

**TD1 Forensic Duplicator  
User Guide**

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## 1. Introducing the TD1 Forensic Duplicator

The Tableau TD1 is a "forensic duplicator". As a forensic duplicator, the TD1 has many of the functions traditionally found in duplicators for the general IT market. In addition, the TD1 has features and capabilities that make it very good at handling the special needs of forensic practice.

Like any good IT duplicator, the TD1 is *very fast*, sustaining data rates up to 6 GB/minute. The TD1 is also versatile, having native support for both SATA and IDE hard disks on both the input (source) and output (destination) interfaces.

The TD1 also has features uniquely valuable in forensic applications. One of the most important of these features is the ability to calculate MD5 and SHA-1 hash values – sometimes called fingerprints – for the data being duplicated *without slowing the duplicator*. Other forensic features include detailed log generation (useful for case documentation), automatic blank-checking of source and destination drives, detection and handling of hidden/protected data areas on source and destination drives (HPA & DCO support), and so forth.

These pages contain a wealth of information about the Tableau TD1 Forensic Duplicator. We hope you find this information useful and informative as you work with the TD1.

## 2. How to Use This Manual

This manual is divided into four main sections:

**Quick Start.** Quick information for setting up and using the TD1.

**Useful Information.** Highlights key areas worth understanding when using the TD1.

**Reference.** A detailed, menu-by-menu guide to the operation of the TD1.

**Troubleshooting and Support.** Ways to resolve common problems.

We suggest you begin with the *Quick Start* and *Useful Information* sections. These sections are shorter than the complete *Reference*, and will generally give you enough information to get started with the TD1.

When you are ready to understand the TD1 in more detail, the *Reference* section will give you detailed information about the many capabilities of the TD1.

The *Troubleshooting and Support* section is a brief list of solutions for common problems when using the TD1. However, if you find yourself having trouble with the TD1, please visit the Tableau web site ([www.tableau.com](http://www.tableau.com)) where you will find up-to-date guidance and answers to frequently asked questions.

## 2.1 Conventions Used In This Manual

While reading this manual please pay special attention to text highlighted using the following convention.

***IMPORTANT: Paragraphs in bold italics make important points.***

***Hint: Sometimes paragraphs in bold italics highlight information and tips for getting the best performance from your Tableau TD1 Forensic Duplicator.***

This manual also highlights *critical* points with an exclamation mark in a yellow triangle.



Highlights an important point or caution. You won't find this symbol very often in this manual. When you do, it means there is an especially important point which you *must* understand in order to use your Tableau TD1 properly.

The TD1 has two "soft keys" placed immediately under the LCD display. The bottom (i.e., fourth) line of the LCD will have text indicating the current function for each of the two soft keys. In this manual the text is surrounded by square brackets. For example, [Select] indicates the soft key with the word "Select" displayed above it on the LCD.

### 2.1.1 Conventions for Disk Capacity and Transfer Rates

In the computer industry there are two conventions for the meaning of terms like "megabyte" and "gigabyte". When talking about devices like computer RAM, one megabyte is traditionally equal to  $2^{20} = 1,048,576$  bytes and one gigabyte is traditionally equal to  $2^{30} = 1,073,741,824$  bytes.

However, when talking about disk storage, disk manufacturers have traditionally referred to one megabyte as  $10^6 = 1,000,000$  bytes and one gigabyte as  $10^9 = 1,000,000,000$  bytes.

To make matters more complicated, Microsoft operating systems such as Microsoft Windows have traditionally measured disk capacity using the "powers-of-two" convention typically used for RAM while the Apple Macintosh operating systems have traditionally measured the same disk capacities using the "powers-of-ten" convention.

When referring to disk capacities and disk transfer rates, Tableau has adopted the convention traditionally used by disk manufacturers. So, when Tableau displays a number on screen such as "4 GB" this should be interpreted as 4,000,000,000 bytes. Similarly, when Tableau refers to the TD1's peak transfer rate of "100 MB/sec" this should be interpreted as 100,000,000 bytes per second.

### 2.1.2 The Alert LED

The TD1 has a yellow Alert LED. By convention the TD1 will flash the yellow Alert LED whenever the unit requires user intervention.





### 3. Quick Start

#### 3.1 Unpacking your TD1 Kit

The TD1 is shipped in a complete kit which includes cables, adapters, and a power supply which should satisfy most of your day-to-day forensic imaging requirements.



When you first receive your TD1, please unpack the kit and familiarize yourself with its contents. The following table lists each of the items found in the kit.

Product Photo	Tableau Model #	Description
	TD1	Duplicator main unit.
	TP3-NC	High-output power supply for use with TD1. The TP3 provides enough power to supply the TD1 and most common combinations of source and destination hard disks. The TP3 uses a universal 2-pin AC line cord and is compatible with 110-240VAC line voltages worldwide.
	TP2-LC-US	When shipped to markets in North America the kit includes the TP2-LC-US AC line cord for use with the TP3-NC power supply. When shipped to other geographic markets, the local reseller typically adds a 2-pin AC line cord which is appropriate for the local market.
	TC2-8	"Molex-style" power cable (2 pcs). Power cable to connect IDE hard disks and older, legacy style SATA hard disks to the TD1.

	TC5-8	"SATA-style" power cable (2 pcs). Power cable to connect the 15-pin SATA power connector found on most modern SATA hard disks to the TD1.
	TC3-8	SATA signal cable (2 pcs). Signal cable to connect SATA hard disks to the TD1.
	TC6-8	IDE signal cable (2 pcs). Signal cable to connect IDE hard disks to the TD1.  Do not use the TC6-8 IDE cable to connect notebook drive adapters to the TD1. Instead, use the shorter TC6-2 IDE cable (below).
	TC6-2	IDE signal cable for notebook drive adapters. Signal cable to connect notebook drive adapters to the TD1.
	TDA5-25	Adapter for 2.5" notebook hard disks.
	TDA5-18	Adapter for 1.8" notebook hard disks.
	TKDA5-ZIF	Adapter kit for 1.8" "ZIF-style" notebook hard disks.
	TC7-6-6	6-pin FireWire/1394 signal cable. Used to connect the TD1 to a host computer for firmware updates.
	TQS-TD1	Quick Start card for TD1 kit.



Don't overlook or discard the foam packaging! The foam packaging in the TD1 kit is designed to fit several industry-standard hard-sided carrying cases. So, if you received the TD1 kit in the cardboard box shipped by Tableau, you can buy a hard-sided case and re-use the foam insert directly in that case.

## 3.1.1 Turning ON Your TD1 for the First Time

Your TD1 will be in the "factory reset" state when you first receive it. After you have unpacked your TD1 for the first time, connect it to the TP3 power supply and turn it ON. You *do not* need to connect any hard disks to the TD1 at this point.

When the TD1 is turned ON for the first time it runs a "Configuration Wizard" which prompts the user to enter defaults for several configuration items<sup>1</sup>. (The TD1 stores your responses in flash memory, so you will need to enter this information only one time.)

- Your user name (see Section 5.2.9.1)
- The current date and time (see Section 5.2.9.2)
- The TD1 startup mode (see Section 5.2.9.3)

Your user name and the current date/time are recorded in TD1 logs each time you perform a task with the duplicator. "Tasks" and TD1 logging are discussed more fully in a later section.

The startup mode is a unique feature of the TD1. With this feature you can select the default power-ON behavior of the TD1, customizing the unit for your particular work flow. At present there are three options. The TD1 can be configured to go directly to one of two duplication modes (either disk-to-disk or disk-to-file) or directly to the Main Menu. If your workflow typically involves a lot of duplication, then set either the disk-to-disk (cloning) or disk-to-file (imaging) mode. If you prefer to start at the Main Menu, then set that option instead.

Don't worry if you enter the wrong information through the Configuration Wizard! These three items and many other TD1 defaults and settings can be configured through the Setup Menu at any time.

## 3.1.2 Learning to Navigate the TD1 Screens & Menus

As you are prompted for each item by the Configuration Wizard, use the up/down/left/right arrow keys and the center button to select values.

As you are entering information you will also notice that the TD1 displays "soft key" functions at the bottom of the LCD display. There are two soft keys (left and right).

The function of the soft keys depends on the current context. Sometimes the soft keys will have functions like [Back] and [Next] (as they do during the Configuration Wizard). At other times the soft keys may select items like [Cancel] and [Ok], etc.

***Hint: Here is a useful way to think about the functions of the different buttons on the TD1. The soft keys perform major actions, like selecting a task, cancelling a function, or moving between different display screens. The arrow keypad is typically used to navigate within a given screen/menu.***



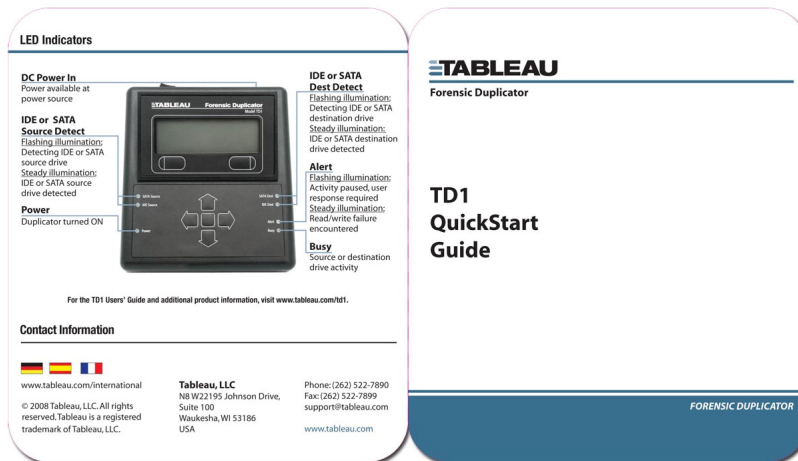
<sup>1</sup> The TD1 also starts the Configuration Wizard after it has been returned to the "factory default" state through the Factory Reset option in the Setup Menu.

As a convenience, the center button on the arrow keypad also acts like a "Select" button when navigating among TD1 menus. However, the center button on the keypad can never be used to start a "major task" (i.e., duplication, disk wiping, etc.). To start a "major task" you must always use the soft key marked as [Select] or [Start].

When you are viewing the Main Menu you will notice that the upper left corner of the display alternates between the date and time. Once you descend into a specific menu you will notice that the date and time is replaced with a menu number. For example, the "Duplicate" Menu is menu #1. As you descend further into the TD1's menu structure you will see additional menu numbers appear in the upper left corner. For example, "Disk-to-File" duplication is menu 1.2 (menu #1, sub-menu #2).

