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CIS TROUBLESHOOTING HANDBOOK FOR THE 73-83 PORSCHE 911

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FORWARD

Have you ever taken a close look at the troubleshooting manuals today?
The information you receive is incomplete. At best,you get only general information.
Have you ever gotten to a point that you are frustrated with the time spent researching material to just get your Porsche 911 running?

I have the solution to your frustrations.
I have written the best troubleshooting handbook for the CIS FUEL INJECTION system for the non Turbo Porsche 911.

I have been in the fuel injection repair business for over twenty years. Each time I went to work on a 911, I had to refer to a component list then refer to another book for the specifications. I have made it easier for you to work on your car by having just one book to refer to for information. This troubleshooting manual has troubleshooting charts geared to your car. You will find photos, wiring diagrams, component location, component photos and simple procedures to test the fuel injection in your Porsche 911.

PURPOSE

The purpose of this handbook is to provide .information in one easy to follow book. This book will answer your questions on CIS fuel injection. It will allow you to follow simple instructions, without having to refer to a number of other manuals. You will find that each year of the CIS system is covered. This handbook will not go into the complete theory of operation of the system. There are many books written on the subject. This handbook will help you with a brief description of each component, photo, specifications and the procedures to test the component.

SUMMARY

The hand book covers the CIS fuel injection on the non turbo Porsche 911 from 1973 through 1983. Tech Tips, troubleshooting charts, and" how to test" sections are clearly written. The handbook is a reference book that all mid year Porsche 911 owners will want for their library.

DISCLAIMER

By using this hand book, the user assumes all responsibility of safety, possibility of damage to the vehicle, and his/her ability to perform the tasks required.

The user of this handbook will be working around high gasoline pressures, hot temperatures and electrical current, all of which are dangerous to the health of the user.

By using this handbook the user will hold the writer harmless of any damage or injury that may occur.

This book is put together with information available at the time of printing. This handbook is not meant to be the definitive answer to all CIS fuel injection problems. The person using this handbook is assumed to have the mechanical ability and have the knowledge of the mechanical, electrical and safety aspects of working with fuel on an automobile.
This handbook is for informational purposes only and if the user has any doubts of their abilities, consult a specialist.

Introduction to CIS (Continuous Injection System)

There were two types of CIS used on the Porsche 911 from 1973 through 1983.
They are the K-jetronic and K-jetronic with Lambda.

K-jetronic- K is for continuous, the system is mechanical with parts that control cold start and idle that are electrical or electrical with vacuum assistance.
The amount of fuel is controlled in proportion to air flow to give the correct air- fuel ratio. Air flow is measured by a metal plate in a cone shaped cylinder. A plunger is connected to this plate. The plunger controls the pressure in the fuel metering unit. The pressure is produced by the fuel pump operating at a specified pressure particular to each vehicle. There is a differential pressure controlled by the plunger. This differential pressure operates the injectors. The greater the air the greater the differential pressure, the more fuel that is injected. The fuel is continuously injected rather than with each intake opening.

K-jetronic with lambda- operation is the same as above with the addition of a lambda (oxygen sensing). The lambda was added to further help the emissions of the vehicle. By sensing the oxygen in the exhaust, the lambda will adjust the co content.

NOTE: I have included a Theory of Operation to help in the understanding, operation and troubleshooting of the CIS system.

Getting Started:

There are a few things that you should do before trouble shooting the fuel system.

You will need to ask a few questions to your self. By doing this you may be able to find the problem and not have to test the system.

Ask the following questions ...
What is the problem? Cold start ...Hot start...Driveability...
When did the problem start? Overnight ..After driving ...Damp day...After fueling ...On startup
How was the car running before the problem started? Good ...Fair ...Poor...
What was done to the car at the last service? Oil change ...Tune up ...Engine overhaul...
Were there any other problems before the new problem started? Low battery ...Bad fuel pump
Correct starting procedure:
1973-1975 required the hand throttle to assist in starting. 76-83 did not.

By answering the above questions you may be able to narrow the possible problems to just a few.

1. Make sure the Battery is in good condition.
2. Check the Connections to the battery. Clean the connections just in case.
3. Make sure the Ignition System is in good condition.1nspect plugs, check condition of distributor, check the wiring, check the coil and check the timing. You need to be sure all of these are in good condition before starting. You can check each of the above with out the engine running. Do a static test on the timing if the engine is not running. Pull each plug, clean if necessary, replace if needed.
4. Make sure the condition of the Engine is good.
5. Check the Starter.
6. Check the outside of the engine Rubber boots, Hoses, Electrical connections and Vacuum Hoses.
7. Do a sniff test if the car has been sitting for a long period of time. Carefully sniff the fuel. If the fuel smells like varnish, drain the fuel tank and fill with clean fuel.
8. Keep in mind that if the fuel is bad you may have some components that are covered with this bad fuel. Examples would be the mixture control unit, fuel filter, cold start valve, fuel accumulator, fuel pump, fuel check valve and fuel injectors. If you have bad fuel and there is evidence of varnish, a brownish, sticky material, is indication that the car has been sitting for a long period of time, it would be a good idea to inspect and clean all of the above. I would suggest not disassembling the mixture control unit, buy a reconditioned unit from a good parts supplier, you will save a lot of time and frustration.
9. Check the condition of the wiring. There should be no cuts, burns or stiffness in any of the wires. Check the ground wires and the ground to the battery.
10. Check to see if the flow sensor plate moves freely. You will have to remove the air cleaner to do this check. While you are there check to see if there is evidence of "backfire". See if an anti backfire device has been installed. If it has not been installed, it is recommended that you install one, see the photo in the photo section.
11. If all the above has been checked and the condition of the engine is found to be safe, apply power and start a process of elimination.
12. Apply power to the car and try to start the engine.
    If the engine does not start go to the **Trouble Shooting Chart.**

