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1994 VOLVO 940 Estate OEM Service and Repair Workshop Manual

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is specified for a temperature range from -40 - 85°C. It is possible to switch between primary power and the TCAM backup battery without losing functionality and it can support up to 10 years of operation. The TCAM backup battery can be used for:

- eCall functionality within the European Union.
- Stolen vehicle tracking.
- Backup supply to prevent system reset in cold cranking.

TCAM BACKUP BATTERY > TCAM BACKUP BATTERY (1/9) [2021-2022, E400V6] > DIAGNOSTIC INFORMATION

The TCAM backup battery does not have a built-in diagnostic system. The Telematics and Connectivity Antenna Module (TCAM) monitors the TCAM backup battery and sets DTCs.

TCAM BACKUP BATTERY > TCAM BACKUP BATTERY (1/9) [2021-2022, E400V6] > CONNECTION AND COMMUNICATION

The TCAM backup battery is directly connected to the Telematics and Connectivity Antenna Module (TCAM).

TELEMATICS AND CONNECTIVITY ANTENNA MODULE > TELEMATICS AND CONNECTIVITY ANTENNA MODULE (TCAM) (4/313) [2021-2022] > DESCRIPTION

The Telematics and Connectivity Antenna Module (TCAM) is a roof mounted intelligent antenna used to establish a wireless connection from the vehicle to mobile networks, WLAN hot spots. It has an embedded SIM card / Wi-Fi chip.
The Telematics and Connectivity Antenna Module (TCAM) also acts as:

- Global Navigation Satellite System GNSS receiver.
- Remote keyless entry receiver to remotely lock or unlock doors.
- Digital radio receiver (SDARS).
- Remote climate receiver, which receive signals for starting the fuel operated auxiliary heater and starting the heating of seats, steering wheel, rear window, windshield and door mirrors.
- Diagnostic data receiver from the Sensus Cloud.

TELEMATICS AND CONNECTIVITY ANTENNA MODULE > TELEMATICS AND CONNECTIVITY ANTENNA MODULE (TCAM) (4/313) [2021-2022] > VARIANTS

The Telematics and Connectivity Antenna Module (TCAM) has two variants:

> **NOTE:** *Each variant has different hardware and cannot be used in another market.*

Market	WLAN	GNSS	TEL / 2G / 3G /	LTE2 (4G)	SDARS

- Global Navigation Satellite System GNSS receiver.
- Diagnostic gateway to the other FlexRay nodes in the vehicle.
- FlexRay coordinator for the FlexRay bus.

The Vehicle Connectivity Module (VCM) handles secure software downloads for the vehicle.

VEHICLE CONNECTIVITY MODULE > VEHICLE CONNECTIVITY MODULE (VCM) (4/161) [2018-2020 | 2021-2022, B4204T18; B4204T47] > VARIANTS

The variants of the Vehicle Connectivity Module (VCM) depends on factors such as vehicle model, market and accessory level, as detailed below.

Component	Market, customer option, vehicle model
Vehicle Connectivity Module (VCM) without telematics functionality (VCM Mid)	MY 2016- Vehicles without Volvo On Call
Vehicle Connectivity Module (VCM) with built-in telematics functionality (VCM High)	For 2017- (option)
Global Navigation Satellite System GNSS receiver	Option

VEHICLE CONNECTIVITY MODULE > VEHICLE CONNECTIVITY MODULE (VCM) (4/161) [2018-2020 | 2021-2022, B4204T18; B4204T47] > DIAGNOSTIC INFORMATION

The Vehicle Connectivity Module (VCM) has a built-in diagnostic system, which continuously monitors itself and the input and output signals.

