

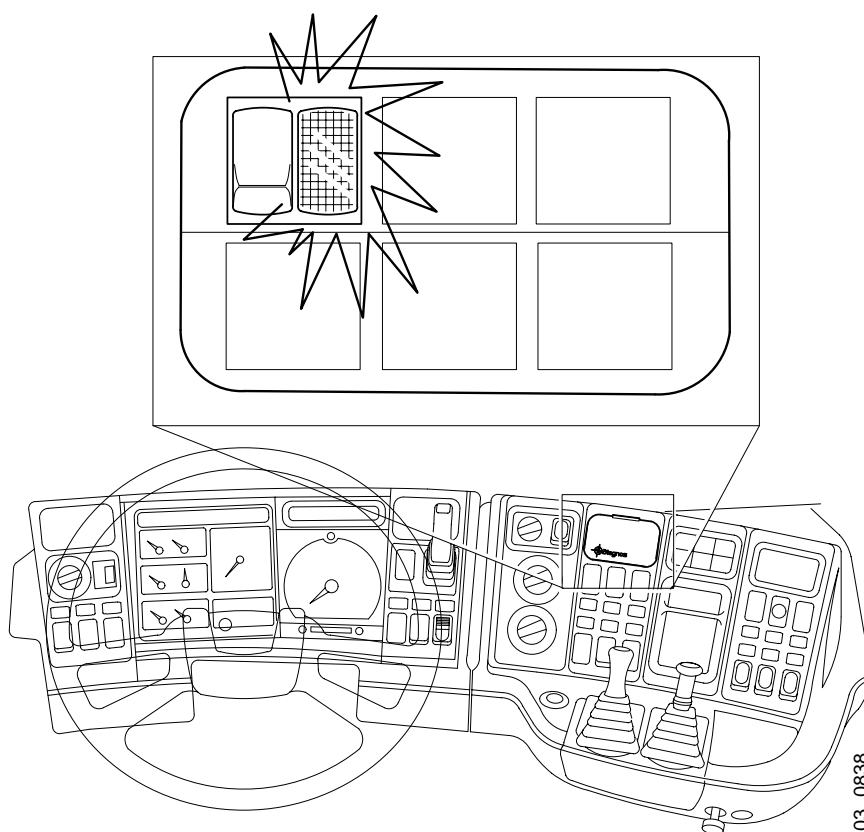
**SCANIA**

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## EDC MS5 in-line injection pump

### Fault diagnosis



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# EDC

## Diagnosing faults with the diagnostics lamp

- The fault code texts have been taken directly from the PC program Scania Diagnos and are given here in their original form to avoid confusion.
- Suggestions are made in the text as to how each fault may be dealt with.
- The fault code texts conclude with references to the current circuit diagrams in the "Wiring diagrams" section. This section also contains diagrams showing the locations of the electrical components.
- Further information on how the EDC system is connected to the various electrical systems in the vehicle is given in the connection diagrams in Group 16.
- Faults that do not cause fault codes to be generated are included in the section headed "Faults that do not generate fault codes".

### Interviewing the driver

Begin fault diagnosis by interviewing the driver. Try to get an overall picture of the problem. Ask about the following:

- Fault symptoms
- Under what conditions the fault arose
- How often the fault has arisen
- If the warning lamp came on
- If the warning lamp went out by itself
- If the driver has erased fault codes

### Fault codes

Access all the fault codes stored in the memory. Compare them and attempt to reach a conclusion as to the probable cause of the fault before taking any further action. Fault codes are stored in the order in which they were registered.

### Wiring diagrams

The fault code texts conclude with references to current circuits. These current circuits refer to the current circuit diagrams in the "Wiring diagrams" section.

The diagrams for the 12 and 14 engines are shown individually and in unbroken sequence. Each section starts with a drawing which shows the location of components.

Further information as to how the EDC system is connected to the vehicle's electrical system is shown in the connection diagrams in Group 16.

### Faults that do not generate fault codes

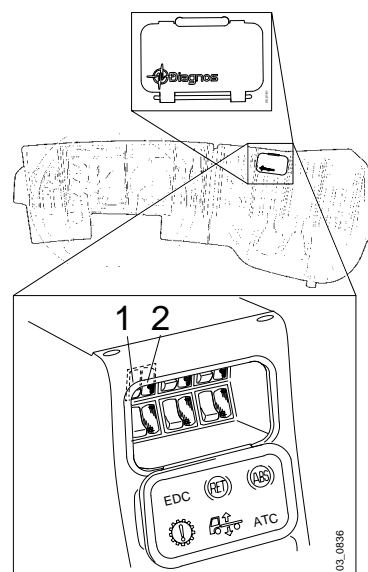
Although the control unit software is advanced and anticipatory, a fault may arise which the control unit cannot distinguish from something that can occur during the course of normal operation. In such case, no fault code will be generated; there is always a limit to how extensively a function can be monitored. A table of various faults with their symptoms and causes is given in the section headed "Faults that do not generate fault codes".

Remember that the kind of faults which can arise in a fuel system without EDC, such as defective injectors, can also arise in EDC vehicles.

## Accessing the fault codes

The power should be switched on with the starter key.

- 1 Press the diagnostics switch and count the number of flashes.
- 2 Press the switch again and count the number of flashes. If the same code is repeated, there is only one fault in the system. If more than one code is shown, continue to press the button until the first code is displayed again. Note all the fault codes.



- 1 Diagnostics switch  
2 Diagnostics lamp

The long flashes (1 second) that appear first represent tens, the short flashes (0.3 second) that follow are units.

The example to the right displays fault code 25.



A single long flash (4 seconds) means that there are no fault codes in the memory.



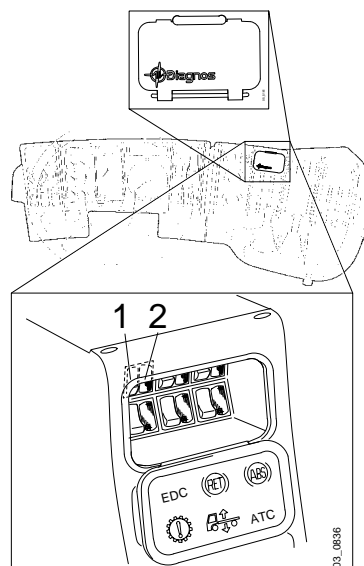
### Erasing the fault codes

Fault codes should be erased once the fault diagnosis has been completed and the fault rectified. Erasure is carried out at two different levels and is described below.

#### Erasing fault codes

The following erases **fault codes** that are flashed with the diagnostics lamp. However, the fault codes will still remain in another memory which can only be accessed with a PC.

- 1 Start and switch off the engine to initiate a shutdown test. Wait until the indicator lamp goes out.
- 2 Press and hold the diagnostics switch in the depressed position.
- 3 Turn the starter key to the drive position and wait for at least 3 seconds. Resetting is now completed.
- 4 Start the engine and check that the indicator lamp goes out.
- 5 Press the diagnostics switch. The fault code memory should be empty, i.e. it should give one long flash.

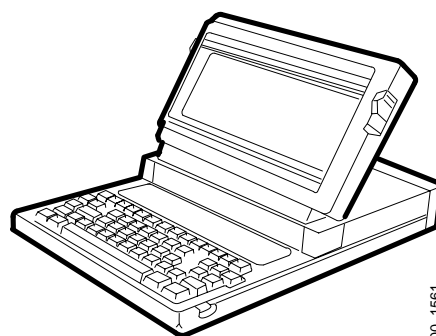


1 Diagnostics switch  
2 Diagnostics lamp

#### Final erasure of fault codes using a PC

After the fault diagnosis has been completed and the fault rectified, final erasure of the fault codes should be carried out using Scania Diagnos and a PC. The PC erases the flashing code memory and the PC memory in the control unit at the same time.

A PC should also be used to erase the fault code memory when the pre-delivery inspection has been carried out to ensure that the PC memory is empty when the vehicle is delivered to the customer.



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# List of fault codes

The following is a list of those fault codes that can be generated. More detailed information about each fault code is given in the following pages.

<b>Fault code</b>	<b>Cause</b>
11	Overrevving
12	Main engine-speed sensor
13	Auxiliary engine-speed sensor
14	Coolant temperature sensor
15	Charge air temperature sensor
16	Charge air pressure sensor
21	Control for cruise control
22	Brake pedal switches
24	Throttle pedal/brake pedal
25	Throttle pedal sensor
26	Speed signal
27	Speed signal
28	Speed signal
31	Injection timing
32	Control rack position
33	Battery voltage
34	Needle movement sensor
35	Control-rack position sensor
36	Control-rack position sensor
37	Emergency stop
41	Throttle pedal sensor
42	Throttle pedal sensor
43	CAN communication
44	Needle movement sensor
45	Needle movement sensor
46	Needle movement sensor
61	Shut-down test
62	Fuel valve
63	Driver stage
64	Supply relay
81	Control unit
82	Shut-down test
83	Control unit

## Fault code 11

### Overrevving

**Fault:** At least one of the signals for engine speed shows over 3000 rpm.

**Cause:** The control unit has sensed that the frequency of at least one of the signals to pins 21 and 22 has been too high.

**Comment:** The signal from the main engine speed sensor or the auxiliary engine speed sensor has shown over 3000 rpm. The setting solenoid loses power (engine switched off) until both engine speed signals are below 3000 rpm. The engine then functions as normal.

The fault is caused by the driver changing to a lower gear in an incorrect manner. It can also be caused by interference in the engine speed signal.

**Action:** Check engine speed sensors, connectors and wiring.

**Current circuit, 12 engine:** 38, 62

**Current circuit, 14 engine:** 9, 62



## Fault code 12

### Main engine-speed sensor

**Fault:** The fault code may be generated for any of four reasons:

- 1 When the engine is started, the signal from the main engine speed sensor shows a lower engine speed than the signal from the auxiliary engine speed sensor. The speed shown by the main engine speed sensor is below 50 rpm while the speed shown by the auxiliary engine speed sensor is above 100 rpm.
- 2 The signal from the main engine speed sensor shows implausible changes in engine speed from pulse to pulse.
- 3 The speed shown by the signal from the main engine speed sensor is lower than that shown by the signal from the auxiliary engine speed sensor. The speed shown by the auxiliary engine speed sensor is above 700 rpm. the speed shown by the main engine speed sensor at the same time is less than 90 % of the speed shown by the auxiliary engine speed sensor.
- 4 Every revolution of the engine gives rise to a regularly recurring disturbance in the signal from the main engine speed sensor.

**Cause:**

- 1 When starting the engine, the frequency of the signal to pin 21 has been too low compared with the frequency of the signal to pin 22.
- 2 The frequency of the signal to pin 21 has been too uneven.
- 3 The frequency of the signal to pin 21 has been too low compared with the frequency of the signal to pin 22.
- 4 Every revolution of the engine has given rise to a regularly recurring disturbance in the signal applied to pin 21.

**Comment:** As long as the fault is active, engine torque is limited. If the fault disappears, the engine functions as normal.

For safety reasons, the control unit always works on the information from the sensor which gives the highest engine speed. This fault code can therefore sometimes be generated for the sensor which is actually giving the right reading.

The fault code is generated if the sensor cables are incorrectly connected. A cable that is mistaken for another and connected will transmit an inverted signal.

This fault can be caused by incorrect distance between sensor and flywheel/toothed wheel.

If fault code 13 arises at the same time, that is to say both engine speed sensors are faulty, the engine is switched off (setting solenoid is not powered).

**Action:** Check engine speed sensors, connectors and wiring.

**Current circuit, 12 engine:** 38

**Current circuit, 14 engine:** 9

## Fault code 13

## Auxiliary engine-speed sensor

**Fault:** This fault code can be generated for two reasons:

- 1 The signal from the auxiliary engine speed sensor shows implausible changes in engine speed from pulse to pulse.
- 2 The engine speed shown by the signal from the auxiliary engine speed sensor is lower than that shown by the signal from the main engine speed sensor. The speed shown by the main engine speed sensor is above 700 rpm. The speed shown by the auxiliary engine speed sensor is less than 90 % of that shown by the main engine speed sensor.

