South Carolina
Amateur Radio Emergency Service and
Radio Amateur Civil Emergency Service
Auxiliary Communication Tactical
Communications Guide

February 15, 2024

A key provision for the establishment and continuation of Amateur Radio Service is its ability to serve the public, particularly with respect to providing emergency communications.[1] This guide provides tactical information for members of the South Carolina Amateur Radio Emergency Service® (ARES), Radio Amateur Civil Emergency Service (RACES), and the general amateur radio community to assist in the development of local communication procedures that best serves the citizens of South Carolina during an emergency.

Comments or corrections to the guide may be sent the ARRL Section Emergency Coordinator, the District Emergency Coordinator-South Carolina Emergency Operations Center (SEOC) or to feedback@ares-sc.org.

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[1] FCC Part 97 Subpart A, 97.1(a)

1.0 South Carolina ARES Emergency Communications Structure

The American Radio Relay League (ARRL) provides the general amateur radio community a voice in dealing with Congress and the many organizations that impact amateur communications. As part of its mission, ARRL established the Amateur Radio Emergency Services® which "consists of licensed amateurs who have voluntarily registered their qualifications and equipment, with their local ARES® leadership, for communications duty in the public service when disaster strikes"[2] . Members of ARES organize on the local level and support various organizations which may need supplemental communications during an emergency. Since ARES is an ARRL organization, it is managed under the direction of the state's ARRL Section Manager (SM). The SM is the only elected league position in South Carolina. In addition to ARES program, the SM represents the general amateur radio community when dealing with government agencies and non-governmental organizations. To ensure adequate focus is retained on the ARES program, the SM appoints a Section Emergency Coordinator (SEC) to lead daily activities and oversee the program (see Figure 1 ARES Organizational Structure).

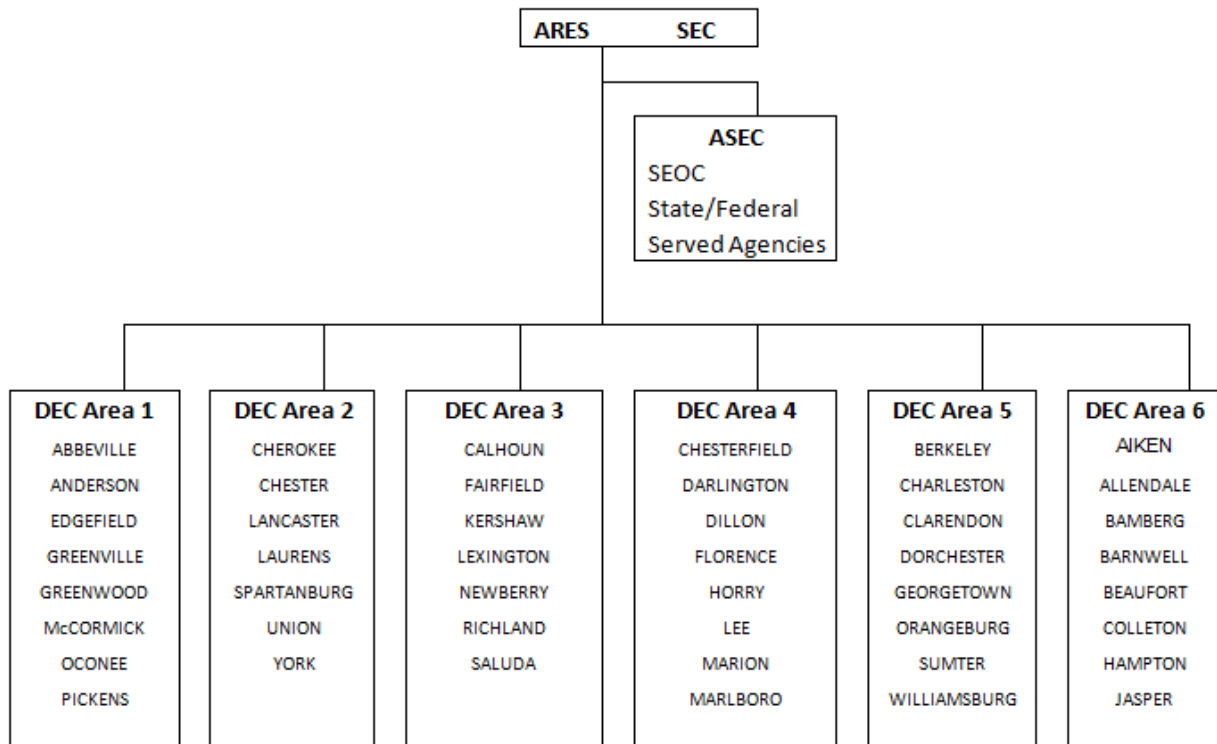| DEC Area 1	DEC Area 2	DEC Area 3	DEC Area 4	DEC Area 5	DEC Area 6
ABBEVILLE	CHEROKEE	CALHOUN	CHESTERFIELD	BERKELEY	AIKEN
ANDERSON	CHESTER	FAIRFIELD	DARLINGTON	CHARLESTON	ALLENDALE
EDGEFIELD	LANCASTER	KERSHAW	DILLON	CLARENDON	BAMBERG
GREENVILLE	LAURENS	LEXINGTON	FLORENCE	DORCHESTER	BARNWELL
GREENWOOD	SPARTANBURG	NEWBERRY	HORRY	GEORGETOWN	BEAUFORT
McCORMICK	UNION	RICHLAND	LEE	ORANGEBURG	COLLETON
OCONEE	YORK	SALUDA	MARION	SUMTER	HAMPTON
PICKENS			MARLBORO	WILLIAMSBURG	JASPER

Figure 1- South Carolina ARES Organizational Structure

The SEC develops strategic guidance for ARES in the state and appoints an Assistant Section Emergency Coordinator (ASEC) to assist in program management. The ASEC is a liaison with South Carolina Emergency Management Division (SCEMD) and Emergency Support Function 2 staff. Also, the ASEC acts as the coordinator for state agencies and non-governmental organizations at the SEOC. The ASEC and other members at the SEOC jointly support ARES leadership and other communication participants in auxiliary communications exercises and responses.

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[2] http://www.arrl.org/ares

The SEC recruits qualified ARRL members to serve as the District Emergency Coordinators (DEC) for each Emergency Management Areas (EMA). Figure 2 shows a map of the six emergency management areas. SCEMD has one Regional Emergency Manager (REM) assigned to each area to coordinate county/state plans and support responses to incidents. The DEC works with the REM in developing auxiliary communications plans and exercises specifically for the area.   In addition to working with the REMs, the area DEC recruits an Emergency Coordinator (EC) for each county and assists them in the recruitment and training of local ARES members. The DEC plays a key role in coordination and communication between county ECs, and EMA REM.   The DEC is responsible in helping each EC develop local plans on how they will support their county's communication needs when requested. Generally, this entails working with the County Emergency Management Team but also may include shelter operators and area hospitals.   In some cases, this will mean ARES members from one county will back up another county. When an emergency exceeds the ability of the DEC to find local resources, outside help would be requested via the SEOC or SEC. The DEC may appoint an Assistant DEC to help manage their district.
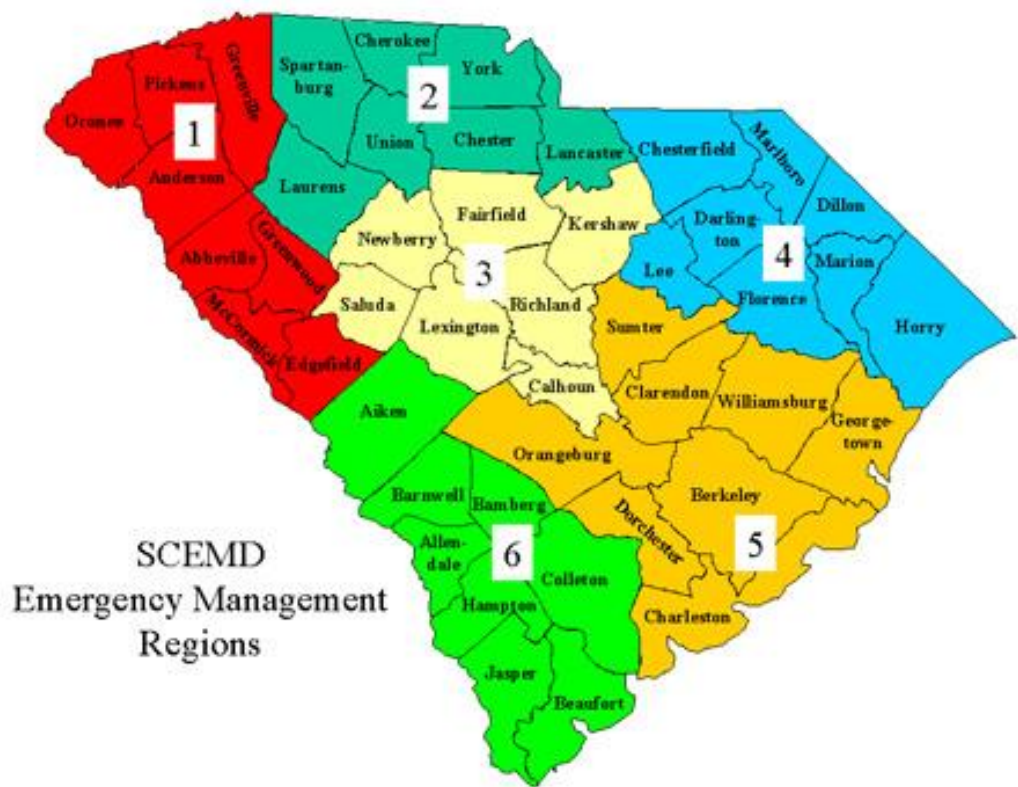

Figure 2

The County EC (or in the case where a county does not have an EC, the DEC), works with local emergency management planners and individual ARES members to develop communications support plans and exercises. The EC's role is essential in recruitment of ARES operators from the general amateur radio population and helping these operators develop necessary operating skills needed to augment local communication needs during emergencies events. Not only do Amateur Radio Operators need to know how to use their radios, but they will also need to know how to complete necessary paperwork and practice procedures during regular exercises. Working in a County Emergency Operations Center will be different than a local shelter which will be different than a hospital. The EC uses exercises

or special events to help operators learn required skills and improve internal procedures during these events. The EC also is responsible for their team's participation in the state's annual Full-Scale Exercise.

