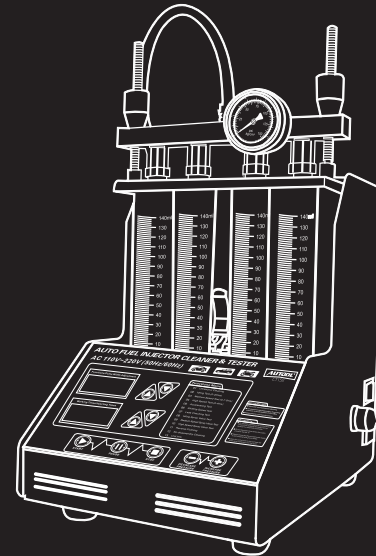


AUTOOL®

AUTOOL CT150/CT200
Fuel System Cleaner
User Manual

AUTOOL®



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Safety Warning

- Please read this manual carefully before using the instrument for proper operation.
- Be careful with the high temperature parts of the engine and machine.
- Please don't use the power cord if it is damaged. Please check it before using the equipment if the equipment falls or is damaged.
- Do not hang the power cord alongside the side of the table, chair or counter, and do not expose the power cord to high temperature.
- For a power cord extension, the extension cord should be higher or equal level as the original equipment's power cord, otherwise it will be over heated.

- Do not plug the power cord in socket when the device is not being used.
- Do not pull the plug by pulling the cord, remove the power plug instead.
- Allow the unit to cool down completely before storing the unit and wrap the cord.
- To prevent fire, do not put equipment near to open containers with flammable liquids (gasoline).
- Ensure the ventilation when the fuel engine is under operation.
- The instrument should be placed in a well-ventilated room without direct sunlight, and the "No Fireworks" and "Flammable Hazard Warning" signs should be posted.
- The operator's hair, clothing, fingers or other parts of the body should be kept away from the operating parts of the equipment.
- To prevent electric shock, do not touch the working equipment in wetness or operate the equipment in the rain.
- Please operate the device as described in the manual. Use accessories recommended by the manufacturer.
- In the case where the ultrasonic cleaning bath is not filled with cleaning liquid, it is forbidden to open the ultrasonic system, otherwise the ultrasonic equipment will be damaged.
- The equipment case must be grounded.
- Vehicle exhaust contains a variety of toxic and harmful gases (such as carbon monoxide, hydrocarbons, nitrogen oxides, etc.), so please keep good airflow when the machine is working, preferably outdoor.

- Pull the hand brake in testing and place the transmission in neutral while blocking the front wheel.
- Please wear safety glasses when handling the machine, but not the daily glasses .
- When disconnecting the fuel pipe joint under pressure, use a towel to cover the joint to prevent the fuel bursting forth and causing fire.
- The main unit of the device uses the test solution, and the cleaning liquid is used for cleaning. The ultrasonic cleaning needs a special ultrasonic cleaning liquid, if user does not have it, it can be replaced with a cleaning liquid equipped with this equipment.

Note:

This manual describes the structure, functional characteristics and operation methods of the CT 200 injector cleaning detector in detail.

A brief description of the precautions, maintenance, and abnormal handling in use.

Product Introduction

Welcome to the CT200 / CT150 injector cleaning detector manufactured by Shenzhen Accidental Technology Co., Ltd.. The CT200/ CT150 is a mechatronic product combined ultrasonic cleaning technology and microprocessor oil pressure control cleaning detection technology. The CT200/ CT150 can simulate various working conditions of the engine, clean and inspect the fuel injector of the car, and can also clean and disassemble the fuel injector and the fuel supply system.

functions

- **Ultrasonic cleaning:** To perform simultaneous cleaning on several injectors and to remove the carbon deposits on the injector completely.
- **Uniformity/Sprayability test:** To test the uniformity of injecting amount of each injector, and to monitor the spraying status of each injector with the help of backlight. This test is also for reverse flush.
- **Leakage test:** To test the sealing and dribbling conditions of injectors under system pressure.
- **Injecting flow test:** To check the injecting amount of the injector in 15 seconds of constant injection.
- **Automatic test:** To test injectors by simulating different working conditions.
- **On-vehicle cleaning:** The unit is equipped with various adaptors and couplers that facilitate cleaning on the injectors on vehicle.

functions

- Adopting the powerful ultrasonic cleaning technology, the equipment offers complete cleaning to the injectors.
- Fuel pressure control through microcomputer offers stable pressure control and large adjustable range, which is suitable for all EGI vehicles and can help to achieve automatic cleaning and testing of injectors.
- With the help of microcomputer control and digital display, the equipment makes possible automatic cleaning, testing

injectors and real-time monitoring of the dynamic values.

