B circuit short to battery
P070513	Transmission range sensor A circuit open
P070562	Transmission range sensor A signal compare failure
P071000	Transmission fluid temperature sensor A circuit range/performance
P071011	Transmission fluid temperature sensor A circuit short to ground
P071015	Transmission fluid temperature sensor A circuit short to battery or open
P071512	Input/turbine speed sensor A circuit short to battery
P071514	Input/turbine speed sensor a circuit short to ground or open
P071531	Input/turbine speed sensor a no signal
P072012	Output speed sensor circuit short to battery
P072014	Output speed sensor circuit short to ground or open
P072031	Output speed sensor no signal
P074512	Pressure control solenoid a circuit short to battery
P074514	Pressure control solenoid a circuit short to ground or open
P07457F	Pressure control solenoid a actuator stuck off
P077512	Pressure control solenoid b circuit short to battery
P077514	Pressure control solenoid b circuit short to ground or open
P07757F	Pressure control solenoid b actuator stuck off
P084000	Transmission fluid pressure sensor/switch a circuitrange/performance
P084011	Transmission fluid pressure sensor/switch a circuit short to ground
P084015	Transmission fluid pressure sensor/switch a circuit short to battery or open
P08C312	Pressure control solenoid m circuit short to battery
P08C314	Pressure control solenoid m circuit short to ground or open
P08C37F	Pressure control solenoid m actuator stuck off
P091400	Gear shift position circuit range/performance
P091412	Gear shift position circuit short to battery
P091414	Gear shift position circuit short to ground or open
P158504	Acceleration sensor circuit system internal failure
P158549	Acceleration sensor circuit internal electronic failure
P158649	Acceleration sensor circuit range / performance internal electronic failure

P158900	Acceleration sensor learning value
P17029F	AT solenoids operation shutdown circuit stuck off
P170300	AT solenoid output malfunction
P175009	Brake ECU malfunction
P274512	Intermediate shaft speed sensor b circuit short to battery
P274514	Intermediate shaft speed sensor b circuit short to ground or open
P274531	Intermediate shaft speed sensor b no signal
P274912	Intermediate shaft speed sensor c circuit short to battery
P274914	Intermediate shaft speed sensor c circuit short to ground or open
P274931	Intermediate shaft speed sensor c no signal
P275600	Torque converter clutch pressure control solenoid control circuit performance/stuck off
P275612	Torque converter clutch pressure control solenoid control circuit short to battery
P275614	Torque converter clutch pressure control solenoid control circuit short to ground or open
P27567E	Torque converter clutch pressure control solenoid control actuator stuck on
P281F00	Pressure control solenoid j performance/stuck off (2 trip detected)
P281F12	Pressure control solenoid j circuit short to battery
P281F14	Pressure control solenoid j circuit short to ground or open
P281F71	Pressure control solenoid j performance/stuck off actuator stuck
P282812	Pressure control solenoid k circuit short to battery
P282814	Pressure control solenoid k circuit short to ground or open
P28287F	Pressure control solenoid k actuator stuck off
U010087	Lost communication with ECM/PCM A missing message
U012587	Lost communication with multi-axis acceleration sensor module missing message
U012987	Lost communication with brake system control module missing message
U110387	Lost communication with stop and start control module missing message

K114F (previous type)

A better assessment of the complexity of the new CVTs is allowed by comparison with the previous CVT of traditional design, which was used for previous RAV4.