Trouble Shooting Chart:

Engine does not start / starts hard cold:

1. Sensor plate or plunger not moving freely:
   Remove air filter and gently apply pressure to the sensor plate. If the plate does not move, there may be an internal problem. Look for any possible cause for the binding externally. If this fails, remove the fuel distributor and have it repaired or replaced by a qualified repair shop.
2. Auxiliary air valve does not open:
   Remove the hoses from the valve and verify that the valve is open. If not check that the electrical connection is good and that there is voltage present with the ignition on.
3. Electric fuel pump not operating:
   Check the fuel pump fuse and the pump relay, if both are good check voltage at the fuel pump, if good replace fuel pump.
4. Thermo time switch defective:
   Disconnect the connection to the cold start valve. Put a test light across the terminals. Run the starter, the light should stay on for a few seconds, depending on the temperature of the engine. If the light does not work, check for voltage on the yellow wire between the starter and the Thermo switch. If there is voltage to the switch and the light does not work, replace the Thermo time switch.
5. Cold control pressure out of tolerance:
   Check the control pressure Regulator. Check the voltage at the connector to the regulator - at least 11.5 volts. With power off and the connector off, check for continuity, if none replace the regulator.
6. Injector leaking, opening pressure low:
   With the engine not running pull the suspected injector and look for any leaks. If leaking replace with it new injector.
7. Injected fuel quantities not equal:
   Suspect that there is an injector problem. Pull each injector and test for quantity of fuel injected into a measuring container. Run the engine for a short time for each injector. Compare the amounts of fuel. Replace the injector that is not operating correctly.
8. Basic idle setting incorrect:
   Check the speed and adjust as necessary.
9. Fuel Accumulator and/ or Fuel Pump Check Valve:
   These keep pressure on the system.

Engine will not start Warm

1. Air flow sensor plate not adjusted correctly:
   Remove the boot and the air filter and check the position of the plate as compared to the barrel. The plate should be even to the bottom of the barrel, a tolerance of +/- .020 is allowed. You can adjust the plate: 1973 ½ - 1975 by bending the clip and 1976- 1983 by adjusting the screw with an allen screw driver. The screw driver is put m at the top of the mixture control unit through a hole.
2. Fuel pressure is not correct:
   Check fuel pressure at the fuel pump.
3. Cold Start valve leaking:
   Check the cold start valve by removing the part from its location. Leave the fuel line connected. Remove the connector, place the valve over a container and apply voltage to on of the connectors and a ground to the other. Look for a coned shaped injection of fuel. Turn off the power and wait a few seconds. Watch for leaks. If either of the above does not work, replace the valve.
4. Vacuum Leaks:
   Carefully inspect the complete engine for any cracked or worn hoses.
   Look for connections that may be loose or have come loose.
5. Control Plunger in Fuel Distributor binding:
   Check this by first depressurizing the fuel system. Do this by relieving the fuel pressure at the warm up regulator. Remove the fuel filter and carefully move the plate up and down. This movement should be free and with no binding. If you detect binding, replace the fuel distributor with a rebuilt unit.
6. Fuel Accumulator and/or Fuel Pump Check Valve:
   These hold pressure in the fuel system.
7. Fuel injector Clogged:
   Pull the injectors and inspect for correct operation. Apply power to the fuel pump, jump the wire terminal numbers 30 and 87a. Caution fuel will flow from the injectors when the air flow plate is moved in an upward direction. Check for correct operation.
8. Control Plunger in the fuel distributor binding:
   Remove the air cleaner and carefully move the plate up and down, do not force the plate. If it binds investigate. If it is not simple to repair replace the unit.
9. Idle speed, Ignition Timing, and mixture out of tolerance:
   Check and adjust all of the above.
10. Faulty Ignition System:
    Check the ignition system. 1973-1977 check point gap .016, correct plugs see chart, Condition of cap and rotor, 1978-1983 check for a distinctive hum in the CDI with ignition on in engine compartment, (if no hum the CDI may be defective) CDI is the ignition module located on the relay panel in the engine compartment left side.

