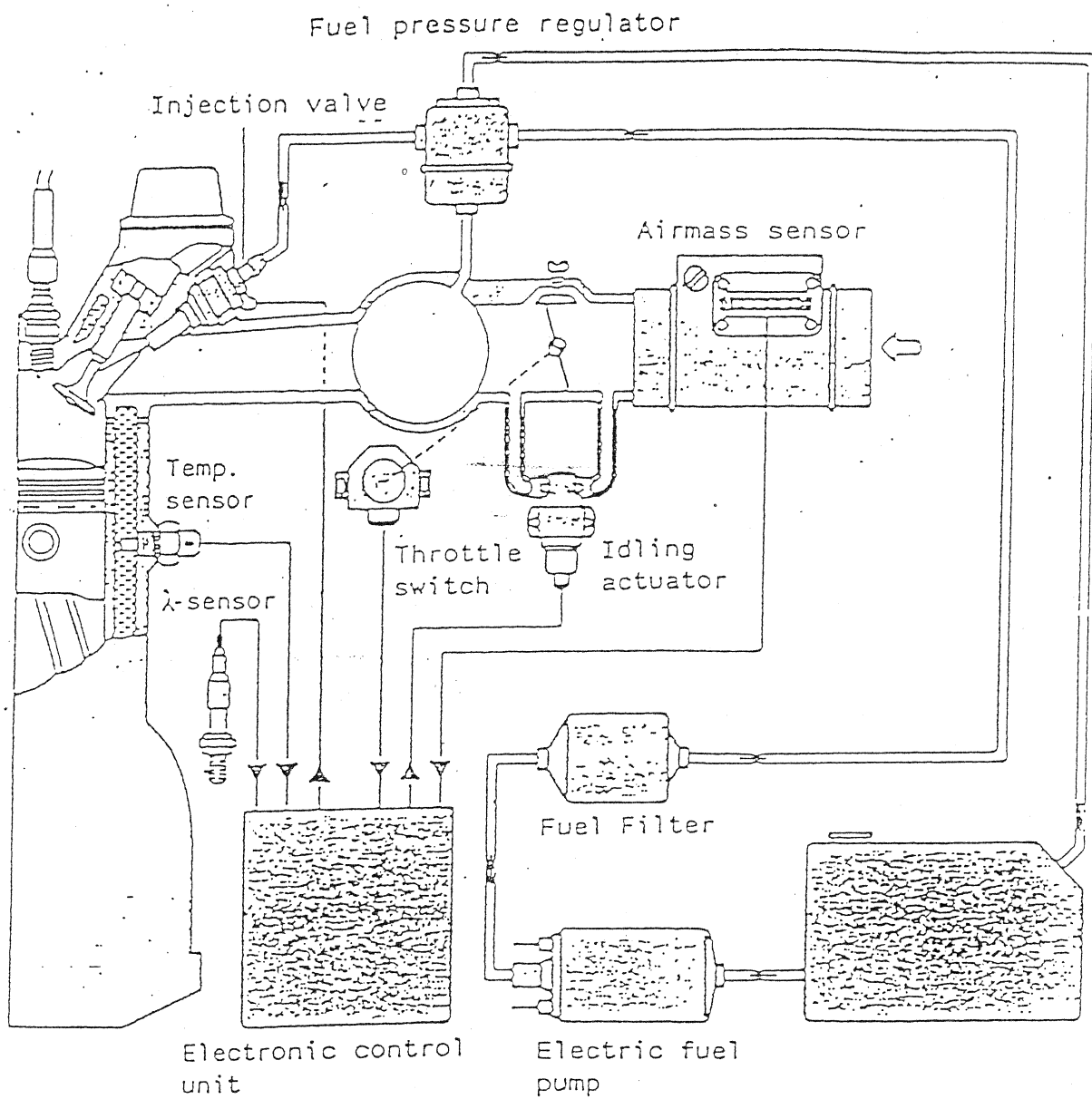


LH2 JETRONIC & MOTRONIC

L - Jetronic

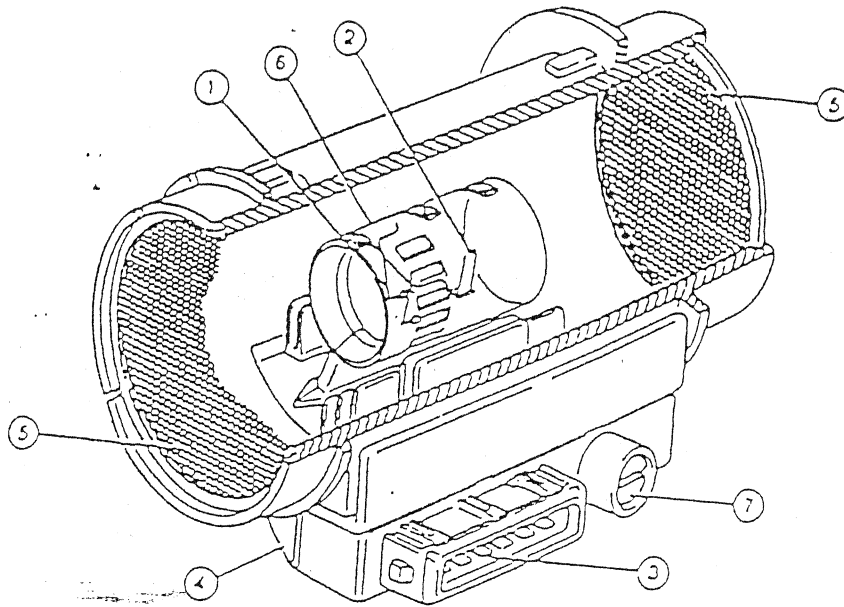
LH2 - Complete system

LH2 - Jetronic: complete system

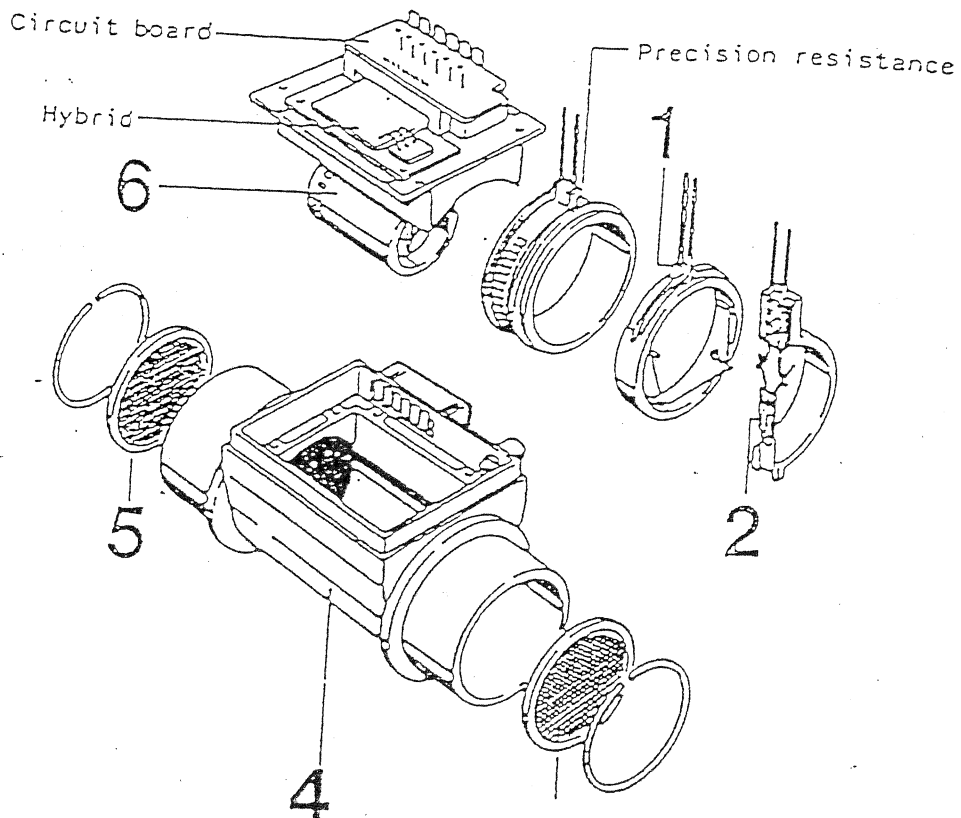


L - Jetronic

Hot wire airmass sensor



HEATED TO 100° ABOVE INTAKE TEMPERATURE - MEASUREMENT OCCURS EVERY 1ms.



Hot-wire airmass sensor

CO setting (general)

01. Name the components

1. HOT WIRE.
 2. TEMPERATURE COMPENSATION RESISTOR.
 3. PLUG.
 4. CASING.
 5. PROTECTIVE MESH.
 6. INNER TUBE.
 7. CO POTENTIOMETER.
-

02. Where is the CO setting made?

L/LE/LU - JETRONIC: AIR BY-PASS BLEED
L3/LH - JETRONIC: POTENTIOMETER (MOTRONIC)

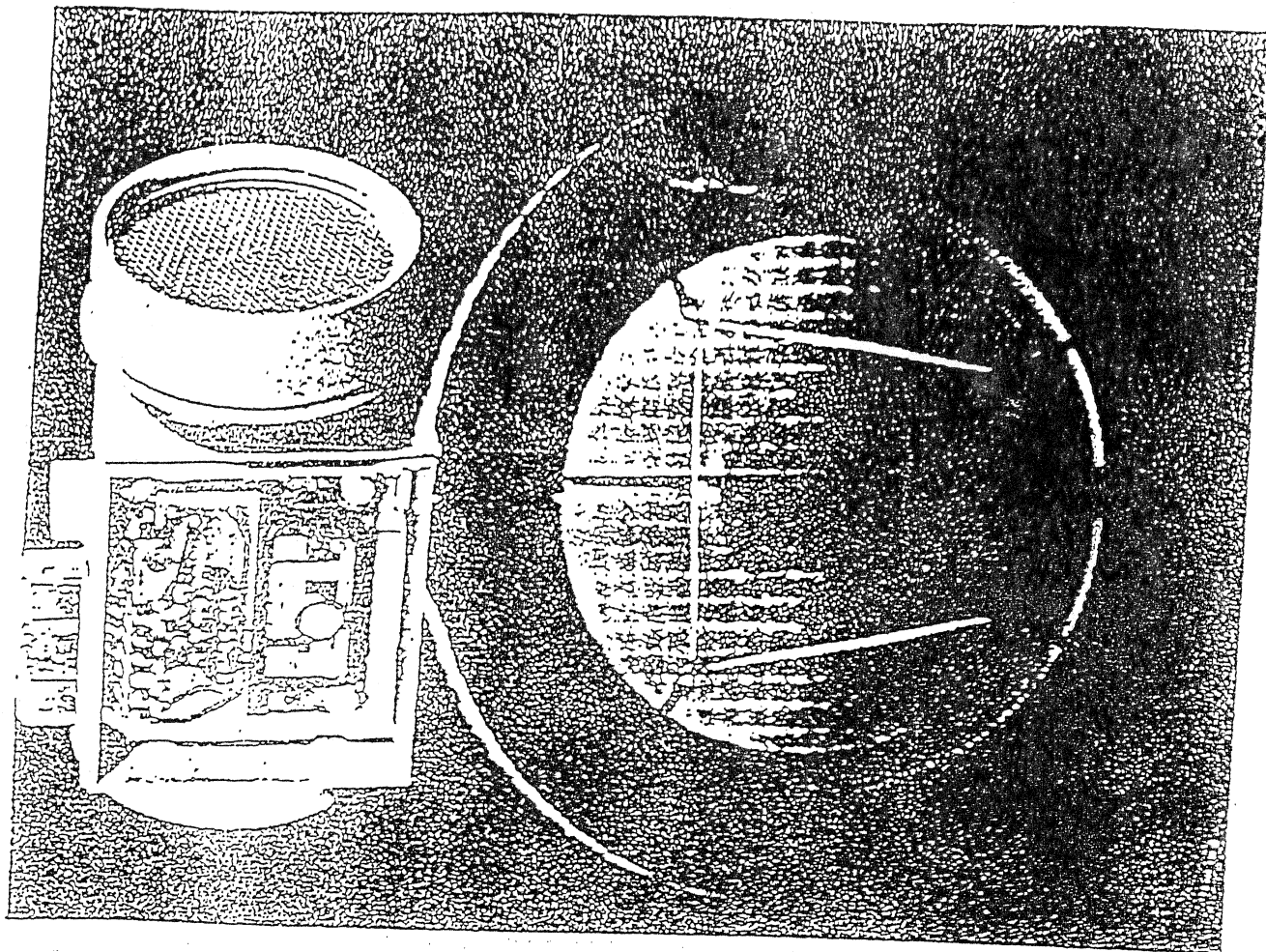
.....

03. What points should be noted before/during the CO setting?

ALL SETTINGS CORRECT - AIR FILTER MUST BE IN POSITION

.....

HOT WIRE - AIR MASS METER



BURN-OFF - WIRE IS HEATED TO 1000°C

TESTS:

VISUAL CHECK - BURN-OFF

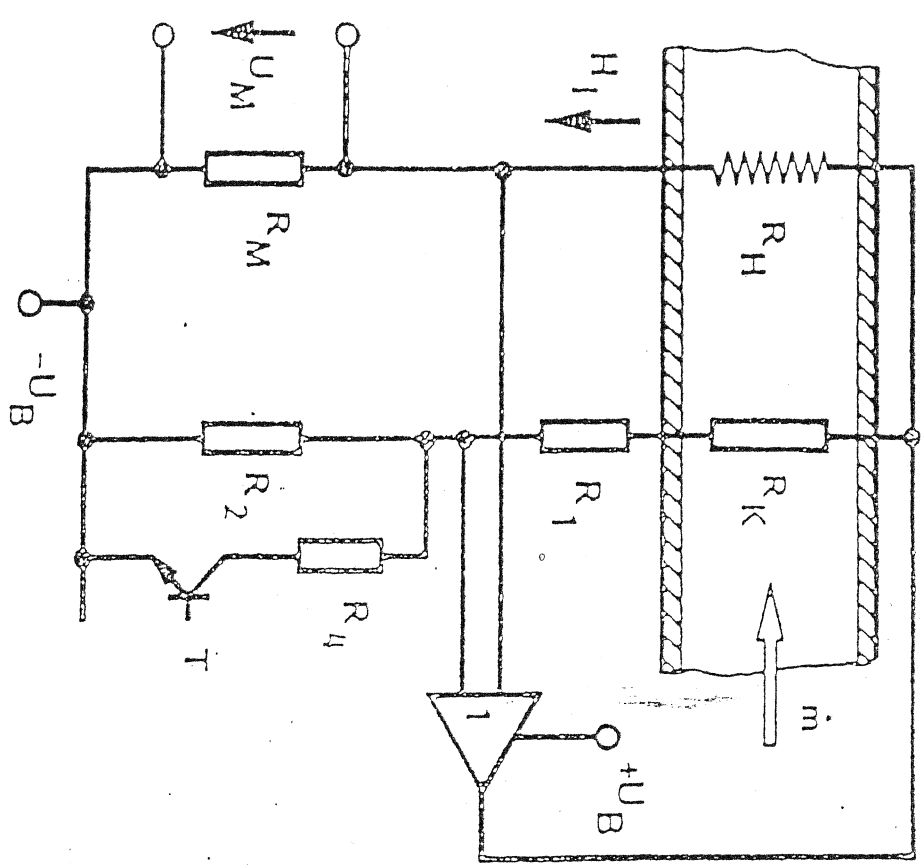
BURN-OFF OCCURS AFTER 4 SECS WHEN IGNITION IS SWITCHED OFF FOR 1 SEC.

