

Description

Power tailgate is an electro-mechanical system designed to provide power opening and closing of the tailgate through the push of a button of a remote key (fob), console switch, inner switch or an outside handle switch of the tailgate. The power tailgate will reverse direction of travel if resistance to movement is detected while the tailgate is being opened or closed.

Tailgate Position And Direction

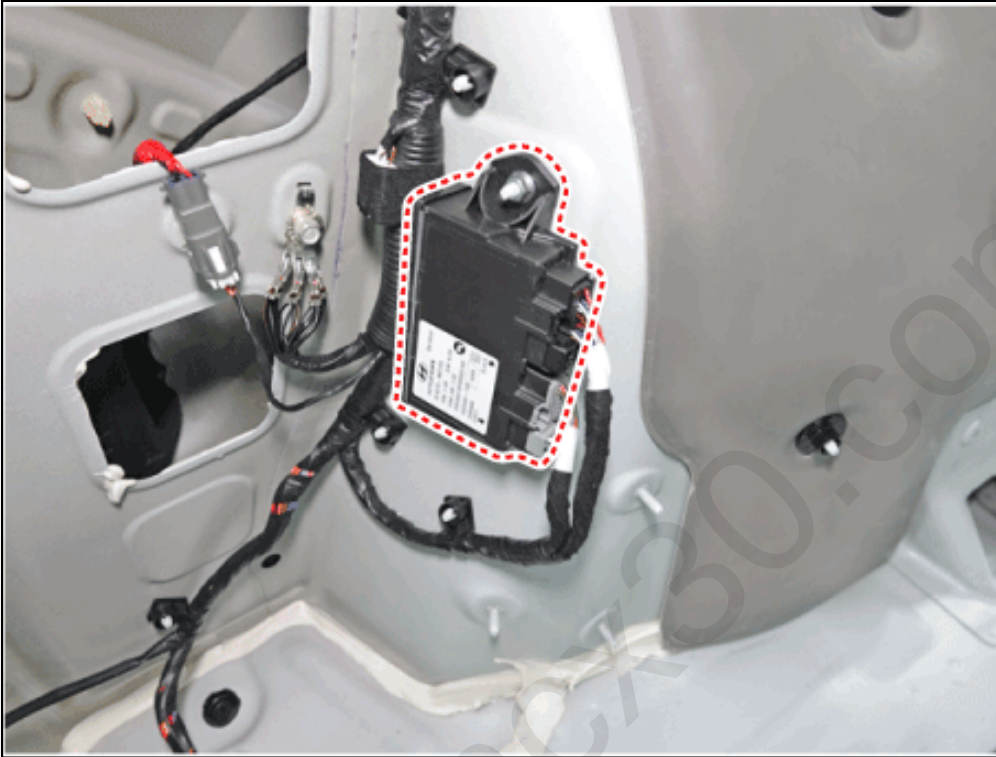
The PTG system will measure the Tailgate position via an integrated hall sensor inside the Spindle drive unit motor.

The moving direction of tailgate will be detected by analyzing the direction of the drive unit motor.

The hall sensor pulse counting (position detection) is active during power and manual operation mode.

System Components

1. PTG Unit

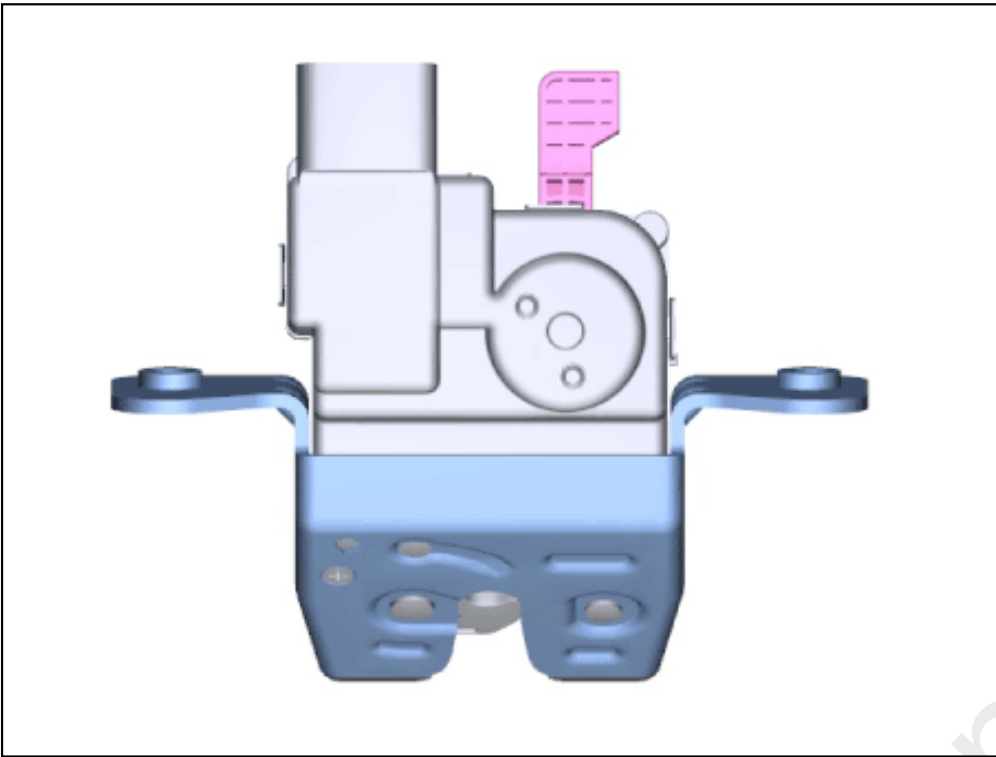


PTG unit is located in rear left luggage side trim.

PTG drive unit drive the two actuators (Spindles) by measuring the driving motors.

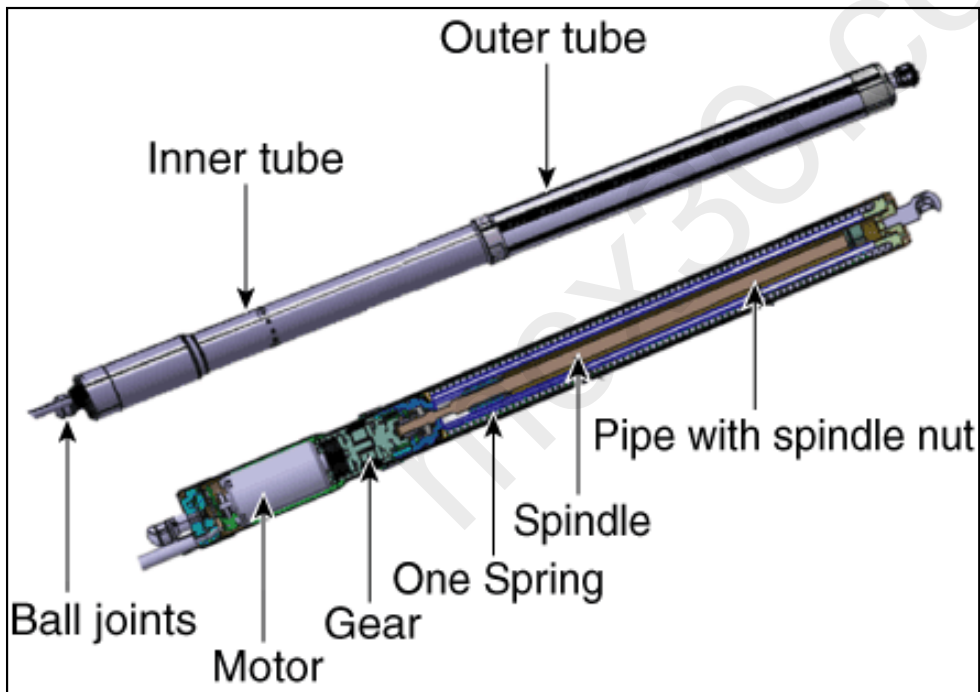
PTG unit also controls anti trap functions by hall sensor analysis in the anti-pinch strip.

2. PTG Latch Assembly



Power latch is located in the lower part of tail gate panel.

3. PTG Spindle



PTG spindle open and close the tailgate by driving the motor.

4. SMK (Smart key)



Push the power tailgate open of the SMK more than 0.5s to open the power tailgate. Power Open operation shall be reversed when an additional Open/Close signal is received during power opening.

