Product Description Document (PDD):
PAG BPM

Version: Draft 3

Date: 14-July-2005

Abstract:
This document defines the functional baseline for the PAG BPM release including the system and subsystem architectures, itemized feature list, and high-level feature descriptions.

File Name: PAG_BPM_PDD Draft 3.doc

Revision History:

Date dd-mm-yyy	Revision	Revision Author	Comments
04-04-2003	Draft	D. McCartney	Initial Draft
09-04-2003	Draft 1	D. McCartney	Updated to include DTMF Send, VDA 1.1, Redial, Speed Dial, SMS Send, SMS Management details, HELP Display at HMI.
29-04-2003	Draft 2	D. McCartney	Update to include : Last Number/Redial List Sync, Auto Answer, Audio Parameter Settings, Locking MO Calls, Call Hold, DTMF via VR, MT Call Announcer and dial from NAV in support of the TA Baseline
14-07-2005	Draft 3	D. McCartney	Update to align with the many changes in both Hardware and functional aspects.

Table of Contents:

Figures:

Tables:

1. Purpose

This document defines the functional baseline for the PAG BPM release including the system and subsystem architectures, itemized feature list, and high-level feature descriptions offered in Ref [1]. This document is intended for use in defining the framework and domain of the detailed system requirement specifications for BPM development not to describe the design of the product.

2. Overview

PAG Bluetooth Phone Module is the Motorola Telematics BPM release for CDMA, AMPS, WCDMA, CDMA2000, TDMA and GSM Bluetooth Handsfree communication products. It is an instance of what is commonly referred to as a Class1 BPM within the Motorola Telematics architectural framework. It consists of the Bluetooth Phone Module (BPM).

The PAG BPM will provide consumers with the ability to make and receive hands-free personal calls within their vehicles by interacting with the BPM through Voice Recognition (VR) and in-vehicle HMI. The BPM uses the capabilities within the consumer's personal Portable Phone connected via Bluetooth to access the cellular network. Key features include speaker independent continuous digit dialling, voice tag dialling and high quality handsfree audio processing . Additionally, the BPM provides run-time and on-demand diagnostics capabilities and provides configurable parameter management and software update capabilities.

The BPM is delivered in two variants;

- BPM1 with an internal BT Antenna, Single MOST Node and NO VR capabilities, with an associated reduction in memory elements.

- BPM2 with external BT Antenna, Dual MOST Node and VR capabilities.

All descriptions in this document use the generic term BPM and describe the BPM2 variant.

2.1 System Architecture

The system architecture diagram is presented to illustrate the major end-to-end system entities and their relationship to the PAG BPM. Figure-1 specifies those components needed for the completion / packaging of the PAG BPM system.

