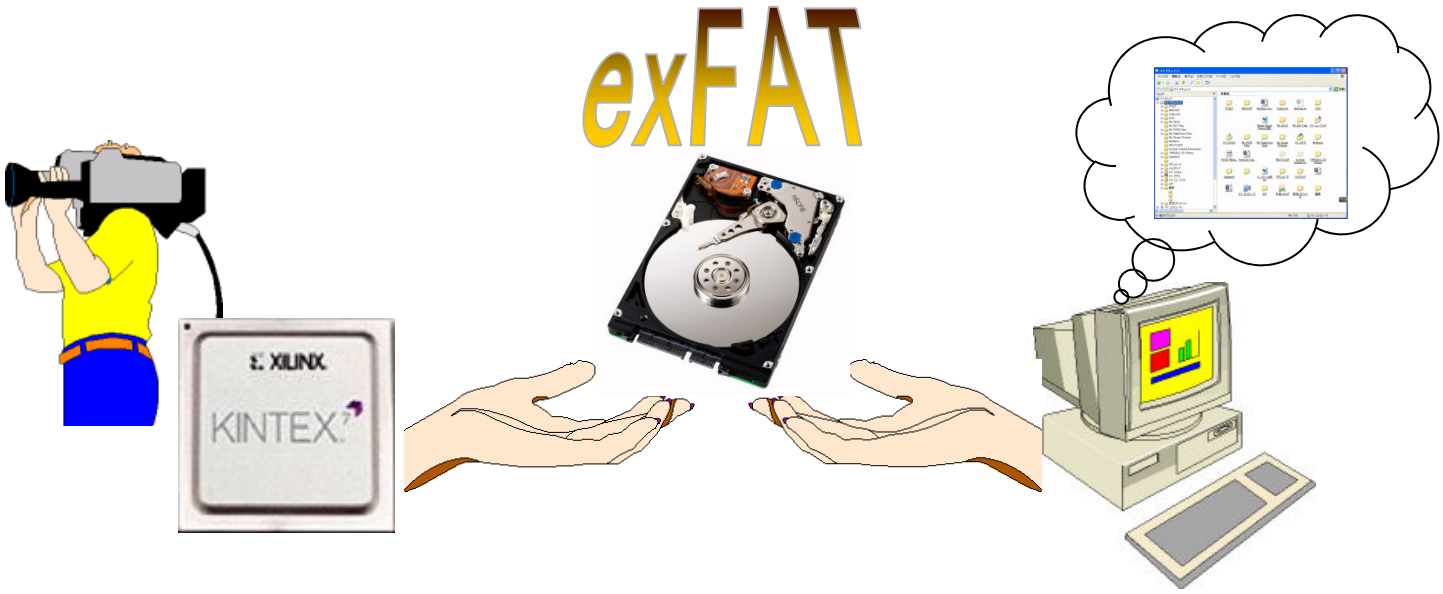
exFAT Reference Design Introduction

Ver1.1E



Direct file-system access from SATA-IP

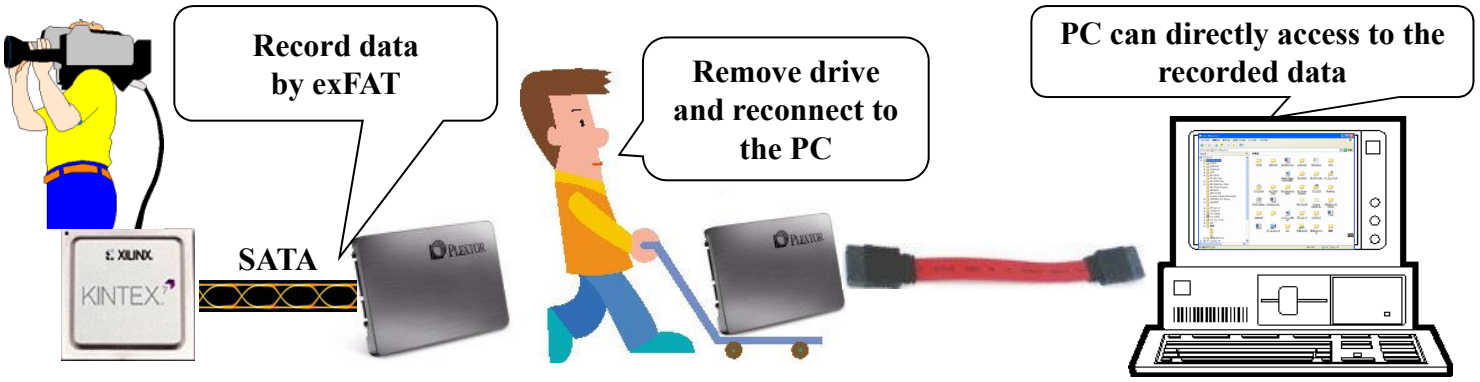
What is exFAT?

