

校企合作培训论证教材

# Chang'an

# CX70

## Maintenance Technician Training Course

长安CX70维修技师培训教程

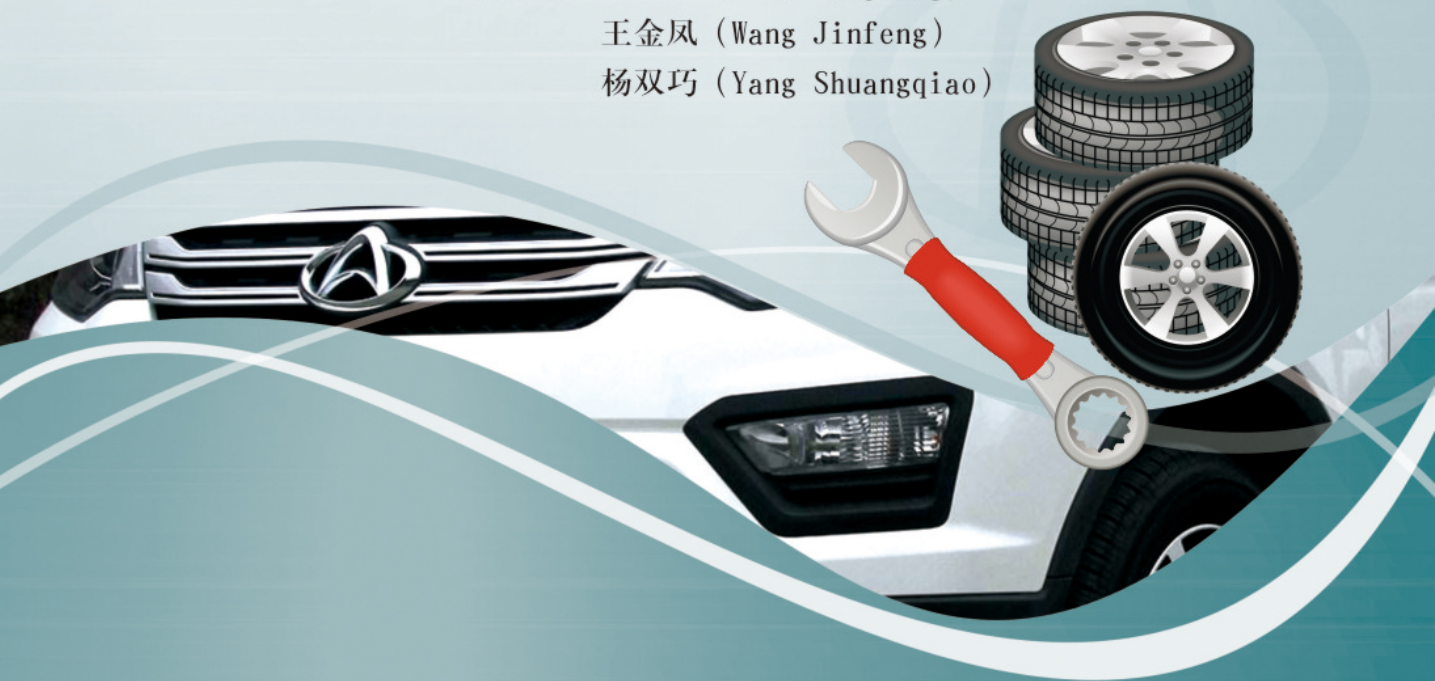
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# 校企合作培训论证教材

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## 前言

## PREF / CE

汽车电气化、智能化的发展，为广大车主带来舒适、便利的同时，也给汽车维修从业人员与职业培训人员提出了新课题、新挑战。汽车维修专业书籍琳琅满目，大多涉及各种车型技术知识，读者缺乏相应的实训条件，普通存在教材上的知识得不到实践的问题。本书作者从事多年长安欧尚星级维修技师培训教学工作并进行了大量社会调研，同时充分考虑了维修一线从业人员的需求，紧密结合汽车新知识、新技术，以理实一体化的教学方法组织编写了本书，故本书有较强的针对性和适用性。

本书采用“项目引领、任务驱动”的模式编写，以长安欧尚 CX70 为例，以掌握该车型新技术为任务驱动，设计理实一体化的学习任务，读者在使用教材过程中实现“学中练”“练中学”，体现以读者为中心、教材为引导的自学理念。本书不论是内容选择，还是形式安排，都体现了我们编写的基本原则：准确、实用和方便。内容上，严格遵循原厂电路，原汁原味，且以汽车电控电路为主，机械结构知识为辅，主要使读者了解并掌握汽车电控系统；形式上，技能训练部分，以汽车各模块中的一个知识点为例，采用填空的形式引导学员完成相应模块的检查和诊断，以达到举一反三的效果。

