

Safeguard Solutions

WG-23 Series Retrofit Guide for 3 PoE Port Support

This guide will walk you through step by step how to retro fit a WG-23 series box for adding 3 PoE ports capable of powering up to 3 PoE devices.

You will need the following tools:

- Wire strippers
- 6 inch bit extension
- Diagonal Wire Cutters
- Pliers
- Screwdriver set with changeable bits
- Small Adjustable Wrench
- Left angle or very small screwdriver (Phillips)
- Power drill or impact driver
- Docking station or USB hub (USB-C)
- Keyboard and mouse
- Computer Monitor
- HDMI Cable

Optional but very helpful:

- Network cable wire stripper
- Socket Set
- Telescoping magnetic pickup tool
- Right angle HDMI adapter (both directions)
- Right angle USB-C to Standard USB (if not using USB-C hub)

Parts Needed:

- Four - 1.5 ft Ethernet cables
- 5 port PoE Network Switch – (TP-Link Model: TL-SG1005P is recommended)
- Two 3/8 self drilling / tapping screws for metal

Any questions please email support@safeguardsolutions.org

Visual Tool List

Required:

Wire Strippers



6 inch Bit
Extender



Adj. Wrench



Diagonal Wire
Cutters



Pliers



Right Angle
Screwdriver



Screwdriver and
Socket Set



Keyboard and Mouse



USB-C Hub



Power Drill



Visual Tool List – Continued

Optional:

Right Angle
USB-C



Right Angle
HDMI



Network Wire
Strippers



Magnetic
Pickup Tool



Visual Part List

5 Port PoE Ethernet
Switch



1.5 Ft Ethernet Cable



3/8 Inch Self
Drilling Screws



Parts List Cost and Links Where to Buy

Part	Type	Qty Needed	Low Cost	High Cost	Purchasable From	Option 1	Option 2
1.5ft ethernet cable (pack of 10)	Network Cables	4	\$17.50	\$23.75	Cables.com, amazon.com	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=IGEMNASKHD	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=CVCHJKDJDJH
TP-Link TL-SF1005P	Network Switch	1	\$35.99	\$39.99	amazon.com, newegg.com	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=KLAJDHJXUDS	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=KXOEYASHJSS
3/8 Inch Self Tapping Screws (2)	Screws	2	\$1.00	\$4.00	homedepot, lowes, menards, ace		
Total			\$54.49	\$67.74			

Required Tools Cost and Links Where to Buy

Type	Qty Needed	Cost	Purchasable From	Part Link
Wire Strippers	1	\$7.99	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=KJDGDJDGD
Adjustable Wrench	1	\$6.99	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=LJXNSISHEH
Diagonal Cutters	1	\$14.00	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=LKSBAGHDJ
Pliers	1	\$6.00	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=KNXGEDIGDJ
Right Angle Screw Driver	1	\$9.99	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=MBSXGSJDGD
Screwdriver Socket Set	1	\$23.99	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=OIAHJSEHAS
USBC Hub	1	\$15.99	Amazon, Newegg, Bestbuy, target	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=MNDVAUJEJD
Extender Bits	1	\$9.99	Hardware store, amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=PAEJASKANH
Total		\$94.94		

Optional Tools Cost and Links Where to Buy

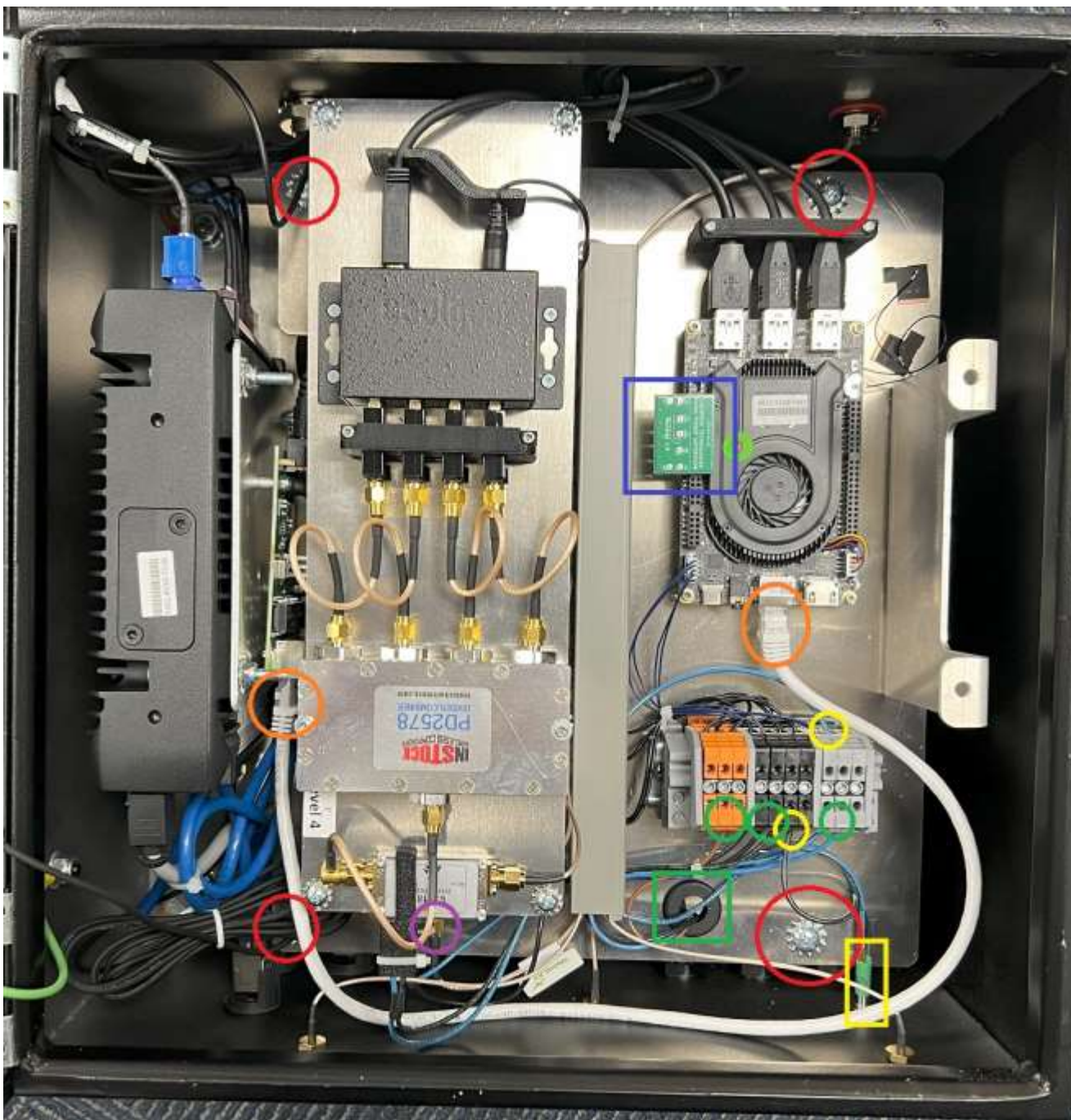
Item	Qty Needed	Cost	Purchasable From	Part Link
Right Angle HDMI	1	\$5.99	amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=MSVAJDUEH
Right Angle USBC	1	\$9.99	amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=UIEHAKSDGH
Network Wire Strippers	1	\$5.99	amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=TWEJANDSGD
Magnetic Tool	1	\$9.99	amazon	https://sales.safeguardsolutions.org/cgi-bin/redirect.cgi?link=IEUAHSDHSSF
Total		\$31.96		



1. Remove the two screws and nuts underneath circled in red.



2. Remove the two nuts using an adjustable wrench circled in red. The metal plate marked in yellow should slide out. Place this to the side.



1. Remove the 4 screws in marked in red.
2. Remove the computer chip marked in blue. It pulls straight up. This can be thrown away.
3. The yellow box outlining the status light has 2 wires coming from it. Trace the 2 wires and unscrew the terminal screws marked by the yellow circles.
4. Unscrew the nut attached to the status light and remove the light. Place to the side.
5. The green box has 3 wires coming up from below. Trace those 3 wires and unscrew the terminal screws marked by the green circles.
6. Using an adjustable wrench, unscrew the SMA connector marked in purple.
7. Disconnect the ethernet cable from the computer to the network switch marked by the orange circles.

For a video guide of the terminal bar, follow this link:
https://support.safeguardsolutions.org/remove_wires.html



1. Unscrew the nuts attached to the 3 SMA connectors circled in red. Place the 3 nuts and 3 washers to the side.
2. Push the SMA connectors through the box so the holes are empty.



1. The metal plate outlined by the purple box should now be completely disconnected. This plate can be lifted out and placed to the side. You will have to untuck the wires circled in red at the top of the box. The wires feeding in from below should slide through the plate as well.
2. Place this to the side.



1. Remove the plastic cover outlined by the red box. Place to the side.
2. Disconnect all ethernet cables and remove them from the box.



1. Using a small or right-angle screwdriver, remove the plate marked by the yellow box.
2. Remove the sim card behind this plate and discard.
3. Insert your new sim card in the left slot. If you have a backup sim card, this is inserted into the slot on the right.



1. Record or take a picture of the default password outlined by the red box.

This step is very important at this stage as it is very difficult to read the password once the box is fully assembled.