- Automatic fuel draining through preset programs for some test items. Test liquid/detergent can also be drained by pushing a button on the control panel after the test.
- Adopting humanization design can make the system pressure fast restored to the default values.

Specifications

Working Condition:

- Power supply: AC220V±10%
- Frequency: 50HZ±0.5
- Ambient temperature; -10 °C ~ +40 °C
- Relative humidity: <85%
- External magnetic field strength: <400A/m
- Open flames are strictly prohibited within 2m

Working Condition:

- Power supply: AC220V/AC110V±10% 50Hz/60Hz
- Fuel Tank Capacity: 2000 ml
- Capacity of Measuring Cylinder: 125 ml
- Speed Range: 0~7500 rpm
- Injecting Times: 0~9900 Step: 100ms
- PWM Pulse: 0~20.0 ms Step: 0.1 ms
- System Pressure: 0~0.6Mpa (adjustable)
- Time: 0~20 minute (adjustable)
- Power of Ultrasonic Cleaning: 70W
- Frequency of Ultrasonic Cleaning: 28 KHZ±0.5 KHZ

- Input power: 250W
- Timing range: 1 to 9999 seconds
- Pulse width range: 0.5 ~ 25ms Step size 0.1ms

Structure

The CT150 injector cleaning detector is a cabinet structure. CT150 is similar to C150 except the number of the tanks. The Figure 1 shows the structure of the CT150. It is divided into two layers. The upper layer is the ultrasonic cleaning machine table and the lower layer is the control panel console.

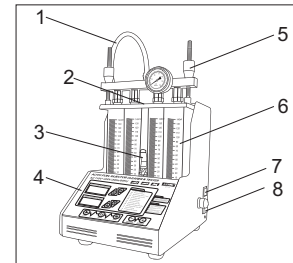


Figure.01

1-quick-connect tubing; 2-ultrasonic cleaner; 3-level switch; 4-control panel (console); 5-fixing bolt; 6-test tube; 7-power switch; 8-power outlet;

Control Panel

The control panel is shown in Fig.02. (The panel of CT150 and CT200 are similar.)

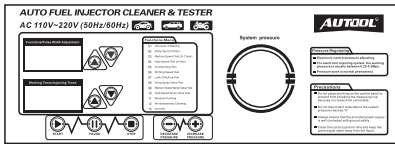


Figure.02

1-LED screen; 2-Start; 3-Arrow key; 4-PAUSE; 5-Arrow key; 6-STOP; 7-Pressure down; 8-Pressure up; 9-Pressure Meter

Operating Procedures

Preparation

- Remove the injector from the vehicle and carefully check the rubber seal of the injector for damage. If it is damaged, replace the same type of seal before the cleaning test, in order to avoid leakage during the test.
- Put the nozzle into gasoline or detergent, carefully remove the external oil and wipe it with a soft cloth.
- Check and add the test solution. Fill the fuel tank from the fuel filler port on the side of the main unit and observe the liquid level pipe on the side. Generally, 1/2 capacity of the tank is enough.
- Press the power switch and backlight switch on the right side of the main unit.
- Add an appropriate amount of cleaning liquid or special ultrasonic cleaning liquid to the ultrasonic cleaning tank, and dip the nozzle needle valve.
- Select the corresponding injector connection coupler.

Note: This equipment requires a special test solution and cleaning agent. The test solution is used by the host during uniformity detection/atomization observation, sealing test, fuel injection quantity detection and automatic cleaning detection. The main engine uses gasoline plus cleaning agent during the cleaning. The ultrasonic cleaner uses a special ultrasonic cleaner.

Cleaning and Testing Sequence

Generally complete cleaning test procedure is recommended in the following order.

- Ultrasonic cleaning;
- Uniformity/Sprayability test;
- Leakage test;
- Injecting flow test;
- Automatic test.

According to different test items, select the corresponding parameters in the parameter selection field and set them. For details, please refer to the “ Operation Procedure Description”.

After Operation

After the cleaning and testing work is finished, it should be cleaned up, including:

- Press the control panel drain button to return the test fluid to the tank.
- Turn off the power switch and unplug the power cord.

- Pour the cleaning liquid from the ultrasonic cleaning tank back into the original bottle and wipe the ultrasonic cleaner with a soft dry cloth.
- Wipe the machine table top with a dry soft cloth.
- In order to avoid volatilization, all the test solution in the fuel tank should be cleaned out. If it can be used continuously, it should be stored in a safe place. If it is dirty, it can not be used any more, dispose it according to relevant regulations.