These menu numbers will help you keep track of where you are in the menu system as you navigate up and down through the menu hierarchy. This manual references the same menu numbers to make it easier for you to cross reference information in this manual with on-screen displays.

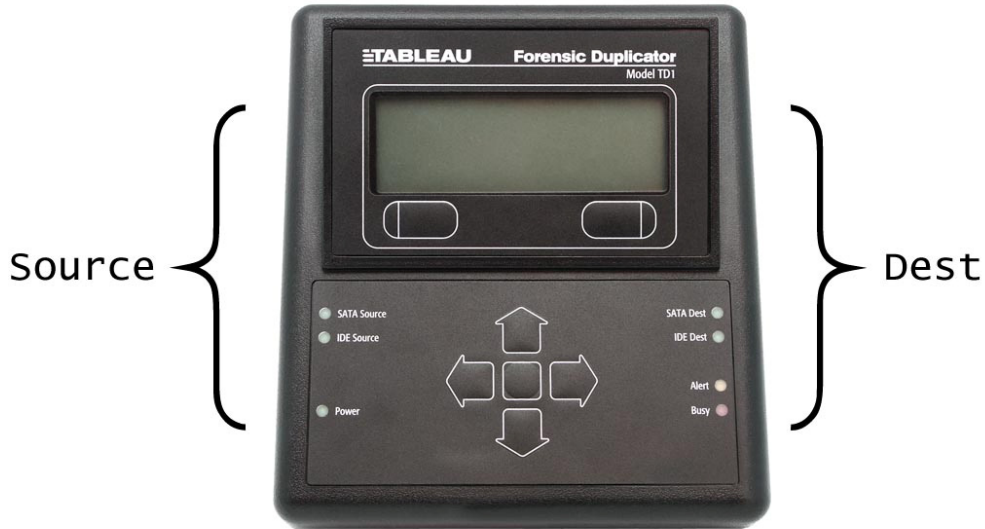
The TD1 is shipped with a *Quick Start* card. The Quick Start card illustrates the layout of the display, buttons, connectors, and switches found on the TD1. We encourage you to keep the Quick Start card with you as you familiarize yourself with the operation of the TD1.



In designing the TD1 Tableau made an effort to keep the user interface as simple and intuitive as possible. We think you will find the combination of the soft keys and the arrow keypad to be quite natural after a few minutes of use.

### 3.1.3 The Source is on the Left!

The first question asked by many users is "which side is the source"? When looking at the TD1 from the front, the source drive should always be attached to the left side of the duplicator and the destination drive should be attached to the right side of the duplicator.



If you look at the front of the TD1 you will notice seven light emitting diodes (LEDs). An eighth LED is located on the rear edge of the TD1 near the DIN-style power connector.



Two of the LEDs on the left are marked "SATA Source" and "IDE Source" and two of the LEDs on the right are marked "SATA Dest" and "IDE Dest". These markings will help you remember that the source drive is always connected to the left side of the TD1 and the destination (dest) drive is always connected to the right side.

## 3.1.4 Connecting Source and Destination Hard Disks

***Like Tableau's forensic bridges (also known as "write blockers"), the Tableau TD1 should be turned OFF when connecting and disconnecting hard disks. There is one exception to this rule...When imaging (disk-to-file duplication), the destination disk may become full. When this happens, the TD1 will turn OFF the destination disk and ask you to connect a new/different destination disk. You should not turn the TD1 OFF during this process.***

Step-by-step instructions for connecting hard disks to the TD1:

1. Confirm that the TD1 power switch is in the OFF position (the Power LED will be OFF).
2. Connect one source disk to the TD1 using the appropriate signal cable.
  - a. TC6-8 IDE signal cable<sup>2</sup> or
  - b. TC3-8 SATA signal cable
3. Connect the source disk to the TD1 source power using the appropriate drive power cable.
  - a. TC2-8: IDE / SATA drive power cable or
  - b. TC5-8: SATA drive power cable
4. Connect one destination disk to the TD1 using the appropriate signal cable.
  - a. TC6-8: IDE signal cable<sup>2</sup> or
  - b. TC3-8: SATA signal cable
5. Connect the destination disk to the TD1 destination power using the appropriate drive power cable.
  - a. TC2-8: IDE / SATA drive power cable or
  - b. TC5-8: SATA drive power cable
6. Connect the TP3 power supply to the power connection located on the back of the TD1. Using the appropriate line cord, plug your TD1 into an AC power source.

NOTE: The green *DC Power In* LED indicates that power is available at the power connector.

Toggle the TD1 power switch "ON" to power on the TD1.

NOTE: The green *Power* LED indicates that the duplicator is turned ON.

***The TD1 is a 1-to-1 duplicator. When connecting hard disks to the TD1, never connect more than one hard disk to each side of the TD1 at the same time.***

The preceding instructions apply to typical 3.5" SATA and IDE hard disks. If you are connecting a 1.8" or 2.5" notebook hard disk to the TD1 you will need to use a TC6-2 IDE signal cable in conjunction with one of the following notebook adapters:

- a. TDA5-18 1.8" notebook adapter
- b. TDA5-25 2.5" notebook adapter
- c. TDA5-ZIF 1.8" ZIF adapter and cables
  - TC20-3-2 ZIF cable for 0.2mm ZIF connectors
  - TC20-3-3 ZIF cable for 0.3mm ZIF connectors

***IMPORTANT: You must use the shorter TC6-2 (2") IDE cable when connecting a notebook drive adapter to any Tableau product, including the TD1. Never use the longer TC6-8 (8") IDE cable with notebook drive adapters.***

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<sup>2</sup> When using IDE signal cables, the blue cable connector must be plugged into the TD1 unit for proper operation.

## 3.2 Common Tasks

The following sections illustrate brief, step-by-step instructions for some of the most common tasks performed using the TD1.

### 3.2.1 Duplication

You have purchased a high-performance duplicator, so it stands to reason that duplication will be one of the most common tasks you perform with your TD1.

The TD1 can perform either of two types of duplication: cloning and imaging. Cloning is the process of copying a source disk sector-by-sector to a destination disk. The first sector on the source disk is copied to the first sector on the destination disk, the second to the second, and so forth. In the TD1 we refer to this as "disk-to-disk" duplication. Imaging is the process of copying the source disk into one or more *files* on the destination disk. In the TD1 we refer to this as "disk-to-file" duplication.

#### 3.2.1.1 Cloning (Disk-to-Disk Duplication)

1. Follow the steps listed in Section 3.1.4 to connect the source and destination hard disks to the TD1 and turn on the TD1.
2. Starting with the Main Menu, navigate to Disk-to-Disk duplication (Menu #1.1).
3. Press the [Start] soft key to begin duplication.
4. On-screen displays report the progress of the duplication task. You may press the [Details] button at any time during duplication to see more information about the duplication process.
5. When duplication finishes you may print or save a copy of the log.

Before beginning duplication the TD1 will check for situations which might require your special attention. For example, the TD1 checks to make sure the destination disk is at least as large as the source disk. If not, the TD1 will inform you of the problem and will not allow duplication to proceed. The TD1 performs a number of other automatic tests before beginning duplication. A complete list of these tests is provided in Section 4.3.

#### 3.2.1.2 Imaging (Disk-to-File Duplication)

1. Follow the steps listed in Section 3.1.4 to connect the source and destination hard disks to the TD1 and turn on the TD1.
2. Starting with the Main Menu, navigate to Disk-to-File duplication (Menu #1.2).
3. Press the [Start] soft key to begin duplication.
4. On-screen displays report the progress of the duplication task. You may press the [Details] button at any time during duplication to see more information about the duplication process.
5. When duplication finishes you may print or save a copy of the log.

Unlike Disk-to-Disk duplication, Disk-to-File duplication *does not* require that the destination disk be as large as the source disk. The TD1 supports a feature called "spanning" which allows the destination data to span more than one destination disk.

You *do not* need to format the destination disk before starting Disk-to-File duplication. If a destination disk already has an acceptable format<sup>3</sup>, the TD1 will use it as-is. Otherwise, the TD1 will automatically format each destination disk as needed. If a destination disk is not already formatted and if the disk does

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<sup>3</sup> As of this writing, the TD1 supports destination disks formatted for the FAT32 file system.

not appear to be blank, the TD1 will prompt you to confirm that you want to format the disk. This helps to prevent the unintended overwriting of disks.

### 3.2.2 Wiping Destination Disks

1. Follow steps similar to those listed in Section 3.1.4 to connect a destination disk. You *do not* need to connect a source disk.
2. Starting with the Main Menu, navigate to the Wipe Menu (Menu #3).
3. Select "One Pass Write" or "Multi Pass Write".
4. Press [Yes] to confirm your selection.
5. On-screen displays report the progress of the wiping task.

## 4. Useful Information

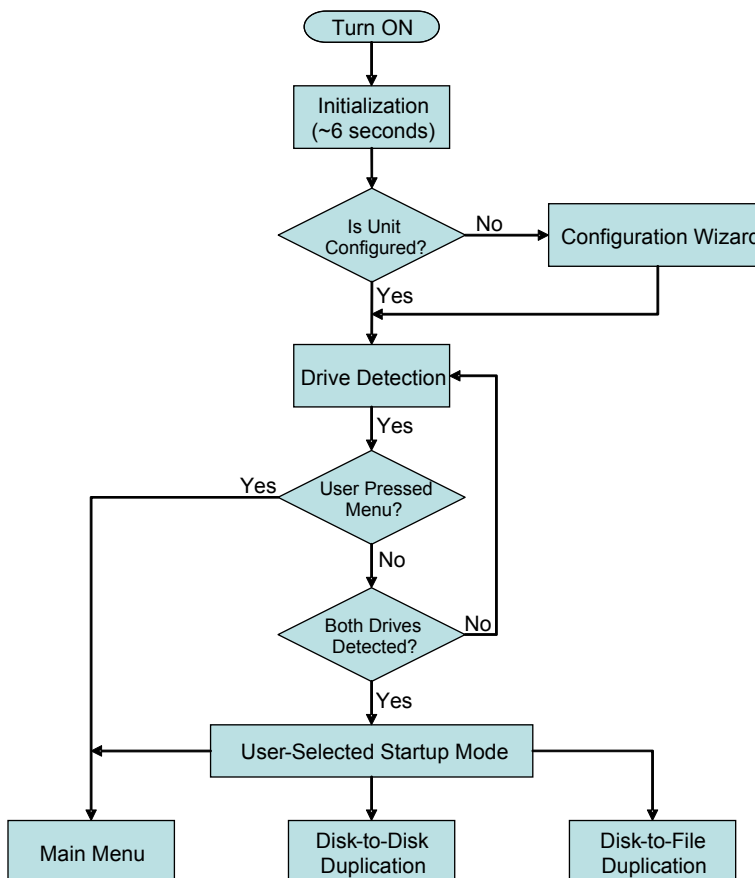
The following sections provide information regarding the operation and usage of the TD1 which you will likely find useful.

