



# Deployment Handbook

Livermore  
Pleasanton  
Dublin  
Tri-Valley Area

**January 2004**

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## To the Tri-Valley Amateur Radio Operator:

Emergency communications is identified as one of the major purposes of the amateur radio service in the enabling federal legislation,

“The rules and regulations of this Part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

- (a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications....” [CFR §97.1]

As an individual, success depends on becoming acquainted with new skills, techniques, equipment, and your fellow operators. Success absolutely requires study and practice. This *Deployment Handbook* has been prepared to provide a reference for commonly needed information when you are in the field. It provides general orientation materials for operations during an emergency response. However, this brief handbook will not answer every question, nor can it provide all of the data and information you may need during an emergency. We live in a dynamic area and we must expect that today’s plans and information will be different tomorrow. In addition to your technical and operational expertise, your ability to respond to a changing environment with flexibility, patience, and understanding will play a major part in your success as an amateur radio service emergency communicator.

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## Preface to Edition One

This *Deployment Handbook* is derived from a document called the *Instant Trainer* written by David G. Hunt (KB6JAW) and Syd Furman (W6QWK). The *Instant Trainer* was originally written in 1993 for use by Alameda County emergency responders, and was later extensively revised by Fred Leif (W6WTI) and distributed by the Northern Alameda County ARES/RACES group in 2001.

The author has drawn some of the material from similar documents from around the Bay area and across the nation. The handbook includes both original materials and items begged, borrowed and perhaps inadvertently stolen from many communications personnel and organizations. No one person or group has the final answer on how we should respond to an emergency. It is through our combined efforts that we arrive at a response that will provide help and comfort to our community

Like the original document, this handbook contains both general material of interest to an amateur radio operator preparing for an emergency response, and specific details needed in the field during a deployment. This *Deployment Handbook* differs from the earlier document in several significant ways. The most important is that this document has been divided into two independent – but related – parts.

Part One contains text and figures covering a wide variety of topics. This Part is meant to serve as an introduction and background on the general topic of amateur radio emergency response. This Part includes more information than the original *Instant Trainer* and includes new material derived from emergency response organizations from across the United States. While it is hoped that all of this material will be useful, much of the material should be read, then filed away for future reference and review.

Part Two contains reminders and specific information needed for deployment in a format that encourages it being made a part of the Responders “get away” kit and carried into the field. Text has been kept to a minimum and tables are used to convey important and timely data. Part Two will need to be updated frequently to ensure that information such as phone numbers and frequencies are accurate and up-to-date.

This format represents a departure from the *Instant Trainer*, not because the earlier document did not serve its purpose, but rather that so much new information has become available, and a Responder is now expected to be able to do so many more tasks. As is typical for such documents, this *Deployment Handbook* will always be a work-in-progress, always ready for new material, and always open to a fresh approach to the complex topic of amateur radio emergency response.

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December 2003

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# CALIFORNIA'S ORGANIZATION FOR EMERGENCY COMMUNICATIONS

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## ***Scope and Purpose of ACS***

The Auxiliary Communications Service (ACS) is a program created by government to supplement its emergency communications with professional, unpaid staff. The formal ACS program comes under the State of California, Governor's Office of Emergency Services. ACS is not a ham radio club, but is part of local government and operates under the authority of the Disaster Plans for the Cities of Livermore, Pleasanton and Dublin. The ACS is supported by volunteer staff.

## ***Supporting Organizations***

The ACS has its genesis in units originally designed for radio communications by Amateur Radio operators on Federal Communications Commission (FCC) authorized frequencies. Dramatic changes in technology and expansion of governmental Public Safety systems indicated the need for a broader service. Activities include much more than operations on selected frequencies of a single service.

ACS supports any and all government public service communications systems in the event of failure, overload or other problems that might jeopardize their usefulness. ACS provides tactical, logistical and administrative support and communications for all government communications systems. The ACS organization makes possible the effective management, coordination, and utilization of personnel from supporting organizations such as: Amateur Radio Emergency Service (ARES), Volunteers in Prevention (VIP), Civil Air Patrol (CAP), the Military Affiliate Radio System (MARS), Special Emergency Radio Service, citizen's band radio groups such as Radio Emergency Affiliated Citizens Teams (REACT), Mercury Amateur Radio Association (MARA), the Salvation Army Team Emergency Radio Network (SATERN) and others. Supporting organizations retain their separate identities and may require their volunteers to meet different membership requirements and training standards.

The Radio Amateur Civil Emergency Service (RACES) is part of ACS and has the same mission: to augment public safety communications during emergencies and exercises. The RACES operates according to FCC rules and regulations.

At this time, the Livermore, Pleasanton, and Dublin ACS plans only include RACES, but other organizations may be included in the future.

## ***Mission***

The mission of the ACS is to serve the Ti-Valley area in support of any possible need relative to communications in an emergency. This means far more than being activated in sporadic emergencies. The ACS is an integrated aspect of the EOC staff, albeit unpaid.

The ACS unit provides a variety of professional unpaid (volunteer) skills to ensure emergency communications between the cities and their jurisdictions, county and city governments and neighboring governments. Within RACES, the ACS response will primarily provide communications support using amateur radio, but ACS through its technical and professional capabilities may be called upon in an emergency situation to assist using other communication routes, such as cellular and regular phones, computers, email, facsimile, internet, microwave, public service radio (police, fire, law enforcement), satellite, television, and video-conference systems; as well as field and in-office support of personnel.

ACS will, in a professional manner, provide auxiliary communications and other support services to city government and the community as are necessary to support disaster response and recovery efforts. In general, it is not the mission of ACS to originate messages. The mission is to transmit messages generated by emergency response personnel. If asked to perform other duties, it is important to recognize that in accepting other duties, we have moved outside of our assigned mission. There is the possibility that in performing other duties, we may compromise our ability to perform our primary function, or we may be performing outside our areas of expertise and capability. ACS mission objectives may include:

- Establishing and operating primary and secondary radio networks to carry public safety and emergency communications utilizing amateur as well as a variety of government systems.
- Providing communications and administrative support by answering phones, making calls, relaying messages within the EOC and other command centers and between various facilities utilizing computer networks, FAX, e-mail and other methods and provide any other support assistance as may be necessary.
- Maintain communications equipment in an ongoing state of readiness and conduct regular communications tests for equipment assigned to the ACS.

Participants in ACS are expected to be more than just operators of radios in a “call me if you need me” situation. They are skilled professionals who work as unpaid staff with the local emergency management agency to enhance its response and recovery in any possible emergency.

## ***Status as a Disaster Service Worker***

Members of the RACES are formally made State of California Disaster Service Workers (DSW). A disaster service worker is anyone registered with a disaster council approved by the California Emergency Council, or any person ordered by a person or body having authority to command the aid of citizens to carry out assigned duties to perform services during a “state of war emergency” or any “state of emergency” or “local emergency.” Livermore, Pleasanton and Dublin have approved disaster councils.

It is preferred that ACS utilize pre-registered volunteers because they are experienced in operating under a unified command structure and performing executive, administrative, technical, and clerical functions for the organization. Registration of ACS members into RACES as disaster service workers is done during the application process. Registration is accomplished by using a Disaster Service Worker Registration form that contains a loyalty oath. An authorized official administers the required loyalty oath and signs the form.

Spontaneous (convergent) volunteers are members of the general public who spontaneously volunteer during emergencies or disasters. They are not usually involved with organized volunteer groups and may lack specific disaster training. In an emergency, there is very little time and few resources to train them. Suggestions for handling spontaneous volunteers appears later in this *Handbook*.

## ***Insurance***

**WORKERS’ COMPENSATION BENEFITS.** Upon registration as a DSW, ACS members are eligible for workers’ compensation benefits while performing assigned duties or undergoing authorized training activities. Volunteer DSW may be covered by workers’ compensation insurance from the moment they leave their home until their safe return home if they are dispatched for duty during an emergency by competent authority prior to departure and no route deviations are made for personal reasons. For example, Radio Amateurs from a non-impacted area may be covered while en route to a disaster response area if properly dispatched for mutual aid purposes by an official. On the other hand, the same Radio Amateurs traveling to the disaster impacted area on their own initiative, without official orders or permission, would not be covered by disaster workers’ compensation insurance until they

physically register (log-in) with the authorities at the disaster site.

Coverage is also available for scheduled disaster preparedness activities including authorized training, but not while en route to and from the reporting place for these activities. Travel performed in support of training events (organizers and instructors) is covered. “Authorized” training events are those that are approved and documented by city officials. Training must be directly related to the ACS mission. *(Note: ARES or radio club activities are not considered authorized ACS training events unless ACS participation is approved and documented by the officials of Livermore, Pleasanton or Dublin.)*

ACS members are registered as DSW in the “Communications” classification. Services such as traffic control, scene security, or other non-communications functions are not part of the ACS mission and should be avoided by ACS members when they are fulfilling ACS assignments. If an ACS member is injured while performing a task outside of their communications role, they may not be eligible for workers’ compensation benefits.

This does not preclude any individual who is a member of ACS from participating in the above activities, however as these are not primarily communications activities, it is important to understand that the individual would not be performing as an ACS member. Nothing prevents an individual from being enrolled as a DSW in more than one classification, providing that the registration and training requirements are met for each classification.

**AUTOMOBILE INSURANCE.** In general, there is no city-provided automobile insurance for ACS volunteers when responding to or performing their duties for the ACS. It is expected that volunteers will obtain their own personal insurance and this will be the only coverage for a vehicle used by the volunteer. If riding in a city-owned vehicle on approved travel, city insurance will apply. ACS volunteers do not have authority to drive city vehicles.

## **Good Samaritan Statutes**

Both the Federal and State government have enacted laws to protect volunteers and private citizens who give aid to others in an emergency. Basically they say that people who lend aid, acting in good faith, within the scope of their experience and expertise, cannot be held liable for their acts even if they result in damage to others. The Federal law is the Volunteer Protection Act, Public Law 105-19, signed into law by President Clinton on June 18, 1997.

While this Handbook cannot provide legal guidance and interpretation of Good Samaritan laws, the following excerpts from California law indicate that our acts as amateur radio emergency communicators would be protected under the Good Samaritan statutes.

### **CALIFORNIA CODES**

#### **SECTION 13970 – 13974.1**

(Good Samaritan Statute)

13970. Direct action on the part of private citizens in preventing the commission of crimes against the person or property of others, or in apprehending criminals, or rescuing a person in immediate danger of injury or death as a result of fire, drowning, or other catastrophe, benefits the entire public.

In recognition of the public purpose served, the state may indemnify such citizens, their surviving spouses, their surviving children, and any persons dependent upon such citizens for their principal support in appropriate cases for any injury, death, or damage sustained by such citizens, their surviving spouses, their surviving children, and any persons dependent upon such citizens for their principal support as a direct consequence of such meritorious action to the extent that they are not compensated for the injury, death, or damage from any other source....

#### **SECTION 1714.5**

(Emergency Disaster Situation Statutory Immunities)

...No disaster service worker who is performing disaster services ordered by lawful authority during a state of war emergency, a state of emergency, or a local emergency, as such emergencies are defined in Section 8558 of the

Government Code, shall be liable for civil damages on account of personal injury to or death of any person or damage to property resulting from any act or omission in the line of duty, except one that is willful.

#### **SECTION 8655-8660**

(Emergency Services Act)

8656. All of the privileges and immunities from liability; exemptions from laws, ordinances, and rules; all pension, relief, disability, workers' compensation, and other benefits which apply to the activity of officers, agents, or employees of any political subdivision when performing their respective functions within the territorial limits of their respective political subdivisions, shall apply to them to the same degree and extent while engaged in the performance of any of their functions and duties extraterritorially under this chapter.

8657. (a) Volunteers duly enrolled or registered with the Office of Emergency Services or any disaster council of any political subdivision, or unregistered persons duly impressed into service during a state of war emergency, a state of emergency, or a local emergency, in carrying out, complying with, or attempting to comply with, any order or regulation issued or promulgated pursuant to the provisions of this chapter or any local ordinance, or performing any of their authorized functions or duties or training for the performance of their authorized functions or duties, shall have the same degree of responsibility for their actions and enjoy the same immunities as officers and employees of the state and its political subdivisions performing similar work for their respective entities.

(b) No political subdivision or other public agency under any circumstances, nor the officers, employees, agents, or duly enrolled or registered volunteers thereof, or unregistered persons duly impressed into service during a state of war emergency, a state of emergency, or a local emergency, acting within the scope of their official duties under this chapter or any local ordinance shall be liable for personal injury or property damage sustained by any duly enrolled or registered volunteer engaged in or training for emergency preparedness or relief activity, or by any unregistered person duly impressed into service during a state of war emergency, a state of emergency, or a local emergency and engaged in such service. The foregoing shall not affect the right of any such person to receive benefits or compensation which may be specifically provided by the provisions of any federal or state statute nor shall it affect the right of any person to recover under the terms of any policy of insurance.

