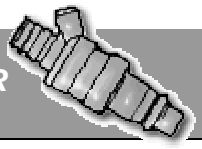
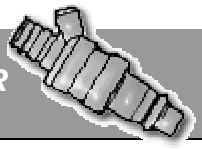


USER MANUAL

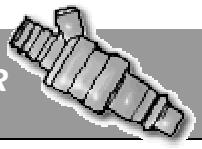
ICM-6D FUEL INJECTOR CLEANER

2005 EDITION

AUTOBOSS®



Contents



Preface

ICM-6D Fuel Injector Cleaner is used to detect the equipment of electrically controlled gasoline spray system. It is designed and manufactured on the basis of the newest technology of car electrical spray, according to the Chinese State Standard GB/T 16739.1-3-1997.

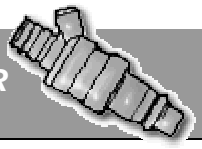
All the techniques of car manufacturing, electronic engineering, hydraulic engineering, and computer and mechanic technology are perfectly combined in the product. They not only have the most perfect functions of various electrical spray nozzle testing tables in the world, but also make significant creation and breakthrough in detecting methods, detecting functions, detecting accuracy, performance indices, structure optimizing, combining the mechanic and electrical techniques into an organic whole, intelligence and automation. Now they are the most advanced detecting and repair equipment of the electrical spray car and have been well received by the users in the world. They are wide suitable for the car research institutes, the spray nozzle manufacturers, and the servicing centers of the high-quality cars.

The series equipment of car detecting and repair can be guaranteed to repair with free of charge for one year to equipment set, for half year to oil pump from the original purchase date in the condition that the defects are due to manufacturing quality.

Usage

The ICM-6D Fuel Injector Cleaner is suitable for performance detecting and cleaning of the spray nozzles of electrical spray cars manufactured in all world countries. The optimal effects of increasing the stability, reliability of car operation and decreasing the pollution of exhaust gas can be obtained by using them. Their main usage includes:

1. Detect and analysis the product quality operation status of the spray nozzles. Can perform automatic statistic, dynamic and selectively detecting for single or many spray nozzles about drop leakage, block, atomization, spray angle, spray oil amount, spray on-off period and spray homogeneity.
2. Can perform detecting, reverse and ultrasonic cleaning as well as cleaning without removal.
3. Can really simulate all the work process of the spray nozzles at various pulse duration and under different rotation speeds of car engines and directly observe the work situation of the spray nozzles at the accelerating or decelerating process of the car engine.
4. Can measure the minimum on-off period of the spray nozzles to appraise their quality and identify their brands.
5. Can be used as the cleaning machine without removal and the detecting instrument of oil circuits. Can detect and analysis the car oil circuits. Can also perform cleaning the car engine without removal.



Technical Parameters

1. Appearance size: 480mm(width)×500mm(depth)×460mm(height)
2. Weight: 48 kg
3. Power supply: AC 220V±10%, 50HZ, 500W
4. Temperature Scope of Operation: -10℃~+40℃
5. Oil Tank Volume: 4L
6. Testing Tube Volume: 120 ml
7. Ultrasonic Frequency: 40 kHz
8. Ultrasonic Power: 100W
9. Max. Testing Number of Cylinder: 6
10. Rotation Speed Range: 0~9950 r/min step 50 r/min
11. Pulse Duration: 1~20 ms step 0.1 ms
12. Spray Number of Times Counting Range: 0~10000 step 50
13. Spray Time Counting Range: 0~600sec step 1 sec (adjustable)
14. Oil Pressure: 0~637kpa(6.5kg/cm2)±9.8kpa(0.1kg/cm2) (adjustable)
15. Flow Capacity: 4 L/min

Main Functions And Specifications

1. Performing automatic statistic, dynamic and selectively detecting for single or many (up to 8) spray nozzles about drop leakage, spray angle, spray atomization and spray homogeneity, and simulate the work situation of car engine, and really observe all the work process of the spray nozzles.

