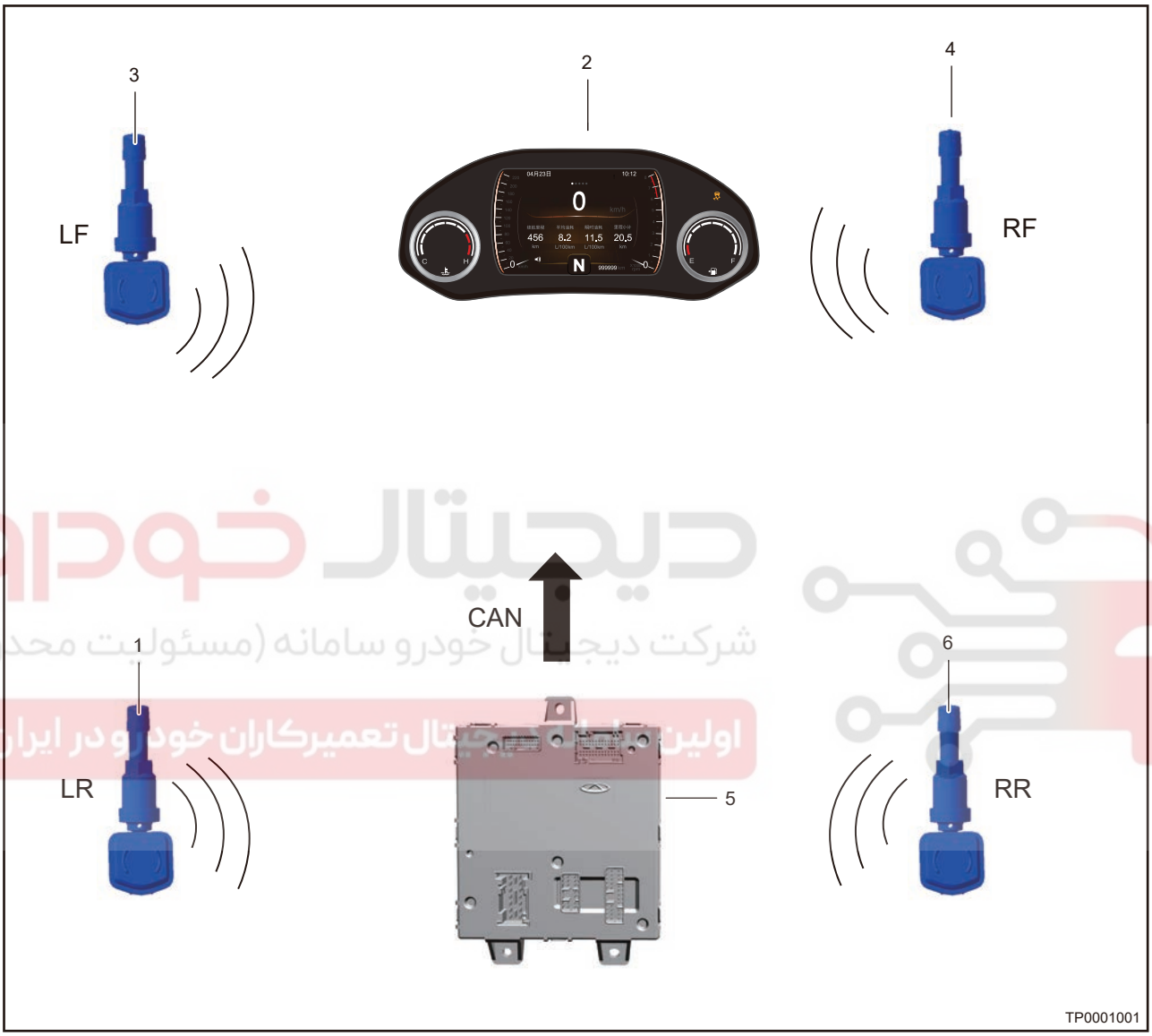
TIRE PRESSURE MONITORING SYSTEM

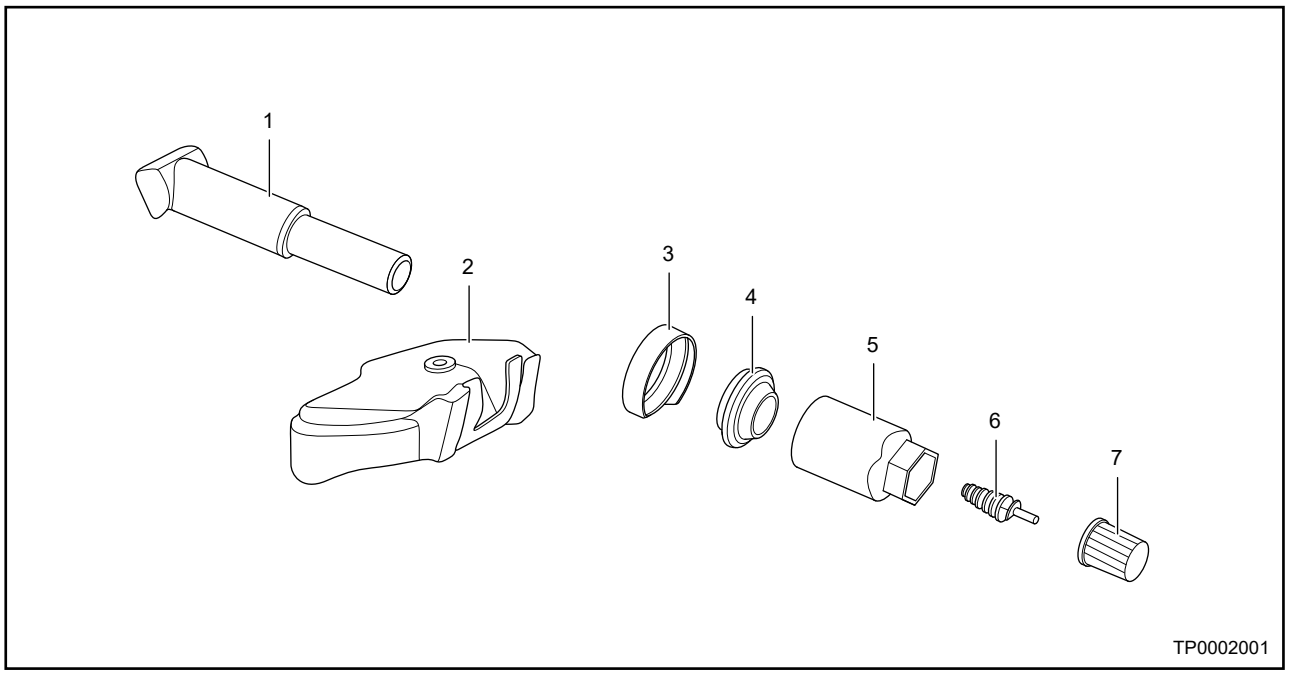
GENERAL INFORMATION

System Overview

Description



1	Rear Left Tire Pressure Sensor	2	Front Left Tire Pressure Sensor
3	Instrument Cluster	4	Front Right Tire Pressure Sensor
5	Rear Right Tire Pressure Sensor	6	Body Control Module



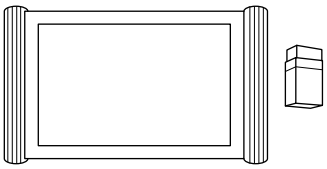
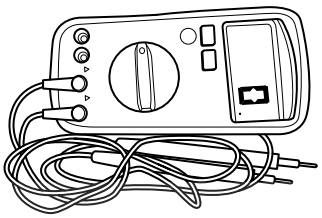
1	Screw	2	Tire Pressure Sensor Case
3	Air Valve Stem	4	Seal Ring
5	Tire Pressure Sensor Nut	6	Air Valve Core
7	Air Valve Cap		

Tire Pressure Monitoring System (TPMS) is an active safety device, which can monitor tire pressure and temperature in real time and display tire pressure and temperature on meter. When tire pressure is too low or temperature is too high, tire pressure monitoring system will warn the driver of driving danger.

Operation

Tire pressure sensor is the transmitting terminal of tire information, body control module is the receiving terminal of tire information, meter is the display terminal of tire information, and tire pressure sensor is the core of tire pressure monitoring system. Tire pressure sensor is installed on rim, which collects data such as pressure, temperature inside tire, and sends these data to body control module as radio-frequency signal. The wireless communication frequency between tire pressure sensor and body control module is 433 MHz.The body control module receives radio-frequency signal sent from tire pressure sensor and processes these data. Body control module processes data of tire pressure sensor, then sends them to meter via CAN bus. Tire pressure value is displayed on meter via CAN bus signal. When tire pressure is too high or too low, or temperature is too high, it informs driver of abnormal tire.

Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006
Low Frequency Trigger	 RCH009806

Torque Specifications

Description	Torque (N•m)
Body Control Module Fixing Nut	5 ± 1
Tire Pressure Sensor Fixing Nut	5 ± 1

Tire Pressure System Warning Information

High Temperature or Low Pressure

When there is a low pressure or high temperature alarm due to abnormal pressure or temperature inside the wheel, the tire pressure warning light on meter illuminates immediately and the meter switches to tire pressure monitoring system display screen automatically from normal display screen and indicates which tire is sending the alarm.

System Malfunction

When system malfunction is received by meter, the tire pressure warning light on meter flashes for 75 seconds and then remains on, the center meter display will display “Please inspect the tire pressure