ENGINE MUST BE ABOVE 60°C - MUST HAVE RUN OVER 3000 RPM.

NO BURN-OFF OCCURS IF ENGINE SPEED IS BELOW 200RPM WHEN IGN IS SWITCHED OFF.

.....

HOT WIRE - AIR MASS METER BLOCK DIAGRAM



BLOCK DIAGRAM - HOT WIRE - AIR MASS METER

- 1 = REGULATED SUPPLY AMPLIFIER
- R_K = AIR COMPENSATION RESISTOR (TEMP)
- R_H = HOT WIRE
- I_H = HEATING CURRENT
- R_M = MEASURING RESISTOR
- U_M = OUTPUT VOLTAGE (DEPENDANT ON THE INDUCTED AIR MASS)
- R_1 = BRIDGE CIRCUIT RESISTOR
- R_2 = TRIMMING RESISTOR (LINEAR)
- R_4 = TRIMMING RESISTOR (BURN FREE TEMP)
- T = TRANSISTOR FOR BURN FREE FUNCTION
- U_B = APPLIED VOLTAGE
- $\dot{m}$ = AIR MASS

CONVERTER CIRCUITS

POWER END STAGE

U_B

STABIL -
ISATION

OSCILL -
ATOR

IO

CPU

RAM

ROM

BURN -
FREE

HOT
WIRE

INJECTION

INJECTORS

END -
STAGE

DIGITAL
PROCESSING

RM'L,

R MASS

SINE TEMP, r

TERY
TAGE

NOTICE
INAL

TCH

-SENSOR

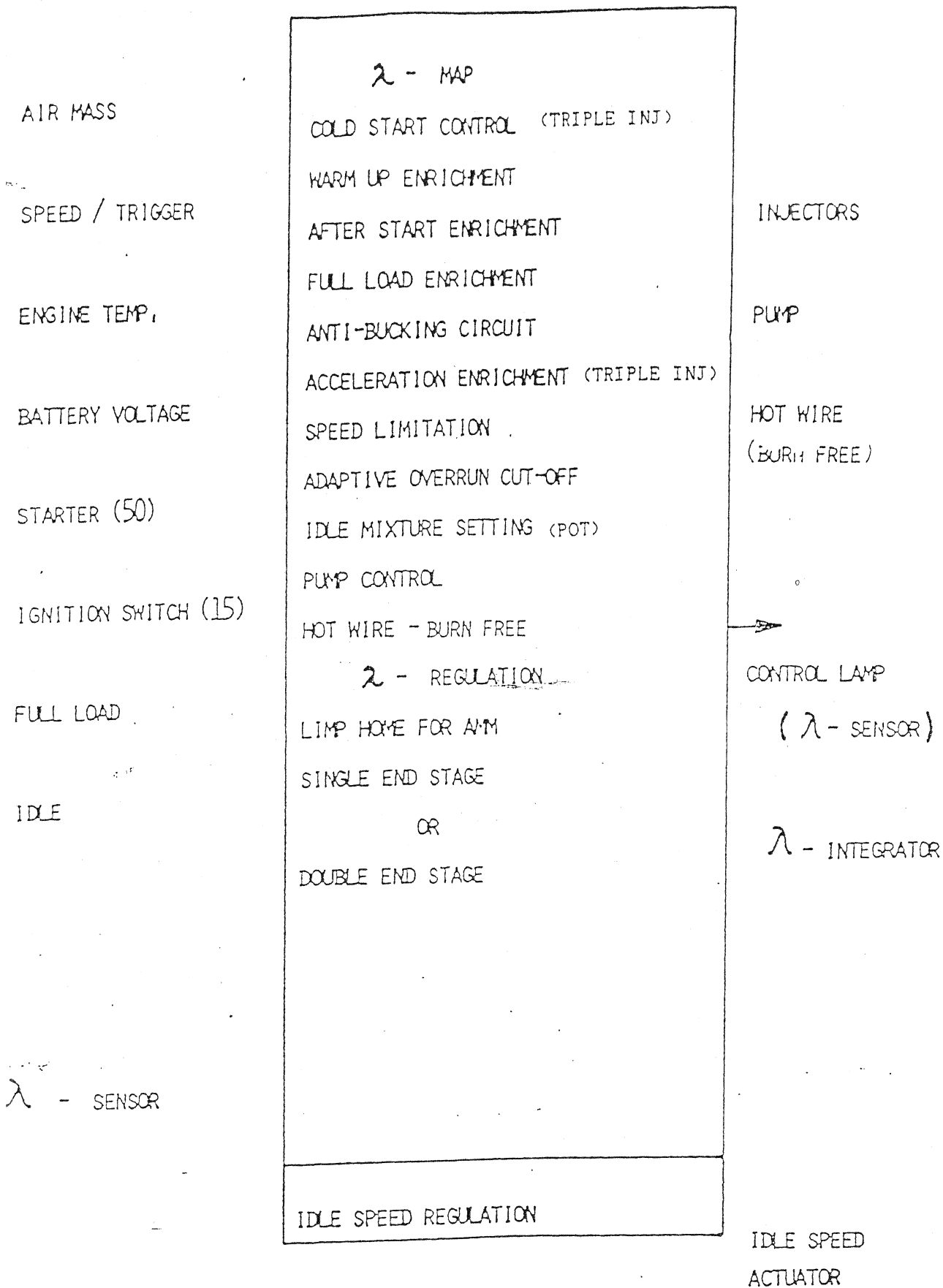
U_B

RELAY

FUEL PUMP

ECU SWITCHES SAFETY CIRCUIT

FUEL MAP



FUNCTION DIAGRAM LH - JETRONIC

2ND GENERATION

IDLE SPEED REGULATION (LDR/LFR)

ADVANTAGES : - CONSTANT IDLE SPEED THROUGHOUT THE ENGINES LIFE

- REDUCED IDLE SPEED POSSIBLE

- COMPENSATION OF LOAD CHANGES

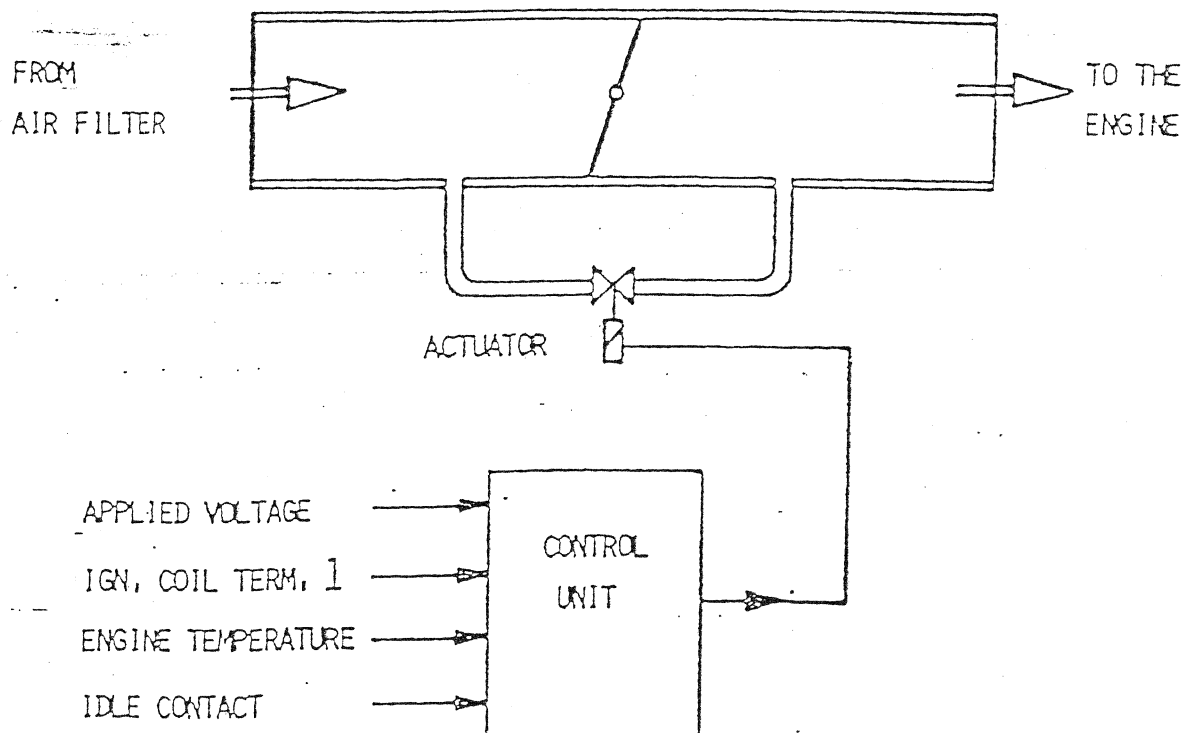
- ADDITIONAL INPUTS POSSIBLE

- TEMPERATURE DEPENDANT IDLE SPEED INCREASE (COLD)

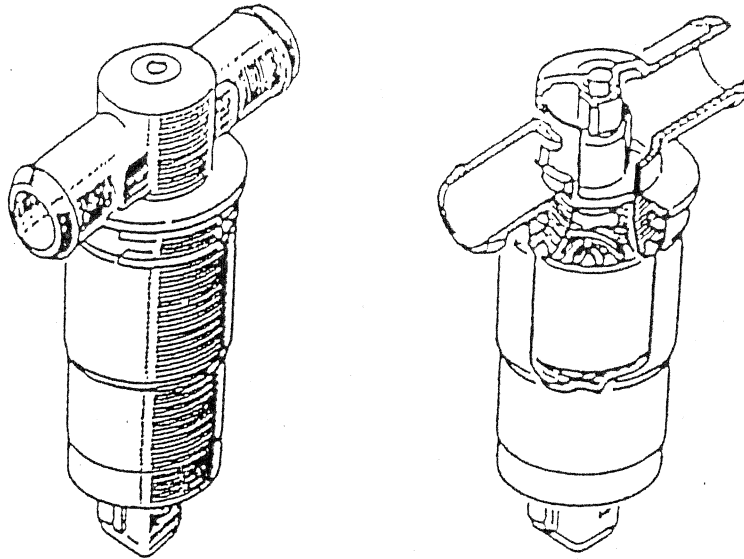
- REPLACES THE AUXILIARY AIR VALVE

1. SELF CONTAINED SYSTEM (OWN ECU)

2. INTEGRATED WITHIN SYSTEM - LH -KE - MOTRONIC



Idling control



01. What is the advantage of an idle speed control?

IDLE SPEED ALMOST CONSTANT.
.....

02. What types of idle control are used today?

EWD - SINGLE COIL ACTUATOR
ZWD - TWIN COIL ACTUATOR
.....

03. How is idle control usually achieved?

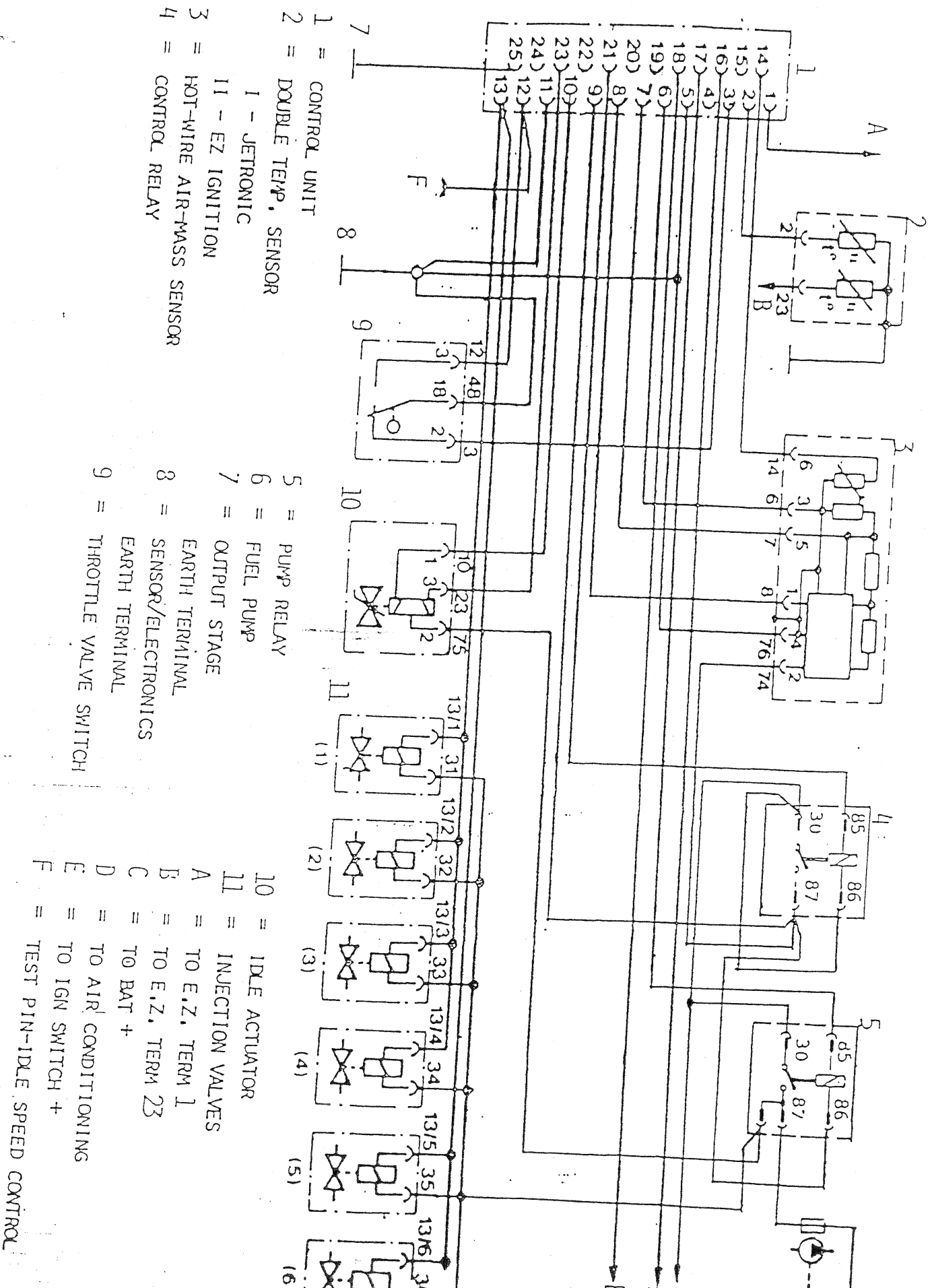
SETTING A GIVEN KEYING RATIO WHEN THE ENGINE IS WARM.
.....