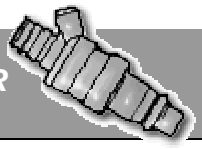
2. Detecting Scope
   a) Spray Pulse Duration: 1~20ms step 0.1ms
   b) Spray Number of Times: 0~10000 step 50
   c) Spray time: 0~600sec step 1sec
   d) Rotation Speed: 0~9950r/min step 50r/min

   Setting the spray pulse duration, spray number of times or spray time and rotation speed of various spray nozzles within scope mentioned above. The detecting mode may be statistic or dynamic, accelerated or decelerated. The detecting process can be interrupted and resumed to original program.

3. Performing automatic detecting and cleaning, reverse cleaning and ultrasonic cleaning for single or many spray nozzles that can be high impedance, low impedance, voltage or current.

4. Counting spray number of times or counting spray time. There is a background lamp to observe the work situation of the spray nozzles.

5. Setting up a special detecting device of on-off period of the spray nozzles. It can



detect and appraise the quality and identify their brands.

6. Providing the flashgun to measure the angle and atomization status of spray.

7. Detecting the spray nozzles about the drop leakage, spray angle, atomization and spray homogeneity without disassemble, and safely and cyclically perform the automatic detecting cleaning in sealed state at the continuous spray situation.

8. Unique universal double collecting oil system. It is suitable for all the connections of single or many spray nozzles with the top or the side installation. It has the automatic oil drain function after detecting to avoid to drain the oil back to the tank manually.

9. Selecting a right connector and replacing a “O” ring nozzle are needed for a new model spray nozzle.

10. The microcomputer technique and intelligently combining the mechanic and electrical techniques into an organic whole are used on the design. There is a strong power supply and a special automatic protect device of the spray nozzle, which can assure to perform safe detecting cleaning for various models of the spray nozzles, such as high impedance, low impedance, voltage or current one.

11. A new special function of reverse cleaning is set. The reverse cleaning for many spray nozzles can be performed.

12. There is a strong, safe and time-preset ultrasonic cleaning system. A 40 kHz ultrasonic cleaning system is provided, which can perform detecting cleaning according to the manufacturer’s recommendation to assure to prevent the spray nozzle from damage.

13. A damp and safety system and a stainless steel tank are provided.
The high-pressure air oil supply system is unnecessary. The pressure of the oil supply is 0-539 kpa, adjustable and can precisely be displayed. The display accuracy is 9.8 kpa.

14. Perform the detecting cleaning without removal.
Perform the detecting cleaning for the engines of the electrical spray car or the ordinary carburetor car without removal. The other cleaning machine without removal is unnecessarily bought. Only the connector to connect to the car engine is needed to be bought.

15. Using safety and cheep cleaning solvent
The solvent can be automatically retrieved. No. 93 leadless gasoline and detergent of KLEEN-FLO made in Canada or ABRO made in U.S.A. (mixing ratio is ten to one) are used as the detecting cleaning solution in the equipment. This solution has no corrosion and pollution, and is safe in the cleaning process.