monitoring system”, and then the meter switches to tire pressure monitoring system display screen automatically from normal screen.

Low Pressure Alarm

When vehicle tire pressure is less than 1.8 bar, and the vehicle is continuously driving with a speed higher than 30 Km/h, the system will send a low pressure alarm within 5 minutes. With ENGINE START STOP switch turned from OFF to ON position, the system will also send a low pressure alarm if tire pressure displayed on meter is less than 1.8 bar. When there is a low pressure alarm, the waring light remains on and normal screen switches into tire pressure screen directly: The tire with low pressure (e.g., front right tire) will flash and its tire pressure and temperature will be displayed. The tire pressure is too low, please resume it to normal pressure as soon as possible. Too low tire pressure will increase fuel consumption and tire wear. And seriously worn tire will cause an accident such as flat tire.Please resume the tire pressure to 2.3 bar (with an error limit of 0.1 bar). When the vehicle tire pressure resumes to 2.3 bar (with an error limit of 0.1 bar) and the vehicle is continuously driving with a speed higher than 30 Km/h, the system will deactivate the low pressure alarm automatically within 5 minutes.

High Temperature Alarm

When the vehicle tire temperature is higher than 85 ℃ and the vehicle is continuously driving with a speed higher than 30 Km/h, the system will send a high temperature alarm automatically within 5 minutes. With ENGINE START STOP switch turned from OFF to ON position, the system will also send a high temperature alarm if tire temperature displayed on meter is higher than 85 ℃. When temperature of front wheel reaches 88 ℃, which is higher than high temperature alarm threshold (85 ℃), the system will send high temperature alarm, front left wheel symbol will flash, the tire pressure and temperature values will be displayed and tire pressure warning light remains on. When there is a high temperature alarm, the warning light remains on and normal screen switches to tire pressure screen directly: The tire with high temperature (e.g., front right tire) will flash and its tire pressure and temperature values will be displayed. When a high temperature alarm occurs, stop vehicle to cool the tire naturally, otherwise there is a danger of accident. When tire temperature is too high, never cool the tire by pouring cold water, otherwise, tire may be damaged, resulting in an accident.When the vehicle wheel temperature is lower than 80 ℃ and the vehicle is continuously driving with a speed higher than 30 Km/h, the system will deactivate high temperature alarm automatically within 5 minutes. The system stores the history DTCs.

