CHAPTER 1 Overview

The HOLMES 221B is an easy-to-use forensic duplicator capable of performing 1 to 1, 1 to 2, and 1 to 3 duplications. Not only duplication but also write block are built inside the machine. Users can read drive data from PC through HOLMES 221B without any data changed to keep the integrity of suspect drive. There are many functions and features designed to fit the specialized needs of forensic practice, including：

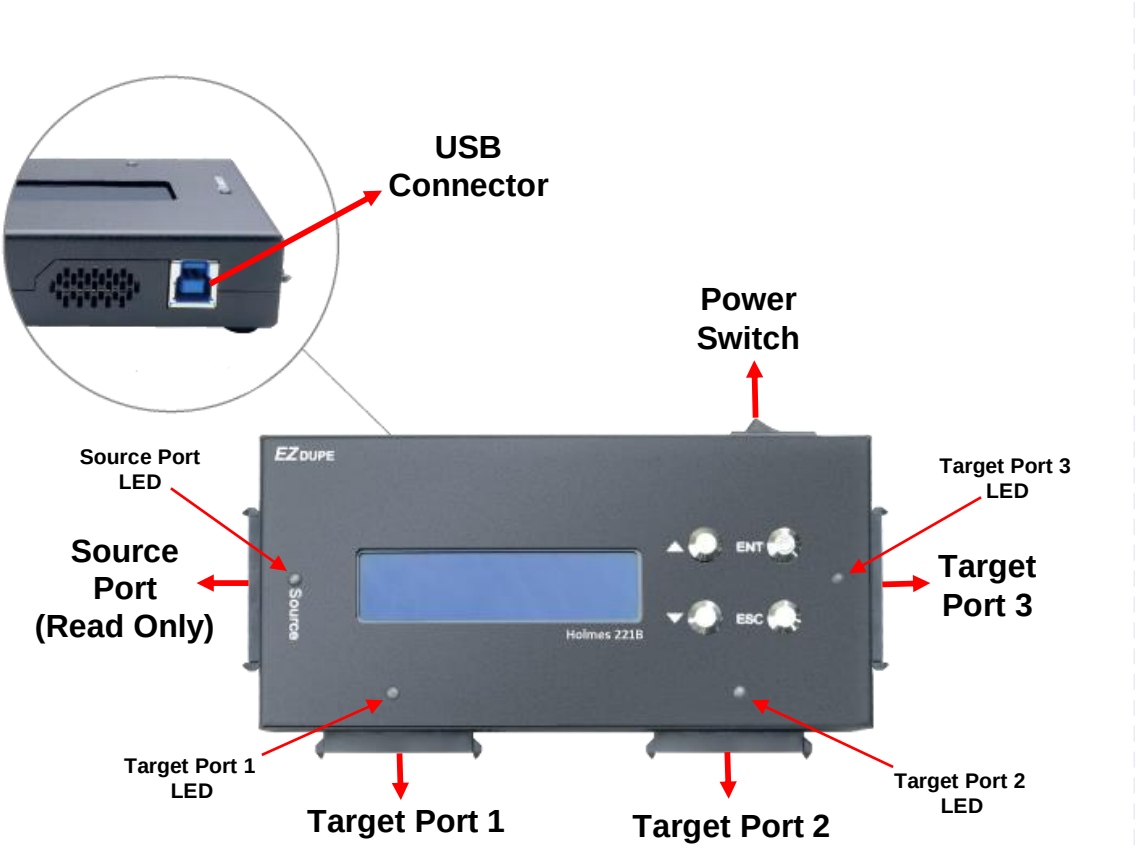
- Up to 18 GB/minute data transfer rate (the real speed depends on disk drive)
- 3 copy mode：Disk to Disk, Disk to File, File to Disk
- Make full disk image with Raw/DD
- Native support for SATA I, II, III hard disks
- Support IDE hard disks with SATA to IDE converter
- Source port read only
- Calculate MD5 and SHA-1 hash values
- HPA and DCO duplications and removal
- Skip bad sector as small as possible when duplicate
- A variety of data erase method
- Log file
- Built-in Write Blocker
- Instant power on and off, no warm-up or cool-down required

1. Kit Contents

The kits contained in the box are as follows：

Item	Description / SPEC.
	**HOLMES Forensic HDD Duplicator**
	**60W AC-DC High Reliability Industrial Adaptor** • Input：100~240VAC, 50/60Hz, 1.4A • Output：DC 12V/5A • -30~+70℃ wide range working temperature • Global certificate：UL, FCC, CE, CB, PSE, KC, BSMI, GS,…etc.
	**North American Power Cord** • 3 conductors • UL E315167, 18 AGW*3 • 105℃, 300V
	**22 Pin SATA Extension Cable x 4** • Power wire：UL 1007 18AWG, 80℃, 300V • Data wire：UL 21149 26AWG, 80℃, 30V • Contact area plating：10u • Length：10cm
	**SATA to IDE Adaptor x 4** • Used for IDE hard drive • From：SATA 22P male connector • To：IDE 40P female connector
	**User Manual for HOLMES 221B**

2. Outlook Overview



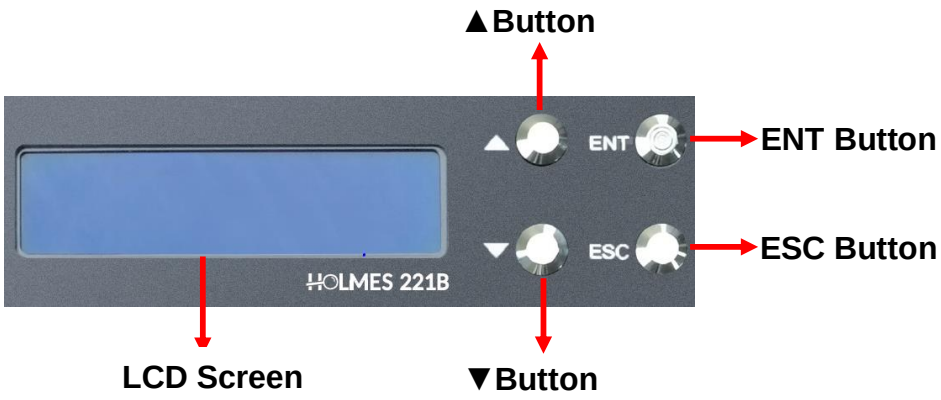
Power Switch：Power On/Off the HOLMES 221B

Source Port：The port which the source (suspect) disk connect to. No data will be changed when connect to this port in any condition.

Target Port 1-3：The ports which the target (evidence) disks connect to. Up to 3 target disks can be duplicated at a time.

USB Connector：Connect to PC, no data changed when reads disk which is connected to source port from PC. It acts as a Write Blocker.

3. Top Panel Overview



▲Button: *Up, Backward:* To navigate backward in the menu.

▼Button: *Down, Forward:* To navigate forward in the menu.

ENT Button: *Enter, OK:* Execute the function.

ESC Button: *Escape, Cancel:* Go back to the previous level in the menu.

CHAPTER 2 Using the HOLMES 221B

1. General Information

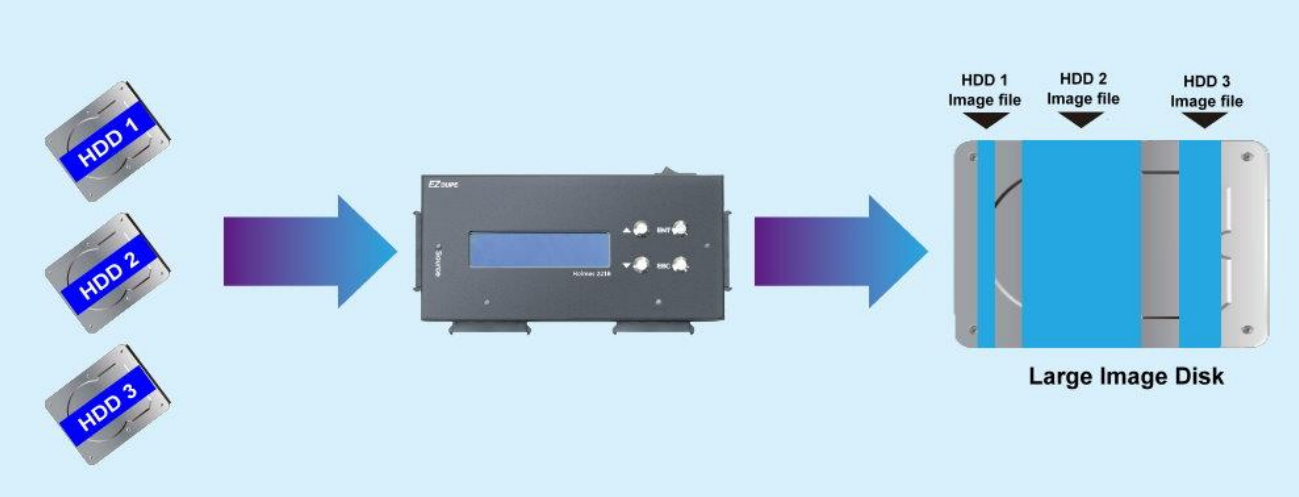
- The tasks mentioned in this user's manual are as following: Copy, Compare, Copy + Compare, Erase, and Format functions.
- The standby mode standards for no task is processed.
- The SATA ports always detect if drives are inserted under standby mode. When a drive is inserted into a SATA port, the corresponding Green LED will be on when the connection between machine and drive is established. Green LED will be off when the drive is removed.
- The duplicator will start to execute a task after the source (if needed) and target devices have been inserted and the ENT button is pressed.
- The Green LED flashes during the execution process of a task. After the task is done, the Green LED will stay solid if the process is successful, otherwise the Red LED will be on if the process is failed.
- The task will begin and end at the same time for all target devices.
- Any other target device plugged in during the process of a task will not be executed with the task.
- Pressing and holding **ESC** button during the execution process of a task for more than 5 seconds will stop and exit the execution of the task.
- **DO NOT** unplug disks from the duplicator during the execution process of a task. It may cause damage to the duplicator system and media.
- It is strongly recommended that the capacities of the targets media are equal or larger than source at Disk to Disk mode.

