Starlink In A Box

(SIAB)

A project to provide Internet and Phone/Fax services during grid down emergent events

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March 2025

Forward

This project is subject to change without notice. This manual was created using my own time during evenings and weekends. All the resources, software, and equipment were personally owned or purchased. No Sponsorship of any kind was received during the creation of the SIAB system. This project was created using off the shelf components that are readily available to create a system that fits into a hard case.

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2025

"When wireless is fully applied the earth will be converted into a huge brain, capable of response in every one of its parts."

Nikola Tesla

Legal Stuff

Disclaimer 1

Please note that this project may incorporate or reference proprietary hardware and software. All product names, logos, brands, and other trademarks mentioned or used within this project, such as Starlink, Starlink Mini, Grandstream HT802, Vonage Telephone adapter, Various suppliers such as Amazon and Harbor Freight, etc. are the property of their respective trademark holders. These trademark holders are not affiliated with this project, nor do they endorse or sponsor its content. The use of these names is purely for descriptive and informational purposes, acknowledging the tools and technologies leveraged during development. All copyrights to software code, documentation, and designs remain with the original copyright holders.

Disclaimer 2

The "Starlink In A Box" guide is provided for informational and educational purposes only. While we've done our best to make it comprehensive, the authors of this guide are unable to provide individual technical support or personalized assistance to those who choose to follow it.

Building and configuring a "Starlink In A Box" system can be complex and may require a certain level of technical proficiency. We encourage users to carefully read through the entire guide, consult the official documentation for any referenced hardware or software, and utilize online communities and forums for troubleshooting.

By proceeding with this guide, you acknowledge and agree that the authors are not responsible for any issues, damages, or losses that may arise from its use.

Record of Changes

Change Number	Date of Change	Description of Change	Initials
1	5/25	Initial Version	TK

Executive Summary

The Starlink Mini Dish is a compact, portable satellite internet system designed for high-speed connectivity in diverse locations. It offers an affordable and easy-to-use solution, delivering download speeds of approximately 120 Mbps and upload speeds of 20 Mbps. (many users experience much higher throughput) Users manage the system through a smartphone app, and it can be powered by a 120 VAC adapter, generator, or solar powered power bank.

A significant application of this technology is the "Starlink in a Box" (SIAB) project, which aims to provide internet and telephone connectivity during emergency situations. As any number of first responders have observed, a common point of failure during emergency operations is communications. While amateur radio fills a gap, not everyone is licensed, necessitating a better solution. The creation of Starlink In A Box (SIAB) system, was spurred by experiences during Hurricane IDA. It is housed in a small, rugged, and easily transportable case and includes a number of essential components like DC-to-DC converters, a fuse block, power supplies, a travel router, network switch, and a VOIP adapter. External accessories are limited to a tripod and a small bag for an analog phone and extra ethernet cables. Power is sourced from what is available on-scene, such as a generator, vehicle, or solar power bank. A small solar power bank (Ecoflow Delta 2) can power SIAB for about 9 hours, and adding solar panels and a larger power bank can extend this to 24 hours.

The SIAB project addresses the critical need for reliable communication during emergencies. It uses an analog to VOIP converter to enable analog phones or faxes to send and receive calls over the Starlink Mini, which is particularly useful for healthcare systems that widely use faxes. Once configured, inbound and outbound calls "Just Work." The system is designed for assembly from off-the-shelf components by someone with basic electronics knowledge. While configuring the Grandstream Analog to VOIP device requires some technical expertise, the Vonage version is plug-and-play. An appendix details configuring the Grandstream device on voip.ms. Future additions may include installing a PBX on a Raspberry Pi for multiple lines in a command post.

Starlink Mini In A Box (SIAB)

TABLE OF CONTENTS

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Starlink In A Box for Emergency Management

Overview

Recently Starlink has released the Starlink Mini Dish that is about the size of a page of paper and about 3 inches thick. This dish can provide high speed internet anywhere and fits into a small backpack along with a power bank. This dish can provide high speed upload and download with very low latency for an affordable price (relatively).

The system is comprised of the dish, which contains a built in Wi-Fi router and a single ethernet port, a power cable and 120 VAC power adapter. During testing the dish achieved consistent download speeds of about 120 Mbs and 20 Mps upload speeds. The system is administered via an app that is downloaded to your Android or I-phone and is used to each time you power the system on.

Setting up the system is as easy as placing the Starlink Mini outside with a clear view of the sky generally pointed north and powering the dish up. The app on your phone connects to the Starlink Mini and will inform you how to rotate the dish to obtain optimum connection speed. This usually takes a few minutes and once it is optimally oriented you can connect your external devices via Wi-Fi or the ethernet port.

The system can draw anything from 20-60 watts depending on startup and what mode it is in. The duration of use on battery power depends on how large your power bank is. In the power bank I use it has 1023-watt hours of capacity which translates to 10-14 hours of constant use. Your mileage may vary! There is some conversion losses between voltages which can affect the runtime of this power bank.

Ordering the Starlink Mini

The process is very easy. Please follow the steps outlined below:

1. In a browser, please go to https://www.starlink.com/us
2. You should see the following choices in the top left of the window. Please select roam

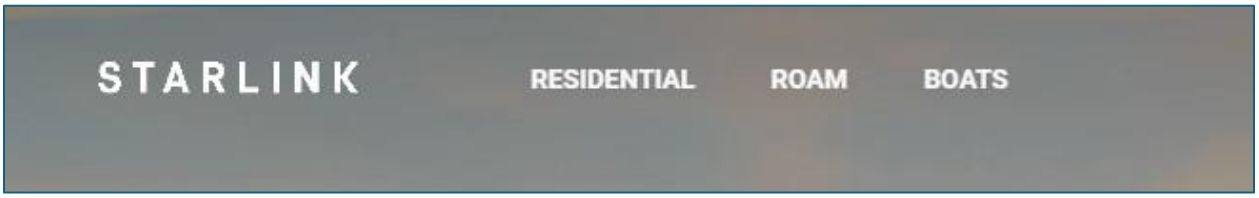

Figure 1 – Choose your plan

3. Near the bottom of this window, you will see a button called ORDER NOW. Please single left click on this choice. BOTE for the moment ensure you have the

PERSONAL choice selected at the top right of this window as the Starlink Mini is only available on this type of account at the moment.

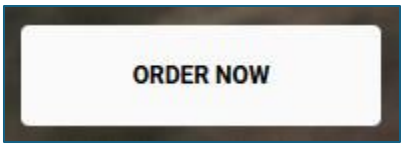

Figure 2 – Order Now

4. On the order page please select mini and regional. The other option is to select Mini and Mini Roam. The cost of the Starlink mini hardware is $499 plus tax currently. The service is divided into three types:
    a. Regional – Unlimited download/upload (subject to fair use) this service is $150/month and can be paused and turned on as needed. Once turned on you are billed in monthly increments until you suspend the service again.
    b. Mini Roam – is $50/month and provides you with 50GB per month of service. Additional bandwidth can be purchased for $1 per GB used. At the time of this writing, it is unclear if this service can be paused like the regional service. During real world emergent events it is difficult to predict how much bandwidth you might use
    c. Mini Roam – is $30 per month and provides you with 50GB per month of service. Additional bandwidth can be purchased for $1 per GB used. In order to access this lower monthly cost, you will need to have an existing residential Starlink Account. At the time of this writing, it is unclear if this service can be paused like the regional service. During real world emergent events it is difficult to predict how much bandwidth you might use.

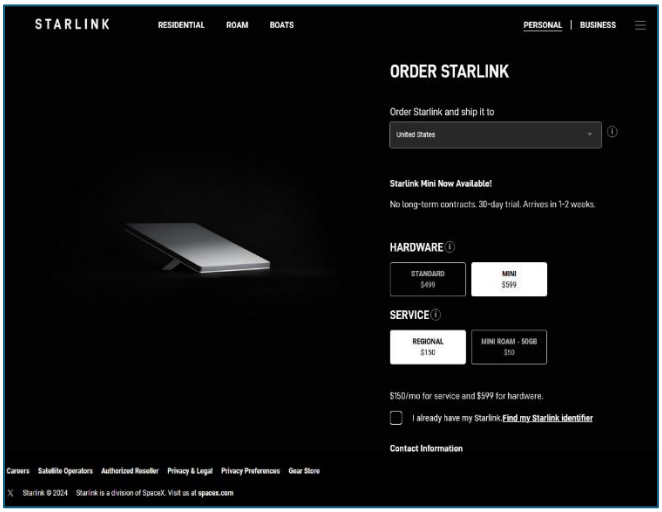

Figure 3 – Starlink Mini order page.

    d. If you have an existing Starlink account please click the “I already have my Starlink,,,,” click box and you will be asked to log in. If you have an account and login most of the information should be populated. If this is a new

account you need to fill out all of the information on this page and set up your payment method.

e. Upon verification and account set up you will receive several emails from Starlink indicating acceptance and ETA of the Starlink Mini system. Then when the disk ships you will get a notice with a tracking number. Generally, Starlink uses FedEx for shipping.
f. It is also recommended you order the Starlink Mini Pipe adapter.

******NOTE it is recommended you only buy from Starlink or an authorized retailer! If you find a cheap version of the Starlink Mini beware additional out of region charges (up to $300). Currently the Starlink Mini hardware sells outside of North America cheaper than you can get it here. People have been known to buy Starlink Minis out of the North American region and try to sell them at various online retailers at a discount. Unfortunately, the electronic serial number only allows it to be activated in the region it was shipped to. If you attempt to activate the Starlink Mini out of region it was shipped to you will incur an additional $300 charge. Only buy from authorized retailer in your region!**

Service Type Discussion

Which service is best for your use case can vary on several factors. Ongoing cost is a major factor. A $50/month for 50GB per month may satisfy your needs of use during an emergency event. The downside is that if you run over your bandwidth allocation per month you can be hit with an extra bill depending on how much you use your Starlink mini. Modern software requires higher bandwidth use which could exceed your monthly bandwidth allocation.

In essence the Mini Roam plan is very much a “Pay as you Go” type of plan where you predict you will not use more than 50gb per month, inclusive of exercises and real-world events. In the event you do use more than the allotted bandwidth extra funds will be required. The Regional plan provides for unlimited use (Fair Use Policy) for a fixed rate with no overages. For heavy bandwidth users this might make the most sense.

You can suspend (I think of it as Hibernation) your Roam plan and only activate it during emergent events. You can activate it and you will be billed in monthly increments. Thus, if you need it for a week you will be billed for one month regardless just remember to suspend the service within the one month window.

Regardless, you should deploy your Starlink mini at least once a month, even if the service is suspended, as this will allow the dish to get any software updates it needs. If you store your Starlink mini for long periods and need the service immediately the dish may insist on downloading and installing all the updates first regardless of your needs. The software update data is not charged against your 50GB per month allocation and the dish seem to update itself even if you have suspended your plan.

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The SIAB Project

The **Starlink In A Box project (SIAB)** is the result of my experience during Hurricane IDA in New Orleans. Briefly the power, internet, telephone, cell system all went down. During the event there was only a single cell carrier was operational and the other cell carriers came back very slowly. The Statewide radio system (LWIN) was also having problems. The only communication system that was working and reliable was amateur radio.

The Starlink service was not widely available during Hurricane IDA however in some areas it was used to restore communications. Based on the event and my background with VOIP/Software/Amateur Radio/Electronics I put together a system that allows an average user to ensure they have internet and telephone connectivity. There are several commercial systems available on the market that provide a box that will connect Starlink/Other Satellite Providers/Cellular and provide internet and Wi-Fi however, for small organizations they are very expensive.