Operation

Ultrasonic Cleaning

Ultrasonic cleaning is the penetration and cavitation shock wave generated by the ultrasonic wave propagating in the medium. The object with complex shape, inner cavity and fine pores is strongly cleaned to completely remove the stubborn carbon on the injector.

Method and Steps:

- Turn on the power of the ultrasonic cleaner. Plug the end of the power cord into the socket of the washer and the other end into the power outlet.
- Place the outside cleaned injector on the cleaning bracket in the cleaning tank.
- Add an appropriate amount of cleaning liquid or special ultrasonic cleaning liquid to the ultrasonic cleaning machine. Generally, the cleaning liquid can be immersed in the nozzle needle valve for about 20mm.

- Insert the injector pulse signal line into the injector separately.
- Turn on the ultrasonic power switch.
- Select the ultrasonic cleaning function in the control panel, then set the time (the default system time is 10 minutes), and press the [Run] key.
- At the end of this work, the system will automatically stop and beep with a buzzer. At this time, the ultrasonic power switch can be turned off.
- Take the nozzle from the cleaning tank and clean the cleaning liquid with a soft cloth to prepare for the next job.

Note: In the case that the ultrasonic cleaning bath is not equipped with ultrasonic cleaning agent, it is forbidden to open the ultrasonic system, otherwise the ultrasonic equipment will be easily damaged.

Uniformity/Sprayability Test

The uniformity test is to detect whether the difference between the injection quantities of the injectors meets the requirements or within the specified error range under the same working conditions of the injectors on the same vehicle. This inspection can reflect the electrical characteristics of the injector, the change in the diameter of the nozzle, and the combined effects of the plugging and other factors on the injector. The atomization test is to detect the atomization performance of the injector by observing the injection condition and atomization of the injector when working under certain working conditions.

- Pour the cleaning liquid from the ultrasonic cleaning tank back into the original bottle and wipe the ultrasonic cleaner with a soft dry cloth.
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Up-inlet injector installation method and testing steps

- Select the oil separator from the accessory box, select the matching “O” ring and install it on the blockage, and apply a little grease to load the plug into the oil separator.
- Install the crescent-shaped pressure plate and tighten the platen screws.
- According to the type of nozzle connection, select the appropriate straight oil connector to be installed at the corresponding coupler under the oil separator.
- Install the injector in the forward direction (apply a small amount of grease on the “O” ring of the injector).
- According to the height of the injector, select the appropriate adjusting screw and knurled nut to install on the oil separator bracket. Then install the oil separator and fuel injector on the oil separator bracket and evenly tighten the two knurled screws (black). The installation diagram is shown in Figure.03.
- Insert the injector pulse signal line.
- If there is a test solution in the test cup, press the [Oil drain] button to drain the test solution from the test cup.
- Select the uniformity/atomization detection in the control panel, set the corresponding working condition parameters, and press the [Run] key

(**Note:** During operation, press the [Oil drain] key to perform uniformity and atomization. Switching between each other).

- After the test is completed, the system will stop automatically and beep with a buzzer.

- 1-Platen screw; 2-Knurled screw; 3-Moon tooth plate; 4-Oil separator is blocked; 5-Straight oil connector; 6-Top fuel supply nozzle; 7-Knurled nut; 8-Adjustment screw

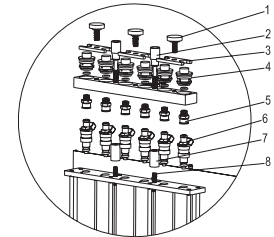


Figure.03

Side- inlet injector installation method and testing steps

- Select the appropriate side oil supply nozzle from the accessory box (select the appropriate “O” ring on the coupling and apply a little on the “O” ring of the coupling and injector) Grease).
- Insert the injector into the coupling and load it into the oil separator together.
- Install the cross platen and tighten the platen screws.
- Install the oil separator and fuel injector on the oil separator bracket and evenly tighten the two knurled screws (black). The installation diagram is shown in Figure.04.
- Insert the injector pulse signal line.
- If there is a test solution in the test cup, press the [Oil drain] button to drain the test solution from the test cup.

- Select the uniformity/atomization detection in the control panel, set the corresponding working condition parameters, and press the [Run] key (Note: During the operation, press the [Oil drain] key to perform uniformity and atomization. Change each other).
- After the test is completed, the system will automatically stop and beep with a buzzer.