K114F

Fluid capacity (full): 7.1 liters

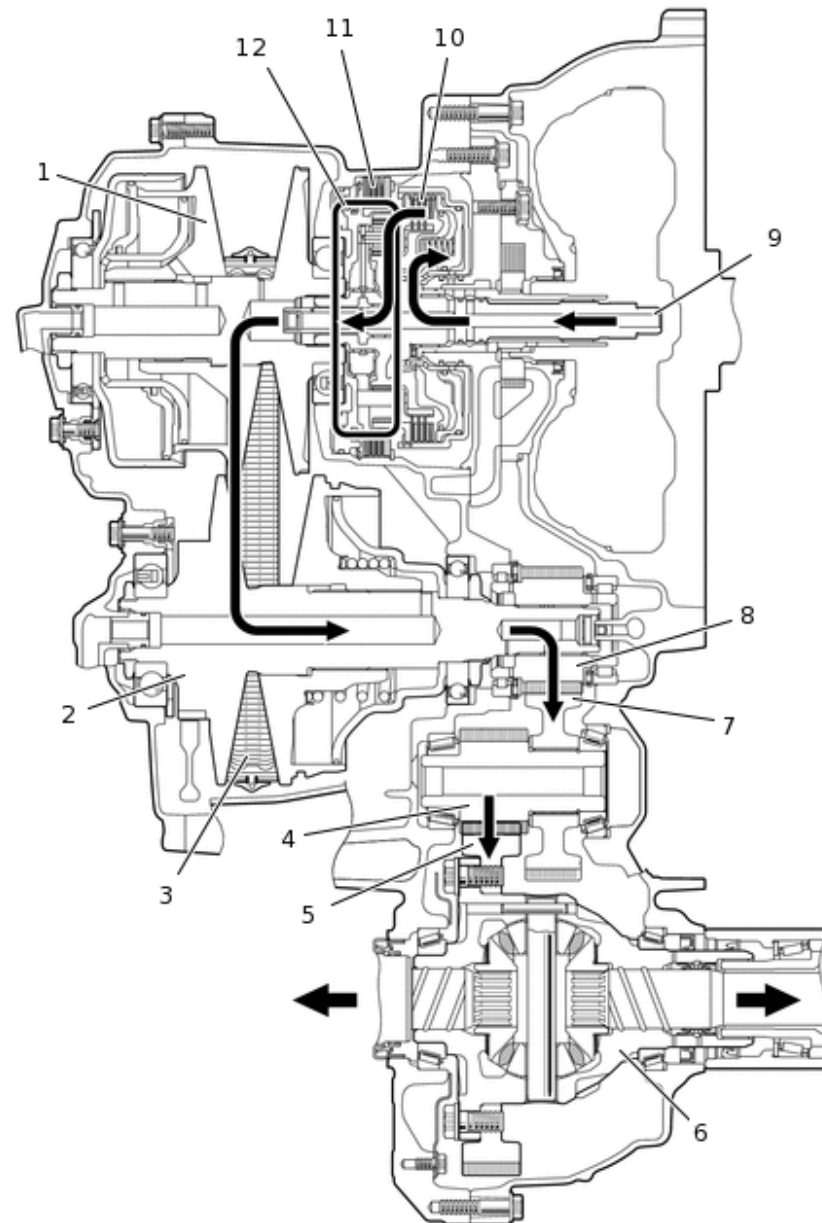
Fluid type: Toyota genuine CVT Fluid FE

Pulley ratio: 2.517~0.3907

Final gear ratio: 5.791

Weight (with fluid): 94-95 kg

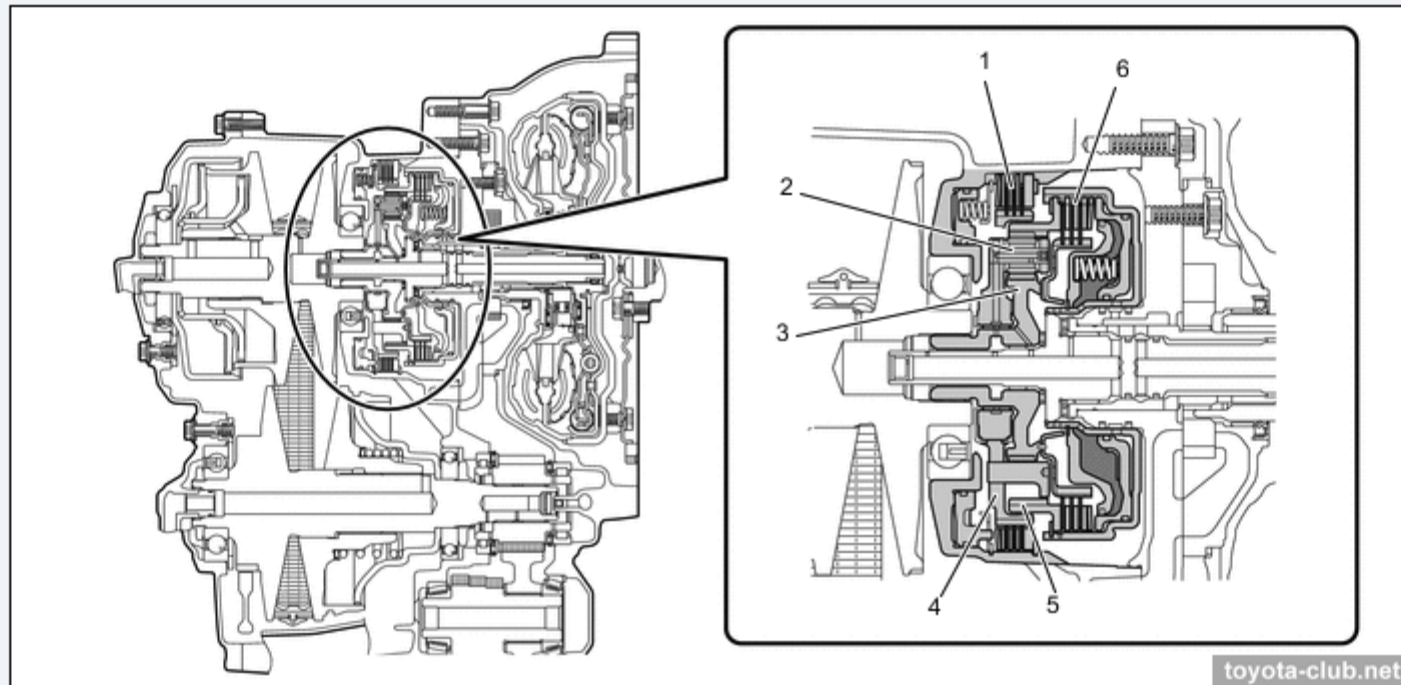
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<https://autolibrary.ir>