The SIAB system needs to provide the following:

1. Be able to fit the Starlink Mini and associated components into a small, rugged case.

2. The Case would also house several components:
    a. DC to DC converters to generate at least 36 volts of power to power the Starlink Mini. The input voltage would be 12-13.8 volts. The device would combine the Power and Network cable into one to facilitate running a single cable from the box to power the Starlink Mini.
    b. Fuse Block
    c. DC to 5-volt power supply which has 2 USB C cables.
    d. Dc to 24-volt power supply to power the Wi-Fi extender via POE
    e. Travel Router – This provides enhanced features beyond what the mini dish offers when in standalone mode.
    f. 5 Port Network Switch – enhanced connectivity
    g. Accessory power plug output – powers external 12-volt accessories
    h. Grandstream 2 port FXS adapter for VOIP services
    i. AC to DC power supply that would allow the Starlink system to run off the grid or a generator
    j. External Power, Network, and POTS (Plain Old Telephone Service) connectors this will allow the case to be closed while running Starlink Mini. Note a small fan may be added in the future to support this mode.

3. A collapsible tripod to mount the Starlink Mini to keep it off the ground
4. At least 40 feet of ruggedized Cat 6 outdoor ethernet cable.
5. Use easily obtainable parts (Most are available from Amazon or Harbor Freight)
6. SIAB should be able to be put together by someone with average skills and very few specialized tools (A list of recommended tools is in the Appendix)
7. **VOIP Phone service. The Grandstream FXS adapter provides analog ports for old fashioned analog telephones and fax machines. Setting this up with a VOIP provider can be somewhat complex however a company called Vonage can send you something preconfigured that just works. Why include analog phone technology? Fax machines that most healthcare systems still use rely on “analog” phone lines.
   The FXS adapter simulates an analog phone line and allow fax machines to work. They support a standard called T.38 which fax lines require. You could plug in a VOIP phone directly however configuration is quite complex and during an emergent event simple systems are the best. The pictures that follow show a Grandstream adapter which is nearly identical to the Vonage adapter.

8. A device to extend the Wi-Fi range extender. Depending on your needs for deployment an external pole mounted Wi-Fi extender is recommended. This device will take the internet signals from the Travel router and provide access over a large area. This device requires a special POE device (which comes with the Wi-Fi extender and uses the 12-volt system in the SIAB hard case. A 12-to-24-volt boost supply also needs to be purchased.
9. Lastly easy to use and setup. While the apparent complexity of the SIAB might worry folks once the system is assembled it is easy to set up and use.

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Parts Order

Once you have decided on the Starlink Mini and have signed up for a plan the waiting begins for delivery of your hardware from Starlink. In the interim you can order the parts needed to assemble this project. A complete list of hardware requirements including links is contained in the Appendix. A simple parts list is below.

Item Description	Quantity	Cost*	Ordered
Starlink Mini Kit	1	499	
Starlink Mini Pipe Adapter	1	30	
Tripod	1	40	
Hard Case	1	40	
Travel Router	1	113	
Starlink Mini 12 Volt Adapter Kit	1	144	
Cat 6 Outdoor Network Cable 40’ (Starlink)	1	13	
5 Port Gigabit Ethernet Switch	1	14	
12 Volt 15 Amp Auxiliary Power Cable	1	13	
12/24V to 5V 6A USB-C power supply	1	13	
AC to DC power supply	1	21	
12 Volt Fuse Block	1	12	
RJ45 Pass Through connector (5 connectors)	1	26	
RJ11 Pass Through connector (2 Connectors)	1	12	
DC 2 Pin Power Connector Pass Through (2 sets M/F)	1	33	
Cat 6 Patch Cables (5 Cables)	1	7	
USB C to Micro USB Cable (2 Cables)	1	7	
RJ11 M/M cable (3 cables)	1	8	
Grandstream FXO Device (Alternate Vonage zero cost)	1	42	
Analog Telephone	1	40	
Analog Telephone & external AC/DC converter Case	1	14	
Wavlink AC1200 Wi-Fi range extender	1	120	
12-to-24-volt boost power supply	1	17	
Cat 6 Outdoor Network Cable 50’ (Wi-Fi Booster)	1	14	
Antenna mast (RCA 4’)	3	14	
Flagpole Mount for Wi-Fi Extender	1	39	

***Approximate! Subject to change!**

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Starlink Mini setup and acceptance.

After ordering your Starlink Mini and it arriving it is time to set it up and test it. Once you have ensured your Starlink Mini is working it is time to proceed with assembly although depending on the lead time to get your Starlink Mini you could begin the assembly prior to receiving your dish.

Theory of Operation

The Starlink Mini provides the connection between the ground and satellites in low earth orbit. These satellites can relay traffic between each other and to ground stations and connect to the internet at large with low latency. Upon connecting the Starlink Mini to the satellite constellation the internet will be made available at the dish in 2 separate methods:

- Available via the built in Wi-Fi router contained in the Starlink Mini dish itself
- Available via a single ethernet port on the Starlink Mini dish.

While for emergent situations the built in Wi-Fi is adequate it is recommended you hook up a travel router to the single ethernet port and use this to connect devices to Wi-Fi. This provides greater flexibility and security. The Starlink Mini Requires and Ethernet cable for connection as well as power for the dish. In some instances, where a cable run is short, enough it is possible to power the dish directly from a running vehicle. However longer runs of power cable require a different solution.

The recommended device can run from a 12-volt battery, or a running vehicle and it converts the 12-volt power to a much higher voltage thus you can position the dish outside and have a longer cable run. The recommended device also sends the power over the ethernet cable, so you only need a single cable to provide power and gain internet access. This is like Power Over Ethernet (POE) however, the Starlink Mini **DOES NOT SUPPORT POE!** At the end of the ethernet cable a splitter box connects to the ethernet cable and splits into a power connector and an ethernet connector.

At the other end the ethernet signals are split out and a cable runs from the power adapter into the travel router. A simplified functional diagram is on the next page.

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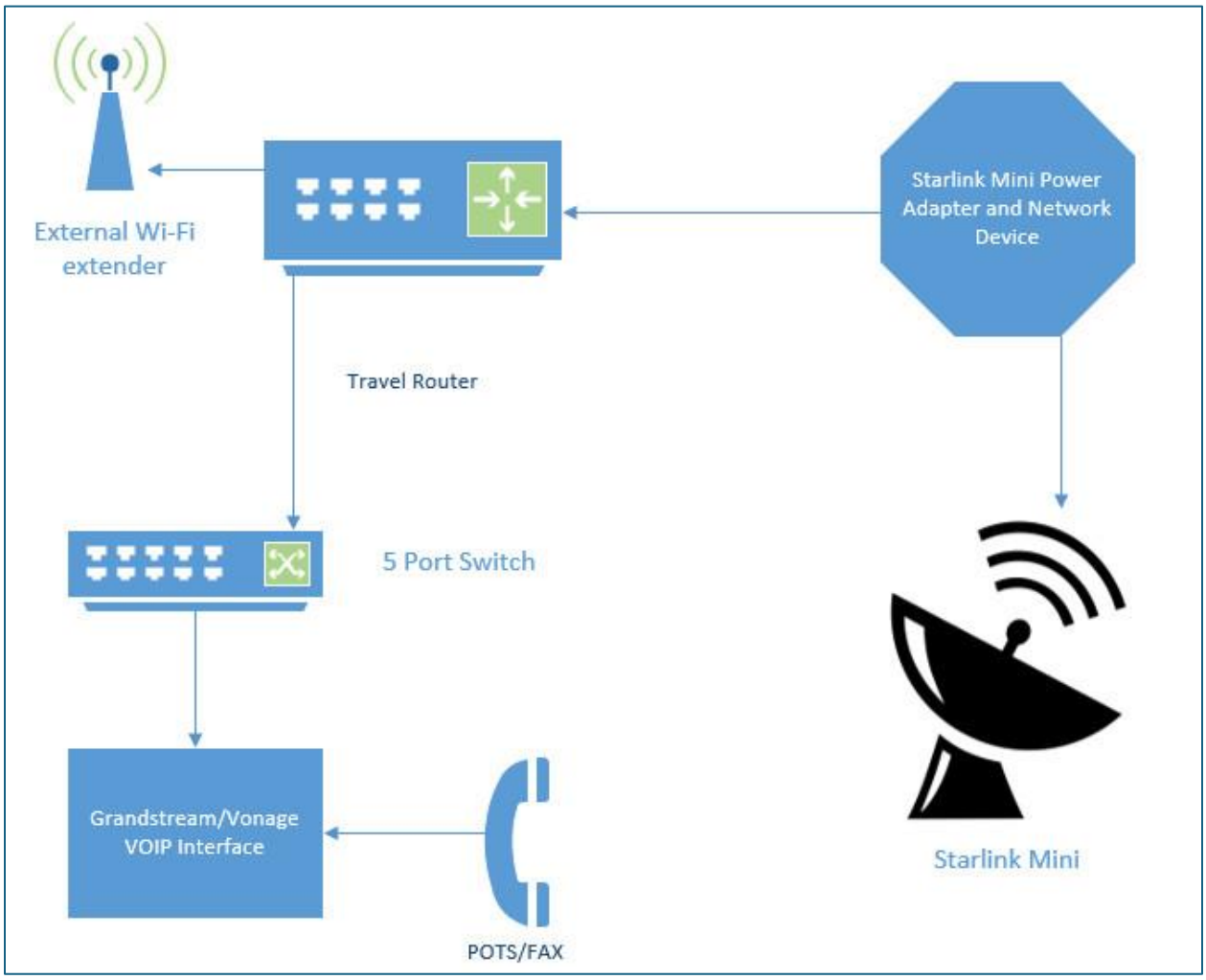

Figure 4 – Functional diagram of the network in the SIAB project

Figure 4 illustrates the ethernet connections and various devices. Initially the Starlink Mini is connected to the Starlink mini power adapter which provides power and connectivity to the dish via a single ethernet cable. The ethernet signal emerges from the mini power adapter and feeds a travel router. The travel router also allows for Wi-Fi connectivity to the internet. NOTE in this diagram the Starlink Mini internal Wi-Fi connectivity is not shown. It is recommended while using the SIAB system that you don't connect to the Starlink Mini internal Wi-Fi system.

The travel router can hook up to several other internet sources also. The ethernet signal is then connected to a 5-port switch which further distributes ethernet. The Grandstream/Vonage FXO device is connected to one of the ethernet ports to provide inbound and outbound telephone/fax services. In this diagram an analog phone is connected to the Grandstream/Vonage FXO device.

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Power distribution is shown on figure 5. 12-13.8-volt power comes in and is routed to a fuse block and then supplied to various devices as well as a 5-volt regulated power supply.