### 4.1 TD1 Startup Sequence

Tableau designed the TD1 from the ground up to optimize it for the needs for forensic practitioners and computer forensic processes. Because of this focus on forensics, users who are accustomed to using duplicators from other vendors may find the TD1 usage model a little unfamiliar at first. However, Tableau believes users will quickly come to appreciate the TD1's focus on efficiency.

***Unlike duplicators from other vendors, the TD1 is designed to be turned OFF between acquisitions. Turning the TD1 off between acquisitions minimizes the chances that users will inadvertently apply power to a source or destination drive, possibly damaging a critical evidence device.***

The following flowchart illustrates what happens when you turn ON the TD1.



**Initialization.** Immediately after power-ON, the TD1 begins an initialization and self-test procedure which lasts approximately six seconds during which time the TD1 displays a copyright notice. If the TD1 detects any faults, such as a low real-time clock battery or a power supply which is out of specification, it will display warning messages at the end of initialization.

**Configuration Wizard.** If the TD1 is new, or if the user has erased all TD1 settings using the Setup → Factory Reset option, then the TD1 will automatically start its Configuration Wizard. The Configuration Wizard prompts for the user name, the current date and time, and the user's preferred TD1 startup mode.

**Drive Detection.** After initialization (or after the Configuration Wizard) the TD1 immediately begins drive detection. During drive detection the user will see an on-screen display indicating whether source and destination drives have been recognized properly. During this time the TD1 will also blink the "SATA" or "IDE" LEDs for the source and destination sides of the duplicator.

The TD1 automatically detects the cable-type for the source and destination drives. If you are using a SATA device, the corresponding "SATA" LED should be blinking. If you are using an IDE device, then the corresponding "IDE" LED should be blinking.

***At any time during drive detection you may press the "Menu" button to proceed immediately to the TD1's Main Menu. . If you are performing a single-drive operation, such as formatting or wiping a destination drive, then you should use the "Menu" button to proceed to the Main Menu after the desired drive has been detected.***

***NOTE: The TD1 will continue drive detection in the background, even after you proceed to the Main Menu. Drive detection stops when both source and destination drives have been detected or when you start a single-drive task, such as destination disk wiping.***

**User-Selected Startup Mode.** One of the novel features in the TD1 is the ability to select a default startup mode. If you are typically using the TD1 for duplication, then set Disk-to-Disk or Disk-to-File as your default startup mode. Immediately after detecting both source and destination disks the TD1 will proceed automatically to the selected Duplication screen where you will have the option of pressing one only one button to start the duplication. This feature gives you the ability to start typical duplication operations very quickly and with minimum user input.

If instead of duplication you find yourself frequently using the TD1 for other operations such as disk wiping or stand-alone hashing (hashing without duplication), then set "Main Menu" as your startup mode. In this mode the TD1 will proceed immediately to the Main Menu after finishing drive detection. Again, you can also proceed directly to the Main Menu at any time by pressing the [Menu] soft key which is displayed during drive detection.

## 4.2 Progress Displays During Duplication, Wiping and Hashing

During long disk operations including duplication, wiping, and stand-alone hashing, the TD1 displays performance and timing metrics to help you observe and gauge the progress of the selected operation.

As of Firmware Revision 1.2, the TD1 displays five on-screen metrics. These metrics are displayed in a rotating "loop". Each metric is displayed for approximately 2 seconds on the LCD line immediately above the soft-key legends.

The following chart explains each of the performance/timing metrics displayed by the TD1.

Metric	Displayed As	Meaning/Description
Elapsed Time	"Elapsed: min sec"	Total elapsed time since the start of the current task.
Time Remaining	"TimeRem: min sec"	Estimated remaining time for the current task. This time is calculated using the amount of data remaining divided by the average transfer rate (see below).
Instantaneous Transfer Rate (bytes per second)	"Instant: xxx MB/sec"	The "instantaneous" transfer rate is really the average over the most recent 6 seconds. This rate is displayed both in bytes per second and bytes per minute.
Instantaneous Transfer Rate (bytes per minute)	"Instant: yyy GB/min"	
Average Transfer Rate (bytes per minute)	"Average: yyy GB/min"	The "average" transfer rate is the average rate since the start of the current task.

**Table 1. TD1 Performance and Timing Metrics**

***IMPORTANT: Rotating-media hard disks are faster at the beginning of the disk than they are at the end of the disk. It is normal to see the "instantaneous" transfer rate at the beginning of the disk with is 50 – 100% faster than the instantaneous transfer rate at the end of the disk. The difference in speed from the beginning of the hard disk to the end is normal given the design of modern hard disks and does not imply a problem with either the hard disks or the TD1 duplicator<sup>4</sup>.***

<sup>4</sup> Tableau has written a white paper explaining hard disk performance. This white paper, *Benchmarking Hard Disk Duplication Performance in Forensic Applications*, is available for download from Tableau's web site.

### 4.3 Conditions Checked Before Duplication

In designing the TD1 for use in forensic applications, Tableau has paid special attention to conditions which require exceptional handling by forensic practitioners. Before starting a Disk-to-Disk or Disk-to-File duplication the TD1 automatically checks for a number of "preconditions". Some preconditions are warnings, and the user can choose to continue or cancel after viewing each warning. Other preconditions are fatal and require that the duplication process be aborted.

The following table summarizes preconditions checked by the TD1 prior to duplication.

Name	Disk-to-Disk or Disk-to-File	Type	Explanation
Source Disk HPA	Both	Warning	Reports that HPA is in use on the source disk.  Note: HPA on the source disk is automatically removed by the TD1. This warning gives the forensic practitioner an extra "heads-up" to be aware that an HPA was present on the source disk.
Source Disk DCO	Both	Warning	Reports that DCO is in use on the source disk.  The TD1 does <i>not</i> automatically remove DCO on the source disk as doing so requires a permanent modification of the source disk. The user can cancel the duplication and manually remove the DCO using the Disk Utilities option under the Main Menu.
Destination Disk HPA or DCO	Both	Warning	Reports that either HPA or DCO is in use on the destination disk.  The TD1 does not automatically remove HPA or DCO on the destination disk. This warning notifies the user that the duplicator will not be using the total size of the destination disk. The user can cancel the duplication and manually remove the HPA / DCO using the Disk Utilities option under the Main Menu.
Destination Disk Too Small	Disk-to-Disk	Fatal	For Disk-to-Disk duplication the destination disk must be at least as large as the source disk.
Chunk Size Too Small	Disk-to-File	Fatal	For Disk-to-File duplication the "chunk size" must be large enough so that the entire copy can fit in 999 chunks. The user must specify a larger chunk size using the Setup → Duplicate Optns menu.

Source Disk May Be Blank	Both	Warning	The TD1 checks selected sectors on the source disk looking for non-blank data patterns. If all of the checked sectors appear to be blank, the TD1 warns the user that the source <i>may</i> be blank. This does not mean that the source <i>is</i> blank, but it might mean that the source has been partially wiped or that an ATA password has been set for the source drive.
Destination Disk Is Not Blank	Disk-to-Disk	Warning	The TD1 checks selected sectors on the destination disk looking for non-blank data patterns. If the destination disk is not blank the user might be about to overwrite a disk unintentionally, and this warning gives the user the chance to abort the duplication.
Destination Disk Is Not Blank	Disk-to-File	Warning	When performing Disk-to-File duplication the TD1 needs each destination disk to be formatted with the FAT32 file system. If the destination disk is already formatted for FAT32, the TD1 will use it as-is without overwriting any existing files. If the destination disk does not have a FAT32 file system the TD1 can format it on the fly during duplication. If the destination disk appears to be blank, the TD1 formats it without any warnings. However, if the destination disk <i>does not</i> appear to be blank, then the TD1 will issue a warning before formatting it.
Duplication Will Span Multiple Destination Disks	Disk-to-File	Warning	When performing Disk-to-File duplication the TD1 checks the available space on the destination disk. If the destination disk appears to be too small to receive the entire contents of the source drive, then the TD1 will issue a warning giving the user the opportunity to change disks or to proceed.
Destination File System Nearly Full	Disk-to-File	Warning	When performing Disk-to-File duplication the TD1 checks the available space on the destination disk. If the destination disk does not have enough room for a complete "chunk", then the TD1 will pause and <i>require</i> the user to change destination disks.

**Table 2. Conditions Checked Before Duplication**

## 4.4 File Structure and Naming Conventions

**Note:** Prior to TD1 firmware v2.1 the TD1 used a different directory and file naming convention. The naming conventions used by older firmware are documented in Appendix B.

There are two situations in which the TD1 creates files on a destination disk:

1. When performing Disk-to-File duplication the TD1 writes copied data as a series of file "chunks". The TD1 also writes a text file containing the log for the Disk-to-File operation.
2. When saving logs to a USB storage device the TD1 writes each log as a text file.

The following sections illustrate the directory and file naming conventions used in each of these processes.

### 4.4.1 Disk-to-File Duplication

When performing Disk-to-File duplication (also known as "imaging") the TD1 creates files on the destination hard disk which contain the data copied from the source hard disk. Each of these files is called a "chunk".

Chunks are written to the destination disk according to the following convention:

```
(root dir)/
  TD1_IMG/
    [directory name]/
      [filename].001
      [filename].002
      ...
      [filename].999
      yyyy-mm-dd hh-mm-ss nnnnn TTT.LOG
```

[directory name] is the name generated by the TD1 for each separate acquisition. If an acquisition spans multiple destination disks, the same [directory name] will be used on each destination disk. This makes it easy to group image files related to a particular acquisition.

The [directory name] can be auto-generated by the TD1 or entered by the user. Auto-generated names can be based on the date/time, the serial number of the source device, or the model and serial number of the source device. The auto-generated [filename] is "IMAGE", though this value can be overridden by the user. Please refer to Section 5.2.9.3 Duplicate Optns (Menu 9.3) for a complete list of the options which can be used to control the auto-generation and user prompting for directory and file names.

[filename].001 is the first chunk, or portion of the data copied from the source disk. The chunk size is a user-settable option and may be also be specified under the Setup → Duplicate Optns menu. There may be a maximum of 999 chunks for a single disk copy. If the user has specified a chunk size which would require more than 999 chunks, the TD1 will report an error and abort the duplication process.

