Colonel Panic's Beginners guide for creating a Hackintosh using the ASRock Deskmini 110 (21/4/17).

Acknowledgements:
I claim no ownership of the ideas herein. I am a complete numpty where Hackintosh is concerned as this is only my second build. All I have done is trawl the internet to collate the ideas of others and assemble them into a single (hopefully) definitive source for those wishing to create an ASRock Deskmini 110 Hackintosh. As a numpty I need the dots to be very close together, so that I can join them up. This procedure is so extensive it makes it seem like Hackintosh on a Deskmini is hard. It isn't - when you know what you are doing. I have simply put the put the dots very close together, so that first time builders can get it working in a few hours.

Links to software and useful sources of information are provided and thanks are given to the developers of the tools used here. The TonyMac website (tonymacx86.com) has been immensely useful as have the numerous contributors to the forums therein. Ditto the folks contributing at Insanely Mac (http://www.insanelymac.com). Getting a m.2 PCIe NVME drive to work in OSX was particular irksome. My thanks to Mork vom Ork (http://www.insanelymac.com/forum/topic/312803-patch-for-using-nvme-under-macos-sierra-is-ready/) for making it simple. RehabMan and Dark Void have done a huge amount of collaborative work to make WiFi and Bluetooth a possibility. They have supported a huge number of queries from folk with different hardware combinations and incorporated those efforts into kexts to support a very wide range of hardware. Links to RehabMan's kexts are provided. Pike R Alpha (https://pikeralpha.wordpress.com) is thanked for all round brilliance in creating the code to allow OSX to see an M.2 drive, fixing the graphics glitch and for so many other useful tools – such as keeping my Mac Pro 1.1 in the game for five years after Apple said it was a doorstop.

I have collated this information, but I have invented, devised, troubleshot, adapted, created none of it. If this doesn't get you over the line, I am not the person to ask. Try the forums at TonyMac and elsewhere.

Given that the Deskmini's hardware is fixed, it would be wonderful if somebody could develop a tool to do this procedure in one hit. To my mind the Deskmini is the (almost) ideal hackintosh. The only thing missing is a graphics card. However, for small form-factor desktop work, media/storage/backup server and home theatre applications, this is just the perfect machine being inexpensive, compact and very low cost to run.

Machine Performance:
At the time of posting **WiFi**, **Bluetooth** and on-board **Audio** are all working. I have been able to get the OS X Server application to interact with the Apple Servers, which means that the Serial Number and Board ID created by the installer is probably OK. I don't use iMessage - but chances are that might be OK too.

Sleep is not working. Putting the machine to sleep would result in a restart on wake. This doesn't bother me as this is machine uses so little power it can be left on continuously. The Intel Power Gadget tells me that the CPU is drawing around 4 Watts on idle - which means the whole machine is using probably around 10 Watts -

so around 5 cents a day in power. Given the murderous charges for power in so many countries these days, running this machine as a media/home theatre server will not break the bank. **USB C** - I have no such devices and so have not been able to test it. **Dual Monitor** - I haven't tested. There are fixes on the TonyMac forum if you need this.

Out of interest I ran GeekBench 4 in demo mode, to see how the Deskmini performed in OS X (i5 6500, 16GB RAM, 256GB m.2 NVMe drive).

Single Core Score : 4712
Multi-Core Score : 13394

These scores are really quite outstanding. The single core performance is beaten by only one Mac in the Geekbench database - the 2015 iMac with an i7 6700K processor. The multicore performance sees the machine at around 13th position with around 150 Macs listed (Geekbench database: https://browser.geekbench.com/mac-benchmarks). This puts it in some very illustrious company (including modern Mac Pros). Comparison with the performance of assorted Mac minis (it is a very small form factor PC after all), shows that the nearest Mac Minis are a long, long way down the list. So for the money (about US$600 - I sourced a few used parts for the build) it is a little screamer.

Even when I throw all the cores at a job, the cooling fan is barely audible and the CPU temperature doesn't go past 50°C (122°F). Although I have a high performance cooler installed, the stock standard Intel cooler which came with the CPU was more than adequate. It too was whisper quiet and really effective. These 6000 series CPUs are amazingly efficient.

Section A: Hardware used:

1. AsRock Deskmini 110 – (non-COM port version)
2. i5 6500 CPU – Noctua NH-L9i Cooler. Note the stock Intel Cooler is also more than adequate for this CPU.
3. 16GB of RAM - DDR4 2400MHz, 2 x 8GB SO-DIMM Slots
4. 256GB 2280 m.2 solid-state drive: Samsung PM951 MZVLV256HCHP PCIe 3.0 x4 nVMe drive. Unlike a SATA drive, OSX will not recognise a non-Apple M.2 PCIe drive, since Apple does not follow the industry standard. A kext patch is necessary for OSX to recognise the Samsung drive mentioned here. If you use other brands of drive, the solution proposed here may not work. I would advise you use the Samsung drive specified. 128GB should be fine for just OSX. I used 256GB and partitioned my drive in two for OS X and Windows dual boot.
5. 750GB spinning hard drive (x2) - one for OS X data and one for Windows data. Of course you could combine them into a RAID if you were so inclined. Drives up to 9.5mm in thickness are supported.
6. The stock Intel Bluetooth/WiFi cards supplied with the Deskmini works fine for Windows. However, it will NOT work in the Hackintosh environment. If you want Bluetooth/WiFi you will have to purchase and install a Broadcom Bluetooth/wifi card of type: BCM94352Z. These are available on eBay for around $35.

Section B: Updating the BIOS (note: in this guide the terms BIOS and UEFI are used interchangeably)

Using the Internet Flash route.

