# Providing Backup Communications Capability During Emergencies

Submitted to the Philipsburg Borough Council
by the Philipsburg Amateur Radio Association
October 28, 2022

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# Project Description

The Philipsburg Amateur Radio Association (PARA) is seeking a grant to create an **Emergency Communications Station** in the Philipsburg American Legion Post #437 and an **Emergency Communications Team** consisting of trained volunteers.

Our mission is identical to that of the PEMA Auxiliary Communications Service (ACS):

> "…to be a redundant communications resource, ready to enhance or assume emergency communications duties for governmental agencies (county, regional, state, and federal) during times of actual or potential disaster, or when normal communications are either unavailable or are unable to adequately transfer the traffic as needed."
>
> https://www.pema.pa.gov/Response/Auxiliary-Communications/Pages/default.aspx

## PARA EmComm Station

The station will be activated in response to a natural disaster or at any time when ordinary means of communication are unavailable. It will be capable of communicating with the Clearfield and Centre County 911 centers, the National Weather Service office at University Park, PEMA headquarters in Harrisburg, and individual radio operators at field locations assisting the Red Cross, the Salvation Army, and other agencies.

## PARA EmComm Team

During an emergency, the PARA EmComm Station will typically be staffed by team members who live in or near Philipsburg Borough. Team members living elsewhere in Centre and Clearfield counties will activate their own private Amateur/GMRS stations to enhance the team's overall effectiveness and reach.

### Basic Requirements

- Have a willingness to serve and be at least 18 years of age.
- Complete the team's required training program.
- Complete FEMA's online Incident Command System courses ICS 100, ICS 200, IS 700, and IS 800 during the first year of service.
- Obtain an Amateur Radio Operators license and/or a GMRS license during the first year of service.
- Successfully pass a background check.
- Sign a Volunteer Service Agreement and Code of Ethics.
- Participate in at least one Simulated Emergency Test per year.

# Statement of Need

Modern cell phone and internet services are widely available and very reliable in most places, most of the time. So you might be wondering why anyone would ever need radios to communicate.

**Cell Towers Require Electrical Power**

When utility power is unavailable, cell towers switch to battery backup power. Service providers do not publish information on battery capacity, but discussions in online forums give the impression that a typical cell tower has enough battery capacity to operate for four to eight hours. Some towers are also equipped with generators that could probably supply power for several days without refueling. During a blizzard, fuel trucks may have difficulty navigating snow-clogged or icy roads to reach cell towers located at the tops of hills or mountains. The PARA repeaters are not immune to these issues, but our volunteer members have generators and four-wheel drive vehicles, and our community is our top priority.

**Cell Towers Have Limited Capacity**

In the hours and days following a major event such as an earthquake or a terrorist attack, the number of phone calls being attempted can exceed the capacity of cell towers, preventing you from getting a connection.

**Land Line Phone Service is in Decline**

In recent years, as cell phones have become more popular, increasing numbers of people are eliminating their land line phones. Some land line service providers may cut back on preventative maintenance such as tree trimming due to limited funds. This leaves phone lines susceptible to weather events such as ice storms.

**Power and Communication Infrastructure is Vulnerable to Malicious Attack**

We are living through a time of political instability and social unrest. Malicious attacks upon public buildings and public infrastructure, in this country and abroad, are becoming increasingly common. In the event of a communications blackout, radio communications may be the only way for a community to maintain awareness of regional, state, national, and international events.

# Organizational Background

The Philipsburg Amateur Radio Association (PARA) was organized in 1992 for the purposes of learning, experimentation, and the sharing of knowledge related to amateur radio, with an emphasis on community service and emergency communications.

## 501(c)(3) Status

PARA has completed all of the steps necessary to apply for 501(c)(3) status. Our membership will vote on whether to approve payment of the $275 application fee at our Nov 12 meeting. As soon as the expenditure is approved, a completed 1023-EZ form will be submitted. It is our understanding that 501(c)(3) status is typically granted within two to four weeks after the application is received.

## Membership

The Association currently has thirty full members and two associate members. Full membership is offered to persons who have studied and passed an examination to earn an amateur radio license from the Federal Communications Commission (FCC). Associate membership is offered to any person who does not hold an amateur radio license. Associate members can participate in all club activities except for voting and holding office.

## Activities

Weekly radio meetings ("nets") take place on two of the club's radio repeaters for the purpose of ensuring that the repeaters and everyone's personal radio equipment is in working order.

Weekly roundtable discussions take place online via Zoom. Members share ideas, ask and answer technical questions, and discuss personal or club projects.

Monthly business meetings are held in a meeting room on the second floor of the American Legion Post #437 in Philipsburg. Each meeting is followed by an educational presentation delivered by a PARA member or a guest speaker who has knowledge of a specific topic related to radio communication.