VEHICLE CONNECTIVITY MODULE > VEHICLE CONNECTIVITY MODULE (VCM) (4/161) [2018-2020 | 2021-2022, B4204T18; B4204T47] > CONNECTION AND COMMUNICATION

Vehicles without telematics functionality
The Vehicle Connectivity Module (VCM) is a CAN master and connected to the Telematics Module (TEM) via USB. The control module also acts as a router for broadband connection via the Telematics Module (TEM).
The Vehicle Connectivity Module (VCM) consists of two processors:

1. The router CPU (RCPU) communicates with all the IP-networks that the VCM is connected to, for example when the connection takes place via Diagnostics over IP (DoIP) or between the Infotainment Head Unit (IHU), Audio Module (AUD), and Vehicle Connectivity Module (VCM).
   The RCPU also manages the WiFi functionality, the connectivity part in the VCM, and the internet traffic for all connection sources except Bluetooth (which is handled by the IHU).

2. The vehicle CPU (VCPU) is connected to the FlexRay, Body CAN and Propulsion/Diagnostic CAN and manages all the gateway functionality in the Vehicle Connectivity Module (VCM).

Vehicles Connectivity Module (VCM) with built-in telematics functionality
The telematics functionality is integrated in the Vehicle Connectivity Module (VCM). The control module is connected to the Infotainment Head Unit (IHU) via Ethernet.
The Vehicle Connectivity Module (VCM) is an upstart control module on the FlexRay network.

EMERGENCY SERVICES > EMERGENCY SERVICES [2018-2022] > DESCRIPTION

The function emergency services is available for Russia and Belarus (ERA-GLONASS) as well as countries in the European Union (eCall).

In case of an accident, the emergency services function uses the global navigation satellite system to identify the exact location of the vehicle to trigger an emergency call. Emergency calls can also be triggered manually by long pressing the SOS button in the Overhead Console (OHC).

EMERGENCY SERVICES > EMERGENCY SERVICES [2018-2022] > VARIANTS

Component or function	Market, option, vehicle model
ERA-GLONASS	Russia and Belarus
eCall	EU countries
Analog microphones: • Microphone handsfree / active noise control ANC	MY -2019
Digital microphones: • Digital microphone handsfree/ANC, dual (16/237) • Digital microphone handsfree/ANC, dual endpoint (16/238)	MY 2019-
Vehicle Connectivity Module (VCM)	All vehicles **except** Polestar 2 Pure electric vehicles
Vehicle Gateway Module (VGM) Telematics and Connectivity Antenna Module (TCAM)	Polestar 2 Pure electric vehicles

EMERGENCY SERVICES > EMERGENCY SERVICES [2018-2022] > ERA-GLONASS

Operation

ERA-GLONASS is a Russian emergency response system. In case of an accident, the system uses the global navigation satellite system GLONASS to identify the exact position of the vehicle. The system will also trigger an automatic SOS call.

Automatic crash notification

If the Supplemental Restraint System Module (SRS) detects a collision, an alarm is automatically sent to the ERA-GLONASS service center and a voice line to the vehicle is opened. The vehicle collects and submits data such as location and time to an ERA-GLONASS operator.

Emergency help

A call to an ERA-GLONASS operator can also be triggered manually by long pressing the SOS button in the Overhead Console (OHC). Pressing the SOS button sends a message to the ERA-GLONASS service center and opens a voice line to the vehicle. An immediate dispatch of police, ambulance or other relevant assistance is initiated.

|	
FlexRay Collision signal used as backup if the communication via the Central Electronic Module (CEM) malfunctions: • Supplemental Restraint System Module (SRS) (4/176)	**FlexRay**

SENSUS: ENTERTAINMENT AND MEDIA > SENSUS: ENTERTAINMENT AND MEDIA [2018-2022] > DESCRIPTION

The entertainment and media function contains the following sub-functions:

- **TV** - Handles playback of digital television transmission on the Center Console Display (CCD) and the infotainment speakers. The function is only active when the Television Module (TVM) is in operating mode ON when the vehicle is in a stationary position or driving in low speed.
- **Applications**
  - Applications for embedded functions
  Basic applications that are preinstalled in the vehicle. This category includes for example Browser and Download Manager.
  - Third party applications
  Applications that are not installed from the start but can be downloaded and installed. This category includes for example music services.
- **Device mirroring** - Applications that run on a smartphone and, when paired with the vehicle, mirror the application in the Center Console Display (CCD). This category includes for example Android Auto and Apple CarPlay.
- **Digital owner's manual** - The digital owner's manual consists of information about how the vehicle functions are used. The manual can be accessed on the Center Console Display (CCD), but also on the internet and as a mobile application.
- **Settings** - The vehicle has a number of function settings that can be changed based on personal preferences. Personal settings can be stored in a driver profile, which can be connected to the remote key. When a key with a driver profile is detected, the vehicle automatically adapts to the settings of that profile.
- **Voice control** - Uses speech recognition to control certain features that are normally controlled by the Center Console Display (CCD). Voice control is mainly controlled by the Infotainment Head Unit (IHU).
- **Bluetooth telephony** - Connects the driver's smartphone with the vehicle, creating a hands-free environment.
- **Wi-Fi hotspot connection** - Allows the passengers to connect to the internet.
- **Wi-Fi tethering** - Allows the passenger to set up an internet connection via Wi-Fi from a personal mobile device.
- **Bluetooth tethering** - Connects a Bluetooth device with internet access to the vehicle.
- **USB tethering** - Provides vehicle connection to Sensus Cloud by tethering to a USB connected mobile device.
- **Vehicle modem** - Connects the vehicle to the internet via the car modem (P or T-SIM). The SIM card is used to connect the Vehicle Connectivity Module (VCM) or the Telematics and Connectivity Antenna Module (TCAM) to the internet.
- **Bluetooth audio streaming** - Connects the vehicle with a mobile device and plays audio from the device over the speakers.
- **USB media** - Gives support for audio and video playback from a USB connected media player.
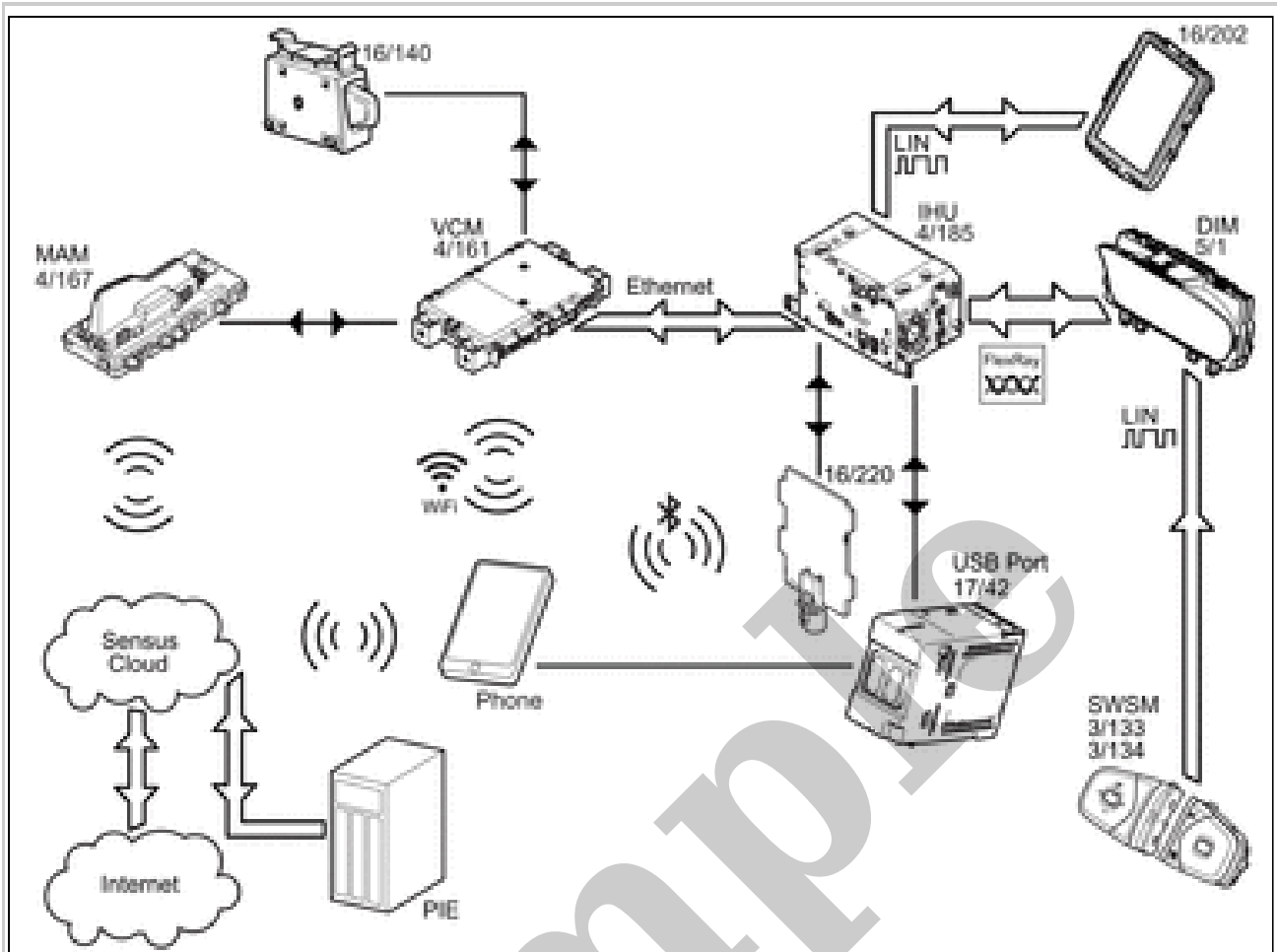
Courtesy of VOLVO CARS CORPORATION

