VOLVO
for life

Course Code: 0819

2004 Model Year Product, Featuring the R-Range

TECHNICAL UPDATE 1

Name:_____ S.S.N./S.I.N.:_____ Retailer/Code:_____ Date:_____

IMPORTANT SAFETY NOTICE

WARNING: Before performing service, diagnosis or troubleshooting procedures on a vehicle equipped with safety devices containing pyro-technical igniters, i.e., airbags, seatbelt tensioners, side impact curtains, etc., **you must be aware of certain precautions, and follow special procedures to help ensure your safety**. Refer to applicable SAFETY SYSTEM service information for these procedures and precautions.

NOTE: The information contained in this manual is intended for technical training purposes **ONLY**. Always refer to appropriate Volvo service information & wiring diagram manuals when performing fault tracing or service procedures.

Following proper service and repair procedures is essential for the safe, reliable operation of motor vehicles, as well as for the personal safety of the individual doing the work. This manual provides general directions for accomplishing service and repair work with tested, effective techniques.

Numerous variations in procedures, techniques, tools and parts for servicing vehicles, as well as the skill of individual doing the work cannot possibly be anticipated or provided for. Accordingly, anyone who departs from instructions provided in this manual must first establish that they compromise neither their own personal safety nor the vehicle integrity by their choice of methods, tools or parts.

As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. NOTES give you added information that can help you to complete a particular procedure. CAUTIONS are given to help prevent you from making an error that could damage the vehicle. WARNINGS remind you to be especially careful in areas where carelessness can cause personal injury. The following list contains some general WARNINGS that you should follow whenever you work on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle.
- Turn the ignition switch OFF unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. If you have an automatic transmission, set it in PARK unless instructed otherwise for a specific service operation. If you have a manual transmission it should be in NEUTRAL unless instructed otherwise for a specific service operation.
- Operate the engine only in a well-ventilated area to avoid the danger from carbon monoxide.
- Keep yourself and your clothing away from moving parts when the engine is running, especially the cooling fan and belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Do not smoke while working on the vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle. Tie long hair securely behind your head.
- Keep hands and other objects clear of the radiator fan blades. Electric cooling fans can start to operate at any time even with the ignition turned OFF.

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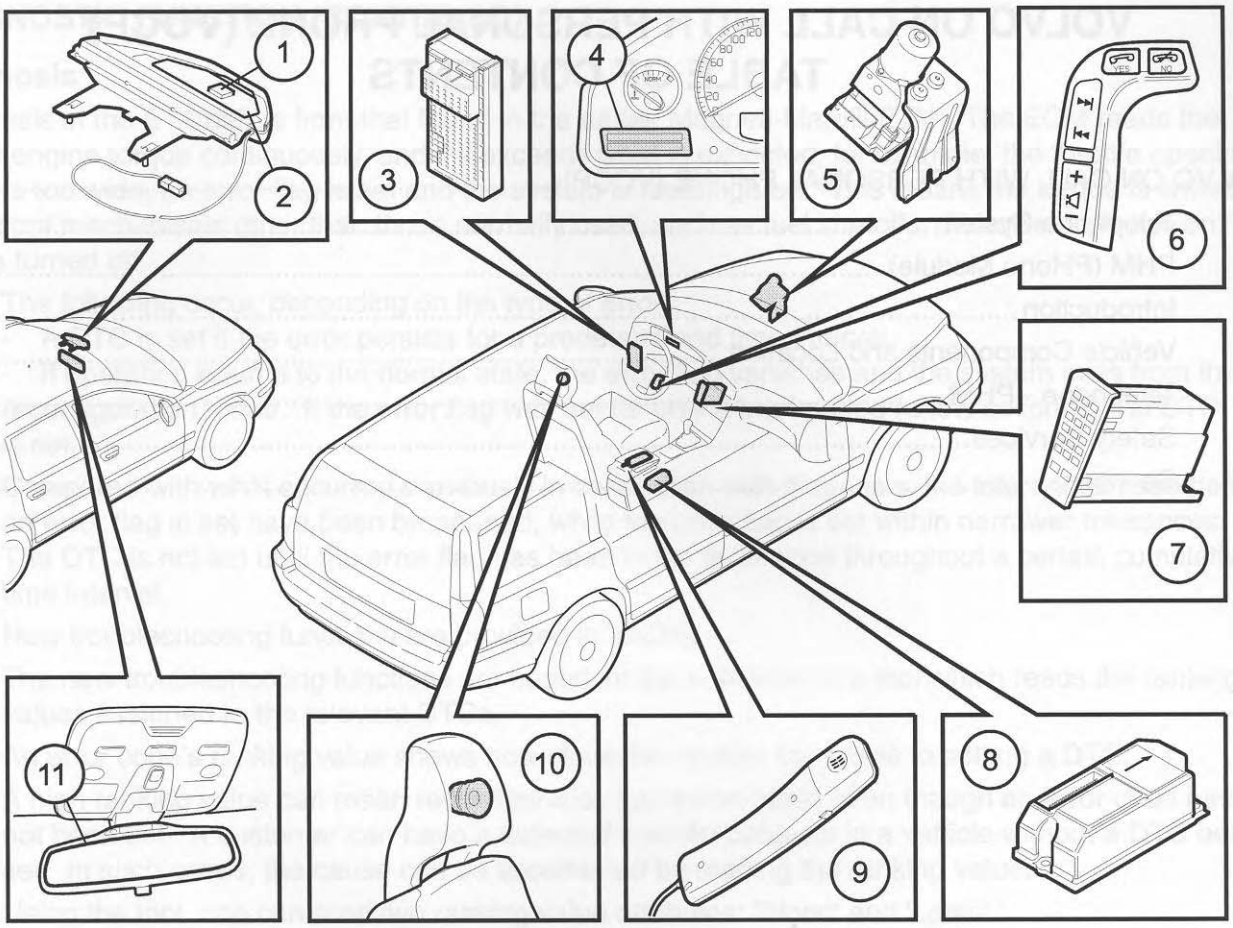


VOLVO ON CALL WITH PERSONAL PHONE (VOCP)

TELEPHONE SYSTEM

1	GPS antenna	**5**	BCM (Brake Control Module)	**9**	Privacy handset
2	Telephone antenna	**6**	Key pad, steering wheel	**10**	Speaker
3	CEM (Central Electronic Module)	**7**	PHM (PHone Module)	**11**	Microphone
4	DIM (Driver Information Module)	**8**	SRS (Supplementary Restraint System)		

FEATURES

As a part of Volvo On Call Plus, the vehicle has a complete telephone system which supports AMPS/ TDMA 800/1900 MHz.