The PAG BPM will have the ability to operate with a limited number of third party portable devices that are either compliant with the supported Bluetooth profiles.
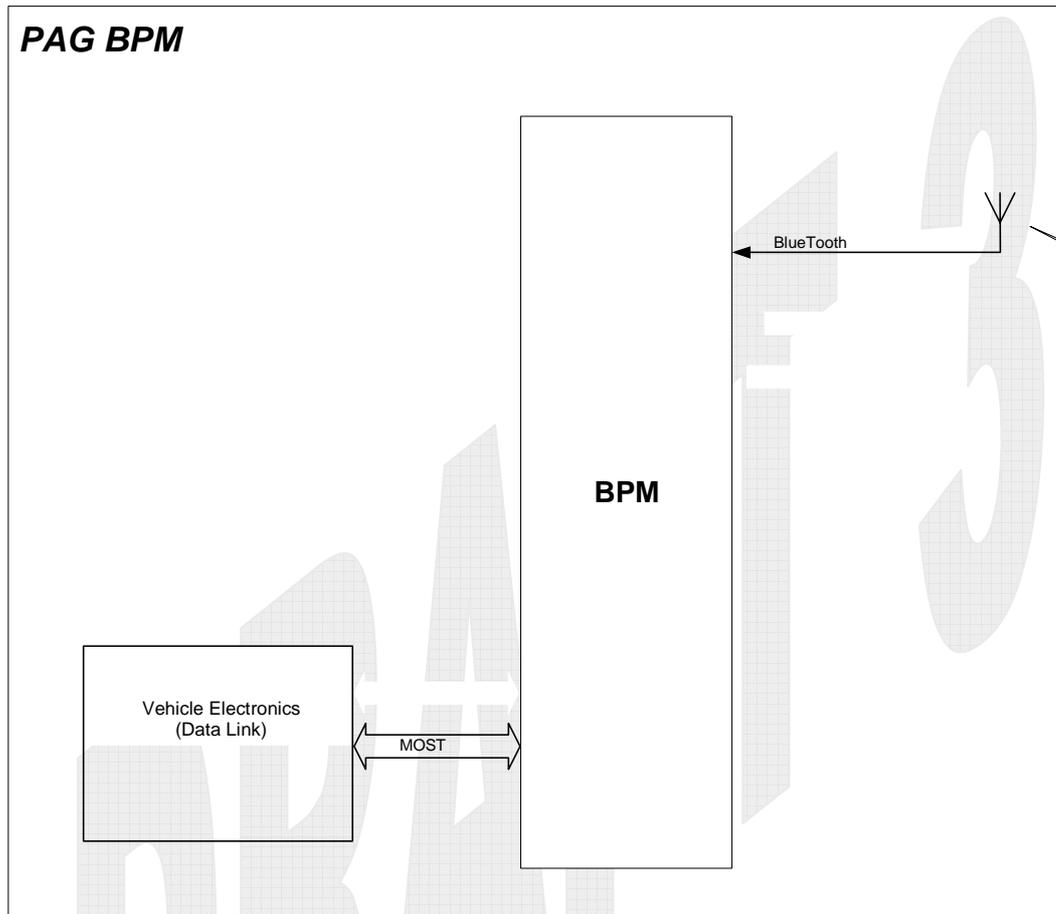
Figure 1: System Architecture Diagram for PAG BPM