**Cause:**

- 1 The frequency of the signal to pin 22 has been too uneven.
- 2 The frequency of the signal to pin 22 has been too low compared with the frequency of the signal to pin 21.

**Comment:** As long as the fault is active, engine torque is limited. If the fault disappears, the engine functions as normal.

For safety reasons, the control unit always works on the information from the sensor which gives the highest engine speed. This fault code can therefore sometimes be generated for the sensor which is actually giving the right reading.

The fault can be caused by incorrect distance between sensor and ring gear.

If fault code 12 arises at the same time, that is to say both engine speed sensors are faulty, the engine is switched off (setting solenoid loses power).

**Action:** Check engine speed sensors, connectors and wiring.

**Current circuit, 12 engine:** 62

**Current circuit, 14 engine:** 62

## Fault code 14

### Coolant temperature sensor

**Fault:** Implausible signal from the coolant temperature sensor.

**Cause:** Voltage too low or too high between pins 53 and 13 on the control unit.

**Comment:** The voltage has been below 0.44 V (above 130 °C) or above 4.94 V (below -40 °C).

If the voltage is outside the permitted range, the control unit uses a pre-programmed temperature (40 °C).

The engine's ability to start in the cold will be impaired as long as the fault is active. Idling speed is raised to 600 rpm and cannot be adjusted.

**Action:** Check temperature sensor, connectors and wiring.

**Current circuit, 12 engine:** 17

**Current circuit, 14 engine:** 17

## Fault code 15

### Charge air temperature sensor

**Fault:** Implausible signal from the charge air temperature sensor.

**Cause:** Voltage too low or too high between pins 55 and 13 on the control unit.

**Comment:** The voltage has been below 0.44 V (above 130 °C) or above 4.94 V (below -40 °C).

If the voltage is outside the permitted range, the control unit uses a pre-programmed temperature (40 °C).

As long as the fault is active, the engine will respond slower than usual to acceleration in cold weather because the smoke limiter is not working as it should.

**Action:** Check temperature sensor, connectors and wiring.

**Current circuit, 12 engine:** 13

**Current circuit, 14 engine:** 13

## Fault code 16

### Charge air pressure sensor

**Fault:** Implausible signal from charge air pressure sensor.

**Cause:** Voltage too low or too high to pin 36 on the control unit.

**Comment:** The voltage has been below 0.33 V (0.5 bar) or above 4.66 V (4.0 bar).

If the voltage is outside the permissible range, the control unit uses a preprogrammed pressure (approx. 1.7 bar).

The charge air pressure sensor reads the absolute pressure in the intake manifold, that is, it reads the surrounding air pressure and the overpressure given off by the turbocharger.

Engine torque is limited as long as the fault is active.

**Action:** Check the charge air pressure sensor, connectors and wiring.

**Current circuit, 12 engine:** 21

**Current circuit, 14 engine:** 21

## Fault code 21

### Control for cruise control

**Fault:** Implausible signal from control for cruise control.

**Cause:** Voltage between pins 44 and 13 too low or too high. The voltage level between the ACC, RES, RET, ON and OFF functions may also be one that is not allowed.

**Comment:** As long as the fault is present, cruise control, hand throttle and idling adjustment do not work.

The control unit interprets the voltage level as follows:

0.67-1.03 V, ON+ACC

1.50-1.89 V, ON+RES

2.37-2.82 V, ON+RET

3.20-3.57 V, ON

3.57-4.40 V, OFF

The fault code is generated if the voltage level is outside these ranges.

**Action:** Check the switch, connectors and wiring.

**Current circuit, 12 engine:** 4

**Current circuit, 14 engine:** 4

## Fault code 22

### Brake pedal switches

**Fault:** The brake pedal switches give conflicting signals about the position of the pedal. One switch signals that the pedal is released while the other signals that it is depressed.

**Cause:** Pins 24 and 43 have both been earthed at the same time or both pins have lacked earth connection at the same time.

**Comment:** Both the brake pedal switches have been simultaneously closed or open for more than five minutes.

Cruise control, the hand throttle and idling adjustments will not work as long as the fault is active.

This fault can be due to the switches being incorrectly adjusted or the nut being tightened too hard so that the switch seizes.

**Action:** Check switches, connectors and wiring.

**Current circuit, 12 engine:** 103, 113

**Current circuit, 14 engine:** 103, 113

## Fault code 24

## Throttle pedal/brake pedal

**Fault:** Signals that the throttle and brake pedals are both depressed at the same time.

**Cause:** Voltage too high to pin 27 at the same time as pin 24 has been earthed or pin 43 has not been earthed.

**Comment:** Throttle pedal and brake pedal must have been depressed at the same time while braking more than 20 times in a row for the fault code to be generated. The intention of this fault code is to discover if the throttle pedal is not returning properly e.g. broken return spring.

Voltage to pin 27 has been above 0.45 V.

Fault in the brake pedal switches gives fault code 22. Fault in the throttle pedal sensor actuation switch/potentiometer gives fault code 25.

**Action:** Check the movement of the throttle pedal.

**Current circuit, 12 engine:** 71, 103. 113

**Current circuit, 14 engine:** 71, 103. 113

## Fault code 25

## Throttle pedal sensor

**Fault:** This fault code can be generated for two reasons:

- 1 Implausible signal from potentiometer.
- 2 Implausible difference between the throttle pedal sensor's potentiometer and throttle actuation switch.

**Cause:**

- 1 Voltage too low or too high to pin 27.
- 2 Voltage too low to pin 27 at the same time as pin 39 is earthed. Voltage too high to pin 27 at the same time as pin 39 is not earthed.

**Comment:**

- 1 Voltage has been below 0.25 V or above 4.00 V.
- 2 The vehicle can be driven in emergency mode to the nearest repair shop by means of the throttle actuation switch. In emergency mode, idling speed is obtained when the accelerator is released and half throttle performance when it is fully depressed (throttle actuation switch closed). The cruise control can be used when vehicle speed exceeds 35 km/h.
- 3 Voltage has either been below 0.49 V with the throttle actuation switch closed or else it has been above 0.90 V with the throttle actuation switch open.
- 4 The engine runs at slightly higher rpm than normal idling speed. The engine does not respond to the throttle pedal. The cruise control can be used when vehicle speed exceeds 35 km/h.

**Action:** Check potentiometer. Compare potentiometer and throttle actuation switch. Check connectors and wiring.

**Current circuit, 12 engine:** 71, 107

**Current circuit, 14 engine:** 71, 107

## Fault code 26

### Speed signal

**Fault:** Speed signal absent or implausible.

**Cause:** No input signal on pin 51, signal shows implausibly high speed, signal frequency is too high or signal voltage level is too low or too high.

**Comment:** The signal from the tachograph has shown a speed above 150 km/h. Cruise control, hand throttle and idling adjustment do not work.

When the fault is active, the control unit uses a pre-programmed speed (15 km/h).

The fault code is generated even if a break or short circuit occurs in the cable leading from the tachograph to the control unit.

The voltage of the road-speed signal is an internal voltage level of the control unit. It cannot be read with a multimeter.

**Action:** Check tachograph operation on the chart or while test driving. If the tachograph is working properly, check the wiring between the tachograph and the control unit.

**Current circuit, 12 engine:** 89

**Current circuit, 14 engine:** 89



## Fault code 27

## Speed signal

**Fault:** No speed signal or implausibly high speed.

**Cause:** No input signal on pin 51 or speed calculated by the control unit is implausibly high.

**Comment:** The fault code is generated in the event of an open circuit (break) in the lead between the tachograph and the control unit.

The fault code will be generated if the signal from the tachograph shows a speed above 150 km/h.

On control units manufactured in January, 1998 and later, the engine must be running for the fault code to be generated.

When the fault is active, the control unit uses a pre-programmed speed (15 km/h).

Cruise control, hand throttle and idling adjustment not working.

**Action:** Check tachograph operation on the chart or while test driving. If the tachograph is working properly, check the wiring between the tachograph and the control unit.

**Current circuit, 12 engine:** 89

**Current circuit, 14 engine:** 89

## Fault code 28

## Speed signal

**Fault:** Implausible speed signal.

**Cause:** The input signal frequency on pin 51 is too high, the signal voltage level is too low or too high.

**Comment:** The fault code will be generated if the cable between the tachograph and control unit is shorted to +24 V or chassis earth.

The fault code can also be generated by external electrical interference.

Cruise control, hand throttle and idling adjustment not working.

When the fault is active, the control unit uses a pre-programmed speed (15 km/h).

On control units manufactured in January, 1998 and later, the engine must be running for the fault code to be generated.

The voltage of the road-speed signal is an internal voltage level of the control unit. It cannot be read with a multimeter.

**Action:** Check tachograph operation on the chart or while test driving. If the tachograph is working properly, check the wiring between the tachograph and the control unit.

**Current circuit, 12 engine:** 89

**Current circuit, 14 engine:** 89

## Fault code 31

## Injection timing

**Fault:** Injection timing cannot be set correctly.

**Cause:** Implausible deviation in time between the input signal on pin 32 (needle movement sensor) and the input signal on pin 21 (main engine speed sensor).

**Comment:** This fault could be due to:

- 1 Low fuel pressure or poor filling (air in fuel) of injection pump.
- 2 Injection pump seizing (prestroke sleeve, prestroke shaft or setting solenoid).
- 3 Opening pressure too low on the injector having the needle movement sensor (on exhaust braking).
- 4 Faulty basic setting of pump or fault in pump transmission.
- 5 Control unit's driver stage has stopped working.

Engine torque is limited as long as the fault is active.

The fault code can only arise in engines with variable injection timing. The fault may arise together with fault codes 34, 44 and 45.

**Action:** Look for air leakage into the fuel system, both on the low pressure and high pressure sides.

Check that the overflow valve is working.

Check that the fuel valve does not have a defective contact.

Check the injection timing setting solenoid, connectors and wiring.

Check the basic setting of the pump and mechanical components.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** 9, 67, 37

## Fault code 32

## Control rack position

**Fault:** The control rack cannot be correctly set. The position of the control rack measured by the control rack position sensor (actual value) does not correspond to the position the control unit is attempting to set (nominal value).

**Cause:** The output signal on pins 1 and 2 (setting solenoid, fuel volume) does not correspond to the input signal on pins 9, 10 and 11 (control rack position sensor).

**Comment:** This fault can be due to seizure of the control rack or a defective setting solenoid.

On vehicles manufactured in March 1997 and earlier, the most common cause of the fault is shorting in the wiring between engine and cab. Improved wiring was introduced in March, 1997.

Power is removed from the setting solenoid (engine switched off). If the fault disappears by itself, power must be switched off and on (shutdown test) before the control unit interprets function as normal.

Control units manufactured in April, 1996 and later are of improved design and not as likely to generate fault code 32.

**Action:** Check setting solenoid, connectors and wiring. Check control rack movement.

In the case of trouble associated with fault code 32 and sudden engine failure on vehicles manufactured in March 1997 and earlier, try fitting the wiring of improved design as an initial remedy.

**Current circuit, 12 engine:** 44

**Current circuit, 14 engine:** 44

## Fault code 33

### Battery voltage

**Fault:** Control unit has detected battery voltage below 9 V.

**Cause:** Input voltage on pins 15 and 16 too low.

**Comment:** This fault can arise when starting from cold with poor batteries.

**Action:** Check battery and alternator. Check connectors and wiring.

**Current circuit, 12 engine:** 33

**Current circuit, 14 engine:** 33

## Fault code 34

## Needle movement sensor

**Fault:** This fault code can be generated for two reasons:

- 1 Implausible resistance in circuit for needle movement sensor.
- 2 Implausible deviations in needle movement sensor signal compared with engine speed.

