



# Voom Shadow 3™

## User Guide



**Portable Computer Forensic Test Lab  
For Immediate Real-Time Computer  
Investigation**

# Voom Shadow 3™ User Guide

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**Third Edition**

2 August 2018

(Based on the Shadow 3 v1-04 release)

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Shadow 3 is designed, developed, and manufactured in the USA.

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# 1 Information

## 1.1 Patents

Shadow 3 is protected by patent number US 6,345,346; other patents pending.

## 1.2 Technical Documentation

Specifications and information contained in this manual are furnished by Voom Technologies, Inc. for informational use only and are subject to change at any time without notice and should not be construed as a commitment by Voom Technologies, Inc. Voom Technologies, Inc. assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual; including the products, firmware and included accessories.

## 1.3 Data Protection

The user must be aware that an improper system configuration can lead to data corruption. Please read the [Shadow Setup](#) chapter of this manual carefully before attempting to investigate a suspect computer. Voom Technologies, Inc. is not responsible for any loss of data resulting from the use, disuse or misuse of this product.

## 2 Technical Support

### 2.1 Support by Telephone

Technical support is available to registered owners of Voom Technologies, Inc. products by telephone Monday through Friday 8:00am to 4:00pm, Central Time Zone at 651-998-1618.

### 2.2 Support by E-Mail

Voom Technologies, Inc. technical support is available by e-mail at [support@voomtech.com](mailto:support@voomtech.com).

### 2.3 Technical Support Tips

Call from a telephone where you have access to your computer. Please be prepared to provide the following information:

- Name, telephone number, e-mail address
- Serial Number and version of the Voom Shadow product
- Make and model of your computer
- Operating system and version
- Symptoms of the problem

## 3 Preface

### 3.1 Product Contents

- 1 Voom Shadow 3 System
- 1 DC power cable (Shadow to suspect hard drive)
- 1 0.5m SATA Cable (Used for all configurations)
- 1 Auto-ranging AC Power Supply
- 1 Standard serial interface cable
- 1 User Guide

SATA Laptop Adapter Kit:

- 1 SATA Extension Cable

IDE Adapter Kit:

- 1 IDE to SATA Adapter
- 1 SATA to IDE Adapter

### 3.2 System Requirements

The Voom Shadow 3 product is designed to operate on computers that boot from a SATA hard drive. Shadow 3 supports drives of sizes up to 2 TB. For computers with multiple hard drives, a separate Shadow 3 unit is required for each hard drive. Via a IDE to SATA adapter Shadow 3 may support PATA/IDE hard drives. A separate IDE bus is required for each IDE drive to be shadowed.

### 3.3 Overview

The investigation of a computer hard drive is often a very time consuming process. Because it is absolutely essential that the evidence on a suspect hard drive not be altered in any way, investigation and analysis of the data on the hard drive is often times done in a lab environment.

Imagine if you could boot and use the suspect computer all the while preventing any alteration of the suspect hard drive. Voom Shadow 3 is an investigative tool that is designed to enable **investigation of the hard drive in place** inside the suspect computer, while preventing any alteration of the hard drive during the investigation.

Here's how it works. After connecting a Shadow 3 system to each hard drive on the suspect computer, the investigator will use the suspect computer to search the contents of the hard drive(s) using any software tool already on the computer, including Word, Excel, File Browsers, Internet and Email browsers, picture viewers etc... as well as view internet history, last files accessed, last files altered – all by simply using the tools on the suspect computer. **Investigators may also**

**install any forensic software they choose to assist in the investigation.**

With Shadow, all writes that occur during the investigative process are written to the internal Shadow hard drive. The suspect hard drive is not altered in any way during the investigative process.

System operating integrity is maintained because the Shadow remembers where the writes occurred, and reads from the Shadow drive whenever the suspect computer reads data from a block that the Shadow has written.



## 3.4 Definitions

### 3.4.1 General

**AHCI:** Advanced Host Controller Interface. Defines the operation of Serial ATA host bus adapters in a non-implementation-specific manner. This interface is the native interface for SATA.

**Applications:** Software programs such as Microsoft Word.

**Boot Partition:** The C:\ partition is commonly the boot partition that contains the operating system. Many computers are set up with just one C:\ partition. Remaining hard drive space, if any, is unallocated.

**Ctrl:** The keyboard control key.

**HD or HDD:** Hard Drive, also called the Hard Disk Drive.

**Jumper:** Refers to the hard drive jumper located at the back of the hard drive.

This jumper configures the hard drive as a slave or master hard drive based on the number of hard drives used and the hard drive cable used.

