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- U660E Automatic Transaxle
- Suspension and Axle
- Brake
- Brake Control System
- Tire and Wheel
- Steering

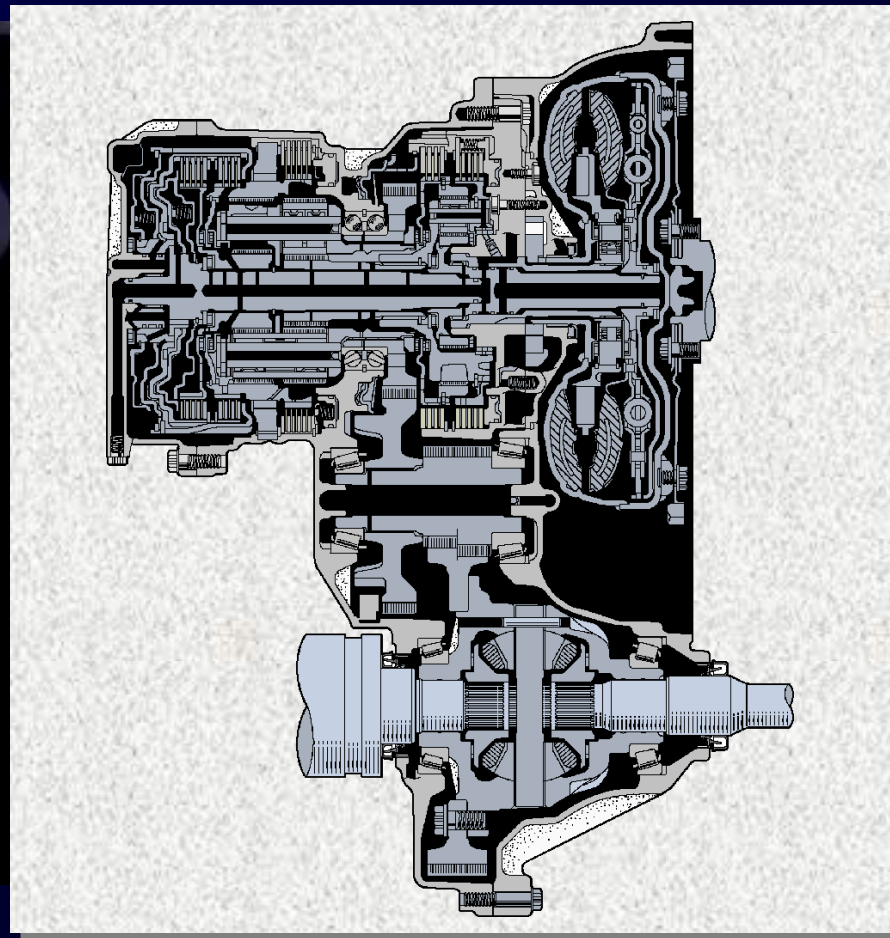


U660E Automatic Transaxle

- General
 - Compact, lightweight and high-capacity 6-speed Super ECT



U660E



U660E Automatic Transaxle

● Specification

Model		New ALPHARD	'07 CAMRY
Engine Type		2GR-FE	2GR-FE
Transaxle Type		U660E	U660E
Gear Ratio	1st	3.300	←
	2nd	1.900	←
	3rd	1.420	←
	4th	1.000	←
	5th	0.713	←
	6th	0.608	←
	Reverse	4.148	←
Differential Gear Ratio* ¹		3.935	3.685
Fluid Capacity* ² [Liter (US qts, Imp. qts)]		6.54 (6.91, 5.76)	6.57 (6.94, 5.78)
Fluid Type		TOYOTA Genuine ATF WS	←

*1: Counter gear ratio included

*2: Differential included

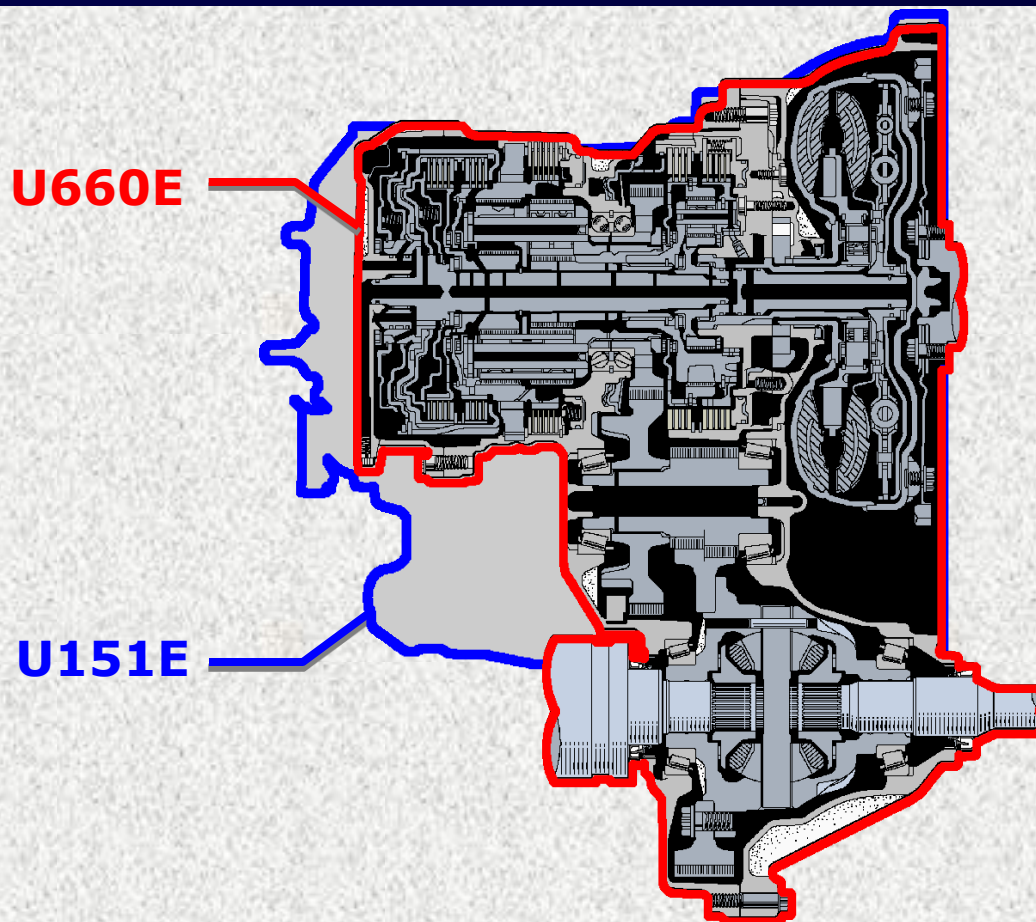
U660E Automatic Transaxle

● Features

Gear Portion	• 2 planetary gear units are used • Number of planetary gear unit, clutch and one-way clutch is reduced from U151E
Hydraulic Portion	• The pump impeller and turbine runner portions have been made narrower • Split piston for Clutch C2 that acts in the pull direction • Compact and high-flow rate linear solenoid valve (SL1, SL2, SL3 and SL4) controls the engagement elements by directly • 3 ATF pressure switches are located in the output fluid passages of SL1, SL2 and SLU • A felt type oil strainer is used • Overflow plug for ATF adjustment
Control	• TCM is mounted on the transaxle • Hall IC type speed sensor (NT & NC) is used • Clutch to clutch pressure control is operated at 2 ↔ 3 ↔ 4 ↔ 5 ↔ 6 shift change • Powertrain cooperative control ensures excellent start-off performance, and realizes the deceleration which responded to the drive's intension • Lock-up clutch control & flex lock-up clutch control operation range is increased
Other	• The curvature of the differential case opening is enlarged to moderate the stress concentration

U660E Automatic Transaxle

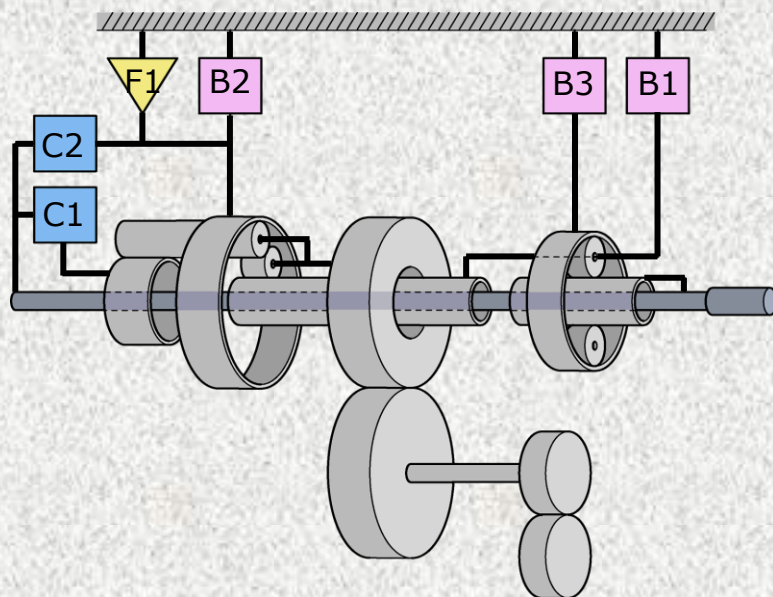
- General
 - Compact 6-speed transaxle



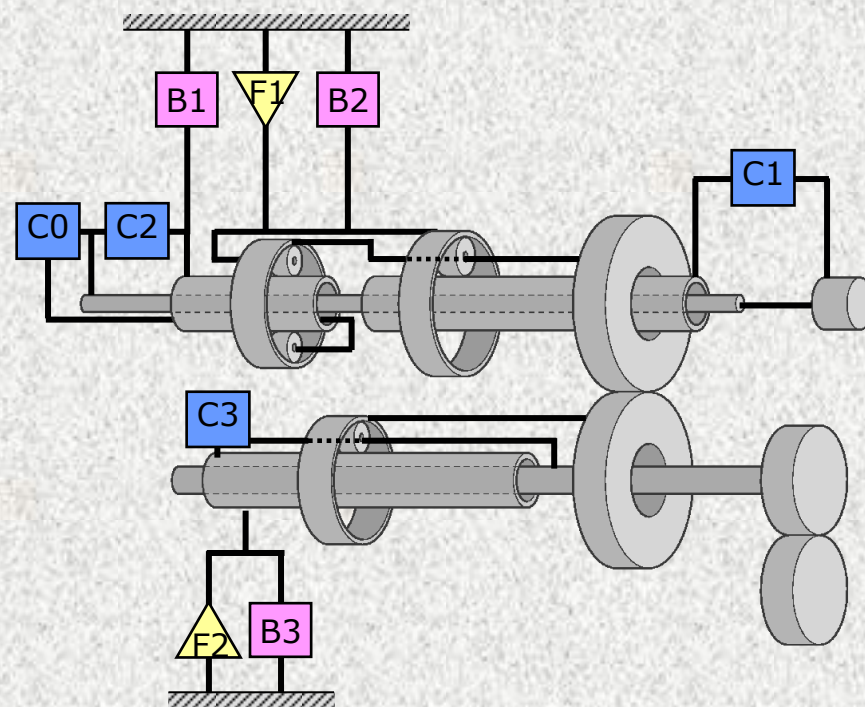
U660E Automatic Transaxle

- Planetary Gear Unit
 - Number of planetary gear unit, clutch and one-way clutch is reduced from U151E

U660E



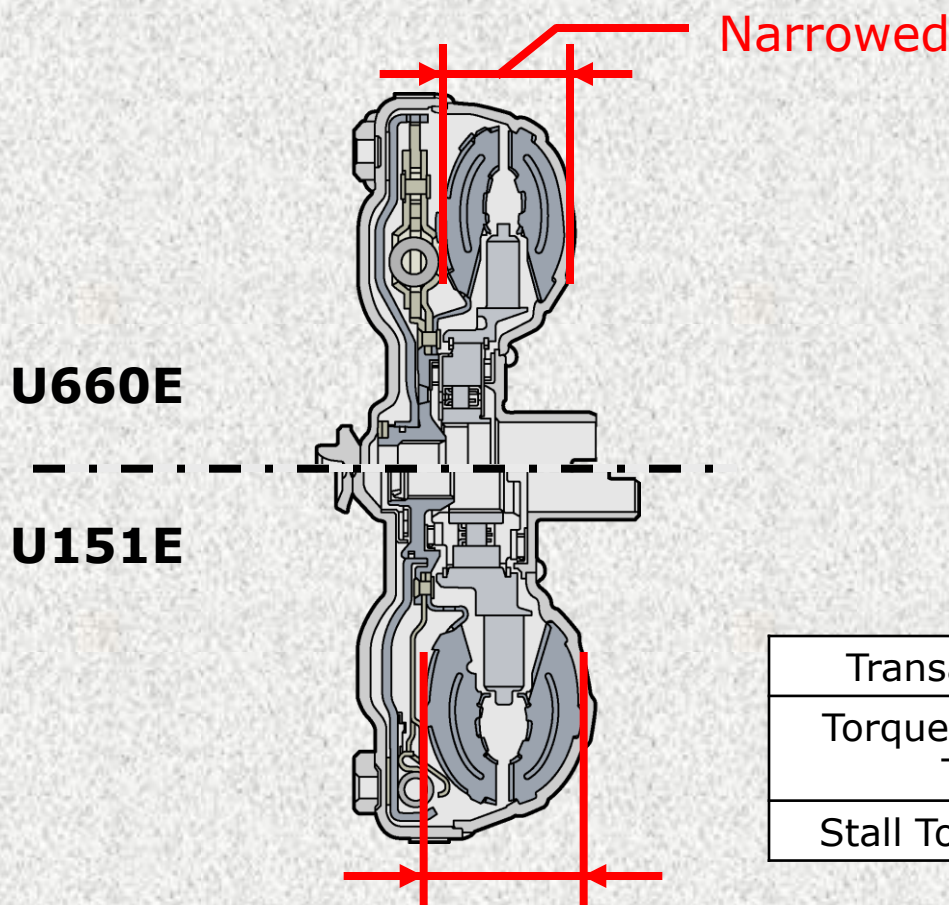
U151E



-  : Clutch
-  : Brake
-  : One-way Clutch

U660E Automatic Transaxle

- Torque Converter
 - The pump impeller and turbine runner portions have been made narrower

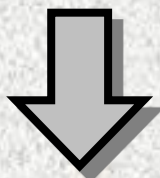


Transaxle Type	U660E
Torque Converter Type	3-Element, 1-Step, 2-Phase
Stall Torque Ratio	1.78

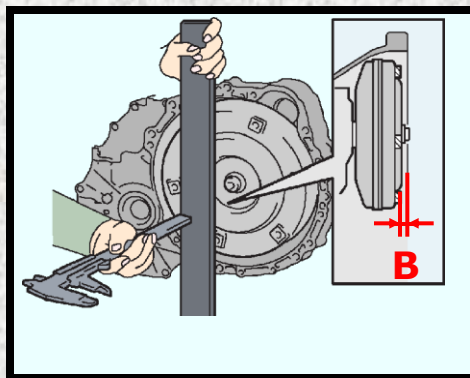
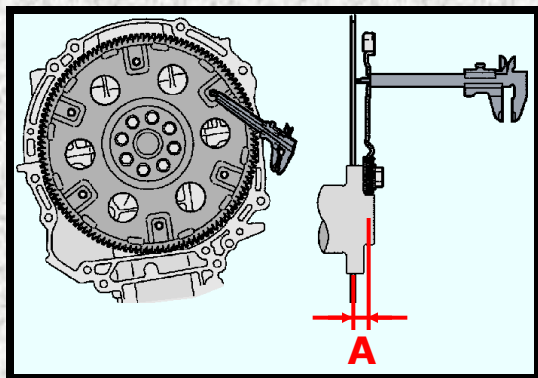
Service Point (U660E Automatic Transaxle)

- Torque Converter
 - Please make sure to check the installation condition of torque converter after you install

**After the torque
converter installation**



**Make sure to check the
installation condition**

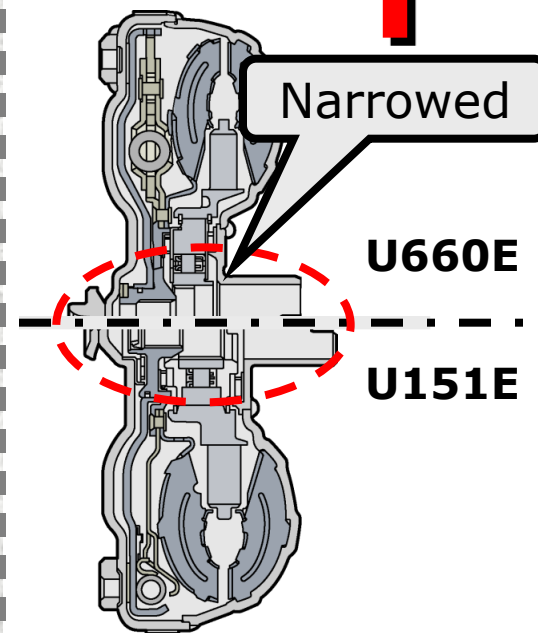


Standard: **B** = **A** + 1 mm [0.03937 in.] or more

**Difficult
to install**

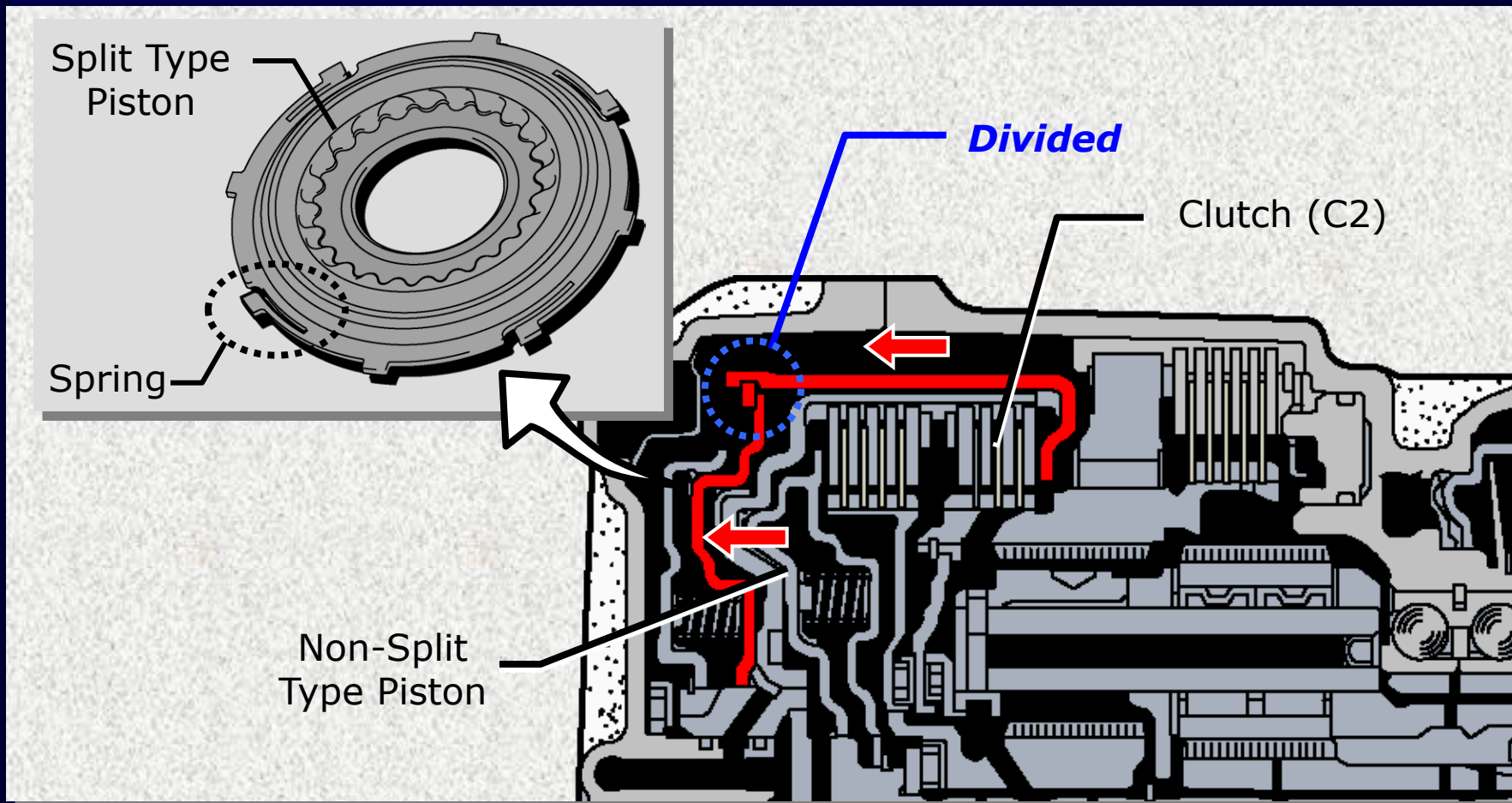


Narrowed



U660E Automatic Transaxle

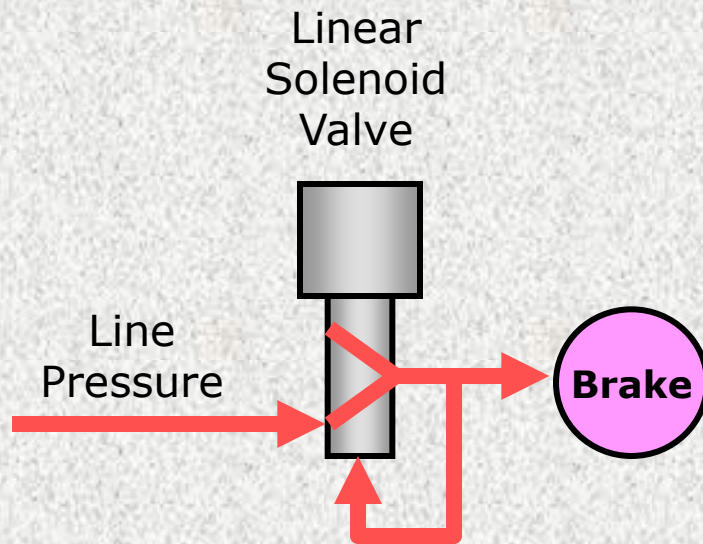
- Clutch Piston for C2
 - Split piston that acts in the pull direction