The table below summarizes input and output signals to and from the Infotainment Head Unit (IHU).

Input signals	Input signals

Directly connected
Communication with the Sensus Cloud:
 	
• Mobile devices via
  - USB port (17/42)
• Mobile devices via
  - Bluetooth antenna (16/220)
	Directly connected
	Communication with the Sensus Cloud:
	
	• USB port (17/42) to
	  - Mobile devices
	• Bluetooth antenna (16/220) to
	  - Mobile devices

Ethernet Communication with the Sensus Cloud: • Vehicle Connectivity Module (VCM) (4/161) / Telematics and Connectivity Antenna Module (TCAM) (4/313) • Mobile devices via	**Ethernet** Communication with the Sensus Cloud: • Vehicle Connectivity Module (VCM) (4/161) / Telematics and Connectivity Antenna Module (TCAM) (4/313) • Vehicle Connectivity Module (VCM) (4/161) / Telematics and Connectivity Antenna Module (TCAM) (4/313) to

The digital owner's manual can be deactivated by configuring the vehicle parameters.

Related functions

The digital owner's manual function is related to the following function:

- Remote update

SENSUS: ENTERTAINMENT AND MEDIA > SENSUS: ENTERTAINMENT AND MEDIA [2018-2022] > SETTINGS

Operation

Most settings are managed in the Center Console Display (CCD). They can be divided in the categories infotainment and vehicle function settings.

