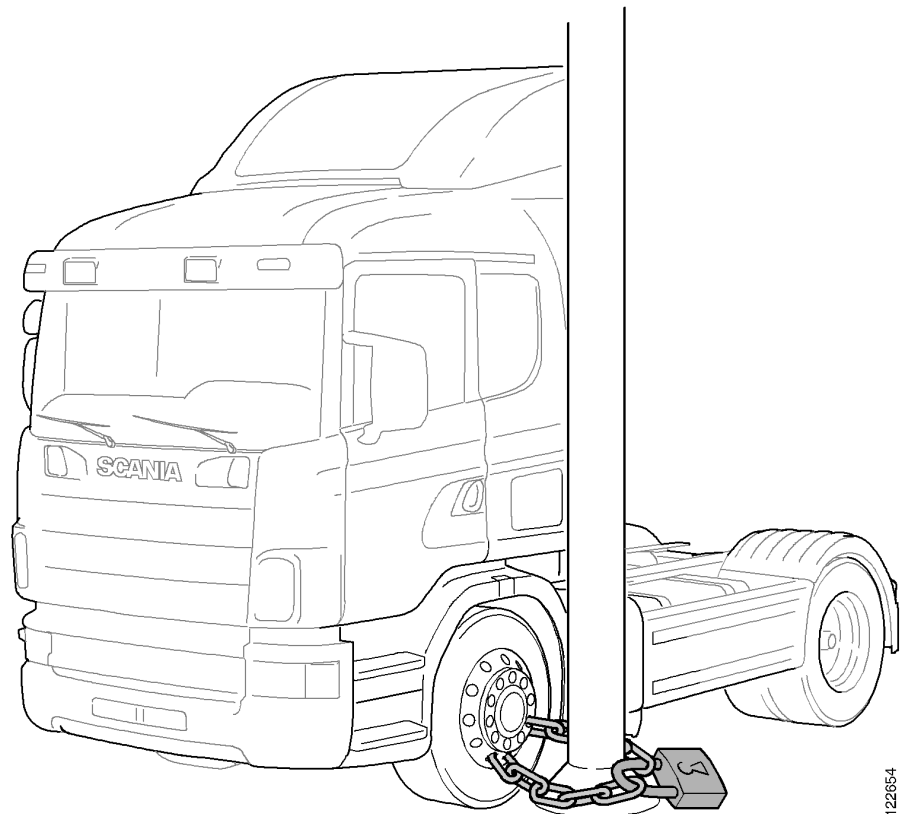


SCANIA

16:06-55

Issue 1 en

Immobiliser



12265-4

Function description

Troubleshooting

Work description

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Function description

General

The electronic immobiliser is an anti-theft device that makes it impossible to start the vehicle without using a valid starter key.

The transponder (integrated in the starter key), coordinator and engine control unit communicate with each other using encrypted signals. This principle is very secure as the encrypted signals cannot be read or copied.

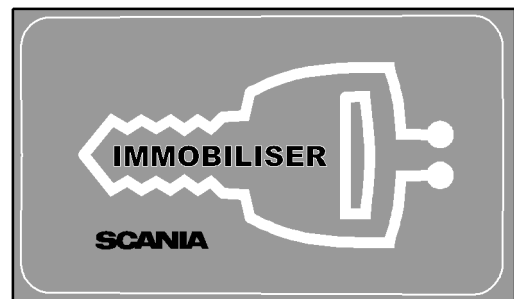
When the driver turns the starter key, the coordinator will verify the validity of the key at the same time as both control units (the coordinator and the engine control unit) will verify each other.

If a fault is detected, the system will prevent starting with the coordinator blocking the starter relay that controls the starter motor and the engine control unit cutting off the fuel supply.

The electronic immobiliser is fully independent from the one included in certain generations of Scania VPS (Vehicle Protection System). They operate to different principles and must not be confused.