## Community Service

### Radio Support for Charity Events

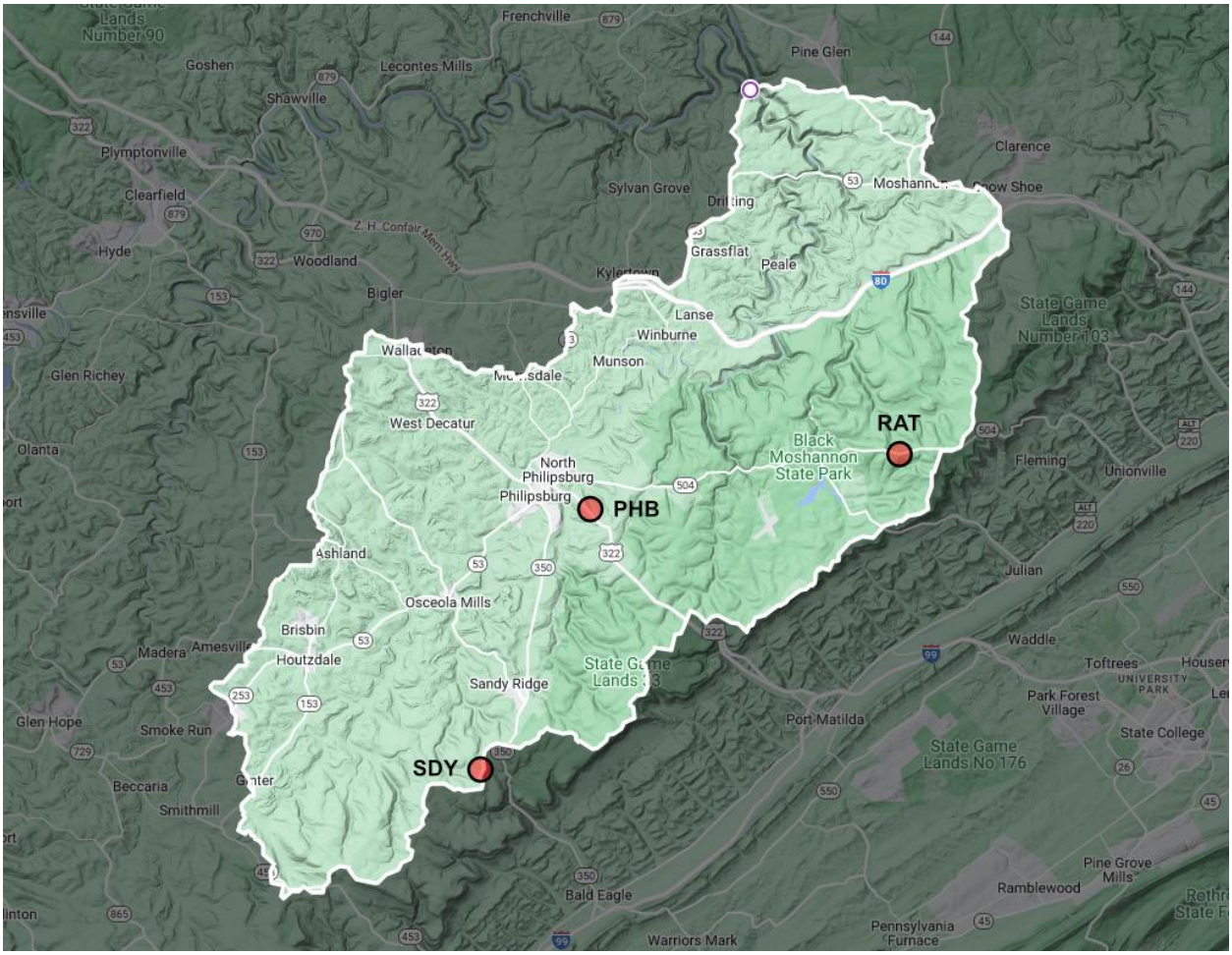
PARA volunteers provide radio communications for annual charity fundraising events, such as the YMCA 5K/10K Walk/Run and the PEC Public Lands Ride, which are held near Black Moshannon Park where cell phone coverage is spotty at best.

### Promoting Emergency Preparedness

PARA maintains the mvrn.org website which helps ordinary citizens who are concerned about emergency preparedness to get started with GMRS radios and learn how to communicate with other citizens of the Moshannon Valley.

## Radio Repeaters

PARA volunteers have funded and constructed a network of radio repeaters located near the Rattlesnake and Sandy Ridge fire towers and near Philipsburg Borough. The repeaters continually listen for weak signals and instantly retransmit them with greater power from a higher elevation so they can be heard over a much wider coverage area. The repeaters can be utilized at any time, free of charge, by properly-licensed individuals for noncommercial purposes.




Map of the Moshannon Creek watershed showing PARA repeater sites at Philipsburg, Rattlesnake, and Sandy Ridge

## Philipsburg Repeater Site

Two repeaters serving Philipsburg Borough are currently located at a PARA member's home in North Philipsburg. They provide coverage to Philipsburg, South Philipsburg, North Philipsburg, Chester Hill, and Hawk Run.

**Rush Township Funding Request**

PARA has developed a plan to migrate the repeaters to the Centre County District Court building at 118 Enterprise Drive. The plan includes construction of a 40-foot radio tower which would significantly enhance the coverage of the repeaters. Centre County government officials, including the Centre County Administrator and the 911 Director, have responded favorably to this plan. The plan has been approved by the Rush Township engineer and building inspector. We have applied to Rush Township for ARPA funding in the amount of $10,000 for the purpose of erecting the radio tower and building an enclosure for the radio repeaters.

GMRS repeater at North Philipsburg

## Rattlesnake Repeater Site

PARA members maintain three repeaters at a tower site owned by the Centre County government and located near the Rattlesnake Fire Tower. These mountaintop repeaters provide good coverage of western Centre County and eastern Clearfield County.

UHF, VHF, and GMRS repeaters

100-foot radio tower

Repeater shed, generator, and propane tank

## Sandy Ridge Repeater Site

One PARA members maintains a GMRS repeater at a commercial radio tower site located near the Sandy Ridge Fire Tower.  This repeater provides GMRS coverage to Sandy Ridge, Houtzdale, Brisbin, Ginter, and Osceola Mills.

