Minimum
SOFTWARE MANUAL

OAK_EMUF

Revision 3.05
Status: Preliminary
W. Bals
# Edition history

<table>
<thead>
<tr>
<th>Date</th>
<th>Changes</th>
<th>Name</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>002 05 28</td>
<td>First draft</td>
<td>WB</td>
<td>Taken from OS-9 SW description</td>
</tr>
</tbody>
</table>


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Preface

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W.B.
Scope of delivery

Content:

<table>
<thead>
<tr>
<th>Description</th>
<th>Order No.</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal Software</td>
<td></td>
<td>Setup Board (RAM / ROM)</td>
</tr>
</tbody>
</table>

Related products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Order No.</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware and freeware OAKEMUF 2MB RAM, 2MB ROM</td>
<td>GER-99993-000</td>
<td></td>
</tr>
<tr>
<td>Manual OAKEMUF</td>
<td>GER-99994-000</td>
<td></td>
</tr>
<tr>
<td>OS-9000 V2.1 Prof. OS-9000 Board support package OAKEMUF</td>
<td>GER-99991-000</td>
<td>Only available with OAKEMUF HW</td>
</tr>
<tr>
<td>OS-9000 V2.2 Prof. OS-9000 Board support package OAKEMUF</td>
<td>GER-99992-000</td>
<td>Only available with OAKEMUF HW complete Hawk / PPC 1.3</td>
</tr>
</tbody>
</table>
Conventions

If not otherwise specified, addresses are written in hexadecimal notation and identified by a leading 0x.

Signal names preceded by a slash („/“) indicate that this signal is either active low or that this signals becomes active with the trailing edge.

### General

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>„b“</td>
<td>Bit</td>
<td></td>
</tr>
<tr>
<td>„B“</td>
<td>Byte</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>Kilo, means the factor 0x400 = 1024</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Mega, means the factor 0x100000 = 1048576</td>
<td></td>
</tr>
<tr>
<td>MHz</td>
<td>1 000 000 Hertz</td>
<td></td>
</tr>
</tbody>
</table>

### Software-specific abbreviations:

<table>
<thead>
<tr>
<th>Description</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;BS&gt;</td>
<td>Back Space (0x8)</td>
<td></td>
</tr>
<tr>
<td>&lt;CAN&gt;</td>
<td>Control-X (0x19)</td>
<td></td>
</tr>
<tr>
<td>&lt;Ctrl&gt;</td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt;</td>
<td>Carriage Return (0xd)</td>
<td></td>
</tr>
<tr>
<td>&lt;ESC&gt;</td>
<td>Escape Character (0x2b)</td>
<td></td>
</tr>
<tr>
<td>&lt;LF&gt;</td>
<td>Line Feed (0xa)</td>
<td></td>
</tr>
<tr>
<td>&lt;SP&gt;</td>
<td>Space (0x20)</td>
<td></td>
</tr>
<tr>
<td>NMI</td>
<td>Non maskable interrupt</td>
<td></td>
</tr>
</tbody>
</table>
How to use this manual

Documentation conventions:

<table>
<thead>
<tr>
<th>Font</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Courier New&quot;</td>
<td>C-Sources or defines or assembler</td>
<td></td>
</tr>
<tr>
<td></td>
<td>files</td>
<td></td>
</tr>
</tbody>
</table>

Other Conventions
Basic features of Minimum Software for OAKEMUF

1. Full implemented .h-structure of processor internals
2. Full implemented .h structure for all internal peripherals like Serial interface, RAM, FLASH, ADC, CAN, TPU, MIOS, SCI, SPI, ...
3. init process initializing all internal features like chip select, bus interface

The MPC555 is the first PowerPC – device with internal Flash. It also contains all automotive peripherals like Serial, CAN, Timer, …
Due to the fixed memory layout and the vector table requirements BALS HW & SW recommends a special memory layout to use all available ROM on board.
The HW recommendation list contains a description to connect external peripherals ( f.e. ethernet controller ) to use correct bus access and irq model.

Getting started

This manual contains information about the basic software on OAKEMUF board from KANIS
We recommend, that you are familiar with the following documentation:

- OAKEMUF HARDWARE Documentation
- MPC555 user manual
- Using standard editor
- EBDI-light / EBDS-Software
- BDM debug port for Motorola PowerPC on 55x
**Installation**

**Initialisation sequence via BDM**

This sequence is also contained in the macro OAK.DO in the BDM / EBDS SW directory (see below).

**BDM / EBDS**

The installation process is done by EBDS-SW using BDM-interface of 555-processors. The board-support-package is supplied with EBDS-SW and EBDI-lite BDM-interface.

