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1. Symbols used

1.1 In the documentation

1.1.1 Warning notices - Structure and meaning

Warning notices warn of dangers to the user or people in the vicinity. Warning notices also indicate the consequences of the hazard as well as preventive action. Warning notices have the following structure:

Warning symbol	KEY WORD – Nature and source of hazard! Consequences of hazard in the event of failure to observe action and information given. ➤ Hazard prevention action and information.
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The key word indicates the likelihood of occurrence and the severity of the hazard in the event of non-observance:

Key word	Probability of occurrence	Severity of danger if instructions not observed
DANGER	Immediate impending danger	Death or severe injury
WARNING	Possible impending danger	Death or severe injury
CAUTION	Possible dangerous situation	Minor injury

1.1.2 Symbols in this documentation

Symbol	Designation	Explanation
!	Attention	Warns about possible property damage.
i	Information	Practical hints and other useful information.
1. 2.	Multi-step operation	Instruction consisting of several steps.
➤	One-step operation	Instruction consisting of one step.
⇨	Intermediate result	An instruction produces a visible intermediate result.
→	Final result	There is a visible final result on completion of the instruction.

1.2 On the product

- ! Observe all warning notices on products and ensure they remain legible.

2. Important notes



Before start up, connecting and operating Bosch products it is absolutely essential that the operating instructions/owner's manual and, in particular, the safety instructions are studied carefully. By doing so you can eliminate any uncertainties in handling Bosch products and thus associated safety risks upfront; something which is in the interests of your own safety and will ultimately help avoid damage to the device. When a Bosch product is handed over to another person, not only the operating instructions but also the safety instructions and information on its designated use must be handed over to the person.

2.1 User group

The product may be used by skilled and instructed personnel only. Personnel scheduled to be trained, familiarized, instructed or to take part in a general training course may only work with the product under the supervision of an experienced person.

All work conducted on electrical and hydraulic devices may be performed by persons with sufficient knowledge and experience in the field of electrics and hydraulics.

Children have to be supervised to ensure that they do not play with the appliance.

2.2 Agreement

By using the product you agree to the following regulations:

Declare

- Refer to packing list for detailed product configuration;
- Refer to software for functions, pictures.

This product cannot use in:

Locations characterized by a separate power network, in most cases supplied from a high- or medium-voltage transformer, dedicated for the supply of installations feeding manufacturing or similar plants with one or more of the following conditions:

- frequent switching of heavy inductive or capacitive loads;
- high currents and associated magnetic fields;
- presence of Industrial, Scientific and Medical (ISM) apparatus (for example, welding machines).

The equipment complies with relevant requirements of Directive 2004/108/EC for Electromagnetic compatibility (EMC) and Directive 2006/95/EC for Low Voltage.



Copyright

Software and data are the property of Bosch or its suppliers and protected against copying by copyright laws, international agreements and other national legal regulations. Copying or selling of data and software or any part thereof is impermissible and punishable; in the event of any infringements Bosch reserves the right to proceed with criminal prosecution and to claim for damages.

Liability

All data in this program is based - where possible - on manufacturer and importer details. Bosch does not accept liability for the correctness and completeness of software and data; liability for damage caused by faulty software and data is ruled out. Whatever the event, Bosch liability is restricted to the amount for which the customer actually pays for this product. This disclaimer of liability does not apply to damages caused by intent or gross negligence on the part of Bosch.

Warranty

Any use of non-approved hardware and software will result in a modification to our product and thus to exclusion of any liability and warranty, even if the hardware or software has in the meantime been removed or deleted.

No changes may be made to our products. Our products may only be used in combination with original accessories and original service parts. Failing to do so, will render null and void all warranty claims.

This product may only be operated using Bosch approved operating systems. If the product is operated using an operating system other than the approved one, then our warranty obligation pursuant to our supply conditions will be rendered null and void. Furthermore, we will not be held liable for damage and consequential damage incurred through the use of a non-approved operating system.

Warning

Test on a known source within the rated voltage range of the product, both before and after use to ensure unit is in good working condition.

- Not to use the equipment for measurements on mains circuits, not to use the equipment for measurements on voltage exceed the voltage range describe in the manual.
- Not to use the product for measurements within other measurement categories, such as CAT II, CAT III, CAT IV.
- Any parts of the device and its accessories are not allowed to be changed or replaced, other than authorized by the manufacturer of his agent

2.3 Obligation of contractor

The contractor is obliged to ensure that all measures geared towards the prevention of accidents, industrial diseases, labor-related health risks are taken and measures towards making the workplace fit for people to work in are carried out.

Specifications for electrical systems (BGV A3)

Electrical engineering in Germany is subject to the accident prevention regulations of the trade association "Electrical Plant and Equipment as under BGV A3 (previously VBG 4)". In all other countries, the applicable national regulations acts or decrees are to be adhered to.