## **STANDARDIZED EMERGENCY MANAGEMENT SYSTEM (SEMS)**

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[The following material is based on the SEMS Introductory Course, Student Reference Manual]

### ***Background, legal basis and intent of the SEMS law***

As a result of the 1991 East Bay Hills Fire in Oakland, Senate Bill 1841 was passed by the legislature and made effective January 1, 1993. The law is found in Section 8607 of the Government Code. The intent of this law, is to improve the coordination of state and local emergency response in California.

The statute directed the Governor's Office of Emergency Services, in coordination with other state agencies and interested local emergency management agencies, to establish by regulation the Standardized Emergency Management System. The SEMS Regulations took effect in September of 1994.

### ***Purpose and Scope of the SEMS Law***

The basic framework of SEMS incorporates the use of the Incident Command System (ICS) developed under the Fire Fighting Resources of California Organized for Potential Emergencies (FIRESCOPE) Program, multi-agency or inter-agency coordination, the State's master mutual aid agreement and mutual aid program, the operational area concept, and the Operational Area Satellite Information System (OASIS).

SEMS provides for a five level emergency response organization, activated as needed, to provide an effective response to multi-agency and multi-jurisdiction emergencies. The five organizational levels in SEMS are: Field, Local Government, Operational Area, Region, and State.

The use of SEMS facilitates:

- The *flow* of emergency information and resources within and between involved agencies at all SEMS organizational levels.
- The process of coordination between responding agencies.
- The rapid mobilization, deployment, use, and tracking of resources.

SEMS is designed to be flexible and adaptable to the varied emergencies that can occur in California, and to meet the emergency management needs of all responders.

By law, state agencies must use SEMS when responding to emergencies involving multiple jurisdictions or multiple agencies. Local governments are strongly encouraged to use SEMS, and they must use SEMS in order to be eligible for state funding of response related personnel costs.

SEMS is a management system. It is based on a proven system that has been in use for over twenty years. SEMS provides an organizational framework and guidance for operations at each level of the state's emergency management system. It provides the umbrella under which all response agencies may function in an integrated fashion.

## ***Five basic components of SEMS***

SEMS will integrate several of the state's primary emergency response programs. The primary components that comprise SEMS are:

- The Incident Command System (ICS)
- Multi-Agency Coordination System (MACS)
- The Master Mutual Aid agreement
- Use of Operational Areas
- The Operational Area Satellite Information System (OASIS)

**THE INCIDENT COMMAND SYSTEM.** The ICS was developed as a part of the FIRESCOPE program during the 1970's by an interagency working group representing local, state and federal fire services in California. After field tests, ICS was adopted by the fire services in California as the standard all hazards response system. ICS also has been adopted nationally by the federal land management agencies as the standard for response to all wildlands fires.

**MULTI-AGENCY COORDINATION.** Multi-agency or inter-agency coordination as it applies to SEMS, means the participation of agencies and disciplines involved at any level of the SEMS organization working together in a coordinated effort to facilitate decisions for overall emergency response activities, including the sharing of critical resources and the prioritization of incidents.

Multi-agency coordination is generally that which takes place among agencies within a jurisdiction. For example, coordination between police, fire, and public works departments working together at an EOC. Inter-agency coordination is generally that which takes place between agencies in different jurisdictions or between agencies at different levels. For example, a county sheriff municipal police and national guard.

**THE MASTER MUTUAL AID AGREEMENT.** A Master Mutual Aid Agreement in California was originally signed in 1950. Under this agreement, cities, counties and the State joined together to provide for a comprehensive

program of voluntarily providing services, resources and facilities to jurisdictions when local resources prove to be inadequate to cope with a given situation.

Written mutual aid plans and operating procedures have been developed for several discipline specific mutual aid systems that function on a statewide basis within the Master Mutual Aid Agreement. The fire and rescue and law enforcement systems are examples that we hear the most about. Emergency Medical, Coroner and Search and Rescue systems also exist. Public works and building officials mutual aid systems are under development.

**OPERATIONAL AREA.** An Operational Area consists of a county, and all political subdivisions within the county area. The governing bodies of each county and of the political subdivisions in the county may organize and structure their operational area. The county will be the lead agency for the operational area unless another arrangement is established by agreement.

The operational area is used by the county and the political subdivisions within the operational area for the coordination of resources and information, and to serve as a link in the system of communications and coordination between the state's emergency operation centers and the operation centers of the political subdivisions within the operational area.

**OPERATIONAL AREA SATELLITE INFORMATION SYSTEM.** The Operational Area Satellite Information System is a satellite based communications system with a high frequency radio backup. OASIS provides the capability to rapidly transfer a wide variety of information reports between OASIS user agencies. In SEMS, OASIS can be viewed as both a communications network and information dissemination system linking three of the five SEMS organizational levels.

The communications components to the system include a satellite system in each operational area linked to selected state, federal and local agencies. The information-processing component of OASIS contains fifteen forms which provide a rapid and accurate means of transferring information between locations on the OASIS network.

## ***Organizational/response levels***

SEMS regulations describe five organizational response levels. The levels are:

- Field
- Local Government
- Operational Area
- Region
- State

**FIELD LEVEL.** The field response level is the level where emergency response personnel and resources carry out tactical decisions and activities under the command of an appropriate authority in direct response to an incident or threat.

**LOCAL GOVERNMENT LEVEL.** Local governments include cities, counties, and special districts. Local governments manage and coordinate the overall emergency response and recovery activities within their jurisdiction.

In SEMS, the local government emergency management organization and its relationship and connections to the Field Response level may vary depending upon factors related to geographical size, population, function, or complexity.

**OPERATIONAL LEVEL.** Under SEMS, the operational level means an intermediate level of the state's emergency services organization which encompasses the county and all political subdivisions located within the county. The operational area manages and/or coordinates information, resources, and priorities among local governments within the operational area, and serves as the coordination and communication link between the local government level and

the regional level.

It is important to note, that while an operational area always encompasses the entire county area, it does not necessarily mean that the county government itself manages and coordinates the response and recovery activities within the county. In most cases, the county EOC will function as both the Operational Area EOC and the EOC for the county.

The decision on organization and structure within the Operational Area is made by the governing bodies of the county and the political subdivisions within the county.

**REGIONAL LEVEL.** Because of its size and geography, the state has been divided into six Mutual Aid Regions. The purpose of a mutual aid region, is to provide for the more effective application and coordination of mutual aid and other emergency related activities. The Office of Emergency Services provides administrative oversight over the mutual aid regions through three Administrative Regional Offices.

In SEMS, the regional level manages and coordinates information and resources among operational areas within the mutual aid region, and also between the operational areas and the state level. The regional level also coordinates overall state agency support for emergency response activities within the region.

**STATE LEVEL.** The state level of SEMS manages state resources in response to the emergency needs of the other levels, and coordinates mutual aid among the mutual aid regions and between the regional level and state level.

The state level also serves as the initial coordination and communication link between the state and the federal disaster response system. After initial contact at the state level, those federal response elements deemed necessary by the Regional Emergency Operations Center (REOC) Director will be directed to co-locate with state counterparts at the REOC.

### ***Basic features used at each SEMS level***

SEMS has several features based on the Incident Command System. The field response level uses functions, principles, and components of ICS as required in SEMS regulations. Many of these field response level features are also applicable at local government, operational area, regional and state levels. In addition, there are other ICS features that have application to all SEMS levels.

**ESSENTIAL MANAGEMENT FUNCTIONS.** ICS has five primary functions applicable to any emergency. These are: command, operations, planning/intelligence, logistics and finance/administration. These functions are required for use at all SEMS levels. To avoid confusion, and to stress the role of the EOC, the term management is used rather than command at all EOC levels.

**MANAGEMENT BY OBJECTIVES.** The Management by Objectives feature of ICS as applied to SEMS, means that each SEMS level should identify measurable and attainable objectives to be achieved. The time frame necessary to accomplish these objectives is known as the Operational Period.

**ACTION PLANNING.** Action planning should be used at all SEMS levels. The use of action plans provides designated personnel with knowledge of the objectives to be achieved and the steps required for achievement. Once objectives are determined, the operational period action plan provides a framework for establishing the necessary organization, making assignments and allocating resources to accomplish the objectives. At the incident, action plans are known as Incident Action Plans.

**ORGANIZATIONAL FLEXIBILITY – MODULAR ORGANIZATION.** At each SEMS level, only those parts of the planned organization that are necessary to meet current objectives need to be activated, and the organization can be arranged in various ways within or under the five SEMS functions. The tasks assigned to non-activated parts

of the organization will be the responsibility of the next highest level in the organization.

**ORGANIZATIONAL UNITY AND HIERARCHY OF COMMAND OR MANAGEMENT.** Organizational Unity means that every individual within an organization has designated supervision.

Hierarchy of command/management means that all parts of the organization within each activated SEMS level are linked together to form a single overall organization within appropriate span-of-control limits.

**SPAN OF CONTROL.** Maintaining a reasonable span of control is the responsibility of every supervisor at all SEMS levels. ICS development established a one to seven ratio as the maximum span of control under emergency response conditions. One to five ratio was established as an optimum. This means that in an emergency response organization, one supervisor should have direct supervisory authority of no more than five positions if they are performing separate functions.

**PERSONNEL ACCOUNTABILITY.** Personnel accountability is accomplished through the Organizational Unity and Hierarchy of Command/management feature along with the use of check-in forms, position logs and various status keeping systems.

**COMMON TERMINOLOGY.** Common terminology is applied to organizational elements, position titles, facility designations and resources in order to rapidly enable multi-agency, multi-jurisdiction organizations, disciplines and resources to work together effectively.

**RESOURCES MANAGEMENT.** At all SEMS levels, there is a responsibility related to managing resources. This will vary from level to level in terms of tactical directing and controlling, to coordination, to resource inventorying or strategic planning.

**INTEGRATED COMMUNICATIONS.** At the field response level, integrated communications is used on any emergency involving multiple agencies. At all EOC levels, and between all SEMS levels there must be a dedicated effort to ensure that communications systems, planning, and information flow are being accomplished in an effective manner.

## ***Titles and Roles***

The primary functions found in ICS are:

- Incident Command
- Operations
- Planning/Intelligence
- Logistics
- Finance/Administration

These same functions with some minor variation in titles and associated activity are the key functional activities found at all SEMS EOC levels. The table below provides a brief summary of the titles and definitions of activities associated with these functions.

<b>PRIMARY SEMS FUNCTION</b>	<b>FIELD RESPONSE LEVEL</b>	<b>EOCS AT OTHER SEMS LEVELS</b>
Command/Management	Command is responsible for the directing, ordering, and/or controlling of resources.	Management is responsible for overall emergency policy and coordination.
Operations	The coordinated tactical response of all field operations in	The coordinating all jurisdictional operations in support of the

	accordance with the Incident Action Plan.	response to the emergency.
Planning/ Intelligence	The collection, evaluation, Documentation, and use of information related to the Incident.	Collecting, evaluating, and Disseminating information and Maintaining documentation.
Logistics	Providing facilities, services, personnel, equipment, and materials in support of the incident.	Providing facilities, services, personnel, equipment, and materials.
Finance/ Administration	Financial and cost analysis and administrative aspects not handled by the other functions.	Financial activities and administrative aspects not assigned to the other functions.

### **Concept of teamwork, coordination and effectiveness**

SEMS as a management system provides for a fully integrated and coordinated multiple level response to multi-agency, multi jurisdictional emergencies. The bringing together of the ICS, multi-agency or inter-agency coordination, mutual aid systems, the operational area concept, and OASIS into a single standardized management system is a major step forward in increasing the effectiveness of California’s response to emergencies.

### **Roles and Functions for Personnel**

**FIELD LEVEL.** At the field level, emergency response personnel may assume a variety of roles within the Incident Command System. Agency policy will often dictate what personnel will fill what roles. A concept here is to use the most qualified individuals regardless of rank or position. The determination of what role they will perform will be a function of:

- The kind and size of the emergency
- Disciplines involved
- Personnel background and experience
- Training
- Qualifications and certifications
- Agency policy

ICS provides an emergency management structure that allows for the most qualified personnel to be used at any position.

Incident Commanders may at the onset of the emergency be relatively low ranking personnel. ICS provides a mechanism for the transfer of command if the emergency requires more qualified personnel.

**EOC LEVEL.** The five major functions required within the organization at the EOC level may require personnel from a variety of agencies within a municipality, operational area, region or state, depending upon the level being activated.

Shown below, are two examples: one for local government and operational areas, and the other for region and State.

#### **LOCAL GOVERNMENT OR OPERATIONAL AREA EOC**

<b>FUNCTION</b>	<b>STAFFING CONSIDERATIONS</b>
Management	Administrative personnel, special district managers,

	Emergency management, fire, law enforcement are Recommended for use in initial EOC activation.
Operations	Key dept. managers and public safety personnel will Generally coordinate these activities within the EOC During initial activation.
Planning/ Intelligence	Emergency management, fire, law enforcement, Planning depts., utilities and other departments can Contribute personnel depending upon the nature of the Emergency.
Logistics	Departments of General Services, Public Works and Utilities are good candidates to provide personnel for this EOC function. Other departments may also have the Background to manage or assist in this function.
Finance/ Administration	City/County Finance Departments are candidates For managing this function within an EOC.

