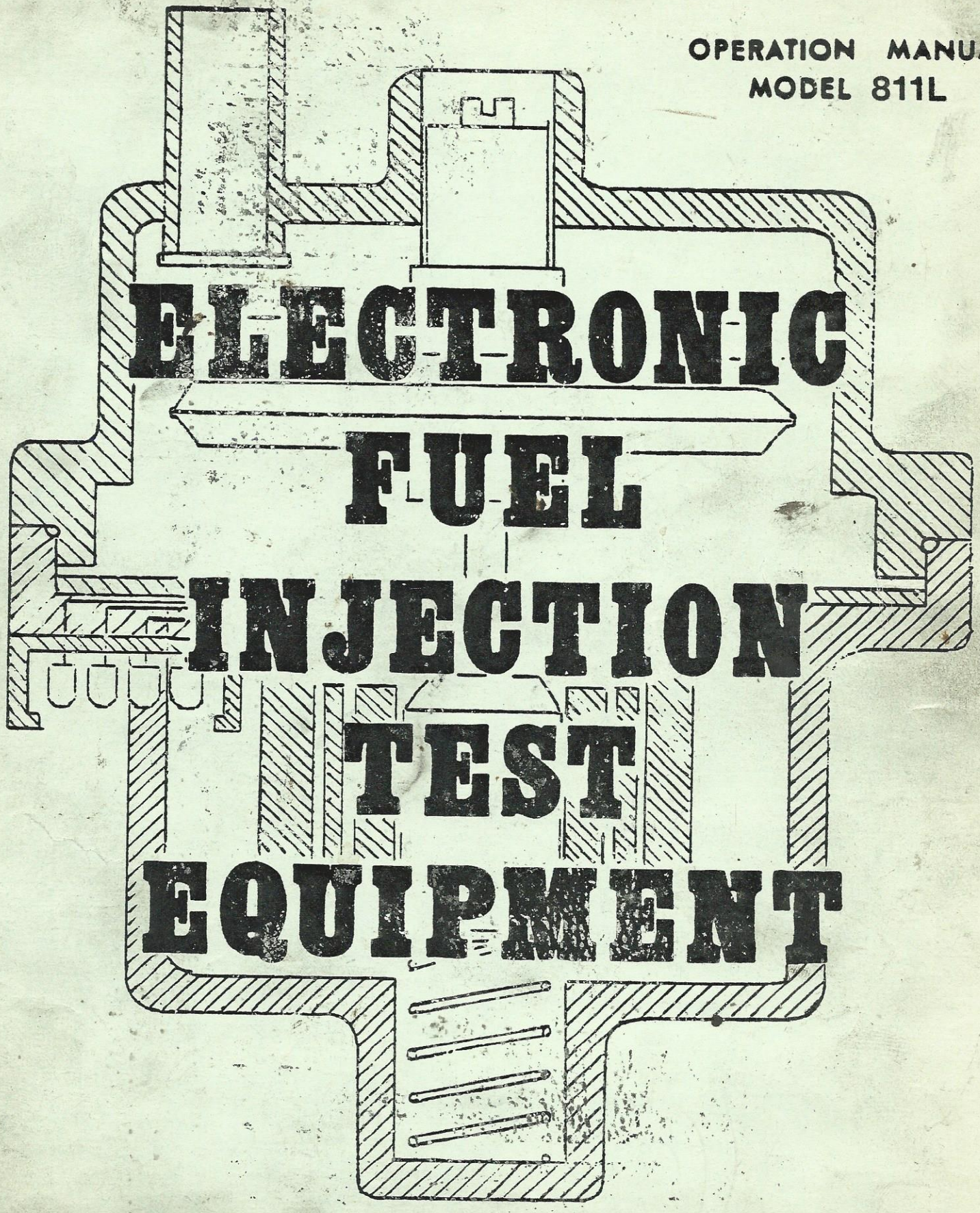
OPERATION MANUAL
MODEL 811L



ELECTRONIC FUEL INJECTION TEST EQUIPMENT

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CONTENTS

INTRODUCTION

Electronic Fuel Injection (EFI) has come into use because of the need to efficiently meet the various exhaust emission requirements and more recently to improve fuel economy. EFI replaces the standard carburetor with a system of electonically actuated solenoid valves which deliver a precisely controlled amount of fuel to the cylinders. EFI differs from mechanical fuel injection in that fuel is injected into the intake manifold toward the intake valve rather than directly into each cylinder. EFI is used primarily because it can control exhaust emissions and fuel metering effectively without sacrificing engine performance.

There are two types of Electronic Fuel Injection in use today. The original system sensed vacuum and used the Manifold Absolute Pressure (MAP) to control the amount of fuel injected. This is the "D-JETRONIC" system invented by Bendix and first put into production by Bosch of Germany. The latest system, developed by Bosch itself, is based on the continious measurement of the amount of air drawn into the engine and is designated the "L-JETRONIC" system. The L stands for Luftemengenmassurg which is German for Air Flow Measurement.

The measurement of air flow vs engine vacuum has the following advantages:

1. Compensation for changes in performance due to wear and deposits in the combustion chamber or to changes in valve adjustment.

2. Compensation for changes in engine speed due to changes in volumetric efficiency.

3. Accelerator enrichment is unnecessary because the air flow measurement precedes the filling of the cylinders.

4. Idling stability is improved.

5. Compensation for changes in the exhaust back pressure caused by thermal and catalytic reactors.

ELECTRONIC FUEL INJECTION

The "L-JETRONIC" Fuel Injection system is a pulse-time manifold injection system that injects precisely metered fuel into the intake manifold behind the intake valves through electronically activated injectors.

The duration the injectors are held open is determined by the Control Unit (ECU) on the basis of signals received from engine sensors and components.

The primary input signal used by the ECU is developed by the Air Flow Meter. The Air Flow Meter measures the quantity of air being drawn into the engine. The force of this air stream deflects a moveable sensor (Air Vane) in the Air Flow Meter, which is connected to a potentiometer.

The signal from the potentiometer is used by the ECU to determine the basic duration for keeping the injectors open. It then varies this opening period depending upon the engine temperature, loading, RPMs, air density. On the later systems is also responds to the amount of oxygen in the exhaust and further controls injector fuel flow. In this way, the ECU closely controls the air/fuel mixture to achieve tight emissions control while maintaining a very high degree of driveability and fuel economy.

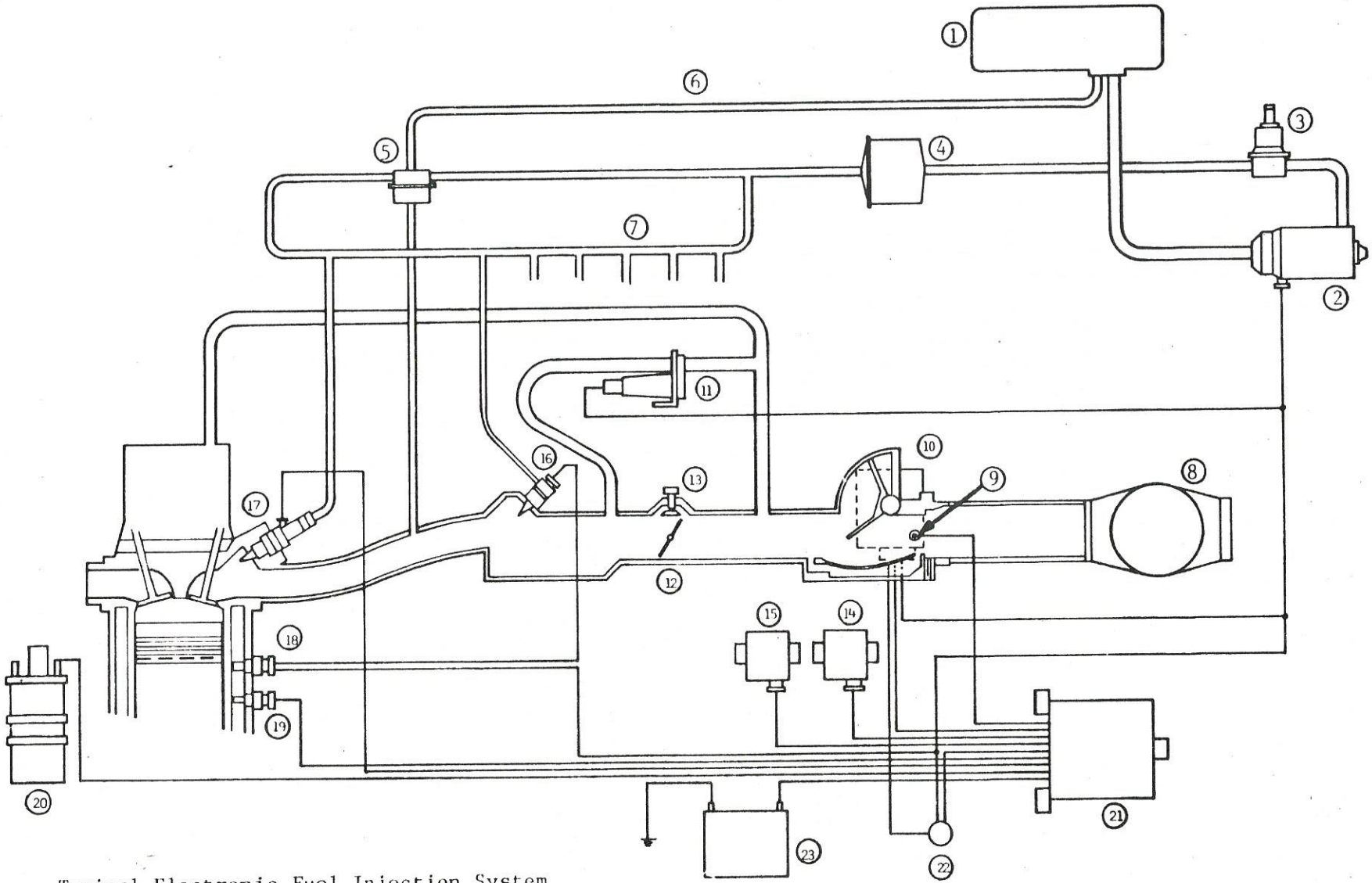
ELECTOR-MECHANICAL COMPONENTS

The 810 tests only the electro-mechanical portion of the fuel injection system. If satisfactory results are obtained on the analyzer (and some additional tests) then it is safe to assume that the system fault lies in the ECU itself.

The electro-mechanical components and sensors used in the "L-JETRONIC" system are as follows:

- Control Unit (ECU)
- Fuel Injectors
- Dropping Resistors
- Air Flow Meter (air Box)
- Ignition Points or Electronic Ignition
- Air and Engine Temperature Sensors
- Throttle Switch
- Power and Fuel Pump Relays
- Cold Start Valve and Thermo-Time Switch
- Auxillary Air Valve
- Altitude Compensator (optional)
- Exhaust Oxygen Sensor

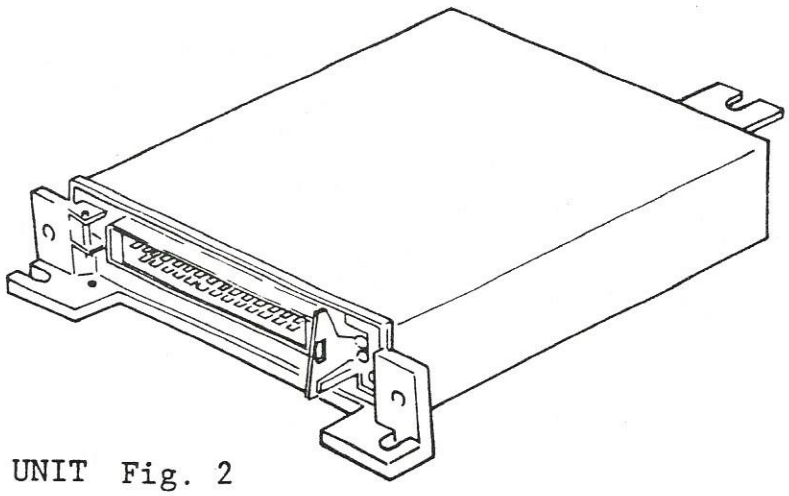
Identfication and location of the various parts of the EFI system are contained on the next two pages.