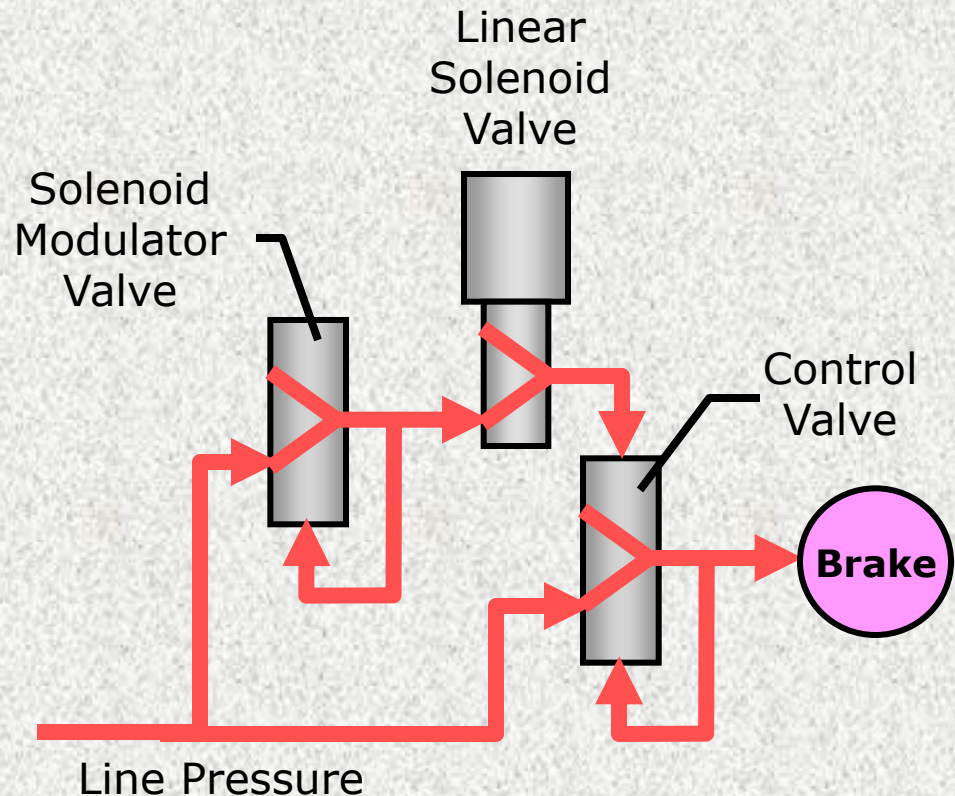
U660E Automatic Transaxle

- Linear Solenoid Valve (SL1, SL2, SL3 and SL4)
 - Compact and high-flow rate linear solenoid valve controls the engagement elements by directly

U660E

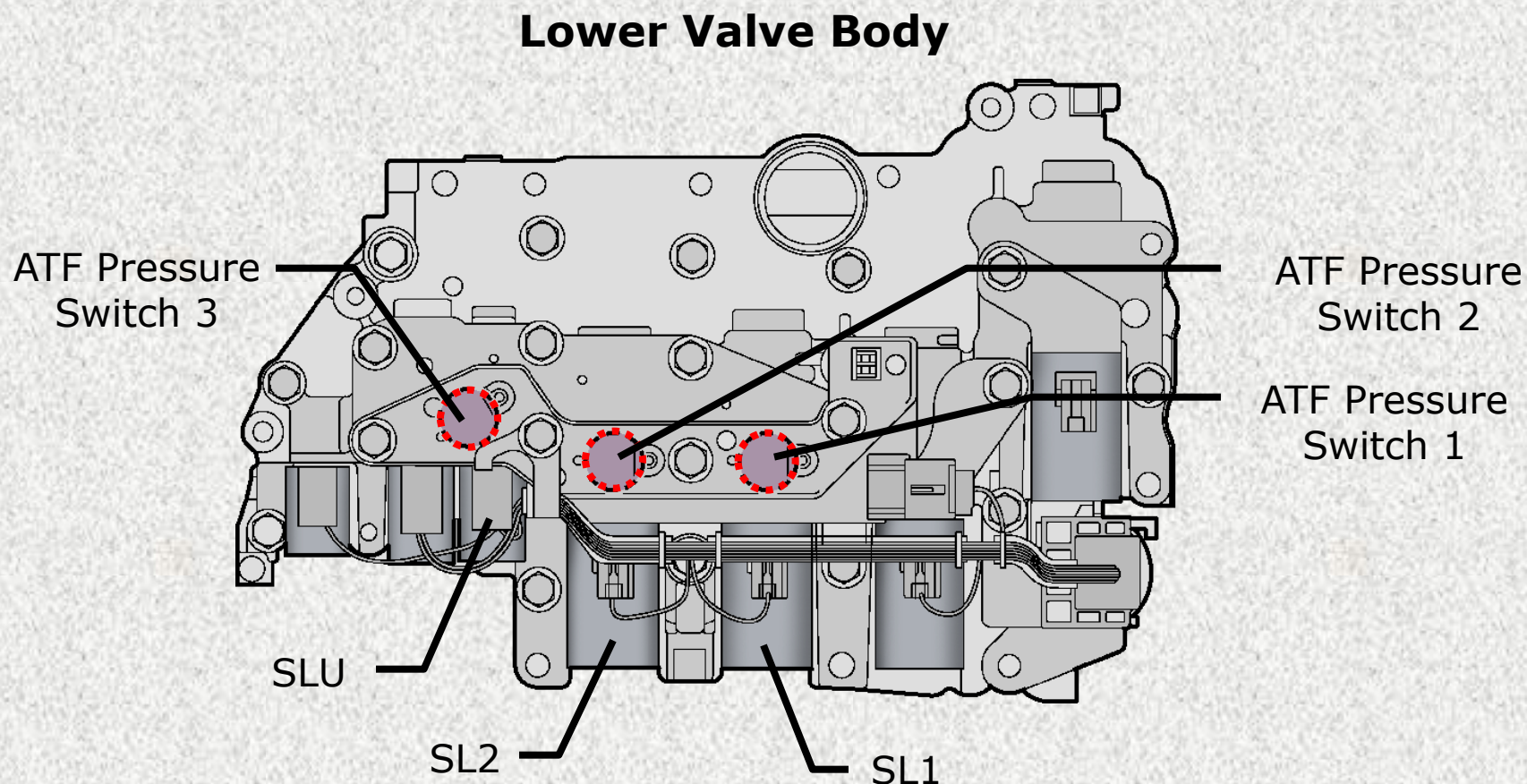


U151E



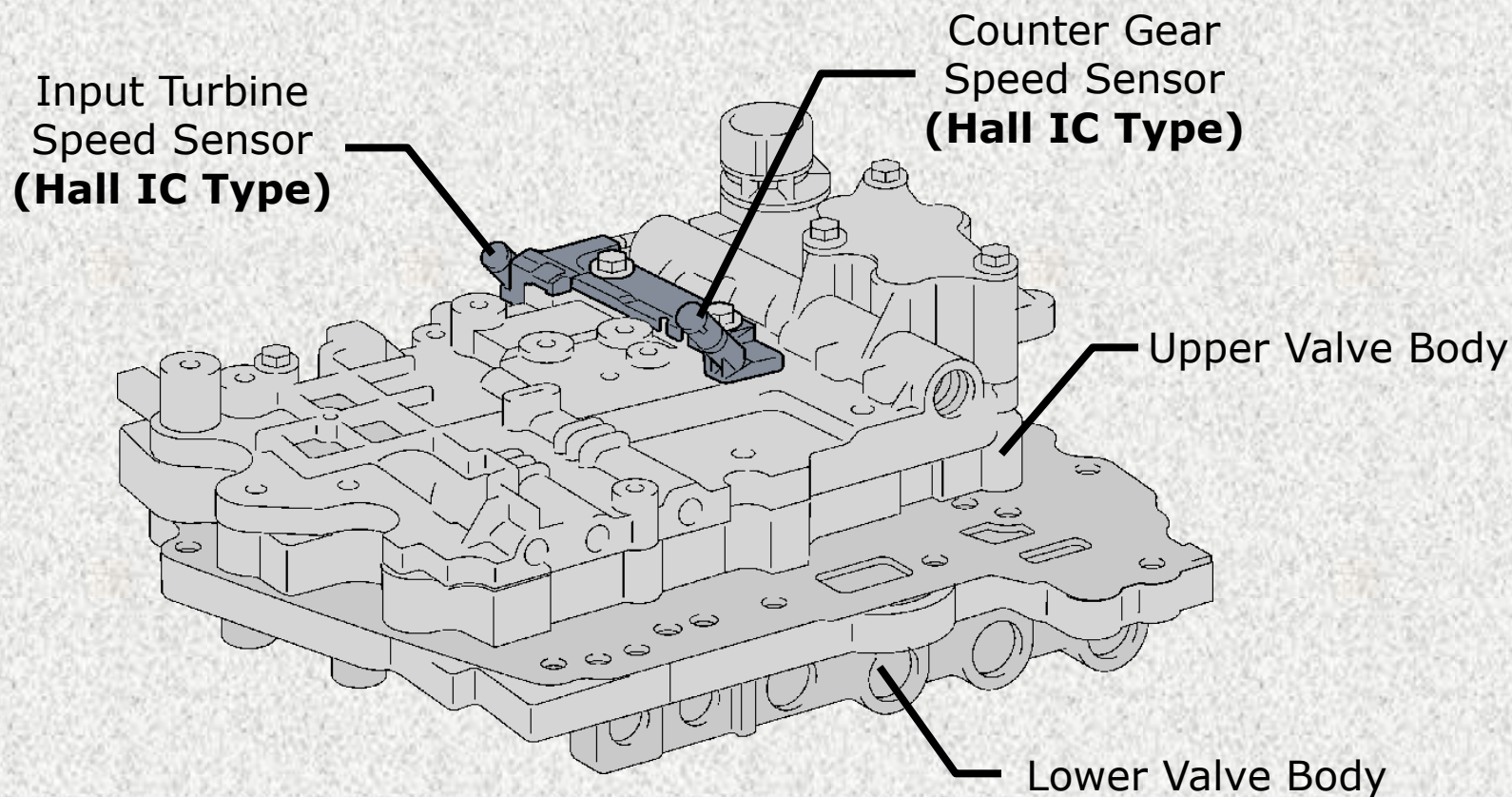
U660E Automatic Transaxle

- **ATF Pressure Switch**
 - 3 ATF pressure switches are located in the output fluid passages of SL1, SL2 and SLU



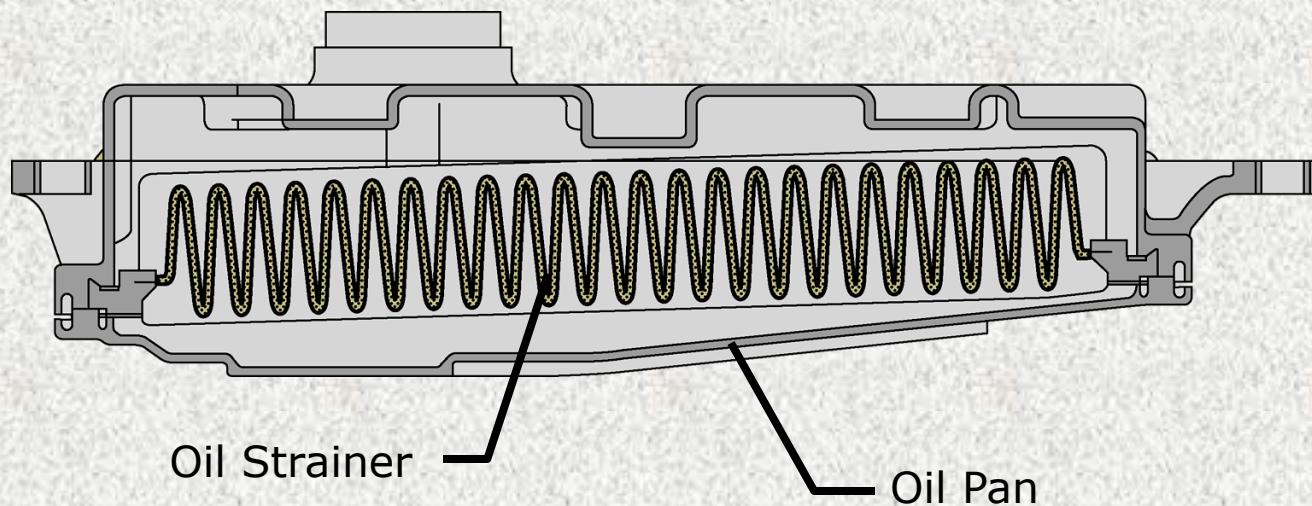
U660E Automatic Transaxle

- Speed Sensor (NT & NC)
 - Hall IC type speed sensor is used



U660E Automatic Transaxle

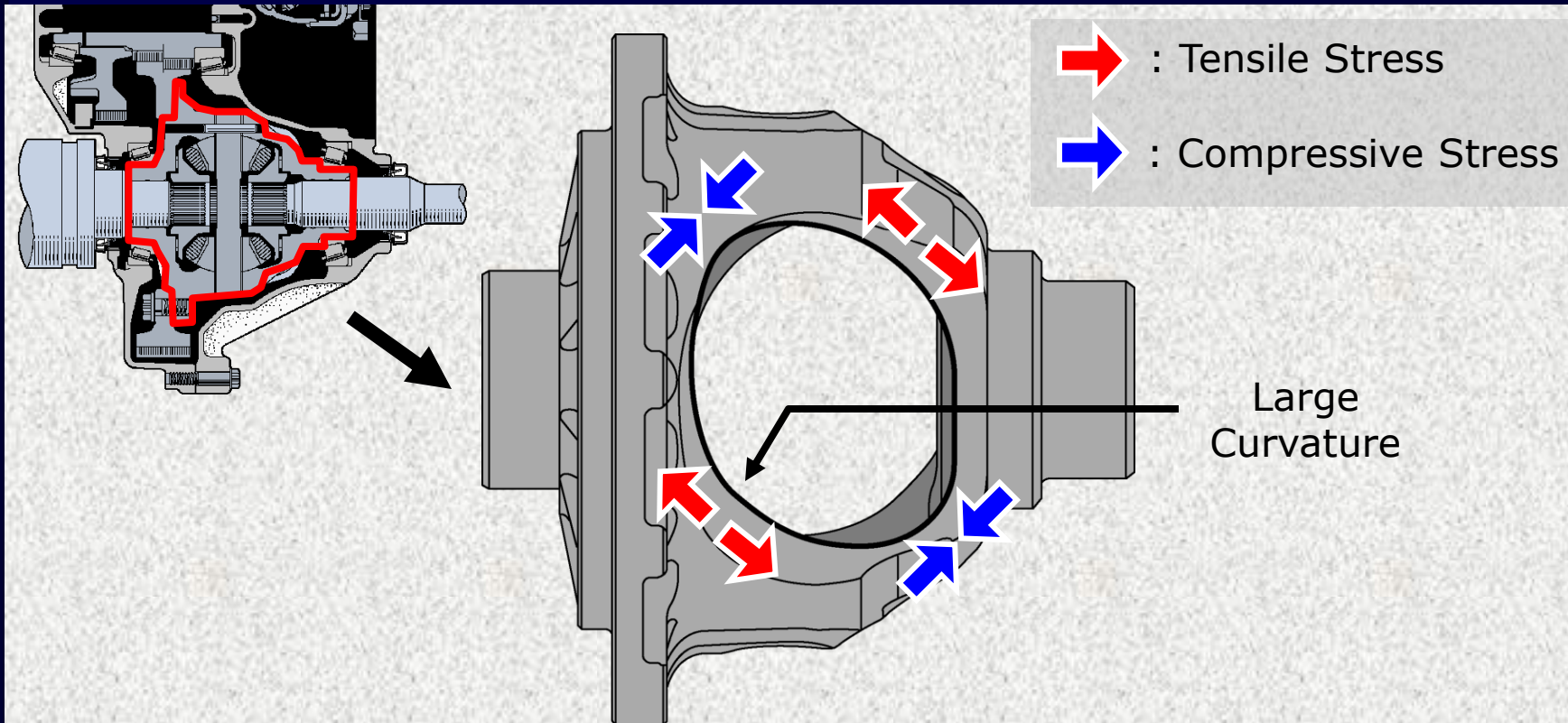
- Oil Strainer
 - A felt made pleated oil strainer is used



U660E Automatic Transaxle

● Differential Case

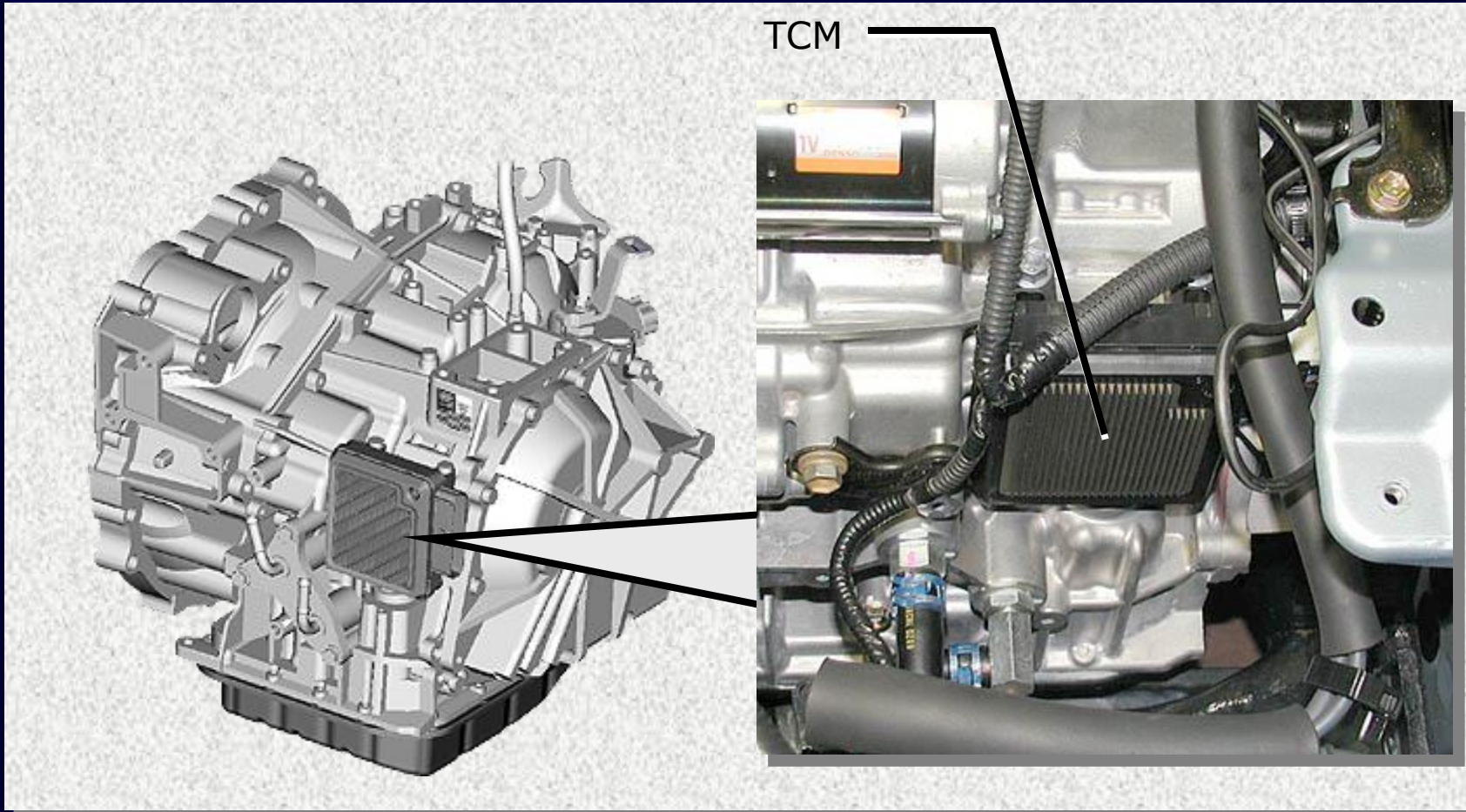
- The curvature of the differential case opening is enlarged to moderate the stress concentration



Stresses applied to differential case opening during driving

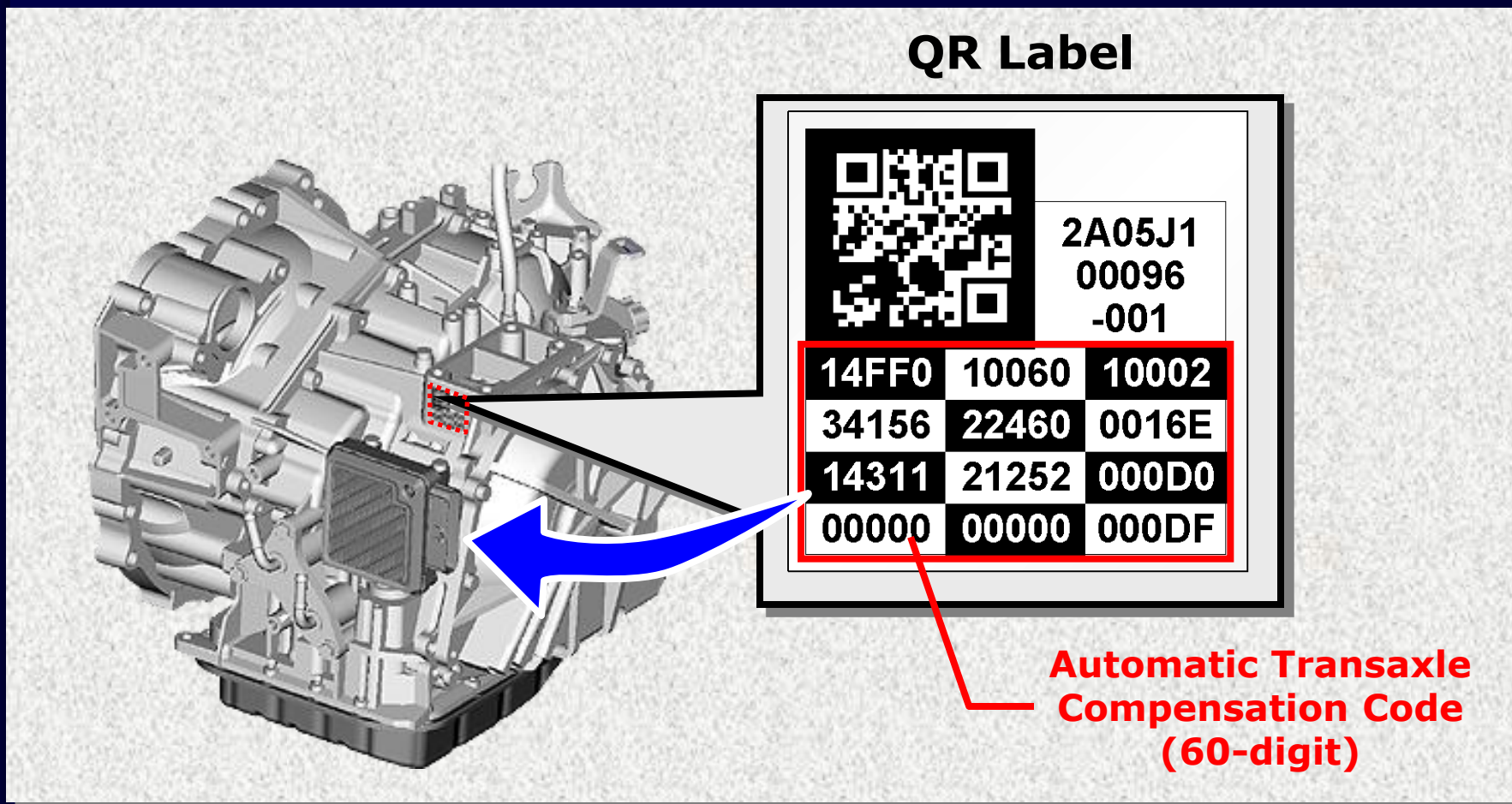
U660E Automatic Transaxle

- TCM (Transaxle Control Module)
 - TCM is mounted on the transaxle



U660E Automatic Transaxle

- Automatic Transaxle Compensation Code
 - Automatic transaxle compensation code (60-digit) on the QR label



Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - After the following parts replacement, perform the A/T CODE SET or the ROAD TEST to improve shift shock

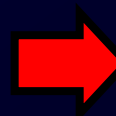
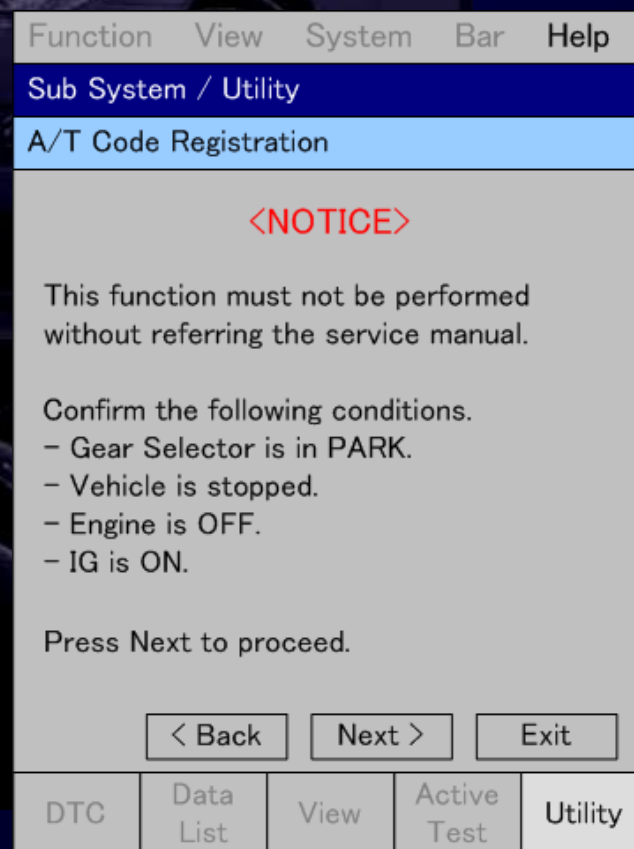
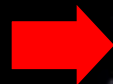
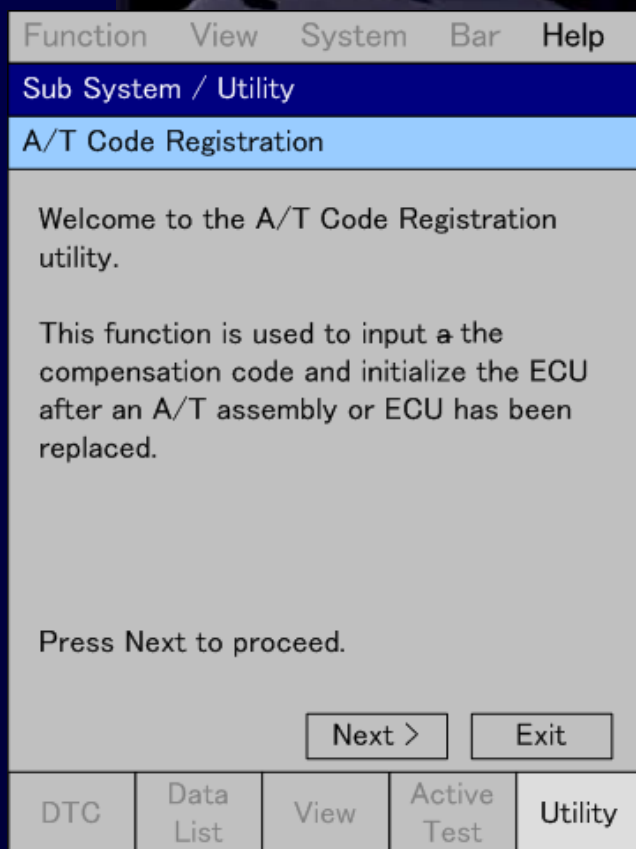
Replacement Parts	Before the replacement	After the replacement		
	READ A/T CODE	SET A/T CODE	RESET MEMORY	ROAD TEST
TCM	○	○*1	(○*2)	○
Automatic Transaxle	-	○	(○*2)	○
Valve Body Assembly	-	-	○	○
Shift Solenoid Valve (SL1 and SL2)	-	-	-	○
Shift Solenoid Valve (SL3 and SL4)	-	-	○	○

*1: When the transaxle compensation code cannot be read from previous TCM, input the 60-digit compensation code from the QR label on the current automatic transaxle

*2: When SET A/T CODE is performed, the compensation code value learned by driving is also cleared

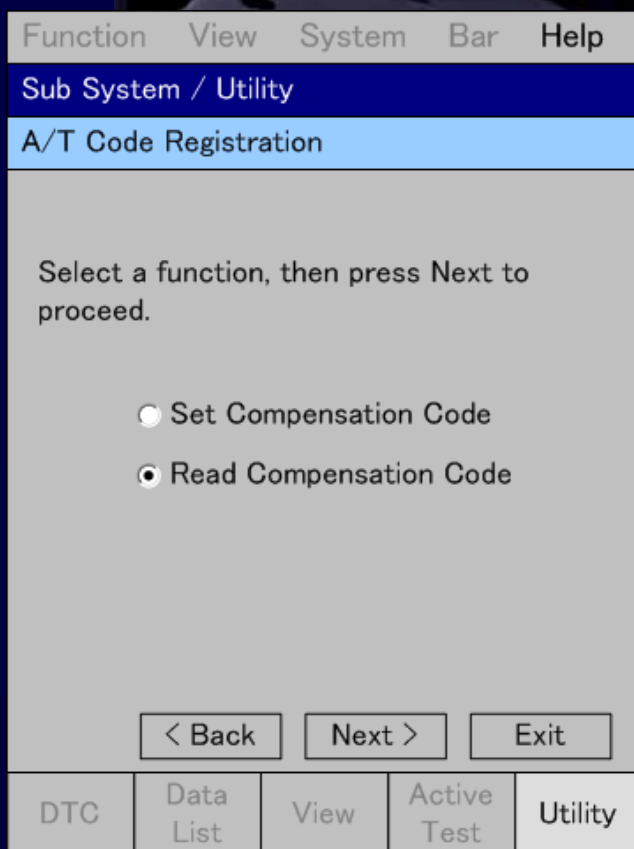
Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - A/T Code Registration (Read Compensation Code)



Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - A/T Code Registration (Read Compensation Code)



Function View System Bar Help

Sub System / Utility

A/T Code Registration

Select a function, then press Next to proceed.

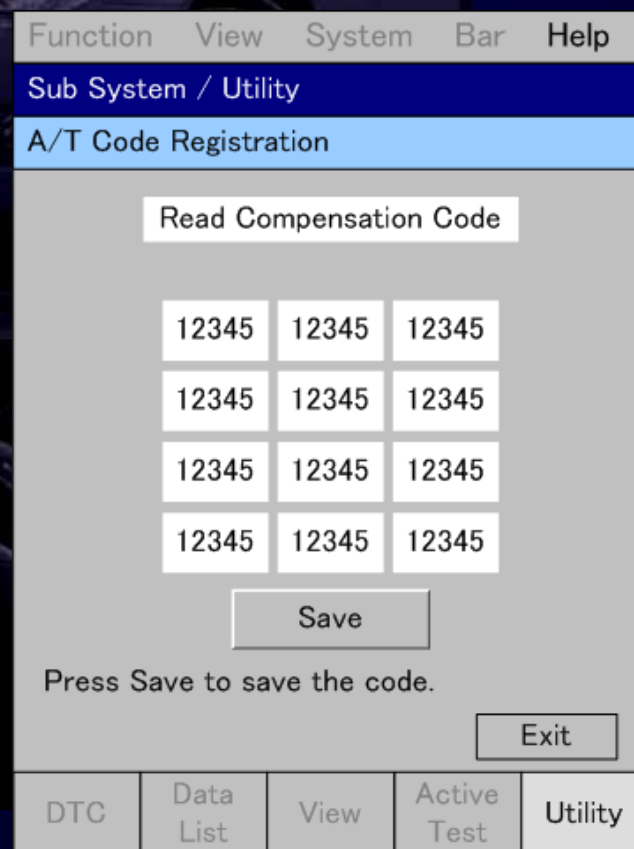
☐ Set Compensation Code

☒ Read Compensation Code

< Back Next > Exit

DTC Data List View Active Test Utility

A red arrow points from the left towards this screen.



Function View System Bar Help

Sub System / Utility

A/T Code Registration

Read Compensation Code

12345	12345	12345
12345	12345	12345
12345	12345	12345
12345	12345	12345

Save

Press Save to save the code.

Exit

DTC Data List View Active Test Utility

A red arrow points from the left towards this screen, and another red arrow points from the right towards this screen.

Service Point (U660E Automatic Transaxle)

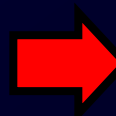
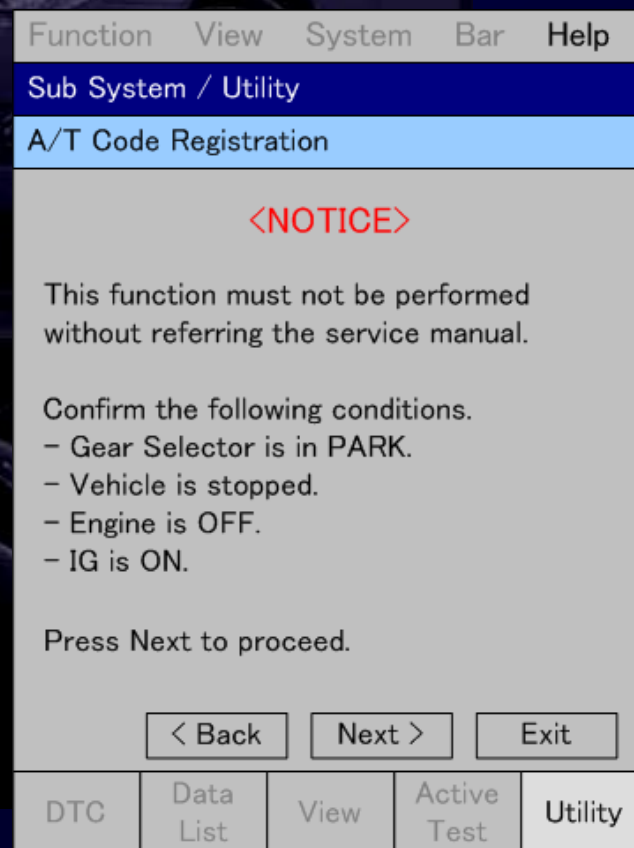
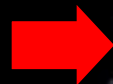
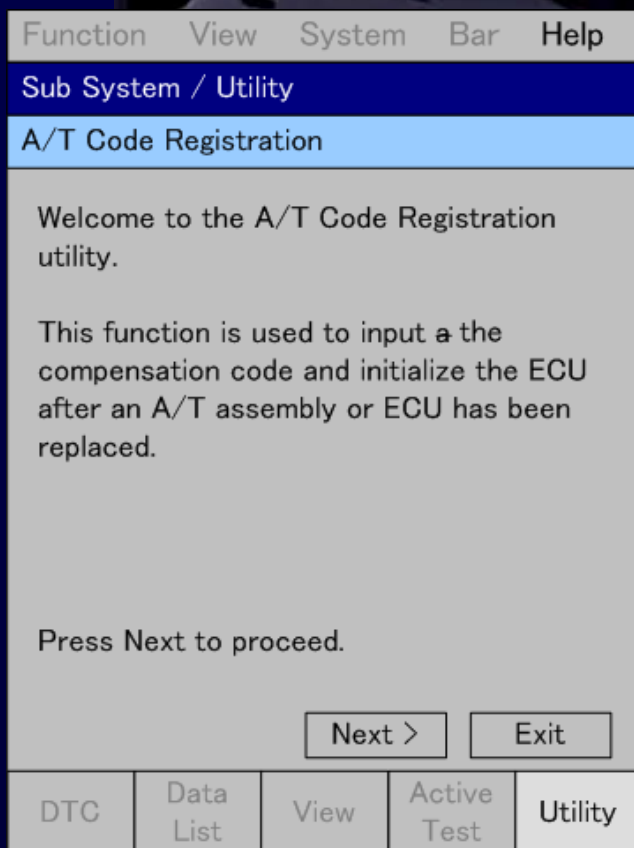
- Automatic Transaxle Compensation Code
 - A/T Code Registration (Read Compensation Code)

The screenshot displays the 'A/T Code Registration' utility window. The window has a menu bar with 'Function', 'View', 'System', 'Bar', and 'Help'. Below the menu bar is a 'Sub System / Utility' section with 'A/T Code Registration' selected. The main area is titled 'Read Compensation Code' and contains a 4x3 grid of input fields, each displaying '12345'. Below the grid, a message states 'Saving the above code has completed.' and an 'Exit' button is present. At the bottom, there are buttons for 'DTC', 'Data List', 'View', 'Active Test', and 'Utility'.

A separate 'Save' dialog box is shown on the left, with a red arrow pointing from it to the main window. The dialog box has a title bar 'Save' and a 'Date' field showing '4:19 PM, 04/15/05'. It contains a 4x3 grid of input fields, each displaying '12345'. Below the grid, a message asks 'Do you want to save this code?' with 'Save' and 'Cancel' buttons.

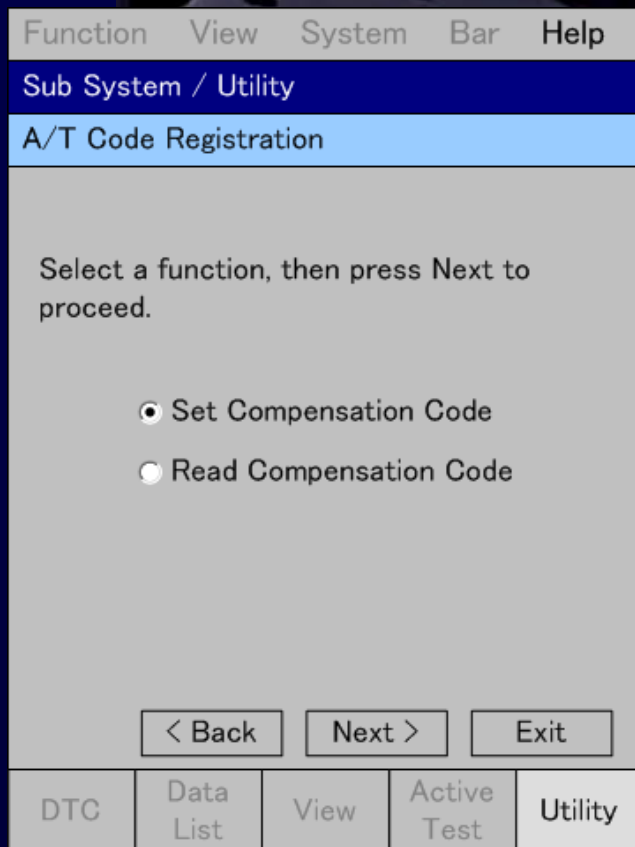
Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - A/T Code Registration (Set Compensation Code)



Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - A/T Code Registration (Set Compensation Code)



Function View System Bar Help

Sub System / Utility

A/T Code Registration

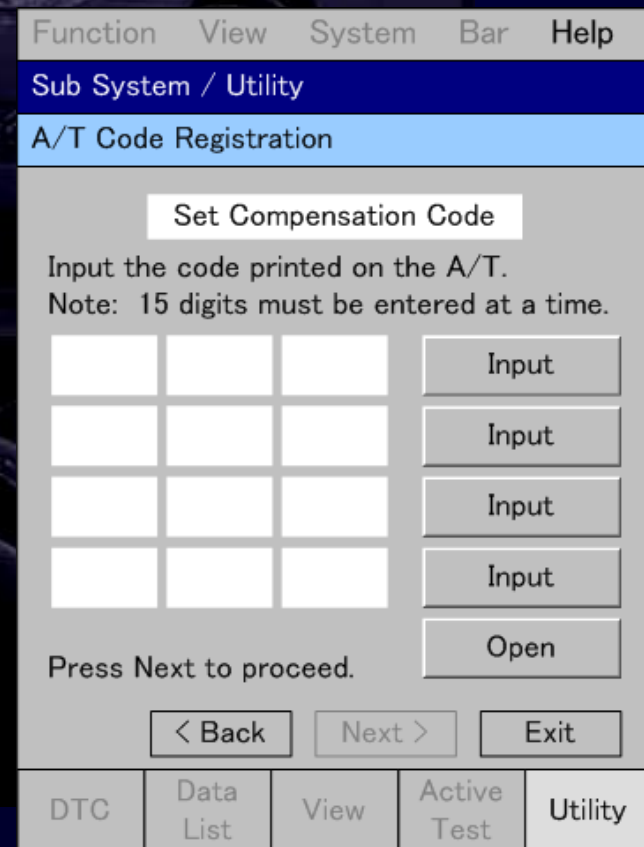
Select a function, then press Next to proceed.

☒ Set Compensation Code

☐ Read Compensation Code

< Back Next > Exit

DTC Data List View Active Test Utility



Function View System Bar Help

Sub System / Utility

A/T Code Registration

Set Compensation Code

Input the code printed on the A/T.
Note: 15 digits must be entered at a time.

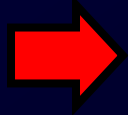
			Input
			Input
			Input
			Input
			Open

Press Next to proceed.

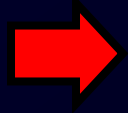
< Back Next > Exit

DTC Data List View Active Test Utility

Input



Open

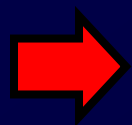


Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - A/T Code Registration (Set Compensation Code)

(15 digits x 4 times)

Input



Input Value

123451234512345

OK Cancel BS Clear

1	2	3	4	5	+/-
6	7	8	9	0	.
A	B	C	D	E	F



Function View System Bar Help

Sub System / Utility

A/T Code Registration

Set Compensation Code

Input the code printed on the A/T.
Note: 15 digits must be entered at a time.

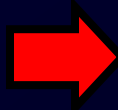
12345	12345	12345	Input
12345	12345	12345	Input
12345	12345	12345	Input
12345	12345	12345	Input
			Open

Press Next to proceed.

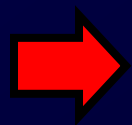
< Back Next > Exit

DTC Data List View Active Test Utility

Next



Open



Open

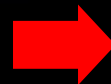
Saved Date

4:19 PM, 04/15/05

12345	12345	12345
12345	12345	12345
12345	12345	12345
12345	12345	12345

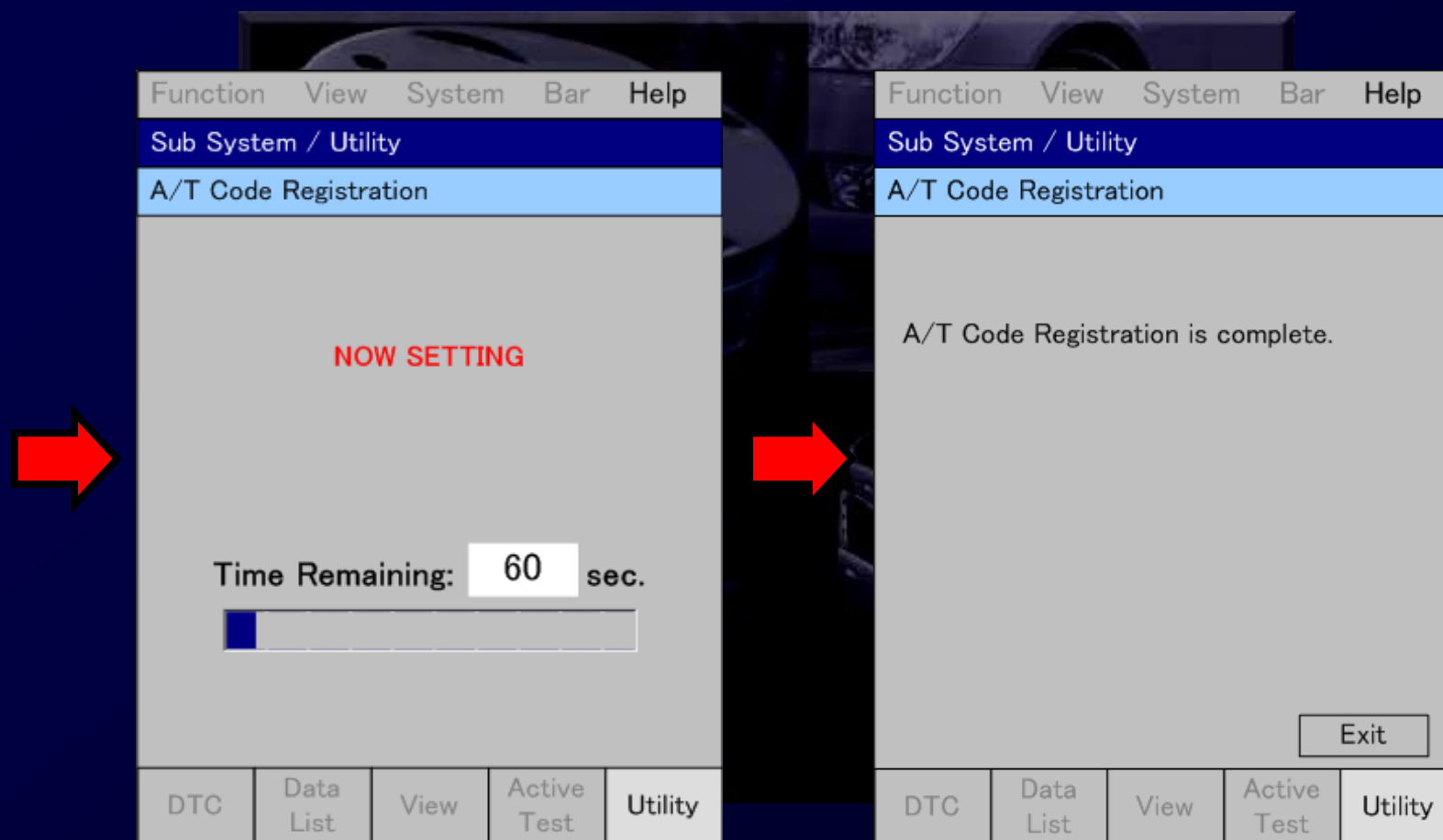
Do you want to open this code?

