

Star Auto Scanner

USER MANUAL

Version 1.0

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1 Introduction

Star auto scanner is the latest innovative automotive diagnostic product based on both automotive electronics and information technology.

1.1 Features & functions

Features

- OEM-level coverage for European/Asian vehicles
- Wide color touch screen menu for easy navigation
- Built-in printer for convenient data recording
- Multi-language support
- Multiple tasking support
- Full component activation
- Settings of adaptation values
- Read & Change ECU coding
- Coding of the new control modules
- Software update directly from the Internet



Fig. 1.1

Functions

- Paper Printout
- Internet update function
- Circuit diagram reference
- Live data and waveform display
- Educational Demo with projection
- Multiple language display function

Technical Parameter

- 128MB CF card
- Built-in USB port
- 7.4" color touch screen LCD
- I/O of main unit: standard serial port RS232
- 32-bit microprocessor with 60MHz frequency

1.2 Layout of Star Auto Scanner

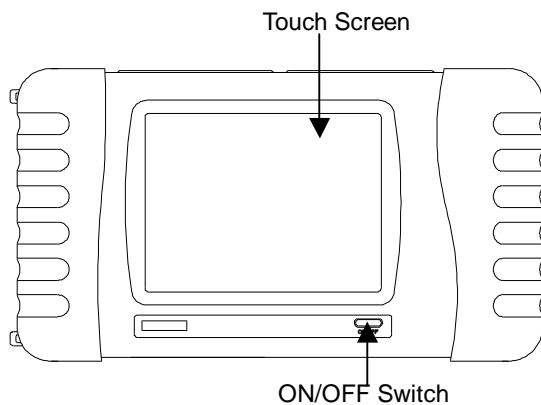


Fig.1.2

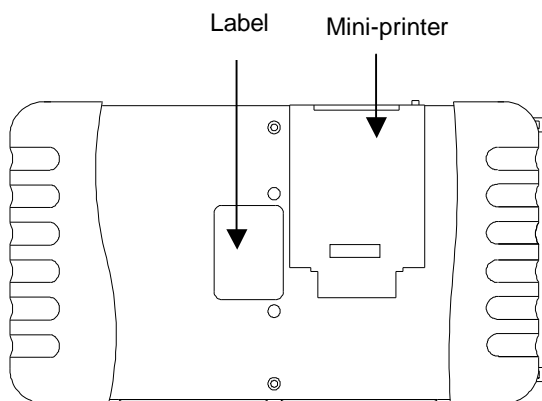


Fig.1.3

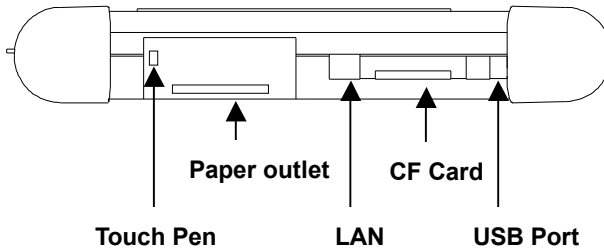


Fig.1.4

1.3 Diagnostic Connectors and Cables

Star auto scanner consists of a total of 9 diagnostic connectors and 4 cables, which can test the cars including BENZ, BMW, NISSAN, INFINITI, MITSUBISHI, HYUNDAI, TOYOTA, LEXUS, HONDA, ACURA, VW, AUDI and etc.

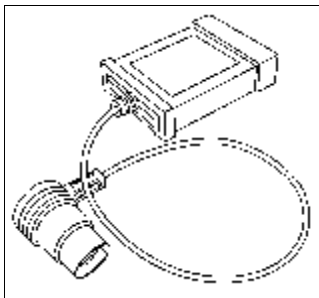


Fig.1.5

Name: BENZ-38 connector

Quantity: 1

Function: Connect to Mercedes-Benz vehicles equipped with a circular 38-pin diagnostic socket. Currently the BENZ-38 connector can be used on the following chassis: 202, 201, 208, 124, 210, 140, 126, 107, 129, 170, 463, and 461.

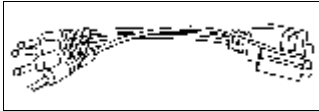


Fig.1.6

Name: BENZ-4 connector

Quantity: 1

Function: Connect to Mercedes-Benz vehicles before 1997 with flash codes. Those vehicles are usually equipped with either a rectangular 8-pin (as shown in Fig 3.4) or 16-pin (as shown in Fig 3.2) diagnostic socket.

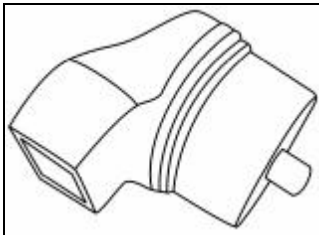


Fig.1.7

Name: BMW-20 connector

Quantity: 1

Function: Connect to BMW vehicles equipped with a 20-pin diagnostic socket.

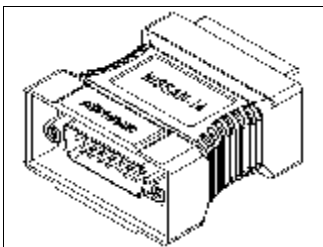


Fig.1.8

Name: NISSAN-14 connector

Quantity: 1

Function: Connect to Nissan and Infiniti vehicles equipped with a 14-pin diagnostic socket.



Fig.1.9

Name: MIT-12+16 connector

Quantity: 1

Function: Connect to Mitsubishi and Hyundai vehicles equipped with a 12-pin or 16-pin diagnostic socket.

NOTE: You should plug in both 12-pin head and 16-pin head if both diagnostic sockets are available on the vehicle.

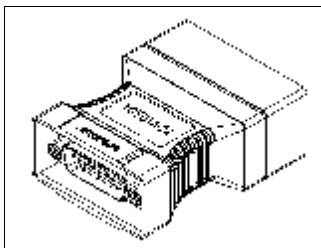


Fig.1.10

Name: TOYOTA-22 connector

Quantity: 1

Function: Connect to Toyota and Lexus vehicles with a rectangular 22-pin diagnostic socket.

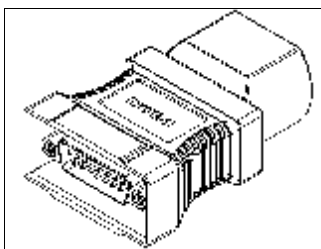


Fig.1.11

Name: TOYOTA-17 connector

Quantity: 1

Function: Connect to Toyota and Lexus vehicles with a semi-circular 17pin diagnostic socket.

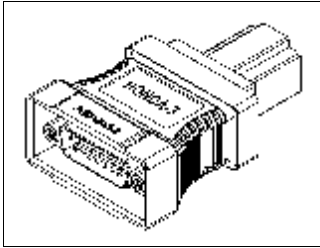


Fig.1.12

Name: HONDA-3 connector

Quantity: 1

Function: Connect to HONDA and ACURA vehicles with a 3-pin diagnostic socket.

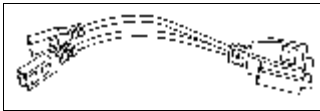


Fig.1.13

Name: AUDI-4 connector

Quantity: 1

Function: Connect to VW/AUDI vehicles with a 4-pin diagnostic socket.

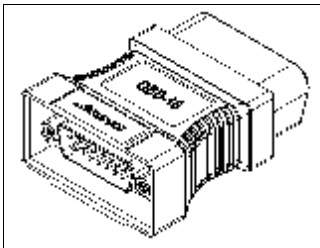


Fig.1.14

Name: OBD-16 connector

Quantity: 1

Function: Connect to all vehicles with a 16-pin diagnostic socket.

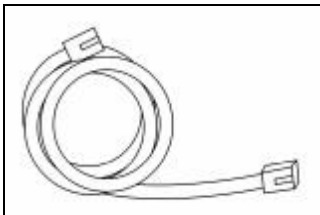


Fig.1.15

Name: Network cable

Quantity: 1

Function: Connect PC and **Star** for educational demo projection.

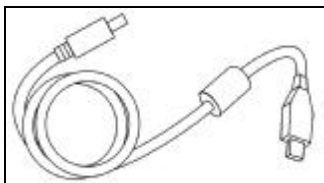


Fig.1.16

Name: USB cable

Quantity: 1

Function: Transfer data and download the software through Internet.



Fig.1.17

Name: Cigarette lighter cable

Quantity: 1

Function: Getting 12V DC power from the cigarette lighter on the vehicle when the voltage from diagnostic socket is insufficient or the connector is damaged.

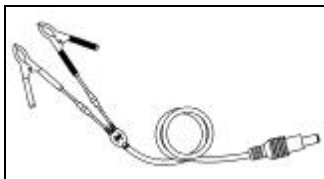


Fig.1.18

Name: Battery cable

Quantity: 1

Function: Getting 12V power from the battery of the vehicle when the voltage from diagnostic socket is insufficient or the connector is damaged.

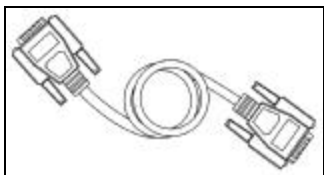


Fig.1.19

Name: Main Cable

Quantity: 1

Function: Connecting the main unit and the diagnostic connectors when testing.

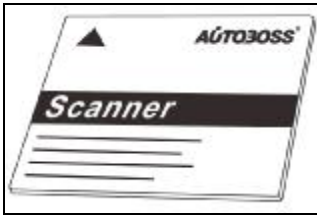


Fig.1.20

Name: CF card

Quantity: 1

Function: Storing software programs and data.

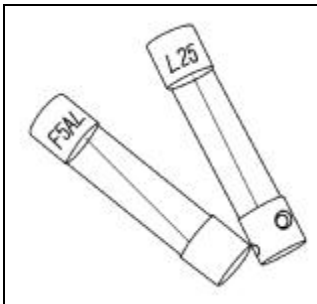


Fig.1.21

Name: Fuse 5A

Quantity: 2

Function: Spare parts for cigarette light cable.

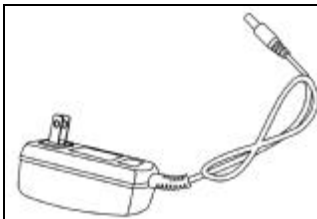


Fig.1.22

Name: DC Adaptor

Quantity: 1

Function: Providing power from AC-power socket when in house for updating the software, making the education demo projection, etc.

2 Operation methods

2.1 Precautions on operation

1. Try your best to keep the screen facing upward and leveled during the testing.
2. Be careful when plugging and unplugging the main cable and diagnostic connectors. Tighten the screw before operation so as to avoid unexpected disconnection and/or damage to the serial port.
3. Hold the **Star** Auto Scanner main unit during the operation. Avoid hitting or dropping the main unit on the ground. Turn off the power after operation.
4. Do not insert and pull out CF memory card too frequently. Insert the CF memory card into the CF memory card slot, keep the face labeled "Scanner" upward, and make sure the card is fully seated.
5. Hold the connector when plugging or unplugging to the scanner. Do not pull the cable when unplugging.

2.2 Adaptor connection

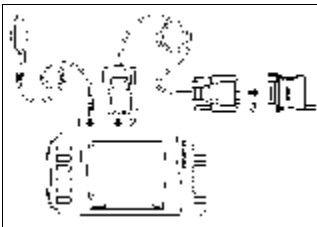


Fig.2.1

1. Connect the adaptor and **Star** auto scanner main unit with main test cable (i.e. steps 2 & 3 on Fig.2.1);
2. Plug the connector into vehicle diagnostic socket;
3. Connect the power adaptor if necessary (i.e. step 1 on Fig 2.1)

NOTE: A 12VDC voltage must be used, or it will damage the auto scanner.

2.3 Power Supply

Most **Star** auto scanner connectors can get power from the vehicle diagnostic socket directly (except for BENZ-4). If the voltage is insufficient or the power pin is damaged, you can get the power from the following ways:

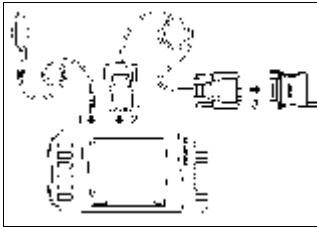


Fig.2.2

1. From cigarette lighter. Insert one end of the cigarette lighter cable into the lighter socket in vehicle and connect the other end to the power connector of **Star** main unit (see step 1 in Fig.2.2).

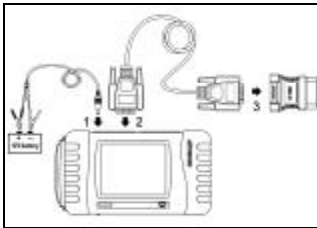


Fig.2.3

2. From vehicle battery. Clamp the two clips of battery cable on the positive and negative poles of battery and insert another end of the cable into the power port of **Star** main unit as shown in Fig.2.3.

3. From power adaptor. Connect the power adaptor to the 100-240V AC outlet with power cord. Insert the 12V DC plug of power adaptor into the power connector of **Star** main unit.

NOTE: A universal 12VDC power adaptor can also be bought from the local market. However AUTOBOSS® does not recommend users to get power in this method.

2.4 Basic functions and operation flow

2.4.1 User Information

1. Function: Workshop Information

Star Auto Scanner prompts the user to input the workshop information. The user can record the user information including the name, telephone number, fax and address etc.

2. Path: Settings----User Information

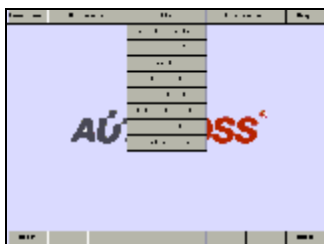


Fig. 2.4

Select **User Information** under **Settings** menu as shown in Fig.2.4.



Fig. 2.5

The information can be input via the keyboard by selecting the keyboard icon under **Keyboard** menu. If incorrect information is entered, just click [←] to delete the incorrect character or number and input the correct one. If you want to enter Chinese characters, please press the button [中] first as shown in Fig.2.5.

2.4.2 Language

1. Function: Language Switchover

Star Auto Scanner is multilingual and currently supports both Chinese and English. The user can select either language as personal favorite.

2. Path: Settings----Language



Fig.2.6

Select **Language** under **Settings** menu.

NOTE: *Star* has already set English as the default language. Press **language-> 中文** to switch into Chinese (Fig.2.6).

2.4.3 Display

1. Function: LCD display adjustment

The user can adjust the screen contrast or color by pressing the boxes.

2. Path: Settings----Contrast

AUTOBOSS® has already set the screen at the optimum contrast at the factory before delivery. Follow the procedures listed below if the screen is too white or too dark during the testing:

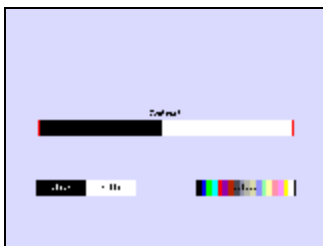


Fig2.7

- ① Select **Settings** from the main menu, and then select **Display**, the Fig 2.7 page will pop out;
- ② Adjust the optimum contrast with the touch pen and choose black/white or colour, the system will save the adjustment and return to the main menu automatically.

2.4.4 TouchSet

1. **Function: Touch screen calibration**
2. **Path: Settings----TouchSet**

NOTE: The screen has been calibrated at the factory before delivery. Do not touch the screen without purpose since it will affect the accuracy of the screen.

