

South Carolina
Amateur Radio Emergency Service,
Radio Amateur Civil Emergency Service, and
Auxiliary Communications Service **AUXCOMM**
Tactical Communications Guide

February 16, 2016

This guide provides tactical information for members of the South Carolina Amateur Radio Emergency Service (ARES), Radio Amateur Civil Emergency Service (RACES), AUXCOMM Service and the general amateur radio community.

Comments or corrections to the guide should be sent the ARRL Section Emergency Coordinator or the District Emergency Coordinator-South Carolina Emergency Operations Center (SEOC). ARRL Emergency Leadership for South Carolina may be found on the SC ARES website at: <http://ares-sc.org/>.

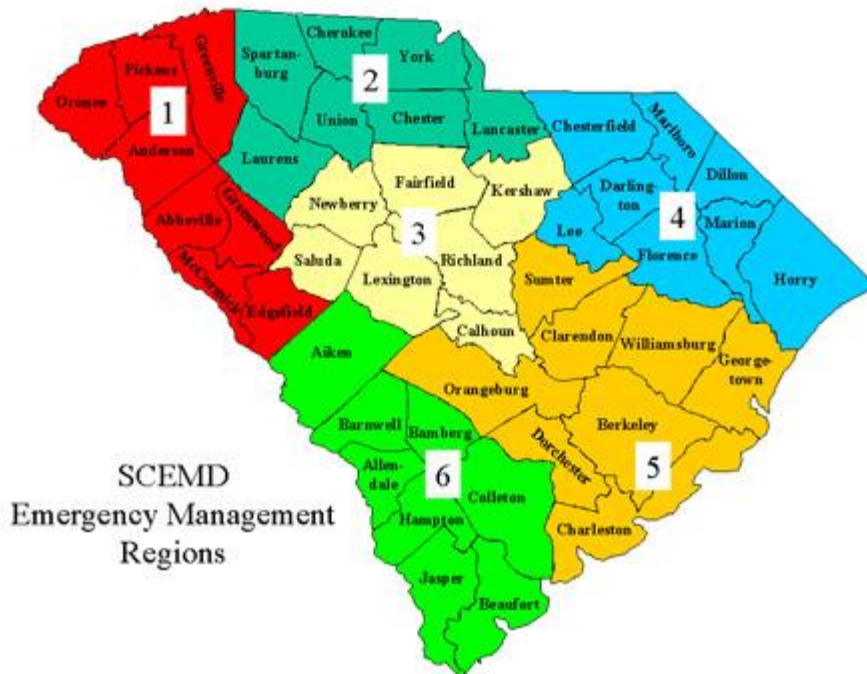
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1.0 South Carolina ARES/RACES Emergency Communications Structure

In South Carolina, the Amateur Radio Emergency Service (ARES) and the Radio Amateur Civil Emergency Service (RACES) are integrated under one leadership structure. The Section Manager is elected by the ARRL membership and represents amateur radio interests in the state. The Section Manager appoints a Section Emergency Coordinator (SEC) to manage the ARES and RACES programs. Integration of both programs under one individual improves efficiency and resource use for training and response functions. Information about and application to ARES/RACES programs can be found at <http://ares-sc.org/>.

The SEC recruits qualified ARRL members to serve as individual county Emergency Coordinators (EC) and District Emergency Coordinators (DEC). The ARES/RACES field organization is aligned to the South Carolina Emergency Management Division's Regional Emergency Areas, and uses the same district numbering plan.



DECs work with County ECs to help train ARES/RACES members, recruit new members, provide information on local nets, and coordinate with local county agencies in preparing for communication emergencies. Any ARRL member can volunteer to be an EC. The EC, or in the case where a county does not have an EC, the DEC, will work with individual amateur radio operators to provide any necessary training. If you are interested in joining the emergency leadership team, please contact the Section Emergency Coordinator.