Open Cancel



Service Point (U660E Automatic Transaxle)

- Automatic Transaxle Compensation Code
 - A/T Code Registration (Set Compensation Code)



U660E Automatic Transaxle

● Control

Control

Clutch to Clutch Pressure Control

Line Pressure Optimal Control

Powertrain Cooperative Control

Shift Timing Control

Lock-up Timing Control

Flex Lock-up Clutch Control

Coast Downshift Control

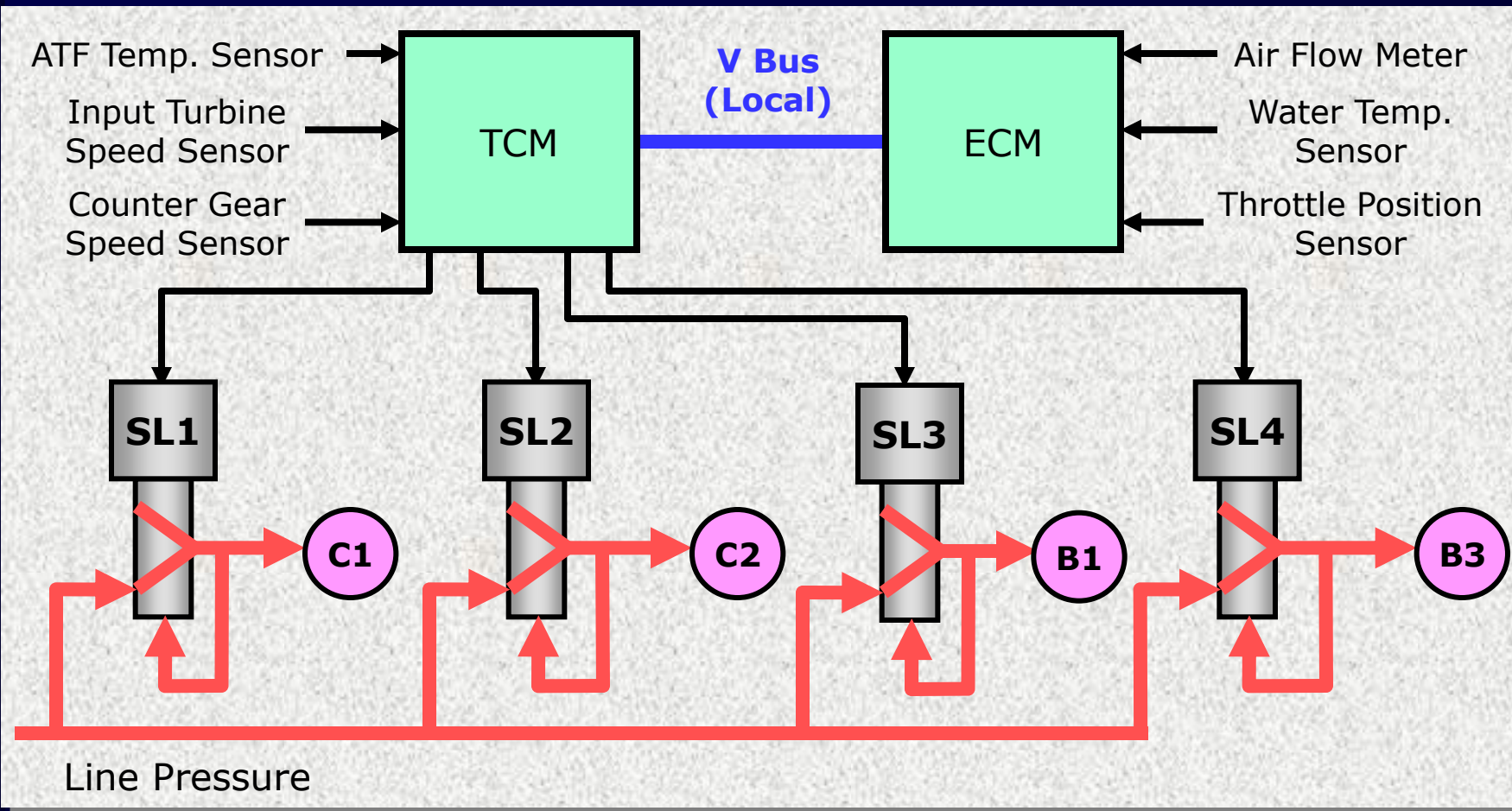
AI (Artificial Intelligence)-SHIFT

Multi-Mode Automatic Transmission



U660E Automatic Transaxle

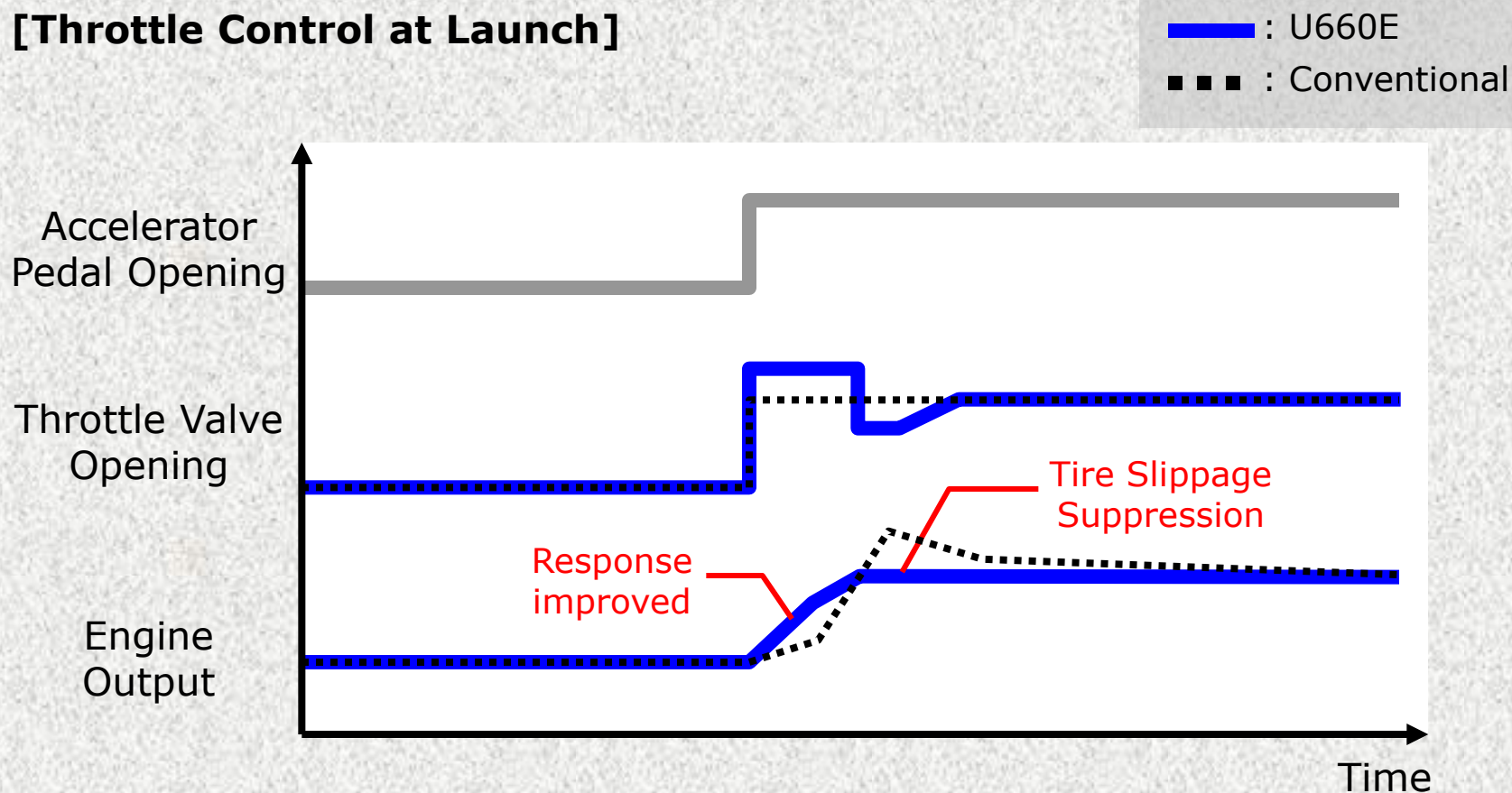
- Clutch to Clutch Pressure Control
 - This control is operated at 2 ↔ 3 ↔ 4 ↔ 5 ↔ 6 shift change



U660E Automatic Transaxle

- Powertrain Cooperative Control
 - Excellent start-off performance is ensured

[Throttle Control at Launch]

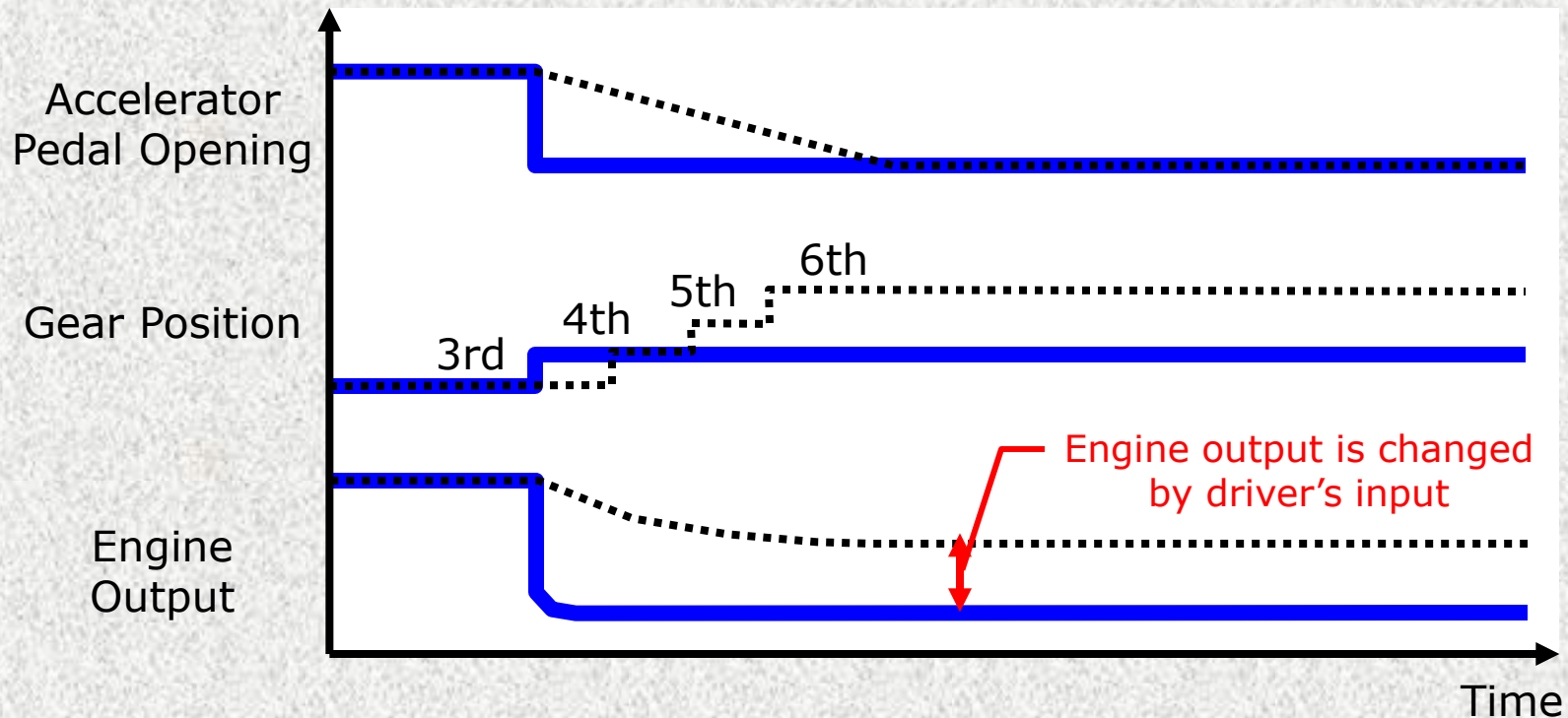


U660E Automatic Transaxle

- Powertrain Cooperative Control
 - The gear position during accelerator pedal OFF is determined by the drive's pedal operation

[Deceleration Force Control]

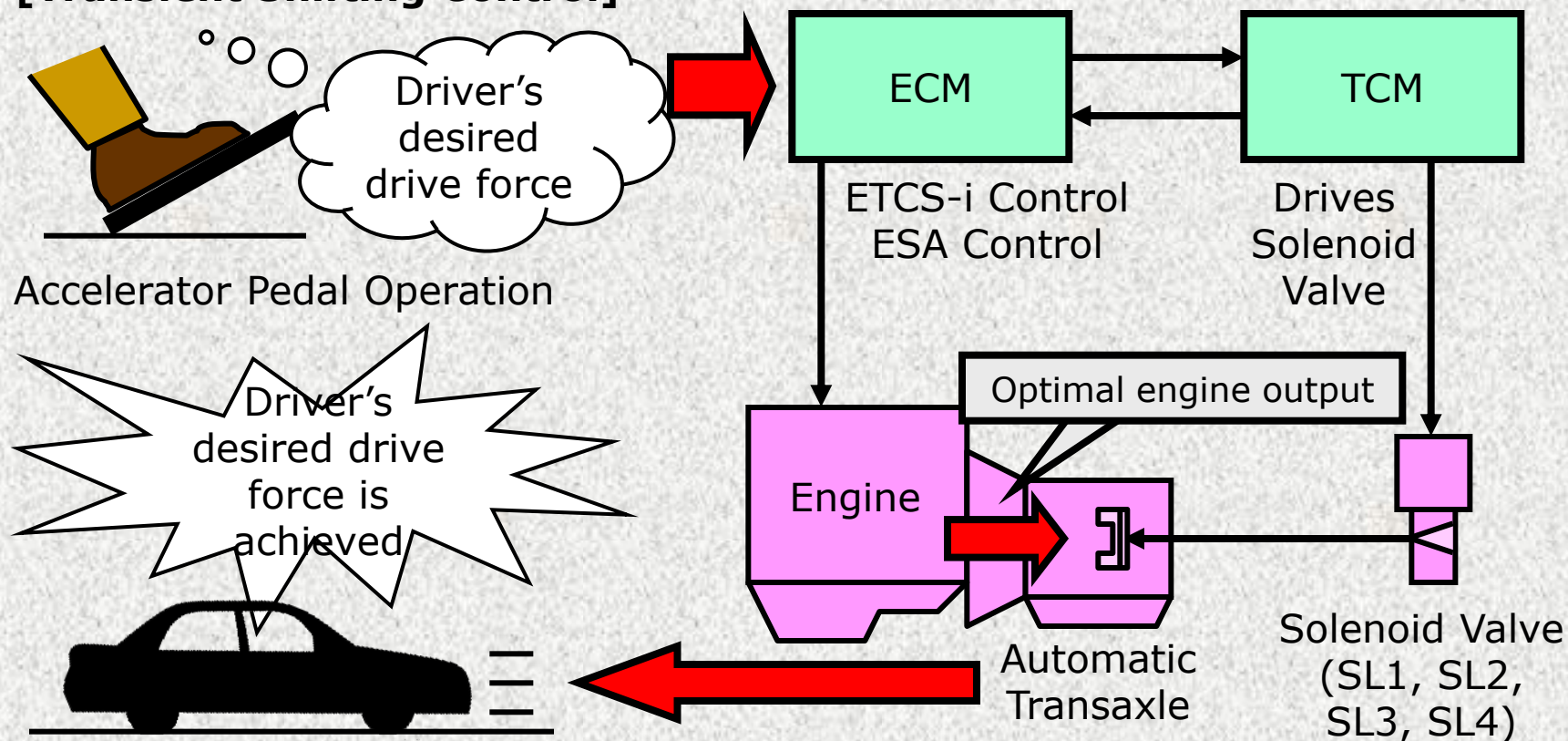
— : Sudden accelerator pedal operation
..... : Slow accelerator pedal operation



U660E Automatic Transaxle

- Powertrain Cooperative Control
 - Excellent response and shift shock reduction are achieved

[Transient Shifting Control]



U660E Automatic Transaxle

- Lock-up Timing Control & Flex Lock-up Clutch Control
– Operation range

[Lock-up Timing Control]

Gear	Position or Range		
	D or S6	S5	S4
1st	X	X	X
2nd	O	O	O
3rd	O	O	O
4th	O	O	O
5th	O	O	—
6th	O	—	—

[Flex Lock-up Clutch Control]

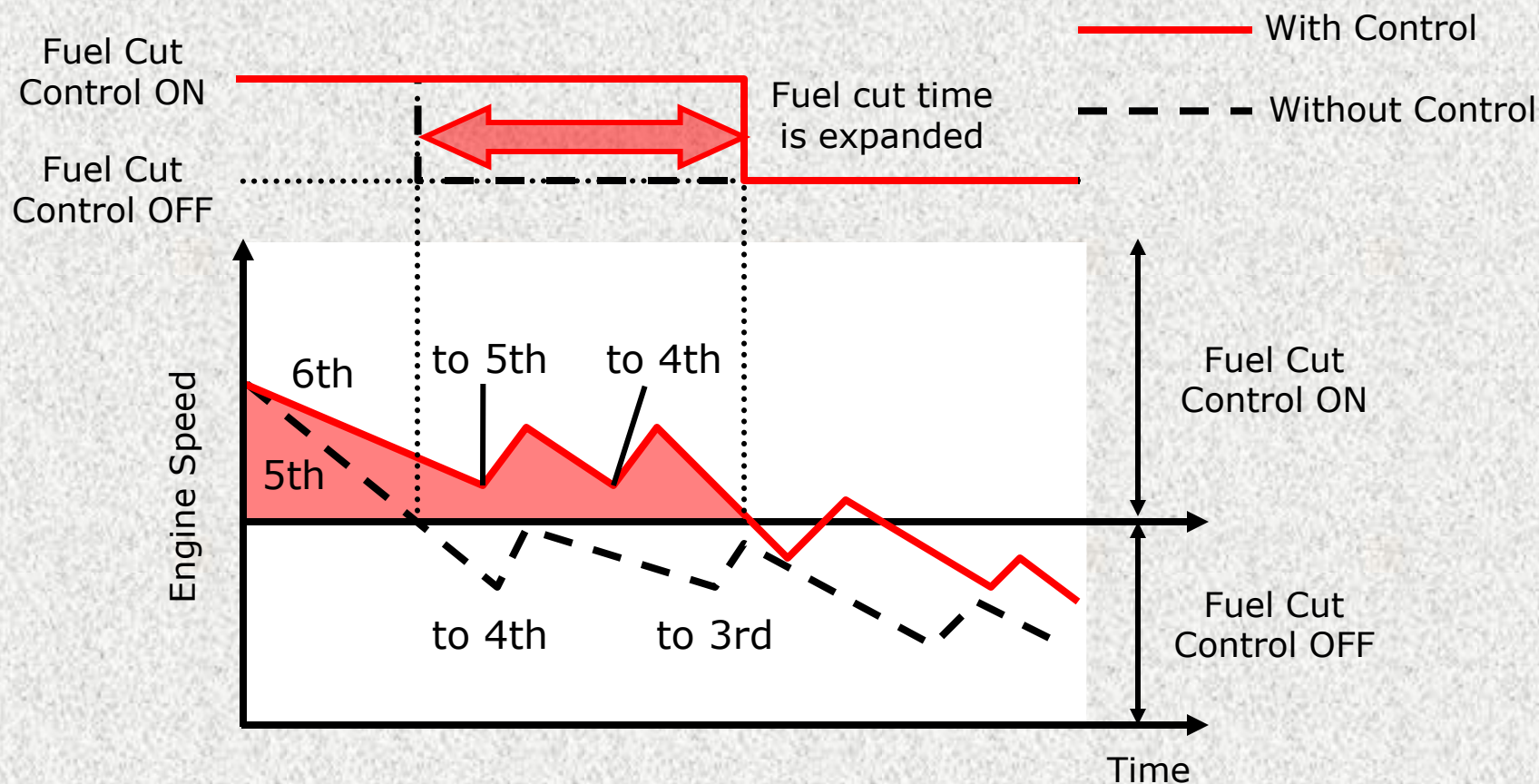
Gear	Position or Range		
	D or S6	S5	S4
1st	X	X	X
2nd	O	O	O
3rd	O	O	O
4th	O*	O*	O*
5th	O*	O*	—
6th	O*	—	—

O: Available X: Not available —: Not applicable

*: Flex Lock-up also operates, when the vehicle is decelerating

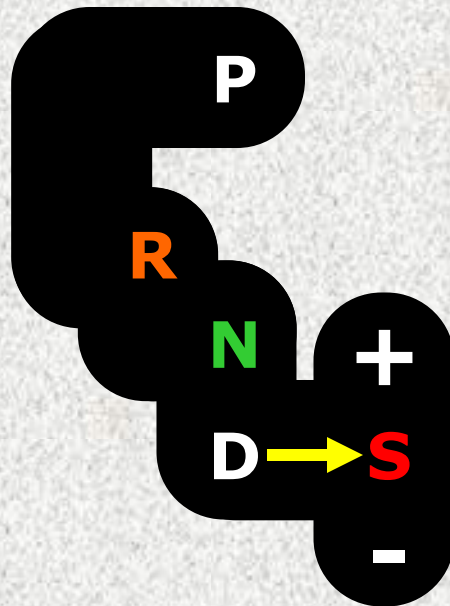
U660E Automatic Transaxle

- Coast Downshift Control
 - This control maintains sufficient engine speed and keeps fuel cut control operating for as long as possible

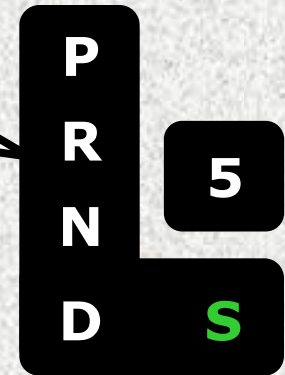
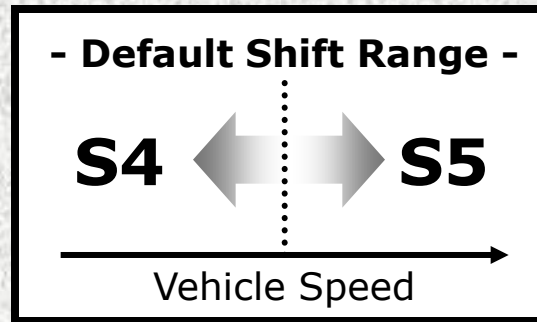


U660E Automatic Transaxle

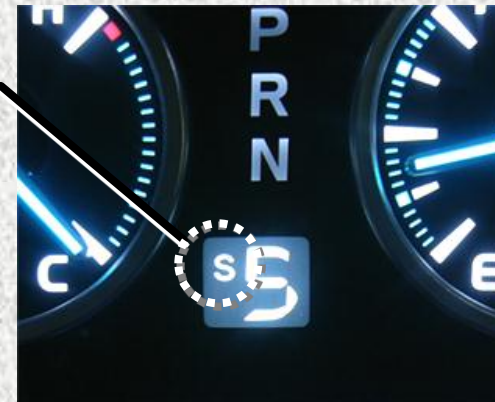
- Multi-Mode Automatic Transmission
 - Initial shift range from "D" to "S" is S4 or S5 range
 - It is selected depending on the vehicle speed