Basic rules

The contractor is bound to ensure that all electrical equipment and operating material is set up, modified and maintained by skilled electricians only or under the guidance and supervision of a skilled electrician in accordance with electrical engineering principles.

Furthermore, the contractor must ensure that all electrical equipment and operating material is operated in keeping with electrical engineering principles.

If a piece of electrical equipment or operating material is found to be defective, i.e. it does not or no longer complies with electrical engineering principles, the contractor must ensure that the fault is rectified immediately and, in the event that imminent danger exists, also ensure that the electrical equipment or the electrical operating material is not used.

Tests (taking Germany as an example):

- The contractor must ensure that all electrical systems and equipment are tested by a qualified electrician or under the guidance of a qualified electrician to ensure they are in proper working order:
 - Before starting for the first time.
 - After modification or repair before starting for the first time.
 - At given intervals. Set intervals such as to ensure that faults that can be expected to occur are determined in good time.
- The test is to take the electrical engineering principles relating hereto into account.
- Upon request of the trade association, a test manual is to be maintained into which specific entries are made.

3. Safety instructions

3.1 Risk of electric shocks

3.1.1 Low voltages, high voltages



Hazardous voltages occur in both the lighting system and the electrical system of a motor vehicle. If contact is made with live parts (e.g. with the ignition coil), there is a risk of electric shock from flashover voltages caused by damaged insulation (e.g. ignition cables which have been attacked by martens). These apply to the secondary and primary sides of the ignition system, the wiring harness with connectors, lighting system (Litronic) as well as connection to the vehicle.

Safety measures:

- Only connect to a properly grounded outlet.
- Only the enclosed or a tested power supply cable is to be used.
- All extension cables must be fitted with shock-proof contacts.
- Any cables with damaged insulation must be replaced.
- First connect the lighting system and turn it on before connecting it to the vehicle.
- Before switching on the ignition connect the (B-) cable to engine ground or the battery (B-) terminal.
- Always switch off the ignition before performing any work on the electrical system of the vehicle. Intervention includes, for instance, connection to the vehicle, replacement of ignition system components, removal of equipment (e. g. alternators), connection of equipment to a test bench.
- Wherever possible, tests and settings should always be carried out with the ignition switched off and the engine stationary.
- If tests or settings are carried out with the ignition switched on or the engine running, care must be taken not to touch any live parts. This applies to all connection cables and leads as well as to connections of equipment to test benches.
- Test connections must always be made using suitable connectors (e.g. Bosch testing cable set or vehicle-specific adapter cables).
- Make sure that all test connections are properly plugged in and secure.
- Before disconnecting the (B-) cable from the engine ground or battery (B-), switch off the ignition.
- Never open the enclosures.

3.1.2 High voltages in hybrid vehicles and electric vehicles as well as their high-voltage components



If high-voltage components or high-voltage wires are inexpertly handled, there is a risk of fatal injury from high voltages and the possible transmission of current through the body.

- Deenergization is only to be performed by a qualified electrician, a qualified electrician for specific tasks (hybrid) or a power systems engineer.
- Work on vehicles with high-voltage components is only ever to be performed in a safe, deenergized condition by persons with the minimum qualification "Trained to perform electrical work".
- Even after deactivating the high-voltage vehicle electrical system, the high-voltage battery may still be live.
- Operating condition cannot be established from any running noise, as the electric machine is silent when stationary.
- In gear positions "P" and "N" the engine or electric motor may start spontaneously depending on the charge of the high-voltage battery.

Safety measures:

- Never open or damage high-voltage batteries.
- On accident vehicles, never touch high-voltage components or exposed high-voltage wires before deactivating the high-voltage vehicle electrical system.
- Avoid contact with any high-voltage components and high-voltage wires (orange sheathing) when in operation.
- Secure against unauthorized renewed start-up (e.g. by means of a padlock).
- Always wait at least 10 seconds after deactivating the high-voltage system.
- Visually inspect the high-voltage components and high-voltage wires for damage. The power systems engineer responsible should always be immediately notified of any irregularities, doubts or defects found.
 - High-voltage components must never exhibit signs of external damage.
 - The insulation of the high-voltage wiring must be intact and undamaged.
 - Watch out for any abnormal deformation of the high-voltage wiring.

3.2 Danger of acid burning



When exhaust gas measurements are taken, the **sampling hoses** which are used release a highly caustic gas (hydrogen fluoride) that can cause acid burning in the respiratory system when heated to temperatures in excess of 250 °C (482 °F) or in the event of fire.



Rules of conduct:

- Consult a doctor immediately after inhaling!
- Always wear gloves made of neoprene or PVC when removing residues left after a fire.
- Neutralize any residues left after a fire with a calcium hydroxide solution. This produces non-toxic calcium fluoride, which can be washed away.



Acids and alkalis can cause severe burning on unprotected skin. Hydrogen fluoride in combination with moisture (water) forms hydrofluoric acid. The **condensate**, which accumulates in the sampling hose and in the condensate container likewise contains acid.