- Advanced Mobile Phone Service (AMPS). Analogue telecommunications system 800 MHz.
- Time Division Multiple Access (TDMA). Digital telecommunications system 800/1900 MHz.
- PHone Module (PHM) switch unit is installed next to the main unit of the audio system.
- When calls are in progress or when using the other functions of the telephone system, the buttons in the steering wheel control the telephone system.
- Information from the telephone system is displayed in the combined instrument display window.

- Full duplex, both parties can talk at the same time.
- The telephone operates in ignition positions I and II. Calls are cut off with a 5 second delay when the ignition key is turned from position I to 0.
- Option to program 9 calling card numbers.
- Option to select whether audio sound should be reduced during incoming and outgoing calls.
- Option to write names in the telephone book in upper and lower case letters.
- The choice of language in the telephone system does not affect the vehicle's global choice of language (in the CEM), but a change in the global choice of language controls the telephone system.
- The telephone system is equipped with Active Sound Control (ASC), the hands-free loudspeaker sound level is adjusted automatically according to vehicle speed, to compensate for noise. The ASC can be disconnected with the telephone system's menu functions.
- The current call time is shown in the display.
- Option to receive text messages.
- The handset is used for private conversations where the hands-free function is not required.
- The telephone power output which varies depending on whether AMPS or TDMA is used.
- There is a function for Calling Card handling in the menu system.

Connections

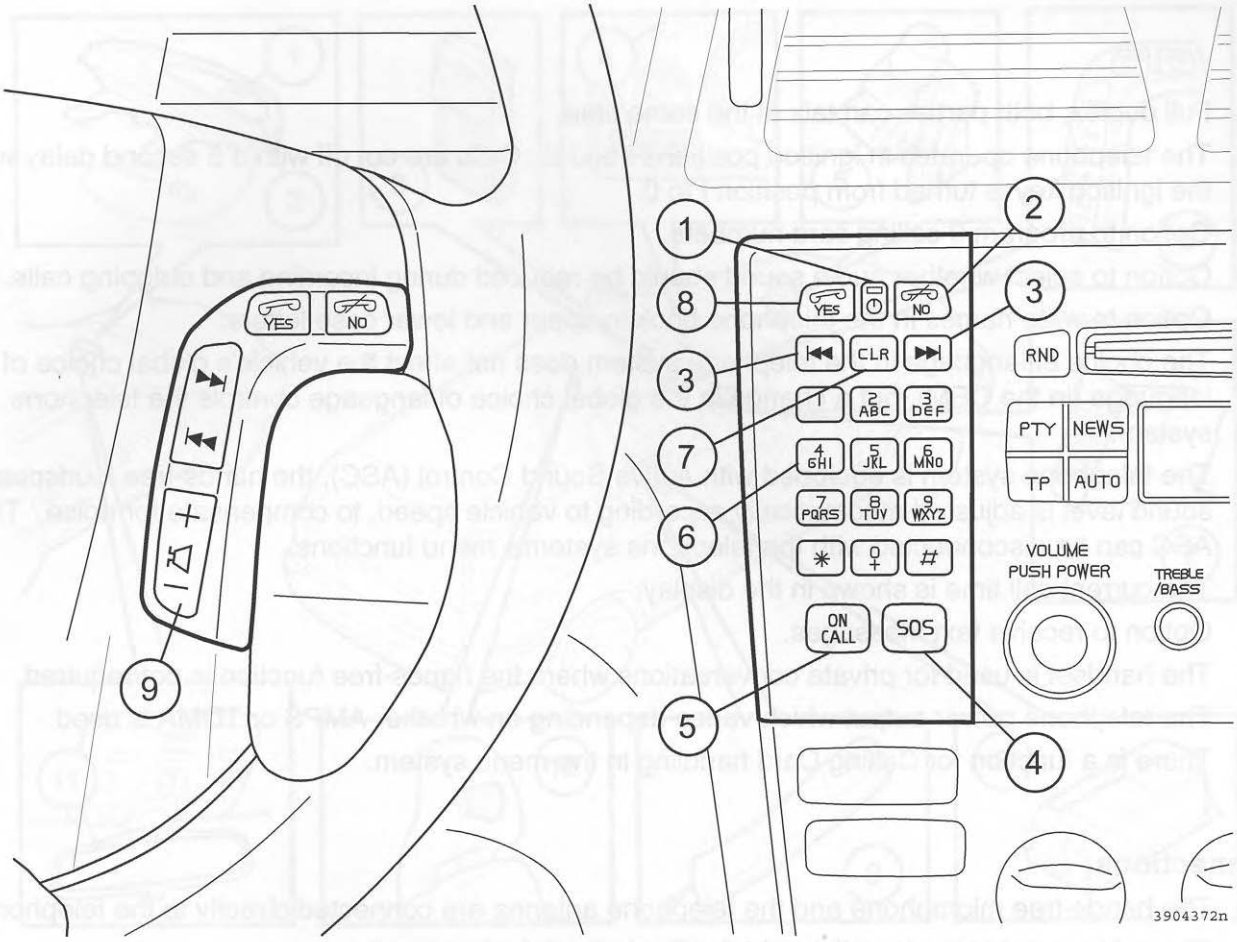
- The hands-free microphone and the telephone antenna are connected directly to the telephone.
- The antenna cable is along the right A-pillar to the telephone unit.

Additional Information for the Instructor

Emergency Calls

Emergency calls are performed as follows and can be made without an ignition key:

- Press the on/off button.
- Dial 911.
- Press the green button.