Shift Pattern

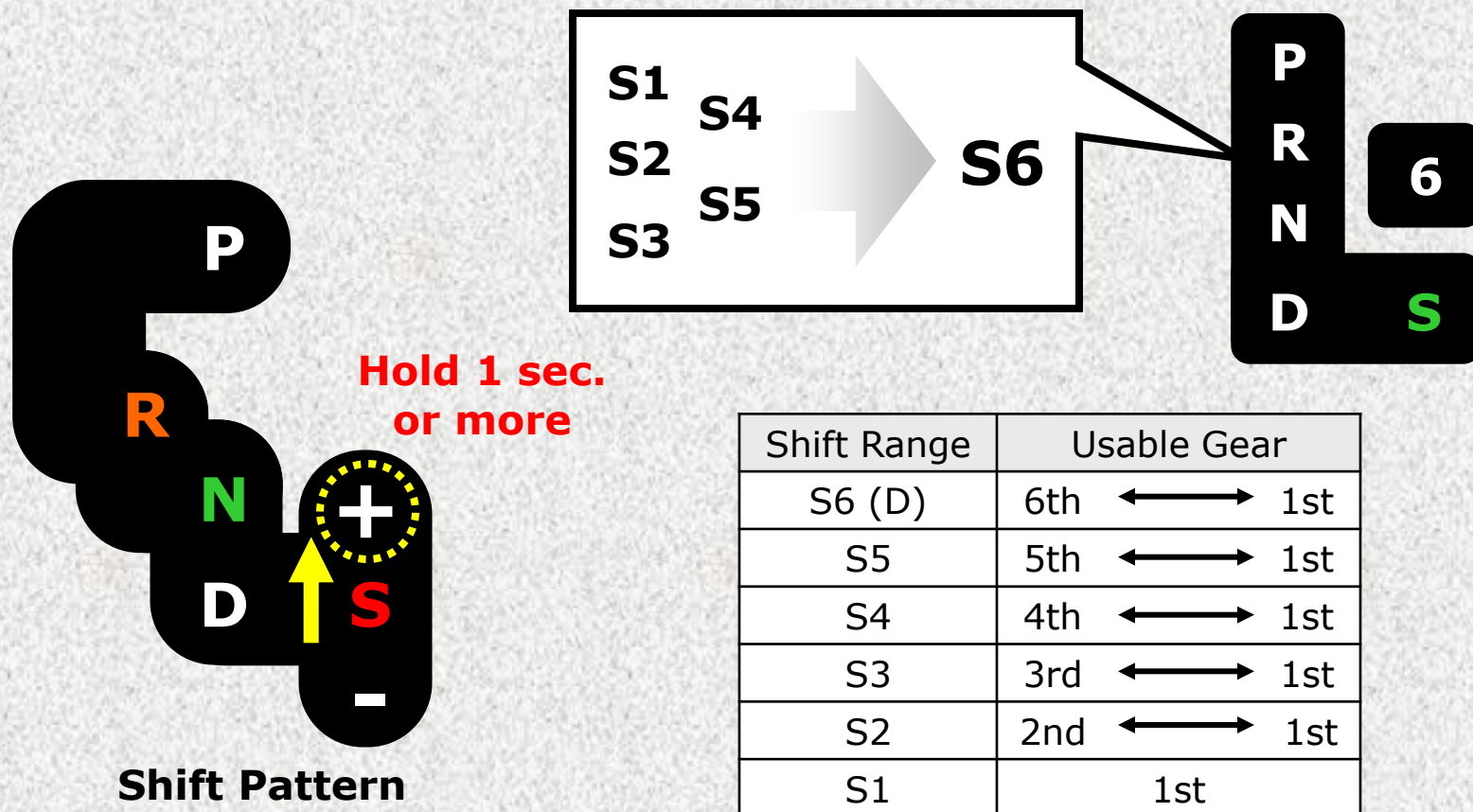


S Position
Indicator Light



U660E Automatic Transaxle

- Multi-Mode Automatic Transmission
 - When holding the shift lever to “+” position 1 second or more, the shift range is shifted up to S6 range



U660E Automatic Transaxle

Fail-safe

Malfunction Part	Function
Input Turbine Speed Sensor	Shifting to only either the 1st or 3rd gears is allowed.
Counter Gear Speed Sensor	• The counter gear speed is detected through the signals from the skid control ECU (speed sensor signals). • Shifting between the 1st to 4th gears is allowed.
ATF Temp. Sensor	Shifting between the 1st to 4th gears is allowed.
TCM Power Supply (Voltage is Low)	When the vehicle is being driven in 6th gear, the transaxle is fixed in 6th gear. When being driven in any of the 1st to 5th gears, the transaxle is fixed in 5th gear.
CAN Communication	Shifting to only either the 1st or 3rd gears is allowed.
Knock Sensor	Shifting between the 1st to 4th gears is allowed.
Solenoid Valve SL1, SL2, SL3 and SL4	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation

U660E Automatic Transaxle

DTCs for TCM

DTC No.	Detection Item	Trouble Area
P0715	Input/Turbine Speed Sensor Circuit Malfunction	Input Turbine Speed Sensor (Hall IC Type)
P0791	Intermediate Shaft Speed Sensor "A" Circuit	Counter Gear Speed Sensor (Hall IC Type)
P0872	Transmission Fluid Pressure Sensor/Switch "C" Circuit Low	ATF Pressure Switch 1
P0873	Transmission Fluid Pressure Sensor/Switch "C" Circuit High	
P0877	Transmission Fluid Pressure Sensor/Switch "D" Circuit Low	ATF Pressure Switch 2
P0878	Transmission Fluid Pressure Sensor/Switch "D" Circuit High	
P0989	Transmission Fluid Pressure Sensor/Switch "E" Circuit Low	ATF Pressure Switch 3
P0990	Transmission Fluid Pressure Sensor/Switch "E" Circuit High	
P2808	Pressure Control Solenoid "G" Performance	Solenoid Valve SL4
P2810	Pressure Control Solenoid "G" Electrical	

Service Point (U660E Automatic Transaxle)

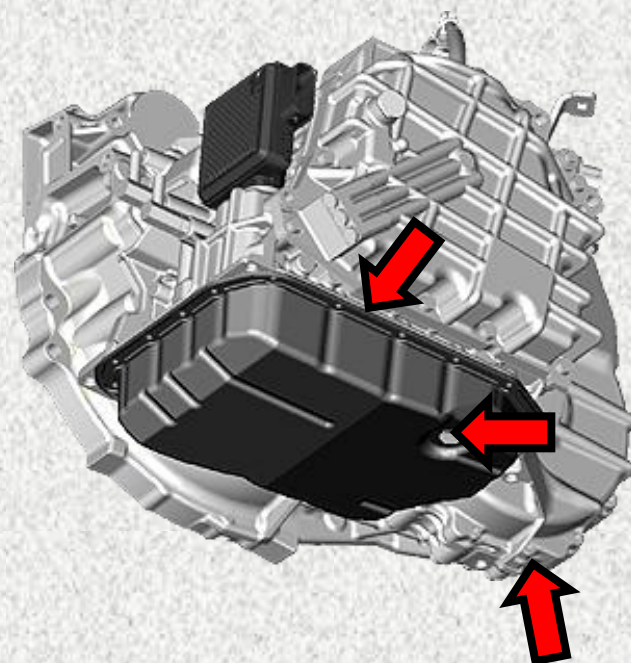
- Inspection
 - ATF Inspection Procedure
(No level gauge (dip-stick) and filler tube)

Check Items

- Visually check for ATF leaks of the following areas
 - Overflow Plug
 - Oil Seal
 - Each Case Join, etc

NOTE:

If there is no ATF leak from transaxle, check of the ATF level is no required

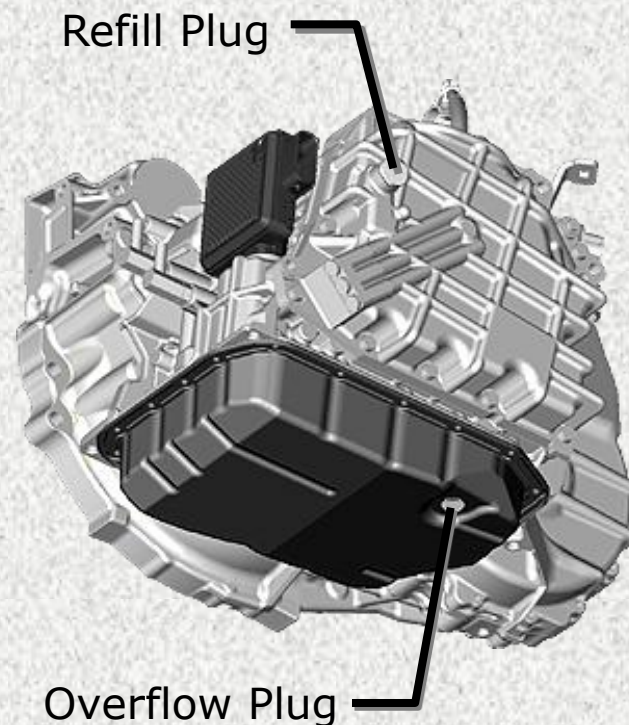


Service Point (U660E Automatic Transaxle)

● Initial Refill / Replacement – Service Procedure

1: Refill the ATF

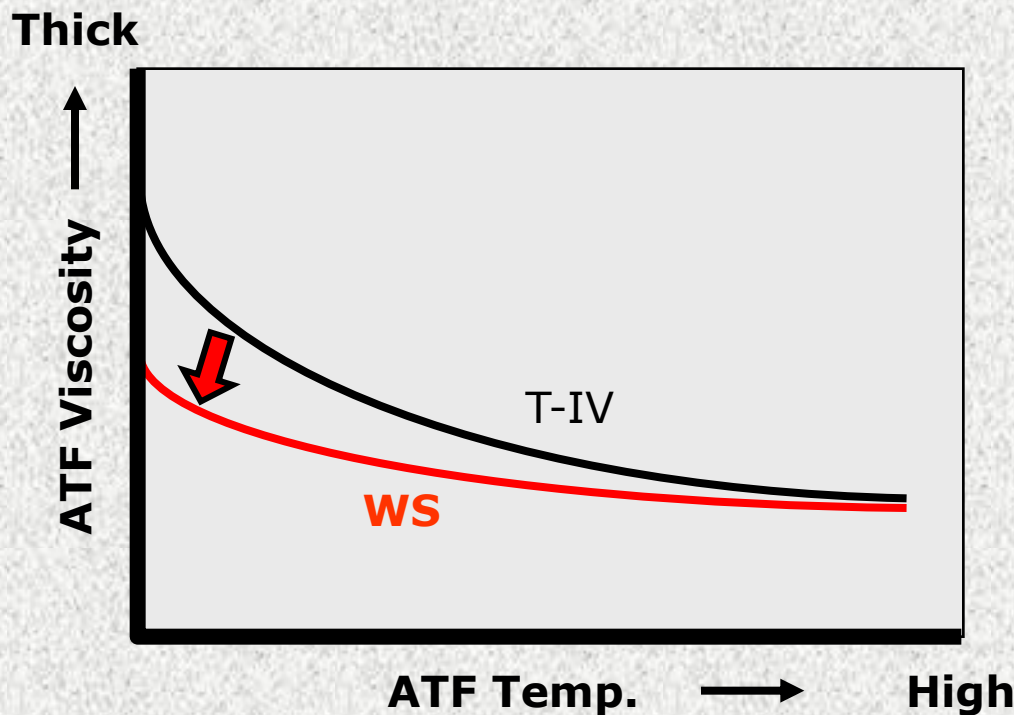
1. Lift the vehicle
2. Remove the refill plug and the overflow plug
3. Fill up ATF from the refill hole until overflowing from the overflow plug hole
4. Install the overflow plug
5. Refill ATF* from the refill hole
6. Install the refill plug
7. Lowering the vehicle



*: Refer to the 40th slide

Service Point (U660E Automatic Transaxle)

- Automatic Fluid (ATF)
 - TOYOTA Genuine ATF WS is used for fuel economy by reducing its viscosity



Service Point (U660E Automatic Transaxle)

- Initial Refill / Replacement
 - Service Procedure
 - Refill Quantity

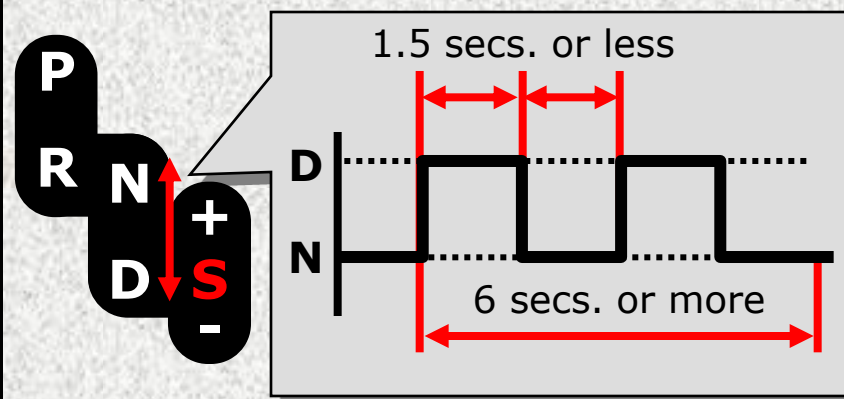
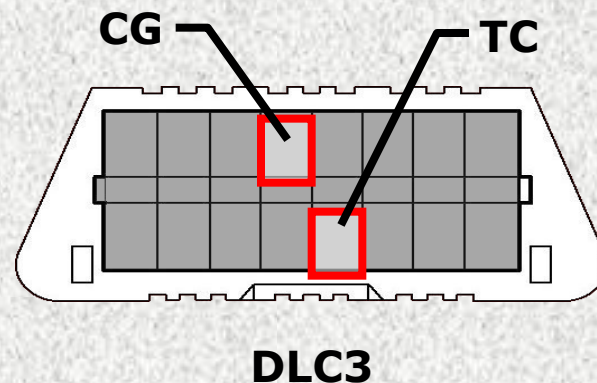
Service Part		Refill Quantity [Liter (US qts, Imp. qts)]
Replacement of transaxle	New torque converter is used	5.3 (5.6, 4.7)
	Torque converter is reused	3.4 (3.6, 3.0)
• Removal and installation of oil pan • Removal and installation of drive shaft		2.8 (3.0, 2.5)
Removal and installation of valve body		3.2 (3.4, 2.8)
Removal and installation of torque converter		4.8 (5.1, 4.2)
• Replacement of oil cooler • Repair of oil leakage		0.5 (0.5, 0.4)

Service Point (U660E Automatic Transaxle)

- Fluid Level Check (Without Intelligent Tester)
 - Service Procedure

2: ATF temperature check

1. Using the SST, connect TC and CG of DLC3
2. Start the engine
3. Shift into position from P to D range
4. Move the shift lever quickly between N and D position
5. Confirm "D" position indicator lights up for 2 sec.
6. Shift to P and remove the SST

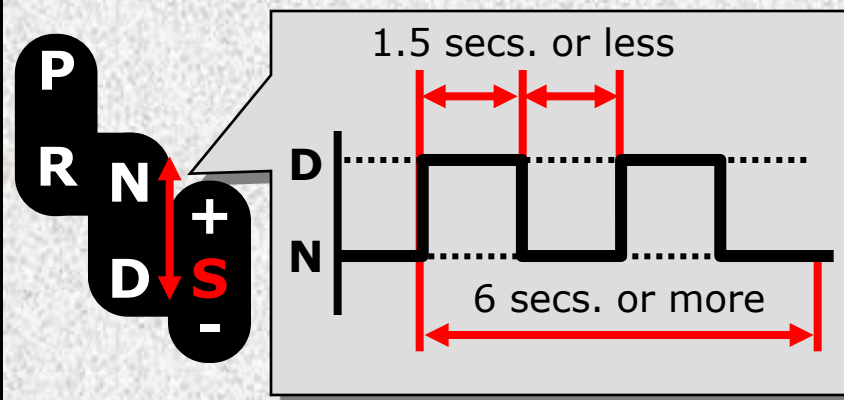


Service Point (U660E Automatic Transaxle)

- Fluid Level Check (With Intelligent Tester)
 - Service Procedure

2: ATF temperature check

1. Connect the Intelligent Tester to DLC3
2. Turn the engine on and turn the Intelligent Tester on
3. Check A/T oil temperature
4. Start the engine
5. Shift into position from P to D range
6. Move the shift lever quickly between N and D position
7. Confirm "D" position indicator lights up for 2 sec.

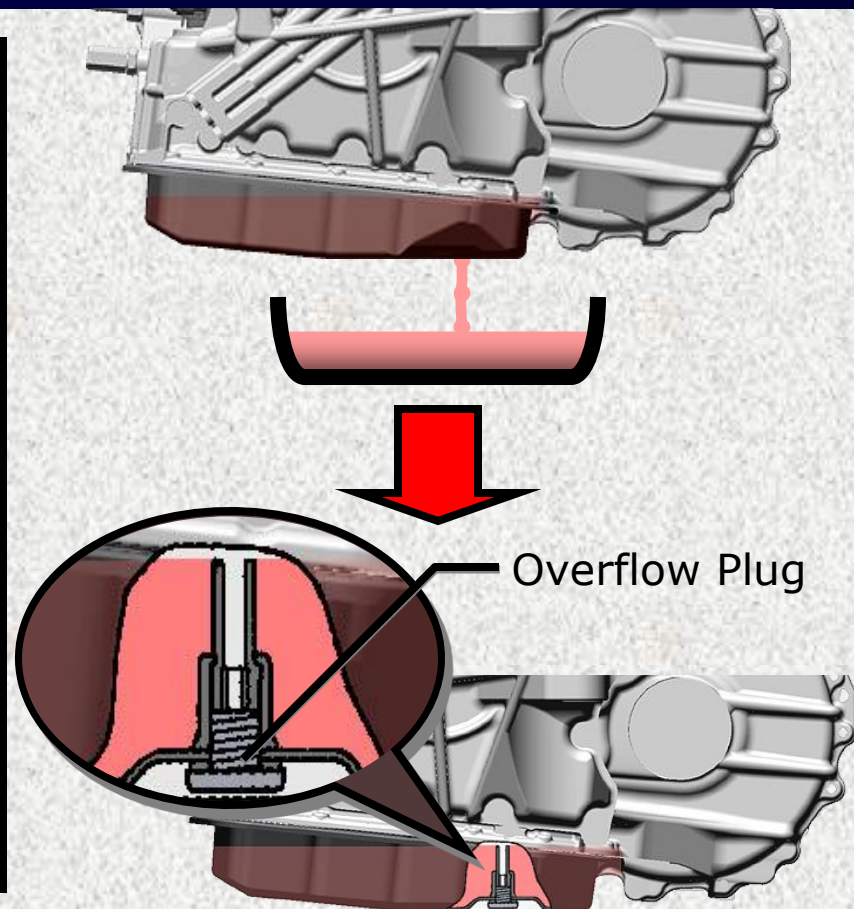


Service Point (U660E Automatic Transaxle)

- Fluid Level Check
 - Service Procedure

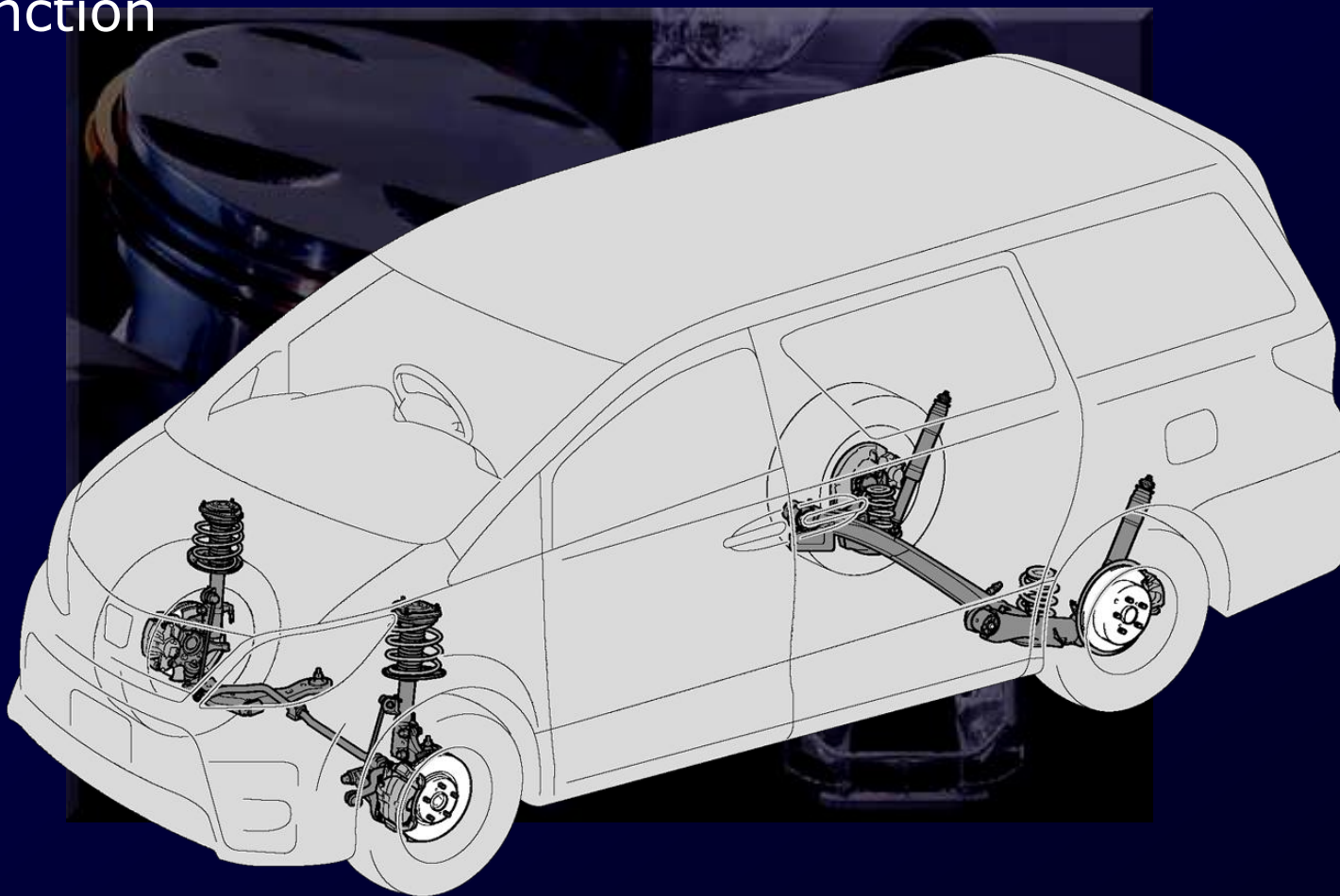
3: Adjust the ATF level

1. Engine idling warm-up ATF
2. Verify "D" position indicator turns on (ATF temp. check)
3. Lift up the vehicle with engine idling
4. Check the ATF level by ATF overflow from overflow plug hole
5. Install the overflow plug and the refill plug
6. Lower the vehicle
7. Stop the engine



Suspension and Axle

- Suspension
 - MacPherson strut type front suspension
 - Torsion beam type rear suspension with toe-correct function



Suspension and Axle

● Suspension Specification – Wheel alignment

Front Wheel Alignment*	Type	MacPherson Strut
	Tread [mm (in.)]	1,580 (62.2)
	Caster [degree]	5° 40'
	Camber [degree]	-0° 10'
	Toe-in [mm (in.)]	1 (0.04)
	Steering Axis Inclination (Reference) [degree]	11° 25'
Rear Wheel Alignment*	Type	Torsion Beam
	Tread [mm (in.)]	1,585 (62.4)
	Camber [degree]	-1° 30'
	Toe-in [mm (in.)]	3 (0.12)