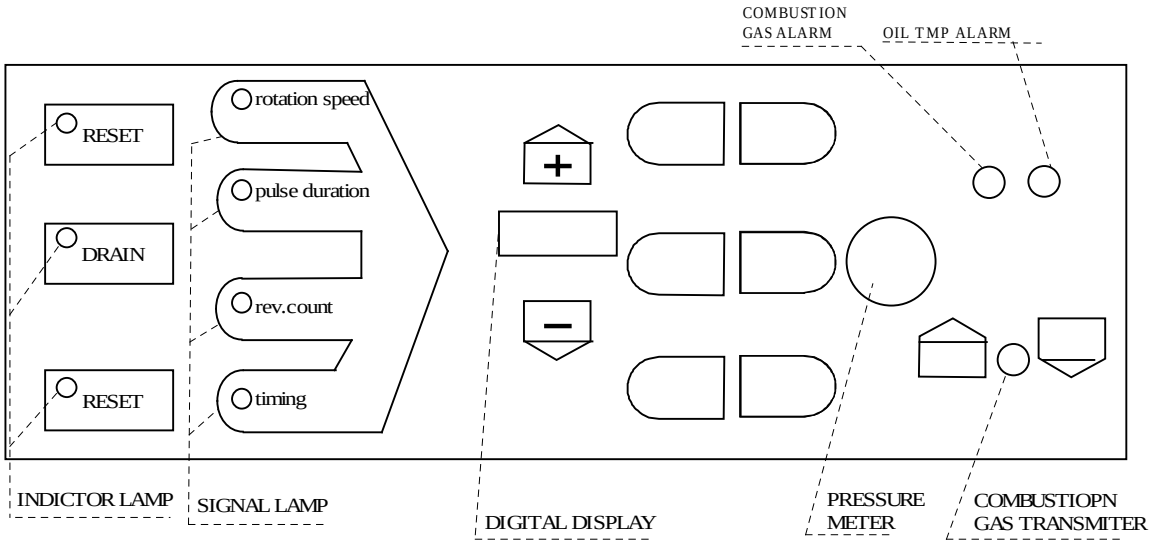
16. Various Connectors

Various spray nozzle connectors are provided. They are suitable for the types of standard, Hose-Tail, K and TBL. The special design of the connector can be performed according to the user's demands.

17. Using the microcomputer to regulate the pressure of the oil supply system to assure the stability of pressure and flow capacity. There is a special device to protect exceeding the oil pressure limit.

18. Sending an alarm signal when the density of combustible gas is over the limit (more than 2%) and there is a display alarm safe system to detect whether the temperature of the cleaning solution exceeds the limit.

Description Of Control Panel



1. "Reset" Key

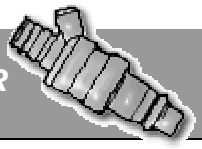
Pressing "RESET" key returns the system to original state.

2. "Pumping" Key

Pressing "PUMPING" key provides the system with oil and makes the pump indicator lamp bright. Pressing "PUMPING" key again stops the pump and makes the pump indicator lamp dark.

3. "Drain" Key

Pressing "DRAIN" key makes the system draining and the drain indicator lamp bright. Pressing "DRAIN" key again stops the pump and makes the drain indicator lamp dark.



4. **Signal Lamp**

When the Rotation Speed Signal Lamp is bright, the Screen of Digital Display show rotation speed value. When the Pulse Duration Signal Lamp is bright, the Screen of Digital Display Duration Shows pulse duration value. When the Rev Count Signal Lamp is bright, the Screen of Digital Display shows spray number of times counting. When the Timing Signal Lamp is bright, the Screen of Digital Display shows spray tine counting.

5. "Auto" Key

Pressing "AUTO" key makes the system enter the automatic detecting, cleaning and analysis mode by counting spray number of times. Before entering into the automatic detecting, cleaning and analysis mode, the oil supply system pressure of the detected car must be adjusted to the set range.

6. "Selection" Key

Pressing the "SELECTION" key a time makes the rotation speed indicator lamp, the pulse duration indicator lamp and the spray number of times (rev. Count) indicator lamp display cyclically. Which indicator lamp is bright, so that the number of the digital display indicates the value of the signal in correspondence with the bright indicator lamp. The pulse duration indicator lamp is bright and the number of the digital display is “03.00”. That means that the pulse duration is 3ms. The rotation speed indicator lamp is bright and the number of the digital display is 0650. That means that the rotation speed is 650r/min. Pressing the “+” key can increase the presetting number. Pressing the “-” key can decrease the presetting number.

7. “Test” Key

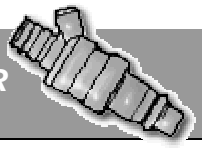
Before pressing “TEST” key, the parameters of car engine, spray oil pulse duration, spray number of times or spray time must be set, and pressing “SELECTION” key selects the detecting mode. If counting spray number of times mode is selected, the spray number of times indicator lamp (rev. Count) is bright. If counting spray time mode is selected, the spray time indicator lamp (timing) is bright. Then pressing “TEST” key can make the system work according to the preset detecting program. If you want the detecting process to pause, pressing “STOP” key can interrupt the detecting process. Pressing “TEST” key again can resume the detecting process from the interruption point.

