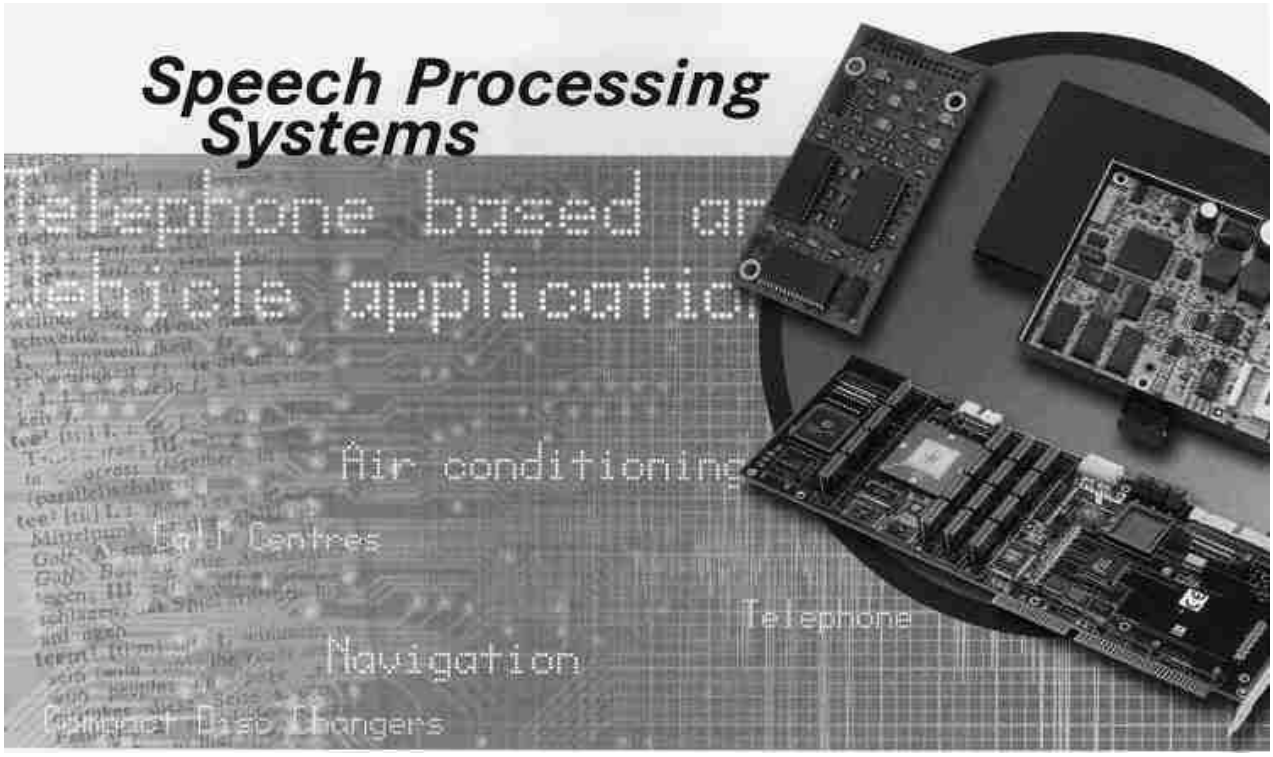
HARMAN/BECKER
AUTOMOTIVE SYSTEMS

COMBOX



Technical Description

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1 Allgemeiner Teil

1.1 Änderungsindex

No.	State	Version	Change Description	Changed pages	Autor
1		001	first edition	all	RCM
2					
3					

1.2 Mitgeltende Dokumente

Ref.	State	Version	Document Description	Autor

2 Detailed Specification

2.1 General Overview

The COMBOX basically supports the following features:

- Telefony (incl. Multipartycalling, Phone book download, short-notice adaptation to new phones/CEdevices)
- Personal information management (SMS, Email, Calendar download
- Audioplayer Integration (incl. short-notice adaptation to new CE devices)
- parallel use cases incl. 2 parallel audio player
- iSpeech (optional)
- Online access via NAD and BT customer device (optional – not for all countries)
- BMW Assist & Online & Remote Services
- ECall (optional – not for all countries)

2.3 External Connectors

2.3.1 System Connector (ELO Connector)

The following table shows the pinning of the 26pin ELO Connector (Tyco, 2-1393375-5, Coding A, Black). The table also describes the output/input level and the direction of each pin..