2. 3 Operation Modes

HOLMES 221B provides 3 operation modes to be selected by users. Selects the operation mode at **7.1 Operation Mode**. The selected operation mode will be shown on the LCD display.

Disk to Disk Performs a sector by sector copy of the source disk to target disks to produce exact duplicates of the source disc. Source disk sector 1 is copied to destination disk sector 1, then sector 2 is copied to sector 2, sector 3 to sector 3, and so on. It can do up to 3 targets duplications.

Disk to File Images the source disk to a file and stores in a large image disc. The different image files can be stored in a large image disc in sequence. Images HDD 1 then HDD 2 and then HDD 3.



File to Disk Restores image file from a large image disc to target disks. Users can choose one of the image file in the large image disc to be restored. Up to 3 target disks can be restored at

a time.

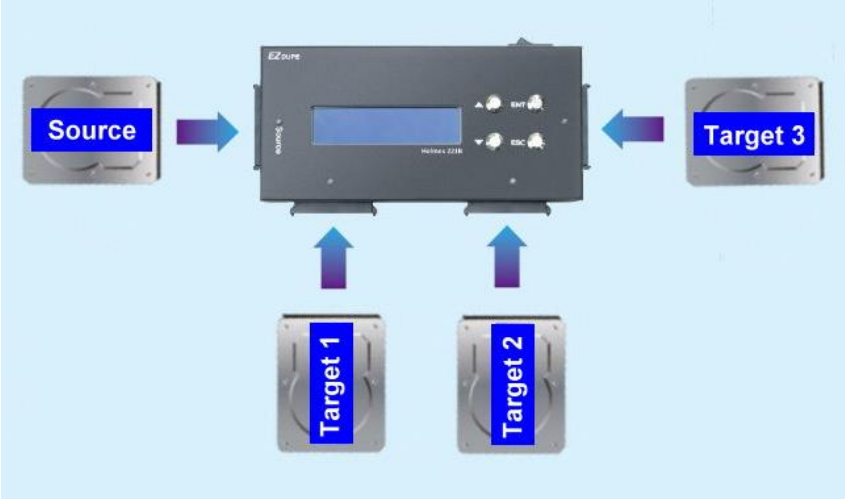

HDD 1
Image file
HDD 2
Image file
HDD 3
Image file
Large Image Disk
HDD 1
HDD 2
HDD 3

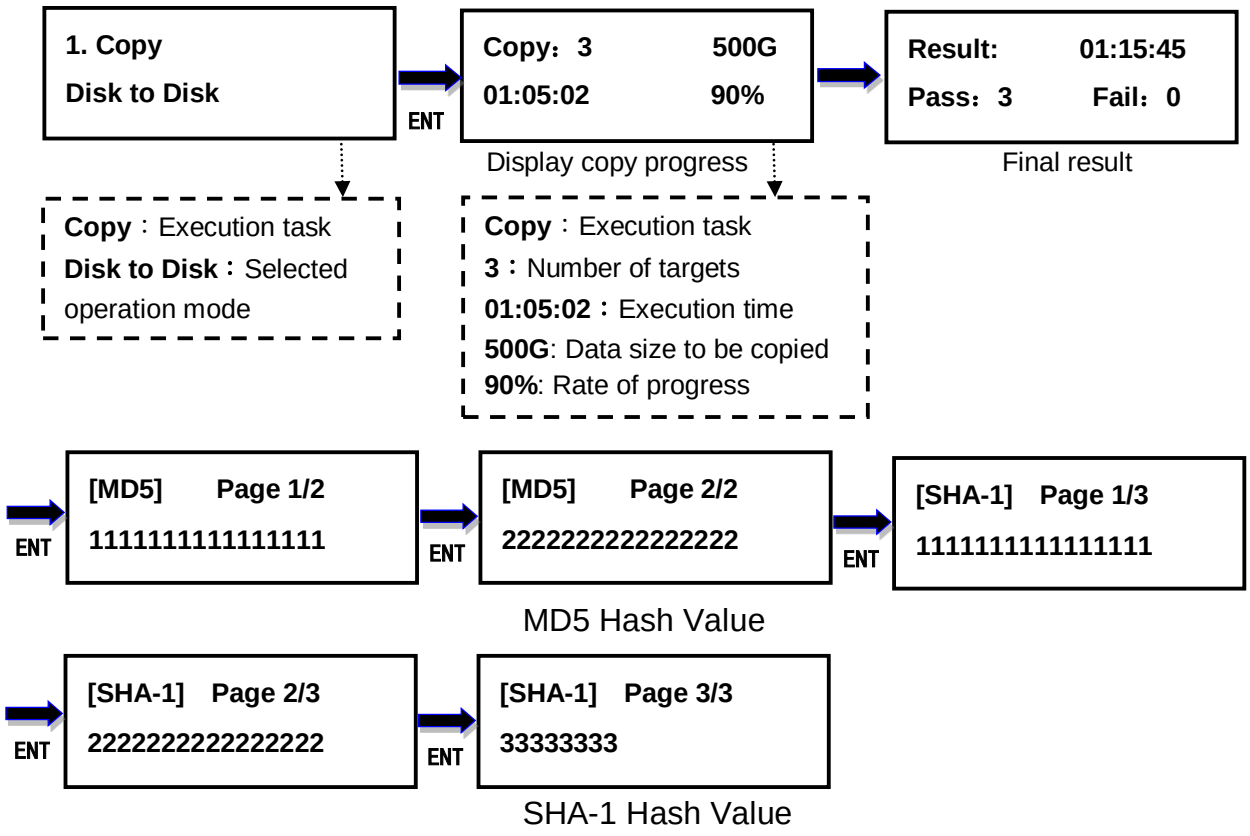
CHAPTER 3 Menu Overview

1. Copy

A. Disk to Disk Mode：

Selects the operation mode at **7.1 Operation Mode**. It performs copying source disk sector by sector to target disks. 1 to 1, 1 to 2 and 1 to 3 copy are supported. The connection and operation procedure diagram are shown as below.





a. Insert source disk into the source port and the corresponding green LED will be on when the connection between duplicator and source disk is established properly.

b. Insert target disks into the target ports and the corresponding green LEDs will be on when the connection between duplicator and target disks are established properly.

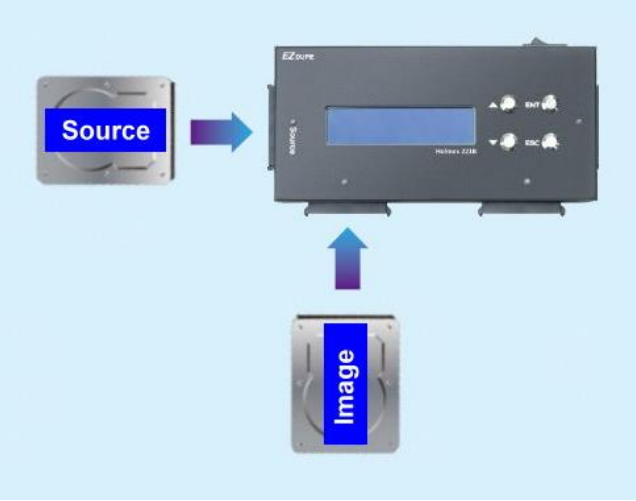
c. Select the task **1.Copy** on menu, and press **ENT** button to execute it.

d. During the execution process, the status of each target disk can be checked by using the ▲ and ▼ buttons.

e. After the task is done, LCD display will show the number of successful and failed target(s), execution time, and Hash Value if the setting of the hash function is turned on.

