

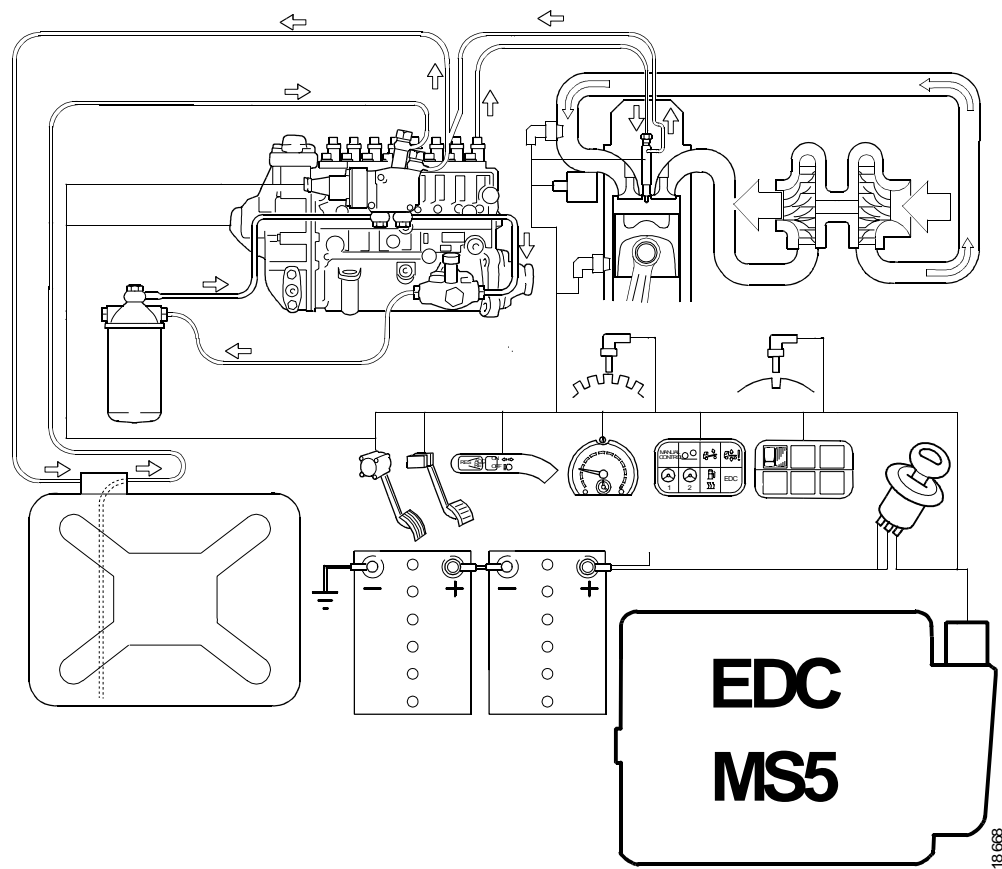
SCANIA

03:02-01

Issue 3 en

EDC MS5 for injection pump

Description of operation



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Important

The safety precautions and warnings in the work description must be read thoroughly before any work is carried out.

Using only the work description as a basis for the work is not permitted.

General

This booklet describes the EDC MS5. EDC is an acronym for Electronic Diesel Control.

EDC MS5 is an electronic system for controlling fuel volume and injection timing. EDC MS5 is fitted to vehicles with an injection pump.

More information on the fuel system can be found in the following service booklets:

- Fuel system, function description, 03:01-01
- Fuel system, work description, 03:01-02
- Injector for in-line pump system, function and work description, 03:01-03

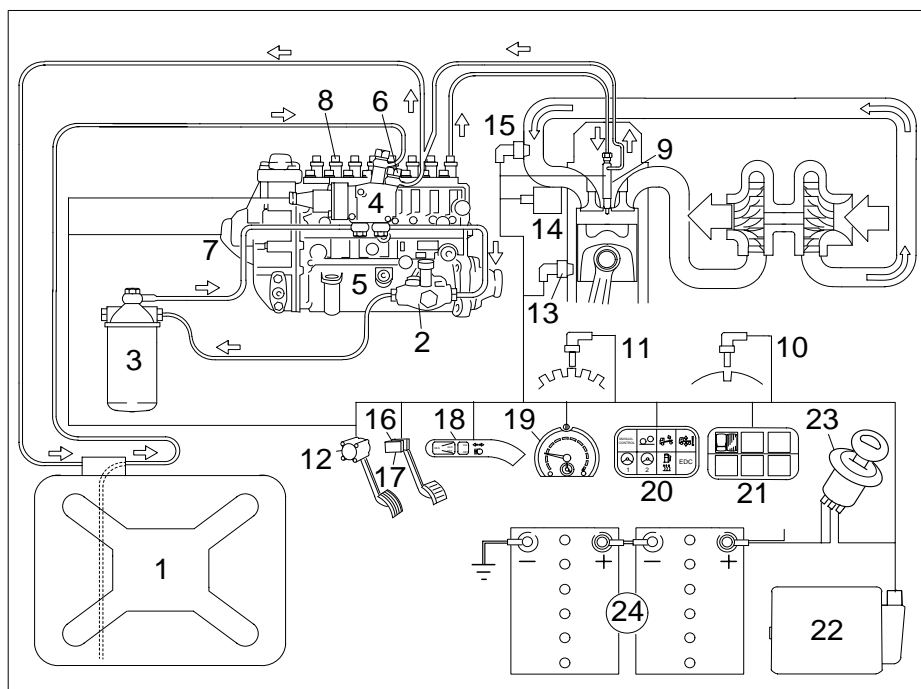
Fuel quantity and injection timing

The EDC MS5 determines the fuel volume to supply to the engine. In certain cases, the EDC MS5 also determines the injection timing. This control of the injection means that we can optimise the combustion, which in turn leads to cleaner exhaust gases and lower fuel consumption.

The control unit is the brain of the EDC system. The control unit processes the information from both the sensors and the components that are part of the EDC system and also from the control units in other systems. Refer to illustration.

When the control unit has processed the information, it sends signals to the electronically controlled injection pump governor. The signals control the injection of the fuel.

The EDC system makes possible such functions as cruise control, hand throttle, speed limiter, smoke limiter and a special cold start programme.

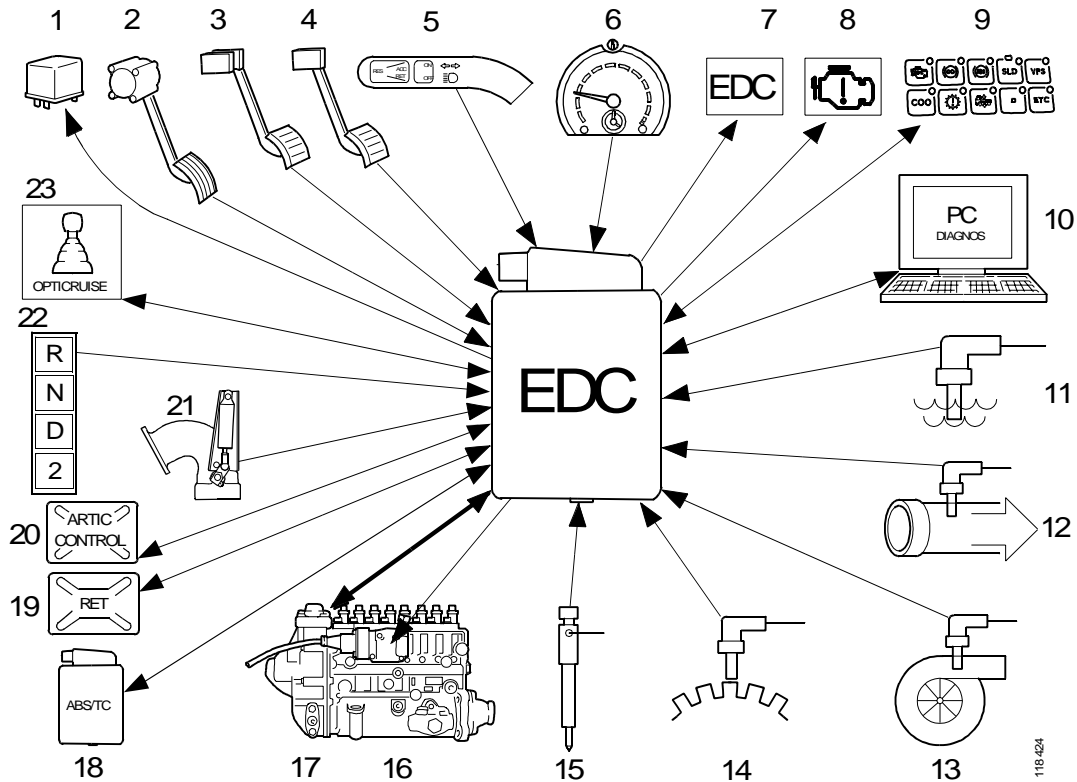


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- | | |
|----------------------------------|-----------------------------------|
| 1 Fuel tank | 13 Coolant temperature sensor |
| 2 Feed pump | 14 Charge air pressure sensor |
| 3 Fuel filter | 15 Charge air temperature sensor |
| 4 Fuel valve | 16 Brake pedal switches |
| 5 Injection pump | 17 Clutch pedal switch |
| 6 Overflow valve | 18 Control for the cruise control |
| 7 Governor | 19 Tachograph |
| 8 Delivery valve | 20 Indicator lamp |
| 9 Injector | 21 Diagnostic switch |
| 10 Main engine speed sensor | 22 Control unit |
| 11 Auxiliary engine speed sensor | 23 Starter lock |
| 12 Accelerator pedal sensor | 24 Battery |

Communication in the EDC system

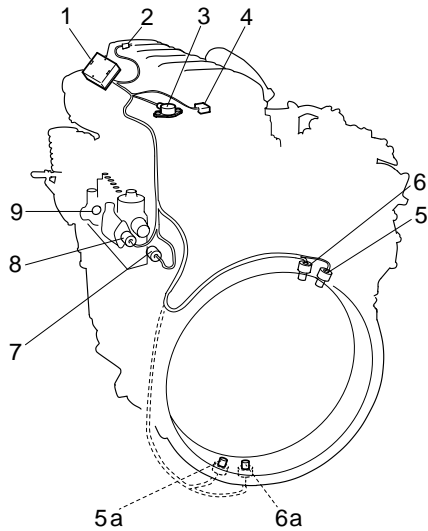
The EDC control unit is the brain of the EDC system. Below you can see which components the control unit communicates with and the direction of the information flow.