It is also possible to specify ".DMG" naming for chunks. .DMG refers to a file naming convention used by Apple operating systems like OS X. If the .DMG naming option is selected the first chunk will be named "IMAGE.DMG" instead of "IMAGE.001". All other chunks will have the same names (i.e., IMAGE.002, IMAGE.003, etc.).

A .LOG file is generated by the TD1 for each Disk-to-File acquisition. "yyyy-mm-dd hh-mm-ss" is the date and time at which the duplication task started. The next five characters – "nnnnn" – are generated from

the internal log ID number assigned to the log by the TD1. The "TTT" in the filename refers to the type of task as listed in Table 3 and will always be "D2F" for a Disk-to-File acquisition.

3-Character Prefix	Type of Log Entry/Task
BCK	Blank Check
D2D	Disk-to-Disk Duplication
D2F	Disk-to-File Duplication
FMT	Disk Formatting (destination only)
HPA	HPA / DCO Operation
HSH	Disk Hashing (source only)
WIP	Disk Wiping (destination only)

**Table 3. 3-Character Abbreviations for TD1 Tasks**

**Note:** The 3-character codes in the above table match the 3-character codes displayed in the Logs → View Logs menu.

**NOTE:** If the Disk-to-File duplication spans more than one destination disk, then the directory structure shown above will be reproduced on each destination disk. However, the .LOG file will be written only to the "last" disk in the set.

#### 4.4.2 Saving Logs to a USB Storage Device

With TD1 REV 1.2 or later firmware it is possible to save logs to a mass storage device – like a thumb drive – attached to one of the USB ports on the TD1. When the TD1 writes logs to a USB storage device it adheres to the following directory and naming conventions:

```
(root dir)/
  TD1_IMG/
    LOGS/
      SSSSSSSS/
        yyyy-mm-dd hh-mm-ss nnnnn TTT.LOG
```

Here, "SSSSSSSS" is the "short-form serial number" for the duplicator itself. This eight-digit serial number is the same as the serial number you will find printed on a label on the bottom of the TD1 itself. "01D1000C" is an example of a valid TD1 serial number.

The format of the .LOG filename is described in the previous section.

## 4.5 Sample TD1 Log

The TD1 maintains detailed logs for each task initiated by the user. Here is a sample log for a Disk-to-File acquisition which completed without errors.

-----Start of Tableau TD1 Log entry-----

Task: Disk to File  
Status: Ok  
Created: 2008-08-14 13:15  
Closed : 2008-08-14 13:43  
User: Tableau  
Case ID:  
    TD1 Demonstration  
Case Notes:  
    The TD1 is an awesome forensic duplicator!

Duplicator serial num: 01d1101a  
Duplicator firmware timestamp: Aug 12 2009 11:43:33  
Duplicator firmware revision: 2.10  
Duplicator log ID num: 7

-----Disk-to-File Results-----

# of sectors: 293,046,768 (150.0 GB)  
Destination filename convention: Default  
Chunk size in sectors: 7,812,480 (3.9 GB)  
Chunks expected: 38  
Chunks written: 38  
Filename of first chunk: TD1\_IMG/WDC WD1500HLFS-01G6U0\_WD-WXLY08147051/IMAGE.001  
Total errors: 0  
Errors recorded: 0  
SHA1: 813d0f6bf853d6681314911fe6fe02c9b96ecbd8  
MD5 : af995be7c61fc0a8ffe052b842fbabbd

-----Source Disk-----

Model: WDC WD1500HLFS-01G6U0  
S/N: WD-WXLY08147051  
Firmware Revision: 04.04V01  
Capacity in sectors reported Pwr-ON: 293,046,768 (150.0 GB)  
Capacity in sectors reported by HPA: 293,046,768 (150.0 GB)  
Capacity in sectors reported by DCO: 293,046,768 (150.0 GB)  
HPA in use: No  
DCO in use: No  
ATA Security in use: No  
Cable/Interface type: SATA  
ATA PIO mode: PIO 4  
ATA DMA mode: UDMA 5  
Peak power:  
    +5V : 4.81 V 691 mA  
    +12V: 12.2 V 335 mA

(continued on next page)

-----Destination Disks-----

Destination disks used: 1  
Destination disks recorded: 1

-----Destination Disk #1-----

Model: WDC WD3000GLFS-01F8U0  
S/N: WD-WXL508028462  
Firmware Revision: 03.03V01  
Capacity in sectors reported Pwr-ON: 586,072,368 (300.0 GB)  
Capacity in sectors reported by HPA: 586,072,368 (300.0 GB)  
Capacity in sectors reported by DCO: 586,072,368 (300.0 GB)  
HPA in use: No  
DCO in use: No  
ATA Security in use: No  
Cable/Interface type: SATA  
ATA PIO mode: PIO 4  
ATA DMA mode: UDMA 5  
Peak power:  
  +5V : 4.74 V 746 mA  
  +12V: 12.5 V 298 mA

-----End of Tableau TD1 Log entry-----

If the TD1 had detected any bad sectors on the source drive then there would be an additional section at the end of the TD1 log. This additional section would list the sector address and sector length of each unreadable region of the source disk.

## 4.6 Information Stored Internally by the TD1

Some forensic and security applications require that the user be aware of the kinds of information which can be stored by the duplicator. In some cases, users want to know what, if any information is preserved by the unit from one acquisition to the next. In other cases, users in security-sensitive environments need to be able to "sanitize" equipment before that equipment may be removed from a secure environment.

The TD1 has three separate non-volatile memories. The first non-volatile memory is a flash device which is used to store the TD1's firmware and serial number. The firmware can be updated using the Tableau Firmware Update utility (available from Tableau's web site). This flash device is never used to record any user-specific or acquisition-specific information.

The second non-volatile memory is a separate flash device which is used to store two different types of information: configuration settings and logs. Configuration settings include items such as:

- User/operator name (entered via Configuration Wizard or Setup Menu).
- Startup mode of operation (entered via Configuration Wizard or Setup Menu).
- Error handling settings (error recovery strategy and error counter limits).
- Default directory naming conventions for disk-to-file duplication (directory name format).
- Default file naming conventions for disk-to-file duplication (file name format).
- Default file format conventions (chunk size, etc.).
- Last-used case ID and case notes (if case information is enabled).
- User preferences for prompts (directory name, file name, case information).

This second flash also records up to 59 of the most recent tasks performed by the duplicator. A "task" in this context is any operation which operates on a disk device, including duplication, formatting, wiping, hashing, blank checking, and HPA/DCO operations. Logs include detailed information about each disk device attached to the TD1 including the make/model, serial number, capacity, and so forth.

The third and final non-volatile memory is the on-board real-time clock (RTC) with battery backup. The real-time clock records the date and time as set by the user. The real-time clock does not record any user-specific or acquisition-specific information.

#### 4.6.1 Resetting/Clearing Information Stored Internally by the TD1

There are several ways to reset/clear information stored internally by the TD1.

TD1 Non-Volatile Memory	Information Stored	User/Case-Specific Info	How to Reset/Clear
Flash #1	TD1 firmware	None	Firmware can be updated using the Tableau Firmware Update program which can be downloaded from Tableau's web site.
	TD1 serial number	None	It is not possible to change the TD1 serial number in the field.
Flash #2	TD1 configuration	User-specific	All configuration settings can be erased and stored to factory defaults by selecting Setup → Factory Reset.  Configuration settings (excluding user name and startup mode) can be reset to defaults using Setup → Duplicate Optns → Restore Options.
	TD1 configuration	Case-specific (if case ID/notes are enabled)	All configuration settings can be erased and stored to factory defaults by selecting Setup → Factory Reset.  Alternately, the Case ID/Notes can be disabled through Setup → Case Info Optns.
	TD1 logs	User-specific and Case-specific	All logs can be erased by either selecting Logs → Erase Logs or Setup → Factory Reset.  Alternately, logs can be erased individually. When viewing a specific log entry, select the [Options] soft key, then select Erase Log.
Real-Time Clock	Date/Time	None	The Date/Time cannot be restored to factory a factory default state. However, after performing a Factory Reset the TD1 prompts the user to change the Date/Time within the Setup Wizard.  The Date/Time can also be changed by selecting Setup → Date and Time.

**Table 4. Non-Volatile Storage in the TD1**

**NOTE: The "Factory Reset" and "Erase Logs" options physically erase the flash memory corresponding with each item. It is not possible to recover settings or log entries after the flash memory has been physically erased.**

## 5. Reference

### 5.1 Physical Layout & Controls

#### 5.1.1 LEDs

The following picture illustrates the location of each of the eight LEDs on the TD1.



#### 5.1.2 Buttons

Use your keypad and soft keys to navigate TD1 screen displays:

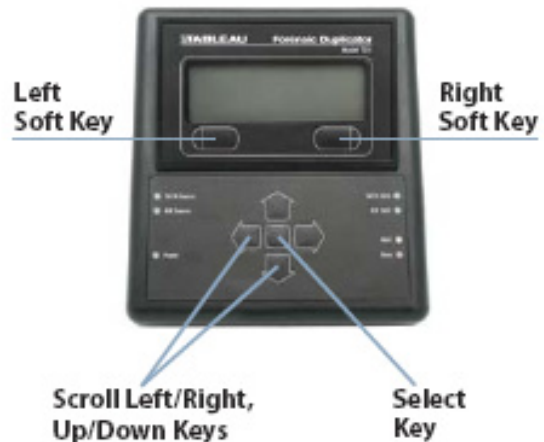
**Left Soft Key** returns to a previous window or stops / cancels an activity, as defined by the on-screen button label.

**Right Soft Key** selects a highlighted menu item or starts / continues an activity, as defined by the on-screen button label.

**Select Key** selects a highlighted menu item or enters an examiner name character. Note: The Select Key is never used to start activity. This key is only used for menu navigation.

**Vertical Arrow Keys** scroll up or down and highlight menu items for selection.

**Horizontal Arrow Keys** scroll left or right and toggle between character lists.



## 5.1.3 USB Keyboard Support

You may connect a standard USB keyboard to either of the USB ports on the front of the TD1. Using a keyboard is often more convenient than entering data using the arrow keypad on the TD1.

When using a USB keyboard the Enter key on the keyboard generally corresponds to the Right Soft Key on the TD1 and the Esc (escape) key on the keyboard generally corresponds to the Left Soft Key on the TD1.

If your keyboard has arrow keys or a mouse-like input device, the up and down arrows (or mouse actions) generally correspond to the up and down (vertical) arrows on the TD1.

## 5.1.4 LCD Contrast

The following picture illustrates the front edge of the TD1 (the edge closest to the user).