B. Disk to File Mode：

Selects the operation mode at **7.1 Operation Mode**. It performs imaging source disk to a file and stores in a large image disk. The operation procedure is the same as the above **Disk to Disk** mode. The connection diagram is shown below. HOLMES 221B makes full disk image with Raw/DD. There are 2 files will be produced. The first file is IMG_XXXX.dd (X from 0-9) which contains the raw dada of full image disk without the data in HPA and the setting of HPA and DCO. It is the same as the DD function in Linux OS. Users can load this file on computer. The second file is IMG_XXXX.t0 which contains the data in HPA and the setting of HPA and DCO. Users can duplicate the identical target disks by 2 files with the function of **File to Disk**

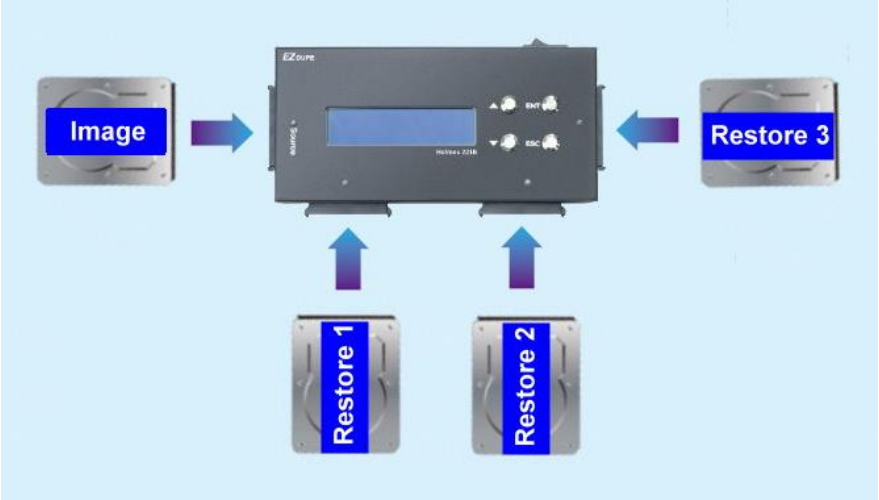


Remark：

- Source disk, the disk you want to image to a file, have to be connected to **source port.**
- Image disk, the file you want to be stored, have to be connected to **target port 1.**

C. File to Disk Mode：

Selects the operation mode at **7.1 Operation Mode**. It performs restoring one of image file in an image disk to target disks. The operation procedure is the same as the above **Disk to Disk** mode. The connection diagram is shown below.



Remark：

- Image disk, the disk stored image files, have to be connected to **source port.**
- Restored disks, the targets disks you want to restore to, have to be connected to **target ports**, 1, 2, 3 disks are supported.

D. HPA & DCO

No need to set any parameter. The data in HPA, HPA setting and DCO setting will be duplicated at all 3 modes to make sure all duplicates are identical to the original.

E. Error Recovery Method

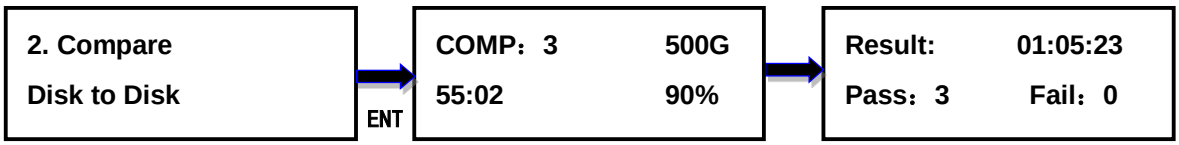
When the HOLMES 221B detects a read error, it will retry 3 times to make sure the 64-sector block cannot be read (call it as bad sector). When make sure this block cannot be read, HOLMES 221B will read each sector in this block to maximize the copy integrity. When determine a sector cannot be read from the source drive, it fills in the missing data with a character string **"UNREADABLESECTOR"** on the destination drive. It is easier for users to know where the bad sectors are in a target (evidence) disk. **"UNREADABLESECTOR"** character string inserted in this way is also included when calculates the MD5 and SHA1 hash values for the duplication.

Remark：

When bad sectors are detected on a source (suspect) disk, the target disks cannot be the same as the original (suspect disk). The hash value of MD5/SHA-1 might be not the same at each copy. It is because bad sectors might be not happened every time at the same sectors. HOLMES 221B will do the best to make the best integrity when bad sectors are detected.

2. Compare

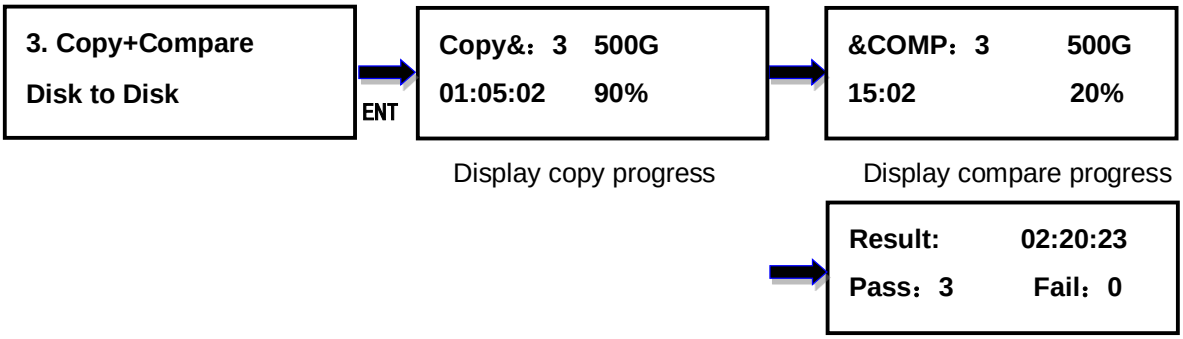
This function allows to compare the copied target disks against the source for accuracy. If a bad sector is determined on the source disk, the process of compare will be stop and show compare error. All connection and operation procedure diagrams are the same as **1. Copy**. Please refers to the above description.



Display compare progress　　Final result

3. Copy + Compare

This function allows duplicator to start Copy process first, then follow with Compare process immediately. All connection and operation procedure diagrams are the same as **1. Copy.** Please refers to the above description.



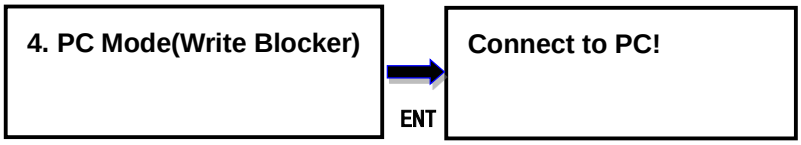
Display copy progress　　Display compare progress

Final result

4. PC Mode(Write Block)

This function allows Holmes 221B works as a hardware Write Blocker when the disk which is inserted into the source port connects to computer through USB 3.0 port. It can intercept and prevent (or ‘block’) any modifying command operation from ever reaching the source

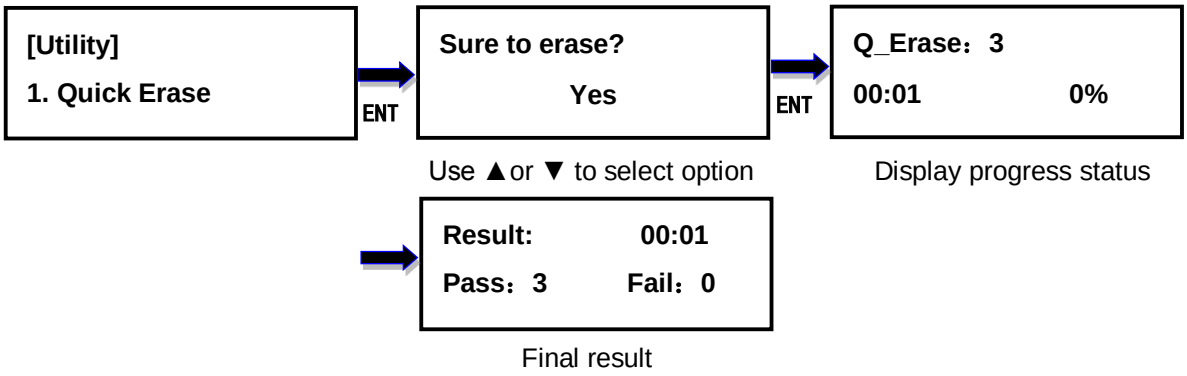
HDD. No data will be changed when reads the disk which is inserted into the source port from a computer. Press **ESC** when you want to disconnect from the PC.



5. Erase

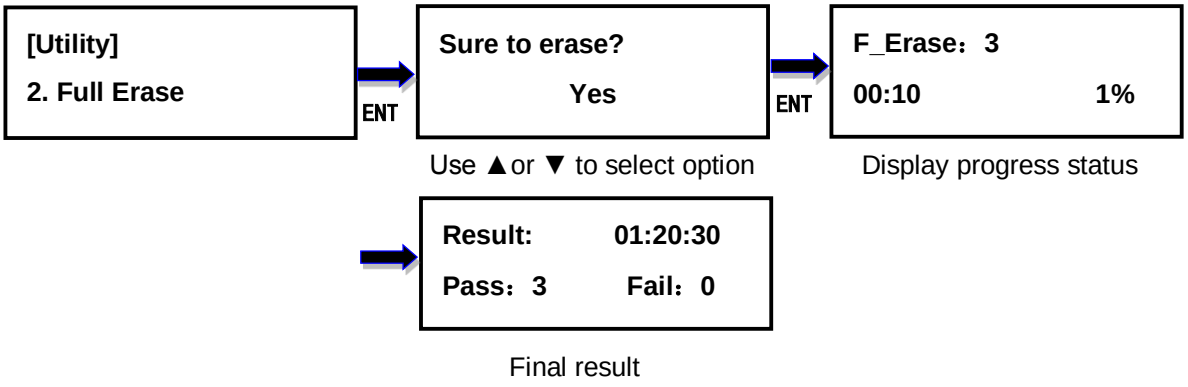
5.1 Quick Erase

This option erases the table of content of file system of the target disks, so it is fast to do Quick Erase. There is chance that some files can be retrieved by software.



