

HT-IVOS II

Digital Camera

Hardware Guide

Version 1.1



IVOS II SERIAL NUMBER



HAMILTON THORNE

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HTM-IVOS II Hardware Guide - Digital Camera

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Robin Dolan



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1 Preface

1.1 Style Convention Used in the Manual



1.1.1 Note

A **Note** presents information that is important, but not hazard related.



1.1.2 Caution

A **Caution** contains information essential to avoid damage to the system, to equipment, or to data. The caution may apply to software or hardware.

1.2 Related Documentation

In addition to this *Hardware Guide*, the following manuals are included with your systems:

- *Software Guide*: Provides detailed instructions and descriptions of the basic software functions, see *HT CASA II Software Guide*.
- *Validation Guide*: Defines a detailed method of validating the system, requiring only a microscope reticle scale, see *IVOS II Validation Guide*.



2 Introduction

The IVOS II **Hardware Guide – Digital Camera** is designed to help with the Physical Installation and provide a Quick Overview of the program, the Optical Settings and Instructions for operating the hardware components of the Program.



All users must carefully read the instructions for use before attempting to operate this device.

2.1 Intended Use

The IVOS II is used to determine the concentration, morphometry, motility and movement parameters of a sperm sample in a special thin chamber. No diagnoses are performed by the IVOS II, and no diagnostic interpretations are provided.

A sperm sample (typical sample chamber depth 10-20 μm) is placed in the image plane of the microscope optical train. The object is illuminated with an LED and gives an image on the camera. The camera transfers the image to a digitizer board which produces an image pixel array. The pixel array is then analyzed by the Software to determine the number and concentration of motile and static sperm cells in the sample. From this the mean concentration over a number of fields is determined, the mean motility is derived and the mean velocities and motion parameters are displayed to the users.

2.2 Overview of IVOS II Hardware

The IVOS II contains a digital camera with internal optics and an internal computer, its illumination and stage position are controlled by the software.

The HT-CASA II software is based on the digital camera and uses high-resolution digital images. The concentration and movement of sperm is derived using sequential frames acquired at set acquisition rate (normally 60Hz). The code also performs a live morphometry on the images, categorizes sperm by their morphometry as well as their motion parameters, and computes the dosing parameters for artificial insemination. Results are stored in an internal database and transferred to reports or output files as required.

The basic steps for installation of the new IVOS II are covered in the following sections. For further information, please contact your distributor or Hamilton Thorne for assistance.



3 Minimum System Requirements

3.1 Computer

3.1.1 Hardware

CPU	Intel i5 or optional i7
RAM	8GB
Disk space	Typical 320GB – 1TB
Display	Typical 23" wide screen 1920x1080
USB	2.0 and 3.0 available
Network	2x10/100/1000 (1 used for internal camera)

Table 1. Hardware Requirements

3.1.2 Software

Operating System	Windows 7 or Ultimate
.NET	.NET Framework V3.5 (included in Windows 7)
HASP HL	Driver software for Version 5 or higher (licensing is done via USB key)
IVOS II	HT CASA II

Table 2. Software Requirements

3.2 Camera

3.2.1 Digital Camera

Models Supported	JAI 1/2 inch, CM040 GE, JAI 1/3 inch CM-030 GE
Interface Type	Gigabit Ethernet
Interface Version	Cable cat5E or cat6

Table 3. Digital Camera Requirements

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3.3 Operating Environment

Factor	Metric	United States
Temperature		
Operating	10° - 35°C	50° - 95°F
Non-operating	-10° - 60°C	14° - 140°F
Relative Humidity (non-condensing)		
Operating	10 - 90%	10 - 90%
Non-operating	5 - 95%	5 - 95%
Maximum Altitude (unpressurized)		
Operating	4,000m	13,000 ft.
Non-operating	9,000m	30,000 ft.

Table 4. Operating Environment Requirements

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4 Unpacking

Remove the IVOS II from its box and place it on a flat surface. The components in the other container should be placed next to the IVOS II.

Please ensure that you have each item in the checklist shown on the following pages. If any items are missing, please call your sales representative.



DO NOT PLUG THE IVOS II INTO THE LINE CURRENT UNTIL INSTALLATION IS COMPLETE. Please follow the installation steps below. Damage to the instrument may result if it is operated before complete installation.

4.1 Important Precautions

- Place the IVOS II in a well-ventilated area. To avoid overheating, do not block the IVOS II vents. The vents are located on the back and top of the IVOS II.
- Use a surge suppressor/protector. In the case of a lightning strike, power outage, or brown out, your equipment will have additional protection if all components are plugged into the surge suppressor.
- Keep food and drink away from the work area.



