



KanguruClone 7HDS, 15HDS & 23HDS Pro Duplicator

User Manual

Notices and Information

Please be aware of the following points before using your KanguruClone

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- Consult the dealer or an experienced radio/TV technician for help.

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1. INTRODUCTION

Congratulations on your purchase of the KanguruClone HD SATA Pro Disk Duplicator from Kanguru Solutions.

The KanguruClone is a high speed, stand-alone SATA disk duplicator that can simultaneously create up to 7, 14 or 23 SATA HDD or SSD copies (depending on model). The duplicator has many advanced features for the IT professional, yet a novice can begin cloning hard drives within minutes of taking it out of the box. With ultra fast copy speeds of up to 12GB/min, the KanguruClone is one of the fastest cloning systems available.

Features

- √ Up to 12GB/min transfer rates
- √ HDD size and brand independent.
- √ Supports all standard SATA hard drives.
- √ IDE hard drives supported with adapters (sold separately)
- √ One-year Standard Warranty: This system comes complete with a one-year parts and 90 day labor warranty. One-year and two-year extended warranties available, contact Kanguru sales for more information.
- √ Clones any operating system: including Window, Linux, Mac and many more.
- √ 5 Copy Operations:
 - **Smart Copy** - System automatically detects the most efficient copy method
 - **Brief Copy** - Copies only sectors with data (compatible with most major file systems)
 - **Resize Copy** - Copies HDDs with different capacities
 - **Disk Copy** - Sector for sector duplication
 - **Ratio Copy** - Copies a defined percentage of the Master HDD
- √ Powerful diagnostic functions
- √ Robust logging software (Windows only)
- √ Supports HPA (Host Protection Area) and DCO (Device Configuration Overlay)
- √ Up to 999 x wipe cycles (7 x wipe cycles complies with the 5220-22.M Standard)
- √ Load disk images to a Storage Center for convenient storage

1.1 Package Contents

If any of the following items are missing, please call Kanguru Solutions' Tech Support department at: (508) 376-4245, extension 2 and replacement parts will be shipped to you ASAP.

- KanguruClone Hard Drive Duplicator unit with internal power supply
- Quick Start Guide
- Power Cable
- RS-232 to USB2.0 Converter Cable
- SATA Connection Cables
 - 7 Target Models: 8x SATA data + power cable
 - 15 Target Models: 16x SATA data + power cable
 - 23 Target Models: 24x SATA data + power cable
- Daisy Chain Cable (15HDS and 23HDS models only)

Note: 3.5" IDE adapters sold separately

1.2 Specifications

KanguruClone 7HDS - PRO	
LCD Screen	20 x 2 Characters back-lit LCD
Input Device	7 Push Buttons
Dimensions	15.5" x 13.5" x 9"
Weight	16.5 lbs.
Power Supply	400W 115V/230V 12A/6A Autoswitching
Operating Temperature	41°F ~ 122°F
Relative Humidity	15% ~ 90%

KanguruClone 15HDS - PRO	
LCD Screen	20 x 2 Characters back-lit LCD
Input Device	7 Push Buttons
Dimensions	16" x 21" x 9.5"
Weight	25 lbs.
Power Supply	800W 115V/230V 12A/6A Autoswitching
Operating Temperature	41°F ~ 122°F
Relative Humidity	15% ~ 90%

KanguruClone 23HDS - PRO	
LCD Screen	20 x 2 Characters back-lit LCD
Input Device	7 Push Buttons
Dimensions	26" x 19.5" x 9.5"
Weight	39 lbs.
Power Supply	2x 600W 115V/230V 12A/6A Autoswitching
Operating Temperature	41°F ~ 122°F
Relative Humidity	15% ~ 90%

1.3 Hardware Setup

1. Place the KanguruClone where there is proper ventilation. Avoid using the KanguruClone in environments with high temperatures.
2. Make sure that sufficient power is supplied to the KanguruClone. Incorrect power will cause faulty operation. It is highly recommended that you use a UPS (uninterruptible power supply) with the KanguruClone.
3. You are now ready to begin using your KanguruClone. To begin, turn on the unit by flipping the power switch located on the back panel.

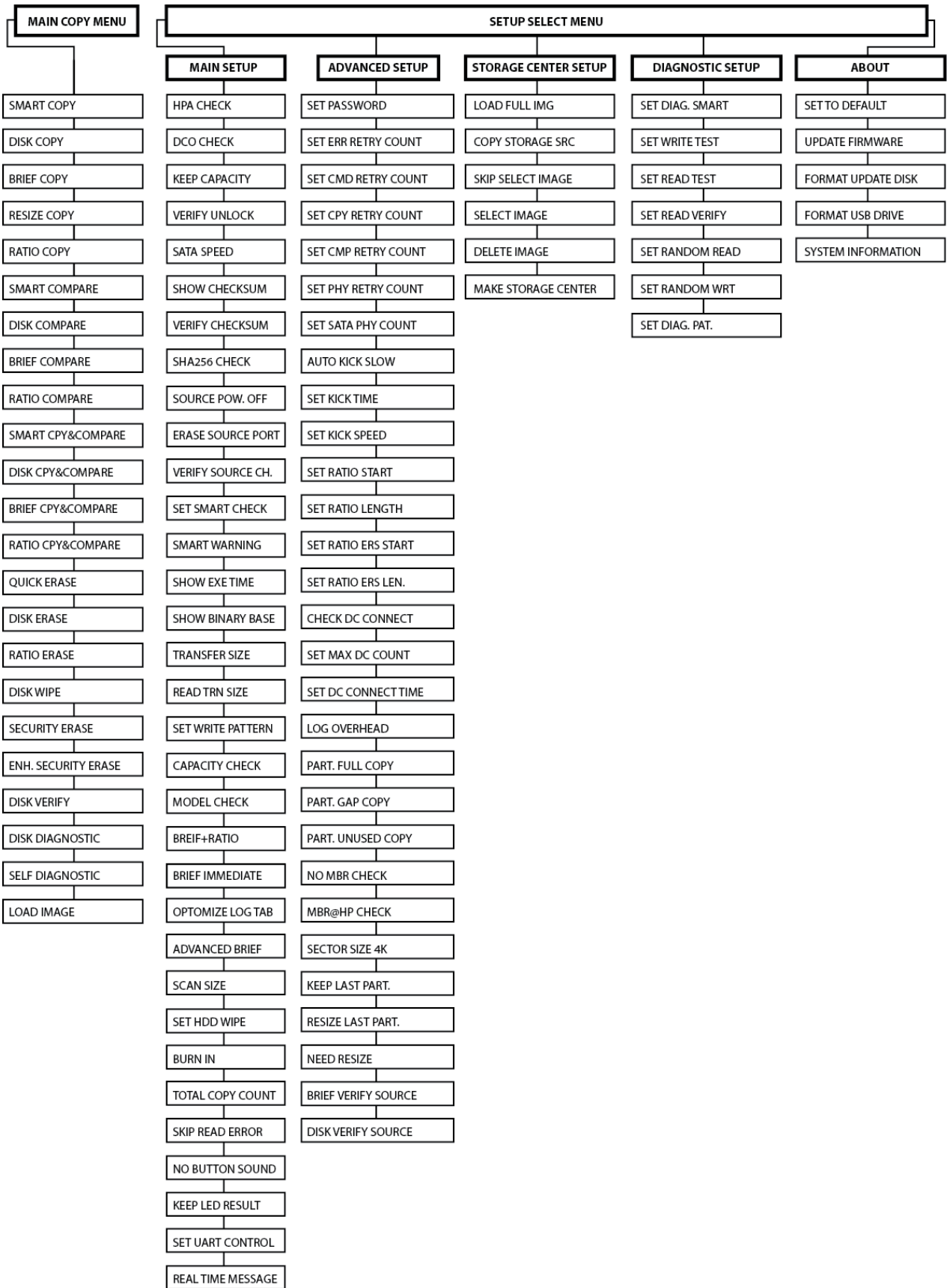
Things to remember

- Make sure that sufficient power is supplied to the KanguruClone. Incorrect power will cause faulty operation. It is highly recommended that you use a UPS (uninterruptible power supply) with the KanguruClone.
- The KanguruClone is powered by an internal power supply that is controlled by a rocker switch located at the rear of the unit.
- The KanguruClone supplies power to all drives during a cloning session. There is no need to connect an external power source to the drives. The unit can supply up to 1.5A at 12V and up to 1A at 5V to each drive.

Note: the drives are not powered until you start a copy operation.

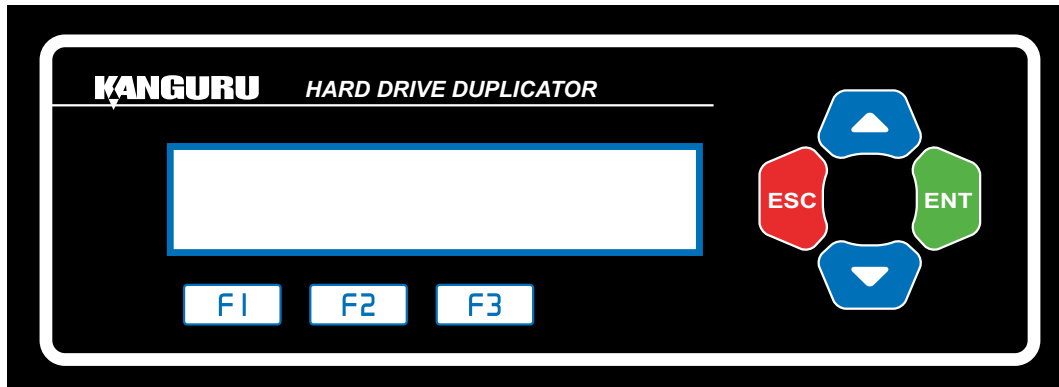
- It is OK to connect and disconnect Master or Target drives while the KanguruClone is powered on. However, do NOT connect or disconnect drives while any operation is running or is in progress. The green LED light will blink to indicate that the unit is cloning or operating.
- The supplied cables are NOT standard cables like the ones found in a PC. Do not attempt to use these cables in a PC nor to use PC cables with the KanguruClone. Doing so may cause damage to the unit and drives.
- Your the Source port is labeled 'S'. Target ports are any other ports labeled with a number.
- Connect all Master and Target hard drives before you execute an operation.





1.4 Function Tree Diagram






2. THE USER INTERFACE

2.1 The LCD Display and Control Panel

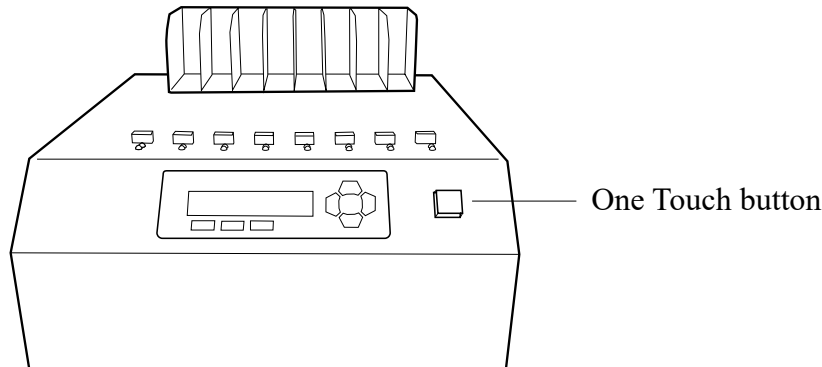


-  : Up (Menu/Option Scroll Up)
-  : Down (Menu/Option Scroll Down)
-  : Enter, Forward, OK, Execute
-  : Escape, Back, Cancel

-  : Shortcut button to BRIEF COPY
-  : Shortcut button to DISK ERASE
-  : Shortcut button to DISK COPY

2.2 One Touch Operation

All HDS-PRO Duplicators feature a One Touch button.