Radio tower at Sandy Ridge

# Project Budget

## Option 1 - Basic EmComm Station

Provides essential communications during an emergency with a two-day supply of battery backup power.

| Subsystem | Description | Purpose | Cost |
|---|---|---|---|
| A | Power and Lighting | A power supply and batteries to provide 12V DC power to all radio equipment and room lights with sufficient backup capacity to handle a two-day power outage. For longer power outages, a Solar Charging subsystem is recommended (see below). | 1,647.91 |
| B | Station Grounding | Ensure proper grounding of antennas and equipment for the safety of the structure and all personnel. | 524.36 |
| C | VHF/UHF Communications | Communicate with Clearfield and Centre County 911 centers, NWS, PEMA, and PARA EmComm team members operating home stations or assisting Red Cross, Salvation Army, and local officials in the field. | 1017.92 |
| | | **Complete station price:** | **3,190.19** |

## Option 2 - Well-Equipped Station

A basic EmComm station plus GMRS Communications and Frequency Scanning.

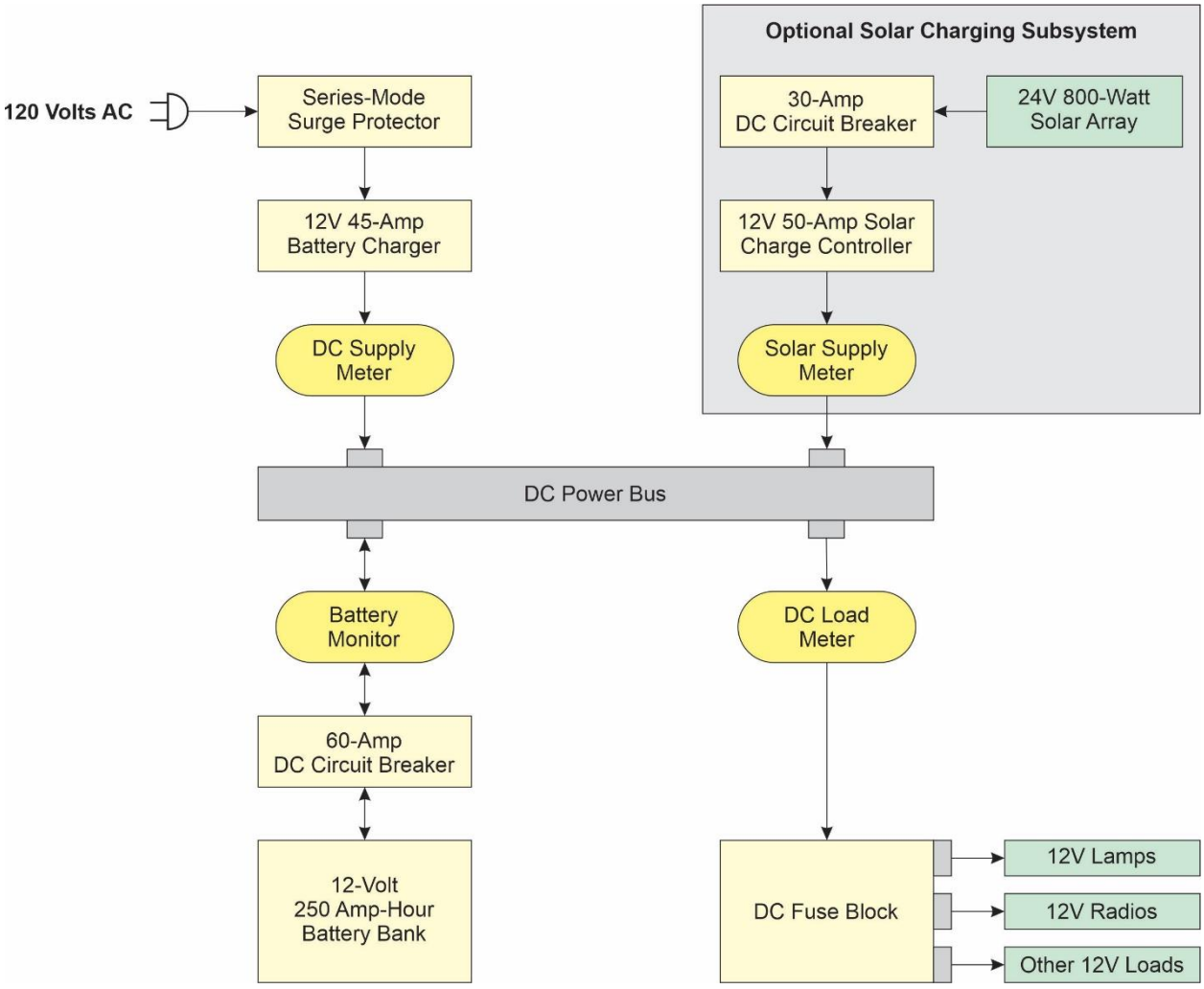
| Subsystem | Description | Purpose | Cost |
|---|---|---|---|
| A-C | Basic EmComm Station | (see above) | 3,190.19 |
| D | GMRS Communications | Communicate with residents of the Moshannon Valley through our network of GMRS repeaters located at Rattlesnake, Philipsburg, and Sandy Ridge. | 538.97 |
| E | Frequency Scanning | Maintain situational awareness by monitoring Centre and Clearfield County EMS/Fire/Police as well as Commercial Aviation (air-to-air and air-to-ground). Receive severe weather alerts. | 476.54 |
| | | **Complete station price:** | **4,205.70** |

## Option 3 - Fully-Equipped Station

A well-equipped station plus Solar Charging.

| Subsystem | Description | Purpose | Cost |
|---|---|---|---|
| A-E | Well-Equipped Station | (see above) | 4,205.70 |
| F | Solar Charging | Automatically recharge the battery bank whenever the sun is shining to enable continuous operation during an extended power outage without the need for a generator and fuel. | 1,663.34 |
| | | **Complete station price:** | **5,869.04** |

# Subsystem A - Power and Lighting



# Objectives

The power and lighting subsystem provides clean, battery-backed 12V electrical power to all radio equipment and interior lighting so that the EmComm station can continue to operate during an electrical power outage.