04. What is meant by the term 'keying ratio'?

THE RATIO OF +VE OR -VE PULSES PER UNIT OF TIME FOR A SQUARE WAVE VOLTAGE.
.....

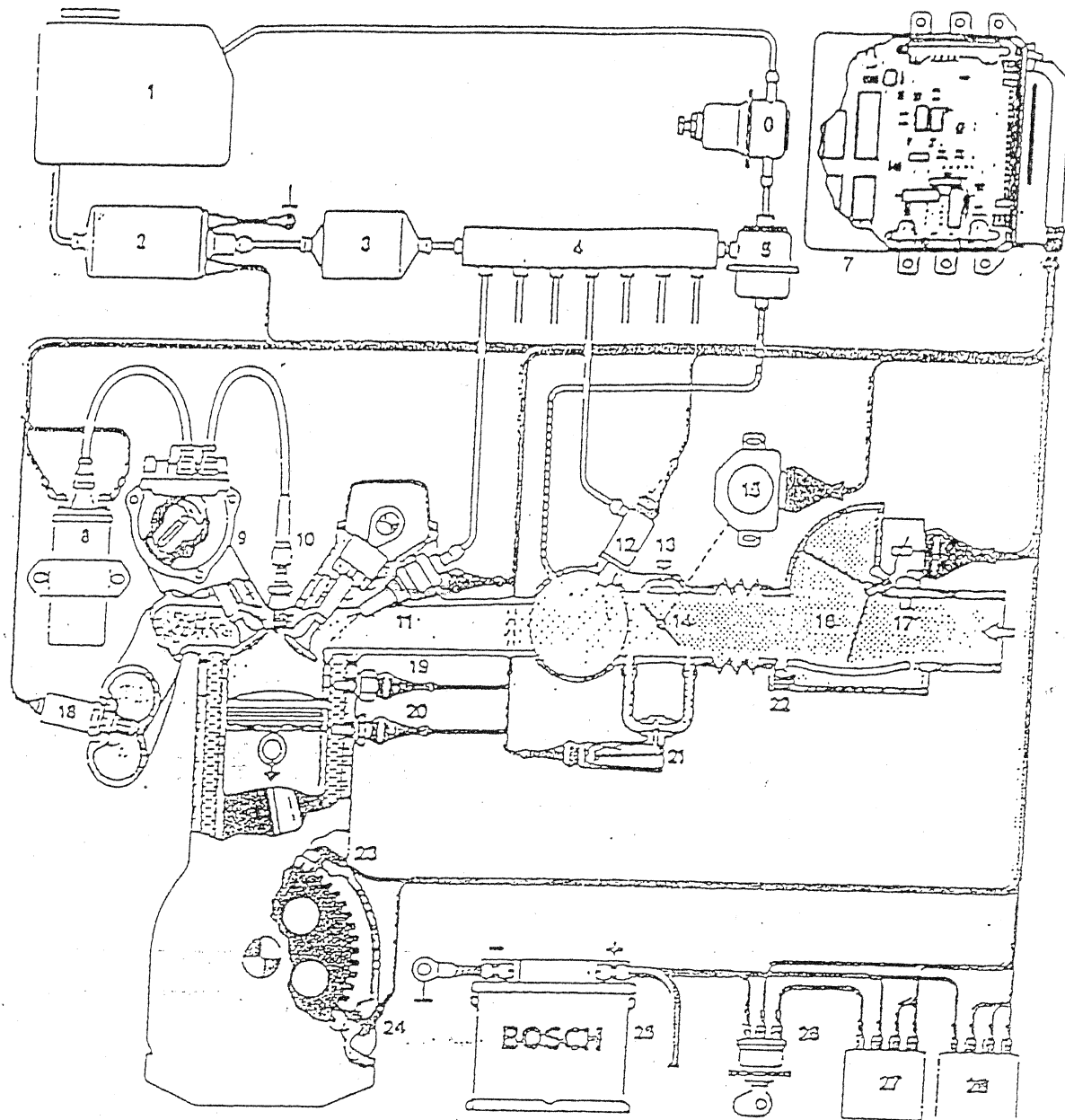
LH2 - JETRONIC CIRCUIT DIAGRAM

K.B.7.7.86,
AU / TR



Motronic

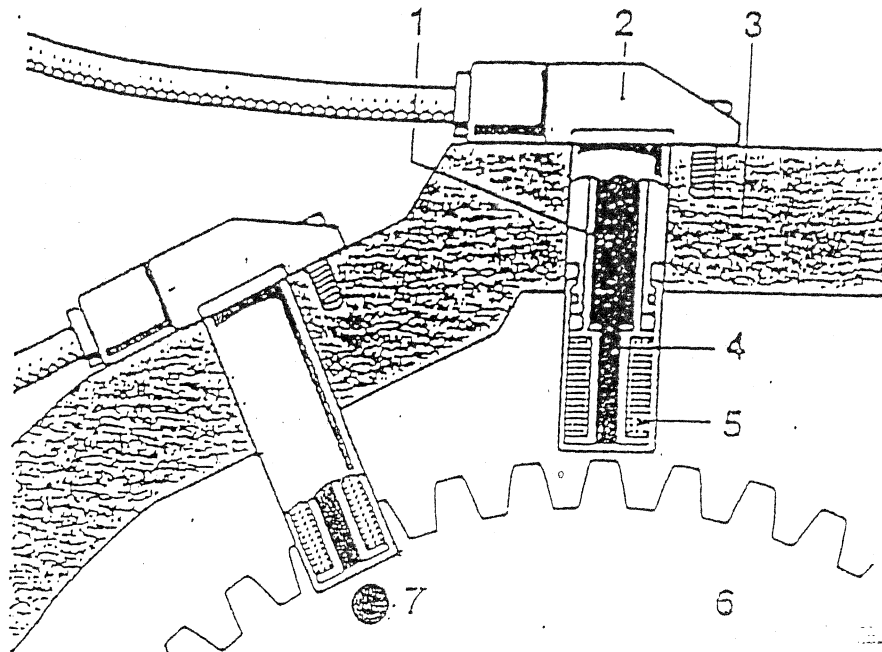
Operating principle



- | | | | |
|----|------------------------------|----|--------------------------------|
| 1 | Fuel tank | 15 | Throttle valve switch |
| 2 | Electric fuel pump | 16 | Air-flow sensor |
| 3 | Fuel filter | 17 | Air temperature sensor |
| 4 | Fuel distributor pipe | 18 | Lambda sensor |
| 5 | Pressure regulator | 19 | Thermo time switch |
| 6 | Vibration damper | 20 | Engine temperature sensor |
| 7 | Control unit | 21 | Auxiliary-air valve |
| 8 | Ignition coil | 22 | Idling mixture adjusting screw |
| 9 | Ignition distributor | 23 | Reference marker sensor |
| 10 | Spark plug | 24 | Engine speed sensor |
| 11 | Fuel injection valve | 25 | Battery |
| 12 | Cold-start valve | 26 | Ignition-starting switch |
| 13 | Idling speed adjusting screw | 27 | Main relay |
| 14 | Throttle valve | 28 | Pump relay |

MOTRONIC

Engine speed and reference mark sensors



Engine speed (right) and reference mark (left) sensors

- | | | | |
|---|------------------|---|----------------|
| 1 | Permanent magnet | 5 | Winding |
| 2 | Casing | 6 | Flywheel gear |
| 3 | Engine block | 7 | Reference mark |
| 4 | Soft iron core | | |

01. What is the function of the engine speed sensor?

TO PRODUCE ALTERNATING VOLTAGE - FREQUENCY REPRESENTS ENGINE SPEED.

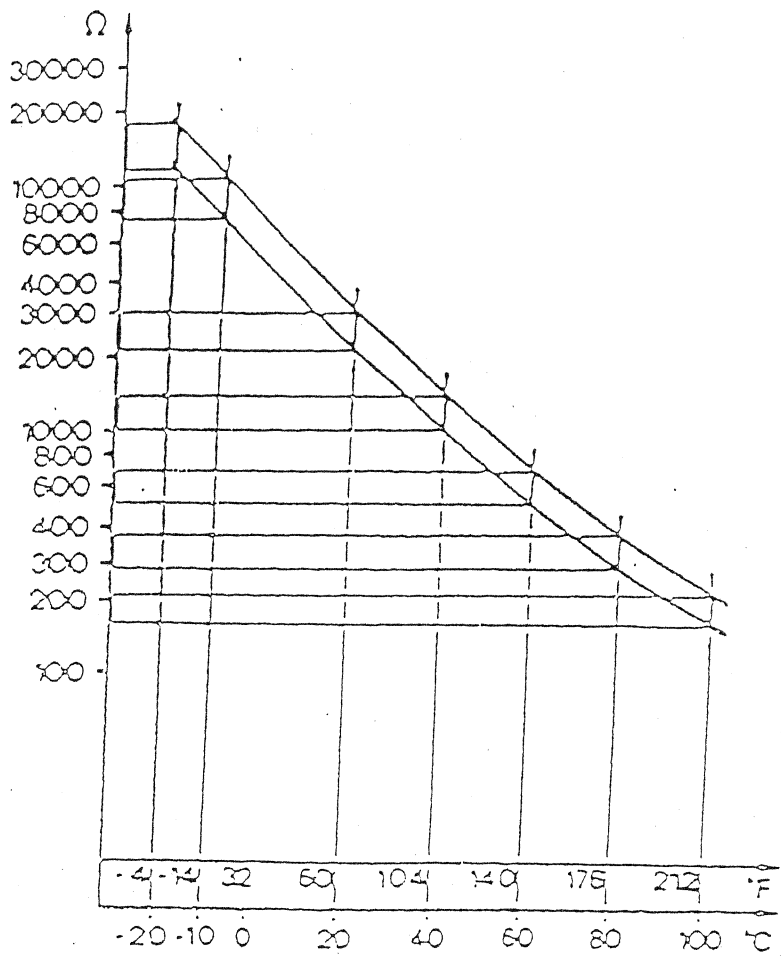
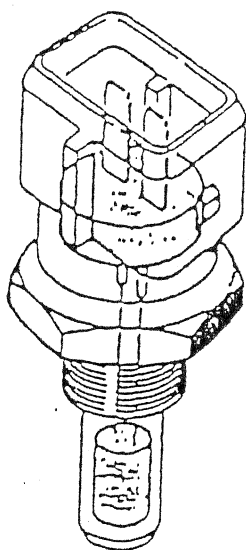
02. What is the function of the reference mark sensor?

PRODUCES ONE PULSE PER CRANK REV - SIGNALS POSITION OF CRANKSHAFT.

03. How can the sensors be tested?

RESISTANCE OF COIL AND SHIELD - OSCILLOSCOPE TRACE - AC VOLTAGE.

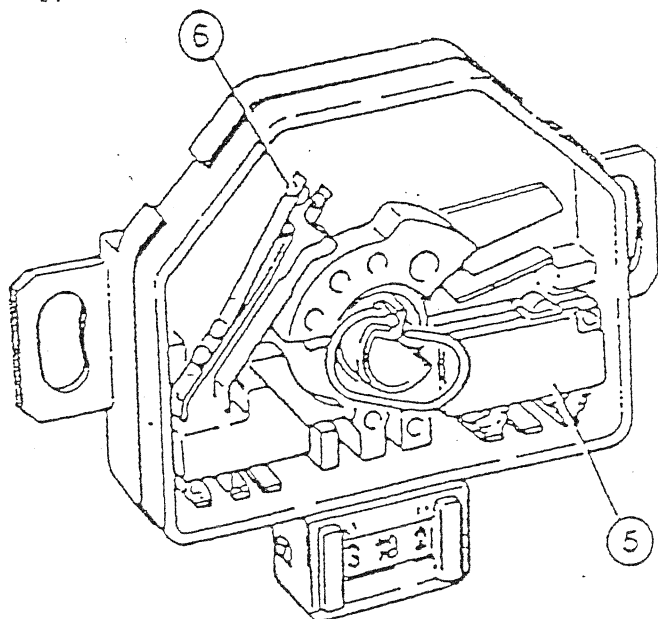
NIC 11, throttle valve switch



01. What is the function of the NTC sensor?

REPORT TO ECU ENGINE TEMPERATURE BY RESISTANCE CHANGE/VOLTAGE SIGNAL

.....

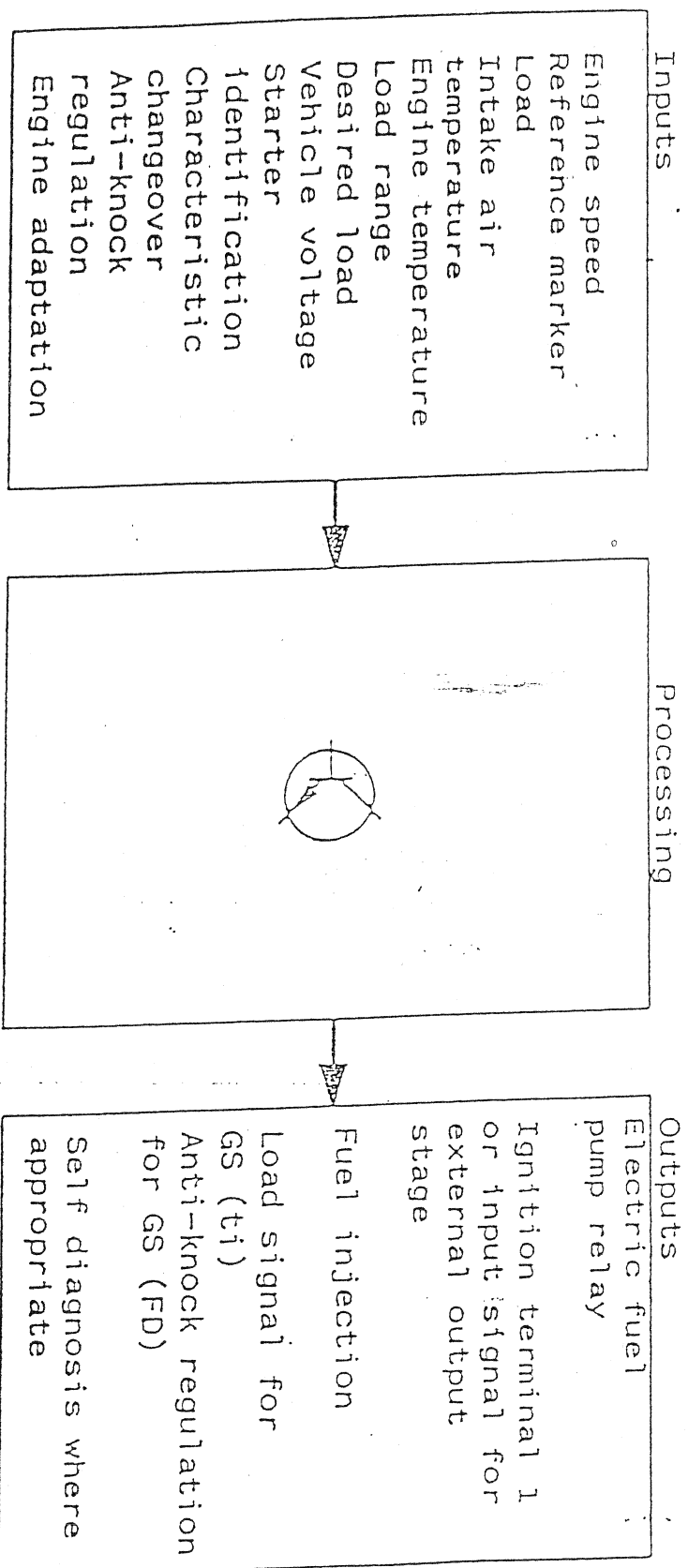


- 5 = IDLING SWITCH
- 6 = FULL LOAD CONTACT
- 2 = IDLE (CLOSED = 0V, OPEN = 5V)
- 18 = GROUND
- 8 = FULL LOAD (OPEN 5V, CLOSED 0V)

.....