**REGION/STATE EOC**

<b>FUNCTION</b>	<b>STAFFING CONSIDERATIONS</b>
Management	OES Director, Chief Deputy Director, Deputy Directors, REOC Director – Regional Administrators
Operations	To fill Section/Branch Positions: OES, CDF, Fire Marshal, State Police, Mental Health, etc.
Planning/ Intelligence	OES Staff, CDF, plus Technical Advisors as necessary.
Logistics	To fill Section/Branch Positions: General Services, OES, CDF, etc.
Finance/ Administration	OES, Dept. of Finance

***Pre-assignment responsibilities***

The activation of any SEMS level (field or EOC) may require personnel to be temporarily relocated for an indefinite time. While most activations will generally be of short duration (one day to a few days), there may be situations in which personnel will be absent from their normal workplace and homes for extended periods, many days, or even weeks.

The following are general guidelines to take before departing for those situations that will require an extended stay or out-of-jurisdiction travel:

- Assemble or update a travel kit containing any special technical information, e.g., maps, manuals, contact lists, and other reference materials that you may need.
- Prepare personal items that you will need for your estimated length of stay.
- Review your emergency assignment. Know to whom you will report and what your responsibility will be.
- Have a clear understanding of the decision-making authority you hold for your agency while at an incident or at an EOC. Determine this as soon as you realize you may be assigned to an incident or to your own or another EOC.

- Determine what communications procedures should be followed so you can contact your headquarters or home office if necessary.
- Ensure that family members know your destination and how to contact you in the event of a family emergency.
- Familiarize yourself with travel and pick-up arrangements that have been established for you.
- Determine what your return mode of transportation will be if possible.

## ***Check-in***

**FIELD LEVEL.** All personnel assigned to an incident using ICS must check-in upon arrival. The check-in function at an incident ensures that there is complete and continuous accountability over all assigned personnel.

**EOC LEVEL.** To ensure accountability of personnel, it is essential that a check-in function be established at all EOC levels. Currently, this is done through the use of sign-in sheets, rosters etc. An adaptation of the ICS check-in form and procedure for EOCs may be useful for the EOC level check-in function.

**REPORTING TO SUPERVISORS.** Under the unity of command or management feature of SEMS, all personnel operating within a field response ICS organization, or at an EOC level must have a supervisory reporting link established.

## ***Incoming briefings***

All incoming personnel, whether to an ICS organization at the Field Response level, or reporting to an EOC, should be provided with a briefing, prior to their assuming their assigned position. Briefings should include:

- Current situation assessment.
- Identification of specific job responsibilities expected of you.
- Identification of co-workers within your job function and/or geographical assignment.
- Availability of communications.
- Location of work area.
- Identification of eating and sleeping arrangements as appropriate.
- Procedural instructions for obtaining additional supplies, services and personnel.
- Identification of operational period work shifts.
- After receiving' your briefing and activating your assignment, give a similar briefing to any personnel assigned to you.

## **General demobilization/release requirements**

Agency requirements for demobilization at incidents at the Field Response or at EOC levels will vary considerably.

Large incidents and/or EOCs within larger jurisdictions may require the establishment of a Demobilization Unit within the Planning/Intelligence Section to help facilitate the demobilization process.

General demobilization considerations for all personnel at either the Field Response or EOC levels are to:

- Complete all work assignments.
- Brief subordinates regarding demobilization.
- Complete and file required forms and reports.
- Follow agency check-out procedures.
- Evaluate performance of subordinates prior to release.
- Return any communications equipment or other non-expendable supplies.
- Report to assigned departure points on time or slightly ahead of schedule.

## **SHOULD YOU BE IN AMATEUR RADIO EMERGENCY RESPONSE?**

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Reliance on Internet, cellular, paging and other personal communication services for disaster communications have resulted in some notable failures. This is because these systems are not designed to include the necessary capacity and system redundancy to handle disaster call volume. Urban cellular systems are overloaded during everyday highway tie-ups when citizens stuck in traffic all try to call at once. Public safety has priority via “ruthless preemption,” but these systems remain vulnerable to single-point failures in their Central Offices and automated switching. Antenna towers can be damaged by ice, high winds or lightning. Exercises rarely stress the high probability for substantial loss of communications services. The advantage of using amateur radio to supplement disaster communications lies in its inherent flexibility. ARES/RACES can bring more operators and equipment than most localities can afford to keep in reserve. Operators maintain their equipment in a high state of readiness, are familiar with it from daily use, technically trained and able to work around most common problems. When integrated into local emergency plans, ARES/RACES is a valuable communication asset.

### ***Honestly Assess Your Abilities***

Not everyone can climb mountains or swim deep oceans, and not every amateur radio operator can communicate effectively when in a difficult or hazardous location, or in a high-stress emergency operation. Working in the controlled environment of an EOC will be quite different than being on location with a fire unit, or being asked to interact with hurt and injured victims as part of a first aid unit. It is important that every ARES/RACES volunteer honestly evaluate their physical, emotional, and psychological make-up so they volunteer only for tasks and in locations in which they will feel capable of effective performance.

Below are a set of essential abilities, skills and capabilities considered by many organizations to be critical for a person to perform successfully in an emergency response. If you can make a positive response in only a majority of

the answers, you probably should *assist* another more experienced volunteer and not take a lead position or a role where you are the sole ARES/RACES communicator. If you honestly feel you meet essentially *all* of the conditions, then consider assuming a significant role, including a position where you may be the sole ARES/RACES communicator or may be asked to operate in a high stress environment.

If you can only make a positive response to a few of the criteria, **don't give up or quit!** Study, practice, ask for help and develop your skills so you too can be an effective ARES/RACES volunteer in the future.

No matter what your skill level or willingness to assume responsibility, if the situation becomes more than you can handle, or one in which you do not feel able to perform effectively, it is better to say that you can not continue and to obtain needed help, than to press on, possibly endangering yourself and others.

### ***NEVER BE AFRAID TO ASK FOR HELP***

## ***Essential Abilities, Skills and Capabilities***

Emergency response organizations are *supposed* to have trained members, who are prepared to deal with a disaster. While each jurisdiction will establish its own requirements, ARES/RACES team members should address their own abilities, skills and capabilities, both as an amateur radio operator and as an individual prepared to respond in an emergency situation. This type of personal preparation may include:

- Training in basic First Aid, and CPR.
- Training in basic land navigation, map and compass fundamentals.
- Training in basic fire safety and hazardous material handling (e.g., CERT).
- Training in basic emergency radio communications (ARECC, Level 1).
- If operating in an EOC or in a lead role, training in advanced emergency radio communications (ARECC, Level 2 and 3).
- Family members prepared to evacuate to a safe location or “shelter in place” and have a “Home Disaster Kit” accessible with supplies to sustain them for at least 72 hours at home or in a community shelter.
- Having the necessary radio equipment, supplies and safety gear to travel to a deployment site and operate for 72 hours until arrival of your relief team.
- Experience handling an organized communications net.
- Experience originating and operating a net in response to a public event or natural event such as a small – “felt” – earthquake.

In the following sections are information, background and suggestions to help you prepare for your role in amateur radio emergency communications response. As with the emergency itself, nothing about how to do a response is absolute or “set in concrete”. The ability to remain flexible, to adapt and adjust to the changing situation, and to stay aware of the condition of others – and yourself – is critical to a safe and successful response.

## **GOING TO YOUR ASSIGNMENT**

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***The first and most important thing is to make sure that your family and those who may depend on you are safe and in a secure location.***

### ***Family Considerations***

Confirm to your own satisfaction that your family and those who may depend on you are safe and in a secure location. No one will perform well in an emergency if they are concerned about the well-being of their family.

Sometimes you may assist temporarily before knowing the status of your family. Make sure net control knows your situation so that you can be relieved as soon as possible. Please check back to help out when you are confident about the safety of your family.

## ***Insurance Coverage***

Insurance for responders depends on the agreement with the client and the insurance coverage they have obtained. Until informed otherwise, as a volunteer you should assume that you are responding only as a public volunteer and are not covered by the client's private, local or state insurance. You are responsible for your own health and safety, and for any associated medical and insurance coverage. If the client has obtained insurance coverage that includes the amateur radio service responders, the EC/AEC or other amateur radio organizer for the response will be able to inform you of the insurance coverage and any requirements to sign-in, etc. Because you will generally not be covered during transit to and from your assignment, or until you have completed the required check-in forms, be sure to learn and complete all required check-in procedures.

## ***Obey all laws and regulations when responding***

Although you may have a critical role to play in the emergency response, you are a private citizen and you have no special legal status as an ARES/RACES volunteer. You must obey all laws and follow the directions of law enforcement or other public safety officials. If you have ARES/RACES credentials, they should be recognized by local emergency response personnel to grant you access or passage to your assignment. However, if you encounter any problems, follow directions and as soon as possible call the EC or NCS for assistance and instructions.

## ***Personal safety when responding***

***You are always responsible for your own safety!***

As a volunteer, you should never be asked to put yourself at risk of injury, and you should not accept an assignment that you feel places you at risk. Others responding during an emergency may have accepted different levels of risk by the very nature of their employment or position within a response organization. It is not uncommon for these responders to view everyone as having the same commitment and obligation, and to make assignments and requests based on their role. As a volunteer, you have no more or less obligation to be placed in harms way than any other citizen in the community.

In today's climate of terrorism and the use of unconventional weapons such as chemical, biological and nuclear materials against the public, the amateur radio volunteer must consider that they may be exposed to risk in responding to an emergency. If there is any potential for exposure to hazardous materials or to situations in which injury may occur, it is critically important that each amateur radio responder be in the company of properly trained and equipped professional emergency personnel.

**HAZMAT INCIDENTS.** Outside of terrorist acts, one incident that does occur throughout the United States and frequently involves amateur radio support is a hazardous material spill or release – a “Hazmat Incident”. This may be an accident involving a tanker truck, a train car derailment, or a release from an industrial plant. In each case, the release of dangerous material may threaten the public and require the major deployment of emergency personnel. Experience in other areas of the U.S. have shown that amateur radio emergency communications can play a significant role in these responses.

If confronted with a hazmat incident, areas of safety are:

- Uphill
- Upwind

- Upstream

In responding to an incident, a general rule of thumb is the “rule-of-thumb”:

Hold up your arm and look at the incident scene over your outstretched hand. If your thumb does not cover the scene, **you are too close!**

## WHAT TO BRING TO A RESPONSE

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Each responder should bring the “**Basic**” items to every response. Many ARES/RACES volunteers carry these items in their vehicle at all times so as to be ready for a deployment no matter where they may be located.

The **72-Hour Kit** supplements the basic items for extended, isolated, or field deployment. Because several of the items in this kit need to be replenished, replaced or are perishable, storage in a more controlled environment such as your home or garage may be preferred. The important thing is to have the kit prepared and ready for immediate deployment. Attempting to collect and organize the kit *following* a deployment call is likely to fail, and will certainly delay your leaving for your assignment. At best, the missing items will just be an inconvenience, but missing an important item could compromise your response and seriously impact those you have been sent to serve.

Consider marking expensive items with your call sign. If you do not want to permanently mark the items (for possible future resale), at least put return address labels on your gear so it can be returned if lost or misplaced in the field.

### **Basic Items**

#### COMMUNICATIONS EQUIPMENT

- Transceiver(s) – if possible a dual band, 2 meter, 70 cm
- Headphones or earphone with tip adapters
- Extra battery packs (charged) or external battery
- Cigarette lighter power adaptor
- Antenna(s) for HT (something better than a rubber duck).
- Extra fuses for any protected power connectors
- Male BNC to SMA adapter
- Female BNC to SO-239 adapter
- Flashlight, batteries and spare bulbs
- Power adapters for your rig **allowing it to be connected to a power source through a Molex 8A, Anderson Powerpole, or OEM T connector.**
- Steno pad or notebook, pencils; pens are OK but tend to fail in the field
- *Thomas* maps for East Bay

#### PERSONAL ITEMS

FCC License (laminated several copies and put one in all kits, bags, and all vehicles)

- ARES ID
- RACES ID
- Credit cards
- Cash, including change for telephones
- Water (3 x 20 oz bottles)

## **The “72-Hour Kit”**

If deployed away from your home location, or if “held-over” at an EOC or other “urban” emergency location, be prepared:

- to get a motel at your own expense (if they exist or are open for business);
- to “camp out” in a shelter-type facility using your own equipment; or,
- to be offered space in a shelter. However, shelters are usually very noisy and are not conducive to getting needed rest; meals are usually provided but may be in short supply, so have your own food.

The equipment items in the kit provide an additional level of radio support and simple tools for repairs in the field. While we can’t carry a Radio Shack or Ace Hardware store, the items should allow you to fix most immediate problems.

The personal items in the kit provide a degree of comfort should you be 'held over' for more than a few hours. Just about everything on the list, except the sleeping bag and cot, can be packed in a small suitcase or a canvas athletic bag. If you keep the sizes of items small, people have found that padded, insulated lunch bags work well. They come in several sizes, are colored for easy identification, and are usually inexpensive.