Low Power:

1. Fuel Pressure Incorrect:
   Check for pressure to be at least 66 PSI.
   If too low, test the fuel pump and the warm up regulator.
2. O2 Sensor defective:
   Replace as needed.
3. Fuel injector clogged:
   Test the fuel injectors for equal quantities at a given time. Jump the fuel pump relay #30 and 87a. Run the pump with the injectors in a container. Look for problems.
4. Fuel distributor binding:
   Check the plate for free movement. Remove the air cleaner and the air intake and gently move the plate. It must move freely, if not look for the problem.
   If it is not easy to repair replace the distributor.
5. Idle speed, Ignition timing or bad Ignition system:
   Check the timing. Check the points 1973 - 1976 gap .016, 1977 - 1983 Check the CDI for a distinctive hum with the ignition on. CDI is located in the engine compartment.
   The CDI is the ignition module.
6. Full Throttle switch faulty or not adjusted correctly:
   1980 -1 983 cars. This switch is located on the throttle body. It will at full throttle disconnect the O2 sensor and allow open loop (a richer mixture) and turn off the air condition during full throttle. The switch looks like a little black box.
   Test the switch for continuity.

Poor Fuel Mileage:

1. Fuel Pressure incorrect:
   Test fuel pressure. It should be at least 66 PSI.
2. Cold Start Valve Leaking:
   Test cold start valve. Remove the valve and leave the fuel line connected.
   Disconnect the electrical connection to the valve. Apply 12 Volts to one side of the valve and a ground to the other side. Fuel will spray so do this over a container. Remove the power and look for leaks. If there are and replace the valve.
3. Fuel Leaks:
   Look and sniff for leaks. Repair as necessary.
4. O2 Sensor faulty:
   Replace as necessary.
5. Idle Speed, Ignition timing and Idle Mixture CO out of Adjustment:
   Make adjustments as necessary.
6. Control pressure regulator faulty:
   Disconnect the electrical connection at the regulator and turn the switch on, check for a voltage of at least 11.5 volts. Turn the switch off and test for continuity. If either of these test bad, replace the control pressure regulator.
7. Fuel pump not working:
   Check the fuse and the relay. Test for voltage at the pump.
   If these test good replace the pump.
8. Warm Control pressure to high:
   Check the wann up regulator. 1973 ½ check the connections to the regulator. If this regulator is defective, you will have to replace the regulator with a later version. Consult a Porsche parts house for the correct replacement. 1974 – '83 check the connections at the regulator. Check for voltage at the connection and units with vacuum connections check for leaks.
9. Fuel system leakage:
   Suspect a leak if you smell raw fuel in the engine compartment.
   Inspect all connections and any injector or fuel connection.
10. Injected fuel quantities unequal:
    Test the amount of fuel delivered by each injector. Pull each injector and collect the fuel as you test run the fuel pump. Compare the quantities. Replace the defective injector if the quantity is not the same as the others.
11. Basic idle setting not correct:
    Check the idle and adjust as necessary.

Idle Bad with Cold Engine

1. Leaks in air intake system:
   Check all air intake and vacuum connections. Any old hoses must be replaced. Be sure to check the intake boots around the intake runners. Check all hose clamps. Replace any collapsed hoses.
2. Auxiliary Air Valve does not open:
   Check the hose connections to the valve. If these check good remove the valve and check for leaks by closing off one end and applying a small amount of suction to the other end, if air can be drawn through the valve, with the other end capped off, replace the valve.
3. Cold Start Valve leaking:
   Remove the cold start valve, located in front of the intake. Leave the fuel line connected, place the valve over a container, disconnect the electrical connection, apply 12 volts to one of the connections, apply a ground to the other side, look for an even conical spray pattern, turn the power off, wait a few seconds, there should be no leaks. If the pattern is not correct or the valve leaks, replace the valve.
4. Cold control pressure not correct:
   Check the warm up regulator. I would look for a pressure of at least 1.25 -1.50 bar (18-22 PSI) at freezing temperatures. Be sure to check the pressure coming from the mixture control unit.
   If the pressure is not correct, do a complete check of the warm up regulator.
5. Injector Leaking:
   The opening pressure could be to low, opening pressure should be around 2.5-3.6 bar (36-52 PSI). Check all the injectors for evidence of leakage. Test for opening pressure. When you reinstall the injectors be sure to replace the o-rings.
6. Injected Quantities low:
   Compare the fuel quantities of each injector. Place each injector over a container and record the amount of fuel each produces at a given amount of time. They should be equal.
7. Basic Idle incorrect:
   Check and rest the idle per the specifications. It is best to set it when the engine is warm. Check the co output, also.
8. Fuel Leaks:
   Inspect all fuel connections.
9. Fuel injector Clogged:
   Pull the injectors and inspect for correct operation. Apply power to the fuel pump, jump the wire terminal numbers 30 and 87a. Caution fuel will flow from the injectors when the air flow plate is moved in an upward direction. Check for correct operation.
10. Control Plunger in the fuel distributor binding:
    Remove the air cleaner and carefully move the plate up and down, do not force the plate. If it binds investigate. If it is not simple to repair replace the unit.
11. Idle speed, Ignition Timing, and mixture out of tolerance:
    Check and adjust all of the above.
12. Faulty Ignition System:
    Check the ignition system. 1973-1977 check point gap .016, correct plugs see chart, Condition of cap and rotor, 1978-1983 check for a distinctive hum in the CDI with ignition on in engine compartment, (if no hum the CDI may be defective) CDI is the ignition module located on the relay panel in the engine compartment left side.