There is also a DEC for the State Emergency Operations Center (SEOC). The SEOC DEC and the 3 EC team leaders, provide support resources to the various government agencies and supports ARES members in the field. 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 the field Incident Commander is in charge of the operation and local EOC and SEOC act in supporting roles. It is very important that DEC and EC leadership fully understand the ICS and should complete basic FEMA training courses: IS-100b Introduction to Incident Command System, IS-200b ICS for Single Resources and Initial Action Incidents, IS-700a National Incident Management System (NIMS), An Introduction and IS-800b National Response Framework, An Introduction.

All of these 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 all AUXCOMM members. Individual counties may require additional training for people who work in the EOC. 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, we always need to present a professional image and remember we are there to support the operation, not direct it. We cannot tell the agencies what to do, or how to conduct their missions. Interfering with the operation is a quick way to be escorted from the scene. Amateur Radio volunteers shine when other systems break down, and we can pass traffic effectively for others. It is important to remember our role.

The RACES program, while integrated with ARES, has additional requirements. First, a volunteer in RACES must have a county Emergency Manager's endorsement. The Volunteer may undergo a security background check, and they must complete additional FEMA training. In the end, RACES members become part of the South Carolina Volunteer Emergency Communicator Program and are issued an identification badge. Starting in 2012, each county started issuing identification badges for their radio volunteers. The identification badge provides access to communication facilities for emergency response. While not a requirement, almost all RACES members are also members of ARES. If you would like to join RACES, complete the application at <http://ares-sc.org/>. It is a good practice to contact your EC or the SEC before sending the application to the County Emergency Manager for advice and to let them know you are starting the process. If you need help determining contact information for the County Emergency Manager, go to <http://scemd.org/index.php/who-we-are/county-agencies>. South Carolina EMD maintains this listing on their web site <http://scemd.org/>

You do not have to be a member of ARRL to join ARES or RACES. However to be in a leadership role, you must be a member of the League.

The South Carolina Auxiliary Communications Service (SCAUXCOMM) is a statewide pool of highly qualified emergency communicators who commit to support government agencies in an emergency. Members of this elite group must complete additional training; participate in various training events, and pass personal background checks. 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 join SC AUXCOMM. During emergencies, members of SC AUXCOMM will be called on to support the SEOC, state deploy-able communication assets and some local county governments.

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. Amateur Radio has been integrated into emergency back-up plans for county to county EOC communications, healthcare communications, and weather information communications. The planners did not include amateur radio because they believe that it is easy and cheap communication; it's actually hard to organize groups of amateur radio operators, to 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 the only communication channel 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. It is now up to our amateur community to volunteer, train and support our fellow citizens. With staffing cuts that are occurring across the state and county agencies, volunteers will be key to success in an emergency. Joining ARES/RACE/SCAUXCOMM and participating in these programs will help you be ready to help those in need.

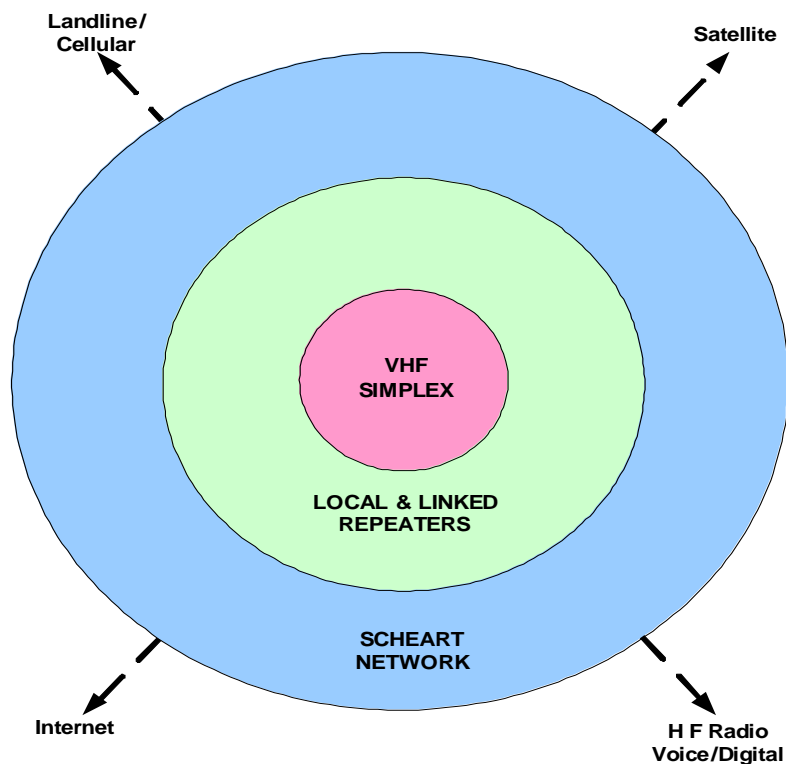
3.0 The Communications Plan for South Carolina ARES/RACES/SC AUXCOMM