- **Industrial standard File System**
  - **Compatible among Windows(XP/Vista/7/8),Mac,Linux...**
- **Suitable for flash storage such as SDXC,USB memory.**
  - **Also applicable to SSD/HDD**
- **Maximum file size = 16 Ei-Byte (2^60byte)**
  - **For FAT32, max file size is only 4GByte**


exFAT file system is supported by popular OS.

Application merit of exFAT with SATA-IP 1

- **Direct access to the recorded data from the PC**
  - **Record data as an exFAT file by this design application.**
  - **Remove drive and reconnect to SATA port of Host PC.**
  - **PC can detect drive and can access to the recorded file.**



PC can directly access to the recorded data

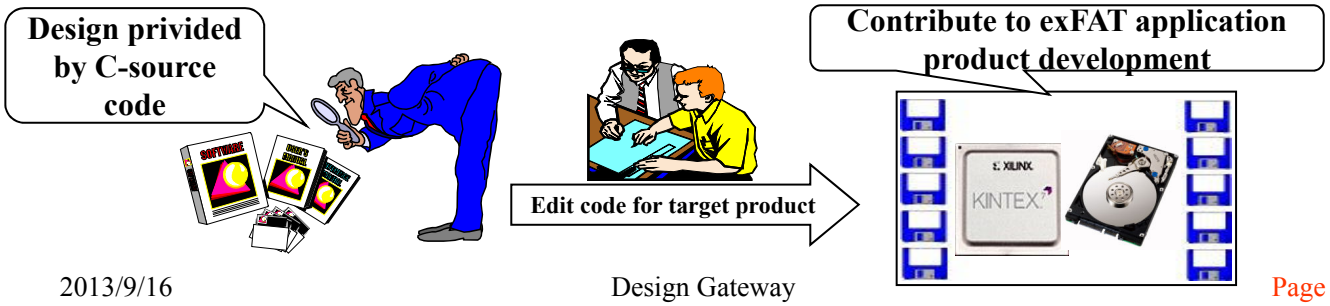
Application merit of exFAT with SATA-IP 2

- **Playback pattern data recorded by the PC**
  - **Save pattern data to the drive as an exFAT file.**
  - **Remove drive and reconnect to the FPGA via SATA-IP.**
  - **FPGA can directly read data from the connected drive.**