02. What is the function of the throttle valve switch?

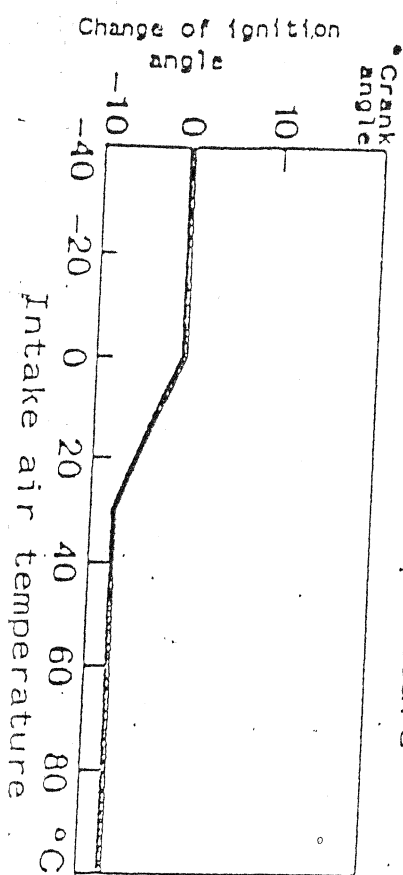
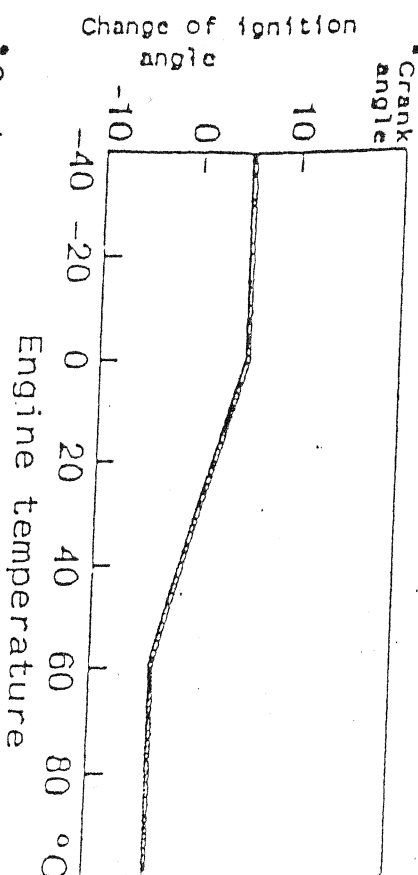
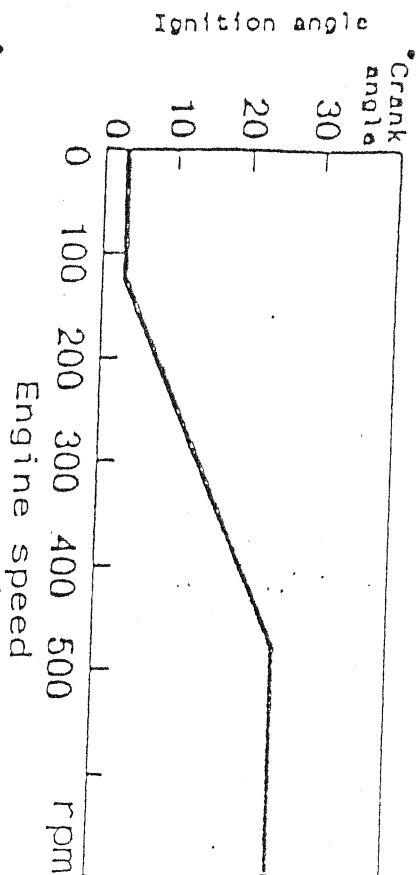
IDLE, FULL LOAD, PART LOAD, OVERRUN CUTOFF



Ignition control on starting

Why does the ignition angle on starting depend on the starting speed?

1. PREVENT ENGINE KICK BACK
2. AT HIGHER ENGINE SPEEDS TIMING IS ADVANCED TO SPEED UP INCREASE TO IDLE SPEED.



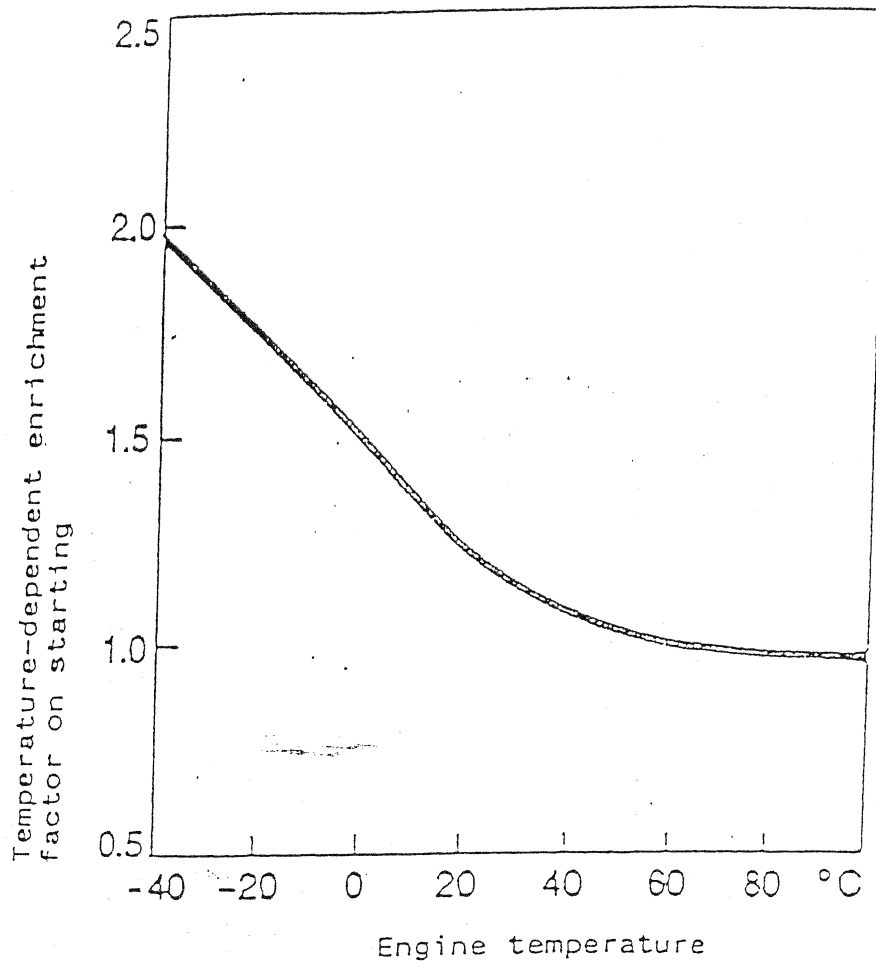
Engine temperature:

TIMING ADVANCED WHEN COLD TO COMPENSATE FOR SLOW BURNING TIME.
TIMING RETARDED AS ENGINE WARMS UP TO PREVENT KICKBACK DUE TO FASTER COMBUSTION PROCESS.

Intake air temperature:

WHEN HIGH, RAPID COMBUSTION TAKES PLACE THUS IGNITION RETARDED TO PREVENT KICKBACK.

Motronic Start control



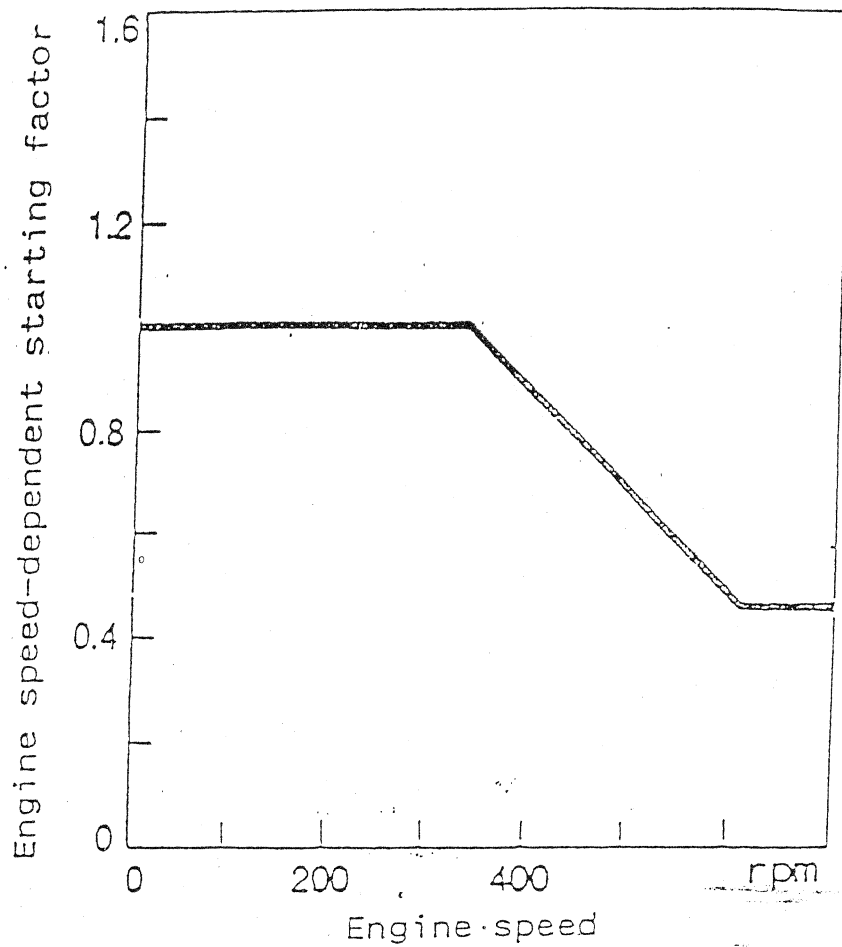
01. Why is the enrichment factor on starting increased at low temperature?

TO COMPENSATE FOR CONDENSATION OF FUEL ON CYLINDER WALLS ETC
.....

02. How is the additional quantity supplied to the engine?

1ST GENERATION MOTRONIC - COLD START VALVE
2ND GENERATION ONWARDS - INJECTION DURATION INCREASED - ECU FUNCTION
.....

Motronic
Cold-start control

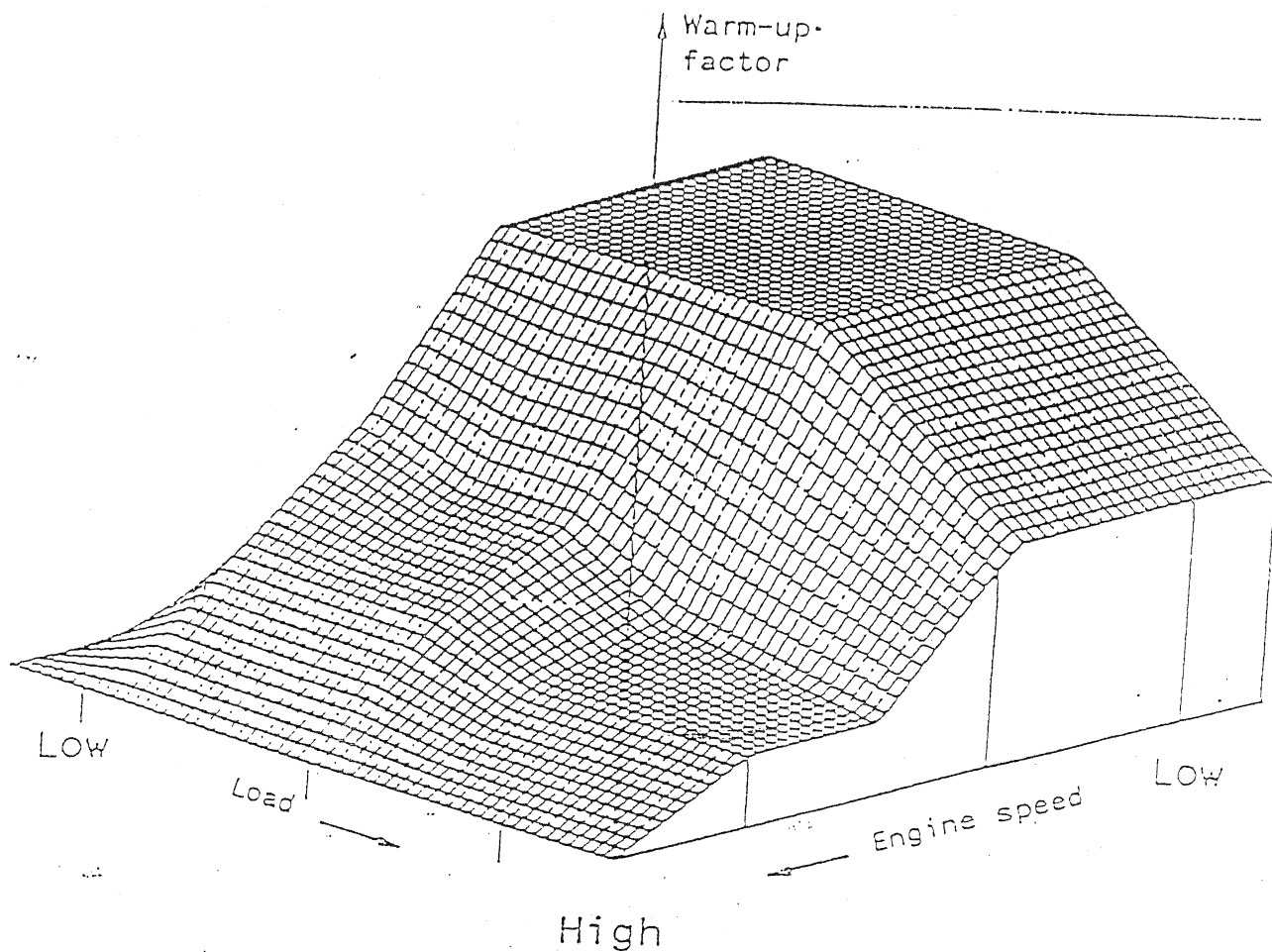


01. Why is the injected quantity reduced with a rising starting speed?

TO PREVENT OVER ENRICHMENT (FLOODING).