2.2 PAG BPM Sub-System Architecture

Bluetooth Phone Module (BPM)
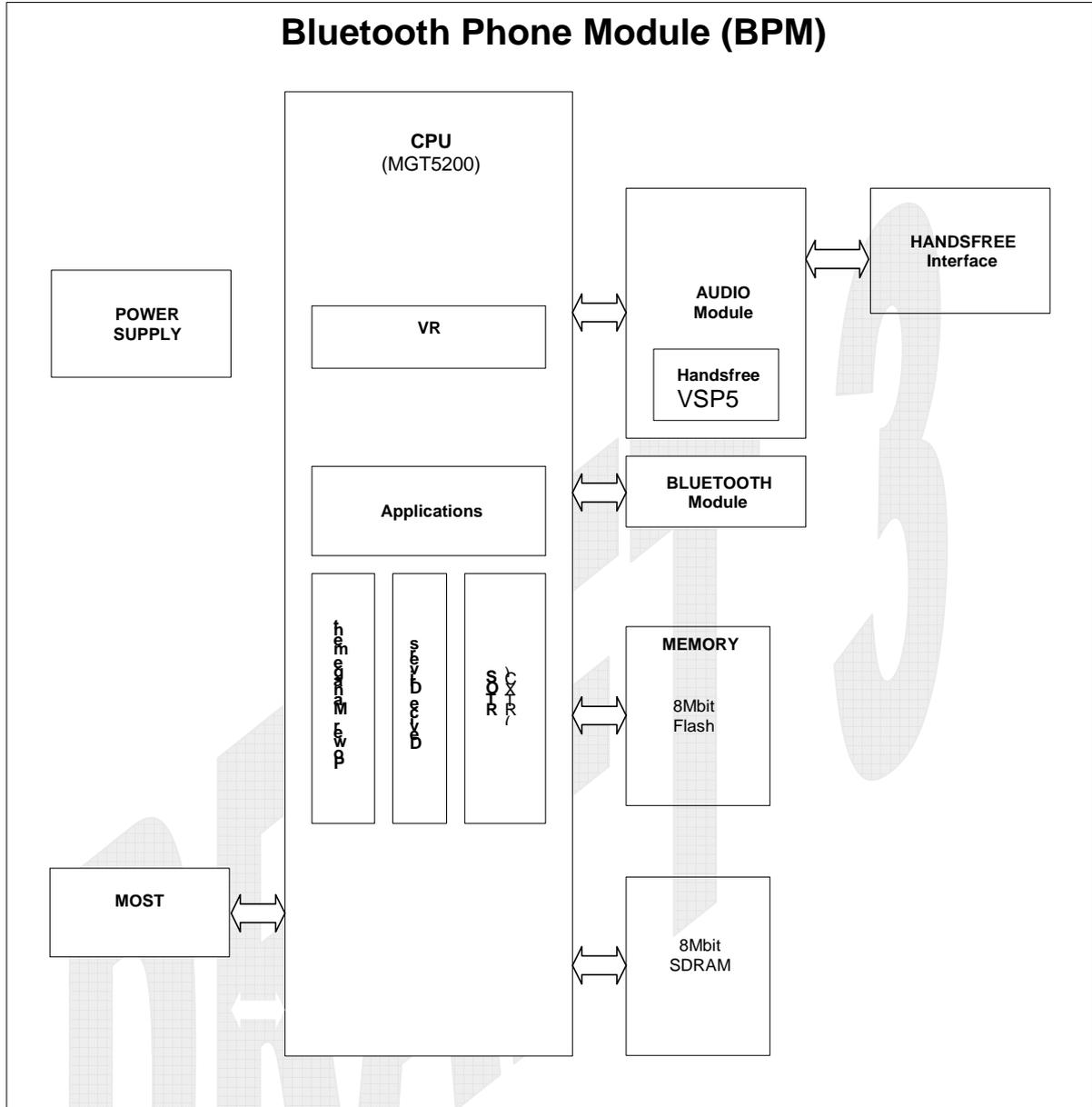
Figure 2: PAG BPM subsystem architecture.

MOTOROLA

Product Description Document	**Version:** Draft 3	
PAG BPM	**Date:** 14-July -05	**Page:** 8 (16)

3. Feature Matrix

This section contains more detailed specification of the system behaviour and shows how components collaborate for achieving this system behaviour.

Bluetooth Profiles

- Core
- Handsfree
- Headset
- Phone access
- OBEX

Operations and Maintenance

- BPM Self Diagnostics
- End of Line Configurable Parameter Management
- Service/Dealer Diagnostics
- Re-Flash - Software update via MOST

Handsfree

- Echo Cancellation
- Noise Suppression

HMI

- BPM Status Reporting
- Command Interface from HMI

Personal Calling

- BT Device status (Network Signal Strength, Battery Power Level, Roaming Indication) *
- Mobile Originated
- Mobile Terminated
- Privacy/Handsfree selection
- DTMF Send

Phonebook

- Store
- Delete
- List

- Speed Dial

Power Management

- Wake-up from MOST
- Delayed Power Down

System Interfaces

- Standard MOST
- External Bluetooth Antenna

Voice Recognition

- SMS Text to Speech
- Email Text to Speech
- Text to Speech from a vehicle bus connected source.
- Call Announcer Text to Speech
- Digit Dialling
- Nametags
- Voice Memo (Notepad)
- Multi-Language – EFIGS
- Redial
- DTMF

Enablers

- Processor
- Static Memory
- Dynamic Memory

Physical

- Size Max(mm) = 110 (W) x 158 (L) x 30 (H)
- Mass Max = 500 grams

Connectors

- Main I/O – 32 Pin Tyco Automotive style with positive locking and keying
- Bluetooth Antenna – Fakra style with zinc die-cast body, code I, exceeding USCAR requirements and Fakra industry standards.
- MOST – Standard 2 channel / 4 pin optical transmitter/connector from either Tyco or Molex.
- Motorola will use its preferred suppliers to meet its manufacturing needs.