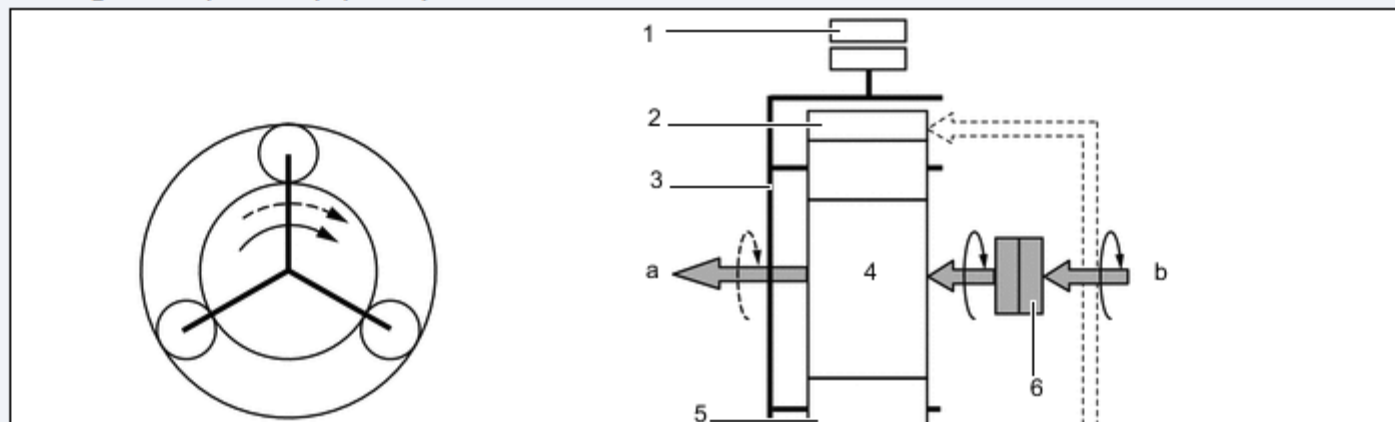
CVT K114F. 1 - primary pulley, 2 - secondary pulley, 3 - planetary carrier, 4 - differential drive pinion, 5 - differential driven gear, 6 - differential, 7 - reduction driven gear, 8 - reduction drive gear, 9 - primary shaft, 10 - forward clutch, 11 - reverse brake, 12 - planetary

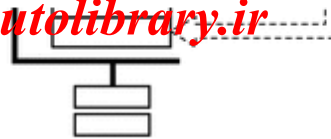
Forward/reverse driving



1 - reverse brake, 2 - pinion, 3 - sun gear, 4 - planetary carrier, 5 - ring gear, 6 - forward clutch.

Forward driving: forward clutch is engaged, torque input to the sun gear and output through the primary pulley.