1. Make sure you have the most current bios for your system. ASRock released a BIOS fix for the Deskmini in Feb 2017 (v7.0) to ensure it was Hackintosh compatible.
2. Attach the Deskmini to a wired network.
3. Start the Deskmini and hold down the F2 key to go into the UEFI. When the UEFI page launches, ensure you are in Easy Mode (normally the default). If you are in Advanced Mode – there is a button (top right) which will take you back to Easy Mode.
4. Click on the **Internet Flash** button. This will contact the ASRock support site and tell you if your firmware is up to date. If it is not up to date, you can (in principle) download the update and install it this way. I had problems actually doing the update via this method – the download kept crashing out. If the method works for you, great. If not, try the manual method below:

   Manual method using the Instant Flash route.

1. Since the Internet Flash method refused to work for me, I therefore went to the ASRock support site (on another computer):

http://www.asrock.com/support/support.asp?Model=DeskMini%20110%20Series&cat=BIOS

2. Manually download the relevant BIOS file. IMPORTANT make sure you download the correct file for your system. The system name of the Deskmini is shown in the top left corner of the Easy View UEFI page. – my Deskmini is shown as 'H110M-STX'. There is a second version of the Deskmini which has a COM port. This model is called 'H110M-STX/COM'.
3. Decompress the downloaded BIOS file and copy it to a FAT32 formatted USB drive.
4. Insert the USB drive containing the BIOS file into the Deskmini and then, in the UEFI Easy View page click on Instant Flash. This should find the BIOS file and install it. Do not interrupt the installer and do not do this update if your mains power is flakey – eg you live in South Australia or a thunderstorm is happening.

Section C: Setting the BIOS for Hackintosh.
Once you have updated the BIOS, or confirmed that it is current, you can configure the BIOS for Hackintosh compatibility. These settings work on the Deskmini which does NOT have a COM port. If your Deskmini does have a COM port check for any settings relating to the COM port and ensure that the port is DISABLED.

1. With the Deskmini's BIOS page shown (press F2 at startup to enter the UEFI), enter **Advanced Mode** (F6 or click top right).

2. Click on the **Exit** tab and select **Load UEFI Defaults**.
3. From the **Advanced** options page, click on the **CPU Configuration** option.
   a. Set the **Intel Virtualization Technology** to DISABLED. *
   b. Click on the small left arrow (top left) to return to the main **Advanced** options page.
4. • From the **Advanced** options page, click on the **Chipset Configuration** option.
   a. Set the **VT-d** option to DISABLED.*
   b. Set the **IOAPIC 24-119 Entries** option to DISABLED.
   c. Click on the small left arrow (top left) to return to the main **Advanced** options page.
5. From the **Advanced** options page, click on the **USB Configuration** option.
   a. Set the **XHCI Hand-off** to ENABLED.
   b. Click on the small left arrow (top left) to return to the main **Advanced** options page.
6. Click on the **Security** Tab on the main UEFI page.
   a. Set the **Secure Boot State** option to DISABLED.
   b. Click on the small left arrow (top left) to return to the main **Advanced** options page.
7. Double-check these settings to make sure that they are correct. Then click on the **Exit** tab and select the option **Save Changes and Exit**. The Deskmini will restart.

*Note: I have a dual boot system. In Windows I wanted to test how VMWare Player would run an OS X installation as a virtual machine (very well it turns out). In order to run virtualisation, the two BIOS options labelled with an * above (Intel Virtualisation Technology and VT-d) have to be set to ENABLED. After turning these on, I had no issues with subsequently running my Hackintosh. Disabling these technologies seems part of the standard setup advice for Hackintosh - it's not clear to me just how important disabling them is. Currently, I have them enabled.

Section D: Creating a Hackintosh USB installer.

1. Make sure you use a reasonably good quality USB – at least 8GB in size. Cheap USBs can be very slow and these may not boot your computer – even if all the files are installed correctly. Use a brand name usb like SanDisk Cruiser.
2. Insert the usb into a Mac and format the drive: OSX Extended (Journaled)
   a. Scheme: GUID Partition Map
   b. Call the drive something short and simple like USB – do not put spaces in the name.
3. To access the software you need you will have to create an account on the TonyMac website (https://www.tonymacx86.com/threads/unibeast-install-macos-sierra-on-any-supported-intel-based-pc.200564/).
4. Download the latest copies of:
   a. Unibeast – used to create a bootable installer.
   b. Multibeast – customises the installation to match the hardware in your target PC.
5. Create a Sierra UniBeast installer using the method on TonyMac's website (https://www.tonymacx86.com/threads/unibeast-install-macos-sierra-on-any-supported-intel-based-pc.200564/) details below:
   a. Run the Unibeast installer – click Continue/Agree as prompted.

b. Select a destination and choose the usb drive you just named USB.
c. You need to have the installer for OS X Sierra in the Applications folder of the Mac you are using to create the installer. If you do not have such an installer you will have to download one from the App Store. I am using Sierra 10.12.2. If the Installer is present in your Mac's Applications folder it will appear in the Select OS Installation page.
d. Click on the Sierra icon (sky goes blue) then click on Continue.
e. In the Bootloader Configuration page, select the UEFI Boot Mode option, then click on Continue.
f. In the Optional Graphics Configuration page – select nothing, click Continue.
g. At the Verify Installation options it should show your USB drive, OS X Sierra and UEFI boot mode. Click Continue and enter your admin password to create the installer – ca 10mins.

6. Once the Installer is complete, drag a copy of the Multibeast software (which you downloaded earlier) onto the USB drive.
7. Your installer is now ready to use.