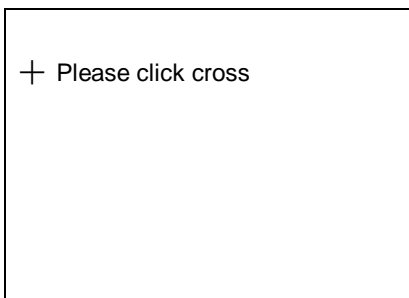


Fig 2.8

- ① Select **Settings** from the main menu, and then select **TouchSet**, the screen should be displayed as shown in Fig 2.8:

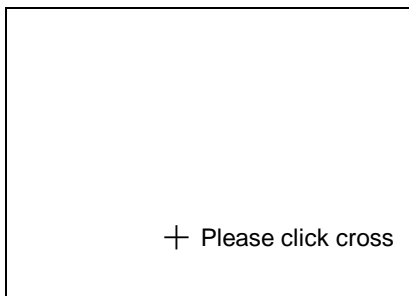


Fig 2.9

② Just follow the calibration procedure on the screen: Click the center of the cross with the touch pen. Then the next page as shown in Fig 2.9 will be displayed.

After clicking the cross the calibration is complete.

NOTE: Calibration can also be performed during the start-up of the scanner and the procedures are as follows:

- ① Turn off Star Auto Scanner first.
- ② Wait for more than 5 seconds and then turn on Star Auto Scanner.
- ③ Press the company logo “AUTOBOSS” with the touch pen for several seconds until the Fig. 2.8 is displayed, then just click on the center of the cross following the screen instruction.

Star Auto Scanner should return to the original configuration.

2.4.5 Projection

1. Function: Demonstration function for the current information transmitted to the PC via serial port.

The user can make education Demo anywhere at the mode of Projection.

2. Path: Settings---- Projection



Fig.2.10

① Download **educatedemo.exe** from AUTOBOSS® website:

www.autoboss.net to your PC and open it, you should receive three files as shown in Fig.2.10.

② Connect **Star** and PC with the network cable as shown in Fig. 2.11.

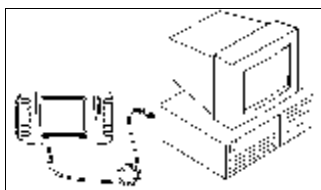


Fig.2.11

③ Manually Set the IP address of your computer between 192.168.1.2 and 192.168.1.253 **except** the following three one:

- 192.168.1.233
- 192.168.1.10
- 192.168.1.11

NOTE: the procedure of IP Address setting is as follow (e.g. windows XP operation system):

- a) Go to **Start** menu;
- b) Go to **Settings**;
- c) Select **Network Connections**;
- d) Click **Local Area Network** icon;
- e) Right click the PC mouse and select **Properties**;

- f) *Go to General Tab and scroll down the window until you see **Internet Protocol (TCP/IP)**;*
- g) *Click on **Properties**;*
- h) *Select the ratio button use the above-mentioned IP address.*



Fig.2.12

④ Select **Projection** under **Settings** on **Star** auto scanner and then run the file of **educatedemo.exe** on your PC and you should see the screen as shown in Fig 2.12. At the same time you should see a small icon on the most left bottom of **Star**.

⑤ Just operate on your **Star** auto scanner and stay in one interface, then click **Start** on PC. After this procedure, click the most left bottom icon on **Star** until the icon becomes red. The interface can be transferred to your PC screen. Click the **save** button on PC to capture the interface picture.

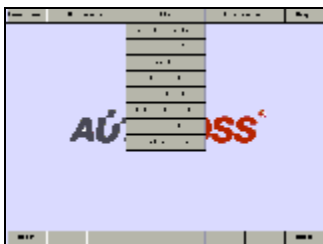


Fig.2.13

⑥ Click **Cancel Projection** under **Settings** menu to exit the PC projection mode (Fig. 2.13)

2.4.6 Internet update

1. **Function: Convenient software update from the Internet**
2. **Path: Settings---- Internet Update**

2.4.7 USB update

1. **Function: Update the software via the USB mode**
2. **Path: Settings-----USB Update**

***NOTE:** Only version 12.8 or above operating system can support this function.*

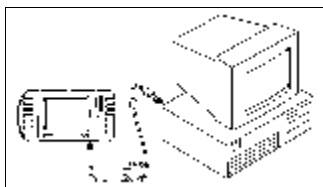


Fig.2.14

Connect **Star** and PC with the USB cable as shown in Fig.2.14. Select **USB Update** under **Settings** menu and the system should display “USB Card Reader Mode”. Now the CF card information on **Star** can be read from the PC. Follow the procedures to

update the latest software at AUTOBOSS® website:

www.autoboss.net or call us at 0086-755-83285146, 83285370.

For detailed update operation flow please refer **chapter 4 update**

2.4.8 System Check

1. Function: Star Self-checking

Star auto scanner can automatically check whether the system is OK or not during Start up.

2. Path: Settings-----System check

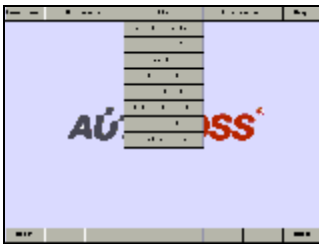


Fig.2.15

Select **System Check** from **Settings** menu, you should hear the checking sound from **Star** auto scanner. This sound indicates that the system is performing self-checking.

If there is any problem, the screen will display the error information.

2.4.9 Printer

1. Function: record the information when testing

Star auto scanner has one built-in mini printer, this mini printer makes the data recording very convenient and easy.

2. Path: functions-----



Fig.2.16

To print out the report on the screen, simply click the printer icon under **Functions** menu.

After the original paper is used up, replace a new paper roll under the following steps as illustrated in Fig. 2.17:

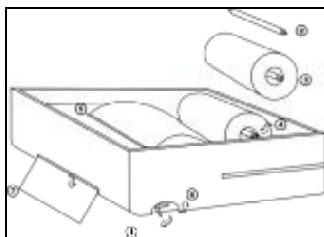



Fig.2.17

- ① Lift the switch;
- ② Take out the paper shaft;
- ③ Replace new paper roll into the paper shaft;
- ④ Secure the paper shaft into the bracket;
- ⑤ Roll out paper into the printer outlet;
- ⑥ Close the switch, than press the icon  to feed paper;
- ⑦ Tear out the paper clockwise with right hand.

2.4.10 Screen Turnover

1. Function: Turning the screen display 180°

Star provides the function of turning the screen display 180° .

2. Path: Functions----

The icon is located under **Functions** menu. If the original display orientation is not convenient for viewing during testing, just click this icon and the screen will turn upside down by 180° , re-click the icon and it will reset to original orientation.

2.4.11 Demo

1. Function: Demonstrate the operation without any adaptor and vehicle

2. Path: Functions----Demo

Demo button is located under **Functions** menu.

2.4.12 Actual value replay

1. Function: review the stored actual value

2. Path: Functions----

Refer Fig.2.16. The icon is the middle one under **Functions** menu.

2.4.13 Help

1. **Function: Provide help information on Star auto scanner**
2. **Path: Functions----Help**

2.4.14 Circuit

1. **Function: Provide vehicle system circuit diagrams for reference**
2. **Path: Information----Circuit (Fig.2.18)**



Fig.2.18

Star auto scanner provides demo circuit diagrams for Mercedes Benz E320, Select the folder as per the screen instructions.

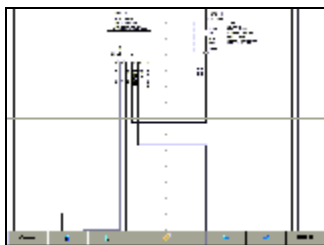


Fig.2.19

Select one circuit diagram and then click **OK** button on the bottom, the circuit diagram will be displayed on the LCD screen. Use [↑] [↓] [←] [→] button to move the circuit diagram, click **zoom** to magnify or enlarge, click **BACK** to re-select a new one (Fig.2.19).

2.4.15 Dictionary

1. Function: English words look-over

The users can search the dictionary for vehicle system abbreviation definitions.

2. Path: Information----Dictionary (Fig.2.20)



Fig.2.20

Enter the words via keyboard (read section **2.3.17 keyboard** if you cannot find the keyboard location). Press **Enter** button to retrieve explanations.

2.4.16 Keyboard

1. Function: Entry information

2. Path: Keyboard (the most right button of the bar, see Fig.2.21)



Fig.2.21

The function of Keyboard is the same as PC keyboard.

3 Vehicle diagnosis description

3.1 Mercedes Benz

3.1.1 Diagnostic socket location

1. The 16-pin trapezoidal diagnostic socket is located in the cab under the instrument cluster.
2. The 38-pin diagnostic socket is located in the engine compartment, passenger side, near the strut tower.
3. The 8-pin or 16-pin rectangular diagnostic socket is located in the engine compartment, near the firewall of the vehicle.

3.1.2 Pin definition

1. Pin definition for 16-pin OBD II diagnostic socket (Fig.3.1)

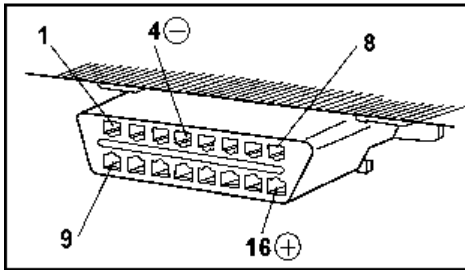


Fig.3.1

| Pin | Definition | Pin | Definition |
|-----|--------------------------|-----|--------------------------|
| 1 | 2-way communication line | 9 | 2-way communication line |
| 2 | Not used | 10 | Not used |
| 3 | Not used | 11 | 2-way communication line |
| 4 | Body ground | 12 | 2-way communication line |
| 5 | Signal ground | 13 | 2-way communication line |
| 6 | CAN interior bus (H) | 14 | CAN interior bus (L) |
| 7 | 2-way communication | 15 | 2-way communication line |
| 8 | Ignition signal | 16 | Battery voltage |

2. Pin definition for 16-pin rectangle diagnostic socket (Fig.3.2).

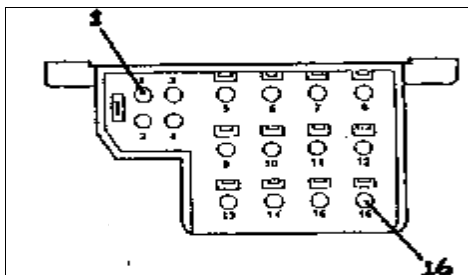


Fig.3.2

| Pin | Definition | Pin | Definition |
|-----|----------------------------|-----|-------------------------------|
| 1 | Body ground | 9 | ADS/RB(124) |
| 2 | On-board diagnostic switch | 10 | RST(129)/speed signal |
| 3 | CIS-E/DM | 11 | ATA |
| 4 | EDS/LED | 12 | IRCL |
| 5 | ASD | 13 | EATC |
| 6 | AB | 14 | EA(124)/ISC(124)/ESCM(129)/CC |
| 7 | AC(124)/RB(129) | 15 | Not used |
| 8 | DI/HFM,SFI,MFK/DMS | 16 | Positive pole of power |

3. PIN definition for 38-pin diagnostic socket (Fig.3.3)

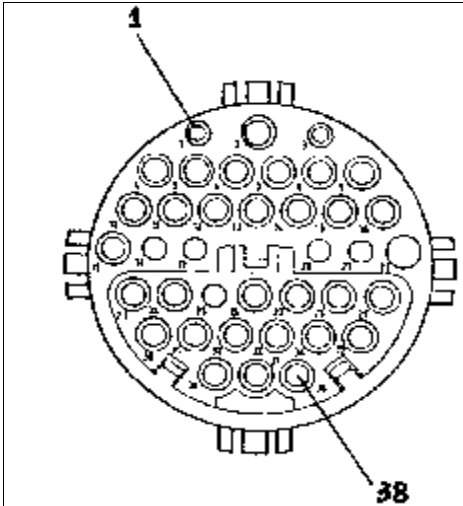


Fig.3.3

| PIN | Definition | PIN | Definition |
|-----|---|-----|--|
| 1 | Body ground (or battery ground) | 20 | CLS, PSE |
| 2 | Ignition signal | 21 | Additional equipment (slide roof control) |
| 3 | Power | 22 | Additional equipment (rollover bar control module) |
| 4 | ENG ECU (M120 right), IGN ECU, diesel ENG ECU | 23 | EDW |
| 5 | LH engine ECU (M120 left) | 24 | Not used |
| 6 | ABS/ASR | 25 | Not used |

| | | | |
|----|---|----|----------------------|
| 7 | Electronic throttle/CC/Idle Control | 26 | Not used; ASD |
| 8 | Comprehensive ECU | 27 | Not used |
| 9 | ASD | 28 | Not used |
| 10 | Auto transmission | 29 | Not used |
| 11 | ADS | 30 | SRS; AB/ETR |
| 12 | PML, SPS | 31 | Infrared door lock |
| 13 | Not used; RPM signal (LH & HFM-direct ignition) | 32 | Not used |
| 14 | Not used; Percentage diagnosis (LH-right) | 33 | Travel ECU; Not used |
| 15 | Not used; Percentage diagnosis (LH-left) | 34 | Not used |
| 16 | A/C | 35 | Not used |
| 17 | EZL (M120 right), TD signal (HFM&140);RPM signal (LH) | 36 | Assistant Heater |
| 18 | EZL (M120 left) | 37 | Not used |
| 19 | CARB. DM | 38 | Not used |

4. PIN definition for 8-pin rectangle diagnostic socket (Fig.3.4).

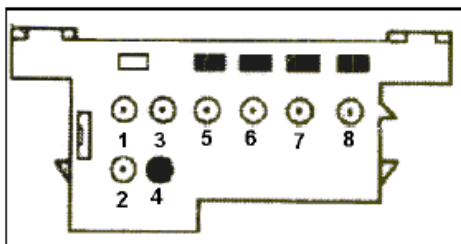


Fig.3.4

| Pin | Definition | Pin | Definition |
|-----|-------------------------------|-----|-------------------------|
| 1 | Body ground | 5 | ASD |
| 2 | Ignition signal /Press button | 6 | SUS trouble code |
| 3 | Diagnosis percentage | 7 | A/C trouble code |
| 4 | Engine trouble code /LED | 8 | Ignition control system |

3.1.3 Select Diagnostic Adaptor

1. For vehicles before 1997 or equipped with 8-pin or 16-pin rectangular diagnostic socket, select BENZ-4 connector (i.e. Fig.1.6);
2. For vehicles with 38-pin diagnostic socket such as chassis 202, 201, 208, 124, 210, 140, 126, 107, 129, 170, 463, 461, please select BENZ-38 connector (i.e. Fig.1.5);
3. For new vehicles with only 16-pin diagnostic socket such as chassis 168, 169, 209, 211, 219, 221, 220, 215, 240, 230, 199, 171, 170, 164, 163, 251, 245, 463, 461, please use the OBD-16 connector (i.e. Fig.1.14).

NOTE: for connecting information please refer to section **2.2 adaptor connections**.

3.1.4 Testing power supply

All BENZ connectors can get power from the vehicle diagnostic socket directly except for BENZ-4. For BENZ-4, either cigarette lighter or the battery adaptor must be used to obtain 12VDC power to the scanner. For detail information and the connecting methods, please refer to section **2.3 Power supply**.