### **EQUIPMENT**

- Large capacity flashlight (*Maglite*), fresh batteries, spare batteries, spare bulb
- *Leatherman* multipurpose tool, sharpened, in good condition
- *Swiss Army* pocket knife, sharpened, in good condition
- Disposable butane lighter, unused
- Pocket compass
- Duct tape (at least one roll each of 1 and 2 inch width)
- Electrical tape (3/4 inch width)
- Cable ties (assorted)
- Lighters – “day-glo” orange and green work well
- Soldering iron, portable butane fuel; solder, flux.
- 50’ coax (RG-58 or 8X) with PL-259 connectors
- 50’ 1/8<sup>th</sup> inch nylon cord
- Coax adapters (2 each): PL259 > BNC F, BNC M > SO239, SO-239 > SO-239 (barrel), BNC-F > BNC-F (barrel)
- Speaker microphone
- Aux speaker with connectors for HT
- Battery case(s) for use with AA batteries
- AC power adapter for radio(s)
- Cigarette lighter power adapter

### **PERSONAL**

- Toiletry Kit
- Medicines you require or may need
- Glasses - an extra pair
- Small bag, or box, 'cold water' laundry soap
- Towel and washcloth
- Baby wipes (sealed packet)
- Travel alarm
- Sewing kit (hotel size)
- Sunscreen
- Lip balm with sunscreen (at least SPF 15)
- Aspirin/Tylenol/Ibuprofen

- Antacid tablets
- Throat lozenges
- Roll of toilet paper in a ziplock bag
- First Aid kit, personal size
- Surgical gloves (several pair)
- Ear plugs, to help you to sleep in a shelter
- Eye covering mask, to help you to sleep – wherever.
- Whistle
- American flag (small, frequently welcomed at the site)
- Deck of playing cards

#### **FOOD AND SHELTER**

- Water – at least a gallon, as much more as you are willing to carry, small bottles are convenient for rotating your supply.
- Knife, fork and spoon, Sierra-type cup, pan/pot
- Basic condiments - salt/pepper/etc.
- Wrapped hard candy
- Wrapped granola bars
- MRE or USCG food packets (3 days) (better than instant, no water required)
- Sugar, sugar substitute, powdered creamer in sealed packets
- Instant coffee, tea, cocoa
- Miniature field stove, fueled, with extra fuel
- Survival blanket (2) (“space” blanket)
- Sleeping bag
- Air mattress or cot
- Pillow
- Tent

#### **CLOTHING**

- Several complete changes of clothing
- Hat, rain gear, boots, warm jacket, etc.
- Layers to accommodate varying climate/weather conditions.

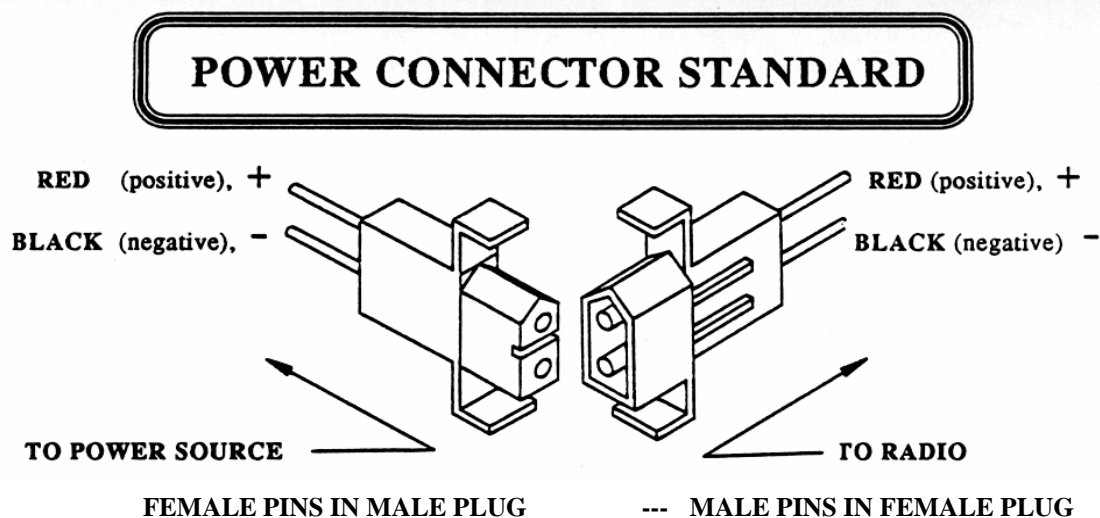
#### **OPTIONAL ADDITIONAL ITEMS**

- 2<sup>nd</sup> VHF-UHF radio with 12 hours battery power
- Wide-range scanner/receiver
- Large 12V battery, charger
- 100’ AC extension cord (3-wire, outdoor, at least 15A)
- 250 watt DC- AC inverter
- Battery powered AM/FM radio, TV
- Magnetic mount antenna with 10’ coax cable
- VHF packet station: radio, computer, printer, cables, printer paper, ink
- Generator with 5 gal fuel
- Gasoline pump/siphon
- Repeater directory
- Hard hat
- Reflective vest
- Vehicle-type flares

## Power Connector: Molex and Anderson Powerpole®

The Molex power connector standard was adopted by the LARK and used as a standard connector for many years. ARES and RACES have now adopted a standard connector based on the Anderson Powerpole® connector. It is recommended that responders carry adapters for Powerpole – Molex (male and female) since many older pieces of equipment may not have been converted to the new standard.

### MOLEX



**Type:** Molex Series 1545, 2 circuit

**Rating:** 250 Volt 8 Amp

**Wire Size:** #18 AWG or Greater

**Fusing:** In-line fuse between power source and first connector is recommended.

#### **Radio Shack equivalent: #274-222**

Radio Shack, Part No. 274-222 has male pins of 0.093" diameter and is suitable for wire gages from AWG16 through AWG 12. It is rated for 8A maximum continuous duty and appropriate only for handheld transceivers, QRP, laptop PCs and portable packet equipment, emergency lighting, small brick amps, 220 or UHF mobile transceivers to 35w and recharging gel cell batteries with light duty battery chargers up to 6A. This connector can sustain intermittent current to 11A, but may heat excessively if subjected to more than 15 minutes at >10 A, such as when using it to connect a discharged deep-cycle battery to a 10 A automotive battery charger.

The female pins are assembled into the male plug, which attaches to the emergency power source. The male pins are assembled into the female receptacle attached to the equipment. The end cross section profile of the connector resembles a house with a peaked roof. To remember proper polarity use the word associations "red roof" and "black basement," or "pointy positive" and "flat black." Crimp the wire tabs before soldering the pins to ensure a strong connection, trim the excess flashing with side cutters and form the pins with needle-nosed pliers. After inserting the pins into the plug and receptacle, check the fit of the assembled fitting and adjust as necessary.

Consider a variety of 'supply side' adapters, terminating in battery clips, alligator clips, spade lugs, or tinned wire to allow quick and easy access to any 13.8 V DC source. Clearly mark for polarity.

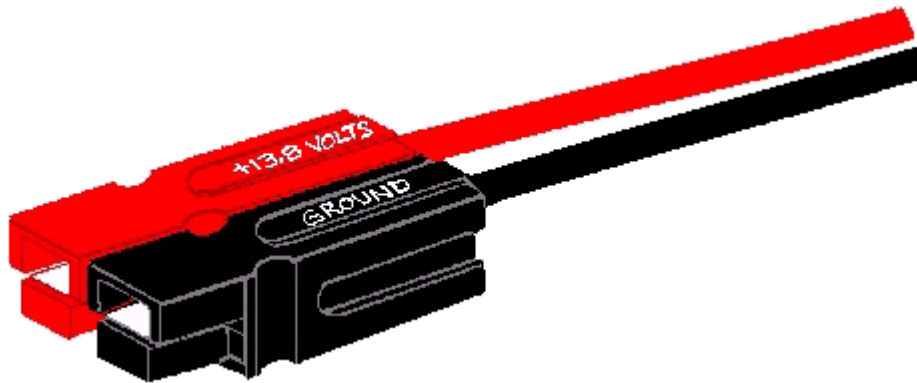
NOTE: Radio Shack also sells a 'heavy duty' 20 Amp - 2 circuit connector. **They are not compatible.** Be careful in making your selection. Some other ARES and RACES groups use this same connector, but with the opposite polarity

standard!

## ANDERSON POWERPOLE®

The 30 amp Anderson Powerpole® is quickly becoming the standard power connector of preference within emergency communications organizations around the country. First becoming popular in the Pacific Northwest, the Powerpole® allows for quick field installation and interchange of power supplies and radio equipment without having to resort to adapter cables, clip leads and other jury rigged arrangements.

Powerpoles® are both polarized and genderless, so you never have to worry about male vs. female or positive vs. negative. Connections can be quickly made and remade in the dark without any hassles and the 30 amp connector can easily handle 100 watt radios.



Housings should be mated according to the diagram above, viewing from the contact side (opposite the wire side), tongue down, hood up, RED on the LEFT, BLACK on the RIGHT. A 3/32-inch-diameter roll pin, 1/4 inch long, may be used to keep the housings from sliding apart. *(The author has found super glue to be a better solution.)*

Highly conductive silver-plated copper contacts allow minimal contact resistance at high currents. Self-wiping action on make and break keeps conducting surfaces clean. Contact dents keep connectors mated in high-vibration applications and provide quick-break, snap action upon disconnect. Noncorrosive stainless-steel leaf springs maintain constant contact pressure – ideal for frequent connections/disconnections and intermittent overloading. Durable, high impact-resistant, polycarbonate housing with UL94V-2 flammability ratings comes in many colors for circuit traceability and coding. Identical connector halves are genderless—making assembly quick and easy and reducing the number of parts stocked. Molded-in dovetails allow for customized harness in a variety of configurations.

The 15-ampere contacts are designed for 16-20 AWG wire and the 30-ampere contacts are designed for 12-16 AWG wire. The contacts can be soldered or crimped to wires. A very expensive crimping tool is available from Anderson. After a contact has been attached to a wire, it should be installed into the housing so that the housing spring mates with the underside of the contact.

To remove a contact from the housing, use Anderson insertion/extraction tool #111038G2. You may also substitute a very small blade (jeweler's screwdriver or X-acto knife) to depress the spring, allowing the contact to be removed.

## **Batteries**

**Always verify polarity before connecting your equipment!**

**BATTERY CONNECTIONS.** Small gel cell batteries of less than 10 amp/hours may be equipped with 8A Molex connectors because they have insufficient capacity to operate other than light-duty, portable equipment Batteries of

larger capacity suitable for mobile radios and limited HF operation to 50w output, such as BCI Group U1 (34 ah) should be equipped with 8A Molex, Anderson Powerpole or OEM “T” connectors. Auxiliary batteries larger than BCI Group U1 should always be equipped with both OEM “T” and Anderson Powerpole® 30 Amp connectors, with minimum AWG 12 gage wiring. Use appropriate wire gages to limit voltage drop to 5% as dictated by the length of the power leads: AWG16 @ 8A for up to 8 feet; AWG14 @ 10A for up to 10 feet; AWG12 @ 15A for up to 15 feet; AWG10 @ 20A for up to 15 feet. (For longer leads than listed, increase wire diameter 2 AWG gages.)

[From Virginal RACES, Inc. 2002] Typical 12 V lead-acid batteries have a voltage of about 14 V when fully charged and 11V fully discharged. Most amateur radio equipment doesn’t operate properly below 11.5 V. You cannot practically exceed the depth of discharge at which battery voltage under load drops to below that figure. Over-sized loads or excessive duty cycle causes rapid depletion of battery capacity, so battery systems must be sized for the expected load.

Cranking amps tell nothing about how long a starting battery can run your transmitter. Cold Cranking Amps represent the current a “starting” battery provides continuously for 30 seconds at 0° F before voltage is drops to 1.7 volts per cell (V/c) at which point it is fully discharged. Marine Cranking Amps are measured at 32° F. Reserve capacity is the time a starting battery can sustain a 25 A load before cell voltage drops to 1.7 V/c. A 12 V battery has six cells, so at 1.7 V/c, a discharged battery has only 10.2 V. Most 12 V radio equipment fails to function properly before a lead-acid battery is fully discharged. Discard any 12 V battery with open-circuit voltage below 10.2 V, it probably has a bad cell and probably won’t accept a full recharge.

Performance measurements for “deep cycle” batteries are amp-hour capacity at a specified depth of discharge (DoD). Amp-hour capacity is current available over time, measured at 80° F. DoD is percentage of capacity available during a charge-discharge cycle. Amp-hour ratings of deep cycle batteries are based upon a discharge rate at 1/20 capacity, expressed as C20. A marine battery rated 200 AHr at C20, when discharged continuously at 10 A, at 80° F, sustains the load for 20 hrs. Starting batteries are designed for 20% DoD, gel cells 25%, “deep cycle” batteries from 50% to 80%.

Engine starting batteries perform poorly for communications because they are designed for short periods of high load. Deep cycle batteries are better for communications because they withstand long periods of slow discharge.