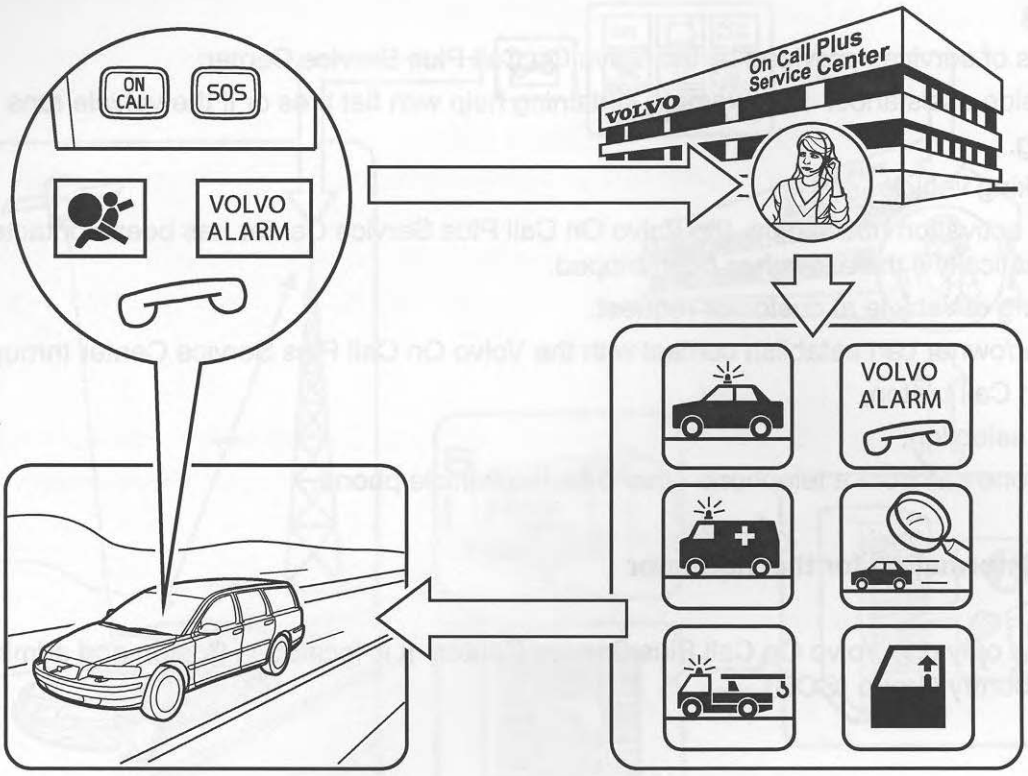
PHM (PHONE MODULE)

1	On/off button	**6**	Numerical buttons
2	End call	**7**	Clear button
3	Arrow buttons	**8**	Activate call
4	SOS button	**9**	Volume button
5	On Call button		

Handling

The telephone is operated from the switch unit next to the main unit of the audio system or from the telephone buttons in the steering wheel hub. The telephone can only be switched on/off from the switch unit.

- Calls to emergency numbers can be performed without the ignition being on and without a key in the ignition lock.
- The buttons make a clicking noise when they are pressed (they can be switched off via the telephone menu functions).
- To make it easier to adjust the volume, a tone sounds at the current level at the same time as the adjustment is performed.
- For safety reasons, certain functions cannot be used at speeds of over 8 km/h (5 mph), although functions in process can be completed. (The function can be disconnected through the menu selection).



INTRODUCTION

GENERAL

- Volvo On Call Plus is a system developed by Volvo in which the owner can receive different services within the field of safety and service. The vehicle's technical equipment is used in conjunction with technologies in the infrastructure of society in what is known as the Intelligent Transportation System (ITS).
- The system is based on the driver/passenger being able to get in contact, by telephone, with a Volvo On Call Plus Service Center established by Volvo. Staff at the Volvo On Call Plus Service Center decide on the appropriate action to be taken depending on the situation.
- Through the information provided by the On Call Plus system, for example, the precise location of the vehicle, the Volvo On Call Plus Service Center can direct an ambulance, the police, a recovery vehicle to the vehicle quickly.

The different services which are provided can be divided into two groups: safety and service.

SAFETY

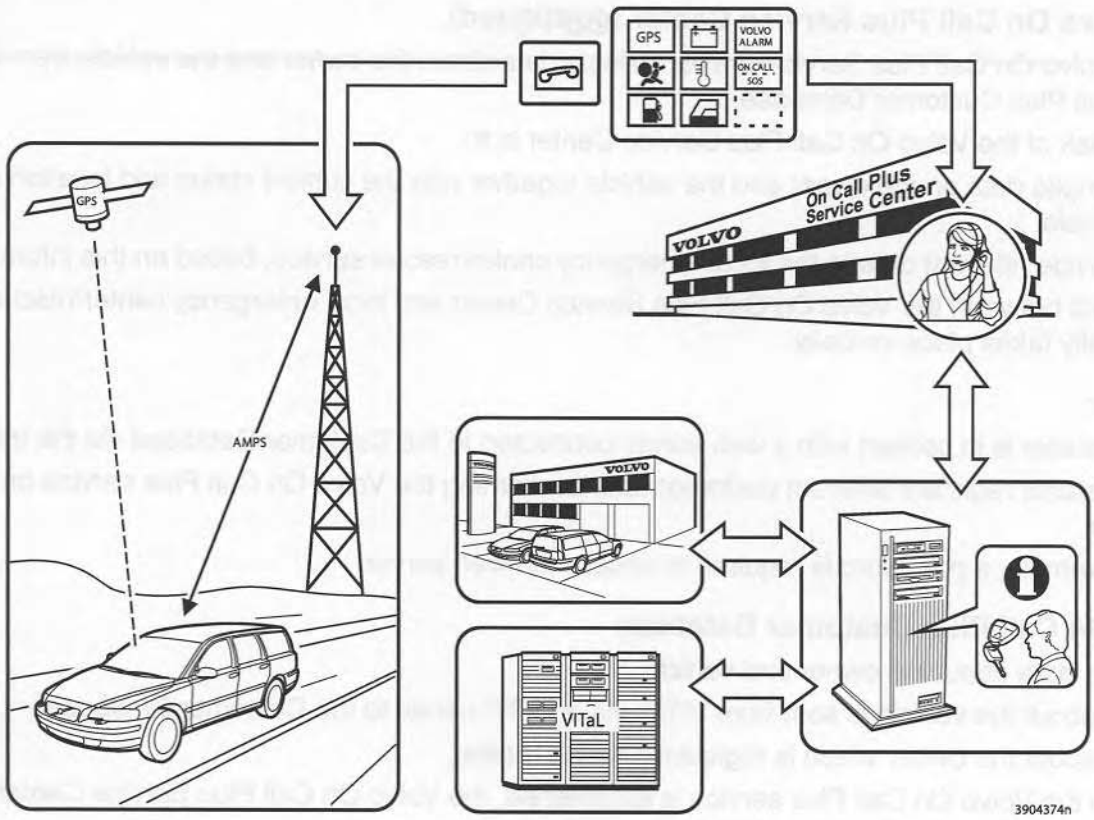
- If an accident occurs, and the SRS system is activated or a severe rear end collision, contact is automatically undertaken with the Volvo On Call Plus Service Center via the telephone unit.
- Depending on the situation, the Volvo On Call Plus Service Center will, for example, call:
  - an ambulance,
  - the fire department,
  - the police.
- By activating the telephone SOS button, the occupant(s) in the vehicle can contact the Volvo On Call Plus Service Center in other emergency situations. It is also possible to establish SOS calls by menu selection.