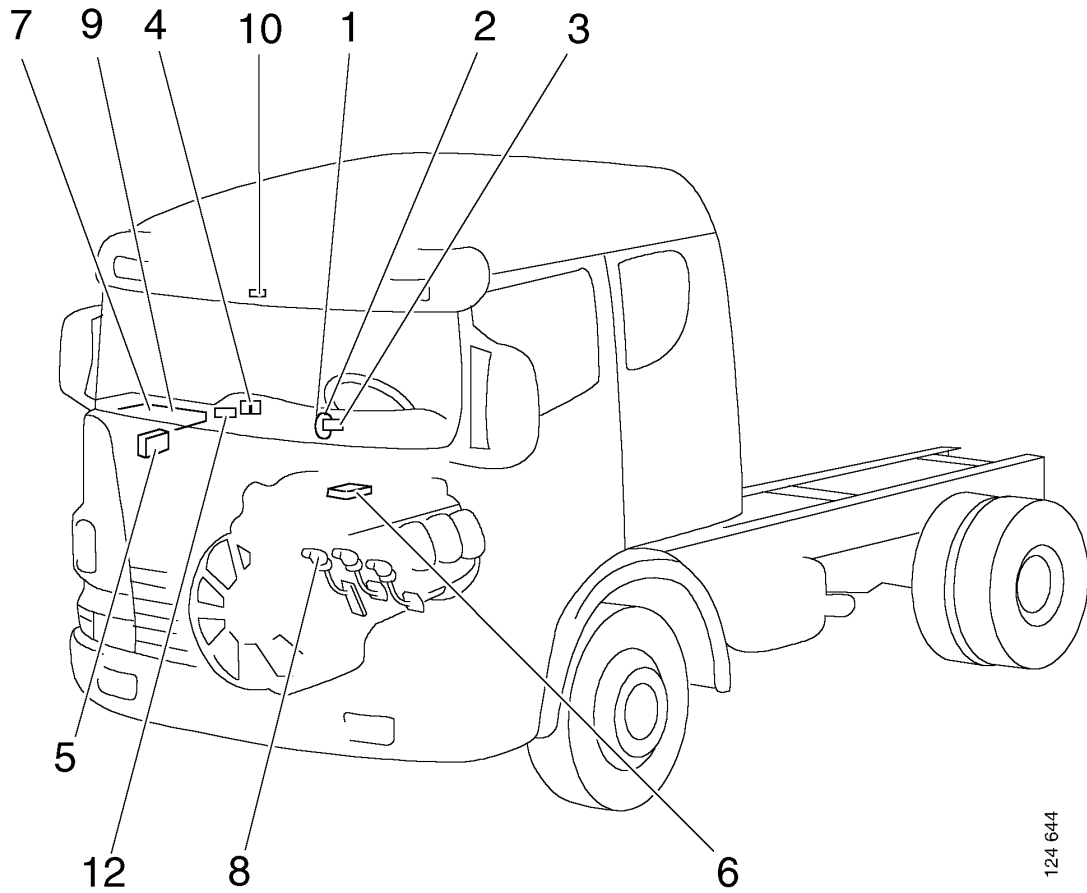
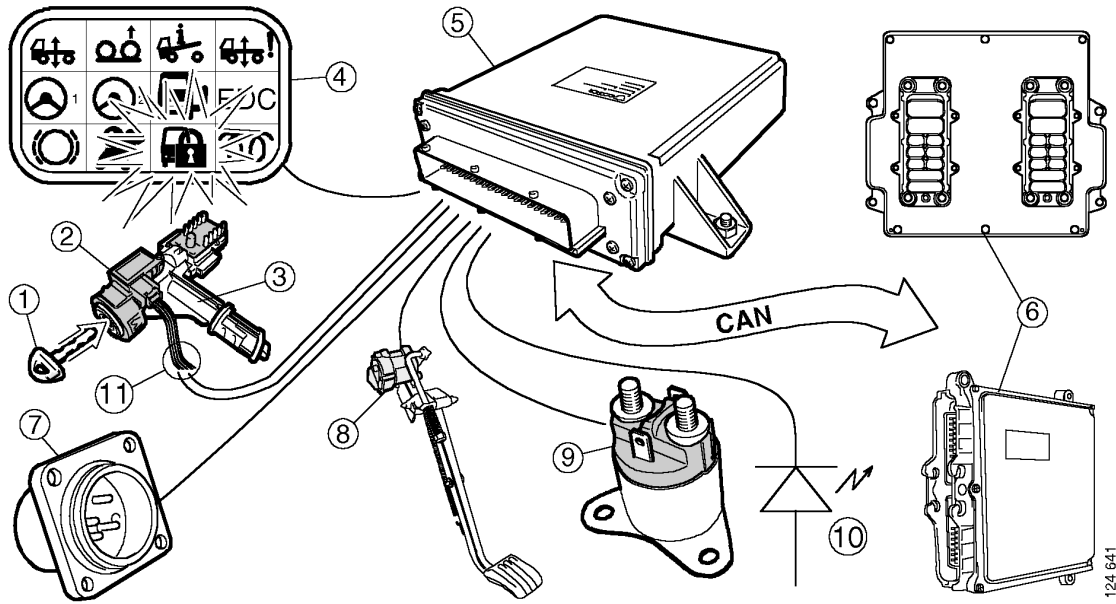
From 0111 (may vary depending on market), the immobiliser can be fitted as an option from the factory or retrofitted provided the vehicle is equipped with a coordinator and engine control unit of the correct generation.

The coordinator must be generation 4, combined with an EDC control unit of either type S6 or MS6.



Vehicles equipped with immobiliser have an "Immobiliser" label affixed to the side windows.

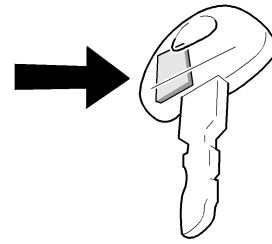
Component overview



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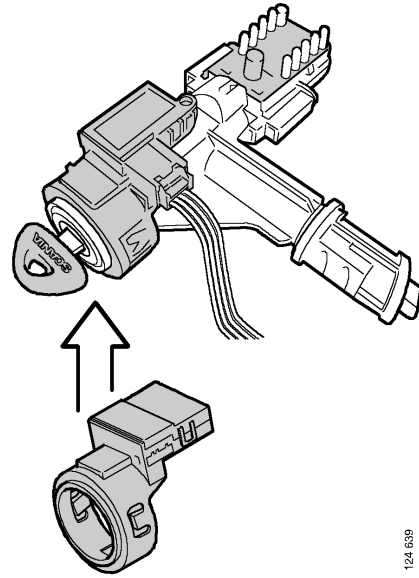
1 Starter key with transponder

The starter key has a traditional mechanical function but also has an integrated transponder to encrypt the electronic signals from the coordinator.



2 Transceiver unit (E49)

This acts as a link between the coordinator and the transponder. It is located round the starter lock and comprises an aerial and a transmitter/receiver unit. The aerial coil has an inductive connection with the transponder, while the transmitter/receiver unit is in serial contact with the coordinator.

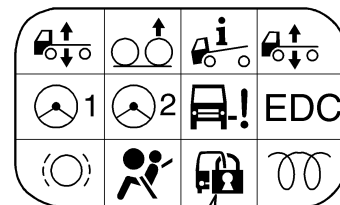


3 Starter switch (S4)

Besides providing the coordinator with voltage via pin 15, the starter lock also transmits a signal to the coordinator when the starter key is inserted into the lock.

4 Warning lamp (W33)

This lamp is located in the control panel and provides the driver with information on the status of the immobiliser. It can light up continuously or flash depending on the current situation.



5 Coordinator (E30)

The coordinator contains the actual brains of the immobiliser system. Vehicles with immobiliser are always equipped with a coordinator of at least generation 4.



6 Engine control unit (E44 or E12)

Vehicles with immobiliser are equipped with either EDC S6 or EDC MS6 engine control unit. The control unit cuts off the fuel supply if the conditions set by the immobiliser system are not fully fulfilled.