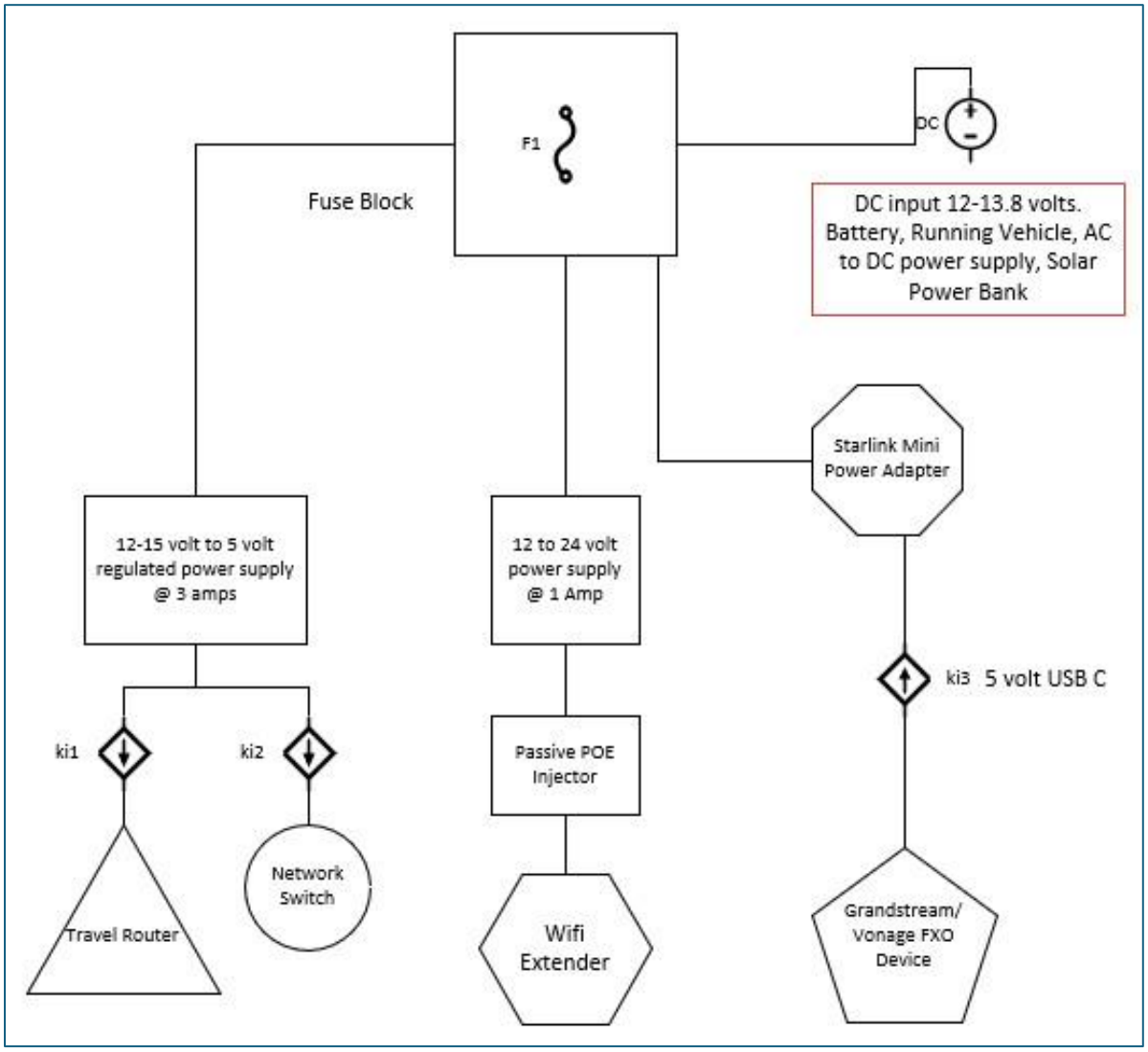

Figure 5 – SIAB power distribution

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Assembly

*NOTE This prototype system uses some parts from other projects and thus you may see extra holes or odd wiring. Part of my goal is to reduce e-waste and thus some items have been repurposed. Most notably the case in the picture was used for several other projects until it found its way into SIAB.

After ordering the additional parts from the vendors listed in the Appendix and receiving them you can begin your assembly of the project. As a side note measurements for drilling hole and mounting points are not included. You can modify how things are mounted to suit your own needs.

Layout

Below are several pictures that show how this project was laid out in the Harbor Freight hard case. Remember that how you put together your SIAB is entirely up to you. This is a beta version and thus things are subject to change.

The empty case was purchased from Harbor Freight and just allows the Starlink Mini to fit in the lid.

Figure 6 – Hard case for project

Figure 7 – Hard Case, Soft case (Phone), and tripod

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Hard Case Overview

The figures that follow show the components mounted in the Hard case and the soft case. Each component installation will be reviewed.

Figure 8 Inside the hard case with all of the components required to function. Notice the lid contains the Starlink Mini

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Here is an interior picture of the hard case with all the accessories removed.

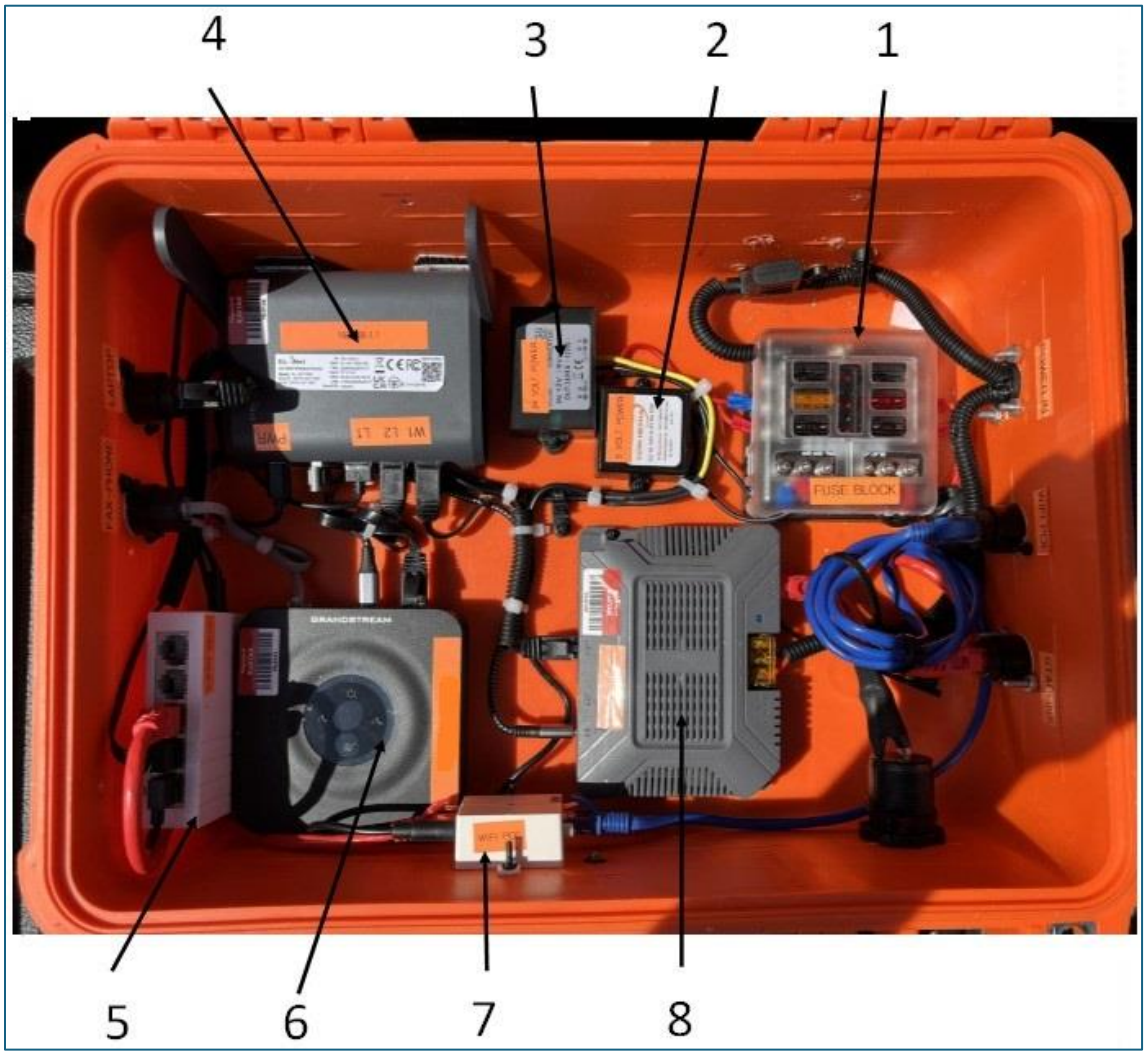

Figure 9 – Bottom half of the hard case (looking from front to rear)

Inside you can see the following devices:

1. Fuse Block
2. !2-Volt to 5 Volt USB-C Power Supply
3. 12-Volt to 24 Volt Power Supply
4. USB Travel Router
5. 5 Port ethernet switch
6. Grandstream/Vonage VOIP Device
7. 24-Volt Passive POE Injector for Wi-Fi Range Extender
8. Starlink Mini – Power and Ethernet Adapter

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This forms the bulk of the devices needed for this project.

Accessories Contained in the Hard Case

Several external accessories are carried within the hard case for transport and are as follows:

1. Power cable – This connects to an external 2 pin connector and brings in 12-14 volts DC. The other end has a standard automotive accessory connector

Figure 10 – DC Power Cable

2. Starlink Power and Ethernet Cable – This connects the Starlink Power adapter to the Starlink Mini. Notice the two end connectors one for power and one for ethernet. This connects to the dish and the other end connects to the Starlink Power and Ethernet Adapter. The power/ethernet splitter comes with the Starlink Power and Ethernet Adapter kit. This is a 40-foot outdoor cat 6 network cable. NOTE since this cable is long it uses solid core wire which is considered a disposable item if this kit is used frequently.

Figure 11 – Starlink Ethernet/Power Cable.

3. Starlink Mini Pipe Adapter – This allows the Starlink Mini to be mounted on the Tripod which is used to keep the Starlink Mini off the ground. This is highly recommended.

Figure 13 – Starlink Mini Pipe Adapter

External Accessories

There are several accessories that do no fit into the hard case but help with the deployment of SIAF

1. Analog telephone and spare ethernet cables – This is a POTS telephone for which I chose the EMERGENCY RED color. This is contained in a soft case along with several extra ethernet cables which can be used to plug additional network devices into the system. I use a cable clamp to attach it to the hard case. The external AC to DC power supply also fits in this case.

Figure 14 – POTS Phone, Ethernet Cables, and External Power supply

2. Tripod – This is a short tripod built specifically for Starlink Type II and Mini dishes. It keeps the dish off the ground and away from moisture. It takes only moments to setup the biggest challenge is connecting the power and ethernet cables to the dish and routing them through this mount.

Figure 15 – Tripod for the Starlink Mini

Hard Case External Ports

The hard case has several external connectors to facilitate connections to power, ethernet, and analog phone/fax. They are as follows

- DC in Connector – This is where the power cable connects

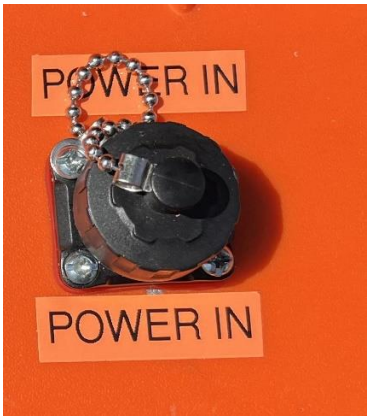

Figure 16 – Power Connector

- Ethernet Cable Out to Starlink Mini – This connector goes to the Starlink Mini and carries DC power and ethernet signals. This connector is a standard RJ45.

Figure 17 – Starlink Mini Power and Network Connection

- POE Connector to Wi-Fi Extender

Figure 17a – POE Connection for Wi-Fi Extender Only

- Auxiliary 12-volt output – This is used to power another 12-volt accessory. For example, I use this to power my Globalstar Satellite Phone.

Figure 18 – Auxiliary Power Out

- Laptop and POTS connectors – These connectors allow a laptop to plugged into the internal ethernet and connect to the internet. The POTS connector (Plain Old Telephone Service) allows an analog phone or fax to be connected to the hard case and send and receive calls/faxes. The Laptop port is a standard RJ45 connector, and the POTS line is a standard RJ11 connector.

Figure 19 – RJ45 and RJ11 Connectors.

- Wi-Fi Extender – This optional equipment rebroadcasts the Internet received from the Starlink Mini over a much wider area. The Wi-Fi extender is mounted on 12 feet of antenna mast whose base is held in a tire flagpole mount. This setup provides for wide area coverage with Wi-Fi.

