FCAR

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● This manual is intended for professional vehicle repair technicians.

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● This manual is written in accordance with the existing configuration and functions of the product, and is subject to change without notice if the product adds new configurations and functions.

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FCAR Series Host Machine Maintenance and Use Cautions
- Do not allow unauthorized disassembly.
- Avoid strong impacts to the equipment.
- Avoid proximity to any magnetic field.
- Do not keep this machine in a high temperature environment for any length of time.
- Do not keep this machine in a low temperature environment for any length of time.
- Do not forcefully click on the screen or click the screen with sharp tools.
- Do not use water and chemical solvents to clean the machine, please use a soft clean cloth and neutral detergent instead.

Automobile Inspection Notes
- Follow the standard safety rules of the auto repair industry to operate. Be especially careful to avoid impact or damage caused by environmental factors such as the surrounding pH, poison gas or high pressure environment.
- Vehicle battery fluid contains sulfuric acid, which is corrosive to the skin. During the operation, avoid direct contact with the battery fluid, in particular being careful not to splash into the eyes. Keep away from fire.
- The engine exhaust gas contains a variety of toxic compounds, which one should avoid breathing in. During the operation, park the vehicle in a well-ventilated place.
- When the engine is running, the temperature is very high; please avoid contact with the water tank, exhaust pipe and other high temperature components.

- Before starting the engine, apply the handbrake and place the shift lever in Gear Neutral (Manual Transmission) or P (Automatic Transmission) to avoid sudden movements of the vehicle when starting the engine.
- Before repairing the vehicle, apply the parking brake, engage the Neutral or P range, and lower the driver seat's glass doors.
- If the engine can be started, warm-up the vehicle to normal temperature (water temperature is about 80 °C), and turn off the auxiliary electrical appliances (such as air conditioning, lighting, sound, etc.).
- Find the diagnostic socket of this car; check and confirm the diagnostic socket cables are in good condition, connecting the main unit for diagnosis. Otherwise, do not test, to avoid damage to the main unit. If necessary, use a multimeter to measure the voltage of the diagnostic socket.

Instrument Use Notes

- When using FCAR series products for testing, please be gentle and keep them away from heat and electromagnetic fields, to avoid interference to the main unit.
- Do not use sharp tools to click the screen; the matched touch pen is recommended.
- When electrical components are energized, do not disconnect the circuit, to prevent self-inductance and mutual inductance current damaging the sensors and automotive ECU.
- When electrical components are working normally, magnetic objects are forbidden to approach the automotive control unit, otherwise the vehicle control unit may be damaged.
- Before disassembling the vehicle control unit or electrical components, turn off the ignition switch for 1 minute.
- Do not operate the diagnostic equipment when driving the vehicle, in order to avoid traffic accident.

CONTENTS

CHAPTER I   PRODUCT INTRODUCTION

1.1 INTRODUCTION

FCAR F7S series product is an integrated automotive computer fault diagnostic instrument aimed at the testing and diagnosis of gasoline, diesel, natural gas and other electronic control systems. The product is applicable to large and small service companies, training institutions, automobile manufacturers, repair stations, diesel engine manufacturers, mining machinery, petrochemical, energy and other enterprises.

Software of F7S is comprehensively configured, and vehicle data and information in it are authoritative and fully meet the strict requirements of customers' detection breadth and depth. The software covers thousands of domestic and imported vehicle model data, and provides a powerful help system with maintenance information, enabling users to deal with the problems in practical work easily and quickly, thereby increasing the efficiency and technical level and reflecting the advantage of professional level quality.

1.2 F7S HOST STRUCTURE
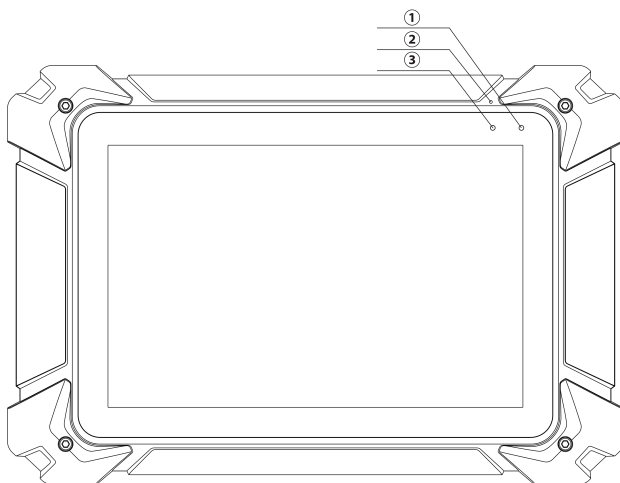
Serial number	Name	Description
①	Power supply indicator	Charge indicator
②	Microphone port	Voice input port
③	Light sensor	Outside light intensity induction

Host parameter

System	Android5.1 multiple task operating system
Processor	Cortex-A17 RK3288 Quad-core processor, 1.8GHz architecture processor
Touch screen	10.1" Multi touch capacitive screen，TP thickness：1.1mm
Memory	2GB RAM & 32GB ROM，besides supporting 32GB TF memory card
Connection	WiFi &Bluetooth 2.0/4.0
Camera	Rear camera 13 million pixels，supporting Autofocus
Battery capacity	3.7V/10000mAh
Interface	RJ45, HDMI, USB2.0, TF card slot, Headphone plug, power interface
Size	320*210*30mm
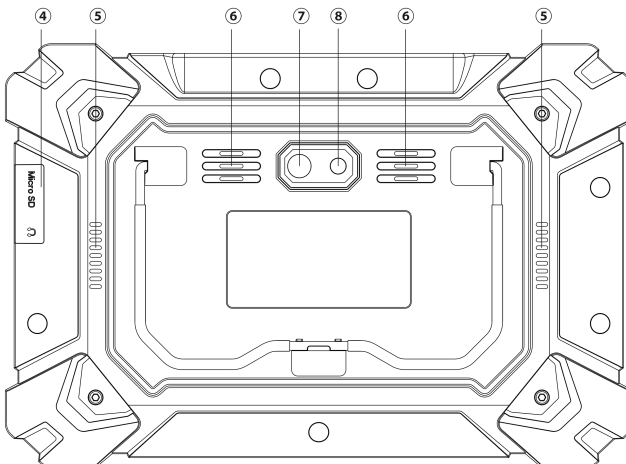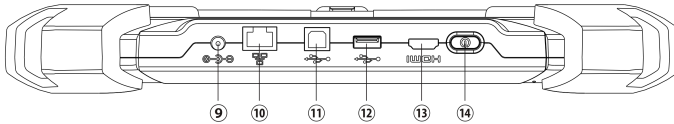
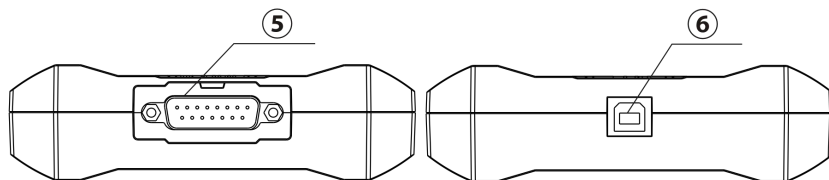| Serial number	Name	Description
④	TF card slot / 3.5 headphone jack	Storage TF card location / headphone jack
⑤	Vents	Used to cool the F7S host to avoid overheating
⑥	External speaker port	For external sound playback
⑦	Camera	Used to take a photo or record a video
⑧	Flashing light	Used to provide light when the light is weak
⑨	DC power port	Used to charge or energize the F7S host
⑩	RJ45 port	For network connections
⑪	USB port (Type-B)	Device interface: used to connect to a computer and use the F7S host as a U disk.
⑫	USB port	Host interface: used to connect F7S host to the VCI or connect to the USB flash drive.
⑬	HDMI port	Standard HDMI interface: used to connect to TV HD output
⑭	Power switch	Used to switch on or off F7S host, or lock screen

1.3 VCI BOX STRUCTURE
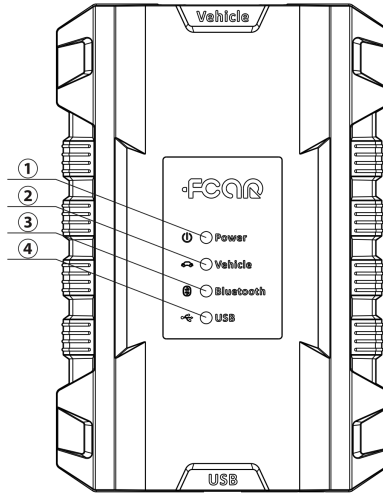
Serial number	Name	Description
①	Power supply indicator	Lighted on when the power is supplied (connected to the car)
②	Diagnostic indicator	Lighted on when communicating with the vehicle
③	Bluetooth indicator	Lighted on when connected to the F7S Host machine
④	USB indicator	Lighted on when connected to F7S host

Serial number	Name	Description
⑤	DB15 port	Connected to the main test cable, and connected to the vehicle via the diagnostic connector
⑥	USB port (B shape)	Connected to F7S host or used to upgrade the VCI box

VCI BOX PARAMETERS

Processor	Cortex-M3 Micro controller
Frequency	100MHz
Processor model	LPC1768
Flash EPROM	512KB
Memory	64KB
Bluetooth	Support Bluetooth 2.0, Bluetooth 4.0

CHAPTER II　　HOST ON/OFF AND FUNCTION MENU

2.1 HOST CHARGING

Host can be charged in following ways:

Power adapter: Plug one end of the AC/DC power adapter to the DC power port of the host and then connect the other end to the wall socket. The power adapter can be used to charge the built-in battery pack.

Note: Voltage of the power supply should be within the scope of the product host. Exceeding the range may cause damage to the product.

2.2 BOOTING

Press and hold the F7S host power switch (about 3 seconds) to power on host, the following welcome interface will pop up, and then system starts working.


2.3 SHUTDOWN

All vehicle communication must be terminated before shutting down the F7S diagnostic equipment. Vehicle's electronic control module would go wrong if forced shutdown during communication, please exit all diagnostic applications before shutting down.

The shutdown steps are as follows:

1)   Short press F7S host power switch (about 2 seconds)

2)   Click [Shutdown] in the pop-up prompt to close F7S host.