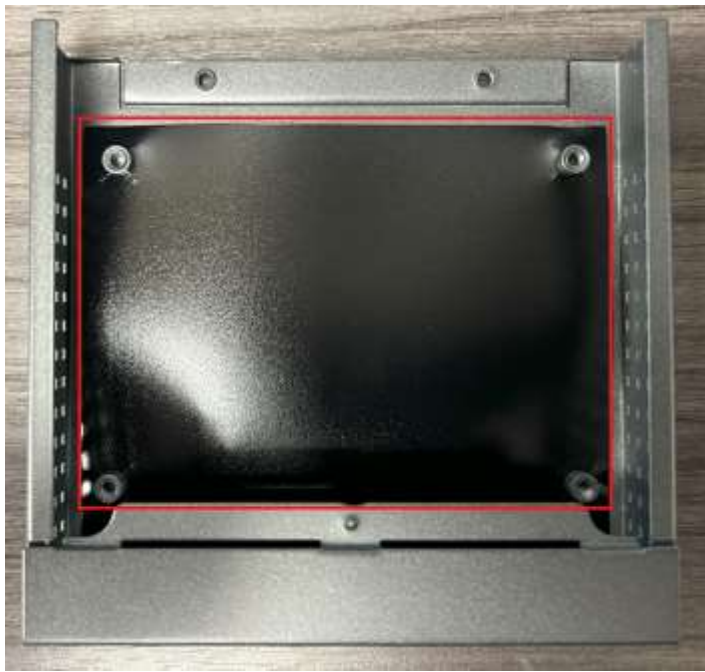
PoE Network Switch Prep (TL-SG1005p)

1. Unscrew and remove the two screws circled in red.
2. The top plate should slide off now. Place to the side.

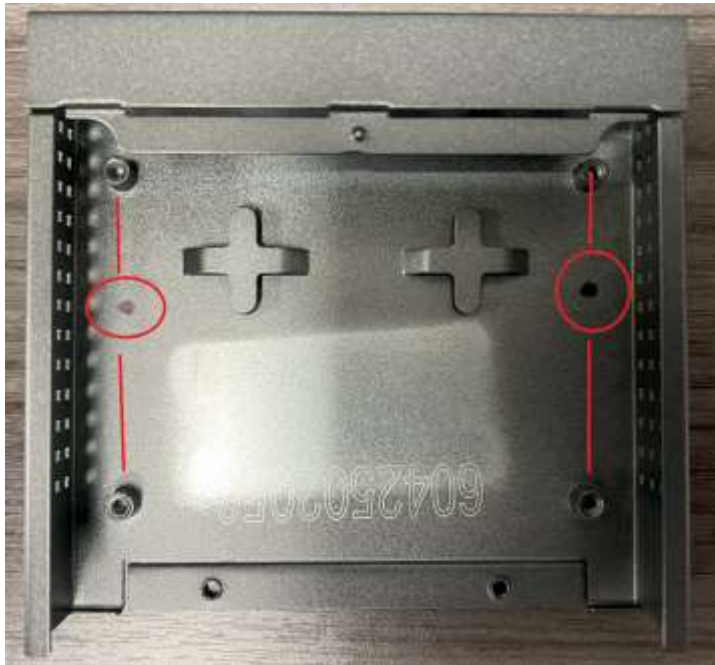
Please note these steps may be slightly different if you are using a different model switch. The screws may be in a different position, but the process should be similar for all switches.



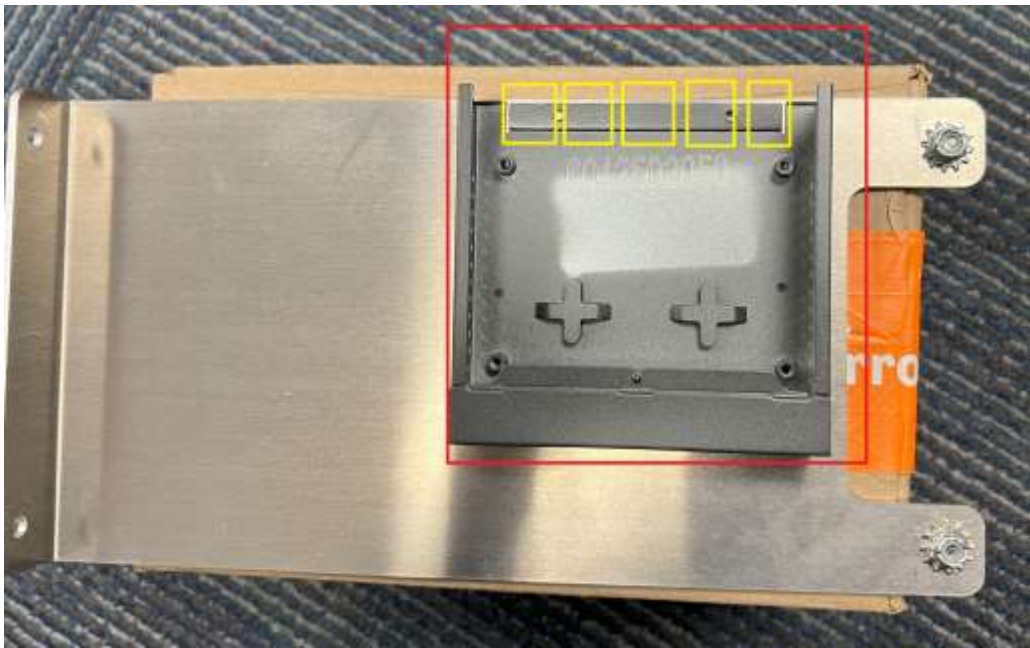
1. Remove the screws circled in red. They may be in different locations depending on the network switch model.
2. Remove the circuit board and place to the side.



1. Remove the black piece of protective plastic. Place this to the side.



1. Using a black sharpie, create two marks in line with the screw poles at roughly the same location on each side.



1. Aline the base plate of the switch on the metal plate from step 1.
2. Ensure the positioning of the network base plate is aligned exactly like the picture to the left.
3. If you are using a different switch, the goal is to have the network ports coming out the top (outlined by the yellow boxes).



1. Place the metal base plate and network switch base plate on a cardboard box.
2. Using two self tapping sheet metal screws, drill through the network base plate switch where you marked with sharpie before to attach the network switch to the metal base plate.



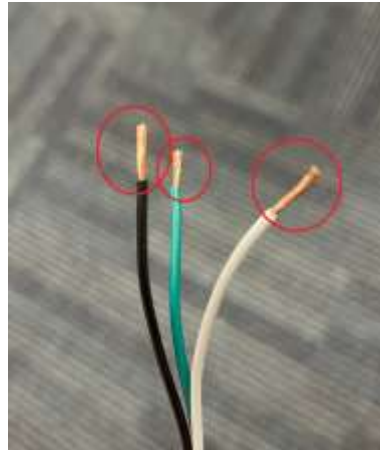
1. Replace the black plastic cover.



1. Reinsert the network switch.
2. Attach the network switch to the network switch baseplate with 4 screws.

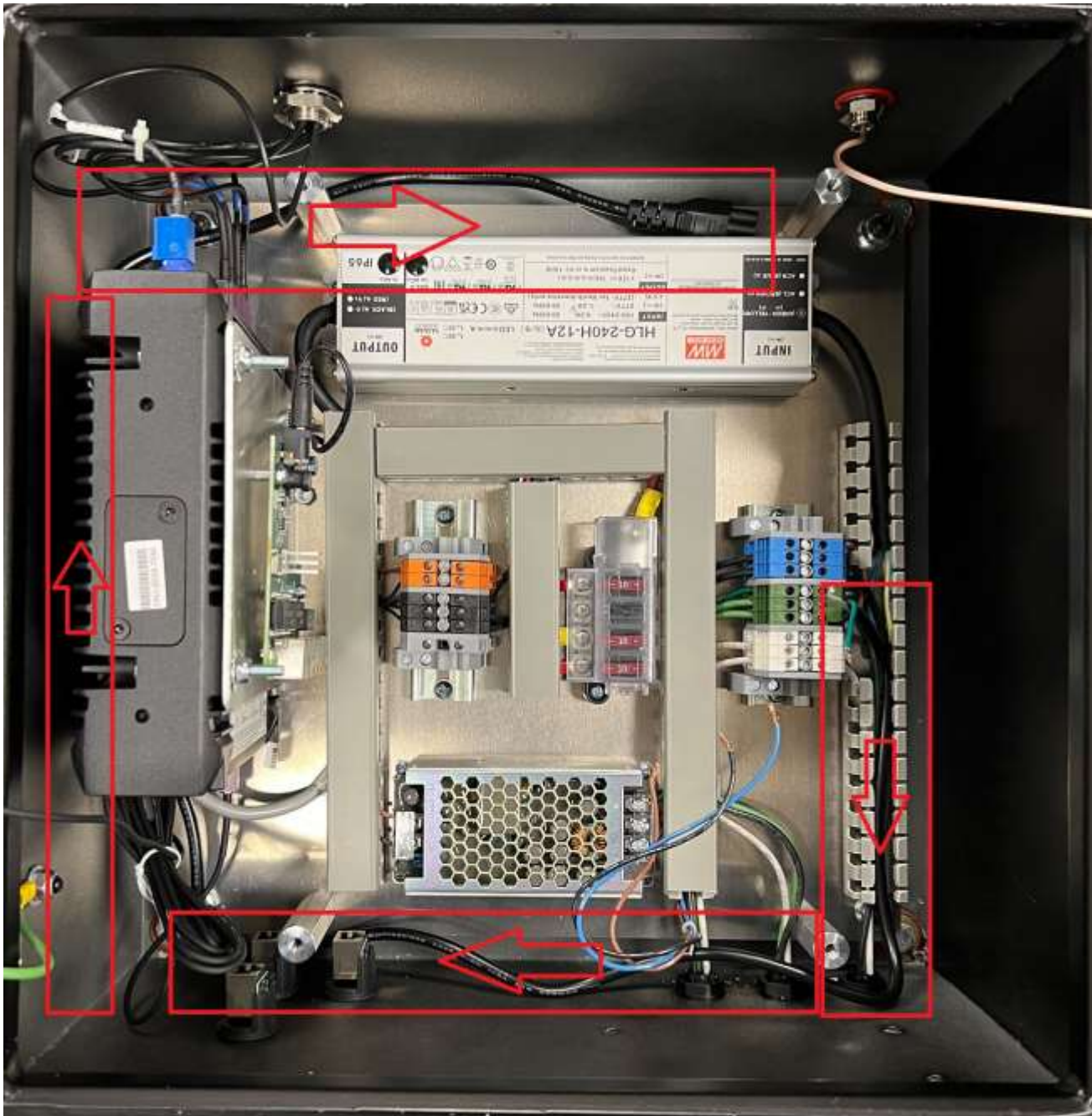


1. Using a pair of diagonal wire cutters or wire strippers, cut the network switch power cable approximately 8 inches from the side that plugs into the wall.