The success of the organization is the individual ARES member. ARES members demonstrate a willingness to get involved, to learn new operating skills and to use their equipment in possibility challenging positions. ARES members demonstrate the best in amateur radio. They are willing to help others in times of crisis. ARES members ensure they are ready to respond in an emergency by participating in scheduled exercises and completing required training. Information on becoming a ARES member can be found at http://ares-sc.org/

More detailed information about the national ARRL ARES program can be found at http://www.arrl.org/ares .

ARRL members can volunteer for an assignment to a SEC, DEC or EC position. Any licensed operator can volunteer to be in ARES. ARES volunteers are not required to be an ARRL member to participate. The EC determines if the volunteer's skill and attitude fit the local support mission and the types of additional training required. It is essential that all ARES volunteers remember the following two rules:

1. You are a volunteer at the event to serve an organization and you must follow their procedures and rules as instructed. This includes completing required paperwork.
2. As a volunteer, you are not there to direct the organization nor instruct them on how they should be doing their mission.

The fastest way to be removed for any exercise or event is to insist on telling the served organization that they are doing the mission wrong. Your local EC has full authority to remove any ARES members who cannot follow the rules. It is the responsibility of the EC to ensure their volunteers remain professional and supportive of the agency they are serving.

During activation, all responding agencies will be operating under the Incident Command System (ICS) as part of the National Incident Management System (NIMS). That means a field Incident Commander is in charge of the operation and local the EOC and SEOC act in supporting roles. It is particularly important that DEC and EC leadership fully understand the ICS and complete basic FEMA training courses: IS-100c Introduction to Incident Command System, IS-200c Basic Incident Command System for Initial Response, IS-700b National Incident Management System (NIMS), and dS-800b National Response Framework, An Introduction.

The courses are free and can be found at FEMA Independent Study Program National Incident Management System web site: http://training.fema.gov/IS/NIMS.asp

These courses are highly recommended for all ARES members and required for RACES members. Individual counties, hospitals and other served organizations may require additional training for volunteers who work in their facility. In the case of County EOC operators, it is up to the county EC to ensure volunteers have the necessary skills (training and knowledge) to successfully work in the demanding environment of an EOC.   As volunteer communicators, you need to present a professional image and remember that you are there to support the operation. Amateur Radio volunteers shine when other systems break down, and we can pass traffic effectively for others.

1.1 ARES and RACES. What's the difference?
This question arises frequently and there has been misunderstanding of roles between the two programs. ARES is part of ARRL, and they control the trademark. ARES is organized around local volunteers who register their equipment to assist others during times of an emergency. Most emergencies are local in nature, so ARES is organized to provide maximum flexibility for the EC and the local teams. The EC organizes local resources (volunteers and equipment), coordinates training/exercises events,

communicates local plans and provides leadership during an incident. While the EC is a leader, success is a team effort from all members. ARES is open for all licensed operators to apply but the local EC has the final say on who is a designated ARES member in the county. Training standards may differ county by county based on the local requirements and volunteer's interest. The local EC is the primary contact person for any operator wishing to enter the ARES program.

Radio Amateur Civil Emergency Service (RACES) is established under FCC Part 97 regulations[3]. When established by the regulation, RACES was part of the civil defense organization and was operated under direction of civil authorities in local jurisdictions. Over the years it has evolved from a strict civil defense mission into more of a group that supports emergency management offices. Therefore, in addition to having a radio license, volunteers in RACES must have an emergency management agency endorsement. That means somebody with a County or State emergency agency must approve the individual and endorse them to carry official governmental traffic for that office. Additionally, RACES volunteers must undergo security background verification and complete additional FEMA training. Many offices also required additional specialized equipment training to work in their EOC. In the end, state RACES members become part of the South Carolina Auxiliary Communications Program and can be issued a state identification media. Membership in RACES demonstrates a higher level of commitment by the volunteer and a pledge to support their community when needed.

RACES in South Carolina operates under the guidance of South Carolina Emergency Management Division. The state program uses the SC AUXCOMM registration system to track and manage volunteer resources. Program management falls under the SCEMD Communication Manager.

Can a person be a member of ARES and RACES? Absolutely! Generally, volunteers would become involved with the local ARES group and as they enhance their skills and desire an enhanced role in supporting government agencies, they would join RACES and register in South Carolina AUXCOMM.

1.2 Auxiliary Communications and SC AUXCOMM
In the past few years, a new term, AUXCOMM has been introduced within emergency communications environment. The Department of Homeland Security coined the term to explain the support functions of Auxiliary Communications operating under a NIMS environment. AUXCOMM is NOT a group. AUXCOMM is not an organization. AUXCOMM describes how volunteer Auxiliary Communicators are recognized and fit into the NIMS/ICS structure. AUXCOMM volunteers are designated Technical Specialists under NIMS. When operating within an ICS environment, volunteers lose all affiliation to their organizational group such as ARES, RACES, MARS, CERT, REACT or CAP. They become AUXC Technical Specialist and report to the Communication Leader, COM-L or designee as part of the logistic branch. When they are acting in the capacity of a technical specialist, they are solely responsive to the organization that established the ICS structure for that incident. Volunteers amateur radio operators working as part of AUXCOMM have access to the normal amateur band frequencies but may also operate on designated Federal and State frequencies as defined by the COM-L while supporting the communication mission. Their role as a ham radio operator is expanded and their ability to help provide communications is enhanced during the response.

South Carolina implemented a structured program to follow NIMS guidelines for AUXCOMM in 2012. This program requires users to register in a central database and tracks specific training relating to emergency communication. The automated database allows users to maintain their current address, telephone numbers, emails, and training files. Previously, the state only had a central database for RACES members and that database was maintained by the SEC. That proved to be problematic.

Amateur radio operators who demonstrate strong interest in emergency communication and the ability to work well as part of an emergency team can be invited to register and complete necessary training to be

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[3] FCC Part 97 Subpart E Paragraph 97.407

eligible for participation in the program. Generally, candidates are identified from their participation in ARES, CERT, MARS, or CAP programs. Registration and credentialing in AUXCOMM do not affect your status in the other programs. The DEC, SEC and ASEC can invite individuals to obtain an AUXCOMM credential and the EC can recommend candidates. Candidates who successfully complete mandatory training and successful background checks receive a state RACES endorsement and may obtain additional ICS credentials with appropriate training.   During emergencies, registered volunteers in AUXCOMM database will be called on to support the SEOC, state deploy-able communication assets and some local county governments. AUXCOMM registration does not replace or eliminate ARES, CERT, MARS, or CAP programs or operation. It does not compete with these programs. AUXCOMM provides a list of qualified people who can operate under NIMS and possess the necessary clearance. In general, registered people would deploy to an EOC, or Incident command location when requested. Support of individual shelters and hospitals continue to be a primary focus of ARES, SCHEART radio response teams and other local groups. More information on the SC AUXCOMM program can be found in Appendix C.

2.0 Role of Amateur Radio in South Carolina Emergency Communications
The State of South Carolina includes Amateur Radio in its emergency communications planning documents and standard operating procedures. It has a signed Memorandum of Understanding with SC ARES for providing radio operators during emergencies. A link to the MOU is located under Appendix F. Amateur Radio has been integrated into emergency back-up plans for county-to-county EOC communications, healthcare communications, and weather information communication. Emergency planners did not include amateur radio because they believe that it is easy and cheap way to communicate. It's actually very difficult to organize groups of amateur radio operators, depend on them to show up for training exercises and to integrate their capabilities into a statewide plan. However, time and time again, individual amateur radio operators have risen to the challenge and provided communication modes when disaster strikes.   We need to recognize that planners in our state have seen the benefits offered by the amateur community and have formally documented our support in state plans. Now it is up to the amateur community to organize an effective ARES team, recruit an adequate number of willing volunteers and provide necessary training to support our fellow citizens when needed. With staffing reductions occurring across the state and county agencies, volunteers may be the essential key to success in the next emergency. Joining the ARES program and participating in exercises will help you be ready to support those in need when needed. It will also help you be better ready to support your family.

