Service Manual

Construction and function

Section	Group
2	25

Emission Control Systems
240/260
1976-

VOLVO

Table of Contents
EMISSION CONTROL SYSTEMS
(240/260 1975-)

General
Applications Chart (US) 2
Applications Chart (CANADA) 3
Catalytic Converter 4
Oxidation Converter
Three-Way Converter
Crankcase Emission Control System 6
Components
Component Placement
Evaporative Emission Control System 9
Components
Component Placement
Air Injection Reactor 16
Components
Component Placement
Altitude Compensating Control Pressure Regulator 19
Components
Component Placement
Exhaust Gas Recirculation 21
Components
Component Placement
Pulsair System 26
Components
Lambda Sond System 27
Components
Component Wiring/Placement 240-series 1977 28
Component Wiring/Placement 240-series 1978 30
Component Wiring/Placement 260-series 1978 32
Component Wiring/Placement 240-series 1979 34
Component Wiring/Placement 260-series 1979 36
Component Wiring/Placement 240-series; B21F engine 1980 38
Component Wiring/Placement 260-series; B28F engine 1980 40
Component Wiring/Placement 240-series; B21F engine 1981 42
Component Wiring/Placement 240-series; B21F-Turbo 1981 44
Component Wiring/Placement 260-series; B28F engine 1981 46
Component Wiring/Placement 240-series; B21F engine 1982 48
Component Wiring/Placement 240-series; B21F-Turbo 1982 50
Component Wiring/Placement 260-series; B28F engine 1982 52
Component Wiring/Placement 240-series; B21F-Turbo 1983 54
Component Wiring/Placement 240-series; B23F engine 1983-1984 56
Component Wiring/Placement 240-series; B230F engine 1985-1986 58
Component Wiring/Placement 240-series; B21F-Turbo 1984-1985 60

Diesel Emission Controls 62

Tune-Up Specificaions 63

Order Number TP 30727/2

Emission Control Systems
General

Volvo employs a variety of mechanical, electrical, and electromechanical systems designed to reduce the amount of pollutants found in the exhaust emissions.

The systems listed below vary in application across model years and engine types. Use applications charts on the pages that follow for information on specific applications.

— Evaporative Control System

— Crankcase Emission Control System

— Lambda-Sond™ System

— Catalytic Converter

— Altitude Compensating Control Pressure Regulator

— Exhaust Gas Recirculation

— Air Injection Reactor

The increasing stringency in emission control requirements mandated by Federal and State governments have effected changes in emission control technology since the 1975 model year. The California Air Resources Board (CARB) has set unique exhaust emissions standards for cars sold in California; this is why the emission control equipment may vary with engine type within a model year.

This manual describes the construction and function of the emission controls that were incorporated to meet the emission requirements for each model year and model. Refer to other service literature, i.e. service manuals, for the adjustments and fault tracing of emission control equipment.

-Applications Chart-

U.S. 240/260 Series

Year	Model(s)	Engine Type	Exhaust Gas Recirculation		Air Injection Reactor		Catalytic Converter 3-Way		Catalytic Converter 2-Way		Crankcase Emission Control System		Altitude Compensating Regulator		Evaporative Control System		Lambda-Sond	
1975	242, 244, 245	B20F	x	•	x	•				•	x	•			x	•		
1976	242, 244, 245	B21F	x	•	x	•				•	x	•	x	•	x	•		
1976	262, 264, 265	B27F	x	•	x	•				•	x	•	x	•	x	•		
1977	242, 244, 245	B21F	x					•			x	•	x	•	x	•		•
1977	262, 264, 265	B27F	x					•			x	•			x	•		•
1978	242, 244, 245	B21F	x					•	x		x	•			x	•		•
1978	242, 244, 245	B21F					x	•			x	•			x	•	x	•
1978	262, 264, 265	B27F	x					•	x		x	•			x	•		•
1978	262, 264, 265	B27F					x	•			x	•			x	•	x	•
1979	242, 244, 245	B21F	x					•	x		x	•			x	•		•
1979	242, 244, 245	B21F					x	•			x	•			x	•	x	•
1979	262, 264, 265	B27F					x	•			x	•			x	•	x	•
1980	242, 244, 245	B21F					x	•			x	•			x	•	x	•
1980	262, 264, 265	B28F					x	•			x	•			x	•	x	•
1981	242, 244, 245	B21F A)					x	•			x	•			x	•	x	•
1981	242, 244, 245	B21F - Turbo					x	•			x	•			x	•	x	•
1981	262, 264, 265	B28F B)					x	•			x	•			x	•	x	•
1981	264, 265	D24									x	•	x	•				
1982	242, 244, 245	B21F C)					x	•			x	•			x	•	x	•
1982	242, 244, 245	B21F - Turbo					x	•			x	•			x	•	x	•
1982	264	B28F					x	•			x	•			x	•	x	•
1982	244, 245	D24									x	•	x	•				
1983	242, 244, 245	B23F					x	•			x	•			x	•	x	•
1983	242, 244, 245	B21F - Turbo					x	•			x	•			x	•	x	•
1983	244, 245	D24									x	•	x	•				
1984	242, 244, 245	B23F					x	•			x	•			x	•	x	•
1984	242, 244, 245	B21F - Turbo					x	•			x	•	x	•	x	•	x	•
1984	244, 245	D24									x	•	x	•				
1985	244, 245	B230F					x	•			x	•				•	x	•
1985	244, 245	B21F - Turbo					x	•			x	•	x	•	x	•	x	•

[x] U.S. (49 state)

[•] California

A) Includes B21F, B21F-MPG
B) Includes B28F, B28F w/CIS
C) Includes B21F, B21F-LH