Typical Electronic Fuel Injection System

Identification of parts in Fig. 1.

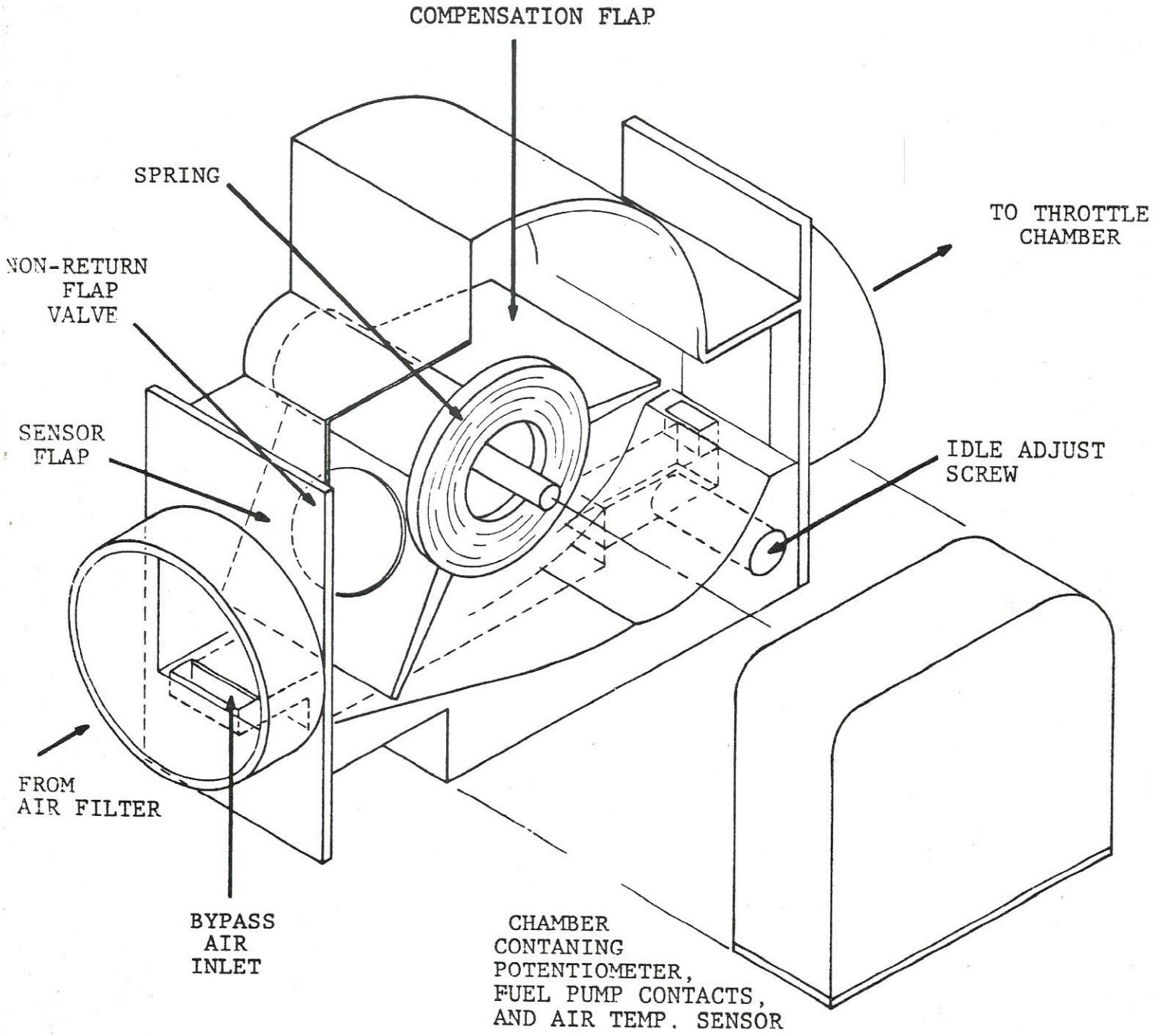
1. Fuel tank
2. Fuel pump
3. Fuel damper
4. Fuel filter
5. Pressure regulator
6. Return line
7. Fuel distribution pipes to injectors
8. Air filter
9. Air temperature sensor
10. Air flow meter
11. Auxiliary air regulator
12. Throttle chamber
13. Idle adjust screw
14. Altitude compensator
15. Throttle valve switch
16. Cold start injector
17. Injector
18. Thermotime switch
19. Engine temperature sensor
20. Ignition coil
21. Electronic control unit (ECU)
22. Starter motor
23. Battery



CONTROL UNIT Fig. 2

The Electronic Control Unit, or ECU, processes the electrical data of the various sensors and components. The Control Unit is programmed to regulate the pulse-width based on the electrical data. The solenoid-operated fuel injectors are held open for the exact length of time necessary for optimum engine performance. There is a harness to join the 35 pin connector on the Control Unit to the sensors and electrical components in the engine compartment.

AIR FLOW METER ASSEMBLY



AIR FLOW METER ASSEMBLY

The air flow meter is located between the air cleaner and the throttle chamber. It measures the amount of air being drawn in by the engine, so that the Control Unit (ECU) can determine the basic pulse-with (Duration) for the fuel injectors.

In the rectangular air channel, there is an air flow sensor flap that is held in an angular position by the force of the air stream acting against the spring. To prevent the fluctuations of the manifold pressure from affecting the measurement, there is a damping chamber and a compensation flap attatched to the air sensor flap. There is also a non-return flap valve on the sensor flap to eliminate the effects of possible back-firing in the manifold.

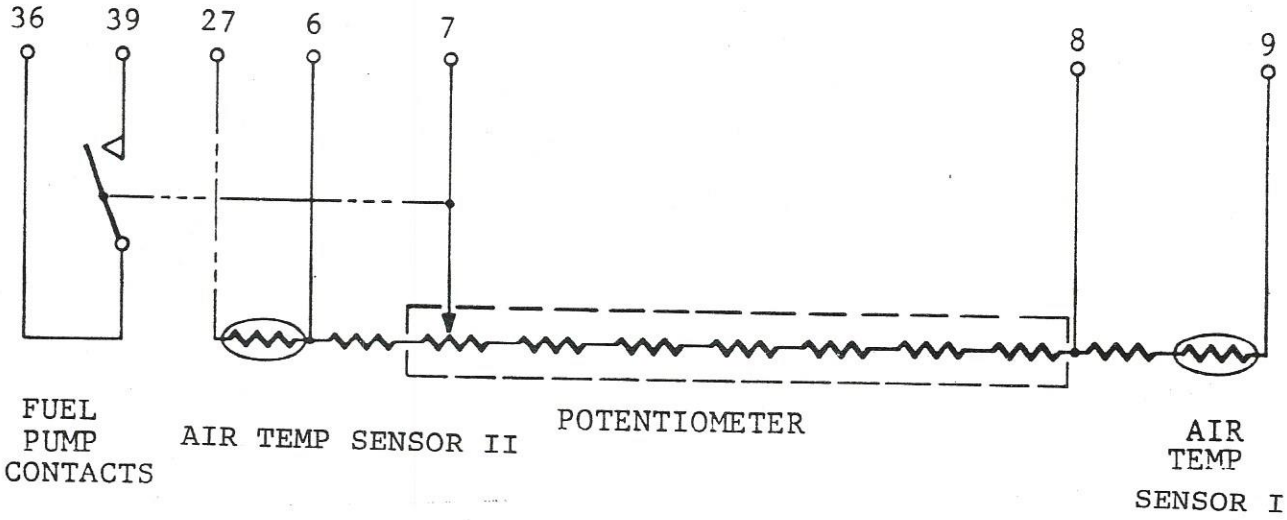
While the engine is idling, a portion of the intake air is allowed to bypass the sensor flap through the bypass channel. The air/fuel mixture at idle can be varied by changing the size of the bypass channel. An adjustment screw is provided for this.

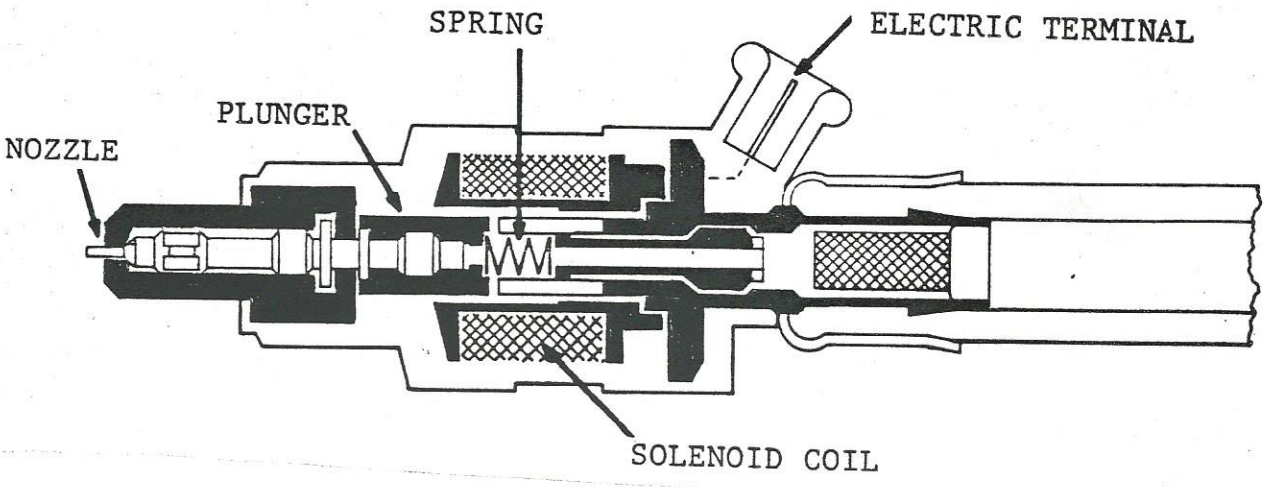
A change of intake air quantity deflects the air-flow sensor flap which changes the resistance of the potentiometer attatched to the flap.

The fuel pump relay contacts are located in the chamber (on the standard design) containing the potentiometer. The contacts are closed when the engine is running so as to provide safety. Toyota uses a different method, however. (See P40)

The air temperature sensor is located at the intake end of the air flow meter. Some early cars contain only the I sensor. Most of the later cars have both the I and the II air sensors. But the type I is part of the potentiometer assy.

AIR FLOW METER SCHEMATIC



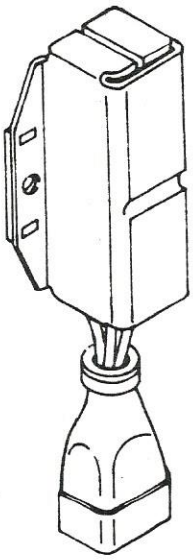


FUEL INJECTORS

The fuel injector is a solenoid actuated needle valve located in the intake manifold near the individual intake valves. All the injectors are actuated simultaneously by a signal from the ingntion points, or electronic ignition. This causes the plunger to open the needle valve allowing the fuel, under pressure, to be sprayed as a fine mist at the rear of the intake valve. The injectors are held open by the ECU for the proper length of time and then closed by a spring.