8. “Cleaning” Key

Pressing “CLEANING” key and holding it make the spray nozzle detect and clean at the continuous spray situation. Releasing “CLEANING” key stops the detecting and cleaning process.

9. “Preset” Key

Pressing “PRESET” key first time can set the operation parameters (rotation speed: 650 rpm, pulse duration: 3ms, spray number of times: 4000). Pressing “PRESET” key



second time can set maximum horsepower operation parameters (they are 2250 rpm, 12ms, 2000 in the order mentioned above). Pressing “PRESET” key third time can set the operation parameters under the high speed (they are 3000 rpm, 6ms, 3000 in the order as well).

10. “Stop” Key

Pressing “STOP” key makes the system pause.

11. Oil Pressure Meter

It indicates the oil pressure.

12. Keys Of Adjusting Oil Pressure

Pressing “UP” key makes the oil pressure increase (pressing one time, increasing 0.2kg/cm^2). Pressing “DOWN” key makes the oil pressure decrease (pressing one time, decreasing 0.2kg/cm^2).

13. Temperature Exceeding Limit Alarm Indicator

When the environment of detecting and cleaning, or machine inner temperature is higher than 75 degree centigrade, the indicator lamp is bright and an alarm signal is sent. In that time the equipment must be stopped detecting and cleaning at once.

14. Alarm Lamp Of The Density Of Combustible Gas Exceeding Limit

When the density of combustible gas in the work place is more than 2%, the alarm lamp bright and the alarm signal is sent. In that time the equipment must be stopped detecting and cleaning at once.

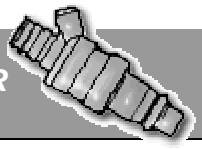
Operation Procedure

The First: Checking Liquid Level Height In Oil Tank

Checking the liquid level of oil tank whether the height reaches the standard value (ST). If the height displayed on liquid level meter is lower than the standard value, screw the tight bolt of detecting shelf off, take the oil circuit device of detecting shelf off and press “DRAIN” key, then add detecting solution to the testing tube. The height cannot be over the high limit (HI).

The Second: Put Power Supply Through

Insert the cable plug of main machine power supply to the socket on the right side of the equipment. Put 220V AC power supply through and open the switch on the right side of the equipment (the red lamp is bright). Check whether the states of various safety and alarm devices are normal.



The Third: Measuring Impedance Of Spray Nozzle

First of all, disassemble the detected spray nozzles from the car and make marks in regular sequence. Then measure the impedance of spray nozzles with the digital multi meter.

The difference of impedance values of spray nozzles cannot be more than 1 ohm, otherwise the over limit spray nozzles must be changed.

The Fourth: Detecting And Cleaning

I. Optional Detecting, Cleaning And Analysis

1. Ultrasonic Cleaning

Connect the detected spray nozzles to the pulse input signal line and mount them to ultrasonic cleaning trough shelf, adding cleaning solution makes the liquid level to the standard value. (The height of liquid level is normally two thirds of the deepness of cleaning trough)

Open the switch of power supply of ultrasonic generator. Press “SELECTION” key. Set the rotation speed to 50 r/min, the pulse duration to 20 ms, the spray number of times to 500. Press “TEST” key. Then the system performs automatic cleaning. After cleaning is finished, close the switch the power supply of the ultrasonic generator.

2. Reverse Cleaning

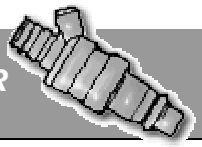
Connect the reverse cleaning connectors to the spray nozzles and then put them on the detecting shelf. Adjust the oil supply pressure to 2~4kg/cm^2. Press “CLEANING” key. After cleaning process is finished, stop the pump by pressing “PUMPING” key and disassemble the connectors from the spray nozzles.