7 **Diagnostic socket (K1)**

The socket for connecting VCI and Scania Diagnos/Programmer is located on top of the central electric unit.

8 **Make switch, integrated in accelerator pedal sensor (B25)**

Together with the system PIN code, this makes it possible to perform an emergency start in case there is a problem in the communication between the transponder and the transceiver (see page 28). The switch is open when the pedal is released.

9 **Starter relay (R2)**

The starter relay governs the control voltage to starter motor pin 50. The relay is blocked by the coordinator if the conditions set by the immobiliser system are not fully fulfilled.

10 **Indicator lamp (W44)**

The lamp is located in the roof shelf panel. When the starter key is removed from the starter lock, the lamp will flash to indicate that the immobiliser is active. Vehicles equipped with VPS and immobiliser do not have W44 and only the two VPS lamps are used.

A small number of an early series of vehicles may not have the W44 indicator lamp at all, irrespective of whether or not they are equipped with VPS.

11 **Cable harness**

There is a special cable harness for connecting the transceiver. The cables between the control units are the same as on vehicles without immobiliser, however.

12 **Connector (C487)**

The C487 connector is only fitted to the small series of vehicles of early manufacture that do not have the W44 indicator lamp.

Components 1, 2, 4, 10, 11 (and 12) are unique for vehicles equipped with immobiliser. With regard to the coordinator and engine control unit, it is possible they are present in other vehicles with the same component designation. It is the programming that differs.

Starting procedure

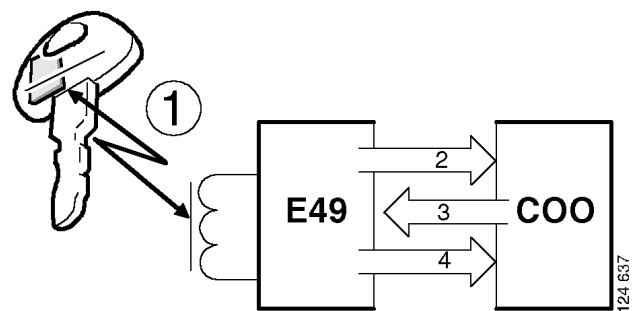
When the driver turns the starter key to power position 15, current will be supplied to the coordinator, which in turn supplies 12 volts to the transceiver. The system uses 12 volts due to its origin in the passenger car industry.

The starter key, coordinator and EDC control unit are subsequently verified. If everything is in agreement, the starter relay and fuel supply will be activated. The W33 warning lamp will come on if there is anything wrong.

This whole process takes no longer the 200-300 ms and is hardly noticeable to the driver.

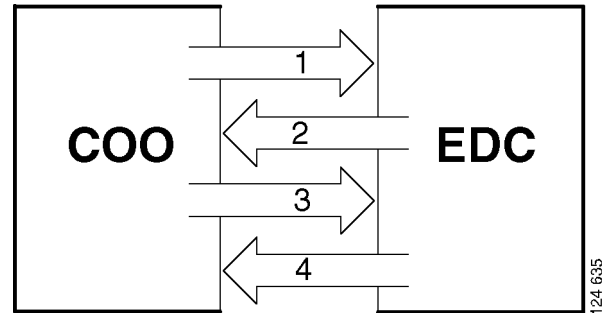
Verifying the starter key

- 1 After powering up, the transceiver will seek inductive contact with the starter key transponder.
- 2 After making contact, the transceiver will send confirmation to the coordinator.
- 3 The coordinator then sends a random number to the transponder via the transceiver unit.
- 4 The transponder encrypts the random number and sends back an encrypted response to the coordinator. Meanwhile, the coordinator has itself encrypted its own random number and now checks that the transponder's response is the same as its own.



Verification of coordinator and EDC control unit

- 1 The coordinator sends a request for a random number to the EDC control unit.
- 2 The EDC control unit responds to the request and sends its random number to the coordinator.
- 3 The coordinator encrypts the random number and sends back an encrypted response to the EDC control unit. The control unit compares it with its own encrypted response to make sure both are the same.
- 4 Finally, the EDC control unit encrypts the random number again and sends it back to the coordinator for a final check.



Verification of the coordinator and the EDC control unit is the joint responsibility of both control units. Both units must accept each other before it is possible to start.

Random numbers and encryption

Random numbers are generated by a random number generator in the respective control unit.

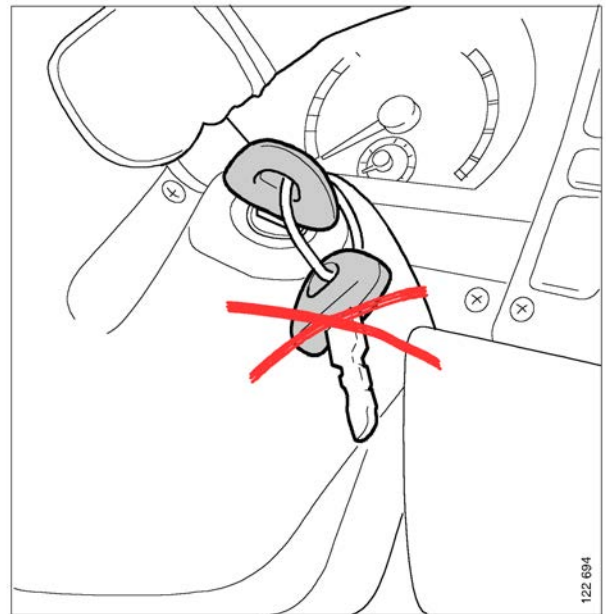
The units receiving the random numbers (transponder and coordinator) have an algorithm and an encryption code. Together, they encrypt the random numbers.

An algorithm is an instruction for solving a mathematical problem. It is the same in all Scania vehicles equipped with immobiliser. The encryption code, however, is programmed at the factory and is unique for each individual vehicle.

