GM Model: NG 2.5 HMI
Product Technical Description

Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
<th>Revision Number + Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.12.2011</td>
<td>Sven Nisse</td>
<td>PDT Rev 1.0</td>
</tr>
<tr>
<td>12.06.2012</td>
<td>Torsten Sahm</td>
<td>Changes to 2.0</td>
</tr>
<tr>
<td>06.09.2012</td>
<td>Torsten Sahm</td>
<td>Minor changes</td>
</tr>
<tr>
<td>24.07.2014</td>
<td>Torsten Sahm</td>
<td>Change from NG 2.0 HMI to NG 2.5 HMI</td>
</tr>
<tr>
<td>25.11.2014</td>
<td>Torsten Sahm</td>
<td>Minor changes for clarification</td>
</tr>
</tbody>
</table>

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1 Introduction

GM will introduce a distributed architecture of infotainment for several car-lines for several markets. Bosch will provide only the HMI module, which will be described in more detail in following sections. Following picture shows an example of the GM interior, especially the display in the center stack, showing the information of the GM NG 2.5 HMI module provided by Bosch:

2 NG 2.5 HMI module provided by Bosch

Bosch part of the GM Next Generation (GM NG) infotainment system is the HMI module (NG 2.5 HMI), which serves as the central HMI interface in the GM NG infotainment system which contains Bluetooth, WLAN, GPS.

The previous models

- NG 1.0 HMI was without WLAN and was never placed on the market.
- NG 1.1 HMI has the Bluetooth 3.0 + HS (=WLAN): UGK Z2
- NG 2.0 HMI similar to NG 1.1 HMI but a new PCB layout and a different Bluetooth WLAN Module: UGKZ2-E.
  No change on connectors.
- NG 2.5 HMI similar to NG 2.0 HMI but new:
  No change on connectors.

There is one variant where the GPS components and the GPS connector are not inserted on the PCB. The layout is unchanged. These modules have no navigation functionality.

RF power control:
For Bluetooth the RF power settings are fixed and cannot be changed.
2.1 Product Functional Description

The NG 2.5 HMI module provides support for HS-GMLAN (CAN) and MOST 50 communication busses. Using these busses, command and control for all feature groups (radio, CD, phone, navigation) are processed. A Communication-Enable-Interface (COMM Enable) is used for device-wake up functionality. Similarly for MOST 50 el. (MOST = Media Oriented Systems Transport), there exists a MOST ECL line for wakeup of the device.

An external touch display is connected via single LVDS (Low Voltage Differential Signal) for video signal output and LIN (Local Interconnect Network) for Touch-screen display inputs, a display driver for WVGA is included.

The unit provides an analogue video input for rear view camera (RVC) signals.

An integrated Bluetooth module and antenna provide connectivity to e.g. mobile phones. Apple iPhone is supported through USB2.0 Host interface 1, in total there are two USB interfaces, codecs for MP3, WMA, AAC, WAV are supported.

Two microphone inputs are provided, microphone 1 is used for speech recognition and the Bluetooth hands free mode, microphone 2 is used for noise suppression. In addition 2 MOST (or one MOST plus one analogue) microphones can be connected via MOST.

Summary:

- integrated GPS, graphics, and video
- One mechanical solution for all regions and variants, plastic housing for weight savings
- Support for HSCAN-, TLIN- and MOST-communication busses (HSCAN = High Speed Controller Area Network)
- Single LVDS display driver supporting WVGA (up to 24 bit)
- Apple iPod support through USB (incl. 1A charging)
- Media database with browsing
- Integrated RF Module with Bluetooth 3.0+ HS and WLAN with two antennas connected
- Internet functionalities
- Dual microphone inputs, echo cancellation integrated
- Voice recognition for all feature groups (radio, CD, media data base, phone, navigation)
- Text to speech output
- 3D navigation, dynamic guidance using XM or FM Traffic (NAV variant only)
- Download for all MOST devices via USB
- Rear view camera input (RVC)
- One printed circuit board (PCB). In some cases not all components are equipped.
- The software differs depending on the vehicle, map data and features.
2.2 **Housing DUT**