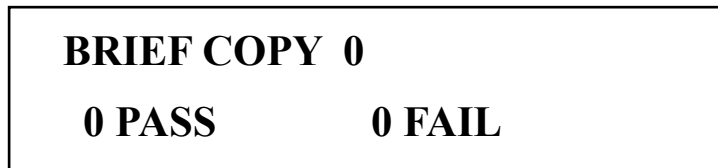


The One Touch button simplifies operations by allowing you to press one button to start and clear jobs. The button's color changes depending on the duplicator's status:

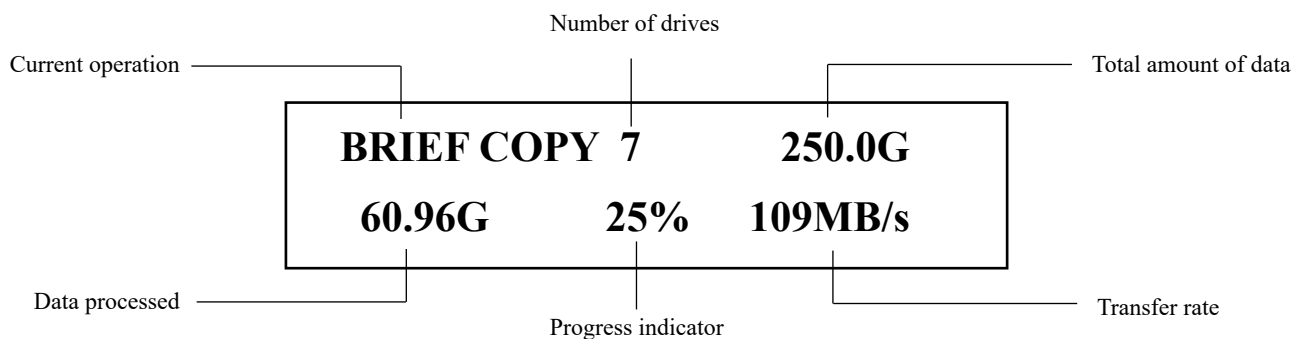
- **Blue** - Standby. Press the button to start the current job
- **Blinking Green** - Operation in progress. Pressing the button has no action.
- **Solid Green** - Operation completed, passed. Press the button to clear the job results and return to standby.
- **Red** - Operation completed, failed. Press the button to clear the job results and return to standby.

2.3 Understanding the LCD Display

The LCD display allows you to easily navigate and operate the Kanguru Duplicator. After the Kanguru Duplicator boots up, you will see the following screen.



While the Kanguru Duplicator is executing certain functions (i.e. Copy, Compare, Copy & Compare, Erase, Load) the LCD will display the following information on screen.

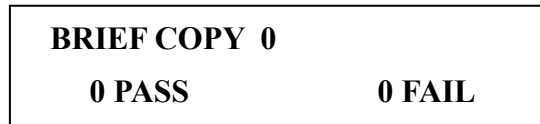


2.4 The Menus

There are three tiers to the duplicator user interface: Main menu, Setup Selection menu and the Setup menus.

2.4.1 The Main Menu

The Main menu contains the main duplication operations (e.g. Copy, Compare, Erase, Load, etc.). The duplicator will boot into this menu by default.



- Tap the UP/DOWN buttons to navigate through the different operations within the Main menu.
- Tap the **'ENT' button** to execute an operation.
- Tap the **'ESC' button** to enter the Setup Selection Menu

2.4.2 The Setup Selection Menu

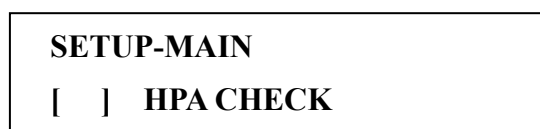
From the Main Menu, tap the **'ESC' button** to enter the Setup Selection Menu. The duplicator contains four Setup subcategories used to configure the way different features on the duplicator operate. The Setup sub-categories are: Main, Advanced, Storage Center and About



- Tap the UP/DOWN buttons to navigate through the different Setup Options.
- Tap the **'ENT' button** to enter the selected Setup Option.
- Tap the **'ESC' button** to return to the Main Menu

2.4.3 The Setup Menus

Each of the individual Setup Menu contain options for configuring the way your duplicator operates.



- Tap the UP/DOWN buttons to navigate through the different menu options.
- Tap the **'ENT' button** to select/configure an option.
- Tap the **'ESC' button** to return to the Setup Selection Menu

3. GENERAL OPERATION

3.1 Duplication Modes

The KanguruClone can copy hard drives in one of five ways: SMART mode, BRIEF mode, RESIZE mode, DISK mode and RATIO mode.

After the Copy operation has been completed, you can manually run a Compare operation to compare the data on the Source drive against the data on the Target drives to ensure that the all data was copied successfully. If you select a ‘Copy & Compare’ action the duplicator will automatically run the Compare operation after the Copy operation is completed.

3.1.1 Smart Copy

SMART mode checks the Source and Target drives and determines which copy mode is the most efficient and automatically operates in that mode.

1. First the duplicator will try to detect the Source drive’s file system. If it does not recognize the file system then it will copy in Disk mode. The Duplicator recognizes the following file systems: FAT, FAT32, exFAT, NTFS, EXT2, EXT3, EXT4, XFS, RFS, HFS, HFS+
2. If the duplicator is able to recognize the file system of the Source, it will compare the capacity between the Source and the Target.
 - If the Source is formatted in a Windows file system and its capacity is smaller than the Target then the duplicator will copy in Resize mode.
 - If the Source’s capacity is equal to the Target, then it will copy in Brief mode.
 - If the Target drives are of mixed capacities, it will determine a suitable copy mode based on the capacity of the smallest Target drive.

3.1.2 Brief Copy

BRIEF mode copies only the sectors that contain data and skips any blank sectors (including information hidden in sub channels). This mode supports the following file systems: FAT, FAT32, exFAT, NTFS, EXT2, EXT3, EXT4, HFS, HFS+, JFS, XFS.

Note: If the Source is not formatted as a supported file system then the duplicator will automatically switch to Disk mode. If you want to copy an unsupported file system in Brief mode, you will need to enable Advanced Brief mode (see section 6.1.23 Advanced Brief Mode on page 38).

3.1.3 Resize Copy

Resize mode is used to copy between Source and Target drives of different capacities. Resize copy supports the following file systems: FAT, FAT32, NTFS. If the Source is not formatted as a supported file system then the duplicator will automatically switch to Disk mode. When duplicating in Resize mode, Target drives should all be the same capacity.

All KanguruClone HD SATA Pro duplicators support copying from a smaller Source drive to larger Target drives. Duplicators running firmware version 6.10 or later have the ability to copy from a larger Source to a smaller Target. This is extremely useful when cloning an operating system from a larger capacity HDD to a smaller capacity SSD.

In order to clone from a larger Source to a smaller Target, the following two conditions are met:

- The Master drive must be a Windows OS drive, formatted NTFS or FAT32. Large to small resizing is not supported for Mac or Linux operating systems.
- The total data content on the Master must be smaller than the total capacity on the Target (e.g. if the Master drive is a 500GB HDD with 100GB of used space, then the Target drive capacity must be greater than 100GB).

Other things to be aware of:

- Encrypted partitions are not supported by Resize.
- The exFAT file system is not supported by Resize.
- Hidden/boot partitions are supported, as are multi-partitions as long as they are formatted NTFS or FAT32.
- In a multi-partition situation, hidden/boot partitions are not resized. NTFS and FAT32 partitions are resized proportionally.
- There is an option “Resize Last Partition” that can be enabled which will instruct the duplicator to resize only the last FAT32/NTFS partition on the Master drive.

Note: When using Resize Copy to duplicate a drive with multiple partitions, each partition will be expanded equally in proportion to the remaining unallocated space. If you want to resize only the last partition on the drive, you will need to enable the Resize Last Partition setup option (see section 6.2.26 Resize Last Partition on page 49).

3.1.4 Disk Copy

Disk mode copies drives sector by sector from the Source to the Target(s), and supports all major OS formats (DOS/Windows/Mac/Linux). This mode is the slowest copy mode, but the safest.

3.1.5 Ratio

The Ratio Copy operation allows you to copy a defined percentage of the Master hard drive. The Master hard drive is divided in 1000 units. You must define the beginning and ending percentages before using this operation. To define the percentages you have to enter the Advanced Setup menu, and configure the SET RATIO START and SET RATIO LENGTH options. For more information see section 6.2.11 Set Ratio Start on page 45 and section 6.2.12 Set Ratio Length on page 45.

3.2 Duplication

The KanguruClone Duplicator can operate in either one of two duplication methods:

- With a Master HDD as the source
- With a Storage Center as the source

Both methods are described in the following sections.

3.2.1 Duplicating From a Master HDD

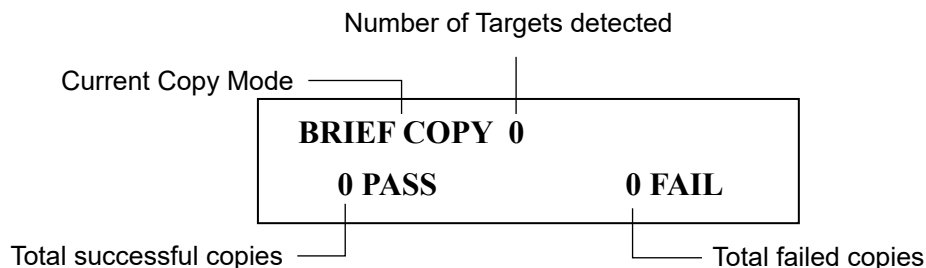
Using a Master HDD as the Source is the simplest and most convenient way to perform the duplication process.

IMPORTANT! Connect all Master and Target hard drives before you execute an operation.

To execute the duplication of a Master HDD:

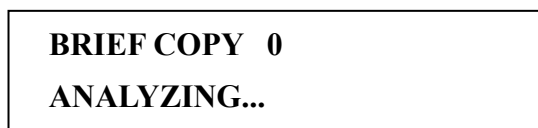
1. From the Main menu, tap the **UP/DOWN buttons** to navigate to the desired copy mode. For more information on the different available copy modes see chapter 3.1 Duplication Modes on page 13.