Caution: Take precautions to avoid liquids getting into the system. Be aware of Window and Air Conditioning systems and make sure all liquids near the system such as cleaning solutions are properly sealed. The liquids can damage the system. Avoid operating the systems in humid environments.

- Connecting to outside network is **not** recommended.

4.2 Checklist

1. IVOS II Analyzer
2. Monitor
3. Wireless Keyboard and Mouse
4. Wired Keyboard and Mouse
5. Camera Network Patch cable
6. USB Security Key (lists IVOS II serial number)
7. Grounding Cable (Green/Yellow)
8. Power Cable (x2): (Computer, Monitor)
9. USB Monitor Hub Cable (Communication Cable)
10. Phase Annulus
11. Phase Adjustment Lens

Stedus



12. Objectives (10x)
13. System CD
14. SnagIt CD
15. Monitor CD
16. DVI-D Monitor Cable
17. VGA Monitor Cable
18. USB Extension Cable 3'
19. Motherboard CD
20. Microsoft Windows CD
21. IVOS II (Digital) Manual

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5 Assembling the IVOS II Hardware

5.1 Removing Stage Retainer

The IVOS II is shipped with a **Foam Stage Retainer** wedged between the stage and the front housing. This foam block must be removed before operating the unit.

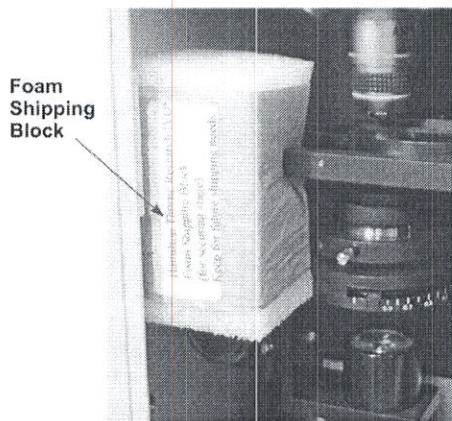


Figure 5-1. Foam Stage Retainer

1. Open the optics panel door.
2. Squeeze the foam block and gently pull it from its position.



DO NOT throw away the foam block. Store it with the IVOS II tools so it will be available for use if IVOS II needs to be transported.

3. Push the filter block assembly to the full **inward** position using one of the two knurled, brass knobs.
4. Pull slightly outward (~ 1mm) until the filter block assembly clicks into place.

5.2 Removing Tape from Camera Nose

The IVOS II is shipped with a tape on the camera nose to keep dust off camera lens during shipping. The tape must be removed before operating the unit.

1. Gently remove the tape from the camera nose.



5.3 IVOS II Analyzer

The IVOS II is an Integrated Visual Optical System for sperm analysis. Stage controls, Focus knob, Stage slot, Blue Ray/DVD drive, USB Ports and an On/Off switch are located on the front of the unit. The stage emerges from the stage slot for specimen placement. On the side, the optics panel door protects the optical components from light and dust.