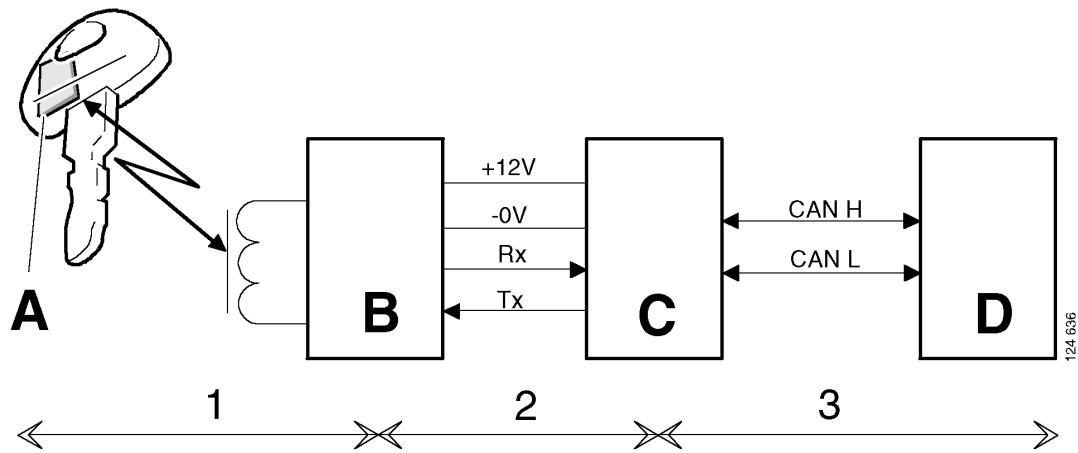
The advantage of this principle is that the encryption code is fixed and cannot be read or duplicated from the responses sent between the units.

Handling keys

Note: Do not put more than one starter key with transponder on the same key ring. They can easily interfere with each other during verification. This applies not only to the vehicle's spare keys but also to keys from other vehicles with electronic immobiliser. Consequently, it is unadvisable to have copies of keys on the same key ring, and don't mix passenger car keys with truck keys on the same key ring either.



Communication

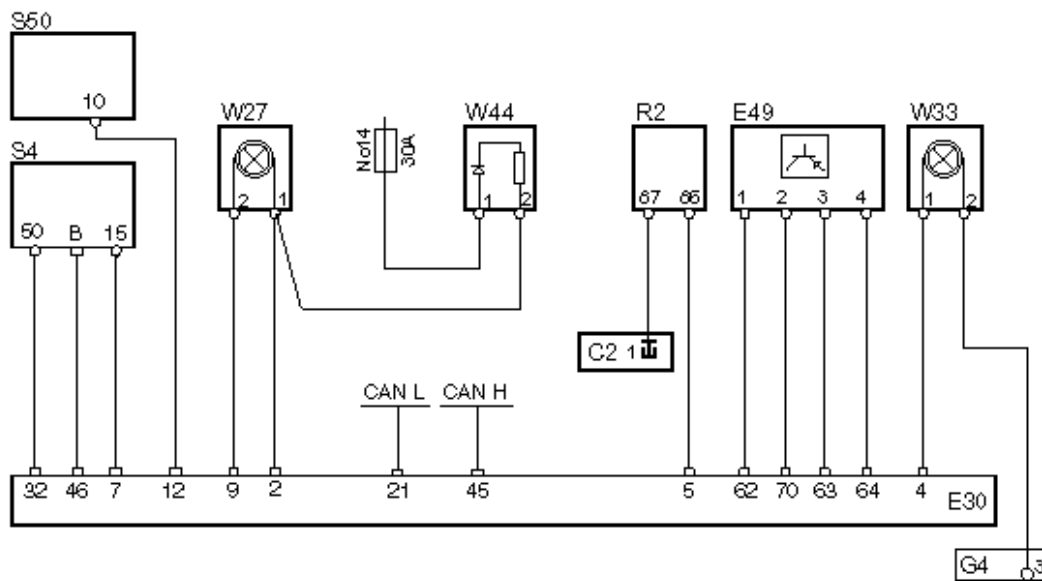


- 1 Communication between the starter key transponder A and transceiver B takes place inductively, i.e. wireless. Messages are transmitted on frequency 137 kHz.
- 2 Communication between the transceiver B and coordinator C takes place in a traditional manner with regard to the coordinator supplying current to the transceiver. However, random numbers and encrypted messages are transmitted with serial communication. Messages are transmitted on the "Tx" wire (Transmit) and received via "Rx" (Receive).
- 3 All communication between the coordinator C and the EDC control unit D is serial via the CAN buses L and H.

Connections

As it is the coordinator in which the immobiliser function is located, it is here that the input and output signals are collected.

The wiring diagram below has been simplified for clarity. For more detailed wiring diagrams, see 16:02 - 23, 16:02 - 24 or Scania Diagnos.



Coordinator pin	Task	Signal type	Source/Destination
2	Supply to EDC warning lamp (W27)	Output signal, +24V	Warning lamp for EDC (W27)
4	Supply to immobiliser indicator lamp (W33)	Output signal, +24V	Immobiliser indicator lamp (W33)
5	Supply (50) to starter relay (R2)	Output signal, +24V	Starter relay (R2)
7	Voltage supply (15) to coordinator	Input signal, +24V	Starter switch (S4)
9	Fault codes are flashed to the EDC warning lamp (W27)	Grounding	Warning lamp for EDC (W27)
12	Fault codes are flashed to the diagnostic switch (S50)	Grounding	Diagnostic switch (S50)
21	Digital communication with the EDC control unit	Digital messages on the CAN bus	EDC control unit
32	Start signal (50) to coordinator	Input signal, +24V	Starter switch (S4)
45	Digital communication with the EDC control unit	Digital messages on the CAN bus	EDC control unit
46	Signal notifying starter key in starter lock	Input signal, +24V	Starter switch (S4)
62	Supply to transceiver (E49)	Output signal, +12V	Transceiver unit (E49)
63	Transmission of messages	Serial messages, out (Tx)	Transceiver unit (E49)
64	Reception of messages	Serial messages, in (Rx)	Transceiver unit (E49)
70	Ground to transceiver (E49)	Grounding	Transceiver unit (E49)

Troubleshooting

Indicator lamp

One of the first indications that there is something wrong with the system is given by the immobiliser warning lamp W33. It can light up continuously or flash depending on the type of fault that has occurred.