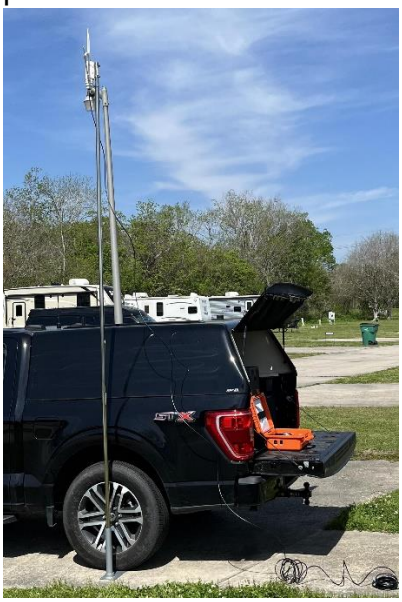

Figure 19a – Pole mounted Wi-Fi extender

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Instructions

This is a guide only, feel free to modify the components and mounting locations to suit your needs. No representations or warranties are included or implied at all. If you build this and it does not work or suit your needs you are on your own and the authors of this manual shall not be held liable. Follow safe work practices and always read the manuals of the components used in this project. Always follow manufacturer recommendations for the care and use of this equipment.

Storage of the Starlink Mini

The dimension of this particular hard case is ideal to store the Starlink Mini in the lid. Two-inch Velcro is used and cut to an overlapping link. I only had Velcro in the shop that had glue on one side so I use 3 pieces of the loop and one piece of the hook to make the straps. Two pieces of the loop were stuck together, and the piece of the loop and the hook piece were stuck together. The straps overlap by about 50% and were secured to the hard case top by 4 machine screws with locking nuts and oversize washers. (All of this was available at home depot). Modifications would be to line the lid with foam or rubber to prevent the Starlink Mini from rubbing against the case in transport.

Figure 20 – Starlink Mini stored in lid of hard case.

Installation of the external connectors

Bottom of Hard Case

For this portion of the assembly, you will need the connectors as well as a hole saw set, drill bit set, and a drill. Ensure you have all the connectors prior beginning this process and check each connector against the hole saw selection to ensure a snug fit. From the front of the hard case facing rearward The right-hand side of the case has the Power and Starlink connector, The front of the case has the 12 volt auxiliary power out connector and the left hand side of the case has the extra network port and the telephone/fax jack.

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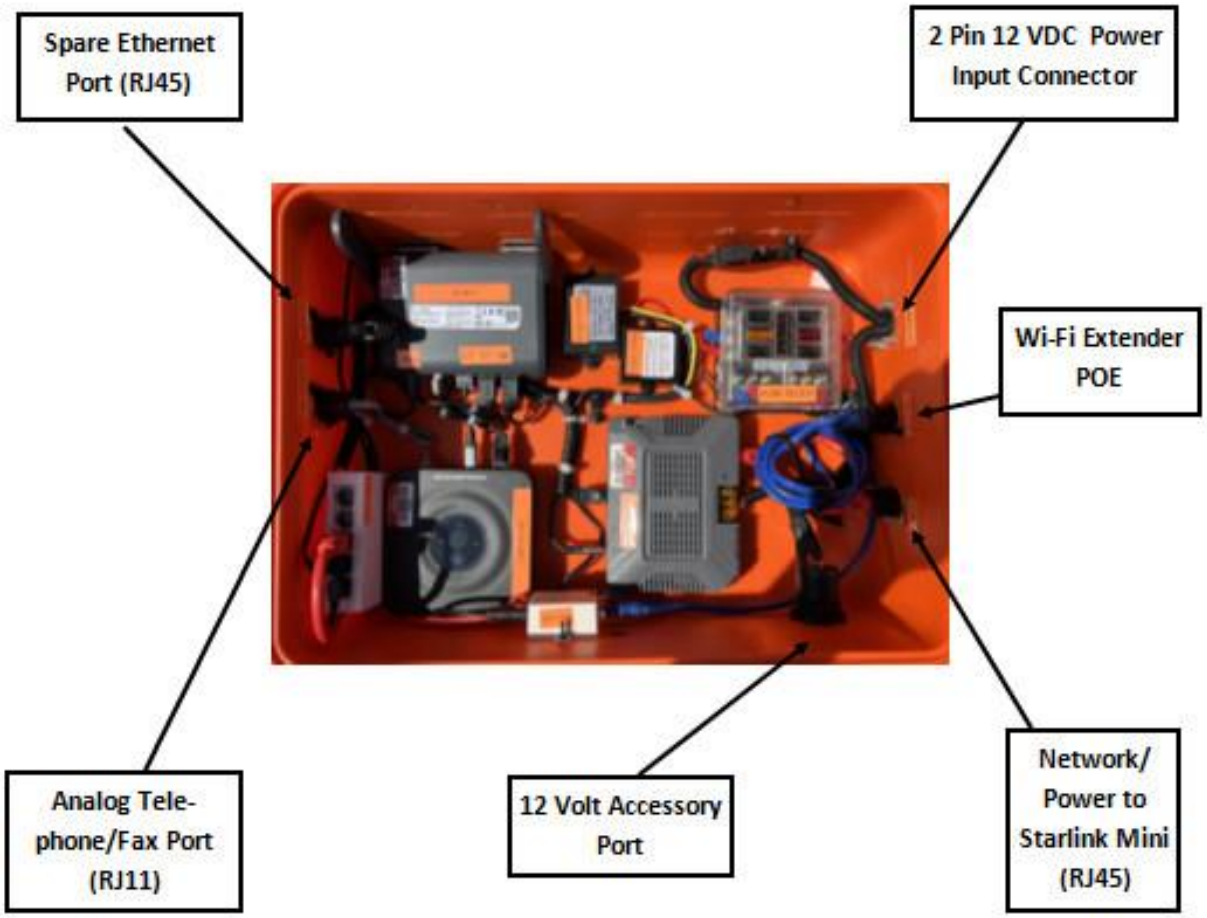

Figure 21 – Approximate placement of external connectors with optional Wi-Fi POE extender port

NOTE* Precise drill measurements have not been given as this is an example of how to put things together in a small case. Your mileage may vary depending on what components you use in your build! Once you have the connectors installed it is time to mount the other components in the case. I recommend purchasing a selection of machine screws as outlined in the Appendix.

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Fuse Block

I mounted the fuse block close to the power inlet. It does require machine screws to mount it. Position the Fuse Block in the upper right-hand corner near the 2 pin DC input connector. Leave enough room around the fuse block to run wires.

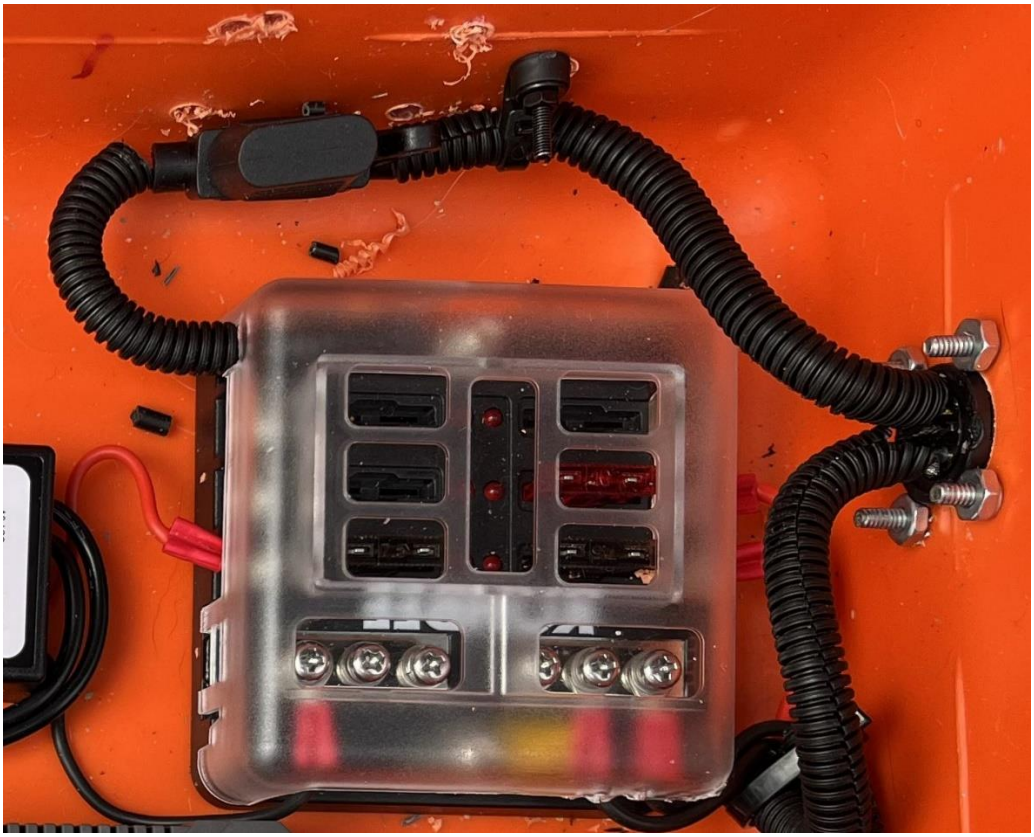

Figure 22 – Fuse block mounted near power connector

Notice the wiring that runs from the power connector on the right into an extra fuse holder at the top of the page on the positive line and then onto the positive side of the fuse block. The negative wire goes directly to the – terminal on the fuse block. To connect the positive and negative wires to the 2-pin power connector you will need a soldering iron and solder. The fuse block is attached to the case with screws. 4 of the 6 fused connections are used. (This includes the optional high power POE injector)

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Starlink Mini Power/Network adapter

This is the heart of this project. In essence this device takes 12-volt external power and converts it to 48 volts DC (POE Standard). The power is then injected into a standard Cat 6 ethernet cable which carries both dc power and ethernet on the same cable. At the end of the Cat 6 cable a special splitter device separates the ethernet from the dc power and provides both power to the Starlink Mini and ethernet connectivity. A travel router then plugs into the Power/Network Adapter which only carries ethernet to and from the Starlink Mini. This adapter allows you to run a single 100-foot cat 6 ethernet cable and remotely locate your Starlink Mini. **NOTE** Starlink Mini DOES NOT SUPPORT POE!**

Figure 23 – Power/Network adapter for Starlink Mini.

Connections:

- Top Left is the label POE this goes to the Starlink Mini, Note this uses a full-size patch cable and connects to the right front F-F RJ45 panel mount connector. Do not use the flat Cat6 patch cable.
- Top Middle is the DC Power in. There is a green power indicator light next to it.
- Bottom Right is a 5-volt type C USB power out. NOTE There is an older USB port next to it be warned this outputs 12 volts **DO NOT USE Please tape it over.**
- Bottom middle is the LAN port which connects to your router. Using a flat network cable

This device is held to the bottom of the Hard case with 2 machine screws.

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The next figure displays a functional diagram of how the Starlink Mini Power/Network adapter works.