2.4 INTRODUCTION TO EACH MENU OPTION

After the system is powered on, enter the following main menu:
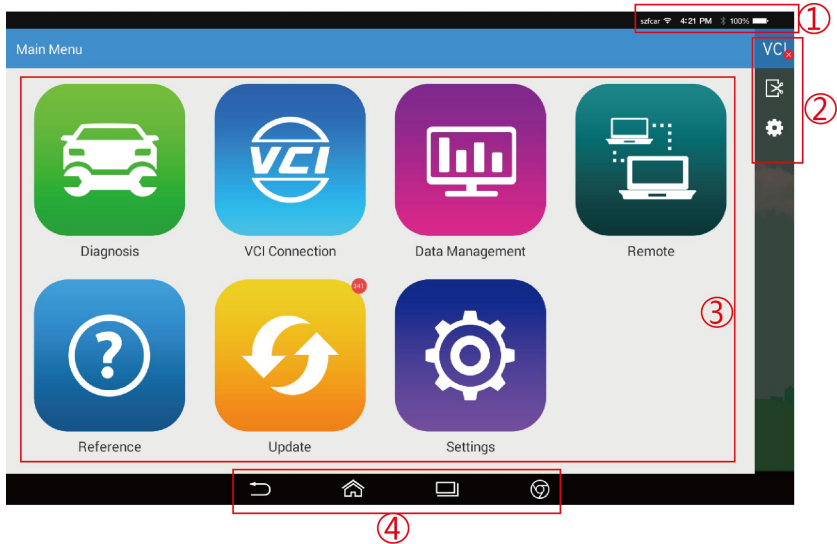
1) Status icon: is the default icon of the standard Android operating system

2) Toolbar (see Table 1 below)

3) Main menu (see Table 2 below)

4) Guide bar (see Table 3 below)

Tip: It is recommended to lock the screen whenever you are not using the device to protect your system information and save battery power. Slightly click the power/lock screen button once, the screen will be automatically locked. Excessive force or long press may cause the button to malfunction or enter the shutdown interface.

Table 1: Toolbar

Icon	Function name	Function description
VCI	VCI Connection	VCI box connection and status display (always available throughout diagnostic operation)
	Screenshot	One click to capture the current visual screen (always available throughout the diagnostic operation)

	Settings	"Settings" function shortcut

Table 2: Main Menu

Icon	Function name	Function description
Diagnosis	Diagnosis	Car diagnostic procedures, see section 3
VCI Connection	VCI connection	Establish and manage communication connections with VCI devices, see section 3
Data Management	Data management	For browsing and managing data files stored, see section 4
Remote	Remote	Run this program to establish remote assistance with FCAR after-sales technical team, see section 5
Reference	Reference guide	Provide help information such as equipment usage instructions, maintenance assistance, trouble code inquiry, etc. See section 6 for details.
Update	Update	Online upgrade of system software, model software, etc. See section 7 for details.
Settings	Settings	Set up and view system information, see section 8 for details.

Table 3: Guide bar

Icon	Function name	Function description
⤺	Back	Return to last interface
⌂	Homepage	Return to the main interface of the Android system

	Recently used program	Display the list of recently-used program thumbnails list, click on the program thumbnail to open the program, and swipe up the program thumbnail to close the program
	Website information	With internet connected, click it to enter FCAR official website

CHAPTER III   VEHICLE DIAGNOSIS

Through having established data connection with the vehicle's electronic control system that has been connected to the VCI device, the diagnostic program can read vehicle diagnostic information, check the data stream, and perform actuation test and other functions.

To establish good communication between the diagnostic program and the vehicle, you need to do as below:

1)   Connect the VCI box to the vehicle diagnostics socket and supply the power;

2)   Establish communication between VCI and F7S host via Bluetooth pairing or USB data cable;

3)   Check VCI connection status in the upper right corner of the screen (see 3.2.2). The vehicle diagnosis can be performed after the connection.

Vehicle diagnosis:

1)   Establish a good communication between the diagnostic program and the vehicle under test, see 3.2

2)   Select vehicle type, see 3.3.

3)   Perform vehicle diagnosis by "Auto Scan" all systems of the vehicle or manually selecting and detecting a designated control unit. For details, see 3.5.

Here we make the detailed instructions.

3.1 PRE-DIAGNOSTIC TECHNICAL REQUIREMENTS

3.1.1 EQUIPMENT REQUIREMENTS

F7S series automotive computer fault diagnostics is equipped with a host and various test connectors when leave factory. In testing, please select appropriate test connector according to the type of vehicle diagnosis socket.

3.1.2 VEHICLE REQUIREMENTS

1) Turn ignition switch to gear ON;
2) Vehicle battery voltage should be between 11~14V or 24~27V (subject to the vehicle's power supply)
3) Accelerator pedal is in OFF state, that is, the idle coupling point;
4) Ignition timing and idle speed value should be within the standard range, and the water temperature and transmission oil temperature are in the normal working temperature (water temperature 90~110°C, transmission oil temperature 50~80°C);

Then, diagnostic cable is connected properly.

3.1.3 MAINTENANCE TECHNICIAN REQUIREMENTS

1) Must have a basic knowledge of automotive electronics;
2) Understand the basic operation methods of this product and familiarize with this

manual;

3) Basically distinguish whether it is a mechanical fault or an electronic control fault from the vehicle fault phenomenon tested;

4) Learn about the vehicle's origin, year of production, model, engine model and more.

3.2 VEHICLE CONNECTION

3.2.1 CONNECT VCI BOX TO VEHICLE

Before VCI box connected to vehicle, it is necessary to judge whether the diagnostic socket of the test vehicle is a standard OBD-II port or a non-standard OBD-II port.

1) Vehicles compatible with the OBD-II management system can be connected to vehicle diagnostics socket and supplied with power only with one standard OBDII-16 connector;

2) Vehicles that are not compatible with the OBD-II management system need to select the corresponding connector; some other vehicles need to supply power to the VCI box through other power sources of the vehicle.

Here we make the operating instruction regards to these two connection modes

Standard OBD-II port connection:

For vehicles that can be connected to standard OBD-II port, you just need to connect with all-in-one main test cable OBD connector rather than other connectors, as shown in Figure 3.2-1:
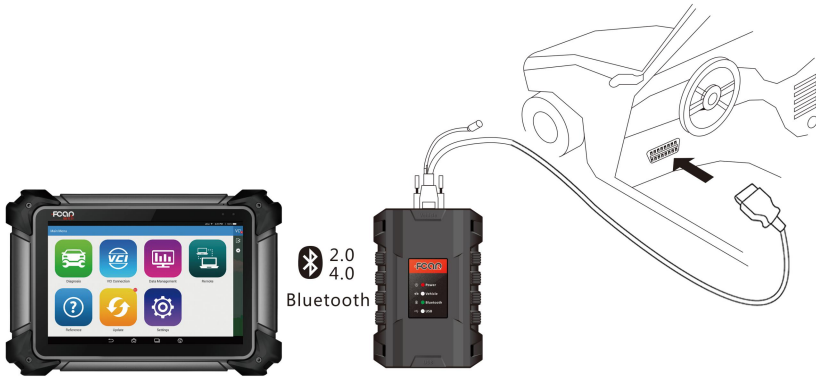
Figure 3.2-1 Connection of standard-OBD-II socket

Instructions:

1) Determine the location and the port of the diagnostic socket;

2) Connect one end of main test cable to DB15 connector of the VCI box and fasten the fixing bolt;

3) Connect the other end of the main test cable to the vehicle diagnostic socket;

4) At this time, the VCI box is powered by the vehicle diagnostic socket, and the power indicator light is on.

Note: After test is completed, please rotate the fixing bolts and then gently unplug the main test cable to avoid damage to the diagnostic port.

NON-OBD-II PORT CONNECTION

For vehicles connected to non-OBD-II interfaces, need to connect the main test cable to their corresponding dedicated connectors, as shown in Figure 3.2-2:

Figure 3.2-2 Connection of non-OBD-II interface

Instructions:

1) Determine the location, the port, and whether need to be connected to external power source of diagnostic socket;

2) Connect one end of the main test cable to the DB15 connector of the VCI box and lock the fixing bolts;

3) Connect the other end of the main test cable to a dedicated adaptor corresponding to the vehicle;

4) Connect the dedicated connector that is connected to the main test cable to the vehicle diagnostic socket;

5) At this time, VCI box is powered by the vehicle diagnostic socket, and then power indicator light is on (if it is not lit, it may be because the vehicle diagnostic socket is not energized, you can energize the VCI box by the cigarette lighter or the battery clip).

3.2.2 HOST AND VCI BOX CONNECTION

After VCI box is connected to the vehicle, the connection between the host and the VCI box needs to be matched, and then vehicle diagnosis can be started after matching is completed; the VCI box supports two ways of communicating with the F7S host: Bluetooth pairing and USB cable.

Paired through Bluetooth

1) Turn on F7S host power supply;

2) Select [VCI Connection] in the main menu; select [Bluetooth] in the connection mode;

3) Click the Scan icon on the right side of the device to automatically scan Bluetooth devices nearby.

4) Select target Bluetooth to match;

5) When matching is completed, state of VCI icon in the upper right corner of the screen changes from "VCI" to "VCI", indicating that the Bluetooth pairing is successful and the vehicle diagnosis can be started.
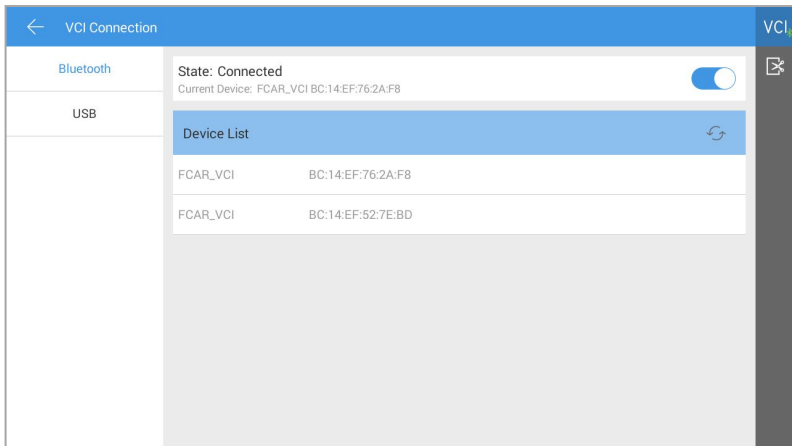
Note: If Bluetooth device can't be searched, it is maybe because the signal strength of the transmitter is too weak. In this case, please move it as close as possible to the VCI Bluetooth device.

