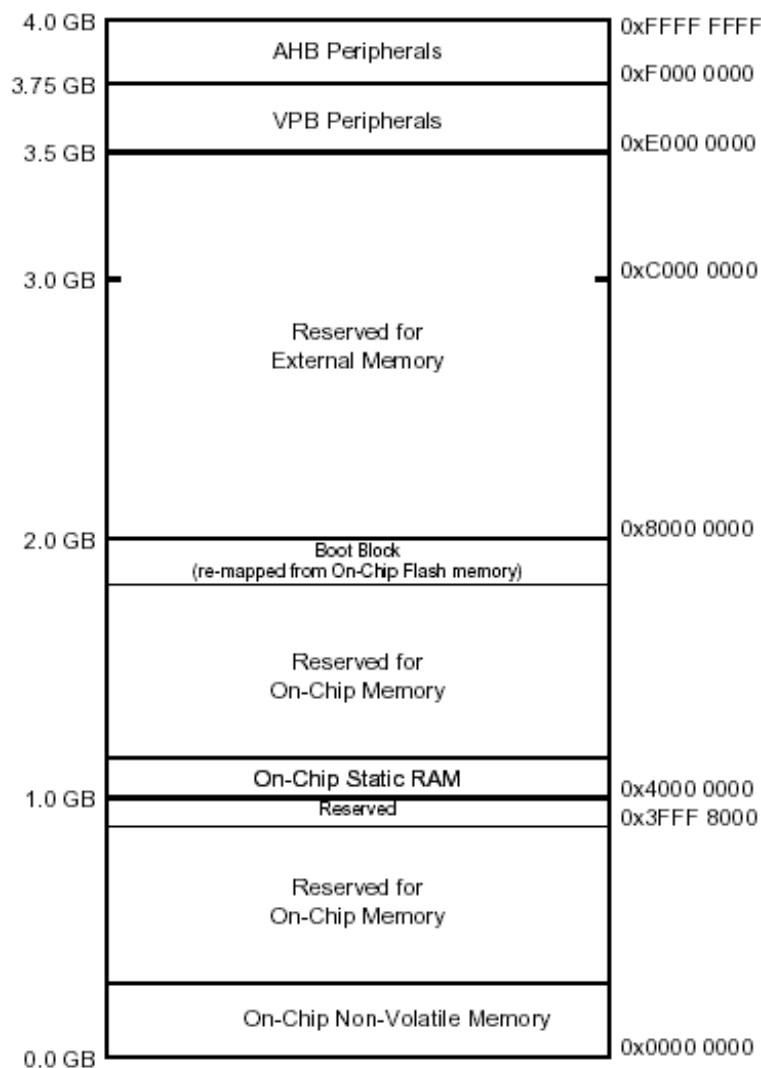


Reset Behaviour, Memory Layout and Remapping of LPC2000 Microcontrollers

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Like all other ARM7 microcontrollers, the vector table of the LPC2000 is located at address 0. After reset the, CPU begins to execute the instruction at the first vector, located at the base of the table.

The original memory layout of the LPC2000 controllers is shown in the following figure:



The size of the internal non-volatile memory (FLASH) and the static RAM depends on the derivative, as well as the ability to connect an external memory device.

The LPC2000 microcontrollers have several boot modes which have to be taken into account during the development of an application. To perform these capabilities the last sector of the internal FLASH includes a boot program that is executed after each reset. This last sector is remapped below address 0x8000 0000 and after reset also appears as the first 0x40 bytes at address 0 to give the CPU a valid vector table.

This boot program is able to

1. perform FLASH programming using an internal serial port (ISP)
2. switch to the user application located in the internal FLASH

The details of the ISP are described in the section "FLASH Memory System and Programming" in the LPC2000 user manuals.

The switch to the user application in FLASH is done automatically if the checksum of the vector table shown in the following table in the internal FLASH is zero.

Address	Exception
0x0000 0000	Reset
0x0000 0004	Undefined instruction
0x0000 0008	Software interrupt
0x0000 000C	Prefetch abort (instruction fetch memory fault)
0x0000 0010	Data abort (data access memory fault)
0x0000 0014	Reserved *
0x0000 0018	IRQ
0x0000 001C	FIQ

Table 1 Vector table

A user application in the FLASH to be executed after reset automatically by the boot program must have the 2's complement of the rest of the vectors at address 0x14 (the reserved vector).

It is recommended to build the vector table in such a way that the addresses of the branches are located in the address range 0x20 to 0x3C, as in the following example:

```

0x00 Vectors:    LDR    PC, Reset_Addr
0x04           LDR    PC, Undef_Addr
0x08           LDR    PC, SWI_Addr
0x0C           LDR    PC, PAbt_Addr
0x10           LDR    PC, DAbt_Addr
0x14           DCD    0xB9205F80 /* Reserved Vector with 2s complement */
0x18           LDR    PC, [PC, #-0xFF0] /* Vector from VICVectAddr */
0x1c           LDR    PC, FIQ_Addr

0x20 Reset_Addr: .word  Reset_Handler
0x24 Undef_Addr: .word  Undef_Handler
0x28 SWI_Addr:   .word  SWI_Handler
0x2C PAbt_Addr:  .word  PAbt_Handler
0x30 DAbt_Addr:  .word  DAbt_Handler
0x34           .word  0 /* not used */
0x38 IRQ_Addr:   .word  IRQ_Handler /* probably not used */
0x3C FIQ_Addr:   .word  FIQ_Handler

```

The IRQ vector entry at address 0x18 is quite tricky because the vectored interrupt controller puts the address of the current interrupt routine in the VICVectAddr register at address 0xFFFF030. Since the PC is incremented to 0x20 at the execution of the LDR instruction at address 0x18, the PC's relative location [PC, #-FF0] is the VICVectAddr register (0xFFFF030).

The current remapping of the first 0x40 bytes is displayed and can be changed in the MEMMAP register in the System Control Block. The bits 0 and 1 of this register define the map mode according to the following table:

Bit 1	Bit 0	Mode
0	0	Boot loader mode Vectors are remapped from boot block
0	1	User FLASH mode Vectors are remapped from internal FLASH
1	0	User RAM mode Vectors are remapped from internal RAM
1	1	User external mode Vectors are remapped from external memory (only valid at devices with external memory)

Table 2 MEMMAP register - Map mode definition

During the debugging with a JTAG debugging tool like Tantino or Tanto, this mode can also be selected manually in HiTOP using the SFR windows or via a HiSCRIPT command, which can be executed automatically when loading the project.

The projects delivered with the HiTOP installation execute this mode settings automatically with the project start and when clicking on the RESET_APPL icon in HiTOP's toolbar.

If you have any questions about developing applications with the LPC2000 microcontroller family, please don't hesitate to contact ARM@hitex.de.