Rules of conduct:

- When replacing the O₂ measuring sensor, bear in mind that it contains alkali.
- When replacing the NO measuring sensor, bear in mind that it contains acid.
- Rinse any affected parts of the skin immediately in water, then consult a doctor!
- NO and O₂ measuring sensors are hazardous waste and must be disposed of separately. Your Bosch specialist equipper can dispose of sensors in the proper manner.



If liquid crystal escapes from a damaged **liquid crystal display**, it is imperative to avoid direct skin contact, inhalation and swallowing.

Rules of conduct:

- If you have inhaled or swallowed liquid crystal, consult a doctor immediately!
- Wash the skin and clothing thoroughly with soap and water if it has come into contact with liquid crystal.



If fluid (electrolyte) escapes from **batteries and rechargeable batteries**, avoid getting it on your skin or in your eyes.

Rules of conduct:

- If contact with skin or eyes happens nevertheless, wash the affected parts immediately with clean water and then consult a doctor.

3.3 Danger of injury, Danger of crushing



The vehicle has rotating and moving parts that can injure fingers and arms.



If the vehicle is not prevented from rolling away, there is a danger of people being crushed against a workbench, for example.



There is the risk with electrically operated fans in particular that the fan can start running unexpectedly even when the engine and ignition are off.

Safety measures:

- Take steps to prevent the vehicle from rolling away while it is being tested. Select the park position if the vehicle has an automatic transmission and apply the handbrake or lock the wheels with chocks (wedges).
- Operating staff must wear work clothes without loose bands and loops.
- Do not reach in any area with rotating or moving parts.
- When working on or in the vicinity of electrically driven fans, allow the engine to cool down first, then disconnect the plug of the fan motor.
- Route cables at a suitable distance from rotating parts.
- Secure the trolley against rolling away by setting the brakes.
- Do not place heavy objects on or lean on the sensor holder.
- Transport and operate the equipment only in accordance with the operating instructions.

3.4 Danger of burning



When working on a hot engine, there is a risk of injury from burning if such components as the exhaust gas manifold, the turbo-charger, the Lambda sensor, etc. are touched or if parts of the body come too close to them. These components may be heated to temperatures of several hundred degrees Celsius. Depending on the duration of the exhaust gas measurements, the sampling probe of the exhaust gas measuring instrument may also become extremely hot.

Safety measures:

- Always wear protective clothing, e.g. gloves.
- Allow the engine to cool down first. This also applies to auxiliary heating systems.
- Keep connecting cables well away from all hot parts.
- Do not leave the engine running any longer than necessary for the test or setting.

3.5 Danger of fire, Danger of explosion



There is a risk of fire and explosion from fuels and fuel vapors when work is performed on the fuel system or on the mixture control system.

Safety measures:

- Switch off the ignition.
- Allow the engine to cool down first.
- Avoid naked flames and potential sources of sparks.
- Do not smoke.
- Collect any leaked fuel.
- Always ensure effective ventilation and suction when working in closed areas.

3.6 Danger of asphyxiation



Car exhaust fumes contain carbon monoxide (CO) - a colorless, odorless gas. If inhaled, carbon monoxide causes an oxygen deficiency in the body. Extreme caution is therefore essential when working in a pit, as some of the components of the exhaust gas are heavier than air and settle at the bottom of the pit. Caution is also necessary when working on LPG-driven vehicles.

Safety measures:

- Always ensure effective ventilation and suction (especially when working in a pit).
- Always switch on and connect the suction plant in a closed area.

3.7 Danger of tripping



When conducting tests or making adjustments, the sensor and connection cables increase the risk of tripping.

Safety measures:

- Route the connecting cables such that any risk of tripping up is prevented.

3.8 Noise



Noise levels in excess of 70 dB(A) can occur when measurements are carried out on a vehicle, especially at high engine speeds. Damage to hearing may result if human beings are exposed to noise at such levels over an extended period of time.

Safety measures:

- Noise protection facilities must be provided by the owner at all workplaces in the vicinity of the testing area.
- Suitable personal noise protection facilities must be used by the operator.

3.9 FCC Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

- Reorient or relocate the receiving antenna;
- Increase the separation between the equipment and receiver;
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected;
- Consult the dealer or an experienced radio/TV technician for help.