Pin	Pin Name	Pin Description	Level	I/O
1	KL30gz	KL30, Power for Media Type	+12V	I
2	KL30gf	KL30, Power for Telematic Type	+12V	I
3	UART Rx/ECall	Debug SCI of the ECALL-BOARD	+5V	I
4	UART Tx/ECall	Debug SCI of the ECALL-BOARD	+5V	O
5	CAN+	CAN Interface of the ECALL-BOARD	+5V	I/0
6	CAN-	CAN Interface of the ECALL-BOARD	+5V	I/0
7	Airbag	Airbag Control Messages	+12V	I
8	UART Tx/SH4	Debug SCI of the MAIN-BOARD	+3,3V	O
9	UART Rx/SH4	Debug SCI of the MAIN-BOARD	+3,3V	I
10	AuxGND	AuxGND	0V	O
11	Mic-Shield[1]	KfzGnd, Shield for Mic 1	0V	O
12	MicGND[1]	Ground for Microphon 1		I/O
13	MicGND[2]	Ground for Microphon 2		I/O
14	KL31	Ground	0V	I
15	CAS	WakeUp Line	+12V	O
16	UART GND	Ground for Debug Interface	0V	O
17	ECALL LED	LED Power	+12V	O
18	ECALL Button	ECall Button	+12V	I
19	Mic-Shield[2]	KfzGnd, Shield for Mic 2	0V	
20	SOS Speaker-	ECALL Speaker of the ECALL- BOARD	0V	O
21	SOS Speaker+	ECALL Speaker of the ECALL- BOARD	0V	O
22	Aux-Shield	KfzGnd, Shield for Aux Input	0V	O
23	AuxL	AuxIn left	max. 5,7Vss	I
24	AuxR	AuxIn right	max. 5,7Vss	I
25	MicIn[1]	NF Microphone In 1		I/O
26	MicIn[2]	NF Microphone In 2		I/O

2.3.2 MOST Connector

The COMBOX ECALL-Board has a MOST Connector, which is the interface to the car MOST Ring.

2.3.3 USB Connectors

The COMBOX MAIN-Board has two USB- Connectors, to connect two separate CE-Devices simultaneously. The following table describes the pinning of the USB- Connector.

Pin	Signal Name	Description	Level	I/O
1	GND	USB GND	0V	O
2	DM	Data -	0V ... 3,3V	I/O
3	VCC	USB Power Supply	+5V	O
4	DP	Data +	0V ... 3,3V	I/O
	USB-Shield		0V	

2.3.4 Bluetooth Connector

The COMBOX MAIN-Board has a Bluetooth- Connector, which is the interface to the car BT antenna. As Connector a beige Connector is used.

Pin	Signal Name	Description	Level	I/O
1	BTAnt	Antenna Signal	< +4dBm, nom. +2dBm	I/O
2	GND	Ground	0V	O

2.3.5 GPS Connector

The COMBOX ECALL-Board has a GPS Connector, which is the interface to the car GPS antenna.

Pin	Signal Name	Description	Level	I/O
1	GPS Ant.	Antenna Signal		I/O
2	GND	Ground	0V	O

2.3.6 GSM Connector

The COMBOX ECALL-Board has a GSM Connector, which is the interface to the car GSM antennas. The GSM connector is a double Fakra- connector , because two GSM antennas must be connected to the COMBOX, GSM antenna and GSM backup antenna for emergency case. As Connector a 2pin Rosenberger (black) is used.

