5.9.3. Flash Memory Commands

5.9.3.1. cp - memory copy

```
=> help cp
cp - memory copy

Usage:
cp [.b, .w, .1] source target count
=> help cp
cp - memory copy

Usage:
cp [.b, .w, .1] source target count
=>
```

The cp command "knows" about flash memory areas and will automatically invoke the necessary flash programming algorithm when the target area is in flash memory.

```
=> cp.b 0x100000 0xFF900000 0x40000
Copy to Flash... done
=>
```

Mriting to flash memory may fail when the target area has not been erased (see erase below), or if it is write-protected (see protect below).

```
=> cp.b 0x100000 0xFF900000 0x40000
Copy to Flash... Can't write to protected Flash sectors
=>
```

Remember that the *count* argument specifies the number of items to copy. If you have a "length" instead (= byte count) you should use cp.b or you will have to calculate the correct number of items.

5.9.3.2. flinfo - print FLASH memory information

The command flinfo (short: fli) can be used to get information about the available flash memory. The number of flash banks is printed with information about the size and organization into flash "sectors" or *erase units*. For all sectors the start addresses are printed; write-protected sectors are marked as read-only (RO). Some configurations of U-Boot also mark empty sectors with an (E).

Bank # 1: CFI conformant FLASH (16 x 16) Size: 64 MB in 512 Sectors

AMD Standard command set, Manufacturer ID: 0x01, Device ID: 0x227E

Erase timeout: 16384 ms, write timeout: 2 ms

Buffer write timeout: 5 ms, buffer size: 32 bytes

FC000000		FC020000		FC040000	FC0600	000	FC08000	0	
FC0A0000		FC0C0000		FC0E0000	FC1000	000	FC12000	0	
FC140000		FC160000		FC180000	FC1A00	000	FC1C000	0 E	
FC1E0000		FC200000		FC220000	FC2400	000	FC26000	0	
FC280000		FC2A0000		FC2C0000	FC2E00	000	FC30000	0	
FC320000		FC340000		FC360000	FC3800	000	FC3A000	0	
FC3C0000	E	FC3E0000	Ε	FC400000	E	FC42000	00 E	FC440000	Ε
FC460000	E	FC480000	Ε	FC4A0000	E	FC4C000	00 E	FC4E0000	Ε
FC500000	E	FC520000	Ε	FC540000	E	FC56000	00 E	FC580000	Ε
FC5A0000	E	FC5C0000	Ε	FC5E0000	E	FC60000	00 E	FC620000	Ε
FC640000	Ε	FC660000	Ε	FC680000	E	FC6A000	00 E	FC6C0000	Ε
FC6E0000	Ε	FC700000	Ε	FC720000	E	FC74000	00 E	FC760000	Ε
FC780000	E	FC7A0000	Ε	FC7C0000	E	FC7E000	00 E	FC800000	Ε
FC820000	E	FC840000	Ε	FC860000	E	FC88000	00 E	FC8A0000	Ε
FC8C0000	E	FC8E0000	Ε	FC900000	E	FC92000	00 E	FC940000	Ε
FC960000	E	FC980000	Ε	FC9A0000	E	FC9C000	00 E	FC9E0000	Ε
FCA00000	E	FCA20000	Ε	FCA40000	E	FCA6000	00 E	FCA80000	Ε
FCAA0000	E	FCAC0000	Ε	FCAE0000	E	FCB0000	00 E	FCB20000	Ε
FCB40000	Ε	FCB60000	Ε	FCB80000	E	FCBA000	00 E	FCBC0000	Ε
FCBE0000	E	FCC00000	Ε	FCC20000	E	FCC4000	00 E	FCC60000	Ε
FCC80000	E	FCCA0000	Ε	FCCC0000	E	FCCE000	00 E	FCD00000	Ε
FCD20000	E	FCD40000	Ε	FCD60000	E	FCD8000	00 E	FCDA0000	Ε
FCDC0000	E	FCDE0000	Ε	FCE00000	E	FCE2000	00 E	FCE40000	Ε
FCE60000	Ε	FCE80000	Ε	FCEA0000	E	FCEC000	00 E	FCEE0000	Ε
FCF00000	E	FCF20000	Ε	FCF40000	E	FCF6000	00 E	FCF80000	Ε
FCFA0000	E	FCFC0000	Ε	FCFE0000	E	FD00000	00 E	FD020000	Ε
FD040000	E	FD060000	Ε	FD080000	E	FD0A000	00 E	FD0C0000	Ε
FD0E0000	E	FD100000	Ε	FD120000	E	FD14000	00 E	FD160000	Ε
FD180000	E	FD1A0000	Ε	FD1C0000	E	FD1E000	00 E	FD200000	Ε

FD220000	E	FD240000	E	FD260000	E	FD280000	E	FD2A0000	Ε
FD2C0000	E	FD2E0000	E	FD300000	E	FD320000	E	FD340000	E
FD360000	E	FD380000	E	FD3A0000	E	FD3C0000	E	FD3E0000	Ε
FD40000	E	FD420000	E	FD440000	E	FD460000	E	FD480000	Ε
FD4A0000	E	FD4C0000	E	FD4E0000	E	FD500000	E	FD520000	Ε
FD540000	E	FD560000	E	FD580000	E	FD5A0000	E	FD5C0000	Ε
FD5E0000	E	FD600000		FD620000 E		FD640000 E		FD660000 E	
FD680000	E	FD6A0000	E	FD6C0000	E	FD6E0000	E	FD700000	E
FD720000	E	FD740000	E	FD760000	E	FD780000	E	FD7A0000	Ε
FD7C0000	E	FD7E0000	E	FD800000	E	FD820000	E	FD840000	Ε
FD860000	E	FD880000	E	FD8A0000	E	FD8C0000	E	FD8E0000	Ε
FD900000	E	FD920000	E	FD940000	E	FD960000	E	FD980000	E
FD9A0000	E	FD9C0000	E	FD9E0000	E	FDA00000	E	FDA20000	Ε
FDA40000	E	FDA60000	E	FDA80000	E	FDAA0000	E	FDAC0000	Ε
FDAE0000	E	FDB00000	E	FDB20000	E	FDB40000	E	FDB60000	Ε
FDB80000	E	FDBA0000	E	FDBC0000	E	FDBE0000	E	FDC00000	E
FDC20000	E	FDC40000	E	FDC60000	E	FDC80000	E	FDCA0000	E
FDCC0000	E	FDCE0000	E	FDD00000	E	FDD20000	E	FDD40000	E
FDD60000	E	FDD80000	E	FDDA0000	E	FDDC0000	E	FDDE0000	E
FDE00000	E	FDE20000	E	FDE40000	E	FDE60000	E	FDE80000	E
FDEA0000	E	FDEC0000	E	FDEE0000	E	FDF00000	E	FDF20000	E
FDF40000	E	FDF60000	E	FDF80000	E	FDFA0000	E	FDFC0000	E
FDFE0000	E	FE000000	E	FE020000	E	FE040000	E	FE060000	E
FE080000	E	FE0A0000	E	FE0C0000	E	FE0E0000	E	FE100000	E
FE120000	E	FE140000	E	FE160000	E	FE180000	E	FE1A0000	E
FE1C0000	E	FE1E0000	E	FE200000	E	FE220000	E	FE240000	E
FE260000	E	FE280000	E	FE2A0000	E	FE2C0000	E	FE2E0000	E
FE300000	E	FE320000	E	FE340000	E	FE360000	E	FE380000	E
FE3A0000	E	FE3C0000	E	FE3E0000	E	FE400000	E	FE420000	E
FE440000	E	FE460000	E	FE480000	E	FE4A0000	E	FE4C0000	E
FE4E0000	E	FE500000	E	FE520000	E	FE540000	E	FE560000	E
FE580000	E	FE5A0000	E	FE5C0000	E	FE5E0000	E	FE600000	E
FE620000	E	FE640000	E	FE660000	E	FE680000	E	FE6A0000	E
FE6C0000	E	FE6E0000	E	FE700000	E	FE720000	E	FE740000	Ε
FE760000	E	FE780000	E	FE7A0000	E	FE7C0000	E	FE7E0000	E
FE800000	E	FE820000	E	FE840000	E	FE860000	E	FE880000	Ε