CANADA 240/260 Series

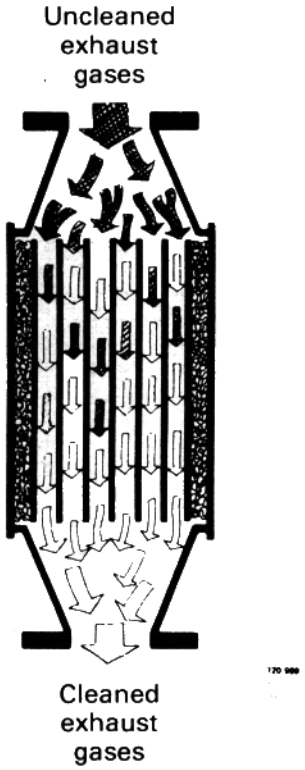
Year	Model(s)	Engine Type	Exhaust Gas Recirculation		Air Injection Reactor		Catalytic Converter 3-Way		Catalytic Converter 2-Way		Crankcase Emission Control System		Altitude Compensating Regulator		Evaporative Control System		Lambda-Sond		Pulsair	
1975	242, 244, 245	B20F																		
1976	242, 244, 245	B21F																		
1976	262, 264, 265	B27F																		
1977	242, 244, 245	B21F				•														
1977	262, 264, 265	B27F				•														
1978	242, 244, 245	B21F				•														
1978	245	B21A	x			•														
1978	245	B21A																		•
1978	262, 264, 265	B27F																		
1978	264, 265	B27A	x				x	•									x	•		
1979	242, 244, 245	B21A	x																	
1979	242, 244	B21F																		
1979	262, 264, 265	B27F					x	•									x	•		
1980	242, 244, 245	B21F																		
1980	262, 264, 265	B28F					x	•									x	•		
1980	244	B21A	x																x	•
1981	242	B21A	x																x	•
1981	244, 245	B23E																	x	•
1981	262, 264, 265	B28F					x	•									x	•		
1981	264, 265	D24																		
1982	242	B21A	x	•																
1982	244, 245	B23E	x	•																
1982	262, 264, 265	B28F					x	•									x	•		
1982	244, 245	D24																		
1983	242	B21A																	x	•
1983	244, 245	B23E																		•
1983	242, 244, 245	B21F - Turbo					x	•									x	•		
1983	244, 245	D24																		
1984	242	B21A	x	•																•
1984	244, 245	B23F					x	•									x	•		
1984	242, 244, 245	B21F - Turbo					x	•					x	•			x	•		
1983	244, 245	D24	x	•																
1985	244, 245	B230F					x	•										•		
1985	244, 245	B21F - Turbo					x	•					x	•			x	•		

x with automatic transmission

• with manual transmission

CATALYTIC CONVERTER

General



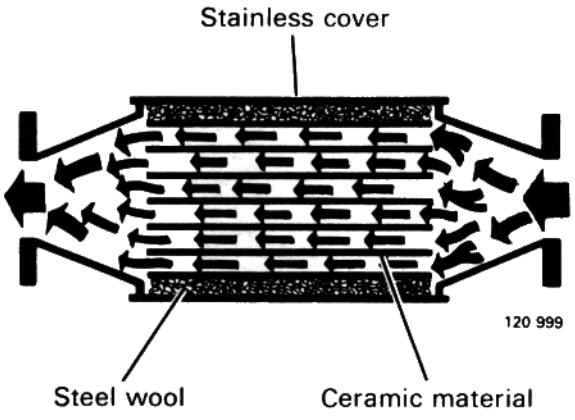
Catalytic Converter
This is a supplementary device in the exhaust system, designed to clean up the remaining unclean exhaust gases.

This device is mainly a steel container with a ceramic material insert, designed to let the exhaust gases pass through channels in the insert. The channel walls are covered by a thin layer of metals. These metals act as catalysts, permitting a chemical action to occur without actually taking part in it.

Damage to the catalytic converter will increase exhaust gas emissions. Additives to fuel and lubricating oil will impair the converter operation. Even short periods of operation with fuel containing lead additives will cause the catalytic converter to partly or completely lose its effectiveness.

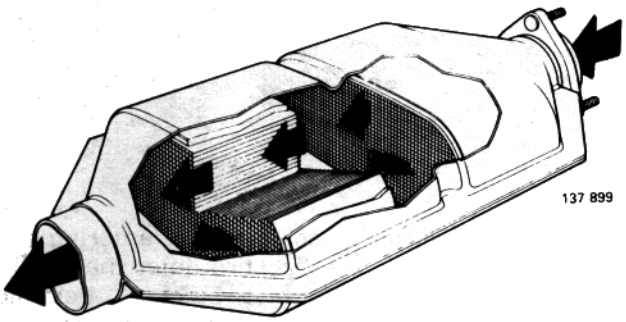
At extremely high temperatures in the converter (more than 1400°C=2500°F) the ceramic body melts. At 1000°C (1800°F), the converter effectiveness will be impaired because the active catalytic surface decreases.

Component Types



Oxidation-Type (Two-Way) Catalytic Converter
This is the standard type of catalytic converter. It will oxidize carbon monoxide (CO) and hydrocarbons (HC) in the exhaust gases by subjecting them to combustion by using extra air. The end products are carbon dioxide and water which are blown out by the exhaust system. This type of catalytic converter will convert only a small amount of the nitrogen oxides (NOx).

Combustion of carbon monoxide and hydrocarbons is normally achieved in an environment with a high content of oxygen and at a temperature of 650°C (1200°F) or higher. This temperature cannot be reached in the exhaust system under all engine operating conditions.



By means of the catalytic converter, this combustion can be achieved at temperatures as low as 300°C = 575°F.

The most important substances used are platinum and palladium. These metals are evenly spread over a ceramic body with a cellular structure. The exhaust gases come into contact with these surfaces as they pass through the converter. The catalytic ceramic body is not in any way used-up during operation.