3.10 Safety Warning

- Inspection shall be carried out in good ventilation. Connect the exhaust pipe to outside if there is no enough ventilation;
- Smoking and open fire are prohibited in the inspection;
- The battery liquid contains sulphuric acid that could erode the skin. Avoid battery liquid from touching the skin directly in operation, especially note that the liquid shall not be splashed into eye;
- The engine temperature is high when running. Avoid touching the high-temperature parts, such as radiator and exhaust pipe;
- Pull manual brake before starting the engine. Block the front wheels and place shift lever at P or neutral gear to avoid accident when starting the engine;
- If external battery is used as power supply, pay attention to the electrode; use red alligator clip to connect anode and black alligator clip to connect cathode;
- Keep all the power cables, pens and tools away from belt or other moving parts if using instrument in engine compartment;
- Do not wear watch, ring and loose clothes in maintenance for engine compartment;
- Wear approved safety glasses in all inspection processes;
- Only the enclosed power adapter or power supply cable can be used for supply connection;
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

3.11 Using notes

- The instrument is precise electronic instrument, do not drop it;
- The instrument may respond slowly in first inspection. Please be patient. Do not operate the instrument frequently;
- If the program is interrupted or the display is disordered after flashing. Shut off the power and switch it on again for test;
- Ensure that the instrument and the diagnosis retainer are connected securely, otherwise the interrupted signal will affect the test. ;
- Handle the instrument gently and put it in safe place to avoid impact. Shut off the power when not using;
- After using put the accessories into the kit;
- Online upgrade will be affected by local wire speed. Please wait patiently if the loading is slow;
- Certain inspection and maintenance basis are required to operate the instrument, as well as electrical control system of the inspected automobile.

4. PC Software environment

As VMI operates based on the computer, the VMI software and relevant hardware driver software shall be installed onto the computer first of all.

4.1 Computer parameters


Configuration	Parameter (Recommended)	Parameter (Minimum)
Main frequency	CPU larger than 2G	CPU larger than 1.5G
Memory	Larger than 1G	Larger than 512M
Free space of hard disc	Larger than 2G	Larger than 1G
USB interface	USB2.0 full speed or high speed	USB2.0 full speed or high speed
WLAN	Wireless network card	Wireless network card
LAN	10M/100M	10M/100M
Display resolution	Higher than 1280*800, 32-bit above color depth	1024*768, 16-bit above color depth
OS	WINDOWS XP /WINDOWS 7	WINDOWS XP /WINDOWS 7


4.2 Installation guidance

4.2.1 VCI Software installation

Installation Steps:

1. Get the installation file(KT700_Full_Setup_V2.5.5.exe) from the CD disc furnished by Bosch Automotive Diagnostics Equipment (Shenzhen) Limited or its official website;
2. Double click the file;
3. Click the “**Next**” button to get the interface displaying the user license protocol, which shall be carefully read; if you accept all protocols, please click the “**Accept (I)**” button;
4. Select the target folder for software installation (disc C is the default file location); you can click the “**Browse**” button to select the target folder, and the program will automatically detect the corresponding used and free spaces of target disc;
5. Click the “**Installation**” button, and the software will be under installation; please wait for the installation completion;
6. After installation, if you select the “Run KT700” and click the “**Finish**” button, the installation completion will be confirmed and the VMI software will be run; if you only click the “**Finish**” button, the installation completion will be confirmed but the VMI software will not be run;
7. After installation, the shortcut will be displayed on the computer desktop; just click the shortcut to run the VMI software.

 You are administrator when you install software; You have access to write installed folders;

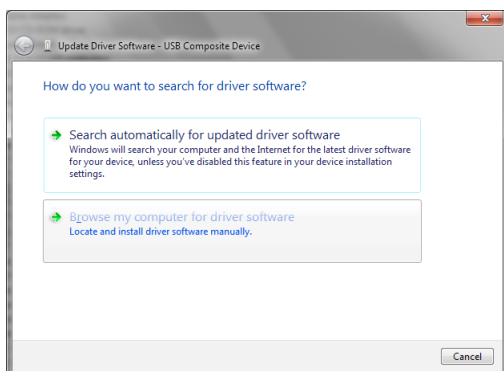
 Please install the PDF reader to view more help files conveniently.

4.3 USB driver installation

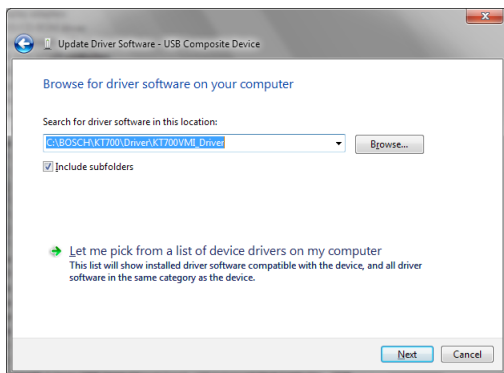
you must manually install USB driver after VMI software installation.

Installation steps:

1. Select "Device Manager" in "Control Panel";
2. Select "RNDIS/Ethernet Gadget" in "Other Device";
3. Click right mouse button, select "Update Driver Software";
4. Select "Browse my computer for driver software";



5. Click "Browse" button, find the driver software in install folder of BOSCH\KT700\Driver\KT700VMI_Driver.



6. Click "Next" button, wait for install successfully.

4.4 Software uninstall

After installing the software, KT700 folder will be displayed under the program submenu of the "Start" menu.

Directly click "Uninstall" to uninstall the software. Please operate following the interface prompts till the uninstall completion.