Data playback from FPGA saved by the PC

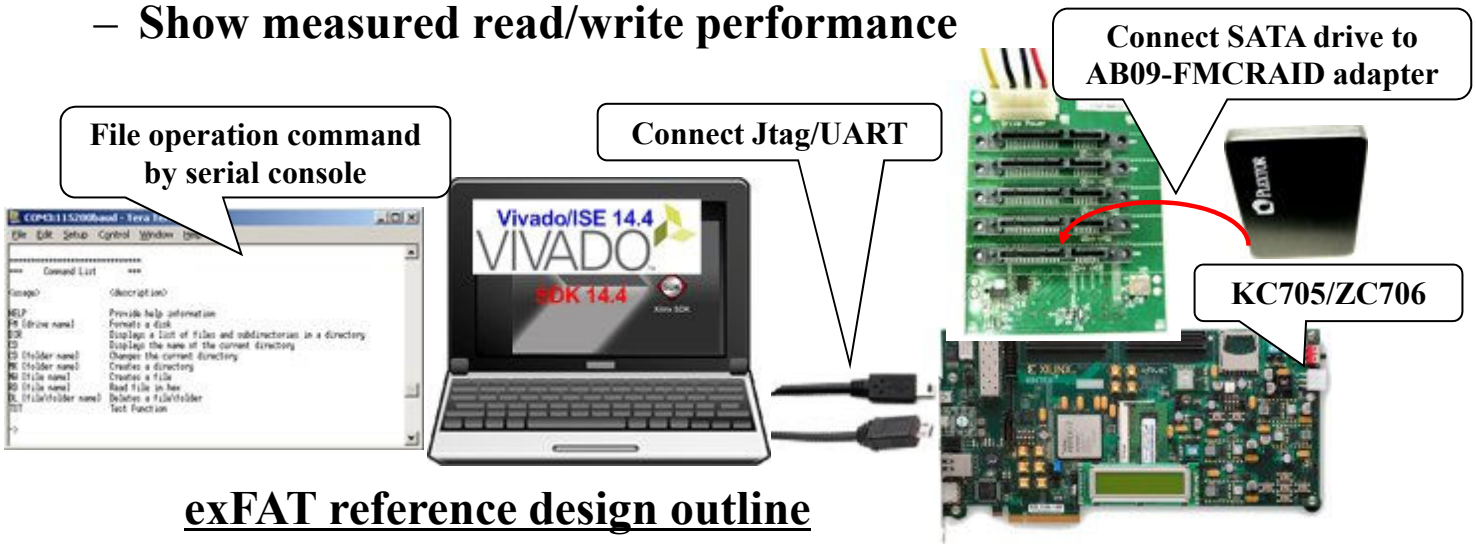
exFAT reference design summary 1

- **Reference design for Kintex-7/Zynq-7000**
  - **Operation on KC705/ZC706+AB09-FMCRAID environment**
  - **Optional product for exFAT application development**
- **Real read/write access to connected drive by exFAT**
  - **PC can directly access to the drive when reconnected**
  - **Design provided by MicroBlaze firmware C-source code**
  - **User can apply C-source code to the final application product**



exFAT reference design summary 2

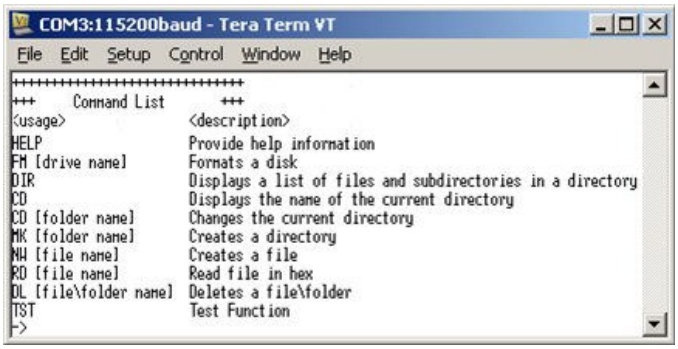
- **Same hardware as KC705/ZC706 reference design**
  - **MicroBlaze firmware is modified for exFAT support**
- **Serial console user interface for control**
  - **Show measured read/write performance**



exFAT reference design outline

exFAT reference design summary 3

- **Cover basic command for exFAT operation**
  - **Read/write for file/dir (directory) operation**
  - **Help user to understand exFAT operation for target design**
  - **Can check exFAT compatibility by drive reconnection to PC**

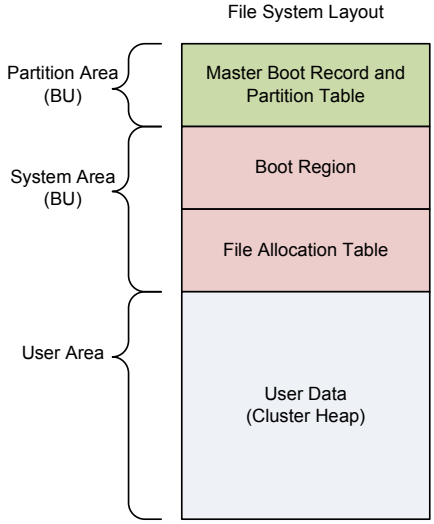


Command	Summary
HELP	Show command help
FM	Format a disk
DIR	Show file list in current directory
CD	Change current directory
MK	Create new directory
NW	Create new file
RD	Read file from disk
DL	Delete file/directory
TST	Test function