1. Strip the wire approximately 3 inches from the end of the cut wire using a network wire strippers or utility knife.
2. Bending the wire back and forth after cutting / scoring the black wire makes removing this piece more easily.
3. Strip the wires using a pair of wire strippers to approximately 1 centimeter as shown.

For a video guide of splicing the wires, follow this link:
https://support.safeguardsolutions.org/splice_network_wires.html

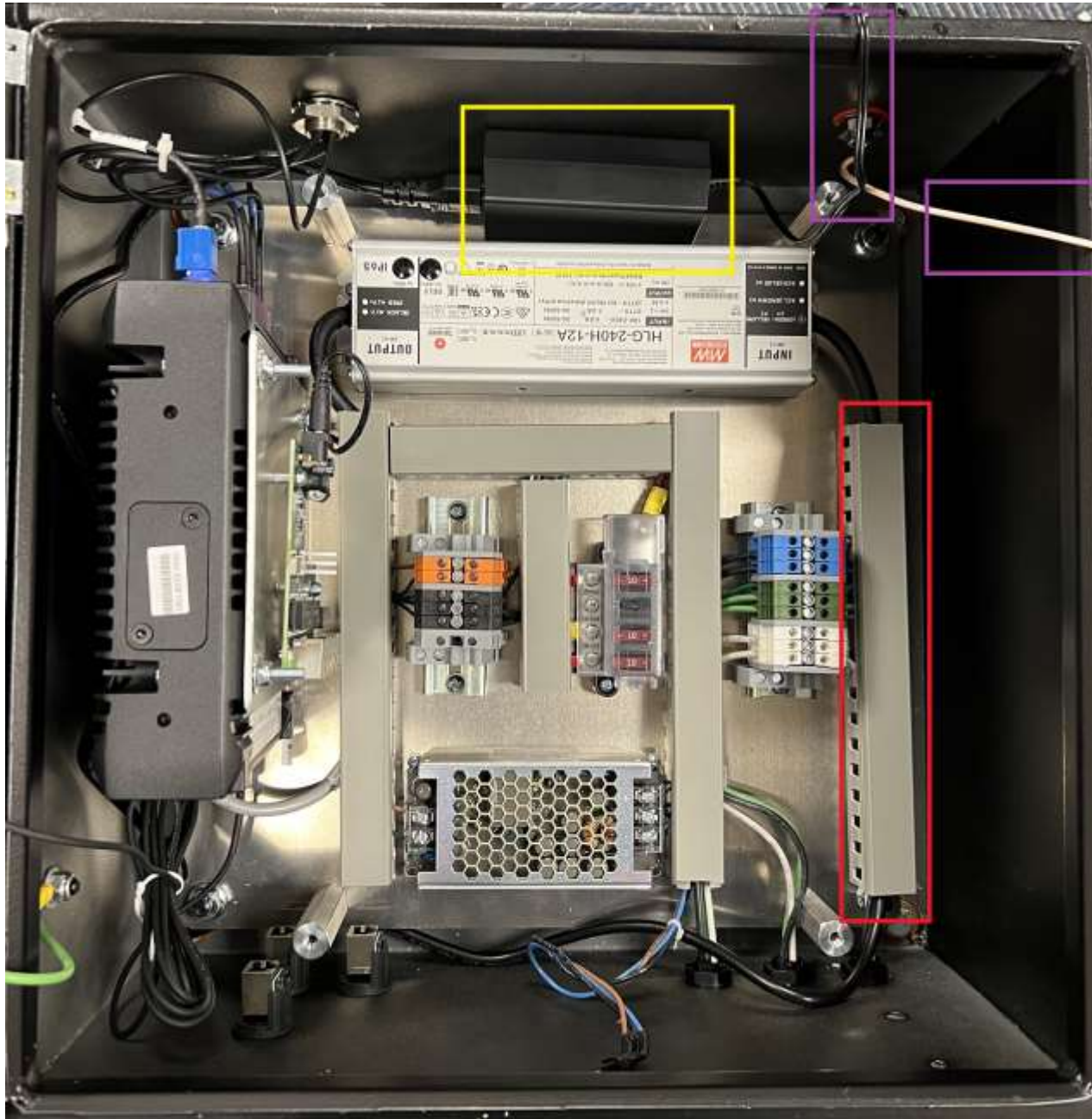


1. Place the power cord in the box as shown.
2. Position the end that was just cut on the right side of the box in the channel with the removed plastic top.
3. Snake the rest of the cable around the box, ending with the power connector just above power supply at the top of the box.

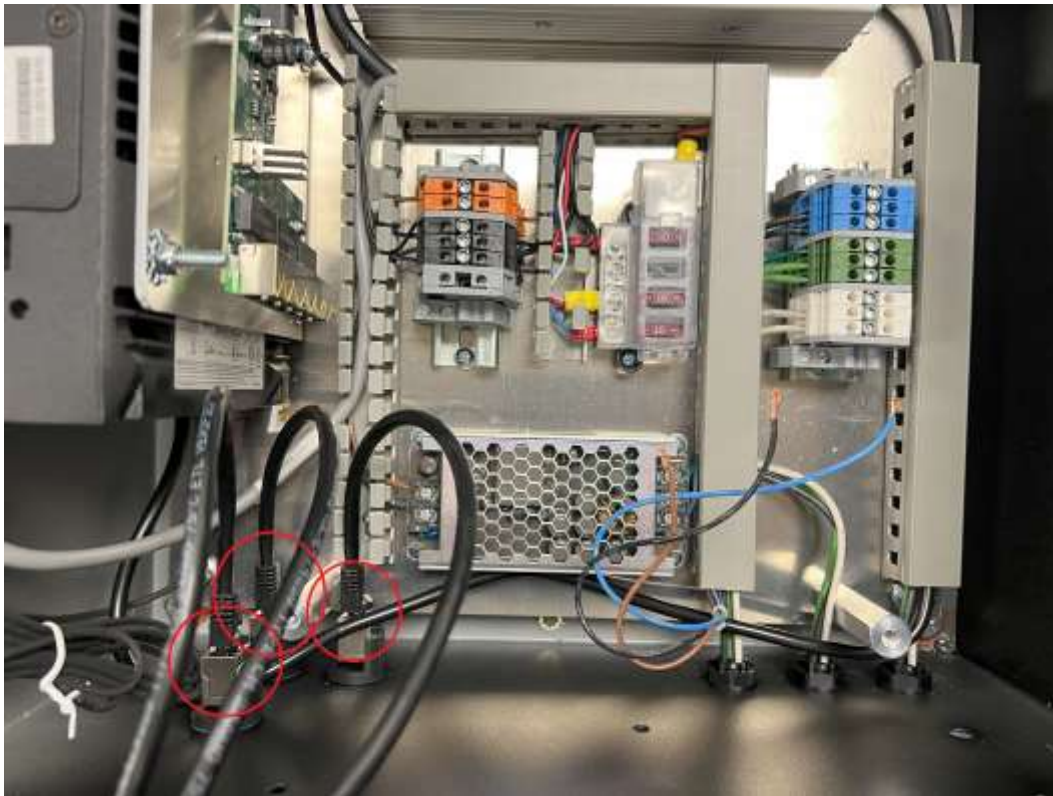


1. Insert the green ground wire into the open ground slot shown by the red circle. Note that no copper wire should be showing.
2. Screw down the terminal circled in yellow while holding the green ground wire in place.
3. Do not over tighten but ensure the wire is snug. Gently pull on the wire to ensure it is secure.
4. Repeat for the white wire into the white terminal.
5. Repeat for the black wire into the blue terminal.