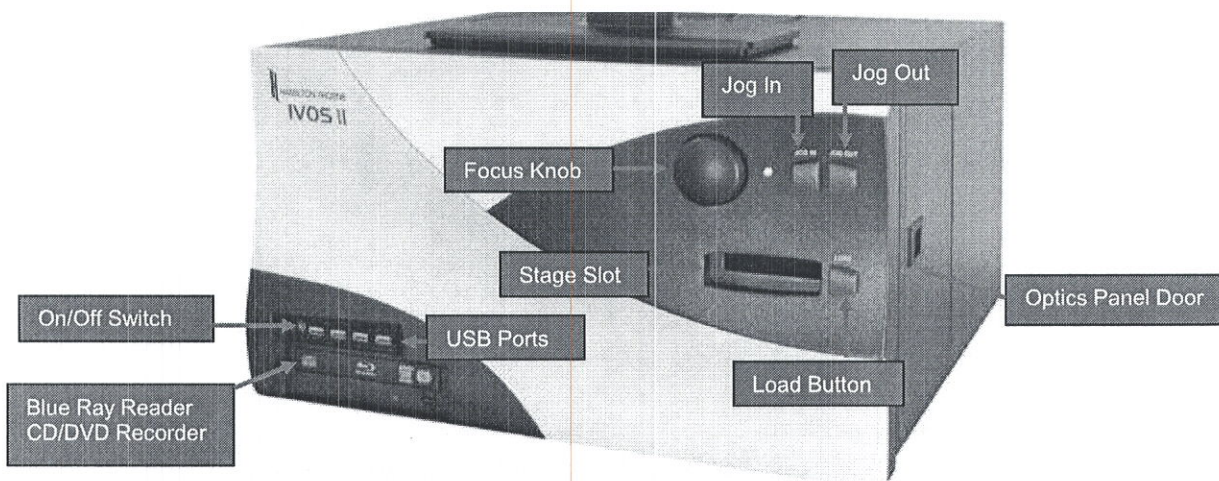


Figure 5-2. IVOS II Analyzer

The Schematic diagram in Figure 5-3 shows the optical subassembly of the IVOS II as it would appear with the IVOS II cover removed. All adjustable parts of the optical system can be reached through the optics panel. These parts include the Turret, Condenser, Phase annulus adjusters, Red/Blue LED Joy stick, Filter Blocks (IDENT) and the Condenser adjustment knob.

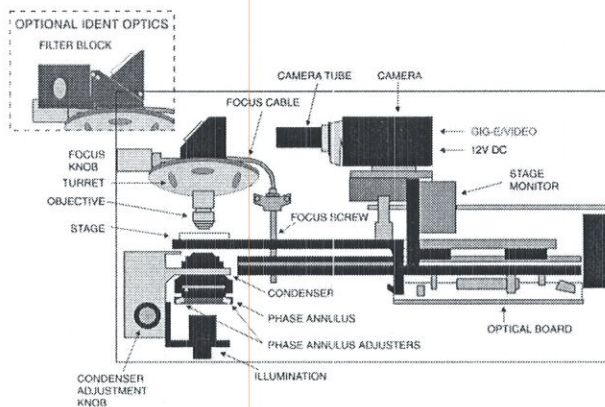


Figure 5-3. Side View of IVOS II Optical System



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5.3.1 Integrated Optics

As the only sperm analysis system with an internal optical system, the IVOS II offers distinct advantages to the sperm analysis laboratory. In contrast to the continuous illumination of a microscope, the IVOS II uses illumination strobed at 1/1000 of a second to visualize sperm motion. This strobed illumination eliminates motion-related blurring along the length of the sperm head, resulting in precise sperm tracking. By adding an image capture rate of 60 frames per second, you get the highest level of accuracy available today for measuring sperm velocities and motion parameters. For added flexibility, the IVOS II performs analyses under two types of internal, strobed illumination: phase contrast and bright field.

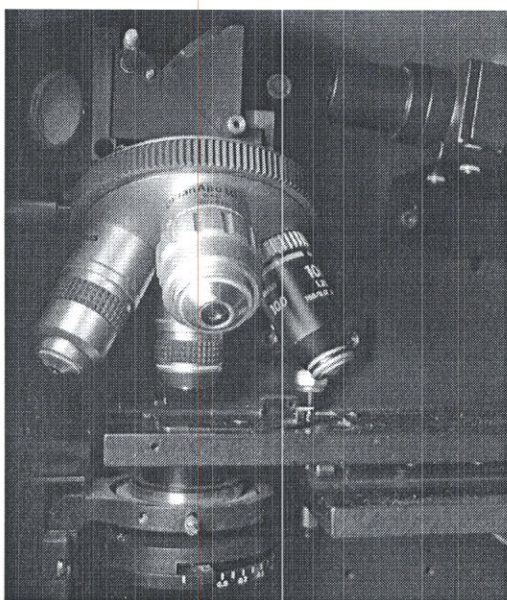


Figure 5-4. IVOS II Integrated Optics

5.3.2 Stage Control

The IVOS II **Load** button and **Jog** buttons are separated to avoid inadvertent stage loading or unloading. The stage is moved completely in or out by pressing the button labelled **Load** on the IVOS II.

1. Press **Load** to access the stage.
2. Place the loaded chamber on the stage.
3. Press **Load** again.
4. The stage withdraws into the IVOS II and positions under the objective at the entered **Stage Position**.

By pressing and holding buttons labelled **Jog In** or **Jog Out** on the IVOS II, the stage position is adjusted and the stage is moved (see Figure 5-5).