Adjust the contrast of the TD1 LCD display using a small Phillips screwdriver to rotate the contrast control located on the front of your TD1.

## 5.2 Menus and Options

The menus and screens in the TD1 are arranged in a tree structure. Under the Main Menu each branch of the tree is numbered. These numbers will assist you in navigating the tree and in referring back to the documentation in this manual. The following outline illustrates each of the menus.

### Main Menu

1. Duplicate Disk
  - 1.1 Disk-to-Disk
  - 1.2 Disk-to-File
2. Format
  - 2.1 Format Dest
    - 2.1.1 Quick FAT32
  - 2.2 Format USB
    - 2.2.1 Quick FAT32
3. Wipe Disk
  - 3.1 One Pass Write
  - 3.2 Multi Pass Write
4. Hash Utilities
  - 4.1 Hash Source
5. Blank Check
  - 5.1 Source Disk
    - 5.1.1 Quick Check
  - 5.2 Dest Disk
    - 5.2.1 Quick Check
6. Disk Information
  - 6.1 Source Disk
  - 6.2 Dest Disk
7. Disk Utilities
  - 7.1 Remove DCO & HPA
    - 7.1.1 Source Disk
    - 7.1.2 Dest Disk
  - 7.2 Remove HPA
    - 7.2.1 Source Disk
    - 7.2.2 Dest Disk
8. Logs
  - 8.1 View Logs
  - 8.2 Save All Logs
  - 8.3 Print All Logs
    - 8.3.1 Newest to Oldest
    - 8.3.2 Oldest to Newest
  - 8.4 Erase Logs

(continued on next page)

- 9. Setup
  - 9.1 Examiner Name
  - 9.2 Date and Time
  - 9.3 Duplicate Optns
    - 9.3.1 Startup
    - 9.3.2 MD5 Hash
    - 9.3.3 SHA1 Hash
    - 9.3.4 Chunk Size
    - 9.3.5 Read Fail
    - 9.3.6 Err Limit
    - 9.3.7 File Ext
    - 9.3.8 File Prompt
    - 9.3.9 Dir Prompt
    - 9.3.10 Dir Name
    - 9.3.11 Finished Alrt
    - 9.3.12 Backlight
    - 9.3.13 Bcklight Alert
    - 9.3.14 Restore Options
  - 9.4 TD1 Info
  - 9.5 Power Info
  - 9.6 Case Info Optns
    - 9.6.1 Case ID
    - 9.6.2 Case Note
  - 9.7 Factory Reset

The following sections describe each of the menu choices in detail.

## 5.2.1 Duplicate Disk

From the Duplicate Disk menu you can select Disk-to-Disk (cloning) or Disk-to-File (imaging).

### 5.2.1.1 Disk-to-Disk / Cloning (Menu 1.1)

Disk-to-Disk duplication, sometimes called cloning, is the process of making a sector-by-sector copy from the source disk to the destination disk.

1 . 1										D i s k - t o - D i s k
S r c :	S T 3 8 0 2 1 5 A									
D s t :	W D C					W D 4 0 0 0 A A K S - 0				
[ B a c k ]										[ S t a r t ]

From the Disk-to-Disk menu select the [Start] soft key to begin duplication. The TD1 will display an on-screen indication of duplication progress. During the duplication you may press [Cancel] to terminate the duplication or you may press [Details] to see more information regarding the duplication in progress.

1 . 1 . 1										D u p l i c a t i n g
[ ■ . . . . . ]										1 4 %
A v e r a g e :	4 . 6					G B / m				
[ C a n c e l ]										[ D e t a i l s ]

#### 5.2.1.1.1 Disk-to-Disk Details

The following details are available during Disk-to-Disk duplication or at the end of duplication.

Legend	Example Value	Meaning/Description
Task	Disk to Disk	Indicates Disk-to-Disk duplication has been selected.
Stat	Ok Error Incomplete	Current status of the duplication.
Date	2008-10-14	Date on which the duplication started.
Time	14:54	Time at which the duplication started.
User	Tableau	The name of the user (see Section 5.2.9.1).
--Source Disk--		
Model	ST380215A	The model of the source disk.
S/N	9RX7Y3DP	Serial number of the source disk.
--Dest Disk--		
Model	WDC WD4000A	The model of the destination disk.
S/N	WD-WCAS838529	Serial number of the destination disk.

--Errors--		
Counted	0	Number of read errors on source disk.
Recorded	0	Number of read errors recorded in the logs. This may be less than the number of errors counted if the log entry is full. Log entries can typically record up to several hundred errors for each logged operation.
--Hashes--		
SHA1	<<no info>>	<<no info>> will be displayed until the operation is finished. Once the operation is finished the hash value will be displayed.
MD5	<<no info>>	

**Table 5. Disk-to-Disk Details**

### 5.2.1.2 Disk-to-File / Imaging (Menu 1.2)

Disk-to-File duplication, sometimes called imaging, is the process of copying the entire source disk (all sectors) into one or more files on the destination disk. The destination disk must be formatted with a supported file system such as FAT32.

From the Disk-to-File menu select the [Start] soft key to begin duplication. The TD1 will display an on-screen indication of duplication progress. During the duplication you may press [Cancel] to terminate the duplication or you may press [Details] to see more information regarding the duplication in progress.

If you have enabled additional prompts (through Setup → Duplicate Optns or Setup → Case Info Optns) you will be prompted for additional information after pressing the [Start] soft key. By default all optional prompts are turned off. Through the Setup menus you can choose to enable prompts for directory and file names and for case ID and case notes fields.

The TD1 offers a high degree of flexibility in selecting defaults for each kind of field so that you can configure the TD1 to match your desired workflow.

#### 5.2.1.2.1 Disk-to-File Details

The following details are available during Disk-to-File duplication or at the end of duplication.

Legend	Example Value	Meaning/Description
Task	Disk to File	Indicates Disk-to-File duplication has been selected.
Stat	Ok Error Incomplete	Current status of the duplication.
Date	2008-10-14	Date on which the duplication started.
Time	14:54	Time at which the duplication started.
User	Tableau	The name of the user (see Section 5.2.9.1).
--Source Disk--		
Model	ST380215A	The model of the source disk.
S/N	9RX7Y3DP	Serial number of the source disk.
--Dest Disk--		
Model	WDC WD4000A	The model of the first destination disk (see note following this table).
S/N	WD-WCAS838529	Serial number of the first destination disk.
Chunk Size	4.0 GB	Indicates the chunk size being used for files on the destination disk(s).
# of Chunks	10	Number of chunks written (so far) to the destination disk(s).
Disk Count	1	Number of destination disk(s) used so far.

--Errors--		
Counted	0	Number of read errors on source disk.
Recorded	0	Number of read errors recorded in the logs. This may be less than the number of errors counted if the log entry is full. Log entries can typically record up to several hundred errors for each logged operation.
--Hashes--		
SHA1	<<no info>>	<<no info>> will be displayed until the operation is finished. Once the operation is finished the hash value will be displayed.
MD5	<<no info>>	

**Table 6. Disk-to-File Details**

Disk-to-File operations may span more than one destination disk. The on-screen TD1 display will show information only for the *first* destination disk. The log recorded in flash by the TD1 will record information for *each* destination disk, and a copy of this log is written to the last destination disk.

## 5.2.2 Format

From the formatting menu you can manually format either the destination disk (SATA or IDE) or you can format a USB mass storage device attached to one of the TD1's USB ports.

### 5.2.2.1 Format Dest (Menu 2.1)

The Format Dest option allows you to format the destination SATA or IDE disk with the FAT32 file system used by the TD1.

The TD1 does what is generally referred to as a "Quick Format." In other words, the TD1 writes the necessary *Master Boot Record*, *Partition Boot Record*, and FAT32 data structures to the destination disk.

The TD1 *does not* do a full surface scan of the destination disk. If you want to verify the integrity of the destination disk you should format it using a traditional computer and operating system.

***Hint: You don't really need to pre-format destination drives when using the Disk-to-File duplication mode of the TD1. If a destination disk is blank, the TD1 will automatically format it with the FAT32 file system.***

### 5.2.2.2 Format USB (Menu 2.2)

The Format USB option allows you to format a USB mass storage device connected to one of the TD1's USB ports. You must attach a USB mass storage device (like a thumb drive) to one of the TD1's USB ports before selecting this option.

***Note: You may only attach one USB mass storage device to the TD1 at a time. Connecting more than one USB mass storage device to the TD1's USB ports may lead to confusing results, as you won't know which USB mass storage device the TD1 is actually using.***

### 5.2.3 Wipe Disk

The Wipe Disk menu gives you two options for wiping the destination disk (SATA or IDE). You can perform a fast, one-pass wipe or you can perform a multi-pass wipe.

#### 5.2.3.1 One Pass Write (Menu 3.1)

The TD1 will write a constant pattern of zeros (00h) to the destination drive in a single pass. The TD1 will display on-screen performance and timing metrics during the wiping process.

You may cancel the wiping operation at any time by pressing the [Cancel] soft key.

**Note:** *The TD1 will not automatically overwrite an HPA or DCO on the destination drive.*

#### 5.2.3.2 Multi Pass Write (Menu 3.2)

The TD1 performs full passes of writes to the destination drive. The first pass writes zeros (00h), the second pass writes ones (FFh), and the third pass writes a randomly selected constant value between 01h and FEh. The TD1 will display on-screen performance and timing metrics during the wiping process.

You may cancel the wiping operation at any time by pressing the [Cancel] soft key.

## 5.2.4 Hash Utilities

There are times when a forensic practitioner would like to be able to calculate the hash signatures (or fingerprints) for a source disk without making a copy of the disk. The Hash Utilities menu gives the user the ability to hash the hard disk attached to the "source" side of the TD1.

You may cancel the hashing operation at any time by pressing the [Cancel] soft key.

***Note: If the source disk has an HPA-protected region, the TD1 automatically disables the HPA before performing the hash calculation. This is the same as the TD1's behavior during duplication. So, if you compare the hash values produced when duplicating a disk and when using the Hash Utilities, you should get the same hash results.***

When the hashing operation is finished, the TD1 prompts you to press the [Ok] soft key. After pressing [Ok] you will see a Hash Options menu:

```
Hash Options
1.  View Hash
2.  Compare to Logs
```

Selecting View Hash lets you view the MD5 and SHA-1 hash results on the TD1 display. The MD5 and SHA-1 hash results are too wide to display completely on screen, so you may use the left and right arrow keys to scroll the hash results.

