PSIClone™

User's Guide

Version 5.0

"Helping You Find What You're Looking For"

905 Industrial Blvd • LaBelle, FL 33935

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CPR TOOLS
Media Research & Recovery

Company Information

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CPR Tools has been a leader in the field of data recovery for nearly three decades. In meeting the needs of our own data recovery technicians and in our role as educators to the industry, CPR Tools has developed tools designed to simplify and automate tasks in the data recovery lab. PSIClone™ is such a tool.

Designed for use in the field or the lab, PSIClone™ will provide years of consistent and reliable service.

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Introduction

Congratulations on your purchase of PSIClone™ from CPR Tools. PSIClone™ was developed by CPR Tools' engineers in answer to our own data recovery lab technicians' requests, PSIClone™ is packed with useful features which make it a unique product.

Designed with forensic data integrity in mind, a primary feature of PSIClone™ is that the user is unable to write to the 'source' side of the device (Side A). This built in 'Write Protect' feature is one of the advanced features that your new PSIClone™ contains.

While PSIClone™ is primarily a drive-to-drive cloning and imaging device, it stands out from other such devices because, unlike others in this category, PSIClone™ can be used to 'clear' data in accordance with NIST 800-88[1] specifications to ensure complete destruction of personal information.

The free host utility software, CPR Toolbox™ extends PSIClone™ functionality with features not found in any package at twice the price. PSIClone™ performs and provides tremendous value.

At CPR Tools we truly believe that data recovery engineers are the best people to design data recovery tools. If you have any comments, questions or ideas for enhancements or additions to the functionality of PSIClone™, email (psiclone.support@cprtools.net) or contact us via the contact form at http://www.cprtools.net.

What's New in PSIClone™?

Simply put: A LOT!! This exciting new release of PSIClone™ and the CPR Tools Utilities Suite includes version 5 of the CPR Toolbox™ host companion software. Featuring a new, sleek and fully redesigned interface, CPR Toolbox™ version 5 extends PSIClone™ functionality with powerful new recovery tools, including:

- Enhanced Imaging Control
    - o PSIClone™ now allows for custom filenames when creating image filesets.
- iFirmware™
    - o Work with hard drive firmware modules
    - o AIR: Automatic Identification & Repair
- ADR
    - o Perform advanced data recovery techniques

These features add to the robust list of PSIClone™/CPR Toolbox™ capabilities, which include:

- Compression
    - o PSIClone™ can employ a compression algorithm during the creation of image files.
- The ability to mount a filesystem on a drive connected to PSIClone™
    - o USB 2.0 connection to a host system running CPR Toolbox™ required.
    - o In this mode, PSIClone™ employs a USB 2.0 Write Block – no write operations are permitted to drives in Mass Storage Mode while connected to PSIClone™
- Partition Clone
    - o Provides the ability to quickly clone a logical partition.
- FastClone
    - o Copies only allocated sectors within a detected filesystem.
- eDrive™
    - o Allows for the creation of known errors on drives. This feature is helpful in software or hardware validation and may be used for training.
- gClone™
    - o Allows cloning of sectors which have been remapped by a drive's defect mapping mechanism

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[1] http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_rev1.pdf

Getting Started

Before starting to use your new PSIClone™, take a moment to examine the contents of your PSIClone™ package.

1 x PSIClone

1 x Documentation/CPR Tools Utilities Suite CD

2 x SATA Data/Power Cables

2 x PATA Data Cables

1 x USB Cable[2]

1 x AC Power Supply

1 x AC Power Cord

Figure 1 illustrates the entire contents of your PSIClone™ package.

| PSIClone™ (1) | Documentation/CPR Tools Utilities Suite CD (1) |

| SATA + Power Cables (2) | PATA Cables (2) | USB Cable (1) | AC Power supply & cord (1) |

Figure 1 - PSIClone™ Package – Contents

Additional cables and accessories, including many hard drive adapters which extend PSIClone functionality, may be purchased at www.cprtools.net/store.

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[2] USB cable provided for use with CPR Toolbox™ and CPR Flash™; USB 2.0 required

Overview

Please take a moment to familiarize yourself with the device. Notice that PSIClone™ is labeled with a letter 'A' on the left, and 'B' on the right. PSIClone™ permanently write-protects the 'A' side of the device. This protects your 'source' drive by only allowing writes or erasures to happen on the 'B' side of the device.

PSIClone™ is controlled by five buttons, shown in Figure 2. The red power button is used to power the unit on or off. Upon turning the unit on, the LCD screen will display 'CPR Tools – PSIClone' and the version number.

Using the four navigation buttons and the 16x2 backlit LCD screen, a user can traverse the menu structure to instruct PSIClone™ to perform tasks. We will refer to these buttons as 'UP', 'DOWN', 'LEFT' and 'RIGHT'.

PSIClone™ features two (2) PATA and two (2) SATA ports for Parallel ATA and Serial ATA drives. PSIClone™ is capable of safely powering no more than two (2) drives simultaneously, one on each side of PSIClone™ (Side A and Side B). As an example you cannot place a drive on Side A PATA and Side A SATA and power them simultaneously.

To ensure consistent and safe operation of PSIClone™, CPR Tools advises powering off PSIClone™ prior to attaching hard drives to either Side A or Side B. Failure to do this may result in damage to your hard drives or void your PSIClone™ warranty.

Figure 3 and Figure 4 offer a close-up, labeled view of 'Side A' and 'Side B' of PSIClone™.

Figure 2 - PSIClone Navigation Buttons

Figure 3 - PSIClone™, Side A

Figure 4 - PSIClone™, Side B

WARNING:

Do **NOT** use a power splitter on any of the HDD power ports on either side A or B of the PSIClone™ device.

The use of power splitters with PSIClone™ will void manufacturer's warranty for the product and risks damaging PSIClone™ and attached drives.

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Overview (continued)

PSIClone™ Basics

Side A of PSIClone™ will serve as a connection point for 'source' drives only. To preserve forensic integrity, no write operations are permitted to Side A.

Conversely, Side B of PSIClone™ will serve as a connection point for 'target' or 'destination' drives.

Only drives connected to Side B can be written to by PSIClone™.

The PSIClone™ menu structure begins with eleven (11) top level menus. Each of these will be discussed in detail. The top level menus are:

> **NOTE:** Most PATA drives have 'master', 'slave' and 'cable select' jumper positions printed on the drive container. **PATA drives must be set to 'master' to work consistently with PSIClone™.**
>
> For WD drives which offer a jumper setting for 'single', this is optimal for working with CPR Tools' devices.

- Clone
- Image
- Format Drive
- Compare
- Bang
- Identify
- Reset
- Drive Power
- MD5 Hash
- Error Handling
- Options

Using PSIClone™ with a PC

System Requirements

To use PSIClone™ with the CPR Toolbox™ or CPR Flash™ utilities, ensure that the host PC meets the minimum system requirements. These are:

1. Operating System:
   - Microsoft® Windows XP® SP2
   - Microsoft® Windows Vista®
   - Microsoft® Windows 7®
2. USB
   - USB 2.0

PSIClone™ User Interface

PSIClone™ provides a 2 by 16 character LCD and 4 push navigation buttons, positioned in a diamond configuration: UP, DOWN, RIGHT and LEFT. When the unit is turned on the main menu is presented. Users may make use of the UP and DOWN navigation buttons to scroll through menu items and/or options. To select an option, the RIGHT button is used. LEFT button is used to cancel a selection or action, or to return to the previous menu.

Additionally, the host companion software, CPR Toolbox™ (included with PSIClone™), may be used to control PSIClone™. See the chapter titled 'CPR Toolbox™' for detailed information on using this utility with PSIClone™.

Figure 5 - PSIClone™ - Navigation buttons

In the menu map for PSIClone™ (Figure 6) and in subsequent 'menu map' snippets, an asterisk (*) is used to denote 'active' or 'selected' values.

```
|========================        |========================        |========================
|CLONE                           |IDENTIFY                        |OPTIONS
|-------FROM A PATA              |--------A PATA                  |-------TRANSFER RATE
|-------|-----TO B PATA         |--------A SATA                  |--------|-----AUTO*
|-------|-----TO B SATA         |--------B PATA                  |--------|-----UDMA MODE 3
|-------FROM A SATA              |--------B SATA                  |--------|-----UDMA MODE 2
|-------|-----TO B PATA         |========================        |--------|-----UDMA MODE 1
|-------|-----TO B SATA         |RESET                           |--------|-----UDMA MODE 0
|========================        |--------A PATA                  |--------|-----PIO
|IMAGE                           |--------A SATA                  |--------BACKLIGHT
|-------FROM A PATA              |--------B PATA                  |--------|-----ON
|-------|-----TO B PATA         |--------B SATA                  |--------|-----OFF
|-------|-----TO B SATA         |========================        |--------POWER DOWN
|-------FROM A SATA              |DRIVE POWER                     |--------|-----AFTER COMPLETE
|-------|-----TO B PATA         |--------SIDE A                  |--------|-----LEAVE DRIVES ON*
|-------|-----TO B SATA         |--------|-----TURN ON           |--------POWER ON TIMEOUT
|========================        |--------|-----TURN OFF          |--------|-----<SELECT TIME IN MS>
|FORMAT DRIVE                    |--------SIDE B                  |--------COMMAND TIMEOUT
|--------QUICK FORMAT           |--------|-----TURN ON           |--------|-----<SELECT TIME IN MS>
|--------COMPLETE FORMAT        |--------|-----TURN OFF          |--------FILE SIZE
|========================        |========================        |--------|-----700 MB
|COMPARE                         |MD5 HASH                        |--------|-----1 GB
|-------FROM A PATA              |--------CALCULATE HASH         |--------|-----2 GB*
|-------|-----TO B PATA         |--------|-----A PATA           |--------FILE NAME
|-------|-----TO B SATA         |--------|-----A SATA           |--------|-----NAME:IMAGEBIN*
|-------FROM A SATA              |--------|-----B PATA           |--------|-----|-----<CHOICE>
|-------|-----TO B PATA         |--------|-----B SATA           |--------CMD. DIRECTION
|-------|-----TO B SATA         |--------VIEW LAST HASH         |--------|-----FORWARD*
|-------PATTERN                  |========================        |--------|-----BACKWARD
|-------|-----<CHOICES>         |ERROR HANDLING                  |--------BUZZER
|-------|-----|-----TO B PATA   |--------STOP ON ERRORS         |--------|-----ENABLED
|-------|-----|-----TO B SATA   |--------RECOVER ERRORS*        |--------|-----DISABLED*
|-------INCREMENT                |--------|-----JUMP SIZE ON ERR |--------SESSION NUMBER
|-------|-----TO B PATA         |--------|-----|-----<SELECT SIZE> |--------|-----DISPLAY SESSION
|-------|-----TO B SATA         |--------|-----PASS 2 T.O. CNT  |--------|-----RESET SESSION
|-------INVERSE BITS             |--------|-----|-----<SELECT TIMEOUT> |--------COMPRESSION
|-------|-----TO B PATA         |--------|-----SOFTWARE RESET   |--------|-----ENABLED
|-------|-----TO B SATA         |--------|-----|-----TIMEOUT ERROR |--------|-----DISABLED*
|========================        |--------|-----|-----ON DRIVE ERROR |--------RESTORE DEFAULTS
|BANG                            |--------|-----HARDWARE RESET   |========================
|--------B PATA                  |--------|-----|-----TIMEOUT ERROR
|-----------PATTERN              |--------|-----|-----ON DRIVE ERROR
|--------|-----<CHOICES>        |--------|-----POWER CYCLE
|-----------INCREMENT            |--------|-----|-----TIMEOUT ERROR
|-----------INVERSE BITS         |--------|-----|-----ON DRIVE ERROR
|-----------RANDOM               |--------|-----NUMBER OF PASSES
|--------B SATA                  |--------|-----|-----1 PASS
|-----------PATTERN              |--------|-----|-----2 PASSES*
|--------|-----<CHOICES>        |========================
|-----------INCREMENT
|-----------INVERSE BITS
|-----------RANDOM
|========================
```

Figure 6 - PSIClone™ Menu Map

(* indicates default value)

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Example: Power on Timeout

The following example is presented to illustrate entering and confirming a PSIClone™ value. The example uses the PSIClone™ 'Power on Timeout' setting; these techniques may be used for any item which permits user entry of a value.

Where <SELECT TIME IN MS> is shown below, the user may select a value using the navigation buttons as described in the example titled "Power on Timeout".

Once a menu option is desired, use the RIGHT navigation button to select the option. Some menu options may have submenus. Once the user is faced with the final selection of a menu traversal, the RIGHT navigation button is used again to select and execute the function.

When interacting with a PSIClone™ menu which requires you to select a numeric or hexadecimal value, remember to use the RIGHT navigation button to move to the rightmost position so that any choices will be accepted by PSIClone™. When PSIClone™ accepts a value it will display 'Configured' on the LCD to confirm.

'Power on Timeout' is part of the 'Options' menu tree.

Menu Tree

```
|=======================
|OPTIONS
|--------TRANSFER RATE
|--------|-----AUTO*
|--------|-----UDMA MODE 3
|--------|-----UDMA MODE 2
|--------|-----UDMA MODE 1
|--------|-----UDMA MODE 0
|--------|-----PIO
|--------BACKLIGHT
|--------|-----ON
|--------|-----OFF
|--------POWER DOWN
|--------|-----AFTER COMPLETE
|--------|-----LEAVE DRIVES ON*
|--------POWER ON TIMEOUT
|--------|-----<SELECT TIME IN MS>
|--------COMMAND TIMEOUT
|--------|-----<SELECT TIME IN MS>
|--------FILE SIZE
|--------|-----700 MB
|--------|-----1 GB
|--------|-----2 GB*
|--------CMD. DIRECTION
|--------|-----FORWARD*
|--------|-----BACKWARD
|--------BUZZER
|--------|-----ENABLED
|--------|-----DISABLED*
|--------SESSION NUMBER
|--------|-----DISPLAY SESSION
|--------|-----RESET SESSION
|--------COMPRESSION
|--------|-----ENABLED
|--------|-----DISABLED*
|--------RESTORE DEFAULTS
|=======================
```

PSIClone™ Tips:

The LEFT navigation button can be used at any time to back out a level of a menu.

The LEFT navigation button can also be used to cancel a process that may be in progress. Depressing the LEFT navigation button during a process produces a 'confirmation' prompt. If the user accepts this prompt, the process is terminated.

PSIClone™ uses the LCD display to present much information to the user, not only about options to be selected, but also about the status of the operation.

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Example: Power on Timeout

To change the 'Power On Timeout', scroll through the top level menus until 'Settings' is reached, select it by pressing the RIGHT navigation button. 'Transfer Rate' is shown. Press the DOWN navigation button to display the 'Power On Timeout' screen.

```
SETTINGS
POWER ON TIMEOUT
```

Press the RIGHT navigation button to be presented with the Power On Timeout menu item. The default value of 20000 milliseconds (ms) is shown.

```
POWER ON TIMEOUT
mSEC:      20000
```
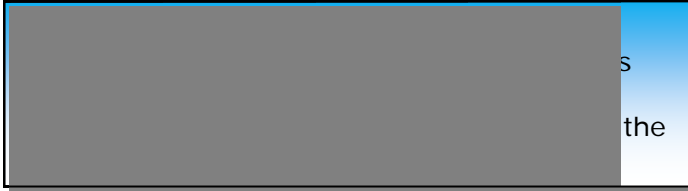
Using the RIGHT arrow to move the cursor right, advance to any digit shown in the numeric display; the UP and DOWN buttons may now be used to change that digit's value.

```
POWER ON TIMEOUT
mSEC:      21000
```

Continue editing values until finished. Once done, press the RIGHT navigation button to advance the cursor to the right, one position at a time until it is positioned under the last editable value.

```
POWER ON TIMEOUT
mSEC:      21000
```
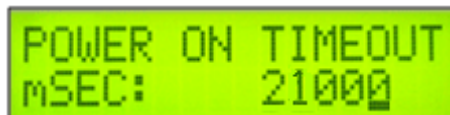
One additional press of the RIGHT navigation button instructs PSIClone™ to 'accept' your changes. PSIClone™ responds with a confirmation screen.

```
CONFIGURED
```

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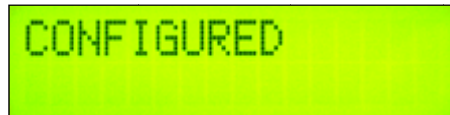
PSIClone™ Functions

The menu structure described in Figure 6 is meant to serve as a handy reference. A more in-depth discussion of each menu item available on your PSIClone™ is presented here.

When scrolling through menus and submenus for which options may be selected, currently selected values are appended by an asterisk character (*).

Clone

Menu Tree

```
|=======================
|CLONE
|--------FROM A PATA
|--------|-----TO B PATA
|--------|-----TO B SATA
|--------FROM A SATA
|--------|-----TO B PATA
|--------|-----TO B SATA
|=======================
```

Default: N/A

PSIClone™ defines a 'clone' as an exact sector-by-sector copy.

Any drive connected to 'Side A' can be cloned to a drive connected to 'Side B'. PSIClone™ uses the maximum transfer mode supported for the drives unless a different transfer rate was specifically chosen by the user. Users may select alternate transfer rates in the Options menu. If the user selects a transfer rate that is not supported by either of the attached drives PSIClone™ will automatically adjust the rate to the maximum rate supported by both drives.

In order to clone the drive as quickly as possible, PSIClone™ uses an advanced error handling algorithm which is divided into two passes. The first pass clones all error free sectors and identifies and reports all problem areas. The second pass revisits problem areas and extracts each sector of readable data and clones them to the destination. More information can be found on error handling later in this manual.

Example:

Drive A (source) supports up to UDMA 3 and Drive B (destination) supports PIO only; PSIClone™ will automatically adjust to PIO Mode.

In order to perform a sector-by-sector clone, the destination drive must be at least the same size or larger than the source drive and must be free of errors. All sectors of the source drive will be copied to the destination until the last source sector is transferred.

To ensure data integrity and to be certain the destination drive is free of write errors, CPR Tools recommends running the PSIClone™ Bang function on any drive intended to be the destination of a cloning operation; after a successful Bang function has been completed, it is recommended the user run the Compare function against the bang pattern written to the drive.

Image

Menu Tree
```
|=======================
|IMAGE
|--------FROM A PATA
|--------|-----TO B PATA
|--------|-----TO B SATA
|--------FROM A SATA
|--------|-----TO B PATA
|--------|-----TO B SATA
|=======================
```
Default: N/A

A drive image is a file or set of files which represent the source drive, including any filesystem(s) thereon. Imaging utilities vary in their implementations, but all result in a file or

set of files (fileset) which can be restored to create a copy of the source drive's data. If an image consists of more than one file, each component file in the fileset is called an 'image segment'. PSIClone™ creates filesets which are comprised of segment files each of which may be 700 MB, 1 GB or 2GB.

> **Note:**
> The 700 MB option is provided to facilitate copying of image files to CD media.

The size of segment files is user-defined and is configurable under the Options/File Size menu. By default, this value is set to 2GB.

Creating a drive image with PSIClone™

1. Attach the source drive to Side A of PSIClone™. Ensure that the storage capacity of the destination drive is larger than that of the source. Attach the destination drive to Side B of PSIClone™.
   a. The destination drive must be formatted by PSIClone™; use the 'Format Drive' command to prepare the destination drive to receive the image fileset.
      i. The 'Format Drive' command is available under the 'Options' menu.
2. Set or change the size of each segment of the drive image fileset by using the PSIClone™ menus. PSIClone™ performs formats using the FAT32 filesystem.
   a. The 'File Size' setting is located under 'Options'
3. Navigate to the Image menu.
4. Select source drive location (A PATA or A SATA)
5. Select destination drive location (B PATA or B SATA)
6. Press the right navigation button to initiate the Image process.

PSIClone™ Image Filesets

Filesets generated by the PSIClone™ image function are stored on the destination drive. For each drive image session a directory is created on the destination drive in the format 'Dirxxxxx' where xxxxx represents an incrementing number, beginning with 000.

> **Note:**
> PSIClone™ now permits user-defined filenames for image filesets. Manage image fileset names under `Options/File Name` in the PSIClone™ menus.

Within each fileset folder, fileset segments (individual files) are created and named in the format "Imagebin.xxx" where xxx represents an incrementing number beginning with 001.

PSIClone™ image filesets are written to industry standards; reassembly of PSIClone™ image filesets is able to be accomplished through the use of industry standard tools including the XCOPY command included with most DOS-like operating systems (if using MS-DOS XCOPY.EXE or others like it, be sure to use the /b flag which instructs the utility to assume 'binary' type files).

Cancelling and Resuming an Image

The imaging process may be interrupted and resumed at a later time. If an imaging process has been cancelled (by pressing the LEFT navigation button) and is re-initiated, PSIClone™ identifies the existing image files and offers to resume the process.

If an image has been cancelled and is re-initiated, the LCD displays:

```
RESUME IMAGE?
← NO    YES →
```

Pressing the RIGHT navigation button will instruct PSIClone™ to resume the imaging process from the point it was previously interrupted. Pressing the LEFT navigation button will instruct PSIClone™ to ignore the existing fileset and begin a fresh image fileset.

Restoring From An Image Fileset Which Was Cancelled And Resumed

Reconstructing data from an image fileset which was cancelled and resumed at a later date is made possible through information contained in the imaging logs which PSIClone™ writes to the destination drive.

As previously discussed, upon initiation of an image fileset, a directory is created in the format `DIRxxxxx` where `xxxxx` is an incrementing number starting with `00000`. The actual image filesets are written to these folders; PSIClone™ also writes a log file (`LOG_FILE.txt`) in plain text which provides an audit trail of each imaging process.

When working with image filesets which have been resumed, the section of the log file labeled `Results` contains important information which will be required if an image is to be stitched together from the fileset segments within each `DIRxxxxx`. The example below depicts the `Results` section

> **PSIClone Tips:**
>
> When PSIClone™ resumes a previously cancelled image a new incrementally numbered directory is created. The `Imagebin.xxx` files written are <u>continued in the folder created when the image process is resumed</u>.
>
> <u>Example:</u> A user initiates the creation of an image fileset. PSIClone™ creates `DIR00000` on the target drive and creates `Imagbin.001` through `Imagebin.006` at which point the image process is cancelled. When the image is resumed, PSIClone™ creates `DIR00001` on the target drive and <u>resumes the numbering of the `Imagebin.xxx` files, starting from `Imagebin.007`</u>.

from two image fileset log files. The first is from an initial image which was interrupted. The second is from the resumption of the first image and the completion of the image fileset.

```
Results
--------------
Directory: DIR00001
Error LBA, Status, Pass:

Total Errors: 0000000000
Operation Status: Cancelled
Number of Files: 0000000001
First LBA Imaged: 0000000000
Last LBA Imaged: 0003763199
MD5 Hash: N/A

End Date: 09/18/08
End Time: 15:00
```

Initial Image – Cancelled

```
Results
--------------
Directory: DIR00002
Error LBA, Status, Pass:

Total Errors: 0000000000
Operation Status: Resumed From DIR00001
Number of Files: 0000000004
First LBA Imaged: 0003763200
Last LBA Imaged: 0019541087
MD5 Hash: N/A

End Date: 09/18/08
End Time: 15:06
```

Resumed from Initial Image

Using the information in this section of the resulting log files, the user may determine what files are required to restore from a series of image filesets. As there are no filename conflicts within cancelled/resumed image filesets, the contents of the folders may be merged to facilitate restoring of the image.

Format Drive

Menu Tree
```
|=======================
|FORMAT DRIVE
|--------QUICK FORMAT
|--------COMPLETE FORMAT
|=======================
```
Default: N/A

The 'Format Drive' function will format a drive connected to Side B. Users may select Quick or Complete Format from the options provided. Selecting 'Complete Format' will cause PSIClone™ to first write a pattern of 00 to each sector of the drive before applying a FAT32 file system.

Compare

Menu Tree
```
|=======================
|COMPARE
|--------FROM A PATA
|--------|-----TO B PATA
|--------|-----TO B SATA
|--------FROM A SATA
|--------|-----TO B PATA
|--------|-----TO B SATA
|--------PATTERN
|--------|-----<CHOICES>
|--------|-----|-----TO B PATA
|--------|-----|-----TO B SATA
|--------INCREMENT
|--------|-----TO B PATA
|--------|-----TO B SATA
|--------INVERSE BITS
|--------|-----TO B PATA
|--------|-----TO B SATA
|=======================
```
Default: N/A

> **PSIClone™ Tips**:
>
> PSIClone™ performs compare operations on a 'byte-by-byte' basis.

The compare command is used to:

1. Compare a drive attached to Side A of the PSIClone™ to a drive attached to Side B of the PSIClone. This is used for validating the results of a clone.
2. Compare a drive to any 'bang' pattern (other than random). This is used to validate that the selected pattern was written.

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Bang

Menu Tree
```
|=======================
|BANG
|-------B SATA
|-----------PATTERN
|-------|-----<CHOICES>
|-----------INCREMENT
|-----------INVERSE BITS
|-----------RANDOM
|-------B PATA
|-----------PATTERN
|-------|-----<CHOICES>
|-----------INCREMENT
|-----------INVERSE BITS
|-----------RANDOM
|=======================
```
Default: N/A

This erases all user-addressable sectors, writing one of many different patterns to the drive:

- Pattern – The user can select any hexadecimal byte pattern to be used in the process.
- Increment – An incrementing word pattern is used for each word written to the device. The pattern repeats after 65536 words as it rolls over from FFFFh to 0000h.
- Inverse Bit – Writes an inverting bit pattern to consecutive locations on the drive.
- Random – A new 16 bit random number is generated for each word location.

Identify

Menu Tree
```
|=======================
|IDENTIFY
|-------A PATA
|-------A SATA
|-------B PATA
|-------B SATA
|=======================
```
Default: N/A

Selecting 'Identify' executes the ATA Identify Device command. If a drive is connected and responds to the command, the following data will be displayed on the LCD:

- Model Name
- Serial Number
- Firmware Revision
- ATA Specification Version Supported
- Maximum UDMA Mode
- Maximum PIO Mode
- Maximum LBA

Use the UP and DOWN navigation buttons to scroll through the returned results.

Reset

Menu Tree
```
|=======================
|RESET
|--------A PATA
|--------A SATA
|--------B PATA
|--------B SATA
|=======================
```
Default: N/A

Selecting 'Reset' performs a hardware reset on the selected drive. This function does not execute any ATA commands.

Drive Power

Menu Tree
```
|=======================
|DRIVE POWER
|--------SIDE A
|--------|-----TURN ON
|--------|-----TURN OFF
|--------SIDE B
|--------|-----TURN ON
|--------|-----TURN OFF
|=======================
```
Default: N/A

PSIClone™ controls the power applied to any attached drives. By using this function, the user may power up or power down drives connected to either 'Side' of the PSIClone™.

If the user initiates a PSIClone™ function which requires attached drive(s) to be powered, PSIClone™ will automatically initiate 'power on' sequences to each of the required drives.

> **NOTE:**
> PSIClone™ is capable of safely powering **no more than two (2) drives** simultaneously, one on each side of PSIClone™ (Side A and Side B). As an example you cannot place a drive on Side A PATA and Side A SATA and power them simultaneously.

MD5 Hash

Menu Tree
```
|========================
|MD5 HASH
|--------CALCULATE HASH
|--------|-----A PATA
|--------|-----A SATA
|--------|-----B PATA
|--------|-----B SATA
|--------VIEW LAST HASH
|========================
```
Default: N/A

PSIClone™ is able to calculate an MD5 hash for any attached drive. **Unlike other handheld devices, 'on the fly' generation of an MD5 hash for any attached drive does not affect PSIClone™ performance and will not impact the time to complete an operation.** The 'View Last Hash' submenu item may be used to display the last hash calculated by PSIClone™. Once calculated, the MD5 hash may be displayed by navigating to the 'View Last Hash' menu.

Error Handling

Menu Tree
```
|========================
|ERROR HANDLING
|--------STOP ON ERRORS
|--------RECOVER ERRORS*
|--------|-----JUMP SIZE ON ERR
|--------|-----|-----<SELECT SIZE>
|--------|-----PASS 2 T.O. CNT
|--------|-----|-----<SELECT TIMEOUT>
|--------|-----SOFTWARE RESET
|--------|-----|-----TIMEOUT ERROR
|--------|-----|-----ON DRIVE ERROR
|--------|-----HARDWARE RESET
|--------|-----|-----TIMEOUT ERROR
|--------|-----|-----ON DRIVE ERROR
|--------|-----POWER CYCLE
|--------|-----|-----TIMEOUT ERROR
|--------|-----|-----ON DRIVE ERROR
|--------|-----NUMBER OF PASSES
|--------|-----|-----1 PASS
|--------|-----|-----2 PASSES*
|========================
```
Default: Recover Errors

Stop On Errors
Selecting this option will cause PSIClone™ to terminate a command upon encountering an error. A 'FAILED' message, as well as the LBA attempted when the error occurred, is displayed on the PSIClone™ LCD screen.

Recover Errors [default]

Users may configure how PSIClone™ reacts to errors it may encounter when reading from or writing to a hard drive.

> **PSIClone™ Tips:**
>
> In order to take full advantage of the Error Handling features built into PSIClone™, CPR Tools recommends a thorough review of each of the submenu options within Error Handling. These submenu options work intimately with one another.
>
> Modifications within the submenus of the Error Handling structure may affect the results obtained.

Recover Errors Options

PSIClone™ may be configured to 'Recover Errors'. This setting instructs PSIClone™ to flag the sector in which the error was encountered and to continue with the clone process. Upon completion of the first pass, PSIClone™ will automatically attempt to clone the flagged sectors, one at a time.

In general, two types of errors may occur:

1. Timeout Error
    o   A Timeout Error is generated by PSIClone™ when a reply to an issued command is not returned within the established time threshold.
2. Drive Error
    o   Drive errors are those that PSIClone™ receives from an attached device in response to a command.

PSIClone™ handles each of these errors similarly; the difference is the order in which certain steps are taken.

PSIClone™ can be configured to perform any, all or none of the following steps when a <u>Timeout Error</u> is generated. The steps are executed in the order listed:

1. Power Cycle
2. Hardware Reset
3. Software Reset

PSIClone™ can be configured to perform any, all or none of the following steps when a <u>Drive Error</u> is generated. The steps are executed in the order listed:

1. Software Reset
2. Hardware Reset
3. Power Cycle

The 'Recover Errors' submenu contains options which allow the user to customize the behavior of the PSIClone™:

- Jump Size On Error
- Pass 2 T.O. Cnt
- Software Reset
- Hardware Reset
- Power Cycle
- Number of Passes

Each of the 'Recover Errors' sub-options are discussed below.

Jump Size On Error

Default: 256 LBAs

The value set for Jump Size On Error is used when PSIClone™ encounters a Drive or Timeout Error on the first pass.

If PSIClone™ encounters an error from a device on first pass, it flags the sector for later review and proceeds after jumping ahead by this value. The user may change this decimal value by positioning the cursor under each of the ten (10) digits in turn; once positioned, the UP and DOWN buttons will increment or decrement the value for that digit. Valid values range from 1 to 4,294,967,295.

Pass 2 T.O. Cnt (Pass 2 timeout count)

Default: 5,000ms (5 seconds)

The value set here will define how long PSIClone™ is configured to wait for a device to recover from an error and return to 'ready' state. This value affects the second pass only, as the 'Command Timeout' setting defines the wait time for pass one.

Software Reset

Default: None

This option, when selected, performs a 'software reset' on the drive from which an error has been reported.

Software Reset may be selected to occur in the case of timeout errors, drive errors, both timeout and drive errors or neither timeout nor drive errors.

Hardware Reset

Default: Timeout Error/Drive Error (both)

This option, when selected, performs a 'hardware reset' on the drive from which an error has been reported.

Hardware Reset may be selected to occur in the case of timeout errors, drive errors, both timeout and drive errors or neither timeout nor drive errors.

Power Cycle

Default: None

This option, when selected, performs a 'power cycle' on the drive from which an error has been reported.

Power Cycle may be selected to occur in the case of:

- Timeout Errors
- Drive Errors

Options

Menu Tree

```
|========================
|OPTIONS
|--------TRANSFER RATE
|--------|-----AUTO*
|--------|-----UDMA MODE 3
|--------|-----UDMA MODE 2
|--------|-----UDMA MODE 1
|--------|-----UDMA MODE 0
|--------|-----PIO
|--------BACKLIGHT
|--------|-----ON
|--------|-----OFF
|--------POWER DOWN
|--------|-----AFTER COMPLETE
|--------|-----LEAVE DRIVES ON*
|--------POWER ON TIMEOUT
|--------|-----<SELECT TIME IN MS>
|--------COMMAND TIMEOUT
|--------|-----<SELECT TIME IN MS>
|--------FILE SIZE
|--------|-----700 MB
|--------|-----1 GB
|--------|-----2 GB*
|--------FILE NAME
|--------|-----NAME:IMAGEBIN*
|--------|-----|-----<CHOICE>
|--------CMD. DIRECTION
|--------|-----FORWARD*
|--------|-----BACKWARD
|--------BUZZER
|--------|-----ENABLED
|--------|-----DISABLED*
|--------SESSION NUMBER
|--------|-----DISPLAY SESSION
|--------|-----RESET SESSION
|--------COMPRESSION
|--------|-----ENABLED
|--------|-----DISABLED*
|--------RESTORE DEFAULTS
|========================
```

Default: See individual listings below

The user may set options that will aid in the use of PSIClone™. User selected parameters within the Options menu are stored in non-volatile memory and may be reset to factory defaults using the 'Restore Defaults' submenu item, if desired.

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PSIClone™ Options Submenus

Transfer Rate
Default: Auto

Transfer rate set to the default, 'Auto', allows PSIClone™ to use the most efficient transfer rate for the attached drives.

Select a maximum transfer rate from the available choices: 'UDMA Mode 3', 'UDMA Mode 2', 'UDMA Mode 1', 'UDMA Mode 0', 'PIO'. By setting this value to anything other than 'auto', the user is setting an upper limit for transfers. This option is made available to users in the event the user must force a drive to use a lower transfer rate.

Backlight
Default: On

This setting allows the user to toggle the backlight of the LCD display.

Power Down
Default: 'Leave drives on'

This setting allows the user to toggle the behavior of PSIClone™ after a clone or Bang has completed. Select from 'Leave drives on' (drives continue to be powered on after the function has completed) or 'After Complete' (drives are powered off after the function has completed).

Power On Timeout
Default: 20,000ms (20 seconds)

This value defines the maximum time PSIClone™ will wait for a drive to come ready on power-up. While this value is typically sufficient for healthy drives, users may wish to increase this value for drives with errors.

This does not mean that every power-up sequence will take the full Power on Timeout period, as PSIClone™ will continue as soon as a drive comes ready.

Command Timeout
Default: 4,000ms (4 seconds)

This value represents the amount of time PSIClone™ will wait for a reply after issuing a command. Replies from devices which exceed this value will be considered to have 'timed-out'.

File Size
Default: 2GB

The value set here is used in conjunction with the imaging function included with PSIClone™. The available values are 700 MB, 1 GB and 2GB; the size chosen will define the size of drive image file segments output by PSIClone™.

> **PSIClone Tips:** PSIClone™ supports 700MB file segments to enable transfer of image segment files to CD media

File Name
Default: IMAGEBIN

User's may customize the base filename for image file segments. Use the UP and DOWN navigation keys at each letter position to cycle through letters A through Z and 0 through 9 to create an 8 character custom filename, if desired. When the custom name has been entered, press the RIGHT navigation button. PSIClone™ responds with CONFIGURED to indicate that the new name has been stored.

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Cmd Direction

Default: Forward

> The Cmd Direction (Command direction) setting provides PSIClone™ with instructions to perform commands either, forward or backward.
> *Note: Backward direction is available for BANG or CLONE operations only.*

Buzzer

Default: Disabled

> Enabling this option will cause PSIClone™ to sound an audible alert upon completion of an action.

Session Number

Default: Not Applicable

> Selecting 'Display Session' causes PSIClone™ to display the current session ID.
>
> Selecting 'Reset Session' from within this submenu will cause PSIClone™ to clear all logs from the integrated flash memory and reset the numbering scheme for the creation of image filesets and the directories in which they reside.

Compression

Default: Disabled

> Set this to 'Enabled' to instruct PSIClone™ to employ a compression algorithm when creating an image fileset.

Restore Defaults

Default: Not applicable

> Users may globally reset all PSIClone™ options to their factory defaults by navigating to this item and pressing the RIGHT navigation button. PSIClone™ responds with 'Configured' when settings have been reset to factory defaults.

Software:

CPR Tools Utilities Suite

The CPR Tools Utilities Suite is a collection of software designed to work with Hammer™, PSIClone™, SCSI Hammer™ and other CPR Tools devices. The CPR Tools Utilities Suite includes:

CPR Toolbox™
- Host utility

CPR Tools Flash Utility + USB Driver
- Software to update firmware
- CPR Tools USB Driver

Firmware
- Latest firmware

Documentation
- Release Notes
- User Guides
- Specification Sheets

> **NOTE**:
> When available, updates to software, firmware and documentation may be downloaded from http://www.cprtools.net/downloads.

The next section of this guide will review installation of the CPR Tools Utilities Suite and use of the host companion software, CPR Toolbox™.

> **IMPORTANT**:
> When upgrading CPR Tools Utilities Suite™ from a previous version, users may be required to upgrade the firmware on PSIClone™ to ensure functionality with the new version.
>
> The CPR Flash™ utility and new firmware files are included with each CPR Tools Utilities Suite™ release.

Working with a Windows XP®, Windows Vista® or Windows 7® Host

The CPR Utilities Suite is a collection of applications designed to run on Microsoft® Windows XP® SP2, Windows Vista® and Windows 7® Operating Systems. PSIClone™ may be connected to a Windows host computer by USB, using the cable provided. CPR Toolbox™ not only provides a familiar user interface with which PSIClone™ may be used, it offers extended functionality.

> **NOTE:**
> CPR Tools host utilities interact with PSIClone™ via **USB 2.0** connections only.

Installing CPR Utilities Suite

The CPR Tools Utilities Suite is included on the CD which was shipped with PSIClone™. Install the software by inserting the CD into the host system. The CPR Tools Utilities Suite installer is packaged as a self-extracting archive.

Double click the file 'CPR Tools Utilities Suite.EXE' to begin the installation process. The install process is guided by the CPR Tools Utilities Suite Setup Wizard.

> **NOTE:**
> The latest updates for the CPR Tools Utilities Suite including CPR Toolbox™ are always available at the CPR Tools download page: http://downloads.cprtools.net/.

Figure 7 - CPR Tools Utilities Suite Setup Wizard

Click 'Next' to continue.

The 'License Agreement' screen which follows, is shown in Figure 8.
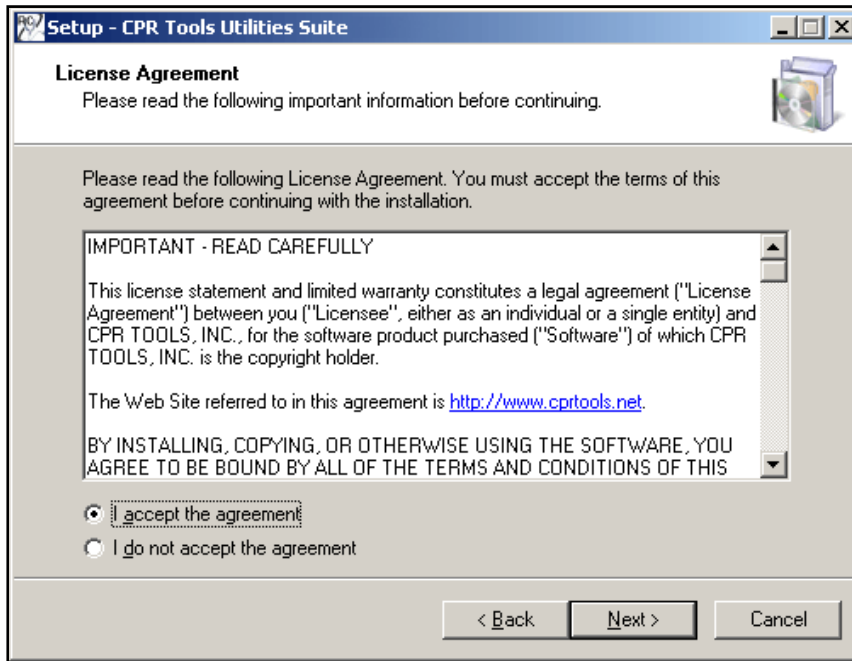
Figure 8 - License Agreement

The destination of the installation is user configurable. Users may select the default location or specify a path on the host.
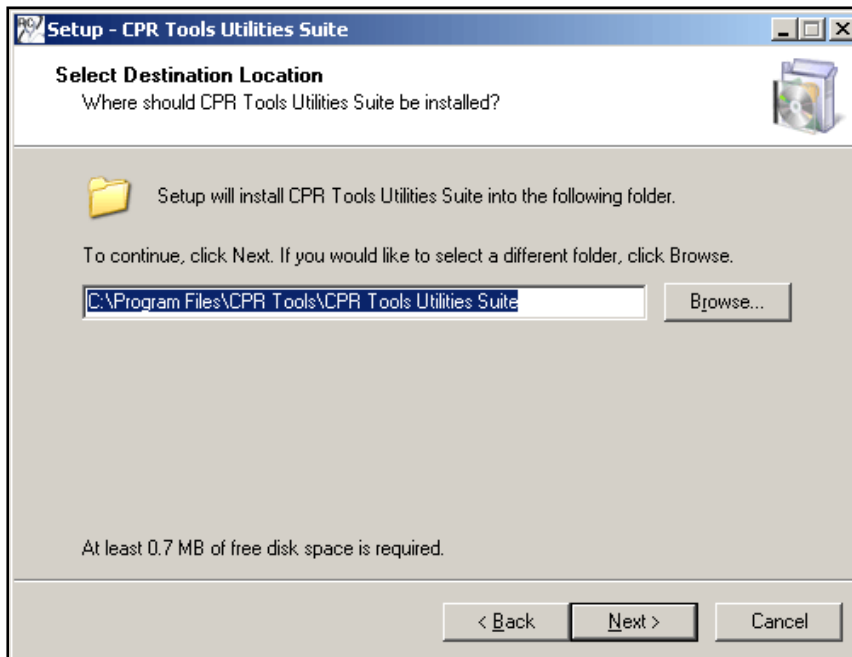
Figure 9 - Select Destination Location

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By default, the program will install to the system drive (typically 'C:') under 'Program Files\CPR Tools\CPR Tools Utilities Suite\'. To install to the default location, click 'Next'.

Users may select a complete installation or customize the installation of CPR Tools Utilities Suite. Figure 10 depicts the 'Select Components' dialog box which allows for customizing the installation of components.

In this view, 'Full Installation' is selected and shown in the drop-down list at the top of the dialog box. Users may deselect any undesired components by clicking the checkbox beside the listed component. As CPR Utilities Suite contains documentation, firmware and support files for PSIClone™, Hammer™ and SCSI Hammer™, 'Full Installation' includes firmware and documentation for both PSIClone™, Hammer™ and SCSI Hammer™.

Users may choose to install only files relating to PSIClone™ by selecting 'PSIClone Installation' from the drop-down list provided.
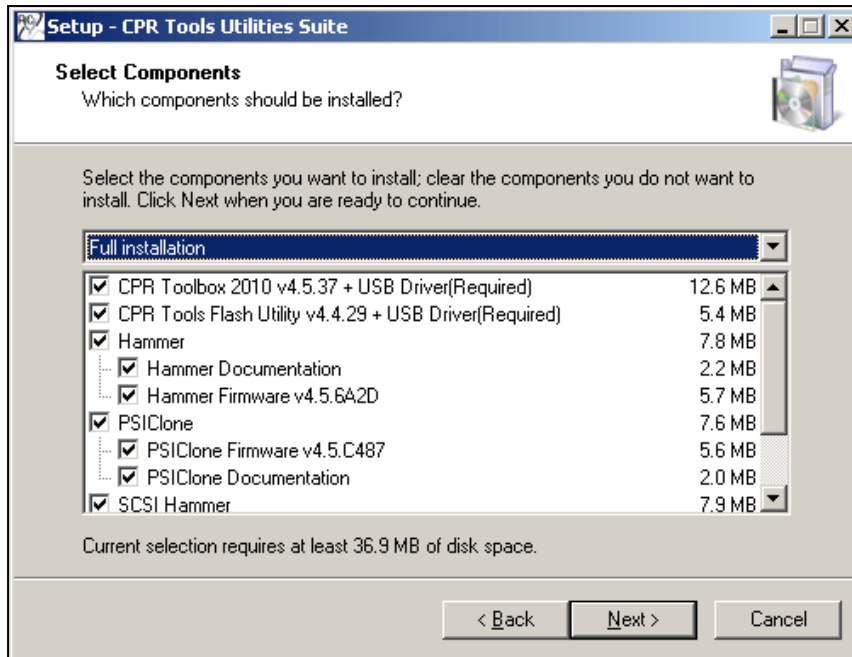
Figure 10 - Full Installation - All items are installed

After selecting desired components, click 'Next'.

The 'Select Start Menu Folder' dialog is presented. The default entry will cause a folder named 'CPR Tools' to appear under 'Start/Programs'. Within this folder, users will have access to all components selected. If no start menu folder is desired, check the box marked 'Don't Create a Startup Folder'.
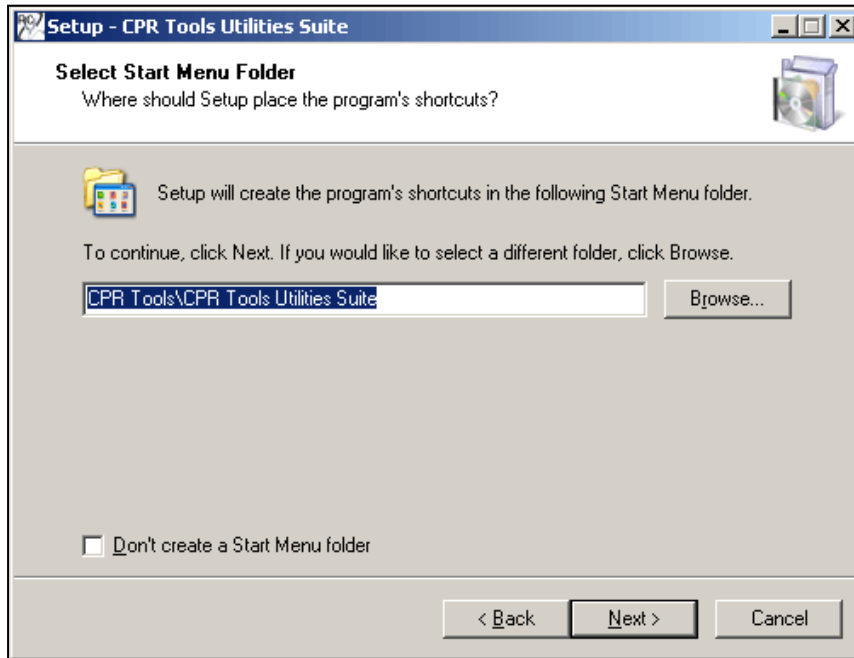
Figure 11 - Selecting a Start Menu Folder

Click 'Next'.