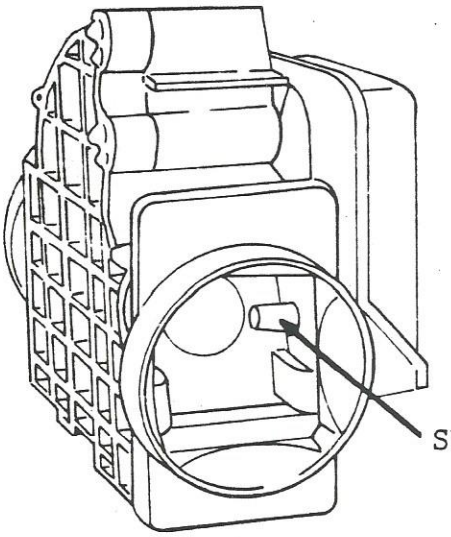
DROPPING RESISTORS

The dropping resistors are electrically in series with the fuel injectors. The resistors are used to limit the current that goes through the injectors making operation more reliable.



IGNITION COIL (NOT SHOWN)

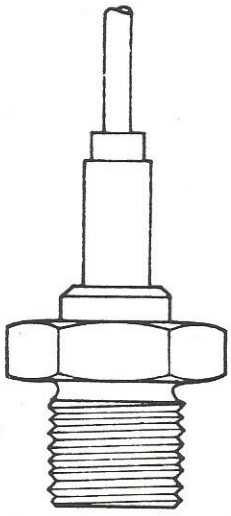
The ignition coil, points or electronic ignition system supply RPM information to the ECU as well as the signal to open each injector.
The points close 4 times per cycle (on a 4 cylinder engine), but the injectors fire only twice per cycle. The difference is accounted for in the ECU.

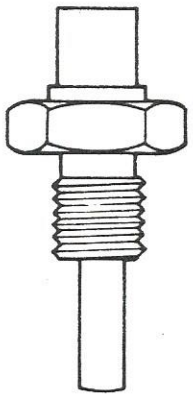


AIR TEMP SENSOR II

This sensor is located at the intake side of the air flow meter on the same side as the potentiometer chamber. When the intake air temperature is below approximately 20°C (68°F), the Control Unit enrichens the fuel-air mixture. This sensor is very sensitive in the low temperature range. but has little effect at operating temperatures.

Cylinderhead Temperature Sensor used in air-cooled engines



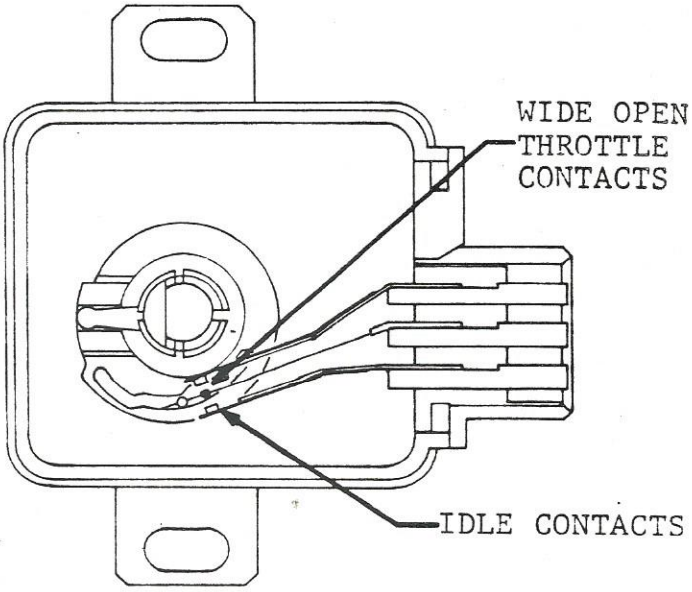


Coolant Temperature Sensor used in liquid-cooled engines

ENGINE TEMP SENSOR

The engine temperature sensor measures the temperature of either the coolant or the engine block depending upon the type of engine used in the car.
During the warm-up period, the Control Unit enrichens the fuel-air mixture by changing the injector pulse duration. As the coolant or engine temperature increases, the pulse duration is shortened.
This sensor is very sensitive in the low temperature range.

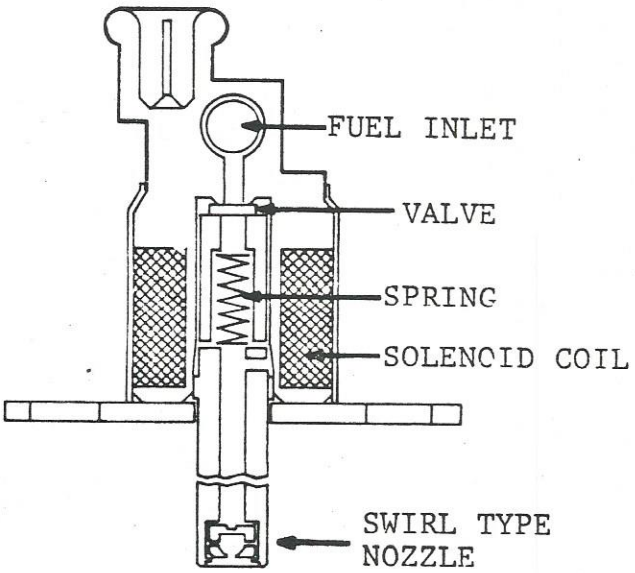
THROTTLE SWITCH



The Throttle Switch is located on the throttle chamber and is controlled directly by the movement of the accelerator pedal.

When the throttle is at the idle stop, the idling switch contacts are closed, causing additional fuel to be injected during idle and providing for smooth acceleration. With the throttle in the full or wide open position, the wide open throttle switch contacts are closed providing additional fuel injection for smooth hi-speed driving performance. The contacts are open when the throttle is in any other position.

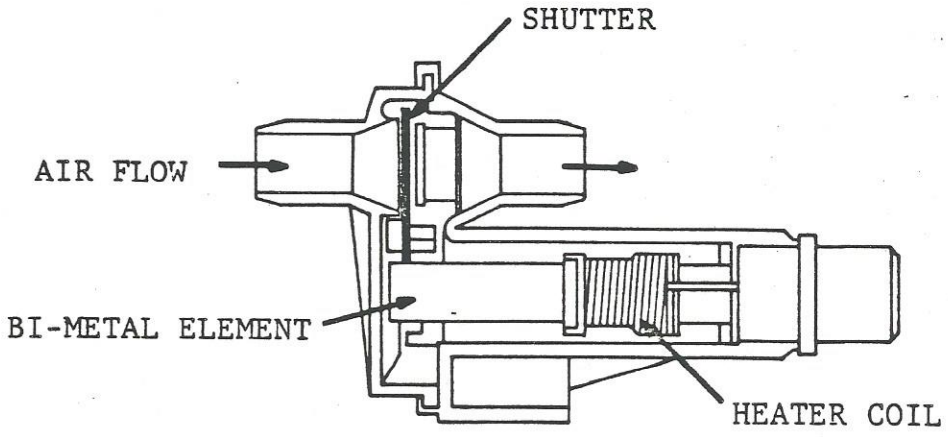
If the engine speed is above 3,200 R.P.M. and the idling switch contacts are closed, as in sharp deceleration, the Control Unit stops the injection of fuel. When the speed drops below 2,800 R.P.M., the fuel injection resumes, providing smooth idling without stopping the engine.



COLD START SYSTEM

The Cold Start System injects additional fuel into the intake manifold after the throttle chamber during the starting operation in cold weather.

The Thermotime Switch contains a bimetalic switch that closes when the temperature is lower than the set point. When the switch closes, the Cold Start Valve injects additional fuel into the intake manifold for smoother cranking and easier starting. To prevent excessive fuel from being injected, a heater coil in the Thermotime Switch warms the bimetalic switch when the ignition is in the START position. Repeated attempts to start the engine results in the opening of the switch, thus stopping the injection of fuel from the Cold Start Valve and preventing flooding.



AUXILIARY AIR REGULATOR

The Auxiliary Air Regulator allows air to bypass the throttle chamber during the warm-up phase.

The regulator contains a shutter that is controlled by a bi-metalic strip. When the underhood temperature is below 80°C (176°F), the bimetalic strip moves the shutter, allowing additional air into the manifold and increasing the engine idle speed.

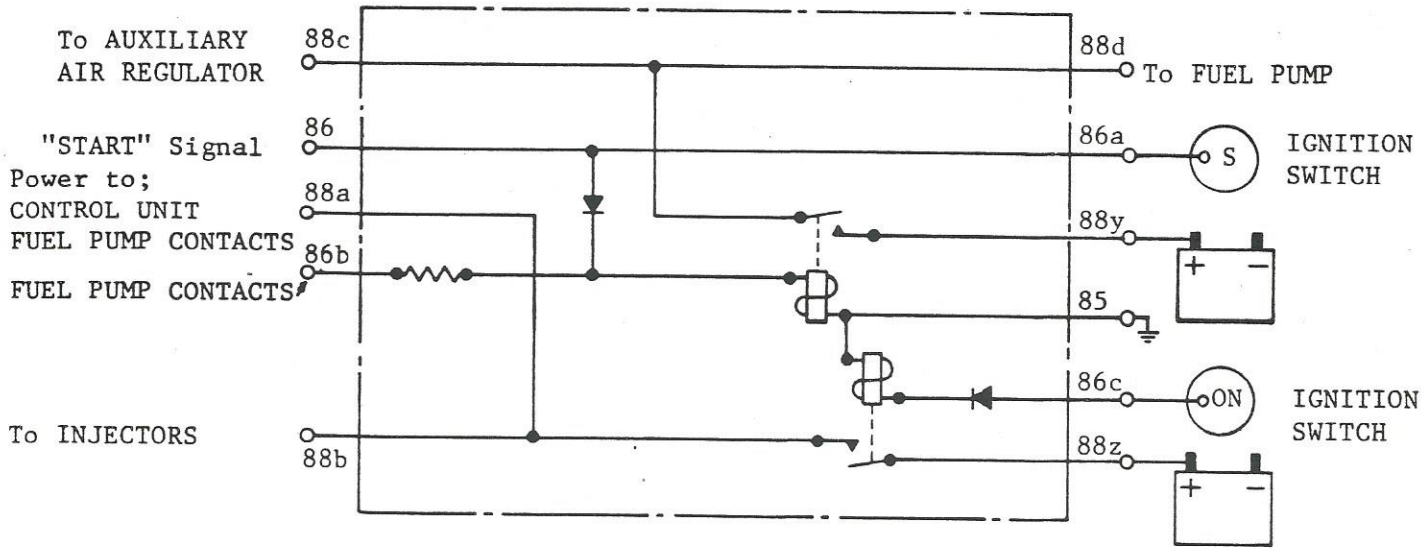
In most systems, the regulator also contains a heater that warms the bimetalic strip when the engine is being cranked or running. As the strip is warmed by the heater, the shutter closes the air passage slowing the engine idle speed. The passage remains closed until the engine is stopped and the temperature drops below 80°C (176°F).

In some systems, the regulator contains a bimetalic element that is warmed by the coolant liquid rather than an electric heater. This does not affect the function of the regulator but it cannot be tested directly.

ALTITUDE COMPENSATOR (NOT SHOWN)

The Altitude Compensator has been added to some cars to improve engine performance at high altitudes where the air is less dense.

The compensator consists of a potentiometer that is controlled by an evacuated aneroid. When the atmospheric pressure is 700 mm Hg (27.56 in Hg) or lower, the aneroid varies the resistance of the potentiometer, causing the air-fuel mixture to be made leaner as the atmospheric pressure decreases.