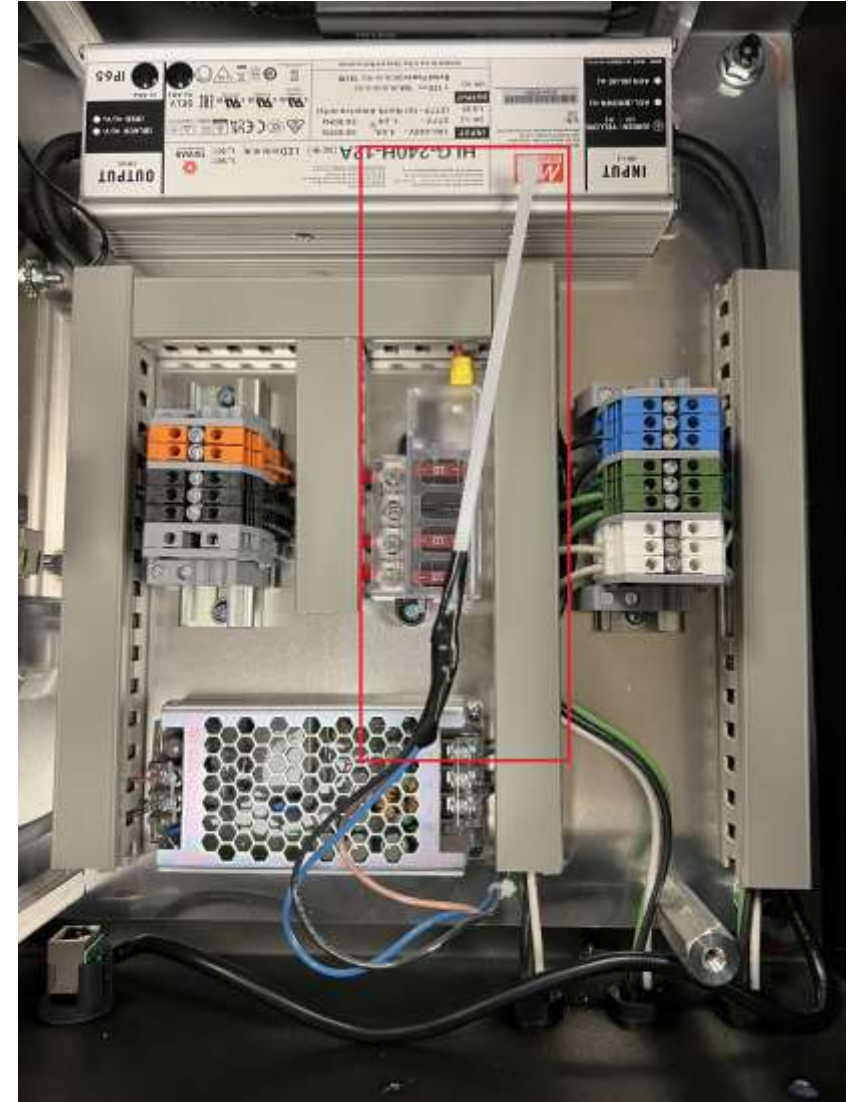
For a video guide of attaching the wires, follow this link:
https://support.safeguardsolutions.org/network_wires.html



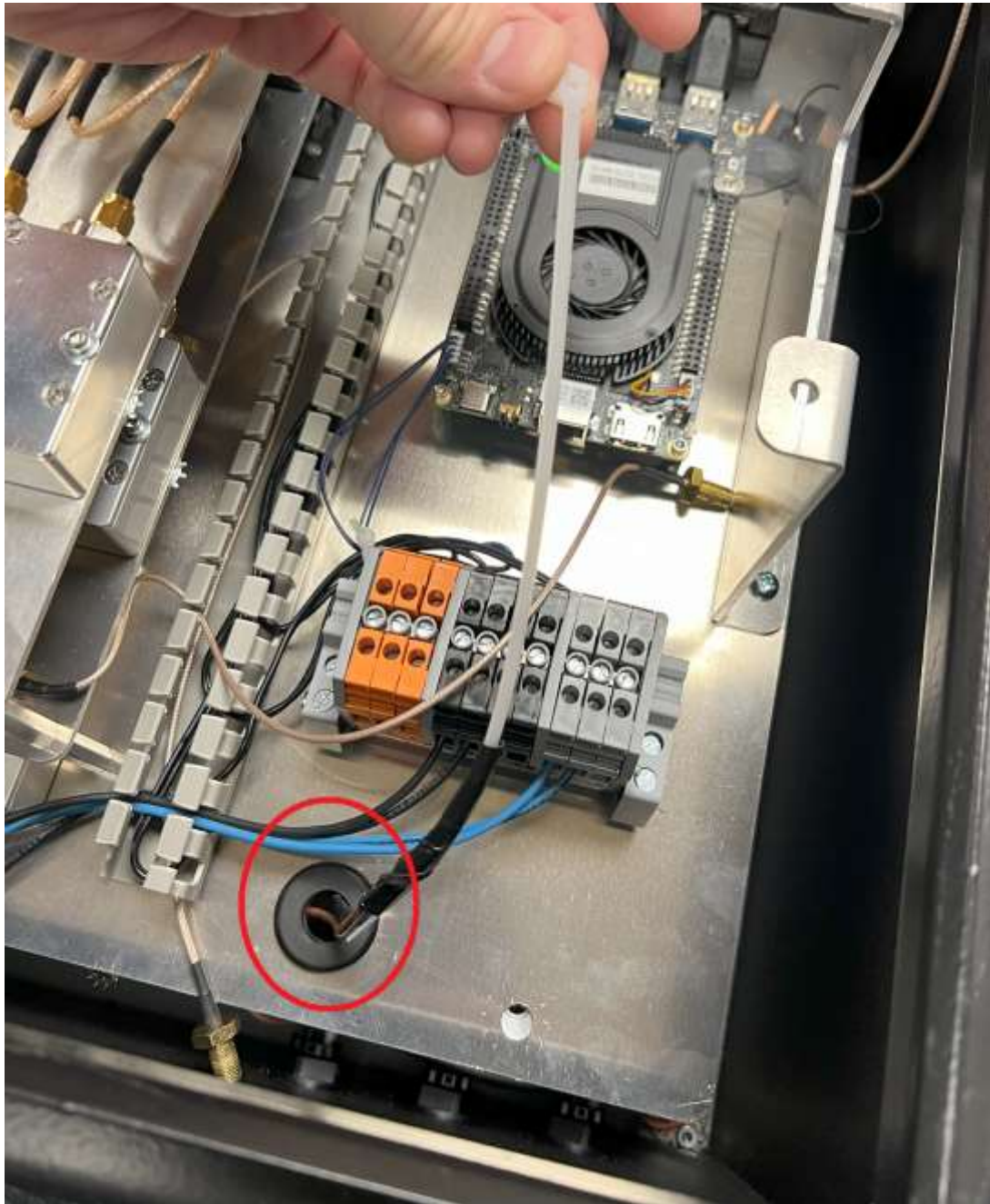
1. Press the wires into the gray plastic enclosure and replace the plastic sleeve on top of the connections shown by the red box.
2. Connect the power pack / transformer from the network switch shown by the yellow box.
3. Hang both the power cord and SMA cable from the antenna over the side of the box shown by the purple wires.



1. Attach 3 network cables to the ports circled in red.
2. It is recommended to upgrade to 1.5 ft ethernet cables in order to reach the new POE network switch.



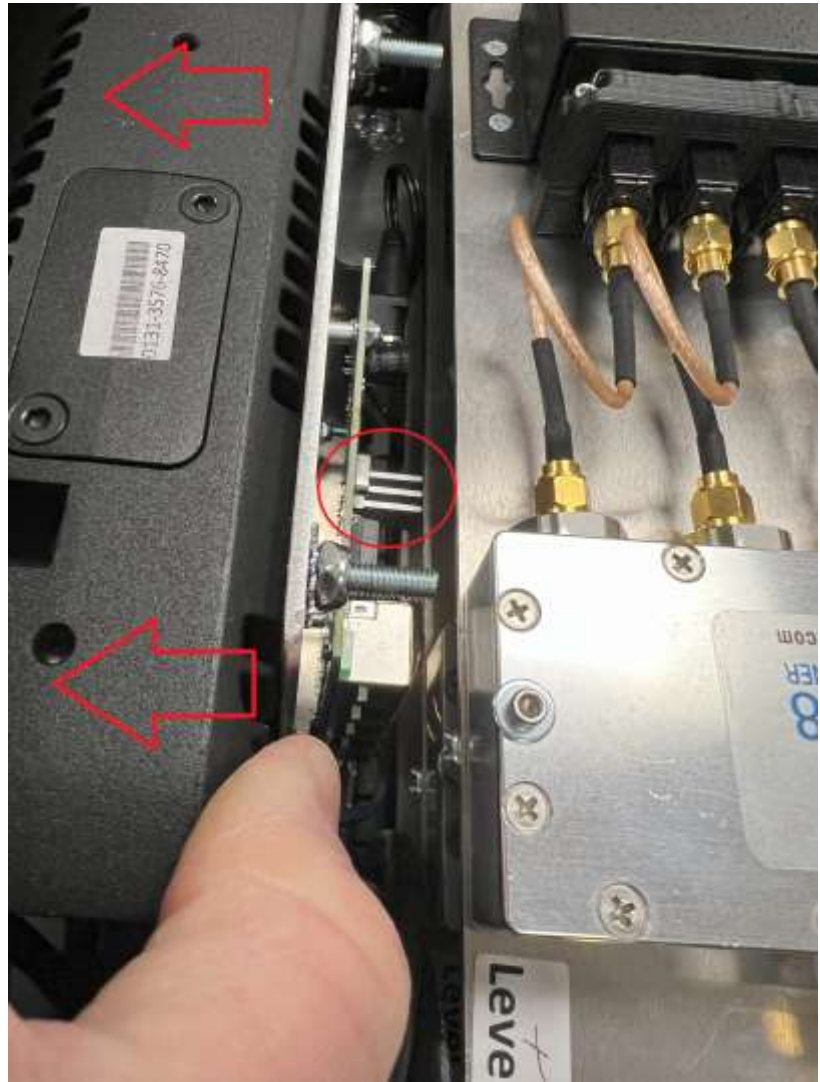
1. Using electrical tape or masking tape, connect a zip tie or other flexible item to the three wires to form a fish line.
2. This step is optional but greatly reduces the difficulty of the next step.