**Host Computer:** The computer the Suspect/Source hard drive is located in.

**Master Hard Drive:** A IDE hard drive that is configured as master through jumper setting or cable select connection.

**Motherboard:** The main computer circuit board, sometimes called the mainboard.

**OS:** Refers to the Operating System. Examples include Microsoft Windows 2000 Professional and Microsoft Windows XP Home.

**Partition:** Partitions can be created on a hard drive so that each partition acts like a separate hard drive. In Microsoft Windows, partitions are commonly referred to as drive letters, such as C:\.

**Slave Hard Drive:** A IDE hard drive that is configured as slave through jumper setting or cable select connection.

**GB:** Gigabyte: 1000000000 bytes.

**MB:** Megabyte: 1000000 bytes.

**KB:** Kilobyte. 1024 bytes.

### 3.4.2 Shadow

**Locked:** When Shadow is locked, all writes to the Shadow hard drive are blocked – this in effect causes the Shadow to act as a traditional write blocker.

**Disabled:** The Shadow reports Shadow disabled when an error has occurred, such as when a cable is not connected properly; a cable is damaged, or any other event that causes the Shadow to be unable to operate.

**Zero:** This term applies to zeroing the Shadow hard drive – that is, to make the Shadow forget about any previous writes.

## 4 Shadow Setup

This chapter describes how to connect the Shadow 3 to a computer system.

### Caution for multiple hard drive systems:

Shadow 3 prevents data from being written to a single computer hard drive. If more than one hard drive is used in a suspect computer, then please refer to the [Multiple Hard Drive System](#) section.

### 4.1 Single Hard Drive System

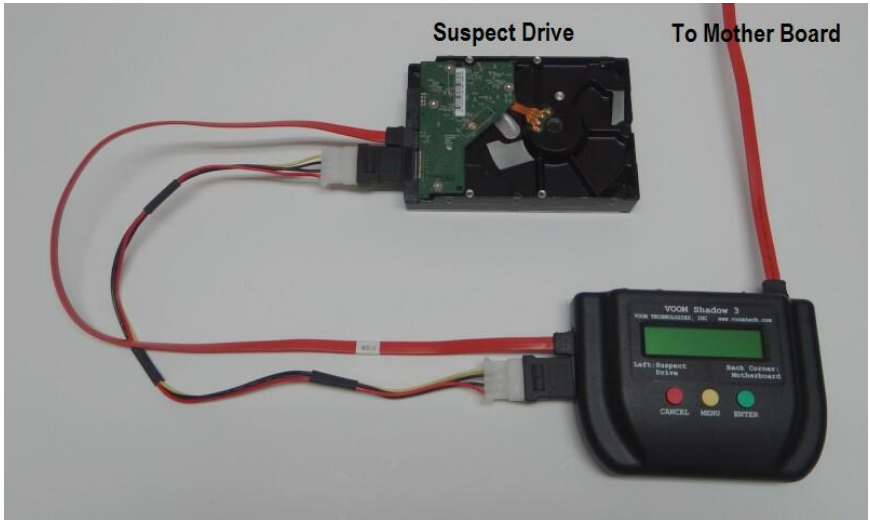
This section describes how to connect Shadow to a standard SATA system. Please use the [picture](#) on the next page as a reference during setup.

#### Step 1: Suspect Computer Preparation

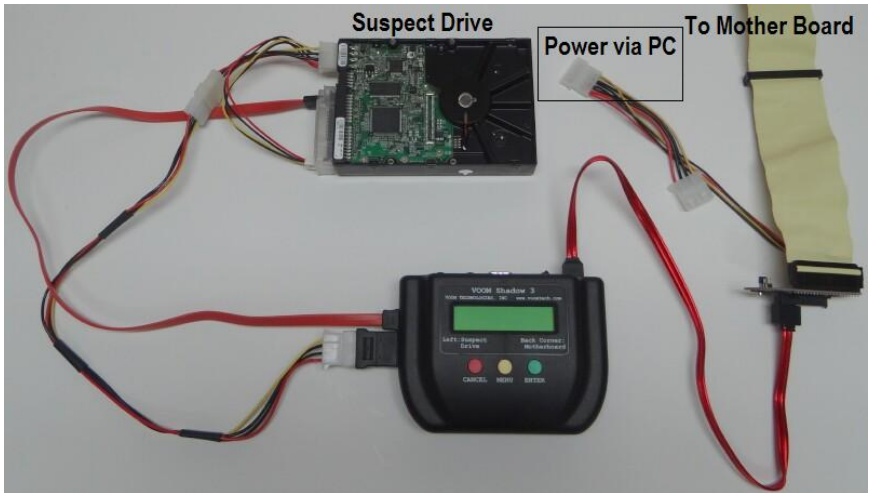
1. Disconnect the computer AC power cable, and remove the computer cover.
2. Disconnect the DC power cable from the suspect hard drive.
3. Disconnect the SATA cable from the suspect hard drive. Leave it connected to the motherboard.