Three-Way (Oxidation & Reduction) Catalytic Converter

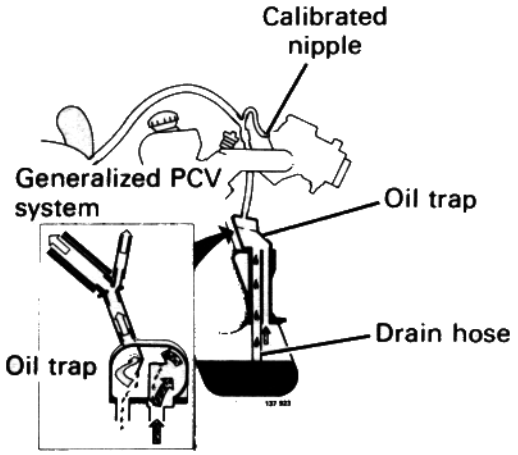
The purpose of the three-way catalytic converter is to oxidize carbon monoxide (CO), hydrocarbons (HC) and reduce oxides of nitrogen (NOx) in the exhaust gases. This is achieved by converting carbon monoxide and hydrocarbons to carbon dioxide and water, respectively. At the same time, oxides of nitrogen are converted to nitrogen and water. The operating range of the three-way catalytic converter is limited to a narrow band around the ideal air/fuel ratio for the engine. Within this band, the conversion of carbon monoxide, hydrocarbons and oxides of nitrogen can take place most efficiently.

The three-way catalytic converter accelerates the reaction of carbon monoxide, hydrocarbons and oxides of nitrogen at temperatures as low as 300°C = 575°F.

Platinum and rhodium are the most important substances in this type of converter.

CRANKCASE EMISSION CONTROLS

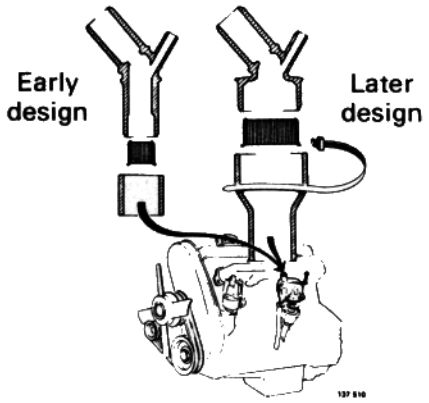
General



The crankcase emission controls prevent crankcase gases from being released into the atmosphere. Instead, the crankcase gases are directed to the intake manifold. Crankcase gases are removed from the crankcase by positive crankcase ventilation (PCV). Engine vacuum draws the crankcase gases out, thus allowing fresh air to be drawn in.

Components

(Not all components appear on all models; designs may vary)

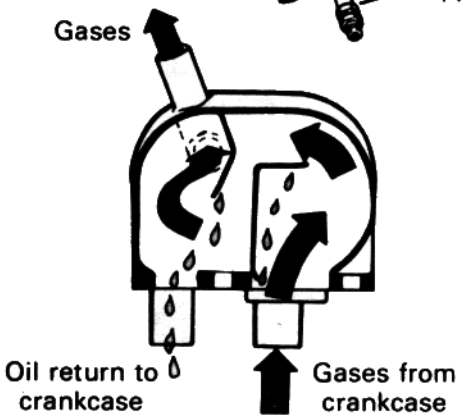


Flame Guard

Prevents a possible backfire from entering the crankcase. Should the backfire enter the crankcase, it could ignite the blow-by gases. Periodic cleaning of the flame guard helps prevent crankcase over-pressure.

Nipple

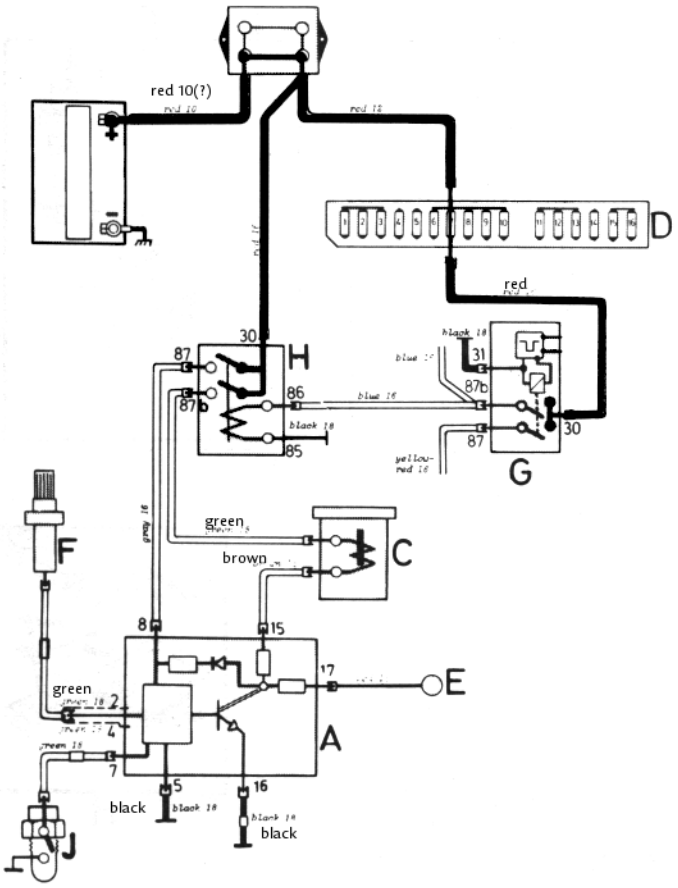
Regulates the crankcase gas flow and ensures that crankcase vacuum does not become excessive.



Oil Trap

Separates oil from gases and thus reduces oil consumption and emissions. An additional benefit is more effective control of the vacuum in the crankcase.