The lamp always comes on when the starter key is turned to drive position 15 and stay on as long as the transponder and control units are being verified.

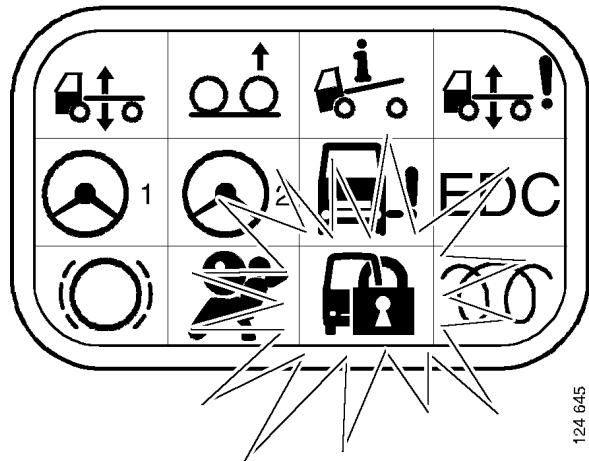
However, if the lamp continues to stay on...

- ... then a fault has occurred in the verification of the control units. A fault code that explains what has happened in more detail should be generated in the coordinator. See also the fault code list or Scania Diagnos.

If the lamp starts flashing...

- ... then a fault has occurred in the verification of the starter key transponder. This also should generate a fault code. However, provided you have access to the system PIN code, it is still possible to start the vehicle in this case despite the fault. You can then use the emergency starting procedure described on page 28.

The lamp will also flash when the immobiliser is being programmed with Scania Programmer but then at a slower rate.



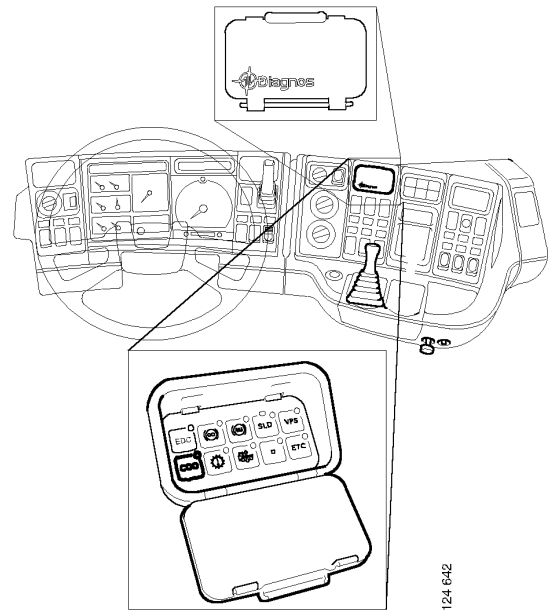
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Fault codes

Fault codes related to the immobiliser are stored in the coordinator. The principle tool used to check for any fault codes is Scania Diagnos. There are, however, other ways of reading and clearing codes using the diagnostic lamp and the diagnostic switch (S50) on the instrument panel.

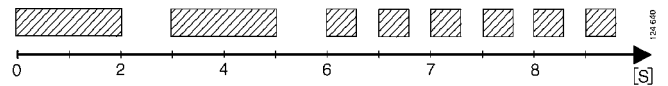
The switch in question is marked "COO" (diagnostic switch panel pin 10) and is connected to coordinator pin 12. The switch, which has a return spring, closes and earths pin 12 when it is depressed.

The coordinator interprets this as a request to show any fault codes and will flash them out by intermittently connecting pin 12 to ground in the required pulse sequence when the switch on the panel is released.



Reading fault codes

- Switch on the power supply.
- Depress the diagnostics switch marked "COO" and keep it depressed for two seconds.
- The lamp will now flash if there are any fault codes present. A long flash indicates tens and a short flash ones. Illustrated example: Fault code 26 is indicated with two long flashes followed by six short ones.
- Depress the diagnostic switch once again to read the next fault code.



Erasing fault codes

Clear all fault codes as follows:

- Begin by switching off the current.
- Press the diagnostics switch and keep it depressed.
- Switch on the current again with the diagnostic switch depressed.

Limitations

Remember that reading fault codes is not always regarded as the perfect troubleshooting method. The software used is very advanced but, nonetheless, some types of faults may arise that cannot be registered with fault codes.

Likewise, situations may arise when a fault code is generated even though there is not a fault at present. Such an example may be temporary bad contact or that a cable splice has disconnected and then connected again while the power has been on.

List of fault codes

This list includes only fault codes related to the immobiliser function. For a complete list of all fault codes for the coordinator, refer to Workshop Manual 16:07-10.

Fault code 26

Fault

The starter key cannot be verified.

Cause

The starter key is interpreted as being invalid. Either the key does not have a transponder at all or the transponder is faulty. However, it is also possible that the starter key has been programmed for another coordinator or other starter keys with transponders on the same key ring are interfering with the verification of the key.

A fault in the transceiver can also generate this fault code.

Remarks

The immobiliser warning lamp, W33, will flash if this fault occurs.

For more information, select "Display of status" under the "Configuration..." button in the system window.

Action

Make sure the correct starter key is in the starter lock. Make sure there are no more keys with transponders on the key ring. Check the transceiver and wiring.

Fault code 27

Fault

The coordinator cannot verify the EDC control unit.

Cause

The EDC control unit is interpreted as being faulty or invalid for this vehicle. It may not be programmed or has another PIN code than the coordinator.

This can be due to the EDC control unit not being locked to the coordinator after renewal of either the coordinator or the EDC control unit. Scania Programmer is to be used to lock the units.