5. Deliver scope

Name	Part.No	Amount
KT700 VMI device	1 697 020 073	1
VMI battery	1 697 020 132	1
Standard big box	1 697 020 196	1
KT700 VMI Standard big instrument	1 697 020 079	1
KT700 VMI customer manual	1 697 020 201	1
USB communication cable	1 697 020 109	1
Record extension cable	1 697 020 225	1
14V power adapter	1 697 020 113	1
Power extension cable(length<3m)	1 697 020 105	1
Cigarette igniter power cable	1 697 020 107	1
Battery clip power cable	1 697 020 106	1
Red capacitive pickup	1 697 020 114	1
Gray capacitive pickup	1 697 020 115	1
Oscilloscope probe	1 697 020 116	2
Pierce probe(red)	1 697 020 117	1
Pierce probe(gray)	1 697 020 118	1
Pierce probe(black)	1 697 020 119	1
Cyl1 signal clip	1 697 020 120	1
Oscilloscope probe	1 697 020 121	2
Black alligator clip	1 697 020 125	1
Red alligator clip	1 697 020 124	1
KT700/780 SW DVD	1 697 020 178	1
Quality card	1 697 020 183	1
Anti-counterfeit label	1 697 020 232	1
Box barcode_blank	1 697 020 234	1
KT700 VMI Qucik start	1 697 020 256	1

Tab. 1: Deliver scope

6. Introduction to VMI host

6.1 Host identifications

Identification	Description
	The power indicator lamp, lighting in green to indicate the normal power supply;
	The malfunction indicator lamp, lighting in red to indicate the VMI malfunction;
	The computer communication indicator lamp, lighting in green to indicate the wired connection or in yellow to indicate the wireless connection;
	Power button;
	The travel recorder button identification, used for your convenient and rapid operation.

6.2 Connection terminal

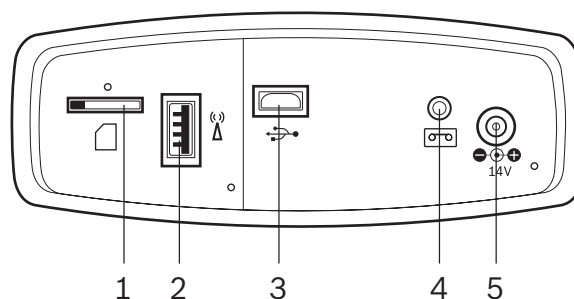



Fig. 1: Connection terminal

No.	Description
1	Trough of SD card, store measure data, the function didn't used temporarily
2	Trough of wireless adapter, the function didn't used temporarily
3	Micro USB
4	Data record interface, the function didn't used temporarily
5	Power interface

Tab. 2: Connection terminal

 Avoid missing wireless adapter, please don't pull out.

6.3 Oscilloscope terminal

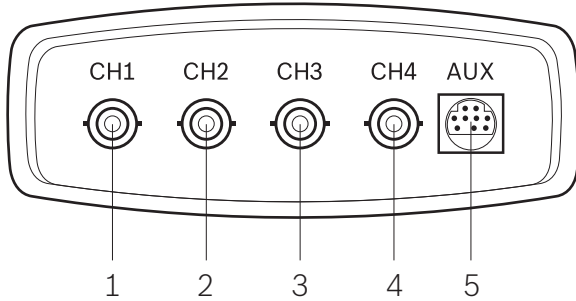


Fig. 2: Oscilloscope terminal

No.	Description
1	CH1, Oscillographic channel 1, Logic channel 1
2	CH2, Oscillographic channel 2, Logic channel 2
3	CH3, Oscillographic channel 3, Logic channel 3
4	CH4, Oscillographic channel 4, Logic channel 4
5	AUX, Assistant channel 5-8

Tab. 3: Oscilloscope terminal

6.4 Assistant function

Hook: VMI device hung on the front of car cover in measurement process, convenient measure.

Loading capacity: 5KG.

Battery: 2200mAh battery, the work time of battery is at least 2 hours under USB communication.

7. Equipment connection

According to different functions, the connection modes are: including measure connection, selfcheck connection and upgrade connection.

7.1 Measure connection

Before using the equipment, please ensure the normal connection among the VMI, computer, and measure assembly.