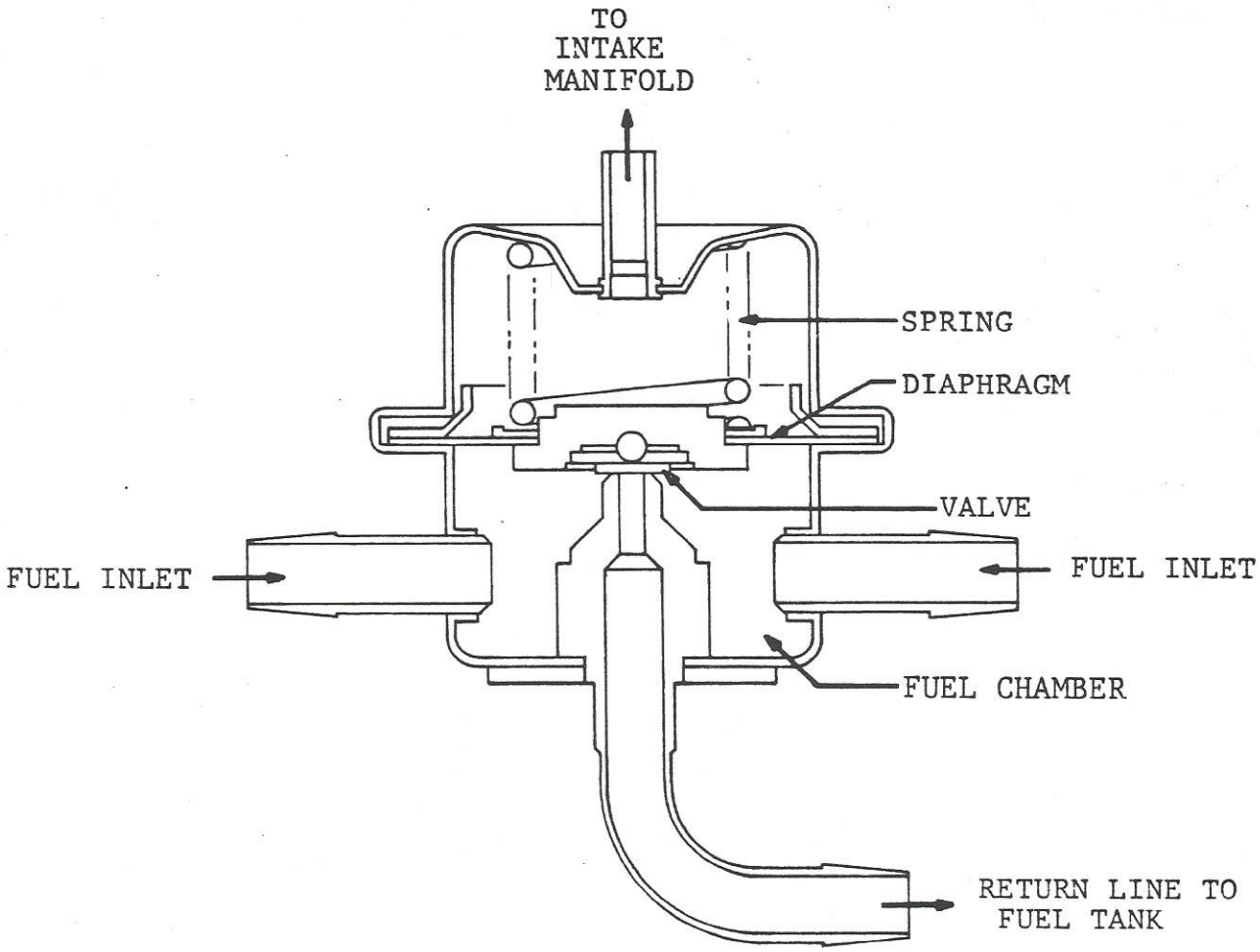
FUEL INJECTION RELAY

The Fuel Injection Relay is actually two relays, one supplies power to the Control Unit, the injectors and the fuel pump contacts in the Air Flow Meter; the other relay supplies power to the fuel pump and the heating element in the Auxiliary Air Regulator.

When the ignition switch is in the START position, both relays are energized providing power to run the injection system. When the engine is running and the ignition switch returns to the ON position, only the relay supplying power to the Control Unit, injectors, and Air Flow Meter contacts remains energized directly by the ignition switch. The relay supplying power to the Fuel Pump and the Auxiliary Air Regulator is energized by the fuel pump contacts in the Air Flow Meter that are closed only when there is air being drawn through the meter.

On some systems using a coolant liquid controlled Auxiliary Air Regulator, the pin number 88c is used to power the Cold Start Relay.

See the wiring diagram on page 40 for the changes incorporated into the power and fuel pump relays on the Toyota systems thru 1981.

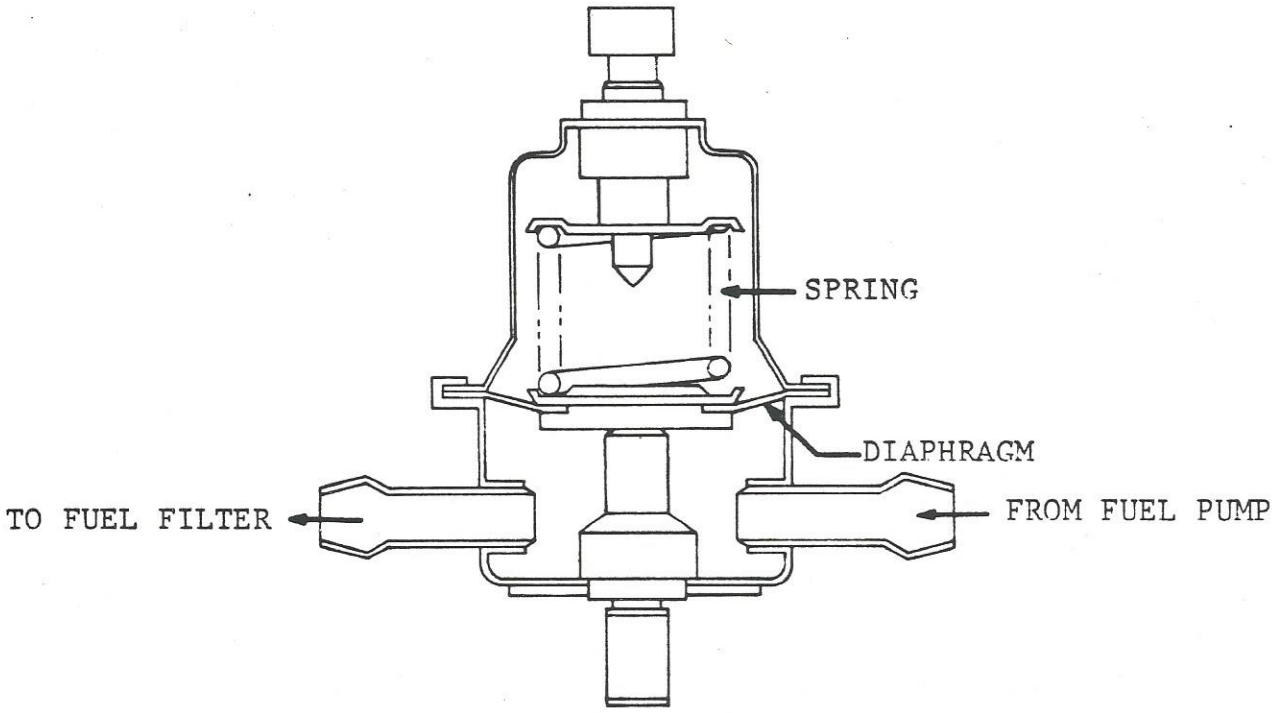


PRESSURE REGULATOR

The Pressure Regulator is designed to control a pressure difference between the fuel pressure and the intake manifold vacuum. Too great a pressure difference would result in the vacuum drawing an excessive amount of fuel through the injectors.

The regulator consists of a diaphragm held against the fuel return line by a spring. When the manifold vacuum and fuel pressure overcome the spring force, the return line opens to allow the fuel to return to the tank, thus lowering the fuel pressure.

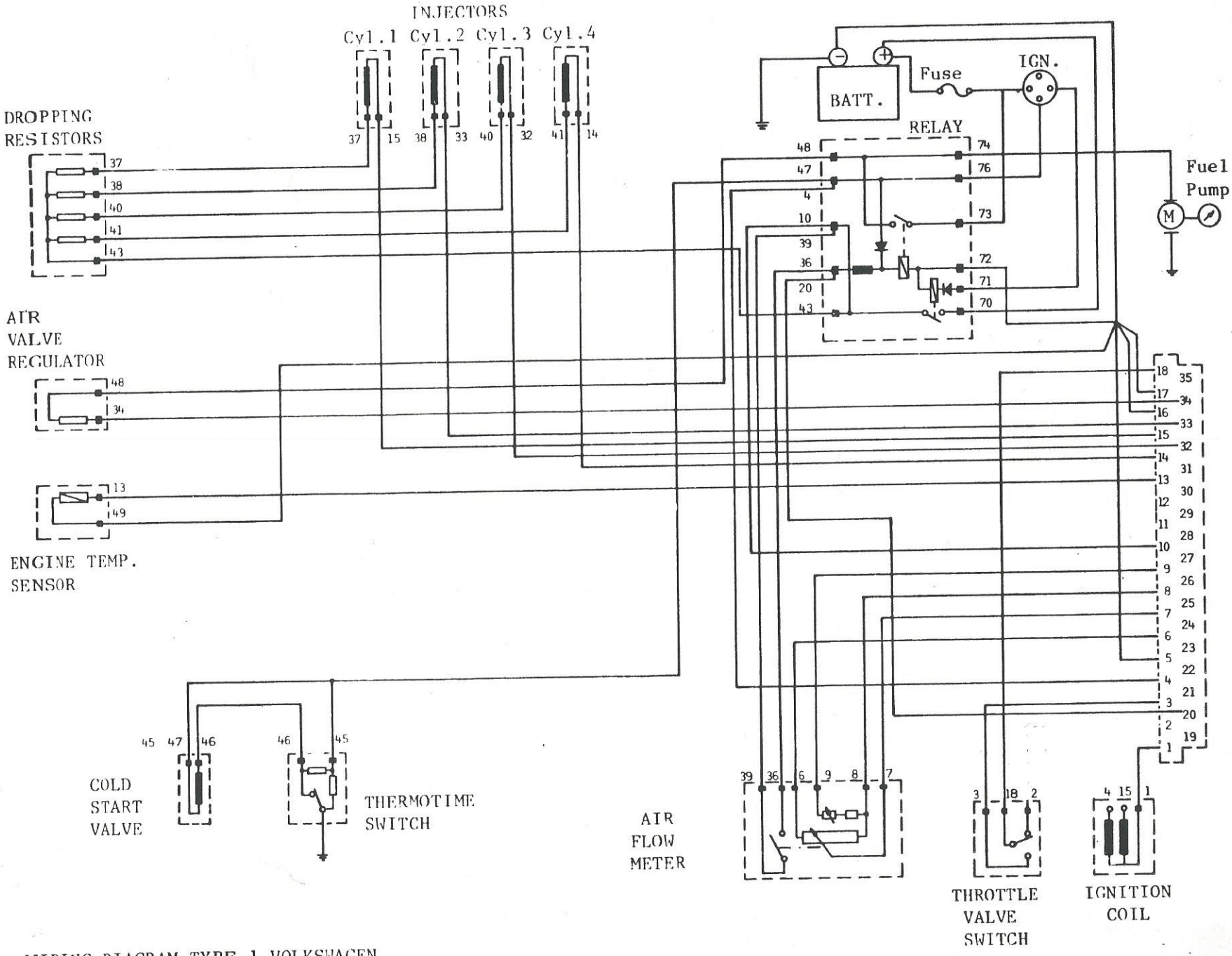
In this manner, the fuel pressure is maintained higher than the intake manifold vacuum by approximately 2.50 kg/cm^2 (35.56 psi.)