5. Tailgate inner switch



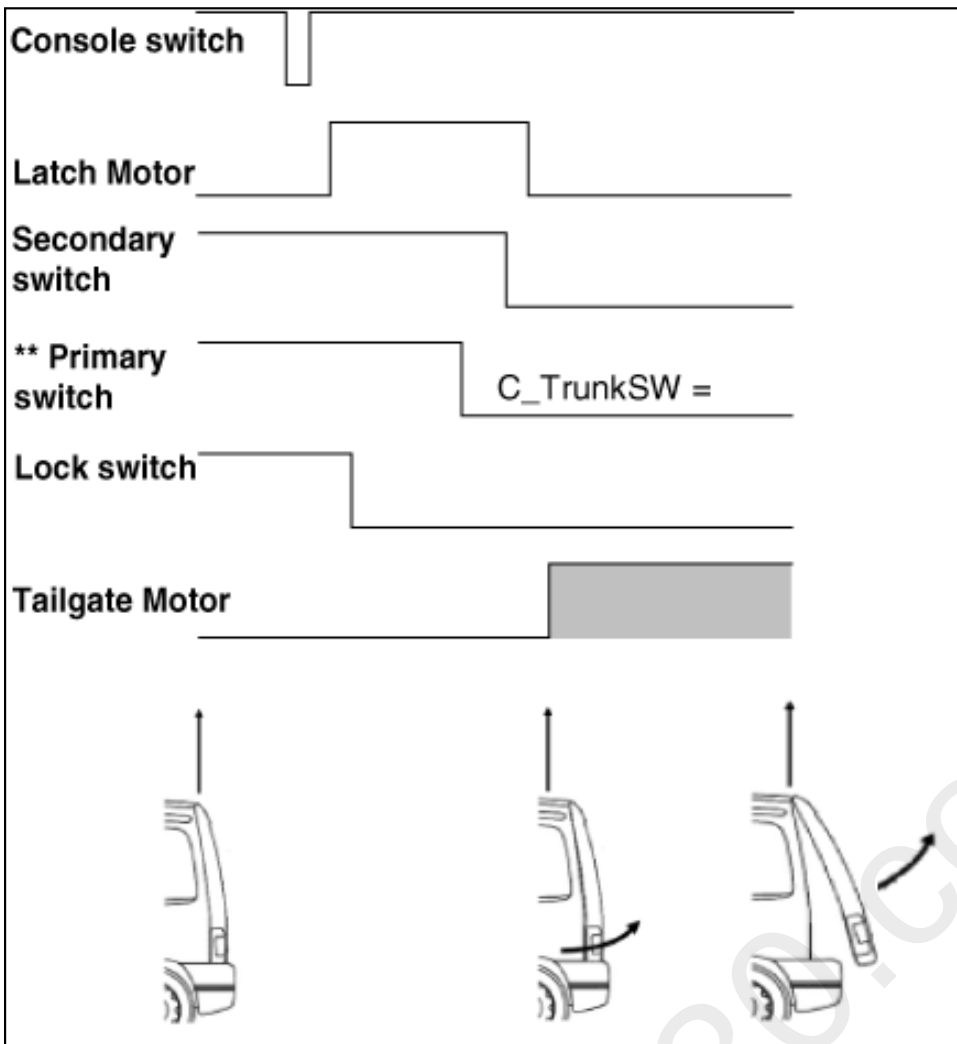
6. Tailgate buzzer



When a power operation cannot be performed as requested or an obstacle has been detected.

Operation

Power Tailgate Opening



** - Primary switch signal received by PTGM via CAN bus (sent by SJB)

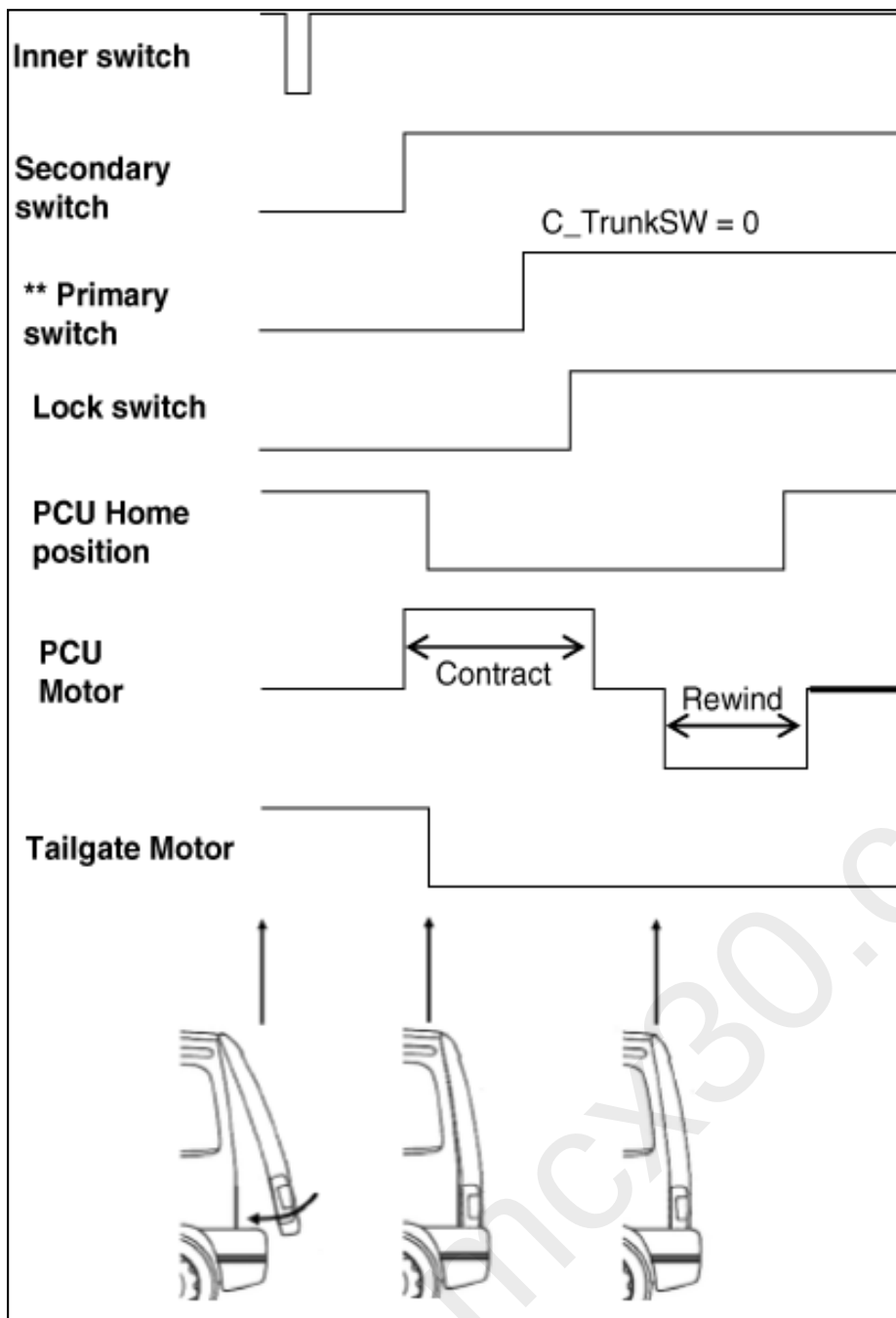
PTGM Opening procedure:

1. Opening can be triggered after a signal is received from, driver-console switch, outside handle switch, remote Key (FOB)
2. The latch will be released (by SJB) by actuation of latch motor.
3. On latch release, the tailgate latch pops out of the striker.
4. PTG module controls the tailgate motor in order to open the tailgate.
5. The rotating speed of the tailgate motor can be hall sensor that is built in the motor.
6. Opening angle of the tailgate is calculated by counting the input pulse signals from Hall sensor.



When the motor movement is restricted, the PTGM stops the tailgate motor movement due to obstacle detection.

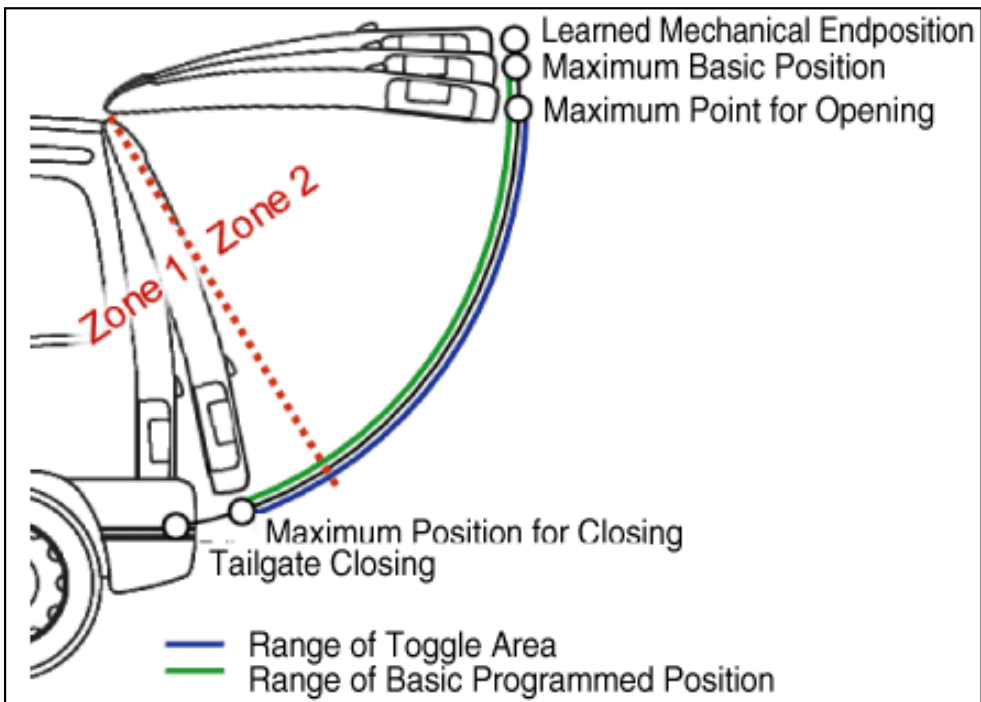
Power Tailgate Closing



PTGM Closing procedure:

1. Closing can be triggered after receiving a signal from, console (driver) switch, outside handle switch, remote key (FOB), inner switch
2. PTGM module controls the tailgate motor in order to close the tailgate
3. Closing angle of the tailgate is calculated by counting the input pulse signals from hall sensor
4. The rotating speed of the tailgate motor can be hall sensor that is built in the motor
5. The tailgate latch engages with the striker and the latch is locked mechanically (Latch unlock → Latch lock)
6. PTGM stops the tailgate motor operation after detecting the tailgate latch's secondary signal
7. On detecting the latch's secondary signal, the power close unit (PCU) starts the contract (cinch) operation and stops after the latch lock signal is detected
8. After contract operation is stopped, PCU is rewound until the PCU home position is reached
9. The tailgate is completely closed and latch is fully locked

Learned/Calculated/Programmed positions



1. Maximum Point for Opening

Above this position a start in opening direction could make the tailgate move beyond the Maximum Basic Position and overload the mechanical system (hinges).

Therefore the start of an opening action above this point is disabled.

Anyway the tailgate moves beyond this point, if it has been started at a lower position.

2. Learned Mechanical End Position

This is the mechanical block position while opening and is considered to be 100% opening. During the first tailgate opening this position is learned.

After learning, the tailgate will not move beyond the Maximum Basic Position, which is defined by the Learned Mechanical Position – Security Distance.

All positions are defined by parameters in the ECU or programmed by the user (Basic Programmed Position)

Programming the max. T/gate opening (Garage Position)

1. The customizable Programmed Basic Position is set equal to the Maximum Basic Position after the Learned Mechanical End Position is learned.