Supplementary. Editing the config.plist file

Software you will need to edit the config.plist file:

1. Clover Configurator: available for free from:

http://mackie100projects.altervista.org/download-clover-configurator/

2. **Text Wrangler**: You will also need a suitable editor for editing the Config.plist file. Text Wrangler is a free editor and nicely handles the structures of .plist files. You can get a copy from the App Store or directly from:

http://textwrangler.en.uptodown.com/mac

Editing the config.plist file is a critical step in some of the procedures, which follow. The format of the config.plist file matters – it is in XML. If you inadvertently delete a line or duplicate a line, the file may be rendered unusable. It is therefore VITAL that you keep copies of the config.plist file at each step in a process where you edit the file. Save copies to a folder in which the name/number gives a clue as to to where in the installation timeline it came from eg 1 config as installed by Unibeast.plist; 2. config after inserting NVMe code etc.

3. Plist Pro: You can test if your edited config.plist is OK by attempting to open it with Plist Pro available free from:

https://www.fatcatsoftware.com/plisteditpro/

If there is a problem with your file, it will not open.

It is incredibly difficult to find errors you have created during editing, unless you have incremental copies. By comparing the two files (and knowing where you added the changes), you can hopefully identify a misplaced <dict> or similar error. If you cannot find the error, then at least you can backtrack to the previous version and try again. Plist Pro is a useful tool for doing minor edits on your config.plist file, such as changing a No to a Yes or changing a numerical or string value. This tool cannot break the formatting of your file. However, for major additions, by far the quickest way is to copy the relevant code and paste it into the config.plist using Text Wrangler. When editing in this way, be absolutely certain you are inserting patches in the correct location – otherwise you can break your file. Do not use a basic text editor for config.plist editing, as it may corrupt your file, even if you do the edits correctly. Clover Configurator is a useful utility which allows you to mount the (hidden) EFI volume which contains the config.plist file you need to edit. As the name suggests, you can edit the settings of the config.plist file with this tool also. It has a lot of options to it, which I do not understand, so I tend to restrict my use of it to mounting the EFI volume, and then do all my editing with Text Wrangler and Plist Pro. As with Plist Pro, if there is a problem with the formatting of the config.plist file, Clover Configurator will not open the file, and all the fields will be blank or grey.

Installation of OS X on your hard drive: There are two procedures depending on the type of hard drive you are using. Follow Section E1 for SATA drives such as a conventional spinning disk or an SSD. Follow Section E2 if you are using a PCIe NVMe type drive (installed in the m.2 slot)

Section E1: Installing OSX on a SATA spinning drive or a SATA SSD (ie NOT on an m.2 PCIe drive)

1. Insert your installer USB into one of the USB 2 ports on the Deskmini and power it up.
2. As soon as the prompt appears (bottom right of screen), press F2 to bring up the UEFI page.
3. In the **Easy View** version of the UEFI page on the right hand side is a boot list for all available disks. Drag the boot partition on your USB installer to the top of the list. This will be called something like **UEFI: Drivename**, where drivename is the brand of drive.
4. Click on the floppy disk icon (top centre) to save the settings and reboot the Deskmini.
5. The Deskmini should now boot off your USB drive and the Clover prompt will appear. This will show all available volumes.
6. Use the left/right arrow keys to scroll across the options and choose Install OSX (External). Clover will then hand over to the installer on the usb drive.
7. When the OSX installer boots, after several minutes the language selection page will appear – choose English.
8. At the next page from the Utilities menu select Disk Utility.

9. Note: Only SATA drives will be visible to Disk Utility. If an m.2 PCIe drive is installed, it will not be visible to OS X – installation of a kext patch is required – see Section E2.

10. In Disk Utility click on the target SATA drive where you wish to install OS X.

11. If you intend to partition the drive to be a dual boot volume, click on the Partition button and set the size of the OSX partition. Set the name of the partition (I called mine OSX), set the format as Mac OS Extended (Journaled), and set the size. Since it was a 256GB drive I set my OSX partition to be 128GB. Click Apply. Note if you intend installing OS X and Windows on the same (partitioned) drive, you must partition it using OS X's Disk Utility and set the scheme to GUID – Windows can then be installed on the empty partition after setting up OS X. If you partition the drive using Windows, the scheme is MBR – which OS X will not install into.

12. If you do not wish to partition the drive, select the Erase button, set the drive name to OSX or similar and set the formatting option to Mac OS Extended (Journaled) and the scheme to GUID.

13. Quit Disk Utility to return to the installer and click on Continue.

14. Follow the default options and install OS X. On a spinning disk, this may take fifteen minutes or more.

15. Once installation is complete, the Deskmini will reboot. Hold down the F2 key to enter the BIOS and confirm that the system is still set to boot from the usb drive – then reboot.

16. At the Clover prompt select the hard disk you just installed to as the boot volume. Clover will describe this volume as HFS and the prompt 'Boot Mac OS X from OSX' will appear (OSX is the name I gave the volume at install). The newly installed OS X will load. If it is a spinning disk it will be quite slow to load (several minutes), as the installation process completes.

17. When it has loaded you will prompted with the usual Mac setup options to set the country, create an account etc – complete these as you would normally.

18. At this stage many things, such as wired networking, will not work. So ignore errors telling you the Mac isn't connected to the internet and continue.

19. Apart from your country, use the default options for all prompts.

20. Given the nature of this device at the Diagnostics and Usage page deselect the options to send info to Apple.

21. At this stage you should have a very basic OS X installation. Many things, like networking, will not yet work.

22. If your system fails to install, try your usb drive in another port. Try creating an installer on another (faster) usb drive – they are not all created equal. Check your BIOS settings and that your BIOS is current.