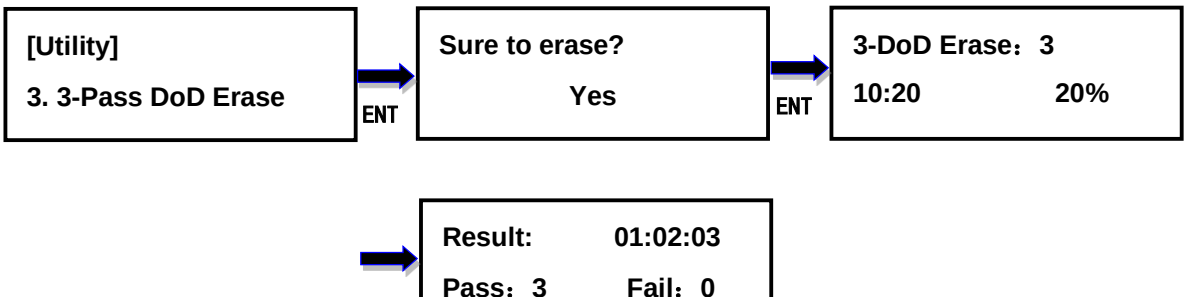
5.2 Full Erase

This option completely erases the content of target disks. The data of all sectors are filled in 0x00. It takes longer time to erase and the content will not be retrieved by software.



5.3 3-Pass DoD Erase

This is to comply with the U.S.A. Department of Defense (DoD 5220) standard to fully erase the media by rewriting sector by sector 3 times to guarantee the data to be permanently deleted. It takes the longest time to erase, and the content will not be retrieved by software.

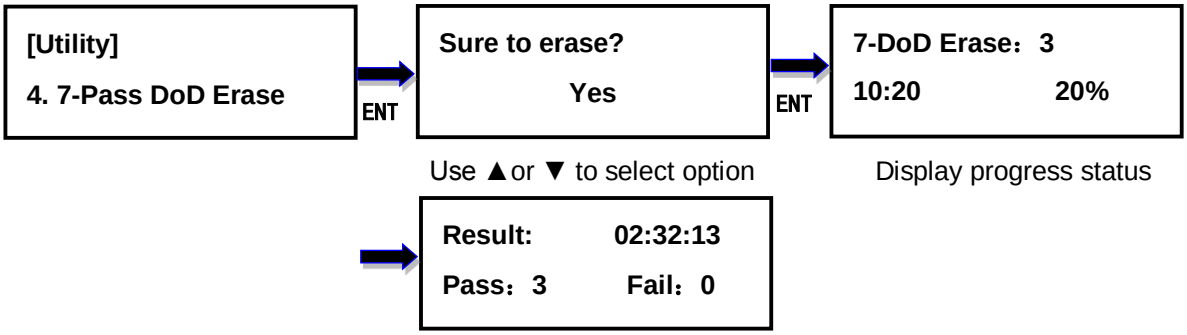


Use ▲or ▼ to select option Display progress status

Final result

5.4 7-Pass DoD Erase

This is to comply with the U.S.A. Department of Defense (DoD 5220) standard to fully erase the media by rewriting sector by sector 7 times to guarantee the data to be permanently deleted. It takes the longest time to erase, and the content will not be retrieved by software.

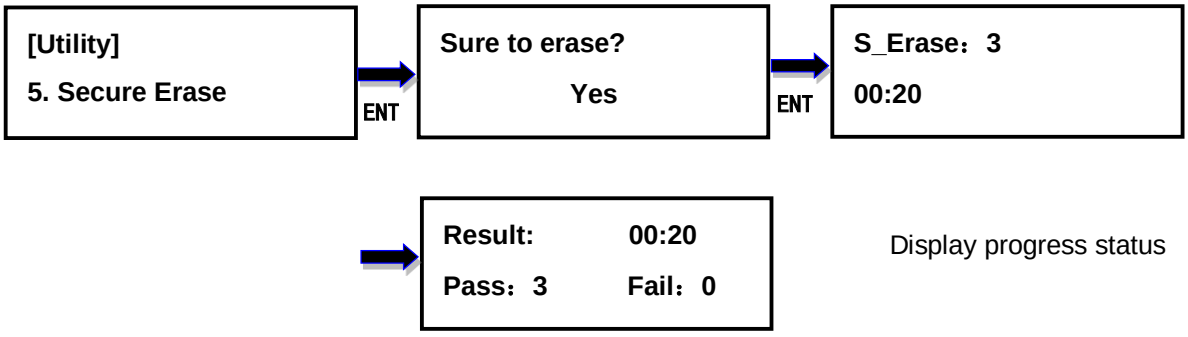


Use ▲or ▼ to select option Display progress status

Final result

5.5 Secure Erase

The Secure Erase is dedicated to erasing SSD. It resets all its storage cells as empty - restoring the SSD to factory default settings and write performance. Secure Erase is recognized by the US National Institute for Standards and Technology (NIST), as an effective and secure way to meet legal requirements data sanitization attacks against up to laboratory level. It only spends few seconds (the real time depends on drive) when used for SSD.

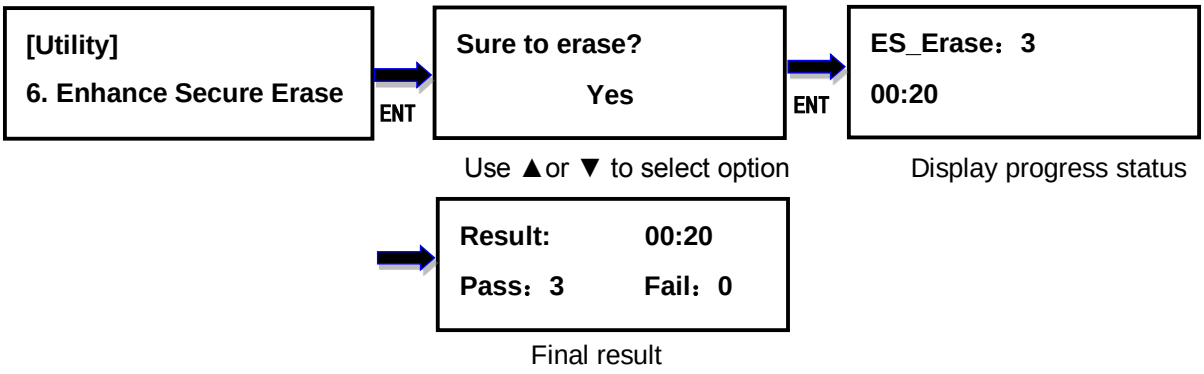


Display progress status

Final result

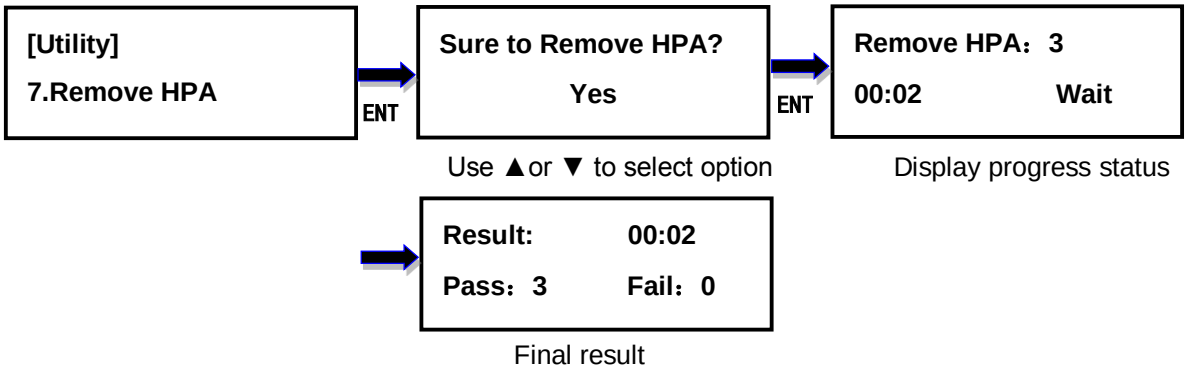
5.6 Enhance Secure Erase

The **Enhance Secure Erase** is similar to Secure Erase. Beside the function of Secure Erase, it shall write predetermined data patterns to all user data areas. All previously written user data shall be overwritten, including sectors that are no longer in use due to reallocation.