Selecting Compare to Logs lets you see quickly if you have recently performed any other tasks with the same source drive on this TD1 unit. The TD1 will search the logs stored in flash memory looking for any Disk-to-Disk, Disk-to-File, or Hash log entries which have matching hash values. If there are any matching entries, the TD1 will show you a list of the matching entries.

### 5.2.5 Blank Check

The Blank Check menu gives the user the ability to do a quick blank check on either the source or the destination drive.

After selecting the source disk or the destination disk you should select "Quick Check". This will perform a quick check to determine if the selected disk appears to be blank. When performing a "Quick Check" the TD1 reads sectors in the *Master Boot Record*, the *Primary GPT*, and the *Secondary GPT*. A sector is considered to be blank if it contains only a repeating pattern such as 00h, E5h, or FFh. Any non-repeating pattern is considered to be non-blank. If all sectors read by the TD1 have repeating patterns (though not necessarily the same repeating pattern), then the TD1 concludes the drive may be blank.

***Important: A "Quick Check" is not an exhaustive check of the entire drive. It is possible for a drive to appear to be blank according to the quick check while still storing forensically relevant information. A forensic examiner should treat "blank" source disks with some suspicion and use other tools, like a Tableau write blocker, to examine the drive to see if it contains forensically relevant information.***

## 5.2.6 Disk Information

The TD1 is capable of displaying detailed information for either the source or destination hard disks. Source Disk (Menu 6.1) displays information for the SATA or IDE hard disk attached to the source side of the TD1. Dest Disk (Menu 6.2) displays information for the SATA or IDE hard disk attached to the destination side of the TD1.

The following information is displayed:

Legend	Example Value	Meaning/Description
Model	ST380215A	The model named reported by the hard disk through the ATA IDENTIFY command.
S/N	9RX7Y3DP	The serial number reported by the hard disk through the ATA IDENTIFY command.
Firm Rev	3.AAD	The firmware revision reported by the hard disk through the ATA IDENTIFY command.
Capacity	40.0 GB	The capacity of the hard disk as it will be copied/used by the TD1.
LBA	20,000,000	The capacity in sectors as reported by the hard disk at power ON.
HPA	78,125,000	The capacity in sectors as reported by the hard disk using the ATA HPA (Host Protected Area) feature set.
DCO	156,301,488	The capacity in sectors as reported by the hard disk using the ATA DCO (Device Configuration Overlay) feature set.
HPA in use	Yes	"Yes" if the ATA HPA feature set is being used to reduce the apparent capacity of the hard disk.
DCO in use	Yes	"Yes" if the ATA DCO feature set is being used to reduce the apparent capacity of the hard disk.
Sec in use	No	"Yes" if the ATA Security feature set <i>may</i> be in use to password protect the contents of the hard disk.
Cable	IDE	"IDE" or "SATA".
PIO mode	PIO 4	The PIO (Programmed I/O) mode being used by the TD1 to communicate with the hard disk.
DMA mode	UDMA 5	The DMA or UDMA mode being used by the TD1 to communicate with the hard disk.

--Inst Power--		
5v	4.79 V 398 mA	Real-time display of the +5VDC supply to the hard disk and the current being consumed by the hard disk on +5VDC.
12v	12.4 V 249 mA	Real-time display of the +12VDC supply to the hard disk and the current being consumed by the hard disk on +12VDC.
--Peak Power--		
5v	4.70 V 1.8 A	Records the maximum current consumed by the hard disk on the +5VDC supply and the voltage on the supply at the time of the maximum current reading.
12v	12.3 V 794 mA	Records the maximum current consumed by the hard disk on the +12VDC supply and the voltage on the supply at the time of the maximum current reading.

**Table 7. Disk Information Displayed by TD1**

## 5.2.7 Disk Utilities

The TD1 automatically detects the use of the ATA HPA (Host Protected Area) and DCO (Device Configuration Overlay) feature sets. Both HPA and DCO feature sets can be used to reduce the apparent capacity of a hard disk. From a forensic point of view it is valuable to know if HPA and/or DCO are in use. With that knowledge, the forensic practitioner can make an informed decision about whether or not to acquire data in the "hidden" regions of the drive.

It is possible to disable HPA without making a permanent modification to the drive, so the TD1 *automatically* disables HPA on any hard disk connected to the source side of the duplicator. It is not, however, possible to disable DCO without making a permanent modification to the hard disk, and for this reason the TD1 will *not* automatically disable DCO on the source hard disk.

The TD1 never makes automatic changes to HPA and DCO on a destination hard disk. The TD1 is designed using the assumption that the forensic practitioner has complete control over the destination hard disk; if you choose to restrict the destination drive capacity using HPA or DCO, the TD1 will not override that decision.

The options within the Disk Utilities menu allow the user to *permanently* disable either just the HPA or both the DCO and HPA on either the source or destination hard disk under user control.

### 5.2.7.1 Remove DCO & HPA (Menu 7.1)

It is not possible to remove a DCO-protected region on a hard disk without also removing any HPA-protected region. If you want to remove permanently *both* the HPA and DCO on either the source or destination hard disk, use the options under this menu.

### 5.2.7.2 Remove HPA (Menu 7.2)

It is possible to remove an HPA-protected region on a hard disk without making any changes to the DCO settings on the hard disk. If you want to remove permanently the HPA on either the source or destination hard disk, use the options under this menu.

## 5.2.8 Logs

Whenever the TD1 performs an operation which reads, writes or modifies a hard disk it creates a log entry to record that operation.

The TD1 has an internal flash memory with the capacity to store approximately 59 of the most recently logged operations.

***Once the TD1 has stored 59 log entries the creation of a new log entry will automatically overwrite the oldest log entry.***

The Logs menu gives the user the ability to view, print, save, and erase log entries.

### 5.2.8.1 View Logs (Menu 8.1)

Selecting the View Logs option displays a list of the logs currently recorded in the TD1's internal flash memory. The most recent log entry is displayed at the top of this list with the oldest log entry at the bottom (end) of the list. Log entries are displayed as:

```
10-13 12:46 Wip Ok
10-13 12:45 Wip X
...
```

The first part of the line is the month and date (MM-DD) on which the log was recorded. The second part of the line is the time at which the log was recorded (HH:MM) using a 24-hour clock format.

The third part of each line is a three-character abbreviation indicating the type of task recorded in the log. In the above example, "Wip" refers to a Disk Wiping operation. The 3-character codes are listed earlier in this manual in Table 3.

The last part of the line is an abbreviation which indicates the result of the logged operation:

Abbreviated Result	Explanation/Meaning
Ok	Task completed normally.
Er	Task completed with an error.
X	Task was aborted/cancelled by the user.
NC	Task did not finish. This might happen, for example, if the duplicator is turned off in the middle of the task.

**Table 8. Abbreviated Result Codes Used in TD1 Log Listings**

Use the up/down arrows to scroll through the list of log entries. As you are scrolling through the list of log entries a small sideways triangle ► indicates the currently selected log entry. To view the currently selected entry press the [Select] soft key.

### 5.2.8.2 Save All Logs (Menu 8.2)

It is possible to save all logs to a USB storage device connected to one of the TD1's USB ports. After connecting a USB storage device (i.e., a USB thumb drive) to one of the TD1's USB ports, select the Save All Logs option to save the logs. Logs are saved in an ASCII text format and you should be able to view the logs using a text editor of your choice.

Section 4.4.2 illustrates the naming convention used by the TD1 when saving logs to a USB storage device.

### 5.2.8.3 Print All Logs (Menu 8.3)

It is possible to print all logs to a USB printer attached to one of the TD1's USB ports. After connecting a USB printer to one of the TD1's USB ports, select the Print All Logs option to print the logs. After selecting Print All Logs you will be asked to select whether logs should be printed in the order of "Newest to Oldest" or in the order of "Oldest to Newest".

***Note: The TD1 is compatible with USB printers which support the USB Printer Class Specification. Further, the USB printer must support raw ASCII printing.***

### 5.2.8.4 Erase Logs (Menu 8.4)

Some users may wish to erase the logs stored in the TD1's internal flash memory. Selecting the Erase Logs option will perform a physical erase of the flash memory in which the logs are stored. It is not possible to recover the logs after Erase Logs is finished.



### 5.2.9.3 Duplicate Optns (Menu 9.3)

Duplicate Optns lets the user specify the duplicator startup mode and other options related to disk duplication. The following table lists the options and values which may be set for each option.

Option	Choices	Default	Meaning/Description
StartUp	Disk File Main Menu	Disk	Specifies the TD1 startup mode as: Disk = Disk-to-Disk duplication File = Disk-to-File duplication Main Menu = Main Menu
MD5 Hash	On	On	The TD1 can hash at drive speed up to the maximum 100 MB/sec data rate supported by the TD1 itself. So, hashing is always enabled.
SHA1 Hash	On	On	
Chunk Size	4 GB 2 GB 1 GB 700 MB	4 GB	Chunk size affects the size of file chunks written when performing Disk-to-File (imaging) operations.
Read Fail	Fast Complete	Complete	The TD1 supports two different error recovery modes, fast and complete. These modes are explained in the text following this table.
Err Limit	No Limit 1000 100 One Zero	100	Specifies the maximum number of errors allowed on the source drive.
File Ext	Default DMG	Default	Specifies the file naming convention used during Disk-to-File duplication. In default mode the first "chunk" is named "IMAGE.001". In DMG mode the first chunk is named "IMAGE.DMG".
File Prompt	Yes No	No	Specifies whether the user will be prompted to enter/override the default filename for each "chunk" (segment file) in a disk-to-file acquisition.
Dir Prompt	Yes No	No	Specifies whether the user will be prompted to enter/override the default directory name in a disk-to-file acquisition.
Dir Name	Date+Time Serial Number Model+Serial Num	Date+Time	Specifies the default format for the name of the directory assigned for each acquisition.  Date+Time generates a directory name of the form "yyyy-mm-dd hh-mm-ss"

			<p>corresponding to the date/time at which the duplication started.</p> <p>Serial Number generates a directory name from the serial number of the source disk.</p> <p>Model+Serial Num generates a directory name from the model and serial number of the source disk.</p>
Finished Alert	On Off	On	<p>When "On" the TD1 will flash the yellow Alert LED at the end of a normal/successful acquisition/task.</p> <p>When "Off" the TD1 will flash the yellow Alert LED only if there is an unusual condition or error.</p>
Backlight	Off 1 Min 3 Min	1 Min	Specifies the length of time the LCD backlight will remain on.
Bcklight Alert	On Off	Off	When this option is "On" the TD1 will blink the LCD backlight in unison with the yellow Alert LED. This is intended to make it easier to tell when the TD1 has finished a task or requires user intervention.