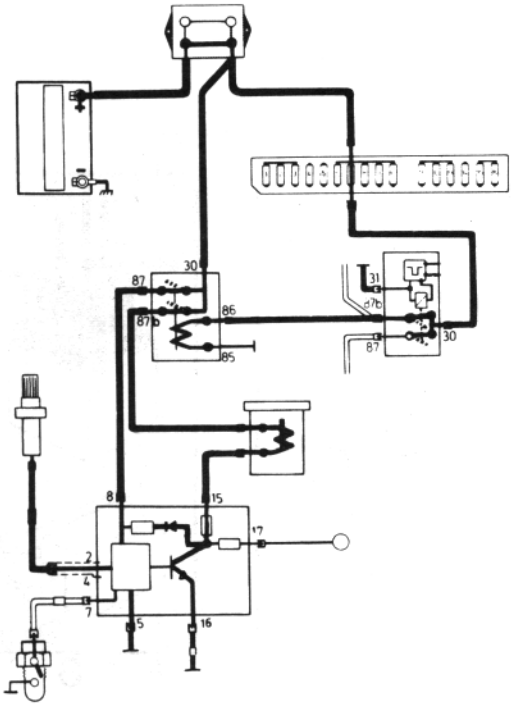
LAMBDA SOND WIRING DIAGRAM
B21F/1981



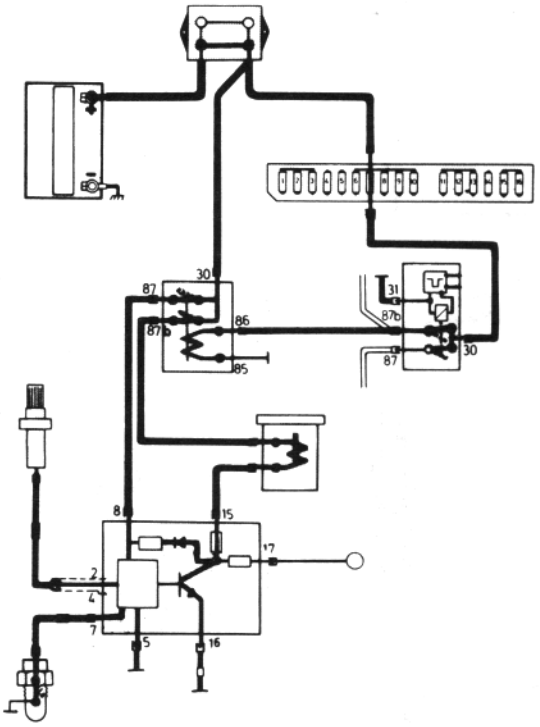
Fuse No. 7:
Fuel pump (main pump)

Legend:
- A Electronic module
- B Ground points
- C Frequency valve
- D Fuse box
- E Test instrument pick-up point
- F Oxygen sensor
- G Electronic pump relay
- H System relay

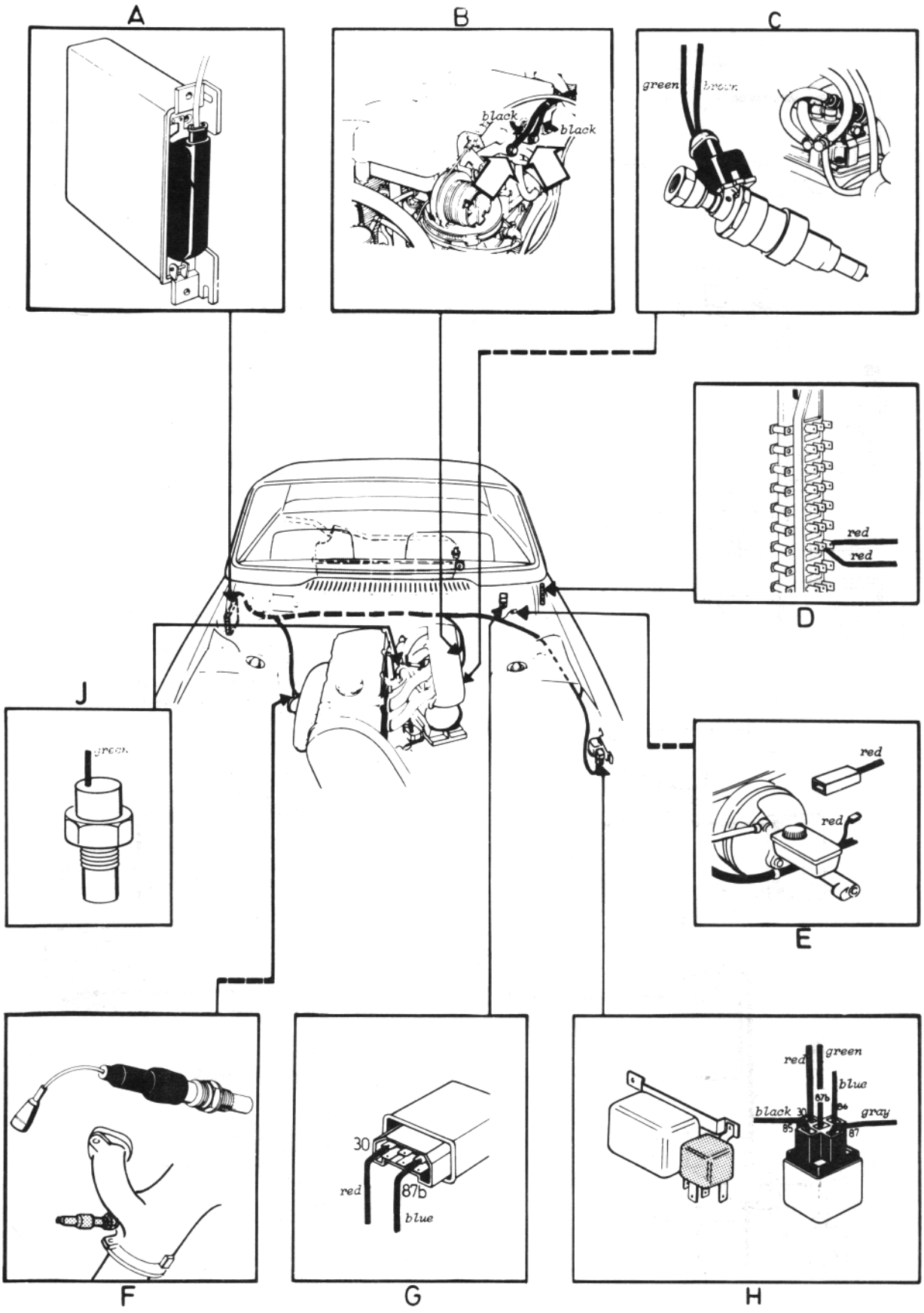
Warm engine.
System operates on duty cycle, regulating air/fuel mixture.