For a typical 25% transmit duty cycle, a 100 W HF rig on SSB, requires 20 A on transmit, provided by a minimum BCI Group 27 Marine deep cycle battery (65 pounds!) to stay within a C20 discharge rate, at 80°F. A smaller group U1, 33 AHr gel cell (25 lbs.) will power the same HF rig at reduced power, such as 25 W, with a loss of about an S-unit in signal strength. At lower temperatures, available capacity is reduced. Lead-acids lose 50% of their capacity at 32° F!

More rapid rates of discharge (such as using a marginally sized battery for the load) reduce capacity and the number of charge-discharge cycles the battery will provide. A BCI Group U1 (25 lb., 31 AHr) gel cell, often recommended for portable communications, is well balanced to power a 2-meter mobile at 20-25% duty cycle, on medium power (10-25 W) transmit, requiring about 6A, approximating the C20 discharge rate. Increasing transmitter output to 50 W increases the current load to 10 A, approximating C/10) at the same duty cycle. The battery will tolerate intermittent full power 50 W transmit, but routine use of an undersized battery for such duty severely shortens its useful life.

A common rule for sizing communications battery systems for a C/20 discharge rate is one amp-hour per watt of transmitter output. Estimate the amp-hour capacity required for 24 hours by summing all loads: transmit current times total operating time times duty cycle, plus receive current with squelch open times standby time and repeat for each piece of equipment. Multiply total loads by 150% safety factor and assume the result as a minimum for 24 hours of SSB or 12 hours of FM or digital operations. *For greater confidence of adequate capacity in critical systems, use a factor of 200%.*

Measuring the specific gravity (Sg) of a wet, lead-acid battery during discharge is a good indicator of the state of

charge. A fully charged battery has an Sg of 1.265 g/cc; at 75% charge it is 1.225 g/cc; at 50% charge it is 1.19g/cc; and a fully discharged battery is 1.120 g/cc.

Because of uncertainty of mixing, Sg is not an absolute measure of capacity, but should always be considered in combination with load testing and open circuit voltage. This is because during charging of a flooded battery, Sg lags charge state because complete mixing of the electrolyte does not occur until gassing commences at the end of the charge cycle.

Lead-acids at normal ambient temperature should be recharged with current of 1/10 to 1/20 of capacity. They will accept only about 1/10 of the charging current at 30° F that they will at 80° F.

When not in service all lead-acid batteries self-discharge at rate of about 5% per month. The rate of self-discharge increases with increasing temperature. If left in a deeply discharged condition for a long time lead-acid batteries “sulfate” as sulfur in the acid combines with lead in the plates to form lead sulfate.

Auxiliary batteries should be connected to a charge controller to provide a regulated, low-level current of 1 to 1.5% of C to compensate for self-discharge and protect against sulfating.

A fully automatic, low amperage charger such as the Schumacher Model SE-1-12S, available from Sears or Wal-Mart for around \$25, recharges small SLA batteries and will maintain vehicle starting or deep cycle batteries up to BSI Group 30(105 AHr).

Flooded lead-acid batteries require regular testing, inspection and replacement of lost electrolyte. If water is lost during charging and not replaced, the process of sulfating is accelerated in plates, which are partially exposed, to air. “Treeing” is a short circuit occurring between positive and negative plates. This may be caused by manufacturing defects, or rough handling, that results in misalignment of the plates and separators. “Mossing” caused by circulating electrolyte bringing particulate matter to the tops of the plates can also cause a short.

Sealed, flooded (wet) lead-acid batteries are also called “maintenance free” and experience less self-discharge. They contain lead-calcium or lead-strontium plates to reduce water loss and usually have catalytic recombiners to reduce water loss and sealed, valve regulated vents. Sealed-flooded lead-acids tolerate the same temperatures as unsealed batteries, but because Sg isn’t readily measured, some sealed-wet batteries are provided with a captive float hydrometer in the electrolyte.

Sealed-wet batteries are common for engine starting, but should not be discharged below 25%, or their life is dramatically shortened.

Sealed lead-acid (SLA) batteries include gel cells and absorbed glass mat (AGM) types. Sometimes called “starved” electrolyte or valve-regulated, these units are completely sealed. Because there is no free liquid electrolyte to spill, the battery can be used safely in any position. SLAs are safer than flooded types for indoor use and in sensitive equipment such as computer backup power supplies, which would be damaged by exposure to acid fumes.

Any sealed battery will vent if overcharged to the point of excessive gassing, because the valves are designed to purge excessive pressure building up inside the battery case. Therefore, battery chargers designed for flooded cells must not be used to charge gel cells unless they have voltage limiting circuitry to prevent exceeding 14V during charging.

Self-discharge of gel cells is minimized by storing them in moderately cool areas of 5° to 15° C. A suitable charger for larger gel cell batteries is the Schumacher SE-600A especially for 12 V gel cell batteries (see [www.batterychargers.com](http://www.batterychargers.com)).

Auxiliary batteries in your ham shack may also be floated in parallel across a regulated 13.8V DC power supply. Shotky diodes should be placed in line to prevent back-feed into the power supply if the AC mains fail and the

system 'fails to battery.'

Most gel cells are NOT deep cycle. Depth of discharge greater than 25% significantly reduces their life. Gel cells must not be used below -20°C; in vehicle engine compartments or in uses subjecting them to temperatures above 50° C.

Absorbed glass mat (AGM) batteries are deep cycle can be quickly recharged with no current limit and provides a broad operating temperature range. Their depth of discharge approaches wet NiCd's, with reduced maintenance and lower life cycle cost. New aviation AGM batteries are more expensive than flooded deep cycle batteries of equal capacity, but much less expensive than flooded NiCd's.

Marine or emergency vehicle AGM batteries, such as Lifeline or Optima, are not prohibitively expensive, have aviation type cell construction and are very well suited as auxiliary power sources for emergency communications. For more information go to the reference library at [www.varaces.org](http://www.varaces.org).

## NET CONTROL OPERATION

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### *Types of nets*

There are three types of nets that usually are set up during an emergency: the TACTICAL NET, the RESOURCE NET, and the COMMAND NET. One or more nets may be established based on of the size of the incident.

Nets may be:

"OPEN", if the incident has little traffic volume, or if there is little need to direct individual stations. Operators make their own contacts and maintain self-directed order using normal amateur protocol for contacts.

"CONTROLLED" or "DIRECTED" where stations pass traffic through the NCS, or obtain the permission of the NCS before communicating directly with another station. ARES/RACES most often utilizes this form of net for tactical purposes.

**TACTICAL NET.** The "Tactical Net" is the "front line" net during an incident. This type of net is usually used by a single city to manage amateur radio operations within that city's boundaries. There may be several Tactical Nets for a single operation depending on the volume of traffic.

Much of the traffic handled by ARES/RACES operators will be local tactical messages from point to point in the community. These may be messages between organizations that do not have common radio channels, other than amateur radio, or between people who haven't used a radio before.

Before putting traffic on the net, check with net control, advise that you have (routine/priority/ emergency) traffic for xyz at abc location. Net Control will know whether there is a station available to take your traffic.

If a station is available to take your traffic, expect Net Control to request you to go to another frequency to conduct your traffic. Net Control may stand-by while you demonstrate that you have simplex communication, before asking you to move off frequency.

If the message is short, Net Control may tell you to go ahead and pass it to the operator who can deliver it. If your traffic is a question, and the asking and answering parties are readily available at each end, do not hesitate to put the radios in the principals' hands to talk directly.

Public Works, Police, Fire and other responders will be familiar with push to talk operation. If you are in a 'shadow'

assignment, say with an elected official, you may have to provide a quick instruction in the operation of your radio and that it is not 'full duplex' like a telephone...only one person can talk at a time. Make sure that they understand that our radios operate on a PUSH THEN TALK basis...and then to release the PTT switch! We want the communication to work the first time...repeats waste air time...and give a bad impression of our service.

Whether or not your NCS is located on-scene, a second operator who is in a position to transcribe incoming traffic is convenient, and in many cases of critical importance. A "recorder" keeps NCS's hands free to operate the radio and take notes as necessary to keep the net moving. An operating position with adequate work space and good access to the radio's controls is essential. If operating in close proximity to other important operations, consider using headphones to prevent distracting/being distracted by others.

**RESOURCE NET.** A "Resource Net" is used to recruit resources (both operators and equipment) in support of operations on the Tactical Net. As an incident requires more operators or equipment, the Resource Net evolves as a check-in point for volunteers to register, be oriented, and receive assignments.

**COMMAND NET.** As the size of an incident increases and more jurisdictions become involved in the incident, a "Command Net" may become necessary. The Command Net allows the incident leadership to communicate with each other to resolve inter- or intra-agency problems, particularly between cities, or within larger jurisdictional areas.

## ***Net Control Basics***

**CONTROL THE NET.** The NCS is in charge of the net. The NCS is responsible for controlling who uses the frequency, duration of contacts, and information exchanged.

**COORDINATE WITH THE EC.** The NCS must coordinate with the EC/AEC in order to meet the client needs.

**HAVE A CLEAR SIGNAL.** The NCS must have a commanding signal - full quieting into the repeater and adequate audio is a minimum; everyone must be able to hear the NCS. An NCS running a mobile station must be sensitive to the quality of their signal to insure effective net direction. Weak or noisy NCS signals are not satisfactory.

**RESOURCE MANAGEMENT.** The NCS must keep track of which resources are on the net.

**IDENTIFY A BACKUP NCS.** As soon as possible, identify an alternate NCS to serve as backup in case of loss of signal or other operating difficulty by the primary NCS.

**KEEP A LOG.** Keep a written record of the incident and a list of traffic for each station in a systematic manner.

**BE BRIEF.** Make instructions clear and concise, using as few words as possible.

**SEND MESSAGES SLOWLY, DISTINCTLY, AT AN EVEN PACE.** When sending traffic, dictate the message only as fast as you would write it down. Remind net participants to speak very slowly and distinctly. Break after every five words to allow stations time to complete writing. Ask for fills in the text at the end of each paragraph. Confirm receipt with a repeat of the whole message by the receiving station at the end of each message.

**TACTICAL CALL SIGNS.** The use of tactical call signs is essential to insure accurate transmission to a location or function rather than to an individual. This is also important when working with other agencies to whom a call-sign is meaningless. Responders need to add their FCC call sign at the end of an exchange, but no more often than once every 10 minutes.

## **TRAFFIC MANAGEMENT.**

A. Ask for traffic in priority order: Emergency, Priority and Routine. Take down as many calls for each as

you can before acknowledging anyone. This provides a solid basis for clearing the messages.

B. Acknowledge all the stations that you heard for a specific priority level. Then yield the frequency over to a single station with the highest priority traffic. When that station is finished, hand the frequency over to the next station that you heard without soliciting more traffic. Follow this pattern until all of the calling stations you heard have made their calls. After you've completed your list, begin the same procedure once again. Give your directions to the net in a clear and concise manner. Provide pauses for stations to 'break' the net for Emergency or Priority traffic.

C. After asking for reports or soliciting traffic, LISTEN!

**KNOW YOUR NET MEMBERS.** Through weekly net and exercises get to know your 'core' operators. Recognizing voices and call signs (even from partials) lets the NCS acknowledge check-ins with few repeats.

## ***Operating on a Tactical Radio Net***

**GET TO YOUR ASSIGNMENT AHEAD OF TIME.** Arrive at your assigned operating point 10 to 30 minutes before your shift starts to get set up and get a briefing before the start of your shift.

### **DON'T HELP THE NCS.**

- Resist the urge to help the NCS.
- Act as a relay station only if the NCS, or another radio station, asks for a relay and you can fulfill the requirement.
- If you call the NCS or dispatcher and do not get a reply, be patient and call again in a minute or two.
- If you have an emergency, say "Emergency Traffic" after you identify yourself when you call the NCS.

**USE TACTICAL AND FCC CALL SIGNS EFFECTIVELY.** By using tactical call signs, the net can be conducted without regard to which operator is at the radio.

- Use the tactical call sign to identify your transmissions and address another station by its tactical call sign.
- No call sign is necessary in a two-way conversation once communication has been established.
- To comply with FCC rules, add your FCC call sign to your last transmission in a series.
- It is not necessary to add the receiving party's call sign, just your own.

### **NEVER LEAVE A NET WITHOUT CHECKING OUT.**

- If you know you will be unable to participate for an interval, tell that to the NCS before you leave.
- Check in with the NCS when you return.
- Never depart at the end of your shift without making certain that the NCS knows that you are leaving.

### **BRIEF THE OPERATOR WHO RELIEVES YOU.**

- Tell the operator who takes your place everything they need to know to do the job.
- Try to write down most of the information during activity lulls.
- The radio channel or channels you are using.
- Radio, power, or antenna details.
- All the tactical call signs and where the stations are located; possibly also names and FCC calls.
- The location of the nearest telephone, if any.
- The name and titles of the officials you are serving; how to find and recognize them.
- The specific purpose and responsibilities of your station.