#### Step 2: Shadow Setup

1. Connect the SATA cable that was disconnected from the hard drive in Step 1-3 to the Shadow 3 port labeled "Motherboard".
2. Connect one end of the Voom supplied SATA cable to the Shadow 3 port labeled "Suspect Drive," and connect the other end to the suspect hard drive.
3. Connect the Voom supplied DC power cable from the Shadow 3 to the Suspect drive.
4. Plug the Voom supplied AC adapter between the Shadow 3 and an AC power outlet. (Not shown in picture.)
5. Reconnect the suspect computer AC power.
6. Turn on the Shadow 3.
7. Once the Shadow 3 is turned on and reports ready the suspect system may be booted.



The following picture is included for reference when using IDE hard drives:



## **4.2 Multiple Hard Drive System**

For the investigation of a multiple hard drive system there are two approaches which may be used.

### **4.2.1 Use Multiple Shadows**

Connect each hard drive to a separate Shadow 3 as described in [Single Hard Drive System](#) .

### **4.2.2 Use Third Party Write Blockers**

Because most of the writes will occur on the boot drive (or if there are no other available SATA ports) it should be tolerable to protect the non-boot drives with a simple write blocker. Keep in mind that the additional functionality of Shadow 3 will not be available on the secondary hard drives.

## **4.3 Operating the Host Computer**

Once the system has been connected as described above the Shadow unit may be turned on. When the Shadow reports ready, then the Host computer may be turned on. The Host may be operated exactly as it would be if the Shadow were not present.

## **5 Command Description**

### **5.1 Zero Shadow Command**

The Zero Shadow command will make the Shadow unit forget any writes it has made to its internal Shadow drive.

Shadow 3 will automatically zero itself every time you connect the Shadow unit to a new Suspect/Source drive. Manual zeroing of the Shadow drive should only be necessary when you want to continue investigating the same Source drive but want to start from scratch.

It is not recommended to issue the Zero Shadow command while the Host computer is turned on as it will likely confuse the computer's operating system.

### **5.2 Wipe Shadow Command**

The Wipe Shadow command will wipe the Shadow drive with a fixed byte value across all LBAs. Wipe also locks the Shadow.

It is not recommended to issue the Wipe Shadow command while the Host computer is turned on as it will likely confuse the computer's operating system.

### **5.3 Park Drives Command**

The Park Drives command will tell the Source drive and Shadow drive to "park" their heads in preparation for powering off. This controlled shutdown does not stress the hard drives the way an unexpected "emergency" shutdown will. Shadow 3 will automatically issue the Park command to the drives during normal operation.

It is recommended to issue the Park Drives command every time the Shadow's LCD does not display parked before you turn it off. (e.g. If the Host computer did not shutdown properly.)

#### **5.3.1 Spin Drives Command**

When the drives are already parked, the menu option becomes Spin Drives. The Spin Drives command will spin the drives back up. Use this command before turning the Host computer back on to speed the boot process.

### **5.4 Lock Shadow Command**

The Lock Shadow command will place the Shadow in simple write block mode. Any writes that would go to the Shadow drive are simply thrown away.

The Shadow will remain locked until it is turned off.

### **5.5 Toggle Ctrl Blk Command**

Toggle the behavior the Shadow 3 will use regarding the HD control block between Classic mode and Compatible mode. The Shadow 3 ships in Classic

mode. Classic mode is what Shadow 3 has always used. In Compatible mode, the Shadow 3 alters the HD control block to be more compatible with some motherboard / OS combinations, in particular, 2007 and newer motherboards in combination with Windows 10.

The modified behavior is entirely in software, the HD is never physically altered by the change.

There is no guarantee either mode will allow a shadowed HD to boot.

## 6 Button Interface

The button control panel and the LCD are the user interface. The button panel consists of the following three buttons:

Button	Function	Description
Yellow	Menu	This button is designed to step through each of the menu items. It always steps in a forward direction.
Green	Enter	This button is designed to either select a menu item or acknowledge status information.
Red	Cancel	This button is designed to either abort the entering of a new command or the execution of the previous command.