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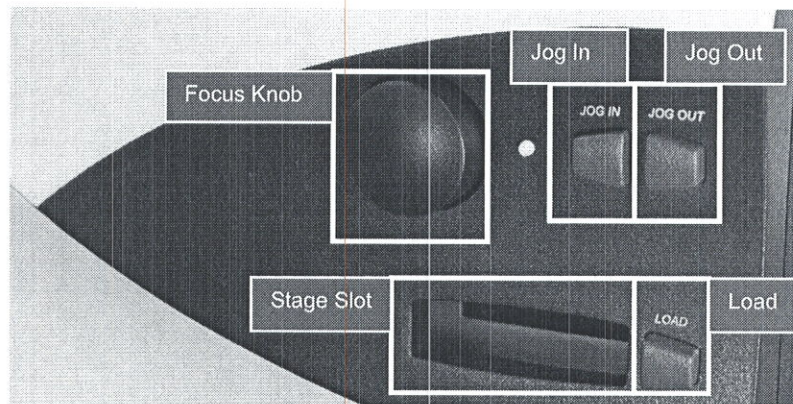


Figure 5-5. IVOS II Stage Controls

The stage can also be moved with the mouse by checking on the **Jog In** or **Jog Out** controls located next to the **Stage Position** field on the **Motility Toolbar** (see Figure 5-6).



Figure 5-6. Motility Toolbar - Jog Control Buttons

5.3.3 Automated, Internal, Heated Specimen Stage

As part of the integrated optical system (see Figure 5-7), the unique computer controlled specimen stage of the IVOS II provides precise control of temperature and position during analysis. The stage temperature, which may be set from ambient to 40°C, remains constant to within 0.5°C. For selection of analysis fields, the stage may be programmed for either manual or automatic field selection. For at-a-glance monitoring, the current stage temperature and position are continuously shown on screen as a real-time, digital display. The IVOS II stage accommodates and automatically adjusts for commonly used analysis chambers, such as disposable fixed-depth slides, cannulas and Makler chambers. In addition, a user-defined chamber setting is available.

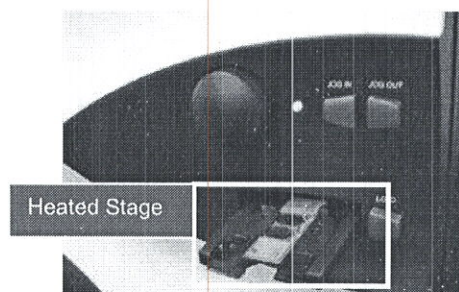


Figure 5-7. Heated Specimen Stage

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6 Installation

6.1 Connecting the Computer and Monitor

After removing the Computer, Monitor, Keyboard, Mouse and Accessories from shipping boxes, place the monitor either beside or on top of the IVOS II, with the keyboard and mouse conveniently located. You will need room to access the rear of the instrument for making the connections. Do not block the IVOS II ventilation slots on the top or at the rear of the system.



The IVOS II should be turned OFF and unplugged from the power source whenever cables are connected or disconnected. Failure to do so could damage the analyzer.

While the configuration may differ slightly, all connections are labeled on the back of the IVOS II.