全书共分五大模块，模块一为整车介绍，主要介绍 CX70 整车及各总成技术参数、新技术、车型亮点，同时介绍功能、使用方法及注意事项，方便技术服务人员快速熟悉该车情况并了解其性能特色。模块二为 CAN-BUS 系统，主要介绍 CX70 的 CAN-BUS 系统，从 CAN-BUS 系统的结构组成、功能以及基本原理入手，对 CAN-BUS 系统基本检测方法和故障原因进行了详细的阐述，并对测量结果进行了分析和说明，为学员深入学习 CAN-BUS 系统知识以及实践该系统的故障诊断提供了基础；模块三为车身电器系统，主要介绍了电动车窗系统、电动后视镜

系统、照明系统、雨刮系统、仪表及娱乐系统、安全气囊系统、中控及防盗系统以及空调系统等八个车身电器系统的组成部件、结构及各部分零件的检测方法，结合各个系统的电路图分析了各系统工作原理，并结合各个系统的基本构造和工作原理介绍了检测和维修方法。模块四为发动机管理系统，主要介绍了 ME17 发动机电控系统的控制逻辑及进气系统、排放系统、点火系统的工作原理、结构组成及主要部件的检测诊断方法，并重点分析了 ME1788 系统常见故障代码，同时介绍了 CX70 所搭载的 4G18 发动机机械系统的拆装规范、检修方法和要求等。模块五为底盘电控系统，主要介绍了底盘电控系统的 EPS 系统、ESP 系统和手动变速器的结构组成、工作原理及主要部件的检测诊断方法，并阐述了 CX70 所搭载的 MR515B03 变速器的动力传动路线和常见故障诊断和处理方法。

本书模块一由重庆电子工程职业学院王勇、重庆长安汽车国际销售服务有限公司王金凤合编；模块二由重庆电子工程职业学院李穗平、重庆长安汽车国际销售服务有限公司、邓廷波合编；模块三由重庆电子工程职业学院陈世江、姚晶晶合编；模块四由重庆电子工程职业学院周均、王勇、蔺朝莉合编；模块五由重庆电子工程职业学院甘守武、丁伟合编。全书由甘守武、丁伟负责统稿。

本书在编写过程中得到了长安汽车股份有限公司的大力支持，收获了许多宝贵意见，在此深表感谢。

本书出版得到了中国高等教育学会职业技术分会 2016 年课题资助项目(编号 GZYZD2016015)的资助。笔者在编写本书的过程中，花费了大量时间，耗费了很多精力，可以说书中的每个数据和每幅图片都凝结着笔者的心血。虽然在编写时笔者对内容进行了仔细检查，但由于水平有限，书中不妥之处在所难免，敬请广大读者朋友批评指正。

作 者

2018 年 7 月



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# Module 1 Vehicle Introduction

## ☆Module Description

This module mainly introduces the technical parameters of CX70 vehicle and various assemblies, new technology and highlights of this vehicle type. Meanwhile, the usage methods and precautions of some functions are presented so as to help the technical service personnel be quickly familiar with the car and learn about its performance features.

## ☆Knowledge Standard

- Learn about the parameters of CX70 vehicle;
- Learn about the technical highlights of CX70 vehicle;
- Learn about the characteristics of the engine, transmission and body part of CX70 vehicle.

## ☆Main Content

- Introduction of CX70 Products;
- Highlights of CX70 Vehicle Type;
- Introduction of Power Transmission System;
- Introduction of Vehicle Body and Electrical System.

## ☆Objectives

- Master the parameters of CX70 vehicle;
- Master the technical highlights of CX70 vehicle;
- Master the characteristics of the engine, transmission and body part of CX70 vehicle.

## ☆Resources

- Equipment: CX70 vehicle;
- Documents: CX70 supplementary circuit diagram and maintenance manual.

### 1. Introduction of CX70 Vehicle

Chang'an CX70 is a multi-function vehicle which is developed by Chongqing Chang'an Automobile Co., Ltd. independently with the proprietary intellectual property rights. With fashionable appearance, off-road vehicle style, solid and strong structure, unique design and high cost-performance ratio, the car has unparalleled advantages in engine performance, transmission structure, fuel consumption, emission, safety and comfortableness of driving which other same kinds of vehicles can't match with.