3.1.5 Test procedure

Path: Diagnosis-----Auto Scanner (Fig.3.6)

NOTE: Now we take a 2004 Mercedes-Benz C180 Kompressor Sedan in the United States as an example to explain the diagnosis steps. There are many models and systems for Mercedes-Benz. It is not possible and not necessary to list the test steps for all of the models and systems. The test procedures for different models and systems are similar.

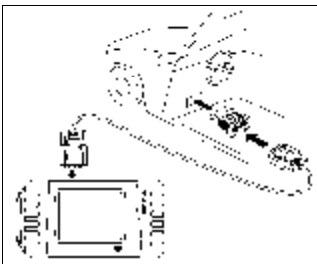


Fig.3.5

1. Choose OBD II adaptor and connect the main test cable as shown in Fig.3.5.



Fig.3.6

2. After the connection, turn on the power to start the **Star** auto scanner.

3. Select **Auto Scanner** from **Diagnostic** menu, you will get the interface as shown in Fig. 3.7



Fig.3.7

4. Select Mercedes Benz icon to enter the MB system as shown in Fig. 3.8.

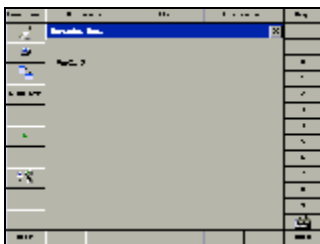


Fig.3.8

5. Select software version e.g. **V21.9** from the menu to enter mode/chassis type selection as shown in Fig.3.9.

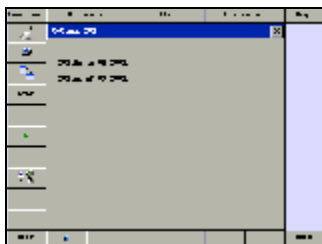


Fig.3.12

8. Select **203 (as of 09/2003)** as shown in Fig.3.12.

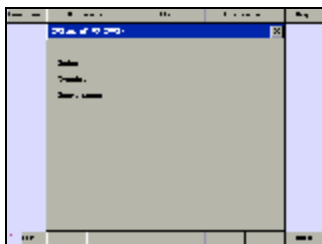


Fig.3.13

9. Select **Sedan** as shown in Fig.3.13.

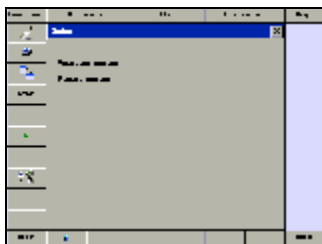


Fig.3.14

10. Select **Gasoline engine** as shown in Fig. 3.14

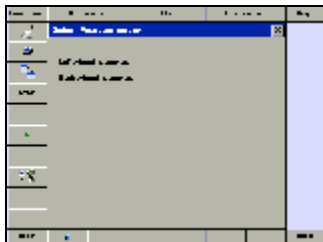


Fig.3.15

11. Select **Left-hand steering** as shown in Fig.3.15.

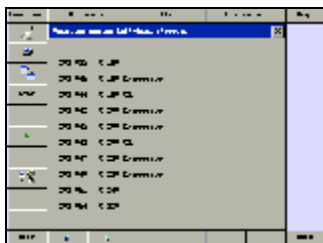


Fig.3.16

12. Select **203.046 C 180 Kompressor** as shown in Fig.3.16.



Fig.3.17

13. Select **Control units** as shown in Fig.3.17

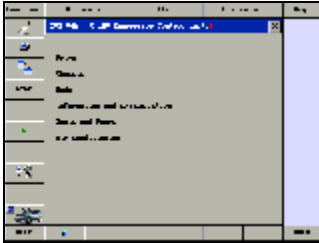


Fig.3.18

14. Select **Drive** to enter the interface as shown in Fig.3.19.

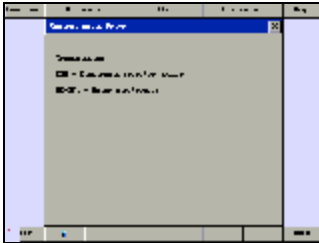


Fig.3.19

15. Select **Transmission** and wait for several seconds for file loading and vehicle communication.

NOTE: If **Demo mode** is used, the data can only serve as demo purpose and may not be correct.

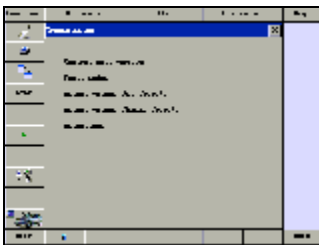


Fig.3.20

16. Select either **Control unit version**, **Fault codes**, **Actual values (All select)**, **Actual values (Manual Select)** or **Actuations** as shown in Fig. 3.20. Here we select **Actual values (All select)** to explain the self-study and actual value review as shown in Fig. 3.21.

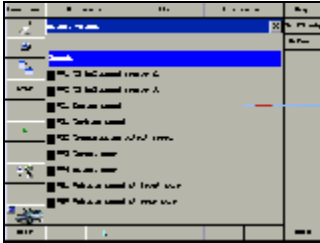


Fig.3.21

17. In this interface you will see all actual values listed, also there are a **Self Learn** button and a **Default** button in the right bar under the **Keyboard** menu.

Click the button **Self Learn** and a small window should pop up and ask: **Self-Learn Start?** Press **OK** to enter self-Learn system or **Cancel** to exit.

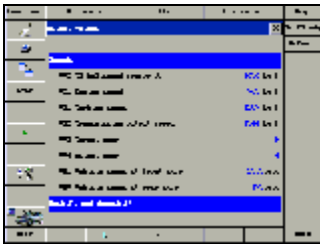


Fig.3.22

18. The system default selects all of the items, click on the black box for the items, which you do not want to study. The box should become white and it means the item will be skipped during Learning.

Press **OK** in the bottom to begin the study, Press [↓] to study more. And the max value and the min value will be recorded in the right bar (press **Default** to switch-over).

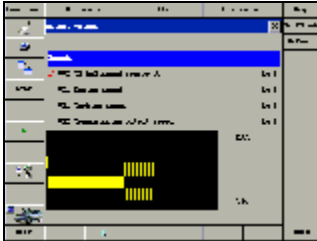



Fig.3.23

19. **Star** will store the actual values studied. You can review it when you test the vehicle next time.

If the value is red during studying, this means the system deviates from the operating max/min values from Self Learn. Just click the actual value replay icon  to review the value.

Star auto scanner can replay up to 160-frame actual value.

The actual value also can be displayed as a waveform, please click **Wave** in the bottom to enter the wave display as shown in Fig.3.23.

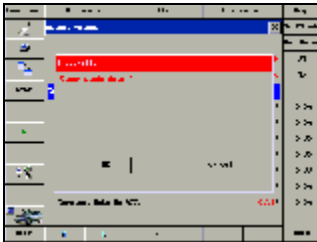


Fig.3.24

Click the button **Self Learn** for the second time, the system will ask: **Clear Learned data?** As shown in Fig.3.24. Press **OK** to clear the first time learned data and record new data, press **Cancel** to exit learning.

20. Click **BACK** to return to the previous screen, press **X** (at the top right corner of the window) to close the testing.

NOTE: If you enter **Quick test** mode in Fig.3.17 interface, **Star** system will perform Quick test of the entire vehicle system (see Fig.3.25).

The followings explain the status of the **Quick test** results:



Fig.3.25

-F- means that there is fault code(s) in the system;

-I- means that the vehicle is not equipped with the system being tested;

-√- means the system is OK.

Press **Quick Delete** in the bottom to delete the fault code(s) on all vehicle systems.

Select the system with DTC(s) to read the DTC(s) and the description (s), Press **BACK** to connect to control unit testing; press **X** to end the quick testing.

3.2 BMW

3.2.1 Diagnostic socket location



Fig. 3.26

Diagnostic socket

1. BMW 20-pin diagnostic socket location

① For the BMWs of model year 80s-90s, the diagnostic socket is at the right side in the engine compartment as shown in Fig. 3.26.

② The diagnostic socket for 525i and 535i is at the left or right side in the engine compartment..

③ The diagnostic socket for 325, 635i and 735i is located in the cab under the instrument.

2. BMW-16PIN diagnostic socket location:

BMW 16-pin diagnostic socket is located in the cab under the instrument cluster at the left side. See Fig.3.28 for its outline.

3.2.2 Pin definition

1. Pin definition for 20-pin diagnostic socket (Fig. 3.27)

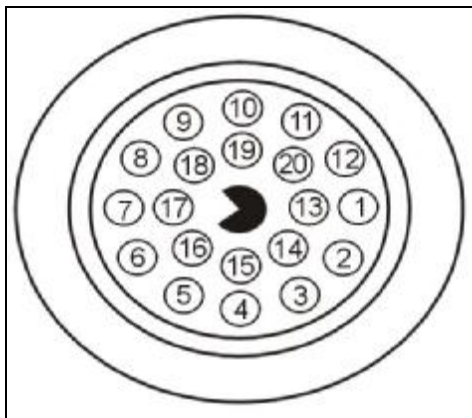


Fig.3.27

| Pin | Definition | Pin | Definition |
|-----|---------------|-----|---|
| 1 | Not used | 11 | Starting signal |
| 2 | Not used | 12 | Alternator D+ control |
| 3 | Not used | 13 | Not used |
| 4 | Not used | 14 | Permanent power supply |
| 5 | Not used | 15 | Diagnostic information line RxD |
| 6 | Not used | 16 | Ignition operation 15 and Starting |
| 7 | Service reset | 17 | Diagnostic information line |
| 8 | Not used | 18 | Input line for DME ECU software modification. |
| 9 | Not used | 19 | Body ground |
| 10 | Not used | 20 | Diagnostic information TxD |

2. Pin definition for 16-pin diagnostic socket (Fig.3.28)

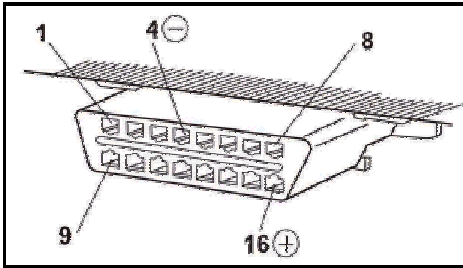


Fig.3.28

| Pin | Definition | Pin | Definition |
|-----|----------------|-----|-----------------|
| 1 | Not used | 9 | Not used |
| 2 | J1850 BUS+ | 10 | J1850 BUS- |
| 3 | Not used | 11 | Not used |
| 4 | Body ground | 12 | Not used |
| 5 | Signal ground | 13 | Not used |
| 6 | Not used | 14 | Not used |
| 7 | ISO9141 K line | 15 | ISO9141 L line |
| 8 | Not used | 16 | Battery voltage |

3.2.3 Select Diagnostic Adaptor

Select the **BMW-20** connector for the vehicle with a 20-pin diagnostic socket and select **OBD-16** connector for the vehicle with a 16-pin diagnostic socket.

3.2.4 Testing power supply

Both 16-pin and 20-pin BMW connectors can get power from the vehicle diagnostic socket directly. If the voltage is insufficient or the power pin is damaged, please refer to section **2.3 Power supply** for detailed information and the connection methods.

3.2.5 Test procedure

Path: Diagnostic-----Auto Scanner (Fig.3.29)

Example: 2005 BMW 118i

Button explanations:

[↑] page up; [↓] page down; [Back] return to the front interface;

[×] close the window/exit; [Ok] confirm;

[←] move the page to left; [→] move the page to right.



Fig.3.29

1. Select **Auto Scanner** from **Diagnostic** Menu (see Fig.3.29), you will get the interface as shown in Fig.3.30.

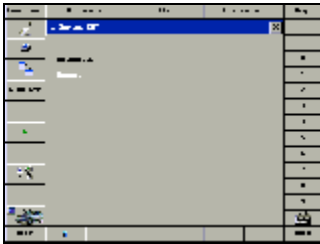


Fig.3.33

5. Select **Automatic** or **Manual** (see Fig.3.33). **Automatic** means the vehicle systems will be automatically detected by Star system while **Manual** means the user will input the vehicle information.



Fig.3.34

6. Select test mode. **Quick test** will quickly scan all of the vehicle systems. If you do not like to scan all of the systems, select the particular module (**Drive**, **Chassis** or **Body**) you want to test.

For example, select **Drive** to enter the interface as shown in Fig.3.35.

NOTE: In the end of normal test we will explain the **Quick test** procedure.



Fig.3.35

7. Select **CAS Car Access System** and you will see the interface as shown in Fig.3.36.

8. Select **Control unit version** to retrieve the information about the control unit such as **Part number, Coding index, Date of manufacture, Diagnosis index, Hardware number,** etc.

Select **Fault codes** to read and erase fault memory.

Select either **Actual values (all select)** or **Actual values (Manual Select)** to retrieve the real-time data stream (see Fig.3.36).



Fig.3.36

9. Press **Self Learn->OK** to learn the actual value(s).

Press **↓** to learn more actual value(s) (see Fig.3.37).

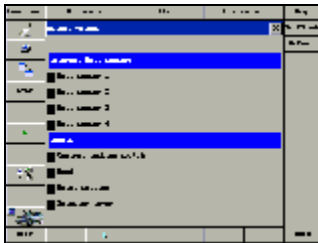


Fig.3.37

Star auto scanner will store the learned value automatically and record the learned range in the left bar.

Click **Max** to read the maximum; click **Min** to read the minimum (see Fig.3.38).

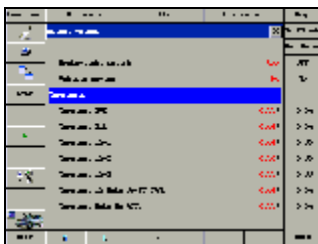


Fig.3.38

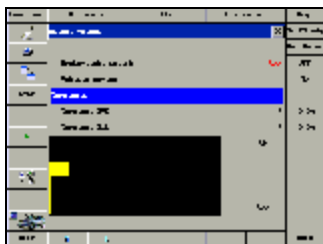


Fig.3.39

Click **Wave** in the bottom to display the actual value as a waveform (see Fig.3.39).

Click **BACK** to return to the learning interface.

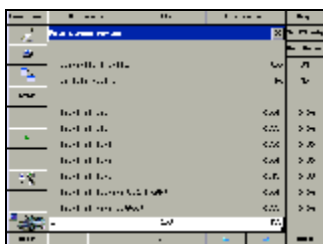






Fig.3.40

Star will display the value in red if the system is abnormal. Click  to review the data stream and find out the abnormal ones.

Star can replay up to 160 frames data stream per time. Click  and  to read every frame.

Click  to print out the result.

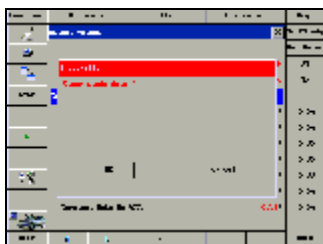


Fig.3.41

10. Click **Self Learn** to clean the learned actual values and begin to new learn.

Click **X** to exit.

Quick test procedure:

1. See Fig.3.34. Select **Quick test** to enter quick test mode.

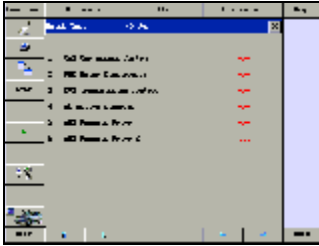


Fig.3.42

Wait several minutes for file loading and vehicle communication. After the testing is complete, there will be a red character following every system to indicate the testing results. For example:

-F- means that there is a DTC(s) in the system;

-I- means that there is no such system in the car;

-√- means that the system is ok.