# Design Considerations

**Surge Protector**

During an electrical storm, the surge protector will protect the radio equipment from damage due to voltage spikes on the building's 120 volt AC power line. Unlike most surge protectors, the SurgeX product is designed to withstand thousands of surges without needing to be replaced.

**12-Volt Operation**

All essential equipment in the EmComm station will operate on 12-volt DC battery power so that it will keep working in the event of a power outage. This avoids the need for DC-to-AC inverters which waste energy and sometimes interfere with radio communications.

**Power Supply / Battery Charger**

The power supply / battery charger supplies the station with 12V DC power whenever AC power is available. It also keeps the batteries fully charged so they are always ready for use during a power outage.

**Battery Capacity**

Two AGM deep-cycle batteries will provide up to 3,000 watt-hours of electrical energy during a power outage. That is sufficient to supply the station with 120 watts of power for up to 24 hours, or 60 watts of power for up to 48 hours.

The station's average power usage will largely depend upon the amount of transmitting that is done. Most radios require only a few watts of power when receiving signals, but require much more power when transmitting. Station operators can conserve power by keeping transmissions brief.

During a power outage lasting more than one day, an EmComm team member could bring a 1000-watt or larger gasoline generator to the site for the purpose of recharging the batteries. If the batteries are 50% discharged, about three hours would be required to recharge them.

**Efficient LED Lighting**

12-volt LED lamps will illuminate the station while operating on battery power.

**Instrumentation**

Battery, source, and load meters allow station operators to monitor the inflow and outflow of energy and the state of charge of the battery bank to ensure that limited energy is used efficiently.

## Bill of Materials – Power and Lighting

| Brand | Part No | Description | Qty | Vendor | Unit Price | Extd Amount |
|---|---|---|---|---|---|---|
| Victron Energy | AGM 12-125 | 125 amp-hour Super Cycle AGM battery | 2 | Inverters-R-Us | 412.25 | 824.50 |
| SurgeX | SA-20 | 20-amp surge protector (used) | 1 | eBay | 200.00 | 200.00 |
| Iota | DLS-45/IQ4 | 12V 45A regulated battery charger w. IQ4 | 1 | Northern Arizona Wind & Sun | 174.08 | 174.08 |
| | | 12V LED lighting fixtures | 2 | | 50.00 | 100.00 |
| | | Battery cables + terminals | | | 50.00 | 50.00 |
| | | Aluminum control panel | 1 | TD Fabrication | 50.00 | 50.00 |
| Morning Group | B094RHQKMB | Battery monitor | 2 | Amazon | 19.99 | 39.98 |
| Blue Sea Systems | B001P6FTHC | DC fuse block | 1 | Amazon | 38.03 | 38.03 |
| Bayite | B013PKYILS | DC energy meter | 2 | Amazon | 17.99 | 35.98 |
| | B07TN3RLYZ | DIN rail jumper kit | 1 | Amazon | 29.99 | 29.99 |
| Ouffun | B09PDBWWDR | USB charging port (pair) | 1 | Amazon | 23.38 | 23.38 |
| CHTAIXI | TXC65Z-60-B60 | 60-amp DC circuit breaker | 2 | Amazon | 10.99 | 21.98 |
| Intl. Connector | D357A11-305(2) | 12” DIN rail (pair) | 1 | Amazon | 9.99 | 9.99 |
| | | Shipping and incidentals | | | | 50.00 |
| | | | | | **Total:** | **1647.91** |