Misses and Hesitates under a load

1. Fuel pressure incorrect:
   Test fuel pressure.
2. Fuel injector clogged:
   Same as above #9
3. Control Plunger Binding:
   Same as above #10
4. Incorrect ignition timing or faulty ignition system:
   Same as above #12
5. Clogged Fuel Filter:
   Check the fuel filter. Replace if necessary.
6. Faulty injector:
   Test all injectors for quantity and leaks.
7. Vacuum leaks:
   Inspect all hose connections and clamps. Replace all old and loose fitting hoses.
8. Fuel Pump not working:
   Check for voltage at the pump. If no power check the fuse and the relay.
   Replace if necessary.
   If there is voltage at the pump and it is not running replace the pump.
9. Warm Control Pressure too high:
   Check for at least 40 PSI with out vacuum on the warm up regulator and 46 PSI with vacuum on the warm up regulator.
10. Warm Control Pressure to low:
    Check for at least 40 PSI with out vacuum on the warm up regulator and 46 PSI with vacuum on the warm up regulator.

Hesitation on Acceleration

1. Air flow sensor plate not positioned correctly:
   Check the plate. Remove the air cleaner and air intake. Check for at least a .020 clearance between the plate and the bottom of the barrow. 1973-1976 adjust the clip. 1977-1983 adjust with a screw driver.
2. Fuel pressure not correct:
   Check for pressure to be at least 66 PSI.
3. Fuel injector clogged:
   Test the fuel injectors for quantities at a given time.
   Jump terminal 30 and 87a to run pump.

Theory of Operation

This can be one of the most useful tools you can have to troubleshoot a fuel injection system. You will find that the operation of the CIS fuel injection system has a sequence of events that must happen before the car will start.

1973 - Cold Start

1. Pull the hand throttle- This closes the micro switch (on the throttle) for the cold start valve.
2. With the starter in the start position, power is applied through the micro switch to the cold start valve allowing additional fuel to be injected into the intake. [Power is received from pin 50 (starter solenoid) yellow wire and ground is applied at pin D- (alternator) brown wire.
3. Additional fuel is received from the warm up regulator, which is electrically controlled. Regulated fuel pressure is lowered to allow a richer mixture to flow through the injectors.
4. Once the engine has started the power for the cold start valve is cut off by releasing the starter switch. The hand throttle is then pushed back to its rest position.
5. During warm up the warm up regulator will control the fuel pressure, allowing the fuel pressure to increase during warm up.
6. Power is applied to the warm up regulator through a relay located on the engine compartment relay shelf. With the starter switch in the run position, power and ground to energize the relay is received from the voltage regulator. Positive voltage is from pin D+ (voltage regulator) and a ground is from pinD - (voltage regulator). When the relay is energized, power from fuse #2 (fuse box #3) is applied to pin #30 on the relay applying power to pin #87 of the relay. The RD/WH wire from #87 is connected to a *RDIBR* wire through a 14 pin connector (engine compartment relay shelf). This *RDIBR* wire then energizes the warm up regulator.
7. Hot Start: Do not pull the hand throttle up. Turn the starter to the start position and the car will start. The cold start valve is not needed for the restart of a warm engine. The warm up regulator is already adjusted automatically because it is electrically controlled.

1974-1975 Cold Start

1. Pull the hand throttle, this closes the micro switch to the cold start valve.
2. With the starter in the start position, power is applied to the cold start valve and the thermo-switch(a temperature sensing switch) allowing additional fuel as needed. Note: If the engine is warm the cold start is not needed and the thermo switch will not allow it to operate, even if the hand throttle is pulled. Power is received from pin 50 (starter solenoid) yellow wire and ground is applied on the other side of the thermo-switch.
3. Additional fuel is received from the warm up regulator, which is electrically controlled. Regulated fuel pressure is lowered to allow a richer mixture to flow to the injectors.
4. Once the engine has started, the power for the cold start valve is cut off by releasing the starter switch. The hand throttle is then pushed back down to its rest position.
5. During warm up the warm up regulator will control the fuel pressure, allowing the fuel pressure to increase during engine warm up.
6. Power is applied to the warm up regulator through a relay (located on the relay shelf in the engine compartment). With the starter in the run position: Power and ground to energize the relay is received from the voltage regulator. Positive voltage is from pin D+ voltage reg. and a ground is from pin D voltage reg. When the relay is energized, power from fuse #2, fuse box #3 is applied to pin #30 on the relay. From that point power is applied internally to pin #87, a RD/WH wire. This RD/WH wire changes to a *RDIBR* wire through a 14 pin connector on the engine compartment relay panel. This *RDIBN* then energizes the warm up regulator.
7. If the throttle is up on a hot engine, the cold start valve will not operate because the thermo switch has turned it off.
8. Hot Start: Do not pull the hand throttle. Turn the key and the car will start. The cold start valve is not needed to start a warm engine. Go to #6 above and continue follow the sequence.