The screen will display the following:

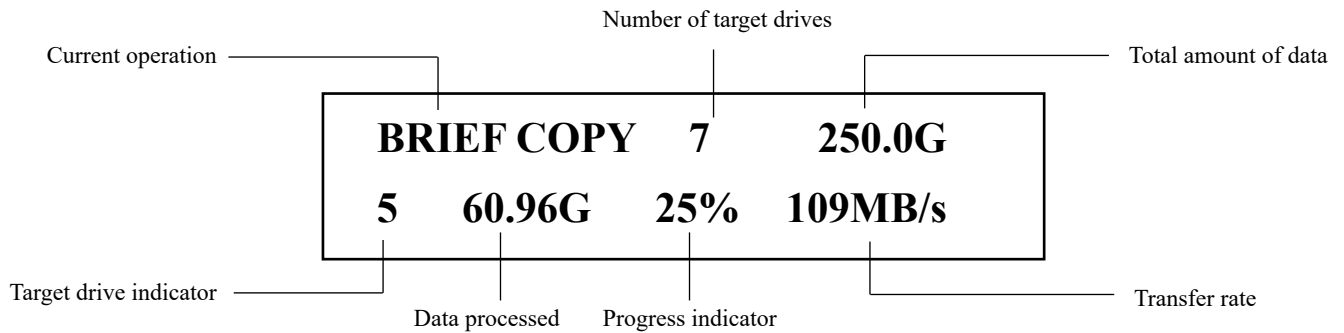


Note: The system will not detect any connected drives before the duplication starts. Therefore the “Number of Targets detected” value will remain zero until you execute the copy process.

2. Once you have selected the desired copy mode, tap the **‘ENT’ button** to execute. The duplication process begins as the system initializes the connected disks. After this point the system will be able to display the number of connected targets correctly.



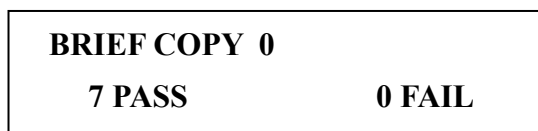
- Once all connected disks have been detected and initialized, the duplication process begins. During duplication the screen will display the following information:



WARNING! Do not disconnect any drives while they are in use. You can tell if a drive is in use if the LED next to it is blinking. Wait for a solid green or red LED before disconnecting a drive. If you want to cancel the current process, press and hold the **‘ESC’ button** and wait for a solid red LED to come on.

- When the copy process has completed, you will receive a message saying “Remove xPS xFL”, where “x” indicates the number of drives that passed (PS) and failed (FL). Target drives that passed will have a green LED displayed next to it. Target drives that failed the duplication process will display a red LED next to it.
- Tap the **‘ENT’ button** to return to the Main menu.

Note: The duplicator will keep a running count of the number of passed and failed drives until you change copy modes.



3.2.2 Duplicating From a Storage Center

The KanguruClone hard drive duplicator allows you to turn a standard hard drive into a Storage Center. You can load images of your Master HDDs directly to the Storage Center providing you with a convenient way to store common Source files as images.

3.2.2.1 Formatting a hard drive as a Storage Center

First you need to format a hard drive as a Storage Center:

1. From the Main menu, tap the **'ESC' button** to enter the Setup Selection Menu.
2. From the Setup Selection Menu, tap the **UP/DOWN buttons** to navigate to the 'SETUP-STORAGE CENTER' option.
3. Tap the **'ENT' button** to enter the Storage Center Setup menu.
4. From the Storage Center Setup menu, tap the **UP/DOWN buttons** to navigate to the 'MAKE STORAGE CENTER' operation.
5. Connect the hard drive that you want to format as a Storage Center to the Source port on the duplicator. **WARNING!** Making a hard drive into a storage center drive will require it to be formatted, which will erase any data previously saved to it.
6. Tap the **'ENT' button** to execute the 'MAKE STORAGE CENTER' option.
7. A confirmation screen appears. Tap the **'ENT' button** to proceed with formatting the hard drive as a Storage Center, or tap the **'ESC' button** to cancel.

Caution! Formatting will erase any data currently stored on the hard drive.

Once the format has completed successfully, tap any button to return to the Storage Center Setup menu. Your hard drive has now been formatted as a Storage Center. You can now load images of Master HDD's to the Storage Center for convenient duplication.

Note: When connected directly to a computer, a hard drive formatted as a Storage Center will not be recognized by most operating systems. The Storage Center uses a proprietary format not recognized by most operating systems.

3.2.2.2 Loading a Master HDD image to the Storage Center

Once you have formatted a hard drive to act as a Storage Center, you can use the duplicator to load images of your Master HDD's to the Storage Center. To load a Master HDD image to the Storage Center:

1. Connect the Storage Center to the Source port.
2. Connect the Master drive you are imaging to the last Target port on the duplicator (either #7, #15 or #23 depending on model).
3. From the Main menu, tap the **UP/DOWN buttons** to navigate to 'LOAD IMAGE'. You will see the following screen:

LOAD IMAGE	
0 PASS	0 FAIL

4. Tap the **'ENT' button**. The duplicator will initialize the disks and then ask you to input a 3-digit name for the image file. Up to 127 file names can be saved in the Storage Center.

Please input
[001] SELECT IMAGE

- a) The file name consists of three digits. The digit furthest to the left will be blinking, indicating that it is currently selected. Tap the **UP/DOWN button** to increase/decrease the digit by one.
- b) Tap the **'ENT' button** to select the next digit to the right. Tap the **UP/DOWN button** to increase/decrease the digit by one.

Note: If your duplicator displays the error message, "TARGET NOT FORMATTED" then the hard drive connected to the Source port has not been formatted as a Storage Center yet (see section 3.2.2.1 Formatting a hard drive as a Storage Center on page 18).

5. When you have completed naming the image file, press and hold the **'ENT' button** for three seconds and the Load process will begin.

Note: If the image file name you entered already exists for an image file previously loaded on the Storage Center, the system will ask you to confirm overwriting the previously saved file. Tap the **'ENT' button** to confirm or tap the **'ESC' button** to cancel.

LOAD IMAGE 1		63.63G
2.12G	3%	143M/s

Size of Source data

Amount of data loaded

Percentage completed

Data transfer rate

6. When the load process has completed you can remove the Master HDD.

3.2.2.3 Duplicating an image file stored on a Storage Center

Now that you have loaded an image file on the Storage Center, you can begin the copy process:

1. Make sure the Storage Center is connected to the Source port. Connect your Target drives into any available target ports.
2. From the Main menu, select a copy mode and then press the **'ENT' button**.
3. When the duplicator recognizes the Storage Center drive it will ask you to input an image file.

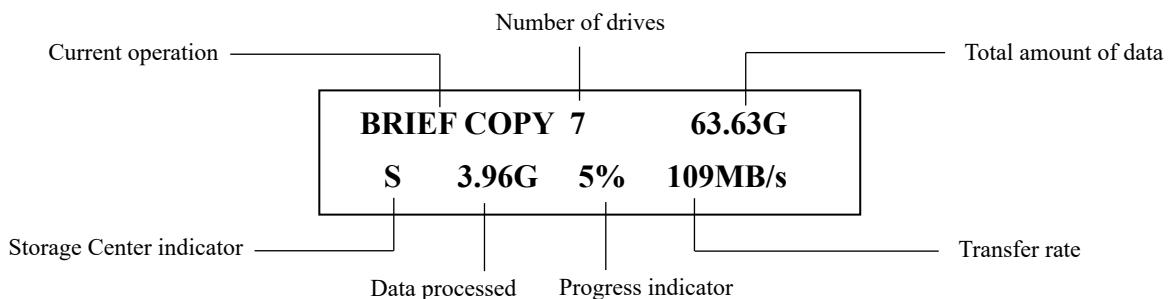
Please input
[001] SELECT IMAGE

- a) The file name consists of three digits. The digit furthest to the left will be blinking, indicating that it is currently selected. Tap the **UP/DOWN button** to increase/decrease the digit by one.
- b) Tap the **'ENT' button** to select the next digit to the right. Tap the **UP/DOWN button** to increase/decrease the digit by one.

In the example above, file number 001 is currently selected. **Note:** If the Skip Select Image setting has been enabled then you will not be asked to enter an image file name (see section 6.3.3 Skip Select Image on page 50)

4. Once you have entered the image file name press and hold the **'ENT' button** for 3 seconds to begin copying. **Note:** If you receive the following error message: "NO DATA FOUND", then the image file that you selected does not contain any data.

After all connected Target disks have been detected and initialized, the duplication process begins. During duplication the screen will display the following information:



WARNING! Do not remove any drives while they are in use. You can tell if a drive is in use if the green LED next to it is blinking. Wait for a solid green or red LED before removing a drive. If you want to interrupt the current process, press and hold the **'ESC' button** for 3 seconds.

5. When the copy process has completed, you will receive a message saying "Remove xPS xFL", where "x" indicates the number of drives that passed (PS) and failed (FL). Target drives that passed will have a green LED displayed next to it. Target drives that failed the duplication process will display a red LED next to it.

Note: The duplicator will keep a running count of passed and failed drives until you change copy modes.

3.3 Kicking Slow Drives (*15 and 23 target models only*)

Kanguru's 15 Target and 23 Target HDD Duplicators have the ability to kick slow functioning drives from a copy/compare/erase operation.

KanguruClone HDD Duplicators duplicate drives in a synchronous process. Because of this, any copy, compare or erase that you attempt will be limited by the speed of the slowest drive connected. For example, if you are cloning to 23 target HDDs and out of those drives 22 have a max transfer rate of 90MB/s and one has a max transfer rate of 15MB/s, then duplication speed will be capped at 15MB/s.

In order to prevent a single, faulty drive from disrupting an operation, you have the ability to either manually kick a slow drive or configure settings which will automatically kick slow drives that fall below a defined threshold.

3.3.1 Manually Kick Slow Drives

During a copy, compare or erase operation, you can view the performance of each individual drive by pressing the **UP/DOWN** buttons.

BRIEF COPY 14 250.0G			
8	60.96G	25%	109MB/s

Target drive indicator: 8
Transfer rate: 109MB/s

The Target Drive Indicator will inform you which drive is currently selected. The Transfer Rate will show you the speed of this drive. **Note:** The transfer rate information is not static and can fluctuate, sometimes significantly.

If you notice any slow drives, press and hold the **'F1' button**. This will eject the slowest drive connected from the operation. The red LED will appear next to the ejected drive. Do not disconnect the ejected drive from the duplicator until the current operation is completed.

3.3.2 Automatically Kick Slow Drives

You can configure some settings in the Advanced Settings menu that will allow the duplicator to automatically kick any drives that meet a specific, defined criteria. The options that need to be configured in the Advanced Setup menu are: Auto Kick Slow, Set Kick Time and Set Kick Speed.

To configure your duplicator to automatically kick slow drives:

1. Navigate to the Advanced Setup menu.
2. Navigate to the option 'Auto Kick Slow'.
3. Enable the 'Auto Kick Slow' option (see section 6.2.8 Auto Kick Slow (15 and 23 target duplicators only) on page 44).
4. Exit back to the Advanced Setup menu.
5. Navigate to the option 'Set Kick Speed'.
6. Configure the 'Set Kick Speed' option to define the low speed threshold (see section 6.2.10 Set Kick Speed (15 and 23 target duplicators only) on page 44). Drives that fall below this speed will be kicked after a designated amount of time.
7. Exit back to the Advanced Setup menu.
8. Navigate to the option 'Set Kick Time'.
9. Configure the 'Set Kick Time' option (see section 6.2.9 Set Kick Time (15 and 23 target duplicators only) on page 44). Drives that fall below the speed designated in the Set Kick Speed option for this amount of time will be kicked.