- | | |
|----------------------------------|--------------------------------|
| 1 Supply relay | 13 Charge air pressure sensor |
| 2 Accelerator pedal sensor | 14 Two engine speed sensors |
| 3 Brake pedal switches | 15 Needle movement sensor |
| 4 Clutch pedal switch | 16 Fuel valve |
| 5 Control for cruise control | 17 Governor |
| 6 Tachograph (speed) | 18 ABS/TC, EBS |
| 7 Warning lamp for EDC (truck) | 19 Retarder |
| 8 Warning lamp for EDC (bus) | 20 Articulation control system |
| 9 Diagnostics switch with lamp | 21 Exhaust brake |
| 10 Diagnostic socket for PC | 22 Automatic gearbox |
| 11 Coolant temperature sensor | 23 Opticruise |
| 12 Charge air temperature sensor | |

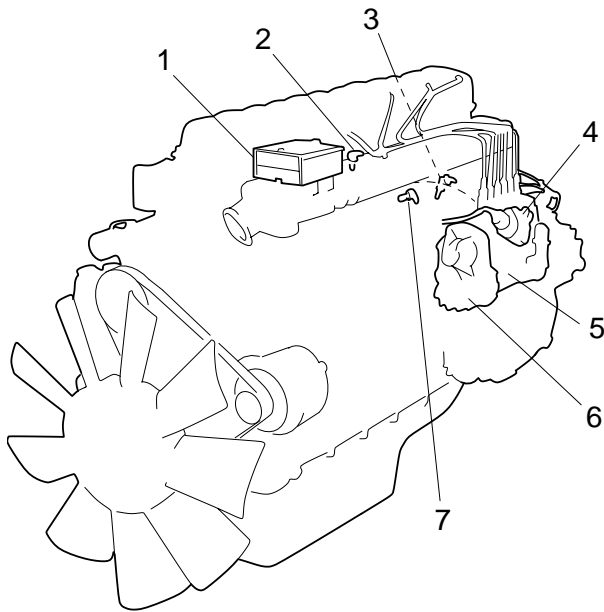
Components on the engine

Component locations on a 9-litre engine



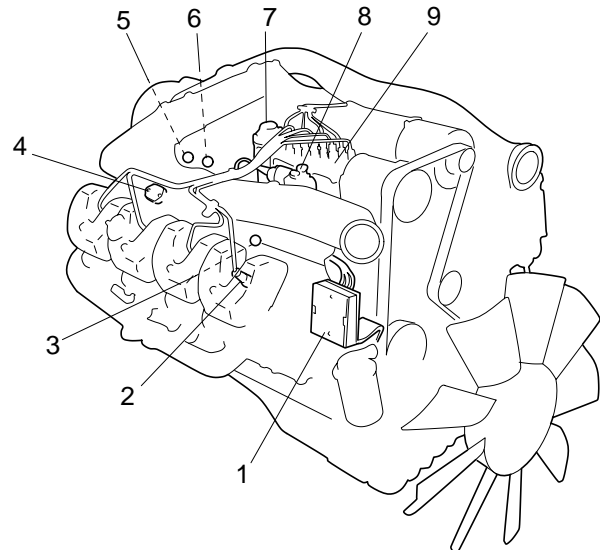
- 1 Junction box connecting the EDC control unit to the EDC components on the engine
- 2 Needle movement sensor
- 3 Charge air pressure and temperature sensor
- 4 Coolant temperature sensor
- 5 Auxiliary engine speed sensor (5a on bus)
- 6 Main engine speed sensor (6a on bus)
- 7 Governor (control rack position sensor and setting solenoids for fuel volume and injection timing)
- 8 Fuel valve
- 9 Injection pump

Component locations on a 12-litre engine



- 1 Junction box connecting the EDC control unit to the EDC components on the engine
- 2 Charge air pressure and temperature sensor (may also be two separate sensors)
- 3 Auxiliary engine speed sensor
- 4 Fuel valve
- 5 Injection pump
- 6 Governor (control rack position sensor, main engine speed sensor and setting solenoid for fuel volume)
- 7 Coolant temperature sensor

Component locations on a 14-litre engine



- 1 Junction box connecting the EDC control unit to the EDC components on the engine
- 2 Needle movement sensor
- 3 Coolant temperature sensor
- 4 Charge air pressure and temperature sensor (may also be two separate sensors)
- 5 Main engine speed sensor
- 6 Auxiliary engine speed sensor
- 7 Governor (control rack position sensor and setting solenoids for fuel volume and injection timing)
- 8 Fuel valve
- 9 Injection pump

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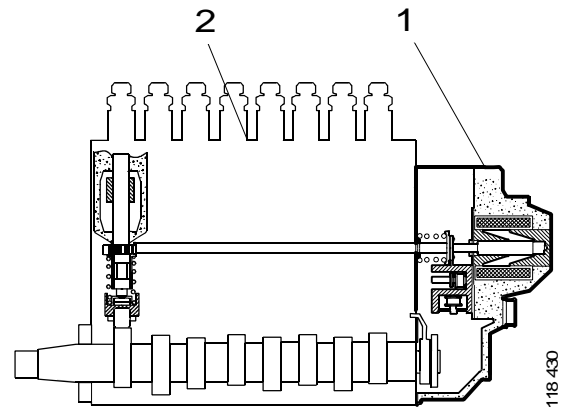
Governor E15

The injection pump governor is described here. The injection pump is described in the service booklet Fuel system, function description, 03:01-01.

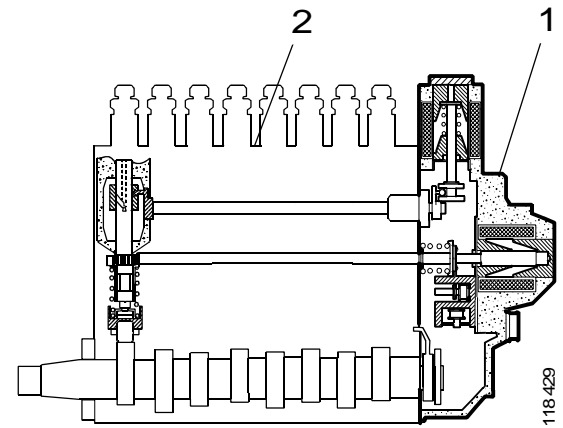
The EDC control unit communicates with the following components of the injection pump governor:

- One control rack position sensor
- One fuel volume setting solenoid
- One injection timing setting solenoid On 9 and 14-litre engines.
- One main engine speed sensor. Only in vehicles with 12-litre engines is this located in the governor. The section 'Engine speed sensors' describes the main engine speed sensor in vehicles with 9 and 14-litre engines.

The components above control the control rack. The components are described below.



- 1 Governor to regulate the fuel volume
- 2 Injection pump



- 1 Governor to regulate the injection timing and fuel volume
- 2 Injection pump

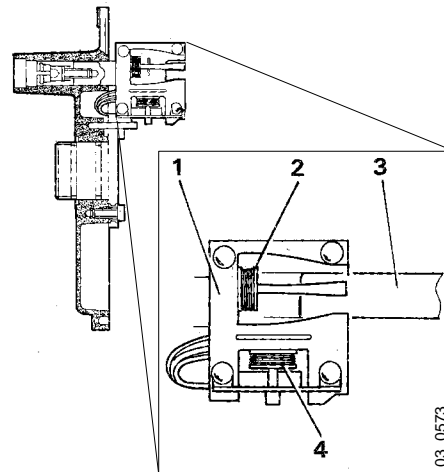
Control rack position sensor

The control rack position sensor informs the EDC control unit about the control rack position.

The control rack position sensor consists of an iron core, a measuring coil and a reference coil.

The measuring coil signal reports the control rack position. The signal changes when the control rack moves.

The reference coil signal allows the control unit to compensate for external factors, such as temperature, that affect the measuring coil signal. The reference coil signal is not affected by the motion of the control rack.



- 1 *Iron core*
- 2 *Measuring coil*
- 3 *Control rack*
- 4 *Reference coil*

Setting solenoid for fuel volume

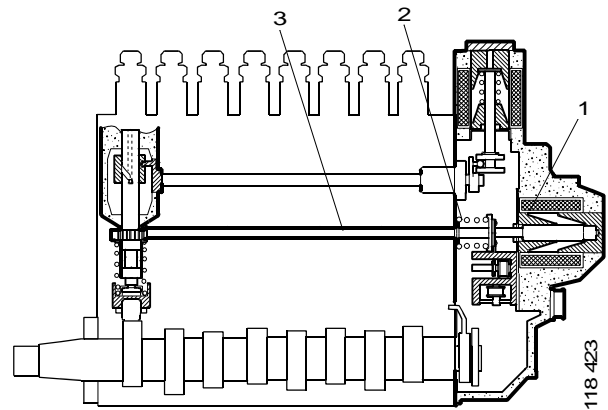
The setting solenoid for fuel volume pushes the control rack towards full throttle position. The setting solenoid works against the return spring that tries to force the control rack back.

The setting solenoid receives +24 V from the supply relay and is earthed via EDC control unit pins 1 and 2.

The control unit regulates the current through the solenoid and thus controls the control rack.

Increasing the current pushes the control rack towards full throttle position and vice versa.

If the circuit is broken, the control rack is forced to the stop position by the return spring.



- 1 *Setting solenoid for fuel volume*
- 2 *Return spring*
- 3 *Control rack*

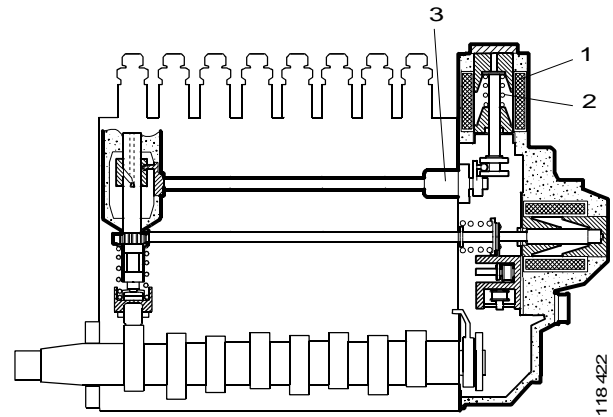
Injection timing setting solenoid

The injection timing setting solenoid is only fitted in certain governors. It turns the prestroke shaft toward earlier injection timing. It works against the return spring that tries to turn the prestroke shaft back.