**Cause:**

- 1 Control unit has sensed that the resistance in the circuit between pins 32 and 17 has been too low or too high.
- 2 The frequency of the signal to pin 32 has deviated from the engine speed signals to pin 21.

**Comment:** As long as the fault is present, engine torque will be limited.

This fault can only arise in engines with variable injection timing. The fault may arise together with fault code 31.

Air in the fuel system could be the cause of the nozzle needle not opening as it should, e.g. after replacement of the fuel filter.

The fault could be due to a binding nozzle needle.

If the warning lamp comes on during exhaust braking, the injector with the needle movement sensor probably has too low opening pressure.

**Action:** Check needle movement sensor, connectors and wiring.

Look for air leakage into the fuel system, both on the low pressure and high pressure sides.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** 67

## Fault code 35

## Control-rack position sensor

**Fault:** Defective contact, control rack position sensor signal.

**Cause:** The control unit has sensed that the signals on pins 9, 10 or 11 have been too uneven.

**Comment:** The fault code will be generated if at least 3 defective contacts occur within 10 seconds. If the fault disappears by itself, power must be switched off and on before the indicator lamp goes out. The fault code should provide a reminder that the vehicle should be taken to a workshop for repair.

This fault code can arise together with fault code 36.

**Action:** Check control rack position sensor, connectors and wiring.

Look for breaks in the wiring. Switch on the power. Erase the fault code memory, shake connectors and check to see if the fault code is regenerated.

**Current circuit, 12 engine:** 45

**Current circuit, 14 engine:** 45

## Fault code 36

## Control-rack position sensor

**Fault:** Implausible signal from control rack position sensor.

**Cause:** Voltage level on pins 9, 10 or 11 too high or too low.

**Comment:** On control units manufactured in April, 1996 and earlier, the setting solenoid will be without power (engine is switched off).

On control units manufactured in April 1996 and later, the engine will run at a speed slightly above that of normal idling speed. The vehicle can be driven in emergency mode to the nearest workshop. The engine does not respond to the throttle pedal.

This fault can arise together with fault code 35.

**Action:** Check control rack position sensor, connectors and wiring.

Look for breaks in the wiring. Switch on the power. Erase the fault code memory, shake connectors and check to see if the fault code is regenerated.

**Current circuit, 12 engine:** 45

**Current circuit, 14 engine:** 45



## Fault code 37

## Emergency stop

**Fault:** Signal from emergency stop switch.

**Cause:** Pin 25 on the control unit has been earthed.

**Comment:** On a stationary vehicle the engine is switched off. While the vehicle is being driven, the engine will run at idling speed. This ensures that the power steering system will continue to be operative.

The fault code is generated every time the emergency stop switch is used. In most cases this will not indicate a fault in the system. Should there be a cable fault between the control unit and the emergency stop switch, however, the fault code could be useful.

The fault code is generated only by control units manufactured in April, 1996 and earlier. Control units manufactured in April, 1996 and later do not generate a fault code when the emergency stop switch is used.

**Action:** Check the switch, connectors and wiring.

**Current circuit, 12 engine:** 94

**Current circuit, 14 engine:** 94

## Fault code 41

## Throttle pedal sensor

**Fault:** Implausible signal from the accelerator pedal sensor's potentiometer.

**Cause:** Input voltage on pin 27 too low or too high.

**Comment:** The voltage has been lower than 0.25 V or higher than 4.00 V.

Throttle opening is reduced to idling when the fault arises, and engine torque is limited.

The vehicle can be driven in emergency mode to the nearest repair shop by means of the throttle actuation switch. In emergency mode, idling speed is obtained when the throttle pedal is released and half throttle performance when it is fully depressed (throttle actuation switch closed). The cruise control can be used when vehicle speed exceeds 35 km/h.

**Action:** Check the potentiometer, connectors and wiring.

**Current circuit, 12 engine:** 71

**Current circuit, 14 engine:** 71

## Fault code 42

### Throttle pedal sensor

**Fault:** Implausible deviation between throttle pedal sensor potentiometer and throttle actuation switch.

**Cause:** Input voltage on pin 27 too low and pin 39 earthed. Input voltage on pin 27 too high and pin 39 not earthed.

**Comment:** The voltage has been lower than 0.49 V at the same time as the throttle actuation switch has been closed. Alternatively, the voltage has been higher than 0.90 V at the same time as the throttle actuation switch has been open.

The engine runs slightly faster than at normal idling speed. The engine does not respond to the throttle pedal. The cruise control can be used when vehicle speed exceeds 35 km/h.

Engine torque is limited.

**Action:** Check potentiometer. Compare potentiometer and throttle activation switch. Check connectors and wiring.

**Current circuit, 12 engine:** 71, 107

**Current circuit, 14 engine:** 71, 107

## Fault code 43

### CAN communication

**Fault:** Fault in CAN communications circuit.

**Cause:** Internal fault in control unit.

**Comment:** The fault does not affect the operation of the engine, but the other control units receive no engine information. Other systems (e.g. ABS/TC, Opticruise) cannot take over control of engine operation.

**Action:** Replace the control unit.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** -

## Fault code 44

### Needle movement sensor

**Fault:** There have been more pulses from the needle movement sensor than there should be for a given engine speed.

**Cause:** The frequency of the signal on pin 32 differs from the engine speed signal applied to pin 21.

**Comment:** As long as the fault is present, engine torque will be limited.

This fault can only arise in engines with variable injection timing. The fault may arise together with fault code 31.

If the warning lamp comes on during exhaust braking, the injector with the needle movement sensor probably has too low opening pressure.

**Action:** Check needle movement sensor, connectors and wiring.

Look for air leakage into the fuel system both on the low pressure and high pressure sides.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** 67

## Fault code 45

### Needle movement sensor

**Fault:** There have been fewer pulses from the needle movement sensor than there should be for a given engine speed.

**Cause:** The frequency of the signal on pin 32 differs from the engine speed signal applied to pin 21.

**Comment:** As long as the fault is present, engine torque will be limited.

This fault can only arise in engines with variable injection timing. The fault may arise together with fault code 31.

Air in the fuel system could be the cause of the nozzle needle not opening as it should, e.g. after replacement of the fuel filter.

The fault could be due to a binding nozzle needle.

**Action:** Check needle movement sensor, connectors and wiring.

Check the injectors.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** 67

## Fault code 46

## Needle movement sensor

**Fault:** Implausible resistance in the needle movement sensor circuit.

**Cause:** Control unit has sensed that the resistance in the circuit between pins 32 and 17 has been too low or too high.

**Comment:** As long as the fault is present, engine torque will be limited.

The fault code can only occur on engines with adjustable injection timing.

**Action:** Check needle movement sensor, connectors and wiring.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** 67

## Fault code 61

### Shut-down test

**Fault:** Control unit has been interrupted before shutdown test is completed.

**Cause:** Voltage to pins 15 and 16 has disappeared too early.

**Comment:** The shutdown test entails the control unit carrying out an operational test after power has been switched off using the key.

Engine torque will be limited if the shutdown test is interrupted ten times in a row. As soon as the control unit succeeds in carrying out a test without interruption, the fault will be considered remedied.

The engine should always be switched off with the key. If there is a battery master switch in the vehicle, it must not be switched off until the indicator lamp has gone out.

**Action:** Check that the warning lamp comes on for a short time after power is switched off using the key.

Check connectors and wiring to pins 15, 16 and 46 on the control unit. Power supply may be interrupted if extra equipment has been connected.

**Current circuit, 12 engine:** 32

**Current circuit, 14 engine:** 32

## Fault code 62

### Fuel valve

**Fault:** Engine speed does not drop sufficiently quickly when the engine is switched off.

**Cause:** The frequency of the engine speed signals to pins 21 and 22 does not decrease sufficiently after power is removed from pin 47.

**Comment:** Engine speed should decrease by at least 150 rpm in 4 s.

Power is cut to the setting solenoid (engine switched off). Next time the engine is started, torque is limited. If engine speed drops sufficiently quickly once when the engine is switched off, normal torque is resumed.

A possible fault cause is air in the fuel system or internal leakage in the fuel valve.

This fault can arise together with fault code 63.

**Action:** Check that fuel valve power supply disappears immediately when power is switched off using the key.

When engine speed has dropped to 350 rpm, the fuel valve is once again powered. The valve is then powered until the shutdown test is complete, i.e. the indicator lamp goes out.

Look for air leakage into the fuel system in the piping between the fuel valve and feed pump. Check the overflow valve.

**Current circuit, 12 engine:** 27, 39, 57, 62

**Current circuit, 14 engine:** 9, 27, 57, 62



## Fault code 63

### Driver stage

**Fault:** Break or shorting in the circuit controlled by the control unit's driver stage.

**Cause:** Break or short circuit to earth in the cable to pin 14.

**Comment:** Fuel valve shuts and the engine stops. If there is a faulty contact, the engine runs irregularly.

If the fault disappears by itself, the power must be switched off and on (shutdown test) before the control unit will consider the function to be normal.

Fault can arise together with fault code 62.

**Action:** Check connectors, wiring and fuel valve.

**Current circuit, 12 engine:** 57

**Current circuit, 14 engine:** 57

## Fault code 64

### Supply relay

**Fault:** Power supply to the control unit despite the fact that the starter key is set to locking position.

**Cause:** Voltage to pins 15 and 16 despite the fact that voltage has disappeared on pin 47.

**Comment:** Power has not been cut to the supply relay after the shutdown test is complete.

The indicator lamp remains on even though the power is off. Engine operation is not affected and the engine can be restarted.

If the indicator lamp is on, the supply relay must first be removed before the connector for the control unit can be disconnected.

**Action:** Remove the supply relay and see if the warning lamp goes out. If it goes out, the relay is not working or the cable to pin 46 is shorted to earth. If the lamp stays lit, the wiring to pins 15 and 16 is shorted to +24 V.

**Current circuit, 12 engine:** 27, 33

**Current circuit, 14 engine:** 27, 33

## Fault code 81

### Control unit

**Fault:** Internal fault in the control unit.

**Cause:** The control unit's two microprocessors have lost contact with each other.

**Comment:** The setting solenoid loses power (engine switched off).

**Action:** Replace the control unit.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** -

## Fault code 82

### Shut-down test

**Fault:** The control unit has discovered a fault during the shutdown test. The position of the control rack does not correspond to the preprogrammed position.

**Cause:** The output signal on pins 1 and 2 (setting solenoid, fuel volume) does not correspond to the input signal on pins 9, 10 and 11 (control rack position sensor).

**Comment:** During the shutdown test, the control unit guides the control rack out to a preprogrammed position and allows the position sensor to read this. Power is then interrupted to the setting solenoid.

If the control unit discovers any faults during this test, engine torque is limited the next time the engine is started.

If fault code 82 arises together with any of fault codes 32, 35 and 36, the fault is probably outside the control unit.

However, if fault code 82 arises on its own, this indicates an internal fault in the control unit.

**Action:** Check if there are other fault codes such as 32, 35 and 36. If there are, take action on these first. Code 82 on its own means that the control unit must be changed.