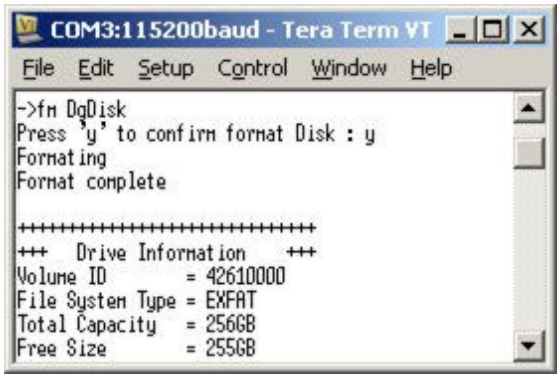
Basic command provided by this reference design

Command detail 1: Format

- **Format whole drive by exFAT**
  - **Show drive information after format completion**



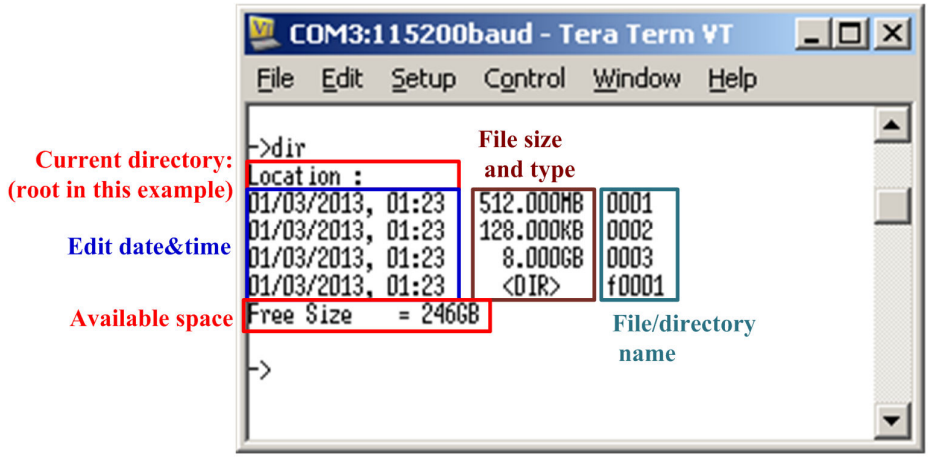
exFAT format image



Example of format command

Command detail 2: Display directory

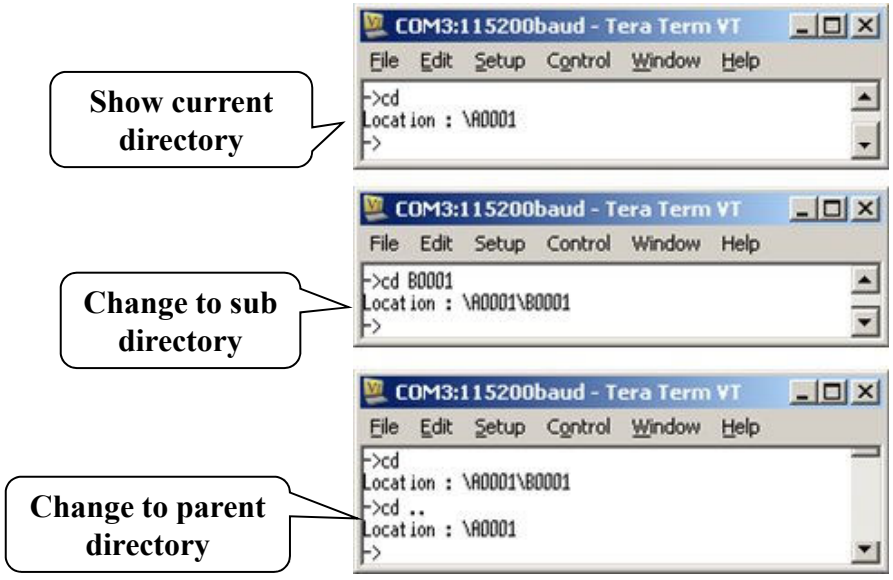
- **Display file and sub dir information in current dir**
  - **Show file size, update date&time, type in a list**
  - **Show available free space in the drive**