3.0 The Communications Plan for South Carolina ARES/RACES
An effective emergency communications program must be developed around a structure that provides sufficient levels of redundancy to meet anticipated failure modes, offers multiple means of message transport, be adaptive to a changing environment, and have enough operators to manage the system. The South Carolina Plan is based on a redundancy of systems. The strategy of including commercial transport modes with amateur radio capability provides an adaptive and efficient communication concept. As systems fail or degrade, operators will rely on less infrastructure intensive systems with simplex radio operation as the last fallback foundation. Figure 3 shows a graphical representation of a tiered communication concept with layers of increasing capability. Each layer is built on a simpler, more robust layer.

The core of the communication model is based on simplex operation. Simplex is just two radios talking to each other directly (on the same frequency) with minimal infrastructure. Each additional layer surrounding the core builds additional capability and increases the dependency on infrastructure. Underlying the VHF simplex layer is HF simplex (shown lower right).   Exiting the model to the upper right and left are landlines/cell phones and satellite. In a communication emergency, a partial or total impairment of these commercial systems will very likely occur at some point somewhere within the state.

However, at locations where cell phone, landline and satellite are still functional, they should be incorporated into ARES/RACES operations to ensure the most efficient method to pass traffic is being used. On the lower left is Internet connectivity for data transport. To the extent possible, ARES/RACES integrate functioning Internet connections to move data. When local Internet connections fail, ARES/RACES activate the digital fallback plan.
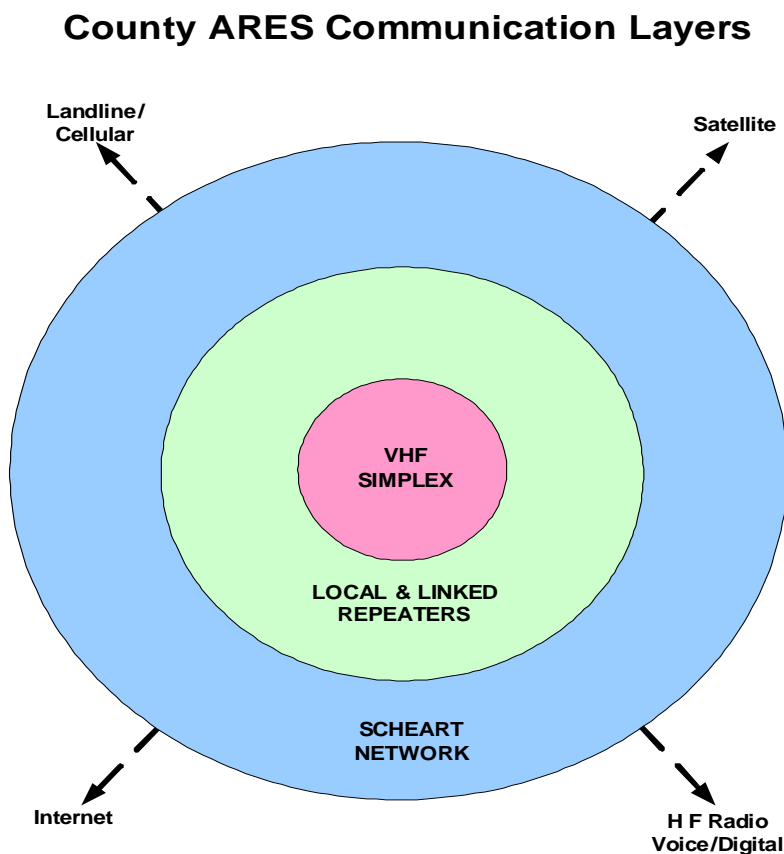
County ARES Communication Layers

Figure 3

The following paragraphs explain the three tiers of operational capability represented in the Figure 3.

System redundancy is achieved by using an encapsulated communication model with simplex being the absolute fallback mode. When all other infrastructure has failed, simplex VHF/UHF and HF modes are available to move messages. In the case of total infrastructure failure, ARES/RACES members must establish basic simplex operation quickly and relay traffic to county EOCs or the State EOC. The center core of the figure 2 is designated Tier 1 Operational Capability or T1OC.

The next communication layer adds infrastructure and establishes local repeaters or local linked repeaters. This layer provides additional capability by extending station range and allowing members with handheld transmitters to communicate over wide geographic areas. The enhanced geographic coverage provides for county-to-county contact. Local repeaters provide for Tier 2 Operational Capability or T2OC. Emergency Coordinators, in consultation with the District Emergency Coordinator, determine what repeater frequency is designated for the county, and perform the necessary coordination with the repeater Trustee or owner. The designated repeater will then provide coverage for periodic ARES/RACES nets, so members can train and verify equipment operation. The repeater output frequency is the **county tactical frequency** and is published in section 8 of this guide.

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The top layer provides statewide coverage by linking wide area repeaters via the South Carolina Educational Television (SCETV) microwave network. With only a few exceptions, these repeaters are co-located with SCETV transmitter or microwave sites. The SCETV corporate network is independent of commercial Internet and in general provides a redundant link across the state. The top layer supports three systems: VHF analog, UHF analog and UHF digital. The analog system allows operators to establish point to point links or SCHEART network control stations can link numerous repeaters for statewide or regional coverage. Individual repeaters provide wide area local coverage and have the ability to link to other SCHEART repeaters. Collectively, this network provides adaptable geographic coverage and greatly increases the number of stations that can support an incident. While the SCHEART analog network provides for flexible linking for point to point or statewide conference mode of all repeaters, the digital network provides fixed talk groups to support local, statewide connections and dynamic connections between two or more locations during an emergency. Detailed information on the SCHEART repeater network can be located under the Analog and Digital tabs on the SCHEART web site at http://scheart.us/. A quick guide for operating on SCHEART system is in Appendix A.

Also note that HF simplex communication remains an option for communication while operating in any of the three tiers. HF represents another transport mode for communication traffic, voice and digital.

Included in the model, is an Internet path. Failure of this path adversely impacts all agencies responding to the emergency. While amateur radio provides various means to transport digital data, ARES/RACES have been requested to support South Carolina's emergency backup interoperability mode for data. That mode operates under the Department of Homeland Security Cybersecurity and Infrastructure Security Agency shared resources HF program (DHS CISA SHARES HF network). South Carolina joined adjacent states and other governmental and non-governmental agencies as part of the SHARES HF Program for the primary use of the SHARES Winlink resource. The state of South Carolina holds the station license, and it is responsible for training operators. RACES members are encouraged to complete agency provided SHARES Winlink training. ARES operators are encouraged to use the amateur Winlink system to provide messages to the CISA SHARES Winlink network. Information for sending emails from Amateur Winlink to the CISA SHARES Winlink is located in Appendix D.

3.1 Tier 1 Operational Capability T1OC

Tier 1 represents the most basic operational mode that requires the least infrastructure: SIMPLEX. A fallback to full Tier 1 Operational Capability occurs if higher tiers have been compromised. Simplex is also highly effective when communications is needed in a localized area such as a train derailment or fire. Paragraph 7.0 provides a county-by-county listing showing two simplex ARES VHF frequencies: a Coordination Frequency and a Tactical Frequency (The Tactical Frequency is the local ARES/RACES designated repeater output frequency). The Tactical Frequency supports primary communication for ARES/RACES volunteers actively working the emergency. Establishment of a controlled net on the Tactical Frequency is a top priority for local emergency activation. A controlled net allows ARES/RACES stations to check-in for tasking, accepting remote station reports and providing a central communication channel to share current situational information. The controlled net is essential to ensuring coordinated action. Note in T1OC the net will be operating on the County Tactical Channel, that is the repeater output frequency. This would only occur when the designated repeater is out of service.

County to county coordination and command and control will occur on the assigned Coordination Frequency. The County Coordinating Frequencies can provide inter-county contact from the incident command location and adjacent county EOC. The County Coordination Frequency handles supervisory level traffic or information that is not directed to all volunteer communicators. The County Tactical Frequency is the frequency for primary operations.

The statewide designated ARES simplex frequencies are 146.595 MHz for VHF and HF (+/-) 3.9935/3.9900 MHz LSB or +/- 7.232 MHz LSB. The (+/-) means in the general vicinity of the listed

frequency. Since HF band conditions have a major impact on propagation and how busy the band may be, the SEOC will shift up or down from these target frequencies. ARES stations may send email traffic over HF using the amateur Winlink network to the SHARES Winlink network. For VHF, the SEOC monitors 146.595 MHz with a PL encoded tone of 156.7 Hz when activated. Amateur radio members can use this frequency to relay information across the state during an emergency when SCHEARTS and/or HF are not available. If required, the DEC/EC can establish simplex relay points to move traffic across the emergency management area EMA to the SEOC. Activated ARES/RACES net control stations are encouraged to monitor these frequencies for possible activity.

During activation, DEC/EC's should monitor the County Coordinating Frequency and Tactical Frequency. If the event covers a wide area, they should also monitor the SCHEART network: VHF for EOC type traffic and UHF for Healthcare type traffic. There may be events where both VHF and UHF systems are linked statewide with joint traffic.

ARES/RACES volunteers are encouraged to monitor their assigned County Tactical Frequency. By routinely monitoring the County Tactical Frequency, members are able to learn of an emergency and start net activations quickly. Monitoring the County Tactical Frequency also serves to assist in the alert process should cell phone and landlines be disrupted without warning. The County Tactical Frequency should be the first place to start net control operations and local response.