1. Replace the main board that was removed on page 2.
2. Fish the zip tie through the hole circled in red.



1. Reattach the 4 screws circled in red.
2. As you are reattaching the screws, put slight pressure on the router as shown below to ensure the heatsink circled in red does not snap off.



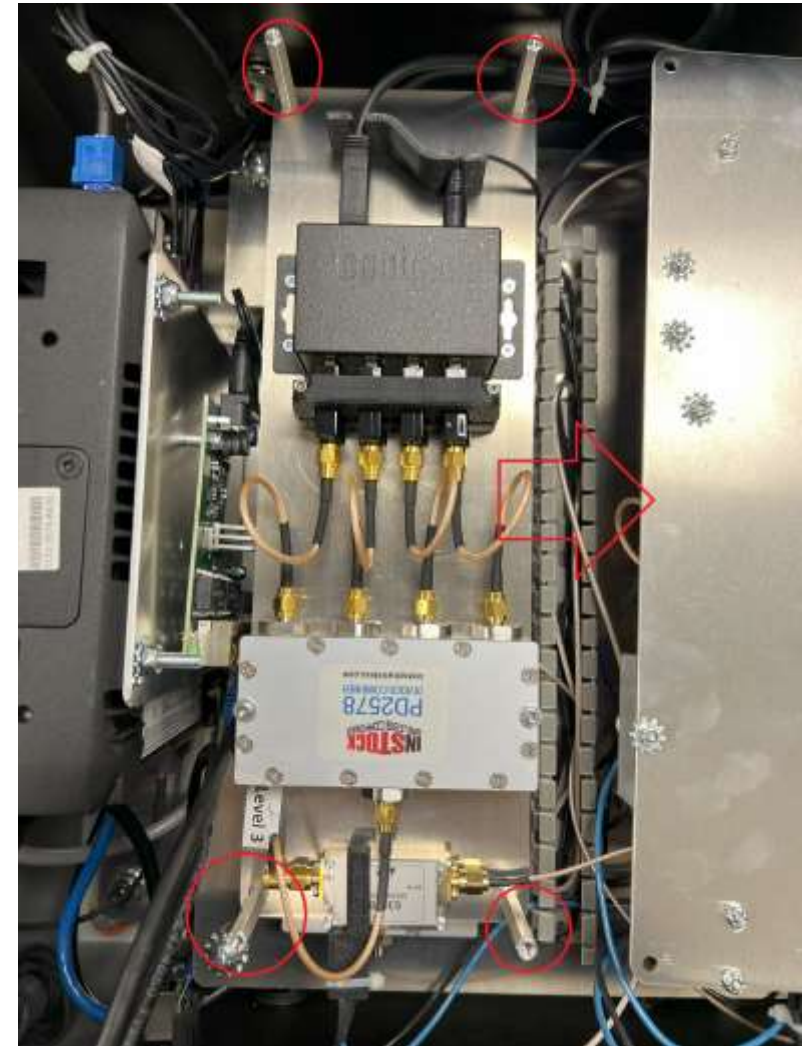


- Note: You may need to unscrew the terminal screws further to allow room to insert the wires into the slots.

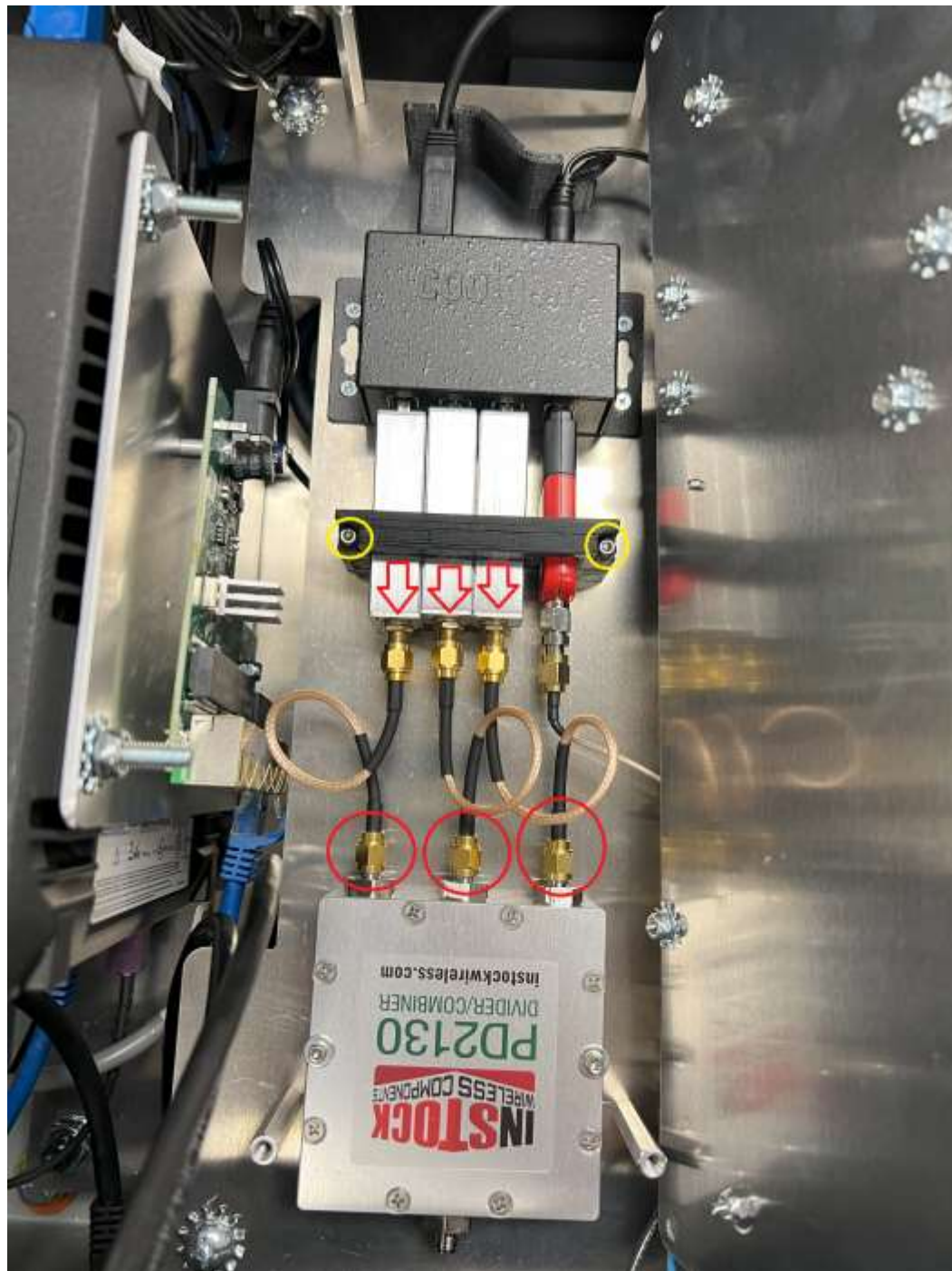
For a video guide of attaching the wires, follow this link:
https://support.safeguardsolutions.org/reattach_wires.html



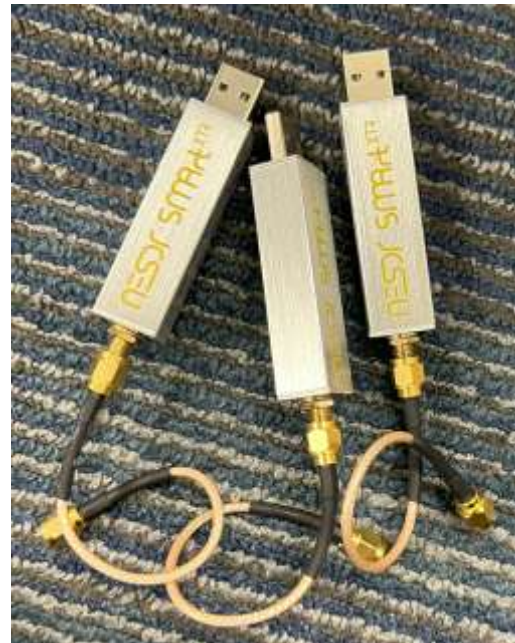
1. Unscrew the 4 screws circled in red. Set aside.
2. Carefully flip the board to the right upside down.