Paired through USB cable connection

USB connection is the fastest communication method between the F7S host and the VCI device. Please use dedicated USB cable configured by our factory to connect. After the connection is completed, state of VCI icon in the upper right corner of the screen changes

from " VCI× " to " VCI↓ ". , indicating that the USB connection is successful, and then the vehicle diagnosis can be started.

Note: These two connection methods can't be used at the same time!

3.3 VEHICLE TYPE SELECTION

When all the above connections are completed, click [Diagnosis] on Main Menu to start the vehicle diagnosis. The following figure shows the gasoline version of the vehicle selection interface. The other versions of the model interface are similar.
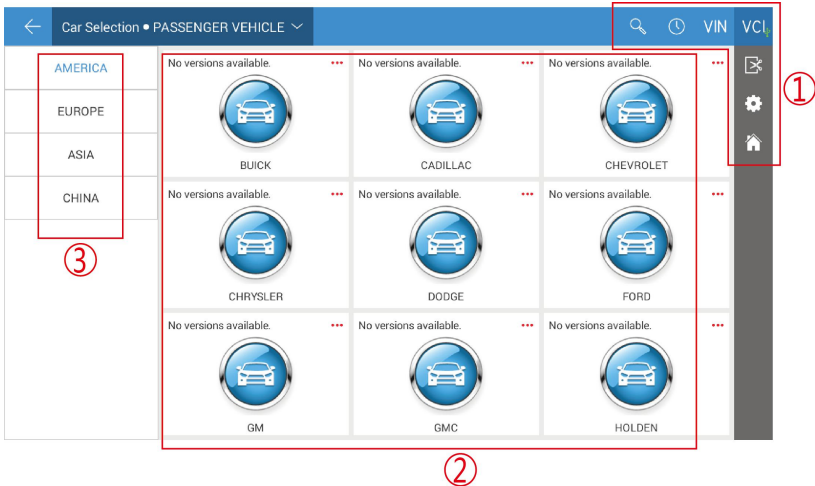
1) Toolbar (see Table 1 below)

2) Regards to model manufacturer and related detection functions, click on " ● ● ● " in upper right corner of the model to view function list and other related information of the vehicle type.

3) Asian, European, American major brand vehicle series selection menu

Table 1:

Icon	Name	Function description
🔍	Search	One-click search for major brand vehicle types

	History record	View maintenance history, quick access to diagnostics, view diagnostic List, model version information, and more
VIN	VIN code	Identify the vehicle types by manually or automatically scanning the VIN code
	Homepage	Return to Main Menu

Diagnostic program requires "Car Selection" before entering the system module diagnostic function. FCAR F7S series can do vehicle identification in the following ways:

1) Manual selection
2) Through "Auto Diagnosis" function (for gasoline models)
3) Direct access to the vehicle system module (for gasoline models)
4) Automatically scan VIN code (for gasoline models)
5) Manually input VIN code (for gasoline models)
6) Access via OBDII (for gasoline models)

3.3.1 MANUAL VEHICLE SELECTION

Manual Vehicle Selection uses menu guide mode, just follow the on-screen instructions to make a series of selections, and then specific options will vary depending on the model being tested. Among a large number of vehicle types, you can even quickly find the target brand through search function of the toolbar, and then select according to the screen prompts; for gasoline models, you can find the brand according to the location of the model (i.e. Chinese, Asian, European, American), then select according to the screen prompts until accurately identify the vehicle to be tested.

3.3.2 AUTO VEHICLE SELECTION

(FOR GASOLINE MODELS)

The latest "Auto Vehicle Selection" function of FCAR smart diagnostic system can skip Manual Vehicle Selection, to obtain specific vehicle information directly from the vehicle ECU, and quickly enter the diagnostic interface after confirmation. At present, this function supports a few models, subject to the menu displayed. The following is an example of Lincoln:

1) Select [LINCOLN] of AMERICA from the vehicle selection interface;
2) Click [Auto Vehicle Selection] from the vehicle selection, then the diagnostic program will automatically recognizes vehicle information;
3) Check the vehicle information carefully and click [OK] to enter the vehicle diagnosis interface directly.

3.3.3 DIRECT ACCESS TO THE VEHICLE SYSTEM

(FOR GASOLINE MODELS)

If clearly know the cause of the vehicle failure, you only need to enter specific system module. Currently the supported vehicle electronic control system includes engine system, anti-lock brake system, and airbag. Here we take Bosch M797 engine system as an example:

1) Select [ENGINE SYSTEM] under CHINA menu in the vehicle selection interface;
2) Select [Bosch] in the engine electronic control system interface;
3) In the Bosch engine interface [Bosch M797 engine system], the system will automatically enter the function diagnosis interface.

3.3.4 AUTOMATICALLY SCAN VIN CODE

(FOR GASOLINE MODELS)

Automatic-scanning VIN code of FCAR smart diagnostic system can identify all CAN-compatible vehicles. With function of automatic VIN code scanning, service technicians can quickly find the target vehicle type. The operation steps are as follows:

1) Click [VIN] function icon on [Car Selection] and select [AUTO];
2) Click [Start Scan], then the diagnostic instrument starts to scan the VIN code on the

ECU;

3) Once the vehicle is successfully identified, the system will guide you to enter into the vehicle diagnostic interface.

3.3.5 MANUALLY INPUT VIN CODE

(FOR GASOLINE MODELS)

For models that do not support automatic scanning of VIN codes, FCAR Diagnostic System also supports manual input of VIN codes as below:

1) Click [VIN] function icon on Car Selection interface and select [MANUAL];

2) Enter correct VIN code in the input box, and click the search " Q " icon on the right, the system will automatically display the searched model;

3) Once the vehicle is successfully identified, the system will guide you to enter into the vehicle diagnostic interface.

3.3.6 GENERAL OBDII ACCESS MODE

(FOR GASOLINE MODELS)

In some cases, database does not support or the vehicle has other functional features, so the diagnostic instrument cannot identify the vehicle and establish communication through the normal channel. At this time, OBDII or EOBD test can be started through the OBD direct access function. For details, see 3.7.

3.4 DIAGNOSIS AND OTHER HIGH-LEVEL FUNCTION

After the vehicle selection is completed, the vehicle diagnosis can be started. Following is the operation method for the diagnosis of the gasoline models. Diagnosis methods of other models are similar. Here we check main interface of the gasoline version diagnosis:
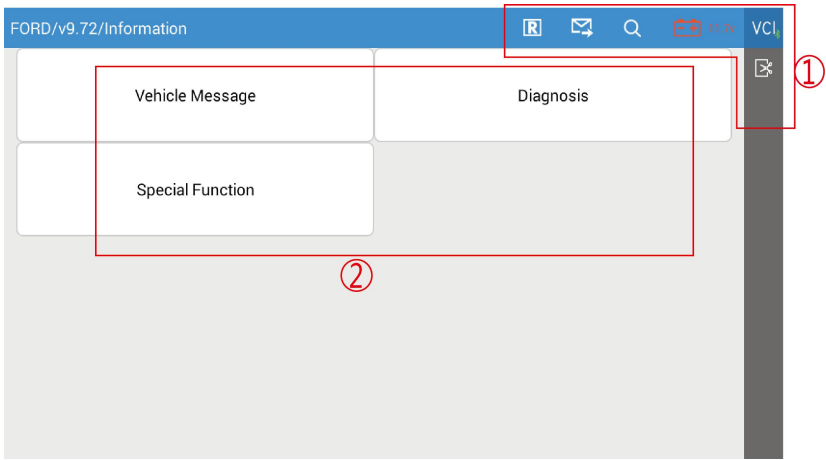
①   Toolbar and status bar (see Table 1 below)

②   Diagnostic function main interface (see 3.4.1 for details)

Table 1:

Icon	Function description
R	Create test reports, you can view, print, send test reports, etc. in 'Data Management'
✉	One-click feedback, you can feedback problems in the vehicle diagnosis process to FCAR after-sales technical team

3.4.1 MAIN INTERFACE

Main interface of diagnosis displays the function options of the selected models. The interface options are little different based on the different selected models.

The main function interface usually includes the following options:

Vehicle information: Click to view the vehicle information to be tested, including: vehicle type, engine model, displacement, production year, etc.

Diagnosis: Start the diagnosis of the vehicle's electronic control system, including read

fault code, erase fault code, read live data, actuation test and so on.

Special function: different selected vehicle types have different special functions and the displayed function names are slightly different. This option sometimes may be displayed as special function, maintenance data, maintenance reset or other similar names.

3.5 DIAGNOSIS

After enter [Diagnosis], you have the following two ways to enter the vehicle system module: **Auto Vehicle Selection and Manual Vehicle Selection**.

Auto Vehicle Selection: after select the option, the diagnostic program will automatically scan all the systems of the vehicle under test. Some vehicles also support reading the global fault code and one-key clearing code function. The following figure shows the automatic scanning interface:
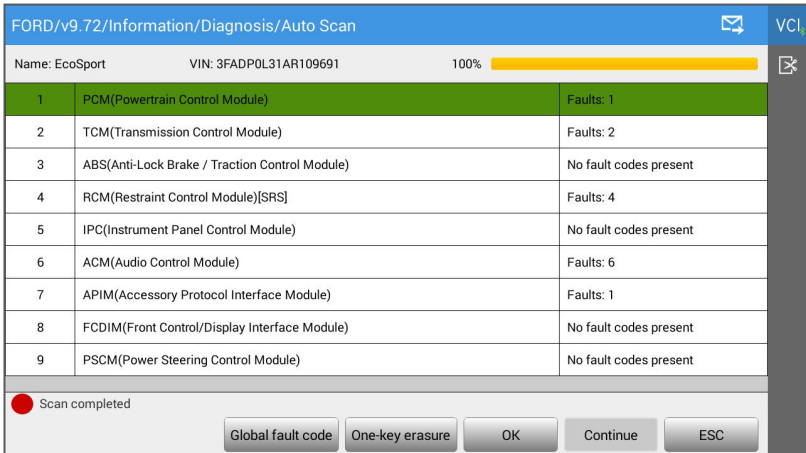

