**All commands to type will be specified with gray highlighting**

**Example**

**Additionally, all commands are listed in setup commands.txt for ease of copy/pasting. Note: when pasting into a pi terminal use ctrl+shift+v**

**Client Software Setup**

**-Option 1 (Fresh install)**

**1.** If the sd card has Raspbian pre-installed skip to step 2B (The BOM listing should facilitate this route). If imaging a blank SD card manually go to 2A.

**2A.** Follow the [Tutorial Here](https://www.raspberrypi.com/documentation/computers/getting-started.html#using-raspberry-pi-imager) on how to install an image

Under the gear icon set the following:

-Enable ssh with password authentication

-Username: pi and password: pi

-Configure the wifi password

-Enable locale settings and set to the correct locale

Click save then write, click yes, it will then ask for admin access to write to the drive. wait for the writing to finish and insert the micro sd card into the PI and connect keyboard, mouse, power supply, and display.

Boot the pi and open the menu by clicking the upper left icon. Under preferences open raspberry pi configuration.

-Under display disable screen blanking

-Under interfaces double check that ssh is enabled

-Under localization double check for the correct time zone and keyboard

There is no need to reboot, we will do that at the end

**2B.** Boot to the Pi with a keyboard, mouse, power supply, and display attached

In the setup tool do the following:

-set the correct country, language, and timezone. Enable the U.S. keyboard

-set the username and password as pi

-connect to the correct Wi-Fi

-update software

-restart

Boot the pi and open the menu by clicking the upper left icon. Under preferences open raspberry pi configuration.

-Under display disable screen blanking

-Under interfaces double check that ssh is enabled

-Under localization double check for the correct time zone and keyboard

**3.** Open a command console with ctrl+alt+t.

Type: sudo raspi-config

Use arrow keys and enter to navigate. Go to interface options and enable legacy camera support.

Navigate to finish, there is no need to reboot.

**4**. On a PC go to the [Github](https://github.com/cameroncircowestfalltechnik/Image_Compare) and click code then “Download zip”. Save the content of the zip file to the usb stick. Remove the USB stick and plug it into a usb port on the pi.

**5**. From the usb stick copy the scripts Main.py, Main\_Transmit.py, Main\_Startup.py and toggle-matchbox-keyboard.sh to the desktop and the folder “Main” to the desktop. Copy “click me to start” and “prog” to desktop.

**6.** The next few steps install the required libraries, setup the keyboard, configure the main program autostart, and create the file reception server. You can run a script to do these steps automatically by following 6A or you can do each item manually with steps 6B, 7, and 8.

**6A.** Use the autosetup script: copy “client\_setup.sh” from the usb drive to desktop. In a terminal (ctrl+alt+t), run the following commands:

Type: sudo chmod +x /home/pi/Desktop/client\_setup.sh

Type: /home/pi/Desktop/client\_setup.sh

Wait for the script to finish, you can now start on step 9

**6B**. Manual setup: Install all the necessary libraries by entering the following commands in a terminal (ctrl+alt+t):

-PIL (Python imaging library): sudo pip install pillow (pre-installed, run to double check install)

-guizero: sudo pip3 install guizero

-picamera: sudo apt-get install python-picamera python3-picamera (pre-installed, run to double check install)

-numpy: sudo apt-get install python3-numpy (pre-installed, run to double check install)

-gpiozero: sudo apt install python3-gpiozero (pre-installed, double check install)

-argparse: pip install argparse

-imagetk: sudo apt-get install python3-pil.imagetk

-Subprocess: pip install subprocess.run

-matchbox keyboard: Do the indented commands below

Type: sudo apt-get install matchbox-keyboard -y

Type: sudo apt-get install libmatchbox1 -y

Type: sudo mv /home/pi/Desktop/toggle-matchbox-keyboard.sh /usr/bin

Type: sudo chmod +x /usr/bin/toggle-matchbox-keyboard.sh

Type: mkdir ~/.matchbox

Type: sudo cp /usr/share/matchbox-keyboard/keyboard-lq1.xml ~/.matchbox/keyboard.xml

Type: sudo chown pi:pi ~/.matchbox/keyboard.xml

Try typing: toggle-matchbox-keyboard.sh

This should make a keyboard with a numpad show up, run the command again to close it

**7**. Setup main program autostart by running the command “mkdir /home/pi/.config/autostart” and then then running “mv /home/pi/Desktop/start.desktop /home/pi/.config/autostart”.

**8**. make the file receive folder by running the command “mkdir /home/pi/Desktop/receive”

**9**. Setup task scheduling by typing “sudo crontab -e” in the terminal and adding the specified lines [here](https://github.com/cameroncircowestfalltechnik/Image_Compare#crontab-setup)/Written below. This will make the program schedule file transmission and reboots. (use editor 1)

Add the following lines to the bottom:

00 00 \* \* \* /sbin/shutdown -r now

05 00 \* \* \* /usr/bin/python3 /home/pi/Desktop/Main\_Transmit.py >> /home/pi/Desktop/Transmit.log 2>&1

Note: the “05” should be different for every client. In this case this transmits at 00:05, space clients at least 30 minutes apart to prevent file reception errors. So the next client would start with “35 00 \* \* \*” and so on

Do ctrl+s and then ctrl+x to save and exit the config window.