*: Unloaded Vehicle Condition

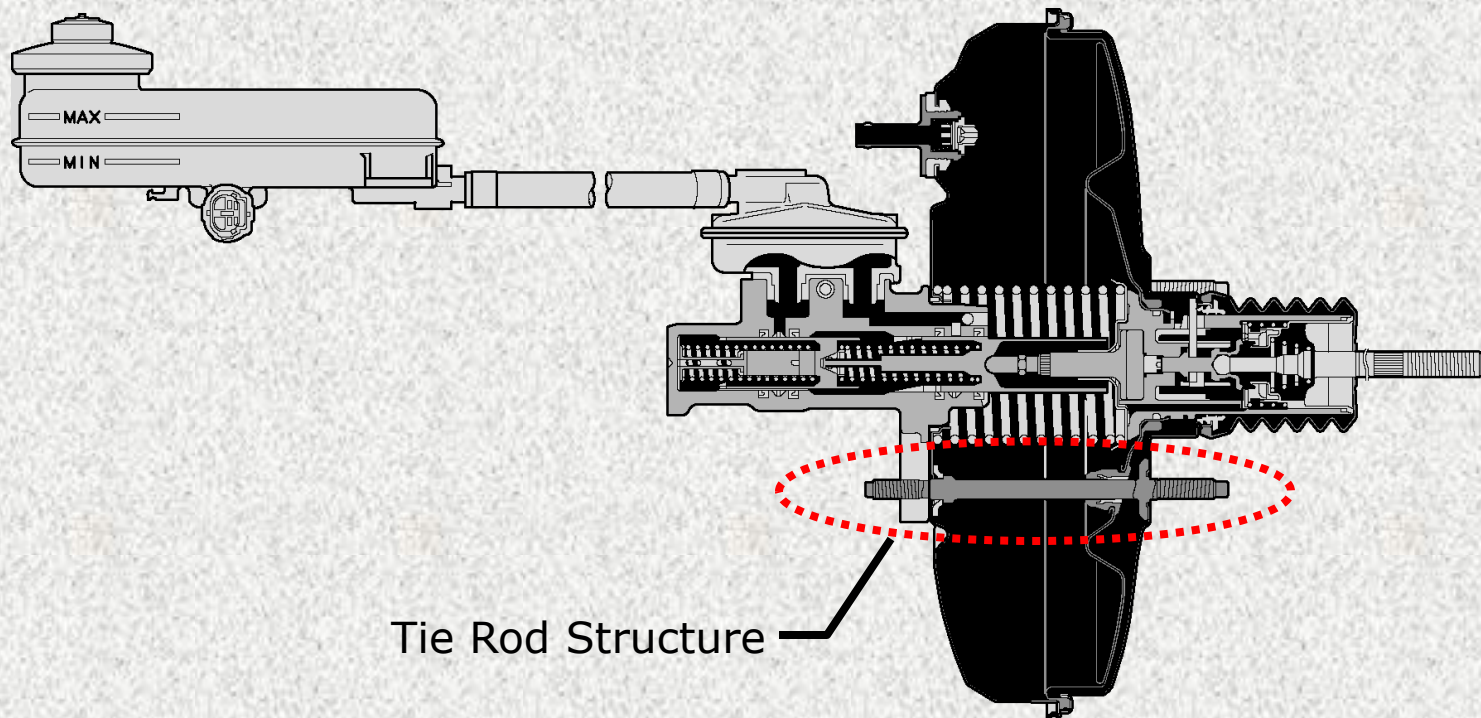
Brake

● Specification

Master Cylinder	Type	Tandem
	Diameter	22.2 mm (0.87 in.)
Brake Booster	Type	Single
	Size	10.5 in.
Front Brake	Caliper Type	AX63
	Wheel Cylinder Diameter	63.5 mm (2.50 in.)
	Rotor Size (D x T)	296 mm x 28 mm (11.65 in. x 1.10 in.)
	Pad	PV565H
Rear Brake	Caliper Type	ZOH43
	Wheel Cylinder Diameter	42.86 mm (1.69 in.)
	Rotor Size (D x T)	298 mm x 12 mm (11.73 in. x 0.47 in.)
	Pad	NS254
Parking Brake	Type	Duo servo
	Drum Inner Diameter	190 mm (7.48 in.)
Brake Control Function		ABS with EBD, BA, TRC, VSC and Cooperative Control with EPS
Skid Control ECU and Brake Actuator Manufacture		BOSCH
VSC OFF Switch		With

Brake

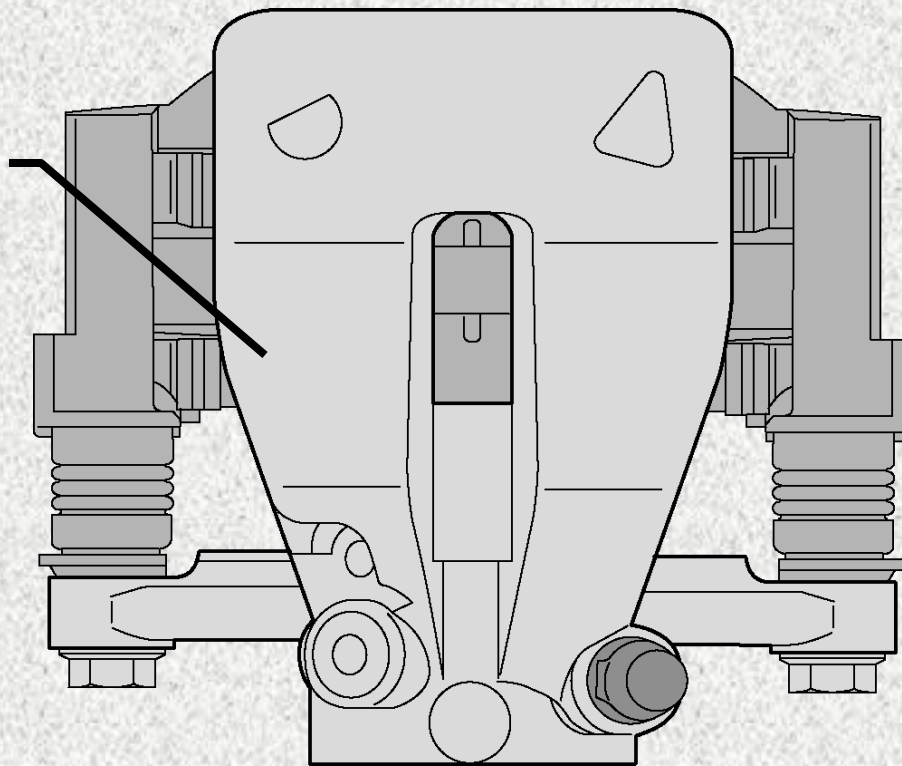
- Brake Booster
 - Single diaphragm type brake booster with a tie rod structure for weight reduction



Brake

- Rear Brake
 - Caliper cylinder made of aluminum

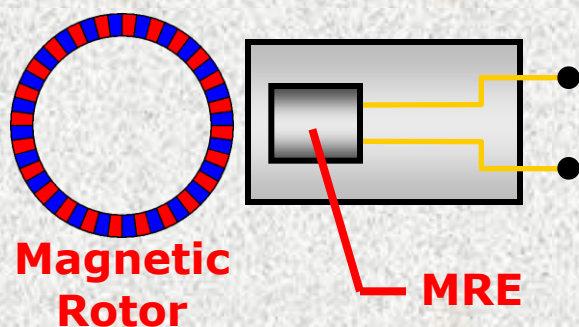
Aluminum



Brake Control System

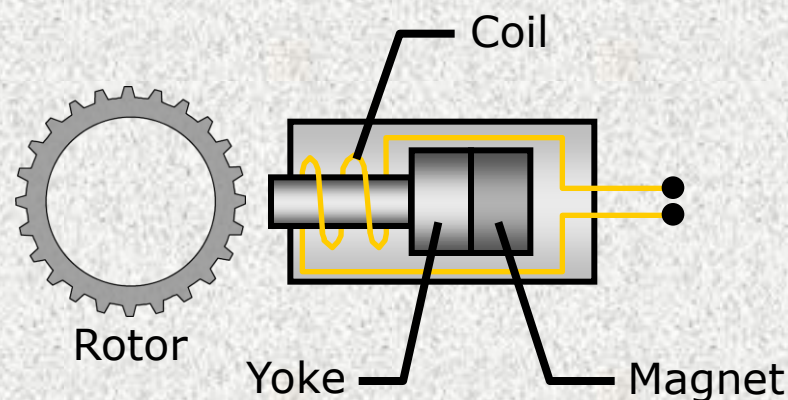
- Speed Sensor
 - Speed sensor type has been changed from passive type to active type