3. Detecting Drop Leakage of Spray Nozzles

Select the connectors according to the type of the spray nozzles and connect them. Check “O” rings (if damage, need to change). Mount the spray nozzles to detecting shelf. Press “PUMPING” key. The oil pressure is adjusted to the set value assigned by the car manufacturer (over 10% is better). Observe whether the oil is leaked from the spray nozzles. If the leakage oil is more than a drop within 1 minute (or according to specifications), the spray nozzles need to be changed.

4. Detecting Spray Angle and Atomization Status of Spray Nozzle

Press “CLEANING” key. Spray nozzles perform continuous spray. Observe spray angle and atomization status. The spray angles must be identical (or according to the specifications assigned by car manufacturers). The atomization must be even. Efflux cannot be observed. Otherwise need to change the bad spray nozzles. Observation can be also performed with flashgun. First of all, insert the power supply plug to the socket



on the right side of the equipment. Tighten the nut. Set the rotation speed to 1500 r/min, the pulse duration to 12ms, the spray number of times to 4000. Press “TEST” key. And then make the trigger of flashgun percussion with the muzzle toward the glass cylinder. The spray angle and atomization particle of the spray nozzle can be observed.

5. Detecting Spray Oil Amount of Spray Nozzle

Close the drain oil switch “DRAIN” key. Press “PUMPING” key. Then press “CLEANING” key and hold for 15 seconds. Observe the spray oil amount in the testing tube. It must be between 34 ml and 38ml (or according to the specification). Otherwise need to change the spray nozzles.

6. Detecting Homogeneity of Spray Oil Amount of Spray Nozzles

Press “PRESET” key. Set the rotation speed to 650 r/min, the pulse duration to 3ms, the spray number of times to 4000. Press the button “PUMPING”. Adjust the oil supply system pressure to the set value of the detected car. Press “TEST” key. After the spray number of times is finished (the digital display is “0000”), observe the oil amount in the testing tube of each spray nozzle. If the dispersion is less than 9%, the spray nozzles are up to standard (or according to the specifications). If the dispersion is more than 9%, the spray nozzles must be changed.

II. Automatic Detecting, Cleaning And Analysis

When automatic detecting, cleaning and analysis is performed, first of all, press “PUMPING” key to start the oil pump and adjust the oil supply system pressure to the set limit of detected car (over 10% is better). And then press “AUTO” key. The automatic detecting, cleaning and analysis is executed according to the following program. If “RESET” key is pressed in automatic detecting and cleaning process, the system returns to the original state.

Automatic detecting, spray oil amount, spray angle, atomization status, drop leakage, spray homogeneity, and automatic, detecting and, cleaning.

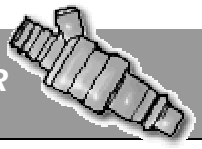
Open “DRAIN” switch continuous spray for 15 seconds.

Observe the spray angle and atomization status.

Perform continuous detecting and cleaning.

Detect the spray oil amount.

If efflux and anomalous spray angle are observed, the spray nozzles must be changed.



Stop continuous spray for 60 seconds.
Observe block and drop leakage.
When oil drain is finished, close “DRAIN” switch.
Continuous spray is finished.
Program enter into the routine detecting

Automatic detecting spray oil amount under idle speed

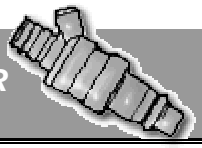
Spray pulse is executed according to the following procedure.
Spray Rotation Speed: 650 r/min
(Simulating multiple point spray operation under sluggish speed).
Spray Pulse Duration: 3ms
Spray Number of Times: 4000.
Spray Time: 369 seconds.
After the procedure is finished for 30 seconds, observe the results.
This procedure is used for observing the operation status under sluggish speed.
If the dispersion of spray oil amount is less than 9%, the spray nozzles are up to standard. Otherwise they must be changed.

Automatic detecting spray oil amount under sluggish speed

Open “DRAIN” switch for 30 seconds.
When oil drain is finished, close “DRAIN” switch.
Spray Routine Detecting is finished.
Program is entered into the middle and high speed detecting automatically.