Fig.3.43

2. ① Click **CAS Car Access System** to read the DTC(s) and the Description(s) (See Fig.3.43).



Fig.3.44

Click **BACK**, a window will pop up to ask you **'Connect Control Unit?'** (See Fig.3.44).



Fig.3.45

Choose **OK** to enter the control unit testing (see Fig.3.45).

Select **Cancel** to return to **Quick test** result interface.

The operating procedure is the same as choose **Drive->CAS Car Access System** in normal test mode.



Fig.3.46

②Click **Quick delete** to delete the DTC(s) on all the vehicle system(s) (see Fig.3.46).



Fig.3.47

Click **BACK** to re-read the DTC (see Fig.3.47).

Click **X** to exit.

NOTE: The values or DTCs in the example are from Simulate mode, which only serve as demonstration purposes. For the actual data please refer to the real testing.

4 Software Update

Star auto scanner software update normally is via Internet. This is very convenient for customers to obtain the latest diagnostic program(s) and keep pace with the development of new features and functions. The following instructions will illustrate how to update the **Star** scanner. It is as easy as 1, 2, 3...

4.1 Precautions

1. Install the CF card into the main unit correctly;
2. Ensure the proper cable connection and stable power supply. Avoid the CF card being damaged or slow update speed due to power breakdown or the harness connection;
3. Do not touch the PC and main unit during the software update;
4. Check the CF card after the software update. Repeat the diagnostic program download and update or contact your local dealer for assistance if the screen does not display properly;
5. ***Backup CF card to PC computer for security.***

4.2 Hardware Requirements

1. Desktop or Laptop PC with operating systems Windows 98/2000/XP;
2. **Star** main unit and CF card;
3. USB Cable and 12V AC/DC adaptor;
4. Internet access to website: <http://www.autoboss.net> .

4.3 Update flow

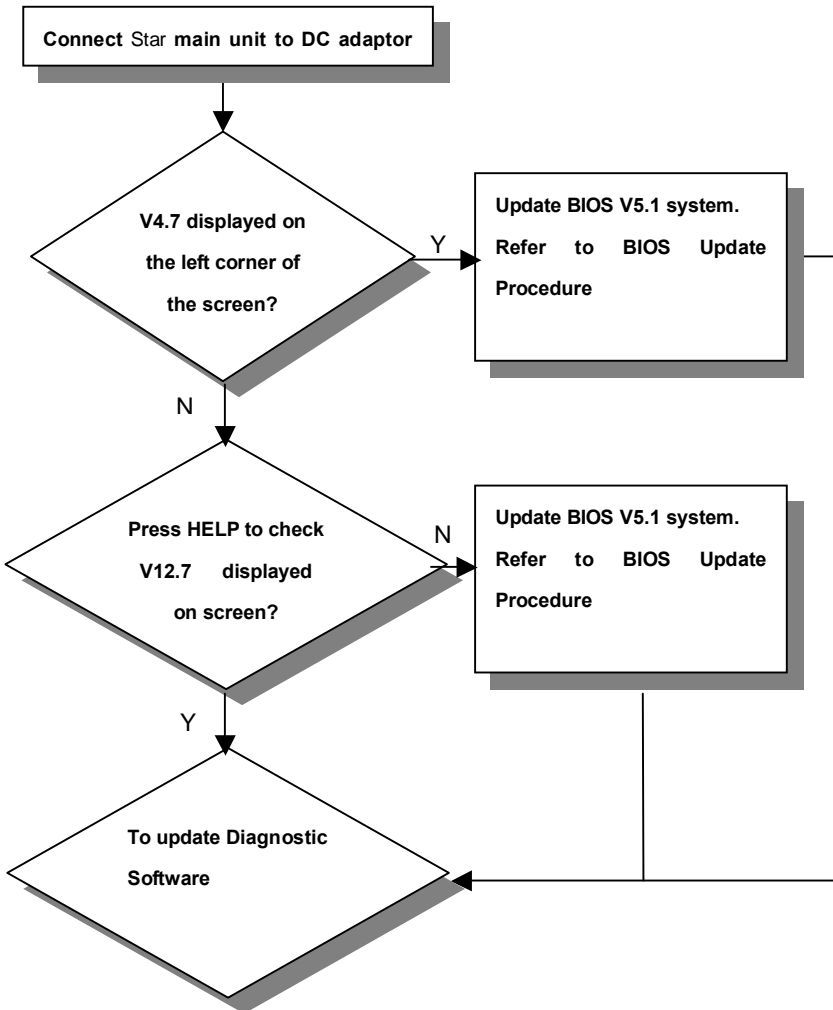


Fig.4.1

4.3.1 Bios update

1. Backup CF card to PC computer for security.



Fig.4.2

2. Go to AUTOBOSS® website: www.autoboss.net to download **BIOS System Program** and **Operating System** to the desktop of your PC computer.

3. Connect **Star** main unit to the PC correctly with **USB cable** and **DC adaptor**.
4. Turn on the power by pressing the button **[ON/OFF]**.



Fig.4.3

5. Access the **USB update mode** from the menu **Setting--USB Update** (see Fig.4.3).

NOTE: For BIOS 4.7: The screen will display “Updating via the USB? Press any where point for USB Card Reader.” Touch anywhere of the screen to access the USB update mode.



A Series Upgrade

Fig.4.4

6. The removable disc **AUTOBOSS** will be displayed as shown in Fig.4.4



Press it

Fig.4.5

7. Double click the icon



bios-V5.1-051123-en.exe and Fig.4.5

will pop up.

8. Press the button **Update CF Card**.



Fig.4.6

9. The information **Upgrade Succeed!** will be displayed on the top of the screen shown as shown in Fig.4.6

10. Press the button **Exit [X]** first and then safely remove USB Mass

Storage Drive – Drive.

11. Turn off the power by pressing the button [ON/OFF]
12. After three seconds later, turn on the power to refresh the bios operating system.

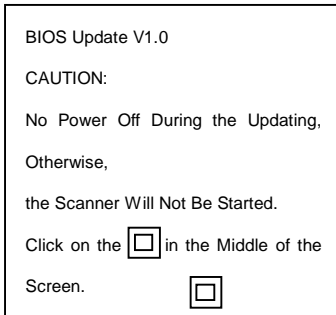


Fig.4.7

13. The information **Upgrade Succeed!** will be displayed on the top of the screen shown as Fig.4.6 shown

14. The following page will be displayed after several seconds later:
15. Touch the center of the [square icon] by the touch pen provided.

NOTE: Press the center of the [square icon] with the touch pen.

Turn off the power and repeat the Step 11, 12, 13 and 14 when the information is displayed: “----Clicking Error, Operation Abort----”.

16. The information “**BIOS Update Completed**” will be displayed if the bios update is successful.
17. Turn off the power. Three seconds later, turn on the power and press the **USB icon immediately** to access **USB update mode**.



Fig.4.8

18. Double click the icon



OS-V12.7-051123.exe to run the file

OS-V12.7-051123.exe, and press button **Format CF Card**. The Fig.4.8 page will be displayed:

19. Press the button **Yes** to format the CF card.



Fig.4.9

20. Several seconds later, the formatting of the CF card is complete and the Fig.4.9 page will be displayed.

21. Press the button **OK** first and then copies the backup software (see **Step 1**) to CF card.
22. Then press the button **Update CF Card** again to update software, wait until you see **Upgrade Succeed!** in window title.
23. Press the button **Exit [X]** first and then safely remove USB Mass Storage Drive –Drive.
24. Turn off the power. Wait 3 seconds and then turn on the power to refresh the system.

4.3.2 Operation system (OS) update



Fig.4.10

1. Login www.autoboss.net and download the operating system



OS-V12.7-051123.exe to the desktop of your computer.

2. Connect **Star** main unit to PC correctly with **USB cable** and **DC adaptor**.
3. Turn on the power by pressing the button **[ON/OFF]**.



Fig.4.11

4. Access the **USB update mode** from the menu **Settings--USB Update**.



Fig.4.12

5. The removable disc AUTOBOSS will be displayed as Fig.4.12.



Fig.4.13

6. Press the button **Update CF Card**.



Fig.4.14

7. The information **Upgrade Succeed!** will be displayed on the top of the screen as shown in Fig.4.14.

8. Press the button **Exit [X]** first and then safely remove USB Mass Storage Drive – Drive.
9. Turn off the power by pressing the button **[ON/OFF]**.
10. Wait three seconds and then turn on the power to refresh the system.

4.3.3 Diagnostic program update

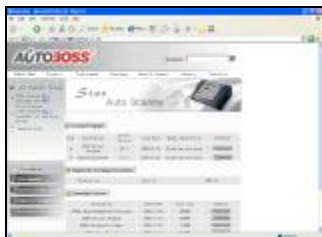


Fig.4.15

1. Login www.autoboss.net and download the diagnostic software program to the desktop of your computer. For example, download



mitsubishi-V17.1-V22.0-051123.exe from the **Diagnostic Package Download**.

2. Connect **Star** main unit to PC correctly with **USB cable** and **DC adaptor**

3. Turn on the power by pressing the button **[ON/OFF]**.



Fig.4.16

4. Access the **USB update mode** from the menu **Settings—>USB Update**.



Fig.4.17

5. The removable disc **AUTOBOSS** will be displayed as Fig.4.17 shown.

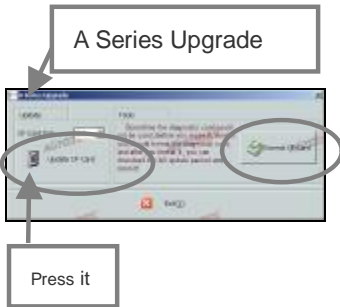


Fig. 4.18

6. Double click the icon



nitsubishi-V17.1-V22.0-051123.exe and Fig. 4.18 will pop up.

7. Press the button **Update CF Card**.



Fig. 4.19

8. The information **Upgrade Succeed!** will be displayed on the top of the screen shown as below:

9. Press the button **Exit [X]** first and then safely remove USB Mass Storage Drive – Drive.
10. Turn off the power by pressing the button **[ON/OFF]**.
11. After three seconds later, turn on the power to refresh the system for a new trial.

NOTE: For detailed version and relevant information of the update software, please browse www.autoboss.net or call **0086-755-83285146, 83285370 or fax 0086-755-82170248.**

AUTOBOSS may revise the information without any other notice.

5 Warranty

THIS WARRANTY IS EXPRESSLY LIMITED TO PERSONS WHO PURCHASE AUTOBOSS PRODUCTS FOR PURPOSES OF RESALE OR USE IN THE ORDINARY COURSE OF THE BUYER'S BUSINESS.

AUTOBOSS electronic product is warranted against defects in materials and workmanship for two years (24 months) from date of delivery to the user. This warranty does not cover any part that has been abused, altered, used for a purpose other than for which it was intended, or used in a manner inconsistent with instructions from the manual. The exclusive remedy for any product found to be defective is repair or replacement, and AUTOBOSS shall not be liable for any consequential or incidental damages. Final determination of defects shall be made by AUTOBOSS in accordance with procedures established by AUTOBOSS. No agent, employee, or representative of AUTOBOSS has any authority to bind AUTOBOSS to any affirmation, representation, or warranty concerning AUTOBOSS product, except as stated herein.

6 FAQ

Star Auto Scanner is a hi-tech product. With the rapid development of modern automotive industry, more and more new technology will be adopted and there may be questions during operation. Read the user's manual to get the answers whenever you have any questions, or contact our Customer Service Center or local dealers for assistance.

Here we list some frequently asked questions and answers relating to **Star** Auto Scanner.

6.1 Maintenance

Question: how to extend the life of Star auto scanner?

Answer: Pay attention to the followings during operation:

1. Store **Star** Auto Scanner on a flat and dry place at room temperature.
2. Never place **Star** Auto Scanner in direct sunlight or near the heating source.
3. Prevent smoke, water and oil from entering **Star** Auto Scanner.
4. Avoid shock, dust, moisture and heat.
5. Do not disassemble the main unit. Clean the outside surface and screen with soft cloth when the machine is turned off and the power cable is removed.
6. Periodically turn on **Star** Auto Scanner main unit if it is not operated for long time to avoid moisture buildup.
7. Do not place any object on the main unit to avoid damage to the internal components.
8. Use the equipped stylus to click the touch screen LCD. Do not use fingernail or other sharp object to touch the screen.

9. Dust may be accumulated on the LCD screen owing to the electrostatics. Use a special LCD screen wiper to clean the screen gently. Do not wipe the screen with bare finger.
10. Never use any chemicals to clean the screen.
11. Turn off the power if it is expected not to operate **Star** Auto Scanner for a long time. It can extend the life of screen.

6.2 About software update

1. Question: Why the main unit cannot recognize the replaced CF card?

Answer: There are two possible reasons:

- ① The files on the original 128MB CF card has not been fully copied. Please delete the incomplete file(s) and copy again.
- ② The new CF card is not compatible with Star scanner. Mono-functional CF card is better in such situation.

2. Question: How to make a new Star CF card when the data in old one is lost or damaged?

Answer: In case **Star** CF card is damaged and the program(s) in the card cannot be read, please follow the listed procedures to make a new CF card:

- ① Purchase the same compatible CF card from the market.
- ② Format **Star** CF card.
- ③ Download the software program(s) from AUTOBOSS® website.
- ④ Connect **Star** Auto Scanner and PC through with the USB cable for software update.

6.3 About hardware

1. Question: Why does the saved data disappear?

Answer: Your CF card is damaged.

2. Question: The LCD screen does not respond or responds incorrectly when I click it with a pen. What should I do?

Answer: It is necessary to calibrate the screen. Please refer to the section "TouchSet" in the User's Manual.

3. Question: What can I do when the screen is confused?

Answer: Please exit the current interface and run it again. If the problem still exists, restart the system.

4. Question: Why I cannot operate in current interface?

Answer: There are two possible reasons:

- ① Your current interface has exited illegally. In this situation, you may not see the name of the application (interface) in the pop-up list when you click the active taskbar icon.
- ② The system is busy, please wait patiently, or click the active taskbar icon to switch to another application.

5. Question: Why does the LCD screen respond so slowly?

Answer: It is because the ambient temperature is close to the lower limit of operating temperature range (0~50 °C). In this situation, it is necessary to warm up the machine for 20 minutes before testing.

6. Question: *The screen keeps blinking after flashing when the machine is turned on. What should I do?*

Answer: Take out the CF card and restart the machine to see if the display is back to normal. If the display is normal when the CF card is taken out, the CF card should be replaced. If the screen is still blinking, please contact your local dealer for assistance.

7. Question: *Why does the system prompt display “checking CF card” when the machine is turned on?*

Answer: The possible cause is that no CF card is in the machine or the CF card is inserted improperly or damaged. If it is damaged, it is necessary to replace a new one.

8. Question: *What should I do if I cannot get into the diagnostic interface during test?*

Answer: The possible cause is that no CF card is in the machine or CF card is inserted improperly or damaged. If it is damaged, it is necessary to replace a new one.

9. Question: *Why the data cannot be inputted after the keyboard is activated?*

Answer: The position where the cursor lies cannot be edited. Or you have not activated the cursor on the input position. Please use the touch pen to click the part to edit. When the cursor twinkles, you can input the data.

