INTRODUCTION

Welcome to Fundamental Surgery™ – the home of innovative Virtual Reality surgical simulations with haptic feedback delivered on low-cost hardware.

You will shortly be able to practice procedures in a lifelike environment again and again, with live feedback on your performance.

This short guide will help get you setup with your equipment and the Fundamental Surgery app in under 20 minutes.

STEPS

1. HARDWARE REQUIREMENTS
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3. PC SETUP
4. FUNDAMENTAL SURGERY APP INSTALL
5. VR INSTALL & SETUP
6. HAPTIC ARM SETUP
7. ENTER THE SIMULATION
1. HARDWARE REQUIREMENTS

You may already have most of the hardware you need to run the Fundamental Surgery™ system.

**PC** – you’ll need a powerful PC with an Nvidia GTX1080 (or similar) graphics card.

**VR headset** – for your VR headset the choice is yours; Windows, Oculus or Vive.

**Haptic Arm** – you’ll need two Geomagic haptic arms which are available through a simple online purchase.

Please find all the specifications for the equipment in the panel on the right.

You can find links to purchase on our website (fundamentalsurgery.com) or, if you would prefer a fully managed service, we are able to provide this (along with Service Level Agreements for hardware maintenance) as a turnkey solution through our vetted and approved hardware installation partners.

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**PC/Laptop**

- Minimum core i5 4590 processor, recommended core i7.
- Minimum 16Gb RAM.
- Minimum Geforce GTX1080 or equivalent.
- 1 x HDMI cable and 1 HDMI to DVI cable (1 HDMI cable on a laptop).
- 6 x USB 3.0 ports (3 on a laptop).
- Windows 10.

**VR headset**

- Windows Mixed Reality Devices (Acer, Dell Visor, Lenovo Explorer...)
- Oculus Rift, or
- HTC Vive and Audio Strap.

**Haptic arms**

- 2 x Geomagic Touch haptic arm devices.

**Ergonomics**

Some clients prefer to use a height adjustable desk or
laptop riser to create a comfortable operating height for surgeons using the haptic arms.

2. HARDWARE LAYOUT

Most clients choose to setup using a full-size PC, screen, haptic arms and VR headset on a standard desk. A typical layout for this arrangement would be as follows (with the PC under the desk):
User position - Standing, in front of the desk, in a central position with clear, safe and comfortable access to the Haptic arms.

VR Sensors 1m Apart

- VR Sensor
- Haptic
- VR
- PC Monitor
- Keyboard & Mouse
- 20cm
Haptic arm position and orientation – Please position the arms as shown in the diagram above.

Minimum suggested desk height – 32 inches.

PC location - The PC can be placed on the floor or desktop, depending on space available. Wherever the PC is positioned please ensure that it is still within reach of all cables.

E.g. for Oculus and Vive, the VR Headset cable can reach from the back of the PC to where the user’s head will be when standing, with enough slack to enable safe, comfortable and free movement of the headset when in VR.

Monitor location - A suggested position for the monitor is to have it centred at the back of the desk, facing the user. Importantly, the HDMI-to-DVI cable from the monitor needs to be able to reach the DVI port on the back of the PC.

Haptic arm height (if fixed desk height) - A comfortable height for the Haptic arms is somewhat dependent on the height of the user. Generally, if the Haptic Arms can sit on a surface that is approximately 32 inches from the floor this will be suitable for most people. To achieve this height, you may need to sit the Haptic arms on a riser to bring them up to the required height. The additional height required is dependent on the height of your table. The Haptic arms can also be placed directly onto the table top if no riser is available.

Sensors (Oculus Rift)/Base Stations (HTC Vive) Placement - Please follow the manufacturer’s recommendations when setting up and positioning the Oculus Rift sensors or HTC Vive base stations.
3. PC SETUP

Please follow the manufacturer’s instructions on how to setup your PC for general use, or consult your IT team/department. Once the PC is set up, run all the Windows updates to ensure your PC is fully up to date.

VR SPECIFIC SETUP

- The PC can be placed on the floor or desktop, depending on space available. Wherever the PC is positioned please ensure that it is still within reach of all cables.
  
  e.g. for Oculus and Vive, the VR Headset cable can reach from the back of the PC to where the user’s head will be when standing, with enough slack to enable safe, comfortable and free movement of the headset when in VR.