If 'Auto Kick Slow' is enabled, then during a copy, compare or erase operation, any drives that fall below the 'Set Kick Speed' for the time defined by 'Set Kick Time' will automatically be ejected from the operation. The red LED will appear next to the ejected drive. Do not disconnect the ejected drive from the duplicator until the current operation is completed.

4. OTHER OPERATIONS

Besides the Copy and Compare modes, the KanguruClone Hard Drive Duplicator has several additional operations that are incredibly useful, including: QUICK ERASE, DISK ERASE, DISK WIPE, SELF DIAGNOSTIC and LOAD IMAGE. The following chapter will cover these operations.

4.1 Quick Erase

The Quick Erase operation will delete the partition table from any connected Target drives. Without the partition table, the drive will appear as a blank, unformatted drive to a computer operating system. This is the quickest erase method and typically only takes a few seconds to complete.

Caution: The Quick Erase operation only deletes the drive's partition table. The actual data saved to the disk will still exist and with commonly available tools it is possible to recover the data from a drive that has been erased using Quick Erase.

4.2 Disk Erase

Disk Erase deletes all data on any connected Target drives by writing zeroes to all sectors on the drive. Disk Erase will ensure that all data previously saved the disk is overwritten.

Caution: Although Disk Erase will delete all data from your drive, with the high-level forensic tools it may still be possible to recover the erased data. If you want to permanently delete data to point where it is virtually impossible to recover, use the Disk Wipe or Secure Erase operation.

4.3 Disk Wipe

Disk Wipe deletes all information on any connected Target drives by writing zeros into each sector of the hard drive, sector by sector. The Wipe permanently removes data, making it almost impossible to recover.

The Disk Wipe is a four step process.

1. The duplicator writes 1's to all sectors on the disk
2. The duplicator writes 0's to all sectors on the disk
3. The duplicator writes a random pattern of 1's and 0's to all sectors on the disk
4. All sectors are verified

The multi-pass process ensures that any old data is virtually unrecoverable. By default the Disk Wipe operation will execute the four-pass method once. The Disk Wipe can be executed repeatedly on the same disk for additional security. To increase the number of times the Disk Wipe runs, see section 6.1.25 Set HDD Wipe on page 39

4.4 Secure Erase

Secure Erase is a set of firmware commands available on many ATA drives. These commands are used as a secure method of data sanitization by completely overwriting all data on a drive. When a Secure Erase command is issued against a SSD, all of its cells will be marked as empty, restoring it to factory default configuration. Unlike Disk Wipe and Disk Erase, the Secure Erase process is effective at sanitizing SSDs because it can access and erase all sectors on a SSD.

Secure Erase is approved by the National Institute of Standards and Technology (NIST) Special Publication 800-88 as a method for purging ATA hard disk drives.

Caution! Unlike Disk Wipe or Disk Erase, the duplicator only invokes the Secure Erase command. The actual data wiping is done at the drive firmware level. Please keep the following points in mind:

- Although most ATA drive manufacturers include Secure Erase commands in firmware, not all do. Please check with the drive manufacturer to verify that your drive model supports ATA Secure Erase before attempting.
- Although the duplicator can report whether the function completed, it cannot guarantee that the Secure Erase function was implemented correctly by the drive. It is recommended to check with the drive manufacturer for verification that the data was actually wiped.

4.5 Enhanced Secure Erase

Secure Erase is a set of firmware commands available on many ATA drives. These commands are used as a secure method of data sanitization by completely overwriting all data on a drive. The type of sanitization method implemented by Enhanced Secure Erase is device-specific, and may vary from drive to drive. In some cases, the Enhanced Secure Erase will overwrite all sectors with a predefined pattern of ones and zeroes. In other cases, the drive has an internal encryption key which is simply destroyed and regenerated. Unlike Disk Wipe and Disk Erase, the Enhanced Secure Erase process is effective at sanitizing SSDs because it can access and erase all sectors on a SSD.

Enhanced Secure Erase is approved by the National Institute of Standards and Technology (NIST) Special Publication 800-88 as a method for purging ATA hard disk drives.

Caution! Unlike Disk Wipe or Disk Erase, the duplicator only invokes the Enhanced Secure Erase command. The actual data wiping is done at the drive firmware level. Please keep the following points in mind:

- Only some ATA drive manufacturers include Secure Erase commands in firmware, most do not. Please check with the drive manufacturer to verify that your drive model supports ATA Enhanced Secure Erase before attempting.
- If there are kernel or firmware bugs, executing the ATA Enhanced Secure Erase command could render a drive unusable. It is recommended to check with the drive manufacturer before performing this function.

4.6 Disk Diagnostic

The Disk Diagnostic feature allows you to run a series of tests to verify the health of the Target drives connected to the duplicator. If you are experiencing a high rate of failures during the duplication process, there could be something mechanically malfunctioning with the drives. The Disk Diagnostic will run tests based on the configuration of the Diagnostic Setup menu (see section 6.4 The Diagnostic Setup Menu on page 52) and generate a log file that can be saved to a USB flash drive. Providing this log file will help a Kanguru support technician diagnose any problems that could cause duplication failures.

To generate the log file:

1. Connect a USB flash drive formatted FAT32 to the back of the duplicator.
2. Run Disk Diagnostic.
3. When the Disk Diagnostic is complete, remove the USB flash drive and connect it to your PC.

There will be a new text document saved to the flash drive. Provide this log file to a Kanguru support technician and they will be able to use it to determine any problems that could be causing duplication failures.

4.7 Self Diagnostic

The Self Diagnostic feature allows you to run tests to verify the health of the duplicator and of any connected drives. If you are experiencing a high rate of failures during the duplication process, there could be something mechanically malfunctioning with the duplicator. The Self Diagnostic will generate a log file that can be saved to a USB flash drive. Providing this log file will help a Kanguru support technician diagnose any problems that could cause duplication failures.

To generate the log file:

1. Connect a USB flash drive formatted FAT32 to the back of the duplicator.
2. Run Self Diagnostic.
3. When the Self Diagnostic is complete, remove the USB flash drive and connect it to your PC.

There will be a new text document saved to the flash drive. Provide this log file to a Kanguru support technician and they will be able to use it to determine any problems that could be causing duplication failures.

4.8 Load Image

Load Image creates and saves a drive image to a Storage Center drive.

A Storage Center drive is a drive that has been formatted to store Master drive images. The Storage Center allows you to quickly and conveniently access commonly duplicated Master drive images.

For detailed instructions on loading a drive image to a Storage Center drive, please refer to section 3.2.2.2 Loading a Master HDD image to the Storage Center on page 19.

5. LOGGING

Logging capability is a useful function of the Kanguru HDD Duplicator. The logging feature can be used to keep track of duplication and/or disk wipe jobs when logs are required for auditing, and they also provide useful information that can be used by Kanguru's technical support staff to diagnose problems.

There are two methods of creating a log file:

- Using a USB flash drive
- Using the Control Manger software application

5.1 Logging Using a USB Flash Drive

Logging your duplicator's operations using a USB flash drive is the simplest method, however it is not recommended for auditing purposes. This is because all the duplicator's operations are stored in an unformatted, plain-text file which is difficult to decipher. Logs generated using a USB flash drive are primarily used by Kanguru support technicians to troubleshoot problems with the duplicator.

To generate a log file using a USB flash drive:

1. Format a USB flash drive using the FAT32 file system.
2. Before powering on the Kanguru Clone duplicator, insert the USB flash drive into the USB port located on the back of the duplicator.
3. Turn on the duplicator.
4. Perform a copy, compare or erase operation.
5. When the operation is completed, power off the duplicator. You can now remove the USB flash drive.

Connect the USB flash drive to a computer. Contained within the USB flash drive will be two plain text files containing all the logged data.

5.2 Logging Using the Control Manager Software (*Windows Only*)

Users with a computer running Windows operating systems can connect the Kanguru Clone HDD Duplicator to their PC for robust logging. The Control Manager software was provided on the CD that accompanied your duplicator. If you did not receive a CD, or the CD was lost, please visit Kanguru's Support Site to download a copy of the Control Manager software: support.kanguru.com

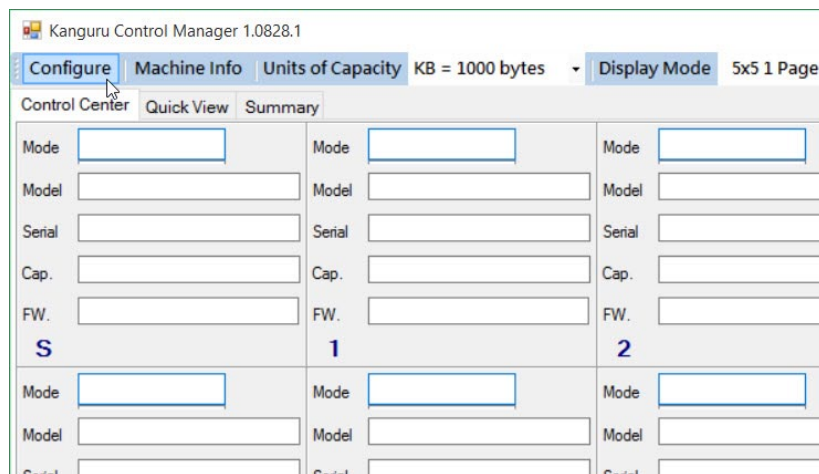
To use the Kanguru Control Manager software for logging:

1. Connect the Kanguru Clone to the PC using the provided Serial to USB adapter cable.
 - The serial end of the cable connects to the port located on the back of the duplicator.
 - The USB end of the cable connects to a USB port on your PC.

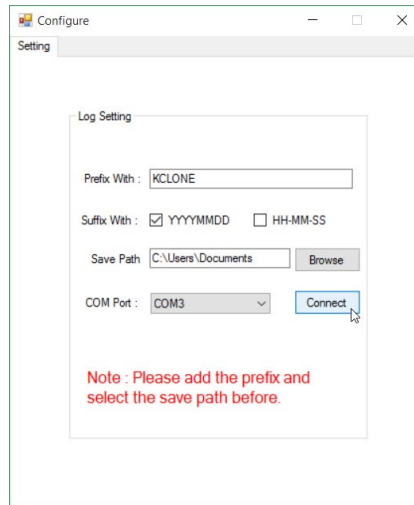
Note: If this is your first time connecting the Serial to USB adapter cable to your computer, you will need to install the device driver. The device driver can be found on the CD that came with your duplicator, located in the "Serial to USB Driver" folder.
2. Power on the Kanguru Clone Duplicator. Make sure that Main Setup > Set UART Control option has been enabled on the duplicator (see section 6.1.31 Set UART Control on page 41).
3. Load the CD that came with your duplicator into the PC and open the folder named "Kanguru Control Manager".
4. Double-click on the **ControlManager.exe** file to launch the Control Manager Software.