System Malfunction

When the vehicle speed is higher than 30 Km/h, if the tire pressure monitoring system fails to receive radio frequency signal from one or more sensors within 10 minutes, it will send a system malfunction alarm, the meter will display “Please inspect and repair the tire pressure monitoring system”, and the indication symbol will remain on after flashing for 75 seconds. The meter system will also switch to tire pressure monitoring system display screen automatically.

High Pressure Display

- If the tire pressure is higher than 3.5 bar, the tire pressure will be displayed as –; but the temperature will be displayed normally.
- If the tire pressure is less than 3.50 bar, it will resume normal display within 5 minutes.
- If the alarm is caused by high tire pressure, just resume it to 2.3 bar.

Detection Requirements of Tire Pressure Sensor

If assembly of tire pressure sensor is performed in tire sub assembly workshop, it is necessary to perform test after tire assembly is assembled. After tire assembly is assembled, the sensor should meet:

- The low frequency wake-up function of tire pressure sensor is intact, that is, low frequency trigger device can wake up the tire pressure sensor.
- Detection function of tire pressure sensor is intact, that is, sensor can detect pressure value and temperature value inside tires.
- Communication function of tire pressure sensor is intact, that is, sensor can send pressure value and temperature value inside tires as high frequency signal.

Configuration & Learning for Tire Pressure Monitoring System

Tire Pressure Sensor Learning Methods

Precautions

No.	Precautions	Details
1	Avoid error learning of tire	Tire learned on diagnostic tester menu must be matched with bleeding tire
2	Avoid error learning of tire	Only operate one tire every time, and do not bleed (or inflate) other tires at this time
3	Avoid error learning of tire	Keep away from other vehicles with tire pressure sensor, avoiding error learning or interference

If only one tire is to be replaced, other tires should not be replaced and their positions should not be changed, only learn one tire separately.

Correction methods for tire pressure monitoring system are as follows:

- Keep vehicle speed more than 30 Km/h for about 45 seconds.
- If tire pressure monitoring system can operate normally, pressure information of four tires will be displayed.
- If certain tire pressure information is still not displayed, tire configuration may error and needs to be relearned.

Tire Pressure Learning Method for Inflating/Bleeding

Learning Process

Hint:

After learning is finished, use tire pressure gauge to inflate tire to standard pressure, then perform correction on tire pressure monitoring system with vehicle speed higher than 30 Km/h for 45 seconds.

1	**Start**

Next

2	**There is enough pressure in tire (full loaded pressure is recommended)**

Next

3	**Tire pressure monitoring system enters learning status by operating diagnostic tester**

Next

4	**Perform tire pressure bleeding (for about 20 seconds)**

Next

5	**Learned tire pressure value can be displayed on meter**

Next

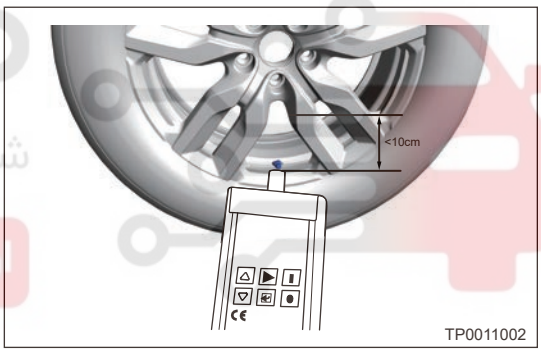
6	**Learning is successful**

Next

7	**End**

Tire Pressure Learning Method for Low-Frequency Trigger

1. If the malfunction is suspected in tire pressure sensor, use the low-frequency trigger to perform test.
2. After turning the ENGINE START STOP switch to IGN-ON and learning status is entered, the sensor can send wireless tire pressure signal with low-frequency trigger (- without inflating/deflating the tire). After the triggering operation is finished, tire pressure for the wheel learned will be displayed on the meter, which indicates that the learning is finished successfully.
3. Distance between low-frequency trigger and tire pressure sensor is less than 10 cm. Place the antenna of low-frequency trigger near the tire with tire pressure sensor on the wheel, and then press triggering button on low-frequency trigger. After the low-frequency trigger is successfully triggered, relative information about learned tire such as tire ID, pressure and temperature will be displayed, which indicates that the sensor is operating normally. Otherwise, replace the tire pressure sensor.



1	**Start**

Next

2	**ENGINE START STOP switch is in IGN-ON**

Next

3	**Tire pressure monitoring system enters learning status by operating diagnostic tester**

Next

4	**Trigger tire pressure sensor to be learned using low-frequency trigger**

Next

5	**Tire pressure sensor ID, temperature and pressure values are displayed on low-frequency trigger**

Next

6	**Learning is successful**

Next

7	**End**

Inspection of Tire Pressure Monitoring System Learning Status

1. After reconfiguring tire pressure monitoring system, use reading datastream function to perform inspection for each tire pressure sensor learning status in tire pressure monitoring system (take front left wheel as an example).
   a. Front left sensor ID can be read using diagnostic tester, if learning status is successful, it indicates that body control module is matched with front left sensor successfully. If not, it indicates that the match is not successful and front left wheel sensor should be relearned.
2. Use diagnostic tester to read following datastreams with vehicle speed higher than 30 Km/h for more than 45 seconds:
   a. Front left sensor pressure: 2.2 Bar
   b. Front left sensor temperature: 26 ˚C
   c. Temperature is not default and tire pressure is close to the value displayed on meter, which indicate that body control module can receive wireless signals from front left tire pressure sensor. Or, it indicates that learning is not successful or tire pressure sensor is faulty.