Power Consumption (BPM Only)

- Quiescent (BPM OFF) = Less than 100 micro Amperes.
- Operating = Less than 1.5 Amperes.

Note

*   - Bluetooth Profile Dependent
**   - Cellular Phone Network Dependent

Table 1: PAG BPM feature reference

MOTOROLA

Product Description Document	**Version:** Draft 3	
PAG BPM	**Date:** 14-July -05	**Page:** 11 (16)

4. System Feature Description

4.1 Bluetooth Profiles

4.1.1 Core

The Bluetooth feature group profiles specified require the General Access Profile and the Serial Port Profile.

4.1.2 Hands Free Profile (HFP)

The Hands-Free Profile (HFP) is a phone centric specification defining the minimum set of functions such that a Portable Phone can be used in conjunction with the BPM, with a Bluetooth Link providing a wireless means for both remote control of the Portable Phone by the BPM and voice connections between the Portable Phone and the BPM.

4.1.3 Headset Profile (HSP)

The Headset Profile (HFP) is a phone centric specification defining the minimum set of functions such that a Headset can be used in conjunction with the BPM, with a Bluetooth Link providing a wireless means for voice connections between the Portable Phone and the BPM.

4.1.4 Phone Access Profile (PAP)

The Phone Access Profile (PAP) is a phone centric specification defining the set of requirements such that the Portable Phone can be used in conjunction with any Terminal device (e.g. Cordless Handset or Car-Kit installed in the car), with a Bluetooth Link providing a wireless means for both remote control of the Phone by the Terminal device and voice connections between the Portable Phone and the Terminal device.

4.1.5 Object Exchange (OBEX)

The OBEX profile specifically relies on the Object Push Profile of the Generic Object Exchange Profile. It will be used to provide data exchange between the Bluetooth enabled Portable Phone and the BPM. This will be provided on a need basis.

4.2 Operations and Maintenance

4.2.1 BPM Self Diagnostics

The Self diagnostics provides logging, reporting and testing of hardware and software conditions that occur within the BPM subsystems. The intention is to provide information that will assist in the determination of whether or not a repair or a configuration change is necessary. In terms of logging information, the BPM is capable of storing subsystem diagnostic information for later interpretation. The BPM checks the subsystems such as:

Antennas (Bluetooth) when cooperative antennas are fitted and Vehicle Bus.

Internal Diagnostics capability is configured to execute while the BPM is operating. Internal Diagnostic information is used to determine why a particular service is not operating as expected. The diagnostic data retained within the BPM is available at the Diagnostic interface for extraction by the appropriate external Diagnostic Tool.

4.2.2 BPM End of Line Configuration Parameter Management

Configuration parameter management will be established to allow (via appropriate diagnostic/test tool) for the manipulation of the BPM configuration, including: audio settings covering both VR and in-vehicle audio systems, and where applicable the VR desired language.

This service allows the settings, software, and hardware on the BPM to be updated to accommodate different vehicle interfaces, external devices, or network connections.

4.2.3 BPM Service/Dealer Diagnostics

The PAG BPM will support the Diagnostic Tool interface over MOST. The purpose of the dealer diagnostics is to allow for post-factory testing and general inspective access to the BPM. The Diagnostic reports will be across MOST.

4.2.4 BPM Reflash

Reflash will be used to program the PAG BPM in a post-production capability. The BPM will have the capability to be reflashed while still installed in the BPM using the MOST vehicle bus.