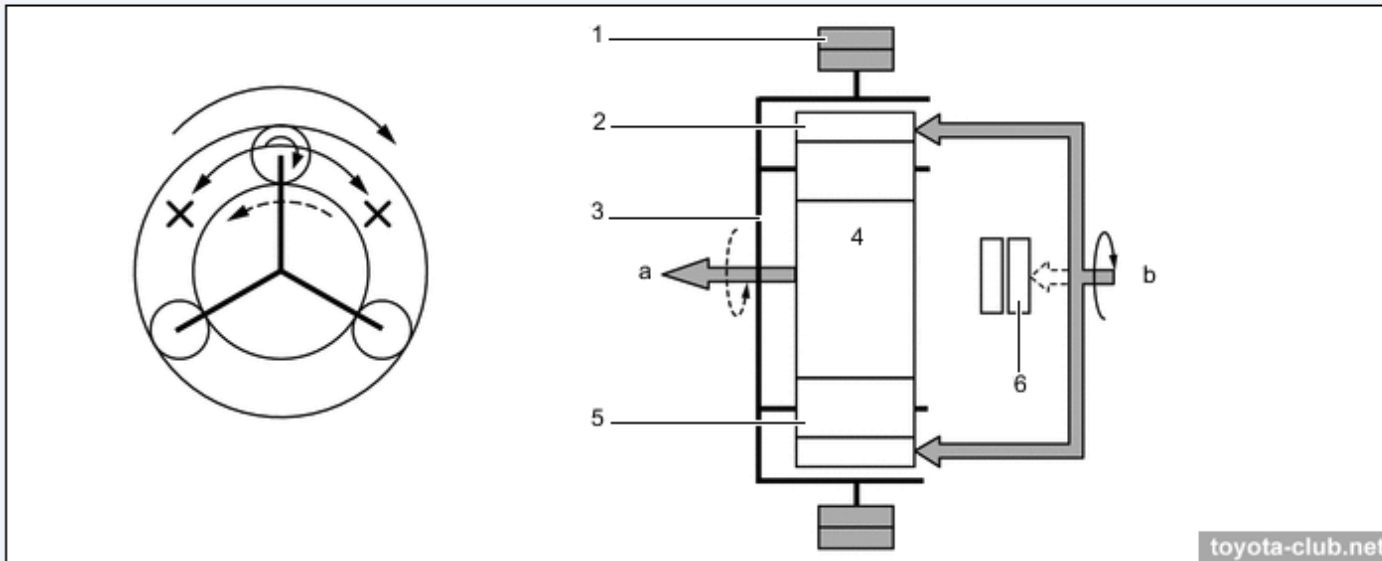




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1 - reverse brake, 2 - ring gear, 3 - planetary carrier, 4 - sun gear, 5 - pinion, 6 - forward clutch. a - output, b - input

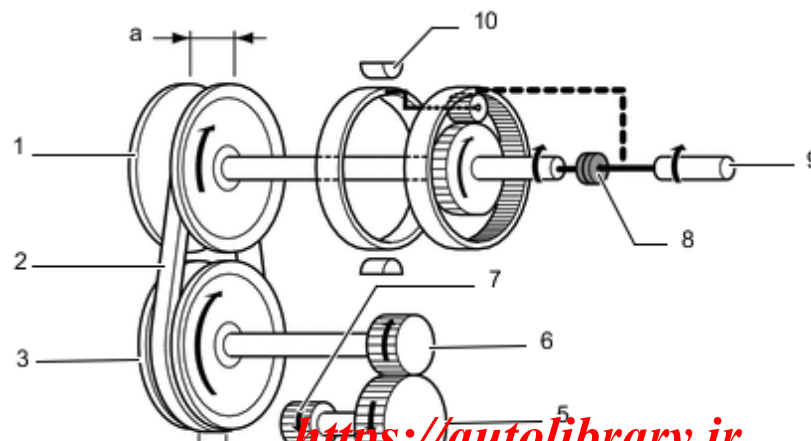
Reverse driving: torque input to the ring gear, then to the sun gear via the pinion (held by the reverse brake), so the gear and primary pulley rotation is reversed.

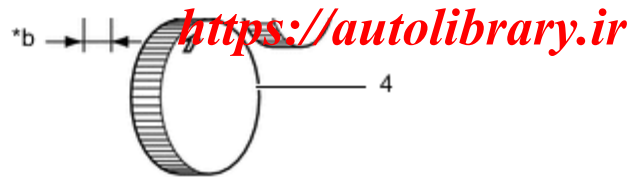


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1 - reverse brake, 2 - ring gear, 3 - planetary carrier, 4 - sun gear, 5 - pinion, 6 - forward clutch. a - output, b - input