**Table 9. Duplicator Options**

There is also a "Restore Options" selection under Duplicate Optns. Selecting this option automatically restores all Options to the settings shown in the "Default" column in the preceding table.

### 5.2.9.3.1 Error Recovery Modes

The TD1 supports two different error recovery modes, "fast" and "complete". Both modes refer to the way in which the TD1 recovers from read errors on the source hard disk.

The "complete" error recovery mode is the default and more exhaustive of the two modes. When the TD1 detects a read fault in complete mode it begins a retry strategy which will read *all* sectors which are readable from the drive. Complete mode will therefore produce the most complete destination image. However, the exhaustive strategy used by the TD1 may also be very time-consuming if the source drive has many read faults.

The "fast" error recovery mode is intended for use with drives which have a high number of read faults. When in "fast" mode, the TD1 treats the source drive as a series of 128-sector blocks (65,536 byte blocks). An error in any 128-sector block will cause the entire block to be treated as an error. This allows the TD1 to move much more quickly through a drive with many read faults, but at the loss of some potentially readable sectors near each fault.

In both error recovery modes the TD1 handles unreadable sectors the same way. When the TD1 has determined that a sector cannot be read from the source drive, it "fills in" the missing data with zeros on the destination drive. Zero data inserted in this way is also included by the TD1 when calculating the MD5 and SHA1 hashes for the duplication.

***The TD1 treats all media errors on a destination disk as fatal / unrecoverable errors. Tableau's philosophy is that each destination disk is receiving a copy of evidence which is critical to a forensic examination. As such, it is unwise to allow the user to store data to a destination disk with known defects.***

#### 5.2.9.4 TD1 Info (Menu 9.4)

Selecting the TD1 Info option displays selected information for the TD1 itself as shown in the following table:

Legend	Example Value	Meaning/Description
S/N	01d1000c	The TD1 serial number.
FWVersion	1.20	The TD1 firmware release.
FWDate	Oct 10 2008	The build date for the TD1 firmware release.
FWTime	09:05:46	The build time for the TD1 firmware release.

**Table 10. Information Displayed by Setup → TD1 Info**

### 5.2.9.5 Power Info (Menu 9.5)

The Power Info option lets you view the current voltage and current for each of the source and destination power ports on the TD1. This information is similar to information which is displayed at the end of the Disk Information display (see Section 5.2.6) for each drive.

--Inst Power--		
5v	4.79 V 398 mA	Real-time display of the +5VDC supply to the hard disk and the current being consumed by the hard disk on +5VDC.
12v	12.4 V 249 mA	Real-time display of the +12VDC supply to the hard disk and the current being consumed by the hard disk on +12VDC.
--Peak Power--		
5v	4.70 V 1.8 A	Records the maximum current consumed by the hard disk on the +5VDC supply and the voltage on the supply at the time of the maximum current reading.
12v	12.3 V 794 mA	Records the maximum current consumed by the hard disk on the +12VDC supply and the voltage on the supply at the time of the maximum current reading.

**Table 11. Information Displayed by Setup → Power Info**

There is an important difference between the power information displayed through the Power Info option in Setup and the power information displayed at the end of Disk Information. Disk Information is displayed only *after* the TD1 has successfully recognized the attached hard disk. Using the Power Info option in Setup you can view power information whether or not the TD1 has successfully detected the attached hard disk. This information can be useful in diagnosing disk detection problems.

### 5.2.9.6 Case Info Optns (Menu 9.6)

Case Info Optns control whether or not the user is prompted for case-specific information at the beginning of tasks like duplication.

Option	Choices	Default	Meaning/Description
Case ID	Prompt Skip	Skip	When set to "Prompt" the TD1 will prompt the user to enter a Case ID.  When set to "Skip" the Case ID will be suppressed in subsequent TD1 logs.
Case Notes	Prompt Skip	Skip	When set to "Prompt" the TD1 will prompt the user to enter Case Notes.  When set to "Skip" the Case Notes will be suppressed in subsequent TD1 logs.

**Table 12. Case Info Options**

### 5.2.9.7 Factory Reset (Menu 9.7)

The Factory Reset option resets *all* TD1 configuration settings and defaults to the factory state. Factory Reset also does a physical erase of all logs stored in TD1 flash.

After performing a Factory Reset the TD1 retains no user-specific or case-specific information.

The only setting not cleared by a Factory Reset is the current date and time.

Section 4.6 provides additional information regarding data stored in non-volatile memory by the TD1.

## 6. Troubleshooting and Support

### 6.1 Troubleshooting Common Problems

#### 6.1.1 Power Supply Issues

The TP3 power supply provided with the TP1 has the following voltage/current ratings

Voltage	Current
+5VDC +/- 5%	4A
+12VDC +/- 5%	4A

These ratings are adequate to power the TD1 and nearly all combinations of one or two hard disks. The TD1 also employs staggered power sequencing for the source and destination hard disks. Staggered sequencing means the TD1 will first apply power to one drive, wait a few seconds while the first drive spins up, then apply power to the second drive. So, when using the TD1 it is normal to hear the source and destination drives spin up separately.

During power ON initialization and self-test, the TD1 will check the output voltages of the TP3 power supply. If either the +5VDC or +12VDC is below the minimum specification, the TD1 will display an on-screen warning.

***Hint: There is a green LED on the rear edge of the TD1 next to the DIN power connector. If the TP3 power supply is connected properly to the TD1 and to AC power, the green LED should be ON. The TD1 itself does not need to be turned ON. If you are having difficulty turning ON the TD1, check the status of this LED to ensure that the TD1 is receiving power from the TP3 power supply.***

#### 6.1.2 Problems with Disk Detection

When using a product like the TD1, the most common problem users encounter is a failure to achieve drive detection. Most drive detection problems are the result of improper cabling. The following table lists the most common drive detection problems and corrective actions.

Problem	Corrective Action
Hard disk does not spin up.	<p>NOTE: The TC2-8 ("Molex" or legacy style) and TC5-8 (SATA style) power cables provided by Tableau have easy-release blue connectors. While these blue connectors make it <i>much</i> easier to unplug the 4-pin "Molex"-style power plug, these blue connectors are sometimes tricky to use, especially for users not familiar with them.</p> <p>Check the power connection between the TD1 and the hard disk. Be especially careful to ensure that the blue 4-pin power connectors are properly seated in the connectors on the TD1 and on the hard disk (if using cable model TC2-8). The blue connectors should be fully inserted in the TD1 and hard disk. The blue 4-pin connectors should not be loose and it should not be possible to remove these connectors without squeezing the blue tabs on the cable connector.</p>
TD1 does not detect IDE hard disk.	IDE hard disks should be set for "Master" or "Single Drive".

<p>TD1 does not detect 3.5" IDE hard disk.</p>	<p>Normal 3.5" IDE hard disks may be connected to the TD1 using either the 8" TC6-8 IDE cable or the 2" TC6-2 cable. In either case, the blue end of the IDE cable must be connected to the TD1.</p> <p>You must <i>never</i> use an IDE cable longer than 8" with the TD1. Always use the Tableau-provided, high-quality, 80-conductor TC6-8 or TC6-2 cable.</p>
<p>TD1 does not detect notebook IDE hard disk.</p>	<p>When using one of the notebook drive adapters provided with the TD1 (model TDA5-18, TDA5-25, or TDA5-ZIF), you <i>must</i> always use the 2" TC6-2 IDE cable. <i>Never</i> use the 8" TC6-8 IDE cable or any non-Tableau IDE cable when using a notebook drive adapter.</p> <p>When using notebook drive adapters, the blue end of the TC6-2 IDE cable should be connected to the TD1 and the black end of the cable should be connected to the notebook drive adapter.</p>
<p>TD1 does not detect ZIF-style notebook IDE hard disk.</p>	<p>There are several models of "ZIF" hard disks. Please refer to the Support pages on Tableau's web site for documentation regarding the proper selection and orientation of ZIF cables when using the TDA5-ZIF kit provided with the TD1.</p>
<p>TD1 does not detect SATA hard disk.</p>	<p>Use only the 8" TC3-8 SATA cable provided by Tableau. With some SATA hard disks the SATA connector may be loose. Ensure that the TC3-8 cable is seated properly in the hard disk's SATA connector.</p>
<p>Too many hard disks connected to TD1.</p>	<p>The TD1 is a 1-to-1 duplicator, meaning you can connect one source disk and one destination disk to the duplicator at a time.</p> <p>For example, if you are using a SATA destination hard disk, the IDE connector on the "destination side" of the TD1 should be left unconnected and vice versa.</p>

**Table 13. Troubleshooting Disk Detection Issues**

Tableau has tested the TD1 with an extensive in-house library of different hard disks spanning many years of hard disk development. Even so, there may be occasional hard disks with which the TD1 is not compatible. Generally speaking, Tableau can correct such compatibility problems by issuing firmware updates. If you have a hard disk which cannot be recognized by the TD1, please check the Support pages on Tableau's web site to see if any firmware updates are available for the TD1.

### 6.1.3 Real-Time Clock / Battery

The TD1 has a built-in real-time clock (RTC) with a battery backup. The battery will allow the TD1 to keep time accurately for 1 to 1 ½ years *when power is not applied to the unit*. If you use your TD1 frequently and the TD1 power switch is ON, then battery life may be extended.

The battery is a user-serviceable item, and the TD1 will display a warning message after power-ON if the battery is low.

For detailed battery replacement instructions please refer to Appendix A.

## 6.2 Support

If you have problems using the TD1 Forensic Duplicator, we strongly encourage you to visit the support pages on Tableau's web site.

<http://www.tableau.com/support>

Here you will find answers to common questions, information regarding specific compatibility issues and firmware updates for your TD1 Forensic Duplicator.

E-mail support for the TD1 Forensic Duplicator is available through:

[support@tableau.com](mailto:support@tableau.com)

We are sorry, but Tableau does not provide technical support by phone.

## Appendix A. Battery Replacement

The TD1 has a built-in real-time clock (RTC) with a battery backup. The battery will allow the TD1 to keep time accurately for 1 to 1 ½ years *when power is not applied to the unit*. If you use your TD1 frequently and the TD1 power switch is ON, then battery life may be extended.

The battery is a user-serviceable item, and the TD1 will display a warning message after power-ON if the battery is low.

The following sections illustrate the replacement of the TD1 battery.

### A.1 Compatible Batteries

The TD1 uses an **ANSI/NEDA type 5012LC** battery. The following table lists several common batteries compatible with this type.