FE8A0000	E	FE8C0000	E	FE8E0000	E	FE900000	E	FE920000	E
FE940000	E	FE960000	E	FE980000	E	FE9A0000	E	FE9C0000	E
FE9E0000	E	FEA00000	E	FEA20000	E	FEA40000	E	FEA60000	E
FEA80000	E	FEAA0000	E	FEAC0000	E	FEAE0000	E	FEB00000	E
FEB20000	E	FEB40000	E	FEB60000	E	FEB80000	E	FEBA0000	E
FEBC0000	E	FEBE0000	E	FEC00000	E	FEC20000	E	FEC40000	E
FEC60000	E	FEC80000	E	FECA0000	E	FECC0000	E	FECE0000	E
FED00000	E	FED20000	E	FED40000	E	FED60000	E	FED80000	E
FEDA0000	E	FEDC0000	E	FEDE0000	E	FEE00000	E	FEE20000	Ε
FEE40000	E	FEE60000	E	FEE80000	E	FEEA0000	E	FEEC0000	E
FEEE0000	E	FEF00000	E	FEF20000	E	FEF40000	E	FEF60000	E
FEF80000	E	FEFA0000	E	FEFC0000	E	FEFE0000	E	FF000000	E
FF020000	E	FF040000	E	FF060000	E	FF080000	E	FF0A0000	E
FF0C0000	E	FF0E0000	E	FF100000	E	FF120000	E	FF140000	E
FF160000	E	FF180000	E	FF1A0000	E	FF1C0000	E	FF1E0000	E
FF200000	E	FF220000	E	FF240000	E	FF260000	E	FF280000	E
FF2A0000	E	FF2C0000	E	FF2E0000	E	FF300000	E	FF320000	E
FF340000	E	FF360000	E	FF380000	E	FF3A0000	E	FF3C0000	E
FF3E0000	E	FF400000	E	FF420000	E	FF440000	E	FF460000	E
FF480000	E	FF4A0000	E	FF4C0000	E	FF4E0000	E	FF500000	E
FF520000	E	FF540000	E	FF560000	E	FF580000	E	FF5A0000	E
FF5C0000	E	FF5E0000	E	FF600000	E	FF620000	E	FF640000	E
FF660000	E	FF680000	E	FF6A0000	E	FF6C0000	E	FF6E0000	E
FF700000	E	FF720000	E	FF740000	E	FF760000	E	FF780000	E
FF7A0000	E	FF7C0000	E	FF7E0000	E	FF800000	E	FF820000	E
FF840000	E	FF860000	E	FF880000	E	FF8A0000	E	FF8C0000	E
FF8E0000	E	FF900000	E	FF920000	E	FF940000	E	FF960000	E
FF980000	E	FF9A0000	E	FF9C0000	E	FF9E0000	E	FFA00000	E
FFA20000	E	FFA40000	E	FFA60000	E	FFA80000	E	FFAA0000	E
FFAC0000	E	FFAE0000	E	FFB00000	E	FFB20000	E	FFB40000	E
FFB60000	E	FFB80000	E	FFBA0000	E	FFBC0000	E	FFBE0000	E
FFC00000	E	FFC20000	E	FFC40000	E	FFC60000	E	FFC80000	E
FFCA0000	E	FFCC0000	E	FFCE0000	E	FFD00000	E	FFD20000	E
FFD40000	E	FFD60000	E	FFD80000	E	FFDA0000	E	FFDC0000	E
FFDE0000	E	FFE00000	E	FFE20000	E	FFE40000	E	FFE60000	E
FFE80000	E	FFEA0000	E	FFEC0000	E	FFEE0000	E	FFF00000	E

```
FFF20000 E FFF40000 E FFF60000 RO FFF80000 RO FFFA0000 RO

FFFC0000 RO FFFE0000 RO
```

5.9.3.3. erase - erase FLASH memory

```
=> help era
erase - erase FLASH memory

Usage:
erase start end
    - erase FLASH from addr 'start' to addr 'end'
erase start +len
    - erase FLASH from addr 'start' to the end of sect w/addr 'start'+'len'-1
erase N:SF[-SL]
    - erase sectors SF-SL in FLASH bank # N
erase bank N
    - erase FLASH bank # N
erase all
    - erase all FLASH banks
```

The erase command (short: era) is used to erase the contents of one or more sectors of the flash memory. It is one of the more complex commands; the help output shows this.

Probably the most frequent usage of this command is to pass the start and end addresses of the area to be erased:

```
=> era 0xFF900000 0xFF95FFFF

... done
Erased 3 sectors
=>
```

⚠ Note that both the start and end addresses for this command must point **exactly** at the start resp. end addresses of flash sectors. Otherwise the command will not be executed.

Another way to select certain areas of the flash memory for the erase command uses the notation of flash *banks* and *sectors*:

Technically speaking, a *bank* is an area of memory implemented by one or more memory chips that are connected to the same *chip select* signal of the <u>CPU</u>, and a flash *sector* or *erase unit* is the smallest area that can be erased in one operation.

For practical purposes it is sufficient to remember that with flash memory a bank is something that eventually may be erased as a whole in a single operation. This may be more efficient (faster) than erasing the same area sector by sector.

[It depends on the actual type of flash chips used on the board if such a fast bank erase algorithm exists, and on the implementation of the flash device driver if is actually used.]

In U-Boot, flash banks are numbered starting with 1, while flash sectors start with 0.

To erase the same flash area as specified using start and end addresses in the example above you could also type:

```
=> era 1:455-456

Erase Flash Sectors 455-456 in Bank # 1
.. done
=>
```

To erase a whole bank of flash memory you can use a command like this one:

① Note that a warning message is printed because some write protected sectors exist in this flash bank which were not erased.

With the command:

the whole flash memory (except for the write-protected sectors) can be erased.

5.9.3.4. protect - enable or disable FLASH write protection

```
=> help protect
protect - enable or disable FLASH write protection
Usage:
protect on start end
    - protect FLASH from addr 'start' to addr 'end'
protect on start +len
    - protect FLASH from addr 'start' to end of sect w/addr 'start'+'len'-1
protect on N:SF[-SL]
    - protect sectors SF-SL in FLASH bank # N
protect on bank N
    - protect FLASH bank # N
protect on all
    - protect all FLASH banks
protect off start end
    - make FLASH from addr 'start' to addr 'end' writable
protect off start +len
    - make FLASH from addr 'start' to end of sect w/addr 'start'+'len'-1 wrtable
protect off N:SF[-SL]
    - make sectors SF-SL writable in FLASH bank # N
protect off bank N
    - make FLASH bank # N writable
protect off all
    - make all FLASH banks writable
=>
```

The protect command is another complex one. It is used to set certain parts of the flash memory to read-only mode or to make them writable again. Flash memory that is "protected" (= read-only) cannot be written (with the \mbox{cp} command) or erased (with the erase command). Protected areas are marked as (RO) (for "read-only") in the output of the flinfo command:

```
=> fli

Bank # 1: CFI conformant FLASH (16 x 16) Size: 64 MB in 512 Sectors
```