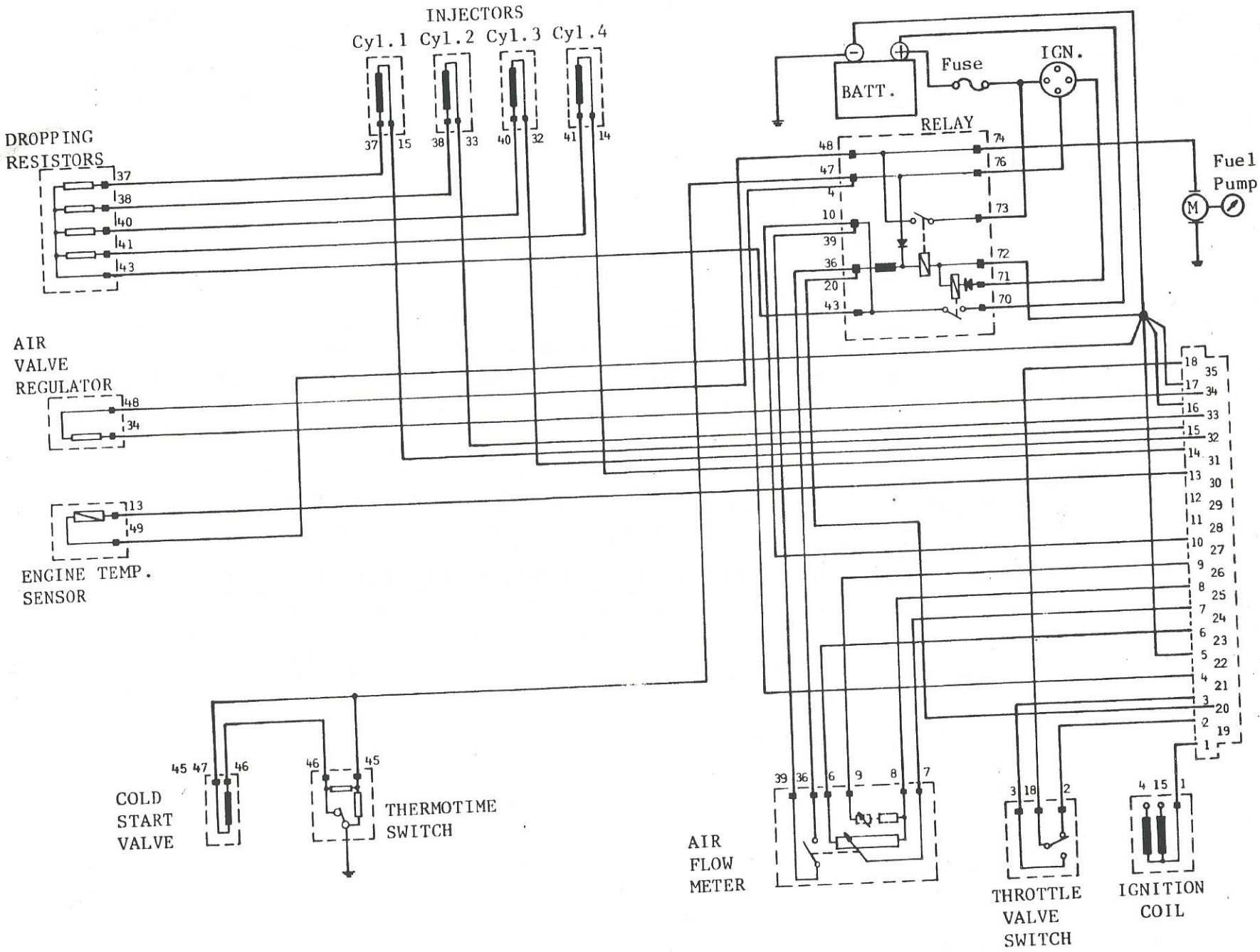
FUEL DAMPER

The Fuel Damper absorbs the pulsation of fuel pressure caused by the fuel pump.

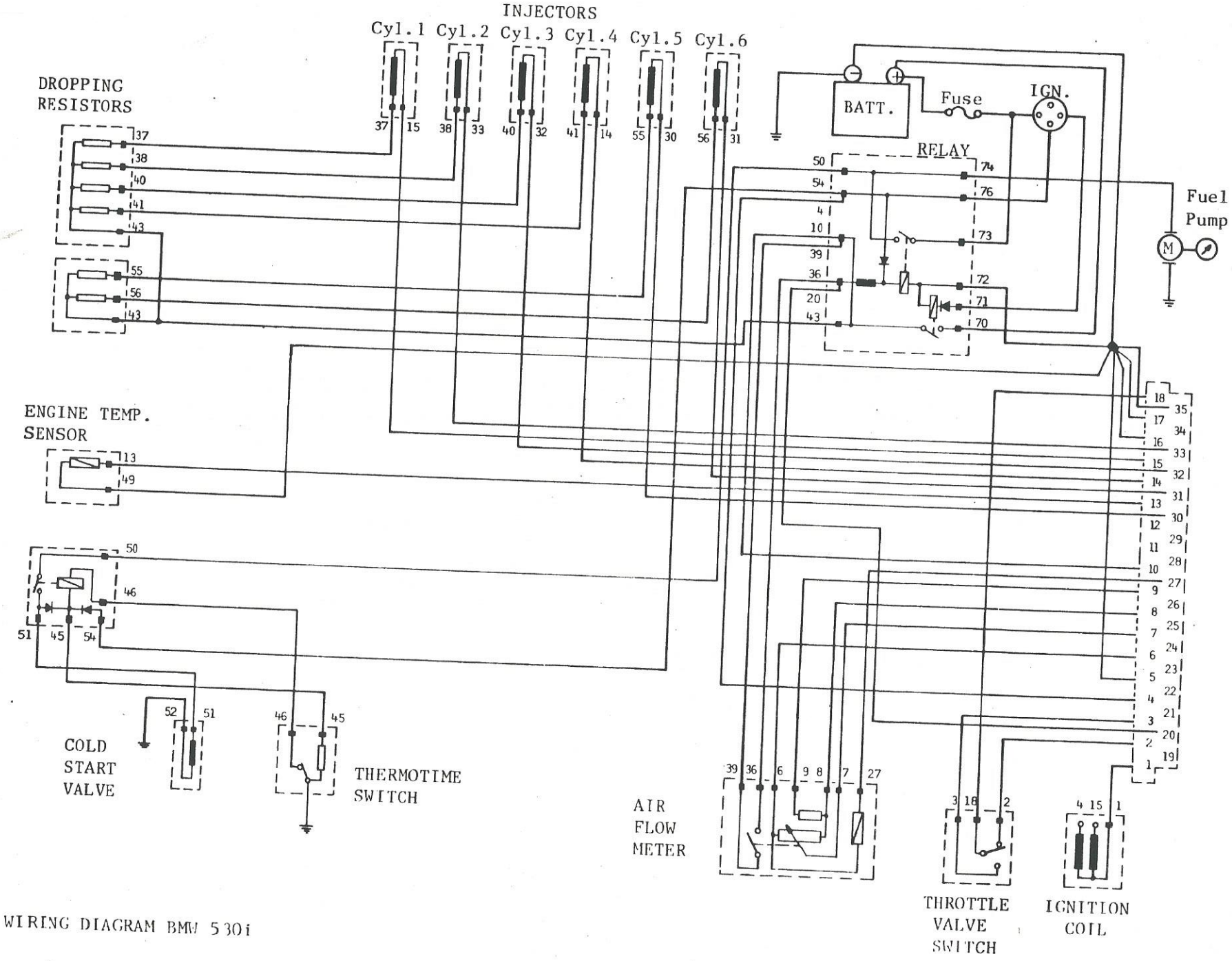
As the fuel pressure surges, the fuel pushes against the diaphragm and the surge is absorbed by the spring. If the pulsations weren't dampened, the fuel would surge out of the injectors and affect the engine performance.