3.2 Tier 2 Operational Capability- Local Repeaters

Local Emergency Coordinators in consultation with the local District Emergency Coordinator are responsible for establishing the local repeater frequency or frequencies where one repeater does not cover the county. The paragraph 7.0 lists the repeater input frequency assignment for the published County Tactical channel. The EC must notify the SEOC (if activated) when they are using any other frequency either for a temporary period or if they want to re-coordinate the county frequency. Notification helps ensure all responders know what frequency to use. The output of the primary ARES/RACES repeater for the county becomes the County Tactical Frequency. ARES/RACES volunteers use the designated County Tactical Frequency to conduct local nets and training exercises as scheduled by the EC/DEC. Members are encouraged to monitor the Tactical Frequency. In the event of an emergency, implementation of a controlled net on the frequency should begin immediately and timely information provided to ARES/RACES responders.

If the designated county repeater fails, a simplex control net is implemented on the County Tactical Frequency (repeater output). This serves two distinct purposes. First, members are trained to monitor the County Tactical Frequency and if there is no activity on the frequency, members may not be aware of an emergency situation. Second, it provides a graceful fallback mode to simplex operation that is easy to remember. If the repeater is put back in service while the emergency is in progress, all members are already listening to that frequency. By staying on the County Tactical Frequency, people coming into the area will hear the latest instructions. Local EC/DEC may establish alternate communication channels but should ensure the County Tactical Frequency is monitored with periodic announcements that a net is being conducted on another frequency.

If interference occurs on the tactical frequency, members should switch to the County Coordinating Frequency until the interference can be resolved.

So why can't our county designate the SCHEART repeater as our local tactical repeater? On the surface, it would seem that SCHEART repeaters cover large geographic areas and would be ideal choice for a local tactical repeater. The problem arises when the repeater is linked either locally or externally into the larger network. At that time local control is lost. Statewide or regional traffic becomes mixed with your local traffic or worse your local traffic is broadcast statewide. In a large-scale emergency, there could be significant local traffic between shelters and the County and at the same time other counties need to get information to the SEOC. Likewise, if the SEOC has a statewide update broadcast, the repeater becomes

unavailable for a period of time.   Ideally having separate repeaters provide the best flexibility for the response. However, a SCHEART repeater could be used to supplement the local tactical repeater if conditions warrant. This would be on a temporary basis and must be coordinated with the SEOC if activated, or SCHEART network management, or the SEOC DEC when the SEOC isn't activated.

3.3 Tier 3 Operational Capability Linked Repeaters

Statewide VHF/UHF communication and coordination is available via the SCHEART repeater network. The SCHEART network uses the SCETV Microwave system to interconnect repeaters primarily located at SCETV sites to central conference bridges located in Columbia. This network is structured to maintain communication independent of the commercial Internet.   SCHEART provides three statewide communication networks for amateur radio use: SCHEART VHF Analog, SCHEART UHF Analog and SCHEART UHF Digital.

SCHEART Analog repeaters are accessible by anyone with an Amateur VHF/UHF FM radio. Frequency and CTCSS (PL) information for each site is contained in appendix A. This network allows individual operators to use Dual Tone Multiple Frequency (DTMF) to link any two repeaters in the state by using their 2-digit node number (DTMF is the touch tone buttons on your amateur radio/ microphone). Authorized network system operators can link any combination of repeaters within the state. The analog repeaters support routine amateur communications and are open to all licensed operators. During emergencies, the VHF repeaters are primarily tasked to support ARES/RACES tactical communication supporting essential government services. The UHF repeaters are primarily tasked to support backup communications for healthcare services. Two conference bridges are available with Main assigned to VHF and Back Up to UHF. Configuration Management of the SCHEART Analog network during an emergency activation is assigned to the SEOC. Specials configuration requests should be routed to them.

SCHEART DMR repeaters are accessible to amateur operators with radios that support the DMR standard protocol. DMR radios support two simultaneous conversations on the same repeater frequency by using Time Division Multiple Access (TDMA) technology. Voice signals are digitized and encoded with system talk group codes.   The SCHEART DMR provides for wide area coverage on the PRN talk group and for local traffic on a local talk group.   Additionally, other specialized talk groups are available during normal and emergency operations. During a communication emergency, the DMR system supports essential communication for command and coordination traffic and works with the conventional system to provide additional communication capability. The SEOC can configure the SCHEART DMR for emergency mode operation. Under emergency mode, talk groups are restricted to within South Carolina. Detailed information on the DMR repeater network is included in the Appendix B.

In a typical emergency scenario, the SCHEART Conventional Repeaters will be configured to provide two coordination paths and support two traffic nets: VHF net for EOC/SEOC traffic and UHF net for healthcare traffic. At periodic intervals, these two nets merge and coordinate information and status. Depending on the emergency situation, directed nets may be established during certain time periods for statewide information coordination and situation reporting. At times when a controlled net is not operational, the SCHEART system will be configured to allow point to point communication traffic with VHF being primarily for EOC type information flow and UHF being primary healthcare emergency traffic. HF remains a backup mode for statewide coordination traffic. Under ICS concepts, the SCHEART network is configured to support the ARES/RACES and radio response team stations. Since a statewide situation falls under an Area Command or Multi Agency Coordination System, the State EOC is responsible for SCHEART configuration during training exercises or incident responses. Special requests or issues should be reported to them.

During normal day to day operation, any amateur may link two repeaters in the SCHEART system. During training exercises and emergencies, point to point links should be established by ARES/RACES members or radio response team members participating in the event. Amateurs not involved in the

training or activation should not use linking the functions. Establishment of multiple point links is restricted to official SCHEART control operators. The SCHEART Network Manager or Trustee are solely responsible for designating system control operators. Control operators must complete training and receive authorization from SCETV before they can implement configuration changes. County EOC operators requiring specialized linking configurations during an event must contact their area DEC or the SEOC. SCHEART Control stations must coordinate with any net control operators who may be using SCHEART before changing the configuration that would affect their net operations. For instance, if the SEOC is having a statewide net every 3 hours that lasts 30 minutes, the control operator must ensure the configuration change will not impact the next scheduled net.

4.0 Establishing Local or Regional Emergency Nets

During a communication emergency, it is critical to quickly re-establish communications for the following purposes: 1) protection of life, 2) stabilization of the incident that caused the emergency, 3) conservation of property and 4) protection of the environment. ARES/RACES members assist local authorities and responders by quickly establishing back up modes of communication and providing situational and tactical information between the agencies that have lost communication capability. ARES/RACES members must be able to mobilize quickly and implement pre-planned communication strategies. Planning and exercising is the key to success. So, the first stage of any response is the planning and training program.

4.1 Understanding the Communication Structure During an Emergency

Controlled nets are a way to manage the flow of information in a timely manner with appropriate priorities placed on the traffic. It is important that operators understand how traffic flows and is managed in support of an emergency. For example, a situation occurs within a county creating loss of primary communication paths within the jurisdiction and affecting ability to calls inside the county and outside of the county. It is imperative that communication from shelters, hospitals, incident command centers and other key facilities remain in contact with the county emergency management team. Volunteers with ARES, RACES, AUXCOMM, and SCHEART who deploy should ensure any resource requests are properly routed to the County Emergency Operations Center. At the County EOC, the traffic is processed, and priorities set for resource distribution. In turn, the County EOC needs to be able to communication with adjacent counties for mutual aid assistance. Lastly, the County EOC needs to be able to contact the State EOC to communication resource needs and local conditions. ARES/RACES members supporting this county would need to establish a tactical net to manage local traffic and they would need maintain communication to the State EOC. Typically, a resource request comes the County EOC for processing. A decision is made if the county can fill the requirement with local resources. If not, the county may contact an adjacent county to request support. If local measures can not fulfill the need, the county then sends a request to the state level. If communications infrastructure is severely damaged, ARES/RACES would need to set up a local emergency net using their designated tactical repeater to move messages within the county and also monitor the statewide tactical net. ARES/RACES volunteers should conduct local exercises where they practice sending traffic to the county from specific locations and then moving unmet needs to the SEOC.

4.2 Emergency Nets are triggered by an event that creates a need to establish a controlled communication net. Other than personal safety of an ARES/RACES member, the establishment of a control net should be the top priority. The first station to initiate the net becomes the control operator.

The control operator has the following responsibilities:
1) Alert all stations listening to the frequency that a control net is being implemented and the reason why a control net is being started,
2) Provide stations with information about checking into the net such as who should check in, how to check in to the net, i.e., call sign; name, location, and availability to help or if they are already supporting an agency or organization,

3) Document all stations checking into the net, where they are located and what organization they are supporting,
4) Assist stations in passing traffic essential to the communication objectives,
5) Develop an overview of the situation and provide relevant data to stations, as it becomes known,
6) Continue net control duties until relieved by another station or the emergency is over,
7) Remain calm and focused on the primary duty of passing accurate information in a timely manner.

For an unexpected event, a controlled net is started while many ARES/RACES responders are in route to the agencies they support. Once ARES/RACES establish operation at the Incident Command Post, Area Command Location or the Emergency Operations Center, net control should be transferred to that location. Ideally, net control originates where command decisions and instructions are being issued.

For example, assume that a large fire is affecting part of the state and has adversely affected cellular and 800 MHz communications. Due to the complexity of the fire and agencies involved, a Unified Command is implemented. Net control would move to the Unified Command location because it improves efficiency and reduces resources. ARES/RACES can work with command staff and assist in moving traffic between responders and/or the County or City EOC. This may require mobile communication resources but could be accomplished in a vehicle if a communication trailer isn't available. The role of ARES/RACES is to assist in providing back-up communications when normal channels fail. Volunteers need to listen closely to the radio traffic and not become too engaged in other support functions.