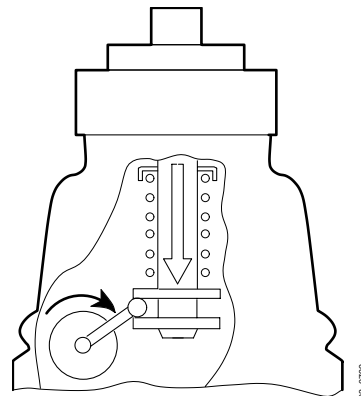
The setting solenoid receives +24 V from the supply relay and is earthed via EDC control unit pins 3 and 4.

The control unit regulates the current through the solenoid and thus controls the prestroke shaft. If the current increases, the prestroke shaft is turned towards earlier injection timing and vice versa.

If the circuit is broken, the prestroke shaft is turned back by the return spring, resulting in delayed injection timing.



- 1 *Injection timing setting solenoid*
- 2 *Return spring*
- 3 *Prestroke shaft*



The injection timing setting solenoid turns the prestroke shaft toward earlier injection timing.

Main engine speed sensor

The main engine speed sensor in the governor senses when a pulse wheel mounted on the injection pump camshaft is rotating.

If the EDC control unit detects a fault, fault code 12 is generated.

Note: The sensor is sensitive to polarity reversal and the pins must be connected as indicated below.

Pin 21— signal voltage.

Pin 13 — earth.

More information about the following can be found in the section 'Engine speed sensors':

- Main engine speed sensor T74. This is fitted in vehicles with EDC MS5 and 9 or 14 litre engines.
- Main engine speed sensor interaction with auxiliary engine speed sensor.

Engine speed sensors

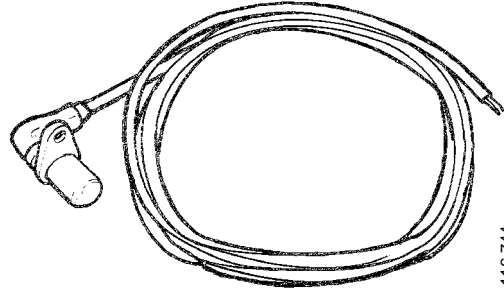
The EDC system contains two engine speed sensors: main engine speed sensor and auxiliary engine speed sensor. The sensors are inductive.

For safety reasons, the control unit acts according to the sensor reading the highest engine speed.

If the control unit does not receive a signal from one of the sensors, the engine torque will be limited. If the signal returns, the engine will operate normally again.

If the control unit receives no signal from either sensor, the engine will not start; if the engine is running, it will be switched off.

Both sensors are described in more detail on the next page.



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Main engine speed sensor T74 (in flywheel housing)

Note: Main engine speed sensor T74 is only in vehicles with 9 or 14-litre engines. The main engine speed sensor in vehicles with 12-litre engines is described in the section 'Governor E15'.

There are holes along the edge of the flywheel. The main engine speed sensor senses the holes when the flywheel rotates and sends impulses from each hole to the EDC control unit. In this way, the control unit can calculate the position and speed of the engine.

The control unit senses the voltage from the main engine speed sensor between pins 21 and 13.

If the control unit detects a fault, fault code 12 is generated.

Note: The sensor is sensitive to polarity reversal and the pins must be connected as indicated below.

Pin 21 — signal voltage.

Pin 13 — earth.

Auxiliary engine speed sensor T75

The auxiliary engine speed sensor senses the teeth of the starter motor ring gear when the flywheel is rotating. In this way, the control unit can also calculate the engine speed.

The control unit senses the voltage from the sensor between pins 22 and 17.

If the control unit detects a fault, fault code 13 is generated.

Note: The sensor is sensitive to polarity reversal and the pins must be connected as indicated below.

Pin 22 — signal voltage.

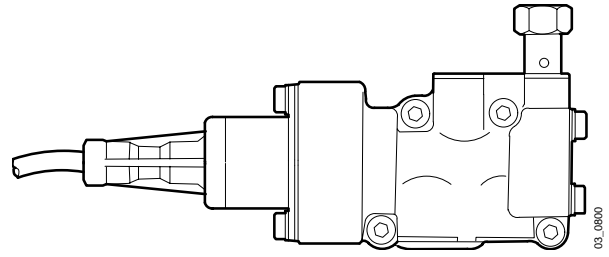
Pin 17 — earth.

Fuel valve V45

The fuel valve is a solenoid valve that is open when the power supply is switched on with the ignition key. Therefore the voltage should be on when bleeding the fuel system.

The fuel valve receives +24 V from EDC control unit pin 14 and is earthed to the chassis.

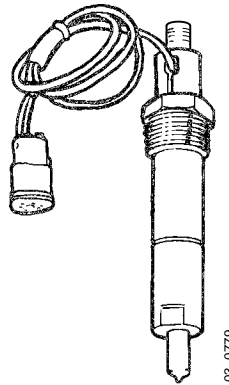
The fuel valve is described in more detail in the service booklet Fuel system, Function description, 03:01-01.



Needle movement sensor T76

The needle movement sensor integrated in the injector senses when the nozzle needle opens to allow fuel to be injected into the cylinder. It is used in engines with variable injection timing. Only one of the engine's injectors (cylinder 1) is equipped with a needle movement sensor. The sensor is of inductive type. It is magnetized by current from the control unit.

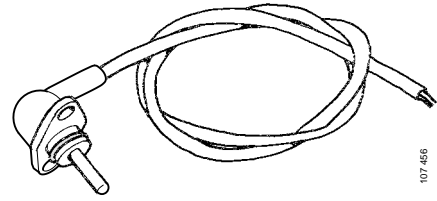
The needle movement sensor receives voltage from EDC control unit pin 32 and is earthed via pin 17.



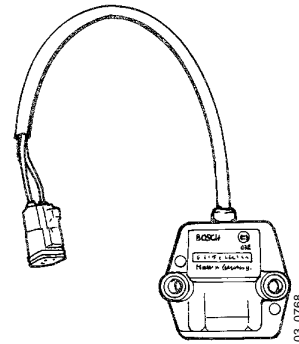
Charge air pressure and temperature sensors

The charge air pressure and temperature sensors may either be integrated into a single component (T47) or consist of two separate components (T31 and T32). However, the function of the sensors is the same.

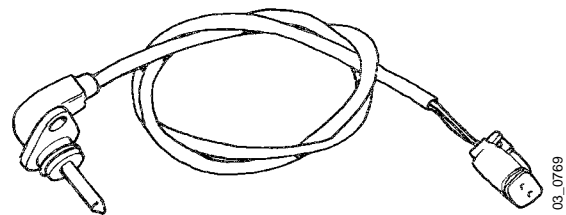
The sensors are described on the next page.



T47 — the combined charge air pressure and temperature sensor.



T31 — the charge air pressure sensor.



T32 — the charge air temperature sensor.

Charge air pressure sensor, T47 or T31

The charge air pressure sensor detects the absolute pressure in the intake manifold, i.e. the atmospheric pressure plus the positive pressure provided by the turbocharger.

The EDC control unit uses the signal from the sensor to limit the fuel quantity when the charge air pressure is under a certain level. The lower the pressure, the less fuel the control unit allows the injection pump to distribute. Black smoke is avoided in this way.

The sensor receives a supply voltage of +5 V from the EDC control unit pin 33 and is earthed through pin 13.

The control unit pin 36 receives a signal voltage from the sensor. The signal voltage is directly proportional to the charge air pressure. High pressure gives high voltage and vice versa.

If there is a fault with the signal, the control unit operates after a pre-programmed pressure value — while at the same time generating fault code 16.

As a safety precaution, the engine torque is then limited.

Charge air temperature sensor, T47 or T32

The sensor for charge air temperature senses the temperature in the intake manifold. The EDC control unit uses the signal from the sensor to finely adjust the fuel quantity so that black smoke is not produced. The warmer the charge air, the less fuel the control unit allows out to the unit injectors.

The sensor is of the NTC type, which means that the resistance is temperature dependent. If the temperature increases, the resistance in the sensor drops.

The sensor is earthed via pin 13. The control unit detects the voltage level between pins 13 and 55.

If the voltage is outside a given range, the control unit operates after a pre-programmed temperature value — while at the same time generating fault code 15.

The engine will then respond more slowly than normal to throttle actuation in cold conditions, as the white smoke limiter will not be operating correctly.

Coolant temperature sensor T33

The coolant temperature sensor affects the fuel quantity when starting the engine. It also affects the engine idling speed and maximum engine speed when the engine is cold.

If the coolant temperature sensor senses that the engine is cold when attempting to start (cold start), the following will occur. If the engine does not start within 2 seconds, the fuel quantity injected will successively increase until the engine starts.

Directly after a cold start, the engine speed is limited to 1000 rpm in order to protect the engine — the engine idling speed is raised to 600 rpm.

The length of time engine speed limitation is engaged varies depending on the coolant temperature:

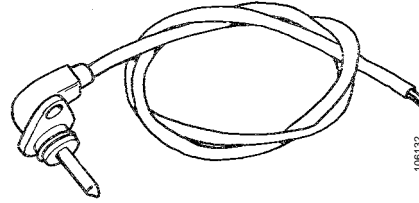
Below +10 °C	30 seconds
Above +20 °C	3 seconds

The idling speed returns to normal when the coolant has reached 50 °C.

The sensor is earthed via pin 13. The EDC control unit detects the voltage level between pins 13 and 53.

If the voltage is outside a given range, the control unit operates after a pre-programmed temperature value — while at the same time generating fault code 14.

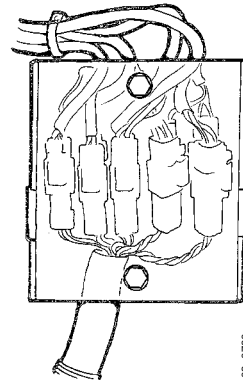
The engine will then have poorer cold start characteristics, the engine idling speed is raised to 600 rpm and it cannot be adjusted.



Junction box

The junction box on the engine connects the engine's EDC components with the chassis electrical system. The box protects the connectors from dirt and mechanical damage.

All EDC components on the engine are equipped with cables that fit into the junction box.



EDC control unit E12

Note: It is important that the control unit casing is properly earthed. Inside the control unit is an interference suppressor that requires perfect earthing in order to function correctly.

In trucks, the EDC control unit is located in the central electric unit. In buses, the EDC control unit is located in the rear left-hand corner of the body.