#### 1) Vehicle Parameters

CX70 adopts large-sized SUV body with larger wheel base, 2+3+2 theater-type 7 seats, 190 mm ground clearance, and is equipped with 215/60R17 wheels, whose ramp angle is 23.5° and departure angle is 25°. Its internal space is flexible, which can meet all kinds of requirements, as shown in Fig.1.1.

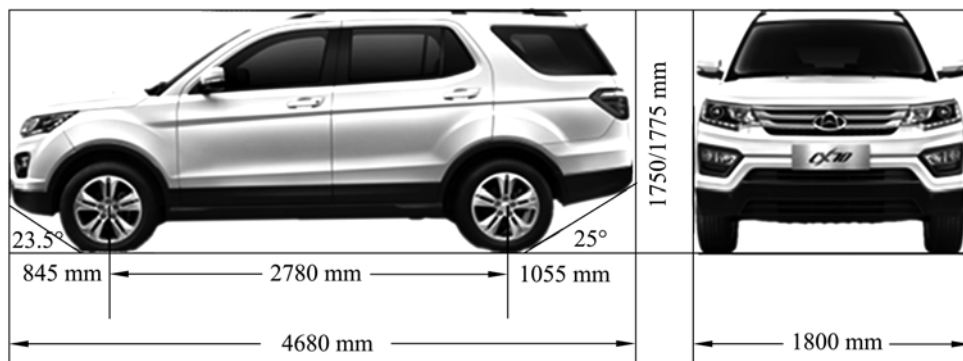


Fig.1.1 CX70 Vehicle Parameters

#### 2) Vehicle Characteristics

On the whole, CX70 appears to be solid and strong with off-road vehicle style; the internal decorations are simple and elegant, which also shows a kind of strength and matches with the external decorations. It adopts Macpherson independent front suspension and

five-link rear suspension and it is equipped with EPS, ESP and electronic sunroof and so on.

## 2. Highlights of CX70

### 1) Manly Appearance

(1) The car body looks manly and grand with “Tough Guy” style. The simple and clear image makes the car look solid and strong. The integral full surrounding enclosure design, bold but not dull, makes it much fashionable. The simplified and stylish internal decorations and the manly and bold external decorations are echoing each other.

(2) It also combines the strength and durability of off-road vehicle and SUV. Head lamp, rear lamp and rear-view mirror expand horizontally and look manly. The whole appearance, highlighting the tensile force and extension feeling, is very dashing handsome, as shown in Fig.1.2.



Fig.1.2 CX70 Appearance Explanation

(3) The gravity center of the whole body presses downward in trapezoid, transferring a feeling of being steady and sound. The design style of front-high-rear-low and luggage rack are combined together, making the car body dynamic and enhancing the “tough guy” image of the whole car.

(4) The exquisite workmanship reaches CS35 level. The internal decorations, based on the delicacy of CS75, embeds the element of strength and part division cooperation and increases the large storage space, which greatly illustrates the large family-friendly characteristics of SUV. In terms of hearing, the operation sound of components, such as good-quality door is comfortable to ears; in terms of touching, with appropriate match, everything touches wonderful; as for the smell, there is no peculiar smell in the car or any components which are all healthy and environment-friendly.

## 2) Flexible Space

( 1 )Super Large Space: The storage space after the first-row seats is 2.8 m<sup>3</sup> and the space between the first-row seats backrest and the back door is 2.8 m<sup>3</sup>, which easily surpassed that of the same-grade MPV. The users are free to enjoy the loading capacity of SUV space, as shown in Fig.1.3.



Fig.1.3 CX 70 Internal Space Comparison Diagram

( 2 )There are up to 32 storage spaces inside, and these spaces are easily accessible to the users, making all of the users' objects, large or small, in the suitable position.

( 3 ) The seats can be combined flexibly. With super large internal space of 7 seats, the middle and rear seats can be combined freely.

## 3) Driving and Riding Comfortableness

( 1 )Excellent NVH performance, outstanding idling noise, good mute effect of the whole car, steering support and body structure optimization brings about comfortable vibrating experience of the whole car.

( 2 ) Better gear-shift experience. Choose the latest gearshift lever used in the sedan, which manifests the high grade of the car. The more comfortable hand feel is, the easier the gear-shifting is.

( 3 ) Wonderful riding comfortableness.

( 4 ) Strong vehicle pass ability: With good vehicle pass ability, it is suitable for all kinds of roads, and compared with other same-grade vehicles, it has stronger vehicle pass ability.