.....

Warm-up characteristic



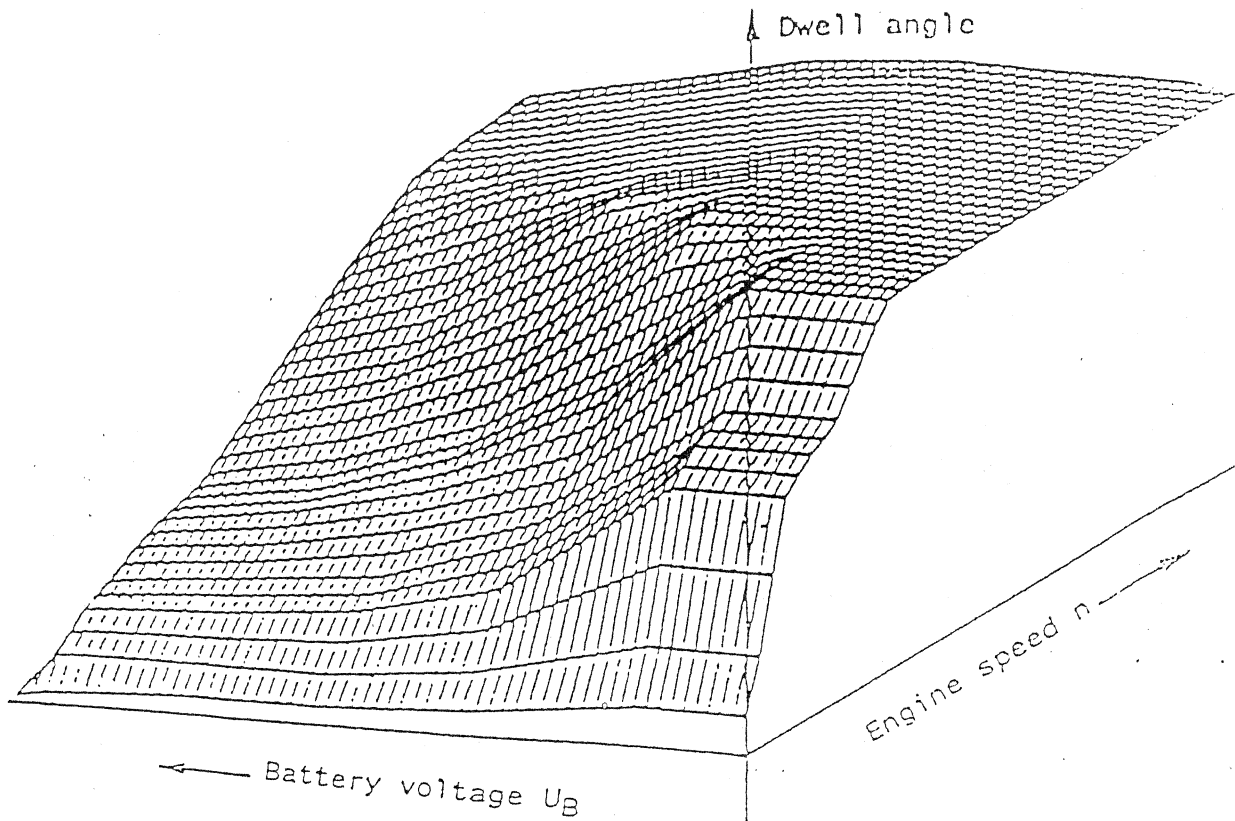
01. Enter the following operating conditions:

- low load/engine speed
- medium load/engine speed
- high load/engine speed
- high load/low engine speed

02. Why does the warm-up factor depend on engine speed and load?

TO OBTAIN OPTIMUM ENRICHMENT FACTOR GIVING GOOD DRIVEABILITY - ACCELERATION
- REDUCED EMISSIONS - IMPROVED FUEL CONSUMPTION

Dwell angle characteristic



01. Why is the dwell angle dependent on
a) engine speed?

DWELL ANGLE INCREASES TO ENSURE SUFFICIENT COIL BUILD-UP TIME.
.....

- b) vehicle voltage?

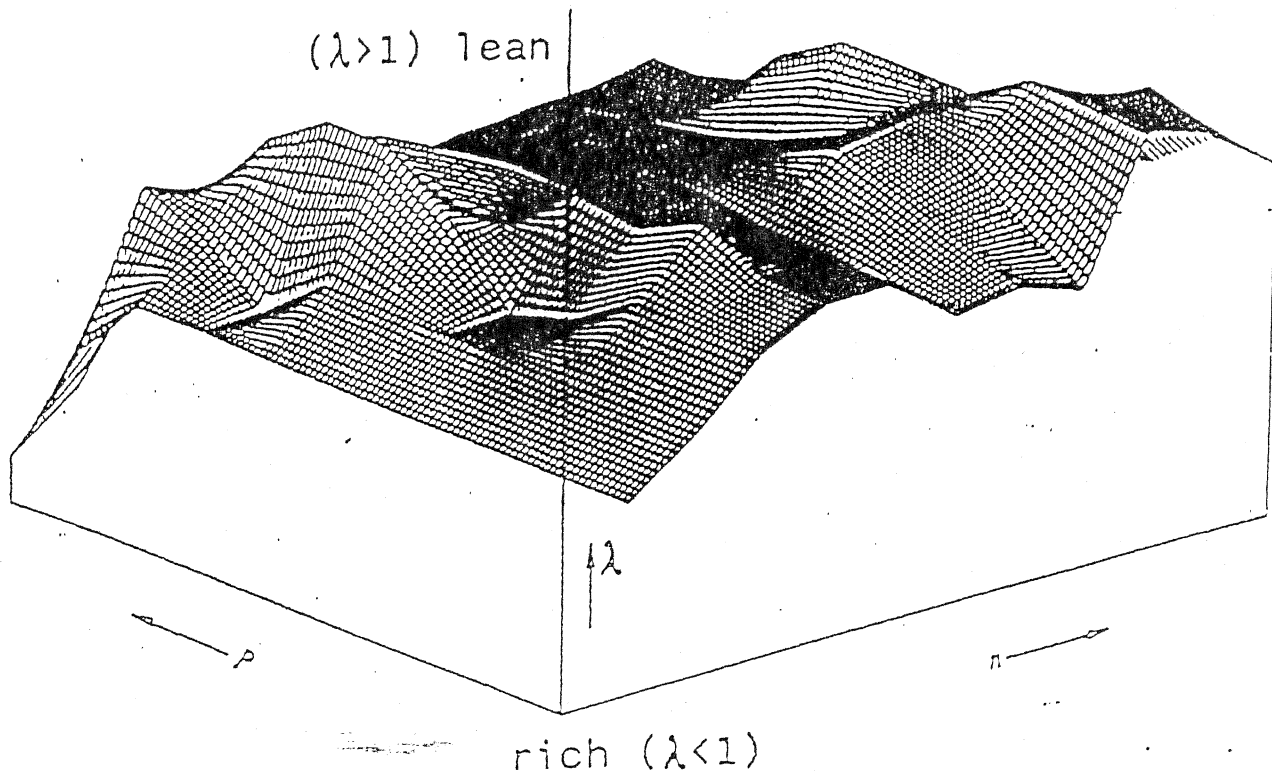
VOLTAGE DECREASE - DWELL INCREASE TO ENSURE SUFFICIENT COIL BUILD-UP.
.....

02. What is the difference between dwell angle
regulation and control?

REGULATION - SPECIFIC ANGLE CONTROL CHECKED BY MEASURING PRIMARY CURRENT,
VOLT DROP ON TERMINAL 1 IS VARIABLE.

CONTROL - ANGLE CHANGES WITH ENGINE SPEED.
.....

Lambda characteristic



$$\lambda = \frac{\text{intake air quantity}}{\text{theoretical air requirement}}$$

$P = \text{Load}$
 $n = \text{Engine speed}$
 $\lambda = \text{Air ratio}$

01. What is meant by air number?

$$\lambda = 1$$

.....

02. What advantages are obtained by the programmed λ characteristic?

OPTIMUM MIXTURE COMPOSITION FOR THE ENGINE

.....

03. Which objectives should the following operating conditions achieve?

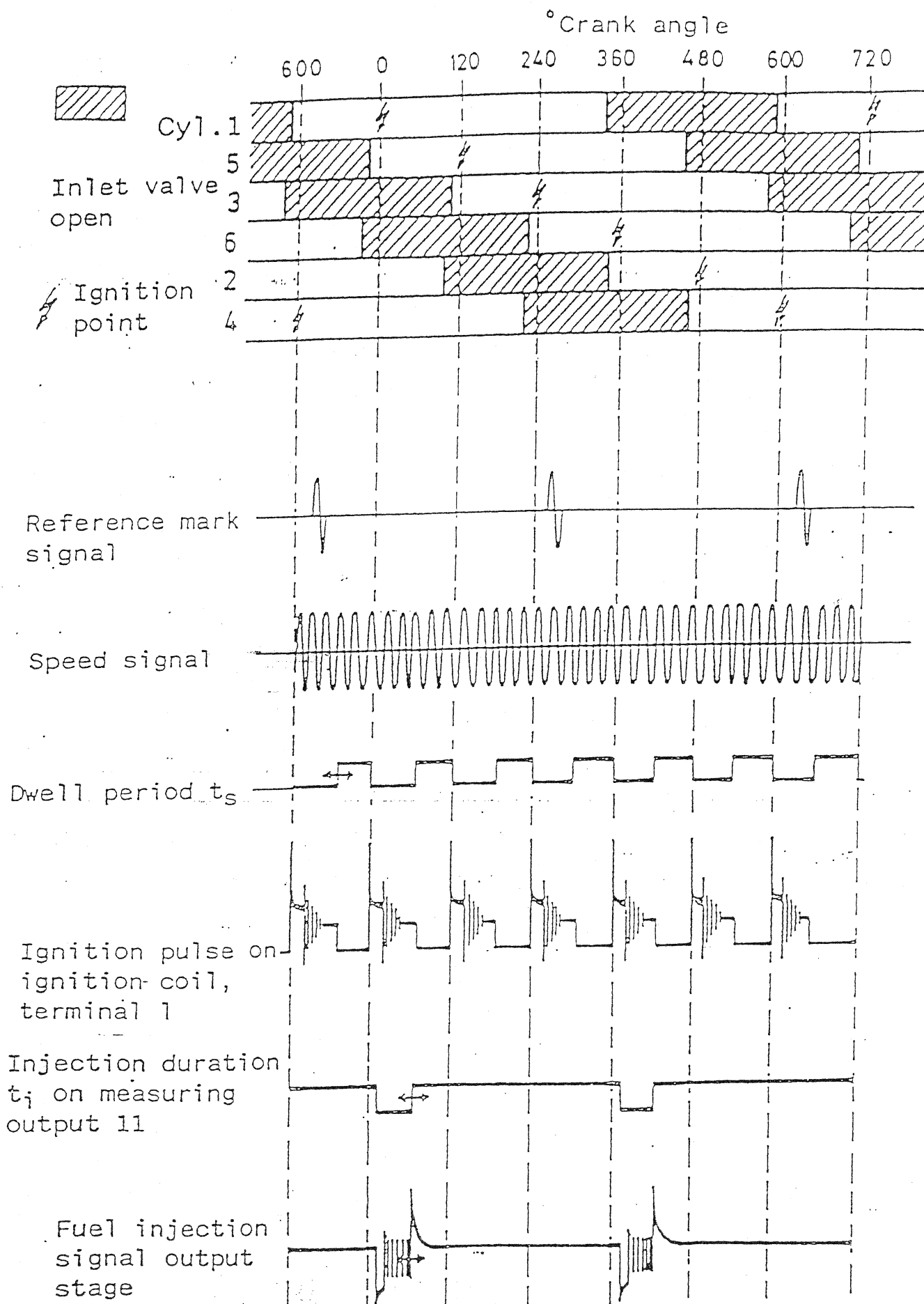
IDLING: SMOOTH RUNNING.

PARTIAL LOAD: SMOOTH TAKE-UP - ECONOMY.

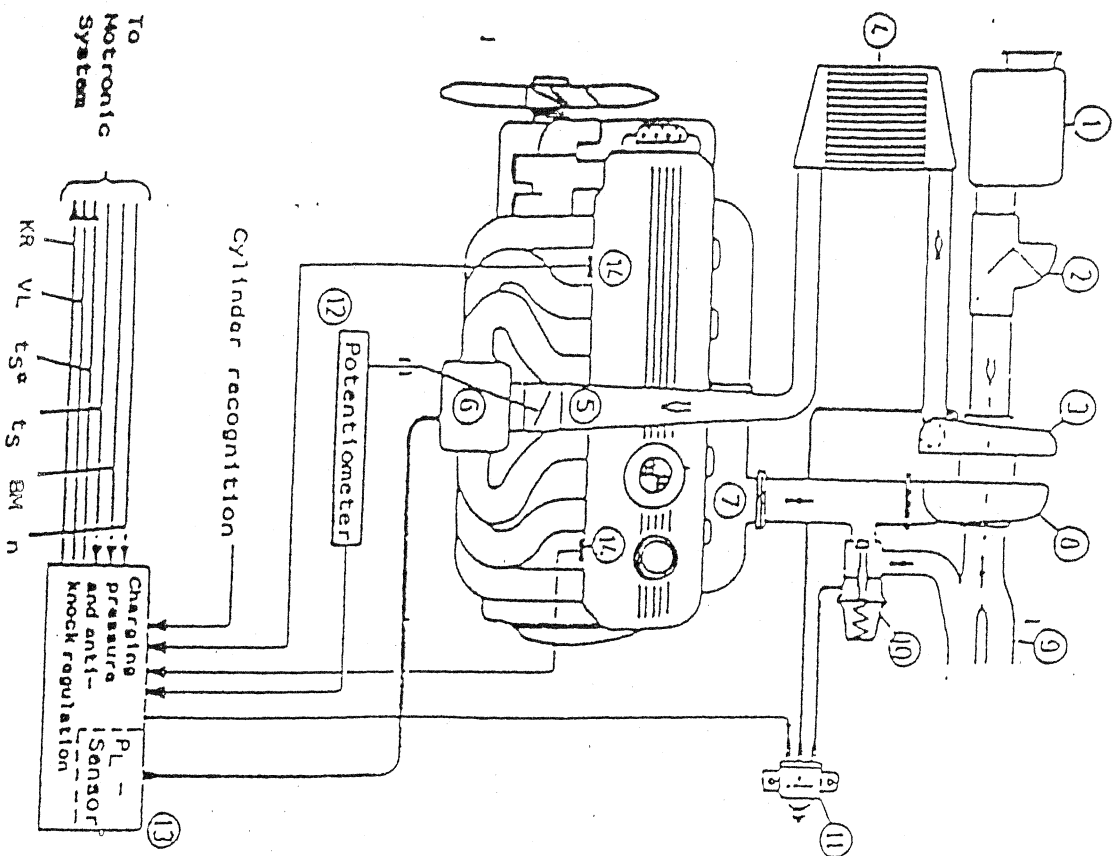
FULL LOAD: PERFORMANCE.