Once the Control Manager software is running, you need to establish the connection between the Kanguru Clone Duplicator and the application. To establish the connection:

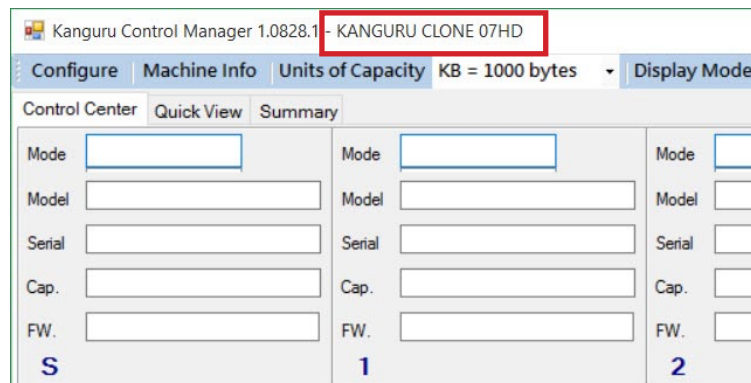
1. Click on the **Configure** menu in the Control Manager window.



2. The Configure window appears.
 - a) Enter a prefix for the log's filename. You can also choose to suffix the file name with a date or time stamp.
 - b) Select the path where you want the log files saved to. It is recommended to save to a local hard drive and not a removable device.
 - c) Select the COM port
 - d) Click on the **Connect** button.



3. When a connection between the duplicator and the Control Manager is established, you will see the duplicator model appear in the top left.



Once connected, two plain text files will be created that will log all duplicator activity until you either disconnect the duplicator from the computer or power off the duplicator.

6. THE SETUP MENUS

To make it easier to navigate to the desired setting the Setup menu has been broken out into 4 setup menus: Main Setup, Advanced Setup, Storage Center Setup and About

You can open any of these setup menus from Setup Select menu. To open the Setup Select menu, simply tap the **'ESC'** button while in the Main Copy menu.

Once you have entered the Setup Selection menu:

- Tap the **UP/DOWN buttons** to navigate the different Setup menus.
- Tap the **'ENT' button** to enter a menu.
- Tap the **'ESC' button** to exit to the Main copy menu

6.1 Main Setup

6.1.1 HPA Check

The Host Protected Area (HPA), sometimes referred to as the Hidden Protected Area, is a partition on the hard drive that is not normally visible to an operating system.

Tap the **'ENT' button** to change this option's setting.

- [] – HPA Check is disabled. The system will not check for HPA partitions.
- [*] – HPA Check is enabled (default). When HPA Check is enabled the duplicator will support Host Protection Areas. When you duplicate a Master drive that contains HPA, the system will detect the HPA partition, unlock it, copy the area and then re-lock the area once duplication is complete.

6.1.2 DCO Check

A Device Configuration Overlay (DCO), is a partition on the hard drive that is not normally visible to an operating system. The DCO can report to the system that supported features are nonexistent or that the drive is smaller in capacity than it actually is.

Tap the **'ENT' button** to change this option's setting.

- [] – DCO Check is disabled (default). The system will not check for DCO partitions.
- [*] – DCO Check is enabled. When DCO Check is enabled the duplicator will support Device Configuration Overlay configurations. When you duplicate a Master drive that contains a DCO partition, detect the DCO partition, unlock it, copy the area and then re-lock the area once duplication is complete.

6.1.3 Keep Capacity

The Keep Capacity option allows you to lock the amount of free space on the Target drives so the total disk capacity appears the same as the Source drive.

Tap the **'ENT' button** to change this option's setting.

- [] – Keep Capacity is disabled (default). The system will leave any unused capacity on Target drives as unallocated space. Example, if you use Brief Copy to duplicate a 250GB Master HDD to a 500GB Target HDD, when the duplication completes the 500GB Target disk will appear as 500GB drive with a 250GB active partition and 250GB of unallocated space.
- [*] – Any unused space will be separated into an HPA partition. Example, if you use Brief Copy to duplicate a 250GB Master HDD to a 500GB Target HDD, when the duplication completes the 500GB Target disk will appear as a 250GB drive with zero unallocated space.

6.1.4 SATA Speed

The SATA Speed option allows you to Select the data transfer mode.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.

- AUTO - The system auto-selects the SATA speed mode based on the connected drives (default).
- 1.5G - Limit the data transfer mode to SATA I speeds (1.5Gbps)
- 3G - Limit the data transfer mode to SATA II speeds (3Gbps)

6.1.5 Show Checksum

The Show Checksum option allows you to configure whether the disk checksum is displayed on the LCD screen when duplication is finished.

Tap the **'ENT' button** to change this option's setting.

- [] – Showing the disk checksum is disabled (default). The checksum information will not be displayed at the end of each duplication process.
- [*] – Showing the disk checksum is enabled. The checksum information will be displayed at the end of each duplication process.

6.1.6 Verify Checksum

The Verify Checksum option allows you to configure whether the duplicator will compare the checksum value of the Source against the Target drives when duplication is finished.

Tap the **'ENT' button** to change this option's setting.

- [] – Verifying the disk checksum is disabled (default).
- [*] – Verifying the disk checksum is enabled.

6.1.7 SHA256 Check

The SHA256 Check option allows you to configure whether the system checks for a matching SHA256 hash between the Master and Target drives when duplication completes successfully.

Tap the **'ENT' button** to change this option's setting.

- [] – SHA256 hash checking is disabled (default). The hash of the Master will not be checked against the Target hash at the end of each duplication process.
- [*] – SHA256 hash checking is enabled. The hash of the Master will be checked against the Target hash at the end of each duplication process.

6.1.8 Source Power Off

The Source Power Off option allows you to configure whether the system turns off power to the Source drive after a process is completed.

Tap the **'ENT' button** to change this option's setting.

- [] – Source Power Off is disabled. The system will keep the Source drive powered on after a process is completed.
- [*] – Source Power Off is enabled (default). The system will shut off power to the Source drive after a process is completed.

6.1.9 Erase Source Port

The Erase Source port option allows you to configure whether the system erases the disk connected to the Source port when running Quick Erase, Disk Erase or Disk Wipe.

Tap the **'ENT' button** to change this option's setting.

- [] – Erase Source Port is disabled (default). A drive connected to the Source port will not be erased if you run Quick Erase, Disk Erase or Disk Wipe.
- [*] – Erase Source Port is enabled. A drive connected to the Source port will be erased if you run Quick Erase, Disk Erase or Disk Wipe.

6.1.10 Verify Source Check

The Verify Source Check option allows you to configure whether the system checks the Source's CRC to ensure that the source data is healthy before starting a copy process.

Tap the **'ENT' button** to change this option's setting.

- [] – Verify Source Check is disabled (default). The duplicator will not check the Source's CRC before a copy process.
- [*] – Verify Source Check is enabled. The duplicator will check the Source's CRC and ensure the source data is healthy before starting a copy process.

6.1.11 Set SMART Check

The Set SMART Check option allows you to configure whether the system runs a SMART check before starting a copy process. You can configure what level of SMART check is performed through the SMART Warning option.

Tap the **'ENT' button** to change this option's setting.

- [] – Set SMART Check is disabled (default). The duplicator will not check the Source's SMART monitoring information before a copy process.
- [*] – Set SMART Check is enabled. The duplicator will check the Source's SMART monitoring information before a copy process.

6.1.12 SMART Warning

If Set SMART Check is enabled, you can configure what level of SMART check performed. There are 3 levels of SMART checking:

- [0] - Level 0: Checks for critical, uncorrectable errors (e.g. read/write errors)
- [1] - Level 1: Checks for any major errors that could force the drive to stop working.
- [2] - Level 2: Checks for any warning status errors that could force the drive to stop working.

6.1.13 Show EXE Time

The SHOW EXE TIME option allows you to enable or disable whether the total execution time for an operation is displayed on the LCD screen. The total execution time will be displayed after an operation has completed.

Tap the **'ENT' button** to change this option's setting.

- [] – Disabled (default). The total execution time is not displayed.
- [*] – Enabled. The total execution time is displayed.

6.1.14 Show Binary Base

The SHOW BINARY BASE option allows you to change whether capacities are displayed in decimal form (e.g. 1KB=1000 bytes) or in binary form (e.g. 1KB = 1024 bytes)

Tap the **'ENT' button** to change this option's setting.

- [] – Disabled (default). Capacities are displayed in decimal form.
- [*] – Enabled. Capacities are displayed in binary form.

6.1.15 Transfer Size

The Transfer Size setting allows you define the data transfer block size for each ATA write command. Generally, larger transfer block sizes are better for duplication purposes than smaller sizes. However, there are some hard drives which can only accept 2MB data transfer size per ATA command. If your drives only support small data transfer block sizes, then you will need to change this setting.

The Transfer Size settings can be set to 8KB, 16KB, 32KB, 64KB, 128KB, 256KB, 512KB, 1MB, 2MB, 4MB, 8MB and 16MB. The default setting is 4MB.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Transfer Size.

6.1.16 Read Transfer Size

The Transfer Size setting allows you define the data transfer block size for each ATA read command. Generally, larger transfer block sizes are better for duplication purposes than smaller sizes. However, there are some hard drives which can only accept 2MB data transfer size per ATA command. If your drives only support small data transfer block sizes, then you will need to change this setting.

The Read Transfer Size settings can be set to 8KB, 16KB, 32KB, 64KB, 128KB, 256KB, 512KB, 1MB, 2MB, 4MB, 8MB and 16MB. The default setting is 16MB.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Transfer Size.

6.1.17 Set Write Pat.

The Set Write Pattern setting is used to define the data that you want written to all sectors of your drives during a Disk Erase operation.

The Write Pattern can be set to 00, RM (random), AA, A5, 5A, C9, FF, E5 or F6. The default setting is 00.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the Set Write Pattern.

6.1.18 Capacity Check

The duplicator has a built in capacity check function which will check the capacity of the Master hard drive and the Target hard drive(s) during Disk or Brief copy processes and determine whether the drives' capacities are the same.

Tap the **'ENT' button** to change this option's setting.

- [] – Capacity Check is disabled. When a Disk or Brief copy process is executed the system will not check the capacity between the Master and Target drive(s) and start the copy process as normal.
- [*] – Capacity Check is enabled (default). When a Disk or Brief copy process is executed the system will check the capacity between the Master and Target drive(s) to determine whether the capacity is the same. If the capacity is different the copy process will be cancelled.

6.1.19 Model Check

The duplicator has a built in capacity check function which will check the model of the Master drive and the Target drive(s) during Disk or Brief copy processes and determine whether the drive models are the same.

Tap the **'ENT' button** to change this option's setting.

- [] – Model Check is disabled (default). When a Disk or Brief copy process is executed the system will not check the models of the Master and Target hard drive(s) and start the copy process as normal.
- [*] – Model Check is enabled. When a Disk or Brief copy process is executed the system will check the model of the Master and Target drive(s) to determine whether the model is the same. If the drives are different models then the copy process will be cancelled.

6.1.20 Brief + Ratio

The Brief+Ratio option allows you to enable Brief+Ratio copy.

Tap the **'ENT' button** to change this option's setting.

- [] – Brief+Ratio is disabled (default). When a Brief copy process is executed the system will execute the copy process as normal.
- [*] – Brief+Ratio is enabled. When a Brief copy process is executed the system will run a normal Brief Copy mode to copy the data first, and then use Ratio Copy to copy the user defined area.

6.1.21 Brief Immediate

If you are experiencing issues when running Brief Copy, disabling the Brief Immediate function may improve the chance of a successful duplication.

Tap the **'ENT' button** to change this option's setting.