Remarks

Warning lamp W33 will come on continuously if the vehicle is specified with immobiliser. This fault can also occur on vehicles without immobiliser if they are equipped with generation 4 coordinator. These vehicles do not have the W33 warning lamp.

The engine will not start if this fault occurs.

More information can be obtained by reading the status of the control units. Select "Display of status" under the "Configuration..." button in the system window.

Action

Check the EDC control unit, coordinator and wiring. Use Scania Programmer to lock the EDC control unit to the coordinator.

Fault code 28

Fault

Short circuit on output from starter relay.

Cause

This fault code is generated when the output is short-circuited to ground.

Action

Check the starter relay and wiring.

Fault code 29

Fault

Invalid combination of signals to the coordinator.

Cause

This fault code is generated when the coordinator received a signal that the power is turned but there is no signal that the starter key is in the starter lock. The fault code will be generated if there is a fault for longer than 10 seconds.

Action

Check the starter lock and wiring.

Fault code 31

Fault

Start signal active continuously.

Cause

This fault code is generated when the coordinator receives a continuous signal that the engine has been started even though it is already running. The fault code is generated when the signal has been active for over 5 minutes.

Action

Check the starter lock and wiring.

Viewing status

Scania Diagnos also provides the possibility of reading status values from the control units. The program also shows the status of the starter key presently inserted in the starter lock.

A control unit always has a certain status, depending on how it is programmed or on its position in the programming process.

Viewing the status can therefore be useful when you need to find out what type of control units are present in the vehicle and how they are programmed. Correspondingly for the starter key, you can see whether it has a transponder and accordingly intended for use with an immobiliser.

Viewing the status can also be regarded as a complement to troubleshooting using fault codes. For example, the status will indicate whether there is a communication problem. This will help you to assess the kind of fault and what action to take.

Viewing status is relevant to all systems using generation 4 coordinators, irrespective of whether the vehicle is equipped with immobiliser. Select "Display of status" under the "Configuration..." button in the program to view the status.

Does this vehicle have an immobiliser or not?

A vehicle with immobiliser has special labels affixed to the side windows, a special warning lamp and starter keys marked to show they contain transponders. You can also use Scania Diagnos to detect whether the vehicle is equipped with an immobiliser or not. This can be done by reading the status of the function. Select "Immobiliser" from "Configuration..."

Work description

Preconditions

Most tasks performed on the electronic immobiliser require the use of Scania Programmer. If one of the two control units associated with the immobiliser function is renewed, the new control unit must always be programmed to suit the control unit that is left in the vehicle. It is also possible to change to a used control unit.

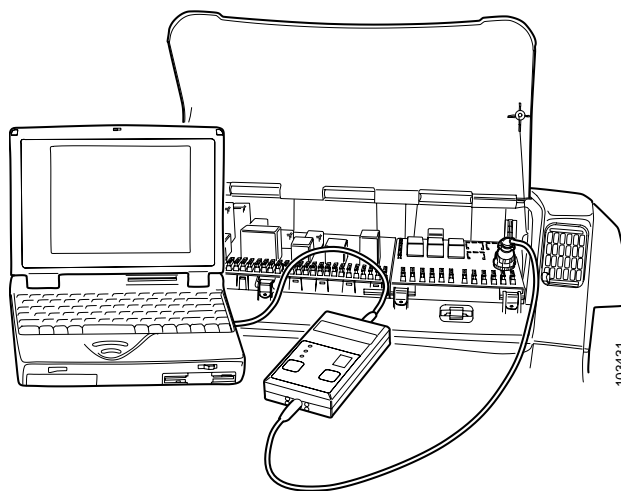
Likewise, renewed or additional starter keys must be programmed with Scania Programmer.

This does not include the transceiver as its role as a link between the coordinator and the starter key does not require programming.

A vehicle with immobiliser always has:

- Generation 4 coordinator.
- EDC control unit type S6 or MS6.

Note: If a vehicle is equipped with coordinator 4 it does not automatically mean that it is also equipped with immobiliser. Programming must always be carried out after renewing control units on a vehicle specified for coordinator 4, irrespective of whether the vehicle has an immobiliser. This is because a coordinator 4 without immobiliser communicates with the EDC control unit via a preset code.



Codes

Besides a plastic pouch containing the mechanical code for the starter key, a plastic pouch with three other codes is also delivered together with new vehicles with immobiliser. These are the PIN code, encryption code and bar code.

IMPORTANT! The codes are required for programming control units and starter keys. Scania does not keep a register of codes and it is important that the vehicle owner keeps them safe. Lost codes will lead to extra labour and increased costs.

1. PIN Code

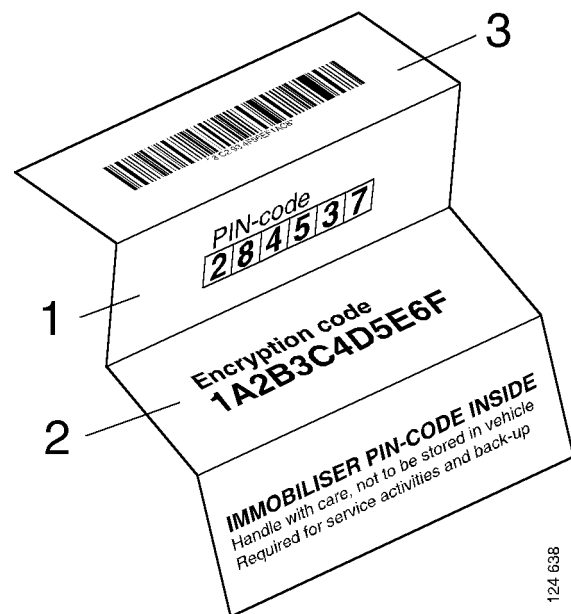
The PIN code can be found concealed inside the sealed plastic pouch. It always comprises 6 digits.

Principally, both the associated control units must be unlocked before any work can be done on them. The PIN code then acts as a key.