DIAGNOSIS & TESTING

Diagnosis Contents

Problem Symptoms Table

Hint
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area	Troubleshooting
Low pressure alarm (warning light remains on, malfunctioning wheel symbol flashes)	Tire pressure is less than 1.9 bar	Check and charge tire pressure
	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Body Control Module (BCM) damage	Replace body control module and perform sensor learning
High temperature alarm (warning light remains on, wheel symbol flashes)	Tire temperature is higher than 85°C	Cool down naturally
	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Body Control Module (BCM) damage	Replace body control module and perform sensor learning
	Tire pressure system set	Check and repair
System malfunction alarm (- warning light remains on after flashing for 75 seconds, tire pressure value of corresponding wheel does not display and wheel symbol will flash)	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Incorrect sensor configuration and learning when replacing with new wheel (spare tire included)	Perform configuration and learning
	Electromagnetic interference/ shield	Eliminate shielded objects outside of tire/strong electromagnetic radio interference
	Body Control Module (BCM) damage	Replace
	Tire pressure system set	Check and repair
All tire pressure information cannot be displayed (all tire pressure information for four wheels display as “–”)	Display status cannot be reached	Vehicle speed is more than 30 Km/h for 45 seconds
	Replaced tire pressure sensor is not configured correctly, sensor is not learned	Perform configuration and learning
	Body Control Module (BCM)	Replace body control module and perform sensor learning

Symptom	Suspected Area	Troubleshooting
	Electromagnetic interference/ shield	Eliminate shielded objects outside of tire/strong electromagnetic radio interference
	Four sensors are not installed or all of them are damaged (very rare)	Reinstall or replace
Certain tire pressure information cannot be displayed (certain tire pressure information displays as “–”)	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Incorrect sensor configuration and learning when replacing with new wheel (spare tire included)	Perform configuration and learning
	Electromagnetic interference/ shield	Eliminate shielded objects outside of tire/strong electromagnetic radio interference
	Body Control Module (BCM) damage	Replace
	Tire pressure system set	Check and repair

Diagnostic Help

1. Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
2. Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
3. If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
4. Only use a digital multimeter to measure voltage of electronic system.
5. Refer to any Technical Bulletin that may apply to this malfunction.
6. Visually check related wire harness and connector.
7. Check and clean all system grounds related to the latest DTCs.
8. If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.

- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

1. Remove ground bolt or nut.
2. Check all contact surfaces for tarnish, dirt and rust, etc.
3. Clean as necessary to ensure that contact is in good condition.
4. Reinstall ground bolt or nut securely.
5. Check if any additional accessories interfere with ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

Precautions for Maintaining Tire Pressure Monitoring System

Tire Inflation

- Do not inflate tires depending on values displayed from tire pressure monitoring system. Tire pressure monitoring system can monitor tire pressure and temperature in real time only when vehicle speed is more than 30 km/h. If inflating tires using pressure values displayed from tire pressure monitoring system, inflation value may be higher than tire standard value, which will cause accidents. Do not inflate tires with high tire temperature, which will cause serious damage to the tire, even blowouts, resulting in accidents.

Tire Pressure Sensor

- When system is faulty or disabled, check tire pressure sensor and judge if it is the tire pressure sensor in Tiggo 5x of Chery Automobile Co., Ltd. If tire pressure sensor of other manufacturers (not in Tiggo 5x of Chery Automobile Co., Ltd.) is used by customer, configuration and learning for tire pressure sensor cannot be performed and system is abnormal or disabled.
- Tire pressure sensor is integrated with functions of common valve, and inflating/deflating operation is the same as common valve. Use genuine sensor fittings, without replacing components inside of sensor. After maintenance, install genuine waterproof cap of tire pressure sensor correctly. Do not reuse disposed tire pressure sensor components, otherwise air leakage may be caused, resulting in a possibility of danger. When performing inflation/deflation and tire removal operations, it is not necessary to remove nut from the sensor. If the tire pressure sensor nut is removed with tire pressure higher than atmosphere pressure, there is possibility of danger.
- Always use torque wrench when installing tire pressure sensor, with a torque of 8 ±1 N•m. If the torque is relatively low, air leakage may occur, resulting in a risk of danger; if the torque is relatively high, tire pressure sensor or related components may be damaged, resulting in a risk of danger.

Tire Pressure Value Increase

- When vehicle is driving normally, heat is generated in the tire due to friction, which will cause tire pressure to increase. For every 10°C increase in tire temperature, tire pressure will increase by about 0.1 bar.

Replacing Tires

- If replacing tires with tire pressure monitoring system with ones without tire pressure monitoring system, system malfunction alarm will occur. If replacing with tire equipped with tire pressure sensor (-Tiggo 5x of Chery Automobile Co., Ltd.), system malfunction alarm still will occur without performing

configuration and learning. Spare tire in Tiggo 5x is not equipped with tire pressure sensor, so tire pressure monitoring system is still malfunctioning when spare tire is used in vehicle with tire pressure monitoring system.

- When replacing tire, perform operations following assembly specification of tire pressure, to avoid damaging tire pressure sensor during replacement. For installation and removal of tire, refer to Installation and Removal of Tire Pressure Sensor sections. Never allow tire bead breaker and tire tread to squeeze the sensor.

ON-VEHICLE SERVICE

Tire

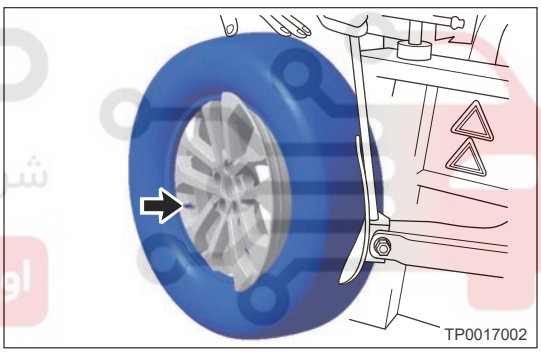
Removal

CAUTION
• Avoid dropping the sensor. If tire pressure sensor is dropped from a place 1m high to the ground, it is interpreted as fault in tire pressure sensor. • Tire pressure sensor must be installed on clean and dry hub. • Valve cap must be on the valve, except inflation, deflation, air pressure inspection, etc. • Sensor air pressure inlet cannot be covered partially or completely by lubricant or other materials. • During removal and installation of tire, used tools cannot contact with tire pressure sensor, and tires cannot extrude tire pressure sensor, to avoid damage to the tire pressure sensor.