The LCD is used to display each of the menu items, the progress of the current command, and to acknowledge the command status information.

Whenever commands are entered from the button control panel, all status information must be acknowledged by the operator. A special arrow character [–] displayed in the lower right hand corner of the LCD indicates that the unit is waiting for acknowledgment of the data currently displayed in the LCD. Press the <enter> button each time the arrow character is displayed in order to continue executing the current command.

**Note: The user may terminate an executing command by pressing the <cancel> button.**

**Note: The button command menu is unavailable when there is not a Source Drive attached.**

The button command menu is organized into levels. The prompting hierarchy used to organize the set of supported commands follows:

Level	Prompt	Description
1	Zero Shadow	Zero (clear) the Shadow drive.
2	Wipe Shadow	A more secure clearing of the Shadow drive.
3	Park Drives	Prepare the drives for powering off.
	Spin Drives	Spin the drives back up.
4	Lock Shadow	Place the Shadow unit in simple write block mode.
5	Toggle Ctrl Blk	Toggle the control block mode.

Step-by-step examples of the operations that the user can perform through the button interface are described in the following sections of this chapter:

## 6.1 Zero Shadow Procedure

The following table describes the normal sequence associated with performing a Zeroing of the Shadow drive:

LCD interface	Comments
Shadow3 1-04 ready classic	From the main window, press <menu> to display the initial menu item.
Zero Shadow	Press <enter> to execute the Zero Shadow command.
Zero Shadow Are You Sure?	Press <enter> to perform the Zero, <cancel> to abort the command.
Zero Shadow * Task Done *←	Your Shadow drive has been zeroed. Press <enter> to return to the ready screen.

## 6.2 Wipe Shadow Procedure

The following table describes the normal sequence associated with wiping the Shadow drive:

LCD interface	Comments
Shadow3 1-04 ready classic	From the main window, press <menu> to display the initial menu item.
Zero Shadow	Press <menu> to proceed to the next command.
Wipe Shadow	Press <enter> to execute the Wipe Shadow command.
Wipe Shadow Are You Sure?	Press <enter> to perform the Wipe, <cancel> to abort the command.
Wiping Shadow 42%	Interim status.
Wiping Shadow DONE ←	The Shadow drive has been wiped ...
0 errors 50:50 elapsed ←	Successfully. Press <enter> to return to the ready screen.



### 6.3 Park Drives Procedure

The following table describes the normal sequence associated with parking the drives:

LCD interface	Comments
Shadow3 1-04 ready classic	From the main window, press <menu> to display the initial menu item.
Zero Shadow	Press <menu> to proceed to the next command.
Wipe Shadow	Press <menu> to proceed to the next command.
Park Drives	Press <enter> to execute the Park Drives command.
Spin Drives	Press <enter> to execute the Spin Drives command.
Shadow3 1-04 parked	The drives have been parked.
Shadow3 1-04 ready	The drives have been spun up.

### 6.4 Lock Shadow Procedure

The following table describes the normal sequence associated with locking the Shadow:

LCD interface	Comments
Shadow3 1-04 ready classic	From the main window, press <menu> to display the initial menu item.
Zero Shadow	Press <menu> to proceed to the next command.
Wipe Shadow	Press <menu> to proceed to the next command.
Park Drives	Press <menu> to proceed to the next command.
Lock Shadow	Press <enter> to execute the Lock Shadow command.
Lock Shadow Are You Sure?	Press <enter> to perform the Lock, <cancel> to abort the command.
Shadow3 1-04 ready lock	The Shadow is locked.

## 6.5 Toggle Ctrl Blk Procedure

The following table describes the normal sequence associated with toggling the control block:

LCD interface	Comments
Shadow3 1-04 ready classic	From the main window, press <menu> to display the initial menu item.
Zero Shadow	Press <menu> to proceed to the next command.
Wipe Shadow	Press <menu> to proceed to the next command.
Park Drives	Press <menu> to proceed to the next command.
Lock Shadow	Press <menu> to proceed to the next command.
Toggle Ctrl Blk to Compatible	Press <enter> to execute the Toggle Ctrl Blk command.
Toggle Ctrl Blk Are You Sure?	Press <enter> to perform the Toggle, <cancel> to abort the command.
Shadow3 1-04 ready compat	The Shadow is now in compatible mode..