1-Cross platen;2-Side-inlet nozzle;
3-Lateral oil supply parts;
4-5-"O" ring seal;6-Oil separator

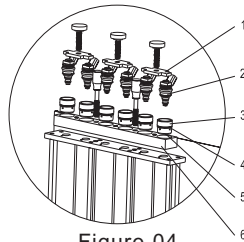


Figure.04

Note:

- During the test, you can switch the uniformity detection and the atomization detection by the [Oil drain] button. The system default solenoid valve is closed. At this time, the uniformity detection can be performed. If the [Oil drain] button is pressed, the solenoid valve drains. At this time, the atomization test can be performed.
- The default "cylinder number" parameter of the system is 0, that is, all the injectors are working during operation. You can select a certain injector to work by setting the "cylinder number" parameter.
- At the time of detection, the system pressure can be adjusted by the [Supercharge] and [Decompression] buttons.

- In the uniformity test, make sure that the liquid level in the test cup reaches more than 30ml, but considering that the oil will foam during the injection process, to prevent overflow, refer to the formula: pulse width (ms) × timing time (s) × speed (rpm) / 120 ≤ 18000 set the relevant parameters.
- In the case of uniformity detection, under normal circumstances, the deviation of the fuel injection amount of all the injectors on the same vehicle should be within ±2%.
- During operation, select the "Speed" or "Pulse Width" parameters, then press the ► or ◀ key, this can achieve variable working condition simulation.
- The injection angle of the injector should be consistent, the atomization should be uniform, and there is no jet phenomenon, otherwise it needs to be replaced.
- The detection of the electrical characteristic parameter of the minimum injection opening pulse width of the injector can be performed under the atomization detection to compare the difference of this parameter among all the injectors of the same engine. That is, after setting a certain cylinder or all cylinders, starting from the minimum injection pulse width during operation, gradually increase the pulse width until the injector can be observed to open the fuel injection (observable by the backlight), and the spray is set at this time. The oil pulse width is the minimum injection opening pulse width of the injector. Thereby observing the difference in the minimum opening pulse width of the injector.

Reverse flush

Injector Cleaner & Tester can also perform reverse flush by connecting with flush-back adaptor at [Uniformity/Sprayability test] mode. Reverse flush is a way to clean the injectors with the test liquid flowing from the outlet to the inlet of the injector. Reverse flush may remove the dirt inside the injector or the injector Strainer (Only for the top fuel supply injector).

Procedures:

- Select the oil separator blockage from the accessory box, and select the matching "O" ring on the blockage, and apply a little grease on the "O" ring (to avoid deformation or scratching of the rubber ring). Leak, plug the oil separator into the oil separator).
 - Install the crescent-shaped pressure plate and tighten the platen screws.
 - Locate the backwash fitting (and select the "O" ring that fits in the fitting) and install it under the oil separator.
- Install the injector in the opposite direction (the oil outlet is facing up and the inlet is facing down).
- Select the corresponding lower part under the injector according to the shape of the injector.
 - According to the height of the injector, select the appropriate adjusting screw and knurled nut to be mounted on the oil separator bracket, install the oil separator assembly and the fuel injector on the oil separator bracket, and evenly tighten the two rollers. Flower screw (black). The installation diagram is shown in Figure.05.
 - Insert the injector pulse signal line.

- Set the working parameters and press the [Run] key.
- After cleaning, the system will stop automatically and beep with a buzzer.

Note:

- During reverse rinsing, the system pressure can be adjusted by the [Supercharge] and [Decompression] keys.
- During the backwashing process, it is recommended to press the [Oil drain] button to prevent the test solution from overflowing.

1-Platen screw; 2-Cavity pressure plate; 3-Oil separator plugging; 4-Back flushing joint; 5-Injector; 6-Knurled nut; 7-Adjusting screw; 8-Knurled screw; 9-10-11-"O" ring; 12-Separator; 13-"O" ring; 14-Lower part.

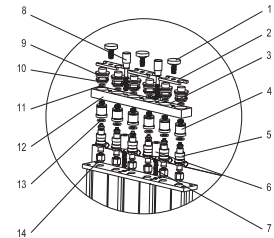


Figure.05

Leakage Test

The seal test is to detect the needle seal of the injector under system pressure and test whether the injector has dripping.

Procedures

- Before testing the leak test, if there is test liquid in the test cup, press the [Oil drain] button to drain the test solution from the test cup.
- Select the sealing test item, press [Run] key, the system starts to work. At this time, the pressure can be adjusted by [pressurization] and [decompression] keys (the pressure is set

- to the pressure specified by the factory to be inspected, most Beyond the original factory pressure of 10%), observe whether the injector is dripping.
- After the test is completed, the system will automatically stop and beep with a buzzer.