AMD Standard command set, Manufacturer ID: 0x01, Device ID: 0x227E

Erase timeout: 16384 ms, write timeout: 2 ms

Buffer write timeout: 5 ms, buffer size: 32 bytes

1 1 1 1	FC000000 E FC0A0000 E FC140000 E FC1E0000 E FC280000 E FC320000 E FC3C0000 E	FC020000 FC160000 FC200000 FC2A0000 FC340000 FC3E0000	E E E	FC040000 FC0E00000 FC180000 FC220000 FC2C0000	E E	FC100000 FC1A0000 FC240000	E E	FC120000 FC1C0000 FC260000	E E
1 1 1	FC140000 E FC1E0000 E FC280000 E FC320000 E	FC160000 FC200000 FC2A0000 FC340000	E E	FC180000 FC220000	E E	FC1A0000	E	FC1C0000	E
1	FC1E0000 E FC280000 E FC320000 E FC3C0000 E	FC200000 FC2A0000 FC340000	E E	FC220000	E				
]	FC280000 E FC320000 E FC3C0000 E	FC2A0000	E			FC240000	E	EC360000	
]	FC320000 E	FC340000		FC2C0000	E			10200000	E
	FC3C0000 E		E		_	FC2E0000	E	FC300000	E
]		FC3E0000		FC360000	E	FC380000	E	FC3A0000	E
	FC460000 E		E	FC400000	E	FC420000	E	FC440000	E
]		FC480000	E	FC4A0000	E	FC4C0000	E	FC4E0000	E
]	FC500000 E	FC520000	E	FC540000	E	FC560000	E	FC580000	E
]	FC5A0000 E	FC5C0000	E	FC5E0000	E	FC600000	E	FC620000	E
]	FC640000 E	FC660000	E	FC680000	E	FC6A0000	E	FC6C0000	E
]	FC6E0000 E	FC700000	E	FC720000	E	FC740000	E	FC760000	E
]	FC780000 E	FC7A0000	E	FC7C0000	E	FC7E0000	E	FC800000	E
]	FC820000 E	FC840000	E	FC860000	E	FC880000	E	FC8A0000	E
]	FC8C0000 E	FC8E0000	E	FC900000	E	FC920000	E	FC940000	E
]	FC960000 E	FC980000	E	FC9A0000	E	FC9C0000	E	FC9E0000	E
]	FCA00000 E	FCA20000	E	FCA40000	E	FCA60000	E	FCA80000	E
]	FCAA0000 E	FCAC0000	E	FCAE0000	E	FCB00000	E	FCB20000	E
]	FCB40000 E	FCB60000	E	FCB80000	E	FCBA0000	E	FCBC0000	E
]	FCBE0000 E	FCC00000	E	FCC20000	E	FCC40000	E	FCC60000	E
]	FCC80000 E	FCCA0000	E	FCCC0000	E	FCCE0000	E	FCD00000	E
]	FCD20000 E	FCD40000	E	FCD60000	E	FCD80000	E	FCDA0000	E
]	FCDC0000 E	FCDE0000	E	FCE00000	E	FCE20000	E	FCE40000	Ε
]	FCE60000 E	FCE80000	E	FCEA0000	E	FCEC0000	E	FCEE0000	E
]	FCF00000 E	FCF20000	E	FCF40000	E	FCF60000	E	FCF80000	E
]	FCFA0000 E	FCFC0000	E	FCFE0000	E	FD000000	E	FD020000	E
]	FD040000 E	FD060000	E	FD080000	E	FD0A0000	E	FD0C0000	E
]	FD0E0000 E	FD100000	E	FD120000	E	FD140000	E	FD160000	E
]	FD180000 E	FD1A0000	E	FD1C0000	E	FD1E0000	E	FD200000	E
]	FD220000 E	FD240000	E	FD260000	E	FD280000	E	FD2A0000	Ε
]	FD2C0000 E	FD2E0000	E	FD300000	E	FD320000	E	FD340000	Ε

FD360000	E	FD380000	E	FD3A0000	E	FD3C0000	E	FD3E0000	E
FD40000	E	FD420000	E	FD440000	E	FD460000	E	FD480000	E
FD4A0000	E	FD4C0000	E	FD4E0000	E	FD500000	E	FD520000	E
FD540000	E	FD560000	E	FD580000	E	FD5A0000	E	FD5C0000	E
FD5E0000	E	FD600000	E	FD620000	E	FD640000	E	FD660000	E
FD680000	E	FD6A0000	E	FD6C0000	E	FD6E0000	E	FD700000	E
FD720000	E	FD740000	E	FD760000	E	FD780000	E	FD7A0000	E
FD7C0000	E	FD7E0000	E	FD800000	E	FD820000	E	FD840000	E
FD860000	E	FD880000	E	FD8A0000	E	FD8C0000	E	FD8E0000	E
FD900000	E	FD920000	E	FD940000	E	FD960000	E	FD980000	E
FD9A0000	E	FD9C0000	E	FD9E0000	E	FDA00000	E	FDA20000	E
FDA40000	E	FDA60000	E	FDA80000	E	FDAA0000	E	FDAC0000	E
FDAE0000	E	FDB00000	E	FDB20000	E	FDB40000	E	FDB60000	E
FDB80000	E	FDBA0000	E	FDBC0000	E	FDBE0000	E	FDC00000	E
FDC20000	E	FDC40000	E	FDC60000	E	FDC80000	E	FDCA0000	E
FDCC0000	E	FDCE0000	E	FDD00000	E	FDD20000	E	FDD40000	E
FDD60000	E	FDD80000	E	FDDA0000	E	FDDC0000	E	FDDE0000	E
FDE00000	E	FDE20000	E	FDE40000	E	FDE60000	E	FDE80000	E
FDEA0000	E	FDEC0000	E	FDEE0000	E	FDF00000	E	FDF20000	E
FDF40000	E	FDF60000	E	FDF80000	E	FDFA0000	E	FDFC0000	E
FDFE0000	E	FE000000	E	FE020000	E	FE040000	E	FE060000	E
FE080000	E	FE0A0000	E	FE0C0000	E	FE0E0000	E	FE100000	E
FE120000	E	FE140000	E	FE160000	E	FE180000	E	FE1A0000	E
FE1C0000	E	FE1E0000	E	FE200000	E	FE220000	E	FE240000	E
FE260000	E	FE280000	E	FE2A0000	E	FE2C0000	E	FE2E0000	E
FE300000	E	FE320000	E	FE340000	E	FE360000	E	FE380000	E
FE3A0000	E	FE3C0000	E	FE3E0000	E	FE400000	E	FE420000	E
FE440000	E	FE460000	E	FE480000	E	FE4A0000	E	FE4C0000	E
FE4E0000	E	FE500000	E	FE520000	E	FE540000	E	FE560000	Ε
FE580000	E	FE5A0000	E	FE5C0000	E	FE5E0000	E	FE600000	E
FE620000	E	FE640000	E	FE660000	E	FE680000	E	FE6A0000	E
FE6C0000	E	FE6E0000	E	FE700000	E	FE720000	E	FE740000	E
FE760000	E	FE780000	E	FE7A0000	Е	FE7C0000	E	FE7E0000	E
FE800000	E	FE820000	E	FE840000	E	FE860000	E	FE880000	E
FE8A0000	E	FE8C0000	E	FE8E0000	E	FE900000	E	FE920000	E
FE940000	E	FE960000	E	FE980000	E	FE9A0000	E	FE9C0000	E

FE9E0000	E	FEA00000	E	FEA20000	E	FEA40000	E	FEA600	000 E	
FEA80000	E	FEAA0000	E	FEAC0000	E	FEAE0000	E	FEB000	000 E	
FEB20000	E	FEB40000	E	FEB60000	E	FEB80000	E	FEBA00	000 E	
FEBC0000	E	FEBE0000	E	FEC00000	E	FEC20000	E	FEC400	000 E	
FEC60000	E	FEC80000	E	FECA0000	E	FECC0000	E	FECE 00	000 E	
FED00000	E	FED20000	E	FED40000	E	FED60000	E	FED800	000 E	
FEDA0000	E	FEDC0000	E	FEDE0000	E	FEE00000	E	FEE200	000 E	
FEE40000	E	FEE60000	E	FEE80000	E	FEEA0000	E	FEEC00	000 E	
FEEE0000	E	FEF00000	E	FEF20000	E	FEF40000	E	FEF600	000 E	
FEF80000	E	FEFA0000	E	FEFC0000	E	FEFE0000	E	FF0000	000 E	
FF020000	E	FF040000	E	FF060000	E	FF080000	E	FF0A00	000 E	
FF0C0000	E	FF0E0000	E	FF100000	E	FF120000	E	FF1400	000 E	
FF160000	E	FF180000	E	FF1A0000	E	FF1C0000	E	FF1E00	000 E	
FF200000	E	FF220000	E	FF240000	E	FF260000	E	FF2800	000 E	
FF2A0000	E	FF2C0000	E	FF2E0000	E	FF300000	E	FF3200	000 E	
FF340000	E	FF360000	E	FF380000	E	FF3A0000	E	FF3C00	000 E	
FF3E0000	E	FF400000	E	FF420000	E	FF440000	E	FF4600	000 E	
FF480000	E	FF4A0000	E	FF4C0000	E	FF4E0000	E	FF5000	000 E	
FF520000	E	FF540000	E	FF560000	E	FF580000	E	FF5A00	000 E	
FF5C0000	E	FF5E0000	E	FF600000	E	FF620000	E	FF6400	000 E	
FF660000	E	FF680000	E	FF6A0000	E	FF6C0000	E	FF6E00	000 E	
FF700000	E	FF720000	E	FF740000	E	FF760000	E	FF7800	000 E	
FF7A0000	E	FF7C0000	E	FF7E0000	E	FF800000	E	FF8200	000 E	
FF840000	E	FF860000	E	FF880000	E	FF8A0000	E	FF8C00	000 E	
FF8E0000	E	FF900000	E	FF920000	E	FF940000	E	FF9600	000 E	
FF980000	E	FF9A0000	E	FF9C0000	E	FF9E0000	E	FFA000	000 E	
FFA20000	E	FFA40000	E	FFA60000	E	FFA80000	E	FFAA00	000 E	
FFAC0000	E	FFAE0000	E	FFB00000	E	FFB20000	E	FFB400	000 E	
FFB60000	E	FFB80000	E	FFBA0000	E	FFBC0000	E	FFBE00	000 E	
FFC00000	E	FFC20000	E	FFC40000	E	FFC60000	E	FFC800	000 E	
FFCA0000	E	FFCC0000	E	FFCE0000	E	FFD00000	E	FFD200	000 E	
FFD40000	E	FFD60000	E	FFD80000	E	FFDA0000	E	FFDC00	000 E	
FFDE0000	E	FFE00000	E	FFE20000	E	FFE40000	E	FFE600	000 E	
FFE80000	E	FFEA0000	E	FFEC0000	E	FFEE0000	E	FFF000	000 E	
FFF20000	E	FFF40000	E	FFF60000	RO	FFF800	000 I	RO	FFFA0000	RO
FFFC0000	RO	FFFE0	1 000	RO						