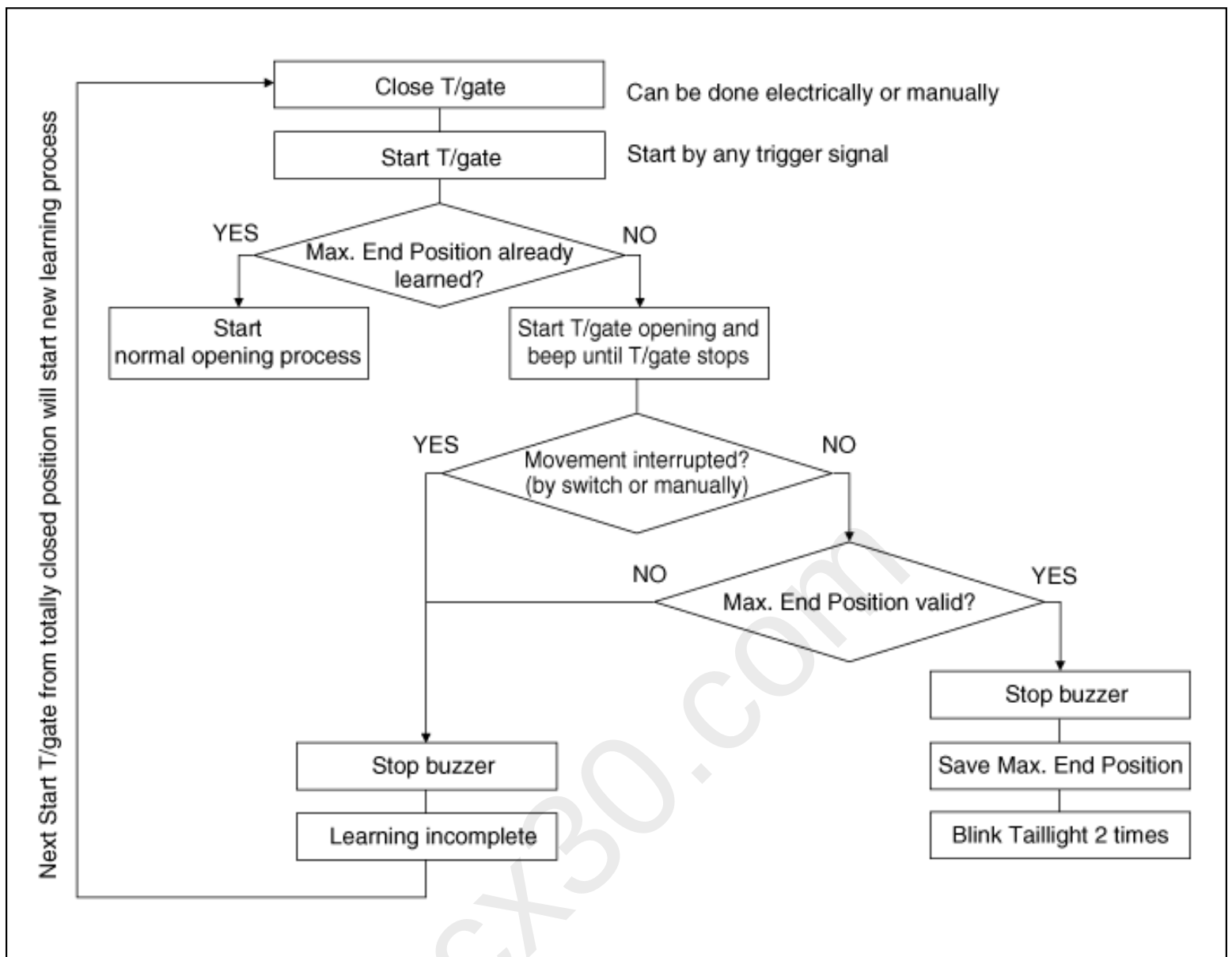
- The customer can change the Programmed Basic Position to any new position between the Maximum Point For Closing and the Maximum Basic Position.
- If the customer wants to set a new Programmed Basic Position below the actual Programmed Basic Position, he has to move the tailgate electrically or manually to the new position and has to push the Inner Switch for e.g. 3 seconds (time can be modified by parameter)
- If the customer wants to set a new Programmed Basic Position above the actual Programmed Basic Position he has to move the tailgate manually to the new position and has to push the Inner Switch for 5 seconds (time can be modified by parameter)
- If the user tries to program a tailgate position above the Maximum Basic Position, the ECU will set the Programmed Basic Position to the Maximum Basic Position.

System Parameterization

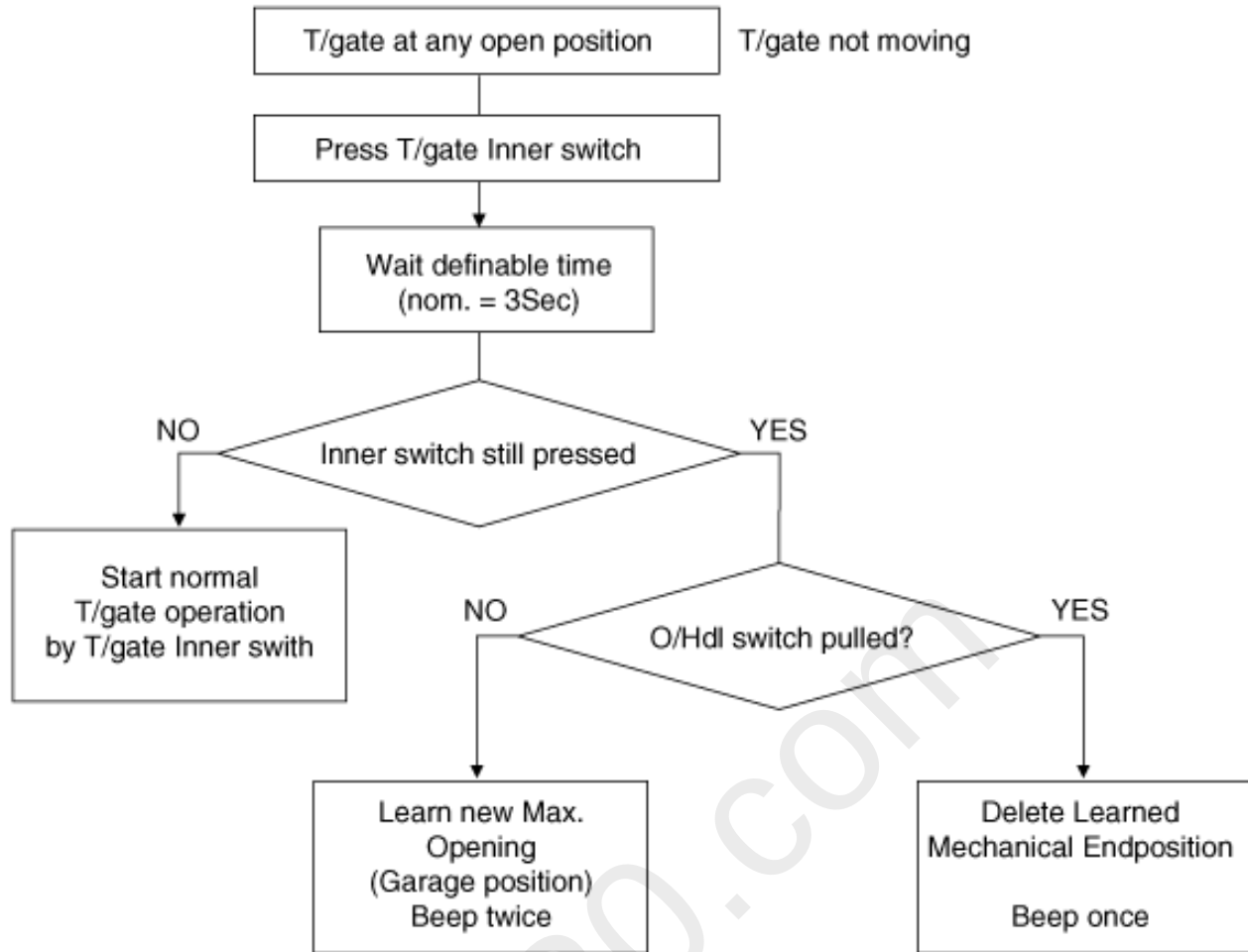
Due to mechanical tolerances and adjustments in vehicle production and assembly the power operated tailgate needs calibration of the maximum movement range before proper operation can be ensured.

The tailgate's maximum movement range is represented by the number of Hall-pulses received by the ECU from the actuators' speed / position sensors during a tailgate movement from the fully closed position (closure unit in fully latched position) to the upper end position limited by mechanical constraints (e.g. upper bump stops, spindle length or similar).