Cold engine.
Circuit through thermal switch is closed = system operates on fixed cycle and provides richer air/fuel mixture.



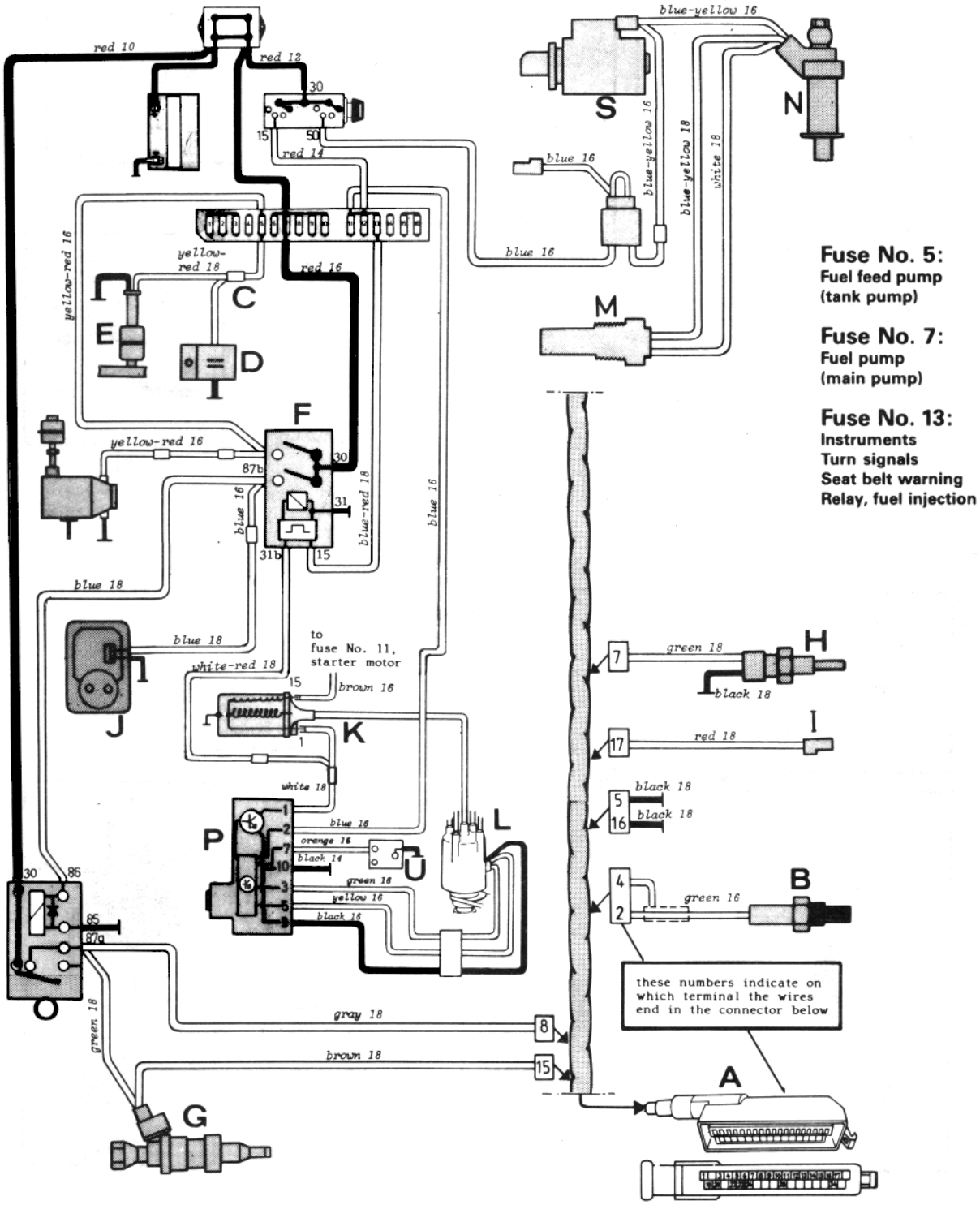
LAMBDA SOND COMPONENT PLACEMENT
B21F/1981



LAMBDA SOND WIRING DIAGRAM
B21F/1982

Legend:

A Connector, oxygen sensor Electronic Control Unit
B Oxygen sensor (Lambda-sond)
C Connector, fuel tank pump
D Capacitor, fuel tank pump
E Fuel tank pump
F Fuel pump relay
G Frequency valve
H Temperature switch
I Test instrument pick-up
J Control pressure regulator
K Ignition coil
L Distributor
M Thermal time switch
N Cold start injector
O Relay, oxygen sensor system
P Electronic Control Unit, ignition system
S Starter motor
T Fuel pump (main pump)