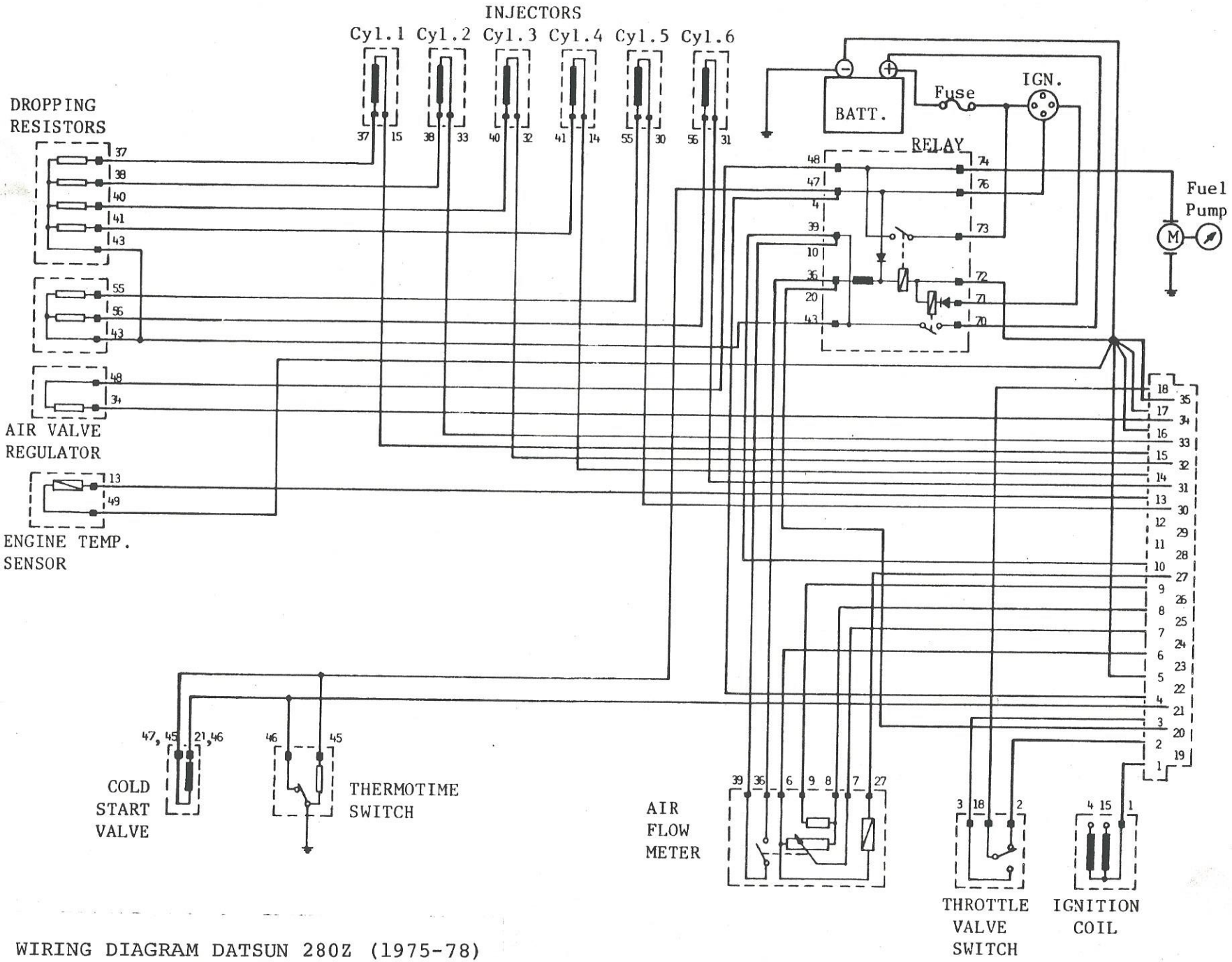
WIRING DIAGRAM TYPE 1 VOLKSWAGEN



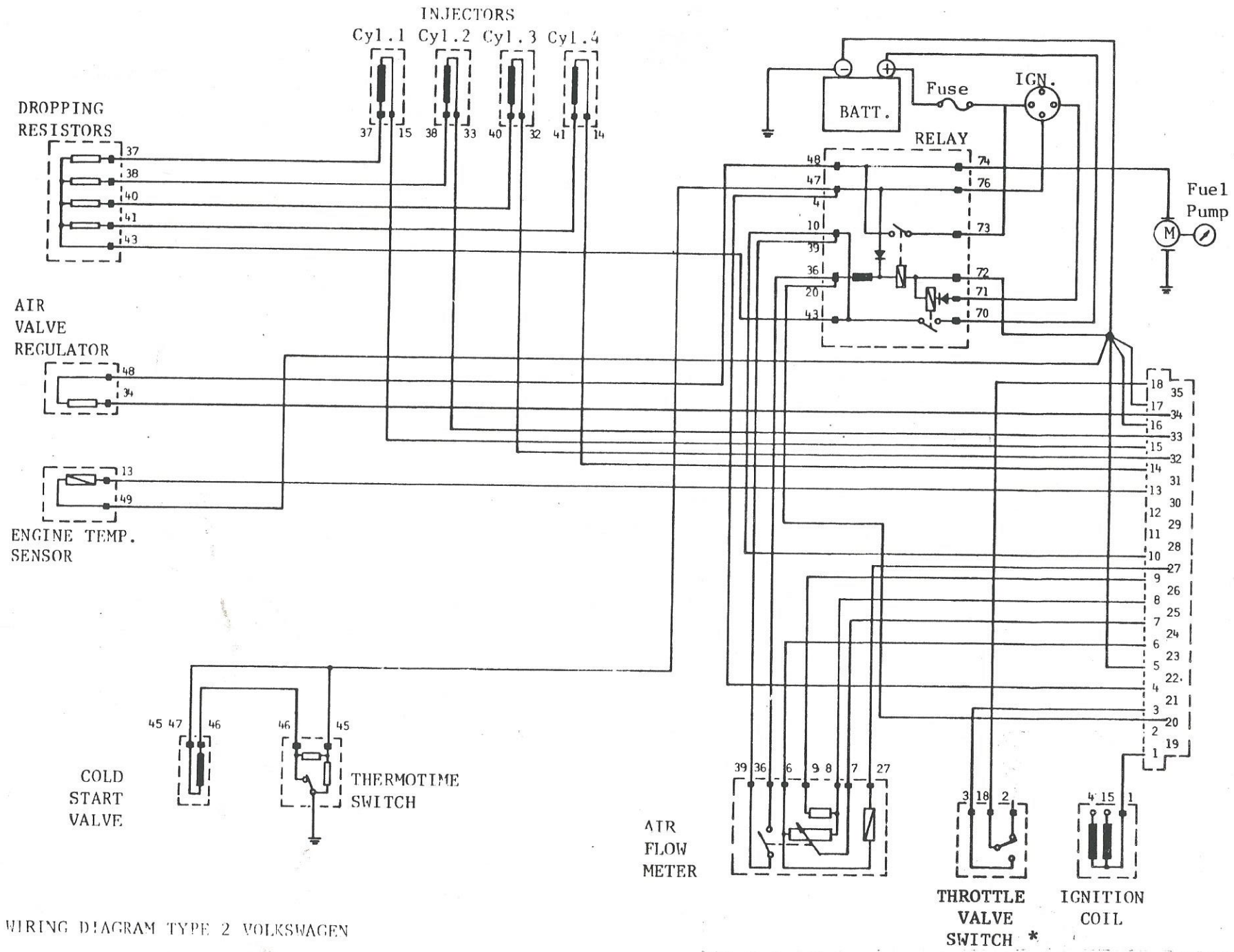
WIRING DIAGRAM 1975 OPEL



WIRING DIAGRAM BMW 530i



WIRING DIAGRAM DATSUN 280Z (1975-78)



WIRING DIAGRAM TYPE 2 VOLKSWAGEN

*Note! Not connected at all on some buses.

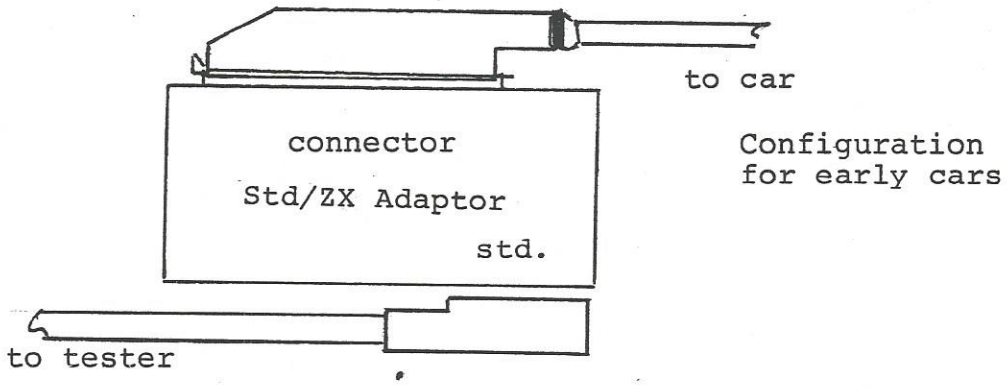
PREPARATION FOR TEST

1. Make sure the IGNITION SW. is OFF, the transmission is either in NEUTRAL or PARK and that the PARKING BRAKE is ON.

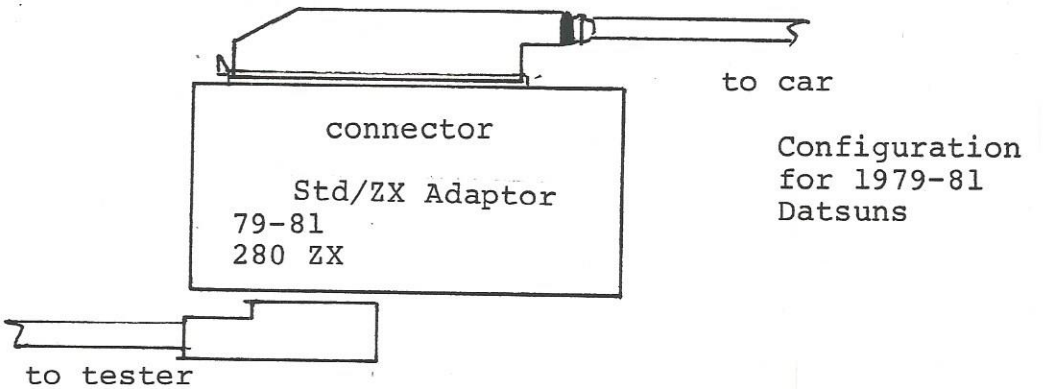
2. Disconnect the car harness connector from the ECU by releasing the spring clip at the cable end of the connector and tilting the connector until the rocker hinge is disengaged.

3. Select the proper adaptor for the particular system being tested. The 811L is supplied with the 811-1 adaptor unless otherwise specified. The 811-1 can be used on all "STD." systems as well as the 1979-81 Datsun 280ZX, 200SX and 810's.
The "STD." positions is to be used for: VW type 4, 2 and 1; Porche 914 and 911; OPEL; BMW 530i; Jaguar 6L.
Generally all cars before 1979 use the "STD." system. But Generally all cars before 1979 use the "STD." system but always check the service manual if in doubt.
(NOTE! Additional adaptors will be made available as the need arrises).

CONNECTING THE TESTER TO THE CAR.



Configuration for early cars



Configuration for 1979-81 Datsuns

STANDARD TEST PROCEDURE

TEST 1. BATTERY VOLTAGE

This position accomplishes several tests at the same time.

1.1 The meter should read above the 12 volt point. If it does, then power is getting to the ECU from the battery and thru the power relay contacts. But we must also test for voltage under load.

1.2 Make sure the hand brake is ON and the transmission is in either PARK or NEUTRAL before starting. Engage the starter for a few seconds and observe the meter reading. The voltage level should drop slightly, but never below 9 volts. This tests the battery leads, relay contacts and condition of the harness

1.3 While the engine is turning over also observe the the RED lights.
The FUEL PUMP light should come ON only while the the starter is engaged.
The IGN. light should blink ON and OFF indicating that the ign points (or electronic ignition) are operating correctly and that this signal is reaching the ECU.
The STARTER light should also come ON as long as the starter is engaged.

TEST 2 AIR TEMPERATURE SENSOR

This test measures the resistance of the air temp. sensor which changes as the air temperature changes. It is located inside the inlet side of the AIR FLOW METER. It is connected to pin 27 of the connector and is not used on all cars. To verify that it is being used, check to see of this pin number is included in the connector on the side of the AIR FLOW METER. If it is not there disregard this test.
If it is missing, then the air temperature is sensed by a portion of the potentiometer built in the AIR FLOW METER and will be tested during the AIR FLOW METER test.
If the sensor is connected then the meter temperature reading should roughly correspond to the outside air temperature or slightly higher if the engine is still warm. This sensor is not critical to operation of the engine. If it is open (indicating a cold air temp.) the car will run RICH when the air is WARM. It could go unnoticed during the winter months. Thus it can contribute to a symptom of poor mileage.

TEST 3 ENGINE TEMPERATURE SENSOR

This test measures the resistance of the ENGINE TEMP. SENSOR located either in the cylinder head area or in the coolant line. This sensor plays a major part in the engine warm-up cycle. Once the engine warms up, it has little effect on engine operation as long as it is operating properly.
The meter should indicate a temperature reading approximately that of the engine or the coolant. Generally, this sensor will not change a small amount. It will either be OPEN, SHORTED or OBVIOUSLY incorrect. As with the air temperature sensor, an OPEN condition will ENRICHEN the mixture but the engine will still operate on most systems.

TEST 4 FUEL INJECTORS AND FUEL SYSTEM

The fuel injectors are closely matched solenoid valves that inject a precise amount of fuel into each cylinder via the intake manifold. They are activated twice per cylinder cycle.
The fuel orifices are very small and suseptible to contamination from water, fuel deposits or foreign material. It is very important that all injectors deliver the SAME amount of juel so as not to create an overly lean mixture in one cylinder. The orifice is opened and closed by a pintel that moves only about .006". Durations for opening are about 2-6 milliseconds when the engine is warm and under normal load.
So in this test we actually operate each injector under conditions that are as close to actual conditions as we can. This will permit us to detect subtle changes in injector operation that would go undetected with a normal flow test.

To perform these tests procede as follows:

4.1 Install the 60 P.S.I. fuel pressure gage into the fuel line at some convient point. Use caution when removing a clamp or hose fitting as pressure can exist in the system even hours after it has been shut down. Be sure and wear safety glasses during all fuel tests. Tighten all clamps securely to prevent leaks.

4.2 Turn on the IGN. switch. Press the "FUEL PUMP" sw on the tester and note how the pressure builds up and to what pressure it reaches.
It should build up to 40-45 P.S.I. in approx 1 second or less.

4.3 Release the FUEL PUMP sw. and note how the pressure behaves. It should stay the same or drop slightly and then stabilize. The pressure should remain at that value for at least 15 minutes.
If the pressure does not stabilize, then there is a leak in the system and it must be corrected before you can proceed with the test.
A leak is usually caused by a loose clamp, bad hose or a leaky cold start valve. If the leak cannot be found then clamp off one injector at a time until the faulty one is located or replace the fuel pressure regulator or the check valve in the fuel pump itself.

4.4 Rotate the INJECTOR SELECTOR sw. to POS. 1 (see chart below for cylinder identification)
Press the INJ. ACTIVATE sw. one time and notice the drop in fuel pressure. Each press of this sw. activates the injector 10 times. Since only a minute amount of fuel is released with each opening it is usually necessary to press the sw. several times to get a meaningful pressure drop, say 5 to 10 lbs. Do not activate the injectors more than necessary to obtain a definite drop in pressure as fuel is actually being injected into the cylinder and flooding could occur.
Note the exact number of times the sw. was pushed and the exact value of the pressure obtained.

4.5 Sw. to the "2" pos. Momentarially press the FUEL PUMP sw. again to restore full pressure and release.

4.6 Now press the ACT. INJ. sw again and note the pressure drop. It should be the same as before with the same number of activations of the switch.