.....

Impulse diagram



Mocronic Charging pressure and knock control



ts Unregulated ignition signal
ts* Regulated ignition signal
BM Reference marker (TDC coordination)
n Starter ring impulses (engine speed)
VL Full load signal
KR Knock control signal

- | | | | |
|---|---------------------|----|--|
| 1 | Air filter | 10 | Bypass valve |
| 2 | Air-flow sensor | 11 | Solenoid valve |
| 3 | Compressor | 12 | Throttle valve |
| 4 | Charging air cooler | 13 | Charging pressure/anti-knock regulator |
| 5 | Throttle valve | 14 | Knock sensor |
| 6 | Air distributor | | |
| 7 | Exhaust manifold | | |
| 8 | Exhaust gas turbine | | |
| 9 | Front exhaust pipe | | |

01. What advantages are obtained by
 - a) knock control?

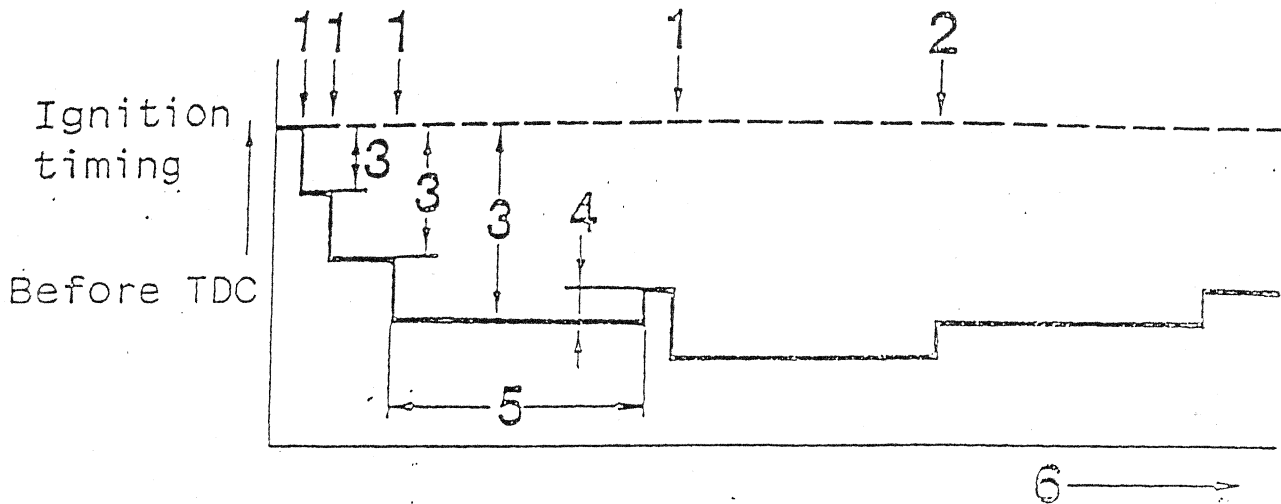
OPTIMUM IGNITION ANGLE OBTAINED - REDUCED ENGINE DAMAGE.

- b) charging pressure control?

TURBOCHARGER OPERATES ONLY WHEN REQUIRED - EG. SPORTS MODE.

Motronic

Ignition advance under knock conditions



Multiple knock combustion

Legend:

- 1 = Knocking occurs
- 2 = Set point provided by ignition characteristic
- 3 = Ignition retarded
- 4 = Ignition advanced
- 5 = Step width/Number of operating cycles after which the ignition is advanced
- 6 = Operating cycles

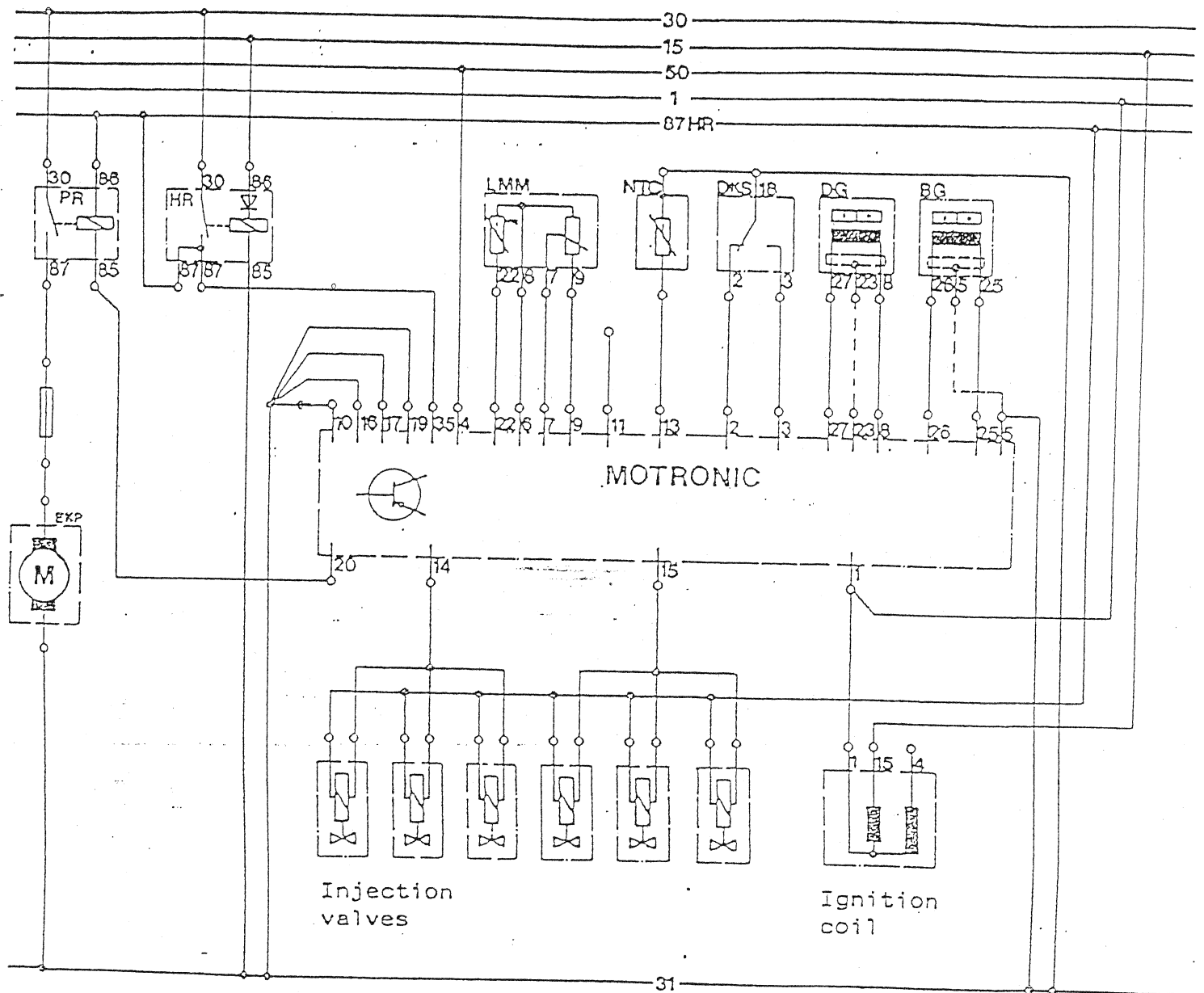
01. How is the ignition timing altered under knocking conditions?

WHEN KNOCKING OCCURS - IGNITION RETARDED IN 3° STEPS UNTIL KNOCKING CEASES (MAX 30°).

WHEN KNOCKING CEASES - IGNITION ADVANCED IN 0.7° STEPS AFTER 68 OPERATING CYCLES.

.....

Motronic Circuit diagram



Motronic

Summary, Sheet 1

Basic functions

The control signals are functions of measuring signals and intermediate values. Functions are determined during development, involving optimising of consumption, exhaust gas and driving characteristics. There are specific characteristics or sets of characteristics for each engine type.

Characteristics or sets of characteristics are stored in the program memory of the microcomputer.

When the program calls up a control signal which is situated between two stored characteristic points, an intermediate value will be computed.

Load signal

The air-flow sensor signal is a measure of the air throughput.

This relationship determines the amount of air per unit time. Since all injection valves inject once per rotation (simultaneous injection), it is necessary to compute the air throughput per rotation. In sequential injection the entire quantity is injected only once per operating cycle and the injection valves are operated in groups, either alternately (semi-SEFI) or individually (SEFI). Since the pressure difference between the fuel circuit and the inlet tube is kept constant, the duration of injection is a measure of the amount of fuel required.

Injection signal

The injection time value (fuel quantity) depends on several factors.

The injection time (operating time) is corrected in dependence on the battery voltage.

The injection time can be altered by preprogrammed factors through a coding involving resistors in the cable loom or a circuit board switch, injection can be switched off above a preprogrammed engine speed limit and thus prevent overspeeding of the engine (engine speed limitation).

Motronic

Summary, Sheet 2

Sensor systems

The following sensor systems are at present in use:

2 sensors	Engine speed sensor and reference mark sensor
1 sensor —	Using a suitable serrated disc, both engine speed and reference marker are detected by a single sensor
Hall sensor	Engine speed and reference mark recognition by means of a conventional Hall sensor application: Digifant.

The tooth gap in the pick-up wheel or the reference marker (sensor system) supplies the crankshaft position to the control unit. A sensor also measures the engine speed.

Each signal triggers an interruption and thus supplies the actual angular position of the crankshaft to the program. The ignition timing output is oriented with respect to these angular positions.

At intervals of approximately every 0.75 angular degrees - in terms of the toothed disc - the microprocessor will compute the relevant timing. At engine speeds below a limit of approximately 20 rev/min, the ignition output stage can be switched off (coil current cut-out). The calculated ignition timing can be altered by a preprogrammed value through a coded resistor network in the cable loom or by means of a circuit board switch.

Steady-state conditions

— Under steady-state conditions (constant engine speed and load) there are three ranges, distinguished by the throttle valve switch:

partial load, full load, idling

Partial load

Condition: No contact between the throttle valve switch and chassis. Formation of the fuel injection signal from the load signal is extended by a factor obtained from the load factor.

Motronic

Summary, Sheet 3

The ignition angle is obtained from the ignition angle characteristic values, which depend on load and engine speed.

Mixtures and ignition timings, determined on the test stand as optimum values,—can be obtained in practice for each load-engine speed by means of the pre-programmed sets of characteristics.

Full load

Condition: Full-load contact of the throttle valve switch connected to chassis. The full load factor functions in dependence on engine speed (Λ approx. 0.85 - 0.95) in place of the general characteristic program.

The full-load ignition angle is obtained in accordance with the full-load characteristic which depends on engine speed.

Maximum engine torque, which is required at full load, can thus be obtained.

Idling

Condition: Idling contact of the throttle valve switch connected to chassis and engine speed below the overrun cut-out range.

The idling factor acts in dependence on engine speed and idling speed regulator - LFR - (if fitted) instead of the general characteristic program. The idling ignition angle is obtained from a characteristic dependent on engine speed.

The individual transition functions are obtained if the idling operating condition changes.

Starting

The starting program (n or terminal 50) is called up after the ignition is switched on and after the starting procedure is recognised.

It remains active until an engine speed limit is exceeded, which depends on engine temperature.

If the engine speed drops below a specific limit during operation, the starting program is again called up.

Motronic

Summary, Sheet 4

During the starting procedure, the fuel injection time depends on the following factors:

- coolant temperature
- engine speed
- number of ignition cycles after starting

The air-flow sensor signal has no effect.

Post-starting

After completion of the starting program, the fuel injection time is increased by a factor which depends on the engine temperature and is run down by a programmed time constant.

Warm-up

The injected amount of fuel is increased while the engine runs up to temperature. This depends on engine temperature, engine speed and load. Ignition timing is corrected in dependence on the engine temperature.

Acceleration enrichment

This is triggered when the programmed increase of the air-flow meter signal is exceeded. The amount of acceleration enrichment depends on:

- coolant temperature
- engine speed
- load
- rate of increase of the air-flow meter signal

An "intermediate injection", depending on engine temperature, can assist in the instantaneous effect.

After being triggered, the enrichment is reduced in accordance with a program. Ignition timing is suitably adapted to prevent acceleration knocking.

Summary, Sheet 5

Overrun cut-out

Overrun cut-out depends on the following conditions:

- the idling contact of the throttle valve switch is closed
- the intake air temperature is higher than the programmed limiting value

The engine resumption speed depends on the engine temperature and the loss of engine speed with respect to time.

Smooth resumption is achieved by suitable adaptation of the amount of fuel injected and of the ignition timing.

Lambda regulation/Catalyser

A catalyser can be incorporated to minimise exhaust gas emission. The vehicle may be operated only with lead-free fuel. The air-fuel mixture is adjusted to $\text{Lambda} = 1$. The permissible tolerance deviation is very small and must not exceed $\pm 0.15\%$.

Under these conditions, exhaust gas emissions such as CO, CH and NO_x are reduced by 80 - 90%.

The air-fuel mixture is regulated via the Lambda sensor. This measures the residual oxygen content in the exhaust gas and compares it with the ambient air.

Emergency Limp-home facilities

It is the purpose of the limp-home facilities to by pass defective information sensors so that driving is possible. The control unit checks the signal for plausibility.

Example:

An open circuit in the temperature sensor cable results in an infinitely high resistance value. The temperature associated with this is not plausible. This fault is recognised, the sensor is decoupled and replaced by a substitution value.

A fault in the air-flow sensor substitutes a constant t_i for idling and partial load; overrun cut-off is then no longer effective.

Summary, Sheet 6

Self-diagnosis

The system faults are recognised and stored by the self-diagnosis. The fault display is provided by a fault lamp. The output of the stored faults is usually obtained by a blink code, after the self-diagnosis has been activated.