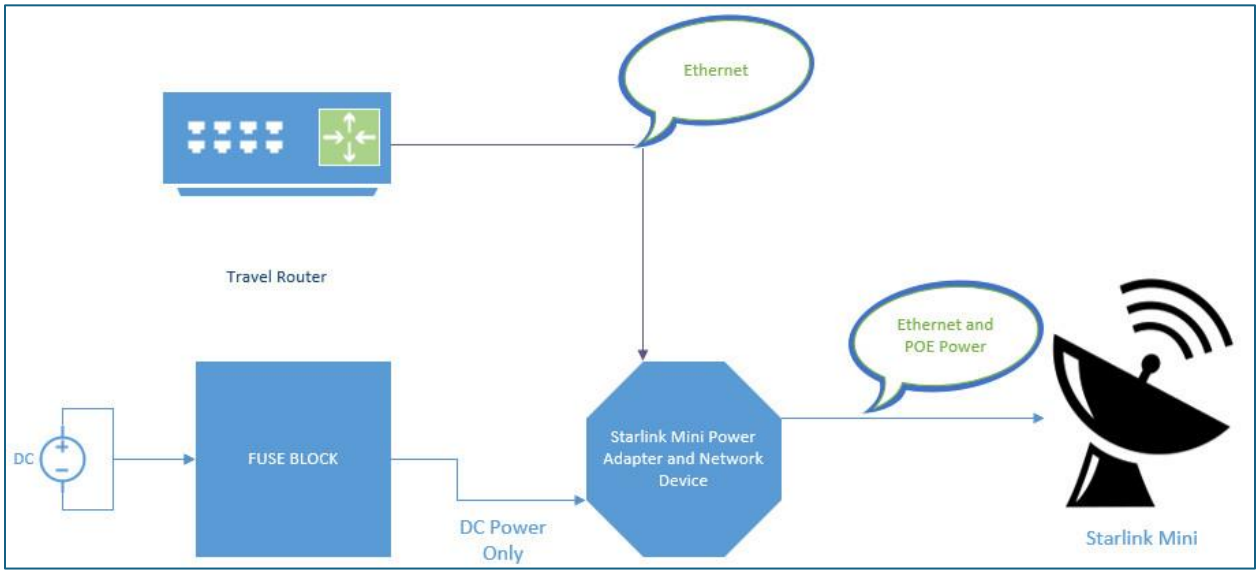

Figure 24 – Power/Network adapter for Starlink Mini functional Diagram

12 volts to 5-volt regulated power supply

Several devices in the SIAB require 5 volt regulated power via USB-C. To this end an off the shelf DC to DC converter was chosen. The input power range is 10-32 volts and the output is 5-volts @ 6 amps. This power supply has 2 USB C ports which power the Travel Router and the 5 port Switch. The Grandstream VOIP device uses 5 volts from the Power/Network adapter. The Black and red wires connect to the fuse block and the 2 USB power connectors are routed to the Travel Router and the 5 Port Switch. This device is bolted to the hard case with 2 machine screws.

Figure 25 – 12-volt to 5-volt USB-C power supply

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12-Volt to 24-Volts regulated power supply

The Wavlink Wi-Extender device requires 24-volts DC to power the passive POE connector. This device combines power and internet into a single Cat 6 cable. To this end an off the shelf DC to DC converter was chosen. The input power range is 9-20 volts and the output is 24-volts at 5 Amps.

Figure 25a – DC to DC converter 24-Volts output.

Travel Router

The heart of SIAB just after the Starlink Mini is the travel router. This provides a plethora of connectivity options which are useful during emergent events. While the Starlink Mini does have a built-in router and Wi-Fi it is somewhat limited in functionality. The travel router allows you to hook up to multiple internet sources which include the Starlink, Wifi hotspots, and tethered Cell phones that support his feature. There are also numerous security features that assist with keeping things secure.

This device also has its own Wi-Fi connectivity that will allow multiple Wi-Fi enabled devices to connect to the internet. Unfortunately, this device does not have the ability to connect external Wi-Fi antennas to it which would enhance the range of connectivity. An optional Wi-Fi Extender can be added to the system which when mounted on a pole can significantly increase Wi-Fi coverage.

There are a few connections on this device:

- USB-C power input
- 2 Lan out ports (To other devices – One to the 5 port Hub and the other to the Grandstream VOIP device)
- 1 Wan in port (To the Power/Network Adapter
- USB type A port (Can tether phone or add USB drive to provide access over network like a NAS. In this system I have installed a 128 GB USB key)

This device also has two Wi-Fi antennas which are fixed to the router but then can be elevated. This device is affixed to the hard case using 3M Dual Lok tape. This method allows for quick attachment but can be removed if needed. There are several strips on the bottom as well as the back. This also allows for air flow to keep the router cool. You may need to add a cooling fan in hot climates.

Figure 26- Travel Router

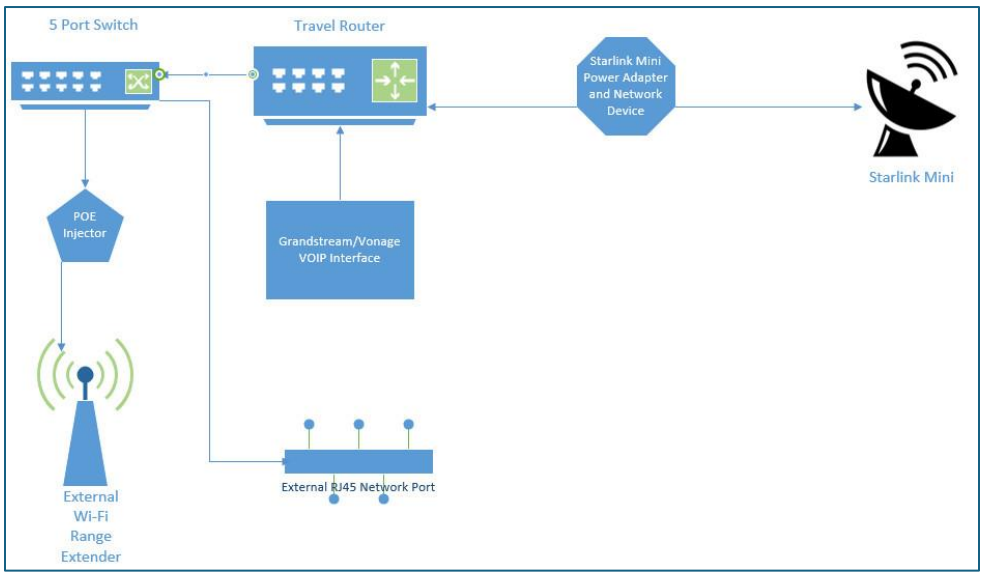

Figure 27 – Network connection overview from Router to peripherals

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Extra Equipment

Should the need arise to provide longer distance Wi-Fi coverage an external Wi-Fi range booster should be added to the project. We purchased he Wavlink AC1200 which is a high-power weatherproof range extender that has coverage in 2.4 & 5 Ghz bands. This item requires power over ethernet to function which also required a special high-power POE injector. In Figure 27 power and ethernet signal is combined in the POE injector and then sent down a single ethernet cable to the Wavlink device.

The Wavlink device is placed atop 3 segments of swedged antenna mast and hoisted up. This bottom of the mast is placed into a tire mounted base and the ethernet cable is connected to the correct port on the hard case. In the initial design of the SIAB this was not included however an extra Network port labeled POE was subsequently added and the POE injector was mounted in the case and hooked to the 5-port switch and to the fuse block. This piece of equipment and the travel router will need to be configured to work together.

Figure 28 – Wi-Fi Range Extender (Wavlink 1200)

Figure 29 – 12 to 24-volt power supply for POE adapter

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Figure 30 – Swedged Antenna Mast (3 x 4')

Figure 31 – Tire Base for Antenna Mast

The POE adapter that comes with the Wavlink Wi-Fi extender and is installed on the front of the hard case with the POE out RJ45 jack facing towards the right side of the case (Blue cable) Immediately above the Blue cable is the on off switch (in case you are not deploying the Wi-Fi extender, conserves power). On the right-hand side of the picture is the network in RJ45 jack facing the left side of the case. (Red Cable – this leads to the 5-port switch) Immediately above this is the 24 Volt DC in. At the time of this writing, I cut the cable from the power brick that came with the Wavlink device and connected the other end to the 24-volt power supply.

Figure 32 – Installation of the POE adapter in the Hard Case

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Figure 33 – External network port for POE power

Figure 34 – Assembled Wi-Fi extender on antenna mast with tire base

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Assembly

Assembly is relatively straightforward and is broken down into assembly of the physical devices and then interconnection them. Once everything has been assembled and connected it is time for testing the system. Recommended assembly process is as follows:

- Mark the case where you will be drilling external holes. You will require the use of a hole saw to make these cuts. You will need holes as follows:
    - Looking from the front of the case to the rear
        - Right hand side 3 holes for the following: Power In. Power/Ethernet to Wavlink, and Power/Ethernet to Starlink. NOTE these connections are not interchangeable!
        - Front Right of case – 1 hole for DC out
        - Left hand side of case – 2 holes one for a Telephone/Fax and One for internet out (Labeled Laptop)
    - Some connectors require additional holes to be drill for screws. You will need an assortment of drill bits and machine screws for this. Additional information in the parts list
    - Mount all the connectors into the hole and ensure everything has been tightened up

- Next begin to place the various modules in the case and use Figure 9 as a guide. Remember you can make this project your own and place things where you want and use different materials. Please send me pictures and details how you assembled yours! I started (looking down and to the rear) as follows:
    - Fuse block – Top right of the bottom of the case. - Two machine screws and nuts
    - Starlink Mini Power/ethernet adapter Bottom Right with some space on the right for the POE to Starlink RJ45 connector – 2 Machine Screws and nuts
    - Bottom Left Grandstream/Vonage device Leave a small space to the left of the device to the Left wall of the case – Dual Lok
    - 5 Port Switch mounted vertically to the Bottom Left Side -Dual Lok
    - Power Supplies 12 to 5-volt and 12 to 24-volt are mounted middle of the case starting at the Starlink Mini Power/Ethernet adapter and going to the back wall of the case. 4 machine screws and nuts are required
    - Travel Router – This is mounted in the Left back of the case. – Dual Lok
    - Wavlink POE – This is mounted to the vertical front of the hard case about the middle just above the Grandstream/Vonage adapter – 2 machine screws and nuts
    - Top Lid Velcro Straps – I used some 2-inch Velcro designed for adhesion to surfaces and doubled the strip and mated the glue sides. One strap was

double loop, and the other was one side hook and the other loop. The Starlink Mini was placed in the lid and measurements were taken. Each side of the Velcro straps had 2 holes in them and 2 machine screws and nut along with oversized washers were used to secure them to the case. The Starlink Mini sits between the Velcro straps goes over the back of the dish to secure it. NOTE a future upgrade will be some foam padding to cushion the dish.

- Wavlink Wi-Fi Extender – Should you decide to add the Wavlink Wi-Fi extender (Recommended) some assembly is required!
    - Assemble the Wavlink device following the included instructions. Generally, it is as follows:
        - Screw in the antennas note the difference between the 2.4 and 5 ghz connectors and antennas. Add the spreader bars between the antennas. These spreaders keep the antennas from moving around. Note the spreaders are removable for storage.

Figure 35 – Wi-Fi antenna spreaders

        - Unscrew the base of the extender and feed the Cat6 cable through the opening while installing the cable gland. Screw the base back on the base of the Wi-Fi extender
        - To mount it to a pole device it comes with a snap-on mount. On the mount drill 2 holes one at the top and one at the bottom. You will need a machine screw and nut to attach the hose clamps. One at the top and one at the bottom. Note you may have to drill a hole through the steel band of the hose clamp to allow the screw and nut to go through.

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Figure 36 – Wi-Fi extender mast mount

- The Antenna mast consists of 3 4-foot lengths of swedged 1 ¾ antenna mast. Place the antenna mast base behind a convenient tired and slowly back the vehicle over it. Place the first section of mast in the base and tighten the nut to hold it securely. Then assemble the Wi-Fi device onto the one of the 4-foot sections of antenna mast and then attach the next piece of the antenna mast to it. Take the 8-foot length of mast and insert it into the mast that is already attached to the base. NOTE While higher elevations of this device is desirable a stronger mast solution with guy wires would be required.

Figure 37 – Antenna mast with Wi-Fi device assembled and mounted.