4.7 Repeat the above tests with the remaining cylinders and note the readings.

If all the above readings are the same (within a lb. or so) the injectors are operating correctly. A bad injector will produce a much larger or smaller pressure drop than the others.
Because hoses flex a little differently on each car (even those of the same make and model) exact pressure values cannot be used. It is the DIFFERENCE that is important. All injectors should pass the same amount of fuel in this test. (See service hints)

See supplemental instructions if your car is equipped with an exhaust sensor.

INJECTOR TEST POSITION	WIRE HARNESS NO. (For Std. sys.)
1	15
2	33
3	32
4	14
5	30
6	31
7	N/C*
8	N/C*
ALL	RUN ONLY

* Postions 7 and 8 are for adaptors that will run 8 cylinder cars only.

TEST 5 AIR FLOW METER (RUN)

To test operation of the Air Flow Meter (Air Box) the 811L has a built-in Control unit which allows you to run the engine, manually, so that movement of the Air Vane can be observed under simulated operating conditions.

CAUTION!! When operating the engine using the built-in Control unit observe the same cautions you would excercise if running the engine normally. Make sure:
The transmission is in Neutral, or Park.
The parking brake is set.
All fuel lines are securely tightened.

To run the engine, procede as follows:

1. Turn the "INJECTOR SELECTOR" knob to the "ALL" position.
2. Turn the Mixture Control know to its approx. mid position. (Pointer up)
3. Engage the starter. As the engine starts, turn the Mixture Control knob back towards the LEAN position until the car runs smoothly. (Idle may be slightly high).
4. Open and close the throttle first using "Quick" motions and letting the throttle snap back against the stop. Note the readings on the meter. See if it returns to the same setting and that it does not hang-up either while increasing or decreasing. Operation should be smooth and consistent.
5. Now open and close the throttle "Slowly" and let it gently hit the idle stop. See if the the readings are the same in both cases. They should be the same.
6. Repeat the above several times.

TEST 6 EXHAUST OXYGEN SENSOR

While the engine is running at idle turn the tester to the EXHAUST OXYGEN SENSOR position. The meter should read in or near the Exhaust Sensor sector position.

1. Momentarily turn the Mixture Control on the tester towards the RICH setting just far enough so that the engine will continue to run but under a richer mixture.
2. Leave the control at this setting for several seconds and note the meter reading. It should change slightly.
3. Now return the Mixture Control to the leanest position that will still allow the engine to idle. After several seconds the meter reading should return to its first position.
4. The actual value of the reading is not as important as the change. No readinf at all is an indication that the sensor is not operating. (The normal failure mode).

TESTS USING THE LIGHTS.

Besides the lights used inconjunction with the meter test, there are several more that are used to monitor operation of the simpler components.

TEST 7 GROUND TEST

This light indicates that the SIGNAL ground wire, or at least one of the signal ground wires, is connectd. There are at least 2 grounds on every car. One is a backup for the other, so only one need be connected at any one time. These are separate from the POWER GROUND which is tested automatically in test 1.

This light will be ON when the ground wire is connected.

TEST 8 THROTTLE SWITCH TEST

The THROTTLE SW. is connected to the accelerator and throttle plate (not to the air vane) and monitors the position of the accelerator. There are 2 positions, IDLE and OPEN. To test both sections procede as follows:

The THROTTLE SW. light should LIGHT when the accelerator pedal is at the IDLE position. As the pedal is depressed, the light should go OUT until it nears the full open area. It should then go ON and stay on all the way to the floor.

It should be noted that not all cars use both positions of the switch, so consult the repair manual for the correct information.

The idle position supplies the ECU with starting information during starting and decelleration. Proper starting procedure is to keep your foot OFF the pedal when starting. Also PUMPING the pedal, as with a carburetor equipped car will do no good since all you are doing is operating a switch. Therefore, faliure of this switch at idle will affect cold weather starting and will reduce mileage in city driving.

Failure of the OPEN sw. will affect passing acceleration or wide open throttle operation. This complements the enrichment feature of the fuel pressure regulator.

In addition to the above test, there are other portions of the EFI system that need be tested but do not require the used of the tester at all, or just indirectly. These tests are explained on the following pages.

NOTE! Test lights A and B are spare lights and are not used with the standard adaptor. If they are fuctional there will be instructions for there use included with an adaptor.

ADDITIONAL TESTS

Several components in the EFI system may not be connected directly to the ECU so must be checked separately. These items can be tested using the following procedures.

COLD START SYSTEM.

The cold start system consists of a Thermo-time Sw., a solenoid fuel valve (injector) and in some systems, a relay. When the engine temperature is lower than the setting of the Thermo-time sw. the switch closes which opens the solenoid valve (during starting only). At all other times, the system in inactive.

Checking the Thermo-Time Switch

Remove the cable from the switch. Use an ohmmeter and touch one lead to a clean spot on the chassis. Touch the other lead to switch pin 46. The meter should read OPEN if the engine temperature is above about 100°F and VERY LOW resistance if the engine is cold (about 75 ohms).

Checking the Solenoid Fuel Valve

Remove the cable from the valve. Touch one lead of an ohmmeter to each of the pins. The reading should be approx. 4 ohms.

To check the actuation of the valve , reconnect the plug on the valve. Disconnect the plug on the Thermo-time sw. and short pin 46 in the sw. cable to the chassis. Turn the ign switch to START and listen for the solenoid to CLICK. Use caution as fuel will spray into the engine.

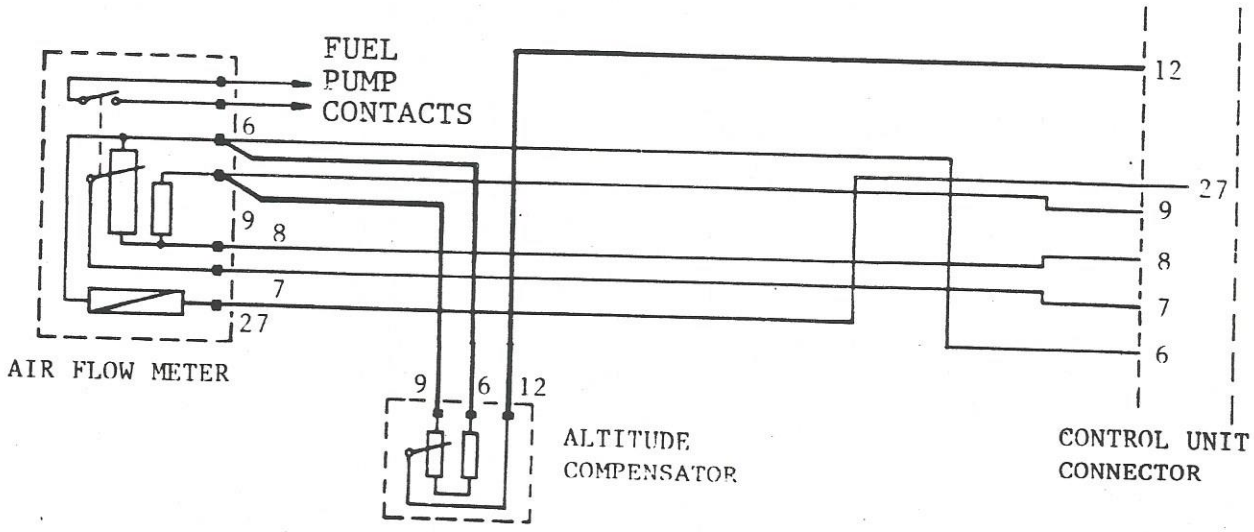
AUXILLARY AIR REGUALTOR

Check the air flow through the regulator by disconnecting the hoses on both sides of the regulator. Blow through the regulator and feel for air on the other side.
The shutter should be closed at temperature s above about 100°f. and closed below.
To check the continuity of the heater coil, disconnect the plug on the regulator and touch the leads from an ohmmeter to the pins. If the reading indicates there is continuity, the heater coil is good. If the reading is OPEN, the the coil is faulty.

ALTITUDE COMPENSATOR

Disconnect the plug at the altitude compensator. Note, not all cars will be equipped with this device. It is normally inserted in the cable running to the Air Flow Meter or is located near the glove compartment. See the diagram below and with an ohmmeter, resistance should be obtained between pins 9,6, and 12.
The altitude compensator is not required for proper operation of the EFI system below about 5,000 ft and may be removed. To take it out of the system, just unplug it and mate the normal connectors in the EFI harness.

PINS	READINGS
6-9	6,000 ohms
6-12	1,500 ohms



TROUBLESHOOTING CHART

Use this guide to aid in troubleshooting a fuel injection system. Locate the symptoms or problem in the left column and check for the items in order as listed at the right. Always verify the complaint making sure that no operating errors have been made that the battery is properly connected and charged.

WON'T START	IGNITION SYSTEM FAULT
	LEAKING HOSE IN AIR SYSTEM
	LEAKING INTAKE AIR
	FAULTY WIRING HARNESS CONNECTION
	FAULTY INJECTORS
	FAULTY FUEL SUPPLY SYSTEM
	FAULTY ENGINE TEMPERATURE SENSOR
	FAULTY COLD START SYSTEM
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE
WON'T START WHEN ENGINE IS COLD	FAULTY COLD START SYSTEM
	FAULTY WIRING HARNESS CONNECTION
	STARTER MOTOR FAULT
	LEAKING HOSE IN AIR SYSTEM
	LEAKING INTAKE AIR
	FAULTY IGNITION SYSTEM
	FAULTY AUXILIARY AIR VALVE
	FAULTY ENGINE TEMPERATURE SENSOR
	FAULTY FUEL SUPPLY SYSTEM
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE

WON'T START WHEN ENGINE IS HOT	FAULTY VALVE ADJUSTMENT
	INCORRECT ENGINE TIMING
	FAULTY FUEL SUPPLY SYSTEM
	FAULTY WIRING HARNESS CONNECTION
	LEAKING HOSE IN AIR SYSTEM
	LEAKING INTAKE AIR
	FAULTY ENGINE TEMPERATURE SENSOR
	FAULTY COLD START SYSTEM
	FAULTY IGNITION SYSTEM
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE
ENGINE STARTS THEN STALLS	FAULTY WIRING HARNESS CONNECTION
	LEAKING HOSE IN AIR SYSTEM
	LEAKING INTAKE AIR
	FAULTY FUEL SUPPLY SYSTEM
	FAULTY COLD START SYSTEM
	FAULTY AUXILIARY AIR REGULATOR
	FAULTY ENGINE TEMPERATURE SENSOR
	FAULTY CONTROL UNIT
	FAULTY INJECTOR

IDLE SPEED TOO HIGH	FAULTY THROTTLE VALVE SWITCH
	INCORRECT IDLE SPEED SCREW ADJUSTMENT
	FAULTY WIRING HARNESS CONNECTION
	LEAKING HOSE IN AIR SYSTEM
	LEAKING INTAKE AIR
	FAULTY AUXILIARY AIR REGULATOR
	FAULTY FUEL PRESSURE SYSTEM
	FAULTY IGNITION SYSTEM
ERRATIC IDLING	LEAKING INTAKE AIR
	FAULTY WIRING HARNESS CONNECTION
	LEAKING HOSE IN AIR SYSTEM
	FAULTY THROTTLE VALVE SWITCH
	FAULTY THROTTLE LINKAGE
	FAULTY INJECTOR
	FAULTY IGNITION SYSTEM
	FAULTY AUXILIARY AIR REGULATOR
	FAULTY IDLE SPEED SCREW ADJUSTMENT
	FAULTY COLD START SYSTEM
	FAULTY FUEL SUPPLY SYSTEM
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE

ENGINE MISFIRES	FAULTY WIRING HARNESS CONNECTION
	FAULTY IGNITION SYSTEM
	LEAKING INTAKE AIR
	LEAKING HOSE IN AIR SYSTEM
	FAULTY SPARK PLUGS
	FAULTY FUEL SUPPLY SYSTEM
	FAULTY ENGINE TEMPERATURE SENSOR
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE
ENGINE BACKFIRES	FAULTY WIRING HARNESS CONNECTION
	FAULTY IGNITION SYSTEM
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE
HIGH FUEL CONSUMPTION	FAULTY FUEL SUPPLY SYSTEM
	FAULTY COLD START SYSTEM
	INCORRECT ENGINE TIMING
	INCORRECT COMPRESSION
	CLOGGED FILTERS
	FAULTY ENGINE TEMPERATURE SENSOR
	FAULTY IGNITION SYSTEM
	FAULTY WIRING HARNESS CONNECTION
	LEAKING INTAKE AIR
	FAULTY THROTTLE VALVE SWITCH
	FAULTY AIR FLOW METER
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE

POOR ENGINE PERFORMANCE	FAULTY VALVE ADJUSTMENT
	INCORRECT COMPRESSION
	INCORRECT ENGINE TIMING
	FAULTY IGNITION SYSTEM
	FAULTY FUEL SUPPLY SYSTEM
	FAULTY THROTTLE LINKAGE
	LEAKING INTAKE AIR
	FAULTY WIRING HARNESS CONNECTION
	LEAKING HOSE IN AIR SYSTEM
	FAULTY COLD START SYSTEM
	FAULTY INJECTOR
	FAULTY ENGINE TEMPERATURE SENSOR
POOR ACCELERATION	LEAKING HOSE IN AIR SYSTEM
	LEAKING INTAKE AIR
	FAULTY FUEL SUPPLY SYSTEM
	FAULTY WIRING HARNESS CONNECTION
	FAULTY IGNTION SYSTEM
	FAULTY ENGINE TEMPERATURE SENSOR
	FAULTY AIR TEMPERATURE SENSOR
	FAULTY THROTTLE LINKAGE
	IF ALL THE ABOVE ARE CORRECT THE PROBLEM IS OTHER MECHANICAL OR ELECTRICAL FAILURE

SUPPLEMENTAL INFORMATION

1979-81 DATSUN 280-ZX

Nissan redesigned the "L_JETRONIC" EFI system in 1979 to incorporate an exhaust oxygen sensor which would help maintain tigher control over the mixture ratio and help meet the stiffer emissions standards.
This sensor "Measures" the amount of oxygen in the exhaust and "Tells" the ECU to adjust the time the injectors are open thus altering the amount of fuel to the engine. In this way the mixture can be run extremely lean, without lean missfiring, and still respond to the needs of acceleration and load demands.
Unfortunately, when redesigning the ECU all the pin assignments were changed making them different than any other cars on the road. Therefore, caution should be exercised when using the 810 to insure that the proper adaptor or connector are used.
To accomodate this change the 810 encorporates a cable connector that can accomodate the STANDARD or the '79 and later 280ZX configurations.
Be sure and check the service manual for the car under repair and any notes that might appear on the ECU box itself before connection the tester to the car's cable harness. Consult the following picture for connections to this year car.

SEE PAGE 21 FOR CORRECT CONNECTIONS TO THE CAR AND PAGE 40 FOR THE NEW WIRING DIAGRAM.

CABLE CONNECTIONS FOR THE 1979 AND LATER 280ZX

TEST PROCEDURE FOR THE 1979 AND LATER 280 ZX

Follow all the STD. test procedures but add the following to test 5 (Fuel injector test).

5.8 With the fuel remaining in each cylinder from the above tests, note the reading on the meter. It should read in the first 25% of the scale. Engage the starter. As the engine fires and runs, the needle should fluctuate up scale and return as the engine dies.

SERVICE NOTES

PROBLEMS ASSOCIATED WITH THE AIR FLOW METER

One commom problem with the "L-JETRONIC" EFI system is its suseptibility to air leaks between the air box and the engine and even the engine itself. Any leak in the intake manifold, air hoses, vacuum system, etc. changes the back pressure on the air vane and puts it out of calibration. To prove this, let the engine set at idle, warmed up, and remove just the oil dip stick and the oil filler cap. Note the change in RPMs. Since these shifts in operating points indicate that there is something wrong with the AIR FLOW METER, either it is needlessly replaced or attempts to recalibrate it are done in the field without the proper test equipment.
Repairs attempted consist of:

A. Large adjustments to the air bleed screw.
B. Retensioning of the air vane return spring.
C. Repositioning of the potentiometer arm.

Once these adjustments are altered, later repair of the "Leak" may not restore proper operation.
The following suggestions and repair tips are included in this manual as a starting point only; or when a rebuilt AIR METER is not available.

ADJUSTING THE AIR BYPASS SCRESW (IDLE ADJUST)

1. Connect an infra-red HC/CO analyzer to the exhaust of the car after it is warmed up and running at idle.
2. Adjust the air bypass until the correct idle RPM is obtained. Note the HC/CO readings both at idle and at 2500 RPM. If both are within specifications for that model and year car then the air box is operating correctly.
3. If the engine has a separate, mechanical or other air bleed adjustment for idle RPM adjustment, then use this to adjust speed and the adjustment on the AIR FLOW METER to adjust the idle HC/CO level.
4. If the bypass setting is so far out that adjustment is difficult, then run this screw completely down (clockwise) and then back it out 3 complete turns. Use this as a starting point and run the above tests again.

Air leaks can also be detected with the infra-red meter by spraying ether or starting fluid around the intake air paths and looking for increases in the exhaust readings.

ADJUSTING THE TENSION SPRING

If the above tests indicate there are no air leaks and the readings are OK at idle but fall off or engine performance is poor at HIGH RPMs then check the large black cover on the air flow meter. If it has been opened it is possible that the spring has been wound up, or down, to compensate for an air leak in the past.

Adjust the tension on the spring until the infra-red readings track well between idle and 2500 RPM and performance is satisfactory.

ADJUSTMENT OF THE POTENTIOMETER ARM

If the cover has been removed from the AIR FLOW METER box and the infra-red readings cannot be brought close to the desired levels, then it is possible that the arm position has been changed. First check to see that it is tight. With the engine running at the connect idle RPMs, or as close as you can get it, adjust the arm by loostening the lock screw and then moving it with a screwdrive between the small gear sector teeth and the body. Move it until the idle HC/CO readings are correct and retighten. Check high speed performance and reset to finer settings if required. Besure to re-tighten the lock screw and replace the cover.

MISCELLANOUS HINTS AND SERVICE TIPS,

Here are some hints we have run across during our field trips that may save you repair time.

FUEL FILTER.

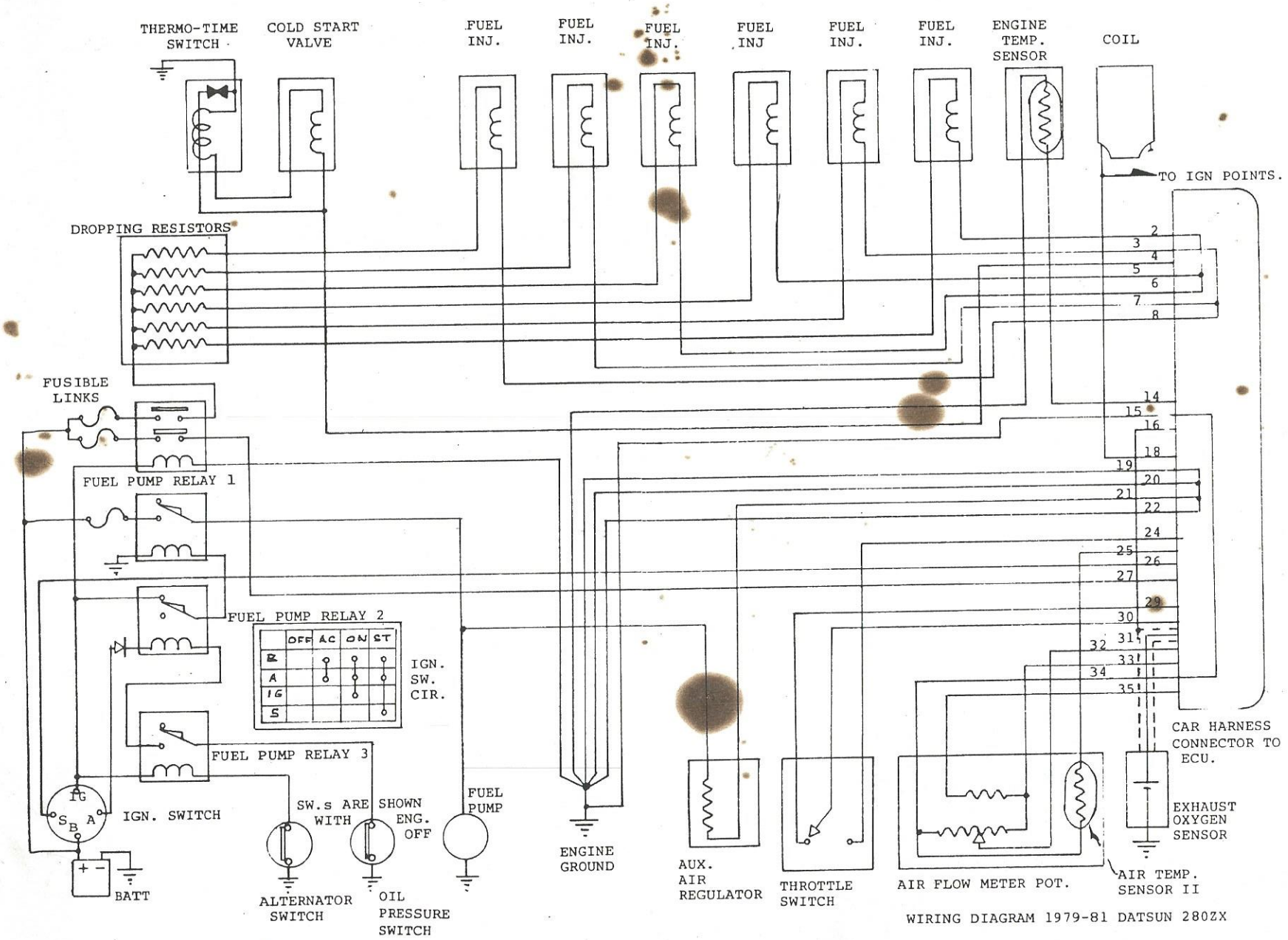
The fuel filter is the most overlooked component in the EFI system. It must separate all foreign material (and water) from the fuel. In doing so it becomes clogged up and fuel flow becomes restricted. This reduces the AMOUNT of fuel that can pass thru. Under normal demands a restriction may go unnoticed. But when demand increases, for a long period of time, the fuel volume may fall off and the engine begin to run extremely lean. Such conditions exist when going up a long hill or when passing at freeway speed. Low speed operation by never be impaired. When a customer complains of these symptoms it is best to replace the filter in any case. Even if it has only been a few thousand miles since it was replaced. As much as 3 or 4 thousand miles can clog up a new one if the gas or tank are contaminated.

RESTRICTED FUEL INJECTORS

Almost all cases of faulty injectors will be detected by the tester during the FUEL INJ. test. However, there are times when ALL injectors become restricted together and performance is degraded on all of them at the same time. This happens if they become coated with varnish or gas deposits and the orfice opening becomes progressively restricted.
If this is suspected, remove one injector and substitute a new injector in its place. Then repeat the INJ. FLOW test and see if the new one registers different readings than the old ones.

ECU BACKUP

Locate and keep a known good ECU on hand. Use a 6 cylinder model since they will also operate a 4 cylinder car. Be sure and get one of the standard units (such as from a type 412 VW, 914, etc.) as well as one of the new ones for the 1979 and later 280ZXs



WIRING DIAGRAM 1979-81 DATSUN 280ZX