4.3 Handsfree

4.3.1 BPM Noise Suppression and Echo Cancellation

The Hands-free Communication capability supports access to audio without having to use tactile functions. The Audio Interface provides mechanisms for noise reduction and echo cancellation. The PAG BPM will use Motorola VSP5 for full duplex Handsfree operation. The PAG BPM will be compliant with VDA 1.1 specifications.

4.4 HMI

4.4.1 BPM Status Reporting

The PAG BPM will provide Status reports to the in-vehicle Intelligent HMI. This status relates directly to the currently active service and is intended to provide the Consumer with action confirmations in a simple HMI independent format.

4.4.2 Command Interface

The PAG BPM will provide Command Interface with the in-vehicle Intelligent HMI. This allows an intelligent HMI to convey validated and previously authenticated Consumer requests in a simple HMI independent format to the BPM.

4.4.3 Help

The PAG BPM will provide three levels of Help data at either the VR, HMI or both VR and HMI interfaces. This will cover Help of a General Nature, Help on all Commands or Help on Specific Commands.

4.5 Personal Calling

The Personal Calling service is the ability for a consumer with his Portable Phone to use the vehicle's audio system and Head Unit (if applicable) to initiate phone calls and to accept phone calls.

4.5.1 Bluetooth Device Status

The PAG BPM will provide Portable Phone status of Network Signal Strength, Battery Power Level and Roaming State from the currently active Phone.

4.5.2 Mobile Originating/Terminating

Mobile originated allows the Consumer to make a phone call from the vehicle using the hands-free capability provided by the BPM. The Consumer initiates the Voice Call using the interface provided by the HMI. The Consumer converses using Microphone and Speaker. When finished, the Consumer can terminate the call by interacting with the provided interface of the HMI.

Mobile terminated allows the Consumer to receive a telephone call in the vehicle using the hands-free capability provided. In this scenario, a 'Ring' indication is provided and the Consumer accepts the call by pressing the button provided at the Portable Phone or the HMI. The Consumer uses the microphone and speakers to converse and terminates the call by interacting with the provided interface of the HMI.

4.5.3 Call Waiting

Call waiting allows for the consumer to receive a third party call indication, and to see the callers CLI during an active call. It should be recognized that Call Waiting feature could be limited by the capabilities of the Portable Phone, the Consumers Network contractual agreements or the specific Cellular Network.

4.5.4 Calling Line ID (CLI)

The Calling line ID (CLI) also known as "caller ID" is used to identify the originating incoming phone number. It should be recognized that Call Waiting feature could be limited by the capabilities of the Portable Phone, the Consumers Network contractual agreements or the specific Cellular Network.

4.5.5 Privacy/Handsfree Selection

The PAG BPM will support the switching of a Call-In-Progress between the Privacy and Handsfree modes.

4.5.6 DTMF Send

The PAG BPM will support the transmission of DTMF tones to the Portable Phone.

4.6 Phonebook

4.6.1 Calling and Scrolling

The ability to retrieve, call, list and store BPM located phonebook entries. The vehicle MOST bus will be the medium of communication between the BPM and the vehicle when applicable.

4.7 Power Management

4.7.1 Wake-up

The BPM will Wake-up when the MOST interface is considered to be in an active state. A wake-up of the BPM from vehicle bus activity would not necessarily cause the BPM to be available to the Consumer.

4.7.2 Delayed Power Down

The deliberate intervention of the BPM to delay the power down of the BPM by a configurable period as determined by the service currently making such request. Delayed Power down, prevents the BPM commencing the Power down sequence during short interruptions of its valid wake-up conditions, such instances occur during CRANK, or short cycles of a valid wake-up. The other significant use is to maintain operations while a Call is in progress and a wake-up condition is removed.

4.8 System Interface

4.8.1 MOST

The BPM will support a MOSTCO compliant MOST interface with MOSTCO Standard Function Blocks. The MOST interface will be realized with two MOST NIC's, the first configured in serial mode and used in the transmission of audio and control messages, the second IC configured in support of parallel asynchronous mode and used in the transmission of packet data. The maximum theoretical data rate supported is 2.822 Mbits/s. The BPM is considered a Slave device.