SERVICES

- Examples of services provided by the Volvo On Call Plus Service Center:
  - Roadside assistance. For example, obtaining help with flat tires or if the vehicle runs out of fuel.
  - Towing.
  - Unlocking vehicle.
  - Alarm activation notification, the Volvo On Call Plus Service Center has been contacted automatically if the alarm has been tripped.
  - Tracking of vehicle at customer request.
- The driver/owner can establish contact with the Volvo On Call Plus Service Center through:
  - the On Call button,
  - menu selection,
  - telephone call from a telephone other than the vehicle phone.

Additional Information for the Instructor

The USA has only one Volvo On Call Plus Service Center. It is located in Boston and administrated by the Cross Country Group (CCG).



Infrastructure

The following technology and services are included in Volvo On Call Plus:

- Telecommunication.
- Position location by satellite.
- Volvo On Call Plus Service Center.
- Retailers.

Communication

Communication between the vehicle and the Volvo On Call Plus Service Center takes place through:

- Telecommunication via AMPS.
- The vehicle position is determined by GPS technology.

The Volvo On Call Plus Service Center

- The task of the Volvo On Call Plus Service Center is to receive calls from the vehicle and to perform different safety and other services.
  - Calls are established manually by using the SOS, On Call button or by menu selection.
  - Calls are established automatically if a severe rear end collision has occurred, any component in the SRS system is activated or if the alarm is tripped. The Volvo On Call Plus Service Center is established in accordance with Volvo specifications and requirements.
- The Volvo On Call Plus Service Center is manned day and night throughout the year and:
  - establishes contact, if necessary, with the local emergency center/rescue service,
  - connected to a Volvo On Call Plus Customer Database,
  - in direct verbal contact with the vehicle via the Volvo On Call Plus service.
- With all Volvo On Call Plus services, data on vehicle status and location are sent from the vehicle to the Volvo On Call Plus Service Center.

The Volvo On Call Plus Service Center (continued)

- The Volvo On Call Plus Service Center collects data about the owner and the vehicle from the Volvo On Call Plus Customer Database.
- The task of the Volvo On Call Plus Service Center is to:
  - compile data on the owner and the vehicle together with the current status and location of the vehicle.
  - provide relevant data to the local emergency center/rescue service, based on this information.

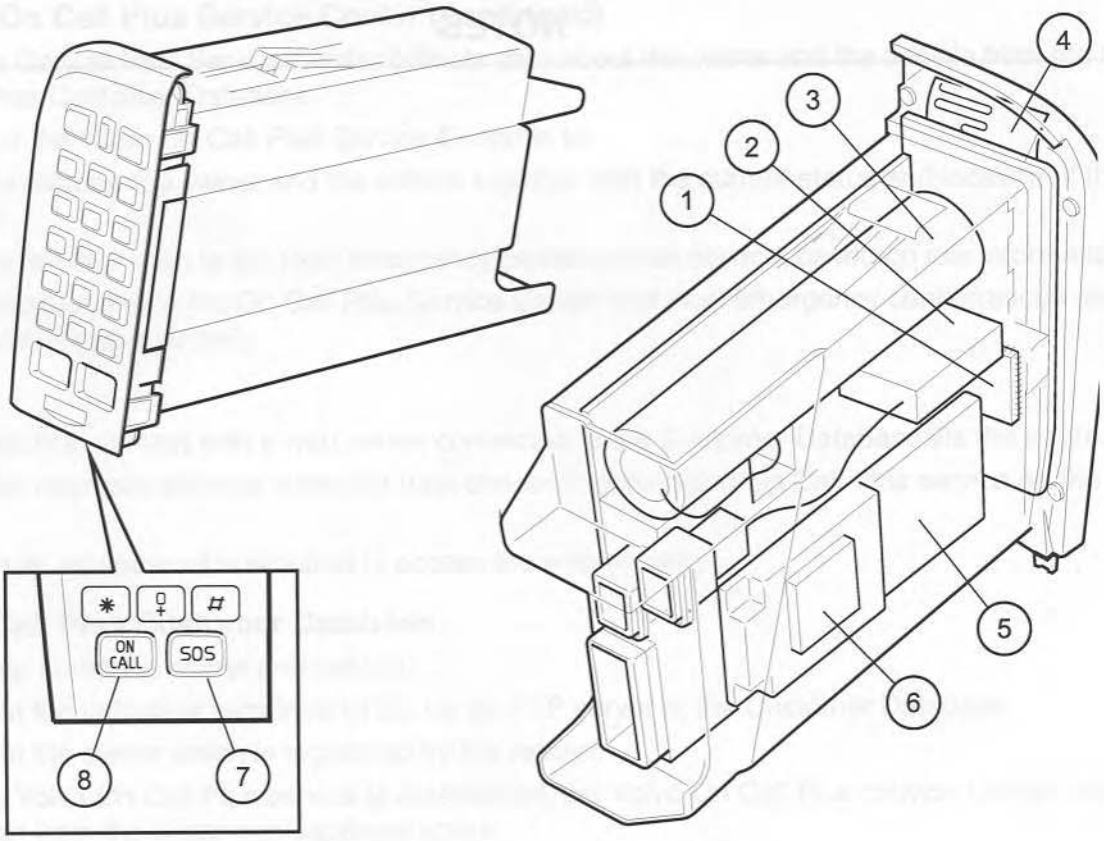
  Contact between the Volvo On Call Plus Service Center and local emergency center/rescue service normally takes place verbally.

Retailer

- The retailer is in contact with a web server connected to the Customer Database via the Internet.
- The retailer registers different customer data concerning the Volvo On Call Plus service on the web server.
- For example, a password is required to access the web server.

Volvo On Call Plus Customer Database

- Stores data about the owner and vehicle.
- Data about the vehicle is sent from VITaL via an FTP server to the Customer Database.
- Data about the owner which is registered by the retailer.
- When the Volvo On Call Plus service is established, the Volvo On Call Plus Service Center obtains information from the Customer Database about:
  - owner data,
  - vehicle data.



TELEPHONE - PHM

COMPONENTS

1	GPS receiver, processor	5	AMPS module
2	GPS receiver, radio receiver	6	Modem for data communication, AMPS
3	Built-in back-up battery	7	SOS button
4	Built-in back-up antenna	8	On Call button

Components/functions used in addition to the conventional telephone are:

- Buttons for SOS and On Call services
- GPS antenna
- GPS receiver
- Built-in back-up battery
- Built-in back-up antenna
- AMPS modem

SAFETY CALLS

SOS calls are established:

- When the PHM receives a signal from the SRS control module indicating a component in the SRS system has been activated or a severe rear end collision has occurred.
- When the SOS button has been pressed for at least 2 seconds, through menu selection.