6.4 About system setting

1. Question: *The screen is too white and characters cannot be seen. What is the reason and what should I do?*

Answer: It may be caused by improper contrast. Please refer to the section “Contrast” to adjust the contrast.

2. Question: *The screen is inactive after the cross cursor appears on the screen. Why?*

Answer: The system is calibrating the touch screen. The machine will work after the screen is calibrated. Refer to the section “Touch Set” in User’s Manual.

3. Question: *Why does the screen flicks during engine starting?*

Answer: It is caused by the electromagnetic interference. There is nothing wrong with **Star** Auto Scanner.

4. Question: *Why is operation interrupted during diagnosis?*

Answer: It may be caused by electromagnetic interference or loose connection of connector.

5. Question: *Why is there no response from vehicle ECU during communication?*

Answer: Make sure that the voltage of vehicle battery, ignition timer and idle speed are in standard range; the throttle is in the closed position; and all electric devices, such as A/C, headlight, stereos etc, are turned off.

6. Question: *Some systems cannot be diagnosed. Why?*

Answer: The diagnostic socket for the system on some early vehicles may be separated. Refer to your vehicle service manual.

7. Question: *Why are there too many trouble codes?*

Answer: It may be caused by poor contact or poor grounding. Make sure that the vehicle model/year is selected correctly and the vehicle is equipped with the system.

6.5 About LCD Troubleshooting

1. Question: When I turn on the power, the yellow lamp (on the left) will light up and the sound “Di” is heard, what is the problem?

Answer: The converter is damaged. Replace a new converter.

2. Question: When I turn on the power, the yellow lamp (on the left) will light up, but there is no sound. The LCD screen lights up, but no “AUTOBOSS” is displayed, What should I do?

Answer: Testing: Switch ON/OFF for several times and check if the LCD display is working or not. If the LCD still does not work after the testing, the main board is damaged. Replace it with a new one.

3. Question: Reset the system... but there is no resetting process displayed on the screen, What is the problem?

Answer: The communication board is damaged. Replace a new one.

4. Question: The screen displays all information, but the menu is not working.

Answer: Turn off the power first. Press the screen slightly with the figure for a few seconds and turn on the power to calibrate the screen.

5. Question: How should I do if the LCD screen keeps blinking?

Answer: Please restart Star auto scanner and keep it far away from electromagnetic wave such as mobile phone.

7 Appendix

7.1 Mercedes Benz chassis and engine number chart

Chassis Family 251

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------|
| R350 | 2006-- | 251.165 | 272.967 |
| R500 | 2006-- | 251.175 | 113.971 |

Chassis Family 230

| Current Models | Year | Chassis | Engine |
|---------------------|--------|---------|---------|
| SL500 | 2003-- | 230.475 | 113.963 |
| SL600 Bi Turbo | 2004-- | 230.476 | 275.960 |
| SL55 AMG Kompressor | 2003-- | 230.474 | 113.992 |
| SL65 AMG | 2005-- | 230.479 | 275.981 |

Chassis Family 220

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------------------------------------|
| S350 | 2006-- | 220.067 | 112.972 |
| S430 | 2000-- | 220.170 | 113.941 |
| S430 4MATIC | 2003-- | 220.183 | 113.948 |
| S500 | 2000-- | 220.175 | 113.960 |
| S500 Guard | 2001-- | 220.175 | 113.960 |
| S500 4MATICI | 2003-- | 220.184 | 113.966 |
| S600 Bi Turbo | 2003-- | 220.176 | 275.950('03) /275.960('04 -'06) |

| | | | | |
|---------------------|-----|--------|---------|---------|
| S55 (Kompressor) | AMG | 2003-- | 220.174 | 113.991 |
| S65 AMG | | 2006-- | 220.179 | 275.981 |

Chassis Family 219

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------|
| CLS500 | 2006-- | 219.375 | 113.967 |
| CLS55 AMG | 2006-- | 219.376 | 113.990 |

Chassis Family 215

| Current Models | Year | Chassis | Engine |
|----------------------|--------|---------|---------------------------------------|
| CL500 | 2000-- | 215.375 | 113.960 |
| CL600 Bi Turbo | 2003-- | 215.376 | 275.960('06) /275.950('03 /'05) |
| CL55 AMG(Kompressor) | 2003-- | 215.374 | 113.991 |
| CL65 AMG | 2005-- | 215.379 | 275.980 |

Chassis Family 211

| Current Models | Year | Chassis | Engine |
|-------------------|--------|---------|---------|
| E320-CDI | 2005-- | 211.026 | 648.961 |
| E350 | 2206-- | 211.056 | 272.964 |
| E350 4MATIC | 2006-- | 211.087 | 272.972 |
| E350 Wagon | 2006-- | 211.256 | 272.964 |
| E350 4MATIC Wagon | 2006-- | 211.287 | 272.972 |
| E500 | 2003-- | 211.070 | 113.967 |

| | | | |
|----------------------|--------|---------|---------|
| E500 4MATIC | 2004-- | 211.083 | 113.969 |
| E500 4MATIC Wagon | 2004-- | 211.283 | 113.969 |
| E55 AMG Wagon | 2006-- | 211.276 | 113.990 |
| E55 AMG (Kompressor) | 2004-- | 211.076 | 113.990 |

Chassis Family 209

| Current Models | Year | Chassis | Engine |
|--------------------|--------|---------|---------|
| CLK350 | 2006-- | 209.356 | 272.960 |
| CLK350 Cabriolet | 2006-- | 209.456 | 272.960 |
| CLK500 | 2003-- | 209.375 | 113.968 |
| CLK500 Cabriolet | 2004-- | 209.475 | 113.968 |
| CLK55 AMG | 2003-- | 209.376 | 113.987 |
| CLK55AMG Cabriolet | 2004-- | 209.476 | 113.987 |

Chassis Family 203

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------|
| C230 | 2006-- | 203.052 | 272.920 |
| C280 | 2006-- | 203.054 | 272.940 |
| C280 4MATIC | 2006-- | 203.092 | 272.941 |
| C350 | 2006-- | 203.056 | 272.960 |
| C350 4MATIC | 2006-- | 203.087 | 272.970 |
| C55 AMG | 2005-- | 203.076 | 113.988 |

Chassis Family 171

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------|
| SLK280 | 2006-- | 171.454 | 272.942 |

| | | | |
|-----------|--------|---------|---------|
| SLK350 | 2005-- | 171.456 | 272.963 |
| SLK55 AMG | 2005-- | 171.473 | 113.989 |

Chassis Family 164

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------|
| ML350 | 2006-- | 164.186 | 272.967 |
| ML500 | 2006-- | 164.175 | 113.964 |

Chassis Family 199

| Current Models | Year | Chassis | Engine |
|----------------|--------|---------|---------|
| SLR McLaren | 2005-- | 199.376 | 155.980 |

Chassis Family 463

| Current Models | Year | Chassis | Engine |
|----------------|-----------|---------|---------|
| G55 AMG | 2002-2004 | 463.246 | 113.982 |
| G500 | 2002-2005 | 463.249 | 113.962 |
| G55K AMG | 2003-2005 | 463.271 | 113.993 |

Chassis Family 220

| Current Models | Year | Chassis | Engine |
|----------------|-----------|---------|---------|
| S600 | 2001-2002 | 220.178 | 137.970 |
| S55 AMG | 2001-2002 | 220.173 | 113.986 |

Chassis Family 215

| Current Models | Year | Chassis | Engine |
|----------------|-----------|---------|---------|
| CL55 AMG | 2001-2002 | 215.373 | 113.982 |
| CL600 | 2001-2003 | 215.378 | 137.970 |

Chassis Family 211

| Current Models | Year | Chassis | Engine |
|-------------------|-----------|---------|---------|
| E320 | 2003-2005 | 211.065 | 112.949 |
| E320 Wagon | 2004-2005 | 211.265 | 112.949 |
| E320 4MATIC | 2004-2005 | 211.082 | 112.954 |
| E320 Wagon 4MATIC | 2004-2005 | 211.282 | 112.954 |

Chassis Family 210

| Current Models | Year | Chassis | Engine |
|-------------------|-----------|---------|---------|
| E320 Wagon 4MATIC | 1998-2003 | 210.282 | 112.941 |
| E320 Wagon | 1998-2003 | 210.265 | 112.941 |
| E55 AMG | 1999-2002 | 210.074 | 113.980 |
| E430 4MATIC | 2000-2002 | 210.083 | 113.940 |
| E430 | 1998-2002 | 210.070 | 113.940 |
| E320 Sedan 4MATIC | 1998-2002 | 210.082 | 112.941 |
| E320 Sedan | 1996-1997 | 210.055 | 104.995 |
| E320 Sedan | 1998-2002 | 210.065 | 112.941 |
| E300 Turbo Diesel | 1998-1999 | 210.025 | 606.962 |
| E420 | 1997 | 210.072 | 119.985 |
| E300 Diesel | 1996-1997 | 210.020 | 606.912 |

Chassis Family 209

| Current Models | Year | Chassis | Engine |
|------------------|-----------|---------|---------|
| CLK320 | 2003-2005 | 209.365 | 112.955 |
| CLK320 Cabriolet | 2004-2005 | 209.465 | 112.955 |

Chassis Family 208

| Current Models | Year | Chassis | Engine |
|---------------------|-----------|---------|---------|
| CLK430 Cabriolet | 2002-2003 | 208.470 | 113.943 |
| CLK320 Cabriolet | 1999-2003 | 208.465 | 112.940 |
| CKL55 AMG Cabriolet | 2002 | 208.474 | 113.984 |
| CLK55 AMG | 2002 | 208.374 | 113.984 |
| CLK430 | 1999-2002 | 208.370 | 113.943 |
| CLK320 | 1998-2002 | 208.365 | 112.940 |

Chassis Family 203

| Current Models | Year | Chassis | Engine |
|---------------------------|-----------|---------|---------|
| C320 | 2001-2005 | 203.064 | 112.946 |
| C320 Wagon | 2002-2005 | 203.246 | 112.946 |
| C320 4MATIC | 2003-2005 | 203.084 | 112.953 |
| C230 Wagon 4MATIC | 2003-2005 | 203.284 | 112.953 |
| C32 AMG | 2002-2004 | 203.065 | 112.961 |
| C230 CL 1.8 Kompressor | 2003-2005 | 203.740 | 271.948 |
| C240 2.6 | 2001-2005 | 203.061 | 112.912 |
| C240 2.6 (w/717.4MT) | 2001-2005 | 203.061 | 112.912 |
| C240 4MATIC | 2003-2005 | 203.081 | 112.916 |

| | | | |
|-------------------------|-----------|---------|---------|
| C240S | 2003-2005 | 203.261 | 112.912 |
| C240S (Wagon) 4MATIC | 2003-2005 | 203.281 | 112.916 |
| C230 1.8 Kompressor | 2004-2005 | 203.040 | 271.948 |
| C320 CL | 2004-2005 | 203.764 | 112.946 |
| C230 CL | 2002 | 203.747 | 111.981 |

Chassis Family 202

| Current Models | Year | Chassis | Engine |
|-----------------|-----------|---------|----------------------------|
| C43 AMG | 1998-2000 | 202.033 | 113.944 |
| C280 | 1998-2000 | 202.029 | 112.920 |
| C230 Kompressor | 1999-2000 | 202.024 | 111.975(2000)&111.974('99) |
| C36 AMG | 1995-1997 | 202.028 | 104.941 |
| C230 | 1997-1998 | 202.023 | 111.974 |
| C280 | 1994-1997 | 202.028 | 104.941 |
| C220 | 1994-1996 | 202.022 | 111.961 |

Chassis Family 201

| Current Models | Year | Chassis | Engine |
|----------------|-----------|-------------|-----------------|
| 190D 2.5 Turbo | 1987 | 201.128 | 602.961 |
| 190 E 2.6 | 1987-1992 | 201.029 | 103.942 |
| 190 E 2.3-16 | 1986-1987 | 201.034 | 102.983 |
| 190 D 2.5 | 1986-1989 | 201.126 | 602.911 |
| 190 D2.2 | 1984-1985 | 201.122 | 601.921 |
| 190 E2.3 | 1984-1998 | 201.028/024 | 102.961/102.985 |

NOTE: The chassis # is the same as the Manufacturer's ID #, or, i.e., the registration #. The engine # may be obtained from the original documentation supplied with your vehicle

7.2 BMW body code chart

| Model | Body | Years | Motor | DME |
|------------|------|------------|--------------|-----------------|
| 316i | E30 | 1988-91 | M40 | M1.3 |
| 318i | E30 | 9/87-89 | M40 | M1.3 |
| 318is | E30 | 1990-91 | M42/B18 | M1.7 |
| 318i/is | E36 | 1992-12/93 | M42/B18 DISA | M1.7 |
| 318i/is | E36 | 1/94-12/94 | M42/B18DISA2 | M1.7.2 |
| 318i/is/Ti | E36 | 1/95-8/95 | M42/B18DISA2 | M1.7.2 w/ WS-II |
| 318i/is/Ti | E36 | 1996-98 | M44/B19 | M5.2 (OBD-II) |
| 318i/is | E46 | 1999-2001 | M43 | MS43 |
| 323Ci | E46 | 6/98-9/00 | M52tu B25 | MS42.0(OBD-II) |
| 325 | E30 | 1988 | M20/B27 | M1.1 |
| 325e/es | E30 | 9/84-9/87 | M20/B27 | Basic M1.0 |
| 325i/is/iX | E30 | 87-8/90 | M20/B25 | M1.3 |
| 325i/is | E36 | 9/90-8/91 | M50/B25 | M3.1 |
| 325i/is | E36 | 9/91-8/92 | M50/B25 | M3.1 |
| 325i/is/ic | E36 | 9/92-12/94 | M50tu/B25 | M3.3.1 |
| 325i/is/ic | E36 | 1/95-8/95 | M50tu/B25 | M3.3.1w/EWS-II |
| 325i/Ci | E46 | 9/00- | M54 B325 | MS43 |
| 328i | E36 | 1996-98 | M52/B28 | MS41.1 |
| 328i | E46 | 6/98-6/00 | M52/B28 | MS42.0 |
| 330i/Ci/Xi | E46 | 6/00- | M54 B30 | MS43 |
| 330i/Ci/Xi | E46 | 6/02 | M56 B30 | MS43 |
| M3 | E30 | 1988-91 | S14/B23 | M1.0Motorsport |
| M3- Evo2 | E30 | 1989-91 | S14/B23 | M1.0Motorsport |