Function of the EDC control unit

The EDC control unit collects information which it then processes into signals that control the fuel valve and the injection pump governor.

The control unit contains two microprocessors. One is used mainly for calculation of fuel volume and the other for calculation of injection timing and fault diagnosis.

We know that the electrical system of the vehicle has a system voltage of +24 V and is earthed via the chassis.

The control unit converts the system voltage to a lower voltage of approximately 5 V, which it then supplies to the sensors, etc. These sensors are always earthed through the control unit.

The Scania Programmer can be used to configure the control unit according to the bullets below.

- Setting the Limited Hand Throttle function.
- Setting the Fixed Engine Speed function.
- Set whether the following functions can be used for engine speed control while a gear is engaged: Normal Hand Throttle, Limited Hand Throttle, Raised Idling speed and Fixed Engine Speed.
- Setting maximum vehicle speed
- Setting a second vehicle speed limit
- Selecting type of governor (RQ or RQV)
- Adjusting idling speed or selecting to

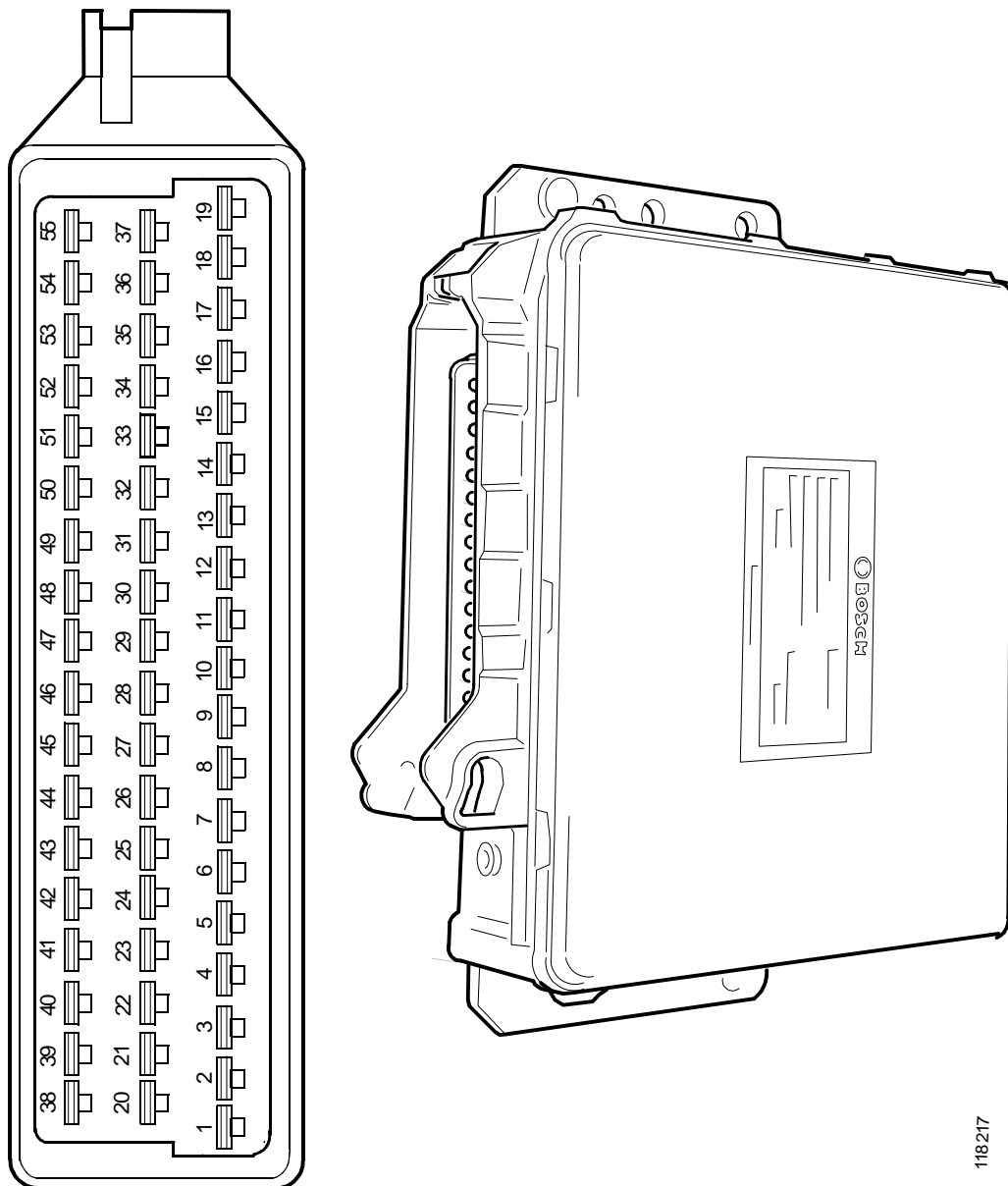
adjust it with the control for cruise control instead.

The work description 03:02-02, EDC MS5 for injection pump, shows which of the above you can set in different control unit versions.

Every time the control unit is configured, the date and VCI identification number are stored in the memory of the control unit. This is the equivalent of security sealing.

EDC control unit, connections

The EDC control unit is connected to the other components of the EDC system via a 55-pin connector. Refer to illustration.



The EDC control unit with the 55-pin connector.

How the pins are connected is shown below.

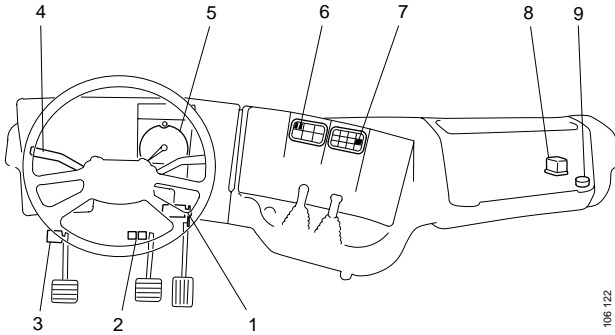
1	Earthing the fuel volume setting solenoid.	23	Input signal for the Limited Hand Throttle and Fixed Engine Speed functions. The Limited Hand Throttle function is activated when the pin is earthed. When pin 41 is earthed at the same time, the Fixed Engine Speed function is activated instead.
2	Earthing the fuel volume setting solenoid.	24	Input signal from brake pedal switch 2. The control unit interprets an earthed pin as a depressed brake pedal.
3	Earthing the injection timing setting solenoid.	25	Input signal from the emergency shut-off switch. An earthed pin will result in an emergency stop of the engine
4	Earthing the injection timing setting solenoid.	26	Input signal from the clutch pedal switch. The control unit interprets an earthed pin as a depressed clutch pedal.
5	Not used.	27	Input signal from the potentiometer in the accelerator pedal sensor. The pin receives a signal voltage of 0.25-4.00 V. The signal voltage depends on how much the throttle pedal is depressed.
6	Not used.	28	Not used (output signal for engine speed).
7	Not used.	29	PWM signal. Output signal for throttle actuation.
8	Not used.	30	CAN communication, L cable.
9	Input signal from the control rack position sensor measuring coil.	31	CAN communication, H cable.
10	Input signal from the control rack position sensor reference coil.	32	Input signal from the needle movement sensor.
11	Power supply to the control rack position sensor.	33	5 V supply to the charge air pressure sensor.
12	Not used.	34	The Torque Limiter 2 function is activated when the pin is earthed. When pin 35 is earthed at the same time, the Torque Limiter 3 function is activated instead.
13	Earth for sensor.	35	The Torque Limiter 1 function is activated when the pin is earthed. When pin 34 is earthed at the same time, the Torque Limiter 3 function is activated instead.
14	+24 V supply to the fuel valve.	36	Input signal from the charge air pressure sensor. The pin receives a signal voltage of 0.33-4.66 V.
15	+24 V supply from the supply relay to the control unit.	37	Not used.
16	+24 V supply from the supply relay to the control unit.	38	Not used.
17	Earth for sensor.		
18	Earthing of the control unit to the chassis.		
19	Earthing of the control unit to the chassis.		
20	+24 V input signal from the diagnostic switch. +24 V output signal for activation of the diagnostic and indicator lamps.		
21	Input signal from the main engine speed sensor.		
22	Input signal from the auxiliary engine speed sensor.		

- | | | | |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---------------------------------------------------------------------------------------------------------------------------------------|
| 39 | Input signal from the throttle actuation switch. If the pin is grounded, the control unit interprets the accelerator pedal as being depressed. | 54 | Not used. |
| 40 | Input signal for disengagement of the cruise control. +24 V applied to the pin disengages the cruise control. | 55 | Input signal from the charge air temperature sensor. The control unit detects the voltage level (0.44-4.94 V) between pins 55 and 13. |
| 41 | Input signal for the Raised idling speed function. If the pin is earthed, the Raised Idling function is activated. If pin 23 is earthed at the same time, the Fixed Engine Speed function is activated instead. | | |
| 42 | Input signal for idle speed request. +24 V applied to the pin gives idling speed. | | |
| 43 | Input signal from brake pedal switch 1. If the earthing connection is broken, the control unit interprets the brake pedal as being depressed. | | |
| 44 | Input signal from the control for the cruise control. The control unit senses the voltage level across pins 44 and 13.