- [*] – Brief Immediate is enabled. When Brief Immediate is enabled, data copying and analysis are done at the same time during Brief Copy. This is the fastest option.
- [] – Brief Immediate is disabled (default). When you run a Brief Copy the duplicator will analyze the Source completely first, and then follow the analysis result to copy the data from the Source to the Target drives. Duplication through Brief Copy will take longer when Brief Immediate is disabled.

6.1.22 Optimize Log Table

The Optimize Log Table option can be enabled to help improve Brief Copy performance when duplicating Linux drives by building a more extensive data map prior to copying.

Tap the **'ENT' button** to change this option's setting.

- [*] – Optimize Log Table is enabled. When using Brief Copy to duplicate a Linux disk, the duplicator will take additional time to build a comprehensive data map which will allow for better duplication speed during the copy process.
- [] – Optimize Log Table is disabled (default). Brief Copy will operate as normal.

6.1.23 Advanced Brief Mode

The Brief copy mode is usually the fastest duplication method available. However Brief mode only supports a handful of file systems. The ADV. BRIEF MODE operation allows you to execute a Brief copy of unsupported file systems.

The Advanced Brief copy mode requires loading a special Master drive image to a Storage Center drive. For information on formatting a hard drive as a Storage Center, see section 6.3.6 Make Storage Center on page 51.

To use the Advanced Brief Copy, first you will need to prepare a new Master disk that will be supported by Advanced Brief Copy:

1. Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change the Advanced Brief Mode setting. This will define the write pattern. The write pattern can be set to 00, RM (random), AA, A5, 5A, C9, FF, E5 or F6. The default setting is 00. This will define the data that will be written to all sectors of your drives during the Disk Erase operation.
2. Exit back to the Main Copy menu by tapping the **'ESC' button**.
3. Connecting a blank drive to any Target port on the duplicator and then execute a Disk Erase operation (see section 4.2 Disk Erase on page 23).
4. Use this newly erased hard drive to create your Master drive.

Now that you've created a Master drive we need to load an image of it to a Storage Center drive.

1. Connect a drive formatted as a Storage Center to the Source port.
2. Connect the Master drive to the last Target port on the duplicator (either #7, #15 or #23 depending on model).
3. Navigate to the Load Image operation.
4. Tap the **'ENT' button** to execute the Load Image operation.
5. Entering a name for the image file, then press and hold the **'ENT' button** to start the Load process. This will build a data map of the Master drive image onto the Storage Center.

A data map image of the Master drive has now been saved to the Storage Center. You can now execute a Brief copy of this image file, regardless of the file system.

Set Advanced Brief Copy to 'NO' to disable this feature.

6.1.24 Scan Size

The Scan Size setting is used to define how the duplicator builds a data map of the Master drive image into flash memory. The device scan performance is based on the Scan Size setting. The larger the Scan Size setting, the faster the device scan performance, however there will be more unused data when the data map is built. A smaller Scan Size will build a more precise data map, but will take more time to build.

The Scan Size can be set to 128KB, 256KB, 512KB, 1MB or 2MB. The default setting is 128KB.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Scan Size.

6.1.25 Set HDD Wipe

The Set HDD Wipe option allows you to configure the number of wipe cycles that are executed when you run the Disk Wipe operation (see section 4.3 Disk Wipe on page 23) The Disk Wipe operation can be run once or consecutively up to 100 times. 7 wipe cycles complies with the American DOD 5220-22.M standard.

Note: The more Wipe Cycles you set, the longer the wipe process will take.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Press the **'ENT' button** to set the number of wipe cycles.

6.1.26 Burn In

The Burn In option allows the you to enable a continuous Copy, Compare, Verify, Erase or Load function to stress test for endurance, reliability and stability of your drives.

The Burn In can be set to: 5, 10, 20, 50 or MX. The number here will tell the system how many times it should repeat the Burn In test.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to configure the Burn In option. Tap the **'ENT' button** to set Burn In.

The next time you run a Copy, Compare, Erase or Load operation, the duplicator will continue running that function as normal. Once the operation has completed the screen will display the total execution time and the operation count. Once this information has been displayed for a few seconds the operation will start again automatically. This will be repeated until the Burn In value has been reached. **Note:** If set to MX, the Burn In test will run continuously until you manually stop it.

You can stop the burn in test at any time by pressing and holding the **"ESC" button** for three seconds. This will automatically disable the Burn In function and the duplicator will return to normal functionality.

6.1.27 Total Copy Count

Total Copy Count keeps track of the total number of successful and unsuccessful duplications produced by the system. This is a running count that includes all copy modes.

Tap the **'ENT' button** to view the total copy count.

6.1.28 Skip Read Error

The Skip Read Error option allows you to enable or disable error skipping during Disk, SMART, Brief and Resize modes.

Tap the **'ENT' button** to change this option.

- [] – Disabled (default). When an error is detected while reading from the Source, the duplicator process will fail out.
- [*] – Enabled. When an error is detected while reading from the Source, the duplicator will skip the bad sector on the Source and fill the sector with zeroes on the Target.

6.1.29 No Button Sound

The No Button Sound option allows you to enable or disable the audible tone that sounds when you tap or hold a button.

Tap the **'ENT' button** to change this option.

- [*] – Button sounds are disabled. No audible tones will sound when you tap or hold a button.
- [] – Button sounds are enabled (default). Tapping a button will be accompanied by a short tone. Holding a button will sound a low tone followed immediately by a higher pitched tone.

6.1.30 Keep LED Result

The Keep LED Result option allows you to configure whether the LED status lights remain on after a duplication completes.

- [*] – LED Status lights from the previous duplication will remain on until the next duplication process is started.
- [] – LED Status lights reset after duplication completes (default). After the duplication completes and you exit from the completion screen, the LEDs will reset.

6.1.31 Set UART Control

The Set UART Control option must be enabled in order to execute commands remotely via the Control Manager software.

Tap the **'ENT' button** to change this option.

- [*] – UART Controls are enabled. You can execute commands on the duplicator from the Control Manager software.
- [] – UART Controls disabled (default). You are unable to execute commands on the duplicator from the Control Manager software.

6.1.32 Real Time Messaging

The Real Time Messaging option allows you to configure how the duplicator sends information about the duplication process to a connected PC (see section 5.2 Logging Using the Control Manager Software (Windows Only) on page 28).

Tap the **'ENT' button** to change this option.

- [*] – Real Time Messaging is enabled. Real time information about the operation process (e.g. percentage complete, data transferred) can be displayed through the PC logging software.
- [] – Real Time Messaging is disabled (default). Information is sent to the logging software only when the operation starts and when it ends.

6.2 Advanced Setup

6.2.1 Set Password

The Set Password option allows you to enable a 4-digit password for the Setup menus, protecting the system against unauthorized setting changes.

To set a password:

1. Tap the **'ENT' button**. The digit furthest to the left will start blinking, indicating that it is currently selected. Tap the **UP/DOWN buttons** to increase/decrease the digit by one.
2. Tap the **'ENT' button** to select the next digit to the right. Tap the **UP/DOWN buttons** to increase/decrease the digit by one.
3. Repeat step 2 until you have entered your password, then press and hold the **'ENT' button** to set your password.

Once your password is set, the user will be prompted to enter the password whenever they try to enter the Setup Selection menu.

Enter the password as "0000" to disable password protection.

6.2.2 Set Error Retry Count

The Set Error Retry Count option allows you to configure the number of times that the duplicator retries sending general error handling commands when it encounters an error before failing.

The number of error retries can be set from 0 to 9 times. The default setting is 1.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the Error Retry Count.

6.2.3 Set Command Retry Count

The Set Command Retry Count option allows you to configure the number of times that the duplicator retries sending general ATA commands to the SATA port before failing.

The number of retries can be set from 0 to 9 times. The default setting is 1.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the Command Retry Count.

6.2.4 Set Copy Retry Count

The Set Copy Retry Count option allows you to configure the number of times that the duplicator retries sending ATA write commands to the SATA port before failing.

The number of retries can be set from 0 to 9 times. The default setting is 1.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Copy Retry Count.

6.2.5 Set Compare Retry Count

The Set Compare Retry Count option allows you to configure the number of times that the duplicator retries sending ATA read commands to the SATA port before failing.

The number of retries can be set from 0 to 9 times. The default setting is 1.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Compare Retry Count.

6.2.6 Set Physical Retry Count

When the machine has major problem or a critical error, the Physical Retry Count is the number of times that the duplicator will reset the drives in an attempt to allow the duplication to progress.

The number of retries can be set from 0 to 9 times. The default setting is 1.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the PHY Retry Count.

6.2.7 Set SATA Physical Count

The Set SATA Physical Retry Count option is used when the duplicator recognizes a major problem with a drive or a critical error at the hardware level that is uncorrectable at the software level. The SATA Physical Count is the number of times that the duplicator will reset the drives at the hardware level in an attempt to allow the duplication to progress.

The number of retries can be set from 0 to 9 times. The default setting is 1.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the SATA PHY Count.

6.2.8 Auto Kick Slow (*15 and 23 target duplicators only*)

Not all drives are equal, and some drives will be slower than others due to max performance, health and other factors. Since the duplicator operates in a synchronous mode, the duplicator can only operate as fast as the slowest drive attached. Enabling Auto Kick Slow option allows the duplicator to detect any slow drives and automatically remove them from the operation.

Tap the **'ENT' button** to change this option.

- [*] – Auto Kick Slow is enabled. If a drive's operating speed falls below a certain level for a specified length of time (as defined by Set Kick Time and Set Kick Speed) the drive will be automatically ejected from the operation.
- [] – Auto Kick Slow is disabled (default). Duplicator will operate as fast as the slowest connected drive. Slow drives can be ejected manually by holding the **'F1' button**.

6.2.9 Set Kick Time (*15 and 23 target duplicators only*)

If Auto Kick Slow has been enabled, the Set Kick Time option will define the how long a drive can operate below the speed defined by Set Kick Speed before it is ejected from the operation.

The time can be set from 1 to 120 seconds. The default setting is 30 seconds.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the Kick Time.

6.2.10 Set Kick Speed (*15 and 23 target duplicators only*)

If Auto Kick Slow has been enabled, the Set Kick Time option will define the lowest speed that a drive can operate at. If a drive remains below this speed threshold for the amount of time defined by Set Kick Time, then it will be ejected from the operation.

The speed can be set between 1 and 255MB/s. The default setting is 60MB/s.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the Kick Speed.

6.2.11 Set Ratio Start

Ratio Copy duplicates only a defined percentage of the Master drive. The Set Ratio Start option allows you to define the starting point. The percentage of the disk duplicated from the start point is defined by the Set Ratio Length option.

By default the Set Ratio Start is 0.0%, which is the very beginning of the drive.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Ratio Start point.

6.2.12 Set Ratio Length

Ratio Copy duplicates only a defined percentage of the Master drive. The Set Ratio Length option allows you to define the percentage of length to be duplicated. The starting point is defined by the Set Ratio Start option.

By default the Set Ratio Length is 10.0%.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Ratio Length.

6.2.13 Set Ratio Erase Start

Ratio Erase erases only a defined percentage of the Master drive. The Set Ratio Erase Start option allows you to define the starting point. The percentage of the disk erased from the start point is defined by the Set Ratio Erase Length option.