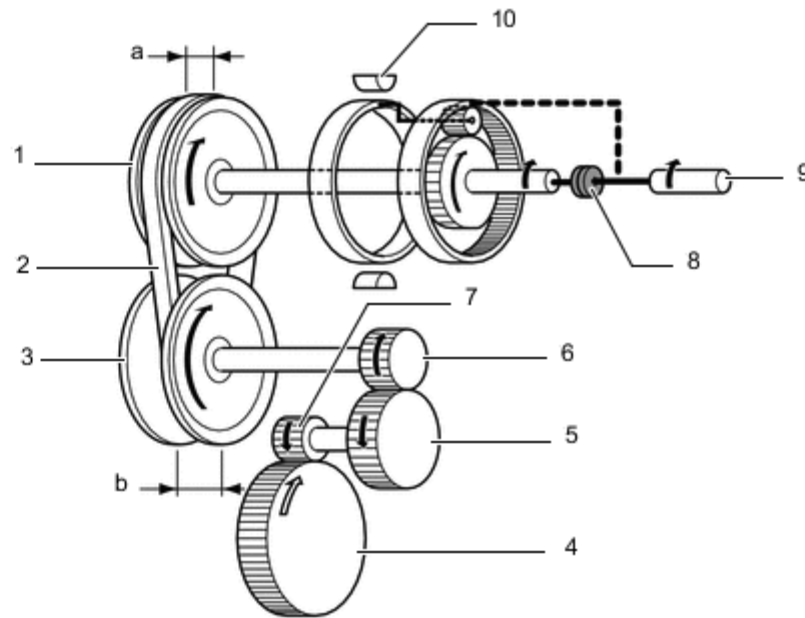
Drive modes





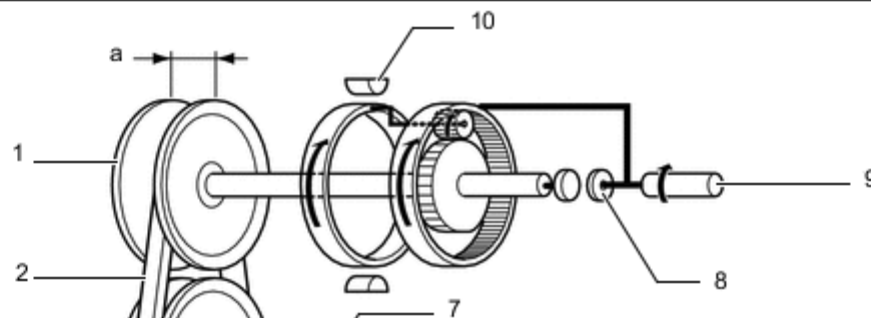
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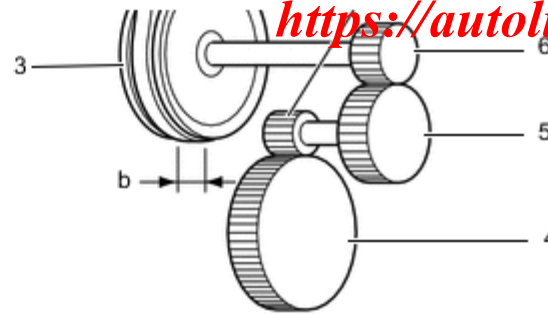
D range (pulley ratio low), forward clutch - on, reverse brake - off. 1 - primary pulley, 2 - steel belt, 3 - secondary pulley, 4 - differential ring gear, 5 - reduction driven gear, 6 - reduction drive gear, 7 - differential drive pinion, 8 - forward clutch, 9 - input shaft, 10 - reverse brake



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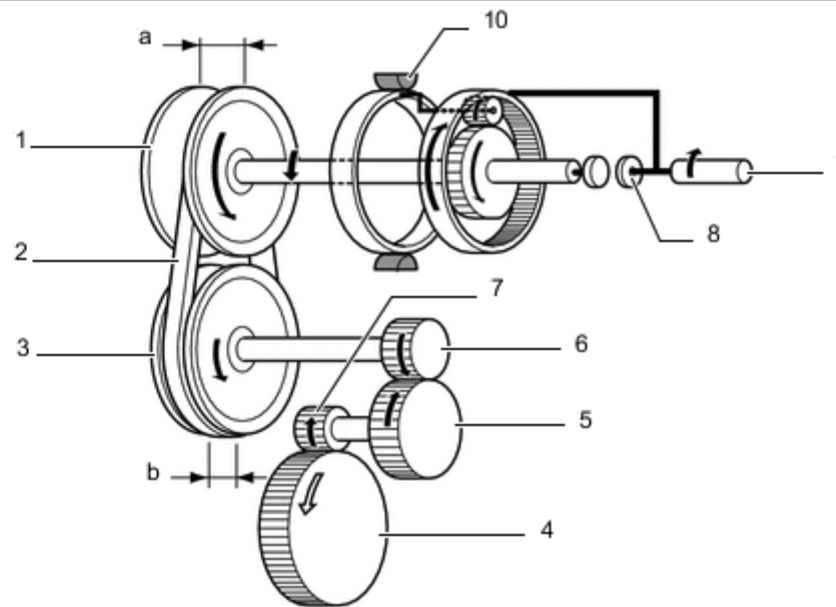
D range (pulley ratio high), forward clutch - on, reverse brake - off. 1 - primary pulley, 2 - steel belt, 3 - secondary pulley, 4 - differential ring gear, 5 - reduction driven gear, 6 - reduction drive gear, 7 - differential drive pinion, 8 - forward clutch, 9 - input shaft, 10 - reverse brake