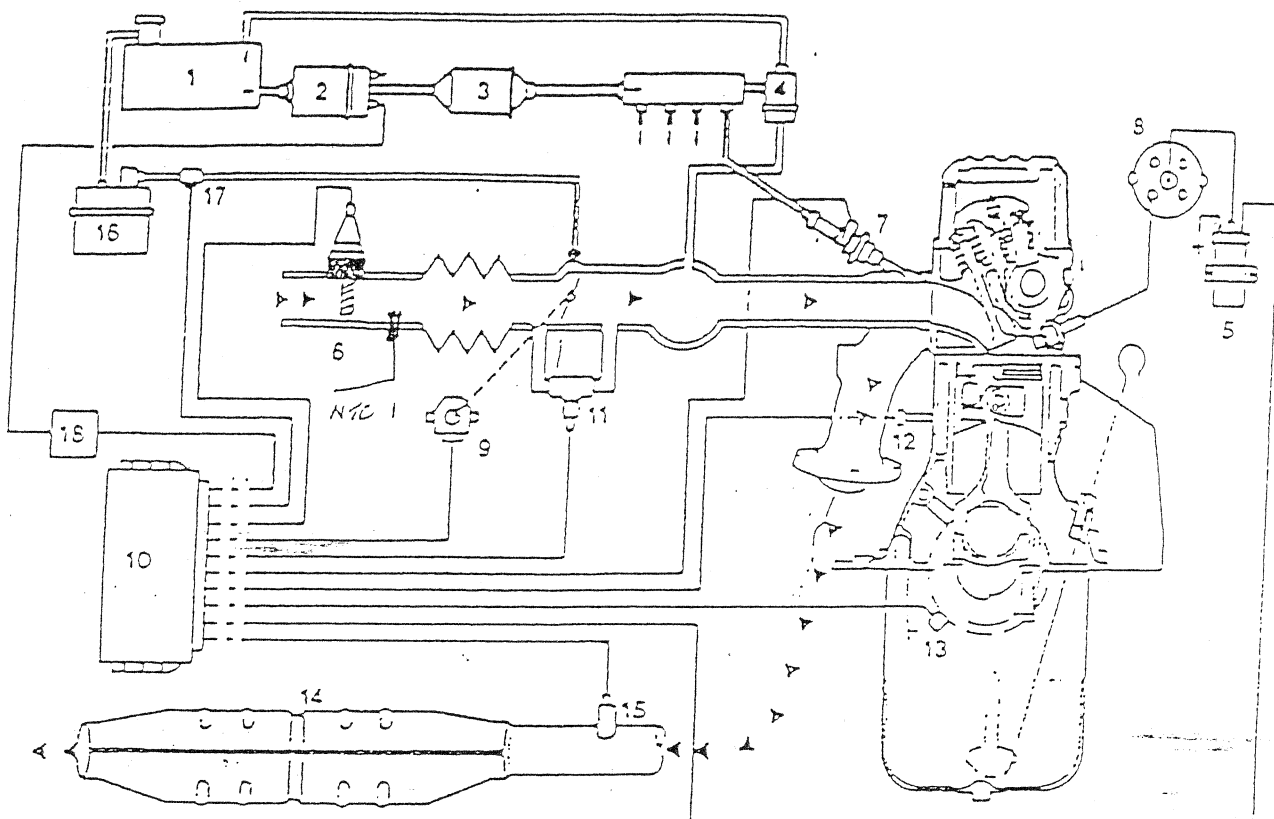
Electronic transmission control

The Motronic system can be combined with an electronic transmission control system. Shifting points and the effectiveness of the converter bypass clutch as well as the reverse ratio interlock are electrically controlled in dependence on load, temperature, engine speed and driving speed. The most important operating data, such as load and engine speed are supplied by the Motronic system to the transmission control; conversely, during shifting functions (engine cut-in) the transmission control provides information to the Motronic system, which then alters the ignition timing, so that the shifting process is performed as rapidly and jerk-free as possible. Any defect in the transmission is indicated by illumination of the transmission signal lamp. In the event of a fault, the transmission control system automatically switches to emergency drive, i.e. constant 3rd ratio, no converter bypass and no reverse ratio interlock.

The transmission control can be equipped with diagnosis.

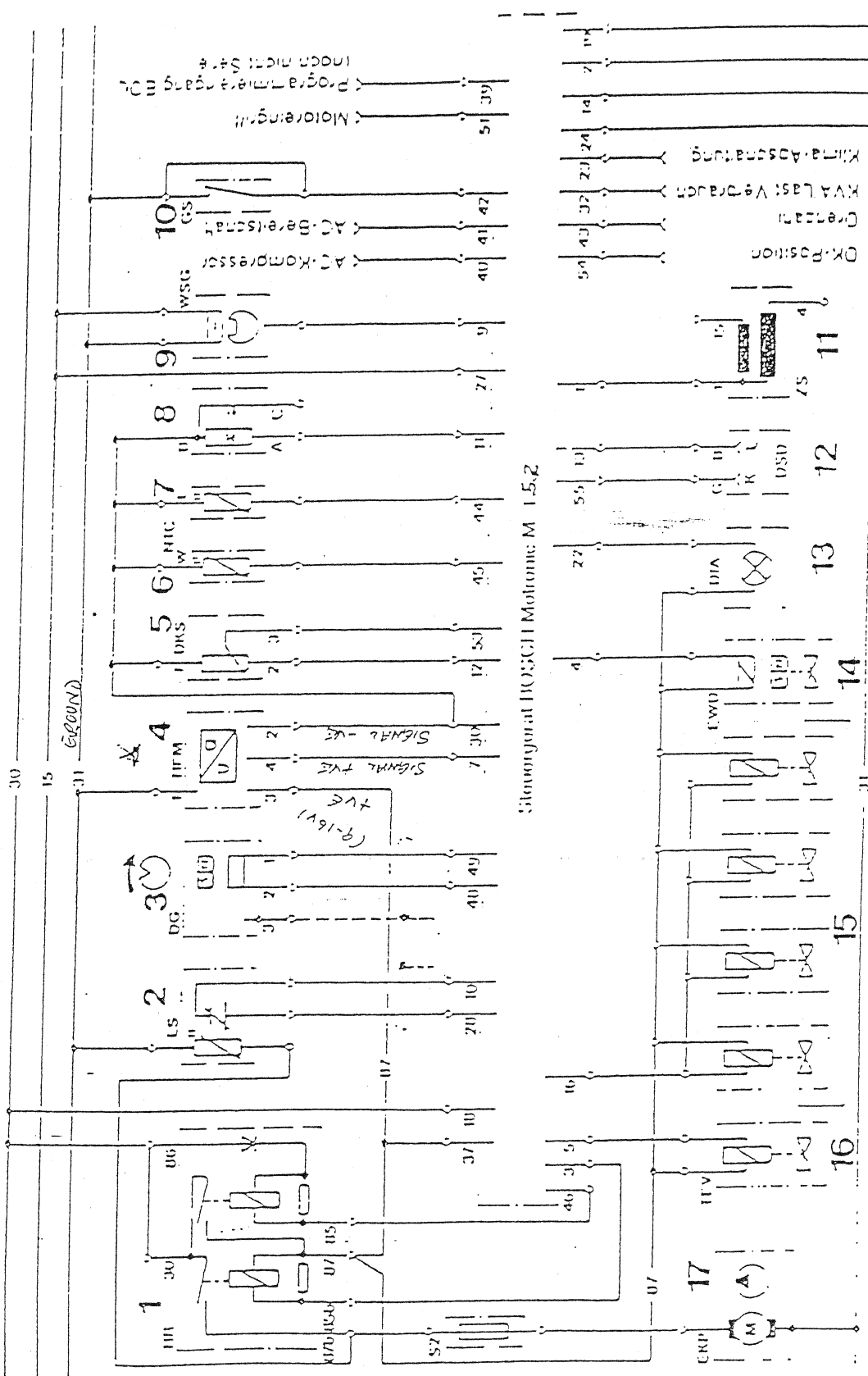
System Summary

SIMULTANEOUS INJECTION



- | | | | | | |
|----|---|------------------------|----|---|----------------------------|
| 1 | = | fuel tank | 2 | = | fuel pump |
| 3 | = | fuel filter | 4 | = | fuel pressure regulator |
| 5 | = | coil | 6 | = | hot film air mass meter |
| 7 | = | Injection valve | 8 | = | high-tension distributor |
| 9 | = | throttle valve sensor | 10 | = | control unit |
| 11 | = | single-coil actuator | 12 | = | coolant temperature sensor |
| 13 | = | rpm-sensor | 14 | = | catalytic converter |
| 15 | = | lambda sensor | 16 | = | active carbon filter |
| 17 | = | tank ventilation valve | 18 | = | main relay |

NOTE: The intake air temperature sensor is not shown.



- KEY**
- 1 - Main relay
 - 2 - LS - Idle actuator
 - 3 - NTC - Negative temperature coefficient
 - 4 - AC-Bereitschaft - AC standby
 - 5 - EOL - End of line
 - 6 - EOL - End of line
 - 7 - EOL - End of line
 - 8 - EOL - End of line
 - 9 - EOL - End of line
 - 10 - EOL - End of line
 - 11 - EOL - End of line
 - 12 - EOL - End of line
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Motronic M 1.5.2

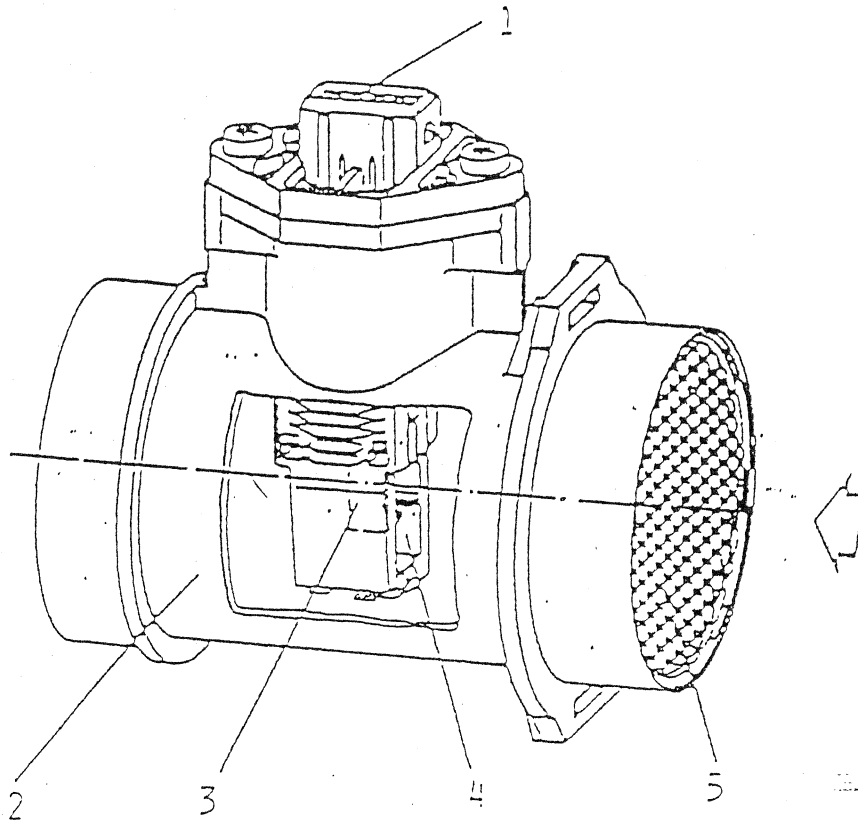
Projects, Characteristics

Projects: Opel Rev 2.0 litre, C 20 NE

Characteristics:

- Rpm and reference mark sensor
- Throttle valve potentiometer
- Intake air temperature sensor
- * Hot film air mass meter
- Code plug for octane number adjustment
- Controlled tank ventilation
- Idle speed control with single coil actuator
- Self-diagnosis FAULT CODE INTERROGATION
- Actuator test OPERATING ON BOARD ACTUATORS/END STAGES
- Instantaneous value interrogation ACTUAL VALUES
- Blink code readout (for fault memory only)
- Fault lamp on instrument panel
- Programming input for EOL provided (not yet standard) EOL PROGRAMMING (END OF LINE)
- Disturbance compensation A/C, POWER STEERING, AUTO ETC.
- Signal output for other systems
- Adaptive lambda control
- Adaptive idling speed control

Motronic M 1.5.2
Hot film air mass meter



01. Name the components

1 = CONNECTOR

2 = CASING (TUBE)

3 = FILM RESISTOR SENSOR

4 = SAMPLE/MEASUREMENT TUBE

02. State the advantages of air mass metering.

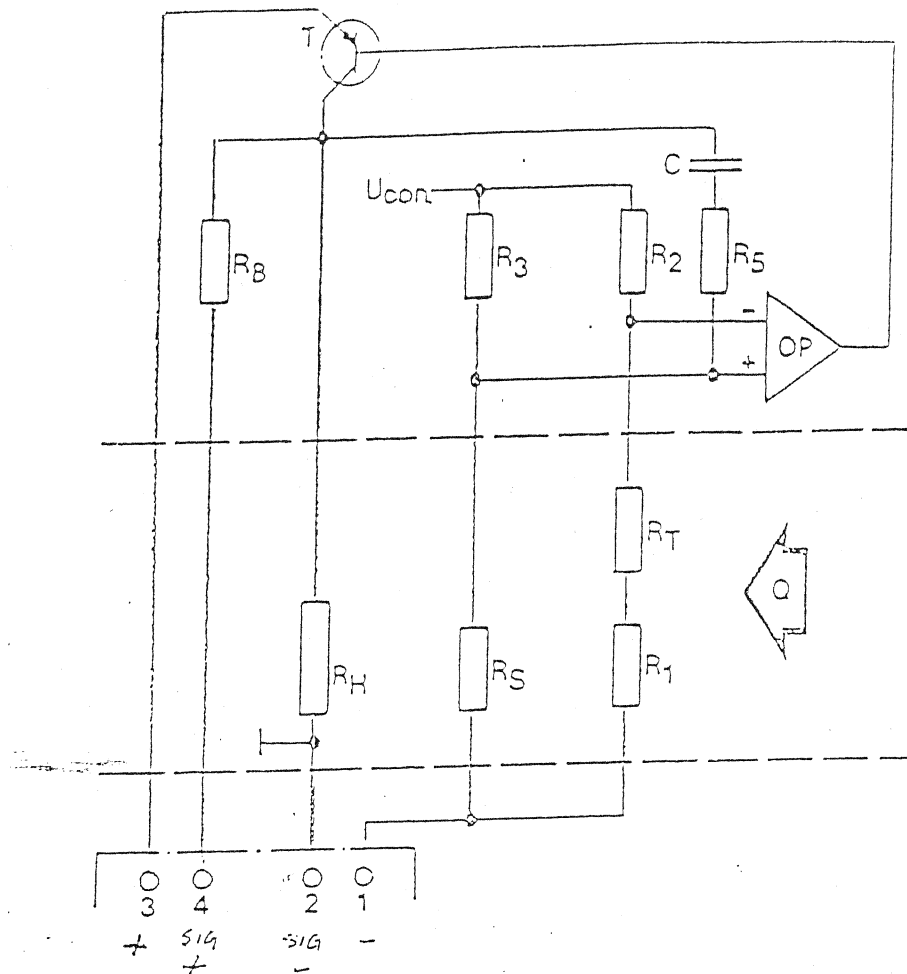
COST OPTIMISED - NO BURNING OFF REQUIRED - ACCURATE
.....