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 sufficient 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 foundation. The figure below shows a graphical representation of a tiered communication system concept with layers of capability. Each layer is built on a simpler, more robust layer.

The core of the model is based on simplex operation, two radios talking to each other directly 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). VHF and HF simplex represent the absolute minimum fall back mode for ARES/RACES. Using these two modes, traffic can be relayed Intrastate and Interstate. 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 integrates functioning Internet connections to move data. When local Internet connections fail, ARES/RACES activate the digital fall back plan.

The following paragraphs outline the three tiers of operational capability represented in the graphic. Later sections provide specific guidance and operational details for the layers and digital fall-back plan.

County ARES Communication Layers



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 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 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 hand held 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 will be published in a statewide Emergency Communications plan.

The top layer provides statewide coverage by allowing operators to establish point to point links or SCHEART control stations to link numerous repeaters for statewide coverage. The SCHEART repeater network consists of VHF/UHF repeaters located across the state. Each individual repeater provides wide area local coverage and has the ability to link to other SCHEART repeaters. Collectively, the network provides adaptable geographic coverage and greatly increases the number of stations that can support an incident. The SCHEART network provides for flexible linking for point to point or statewide conference mode of all repeaters. Full Tier 3 Operational Capability- T3OC is achieved when SCHEART network is operating normally. Detailed information on the SCHEART repeater network can be located under the IRLP tab on <http://scheart.us/>. A quick guide for operating on SCHEART system is located in the Appendix.

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 back up interoperability mode for data. That mode operates under the Department of Homeland Security SHARES network. South Carolina joined adjacent states and other governmental and non-governmental agencies as part of the SHARES Program. The state of South Carolina holds the station license and it is responsible for training operators. ARES/RACES/AUXCOMM members are encouraged to complete the training and obtain an operating permit. The operating permit is good for 10 years and allows the individual to operate any South Carolina SHARES station

3.1 Tier 1 Operational Capability T1OC

Tier 1 represents simplex operational mode. The Appendix provides a county by county listing showing two simplex 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 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.

County to county coordination and command and control will occur on the assigned Coordination Frequency. The County Coordinating Frequencies 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. A fallback to full Tier 1 Operational Capability occurs if higher tiers have been compromised.

The State EOC monitors 146.595 MHz with a PL encode tone of 156.7 Hz when activated. This VHF frequency is defined as the statewide simplex coordination frequency. 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 this frequency for possible activity.

HF provides an additional statewide transport mode. The SEOC monitors 3.9935/3.990 MHz LSB or 7.232 MHz LSB depending on band conditions during activation.

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.

ARES/RACES/SC AUXCOMM 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 local repeater frequency or frequencies where one repeater does not cover the county. The Appendix lists the repeater frequency assignment and 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 fall back 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.

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 connect repeaters primarily located at SCETV sites to central conference bridges located in Columbia. This network is structured to maintain communication independent of Internet or commercial vendor failures. SCHEART provides two statewide communication networks for amateur radio use: SCHEART Analog, and SCHEART Digital Mobile Radio (DMR).

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 (DTMF is the touch tone buttons on your amateur radio/ microphone). Authorized system operators can link any combination of repeaters within the state. The analog repeaters support routine amateur communications. During emergencies, the VHF repeaters primarily support ARES/RACES tactical communication to assist essential government services. The UHF repeaters primarily support tactical communications for healthcare.