![Module Image]

The module is located normally behind glove compartment. In some cases the location is somewhere behind the dash board. The passengers or driver have no access to this device. No serviceable parts inside.
2.3 Wiring Overview

From CM/QMM2
Our Reference Torsten Sahm
Tel +49(5121)49-4644
Hildesheim 25 Nov. 2014

Requirements specification
GM Model: NG 2.5 HMI

- Bluetooth
- WLAN
- GPS
- ...16: NC
- 15: J1
- 14: CAN2 L - J1
- 13: CAN2 H - J1
- CAN1 L 12: - J1
- CAN1 H: 11: - J1
- NC 10: - J1
- TLIN 1 9: - J1
- Batt. 8: - J1
- tt.+ 7: - J1
- C. En.2 6: - J1
- C. En.1 5: - J1
- Mic2 4: - J1
- Mic2+ 3: - J1
- Mic1 2: - J1
- Mic1+ 1: - J1
- J2 5: VideoIn+
- J2 6: VideoIn-
- J3 1: VBUS
- J3 2: USB_D
- J3 3: USB_D+
- J3 5: GND
- J4 1: VBUS
- J4 2: USB_D
- J4 3: USB_D+
- J4 5: GND
- J7 1: GPS_Signal
- J7 2: GPS_GND
- J2 1: ECL
- J2 2: Rx-
- J2 3: Rx+
- J2 8: TX+
- J2 9: Tx-
- J5 2: LVDS-
- J5 3: LVDS+
- J5 4: GND
- J5 2: LVDS-
- J5 3: LVDS+
- J5 4: GND

- Power Supply
- LIN
- HSCAN (siehe unten)
- RVC
- LVDS
- MOST 50 el.
- USB1
- USB2
- 3.0 + HS
- WLAN

DUT
2.4 Radio related functions

2.4.1 GPS Receiver
The GPS receiver has a SMA connector for an external active antenna with phantom power supply. Useable for GLONASS and other systems.

2.4.2 WLAN transmitter
The WLAN and the Bluetooth transmitter are integrated in one module from ALPS. Each transmitter has its own antenna.
The WLAN transmitter is using the 801.11 b, g, n with less than 100 mW only within the 2.4 GHz band. The maximum used bandwidth is 20 MHz. This transmitter is used for the Bluetooth 3.0 High speed channel. The module is factory adjusted to a fixed RF output value. The WLAN transmitter has an antenna, which is connected via an impedance stabilization network to the RF module. The antenna is placed on the PCB inside the housing. No connector is available.

2.4.3 Radio transmitter Bluetooth
The WLAN and the Bluetooth transmitter are integrated in one module from ALPS. Each transmitter has its own antenna.
It is a Bluetooth Class 2 radio. The module is factory adjusted to a fixed RF output value below 2.0 mW under normal conditions. No adaptive power control is used. The Bluetooth transmitter has an antenna, which is connected via an impedance stabilization network to the RF module. The antenna is placed on the PCB inside the housing. No connector is available.
It is a Bluetooth 3.0 + HS transmitter which is using the High Speed channel from the WLAN.

2.4.4 Bluetooth IOP tests
No adaptive power control is used. The RF power is set to a fix value.
A WiFi certification number is given by ALPS to make the Bluetooth + HS certification at Bluetooth SIG.
They will be based on subsystem listings and will have a similar functionality as given on the BT-SIG Qualification numbers, which are related to the Module UGKZ2-H.
The EPL-Listing of the GM NG 2.5 HMI will be made on the ALPS certified Subsystem.
The final IOP-tests needs to be made on a bench or in a vehicle in Hildesheim.
The Bluetooth Qualification Expert (BQE) service is required.
The listing process needs to be made together with the BQE.