# Subsystem B - Station Grounding

## Objectives

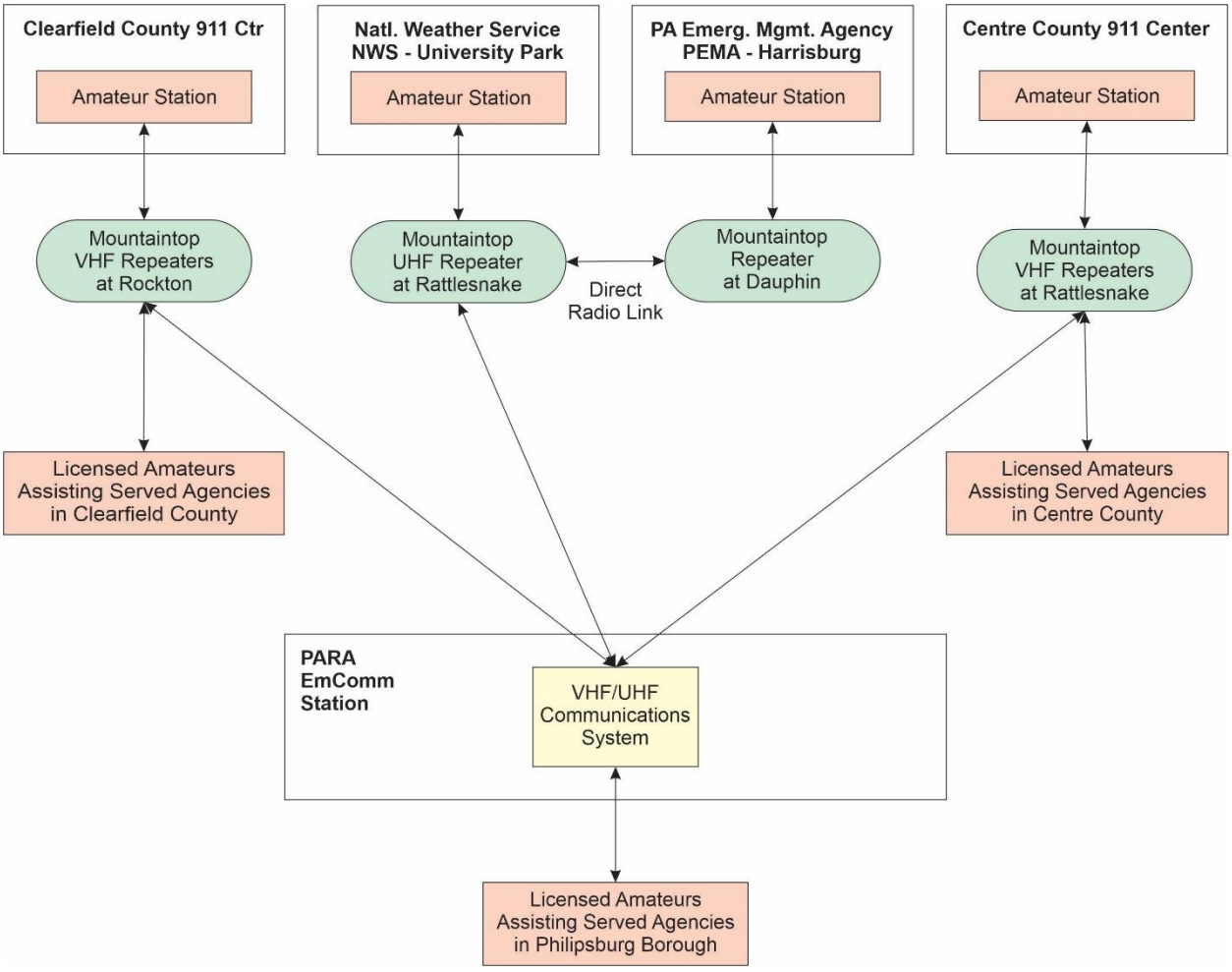
Proper station grounding is needed to ensure that all equipment and personnel are protected from brief voltage surges that can appear on the antenna feed lines and the building's electrical wiring during electrical storms.

Heavy bare-copper wire will connect the individual antenna feed lines and lightning arresters directly to the building's existing ground rods at the meter box. Additional ground rods located closer to the antennas provide additional protection.

## Bill of Materials – Station Grounding

| Brand | Part No | Description | Qty | Vendor | Unit Price | Extd Amount |
|---|---|---|---|---|---|---|
| | | #4 bare copper ground wire (ft) | 150 | Philipsburg Electric | 1.25 | 187.50 |
| CommScope | 252134 | 4-in cable entry panel | 1 | RF Parts Co. | 59.91 | 59.91 |
| | | Lightning arrester panel | 1 | TD Fabrication | 50.00 | 50.00 |
| | | 8-ft x 5/8" copper plated ground rods | 2 | Philipsburg Electric | 20.00 | 40.00 |
| CommScope | IZYBA4-38-4 | 4-in cable entry boot (3 holes 3/8" for LMR400) | 1 | RF Parts Co. | 24.95 | 24.95 |
| | | Ground rod clamps | 2 | Philipsburg Electric | 3.00 | 6.00 |
| | | Copper split bolts | 2 | Philipsburg Electric | 3.00 | 6.00 |
| | | Electrical inspection | | | | 100.00 |
| | | Shipping and incidentals | | | | 50.00 |
| | | | | | **Total:** | **524.36** |

# Subsystem C – VHF/UHF Communications




## Objectives

The VHF and UHF bands provide the most reliable and widely-used means of regional communication among amateur radio stations. Virtually all licensed amateurs assisting served agencies in Clearfield and Centre Counties, including Philipsburg Borough, will be capable of operating on VHF and UHF.