Pin	Signal Name	Description	Level	I/O
1	GSM Ant.	GSM Ant.		I/O
1	GSM Ant.	GSM Ant.		I/O
2	GND	Ground	0V	O

2.3.7 Power Modes

The COMBOX has the following nine power states:

- Sleep Mode
- NAD Always On Mode
- NAD Always On Debug Mode
- Low Power Mode
- Combox Only Mode
- Normal Operating Mode
- MTS (Manufacturing / Transportation / Service) Mode

- Temperature Shut down Mode
- Ring Break Diagnosis Mode

2.3.7.1 Sleep mode

In “Sleep Mode” the COMBOX do not execute any service. Only the Wake-Up-Logic is in function, all other components are in reset-state.

2.3.7.2 NAD Always On Mode

In “NAD Always On Mode” the COMBOX keeps registered in NAD Cellular Network. Incoming calls will be rejected, without leaving this mode, unless the ComBox is configured to accept an incoming call or SMS as a remote service wake-up condition. In this case the COMBOX leave this Mode and enter the “Low Power Mode”.

2.3.7.3 NAD Always On Mode Debug

The “NAD Always On Mode Debug” is a “NAD Always On Mode” with enabled NAD-UART-Trace function The complete ECALL Board is now working. No CAN messages will be sent in this mode. The MAIN Board is still in reset and its power supplies are switched off.

2.3.7.4 Low power Mode

If the COMBOX receives a SMS in “NAD Always On Mode”, the board switches in “Low Power Mode” to process and decrypt this.
The complete ECALL Board is switched on, but no CAN messages will be sent in this mode.
The MAIN Board is still in reset and its power supplies are switched off.

2.3.7.5 COMBOX only Mode

In case that in “Low Power Mode” a Message is received, which contains a valid RemoteService request, the COMBOX transits from “Low Power Mode” to “COMBOX only Mode”.
The whole COMBOX is switched on. No CAN and MOST messages will be sent in this mode. FOT TX-line is switched off.

2.3.7.6 Normal Operating Mode

The whole COMBOX is switched on. All vehicle bus functions are enabled.

2.3.7.7 MTS (Manufacturing / Transportation / Service) Mode

The MTS mode is used during Manufacturing, Transport and Service of the car.

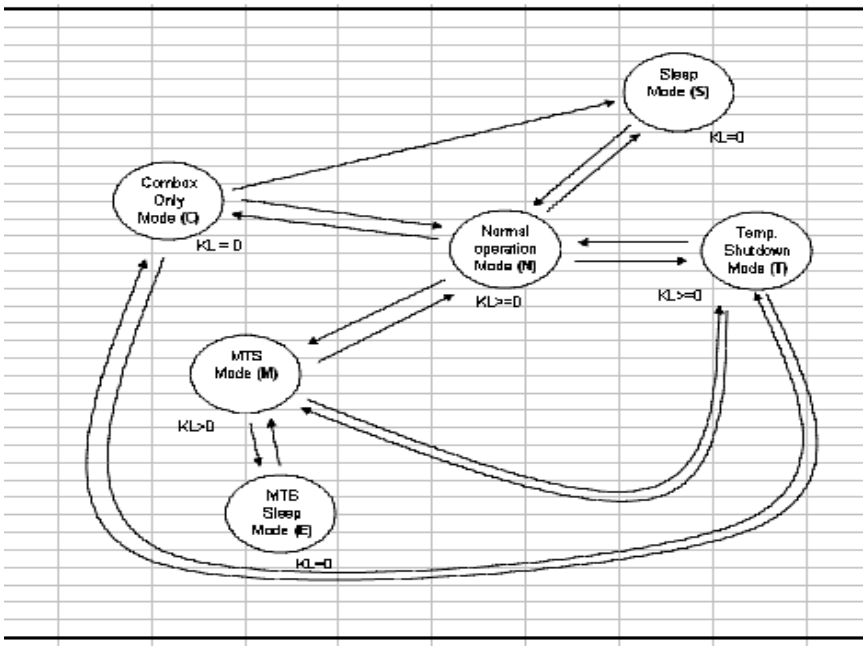
2.3.7.8 Temperature Shut down Mode

If the MAIN board detects criticle temperature, it enters to “Temperature ShutDown Mode”. During “Temperature Shutdown Mode” the COMBOX shall accept eCall trigger events via E-call button or ACSM/airbag signal.