1976 - 1981 Cold Start
1980 on (see information on Lambda System, Oxygen sensing system)

1. The hand throttle has been eliminated and an electrically controlled cold start valve was installed. With the starter in the start position, air is drawn into the air intake and the air sensor plate is moved in the up position. Power is also applied to the cold start valve and the thermal valve (a temperature sensing switch) allowing additional fuel as needed.
2. With the starter still in the start position, there are a number of things happening. The air sensor that moved in the up position caused a switch in the air sensor to make contact. This switch caused a a positive RD wire and a negative BR wire to close the fuel pump relay. The positive RD wire is from pin B+ on the alternator and the negative BR wire is from pin D- , also from the alternator.
3. The action of the fuel pump relay closing caused the fuel pump to run, the warm up regulator to be energized, the thermal valve to operate and the auxiliary air regulator to turn on.
4. The fuel pump relay was energized for a moment during the start cycle. Power for the relay to switch on the above components is received from pin B+ on the alternator. This action is for only a moment until the engine starts.
5. When the engine starts, the ignition swjtch is released. As long as the engine starts, there is still power on the fuel pump relay because of the air flowing in the air sensor. The internal switch is closed allowing the fuel pump relay to stay energized, applying power to pin 30.
6. With power coming trom the fuel pump relay pin 30, the warm up regulator, thermal valve and the auxiliary air regulator are energized.
7. The thermal valve works with the warm up regulator. The thermo valve further enhances the warm up period by helping to control the warm up regulator (fuel pressure) by way of a vacuum line connected from the throttle valve, through the thermal valve to the warm up regulator.
8. The auxiliary air regulator is also receiving power from pin 30. During the warm up period, the auxiliary air regulator allows additional air, as required, to by pass the throttle, only when cold. While the engine is cold and is being started, the auxiliary air valve is working in conjunction with the auxiliary air regulator. During start and the engine is cold the valve is open allowing a small amount of air to bypass. The valve has no electrical connection. When the engine starts, the valve closes.
9. **Hot Start:** Turn the key to the on position. Go to #5 and follow the sequence of events.

Oxygen Sensing System (Lambda)

This system was added to the 1980 and up vehicles to help control the exhaust emission. This system can cause some driveability problems. They are dealt with in the trouble shooting sections. This system is not involved in the cold start series of events. The system operates in an open loop mode during start up. This means that it is not operating. The closed loop operation mode is the term used when the system is in operation.

1977 - 1983

Please note that if you have a change over year, you may have some of the equipment in a previous year. While troubleshooting keep this important information in mind. A good example is the vacuum controlled warm up regulator. Look for a thermal switch to help the operation of the warm up regulator. Trouble spots will usually be in the vacuum lines.

1982 - 1983 Cold Start

1. Turn the ignition key to start. The starter operates and the engine turns drawing air into the intake. This air moves the plate in the air sensing unit. When the plate moves in the upward direction a micro switch is energized. This switch applies a ground to the fuel pump relay. With the switch in the start position, a RD wire applies a positive voltage to the fuel pump relay. The relay then closes and power is applied to the cold start valve.
2. The cold start valve allows additional fuel to be applied as needed to help start the engine. The cold start valve stays on for a short period of time. This is because of a thermo switch in the circuit. The thermo switch controls the amount of time the cold start valve stays on.
3. The warm up regulator is also energized. This valve is electrically controlled. The valve gets its power from pin 30 on the fuel pump relay. Pin 30 also applies power to the auxiliary air valve. The air valve is also electrically controlled. Power is received from a RD/WH wire from pin 30 on the fuel pump relay.
   The warm up regulator will control the fuel pressure during cold start and during warm running. Fuel pressure is lowered during the process of cold start to allow a richer mixture of fuel to be injected. The auxiliary air valve will allow a small amount of air to by pass the throttle to help in cold start.
4. When the engine starts the cold start is turned off and the warm up regulator continues to control the fuel pressure during warm running.
5. **Hot Start:** When the engine is started while it is warm the cold start valve is not turned on. The thermo switch controls the time the cold start valve is on and when it is to turn on and allow additional fuel to be applied. The warm up regulator will continue to control the fuel pressure during warm running of the engine. Fuel pressure is raised to allow a leaner mixture.
   Note: You will find that the cold and hot start operation does not include a thermal valve and a vacuum line attached to the warm up regulator. In 1982 the thermal valve and the vacuum lines were not used.

Testing of Components and Parts:

Air Flow Sensor Plate:
This is one of the most critical components of the whole system. Be sure the adjustment is correct and that there is full and free movement of the plate. The plate should be even with the bottom of the barrel. The plate should move freely up and down smoothly with no resistance. The test is done with no fuel pressure on the system. Relieve the system fuel pressure by loosening the pressure line at the warm up regulator. Be careful fuel will spew. Remove the rubber boot on top of the flow sensor and also remove the air filter. The upper edge of the plate should be even with the bottom of the barrel. Adjust as needed. 1973 ½ - 1975 adjust the clip on the arm. 1976-1983 adjust the screw on the arm through the top with an allen wrench. The adjustment is critical and should not be any more than .020 if below the barrel. Note: Be sure to relieve the fuel pressure before testing for free movement of the plate. Do this by loosening the pressure line connection at the warm up pressure regulator. Catch any fuel that may spill with a rag.