( 5 ) SUV chassis tuning: the structure of combining A-type Macpherson Independent Front Suspension with grid auxiliary frame makes the operation and control more accurate and the strength higher and steadier, as shown in Fig.1.4.

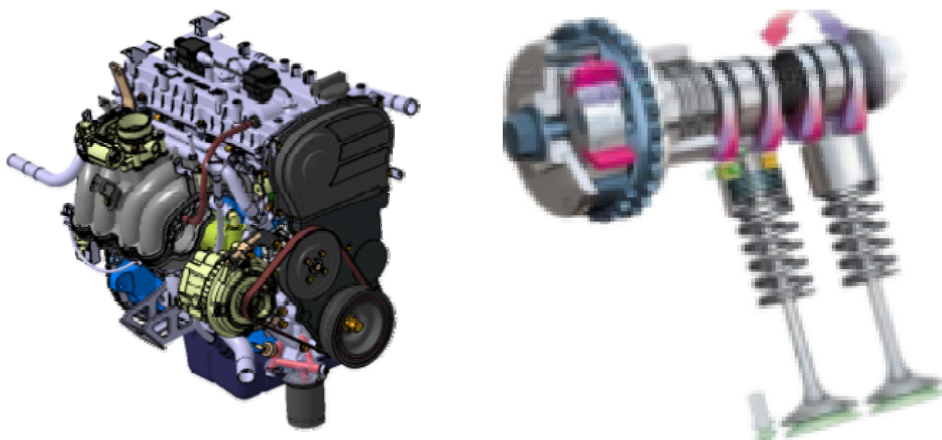


Fig.1.4 Schematic Diagram of 4G18M2 Engine

### 3. Introduction of Power System 4G18M2 Engine

CX70 adopts 4G18M2-TA8, which is a 1.6 L naturally-aspirated engine, upgraded by Mitsubishi Electric on the basis of 4G15M2 and introduced and further improved by DAE. To adjust to the Chinese automobile market, DAE, on the basis of Mitsubishi prototype, improves the power performance of the engine, especially, the low speed torque is increased greatly, which means the maximum torque can be reached with a relatively lower rotation speed. The schematic diagram of the engine is shown in Fig.1.4.

#### 1) Engine Parameters

4G18M2-TA8 engine parameters are as shown in Table 1.1, which indicates the powerful strength and excellent performance.

Table 1.1 4G18M Engine Parameters

Model	4G18M2	Bore×Stroke	Φ76×87.3/mm
Type	Inline Four-cylinder, DOHC、16Valves、IVVT System、Electronic Throttle、 Suitable OBD	Compression Ratio	10.51
Arrangement	Front Loading, Longitudinal Arrangement	(kW/min)Normal Rated Power/Rotation Speed	86 kW/6 000 r/min
Displacement	1.584 ( L )	Maximum Torque/Rotation Speed	150 N · m/4500 r/min

## 2 ) Advanced Technology

### ( 1 ) Electronic Throttle Technology

Throttle regulation is close to idealized condition and the delicate control can be realized, making the engine provide the optimum power output.

### ( 2 ) Low Friction Technology

Use the friction reduction technology such as low tension piston ring to reduce the friction loss and increase the fuel economy.

### ( 3 ) Variable Valve Timing Technology

It can increase the charge efficiency and enhance the middle and low speed torque with low oil consumption and emission.

### ( 4 ) Adopt the dilute lubrication oil 5W-30.

## 4. Introduction of MR515B03 Transmission

CX70 is equipped with MR515B03 Transmission produced by Tsingshan Holding Group. The Transmission is a manually operated five-gear Transmission with five forward and one reverse, and all the forward gears are constant mesh and the reversing gears are sliding idle gear device. The gear shift is easy without any impact noise.

The maximum input torque is 145 N · m, and the index such as transmission driving efficiency, the life span of synchronizer, fatigue life, noise and cleanliness all reach the national advanced level. With box division type of front and rear box, the Transmission shell has good structural rigidity, compact structure and is easy to process and dismantle. It adopts inertial synchronizer and the gear shift is dependable, steady and flexible. The schematic

diagram of Transmission structure is shown in Fig.1.5.



Fig.1.5 Schematic Diagram of MR515B03 Transmission Structure

## 5. Introduction of Body Characteristics

### 1) Vehicle Overview

The overview of CX70 body is shown in Fig.1.6.