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N range, forward clutch - off, reverse brake - off. 1 - primary pulley, 2 - steel belt, 3 - secondary pulley, 4 - differential ring gear, 5 - reduction driven gear, 6 - reduction drive gear, 7 - differential drive pinion, 8 - forward clutch, 9 - input shaft, 10 - reverse brake

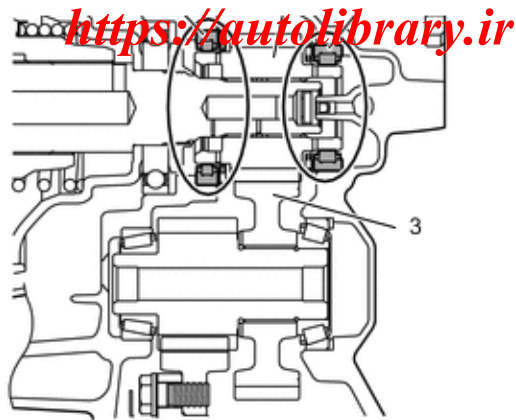


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R range, forward clutch - off, reverse brake - on. 1 - primary pulley, 2 - steel belt, 3 - secondary pulley, 4 - differential ring gear, 5 - reduction driven gear, 6 - reduction drive gear, 7 - differential drive pinion, 8 - forward clutch, 9 - input shaft, 10 - reverse brake

Components

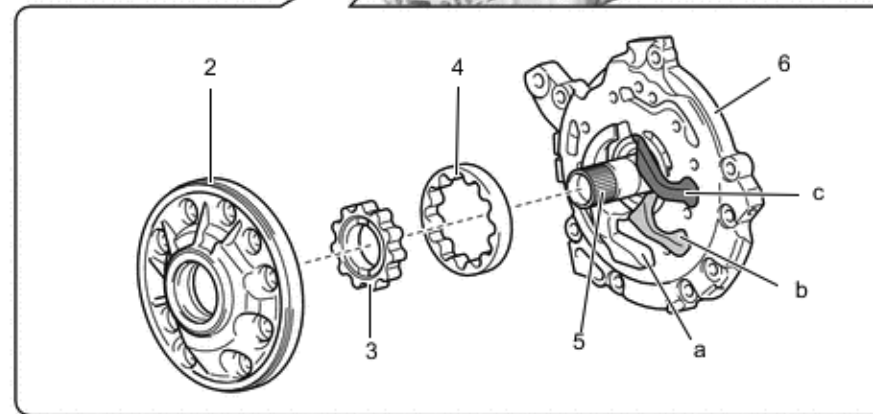
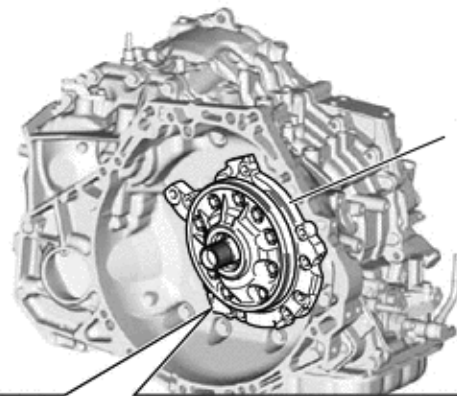
- Reduction drive gear is supported by roller-type bearings.