23. Launch the Clover Configurator program which you copied to your usb installer and at the prompt, mount the EFI partition from the hard drive you just set up and that from the usb installer. These two EFI volumes have the same name, but have different icons – the usb's EFI has an external drive icon, while the hard drive's EFI volume has a hard drive icon – do not confuse the two.

24. Copy the config.plist file from the usb's EFI volume to the EFI volume of your hard drive. The config.plist file lives in /EFI/EFI/Clover.

25. The next stage of installation is to run the Multibeast program described in Section F.

Section E2: Installing OSX onto a m.2 NVMe drive (PCIe solid state drive). Note this is not a regular SATA SSD or spinning drive. See Section E1 for instructions on installing to such a drive.

The starting point for this procedure is that you have already completed Sections A through D inclusive and you have a usb OS X installer created by Unibeast ready to go.

Here I will name my installer and target disk as follows:

usb installer : USB
m.2 PCIe disk on which will be installed OSX : OSX

You will need to source Clover Configurator and Text Wrangler programs. Links to these programs can be found in Section G.

Another useful program is Kext Wizard. This allows you to install kexts and set their permissions correctly. If you drag and drop them they may not operate correctly. Kext Wizard can be sourced from:

http://en.freedownloadmanager.org/Mac-OS/Kext-Wizard-FREE.html

1. Copy all the programs mentioned above onto the usb installer drive (ie Clover Configurator, Text Wrangler and Kext Wizard).
2. Insert the installer usb into a Mac.
3. Run the Clover Configurator program. If you get a prompt saying this program is not from a trusted source and will not be run, go to System Preferences/Security and click on the Run Anyway button to launch it.
4. When Clover Configurator launches it will look for a Clover file called config.plist. This holds all the settings the Clover bootloader needs to launch. Clover Configurator will ask you if you want to mount the EFI partition – at the prompt, choose the Mount EFI Partition button. The Clover bootloader and its associated files (including config.plist) live on a hidden EFI partition on the usb installer.
5. A window showing all the volumes available will appear. Only the EFI volumes are listed in the bottom section. Make sure you choose the correct one – it should be called EFI on EFI, USB (disk. . .) click on the Mount Partition button for that volume and a usb drive icon called EFI will appear on the desktop. Do not confuse this volume with the equivalent EFI volume on your Mac's hard drive.
6. If your usb drive's newly mounted EFI volume does not appear on your desktop, click on Finder/Preferences and check the Show Hard Drives option. Close Clover Configurator.
7. The EFI partition needs to be mounted so that access to the config.plist file is possible. The Config.plist file lives in /EFI/EFI/Clover (ie in the mounted EFI volume). It is a good idea to make a copy of the config.plist file (right click on it and copy and paste to create a file called config copy.plist) so that you can go back to the original, if you make a mistake during editing. Save another

numbered/renamed copy elsewhere every time you are about to edit the config.plist.

8. Launch Text Wrangler and select File/Open and select the config.plist file in the /EFI/EFI/Clover volume from the usb drive.

9. Scroll down the config.plist contents and look for this sequence of code (shown in blue here):

```
<key>KextsToPatch</key>
<array>
                <------    insert code here
. . . .
. . . .
<array>
```

Text Wrangler has a search facility so you can search for kextstopatch.