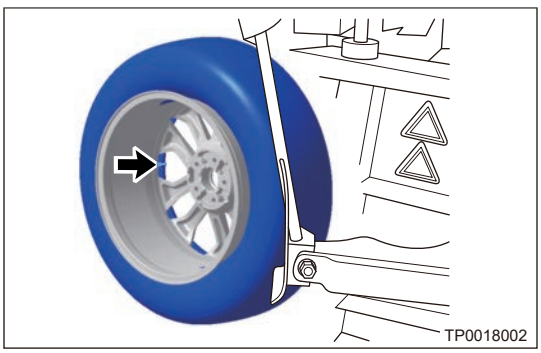
1. Remove tire and deflate tire completely.

   Hint:
   During tire bead breaking, follow the operation specification, never damage the tire pressure sensor.

2. Keep one side with tire pressure sensor 30 cm away from separation shovel (arrow), and put shovel block between rim and tire, then depress the pedal to separate rim and tire.



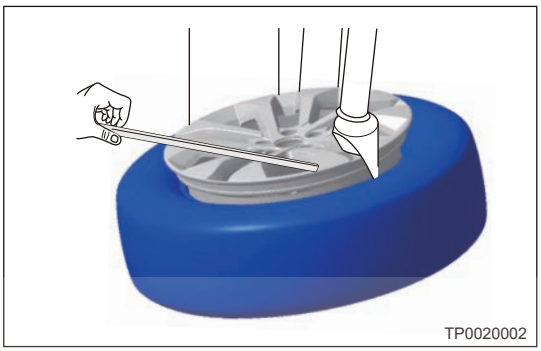
3. Turn over tire to keep one side with tire pressure sensor 30 cm away from separation shovel (arrow), and put shovel block between rim and tire, then depress the pedal to separate rim and tire.



4. Lock tire on wheel, lower replacer head and keep it 5 - 15 cm away from sensor.

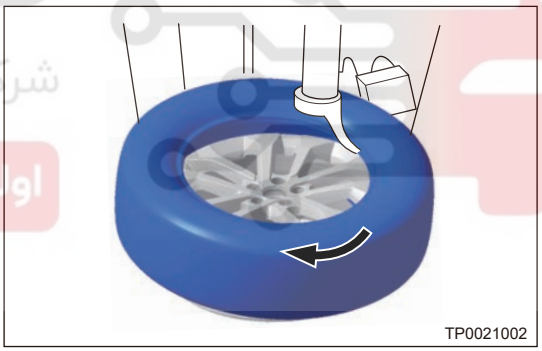
5. Use crowbar to pry out outside tire, and sleeve it to replacer head, then take away crowbar.

   Hint:
   Both crowbar and tire cannot contact with sensor!

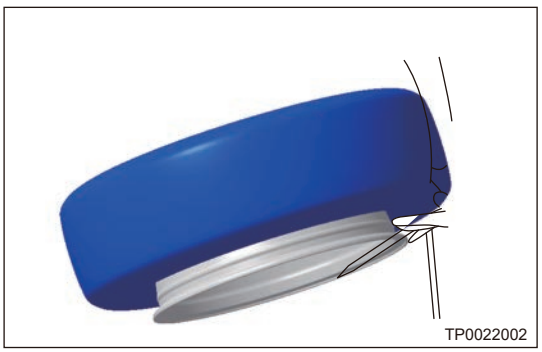


6. Remove the wheel.

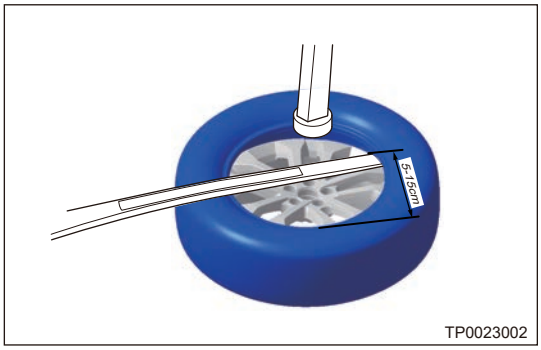
   a. Rotate wheel, and the movable direction of wheel should be the direction that replacer head is gradually kept away from tire pressure sensor (rotation arrow), then remove upper part of tire.



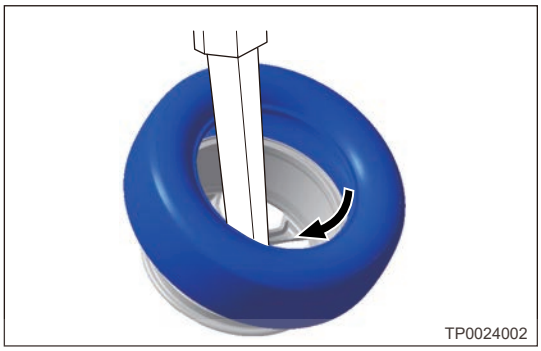
   b. Lift tire and pry out lower part of tire using crowbar.



c. Lower replacer head and pry out lower side tire tread using crowbar, then sleeve it on replacer head and keep it 5 - 15 cm away from sensor.

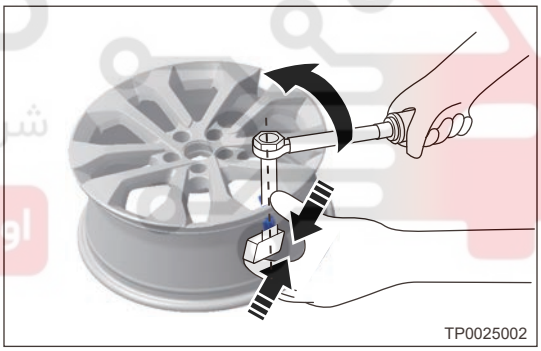


d. Rotate wheel, and the movable direction of wheel should be the direction that replacer head is gradually kept away from tire pressure sensor (rotation arrow), then pry out tire completely.