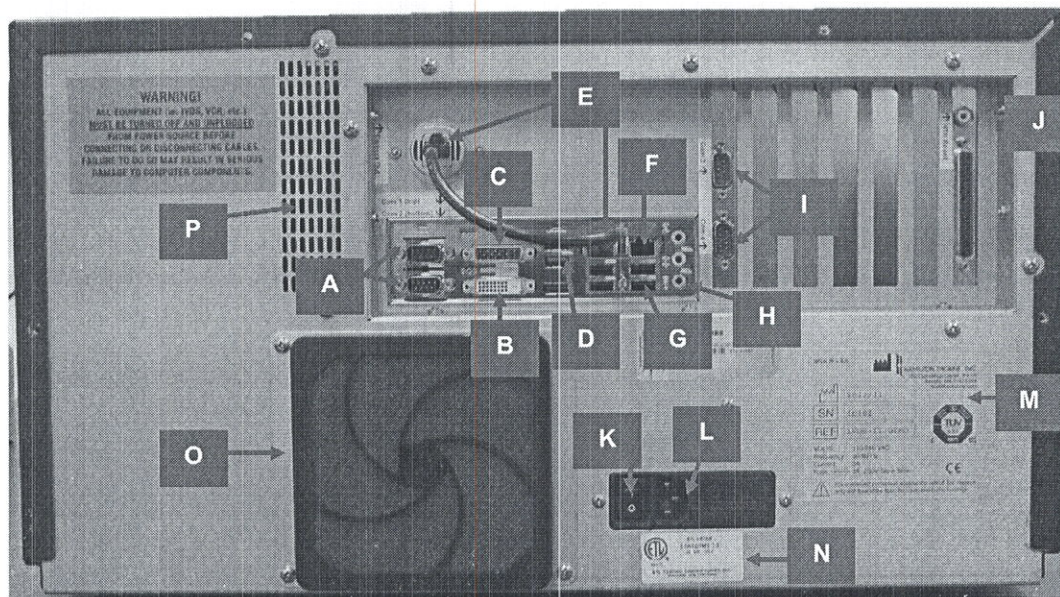


Figure 6-1. IVOS II (rear) Cable Connections

A: Com 1 & 2 Ports
B: Monitor Video Port
C: DVI-1 Port
D: USB 3 Ports
E: Camera Network Out & In
F: Gigabit Ethernet
G: USB 2.0 Ports
H: Audio Cable Ports

I: Com 3 & 4 Ports
J: HTR Board
K: Main Power Switch
L: Power Supply Cable
M: Product Label and Serial No.
N: Safety Testing Label
O: Fan (Do Not Block)
P: Ventilation (Do Not Block)



The cables connections are shown in the back of the IVOS II as shown in Figure 6-1.

1. Plug the white DVI-D **Monitor Video Cable (B)** to the Monitor Video port on the back of the IVOS II and Monitor.
2. Plug the **USB Type A – B (D)** cable from the monitor to one of the USB ports on the IVOS II.
This enables the use of the four port USB hubs which is built into the monitor. The USB hubs on the monitor provide four USB ports, two on the left side and two on the bottom.
3. If supplied with Keyboard & Mouse cables, plug the **USB Keyboard and Mouse cables (C)** into either the IVOS II or the USB hubs built into the monitor.
4. Plug the (CAT5) **Network Cable** from **Camera Out** network port to **Camera In** network port (E) on the IVOS II.
5. Insert the green **USB Security Key** into any available USB port (G).
6. Plug the **Power Supply** cable (L) in the power supply port.
7. After connecting all the cables, turn ON the **Power Switch (K)**.

6.2 Connecting the Network Cable

The **Network Cable** (see Figure 6-2) carries the image from the camera to the computer.

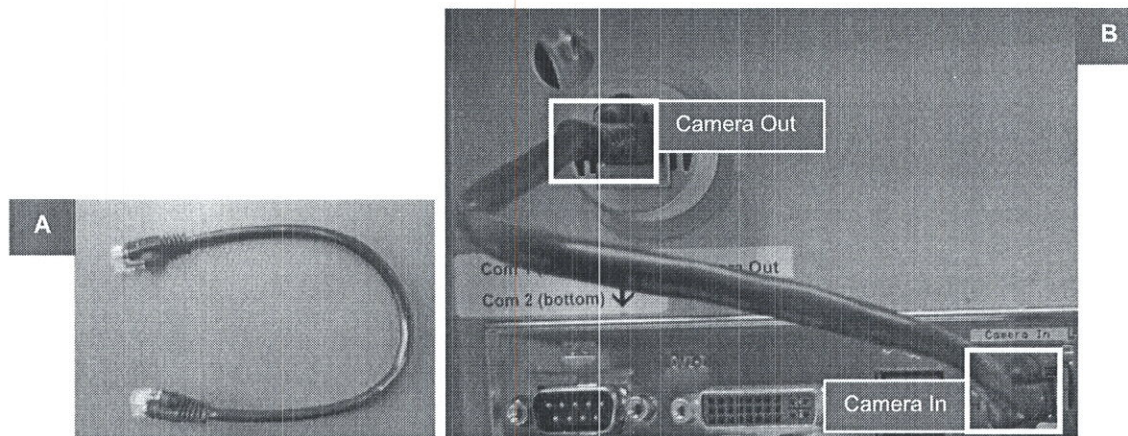


Figure 6-2. Network Cable (A), Connected to Camera In and Camera Out Ports (B)

1. Connect one end of the **Network Cable** to the **Camera Out** port
2. Connect the other end of the **Network cable** to the **Camera In** port.



6.3 Connecting the Monitor, Keyboard and Mouse

1. Connect the monitor to the 15-pin IVOS II port labeled **Monitor**.
2. The IVOS II is provided with wireless keyboard and mouse. The transmitter is plugged into one of the USB port on the front of the IVOS. Be sure to turn the switches on the keyboard and mouse to the “ON” position.

The Logitech USB wireless receivers (not keys) work best when plugged into the monitor's integrated USB Hub and may not function optimally when the USB receivers are plugged into the rear of the IVOS.