Service calls

On Call calls are established:

- When the On Call button has been pressed for at least 2 seconds.
- Through menu selection.

DATA TRANSFERRED TO THE VOLVO ON CALL PLUS SERVICE CENTER

- The following data is transferred to the Volvo On Call Plus Service Center with all calls between Volvo On Call Plus and a vehicle:
  - Type of call (SOS or On Call).
  - Geographical position of vehicle.
  - VIN of vehicle.
  - Functioning power supply (normal battery or back-up battery).
  - Alarm status (off, switched on or tripped).
  - Ignition key in or out.
  - Engine running or not.
  - Vehicle locked or not.
  - Front side window open or closed.
  - Fuel quantity.
  - Battery status.
  - SRS activated or not.
  - Outside temperature.
  - Inside temperature.
  - Mileage.
  - SID version.
  - Hands free working or not.
  - Handset working or not.
- Data is transferred by means of a Data Burst Modem, which is significantly faster than a conventional modem.

BACK-UP FUNCTIONS

- The PHM first tries to establish contact by means of the main antenna, then the back-up antenna.
- The back-up functions only work when:
  - The SOS or On Call button is used.
  - A component is activated in the SRS system.
  - The alarm is tripped.

Back-up Battery

- If there is no normal power supply, the back-up battery takes over the power supply.
- The battery can be replaced.
- If the battery capacity falls below 30%, the driver is alerted by a message on the DIM.

Back-up Antenna

- If there is no normal antenna connection, the back-up antenna takes over the functions.

GPS Receiver

- The vehicle position is calculated by the GPS receiver:
  - from the signal from the GPS antenna,
  - from wheel pulses from the ABS control module to calculate the distance,
  - whether the vehicle is reversing or not. If there is no signal from the GPS antenna, the position is calculated using the wheel pulses. This is known as Dead Reckoning (DR).

COMMUNICATION

Telecommunication

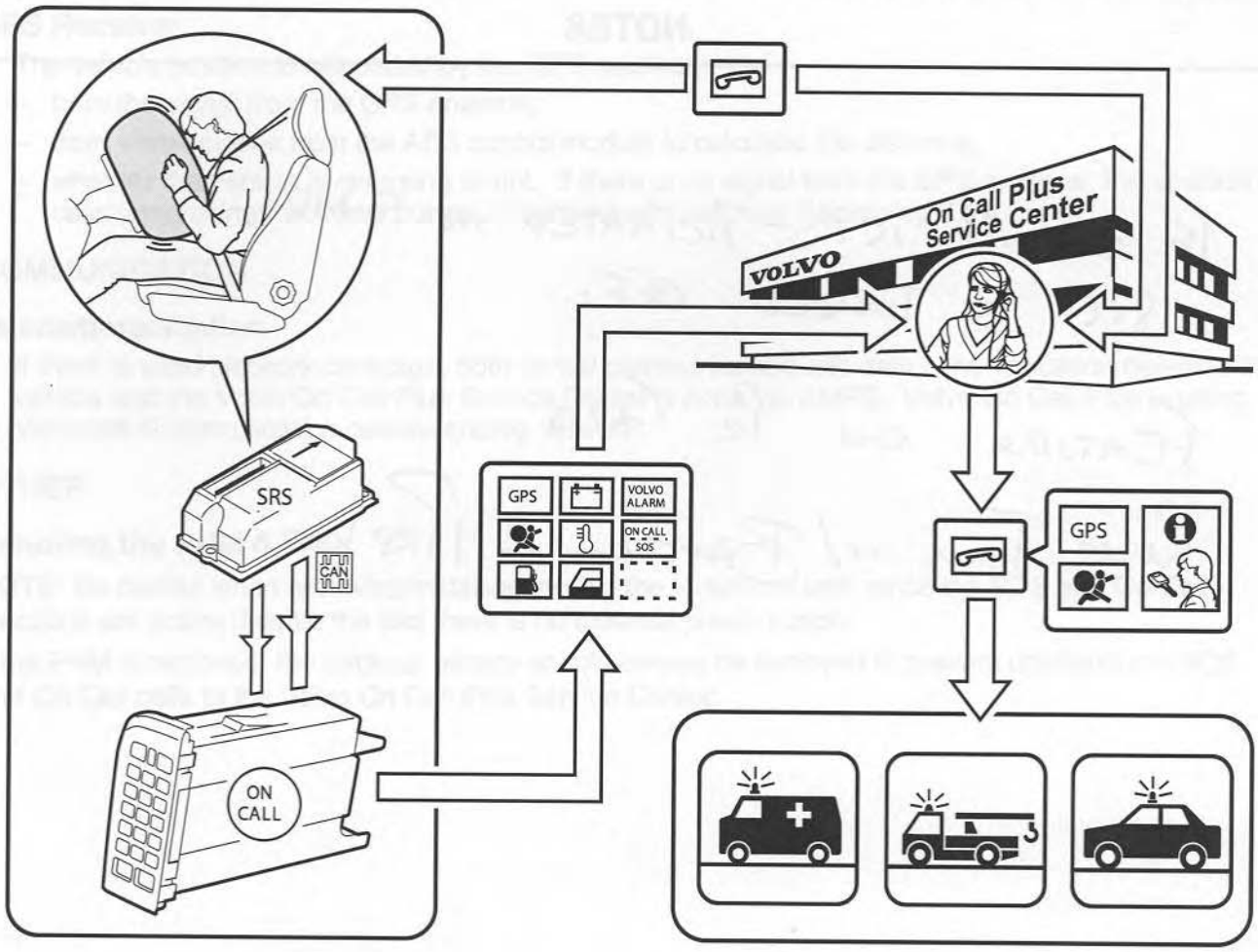
- If there is used Network coverage, both verbal communication and data communication between the vehicle and the Volvo On Call Plus Service Center is done via AMPS. Volvo On Call Plus is using Verizon® Communication cellular analog network.

OTHER

Handling the PHM

NOTE: Be careful when removing/installing/storing the telephone unit, since the SOS and On Call functions are active despite the fact there is no external power supply.

If the PHM is removed, the back-up battery should always be removed to prevent unintentional SOS and On Call calls to the Volvo On Call Plus Service Center.