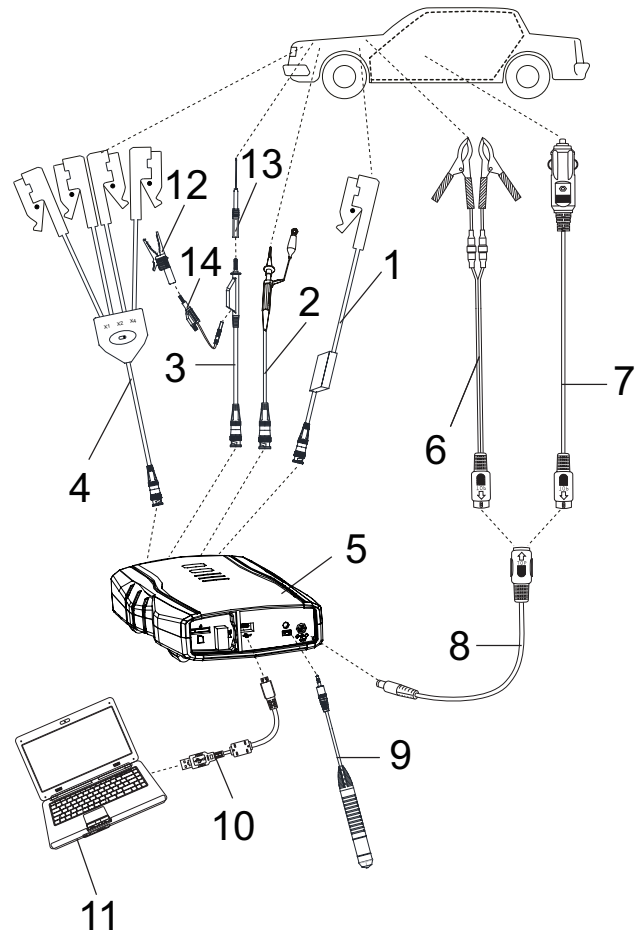


Fig. 3: Measure connection

- 1 Cyl1 signal clip
- 2 Oscilloscope probe
- 3 Oscilloscope probe(Main)
- 4 Capacitive pickup(Red, Gray)
- 5 VMI device
- 6 Battery clip power cable
- 7 Cigarette igniter power cable
- 8 Power extension cable
- 9 Record extension cable
- 10 USB communication cable
- 11 Computer
- 12 Alligator clip(Red, Black)
- 13 Pierce probe(Red, Gray, Black)
- 14 Oscilloscope probe(Secondary)

7.2 Selfcheck / Upgrade connection

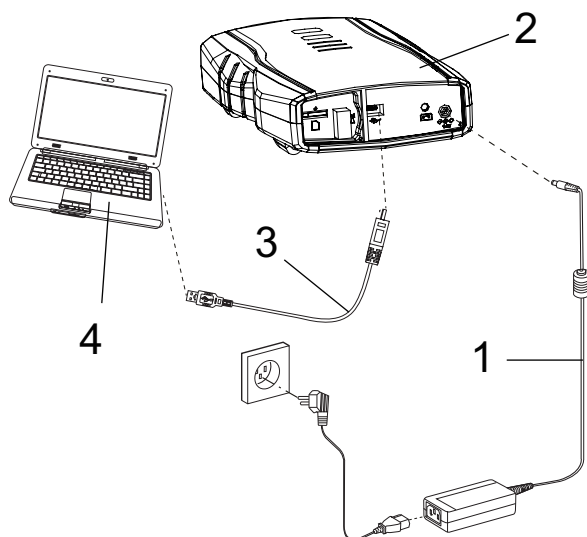


Fig. 4: Selfcheck / Upgrade connection

- 1 14V power adapter
2 VMI device
3 USB communication cable
4 Computer

8. Measure function

Main display:



Fig. 5: Main display

No.	Description
①	The main function area, including vehicle diagnosis, vehicle analyzer and service help;
②	The system function area, including screenshot, play-back, setting, help, feedback
③	The display area for measure function, including oscilloscope function, recording, measure sensor, actuator, ignition system, electronic system, communication system and multimeter.
④	The status column, including measure path , VMI connect status, communication modes status, and battery status.


















Tab. 4: Measure display

8.1 Power supply of host

There are 4 power supply modes for VMI host, you can select according to your requirement:

- AC power supply: take out VMI standard configuration power adapter in the instrument; Connect one end to the power interface of the instrument and another end to 100~240V AC socket;
- Automobile battery cell power supply: take out VMI standard configuration power extension lead and alligator clip; connect one end to the power interface of the instrument and another end to battery end;
- Cigarette lighter power supply: take out VMI standard configuration power extension lead and cigarette lighter; connect one end to power interface and another end to cigarette lighter;
- VMI battery.