The Dell monitors typically have an integrated USB hub with four USB ports, two located on the left side and two more located underneath (out of plain sight). In order for the monitor's USB Hub to function, the monitor must be connected to the IVOS with the included USB cable (in the monitor box).

6.4 Connecting the Security Key

- Connect the green **Security Key** (shows IVOS II serial number) to an available USB port on the IVOS II.

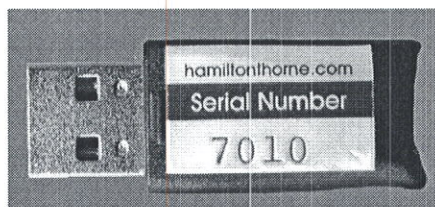


Figure 6-3. Security Key



Do not lose the SECURITY KEYS. Replacement of lost keys is extremely expensive

6.5 Connecting Power Cables

In the U.S. the power cable plug is provided, already attached to the power cable.

In countries outside North America, in general the power cable plug must be provided by the user to fit the local (100-250 volt, 50/60 Hz AC) line current socket. The blue (neutral) and brown (live) wires are the line voltage connections; the green/yellow wire is the ground. The green/yellow wire must be connected to the ground terminal of the plug. The IVOS II automatically adjusts internally to the voltage used. The cable should be 3-pin (grounded). If only 2-pin, the IVOS must be externally grounded (see Section 6.6).



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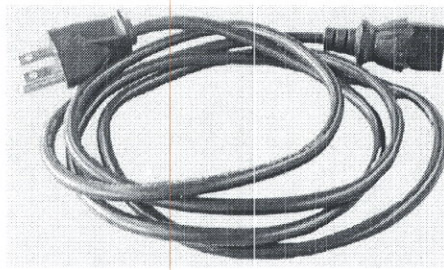


Figure 6-4. Power Cable

1. Plug the IVOS II power cable into the socket in the rear of the IVOS II.
2. Plug the power cable from the IVOS II into the line conditioner or wall socket.
3. Plug the monitor power cable into the socket in the rear of the monitor.
4. Plug the power cable from the monitor into the line conditioner or wall socket.

6.6 Grounding IVOS II Analyzer

It is essential that the IVOS II is properly grounded (earthed) before use. Failure to operate with grounding voids the warranty and may result in severe damage to the IVOS II. A grounding cable is provided which should be connected between computer chassis and earth ground in the absence of a grounded power cable.

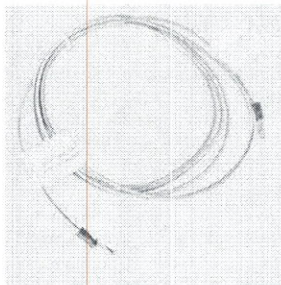


Figure 6-5. Grounding Cable

1. Attach one end of the grounding cable to earth ground.
2. Attach the opposite end of the grounding cable to a screw on the IVOS II back panel (an unpainted surface)

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6.7 Installing the Phase Annulus

The phase annulus (see Figure 6-6) must be installed and aligned prior to both motility and IDENT analysis.

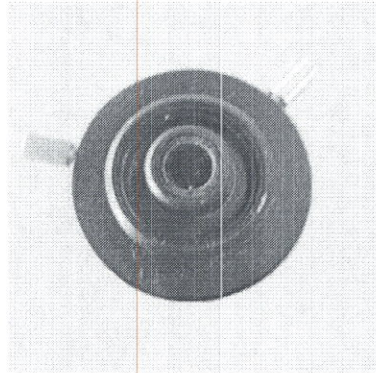


Figure 6-6. Phase Annulus

1. Open the IVOS II optics panel door.
2. Locate the condenser (see Figure 7-1).
3. Hold the phase annulus so that the nose or elevated portion is facing up and the silver phase annulus adjusters are pointing away from the IVOS II as shown in Figure 6-7.
4. Place the phase annulus directly under the condenser and evenly press upwards into the bottom of the condenser. It will snap into place.



The phase annulus must be removed for morphology analyses.