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. Detailed information on the DMR repeater network is included in the Appendix B.

In a typical emergency, SCHEART Conventional Repeaters will be configured to provide two coordination paths and/or 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 back up 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.

During normal day to day operation, any amateur may link two repeaters in the SCHEART system. However, during training exercises and emergencies, point to point links should be established by ARES/RACES members or radio response team members. Amateurs not involved in the training or activation should not use linking functions. Establishment of multiple point links is restricted to official SCHEART control operators. The SEC is responsible for designating control operators for SCHEART, which includes, but is not limited to, ARES/RACES DEC's and ETV system engineers. 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. This allows another configuration outside the scheduled nets but should be announced on the next scheduled net to ensure all stations understand there will be a change in SCHEART configuration. The DMR Repeaters are available for any amateur to use and are configured to support a full time local talk group and a full time PRN wide area talk group. The PRN talk group is a multi-state conference link that covers most all of

SC, NC with additional repeaters in VA, TN and KY. Other dynamic (on demand) talk groups are available that provides expanded coverage. During exercises or incident responses, SCHEART DMR will switch operational modes to a more restrictive coverage. The PRN talk group will be restricted to SC repeaters and normal dynamic wide area talk groups are suspended.

4.0 Establishing Local or Regional Emergency Nets

During a communication emergency situation, 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.

The second stage is 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 establishes 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.

5.0 Establishing Statewide Emergency Net- SEOC Operations

Amateurs in South Carolina have a unique capability with the SCHEART VHF/UHF analog link system along with the statewide Digital Mobile Radio (DMR) system. The analog system is configured each weekend to cover statewide for training. While the SCHEART system is open for all amateurs to use, during an emergency, control responsibility falls under the ARES/RACES/SC AUXCOMM program with the SEOC having lead responsibility. In addition to the SCHEART network management staff, the additional stations are provided with control operator privileges for the analog system. These individuals 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. One talk group routinely provides multi-state coverage (NC, SC, VA, TN, and DC) using talk groups. However during emergencies, the system can be reconfigured to provide a statewide talk group, a regional talk group based on DHEC regions and a Mutual Aid Coordinating talk group. 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 of SC AUXCOMM staff the SEOC radio operations room. These individuals are members of ARES, RACES, MARS, CAP or SCSG who have completed additional mandatory training (see Appendix B 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. 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 WebEOC communications position log. The WebEOC communications position log is used as the official K4EMD station log.

When normal telephone communication capability is ready available, the radio room can be contacted by calling SCEMD at 803-737-8500 and requesting the radio room or Auxiliary Communications Room. The radio room may provide the caller other telephone numbers.

The physical mailing address:

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

Mission essential ARES/RACES email traffic to the SEOC radio room may be sent to aces1@emd.sc.gov.

In the event normal Internet traffic is lost, the SEOC checks NCS800@winlink.org email address. This is a SHARES email address and is restricted to AUXCOMM authorized operators, and ARES/RACES operators with high priority or critical email traffic. Proper protocols must be used in the subject line. This address is used for radio fall back operation. This means traffic may be routed via HF connections, therefore, severe restriction are placed on message size. ARES/RACES stations wishing to send traffic to this email address must 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/RACES/SC AUXCOMM member. **YOU MUST CONTACT THE RADIO ROOM AND COORDINATE ANY VISIT PRIOR TO ARRIVING!** The preferred method of coordination is via the telephone.

6.0 Changes to the Guide

You may submit changes or suggestion to this guide to KD4JQJ@arrl.net .

7.0 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/RACES Emergency Coordinators are encourage to review and submit corrected information to the ARRL Section Emergency Coordinator or the South Carolina State Emergency Operations Center DEC: Roger Mull kd4jqj@arrl.net.