- The overall situation and expected changes.
- Pending activity: messages you have sent and replies you expect (Who gets the reply?).
- Location of the toilet, water, food, etc.
- Sign out on the Activity Log. Complete all paperwork before you leave.

**KEEP TRANSMISSIONS SHORT.**

- Allow other stations to interrupt if they get more urgent traffic.
- Let the NCS exercise control promptly.
- Lose less time if the transmission was partly or completely unreadable, due to radio problems, simultaneous transmissions (doubles), noise nearby, etc.

**STOP TRANSMITTING IF YOU STOP TALKING.** Always release the push-to-talk (PTT) button if you need to pause for some reason: to think of a street name, to remember everything you wanted to report, to listen to something urgent that is happening nearby, etc.

**DON'T USE VOX OR A LOCKING PPT SWITCH.** PTT (push-to-talk transmission) is better than VOX (voice-activated transmission) on a tactical net. PTT allows you to control exactly when to transmit. Avoid locking PTT switches.

**LISTEN BEFORE TRANSMITTING.** If you haven't been monitoring all along, listen a while (15 seconds minimum) before transmitting. Be sure the transmitting station is finished, not just pausing.

**AVOID UNNECESSARY TRANSMISSIONS.** Stay off the air unless you are sure you can be of assistance.

**HOW TO INTERRUPT.** It is proper to interrupt the net, that is, to transmit when Net Control has not invited you to. That is the purpose of leaving gaps between transmissions: it gives other stations a chance to break in.

If you interrupt, key very briefly, only enough to ID or state something about the nature of the interruption. For example: N6ABC", "emergency traffic", or "info"

**USE SHORT SIMPLE PHRASES, COMMON COURTESY.** Don't chew gum or eat while transmitting. Sound alert. If you are tired, get a relief operator. Avoid angry comments on the air at all costs. Obscene statements are not necessary and are out of place at all times.

**ACKNOWLEDGE ALL TRANSMISSIONS TO YOU.** Acknowledge transmissions promptly, even when it is obvious from the context that you were asked to do something that you cannot do instantly.

**ANSWER QUESTIONS DIRECTLY, DO NOT EXPLAIN.** If asked a question, just answer it; do not volunteer additional detail or an explanation of why something is so, but use good judgment. You may believe that the simple answer is misleading. The question may indicate that the person asking it does not understand the actual situation. If you think it necessary, volunteer some more information. Be brief; let the questioner ask for more detail if they choose to.

**IF UNCERTAIN, ASK TO WHOM THE MESSAGE IS DIRECTED.** As you copy a message, consider what you are going to do with it. If you cannot tell, then ask the station that is sending it; particularly if the message originates there. The sender may notice that the message shouldn't be sent to your station after all, and cancel the message.

**LET 3<sup>RD</sup> PARTIES USE THE RADIO IF IT AIDS COMMUNICATION.** Allowing an agency official to use your radio is often better and faster than passing messages back and forth. It is just as legal as passing third-party messages. Make sure the third party understands how to talk through a repeater, i.e., wait for the courtesy tone, etc.

**WORK TO MINIMIZE MISUNDERSTANDINGS.**

- Only transmit facts.
- If your message is a question, deduction, educated guess, or hearsay, identify it as such.
- Be sure you are clear what the other party means if you hear one of these terms.
- Never pass victim or patient names over the radio.

**PAUSE AFTER KEYING BEFORE TRANSMITTING.**

- Wait a fraction of a second after pressing the mike button before speaking, to make sure you don't clip the first syllable.
- Your radio may take a moment to change over to transmit; and the repeater may introduce its own delay.
- If the station you are calling has a hand-held transceiver (HT) in battery-saver mode, and the channel has been quiet, the first second or two of your transmission might go unheard.

**DON'T TALK LOUDER IN A NOISY ENVIRONMENT.** It's natural to talk louder if it gets noisy around you, but don't do that on the radio. Talking too loudly into a microphone makes your signal less understandable, not more.

**SHIELD YOUR MIC FROM THE WIND.** Wind blowing across the microphone can make it impossible to understand you. Close the car windows, pull up your collar, or stand by a shield.

**YOUR HT MAY NOT WORK ON YOUR BELT.** You may have to hold your HT in your hand to transmit reliably, or even to hear well.

**KEEP YOUR BODY STILL WHILE TRANSMITTING.** When on the fringes of coverage, look for a receiving "hot spot" site and use it. Don't walk around talking while in a communications fringe area. Even if you have a good signal *from* a repeater, you may not have a good signal *to* the repeater.

**KNOW YOUR POSITION WHEN MOBILE.** Always know your location, whether mobile or portable and moving around. Keep a sharp lookout for landmarks. You must be able, if called upon, to accurately describe your location at any time. This is particularly important if you are with a search team or other mobile units.

## **SENDING AND RECEIVING TRAFFIC**

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### ***Common Instructions***

<b>Voice</b>	<b>Code</b>	<b>Situation</b>
Go ahead	K	Used after calling CQ, or at the end of a transmission, to indicate any station is invited to transmit.
Over	AR	Used after a call to a specific station, before the contact has been established
	KN	Used at the end of any transmission when only the specific station contacted is invited to answer.
Stand by or wait	AS	A temporary interruption of the contact.
Roger	R	Indicates a transmission has been received correctly and in full.
Clear	SK	End of contact. SK is sent before the final identification.
Leaving the air or closing the station	CL	Indicates that a station is going off the air, and will not listen or answer any further calls. CL is sent after the final identification.

## USE CLEAR TEXT (PLAIN SPEECH) – NO Q-SIGNALS

Special symbols, Q-signals, etc., should be used only when a part of a special message form or communication method, e.g., NTS. In normal communication, use only plain text and attempt to minimize jargon, even where it is typically used in local speech.

### ***Phonetic Alphabet***

Word list adopted by the International Telecommunications Union

<b>A</b>	Alfa	<b>O</b>	Oscar
<b>B</b>	Bravo	<b>P</b>	Papa
<b>C</b>	Charlie	<b>Q</b>	Quebec
<b>D</b>	Delta	<b>R</b>	Romeo
<b>E</b>	Echo	<b>S</b>	Sierra
<b>F</b>	Foxtrot	<b>T</b>	Tango
<b>G</b>	Golf	<b>U</b>	Uniform
<b>H</b>	Hotel	<b>V</b>	Victor
<b>I</b>	India	<b>W</b>	Whiskey
<b>J</b>	Juliet	<b>X</b>	X-ray
<b>K</b>	Kilo	<b>Y</b>	Yankee
<b>L</b>	Lima	<b>Z</b>	Zulu
<b>M</b>	Mike		
<b>N</b>	November		

### ***The R-S-T System***

#### **READABILITY**

<b>1</b>	Unreadable	<b>4</b>	Readable with practically no difficulty.
<b>2</b>	Barely readable, occasional words distinguishable.	<b>5</b>	Perfectly readable.
<b>3</b>	Readable with considerable difficulty.		

#### **SIGNAL STRENGTH**

<b>1</b>	Faint signals, barely perceptible.	<b>6</b>	Good signals.
<b>2</b>	Very weak signals.	<b>7</b>	Moderately strong signals.
<b>3</b>	Weak signals.	<b>8</b>	Strong signals.
<b>4</b>	Fair signals.	<b>9</b>	Extremely strong signals.
<b>5</b>	Fairly good signals.		

#### **STONE**

<b>1</b>	Sixty cycle AC or less, very rough and broad.	<b>6</b>	Filtered tone, definite trace of ripple modulation.
<b>2</b>	Very rough AC, very harsh and broad.	<b>7</b>	Near pure tone, trace of ripple modulation.
<b>3</b>	Rough AC tone, rectified but not filtered.	<b>8</b>	Near perfect tone, slight trace of modulation.
<b>4</b>	Rough note, some trace of filtering.	<b>9</b>	Perfect tone, no trace of ripple or modulation of any kind.
<b>5</b>	Filtered rectified AC but strongly ripple-modulated.		

## The Radiogram

### RADIOGRAM

Number	Precedence	HX	Station of Origin	Check	Place of Origin	Time Filed	Date
To: THIS RADIO MESSAGE WAS RECEIVED AT: Amateur Station: Telephone Number: Phone: Name: (TEXT) Street Address: City/State/Zip:							
From                      Date                      Time REC'd				To                      Date                      Time SENT			

### RADIOGRAM - Example

Number	Precedence	HX	Station of Origin	Check	Place of Origin	Time Filed	Date
101	R	HXC	KB6JAW	20	Fremont CA	1405	Jan 10
To: MR. AND MRS. JOHN Q. RELATIVETHIS RADIO MESSAGE WAS RECEIVED AT: 123 ANY ST. Amateur Station: ANYTOWN, ANYSTATE 00000 Phone: Name: Telephone Number: 510-555-1212 Street Address: City/State/Zip: BT ALL IS WELL HERE DESPITE <i>(Messages are sent with five words on</i> WHAT YOU HEAR ON TV. <i>each line to aid in counting the total number of</i> CALL AUNT HELEN AND LET <i>words in the message. Messages may be any</i> HER KNOW WE ARE OK. <i>length, but should be as brief as possible.)</i> BT DAVID AND CATHY							
From                      Date                      Time REC'd				To                      Date                      Time SENT			

**RADIOGRAM CONTENT.** Every formal radiogram message originated and handled should contain the following component parts in the order given.

## **I. PREAMBLE**

- a. Number (begin with 1 each month or year)
- b. Precedence (R, W, P or EMERGENCY)
- c. Handling Instructions (optional, see text)
- d. Station of Origin (first amateur handler)
- e. Check (number of words/groups in text only)
- f. Place of Origin (not necessarily location of station of origin.)
- g. Time Filed (optional with originating station)
- h. Date (must agree with date of time filed)

**II. ADDRESS.** As complete as possible, include zip code and telephone number.

**III. TEXT.** Limit to 25 words or less, if possible.

## **IV. SIGNATURE**

**V. PRECEDENCE.** The precedence will follow the message number. For example, on CW 207R or 207 EMERGENCY. On phone, “Two Zero Seven, Routine (or Emergency).”

**EMERGENCY** – Any message having life and death urgency to any person or group of persons, which is transmitted by Amateur Radio in the absence of regular commercial facilities. This includes official messages of welfare agencies during emergencies requesting supplies, materials or instructions vital to relief of stricken populace in emergency areas. During normal times, it will be *very rare*. On CW, RTTY and other digital modes this designation will always be spelled out. When in doubt, *do not* use it.

**PRIORITY** – Important messages having a specific time limit. Official messages not covered in the Emergency category. Press dispatches and other emergency-related traffic not of the utmost urgency. Notifications of death or injury in a disaster area, personal or official. Use the abbreviation P on CW.

**WELFARE** – A message that is either a) an inquiry as to the health and welfare of an individual in the disaster area b) an advisory or reply from the disaster area that indicates all is well should carry this precedence, which is abbreviated W on CW. These messages are handled *after* Emergency and Priority traffic but before Routine.

**ROUTINE** – Most traffic normal times will bear this designation. In disaster situations, traffic labeled Routine (R on cw) should be handled *last*, or not at all when circuits are busy with Emergency, Priority or Welfare traffic.

## **HANDLING INSTRUCTIONS (OPTIONAL)**

**HXA**--(Followed by number) Collect landline delivery authorized by addressee within....miles. (If no number, authorization is unlimited.)

**HXB**--(Followed by number) Cancel message if not delivered within....hours of filing time; service originating station.

**HXC**--Report date and time of delivery (TOD) to originating station.

**HXD**--Report to originating station the identity of station from which received, plus date and time. Report identity of station to which relayed, plus date and time, or if delivered report date, time and method of delivery.

**HXE**--Delivering station get reply from addresses, originate message back.

**HXF**--(Followed by number) Hold delivery until....(date).

**HXG**--Delivery by mail or landline toll call not required. If toll or other expense involved, cancel message and service originating station.

For further information on traffic handling, consult the Public Service Communications Manual or the ARRL Operating Manual, both published by ARRL.

## ***ARRL Emergency Relief Numbered Radiograms***

The ARRL has adopted a series of numbered messages that may be used to shorten communication of radiograms for routine messages. The letters ARL are inserted before the number representing the routine text. Some ARL numbered messages allow the insertion of additional text such as the name of a hospital, or number of requested resources.