2.3.7.9 Ring Break Diagnosis Mode

If Kl30 supply voltage is switched off for more 4 seconds, COMBOX Main Board enters to “Ring Break Diagnosis Mode”.

2.3.7.10 State Diagram Main Board only



2.4 HW Function Blocks

The MAIN- Board can be subdivided in the following main function blocks:

- CPU Unit
- Memory
- Authentification Co-Processor
- MOST Interface
- Bluetooth Interface
- 2 USB Interfaces
- Ethernet Interface (only for development)
- Service-Port Interface , RS232 (only for development)
- Mircophone Interface
- AuxIn- Interface
- Wake-up and diagnostic (ATMEGA48)

2.4.1.1 Authentification Co-Processor

The Apple authentication coprocessor is implemented to COMBOX Main Board to handle the iPod authentication mechanism.

2.4.1.2 MOST Interface

The MOST Transceiver is on the COMBOX Main Board.

2.4.1.3 Temperature Sensor

The COMBOX has a temperature sensor to measure the temperature

2.4.1.4 Audio Interface

The audio quality fulfils at least the following VDA requirements.

- For handsfree telefony via Bluetooth phone:	VDA class 1
- For telematics via internal NAD or via Bluetooth phone	VDA class 1
- For eCall use cases:	VDA class 2a

2.4.1.4.1 Microphone Interface

Two microphones can be connected to Combox. They provide the speech inputs signal for the handsfree function, the ispeech function and the ecall function. The interface offers a 9,8V phantom voltage for microphone supply.

2.4.1.4.2 AuxIn Interface

To connect an IPod or another Audio- device the Combox Main Board offers an AuxIn- Input.

2.4.1.5 Bluetooth Interface

The Bluetooth interface is realized with CSR BC06. The chip will be connected to an external BT antenna via FAKRA.

The BC06 supports:

- Bluetooth specification ver 2.1
- enhanced data rate (eDR) with a maximum bandwidth of 2.1 Mbps 3 Mbps
- point to multipoint connections
- multiprofiling capability. Due to this capability, several profiles shall be used in parallel
- A2DP
- eSCO for high class audio performance
- handsfree telefony quality VDA class 1
- mono (for telefony) and stereo (for audio player) simultaneously
- power down modes, sniff mode, park mode and hold mode
- support scatternet capability
- Advanced Frequency Hopping (AFH)