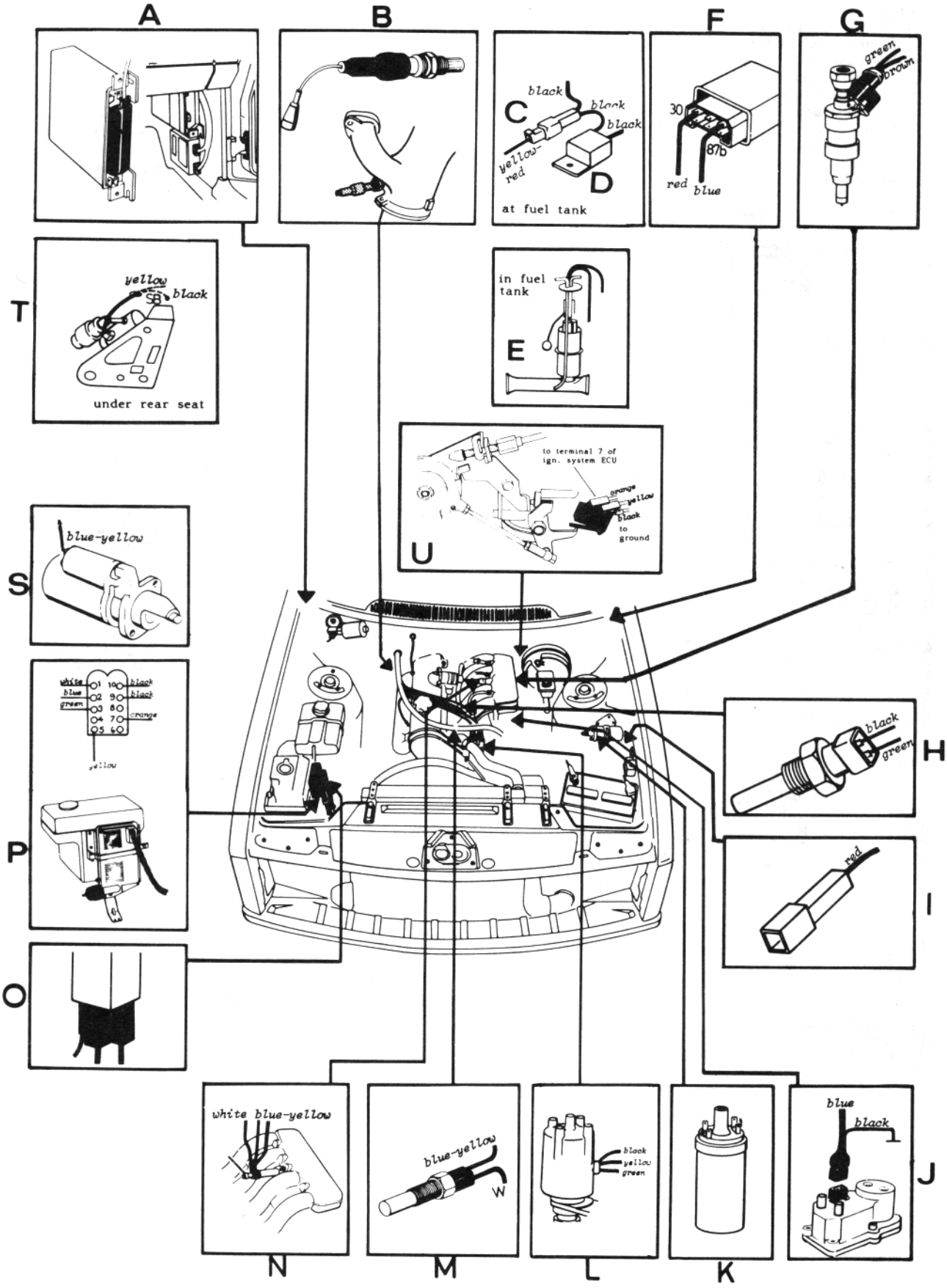


Fuse No. 5:
Fuel feed pump (tank pump)

Fuse No. 7:
Fuel pump (main pump)