Therefore, you must specify the PIN code in order to carry out many of the actions in Scania Programmer. The PIN code is generally required:

- When renewing the coordinator.
- When renewing the EDC control unit.
- When removing any of the control units if they are to be used in another vehicle.
- When additional starter keys are used.
- When activating the immobiliser.

In addition, the PIN code is required if an emergency start has been necessary for some reason (see side 28).

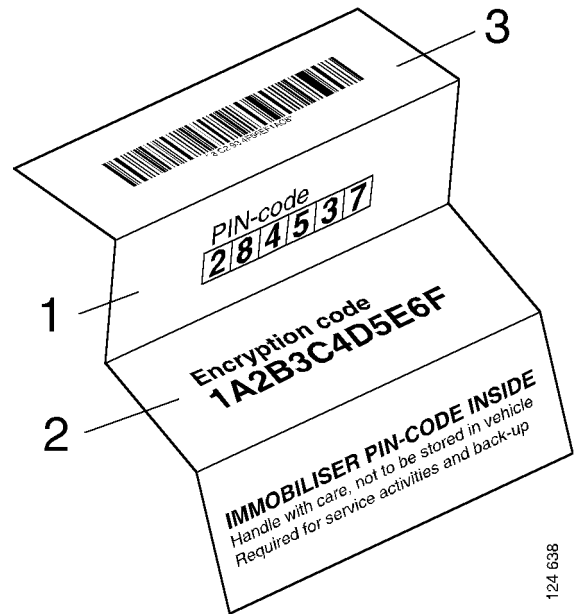


2. Encryption code

The encryption code can be found concealed inside the sealed plastic pouch. It always comprises 12 alphanumeric characters.

You could say that the encryption code is a key that is used to verify the transponder in the starter key. For this reason, the code must be used:

- When the coordinator has been renewed and you still want to use the same starter keys as before.
- When reactivating a system that has previously been deactivated.



3. Bar code

The bar code can be found outside the plastic pouch. It is read at the factory when the control units are initially programmed.

At that moment, the control units automatically learn the PIN code and encryption code that are associated with the bar code. This means that these codes need not be revealed at this time.

The bar code, however, may also have to be specified manually in Scania Programmer. In that case, enter the 16 alphanumeric characters printed underneath the bar code lines. This will be required:

- When using new starter keys.
- When renewing the coordinator with associated new starter keys.



Timed unlocking - if the codes have been mislaid

Scania Programmer has an emergency function called timed unlocking. Performing timed unlocking enables you to unlock and program the control units even though the PIN code and encryption code have been mislaid.

Timed unlocking activates a timer in the coordinator and requires 12 hours to complete, which is why it is regarded as an emergency function.

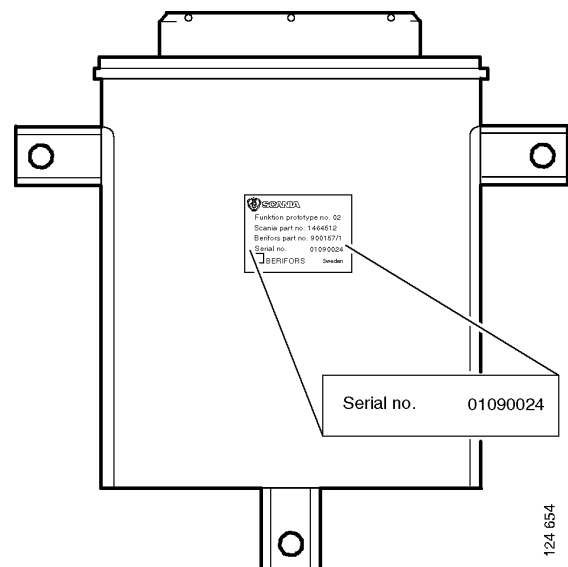
You can disconnect Scania Programmer during this time, but the power must be turned on. Cutting off the power will interrupt the timed unlock.

After initiating timed unlocking, the program will display a lock code that must be given once the 12 hours are up. Entering this code manually will reset the coordinator to basic generation 3 and unlock the EDC control unit.

This means that new codes must be used for reprogramming once timed unlocking has been carried out. Starter keys (and possibly the starter lock) must be replaced with new ones. You will receive new codes with the new keys.

Coordinator serial number

The coordinator serial number must be given when initiating timed unlocking. The number is printed on a label affixed to the top of the coordinator (see illustration).



Functions in Scania Programmer

As Scania Programmer is required for most of the tasks that can be carried out on the immobiliser system, this section contains an overview of the options listed under the "Programming..." button.

An overview with brief descriptions of what each option is used for is given below. For more detailed instructions, refer to the program's help file.

Programming the coordinator

Choose this option to program the codes into an unprogrammed coordinator 4, for example when the coordinator has been replaced with a new one or when the old codes have been deleted from a used coordinator.

Note that all generation 4 coordinators must be programmed, even when the vehicle is not equipped with immobiliser.

You will be asked to select one of three programming alternatives:

- To program new starter keys, which will also entail new codes.
- To retain the vehicle's previous keys and codes.
- To program without immobiliser.

Once the codes have been programmed, the coordinator must be locked to the EDC control unit. Refer to "Locking the EDC control unit to the coordinator" below.

Locking the EDC control unit to the coordinator

Choose this option after renewing the coordinator or the EDC control unit. You go straight to this step after renewing the EDC control unit. Refer to "Programming the coordinator" above regarding the coordinator.

The program will first check the status of both control units. Are they locked or unlocked? Both units must be unlocked in order to be reprogrammed.

This means that the control units can be locked individually without being locked to any other control unit. If any of them are locked, you will be asked to unlock them using the PIN code.

What happens when the control units are subsequently ready for locking to each other naturally depends on the circumstances. Has the coordinator been renewed and in that case which options were selected under "Programming the coordinator"? Or has the EDC control unit been renewed?

The program will detect this information itself and display it on the screen. In principle, the control units will learn the same codes in order to communicate with each other irrespective of the circumstances. After learning it, they are said to be locked with each other.