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1 - reduction drive gear, 2 - bearing, 3 - reduction driven gear

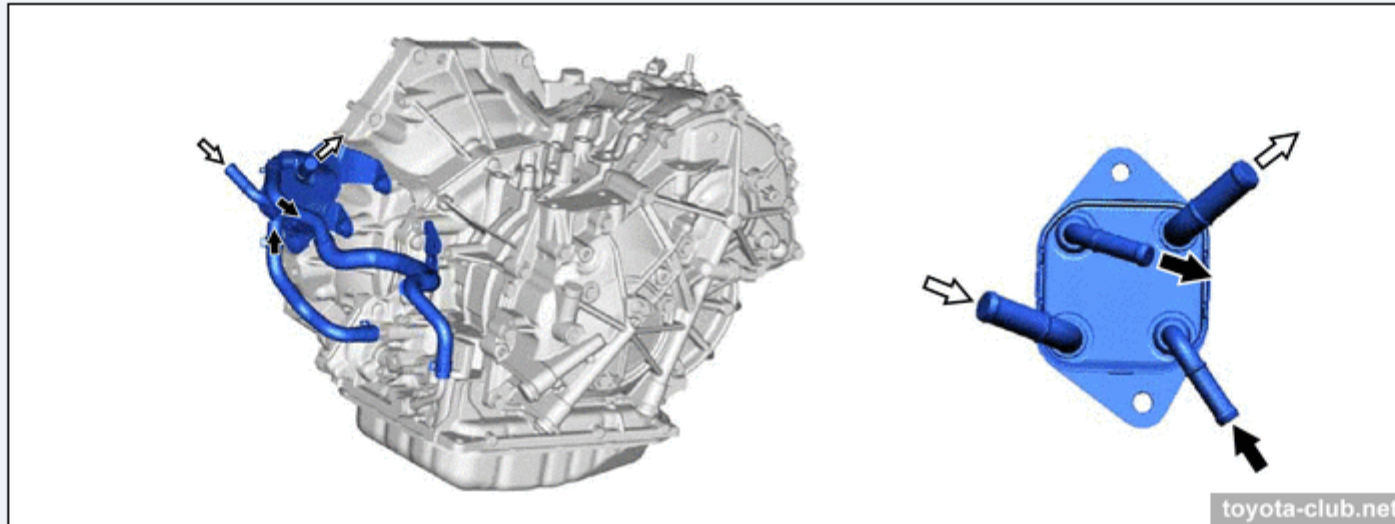
- Oil pump - conventional trochoid type, installed on the input shaft.



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1 - oil pump, 2 - oil pump body, 3 - drive gear, 4 - driven gear, 5 - stator shaft, 6 - oil pump cover (stator shaft). a - inlet port, b - low pressure discharge port, c - high pressure discharge port

- Oil cooler - external, with additional pipes.



Control system

There are 5 shift solenoid valves and 3 speed sensors:

SC: switch SLU for forward and reverse clutch control

SL: switch SLU for lock-up clutch control

SLU: forward and reverse clutch control or lock-up clutch control

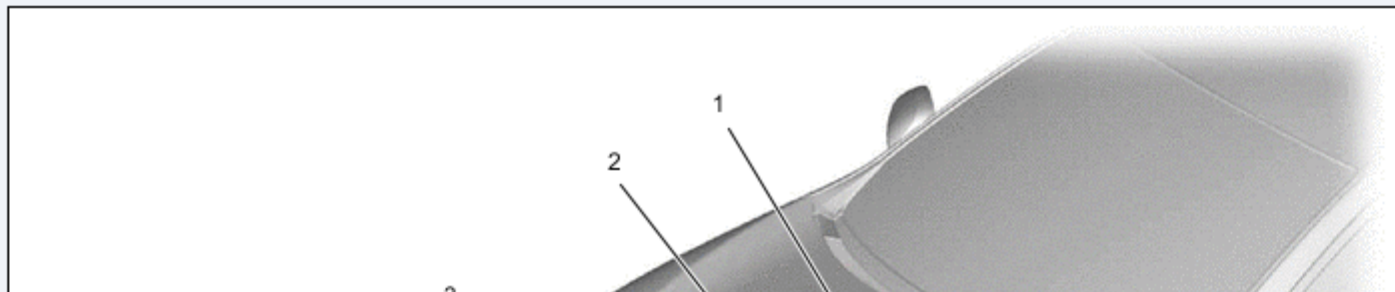
SLP: oil pressure of the primary pulley

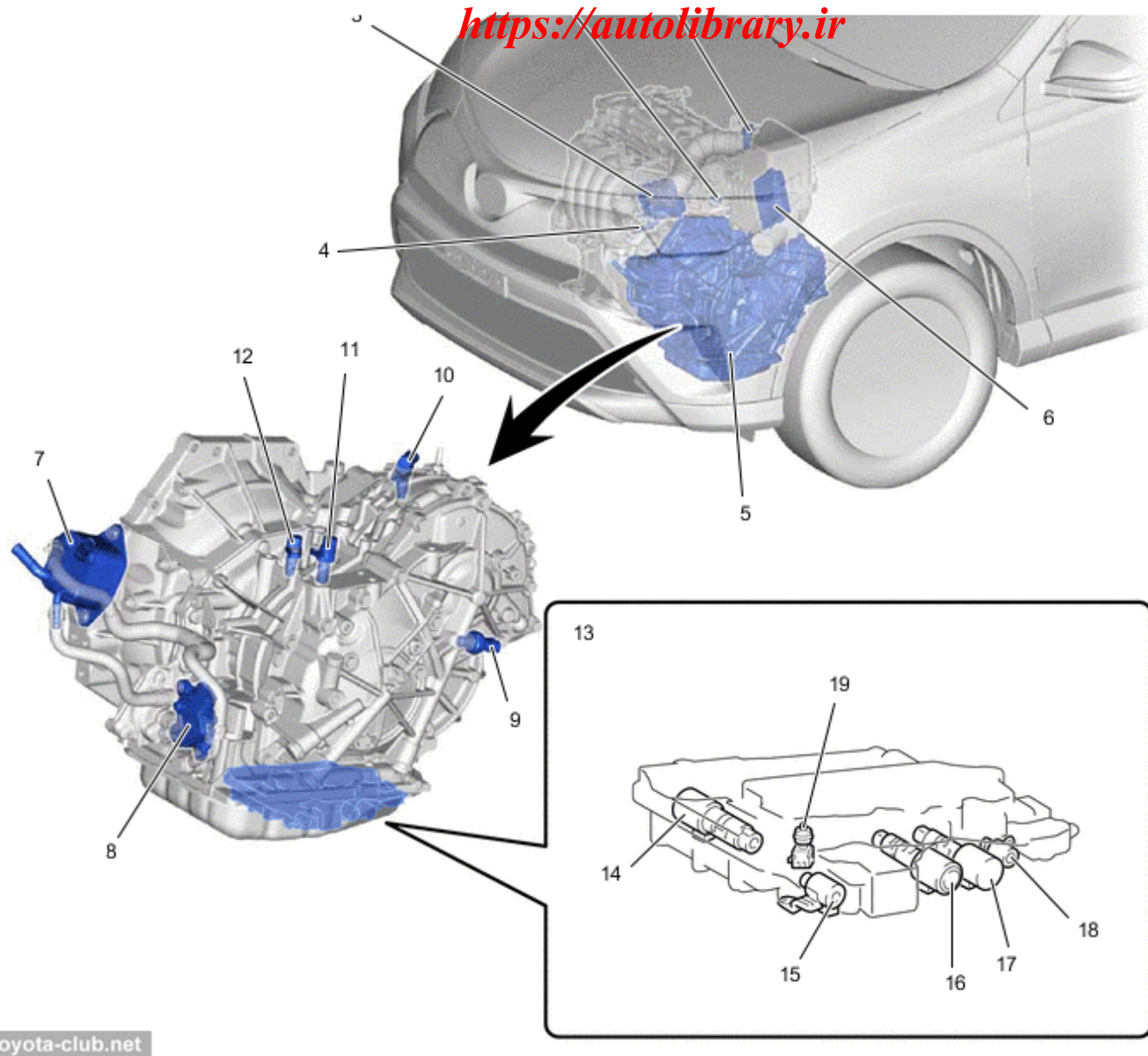
SLS: oil pressure of the secondary pulley

NIN: primary pulley speed (pick-up coil type)

NOUT: secondary pulley speed (Hall type)

NT: forward clutch drum speed (Hall type)





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1 - MAF sensor, 2 - engine coolant temperature sensor, 3 - throttle position sensor, 4 - crankshaft position sensor, 5 - CVT, 6 - ECM, 7 - CVT fluid warmer (transmission oil cooler), 8 - pnp switch, 9 - oil pressure sensor, 10 - NOUT, 11 - NIN, 12 - NT, 13 - valve body, 14 - SLU, 15 - SC, 16 - SLP, 17 - SLS, 18 - SL, 19 - CVT fluid temperature sensor

Note: DNGA D-CVT

Please do not confuse Toyota Direct Shift CVT with D-CVT (Dual-mode) used on Daihatsu own models and rebaged for Toyota ones. At low and medium speeds, the D-CVT operates like a conventional belt-type continuously variable transmission, and the gear train is engaged when driving at high speed (so the motive force is splitted and transmitted through both the belt and gears).