**10**. Configure SCP transfer by following instructions in a command terminal:

Type: ssh-keygen

Press enter at each prompt

Type: ssh-copy-id pi@IP (put the server ip under “IP” (This can be found by running hostname -I on the server))

You may need to press y and then enter

Type yes then enter

Type the server password (“pi”) then enter

Type: sudo chmod 777 /root

Type: sudo cp -r /home/pi/.ssh /root (it may be hard to see but there is a space between “.ssh” and “/root”)

Type: sudo chmod 777 /root/.ssh

**11.** Open any folder, click edit in the top left, select preferences. Under General check the box that says “Don’t ask options on executable file” This will allow the “click me to start” shortcut to work more seamlessly.

**12.** shutdown the system to setup hardware (click the pi logo in the top left, click shutdown, then shutdown)

(this can also be done by typing sudo shutdown now)

**13**. Proceed to client hardware setup

**14**. The Pi should now boot to the program

**15**. If this is a new client being added to a setup with a pre-existing server run the following commands on the server:

Type: ssh-copy-id pi@IP (put the new client ip under “IP” (found by mousing over wifi symbol in to right or typing: hostname -I in the terminal ))

Type: sudo cp -r /home/pi/.ssh /root

**16**. Be sure to configure the settings properly in the program (namely machine name).

**-Option 2 (Clone a pre-existing system)**

**1**. Plug pre-existing setup into a display and plug in a keyboard and mouse

**2**. Connect an empty micro sd card to a USB port. Launch the raspberry pi images by pressing the windows key then opening “SD Card Copier” under “Accessories”. Under “Copy From Device” select the entry with “/dev/mmcblk0” in it, under “Copy To Device” select the attached SD card. It should be the only option.

**3**. Click start and allow it to copy the contents of the pre-existing client to the new card. This should take quite a while.

**4**. Remove the SD card and insert it into the new client PI and it will boot with all the contents and configurations of the pre-existing system.

**5**. Configure SCP transfer by following step 10 above

**6**. Modify the transmission automation

Type: sudo crontab -e

Modify the following line to be compliant to the note below:

05 00 \* \* \* /usr/bin/python3 /home/pi/Desktop/Main\_Transmit.py >> /home/pi/Desktop/Transmit.log 2>&1

Note: the “05” should be different for every client. In this case this transmits at 00:05, space clients at least 30 minutes apart to prevent file reception errors. So the next client would start with “35 00 \* \* \*” and so on

Do ctrl+s and then ctrl+x

**7**. If this is a new client being added to a setup with a pre-existing server run the following commands on the server:

Type: ssh-copy-id pi@IP (put the new client ip under “IP” (found by mousing over wifi symbol in to right or typing: hostname -I in the terminal ))

Type: sudo cp -r /home/pi/.ssh /root

**8**. Be sure to configure the settings properly in the program (namely machine name).

**Client Hardware Setup**

**1**. Follow [this](https://www.youtube.com/watch?v=lAbpDRy-gc0) tutorial on hooking up the camera to a PI

**2.** Attach heatsinks and mount the PI in the case. Note: place two m3x30 screws in the bottom cross shaped holes of the case before mounting as the pi mounting will prohibit you from placing them. These are the screws that attach the pi to the middle of the camera mount.

**3**. Replicate the wiring shown [here](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/Wiring%20Diagram.png) and fan/relay mounting show [here](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/Relay%20and%20Fan%20Mounting.jpg) (use BOM materials: 4xM3 nuts, 4x M3x12mm screws, and 2xRelay Spacers)(see the note at the end of step 3 for using other machine terminals)

**4**. Replicate the machine I/O configuration specified below, an example as seen [here](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/Machine%20IO%20Config.jpg)

The machine I/O panel should have the following entries

-X20.0 ON CYCL STP CAMERA

-Y20.5 ON EJECT COMPLETE

-Y20.7 ON CLAMP FULL OPEN

Note: other Sets of Terminals on the machine can be fond in the operators manual 216 or [here](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/Wiring%20Terminals.png)

**5.** Mount the camera and pi in accordance to the [CAD model](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/CAD/Camera%20Mounting%20v16.stl) in the documentation. The “Camera Mount” from the BOM attaches to the tapped hole on the end of the aluminum bar. Additionally be sure to take advantage of the cable management loops on the base.