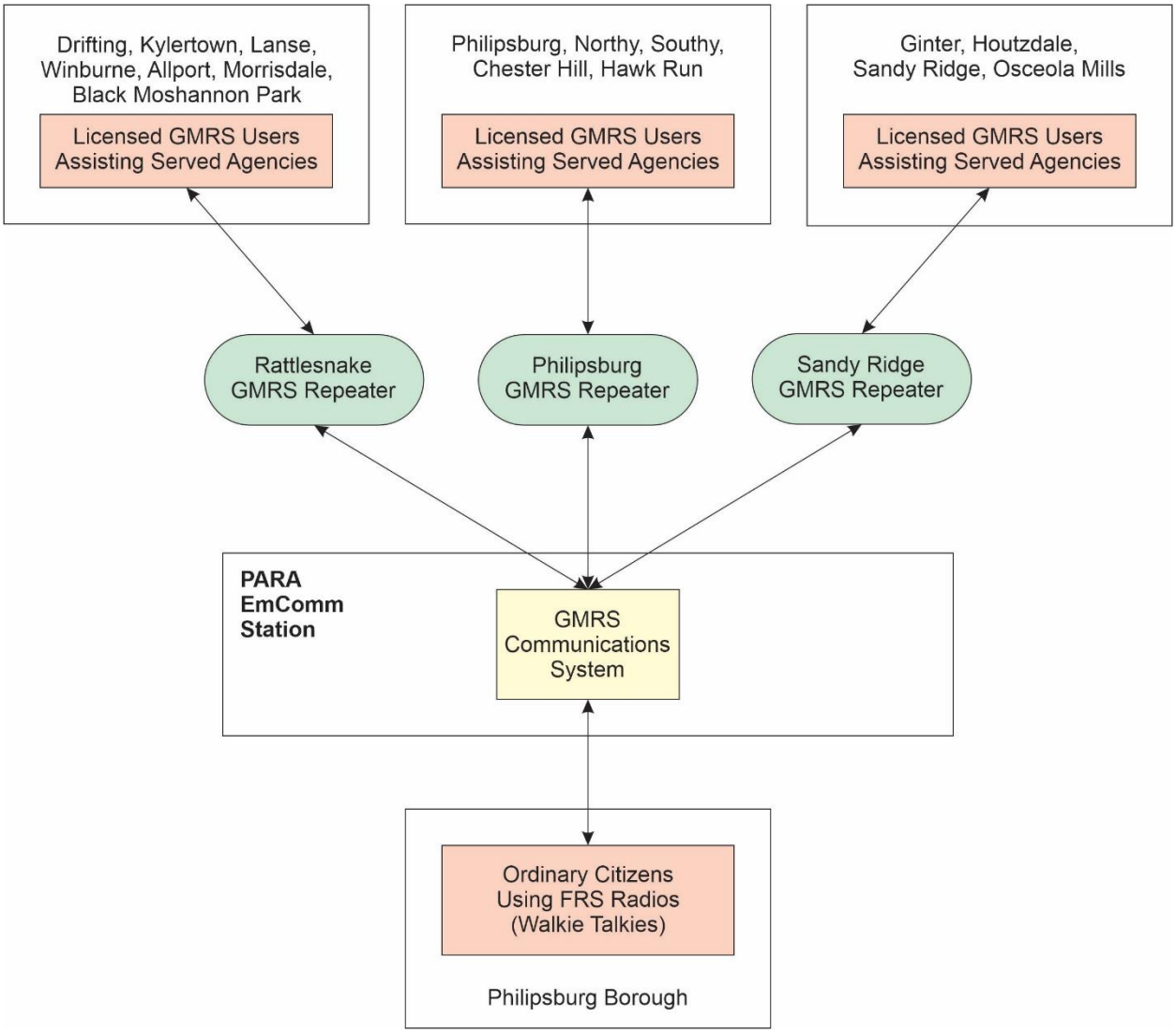
VHF/UHF communications will allow the PARA EmComm Station to communicate with similar EmComm stations in the following facilities:

- Clearfield County 911 Center
- Centre County 911 Center
- Mount Nittany Regional Medical Center
- National Weather Service Office at University Park
- PEMA Headquarters in Harrisburg

## Bill of Materials – VHF/UHF Communications

| Brand | Part No | Description | Qty | Vendor | Unit Price | Extd Amount |
|---|---|---|---|---|---|---|
| ICOM | IC-2730A | VHF/UHF radio transceiver | 1 | DX Engineering | 309.95 | 309.95 |
| Comet | GP-6 | Dual-band base station antenna | 1 | DX Engineering | 289.99 | 289.99 |
| Rohn | TRT60 | Roof tripod | 1 | DX Engineering | 122.99 | 122.99 |
| PolyPhaser | IS-B50HN-C2 | Lightning arrester | 1 | DX Engineering | 99.99 | 99.99 |
| Times Microwave | LMR-400-FOOT | LMR-400 coaxial cable (ft) | 75 | Field Components | 1.28 | 96.00 |
| RT Systems | | Radio programming software | 1 | RT Systems | 49.00 | 49.00 |
| | | Shipping and incidentals | | | | 50.00 |
| | | | | | **Total:** | **1017.92** |

# Subsystem D - GMRS Communications




# Objectives

**Local Communication for Nontechnical People**

GMRS communications provide an effective way for local officials to communicate with one another and with members of the community when normal means of communication are unavailable. Messages transmitted on a GMRS channel can be heard by anyone who owns a GMRS radio, an FRS walkie-talkie, or a police scanner.

Any citizen can obtain a GMRS license from the FCC at a cost of $35. No test is required. The license covers every member of the person's family and is valid for ten years. A good-quality pair of handheld GMRS radios can be purchased for $65, so a person can get started with GMRS for about a hundred dollars.

A pair of good-quality handheld GMRS radios costing about $65.