SAFETY SERVICES

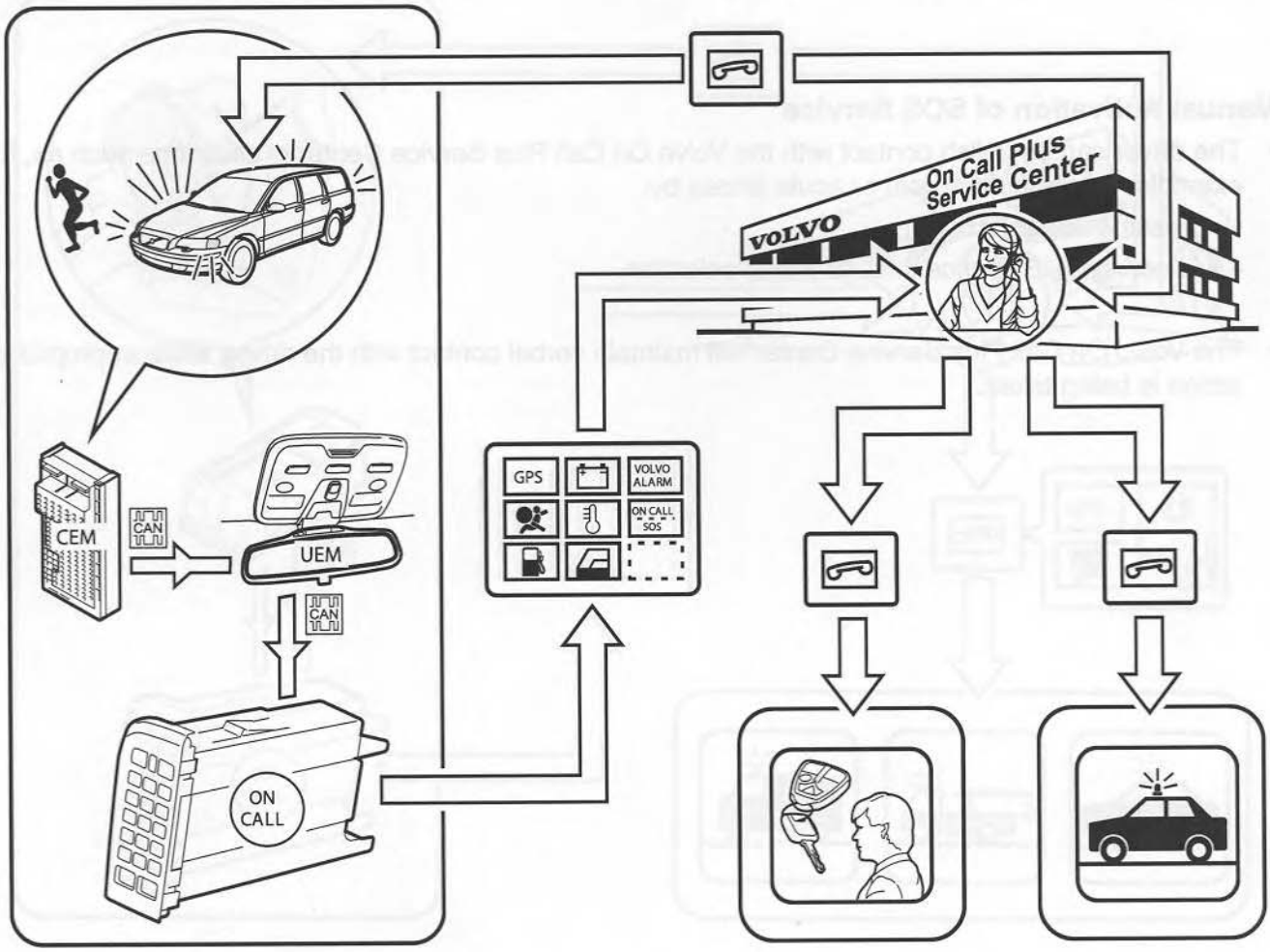
COMMUNICATION ACTIVATED BY THE SRS CONTROL MODULE

If a component (driver/passenger air bag, SIPS bag, IC inflatable curtain or belt tensioner) in the SRS system is activated or a severe rear end collision has been detected, the following takes place:

- The SRS sends a signal to the PHM, via conventional wire and CAN, that a component has been activated.
- The telephone is activated in the Volvo On Call Plus service mode.
- Contact is established with the Volvo On Call Plus Service Center.
- The Volvo On Call Plus Service Center is in verbal contact with the driver/passenger and takes appropriate action for the situation at hand. If the driver/passenger is incapable of verbal contact, the Volvo On Call Plus Service Center decides who/what is to be contacted. The Volvo On Call Plus Service Center establishes verbal contact with the appropriate local emergency center/rescue service. The Volvo On Call Plus Service Center provides the local emergency center/rescue service with information about the vehicle position, vehicle status and driver data.
- Depending on how/whether the vehicle and the Volvo On Call Plus Service Center manage to establish verbal/data communication, the status is always displayed on the DIM.

Manual Activation of SOS Service

- The driver can establish contact with the Volvo On Call Plus Service Center in situations such as, for example, an accident, threat or acute illness by:
  - pressing the SOS button,
  - selecting SOS service through menu selection.
- The Volvo On Call Plus Service Center will maintain verbal contact with the driver, while appropriate action is being taken.