Automatic detecting spray oil amount under maximum horsepower load

Spray pulse is executed according to the following procedure.
Spray Rotation Speed (simulating multiple point spray under maximum horsepower load:



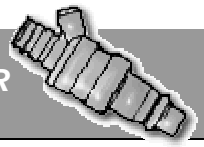
4500 r/min). Display 2250r/min
Spray Pulse Duration: 12 ms.
Spray Number of Times: 2000.
Spray Time: 53 seconds.
After the procedure is finished for 30 seconds, observe the results.
This procedure is used for observing the operation status under maximum load.
If the dispersion of spray oil amount does not vary seriously, the spray nozzles are up to standard. Normally the dispersion must be less than 12%.
Observe the spray operation status-using flashgun.

Open “Drain” switch for 30 seconds.
When oil drain is finished, close “DRAIN” switch.
Enter into the high speed detecting automatically.

Automatic detecting spray oil amount under high speed

Spray pulse is executed according to the following procedure.
Spray Rotation Speed (simulating multiple point spray under high speed, maximum: 6000 r/min): 3000 r/min.
Spray Pulse Duration: 6ms.
Spray Number of Times: 3000.
Spray Time: 60 seconds.
After the procedure is finished for 30 seconds, observe the results.
This procedure is used for observing the operation status under high speed and maximum oil supply amount.
Once more detecting spray nozzle can be operated.

Open “DRAIN” switch for 30 seconds. When oil drain is finished, close “DRAIN” switch.
Enter into the varying speed detecting procedure automatically.



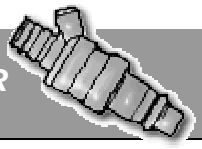
Automatic simulating, detecting spray oil, amount under varying speed

Spray pulse is executed according to the following procedure.
Spray Rotation Speed is accelerated from 350r/min to 6000r/min continuously.
Then decelerated from 6000r/min to 350r/min continuously.
Cycle as mentioned above for four times.
After the procedure is finished for 30 seconds, observe the results.
This procedure is used for observing the work situation of continuously varying speed and oil supply amount under continuously varying speed, and can detect the quality of the spray nozzles synthetically.

Open “DRAIN” switch for 30 seconds.
When oil drain is finished, “DRAIN” switch and oil pump can be automatically switch-off.
Whole program is finished. (The rotation speed of “Digital Display” is 0000).

Usage Of The Cleaning Without Removal

1. Cut off the input oil pipe from the joint of the fuel filter in the cleaned car. Switch off the safety device of the oil pump. Connect the suitable coupler connected with car oil input to an end of an oil pipe 10mm in diameter. Connect the other end of the oil pipe 10mm in diameter, to the male quick acting coupler of cleaning without removal as the fitting of the equipment. Then insert male quick acting coupler to the female quick acting coupler at the oil output end in the equipment.
2. Cut off the return oil pipe of the cleaned car engine. Connect the return oil pipe to an oil pipe 10mm in diameter tightened with a pipe fixture. Connect the oil pipe 10mm in diameter to an oil pipe 8mm in diameter with a corresponding adapter. Connect the oil pipe 8mm in diameter to a male quick acting coupler. Finally insert the male quick acting coupler to the female quick acting coupler of the oil return end on the upper right side in the equipment.
3. Adjust the oil pressure of the detecting equipment to the assigned system value of the cleaned car. Start the car engine. Clean them for 15 minutes.



Method Of Changing Cleaning Solution

After used for several times, the detecting cleaning solution may be dirty. When the dirty phenomenon is happened, the detecting cleaning solution must be changed.

The changing method is as follows:

1. Insert the plug end of pumping oil pipe to the quick acting coupler of the cleaning solution exit at the top of the detecting equipment. Insert the other end of pumping oil pipe to the oil drum used for receiving the dirty solution.
2. Press “PUMPING” key. The dirty solution in the oil tank is automatically pumped out until empty. Then switch off the oil pump at once.
3. Screw the tight bolt on the detecting shelf off. Take off the oil circuit connected with the coupler of spray nozzle at the top of the detecting shelf. Press “DRAIN” key. Then fill each testing tube with the fresh solution until the liquid level of liquid level meter reaches ST standard liquid level.