**Current circuit, 12 engine:** 42

**Current circuit, 14 engine:** 42

## Fault code 83

## Control unit

**Fault:** Internal fault in the control unit.

**Cause:** Control unit has discovered that the fault code memory is not working correctly.

**Comment:** Fault does not affect engine operation.

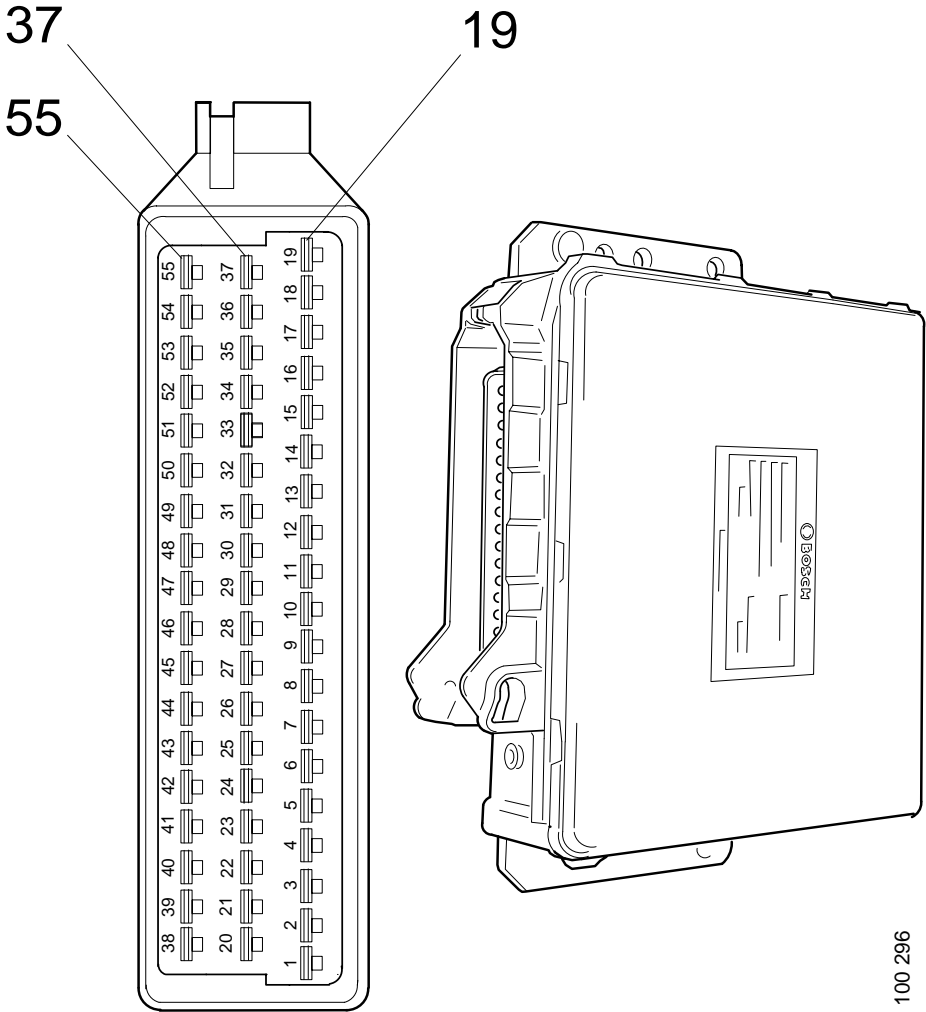
**Action:** Erase the fault code memory and check that the fault code is not regenerated. If the fault code returns, change the control unit.

**Current circuit, 12 engine:** -

**Current circuit, 14 engine:** -

# Control unit connections

The control unit is connected to the other EDC systems in the vehicle via a 55-pin connector.



*Control unit connector*

1	Setting solenoid for fuel supply.	24	Input signal from brake pedal switch 2. When earthed, the pin is interpreted by the control unit as depressed brake pedal.
2	Setting solenoid for fuel supply.	25	Input signal for emergency stop. The pin shuts down the engine when earthed.
3	Setting solenoid for injection timing.	26	Input signal from clutch pedal switch. When earthed, the pin is interpreted by the control unit as depressed clutch pedal.
4	Setting solenoid for injection timing.	27	Input signal from potentiometer in throttle pedal sensor. A signal voltage is applied to the pin which varies according to how much the throttle pedal is depressed.
5	Not used.	28	Not connected (output signal for engine speed).
6	Not used.	29	PWM signal. Output signal for throttle actuation.
7	Not used.	30	CAN communication, L cable.
8	Not used.	31	CAN communication, H cable.
9	Input signal from control rack position sensor's measuring coil.	32	Input signal from needle movement sensor.
10	Input signal from control rack position sensor's reference coil.	33	Power supply (+5 V) to charge air pressure sensor.
11	Supply to control rack position sensor.	34	Input signal for torque limiter 2. When earthed, the pin gives the "Torque limiter 2" function. If pin 35 is earthed at the same time, the "Torque limiter 3" function will be obtained instead.
12	Not used.	35	Input signal for torque limiter 1. When earthed, the pin gives the "Torque limiter 1" function. If pin 34 is earthed at the same time, the "Torque limiter 3" function will be obtained instead.
13	Earthing of sensor.	36	Input signal from charge air pressure sensor.
14	Power supply +24 V to fuel valve.	37	Not used.
15	Power supply +24 V from the supply relay to the control unit.	38	Not used.
16	Power supply +24 V from the supply relay to the control unit.	39	Input signal from throttle actuation switch. When earthed, the pin is interpreted by the control unit as depressed throttle pedal.
17	Earthing of sensor.	40	Input signal for disengagement of cruise control. +24 V on the pin disengages the cruise control.
18	Earthing the control unit to the frame.		
19	Earthing the control unit to the frame.		
20	Input signal (+24 V) from the diagnostics switch. Output signal (+24 V) for activating the diagnostics lamp and indicator lamp.		
21	Input signal from the main engine speed sensor.		
22	Input signal from the auxiliary engine speed sensor.		
23	Input signal for limited hand throttle. When earthed, the pin gives the "Limited hand throttle" function. If pin 41 is earthed at the same time, the "Fixed engine speed" function will be obtained instead.		

- 41 Input signal for raised idling. When earthed, the pin gives the "Raised idling" function. If pin 23 is earthed at the same time, the "Fixed engine speed" function will be obtained instead.
- 42 Input signal for idling request. +24 V on the pin gives idling speed.
- 43 Input signal from brake pedal switch 1. A broken earth connection is interpreted by the control unit as depressed brake pedal.
- 44 Input signal from control for cruise control. The control unit senses the voltage level across pins 44 and 13.
- 45 Power supply (+5 V) to potentiometer in throttle pedal sensor.
- 46 Output signal for activating the supply relay. The pin earths the relay.
- 47 Input signal (+24 V) from the starter lock (key in the drive position).
- 48 Diagnostics cable K.
- 49 Diagnostics cable L.
- 50 Not connected ex works. Input signal for speed limiter 2, +24 V applied to the pin activates speed limiter 2.
- 51 Speed signal from tachograph output D3.
- 52 PWM signal. Input signal for engine control.
- 53 Input signal from coolant temperature sensor. The control unit senses the voltage level across pins 53 and 13.
- 54 Not used.
- 55 Input signal from charge air temperature sensor. The control unit senses the voltage level across pins 5 and 13.

# Wiring diagrams

- The section dealing with the 12 engine begins with a drawing showing the locations of the electrical components.
- The component drawing is diagrammatic. It applies to both left-hand and right-hand drive vehicles.
- The component drawing is followed by wiring diagrams, which are marked with current circuit serial numbers. Use the current circuit references in the list of fault codes to find the right diagram and the components in question.
- The section covering the 14 engine is laid out in the same way.
- The diagrams include the component names, e.g. E12. The full names of the components are given in Group 16 of the Workshop Manual, as also are the test readings, if any.

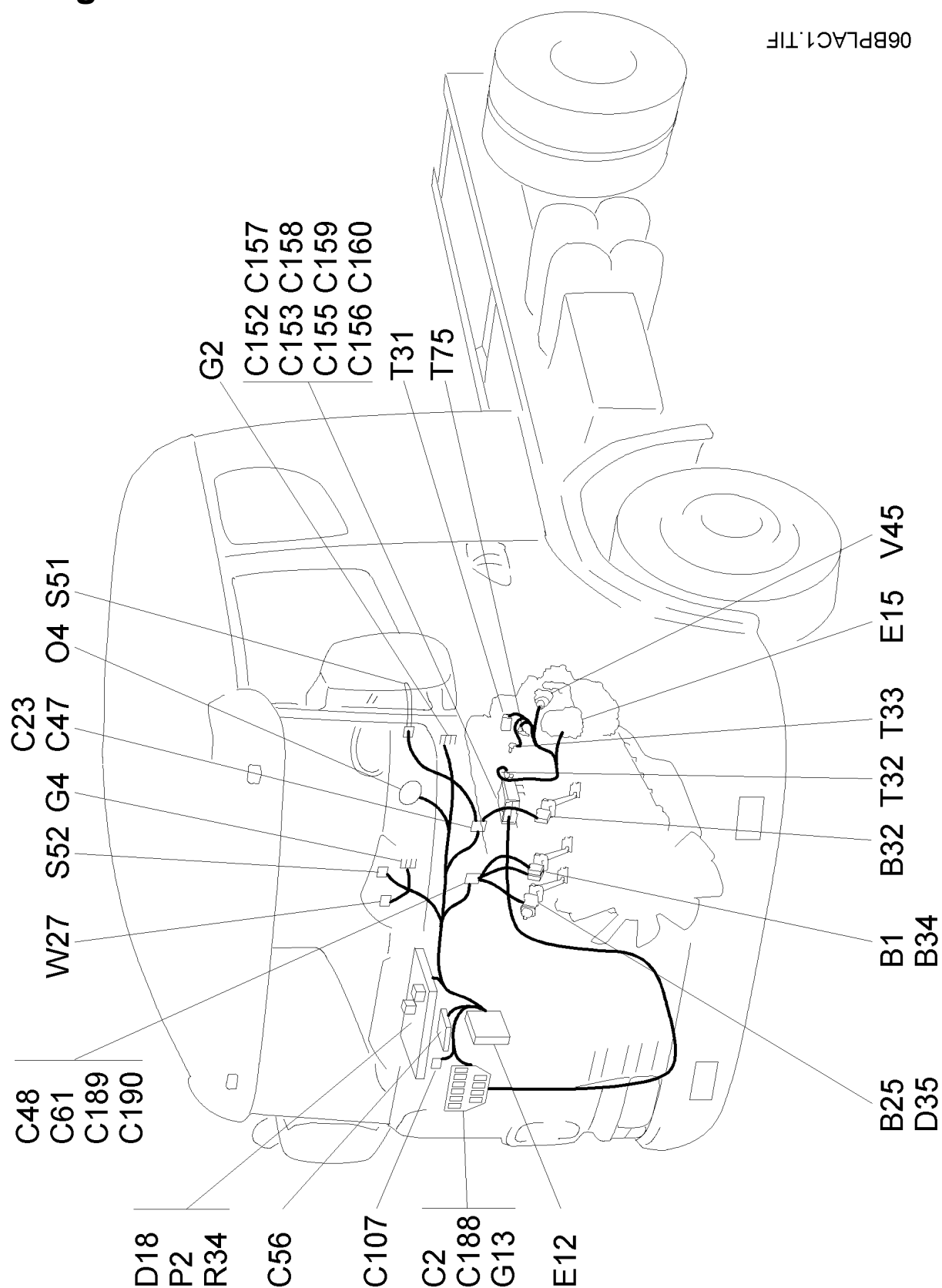
Changes in the wiring diagrams:

- 12 engine, current circuit 37: on vehicles manufactured in January, 1998 and later, cables C2-11 have been moved to C2-14.
- 14 engine, current circuit 39: on vehicles manufactured in January, 1998 and later, cables C2-11 have been moved to C2-14.