Removal of Tire Pressure Sensor

1. Using an appropriate tool, rotate nut counterclockwise until it separates from tire pressure sensor completely.



2. Remove tire pressure sensor from wheel hub.

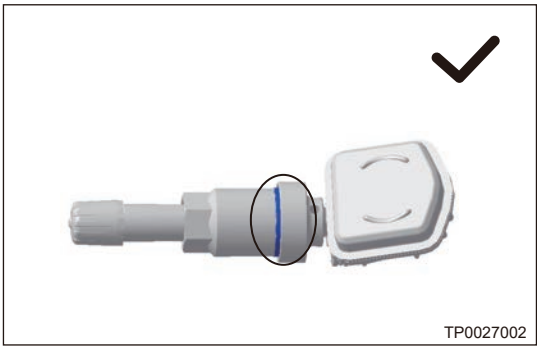
Installation

Caution
• Always use torque wrench when installing tire pressure sensor, common wrench cannot guarantee a torque of 5 ± 1 N•m. If the torque is relatively low, air leakage may occur, resulting in a risk of danger; if the torque is relatively high, tire pressure sensor or related components may be damaged, resulting in a risk of danger.

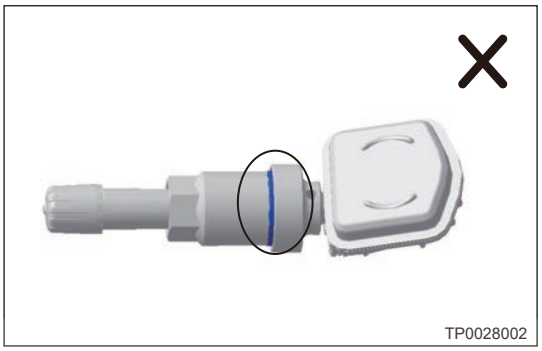
1. Adjust plane direction of seal washer cutout

   a. When removing sensor body, first check if seal washer cutout plane is parallel with the polyester plane. If they are not parallel and there is an angle between two planes, turn seal washer to make seal washer cutout plane parallel with polyester plane.

b. If seal washer cutout plane is parallel with polyester plane, it indicates that assembly is qualified.

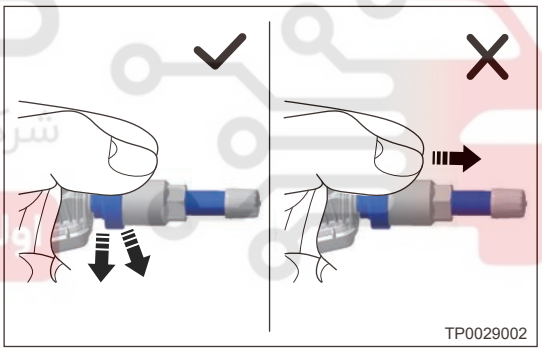


c. If seal washer cutout plane is not parallel with polyester plane and there is a large angle between two planes, it indicates that assembly is not qualified.

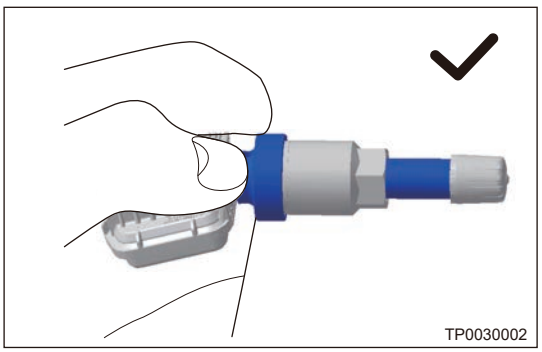


2. Adjust the valve stem position.

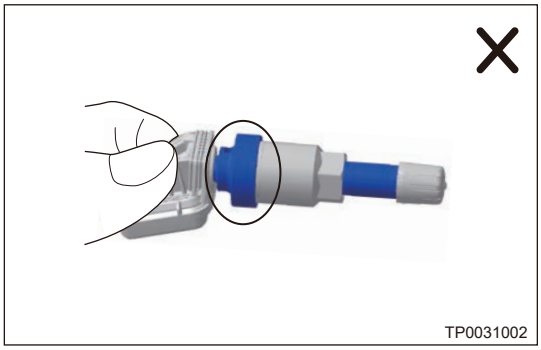
a. Press root of valve stem using middle part of your thumb with a downward force in groove direction, so that root of valve stem can be seated in the groove fully; then, keep middle part of thumb pressed against valve stem and tip part of thumb pressed against the seal washer with a vertical downward force applied along seal washer, so that the valve stem can bend to maximum angle. It is not allowed to apply horizontal force along the seal washer.



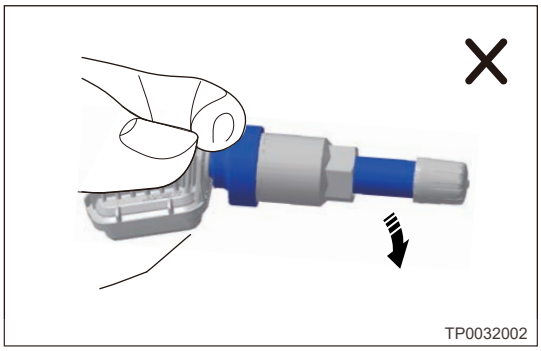
b. If root of valve stem enters groove completely and valve stem bends to limit, it indicates that assembly is qualified.