The 'Select Additional Tasks' dialog is presented which offers users the ability to create Desktop and Quick Launch shortcuts for selected components. Items marked with a checkmark will generate Desktop and Quick Launch icons; deselect any item for which neither Desktop nor Quick Launch icons are desired.
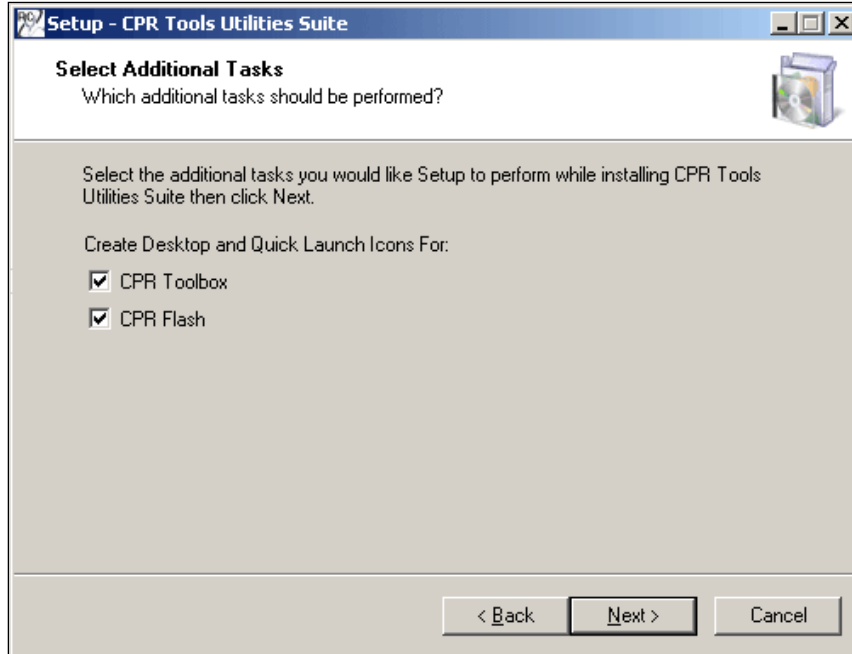
Figure 12 - Select Additional Tasks

Click 'Next'.

The 'Ready to Install' dialog box is presented to confirm all selected components. To change which components are to be installed, click 'Back'.
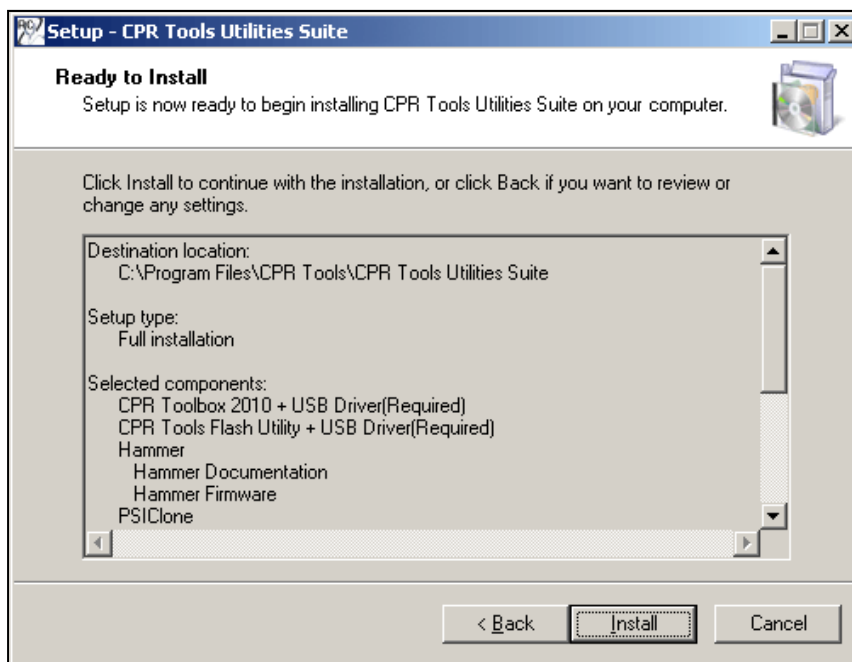
Figure 13 - Ready To Install

To proceed with installing the selected components, click 'Install'.

Installation progress is provided as shown in Figure 14.
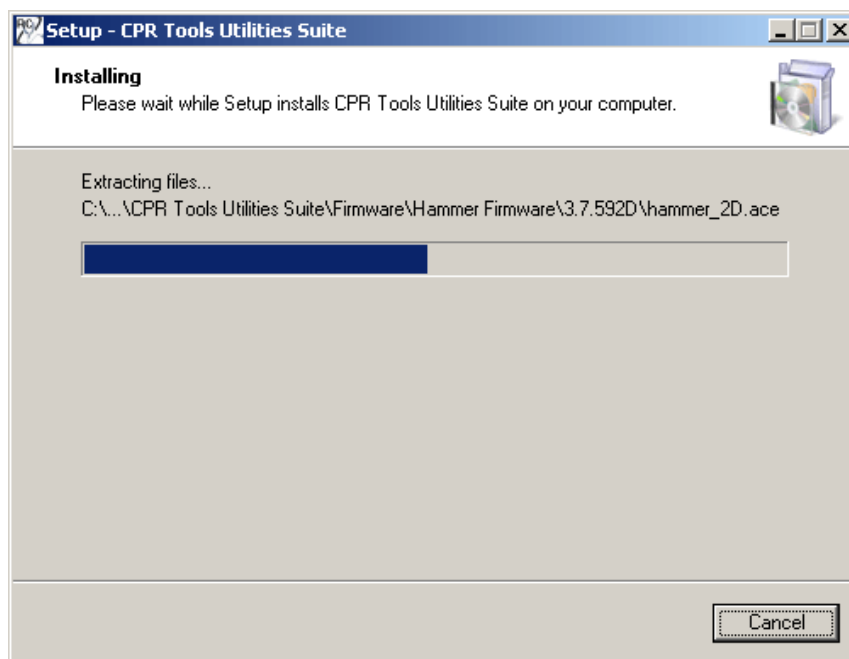
Figure 14 - Installation progress

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The default settings for the installer will cause the 'Windows Logo Testing' dialog box to appear.

Figure 15 - Windows Logo Testing dialog box.
Click 'Continue Anyway' if this is shown.

Users must click 'Continue Anyway' for the required USB driver to be installed.

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When the installer has completed, a confirmation message is displayed.
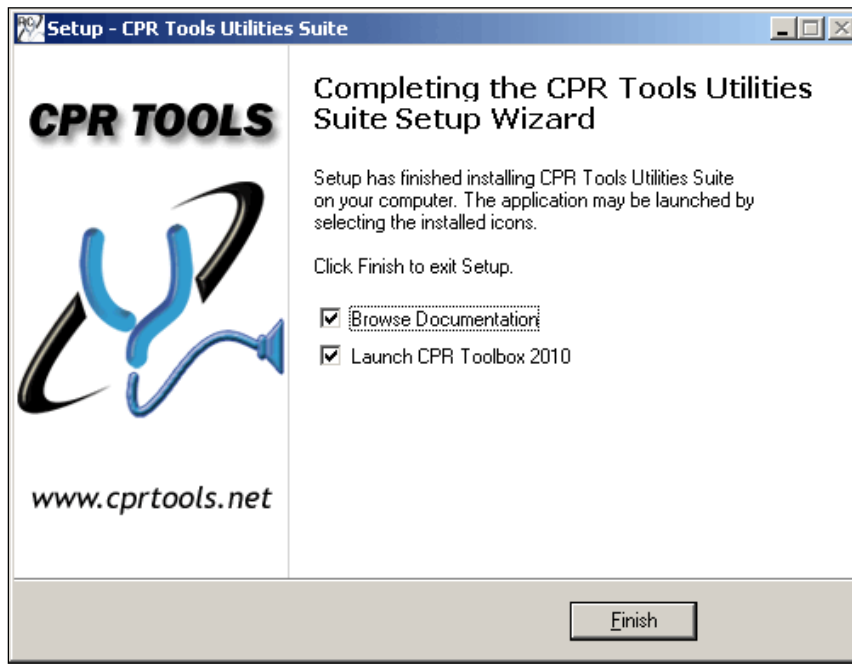
Figure 16 - Installation Complete

To exit the installer, click 'Finish'. If the 'Launch CPR Toolbox 2010' box is checked, CPR Toolbox™ will launch; if the 'Browse Documentation' box is checked, a Windows Explorer window will open to the folder into which documentation was installed. The documentation subfolder contains useful information, including Release Notes, Spec Sheets and User Guides.

The Release Notes folder provides helpful information about PSIClone™ as well as the applications installed by CPR Tools Utilities Suite installer, including CPR Flash™ and CPR Toolbox™.

The Spec Sheets folder includes product specifications for PSIClone™, Hammer™ and SCSI Hammer™.

The User Guides folder contains PDF versions of user guides for PSIClone™, Hammer™ and SCSI Hammer™.

Connecting PSIClone™ to a Host Computer (USB 2.0 required)

After installing CPR Tools Utilities Suite, connect PSIClone™ to the host system via the USB cable provided.

When the 'Found New Hardware' wizard appears, select the radio button labeled 'No, not this time'.

Click 'Next'

Select the radio button labeled 'Install the software automatically (Recommended).
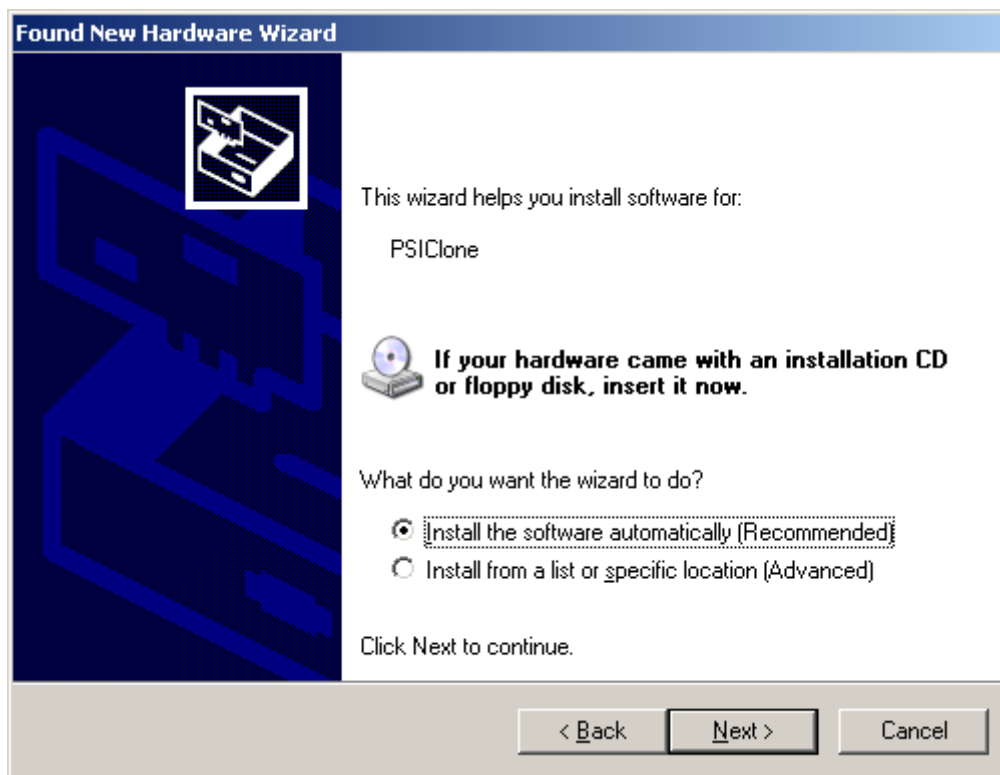
Click 'Next'.

An alert dialog, shown here, may appear. To continue with driver installation, click 'Continue Anyway'.

When the PSIClone™ driver has been installed, Windows will present the 'Completing the Found New Hardware' dialog box. Exit the wizard by clicking 'Finish'.
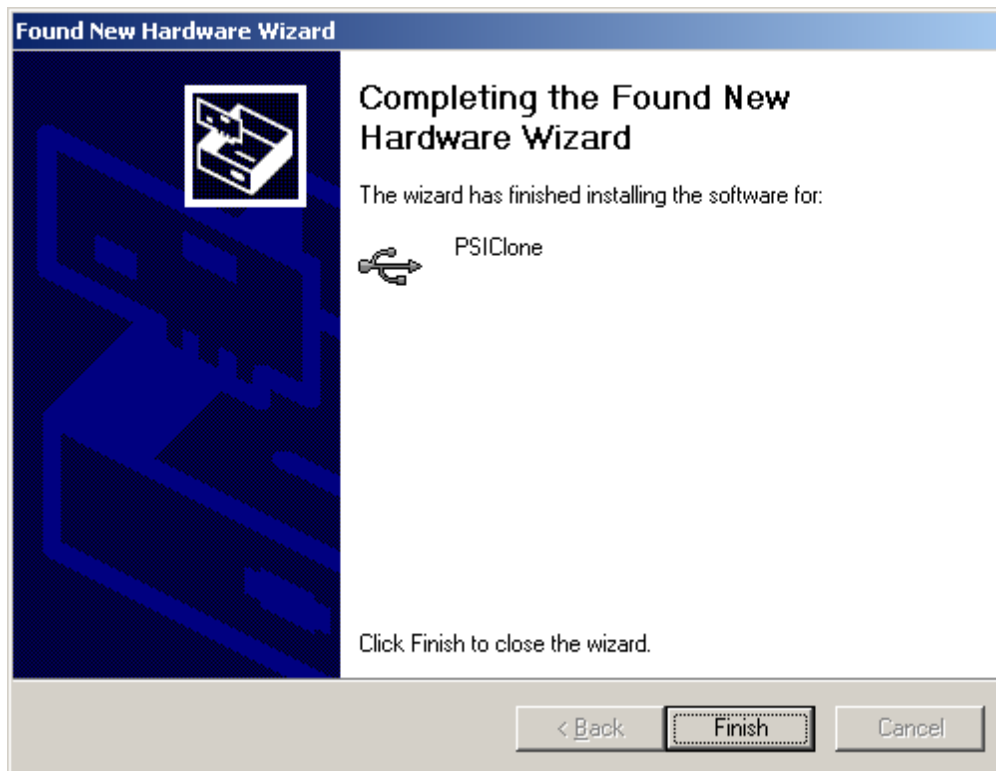
The host system has been successfully prepared for use with PSIClone™ and CPR Toolbox™.

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Launching CPR Toolbox™

If CPR Toolbox™ was installed using default installer settings, the program may be launched from the Windows Start menu, under Programs/CPR Tools/CPR Tools Utilities Suite/CPR Toolbox 2010. The application will discover any CPR Tools' devices (PSIClone™, Hammer™, SCSI Hammer™ etc…) which are powered and connected to the host system. The image below shows the initial screen when CPR Toolbox™ is launched with a PSIClone™ powered and attached to the host PC.
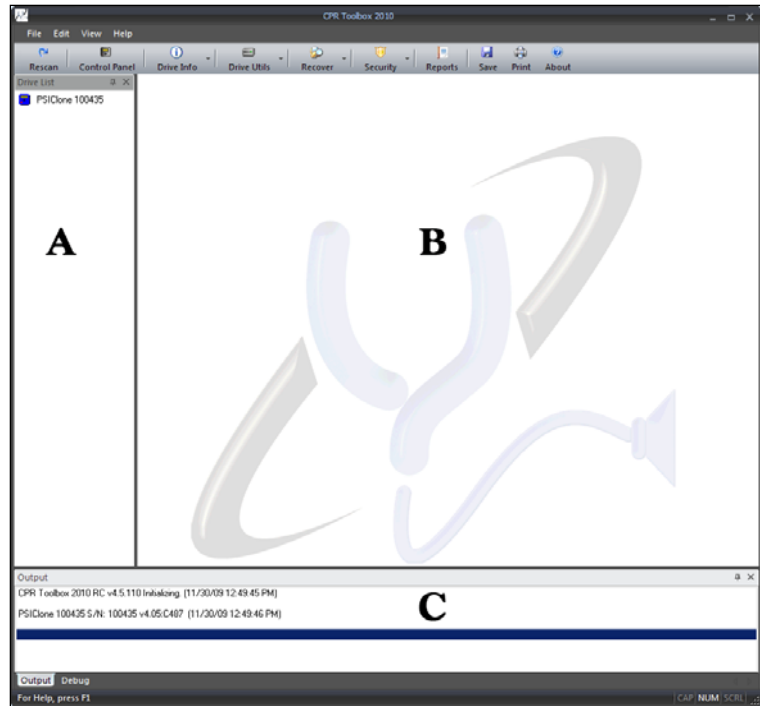
Figure 17 - CPR Toolbox™, Initial Screen

NOTE:

Upon clicking the icon for the attached PSIClone™, CPR Toolbox™ will open the 'Control Panel' for the selected device. This setting may be overridden in the 'Device Options' tab within 'Control Panel'.

This behavior may be changed by deselecting the checkbox under 'Edit/Preferences

---

CPR Toolbox™ displays three main panes of information, a toolbar and typical Windows pull-down menus.

1. The vertical pane at the left of the screen (Labeled 'A') lists CPR Tools' devices and drives attached to CPR Tools' devices.
2. The pane at the right of the screen (Labeled 'B') is the main display window. This will be populated, in tabbed format, as toolbar items are clicked.
3. The lower, horizontal pane (Labeled 'C') displays output; i.e. logs, success/fail information, etc…

The pull-down menu structure within CPR Toolbox™ is:

File	**Edit**	**View**	**Help**
• Save Log	• Preferences	• Toolbars and Docking Windows	• PSIClone Help
• Print Log	• Sync Device Time	o Standard	• Hammer Help
• Find in Log		o Output	• SCSI Hammer Help
• Close		o Drive List	• Debug Registers
• Exit		• Status Bar	• Generate Tech Report
			• About CPR Toolbox

The 'File' menu:
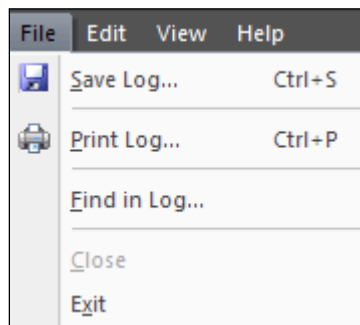
Clicking the 'File' menu reveals options displayed above. 'Save Log', 'Print Log', 'Close' and 'Exit' are presented as options.

'Save Log' will save the output log to a file. The user will be prompted for a location in which to save the file. Alternately, the key combination CNTRL-S may be used to save the log to a file.

'Print Log' will print the output log. Alternately, the key combination CNTRL-P may be used to print the log.

'Find in Log…' will present a search facility, enabling the user to search the log for specific search strings.

'Close' becomes available when CPR Toolbox is displaying one or more tabs within its main window. Clicking 'Close' will close the current tab.

Clicking 'Exit' will close CPR Toolbox.

The 'Edit' Menu
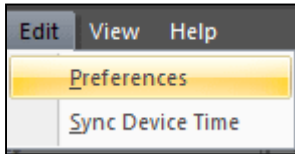
Clicking 'Edit' reveals two options. Clicking the first, 'Preferences', presents the 'Preferences' dialog which is depicted in Figure 18.
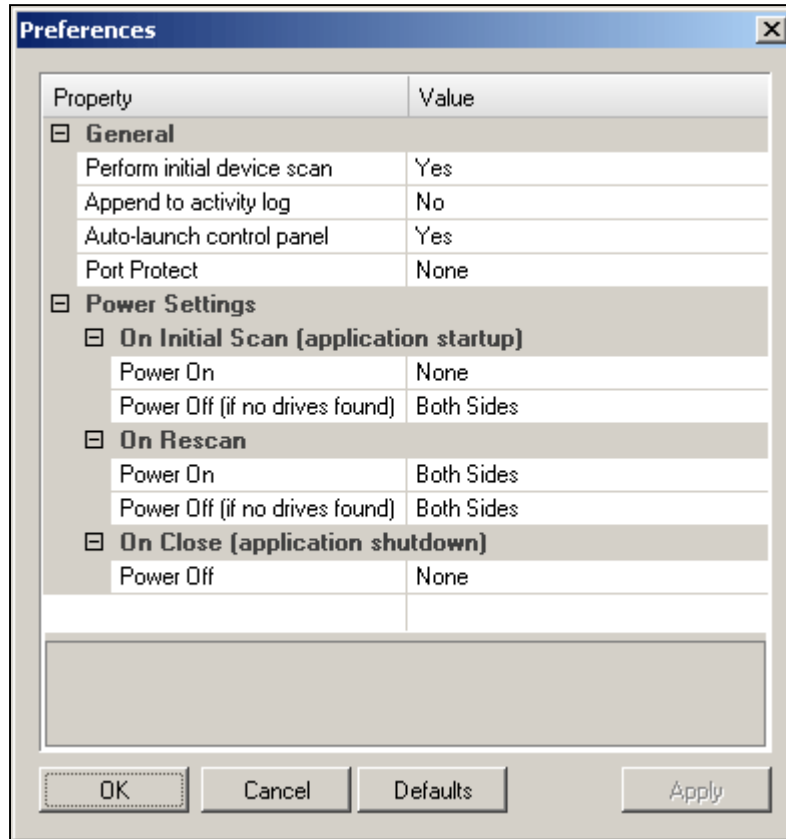
Figure 18 - CPR Toolbox™ Preferences

The Preferences box is divided into two (2) sections labeled General and Power Settings.

General

This section contains options which define how CPR Toolbox™ will behave upon being launched.

By clicking on each line in turn, a dropdown box will appear for the value at right.

Perform initial device scan
By default, CPR Toolbox™ will perform a scan for devices. This may be changed selecting 'No' from the available dropdown box.

Append to activity log
By default, activity logs will be overwritten. To change this behavior, set this value to 'Yes'

Auto-launch control panel
By default, CPR Toolbox will launch the 'Control Panel' whenever a device is selected. Set this to 'No' to alter this behavior.

Port Protect
By default, no ports are protected from initial scans; CPR Toolbox™ will attempt to identify all attached drives when a CPR Tools device is powered. This setting allows for customization of this behavior. Available options are 'Side A', 'Side B', 'Both' or 'None'.

Power Settings

This section contains options which define how CPR Toolbox™ will handle power to 'Sides' of the attached CPR Tools device.

On Initial Scan – Power On
This setting controls which 'Sides' of the device will be powered on initial scan. Available options are 'Side A Only', 'Side B Only', 'Both Sides' or the default, 'None'.

On Initial Scan - Power Off (if no drives found)
This setting controls CPR Tools device behavior if a 'Side' is powered during an initial scan but no drive(s) are found. Available options are 'Side A Only', 'Side B Only', 'None' or the default, 'Both Sides'.

On Rescan – Power On
This setting controls CPR Tools device behavior when performing a Rescan. Available options are 'Side A Only', 'Side B Only', 'None' or the default, 'Both Sides'.

On Rescan – Power Off (if no drives found)
This setting controls CPR Tools device behavior if a 'Side' is powered during a 'Rescan' but no drive(s) are found. Available options are 'Side A Only', 'Side B Only', 'None' or the default, 'Both Sides'.
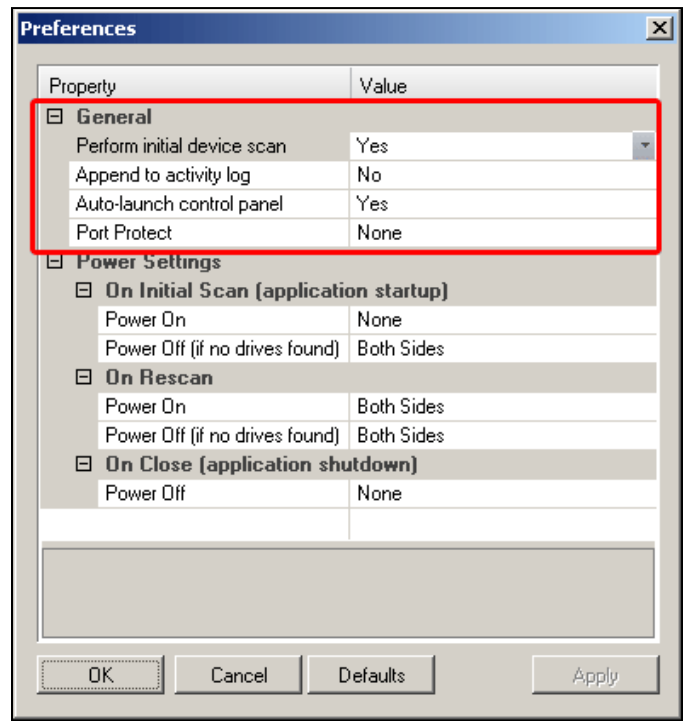
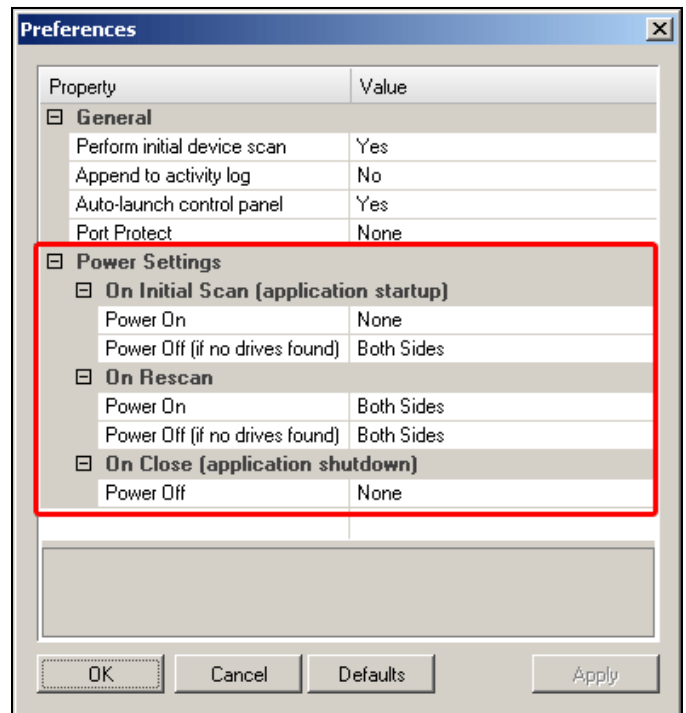**Figure 19 - General Preferences**

Figure 20 - Power Setting Preferences

<u>On Close (application shutdown – Power Off</u>
This setting controls how CPR Toolbox™ interacts with attached CPR Tools devices when the software is being closed. Available options are 'Side A Only', 'Side B Only', 'Both Sides' or the default, 'None'.

For each of the selections in the Preferences dialog, descriptive text is displayed as a reminder of the functionality presented Figure 21.

Several buttons appear at the bottom of the Preferences dialog. Once selections have been made, the user may click 'OK' to apply settings and close the dialog box. Clicking 'Cancel' will close the dialog without applying changes. Clicking 'Defaults' will reload CPR Toolbox defaults. Clicking 'Apply' will apply the user's settings and will keep the Preferences dialog open.
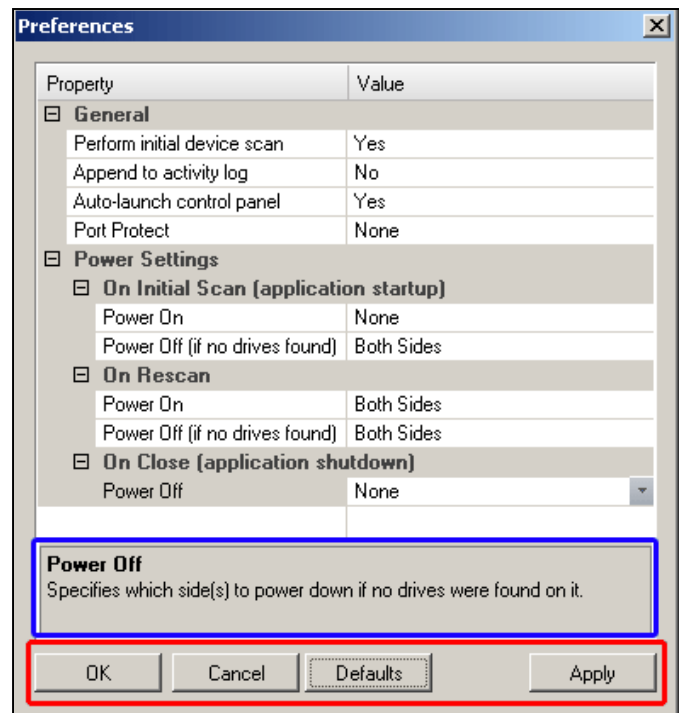
Figure 21 - Text here describes the setting being changed above

<u>Sync Device Time</u>
The second option beneath the 'Edit' menu is 'Sync Device Time'. Use this option to update the selected CPR Tools device to your host system's date and time. When applied, CPR Toolbox™ presents a message box, depicted in Figure 22.
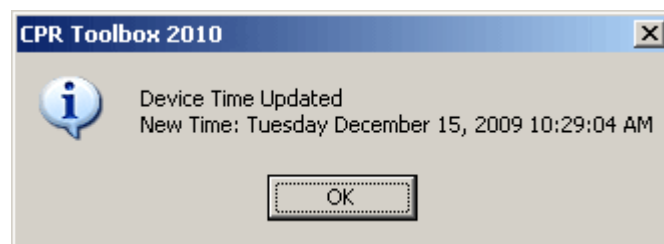
Figure 22 - Successful synchronization of device time

The 'View' Menu
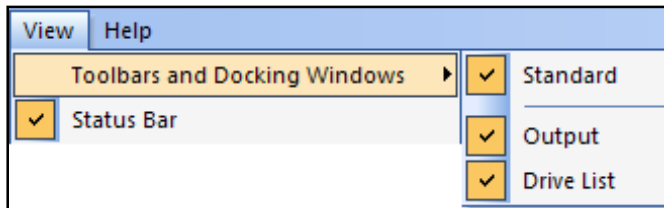
The 'View' menu allows for customization of the CPR Toolbox™ user interface. The top item, 'Toolbars and Docking Windows' provides three (3) sub-choices, all of which are selected by default. The first, 'Standard' allows the user to toggle display of the standard toolbar.

The second item, will 'Output'. Deselect this item to hide the lower, horizontal pane. This pane is labeled 'C' in Figure 17 which appears on 40 of this guide.

The 'Status Bar' is displayed by default. Deselect 'Status Bar' to hide this item.

The 'Help' Menu

Online help is available from within this menu by clicking 'CPR Toolbox Help'. The remaining options and their functions are:
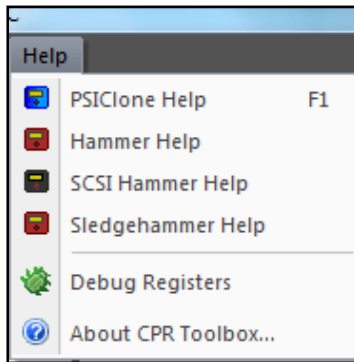
PSIClone™ / Hammer™ / SCSI Hammer™ /Sledge Hammer™ Help
CPR Toolbox™ provides help files for PSIClone™, Hammer™, SCSI Hammer™ and Sledge Hammer™ devices.

Debug Registers
This option will open a 'tab' which displays debug registers for the selected device. Use this when instructed to by CPR Tools technical support personnel.

About CPR Toolbox
Displays version information for CPR Toolbox™ and its components.

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The CPR Toolbox™ Toolbar

The CPR Toolbox™ software is easily controlled through the convenient button bar at the top of the main Toolbox window and is depicted in Figure 23.

Figure 23 – The CPR Toolbox™ button bar

The button bar displays ten (10) buttons, some of which have submenu selections available. The button bar menu structure is displayed here:

- Rescan
- Control Panel
- Drive Info
    - Identify Drive
    - View S.M.A.R.T.
- Drive Utilities
    - Sector Viewer
    - eDrive™
    - gClone™
    - gRase™
- Recover
    - Image Restore
    - Advanced Recovery [3]
    - iFirmware™[3]
    - Mount/Unmount Drive
- Security
    - Drive Key[4]
- Reporting
  (sub tabs)
    - Jobs[5]
    - Certificates[6]
    - Print Labels[6]
    - Device Log[5]
    - Alert Settings
- Save
- Print
- About

---

[3] Available as an add-on module

[4] Available only to Government and Law Enforcement Officials

[5] Used with Hammer™ and SCSI Hammer™

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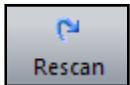
Rescan

Clicking this toolbar button will cause the CPR Toolbox™ to rescan for CPR Tools devices (e.g. PSIClone™, Hammer™, SCSI Hammer™, etc…). By default, rescanning for devices will power each side of PSIClone™. This setting can be overridden, as shown in Figure 20 on page 43 of this guide.
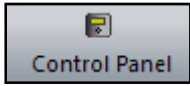
Control Panel

Clicking this toolbar button will launch the Control Panel module. The CPR Toolbox™ Control Panel module is an interface to many data security and data recovery functions. The main window contains several sections, all worthy of discussion.

Control Panel options are presented in tabbed format. These include:

- Image
- Clone
- Fast Clone
- Bang
- MD5 Hash
- Format
- Compare
- HPA
- DCO
- Device Options

Each of the Control Panel tabs provide specific capabilities and will be discussed in detail.

CPR Toolbox Control Panel

Figure 21 depicts the initial view after clicking the 'Control Panel' icon. The 'Image' tab is displayed.
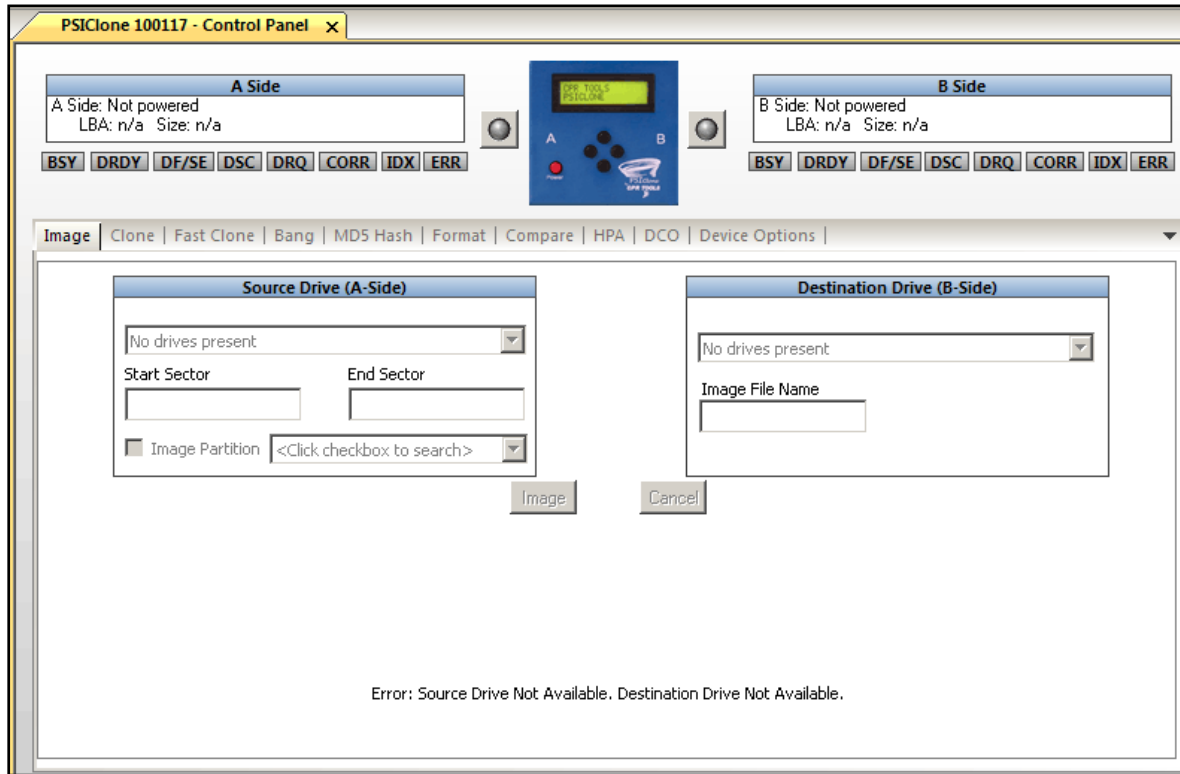
Figure 21 – Control Panel Initial Screen – CPR Toolbox

Figure 22 depicts the top section of the Control Panel window.
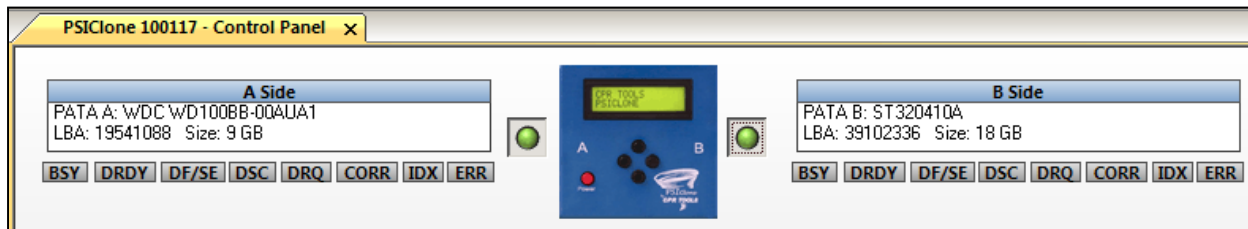
Figure 22 - Control Panel, Top Section – CPR Toolbox

The top section of the control panel provides a visual representation of what drives are connected to PSIClone™ and provides a quick method for powering down a drive attached to PSIClone™. The device power indicators, seen in 'green' may be used to toggle power to each side of the PSIClone™ device. Simply click the icon to toggle power off (grey) or on (green).

The left section describes drives connected to Side A, if any. The right section describes drives connected to Side B, if any. The drive interface, manufacturer, model, LBA count and capacity are displayed.

CPR Toolbox™ provides a color indicator for actions performed or completed. The background colors for any drives connected to PSIClone™ will indicate the following:

Color	Definition
Green	Drive has completed an action without errors
Red	Drive has completed an action with errors
White	Drive is either idle or an action on this drive was cancelled by the user
Yellow	Drive is currently being acted upon; no errors have been encountered
Red on Yellow	Drive is currently being acted upon; errors have been encountered

Figure 23 - CPR Toolbox Color Codes

Figure 24 depicts a clone action. Note PATA A (source) and PATA B (destination) are colored in yellow, indicating that these drives are participating in the current action.
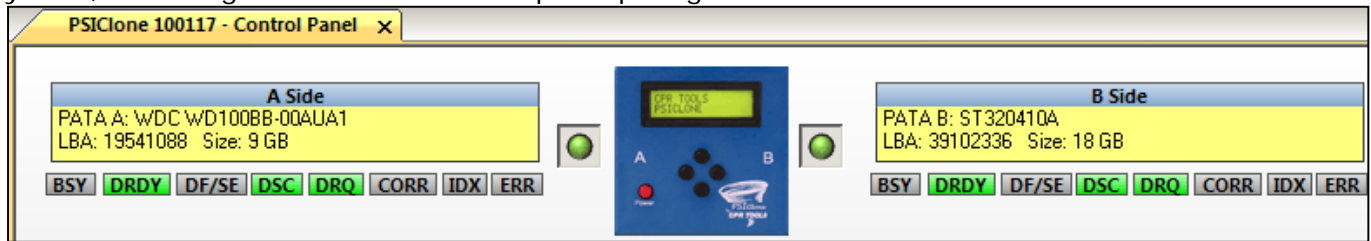
Figure 24 - CPR Toolbox™ color codes indicate current status

The indicator boxes which appear beneath the Side A and Side B sections represent ATA status register activity when executing a command. These indicators will light green or red, to indicate activity within the ATA status register. The legend for these indicators is presented here:

- BSY - device busy
- DRDY - device ready
- DF/SE - device fault/stream error
- DSC - drive seek complete
- DRQ - data request
- CORR – error corrected
- IDX - index
- ERR - last command caused an error

> **NOTE:**
> All write functions are disabled to Side A of PSIClone™ device.
> This 'write blocking' feature is included to help limit the potential for inadvertently overwriting source data.

If an error is encountered, the default value of NA which appears under the ERR indicator will change to reflect, in hexadecimal format, the value of the ATA error register.

Each bit in the ATA error register byte consists of a different error status. Multiple errors can be combined. Following is a description of each error status and its bit position in the ATA error register byte:

- Bit 1 (lowest bit): Media Error/Command Timeout
- Bit 2: No Media In Removable Device
- Bit 3: Command Aborted
- Bit 4: Media Change Request
- Bit 5: LBA Address Not Found
- Bit 6: Media Change Detected
- Bit 7: ECC Error/Write Protected
- Bit 8: CRC Error

Below this section of the Control Panel screen the user will find ten (10) tabs. Each of these allows for specific drive tasks to be performed.

The ten (10) tabs displayed will be discussed in detail. They are:

- Image
- Clone
- Fast Clone
- Bang
- MD5 Hash
- Format
- Compare
- HPA
- DCO
- Device Options

Image

The Image tab provides the ability to create a complete disk image from a drive connected to Side A of the PSIClone™ to a drive connected to Side B of the PSIClone™ device.

A disk image is a computer file or a group of computer files (known as an image fileset) containing the complete contents and structure of a data storage medium or device, such as a hard drive, CD or DVD. The term has been generalized to cover any such file, whether originated from an actual physical storage device or not. As such, a disk image contains all the information necessary to replicate the structure and layout, as well as the actual contents, of a storage device, and this is the distinguishing feature between an ordinary backup and a disk image. A disk image file or fileset is usually created based upon the sectors on the medium, ignoring its filing system.

PSIClone™ and the CPR Toolbox™ create image filesets. The size of individual files within an image fileset is defined under the Settings tab of the CPR Toolbox™ and may be 700 MB, 1 GB or 2 GB.

> **Note:**
> The 700 MB option is provided to facilitate copying of image files to CD media.

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The default file size for image files within a fileset is 2 GB. This value may be changed on the Device Options tab.
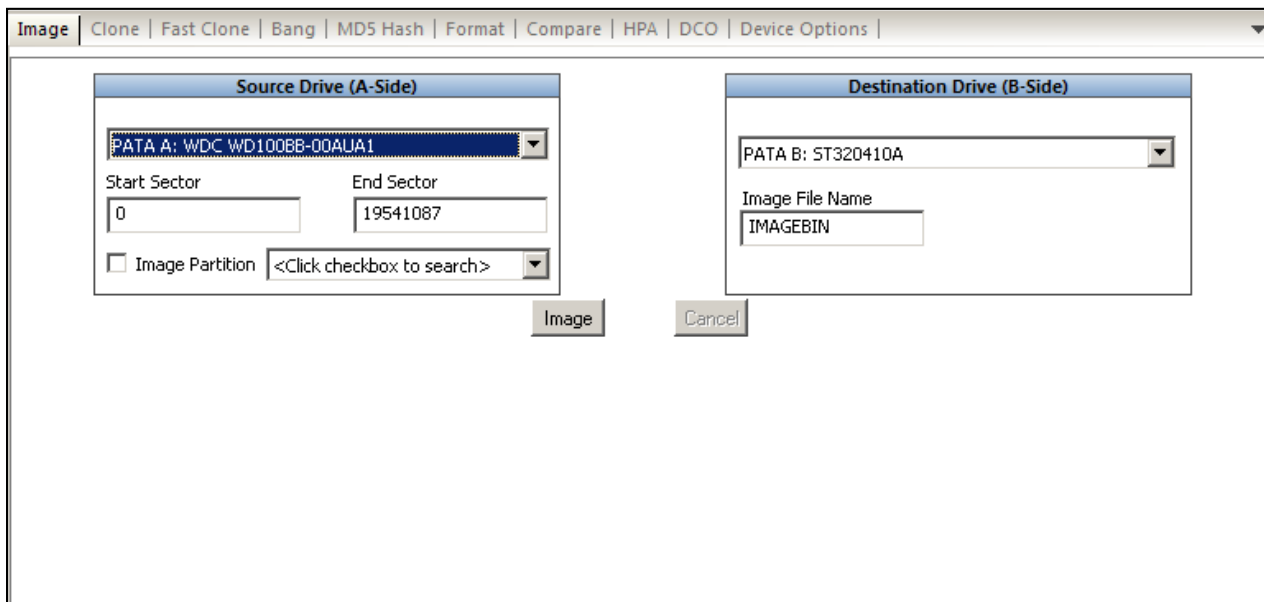
Figure 25 - The 'Image' Tab

Creating an Image Fileset

To create an image fileset, ensure that the destination drive (Side B) is of sufficient capacity to contain the image fileset which will be created from the data on Side A. CPR Toolbox™ requires that the destination drive be formatted using CPR Toolbox. If this is not done prior to initiating an image, CPR Toolbox™ will prompt the user to format the destination drive before continuing.

Image Partition

CPR Toolbox™ allows for the creation of image filesets from a partition on the source drive. To enable this feature, check the box marked 'Image Partition' and select the partition from which the image fileset should be created from the dropdown list provided.

Optional Compression

PSIClone™ and CPR Toolbox™ provide the option to compress image filesets as they are created. Use the PSIClone™ 'Options/Compression' submenu or the 'Device Options' tab in CPR Toolbox™ to enable compression. This option is disabled by default.

Image File Name

User's may elect to change the output file name by modifying the text shown. Filenames must not exceed eight (8) characters; an incremental, three digit extension will be added to the image files created, i.e. IMAGEBIN.000, IMAGEBIN.001, etc…

> **New in this release of CPR Toolbox:** User's may now set custom filenames for image filesets.

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Once the source and destination drives have been attached to the PSIClone™ device, CPR Toolbox™ should display the attached drive information as shown in Figure 24. The size of each individual file within the image fileset is defined in the Options tab of the Control Panel module of CPR Toolbox.

PSIClone™ will write files of the selected size to a folder on the destination drive named DIRxxxxx, where xxxxx is an incremental number beginning with 00001. All files for the current image fileset will be written to this folder. Files within an image fileset are named IMAGEBIN.xxx, or a custom name if one has been set by the user where xxx is an incremental number, beginning with 001. A log file of the imaging process, named LOG_FILE.txt, is also written to the fileset folder.

> **Note:**
> Imaging with PSIClone™ or other CPR devices (with or without CPR Toolbox™), requires that the destination drive be formatted using CPR Toolbox™ or a CPR device. CPR Toolbox™ and devices format drives using the FAT32 filesystem. Other than CPR Toolbox™ or CPR device commands, the destination files system must NOT be modified.

If the destination drive has not been formatted by CPR Toolbox™ or PSIClone™, a message is displayed offering to perform a format.
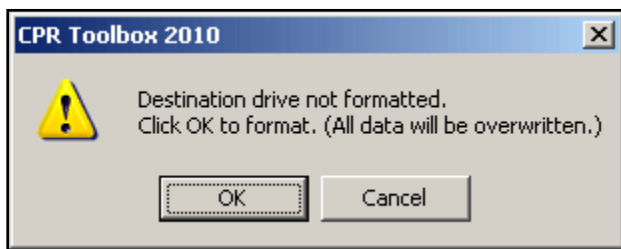
Figure 26 - Format Warning

> **NOTE:**
> If the destination drive is not of sufficient size to receive the image, a message is displayed below the progress bar and PSIClone™ will display 'Source larger than destination' on the device LCD.

Drive formatting may also be performed using CPR Toolbox™ on the 'Format' tab.