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	147.525	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	147.150	147.750	91.5
Calhoun	147.420			
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	
Georgetown	147.420	147.375	147.975	123.0
Greenville	147.585	146.610	146.010	
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	147.510	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			
Union	147.585	145.470	144.870	123.0
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 <http://SCHEART.US>. Use the IRLP 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 a 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 <http://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
32	Columbia	146.715	146.115	91.5
33	Charelston-Wallace	147.105	147.705	123
34	Whitehall	146.715	146.115	123
35	Florence	146.685	146.085	91.5
37	Greenville-Paris Mountain	145.370	144.770	123
38	Edgefield	146.850	146.250	91.5
39	Orangeburg	146.880	146.280	123
40	Rock Hill- K4Ytz	147.030	146.430	88.5
42	Beach Island	147.345	147.945	91.5
44	Sumter- W4GL	147.015	147.615	156.7
46	Murrell's Inlet- W4GS	146.805	146.205	85.4
47	Spartanburg	147.090	147.690	162.2
50	Conway	441.675	446.725	162.2
51	Charleston Awendaw	441.725	446.725	123
52	Columbia	441.725	446.725	91.5
53	Charleston -Wallace	441.575	446.575	123
54	Whitehall	441.675	446.675	123
55	Florence	441.575	446.575	91.5
56	Greenville-Ceasars Head-K4ECG	443.125	448.125	123
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
60	Rock Hill	441.525	446.525	162.2
62	Beach 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
80	NC CARES	224.680	223.080	91.5
81	NC HEARS	444.175	449.175	110.9
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. 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 Virginia, West Virginia, and Tennessee.

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: TAC 1- English worldwide, TAC310 -North America, Southeast, and DCI Bridge -Northern California.

Operationally, stations should use the Local talk group for all local conversations. The PRN talk group activates over 30 repeaters and is used for initial contacts and should be used 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 the Southeast talk group. Southeast is a dynamic talk group that doesn't have any repeaters connected full time. Only stations that activate the talk group through a repeater will be connected. Two stations may move their conversation from PRN to Southeast or multiple stations may move. In either case frees up the PRN channel. When finished, select the Clear Timeslot channel and key your transceiver. This action will cancel the talk group on the repeater or the connection will automatically time out after 15 minutes with no traffic on the repeater. Unlike Southeast, other talk groups (TAC1, TAC310, and DCI Bridge) have some repeaters connected full time. These talk groups can be used to talk to people outside the PRN network.

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. However, during exercises and incident responses, the system may revert to emergency operational mode (EOM). Under the EOM, the PRN talk group is restricted to only SCHEART repeaters. The Local Talk Group is not affected but all normal dynamic talk groups 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
Southeast	3174	1
TAC1	8951	1
TAC310	310	1
DCI bridge	3100	1
Echotest	9998	1
Simplex	99	1 or 2

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

* PRN wide area traffic restricted to repeaters within SC.

** Dynamic PTT group

SC DMR Repeater Information – Color code = 1

Location	Transmit	Receive	Local Talk group Link
Bluffton “	444.7375	449.7375	Low Cntry
Charleston Downtown	443.0375	448.0375	Low Cntry
Charleston North	442.4625	447.4625	Low Cntry
Charleston South	443.3875	448.3875	Low Cntry
Hilton Head “	442.0375	447.0375	Low Cntry
Orangeburg	440.5875	445.5875	Low Cntry
Dillon	443.1625	445.1625	Not linked
Florence	442.1625	447.1625	Pee Dee
Lake City (TBD)	440.6375	445.6375	Pee Dee
Myrtle Beach	441.9125	446.9125	Pee Dee
Sumter	442.3125	447.3125	Pee Dee
Aiken * “	443.4625	448.4625	Midlands
Barnwell (TBD)	440.6875	445.6875	Midlands
Beech Island	444.2875	449.2875	Midlands
Columbia Downtown	440.6125	445.6125	Midlands
Columbia East	442.5125	447.5125	Midlands
Columbia West “	443.5375	448.5375	Midlands
Rock Hill	440.5125	445.5120	Midlands
Greenville	443.1125	448.1125	Upstate
Greenwood	443.8375	448.8375	Upstate
Spartanburg	440.6625	445.6625	Upstate
Wallhalla “	442.1625	447.1625	Upstate
SCHEART trailer	440.8000	445.8000	not Linked
Aiken Cnty Trailer	440.8000	445.8000	not Linked
Anderson Trailer	440.8000	445.8000	not Linked

*- Aiken is connected to the system but configured differently for local and dynamic talk groups. See WWW.NCPRN.NET for specific information on this site.