Protected 4 sectors

=> fli

Bank # 1: CFI conformant FLASH (16 x 16) Size: 64 MB in 512 Sectors

AMD Standard command set, Manufacturer ID: 0x01, Device ID: 0x227E

Erase timeout: 16384 ms, write timeout: 2 ms

Buffer write timeout: 5 ms, buffer size: 32 bytes

FC000000	E	FC020000	E	FC040000	E	FC060000	E	FC080000	E
FC0A0000	E	FC0C0000	E	FC0E0000	E	FC100000	E	FC120000	E
FC140000	E	FC160000	E	FC180000	E	FC1A0000	E	FC1C0000	E
FC1E0000	E	FC200000	E	FC220000	E	FC240000	E	FC260000	E
FC280000	E	FC2A0000	E	FC2C0000	E	FC2E0000	E	FC300000	E
FC320000	E	FC340000	E	FC360000	E	FC380000	E	FC3A0000	Ε
FC3C0000	E	FC3E0000	E	FC400000	E	FC420000	E	FC440000	Ε
FC460000	E	FC480000	E	FC4A0000	E	FC4C0000	E	FC4E0000	E
FC500000	E	FC520000	E	FC540000	E	FC560000	E	FC580000	E
FC5A0000	E	FC5C0000	E	FC5E0000	E	FC600000	E	FC620000	E
FC640000	E	FC660000	E	FC680000	E	FC6A0000	E	FC6C0000	Ε
FC6E0000	E	FC700000	E	FC720000	E	FC740000	E	FC760000	Ε
FC780000	E	FC7A0000	E	FC7C0000	E	FC7E0000	E	FC800000	Ε
FC820000	E	FC840000	E	FC860000	E	FC880000	E	FC8A0000	Ε
FC8C0000	E	FC8E0000	E	FC900000	E	FC920000	E	FC940000	Ε
FC960000	E	FC980000	E	FC9A0000	E	FC9C0000	E	FC9E0000	Ε
FCA00000	E	FCA20000	E	FCA40000	E	FCA60000	E	FCA80000	Ε
FCAA0000	E	FCAC0000	E	FCAE0000	E	FCB00000	E	FCB20000	Ε
FCB40000	E	FCB60000	E	FCB80000	E	FCBA0000	E	FCBC0000	Ε
FCBE0000	E	FCC00000	E	FCC20000	E	FCC40000	E	FCC60000	Ε
FCC80000	E	FCCA0000	E	FCCC0000	E	FCCE0000	E	FCD00000	Ε
FCD20000	E	FCD40000	E	FCD60000	E	FCD80000	E	FCDA0000	E
FCDC0000	E	FCDE0000	E	FCE00000	E	FCE20000	E	FCE40000	Ε
FCE60000	E	FCE80000	E	FCEA0000	E	FCEC0000	E	FCEE0000	Ε
FCF00000	E	FCF20000	E	FCF40000	E	FCF60000	E	FCF80000	E
FCFA0000	E	FCFC0000	E	FCFE0000	E	FD000000	E	FD020000	Ε

FD040000	E	FD060000	E	FD080000	E	FD0A0000	E	FD0C0000	E
FD0E0000	E	FD100000	E	FD120000	E	FD140000	E	FD160000	E
FD180000	E	FD1A0000	E	FD1C0000	E	FD1E0000	E	FD200000	E
FD220000	E	FD240000	E	FD260000	E	FD280000	E	FD2A0000	Ε
FD2C0000	E	FD2E0000	E	FD300000	E	FD320000	E	FD340000	E
FD360000	E	FD380000	E	FD3A0000	E	FD3C0000	E	FD3E0000	E
FD400000	E	FD420000	E	FD440000	E	FD460000	E	FD480000	E
FD4A0000	E	FD4C0000	E	FD4E0000	E	FD500000	E	FD520000	E
FD540000	E	FD560000	E	FD580000	E	FD5A0000	E	FD5C0000	E
FD5E0000	E	FD600000	E	FD620000	E	FD640000	E	FD660000	E
FD680000	E	FD6A0000	E	FD6C0000	E	FD6E0000	E	FD700000	E
FD720000	E	FD740000	E	FD760000	E	FD780000	E	FD7A0000	E
FD7C0000	E	FD7E0000	E	FD800000	E	FD820000	E	FD840000	E
FD860000	E	FD880000	E	FD8A0000	E	FD8C0000	E	FD8E0000	E
FD900000	E	FD920000	E	FD940000	E	FD960000	E	FD980000	E
FD9A0000	E	FD9C0000	E	FD9E0000	E	FDA00000	E	FDA20000	E
FDA40000	E	FDA60000	E	FDA80000	E	FDAA0000	E	FDAC0000	E
FDAE0000	E	FDB00000	E	FDB20000	E	FDB40000	E	FDB60000	E
FDB80000	E	FDBA0000	E	FDBC0000	E	FDBE0000	E	FDC00000	E
FDC20000	E	FDC40000	E	FDC60000	E	FDC80000	E	FDCA0000	E
FDCC0000	E	FDCE0000	E	FDD00000	E	FDD20000	E	FDD40000	E
FDD60000	E	FDD80000	E	FDDA0000	E	FDDC0000	E	FDDE0000	E
FDE00000	E	FDE20000	E	FDE40000	E	FDE60000	E	FDE80000	E
FDEA0000	E	FDEC0000	E	FDEE0000	E	FDF00000	E	FDF20000	E
FDF40000	E	FDF60000	E	FDF80000	E	FDFA0000	E	FDFC0000	E
FDFE0000	E	FE000000	E	FE020000	E	FE040000	E	FE060000	E
FE080000	E	FE0A0000	E	FE0C0000	E	FE0E0000	E	FE100000	E
FE120000	E	FE140000	E	FE160000	E	FE180000	E	FE1A0000	E
FE1C0000	E	FE1E0000	E	FE200000	E	FE220000	E	FE240000	E
FE260000	E	FE280000	E	FE2A0000	E	FE2C0000	E	FE2E0000	E
FE300000	E	FE320000	E	FE340000	E	FE360000	E	FE380000	E
FE3A0000	E	FE3C0000	E	FE3E0000	E	FE400000	E	FE420000	E
FE440000	E	FE460000	E	FE480000	Е	FE4A0000	E	FE4C0000	E
FE4E0000	E	FE500000	E	FE520000	E	FE540000	E	FE560000	E
FE580000	E	FE5A0000	E	FE5C0000	E	FE5E0000	E	FE600000	E
FE620000	E	FE640000	E	FE660000	E	FE680000	E	FE6A0000	E