> **NOTE:** *The settings are not accessible while driving.*

Infotainment settings:

Area	Settings
Speech and language	Language Keyboard layout
Graphical	Display theme
Audio	Equalizer Sound level
Radio	Last played song Favorite station Text display
Communication	Bluetooth DLNA
TV	Last channel Favorites Subtitles
Telephone	Ringtone Volume
Driver information	Clock Date Units
Navigation	Voice guidance Modes Location
Telematics	Location service settings CSB settings
3rd party applications	Data settings

Analog microphones: • Microphone, handsfree / Active noise control ANC (16/199, 16/201)	MY -2019
Digital microphones: • Digital microphone handsfree/ANC, dual (16/237) • Digital microphone handsfree/ANC, dual endpoint (16/238)	MY 2019-

Operation

The smartphone must have Bluetooth enabled and be paired with the vehicle, which means that it can connect to the Infotainment Head Unit (IHU) via the Bluetooth antenna. Once connected, the driver will receive phone call notifications from a pop-up message displayed in the combined instrument display and Center Console Display (CCD). The Infotainment Head Unit (IHU) sends a signal to the Driver Information Module (DIM) which sends a message to the combined instrument display. The message for the Center Console Display (CCD) is sent directly from the Infotainment Head Unit (IHU).

The driver can answer calls using the:

• Steering wheel switch module SWSM
• Center Console Display (CCD)
• Smartphone

When answering a call using the steering wheel switch module SWSM, signals are sent via the Driver Information Module (DIM) to the Infotainment Head Unit (IHU), which sends a request to the smartphone to answer the call. Similarly, when answering via the Center Console Display (CCD), signals are sent via the Infotainment Head Unit (IHU) which sends a request to the smartphone to answer the call.

The driver can make a call using the:

• Steering wheel switch module SWSM
• Center Console Display (CCD)
• Voice control function
• Smartphone

When making a call using the steering wheel switch module SWSM, signals are sent via the Driver Information Module (DIM) to the Infotainment Head Unit (IHU), which sends a request to the smartphone to make the call. Similarly, when calling using the Center Console Display (CCD), signals are sent via the Infotainment Head Unit (IHU) which sends a request to the smartphone to make the call. In order to initiate a voice-controlled request, a button on the steering wheel switch module SWSM is pressed, followed by voice command (gate command) "Call". The microphones are directly connected to the Infotainment Head Unit (IHU) and receive speech input from the driver or passengers.

The incoming audio from the call is played through the vehicle's left and right front speakers. The Infotainment Head Unit (IHU) sends the audio signal to the Audio Control Module (AUD), which forwards it to the speakers.

Signals

The figure below shows the components used for the function.

The Wi-Fi tethering allows the user to set up an internet connection via Wi-Fi from a personal mobile device. Once choosing the Wi-Fi network in the Center Console Display (CCD) the Wi-Fi network password must be entered to establish an internet connection.

The Wi-Fi tethering is activated and deactivated by checking/unchecking the Wi-Fi box in the Center Console Display (CCD) which sends an activation request to the Infotainment Head Unit (IHU).

The Vehicle Connectivity Module (VCM) / Telematics and Connectivity Antenna Module (TCAM) shares the internet connection with the Infotainment Head Unit (IHU). VCM / TCAM receives and sends connection signals from a mobile device via the multiband antenna module MAM / TCAM internal antenna.

> **NOTE:** *Make sure that the mobile device supports tethering and that the function is activated.*