“- SCHEART partner repeater

Appendix C: South Carolina Auxiliary Communications (SC AUXCOMM)

South Carolina Auxiliary Communication Service (SC AUXCOMM) is a statewide resource of highly qualified radio operators that are committed to supporting the state during communication emergencies. SC AUXCOMM represents the interests of affiliated volunteer communications organizations throughout South Carolina and it facilitates the inclusion of operator contact information and specific training certifications. A joint effort with North Carolina established a web database that provides state emergency officials comprehensive and up to date listing of volunteer radio operators who have demonstrated proficiency in providing emergency communications support. By routinely participating in emergency communication organizations like ARES and RACES, members of SC AUXCOMM demonstrate communication expertise along with good interpersonal skills, ability to work well in a team environment and a commitment to develop working knowledge of National Incident Management System (NIMS). Members of SC AUXCOMM may come from ARES, RACES, MARS, SCSG, CAP, or CERT backgrounds. However, all members in SC AUXCOMM are committed to providing emergency communication support in a professional manner to state agencies. Membership in SC AUXCOMM is by invitation and all members must pass state background checks and receive state and or county endorsement.

Amateur Radio Operators who support the South Carolina State Emergency Operations Center and all state deploy-able communications assets are required to be members of SC AUXCOMM. South Carolina Emergency Communication Planners use the SC AUXCOMM database to identify volunteer radio communicators to support state agencies during emergencies and exercises. All AUXCOMM members are required to complete ICS-100, 200, 700 and 800 courses and are encouraged to take SC Interoperability Courses available at <http://interoperability.sc.gov/>. Additional training, both on-line and class room are required of members based on needed skill sets and targeted missions.

A command level team, consisting of representatives from the volunteer communication organizations, state agencies, and federal partners who hold major roles in providing communication, establish policy standards and issue guidance for SC AUXCOMM.

ARES/RACES operators, who are interested in joining SC AUXCOMM, should contact their local Emergency Coordinator or Section Emergency Coordinator or AUXCOMM regional coordinator for additional information about membership. You may also check out the SC AUXCOMM website at: <http://scauxcomm.us/>

Appendix D: South Carolina SHARES Program

South Carolina Emergency Management Division (SCEMD) joined the Department of Homeland Security SHARES program at the end of 2015. The SHARed RESources (SHARES) High Frequency (HF) Radio program supports members using existing HF radio resources to coordinate and transmit messages needed to perform critical agency functions. The SHARES network will be the preferred back-up carrier for digital messages during a widespread communication emergency where primary paths are not available. Amateur Radio will remain the preferred back up carrier for voice communications. AUXCOMM members who have completed state conducted training are authorized to operate state owned SHARES stations. These members will be issued SHARES operator permits by SCEMD.

SHARES replaced the South Carolina Agency MARS program was terminated by DoD. SC Agency MARS Operator Permits are no longer valid for use on MARS frequencies.

Questions about SHARES should be addressed to
Gabe Turner
Communications Manager
South Carolina Emergency Management Division
803-737-8500

Appendix E: Resource Links

1. South Carolina ARES <http://www.ares-sc.org/>
2. South Carolina AUXCOMM <http://scauxcomm.us/>
3. SCHEART <http://sheart.us/>
4. SC State Emergency Management <http://scemd.org/>
5. SC County Emergency Management <http://scemd.org/index.php/who-we-are/county-agencies>
6. ICS Forms <http://training.fema.gov/EMIWeb/is/ICSResource/icsforms.htm>
7. ARRL Radio Gram Form <http://www.arrl.org/files/file/Public%20Service/RADIOGRAM-2011.pdf>
8. NCPRN <http://ncprn.net>
9. SC Interoperability Training <http://interoperability.sc.gov/>