8.2 Function button introduce

Button	Description
 退出	Exit measure process
 打印	Work content, logo could be printed
 载入	Load previous data which saved before, and save to point folder
 配置存取	Current parameter setting could be saving, and configuration can be download
 自动设置	Amplitude parameters setting
 冻结	Collected before and after the freezing point of the waveform data, and save a file in a fixed format
 冻结设置	Set freeze length and trigger position. Length: 400~32K; Trigger position: length*100%
 快照	Capture current screen and save
 参数选择	Select frequency, duty cycle, peak-to-peak, pulse width, maximum, minimum, and average of current acquisition waveform
 记录设置	Only Record display, setting trigger type and length
 波形比较	Waveform comparison, reference wave form and real-time waveform can be compared at same time. Reference waveform display with dotted line.
 点火设置	Only Ignition display, setting ignition display mode, precision, number of cylinder and ignition sequence
 三维显示	Ignition display mode, include 3D, longitudinal wave, concatenation and signal cylinder. Default is 3D.
 模拟信号	Only communication system display, filter function, signal change between simulation model and digital model, default is simulation model.
 采集设置	Only logical signal analysis display, include logical acquisition frequency, logical threshold pressure, logical acquisition length, logical channel, trigger channel, trigger type, and trigger position
 存储	Only logical signal analysis display, save logical wave
 启动	Only logical signal analysis display
 DC电压	Only multimeter display, measure DC pressure in CH1 to CH4 channels
 AC电压	Only multimeter display, measure AC pressure in CH4 channel
 通断	Only multimeter display, measure lead switching in CH4 channel
 电阻	Only multimeter display, measure resistance in CH4 channel
 二极管	Only multimeter display, measure diode in CH4 channel
 	Pause/Start button. Click pause button, display didn't fresh, pause change to start, click start button, continue collect.
	Record button, record displayed waveform. Click this button, start record; click again, stop record. The function same as record button on main unit and record extension cable.

Tab. 5: Function button introduce

8.3 Parameters adjust

8.3.1 Period

Adjust period of waveform, the high frequency will be show one screen waveform everytime, the low frequency will be show waveform by point scanning.

The time base. Use the sec/div control to set the amount of time per division represented horizontally across the screen.

High frequency: 1us~50ms

Low frequency: 100ms~50s

8.3.2 Channels, amplitude and coupling


Open channel and display waveform. CH1, CH2, CH3 and CH4 will display waveform at the same time. Red is CH1, blue is CH2, green is CH3, brown is CH4.

Amplitude: The attenuation or amplification of the signal. Use the volts/div control to adjust the amplitude of the signal to the desired measurement range.

Coupling: include AC, DC, and GND. The default is DC.

8.3.3 Trigger function

Trigger function will be enabled only when the frequency is less than 100ms/div can be selected by the user a particular waveform events need to be concerned. The user can be isolated from the waveform amplitude of the need to care about a particular waveform, glitches, setup and hold times and stable waveform display through different trigger mode. Use repetitive waveform can be shown in the waveform drawing area.

 Trigger function can only be used at high frequencies.


10.3.3.1 Trigger position

Trigger position determines the length of viewable signal both preceding and following a trigger point. Varying the trigger position allows you to capture what a signal did before a trigger event.

➤ You can set the trigger position through directly drag the slider at the top of waveform drawing area.

10.3.3.2 Trigger channel

Use the trigger level to stabilize a repeating signal, or to trigger on a single event. Trigger channel only be selected by opened channels, and only used when the frequency is less than 100ms/div.

 There can be only one channel as the trigger channel.

 Trigger channel and trigger type should be binding.

 The waveform will be bold display of trigger channel.

10.3.3.3 Trigger level

The trigger level provide the basic trigger point definition, when inputted amplitude more than trigger level, VMI will trigger.

- You can set the trigger level through directly drag the arrowhead on the right of waveform drawing area.

10.3.3.4 Trigger type

There have 4 trigger type, as follow:

Level trigger: VMI will be user-set trigger level position as a basic trigger point, when the rising edge amplitude of the input waveform greater than the trigger level, VMI will trigger waveform.

Rising edge of the trigger: VMI will trigger on the rising edge of the input waveform.

Falling edge of the trigger: VMI will trigger on the falling edge of the input waveform.

Automatic level trigger: VMI will automatically calculate the trigger position, and trigger at position of the rising edge greater than trigger level, and simultaneously update trigger level position of VMI software.

8.3.4 Negate routine

Select the channel, the waveform will reverse display based on waveform position. Default is off, check was opened.

8.3.5 Adjust cursor

The cursor is to be measure the voltage amplitude and period. Cursor measurement parameters to the current channel as a reference.

Click the cursor with time and voltage, according to the time(abscissa) move, according to the voltage(vertical axis) move, and display the measurements between cursors.

If you set the "parameters", software will automatically calculate the amplitude, and displayed in the interface; otherwise manual calculations.

8.3.6 Waveform position

The position of waveform display. Directly drag the small arrow on the left of drawing area to change the waveform display position.

8.4 Sensor Measure

8.4.1 Manifold Absolute Pressure Sensor (MAP)

Manifold absolute pressure sensor provides engine control unit (ECU) with engine load signal, which generally is frequency-modulated square wave signal or voltage level signal (depending on manufacturer) and is used to change mixing ratio of fuel and other output value after being processed by ECU.

When engine load increases, manifold pressure increases, or manifold pressure is low. Damaged MAP sensor may affect air-fuel ratio when engine accelerates or decelerates, and may affect ignition timing and other computer output values.