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FERSONOU E	FERROROUS FERR	FE6C0000	E	FE6E0000	E	FE700000	E	FE720000	E	FE740000	E	
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FE940000 E FE960000 E FE960000 E FE960000 E FE960000 E FE990000 E FEA00000 E FEB00000 E FEB20000 E FE940000 E FE860000 E FE860000 E FE860000 E FEG00000 E FE060000 E FE000000 E FE000000 E FE000000 E FED00000 E FED00000 E FE000000 E FE000000 E FE000000 E FED00000 E FED00000 E FE000000 E FE000000 E FE000000 E FEE00000 E FE000000 E FE000000 E FE000000 E FE000000 E FEE00000 E FE000000 E FE000000 E FE000000 E FE000000 E FEE00000 E FE000000 E FE000000 E FE000000 E FE000000 E FEF00000 E FF000000 E FEF00000 E FEF00000 E FEF00000 E FEF00000 E FF000000 E FEF00000 E FF000000 E	FE940000 R	FE800000	E	FE820000	E	FE840000	E	FE860000	E	FE880000	Е	
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FEBROUND E	FERROUGO E	FE940000	E	FE960000	E	FE980000	E	FE9A0000	E	FE9C0000	E	
FEB20000 E FEB40000 E FEC00000 E FEC00000 E FEC40000 E FEC60000 E FEC50000 E FEC00000 E FEC40000 E FEC60000 E FEC50000 E FEC40000 E FEC40000 E FEC60000 E FEC50000 E FEC40000 E FEC60000 E FEC60000 E FED00000 E FED20000 E FED40000 E FED60000 E FED60000 E FED40000 E FED00000 E FED60000 E FEE60000 E FEE60000 E FEE60000 E FEF60000 E FF700000 E FF700000 E FEF60000 E FF700000 E FF000000 E FF700000 E FF000000 E FF700000 E FF000000 E	FERENCOOO E FERENCOOO E FECONOO E FEONOOO E FE	FE9E0000	E	FEA00000	E	FEA20000	E	FEA40000	E	FEA60000	E	
FEBCOUOU E FEBCOUOU E FECCOUOU E FEDOCOUOU E FEECOUOU E FEFCOUOU E FEF	FEBCOUOU E FEBCOUOU E FECANOOU E	FEA80000	E	FEAA0000	E	FEAC0000	E	FEAE0000	E	FEB00000	E	
FEC60000 E FEC80000 E FEC80000 E FEC80000 E FEC80000 E FED00000 E FED20000 E FED40000 E FED60000 E FED80000 E FEDA0000 E FEDC0000 E FED80000 E FED80000 E FEDA0000 E FED60000 E FED80000 E FED80000 E FED80000 E FED90000 E FED90000 E FED80000 E FED80000 E FEF90000 E FED90000 E FED90000 E FED90000 E FED90000 E FED90000 E FED90000 E FF000000 E FF00000 E FF00000 E FF120000 E FF140000 E FF000000 E FF180000 E FF100000 E FF120000 E FF140000 E FF100000 E FF180000 E FF140000 E FF120000 E FF140000 E FF200000 E FF220000 E FF240000 E FF260000 E FF280000 E FF240000 E FF260000 E FF240000 E FF280000 E FF240000 E FF260000 E FF240000 E FF300000 E FF380000 E FF360000 E FF380000 E FF300000 E FF380000 E FF440000 E FF360000 E FF40000 E FF360000 E FF300000 E FF360000 E FF360000 E FF300000 E FF300000 E FF360000 E FF30000 E FF300000 E FF300000 E FF360000 E FF30000 E FF300000 E FF300	FEC60000 E FEC80000 E FEC40000 E FEC60000 E FEC60000 E FEC80000 E FED80000 E	FEB20000	E	FEB40000	E	FEB60000	E	FEB80000	E	FEBA0000	E	
FEDOUDOU E FEDOUDOU E FEDAUDOU E FERAUDOU E FERAUDOU E FEFAUDOU E FEEROUDO E FEFAUDOU E FFOCODOU E FEFAUDOU E FEFAUDOU E FEFAUDOU E FFAUDOU E FEFAUDOU E FEFAUDOU E FEFAUDOU E FFAUDOU E FEFAUDOU E FEFAUDOU E FEFAUDOU E FFAUDOU E FFAUDOU E FEFAUDOU E FEFAUDOU E FFAUDOU E FFA	FEDOUGO E FEDOUG	FEBC0000	E	FEBE0000	E	FEC00000	E	FEC20000	E	FEC40000	E	
FEDAOOOO E FEDCOOOO E FEDEOOOO E FEEDOOOO E FEEDOOOO E FEE40000 E FEE60000 E FEE60000 E FEECOOOO E FEE60000 E FEF60000 E FEF20000 E FEF40000 E FEF60000 E FEF60000 E FEFA0000 E FEF20000 E FEF60000 E FF000000 E FF020000 E FF040000 E FF060000 E FF080000 E FF000000 E FF020000 E FF080000 E FF100000 E FF100000 E FF140000 E FF160000 E FF180000 E FF100000 E FF120000 E FF140000 E FF200000 E FF20000 E FF240000 E FF260000 E FF280000 E FF240000 E FF260000 E FF240000 E FF300000 E FF320000 E FF340000 E FF360000 E FF380000 E FF300000 E FF300000 E FF360000 E FF400000 E FF400000 E FF40000 E FF460000 E FF480000 E FF400000 E FF400000 E FF40000 E FF500000 E FF500000 E FF500000 E FF600000 E FF600000 E FF500000 E FF500000 E FF500000 E FF600000 E FF600000 E FF600000 E FF500000 E FF700000 E FF600000 E FF600000 E FF600000 E FF700000 E FF700000 E FF700000 E FF600000 E FF600000 E FF700000 E FF800000 E FF700000 E FF700000 E FF700000 E FF800000 E FF800000 E FF700000 E FF700000 E FF700000 E FF800000 E FF800000 E FF700000 E FF700000 E FF700000 E FF800000 E FF800000 E FF700000 E FF700000 E FF700000 E FF800000 E FF800000 E FF800000 E FF900000 E FF900000 E FF800000 E FF800000 E FF900000 E FF800000 E FF800000 E FF800000 E FF900000 E FF800000 E FF8	FEDA0000 E FEDCO000 E FEDEO000 E FEDO0000 E FEDEO0000	FEC60000	E	FEC80000	E	FECA0000	E	FECC0000	E	FECE0000	E	
FEE40000 E FEE60000 E FEE80000 E FEE40000 E FEE60000 E FEE60000 E FEF00000 E FEF20000 E FEF40000 E FEF60000 E FEF60000 E FEF40000 E FEF60000 E FEF60000 E FF020000 E FF040000 E FF060000 E FF080000 E FF040000 E FF000000 E FF080000 E FF180000 E FF120000 E FF120000 E FF160000 E FF180000 E FF180000 E FF120000 E FF120000 E FF220000 E FF220000 E FF240000 E FF260000 E FF280000 E FF240000 E FF260000 E FF280000 E FF380000 E FF380000 E FF380000 E FF360000 E FF380000 E FF380000 E FF380000 E FF40000 E FF40000 E FF40000 E FF40000 E FF480000 E FF40000 E FF40000 E FF40000 E FF580000 E FF50000 E FF50000 E FF60000 E FF60000 E FF580000 E FF60000 E FF580000 E FF60000 E FF60000 E FF60000 E FF70000 E FF60000 E FF60000 E FF700000 E FF70000 E FF70000 E FF80000 E FF80000 E FF700000 E FF70000 E FF70000 E FF80000 E FF80000 E FF700000 E FF80000 E FF80000 E FF80000 E FF80000 E FF700000 E FF80000 E FF80000 E FF80000 E FF80000 E FF700000 E FF80000 E FF80000 E FF80000 E FF80000 E FF700000 E FF80000 E FF90000 E FF90000 E FF80000 E	FEE40000 E FEE60000 E FEE80000 E FEE40000 E FEE60000 E FEE60000 E FEF700000 E FEF7000000 E FF7000000 E FF7100000 E FF7000000 E FF7000000 E FF7000000 E FF7000000 E FF7100000 E FF7000000 E FF7000000 E FF7000000 E FF7000000 E FF7000000 E FF7000000 E FF700000 E FF700000 E FF7000000 E FF7000000 E FF7000000 E FF700000 E FF700000 E FF7000000 E FF7000000 E FF7000000 E FF700000 E FF7000000 E FF700000 E FF700000 E FF700000 E FF700000 E FF700000 E FF7000000 E FF700000 E FF7000000 E FF700000 E FF000000 E FF700000 E FF700000 E FF700000 E FF700000 E FF700000 E FF7000000 E FF700000 E FF700000 E FF700000 E FF700000 E FF700000 E FF700000 E FF7000000 E FF700000 E FF700000 E FF700000 E FF7000000 E FF	FED00000	E	FED20000	E	FED40000	E	FED60000	E	FED80000	E	