10. Insert the following code immediately after the line   <array> – as shown above. Copy the code below (courtesy of Pike R Alpha) and paste it using Text Wrangler at the insertion point and then click on File/Save to save the modified config.plist file.

```
<dict>
    <key>Comment</key>
    <string>IONVMeFamily IONameMatch</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>InfoPlistPatch</key>
    <true/>
    <key>Find</key>
    <data>PHN0cmluZz5wY2kxNDRkLGE4MDQ8L3N0cmluZz4=</data>
    <key>Replace</key>
    <data>PHN0cmluZz5wY2kxNDRkLGE4MDI8L3N0cmluZz4=</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#1</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>ibPoAgAAweAMBQAQAACJgw==</data>
    <key>Replace</key>
    <data>ibPoAgAAweAJBQAQAACJgw==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#2</string>
```

```xml
        <key>Disabled</key>
        <false/>
        <key>Name</key>
        <string>IONVMeFamily</string>
        <key>Find</key>
        <data>D7aMiIIAAACD+QwPhTIBAA==</data>
        <key>Replace</key>
        <data>D7aMiIIAAACD+QkPhTIBAA==</data>
    </dict>
    <dict>
        <key>Comment</key>
        <string>IONVMeFamily Pike R. Alpha Patch#3</string>
        <key>Disabled</key>
        <false/>
        <key>Name</key>
        <string>IONVMeFamily</string>
        <key>Find</key>
        <data>AMeDpAAAAAQAABIi0gISA==</data>
        <key>Replace</key>
        <data>AMeDpAAAAACAABIi0gISA==</data>
    </dict>
    <dict>
        <key>Comment</key>
        <string>IONVMeFamily Pike R. Alpha Patch#4</string>
        <key>Disabled</key>
        <false/>
        <key>Name</key>
        <string>IONVMeFamily</string>
        <key>Find</key>
        <data>SYnGTYX2dGFBwecMSWP/vg==</data>
        <key>Replace</key>
        <data>SYnGTYX2dGFBwecJSWP/vg==</data>
    </dict>
    <dict>
        <key>Comment</key>
        <string>IONVMeFamily Pike R. Alpha Patch#5</string>
        <key>Disabled</key>
        <false/>
        <key>Name</key>
        <string>IONVMeFamily</string>
        <key>Find</key>
        <data>hv8PAABIwegMD7cPgeH/Dw==</data>
        <key>Replace</key>
        <data>hv8PAABIwegJD7cPgeH/Dw==</data>
    </dict>
    <dict>
        <key>Comment</key>
        <string>IONVMeFamily Pike R. Alpha Patch#6_7</string>
        <key>Disabled</key>
        <false/>
        <key>Name</key>
        <string>IONVMeFamily</string>
```

```
    <key>Find</key>
    <data>icGB4f8PAABIAdFIgfn/DwAAdzs=</data>
    <key>Replace</key>
    <data>icGB4f8BAABIAdFIgfn/AQAAdzs=</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#8</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>SYHF/w8AAEnB7QxJiwQkSA==</data>
    <key>Replace</key>
    <data>SYHF/w8AAEnB7QlJiwQkSA==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha
Patch#9_10</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>BgIAAEyNuAAQAABMiflIgeEA8P//SYmGGgEAAEmJjiIBAAB
BvAAQAABJKfQ=</data>
    <key>Replace</key>
    <data>BgIAAEyNuAACAABMiflIgeEA8P//SYmGGgEAAEmJjiIBAAB
BvAACAABJKfQ=</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#11</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>AABJiY4iAQAAugAQAABIKQ==</data>
    <key>Replace</key>
    <data>AABJiY4iAQAAugACAABIKQ==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#12</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
```

```
    <data>yAAAAEkp17gAEAAATYskJA==</data>
    <key>Replace</key>
    <data>yAAAAEkp17gAAgAATYskJA==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#13</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>4b+AQBUGTYnWugAQAABFMQ==</data>
    <key>Replace</key>
    <data>4b+AQBUGTYnWugACAABFMQ==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#14</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>iWTY+EmBxAAQAABJgccA8A==</data>
    <key>Replace</key>
    <data>iWTY+EmBxAACAABJgccA8A==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#15</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>Bf8PAABIwegMZvfB/w8PlQ==</data>
    <key>Replace</key>
    <data>Bf8PAABIwegJZvfB/w8PlQ==</data>
</dict>
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#16</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>weIIQQ+2wcHgDEQJ0EQJwA==</data>
    <key>Replace</key>
    <data>weIIQQ+2wcHgCUQJ0EQJwA==</data>
</dict>
```

```
<dict>
    <key>Comment</key>
    <string>IONVMeFamily Pike R. Alpha Patch#17</string>
    <key>Disabled</key>
    <false/>
    <key>Name</key>
    <string>IONVMeFamily</string>
    <key>Find</key>
    <data>RYTJD5XAD7bAweAMRAnYRA==</data>
    <key>Replace</key>
    <data>RYTJD5XAD7bAweAJRAnYRA==</data>
</dict>
```

11. Quit Text Wrangler.
12. Open your just saved config.plist with Plist Pro to ensure that it is working correctly and does not report an error.
13. The usb installer is now ready to use and should now be able to recognise the m.2 PCIe solid state drive installed in the Deskmini's m.2 port. This has been tested with the Samsung drive specified in Section A. Other brands of drive may or may not work.
14. Eject the usb drive from your Mac and insert it into the Deskmini.
15. Restart the Deskmini and hold down the F2 key to enter the UEFI page.
16. In the boot priority list on the right hand side of the Easy View UEFI page, click and drag the UEFI: USB drive to the top of the list, so that the Deskmini boots from that.
17. Click on the floppy disk icon (top centre) to save the settings and restart.
18. The Deskmini should now load the Clover bootloader from the usb drive and show a list of drives to select from. Click on the External (usb) drive. Clover will show the prompt Boot Mac OS X from USB (note USB is the name given to the drive). Select this drive with the left/right arrow keys and hit return.
19. The Mac OS X installer will now run. The first page is the language selection. Choose English.
20. At the macOS installation page stop – do not continue with the installation. The m.2 drive needs to be formatted, and if you choose to do so, partitioned.
21. On the macOS installation page do not press Continue. Instead, from the Utilities menu select Disk Utility.
22. On the left hand side of Disk Utility will be listed all the drives which Disk Utility can see. My m.2 PCIe drive is listed as PM951 NVMe Samsung 256GB media. Click once on this volume. If you intend to partition it to be a dual boot volume, click on the Partition button and set the size of the OSX partition. Set the name of the partition (I called mine OSX), set the format as Mac OS Extended (Journaled), and set the size. Since it was a 256GB drive I set my OSX partition to be 128GB. Click Apply. Note if you intend installing OS X and Windows on the same (partitioned) drive, you must partition it using OS X's Disk Utility and set the scheme to GUID – Windows can then be installed on the empty partition after setting up OS X. If you partition the drive using Windows, the scheme is MBR – which OS X will not install into.
23. If you do not wish to partition it, select the Erase button, set the drive name to OSX or similar and set the formatting option to Mac OS Extended (Journaled) and the scheme to GUID.
24. Quit Disk Utility to return to the Installer, then click on Continue.

25. Click Continue to accept the license terms.
26. At the next page select the installation volume. In this case it is the OSX partition which you just created on the m.2 drive.
27. Click Continue and the installation proceeds.
28. Once the installation completes (ca 12mins), the Deskmini will reboot and launch Clover from the usb drive. Select the recently installed OSX volume in the Clover bootloader. Clover identifies it as Boot Mac OS X from OSX. The OSX m.2 volume will boot – it will take some time as installation steps complete.
29. Follow the normal Mac OSX installation.
30. Networking does not yet work – just skip through that.
31. Do not send any diagnostics to Apple – this is a hackintosh.
32. Use Clover Configurator to mount the EFI volume of the USB boot drive. The EFI will have the same icon as a usb (external drive).
33. Copy the config.plist file from /EFI/EFI/Clover/ to the desktop of the OSX m.2 drive.
34. Use Clover Configurator to mount the EFI volume on the OSX m.2 drive. This EFI will have the same icon as a hard drive. Make sure you do not confuse the two EFI volumes. Drag the config.plist you just copied from the desktop to the /EFI/EFI/Clover folder of the OSX volume (the EFI volume with the hard disk icon) to replace the existing config.plist file.
35. The hard drive will now be bootable. However, we will not boot from it just yet as we need to add drivers as per section F.