Calibration Mode



Manual De-calibration Mode



Buzzer operation is defined in the following chart

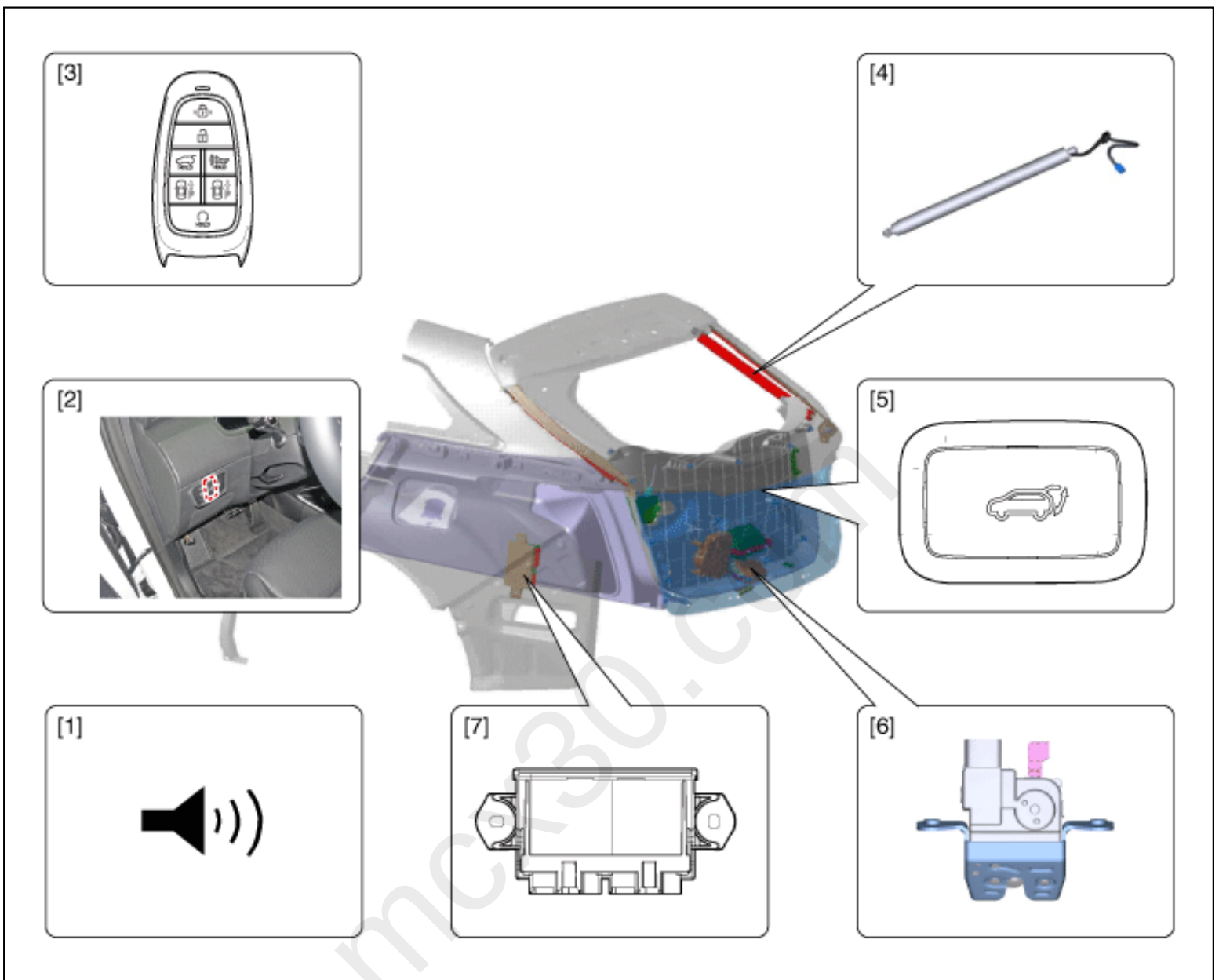
	BUZZER	LAMP *)	Remark
T/gate start	2 times	2 times	When T/gate is triggered by Remote Contol or T/gate Console Switch
T/gate start	n.a.	n.a.	When T/gate is triggered by T/gate Inner Switch or T/gate Outer Handle Switch
T/gate stop	n.a.	n.a.	
System error	3 Times	-	PCU/Tailgate antiplay active, Over-/undervoltage condition, Endposition-/position error, spindle error, CAN error, Latch closed when Tailgate open

T/gate not closed	10 times	10 times	Latch Lock Switch not present
During Calibration run	Continuous ON-OFF beeping	n.a.	Activate buzzer but not C_PTHazard
Max. End Position learned	n.a.	2 times	Buzzer confirms learning finished
Max. End Position deleted	1 time	n.a.	Buzzer confirms "position deleted"
Car is moving with open T/gate	10 times	n.a.	T/gate open AND Speed >3km/h
Garage Position saved	2 times	n.a.	Buzzer confirms "New Garage Position"

*) Lamp will be synchronized by sending C_PTHazard simultaneously to Buzzer signal

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Component
Location



- | | |
|--|--------------------------|
| 1. Buzzer | 5. Tailgate inner switch |
| 2. Tailgate open switch (Crsah pad lower switch) | 6. Power Latch |
| 3. Fob key | 7. PTG Control Module |
| 4. Spindle Drive (2EA) | |

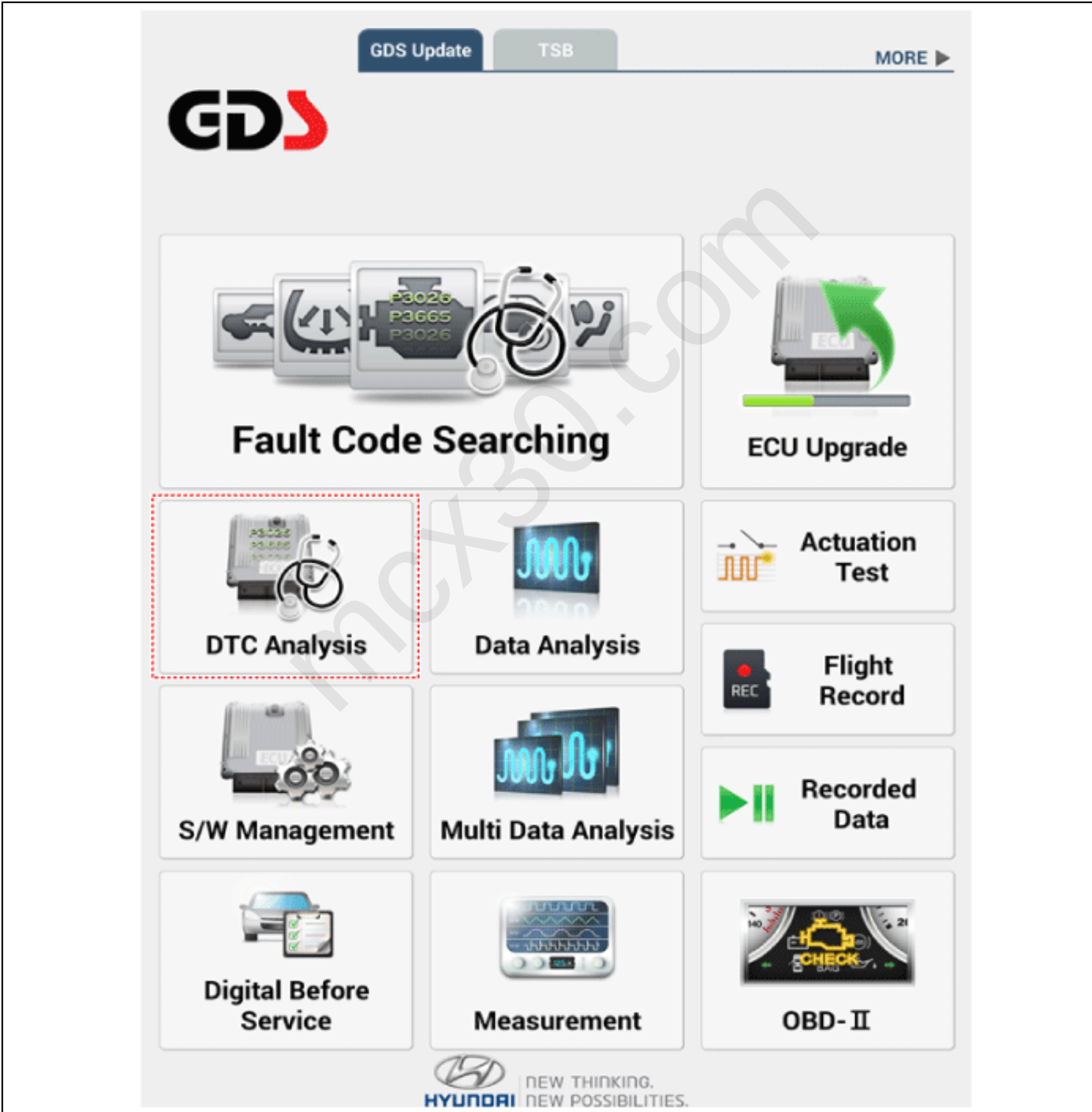
Tailgate Inner Switch

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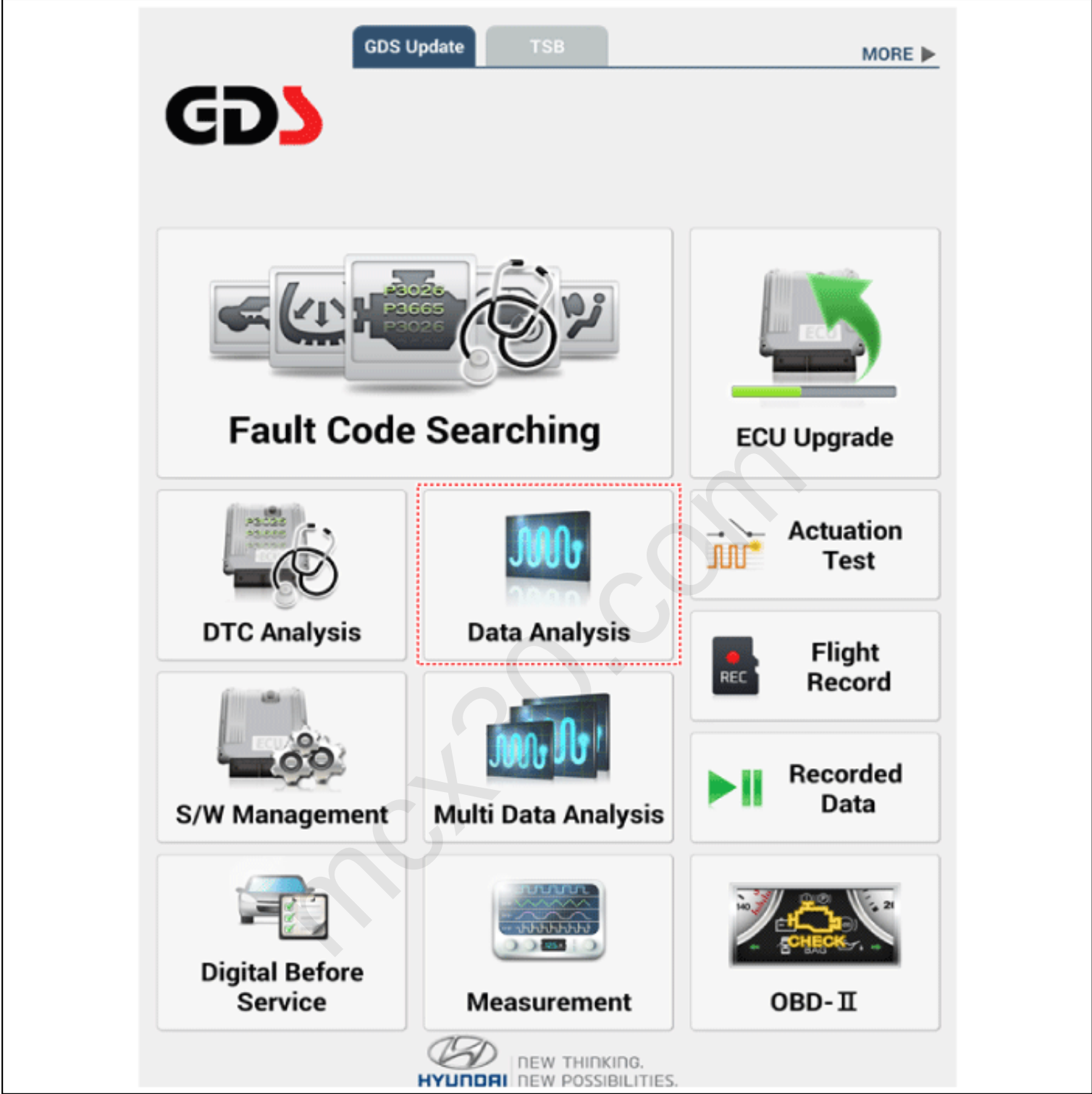
Failure
Inspection