SERVICES

ALARM

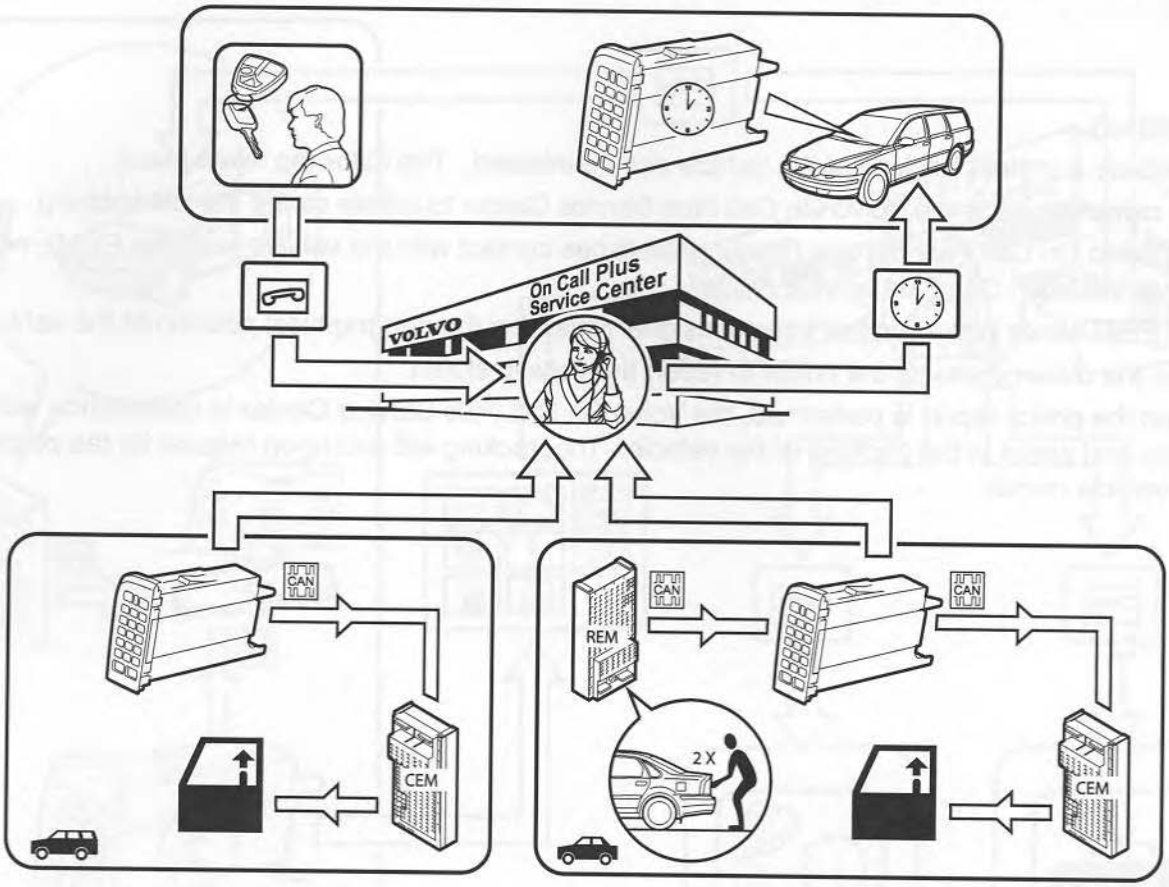
When the alarm is tripped, contact is automatically established with the Volvo On Call Plus Service Center. The following takes place:

- CEM has triggered the alarm, among other things, sent a signal to the UEM to activate the siren.
- In this position, UEM sends a signal periodically on the CAN network, the alarm has been tripped.
- The PHM picks up the signal and automatically enters Volvo On Call Plus service mode.
- Contact is established with the Volvo On Call Plus Service Center after a certain period of time.
- The Volvo On Call Plus Service Center contacts the owner.
- The owner obtains help from the Volvo On Call Plus Service Center on how to handle the matter, for example, reporting the theft to the police.

TRACKING

If the vehicle is stolen, tracking of the vehicle can be initiated. The following takes place:

- The owner contacts the Volvo On Call Plus Service Center to initiate stolen vehicle tracking.
- The Volvo On Call Plus Service Center establishes contact with the vehicle (with the PHM), which enters Volvo On Call Plus service mode.
- The PHM sends with specified intervals signal regarding the geographical position of the vehicle.
- Then the owner contacts the police to report the vehicle stolen.
- When the police report is performed, the Volvo On Call Plus Service Center in cooperation with the police and assist in the tracking of the vehicle. The tracking will end upon request by the police or the vehicle owner.



Unlocking from the Service Center - Vehicles without Contact in Trunk Lid Handle

- The owner contacts the Volvo On Call Plus Service Center and identifies himself with a password.
- The owner and the Volvo On Call Plus Service Center determine the time at which the vehicle will be unlocked.
- The Volvo On Call Plus Service Center sends a signal to the PHM.
- At a fixed time, the PHM sends a request to the CEM via CAN to deactivate the alarm and unlock the vehicle.
- The PHM sends confirmation to the Volvo On Call Plus Service Center indicating the vehicle has been unlocked and the alarm deactivated.

Unlocking from the Service Center - Vehicles with Contact in Trunk Lid Handle

- The owner contacts the Volvo On Call Plus Service Center and identifies himself with a password.
- The owner and the Volvo On Call Plus Service Center determine the time interval during which the vehicle will be unlocked.
- The Volvo On Call Plus Service Center sends a signal to the PHM that the vehicle should be unlocked at a specific time.
- When the contact in the trunk lid handle is closed two times (first time to wake up the network), the REM sends a signal to the PHM.
- If the REM signal conforms to the time interval determined by the customer and the Volvo On Call Plus Service Center, the PHM sends a signal to the CEM via CAN that the vehicle is to be unlocked and the alarm deactivated.
- The PHM sends confirmation to the Volvo On Call Plus Service Center indicating the vehicle has been unlocked and the alarm deactivated.

Sleep and Wake up Cycles

The Volvo On Call Plus System has sleep and wake cycles. The system is engineered this way to preserve the battery so the vehicle can be started after longer periods of being turned off. After a period of four days (96 hours), the Volvo On Call Plus System is then considered to be in a state of deep sleep. The Volvo On Call Plus Service Center will not be able to contact the vehicle to unlock the doors using the Volvo On Call Plus system after the vehicle has been turned off four or more days. A locksmith will be required and the Volvo On Call Plus Service Center will assist.

Once a vehicle has been turned off, the system still is on for 15 more minutes. Then the Volvo On Call Plus System will wake up for 90 seconds every 15 minutes.

Unlock of the vehicle is only possible during this 90 seconds every 15 minutes. The two last digits in the VIN determine starting time of the wake up window.

This will continue over an extended time of four days (96 hours).