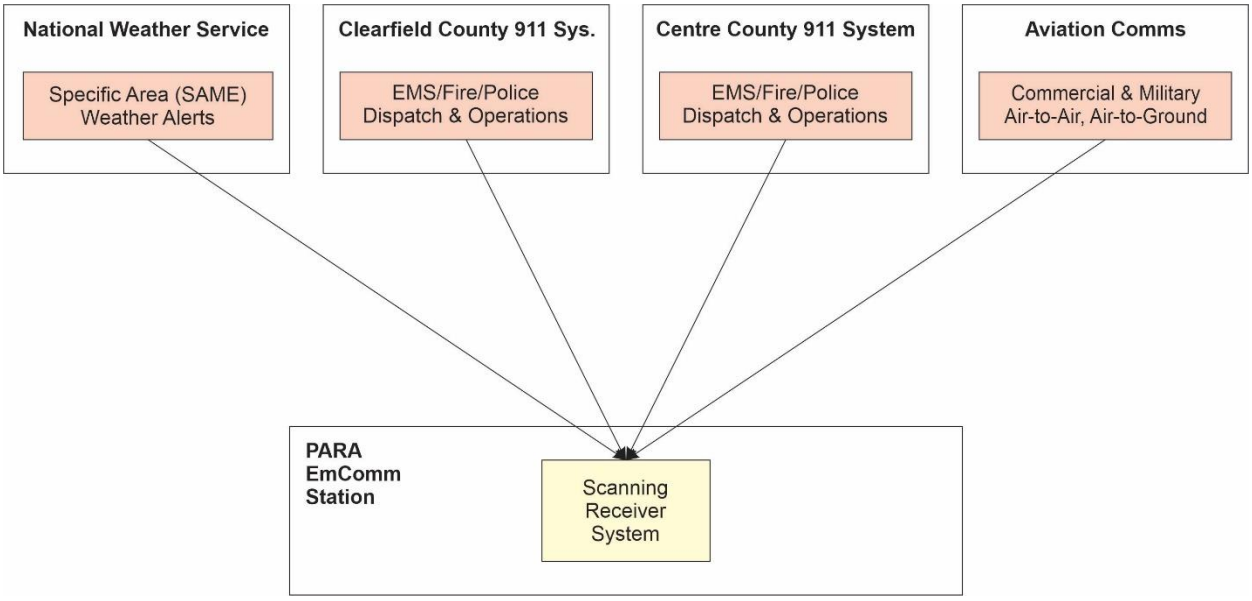
**Facilitating GMRS Adoption**

The PARA EmComm Team will periodically offer classes such as **Basic Radio Skills for Emergency Preparedness** to help local officials and community members to get started with GMRS radios and make effective use of the three GMRS repeaters maintained by PARA members at Rattlesnake, Philipsburg, and Sandy Ridge.

# Bill of Materials – GMRS Communications

| Brand | Part No | Description | Qty | Vendor | Unit Price | Extd Amount |
|---|---|---|---|---|---|---|
| Comet | GP-6NC | GMRS base station antenna | 1 | DX Engineering | 169.99 | 169.99 |
| Rohn | TRT60 | Roof tripod | 1 | DX Engineering | 122.99 | 122.99 |
| PolyPhaser | IS-B50HN-C2 | Lightning arrester | 1 | DX Engineeirng | 99.99 | 99.99 |
| Times Microwave | LMR-400-FOOT | LMR-400 coaxial cable (ft) | 75 | Field Components | 1.28 | 96.00 |
| ICOM | IC-F621-2-TR | GMRS transceiver | 1 | PARA member donation | 0.00 | 0.00 |
| | | Shipping and incidentals | | | | 50.00 |
| | | | | | **Total:** | **538.97** |

# Subsystem E - Frequency Scanning




# Objectives

**Situational Awareness**

A frequency scanner ("police scanner) provides greater awareness of what is happening in Clearfield and Centre counties. It will enable EmComm station personnel to hear all of the EMS, Fire, and Police dispatch calls originating from the Clearfield and Centre County 911 centers as well as field communications on several fireground frequencies.

Knowledge of significant local events can be relayed by PARA EmComm Team members to local officials and to citizens housed in the American Legion's shelter facility.

# Design Considerations

**Digital and Analog Capability**

County 911 centers are gradually moving from analog to digital communication systems. The scanner will have the ability to receive both types of signals, and specifically APCO P25 Phase I and II, the systems to which the Clearfield and Centre County 911 centers are transitioning.

# Bill of Materials – Frequency Scanning

| Brand | Part No | Description | Qty | Vendor | Unit Price | Extd Amount |
|---|---|---|---|---|---|---|
| Uniden | BCD996P2 | Digital Phase II Scanner | 1 | Amazon | 362.54 | 362.54 |
| Times Microwave | LMR-400-FOOT | LMR-400 coaxial cable (ft) | 50 | Field Components | 1.28 | 64.00 |
| | | Antenna | 1 | PARA member donation | 0.00 | 0.00 |
| | | Shipping and incidentals | | | | 50.00 |
| | | | | | **Total:** | **476.54** |

# Subsystem F – Solar Charging

## Objectives

Solar backup power will allow the station to continue operating during an extended power outage without requiring a generator and fuel to be brought to the site. After the community has been without electrical power for several days, a generator located next to the building might be a tempting target for thieves. And generators require fuel, which may be in short supply.

Solar panels are silent and dependable. They can automatically recharge the station's batteries whenever the sun is shining so that the station can continue to provide uninterrupted service.

## Design Considerations

**Mounting Location**

Solar panels would be mounted on the south-facing roof of the front porch in order to harvest the most energy from the sun.

**Snow Removal**

Snow that has accumulated on the solar panels can be removed by a person standing inside the building using an anti-scratch snow rake extended through the front office windows.

## Bill of Materials – Solar Charging

| Brand | Part No | Description | Qty | Vendor | Unit Price | Extd Amount |
|---|---|---|---|---|---|---|
| HQST | HQST-190D | 190-watt solar panel | 4 | HQST | 204.99 | 819.96 |
| Victron Energy | SmartSolar MPPT 100/50 | 50-amp solar charge controller | 1 | Powerwerx | 323.85 | 323.85 |
| | | Solar mounting hardware | | | 200.00 | 200.00 |
| Powerwerx | Wire-PV6-10-00-100 | #10 AWG solar PV wire (100 ft) | 1 | Powerwerx | 59.58 | 59.58 |
| Eversprout | B08QLL4M3M | Extendable snow rake | 1 | Amazon | 54.99 | 54.99 |
| CHTAIXI | TXC65Z-60-B32 | 32-amp DC circuit breaker | 2 | | 10.99 | 21.98 |
| Bayite | B013PKYILS | DC energy meter | 1 | | 17.99 | 17.99 |
| Powerwerx | MC4-10 | MC4 solar power connectors (10 pairs) | 1 | Powerwerx | 14.99 | 14.99 |
| | | Electrical inspection | | | 150.00 | 100.00 |
| | | Shipping and incidentals | | | | 50.00 |
| | | | | | **Total:** | **1663.34** |

# How Philipsburg Borough Can Help

## Funding the EmComm Station

With adequate funding, PARA members are very capable of assembling the EmComm station within a period of six months or less.

