



## General

This document contains information on the FMS standard (Fleet Management System). The FMS standard is an open interface developed by several truck manufacturers. FMS-Standard description version 03 is supported.

Scania's CAN interface for FMS standard messages is connector C137. The vehicle must be ordered with FMS preparation to obtain C137. More information is found under the heading Chassis conditions.



### **IMPORTANT!**

It is not permitted to connect the FMS-CAN network to any other connector than C137 or to another CAN bus. Incorrect connection can cause functional disorder.

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*More information on the FMS standard can be found at [www.fms-standard.com](http://www.fms-standard.com).*

*More information on connector C137 is found in the document [C137 – Connector for FMS](#).*

*Information on FMS-CAN messages is found in the document [CAN Communication Specification for FMS](#).*



## Chassis conditions

*Preparations from the factory*

Option	Alternative	Variant code
Preparation for FMS	With	4019A



## Abbreviations in this document

Abbreviation	Explanation
CAN	Controller Area Network
ECU	Electronic Control Unit
FMS	Fleet Management System
BCI	Bodywork Communication Interface
TCO	Tachograph
OBD	On-board Diagnostics
EOBD	European On-board Diagnostics
TP.CM	Transport Protocol - Connection Management
TP.DT	Transport Protocol - Data Transfer



## Requirements for CAN communication with the vehicle

The requirements for FMS-CAN communication are specified in this section. SAE J1939 forms the basis of the protocol, but large parts are not implemented. These parts are the entire SAE J1939-81 (Network Management), main part of SAE J1939-73 (Diagnostics) and parts of SAE J1939-21 (Data Link Layer).

Scania's interface for FMS standard messages is connector C137. C137 is coloured green and is located on the passenger side, behind the central electric unit in the instrument panel. The twisted CAN cable is blue and white. CAN-low is connected to pin 9, CAN-high is connected to pin 6.

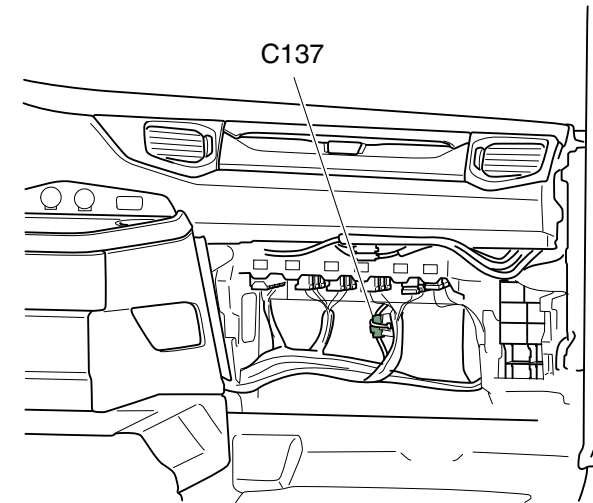
*More information on connector C137 is found in the document Connector C137 – FMS CAN.*

### SAE J1939-81 (Network Management)

The address space in a Scania vehicle is static. Because of this, there is no need for the Network Management described in SAE J1939-81.

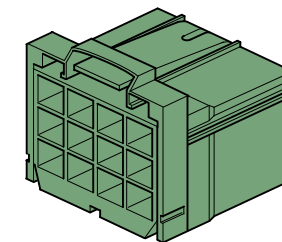
Fixed addressing is used in accordance with Preferred addresses for Industry group 0, Global and Industry group 1, On-highway Equipment.

Source addresses for equipment which does not normally belong to the vehicle follow the requirements in J1939, ISO 11992 or OBD/EOBD.



*Location of connector C137.*

372 701



*Connector C137.*

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## SAE J1939-21 (Data Link Layer)

SAE J1939-21 defines five message types:

Message type	Description
Broadcast/Response	All available information is sent periodically.
Group Functions	Proprietary messages samt Multipacket messages (TP.CM och TP.DT) are supported.
Acknowledgement	Not supported.
Commands	Not supported.
Requests	Not supported.

### Note:

According to section 5.2.1 SAE J1939-21, revised version July 1998, priority bits in message identifiers must be filtered out and ignored by the receivers.



## Load guidelines

Control units connected to a CAN bus must be able to handle up to 100% CAN bus load with the correct messages with no significant functional limitations or malfunctions.

Under normal circumstances the CAN bus load should never exceed 80%.

Avoid closing control loops over the CAN because the guaranteed access time is relatively long and fast control loops require a lot of bandwidth. If closed control loops over the CAN are still required, then they must be fully capable of sending the necessary CAN messages using only half the transmission frequency.



## Connectors and cables

- Scania uses connectors according to the FMS standard.
- Scania uses twisted pair cables (twisted 40 times per metre) with no shield or sheath.
- The electrical properties (resistance, impedance, capacitance etc.) are defined in SAE J1939-15 Physical Layer Light.
- The cable cross-sectional area for bodybuilder cables must be minimum 0.75 mm<sup>2</sup> inside the cab and 1.5 mm<sup>2</sup> outside the cab.
- Scania recommends the following markings and colours for the FMS- CAN bus cables:
  - CAN-high should be marked as CAN\_H and CAN-low as CAN\_L.
  - CAN-high should be blue and CAN-low should be white. To avoid misunderstanding it is important that the cables retain their colour for the lifetime of the vehicle.

## Connection to the FMS-CAN network

The FMS-CAN network's topology is mainly a CAN bus with the nodes connected at a distance of at least 0.1 metres to each other.

The length of the CAN bus should not exceed 30 metres between connector C137 in the vehicle and the control unit with the other termination resistor.