| | | | | |
|------------|-----|------------|-----------|---------------------------|
| M3- Evo3 | E30 | 1988-91 | S14/B25 | M1.0Motorsport |
| M3- Euro | E36 | 1993-95 | S50/B30 | M3.3 |
| M3 | E36 | thru12/95 | S50us/B30 | M3.3.1 |
| M3 | E36 | 1/95+ | S50us/B30 | M3.3.1w/EWS-II |
| M3 | E36 | 1996-99 | S50us/B32 | MS41.1 |
| M3 | E36 | 1996-99 | S52 | MS41.2 |
| M3 | E46 | 1999-2000 | S54 | MS S52 |
| M3 | E46 | 01/01- | S54B32 | MS S54 |
| Z3 | E36 | 1996 | M44/B19 | M5.2 |
| Z3 | E36 | 1997+ | M52/B28 | MS41.1 |
| 525i | E34 | 1989-90 | M20/B25 | M1.3 |
| 525i | E34 | thru | 8/91 | M50/B25 |
| 525i/iT | E34 | 9/91-1/92 | M50/B25 | M3.1 |
| 525i/iT | E34 | 2/92-93 | M50/B25 | M3.1 |
| 525i/iT | E34 | 93-12/94 | M50tu/B25 | M3.3.1 |
| 525i/iT | E34 | 1/95-1996 | M50tu/B25 | M3.3.1w/EWS-II |
| 525i/it/A | E39 | 2001-2002 | M54/B25 | MS43 |
| 528e | E28 | 1988 | M20/B27 | M1.1 |
| 528i/it/A | E39 | 1997-2000 | M52/B28 | MS41.1 |
| 530i | E34 | 3/93-8/94 | M60/B30 | M3.3 |
| 530i | E34 | 9/94-12/94 | M60/B30 | M3.3 w/ air ump |
| 530i | E34 | 1/95-4/94 | M60/B30 | M3.3 w/ EWS-II |
| 5 30i/it/A | E39 | 2001- | M54/B30 | MS43 |
| 535i/is | E28 | 1988 | M30/B34 | M1.0 Adaptive (28 pin) |
| 535i | E34 | 1989-92 | M30/B35 | M1.3 |
| 540i | E34 | thru12/94 | M60/B40 | M3.3 |
| 540i | E34 | 1/95+ | M60/B40 | M3.3 w/ EWS-II |
| 540i | E39 | 1996-8/98 | M62/B44 | M5.2 |

| | | | | |
|-------------|-----|------------|------------|-----------------|
| 540i/iA/iTA | E39 | 9/98-2001 | M62tu | ME7.2 |
| M5 | E34 | 1991+ | S38/B36 | M1.2 |
| M5 | E39 | 9/99-2001 | S62B50 | MS S52 |
| 635csi | E24 | 1988 | M30/B35 | M1.1 |
| 635csi | E24 | 1989 | M30/B35 | M1.3 |
| 735i/iL | E32 | 1/88 | M30/B35 | M1.1 |
| 735i/iL | E32 | 1989-92 | M30/B35 | M1.3 |
| 740i/iL | E32 | 9/92-4/94 | M60/B40 | M3.3 |
| 740i/iL | E38 | 1/95+ | M60/B40 | M3.3 w/ EWS-II |
| 740i/iL | E38 | 1996-99 | M62/B44 | M5.2 (OBD-II) |
| 740iA/iLA | E38 | 9/98-2001 | M62tu | ME 7.2 |
| 745i | E65 | 11/2001 | N62 | ME 9.2 |
| 745Li | E66 | 01/2002 | N62 | ME 9.2 |
| 750iL | E32 | 1988-90 | M70/B50 | M1.2 |
| 750iL | E32 | 1991+ | M70/B50 | M1.7 |
| 750iL | E38 | 9/94-8/96 | M73/B54 | M5.2 (OBD-II) |
| 750iL | E38 | 9/96+ | M73/B54 | M5.2.1 (OBD-II) |
| 760i | E65 | 11/2001 | N73 | ME 9.2 |
| 840i | E31 | 9/93-12/94 | M60/B40 | M3.3 |
| 840i | E31 | 1/95+ | M60/B40 | M3.3 w/ EWS-II |
| 840i | E31 | 1996+ | M62/B44 | M5.2 (OBD-II) |
| 850i | E31 | 1991+ | M70/B50 | M1.7 |
| X5 | E53 | 1998-2000 | M52 | MS42 |
| X5 | E53 | 2000-2001 | M54 | MS43 |
| X5 | E53 | 1999-2001 | M62TU | ME7.2 |
| Z8 | E52 | 9/99-2001 | S62 | MS S52 |
| Z4 | E85 | 2003- | M54B25/B30 | MS45 |

7.3 Block and parameter for Volkswagen vehicle

The Block Number of Audi A8 (MPI 2.8L 2 Valves)

| Group Number | Basic Setting | | Designation |
|--------------|---------------|-----------------|--|
| | Address | Display | |
| 00 | A | 135~160 | A: engine coolant temperature, readout: 50=... °C If the value is out of the range, check sensor or circuit or ECU |
| | B | 150~165 | B: output voltage of air mass flow readout: 100=1V |
| | C | 28~32 | C: engine speed readout: 25=...rpm |
| | D | 0~10 or 240~255 | D: learning value of idling speed stabilization, manual gearbox in neutral or automatic gearbox with selector lever in P or N |
| | E | 0~10 or 240~255 | E: learning value of idling speed stabilization, manual gearbox with drive mode engaged (average value 0). [0 is always displayed for vehicles with manual gearbox.] |

| | | | |
|----|---|----------|--|
| | F | 126~130 | F: feedback of idling speed stabilization (average value 128) |
| | G | 20 | G: shift input |
| | H | 120~136 | H: Lambda control value (average value 128/ cylinder 1 to 3)[0 is always displayed for engines without Lambda probe.] |
| | I | 0 or 3 | I: Lambda learning demand in idling and part load range [0= Lambda learning demand in idling and part load range] [3=Lambda learning process in idle complete] |
| | J | 50~100 | J: learning value of throttle valve potentiometer G69 readout: 5=...mV |
| 01 | A | 80~105°C | A: Engine coolant temperature If the value is out of the range, check sensor or circuit or ECU |

| | | | |
|--|---|------------|--|
| | B | 1.47~1.62V | <p>B: air mass flow output voltage</p> <p>1. If the voltage is lower than 1.47V, check the leakage between MAF and intake air manifold</p> <p>2. If the voltage is higher than 1.62V, please check the following items:</p> <p>(1) whether the electric applications closed or not</p> <p>(2) whether the power steering in the middle position (the vehicle wheel in straight line)</p> <p>(3) whether the shift lever in P/N</p> |
| | C | --- | <p>C: air mass flow sensor ground wire.</p> <p>If the value is 0.02V, it means the ground wire defective.</p> |
| | D | 12~14V | <p>D: MPI control unit voltage supply</p> |

| | | | |
|----|---|------------|---|
| 02 | A | 0.25~4.75V | <p>A: throttle valve potentiometer voltage (coarse)</p> <p>1) The sensor voltage should be .025V when the throttle closed;</p> <p>2) The sensor voltage should be 4.75V when the throttle wide open;</p> <p>3) If the value is out of the range, please check the throttle valve or throttle position sensor;</p> |
| | B | 0.50~1.27V | <p>B: throttle valve potentiometer voltage (fine)</p> <p>1) The sensor voltage should be 0.5V when the throttle closed;</p> <p>2) The sensor voltage should be 1.27V when the throttle is at lower load;</p> <p>3) If the value is out of the range, please check the throttle valve or throttle position sensor;</p> |

| | | | |
|----|---|--------------------|---|
| | C | 0.25~0.50V | <p>C: learning value of throttle valve potentiometer please check the following items:</p> <ol style="list-style-type: none"> 1) Whether the electric applications closed or not; 2) Whether the power steering in the middle position (the vehicle wheel in straight line) 3) Whether the shift lever in P/N. |
| | D | 0=open 1=closed | <p>D: mechanical idling speed switch</p> <p>If the value is out of the range, please check the throttle position sensor or electric circuit</p> |
| 03 | A | 700~800rpm | <p>A: Idle speed</p> <ol style="list-style-type: none"> 1) If the idle speed is lower than 700rpm, please check TP switch or IAC valve 2) If the idle speed is higher than 800rpm, please check TP switch or IAC valve or the leakage of intake air system, meanwhile, be sure the shift lever in P/N |

| | | | |
|----|---|---|--|
| | B | 15.0~32.0% | <p>B: Engine load</p> <ol style="list-style-type: none"> 1) Whether the electric applications closed or not 2) Whether the power steering in the middle position (the vehicle wheel in straight line) 3) Whether the shift lever in P/N 4) Check TP sensor or EGR valve or IAC valve damaged |
| | C | Full load 95% | <p>C: throttle valve angle</p> <ol style="list-style-type: none"> 1) The value should be 0% at idle speed; 2) The value should be higher than 95% when the throttle is open; 3) Check TP sensor or electric circuit. |
| | D | ...Km/h (According to vehicle speed) | <p>D: Road speed</p> <p>If the odometer can not display the vehicle speed, check the electric circuit between odometer and ECM</p> |
| 04 | A | 0±2 | A: Idling speed regulator |
| | B | M/T: +4~-16 A/T: 0~+20 | B: learning value of idling speed stabilization |

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|----|---|--------------|--|
| | C | A/T: +10~-20 | C: learning value of idling speed stabilization |
| | D | 0011 | D: Shift inputs 1= always "1", except "0" if gear engaged in automatic gearbox 2= mechanical idling speed switch (0=open; 1=closed) 3= AC compressor (0= off; 1= on) 4= always "0" |
| 05 | A | -25%~+25% | A: Lambda learning value at idling speed (Bank 1) |
| | B | -25%~+25% | B: Lambda learning value at part load (Bank 1) |
| | C | -25%~+25% | C: Lambda learning value at part load (Bank 1) |
| | D | -25%~+25% | D: Lambda learning value at part load (Bank 1) |
| 06 | A | -25%~+25% | A: Lambda learning value at idling speed (Bank 2) |
| | B | -25%~+25% | B: Lambda learning value at part load (Bank 2) |
| | C | -25%~+25% | C: Lambda learning value at part load (Bank 2) |
| | D | -25%~+25% | D: Lambda learning value at part load (Bank 2) |

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| 07 | A | 0.0±6.0% | A: Lambda control (Bank 1) If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value |
| | B | ...% | B: O2 sensor learning value |
| | C | XXXX | C: Lambda learning demand diagnosis (If diagnosis has been performed, the appropriate value is set to "1".) X1, X2= idling speed (Bank 1, 2) X3, X4= part load 1 (Bank 1, 2) X5, X6= part load 2 (Bank 1, 2) X7, X8= part load 3 (Bank 1, 2) |

| | | | |
|----|---|-----------------|---|
| | D | XXXXXXXX | <p>D: Lambda learning demand display</p> <p>0= request for renew learning</p> <p>1= learning process ended</p> <p>X1, X2= idling speed (Bank 1, 2)</p> <p>X3, X4= part load 1 (Bank 1, 2)</p> <p>X5, X6= part load 2 (Bank 1, 2)</p> <p>X7, X8= part load 3 (Bank 1, 2)</p> |
| 08 | A | $0.0 \pm 6.0\%$ | <p>A: Lambda control (Bank 2)</p> <p>If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value</p> |
| | B | ...% | B: O2 sensor learning value |

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| | C | XXXXXXXXXX | <p>C: Lambda learning demand diagnosis (if diagnosis has been performed, the appropriate value is set to "1".)</p> <p>X1, X2= idling speed (Bank 1, 2)</p> <p>X3, X4= part load 1 (Bank 1, 2)</p> <p>X5, X6= part load 2 (Bank 1, 2)</p> <p>X7, X8= part load 3 (Bank 1, 2)</p> |
| | D | XXXXXXXXXX | <p>D: Lambda learning demand display</p> <p>0= request for renew learning</p> <p>1= learning process ended</p> <p>X1, X2= idling speed (Bank 1, 2)</p> <p>X3, X4= part load 1 (Bank 1, 2)</p> <p>X5, X6= part load 2 (Bank 1, 2)</p> <p>X7, X8= part load 3 (Bank 1, 2)</p> |

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|----|---|--|---|
| 09 | A | $0.0 \pm 6.0\%$ | A: Lambda control (Bank 1) If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value |
| | B | $0.0 \pm 6.0\%$ | B: Lambda control (Bank 2) If the value is out of the range, please check the leakage of intake air system, the injector or O2 sensor learning value |
| | C | 0.0~99.0% | C: EVAP canister purge valve |
| | D | Idling: 0% Full load: 95% | D: throttle valve angle |
| 10 | A | Less than 8% | A: total from Lambda control (Bank 1) and momentary Lambda learning value (Bank 1) |
| | B | Less than 8% | B: total from Lambda control (Bank 2) and momentary Lambda learning value (Bank 2) |
| | C | Greater than 0.6V or less than 0.3V | C: voltage signal Bank 1 Lambda probe 1 --- O2 sensor should be lower than 0.3V or higher than 0.6V, otherwise check O2 sensor or heater |

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|----|---|--|---|
| | D | Greater than 0.6V or less than 0.3V | D: voltage signal Bank 2 Lambda probe 1 --- O2 sensor should be lower than 0.3V or higher than 0.6V, otherwise check O2 sensor or heater |
| 11 | A | ...° BTDC | A: ignition timing point without knock control and without digital idling speed stabilization when TP closed, the ignition angle is 12°BTDC. |
| | B | ...° BTDC | B: Ignition-timing point with knock control and with digital idling speed stabilization when engine load is over 40%, knock control begins to work. |
| | C | ...±°CA | C: ignition timing point manipulation for digital idling speed stabilization |
| | D | 0= open; 1= closed | D: idling speed switch function |
| 12 | A | ...rpm | A: engine speed |
| | B | ...% | B: engine load |
| | C | 1 st map or 2 nd map | C: ignition timing map changeover |
| | D | ...±°CA | D: ignition timing retardation of knock control |

| | | | |
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| 13 | A | 1 st map or 2 nd map | A: ignition timing map changeover |
| | B | ...±°CA | B: ignition timing retardation of knock control (cylinder 1) |
| | C | ...±°CA | C: ignition timing retardation of knock control (cylinder 2) |
| | D | ...±°CA | D: ignition timing retardation of knock control (cylinder 3) |
| 14 | A | 1 st map or 2 nd map | A: ignition timing map changeover |
| | B | ...±°CA | B: ignition timing retardation of knock control (cylinder 4) |
| | C | ...±°CA | C: ignition timing retardation of knock control (cylinder 5) |
| | D | ...±°CA | D: ignition timing retardation of knock control (cylinder 6) |
| 15 | A | ...rpm | A: engine speed |
| | B | ...V | B: knock sensor signal (cylinder 1) |
| | C | ...V | C: knock sensor signal (cylinder 2) |
| | D | ...V | D: knock sensor signal (cylinder 3) |
| 16 | A | ...map | A: engine speed |
| | B | ...V | B: knock sensor signal (cylinder 4) |
| | C | ...V | C: knock sensor signal (cylinder 5) |
| | D | ...V | D: knock sensor signal (cylinder 6) |

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|----|---|----------------------------|---|
| 17 | A | 700~800rpm | A: idle speed |
| | B | ...% | B: engine load |
| | C | ...% | C: EGR duty cycle |
| | D | 0...255°C | D: exhaust gas re-circulation temperature |
| 18 | A | ...% | A: internal specified cycle of idling speed stabilization valve-N71 |
| | B | AMPS | B: current consumption of idling speed stabilization valve-N71 |
| | C | -40~+60% | C: current control of idling speed stabilization valve-N71 |
| | D | 12~14V | D: voltage supply of MPI control unit |
| 19 | A | ...% | A: engine load |
| | B | ...g/s | B: air volume induced |
| | C | Km/h | C: road speed |
| | D | ...m/s | D: injection time |
| 22 | A | 0~12 | A: reducing stage |
| | B | ...± °CA | B: ignition timing retardation as a consequence of ASR |
| | C | -68Nm~250Nm | C: reduced engine torque |
| | D | -68Nm~250Nm | D: non-reduced engine torque |
| 99 | A | ...rpm | A: engine speed |
| | B | ...% | B: engine load |
| | C | °C | C: coolant temperature |
| | D | λ con. OFF or λ con. ON | D: Lambda control OFF/ON |