Connecting Equipment

When connecting VMI to power extension cable for power supply, choose power supply according to the battery position of vehicle mode tested. All connecting diagrams in this users manual take power supply by battery clip power cable as example. Oscilloscope probe(Main line) connect to Channel 1 (CH1 port), and then put black alligator clip or black pierce probe in oscilloscope probe(Secondary line) connect to the negative of battery or grounding, Put red pierce probe in oscilloscope probe(Main line) into the trigger signal line of manifold absolute pressure sensor (MAP).

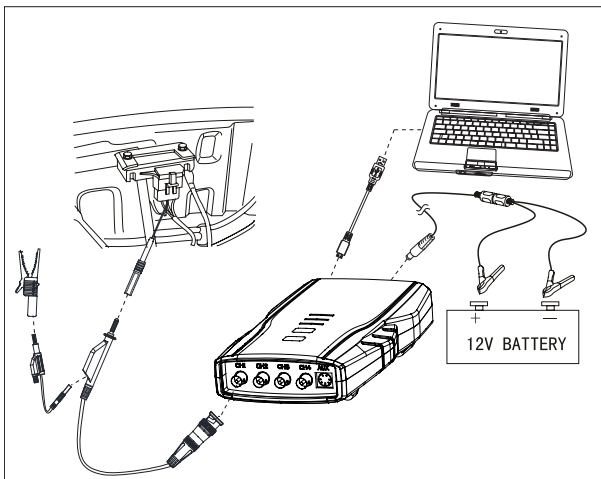


Fig. 6: MAP connect

Measure conditions

- Switch on automobile ignition switch, do not start engine. Use manual vacuum pump to simulate vacuum and connect it to vacuum input port of manifold absolute pressure sensor.
- Monitor signal from idle to acceleration with engine running.

Measure steps

1. Connect equipment according to Fig 6, switch on power supply;
2. Double click run KT700 software;
3. Communication connect ;
4. Click **Auto analyzer → Sensor measure → MAP**;
5. Waveform will be displayed on the screen depending on measure conditions;
6. You can adjust X-deflection, amplitude, coupling, negate routine, and cursor. If X-deflection at high frequencies, you can also adjust the trigger channel and trigger mode;
7. You can also print measure data, loading waveform, save or read config, automatic adjust amplitude, freeze waveform, freeze setting, capture and waveform comparison;
8. If you want to read waveform on current display, you can click "Pause" button,
9. You can click "Record" button to record a continuous waveform.

Waveform Analysis

Generally, analog quantity output is common except that the output of manifold absolute pressure sensor in FORD is digital signal. Manifold pressure sensor of analog quantity produces a voltage to ground signal of about 0V in high degree of vacuum, and produces a high voltage to ground signal in low degree of vacuum (approaching atmospheric pressure). Refer to repair manual since different manufacturers may have different indexes.

Digital MAP sensors are mounted on many FORD and LINCOLN vehicles. Output waveform in digital quantity should be pulse with amplitude value of 5V, at the same time, shape is correct, waveform is steady, square angle of rectangle is correct and rising edge is vertical. Frequency and its corresponding degree of vacuum shall comply with the values given in repair materials.

9. Service and Maintenance

9.1 Cleaning

It is not recommended to clean the VMI host with the corrosive detergent or any coarse cloth; only the soft cloth and neutral detergent can be used.

9.2 Maintenance

- Place the VMI in the flat and dry place with moderate temperature and less dust when the VMI is not used;
- Don't place the VMI in the place with direct sunlight or close to the heating device;
- Don't place the VMI near the stove or in the place where will be easily subjected to smoke erosion, water entry, and oil splashing;
- Don't disassemble the host without permission;
- If the vehicle test is not performed for a long time, please periodically run the VMI host to avoid being affected with damp.

10. Technical Parameters

10.1 Host parameters

Item	Index
Size	227*134*44(mm)
Host Weight	Approximately 765g
External power supply	100V~240V/50~60Hz
Power	≤28W
Working temperature	-10~45°C
Storage temperature	-15~50°C
Relative humidity	10%~95%
Input voltage	DC 7~32V
USB	USB2.0 full speed
Key	Recorder key
LED	4 LED indicator lamps indicating the working status
Protection grade	IP31
Battery(Optional)	2200mah
SD card	≤32GB
Hook	Loading capacity: 5kg

Tab. 6: Host Parameters

10.2 Oscilloscope parameters

Item	Index
Sampling channels	4 channels
Bandwidth	DC~2MHz
Sampling rate	40MS/s
Memory depth	64Kbyte/CH
Vertical scope	20mVDIV~20V/DIV
Level of collection	1uSec~50Sec/Div
Electric level reference	With hardware adjustable(0~100%)

10.3 Multimeter parameters

Item	Index
AC voltage	±33V
DC voltage	±70V
Diodes	0~2.0V
Resistance	0~60MΩ
Switching	0~60Ω

10.4 Logic signal module parameters

Item	Index
Channel number	4CH independent, another 4 is BNC channels
Input voltage	0~24V
Maximum frequency	1MHz
Reference adjusted value	4.096V