## 7 Serial Interface

With the Shadow 3 unit turned off, connect the supplied serial cable between the Shadow 3 and a second computer, do not use the suspect computer. Using a terminal program capable of serial communications, such as HyperTerminal or Tera Term , configure the serial port (usually COM1) as described in the table below:

Parameter	Value
Baud Rate	115200
Data Bits	8
Parity	none
Stop Bits	1
Flow Control	none

### Serial Port Settings

Once the serial cable is connected and the terminal program configured, the Shadow 3 unit may be turned on.

On power-up you should see the following sequence:

```
Start
!-FPGA loaded
Shadow3 1-04 Initializing...
Checking Shadow...
Checking Source...
.                               (only with a Source change)
!-Source Drive Changed         (only with a Source change)
Shadow3 1-04 Ready
Hard Reset
=>
```

Typing help will display a brief description of the available commands.

## 7.1 Zero Shadow Procedure

When using the serial interface, the command syntax for zeroing the Shadow is given below:

```
Zero
```

The following example shows the output from a typical Zero Shadow command.

```
=> Zero
.
!-Shadow Drive Zeroed
```

## 7.2 Wipe Shadow Procedure

When using the serial interface, the command syntax for wiping the Shadow is given below:

```
Wipe
```

The following example shows the output from a typical Wipe Shadow command.

```
=> Wipe
Wiping shadow drive (may take over 20 minutes)...
..... done
  0 errors elapsed  50:50 elapsed
!-Shadow Drive Wiped
```

## 7.3 Park Drives Procedure

When using the serial interface, the command syntax for parking the drives is given below:

```
Park
```

The following example shows the output from a typical Park Drives command.

```
=> Park

parked

!-Drives are parked
```

### 7.3.1 Spin Drives Procedure

When using the serial interface, the command syntax for spinning the drives is given below:

```
Spin
```

The following example shows the output from a typical Spin Drives command.

```
=> Spin
ready
!-Drives are spinning
```

### 7.4 Lock Shadow Procedure

When using the serial interface, the command syntax for parking the drives is given below:

```
Lock
```

The following example shows the output from a typical Lock Shadow command.

```
=> Lock
.
!-Shadow Drive Locked
```

### 7.5 Toggle Ctrl Blk Procedure

When using the serial interface, the command syntax for parking the drives is given below:

```
ToggleControl
```

The following example shows the output from a typical Lock Shadow command.

```
=> ToggleControl
!-Shadow Control Block Mode Compatible
=> ToggleControl
!-Shadow Control Block Mode Classic
```

## 8 Shadow Internal Hard Drive Replacement

Please read this chapter completely before attempting replacement of your Shadow 3 internal hard drive. The Shadow 3 uses a standard height (9.5mm) laptop drive. The use of any other height laptop drive is not intended or recommended.

\* Shadow3 units in the SN range SH-13-A-031 through SH-13-A-098 have an EMI shield under the HDD. If your Shadow3 is not in this range, you may ignore the EMI shield instructions.

### 8.1 Step 1 - Internal Hard Drive Removal

Ensure that there are no cables connected to the Shadow 3. Turn the Shadow 3 upside down exposing the bottom of the enclosure. Remove the 4 screws securing the metal drive access cover on the bottom of the Shadow 3. These screws are located near the corners of the drive access cover. Once the 4 screws are removed the cover should just lift off.

With the drive access cover removed and the rear panel of the Shadow 3 facing away, locate the drive retaining bracket at the right hand end of the internal hard drive. Loosen the single screw holding the drive retaining bracket in place. With the screw fully loosened, carefully lift the drive retaining bracket and screw out and set them aside. The internal hard drive can now be removed by carefully sliding it towards the right which will unplug it from the internal connections. Take note of the orientation of the internal hard drive, the connectors should be on the left end and the hard drive label should be facing up. Once the internal hard drive is unplugged it can be removed from the Shadow 3 enclosure.

\* Note that there is an EMI shield under the hard drive which is held in place by the drive retaining bracket. The EMI shield will now be loose, so take care not to lose it.

### 8.2 Step 2 - Internal Hard Drive Installation

\* Make sure the EMI shield is in place with the corner hole lined up with the screw hole for the drive retaining bracket.