In vehicles without cruise control, the pin is connected to a resistor. The control unit interprets the voltage between pins 44 and 13 as the ON position for the control for cruise control. | | |
| 45 | +5 V supply to the potentiometer in the accelerator pedal sensor. | | |
| 46 | Output signal for activation of the supply relay. The pin earths the relay. | | |
| 47 | +24 V input signal from the starter lock when the key is in the drive position. | | |
| 48 | Diagnostics cable K. | | |
| 49 | Diagnostic cable L. | | |
| 50 | Not connected. (Input signal for speed limiter 2. +24 V applied to the pin activates Speed Limiter 2). | | |
| 51 | Input signal for vehicle speed from tachograph output D3. | | |
| 52 | Not used. (PWM signal. Input signal for engine control). | | |
| 53 | Input signal from the coolant temperature sensor. The control unit detects the voltage level (0.44-4.94 V) between pins 53 and 13. | | |

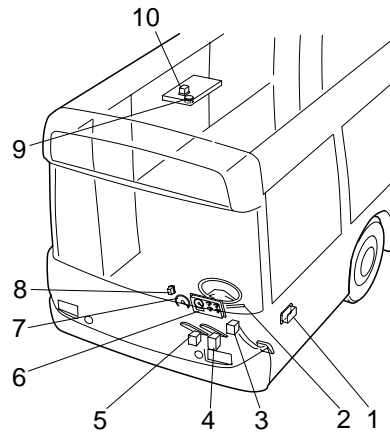
Components in the driver area

Component locations, truck



- 1 Accelerator pedal sensor
- 2 Brake pedal switches
- 3 Clutch pedal switch
- 4 The control for cruise control
- 5 Tachograph (speed)
- 6 Diagnostics switch with lamp
- 7 Warning lamp for EDC
- 8 Supply relay
- 9 Diagnostic socket for PC

Component locations, bus

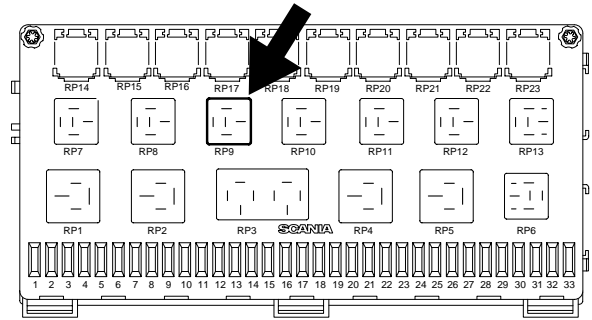


- 1 Diagnostics switch with lamp
- 2 The control for cruise control
- 3 Clutch pedal switch
- 4 Brake pedal switches
- 5 Accelerator pedal sensor
- 6 Warning lamp for EDC
- 7 Tachograph (speed)
- 8 Switch for temporary raising of the engine speed (Fixed Engine Speed function)
- 9 Diagnostic socket for PC
- 10 Supply relay

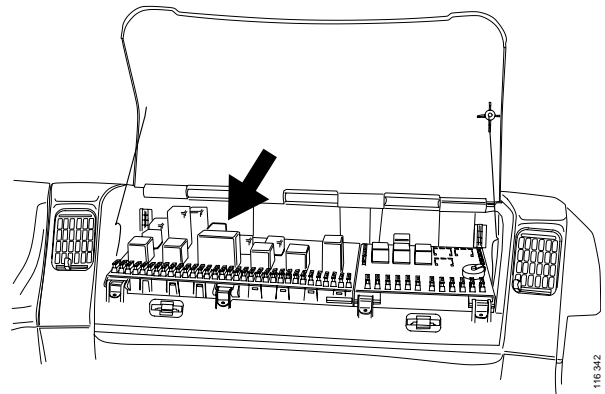
Supply relay R34

The supply relay acts as the main switch for the EDC system. The EDC control unit is supplied with voltage by the supply relay. The control unit controls the relay itself and this gives it control over the system. If the relay releases, the engine will stop.

When the starter voltage is turned on using the starter key, voltage is applied to the control unit pin 47 with the battery voltage of +24 V. The control unit then earths pin 46, the supply relay is activated and the control unit is supplied with +24 V on pins 15 and 16.



Location of supply relay in central electric unit. The central electric unit is the same in both trucks and buses.



Location of supply relay and central electric unit, truck. The location of the central electric unit varies in buses.

Accelerator pedal sensor — B25, B26 and D35

The accelerator pedal sensor consists of the following three components.

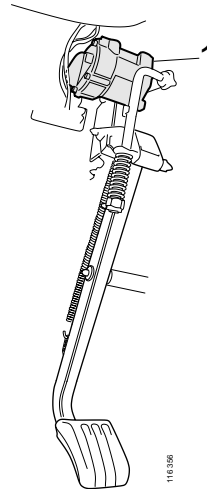
- A potentiometer.
- A throttle actuation switch
- A kick-down switch

The potentiometer informs the EDC control unit of the accelerator pedal position. The potentiometer receives a supply voltage of approximately +5 V from control unit pin 45 and is then earthed via pin 17. The sensor supplies a signal voltage to control unit pin 27. The voltage is directly dependent on how much the accelerator pedal is depressed. At 2.7 V, the control unit interprets the voltage as a request for full throttle. Voltages above 2.7 V do **not** result in higher engine power.

The throttle actuation switch informs the control unit pin 39 if the accelerator pedal is fully released or depressed. When the pedal is fully released, the throttle actuation switch is open. The control unit interprets this as a request for idling speed. The throttle actuation switch closes when the pedal is pressed down and earths pin 39 on the control unit.

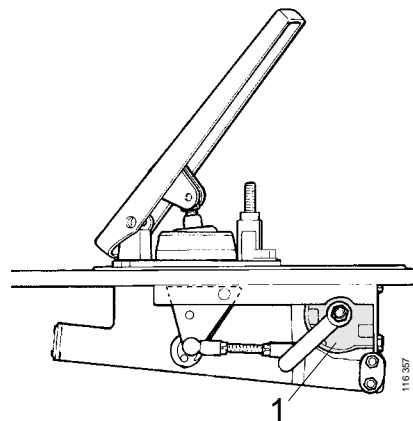
The kick-down switch is activated when the accelerator pedal is pressed from full throttle to the kick-down position. However, the EDC system does not utilise the signal from the kick-down switch. The signal can be used by other systems however — for example Opticruise and automatic gearboxes.

Accelerator pedal and accelerator pedal sensor, truck



1 Accelerator pedal sensor.

Accelerator pedal and accelerator pedal sensor, bus



1 Accelerator pedal sensor.

Control for cruise control S51

Using the control for the cruise control system, the EDC control unit is informed of the speed the vehicle is required to hold. The control unit receives continuous information on vehicle speed from the tachograph.

The control for cruise control is also used when adjusting idling speed or using the functions for the control of engine speed.

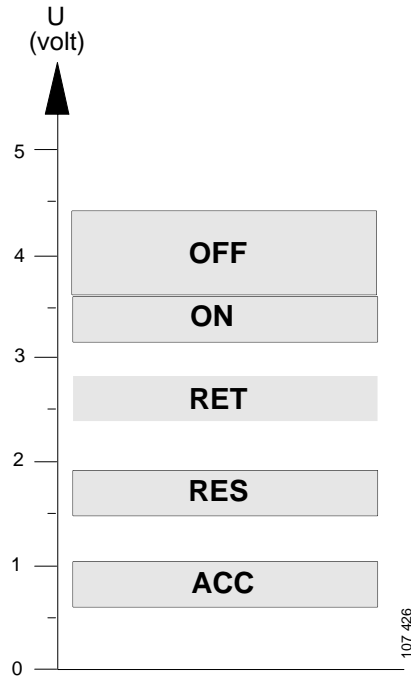
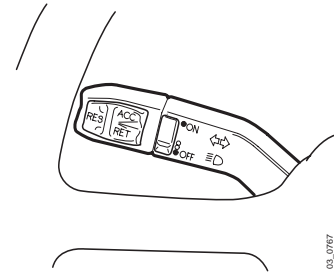
The control for cruise control has the following five functions.

- ON
- OFF
- ACC (accelerate, the speed of the vehicle increases)
- RET (retard, the speed of the vehicle decreases)
- RES (resume, the vehicle returns to the previously selected speed)

There are only two cables between the control and the control unit. The cables are connected to the control unit pins 13 and 44. Each function gives a certain voltage level (refer to graph) which the control unit senses across the pins.

These voltages are generated as the resistance in the circuit changes, depending on which function is engaged.

The control receives a supply voltage of approximately +5 V from control unit pin 44 and is earthed via pin 13.



The different voltage levels of the cruise control functions.

Brake pedal switches B1 and B34

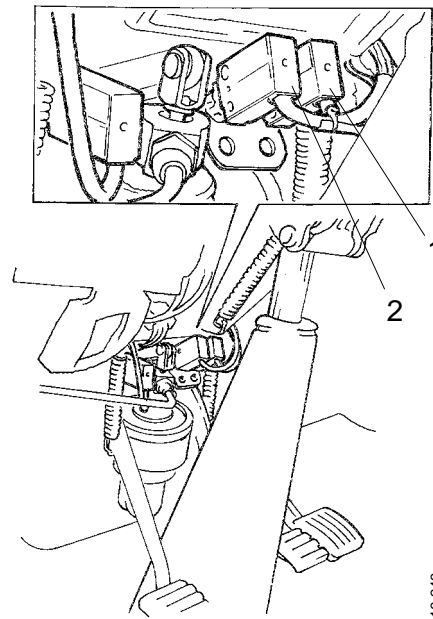
Two brake pedal switches sense when the brake pedal is depressed. In buses, the switches are integrated into one single component designated B1. In trucks, the switches are designated B1 and B34. The switches are connected so that one opens and the other closes when the pedal is depressed. They switch at the same time when the pedal is lightly pressed, i.e. at the start of pedal travel.

The switch that opens when the pedal is depressed is called brake pedal switch 1 and the switch that closes is called brake pedal switch 2.

Brake pedal switch 1 is connected between the EDC control unit pin 43 and chassis earth. When the brake pedal is pressed down, the ground connection to pin 43 is broken.

Brake pedal switch 2 is connected between control unit pin 24 and chassis earth. When the pedal is depressed, pin 24 is earthed.

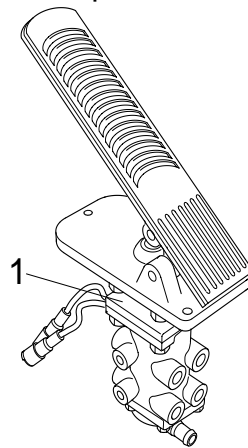
Pedals, truck



116 249

- 1 Brake pedal switch 1
- 2 Brake pedal switch 2

Brake pedal and service brake valve, bus



116 385

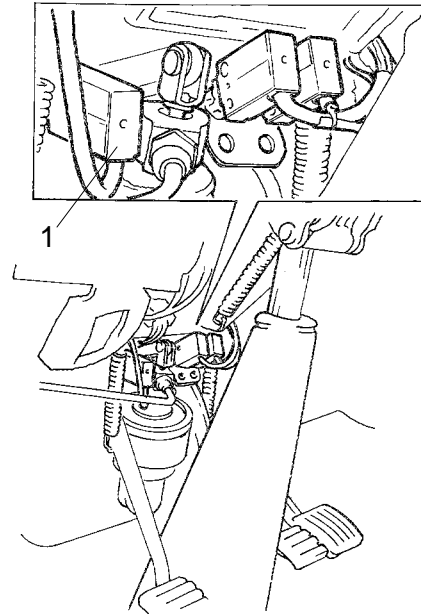
- 1 Service brake valve containing brake pedal switches 1 and 2.