To run EBDS compliant to OAKEMUF, you need 3 support files. All of these files are text-files and simply contain commands for EBDS command line interpreter. The three files are:

<table>
<thead>
<tr>
<th>File name</th>
<th>Content</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAK.DO</td>
<td>Initialisation</td>
<td>Init OAKEMUF to run; after OAKEMUF.do you only need to enter “go”</td>
</tr>
<tr>
<td>oakfl1.do</td>
<td>Program first ROM</td>
<td>Bootrom…; calls flash555.d5x</td>
</tr>
<tr>
<td>oakfl2.do</td>
<td>Program 2nd meg of ROM</td>
<td>Mergelist…; calls flash_xxx.d5x</td>
</tr>
<tr>
<td>Mp5fl555.do</td>
<td>Program internal flash of MPC555</td>
<td>Option to put high speed applications and OS-9 parts into internal flash</td>
</tr>
</tbody>
</table>

To install a complete new board you should do the following steps:
- connect BDM-connector to your OAKEMUF board
- connect EBDI-lite interface with your PC (LPT-connector)
- start EBDS-SW ("ebds.exe")
- configure EBDS to fit to your application (target 555, LPT-port, …)
- start Macro OAK.do to initialize hardware
- start first Macro oakfl1.do to program external flash
  - enter start address 0xffff00000;
  - enter end address 0xffffffff
- start second Macro oakfl2.do to program second half of external flash
  - enter start address 0xffe00000
  - enter end address 0xfffffff0
- disconnect bdm and ebdite lite
- restart the system,

**Attention:**
With EBDS there is no way to program only part of the external flash.
With the current EBDS macros the rom-image and the 2ndmeg.rom image must be less than 1 Mbyte.
MPC555 basics

Reset configuration
OAKEMUF basics

Memory Layout on OAKEMUF

OAKEMUF is available with different RAM and ROM sizes. User can define these areas by config.des and romcnfg.h files. Normally no changes are required.

Additional memory accesses are driven by additional CS-pins of MPC555. On OAKEMUF there is CS3 which is used for accessing SMC Ethernet controller and additional external devices. All these devices can only be accessed by 16bit transfer! For correct use, 128MB space must be available for every sub-CS on this interface.

All MPC555-CS-features are programmed in sysinit.c file in the ROMCORE directory.
Drivers

This chapter describes the available drivers for clock, SCF and ISP-devices.

Clock-Module

Realtime clock

The realtime clock on OAKEMUF is driven by OS-9 task. We recommend to start this task in sysgo-module at startup and to read time/date in this task to setup OS-9 time base.
SCF Drivers and Descriptors

For standard serial I/O the serial interface MPC555 QSM_A module is used. The related files are:
- sc555
  OS-9000 scf driver for serial interface related to motorola QSM interface

QSM Channel B is also available for standard use.
SPF Drivers and Descriptors

Driver

- smc91c94

The SMC-driver is delivered as a complete OS-9-modul. All changes needed by customer are made by descriptor.
Features and Enhancements

Tools:

Enhanced software packages are available for EBDS to program internal flash of mpc555.

BALS HARDWARE and SOFTWARE also offers source code for OS-9 to program internal flash, TOUCAN module, TPU, QUADC or QSPI.
## Appendix

### General source file list

All Source files are fully tested on MPC555 Version G up to Version L. Not all of these source files are included in standard Board support package (BSP). For all source files, portpack license is required.

#### Include files

All include files are tested and support access of internal registers and bits of these registers.

<table>
<thead>
<tr>
<th>Filename</th>
<th>Directory</th>
<th>Specification</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siu555.h</td>
<td></td>
<td>Includes for MPC555 internal SIU</td>
<td></td>
</tr>
<tr>
<td>Reg555.h</td>
<td></td>
<td>MPC555 internal register definitions</td>
<td>Like reg505.h</td>
</tr>
<tr>
<td>Uimb.h</td>
<td></td>
<td>Includes for MPC555 internal U2IMB interface</td>
<td>Required for irqs and speed control</td>
</tr>
<tr>
<td>Sram555.h</td>
<td></td>
<td>Includes for MPC555 internal SRAM</td>
<td>Required for access control and internal definitions</td>
</tr>
<tr>
<td>QSMCM.h</td>
<td></td>
<td>Includes for MPC555 internal serial interface</td>
<td></td>
</tr>
</tbody>
</table>

#### C-source files

<table>
<thead>
<tr>
<th>Filename</th>
<th>Directory</th>
<th>Specification</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
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