Place the new internal hard drive into the Shadow 3 enclosure in the same orientation as was noted above in the removal procedure. With the internal hard drive in the enclosure, carefully line up the connectors on the left end with the connectors on the internal circuit board, then carefully slide it to the left fully seating the connectors. Do not force the connection, if properly lined up it should connect with very little effort. Once the internal hard drive is connected, reinstall the drive retaining bracket and screw. Tighten the screw until snug but do not

over tighten it. Place the drive access cover in it's proper orientation on the bottom of the Shadow 3 enclosure then install and tighten the 4 screws. Do not over tighten the screws.

### **8.3 Step 3 – Internal Hard Drive Introduction**

Turn on the Shadow 3 without any cables attached and wait for the LCD to display:

```
Shadow disabled
* No Source *
```

The new internal “Shadow” drive has now been introduced to the Shadow 3 unit and the unit may be operated normally.

## 9 Warranty

### 9.1 Limited Warranty

Voom Technologies, Inc. (Voom) warrants the Shadow 3 hardware against defects in material and workmanship under normal use and service for one (1) year from the original date of purchase. Voom, at its option, shall repair or replace the defective unit covered by this warranty.

Voom does not warrant this product to be free of interruption or errors.

This warranty covers only defects that arise from normal usage of the product, as it is intended by Voom and indicated in this User Guide and does not cover other issues, including those arising from:

- Improper maintenance or handling,
- Use of parts or supplies not included with the product or approved for usage by Voom,
- Operations that deviate from those intended or indicated in this User Guide,
- Misuse or abuse of the product, modification of the product that is unauthorized by Voom, subjecting the product to abnormal working conditions (including, but not limited to, water or lightning damage) or tampering with the product.

Upon notification of defect in materials or workmanship and return of the product in accordance with the [Warranty Return Instructions \(below\)](#) and in concurrence with the warranty conditions as indicated above, Voom shall either repair or replace the product at its discretion. Voom reserves the right to replace the product with a new or like-new product that has functionality equal to or exceeding that of the originally purchased product.

Voom will be obligated to repair or replace the product only after the product has been returned according to the instructions below and has been received by Voom.

This warranty is valid only if the product is used in conjunction with devices indicated in this User Guide.

Repair or replacement as provided under this warranty is the exclusive remedy of the purchaser. This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular use or purpose, and Voom Technologies, Inc., shall in no event be liable to purchaser for indirect or consequential damages of any kind or character.



Some states do not allow the exclusion or limitation of incidental or consequential damages or allow limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

## 9.2 Warranty Return Instructions

For timely warranty repair and return of the Product please follow the procedure outlined below.

1. Contact a Voom representative (651-998-1618) to obtain a Return Material Authorization (RMA) number.
2. Please be prepared to provide the Voom representative with the product serial number, the invoice number and the date of purchase in order to facilitate this process.
3. Once you receive a RMA number, please pack the Product in its original packaging or any other secure box so that no damage may occur.
4. Deliver the Product **shipping prepaid** to:

Voom Technologies, Inc.  
1000 Westgate Dr Suite 150-I  
St Paul, MN 55114  
Attention: RMA \_\_\_\_\_

5. Shipping with proper insurance and a tracking number is highly advised.
6. Please be sure to include in the return package complete contact information including return shipping information. Please also include a brief description of the problem and a copy of the RMA number.
7. If you do not obtain an RMA, your return will not be able to be processed immediately and may be returned unprocessed.

**NOTE: Voom Technologies, Inc. is not responsible for items lost or damaged in transit.**

## 10 Specifications

This chapter describes the specifications for the Model No. VTSWAL-2WS Shadow 3 unit.

AC Electrical Requirements	
AC Adapter Voltage	Universal AC, 100 VAC/240 VAC
Frequency	50-60 Hz
Current	2.0 Amps
Output Voltage	12 VDC @ 6.67 A
Manufacturer	Mean Well Model: GS90A12-P1M or equivalent
Fusing	5 Amp slow blow (5X20 mm) internal

Operating Environment	
Temperature	50 to 95 Degrees F
Relative Humidity	20% to 80% (non condensing)
Altitude	0 to 8000 Feet

Physical Characteristics	
Height	1.5 inches
Width	5.625 inches
Depth	4 inches
Weight	1 pound (excluding accessories)

### 10.1 CE

Users need to notify any information technology equipment users within a 60 meter radius that Shadow 3 may interfere with other electronic equipment. Although the manufacturer has not observed electromagnetic interference from the Shadow 3 with other electronic equipment in its development lab or offices, this is not an indication that the user will not experience electromagnetic interference from the Shadow 3 with other electronic equipment within the 60 meter radius.

### 10.2 FCC Exemption

This device is exempt from FCC regulations under Part 15, Section 103 c.