The block number of PASSAT B5

| Group NO: | Basic Setting | | Designation |
|--------------|---------------|---------|---|
| | Add. | Display | |
| 00 | A | 170~204 | A: momentary coolant temperature (equals to 80~105°C) |
| | B | 17~44 | B: engine load (equals to 0.85~2.2ms) |
| | C | 82~90 | C: idle speed (equals to 820~900rpm) 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 3) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |
| | D | 142~206 | D: MPI control unit voltage supply (equals to 10~14.5V) |
| | E | 0~12 | E: throttle valve angle (equals to 0~5°) |
| | F | 123~133 | F: idle speed regulator (equals to -2.5~+2.5g/h) |
| | G | 120~136 | G: feedback of idling speed (equals to -4.0~+4.0kg/h) stabilization (average value 128) |
| | H | 77~179 | H: Lambda control value (equals to -10%~+10%) |
| | I | 115~141 | I: Lambda learning value (equals to -0.64~+0.64ms) (average value 128) |
| | J | 117~138 | J: Lambda learning value (equals to -8.0~+8.0%) |

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|----|---|-------------|---|
| 01 | A | 820~900 rpm | <p>A: idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |
| | B | 1.0~2.5 ms | <p>B: engine load if the value is higher than 2.50ms, please check the following items:</p> <ol style="list-style-type: none"> 1) The blockage of injector or spark plug 2) The throttle control unit 3) The power steering should be in the middle position 4) Shift lever should be in P/N |
| | C | 0~5° | <p>C: throttle valve angle</p> <p>If the throttle valve angle is higher than 5°, please check the following items:</p> <ol style="list-style-type: none"> 1) The adaptation between engine ECU and the throttle control unit 2) The throttle control unit 3) Adjust accelerator cable 4) Fuel supply system 5) Throttle operating system |

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|----|---|----------------------|--|
| | D | 5.25°~14.25°v. OT | <p>D: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| 02 | A | 820~900 rpm | <p>A: idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |
| | B | 1.0~2.5 ms | <p>B: engine load</p> <ol style="list-style-type: none"> 1) If the value is lower than 1.00ms, please check purge valve, because the fuel evaporation in purge canister too high or you can check the injection rate 2) If the value is higher than 2.50ms, please check the electric load, for example, A/C compressor or power steering, etc |

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| | C | 2~5ms | <p>C: Injection time</p> <ol style="list-style-type: none"> 1) Check the activated carbon canister solenoid 2) Check the fuel system and activated carbon canister 3) Check the injection rate |
| | D | 2~4g/s | <p>D: Air volume induced</p> <ol style="list-style-type: none"> 1) If the value is lower than 2.0g/s, it means there is a lot of air mass which is not calculated by the mass air flow meter. 2) If the value is higher than 4.0g/s, please check the following items: <ul style="list-style-type: none"> ----Shift selector not in P/N ----Turn off electric applications (Air conditioner, power steering etc) |
| 03 | A | 820~900 rpm | <p>A: Idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) if the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |

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| | <p>B</p> | <p>10.0~14.5V</p> | <p>B: MPI control unit voltage supply</p> <p>1) If the voltage is lower than 2.000V, please check the following items:</p> <ul style="list-style-type: none"> ① check the voltage and charge the battery ② increase engine speed for several minutes and turn off the electric applications ③ check the power supply of engine control unit ④ check the creep of electricity <p>2) If the voltage is higher than 14.500V, Check the voltage and change the regulator if necessary</p> |
| | <p>C</p> | <p>80~105 °C</p> | <p>C: engine coolant temperature</p> <p>1) if the coolant temperature is lower than 80°C, please check the following items:</p> <ul style="list-style-type: none"> ① make a road test if necessary ② check coolant temperature sensor <p>2) if the coolant temperature is higher than 105 °C ,please check the following items:</p> <ul style="list-style-type: none"> ① clean the radiator ② check the cooling fan ③ check the thermostat ④ check the coolant temperature sensor |

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| | D | ---°C | D: intake air temperature According to the environment temperature. if the value is always at 19.5 °C , please check intake air temperature sensor G42 or circuit |
| 04 | A | 0~5° | A: throttle valve angle If the throttle valve angle is higher than 5°, please check the following items: 1) The adaptation between engine ECU and the throttle control unit 2) The throttle control unit 3) Adjust accelerator cable 4) Fuel supply system 5) Throttle operating system |
| | B | -1.7~+1.7g/s | B: learning value of mass air flow idling speed stabilization |
| | C | -1.7~+1.7g/s | C: learning value of mass air flow idling speed stabilization |
| | D | Idling | D: idle speed, full load, part load, power enrichment, overdrive cutoff |
| 05 | A | 820~900 rpm | A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |

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|----|---|----------------|---|
| | B | 860rpm | B: idle speed (M/T) |
| | C | -10~+10 % | C: Lambda learning value at part Load (idle speed regulator) |
| | D | 2.0~4.0g /s | D: air volume induced |
| 06 | A | 0~2550rpm | A: engine speed |
| | B | -10.0~+10.0% | B: Lambda learning value at part load (idle speed regulator) |
| | C | -10~+10 % | C: Lambda learning value at part load (idle speed regulator) check the following items: 1) The leakage of intake air system 2) The rate of injection 3) λ learning value |
| | D | -10°~+45°v. OT | D: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| 07 | A | -10~+10 % | A: Lambda learning value at part load (idle speed regulator) |

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| | B | 0.0~1.0V | <p>B: O2 sensor voltage</p> <ol style="list-style-type: none"> 1) If the mixture air is rich, the voltage of O2 sensor is 0.7~1.0V. 2) If the mixture air is lean, the voltage of O2 sensor is 0.0~0.3V. 3) The displayed value should be lower than 0.3V and higher than 0.6V now and then, when the value is lower than 0.45V, it means air mixture too lean; when the value is higher than 0.45V, it means air mixture too rich. |
| | C | 0~99% | C: EVAP canister purge valve |
| | D | 0.30~1.10 | D: Lambda for fuel tank vent valve |
| 09 | A | 820~900 rpm | <p>A: idle speed</p> <ol style="list-style-type: none"> 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |
| | B | -10~+10 % | B: Lambda control value |

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| | C | 0.0~1.0V | <p>C: O2 sensor voltage</p> <p>1) If the mixture air is rich, the voltage of O2 sensor is 0.7~1.0V.</p> <p>---Check fuel pressure regulator and holding pressure</p> <p>---Check the injector</p> <p>---Contaminated, repair or replacement</p> <p>---Check coolant temperature sensor</p> <p>---Check purge solenoid valve 1</p> <p>2) If the mixture air is lean, the voltage of O2 sensor is 0.0~0.3V.</p> <p>---Check spark plug</p> <p>3) The displayed value should be lower than 0.3V and higher than 0.6V now and then, when the value is lower than 0.45V, it means air mixture too lean; when the value is higher than 0.45V, it means air mixture too rich.</p> <p>---Check the leakage of intake air system</p> |
| | D | -10~10% | D: Lambda value at idle speed (add.) |
| 10 | A | 0~99% | A: EVAP canister purge valve |
| | B | 0.3~1.20 | B: Lambda correction for fuel tank vent |
| | C | -3~+32 | <p>C: fuel tank vent evaporative</p> <p>-3: no fuel evaporation in charcoal purge</p> <p>+32: fuel evaporation saturated in charcoal purge</p> |

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| | D | 0.0~0.30 | D: EVAP tank vacuum decay slope 0.00: no fuel in purge canister 0.30: 30% of fuel evaporation coming from AKF |
| 11 | A | 820~900 rpm | A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |
| | B | 1.0~2.5 ms | B: engine load 1) Lower value only occurs at the conditions of overdrive cutoff 2) If the value is higher than 2.5ms, please check the following items: ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position |
| | C | 0 km/h | C: road speed |
| | D | 0.5~1.5 l/h | D: fuel consumption |

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| 14 | A | 820~900 rpm | <p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p> |
| | B | 1.0~2.5 ms | <p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position |
| | C | 0~15°kW | <p>C: Ignition timing retardation of knock control (cylinder 1)</p> <p>1) If the voltage difference is higher than 50% between max. And min., the possible reason is that the connector corroded</p> <p>2) The knock control begins to work when engine load is higher than 40%</p> |

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|----|---|-------------|--|
| | D | 0~15°kW | <p>D: ignition timing retardation of knock control (cylinder 2)</p> <p>If the voltage difference is higher than 50% between max. And min., the possible reason is that the connector corroded</p> <p>The knock control begins to work when engine load is higher than 40%</p> |
| 15 | A | 820~900 rpm | <p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p> |
| | B | 1.0~2.5 ms | <p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ----Mass air flow meter damaged ----Throttle control unit damaged ----Electric applications ----Adjust power steering to middle position |

| | | | |
|----|---|----------|---|
| | C | 0~15°kW | <p>C: ignition timing retardation of knock control (cylinder 3)</p> <p>1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded</p> <p>2) The knock control begins to work when engine load is higher than 40%</p> |
| | D | 0~15°kW | <p>D: ignition timing retardation of knock control (cylinder 4)</p> <p>1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded</p> <p>2) The knock control begins to work when engine load is higher than 40%</p> |
| 16 | A | 0.3~1.4V | <p>A: Knock sensor signal (cylinder 1)</p> <p>1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded</p> <p>2) The signal voltage of knock control can reach 5.1V at high speed</p> |
| | B | 0.3~1.4V | <p>B: knock sensor signal (cylinder 2)</p> <p>1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded</p> <p>2) The signal voltage of knock control can reach 5.1V at high speed</p> |

| | | | |
|----|---|-------------|---|
| | C | 0.3~1.4V | <p>C: knock sensor signal (cylinder 3)</p> <p>1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded</p> <p>2) The signal voltage of knock control can reach 5.1V at high speed</p> |
| | D | 0.3~1.4V | <p>D: knock sensor signal (cylinder 4)</p> <p>1) If the voltage difference is higher than 50% between max. and min., the possible reason is that the connector corroded</p> <p>2) The signal voltage of knock control can reach 5.1V at high speed</p> |
| 18 | A | 820~900 rpm | <p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p> |

| | | | |
|----|---|-------------|--|
| | B | 1.0~2.5 ms | <p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position |
| | C | --- | C: engine load, throttle open angle |
| | D | -30~+25 % | <p>D: altitude correction value</p> <p>-30%: equals 700mbar</p> <p>25%: equals 1250mbar</p> |
| 19 | A | 820~900 rpm | <p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p> |

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|----|---|-------------|--|
| | B | 1.0~2.5 ms | <p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position |
| | C | X1X or X0X | C: cylinder block status |
| | D | 12.0°v. OT | <p>D: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| 20 | A | 820~900 rpm | <p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p> |

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|----|---|---------------------------------|---|
| | B | Neutral Gear selected ON | B: shift status |
| | C | A/C High or A/C Low | C: A/C status |
| | D | Compressor ON or compressor OFF | D: A/C compressor switch check A/C compressor signal |
| 21 | A | 820~900 rpm | <p>A: idle speed</p> <p>1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system</p> <p>2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system</p> |

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|----|---|--|---|
| | B | 1~2.5ms | <p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <p>---Mass air flow meter damaged</p> <p>---Throttle control unit damaged</p> <p>---Electric applications</p> <p>---Adjust power steering to middle position</p> |
| | C | -39~+14 0°C | C: coolant temperature |
| | D | λ -Reg. OFF or λ -Reg. ON | D: Lambda control |
| 23 | A | 100000 | A: learning value demand display |
| | B | 72.0~95. 0% | B: TPS position at minimum display the last learning value |
| | C | 67.0~83. 0% | C: TPS position at emergency display the last learning value |
| | D | 18.0~54. 0% | D: TPS position at maximum display the last learning value |
| 24 | A | 0~6800r pm | A: engine speed |
| | B | 0~10.00 ms | B: engine load |

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|----|---|--------------------------|--|
| | C | 20°n. OT~ 40°n. OT | C: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| | D | 0~72°kW | D: ignition timing retardation angle (cylinder 1~4) |
| 25 | A | --- | A: engine working status |
| | B | -30~+30 °kW | B: Hall sensor adjustment |
| | C | X00 | C: MAP/CAM changeover |
| | D | -3~+21°k W | D: camshaft adjustment |
| 26 | A | 0~6800r pm | A: engine speed |
| | B | 0~10.ms | B: engine load |
| | C | X00 | C: MAP/CAM changeover |
| | D | -3~+21°k W | D: camshaft adjustment |
| 95 | A | 820~900 rpm | A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |

| | | | |
|----|---|------------|--|
| | B | 1.0~2.5 ms | <p>B: engine load</p> <p>1) Lower value only occurs at the conditions of overdrive cutoff</p> <p>2) If the value is higher than 2.5ms, please check the following items:</p> <ul style="list-style-type: none"> ---Mass air flow meter damaged ---Throttle control unit damaged ---Electric applications ---Adjust power steering to middle position |
| | C | 12°v. OT | <p>C: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| | D | 80~105 °C | <p>D: coolant temperature</p> <p>1) If the temperature is lower than 80°C, you must make a road test and check the coolant temperature sensor</p> <p>2) If the temperature is higher than 110 °C , please clean the radiator, electric fan, coolant regulator as well as coolant temperature sensor</p> |
| 98 | A | --- | A: throttle valve potentiometer voltage G69 |
| | B | 0.5~4.9V | B: throttle position sensor voltage G127 |

| | | | |
|----|---|---------------------------------|--|
| | C | Idling part throttle | C: engine running status |
| | D | RUNNING OK ERROR | D: adaptation mode |
| 99 | A | 820~900 rpm | A: idle speed 1) If the engine speed is lower than 820rpm, please check the throttle control unit and the leakage of intake air system 2) If the engine speed is higher than 900rpm, please check the throttle control unit and the leakage of intake air system |
| | B | -40~125 °C | B: coolant temperature |
| | C | -10%~+10% | C: Lambda value at idle speed |
| | D | λ -Reg. OFF λ -Reg. ON | D: Lambda control OFF/ON |