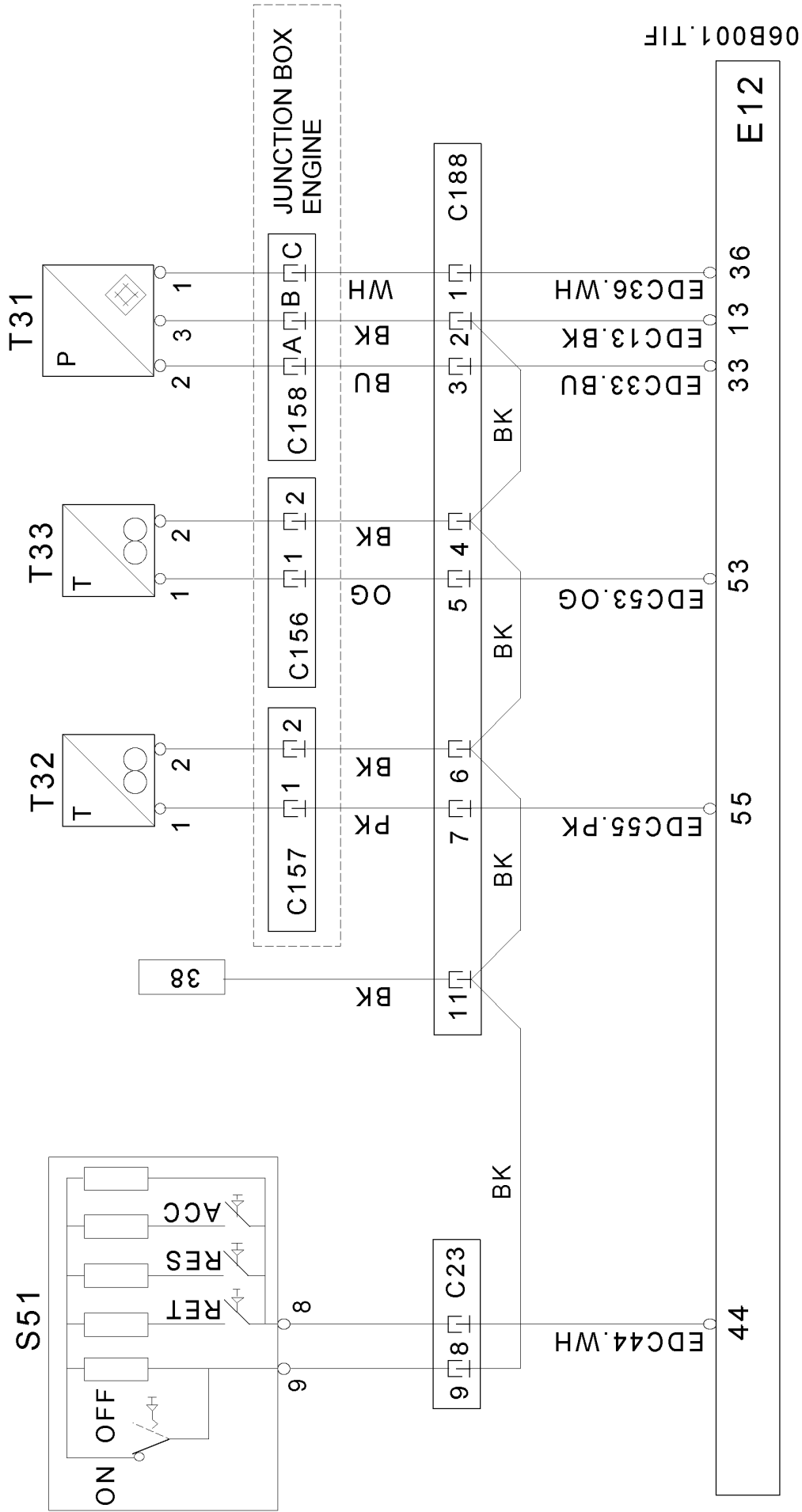
Corresponding changes may have been carried out on earlier vehicles.



## Location of components, 12 engine

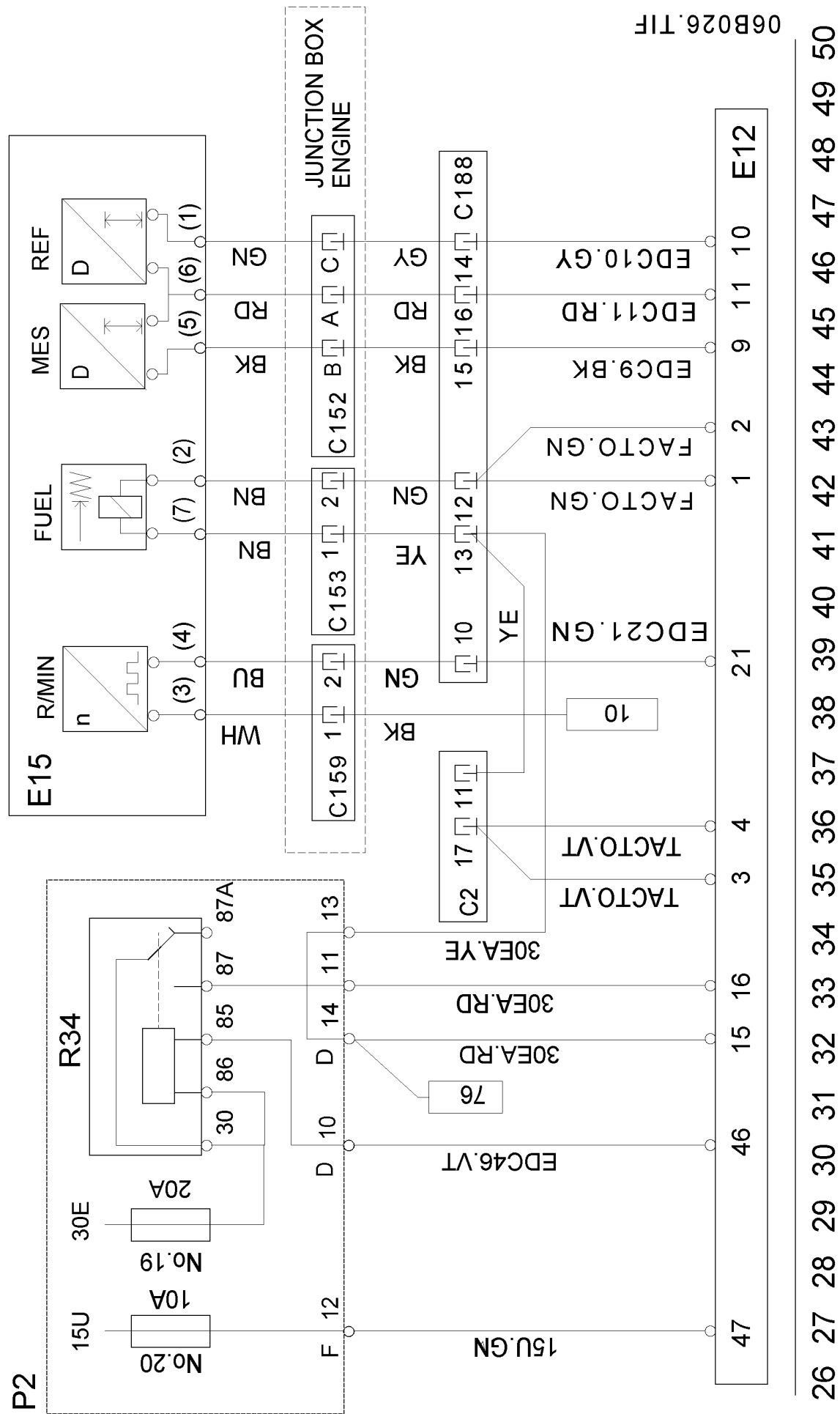


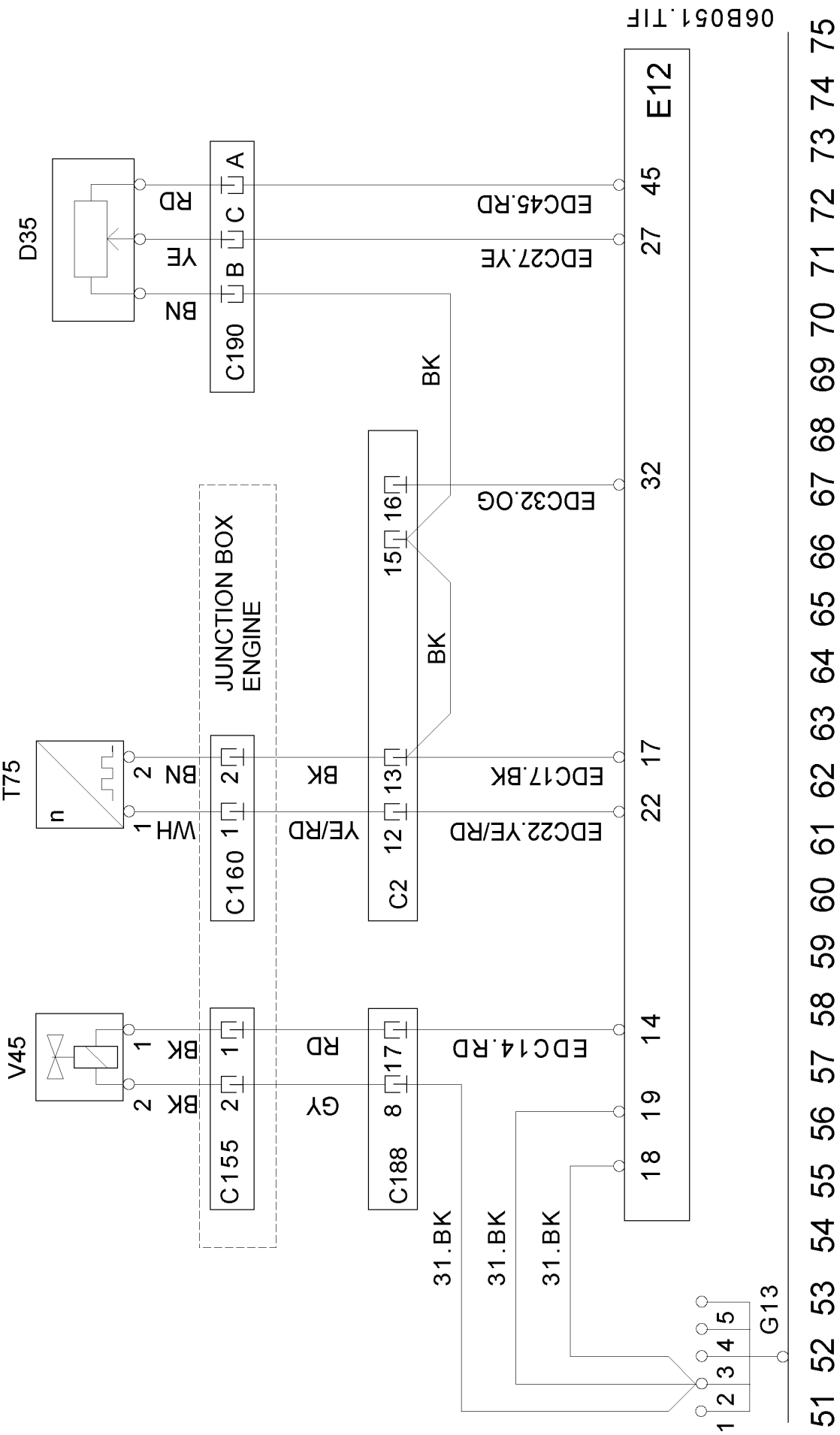
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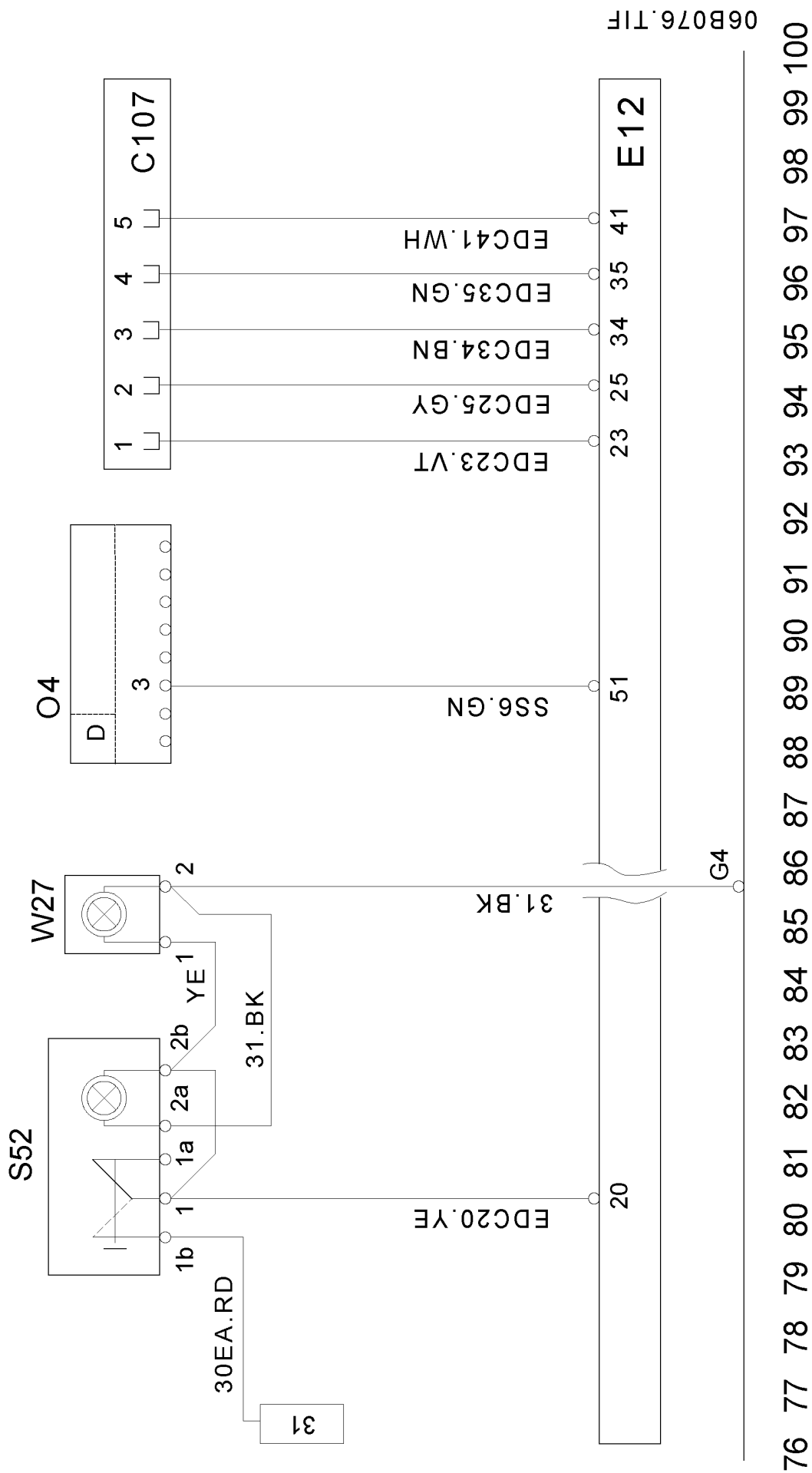