Calculation of starting time of the wake up window

VIN - YV1RS53D112004278

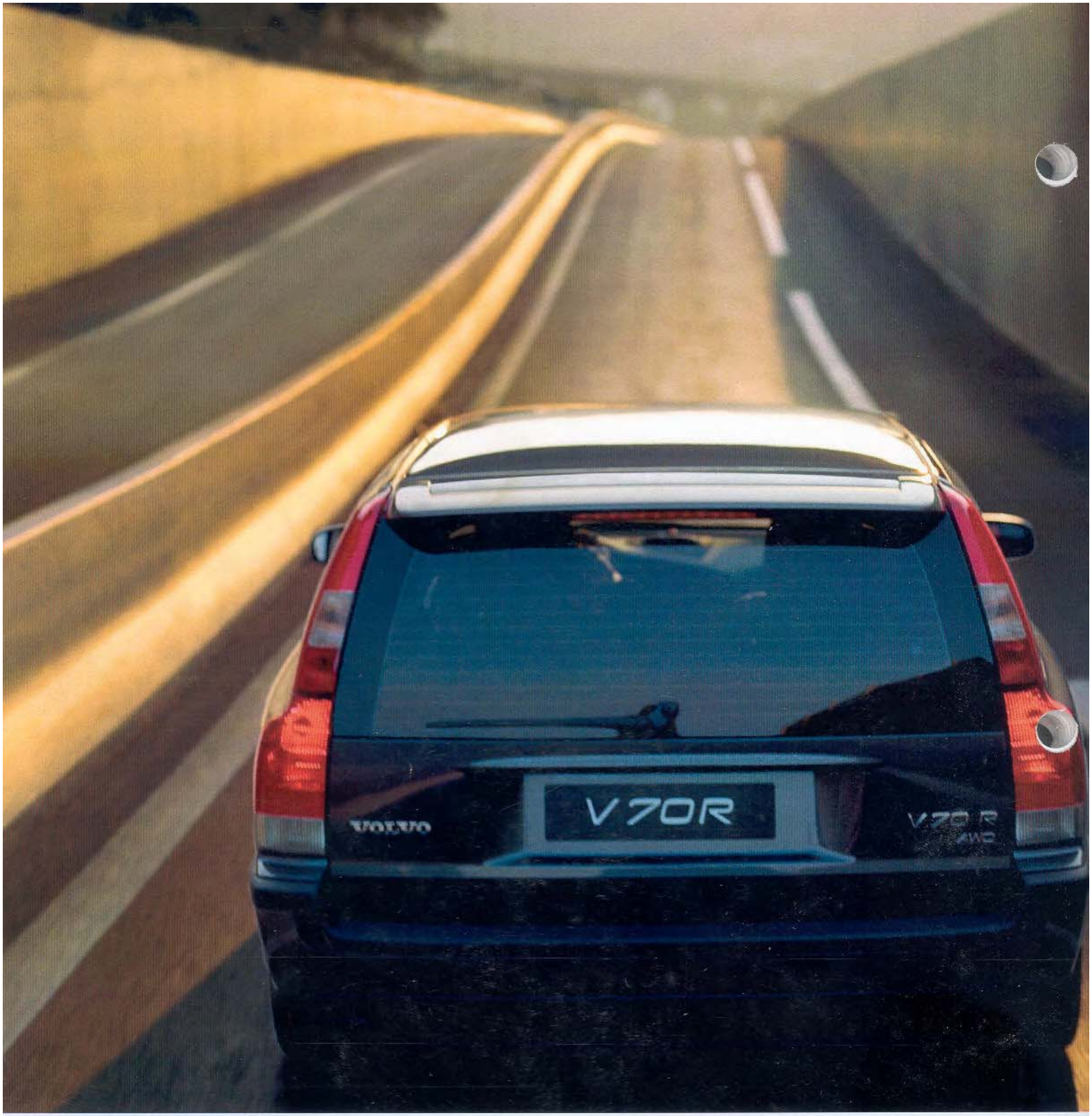
Last two digits 78 to be multiplied with 0.15 and then truncated.

Example: 78 X 0.15 = 11.7

11.7 is shortened to 11. This gives the wake up window of 90 seconds, starting every hour at hh: 11, hh: 26, hh: 41 and hh: 56 during 96 hours after the vehicle has been turned off.

GLOSSARY

ABS	**A**nti-lock **B**raking **S**ystem
A/C	**A**ir **C**onditioning
ACS	**A**ctive **C**hassis **S**etting
AUX	**AUX**iliary
AWD	**A**ll **W**heel **D**rive
AYC	**A**ctive **Y**aw **C**ontrol
BCM	**B**rake **C**ontrol **M**odule
BGC	**B**rake **G**rip **C**ontrol
BRC	**B**ump and **R**ebound **C**ontrol
CAN	**C**ontroller **A**rea **N**etwork
CCC	**C**lose **C**oupled **C**atalyst
CCM	**C**limate **C**ontrol **M**odule
CEM	**C**entral **E**lectronic **M**odule
CM	**C**ontrol **M**odule
CVVT	**C**ontinuously **V**ariable **V**alve **T**iming
DBC	**D**ynamic **B**ody **C**ontrol
DCC	**D**ynamic **C**ornering **C**ontrol
DDM	**D**river **D**oor **M**odule
DEM	**D**ifferential **E**lectronic **M**odule
DIM	**D**river **I**nformation **M**odule
DLC	**D**ive and **L**ift **C**ontrol
DSTC	**D**ynamic **S**tability and **T**raction **C**ontrol
DTC	**D**iagnostic **T**rouble **C**ode
DVD	**D**igital **V**ersatile/**V**ideo **D**isc
EBA	**E**mergency **B**rake **A**ssistance
ECM	**E**ngine **C**ontrol **M**odule
FOUR-C	**C**ontinuously **C**ontrolled **C**hassis **C**oncept
FWD	Front Wheel Drive
GDL	**G**as **D**ischarge **L**ightning
IR	**I**nfra **R**ed
ISM	**I**nclination **S**ensor **M**odule
KIR	**K**ey **I**ntegrated **R**emote
LDC	**L**oad **D**ependable **C**ontrol
LED	**L**ight **E**mitting **D**iode
LEV	**L**ow **E**mission **V**ehicle
LSM	**L**ight **S**witch **M**odule
MHz	**M**ega**H**ertz
MLS	**M**ulti **L**ayer **S**ealing
MMS	**M**ass **M**ovement **S**ensor
MOST	**M**edia **O**riented **S**ystems **T**ransport
PDM	**P**assenger **D**oor **M**odule
PEM	**P**ump **E**lectronic **M**odule
Prog-mode	Programming mode
PRV	**P**ressure **R**egulation **V**alve
PVV	**P**ressure **V**entilation **V**alve
PWM	**P**ulse **W**idth **M**odulated
RSC	**R**oll **S**tability **C**ontrol
REM	**R**ear **E**lectronic **M**odule
SAS	**S**teering **A**ngle **S**ensor
SBL	**S**econdary **B**oot**L**oader
SC	**S**tability **C**ontrol
SCM	**S**iren **C**ontrol **M**odule
SRS	**S**upplementary **R**estraint **S**ystem
SULEV	**S**uper **U**ltra **L**ow **E**mission **V**ehicle
SUM	**SU**spension **M**odule
TCM	**T**ransmission **C**ontrol **M**odule
TCV	**T**urbo **C**ontrol **V**alve
TRACS	**TRAC**tion Control **S**ystem
UEM	**U**pper **E**lectronic **M**odule
VADIS	**V**olvo **A**ftersales **D**iagnostics & **I**nformation **S**ystem
WHC	**W**heel **H**op **C**ontrol



VOLVO

Service Training and Development Department

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