- Meshtastic Repeater – The current build of SIAB also includes a pole mounted solar powered Meshtastic Repeater. This project provides the ability to have encrypted text messaging over a large area without any infrastructure. This is an optional but highly recommended component.

Figure 38 – Solar Meshtastic Repeater mount on antenna mast

Figure 39 – Meshtastic Repeater

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Configuration

Starlink Mini Dish

Initially you will need to ensure your Starlink Mini is fully operational when you receive it. The following steps are required when you first receive your shipment from Starlink. This of this as the acceptance phase of your new equipment and once completed you can begin to integrate the dish into your SIAB.

1. Download the Starlink App:

- The Starlink app is essential for the setup process. Download it from the Apple App Store or Google Play Store on your smartphone or tablet.

2. Find a Location with a Clear View of the Sky:

- Starlink requires an unobstructed view of the sky to connect to satellites
- Use the "Check for Obstructions" tool in the Starlink app to identify the best location.
- Ensure there are no obstructions like trees, buildings, or other structures blocking the view.

3. Unpack the Starlink Mini Kit:

- The Starlink Mini kit typically includes:
- Starlink Mini dish with integrated Wi-Fi router
- Kickstand
- Power cable
- AC adapter

4. Set Up the Starlink Mini:

- Place the Starlink Mini:
    - You can use the included kickstand to place it on a flat surface.
    - Make sure it is stable and won't be easily moved.
- Connect the Power Cable:
- Plug one end of the power cable into the Starlink Mini.
- Plug the other end into the power adapter and then plug the adapter into a power outlet.

5. Connect to Starlink Wi-Fi:

- On your smartphone or computer:
  - Go to your Wi-Fi settings.
  - Look for the Starlink network (it will usually start with "STARLINK").
  - Connect to the Starlink network. Initially, it is an open network.

6. Configure Your Starlink Network:

- Open the Starlink app:
  - The app will guide you through the setup process.
  - You'll likely be prompted to set up your Wi-Fi network name (SSID) and password.
  - Follow the on-screen instructions to configure your network settings.

7. Align the Starlink Mini:

- The Starlink Mini needs to be properly aligned to connect to the satellites.
- The Starlink app will provide guidance on how to do this. It might automatically align, or it might give you instructions.
- Follow the app's instructions to ensure optimal alignment.

8. Check the Connection:

- Once the setup is complete, the Starlink app should indicate that you are connected to the internet.
- You can also check the status light on the Starlink Mini.

Important Notes:

- Obstructions: Even small obstructions can significantly impact performance. Double-check for any potential issues.
- Power: Ensure the Starlink Mini is properly connected to a reliable power source.
- App Guidance: The Starlink app is your primary tool for setup and troubleshooting. Pay close attention to the instructions provided.
- Firmware Updates: Starlink may automatically download and install firmware updates. Your internet service may be interrupted during this process.

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Travel Router - GL.iNet GL-AXT1800 Setup

Setting up the travel router can be quite the process however below is a simple setup to get you connected to the Starlink Mini. There are endless options and settings for this router that you can monkey with. This document only provides for a basic setup and for advanced configuration consult an IT specialist.

Connecting your GL.iNet GL-AXT1800 travel router to a Starlink Mini involves a few straightforward steps. Here's a brief setup guide:

Prerequisites:

- The Special Starlink RJ45 cable is connected to the Special Starlink port on the SIAB Case. At the dish end one connector goes into the RJ45 and the other goes into the power connector

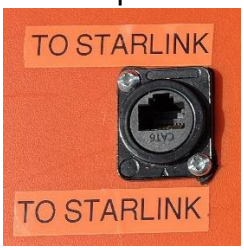

Figure 40 – Starlink

- Your Starlink Mini is set up and online using the Starlink app.
- You have the GL.iNet GL-AXT1800 travel router powered on.

1. Enable Starlink Bypass Mode:
    - Open the Starlink App on your phone or tablet.
    - Go to Settings.
    - Look for a Bypass Mode option (it might be under "Advanced Settings" or "Network").
    - Enable Bypass Mode. This essentially turns the Starlink Mini into a modem.

2. Connect the Ethernet Cable:
    - Locate the Ethernet port on your Starlink Mini. It's important to note that using a non-Starlink Ethernet cable removes the IP67 (waterproof) rating the Mini might have had when using its proprietary cable. The Mini is rated IP54 for dust and splash resistance.
    - Connect one end of the Ethernet cable to the Starlink Mini's Ethernet port.
    - Connect the other end of the Ethernet cable to the WAN port on your GL.iNet GL-AXT1800 router. The WAN port is usually a different color (often blue) and might be labeled "WAN" or "Internet".

3. Connect to the GL.iNet Router:
    - Via Wi-Fi: On your computer or phone, look for the default Wi-Fi network name (SSID) of your GL-AXT1800. This is usually printed on a label on the bottom of the router and follows a format like "GL-AXT1800-XXX" or "GL-AXT1800-XXX-5G". Connect to this network. The default Wi-Fi password is also on the label (some models might have a default password like "goodlife").
    - Via Ethernet: You can also connect your computer directly to one of the LAN ports on the GL-AXT1800 using another Ethernet cable.

4. Access the GL.iNet Admin Panel:
    - Once connected to the GL-AXT1800's network, open a web browser (like Chrome, Firefox, Safari).
    - In the address bar, type 192.168.8.1 and press Enter.
    - You will be prompted to set an admin password for the router. Choose a strong password and follow the on-screen instructions.

5. Configure Internet Connection on GL.iNet Router:
    - After setting the admin password, you'll be taken to the GL.iNet web Admin Panel.
    - Navigate to the Network section (or similar, the exact menu might vary slightly depending on the firmware version).
    - The router should automatically detect the internet connection via the WAN port. If it doesn't, look for a section like "WAN" or "Internet". Ensure it is set to obtain an IP address automatically via DHCP.

6. Enjoy Your Network:
    - Once the GL-AXT1800 has successfully obtained an IP address from the Starlink Mini, your devices connected to the GL.iNet router (either via Wi-Fi or LAN) should now have internet access through Starlink.

Important Considerations:

- Starlink App: You'll primarily use the Starlink app for initial setup of the Starlink Mini itself and for enabling Bypass Mode. Once bypassed, the GL.iNet router will manage your network.
- GL.iNet Admin Panel: You'll manage your Wi-Fi settings (SSID, password), VPN, firewall, and other advanced network settings through the GL.iNet router's web Admin Panel.
- Firmware: Ensure both your Starlink Mini and GL-AXT1800 have the latest firmware for optimal performance and compatibility. You can usually update the GL.iNet router's firmware through its Admin Panel.

- Troubleshooting: If you have issues, double-check all cable connections and ensure Bypass Mode is correctly enabled on the Starlink app. Restart both devices if necessary.

This setup allows you to leverage the advanced features of the GL.iNet GL-AXT1800, like VPN capabilities and better Wi-Fi management, with your Starlink Mini internet service.

Wavlink AC1200 Wi-Fi Extender to GL.iNet GL-AXT1800 Travel Router

The use of a Wi-Fi extender at a remote scene can be critical to provide access to both the Internet and VOIP calls. The Wavlink AC1200 when mounted on an antenna mast will provide wider coverage of Wi-Fi signals than either the travel router or the Starlink dish. The use case is dependent on your needs. For example, if you are at a remote location and are only stopping for a short time you probably will not need to set up this device. If you are setting up for a longer period, you will want this device setup. Several people can access the internet and not be in the immediate area of equipment operation.

Prerequisites:

- Your Starlink Mini is already set up and providing internet service to the travel router (Via the special connector on the SIAB case)
- Your GL.iNet GL-AXT1800 is already set up and providing a Wi-Fi network (as per the previous guide).
- Your WAVLINK AC1200 is powered on. You might need to consult its specific manual for initial power-up instructions.
- An Ethernet cable.

1. Connect via Ethernet:
   - Connect one end of the Ethernet cable to the designated LAN port on the SIAB case. NOTE THE PORTS ARE NOT INTERCHANGEABLE!

Figure 41 – Wavlink AC1200 Port

   - Connect the other end of the Ethernet cable to the LAN/Ethernet port on your WAVLINK AC1200. The WAVLINK AC1200 typically has a port that can function as either LAN or WAN depending on its operating mode. Since we're extending the GL.iNet' s network, we'll treat it as a LAN connection here.

2. Access the WAVLINK Configuration Page:
   - To configure the WAVLINK, you'll likely need to connect to its default Wi-Fi network or access it via a wired connection initially. Consult the WAVLINK AC1200's manual for its default Wi-Fi SSID (network name) and password, or its default IP address for wired access.
   - Via Wi-Fi: On your computer or phone, find the WAVLINK's default Wi-Fi network in your Wi-Fi list and connect to it.
   - Via Ethernet: If you're directly connected via the designated LAPTOP port on the SIAB case, open a web browser. You'll need to find the default IP address of the WAVLINK in its manual (it's often something like 192.168.10.1 or 192.168.0.1). Enter this IP address into your browser's address bar and press Enter.

3. Configure the WAVLINK as an Access Point (AP):
   - Once you access the WAVLINK's configuration page, you'll need to find the "Operating Mode" or similar setting.
   - Select Access Point (AP) mode. This tells the WAVLINK to extend the wired network from your GL.iNet and broadcast it wirelessly.
   - Configure Wireless Settings on the WAVLINK:

4. Look for the wireless configuration settings (often under "Wireless," "Wi-Fi," or similar).
   - Use the same Wi-Fi name (SSID) and password as your GL.iNet network: This creates a seamless roaming experience where your devices automatically connect to the stronger signal. Ensure the security settings (like WPA3/WPA2) match your GL.iNet. It's usually best to use different channels for the 2.4GHz and 5GHz bands on the two routers to avoid interference.
   - Create a new, distinct Wi-Fi name (SSID) and password for the WAVLINK: This will create a separate Wi-Fi network. You'll manually choose which network to connect your devices to. RECOMMENDED!
5. Save and Apply Settings:
   - After configuring the operating mode and wireless settings, click "Save," "Apply," or a similar button to save your changes. The WAVLINK will reboot.
6. Connect to the Extended Network:
   - Once the WAVLINK has restarted, you should be able to see and connect to the Wi-Fi network you configured on it. Devices connected to this network will now get their internet access through the GL.iNet GL-AXT1800.

Important Considerations:

- WAVLINK Manual: Always refer to the specific manual for your WAVLINK AC1200 model for detailed instructions on accessing the configuration page and its various settings, as the interface can vary.

- IP Addressing: When in AP mode, the WAVLINK will typically obtain its IP address automatically from the GL.iNet router via DHCP. You usually won't need to manually configure IP settings on the WAVLINK in this mode.
- Placement: Position the WAVLINK AC1200 in a location where it receives a good wired signal from the GL.iNet and provides the desired wireless coverage extension.
- Troubleshooting: If you have connectivity issues, double-check the Ethernet cable connection, ensure the WAVLINK is in AP mode, and verify the Wi-Fi settings on both devices. You might need to temporarily connect a computer directly to the WAVLINK to troubleshoot its configuration.

Grandstream HT802 2FXS VOIP Adapter Configuration

The Grandstream HT802 is the most complex piece of equipment to configure, and it is recommended you opt for the Vonage VOIP equivalent which works out of the box. With Vonage you would have to sign up for an account for a minimum of one year and pay a monthly fee which would provide you the device and a phone number. www.vonageforhome.com . The device they provide is the Grandstream HT802 however it is rebranded and locked.

Setting up the Grandstream HT802 will require a VOIP provider. The one I have been using for years is WWW.VOIP.MS and setting up an account is easy, and they have good pricing. This VOIP vendor also provides you with setup instructions for the Grandstream HT802. While the directions are most helpful a thorough knowledge of VOIP is beneficial. The advantage of using this provider is the monthly fee is somewhat smaller than other options however setting it up can be challenging.