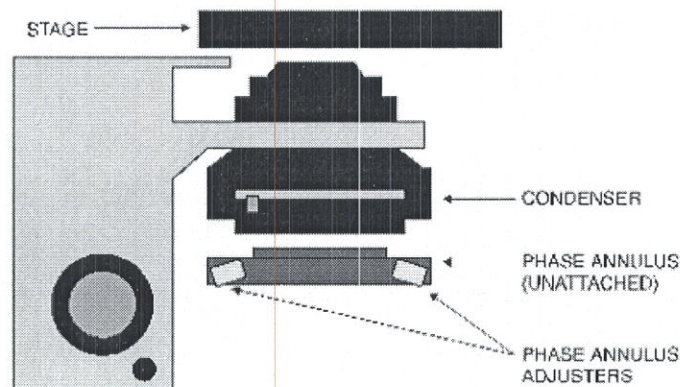


Figure 6-7. Phase Annulus Installation

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7 Getting Started with the Software Program

7.1 Turning on the IVOS II System

1. Turn “ON” the **monitor** using the **On/Off** button on the front panel.
2. Turn “ON” the IVOS II, first by turning “ON” **Power Switch** in the back and then by pressing the **On/Off** button in the front panel.

The computer begins the initiation process.

3. If an IVOS II system password has been employed, enter the **User Name** and associated **Password** and select **OK**.

The *Windows* desktop appears.

7.2 Launching the HT CASA II Motility Program

- Double-click the **HT CASA II** icon on your desktop (see image on right).
- Alternatively select **Start > All programs > Hamilton Thorne > HT CASA II**.

The CASA II program window appears.

The software and its operation are described completely in the *HT CASA II Software Guide*.



7.3 Aligning the Phase Annulus

Prior to shipping, the phase contrast optical system is adjusted as indicated below. However, because the phase annulus is removed for safe shipping, minor realignment may be required.

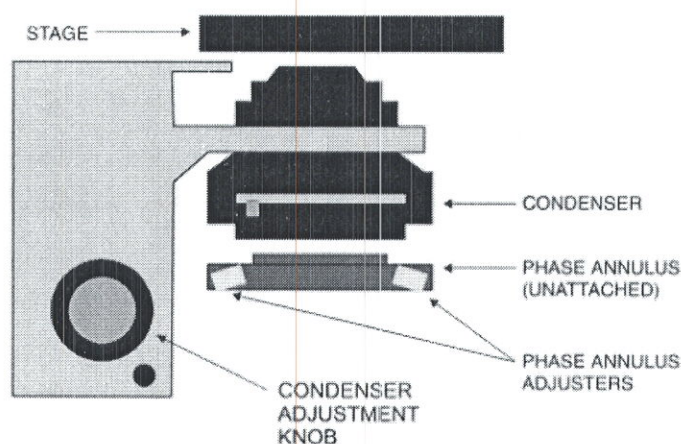


Figure 7-1. Condenser Adjustment

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1. Turn IVOS II on and initiate motility program.
2. Rotate turret so that the 10x NH objective is in position.
Make sure the stage has been raised from its shipping position.
3. Verify that the stage is **Loaded In**, and that the condenser is positioned upward, close to the stage. Rotate the condenser adjustment knob (Figure 7-1) until the condenser touches the stage and then back off slightly, approximately 1mm.
4. Set the **Illumination** approximately between 2220-2700. Return to the **Motility** screen.
5. On the **Motility Setup Configuration**, move the **Minimum Head Brightness** and **Minimum Tail Brightness** settings to highest level, in order to get a proper alignment of the phase rings.
6. Take the **Phase Adjustment Lens** slip it over the **Camera Tube**, as shown in Figure 7-2.

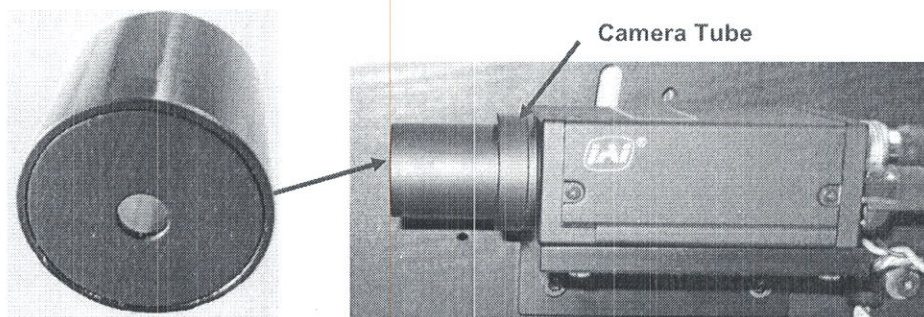


Figure 7-2. Phase Adjustment Lens and Camera Tube

7. Slide the lens back and forth to obtain the best focus. The image does not need to be in the center of the screen.



The phase annulus image appears as a complete bright ring and the phase ring in the objective appears as a dark ring. The phase annulus image must be superimposed on the phase ring image.