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FEF80000 E FEFA0000 E FEFC0000 E FEFE0000 E FF000000 E FF020000 E FF040000 E FF060000 E FF080000 E FF080000 E FF000000 E FF0E0000 E FF100000 E FF120000 E FF140000 E FF160000 E FF180000 E FF180000 E FF120000 E FF120000 E FF200000 E FF220000 E FF240000 E FF260000 E FF280000 E FF280000 E FF20000 E FF260000 E FF300000 E FF320000 E FF340000 E FF360000 E FF380000 E FF380000 E FF300000 E FF380000 E FF400000 E FF400000 E FF400000 E FF500000 E FF520000 E FF540000 E FF60000 E FF60000 E FF500000 E FF500000 E FF50000 E FF60000 E FF60000 E FF60000 E FF60000 E FF70000 E FF60000 E FF60000 E FF60000 E FF700000 E FF70000 E FF70000 E FF70000 E FF80000 E FF700000 E FF70000 E FF70000 E FF80000 E FF80000 E FF700000 E FF70000 E FF70000 E FF80000 E FF80000 E FF700000 E FF70000 E FF70000 E FF80000 E FF80000 E FF70000 E FF70000 E FF70000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF90000 E FF90000 E FF90000 E FF80000 E FF80000 E FF90000 E FF90000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF800000 E FF800000 E FF80000 E FF80000 E FF80000 E FF800000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF800000 E FF80000 E FF800000 E FF80000 E FF800000 E F	FEF80000 E FEFA0000 E FEFC0000 E FEFE0000 E FF000000 E FF020000 E FF040000 E FF060000 E FF080000 E FF000000 E FF000000 E FF000000 E FF100000 E FF120000 E FF140000 E FF160000 E FF180000 E FF100000 E FF120000 E FF120000 E FF200000 E FF20000 E FF20000 E FF20000 E FF20000 E FF200000 E FF20000 E FF20000 E FF300000 E FF300000 E FF340000 E FF360000 E FF380000 E FF300000 E FF300000 E FF380000 E FF40000 E FF40000 E FF40000 E FF40000 E FF520000 E FF40000 E FF40000 E FF40000 E FF500000 E FF500000 E FF50000 E FF60000 E FF60000 E FF60000 E FF500000 E FF60000 E FF60000 E FF60000 E FF60000 E FF700000 E FF70000 E FF70000 E FF60000 E FF60000 E FF700000 E FF70000 E FF70000 E FF80000 E FF80000 E FF80000 E FF70000 E FF70000 E FF80000 E FF80000 E FF80000 E FF70000 E FF70000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF80000 E FF800000 E FF80000 E FF80000 E FF80000 E FF8	FEE40000	E	FEE 60000	E	FEE80000	E	FEEA0000	E	FEEC0000	E	
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FF7A0000 E FF7C0000 E FF7E0000 E FF800000 E FF8C0000 E FF840000 E FF860000 E FF880000 E FF8A0000 E FF8C0000 E FF8E0000 E FF900000 E RO FF920000 E RO FF940000 E RO FF980000 E FF9A0000 E FF9C0000 E FF9E0000 E FFA00000 E FFAC0000 E FFA40000 E FFA60000 E FFA80000 E FFAA0000 E FFAC0000 E FFAE0000 E FFB00000 E FFBC0000 E FFB40000 E	FF7A0000 E FF7C0000 E FF7E0000 E FF8A0000 E FF8C0000 E FF8C0000 E FF8C0000 E FF8E0000 E FF8C0000 E FF9C0000 E FF9C0000 E FF9C0000 E FF9C0000 E FFAC0000 E FFAC0000 E FFAC0000 E FFAC0000 E FF8E0000 E FFBC0000 E FFBC00000 E FFBC0000 E FFBC00000 E FFBC0000	FF660000	E	FF680000	E	FF6A0000	E	FF6C0000	E	FF6E0000	E	
FF840000 E FF860000 E FF880000 E FF880000 E FF8C0000 E FF8E0000 E FF900000 E RO FF920000 E RO FF940000 E RO FF980000 E FF9A0000 E FF9C0000 E FF9E0000 E FFA00000 E FFAC0000 E FFA60000 E FFA60000 E FFA80000 E FFB60000 E FFBE0000 E FFBC0000 E FFBE0000 E	FF840000 E FF860000 E FF880000 E FF880000 E FF860000 E RO FF960000 E RO FF980000 E FF900000 E RO FF920000 E RO FF940000 E RO FF980000 E FF9A0000 E FF9C0000 E FF9E0000 E FFA00000 E FFA20000 E FFA40000 E FFA60000 E FF880000 E FF8A0000 E FF860000 E FF880000 E FF800000 E FF8C0000 E FF860000 E FFC00000 E FFC20000 E FFC40000 E FFC60000 E FFC80000 E	FF700000	E	FF720000	E	FF740000	E	FF760000	E	FF780000	E	
FF8E0000 E FF900000 E RO FF920000 E RO FF940000 E RO FF960000 E RO FF980000 E FF9A0000 E FF9C0000 E FF9E0000 E FFA00000 E FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFB00000 E FFBC0000 E FFB40000 E	FF8E0000 E FF900000 E RO FF920000 E RO FF940000 E RO FF960000 E RO FF980000 E FF9A0000 E FF9C0000 E FFA80000 E FFAA00000 E FFA20000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFBA0000 E FFBC0000 E FFBC0000 E FFC00000 E FFC20000 E FFC40000 E FFC60000 E FFC80000 E	FF7A0000	E	FF7C0000	E	FF7E0000	E	FF800000	E	FF820000	E	
FF980000 E FF9A0000 E FF9C0000 E FF9E0000 E FFA00000 E FFA20000 E FFA40000 E FFA60000 E FFA80000 E FFAA0000 E FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFBA0000 E FFBC0000 E	FF980000 E FF9A0000 E FF9C0000 E FF9E0000 E FFA00000 E FFA20000 E FFA40000 E FFA60000 E FFA80000 E FFAA0000 E FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFC00000 E FFC20000 E FFC40000 E FFC60000 E FFC80000 E	FF840000	E	FF860000	E	FF880000	E	FF8A0000	E	FF8C0000	E	
FFA20000 E FFA40000 E FFA60000 E FFA80000 E FFAA0000 E FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFBA0000 E FFBC0000 E	FFA20000 E FFA40000 E FFA60000 E FFA80000 E FFAA0000 E FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFBC0000 E FFBE0000 E FFC00000 E FFC20000 E FFC40000 E FFC60000 E	FF8E0000	E	FF900000	E RO	FF9200	000 E F	RO FF	940000	E RO	FF960000 E RO	
FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFBA0000 E FFBC0000 E	FFAC0000 E FFAE0000 E FFB00000 E FFB20000 E FFB40000 E FFB60000 E FFB80000 E FFBC0000 E FFBE0000 E FFC00000 E FFC20000 E FFC40000 E FFC60000 E	FF980000	E	FF9A0000	E	FF9C0000	E	FF9E0000	E	FFA00000	E	
FFB60000 E FFB80000 E FFBE0000 E FFBE0000 E	FFB60000 E FFB80000 E FFBA0000 E FFBC0000 E FFC80000 E FFC80000 E	FFA20000	E	FFA40000	E	FFA60000	E	FFA80000	E	FFAA0000	E	
	FFC00000 E FFC20000 E FFC40000 E FFC80000 E	FFAC0000	E	FFAE0000	E	FFB00000	E	FFB20000	E	FFB40000	E	
FFC00000 E FFC20000 E FFC40000 E FFC80000 E		FFB60000	E	FFB80000	E	FFBA0000	E	FFBC0000	E	FFBE0000	E	
	FFCA0000 E FFCC0000 E FFCE0000 E FFD20000 E	FFC00000	E	FFC20000	E	FFC40000	E	FFC60000	E	FFC80000	E	
FFCA0000 E FFCC0000 E FFCE0000 E FFD20000 E		FFCA0000	E	FFCC0000	E	FFCE0000	E	FFD00000	E	FFD20000	E	

```
      FFD40000 E
      FFD60000 E
      FFD80000 E
      FFDA0000 E
      FFDC0000 E
      FFDC0000 E
      FFDA0000 E
      FFEC0000 E
      FFE40000 E
      FFE60000 E
      FFFE0000 E
      FFFE0000 E
      FFFA0000 E
      RO
      FFFA0000 RO
      RO
      RO
      FFFA0000 E
      FFFA0000 RO
      RO
      FFFA0000 RO
      RO
```