The configuration steps below along with the relevant configuration documentation from VOIP.MS and the user and administrator manual from Grandstream will get you going.

Introduction

This manual outlines the steps to configure a Grandstream HandyTone 802 (HT802) Analog Telephone Adapter for use with VOIP.MS. The HT802 is a device that allows you to connect traditional analog phones to a VoIP (Voice over Internet Protocol) service.

Important Notes:

- These instructions are primarily based on HT802 firmware version 1.0.3.2. If your device has a different firmware version, some menus and settings might vary.
- The instructions assume the HT802 is in its factory default configuration and obtains an IP address dynamically from your router via DHCP. For static IP configuration, refer to the HT802 user manual.

- It is recommended to read each step completely before performing the action.

Prerequisites

- Starlink Mini has been connected to the SIAB hard case and is functioning
- The travel router is up and running in the SIAB case
- You have a laptop with a browser connected to the SIAB hard case laptop port
- Your HT802 device is connected in the SIAB hard case and is receiving power and is connected to the travel router or the 5-port switch.
- You have the HT802 User and Administration manuals as well as the VOIP.MS recommendations available to you.
- You have an analog phone which has been plugged into the POTS port on the SIAB hard case. (Plain Old Telephone Service)

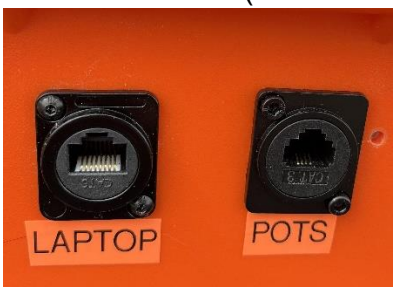

Figure 42 – Laptop/Post ports

1. Connecting the HT802
   - Connect the HT802 to your broadband internet router. (The specific connection details, including cables and ports, can be found in the "Getting Started" section of the Grandstream HT801/HT802 User Guide.)

2. Getting the HT802's IP Address

   - To configure the HT802, you'll need its IP address. You can obtain this through the HT802's interactive voice prompt menu using a connected analog phone, as described in the "Configuration Guide" of the Grandstream HT801/HT802 Administration Guide.

3. Accessing the HT802's Web Interface

   - Once you have the IP address, you can access the HT802's configuration interface by entering the IP address into a web browser.
   - You will need the appropriate login credentials to access the device's web interface. The "Configuration via Web Browser" section of the Grandstream HT801/HT802 User Guide provides details on accessing the web UI and managing access levels.

4. Configuring the FXS Port

- The most important part of the configuration is setting up the FXS port, where you connect your analog phone. This involves entering the VoIP.MS account credentials and server information.
- The "FXS Ports Pages Definitions" in the Grandstream HT801/HT802 Administration Guide provides detailed information on the specific settings.

5. Call Encryption (TLS/SRTP)

- For secure communication, you can configure TLS and SRTP. The "Call Encryption -TLS/SRTP" section in the VOIP.MS document and the "Advanced Settings Page Definitions" in the Grandstream HT801/HT802 Administration Guide will guide you through these settings.

6. Saving Changes

- After making the necessary configurations, ensure you save the changes within the HT802's web interface.

7. Preventing Direct IP Calls

- To enhance security and ensure calls are routed through VOIP.MS, it's recommended to prevent direct IP calls to your device. The VOIP.MS document provides specific settings to achieve this.

8. Auto Provisioning

- Some newer HT802 models might have auto-provisioning features that could overwrite your settings. You might need to disable this feature in the "Advanced Settings" to retain your VOIP.MS configuration.

Important Settings Locations:

- Grandstream HT801/HT802 Administration Guide: This document provides comprehensive details on various settings, particularly in the "Advanced Settings Page Definitions," "Status Page Definitions," "Basic Settings Page Definitions," and "FXS Ports Pages Definitions" sections.
- Grandstream HT801/HT802 User Guide: This guide offers valuable information on call features and basic operations.

Additional Resources:

- For Grandstream guides, you can refer to the links provided in the VOIP.MS document.
- VOIP.MS also offers YouTube tutorials for setting up various features.

- These instructions combines information from the Grandstream HT801/HT802 documentation and the VOIP.MS guide to provide a comprehensive setup process. Remember to consult the official documentation for detailed explanations of specific settings and troubleshooting.

Vonage 2-line analog phone adapter configuration (Alternate to the Grandstream device) EASY

If you have opted to use this service instead of the Grandstream HT802/VOIP.MS (as above) you will need to establish and account with Vonage Home and get their Analog to VOIP adapter first. NOTE the Vonage device is a Grandstream HT802 which has been rebranded and locked. It will fit in the same location as the Grandstream HT802 device and is wired the same.

Prerequisites

- Starlink Mini has been connected to the SIAB hard case and is functioning
- The travel router is up and running in the SIAB case
- Your Vonage device is connected in the SIAB hard case and is receiving power and is connected to the travel router or the 5-port switch..
- You have an analog phone which has been plug into the POTS port on the SIAB hard case. (Plain Old Telephone System)

Figure 43 – Laptop/POTS ports

What's in the Box:

- Vonage Two-Line Analog Phone Adapter
- Power Adapter
- Ethernet Cable
- Quick Start Guide (you're reading a version of it now!)
- Setup Steps:

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Connect Devices

- You will have already connected the Power, Ethernet Cable, and Analog phone cable when you built your SIAB
- Ensure that the power is on and you can peruse the internet.
- Connect the analog phone to the phone port on the SIAB box

Wait for Lights:

- The lights on the top of the Vonage adapter will start to blink.
- Wait until the POWER, INTERNET, and PHONE 1 lights are solid green. This indicates that the adapter has connected to the internet and is ready for use. This process may take a few minutes.
- That's it! You should have a dial tone and be able to send and receive telephone calls.

Troubleshooting Tips:

- No Power Light: Ensure the power adapter is securely plugged into both the adapter and the wall outlet. Try a different outlet.
- No Internet Light: Check that your router or modem is powered on and has an active internet connection. Make sure the Ethernet cable is securely connected to both the adapter and your network device.
- No Phone Lights: Ensure your phones are properly plugged into the PHONE 1 and/or PHONE 2 ports. Try using a different phone cable.
- Cannot Make Calls: Wait a few more minutes for the adapter to fully initialize. If the problem persists, try restarting your modem, router, and Vonage adapter (unplug them for a minute, then plug them back in).
- If you continue to experience issues, please refer to your full Vonage user manual or contact Vonage support for further assistance.

Final Thoughts

You will notice that there are only two free network ports open on the 5-port switch. If you need more RJ45 ports think about adding a larger switch and thus you will need a bigger case. Equipment and technology are always progressing, and future upgrades may include a Travel Router that also supports Cellular internet and external antennas although this get expensive as this is self-funded. Other thoughts are to add a full-fledged PBX system running off of a SBC using Incredible PBX which would allow you to run a number of VOIP telephones.

Appendix

May 2025

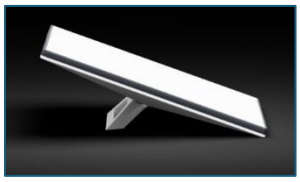
Appendix Parts List

This is a list with links of the major parts that went into putting together a kit that allows the user to have an on-the-go complete Starlink mini kit that includes all the components to be self-sufficient except for an external source of power. This kit requires power from 12-13.8 volts which is available through most automotive accessory ports. An AC to DC power supply has been included to allow the use to plug into a wall or generator outlet. The links are current on the day this is published however links, prices, and technology does change. The document will be updated, when possible, with changes.

Starlink Purchases

While the Starlink company does offer several options for the Starlink Mini other options for mounting and powering the dish are available from other vendors.

Starlink Mini



Link: https://www.starlink.com/us

Directions: You will need to create and account and enter your service address. Once created the cost of the mini is currently $499 (Feb/25). Further directions are at the beginning of this document.

Starlink Pipe Adapter

Link: https://www.starlink.com/us

This is needed to mount the Starlink Mini on the tripod. You will need to order this when you order your Starlink Mini. About $30

Other Components

Tripod

A tripod allows for flexible mounting on uneven terrain while keeping the dish off the ground. While a flat surface mount comes with the dish you will need to attach the Pipe adapter to be able to mount the dish on this tripod. Note. This tripod is sturdy enough to mount a type 2 or 3 dish on! This is the 25.6-inch version and is about $40.

Link: https://www.amazon.com/dp/B0CXDGXR54?ref=ppx_yo2ov_dt_b_product_details&th=1

Hard Case

This hard case was selected as the Starlink Mini fits perfectly in the lid and the rest of the equipment fits in the bottom half (except for the Tripod). The case was sourced from Harbor Freight and was about $40.

Link:

https://www.harborfreight.com/3800-weatherproof-protective-case-large-orange-56766.html

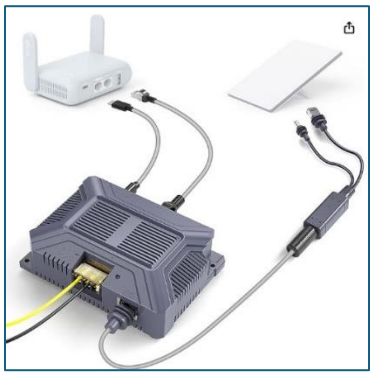
Travel Router

This is an essential addon to make the dish more flexible. Unfortunately, the dish is limited in the number of connections and only has a single network port. The addition of this travel router allows for better control of who connects via wifi as well as providing 2 hardwire ports one of which is dedicated to the unmanaged switch which provides another 4 hardwire ports. In our build we reserve the extra router port for our ATA adapter which provides a VOIP <> POTS line capable of both voice and fax calls. Note this extra feature is not covered in this document. The cost is about $113.

Link: https://www.amazon.com/dp/B0B2J7WSDK?ref=ppx_yo2ov_dt_b_product_details&th=1

Starlink Mini 12 Volt Adapter Kit.

This is the unifying piece of equipment that allows you to power the Starlink Mini from a car, ac to dc power supply, or a 12 volt battery. This device converts 12vdc to 48volts DC and combines both the Power and Network lines into a single cable. This allows you to run a single network cable to your dish which provides both power and data. Since the device produces a higher voltage than 12 volts you can use a longer run of cable. This allows you to mount your dish outside and run a single cable into your area. This device has a single network out port which runs to the travel router. Price is about $144



Link: https://www.amazon.com/dp/B0DM5JH4QX?ref=ppx_yo2ov_dt_b_fed_asin_title

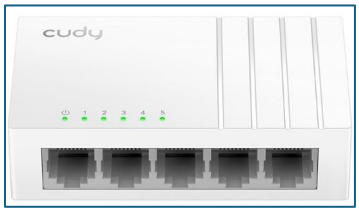
Network Cable

We chose an Outdoor Cat 6 type cable to run between the 12 volt adapter system and the dish. A forty-foot cable was chosen and works great. Longer runs of cable may work although at the time of writing this has not been tested. Note as with all solid core wiring repeated movement of the cables will eventually cause them to break. This piece of equipment should be considered as a consumable. While stranded network cable exists there is significant signal degradation over twenty feet. The cost is about $13

Link: https://www.amazon.com/dp/B0D9S4RCXM?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

5 Port Gigabit Ethernet Switch powered by USB-C

This small device expands your system and allow for the use of 4 additional hardwired network ports. This feature allows for greater throughput than Wi-Fi alone. This switch is unshielded however this does not appear to be a problem; however, your mileage may vary. There is almost enough room in the case to put in a multiport switch without increasing the size of the case. The price for this device is about $14



Link: https://www.amazon.com/dp/B0DLNBKG9C?ref=ppx_yo2ov_dt_b_fed_asin_title

12 Volt 15 Amp Auxiliary Power Plug and Cable

This cable allows you to plug into a car accessory port to get power from the car battery. Commonly known as a lighter adapter plug this will provide power to the Starlink Mini System. Price is about $13

Link: https://www.amazon.com/dp/B01MRPKPPG?ref=ppx_yo2ov_dt_b_fed_asin_title

12/24V to 5V 6A USB-C power supply

This product takes external power and converts it to regulated 5vdc which is required to power the Travel Router and the ethernet switch. This is wired into a 12vdc fuse block. Price is about $13

Link: https://www.amazon.com/dp/B0BCP86XPY?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

AC to DC Power Supply

This product provides regulated 12 VDC via an automotive plug. The power cord above is plugged into this and then 12 volts travels to the fuse block inside the case. The other end of the power supply contains a standard AC plug which can be plugged into the wall or a generator. Price is about $21.