Auxiliary Air Regulator:
Disconnect the electrical connection to the regulator. Check to see if there is a resistance reading. There should be 33 ohms of resistance. Power on: Check for voltage at the plug. There should be at least 11.5 volts. If there was no resistance and you fin9.voltage replace the air regulator. If the resistance is 33 ohms and there is no voltage check the wiring circuit.

Auxiliary Air Device:
Start the engine and bring to operating temperature. Make a note of the RPM. Shut off the engine and disconnect the auxiliary air device hose and seal the connection. Restart the engine and if there is a change in the RPM, replace the auxiliary air device because there is a leak in the device.

Cold Start Valve:
Remove the cold start valve. It is located on the front of the air intake. Look at the photo page if you are not sure what it looks like. Note: You will need to exercise extreme caution, you will be testing this part with the power on and sparks can occur. Disconnect the electrical connection, leave the fuel line connected. Hold the valve over a suitable container to catch the fuel. Apply 12 volts to one of the connections and a ground to the other connection. Look for a cone shaped spray pattern. Remove the power and look for leaks. If you have a bad spray pattern or a leak replace the valve.

Warm up Pressure Regulator/Control Pressure Regulator:
Remove the electrical connection and apply power to the car. Check for at least 11.5 volts at the connection. If you do not have the correct voltage, check your wiring. With the connection disconnected and the power off, take a continuity test. If you do not have continuity, replace the regulator. Note: you are only looking for continuity and not a specific resistance. 1973 ½ - 1975, this device is controlled by a relay located on the relay shelf in the engine compartment. 1976 - 1983, this device is controlled by the fuel pump relay.

Fuel Pump:
Check the fuse, check the relay. Both are located in the front luggage compartment. Test the fuel pump by bypassing the relay with a jumper. Remove the relay and put in a jumper between the connections numbered 30 and 87. If the pump does not work, check for voltage at the pump. There should be at least 11.5 volts. Check the ground, if both are good replace the pump. If you do not have voltage, check your wiring. If all test are good and the car does not start, check the safety switch. It is located on the throttle housing. This switch will allow the fuel pump to run when the engine is being started and there is air flow on the plate causing it to move up. This movement of the plate turns the pump on. To test the switch, remove the air filter, turn the ignition switch to the on position, lift the sensor plate up, the pump should start working. Test the pump on the bench. Apply power to the pump. If it does not run, replace it.

Fuel Injectors:

You can test the injectors while on the car. There are O rings used to seal any air leaks. Replace these as a precaution, they probably have never been replaced. Note: Use caution, fuel and fuel fumes will be present. You will need a container to catch the fuel in this test. Pull all injectors, use caution and do not kink the fuel line. Note: During this test, fuel will be applied to all the injectors at the same time.

Do not make the test with all the injectors still inserted in there places. Excess fuel will dump into each cylinder. Remove all the injectors and catch the fuel in containers. Bypass the fuel pump relay by first removing the relay and putting a jumper on terminal 30 and 87. The pump will run and fuel will be sprayed out of each cylinder. Listen for a distinctive hum while testing each injector. If the hum is not present, replace the injector. Do not let the fuel flow to long. USE CAUTION! Look at the spray patterns while the pump is running. The fuel should be sprayed in a cone shape pattern. If the pattern is not a cone, replace the injector. Disconnect the power and watch for leaks at the injectors. If any leak, replace the injector.

Thermo Time Switch:

The engine should pe cold to do this test. Disconnect the cold start valve electrical connector. Put light across the electrical connections. Disable the ignition system so that the car does not start. Turn the starter on. The light should light up for a short period of time. If the light does not light up, check the voltage at the yellow wire to the thermo time switch, located on the left rear timing cover. If there is no voltage check the wire first, repair as needed. If there is voltage and the light did not light, replace the thermo time switch.

Thermal Valve:

The engine should be cold to do this test. The valve will not allow vacuum to be applied to the warm up regulator when the engine is cold. This will help in cold start and warm run operation. To test, disconnect the vacuum line from the regulator and operate the fuel pump, blow through the hose and at first you will find resistance. After a few moments, you will be able to blow through the valve. If this test does not work, replace the thermal valve.

BOSCH FUEL INJECTION SYSTEMS FOR THE PORSCHE 911

911T	1973	K-JETRONIC
911S	1974-1977	K-JETRONIC
911SC	1978-1979	K-JETRONIC
911SC	1980-1983	K-JETRONIC WITH LAMBDA

K-Jetronic components	K-Jetronic with Lambda (oxygen sensing)
Fuel Pump	Fuel Pump
Fuel Accumulator	Fuel Accumulator
Fuel Filter	Fuel Filter
Warm-up Regulator	Warm up Regulator
Injectors	Injectors
Cold Start Valve	Cold Start Valve
Fuel Distributor	Fuel Distributor
Air Flow Sensor	Air Flow Sensor
Temperature Sensor	Temperature Sensor (Thermo-time switch)
Auxiliary Air Valve	Auxiliary Air Valve
Fuel Pump Relay	Timing Valve
Deceleration Valve	Lambda Sensor (Oxygen Sensor)
Micro Switch	Throttle Valve Switch
	Control Unit
	Fuel Pump Relay
	Deceleration Valve

For a Photo of each of the above parts see "Photo Section"

DEFINITIONS:

Air Flow Sensor: Device used to measure air drawn into the engine.