FORD/v9.72/Information/Diagnosis/Auto Scan		VCI
Name: EcoSport	VIN: 3FADP0L31AR109691 100%	
1	PCM(Powertrain Control Module)	Faults: 1
2	TCM(Transmission Control Module)	Faults: 2
3	ABS(Anti-Lock Brake / Traction Control Module)	No fault codes present
4	RCM(Restraint Control Module)[SRS]	Faults: 4
5	IPC(Instrument Panel Control Module)	No fault codes present
6	ACM(Audio Control Module)	Faults: 6
7	APIM(Accessory Protocol Interface Module)	Faults: 1
8	FCDIM(Front Control/Display Interface Module)	No fault codes present
9	PSCM(Power Steering Control Module)	No fault codes present

Scan completed

Global fault code | One-key erasure | OK | Continue | ESC

Figure 3.5-1 Auto Vehicle Selection

The following table shows the function buttons in Auto Vehicle Selection:

Function name	Function description
Global fault code	Click to view the vehicle total system fault code

One key erasure	One key erase all fault codes in the system
OK	Select any system module and click OK to enter the module diagnostic interface.
Pause	Click Pause, the program will automatically pause the scan and display as [Continue]
ESC	Exit Auto Vehicle Selection and return to the last operation interface

Manual Vehicle Selection: Select this option, the diagnostic program will display all vehicle control units. Select a control unit, you can enter the diagnostic interface of the control unit, as shown in Figure 3.5-2. (If the model is not configured, you can't establish communication with the vehicle ECU).
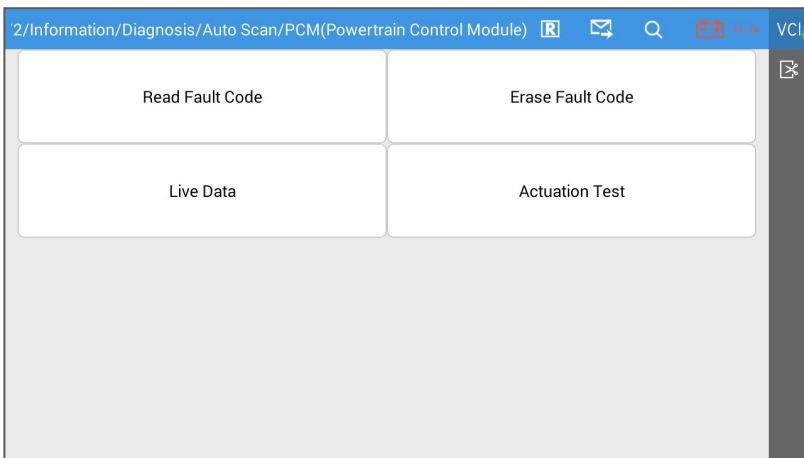
3.5-2 Control unit diagnosis interface

Read fault code: Read and show the Fault Code information retrieved from vehicle system module
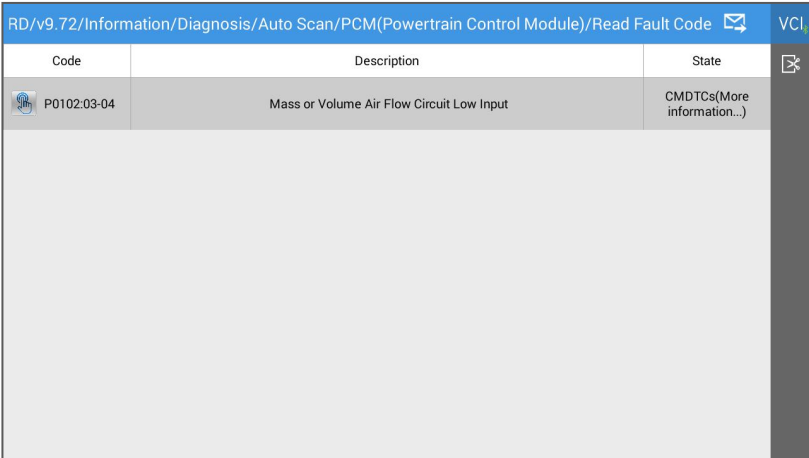
Erase fault code: erase fault code and freeze frame data retrieved from vehicle system module

Live data: Read and show the current system module real-time operational factor, this option sometimes possibly displayed as "read data stream"

Actuation test: Carry out the module testing of specific subsystem

3.5.1 READ FAULT CODE

Read and display the fault code retrieved from the vehicle system module under test and explain the fault content, as shown in Figure 3.5.1:

Figure 3.5.1 Read Fault Code

3.5.2 ERASE FAULT CODE

Before clearing the fault code for later viewing and comparison, please record and store the read fault code that you read.

How to erase fault code

1) Select [Erase fault code] on the control module diagnosis interface;

2) At this time, the diagnostic system will pop up the prompts "Turn off the engine and turn on the ignition switch", "The fault code and freeze frame data will be cleared, do you want to continue?", select [Continue]; (**Note: This step requires you to strictly operate the vehicle in accordance with the menu prompts**)

3) When another prompt message pops up, select [Return] and re-execute the read fault code function to verify whether the fault code has been cleared.

Fault code analysis steps:

1) Read and record all fault codes;

2) Erase all fault codes;

3) Simulate the conditions generated by the fault and start a road test;

4) Then read and record the fault code at this time;

5) Distinguish between incidental fault codes (independent fault codes or historical fault codes) and persistent fault codes (current fault codes or associated fault codes);

6) Distinguish between the major fault code and the minor fault code associated with the fault symptom;

7) Distinguish the major fault codes in many fault codes or related fault codes (it may be the cause of other fault codes);

8) According to the above analysis, you can further detect the sensor represented by fault code, related circuit state of the actuator or control computer, as well as accurate position of the fault occurred.

3.5.3 READ LIVE DATA

Select this function, the real-time operating parameters of the selected system module will be displayed on the screen. Different models or control modules have different data parameters, as shown in Figure 3.5.3-1.
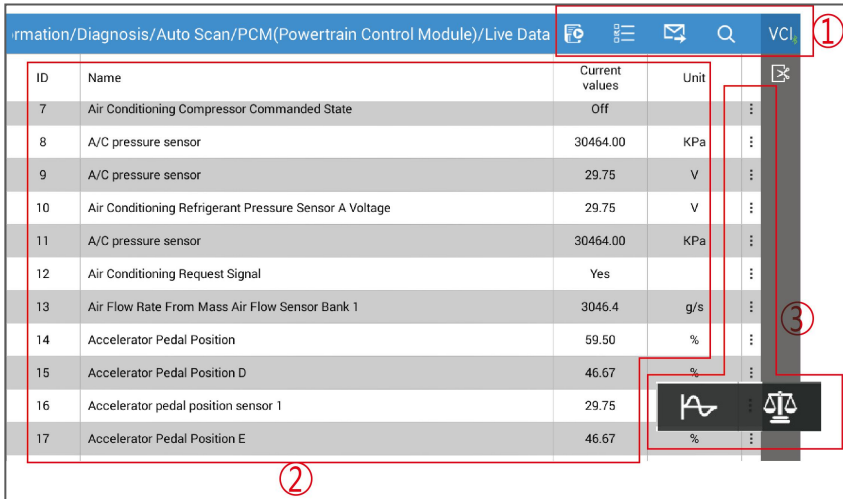
Figure 3.5.3-1 Read Live Data

① Toolbar, see Table 1 below

② Live data display area

③ Hidden column, see Table 2 below

Table 1

Function icon	Function description
	Record data stream
	Select menu

Table 2

Function icon	Function description
	Function hiding icon
	Data stream waveform
	Data stream comparison

Data stream waveform

In data flow interface, click any numerical parameter item in the hidden column, select [Data Flow Waveform] function icon " ", you can view the data flow waveform of the running parameter, as shown in Figure 3.5.3-2. Select lower right corner " " to return to the value display state.
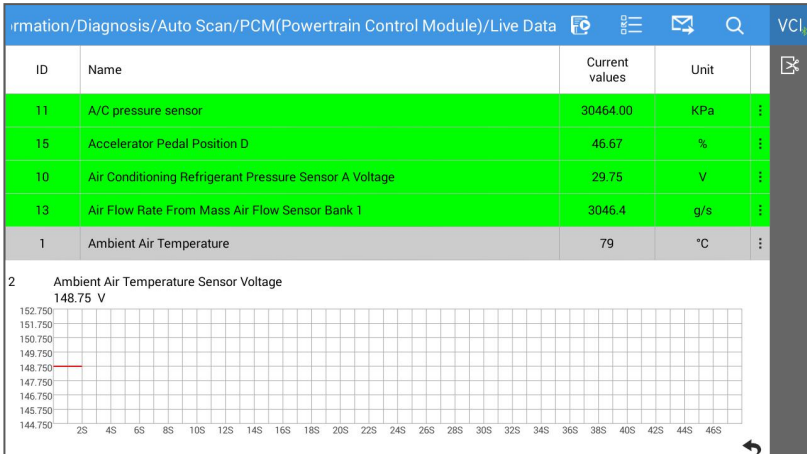

Figure 3.5.3-2 Data Stream Waveform

Data stream recording and comparison function

FCAR smart diagnosis system supports the recording and saving of data stream, and it can be viewed infinitely in [Data Review]. It also supports the comparison function of data streams. When the vehicle is in good condition, the data stream can be collected and stored so as to provide a data reference through the data stream comparison function for the next test or encountering a vehicle with the same model.

How to record data stream

1) Click [Selection] function icon " " in the upper right corner, tick the parameter items to be recorded in the pop-up window, and select [OK] to return;

2) Select the [Data Stream Recording] function icon " ", enter the stored file name

in the pop-up window (it is suggest that the file is named after the vehicle information for easy reference), select [OK] to return;

3)   Click [OK] to start recording, manually slide the touch screen slowly to the last data column; click [Stop] button in the lower left corner to stop recording and automatically save the data stream;

4)   After the data stream is recorded, the system will automatically store it (tip: the data stream can be stored for up to 2 minutes). The data stream stored can be viewed from [Data Review] in the data management function.

How to perform data stream comparison

1)   Click [Selection] function icon " " in the upper right corner, tick the parameter items to be compared with data stream in the pop-up window, and select [OK] to return;

2)   Click [Data Stream Contrast] function icon " " in any hidden column on the right side. In the pop-up dialog box, tick the data file that has stored with the same model and select [OK] to return.