1. Unscrew the 4 posts circled in red. Set aside.
2. Carefully flip the board to the right upside down.



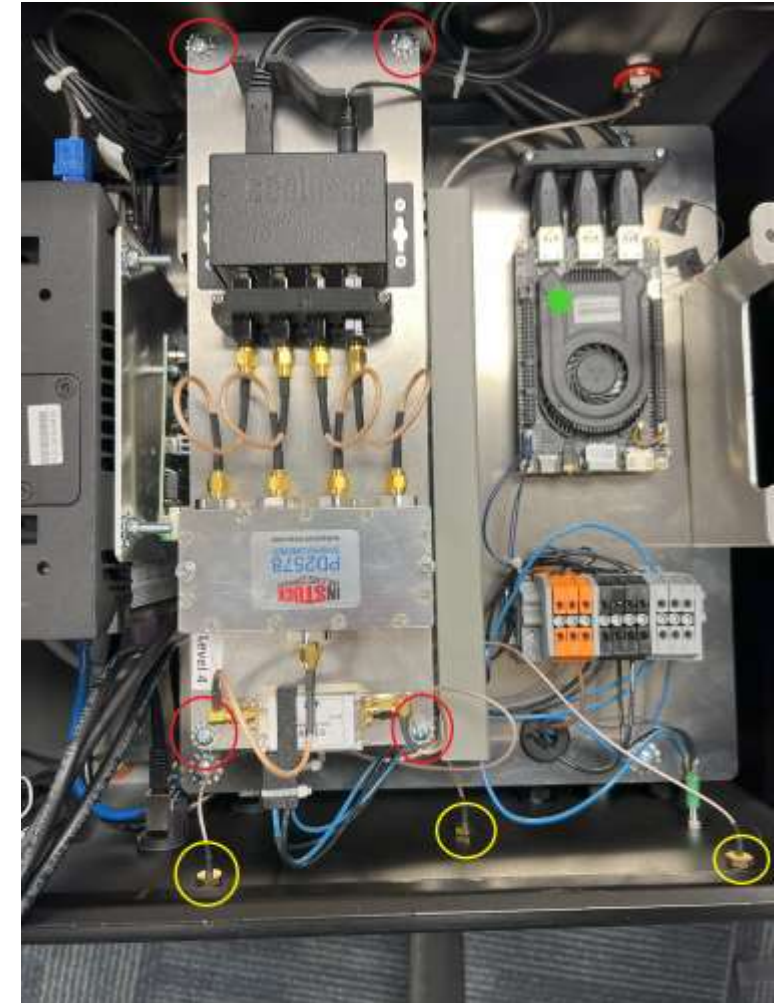
1. Using an adjustable wrench unscrew the three SMA connectors circled in red as shown.
2. Using a pair of pliers or your hands carefully pull down on the IMSI silver USB dongles. They should slide right out. If they do not you can loosen the two screws circled in yellow.
3. These are not needed and can be set aside.

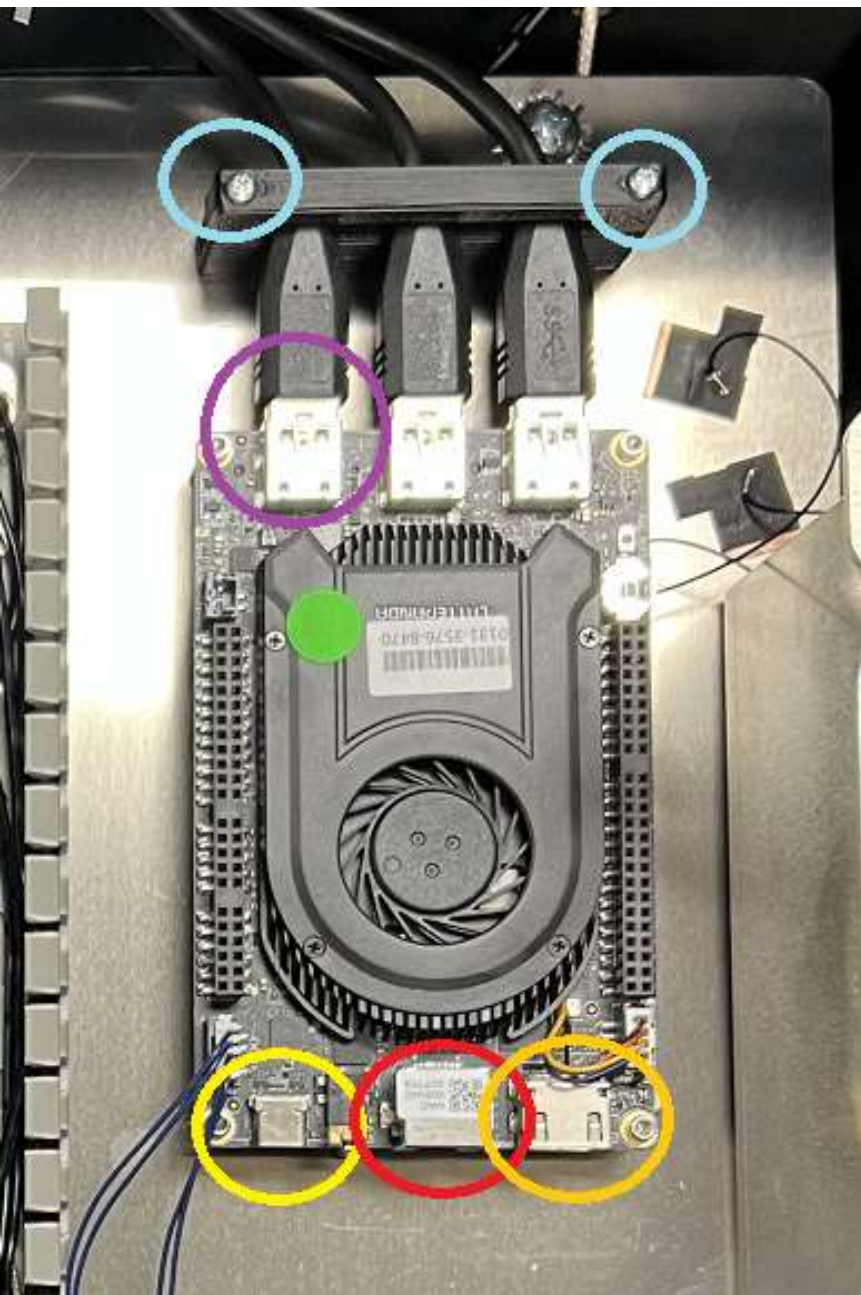




1. Flip the board on the right back on.
2. Reattach the 4 posts circled in red.

1. Flip the last board on the right back on top of the four posts.
2. Reattach the 4 screws circled in red.
3. Insert the 3 SMA connectors through the ports circled in yellow. Note that one side of the SMA connector is slightly flat. You may have to twist it until it inserts.





Software Installation

1. At this stage, the Ubuntu 24.04 operating system can be installed onto the computer.
2. Connect an HDMI cable to a monitor to the port circled in orange.
3. Connect an ethernet cable from an active router or network switch with internet to the port circled in red.
4. Connect a hub to the USB-C port circled in yellow with both a keyboard and mouse.

Alternatively, you can unscrew the 2 screws circled in blue and utilize the standard USB ports at the top to connect a keyboard and mouse. Be sure to replace/reconnect the USB cables and screws after installation.

5. Connect a bootable USB drive loaded with Ubuntu 24.04 (see next slide for instructions).

Tip: Use a 90 degree angle USB-C adapter and a 90 degree HDMI adapter to make the connections more accessible.

Create Ubuntu Bootable USB Drive

1. Download Ubuntu 24.04 ISO

- Go to the official Ubuntu download page and download the Ubuntu 24.04 ISO file.

2. Prepare a USB Drive

- You'll need a USB drive with at least 4 GB of storage (8 GB or more is recommended for a smoother experience).

3. Create a Bootable USB

- You can create a bootable USB drive on either a Linux, Windows, or macOS system. Here are methods for each:
 - **On Windows:**
 - **Use Rufus:**
 - Download and install Rufus.
 - Open Rufus and select the Ubuntu 24.04 ISO you downloaded.
 - Choose your USB drive.
 - Leave other settings as default, but make sure the partition scheme is set to MBR (for BIOS/legacy boot) or GPT (for UEFI).
 - Click Start to create the bootable USB.
 - **On macOS:**
 - **Use Etcher:**
 - Download and install Etcher.
 - Open Etcher and select the Ubuntu 24.04 ISO.
 - Choose your USB drive and click Flash to create the bootable drive.
 - **On Linux:**
 - **Use Make Bootable USB Stick:**
 - Right click on the Ubuntu 24.04 ISO.
 - Select “Make Bootable USB Stick”.
 - Select the USB stick from the drop down.
 - Click “Write”.

Installing Ubuntu 24.04

Steps to Boot from the USB Drive and Install Ubuntu

1. Plug in the Bootable USB Drive

Insert the bootable USB drive into the computer or USB hub.

2. Access the BIOS/UEFI

Restart the computer. Enter the BIOS/UEFI settings by pressing a specific key during boot (typically Del or F2). The key varies by manufacturer, so check the screen during boot or consult the manual.

3. Change Boot Order (If Necessary)

In the BIOS/UEFI, find the Boot Order settings.

Set the USB drive as the first boot device. This will ensure the computer boots from the USB drive instead of the hard drive.

4. Save Changes and Restart

Save the changes and exit the BIOS/UEFI.

The system will reboot, and it should boot from the USB drive, showing the Ubuntu installation menu.

Installing Ubuntu 24.04 - Continued

Begin Installing Ubuntu 24.04

1. Choose the Installation Type

After booting from the USB drive, you'll see the Ubuntu installation menu. Select Install Ubuntu.

2. Choose Language

Select the English language and click Continue.

3. Keyboard Layout

Choose your keyboard layout and click Continue.

4. Prepare Installation Disk

You will be asked how to install Ubuntu: Erase disk and install Ubuntu.

5. Select the Disk/Partition for Installation

Make sure you select the correct drive and not the current USB.