Air Leak: Usually called a vacuum leak. This is a leak that is not wanted, could cause the engine to run badly.

Auxiliary Air Regulator: This valve allows air to bypass the throttle helping to control the idle. This is controlled by an electrical input. This electrical input is controlled by a temperature sensor. If stuck open, it causes a rough idle.

Auxiliary Air Valve: Device used to allow air to bypass the closed throttle.

Accumulator: Device used to dampen fuel pressure surges, reduce fuel pump noise and holds pressure in fuel system to help prevent vapor lock.

Bleeding: Term used when fuel pressure is reduced or eliminated from the fuel system:-

CIS: Continuous Injection System.
A fuel injection system that injects fuel continuously, not one at the time.

Closed Loop: A feed back system that controls a prescribed (set) exhaust output. By receiving signals from the exhaust, the fuel can be adjusted to a prescribed (set) limit. This prescribed (set) limit is referring to the CO content in the exhaust.

Cold Start Valve: Relay (solenoid) operated injector used to inject additional fuel during cold engine starting.

CO Adjustment: An adjustment to the harmful gases put out by the internal combustion engine. This is made either by mechanical means or electronically. These gases are called carbon monoxide.

Compression ratio: The ratio of maximum cylinder volume to minimum cylinder volume. A theoretical amount of air to fuel mixture that is compressed in a cylinder.

Deceleration Valve: Also called vacuum limit valve. Prevents engine vacuum from dropping off to quickly. This will help prevent a rapid change in timing when lifting off the accelerator and prevents backfires.

Fuel Accumulator: Holds fuel pressure to help in starting. Also helps prevent vapor lock.

Fuel Pump: A device used to draw fuel from the fuel tank and deliver fuel at a specified pressure.

Fuel Filter: A fine mesh screen used to filter out unwanted debris from the fuel.

Fuel Distributor: A device used to house the control plunger and the differential pressure valves in the CIS System. Fuel metering takes place in this unit. Fuel is then distributed.

Fuel Pump Relay: A relay used to actuate the fuel pump and controls the warm up regulator, 1976-1983.

Fuel Pump Check Valve: Device used to allow fuel to flow in one direction, also holds fuel pressure.

Flooding: A term used when to much fuel is being injected into the engine.

Idle: The speed at which the manufacturer has set for the engine to run at rest.

Injector: Device used to deliver fuel to each cylinder.

Lambda: Expresses the amount of oxygen in the exhaust. When all the air and fuel is burned in the combustion chamber, Lambda is said to be one. (Oxygen Sensor)

Lambda Control: Closed loop system that that adjust fuel air ratio. (Oxygen Sensor)

Lambda Control Valve: Adjusts the fuel air ratio in response to the signals from the Lambda sensor (Oxygen sensor). This valve is also known as the frequency valve or the timing valve.

Manifold Sleeves: Rubber boots on the manifold runners. These can crack and can cause vacuum leaks.

Oxygen Sensor: Device used to sense oxygen in the exhaust system. Sends signals to the Lambda Control.

Plunger: (control plunger) meters fuel to the injectors.

Temperature Sensor: (Thermistor) Used to sense engine temperature.

Throttle Valve: The movable plate in the intake used to control the amount of air drawn in the engine.

Throttle Switch: (throttle valve switch)

Vapor Lock: A condition where the fuel will not flow because of an air block in the fuel system. This is caused by very hot conditions in the engine bay.

Warm Up Regulator: (Control Pressure Regulator) Device mounted on the engine that controls fuel pressure to the control plunger, influenced by heat. Controls fuel pressure all the time. 1973 ½ - 1975 controlled by relay on relay shelf in engine compartment.
1976 – 1983 controlled by fuel pump relay.

Technical Information:

Idle Speed

1973-1976	850-950 RPM
1977-1979	900-1000 RPM
1977 California and High Altitude	950-1050 RPM
1980-1983	850-950 RPM

Fuel System Pressure

Leak Test (min.)	65-75
	18 PSI (after 10 minutes)
	16 PSI (after 20 minutes)

Warm Control Pressure: Fuel Pressure

1974-1979 (no vacuum)	39 - 45 PSI
1980-1983	49 - 55 PSI

Tune up

1973 T

Engine Code	911/91
Plugs	RN9YC
Gap	.024
Pt Gap	.016
Dwell	40' +/- 3
Timing	5' ATDC
CO	1.5 - 2.0
Valves	.004 Int/Ex. Cold

1974

Engine Code	911/92/97

1974 S

Engine Code	911/93/98
Plugs	RN7YC
Gap	.024
Pt Gap	.016
Dwell	40' +/-3
Timing	5' ATDC
CO	1.5 - 2.0
Valves	.004 Int/Ex. Cold

1975

Engine Code	911/43/48/44/49

1976

Engine Code	911/82/89/84/89
Plugs	RN7YC
Gap	.024
Pt Gap	.016
Dwell	40' +/-3
Timing	5' AIDC
CO	1.5-2.0
Valves	.004 Int/Ex. Cold