<b>ONE</b>	Everyone safe here. Please don't worry.
<b>TWO</b>	Coming home as soon as possible.
<b>THREE</b>	Am in ___ hospital. Receiving excellent care and recovering fine.
<b>FOUR</b>	Only slight property damage here. Do not be concerned about disaster reports.
<b>FIVE</b>	Am moving to new location. Send no further mail. Will inform you of new address when relocated.
<b>SIX</b>	Will contact you ASAP.
<b>SEVEN</b>	Please reply by Amateur Radio through the amateur delivering this message. This is a free public service.
<b>EIGHT</b>	Need additional ___ mobile or portable equipment for immediate emergency use.
<b>NINE</b>	Additional ___ radio operators needed to assist with emergency at this location.
<b>TEN</b>	Please contact ___. Advise to standby and provide further emergency information, instructions, or assistance.
<b>ELEVEN</b>	Establish Amateur Radio emergency communications with ___ on ___ MHz.
<b>TWELVE</b>	Anxious to hear from you. No word in some time. Please contact me as soon as possible.
<b>THIRTEEN</b>	Medical emergency situation exists here.
<b>FOURTEEN</b>	Situation here becoming critical. Losses and damage from ___ increasing.
<b>FIFTEEN</b>	Please advise your condition and what help is needed.
<b>SIXTEEN</b>	Property damage very severe in the area.
<b>SEVENTEEN</b>	REACT communications services also available. Establish REACT communications with ___ on channel ___.
<b>EIGHTEEN</b>	Please contact me as soon as possible at ___.
<b>NINETEEN</b>	Request health and welfare report on ___ (name, address, phone number)
<b>TWENTY</b>	Temporarily stranded. Will need some assistance. Please contact me at ___.
<b>TWENTY ONE</b>	Search and Rescue assistance is needed by local authorities here. Advise availability.
<b>TWENTY TWO</b>	Need accurate information on the extent and type of conditions now existing at your location. Please furnish this information and reply without delay.
<b>TWENTY THREE</b>	Report at once the accessibility and best way to reach your location.
<b>TWENTY FOUR</b>	Evacuation of residents from this area urgently needed. Advise plans for help.
<b>TWENTY FIVE</b>	Furnish as soon as possible the weather conditions at your location.
<b>TWENTY SIX</b>	Help and care for evacuation of sick and injured from this location needed at once.

## ***Special Signals Used for Messages***

### **ARRL QN SIGNALS FOR CW USE**

<b>QNA*</b>	Answer in prearranged order.
<b>QNB*</b>	Act as relay Between _____ and _____
<b>QNC</b>	All net stations Copy. I have a message for all net stations.
<b>QND*</b>	Net is Directed (controlled by net control station).
<b>QNE*</b>	Entire net stand by.
<b>QNF</b>	Net is Free (not controlled).

- QNG** Take over as net control station.
- QNH** Your net frequency is High.
- QNI** Net stations report In.\*.  
I am reporting into the net. (Follow with a list or traffic or QRU).
- QNJ** Can you copy me?  
Can you copy \_\_\_\_\_?
- QNK\*** Transmit message for \_\_\_\_\_ to \_\_\_\_\_
- QNL** Your net frequency is Low.
- QNM\*** You are QRMing the net. Stand by.
- QNN** Net control station is \_\_\_\_\_  
What station has net control?
- QNO** Station is leaving the net.
- QNP** Unable to copy you. Unable to copy \_\_\_\_\_
- QNQ\*** Move frequency to \_\_\_\_\_ and wait for \_\_\_\_\_ to finish handling traffic. Then send him traffic for \_\_\_\_\_
- QNR** Answer \_\_\_\_\_ and Receive traffic.
- QNS\*** Following Stations are in the net. \*(Follow with list.)  
Request list of stations in the net.
- QNT** I request permission to leave the net for \_\_\_\_\_ minutes.
- QNU\*** The net has traffic for you. Stand by.
- QNV\*** Establish contact with \_\_\_\_\_ on this frequency. If successful, move to \_\_\_\_\_ and send him traffic for \_\_\_\_\_
- QNW** How do I route messages for \_\_\_\_\_?
- QNX** You are excused from the net.\* Request to be excused from the net.
- QNY\*** Shift to another frequency (or to \_\_\_\_\_ kHz) to clear traffic with \_\_\_\_\_
- QNZ** Zero beat your signal with mine.

\* For use only by the Net Control Station.

**NOTES ON THE USE OF QN SIGNALS.** The QN signals listed above are special ARRL signals for use in amateur CW nets only. They are not for use in casual amateur conversation. Other meanings that may be used in other services do not apply. Do not use QN signals on phone nets. Say it with words. QN signals need not be followed by a question mark, even though the meaning may be interrogatory.

**INTERNATIONAL Q SIGNALS.** A Q signal followed by a ? asks a question. A Q signal without the ? answers the question affirmatively, unless otherwise indicated.

- QRA** What is the name of your station?
- QRG** What's my exact frequency?
- QRH** Does my frequency vary?
- QRI** How is my tone? (1-3)
- QRK** What is my signal intelligibility? (1-5)
- QRL** Are you busy?
- QRM** Is my transmission being interfered with?
- QRN** Are you troubled by static?
- QRO** Shall I increase transmitter power?
- QRP** Shall I decrease transmitter power?
- QRQ** Shall I send faster?
- QRS** Shall I send slower?
- QRT** Shall I stop sending?
- QRU** Have you anything for me? (Answer in negative)
- QRV** Are you ready?
- QRW** Shall I tell \_\_\_\_\_ you're calling him?
- QRX** When will you call again?
- QRZ** Who is calling me?

<b>QSA</b>	What is my signal strength? (1-5)
<b>QSB</b>	Are my signals fading?
<b>QSD</b>	Is my keying defective?
<b>QSG</b>	Shall I send _____ messages at a time?
<b>QSK</b>	Can you work break-in?
<b>QSL</b>	Can you acknowledge receipt?
<b>QSM</b>	Shall I repeat the last message sent?
<b>QSO</b>	Can you communicate with _____ direct?
<b>QSP</b>	Will you relay to _____?
<b>QSV</b>	Shall I send a series of V's?
<b>QSW</b>	Will you transmit on _____?
<b>QSX</b>	Will you listen for _____ on _____?
<b>QSY</b>	Shall I change frequency?
<b>QSZ</b>	Shall I send each word/group more than once? (Answer, send twice or _____)
<b>QTA</b>	Shall I cancel number _____?
<b>QTB</b>	Do you agree with my word count? (Answer negative)
<b>QTC</b>	How many messages have you to send?
<b>QTH</b>	What is your location?
<b>QTR</b>	What is your time?
<b>QTV</b>	Shall I stand guard for you _____?
<b>QTX</b>	Will you keep your station open for further communication with me?
<b>QUA</b>	Have you news of _____?

#### PROSIGNS AND ABBREVIATIONS

**CW:** The prosign AA separates the parts of the address. BT separates the address from the text and the text from the signature. AR marks end of message; this is followed by B if there is another message to follow, by N if this is the only or last message. It is customary to copy the preamble, parts of the address, text and signature on separate lines.

**RTTY:** Same as CW procedure above, except (1) use extra space between parts of address, instead of AA; (2) omit cw procedure sign BT to separate text from address and signature, using line spaces instead; (3) add a CFM line under the signature, consisting of all names, numerals and unusual words in the message in the order transmitted.

**PACKET/AMTOR BBS:** Same format as shown in the cw message example above, except that the AA and AR prosigns may be omitted. Most AMTOR and packet BBS software in use today allows formal message traffic to be sent with the "ST" command. Always avoid the use of spectrum-wasting multiple line feeds and indentations.

**PHONE:** Use *prowords* instead of prosigns, but it is not necessary to name each part of the message as you send it. For example, the above message would be sent on phone as follows: "Number one routine HX Golf W1AW eight Newington Connecticut one eight three zero zulu july one Donald Smith Figures one six four East Sixth Avenue North River City Missouri zero zero seven eight nine Telephone seven three three four nine six eight Break Happy birthday X-ray see you soon X-ray love Break Diana End of Message Over. "End of Message" is followed by "More" if there is another message to follow, "No More" if it is the only or last message. Speak clearly using VOX (or pause frequently on push-to-talk) so that the receiving station can get fills. Spell phonetically all difficult or unusual words--do not spell out common words. Do not use cw abbreviations or Q-signals in phone traffic handling.

<b>CW</b>	<b>PHONE (meaning or purpose)</b>
<u>AA</u>	(Separation between parts of address or signature).
AA	All after (use to get fills).
AB	An before (used to get fills).
ADEE	Addressee (name of person to whom message addressed).
ADR	Address (second part of message).

<b>AR</b>	End of message (end of record copy).
<b>ARL</b>	(Used with "check," indicates use of ARRL numbered message in text).
<b>AS</b>	Stand by; wait.
<b>B</b>	More (another message to follow).
<b>BK</b>	Break; break me; break-in (interrupt transmission on cw. Quick check on phone).
<b>BT</b>	Separation (break) between address and text; between text and signature.
<b>C</b>	Correct; yes.
<b>CFM</b>	Confirm. (Check me on this).
<b>CK</b>	Check.
<b>DE</b>	From; this is (preceding identification).
<b>HH</b>	(Error in sending. Transmission continues with last word correctly sent.)
<b>HX</b>	(Handling instructions. Optional part of preamble.) Initial(s). Single letter(s) to follow.
<b>IMI</b>	Repeat; I say again. (Difficult or unusual words or groups.)
<b>K</b>	Go ahead; over; reply expected. (Invitation to transmit.)
<b>N</b>	Negative, incorrect; no more. (No more messages to follow.)
<b>NR</b>	Number. (Message follows.)
<b>PBL</b>	Preamble (first part of message)
<b>N/A</b>	Read back. (Repeat as received.)
<b>R</b>	Roger; point. (Received; decimal point.)
<b>SIG</b>	Signed; signature (last part of message.)
<b>SK</b>	Out; clear (end of communications, no reply expected.)
<b>TU</b>	Thank you.
<b>WA</b>	Word after (used to get fills.)
<b>WB</b>	Word before (used to get fills.)
<b>N/A</b>	Speak slower.
<b>N/A</b>	Speak faster.

## PROWORDS

<b>ADDRESS GROUP</b>	Name, title, location, time and date.
<b>AFFIRMATIVE</b>	Yes, correct.
<b>BREAK</b>	For start and end of text, or for a pause.
<b>CALL SIGN</b>	The word group that follows is a call sign.
<b>CLOSE</b>	I am closing my station. (Closing down.)
<b>COPY</b>	I have received your traffic.
<b>CORRECTION</b>	I have made an error. Transmission will continue from the last correct word.
<b>DIRECT</b>	Station copied directly. No relay is required.
<b>EMERGENCY</b>	Highest message precedence. Life/Death messages.
<b>EXERCISE</b>	Used to indicate that the message is not real and is for exercise purposes only.
<b>FIGURE GROUP</b>	The next word group is or begins with numbers.
<b>FROM</b>	Signifies the ADDRESS GROUP or CALL SIGN of the message originator.
<b>I SPELL</b>	I will spell the next word using the ITU alphabet.
<b>LETTER THE TEXT</b>	Missing word(s): Repeat the first letter or number of each word group phonetically.
<b>MAYDAY</b>	International distress call in emergencies.
<b>MORE TO FOLLOW</b>	I have another message for you.
<b>NEGATIVE</b>	No
<b>OUT</b>	This is the end of my series of transmissions to you.
<b>OVER</b>	This is the end of my transmission to you. I am waiting for your response..
<b>PRIORITY</b>	Second highest message precedence (Non-life threatening, or property damage).
<b>RELAY</b>	Transmit this traffic to or for other stations.
<b>ROGER</b>	Message received and understood (It does not mean "yes" or signify agreement.)
<b>ROUTINE</b>	Fourth highest message precedence, below Outgoing Health and Welfare Traffic.

<b>SAY AGAIN</b>	Repeat.
<b>TEXT</b>	The body of a message.
<b>THIS IS</b>	This transmission is from ( <u>call sign</u> )
<b>TO</b>	Signifies the ADDRESS GROUP or CALL SIGN to whom the message is going.
<b>UNKNOWN STATION</b>	Call sign/identity of a station is unknown.
<b>STAND BY</b>	I must pause for a moment.
<b>WELFARE TRAFFIC</b>	Outgoing Health and Welfare traffic is third highest message precedence. Incoming H&W is fifth highest precedence, after Routine Traffic.
<b>ALL AFTER</b>	All the text that follows ( <u>the last word aiven</u> )
<b>ALL BEFORE</b>	All the text that precedes ( <u>the next word qiven</u> )
<b>WORDS TWICE</b>	Transmit each phrase or word twice, under difficult radio conditions.
<b>WRONG</b>	Your last transmission is not correct.

## ***Sending Traffic to the EOC***

When sending traffic to or from an EOC, proper protocol is a MUST. All California government agencies use the Standardized Emergency Management System (see the following section) when responding to multi-jurisdictional or multi-agency emergencies. When asked to send a message “To THE CITY EOC” ... ASK the originator for a more specific address that includes the SEMS Section, e.g.,

To: Logistics Section, Alameda County EOC  
 From: Operations Section, Albany EOC

If the name of an official is associated with the section function, add the specific name as a third line in the address. Remember, when operations are 24 hours a day, the specific individual may go off duty, but the message still needs to get to the correct SEMS Section.

## ***Confidentiality Considerations***

Emergency communications generate a large volume of communications traffic. Radio traffic, telephone messages and data systems enable information to be distributed to large numbers of users. Much of the traffic is mundane, hardly worth mentioning. Some of the information is of a highly sensitive nature, and must be dealt with in a discrete manner. It is essential that personnel involved with emergency operations be familiar with the types of message traffic that are generated and the need to carefully consider the method of transmission prior to the transmission of the traffic. Particular types of messages are automatically considered sensitive and warrant special handling...and are probably *not* best handled via amateur radio. Examples of these types of messages are:

- Messages concerning the death or injury of victims of the incident.
- Messages concerning the death or injury of emergency responders at the incident.
- Messages that affect the health and well-being of those people in and adjacent to the incident area.
- Messages of such a nature that the disclosure of the information could cause panic or other grievous harm to individuals, public or private.
- Messages of a private nature.
- All message traffic should be evaluated for its sensitivity and transmitted to its destination via the most appropriate method, which *may not* be amateur radio.