Section F: Configuring OSX so that it will talk to the Deskmini's hardware.

1. Note: this procedure was carried out with OS X Sierra 10.12.2. A recent update to 10.12.4 has caused some issues with Multibeast (used here). See the link below for tips on dealing with this issue if you are installing 10.12.4 (or later):

https://www.tonymacx86.com/threads/updated-clover-required-for-kext-injection-in-macos-10-12-4.218062/

2. Your starting point for this process is having just completed the final step of the Section E relevant to the type of hard drive you are using ie you have booted from the Clover bootloader on your usb drive and then booted into Mac OS X on your freshly installed OS X installation, which currently has minimal functionality.
3. If the EFI volume of the OSX hard drive (SATA or m.2) is not mounted, launch Clover Configurator and mount it. Click on the Mount Partition button for the EFI on EFI volume relevant for your OSX volume. Here we need to set up the OSX volume's config.plist file (not the corresponding file on the usb volume).
4. The EFI volume will appear on the desktop (if not, from Finder/Preferences set the option to show mounted hard disks). Do not mistake the usb installer's EFI volume with that of the OSX volume (hard disk) you just created. If you have chosen the correct one, it will have the icon of a hard drive. If you have chosen the wrong one, it will have the icon of a external (ejectable) usb drive.
5. Navigate to the config.plist file in EFI/EFI/Clover. Right click (or Control+Click) on the config.plist file and copy and paste it, to create a copy called config copy.plist. That way if you mess up the file, you can go back to a working copy.

Remember also to save a copy in another folder, numbering and labelling such remote copies, so that you can always backtrack to an earlier version if you corrupt the file.

6. Right click (or Control+Click) on the config.plist file and open it with Plist Pro.
   a. Click on the arrow in the Boot Section of Plist Pro to open it:
   b. Set the value field of the Arguments section to: dart=0 darkwake=8
7. Make sure you leave a space between the two above arguments.
8. Set the value of the DefaultVolume to the name of your OS X hard drive. Here it is called OSX. Match the case and spelling exactly.
9. Beneath that option set the Timeout parameter to 3. This is how long Clover will wait (in seconds) before automatically booting the default volume. Change it to suit.
10. Click on the arrow in the Devices section.
    a. Open the Audio Tab and change the value to 66.
11. • Click on the arrow to open the RtVariables section.
    a. Set the CsrActiveConfig value to 0x67 (note that is zero x 6 7). This turns off Apple's Security measures (SIP). You may decide to turn this back on once all installation has been completed. To turn it back on set the value to 0x3 (note that it is zero x 3).
12. Save the changes within Plist Pro by choosing File/Save. Note if you simply close the Plist Pro window any changes you made are not saved automatically, and will be lost.
13. Restart the computer. As before, the Clover Bootloader launches from the usb drive. Select the hard disk on which you just installed OS X as the boot volume.
14. When you have booted into OS X, open the System Preferences and in the Energy Saver preference set both the computer and display to never go to sleep. Sleep is not working here, and if the computer sleeps it will crash the system.
15. From the usb installer drive launch Multibeast.
16. Click on the Quick Start tab and select UEFI Boot Mode.
17. Click on the Drivers button, Select Audio/Realtek ALCxxx and select the following options:
    a. 100 series Audio.
18. Still in the Drivers window click on Network/Intel
    a. Select IntelMausiEthernet v2.2.0
19. Still in the Divers window click on USB.
    a. Check the Increase Max Port Limit option. Note, I found getting Bluetooth to work very difficult. When I installed this driver, all the problems went away.
20. Click on the Customise tab/Graphics Configuration and check the following option:
    a. Intel HD 530
21. Still in the Customise tab select the System Definitions button and set the identity to :
    a. iMac 17,1.
22. Save these Multibeast options as a settings file by clicking on the Save button. You will use the Multibeast installer again shortly and you want to use identical settings. Note: In my version of Multibeast 9.0.1(1) there seems to be a bug, which causes saved settings to corrupt. If that happens, then you will simply have to manually re-enter the settings into Multibeast using the selections described

above, if you run it again. Be very careful to enter exactly the same values as you did first time.

23. To write the settings to the OSX volume you just installed in Multibeast click on Build tab. This will show you a summary of the settings you have selected.
24. On the right hand side of the Multibeast window set Select Install Drive to be the OSX volume, which you just installed and click on the Install button (bottom right). When the installation has completed exit Multibeast.
25. Open the Terminal program from the Applications/Utilities folder of your OS X volume. Type in the following command:

sudo touch /System/Library/Extensions && sudo kextcache –u /

26. At the prompt enter your admin password. You should see a list of kexts appear. If nothing happens check that you have entered the command correctly. This command rebuilds the caches.
27. When the installation has finished your freshly installed OSX volume should become usable. Restart the Deskmini and hold down the F2 key to enter the UEFI.
28. In the Boot Priority list of the Easy View page of the UEFI the newly set up volume should appear as UEFI OS (DriveType x-x, disk serial number). The DriveType will be SATA or M2_1 depending on the type of drive you are using. Click and drag this volume to the top of the list and click on the floppy disk icon (top centre) to restart.
29. Immediately on restart, remove your usb installer drive to convince yourself that your internal drive is booting correctly.
30. On restart a Clover boot page will appear with all available volumes shown. Select the HFS volume which matches the one you just created. You can change the selection with the left/right arrow keys and hit Return to select. The previous settings configured Clover to boot automatically from the previously selected volume after 3s. Changing the selection (left or right arrow key) will stop that and give you time to make a different selection. The Clover prompt will change with each selection. The volume you want should say 'Boot Mac OS X from OSX) – here OSX is what I called the hard drive when I formatted it. Hit Return to select the volume.
31. • You now have a bootable OSX volume, which should have some working hardware.
    a. Sleep will not work. In fact if your Deskmini goes to sleep it will reboot on wake.
    b. Networking should work fine – in OSX click on System Preferences/Network and Ethernet should show connected (assuming you have connected the box to your wired network)
    c. The stock WiFi card will NOT work with OSX. Swap out the card for a Broadcom type as detailed in Section A if you want WiFi and Bluetooth functionality. If you have installed a Broadcom Wifi/Bluetooth card already, it will not yet work. See Procedure H below for setting that up.
    d. Sound. There is no internal speaker so plug a set of headphones into the socket on the front of the Deskmini. Note, the headphone socket is the one at the bottom, (with the Deskmini aligned so that the power button is at the top). The other 3mm socket is for a microphone. Sound will not work yet - see Section I below

    e.   Weird graphics glitch. In the top left corner of the screen you may notice a strange black flickering rectangle. The fix is detailed in Section G below.

    f.   If Clover is not defaulting to your OSX volume, from the OS X System Preferences, set your start up volume to be your OSX volume and Clover will then remember it for automatic startup.

Section G: Fixing the Weird Graphics Glitch (top left corner) in Sierra.

1. Insert your usb installer drive into your Deskmini after booting from the internal OSX drive.
2. Run the Clover Configurator program. If you get a prompt saying this program is not from a trusted source and will not be run, go to System Preferences/Security and click on the Run Anyway button to launch it.
3. Use Clover Configurator to mount the EFI volume of your OSX hard drive.
4. Launch Text Wrangler and select File/Open and select the config.plist file in the /EFI/EFI/Clover volume.
5. Scroll down the config.plist contents and look for the line of code:

```
<key>Devices</key>
```

Text Wrangler has a search function, and so you can search on the word Devices to find the relevant line. Devices appears only once in the config.plist – so the insertion point is not ambiguous.

Immediately after the line:

```
<key>Devices</key>
```

insert the following code. To avoid typing errors, copy and paste the section of code below using Text Wrangler:

```
<dict>
    <key>AddProperties</key>
    <array>
        <dict>
            <key>Device</key>
            <string>IntelGFX</string>
            <key>Key</key>
            <string>AAPL,GfxYTile</string>
            <key>Value</key>
            <data>
            AQAAAA==
            </data>
        </dict>
    </array>
</dict>
```

6. Leave no gaps between the end of the pasted section of code (above) and the rest of the code in the plist.
7. Save the changes by selecting File/Save.

8. Now attempt to open the file you just saved with Plist Pro. If it opens fine your edit was OK. If it reports an error, close the file and reopen with Text Wrangler to find the error.
9. Eject your installer usb drive.
10. Restart OSX and all the graphics glitches will have gone.

Section H Getting WiFi and Bluetooth to work

1. WiFi/Bluetooth will only work if you have swapped out the stock Intel WiFi card for a Broadcom one (see Section A for details. Alternatively, you may be using a usb type WiFi/Bluetooth device.
2. Go the following web link and download the latest kexts:

https://bitbucket.org/RehabMan/os-x-fake-pci-id/downloads/

3. The folder which downloads, contains two versions of kexts. The debug versions can be used to troubleshoot problems – they dump debugging information into logs. In the first instance use the Release version of the kexts. The two kexts which you want are:
   a. **FakePCIID.kext**
   b. **FakePCIID_Broadcom_WiFi.kext**

   These two kexts add WiFi functionality.

4. Go the following web link and download the latest kexts.

https://bitbucket.org/RehabMan/os-x-brcmpatchram/downloads/

5. The folder which downloads is called Release. It contains several kexts – the ones you want are:
   a. **BrcmPatchRAM2.kext**. This will add Bluetooth functionality. Note the . . . RAM2 version is for OSX 10.11 and later. So for Sierra (10.12) you need this version. The . . .RAM version is for 10.10 and earlier.
   b. **BrcmNonPatchRAM2.kext**. The above patch is for Apple cards. For non Apple cards we will include this one as well. Again the . . RAM2 version is for 10.11 and later, while the . . RAM version is for 10.10 and earlier.
   c. **BrcmFirmwareData.kext.** This provides the firmware to drive the card.
6. Copy each of the five kexts listed above (3a, 3b, 5a, 5b, 5c) onto the desktop.
7. Launch Kext Wizard, select the Installation tab and use the Browse button to select the five kexts now on the desktop. Once you have selected the five kexts, set the destination to System/Library/Extensions and make sure the target volume is your OSX drive and click on install.
8. In Kext Wizard, click on the Maintenance tab and check the System/Library/Extensions option so that both the Repair and Rebuild options get selected. Set the Target Disk as your OSX volume, and then click on Execute.