03. State the advantages of the hot film air mass meter.

CHEAPER TO MAKE - FAST RESPONSE - LIGHT & COMPACT
.....

Motronic 1.5.2

Hot film air mass meter circuit (principle)



01. What is the purpose of components R_1 , R_2 , R_3 , R_7 and R_8 ?
FORMS MEASURING BRIDGE
.....
02. What is the purpose of the operational amplifier (OP)?
TO PROVIDE BASE CURRENT FOR TRANSISTOR
.....
03. What is the purpose of the transistor (T)?
TO PROVIDE CURRENT FOR HEATER R_H
.....
04. What is the purpose of the return connection via C and R_5 ?
TO OPERATE OP AMP AS PROPORTIONAL INTEGRATING AMPLIFIER
.....
05. What is the purpose of R_4 ?
LIMIT CURRENT (SIGNAL) IF + SHORT CIRCUIT OR IF SIGNAL SHORT CIRCUIT
.....
06. Terminal wiring:
 - 1 = BATTERY -VE
 - 2 = SIGNAL -VE
 - 3 = BATTERY +VE
 - 4 = SIGNAL +VE (LOAD/MASS)
07. How high is U_{con} ?

Motronic M 1.5.2

Potential Faults

Flashing (blink) code	Potential fault
12	Beginning or end of diagnosis
14	Low voltage at coolant temperature sensor
15	High voltage at coolant temperature sensor
19	Wrong signal from rpm-sensor
21	High voltage at throttle valve sensor
22	Low voltage at throttle valve sensor
25	High voltage at injection valves
31	No signal from rpm-sensor
38	High voltage in lambda sensor circuit
39	Low voltage in lambda sensor circuit
48	Battery voltage low
49	Battery voltage high
52	Diagnostic indicator lamp voltage high
53/54	Main relay power supply
55	Processor fault in control unit
56/57	Idler speed control
61/62	Tank ventilation valve
69/71	Intake air temperature sensor
73/74	Hot film air mass meter
81	Voltage low at injection valves
87/88	Air conditioning safety switch

NOTE: Several conditions for fault detection must be fulfilled for the fault to be detected, so not every fault can be simulated.

Motronic 1.5.2

Summary Sheet 2

The ignition output stage is situated in the control unit, and activates the coil directly.

Idle control is governed by a single-coil servomotor. There is no facility for adjusting idling speed and CO.

The injection valves are grouped and activated together (simultaneously).

The active carbon filter for tank ventilation is regenerated by an electric tank ventilation valve. This is activated by the control unit under certain operating conditions.

The system has extensive self-diagnosis. It is better to interrogate the fault memory by flashing code by using the KTS 300.

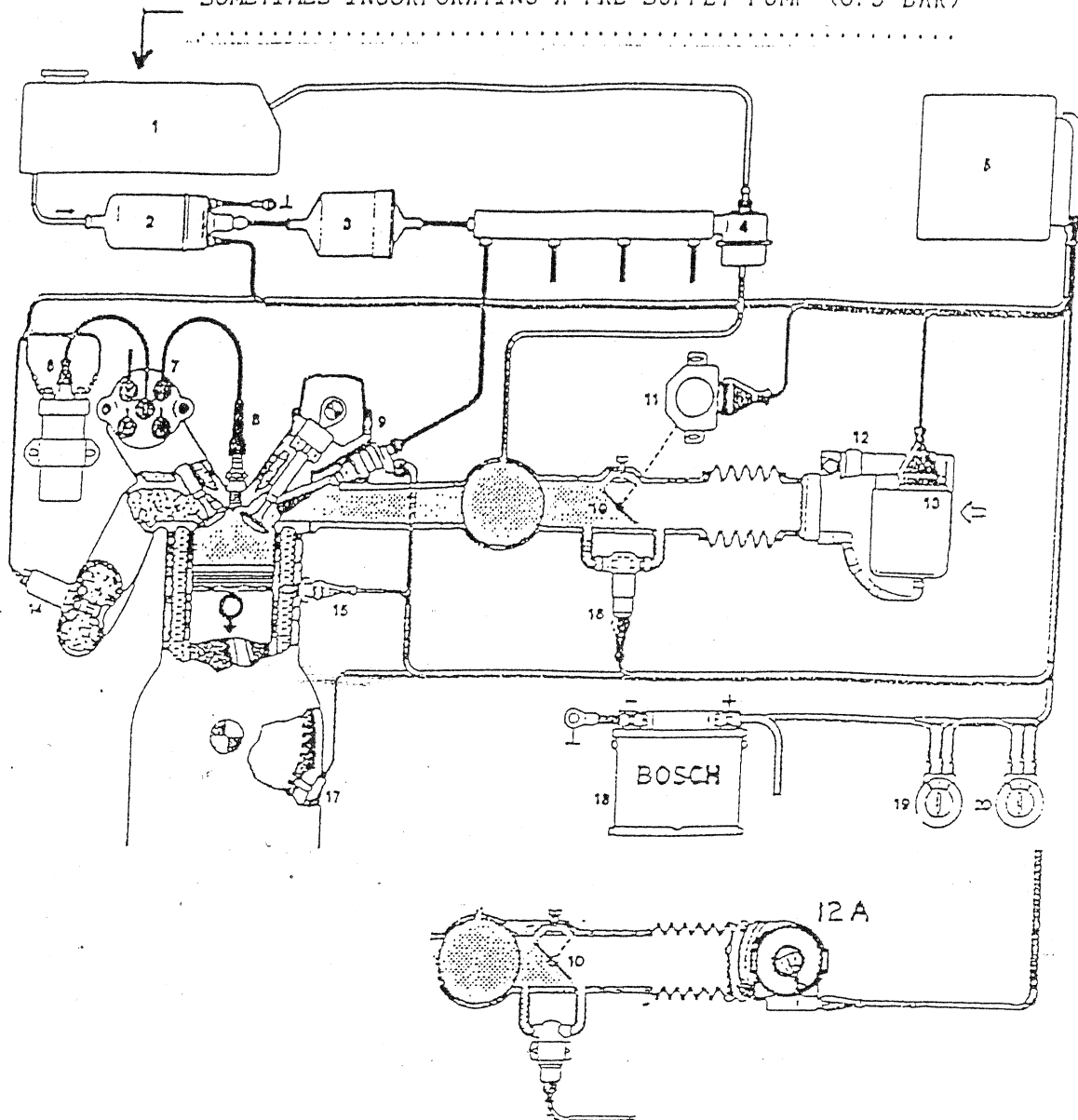
Extensive instantaneous value display and final correcting element diagnosis in respect of idle speed control is possible by using the KTS 300 in conjunction with the PPG 204/4.

The control unit is equipped with additional inputs and outputs for system adaptation and connections to the vehicle or to other systems. EOL programming is currently not possible in this system.

Motronic

Operating principle

SOMETIMES INCORPORATING A PRE-SUPPLY PUMP (0.5 BAR)

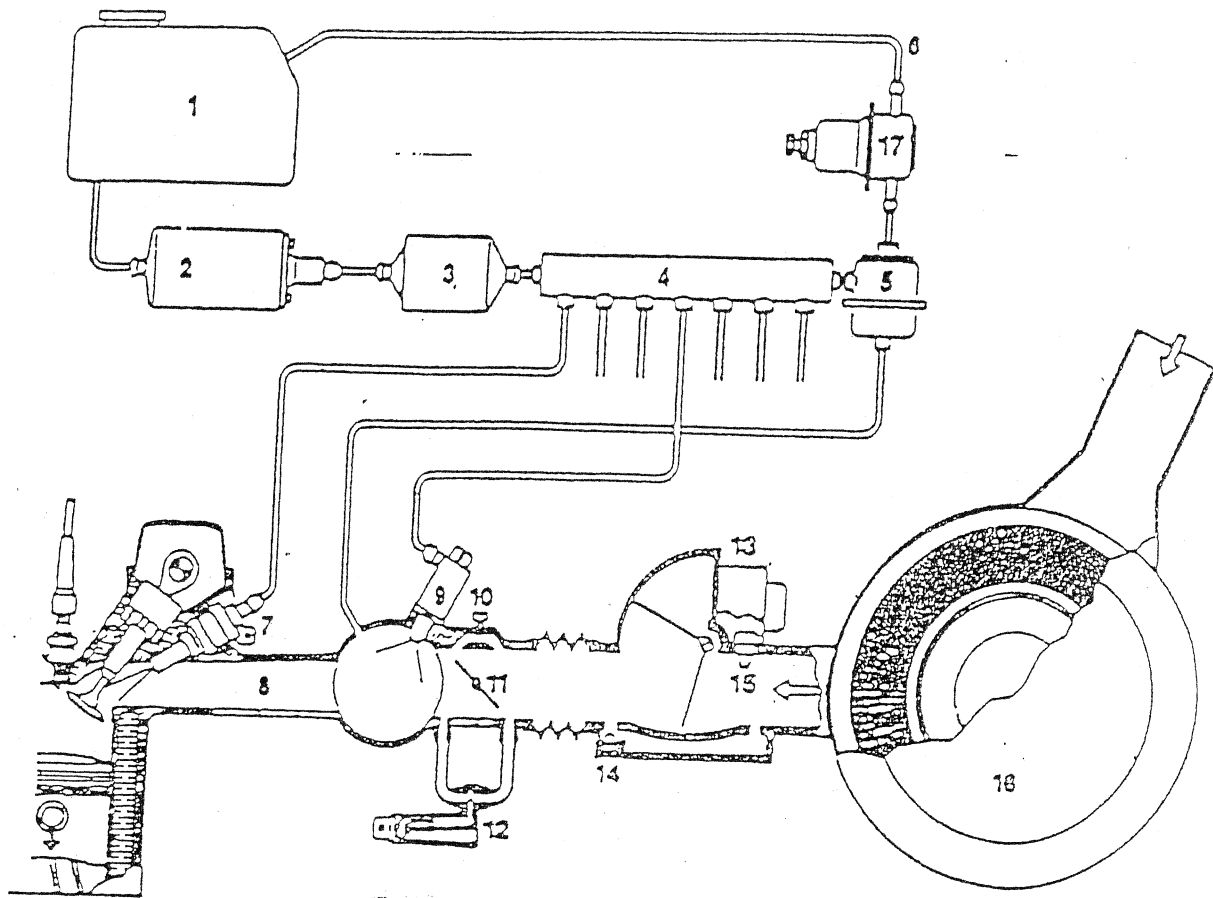


12: AIR FLOW SENSOR - M/ML MOTRONICS

12A: AIR MASS METER - M MOTRONICS

M = UNIVERSAL LOAD SENSING AIR FLOW OR AIR MASS.

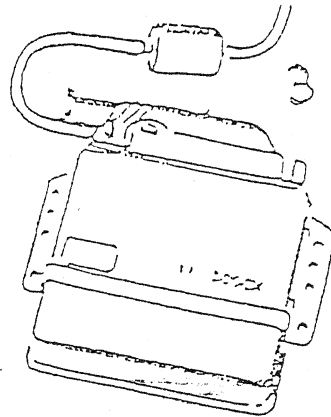
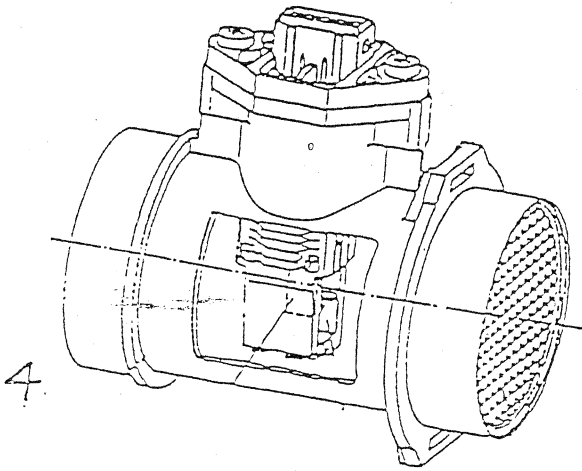
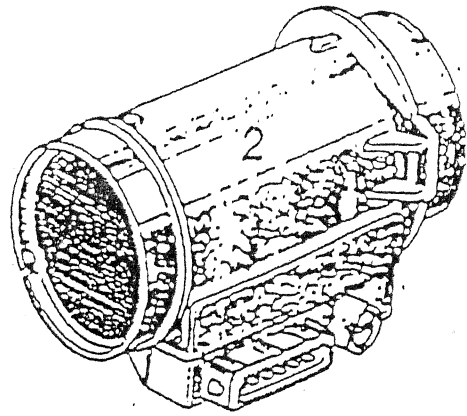
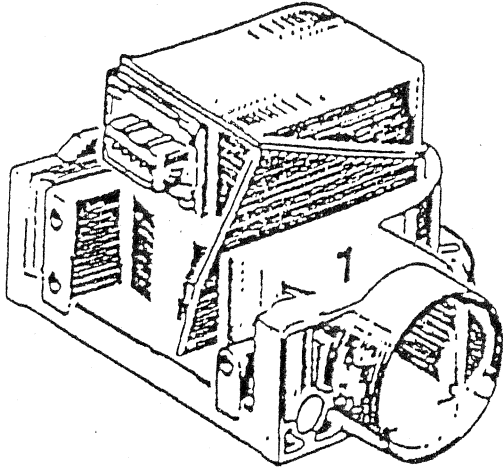
Fuel and air intake system



- | | | | |
|----|------------------------------|----|-------------------------------------|
| 1 | Fuel tank | 11 | Throttle valve |
| 2 | Fuel pump | 12 | Auxiliary-air valve |
| 3 | Fuel filter | 13 | Air-flow sensor |
| 4 | Fuel distributor | 14 | Idling mixture adjusting screw (CO) |
| 5 | Pressure regulator | 15 | Air temperature sensor |
| 6 | Return pipe | 16 | Air filter |
| 7 | Fuel injection valve | 17 | Vibration damper |
| 8 | Single intake tube | | |
| 9 | Cold-start valve | | |
| 10 | Idling speed adjusting screw | | |

Motronic

Load measurement



01. Which load measurement options are possible in Motronic systems?

Option	Type of measurement/application
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1. AIR FLOW SENSOR	MOTRONIC M, ML SYSTEMS (EG ML4.1)
2. AIR MASS SENSOR - HOT WIRE	MOTRONIC M SYSTEMS (EG M2.5)
3. MANIFOLD PRESSURE DELIVERY AND SPEED	MOTRONIC MP SYSTEMS (EG MP3)
4. AIR MASS-SENSOR - HOT FILM	LATEST MOTRONIC M SYSTEMS
.....	