Clutch pedal switch B32

The clutch pedal switch senses when the clutch pedal is depressed.

The switch is connected between the EDC control unit pin 26 and chassis earth. When the pedal is depressed, the switch closes and earths pin 26.

Pedals, truck



- 1 Clutch pedal switch. The clutch pedal and its switch look the same in buses.

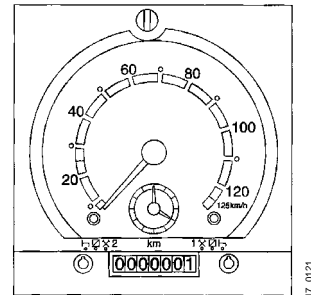
116 250

Tachograph O4

The tachograph gives the EDC control unit information about vehicle speed. Vehicle speed sensing is a prerequisite for certain functions such as cruise control, speed limiter and engine speed control.

If the control unit does not receive a signal from the tachograph, it will then operate according to the pre-programmed speed 15 km/h.

The speed signal is applied to control unit pin 51.



Indicator lamp for EDC, W27 or W502

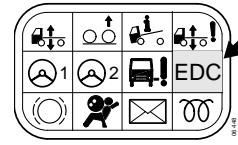
The EDC warning lamp comes on for a few seconds when the starter voltage is switched on with the starter key and also when the engine is switched off.

When starter voltage is switched on, the warning lamp comes on for a few seconds to check that it is intact.

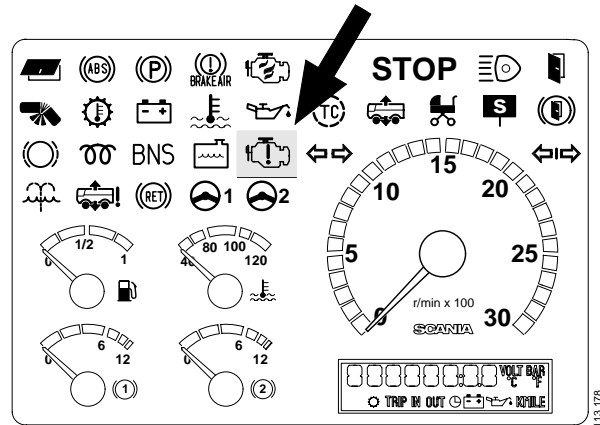
When the engine is switched off, the warning lamp comes on while the EDC control unit carries out a functional check of the EDC system. When the check is completed, the supply relay releases and the warning lamp goes out. Sometimes, the warning lamp may flash as part of the functional check; this is not a fault.

When the engine is running, the warning lamp should normally be off. If there is a fault in the EDC system, the warning lamp comes on.

The indicator lamp receives +24 V from control unit pin 20 and is earthed to the chassis.



Warning lamp for EDC, truck, W27



Warning lamp for EDC, bus, W502.

Diagnostics switch with lamp, S52

Using the diagnostics switch, it is possible to extract fault codes that may be stored in the EDC control unit memory. The fault codes are flashed out on the lamp. This switch is also used to clear fault codes.

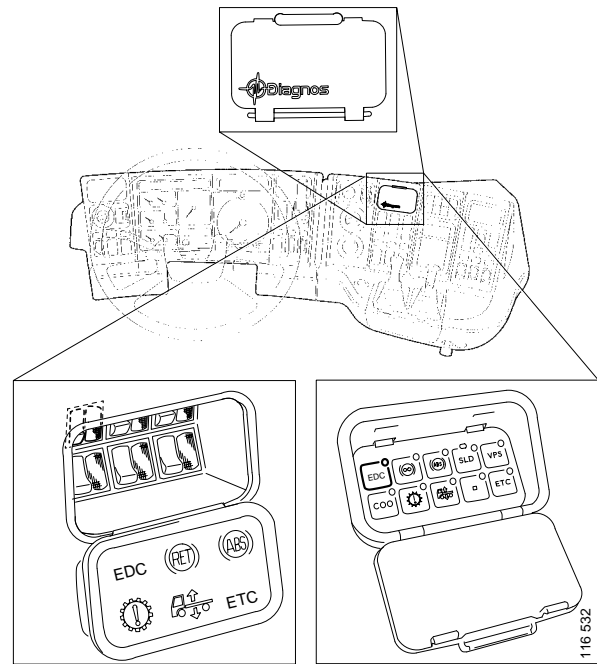
The switch is connected between +24 V battery voltage and control unit pin 20. The switch, which is spring-loaded, closes when pressed.

The diagnostic lamp receives +24 V from control unit pin 20 and is earthed to the chassis.

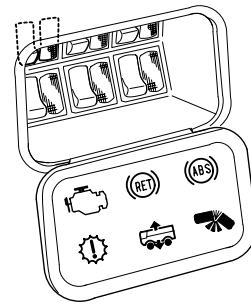
Pressing in the switch supplies voltage to the lamp.

More about the diagnostics switch, e.g. how to interpret the flash codes, can be found in the section Warning system.

The diagnostics lamp is connected in parallel with the EDC warning lamp and therefore, both lamps are always on at the same time.



Two types of diagnostics switch, truck.



Diagnostics switch, bus

cardiagn.com

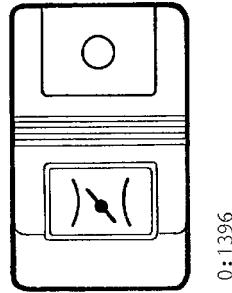
Switch for temporary raising of the engine speed (Fixed Engine Speed function)

Buses may have a separate switch for the Fixed Engine Speed function. Refer to illustration.

The engine speed on a stationery bus can be raised temporarily by activating the switch. The gearbox must then be in neutral and the parking brake applied.

The function is disengaged using the brake pedal, or if fitted, the clutch pedal, exhaust brake or retarder.

The Scania Programmer can be used to reprogram the fixed engine speed. More information on the function can be found in the section 'Fixed Engine Speed'.



Functions

Emergency stop

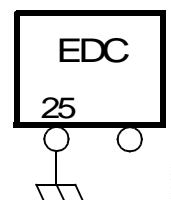
The emergency stop function makes it possible to stop the engine quickly in emergencies such as an accident when operating a crane.

When the function Emergency stop is activated, the engine is immediately switched off if the vehicle is standing still. When driving, the throttle actuation is reduced to idling speed but the engine is not switched off. This allows the continued use of power steering for example.

The emergency stop is activated when EDC control unit pin 25 is earthed. Engagement of the emergency stop function is set at the factory; see work description 03:02-02, EDC MS5 for injection pump.

In buses, there is a stop button in the engine compartment central electric unit connected to pin 25.

In control units manufactured until April 1996, fault code 37 is generated each time the emergency stop is used.



The Emergency Stop function is activated when pin 25 is earthed.

Engine speed control

Engine speed control is a name common to four different functions which are used to control engine speed. The functions are designated as follows:

Normal hand throttle, mod 0

Limited hand throttle, mod 1

Raised idling speed, mod 2

Fixed engine speed, mod 3

In normal cases, Normal hand throttle will be used. This means that the engine does not have any special engine speed restrictions.

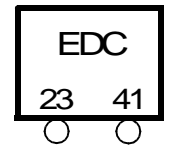
The remaining engine speed functions are activated when EDC control unit pins 23 and 41 are earthed in different combinations.

If you want to activate the functions, the pins can be earthed via a connector located in the central electric unit. See work description 03:02-02, EDC MS5 for injection pump.

It is possible to connect an extra electrical system, so that the correct function is automatically activated when the unit for the extra system is used.

If several of the functions need to be used, the control unit pins can be earthed in different combinations via a switch. More information on this can be found in the work description 03:02-02, EDC MS5 for injection pump.

For a description of how the engine reacts when each function is activated, see below.



The function is selected by — in different combinations — earthing EDC control unit pins 23 and 41.

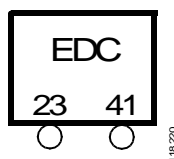
Normal hand throttle (mod 0)

The Normal hand throttle function operates so that the engine maintains the engine speed that is selected with the control for the cruise control. The function operates in a similar way to the cruise control — the difference being that Normal Hand Throttle regulates the engine speed rather than the vehicle speed.

The engine speed can be regulated between 500 and 2000 rpm.

To enable the engine to maintain the selected engine speed, the EDC control unit controls the fuel injection after first having processed signals from the engine speed sensors.

Conditions that must be fulfilled before engaging the function



- EDC control unit pins 23 and 41 must not be earthed.
- The control for the cruise control must be in the ON position.
- The vehicle may not be driven at a speed greater than 10 km/h.

How to select the required engine speed

- Press RES, the engine will maintain the previously selected engine speed.
- First press ACC or RET to select a new engine speed.

Then press RES for at least 3 seconds to store the engine speed.

How to change to idling speed

- Press OFF
- or
- depress the brake or clutch pedal
- or
- activate the exhaust brake or the retarder.

Limited hand throttle (mod 1)

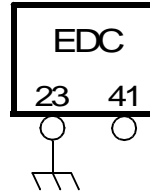
Using the Limited hand throttle function, it is possible to select an engine speed and an engine torque that the engine cannot exceed. The upper limits can be selected within the following ranges:

- 700—2000 rpm
- minimum 200 Nm, maximum, the maximum engine torque available

In this way, a unit attached to the power take off can be protected from overloading for example.

The characteristics above are set using Scania Programmer. Using Scania Programmer, it is also possible to select whether or not the accelerator pedal can affect the vehicle when the Limited hand throttle is activated.

Therefore, before using the function, the function engagement should always be tested. Earth the pin as below. Press ACC and then RES for three seconds to set the upper limit according to the Scania Programmer.



- Earth pin 23 and ensure that pin 41 is not earthed.

How to set an engine speed below the upper limit

- First press ACC or RET to select a new engine speed.

Then press RES for at least 3 seconds to store the engine speed.

Conditions that must be fulfilled before engaging the function

- The control for the cruise control must be in the ON position.
- The vehicle may not be driven at a speed greater than 10 km/h.

How to set the upper limits for engine speed and engine torque

- Set the upper limits for engine speed and engine torque in Scania Programmer.

How to activate the upper limits for engine speed and engine torque

IMPORTANT! By reducing the engine speed limit using the Scania Programmer and earthing the pin as shown below, the engine speed will still increase to the speed that was set previously. Therefore it can exceed the maximum limit set using Scania Programmer.