By default the Set Ratio Erase Start is 0.0%, which is the very beginning of the drive.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Ratio Erase Start point.

6.2.14 Set Ratio Erase Length

Ratio Erase duplicates only a defined percentage of the Master drive. The Set Ratio Erase Length option allows you to define the percentage of length to be erased. The starting point is defined by the Set Ratio Erase Start option.

By default the Set Ratio Erase Length is 10.0%.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.
Tap the **'ENT' button** to set the Ratio Erase Length.

6.2.15 Check DC Connect (15 and 23 target duplicators only)

The Check DC Connect option allows you to configure whether or not the duplicator checks for any other daisy chain connected duplicators during bootup.

Tap the **'ENT' button** to change this option.

- [*] – Check DC Connect is enabled. When the duplicator is powered on, it will check for other daisy chain connected duplicators while it is booting up.
- [] – Check DC Connect is disabled (default). When the duplicator is powered on, it will skip checking for other daisy chain connected duplicators and proceed with booting up in standalone mode.

6.2.16 Set Max DC Count (15 and 23 target duplicators only)

The more duplicators you have connected through daisy chain, the longer it will take to initialize during bootup. The Set Max DC Count option allows you to configure the maximum number of duplicators the system checks for during bootup. Each duplicator has a different value:

- 15 Target Duplicator value = 4
- 23 Target Duplicator value = 6

So for example, if you are connecting two 15 Target Duplicators then you would set this value to 8. If you were connecting 2x 23 Target Duplicators then you would set this value to 12. If you were connecting a 15 Target Duplicator to a 23 Target Duplicator then this value should be set to 10.

The Set Max DC Count can be set from 1 to 32.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the Max DC Count.

6.2.17 Set DC Connect Time (15 and 23 target duplicators only)

The more duplicators you have connected through daisy chain, the longer it will take to initialize during bootup. The Set DC Connect Time option allows you to configure the maximum amount of time that the system checks for daisy chain connected duplicators during bootup.

The Set DC Connect Time can be set from 0 to 999. The default value is set to 999.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting. Tap the **'ENT' button** to set the DC Connect Time.

6.2.18 Log Over Head

Some Linux file systems use a log-structure file system that allows for metadata to be written in between blocks of data. Normally this metadata isn't critical and does not need to be copied. However, if you would like this information to be copied, you must define the gap size.

You can define the gap size as 2MB, 4MB, 8MB, 16MB or 64MB. By default Log Over Head is set to NO, which means the metadata will not be copied.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.

Tap the **'ENT' button** to set the Log Over Head value.

6.2.19 Partition Full Copy

The Partition Full Copy option allows you to run a hybrid Brief/Disk Copy. This type of copy is useful when duplicating a disk that contains hidden data or hidden partitions that would not be recognized by Brief Copy.

Tap the **'ENT' button** to change this option.

- [*] – Partition Full Copy is enabled. The duplicator will make a Disk Copy of an assigned partition after Brief Copy is completed.
- [] – Partition Full Copy is disabled (default). The duplicator will simply make a Brief Copy.

6.2.20 Partition Gap Copy

The Partition Gap Copy option allows the duplicator to copy any gap data that resides between partitions when running Brief Copy. This is only required in rare circumstances.

Tap the **'ENT' button** to change this option.

- [*] – Partition Gap Copy is enabled. The duplicator will check for and copy any data that resides between partitions. .
- [] – Partition Gap Copy is disabled (default). The duplicator will simply make a Brief Copy.

6.2.21 Partition Unused Copy

The Partition Unused Copy option allows the duplicator to copy any unused partitions.

Tap the **'ENT' button** to change this option.

- [*] – Partition Unused Copy is enabled. The duplicator will Brief Copy any unused partitions.
- [] – Partition Unused Copy is disabled (default). The duplicator will skip any unused partitions during a Brief Copy.

6.2.22 No MBR Check

The No MBR Check option will allow the duplicator to start a copy process without checking the MBR table. This is because some drives do not have a standard MBR table, however the data residing within are correct and the duplicator is able to copy them.

Tap the **'ENT' button** to change this option.

- – No MBR Check is enabled. The duplicator will not check the MBR table before starting the copy process.
- – No MBR Check is disabled (default). The duplicator will check the MBR table prior to copying to ensure that it is healthy and intact.

6.2.23 MBR&HP Check

The MBR & HP check is specifically used when copying drives from certain HP computers which need to have this function enabled for it to be successful.

Tap the **'ENT' button** to change this option.

- – MBR&HP Check is enabled.
- – No MBR Check is disabled (default).

6.2.24 Sector Size 4K

The Sector Size 4K setting is used when the source drive is simulating 4K sector size. If your source drive uses a special bridge chip to make the drive act like it has 4K sectors, then you must enable this option when running Brief Copy.

Tap the **'ENT' button** to change this option.

- – Sector Size 4K is enabled. You will be able to Brief Copy a source drive that is simulating 4K sector sizes.
- – Sector Size 4K is disabled (default).

6.2.25 Keep Last Partition

The Keep Last Partition setting is used to configure how Resize Copy functions when the Master drive has multiple partitions.

Tap the **'ENT' button** to change this option.

- – Keep Last Partition is enabled. When you run a Resize Copy operation, the last partition on the Target drive will be the locked as the same size as the last partition on the Master drive.
- – Keep Last Partition is disabled (default). When you run a Resize Copy operation, the last partition on the Target drive will be expanded to use up any unallocated space.

6.2.26 Resize Last Partition

The Resize Last Partition setting is used to configure how Resize Copy functions when the Master drive has multiple partitions.

Tap the **'ENT' button** to change this option.

- [*] – Resize Last Partition is enabled. When you run a Resize Copy operation, the last partition on the Target drive will be expanded to use up any unallocated space.
- [] – Resize Last Partition is disabled (default). When you run a Resize Copy operation, all partitions will be expanded equally to use up any unallocated space.

6.2.27 Need Resize

The Need Resize option configures the way that the Smart Copy operates. When you execute a Smart Copy operation, the system checks the capacity between the Master drive and all connected Target drives. If the capacity of any of the Target drives exceeds the capacity of the Source drive by the tolerance percentage defined by the Need Resize option, then the duplicator will automatically execute a Resize copy. Otherwise it will run a Brief Copy. The default value is: 3%

For example:

- [0%] : All targets must be the same capacity. If the capacity between the Master and Target drives is any different then the system will execute a Resize Copy.
- [10%] : If the capacity difference between the Master and Target drives is between 0% and 10% then the system will execute a Brief Copy. If the capacity of the Targets is larger than the capacity of the Master by more than 10% then the system will execute a Resize Copy.

Tap the **'ENT' button** and then press the **UP/DOWN buttons** to change this option's setting.

Tap the **'ENT' button** to set the Need Resize percentage.

6.2.28 Brief Verify Source

Enabling Brief Verify Source will allow the duplicator to create a Source CRC value (for data only) and save it in the machine until the duplicator is turned off. After a Brief Copy is completed, the duplicator will check the source's CRC is correct or not. This will verify whether the source data was transferred accurately during the copy process.

6.2.29 Disk Verify Source

Enabling Brief Verify Source will allow the duplicator to create a Source CRC value (for the whole disk) and save it in the machine until the duplicator is turned off. After a Disk Copy is completed, the duplicator will check the source's CRC is correct or not. This will verify whether the source data was transferred accurately during the copy process.

6.3 Storage Center Setup

6.3.1 Load Full Image

The Load Full Image option allows you to control how image files are saved to a Storage Center during a Load operation (see section 4.8 Load Image on page 25).

Tap the **'ENT' button** to change this option.

- [] – Disabled (default). The system will analyze the Source's file system before building the image. If the Source's file system is supported, the image will be a Brief image based on the file system and data area. If the Source's file system is unrecognized the image will be a full sector by sector image.
- [*] – Enabled. When executing a Load process, the system will not analyze the Source's file system and will automatically build the image sector by sector.

6.3.2 Copy Storage Source

The Copy Storage Source option allows you to make a duplicate of your Storage Center drive.

Tap the **'ENT' button** to change this option.

- [] – Disabled (default). The system will analyze the Source's file system before duplication. If the Source's file system is recognized as a Storage Center then the duplicator will ask you to choose an image name to copy.
- [*] – Enabled. The system will analyze the Source's file system before duplication. If the Source's file system is recognized as a Storage Center then the duplicator will make a copy of the entire Storage Center drive.

6.3.3 Skip Select Image

The Skip Select Image option allows you to set whether the duplicator asks you to select an image file when it recognizes that the drive connected to the Source is a Storage Center.

Tap the **'ENT' button** to change this option.

- [] – Disabled (default). The system will analyze the Source's file system before duplication. If the Source's file system is recognized as a Storage Center then the duplicator will ask you to choose a image name to copy.
- [*] – Enabled. The system will analyze the Source's file system before duplication. If the Source's file system is recognized as a Storage Center then the duplicator will automatically make a copy of the image configured in the Select Image File option.

6.3.4 Select Image File

The Select Image File option is used to select an image file when the Skip Select Image option is enabled. If Skip Select Image is enabled, the image file selected here will be used as the default Source for any copy process.

To select an image file name:

1. Tap the **'ENT' button**. The digit furthest to the left will start blinking, indicating that it is currently selected. Tap the **UP/DOWN buttons** to increase/decrease the digit by one.
2. Tap the **'ENT' button** to select the next digit to the right. Tap the **UP/DOWN buttons** to increase/decrease the digit by one.
3. Repeat step 2 until you have entered the complete image name, then press and hold the **'ENT' button** to set the default file image.

6.3.5 Delete Image File

The Delete Image File option is used to delete a specific image file that has been saved to the Storage Center.

To delete an image file:

1. Connect your Storage Center drive to the Source port.
2. Tap the **'ENT' button**. The digit furthest to the left will start blinking, indicating that it is currently selected. Tap the **UP/DOWN buttons** to increase/decrease the digit by one.
3. Tap the **'ENT' button** to select the next digit to the right. Tap the **UP/DOWN buttons** to increase/decrease the digit by one.
4. Repeat step 2 until you have entered the complete image name, then press and hold the **'ENT' button** to select the image file for deletion.

Note: If you receive a "File Not Found" error message, then there is no data saved to the image file that you selected.

6.3.6 Make Storage Center

The Make Storage Center option allows you to format a normal drive as a Storage Center drive. Storage Centers which can then be used to store multiple hard drive images for convenient access to your most commonly used Master drives.

To format a hard drive as a Storage Center:

1. Connect the hard drive you want to format as a Storage Center to the duplicator's Source port.
2. Tap the **'ENT' button**.
3. You will receive a message asking you to confirm formatting the drive. Tap the **'ENT' button** to proceed or tap the **'ESC' button** to cancel.
Caution! Formatting the internal hard drive will erase any saved image files stored on the hard drive.

Once the format has completed you will receive a message confirming that the format was successful.

6.4 The Diagnostic Setup Menu

The Diagnostic Setup menu will allow you to choose which disk diagnostic tests are enabled to run when executing the Disk Diagnostic function (see section 4.6 Disk Diagnostic on page 25). Press the **UP** and **DOWN** buttons to navigate through the options available under the Diagnostic Setup menu.

Diagnostic tests that are enabled are marked with an asterisk [*]. Tap the **ENT** button to toggle a test between enabled/disabled.