- Use USB 3.0 ports where possible to connect all peripherals (marked blue on the PC).

- Ensure your VR headset and monitor are both plugged into the graphics card (the same graphics card, if you have more than one). If your PC has a HDMI port on the motherboard [i.e. next to all the USB ports] you can ignore this as it will not be needed for your set up.

- Connect the HDMI plug from your VR headset into the HDMI port in your graphics card and the USB plug into any USB 3.0 port. Avoid using any cable adaptors for VR devices.

- Connect your monitor into one of the other ports on your graphics card. Which port you use will depend on which type of port your monitor has and/or which monitor cable you use:

<table>
<thead>
<tr>
<th>Monitor port</th>
<th>PC port</th>
<th>Cable</th>
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<td>Display port</td>
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CABLE CONNECTIONS

- USB > PC
- Power Outlet
- Video Cables > Headset & Monitor
- USB > PC
- Power Outlet

- USB > PC
- HDMI > PC

- USB > PC
- VR

- USB > PC
- VR Sensor

- Keyboard & Mouse
- Haptic

- Monitor
- Power Outlet
- Video Cable > PC
TYPICAL DESKTOP PC CONNECTIONS

- USB 2.0 ports
- USB video ports on motherboard
- USB 3.0 ports
  (Recommended for Haptic arms & VR headset)
- Ethernet port
- Graphics Card with Video ports
  (VR Headset requires a HDMI)
4. FUNDAMENTAL SURGERY APP INSTALL

You can retrieve your software download link from your invoice, or by logging into the Fundamental Surgery website client area and retrieving your details under ‘My Account -> Purchase History -> View Details & Downloads’.

1. The link will initiate a download to your hard drive

2. You will next see the installer download window and will be asked to download required components. Click ‘OK’.

Save the file, and then open it to begin the installation process.
3. The installer download will progress until all components are downloaded. Click ‘OK’.

4. The setup wizard will then launch. Click ‘Next’.
5. You will be asked to accept our terms of use before proceeding. Tick the checkbox, then click ‘Next.'
6. The setup wizard will continue...

7. Once the wizard completes, click ‘Finish’.
5. VR INSTALL & SETUP

Please follow the manufacturer’s instructions on how to install and setup your chosen headset.

The Steam application is additionally required for all headsets to work with Fundamental Surgery.

STEAM – ALL HEADSETS

1. Download from the website: 
   https://store.steampowered.com/about/

2. Create account

3. Login to account

4. Install ‘SteamVR’. In Steam select:
   LIBRARY > VR > SteamVR > INSTALL

OCULUS RIFT - ONLY

Follow this guide from Oculus:
https://support.oculus.com/guides/rift/latest/concepts/rgsg-2-hw-hardware-setup/

HTC VIVE - ONLY

Follow this guide from HTC Vive:
https://support.steampowered.com/steamvr/HTC_Vive/

WINDOWS MIXED REALITY - ONLY

1. Follow this guide from Windows:
   https://support.microsoft.com/en-gb/help/4043101/windows-10-set-up-windows-mixed-reality

2. Additionally you need to install ‘Windows Mixed Reality for SteamVR’ from the Steam store:
   https://store.steampowered.com/app/719950/Windows_Mixed_Reality_for_SteamVR/
6. HAPTIC ARM SETUP

TOUCH SMART SETUP

Before using your haptic devices, you must calibrate them with the ‘Touch Smart Setup’ software, included in your installation for ‘Fundamental Surgery’.

1. The ‘Touch Smart Setup’ application shortcut can be located on your desktop.

2. Two haptic devices are required. Select ‘Two Devices’ under configuration mode.
3. Following the on-screen instructions, select your left hand device first. The associated serial number on screen can be found underneath each physical device.

4. Repeat for your right-hand device.

5. Now confirm calibration by selecting ‘Save Configuration’.

If you have any issues, disconnect/reconnect wires and select ‘rescan’ in the application. A full system restart may also help.
7. ENTER THE SIMULATION

Launch Fundamental Surgery from the icon on your desktop
Fundamental Surgery™ is provided by FundamentalVR. We are a company led by surgical training experts and leading-edge technologists. Our mission is to bring simulation into the hands of medical professionals around the world by using the latest software combined with low cost, readily available technology.