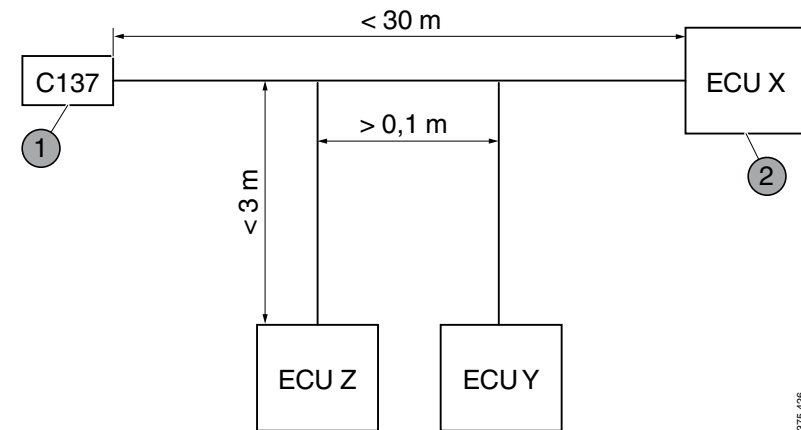
If more than one control unit is connected, the length of the cables that connect the control unit to the CAN bus should not exceed 3 metres. The cables should be as short as possible to minimise the effect of electromagnetic interference.

The number of control units in the bodywork's FMS-CAN network should not exceed 9.

Pos.	Designation	Explanation
1	C137	Connector. Forms the interface to Scania's network.
2	ECU X	FMS control unit in the bodywork with termination resistors

More information on ECU X is found under the heading Termination resistors.

Connection to the FMS-CAN network



*The principle of the FMS-CAN network's topology.*

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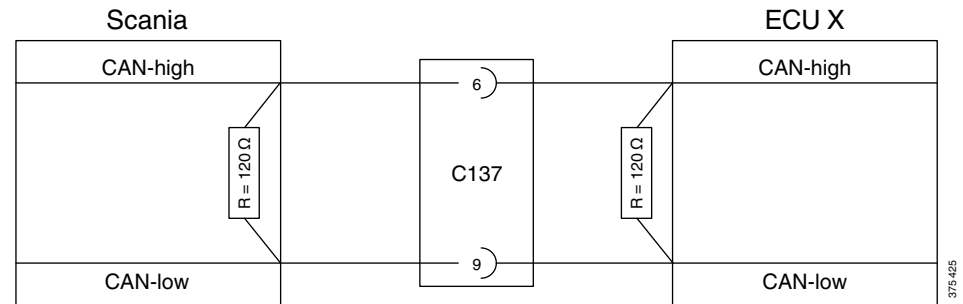


## Termination resistors

The FMS-CAN bus must be terminated using a 120 Ohm termination resistor at each end in accordance with SAE J1939-15 Physical Layer. Check that there is a termination resistor by using a multimeter.

In the end of the FMS-CAN bus connected to Scania's CAN network is a split termination resistor comprising two parallel-connected resistors (60 Ohm).

A number of different systems can be connected to the cable harness for the bodywork's FMS-CAN network. Certain systems are fitted with an internal termination resistor and others are unterminated. Depending on which systems that are connected to the FMS-CAN bus, a 120 Ohm termination resistor must be fitted in the FMS control unit in the bodywork (ECU X). If the FMS control unit in the bodywork is not equipped with an internal termination resistor, an external termination resistor must be connected as close to the FMS control unit as possible, see illustration.





The following table shows when a termination resistor must be fitted in a control unit connected to connector C137, depending on which systems are installed in the vehicle.

Systems in the vehicle			Termination resistor in control unit connected to C137
Digital TCO	Scania Communicator C300	FMS-CAN interface	
-	-	Yes	Yes
Yes	-	Yes	-
Yes	Yes	Yes	-
-	Yes	Yes	Yes
Yes	-	-	Yes
Yes	Yes	-	Yes



## Fault validation of communication (time-out)

Avoid FMS-CAN communication when the starter key is in the lock or radio position. Also avoid FMS-CAN communication during the start sequence of the control units connected to the bodywork's FMS-CAN network.

During normal operation, when the starter key is in the drive position, a message should not be validated as missed (time-out) until at least 5 x the message period time. A longer fault validation time is permitted.

During the engine start sequence, when the starter motor is turning, the supply voltage can be extremely low. Because of this, FMS-CAN communication cannot be guaranteed during this sequence. For this reason, no fault codes related to FMS-CAN communication should be set when the system voltage is lower than 18 V.

When the starter key is turned to the drive position, the FMS control unit starts sending CAN messages within 10,000 ms. A message cannot be considered missed until after  $10,000 \text{ ms} + 5 \times \text{the message period time}$ . Example: If a message has a period time of 100 ms it cannot be considered missed until after  $10,000 + 5 \times 100 = 10,500 \text{ ms}$ . Longer fault validation times are permitted.



## Source addresses

The source addresses in the table are used for messages sent from Scania's FMS-CAN bus to the bodywork's FMS-CAN bus via connector C137. The addresses in the table must not be used by any other control unit in the bodywork's FMS-CAN network. Incorrect use can lead to conflicts and malfunctions in the FMS-CAN network.

### Note:

The table shows the addresses currently in use, but addresses may be added in the future.

Predefined source addresses on the FMS-CAN bus:

System	Name	Source address (Hex)
EMS	Engine Management System	00
GMS	Gearbox Management System	03
BMS	Brake Management System	0B
RET	Retarder	10
ICL	Instrument Cluster	17
ALM	Alarm System	1D
VIS	Visibility System	1E
COO	Coordinator	27
BWE	Bodywork Electrical System	E6
SMS	Suspension Management System	2F
APS	Air Processing System	30
TCO	Tachograph	EE