Section 8.0 lists county tactical frequencies that have been pre-coordinated for use during a local emergency. Should communications needs exceed the coverage requirements of these repeaters, the DEC may request special use of the SCHEART network. If the SEOC is activated, contact the radio room. If the SEOC isn't activated, the area DEC may coordinate via the SEC or the SEOC DEC for the special configuration request.

5.0 Establishing a Simplex Net
ARES operators should become skilled in using simplex to establish a local net. If an event takes out your tactical repeater or maybe all the repeaters for your town, how will you communicate? Simplex is the basic fallback mode. During exercises or routine nets, determine which stations have the best geographic coverage and assign them as net control. Then practice having stations farther away to rely traffic on the same simplex frequency. This may require sending mobile units to a hill or midway location between two end points. Using simplex to relay messages across a county or emergency management area is excellent practice for when your repeaters area not working. VHF simplex can be used to relay messages to a location with HF which can relay messages anywhere. Section 8 lists the statewide simplex frequency as 146.595 with pl 156.7.

6.0 Establishing Statewide Emergency Net- SEOC Operations
Amateurs in South Carolina have a unique capability with the SCHEART VHF/UHF analog link systems along with the statewide Digital Mobile Radio (DMR) system. The analog system is configured each weekend to cover statewide for ARES and healthcare training. While the SCHEART system is open for all amateurs to use, during a state emergency, network control responsibility falls under the SEOC. In addition to the SCHEART network management staff, additional stations are provided with control operator privileges for the analog system and a DMR mode control station is located the SEOC. Control operators have the ability to link multiple repeaters to form a wide area net or to cover the entire state. A decision to implement a statewide net during an emergency is based on the incident complexity, the affected area, and the need to have a common communication channel. There are benefits to having a common communication channel, but there are also risks when running a statewide net during rapidly changing events.

Based on several years of testing, the following type of statewide net is planned for a large-scale emergency event:

1. The system is configured to provide statewide coverage for check-in from all counties. The net control station logs active stations, provides situation information, alerts station to changing environment and maintains communication control. The net control station advises operators the time of the next net when closing the current net.
2. The net is closed, and system opened for any station-to-station traffic.
3. At the appropriate time, the system is configured for statewide coverage. The net control station provides updates, new instructions, current situational information, and takes station reports from the field. Emergency traffic should not wait until the next schedule net. Any emergency traffic should be passed as quickly as possible.

Activation of statewide nets occurs when the South Carolina Emergency Operations Center, SEOC, requests communications support to county EOC's, or when a Healthcare emergency affects the state. Control stations at the SEOC and Department of Health and Environmental Control, DHEC, control the system and coordinate net times. A field DEC and EC may schedule the local area repeaters for wide area nets when not being used for statewide nets but must coordinate with the SEOC. It is preferred that announcements for local area nets be made during the statewide net to ensure that all operators are informed. When possible, DEC and EC should limit their local net time on the SCHEART system during a statewide emergency activation since activity on the local system inhibits the ability of any other station passing point to point traffic.

The SCHEART DMR system provides two simultaneous conversations capabilities over one UHF repeater frequency using talk groups. The PRN talk group routinely provides multi-state coverage (NC, SC, and adjacent states). However, during emergencies, the system can be reconfigured to restrict traffic inside of the state. During emergencies, the PRN talk group becomes a statewide only. Talk groups outside the state are dropped and a couple new groups added: data and Mutual Aid. The DMR system's primary function is for command-and-control function in support of AUXCOMM, ARES, and RACES programs. The SEOC is responsible for managing the DMR configuration during an emergency to best meet the state's communication objective. Detailed information about DMR operations and configuration can be found in Appendix B.

During an emergency activation, the SEOC supports statewide emergency support functions and facilitates multijurisdictional response. Members operate as technical specialists under AUXC concept and hold RACES endorsements. They staff the SEOC radio operations room. These individuals may be members of ARES, MARS, CAP or SCSG who have completed additional mandatory training (see Appendix E for SC AUXCOMM details). The radio room supports operation on multiple amateur radio bands, Homeland Security frequencies along with military and local government radio frequencies.   The SEOC operates under the call sign of K4EMD on amateur frequency bands and NCS800 under DHS SHARES. In most instances, tactical calls are used during net operations and all operators are responsible to properly identify stations in accordance with FCC regulations.

Multiple radio operators are involved in station traffic during each operational period. For each operational period, one senior operator is designated as the station control operator. The designated operator's name/call sign is recorded in the PalmettoEOC communications position log. The PalmettoEOC communications position log is used as the official K4EMD station log.

When normal telephone communication capability is readily available, the radio room can be contacted by calling State Warning Point at 803-737-8500 and requesting the radio room or Auxiliary Communications Room. The State Warning Point is operational 24x7.   Operators with access to the HamShack Hotline Telephone System may call extension 5057.

The physical mailing address:
South Carolina Emergency Management Division
Attention: Radio Room
2779 Fish Hatchery Road
West Columbia, SC 29172.

ARES/RACES email traffic to the SEOC radio room should be sent to races3@emd.sc.gov.

In the event the normal Internet email capability is lost. the radio room will revert to the Winlink email address: NCS800@winlink.org . This is a SHARES email address and is part of a Department of Homeland Security fall back communication network. Operation on SHARES HF frequencies and under SHARES call signs is restricted to AUXCOMM authorized operators with specific Winlink-SHARES training. However, mission critical email traffic may be sent to this address from other email addresses. Because SHARES Winlink may route traffic over HF connections, restrictions apply to message size and each message subject line must start with **//wl2k r/**. ARES members have the ability to operate on amateur frequencies and send email traffic to this address (See Appendix E) or the races3@emd.sc.gov via the Winlink Global Email network. This network provides a redundant email delivery using amateur frequencies to jump over localized Internet outages. The Amateur Winlink network supports radio HF and VHF connections for sending and receiving email messages. The network is connected to the DHS SHARES Winlink data network at the Central Message Server level. It allows for interchange of messages between the two independent networks and allows interface into the world-wide email system. For more information on Winlink Global Email use this link: https://winlink.org/ .

The NCS800@winlink.org address can be used for high priority mission essential email traffic. SHARES stations are authorized to encrypt messages when required for more secure transmission over the SHARES network. No encrypted messages may be sent or received from amateur stations. ARES stations wishing to send traffic to the SHARES email address should verbally coordinate with the SEOC prior to sending messages.

During an actual emergency, heightened security is in effect at the SEOC, and non-essential visitors are restricted. However, during an exercise, there are limited opportunities to visit the facility for any ARES member. These events provide a great opportunity to see how various emergency support functions operate and how the radio room provides communication support. YOU MUST CONTACT THE RADIO ROOM AND COORDINATE ANY VISIT PRIOR TO ARRIVING!   The preferred method of coordination is via the telephone.

7.0 Changes to the Guide
You may submit changes or suggestion to this guide at the following link: feedback@ares-sc.org

8.0 ARES/RACES Coordination and Tactical Frequency Plan

Blank data fields indicate the county information has not been submitted to the Section Emergency Coordinator. All County ARES Emergency Coordinators are encouraged to review and submit corrected information to the ARRL Section Emergency Coordinator, or the Assistant Section Emergency Coordinator as needed.

County	Simplex Coordinating Frequency (MHz)	Tactical Frequency (MHz)	Repeater Input Frequency (MHz)	Repeater CTCSS Tone (Hz)
Abbeville	147.555			
Aiken	147.555	145.350	144.750	156.7
Allendale	147.420			
Anderson	147.510	146.970	146.370	
Bamberg	147.525	145.330	144.730	156.7
Barnwell	147.585	147.030	147.630	156.7
Beaufort	146.535	145.130	144.530	88.5
Hilton head		145.310	144.710	
Beaufort		146.655	146.155	
Hilton head		147.240	147.840	100.0
Berkeley	147.585	146.610	146.010	123.0
Calhoun	147.420	146.670	146.070	156.7
Charleston	147.570	146.790	146.190	123.0
Cherokee	147.420			
Chester	147.570	145.310	144.710	167.9
Chesterfield	147.420	444.375	449.375	91.5
Clarendon	147.510	145.230	144.630	123.0
Colleton	147.510	146.910	146.310	156.7
Darlington	147.585	146.850	146.250	
Dillon	147.555	146.745	146.145	82.5
Dorchester	147.540	147.180	147.780	123.0
Edgefield	147.420	145.490	144.890	71.9
Fairfield	147.420	147.210	147.810	156.7
Florence	147.570	146.850	146.250	123.0
Georgetown	147.420	147.375	147.975	123.0
Greenville	147.585	145.470	144.875	91.5
Greenwood	147.570	147.165	147.765	107.2
Hampton	147.540			

County	Simplex Coordinating Frequency (MHz)	Tactical Frequency (MHz)	Repeater Input Frequency (MHz)	Repeater CTCSS Tone (Hz)
Horry	147.540	145.110	144.510	85.4
Jasper	147.570	146.910	146.310	156.7
Kershaw	146.430	146.775	146.175	156.7
Lancaster	147.525			
Laurens	147.525			
Lee	147.540			
Lexington	147.525	147.000	147.600	123.0
Marion	147.510	147.000	146.400	91.5
Marlboro	147.525	443.000	448.000	123.0
McCormick	147.585			
Newberry	147.555	147.210	147.810	156.7
Oconee	147.420	145.290	144.690	162.2
Orangeburg	147.570			
Pickens	147.540	442.400	447.400	127.3
Southeast		443.450	448.450	110.9
Southwest		441.800	446.800	110.9
Richland	147.585	147.330	147.930	156.7
Saluda	147.510	146.910	146.310	123.0
Spartanburg	147.510	147.315	147.915	123.0
Sumter	147.555	145.430	144.830	156.7
Union	147.585	145.150	144.550	
Williamsburg	147.525			
York	147.540	147.030	146.430	88.5
Statewide	146.595**	SCHEART	SCHEART	SCHEART
Statewide		3.9900 LSB		
Statewide		3.9935 LSB		
Statewide		7.2320 LSB		

** The statewide frequency of 146.595 MHz has an encode tone of 156.7 Hz. Normally, stations should use carrier squelch for receive but may turn on decode tone of 156.7 Hz to minimize local interference.