Fuse No. 13:
Instruments
Turn signals
Seat belt warning
Relay, fuel injection

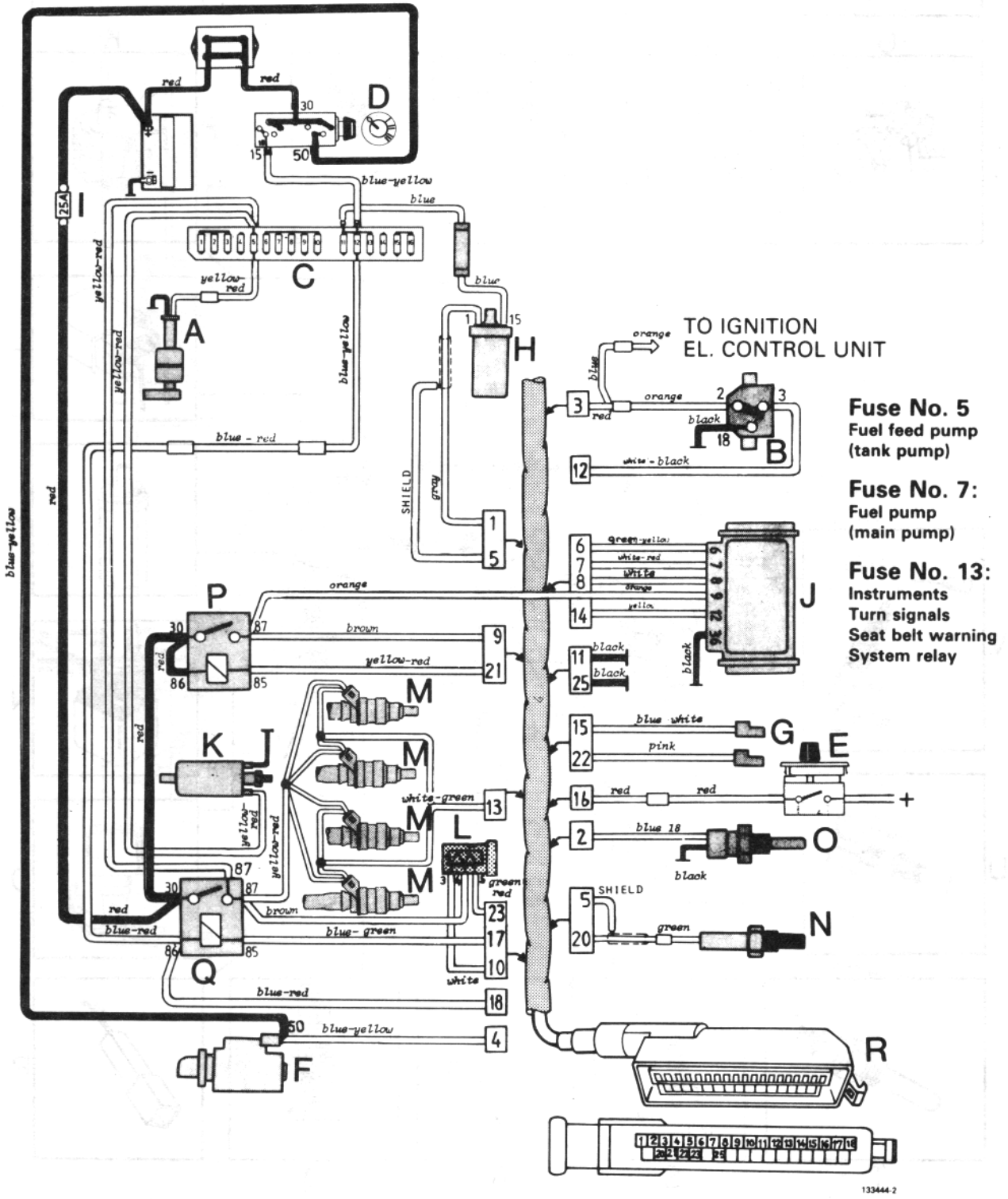
LAMBDA SOND COMPONENT PLACEMENT
B21F/1982



LAMBDA SOND WIRING DIAGRAM
B23F / 1983–1984

Legend:

- **A** Fuel tank pump
- **B** Throttle switch
- **C** Fuse box
- **D** Ignition switch
- **E** Air conditioning switch
- **F** Starter motor
- **G** Test pick-up
- **H** Ignition coil
- **I** Fuse, 25 amp.
- **J** Air mass. meter
- **K** Fuel pump (main pump)
- **L** Air control valve
- **M** Fuel injectors
- **N** Oxygen sensor
- **O** Temperature sensor
- **P** System relay
- **Q** Fuel pump relay
- **R** Electronic control unit (ECU)



1983 - 1986 Model Year

Idle Speed:

B21A - 900 rpm ± 50 rpm
B23E - 900 rpm -5- 50 rpm
B21F-Turbo - 900 rpm ± 50 rpm
B23F, B230F - 750 rpm ± 20 rpm

Ignition Timing:

Vacuum units disconnected, air conditioning off.

B21A	7° BTDC at 750 rpm
B21F-Turbo	12° BTDC at 900 rpm
B23E	10° BTDC at 750 rpm
B23F, B230F	12° BTDC at 750 rpm

Start engine and do not run it over 1500 rpm (to avoid influence from Spark Control Unit).

CO Content:

	CO	Setting Limits
BA21A	3.0%	2.5-4.0%
B23E	1.0%	0.5-2.0%
B21F-Turbo	1.0%	0.7-1.3%
B23F, B230F	0.6%	0.4-0.8%

TUNE UP SPECIFICATIONS

1977 Model Year

Idle Speed:

B21F - 900 ± 50 rpm all (except Canada w/automatic trans.)
- 850 ± 50 rpm (Canada w/automatic trans.)

B27F - 900 rpm

Ignition Timing: (750 rpm, vacuum advance disconnected)

B21F - U.S. model	12° BTDC
- Canada model	15° BTDC
B27F - 10°	

CO Content: (at normal operating temperature)

B21F - U.S. Federal	1.0% ± 0.3%
- California	1.5% ± 0.3%
- Canada	2.0% ± 0.3%

1978 Model Year

Idle Speed:

B21F - 900 ± 50 rpm
B27F - 900 ± 50 rpm

Ignition Timing: (vacuum disconnected, A.I.R. disconnected, A/C off)

B21F - 12° BTDC at 750 ± 50 rpm
B27F - 10° ± 2° BTDC at 750 ± 50 rpm

CO Content:

B21F - Federal, manual transmission	1.0% ± 0.3% at 900 ± 50 rpm
- Federal, automatic transmission	1.0% ± 0.3% at 800 ± 50 rpm
- California, manual and automatic	2.0% ± 0.5% at 900 ± 50 rpm 1.0%
B27F - Federal and California	1.0% ± 0.3% at 900 ± 50 rpm

Cars equipped with oxygen sensor system should be checked with the system disconnected. When the system is reconnected the CO should drop below 1.0%.