Diagnosis with diagnostic tool

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (diagnostic tool).
The diagnostic system (diagnostic tool) provides the following information.
 - (1) Fault Code Searching : Checking failure and code number (DTC)
 - (2) Data Analysis : Checking the system input/output data state
 - (3) Actuation test : Checking the system operation condition
 - (4) S/W Management : Controlling other features including system option setting and zero point adjustment
2. If diagnose the vehicle by diagnostic tool, select "DTC Analysis" and "Vehicle".



3. Select the 'Data Analysis'.



4. Select the 'PTG' to search the current state of the input/output data.

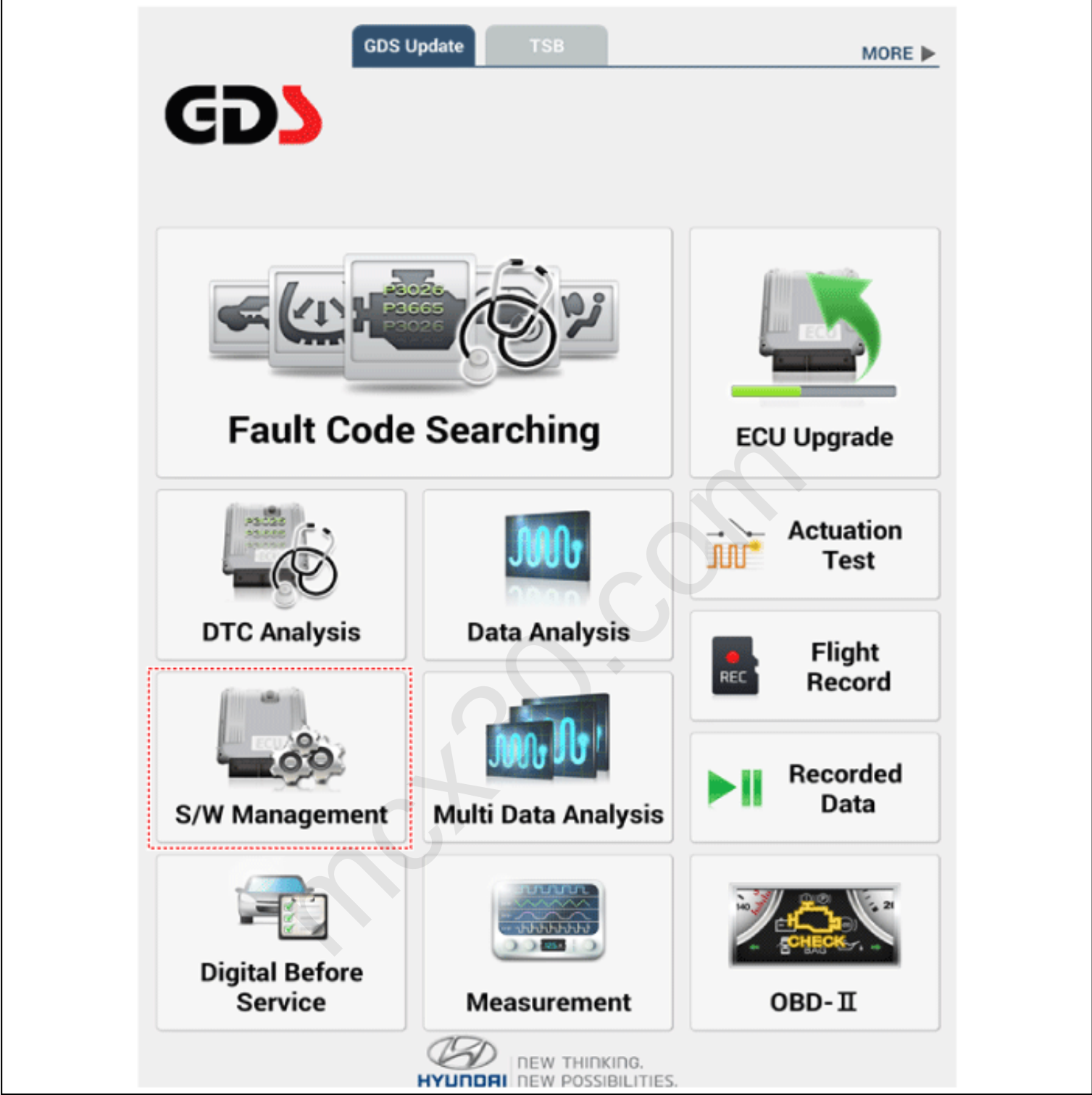


Data Analysis			
Stop Graph Selective Display Actuation Test			
Sensor Name(33)	Value	Unit	Link Up
Power Tailgate Inline Mode	Field Mode	-	
Power Tailgate Open Restrict Option	Default	-	
Battery Voltage	11.4	V	
Driver Motor Operating Current - LH	0.00	A	
Cinching Motor Cinching Current	0.00	A	
Tailgate Position	0.0	%	
Hall Sensor Operation status LH	0	RPM	
ECU Temperature	25	'C	
Driver Motor Operating Current -RH	0.00	A	
Hall Sensor Operation status RH	0	RPM	
Latch Secondary Switch Status	OFF	-	
Latch Lock Switch	OFF	-	
PCU Home Position Switch Status	OFF	-	
Tailgate Interior Switch (Console Switch)	NOT PRESS	-	
Tailgate Inner Switch	NOT PRESS	-	
LED On/Off	OFF	-	
Hazard Lamp	Inactive	-	
Buzzer State	Inactive	-	
Tailgate Command Status	Not Moving	-	
Cinching Motor Command Status	OFF	-	

Mode Change (Power Tailgate System)

1. After replacing with a new power tailgate module, check for DTC code at all times.
If DTC code B24B0 exists, perform power tailgate mode change.

2. After connecting the diagnostic tool, Select the 'S/W Management' and 'Car model'.



3. Select the "Power Tailgate" and Power Tailgate Mode Configuration" procedure.



4. Perform the "Power Tailgate Mode Configuration" procedure according to the diagnostic tool screen message.

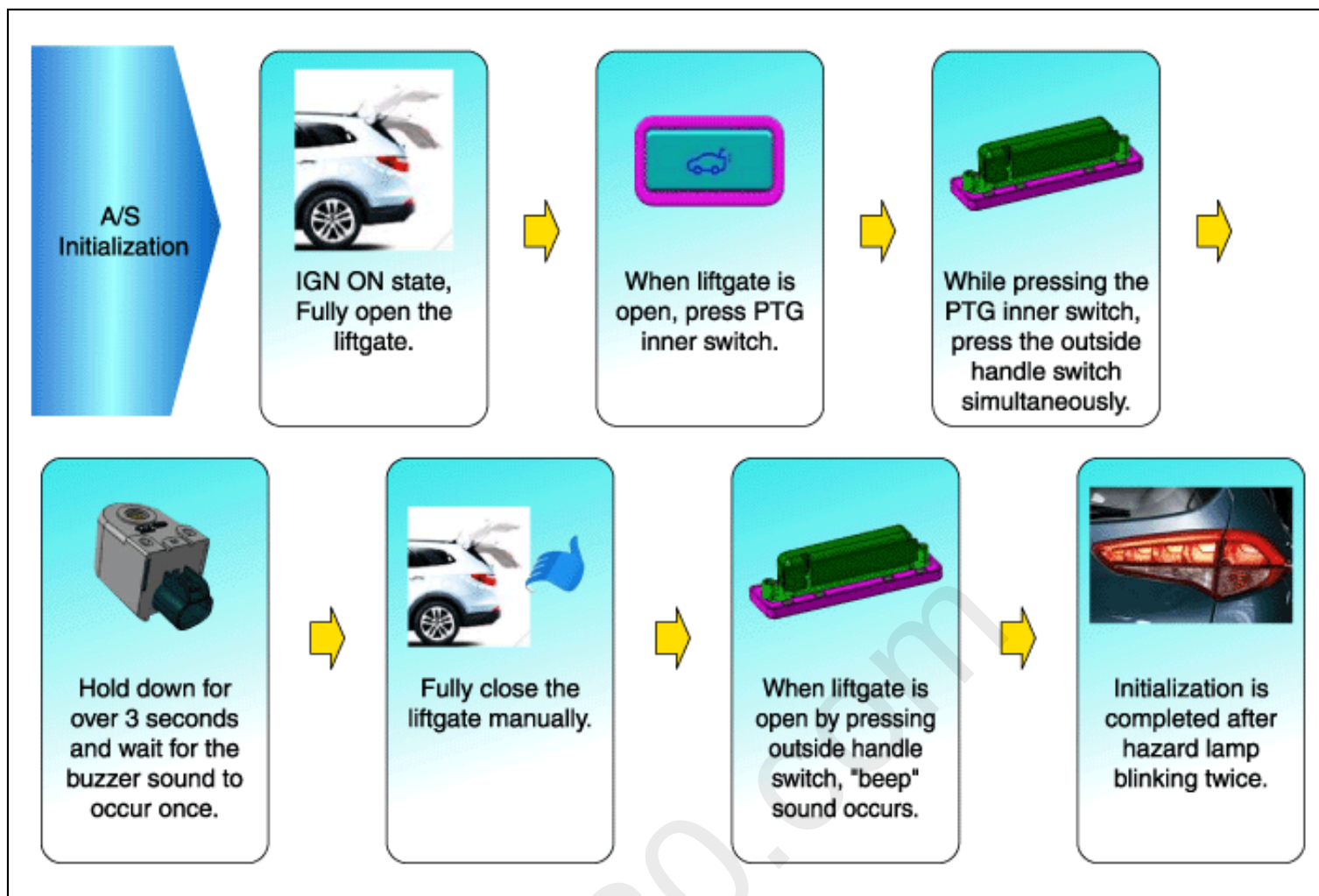
System Initialization

System initialization is needed to recognize the closing position of the tailgate to power tailgate module.