7.4 The block number of AUDI 100/200 2.6E

| Group No. | Basic Setting | | Designation |
|-----------|---------------|---------|----------------|
| | Address | Display | |
| 00 | --- | --- | No designation |

| | | | |
|----|---|----------------|--|
| 01 | A | 680~820rpm | <p>A: idle speed</p> <ol style="list-style-type: none"> If idle speed is higher than 820rpm: <ol style="list-style-type: none"> idle switch F60 defective air leakage, check intake air system idle speed control valve N71 fault If idle speed is lower than 680rpm: <ol style="list-style-type: none"> idle speed control valve N71 fault idle switch F60 defective |
| | B | MAP | <p>B: intake air manifold absolute pressure</p> <p>100% = 1022 Pa or Hg?</p> <p>32% = 327 Pa or Hg?</p> <p>29~59%: at idle speed</p> |
| | C | 6~12 ° BTDC | <p>C: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage |

| | | | |
|----|---|-------------|---|
| | D | 18~75 steps | <p>D: steps for idle speed control valve N71</p> <p>If the step value is out of the range, N71 valve will be blocked or inactive.</p> |
| 02 | A | 0~85% | <p>A: Throttle angle</p> <p>0%: throttle valve closed (idle speed)</p> <p>85%: throttle wide open if the value is higher than 0% at idle speed, the throttle potentiometer G69 maybe damaged.</p> <p>If the value is lower than 85% at the throttle valve wide open, the throttle potentiometer G69 is defective.</p> |
| | B | MAP | <p>B: manifold absolute pressure</p> <p>100% = 1022 Pa or Hg?</p> <p>32% = 327 Pa or Hg?</p> <p>29~59%: at idle speed</p> |
| | C | 81~111 °C | <p>C: Coolant temperature</p> <p>If the coolant temperature is higher than 111 °C, the coolant temperature sensor or circuit failure.</p> |
| | D | ---°C | <p>D: Intake air temperature relative to environment temperature</p> |

| | | | |
|----|---|-----------|---|
| 03 | A | 0.75~1.25 | <p>A: Lambda control value (cylinder 1~3)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |
|----|---|-----------|---|

| | | | |
|--|----------|------------------|---|
| | <p>B</p> | <p>0.75~1.25</p> | <p>B: Lambda control value (cylinder 4-6)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |
|--|----------|------------------|---|

| | | | |
|----|---|---------------------------|--|
| | C | 0.75~1.25 | <p>C: Lambda control value (cylinder 1~3)</p> <p>If the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised</p> |
| | D | 0.75~1.25 | <p>D: Lambda control value (cylinder 1~3)</p> <p>If the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised</p> |
| 04 | A | Lambda control adaptation | A: refer to the Lambda control table enclosed |
| | B | --- | B: Lambda control adaptation for purge canister |
| | C | 0.75~1.25 | <p>C: Lambda control value (cylinder 1~3)</p> <p>if the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised</p> |

| | | | |
|----|---|------------|--|
| | D | 0.75~1.25 | <p>D: Lambda control value (cylinder 1~3)</p> <p>If the value is out of the range, it means the mixture air is too rich, the quantity of fuel injection must be reduced; or the mixture air is too lean, the quantity of fuel injection must be raised</p> |
| 05 | A | 680~820rpm | <p>A: Idle speed</p> <p>1) If idle speed is higher than 820rpm:</p> <ul style="list-style-type: none"> ① idle switch F60 defective ② air leakage, check intake air system ③ idle speed control valve N71 fault <p>2). If idle speed is lower than 680rpm:</p> <ul style="list-style-type: none"> ① idle speed control valve N71 fault ② idle switch F60 defective |
| | B | 60° | <p>B: Knock control</p> <p>If the value is too low, it means the components loose or intake air temperature too high</p> |

| | | | |
|----|---|----------------|---|
| | C | 6~12 ° BTDC | <p>C: ignition angle</p> <p>If the value is out of the range, please check the following items:</p> <ul style="list-style-type: none"> ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| | D | 81~111℃ | <p>D: coolant temperature</p> <p>If the coolant temperature is higher than 111 ℃ , the coolant temperature sensor or circuit failure.</p> |
| 06 | A | 10~60 | <p>A: Steps for idle speed control valve N71</p> <p>If the step value is out of the range, it means intake air system failure or idle speed control valve damaged.</p> |
| | B | 18~75 steps | <p>B: Idle speed control value (current)</p> <p>If the value is always 35, please check idle speed control valve.</p> |
| | C | -- | <p>C: Idle speed control is affected by other signal</p> |
| | D | -- | <p>D: Idle speed control</p> |

| | | | |
|----|---|---------|--|
| 07 | A | 10~60 | <p>A: steps for idle speed control valve N71</p> <p>If the step value is out of the range, it means intake air system failure or idle speed control valve damaged.</p> |
| | B | 81~111℃ | <p>B: coolant temperature</p> <p>If the coolant temperature is higher than 111 ℃ , the coolant temperature sensor or circuit is defective.</p> |

| | | | |
|--|---|-----------|--|
| | C | 0.75~1.25 | <p>C: Lambda control value (cylinder 1~3)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |
|--|---|-----------|--|

| | | | |
|----|---|-----------|--|
| | D | 0.75~1.25 | <p>D: Lambda control value (cylinder 4~6)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |
| 08 | A | 10~60 | A: steps for idle speed control valve N71 |
| | B | 81~111 °C | B: coolant temperature |

| | | | |
|--|---|-----------|--|
| | C | 0.75~1.25 | <p>C: Lambda control value (cylinder 1~3)</p> <p>1) if the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |
|--|---|-----------|--|

| | | | |
|--|---|-----------|--|
| | D | 0.75~1.25 | <p>D: Lambda control value (cylinder 4-6)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) if the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |
|--|---|-----------|--|

| | | | |
|----|---|-----------------|---|
| 09 | A | 81~111℃ | A: coolant temperature If the coolant temperature is higher than 111℃, the coolant temperature sensor or circuit is defective. |
| | B | 0: OFF 1: ON | B: idle switch status |
| | C | 6~12 ° BTDC | C: ignition angle If the value is out of the range, please check the following items: ---Electric applications ---Adjust power steering to middle position ---Air leakage |
| | D | 680~820rpm | D: idle speed 1) If idle speed is higher than 820rpm: ①idle switch F60 defective ②air leakage, check intake air system ③ idle speed control valve N71 fault 2) If idle speed is lower than 680rpm: ① idle speed control valve N71 fault ②idle switch F60 defective |
| 10 | A | 81~111℃ | A: coolant temperature |

| | | | |
|--|---|------------------|--|
| | B | 0: OFF; 1: ON | B: idle switch status |
| | C | 0.75~1.25 | <p>C: Lambda control value (cylinder 1~3)</p> <p>1) If the value is lower than 0.75:</p> <ul style="list-style-type: none"> ① fuel system pressure too high ② fuel injector leakage ③ O2 sensor /heater failure <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater <p>2) If the value is higher than 1.25:</p> <ul style="list-style-type: none"> ① fuel system pressure too low ② fuel injector blocked ③ O2 sensor /heater failure ④ catalytic system leakage <p><i>Please check the following items:</i></p> <ul style="list-style-type: none"> ① check fuel pressure and holding pressure ② check fuel injector ③ check O2 sensor or O2 sensor heater |

| | | | |
|----|---|------------|---|
| | D | 680~820rpm | <p>D: Idle speed</p> <p>1) If idle speed is higher than 820rpm:</p> <ul style="list-style-type: none"> ① idle switch F60 defective ② air leakage, check intake air system ③ idle speed control valve N71 fault <p>2) If idle speed is lower than 680rpm:</p> <ul style="list-style-type: none"> ① idle speed control valve N71 fault ② idle switch F60 defective |
| 11 | A | 680~820rpm | <p>A: Idle speed</p> <p>1) If idle speed is higher than 820rpm:</p> <ul style="list-style-type: none"> ① idle switch F60 defective ② air leakage, check intake air system ③ idle speed control valve N71 fault <p>2) If idle speed is lower than 680rpm:</p> <ul style="list-style-type: none"> ① idle speed control valve N71 fault ② idle switch F60 defective |

| | | | |
|----|---|----------------------------|---|
| | B | MAP | <p>B: Intake air manifold absolute pressure</p> <p>100% = 1022 Pa or Hg?</p> <p>32% = 327 Pa or Hg?</p> <p>29~59%: at idle speed</p> |
| | C | 81~111 °C | <p>C: coolant temperature</p> <p>If the coolant temperature is higher than 111 °C, the coolant temperature sensor or circuit is defective.</p> |
| | D | Lambda control | <p>D: ON: Lambda active</p> <p>OFF: Lambda inactive</p> |
| 99 | A | 680~820rpm | <p>A: idle speed</p> <p>1) If idle speed is higher than 820rpm:</p> <ul style="list-style-type: none"> ① idle switch F60 defective ② air leakage, check intake air system ③ idle speed control valve N71 fault <p>2) If idle speed is lower than 680rpm:</p> <ul style="list-style-type: none"> ① idle speed control valve N71 fault ② idle switch F60 defective |
| | B | Engine load (Actual value) | <p>B: intake air manifold absolute pressure</p> <p>100% = 1022 Pa or Hg?</p> <p>32% = 327 Pa or Hg?</p> <p>29~59%: at idle speed</p> |

| | | | |
|--|---|----------|---|
| | C | 81~111℃ | C: engine coolant temperature If the coolant temperature is higher than 111℃, the coolant temperature sensor or circuit failure. |
| | D | -10~+10% | D: Lambda control |

7.5 Lambda control table

| Value | Lambda Control Status | Reason and Remedy |
|-------|-----------------------------|--|
| 0 | --- | ACF not work |
| 1 | Coolant temperature too low | Not reach engine coolant temperature 85℃ |
| | | Read fault code |
| | | Check coolant temperature sensor G62 |
| 4 | Idle speed too low | Close all electric applications |
| | | Read fault code |
| | | Check idle speed |
| 5 | Idle speed too high | Read fault code |
| | | Check idle speed |
| 6 | O2 sensor not work | Read fault code |
| | | Check O2 sensor |
| 7 | Lambda control fault | not reach engine coolant temperature 85℃ |
| | | Read fault code |
| | | Check throttle potentiometer |
| 10 | Not reach the set value | not reach engine coolant temperature 85℃ |
| | | Read fault code |

| | | |
|----|-------------------------|---------------------|
| 11 | Ignition count too few | Read fault code |
| | | O2 sensor defective |
| 12 | Ignition count too much | Read fault code |
| | | O2 sensor defective |
| 16 | ACF not work | |

7.6 Weights and measures

The metric system

Metric

GB & US

Length

| | | | | |
|--------|---|--------------|---|---------------------------|
| 10 mm | = | 1 centimetre | = | 0.3937 inch |
| 10 cm | = | 1 decimetre | = | 3.937 inches |
| 10 dm | = | 1 metre | = | 1.0936 yards =3.2808 feet |
| 1000 m | = | 1 kilometre | = | 0.6214 mile |
| 1852 m | = | 1 mile marin | = | 1.1500 miles |

Surface

| | | | | |
|-------------------|---|--------------------|---|----------------|
| 100 square metres | = | 1 are | = | 119.6 sq.yards |
| 100 acres | = | 1 hectare | = | 2.471 acres |
| 100 hectares | = | 1 square kilometre | = | 0.386 sq.mile |

Weight

| | | | | |
|-------------------|---|------------------|---|-------------|
| 10milligrams (mg) | = | 1 centigram (cg) | = | 0.154 grain |
|-------------------|---|------------------|---|-------------|

| | | | | |
|-----------------------|---|-------------|---|----------------------|
| 10 centigrams (cg) | = | 1 decigram | = | 1.543 grains |
| 10 decigram | = | 1 gram | = | 15.43 grains |
| 10 grams | = | 1 decagram | = | 5.64 drams |
| 100 grams | = | 1 hectogram | = | 3.527 ounces |
| 1000 grams | = | 1 kilogram | = | 2.205 pounds |
| 1000kilograms | = | 1 tone | = | 19.688 hundredweight |

Capacity

| | | | | |
|------------------------|---|------------------|---|-------------------------------|
| 1000 millitres (ml) | = | 1 litre (l) | = | 1.76 pints (2.1US pints) |
| 10 litres | = | 1 decalitre (dl) | = | 2.2 gallons (2.63 US gallons) |

Avoirdupois Weight

| GB&US | | Metric |
|------------------|---------------------------|-----------------------|
| | = 1 grain (gr) | = 0.065 gram (g) |
| 437.5 grains | = 1 ounce (oz) | = 28.35 grams |
| 16 drams (dr) | = 1 ounce | = 28.35 grams |
| 16 ounces | = 1 pound (lb) | = 0.454 kilogram (kg) |
| 14 pounds | = 1 stone (st) | = 6.356 kilograms |
| 2 stone | = 1 quarter | = 12.7 kilogram |
| 4 quarters | = 1 hundredweight | = 50.8 kilograms |
| 112 pounds | = 1short hundredweight | = 45.4 kilograms |
| 20 | = 1 ton | = 1016.04 kilograms |

hundredweight

2000 pounds = 1 short ton = 0.907 tonne

2240 pounds = 1 long ton = 1.016 tonnes

Linear Measure

GB&US

Metric

1 inch = 25.4 millimetres

12 inches = 1 foot = 30.48 centimetres

3 feet = 1 yard = 0.914 metre

5.5 yards = 1 rod,pole or perch = 5.029 metres

22 yards = 1 chain = 20.17 metres

220 yards = 1 furlong = 201.17 metres

8 furlongs = 1 mile = 1.609 kilometres

1760 yards = 1 mile = 1.609 kilometers

3 miles = 1 league = 4.828 kilometres

Square Measure

GB&US

Metric

1 square (sq) inch = 6.452 sq centimetres

144 sq inches = 1 sq foot = 929.03 sq centimetres

9 sq feet = 1 sq yard = 0.836 sq metre

484 sq yards = 1 sq chain = 404.62 sq metres

4840 sq yards = 1 acre = 0.405 hectare

40 sq rods = 1 rood = 10.1168 ares

4 roods = 1 acre = 0.405 hectare

640 acres = 1 sq mile = 2.59 sq kilometers or 259 hectares

Cubic Measure

| GB&US | | Metric |
|------------------|--------------|------------------------|
| | 1 cubic inch | = 16.39 cu centimetres |
| 1728cu inches | = 1 cu foot | = 0.028 cu metre |
| 27 cu feet | = 1 cu yard | = 0.765 cu metre |

Measure of Capacity

| GB | | US | Metric |
|-----------|------------------|-----------------|---------------|
| 4 gills | = 1 pint (pt) | = 1.201 pints | 0.568litre |
| 2 pints | = 1 quart (qt) | = 1.201 quarts | 1.136litres |
| 4 quarts | = 1 gallon (gal) | = 1.201 gallons | 4.546litres |

Pressure Measure

| GB&US | | Metric |
|--------------------------------|---|-------------------------------|
| 1 pound per square inch(psi) | = | 6.89 Kilopascal (KPa) |
| 1 atmosphere(atm) | = | 101 Kilopascal (KPa) |
| 1 ton per square inch(ton/in2) | = | 15.4 megapascal(MPa) |
| 1 millibar(mb) | = | 0.0295 inch of mercury(in Hg) |
| 1 inch of mercury(in Hg) | = | 33.9 millibar(mb) |

Velocity

| GB&US | | Metric |
|----------------------|---|-------------------------------|
| 1 mile per hour(mph) | = | 1.61 Kilometre per hour(km/h) |

1 knot(kn) = 1.85 Kilometre per hour(km/h)

Temperature Equivalents

| | FAHRENHEIT (F) | = | CELSIUS OR CENTIGRADE (C) |
|----------------|---------------------------|----------|--------------------------------------|
| Boiling-point | 212° | = | 100° |
| | 194° | = | 90° |
| | 176° | = | 80° |
| | 158° | = | 70° |
| | 140° | = | 60° |
| | 122° | = | 50° |
| | 104° | = | 40° |
| | 86° | = | 30° |
| Freezing-point | 68° | = | 20° |
| | 50° | = | 10° |
| | 32° | = | 0° |
| Absolute Zero | 14° | = | -10° |
| | 0° | = | -17.8° |
| | -459.67° | = | -273.17 |