Once the destination drive has been formatted, click the 'Image' button to initiate creation of the image.
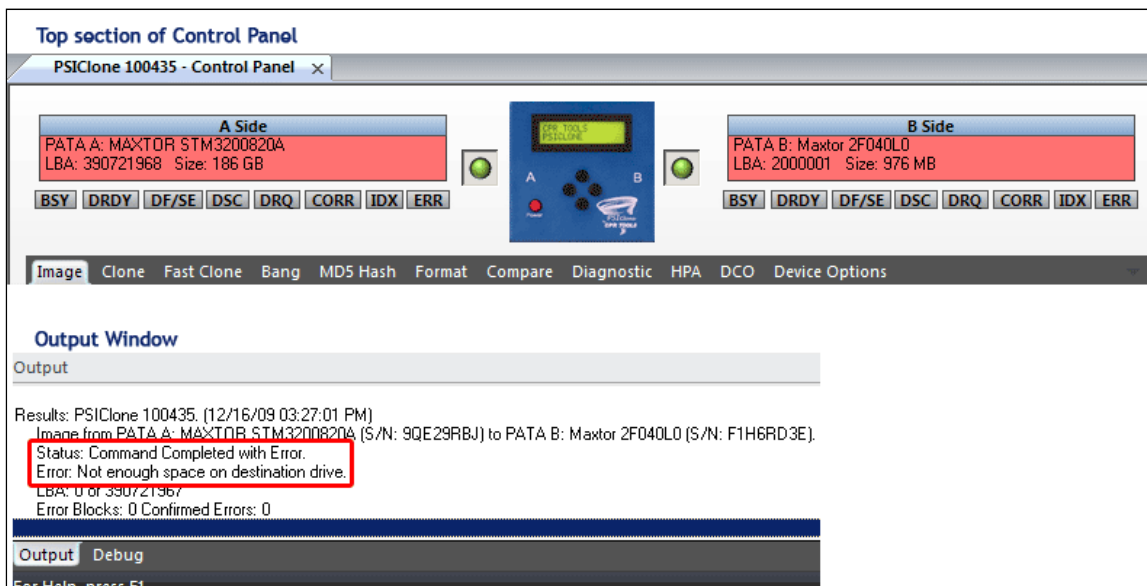
Figure 27 - Messages displayed if destination drive is of insufficient size

Figure 28 displays CPR Toolbox™ during the process of creating an image fileset.
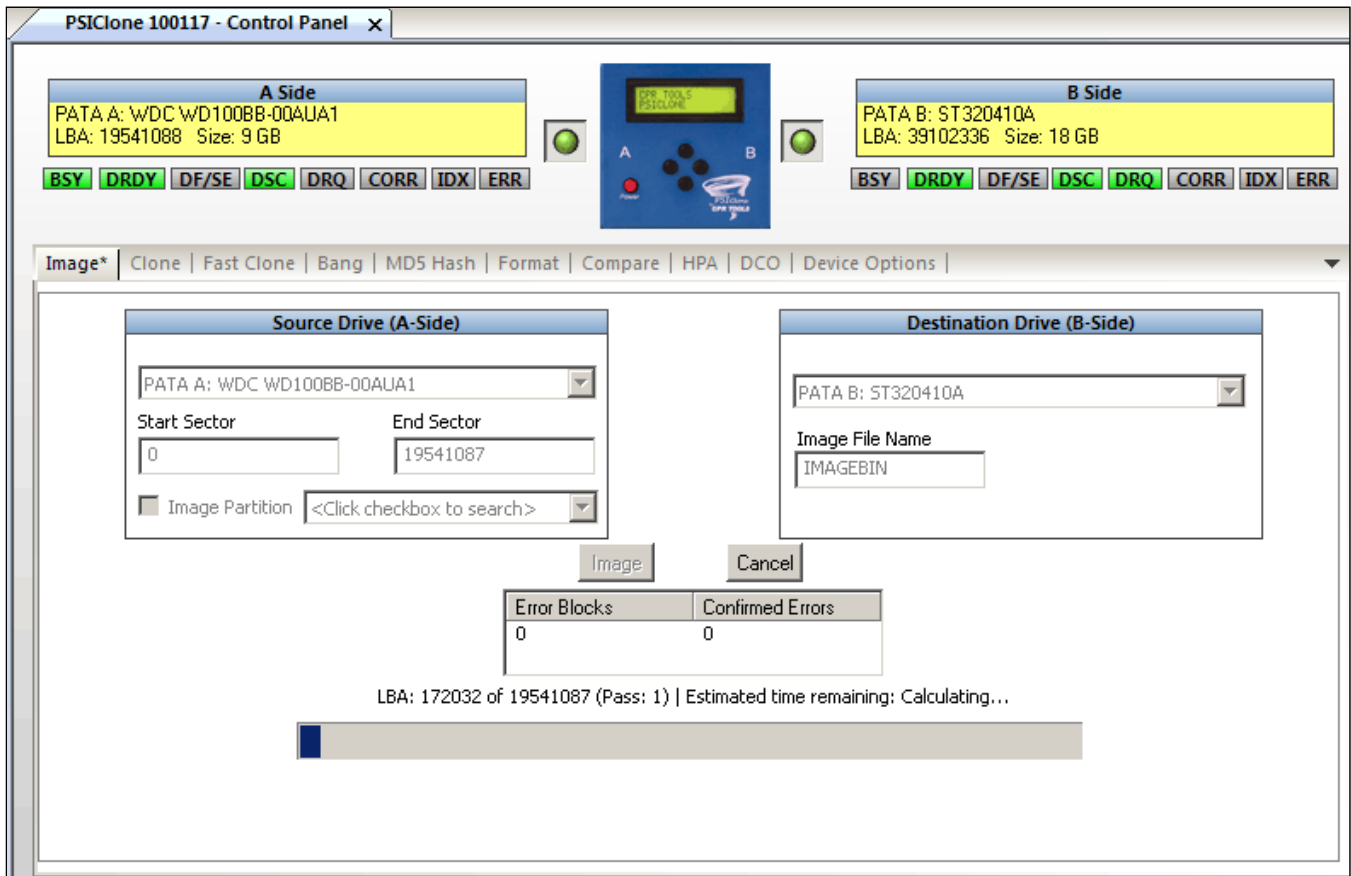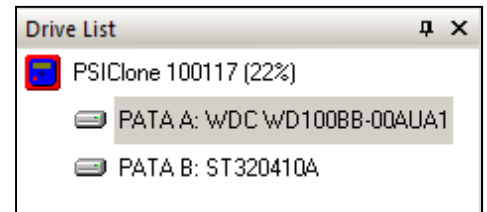

Figure 28 - Imaging in progress

During the Imaging process, a percentage complete is displayed in the drive list, at the left of the screen.

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When the imaging process completes, CPR Toolbox™ alerts the user and provides an MD5 hash of the source. If errors are encountered, an MD5 hash will not be calculated. Errors will display in the output window (horizontal pane at the bottom of the CPR Toolbox™ main window).
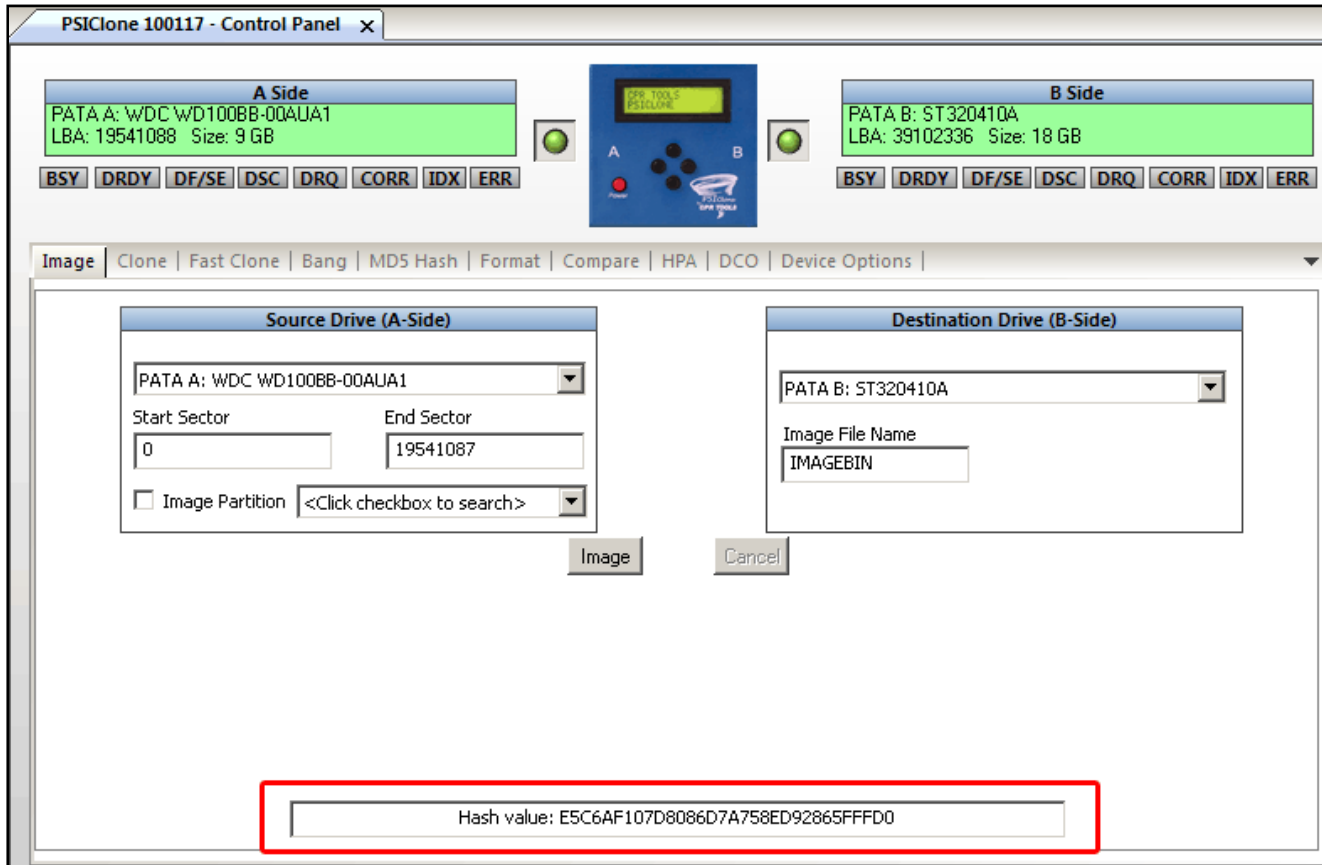
Figure 29 - Image Complete, CPR Toolbox™ displays MD5 Hash

Cancelling and Resuming an Image

As with PSIClone™ in stand-alone mode, CPR Toolbox™ allows for the resumption of previously cancelled image restoration. If CPR Toolbox™ detects a resumable image fileset on the destination drive, a notification is displayed.

Users should familiarize themselves with PSIClone™ image fileset naming conventions as described previously in this User's Guide (Page 18).

Clicking 'Yes' will instruct CPR Toolbox™ and PSIClone™ to resume the imaging process from the point at which it was last cancelled. Clicking 'No' will instruct CPR Toolbox™ and PSIClone™ to disregard the existing image fileset and to create a new image fileset.
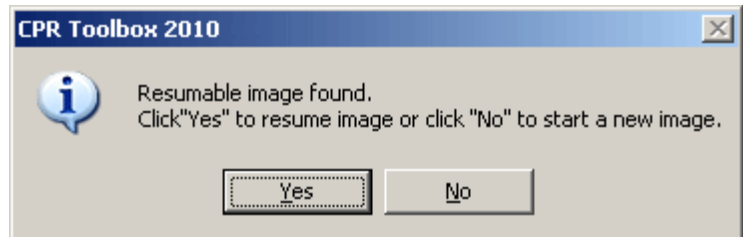
Clone

The Clone tab of the CPR Toolbox™ is used to create a sector-by-sector copy of a source drive attached to Side A of the PSIClone™ device to a destination drive attached to Side B of the PSIClone™ device.
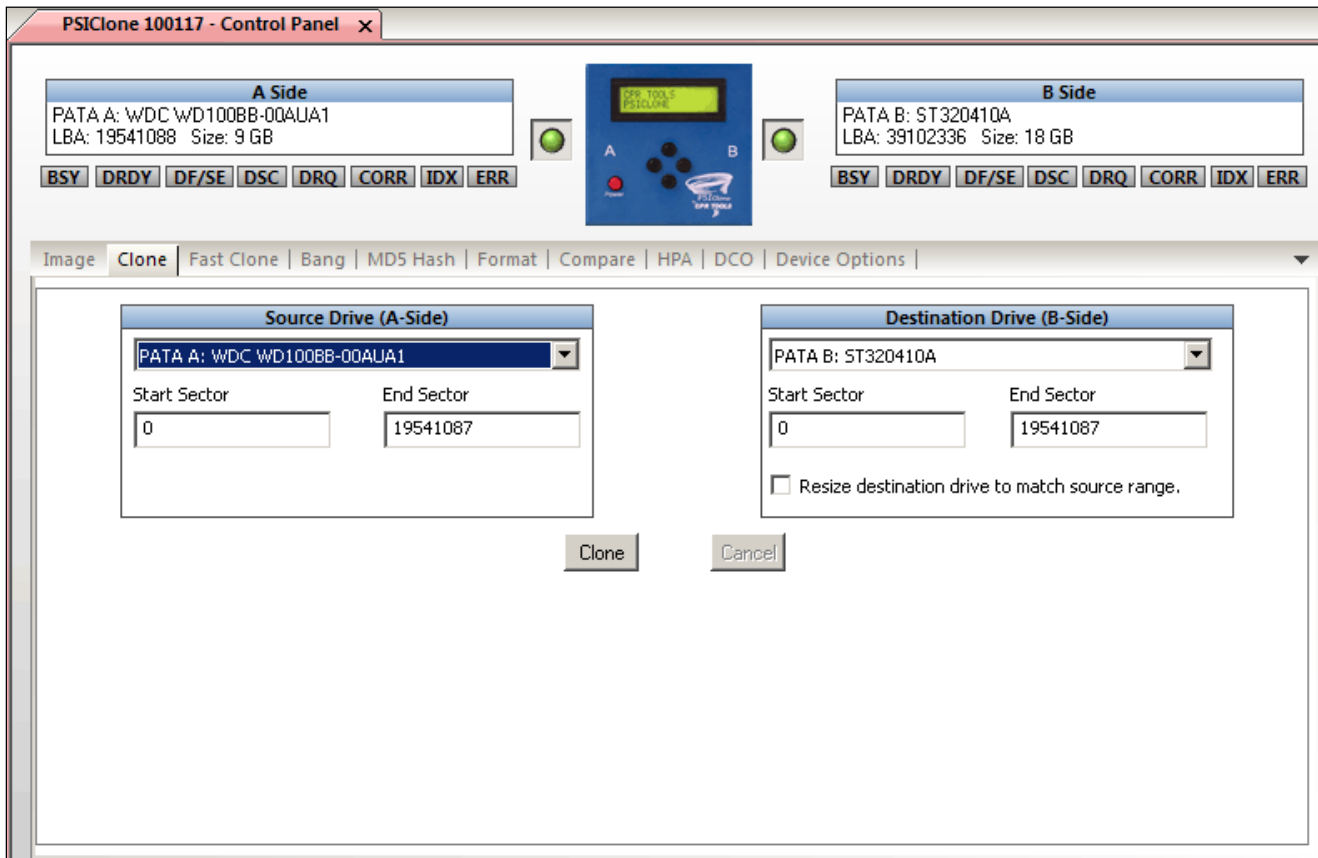
The Clone tab is shown in Figure 30.

Figure 30 - The Clone Tab

To initiate a clone:

1. Select source drive on Side A of the PSIClone™ device.

2. Ensure that start and end sectors are listed correctly

3. Select destination drive on Side B

4. Ensure that destination drive is of sufficient capacity

   a. If 'Resize destination drive to match source range' is selected, PSIClone™ will cause the destination drive to appear to have the same sector count as the source drive. This is accomplished by establishing a Host Protected Area (HPA) on the destination drive.

5. Click 'Clone' to begin a sector-by-sector copy of data from Side A to Side B

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During the Clone process, a progress bar and text information is displayed to indicate cloning status.
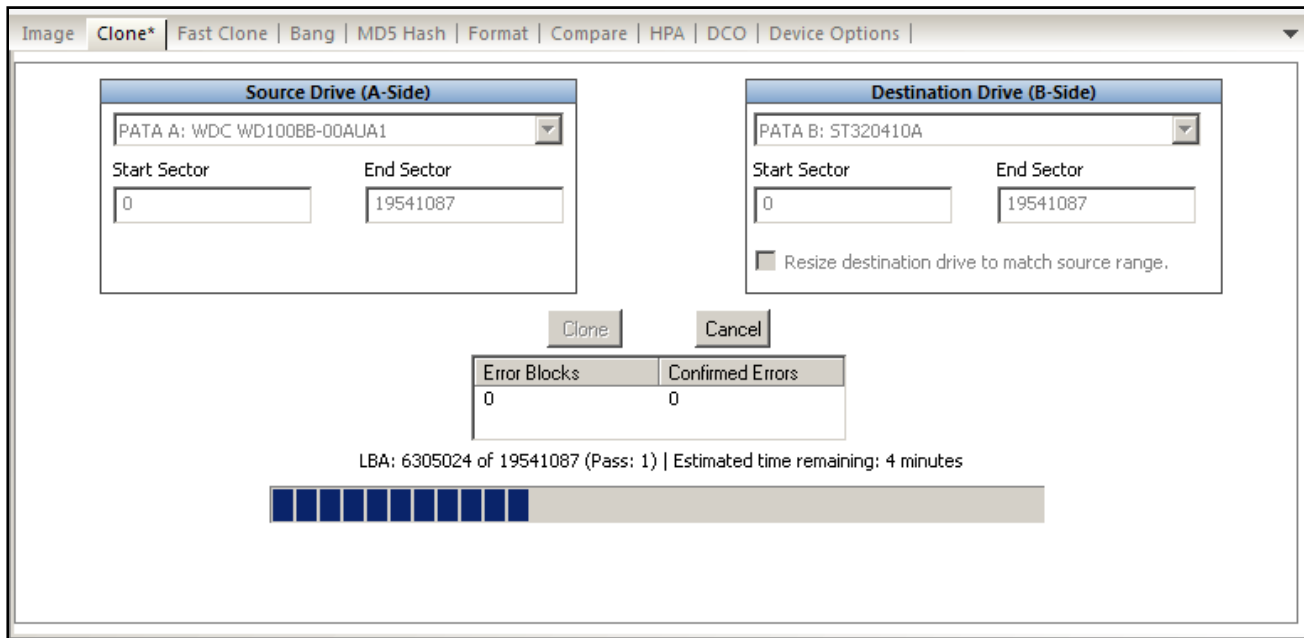
Figure 31 - Clone in progress

When the clone process completes, CPR Toolbox™ displays an MD5 Hash. Success or failure messages appear in the output window (horizontal pane at the bottom of the screen). If errors are encountered, CPR Toolbox™ will not calculate an MD5 hash. If the command was run in reverse, CPR Toolbox™ will not calculate an MD5 hash.
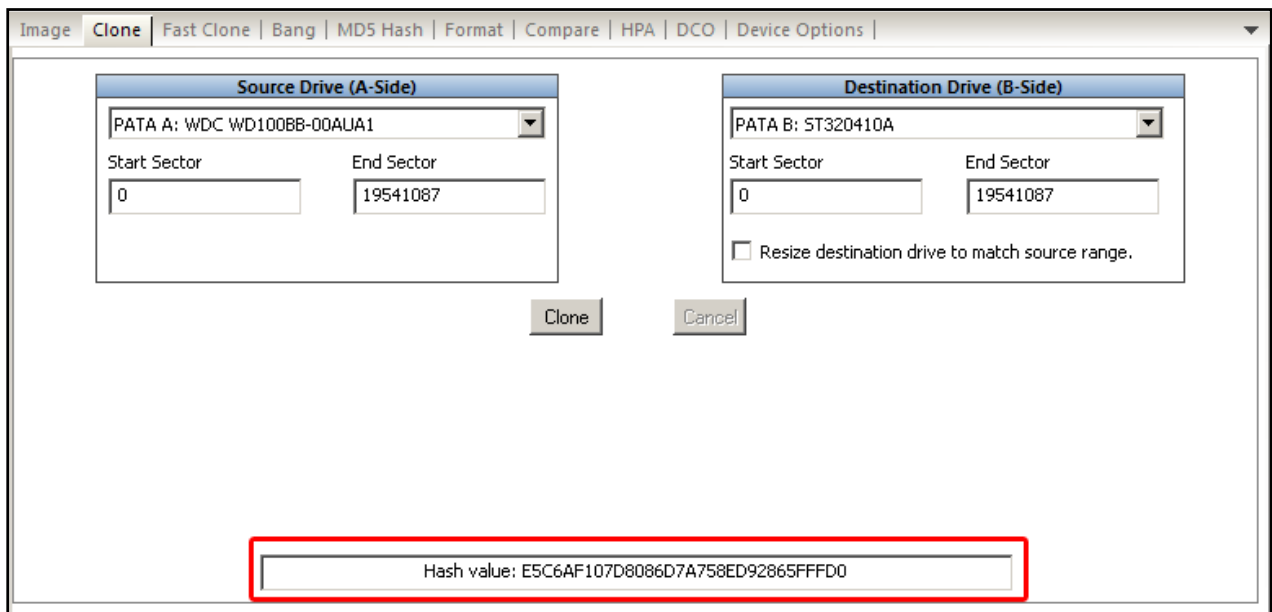

Figure 32 - Clone complete, MD5 Hash displayed

Fast Clone™

FastClone™ is a feature which allows for the copying existing file system(s) from one drive (Side A) to another (Side B). Fast Clone copies only allocated sectors within a file system. This method differs from conventional clones which typically perform sector-by-sector copies of an entire drive without regard for file systems or sector allocations.

The FastClone™ tab is depicted in Figure 33.
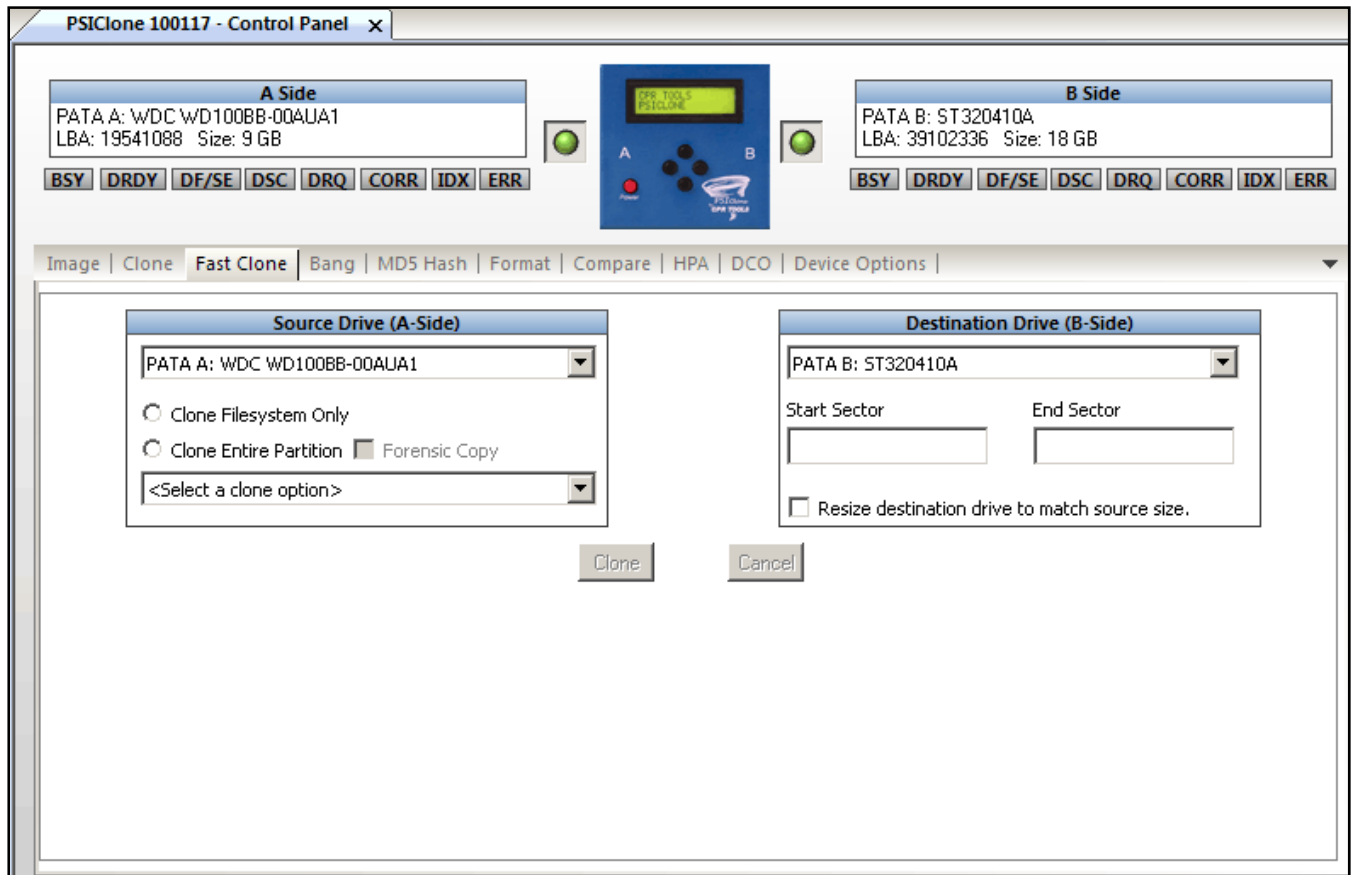
Figure 33 - FastClone™ tab

Select a Source Drive (Side A) from the drop down list provided. Next, select from the file systems discovered by PSIClone™.

Select 'Clone Filesystem only' or 'Clone Entire Partition' by clicking the corresponding radio button. If 'Clone Entire Partition' is selected, users may choose to make a forensic copy by checking the box labeled 'Forensic Copy'.

Select a Destination Drive (Side B) from the drop down list provided. The start and end sectors are calculated and displayed on screen. To resize the destination drive to match the source range of sectors, check the box marked 'Resize destination drive to match source range'. Doing this will create an HPA on the destination drive.

Click the 'Clone' button to initiate the Fast Clone process. A progress bar is displayed while the Fast Clone process is underway.

Forensic or Non-Forensic?

If 'Forensic Copy' is checked, LBA 0 of the source drive is not copied. Further, the clone will begin at LBA 0 of the destination drive and continue until all sectors in the source partition have been cloned. This type of clone will be viewable in a hex editor.

If 'Forensic Copy' is NOT checked, LBA 0 is copied and the sector mapping of the source drive will be duplicated on the destination drive. As LBA 0 will be copied, the partition table will be intact and should be viewable to a host operating system.

Bang

Bang is a term used to describe eradication of all data on a drive by overwriting each sector. PSIClone™ includes an embedded version of CPR Tools' data eradication utility, BangDisk™. BangDisk™ complies with NIST 800-88[6] 'clear' specifications.

Using the Bang function within the CPR Toolbox™, a user may eradicate all data on a drive connected to Side B of the PSIClone™ by overwriting every addressable sector on the drive.

The Bang function allows the user to choose between several pattern types, including a custom type which may be defined by the user. Pre-defined Bang types include 'Random', 'Incrementing', 'LBA Pattern' and 'Inverse Bits'.

Figure 34 displays the options available when the Bang tab of the CPR Toolbox™ Control Panel is in focus.

> **NOTE:**
> LBA Pattern is not available if the current settings call for the operation to be run in reverse.
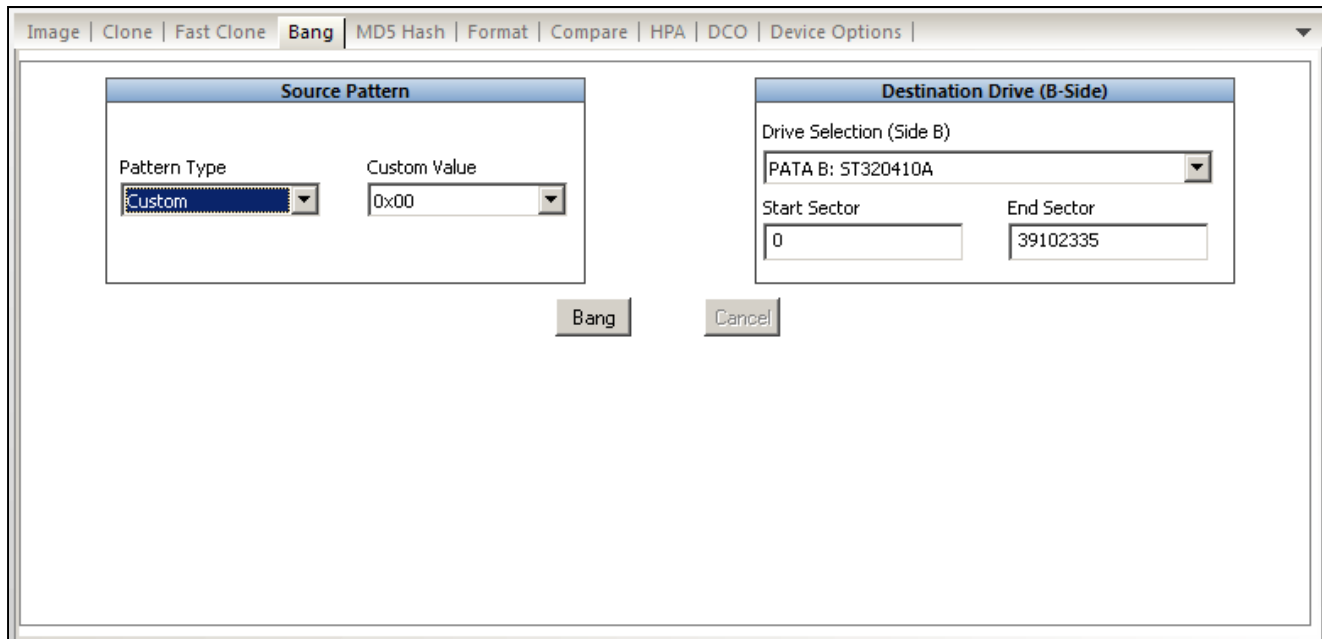
Figure 34 - The 'Bang' Tab

To create a custom pattern, select 'Custom' from the Pattern Type drop down. Select a value from the list; the selected value will be used to overwrite all sectors on the drive. The 'Custom Value' dropdown is populated with a range of hexadecimal values beginning with `0x00` through `0xFF`.

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[6] http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_rev1.pdf

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Banging a Drive

Once the source pattern has been selected, the user may initiate a Bang of the device by clicking the button labeled Bang.

Bang progress is displayed in the form of text indicators and a progress bar. Figure 35 shows the progress of a Bang.
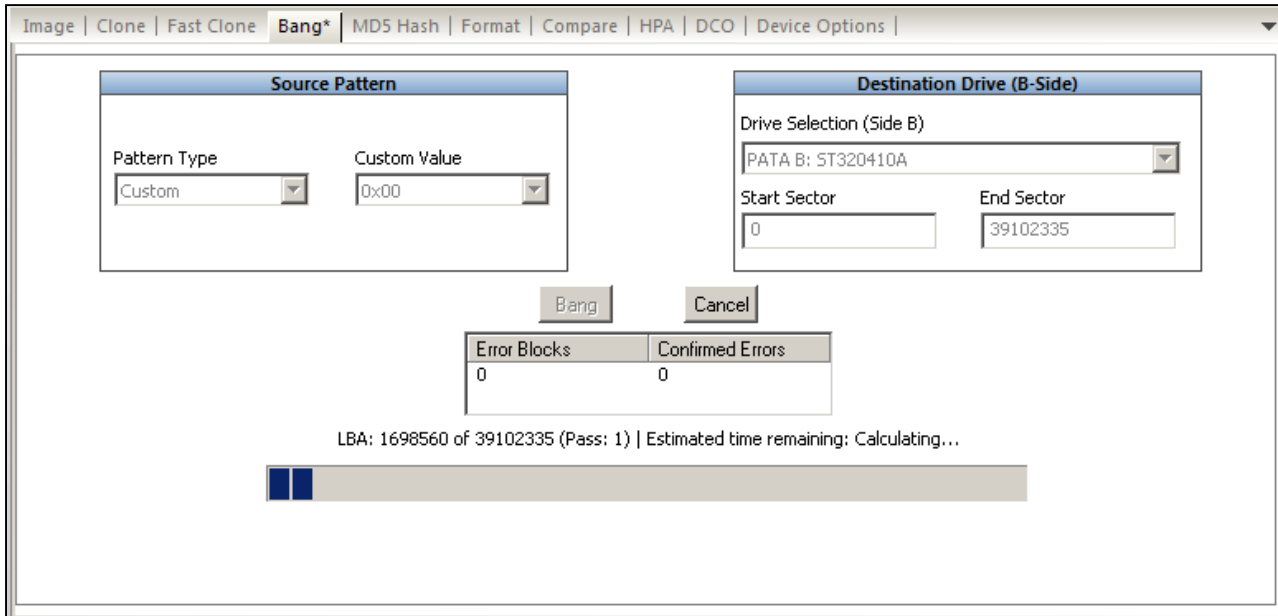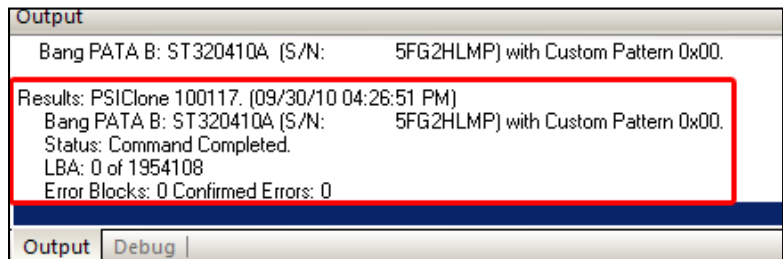

Figure 35 - Bang Progress

CPR Toolbox™ will provide status of the completed Bang in the output window.

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MD5 Hash

Using the CPR Toolbox™ MD5 Hash tab, a user may calculate the MD5 Hash of a drive connected to either side of PSIClone™. This function is useful subsequent to performing a Clone or having restored an Image fileset. As the calculation of an MD5 Hash does not require write access to the drives, users may select drives on either Side A or Side B of the device.

By calculating an MD5 Hash of a source drive and comparing that value to the MD5 Hash calculated on the destination clone or restored image, one may reasonably validate that an accurate clone or image was successfully created.

To calculate an MD5 Hash, select a drive from the dropdown list and click 'Calculate'.
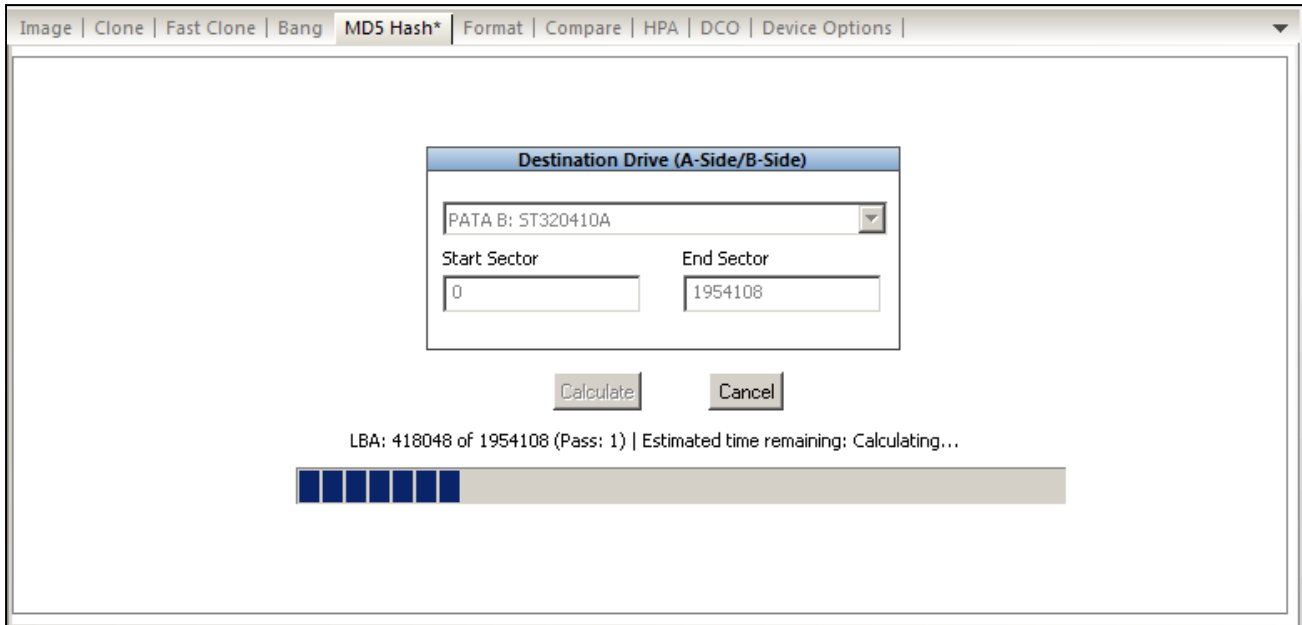
Figure 36 - Calculating an MD5 Hash

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When complete, CPR Toolbox™ displays the calculated hash beneath the progress bar, as shown in Figure 37.
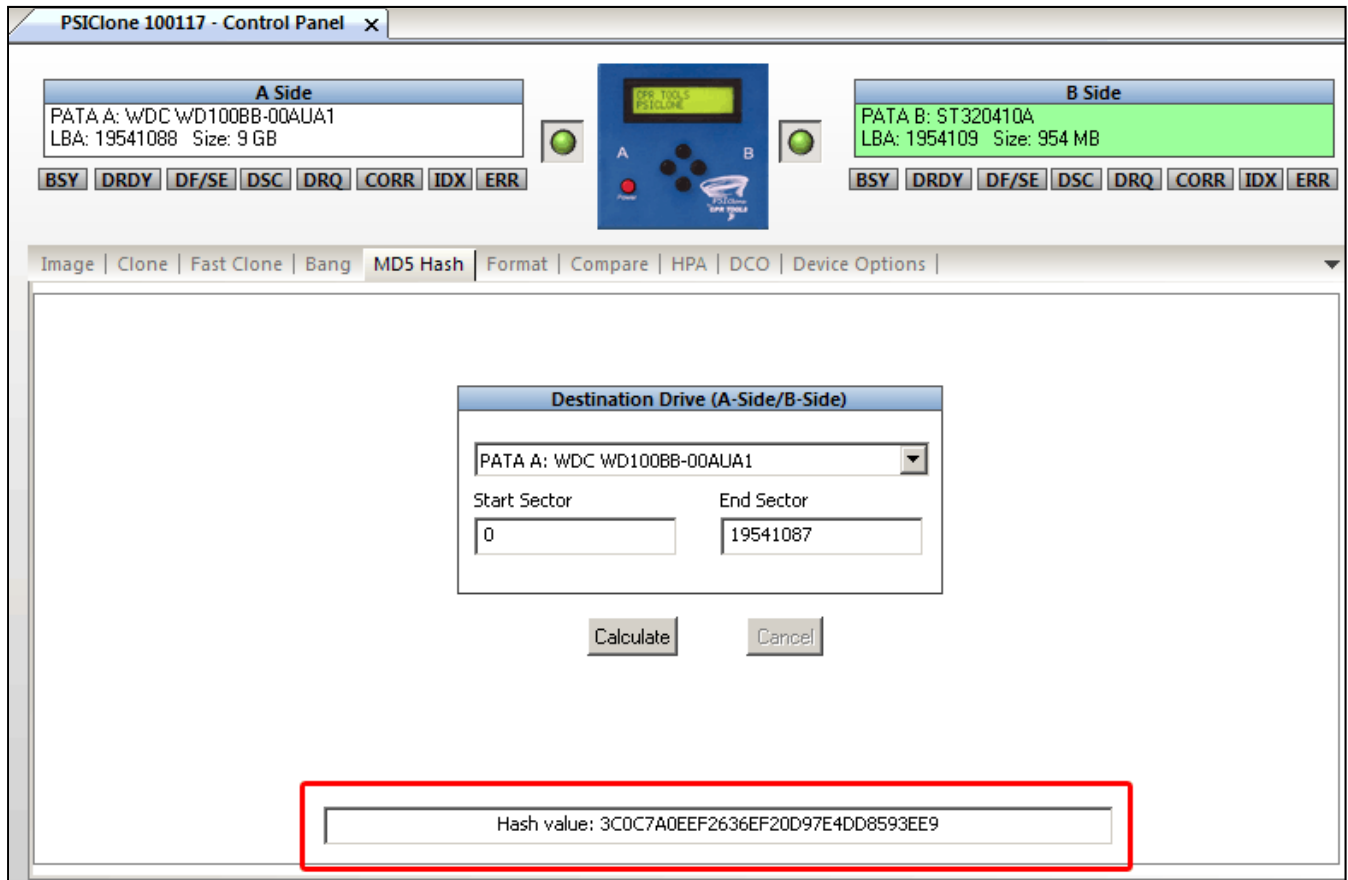
Figure 37 - Completed MD5 Hash Calculation

The calculated hash is displayed in the 'output' window (lower horizontal pane) as well as at the bottom of the MD5 Hash screen.

To save this value for comparison, right-click in the output window and select 'Save to File'.

Format

The Format tab provides the facility to perform a format on a drive connected to Side B of PSIClone™. PSIClone™ performs formats using the FAT32 file system.

Use this function prior to initiating an Image process using CPR Toolbox; should an Image be initiated prior to a Format of the destination drive being performed, CPR Toolbox™ will provide a dialog box offering to Format the destination drive before continuing. PSIClone™ offers both 'Quick' and 'Full' format options.

NOTE:

Imaging with PSIClone™ (with or without CPR Toolbox™), requires that the destination drive be formatted using CPR Toolbox™ or a CPR device. CPR Toolbox™ and devices format drives using the FAT32 filesystem. Other than CPR Toolbox™ or CPR device commands, the destination files system must NOT be modified.
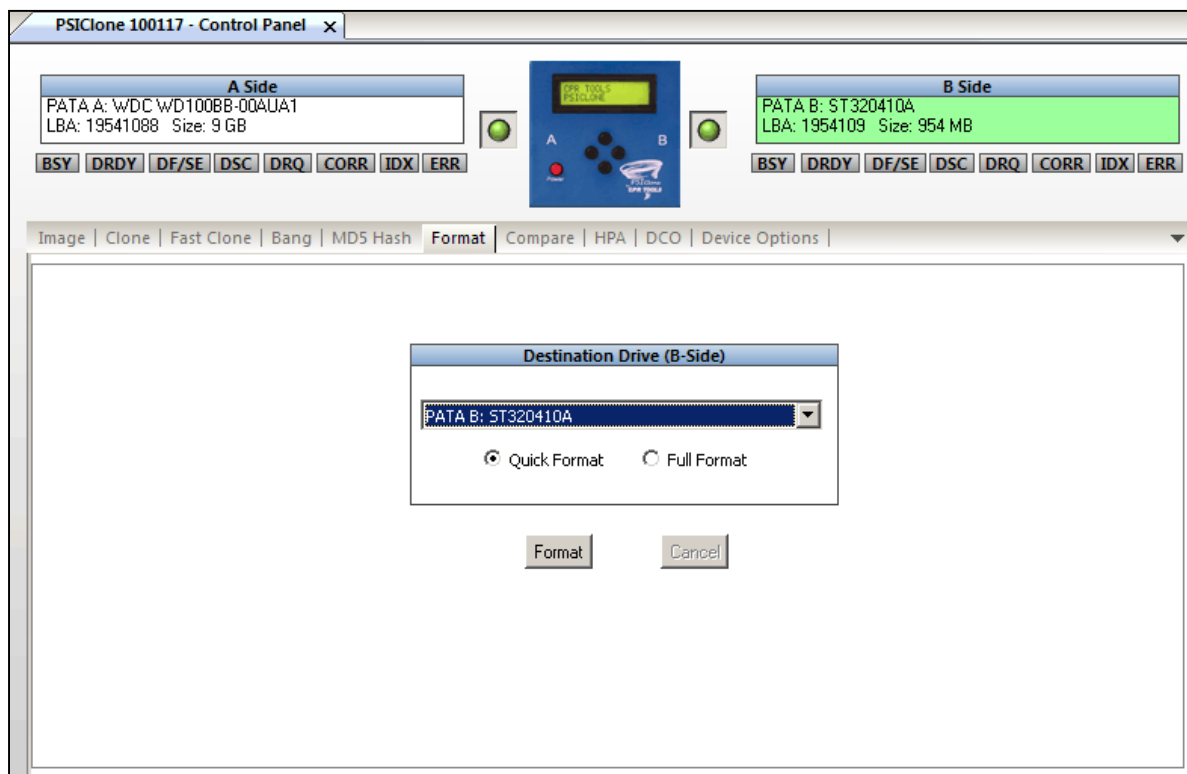
When formatting a drive using 'Full Format', PSIClone™ will first write 00 to each sector, effectively erasing all data on the drive; after the writing of 00 to each sector, the FAT32 file system will be applied.

Figure 38 - Use 'Format' prior to using 'Image'

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Compare

The Compare tab of the CPR Toolbox™ is used to compare data from either a pre-defined pattern or source drive (Side A), to a drive on Side B of PSIClone™. This function is used to verify the integrity of a Clone or Bang function. Compare may be used to validate any PSIClone™/CPR Toolbox™ pattern, other than the 'Random Pattern.
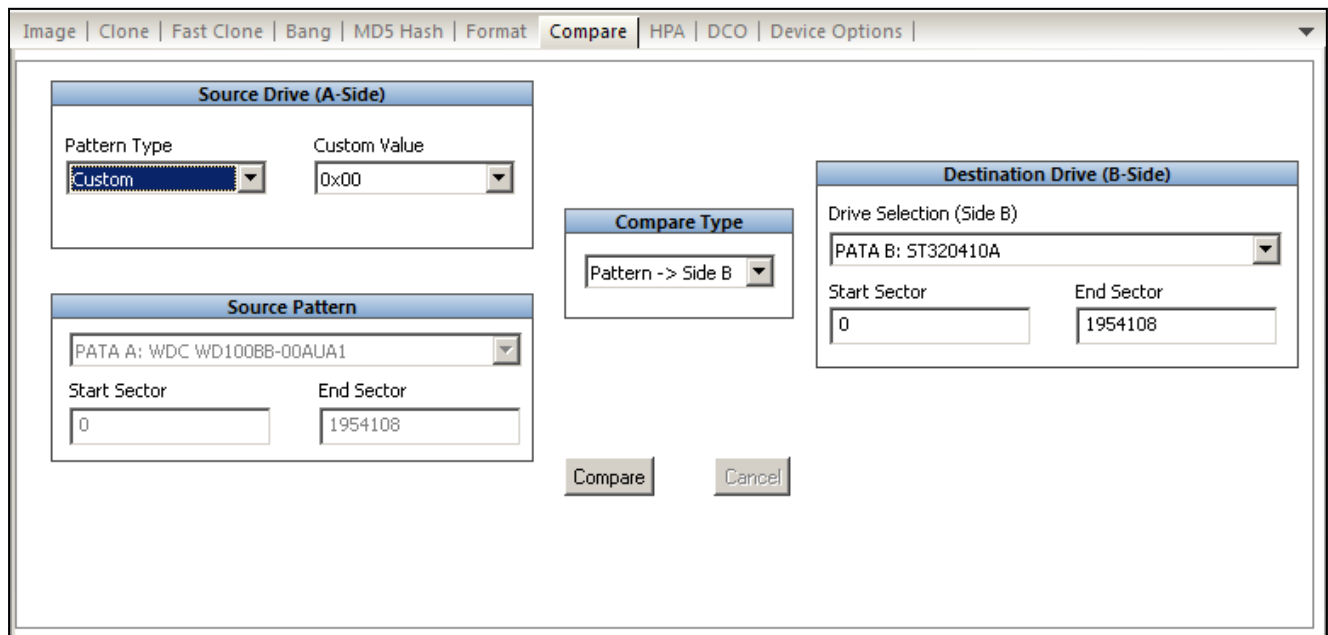
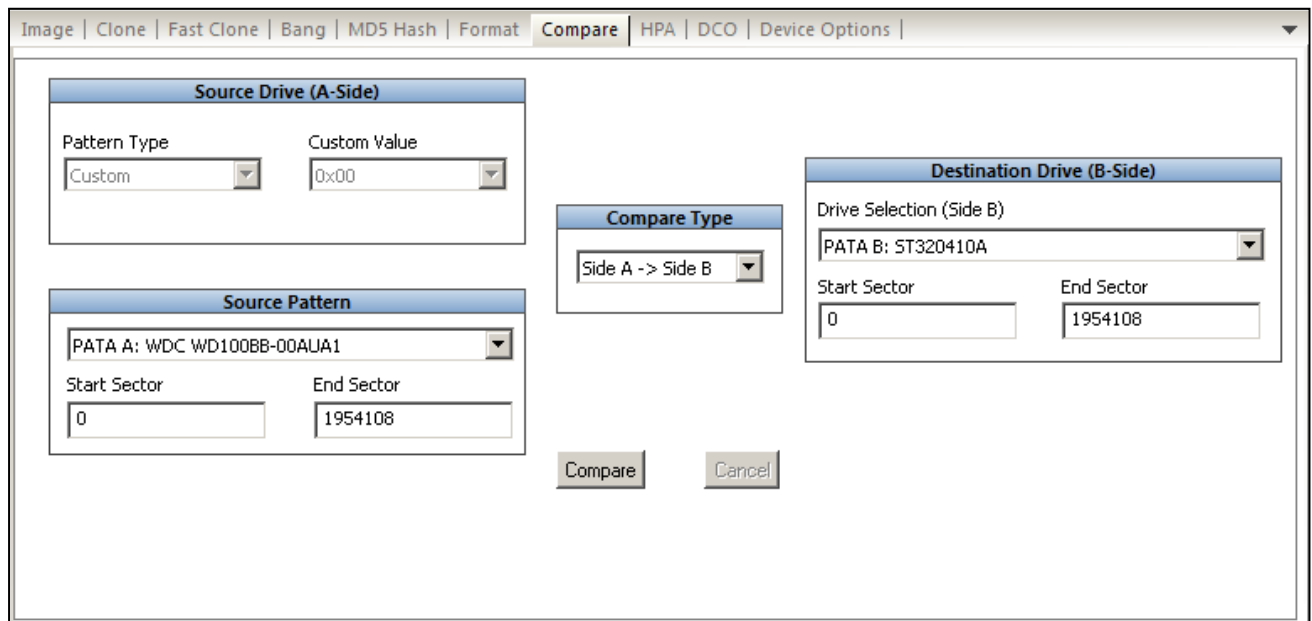

Figure 39 - Compare Pattern to Side B

Figure 40 - Compare Side A to Side B

HPA (Host Protected Area)

Host Protected Area, sometimes referred to as 'Hidden' Protected Area is an area of a hard drive that is not visible to an operating system.