The initialization process after battery power reset, system initialization is needed to recognize the maximum opening and closing tailgate position exactly.

The power tailgate operates normally after system initialization is completed.

Procedure :



Inspection and Test - Power Tailgate System

Power Tailgate system is a complex system that consists of several components. To get an accurate test result, the control module of the Power Tailgate must be inspected.

The most trustworthy, effective and accurate method is using diagnostic tool required by power tailgate.

diagnostic tool helps technicians when inspecting a disabled switch, and enables to check the current status record of the switch of Power Tailgate control module.

The battery must be fully charged before conducting all of the test on power tailgate, and all of the interfering elements of the system must be shown and understood. (refer to the explanation of smart tailgate) Refer to the analysis reference table when inspecting and testing the smart tailgate.

Status	Cause	Solution
Sudden opening of tailgate	Activation by mistake or malfunction of open/close switch	Check for short or malfunction of short circuit of switch
	Latch assembly failure	Check for wiring connection
		Check for failure code, and replace the latch if needed
	Failure of Smart Tailgate or the body control module	Reset the module fuse or reconnect the battery. If it does not operate properly, check the wiring connection and analyze manual.
	False indication, or not parked status	Check a switch status using analyzing device
	Low voltage of the Power Tailgate module battery	Check for proper voltage of the Power Tailgate
		Battery charged

Unable to power open and close the tailgate	Swelling of the fuse	Check if the fuse is swollen
	Malfunction of PTG spindle	Check for PTG spindle status
	Critical code failure at BCM/tailgate control module	Check for code status using diagnostic tool
	Latch assembly failure	Check if the wiring connection of fuse are swollen.
		Check if there's any alien object interfering with the operation of latch assembly.
Unable to open and close of the tailegate	Failure in motor assembly	Check for motor assembly
	Interference of the consisting components	Replace the needed parts or reset the affected position.
	Wiring problem (system or vehicle)	Resolve the problem using the wiring map.
		Refer to wiring diagram.
Loss of electricity during the tailgate operation	Wiring problem (system or vehicle)	Resolve the problem using the wiring map.
		Refer to wiring diagram.
	Low voltage of vehicle battery	Check for proper voltage of PTGM.
		Charge the battery
	Failure in Power Tailgate or BCM	Check for failure code using analyzing device
Power latching unable at Primary/Secondary position	Failure in motor assembly	Test the motor assembly
	Latch assembly failure	Check if the wiring connection of fuse are swollen.
		Check for failure code using analyzing device
		Resolve the problem using a vehicle analyzing manual.
		Replace the latch assembly if needed.
	Interference of the consisting components	Replace the needed parts or reset the affected position.
	Failure in Power Tailgate or BCM	Check for failure code using analyzing device
	Excessive sealing force of the tailgate	Check for shock on sealing, assembly failure, alien object or other possible factors.
	Failure in motor assembly	Check the motor assembly
Unable to unlock the latch at Primary position	False indication, or not parked status	Check switch status using analyzing device
	Low voltage of the Power Tailgate module battery	Check for proper voltage of the Power Tailgate
		Battery charged
	Swelling of the fuse	Check if the fuse is swollen
	Latch assembly failure	Check switch status using analyzing device
		Check for alien object interfering with the latch assembly operation or shock on components.

		Resolve the problem using a vehicle analyzing manual.
		Remove the latch assembly if needed.
	Failure in outside handle connection	Check for handle joint and wiring connection.
	Failure of Power Tailgate or the body control module	Check for the failure code or cycle using analyzing device.
	Interference of the consisting components	Replace the needed parts or reset the affected position.
Tailgate operation using pop/console switch unavailable.	Swelling of the fuse	Check if the fuse is swollen
	Low voltage of PTGM	Check for proper voltage of PTGM.
		Charge the battery
Unable to unlock the electric lock	Failure on the latch assembly	Check for alien object interfering with the latch assembly operation or shock on components.
		Check for the failure code or cycle using analyzing device.
		Check for pole/latch switch using analyzing device.
		Resolve the problem using the vehicle inspection manual
Unable to unlock the electric lock	Failure of Power Tailgate module	Resolve the problem using the vehicle inspection manual
	Failure of Body Control Module (BCM)	Resolve the problem using the vehicle inspection manual
		Replace BCM if needed
	Malfunctioning of wireless remote control key	Rewrite the wireless remote control key program
		Replace the wireless remote control key
	Malfunctioning of the tailgate motor assembly	Check for alien object interfering with the motor assembly operation.
		Check for wiring connection
		Change the assembly if motor clutch is not operable
		Replace the switch if the full opening switch is not working
		Resolve the problem using the vehicle inspection manual
		Replace the motor if needed
Unable to maintain opened status of the tailgate	Failure on PTG spindle	Replace PTG spindle
		Check if attached objects are damaged
Excessive operating force when opening and closing	Failure on PTG spindle	Replace PTG spindle
		Check if attached objects are damaged

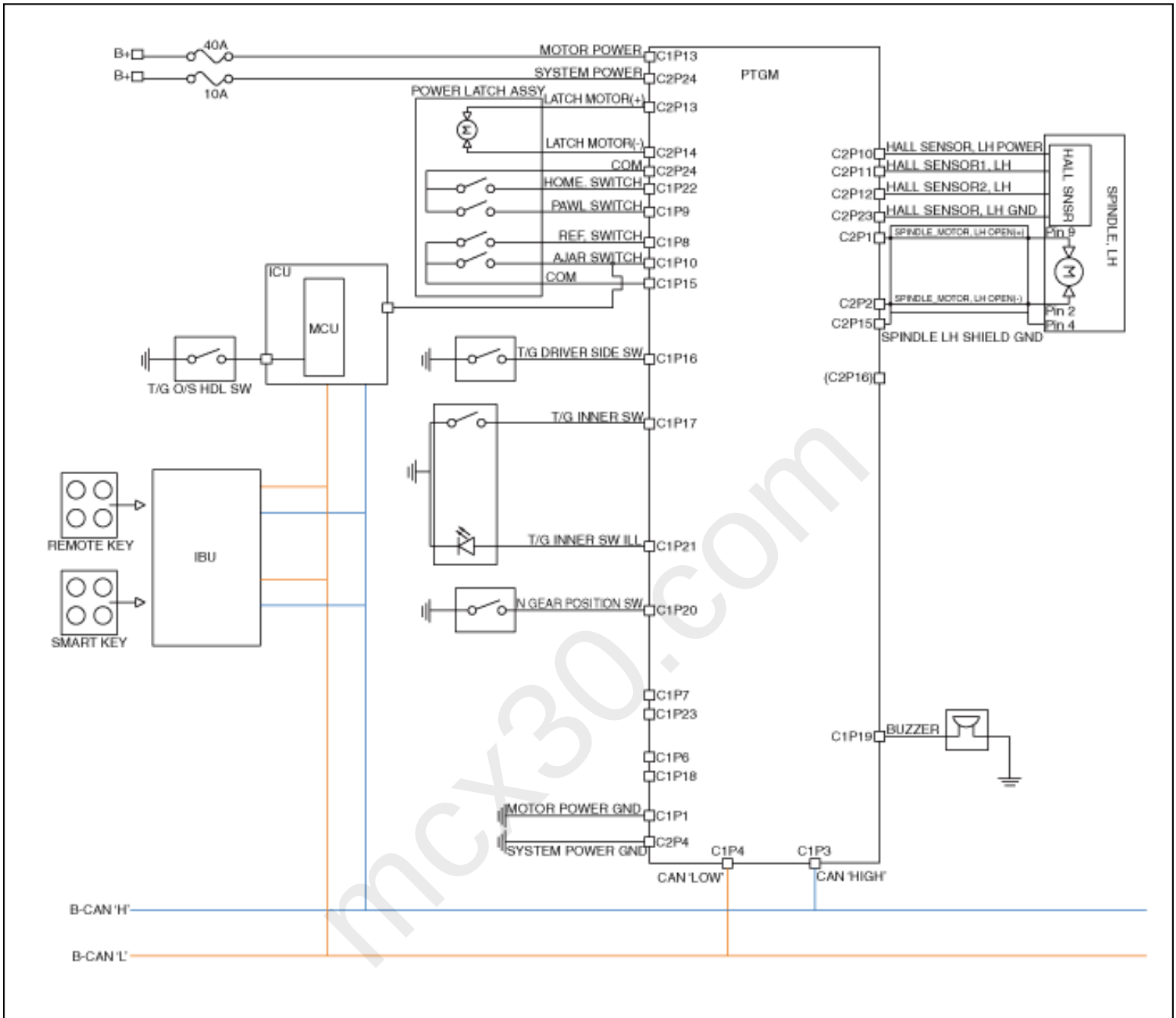
	Interference of the consisting components	Replace the needed parts or reset the affected position.
When tailgate keeps cinching lock mode	Failure on the latch assembly	Check if wiring connection and fuse are swollen
		Check the switch with analyzing device
When tailgate keeps electric lock mode	Failure on the latch assembly	Check for wiring connection
		Check for any alien object
		Resolve the problem using the vehicle inspection manual
	Malfunctioning of the control module	Check for failure code using analyzing device
	Wiring problem (system or vehicle)	Resolve the problem, referring an electric circuit
		Refer to wiring diagram.
		Check for the vehicle inspection manual for detailed process
	Failure of the motor assembly	Check for operating environments constantly
Very slow opening of the tailgate	Vehicle battery voltage too low	Check for proper voltage of PTGM.
		Charge the battery
	Malfunctioning of the tailgate PTG spindle	Replace the tailgate PTG spindle if needed
	Interference of the consisting components	Replace the needed parts or reset the affected position.
	Vehicle angle too steep for electric operation	Operate the tailgate manually
	Malfunctioning of the tailgate motor assembly	Replace the motor assembly if needed
Rattling or squeaky sound	Alien object jammed in tailgate components	Remove the alien object
	Excessive tightening or loosening of the components	Resolve the excessive tightness or looseness