9. Before editing your config.plist file in EFI/EFI/Clover, make a copy of it. Then open the config.plist file with Text Wrangler (use Clover Configurator to show the EFI volume of OSX – if it is not shown). Navigate down to the 'kextstopatch' section (you can search for the term 'kextstopatch' to find it quickly):

```
<key>KextsToPatch</key>
<array>
            <------    insert code here
....
....
<array>
```

10. At the insertion point shown above copy and paste in the following code:

```
<dict>
    <key>Comment</key>
    <string>AirPortBrcm4360 - fcvo</string>
    <key>Disabled</key>
    <false/>
    <key>Find</key>
    <data>gflSqgAAdSk=</data>
    <key>Name</key>
    <string>AirPortBrcm4360</string>
    <key>Replace</key>
    <data>gflSqgAAZpA=</data>
</dict>
```

11. Save the config.plist file, then open it with Plist Pro to make sure it will open OK and has not been corrupted.
12. Open Terminal and type the following and supply your admin password:

sudo touch /system/library/extensions && sudo kextcache –u /

13. Restart your Mac and you should now have functioning WiFi and Bluetooth. Note the card I am using (BCM94352Z) has a smaller channel range (1-11) than my router (1-13) on the 2.5GHz band. You can check the channels which your card will support by selection from the Apple Menu/About this Mac/System Report/Network/WiFi. Check your router. If you have selected Auto for channel selection and your router has chosen channels 12 or 13, you will not be able to see them with this card. The solution is simple, set the channels on the router manually to be 11 or lower. Make sure that the channels on the 5GHz band are also within range of the card, and if not set them in your router manually to appropriate channels. With these patches, both 2.5GHz and 5GHz bands are working as is Bluetooth.

Section I: Getting the on-board audio to work.

1. This procedure is one based on a post by John901223 on the TonyMac forum. This can be found at the top of page 6 of the following thread:

2. The procedure below assumes that when you ran MultiBeast to install drivers (Section F above) you selected the option to Install the Devices>Audio>Reaktek ALCxx>**100 Series Audio only**. If you did not choose this option, run MultiBeast again using the settings specified in Section F. If you inadvertently selected the option to Install the ALC283 (Brix and NUC only) drivers – they will not work and may stop this fix from working. In which case, the ALC283 Brix and NUC kext must be removed. It lives in /Library/Extensions (note NOT /System/Library/Extensions). Just right click on the RealtekALC kext (if present) and delete it.

3. At the foot of John's post is a list of attached files. Download the one labelled 'Deskmini ALC283.zip', and decompress the zip file.

4. The resulting folder contains two kexts: AppleALC.kext and Rehabman's CodecCommander kext.

5. Copy the AppleALC.kext file to the desktop.

6. Open the RehabMan-CodecCommander folder. It contains two folders – Debug and Release. Open the Release folder and copy the CodecCommander.kext file to the Desktop.

7. Launch Kext Wizard. From the Installation tab select the two kexts you just copied to the Desktop and install them into /System/Library/Extensions of your OSX boot volume. Note: John's procedure recommends copying the CodecCommander to the above folder (ie /S/L/E) but copying the AppleALC kext to the Clover EFI boot volume (/EFI/EFI/Clover/Kexts/10.12). I tried his procedure and it didn't work for me, whereas my procedure did.

8. After installation of the two kexts has finished, in Kext Wizard select the Maintenance tab and select the /System/Library/Extensions check box and all options below it. Set the Target Disk to your OSX volume and click on Execute to repair permissions and rebuild the cache.

9. If the EFI volume is not mounted, Open Clover Configurator and mount the EFI volume associated with your OSX boot volume.

10. Navigate to /EFI/EFI/Clover and open the config.plist file using Plist Pro.

11. Click on the Device Item to open it and Select Audio. Ensure that the Inject option Class is type String and that the value is set to 66.

12. From the Plist Pro File menu select Save and close the program.

13. Restart OSX and you audio should now work. Plug headphones or a microphone in (bottom and top sockets respectively) and in the Audio control panel you should see devices shown correctly.

14. If audio is not working. Restart the OS X. As soon as the Clover bootloader page appears hit the right arrow key to move the cursor off the default OSX volume and interrupt auto boot.

15. Move the selection point to Options (not Clover Boot Options) and hit Enter.

16. Use the arrow keys to move the selection point down to Boot args and hit the SPACE BAR to select the item. Type in the following two arguments – all arguments should be separated by a space:

    usesystemcache=no usekernelcache=no

17. Hit Enter to accept the entry and use the down arrow key to select the Return option at the bottom of the menu, then hit Enter.
18. Select your OSX boot volume and hit Enter to boot.
19. Once the Mac has booted open terminal and type:

sudo touch /system/library/extensions && sudo kextcache –u /

20. Enter your password and the kextcache should rebuild. All the kexts which you have installed during the various procedures here should be listed in the general form:

kext-dev-mode allowing invalid signature -67062 blah blah kextname.kext

21. Make sure all the kexts you install are listed and get added to the cache. If you have not installed them correctly they will not load.

Section J: Updating OSX
1. The App Store update will operate normally. I have updated from 10.12.2 to 10.12.4 without issue.

Section K: Backup up your Hackintosh.
Getting everything working can be a bit of work. So it is a good idea to make copies of the important stuff, in case something breaks and you need to backtrack.
1. With the OSX volume's EFI folder mounted (using Clover Configurator), make a complete copy of the contents of the EFI volume and store it on another drive/computer. The key file is your working config.plist file.
2. OS X's Time Machine utility is a great way of making a complete backup of the drive. With a large spinning disk installed, you can run regular, automatic backups of your system drive.
3. Keep a copy of all the files, kexts, patches, software and instructions you used to create this system. Relocating them again on the web can be very time consuming, should you ever need them again.