Signals

The figure below shows the components used for the function. In vehicles with Telematics and Connectivity Antenna Module (TCAM), the Vehicle Connectivity Module and Multiband Antenna Module MAM, is replaced by the TCAM.
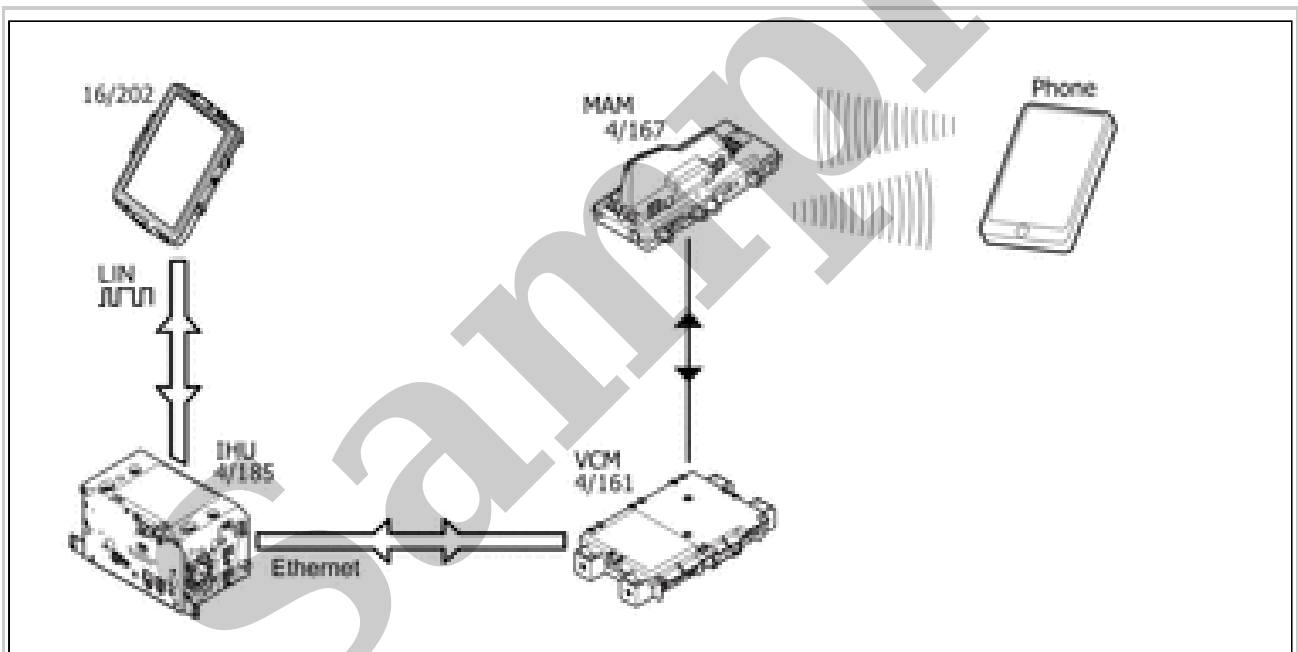
Courtesy of VOLVO CARS CORPORATION

The table below summarizes input and output signals to and from the Vehicle Connectivity Module (VCM).

Input signals	Output signals
Directly connected Internet connection: • Mobile devices via - Multiband antenna module MAM (4/167) / Telematics and Connectivity Antenna Module	**Directly connected** Internet connection: • Multiband antenna module MAM (4/167) / Telematics and Connectivity Antenna Module (4/313) to

Ethernet Input selection: • Center Console Display (CCD) (16/202)	Ethernet Connection status: • Center Console Display (CCD) (16/202)

SENSUS: ENTERTAINMENT AND MEDIA > SENSUS: ENTERTAINMENT AND MEDIA [2018-2022] > BLUETOOTH AUDIO STREAMING

Bluetooth audio streaming connects a Bluetooth enabled device and streams the audio to the vehicle.
Operation
The device must be paired with the vehicle. The device connects to the Infotainment Head Unit (IHU) via the Bluetooth antenna. Once connected, a selection must be made in the Center Console Display (CCD) to activate audio streaming. The device sends audio signals via the Bluetooth antenna to the Infotainment Head Unit (IHU). IHU requests the Audio Control Module (AUD) to play the audio in the sound speakers.
Some playback functions can also be controlled by the:

- Voice control.
- Steering wheel switch module SWSM, where the control signals are sent to the Driver Information Module (DIM), and further to the Infotainment Head Unit (IHU).
- Center console switch module CCSM, which sends control signals to the Infotainment Head Unit (IHU).
- Center Console Display (CCD), which sends control signals to the Infotainment Head Unit (IHU).

If Bluetooth is turned off on the device, it will not automatically connect. The vehicle will try to automatically connect the latest two devices to Bluetooth for approximately five minutes once the vehicles is started.
Signals
The figure below shows the components used for the function.