Components



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Circuit Diagram

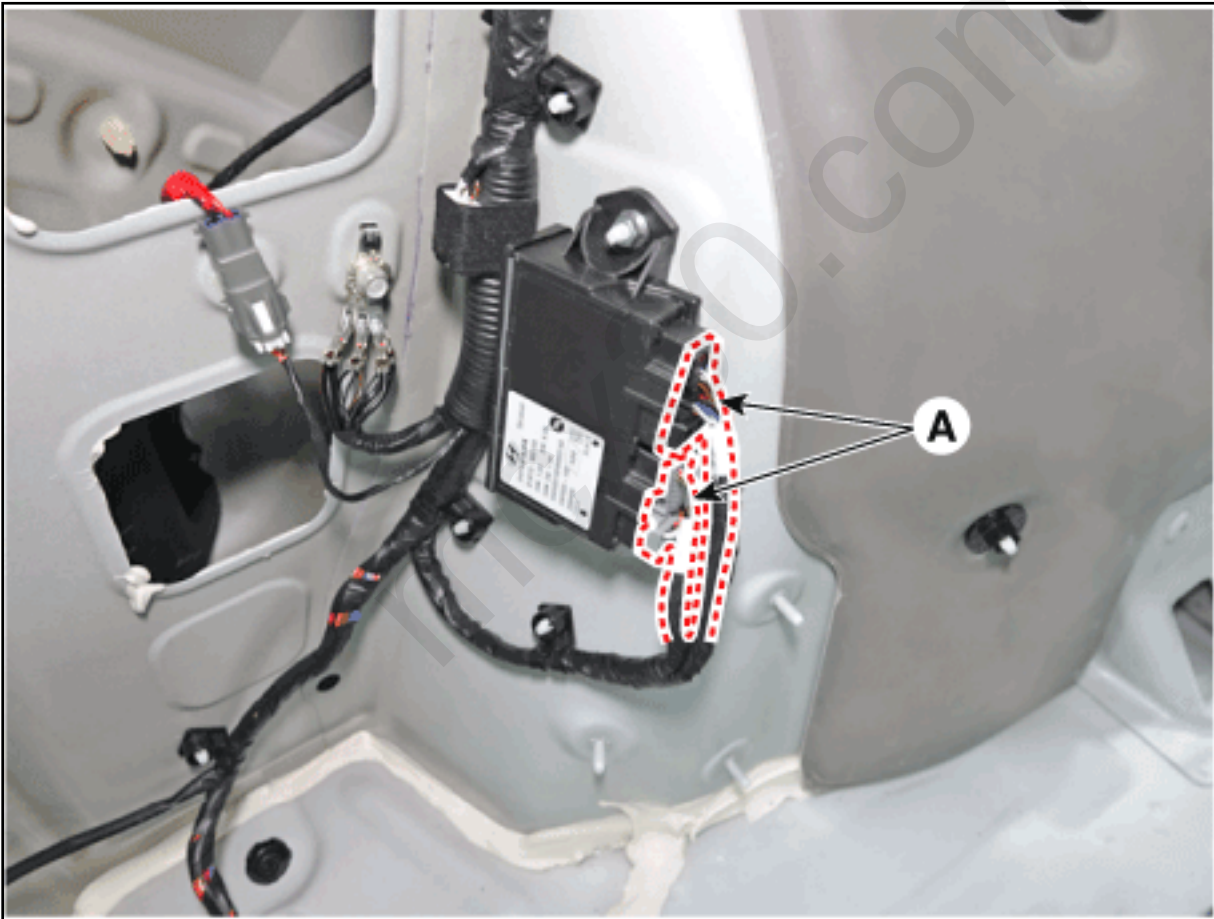


Removal

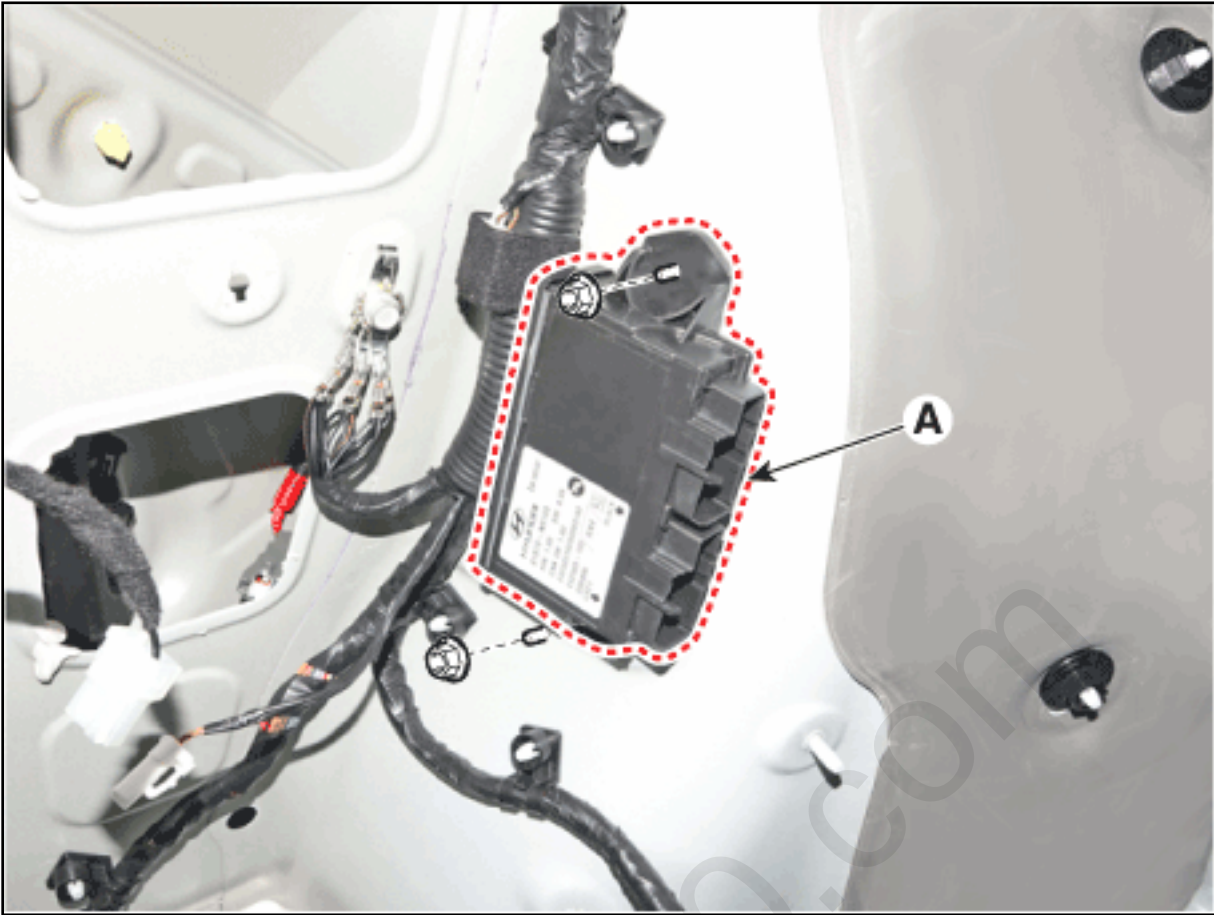


- 1) After replacing with a new power tailgate module, check for DTC code at all times.
If DTC code B24B0 exists, perform power tailgate mode change.
(Refer to Power Tailgate Module - "Troubleshooting")
- 2) After replacing with a new power tailgate module, perform the system initialization.
(Refer to Power Tailgate Module - "Troubleshooting")
- 3) Before delivery to customer, operate the power tailgate to be sure that there is no warning sound.

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage side trim LH.
(Refer to Body - "Luggage Side Trim")
3. Disconnect power tailgate unit connectors (A).