**Active Type
(Semiconductor)**



New ALPHARD

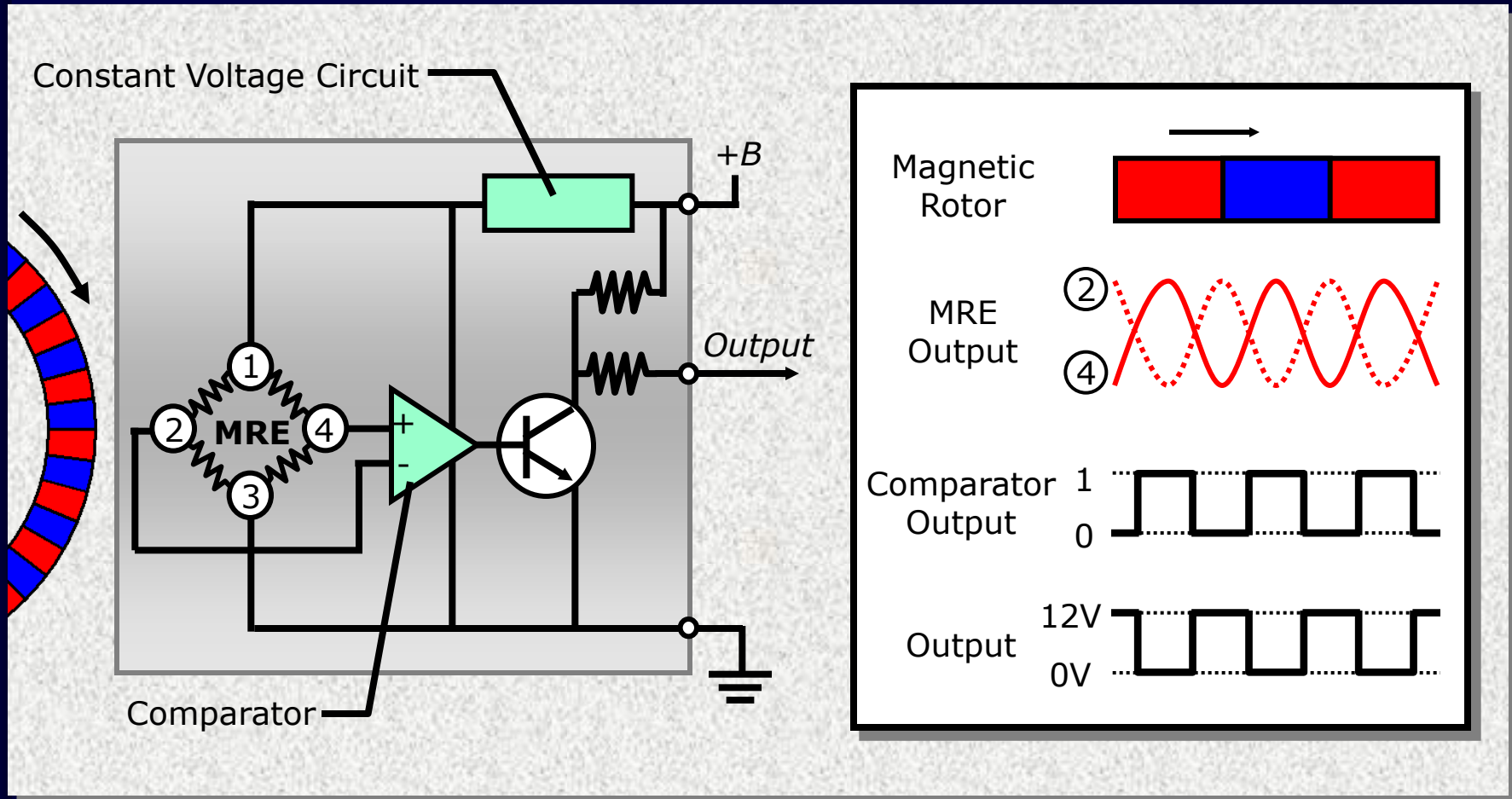
**Passive Type
(Magnetic pick-up)**



Previous ALPHARD

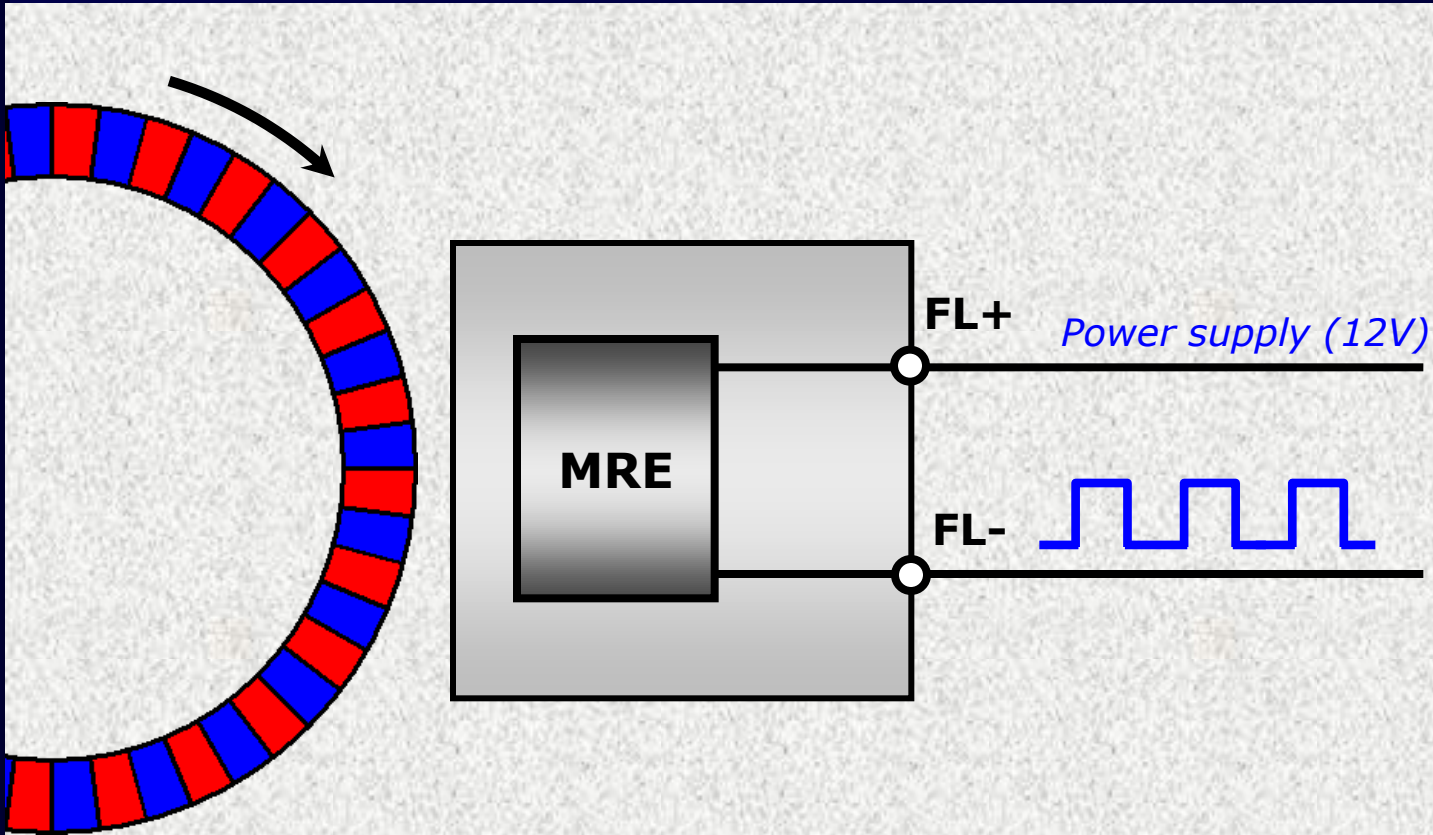
Brake Control System

- Speed Sensor
 - MRE internal operation



Brake Control System

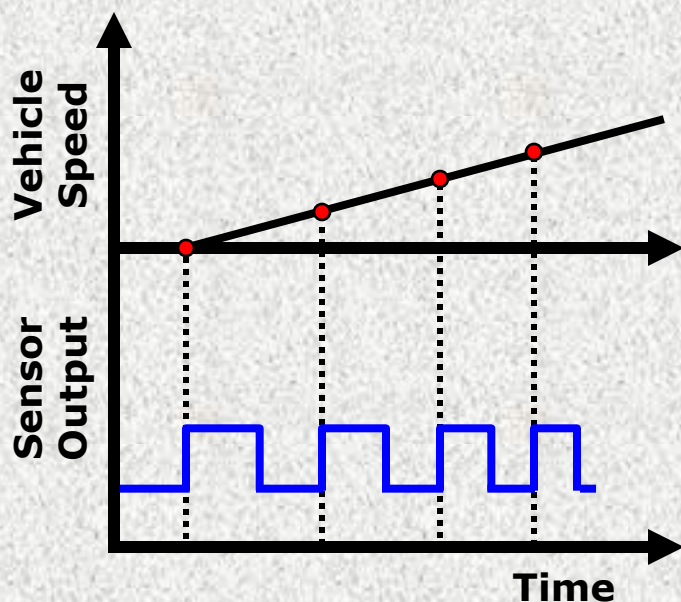
- Speed Sensor
 - Sensor output



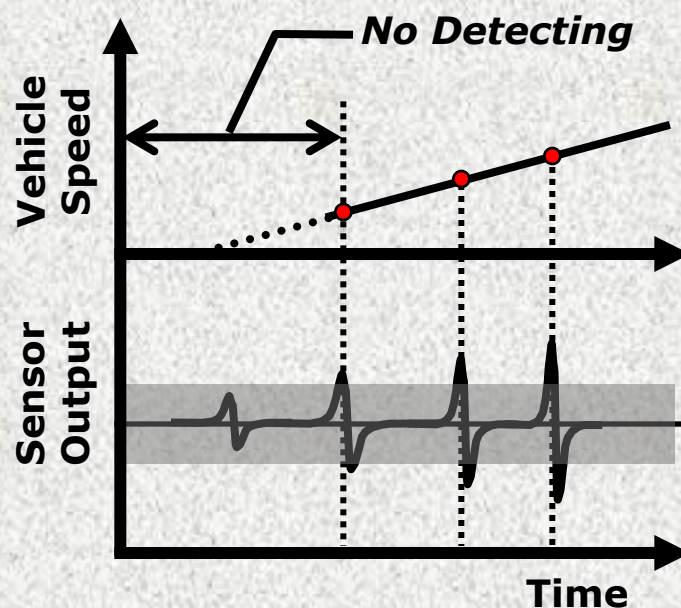
Brake Control System

- Speed Sensor
 - Signal output at extremely low speed rotation can be ensured

**Active Type
(Semiconductor)**

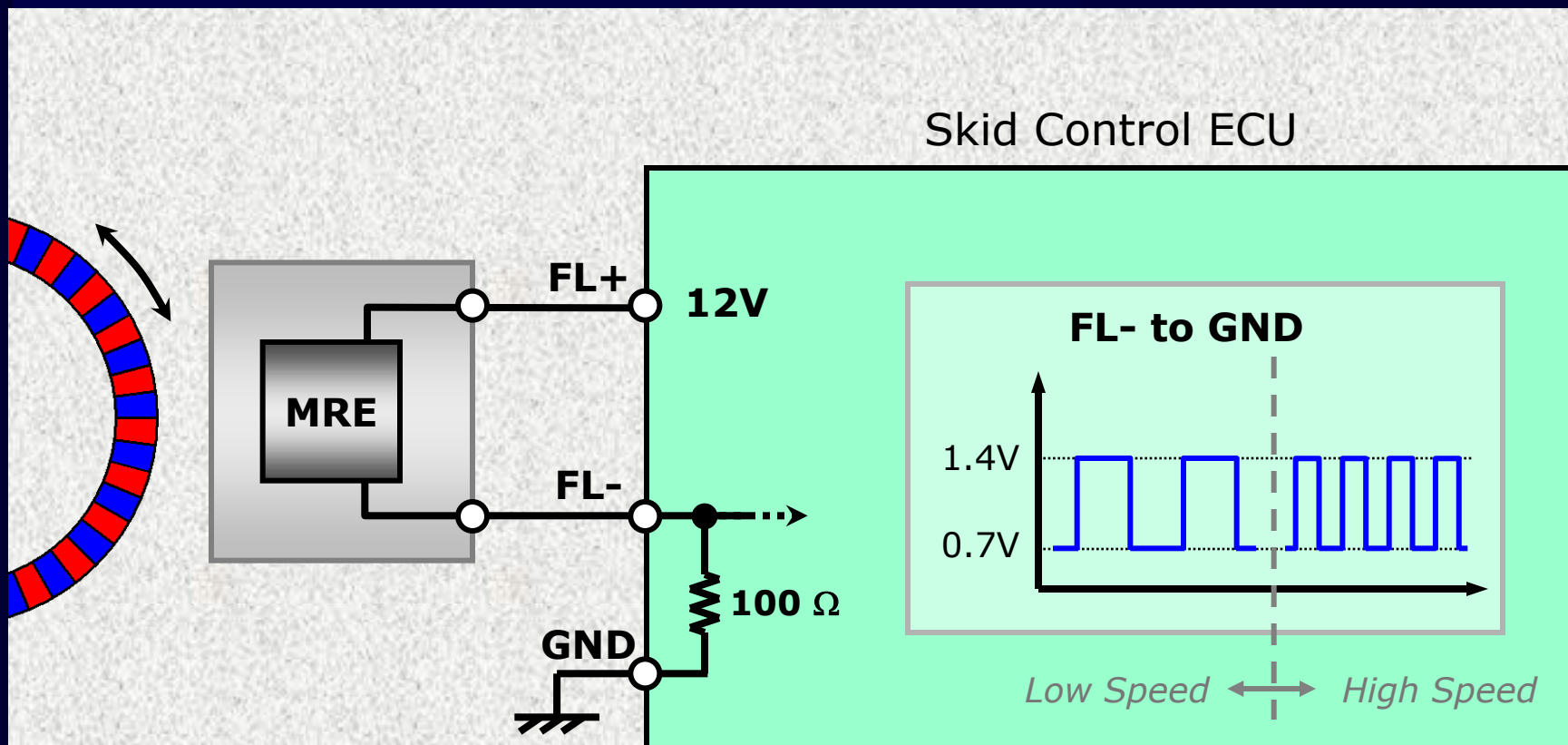


**Passive Type
(Magnetic pick-up)**



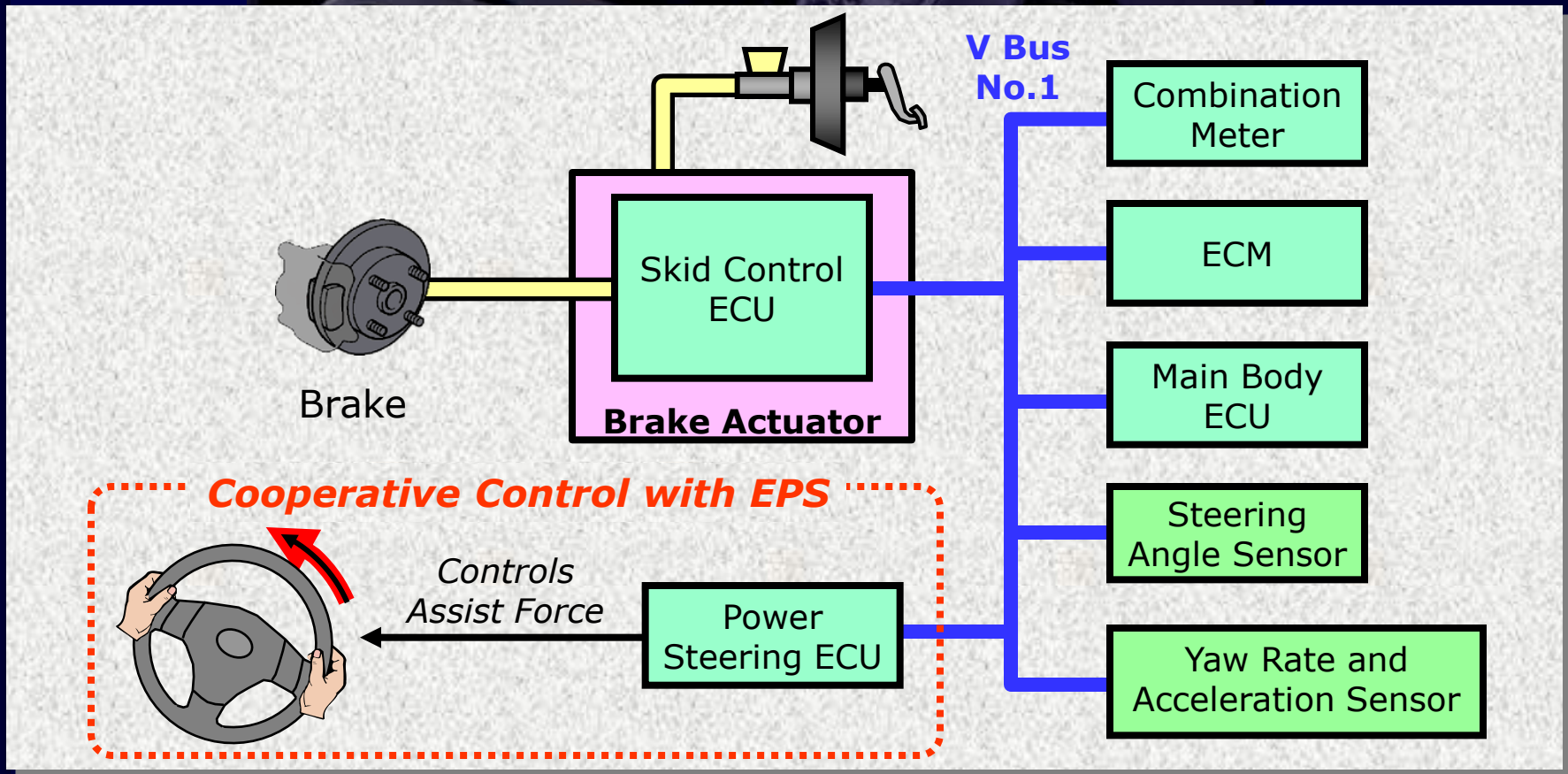
Service Point (Brake Control System)

- Speed Sensor
 - Inspection procedure



Brake Control System

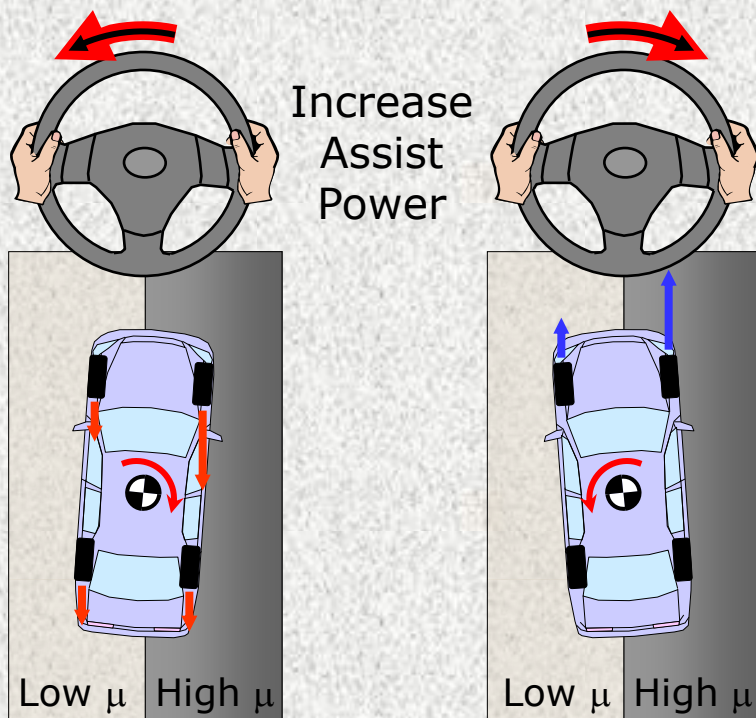
- Cooperative Control with EPS
 - In addition to the conventional VSC system, cooperative control with EPS is newly added to improve the vehicle posture control



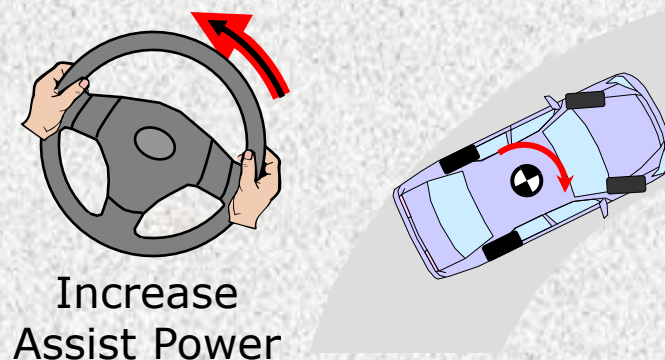
Brake Control System

- Cooperative Control with EPS
 - EPS assist force is controlled to help driver handling during VSC system operation

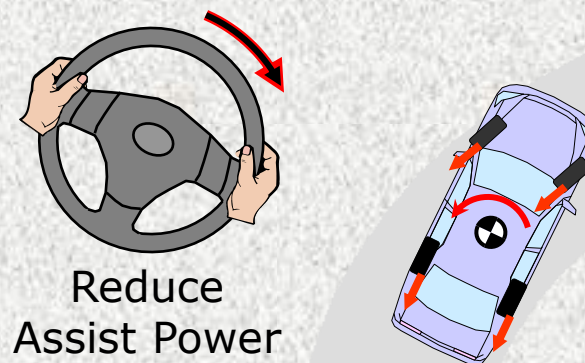
When road surface resistance differs between both sides of wheels



[Rear Wheel Skid Tendency]



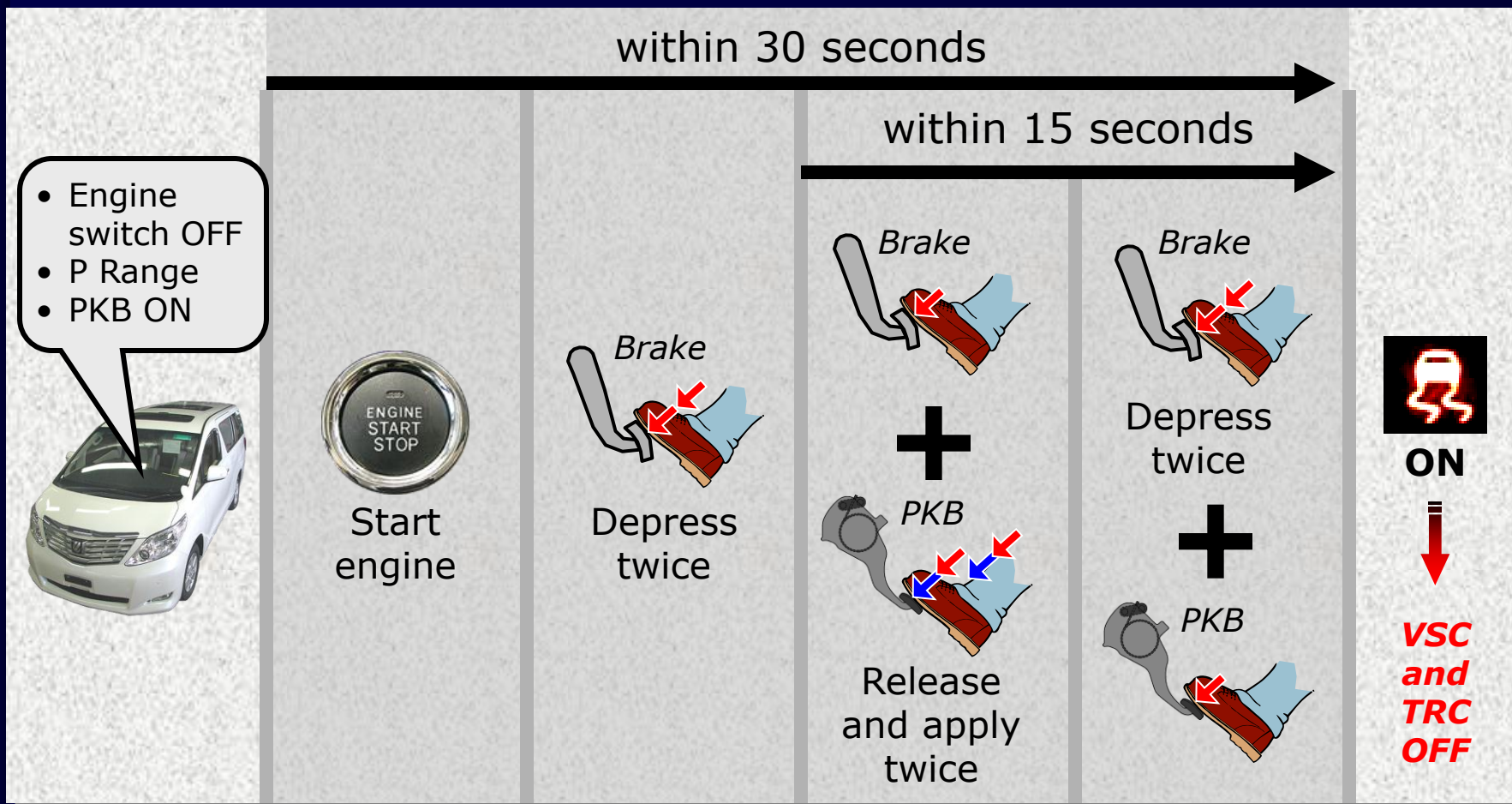
[Front Wheel Skid Tendency]



[Braking Suddenly] [Accelerating Suddenly]

Service Point (Brake Control System)

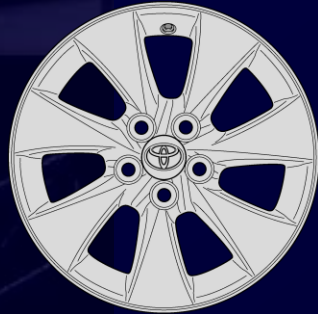
- Inspection Mode
 - Inspection mode turns off the TRC and VSC systems completely



Change to an engine switch OFF → Inspection mode is canceled

Tire and Wheel

● Tire and Wheel Size and Design

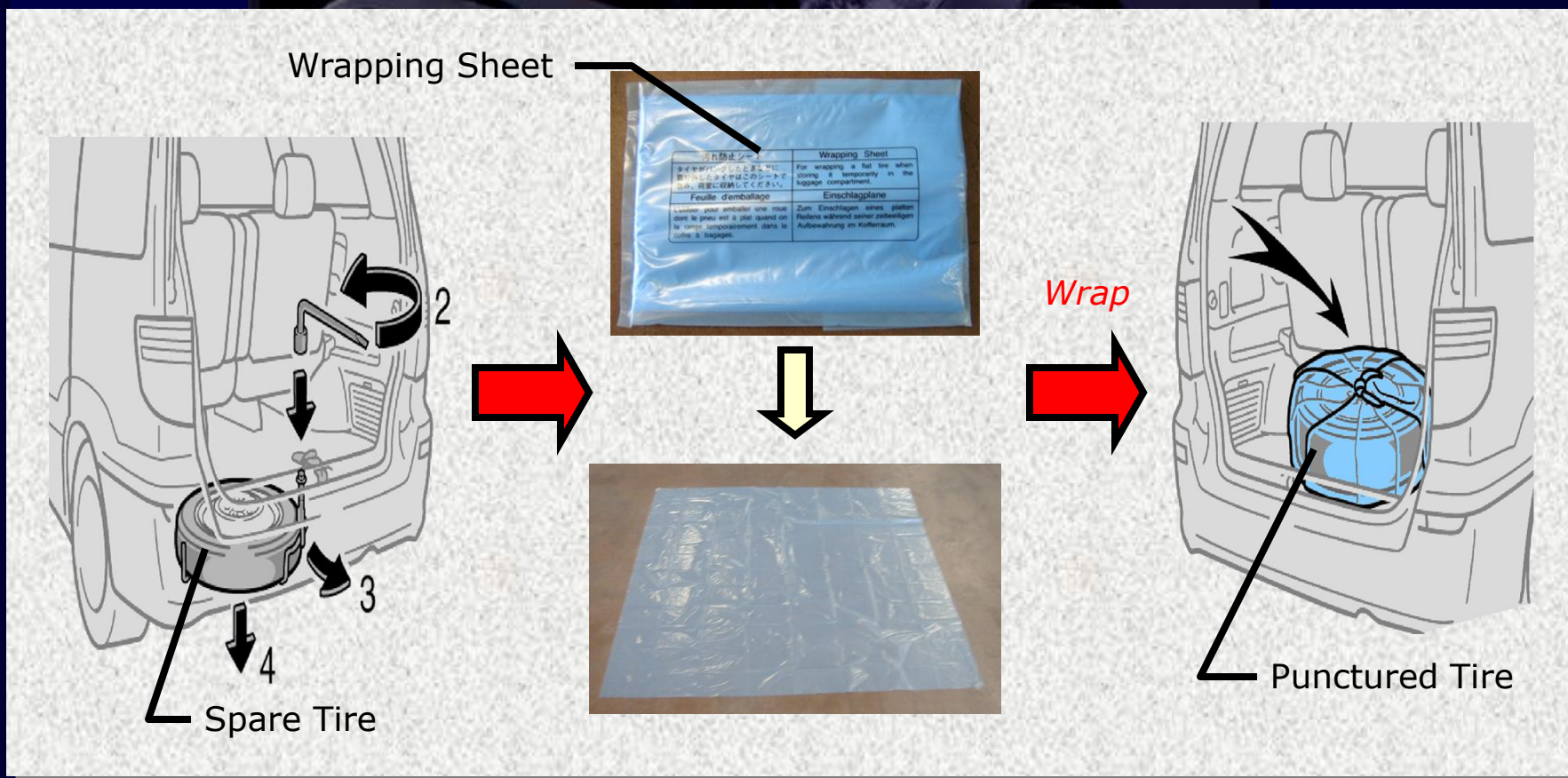
Grade		350G	350S
Tire Size		215/65R16	215/60R17
Disc Wheel	Size	16 x 6.5 J	17 x 7.0 J
	Material	Aluminum with Center Cap	
	P.C.D.*	114.3 mm (4.5 inch)	
	Off Set	33 mm (1.3 inch)	
	Design		

*: Pitch Circle Diameter

Service Point (Tire and Wheel)

● Spare Tire

- Spare tire carrier cannot accommodate ground tire
- Wrap punctured tire in wrapping sheet, and store it in luggage compartment



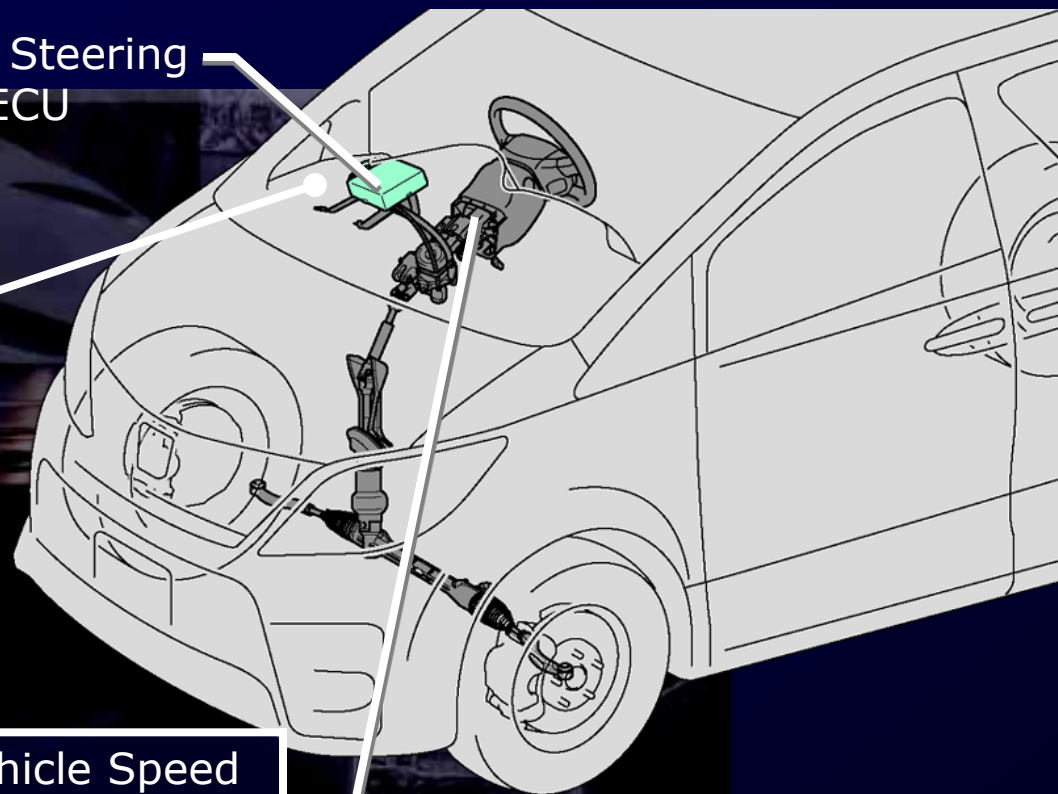
Steering

- EPS (Electric Power Steering)
 - Motor drives the column shaft



P/S Warning Light

Power Steering
ECU



Steering Column Assembly

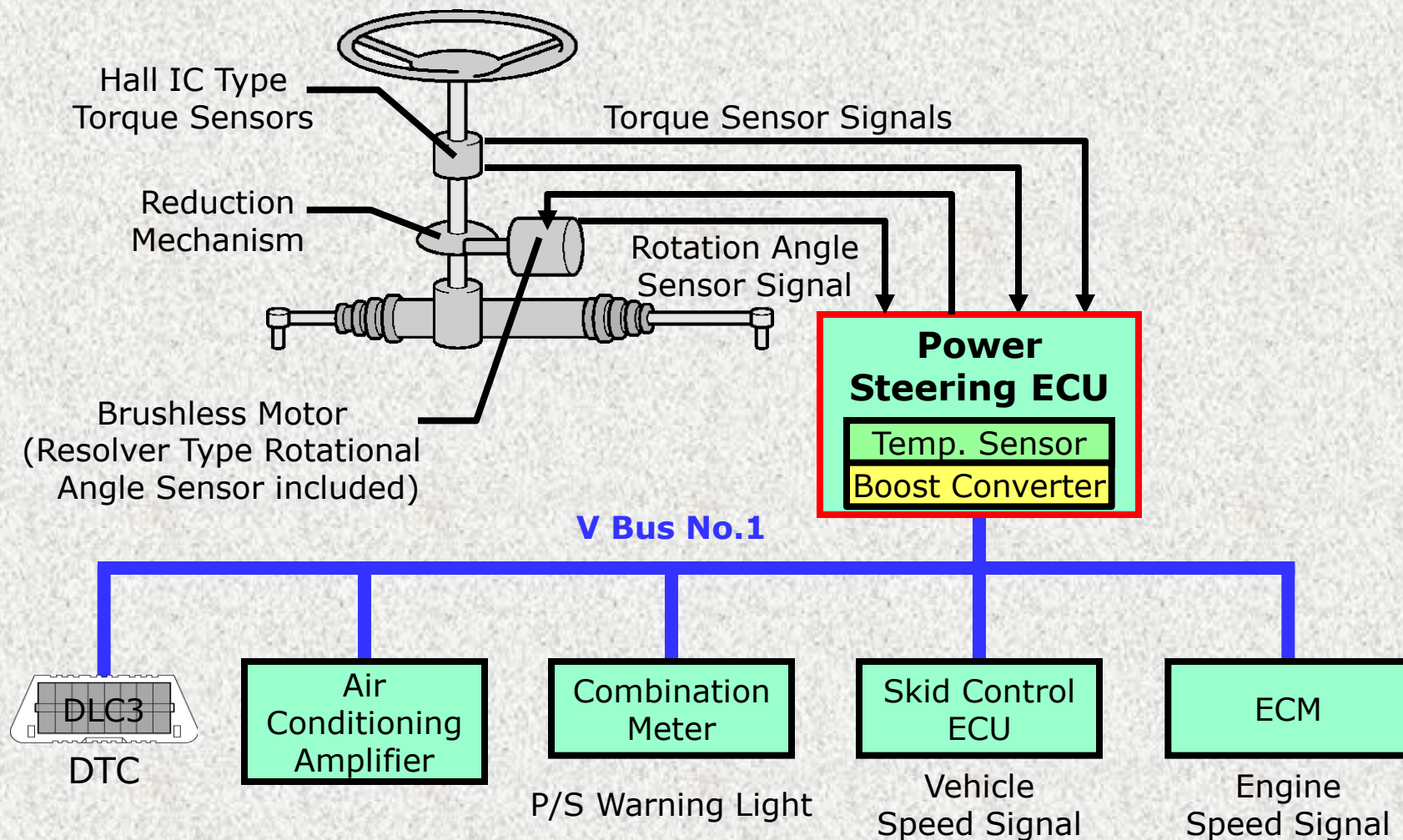
- Brushless Motor with Rotational Angle Sensor
- Reduction Mechanism
- Hall IC Type Torque Sensor

[Specification]

Type	Vehicle Speed Sensing Type
Gear Ratio (Overall)	16.5
No. of Turns Lock to Lock	3.30
Rack Stroke [mm (in.)]	143.8 (5.66)