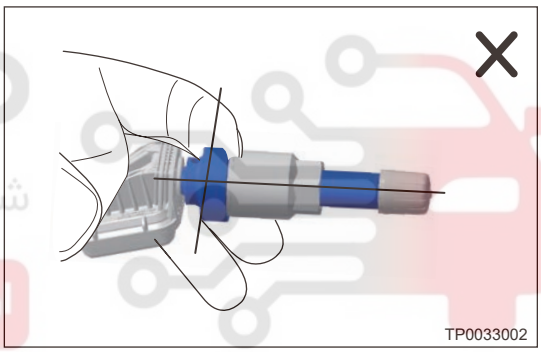
c. If root of valve stem dose not enter groove fully and valve stem dose not bend to limit, it indicates that assembly is not qualified.



d. If valve stem dose not bend to limit, it indicates that assembly is not qualified.

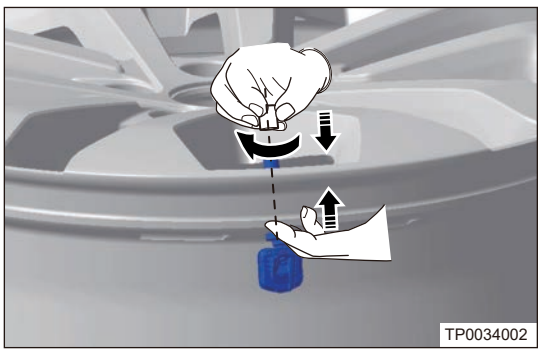


e. If seal washer plane is not perpendicular to valve stem after a horizontal force is applied along the seal washer, it indicates that assembly is not qualified.



3. Insert valve stem of tire pressure sensor into hub and pretightened nut.

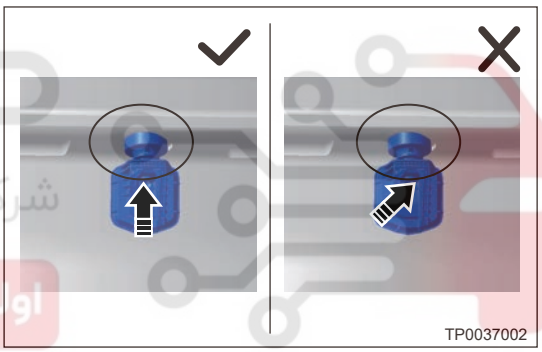
a. Hold the tire pressure sensor vertically with four fingers of the left hand in upward direction, never apply inward component force in horizontal direction; hold the outer edge of rim with left thumb, and apply a downward force to press both sides of sensor housing firmly against the rim. Pass the valve stem into rim along valve hole center axis, and insertion direction is from inward to outward of tire assembly. Tighten the nut with right hand in clockwise direction until the tire pressure sensor is fixed without any movement.



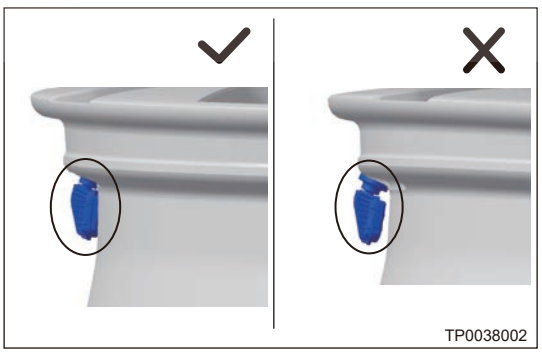
b. If valve stem is fully seated into the groove, sensor is fully fixed without any movement and sensor housing is pressed against rim firmly, it indicates that assembly is qualified.

c. If the pretightened nut is not tightened into place with too much valve stem screw exposed and sensor is not fixed, it indicates that assembly is unqualified.

d. If the sensor valve stem slides out form metal groove after a horizontal inward component force is applied, it indicates that assembly is unqualified.



e. If right side of sensor is not pressed against the rim firmly, it indicates that assembly is unqualified.



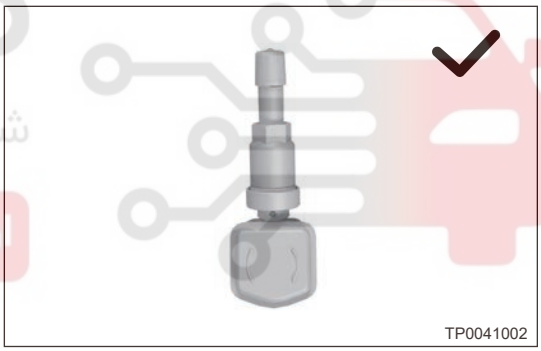
f. If left side of sensor is pressed against the rim firmly, it indicates that assembly is qualified.

g. If left side of sensor is not pressed against the rim firmly, it indicates that assembly is unqualified.

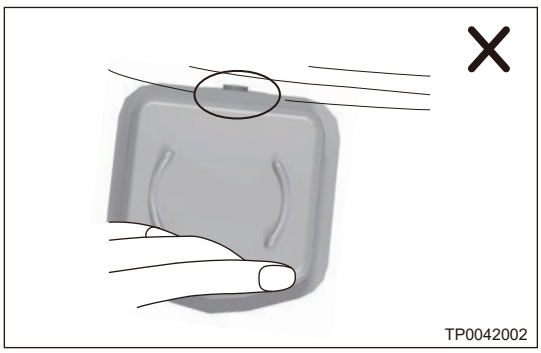
4. Tighten nut firmly.

a. Hold bottom part of the sensor using four fingers of left hand with a upward force. Hold the rim edge with left thumb with a downward force. Press the tire pressure sensor against the rim firmly, and keep the sensor position fixed during tightening process. The axis of manual torque wrench sleeve should be overlaped with that of valve stem without any angle. Start the fitting button to tighten the nut in clockwise direction, and the tightening process is finished after torque reaches 5 ± 1 N•m. Do not tighten the nut again after it is tightened.