6. Timezone & User Setup

Choose your timezone.

Create a user account with the following username and password:

- Username: guard
- Password: safeguard

7. Installation Progress

The installer will copy files and install Ubuntu. This process can take some time, depending on the speed of the USB drive.

Installing Ubuntu 24.04 – VPN Installation

1. Reboot After Installation

Once the installation is complete, the system will ask you to restart.
It will prompt you to remove the USB drive and then press enter.

2. Boot into Ubuntu 24.04

After rebooting, you should be able to boot into Ubuntu 24.04 on the system.

3. Log into Ubuntu 24.04

- After login, open a terminal and run the following commands:
- `sudo apt update`
- `sudo apt upgrade`
- `sudo apt-get install openssh-server openvpn`
- `echo 'AUTOSTART="all" | sudo tee -a /etc/default/openvpn > /dev/null`

4. Install the VPN

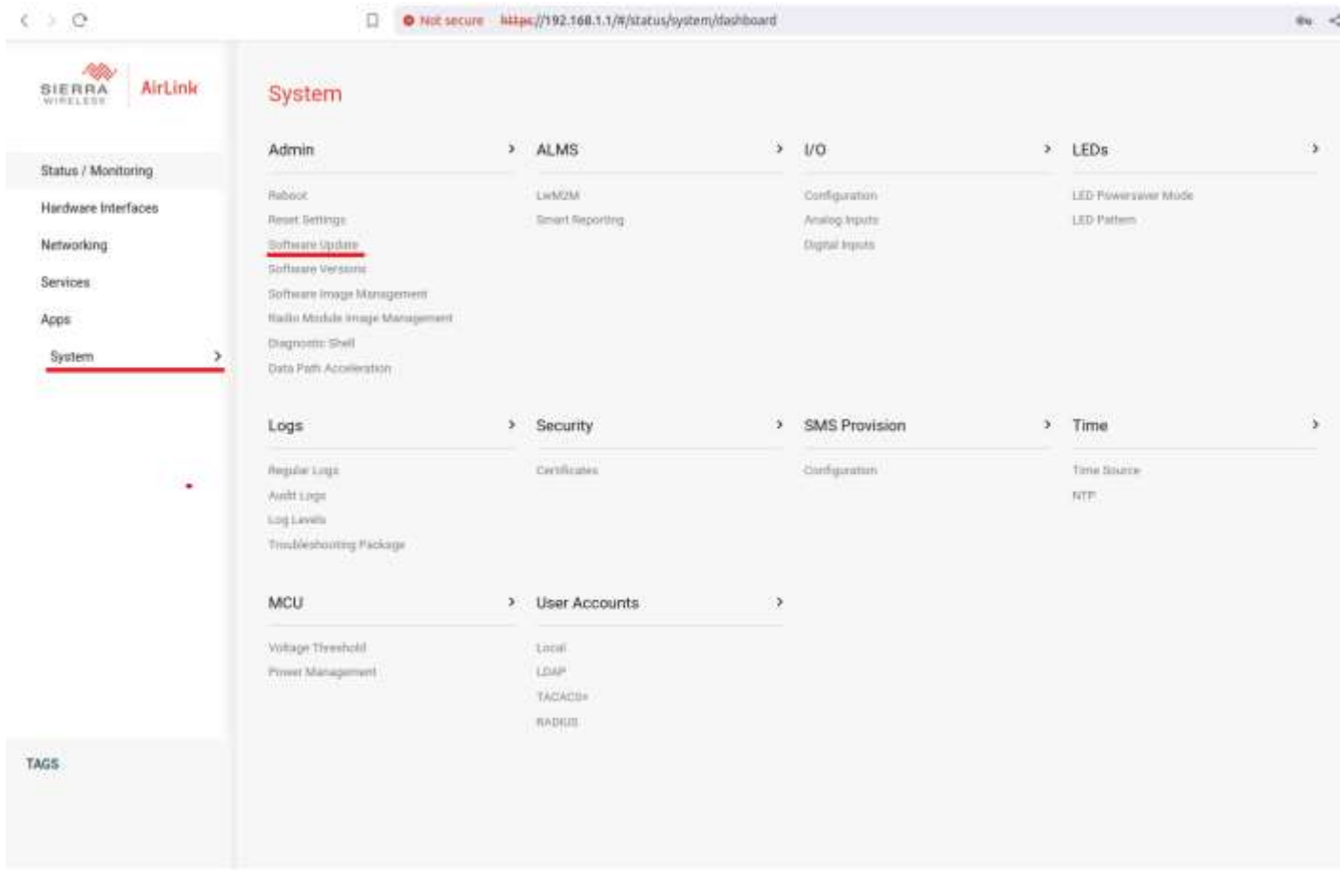
- Place the provided VPN (ie `safeguard.conf`) at: `"/etc/openvpn/safeguard.conf"`
- Please note that every box will require a unique VPN configuration file. You cannot use the same VPN config for multiple boxes. If you need additional VPN configs, please request them from support@safeguardsolutions.org. Be sure to include the location of where the box will be deployed.
- **Please note this is a critical step in the installation process, if you have questions, please reach out to us at support@safeguardsolutions.org**

5. Reboot the machine to enable the VPN

Router Reset

1. Ensure that the power cable is connected to the port circled in red.
2. Power up the router.
3. Wait approximately 45-60 seconds.
4. Using a paperclip, press the reset button and hold it for approximately 10-15 seconds.
5. You should see the lights go off and turn red. After a moment they will start blinking green. After a few seconds they will start blinking red.
6. The router is now reset and you can release the button.
7. Connect an ethernet cable (marked by the blue box) to your computer.
8. Open an internet browser and navigate to 192.168.1.1. If the page does not load – repeat steps 3 through 6.
9. It may warn you about a security risk – ignore this and proceed to the router configuration website.
10. Type in 'admin' for the username.
11. Type in the password you recorded from page 5 and hit sign in.

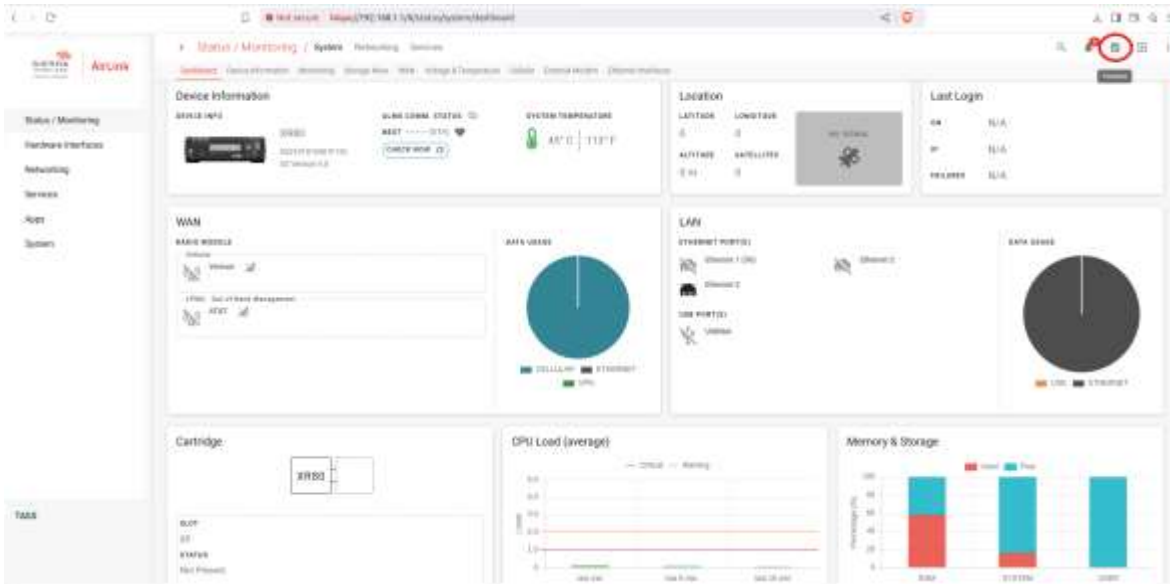
Router Reset - Continued



1. Navigate to the 'System' menu.
2. Select 'Software Update'.
3. Download the updated firmware for the router at: <https://support.safeguardsolutions.org/XR80-5.0.86.ufw>
4. Navigate to the downloaded file: "XR80-5.0.86.ufw".
5. It should start updating immediately.