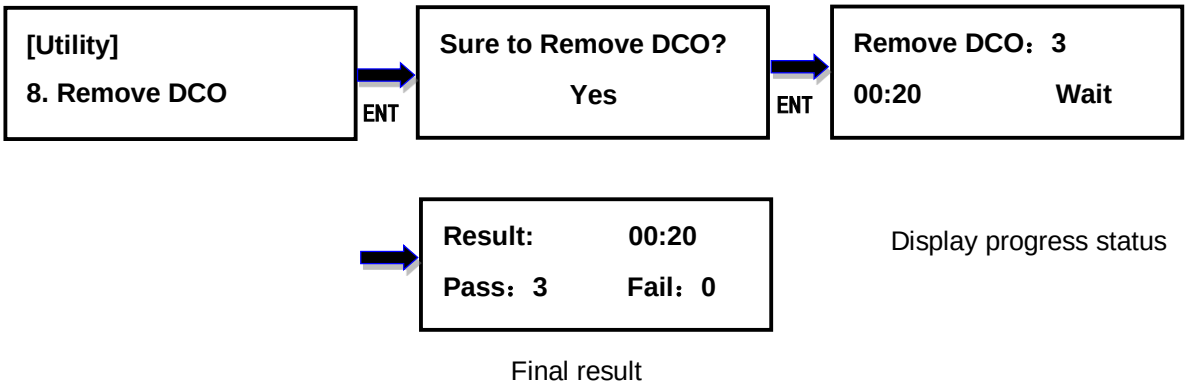
5.7 Remove HPA

This option removes the HPA setting of the disks inserted into the target ports.



5.8 Remove DCO

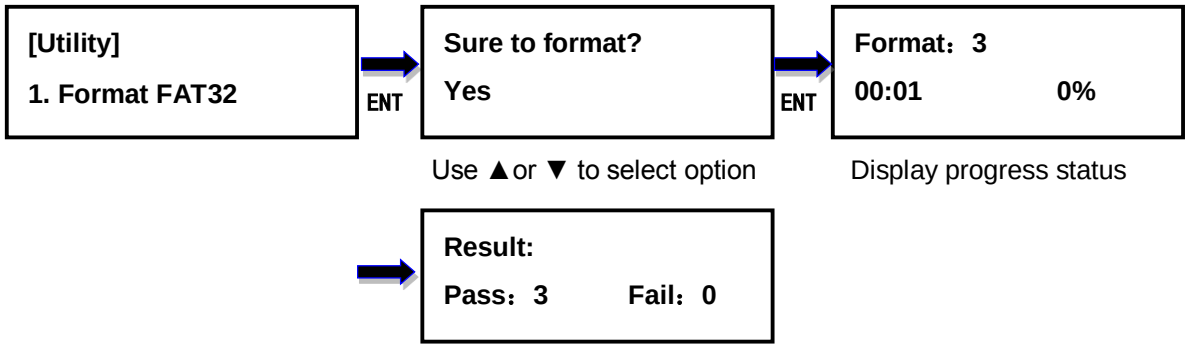
This option removes the DCO setting of the disks inserted into the target ports.



6. Utility

6.1 Format FAT32

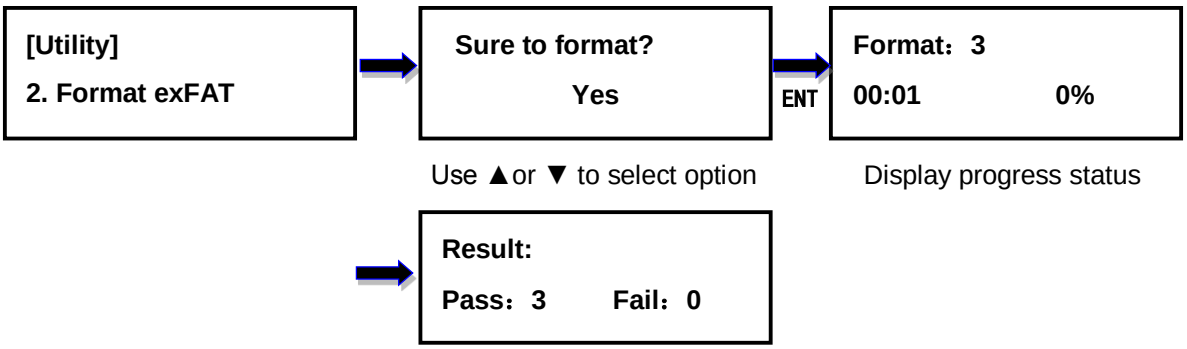
This option allows to format the target device to FAT32 file system. It will not format the source device, avoiding accidently erasing the original data content. User will be asked if it is sure to format the target devices before the Format process starts.



Final Result

6.2 Format exFAT

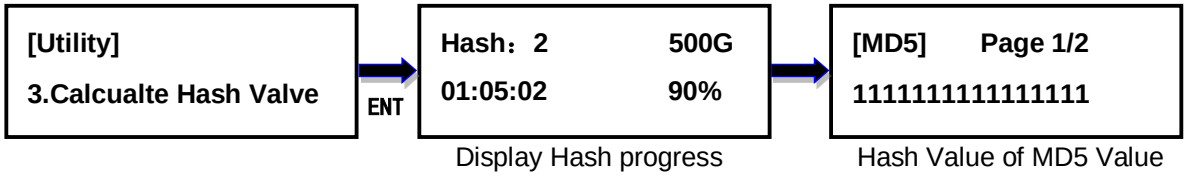
This option allows to format the target device to exFAT file system. It will not format the source device, avoiding accidently erasing the original data content. User will be asked if it is sure to format the target devices before the Format process starts.

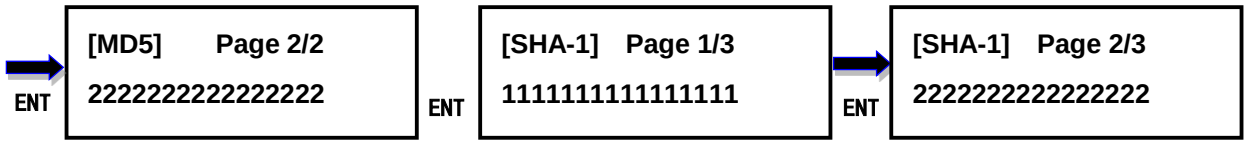


Final result

6.3 Calculate Hash Value

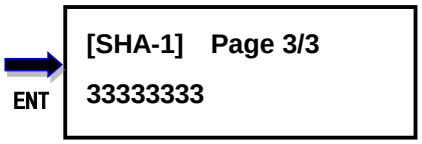
This option allows to calculate the hash value of the disk connected to the source port. It calculates both MD5 & SHA-1 hash value.





Hash Value of MD5 Value

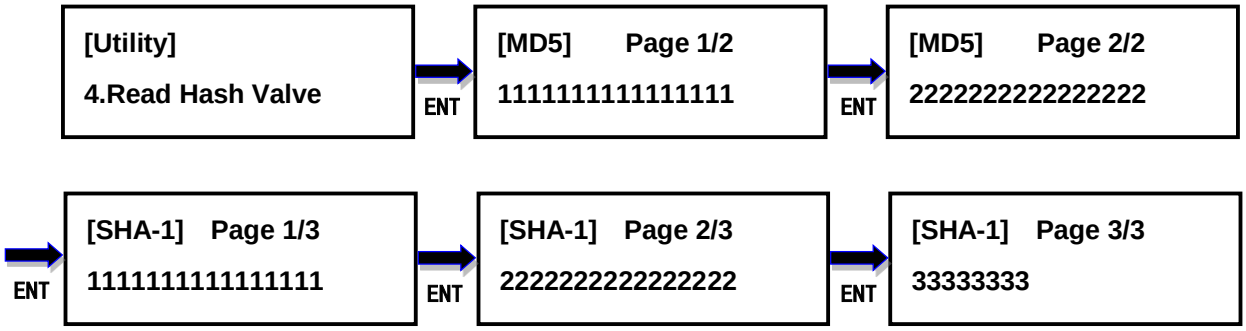
Hash Value of SHA-1 Value



Hash Value of SHA-1 Value

6.4 Read Hash Value

This option allows to read the hash value of the latest execution task of **1.Copy** or **6.3 Calculate Hash Value** to avoid the user forget to write down hash value when last task was finished.

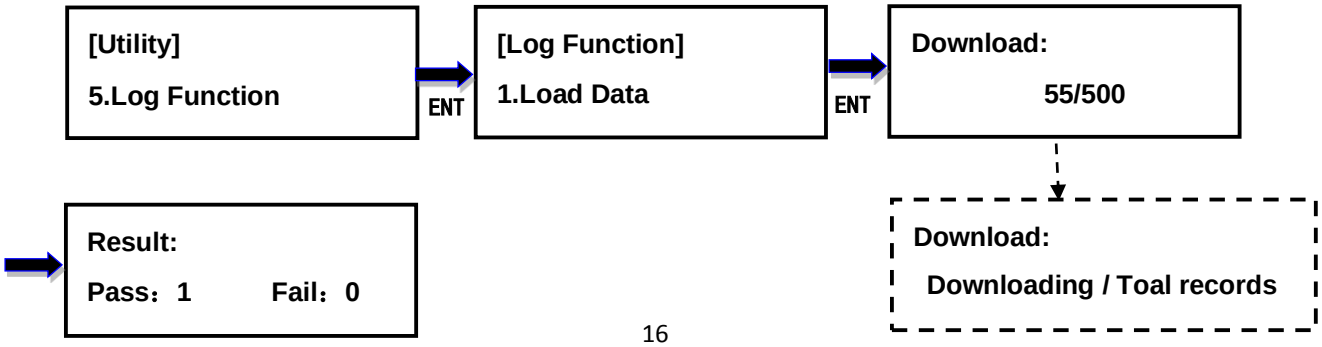


6.5 Log Function

The HOLMES 221B keeps logs in the flash memory of Copy, Compare, Copy+Compare, Erase, and Format function. 10,000 records of log data can be stored. The records of log data for a task is the number of source + targets + 1. For example：1 to 3 copy task needs 1+3+1=5 records. 3 exFAT format task needs 0+3+1=4 records. The log file is **read only**. Users cannot modify the log data.