The HPA tab allows the user to adjust the Current Max setting of a drive attached to either Side A or Side B of PSIClone™. The default capacity of a drive is equivalent to that drive's 'Native Max'. Adjusting the Current Max value sets the drive to appear to be smaller than its default capacity.
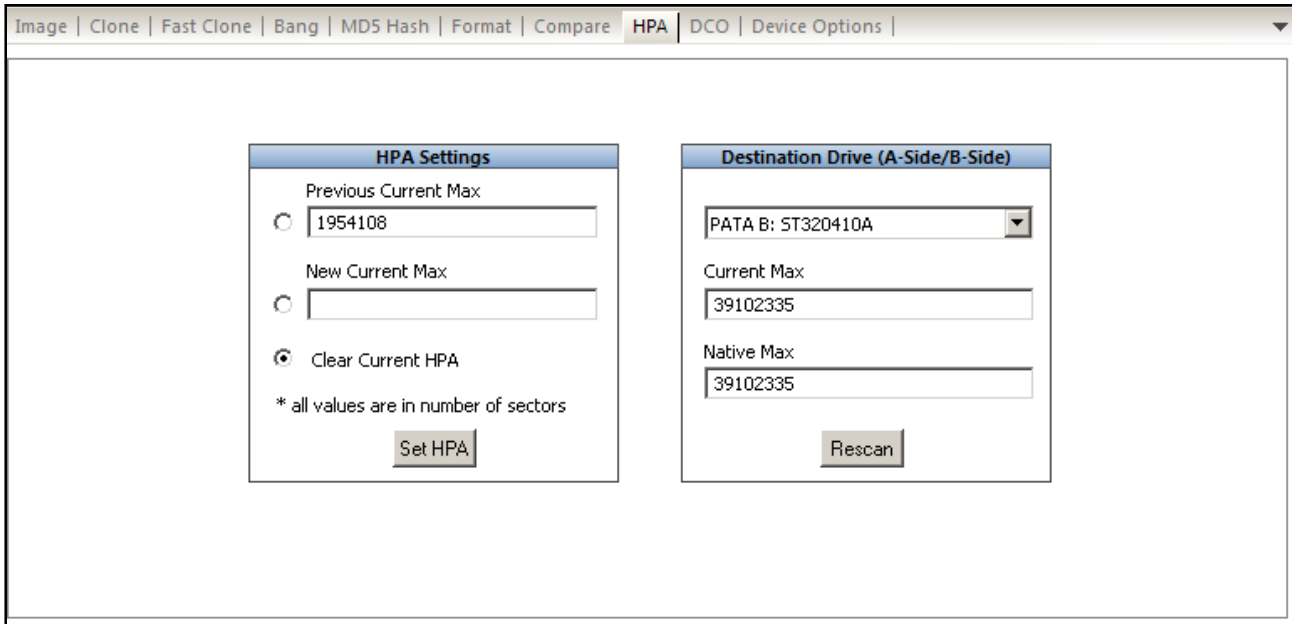
Figure 41 depicts the initial HPA Screen.

Figure 41 - HPA Settings

The right side of this screen shows the drive currently being examined and both the Current and Native Max settings for the drive. If no HPA is present, these two values should be equal.

To set an HPA, first select the radio button beside the New Current Max entry box, and enter a value to be applied as New Current Max.   Click the 'Set HPA' button to change the value for Current Max.

Figure 42 depicts the success messages after an HPA has been created.

Figure 42 – Setting an HPA

Clearing an HPA will configure the drive to use the maximum addressable LBA range.
To clear an existing HPA, select the 'Clear Current HPA' button.

The 'HPA' section of the HPA tab keeps track of the last HPA value set. This is done as a reference in the event the drive needs to be returned to the state it was in prior to being manipulated with CPR Toolbox™.

DCO

Device Configuration Overlay – The DCO tab provides a wealth of functionality, allowing the user to switch certain supported features on or off.

Not all drives support DCO. Figure 43 depicts the DCO tab when a drive which does not support the DCO command set has been selected. CPR Toolbox displays a message indicating the lack of DCO support for the selected drive.

> **PSIClone™ Tips:**
>
> Why use the DCO Tab?
>
> Often, in data recovery scenarios, a drive is received which may be limited by certain DCO settings.
>
> Using the editing ability provided within this tab, recovery technicians may save the initial (or subsequently changed) DCO status of the drive.
>
> Enabling or disabling features may aid in the data recovery effort. The Save/Load functionality is provided to allow for 'snapshots' of DCO settings to be saved or quickly restored.
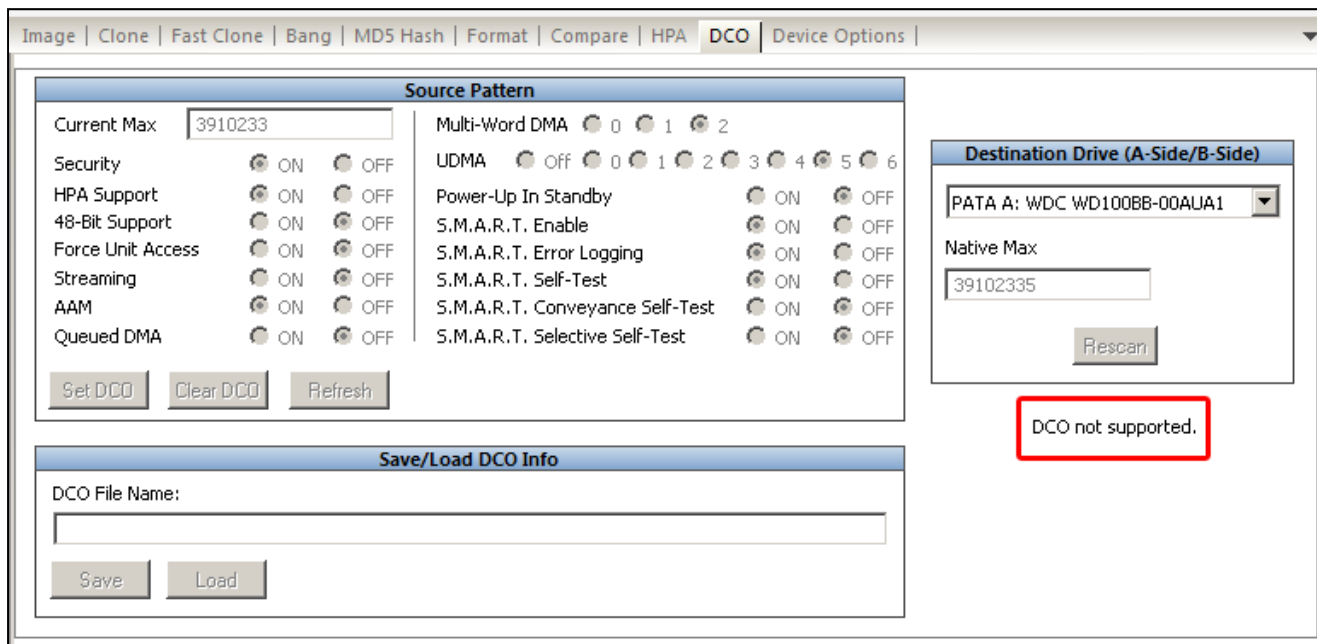

Figure 43 - DCO not supported by drive on Side A

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Once a drive which supports DCO is selected, the user may proceed in working with DCO.
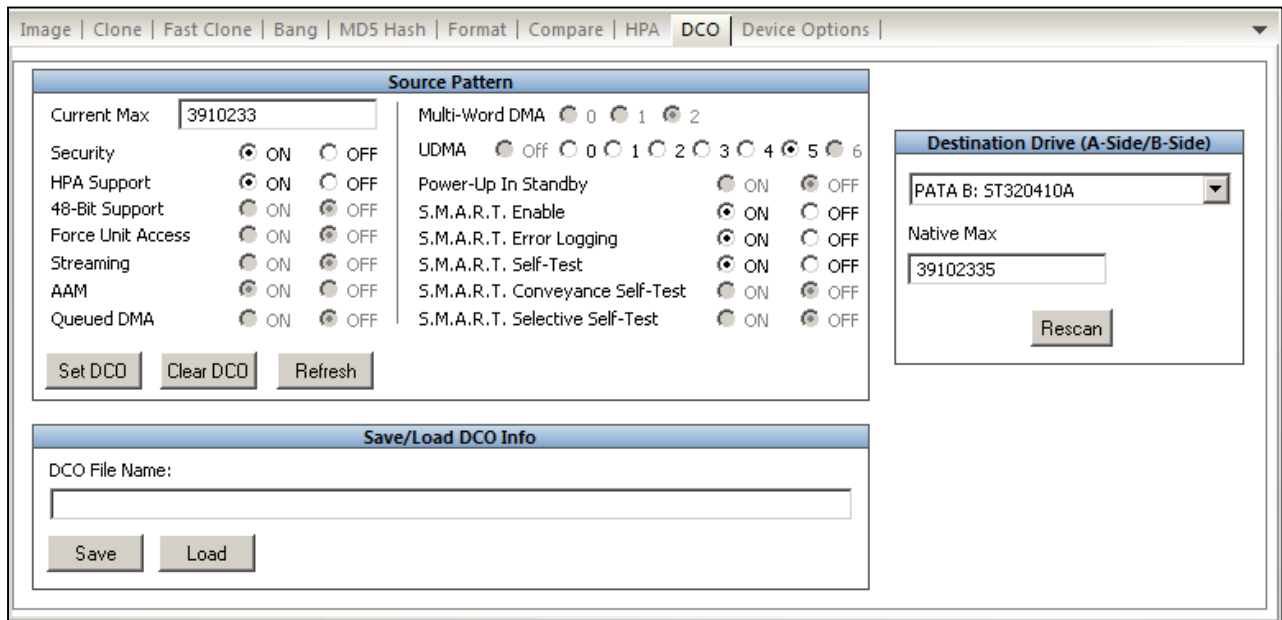

Figure 44 - DCO Tab

DCO Options may be toggled using this screen. Only those options supported by the attached drives may be changed. Options not supported, such as 'S.M.A.R.T Conveyance Self-Test' in Figure 44, are 'grayed out' and unavailable to the user.

DCO Options are presented using the drive's current values. Each of the DCO options will be presented in detail.

> **NOTE:**
>
> The ability to edit or change ANY of the drive functions on this tab is wholly dependent upon support provided by the attached drive.

DCO Settings

Current Max

This setting allows the user to limit the size of the drive by specifying the number of LBAs which the drive will report. This is similar to what may be performed using the HPA tab; it should be noted that an HPA may be set on a drive which has had its Current Max modified via DCO.

This list defines which drive features are enabled or disabled when toggling available options:

Security

Enables/Disables support for the following commands:
- SECURITY SET PASSWORD
- SECURITY UNLOCK
- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD

> *Command set description:*
> Allows user to lock and unlock drives and perform security erases.

> *Advantages of disabling:*
> Prevent inadvertent security erasing or locking of drive.

HPA Support

Enables/Disables support for the following commands:
- READ NATIVE MAX ADDRESS
- READ NATIVE MAX ADDRESS EXT
- SET NATIVE MAX ADDRESS
- SET NATIVE MAX ADDRESS EXT

Command set description:
Allows user to reduce the reported size of a drive.

Advantages of disabling:
Prevents HPA from being set on a drive.

48 Bit Support

Enables/Disables support for the following commands:
- FLUSH CACHE EXT
- READ DMA EXT
- READ DMA QUEUED EXT
- READ MULTIPLE EXT
- READ NATIVE MAX ADDRESS EXT
- READ SECTOR(S) EXT
- READ VERIFY SECTOR(S) EXT
- SET MAX ADDRESS EXT
- WRITE DMA EXT
- WRITE DMA FUA EXT
- WRITE DMA QUEUED EXT
- WRITE DMA QUEUED FUA EXT
- WRITE MULTIPLE EXT
- WRITE MULTIPLE FUA EXT
- WRITE SECTOR(S) EXT

Command set description:
These commands allow the user to read, write, and set HPAs on sectors above the 28 bit mark (268435455).

Force Unit Access:

Enables/Disables support for the following commands:
- WRITE DMA FUA EXT
- WRITE DMA QUEUED FUA EXT
- WRITE MULTIPLE FUA EXT

Command set description:
These commands force writes to bypass the write cache and instead write directly to the media. These commands are used for data integrity purposes.

Streaming:

Enables/Disables support for the following commands:
- CONFIGURE STREAM
- READ STREAM EXT
- WRITE STREAM EXT
- READ STREAM DMA EXT
- WRITE STREAM DMA EXT
- READ LOG EXT
- WRITE LOG EXT

Command set description:
These commands are used to time critical data transfers as opposed to data integrity critical commands. If the command doesn't complete in the specified amount of time, the command fails.

Automatic Acoustic Management:

Enables/Disables support for Automatic Acoustic Management

Command set description:
Sets drive to operate at one of three levels:
1. High noise and performance
2. Medium noise and performance
3. Low noise and performance

Queued DMA:

Enables/Disables support for queued I/O commands

Command set description:
Allows a host to issue concurrent commands to the same device. The device will queue the concurrent commands, then process them.

Multi-Word DMA:

Sets the level of support for Multi-Word DMA support.

Command set description:
Multi-Word DMA is a method used to perform I/O operations in bursts. Changing this value will change the default level at which the drive will perform these transfers.

Ultra DMA:

Sets the level of support for Ultra DMA transfers.

Ultra DMA is a method used to perform I/O operations in bursts. Changing this value will change the default level at which the drive will perform these transfers. Ultra DMA transfers are faster than Multi-Word.

Power Up In Standby:

Enables/Disables the ability of a drive to power up in a standby power state.

Command set description:
"Allows devices to be powered-up into the Standby power management state to minimize inrush current at power-up and to allow the host to sequence the spin-up of devices.
Drive will spin up as soon as a command is sent that requires the drive to access the media."

S.M.A.R.T. Enable:

Enables/Disables the S.M.A.R.T. system on the drive.

> *Advantages of disabling:*
> Drives that have problems with their S.M.A.R.T. system may perform better if S.M.A.R.T. is turned off.

S.M.A.R.T. Error Logging:

Enables/Disables the S.M.A.R.T. error logging support on the drive.

> *Command set description:*
> The collection and storage of drive health related statistics.

S.M.A.R.T. Self Test:

Enables/Disables a drives ability to perform a S.M.A.R.T. self test.

> *Command set description:*
> Causes the drive to perform a test of its health.

S.M.A.R.T. Conveyance Self-Test:

Enables/Disable a drives ability to perform a S.M.A.R.T. conveyance self test.

> *Command set description:*
> S.M.A.R.T. test designed to check if any damage occurred between the time the drive was manufactured and the time it was put into use.

S.M.A.R.T. Selective Self-Test:

Enables/Disables a drives ability to perform a S.M.A.R.T. selective self test.

> *Command set description:*
> Similar to a normal Self-Test, but the user can specify specific areas of the drive to test.

PSIClone™ Tips:
To save DCO Values, click the 'Save' button. Once saved, DCO values may be reloaded using the 'Load' button.

This feature is valuable if a user needs to restore a drive to its original state after having made changes to the DCO.

Device Options

The Device Options tab provides a method for setting values which affect PSIClone™ functionality. This screen may be used to configure device options and error handling.

Figure 45 - Device Options tab

Device Options

Device options are set using the left portion of the screen, as shown in Figure 46.

Figure 46 - Device Options

Power Down On Complete
Default: Not selected

> Selecting 'Power Down On Complete' instructs the device to power off attached drives after it completes a task.

Run Commands in Reverse
Default: Not Selected

> Selecting 'Run Commands in Reverse' will instruct PSIClone™ to perform actions in LBA descending order. The default is to run in ascending LBA order.

Enable Buzzer
Default: Not Selected

> Enabling this option will cause PSIClone™ to sound an audible alert upon completion of an action.

Compress Images
Default: Not Selected

> Enabling this option instruct PSIClone™ to employ a compression algorithm when creating image filesets.

Transfer Rate
Default: Auto

> Transfer rate set to the default, 'Auto', allows PSIClone™ to use the most efficient transfer rate for the attached drives.

Power On Timeout (ms)
Default: 20,000

> The value set here defines how long PSIClone™ will wait for a response from an attached drive after supplying power to the side of PSIClone™ to which the drive is attached.

Pass 1 Timeout (ms)
Default: 4,000ms (4 seconds)

> The value set here will define how long PSIClone™ and CPR Toolbox™ are configured to wait for a device to recover from an error and return to 'ready' state. Values from five hundred milliseconds (½ second) to sixty thousand milliseconds (60 seconds) are allowed.

Image File Size
Default: 2GB

> The value set here is used in conjunction with the imaging function included with PSIClone™. The available values are 700 MB, 1 GB and 2GB; the size chosen will define the size of drive image file segments output by PSIClone™. *Note: PSIClone™, Hammer™ and CPR Toolbox™ support 700MB to enable transfer of image segment files to CD media.*

CPR TOOLS
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Error Handling Options

CPR Toolbox™ provides certain user-configurable control over how errors are handled. These options are displayed on the right side of the 'Device Options' tab, as shown in Figure 47.
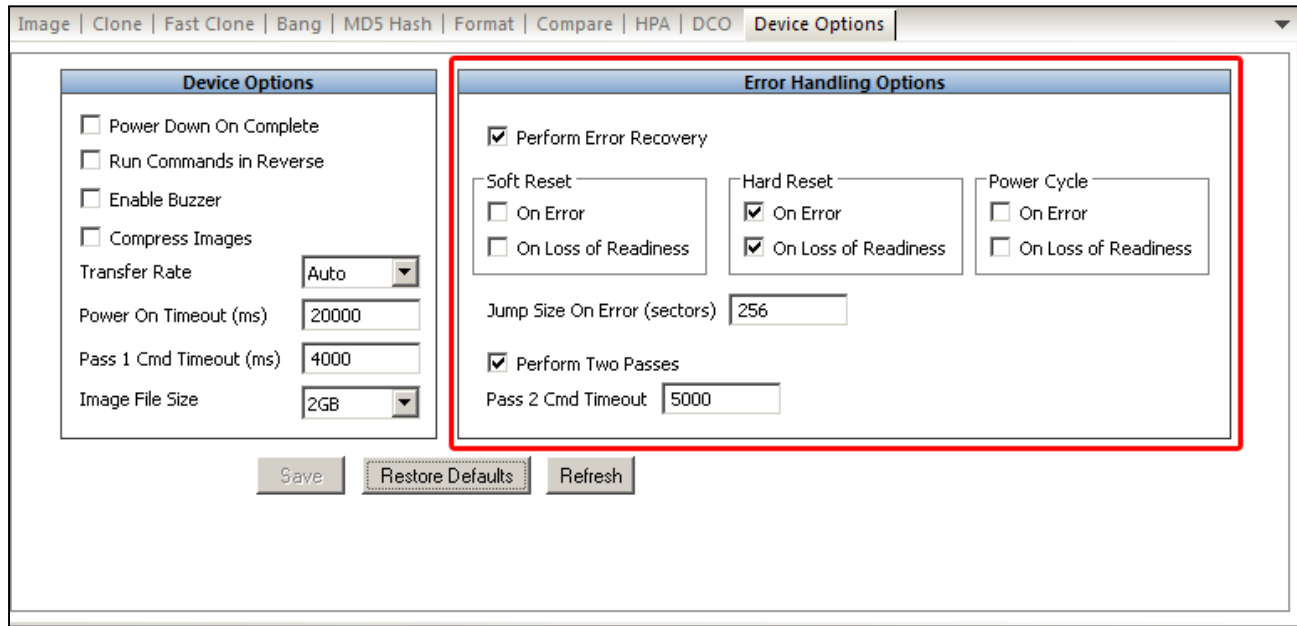

Figure 47 - Error Handling Options

Selecting 'Perform Error Recovery' enables Error Handling options. Each of the sections within Error Handling Options are worthy of discussion.

Sections titled 'Soft Reset', 'Hard Reset' and 'Power Cycle' are used to select what action, if any, CPR Toolbox™ and the PSIClone™ device will take upon encountering errors. Checkboxes marked 'On Error' and 'On Loss of Readiness' are available in each of these sections and may be selected to indicate the users' choice of actions if an error is encountered.

The field labeled 'Jump Size on Error (sectors)' is used to define how many sectors should be skipped over if an error is encountered.   This is most useful when used in conjunction with the 'Perform Two Passes' checkbox.

If 'Perform Two Passes' is checked and an error is encountered on first pass, PSIClone™ flags the sector for later review and proceeds after jumping ahead by this value. Valid values range from 1 to 4,294,967,295.

The Pass 2 Timeout (ms)' field is used to define how long CPR Toolbox™ and PSIClone™ are configured to wait for a device to recover from an error and return to 'ready' state on its second pass. Values from five hundred milliseconds (½ second) to sixty thousand milliseconds (60 seconds) are allowed.

Clicking 'Restore Defaults' will reset all CPR Toolbox™ values on this screen to their default values. Clicking 'Refresh' will synchronize the CPR Toolbox™ using values currently present in PSIClone™. Clicking 'Save' will save the new user defaults to NVRAM.

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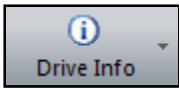
 Drive Info

Clicking Drive Info reveals two (2) submenu choices, _Identify Device_ and _View S.M.A.R.T._
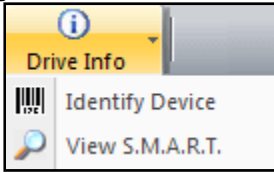
Identify Drive

Clicking this toolbar button will cause the CPR Toolbox™ to issue an ATA 'Identify Device' command to the selected drive. Information retrieved is presented as a tabbed screen in the main section of the CPR Toolbox™. The 'Identify Device' data tab is depicted in Figure 48. The 'Save' button may be used to write this information to a file. The section of output titled

```
-----Integrity Word-----
```

which is presented at the bottom of the output contains a checksum which is used to verify the accuracy of the data being displayed. If the checksum validates, the value `Valid` will be displayed.

Figure 48 - Identify Drive

View S.M.A.R.T.

Self-Monitoring, Analysis, and Reporting Technology, or S.M.A.R.T., is a monitoring system for computer hard disks to detect and report on various indicators of reliability, in the hope of anticipating failures.

The technical documentation for S.M.A.R.T. is in the **AT A**ttachment standard.[7]

Clicking the View S.M.A.R.T. button will retrieve and display current S.M.A.R.T. data for the selected drive. Figure 49 depicts the View S.M.A.R.T. results displayed in a tab of the main window. Output may be saved by clicking 'File/Save' or by pressing CNTRL-S on the keyboard.

| Attribute	Name	Value	Worst	Thresh	Raw(Hex)	Raw(Decimal)	Status
N/A	Attribute Checksum	PASS	PASS	PASS	000000000004	4	PASS: Checksum valid.
N/A	Threshold Checksum	PASS	PASS	PASS	00000000001C	28	PASS: Checksum valid.
01	Raw Read Error	100	100	16	000000000000	0	PASS: Value is normal
02	Throughput Performance	100	100	50	000000000000	0	PASS: Value is normal
03	Spin Up Time	136	136	24	000500F4010D	15991053	PASS: Value is normal
04	Start/Stop Count Number	100	100	0	000000000076	118	PASS: Always passes
05	Reallocated Sector Count	100	100	5	000000000000	0	PASS: Value is normal
07	Seek Error Rate	100	100	67	000000000000	0	PASS: Value is normal
08	Seek Time Performance	100	100	20	000000000000	0	PASS: Value is normal
09	Power-On Hours Count	100	100	0	000000000028	40	PASS: Always passes
0A	Spin-up Retry Count	100	100	60	000000000000	0	PASS: Value is normal
0C	Power Cycle Count	100	100	0	000000000076	118	PASS: Always passes
C0	Power-Off Retract Cycle	100	100	50	000000000077	119	PASS: Value is normal
C1	Load/Unload Cycle Count	100	100	50	000000000077	119	PASS: Value is normal
C2	HDA Temperature	137	137	0	003000170028	1507368	PASS: Always passes
C4	Reallocated Event Count	100	100	0	000000000000	0	PASS: Always passes
C5	Current Pending Sector Count	100	100	0	000000000000	0	PASS: Always passes
C6	Offline Scan Uncorrectable Count	100	100	0	000000000000	0	PASS: Always passes
C7	UltraDMA CRC Error Rate	200	253	0	000000000000	0	PASS: Always passes

Figure 49 - View S.M.A.R.T

The first two lines of output in the View S.M.A.R.T. display contain Attribute and Threshold Checksum values. If the data presented is valid, PASS will be displayed for these values.

The View S.M.A.R.T. display includes columns of information. These are:

- Attribute: S.M.A.R.T. Attribute as described in the ATA specification
- Name: Canonical meaning of the S.M.A.R.T. attribute
- Value: The current value of the given S.M.A.R.T. attribute
- Worst: Lowest value recorded to date for the selected device for the given S.M.A.R.T. attribute
- Thresh: Reference value. 'Value' should be higher than this reference value for the attribute to be in a 'working state'
- Raw (Hex): Vendor specific value for a given S.M.A.R.T. attribute in hexadecimal format
- Raw (Decimal): Vendor specific value for a given S.M.A.R.T. attribute in decimal format
- Status: Lists the current status for the attribute. Potential status listings are PASS or FAIL, followed by additional information. The additional information listed is dependent upon the type of attribute being monitored by S.M.A.R.T.

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[7] http://www.t13.org

CPR TOOLS
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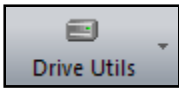
Drive Utilities

Clicking Drive Info reveals four (4) submenu choices, Sector Viewer, eDrive™, gClone™ and gRase™.

Drive Utils
- Sector Viewer
- eDrive
- gClone
- gRase
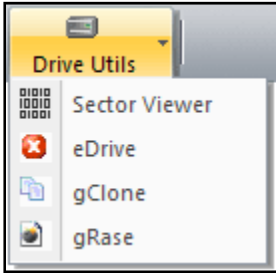
> **NOTE:**
> The *gRase™* utility is functional when working with CPR Toolbox™ in conjunction with CPR Tools data eradication device, Hammer™
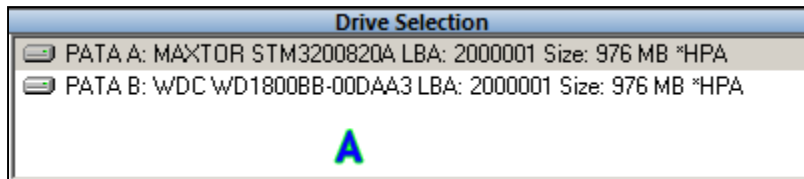
Sector Viewer

Beginning with this version of CPR Toolbox™ additional capabilities have been built into the Sector Viewer. To best describe the functionality of the CPR Toolbox™ Sector Viewer, Figure 50 displays the Sector Viewer, with five (5) distinct sections encircled, labeled **A** through **E.**

Drive Selection
PATA A: MAXTOR STM3200820A LBA: 2000001 Size: 976 MB *HPA
PATA B: WDC WD1800BB-00DAA3 LBA: 2000001 Size: 976 MB *HPA
A

Navigation
Seek To | First | Prev | Next | Last
LBA: 0   Of: 2000000
B

Drive Information
Serial Number: 9QE29RBJ
HPA Detected!
C

Offset	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	ASCII
0x00000000	33	C0	8E	D0	BC	00	7C	FB	50	07	50	1F	FC	BE	1B	7C	3ÀZÐ¼.¦úPⵯPⵯÜ¼|
0x00000010	BF	1B	06	50	57	B9	E5	01	F3	A4	CB	BD	BE	07	B1	04	¿ⵯPW¹åⵯóⵯß¼¹ⵯ±ⵯ
0x00000020	38	6E	00	7C	09	75	13	83	C5	10	E2	F4	CD	18	8B	F5	8n.¦ⵯuⵯƒÅⵯâôÍⵯ‹õ
0x00000030	83	C6	10	49	74	19	38	2C	74	F6	A0	B5	07	B4	07	8B	ƒÆⵯItⵯ8,tö µⵯ´Dⵯ
0x00000040	F0	AC	3C	00	74	FC	BB	07	00	B4	0E	CD	10	EB	F2	88	ã¬<.tü»ⵯ´ⵯÍⵯ뎢^
0x00000050	4E	10	E8	46	00	73	2A	FE	46	10	80	7E	04	0B	74	0B	NⵯèF.s*þFⵯ€‹ⵯtⵯ
0x00000060	80	7E	04	0C	74	05	A0	B6	07	75	D2	80	46	02	06	83	€~ⵯtⵯ ¶ⵯuⵯ€Fⵯⵯƒ
0x00000070	46	08	06	83	56	0A	00	E8	21	00	73	05	A0	B6	07	EB	FⵯⵯƒVⵯ.è!.sⵯ ¶ⵯë
0x00000080	BC	81	3E	FE	7D	55	AA	74	0B	80	7E	10	00	74	C8	A0	¼ⵯ>þ}Uªtⵯ€~ⵯ.tÈ
0x00000090	B7	07	EB	A9	8B	FC	1E	57	8B	F5	CB	BF	05	00	8A	56	·ⵯë©‹ü⣂W‹õË¿ⵯ.ŠV
0x000000A0	00	B4	08	CD	13	72	23	8A	C1	24	3F	98	8A	DE	8A	FC	.´ⵯÍⵯr#ŠÁ$?˜ŠÞŠü
0x000000B0	43	F7	E3	8B	D1	86	D6	B1	06	D2	EE	42	F7	E2	39	56	C÷ã‹Ñ†Ö±ⵯÒîB÷â9V
0x000000C0	0A	77	23	72	05	39	46	08	73	1C	B8	01	02	BB	00	7C	ⵯw#rⵯ9Fⵯsⵯ¸ⵯⵯ».|
0x000000D0	8B	4E	02	8B	56	00	CD	13	73	51	4F	74	4E	32	E4	8A	‹Nⵯ‹Vⵯ.ÍⵯsQOtN2äŠ
0x000000E0	56	00	CD	13	EB	E4	8A	56	00	60	BB	AA	55	B4	41	CD	V.Íⵯëäȯ.`»ªU´AÍ
0x000000F0	13	72	36	81	FB	55	AA	75	30	F6	C1	01	74	2B	61	60	ⵯr6ⵯûUªu0öÁⵯt+a`
0x00000100	6A	00	6A	00	FF	76	0A	FF	76	08	6A	00	68	00	7C	6A	j.j.ÿvⵯÿvⵯj.h.|j
0x00000110	01	6A	10	B4	42	8B	F4	CD	13	61	61	73	0E	4F	74	0B	ⵯjⵯ´B‹ôÍⵯaasⵯOtⵯ
0x00000120	32	E4	8A	56	00	CD	13	EB	D6	61	F9	C3	49	6E	76	61	2äŠV.ÍⵯëÖaùÃInva
0x00000130	6C	69	64	20	70	61	72	74	69	74	69	6F	6E	20	74	61	lid partition ta
0x00000140	62	6C	65	00	45	72	72	6F	72	20	6C	6F	61	64	69	6E	ble.Error loadin
0x00000150	67	20	6F	70	65	72	61	74	69	6E	67	20	73	79	73	74	g operating syst
0x00000160	65	6D	00	4D	69	73	73	69	6E	67	20	6F	70	65	72	61	em.Missing opera
0x00000170	74	69	6E	67	20	73	79	73	74	65	6D	00	00	00	00	00	ting system.....
0x00000180	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x00000190	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001B0	00	00	00	00	00	2C	44	63	CB	B5	CB	B5	00	00	80	01	.....,Dc˵˵..€ⵯ
0x000001C0	01	00	07	FE	FF	FF	3F	00	00	00	82	E4	50	09	00	00	ⵯ.ⵯþÿÿ?...‚äPⵯ..
0x000001D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	55	AA	..............Uª

D

LBA Scroll | Save Changes | Read-Only

Scan Settings

Method	Search
Sector Value (Hex)	00
Run in Reverse	No

Scan Progress
Scan | Pause | Stop

E

**Figure 50 - Sector Viewer**

Drive Selection

This section of the Sector Viewer provides the ability to select from or switch between drives for which sectors are displayed.

As is the case with the drives depicted above, the Drive Selection window also indicates if an HPA has been detected by marking the drive with ***HPA**. Similarly, if DCO Settings which affect drive size are in place, the drive will be marked with ***DCO**.

Navigation
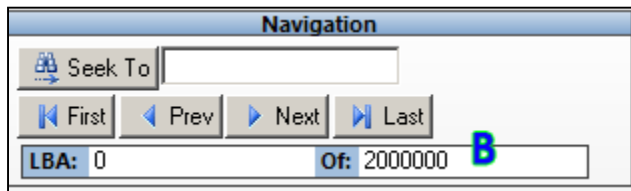
This section of the Sector Viewer provides the ability to move through sectors in a variety of ways.

Seek To
By entering an LBA value and clicking the 'Seek To' button, users may jump to a specific LBA.

First
Clicking the button marked 'First' will cause the sector viewer to display the first LBA.

Prev / Next
Clicking the buttons marked 'Prev' or 'Next' will cause the sector viewer to display one sector previous or one sector after the currently viewed sector.

Last
Clicking the button marked 'Last' will cause the sector viewer to jump to the last LBA.

The last line in this section displays the current LBA.

Drive Information
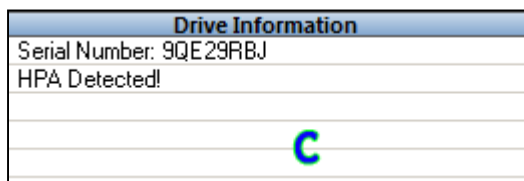
The Drive Information section presents the current drive's Serial Number. If an HPA or DCO is detected, this is indicated, as shown above.

Sector Viewer

Offset	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	ASCII
0x00000000	33	C0	8E	D0	BC	00	7C	FB	50	07	50	1F	FC	BE	1B	7C	3ÀŽĐ¼.|ûP\P\Pü¼□|
0x00000010	BF	1B	06	50	57	B9	E5	01	F3	A4	CB	BD	BE	07	B1	04	¿□□PW¹å□ó¤Ë½¾□±□
0x00000020	38	6E	00	7C	09	75	13	83	C5	10	E2	F4	CD	18	8B	F5	8n.|□u□ƒÅ□âôÍ<□õ
0x00000030	83	C6	10	49	74	19	38	2C	74	F6	A0	B5	07	B4	07	8B	ƒÆ□It□8,tö µ□´□<
0x00000040	F0	AC	3C	00	74	FC	BB	07	00	B4	0E	CD	10	EB	F2	88	ð¬<.tü»□.´□Í□ëò^
0x00000050	4E	10	E8	46	00	73	2A	FE	46	10	80	7E	04	0B	74	0B	N□èF.s*þF□€~□□t□
0x00000060	80	7E	04	0C	74	05	A0	B6	07	75	D2	80	46	02	06	83	€~□□t□ ¶□u0€F□□ƒ
0x00000070	46	08	06	83	56	0A	00	E8	21	00	73	05	A0	B6	07	EB	F□□ƒV□.è!.s□ ¶□ë
0x00000080	BC	81	3E	FE	7D	55	AA	74	0B	80	7E	10	00	74	C8	A0	¼□>þ}U×t□€~□.tÈ
0x00000090	B7	07	EB	A9	8B	FC	1E	57	8B	F5	CB	BF	05	00	8A	56	·□ë©<ü□W<õË¿□.ŠV
0x000000A0	00	B4	08	CD	13	72	23	8A	C1	24	3F	98	8A	DE	8A	FC	.´□Í□r#ŠÁ$?˜ŠÞŠü
0x000000B0	43	F7	E3	8B	D1	86	D6	B1	06	D2	EE	42	F7	E2	39	56	C÷ã<Ñ†Ö±□ÒîB÷â9V
0x000000C0	0A	77	23	72	05	39	46	08	73	1C	B8	01	02	BB	00	7C	□w#r□9F□s□¸□□».|
0x000000D0	8B	4E	02	8B	56	00	CD	13	73	51	4F	74	4E	32	E4	8A	<N□<V.Í□sQOtN2äŠ
0x000000E0	56	00	CD	13	EB	E4	8A	56	00	60	BB	AA	55	B4	41	CD	V.Í□ëäŠV.`»×U´AÍ
0x000000F0	13	72	36	81	FB	55	AA	75	30	F6	C1	01	74	2B	61	60	□r6□ûU×u0öÁ□t+a`
0x00000100	6A	00	6A	00	FF	76	0A	FF	76	08	6A	00	68	00	7C	6A	j.j.ÿv□ÿv□j.h.|j
0x00000110	01	6A	10	B4	42	8B	F4	CD	13	61	61	73	0E	4F	74	0B	□j□´B<ôÍ□aas□Ot□
0x00000120	32	E4	8A	56	00	CD	13	EB	D6	61	F9	C3	49	6E	76	61	2äŠV.Í□ëÖaùÃInva
0x00000130	6C	69	64	20	70	61	72	74	69	74	69	6F	6E	20	74	61	lid partition ta
0x00000140	62	6C	65	00	45	72	72	6F	72	20	6C	6F	61	64	69	6E	ble.Error loadin
0x00000150	67	20	6F	70	65	72	61	74	69	6E	67	20	73	79	73	74	g operating syst
0x00000160	65	6D	00	4D	69	73	73	69	6E	67	20	6F	70	65	72	61	em.Missing opera
0x00000170	74	69	6E	67	20	73	79	73	74	65	6D	00	00	00	00	00	ting system.....
0x00000180	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x00000190	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001B0	00	00	00	00	00	2C	44	63	CB	B5	CB	B5	00	00	80	01	.....,DcËµËµ..€□
0x000001C0	01	00	07	FE	FF	FF	3F	00	00	00	82	E4	50	09	00	00	□.□þÿÿ?...‚äP□..
0x000001D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	....
0x000001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	55	AA	..............U×

LBA Scroll ◀ ▶

☑ Save Changes ✔ Read-Only

The main section of the Sector Viewer displays the data found in the current sector. The data is provided in both hexadecimal and ASCII formats. Users may use the horizontal scroll bar to scroll forward and back through the available LBAs.

Enhanced Sector Viewer Functionality

CPR Tools has developed an add-on module for the Sector Viewer. Available as an add-on module[8], the Enhanced Sector Viewer includes the ability to edit data from within the sector viewer.

At the lower right of the Sector Viewer main window depicted above, users will notice the 'Read Only' button which is depressed. This indicates that read-only mode is enabled (the default setting for Sector Viewer.) Users of the Sector Viewer module who have not purchased the additional editing functionality (Advanced Sector Viewer), will see this button 'greyed out' and unavailable.

For those users who have purchased the Advanced Sector Viewer capability, the 'Read Only' button will be clickable, enabling the user to toggle between 'Read Only' and 'Read/Write' as shown in Figure 51 and Figure 52.
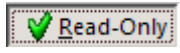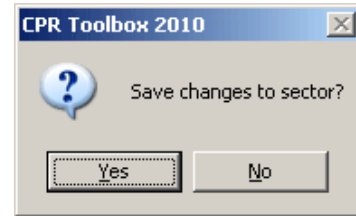

Figure 51 - Read Only Mode   **Figure 52 - Read/Write Mode**

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[8] Available as an add-on module; additional charges apply.

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Subsequent to committing any changes made while in 'Read/Write' mode, CPR Toolbox will prompt to confirm.
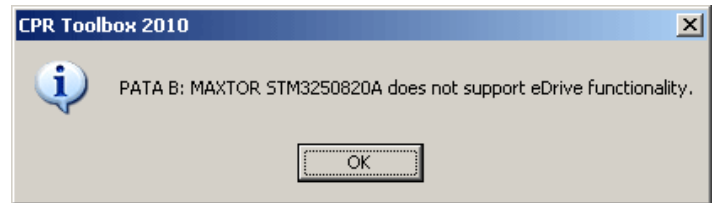
eDrive™

The eDrive™ module provides the ability to create errors on a drive attached to Side B of PSIClone™. This facility is useful for testing hardware, software or in training.

To launch eDrive™, highlight a drive attached to Side B of PSIClone™, then click 'Drive Utilities'/'eDrive'.

Not all drives support this function. When using a drive which does not support eDrive™, CPR Toolbox™ will present a message to this effect.

An updated list of known supported drives is available from the CPR Tools Website at http://www.cprtools.net/downloads.

When working with a drive which supports eDrive™ functionality, the main eDrive screen will be displayed, as depicted in Figure 53.
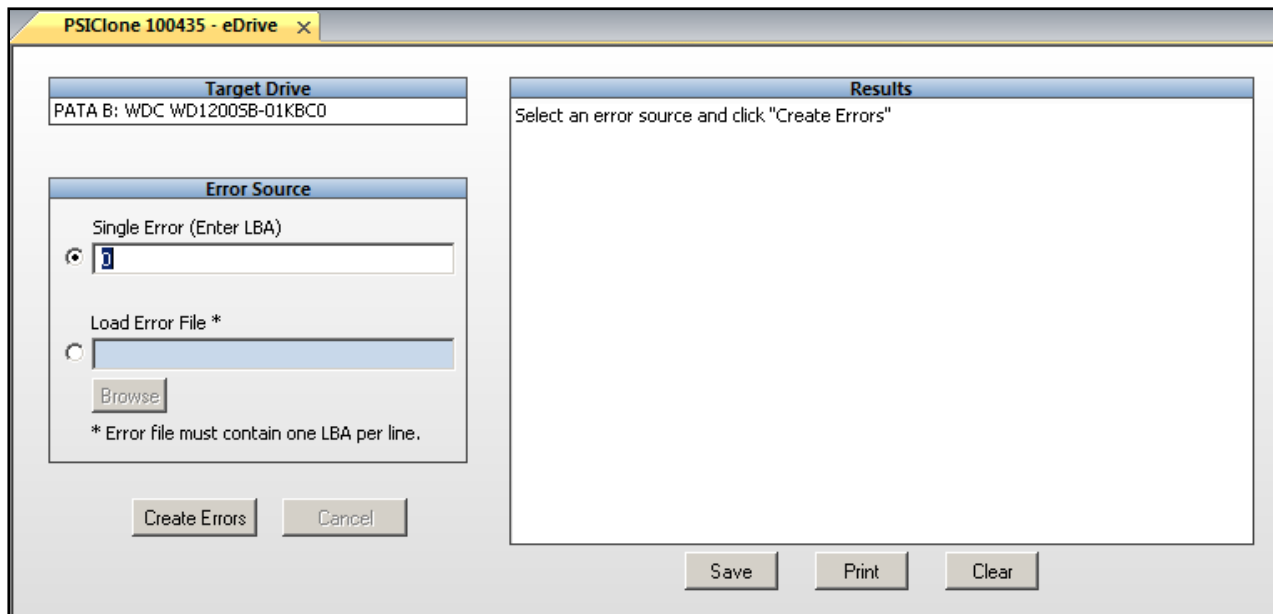
<div align="center">**Figure 53 - eDrive™ main screen**</div>

To generate an error on a single LBA, select the radio button labeled 'Single Error (Enter LBA). This is the default selection. Enter the LBA for which an error should be generated and click the 'Create Errors' button. eDrive™ will generate the error as requested. Output is shown in the 'Results' window at the right of the screen.

eDrive™ Tips:

Errors created using eDrive™ are 'Read' errors. Writing to these marked sectors will remove the read errors created by eDrive™.

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Figure 54 depicts a single error written to sector 63 of the subject drive.
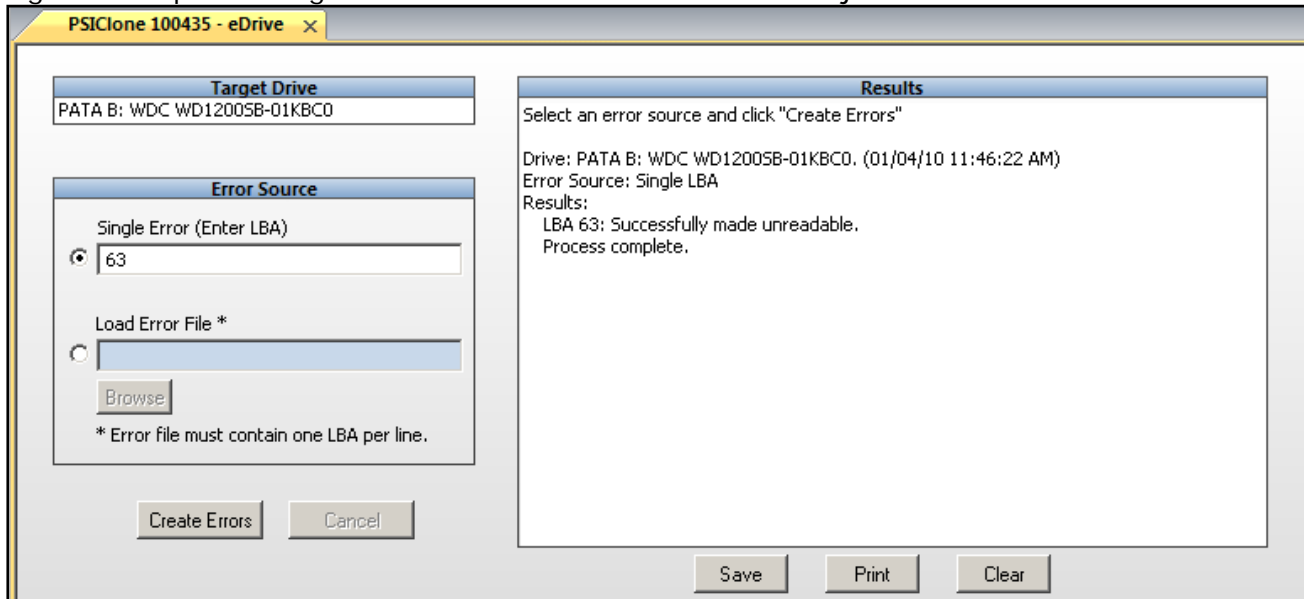
Figure 54 - eDrive™ has successfully marked sector 63 as unreadable

To mark multiple sectors as unreadable, the user may simply create multiple single sectors; alternately, an 'Error File' may be created. Error File(s) should be created as simple ASCII text files; the Windows utility 'notepad.exe' is suitable for the creation of Error Files which may be used with eDrive™.