Note:

- The general requirement is no more than one drop (or according to technical standards) within one minute.
- The system internal setting time defaults to 1 minute.

On-Vehicle cleaning

The hose line connection of the engine with return hose is shown as in Fig.06.

- Disconnect the connections of fuel supply hoses (C、 D) and fuel return hoses (A、 B) of the engine fuel system (wrap the connector with towel when disconnecting the connector). Choose proper connectors and connect them to the B end and C end separately, and then connect the other ends to corresponding return hose and outlet hose of the unit. See Fig.06.
- Connect the disconnected other ends (A、 D) with proper hose, or remove the fuel pump fuse, or disconnect the power cable of engine fuel pump.

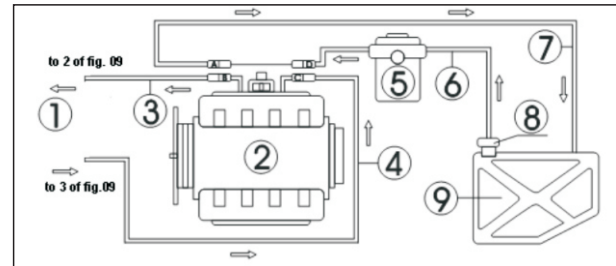


Fig.06

1-C100 Injector Cleaner & Tester; 2-Engine; 3- Fuel-return hose from engine; 4- Fuel-inlet hose to engine; 5-Auto filter; 6-Engine fuel supply hose; 7-Engine fuel return hose; 8- Auto fuel pump; 9-Auto tank

Without return hose connecting:

The hose line connection of the engine without return hose is shown as in Fig.07.

- Disconnect the fuel supply hoses (E, F) of engine fuel system (wrap the connector when disconnecting the connector), and then choose a proper connector and connect it to the E end. Reconnect the fuel outlet hose of the unit well and make the fuel return hose hanging. See Fig.07.
- Stop the other end of the disconnected end (F) with a proper stopper, (use when the fuel pump has the fuel return function only) or remove the fuse of fuel pump or disconnect the power cable of fuel pump.

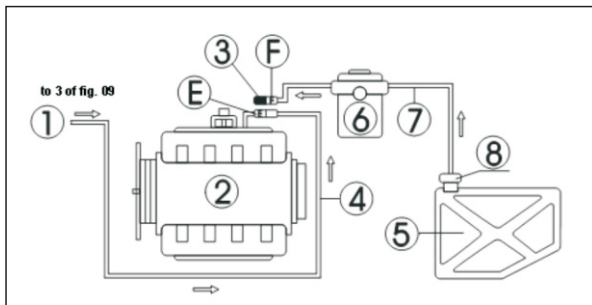


Fig.07

1-C100 Cleaner & Tester; 2-Engine; 3-stopper; 4- Fuel-inlet hose to engine; 5-Auto tank; 6-Auto filter; 7- Engine fuel supply hose; 8-Auto fuel pump;

Tidy up after on-vehicle cleaning

- After the on-vehicle cleaning is completed, turn off the Auto Ignition Switches restitute the link of the Auto fuel hoses then start the Auto to check the leakage of Auto fuel system.
- At last please clean the fuel tank and hose line with test liquid (if there is residual detergent inside fuel tank, please.). The detailed procedure is shown as follows: drain the liquid inside the fuel tank out and dispose it on the clean degree, and then fill little test liquid and turn on the power. Select ?Leakage test? item and press key [RUN] to run the unit for about 2 When the unit stops, drain the test liquid from fuel tank and dispose the liquid as related regulation.
- Tidy up and make preparation for the next cleaning.

Warranty Service

There are 3 years' warranty for AUTOOL product main unit and 1 year warranty for the accessories since the day the customers have received the product parcel.

Warranty Access

- Repair or replace the equipment will be done according to the specific fault conditions;
- We guarantee that all replacement parts, accessories or equipment are brand new;
- When there is a product breakdown that can not be solved within 90 days, customer should provide video and pictures as proof, we will bear the freight cost and provide customer the accessories in need to replace. After receiving the product for more than 90 days, the customer shall bear the freight cost, we will provide the accessory for free to replace.

Warranty Access

- Product is bought through non-official AUTOOL purchase channel.
- Product failure is caused by incorrect use of the product, use for other wrong purpose or human factors.

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