6.5.1 Load Data

Insert a disk into the **target port 1**. The file system of the disk must be FAT32 or exFAT.



Open the file from computer. The file name of log file is “LOG_DATA_XXXX.txt”. XXXX is from 0000 to 9999 in sequence. If no log file in the disk, it starts from 0000. If 0000 is exist in the disk, it will be added 1 to be 0001 and so on. The information in log file is shown below. It was recorded for 1 to 3 Disk to Disk Copy and uses 5 log records.

[Log File]
Machine Model: HOLMES 221B
Target Number: 3
Firmware Version: v2.00.16
Machine ID: 84E15PF8SMS6RBA1
==========

Machine boot at 2018/4/09 17:07
==========
Task: Copy

Operation Mode：Disk to Disk
Performance: Speed

Source:
Device Model: SanDisk SSD U110 64GB
Series Number: 140700400350
Max Size: 58.6GB
DCO Size: 5120M
HPA Size: N/A

MD5 Value: 12345678901234567890123456789012
SHA-1 Value: 1234567890123456789012345678901234567890
Number of Bad Sectors: 0
Result:
Total: 3 Pass : 3 Fail : 0 Spend Time : 00:01:01

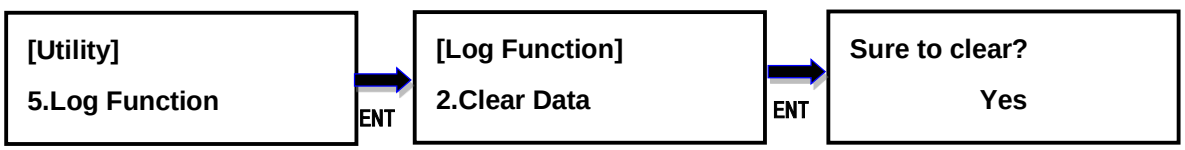
[Detail Target Records]

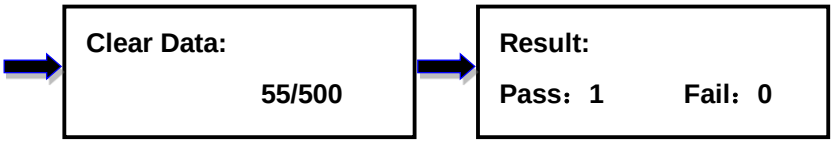
Port	Result	Start Time	Spend Time	Device Model	Target Capacity	Series Number
0002	Pass	2018/04/09 16:09	00:00:57	PLEXTOR PX-128M5Pro	119.2G	P02314109173
0003	Pass	2018/04/09 16:09	00:00:56	SanDisk SSD U110 64GB	58.6G	140791403873
0001	Pass	2018/04/09 16:09	00:00:58	ADATA SP550	111.7G	2F3820030313

==========

6.5.2 Clear Data

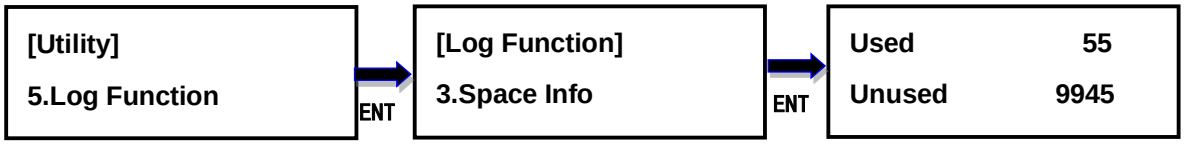
This option clears all the log data in HOLMES 221B.





6.5.3 Space Info

This option shows the number of log records and amount of free space available.



6.6 File Manager

This option is the management of the image disk. The position of image disk (image port) depends on the operation mode, insert the image disk into the image port. All the function in this option read from image port.

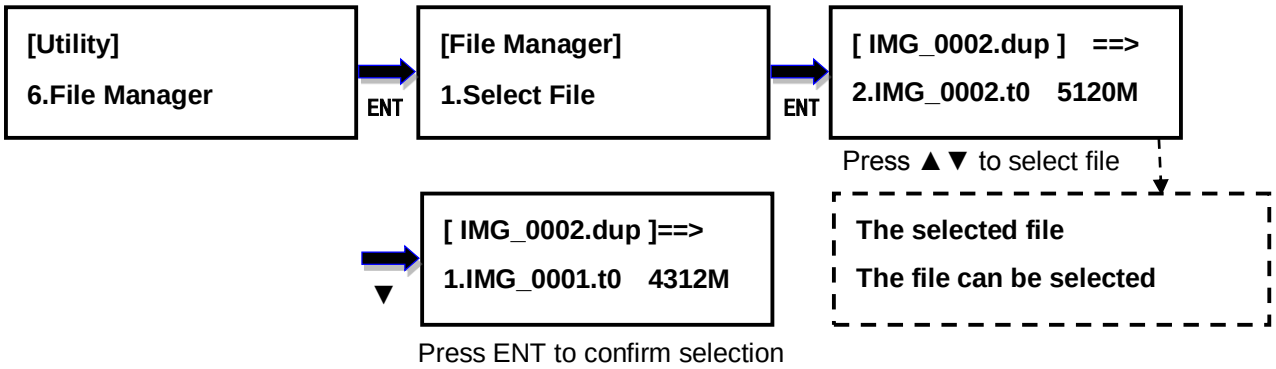
Disk to Disk No image related function so *none port* is the image port.

Disk to File *Target port 1* is the image port.

File to Disk *Source port* is the image port.

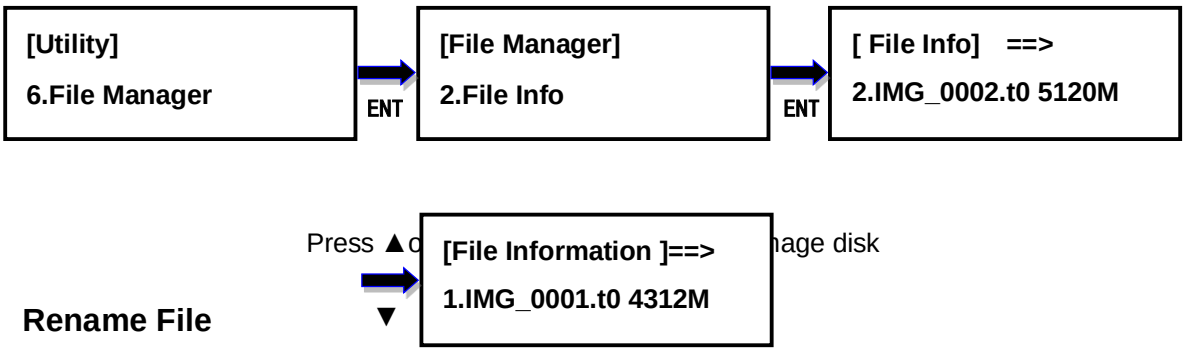
6.6.1 Select File

This option is used at **File to Disk** operation mode, selects the file which you want to be restored to the target disks. Select a file IMG_XXXX.t0, IMG_XXXX.dd won't be shown on the list.
The files are listed in order of which they were imaged.



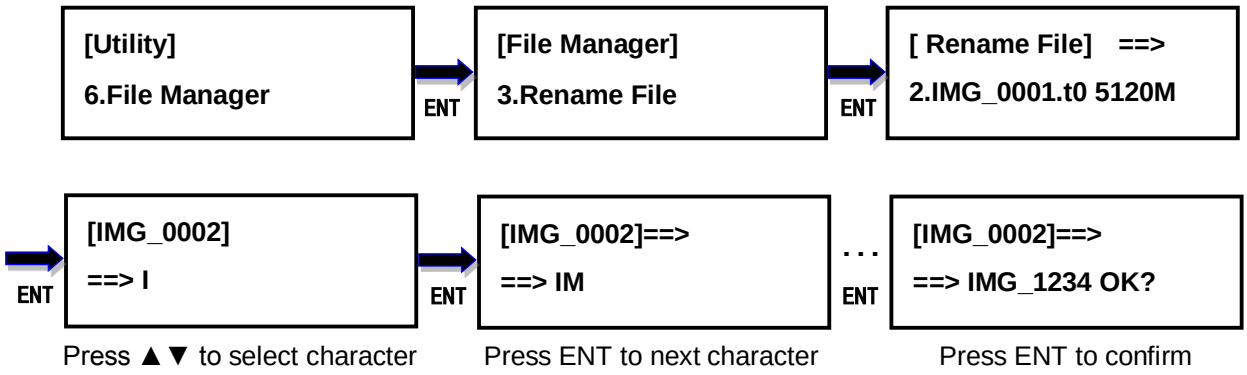
6.6.2 File Info

Shows the files in sequential order. It shows the file name of IMG_XXXX.t0 and the file size of IMG_XXXX.t0 + IMG_XXXX.dd.