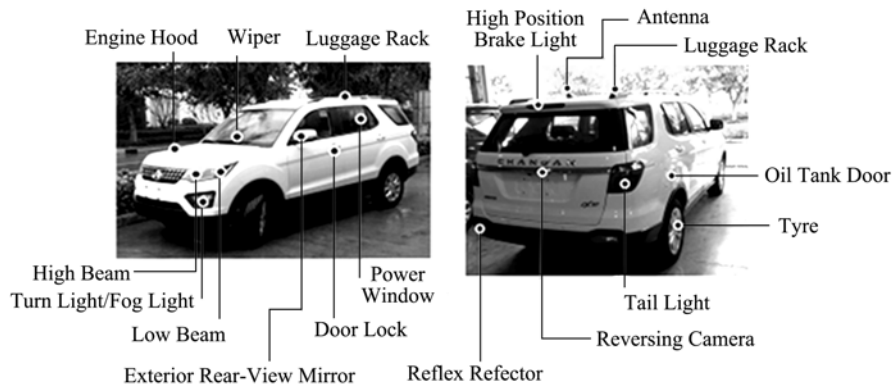


Fig.1.6 Overview Schematic Diagram of CX70 Body

### 2) Door

CX70 adopts standard five-door type, which is basically the same as the sedan. The locks of front hood, front door, middle door and back door are traditional latch firing-pin design. The locks of front door, middle door and back door are controlled by the operating lever connected with the exterior handle and door lock remote control system, and at the same time, the front door lock catch is connected with door lock core. There is only one control rod inside the door lock remote control device to control the locking, unlocking and

opening from the inside. The front hood lock is controlled by control wire and unlocking handle, as shown in Fig.1.7.

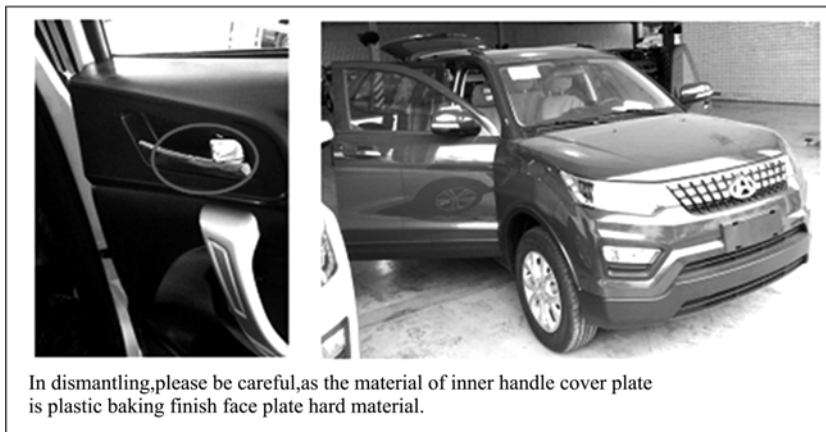


Fig.1.7 Schematic Diagram of CX70 Doors and A few Dos and Don'ts

### 3) Instrument Panel Introduction

Instrument panel and auxiliary fascia console of CX70 are shown in Fig.1.8.



Fig.1.8 Schematic Diagram of CX70 Instrument Panel and Auxiliary Fascia Console

#### 4) Back Door

CX70 back door has emergency unlocking function. When the back door is locked and the unlocking switch can't be used, open the back door from the inside, put down the rear seats, find the cover plate marked in Fig.1.9 in the back door inner panel and then remove it. After removing the cover plate, you can see the reserved via on the back plate and find the button on the back door lock behind the via, then rotate the button anti-clockwise with flat screwdriver or similar tool and when rotated to the extreme, push the back door upward to realize the emergency unlocking.

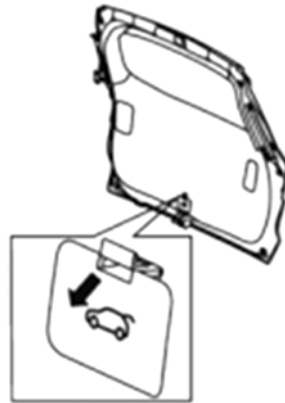


Fig.1.9 Position of CX70 Back Door Emergency Unlock Cover Plate

## 6. Electrical Equipment

### 1) Introduction of Body Control Function

#### (1) Hint Function

- Door Opening: If any door opens when the power is on, the buzzer sounds twice.
- Key Learning Successfully: Every time one key is learned successfully, the buzzer sounds once.
- Anti-theft Off: When the whole car is off, and the anti-theft is activated, if the remote control is unlocked, it means the system has been out of anti-theft, and at this moment, the direction indicator lamp flickers quickly four times and the buzzer sounds four times.