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| PROJECT: SINGLIX Operating System   Issue: 1    Revision: 14    Date: 07/01/2018  OWNER: ERDOĞAN TAN / Istanbul / Turkiye | | | | | |
|  |  |  |  |  |  |
| **BOOT SECTOR PARAMETERS of  SINGLIX FS1, FS2  file systems** | | | | | |
|  |  |  |  |  |  |
| **Offset** | **Item** | **DATA** | **Type** | **Size** | **Description of Item** |
| 0 | Jmp to Offset 65 (or 66) | EB3Fh | Word | 2 byte | “Jump to boot code” / OPCODE (EB40h) |
| 2 | Nop | 90h | Byte | 1 byte | Reserved (90h for this FS version) |
| 3 | FileSystem ID | ‘FS’ | Char | 2 byte | SINGLIX ATA(PI) File System Identifier |
| 5 | Terminator | 0 | Byte | 1 byte | Zero String Terminator |
| 6 | Bytes Per Sector | XXXXh | Word | 2 byte | FS1 = 512 (ATA), FS2 = 2048 (ATAPI) |
| 8 | Media Attributes | XXh | Byte | 1 byte | Media Attributes Byte |
| 9 | Partition ID | XXh | Byte | 1 byte | SINGLIX, FS Hard Disk = A1h, FD = 0 |
| 10 | FS Version Major | XXh | Byte | 1 byte | File System Version – Major = 1 |
| 11 | FS Version Minor | XXh | Byte | 1 byte | File System Ver. – Minor/Revision = 0 |
| 12 | Beginning Sector | XXXXXXXXh | Dword | 4 byte | Volume Beginning (Boot) Sector (LBA) |
| 16 | Volume Size | XXXXXXXXh | Dword | 4 byte | Volume/Partition Size in Sectors |
| 20 | Startup File Address | XXXXXXXXh | Dword | 4 byte | OS Startup File/Code/Program Location |
| 24 | MAT Location | XXXXXXXXh | Dword | 4 byte | Master Allocation Table Location |
| 28 | Root Directory Location | XXXXXXXXh | Dword | 4 byte | Root Directory Descriptor Address |
| 32 | Registry File Address | XXXXXXXXh | Dword | 4 byte | System Configuration File Descriptor Location |
| 36 | Swap File Addr. | XXXXXXXXh | Dword | 4 byte | Swap File/Space Descriptor Location |
| 40 | Undelete Dir Address | XXXXXXXXh | Dword | 4 byte | Undelete/Restore Directory Location |
| 44 | Drive Number | XXh | Byte | 1 byte | Boot Drive Number (80h) |
| 45 | LBA yes | 01h | Byte | 1 byte | LBA mode yes/no signature (1= LBA, 0= CHS) |
| 46 | Magic Word (CHS) | 01A1h | Word | 2 byte | TR-SINGLIX Boot Code Sign (CHS parameters) |
| 48 | Operating System | 16 chars | Char | 16 byte | ‘TR-SINGLIX v1.0b’  etc. |
| 64 | Terminator | 0 | Byte | 1 byte | Zero String Terminator |
| 65 | Boot Code | 445 bytes | Byte | 445 byte | OS Boot (Startup File Loader) Code (90h & 444 bytes) |
| 510 | Boot Sign | AA55h | Word | 2 byte | Boot Sector Identifier |

NOTE: Volume Beginning Sector is LBA address of Boot Sector. Startup File/Code Address, MAT Location, Root Dir. Descriptor Location, Registry File Location, Swap File Descriptor Location are offset addresses (from beginning of the FS/volume, boot sector); these are NOT absolute addresses.   
  
Volume Beginning Sector (LBA) value is needed for passing it to operating system; because, operating system will use it to convert offset addresses to absolute/physical disk addresses. (It points boot sector’s itself. Bootstrap code cannot know boot sector LBA address as default, because boot code runs after INT 19h loads Boot Sectors at the 0:7C00h memory address. ROMBIOS INT 19h code does not pass Boot Sector LBA address to bootstrap code as default. TR-SINGLIX disk format program will assign that 32 bit boot sector address for fixed/partitioned disks in LBA format. For removable/non-partitioned disks, it is ZERO as default.)

Master Allocation Table keeps location and free sector counts of the Volume and it is the header of the Disk Allocation Table.

Root Directory and sub directories may not include OS Startup File; that file (with maximum 512 K size) may be a boot block file, which initializes Operating System. Also, root directory and sub directories may not include Registry (System Config.) File, that file may be a boot block file which reserves OS configuration like GUI settings etc. Also, swap file (instead of a separate swap partition/volume) is for memory extension and it may not be appeared in root or subdirectories. Shortly, we can say that: we cannot make, delete boot (super) block files in directory tree. (File System formatting programs are responsible for that.)

Remember that: in SINGLIX FS, directory and file data is just after their/its description table sector.

(For example: If the first FDT Address is 00006E00h, file data starts from sector 00006E01h.)

*This FS project is for INTEL x86 CPU models, but compatible for other CPU models.*

Media Attributes Byte:

Bit 0 => If Bit 0 is ‘0’, file system is read only. (CD-ROM etc.) WRITE flag

Bit 1 => If Bit 1 is ‘1’, file system is on removable media. REMOVABLE flag

Bit 2 to Bit 7 => Reserved. Must be ‘0’ for This FS Version. (These BITs may be assigned in future.)

FS on ATAPI CD-ROM =  xxxxxx10b = 02h

FS on ATA Hard/Fixed Disk = xxxxxx01b = 01h

FS on USB Virtual/Flash Disk = xxxxxx11b = 03h

**Disk Parameters for CHS mode:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Offset** | **Item** | **DATA** | **Type** | **Size** | **Description of Item** |
| 45 | LBA yes | 00h | Byte | 1 byte | LBA mode yes/no sign (‘NO’ for CHS mode) |
| 46 | Sectors Per Track | XXh | Byte | 1 byte | (17 or 63 for Hard Disks, 18 for 1.44MB Floppy Disk) |
| 47 | Heads | XXh | Byte | 1 byte | (2 to 255 for Hard Disks, 2 for Floppy Disks) |

**Different Boot Sector Parameters for CHS mode hard disks:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Offset** | **Item** | **DATA** | **Type** | **Size** | **Description of Item** |
| 0 | Jmp to Offset 48 | EB2Eh | Word | 2 byte | “Jump to boot code” / OPCODE |
| 48 | Boot Code | 462 bytes | Byte | 462 byte | OS Boot (Startup File Loader) Code |
| 510 | Boot Sign | AA55h | Word | 2 byte | Boot Sector Identifier |

**Different Boot Sector Parameters for file systems with two (double) boot sectors:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Offset** | **Item** | **DATA** | **Type** | **Size** | **Description of Item** |
| 0 | Jmp to Offset 66 | EB40h | Word | 2 byte | “Jump to boot code” / OPCODE |
| 65 | Nop | 90h | Byte | 1 byte | Nop (90h) |
| 66 | Boot Code | 444 bytes | Byte | 444 byte | OS Boot (Startup File Loader) Code |
| 510 | Boot Sign | AA55h | Word | 2 byte | Boot Sector Identifier |