Manufacturer	Model #
Duracell	DL1220
Energizer	CR1220
Rayovac	CR1220

**Table 14. Compatible Batteries**

### A.2 Tools Required

You will need a #1 Philips screwdriver to open the TD1 case. You will also need a small flat-blade screwdriver to remove the battery from the battery holder.

## A.3 Opening the TD1

It is necessary to open the TD1 case in order to replace the battery.



Disconnect all the power supply and all cables from the TD1 before opening the TD1 case. Never connect the power supply or operate the TD1 when the case is open.

After disconnecting the power supply and all cables, turn the TD1 upside down on a clean work surface.



Screws  
(four total, one at each corner)

**Figure A 1. Rear View of TD1 Showing Screws**

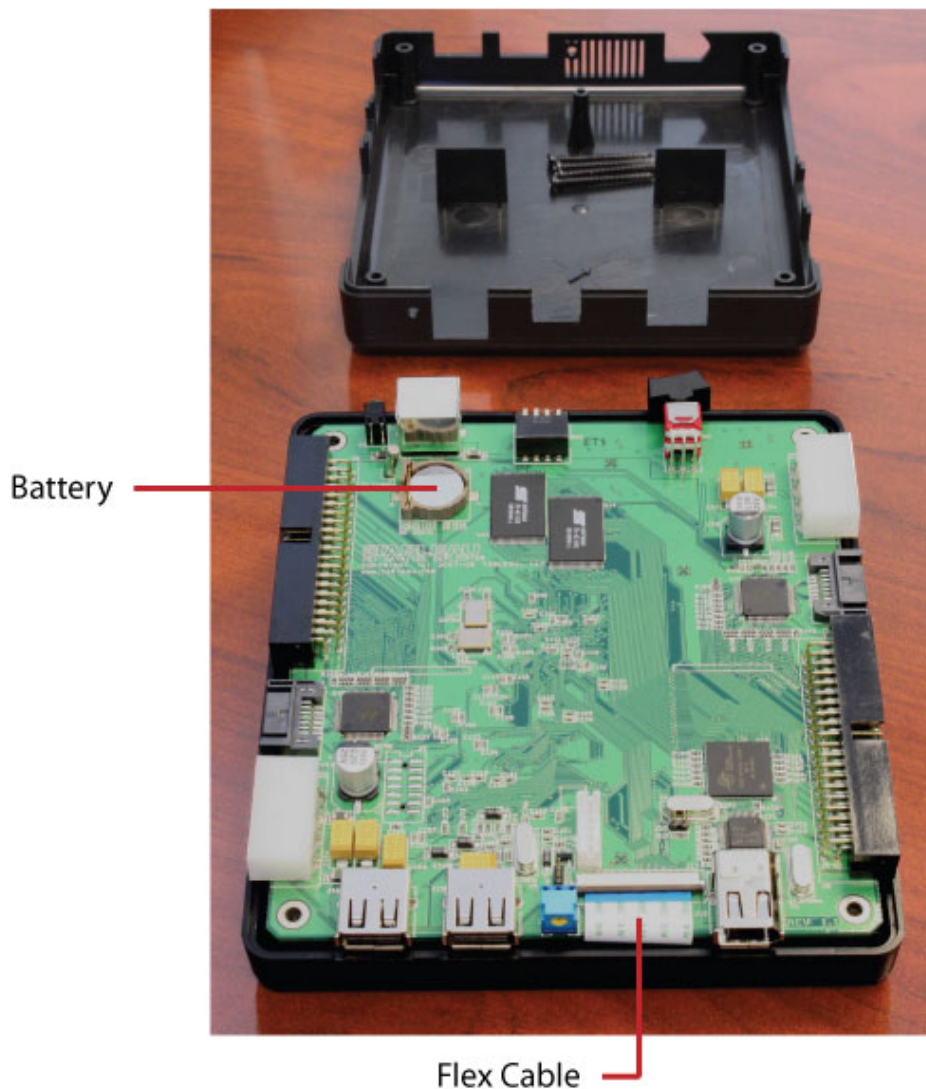
Locate the four case screws as shown in the picture. Using the #1 Philips screwdriver, carefully remove the four screws and set them aside.

Next, carefully lift the rear half of the plastic case away from the TD1. You will notice that the rear half of the plastic enclosure partially surrounds the 1394 connector (shown at the bottom right in the preceding picture). This will prevent you from lifting the rear half of the case in a straight direction. Instead, lift the top edge (near the power switch) first, then tilt the case towards you and pull it towards your body.



While removing the case be sure to leave the TD1 lying on the clean work surface. Lifting or tilting the TD1 may cause the main circuit board to move, possibly causing a "Flex Cable" connector to come loose.

After you have successfully removed the rear half of the plastic case, gently set it aside. You should now see the inside of the TD1 as shown in the following picture.



**Figure A 2. View of TD1 with Rear Case Removed**

There are actually two circuit boards in the TD1. The second board is hidden from view in the above picture. As shown in the picture there is a "Flex Cable" at the bottom edge of the main circuit board which connects the two circuit boards. If you lift the main TD1 circuit board away from the front half of the enclosure you may cause this cable to become loose, causing the TD1 to malfunction.

It is difficult to re-attach the Flex Cable correctly. So, as you replace the battery, please be careful not to move the main circuit board.

## A.4 Locating and Replacing the Battery

In the upper left of the main TD1 circuit board you will see the battery as noted in the preceding picture. The following is a detailed image of the battery and surrounding components.

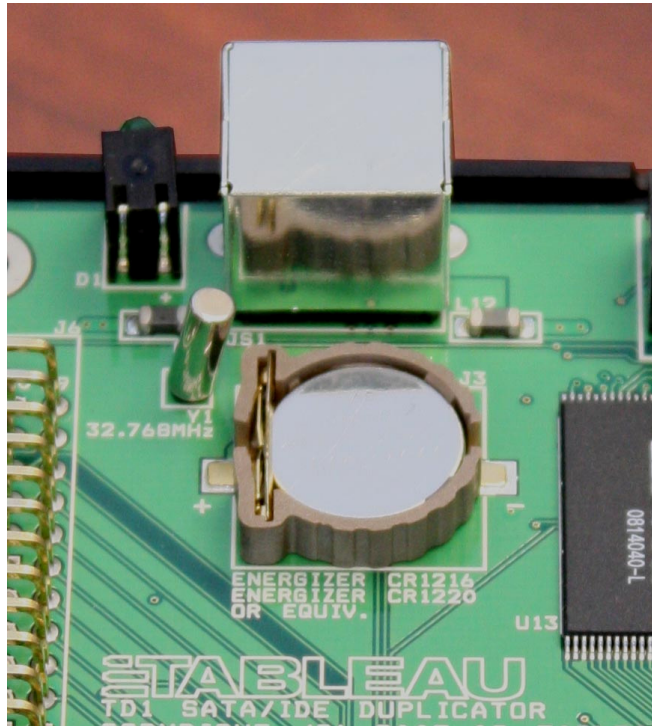


Figure A 3. Close-up View of Battery

Use a flat blade screwdriver to pry the battery gently from the battery holder. Then, replace the battery using one of the compatible batteries listed earlier in this Appendix. When re-installing the battery, make sure the **positive** terminal of the battery is visible (facing upward).

## A.5 Re-Closing the TD1

It can be a little tricky to re-install the rear half of the plastic case because of the shape of the 1394 connector. The correct and easiest way to re-install the case is to tilt the bottom edge of the rear case into position *first*, then to tip the case downward while simultaneously aligning the USB and 1394 connectors at the bottom of the case.

When you opened the TD1 you may have noticed that the same four screws which hold the case together also hold the main TD1 circuit board in position. If you have re-closed the case correctly, the case will self-align with the circuit board, and you should be able to re-install the four case screws without interference.

After re-installing the four case screws (again, using a #1 Philips screwdriver), pick up the TD1 and inspect it to make sure it is closed properly.

## A.6 Testing the New Battery

After you have re-closed the TD1, turn it right-side-up and attach just the TP3 power supply. Turn on the TD1 and observe the power-ON messages. You *should not* see a battery warning dialog but you *may* see a warning indicating that the date/time has been lost and needs to be re-set.

From the TD1 Main Menu select Setup Menu → Date and Time to reset the date and time. See *Section 5.2.9.2 Date and Time (Menu 9.2)* for detailed instructions on setting the date and time.

After setting the date and time, turn OFF the TD1. Wait 1-2 minutes, then turn the TD1 ON again. The date and time should be set correctly. You can see the date and time in the upper-left corner of the Main Menu, or you can see the date and time by navigating to Setup Menu → Date and Time.

## Appendix B. Pre-v2.1 File/Directory Naming Conventions

Prior to TD1 v2.1 the filenames generated by the TD1 were limited to the “8.3” format (up to eight characters of file name followed by up to three characters of file type). In v2.1 Tableau introduced support for long filenames and *changed* the default naming conventions for files and directories created by the TD1. This appendix documents the *original* (pre-v2.1) file naming conventions used by the TD1.

### B.1 Disk-to-File Duplication

During Disk-to-File duplication, pre-v2.1 firmware produced the following directory and file structure:

```
(root dir)/
  TD1_IMG/
    YYYYMMDDhh.mm/
      IMAGE.001
      IMAGE.002
      ...
      IMAGE.999
      nnnnnTTT.LOG
```

"YYYYMMDDhh.mm" is a directory name which is generated using the date and time at which the duplication started. So, if the duplication started on October 13, 2008, at 1:55 p.m., then directory name would be "08101313.55".

"IMAGE.001" is the first chunk, or portion of the data copied from the source disk.

The first five characters – "nnnnn" of the .LOG file are generated from the internal log ID number assigned to the log by the TD1. The next three characters - "TTT" – refer to the type of task. see *Table 3. 3-Character Abbreviations for TD1 Tasks* for a complete list of three-character task codes.

### B.2 Saving Logs to a USB Storage Device

When saving logs to a USB mass storage device, pre-v2.1 firmware produced the following directory and file structure:

```
(root dir)/
  TD1_IMG/
    LOGS/
      SSSSSSSS/
        YYYYMMDD/
          nnnnnTTT.LOG
```

"SSSSSSSS" is the "short-form serial number" for the duplicator itself. This eight-digit serial number is the same as the serial number you will find printed on a label on the bottom of the TD1.

"YYYYMMDD" is a directory name which is generated using the date and time at which each log entry was created. So, a log created on October 13, 2008, will be stored in a directory called "081013". If you are saving logs which were generated on different days, then the TD1 will create multiple "YYYYMMDD" directories under the "SSSSSSSS" directory.

"nnnnn" and "TTT" follow the format documented in the previous section.

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