3)   At this time, a bar of "comparison value" is emerged in the data flow interface, as shown in Figure 3.5.3-3, the service technician can quickly find and eliminate the vehicle fault problem through system parameter comparison.

Note: The function icons such as data stream waveform or line graph and data stream comparison of some models are displayed at the bottom position of the data stream interface. Please operate according to the specific vehicle function display menu.

ID	Name	CMPR values	Current values	Unit	
150	Transmission Park or Neutral Range Switch	Yes	Yes		⋮
151	Time Since Engine Start	507:44	507:44	m:s	⋮
152	Actual Exhaust B Camshaft Position Bank 1	1904.00	1904.00	°	⋮
153	Exhaust B Camshaft Position Duty Cycle Bank 1	92.97	92.97	%	⋮
154	Exhaust B Camshaft Desired Minus Actual Bank 1	1904.00	1904.00	°	⋮
155	Desired Exhaust B Camshaft Position Bank 1	1904.00	1904.00	°	⋮
156	Actual Intake A Camshaft Position Bank 1	1904.00	1904.00	°	⋮
157	Intake A Camshaft Position Duty Cycle Bank 1	92.97	92.97	%	⋮
158	Intake A Camshaft Desired Minus Actual Bank 1	1904.00	1904.00	°	⋮
159	Desired Intake A Camshaft Position Bank 1	1904.00	1904.00	°	⋮
160	Reference Voltage	29.75	29.75	V	⋮

Figure 3.5.3-3 Data Flow Comparison

3.5.4 ACTUATION TEST

By performing this function, you can access the vehicle-specific subsystem and perform component testing, when performing the actuation test, the diagnostic device inputs an instruction to the ECU to drive the actuator, and thereby determines whether the actuator of the vehicle electronic control system and its line are normal. Different control systems of different models have different test options. Please refer to the menu display.

The following is an example of the air conditioner compressor command state under Ford's PCM (Powertrain Control Module).

How to do actuation test

1) Enter Ford PCM (Powertrain Control Module) diagnostic interface by select Auto Vehicle Selection or Manual Vehicle Selection;
2) Select [Actuation Test] on Diagnosis interface;
3) Test item selection [ACC_CMD (air conditioner compressor command status)];
4) Drive the air conditioner compressor operation through [Off] and [On] buttons. When an operation is successfully completed, the screen will display "Operation Successfully" or other similar prompt information, as shown in Figure 3.5.4-1.
5) According to the implementation, test whether the working state of the air

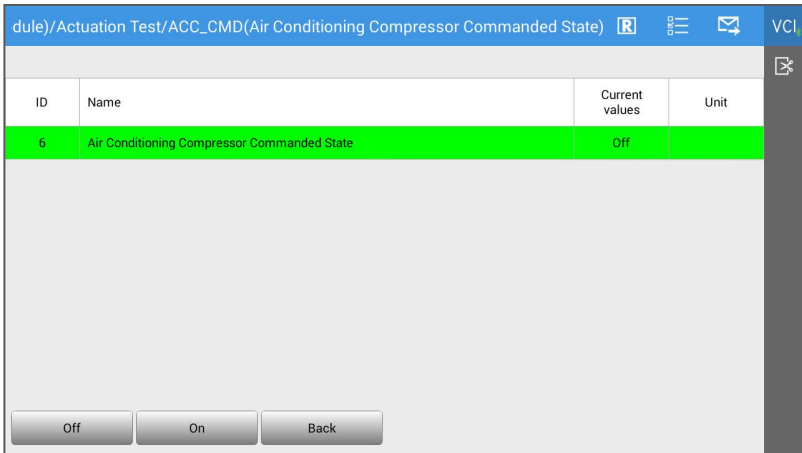conditioner compressor is normal. Click [Back] to exit the test.

Figure 3.5.4-1 Actuation Test

Note: The control buttons will be different according to the selected test item, such as "On" "Off" or "+" "-".

With the "data customization" of some models of FCAR, you can also check the working status or values of other actuators and sensors associated with the component based on actuation test, helping the service technician to find the vehicle fault more accurately and quickly.

How to use data customization to do actuation test

1) Enter Ford PCM (Powertrain Control Module) diagnostic interface by clicking Auto Vehicle Selection or Manual Vehicle Selection;

2) Select [Actuation Test] on diagnosis interface;

3) Select test item [ACC_CMD (air conditioner compressor command status)];

4) In ACC_CMD interface, click the menu " " and tick the data stream related to the status of the component in the pop-up window, and select [OK] to return;

5) At this time, several lines of data stream are automatically added under the "Air Conditioning Compressor Commanded State", and the operation of the air

conditioner compressor is driven with two buttons of [Off] and [On]. Test whether the working state of the air conditioner compressor is normal according to the execution status and the newly added data stream status, as shown in Figure 3.5.4-2:

Figure 3.5.4-2 Data Customization

3.6 SPECIAL FUNCTION

SPECIAL FUNCTION can do self-adapting for each component. It is mainly used to re-calibrate or configure the components after repairing or replacing components, so that the components of the electronic control system can adapt to each other, otherwise the system will not operate normally.

17 special features of FCAR F7S petrol version include: Service Reset, Throttle Matching, Smart Key Matching, Odometer Calibration, Electronic Brake, Electronic Steering Matching, Tire Pressure Reset, ECU Reset, Abs Automatic Exhaust, Airbag Reset, Exhaust Aftertreatment, CKP Learning, ECU Computer Programming, Headlight Adaptation, Suspension System, Battery Matching, Window, shown as Figure 3.6-1:
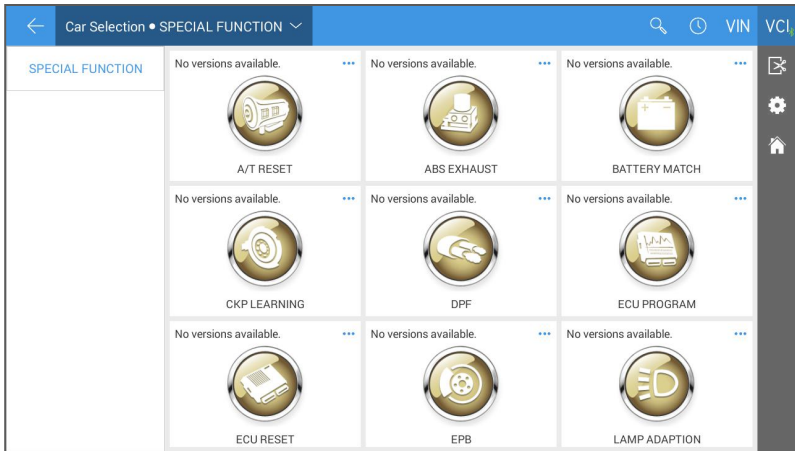
Figure 3.6-1 Special Function

The main interface of the adaptive operation is under the menu guide mode. Please read the screen prompts carefully and operate according to the prompts. The specific selection of the procedure will vary depending on the model tested. Here we check the general processes of adaptive operation:

1) Select vehicle type and related configurations;

2) After the program establishes the normal communication with the vehicle ECU and some functional operations meet certain conditions, select the functional operation that needs to be performed, shown as in Figure 3.6-2:

3) Carefully read the information on the screen and check the corresponding vehicle status, strictly follow the menu prompts;

4) After the adaptive operation is completed, the screen will display prompts such as "Operate successfully" and "Match completely".
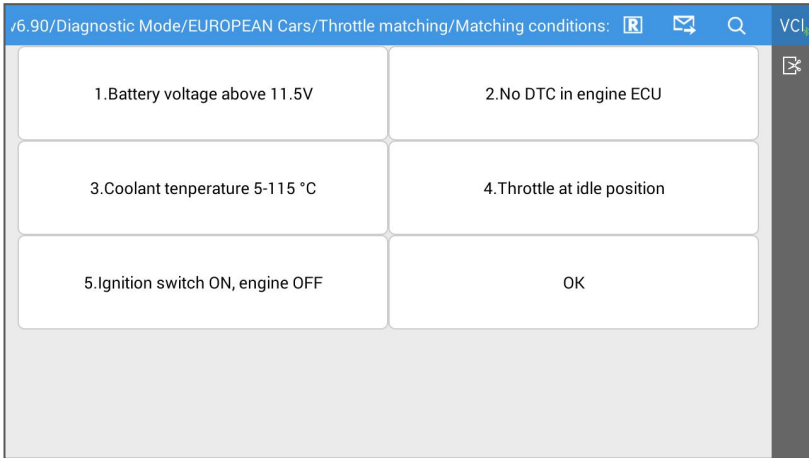
Figure 3.6-2 Specific conditions

3.7 GENERAL OBDII (FOR GASOLINE MODELS)

On the main menu of "Car Selection", there is a quick access option for "OBDII" vehicle diagnosis. This option can be used to quickly check the fault code and find out the fault that enables the fault indicator to light up. Check monitor status before executing emission certification test, verify whether the service is successful, and do other emissions-related maintenance. The direct access option of OBD can also be used to test all OBDII/EOBDII compatible vehicles not included in the Diagnostic System database.

3.8 DEMO ON THE FCAR F7S AND DIAGNOSTIC SOCKET CONNECTION

3.8.1 ON CONNECTING THE OBD-II CONNECTOR

Choose the proper connectors according to the diagnostic connectors of the to-be-detected vehicles. If the connector of the vehicles is standard OBD-II, connect one end of the main test cable to F7S and another to the OBD-II connector, fasten them with bolts and plug the diagnostic connector into the diagnostic sockets on the vehicle, as
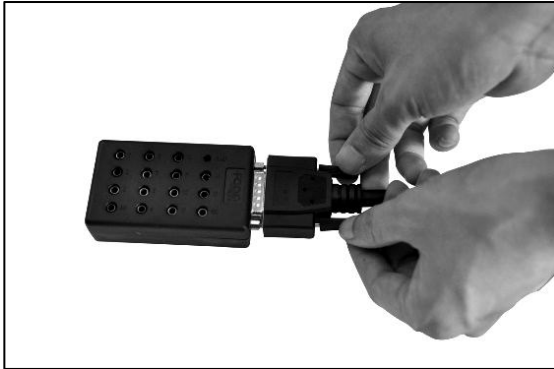
shown in Figure 3.8.1-1.