Example of display directory command

Command detail 3: Change current directory

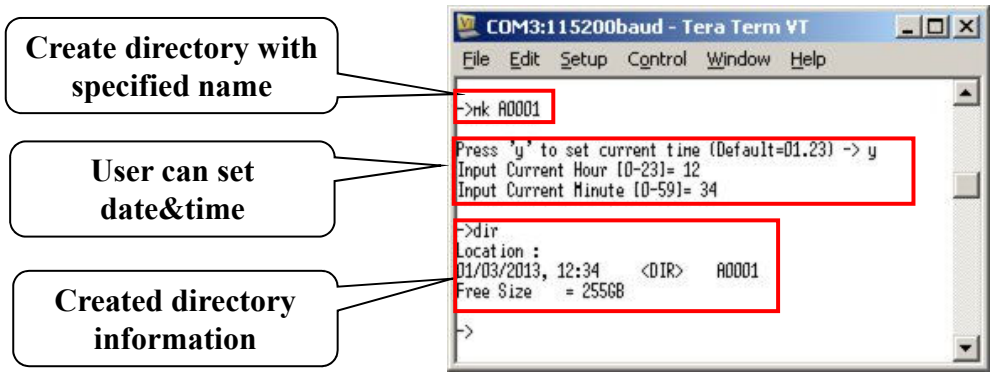
- **Change current directory to parent dir or sub dir**



Example of change directory command

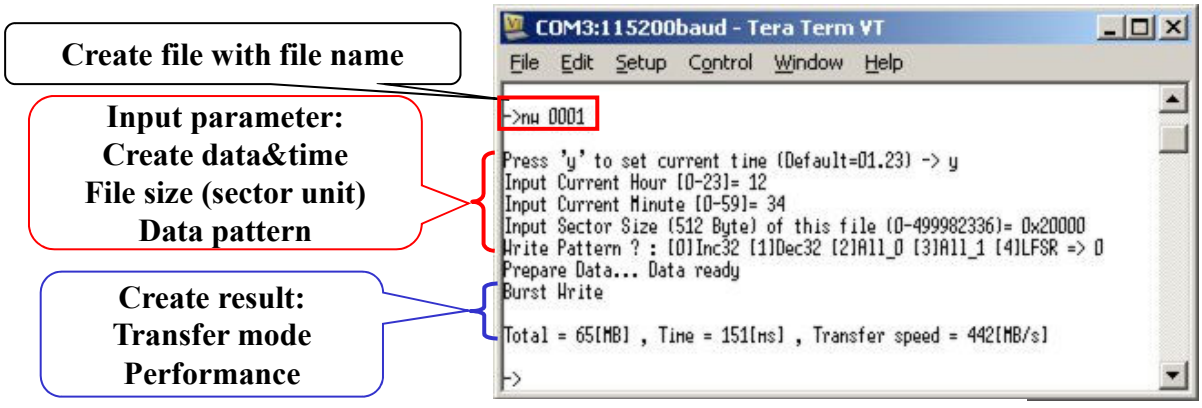
Command detail 4: Create new directory

- **Create sub directory under current directory**
  - **Directory name can be set up to 255 characters**
  - **User can set create date&time (user also can omit it)**



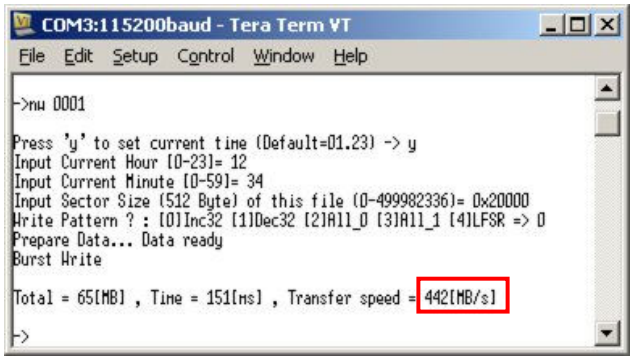
Command detail 5: Create new file

- **Create file in the current directory**
  - **User can specify data pattern in the file**
  - **User can specify file size by sector (512Byte) unit**
  - **Display create time (write performance) result**



Command detail 5: Create new file (cont'd)