Link: https://www.amazon.com/dp/B092ZJ5YS2?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

12 Volt Fuse Block

This provides several fuses so that 12-volt power can be distributed in the case safely. 3 out of the 6 fuses are used which allows for future expansion. Price is about $12

Link:
https://www.amazon.com/dp/B08XWQHMZJ?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_2&th=1

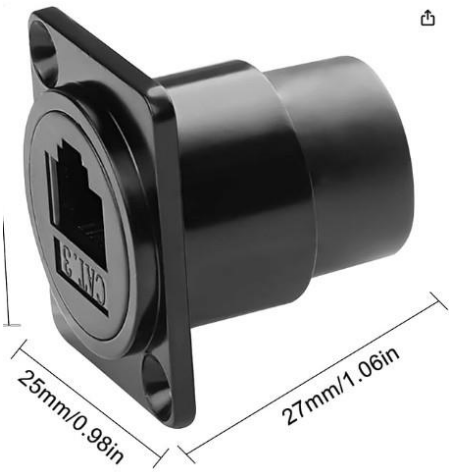
RJ45 Pass-Through Connector

This connector allows the 40-foot network cable to be plugged in externally to the carrying case. This would allow the case to be closed during operation if needed. Inside the case a short 12” cat 6 network patch cable attaches between it and the Starlink Mini Adapter kit. Optionally you could add several more of these to the exterior of the case and allow all the extra network ports to be plugged in while the system is in operation. Price is about $26

Link: https://www.amazon.com/dp/B0BP66NC9B?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_1&th=1

RJ11 Pass-Through Connector

This connector allows POTS (Telephone connection) from the Grandstream/Vonage FXS adapter to connect externally to an analog telephone or fax machine. About $12



Link: https://www.amazon.com/dp/B0D17PPFZF?ref=ppx_yo2ov_dt_b_fed_asin_title

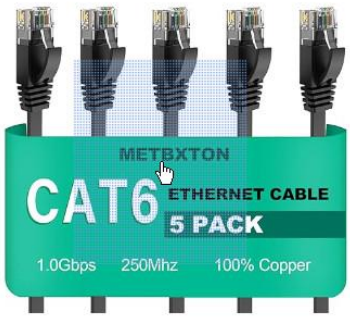
DC 2 Pin Connector Waterproof Pass-Through Connector

This connector is used to pass 12 VDC from outside of the carrying case internally. This is a 2 part system which includes a Male connector that attaches to the Auxiliary Power Plug and a Female connector that mounts on the carrying case. The power is routed from the Female plug via a fuse to the fuse block. Price is about $33

Link:
https://www.amazon.com/dp/B09T91QC7D?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_8&th=1

Cat 6 Patch Cables 1 Foot

Several of these cables will be required internally to make the requisite connections between the Starlink Mini Adapter, Travel Router, and network switch. This comes in a pack of 5 and the price is about $7



Link: https://www.amazon.com/dp/B0CFR2WNQ2?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

Optional 12 V Lighter Socket

This connector is used to provide 12 Volt power out of the system, and it allows you to power other accessories. In our case we power a satellite phone from this plug. This connects internally to the fuse block. Price is about $9

Link: https://www.amazon.com/dp/B07BQ1JYTX?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_8&th=1

USB C to Micro USB Cable

This is an adapter cable which will provide power to the option Grandstream/Vonage FXO device. A pack of 2 is about $7

Link: https://www.amazon.com/dp/B0DGSY1VDT?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

RJ11 Cable M/M

This cable provides connectivity from the Grandstream/Vonage FXO device to the RJ11 Passthrough connector. Carries POTS signals to the exterior of carrying Case. Pack of 3 is about $8.

Link: https://www.amazon.com/dp/B0B8XP2C9H?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

Grandstream FXO Device (Can also use Vonage Device)

This device provides an analog FXO port that allows for an analog phone or fax to be plugged in. Vonage uses a branded version of this device which is plug and go for a monthly fee and it works out of the box. The Grandstream device is not tied to any provider so you can shop around for a VOIP provider that supports T38 if you are going to send faxes over the system. The down side of the Grandstream is you will need some technical expertise to set it up and connect to a VOIP provider. There is a monthly fee and usage fee from VOIP providers. I recommend you choose the Vonage version for a monthly fee (about $16 and then gives you unlimited minutes) The Grandstream FXO device is about $42. Vonage usually does not charge for their FXO device.

Link: https://www.amazon.com/dp/B01JH7MYKA?ref=ppx_yo2ov_dt_b_fed_asin_title

Analog Telephone (for Grandstream/Vonage device)

This device is an analog phone and connects to the Grandstream/Vonage adapter to provide audio service both inbound and outbound telephone calls. This phone was chosen for simplicity. About $40

Link: https://www.amazon.com/dp/B00FQICVWQ?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_3&th=1

Electronic Organizer Case

This is used to house the telephone, Ac to Dc Power Supply, and extra network cables. Space is tight in the recommend hard case, so an external case was chosen. This case connects to the SIAB case cia a clamp and would be deployed with the SIAB. About $14

Link: https://www.amazon.com/dp/B07T1QX3DP?ref=ppx_yo2ov_dt_b_fed_asin_title

Optional Equipment

There are several optional components that are recommended to enhance SIAB. These options enhance the coverage of Wi-Fi by using a high-power weatherproof Wi-Fi long range extender mounted on a pole. This will expand your Wi-Fi coverage enormously from either the Starlink Mini or Travel Routers built in Wi-Fi systems. The downside is this will use more power which should be a consideration when running off battery.

12 to 24 volts Step Up power supply

This device creates 24 volts that is required by the Wavlink Wi-Fi Extender. Power is injected over an ethernet cable which powers remote devices via the POE injector that comes with the Wavlink device. NOTE I have tried several passive 24-volt POE injectors and the only one that worked for me it the one included with the Wavlink Wi-Fi Extender. This device requires a 24-volt input applied from an external source. Cost is $17

Link: https://www.amazon.com/dp/B01EFUHFW6?ref=ppx_yo2ov_dt_b_fed_asin_title&th=1

Wavlink High-Power Wi-Fi Long-Range Extender

This device takes ethernet and power over a single cable and provides enhanced (longer distance) Wi-Fi signals. This device will need to be mounted as high as possible. If for field use a suggestion is a Flagpole that is Tire mounted, and the device be mounted and raised as high as possible. This device costs about $60. You will need an extra Cat 6 outdoor rather network cable like the one mentioned earlier I would recommend a 50-foot cable. You will also need a 1 foot Cat 6 Patch cable rounded style to connect from the POE to the external RJ45 Port. The POE injector has a cable limit of under 100 feet. Note there is some configuration required for both the travel router and the Wi-Fi extender, so they work together. About $118

Link: https://www.amazon.com/dp/B082FW54WK?ref=ppx_yo2ov_dt_b_fed_asin_title

Antenna Mast

To get peak performance from the Wi-Fi extender it should be mounted as high as is practical to provide the greatest coverage. A common way of accomplishing this for portable temporary operation is to use a Flagpole Tire Mount with some repurposed antenna masts. About 13$ for each 4-foot section. One end of each pole is “swedged” to allow it to fit in another section. I use 3 of these to provide 12 feet of elevation. Best price seems to be local pickup at an ACE hardware. I also added a Meshtastic device near the top to provide encrypted text services on cell phones locally. (That is in a different manual!)

Link: https://www.acehardware.com/departments/lighting-and-electrical/home-electronics/television-antennas/3366697

Flagpole Mount for Wi-Fi Extender

This device provides a solid base for a freestanding antenna pole. You simply drive over it with a vehicle and then insert your antenna mast with the Wi-Fi extender already attached. The mast inserts into the mount, and you tighten the screws. About $39

Link: Search on Amazon for “Flagpole Tire Mount, Portable Metal Flag Pole Wheel Stand Tailgate Tire Mount Flagpole Holder”

Miscellaneous Components and Tools

A well-stocked electronics/electrical shop will have most of what is needed. I have included some additional materials/tools that are needed to construct the kit. This kit is a prototype and version 2 may have some changes or updates eventually.

- 14-gauge copper wire red and black for connecting to the power pass through connector going to the fuse block.
- Drill with bits of various sizes
- Hole saw kit to make holes for the various connectors.
- Tie wraps I used the type that allows it to be screwed to the case
- Nut and bolt assortment. I used a metric screw kit. https://www.amazon.com/dp/B0D1KQCBMT?ref_=ppx_hzsearch_conn_dt_b_fed_asin_title_1&th=1 about $22
- Soldering iron and solder. Only needed to solder the power wires to the pass-through connector.
- Various Panduit connectors – These are used to connect wires to the fuse block. Look on amazon for haisstronica 260PCS Marine Grade Heat Shrink Ring Connectors-Heat Shrink Wire Connectors Tinned Red Copper About 27$
- VHB Dual Lock Tape. Used to secure Router, Ethernet Switch, and Grandstream/Vonage Analog/VOIP device 1” x 10 Feet about $24
- 2” Velcro to make the strap that holds the Starlink Mini to the lid of the carrying case.
- Side Cutters, Wire Strippers, Screwdrivers, Pliers, etc.

Parts Order

Once you have decided on the Starlink Mini and have signed up for a plan the waiting begins for delivery of your hardware from Starlink. In the interim you can order the parts needed to assemble this project. A complete list of hardware requirements including links is contained in the Appendix. A simple parts list is below.

Item Description	Quantity	Cost*	Ordered
Starlink Mini Kit	1	499	
Starlink Mini Pipe Adapter	1	30	
Tripod	1	40	
Hard Case	1	40	
Travel Router	1	113	
Starlink Mini 12 Volt Adapter Kit	1	144	
Cat 6 Outdoor Network Cable 40’ (Starlink)	1	13	
5 Port Gigabit Ethernet Switch	1	14	
12 Volt 15 Amp Auxiliary Power Cable	1	13	
12/24V to 5V 6A USB-C power supply	1	13	
AC to DC power supply	1	21	
12 Volt Fuse Block	1	12	
RJ45 Pass Through connector (5 connectors)	1	26	
RJ11 Pass Through connector (2 Connectors)	1	12	
DC 2 Pin Power Connector Pass Through (2 sets M/F)	1	33	
Cat 6 Patch Cables (5 Cables)	1	7	
USB C to Micro USB Cable (2 Cables)	1	7	
RJ11 M/M cable (3 cables)	1	8	
Grandstream FXO Device (Alternate Vonage zero cost)	1	42	
Analog Telephone	1	40	
Analog Telephone & external AC/DC converter Case	1	14	
Wavlink AC1200 Wi-Fi range extender	1	120	
12-to-24-volt boost power supply	1	17	
Cat 6 Outdoor Network Cable 50’ (Wi-Fi Booster)	1	14	
Antenna mast (RCA 4’)	3	14	
Flagpole Mount for Wi-Fi Extender	1	39	

***Approximate! Subject to change!**