Figure 3.8.1-1

3.8.2 ON CONNECTING THE Non-OBD-II CONNECTOR

For starters, users should confirm whether the F7S decoder's connector matches that of the vehicle to be detected. When connecting, users should first connect the connector that is exclusive to F7S decoder to the standard OBD-II connector, and then connect the standard OBD-II connector to the main testing cable and the main unit of the decoder.

3.8.3 CONNECTION BETTWEEN JUMPER HOLDER AND THE VEHICLE DIAGNOSTIC CONNECTOR
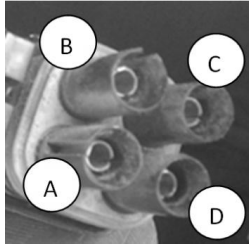
In the course of vehicle diagnosis, it can often be the case that even proper diagnostic connectors are used it's still unable to connect the connectors due to damages, modifications or wrong connection made to the vehicle diagnostic socket. In such cases, users can use jumper holder to make the connection possible via jumpers.

Note that the diagnostic socket doesn't have a power supply. Please use a battery clamp to connect anode (no need to connect battery clamp to the cathode) when providing the diagnostic tool with power. Please do not use a cigarette lighter or else that will lead to ECU test failure.

Jumper Holder and Jumper Introduction

	Introduction to a jumper holder There are 15 holes on the jumper holder, they are marked with 1, 2, 3, GND, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, VCC respectively. Definitions of each hole are as follows: 1#: K Line 　　　2#: K Line 3#: K Line 　　　GND: Ground（Negative） 6#: CAN-H 7#: RSR232+, J1708+, K Line 8#: K Line 　　　9#: K Line 10#: K Line 　　　11#: K Line 12#: K Line 　　　13#: K Line 14#: CAN-L 　　　15#: RSR232-, J1708-, L line VCC: Power Line（positive） POWER: Power indicator
	Introduction to jumper There are 16 jumpers in three colors (red, black and yellow) in an assembly box. Red jumpers are often used to connect the battery anode. Black jumpers are used to connect the battery cathode and the yellow one is used to connect signal lines. There are four kinds of jumper pins: sheet pin, cylindrical, square hole and round hole. They can be applied to any shape of diagnostic port pins. Select the jumper according to the shape of the vehicle's diagnostic connector pins.

Common Communication Protocols

Protocol Name	Name of the Communication Line	Range of Voltage For Reference	Hole Number of Jumper to Be Connected
K Line Communication	K	1V lower than the battery voltage	7
CAN Communication	CAN-H	2.5V＋0.25V	6
	CAN-L	2.5V－0.25V	14
J1708 Communication	J1708-A	3V~5V	7
	J1708-B	0V~2V	15
RS232 Communication	RS232-TD	(-9V) ~ (-5V)	7
	RS232-RD	0V~0.7V	15
Yuchai Natural Gas		Terminal A (5.5V)	7
		Terminal B (4.5V)	15
		Terminal C (GND)	GND

The steps of connecting are given as follows, using K line communication and CAN communication as an example：

Steps to Connect K Line to the Diagnostic Socket

The signal line's voltage of K line is 1V lower than that of the battery. For example, the voltage of the accumulator is 12V, so the voltage of K line's signal line is about 11V. The signal line's voltage will be 23V if the voltage of the accumulator is 24V. There might be a deviation with its value being from -0.25 to +0.25 when the voltage of the vehicle's diagnostic socket's pins is measured.

The method of connecting K line to the diagnostic socket and FCAR jumper holder are demonstrated in Figure *3.8.3-2*. Connect the signal line to No. 7 hole, power line (battery voltage) to VCC and ground line to GND.
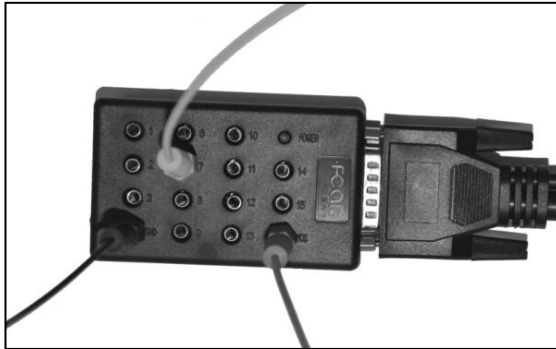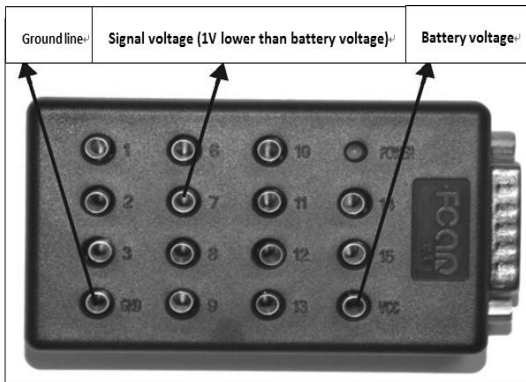

Figure 3.8.3-1

Figure 3.8.3-2

Steps to Connect CAN Line to the Diagnostic Socket

Double signal line is adopted in CAN line communication. Use two diagnostic signal lines to measure the voltage of the ground line via multi-meter after turning the ignition switch to on. The total amount of the voltage measured by these two lines is 5V. The voltage of CAN-H line is about $2.5+0.25$V, and the voltage of CAN-L line is about 2.5

－0.25V. There might be a deviation with its value being from -0.25 to +0.25 in cases of actual measurement.

Methods of connecting CAN line to the diagnostic socket and FCAR jumper holder is demonstrated in Figure 3.8.3-3 Connect CAN-H to No. 6 hole, CAN-L to No. 14 hole, power line (battery voltage) to VCC and ground line to GND.

Note: In actual cases of measuring the voltage of the diagnostic socket pins, there might be a deviation with its value being around -0.25 to +0.25V.
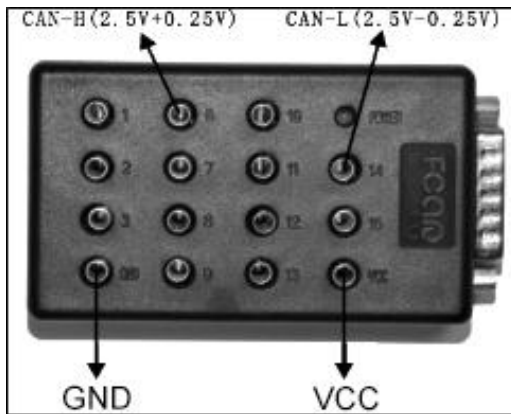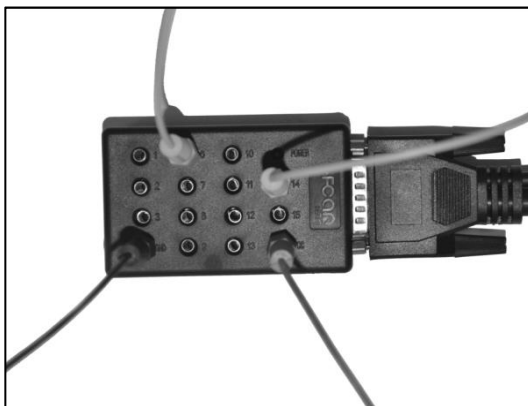

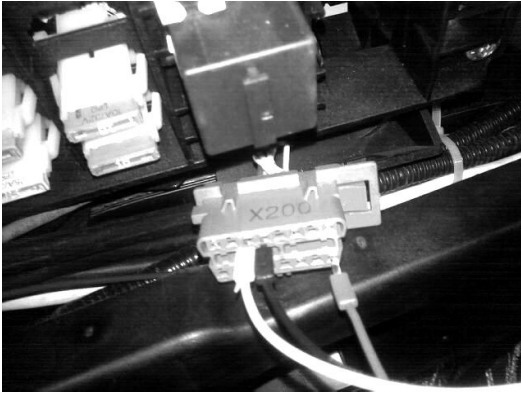
Figure 3.8.3-3

Figure 3.8.3-4

Figure 3.8.3-5

Connect the jumper holder and the main testing cable and fasten them with bolts. After connecting the jumpers according to the right steps, users can connect them to the vehicle for diagnosis.

Turn on the ignition switch after successfully connected everything. The power indicator light on the jumper holder will turn on. Turn on the FCAR F7S products and select proper systems for diagnosis if the diagnostic tool functions properly.

Note: For anyone who lacks knowledge about electric devices on vehicles or is not sure about the power supplier of the electric device please do not carry out a jumper test on your own. Incorrect operation may lead to electric failures of vehicles or the damage the FCAR diagnostic toll and its wires.

Information on the Vehicle's Diagnostic Socket:

1. High impedance digital multi-meter (high impedance meter must be applied, otherwise it could damage the computer board)

2. Turn ignition switch to ON. There should be a power supply to the vehicle from the diagnostic socket. The difference between the voltage of the diagnostic socket and vehicle's battery should not be over 2.5V.

3. While diagnosing, if the signal line is of single-wire communication (K line), the

voltage of the signal line should be 1V lower than that of the battery. (if the voltage of the vehicle's power supply is 12V, the voltage of the signal line should be about 11V±0.25V. If the power supply is 24V, the signal line's voltage should be 23V±0.25V)

4. If CAN communication is adopted in the communication of the duel signal lines, turn on the ignition switch and measure the voltage of the ground line via multi-meter. The total amount of the voltage measure through these two lines should be 5V. The voltage of CAN-H line should be $2.5+0.25$V, and the voltage of CAN-L line should be $2.5-0.25$V. There might be a deviation with its value being from -0.25 to +0.25 in cases of actual measurement.

CHAPTER IV   DATA MANAGEMENT

"Data Management" application is used to save, view, or print saved files. Most of the files are generated by the toolbar operation of the vehicle diagnostics interface.
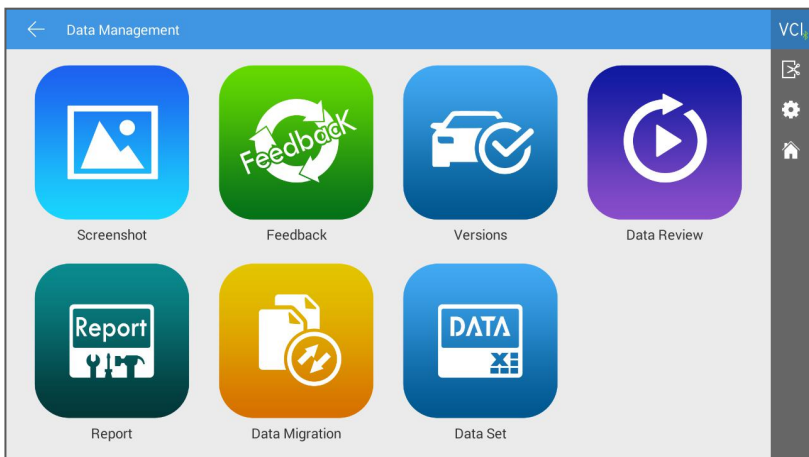
CHAPTER V   REMOTE DIAGNOSIS

This function allows you to receive remote service and support from FCAR's after-sales technicians to assist you with vehicle diagnosis.