Attention Points About Safe Usage

1. Operation and use must be strictly performed according to the rule of operation.
2. The voltage of the power supply must be 220V AC, 50Hz, and the care must well grounding.
3. In operation time, the fire is strictly forbidden and smoking is not allowed at the working place.
4. Don’t open the case of the fuel injector cleaner without the authorization with in the guarantee period.
5. The configuration of the Detecting Cleaning Equipment is suitable for all the car models manufactured in the world, except the models: Cadillac, Chevrolet manufactured by American GM, Previa, Bluebird manufactured by Japanese TOYATA. In order to suit for four models mentioned above must purchase the special connector from our company.
6. The Operation Manual needs to be rivised for technical progress without notice.
7. Must use the special detecting cleaning solution.

Maintenance Arrangement

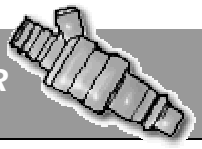
1. Dust proof:

(1) After using the Detecting Cleaning Equipment cover it with the plastic cover to prevent dust entering in the glass test tube and to avoid blocking the drain oil valve.

(2) After using once, must clean the Control Panel.

2. Oil Pump Maintenance

(1) After cleaning without removal, must draw the dirty cleaning solution from the oil



tank to prevent it corroding the oil pump.

(2) The Detecting Cleaning Equipment must be used frequently. If stop using a long period of time, at least every six days charge the Detecting Cleaning Equipment to operation once. That means that inject the number 93 lead less gasoline into the oil tank (Liquid level displays the ST liquid level) every six days press the PUMPING key on the control panel to operate it for 10 minutes and then stop it.

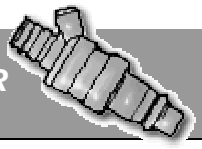
(3) When the detecting cleaning solution in the oil tank is turbid, change it at once.

3. Power Supply

The power supply to be used by the Detecting Cleaning Equipment must ground reliably.

4. Detecting Cleaning Solution Selection

The selected detecting cleaning solution must be non-corrosive, non-poisonous, non-combustible and non-containing water.



Appendix

Table of Oil Supply System Pressure of Partial Cars Manufactured in All World Countries

MANUFACTURER	TYPE	PRESSURE OF OIL SUPPLY SYSTEM (KG/CM●)
MAZDA	323	2.0-2.2
	626	2.5-2.9
	929	2.5-2.9
BMW	528	2.7-2.9
VOLVO	VOLVO	2.7-2.9
NISSAN	BLUEBIRD	2.5
	MAXIMA	2.5
	300ZX	2.06-2.55
FORD	TEMPO (APV)	2.8
	LINCOLN	2.06-3.08
GM	BUICK CENTURY	2.9-3.3
	CADILLAC 5.7	2.9-3.3
	CHEVROLET	2.3-3.0
MITSUBISHI	V63000	3.5
VOLKSWAGEN	JETTA	2.7-2.9
	SANTANA2000	2.2-2.65
DAEWOO	DAEWOO	2.8-3.0
HYUNDAI	HYUNDAI	2.65-2.75
TOYOTA	TOYOTA3.0	2.84
	PREVIA	2.7-3.3
	LEXUS ES300, LS400	2.65-3.04
	CAMRY3.0	2.65-3.04
	LAND CRUISER	3.0
	COROLLA	2.7-3.1
HONDA	ACCORS 2.0, 2.2	2.85
	CIVIC 1.5L	2.55-2.85
	LEGEND 3.2L	2.7-3.04
CHRYSLER	CHEROKEE 213	2.73
	DODGE 3.3L	3.37
AUDI	6 Cylinders	2.8-3.0
	5 Cylinders, 4 Cylinders	4.5-5.0