1977

Engine Code	911/85/90
Plugs	RN7YC
Gap	.024
Pt Gap	.016
Dwell	40' +/-3
Timing	5' AIDC
CO.	1.5 - 2.0
Valves	.004 Int/Ex. Cold

1978 SC
1979 SC

Engine Code	930/04/06
Plugs	RN11YC
Gap	.028
Pt Gap	Pointless
Dwell	----
Timing	5' BIDC
CO	2.5 - 3.0
Valves	004 Int/Ex. Cold

1980 SC

Engine Code	930/07

1981 SC
1982 SC
1983 SC

Engine Code	930/16
Engine Code	930/16
Engine Code	930/16
Plugs	RN7YC
Gap	.028
Pt Gap	Pointless
Dwell	
Timing	5' BTDC
CO	.4 - .8
Valves	004 Int/Ex. Cold

General Information:

1973
HP 137
Compo 7.5-1
Eng.2341cc
Torque 166FT/LB
Oil Pressure 78 - 99lbs @175' F @5500 RPM
Firing Order 162435

1974
HP 143
Comp 8.0-1
Eng. 2687 cc
Torque 168 FT/LB
Oil Pressure 78 – 99lbs. @175' F @5500RPM
Firing Order 162435

1975
HP 157
Compo 8.5-1
Eng. 2687cc
Torque 166 FT/LB
Oil Pressure 78 - 99 lbs. @175' F @5500 RPM
Firing Order 162435

1976
HP 157
Compo 8.5-1
Eng. 2687 cc
Torque 168 FT/LBS
Oil Pressure 73.5 lbs @175' F @5500 RPM
Firing Order 162435

1977
HP 157
Compo 8.5-1
Eng. 2687 cc
Torque 168 FT/LB
Oil Pressure 73.5 lbs. @175' F @5500 RPM
Firing Order 162435

1978
HP 172
Compo 8.5-1
Eng. 2994 cc
Torque 175 FT/LB
Oil Pressure 66lbs. @195' F @5000RPM
Firing Order 162435

1979
HP 172
Compo 8.5-1
Eng. 2994 cc
Torque 189 FT/LB
Oil Pressure 66 lbs. @195' F @5500 RPM
Firing Order 162435

1980
HP 172
Compo 9.3-1
Eng. 2994 cc
Torque 175FT/LB
Oil Pressure 66lbs. @195'F @5500 RPM
Firing Order 162435

1981
HP 180
1982 Compo 9.3-1
1983 Eng. 2994cc
Torque 175 FT/LB
Oil Pressure 66lbs. @195'F @5500 RPM

Performance:

1974 2.7 0-60 7.9 sec.
1978 3.0 0-60 6.3 sec.

Tool list and where to find them

Bosch Tool List:
#KDJE-PIOO Pressure Gauge Tester 0-6 Bar
#KDJE-PIOO/IO Connecting parts set for above
#KDJE-PIOO/12 Connecting parts set for above

Complete Test Kit:
#KDJE-KIOO Contains all of the above

Most of the service and testing can be done with metric tools. Refer to the list of parts and tool suppliers below for additional help in locating special testing tools.

Pelican Parts 1-888-280-7799 www.pelicanparts.com

Vertex Auto 1-866-668-0660 www.vertexauto.com

Euro Products 1-800-982-0911 www.eurowebparts.com

Performance Motorcars 1-866-387-CARS www.performancemotorcars.com

Tweeks 1-888-489-3357 www.tweeks.com

Motor Miester 1-800-756-0956 www.motormiester.com

Questions you may have about the system.

1. What does the part look like?
   Refer to the photo page, Find your model year, look for the particular part.
2. Are all the parts the same on all the CIS fuel injection years?
   No, some model years use different parts. Basically they look the same, but with updates.
3. Where are the parts located?
   Refer to my component page for a photo of the part you seek.
4. Can I rebuild the part in question?
   Refer to the rebuilding section, it will list the parts that are rebuildable.
5. Are there any other cars that have the same part?
   Yes, you will have to look at the part number on the side of the part you are referring.
   If you are going to use the part on your car be sure to test it before you install it.
6. Can I use basic tools to test my CIS fuel injection?
   Most of the tools used are basic, I have made a list, please refer to the tool list.
7. Why do all the photos I refer to have a different looking part in the place of what should be there?
   As the cars progress, each model year there are updates.
   You will ind a correct photo of each on my photo page.
8. Can I get more power out of the CIS fuel injection?
   The CIS fuel injection system, for the most part, is not adjustable.
   There are people that have made modifications to the system.
   I do not recommend any modification or performance enhancing, this may cause untold damage. The CIS fuel injection is perfect for what it was designed to do. The system is a brilliant combination of engineering and simplicity.
9. Can I use a fuel injection cleaner?
   Yes, only if it is in the gasoline. Use gasoline such as Chevron with techron, do not use any cleaner that requires you to block off the return line to the fuel tank. This could cause damage to the system, because the CIS operates on pressure and the excess is returned to the tank.
10. Can I use an additive to rid my fuel of water?
    This is not recommended, flush the system with clean fuel.
11. Can I use Gasohol in my CIS injected car?
    This is not recommended. The chemical make up of this fuel caused problems with rust forming in the fuel system. It is recommended to stay with a non gasohol product.