How to receive technical support from FCAR

1)   Turn on F7S host power supply;

2)   Select [Remote] from Main Menu to enter Team Viewer interface, and then the system automatically generates and displays the device ID.

3)   Send your device ID number to FCAR after-sales team and wait for them to send the remote control request to you;

4)   After receiving the request, you can select [YES] to accept, or [NO] to reject in the pop-up window.

Note: Make sure the device is connected to the Internet before receiving remote assistance.
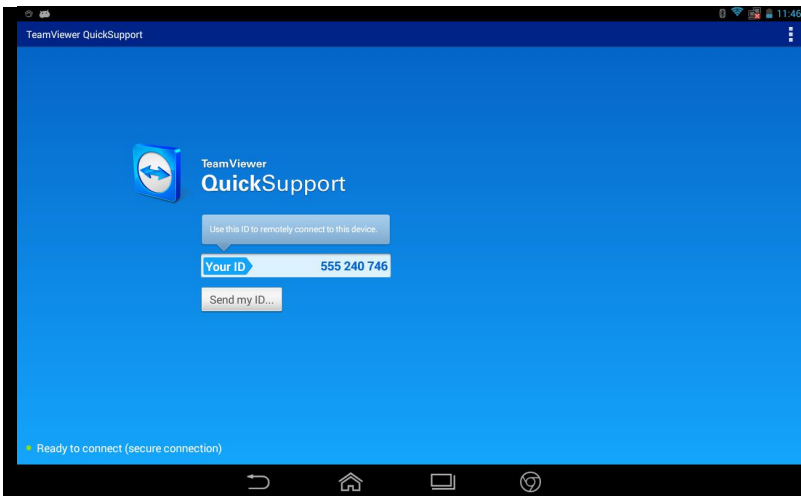
CHAPTER VI   REFERENCE

Here we have built in product manual, FAQ, Fault Code inquiry, dictionary and other maintenance information for the user to access.
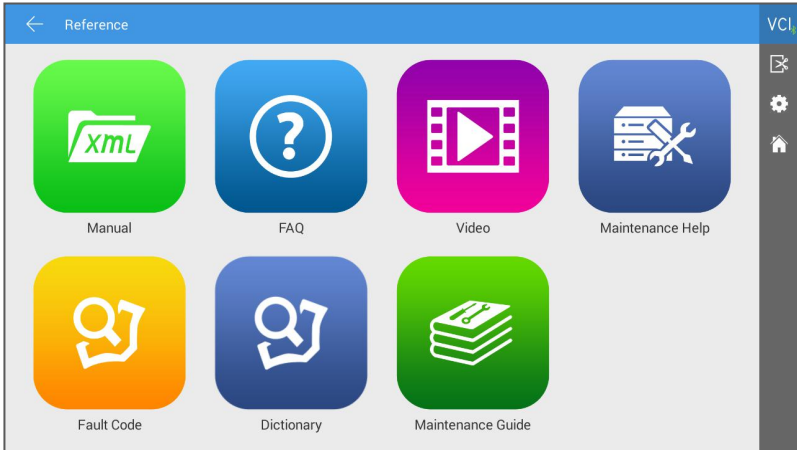
CHAPTER VII   UPDATE

Connect F7S device to the Internet to upgrade the diagnostic software and improve product functionality in a timely manner. Enter [Update] from Main Menu, then the system will automatically search for the latest update program, as shown below, click [Update] to update vehicle types and other applications to the latest version.
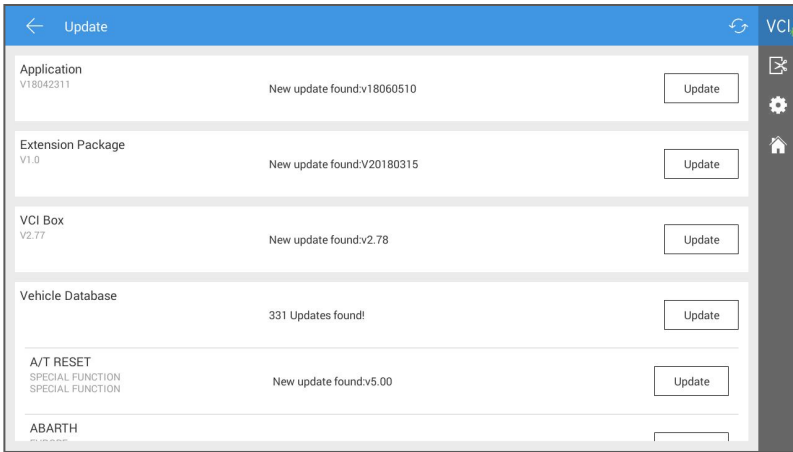
CHAPTER VIII   SETTINGS

In the main menu, click [Settings] to enter the setting interface. On this interface, you can adjust following system settings:

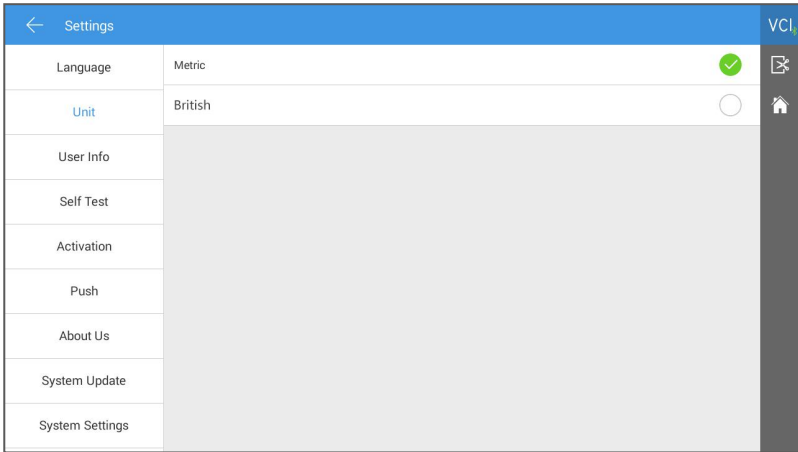### 8.1 LANGUAGE

FCAR F7S series fault diagnostic equipment is available in multiple languages setting, please set according to the language supported by the model you purchased.

8.2 UNIT

This option allows you to set the live data unit in the diagnostic software, please select metric or British as needed.

8.3 USER INFO

Set your personal information: Name, Telephone, Email, Address, etc.
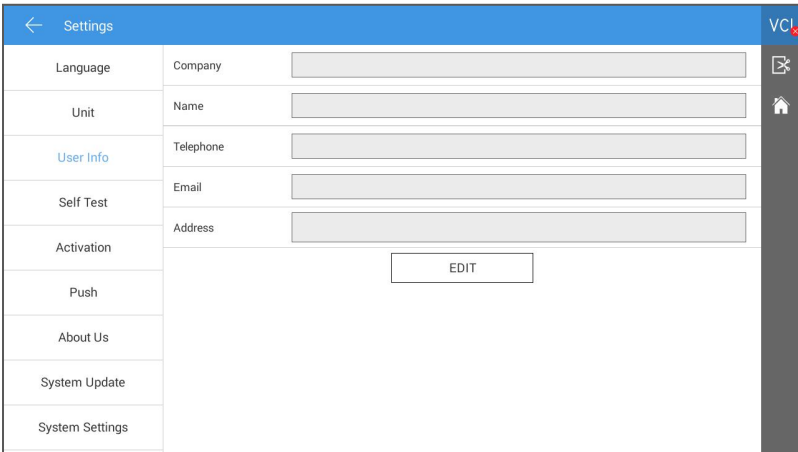
8.4 SELF TEST

Connect the device according to the screen icon, and click [Start Test] to check the open circuit and short circuit of the main test cable and OBD-II connector to judge whether it is good or bad.
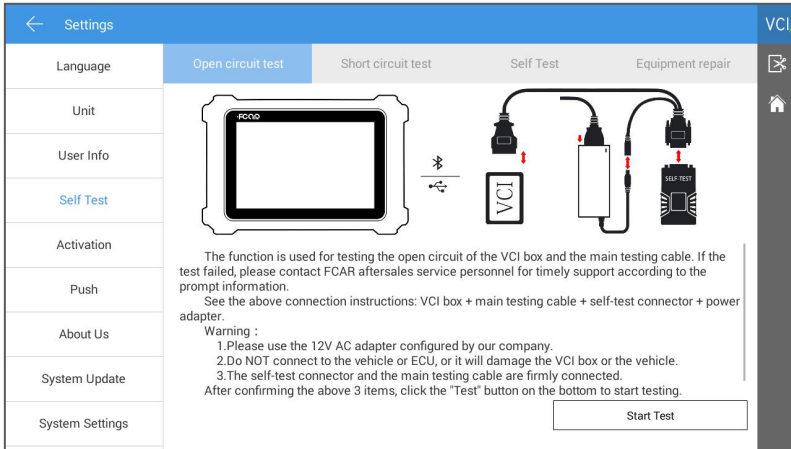
8.5 ACTIVATION

The product is shipped with a time-limited usage restriction. When you power on the machine, it will prompt: "You are using the trial version, there is ** chances left to use", connect Internet and click [Activation] to activate the machine.
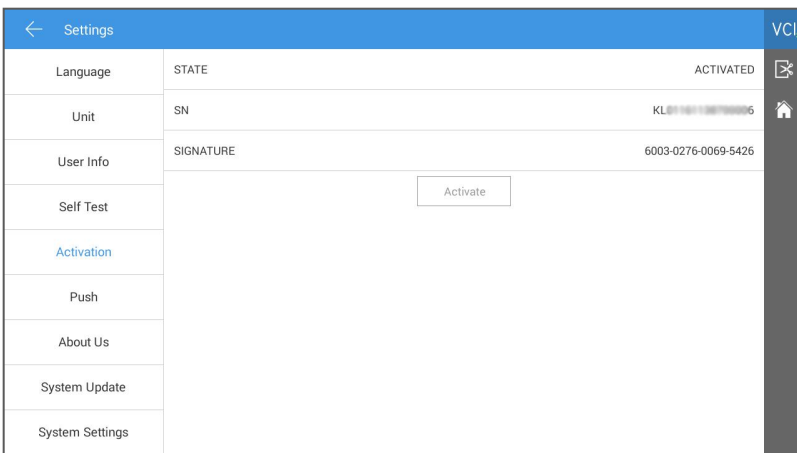
8.6 PUSH