Raised idling speed (mod 2)

Using the Raised idling speed function, it is possible to select an engine speed that the engine must never be below. In this way, it is possible, for example, to fill the compressed air system or run the engine until warm. The function can also be used in vehicles equipped with a cement mixer.

The lower engine speed limit is set with the control for the cruise control — between 500 and 800 rpm.

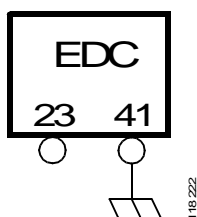
How to re-engage the lower limit

- If pin 41 is already earthed, only ON needs to be pressed, followed by RES.
- If pin 41 is not earthed, the pin only needs to be earthed.

Conditions that must be fulfilled before engaging the function

- The control for the cruise control must be in the ON position.

How to activate the lower limit for the engine speed



- Ensure that EDC control unit pin 23 is not earthed and earth pin 41. The engine speed will now not drop under the limit that was previously set.
- Allow the vehicle to idle and set a new lower limit by first pressing ACC or RET.

Then press RES for at least 3 seconds to store the engine speed.

How to change to normal idling speed

- Press OFF or unearth pin 41.

Fixed engine speed (mod 3)

The fixed engine speed function can, using the Scania Programmer, be set with the following two limits for the engine.

- An engine torque that the engine cannot exceed. The engine torque can be regulated between 200 and 2000 Nm.
- An engine speed that the engine must maintain. The engine speed can be regulated between 600 and 2000 rpm.

When these functions are active, the vehicle cannot be affected by using the accelerator or the control for the cruise control. The function can be used when work requiring high precision is required. i.e. when a crane with a long reach is to be used.

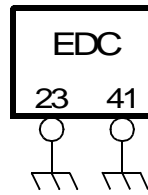
Conditions that must be fulfilled before engaging the function

- The vehicle may not be driven at a speed greater than 10 km/h.

How to set the engine speed and the upper limit for engine torque

- Set the engine speed and the upper limit for engine torque in Scania Programmer.

How to activate the engine speed and the upper limit for engine torque



- Earth EDC control unit pins 23 and 41.

How to change to idling speed

- Depress the brake or clutch pedal
- or
- activate the exhaust brake or the retarder.

How to re-engage the limits

- Break the earth connection to EDC control unit pins 23 and 41 and then re-earth them.

Overview of engine speed control

Shut off criteria

	Mod 0	Mod 1	Mod 2	Mod 3
OFF	Yes	Yes	Yes	No
>10 km/h	Yes	Yes	No	Yes
Brake pedal	Yes	Yes	No	Yes
Exhaust brake	Yes	Yes	No	Yes
Retarder	Yes	Yes	No	Yes
Clutch pedal	Yes	Yes	No	Yes
Emergency stop function	Yes	Yes	Yes	Yes

Activation of engine speed control

	Mod 0	Mod 1	Mod 2	Mod 3
ACC, RET or RES	Yes	Yes	Yes	No

How to store an engine speed

	Mod 0	Mod 1	Mod 2	Mod 3
RES for 3 seconds	Yes	Yes	Yes	No
Scania Programmer .	No	No	No	Yes
Engine speed range (rpm)	500—2000	500—2000	500—800	600—2000

What can be set using the Scania Programmer

	Mod 0	Mod 1	Mod 2	Mod 3
Maximum engine speed	No	Yes	No	Yes
Maximum torque	No	Yes	No	Yes
Can the accelerator pedal be used when engine speed control is active	No	Yes	No	No
Can the engine speed control be used when a gear is engaged	Yes	Yes	Yes	Yes

Torque limitation

Torque limitation is a collective term for four different functions, all of which limit the torque of the engine. The functions are designated as follows:

No torque limitation, mod 0

Torque limiter 1, mod 1

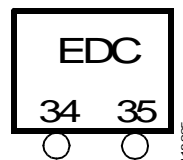
Torque limiter 2, mod 2

Torque limiter 3, mod 3

Normally it is the function No torque limitation that is used. This means that the engine does not have any special restrictions.

The remaining functions are activated when EDC control unit pins 34 and 35 are earthed in different combinations.

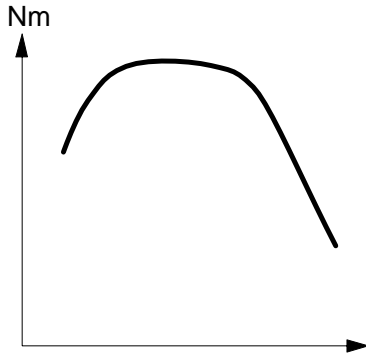
Connection of the functions is already factory prepared. Information on how to engage the functions can be found in Work description EDC MS5 for injection pump. For a description of how the engine reacts when each function is activated, see below.



The function is selected by — in different combinations — earthing EDC control unit pins 34 and 35.

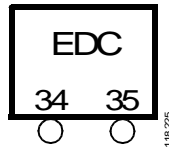
No torque limitation (mod 0)

When the No torque limitation function is connected, the engine torque curve is normal — no special limits are activated.



107 460

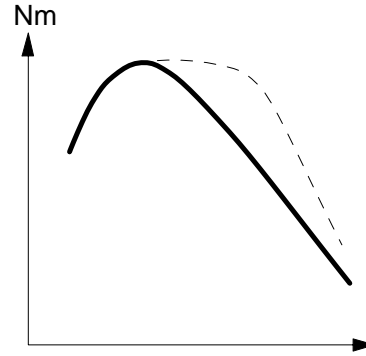
The engine runs according to the torque curve 'No torque limitation (0)' when EDC control unit pins 34 and 35 are not earthed.



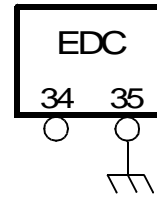
119 225

Torque limiter 1 (mod 1)

When the Torque limiter 1 function is activated, the torque curve of the engine is traditionally peaked. This torque curve may give the sensation that the pulling power increases when the engine speed decreases, i.e. on an uphill slope.



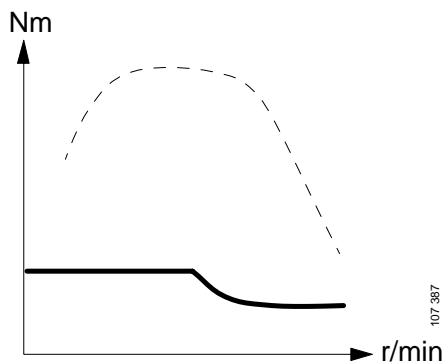
The engine runs according to the torque curve 'Torque Limiter (1)' when EDC control unit pin 34 is not earthed and pin 35 is earthed.



119 226

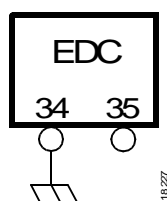
Torque limiter 2 (mod 2)

The Torque limiter 2 function limits the engine torque to 700 Nm for engine speeds up to 1000 rpm. At higher engine speeds, the torque limit decreases slightly.



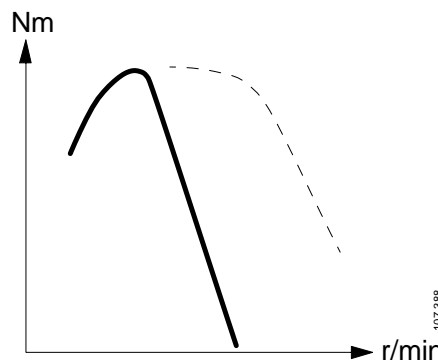
The function is used on vehicles equipped with a torque converter with gear-changing clutch combined with a manual gearbox. It is connected so that the function is active when the clutch pedal is depressed. It is designed to protect the clutch from overheating.

The engine runs according to the torque curve 'Torque Limiter (2)' when EDC control unit pin 34 is earthed and pin 35 is not earthed.

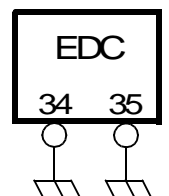


Torque limiter 3 (mod 3)

The Torque limiter 3 function gives a torque curve with a so called early breakaway. The engine torque begins to decrease at 1000 rpm and disappears completely at 1400 rpm. The function can be used as an alternative to the engine speed control function Limited hand throttle if one wants to protect a power take-off for example.



The engine runs according to the function 'Torque Limiter (3)' when EDC control unit pins 34 and 35 are earthed.



Cruise control

Note: Set the switch to the OFF position when the cruise control is not in use. In the ON position the cruise control may be engaged by mistake.

Below is a description of the cruise control functions.

ON	Engaged
OFF	Disengaged
ACC	Accelerate
RET	Decelerate (reduce vehicle speed)
RES	Resume selected speed

Engaging

The road speed must be at least 20—35 km/h (the speed limit varies between engine types) for cruise control to be used.

- 1 Set the switch to ON.
- 2 Drive at the desired road speed. Press ACC or RET to engage the cruise control and then release the accelerator pedal.

Setting the road speed

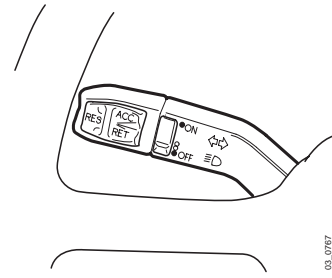
Alter the set road speed using ACC or RET. Release ACC/RET when the desired road speed is attained.

Pressing and releasing once alters the road speed by 1 km/h. Pressing and releasing five times in succession is the maximum number possible.

Disengaging

The cruise control is disengaged by activating one of the following:

- Retarder or exhaust brake
- The cruise control switch. Press it gently towards OFF (the spring-loaded position).
- Brake pedal
- Clutch pedal



- Accelerator pedal — greater vehicle speed than the set value for at least 30 seconds

Resuming the selected speed

After braking for example, it is easy to quickly select the previous road speed by pressing RES.

The previously set value is stored until the engine is switched off or a new value is selected.

Speed limitation

It is possible to programme two different speed limits: Maximum speed and Speed limit 2. The speed limits are programmed using Scania Programmer.

Below is a more detailed description of the two speed limits.

Maximum speed

The EDC control unit continuously receives information about the vehicle speed from the tachograph. When the maximum speed is reached, the control unit cuts in and limits throttle actuation so that the speed is maintained.

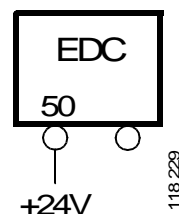
When driving at the set maximum speed, it is possible to temporarily increase the engine speed if the clutch pedal is depressed. This function is present to facilitate downshifting while engine braking.