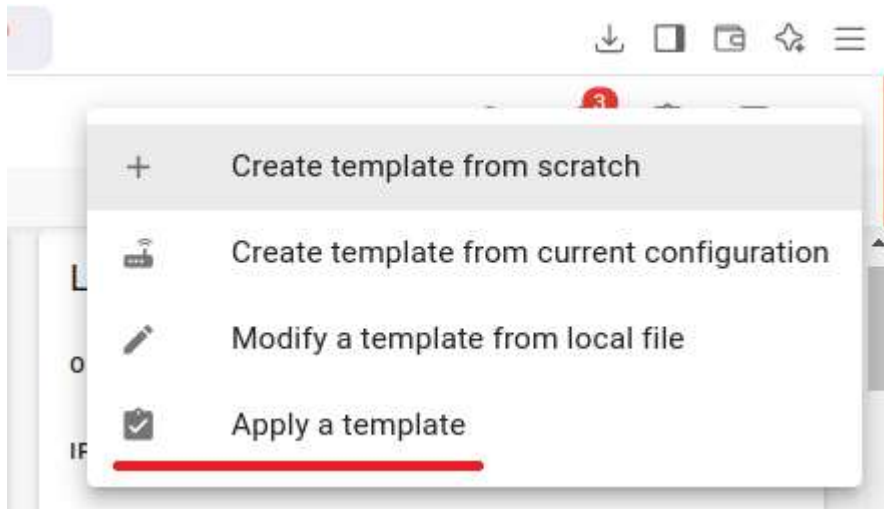
Router Reset - Continued

1



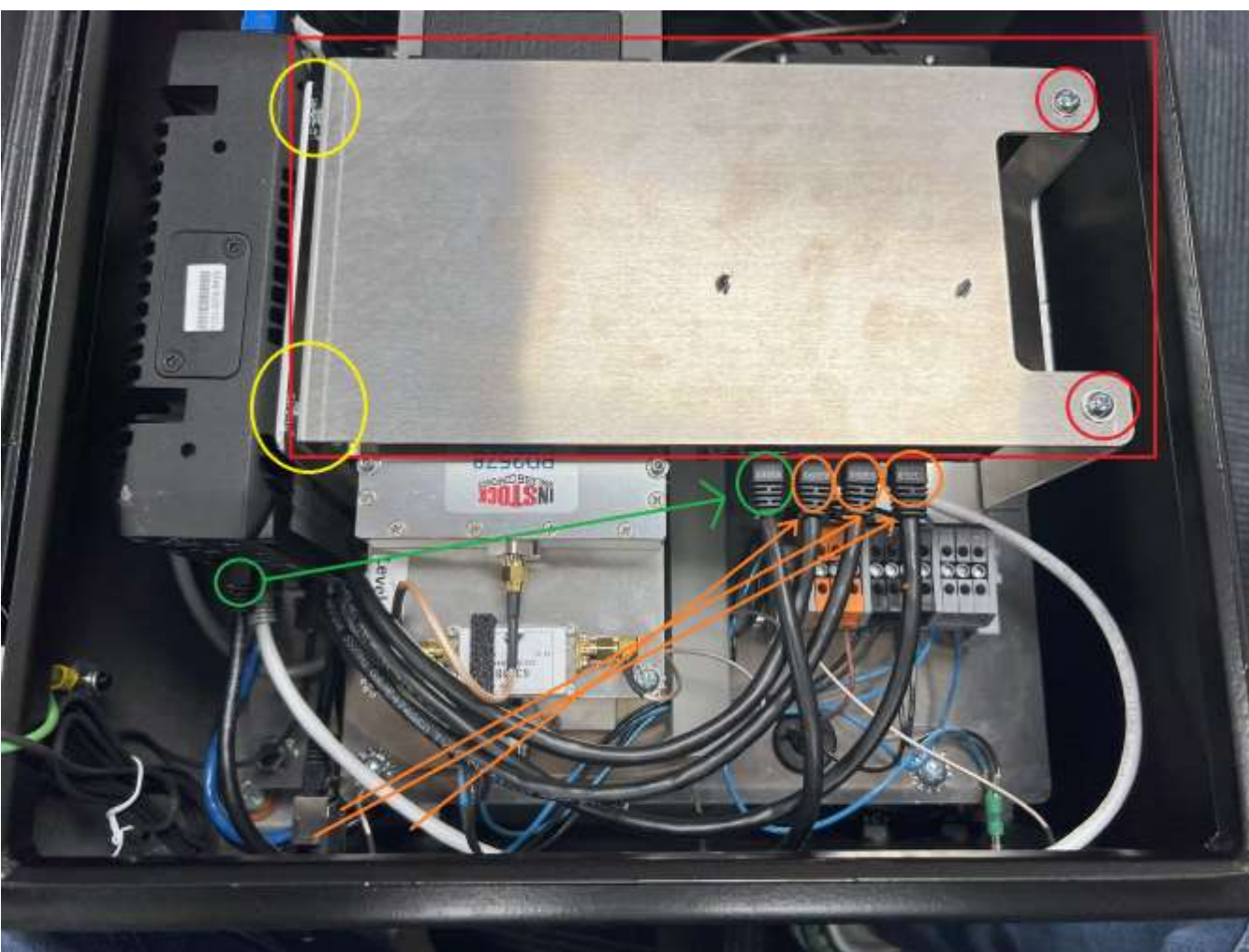
1. Select the 'template' button (Top Left image, circled in red).
2. Select 'Apply a Template' – (Bottom Left Image).
3. Download the template for the router at:
https://support.safeguardsolutions.org/XR80_Template.zip
4. Unzip the template: XR80_Template.json
5. Navigate to the downloaded file and select it.
6. Select 'Save' (Bottom Right Image, circled in green).
7. The router is now configured.

2



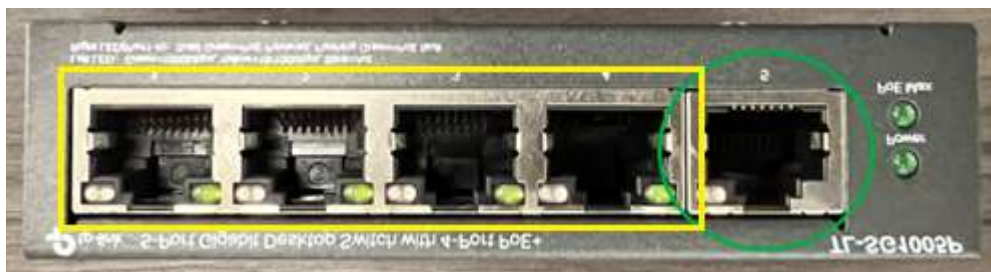
4





1. Reattach the metal plate from page 1 using the 2 screws circled in red on the right.
2. It is not necessary to replace the 2 nuts circled in yellow on the left.
3. Connect the router to the WAN port of the network switch as shown circled in green. The port is typically separated from the other ports with a line (See the port circled in green in the bottom left picture).

Note: Do not use the top port of the router as this is not an ethernet port! (see picture bottom right)

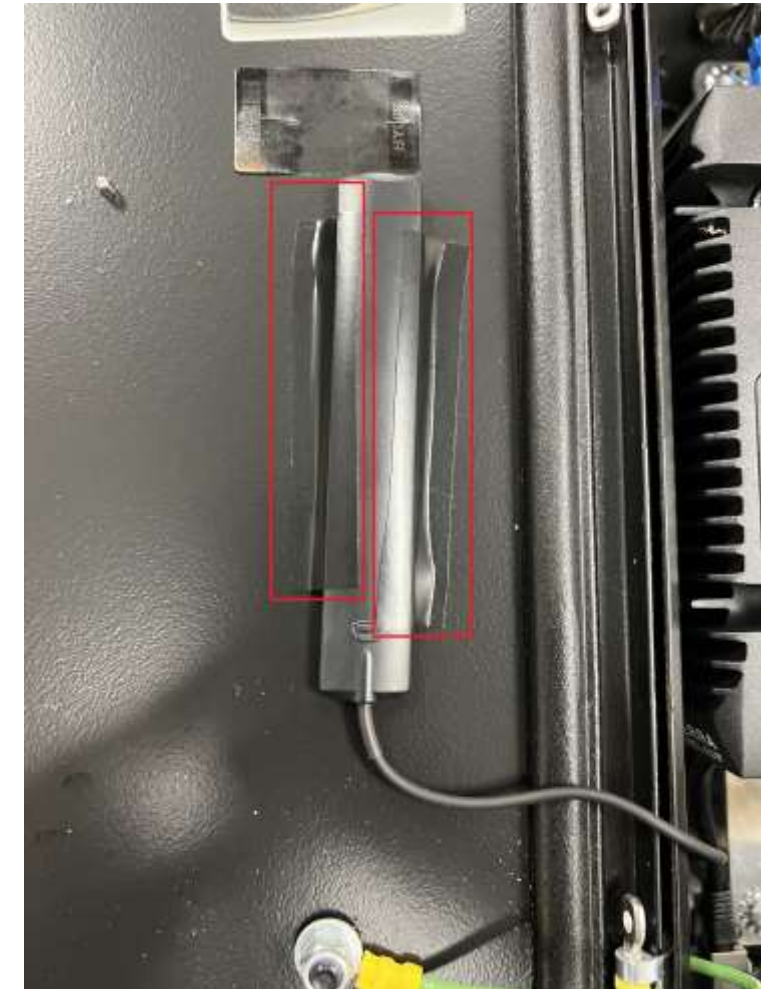


1. Connect the ethernet cables shown in orange from the ports at the bottom of the box to any of the remaining network switch ports (Yellow Box).

1. Connect the power plug from the network adapter.



1. If the antenna on the door is loose, you can apply some electrical tape to both sides to secure it.





1. All cables and wires should be reconnected.

Final Steps: Testing and Software Installation

To test that the box is working correctly and to complete the setup, you must connect the box to the internet:

1. With your local internet (Preferred Method):

1. Connect an ethernet cable with internet from your local router or network switch into any of the 3 bottom ports on the router (shown to the right).
2. Power the box up.

2. With an Activated Sim Card and good cell reception:

1. If an ethernet connection is not possible, power the box up in a location with an activated sim card and good cell connectivity.

3. Confirm With Safeguard:

1. Email support@safeguardsolutions.org and ask for a status confirmation.
2. We will confirm that the box is up and accessible and begin installing additional drivers and software to complete the conversion.
3. You will need to leave the box powered on and connected while we complete this step.
4. You will receive a confirmation email when the box is fully configured and ready to be deployed!