LSB- Lower Side Band, These HF frequencies can vary +/- and are selected based on best atmospheric propagation and band activity.

Appendix A: Quick guide to SCHEART VHF/UHF Analog operation

The SCHEART repeater system is open to all licensed amateur operators except during emergencies. During emergencies, only stations responding to the emergency or stations assisting those responding should use the system. Other stations are welcome to listen.

By having geographically installed VHF/UHF repeaters, the SCHEART network covers all of South Carolina. Most of these repeaters are located at South Carolina Educational Television broadcast sites. Along the coast, other repeaters may link to the SCHEART network to provide expanded coverage. There are three basic system operating modes: 1) stand-alone, 2) point-to-point link and 3) area or statewide link.

Stand Alone Mode
In a stand-alone mode, each SCHEART repeater operates independently. Only local operators within the coverage area of the repeater can use the repeater. Normal repeater protocol is used.

Point-to-Point Link Mode:
In normal operation, an operator may link their local SCHEART repeater to any other SCHEART repeater in the state. First the operator selects the frequency and appropriate encoding tone for the local repeater. Then the operator can link to any remote repeaters by using a DTMF microphone and transmitting the correct link tones. Each SCHEART repeater has an assigned two-digit node number. Think of it as a short telephone number for that location. You must issue a "*" before the two-digit number. This tells the repeater to execute the command to link to the node. The normal process:
1. Listen to the frequency to ensure it is not in use
2. Key your transmitter and identify yourself and indicate you are making a link
3. Key your transmitter and touch * and then the two-digit repeater address number for the remote repeater.   Then un-key the microphone.
4. If the repeater understands the command, it will establish a link between your local repeater and the remote repeater. The system gives you a verbal indication the link is operating.
5. Key your mike, and wait 2 seconds, then speak. It is very important to wait after keying the microphone. Since you are operating across a network and bring up remote repeaters, it takes a couple of seconds for the remote station to key. If you speak too soon, the first part of your transmission at the remote transmitter will be lost.
6. If the system indicates it is busy, wait 5 to 10 minutes before attempting to link again. If the repeater you are linking to is being used, the link will not be established. If you are near to a computer with Internet access you can check repeater status at https://SCHEART.US. Use the IRLP drop down tab.
7. After completing you traffic, you should release the link. Key your transmitter and enter on your DTMF 73. No * command is needed. The system will alert you the link has been cleared.   Don't forget to give your call when you sign off the system.

Area or Statewide Link Mode:
Only SCHEART authorized control operators may access this mode. Authorized operators have the flexibility to configure the VHF/UHF repeaters to provide one or two simultaneous conference channels. The system will be configured for area or statewide operation to support exercise nets and emergencies. Each Sunday night, the system is configured to support statewide ARES/RACES net.

When SCHEART is operating in this mode it is critical for operators should listen to instructions from the net controller. Remember to listen for the frequency to be clear before keying your microphone. When you press the push-to-talk button, wait at least 2 or 3 seconds before speaking. If you do not wait, other stations on the net will not hear the first part of your transmission. Also, remember to give your call sign after finishing.

SCHEART REPEATER INFORMATION (refer to https://scheart.us/)

Node #	Location	Repeater Output Frequency (MHz)	Repeater Input Frequency (MHz)	CTCSS
30	Conway	146.715	146.115	162.2
31	Charleston-Awendaw	146.760	146.160	123.0
32	Columbia	146.715	146.115	91.5
33	Charelston-Wallace	147.105	147.705	123.0
34	Whitehall	146.715	146.115	123.0
35	Florence	146.685	146.085	91.5
36	Greenville-Ceasars Head	145.130	144.530	123.0
37	Greenville-Paris Mountain	145.370	144.770	123.0
38	Edgefield- WR4EC	146.850	146.250	91.5
39	Orangeburg	146.880	146.280	123.0
40	Rock Hill- - K4YTZ	147.030	146.430	88.5
42	Beech Island	147.345	147.945	91.5
44	Sumter- -W4GL	147.015	147.615	156.7
45	Barnwell	147.030	147.630	156.7
46	Murrell's Inlet-- W4GS	146.805	146.205	85.4
47	Spartanburg	147.090	147.690	162.2
48	Union- K4USC	146.835	146.235	123.0
50	Conway	441.675	446.675	162.2
51	Charleston Awendaw	441.725	446.725	123.0
52	Columbia	441.725	446.725	91.5
53	Charleston -Wallace	441.575	446.575	123.0
54	Whitehall	441.675	446.675	123.0
55	Florence	441.575	446.575	91.5
57	Greenville-Paris Mountain	441.675	446.675	91.5
58	Aiken RMC	441.525	446.525	91.5
59	Orangeburg	441.750	446.750	123.0
60	Rock Hill	441.525	446.525	162.2
62	Beech Island	443.125	448.125	91.5
63	Greenwood	441.625	446.625	91.5
64	Sumter	441.625	446.625	162.2
65	Barnwell	442.000	447.000	91.5
67	Spartanburg	441.950	446.950	162.2
82	Dillon W4DPE	146.745	146.145	82.5
70	Main Conference Node			
71	Back up Conference Node			

NOTE: * used before each node number to link nodes; 73 used to de-link, no * required to de-link

Appendix B: SCHEART Digital Mobile Radio (DMR) Repeater System

The DMR repeater system provides amateur radio operators access to a commercial level radio network whose operation is based on talk groups rather than just frequency channels. Talk groups are unique digital identifiers that help route conversations through the network and into the user's radio. Authorized talk groups for use on SCHEART DMR are listed on the SCHEART web site at www.scheart.us under the Digital drop-down tab. DMR repeaters support two simultaneous voice/data conversations on a single frequency pair. Each repeater is configured to support a full-time local talk group and a wide area talk group. During normal operation, the SCHEART DMR network is integrated with the NCPRN network, and the wide area talk group (PRN) covers South Carolina, North Carolina, parts of adjacent states.

To support two simultaneous conversations on the same frequency, the repeater uses Time Division Multiple Access (TDMA) technology. With TDMA, conversations are divided into two time slots and the radio/repeater synchronizes their data depending on which time slot used. In normal operation, SCHEART DMR is configured to support a local talk group (time slot 1) and a wide area (PRN time slot 2) talk group. Stations on the local talk group hear only local traffic while stations on the PRN talk group will hear any traffic on the multi-state network during normal operational mode. Additional talk groups are available that share time slot 1 on a dynamic basis. If a user keys one of the dynamic talk groups, that talk group shares time slot 1 with local. The following dynamic talk groups are available: SC CALL, PRN CHAT 1 and PRN CHAT 2.

Operationally, stations should use the talk group that impacts the fewest repeaters for extended conversations. The PRN talk group activates over 60 repeaters and is great for initial contact and for short conversations. If you make a contact with a station on PRN and plan to have an extended conversation, both stations should switch to a PRN Chat talk group. Two Chat talk groups are provided: PRN Chat 1 and PRN Chat 2. These are dynamic talk groups that do not have any repeaters connected full time. Only stations that activate the PRN Chat talk group through a repeater will be connected. Two stations may move their conversation from PRN to a Chat talk group or multiple stations may move. In either case, moving frees up the PRN channel. When finished, select the Clear Timeslot talk group and key your transceiver. This action will cancel the talk group on the repeater. If you fail to clear the time slot, the connection remains active for 15 minutes or longer if there is activity.

CLEAR TIME SLOT- This talk group is used to clear your connection when using PRN CHAT 1 or 2. If you do not clear these talk groups after you connect, the time slot will continue to carry their audio for 15 minutes and can interrupt conversations on the local talk group.

ECHOTEST- This talk group provides an option for users to test their signal and audio quality into the system. A user pushes PTT and when they receive a talk permit tone, can send a voice message. After releasing the PTT switch, the system will echo back your transmission. This talk group may be unavailable when the system is in the emergency operation mode.