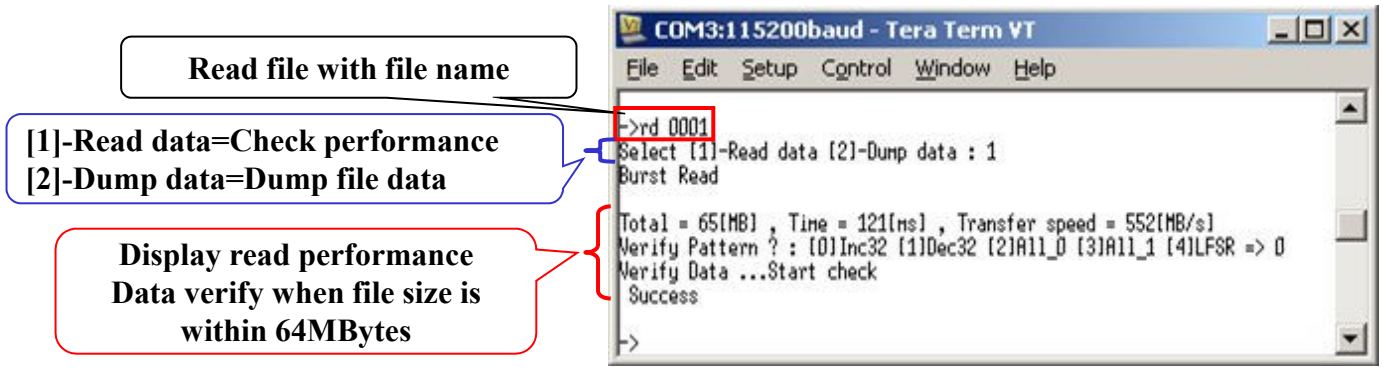
- **Switch write mode according to space distribution**
  - **Burst write mode if available space is continuous**
  - **Single write mode if available space is not continuous**
  - **Performance is much different by fragment distribution**



Space is continuous (Burst mode) **Space is not continuous (Single mode)**

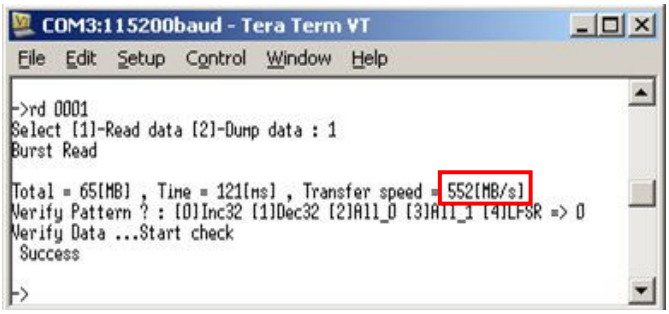
Command detail 6: Read file

- **Execute specified file read operation**
  - **Display file read time (read performance) result**
  - **Data verify is possible if file size is within 64MBytes**

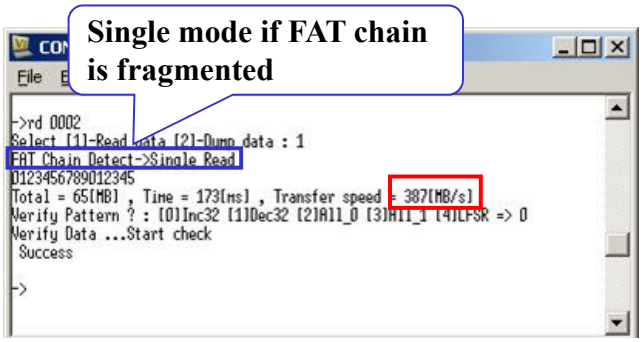


Command detail 6: Read file (cont'd)

- Switch read mode according to FAT chain situation
  - Burst read mode if chain is continuous
  - Single read mode if chain is not continuous
  - Performance is much different by FAT chain fragmentation



FAT chain is continuous (Burst mode)