1979 Model Year

Idle Speed:

B21A - 900 ± 50 rpm
B21F - 900 ± 50 rpm
B27F - 900 ± 50 rpm

Ignition Timing:

B21A - (Canada)	12° ± 2° BTDC at 750 ± 50 rpm
B21F - USA/Federal and Canada vacuum disconnected, A/C off	10° ± 2° BTDC at 750 ± 50 rpm
B21F - USA/California, A/C off	8° ± 2° BTDC at 750 ± 50 rpm
B27F - vacuum disconnected, A/C off	10° ± 2° BTDC at 750 ± 50 rpm

CO Content:

B21A - Canada Pulsair disconnected and plugged	2.5-4% (checking) 3.4% (setting)
B21F - Canada	2.0% ± 0.5% at 900 ± 50 rpm 1.0%
B21F - Federal, manual transmission	1.0% ± 0.3% at 900 ± 50 rpm
B21F - Federal, automatic transmission	1.0% ± 0.3% at 800 ± 50 rpm
B21F - California, manual and automatic	2.0% ± 0.5% at 900 ± 50 rpm 1.0%
B27F - Canada	1.0% ± 0.3% at 900 ± 50 rpm
B27F - Federal and California	1.0% ± 0.3% at 900 ± 50 rpm

Check with oxygen sensor system (Lambda Sond) disconnected.
When the system is reconnected the CO should drop below 1.0%.

1980 Model Year

Idle Speed:

B21A and B21F (Canada) - 900 ± 50 rpm
B21F (USA) - 950 ± 50 rpm
B28F (USA and Canada) - 950 ± 50 rpm

Ignition Timing: (vacuum disconnected, A/C off)

B21A (Canada)	12° ± 2° BTDC at 750 ± 50 rpm
B21F (Canada)	10° ± 2° BTDC at 750 ± 50 rpm
B21F, USA (Federal and California)	8° ± 2° BTDC at 750 ± 50 rpm
B21F, all	10° ± 2° BTDC at 750 ± 50 rpm

CO Content

B21A (Canada) (Pulsair disconnected and plugged)	3.5% ± 0.5% at 900 ± 50 rpm 1.0%
B21F (Canada)	2.0% ± 0.5% at 900 ± 50 rpm 1.0%
B21F (USA)	2.0% ± 0.5% at 950 ± 50 rpm 1.0%
B28F - USA and Canada	1.0% ± 0.3% at 950 ± 50 rpm

Check with oxygen sensor system (Lambda Sond) disconnected.
When the system is reconnected the CO should drop below 1.0%.

1981 Model Year

Idle Speed:

On certain models (with Constant Idle Speed System = CIS System) idle speed cannot be adjusted. Controls are sealed.

B21A (Canada) - 900 rpm ± 50 rpm
B23E (Canada) - 900 rpm ± 50 rpm
B21F (Federal) - 900 rpm ± 50 rpm
B21F (California) - 900 rpm ± 50 rpm with CIS System
B21F-MPG - 750 rpm ± 50 rpm with CIS System
B21F-Turbo - 900 rpm ± 50 rpm with CIS System
B28F (Federal and Canada) - 900 rpm ± 50 rpm
B28F (California) - 900 rpm ± 50 rpm with CIS System

Ignition Timing:

B21A (Canada)	12° ± 2° BTDC at 750 rpm ± 50 rpm
B23E (Canada)	5° ± 2° BTDC at 750 rpm ± 50 rpm
B21F (Federal)	8° ± 2° BTDC at 750 rpm ± 50 rpm
B21F (California)	8° ± 2° BTDC at 900 rpm ± 50 rpm
B21F-MPG	12° ± 2° BTDC at 750 rpm ± 50 rpm
B21F-Turbo	12° ± 2° BTDC at 900 rpm ± 50 rpm
B28F (Federal and Canada)	10° ± 2° BTDC at 750 rpm ± 50 rpm
B28F (California)	10° ± 2° BTDC at 900 rpm ± 50 rpm

CO Content:

On certain models CO content cannot be adjusted. Controls are sealed.

	CO	Setting Limits	To be set at (± 50 rpm)
B21A, Canada (Pulsair and EGR disconnected and plugged)	3.5%	2.5-4.0%	900 rpm
B23E, Canada (Pulsair and EGR disconnected and plugged)	1.0%	0.5-1.0%	900 rpm

Following should be checked with oxygen sensor system (Lambda Sond) disconnected. When the system is reconnected, CO should drop below 1.0%.

B21F, USA (Federal/California)	1.0%	0.7-1.3%	900 rpm
B21F-MPG	1.0%	0.7-1.3%	750 rpm
B21F-Turbo	1.0%	0.7-1.3%	900 rpm
B28F (Canada and USA)	1.0%	0.7-1.3%	900 rpm

1982 Model Year

Idle Speed:

On USA models (with Constant Idle Speed System = CIS System) idle speed cannot be adjusted. Controls are sealed.

B21A (Canada) - 900 rpm ± 50 rpm
B23E (Canada) - 900 rpm ± 50 rpm
B21F - 750 rpm ± 20 rpm
B21F LH-Jetronic - 750 rpm ± 20 rpm
B21F-Turbo - 900 rpm ± 50 rpm
B28F (USA and Canada) - 900 rpm ± 20 rpm

On B21F and B21F LH-Jetronic with idle speed 750 rpm, idle speed increases to 900 rpm when AC is switched on.

Ignition Timing:

To be set at idle.

B21A (Canada)	7° ± 2° BTDC
B23E (Canada)	5° ± 2° BTDC
B21F	12° ± 2° BTDC
B21F LH-Jetronic	12° ± 2° BTDC
B21F-Turbo	12° ± 2° BTDC
B28F (USA and Canada)	10° ± 2° BTDC

CO Content:

CO should be set within three minutes after thermostat opens.
On USA models CO content cannot be adjusted. Controls are sealed.

	CO	Setting Limits
B21A (Canada) (Pulsair and EGR disconnected and plugged)	3.0%	2.5-4.0%
B23E (Canada) (Pulsair and EGR disconnected and plugged)	1.0%	0.5-2.0%

Following should be checked with oxygen sensor system disconnected.
When system is reconnected, CO should drop below 1.0%.

B21 (CI)	1.0%	0.7-1.3%
B21F LH-Jetronic	0.6%	0.4-0.8%
B21F-Turbo	1.0%	0.7-1.3%
B28F	1.0%	0.7-1.3%