=> era 0xFF900000 0xFF97FFFF

- Warning: 4 protected sectors will not be erased!

done

Erased 4 sectors

=> prot off 1:455

Un-Protect Flash Sectors 455-455 in Bank # 1

=> fli

Bank # 1: CFI conformant FLASH (16 x 16) Size: 64 MB in 512 Sectors AMD Standard command set, Manufacturer ID: 0x01, Device ID: 0x227E

Erase timeout: 16384 ms, write timeout: 2 ms

Buffer write timeout: 5 ms, buffer size: 32 bytes

FC000000	E	FC020000	E	FC040000	E	FC060000	E	FC080000	E
FC0A0000	E	FC0C0000	E	FC0E0000	E	FC100000	E	FC120000	E
FC140000	E	FC160000	E	FC180000	E	FC1A0000	E	FC1C0000	E
FC1E0000	E	FC200000	E	FC220000	E	FC240000	E	FC260000	Ε
FC280000	E	FC2A0000	E	FC2C0000	E	FC2E0000	E	FC300000	E
FC320000	E	FC340000	E	FC360000	E	FC380000	E	FC3A0000	Ε
FC3C0000	E	FC3E0000	E	FC400000	E	FC420000	E	FC440000	E
FC460000	E	FC480000	E	FC4A0000	E	FC4C0000	E	FC4E0000	Ε
FC500000	E	FC520000	E	FC540000	E	FC560000	E	FC580000	E
FC5A0000	E	FC5C0000	E	FC5E0000	E	FC600000	E	FC620000	E
FC640000	E	FC660000	E	FC680000	E	FC6A0000	E	FC6C0000	E
FC6E0000	E	FC700000	E	FC720000	E	FC740000	E	FC760000	E
FC780000	E	FC7A0000	E	FC7C0000	E	FC7E0000	E	FC800000	E
FC820000	E	FC840000	E	FC860000	E	FC880000	E	FC8A0000	E
FC8C0000	E	FC8E0000	E	FC900000	E	FC920000	E	FC940000	E
FC960000	E	FC980000	E	FC9A0000	E	FC9C0000	E	FC9E0000	E
FCA00000	E	FCA20000	E	FCA40000	E	FCA60000	E	FCA80000	E

FCAA0000	E	FCAC0000	E	FCAE0000	E	FCB00000	E	FCB20000	E
FCB40000	E	FCB60000	E	FCB80000	E	FCBA0000	E	FCBC0000	E
FCBE0000	E	FCC00000	E	FCC20000	E	FCC40000	E	FCC60000	E
FCC80000	E	FCCA0000	E	FCCC0000	E	FCCE0000	E	FCD00000	E
FCD20000	E	FCD40000	E	FCD60000	E	FCD80000	E	FCDA0000	E
FCDC0000	E	FCDE0000	E	FCE00000	E	FCE20000	E	FCE40000	E
FCE60000	E	FCE80000	E	FCEA0000	E	FCEC0000	E	FCEE0000	E
FCF00000	E	FCF20000	E	FCF40000	E	FCF60000	E	FCF80000	Ε
FCFA0000	E	FCFC0000	E	FCFE0000	E	FD000000	E	FD020000	Ε
FD040000	E	FD060000	E	FD080000	E	FD0A0000	E	FD0C0000	E
FD0E0000	E	FD100000	E	FD120000	E	FD140000	E	FD160000	E
FD180000	E	FD1A0000	E	FD1C0000	E	FD1E0000	E	FD200000	E
FD220000	E	FD240000	E	FD260000	E	FD280000	E	FD2A0000	E
FD2C0000	E	FD2E0000	E	FD300000	E	FD320000	E	FD340000	E
FD360000	E	FD380000	E	FD3A0000	E	FD3C0000	E	FD3E0000	E
FD40000	E	FD420000	E	FD440000	E	FD460000	E	FD480000	E
FD4A0000	E	FD4C0000	E	FD4E0000	E	FD500000	E	FD520000	E
FD540000	E	FD560000	E	FD580000	E	FD5A0000	E	FD5C0000	E
FD5E0000	E	FD600000	E	FD620000	E	FD640000	E	FD660000	E
FD680000	E	FD6A0000	E	FD6C0000	E	FD6E0000	E	FD700000	E
FD720000	E	FD740000	E	FD760000	E	FD780000	E	FD7A0000	E
FD7C0000	E	FD7E0000	E	FD800000	E	FD820000	E	FD840000	E
FD860000	E	FD880000	E	FD8A0000	E	FD8C0000	E	FD8E0000	E
FD900000	E	FD920000	E	FD940000	E	FD960000	E	FD980000	E
FD9A0000	E	FD9C0000	E	FD9E0000	E	FDA00000	E	FDA20000	E
FDA40000	E	FDA60000	E	FDA80000	E	FDAA0000	E	FDAC0000	E
FDAE0000	E	FDB00000	E	FDB20000	E	FDB40000	E	FDB60000	E
FDB80000	E	FDBA0000	E	FDBC0000	E	FDBE0000	E	FDC00000	E
FDC20000	E	FDC40000	E	FDC60000	E	FDC80000	E	FDCA0000	E
FDCC0000	E	FDCE0000	E	FDD00000	E	FDD20000	E	FDD40000	E
FDD60000	E	FDD80000	E	FDDA0000	E	FDDC0000	E	FDDE0000	E
FDE00000	E	FDE20000	E	FDE40000	E	FDE60000	E	FDE80000	E
FDEA0000	E	FDEC0000	E	FDEE0000	E	FDF00000	E	FDF20000	E
FDF40000	E	FDF60000	E	FDF80000	E	FDFA0000	E	FDFC0000	E
FDFE0000	E	FE000000	E	FE020000	E	FE040000	E	FE060000	E
FE080000	E	FE0A0000	E	FE0C0000	E	FE0E0000	E	FE100000	E

FE120000	E	FE140000	E	FE160000	E	FE180000	E	FE1A0000	E
FE1C0000	E	FE1E0000	E	FE200000	E	FE220000	E	FE240000	E
FE260000	E	FE280000	E	FE2A0000	E	FE2C0000	E	FE2E0000	E
FE300000	E	FE320000	E	FE340000	E	FE360000	E	FE380000	E
FE3A0000	E	FE3C0000	E	FE3E0000	E	FE400000	E	FE420000	E
FE440000	E	FE460000	E	FE480000	E	FE4A0000	E	FE4C0000	E
FE4E0000	E	FE500000	E	FE520000	E	FE540000	E	FE560000	E
FE580000	E	FE5A0000	E	FE5C0000	E	FE5E0000	E	FE600000	E
FE620000	E	FE640000	E	FE660000	E	FE680000	E	FE6A0000	E
FE6C0000	E	FE6E0000	E	FE700000	E	FE720000	E	FE740000	E
FE760000	E	FE780000	E	FE7A0000	E	FE7C0000	E	FE7E0000	E
FE800000	E	FE820000	E	FE840000	E	FE860000	E	FE880000	E
FE8A0000	E	FE8C0000	E	FE8E0000	E	FE900000	E	FE920000	E
FE940000	E	FE960000	E	FE980000	E	FE9A0000	E	FE9C0000	E
FE9E0000	E	FEA00000	E	FEA20000	E	FEA40000	E	FEA60000	E
FEA80000	E	FEAA0000	E	FEAC0000	E	FEAE0000	E	FEB00000	E
FEB20000	E	FEB40000	E	FEB60000	E	FEB80000	E	FEBA0000	E
FEBC0000	E	FEBE0000	E	FEC00000	E	FEC20000	E	FEC40000	E
FEC60000	E	FEC80000	E	FECA0000	E	FECC0000	E	FECE0000	E
FED00000	E	FED20000	E	FED40000	E	FED60000	E	FED80000	E
FEDA0000	E	FEDC0000	E	FEDE0000	E	FEE00000	E	FEE20000	Ε
FEE40000	E	FEE60000	E	FEE80000	E	FEEA0000	E	FEEC0000	E
FEEE0000	E	FEF00000	E	FEF20000	E	FEF40000	E	FEF60000	Ε
FEF80000	E	FEFA0000	E	FEFC0000	E	FEFE0000	E	FF000000	E
FF020000	E	FF040000	E	FF060000	E	FF080000	E	FF0A0000	E
FF0C0000	E	FF0E0000	E	FF100000	E	FF120000	E	FF140000	E
FF160000	E	FF180000	E	FF1A0000	E	FF1C0000	E	FF1E0000	E
FF200000	E	FF220000	E	FF240000	E	FF260000	E	FF280000	Ε
FF2A0000	E	FF2C0000	E	FF2E0000	E	FF300000	E	FF320000	Ε
FF340000	E	FF360000	E	FF380000	E	FF3A0000	E	FF3C0000	E
FF3E0000	E	FF400000	E	FF420000	E	FF440000	E	FF460000	E
FF480000	E	FF4A0000	E	FF4C0000	E	FF4E0000	E	FF500000	E
FF520000	E	FF540000	E	FF560000	E	FF580000	E	FF5A0000	E
FF5C0000	E	FF5E0000	E	FF600000	E	FF620000	E	FF640000	E
FF660000	E	FF680000	E	FF6A0000	E	FF6C0000	E	FF6E0000	E
FF700000	E	FF720000	E	FF740000	E	FF760000	E	FF780000	E

```
FF7A0000 E
                 FF7C0000 E
                                FF7E0000 E
                                               FF800000 E
                                                              FF820000 E
  FF840000 E
                 FF860000 E
                                FF880000 E
                                               FF8A0000 E
                                                              FF8C0000 E
  FF8E0000 E
                                                                       FF960000 E RO
                 FF900000 E RO
                                   FF920000 E RO
                                                     FF940000 E RO
  FF980000 E
                 FF9A0000 E
                                FF9C0000 E
                                               FF9E0000 E
                                                              FFA00000 E
  FFA20000 E
                 FFA40000 E
                                FFA60000 E
                                               FFA80000 E
                                                              FFAA0000 E
  FFAC0000 E
                 FFAE0000 E
                                FFB00000 E
                                               FFB20000 E
                                                              FFB40000 E
  FFB60000 E
                 FFB80000 E
                                FFBA0000 E
                                               FFBC0000 E
                                                              FFBE0000 E
  FFC00000 E
                 FFC20000 E
                                FFC40000 E
                                               FFC60000 E
                                                              FFC80000 E
  FFCA0000 E
                 FFCC0000 E
                                FFCE0000 E
                                               FFD00000 E
                                                              FFD20000 E
  FFD40000 E
                 FFD60000 E
                                FFD80000 E
                                               FFDA0000 E
                                                              FFDC0000 E
 FFDE0000 E
                 FFE00000 E
                                FFE20000 E
                                               FFE40000 E
                                                              FFE60000 E
 FFE80000 E
                                               FFEE0000 E
                                                              FFF00000 E
                 FFEA0000 E
                                FFEC0000 E
 FFF20000 E
                 FFF40000 E
                                FFF60000 RO
                                                  FFF80000
                                                                    FFFA0000
                                                                                RO
 FFFC0000 RO
                    FFFE0000
=> era 1:455
Erase Flash Sectors 455-455 in Bank # 1
. done
```