Resetting the coordinator

Choose this option if the coordinator is to be removed from the vehicle and then reused in another vehicle. This need not be done if the coordinator is not programmed for an immobiliser.

These measures can also be employed after fitting a used and locked coordinator that is to be reprogrammed. This presumes that you also have access to the PIN code and encryption code belonging to the coordinator in question.

Resetting the coordinator will delete its code memory and it will retake the basic programming of generation 3 or 4, which is the equivalent of a new coordinator. Of course, resetting also entails that the coordinator is no longer locked to the EDC control unit.

If you remove the coordinator without resetting it and still want to use it in a new connection, you must make sure the PIN code and encryption code accompany the coordinator. Otherwise, it will remain locked and cannot be reused.

Unlocking the EDC control unit

The EDC control unit must be unlocked in order to be reprogrammed. If it is removed from a vehicle with immobiliser without doing this first, its PIN code must accompany it so that the control unit can be used together with another coordinator. Otherwise, it will remain locked and cannot be reused.

As soon as the EDC control unit is unlocked, it will no longer contain any codes.

Additional starter keys

It is possible to add to the number of keys available for a vehicle. The maximum number of starter keys that can be programmed for one and the same vehicle is 8.

The same encryption code programmed into the coordinator is also used for the transponders in the new keys. In this way, the original system codes can be retained.

Replacing starter key

For security reasons, after purchasing a used vehicle for instance, it may be necessary to replace all the starter keys with new ones.

This measure entails first resetting the coordinator to its basic programming (deleting its codes). The new codes that come with the new starter keys can then be programmed by just entering the bar code. The old system codes can then be discarded.

Finally, the control units must be locked to each other again as described in "Locking the coordinator to the EDC control unit" above. The program will take you there automatically.

Activating immobiliser

To be able to activate the immobiliser using this option, the vehicle must have previously had an activated immobiliser that has been deactivated.

This option really does not involve anything other than performing certain measures that have been described earlier. The coordinator must first be reset to a basic generation 4, after which it must be programmed with codes again (either with new ones or the old ones) and then locked together with the EDC control unit.

Deactivating immobiliser

This option also gives only directions on which earlier described measures are to be carried out to deactivate the immobiliser.

Start by resetting the coordinator to a basic generation 4. As all generation 4 coordinators must be locked to the EDC control unit, irrespective of whether the vehicle has an immobiliser or not, you should now select "Programming the coordinator".

You can then select "Without immobiliser" to make the program lock the control units together using the preset standard codes that always apply when the immobiliser has been deselected.

Upgrading the coordinator

If you have changed to a basic generation 3 coordinator in a vehicle that requires coordinator 4, the program will be able to upgrade the coordinator from 3 to 4.

If this is the case, you will not be able to access the measures described above until the coordinator has been upgraded. This is the only selection that can be made at this stage.

Once the coordinator has been upgraded it will be in its basic programmed form and at the same initial position as described above. "Programming the coordinator" is the next step.

Timed unlocking

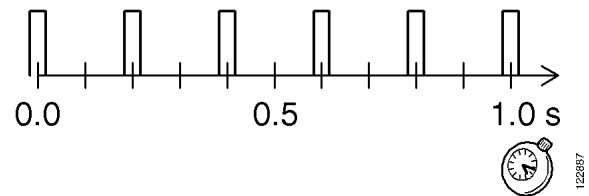
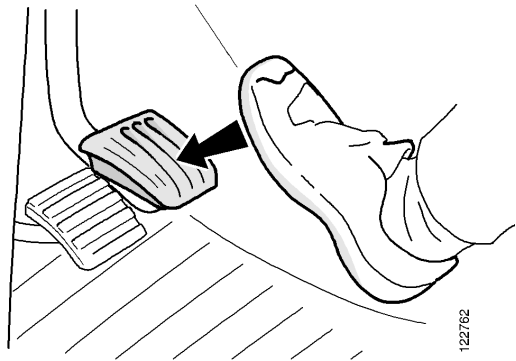
This is an emergency function used to unlock the control units if the codes have been mislaid. This is described in the section "Codes" on page 23.

Back-up start

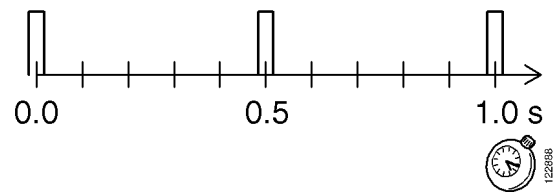
If a fault has occurred in the verification of the starter key, it is still possible to start the vehicle using the back-up start function, provided you have access to the system PIN code. This method is to be considered as purely provisional.

This type of fault will be indicated with the immobiliser warning lamp W33 flashing rapidly. The EDC control unit lamp W27 will stay on continuously.

The back-up start procedure takes place very rapidly and you must read all the steps described below before you start the back-up start.



Short intervals



Long intervals

Working procedure

- 1 Place the PIN code clearly visible in front of you.
- 2 Turn the starter key to the drive position and depress the accelerator pedal. The W33 warning lamp then stops flashing.
- 3 Release the accelerator pedal. The lamp will start to flash again, this time more slowly.
- 4 Count the flashes and depress the accelerator pedal once the number of flashes agrees with the first number in the PIN code. The warning lamp will start to flash again once the accelerator has been released so that you can enter the next number in the PIN code.

Example: If the PIN code is 2 8 4 5 3 7, you must depress the pedal after the second flash, release the pedal and depress it again after the eighth flash, and so on.

- 5 After entering all the numbers and the code has been approved, the W33 warning lamp will go out. Turn back the key and wait until the EDC lamp has also gone out. You can now start the vehicle.

You will have one minute to start the vehicle after the power has been turned off. After this period, you will have to perform another back-up start.

If the warning lamp starts to flash rapidly again during the back-up start, then you have either waited too long before releasing the pedal or you have depressed it after the wrong number of flashes. If this should occur, you will have to restart from the beginning of the back-up start.