8. Turn the phase annulus adjusters until the bright arcs are exactly superimposed on the dark phase ring (see Figure 7-3).
9. At this point the phase contrast optics are lined up and the phase adjustment lens should be removed.



The phase rings are easier to view at an illumination setting that is much lower than the normal analysis setting.

Sheddy

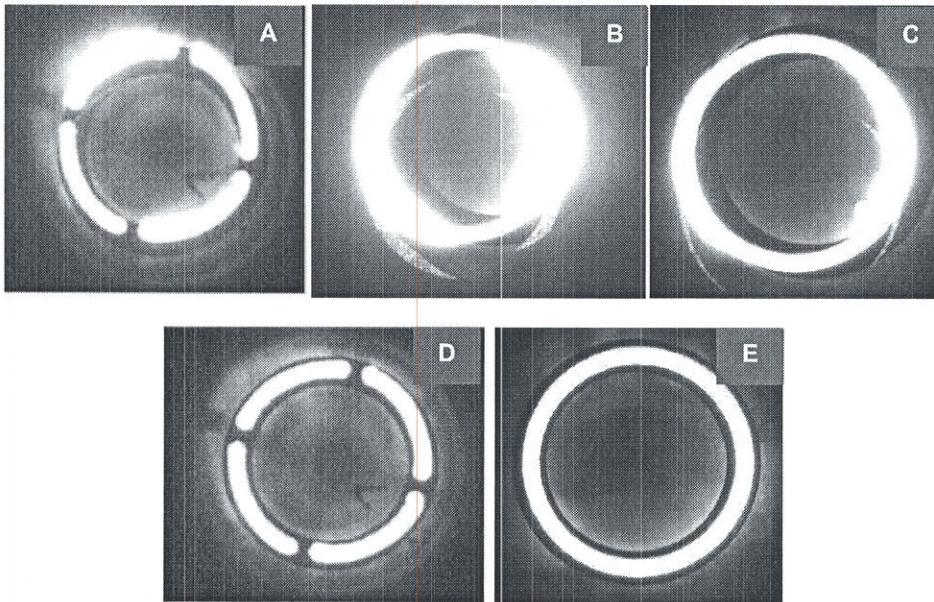


Figure 7-3. Examples of Unaligned Phase Rings (A, B, C); Aligned Phase Rings (D&E)

7.4 Exiting the HT CASA II Motility Program

- Click the **Close** button on window.
The program closes.

Handwritten signature



8 Maintenance

8.1 Cleaning (Optics) Objective Lens

An unclean **Objective Lens** will prevent proper focusing of the lens and will degrade image sharpness and quality.

The **Objective Lens** should always be kept clean. Using index-matching oil at high magnifications could leave some remains on the slide and may get on to other objective lenses. Oil, water or particles of any kind will degrade the image quality and must be removed.



The lens should be cleaned only with MILD SOLVENTS (Recommended: Methyl, Ethyl, Isopropyl alcohol or distilled water).



ACETONE is not a suitable solvent. Methyl ethyl ketone, Ether, Xylene, Chlorinated organics and other strong solvents are also NOT suitable. These solvents may damage the objective.

To clean the Objective Lens:

1. Using a soft brush, remove any dust particles OR use a nitrogen jet to blow particles off from the lens.
2. Wipe the lens with a tissue cleaning paper (e.g. Kimwipe) to remove contaminants.
3. Breathe gently on the lens and wipe off the condensation with a clean Kimwipe.



Inspect the lens surface in reflected light. Any contamination on the surface will show as a region of different reflectivity, and any particles can easily be seen under oblique illumination.

4. Place a drop of alcohol (e.g., Isopropyl) on clean tissue cleaning paper (e.g. Kimwipe) and apply to the lens carefully.



Mild commercial cleaners such as WINDEX can also be used.

5. Clean all parts that come in contact with the index – matching oil, e.g., the stage and top of the condenser.



You can use the PHASE ADJUSTMENT LENS as a magnifying lens to examine the objective for oil, smears, dirt, hair, or scratches.

8.2 Cleaning the Monitor

- Use a soft, clean cloth to wipe the monitor.

This procedure should be performed every six months, or as needed.



8.3 Cleaning the Keyboard

- Use clean compressed air to blow any foreign matter out of the keyboard.
This procedure should be performed every two months, or as needed.

8.4 Cleaning the Camera

- Use a clean compressed nitrogen or air lens-cleaning jet to remove dust particles from the image sensor chip. Do not touch the chip surface as this can leave permanent marks.

Shudo



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Shed