SCHEART DMR has two operational modes: Normal Operations and Emergency Operations. During Normal Operations, all talk groups are available to stations and the PRN talk group covers multiple states. SCHEART also has a special talk group called SC Call. The SC Call talk group uses time slot 1 and is similar to PRN talk group except it only operates on SCHEART repeaters. SC Call traffic is broadcast on all SCHEART repeaters with the following exception: 1) the repeater is busy with Local talk group traffic or 2) the repeater is busy with PRN CHAT 1 or 2 traffic. A hold off timer prevents SC Call traffic from interrupting ongoing conversations for 5 minutes on those repeaters. SC Call talk group is to establish an initial contact and short conversations within the state. For long conversations, please move to either PRN Chat 1 or PRN Chat 2 talk group.

During exercises and incident responses, the DMR system may revert to emergency operational mode (EOM). Under the EOM, the PRN talk group is restricted to SCHEART repeaters. No traffic is routed to repeaters outside of South Carolina. The Local Talk Group is not affected but normal dynamic talk groups outside the state are suspended. Additional talk groups to support mutual aid communications are activated along with a data channel. Other talk groups may be established by the network administrators as necessary to support the response. The DMR system will remain open but stations supporting the incident should be provided priority access. The following two tables describe talk groups in both modes:

Normal Operational Mode:

Talk Group Name	Talk Group Code	Time Slot
Local	27500	1
PRN	2	2
SC Call	27510	1
Clear Timeslot	27000	2
Echo test	9998	1
Simplex	99	1 or 2
PRN Chat 1	27501	1
PRN Chat 2	27502	1

Emergency Operational Mode

Talk Group Name	Talk Group Code	Time Slot
Local	27500	1
PRN -SC Statewide only *	2	2
Data **	36102	1
Statewide Mutual Aid **	36104	2
SC - NC SEOC **	SEOC control	1
SC Call **	27510	1
Chat 1 **	27501	1
Chat 2 **	27502	1
Clear Timeslot	27000	2

* PRN wide area traffic restricted to repeaters within SC.

** Dynamic PTT group

SCHEART DMR Repeater Information – All repeaters use Color code = 1

Location	Transmit	Receive
Anderson ″ N4LRD	*444.5375*	*449.5375*
Barnwell	440.6875	445.6875
Beaufort	441.9875	446.9875
Beech Island	444.2875	449.2875
Bluffton " W4HHI	444.7375	449.7375
Charleston Downtown	443.0375	448.0375
Charleston North	442.4625	447.4625
Charleston South	442.3875	447.3875
Chester	440.5750	445.5750
Clemson " K4BAN	442.2375	447.2375
Columbia Downtown	440.6125	445.6125
Columbia East	442.5125	447.5125
Columbia West	443.5375	448.5375
Dillon	443.1625	448.1625
Florence	442.1625	447.1625
Georgetown	441.8125	446.8125
Greenville	443.1125	448.1125
Greenwood	443.8375	448.8375
Hilton Head " W4HHI	442.0375	447.0375
Lake City	440.6375	445.6375
Landrum "N4BJM	440.7125	445.7125
Lugoff " KI4RAX	441.8000	446.8000
Murrells Inlet	441.8875	446.8875
Myrtle Beach	441.9125	446.9125
Orangeburg	440.5875	445.5875
Pickens ″ WX4PG	442.3125	447.3125
Rock Hill	440.5125	445.5125
Spartanburg	440.6625	445.6625
St George	440.6500	445.6500
Sumter	442.3125	447.3125
Sumter Downtown	441.8375	446.8375
Walhalla " N4LRD	442.5375	447.5375
Trailers & Portables		
Aiken Cnty Trailer	440.8	445.8
Field Com Units	440.8	445.8
SCHEART trailer	440.8	445.8

"- SCHEART partner repeater

Emergency Trailers will only be available on the network during exercises or a response event. They are not normally connected to the network.

Appendix C: South Carolina Auxiliary Communications (SC AUXCOMM)

South Carolina Auxiliary Communication (SC AUXCOMM) is a registration and credentialing process adapted from the Department of Homeland Security concept that defines auxiliary communication support in a NIMS environment. It is a statewide resource pool of qualified radio operators that are committed to supporting the state/county agencies during communication emergencies. Initially, North Carolina established a database standard to provide their state emergency officials access to a comprehensive listing of volunteer radio operators who had demonstrated proficiency in providing emergency communications and support. South Carolina adopted their database standard in 2012.

To be clear, AUXCOMM is NOT a group, and it is not an organization. AUXCOMM describes how volunteer auxiliary communicators are recognized and fit into the NIMS/ICS structure. AUXCOMM volunteers are designated Technical Specialists under NIMS. When operating in an ICS environment, volunteers lose all affiliation to their host organizational group such as ARES, MARS, CERT, REACT or CAP. They become AUXCOMM Technical Specialists and report to the Communication Leader, (COM-L) or designee as part of the logistic support branch. When acting in the capacity of a technical specialist, volunteers are solely responsive to the organization that established the ICS structure for the incident. Volunteer amateur radio operators working as part of AUXCOMM team have access to normal amateur radio frequency bands and may also operate on designated Federal and State frequencies. These additional frequencies are designated by the COM-L and documented in the ICS-205, Incident Radio Communications Plan. So, their ham radio operator role is expanded and capability to effectively communicate enhanced.

Volunteers develop useful communications skills by routinely participating in emergency communication exercises sponsored by ARES, MARS, CAP, and others. Members of these organizations who demonstrate good operational skills, professional attitudes, and the ability to work well as part of a team may be invited to apply for AUXCOMM credentials. AUXCOMM is by invitation from leadership the sponsoring organizations. Upon recommendation of their sponsoring element, candidates are required to demonstrate knowledge of National Incident Management System (NIMS) by completing four on-line courses.   All applicants must pass background verification after they complete four mandatory training courses: ICS-100, 200, 700 and 800. After the applicant successfully completes training and background verification, they become active and at this point receive a State RACES endorsement and are authorized to pass official traffic on behalf of an agency. Volunteers may receive an identification card indicating their AUXCOMM credential. All RACES members are encouraged to take SC Interoperability Courses available at http://interoperability.sc.gov/ . These courses, designed primarily for state employees, provide insight to interoperability issues that RACES operators may face in the field and how to overcome challenges. Additionally, state RACES members are eligible for advanced communication training. When perquisite courses are completed, RACES members are encouraged to complete CISA/FEMA Position Task Book program to become a credentialed AUXC, COML, or COMT.

In 2023, the state RACES Officer established additional volunteer support positions to assist with recruiting and training participants in the AUXCOMM/RACES program. The positions are Recruiting Officer, Secretary, and two Laison Officers and three Training Committee members. Previously. the state RACES program established a deployable asset manager and SEOC radio room coordinator.

Amateur Radio Operators who support the South Carolina State Emergency Operations Center and state deployable communications assets are required have an active account in SC AUXCOMM. South Carolina Emergency Management communication planners use the SC AUXCOMM database to identify potential volunteer radio communicators to support state agencies during emergencies and exercises.

ARES operators, who are interested in registering in SC AUXCOMM, should contact their local Emergency Coordinator, District Emergency Coordinator, or SEC for additional information.

Appendix D: South Carolina SHARES Program

South Carolina Emergency Management Division (SCEMD) joined the Department of Homeland Security CISA SHARES program at the end of 2015. The SHAred RESources (SHARES) High Frequency (HF) Radio program uses HF radio resources outside of the amateur radio bands to coordinate and transmit messages needed to perform critical agency functions during emergencies. SHARES provides HF access to Federal, State, and critical non-government infrastructure organizations a means to communicate when primary systems fail.

South Carolina selected the SHARES network as the preferred back-up carrier for email messages in the event of a widespread communication emergency where primary paths are not available. SHARES uses a system of hybrid Radio Mail Servers (RMS) that continually scan designated HF frequencies. These RMS stations are connected via the Internet to Central Messages Servers but may operate independently of them.   During a localized Internet failure, RMS clients can connect to one of the gateway servers and forward and receive traffic. If that server is still connected to a functioning Internet, messages are routed immediately to the CMS and then routed to the proper destination. If RMS stations are not connected to the Internet, messages can be relayed over HF to other RMS locations which in turn can route the message to the designated pick-up location for the message. This network provides digital RF back up for essential agency email traffic. Extremely sensitive information can be encrypted and transmitted over the SHARES network by operators. Encryption can be used on both binary files and individual text messages.

Amateur radio operators may use their Winlink Global Radio Email network to exchange data with the SHARES network. Winlink provides a gateway function at the CMS level that routes traffic between the two networks. Amateur operators must include the following key at the beginning of each subject line to enable the gateway: **//wl2k r/.** This key must start each subject line of all messages routed to valid SHARES addresses. Remember that no encrypted messages can be transmitted over Amateur Radio frequencies.

While SHARES also supports voice traffic, in South Carolina, Amateur Radio remains the preferred back up means for voice during an emergency. RACES members who have completed state conducted training are authorized to operate any state-owned SHARES stations.

SHARES replaced the South Carolina Agency MARS program. SC Agency MARS Operator Permits are no longer valid for use on MARS frequencies. SCEMD has authorized members who held Agency MARS operator permits to operate state SHARES stations until their permit expires or they receive a replacement SHARES operator permit.