2.4.1.6 USB Interface

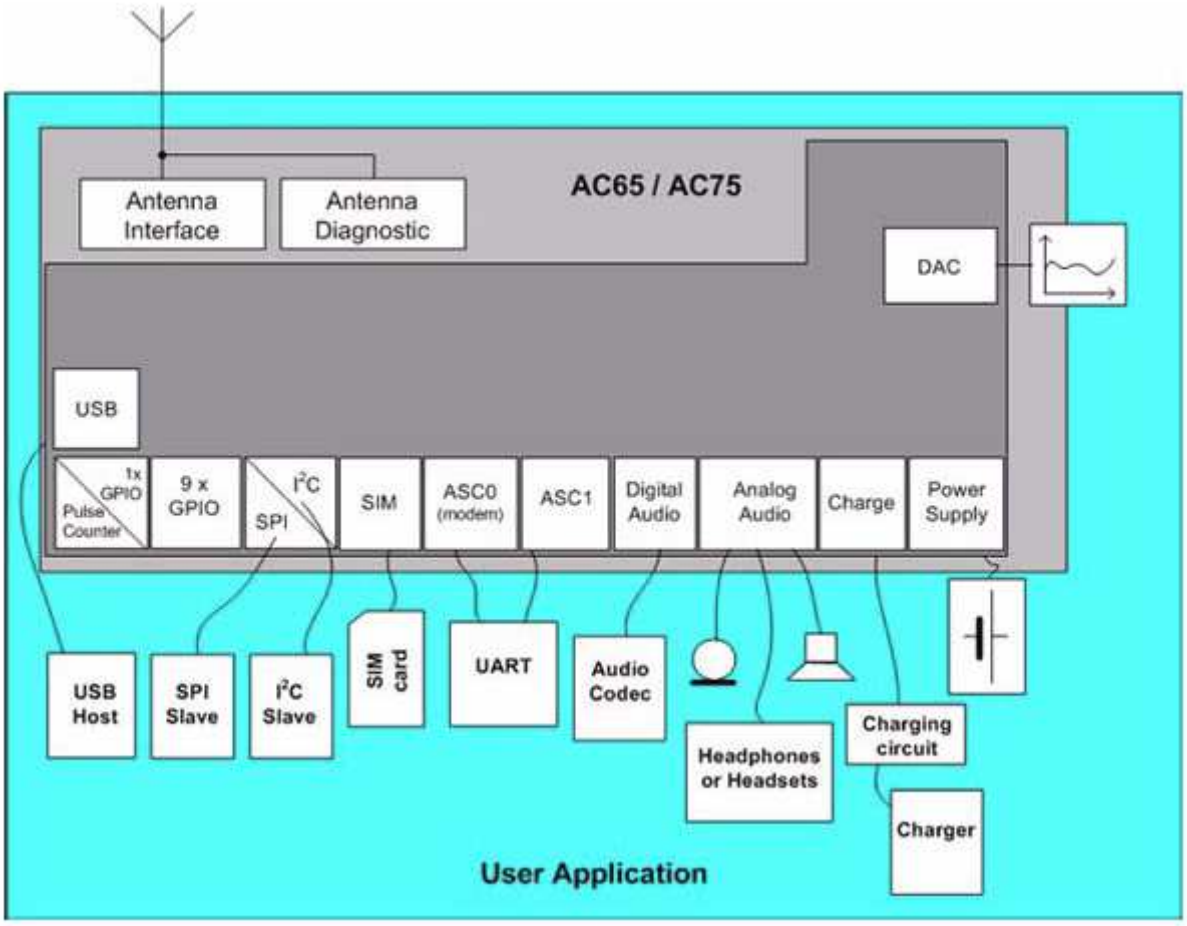
The Combox has two USB interfaces. Via USB, digital data (audio, pictures) are transferred from customer CE device (USB stick, iPod, MTP, etc.) to Combox.
These interfaces are realized with USB2.0 controller. The Combox works as USB Host.
The VBus is the power supply for external CE-devices up to a load of 500mA
The USB interfaces will be also switched off, if Kl30 power supply <6,5V.

2.4.2 Class D amplifier (speaker out)

The Combox Telematic has an own analogue speaker class D amplifier for backup speaker, which is directly connected to the eCall device.

2.4.3 GSM

The GSM Module AC75i is for Data and eCall purposes (not in all variants included). It is about a quad band ME, which is used to establish a data and voice call, respectively. It could be used for dirffertent service applications. The module fulfils all type approval standards of North America and Europe.



Following interfaces of the AC75i are currently used in the Combox Telematic.

- Serial Interface ASC0
- Serial Interface ASC1
- SIM Interface for service SIM card
- Analogue audio speaker interface for eCall purpose
- Digital audio interface for normal calls
- Control Interface for starting up, resetting and monitoring

2.4.4 GSM Antenna Switch

The Combox Telematic comprehends a connector, on which two antennas can be attached. Only one can be used at the same time. One is used at normal condition of the vehicle. The second antenna is a backup, when the main antenna is damaged, due to an accident.

2.4.5 CAN High Speed (BN2020)

The TJA1041 high speed CAN transceiver provides the physical link between the protocol controller and the physical transmission medium according to ISO11898 and SAE J2284. It supports local and remote wakeup with wakeup source recognition.

2.4.6 CAN Low Speed (BN2000)

The TJA1054 high speed CAN transceiver provides the physical link between the protocol controller and the physical transmission medium. It supports local and remote wakeup with wakeup source recognition.