4.8.2 BT Antenna Support

Bluetooth devices within the BPM require the availability of a dedicated antenna. The PAG BPM the system will incorporate a provision for either a dedicated external (to the BPM) or an internal (to the BPM) Bluetooth antenna. The BT Antenna design will require Diagnostic capabilities to facilitate the BPM in determining the presence of such an external Antenna.

4.9 Voice Recognition

In general Voice Recognition or VR is a generic term used to identify the capability of a device/system to sample, and identify a spoken command or instruction. The VR feature converts the spoken command into a system command to act upon the request.

The user will press the HMI "Talk" button to indicate they wish to give a command to the system. The system will play a listening tone and provide a visual indication using the HMI to indicate it is ready to listen to the user's command. The system will then be ready to accept audible input from the user within a configurable time period of the user pressing the button. Following the user's utterance the system will process the utterance and then respond with a

visual and/or audible feedback of the command recognized. Where the system prompts the user for additional input, the system will allow the user to respond within a configurable period. The vehicle audio system will be muted during a voice session.

4.9.1 Speaker Independent Continuous Digit Dialing

This feature will permit the user to instigate a VR command by speaking "naturally". It does not require the user to enter discrete digit commands. i.e. discrete digit dialling requires spoken numbers be separated by distinct pauses.

4.9.2 Voice Tag Support

The ability of the VR system to incorporate, and utilize the stored voice tags that have been predefined by the user. Voice tags are created and stored in the BPM. While voice tags may exist on the Portable Phone, the BPM voice tags are unique and independent to each device and are thus not transferable between devices.

4.9.3 Voice Memo (Notepad)

The ability via the VR system to record a maximum of 5 minutes, and subsequently retrieve a stored Voice Memo. Voice Memo's are created and stored in the BPM.

4.9.4 Multi-Language

The VR engine for the BPM will be configured to support EFIGS language set. Language support will be available through a software re-flash. EFIGS is defined as: -

- English (U.S. & U.K)
- French (Continental)
- Italian
- German
- Spanish (Castilian)

The addition of the Japanese language is recognised as a Costed Option.

4.9.5 BPM Based

The PAG BPM will use the Voice Recognition (VR) system Speech2Go provided by SpeechWorks The VR engine will reside in the BPM only.

4.9.6 Redial

The PAG BPM will support the redialling of up to the last 10 numbers in either the last number dialled or of the last Incoming Calls if the CLI is presented lists.

4.9.7 DTMF

The ability of the VR system to recognise user request to send DTMF tones or sequences via the Portable Phone.

4.10 Phone Management

Given that the PAG BPM will support a Bluetooth interface, the BPM will adopt a strategy that maintains the established connection during an active call. The PAG BPM will support (establish connection) with only one Portable Phone device at a time.

4.10.1 Dock/Undock

The term "docked" is used to describe when a Portable Phone has been paired and bonded to the BPM. When a Portable Phone is docked, a service level connection is established between the BPM and the phone. Only one phone can be docked at a time, and cannot be undocked during an active call..

4.11 Enabler

4.11.1 Processor – MGT5200

The PAG BPM will be centralized on the MGT (mobile GT) 5200 PPC core architecture microprocessor.

4.11.2 Memory - Flash

The PAG BPM will be configured with eight (8) Meg of flash memory.

BPM1 will be configured with four (4) Meg of flash memory

4.11.3 Memory – SDRAM

The PAG BPM will be configured with sixteen (16) Meg of SDRAM memory.

BPM2 will be configured with eight (8) Meg of SDRAM memory

4.11.4 Bluetooth - CSR Class 2

The PAG BPM will use class 2 Bluetooth chipset as provided by the vendor CSR.

5. References

[1]   Proposal for Motorola Partnership with the Premier Automotive Group – Quotation for Bluetooth Phone Module – Version 2.0, Dated February 7, 2003