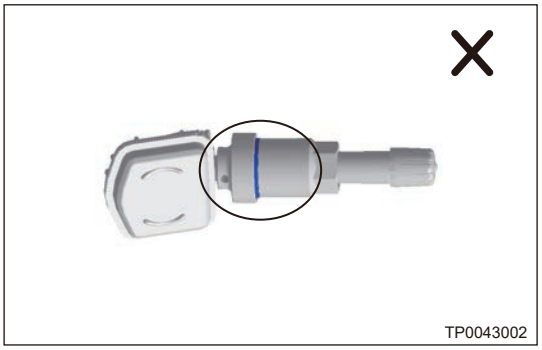
b. If valve stem is fully seated in metal groove, sensor is fully fixed without any movement and both sides of the sensor housing are pressed against rim firmly, it indicates that assembly is qualified.



c. If valve stem slides out of metal groove, it indicates that assembly is unqualified.



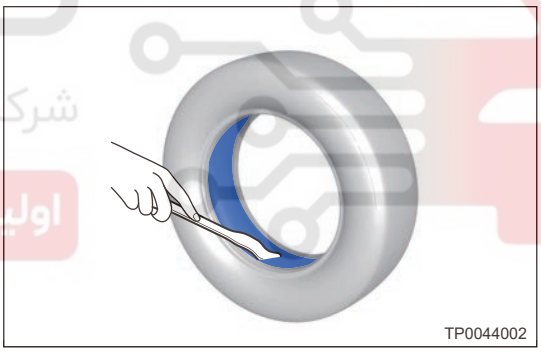
d. If seal washer and seal ring are deformed or damaged due to excessive torque, it indicates that assembly is unqualified.



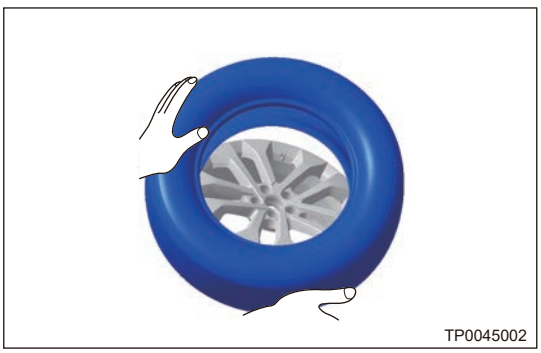
Installation of Tire

Caution
• Be sure to observe the operation regulation to prevent tire pressure sensor from being damaged. • Both crowbar and tire cannot contact with sensor. • Confirm that distance between intersection and valve stem is proper.

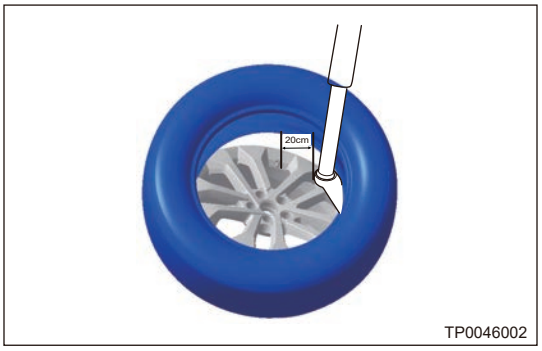
1. When the tire is packaged, the position of the tire pressure sensor should be 270° ± 10°, so as not to damage the tire pressure sensor directly or indirectly during the installation process.
2. Installation is the same as common tire. Before loading tire, apply soapy water or glycerin to tire bead along inner circle.



3. Put tire on hub and keep intersection between hub and tire edge 15 - 20 cm away from valve stem.

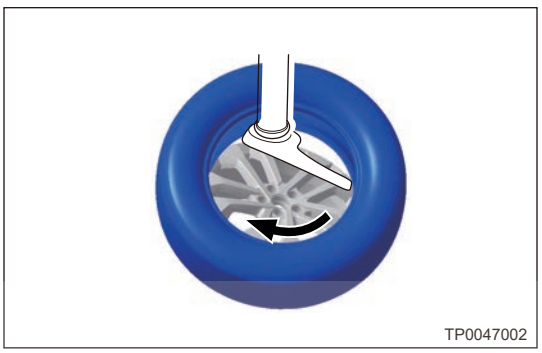


4. Install bottom tire to make sure the distance between intersection and valve stem is about 20 cm.



TP0046002

5. Rotate wheel to install one side of tire into hub. Rotation direction of wheel (rotation arrow) should be the direction that makes replacer head get farther and farther away from sensor.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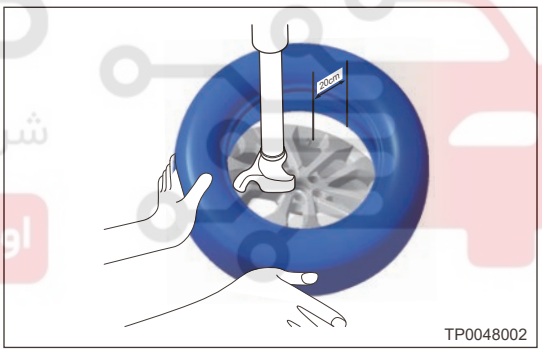
6. Put another side of tire in place, so that intersection between tire edge and hub is 20 cm away from valve stem. Curving arrow indicates rotation direction of wheel.



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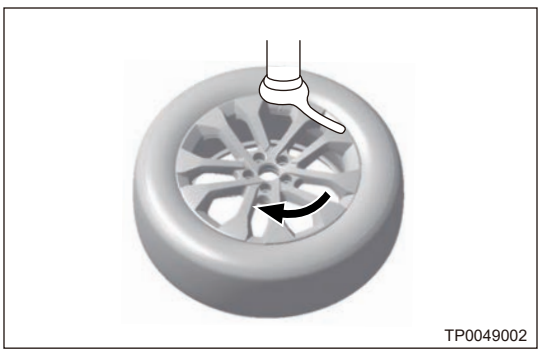
7. Rotate wheel to install another side of tire into hub.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