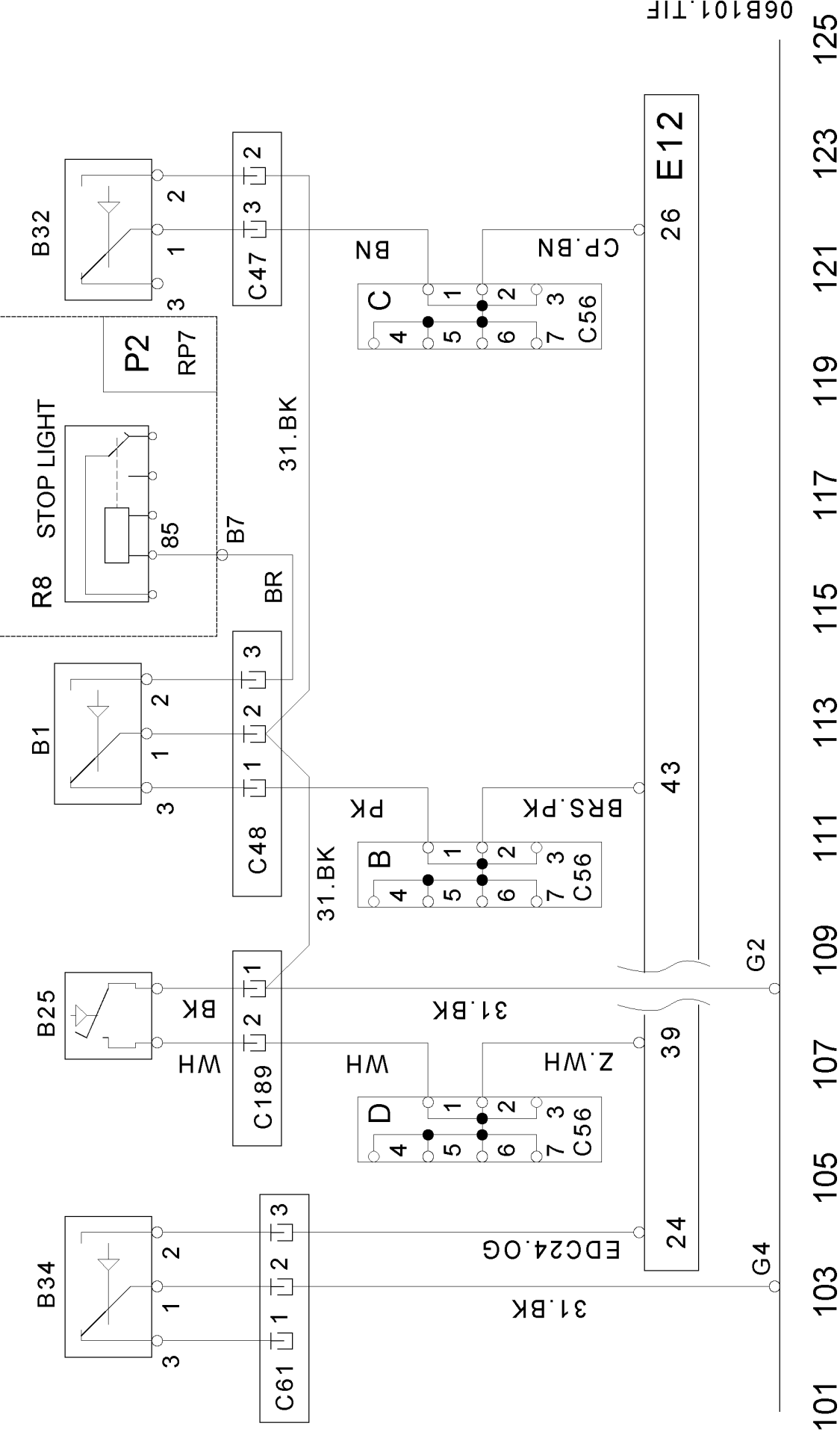
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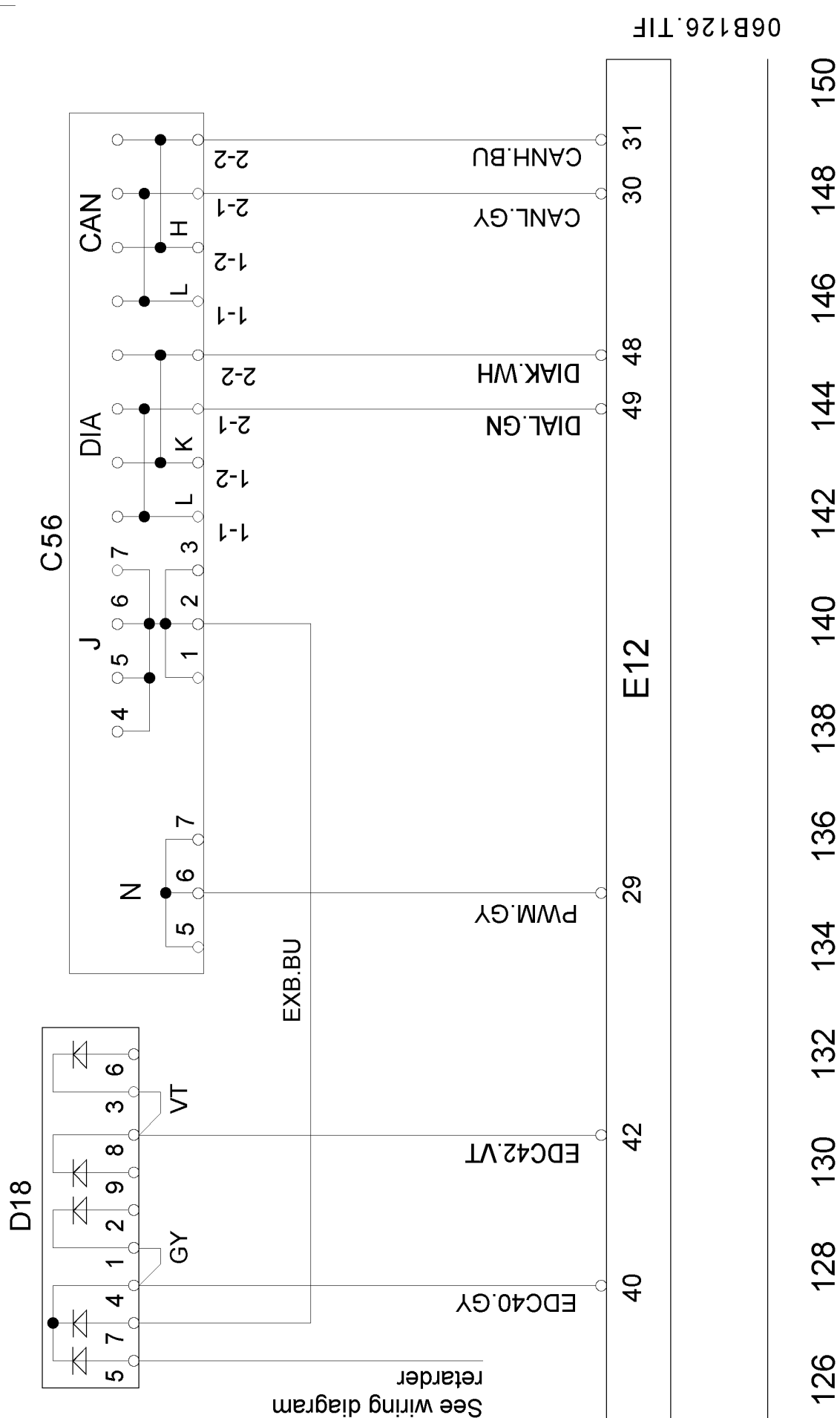
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| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|