6.6.3 Rename File

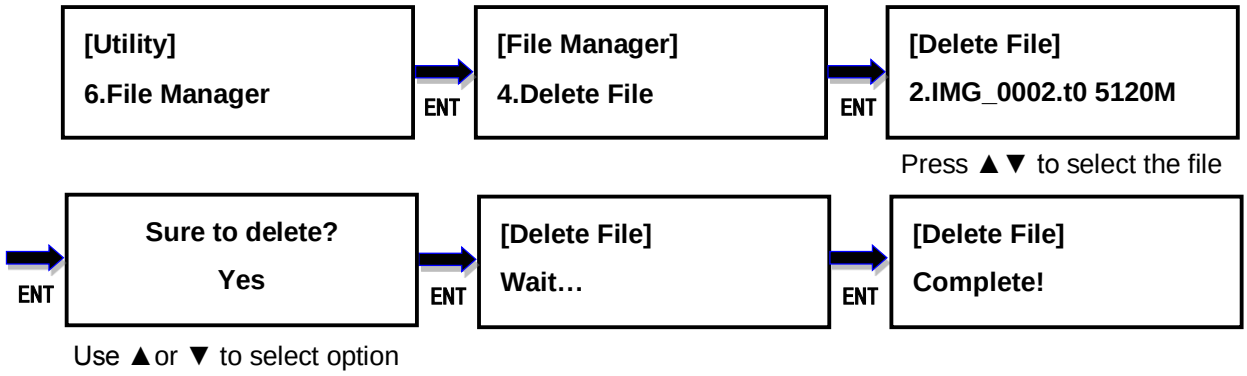
Rename the file instead of using default file names (IMG_0001, IMG_0002, etc.). Only needs to rename the file IMG_XXXX.t0, the file IMG_XXXX.dd will be renamed as the IMG_XXXX.t0 automatically.



Remark : Press ESC to back to last character when rename file name.

6.6.4 Delete File

Delete the file in an image disk. When delete the file IMG_XXXX.t0, the file IMG_XXXX.dd will be deleted automatically.



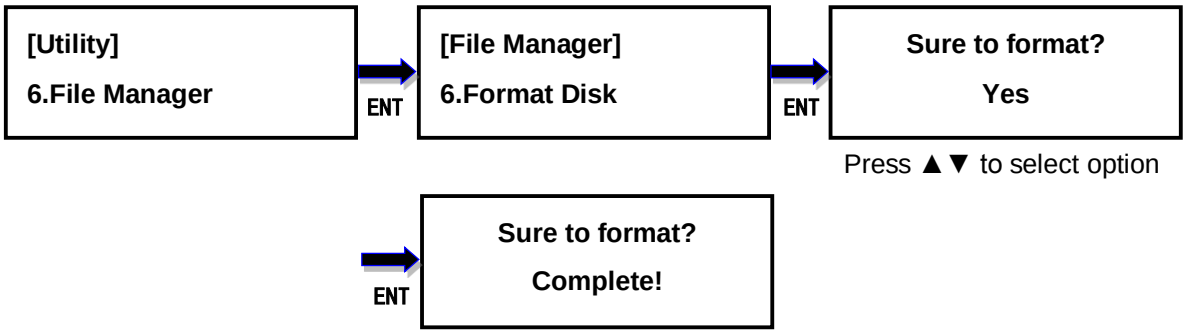
6.6.5 Disk Info

Show the number of files and amount of free space available.

Image	Number of file
Free	Free space

6.6.6 Format Disk

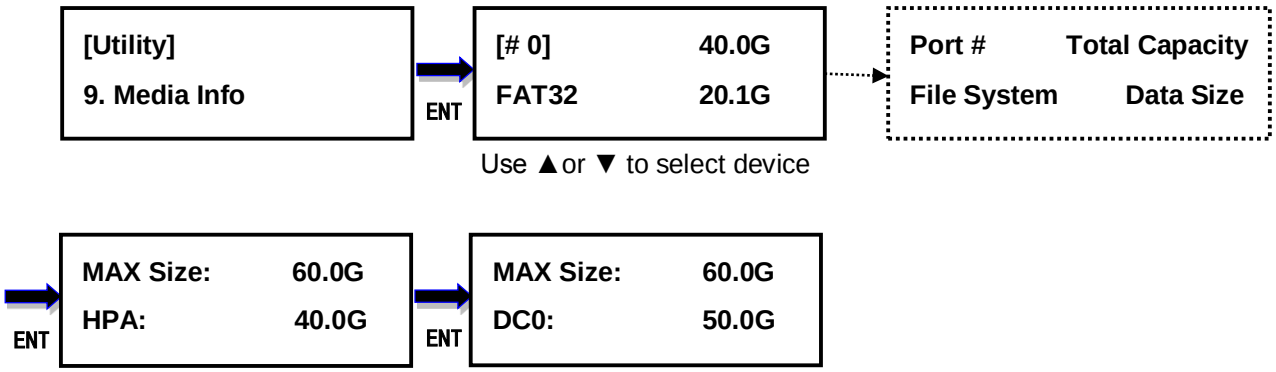
Format the disk connected to image port. The format file system is exFAT.



6.7 Media Info

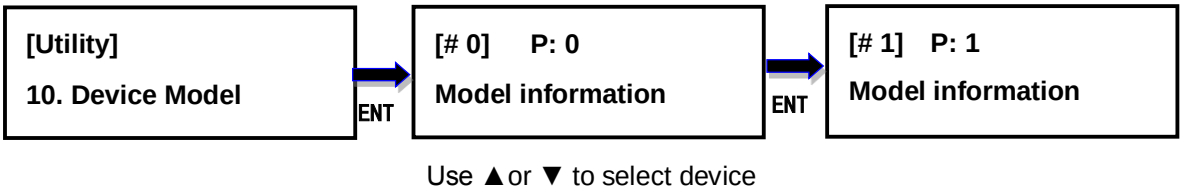
This option displays the information of selected device media, such as total capacity, file system and the size of data content. The DCO&HPA information are displayed as well.

For example：The following diagram shows the information of Source disk port#0 that the Max Size is 60G, DCO is 50G, HPA is 40G, available data is 20.1G with FAT32 file system.



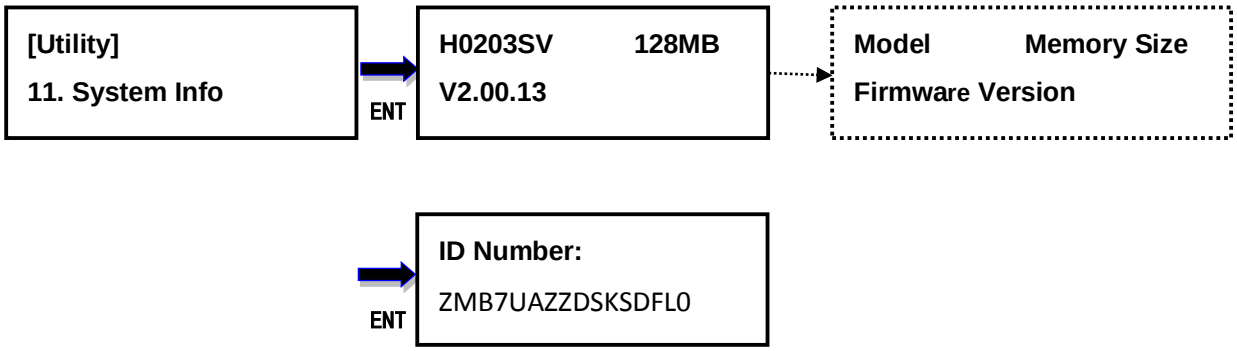
6.8 Device Model

This option displays the model information of selected device, such as device model, serial information and firmware version.



6.9 System Info

This option displays general information of the duplicator, including controller model, system memory size, firmware version and ID number.



6.10 System Update

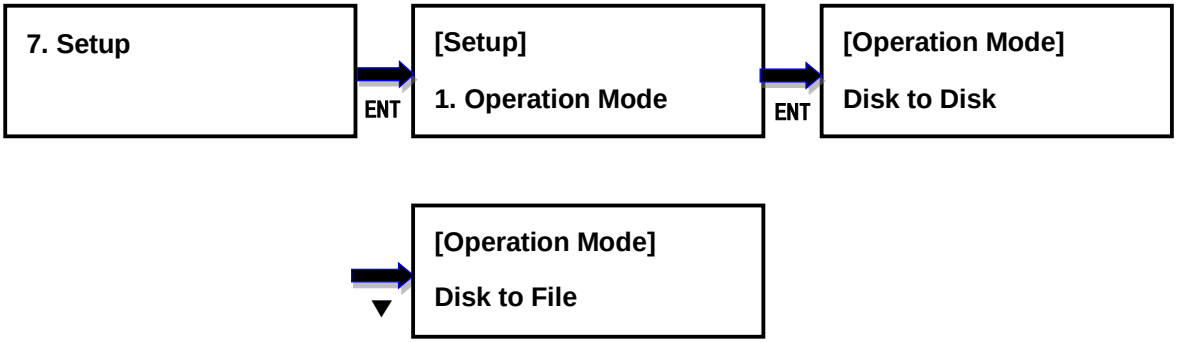
This option allows user to update the firmware of duplicator when necessary. Formats the HDD as **FAT32** file system and then save the unzipped file under home folder on the HDD **(DO NOT save the file under sub folder)**. Insert the HDD containing the firmware into the source port of duplicator and press ENT. It will update the system, reboot the duplicator after update, active and operate under the new firmware.