All questions about the SHARES program should be addressed to:

Gabe Turner
Communications Manager
South Carolina Emergency Management Division
2779 Fish Hatchery Road
West Columbia, SC 29172

803-737-8500

Appendix E: Digital Communications- Winlink

This appendix describes the process ARES/RACES operators can use to move digital messages from the amateur radio environment to the Department of Homeland Security DHS SHARES network by using Winlink software. As stated in Appendix D, South Carolina elected to join the DHS SHARES network in 2015 after using Winlink under the agency MARS program for several years. Winlink software provides a common operating platform for moving email traffic between the amateur service and the Federal SHARES service. You can use a telnet connection or HF/VHF/UHF rf connections with various modulation options to send and receive messages. A key feature of the Winlink software is the ability to efficiently move ICS Forms over RF paths without errors.

Winlink software is available for free download and use at https://winlink.org/. You can purchase a registration key, but it isn't required to access all the software features.   This appendix is not intended to provide detailed instructions on how to install and operate Winlink. You can find that information readily available on YouTube. The objective of this appendix is providing operators with the understanding on how to move messages from amateur radio to the State Emergency Operations Center SEOC during an emergency.

Basic Winlink Overview- Amateur Radio and SHARES Networks

Winlink is actually two separate digital networks which have a common interface in the Internet cloud. Central Message Servers which reside in the cloud provide the ability to exchange traffic between the Amateur network and the Federal network. Winlink provides the ability to jump over a local or regional Internet outage and access the Internet at various remote working locations. Once an operator connects to a Remote Message Server (RMS) gateway, the gateway will inform you if it doesn't have a Internet network connection. If no connection, the operator would try another gateway. Your objective is to find an operational gateway still connected to the Internet and send your message. Within a second of sending your message via any working gateway, the system will transfer a properly formatted message to the SHARES network where it will be stored for the intended receiving station to retrieve.

The amateur radio side of Winlink passes unencrypted general amateur email traffic which may go via Telnet, or amateur VHF/UHF/HF radio frequencies. The Winlink system keeps track of available RMS RF gates locations along with their frequencies that you can use to jump over the local or regional Internet outage. The SHARES side of Winlink passes both encrypted and unencrypted email messages via Telnet or Federal radio frequencies (non-FCC managed frequencies). Both networks may include attachments to their messages like normal email. These two separate networks exchange information using a common protocol as part of Amazon Web Services AWS system. The AWS is a series of redundant network servers that provide mirror operation for data. Properly formatted messages can be moved between amateur and the government SHARES networks much like the 60-meter band where government users can exchange voice traffic with amateur operators. Caution, users must remain aware that no encrypted traffic can be routed over the amateur radio network. Likewise, stations with SHARES call signs cannot be used on amateur frequencies. Messages to and from SHARES are handled like third party traffic under part 97 regulations.

An amateur radio operator running Winlink and wishing to send traffic to a SHARES station would start their email by placing the target location SHARES callsign in the message TO field.   To send a message to the South Carolina SEOC, you would use NCS800. Just like sending a regular email, add your subject line and text in the body of the message. Attach a document if needed. With document attachments, restriction apply. Do not attach documents exceeding 100k bytes. Remember, HF transport can be pretty slow. Winlink offers some streamlined tricks to help move document forms.

Using Winlink to prepare ICS message forms

Under the Incident Command System, standard forms are used to exchange most information. This improves efficiency and effectiveness of communication. Winlink includes standard ICS forms which are available under message templates. To access these templates, select MESSAGE from the top pull down and then select New Message. A new window will open. Use the Select Template menu at the top of the screen and browse though the available templates to pick the one you want. Once you select the appropriate template, a HTML form will open, and you just fill it out. When the form is completed, select OK and close the form viewer. You will be taken back to Winlink with at the completed form embedded in as a text message. Note that the Winlink message has stripped the form data from the message and only your text will be transmitted. The receiving Winlink station will take that data and complete the form. This process condenses the information makes each message shorter reducing RF transmit times. Post the message in the outbox and it will be ready for transmission on your next connection to a gateway.

Winlink Field Situational Report

The Winlink development team in consultation with South Carolina Emergency Management Division and other states created a Field Situational Report that any amateur operator may use to report current conditions at their location. This report will be used by state emergency management to better define the scope of the impact during an emergency. Subsequent reports can be used to refine response efforts. To use this form, open Winlink Express and select New Message. When the message window pops up, use the Select Template button, and scroll to the Mapping GIS Forms directory. From this directory, select Field Situational Report by double clicking. The form will automatically open a web browser and provide a fillable template. In the TO Field enter NCS800; races3@emd.sc.gov. Remember while completing the form, to use the GPS coordinates from your reporting location. The GPS coordinates will be used to map the report information. When you've completed your form, hit submit. A pop-up message will inform you to hit OK to close the form. Hit OK and close your browser window. You will be back in Winlink with your form data loaded as plain text. Next, select Post to Outbox. The message is now ready to be sent via Telnet, HF or VHF if you have a local Winlink node. Select the mode to transmit and send your report.

If Winlink is not available on the computer

If the location does not have Winlink available but has functioning Internet and email, you can still send a message to the SEOC. In the To field, enter the Winlink address NCS800@winlink.org. When using Winlink, it handles the @winlink.org but when outside of Winlink system you must add it to the SHARES or the Amateur address. Just remember outside of Winlink software the email address is callsign@winlink.org. But there's one more step you need to take when not using Winlink software to create messages. On the subject line add **//wl2k r/**. For example: Subject**: //WL2K R/** Status report from MUSC. The **//WL2K R/** can be capital or lower-case letters and is used to reduce spam coming into the Winlink system. When using Winlink software you do not have to add this to the subject line.

Worldwide Internet or complete AWS failure

On the extremely unlikely occasion of a global Internet or AWS failure, Winlink can still be used to move message using the Peer-to-Peer mode. In this mode, you craft your message and address it to the nearest operational Winlink station. Make a direct connection to that station and transfer the message. Amateurs can establish relay paths moving messages between Winlink stations. This becomes a simplex Winlink network. Everyone would need to be on the same frequency. Winlink offers an option to digipeat though a station so you can relay a message without anyone at the next station. If you can establish a connection directly between the destination station and origination station, it becomes a very efficient

way to move messages. Remember, in this mode, you could not send a message directly to NCS800 since that call is not allowed under Part 97.   The SEOC would operate under K4EMD for simplex relay operations. Contact the SEOC first and establish the frequency and time for receiving the message.

Message Monitoring

Amateur radio messages sent over the air can be received by anyone with the proper equipment. All Amateur radio Winlink RF messages are also available for monitoring at Winlink.org. Any amateur can access this database and see messages. The log includes peer to peer messages.

Appendix F: Resource Links

1. South Carolina ARES — http://www.ares-sc.org/

2. SCHEART — http://scheart.us/

3. SC State Emergency Management — http://scemd.org/

4. SC County Emergency Management — https://scemd.org/who-we-are/county-emergency-managers/

5. ICS Forms — https://training.fema.gov/icsresource/icsforms.aspx

6. ARRL Radio Gram Form — http://www.arrl.org/files/file/Public%20Service/RADIOGRAM-2011.pdf

7. NCPRN — http://ncprn.net

8. SC Interoperability Training — http://interoperability.sc.gov/

9. ARES Field Manual — http://www.arrl.org/files/file/Public%20Service/ARES/ARESmanual2015.pdf

10. DHS Field Operations Guides: NIFOG, AUXFOG — https://www.dhs.gov/safecom/field-operations-guides

11. SCEMD/ARES MOU (Annex 1) — https://scemd.org/media/1243/09-attachment-d-mous.pdf

12. South Carolina Field Operational Guide (SCIFOG)-- available for iOS and Android download

13. MOU State of South Carolina and ARES — https://scemd.org/media/1243/09-attachment-d-mous.pdf

Appendix G: Acronyms

AEC	Assistance Emergency Coordinator
ARRL	Amateur Radio Relay League
ARES	Amateur Radio Emergency Service
AUXC	Auxiliary Communicator
AUXCOMM	Auxiliary Communications
Bridge4PS	Bridge for Public Safety Collaboration Platform
CAP	Civil Air Patrol
CERT	Community Emergency Response Team
CISA	Cybersecurity & Infrastructure Security Agency
CMS	Central Message Server
COML	Communications Lead
COMT	Communications Technician
DEC	District Emergency Coordinator
DHS	Department of Homeland Security
DoD	Department of Defense
DHEC	Department of Health and Environmental Control
DMR	Digital Mobile Radio
DTMF	Dual Tone Multiple Frequency
EC	Emergency Coordinator
EMA	Emergency Management Area
EOC	Emergency Operations Center
EOM	Emergency Operation Mode
HF	High Frequency
ICS	Incident Command System
IRLP	Internet Radio Linking Project
MARS	Military Auxiliary Radio Service
NCPRN	North Carolina Private Radio Network
NIMS	National Incident Management System
NOM	Normal Operations Mode
RACES	Radio Amateur Civil Emergency Service
REACT	Radio Emergency Associated Communication
REM	Regional Emergency Manager
RMS	Radio Message Server
SEC	Section Emergency Coordinator
SEOC	State Emergency Operations Center
SCETV	South Carolina Educational Television
SCEMD	South Carolina Emergency Management Division
SCHEART	South Carolina Healthcare Emergency Amateur Radio Team
SHARES	Shared Resources HF System
SM	Section Manager
SWP	State Warning Point
TDMA	Time Division Multiple Access
T1OC	Tier 1 Operational Condition
T2OC	Tier 2 Operational Condition
T3OC	Tier 3 Operational Condition
UHF	Ultra High Frequency
VHF	Very High Frequency
WINLINK	Global Radio Email Network