- **SET DIAG SMART** - S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a monitoring system included in HDDs and SSDs that detects and reports on various indicators of drive reliability, with the intent of enabling the anticipation of hardware failures.
- **SET WRITE TEST** - Checks the ability to write data to the target drives by sequentially writing data to all sectors.
- **SET READ TEST** - Checks the ability to read data from the target drives by writing data to all sectors and attempting to read them sequentially.
- **SET RANDOM READ** - Same as the Read Verify test, except sectors are written and read from in a random pattern.
- **SET RANDOM WRT** - Same as the Write test, except sectors are written to in a random pattern.
- **SET DIAG. PAT.** - Configure the data pattern value for Write and Random Write test

6.5 The About Menu

6.5.1 Set to Default

The Set to Default option allows you to restore all system settings back to their factory default values.

Tap the **'ENT' button** to reset your duplicator to its original default configuration. The screen will display a message asking you to confirm the reset. Tap the **'ENT' button** to confirm, or tap the **'ESC' button** to cancel.

Once the reset has been completed, you will be shown a confirmation message on the screen. Press any button to return to the About menu.

6.5.2 Update Firmware

The Update Firmware option allows you to upgrade your Kanguru Hard Drive Duplicator to the latest firmware version.

Warning! Do not attempt to update your duplicator's firmware unless specifically instructed to do so by a Kanguru Technician.

To update your firmware:

1. Contact Kanguru Technical Support at 508-376-4245 to receive a firmware update file.
2. Format a SATA drive or USB flash drive as FAT32.
3. Copy the firmware file to the drive you just formatted.
4. Connect the hard drive to the duplicator's Source port or USB flash drive to the USB port located on the back of the duplicator.
5. From the About menu, navigate to UPDATE FIRMWARE and then tap the **'ENT' button**.
6. Tap the **'F1' button** if you are using a SATA drive or tap the **'F3' button** if you are using a USB flash drive.
7. Once the system has confirmed the firmware file, a message will be displayed on the screen asking you to confirm the firmware update. Tap the **'ENT' button** to proceed or tap the **'ESC' button** to cancel.
8. Wait for the firmware update process to complete.
9. Once the firmware update process has completed, reboot your system and the new firmware version and build number will be displayed on the startup screen.

Warning! Do not disconnect power or turn off the duplicator while updating the firmware. Doing so may cause the duplicator to become non-functional.

6.5.3 Format Update Disk

The Format Update Disk option allows you to format a connected SATA drive in a supported FAT32 file system. This drive can then be used to load firmware updates to the duplicator.

6.5.4 Format USB Drive

The Format USB Drive option allows you to format a connected USB drive in a supported FAT32 file system. This USB drive can then be used to load firmware updates to the duplicator.

6.5.5 System Information

The System Information option allows you to view information regarding your duplicator's firmware version and build.

Tap the **'ENT' button** to begin viewing the system's information. Tap the **'ESC' button** to exit back to the About menu.

7. FAQ

Q: Do all Target hard drives have to be the same capacity? Same Brand?

A: If you select Disk copy or Brief copy, the Target hard drives must have the same capacity as the Master hard drive. The hard drive brand is not important but capacity must be identical.

Q: Can I clone a smaller capacity Master drive to larger capacity Target drives?

A: Yes, use the “RESIZE COPY“ operation to clone a smaller capacity Master to larger capacity Targets. However, targets must all be the same size (i.e. you can clone a 20GB Master to five 100GB Targets using RESIZE COPY).

Q: Can I clone to Targets of various brands simultaneously?

A: Yes, the machine is able to clone hard drives of different brands as long as they are the same capacity.

Q: Can drives with different RPM speeds be cloned together?

A: Yes, the machine will adjust to hard drives with different RPMs.

Q: How does the duplicator handle multiple partitions on the Master drive?

A: The machine will auto-detect how many partitions in the source hard drive and then copy it, but you are unable to select a specific partition to copy.

Q: How does the duplicator handle multiple partitions of varying formats on the Master drive?

A: The machine will analyze the File System of the Master drive before it begins cloning.

Q: Can the duplicator clone operating systems such as UNIX and OS/2?

A: Yes, use the Disk copy operation to copy any operating system.

Q: Can the duplicator defragment a partition?

A: No, this must be done directly by the operating system of your PC.

Q: Can the Duplicator copy Encrypted HDD's?

A: The KanguruClone is able to copy a limited number of encrypted HDD types through Disk copy.

8. TROUBLESHOOTING

Problem	Possible Cause	Solution
<p>The KanguruClone will not start or there is no display on the LCD screen.</p>	<p>The power cable is damaged or not connected securely.</p>	<p>Make sure that the power cable is not damaged and is not loose.</p>
	<p>The voltage of the outlet the KanguruClone is plugged into does not match the KanguruClone.</p>	<p>Make sure that the voltage of the outlet matches the voltage of the KanguruClone.</p>
	<p>The power supply switch or the system power switch is in the Off position.</p>	<p>Make sure that the power switch located at the back of the unit is in the On position.</p>
<p>The KanguruClone cannot make copies of a Master hard drive.</p>	<p>The hard drive is not connected or was not detected by the Kanguru Clone.</p>	<p>Make sure that all connected hard drives have been successfully detected by the KanguruClone.</p>
	<p>The cables connecting the hard drive are not connected securely.</p>	<p>Make sure that no hard drive connection cables are loose.</p>
	<p>The hard drive jumpers are not set in the correct position.</p>	<p>Make sure that all the hard drive jumpers are set to the Master or Cable Select position.</p>
	<p>The hard drive may be faulty.</p>	<p>Make sure that the Master hard drive is not broken and does not have errors.</p>
	<p>The hard drive's format is not supported by Brief Copy or Resize Copy.</p>	<p>When executing a Brief Copy or Resize Copy, make sure that the format of the Master hard drive is supported.</p>
	<p>The hard drive contains a Host Protected Area.</p>	<p>Enable the HPA CHECK option under the Advanced Setup menu.</p>
<p>The KanguruClone is unstable or operates very slowly.</p>	<p>The data cables from the KanguruClone to the hard drives are not connected securely.</p>	<p>Make sure that none of the data or power cables are loose.</p>
	<p>A hard drive may have an error that is affecting the other hard drives, causing slow operation.</p>	<p>Try to identify the faulty hard drive and replace as needed.</p>
	<p>The cables do not meet the UDMA standards.</p>	<p>Only use the cables provided by Kanguru Solutions with the KanguruClone.</p>

9. WARRANTY INFORMATION

This product carries a 1 year* limited warranty on the power supply, controller, and all internal components. The warranty does not cover any IDE, SATA, or Power cables. Kanguru Solutions is not responsible for any damages incurred in the shipping process. Any claims for loss or damage must be made to carrier directly. Claims for shipping errors should be reported to Kanguru Solutions within three (3) working days of receipt of merchandise. Please refer to the RMA Procedure section of this manual if your duplicator needs servicing.

Kanguru Solutions does not offer money back returns on its duplicator product lines due to the unique nature of the product. All units will be fully supported under manufacturer's and/or extended warranty plans.

10. TECHNICAL SUPPORT

If you experience any problems using your Kanguru product or have any technical questions regarding any of our products, please call our tech support department. Our tech support is free and available Monday thru Friday, 9am to 5pm EST.

Call 1-508-376-4245

Or visit our website at www.Kanguru.com

RMA Procedure

All Duplicators being serviced MUST BE PACKED IN THE ORIGINAL PACKAGING. If you do not have your original packaging, you can purchase replacement packaging for \$25.00 from Kanguru's Tech Support Department. Kanguru Solution's warranty will not be honored in the event that a duplicator is received improperly packaged, altered, or physically damaged.

STEP ONE: Call for a RMA Number: 508-376-4245

Duplicators will not be accepted for repair without a valid RMA number. RMA numbers are valid for 30 days upon assignment. Any return without a valid RMA number will be returned to the customer at their expense.

STEP TWO: Ship and Insure your Duplicator

Kanguru Solutions strongly recommends you fully insure the duplicator for shipping. Kanguru Solutions is not responsible for if the package is lost or damaged in transit. We suggest using a shipping company that utilizes a "tracking" feature to verify "proof of delivery." The customer is responsible for shipping charges when returning a product. Shipping back to the customer is covered by Kanguru Solutions during the first 90 days of purchase. After 90 days of purchase the customer is responsible for shipping both ways.

Clip and Use this Label to Ship Your Return

Kanguru Solutions Tech. Support Dept. 1360 Main St. Millis, MA 02054	
RMA#	<input type="text"/>

APPENDIX A: DAISY CHAIN CONNECTION

Kanguru Clone 15 target and 23 target HDD Duplicators can operate individually as standalone systems. They can also be linked together to create a system of separate HDD Duplicators working together in unison via a daisy chain connection. A maximum of four duplicators can be daisy chained at once, although it is not recommended to have more than two systems connected together.

Note: Daisy Chain connectivity is not currently supported by Kanguru Clone 7 Target models.

Setting up the Daisy Chain Configuration

1. Arrange the duplicators side-by-side on a secure, elevated surface. It will make the setup process easier if you have convenient access to the back of the duplicators.
 - The duplicator furthers to the left (when viewed from the front) is Duplicator #1. This will be the Master system.
 - The duplicator to the right of Duplicator #1 is Duplicator #2
 - The duplicator to the right of Duplicator #2 is Duplicator #3, etc...
2. Locate the “OUT E-SATA” and “IN SATA” ports on the back of the duplicators. The ports should be labeled clearly.
3. Connect all the duplicators together using the provided Daisy Chain cable (referred to as DC Cable). The Daisy Chain cable should have been provided with your duplicator and has a SATA connector on one end and an e-SATA connector on the other.
 - a) Starting with the Master system, connect the e-SATA end of the DC Cable to the port marked “OUT E-SATA”
 - b) Connect the SATA end of the DC Cable to the “IN SATA” port located on the back of Duplicator #2.
 - c) Continue in this fashion until all duplicators are connected.
4. Connect the duplicators to electrical outlets using the provided power cables.
5. Power on all duplicators. The duplicators have not been linked at this point, so they will operate independently.
6. On each duplicator, navigate to the Setup Select Menu → Advanced Setup → Check DC Connect.
7. Enable the Check DC Connect option on all duplicators (see section 6.2.15 Check DC Connect (15 and 23 target duplicators only) on page 46).
8. Power cycle all duplicators by switching the power switch off and on.
9. When the duplicators bootup, the connected duplicators will communicate with each other and establish the daisy chain connection.

Note: If you reboot the duplicator and there is no connection to another duplicator, hold the ‘**ESC**’ button to cancel the Daisy Chain check and then disable the Check DC Connect option.

Duplicating in a Daisy Chain Configuration

Once connected, making disks copies with duplicators in a Daisy Chain configuration is similar to making copies on independent, standalone systems.

1. Connect the Master disk to the Source port on Duplicator #1.
2. Connect Target disks to any remaining ports on any of the duplicators.
Note: A Target disk can be connected to the Source port on Duplicator #2 and it will be copied to.
3. Navigate to the desired copy mode.
4. Press the **'ENT' button** to start the duplication process.



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07.19.17 v1.5 © 2017 Kanguru Solutions

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