Error Files for use with eDrive™ should contain one LBA per line. To load an Error File, select the radio button labeled 'Load Error File', then click the 'Browse' button. Navigate to the location where the error file was saved and click 'Open'. Upon successful loading of the Error File, eDrive™ will display the contents of the error file in the Results window, as shown in Figure 55.
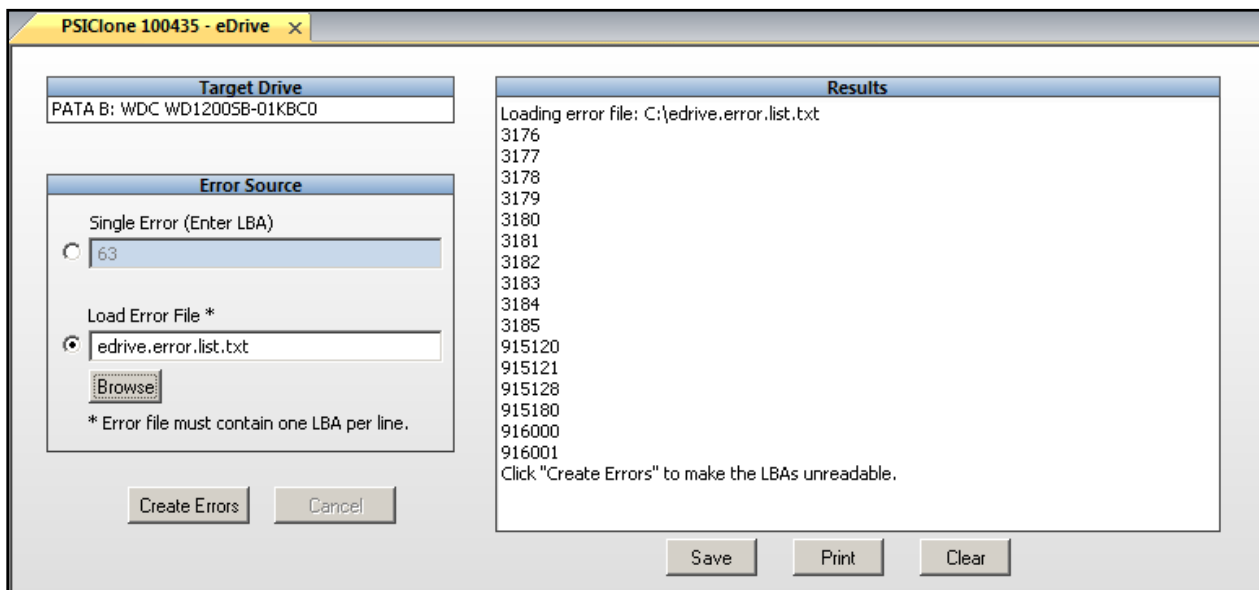
Figure 55 - eDrive™ has successfully loaded an Error File

Click 'Create Errors' to instruct eDrive™ to mark all sectors listed in the Error File as unreadable.

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Figure 56 depicts the output of the Results window after eDrive has marked the listed LBAs as unreadable.
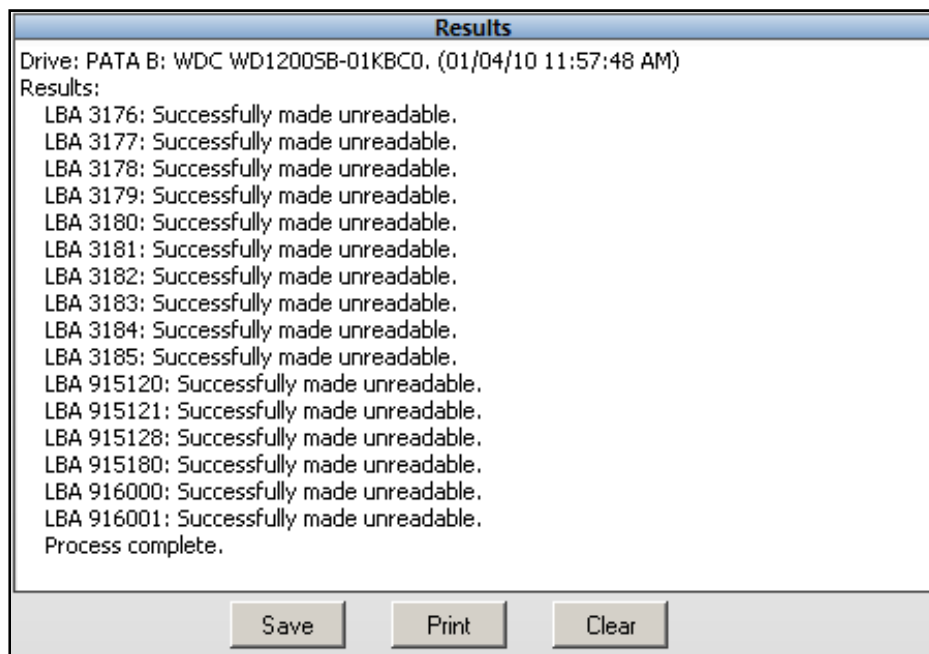
Figure 56 - eDrive has successfully marked all listed LBAs as unreadable

The output displayed in the Results window may be saved, printed or cleared using the buttons provided.

gClone™

A breakthrough in forensics, gClone allows the reading of physical sectors which have been listed in the drive's defect list, bypassing any remapping performed by the drive's defect mapping mechanism. Data found in sectors listed in the defect list will represent the last write to those sectors.

As the sectors being addressed have been marked as defective, not all attempts to read will be successful. Retry count levels are adjustable in the gClone™ screen.

CPR Toolbox™ Tips:

gClone™ does not support all hard drives.

If an unsupported drive is encountered, gClone™ will present a message box to that effect.

A list of currently supported drives is available from the CPR Tools website at http://www.cprtools.net/downloads

Launching a 'read' from this screen will instruct CPR Toolbox™ to first backup the data stored in the defect list's remapped sectors to ensure data integrity.

Only drives connected to Side A of PSIClone™ may be addressed by gClone™.

Data retrieved from these sectors may then be saved to the host system running CPR Toolbox™.

Figure 57 depicts the initial gClone™ screen.
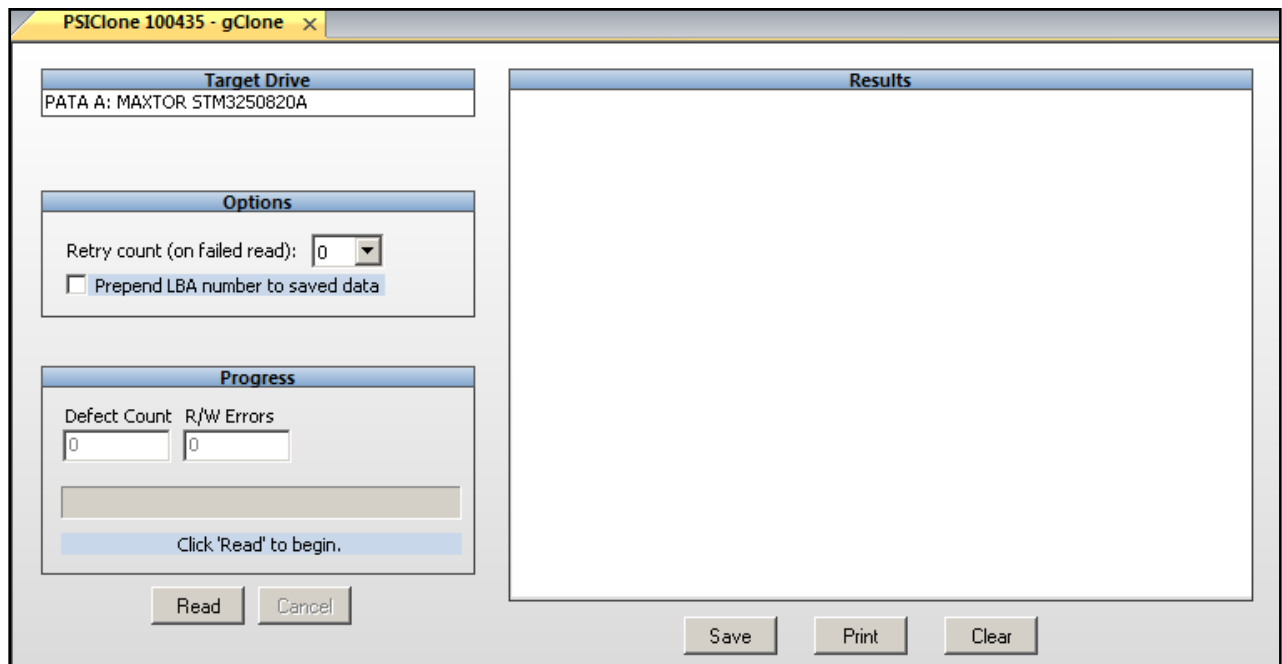
Figure 57 - Initial gClone™ screen

Before initiating gClone™, set a value for 'Retry Count'. The value entered here will provide CPR Toolbox™ and PSIClone™ with a limit to the retries attempted when a read error occurs. The default value is 0 (no retries).

Initiate gClone™ by clicking the 'Read' button. CPR Toolbox™ will present a 'Save As' dialog box for the user to select a storage location for the sector data. The data saved will be a binary (.bin) file. The default location for storage of the .bin file is C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite.

Click the 'Read' Button to initiate the gClone™ process. If no errors are found, CPR Toolbox™ displays a message.

If entries in the defect list are found, they are listed at the right of the screen.

During the gClone™ process, information is provided in the 'Results' window at the right of the screen.

If the checkbox labeled 'Prepend LBA number to saved data' is checked, the output will include the prepended LBA. This is shown encircled in red in Figure 60, located on page 84 of this guide.
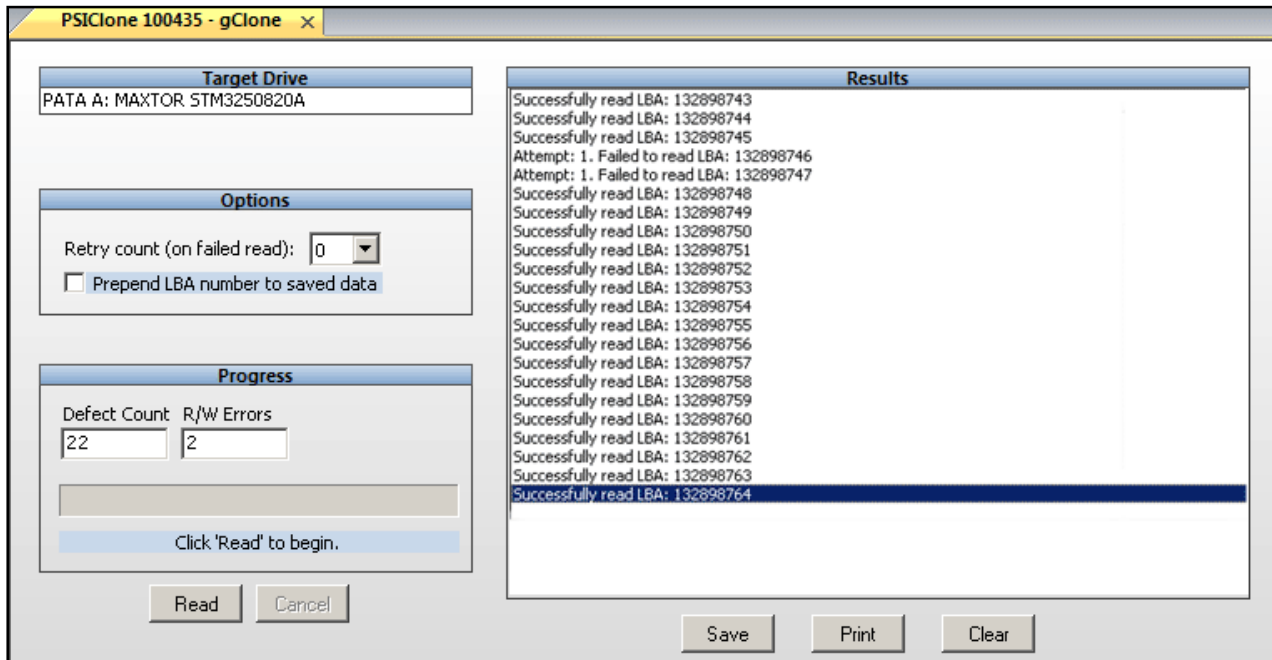
Figure 58 - gClone™ in process

When finished, gClone™ displays a completion message.
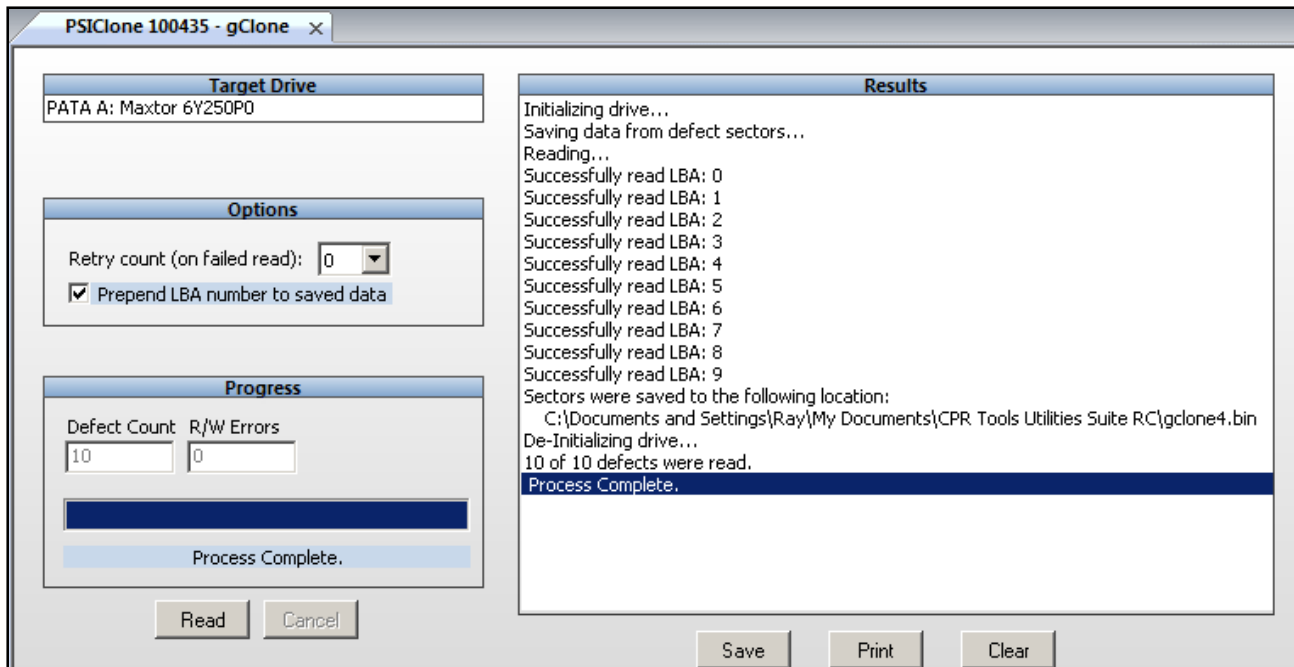
Figure 59 - gClone™ has completed

Figure 60 and Figure 61 depict samples of the stored .bin file as viewed in a hex-editor. Figure 60 shows actual data.

As the checkbox marked 'Prepend LBA number to saved data' was checked, the LBA from which the data has been saved is prepended to the data itself. Figure 60 shows this encircled in red.

Figure 60 - Data from defect-listed sector

Figure 61 represents a sector from which data was unable to be read.

```
4C 42 41 3A 20 20 20 31   33 32 38 39 38 37 34 36 | LBA:    132898746
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
53 45 43 54 4F 52 5F 4E   4F 54 5F 52 45 41 44 5F | SECTOR_NOT_READ_
```

Figure 61 - GClone was unable to read from a sector

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Recover

Clicking the 'Recover' button reveals six (6) submenu items.

These are:

- Image Restore
- Advanced Recovery[9]
- iFirmware™[9]
- Mount/Unmount Drive

Image Restore

Selecting 'Image Restore' launches the CPR Toolbox™ image restore module. The opening screen is presented in Figure 62.

Figure 62 - Image Restore initial screen

If an image fileset has been created using PSIClone™ and/or CPR Toolbox™, the Image Restore module can be used to restore the fileset to an attached destination drive. If the image fileset represents a working file system, the result will be a mountable file system on the destination drive. Using Image Restore requires the image fileset be available to the host operating system.

This may be accomplished in a number of ways. The first method is to attach the source drive (the drive containing the image fileset) directly to the host system's bus.

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[9] Available as an add-on module; additional charges apply.

The Image Restore module works with both compressed and uncompressed image filesets created by PSIClone™ and/or CPR Toolbox™. Compression settings are managed on the Device Options tab of CPR Toolbox™ or within the Options submenu directly on the PSIClone™ device.

Another method for working with image filesets is through the use of a new CPR Toolbox™ feature called 'Mount/Unmount Drive'. Using Mount/Unmount Drive, CPR Toolbox™ uses the PSIClone™ host USB connection to enable the host to see the source drive as a 'Removable Storage Device'.

Mount/Unmount Drive is discussed later in this User's Guide, in the section titled *Mount / Unmount Drive*, on page 120.

Regardless of the method used to attach the source drive to the host, a destination (target) drive also needs to be attached to the host. This destination drive will be the recipient of the reconstructed drive image.

Begin by selecting a directory which contains an image fileset. Once selected, segment files will appear in the box labeled 'Input Files'.

Figure 63 depicts the Image Restore screen after having selected an image fileset. The fileset in the example shown is made up of five (5) segments. Note that the destination drive for the restored image has been selected from the drop-down list of available drives.

> **CPR Toolbox™ Tips:**
> Any data present on the selected destination drive will be overwritten when the image is restored.
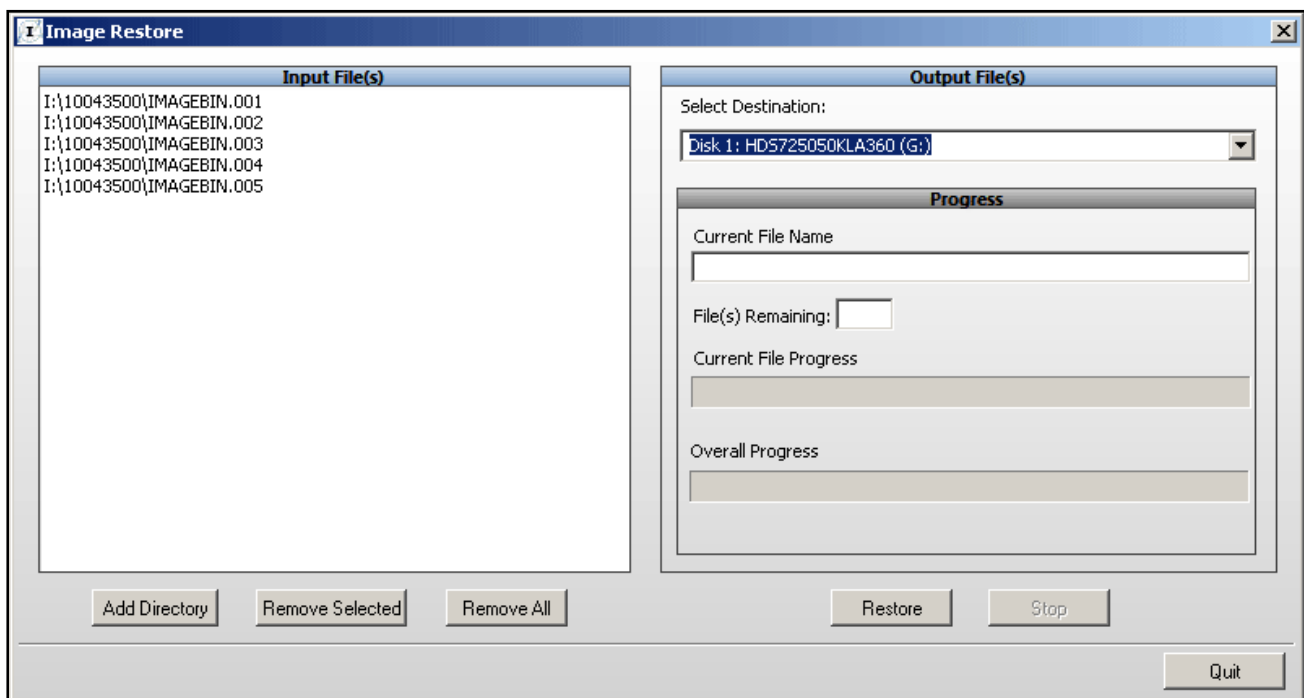
Figure 63 - Preparing to restore an image fileset

Clicking the 'Restore' button initiates the restore process. The restoration process may be monitored on the right side of the screen. As each file in the 'Input Files' list is processed, its filename will appear in the 'Current File Name' field.

The number of files queued for processing will be shown in the 'File(s) Remaining' field.

The 'Current File Progress' status bar shows the progress of the individual file being processed.

The 'Overall Progress' status bar shows the progress of the total restoration process.

Figure 64 depicts a restoration in progress.

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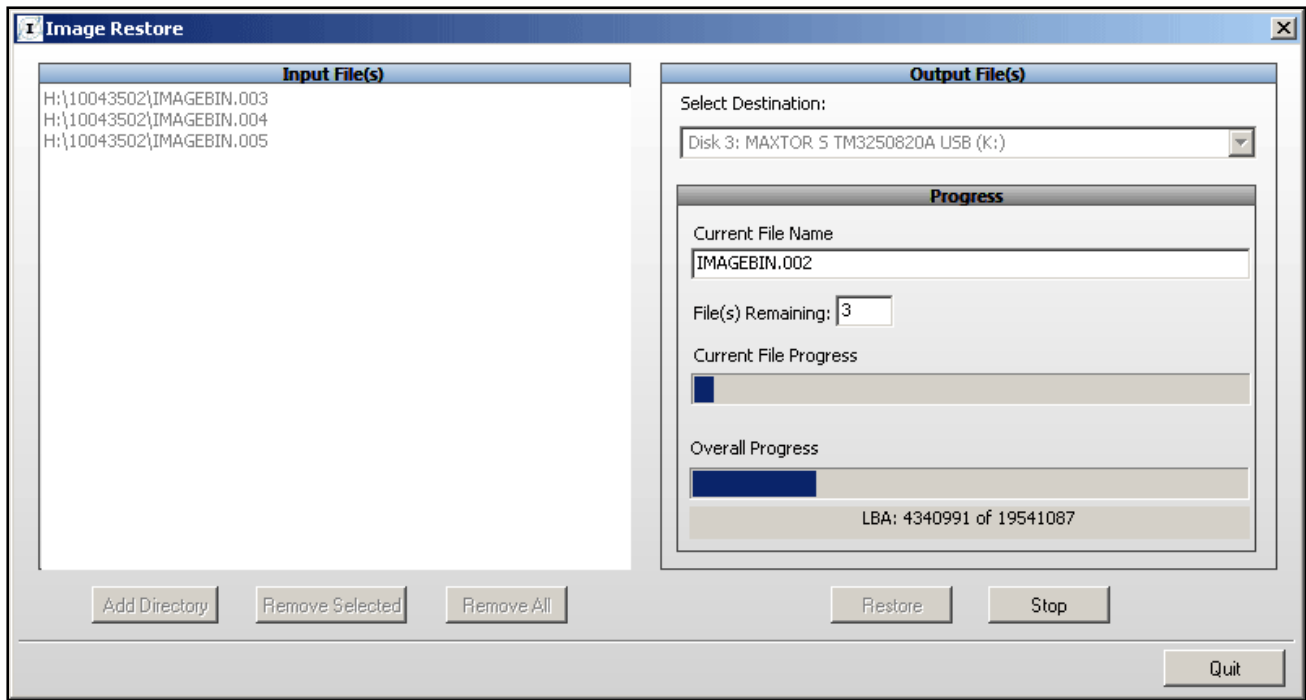
Figure 64 - Image restoration in progress

When the restoration is complete, Image Restore alerts the user.
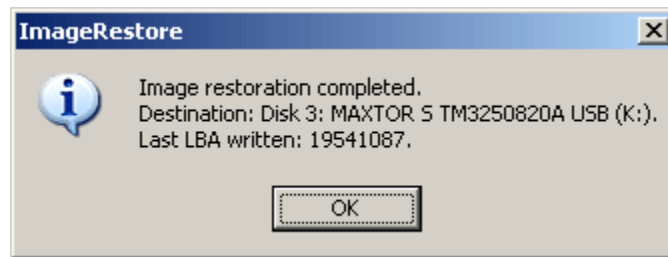
Figure 65 - Image Restoration has completed

Click 'OK' to clear the 'Image restoration completed' message. Click 'Quit' to close the Image Restore module and return to CPR Toolbox™.

Advanced Recovery[10]

Beginning with this release, CPR Toolbox™ includes the ability to perform advanced data recovery techniques. The goal of the Advanced Recovery module is to provide methods for cloning drives which have errors. Advanced Recovery (AR) features can be enabled by purchasing the add-on module from CPR Tools (http://www.cprtools.net/store).

Once enabled, AR provides the ability to:
- Customize recovery algorithms
- Apply Software Head Maps
  o Created in the module command drop-down menu of the iFirmware™[10] module
- Perform Hot Swaps of drive PCBs
- Save specific custom algorithms for re-use or modification
- Keep detailed notes for each recovery effort
- Keep forensic logs of all actions (Journal functions)

Selecting the Advanced Recovery menu item displays the initial AR screen.
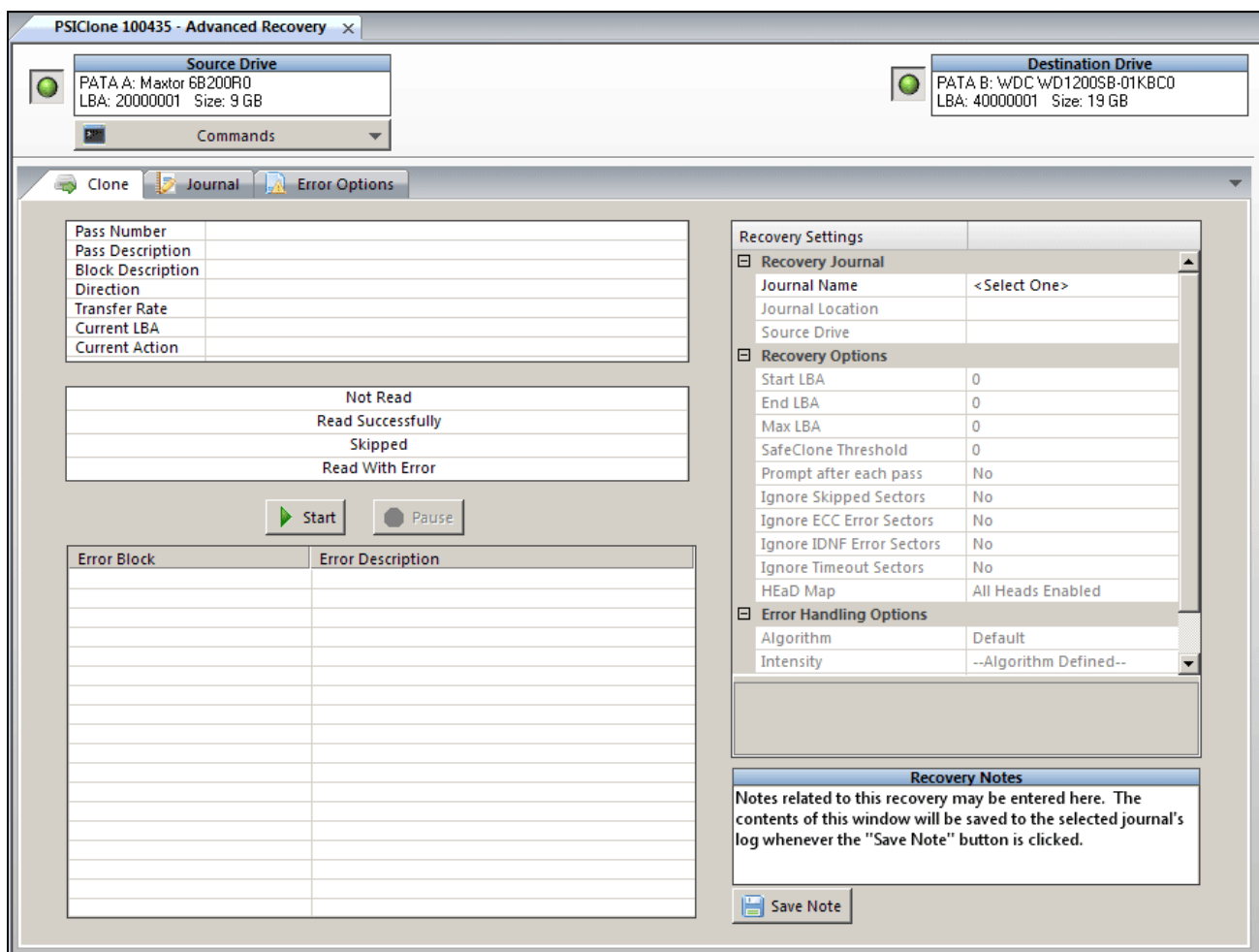
Figure 66 - Advanced Recovery, initial screen

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[10] Available as an add-on module; additional charges apply.

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The topmost section of the AR screen shows connected drives.
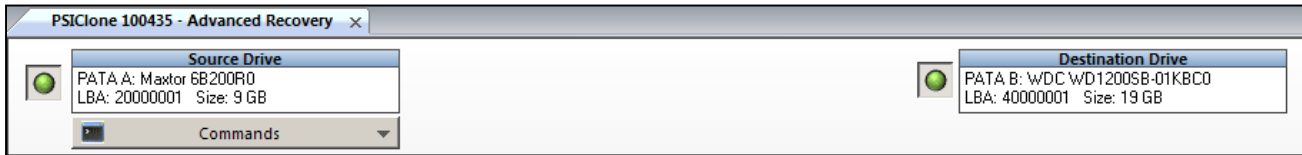
Figure 67 - Drives connected to PSIClone™ - Advanced Recovery

As with the Control Panel module, drive power is controlled by the two button indicators to the left of each drive shown. Figure 67 depicts both drives powered; the buttons show 'green'.

Commands

Beneath the 'Source Drive' shown at left, a Commands drop-down button is visible. Clicking 'Commands' reveals eight (8) menu choices. These are:

1. Hard Reset
2. Soft Reset
3. Identify
4. Hot Swap
5. SMART on
6. SMART off
7. Enable Read Cache
8. Disable Read Cache
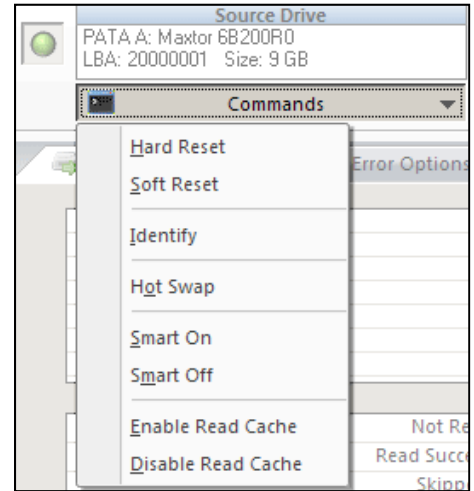
All 'Commands' actions affect the drive connected to Side A (Source Drive) of PSIClone™.

Hard Reset
Selecting Hard Reset will cause the drive to be hard reset. Once the reset has completed, CPR Toolbox™ presents a message box.

Soft Reset
Selecting Soft Reset will cause the drive to be issued a soft reset command. Once the reset has completed, CPR Toolbox™ presents a message box.

Identify
Selecting Identify will issue an ATA Identify Device command to the drive. Output from the command is displayed in a message window.

Clicking 'Save' will allow for saving the data as a plain text file. The default location is C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite.

Attribute	Value/Supported	Enabled
----- Device Information -----		
Model	Maxtor 6B200R0	
Serial	B6117S2H	
Firmware	BAH41BM0	
Total LBA 28-bit	20000001	
Total LBA 48-bit	20000001	
Number of Logical Cylinders	16383	
Specific Configuration	51255	
Number of Logical Heads	16	
Sectors Per Track	63	
Number of Current Logical Cylinders	16383	
Number of Current Logical Heads	16	
Number of Logical Sectors per a Track	63	
Number of Current Sectors	16514064	
Advanced PIO Mode	3	
Min Multi-Word Transfer Time	120 ns	
Recommended Multi-Word Transfer Time	120 ns	
Min PIO Transfer Time	120 ns	
Min PIO Transfer Time with Flow Control	120 ns	
Current Advanced Power Managment	0	
Trusted Computing Group Feature Set	Supported: No	
Free-fall Control Sensitivity Level	Vendor Recommended	
----- Device Capabilities -----		
DMA	Supported: Yes	
LBA	Supported: Yes	
Disabling of IORDY	Supported: Yes	
IORDY	Supported: Yes	
ATA Spec Standby Values	Supported: Yes	
Device Specific Standby Timer Minimum	In Use: Yes	

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Hot Swap

Hot Swapping a known-good PCB from a donor drive onto a recovery subject drive should be considered when the recovery subject appears physically sound but exhibits issues which are likely attributed to firmware corruption.

When recovery efforts include the need to hot swap a PCB from a suitable donor drive to a recovery subject, connect the donor drive to Side A of PSIClone™, power the drive and select Hot Swap.

CPR Toolbox™ will present a message box to verify that the donor drive is powered.

If the drive is not powered, click No. CPR Toolbox™ will prompt with an additional message box and provide an opportunity to connect and power the donor drive.
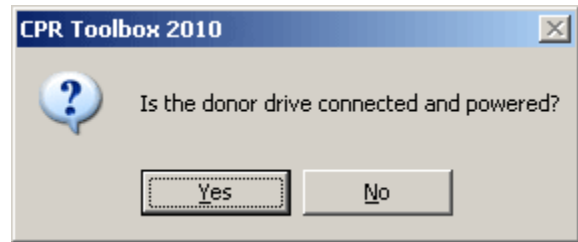
If the donor drive is connected to Side A of PSIClone™ and is powered, click 'Yes'; doing this will cause the donor drive to be placed into 'Standby'. CPR Toolbox™ will present a message box with instructions, as depicted in Figure 68.
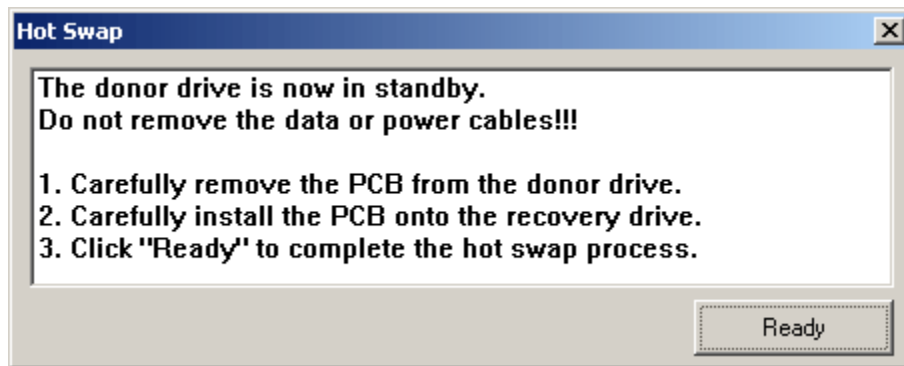
Figure 68 - Hot Swapping a PCB

Click 'Ready' to complete the hot swap process. CPR Toolbox™ and PSIClone™ will attempt to bring the drive out of 'Standby' mode and into a ready state. When complete, a message is displayed.
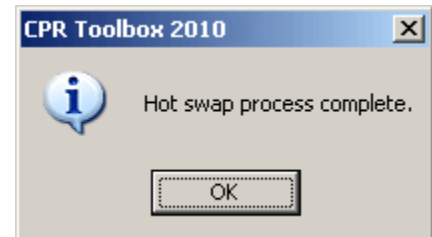
Best Practices for using Hot Swap functionality:

CPR Tools recommends first obtaining a suitable donor drive. Prior to performing a Hot Swap, copy all firmware modules from the donor drive to the host system running CPR Toolbox™. This may be done through the use of the iFirmware™ module, which is a fee-based add-on.

Once the donor drive's firmware has been saved, connect the donor drive to Side A and prepare to hot swap the 'good' PCB onto the recovery subject.

Smart On

Select 'Smart On' to turn on the S.M.A.R.T. feature set for the drive attached to Side A of PSIClone™. CPR Toolbox™ displays a confirmation message.
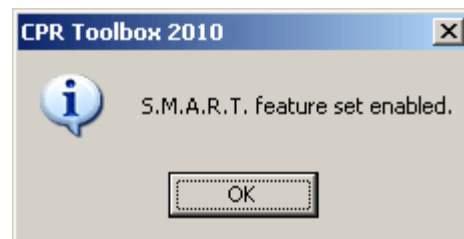
If the S.M.A.R.T. feature set is already enabled, CPR Toolbox™ presents a message to that effect.
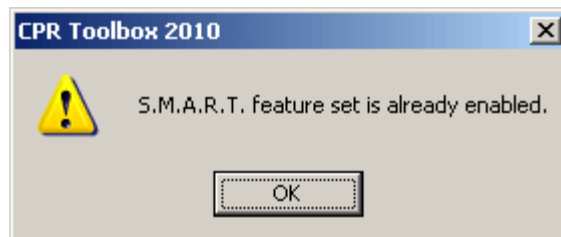
Smart Off

Select 'Smart Off' to turn off the S.M.A.R.T. feature set for the drive attached to Side A of PSIClone™. CPR Toolbox™ displays a confirmation message.
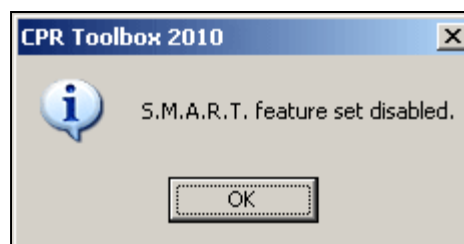
If the S.M.A.R.T. feature set is already disabled, CPR Toolbox™ presents a message to that effect.
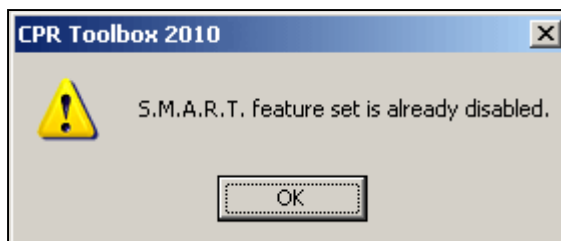
Enable Read Cache

Select 'Enable Read Cache' to enable the read cache for the drive attached to Side A of PSIClone™. CPR Toolbox™ displays a confirmation message.
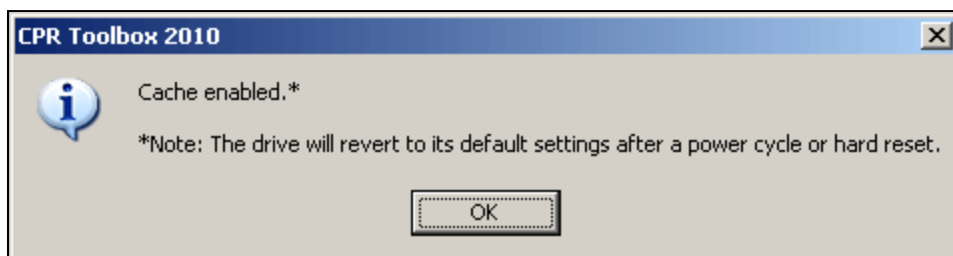
Disable Read Cache

Select 'Disable Read Cache' to disable the read cache for the drive attached to Side A of PSIClone™. CPR Toolbox™ displays a confirmation message.
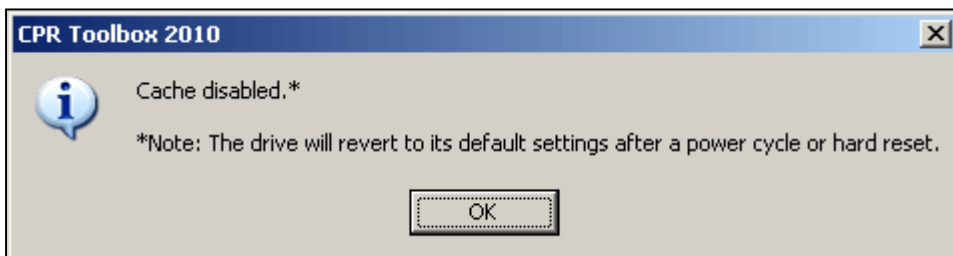
Advanced Recovery - The Clone Tab

As stated earlier, the Advanced Recovery cloning capability was designed for working with drives which contain errors that require special handling. Key features of the Advanced Recovery module include the ability to create custom algorithms when working with difficult recovery subjects. Prior to describing the methods for using Advanced Recovery, a definition of certain terms used in reading from drives is in order.

Advanced Recovery Terms
- Jumper
  - Jumper reads sectors until an error is encountered. When an error is encountered, a pre-defined number of sectors is skipped/jumped over; reading of sectors is then resumed.
- Refiner
  - Refiner reads sectors until an error is encountered. When an error is encountered, Refiner will approach the error sector from the opposite side of the current read direction in an attempt to read as much data as possible before re-encountering the error sector.
- Attacker
  - Attacker uses PIO mode exclusively and attempts to read sectors marked as error sectors.
- Algorithm
  - An Advanced Recovery Algorithm is an instruction set. The default algorithm provided consists of one Jumper, one Refiner and one Attacker pass. Users may create and save custom algorithms using any combination of passes and/or specific error recovery options.[11]
- Journal
  - An Advanced Recovery Journal is a record of all recovery actions taken for a given drive and provides a detailed, forensically sound audit trail.

> **Advanced Recovery Tips:**
>
> Each of the three (3) types of passes / algorithms defined
>
> - Jumper
> - Refiner
> - Attacker
>
> can be further configured for number of retries and direction, as well as many more options, all of which will be discussed further.

Creating a Journal

Attempting to recover data using the Advanced Recovery module requires that a journal be created. This may be accomplished at the right side of the main screen or from the Journal tab.

Users may enter a Journal name, brief description and complete the 'Recovery Options' and 'Error Handling Options' sections. Once the journal has been successfully configured, click 'Create'.

Create New Journal	
Recovery Journal Creation	
Journal Name	Enter Name
Journal Description	Enter Brief Description
⊟ **Recovery Options**	
Start LBA	0
End LBA	20000000
SafeClone Threshold	0
Prompt after each pass	No
Ignore Skipped Sectors	No
Ignore ECC Error Sectors	No
Ignore IDNF Error Sectors	No
Ignore Timeout Sectors	No
⊟ **Error Handling Options**	
Algorithm	Default
Intensity	--Algorithm Defined--

[Create]   [Cancel]

Figure 69 - Creating a Journal

---

[11] This guide uses the term 'algorithm' to refer to a collection of one or more 'passes' configured for a data recovery effort

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Recovery Settings

Recovery Journal
The Recovery Journal section displays the selected Journal Name, Journal Location and Source Drive.

Recovery Options
Users may choose to specify Recovery Options and Error Handling Options. These are depicted in Figure 70. By default, the Start and End LBA fields will be populated by the first and last logical sector of the drive connected to Side A of PSIClone™. If so desired, users may set specific start and end LBAs for the recovery effort.

- Start LBA
    - o Enter LBA at which the clone should begin
- End LBA
    - o Enter the LBA at which the clone should stop
- MaxLBA
    - o Non-editable. This value represents the current max of the drive.
- SafeClone Threshold
    - o Specifies the number of errors which must be reached before the drive is shut down. A value of zero (0) means 'never shut down'
- Prompt after each pass
    - o Set to Yes to be prompted after each pass
- Ignore Skipped Sectors[12]
    - o Set to Yes to Ignore Skipped Sectors
- Ignore ECC Error Sectors[12]
    - o Set to Yes to ignore sectors which have ECC errors
- Ignore IDNF Error Sectors[12]

    - o Set to Yes to ignore sectors which have IDNF errors
- Ignore Timeout Sectors[12]
    - o Set to Yes to ignore sectors which timeout
- HEaD Map[13]
    - o Head Enabling and Disabling (HEaD Map) is a software head mapping facility available to users who have purchased the iFirmware module. Through use of HEaD Map, users may instruct PSIClone™ to disregard signals received on specific heads.

As each field is highlighted, descriptive help text is displayed. In Figure 70, this area is shown encircled in red.

Users may modify each field as needed or accept the displayed settings.

Figure 70 - Recovery Options

---

[12] Applicable to 'attacker' pass only

[13] Available as an add-on module; additional charges apply.

Error Handling Options

Algorithm

Select a pre-defined algorithm from the drop down list. Users may create custom algorithms using the 'Error Options' tab discussed later in this guide.

Intensity

Settings may be:

- Algorithm Defined
    - o Select this to allow the selected algorithm determine number and type of passes
- Off
    - o Select 'Off' to instruct CPR Toolbox to proceed with the following paradigm:
        - ECC err: 0 retries, Do Nothing
        - IDNF err: 0 retries, Do Nothing
        - Timeout: 0 retries, Do Nothing
- Light
    - o Select 'Light' to instruct CPR Toolbox to proceed with the following paradigm:
        - ECC err: 1 retry, soft reset
        - IDNF err: 1 retry, soft reset
        - Timeout: 1 retry, soft reset
- Moderate
    - o Select 'Moderate' to instruct CPR Toolbox to proceed with the following paradigm:
        - ECC err: 3 retries, hard reset
        - IDNF err: 3 retries, hard reset
        - Timeout: 3 retries, hard reset
- Aggressive
    - o Select 'Aggressive' to instruct CPR Toolbox to proceed with the following paradigm:
        - ECC err: 6 retries, hard reset
        - IDNF err: 6 retries, hard reset
        - Timeout: 6 retries, hard reset

The 'Recovery Notes' section may be used to enter notes specific to the recovery effort. The contents of the 'Recovery Notes' window will be saved to the journal's log each time the 'Save Note' button is clicked.