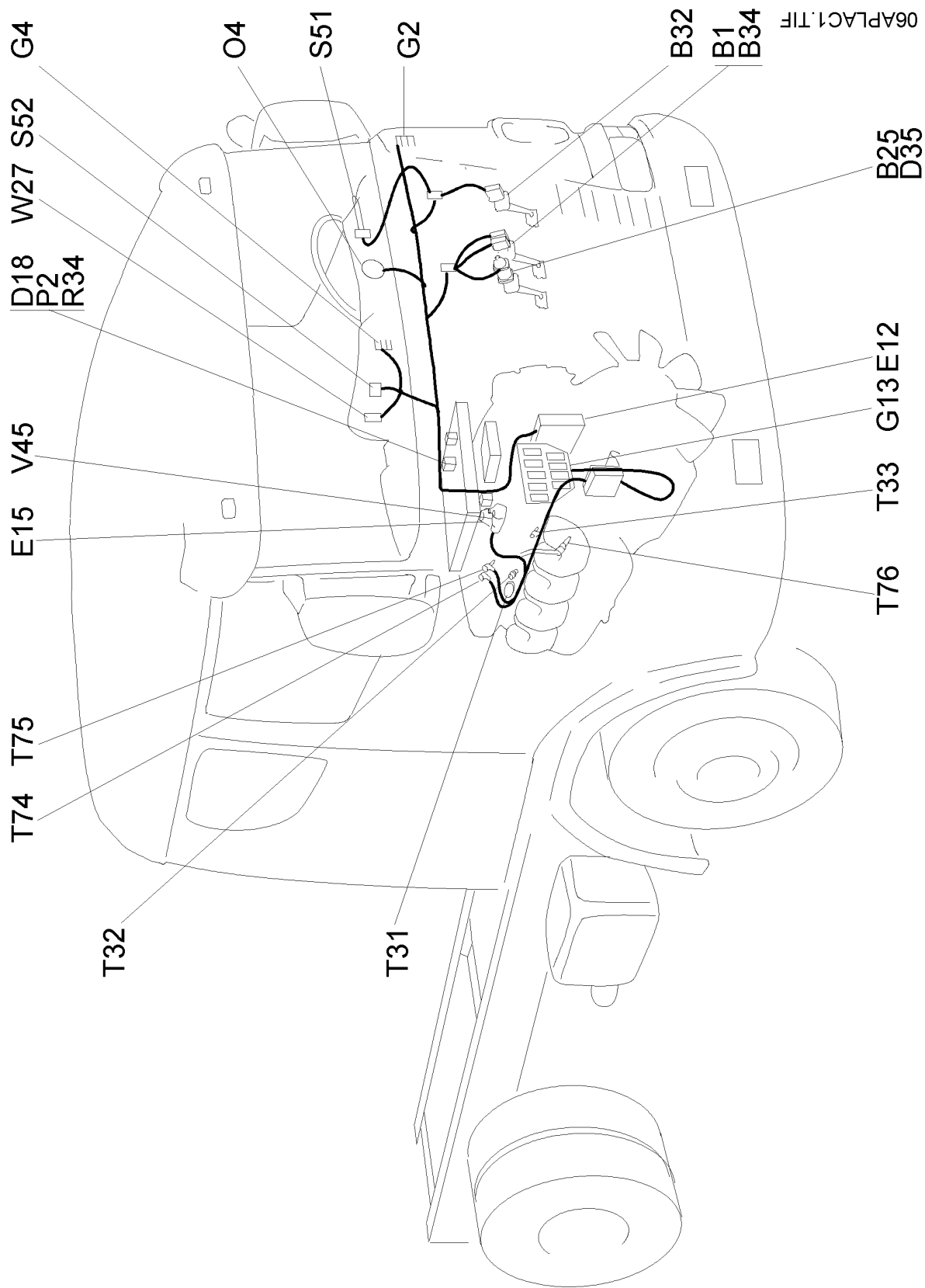




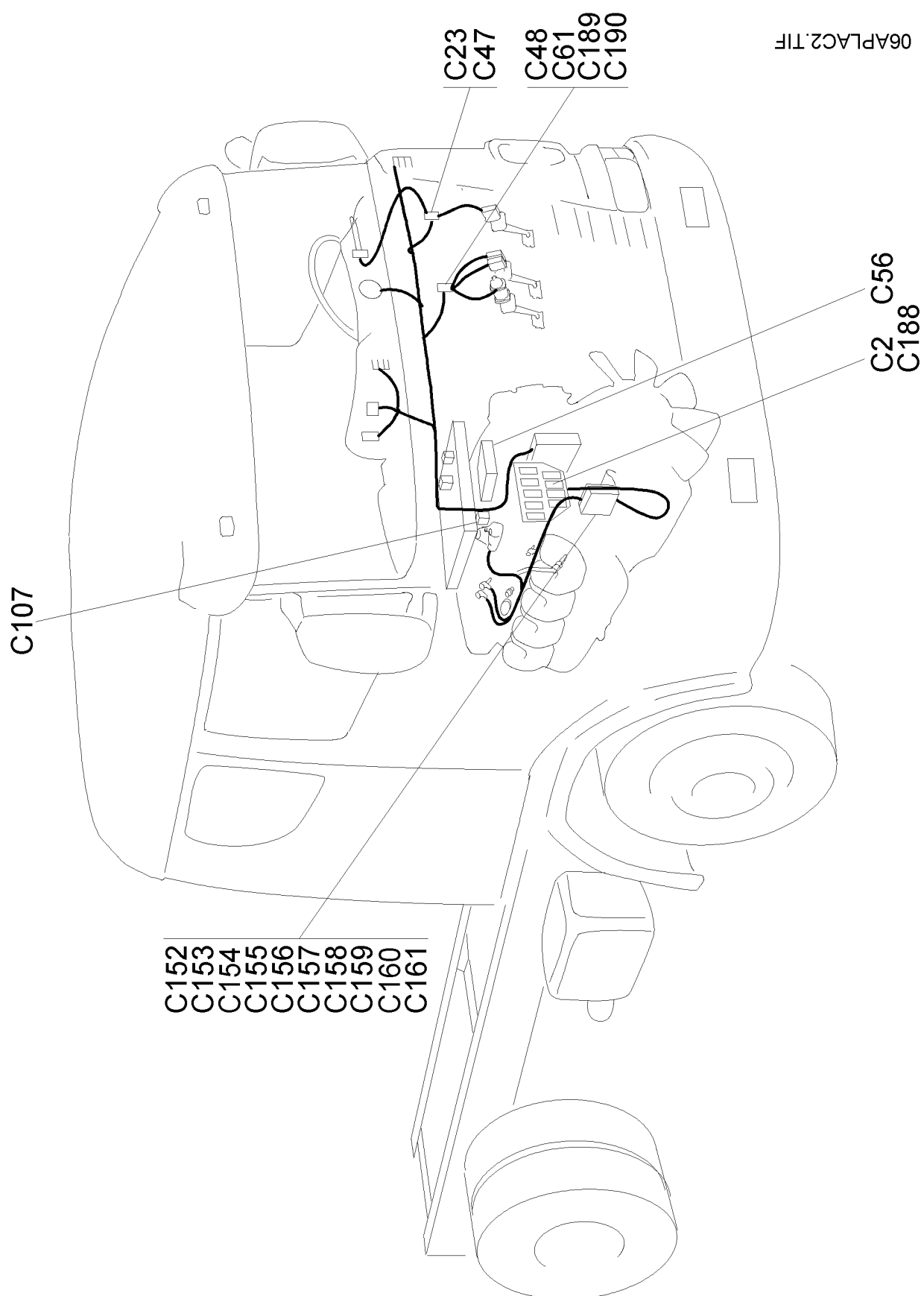


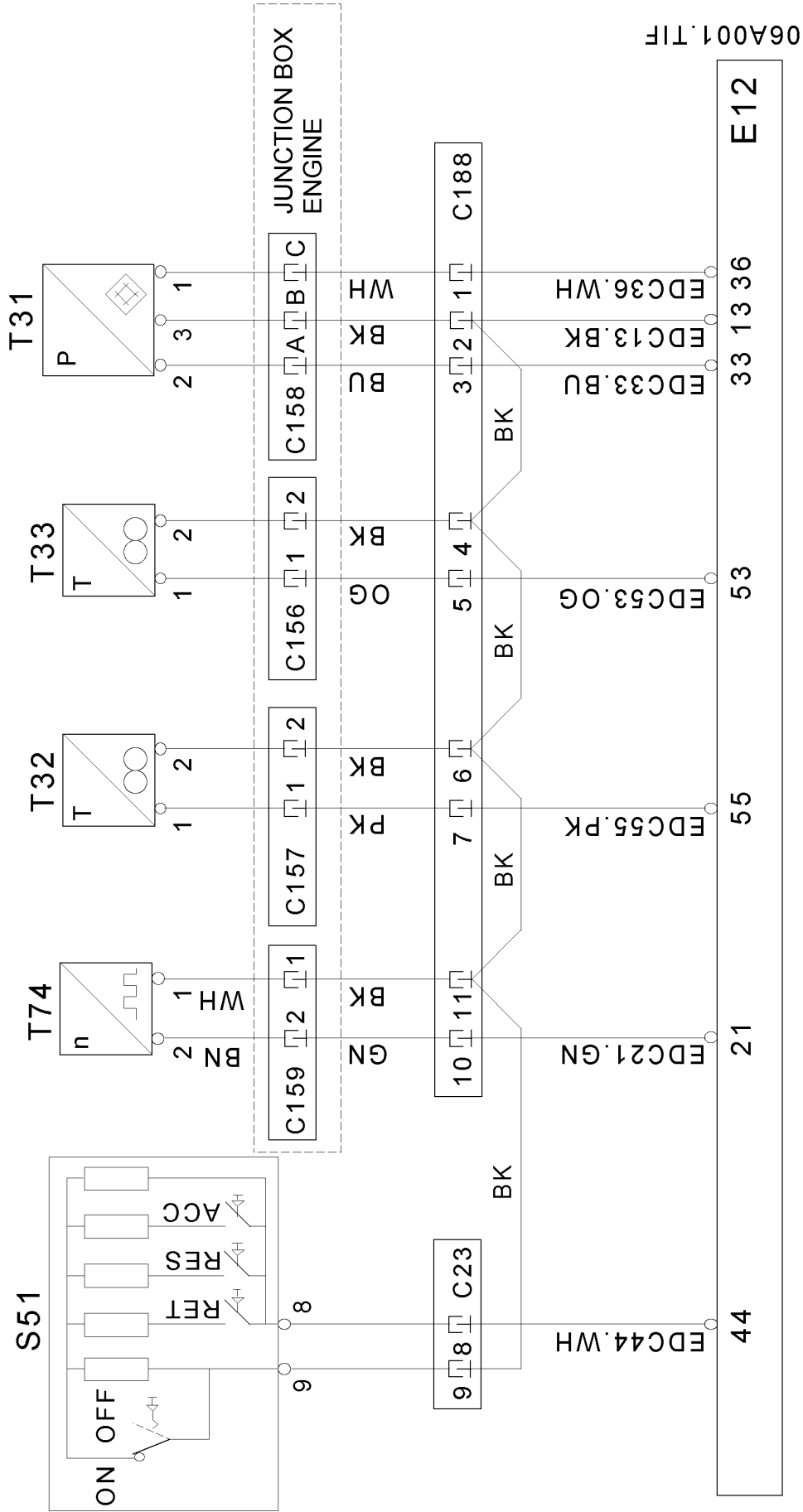


Location of components,  
14 engine



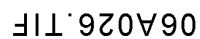


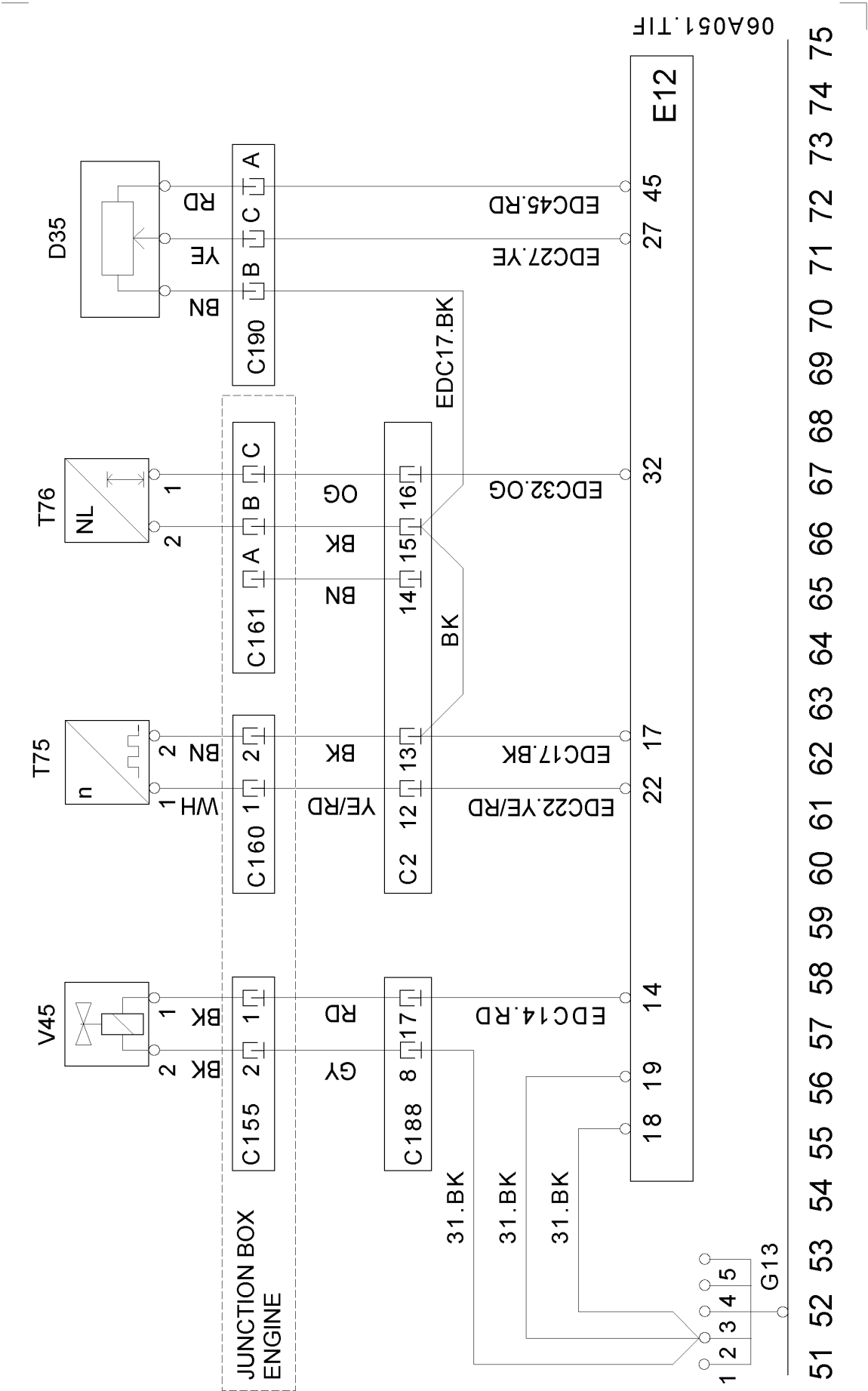


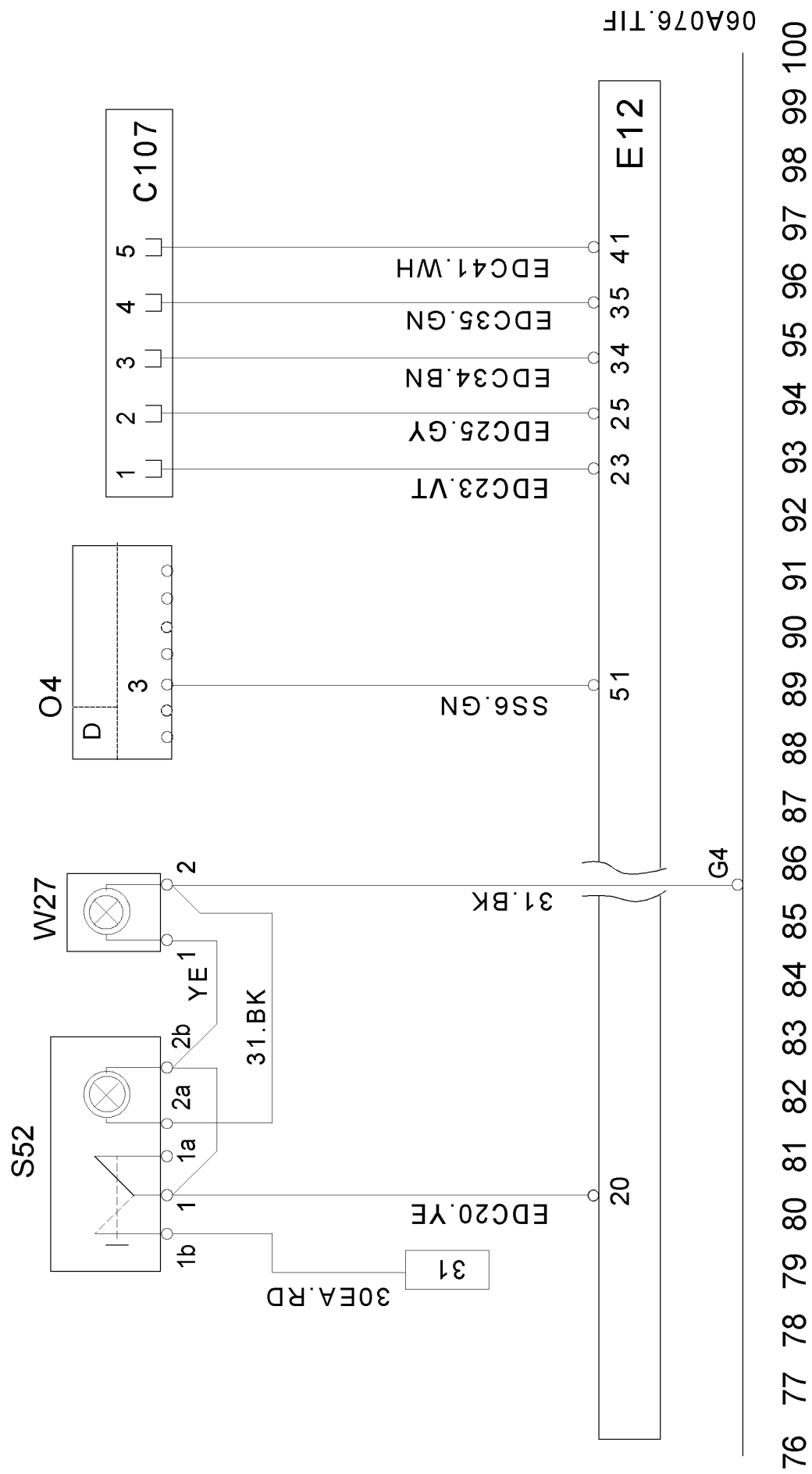


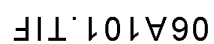
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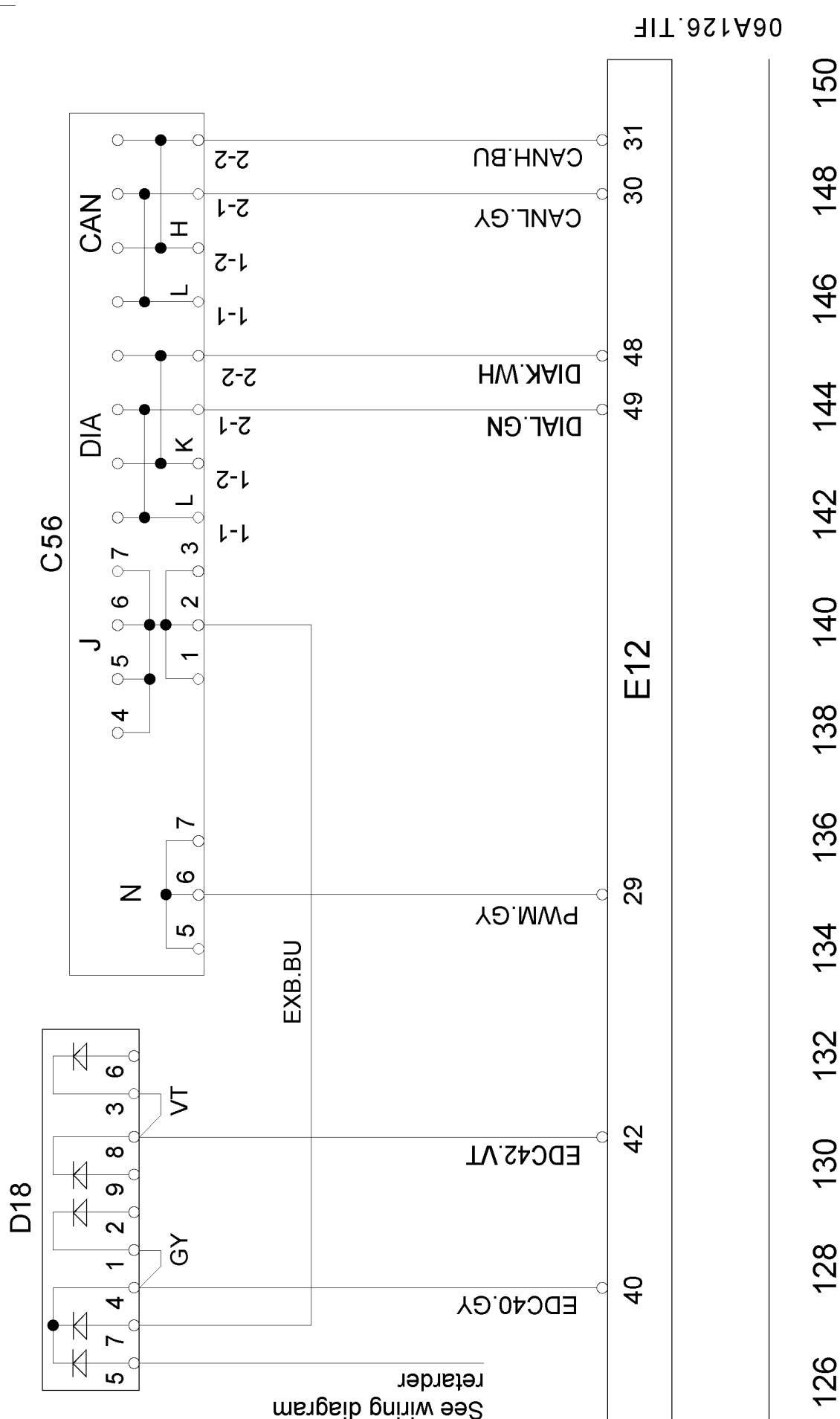
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25











# Faults that do not generate fault codes

Symptom	Cause/Action
The engine has poor tractive power, output and torque.	<p>The charge air pressure sensor is clogged. It then reacts less promptly to changes in the charge air pressure. The result is that the engine seems to respond tardily when the throttle pedal is depressed. No fault code is generated because the signal from the sensor always remains within the permissible limits.</p> <p>Air leakage into fuel lines on the low pressure side or leaking overflow valve.</p> <p>Low supply pressure from feed pump. The feed pump should give a pressure of 3-4 bar.</p> <p>Cables to the charge air pressure sensor that have been inverted can emit a constant pressure signal within the limits permitted.</p>
Black smoke on acceleration.	<p>The charge air pressure sensor is stuck and giving a charge air pressure that is consistently too high.</p> <p>Cables to the charge air pressure sensor that have been inverted can emit a constant pressure signal within the limits permitted.</p>