### 2.4.5 Bluetooth IOP tests Profiles

The Bluetooth profiles are: **Preliminary**

#### CORE

<table>
<thead>
<tr>
<th>Protocol / Profile</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SUM ICS) Summary ICS</td>
<td>External to all Layers</td>
</tr>
<tr>
<td>(PROD ) Product Type</td>
<td>External to All Layers</td>
</tr>
<tr>
<td>(RF) Radio</td>
<td>Vol 2, Part A</td>
</tr>
<tr>
<td>(BB) Baseband</td>
<td>Vol 2, Part B</td>
</tr>
<tr>
<td>(LMP) Link Manager</td>
<td>Vol 2, Part C</td>
</tr>
<tr>
<td>(80211PAL) 802.11 Protocol Adaptation Layer</td>
<td>Vol 5, Part A</td>
</tr>
<tr>
<td>(HCI) Host Controller Interface</td>
<td>Vol 2, Part E</td>
</tr>
<tr>
<td>(AMPHCI) AMP Host Controller Interface</td>
<td>Vol 5, Part A</td>
</tr>
<tr>
<td>(L2CAP) Logical Link Control and Adaptation Protocol</td>
<td>Vol 3, Part A</td>
</tr>
<tr>
<td>(A2MP) AMP Manager Protocol</td>
<td>Vol 3, Part E</td>
</tr>
<tr>
<td>(SDP) Service Discovery Protocol</td>
<td>Vol 3, Part B</td>
</tr>
<tr>
<td>(GAP) Generic Access Profile</td>
<td>Vol 3, Part C</td>
</tr>
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#### PROFILE

<table>
<thead>
<tr>
<th>Protocol / Profile</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A2DP) Advanced Audio Distribution Profile</td>
<td>External to Core</td>
</tr>
<tr>
<td>(AVCTP) Audio/Video Control Transport Protocol</td>
<td>External to Core</td>
</tr>
<tr>
<td>(AVDTP) Audio/Video Distribution Transport Protocol</td>
<td>External to Core</td>
</tr>
<tr>
<td>(AVRCP) Audio/Video Remote Control Profile</td>
<td>External to Core</td>
</tr>
<tr>
<td>(BNEP) Bluetooth Network Encapsulation Protocol</td>
<td>External to Core</td>
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</table>
Requirements specification
GM Model: NG 2.5 HMI

<table>
<thead>
<tr>
<th>Profile</th>
<th>Description</th>
<th>Core Status</th>
</tr>
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<tbody>
<tr>
<td>(DUN)</td>
<td>Dial-Up Networking Profile</td>
<td>External to Core</td>
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<tr>
<td>(GAVDP)</td>
<td>Generic Audio/Video Distribution Profile</td>
<td>External to Core</td>
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<tr>
<td>(HFP 1.5)</td>
<td>Hands-Free Profile</td>
<td>External to Core</td>
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<tr>
<td>(IOP)</td>
<td>Interoperability Test Specification</td>
<td>External to Core</td>
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<tr>
<td>(MAP)</td>
<td>Message Access Profile</td>
<td>External to Core</td>
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<tr>
<td>(MCAP)</td>
<td>Multi-Channel Adaptation Protocol</td>
<td>External to Core</td>
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<tr>
<td>(OPP)</td>
<td>Object Push Profile</td>
<td>External to Core</td>
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<td>(PAN)</td>
<td>Personal Area Networking Profile</td>
<td>External to Core</td>
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<td>(PBAP)</td>
<td>Phone Book Access Profile</td>
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<td>(RFCOMM)</td>
<td>RFCOMM with TS 07.10</td>
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<tr>
<td>(SPP)</td>
<td>Serial Port Profile</td>
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<tr>
<td>(SDAP)</td>
<td>Service Discovery Application Profile</td>
<td>External to Core</td>
</tr>
<tr>
<td>(SAP)</td>
<td>SIM Access Profile</td>
<td>External to Core</td>
</tr>
</tbody>
</table>

These profiles may get some changes.

2.4.6 WiFi Certification

Robert Bosch Car Multimedia GmbH is member of the WiFi Alliance. The WiFi certification for Station and Access point needs to be made. But this features will be released in a later software version.

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