With "Push" function, F7S host can receive periodic online messages from the server, such as system update notifications or other service message notifications. It is recommended that you always turn this function on so that you can receive the latest update service in a timely manner.
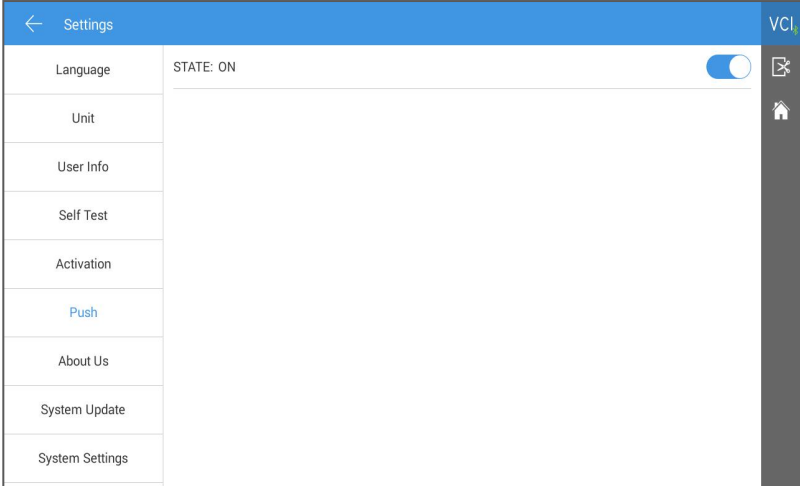
8.7 ABOUT US

This interface shows system information, activation state, storage, etc.
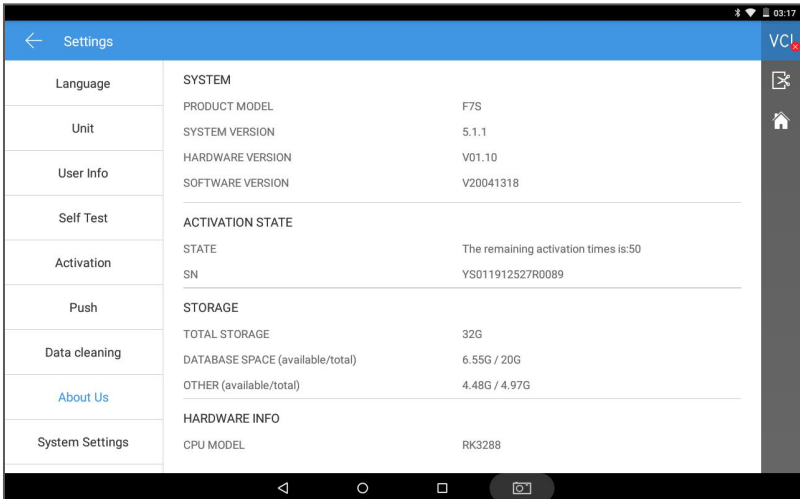
8.8 SYSTEM UPDATE

This function can be used to update Android system firmware, please connect the charger before updating.

8.9 SYSTEM SETTINGS

Set Android system.

CHAPTER Ⅸ   COMPLIANCE INFORMATION

FCC COMPLIANCE   FCC ID: 2AJDD-IDIAGSF7S2

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, 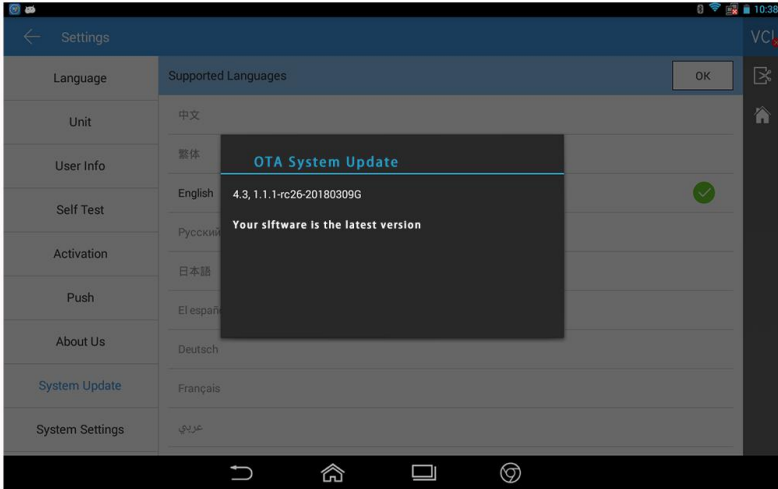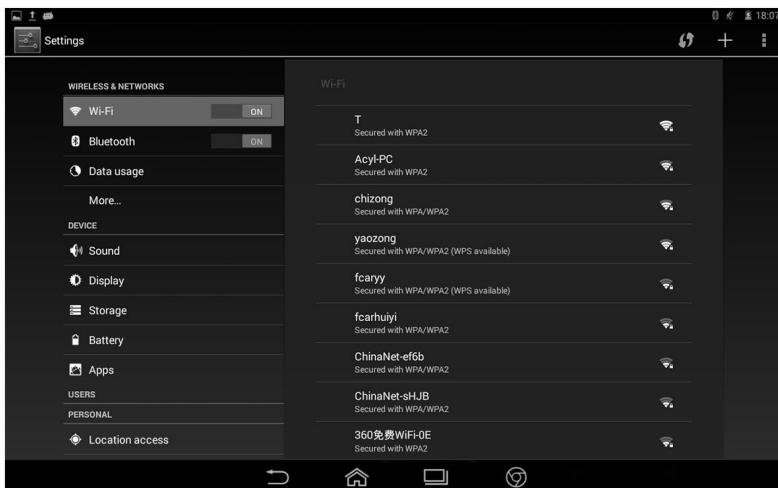there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

SAR tests are conducted using

standard operating positions accepted by the FCC with the F7S-W transmitting at its highest certified power level in all tested frequency bands, although the SAR is determined at the highest certified power level, the actual SAR level of the phone. While operating can be well below the maximum value, in general, the closer you are to a

Wireless base station antenna, the lower the power output. Before a new model phone is a available for sale to the public, it must be tested and certified to the FCC that it does not exceed the exposure limit established by the FCC, Tests for each phone are performed in positions and locations (e.g. at the ear and worn on the body)as required by the FCC.

For body worn operation, this model F6 Plus has been tested and meets the FCC RF exposure. Guidelines when used with an accessory designated for this product or when used with an accessory that Contains no metal and that positions the handset a minimum of 1 cm from the body.

Non-compliance with the above restrictions may result in violation of RF exposure guidelines.

WARRANTY CLAUSES

Thank you for choosing FCAR F7S-W. In order to make the best use of the product, we recommend that you follow all recommendations for maintenance, storage, and operation in accordance with the user manual's instructions at all times. These requirements have been formulated to maximize the useful life of the product.

1. Under the following terms and conditions, and under the premise that you have activated our products and registered on the website of Shenzhen FCAR Technology Co., Ltd. (hereinafter referred to as "FCAR"), we will provide free product warranty services if there are defects in materials or workmanship of hardware.

2. Your product must be purchased from a product dealer that has been authorized by FCAR. If products are purchased from anyone other than a FCAR authorized product dealer, buyers will be solely responsible for the cost of product maintenance services.

3. The following items are not included under the warranty: Items that are readily subject to wear and tear such as product instructions, inner and outer package box, promotional giveaways, SD card, card reader, touch pen, printing supplies, etc.

4. Beginning on the date of purchase (subject to valid purchase proof and effective warranty card of the product), if the product suffers performance failure within one month which is not caused by deviation from the recommended operation or by uncontrollable environmental events, you can choose to repair it or replace with a new one via our maintenance service or replacement of the product with the same model. After that, there is one year warranty service for the main unit, connectors and power adapter.

5. You will not be entitled to free warranty service under any of the following situations:

1.) Failures, defects or flaws not directly related to the quality of the FCAR products, including but not limited to failing to use the product according to the user manual's instructions, crash, fall, disassembly by anyone other than a FCAR approved service person, connecting improper accessories, damage owing to impact because of improper

transport or storage of the product, erosion and/or corrosion caused by infiltration of liquid or food, etc.

2) Natural wear and tear of the product: including but not limited to the outer casing, buttons, touch screen, accessories, etc.;

3) The product serial number do not match the warranty card product serial number, the product quality inspection label or barcode is removed, altered or damaged;

4) Disassembly and repair and modification without the approval of FCAR Technology.

6. If the product has quality problems or malfunctions during the warranty period, you can take the following measures:

1) You can do self-test on the product according to the product help information. If there is no hardware quality problem, you can try to update the product.

2) You can call FCAR Technology Customer Service Hotline (0086-755-82904730) to get the correct service information.

3) After obtaining the company's authorization, the product must be sent to the designated address for repair and maintenance. Otherwise, your product can not receive timely repair and maintenance. Losses caused by customer negligence or failure to follow company instructions are at your peril.

7. During the product warranty repair process, you will bear the costs associated with delivering the product to the repair place designated by FCAR: Including product packaging, transportation, insurance and other expenses.

8. Within the product warranty period and under this warranty clause, you can obtain free warranty service for losses due to product defects. FCAR shall not be liable for your direct or indirect loss.

9. All product warranty information, product functions and specification changes will be posted on FCAR latest promotional materials and the official website. Changes may be made to the website or promotional materials without further notice.

FCAR

Shenzhen Fcar Technology Co., Ltd.

FCAR

Shenzhen Fcar Technology Co., Ltd.

Certification

This product has been strictly inspected as qualified products and met the company standards.

Product name	
Product serial number	
Date of production	
Inspector	

Warranty card

Product name	
Product serial number	
Purchase date	

Company name: _____

User address: _____

Contact person: _____

Contact number: _____