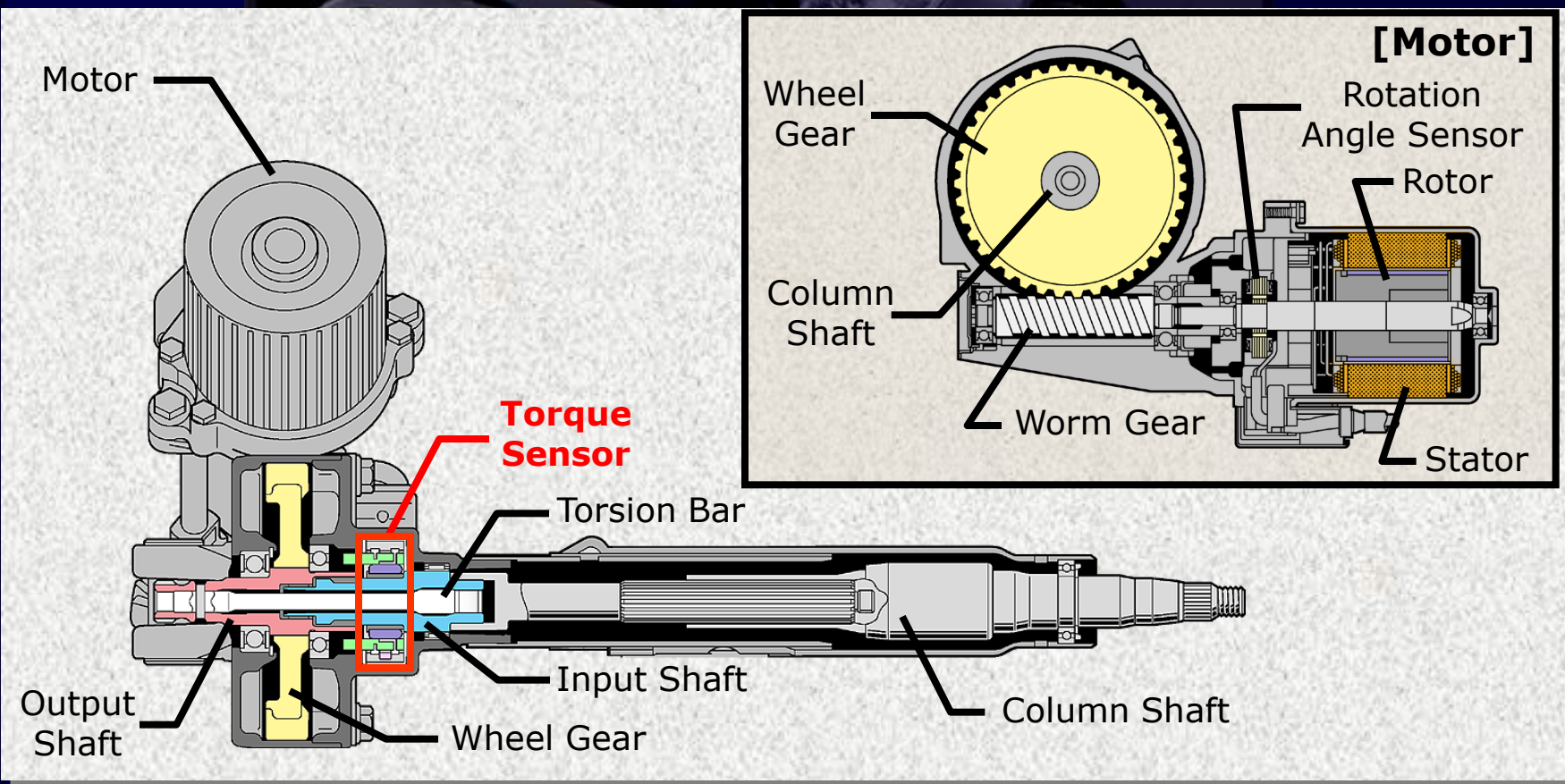
Steering

● System Diagram



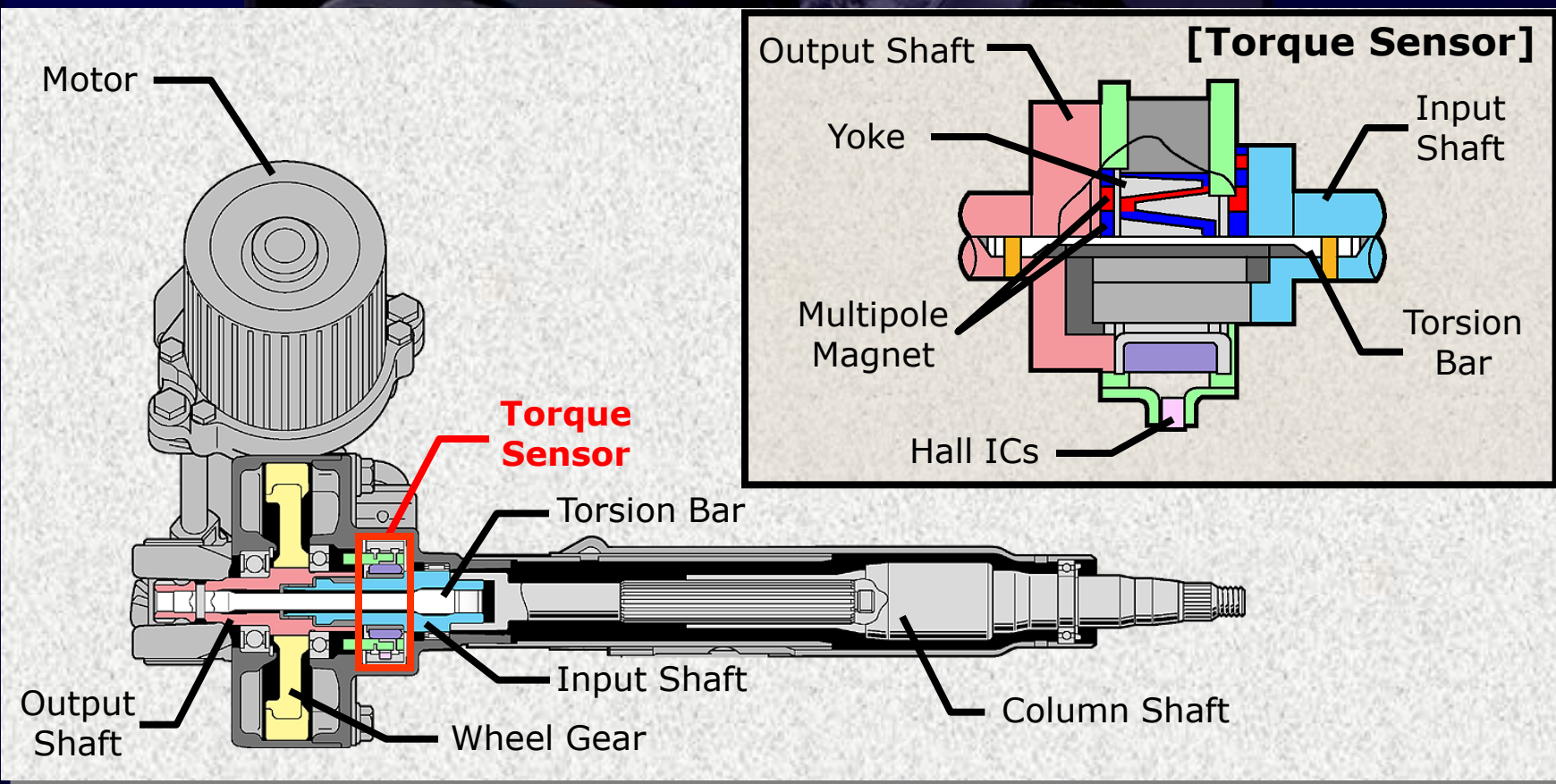
Steering

- Steering Column and Brushless Motor
 - DC brushless motor with resolver type rotation angle sensor which reduces motor speed via worm gear and transmits it to the column shaft



Steering

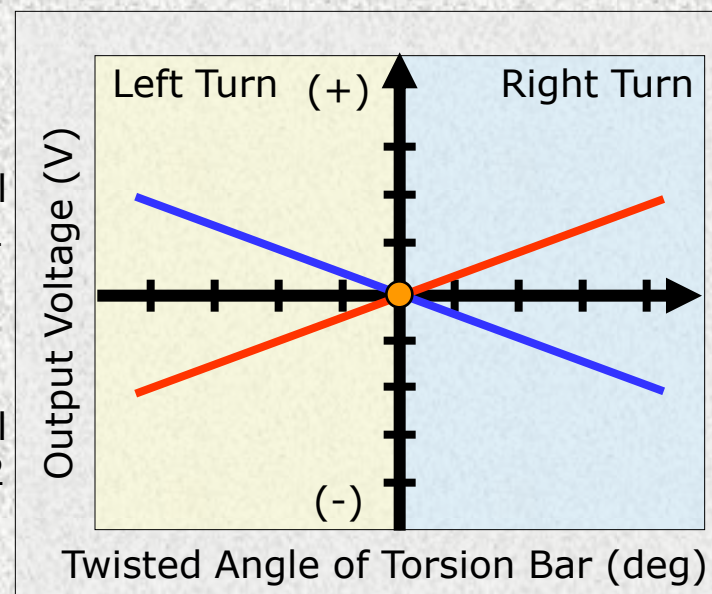
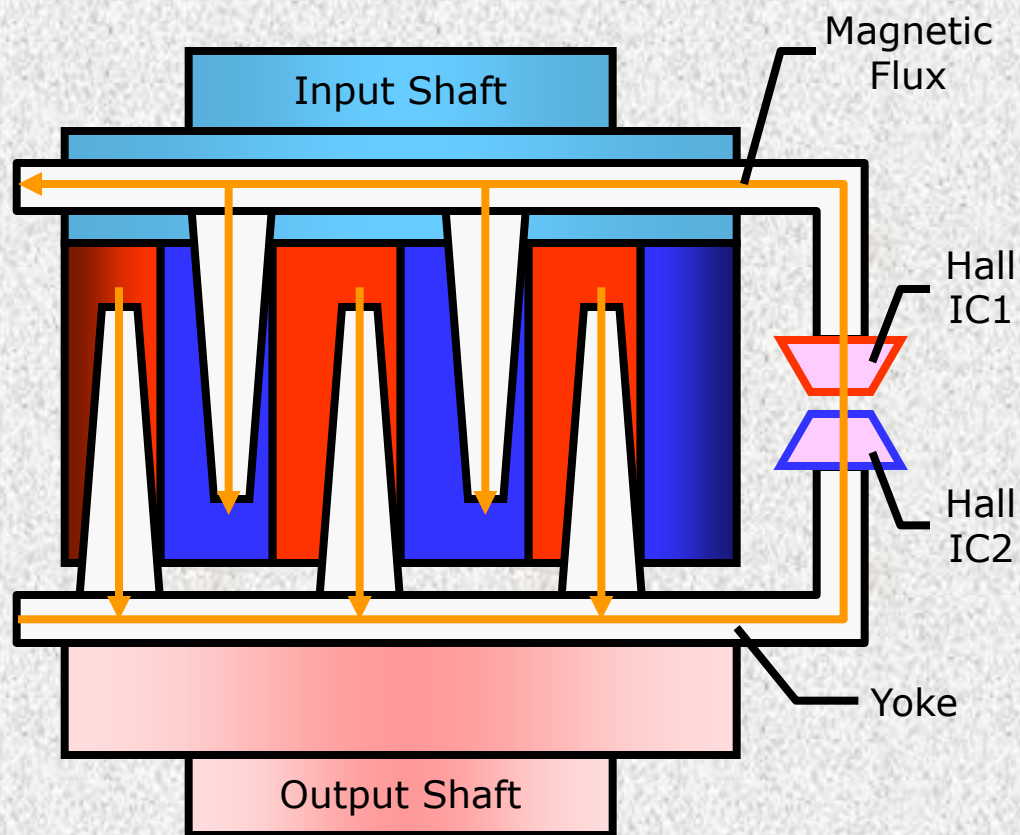
- Torque Sensor
 - Torque sensor using two hall ICs consists of a multipole magnet mounted on the input shaft, and a yoke mounted on the output shaft



Steering

- Torque Sensor (detection of twisted angle of torsion bar)
 - Hall ICs detect the direction of the magnetic flux

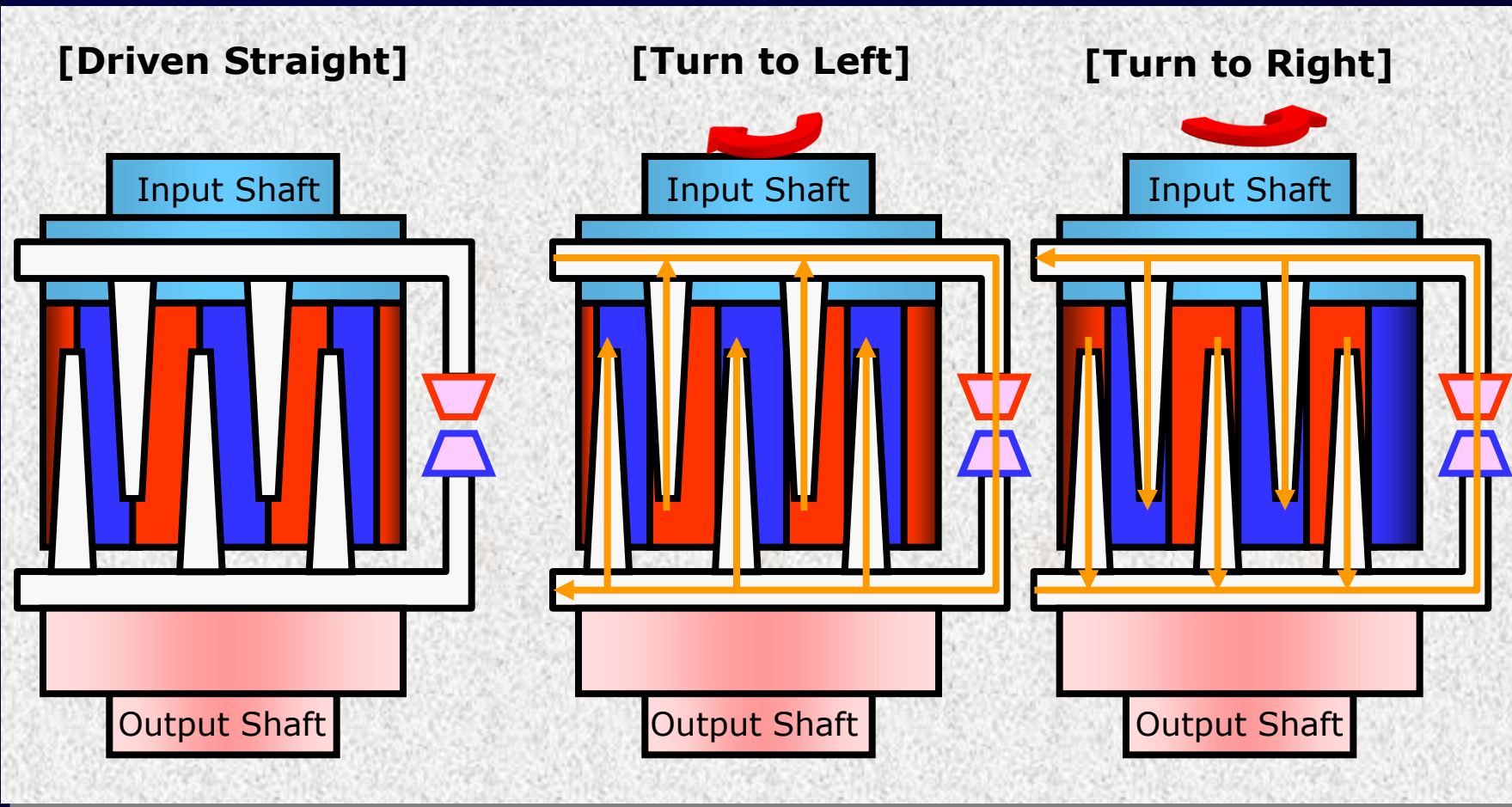
[When steering turned to Right]



- : Hall IC1 Signal
- : Hall IC2 Signal
- : Neutral Position

Steering

- Torque Sensor (detection of twisted angle of torsion bar)
 - Driven straight: Magnetic flux does not through in yoke
 - Turning: Detects the direction of the magnetic flux



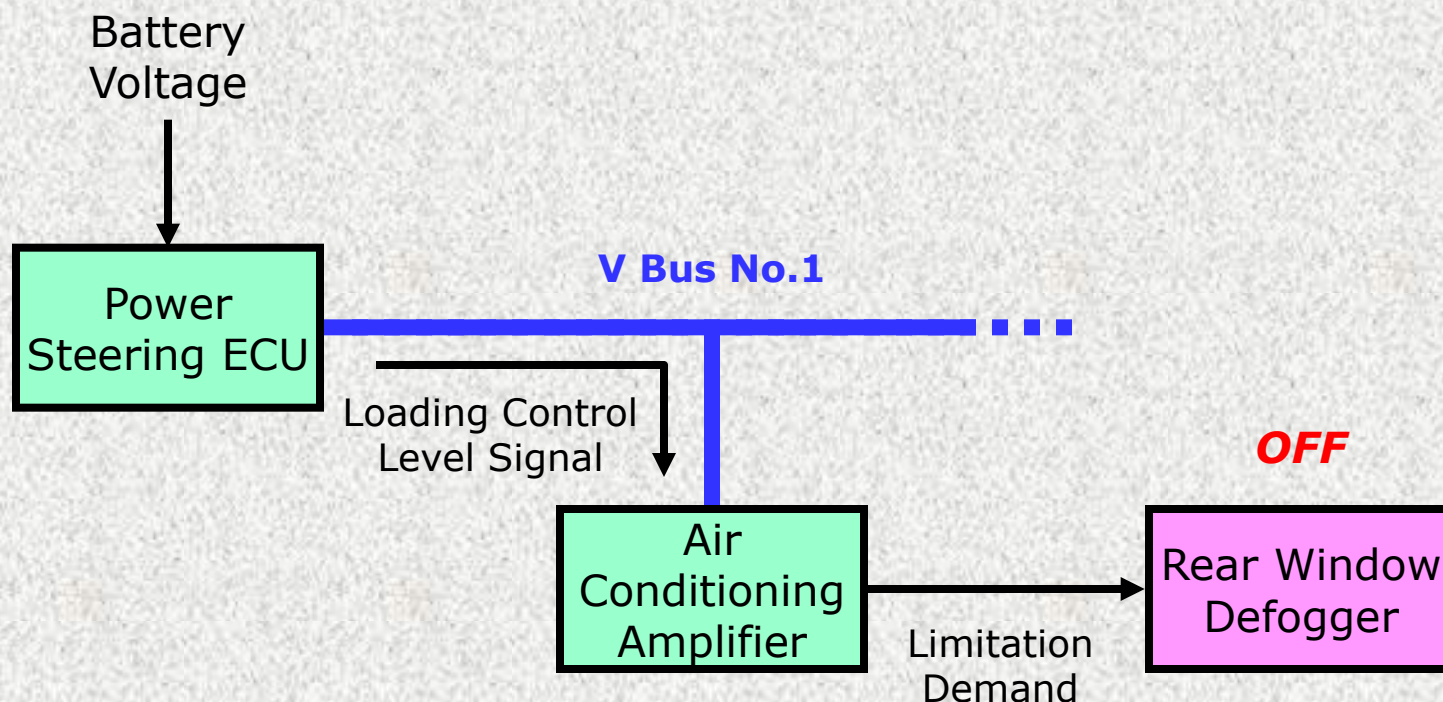
Steering

- **EPS Operation**
 - There are the following functions in assist control

Item	Function
Basic Control	Calculates the assist current from the steering torque value and the vehicle speed, and actuates the motor
Inertia Compensation Control	Improves the starting movement of the motor when the driver starts to turn the steering wheel
Recovery Control	During the short interval between the time the driver fully turns the steering wheel and the wheels try to recover, this control assists the recovery force
Damper Control	Regulates the amount of assist when the driver turns the steering wheel while driving at high speeds, thus damping the changes in the yaw rate of the vehicle body
System Overheat Protection Control	Estimates the motor temp. based on the amperage and the current duration . If the temp. exceeds the standard, it limits the amperage to prevent the motor from overheating
Cooperative Control with EPS	Controls EPS system in order to facilitate the driver to operate the steering in a direction that stabilizes the vehicle during VSC operating
EPS Electric Load Control	Limits the operation of the electric load when the battery voltage decreases

Steering

- EPS Electric Load Control
 - In order to prevent reduction of EPS assist force, when battery voltage becomes low, the operation of rear window defogger is limited



Steering

- Diagnosis and Fail-safe
 - When malfunction occurs in EPS system, power steering ECU controls following control:
 - Turns on P/S warning light and fail-safe operation

DTC No.	Detection Item	
C1511 / 11	Torque sensor malfunction	Illuminate
C1512 / 11		
C1513 / 11		
C1514 / 11	Torque sensor power supply abnormal	Illuminate
C1515 / 15	Torque sensor zero point adjustment undone	Illuminate
C1516 / 16	Torque sensor zero point adjustment incomplete	Illuminate
C1517 / 11	Torque hold abnormal	Illuminate
C1521 / 25	Motor malfunction	Illuminate
C1522 / 25		
C1523 / 24		
C1524 / 24		
C1525 / 17	Rotation angle sensor output initialization undone	Illuminate
C1526 / 18	Rotation angle sensor output initialization incomplete	Illuminate

Steering

● Diagnosis and Fail-safe

DTC No.	Detection Item	
C1528 / 12	Motor rotation angle sensor malfunction	Illuminate
C1531 / 25	ECU malfunction	Illuminate
C1532 / 25		
C1533 / 25	ECU malfunction	—
C1534 / 25		
C1541 / 13	Vehicle speed signal malfunction	Illuminate
C1551 / 25	IG power source voltage malfunction	Illuminate
C1552 / 22	PIG power supply voltage malfunction	Illuminate
C1554 / 23	Power supply relay failure	Illuminate
C1555 / 25	Motor relay welding failure	Illuminate
C1581 / 26	Assist map number un-writing	Illuminate
U0100 / 41	Lost communication with ECM	—
U0129 / 42	Lost communication with brake system control module	—

Steering

- Diagnosis and Fail-safe
 - When the system detects the malfunction, system enters to fail-safe mode as follows

Fail-safe Operation	Items
Disables the assist	• Torque sensor malfunction • Motor overcurrent • Motor short (Including drive system malfunction) • Power steering ECU malfunction
Limits the assist force	• Motor overheating • Power steering ECU internal temperature sensor malfunction
Temporary limits the assist*	• Vehicle speed signal malfunction • Engine speed signal malfunction • Power supply voltage malfunction

*: When the normal conditions are reestablished, it returns to normal controls

Service Point (Steering)

- Initialization and Calibration
 - Perform the initialization and calibration of EPS system in the following cases using the intelligent tester

	Assist Map Writing	Rotation angle sensor initialization	Torque sensor zero point calibration
Power steering ECU replaces	○	○	○
Steering column assembly replaces	-	○	○
Steering effort differs between turning left and right	-	○	○

NOTE: Initialization and calibration cannot be performed when the DTCs (C1516 and C1526) are stored