## Building Public Awareness

In order to ensure that the EmComm Station and PARA's other communication resources are effectively utilized, we will need a sustained effort to increase public awareness and recruit volunteers who are willing to learn and regularly practice basic radio operating skills so they can communicate with the station and with one another in times of need.

The Borough can help to raise public awareness by including materials on its website, Facebook page, and bulletin boards.

The leadership of PARA and the American Legion would be happy to open the EmComm Station and discuss its capabilities during visits by county, state, and federal officials. Coverage of these visits by newspapers and TV stations would also be very helpful.

## Backup Batteries and Equipment Insurance Expenses

AGM backup batteries have an expected lifetime of 5-7 years. The batteries at PARA's repeater sites are reaching the end of their lifetimes, and the new batteries at the EmComm station will also need to be replaced at some point in the future.

PARA member dues currently provide about $640 of income per year, and a significant portion of that money is spent on insurance for our primary repeater. The rest of our repeaters are uninsured.

Annual support from Philipsburg Borough earmarked for backup batteries and equipment insurance would help PARA to maintain its EmComm station and radio repeaters in good working order.

## Volunteer Licensing and Background Check Expenses

After teaching an evening class on Basic Radio Skills for Emergency Preparedness, we will ask people to consider joining our EmComm Team. This requires a willingness to serve and a significant time commitment. It also involves a monetary expense because the volunteer will need to obtain from the FCC an Amateur Operators License and/or a GMRS license. The FCC charges $35 for each license. That expense might be a barrier for some volunteers.

A possible solution would be for the Borough to reimburse the cost of the license for new volunteers who have successfully completed the required online FEMA courses. Volunteers who complete the 12 hours of coursework and pass the exams will have demonstrated a significant level of commitment. This ensures that people don't "game the system" just to get a free license.

We are not certain whether we will require criminal background checks of PARA EmComm Team members. This might present an additional expense which could be a barrier to recruiting new volunteers. A possible solution would be for the Borough to reimburse both licensing and background check expenses upon the successful completion of all team membership requirements, including the coursework and the background check.

## Projector for Use in Classroom Presentations

Evening classes on Basic Radio Skills for Emergency Preparedness will be taught be PARA members in the meeting room on the second floor of the American Legion. Some of these classes will include tours of the PARA EmComm Station which will be located in an office on the same floor.

It will be easier to recruit PARA members to teach those classes if they are based around PowerPoint presentations that provide the key information so that the presenter can just focus on answering questions. This will make it possible to offer classes more frequently.

It would be very helpful to have a new or used projector so that we can display PowerPoint presentations and other computer screens on the wall in a classroom setting.

## Transportation of EmComm Team Members

If the EmComm station is activated during a flood, blizzard, or at any other time when transportation to and from the station may be difficult, it would be helpful if the Borough or a fire company could provide transportation for EmComm team members who lack All-Wheel Drive vehicles with sufficient ground clearance.

# EmComm Stations at Other Facilities

The PARA EmComm Station at the Philipsburg American Legion Post will have the ability to communicate with similar stations staffed by amateur radio operators at the following facilities.

### Centre County 911 Center
### Mount Nittany Regional Medical Center
### National Weather Service Office at University Park

These Amateur EmComm stations are maintained and staffed by members of the Nittany Amateur Radio Club (NARC). They have VHF and UHF capabilities.

### Clearfield County 911 Center

This Amateur EmComm station is maintained and staffed by members of the Clearfield County Amateur Radio Club (CCARC). It has VHF, UHF, and HF capabilities.

Amateur radio station located inside the Clearfield County 911 Center

# Key Terms Used in This Document

| | |
|---|---|
| **Organizations** | |
| FEMA | Federal Emergency Management Agency |
| PEMA | Pennsylvania Emergency Management Agency (Harrisburg) |
| NWS | National Weather Service (University Park) |
| Served Agency | Any public service organization requiring communication assistance when normal means of communication are unavailable. |
| **Frequency Bands** | |
| VHF | Very High Frequency – The Amateur band most widely used for regional communications in rural areas. |
| UHF | Ultra High Frequency – An Amateur band that works well in towns and cities, but has somewhat less range in open spaces. |
| GMRS | General Mobile Radio Service - The GMRS band isintended for family and community use by ordinary citizens. A license costs $35 and covers every member of a family for a period of ten years. |
| **People** | |
| Amateur Operator | A person who has studied and passed an examination to earn an Amateur radio license. Amateur radio operators are permitted to use up to 1500 watts of power. |
| GMRS Operator | A person who has purchased a GMRS license from the FCC. No test is required, and the license covers every member of the person's family for a period of ten years. GMRS operators are limited to 50 watts of power. |
| **Equipment** | |
| Repeater | A fixed or portable radio system that listens for weak signals on a dedicated frequency and instantly retransmits them so they can be heard over a wider area. Repeaters are usually located at hilltop or mountaintop sites. PARA members maintain three Amateur band repeaters and three GMRS band repeaters at Rattlesnake, Sandy Ridge, and Philipsburg Borough. |