Poor engine performance.	Incorrect injection timing set on flywheel.
The cruise control doesn't work.	The clutch pedal switch is inoperative. Pin 26 is earthed. +24 V to pin 40.
The engine runs at idling speed only.	+24 V to pin 42.
The engine doesn't start.	<p>Fault in power supply to pins 15 and 16.</p> <p>Break in cable to pin 46 or 47.</p>
The engine races slightly when the cruise control is disengaged with the brake or clutch pedal.	The brake pedal or clutch pedal switch opens too late.
The cruise control doesn't disengage with the clutch pedal.	The clutch pedal switch is inoperative. In consequence, pin 26 is not earthed when the pedal is depressed.
Warning lamp comes on but no fault codes are flashed on the diagnostic lamp.	Fault code memory which can only be accessed with a PC is full.



Symptom	Cause/Action
The speed limiter is not working.	The tachograph is not working.
Engine hesitates temporarily, which may be put down to misfiring.	The control unit misreads the engine speed and cuts off the supply of fuel briefly. The engine never stops when this happens and no fault code is generated because of the short time it lasts. The fault has been corrected on control units manufactured in May, 1997 and later.

**Note:** Remember that the EDC is basically a normal mechanical fuel system with added electronic control. Faults which can arise in a fuel system without EDC, such as defective injectors, can also arise in a vehicle with EDC.