Figure 71 depicts the Clone tab after selecting a Journal, setting Recovery and Error Handling Options. Note that the progress area, encircled in red, displays a 'Not Read' of value of 20,000,001 sectors. This represents the total sectors (0 through 20,000,000). The progress area also displays values for number of sectors read successfully, number of sectors skipped (this pass) and the number of sectors read with errors.
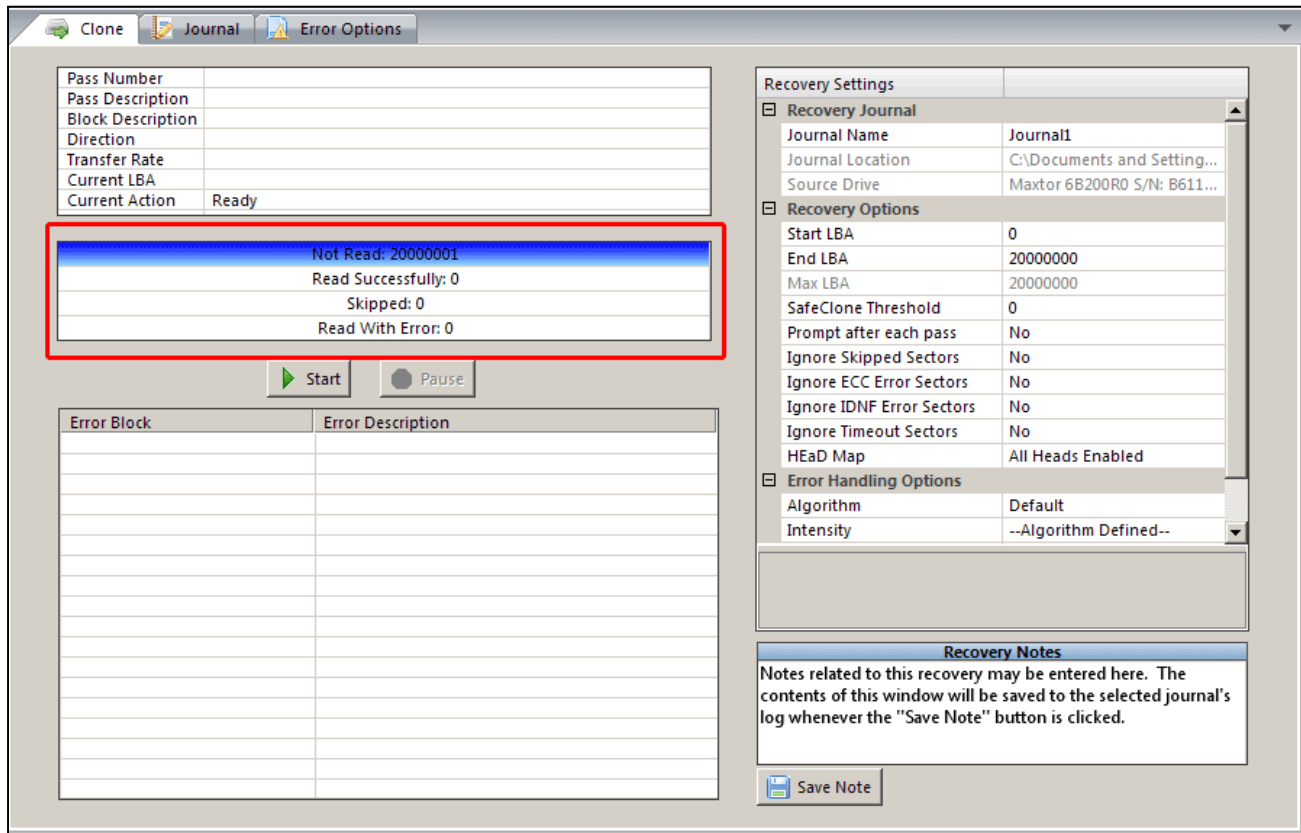
Figure 71 - Ready to being cloning with Advanced Recovery

To begin the cloning process, click the 'Start' Button.
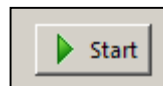
When a clone is initiated, the progress area will begin to provide indications which describe the progress of the clone.

Pass Number	1 of 3
Pass Description	Jumper
Block Description	Block 1 of 1 : [2461696 - 20000000]
Direction	Forward
Transfer Rate	Auto
Current LBA	2461696
Current Action	Cloning
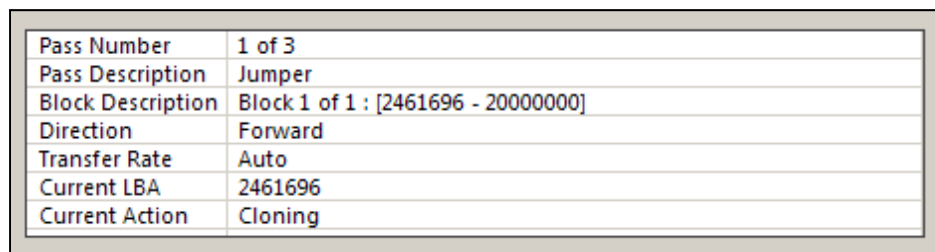
Figure 72 - Information Area during a clone process

The information area, shown in Figure 72, provides important information regarding current action being performed.

The 'Block Description' is useful in that it provides a view of the block currently being acted upon.

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The progress area provides additional information about the current action. The topmost line indicates the number of sectors not yet read. As the clone progresses, this number decreases and the blue progress bar moves from right to left.

The second line indicates the number of sectors which have been read successfully. As sectors are read, the green progress bar moves from left to right.

The third line indicates the number of sectors skipped while the fourth shows how many sectors were read with errors. Progress indicators on Skipped and Read with Error are yellow and red, respectively.

At the bottom of Figure 74, arrows indicate the direction of the clone. In the example shown, the current pass moves backwards through the available LBAs. This is indicated by the blue arrow at left. A pass moving forward would be indicated by the right arrow being illuminated. The Pause button may be used to interrupt a clone process.
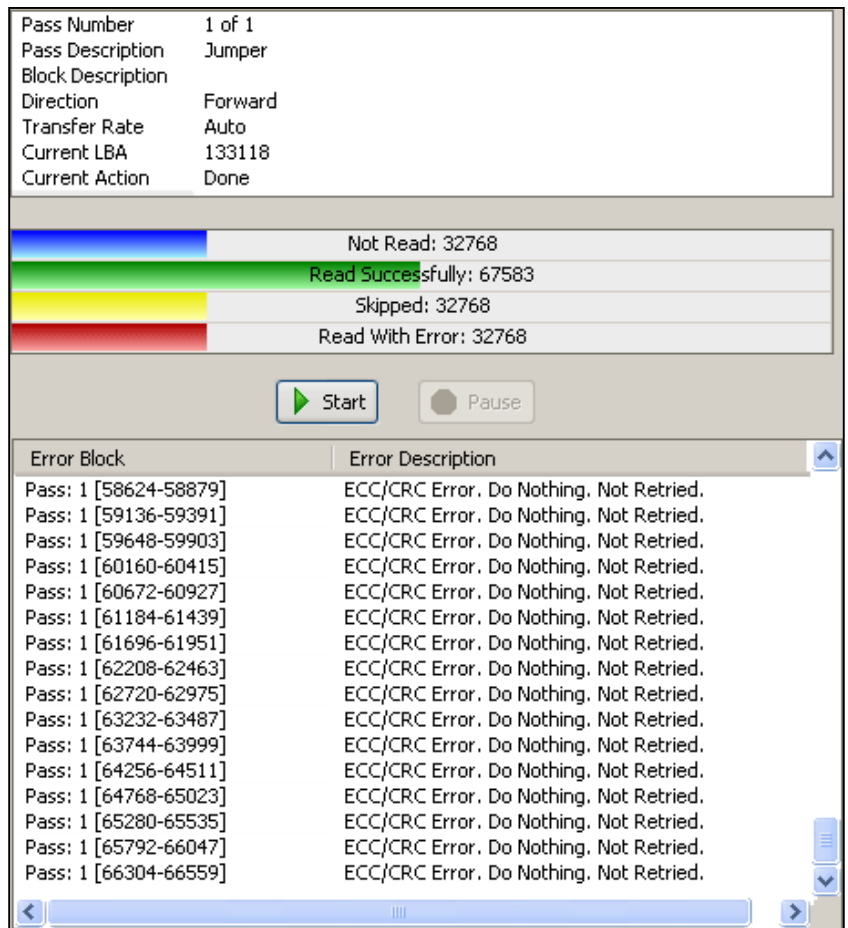
Figure 73 - Advanced recovery clone in process

Figure 74 - Clone proceeds in reverse

If a clone has been paused previously, the 'Start' button becomes available. Clicking 'Start' will cause CPR Toolbox to ask if the previously paused clone should be resumed or if a new clone should be initiated.

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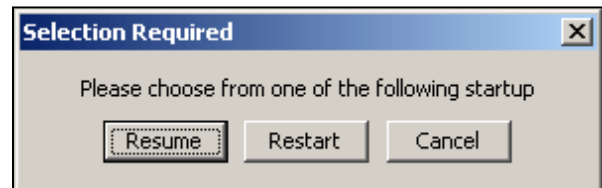
The Journal Tab

The Journal Tab provides an easy to use, thorough view of the recovery effort with which it is associated.
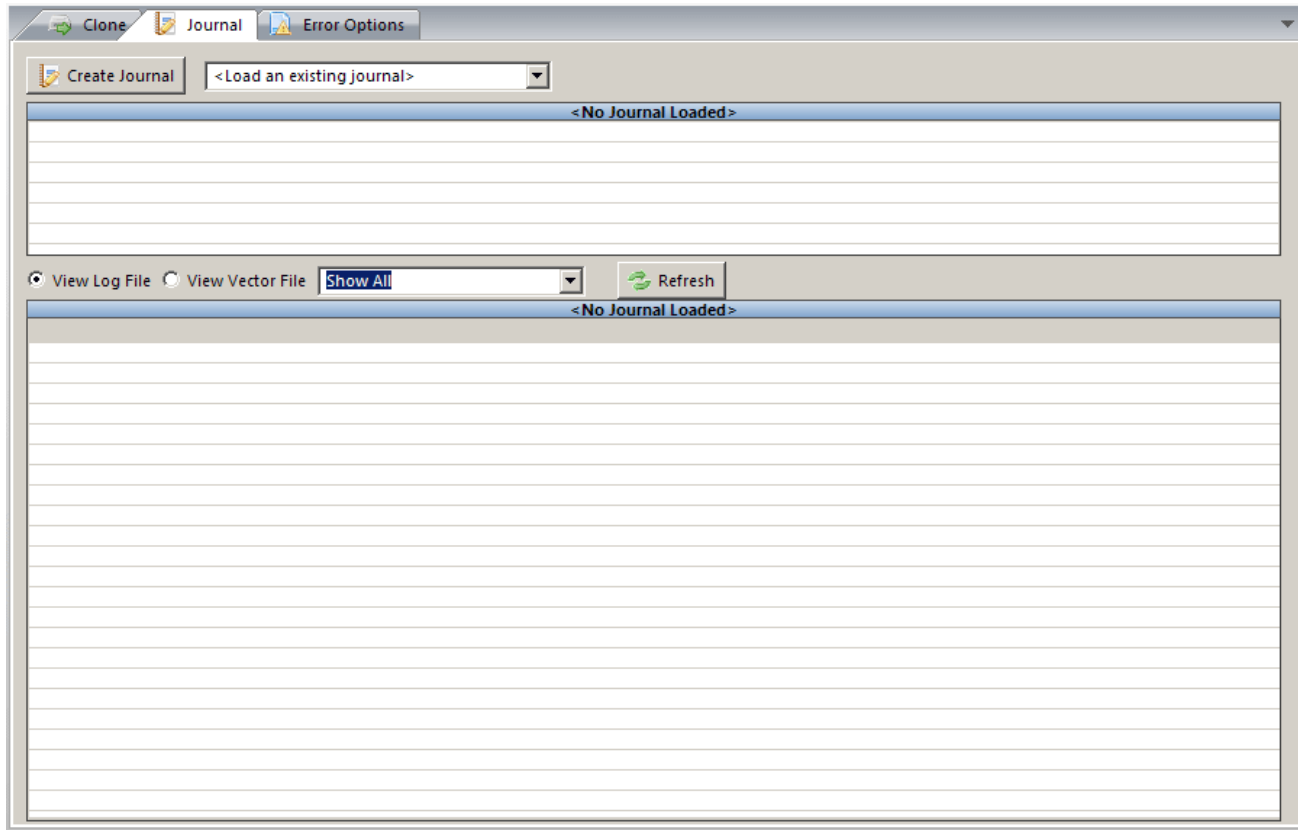
Figure 75 - The Journal Tab

Figure 75 depicts the Journal Tab prior to selecting a recovery effort's journal. The 'Create Journal' button may be used to create a new journal. Creating a Journal is described in the section titled *Creating A Journal*, on page 93.

Figure 76 depicts the Journal tab after having selected a Journal which is associated with a recovery effort
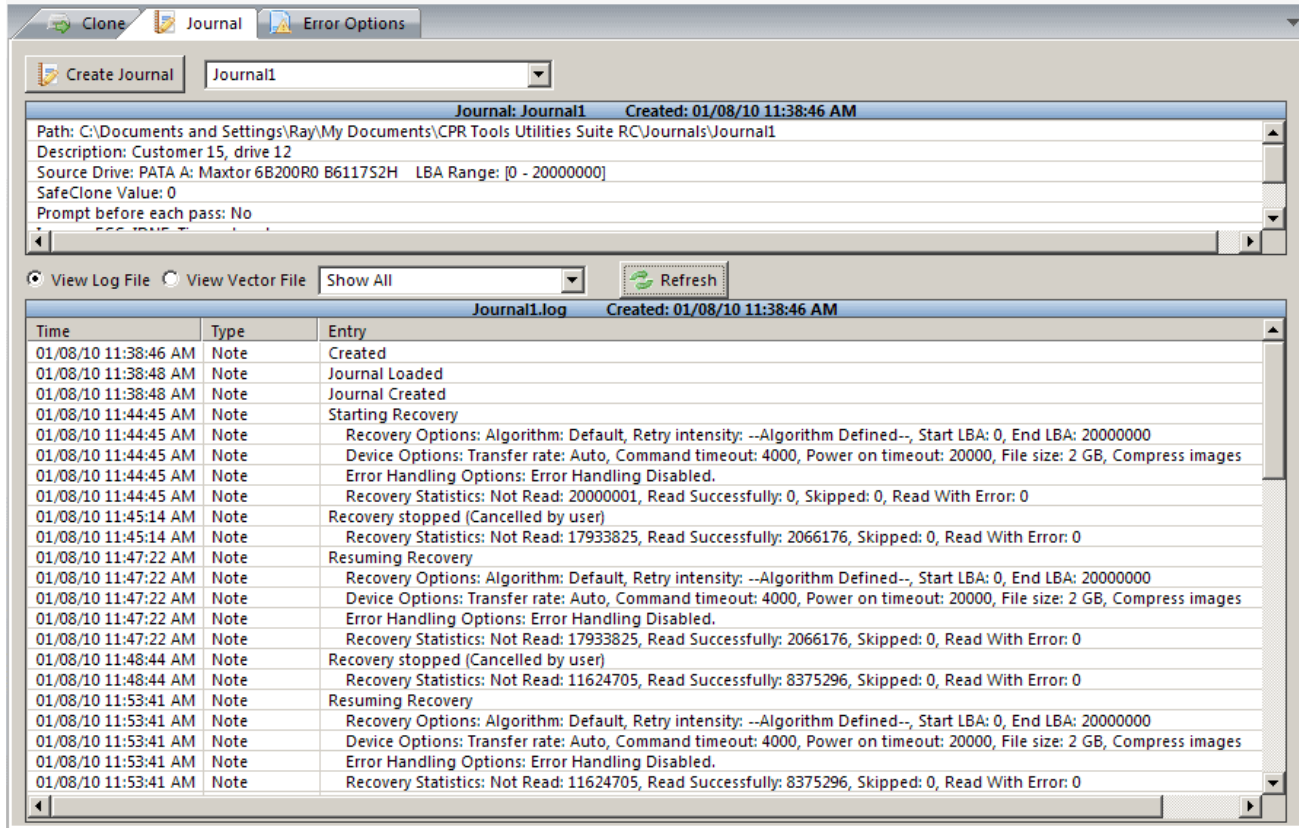
Figure 76 - The Journal Tab - Recovery Data Shown

A journal may be viewed during the recovery effort. For this reason, a 'Refresh' button is available so that current actions can be refreshed to the screen.

Figure 76 depicts a view of the log file; clicking the radio button labeled View Vector File will change the view to show vector details. Figure 77 depicts the Journal Tab while showing a vector file for the current recovery.
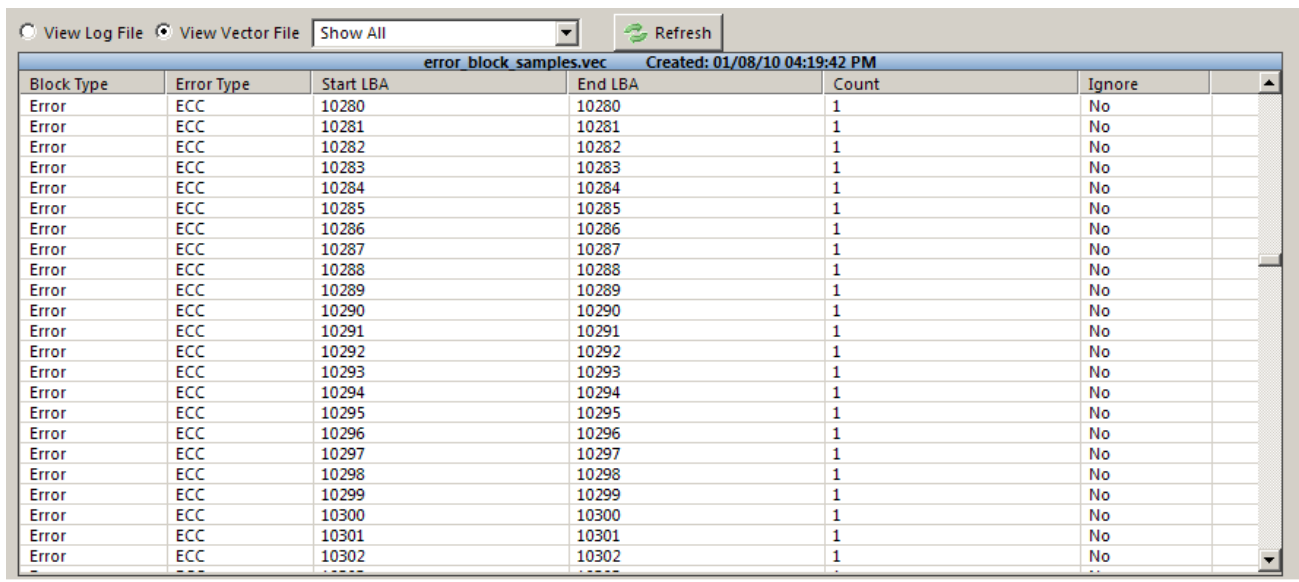
Figure 77 - Vector file for the selected Journal

The Error Options Tab

A key feature of the CPR Toolbox™ Advanced Recovery module is the ability to customize error handling options. This facility is provided by the Error Options tab. Users may design specific methods for each pass using the fields at left.
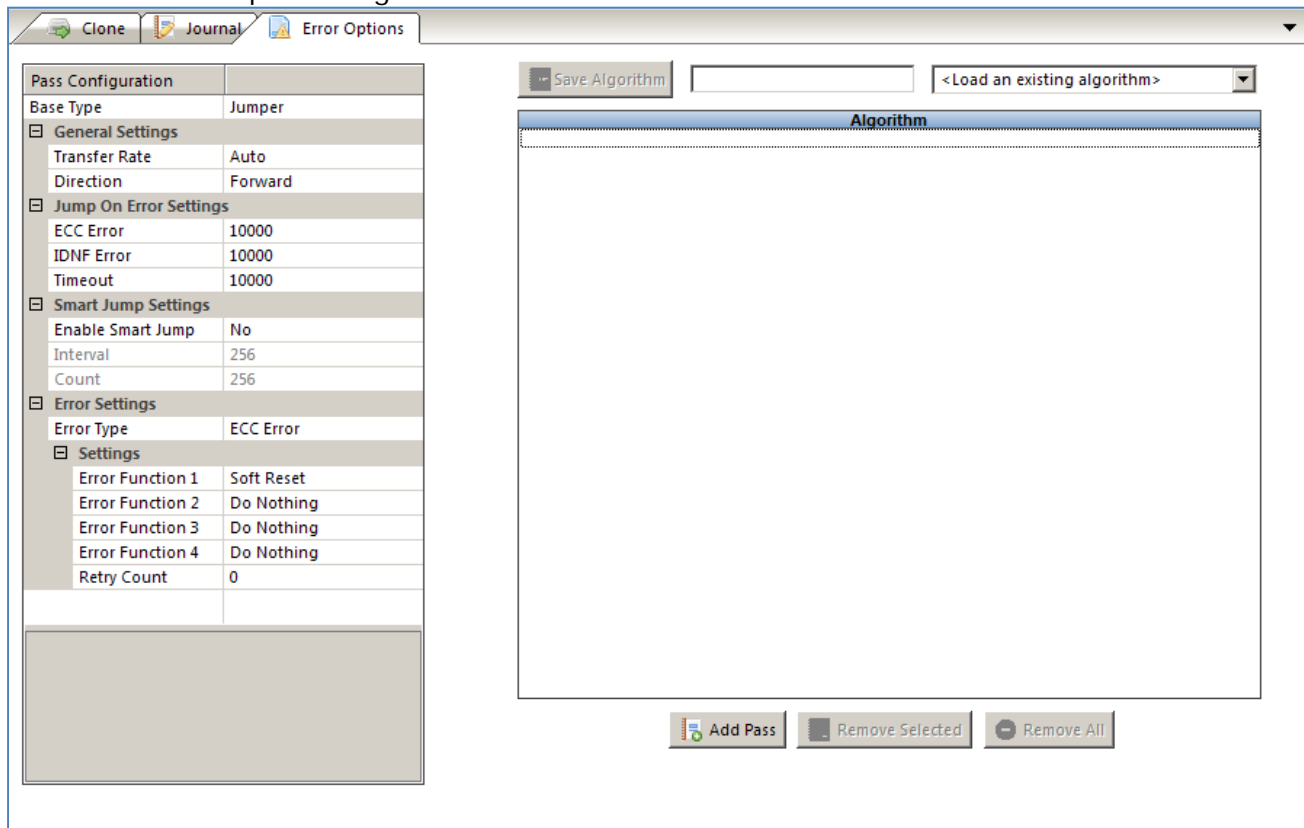
Figure 78 - Advanced Recovery - The Error Options Tab

Select a Base Type. Valid selections are Jumper, Refiner and Attacker. These terms are defined in this guide in the section titled Advanced Recovery - The Clone Tab, on page 93. Selecting one of the Base Types will fill in the remaining fields with default values. Figure 78 shows the default values for 'Jumper'. Default values for 'Refiner' and 'Attacker' are shown below.
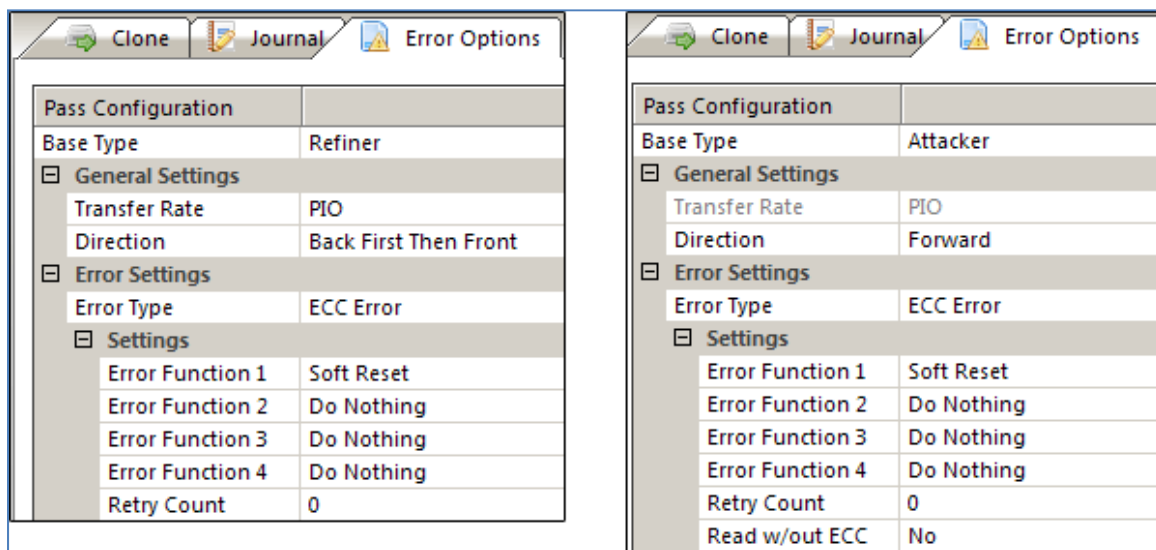
Figure 79 - Refiner and Attacker default values

Customize values for any one of the Base types, then click 'Add Pass' to add that configuration to the list at right. Users may choose to add one or more passes, specifying values for each. These instruction sets are referred to as algorithms and may be saved for future use; in this way users are granted the ability to create base algorithms for handling specific models or families of drives.

To save a constructed algorithm, provide a name and click the 'Save Algorithm' button at top. Figure 80 shows a custom algorithm ready to be saved. The 'Save Algorithm' button and name entry field are encircled in red.
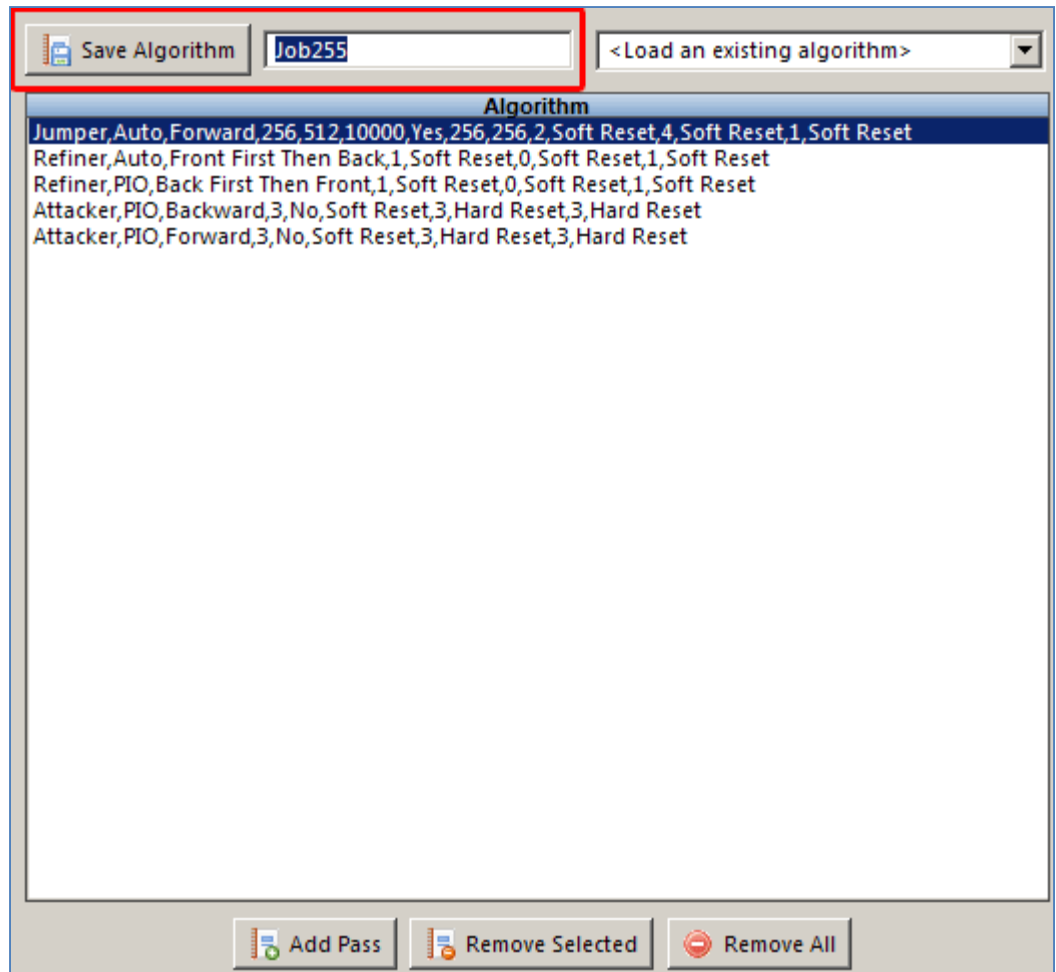
Figure 80 - Saving a custom algorithm

iFirmware™[14]

Beginning with this release, CPR Toolbox™ includes the ability to perform firmware manipulation on supported drives. The goal of the iFirmware™ module is to provide methods for copying, saving, repairing and replacing firmware modules. iFirmware™ features can be enabled by purchasing the add-on module from CPR Tools (http://www.cprtools.net/store).

As working with hard drive firmware often includes working with drives which have firmware problems, CPR Tools recommends that all drives are powered off prior to launching the iFirmware™ application.   This will ensure that no commands, other than those specified by the user, are being sent to the drive.

The iFirmware™ application allows the user to perform the following advanced actions on firmware modules:

- Read
- Edit
- Write
- Backup
- Restore
- Repair

Additionally, iFirmware™ allows for:

- Enabling and disabling of heads
- Service Area Verification
- Alternate Resource Drive Start (ARDS)
- Automatic Identification & Repair (AIR)

Reading firmware modules from an attached drive

Features of this portion of the application include the following functionality:

- Read and store hard drive profiles to the host system
    - o Hard drive profiles refer to a folder structure established to contain collected information pertaining to a given hard drive.
        - Profiles are saved to the host system in `C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite RC\iFirmware\` in folders which use the Drive Manufacturer, Model and Serial Number as the folder name. Example: `C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite RC\iFirmware\Maxtor 4D040H2_D204W44E`
- Read and store individual firmware modules to the host system
    - o Individual firmware modules are saved to `C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite RC\iFirmware\<profile>\Modules`

---

[14] Available as an add-on module; additional charges apply.

To read firmware modules from a hard drive, connect a drive to either side of PSIClone™ and launch CPR Toolbox™.

Select iFirmware™ from the 'Recover' button on the toolbar. CPR Toolbox™ will present the screen depicted in Figure 81.
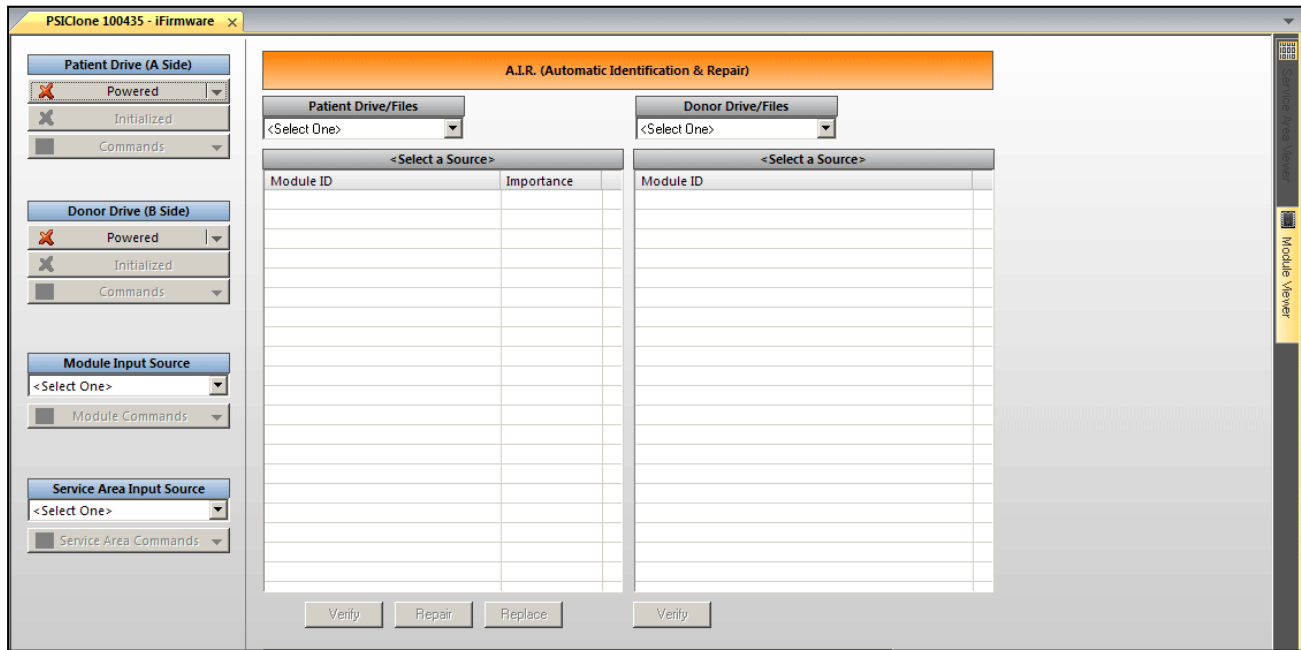
Figure 81 - iFirmware™ initial screen

For the purposes of this example, let us assume that a Maxtor drive is connected to Side B of the PSIClone™. At the left, locate the 'Donor Drive (B)' section and click 'Powered' to supply power to the Side B of the PSIClone™.
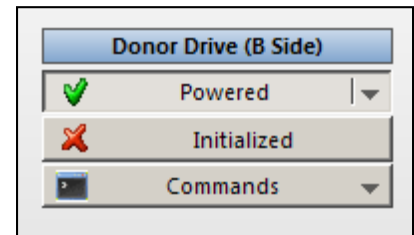
CPR Toolbox will prompt the user to indicate the data port to which the drive is attached.
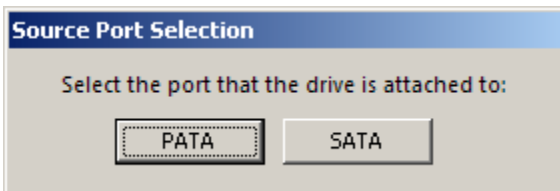
This is done to prevent any unnecessary commands being sent to the attached drive(s).

Select the appropriate port to continue.

To initialize the drive, click the 'Initialize' button. CPR Toolbox will prompt for a profile selection. Select from an existing profile or create a new one by clicking the radio button labeled 'Create New'. If 'Create New' is chosen, the fields marked Model Number, Serial Number and Number of LBAs may be automatically filled if by clicking the 'Identify Drive' button.

NOTE: This will send an ATA Command (Identify Device)

With the drive powered and initialized, we may now proceed to examining the firmware modules.
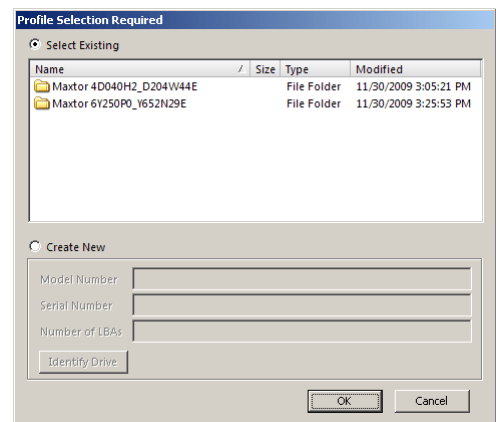
Firmware Modules

To work with firmware modules, select a Module Input Source (encircled in **RED**) from the dropdown box, depicted at right.

Once an input source has been selected, the dropdown labeled 'Module Commands' will be populated, as depicted in Figure 82.
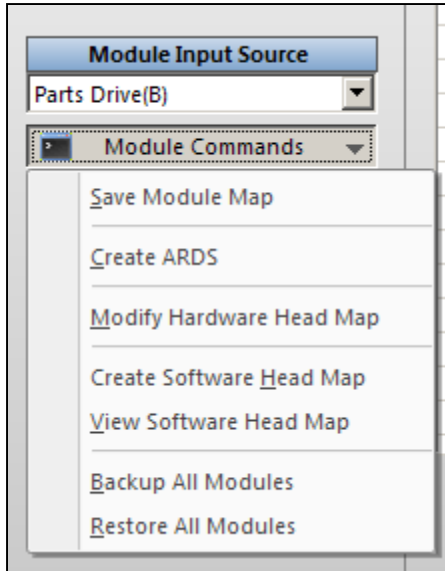
Figure 82 - Module Commands

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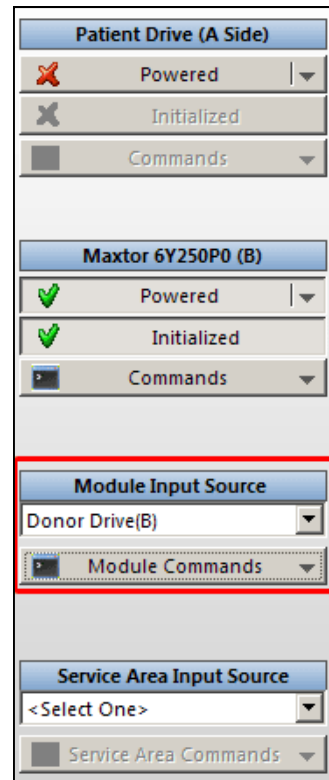
Save Module Map

Selecting 'Save Module Map' will produce a text file which outlines the module map for the selected source (drive or stored profile). A message box will be displayed indicating the name and location of the file being saved.
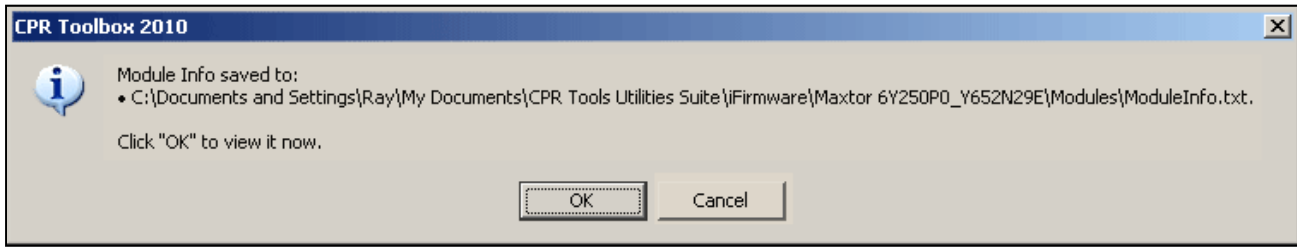
The text file uses an 'importance ratings system' or "IRS" which values the importance of each module from one (1) to four (4) and an asterisk (*). A value of one (1) is highly important and four (4) indicates far less importance. An asterisk (*) indicates the importance is not yet known.[15]

Listed from left to right are the Module ID, the Service Area LBA at which the module begins, and the Module Size in bytes.

```
Module ID: MX_ST_CFG_3 (0000) | Start SLBA: 00008022(0x00001F56) | Importance: 04 | Module Size(in bytes): 00001536 |
Module ID: SCRIPT      (0001) | Start SLBA: 00008025(0x00001F59) | Importance: 04 | Module Size(in bytes): 00004096 |
Module ID: MOD_0002    (0002) | Start SLBA: 00008033(0x00001F61) | Importance: *  | Module Size(in bytes): 00000512 |
Module ID: MOD_0003    (0003) | Start SLBA: 00008034(0x00001F62) | Importance: *  | Module Size(in bytes): 00001024 |
Module ID: MX_ST_CFG_1 (0004) | Start SLBA: 00008037(0x00001F65) | Importance: 04 | Module Size(in bytes): 00000512 |
Module ID: MOD_0005    (0005) | Start SLBA: 00008316(0x0000207C) | Importance: *  | Module Size(in bytes): 01167360 |
Module ID: MOD_0006    (0006) | Start SLBA: 00008039(0x00001F67) | Importance: *  | Module Size(in bytes): 00004096 |
```

Working with drives in Safe Mode

The next section of this guide describes working with ARDS (Alternate Resource Drive Start) capabilities. Using ARDS requires the setting of drives into 'safe mode'.

Begin by determining the drive family to which the subject drive belongs.

For Maxtor PATA drives, the drive family corresponds to the color coded serial number label which is typically on the edge of the drive.

Color	Drive Family Name
Green	ARES C64K
Pink	FALCON
Magenta	SABRE
Yellow	CALYPSO
Red	N40P

Once the drive family has been determined, follow this guide to place the drive jumpers in the appropriate position for the drive to be in safe mode.

---
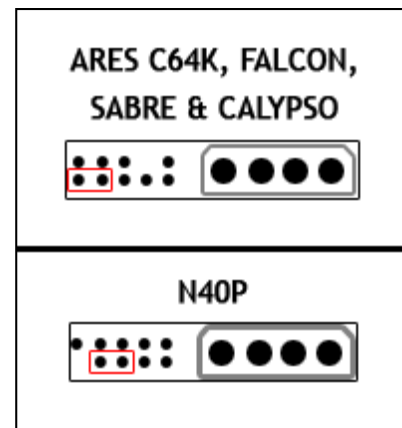
[15] CPR Tools is continuing research into the importance of modules that are currently undetermined; as new information is confirmed, updates to this application are provided through new CPR Toolbox™ releases.

Create ARDS

Alternate Resource Drive Start (ARDS) is a useful utility when encountering drives with firmware corruption which prohibit the drive from starting.

Begin by obtaining a suitably compatible drive, setting the Safe Mode jumpers on the drive and attaching it to either Side A or Side B of PSIClone.

To create an ARDS file, select 'Create ARDS'. CPR Toolbox will create the file and will present a message box detailing the file's location.
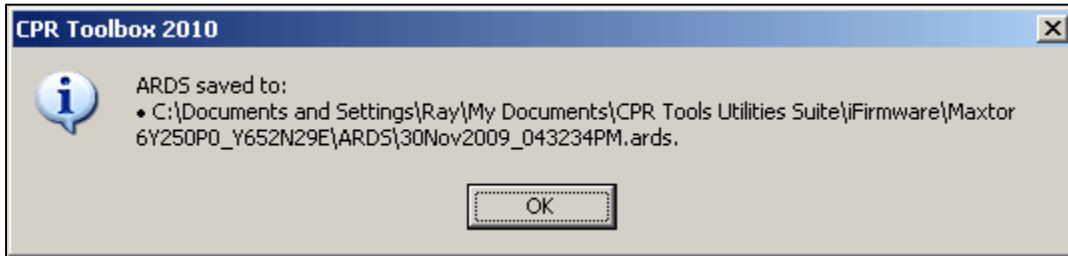
Figure 83 - ARDS saved

To use an ARDS file, click the arrow beside the 'Powered' button to display the message 'Start drive using ARDS'.

Clicking the 'Start drive using ARDS' message will cause CPR Toolbox to prompt the user for information regarding the safe mode jumpers.
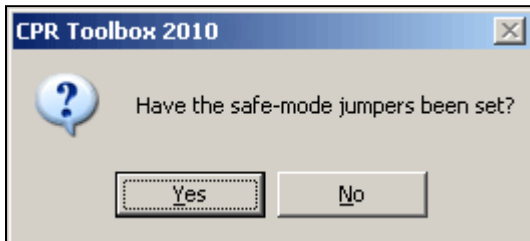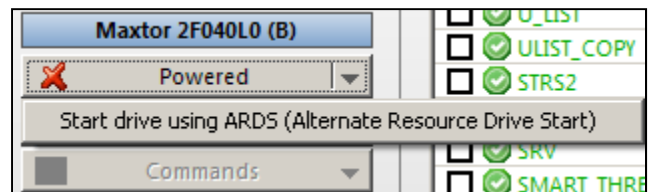
If the safe mode jumpers have been set, click 'Yes'. CPR Toolbox will prompt for a suitable ARDS file.

If the safe mode jumpers have not been set, click 'No'. CPR Toolbox will respond with a message box allowing the user to first set the safe mode jumpers before clicking 'OK' to continue.

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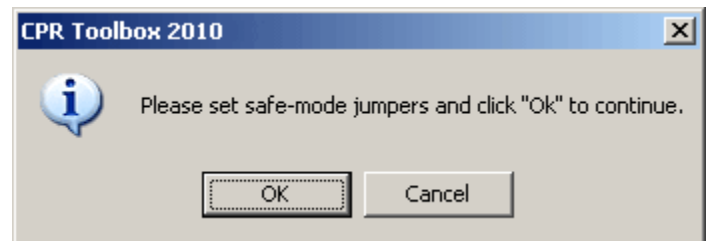
The selection of an appropriate ARDS file begins by selecting a profile folder. Navigate within the profile folder to the ARDS folder which stores all generated .ards files.
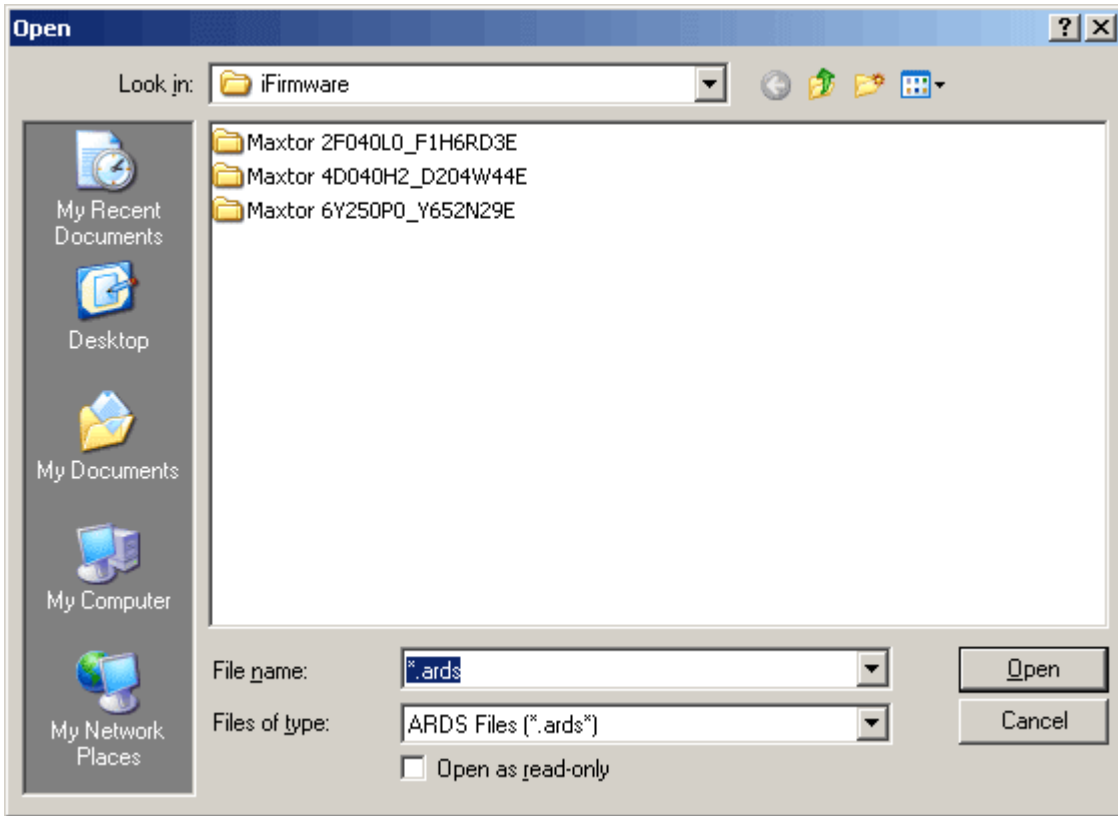
Figure 84 - Selecting a previously generated .ards file

Upon selection of an .ards file, CPR Toolbox will attempt to start the drive using the ARDS information. If the drive starts successfully, a message to that effect will be displayed.

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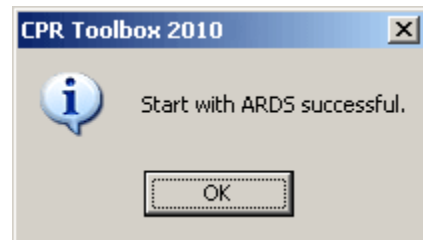
Modifying a Hardware Head Map vs. Creating a Software Head Map

When working with a hardware head map, we can disable a given head or heads. Attempts to read from these heads will result in errors.