**6**. Mount the system and display as seen in the [attached images](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/TouchScreen%20Mounting.jpg) using items from the [BOM](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/BOM.xlsx) (Client Section, namely: Display Mount)

**7**. Connect the display and client power supply to mains power. I highly recommend doing so sort of cable routing to keep the data and power lines out of the way of the doors and other pinch points. See an example [here](https://github.com/cameroncircowestfalltechnik/Image_Compare/blob/main/Documentation/Wire%20Routing.jpg).

**8**. Connect the display via USB and the micro HDMI to HDMI cables

**Server Software Setup**

**-Option 1 (Fresh Install)**

**1.** If the sd card has Raspbian pre-installed skip to step 2B (The BOM listing should facilitate this route). If imaging a blank SD card manually go to 2A.

**2A.** Follow the [Tutorial Here](https://www.raspberrypi.com/documentation/computers/getting-started.html#using-raspberry-pi-imager) on how to install an image

Under the gear icon set the following:

-Enable ssh with password authentication

-Username: pi and password: pi

-Configure the wifi password

-Enable locale settings and set to the correct locale

Click save then write, click yes, it will then ask for admin access to write to the drive. wait for the writing to finish and insert the micro sd card into the PI and connect keyboard, mouse, power supply, and display.

Boot the pi and open the menu by clicking the upper left icon. Under preferences open raspberry pi configuration.

-Under display disable screen blanking

-Under interfaces double check that ssh is enabled

-Under localization double check for the correct time zone and keyboard

There is no need to reboot, we will do that at the end

**2B.** Boot to the Pi with a keyboard, mouse, power supply, and display attached

In the setup tool do the following:

-set the correct country, language, and timezone. Enable the U.S. keyboard

-set the username and password as pi

-connect to the correct Wi-Fi

-update software

-restart

Boot the pi and open the menu by clicking the upper left icon. Under preferences open raspberry pi configuration.

-Under display disable screen blanking

-Under interfaces double check that ssh is enabled

-Under localization double check for the correct time zone and keyboard

**3**. On a PC go to the [Github](https://github.com/cameroncircowestfalltechnik/Image_Compare) and click code then “Download zip”. Save the content of the zip file to the usb stick. Remove the USB stick and plug it into a usb port on the pi.

**4**. From the usb stick copy the script Main\_Recieve.py to the desktop and the folders “archive” and “receive” to the desktop. Go into archive and under each day of the week there should be a placeholder file, delete all of these, they allow the folders to be structured properly in github, but are no longer needed.

**5**. Install all the necessary libraries by entering the following commands in a terminal (open a terminal with: ctrl+alt+t):

-Subprocess: pip install subprocess.run

**6**. Setup task scheduling by typing “sudo crontab -e” in the terminal (select editor 1 by typing 1 then pressing enter) and adding the lines:

00 00 \* \* \* /sbin/shutdown -r now

@reboot /usr/bin/python3 /home/pi/Desktop/Main\_Recieve.py >> /home/pi/Desktop/log.log 2>&1

Save and exit with ctrl+s then ctrl+x

**7**. Configure SCP transfer by following instructions in a command terminal:

Type: ssh-keygen

Press enter at each prompt

Repeat the Indented steps for every client before proceeding:

Type: ssh-copy-id pi@IP (put the client under “IP” (found by running hostname -I in a client’s terminal)

You may need to press y and then enter

Type yes then enter

Type the client password (“pi”) then enter

Type: sudo chmod 777 /root

Type: sudo cp -r /home/pi/.ssh /root (it may be hard to see but there is a space between “.ssh” and “/root”)

Type: sudo chmod 777 /root/.ssh

**8.** Do the server hardware setup below

**9**. Reboot the system and it should startup automatically. It has no user interface so it will just load to the desktop. You should however see a file called log.log that will indicate the program has at least started up properly

**-Option 2 (Clone a pre-existing system)**

**1**. Get to the desktop of a pre-existing system by plugging in a keyboard, mouse, and display.

**2**. Connect an empty micro sd card to a USB port. Open the image copier by pressing the windows key then opening “SD Card Copier” under “Accessories”. Under “Copy From Device” select the entry with “/dev/mmcblk0” in it, under “Copy To Device” select the attached SD card. It should be the only option remaining.

**3**. Click start and allow it to copy the contents of the pre-existing client to the new card. This should take quite a while.

**4**. Remove the SD card and insert it into the new client PI and it will boot with all the contents and configurations of the pre-existing system.

**5**. Configure SCP transfer by following step 7 from above.

**Server Hardware Setup**

**1**. Attach heatsinks and insert into a case.

**2**. Rename the flash drive to “VISION\_SYS” on a PC. Move “archive” to the root folder of the flash drive and delete everything else. Remove the placeholder files in the folder designated to each day, they allow for the github repo to be structured properly but are now no longer needed. This should make it so the only contents of the usb drive are the archive folder. Insert the flash drive into one of the blue USB 2.0 ports for maximum data transfer speed. This usb drive will store all the archived files from the clients or if the drive is missing or not found at the time of file reception they will be saved to the archive folder on the server desktop.

**3**. Connect to power supply