Speed limit 2

Speed limit 2 means that it is possible — using Scania Programmer — to pre-set a speed limit that is lower than the maximum speed. The lower speed limit can, for example, be used in refuse vehicles fitted with an external platform. Speed limit 2 can then be activated when someone is standing on the platform.

The default value for Speed limit 2 is 70 km/h when a new EDC control unit is installed in a vehicle.

Speed limit 2 is activated by applying +24 V to EDC control unit pin 50.



Adjusting idling speed

The idling speed can be adjusted between 500 and 700 rpm. Adjustments can be made using the control for cruise control . If the vehicle is not fitted with a control for cruise control, the idling speed can be adjusted using the Scania Programmer or by manufacturing adapter wiring. See Work description 03:02-02, EDC MS5 for injection pump, for a description of how to adjust the idling speed.

Governor type

There are two different types of governor: RQ and RQV. When choosing governor type it must be decided how the EDC control unit should interpret the signals or messages from the accelerator pedal. Below is an explanation of the difference between RQ and RQV.

- RQV = the throttle pedal requests a certain engine speed. RQV is used in most vehicles and is also pre-programmed in control units that are ordered as parts.
- RQ = the throttle pedal requests a certain torque. RQ is used in buses equipped with automatic gearbox. If a new control unit is ordered, it must be reprogrammed to RQ.

RQ combined with Opticruise can give smoother gear changes when the engine load is low.

The governor type can be programmed into the control unit using Scania Programmer.

Warning system

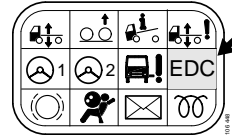
General

If a fault occurs in the EDC system, one or more of the following measures will be carried out by the EDC control unit, depending on what the fault is.

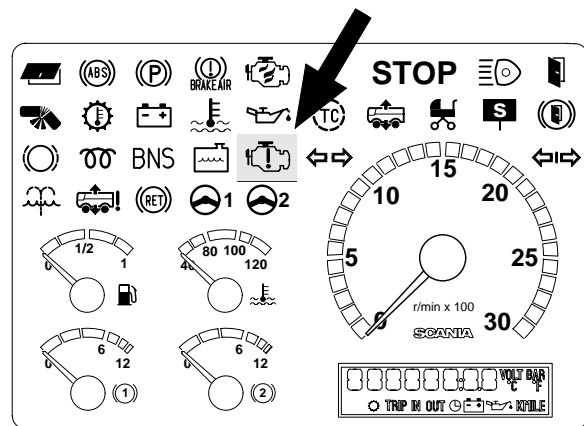
- The warning lamp for EDC comes on. It will often go out on its own when the fault ceases. Sometimes, however, it may be necessary to switch the starter voltage off and on to get the lamp to go out.
- Functions like cruise control and hand throttle are disengaged.
- Torque is limited.
- When idling, the engine runs at a slightly higher engine speed than normal.
- The engine is switched off.

The control unit carries out the above measures in order to prevent the fault causing expensive damage and at worst leading to uncontrolled throttle actuation.

If the engine is not turned off, the vehicle can often be driven to a workshop. It should be remembered, however, that the system has smaller safety margins than normal, especially if engine output is reduced.



Warning lamp for EDC, truck



Warning lamp for EDC, bus.

Shutdown test

Every time the engine is switched off, the EDC control unit carries out a special test of the EDC system. While this shutdown test is running, the warning lamp is lit. When the check is complete, the following occurs: the supply relay releases, the lamp goes out and there is no power to the control unit.

If the control unit discovers a fault during the shutdown test, the warning lamp will come on the next time the engine is started, even if the fault is no longer present. The control unit must carry out a fault free shutdown test before the warning lamp goes out.

Fault codes

When the control unit discovers a fault, or something which it interprets as abnormal, it generates a fault code. The warning system can generate approximately 30 different fault codes.

Arrangement of flashing codes

The fault codes are flashed out by the diagnostics lamp and are arranged in a certain way. The long flashes — of 1 second — that come first represent units of ten. The short flashes — of 0.3 seconds — that follow represent units of one.

The example on the right signifies fault code 25.



A single very long flash of 4 seconds indicates that no fault codes are stored in the memory.



Fault code memory

The EDC control unit memory has sufficient space to store 10 fault codes. The fault codes are prioritised between themselves. If the fault code memory becomes full, higher priority fault codes can be stored and lower priority fault codes erased.

The fault codes are stored in two different places in the control unit. Erasing with the diagnostics switch clears the fault codes that are flashed out on the diagnostics lamp.

However, the fault codes will remain stored in another memory that can only be accessed using Scania Diagnos. Scania Diagnos can be used to see how many times each fault has occurred; this information can be valuable with a loose connection for example. Scania Diagnos is used to erase both fault code memories at the same time.

If the memory that is only accessible by PC becomes full, new fault codes with low priority will not be stored even after clearing the old fault codes using the diagnostic switch. If the eleventh fault occurs and it has low priority, the indicator lamp will light. The indicator lamp lights constantly and indicates fault but the flash code memory is empty.

If a fault already stored in the PC memory occurs again, a flash code is generated and the indicator lamp lights.

Limp-home mode

If the accelerator pedal sensor potentiometer fails, the vehicle can be driven to a workshop in limp-home mode. Limp-home mode is activated by releasing the accelerator pedal once so that the EDC control unit is aware that the throttle actuation switch works.

When the accelerator pedal is then depressed the throttle actuation switch is closed. The closed throttle actuation switch gives a throttle actuation that equals half of full throttle.

When the accelerator pedal is released, the engine will run at idling speed.

Interaction with other systems

ABS/TC and EBS

The ABS/TC system influences the EDC system and vice versa.

The ABS/TC control unit continuously senses if one of the drive wheels is spinning. TC engine control is activated when the drive wheels spin and the throttle actuation is then reduced, irrespective of the accelerator pedal position, until the drive wheels cease to spin.

The EDC control unit continuously sends information on the accelerator pedal position to the ABS/TC control unit.

The EBS and ABS/TC control units communicate with the EDC control unit in the same way.

Opticruise

Opticruise influences the EDC system and vice versa.

The Opticruise control unit continuously receives information from the EDC control unit about data such as engine speed or accelerator pedal position.

During gear changing, the Opticruise control unit takes over control of the EDC system and controls throttle actuation.

Automatic gearbox

The automatic gearbox receives information from the EDC control unit on throttle actuation and the accelerator pedal position. When changing gear, the automatic gearbox can influence the throttle actuation.

Exhaust brake

The exhaust brake influences the EDC system, but not vice versa.

When the exhaust brake is activated, a message is sent to the EDC control unit, which then de-activates the cruise control.

If the exhaust brake is activated using the brake pedal, the throttle actuation is reduced to idling speed.

Retarder

The retarder influences the EDC system and vice versa.

When the retarder is activated, a message is sent to the EDC control unit, which then de-activates the cruise control.

If the accelerator pedal is depressed while the retarder is activated, the retarder will immediately be de-activated and the vehicle will respond to the accelerator pedal.

Articulation control

The articulation control system influences the EDC system and vice versa.

The EDC control unit constantly sends information on throttle actuation to the articulation control unit.

The articulation control unit can request changes in throttle actuation — reduced throttle actuation or idling.

For example, the articulation control unit sends a request that the EDC control unit should reduce throttle actuation when the bus is turning.

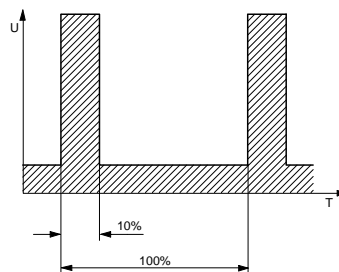
PWM signals

Note: A PWM signal cannot be measured — in a reliable way — using a normal multimeter. Use the fault codes to locate the cause of any malfunctions instead.

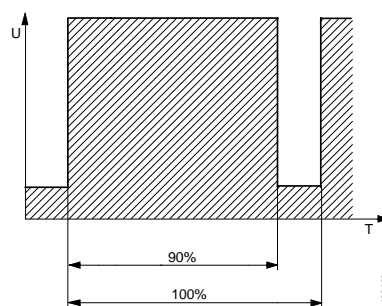
PWM means that a signal is Pulse Width Modulated. The pulse width may, for example, become greater when the throttle actuation increases.

The PWM signal is a square wave with a constant frequency (T). The voltage level (U) is also constant; the variable is the activation time — calculated as a percentage — of each cycle (the cycle is shown as 100% in the illustrations).

The PWM signal transmits very accurate information.



PWM signal at idling speed.



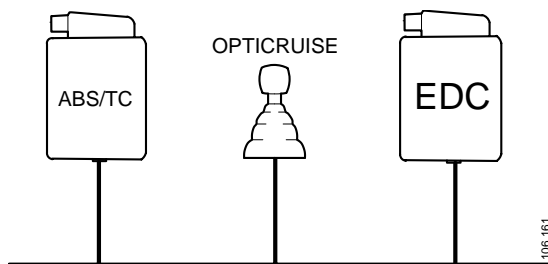
PWM signal at full throttle.

CAN Communication

Note: Bodywork builders and coachbuilders must not connect their own systems to the CAN network without the approval of Scania. If any other equipment other than the factory fitted equipment is connected, safety and reliability can be affected.

Note: It is not possible to measure or check CAN messages with a multimeter either. Use the fault codes to locate the cause of any possible malfunctions.

CAN is an abbreviation of Controller Area Network. CAN communication is used to reduce the number of cables in the vehicle and at the same time increase reliability. The communication circuit consists of two cables, CAN H (High) and CAN L (Low).



Several different systems are connected to these two cables and in this way form a network. CAN communication is used for example between EDC, ABS/TC, EBS, the retarder, Opticruise and the coordinator.

In simple terms, CAN communication is rather like radio. The data messages that travel along a CAN cable can be compared to radio waves that travel through the air.

When we listen to the radio, the receiver is tuned so that only one station can be heard at a time. This is the only station we hear, despite the fact that many other radio stations are broadcasting at the same time.

A control unit does approximately the same with the messages that travel through a CAN cable. It listens, for example, for information from the EDC control unit concerning the coolant temperature, receives this value and uses it in its calculations.

The control unit receives all the CAN messages — that are sent through the communication

circuit — in a special memory. This memory can be compared to a number of radio receivers, all on at the same time but all set to different radio stations in order to hear several individual radio programmes at the same time. In this way, the control unit always knows what is going on.