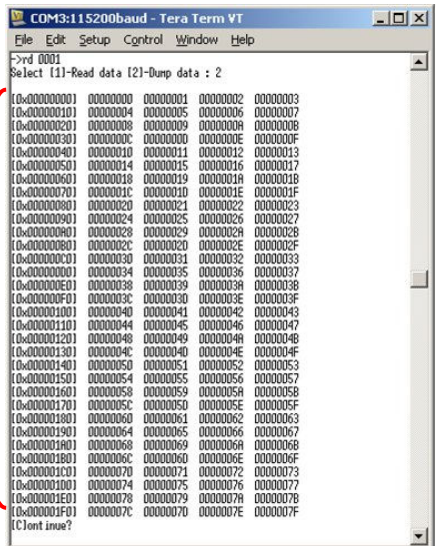


FAT chain is not continuous (Single mode)

Command detail 6: Read file (cont'd 2)

- Dump data to display data in the file
  - Show data when [2]-Dump data is selected

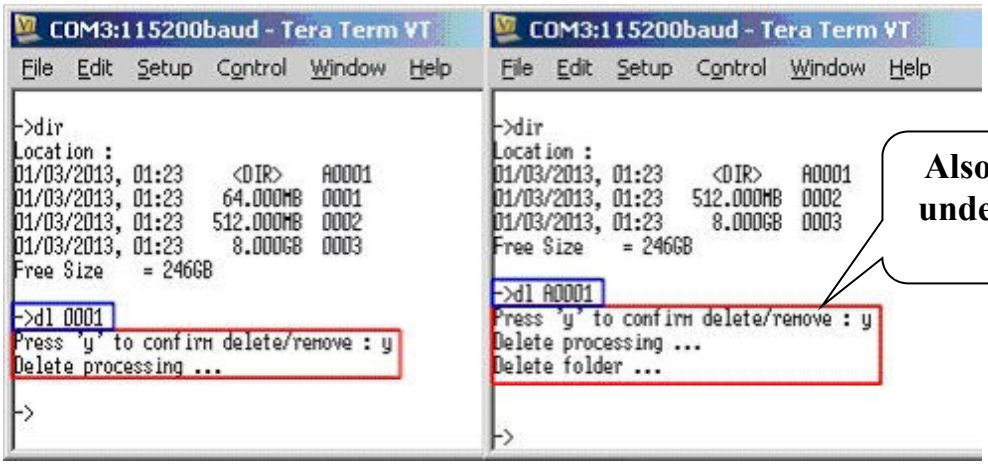
Show each 1 sector data (512Bytes) on the screen



Example of dump data

Command detail 7: Delete file/directory

- **Delete specified file/directory from current directory**
  - **Also delete all files under sub directory if exist**

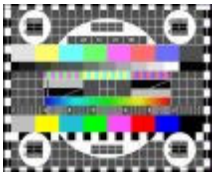


Delete file **Delete directory**

Application Example

- **High speed camera recorder**
  - **High-Vision image recording to SSD (More than 400MB/s)**
  - **Use exFAT format for recording operation**
  - **Reconnect SSD to PC and playback immediately**

- **High speed data pattern generator**
  - **Build data pattern by PC and save to SSD as exFAT file**
  - **Reconnect SSD to the FPGA**
  - **High speed read (500MB/s) and generate pattern**

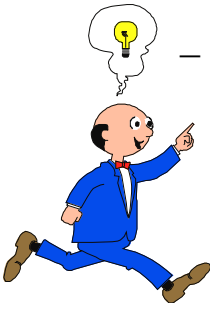


Sales and support condition

- **Sales condition of this reference design**
  - **One project license (valid only for one project)**
  - **Required NDA contract before purchase**
  - **Supported SATA-IP core:**
    - **SATA-IP005 (for Kintex-7)**
    - **SATA-IP006 (for Zynq-7000)**
- **Support condition of this reference design**
  - **Support period is limited to 90 days after purchase**
  - **Supports only KC705/ZC706 + AB09-FMCRAID environment**
  - **Supports original design only (No support if any modification)**
  - **Needs problem reproduce procedure for support request**

For more detail

- **Detailed documents available on the web site.**
  - **http://www.dgway.com/SATA-IP_X_E.html**
- **Contact**
  - **Design Gateway Co,. Ltd.**
  - **E-mail : sales@design-gateway.com**
  - **FAX : +66-2-261-2290**



Revision History

Rev.	Date	History
1.0	01-May-2013	English version initial release
1.1E	2013/9/13	Added Zynq-7000(ZC706) support