Through the utilization of a software head map[16], we are able to determine the range of sectors for which each head is responsible. Through the application of the map, we can simply bypass sector ranges, thereby avoiding errors. Software headmaps are used by the ADR module.

Modify Hardware Head Map

Selecting 'Modify Hardware Head Map' will present a message box which enables the user to toggle each head on or off.
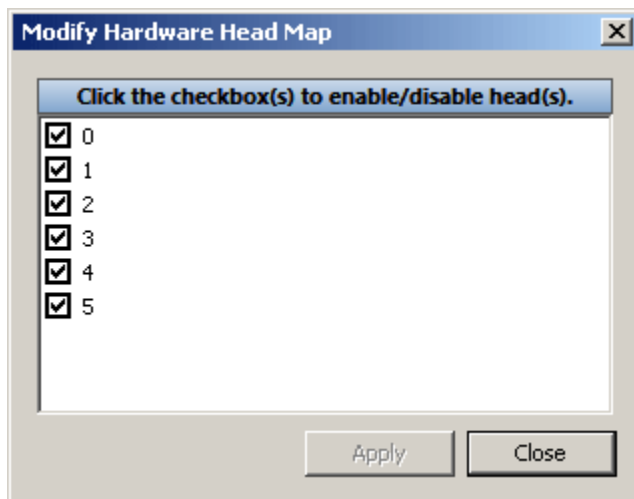
Figure 85 - Modify Hardware Head Map

Create Software Head Map

Selecting 'Create Software Head Map' will instruct CPR Toolbox to create a head map from firmware modules and will write the data to a .map file.

A message box is displayed showing the location and name of the stored .map file.
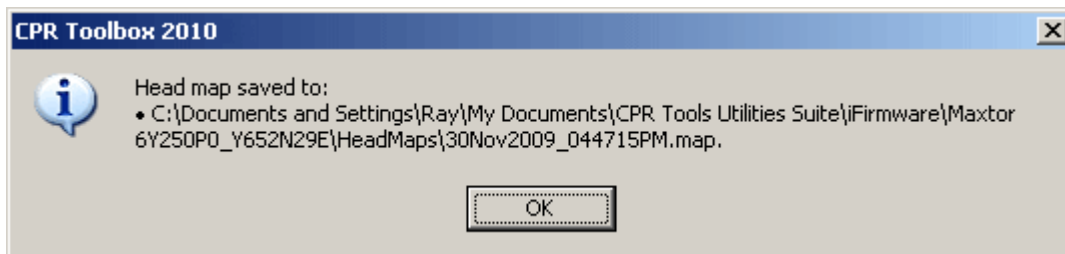
Figure 86 - Saving a software head map

---

[16] Headmaps are used by the ADR utility.

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View Software Head Map

Selecting 'View Software Head Map' will instruct CPR Toolbox to display an 'open file' dialog box so that the user may select a .map.
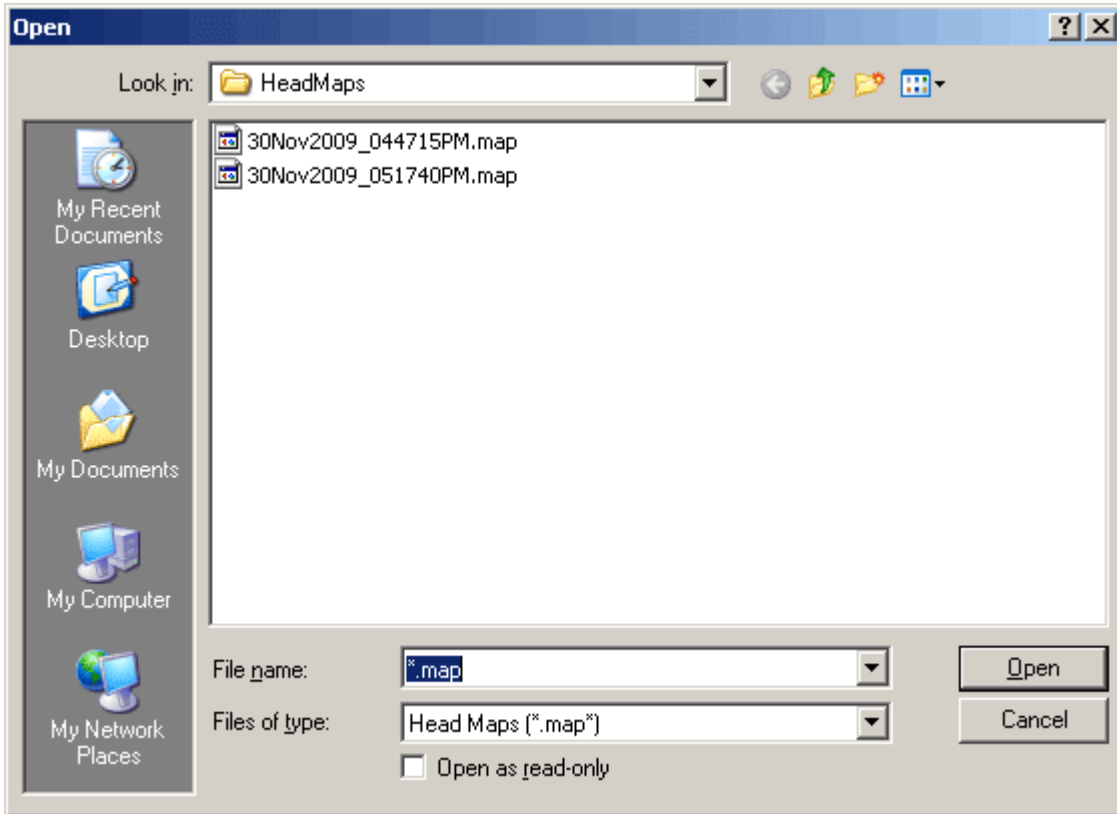
Figure 87 - Selecting a software head map file

Selecting a .map file will instruct CPR Toolbox to parse the data within the file and create a text file with the parsed information.

Upon selection of a .map file, CPR Toolbox will ask if the user wishes to reparse head map information.
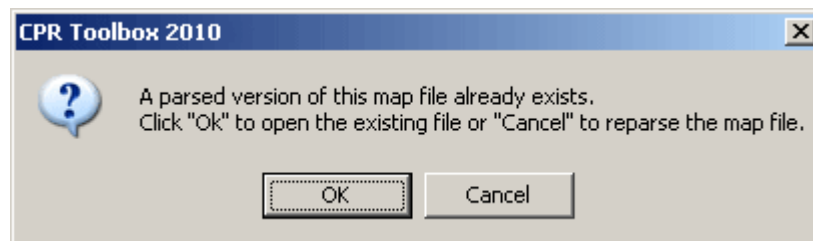
Selecting OK will open the text file created from parsing the .map file. Selecting 'Cancel' will instruct CPR Toolbox to reparse the head map data and will overwrite the selected file.

A sample of the displayed data appears below. The entries are produced in columns, one per head.

For this example, some data has been colored to help explain the layout and meaning of the entries. The lines colored in red outline the number of heads [00] through [04], and the number of entries for each of the heads listed.

The lines colored in blue, list a head number followed by a range of LBAs for which the head is responsible.

```
[00][Total Entries:44385] [01][Total Entries:88769] [02][Total Entries:88769] [03][Total Entries:88769] [04][Total Entries:88769]
[00][5872      -   8175] [01][4720      -   5871] [02][3568      -   4719] [03][2352      -   3567] [04][1200      -   2351]
[00][19920     -  22223] [01][8176      -   9327] [02][9328      -  10479] [03][10480     -  11695] [04][11696     -  12847]
[00][33968     -  36271] [01][18768     -  19919] [02][17616     -  18767] [03][16400     -  17615] [04][15248     -  16399]
[00][48016     -  50319] [01][22224     -  23375] [02][23376     -  24527] [03][24528     -  25743] [04][25744     -  26895]
[00][62064     -  64367] [01][32816     -  33967] [02][31664     -  32815] [03][30448     -  31663]
```

Figure 88 - Sample head map file

Backup All Modules

Selecting this option will instruct CPR Toolbox to create backups of all modules from the selected source. This can be a time consuming process; CPR Toolbox will display a progress indicator during this operation.
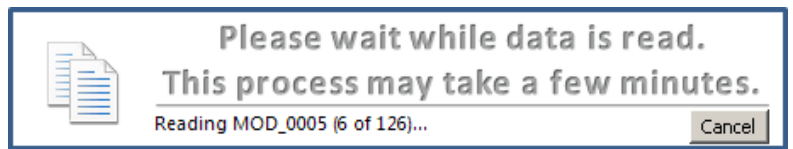
CPR Toolbox will present an alert indicating that the backup process has completed.

Backed up modules are stored in the 'Modules' folder within the current profile folder. An example path:

```
C:\Documents and Settings\Ray\My Documents\CPR Tools Utilities
Suite\iFirmware\Maxtor 6Y250P0_Y652N29E\Modules
```

Within this Modules folder, CPR Toolbox has created a date and time stamped folder which contains the backed up modules. Following the example above, the full path to the backed up modules would be:

```
C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite\iFirmware\Maxtor
6Y250P0_Y652N29E\Modules\01Dec2009_083501AM
```

CPR TOOLS
Media Research & Recovery

PSIClone™ User's Guide

Restore All Modules

Selecting 'Restore All Modules' will provide the user with the ability to select a previously backed up module set.
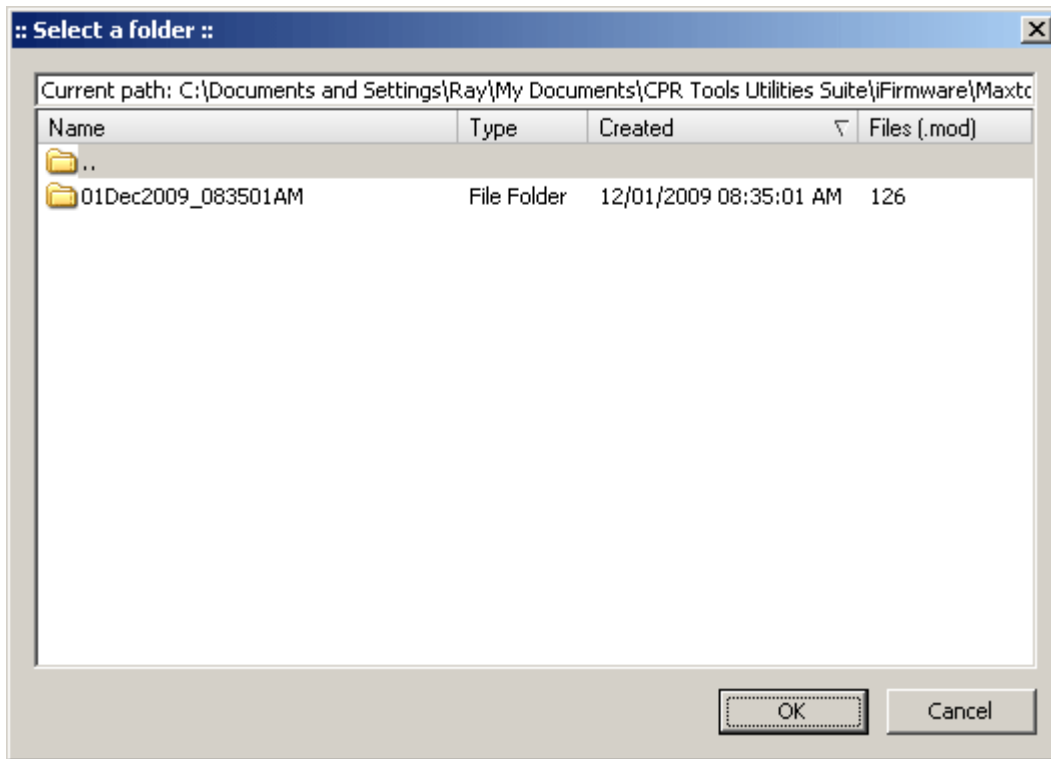
Figure 89 - Selecting a previously backed up module set

To restore a module set, select the desired folder and click OK.

This can be a time consuming process; CPR Toolbox will display a progress indicator during this operation.
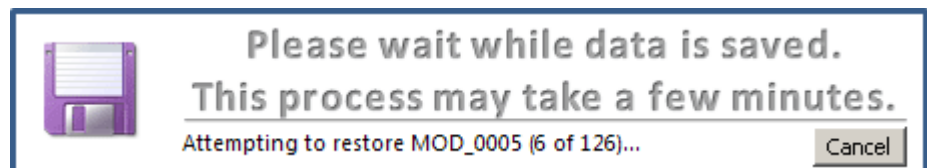

CPR Toolbox will present an alert indicating that the restore process has completed.

Service Area Input Source

The iFirmware™ application has the ability to Backup, Restore and Verify the service area of a given source. A source can be a connected hard drive or a previously backed up set of service area data. Select a source from the drop-down list to begin.

Once a source has been selected, the Service Area Commands dropdown will be populated.
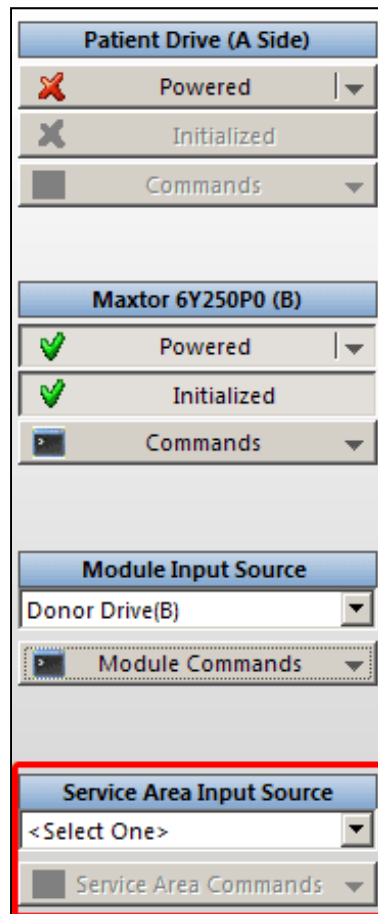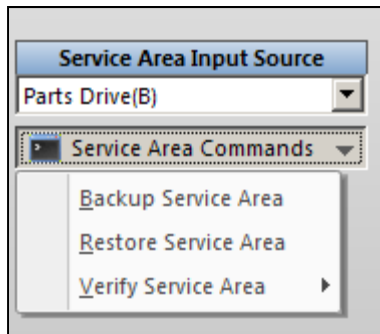
Service Area Commands

Backup Service Area
Selecting 'Backup Service Area' will instruct CPR Toolbox to save a copy of the service area data to a file. This can be a time consuming process; CPR Toolbox will display a progress indicator during this operation.
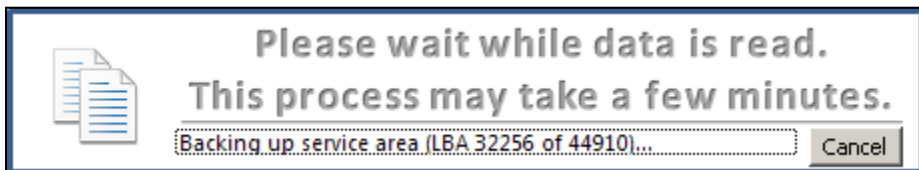
When the backup of the service area has completed, CPR Toolbox will present a message box alerting the user to the location of the saved data.
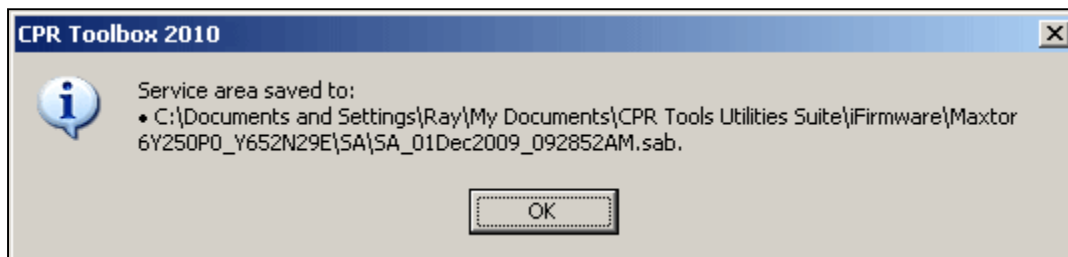
<u>Restore Service Area</u>
Selecting this option will provide the user with the ability to select a previously backed up service area.
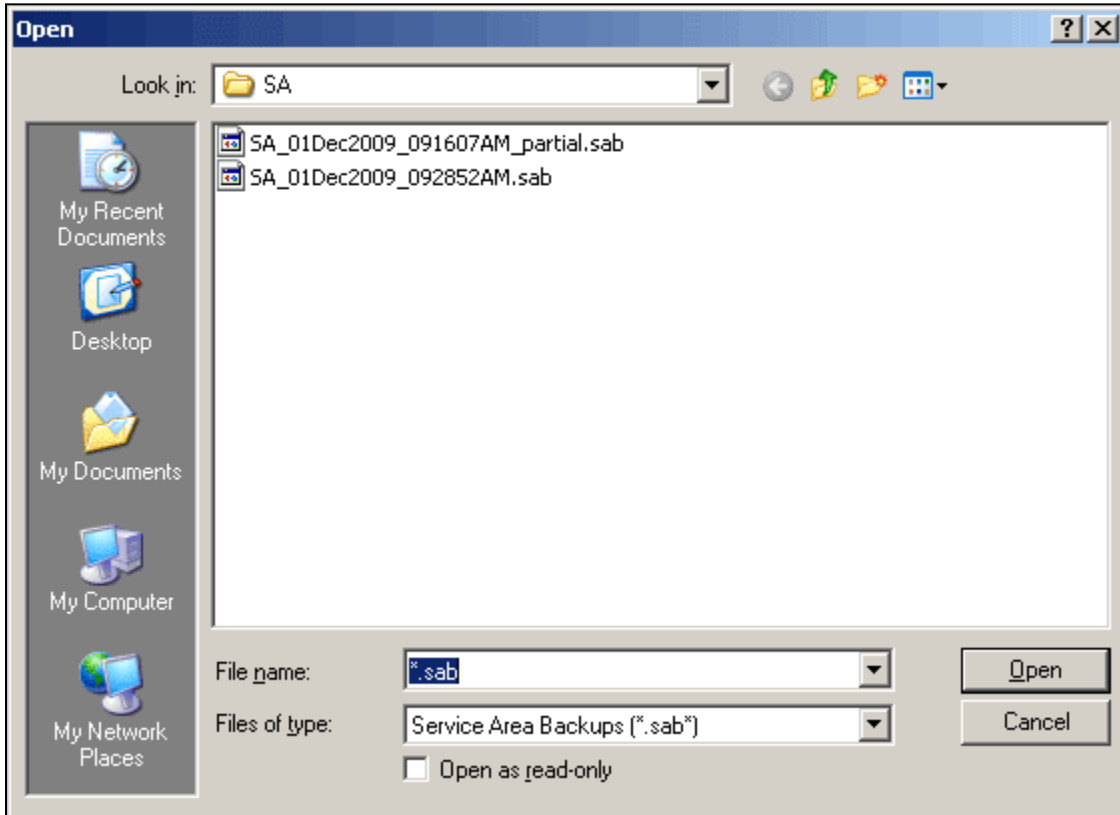
Figure 90 - Selecting a service area backup for restoration

Ensure that the Service Area Input is a connected drive, or a file in a previously saved location. Note: You cannot select a file that is currently in use, this will fail because the restore file is already open.

To restore from a previously backed up set of service area data, select a file and click 'Open'.

This can be a time consuming process; CPR Toolbox will display a progress indicator during this operation.
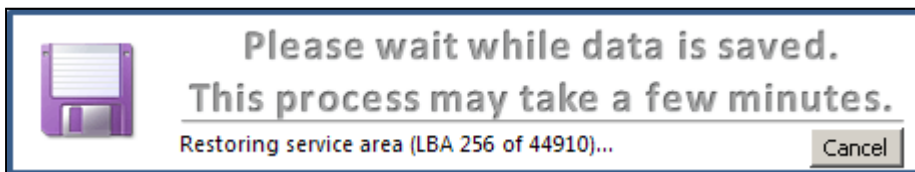
When the restore process has completed, a message box is shown.
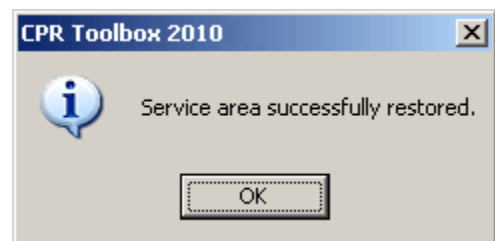
Verify Service Area

Two types of verification are available. These are Quick Verify and Full Verify

Quick Verify

Selecting Quick Verify instructs CPR Toolbox to validate firmware modules for the selected source.

If verification fails, the user may wish to select this source as a 'Repair Source' in the Automatic Identification and Repair (AIR) section to attempt a repair of failed modules.
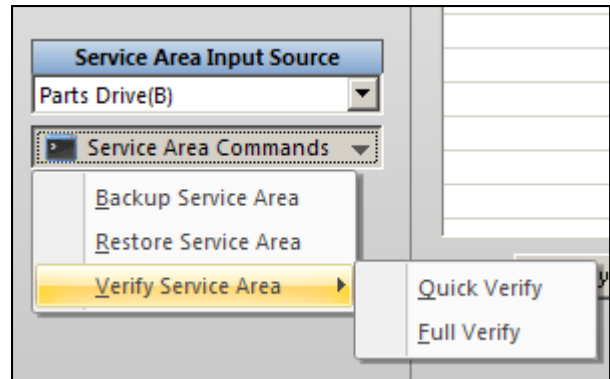
Full Verify

Selecting Full Verify instructs CPR Toolbox to verify the entire Service Area of the selected source.

Automatic Identification & Repair (A.I.R)

A powerful feature of CPR Toolbox's iFirmware application is the ability to repair and/or replace firmware modules.

To begin, select from the list under 'Patient Drive/Files'. Suitable sources may either be a drive connected to Side A of PSIClone, or a previously saved firmware module folder. In the example shown, a hard drive on Side A of PSIClone has been selected.
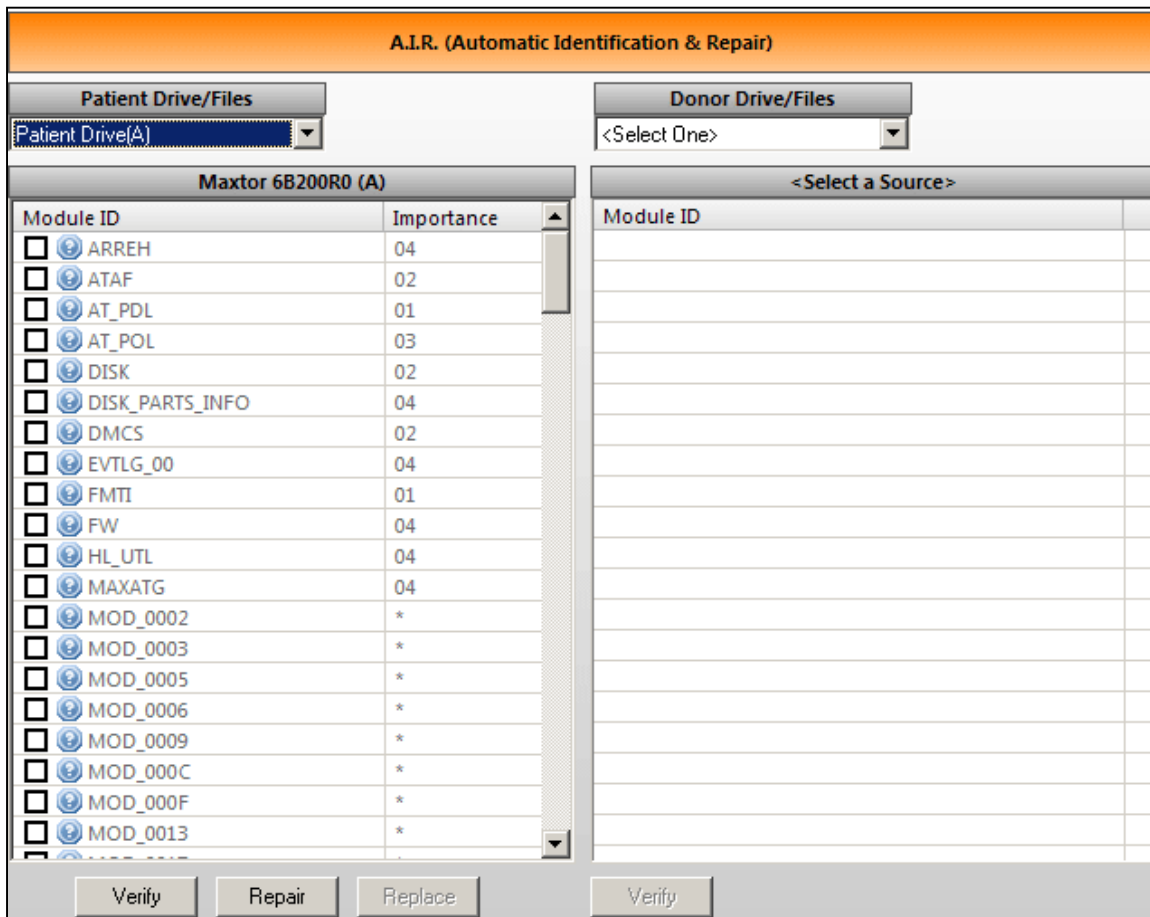
Figure 91 - A.I.R. with Patient Drive selected

Verification of modules

Verification of modules is the preferred first step. Begin by selecting modules listed for which verification should be performed. Modules may be selected individually by clicking the checkbox to the left of each module name. CPR Toolbox also provides a right-click context menu if selecting more than a few modules at a time is desired.
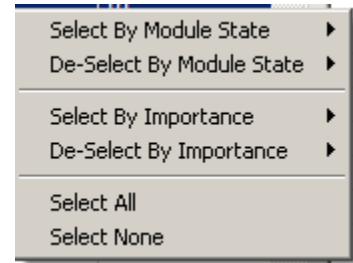
'Select by Module State' and 'De-Select by Module State' provide the following sub-options:
*   Error
*   Not Verified
*   Valid

Select by Importance and De-Select by Importance provide the following sub-options:
*   Level 1
*   Level 2
*   Level 3
*   Level 4
*   Asterisk (*)

As stated earlier, module importance are noted on a scale from one (1) to four (4) where one (1) is the most important and four (4) is far less important. Where an asterisk (*) is listed, the importance has not yet been determined.[17]

Lastly, the user may Select All or Select None.

Verification

The verification state of a module is indicated by the icon which is presented between the checkbox and the module name. Unverified modules are marked by a blue circle with a question mark. Verified modules are marked by a green check mark. Error modules are marked by a red circle with an exclamation point.

In the example shown, all modules were selected and the 'Verify' button has been clicked to initiate the verification process.   Note that the module FW has failed verification and is marked by a red circle with an exclamation point.
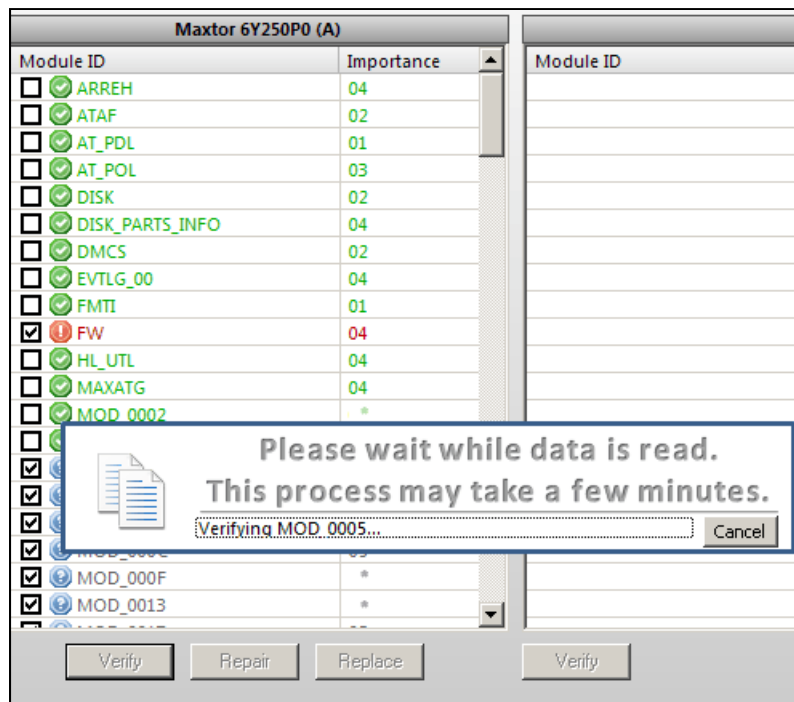

Figure 92 - Verification of modules

Once the verification process has completed, a message box is shown.

---

[17] CPR Tools is continuing research into the importance of modules that are currently undetermined; as new information is confirmed, updates to this application are provided through new CPR Toolbox™ releases.

If a module fails verification, it will remain checked, as depicted in Figure 92. At this point a repair may be attempted by clicking the 'Repair' button.

Alternately, the user may choose to select a 'Replacement Module Source' from the drop-down menu at the right of the screen. Available sources include a hard drive connected to Side B of PSIClone or a previously saved module folder.

To replace a module, select the module to be replaced under the 'Repair Source' listing by ensuring it is checked, then click the 'Replace' button. The 'Replace' button only becomes available if data is listed in the 'Replacement Module Source' section of the interface.

If the repair or replacement of a given module is successful, the icon will change to a green check mark. Not all module repairs will be successful; the resulting state of the module is indicated by the icon beside its check box.

Module and Service Area Viewers

Both Module and Service Area Viewers are available from within the iFirmware application. These are 'docked' at the right of the screen and may be made to 'fly out' into the visible space by clicking either of the tabs shown. The viewers may be 'locked' into the viewable space by clicking the push pin icon at the upper right corner of the viewer screen.

Module Viewer

To populate the Module Viewer with module data, first select a Module Input Source from the dropdown menu at the left of the screen; this is depicted here, encircled in red.

To begin, first select a 'Module Input Source' from the dropdown menu at the left of the screen. Suitable sources include a drive connected to PSIClone or a previously saved module backup.

Once a Module Input Source has been selected, click on or hover the mouse over the tab labeled Module Viewer at the right of the screen to cause the Module Viewer to 'fly out'.

The Module Viewer toolbar is located at the bottom of the viewer interface.
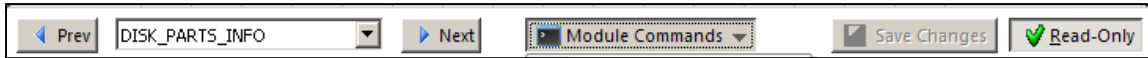
To populate the viewer with module data, select a module from the dropdown at the bottom left. Once a module has been selected, the user may scroll through modules by using the 'Prev' and 'Next' buttons, or by direct selection of another module using the dropdown box.

The Module Viewer offers specific functionality not found in other areas of the iFirmware application. The Module Commands dropdown menu provides access to the following options :

- Save Module Map
- Backup Current Module
- Restore Single Module
- Verify Module
- Repair Module
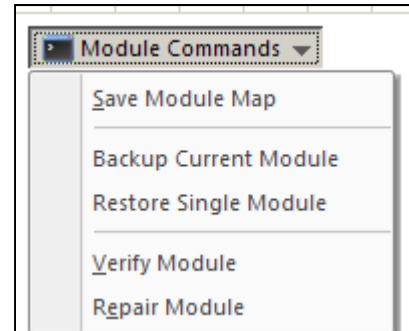
Select 'Save Module Map' to save the module map. This functionality is the same as that shown in the 'Select Module Source' area of the screen. The Backup, Restore, Verify and Repair options enable the user to work with individual modules.

Editing within the Module Viewer
There is a button, marked 'Read Only' at the bottom right corner of the Module Viewer. In its initial state, the Module Viewer allows for the viewing of modules only.
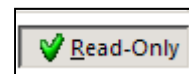
To enable editing of module values, click the 'Read Only' button. When in read/write mode, the button will display a red X in place of the green checkmark.

When editing module data is complete, be sure to click the button marked 'Save Changes' to commit the changes.

Context Menu (right-click) within the Module Viewer
Using the context menu within the Module Viewer provides easy switching from read only to read/write. Additionally, there are some actions available only through the context menu. Cut, Copy, Paste, Load From File and Save To File are functions which are only available through the context menu.

Both 'Load From File' and 'Save To File' provide options to load or save in Hexadecimal or ASCII.
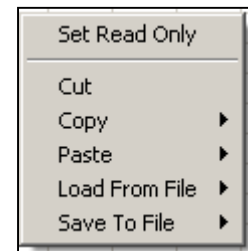
Service Area Viewer

The Service Area Viewer allows for the viewing and editing of service area data.

Begin by selecting a Service Area Input Source. Valid sources are previously saved service area data or a drive connected to either Side the PSIClone.

Once a Service Area Input Source has been selected, click on or hover the mouse over the tab labeled Service Area Viewer at the right of the screen to cause the Service Area Viewer to 'fly out'.

```
Service Area Viewer - Maxtor 6Y250P0 (A)                                          ⚲ ✕
[          ] [0            ] |◄ First  ◄ Prev  ► Next  ►| Last  LBA: [    0    ]  Of: [   44910   ]

Offset    0   1   2   3   4   5   6   7   8   9   A   B   C   D   E   F   ASCII
0x00000000 43  52  30  54  BC  75  26  D7  ED  AF  72  BD  5A  B0  80  50  CR0T¼u&×í¯r½Z°€P
0x00000010 08  3C  02  80  04  4F  08  43  FF  A0  30  2D  2D  A0  10  00  □<□€□□Cÿ 0-- □.
0x00000020 C6  71  27  E4  E7  B3  6C  C4  53  BA  80  20  08  3C  03  80  Æq'äç³lÄSº€ □<□€
0x00000030 04  4F  08  43  FF  A0  30  2D  2D  A0  10  00  20  0B  1B  00  □O□Cÿ 0-- □. □□.
0x00000040 02  00  41  00  00  00  A6  00  18  00  62  00  00  00  40  00  □.A...¦.□.b...@.
0x00000050 16  00  2C  00  BB  00  BB  00  59  00  55  00  12  00  0E  00  □.,.».».Y.U.□.□.
0x00000060 00  00  F2  00  5D  00  46  00  00  00  00  00  8C  00  D0  00  ..ò.].F.....Œ.Ð.
0x00000070 05  00  00  00  8B  00  4B  00  4D  00  37  00  12  00  10  00  □...<.K.M.7.□.□.
0x00000080 78  00  38  00  7C  00  00  00  30  00  30  00  00  00  00  00  x.8.|...0.0.....
0x00000090 00  00  00  00  00  00  00  00  81  00  9E  00  02  00  42  00  ........□.ž.□.B.
0x000000A0 08  00  29  00  00  00  7C  00  05  00  27  00  06  00  37  00  □.)...|.□.'.□.7.
0x000000B0 88  00  05  00  23  00  00  00  00  00  00  00  00  00  00  00  ^.□.#...........
0x000000C0 00  00  00  00  F6  00  D6  00  80  00  00  00  43  00  73  00  ....ö.Ö.€...C.s.
0x000000D0 DF  00  8D  00  5C  00  2C  00  39  00  00  00  D0  00  65  00  ß.□.\.,.9...Ð.e.
0x000000E0 80  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  €...............
0x000000F0 00  00  10  00  1F  00  54  00  16  00  41  00  00  00  00  00  ..□.□.T.□.A.....
0x00000100 00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  ................
0x00000110 00  00  00  00  00  00  00  00  00  00  00  00  00  00  40  00  ..............@.
0x00000120 00  00  00  00  00  00  00  00  00  00  00  00  00  00  01  00  ..............□.
0x00000130 46  60  4A  5C  62  5E  66  7A  7A  5E  78  6A  76  74  74  8C  F`J\b^fzz^xjvttŒ
0x00000140 6E  72  76  00  03  00  00  00  00  00  10  00  FF  00  00  00  nrv.□.....□.ÿ...
0x00000150 00  00  00  00  FF  00  FF  00  FF  00  FF  00  32  02  42  00  ....ÿ.ÿ.ÿ.ÿ.2□B.
0x00000160 52  01  62  00  72  00  82  68  92  00  A2  03  B2  1C  D2  00  R□b.r.‚h'.¢□²□Ò.
0x00000170 E2  10  02  00  F2  00  2B  6D  1A  68  2C  31  2D  05  30  80  â□□.ò.+m□h,1-□0€
0x00000180 31  2C  32  8C  33  50  34  88  35  B6  36  CE  37  80  38  9C  1,2Œ3P4^5¶6Î7€8œ
0x00000190 39  62  3A  80  2B  92  1A  68  2C  31  2D  05  30  80  31  2C  9b:€+'□h,1-□0€1,
0x000001A0 32  8C  33  50  34  88  35  B6  36  CE  37  80  38  9C  39  62  2Œ3P4^5¶6Î7€8œ9b
0x000001B0 3A  80  2B  85  1A  68  2C  31  2D  05  30  80  31  2C  32  8C  :€+…□h,1-□0€1,2Œ
0x000001C0 2B  7B  1A  68  2C  3D  2D  19  30  80  31  38  32  98  33  54  +{□h,=-□0€182˜3T
0x000001D0 34  7C  35  AA  36  BA  37  88  38  84  39  8A  3A  80  2B  77  4|5ª6º7^8„9Š:€+w
0x000001E0 1A  6A  2C  39  2D  1A  30  80  31  40  32  90  33  5C  34  74  □j,9-□0€1@2□3\4t
0x000001F0 35  A6  36  BA  37  84  38  84  39  96  3A  80  00  00  B6  E5  5¦6º7„8„9–:€..¶å

LBA Scroll ◄ | ►
```

The Service Area Viewer includes controls at the top of the screen for navigating through Service Area LBAs (SLBAs). Users may scroll through SLBAs one at a time or jump to the First or Last SLBA. Alternately, the bottom, horizontal scroll bar may be used to scroll through SLBAs.

At the bottom of the Service Area Viewer there are three (3) buttons.

The Service Area Commands button provides the facility to backup or restore the service area.

As with the Module Viewer, there is a toggle for setting the Viewer to Read Only or Read/Write status. If changes are made in Read/Write mode, ensure that the Save Changes button is clicked to commit any edits.

The context menu, available by clicking the right mouse button, also provides certain functionality, and is depicted here.

The Set Read/Write selection performs toggling of the read-only switch.

The Copy and Save to File options offer the ability to save or copy as ASCII or Hexadecimal.

Mount / Unmount Drive (Featuring USB Write-Block)

CPR Toolbox™ now provides the ability to use a drive connected to Side B of PSIClone™ as a USB connected mass storage device (removable hard drive). To begin, click on a drive connected to either Side of PSIClone™ in the left vertical pane of CPR Toolbox™.   Figure 93 shows a PSIClone™ with two drives connected.

Figure 93 – PSIClone™ with two drives connected

CPR Toolbox™ Tips:

Mounted Drives are 'READ ONLY'.

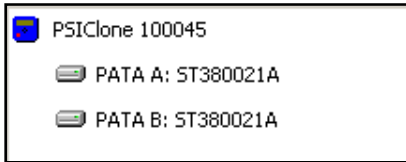No write operations may be performed on a drive which is in 'Mass Storage' mode while connected to PSIClone™.

To mount the drive connected to Side B, select 'Mount Drive' from the Data Recovery menu button. Upon initiating the mounting of this drive, CPR Toolbox™ displays this message:
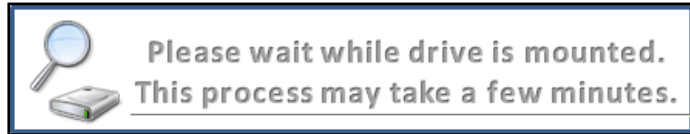

Figure 94 – Mounting a Drive

PSIClone™ Tips:

There is a direct relationship between the size of a drive being mounted and the time it will take to complete the transition to a write-blocked, mounted drive. Large drives take a significant amount of time to become available as mass storage devices.
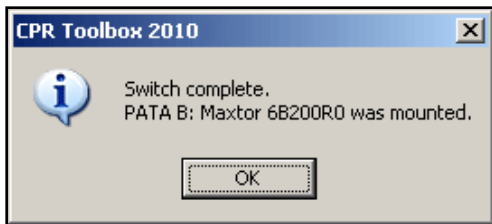

Figure 96 - CPR Toolbox™ has successfully mounted the drive attached to PATA B

When the switch to mass storage has completed, CPR Toolbox™ presents an informational dialog showing the drive and its connection point to PSIClone™.

CPR Toolbox™ changes the display in the left, vertical pane to indicate that PSIClone™ is being used as a USB pass-through to enable the host system to 'see' the attached drive. Figure 96 depicts CPR Toolbox™ new display of the
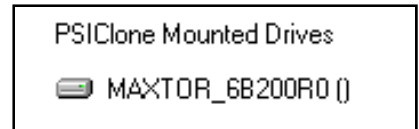

Figure 95 - CPR Toolbox™ reflects the mounted drive

drive, including the operating system's assigned drive letter. Additionally, the device LCD will display 'PSICLONE MASS STORAGE'.

While in Mass Storage mode, the CPR Toolbox™ Sector Viewer may be used but other PSIClone™ / CPR Toolbox™ functions are disabled. The switched drive may be addressed through the host operating system using the drive letter provided; in the example shown, drive letter "I:" has been assigned.

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Why use the Mount Drive feature?

Of the many reasons why the ability to use PSIClone™ to mount a drive is useful, two are presented here:

I. One reason for using with the 'Mount Drive' feature of PSIClone™ and CPR Toolbox™ would be to assign a drive letter to the drive which has just been used as the destination of an image fileset.

By assigning an operating system addressable drive letter to this drive, an external utility, like the included 'Mount Image Pro' software can be used to mount the image.

Once the image fileset has been mounted, a utility such as the included 'Recover My Files' software can be used to perform data recovery actions without the risk of altering the original data from which the image was made.

II. Once a drive has been mounted, files may be 'dragged' using Windows Explorer, effectively copying them to the host system.

III. PSIClone™ initiates a USB Write Block for drives mounted using the 'Mount Drive' feature.

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Security

Clicking the 'Security' button reveals the menu item which launches DriveKey™.

DriveKey™ [18]

What is DriveKey™?

DriveKey™ represents a breakthrough in hard drive security manipulation. **On fully supported drives[19], DriveKey™ is able to retrieve the drive's security password, even if the drive was locked with the highest level of security supported by the ATA specification.**

For drives which are fully supported, DriveKey™ allows the retrieval of passwords which are in effect. For supported and unsupported drives, DriveKey™ acts as a user-friendly front-end to the locking and unlocking of drives at all security levels.

Launch DriveKey™ by clicking the Security button in the CPR Toolbox™ toolbar to reveal the DriveKey™ menu item. Click DriveKey™ to begin.

User and Master Passwords

> **NOTE:**
> Supported drives on either Side A or Side B of PSIClone™ may be locked or unlocked using DriveKey™.

To understand the benefits of DriveKey™, a description of the workings of locking and unlocking drives using 'User' and 'Master' passwords is presented here.

DriveKey™ is a user interface which allows easy manipulation of the password security features implemented in the ATA specification.[20]

Security enabled ATA compliant hard drives use passwords to allow for security to be applied. These passwords, called 'User' and 'Master' may be used separately or together. The level of security depends entirely upon the choices made regarding which passwords are used.

Contrary to the naming conventions, the 'User' password is used to provide security. 'Master' passwords are used solely as an alternative method of unlocking a drive in certain instances.

To lock a drive, 'User' password must be used. The 'User' password has two possible levels of security:

> **DriveKey™ Key Feature:**
> Prior to DriveKey™, a drive locked with a User Password would be unusable without the User Password.
>
> With DriveKey™ support, this is no longer the case; fully supported, locked drives may simply be unlocked using DriveKey™.

High

If a drive is locked with a user password in 'High' mode, either the Master password or User password may unlock the drive.

Max

If a drive was locked with a user password in 'Max' mode, only the User password should be able to unlock the drive. The drive should be completely unusable without the correct 'User' password.

---

[18] Available as an add-on module to Law Enforcement and Government Agencies only; additional charges apply. Contact CPR Tools, Inc. for more information

[19] A current list of fully supported drives is available online at http://www.cprtools.net/downloads

[20] The ATA specification is maintained by INCITS T-13 committee (http://www.t13.org)

DriveKey™'s feature set is best described through example. The first example will assume a fully supported drive so that all of DriveKey™'s features will be displayed.

Fully Supported Drives and DriveKey™

Assumptions for this example:

A fully supported drive[21] is connected to PSIClone™ on Side B and is powered.
PSIClone™ has been attached to a USB 2.0 port on a host computer running CPR Toolbox™ version 5.0 or higher[22].
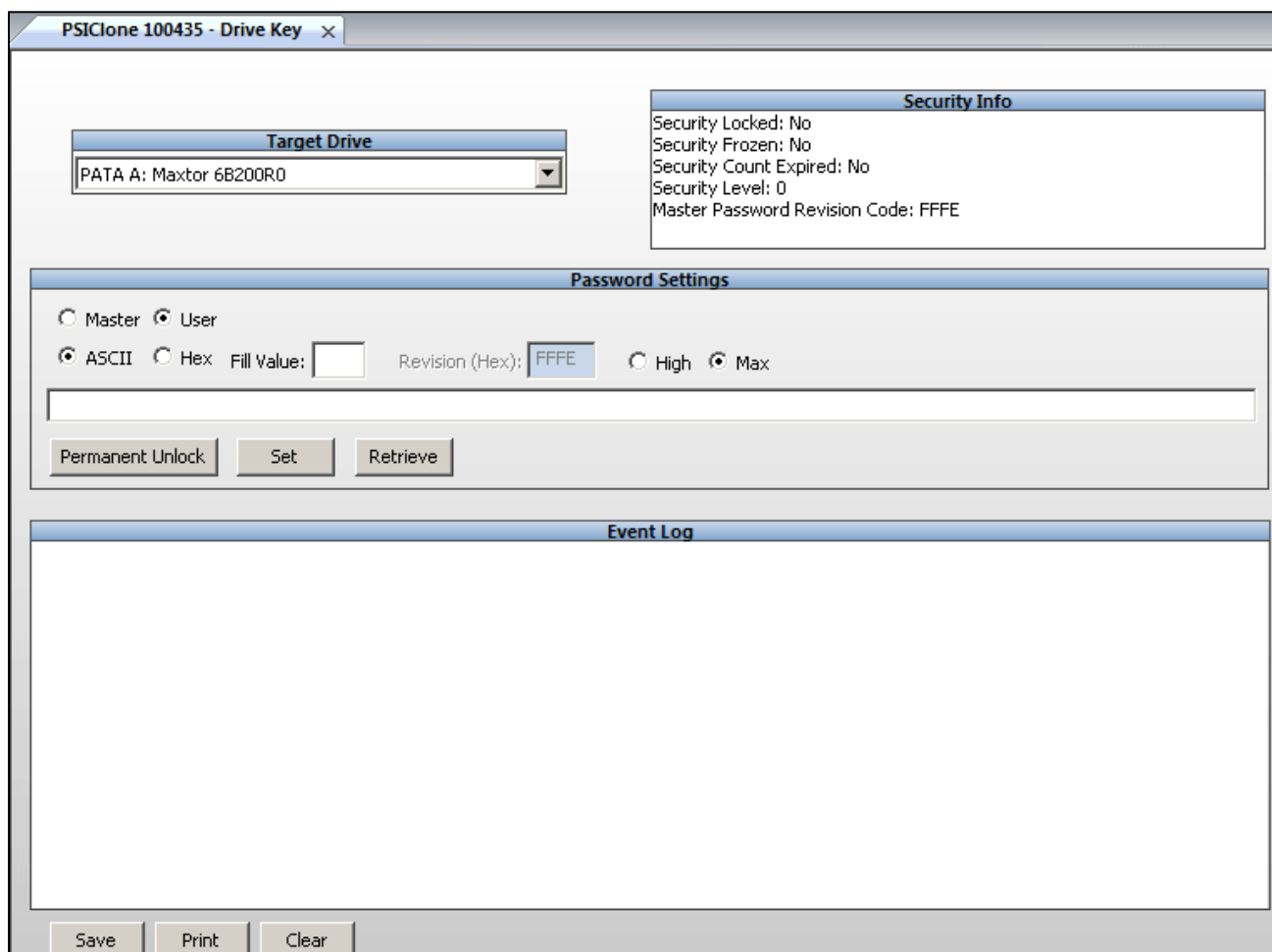DriveKey™ support has been enabled[23].