4. Remove the power tailgate unit (A) after loosening mounting nuts.



Installation

1. Install the power tailgate unit.
2. Install the luggage side trim LH.
3. Connect the negative (-) battery terminal.

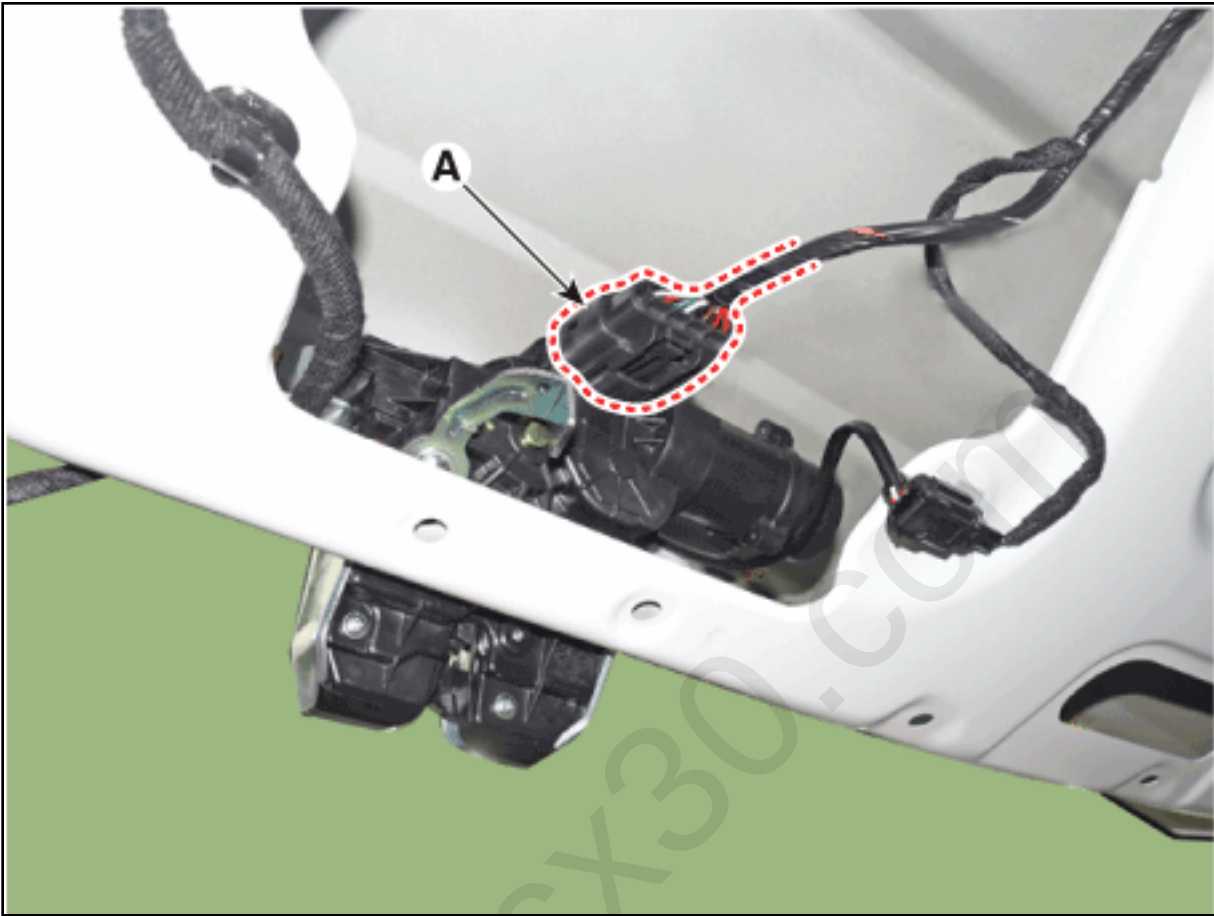
Inspection

Inspection of the Power Tailgate System

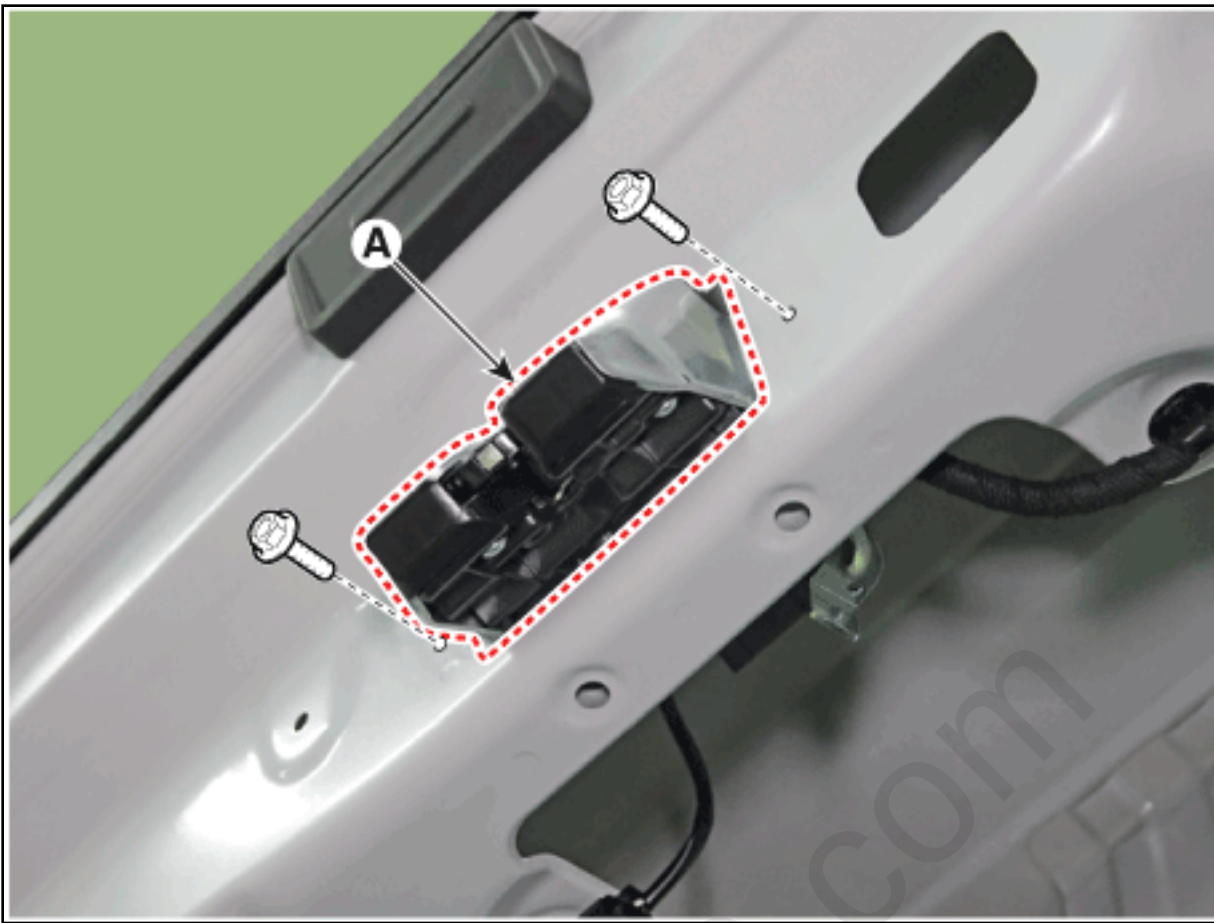
Refer to Power Tailgate System - "Troubleshooting"

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.
(Refer to Body - "Tail Gate Trim")
3. Disconnect the latch connector (A).



4. Remove the power tailgate latch (A) after loosening mounting bolts.



Installation

1. Install the power tailgate latch.
2. Install the tailgate trim.
3. Connect the negative (-) battery terminal.

Inspection

Inspection of the Power Tailgate Latch

Refer to Power Tailgate System - "Troubleshooting"

Removal

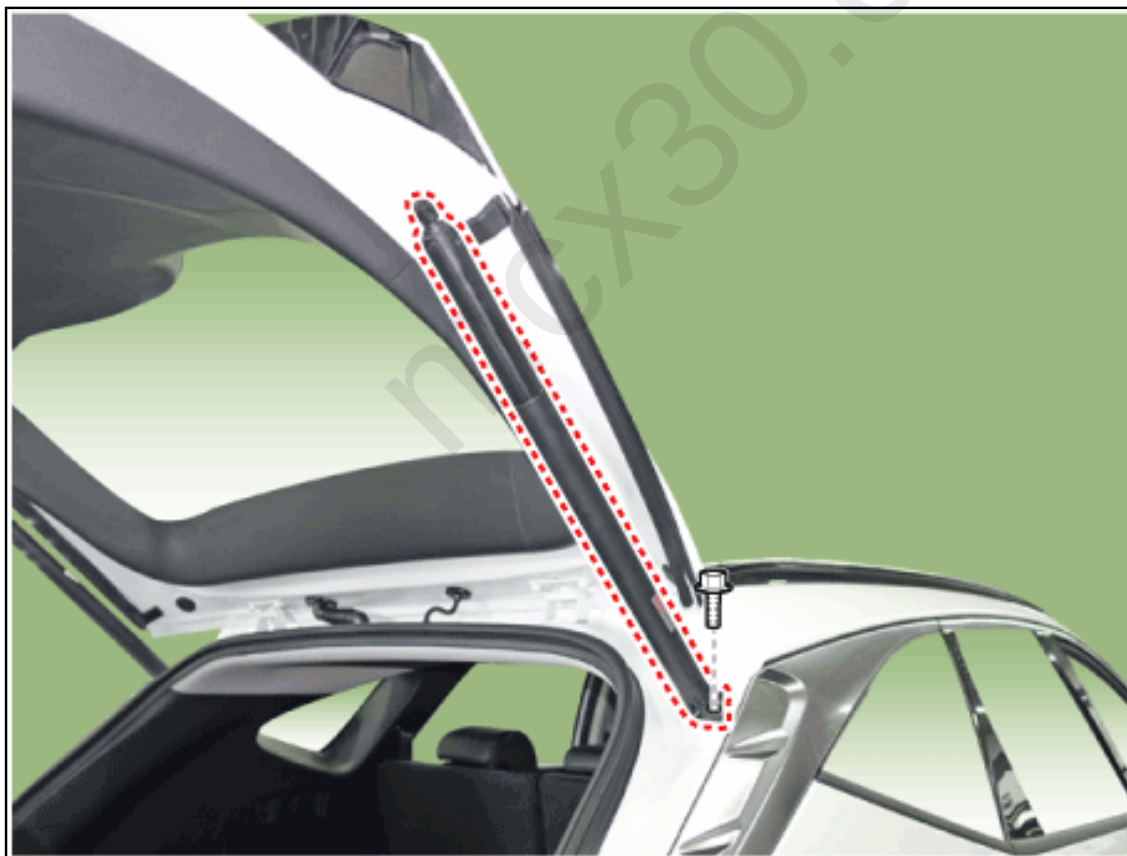
1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.
(Refer to Body - "Tail Gate Trim")
3. Disconnect the PTG spindle connector (A).



4. Using a flat-tip screwdriver, remove the mounting clip (A).



5. Remove the spindle assembly after loosening mounting bolts.



- Take care not to be closed the tail gate, when removing the lift.

Installation

1. Install the PTG spindle assembly.
-

Tightening torque :

6.9 - 10.8 Nm (0.7 - 1.1 kgf.m, 5.0 - 7.9 lbf.ft)

2. Connect the PTG spindle connector.
3. Install the luggage side trim.
4. Connect the negative (-) battery terminal.

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