## ***Electronic Communications Interception***

The explosion of electronic communication technologies has been somewhat of a mixed blessing as far as confidentiality is concerned. Radios, facsimile machines, cellular telephones and computers have many benefits but also bring with them some inherent weaknesses that can, if understood, be minimized. Among the most obvious is

the problem of message content security and confidentiality.

Many of the electronic communications methods that are used in emergency communications allow interception by individuals other than the intended recipient. The widespread availability of equipment capable of receiving electronic information makes it essential that operators involved in emergency communications consider the nature of their traffic and the possible impact that the information could have if released to the public-at-large.

**RADIO COMMUNICATIONS.** Radio communications are, by their very nature, unsecured. Radios generally transmit over a wide area to allow base, mobile, and portable communications within the system service area. Most normal business communications are conducted 'in-the-clear'; that is, the content of the communication is not encrypted and can be received by any person who has access to radio receiving equipment such as a scanner. Communications of a confidential nature should not be conducted over the radio UNLESS there is a direct and immediate threat to life and/or property that requires immediate attention by Public Safety (police, fire, medical, etc.) agencies.

**CELLULAR TELEPHONES.** Cellular telephones allow for direct connection to the public telephone system from portable, mobile and fixed locations. They are somewhat more secure than general use business band radio systems, however, they are still susceptible to interception by scanner radio operators. Sensitive information should not be discussed over cellular telephones UNLESS there is a direct and immediate threat to life and/or property that requires immediate attention by Public Safety agencies.

**LANDLINE TELEPHONES.** Landline telephones, the ones that people are most familiar with, are the most secure type of communications. Direct connections via wire preclude interception by scanner radio operators. Interception is only possible by a technically competent technician and then only by court order. Discussion of confidential information on the telephone should only be done when it can be assured that both parties are able to conduct their conversation in private.

## THINKING ABOUT AN EMERGENCY RESPONSE

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### *Principles of Amateur Radio Emergency Communications Support*

- To **UNDERSTAND** the client's needs and priorities;
- to **EVALUATE** available resources;
- to **DEPLOY** resources;
- to **TELL** the client the level of service we are able to provide; and,
- to **ADVISE** of any changes.

### *Served Agencies*

ARES supports two categories of clients, **local agencies**, and those with which the ARRL has **national agreements**. Each client relationship is described in a formal agreement called a Memorandum of Understanding. Copies of these agreements are available, but are not essential to carrying out our responsibilities in an emergency.

National ARES agreements have been entered into by the ARRL with the following organizations:

American Red Cross  
Salvation Army  
National Weather Service (SKYWARN)  
National Communications System  
Federal Emergency Management Agency  
Associated Public Safety Communications Officers

Within the Tri-Valley, the following **local agencies** are covered by agreements. (Where these agencies are units of government, the agreements create a RACES response pursuant to Part 97 of the Communications Act.)

#### RACES

- City of Livermore
- City of Pleasanton
- City of Dublin

#### ARES

- Livermore Valley Joint Unified School District

In addition, we have an **informal client**, Valley Memorial Hospital, which has provided us with a site for our repeater and which may have communications needs in the event of emergency.

## **Setting Priorities**

- When requests exceed resources:
- Advise client and ask *them* to set priorities and make choices.
- Balance client needs. Try not to cut a client to zero resources.
- Assess level of restored communications assets. If cell-phones are available and reliable, and as hard wired phone service is restored, sites served may require less ARES/RACES support and resources could be redeployed to needier locations.
- Clients may be reluctant to release resources even after reliable communications are restored. It is the EC/Radio Officer's role to work with clients to reassign operator/equipment assets based on need and priority.

## **On-going Assessment of Needs**

It is likely that requests for service will be identified continuously as the response is mobilized. The ARES/RACES response depends on an on-going assessment of available resources, assessment of client needs, and a balanced allocation of operators and equipment.

## **What Is A Communications Emergency?**

It is important to ascertain whether the client is experiencing a communications emergency before deploying resources. An earthquake of moderate intensity may not present an immediate communication emergency. (Local telephone service was established very quickly following Loma Prieta in 1989, but shelter sites were selected which had little/poor telephone service. Radios were critical in coordinating shelter relocation.) It is always important to check with a client to verify their needs. If in doubt, initiate a resource net, and try to establish contact with the local client directly. Remember, we are not chasing clients; we are offering a service. If a client declines service, we accept that decision (but let them know how to contact us, should the situation change).

## ***What Is A Communications Requirement?***

When contacting a client to understand their communication needs, it is important to get the information you need to design a response, and to not take any more of their time than is absolutely necessary. The following are general planning questions that might help you identify the client's needs:

- What is the nature of the emergency (if not obvious)?
- Is this now, or is it expected to become a communications emergency?
- What locations or people need service?
- What is the relative priority of these locations/people to the client?
- How long does the client expect our service to be required?
- Are there special access requirements?
- Are there rendezvous instructions to link operators to locations/people requiring support?
- Does the client understand how to contact the EC/Radio Officer to adjust client needs?
- Does the EC/Radio Officer know how to contact the appropriate client official to advise on changing communications resource availability?

## ***Coping With Unknown Volunteer Operators***

The "radio operator" who appears on the net or walks into a location and offers to help can be either a "help" or a "hindrance". Here are some thoughts on how to handle these volunteers:

- Route all operators who are not registered to a central point for registration and orientation.
- At registration insist on seeing their amateur radio license, note class and expiration.
- Ask them for their emergency operating experience...talk to them...are they registered elsewhere...are they currently active in emergency communications, are they familiar with ICS and SEMS? Familiar with tactical calls? Technical experience? Equipment familiarity? What equipment do they have?
- Assess capabilities in general terms... **Highly Qualified...Qualified...Less Qualified**. (Tell Less Qualified volunteers that we are unable to use their service at this time but will keep their application for possible future use.)
- Only register those who agree to stay in the area, make sure that we know how to contact them, and that they know the schedule for resource check-in.
- At registration make sure that both ARES and RACES forms are filled out and signed.
- Put **Highly Qualified** and **Qualified** operators on assignment schedule/roster (keep records !).
- If at all possible, assign unknown volunteers to a team with an experienced, registered operator for a shift. This provides the volunteer a chance to get the feel of our operation, to confirm the skills assessment, and to prepare the volunteer for handling an assignment solo.
- If a solo assignment must be made, start with shelter work. As capabilities and skills are demonstrated, the volunteer can be moved into critical, high-stress positions.

## ***Client Contacts***

In emergency situations of less wide-spread impact than an earthquake, it should be expected that clients will be able to contact us to request service. Clients are provided with a contact roster and know to contact this list of operators. The first operator contacted should make sure that the requestor is clearly identified, as well as the means to re-contact the client to advise on our response status and level of service.

The first operator contacted has the responsibility to initiate a response unless/until relieved by the EC/Radio Officer (see the following section).

## ***Initial Activities***

1. Monitor primary ARES/RACES local frequency. Is repeater on the air? If not use simplex on Output.
2. Is there a net? If not, start one.
3. Activate phone tree, if appropriate. Check for adjacent or area-wide ARES/RACES nets.
4. Monitor local news sources. (Often the lack of news, or absent radio/TV is an indicator)
5. Call/Contact local emergency agencies (all with whom your ARES/RACES unit has a formal relationship). If phones don't work, send operators to serve as liaison/initial operators. Advise them of ARES/RACES status; be prepared to respond.
6. Determine Action Level (for EACH client):
  - Stand Down** - no ARES/RACES service needed or expected
  - Stand By** - ARES/RACES service needs not known, but possible
  - Alert** - ARES/RACES service probably needed, but requirement uncertain
  - Activate** - ARES/RACES service needed, initial requirements known
7. Ensure Emergency Agencies know how to contact/activate ARES/RACES

## ***Action Levels***

### **STAND DOWN**

1. Verify that all potential Emergency Agencies have no identifiable potential response needs
2. Advise net that no local ARES/RACES response is expected.
3. Advise to monitor neighboring and area-wide nets for possible mutual aid service
4. Secure net if no response local or mutual aid is expected.
5. Ensure that Emergency Agencies know how to contact ARES/RACES for support if the situation changes.

### **STAND BY**

1. Continue Net - advise members of status
2. Activate phone tree
3. Log Resource availability
4. Establish check-back schedules/roll call to verify resource availability
5. Continue monitoring adjacent area and area-wide nets.
6. Contact all potential clients
7. Start developing your strategy that balances all clients' needs (present/anticipated)
8. Review Plan for orienting mutual aid resources
9. Review Plan for orienting and registering volunteers who spontaneously appear
10. Maintain regular and periodic contact with local emergency agencies
11. Monitor local news sources for area status
12. Plan initial operator schedules

### **ALERT**

1. Separate Resource and Tactical Response Nets
2. Continue to log resources and continue check back roll call schedule
3. Assign and deploy liaison to Emergency Agencies - EOC or Equivalent (if not done earlier)
4. Advise net of status of response
5. Maintain contact with all potential clients to ensure appropriate planning.
6. Assign operators to staff your spontaneous volunteer/mutual aid registration/orientation plans.

### **ACTIVATE**

1. Determine Specific Mission Requirements
  - Sites to be Activated (fixed, mobile, shadow)
  - Expected Duration of Activation
  - Status of radio assets at those sites

- Mission # Assigned - if RACES
  - Verify line of communication/responsibility
  - If multiple clients are involved, identify all needs before deploying operators.
2. Plan and implement specific ARES/RACES Response
    - Number of Operators and equipment required
    - Nets Required
    - Tactical, resources, mutual aid, shelter, etc
    - Schedule/Assign Operators
    - On going activation requires planning for 24 hour service
    - Deploy Operators
  3. Report to Client when response is in place.
  4. Maintain regular contact with client to adjust response over time
  5. Assess adequacy of ARES/RACES resources, request mutual aid through client if necessary
  6. Maintain awareness of ARES/RACES operator performance, adjust schedules if operators fatigue earlier than anticipated
  7. As the event evolves, assess changing technical requirements and plan to meet needs as they emerge (e.g. packet, HF)
  8. Balance needs of clients to assure that critical, high priority needs are met.

## ***Wilderness Protocol***

The Wilderness Protocol call for hams in the wilderness to announce their presence on, and to monitor, the national calling frequencies for five minutes beginning at the top of the hour, and every three hours from 7 AM to 7 PM while in the back country. A ham in a remote location may be able to relay emergency information through another wilderness ham who has better access to a repeater. Calling frequencies are (MHz):

- 52.525
- 146.52
- 223.50
- 446.00
- 1294.50

In the event of an urban emergency, the NCS may invoke the Wilderness Protocol as an instruction for local amateur radio operators to check in at regular times and on a simplex frequency. This method of check-in keeps the main repeater frequencies clear, but helps insure that unassigned operators are kept informed and available for assignment.

## **ABREVIATIONS AND ACRONYMS**

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AC	Alternating Current
AEC	Assistant Emergency Coordinator
AGM	Absorbed Glass Mat
ALCO	Alameda County
ARECC	Amateur Radio Emergency Communications Course (ARRL)
ARES	Amateur Radio Emergency Service
ARRL	American Radio Relay League
AWG	American Wire Gauge
BBS	Bulletin Board System
BCI	
BNC	

BT	
CA	California
CCA	Cold Cranking Amps
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
COV	Community Outreach Vehicle (Livermore Police Department)
CTCSS PL	Continuous Tone Coded Squelch System
CW	Continuous Wave (Morse code)
DoD	Depth of Discharge
EC	Emergency Coordinator
EOC	Emergency Operations Center
FCC	Federal Communications Commission
Hz	Hertz (cycles per second)
ICS	Incident Command System
ID	Identification
k	kilo (x 1,000)
LLNL	Lawrence Livermore National Laboratory
LPD	Livermore Police Department
LPFD	Livermore Pleasanton Fire Department
LVJUSD	Livermore Valley Joint Unified School District
M	Mega (x 1,000,000)
MCA	Marine Cranking Amps
MRE	Meals Ready to Eat (Department of Defense issue)
N	
NC	Net Control
NCS	Net Control Station
OEM	
OES	Office of Emergency Services
Ops	Operations
PBBS	Packet Bulletin Board System
PTT	Push To Talk
Q	
RACES	Radio Amateur Civil Emergency Service
REC'd	Received
Reg	Region
RG	
SAC	Sacramento
SEMS	Standardized Emergency Management System
Sg	Specific gravity
SHF	Super-High Frequency
SLA	Sealed Lead Acid
UHF	Ultra-High Frequency
USCG	U. S. Coast Guard
VHF	Very High Frequency
VOX	Voice Operated switch