Looking for firmware

7. Setup

7.1 Operation Mode

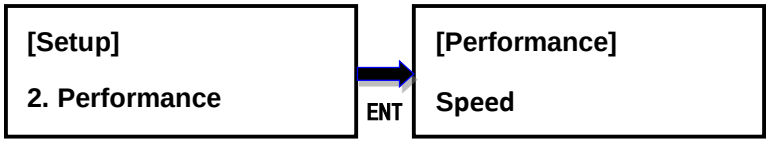
There are 3 operation modes can be selected. **Disk to Disk, Disk to File** and **File to Disk.** The details please refer to **Chapter 2.** The default mode is Disk to Disk



Use▲▼to change option

7.2 Performance

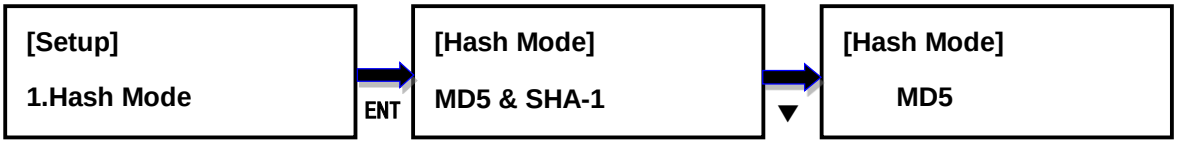
This option allows to set up the performance for Copy and Compare function based on the following modes: Speed, Balance, and Compatibility. Speed mode is to execute the functions at the fastest speed, but may have compatibility issue with certain brands hard disk drive. Balance mode is to execute the Copy function at stable speed, and have less compatibility issue with certain brands hard disk drive. Compatibility mode is to execute the Copy function at the most stable speed, and almost have no compatible issue with hard disk drive. **SATA 1 drive need to select compatibility mode**. The default mode is Speed.



Use ▲or ▼ to select

7.3 Hash Mode

The function of **1.Copy** calculates the hash value according to this setting. There are 4 options can be set. **MD5 & SHA-1**, **MD5**, **SHA-1** and **Disable**. The default mode is Disable.

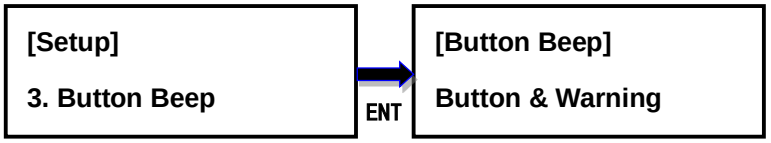


Use ▲or ▼ to select

Remark：The function of **6.3 Calculate Hash Value** calculates both MD5 & SHA-1 hash value. It has nothing with this setting.

7.4 Button Beep

This option allows to set up button sound from the following options: Button & Warning, OFF, Warning only. The default setting is Button & Warning.

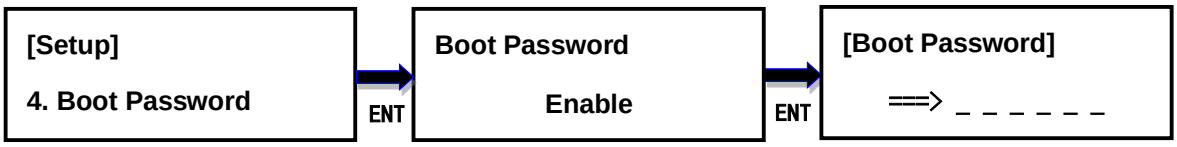


Use ▲or ▼ to select

7.5 Boot Password

This option allows to set up password for system boot up to prevent from the

unauthorized use of the duplicator. The password must be 6 characters.

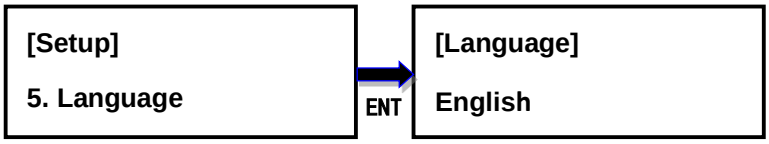


Use ▲or ▼ to select

Use ▲or ▼ to select,
Press ENT to confirm

7.6 Language

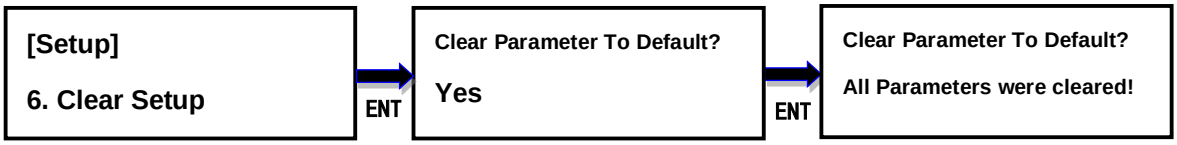
This option allows to choose the language for display: English, Spanish, Portuguese, and Japanese. English is the default language.



Use ▲or ▼ to select

7.7 Clear Setup

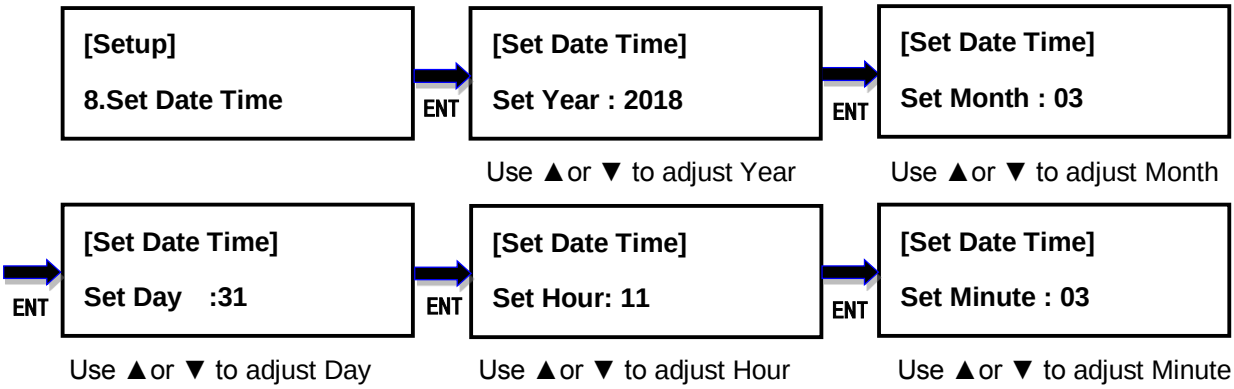
This option resets the duplicator back to factory default settings.



Use ▲or ▼ to select

7.8 Set Date Time

This option sets the date and time of the duplicator. It has a battery to provide power to the clock when no power adapter is connected.



Use ▲or ▼ to adjust Year

Use ▲or ▼ to adjust Month

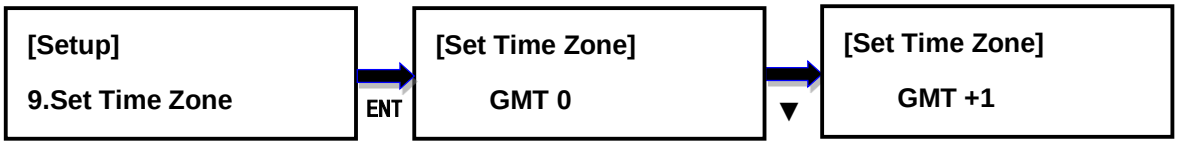
Use ▲or ▼ to adjust Day

Use ▲or ▼ to adjust Hour

Use ▲or ▼ to adjust Minute

7.9 Set Time Zone

This option sets the time zone where the user stay in.



Use ▲or ▼ to adjust time zone

CHAPTER 4 Troubleshooting

1. Troubleshooting

Q: The Holmes 221B cannot be operated or no display on the LCD screen.

- Check the power cord is not damaged and connected to the machine securely.

Q：The hard drive cannot be recognized.

- Make sure the hard drive is good and firmly attached to the Holmes 221B.
- Remove the hard drive and insert again.
- Select the “Compatibility” mode in the menu **7.2 Performance** to recognize again.

Q：The Holmes 221B operates very slow or is unstable.

- Check the SATA extension cable is good and connect to hard drive and HOLMES 221B securely.
- The hard drive might work abnormally.

2. Replacing the Battery for Real-time Clock

There is a battery inside the machine to keep the Real-time clock working. Usually it can be used for more than 5 years. Replace the battery when it is out of the power. The battery type and model is Micro Lithium Cell **CR1220**.