Figure 97 - DriveKey™ initial screen

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[21] A current list of fully supported drives is available online at http://www.cprtools.net/downloads

[22] The images presented may not accurately depict CPR Toolbox versions < 5.0, however functionality on these versions is the same.

[23] Available as an add-on module to Law Enforcement and Government Agencies only; additional charges apply. Contact CPR Tools, Inc. for more information

Using DriveKey™

Begin by selecting a supported drive from the drop-down list, labeled 'Target Drive'. Figure 98 depicts a Maxtor Drive, attached to Side A of PSIClone™ selected.

Figure 98 - A Maxtor drive attached to Side A of PSIClone™ has been selected

Select a drive from the drop-down menu labeled 'Target Drive'. Drive security status is provided in the section to the right labeled 'Security Info'.

The 'Password(s)' section of the screen, depicted in Figure 99, provides an interface through which a drive may be locked or unlocked.
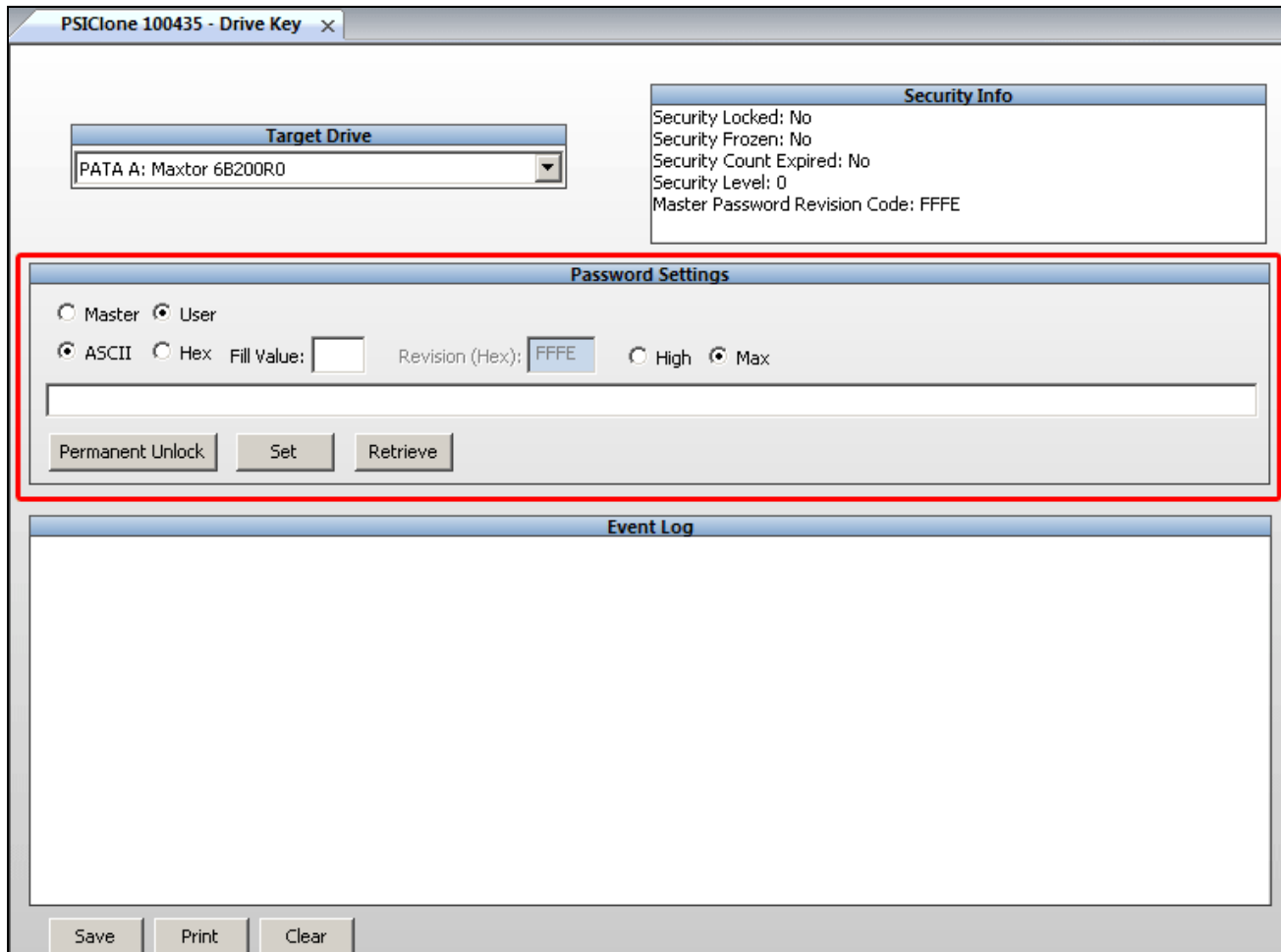

Figure 99 - Password Settings Section of DriveKey™

In this section, the user will be able to read/display Master and User passwords. Additionally, the user may set a Master password and/or a User password in either High or Max modes. The passwords selected may be in either ASCII or Hex.

Setting a Master Password[24]

To set a Master password, ensure that the radio button labeled 'Master' is selected. Next, select either ASCII or Hex and enter a 'Fill Value', if desired, in the text box provided. The 'Fill Value' is used to pad the chosen password. If no Fill Value is

entered DriveKey™ will pad the password field, if needed with `0x00`.
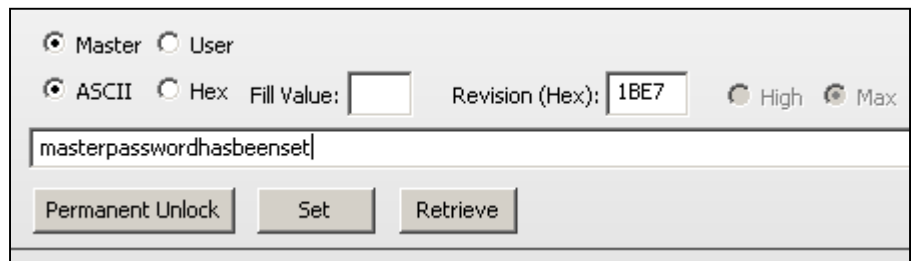
Key a password into the field shown.

---

24 DriveKey is capable of setting Master passwords on both fully supported and minimally supported drives

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According to the ATA specification, a Revision code may be set to specify information about the entity setting a security password. As not all vendors follow the specification, this field may be 'grayed out'. The ATA specification indicates that valid hexadecimal values for Revision are `0001` through `FFFE`.

Click 'Set' to set the Master password.

Upon successful setting of the Master password, CPR Toolbox™ will display a confirmation message, shown in Figure 100.

In addition to the success message, CPR Toolbox™ displays the output of the command in the Event Log section of the module, as shown in Figure 101.
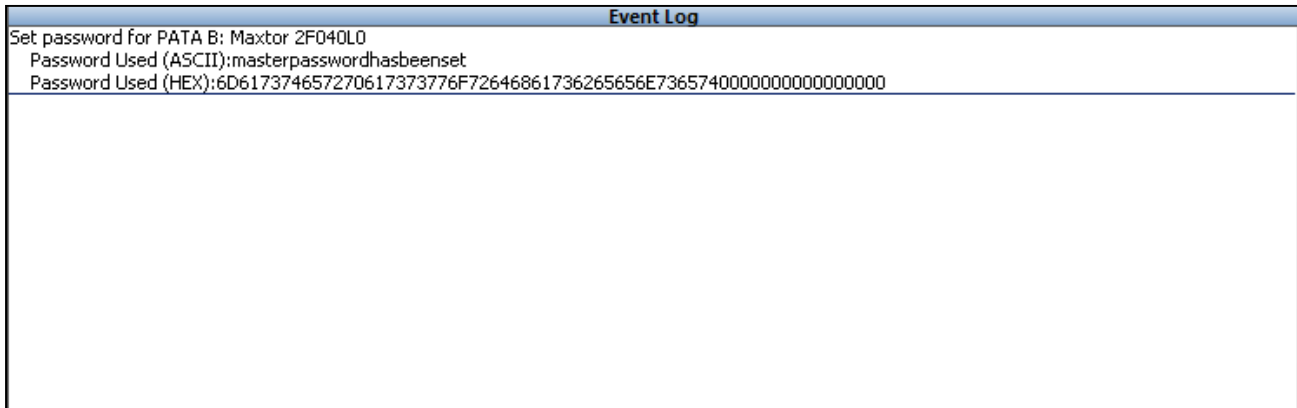
Figure 100 - Successfully set a password

Figure 101 - Output resulting from successful setting of Master password

The password is displayed in both ASCII and Hex. Note that as the password phrase entered did not fill the requisite 32 bytes, the 'Fill Value' was appended to the phrase to pad it to the full length of the password field.

The output in the Event Log may be saved to a file by clicking the 'Save' button. Alternately, this data may be easily printed by clicking 'Print'. The Event Log display may be cleared by clicking 'Clear'.

Setting a User Password[25]

The process for setting a 'User' password closely resembles those for setting a Master password as described above. One significant difference is the ability to choose a security level for the User password.

As with the setting of the Master password, the user must select ASCII or Hex, 'Fill Value', if desired, in the text box provided. The 'Fill Value' is used to pad the chosen password. If no Fill Value is entered DriveKey™ will pad the password field, if needed with `0x00`.

DriveKey™ Key Feature:
Prior to DriveKey™, a drive locked with a User password would be unusable without the User password.
With DriveKey™ support, this is no longer the case; fully supported, locked drives may simply be unlocked using DriveKey™.

---

[25] DriveKey™ is capable of setting User passwords on both fully supported and minimally supported drives

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The 'User' password has two possible levels of security:

High

If a drive is locked with a user password in 'High' mode, either the Master password or User password may unlock the drive.

Max

If a drive was locked with a user password in 'Max' mode, only the User password should be able to unlock the drive. The drive should be completely unusable without the correct 'User' password.

To set a User password, ensure that the radio button labeled 'User' is selected. Next, select either ASCII or Hex and enter a 'Fill Value' in the text box provided.
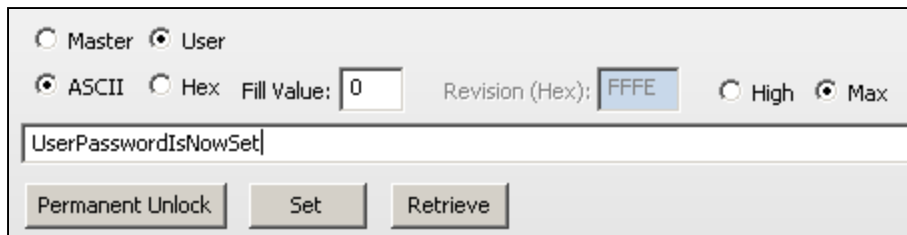
The 'Fill Value' is used to pad the chosen password. Select 'High' or 'Max'.

Key a password into the field shown.

Click 'Set' to set the User password. CPR Toolbox™ displays a confirmation message to acknowledge the setting of the User password, as shown in Figure 102.
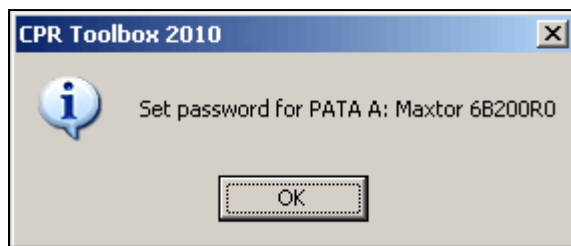
Once a password has been set, the drive is locked. PSIClone™ recognizes this and presents a locked icon adjacent to the drive as displayed in the vertical pane in CPR Toolbox.

Figure 102 - User Password Set

Figure 103 - PATA A is Locked

Retrieve

For fully supported drives, any passwords which exist may be shown within the DriveKey™ module by clicking 'Retrieve'. If 'Retrieve' is used on drives which are not fully supported, CPR Toolbox™ displays a message stating that the selected drive is not yet supported.
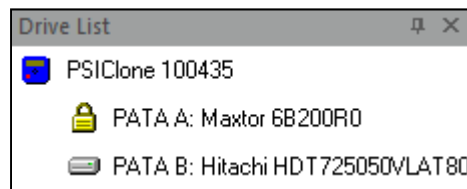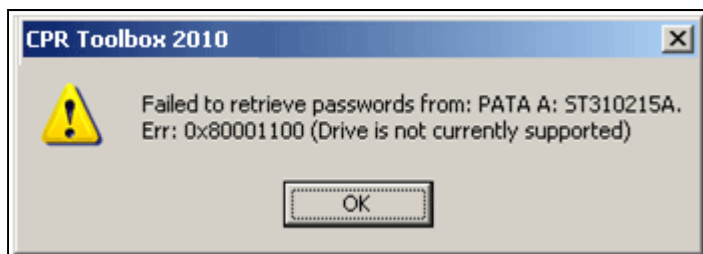

If 'Retrieve' is successful, CPR Toolbox displays a confirmation that the retrieval was successful.

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Click 'OK'. All known password information about the drive is displayed in the Event Log window. A successful 'Retrieve' operation is shown in Figure 104.
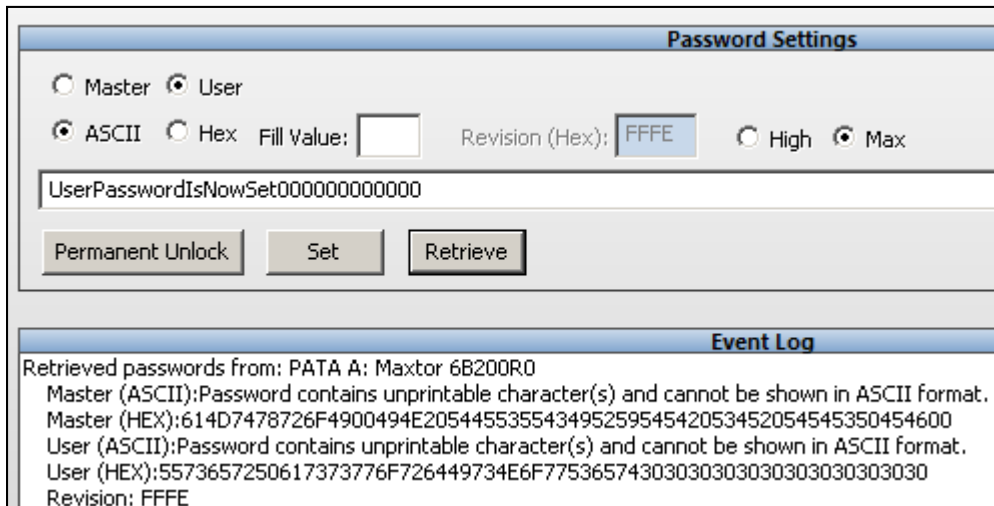

Figure 104 - Successfully retrieved password information is displayed

The output in the Event Log may be saved to a file by clicking the 'Save' button. Alternately, this data may be easily printed by clicking 'Print'. The Event Log display may be cleared by clicking 'Clear'.

Permanent Unlock

The button marked Permanent Unlock may be used to unlock a drive in such a way as to have the 'unlocked' status survive a power cycle of the drive. This feature is available to fully supported drives under most conditions. For drives which are not fully supported, this feature will only succeed if the password(s), if any, for the drive are known.

To use the 'Permanent Unlock' feature for fully supported drives, first click 'Retrieve' to populate the password field. Once the password field is populated, clicking the 'Permanent Unlock' button will unlock the drive. CPR Toolbox™ will display a confirmation message upon success.

The Event Log will show an entry upon successful unlocking of a drive, as shown encircled in red in Figure 105.
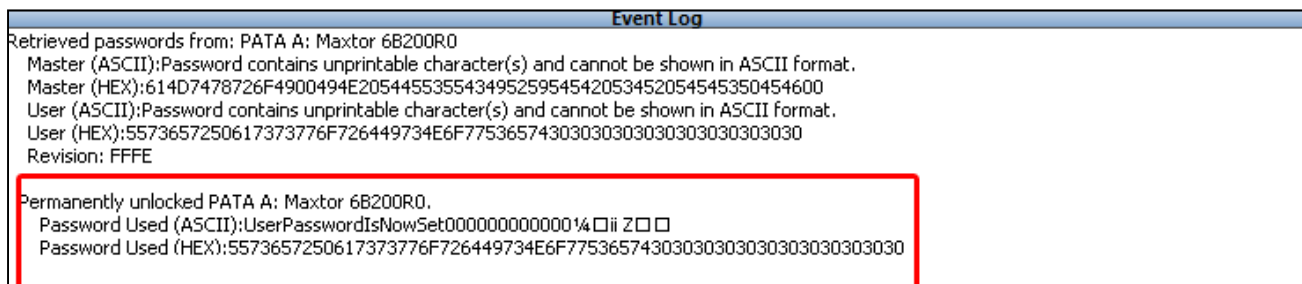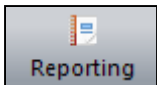

Figure 105 - Event Log provides a summary of the unlocking process

The output in the Event Log may be saved to a file by clicking the 'Save' button. Alternately, this data may be easily printed by clicking 'Print'. The Event Log display may be cleared by clicking 'Clear'.

Reporting

Click the 'Reporting' button to access reporting functions within CPR Toolbox™. The main reporting screen is depicted in Figure 106.

Figure 106 - Reporting - initial screen

The main reporting screen displays five (5) tabs. These are:

- Jobs
- Certificates
- Print Labels
- Device Log
- Alert Settings

The first four (4) tabs are used when CPR Toolbox™ is connected CPR Tools' data eradication devices: Hammer™ and SCSI Hammer™. PSIClone™ users need only be concerned with the 'Alert Settings' tab, depicted in Figure 107.

Figure 107 - Alert Settings, initial screen

The Alert Settings tab is used to send email alerts at specific times during a recovery effort (internet connection and valid email credentials required). To configure CPR Toolbox™ to send email alerts, begin by selecting a device from the dropdown list, as shown. Alternately, users may configure CPR Toolbox™ to work with multiple CPR Tools devices by clicking the 'Add Device' button. Clicking 'Add Device' will cause CPR Toolbox™ to display a dialog box which will collect information about specific CPR Tools devices (Hammer™, SCSI Hammer™ & PSIClone™) so that specific alert settings may be saved for those devices on the host. This feature allows users to configure alerts for devices without needing to connect those devices to a host.
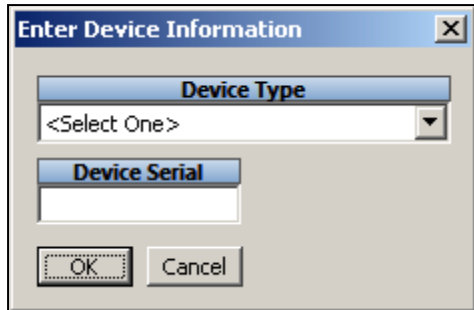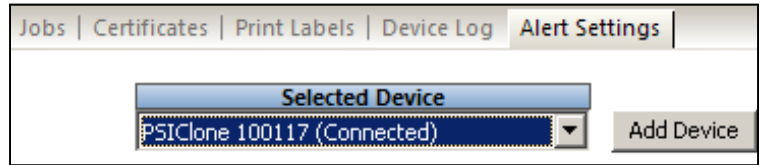
Devices added in this fashion will be available in the 'Selected Device' drop-down box and may be selected for editing at any time. These settings will automatically activate when the device for which they were configured is connected to CPR Toolbox™.

Once a device has been selected, configuration of the alert settings for that device may begin. Start by completing the 'Email Settings' box at left, shown in Figure 108.

Enter a valid email addresses in the Sender and Recipient fields. Enter a valid mail server address in the Server Name field. If your mail server requires authentication for sending emails, check the box marked Authentication Required.

To test your settings, click the 'Test Settings' button.

Doing this will instruct CPR Toolbox™ to send a test message using the values configured for Sender, Recipient and Server Name.

Figure 108 - Email Settings

If the test message is sent successfully, CPR Toolbox™ presents a message box to that affect.

The recipient specified in the 'Recipient' field will receive a test email similar to what is depicted in Figure 109.
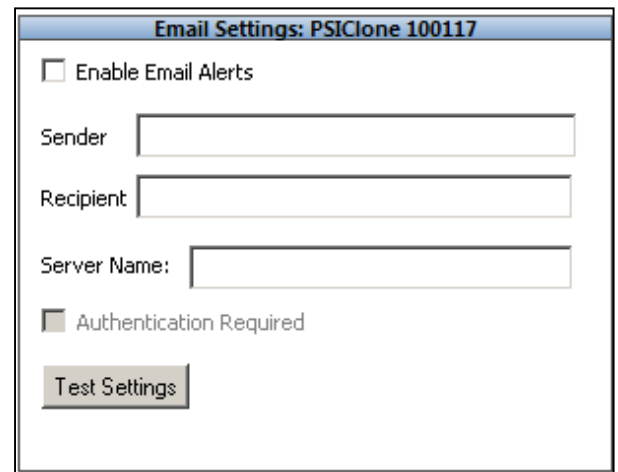
```
Email settings test email.
Sender: alerts@example.com
Recipient: technician@example.com
Server: mail.example.com
Authentication Required: Yes
```

Figure 109 - Sample test email

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Once the email settings have been configured, enable or modify the 'Alert Settings' in the box at right.
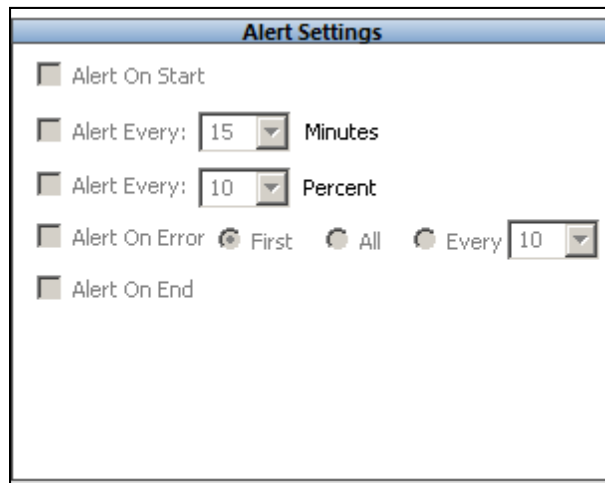
Figure 110 - The 'Alert Settings' box

The Alert Settings box provides options which determine when alerts are sent when using the selected device.

Select the 'Alert on Start' checkbox to instruct CPR Toolbox™ to send an alert when an action is initiated.

Select the 'Alert Every' and select a number of minutes for periodic updates to be sent.

Select the 'Alert Every' and select a value for percentage to receive periodic updates based on the percent complete.

Select 'Alert on Error' and choose 'First', 'All' or 'Every' to receive alerts when errors occur. The 'Every' option requires a number of errors which must occur before an error alert is sent.

Select 'Alert on End' to be alerted when the current action completes.

Assuming that the email configuration is correct, CPR Toolbox will send alert emails at the defined intervals.

FAQ / Troubleshooting

1. *After starting PSIClone™, LCD does not light, device is unresponsive.*
   - ➤ Ensure power cable is connected to the device and a working power source.

2. *PSIClone™ does not recognize one or more attached PATA drives.*
   - ➤ Ensure all attached PATA drives are set to 'Master'.
   - ➤ Ensure that no more than two drives (one on each side of the device) are connected. Do not use power splitters when working with PSIClone™.

3. *CPR Toolbox™ does not display any attached CPR Tools devices.*
   - ➤ Ensure USB Cable is attached to both PSIClone™ and the host PC.
   - ➤ Only USB 2.0 is supported.

4. *Windows® asks for a driver when I plug in PSIClone™ to a USB port on my PC.*
   - ➤ There are two (2) potential reasons why Windows may ask for a driver to be installed.
     - o This is a new installation. The correct driver for PSIClone™ is pre-installed upon installation of CPR Toolbox™ (part of the CPR Tools Utilities Suite installation).
     - o RESOLUTION:
       When the 'Found New Hardware' wizard appears:

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a. Select 'No, not this time' when asked if Windows should connect to the Windows Update site; click 'Next'
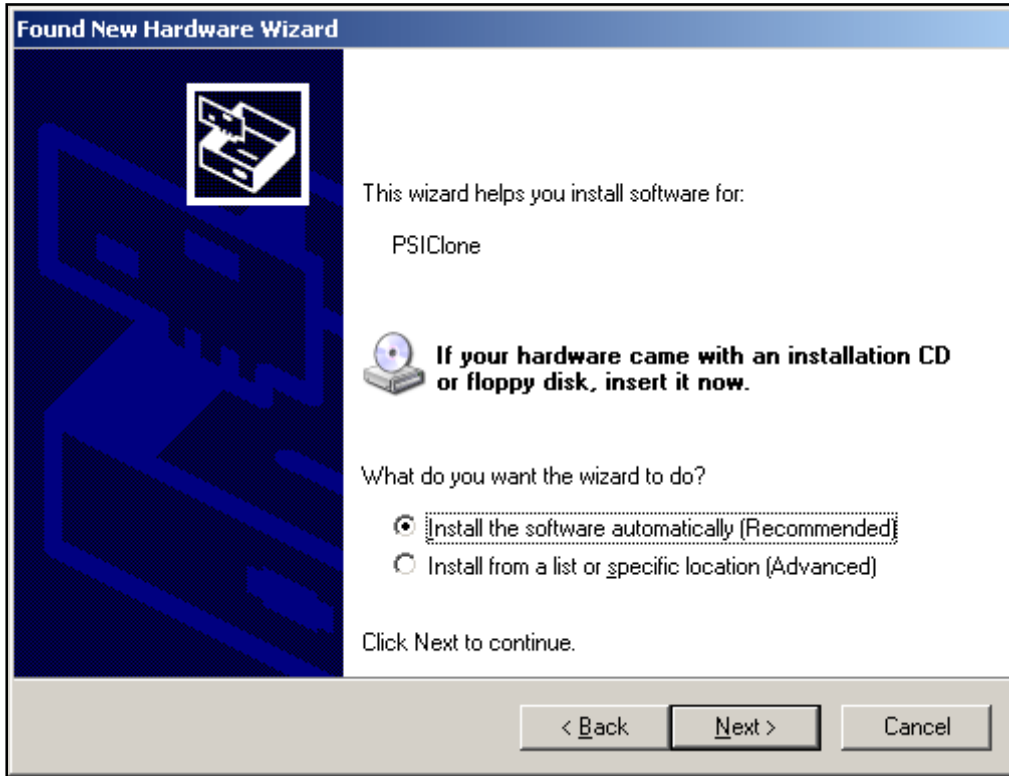
b. Select 'Install the software automatically (Recommended); click 'Next'
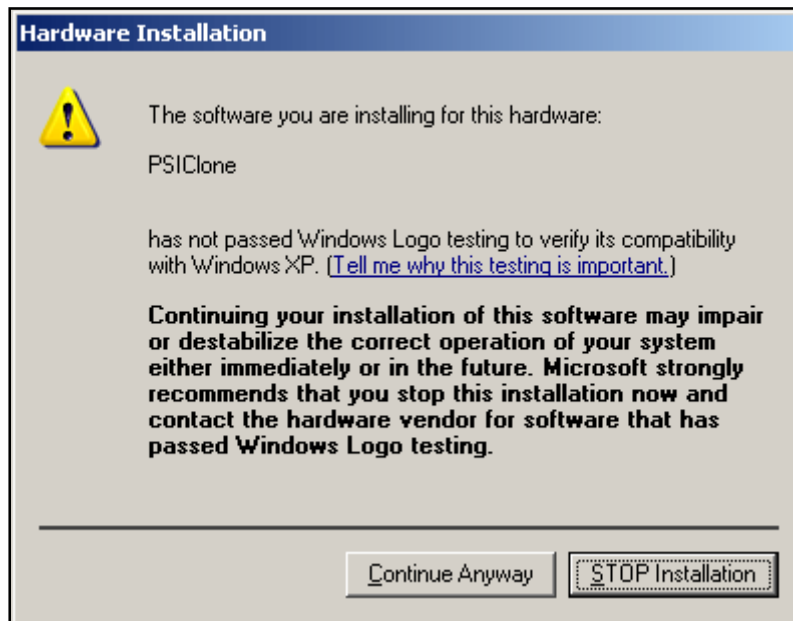
c. Select 'Continue Anyway' if presented with the notice that this driver has not passed 'Windows Logo Testing'.

Found New Hardware Wizard

Completing the Found New Hardware Wizard

The wizard has finished installing the software for:

PSIClone

Click Finish to close the wizard.

< Back | Finish | Cancel
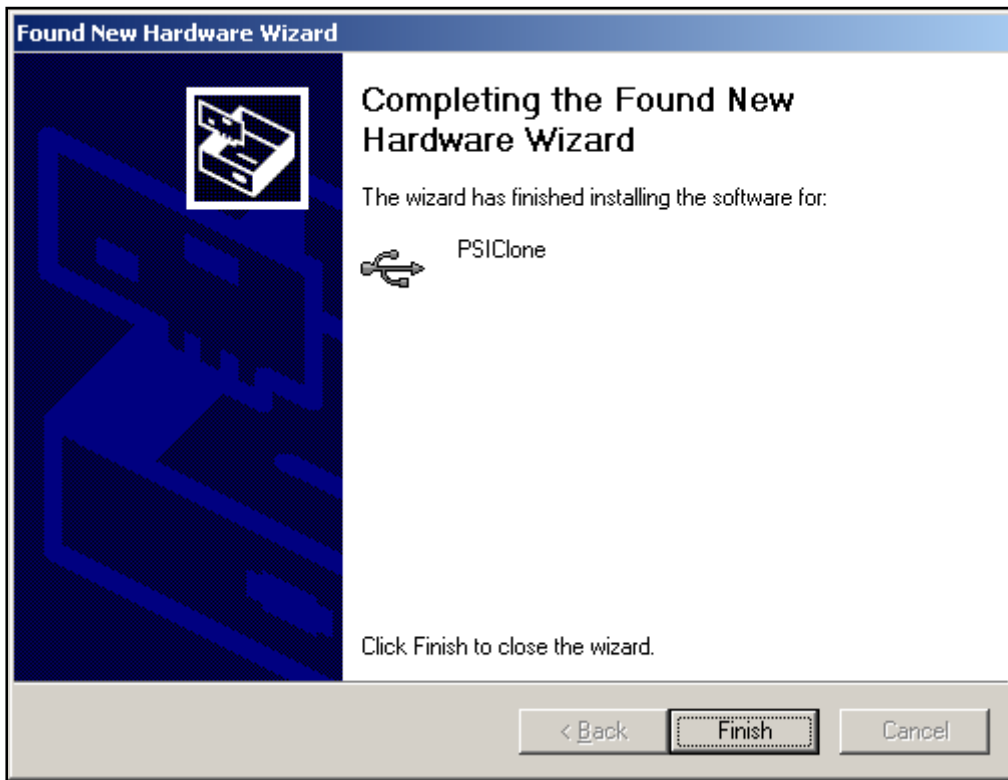
    d. Click 'Finish' to complete the driver installation.

o PSIClone™ is connected to a USB 1.1 port
- o RESOLUTION: USB 2.0 is required.
- o CPR Tools recommends updating PSIClone™ to the most recent firmware available using the CPR Flash utility which ships with PSIClone™.

5. Windows® asks me to select from a list of installed drivers when I connect PSIClone™, Hammer™ or SCSI Hammer™ to my host system, as shown below:
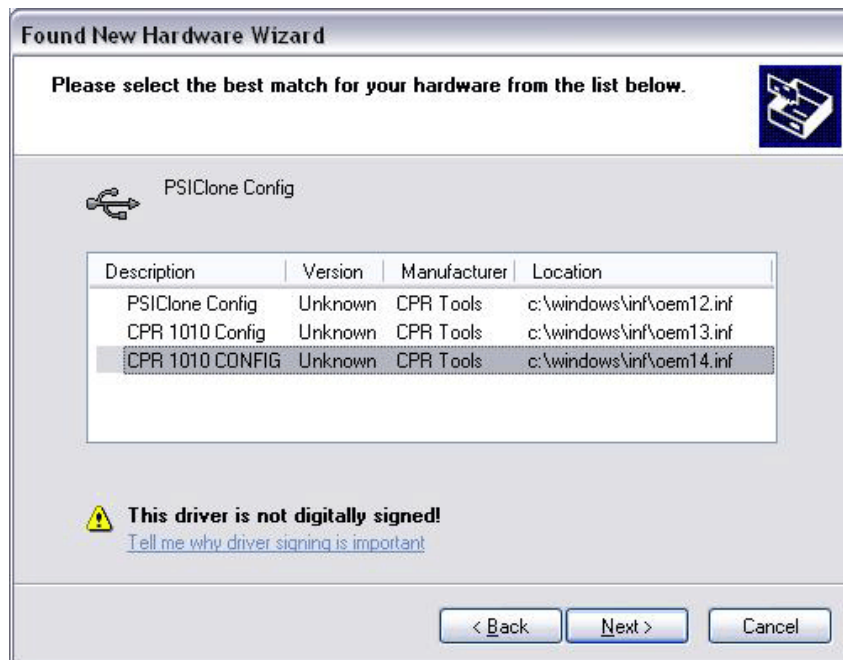
➤ This is known to occur when several iterations of legacy CPR Tools device drivers exist on the host system.

     o RESOLUTION: Always select the driver marked CPR 1010 CONFIG. This is case sensitive – note that the word CONFIG is in all capital letters.

          o This driver selection will only be required once. Once selected, click 'Next' and complete the 'Found New Hardware Wizard'. PSIClone™ may then be used with the host system and CPR Toolbox™.

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Product Specifications

CHARACTERISTIC	SPECIFICATION
Drive Interfaces:	Parallel ATA (PATA) & Serial ATA (SATA)
Host Interface:	USB 2.0
Max Transfer Rate:	Up to 4.0 Gigabytes per minute
Input Voltage:	Max: 3.5 A / Typical: 1.6 A
Input Current:	+12 VDC
Voltage Supplied to Drives:	+12VDC, +5VDC
Operating Temperature Range:	0° to 50° Celsius
Storage Temperature Range:	-20° to 60° Celsius
Operating/Storage Humidity Range:	5% to 95% (non-condensing)
Device Addressing Support:	28 bit and 48 bit supported
Max Transfer Mode:	UDMA Mode 4
Supported Protocols:	ATA 4 through ATA 7
Dimensions:	4.15" L x 1.41" H x 4.16 " W
Approx. Device Weight:	11 oz.

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Glossary of Terms

ATA

AT Attachment, defines the physical, electrical, and command protocols for the internal attachments of storage devices to a host. PSIClone™ supports devices that conform to ATA specification 4, 5, 6, or 7. Also See PATA and SATA.

ATA Device

Any device that conforms to the ATA specification.

Bang

CPR Tools' term for writing a pre-defined pattern to a drive. This function is used for erasing (overwriting data on) a drive.

Clone

To copy all data from one drive and write it to another, creating an exact copy of the source drive. The cloning process copies data on a sector-by-sector basis. PSIClone™ copies from a drive attached to side A to a drive attached to side B.

Compare

PSIClone™ performs compare operations on a 'byte-by-byte' basis.

The compare command is used to compare a drive attached to Side A of the PSIClone™ to a drive attached to Side B of the PSIClone. This is used for validating the results of a clone.

You may also compare a drive to any 'bang' pattern (other than random). This is used to validate that the selected pattern was written.

Hash

A hash function is a reproducible method of representing a data stream as a (relatively) small number that may serve as a digital "fingerprint" of the data. The algorithm substitutes or transposes the data to create such fingerprints. The fingerprints are called hash sums, hash values, hash codes or simply hashes. (Note that hashes can also mean the hash functions.) PSIClone™ employs the MD5 hash algorithm to generate hashes. These are intended to be used as validation that a clone is a true and accurate copy of the original source.

Image

A disk image is a computer file or a group of computer files (known as a fileset) containing the complete contents and structure of a data storage medium or device, such as a Hard drive, CD or DVD. The term has been generalized to cover any such file, whether originated from an actual physical storage device or not. As such, a disk image contains all the information necessary to replicate the structure and layout, as well as the actual contents, of a storage device, and this is the distinguishing feature between an ordinary backup and a disk image. A disk image file or fileset is usually created based upon the sectors on the medium, ignoring its filing system.

PSIClone™ creates image filesets. The size of individual files within an image fileset is defined in the options section of the PSIClone™ menu and may be 700 MB, 1 GB or 2 GB. The 700 MB option is provided to facilitate copying of image files to CD media. PSIClone™ is also capable of creating compressed images. Refer to the Image portions of this manual for details.

LBA

Logical Block Address, the address given to each sector in the device. PSIClone™ prints an "LBA" number upon completion of the identify device command. This number, presented in decimal format, represents the total number of LBAs that the device can access ideally.

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MD5 Hash

In cryptography, MD5 (Message-Digest algorithm 5) is a widely used to check the integrity of files.

An MD5 hash is typically expressed as a 128 bit (16 byte) value. PSIClone™ displays MD5 hash values in hexadecimal format.

PATA

Parallel ATA, describes the physical and electrical hard drive interface that uses a 40 pin connector to interface with host and device. PSIClone™ incorporates a PATA interface on side A and another on side B.

PIO

Programmed Input/Output, transferring data between device and host one sector at a time. Also PIO mode is used to send commands to an ATA device. PIO mode is the slowest means of transferring data between a host and a device.

Power Cycle

Involves powering off a drive, waiting for a short delay, then powering the drive on and waiting for the duration set by 'Power on Delay' before proceeding.

SATA

Serial ATA, describes the physical and electrical hard drive interface that uses a 7 pin connector to interface with host and device. PSIClone™ incorporates a SATA interface on side A and another on side B.

Sector

A group of 512 bytes that has a unique address (LBA). This is the smallest amount of data that can be addressed at a time from the ATA interface.

UDMA

Ultra Direct Memory Access, transferring data between device and host in bursts of multiple sectors at a time, bypassing the CPU. There are seven UDMA modes with mode 6 yielding the fastest transfer rate and mode 0 yielding the slowest transfer rate. PSIClone™ currently supports up to and including mode 4.

Customization

Customizing the Look and Feel of CPR Toolbox™

The default logo presented in the main CPR Toolbox window can be customized. To add a custom logo to CPR Toolbox:

1. Create a Bitmap Image file (.bmp) to be used as the custom logo/background image
2. Place your image in the '`User Data\Images`' folder under the installation folder for CPR Tools Utilities Suite (The default location is "`C:\Documents and Settings\<user>\My Documents\CPR Tools Utilities Suite\Images`").
3. Name this file `backlogo.bmp`
4. Close and restart CPR Toolbox. Your new logo will appear as the main window background.

Using CPR Toolbox™ with Multiple CPR Devices

CPR Toolbox™ was designed to simplify working with CPR Devices (PSIClone™, Hammer™, etc…). One key feature of CPR Toolbox™ is the ability to work with multiple CPR Devices at the same time.

CPR Toolbox™ displays all connected devices (and the drives connected to them) in the horizontal pane at the left of the screen, as shown below.

> **CPR Toolbox™ Tips:**
>
> Use CPR Toolbox™ to manage and control multiple CPR Devices. Commands issued run concurrently; this saves time and increases productivity.

A key feature of using CPR Toolbox™ to control multiple devices is the ability to perform actions simultaneously.
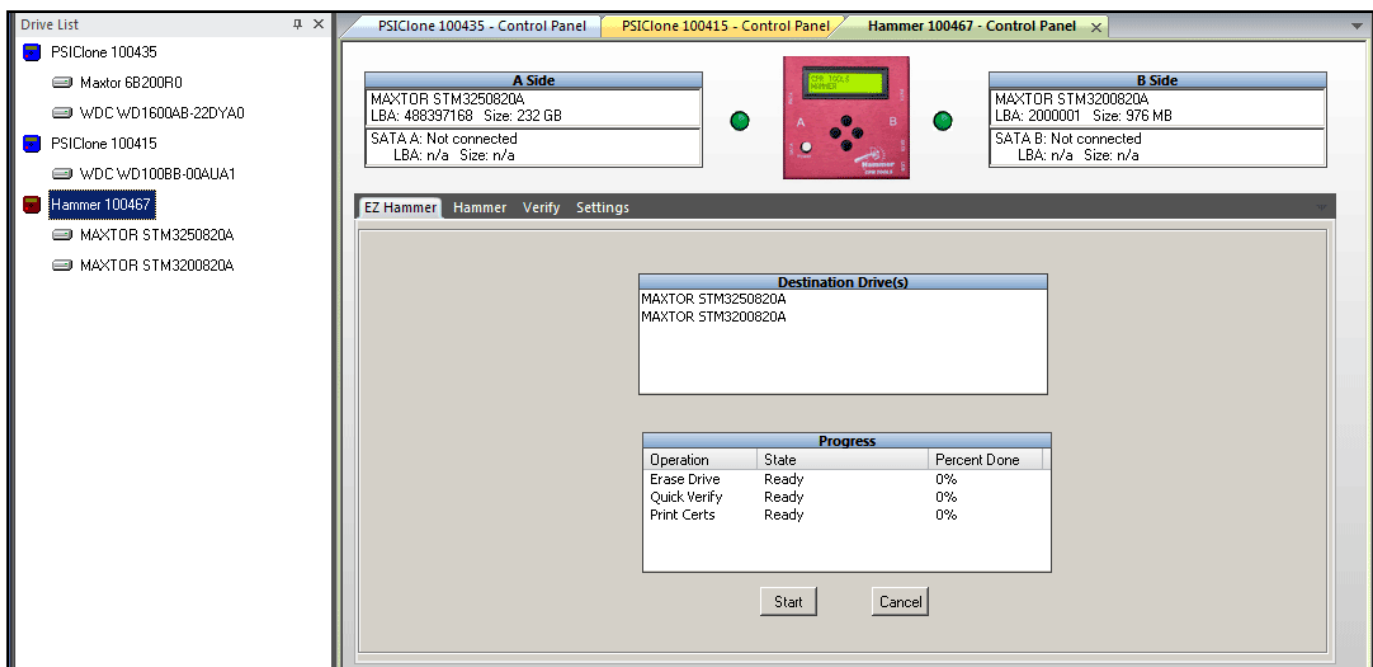

Figure 111 - CPR Toolbox™ controlling multiple CPR Devices

Figures 73 and 74 depict CPR Toolbox™ with three CPR Devices attached. Hammer™ Device (S/N 100467) is displayed performing an erasure.

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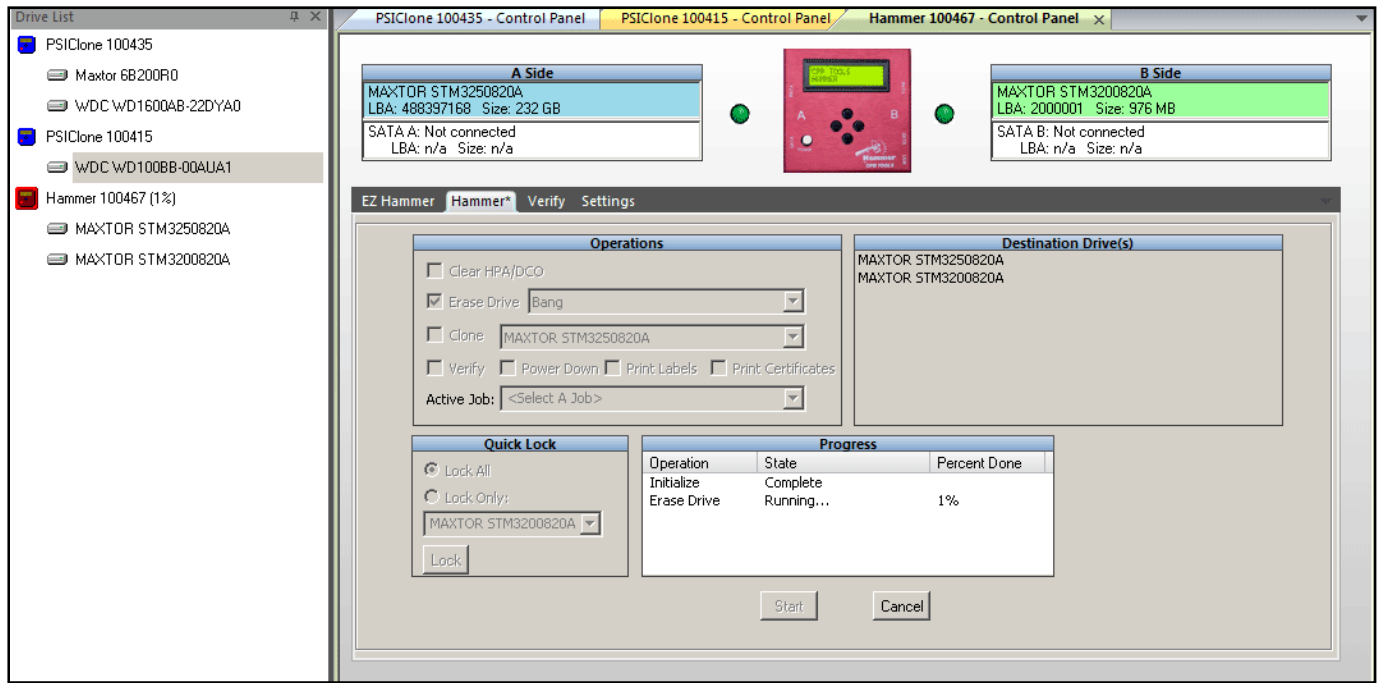Media Research & Recovery

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**Figure 112 - CPR Toolbox™ with multiple CPR Devices
Hammer (S/N 100467) shown performing an erasure**

Figure 112 shows an erasure being performed by the Hammer™ device shown at the bottom of the left horizontal pane. This is able to be determined by the red circle which highlights the Hammer™ icon in the left vertical pane.

CPR Toolbox™ Tips:
When selecting a CPR Tools device (PSIClone™, Hammer™, SCSI Hammer™, etc…) using CPR Toolbox™, the backlit LCD of the device will become illuminated to assist in identifying which device is selected.

The LCD will not illuminate if the device is actively performing a command.

Customer Support

For more information, please visit us on the World Wide Web at http://www.cprtools.net/.

Technical support requests for the PSIClone™ should be sent via email to psiclone.support@cprtools.net.

Visit http://www.cprtools.net for our complete offering of hardware and software for data recovery and data security including:

- ✓ Hammer™
  - o Data eradication unit, suitable for lab or field work. Securely erase data from up to four (4) drives at a time.
- ✓ SCSI Hammer™
  - o SCSI Hammer™ brings secure data eradication to SCSI hard drives. Securely erase data from up to thirty (30) drives at one time with SCSI Hammer™
- ✓ HDD Adapters
  - o A full suite of sturdy adapters to simplify working with a variety of form factors.
- ✓ Head Combs
  - o Pre-fabricated head loaders; a must for hardware based data recovery efforts
- ✓ BangDisk32™
  - o HDD Sanitizing utility for Microsoft Windows
- ✓ AlarmDisk™
  - o Windows based system monitor, provides alerts to unauthorized HDD access

Product specifications, user's guides, instructional videos and more are available at http://www.cprtools.net/downloads.

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