The actual level of protection depends on the flash chips used on your hardware, and on the implementation of the flash device driver for this board. In most cases U-Boot provides just a simple software-protection, i. e. it prevents you from erasing or overwriting important stuff by accident (like the U-Boot code itself or U-Boot's environment variables), but it cannot prevent you from circumventing these restrictions - a nasty user who is loading and running his own flash driver code cannot and will not be stopped by this mechanism. Also, in most cases this protection is only effective while running U-Boot, i. e. any operating system will not know about "protected" flash areas and will happily erase these if requested to do so.

5.9.3.5. mtdparts - define a Linux compatible MTD partition scheme

U-Boot implements two different approaches to define a MTD partition scheme that can be shared easily with the linux kernel.

The first one is to define a single, static partition in your board config file, for example:

The second method uses the Linux kernel's mtdparts command line option and dynamic partitioning:

Command line of course produces bigger images, and may be inappropriate for some targets, so by default it's off.

The mtdparts command offers an easy to use and powerful interface to define the contents of the environment variable of the same name that can be passed as boot argument to the Linux kernel:

```
=> help mtdparts
mtdparts
    - list partition table
mtdparts delall
    - delete all partitions
mtdparts del part-id
    - delete partition (e.g. part-id = nand0,1)
mtdparts add <mtd-dev> <size>[@<offset>] [<name>] [ro]
    - add partition
mtdparts default
   - reset partition table to defaults
this command uses three environment variables:
'partition' - keeps current partition identifier
partition := <part-id>
<part-id> := <dev-id>,part num
'mtdids' - linux kernel mtd device id <-> u-boot device id mapping
mtdids=<idmap>[,<idmap>,...]
<idmap> := <dev-id>=<mtd-id>
```

```
<dev-id>
         := 'nand'|'nor'<dev-num>
<dev-num> := mtd device number, 0...
         := unique device tag used by linux kernel to find mtd device (mtd->name)
<mtd-id>
'mtdparts' - partition list
mtdparts=mtdparts=<mtd-def>[;<mtd-def>...]
<mtd-def> := <mtd-id>:<part-def>[, <part-def>...]
<mtd-id> := unique device tag used by linux kernel to find mtd device (mtd->name)
<part-def> := <size>[@<offset>][<name>][<ro-flag>]
         := standard linux memsize OR '-' to denote all remaining space
<size>
<offset>
         := partition start offset within the device
         := '(' NAME ')'
<name>
<ro-flag> := when set to 'ro' makes partition read-only (not used, passed to kernel)
```

For example, on some target system the <code>mtdparts</code> command might display this information:

```
=> mtdparts
device nor0 <TQM5200-0>, \# parts = 4
 #: name
                              size
                                             offset
                                                           mask flags
 0: firmware
                     0x00100000
                                      0x00000000
                     0x00180000
                                      0x00100000
 1: kernel
                                                     Ω
 2: small-fs
                     0x00d80000
                                      0x00280000
                                                    Ω
 3: big-fs
                0x01000000
                                      0x01000000
                                                     0
active partition: nor0,0 - (firmware) 0x00100000 @ 0x00000000
defaults:
mtdids : nor0=TQM5200-0
mtdparts:
                             mtdparts=TQM5200-0:1m(firmware),1536k(kernel),3584k(small-
fs), 2m(initrd), 8m(misc), 16m(big-fs)
```

The partition table printed here obviously differs from the default value for the mtdparts variable printed in the last line. To verify this, we can check the current content of this variable:

```
=> print mtdparts
```

and we can see that it exactly matches the partition table printed above.

Now let's switch back to the default settings:

```
=> mtdparts default
=> mtdparts
device nor0 <TQM5200-0>, # parts = 6
 #: name
                           size
                                        offset
                                                      mask_flags
 0: firmware 0x00100000 0x00000000 0
 1: kernel 0x00180000 0x00100000
                                                0
2: small-fs 0x00380000 0x00280000
 3: initrd
                   0x00200000
                                 0x00600000
                                               0
                   0x00800000
 4: misc
                                 0x00800000
                                               0
                  0x01000000 0x01000000
 5: big-fs
                                               0
active partition: nor0,0 - (firmware) 0x00100000 @ 0x00000000
defaults:
mtdids : nor0=TQM5200-0
                          mtdparts=TQM5200-0:1m(firmware),1536k(kernel),3584k(small-
mtdparts:
fs), 2m(initrd), 8m(misc), 16m(big-fs)
=> print mtdparts
mtdparts=mtdparts=TQM5200-0:1m(firmware),1536k(kernel),3584k(small-
fs), 2m(initrd), 8m(misc), 16m(big-fs)
```

Then we delete the last 4 partitions ("small-fs", "initrd", "misc" and "big-fs") ...

```
=> mtdparts del small-fs
=> mtdparts del initrd
=> mtdparts del misc
=> mtdparts del big-fs
=> mtdparts
device nor0 <TQM5200-0>, # parts = 2
                                                      mask_flags
                                        offset
#: name
                           size
0: firmware
                   0x00100000
                                  0x00000000
                                               0
1: kernel
                   0x00180000 0x00100000 0
```

... and combine the free space into a singe big partition:

```
=> mtdparts add nor0 - new-part
=> mtdparts
device nor0 <TQM5200-0>, # parts = 3
                                         offset mask_flags
#: name
                            size
                    0x00100000
                                   0x00000000
                                                 0
0: firmware
1: kernel
                    0x00180000
                                   0x00100000
2: new-part 0x01d80000 0x00280000 0
active partition: nor0,0 - (firmware) 0x00100000 @ 0x00000000
defaults:
mtdids : nor0=TQM5200-0
mtdparts:
                           mtdparts=TQM5200-0:1m(firmware),1536k(kernel),3584k(small-
fs), 2m(initrd), 8m(misc), 16m(big-fs)
=> print mtdparts
mtdparts=mtdparts=TQM5200-0:1m(firmware),1536k(kernel),30208k(new-part)
```